ESCALATOR OPERATIONS
AND MAINTENANCE MANUAL

MECHANICAL AND ELECTRICAL
VOLUME 1

FINAL

NEW YORK CITY TRANSIT AUTHORITY
HERALD SQUARE PHASE IV
(HS 11/12)

CONTRACT No. E-34011
ESCALATOR No. E235, E236

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HERALD SQUARE
PHASE IV ESCALATORS
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FUJITEC STANDARD WARRANTY

Fujitec America, Inc. (Fujitec) has furnished, under the Contract Agreement made as of the ___ th day of _____ , 19___, for _____ in the building known as _____ located at _____ and, hereby, warrants each escalator against defects in material and workmanship under normal use for one (1) year, and guarantees to provide repair or replacement free of charge (during normal working hours) for each escalator which, in the opinion of the Fujitec Engineering Department, proves defective as the result of normal use and service. Such replacement or repair shall be the exclusive remedy for any breach of this warranty. Fujitec assumes no responsibility for work done by others, or the defects brought about by abuse, misuse, neglect, or causes beyond Fujitec's control.

This warranty is effective providing:

(1) Regular scheduled maintenance is performed in conformity with Fujitec standards.

(2) The escalator equipment is taken out of service immediately upon the discovery of defects, with prompt written notice given to Fujitec, within ten (10) days of the discovery of facts giving rise to a claim.

This warranty is in lieu of all other warranties, express or implied, including any warranties of merchantability or fitness for a particular purpose.

The warranty period commences on the established date of final acceptance of each unit and is effective for one (1) year, pursuant to the following schedule:

Unit#	Type	From (Date of Final Acceptance)	To (End of (Warranty)
(LIST)			

Fujitec America, Inc.

By: _____

Title: _____

Date: _____

CONTRACT E-34011
HERALD SQUARE
PHASE IV ESCALATORS
E-235 & E-236

FUJITEC PS-S Model 800
HEAVY DUTY TRANSIT ESCALATORS
(2881 HERALD SQUARE L01/M01)

CONTRACTOR (24-Hour Emergency Service)

Fujitec America, Inc. - New York Branch
One Donna Drive
Wood-Ridge, NJ 07075
Phone: 201-438-8400
Fax: 201-438-0328

MANUFACTURER

Fujitec America, Inc.
401 Fujitec Drive
Lebanon, OH 45036
Phone: 513-932-8000

CONTRACT E-34011
HERALD SQUARE
PHASE IV ESCALATORS
E-235 & E-236

FUJITEC PS-S Model 800
HEAVY DUTY TRANSIT ESCALATORS
(2881 HERALD SQUARE L01/M01)

APPLICATION	**E-235 & E-236**
Speed (feet/minute)	90 FPM Inspection 15 FPM Sleep Mode 15 FPM
Step width (inches)	24
Vertical rise	28'-7 5/16"
Power supply Main	200 VAC, 3-phase, 60 Hz
Lighting	120 VAC, 1-phase, 60 Hz
MOTOR	Lincoln
Horsepower	20
RPM	1170
Running current (full load amps)	60
GEAR REDUCER	Cone Textron MHO80-5
Gear Reducer Ratio	25:1
MACHINE BRAKE	Mayr M250 Duo
ARCHITECTURAL MATERIALS and FINISHES	
Interior panels	Stainless steel 304 11GA #4 stainless steel
Skirts	Stainless steel 304 11GA black teflon
Decks	Stainless steel 304 11GA #4 stainless steel
Handrail	black rubber w/white round marks

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PHASE IV ESCALATORS
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A) DRIVE MACHINE, MOTORS, AND TENSION CARRIAGE

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

A.1 DRIVE MACHINE

Herald Square Phase II escalators E-235 and E-236 have underslung drive machines. Each is mounted in an open metal cage suspended directly beneath the upper section of each escalator.

The drive machine components are as follows:

- Main Drive Motor
- Coupling
- Gear Reducer
- Dual Machine Brake

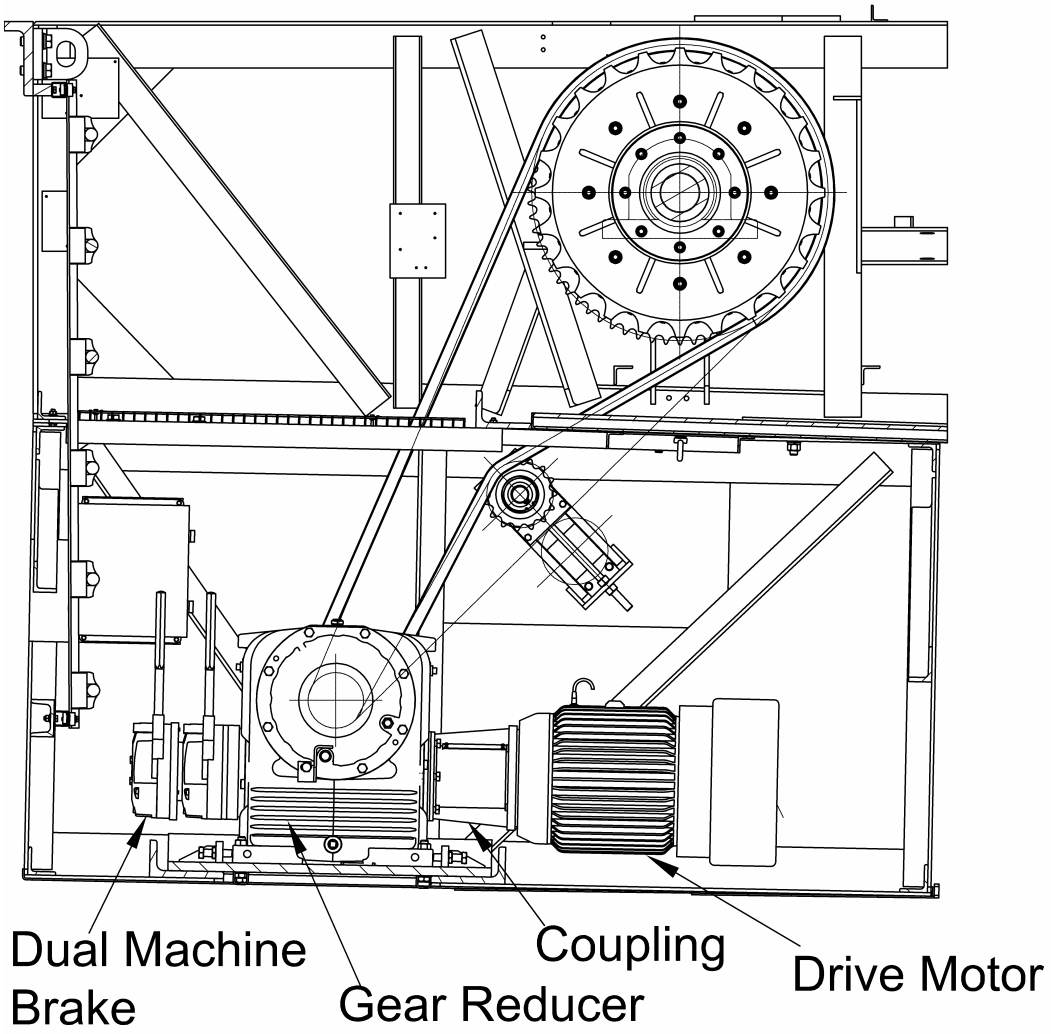


Figure A-1 Drive Machine Installation

The gear reducer has a worm under gear arrangement with the main drive motor c-face mounted (with an adapter and coupling) to the drive end of the input. The opposite end of the reducer input has a mounting plate and shaft for the dual machine brake.

A double strand chain sprocket is mounted on the gear reducer output shaft on the right side of the reducer (as viewed from behind the motor).

The output shaft of the drive motor transfers power to the worm (input) shaft of the gear reducer. The gear reducer, in turn, transfers motor torque through its gear output shaft to the chain sprocket. This sprocket is connected via the main drive chain to the main drive assembly in the upper truss.

The main drive assembly then delivers motion to the main drive shaft, step chain sprockets, and handrail drive sprockets.

The dual machine brake, which stops escalator motion, is mounted on the extended side of the gear reducer's worm input shaft. Brakes are discussed in Mechanical Section B.

The machine normally drives the steps at a speed of 90 feet per minute (27.4 meters per minute). Inspection (maintenance) speed is 15 feet per minute (4.57 meters per minute).

A.1.1 Sleep Mode

In addition, during periods of inactivity, sleep mode is engaged to reduce the drive speed to 15 feet per minute (4.57 meters per minute).

Sensors at the upper and lower ends of the escalator monitor for the presence of passengers. After a preset time delay of inactivity, the control system slows the drive to the sleep mode speed.

When a passenger passes through the infrared light beam, the control system responds to the broken light by returning the escalator to the 90 feet per minute (27.4 meters per minute) speed.

For more information on the Sleep Mode, refer to Electrical Section of this manual.

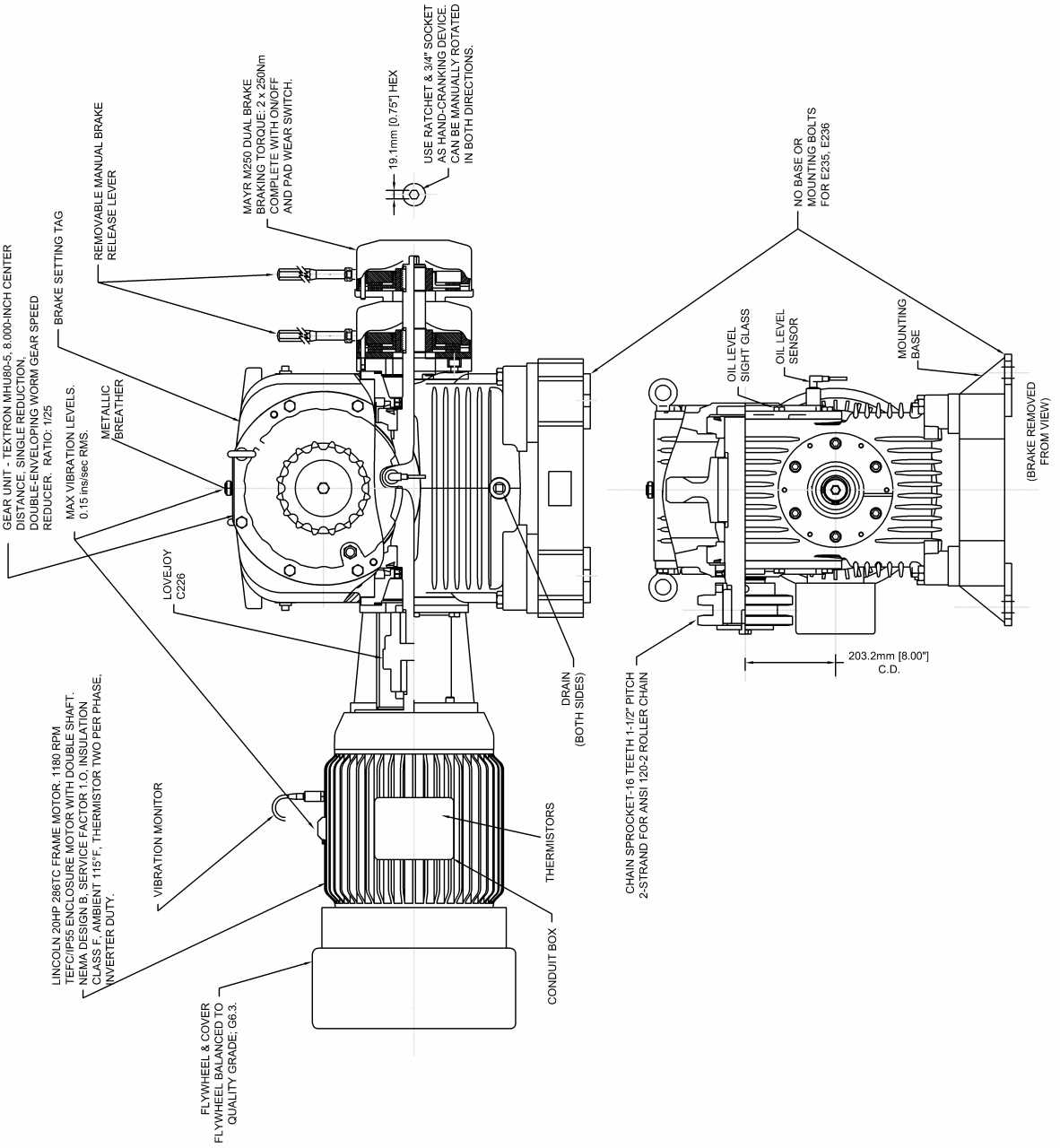


Figure A-2 Machine Assembly

A.2 DRIVE MOTOR

The 20 HP drive motor is a Lincoln 3-phase, 200V AC, totally enclosed fan cooled (TEFC) unit, rated at a speed of 1175 RPM.

It contains a thermistor for over-temperature shut down and a vibration monitor.

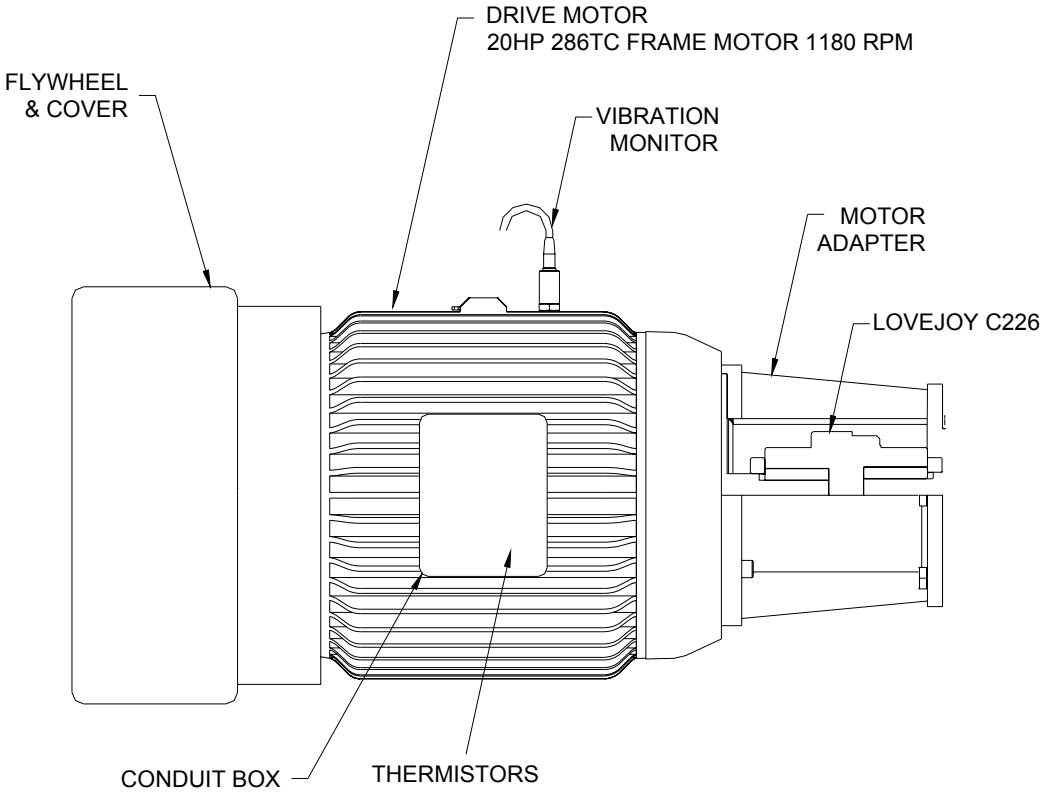


Figure A-3 Drive Motor

A.2.1 Coupling

A cast iron Lovejoy C-226 coupling connects the drive motor output shaft to the gear reducer worm (input) shaft. The coupling's rubber cushion set acts as a damper to reduce vibration and noise and accommodates small misalignment of the gear reducer.

A.3 GEAR REDUCER

The gear reducer is a single reduction, double-enveloping worm gear speed reducer by Cone from Textron Power Transmission with an 8.0” center distance.

It has an oil level sight gauge, low oil level sensor, breather/fill, and a drain plug.

The input shaft has a motor adapter and coupling on one end and a brake adapter on the other end.

The gear reducer takes the power from the drive motor through its worm (input) shaft and delivers motor torque through its gear output shaft at a ratio of 25:1. The output shaft drives the two-strand chain sprocket that connects via the main drive chain to the main drive assembly in the upper truss.

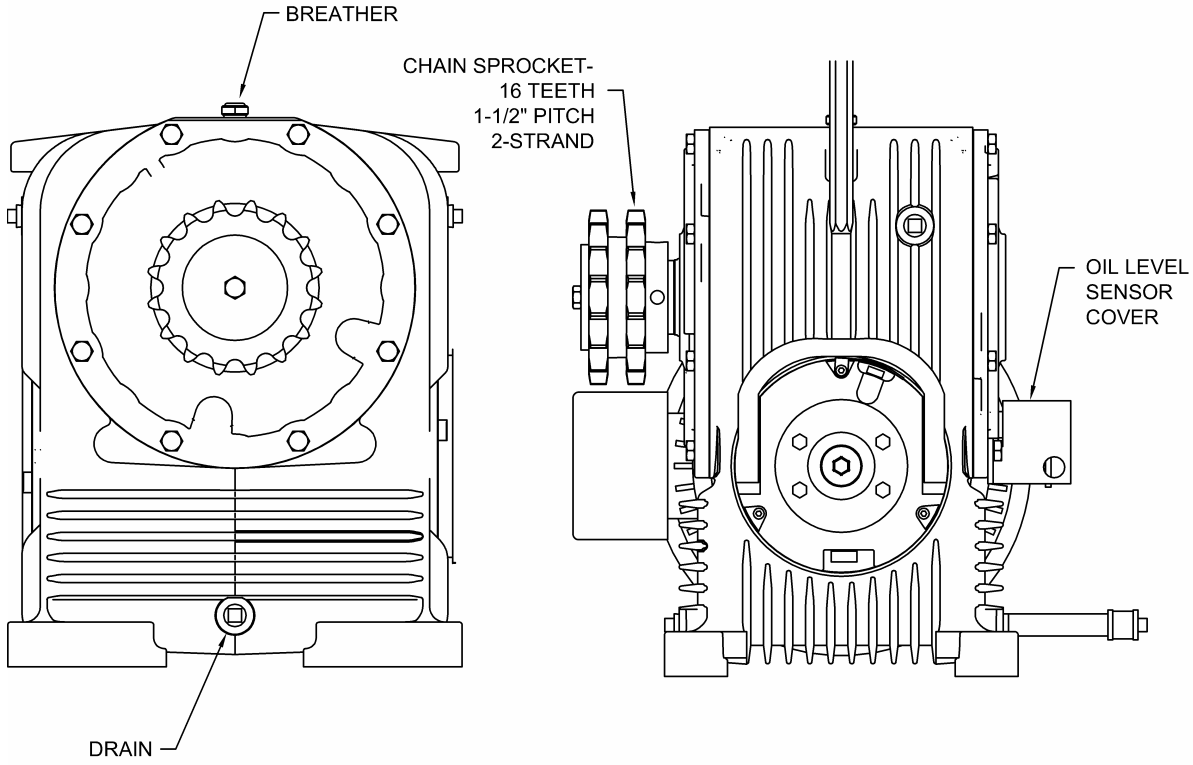


Figure A-4 Gear Reducer

A.4 MAIN DRIVE ASSEMBLY

The main drive consists of the main drive shaft, main drive chain sprocket, handrail drive sprocket, two step chain sprockets, a ratchet for the pawl brake, and split bearings on each end of the shaft.

The main drive chain sprocket is bolted to the left-hand step chain sprocket. The handrail first drive sprocket is bolted to the right hand step chain sprocket.

The main drive receives its motion from its connection to the drive machine. The main drive chain connects the 2-strand chain sprocket on the gear reducer to the double main drive chain sprocket on the main drive shaft in the upper truss.

The main drive, in turn, transmits torque to the step chain sprockets and handrail drive sprocket.

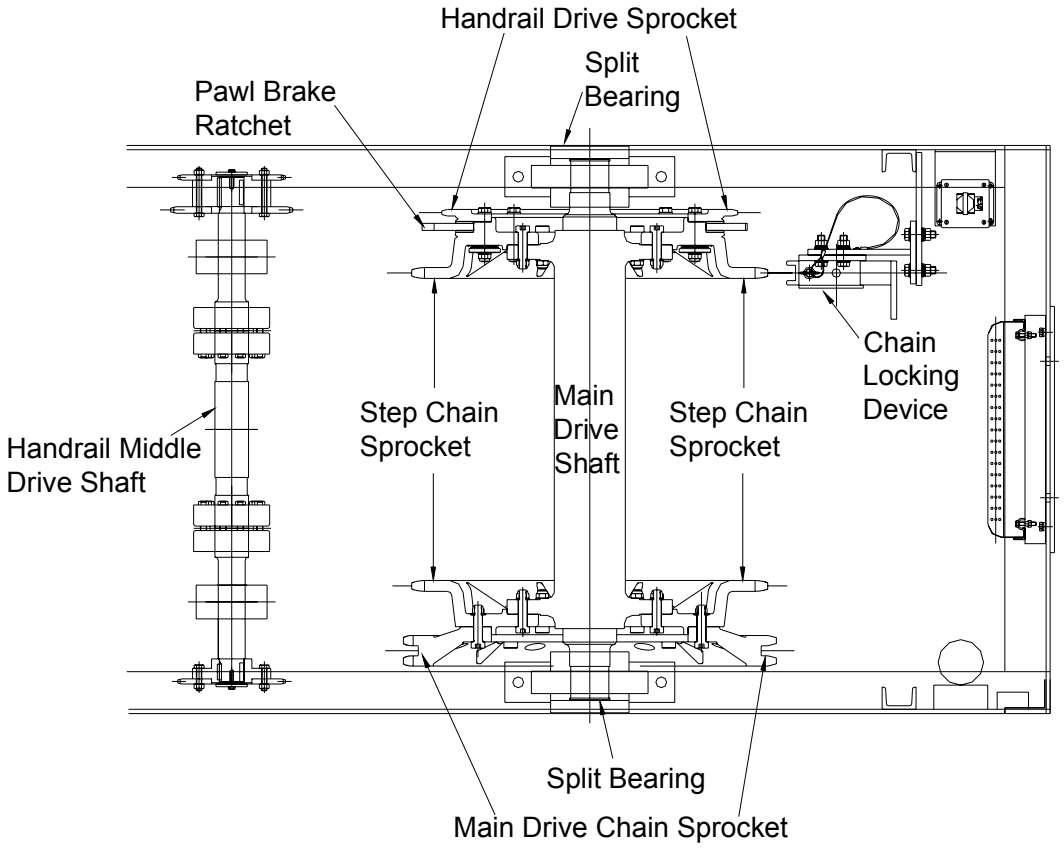


Figure A-5 Main Drive Assembly

A.5 TENSION CARRIAGE

The tension carriage is located in the lower end of the truss. It maintains the proper tension in the step chain by eliminating slack through the use of compression springs.

The tension carriage contains two sprockets independently rotating on a stationary shaft. The shaft is fixed on each end to a frame which has two rollers. The rollers ride on a carriage rail fastened to the truss.

There is a lip on the roller to prevent lateral movement. This prevents crabbing so the steps do not enter the combplate in a skewed position.

The tension carriage and lower turn track allow for enough chain stretch to remove one step and chain section.

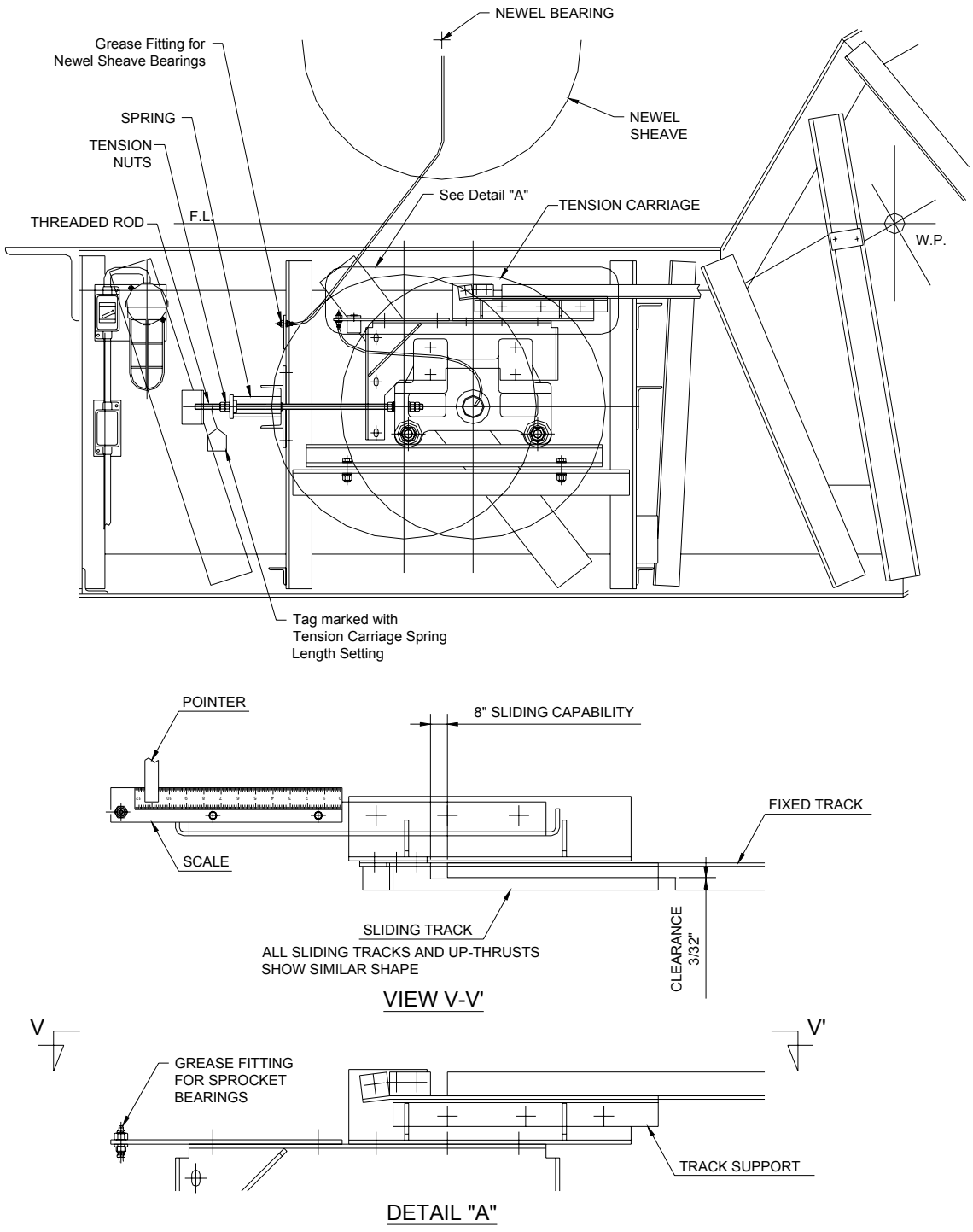


Figure A-6 Tension Carriage

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Drive Motor
- Coupling
- Gear Reducer
- Main Drive Shaft
- Tension Carriage
- Main Drive Chain

A.6 DRIVE MOTOR ADJUSTMENT

Inspect and adjust the drive motor as follows:

1. Clean all grease fittings. (See service schedule for when to lubricate.)
2. Remove grease outlet plugs.
3. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.
4. Reinstall grease outlet plug.
5. Check the mounting bolts to insure they are tight.
6. Check that the motor is clean.
   - Check that the interior and exterior of the motor are free of dirt, oil, grease, water, etc.
   - Debris can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
7. Use a “Megger” periodically to ensure that the integrity of the winding insulation has been maintained.
   - Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
8. Listen for any unusual noise, growling or whining. This could be caused by debris in the air vents or damaged bearings.

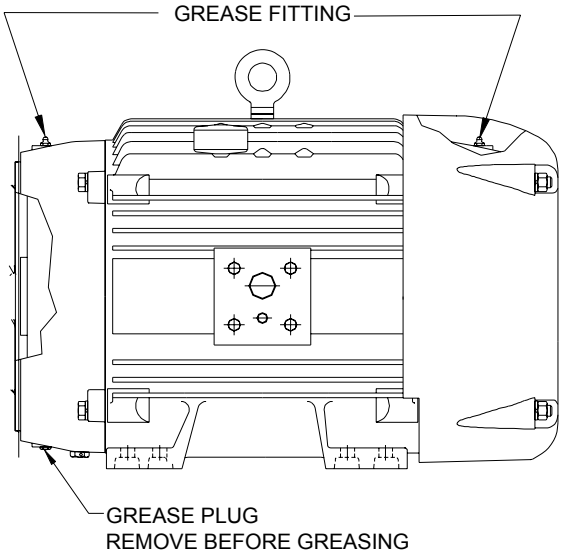


Figure A-7 Typical Drive Motor Grease Fittings and Drain Plug

A.7 COUPLING ADJUSTMENT

Inspect and adjust the coupling as follows:

1. Check for unusual vibration and/or noise.
    - If the coupling is not aligned properly, it will vibrate or make a loud beating sound. Check the mounting bolts to insure they are tight.
    - The same sound and vibration will occur when the cushion set is worn and in need of replacement.
2. Shut down the escalator immediately if unusual vibration or noise is present.
    - Misalignment of the machine may be a symptom of a larger problem.
    - Realign the coupling, motor, and gear reducer.
3. Inspect the cushion set (Lovejoy hytrel #685144-27529).
    - Replace the cushions if worn, cracked, or hard or realign the coupling, motor and gear reducer.
    - The cushion's original dimensions are 5/8" x 1-3/8" x 1-3/8". Replace the cushion immediately and never operate the escalator if there is a dimensional change of any cushion dimension greater than 25%.
4. Check coupling for excessive play.
    - Excessive play may indicate a loose setscrew or damaged key and/or keyway.
    - Replace the coupling as needed.

Figure A-8 Coupling Hub

A.7.1 Misalignment Overview

The function of a coupling is to connect driving and driven equipment. In addition, a coupling serves to protect costly equipment from the effects of misalignment, shock loads, vibration and shaft end float. Of these factors, the most common is misalignment and end float (also known as axial misalignment).

Misalignment is a condition created by two shafts whose axes are not in the same straight line. There are three forms of misalignment: parallel, angular, or the combination of the two. End float is the relative motion of two shaft ends.

Parallel misalignment occurs when the axes of the connected shafts are parallel, but not in the same straight line (item 1 in Figure A-9).

Angular misalignment occurs when the axes of the shafts intersect at the center point of the coupling (item 2 in Figure A-9).

End float occurs when one shaft moves along its axis relative to the other shaft.

Misalignment can result from a combination of manufacturing tolerances, poor installation practices, thermal growth or shrinkage, foundation movement, and/or component wear.

The combination of angular and parallel misalignment within a system may be more detrimental to the coupling and equipment than either of the individual misalignments.

Axial misalignment, which is the result of thrust loads, reaction loads or heat generated movement, compounds the problem.

Understanding the amount of misalignment that the coupling must handle or installing a coupling where it exceeds a maximum rated misalignment can result in premature coupling failure and/or significant equipment damage.

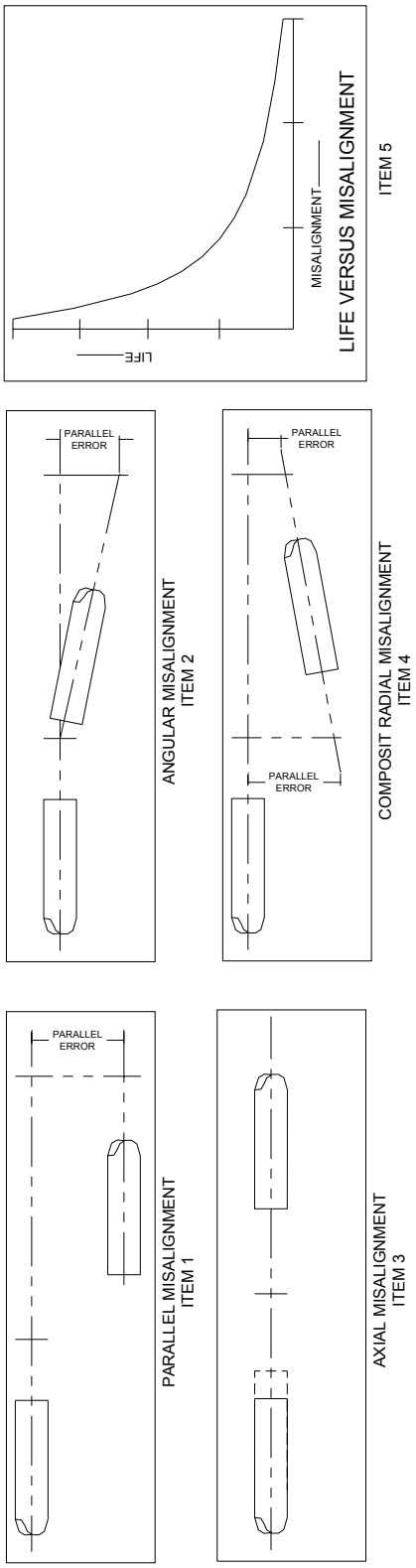


Figure A-9 Misalignment Examples

A.7.1.1 Misalignment and Coupling Failure

The life expectancy of a coupling is affected by the degree of misalignment.

The larger the misalignments, the shorter the life of the coupling (item 5 on Figure A-9).

Misalignment may cause heat generation, fatigue, and an increased in wear in bearings of the drive and driven components.

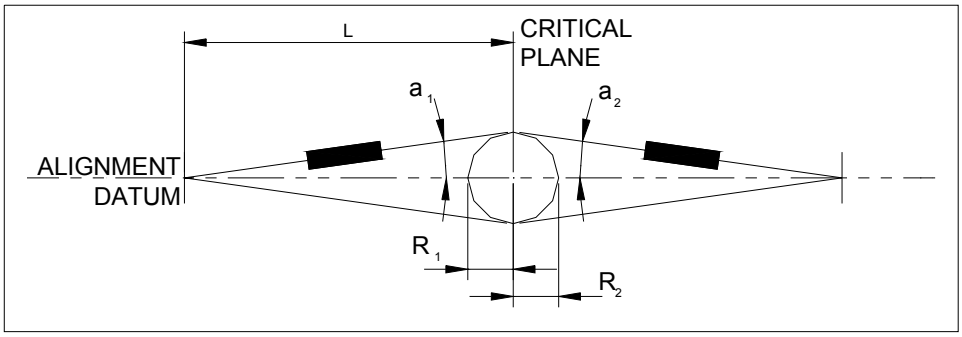
WHEN MISALIGNMENT CANNOT BE MEASURED

The following method can be used to estimate angular, parallel and combined misalignment when measuring the misalignment of a system is not possible or when designing a new system.

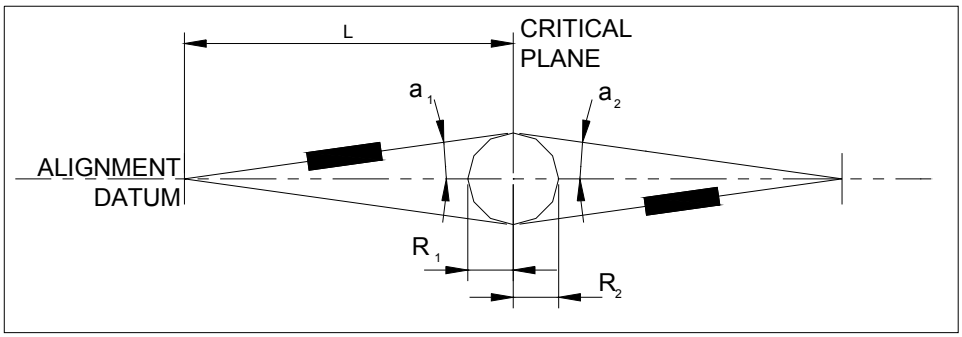
Each type of misalignment is first calculated and then the results are combined.

To calculate the maximum angular misalignment, the distance (L) and the angle (a) must be known or estimated.

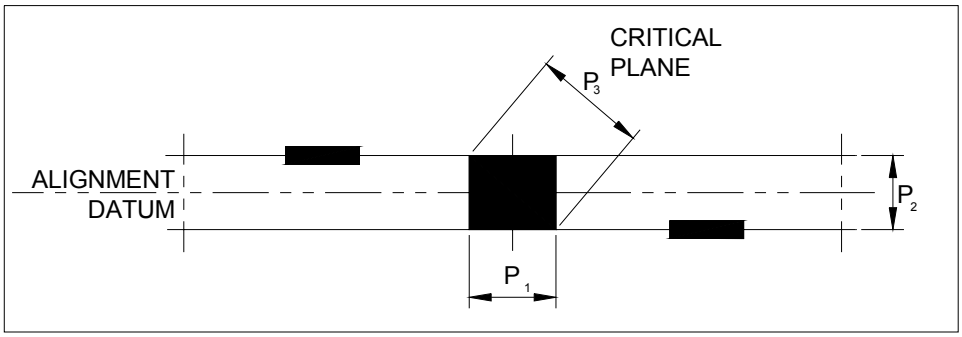
- First, calculate the angular misalignment noting the critical plane or midpoint of the shaft ends.
- Second, using the maximum parallel misalignment, be sure to consider both horizontal and vertical directions (item 3 in Figure A-10). Maximum parallel misalignment occurs when the shafts are diagonally opposed.
- Third, combine the results.



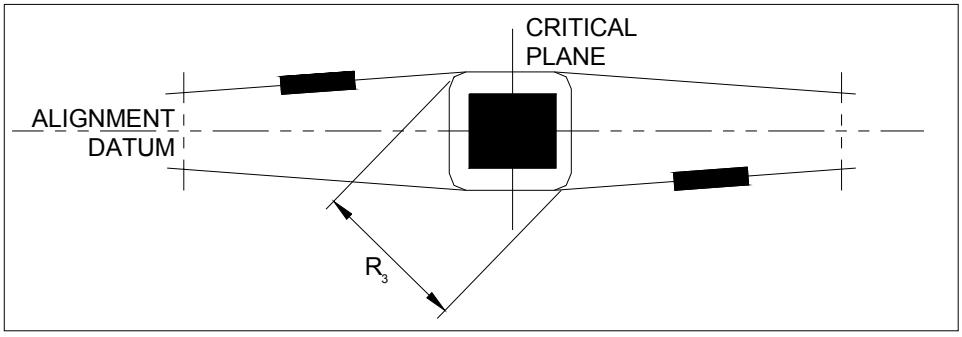
ITEM 1



ITEM 2



ITEM 3



ITEM 4

Figure A-10 Misalignment Illustration

WORKED EXAMPLE

Calculate the worst possible composite alignment, misalignment when:

a_1 max = $\pm$0.4° a_2 max = $\pm$0.4°

P_1max = 0.008 in. P_1max = 0.2mm

P_2max = 0.008 in. P_2max = 0.2mm

1. Worst possible angular misalignment (item 1 in Figure A-10) = a_1+a_2

   =0.4°+0.4°

   =0.8°

2. Maximum radial misalignment (item 2 in Figure A-10) = R1+R2

   Since a_1 and a_2 are equal, $R_1= R_2$

   Calculate for 2(R_2)

   =2(tan a_1 xL) =2(tan a_1xL)

   =2(tan 0.4x3) =2(tan 0.4x75)

   =2(0.007x3) =2(0.007x75)

   =0.042in =1.05mm

3. Maximum parallel misalignment P3 (item 3 in Figure A-10) = $\sqrt{P12+P22}$

   $=\sqrt{0.008^2+0.008^2}$ $=\sqrt{0.2^2+0.2^2}$

   =0.0113inches =0.28mm

4. Worst possible misalignment (item 4 in Figure A-10) where RC = R1+R2+P3

   =0.042+0.0113 =1.05+0.28

   =0.0533inches =1.33mm

No matter how relatively minor angular misalignments are, they can produce disproportionate radial misalignments.

In this example, they account for approximately 80% of the worst possible composite misalignment.

A.8 GEAR REDUCER ADJUSTMENT

Inspect and maintain the gear reducer as follows:

NOTE

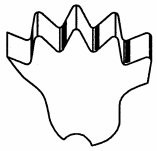
For the manufacturer's maintenance recommendations for this gear reducer, please refer to the Cone / Textron documentation provided in the Vendor Manuals binder of this set.

1. Check for excessive noise and vibration, which could indicate bearing failure.
2. Check oil level using the oil level plug. Check condition of oil.
3. If oil level is low, add MOBIL Glygoyle 320 oil or equivalent lubricant (Klűbersynth UH1 6-320).
4. If oil level is high, remove excess.
    - It is important that oil remain at the correct level. Excess oil will cause heat build-up from excessive oil agitation and may cause seals to leak.
5. Check seals for excess wear or leaks.
    - Replace seals, as needed.
6. Change oil according to service schedule.
    - Use only the recommended oil or equivalent.
7. Check the output sprocket for excessive or unusual tooth wear (Figure A-11).
    - Replace or align, as needed.

(1.) NORMAL CONTACT OF SPROCKET TEETH.

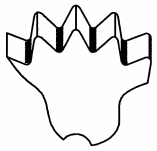
A. IN CASE OF DRIVING SPROCKET.

CONTACT IS MADE EVENLY AT A POSITION JUST ABOVE THE BOTTOM (ROOT) OF TOOTH.



B. IN CASE OF IDLER OR TIGHTENER.

CONTACT IS MADE EVENLY AT CENTER BOTTOM (ROOT) OF TOOTH.



(2.) ABNORMAL TOOTH CONTACT, CAUSES AND COUNTER–MEASURES.

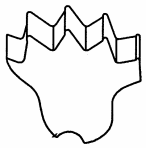
PHENOMENA	CAUSES	COUNTER–MEASURES
 UNEVEN CONTACT OF TOOTH	RUN–OUT OF SPROCKET AND CHAIN CENTERLINE. (SETTING ERROR)	CORRECT THE SETTING POSITION.
		IF THE MISALIGNMENT CANNOT BE CORRECTED, CORRECT THE SHAPE OF TOOTH.
 WEAR AT SIDE OF TOOTH. GENERATION OF NOISE.	MISALIGNMENT BETWEEN SPROCKET AND CHAIN. (SETTING ERROR)	CORRECT THE SETTING POSITION.
		IF THERE IS EXCESSIVE DAMAGE TO THE SPROCKET, REPLACE THE SPROCKET.
 ABNORMAL WEAR. INCORRECT MESHING.	ABNORMAL EXPANSION OF THE CHAIN. (INCORRECT LUBRICATION OF CHAIN, ABNORMAL LOAD.)	REPLACE BOTH SPROCKET AND CHAIN.
		CHECK THE CHAIN FOR PROPER LUBRICATION AND LOAD.

Figure A-11 Sprocket Tooth Wear

A.9 MAIN DRIVE SHAFT ADJUSTMENT

Inspect and adjust the main drive shaft as follows:

1. Check for bearing noise.
2. Apply new grease into grease fittings per maintenance schedule. Use Mobilith AW2 (green) or equivalent.
3. Check for sprocket wear (Figure A-11).

A.10 TENSION CARRIAGE ADJUSTMENT

Inspect and adjust the tension carriage as follows:

1. Remove 5-6 steps and move the opening over the tension carriage frame. (Refer to Mechanical Section F.)
2. Inspect the rollers and carriage rail for rust and debris.
    - Clean, if necessary.
3. Replace the steps and run the escalator at inspection speed to check that the steps enter the combfingers squarely.
    - Adjust spring compression, if necessary (Figure A-12). A tag hanging from the threaded rod is marked with the tension carriage spring length setting.
4. Check alignment of rails. If meshing of the step chain is heard, check the following:
    - Height of track. Adjust if necessary.
    - Spring force of tension carriage. Adjust if necessary.
5. Add grease to tension carriage bearings per maintenance schedule.

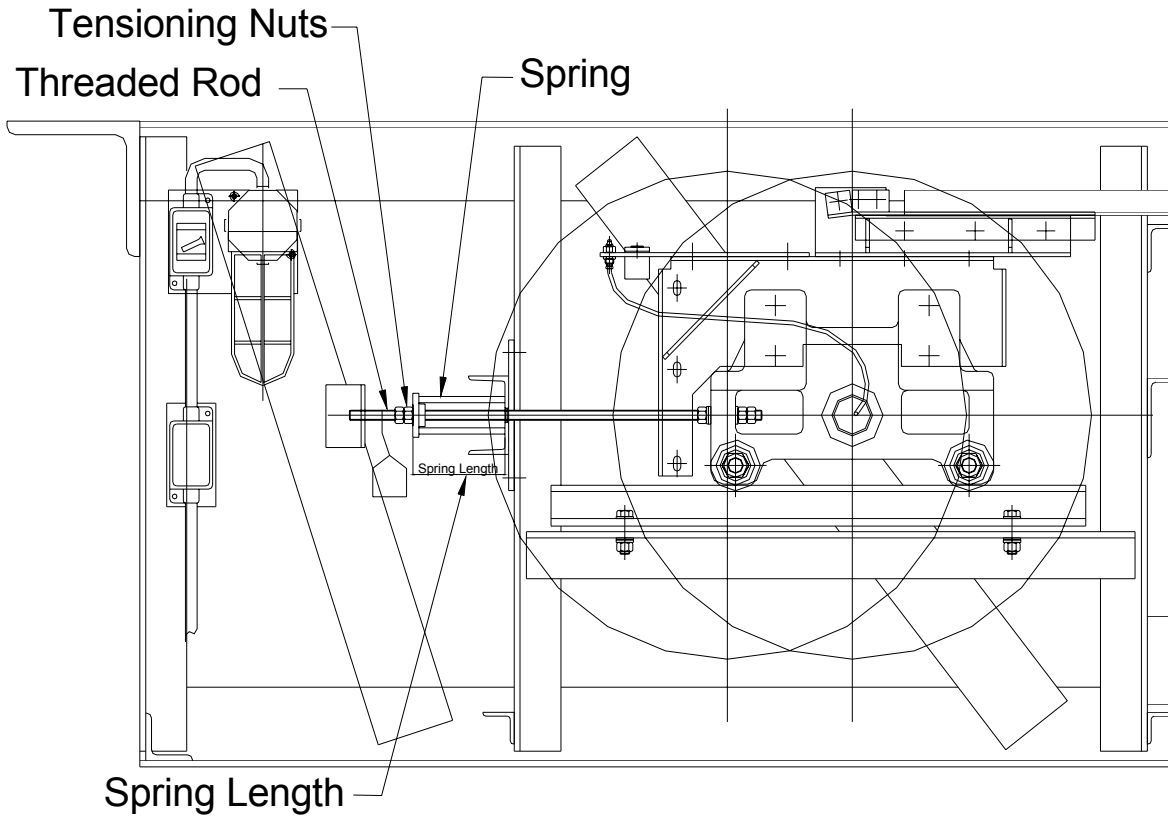


Figure A-12 Tension Carriage Adjustment

A.11 MAIN DRIVE CHAIN ADJUSTMENT

Inspect and maintain the main drive chain as follows:

1. Check for abnormal wear or corrosion on the main drive chain rollers and links.
2. Verify that the chain is adequately lubricated.
    - Adjust the auto lubricator, if necessary.

A.11.1 Check Main Drive Chain Slack

Check for main drive chain slack as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the upper floorplate sections.
3. Plug the maintenance pendant into the upper inspection station socket.
4. Switch the controller key to Inspection.
5. Remove the floor grating to gain access to the underslung machine space and climb down into the space using the ladder.
6. Run the escalator a few steps in the DOWN direction and stop.
7. Measure the length of “L” along the main drive chain – from the point on the chain at right angles to the center of the main drive chain sprocket on the main drive axle to the point on the chain at right angles to the center of the main drive chain sprocket on the gear reducer.
8. Measure the slack “S” of the main drive chain.
    - Slack “S” should be approximately 2% of “L”.
9. If the chain does not have proper slack, adjust the main drive chain idler.
    - Loosen the two bolts which lock the adjustable idler to the base.
    - Loosen one nut on the threaded rod and turn the other to slide the idler in or out.
    - Adjust to proper chain slack and tighten hardware.
10. For an abnormally stretched chain, replace the chain.

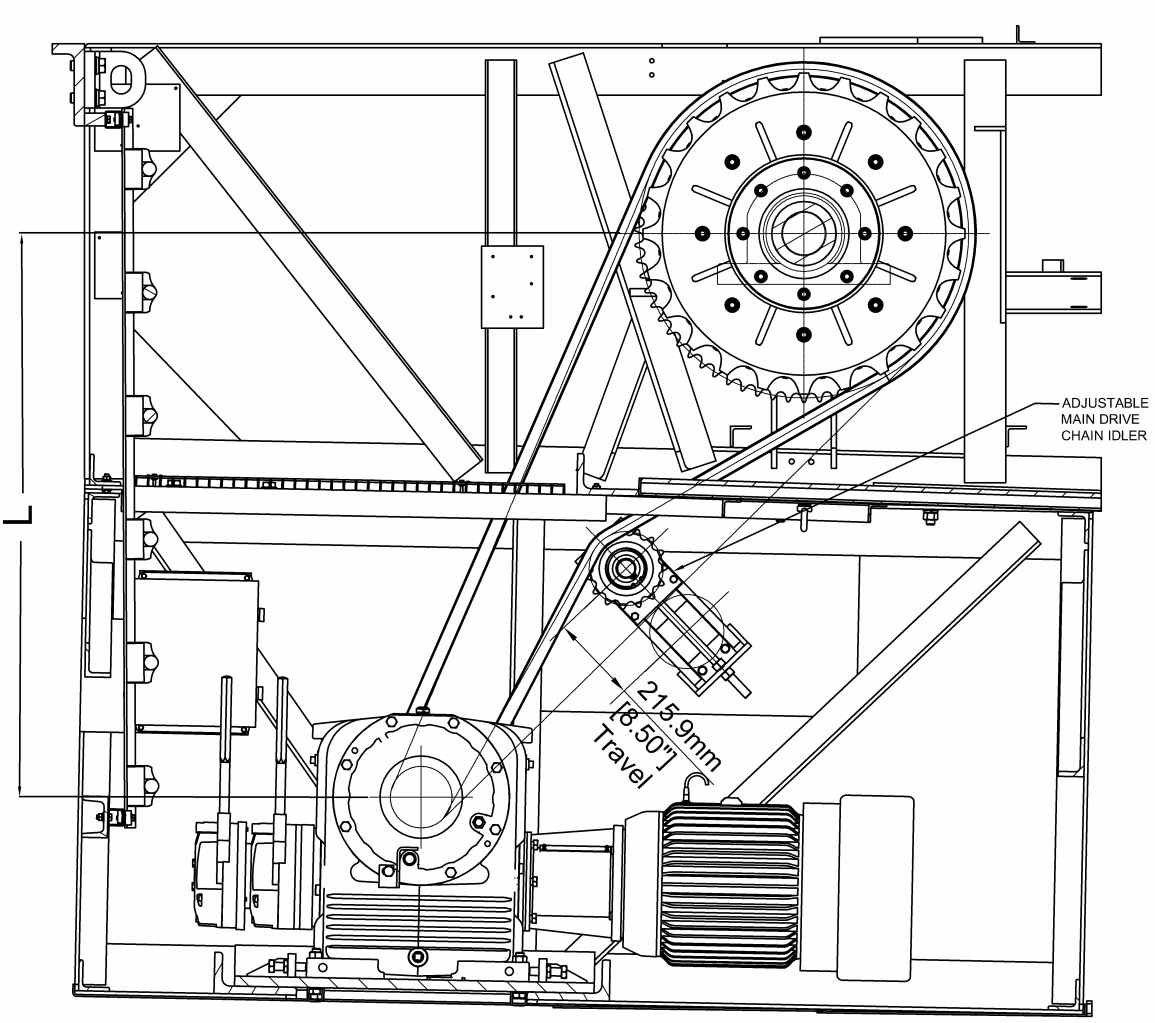
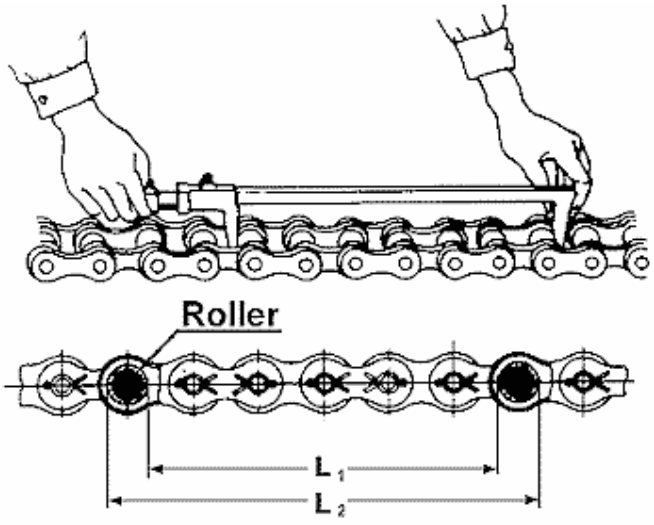


Figure A-13 Proper Main Drive Chain Slack – E-235 & E-236

A.11.2 Check Main Drive Chain Elongation

Check for main drive chain elongation (stretch) as follows:

1. Place the escalator in Inspection mode.
2. Remove the chain guard.
3. Use calipers to measure six links of main drive chain (L1 and L2 measurements in Figure A-14).
4. Record your L1 and L2 measurements.
5. Use these equations to calculate chain elongation (“E”).
    - L = (L1+L2)/2
    - E(%) = ((L-S)/S) x 100 where S = standard length
    - Standard length for 6 links of an RS-120 chain is 228.6mm (9”).
6. If E > 1.5%, replace the main drive chain.



Standard Length and 1.5% Elongation

1mm (inch)

CHAIN SIZE (No.)		RS25	RS35	RS41	RS40	RS50	RS60	RS80
6 link measure	Original	38.10 (1½)	57.15 (2¼)	76.20 (3)	76.20 (3)	95.25 (3¾)	114.30 (4½)	152.40 (6)
	1.5% elongation	38.67 (1.52)	58.01 (2.28)	77.34 (3.05)	77.34 (3.05)	96.68 (3.81)	116.01 (4.57)	154.69 (6.09)
10 link measure	Original	63.50 (2½)	95.25 (3¾)	127.00 (5)	127.00 (5)	158.75 (6¼)	190.50 (7½)	254.00 (10)
	1.5% elongation	64.45 (2.54)	96.68 (3.81)	128.91 (5.08)	128.91 (5.08)	161.13 (6.34)	193.36 (7.61)	257.81 (10.15)
CHAIN SIZE (No.)		RS100	RS120	RS140	RS160	RS180	RS200	RS240
6 link measure	Original	190.50 (7½)	228.60 (9)	266.70 (10½)	304.80 (12)	342.90 (13½)	381.00 (15)	457.20 (18)
	1.5% elongation	193.36 (7.61)	232.03 (9.14)	270.70 (10.66)	309.37 (12.18)	348.04 (13.70)	386.72 (15.23)	464.06 (18.27)
10 link measure	Original	317.50 (12½)	381.00 (15)	444.50 (17½)	508.00 (20)	571.50 (22½)	635.00 (25)	762.00 (30)
	1.5% elongation	322.26 (12.69)	386.72 (15.23)	451.17 (17.76)	515.62 (20.30)	580.07 (22.84)	644.53 (25.38)	773.43 (30.45)

Figure A-14 Main Drive Chain Measurement

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Drive Machine
- Drive Motor
- Gear Reducer
- Tension Carriage
- Main Drive Chain
- Main Drive Bearing and Oil Seals

A.12 DRIVE MACHINE REMOVAL/REPLACEMENT

Remove and replace the drive machine (gear reducer, drive motor, machine brakes) as follows. The machine will be removed as one unit.

1. Stop the escalator.
2. Switch the controller key to “Inspection Mode”.
3. Remove upper floorplates.
4. Plug the maintenance pendant into the upper inspection station socket.
5. Use the pendant to move the escalator until the master link of the main drive chain is accessible for removal (as seen from machine room).
    - Typically, the easiest removal position for the master link is near the top of the gear reducer along the main drive chain idler path.
6. Check position of the step chain and engage the step chain locking device.
7. Lock and tag out the main disconnect.
8. Remove the floor grating and intermediate floor grating support to gain access to the underslung machine space.
9. Climb down into the space.
10. Remove the maintenance ladder.
11. Disconnect wiring at the terminal boxes for the drive motor, oil level switch, and vibration sensor.
12. Remove the machine brake and back-up brake and put to the side.
    - Move any brake conduit to the side (as needed).
13. Unbolt the junction box and move to the side.
14. Adjust the main drive chain idler to a position of maximum chain slack.
15. Disconnect the master link of the main drive chain.
    Remove chain from the machine sprocket.
16. Install eye bolts on the gear reducer.
    - On inside and outside gear reducer faceplates, remove middle bolt closest to brake and replace with eye bolts.
17. Back off all eight (8) push bolts on the machine base.
18. Place wood or plastic under the drive motor to support it and to protect the motor and flywheel housing.

19. Remove the four (4) baseplate bolts holding the gear reducer to the truss.
    - Remove the two bolts closest to the motor first, and then the two bolts closest to the brake.
20. Set up an A-frame, portable winch crane, or other equipment capable of lifting 1200 pounds above the upper floorplate opening.
21. Connect the cables or straps of the lifting device to the two eyebolts on the gear reducer.
    - Cinch the cables tight so they are ready to support the weight of the machine.
22. Have one person access the rear of the underslung truss in the open space above the control room and connect a cable or rope to the eyebolt on the drive motor.
    - The use of chain falls or pulleys may be preferred.
23. Begin lifting from the top while moving the machine towards the center.
    - The person at the rear of the motor should use the rope/cable to stabilize the motor and apply force to properly rotate the machine into the position shown in Figure A-15.

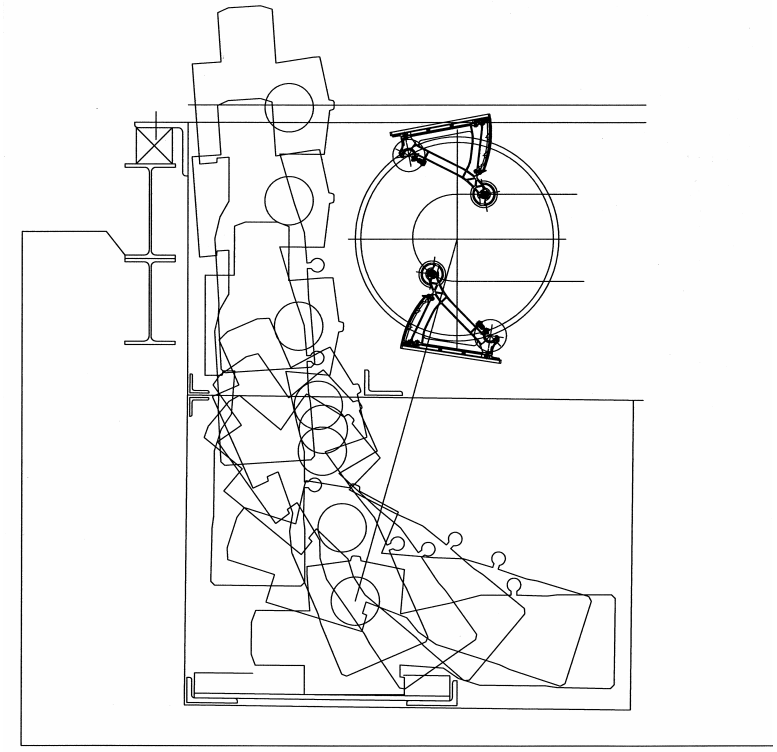


Figure A-15 Drive Machine Removal

24. Once the machine is nearly vertical, it can be rotated to allow even more clearance.
25. Completely lift the machine out through the floorplates opening.
26. Replace the machine in reverse order of removal.
27. Use straight edges to align the sprockets before re-connecting the main drive chain.

A.13 DRIVE MOTOR REMOVAL/REPLACEMENT

Remove and replace the drive motor (only) as follows. The drive motor will be detached from the motor adapter.

1. Stop the escalator.
2. Switch the controller key to “Inspection Mode”.
3. Remove the upper floorplate sections.
4. Remove the intermediate floorplate support frames for extra clearance (Escalator E222 only).
5. Plug the maintenance pendant into the upper inspection station socket.
6. Lock and tag out the main disconnect.
7. Check the position of the step chain and engage the step chain locking device.
8. Remove the floor grating to gain access to the underslung machine space.
9. Climb down into the space.
10. Disconnect wiring at the terminal boxes for the drive motor.
11. Set up an A-frame, portable winch crane, or other equipment capable of lifting 500 pounds above the upper floorplate opening.
12. For positioning, connect a cable or rope to the eyebolt on the drive motor and to the bottom of the upper truss section.
    - Cinch the cable to help support the weight of the motor.
    - The use of chain falls or pulleys may be preferred.
13. Place wood planks adjacent to the gear box to allow the motor to slide toward the end of the truss so it may be lifted out of the truss through the floor opening.
14. Separate the motor from the motor adapter.
    - Verify that the attached cables are tight.
    - On the motor side, four bolts hold the motor adapter to the motor.
    - Use a ½ inch Allen wrench on a breaker bar to break the bolts free (but do not remove them yet).
    - With a pinch bar, separate the motor from the adapter.
    - Once the motor is free from the adapter, remove the bolts and place them in a safe place.

15. Begin lifting the motor while moving it towards the center.
    - Move the motor clear of the machine and slide it down the wood planks for better access from the top.
16. Connect the cable or strap of the lifting device to the eyebolt on the drive motor .
17. Completely lift the motor out through the floorplates opening.
18. Replace the motor in reverse order of removal.
    - Align shafts per manufacturer's required tolerance.

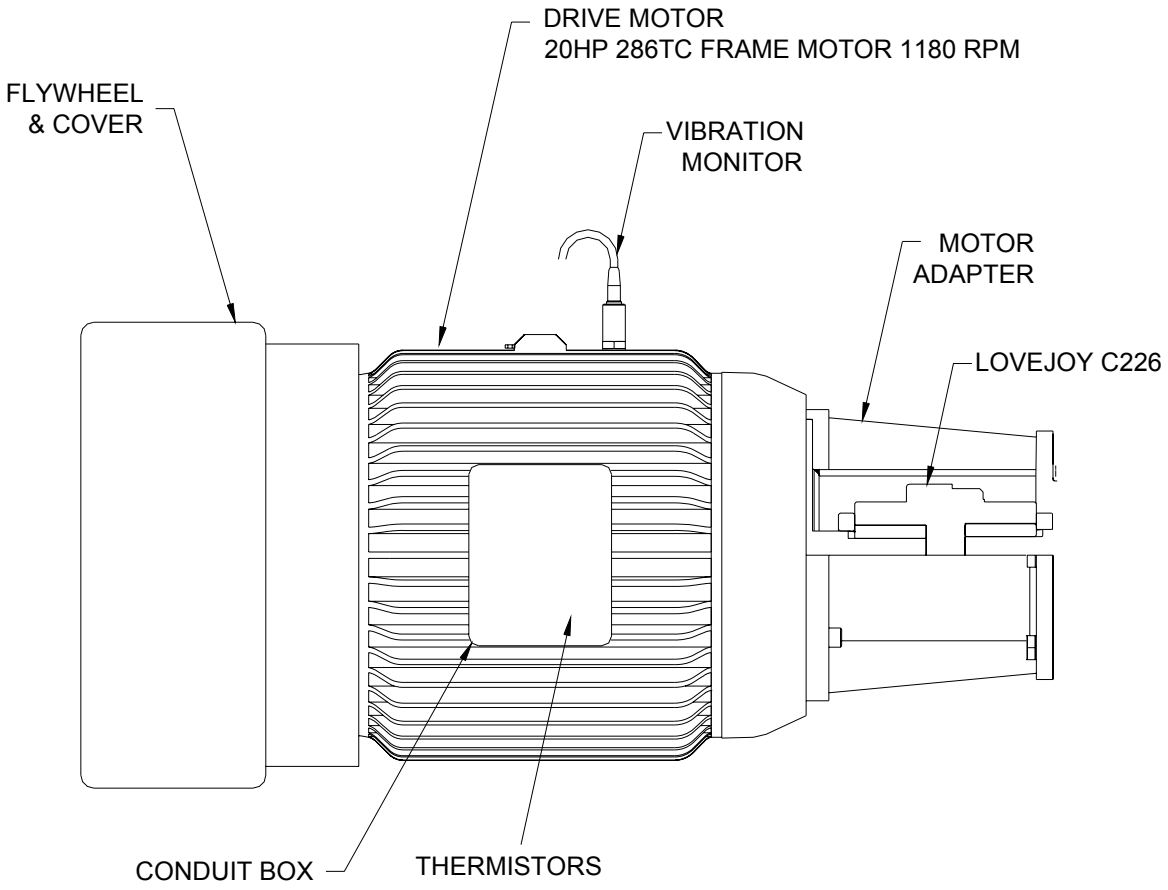


Figure A-16 Drive Motor Removal

A.14 GEAR REDUCER REMOVAL/REPLACEMENT

Remove and replace the gear reducer as follows. The gear reducer will be removed after the entire drive machine has been removed and after the motor and machine brakes have been disconnected from the gear reducer.

1. Follow instructions in Mechanical Section A.12 to lift the entire drive machine from its position.
2. Connect the hoist to the eyebolt on the drive motor to support the weight of the motor.
3. Separate the motor and motor adapter from the gear reducer.
    - Verify that the attached cables are tight.
    - On the gear reducer side, four bolts hold the motor adapter to the gear reducer.
    - Use a ½ inch Allen wrench on a breaker bar to break the bolts free (but do not remove them yet).
    - With a pinch bar, separate the adapter from the gear reducer.
    - Be aware that the spider may drop out of the coupling. Be prepared to catch it and keep it in a safe place.
    - Once the motor and adapter are free from the gear reducer, remove the bolts and place them in a safe place.
    - Place the motor and adapter to the side.
4. Remove the dual machine brakes from the gear reducer shaft. (Refer to Mechanical Section B.)
5. Connect the hoist to the gear reducer and lift the gear reducer.
6. Replace the gear reducer in reverse order of removal.
    - Align shafts per manufacturer's required tolerance.
    - Check alignment of sprocket on machine with main drive sprocket.
    - Be sure to disengage the step chain locking device.

A.15 TENSION CARRIAGE REMOVAL/REPLACEMENT

Remove and replace the tension carriage as follows.

1. Remove all steps. (Refer to Mechanical Section F.)
2. Remove step chain around lower curve. (Refer to Mechanical Section F.)
3. Remove handrail around lower newel section by peeling the handrail off the steel guide in the lower curve; continue peeling around the newel. (Refer to Mechanical Section E.)
4. Disconnect wiring to the emergency stop switch, operating panel, indicator lights, and anti-static device.
5. Remove lower newel molding, interior panels, skirt panels, and skirt frame. (Refer to Mechanical Section G.)
6. Remove lower curve interior panels, deck moldings, and skirt panels.
7. Remove newel molding front panel, disconnecting wiring to the handrail entry device.
8. Remove newel stand.
9. Remove lower combplate section. (Refer to Mechanical Section D.)
10. Remove lower A and B tracks and corresponding up-thrust tracks.
    - Unbolt the M track from the turnaround track base.
    - Remove the lower turnaround track and base.
11. Release tension carriage spring and disconnect threaded rods from the tension carriage.
12. Connect hoist, capable of lifting 650 pounds, to the tension carriage. Lift tension carriage out of the truss.
13. Replace the tension carriage in the reverse order of removal.
    - Set the carriage spring length according to the dimension shown on the tag attached to the threaded rod.
    - Follow the broken step chain device adjustment procedures in Electrical Section B.

A.16 MAIN DRIVE CHAIN REMOVAL/REPLACEMENT

Remove and replace the main drive chain as follows:

1. Stop the escalator.
2. Switch the controller key to “Inspection Mode”.
3. Remove upper floorplates.
4. Plug the maintenance pendant into the upper inspection station socket.
5. Use the pendant to move the escalator until the master link of the main drive chain is accessible for removal (as seen from machine room).
    - Typically, the easiest removal position for the master link is near the top of the gear reducer along the main drive chain idler path.
6. Check position of the step chain and engage the step chain locking device.
7. Lock and tag out the main disconnect.
8. Remove the floor grating and intermediate floor grating support to gain access to the underslung machine space.
9. Climb down into the space.
10. Adjust the main drive chain idler to a position of maximum chain slack.
11. Disconnect the master link of the main drive chain.
12. Remove chain by slowly pulling the chain off the main drive sprocket.
13. Replace main drive chain in the reverse order of removal.

A.17 MAIN DRIVE BEARINGS & OIL SEALS

Remove and replace the main drive bearings and oil seals as follows:

NOTE

There are two different bearings on the main drive shaft.

The handrail drive side has a floating bearing, while the main drive side has a fixed bearing.

When disassembling these bearings, be sure to keep the associated parts with the correct bearing. Even though they look the same, they are different. Interchanging parts will cause damage to the housing and the bearing.

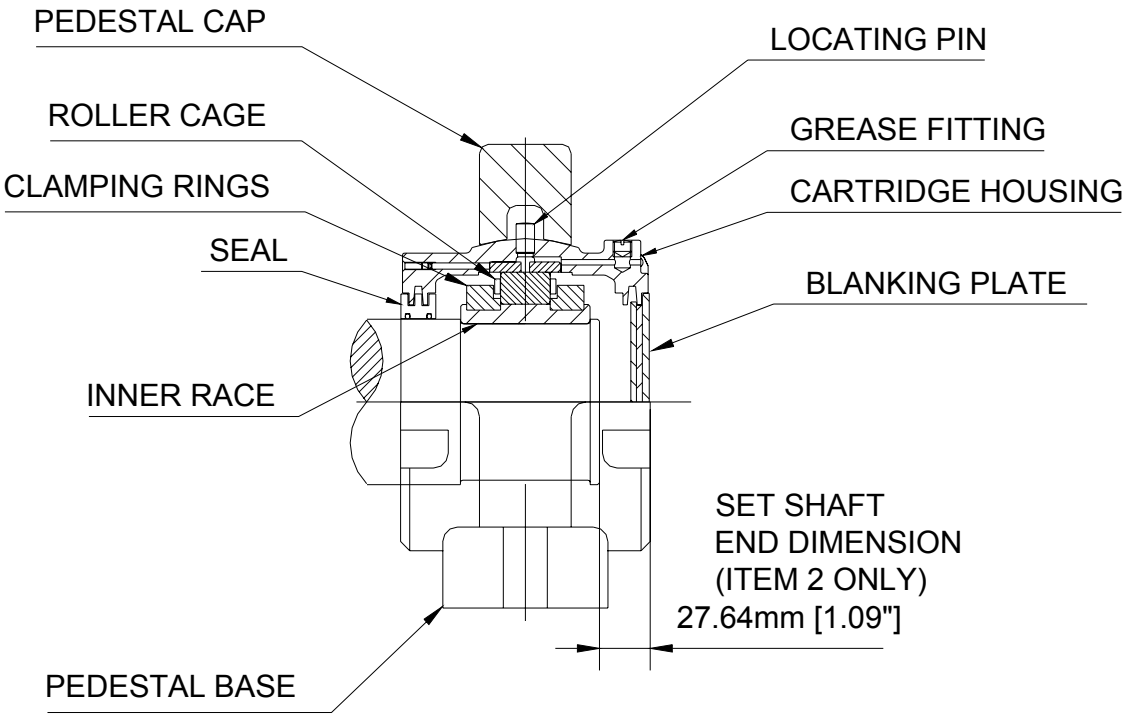


Figure A-17 Main Drive Bearings and Oil Seals

1. Remove the pedestal cap mounting bolts.
2. With a hoist, lift the main drive shaft clear of the lower half of the mounting pedestal.
3. Remove the four mounting bolts that hold the bearing cartridge together.

4. Remove each half of the cartridge, the blanking cap, and seals.
5. Loosen the cap screws and remove the clamp rings.
6. Remove the bearing clip and separate the bearing halves.
7. Remove the inner race halves.
8. Wipe old grease from components and check bearing for any damage.
9. Replace bearings and seals as follows:
    - Place halves of inner race on main shaft, observing match marks. Assemble two clamping rings over each inner race with clamp ring split line 45° from the inner race split line.
      Note: There will be a gap at the inner race.
    - Torque socket head cap screws on the clamp rings to 6.5 ft-lbs. (8.8 Nm). Lightly tap clamping rings with a rubber mallet to seat and retighten.
    - Coat the inner race, roller cage, and area where the seal contacts the shaft with grease. Place the roller cage around the inner race and insert the two joint clips.
    - Fill cartridge housing halves, seal surface with grease, and install over roller cage. Insert blanking plate in fixed bearing only. Close cartridge and tighten four bolts.
    - Fill pedestal base and cap with grease, and grease spherical outer surface of cartridge. Install pedestal base with cartridge locating pin 45° from vertical, pointing towards truss upper support angle. Install pedestal cap and tighten cap bolts.
    - Place locating bolts and nuts in position. Set main drive assembly in position on truss, installing shims and locating bolts.
    - Adjust the floating pedestal base to set shaft end dimension to 1.09” (27.2 mm) from the end of the shaft to the surface of the cartridge.
    - Install pedestal and locating bolts and tighten nuts. Re-check assembly dimension and repeat the previous instruction.
    - Remove pedestal cap on floating bearing, open cartridge, and replace blanking plate. Fill bearings with grease, reassemble cartridge and pedestal cap, then tighten bolts. Fill bearings with grease.

B) BRAKES

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

B.1 MACHINE BRAKE

A dual machine brake (Figure B-1) is provided as the primary piece of equipment used to stop the escalator. Each brake is a spring-applied, electromagnetically-released disc brake installed on the extended input shaft of the gear reducer.

The dual brake is designed to stop the escalator and hold it in position when any of the following conditions occurs:

- Operation of the Emergency Stop Button
- Loss of power
- Any disruption in the circuit from any of the safety devices.

Any of these conditions will cut power to the brake and de-energize the coil. When the coil is de-energized, the springs press the armature against the disc, bringing the escalator to a smooth stop. The torque applied to the rotor is adjustable.

A manual release handle is provided to override the springs and release the brake while the escalator is shut down for maintenance purposes.

The brake (Figure B-2) is equipped with a brake release switch to signal the ON/OFF condition of the brake. While the monitor is signaling OFF, the escalator is allowed to run. The ON signal prevents the escalator from being started.

The brake is also equipped with a brake lining wear detector. An actuator bolt is set to monitor the brake lining wear. Upon activation of the brake, the actuator will not operate the detector switch to signal acceptable wear. When the allowable brake lining is at 100% deteriorated, the actuator will activate the switch to signal excess brake wear. The escalator will shut down and power will be cut to the drive motor. The brake rotor will have to be replaced before putting the escalator back into operation.

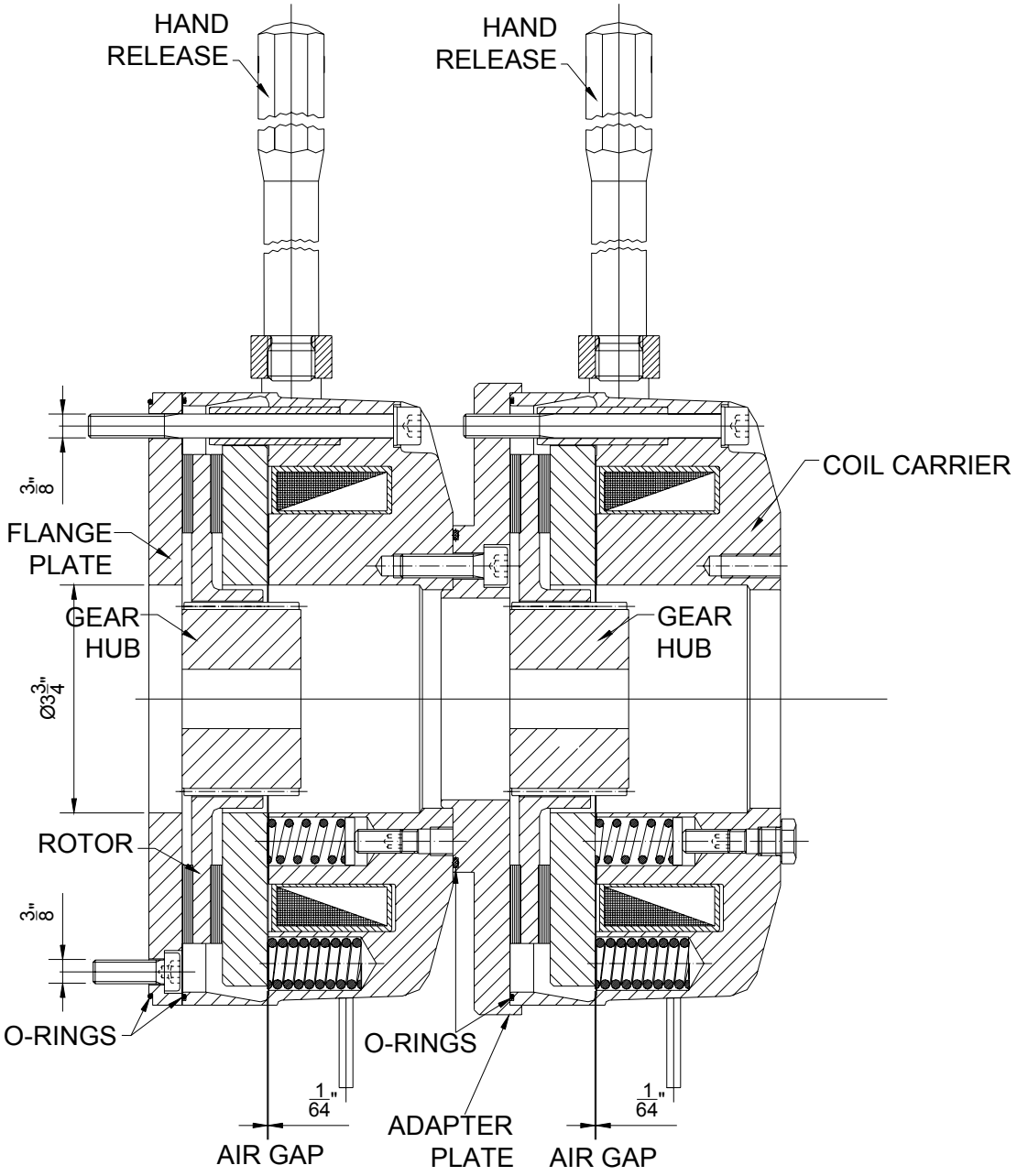


Figure B-1 Mayr M250 Dual Machine Brake

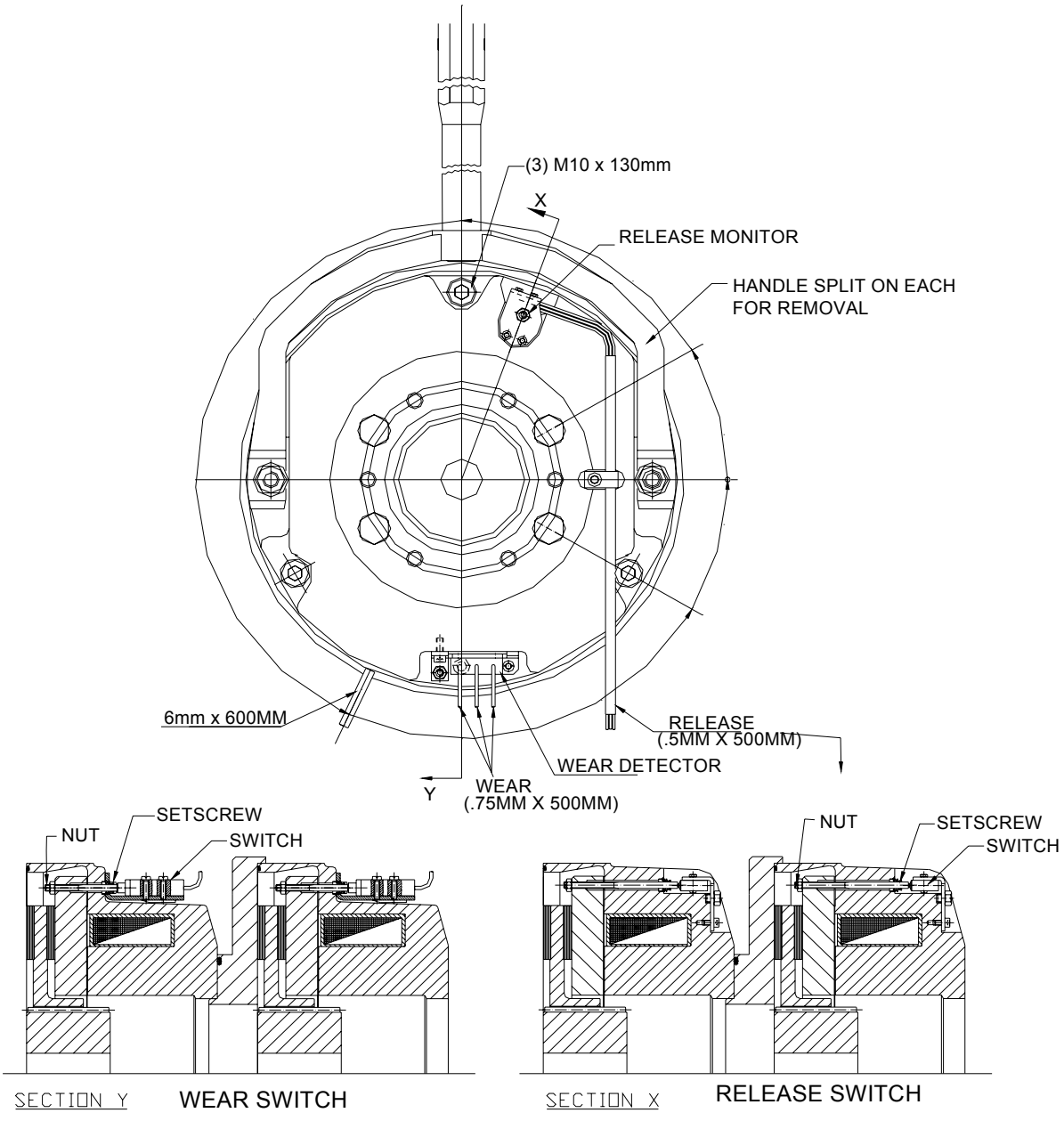


Figure B-2 Machine Brake Monitor Switches

B.2 PAWL BRAKE (MAIN DRIVE SHAFT BRAKE)

The pawl brake locks the main drive shaft when a break in the main drive chain is detected.

A ratchet wheel is mounted on the main drive shaft over the pawl brake assembly. Should a chain break occur, the pawl is rotated up into the ratchet to stop the main drive shaft motion.

A shaft mounted across the width of the escalator holds the pawl and its weighted lever on one side and the guide shoe resting on the main drive chain on the other side.

The unbroken main drive chain holds the guide shoe in position and, by the shaft connection, holds the pawl away from the ratchet.

If the main drive chain breaks, the guide shoe falls forward. This turns the shaft and releases the pawl's weighted lever. The weighted lever drops, rotating the pawl up into the ratchet.

A pawl monitoring limit switch (broken drive chain device) monitors the position of the weighted lever. As the lever drops, the limit switch is triggered, cutting power to the drive machine and machine brake just before the pawl engages the ratchet.

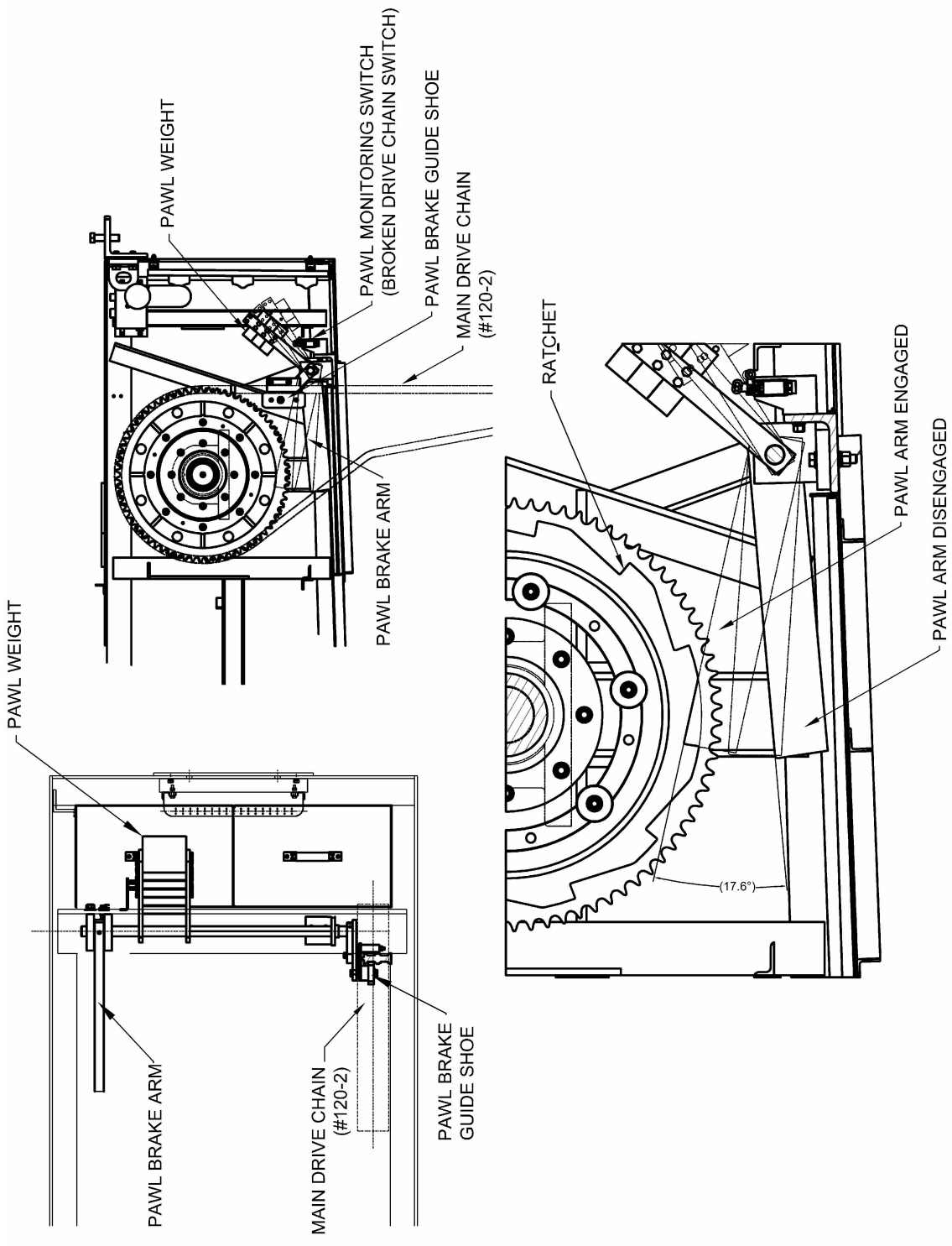


Figure B-3 Pawl Brake (Main Drive Shaft Brake)

B.3 STEP CHAIN LOCKING DEVICE

The step chain locking device is a safety device which prevents accidental main shaft movement during maintenance.

This device manually locks the main drive and step chain in position by extending a locking pin between the rollers of the step chain.

To insert the locking pin in the gap of the step chain and sprocket tooth:

- Remove the quick-release pin.
- Use the grab bar to push the locking pin forward into the chain.
- Re-insert the quick-release pin.

A position detection safety switch detects the position of the locking pin and is interlocked with the controller. When the locking device is engaged, the escalator cannot operate.

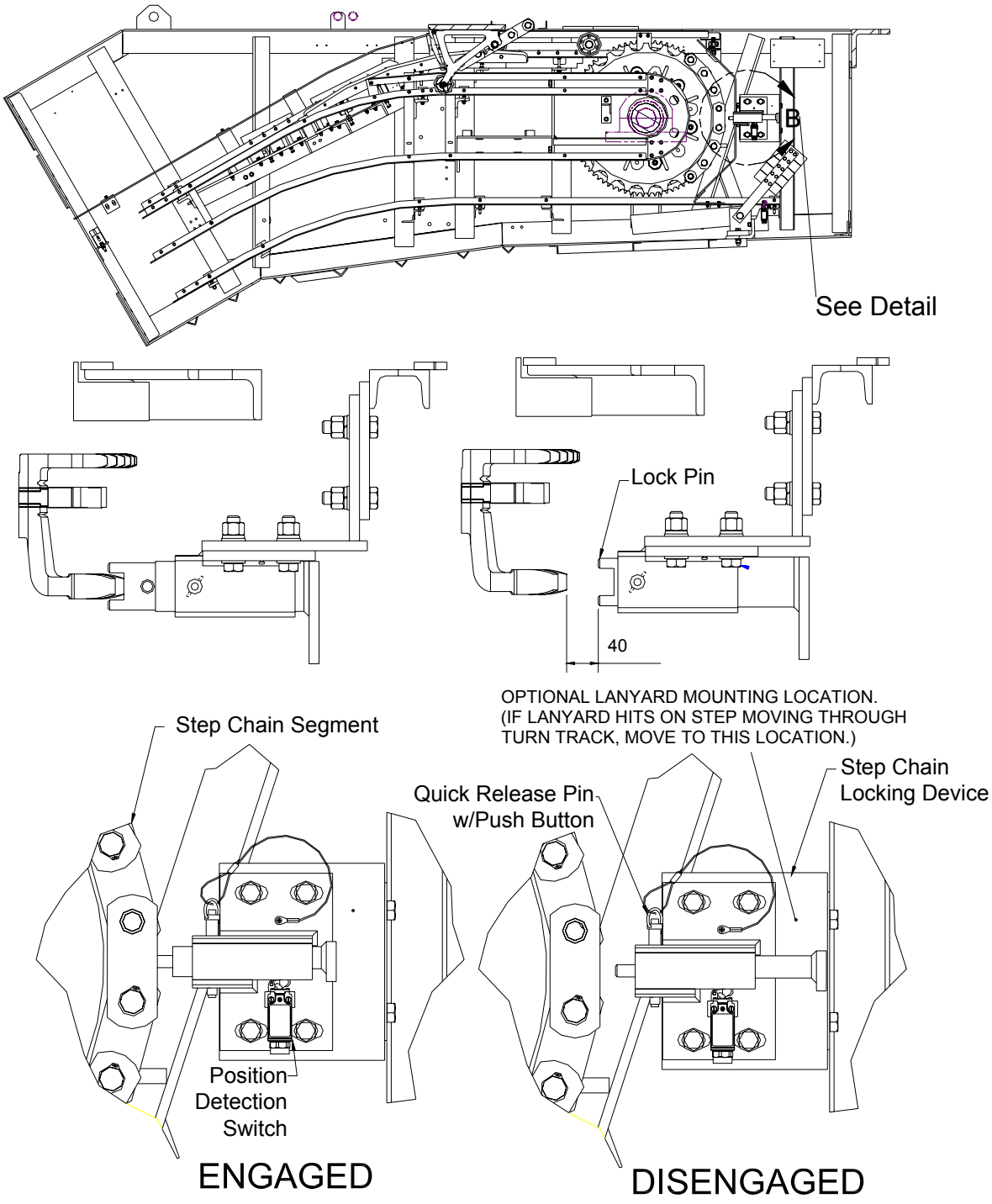


Figure B-4 Step Chain Locking Device

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Dual Machine Brake
- Brake Wear Detector
- Brake Release Switch
- Pawl Brake

B.4 MACHINE BRAKE ADJUSTMENT

Test and adjust the machine brake torque as follows:

1. Stop the escalator.
2. Remove the upper floorplate sections.
3. Plug the maintenance pendant into the upper inspection station socket.
4. Lock and tag out the main disconnect.
5. Remove the floor grating to gain access to the underslung machine space and climb down into the space.
6. Remove the center cap from the brake #1 (front).
    - Testing the brake torque will require using a torque wrench and 1-1/2” socket on the extended shaft of the gear reducer.
    - The brake torque setting for Size 250 brakes on these 20 HP motors is 164 Ft/lbs +/- 16 Ft/lbs (222.3 Nm +/- 21.7 Nm).
7. To test the brake torque on brake #2 (back), pull the hand release lever on brake #1 (front) to manually release that brake while you test the torque on brake #2.
8. To test the brake torque on brake #1 (front), pull the hand release lever on brake #2 (back) to manually release that brake while you test the torque on brake #1.
9. Release both brakes to measure the torque required to move the escalator due to friction.
    - Subtract the value from this step (#9) from the torque values achieved in step #7 or #8 to get the true brake torque.
10. If the torque on brake #2 must be adjusted, you must first remove brake #1:
    - Remove the four (4) bolts on brake #1 and remove brake #1.
    - Remove the four (4) bolts on the adapter plate and remove the adapter plate to expose brake #2.
11. To adjust the torque on either brake, unscrew that brake’s four (4) plug screws with their copper seal rings.
12. Use an Allen wrench to adjust all four setscrews to the desired dimension (see Dimension “a” graph).
13. Rotate the wrench clockwise to increase the brake torque, or counter-clockwise to decrease it.
14. Recheck the torque.
15. Re-attach brake #1 (if torque on brake #2 has been adjusted).

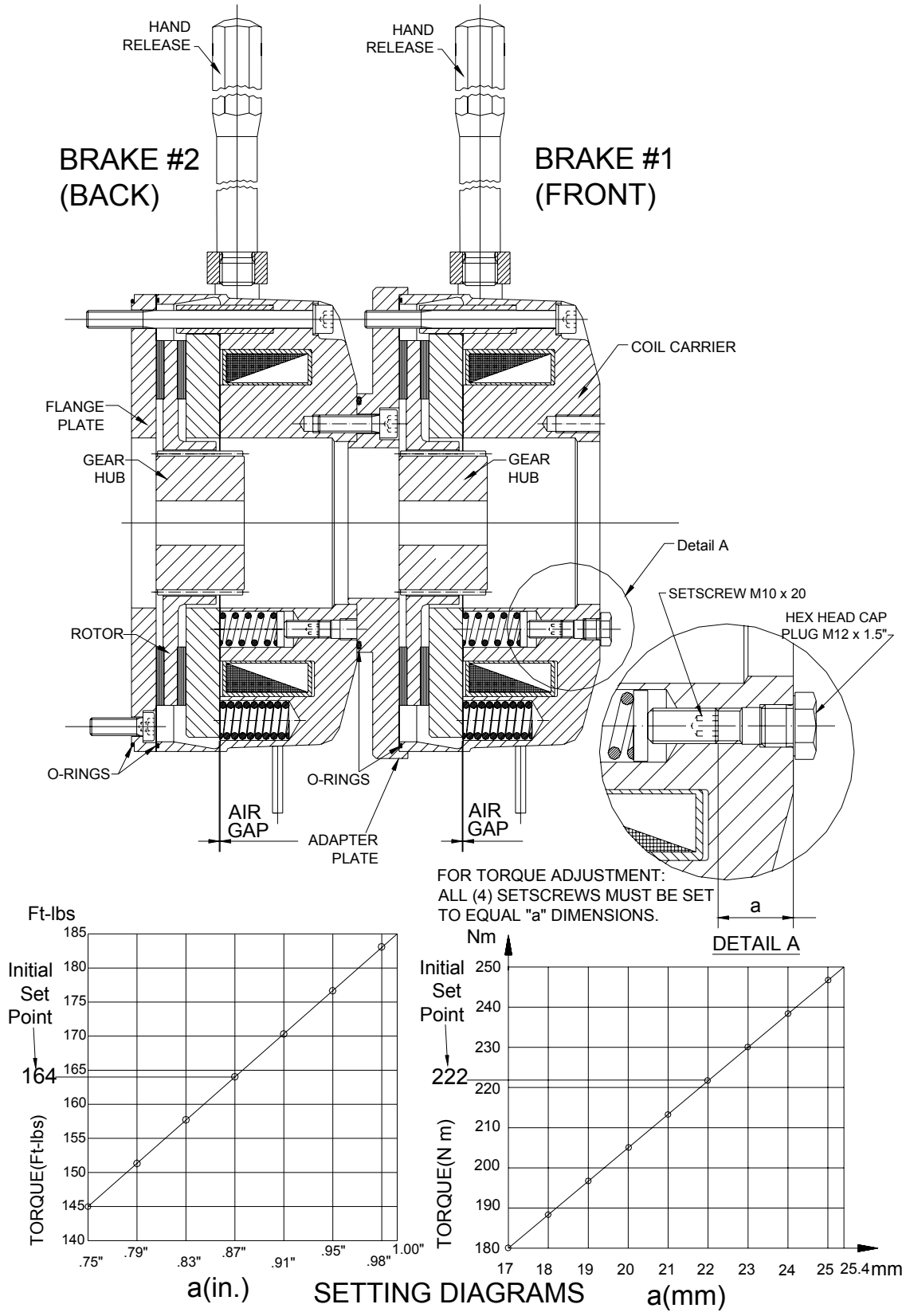


Figure B-5 Mayr M250 Dual Brake Adjustments

B.4.1 Brake Wear Detector Adjustment

The brake wear detector must be checked after replacing the rotor. Test and adjust the brake wear detector on each machine brake as follows:

1. Manually release the brakes.
2. Loosen the two wear detector switch mounting bolts.
3. Position the switch assembly so that a .6mm feeler gauge inserted between the switch and the setscrew does not energize the switch.
4. Check that an .8mm feeler gauge inserted between the switch and the setscrew does activate the wear detector switch.
5. Tighten the two wear detector switch mounting bolts.

B.4.2 Brake Release Switch Adjustment

Inspect and adjust the brake release switch as follows:

1. With the power OFF to the brake, make sure the brake release switch is not operated.
2. Release the brake with the manual brake release handle.
3. Check that the brake release switch is activated.

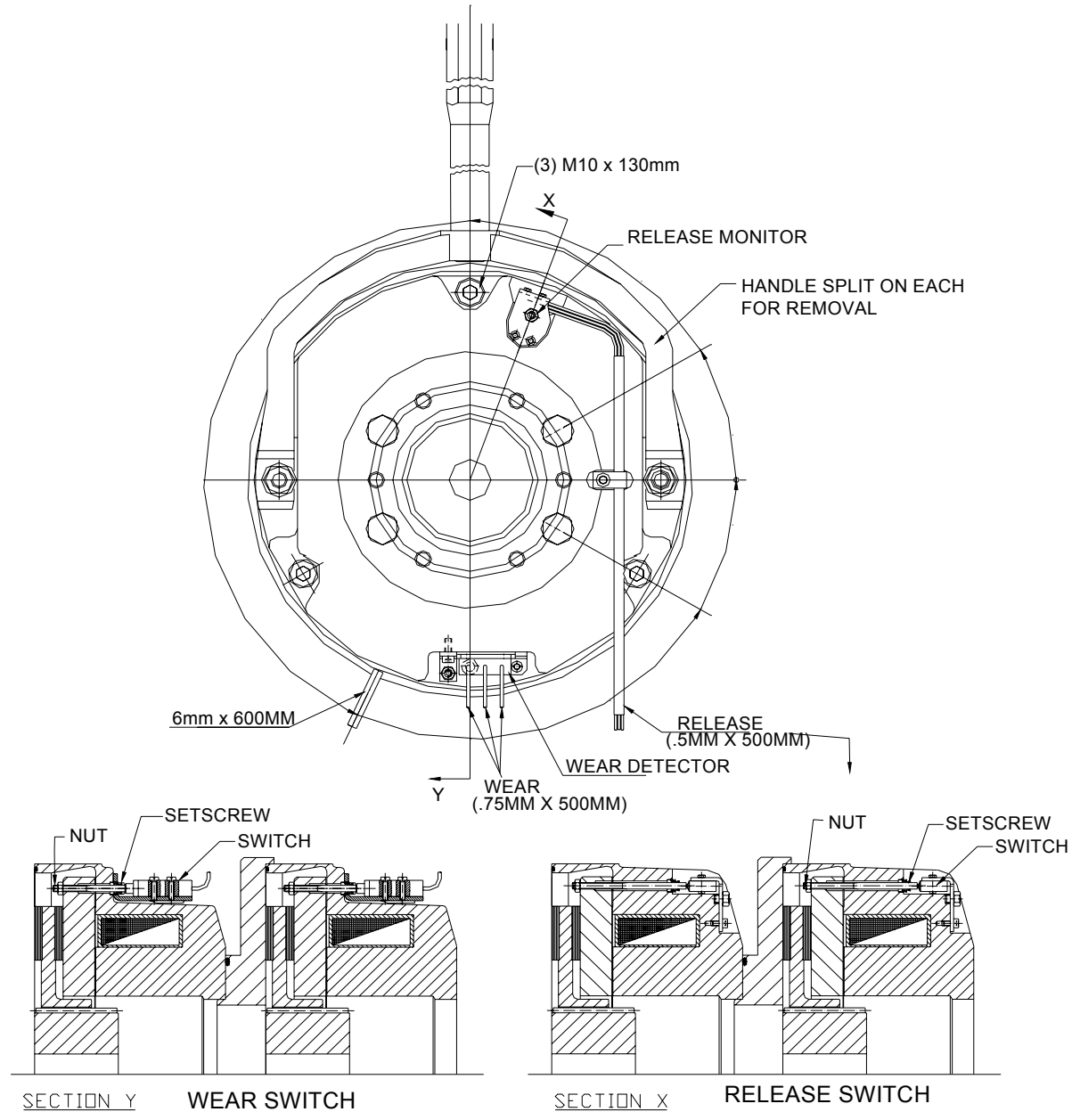


Figure B-6 Brake Switch Adjustment

B.5 PAWL BRAKE ADJUSTMENT

Inspect and adjust the pawl brake as follows:

1. Remove the upper landing plates and attach the maintenance pendant.
2. Check the pawl brake for damage.
    - Replace any worn or damaged parts.
3. Check that the clearance between the pawl and ratchet's outer diameter is at least 132mm (5.2") when the shoe is placed.
    - If needed, adjust the clearance with bolt "A" (in Detail H) on the pawl brake shoe.
4. Release the pawl brake by removing the pawl brake shoe fastener.
5. Check the limit switch for the following:
    - The switch activates when the distance between the pawl and ratchet's outer dimension is 55mm +/- 3mm (2.16" +/- .12"). See Detail J.
    - The pawl can reach the bottom of the ratchet tooth.
6. Reinstall the shoe fastener and check that parts are properly aligned.
    - Adjust the pawl brake assembly side to side so that the pawl shoe equally clears the chain inner link plates.
    - Verify the pawl overlaps the ratchet (side to side) with the pawl engaged.

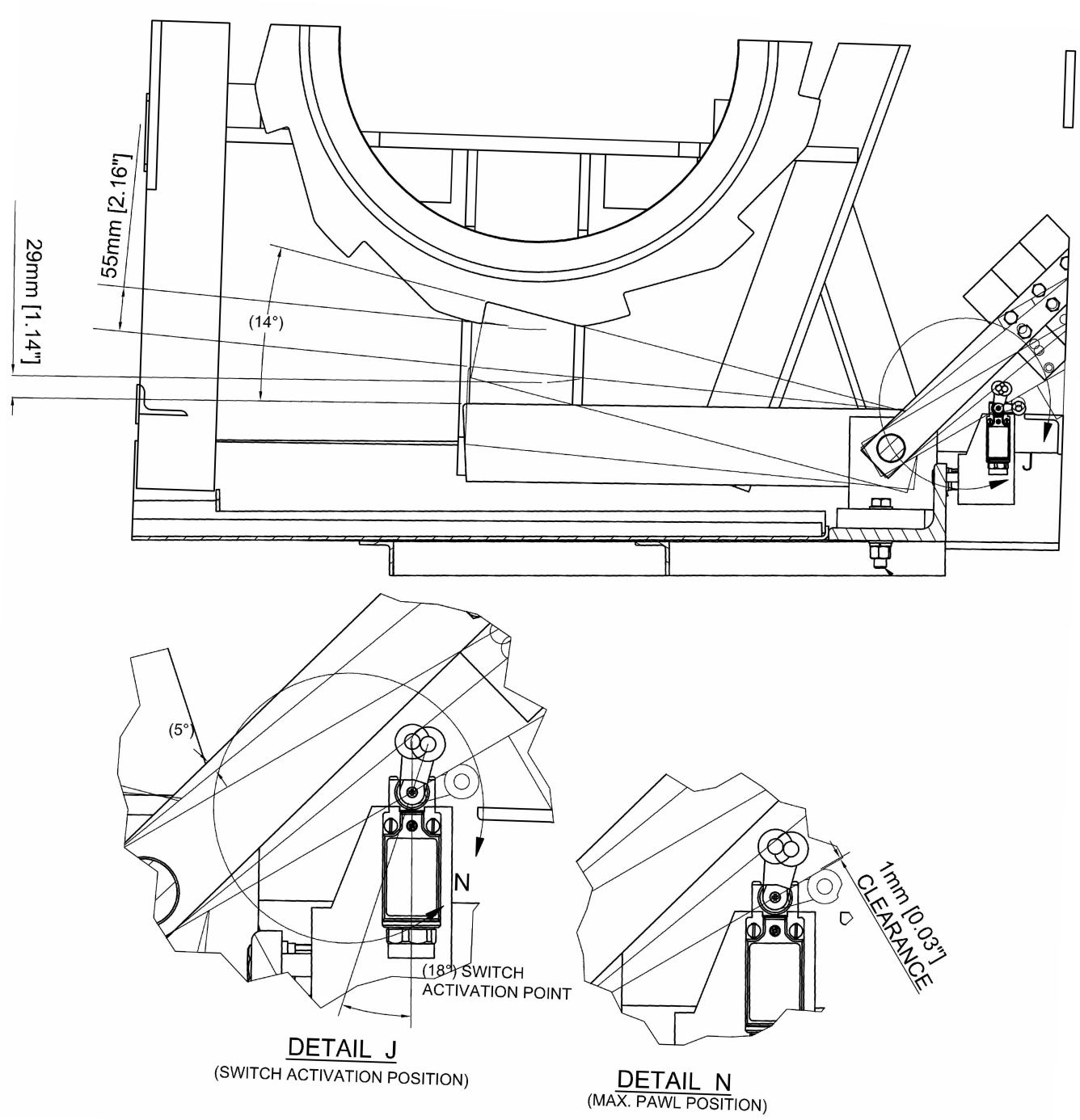


Figure B-7 Pawl Brake Adjustment – Clearance

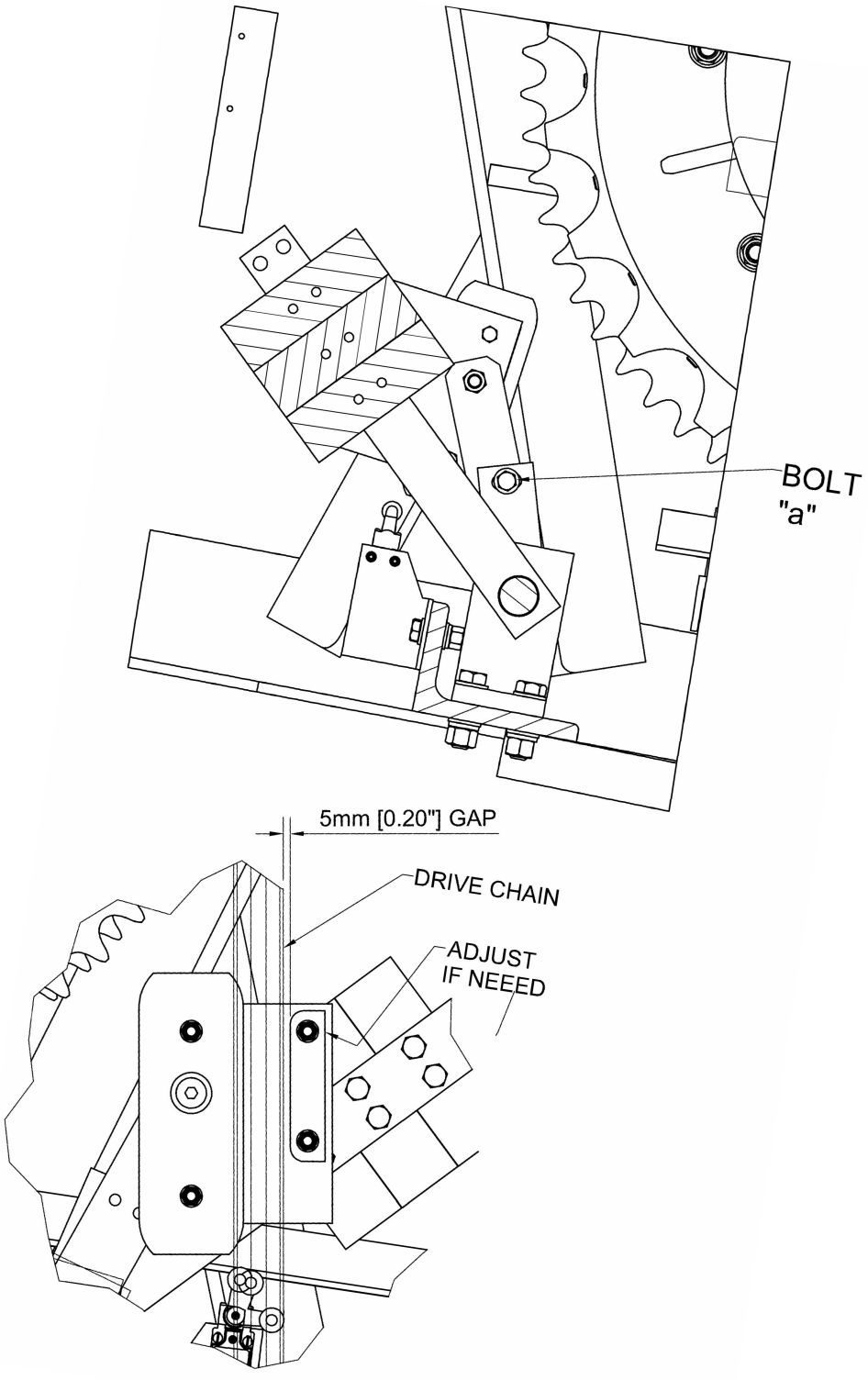


Figure B-8 Pawl Brake Adjustment

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Machine Brakes
- Pawl Brake

B.6 MACHINE BRAKE REMOVAL/REPLACEMENT

Remove and replace the machine brakes as follows:

1. Place the escalator in Inspection mode using the upper inspection station socket.
2. Engage the pawl brake and verify that the pawl is fully in a notch of the ratchet.
3. Lock and tag out the main disconnect.
4. On brake #1 (front), disconnect the wiring for the brake wear detector and brake release monitor.
5. Remove the four (4) mounting bolts from brake #1 assembly.
6. Remove the coil carrier section of brake#1.
7. Loosen the setscrews in the rotor and remove the rotor.
8. If necessary, loosen the hub setscrews and remove the hub and flange plate.
9. Remove the four (4) bolts on the adapter plate and remove the adapter plate to expose brake #2.
10. To remove brake #2 (back), repeat steps #4 through #8 for brake #2.
11. Replace each brake in the reverse order of removal, checking the torque.

B.7 PAWL BRAKE REMOVAL/REPLACEMENT

Remove and replace the pawl brake as follows:

1. Remove the landing plates from the upper truss area and attach the maintenance pendant.
2. Release the pawl brake by removing the pawl brake shoe fastener.
3. Remove the pawl brake mounting bolts and remove the pawl brake.
4. Attach a hoist to the pawl and lift it from the truss.
5. Replace the pawl brake in reverse order of removal.

C) TRACK

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

C.1 TRACK

The track components include the track, turn track, and up-thrust guides. They support and guide the step wheels and step chain wheels through the endless loop between the exposed exterior of the escalator and the interior (return) side.

The track is constructed of zinc-plated angle steel, providing a smooth and corrosion-resistant surface.

Turn tracks are zinc-plated cast iron moldings that form a 180° radius in the upper and lower truss.

Up-thrust guides are flat bar material that keep the step wheels and step chain wheels in place against the track.

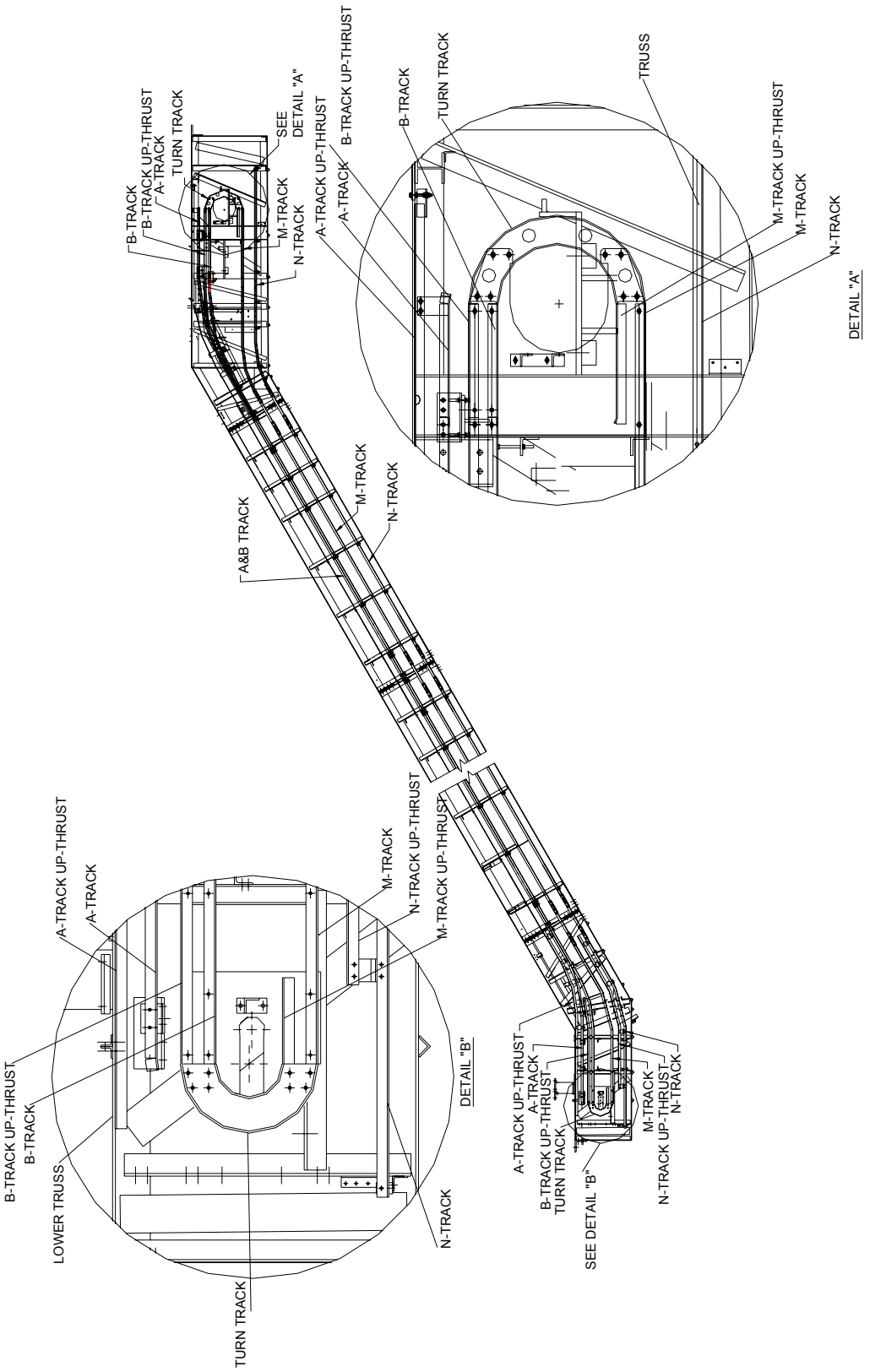


Figure C-1 Track

C.1.1 Track

The escalator track is constructed of zinc-plated steel, providing a smooth and corrosion resistant surface. The rigidity of the track and the spacing of supports prevent the track from deflecting under the load of passengers.

A 0.02-inch (0.5mm) gap is maintained between the Phenolic guide shoe on the step chain wheel and the A Track. This ensures that the step is centered between the skirt panels. A clearance of 0.04-inch (1mm) is maintained between the step chain wheel and the N Track. A 0.28-inch (7mm) clearance is maintained between the step wheel and the B Track and M Track.

Step wheels are bolted to the yokes on both sides of the step. If the step wheel is riding on the up-thrust, the step will trip the step up-thrust switch and stop the escalator.

Step chain wheels are connected to the step axle. They guide the steps throughout the escalator while rolling on tracks.

The step wheels and the step chain wheels travel along the following tracks:

STEP CHAIN WHEEL		
A Track	Upper step chain wheel	For exterior travel
A Track	Up-thrust	
N Track	Step chain wheel return	For interior travel
N Track	Up-thrust	
STEP WHEEL		
B Track	Upper step wheel	For exterior travel
B Track	Up-thrust	
M Track	Step wheel return	For interior travel
M Track	Up-thrust	

Figure C-2 Tracks for Step Chain Wheel / Step Wheel

C.1.2 Turn Track

The turn tracks, known as the turnaround tracks in the upper and lower truss, maintain a step wheel clearance of 0.04 inch (1mm) to assure smooth and quiet turns.

Cut-outs in the turn tracks provide openings through which step wheels can be removed.

C.1.3 Up-Thrust Guides

Up-thrust guides are provided for the step chain wheel over the entire exposed travel and the lower curve on the return side. The chain wheel rides on the up-thrust track in the lower curves. Up-thrust tracks are provided for the step wheel when it approaches the combplate on the upper and lower end of the turn track.

The step wheel up-thrust track keeps the steps level when entering the combfingers, in case something has become trapped between steps in the incline or transition points.

C.1.4 Chain Guide

To decrease wear on the step chain wheels, step chain rollers ride on the surface of a chain guide in the upper transition.

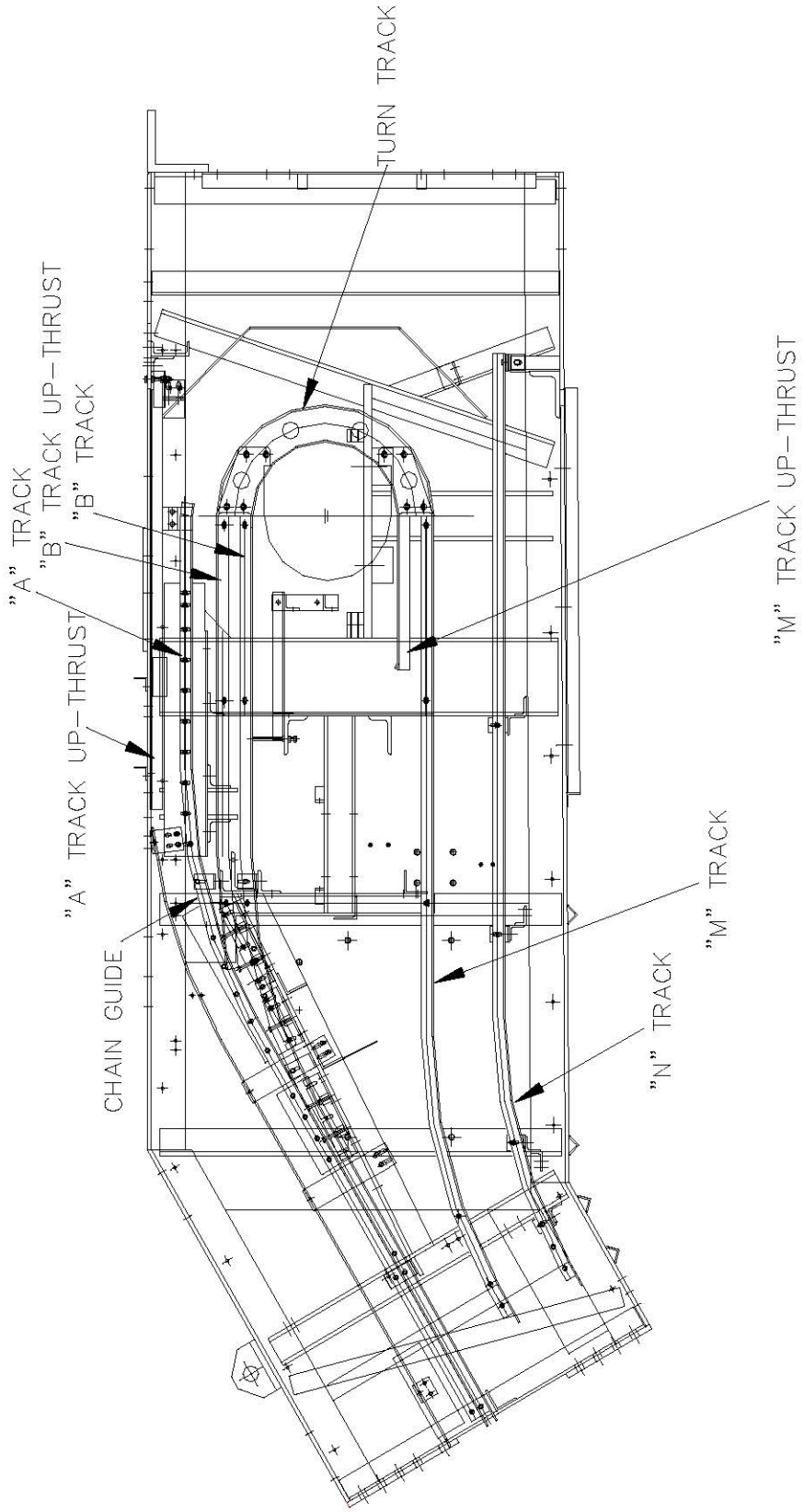


Figure C-3 Track - Upper Truss

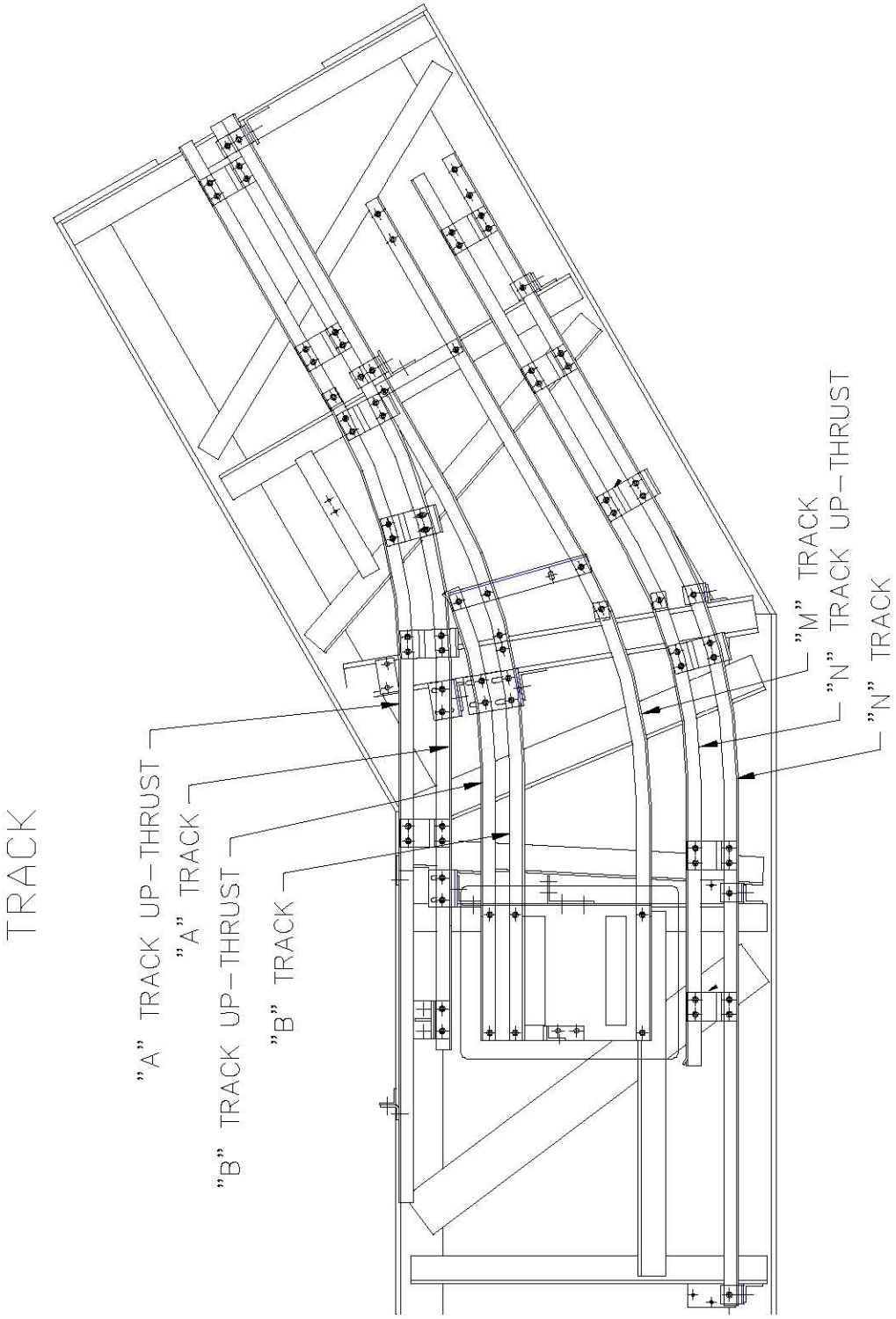


Figure C-4 Track - Lower Truss

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Step Chain Wheel Track and Step Wheel Track
- Up-Thrust Guides
- Turn Track
- Chain Guide Assembly

C.2 STEP CHAIN WHEEL TRACK AND STEP WHEEL TRACK ADJUSTMENT

Maintain and adjust the step chain wheel track and the step wheel track as follows:

1. Examine the alignment of the steps in the exposed travel between skirt panels.
    - If steps appear to be shifting, the track may be misaligned or the skirts may be misaligned. (It is recommended that you check the skirt panel alignment first.)
2. Press the Emergency Stop button to stop the escalator.
3. Remove the floorplates at the upper and lower landings (refer to Mechanical Section D).
4. Plug the maintenance pendant into one of the service boxes.
5. Remove half of the steps (refer to Mechanical Section F).
6. Engage the pawl brake system by removing the pawl brake shoe fastener (refer to Mechanical Section B).
    - This is to prevent any unwanted movement.
7. Clean the track rail with a dry cloth.
8. Check the clearance between the wheel and the track.
    - There should be 1mm clearance.
9. Check for any loose track, uneven joints, and highly worn areas.
    - Adjust as needed to insure the track is level.
10. Check for rust and treat as needed.
11. Return the pawl brake system to its Run position.
12. Re-assemble in reverse order.

C.3 UP-THRUST GUIDE ADJUSTMENT

Inspect and adjust the up-thrust guides as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the floorplates at the upper and lower landings (refer to Mechanical Section D).
3. Plug the maintenance pendant into one of the service boxes.
4. Remove half of the steps (refer to Mechanical Section F).
5. Engage the pawl brake system by removing the pawl brake shoe fastener (refer to Mechanical Section B).
    - This is to prevent any unwanted movement.
6. Clean up-thrust guide with a clean dry cloth.
7. Check for any loose guides, uneven joints, and highly worn areas.
8. Measure the gap between the top of the step wheel and the bottom of the up-thrust tracks. Gap should be:
    - 0.04 ~ 0.10 inches (1.0~2.5 mm) in upper and lower track.
    - 0.01 ~ 0.03 inches (0.25~0.76 mm)in lower curve.
    - 0.25 inches (6.35 mm) in incline track.
9. Adjust the up-thrust guides, if necessary.
10. Return the pawl brake system to its Run position.
11. Re-assemble in reverse order.

C.4 TURN TRACK ADJUSTMENT

Inspect and adjust the turn track as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the floorplates at the upper and lower landings (refer to Mechanical Section D).
3. Plug the maintenance pendant into one of the service boxes.
4. Remove 6-to-8 steps (refer to Mechanical Section F).
5. Position the opening to gain maximum access to the turn track.
6. Engage the pawl brake system by removing the pawl brake shoe fastener (refer to Mechanical Section B).
    - This is to prevent any unwanted movement.
7. Verify that the turn track is aligned with the step wheel track. Realign if necessary.
8. Clean track rail of foreign objects with a dry cloth.
9. Return the pawl brake system to its Run position.
10. Re-assemble in reverse order.

C.5 CHAIN GUIDE ADJUSTMENT

After the replacement of the chain guide assembly or track at the upper transition, adjust the chain guide assembly as follows:

1. Insert the base of the chain guide gauge (#C62L33001) sideways between the top of the chain links and the A-Track Up-Thrust.
2. If the chain guide assembly is positioned TOO LOW:
    - Rotate the gauge so the “feet” of the gauge base are in contact with the A-Track.
    - Then use the chain guide adjusting bolts as needed until the bottom edge of the gauge bar is flush with the top of the chain roller.
3. If the chain guide assembly is positioned TOO HIGH:
    - Rotate the gauge so the bottom edge of the gauge bar is flush with the top of the chain roller.
    - Then use the chain guide adjusting bolts as needed until the “feet” of the gauge base are in contact with the A-Track.
4. Remove the gauge and repeat for the opposite side of the escalator.

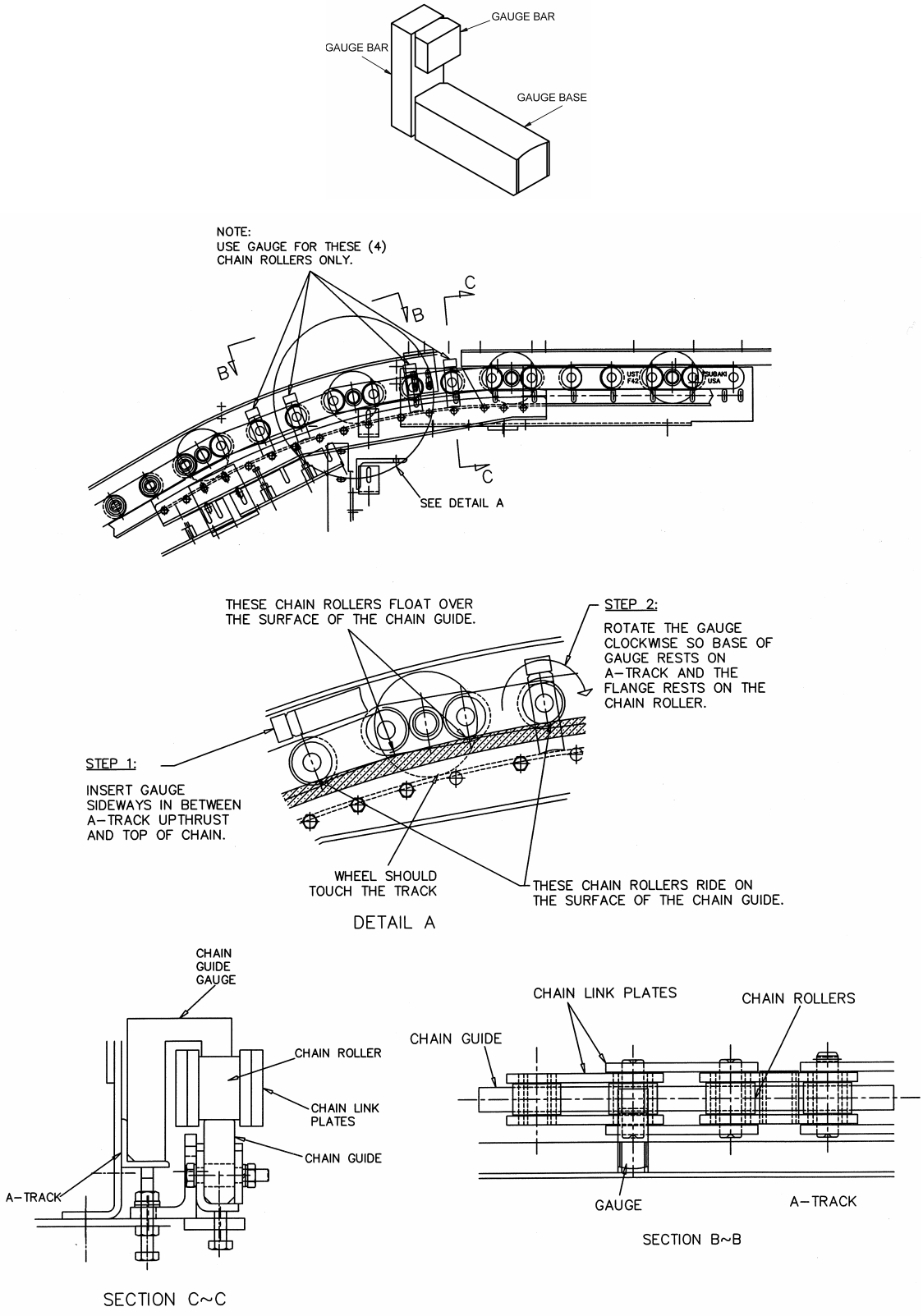


Figure C-5 Chain Guide (Gauge)

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Track and Up-Thrust Track
- Turn Track
- Chain Guide Assembly

C.6 TRACK AND UP-THRUST TRACK REMOVAL/REPLACEMENT

Remove and replace the track and up-thrust track (as one unit) as follows:

NOTE

Here are some time-saving suggestions:

Scribe a reference line on either side of the track bracket(s) for location.

Leave the mounting brackets in place.

Leave the track height adjustment bolts in place.

Remove the track and up-thrust as one unit in the upper and lower end when connected.

---

1. Press the Emergency Stop button to stop the escalator.
2. Remove the floorplates at the upper and lower landings (refer to Mechanical Section D).
3. Plug the maintenance pendant into one of the service boxes.
4. Remove steps as needed and move the opening to the location where the track section will be removed. (Refer to Mechanical Section F.)
5. Loosen nuts at tension carriage spring to reduce chain tension.
6. Remove step chain as needed. (Refer to Mechanical Section F.)
7. Disconnect the main power at the controller.
8. Remove all skirt panels. (Refer to Mechanical Section G.)
9. Install center poles using scribed lines on the main drive shaft and tension carriage shaft as datums.
10. Scribe a reference line at the top or bottom of the track on each track bracket for alignment of new track or re-installing old track.
11. Remove mounting bolts connecting the track to the track brackets, beginning at the upper or lower incline section.
    - After track is disconnected, replace mounting bolts in brackets.
12. Remove mounting bolts at the joint of the next section of track.

13. Remove track section.
14. Replace track in the reverse order of removal using previously scribed lines on the brackets to align the track.
    - Keep joints smooth.
    - Run escalator in both directions and adjust track if necessary.

C.7 TURN TRACK REMOVAL/REPLACEMENT

Remove and replace the turn track as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the floorplates at the landing of the turn track to be removed (refer to Mechanical Section D).
3. Plug the maintenance pendant into the service box.
4. Remove six of the steps at the turnaround. (Refer Mechanical Section F.)
5. Remove eight screws from each side of the turnaround track and remove.
6. Replace turnaround track in the reverse order of removal.
    - Run track in both directions and adjust track if necessary.

C.8 CHAIN GUIDE REMOVAL/REPLACEMENT

Remove and replace the chain guide as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the floorplates at the upper and lower landings (refer to Mechanical Section D).
3. Plug the maintenance pendant into one of the service boxes.
4. Remove eight steps and move the opening to the chain guide location (Refer to Mechanical Section F.)
5. Loosen nuts at tension carriage spring to reduce chain tension.
6. Remove step chain from around the area of the chain guide assembly. (Refer to Mechanical Section F.)
7. Remove skirt panels above the chain guide assembly. (Refer to Mechanical Section G.)
8. Remove eight screws from each chain guide assembly.
9. Lift assembly clear of truss.
10. Replace chain guide assembly in the reverse order of removal.
11. Adjust the chain guide, as needed, using the chain guide gauge. (Refer to chain guide adjustment procedure in this section.)

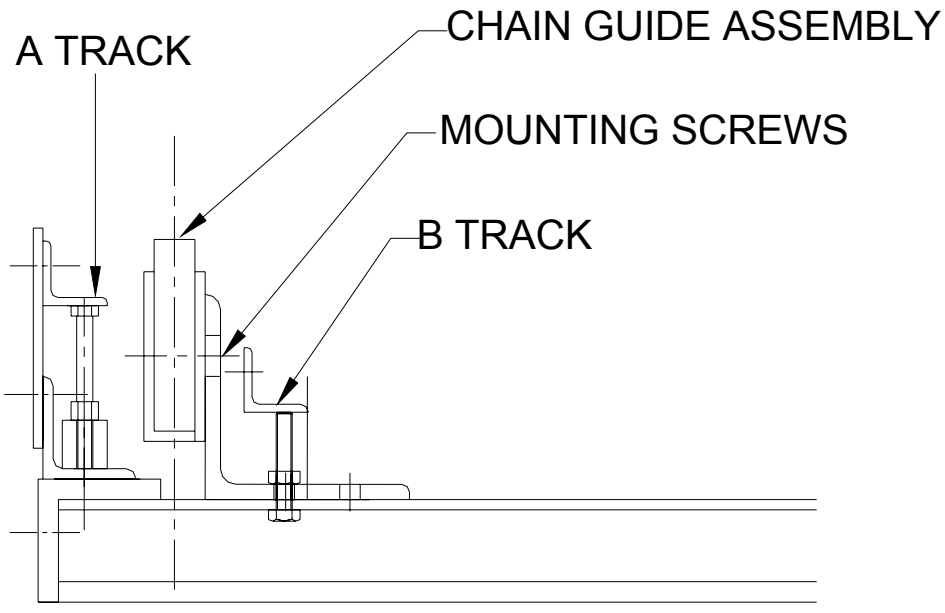


Figure C-6 Chain Guide Removal

D) LANDING PLATES

PREPARATIONS FOR SAFE MAINTENANCE

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- Always keep safety circuits in operation.

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- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

D.1 LANDING PLATES

The upper and lower landing areas include the following components:

- Floorplates
- Combplates and combfingers
- Step guide rollers

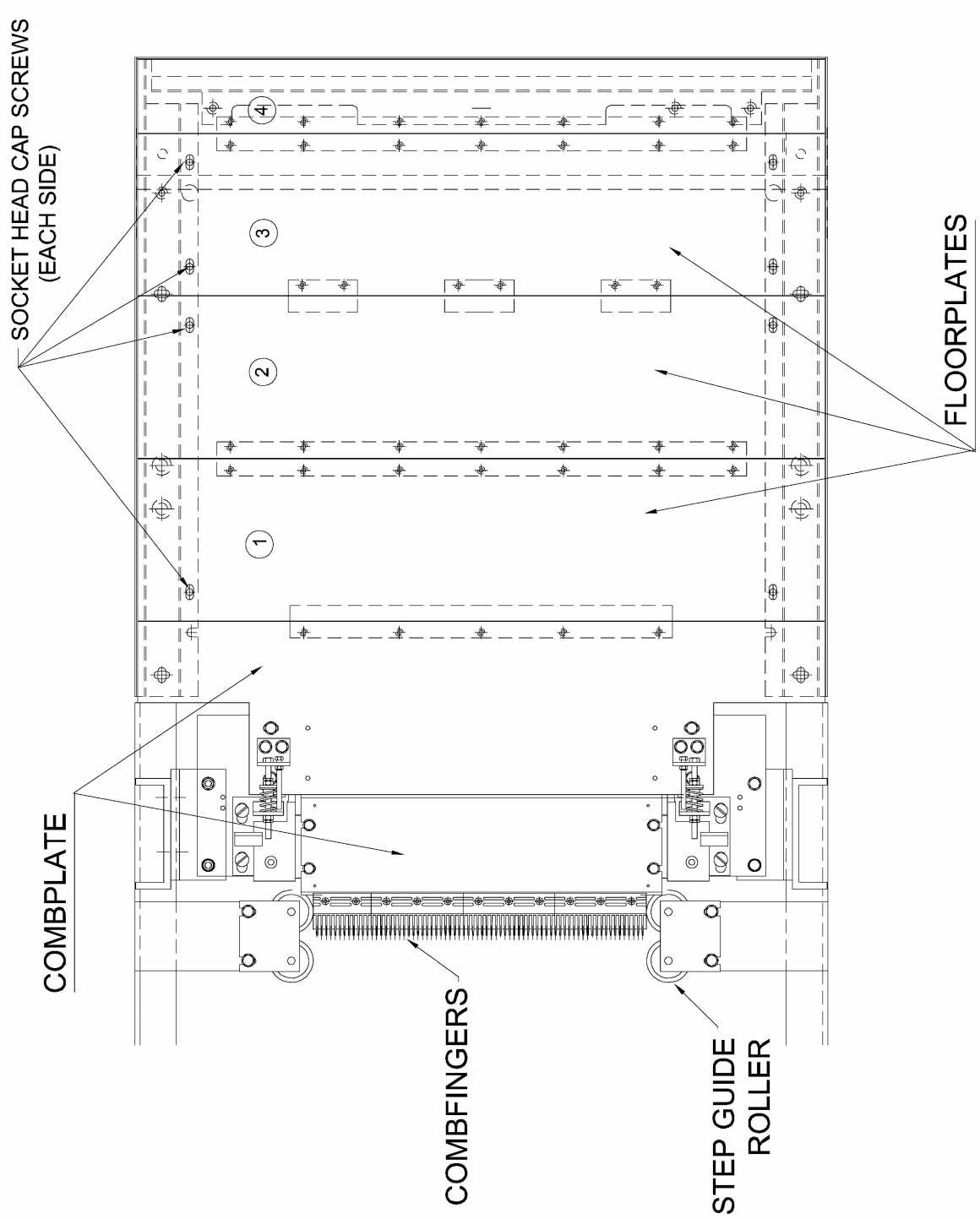


Figure D-1 Floorplate and Combplate Assemblies

D.2 FLOORPLATE ASSEMBLY

The extruded aluminum floorplates provide a flat surface leading to and from the steps. Removing the floorplates provides access to the upper and lower trusses and pits of the escalator.

The floorplates are supported by stainless steel frames mounted to the truss. These frames use socket head cap screws and u-nuts to secure the floorplates to the frames.

D.3 COMBPLATES

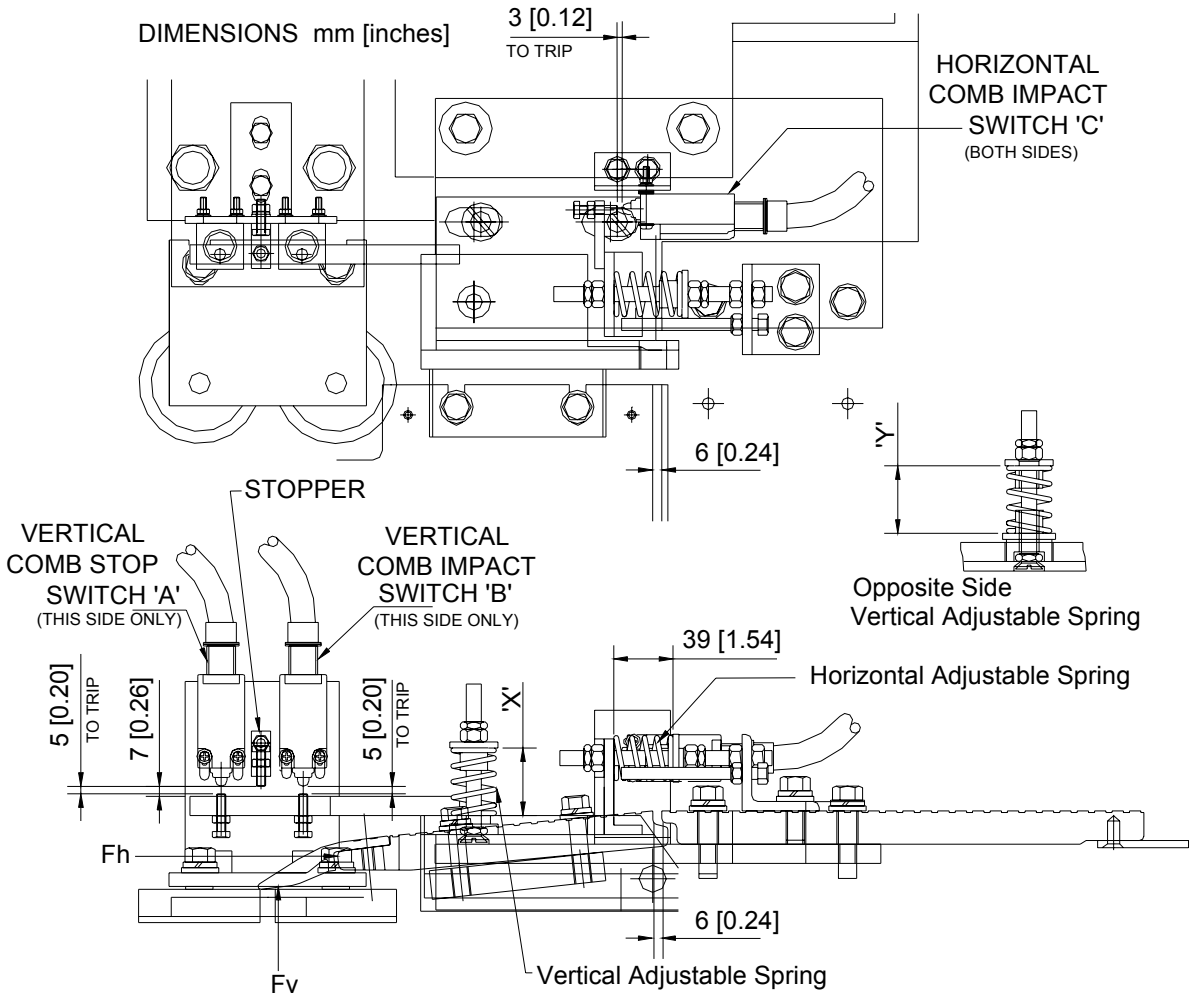
The extruded aluminum combplate provides the basic transition area from the floor to the moving step. The combplate is pinned and spring loaded to allow movement to meet the comb impact device requirements.

The comb switches are located behind the skirt panel. They stop the escalator when an object becomes wedged between the combplate and step.

Refer to Figure D-2.

When horizontal force (Fh) exceeds 200 pounds at either side of the combplate or 400 pounds at the center of the combplate, the combplate slides until the lever depresses the Switch C.

When a vertical force (Fv) exceeds 150 pounds, the combplate rotates slightly until the lever depresses the Switch B, cutting power to the motor and brake, thus stopping the escalator. Switch A trips at a vertical force of 45 pounds.



1) HORIZONTAL COMB IMPACT (SWITCH "C") SHOULD TRIP WHEN Fh IS 180 - 200 LB APPLIED AT EITHER SIDE OR Fh IS 360 - 400 LB APPLIED AT THE CENTER OF THE COMBPLATE.

2) VERTICAL COMB IMPACT (SWITCH "B") SHOULD TRIP WHEN Fv IS 130 - 150 LB APPLIED VERTICALLY AT THE CENTER EDGE OF THE COMBPLATE.

3) COMB STOP (SWITCH "A") SHOULD TRIP WHEN Fv IS 40 - 45 LB.

4) VERTICAL SPRING ADJUSTMENT:

	"X"	"Y"
24" STEP	39mm [1.54"]	38mm [1.50"]
40" STEP	36mm [1.42"]	42mm [1.65"]

Figure D-2 Combplate and Impact Switches

D.4 COMBFINGERS

The combfingers are designed to mesh with the slots (cleats) in the step tread surface. This meshing prevents objects from becoming trapped or pinched between the combplate and the step.

The combfingers are attached to the combplate in segments. Each segment is held in place with a set of screws. This provides easy and quick removal of the combfingers if they become damaged.

The combfingers are made from a cast zinc alloy and are painted safety yellow to indicate the transition area of the step and combplate.

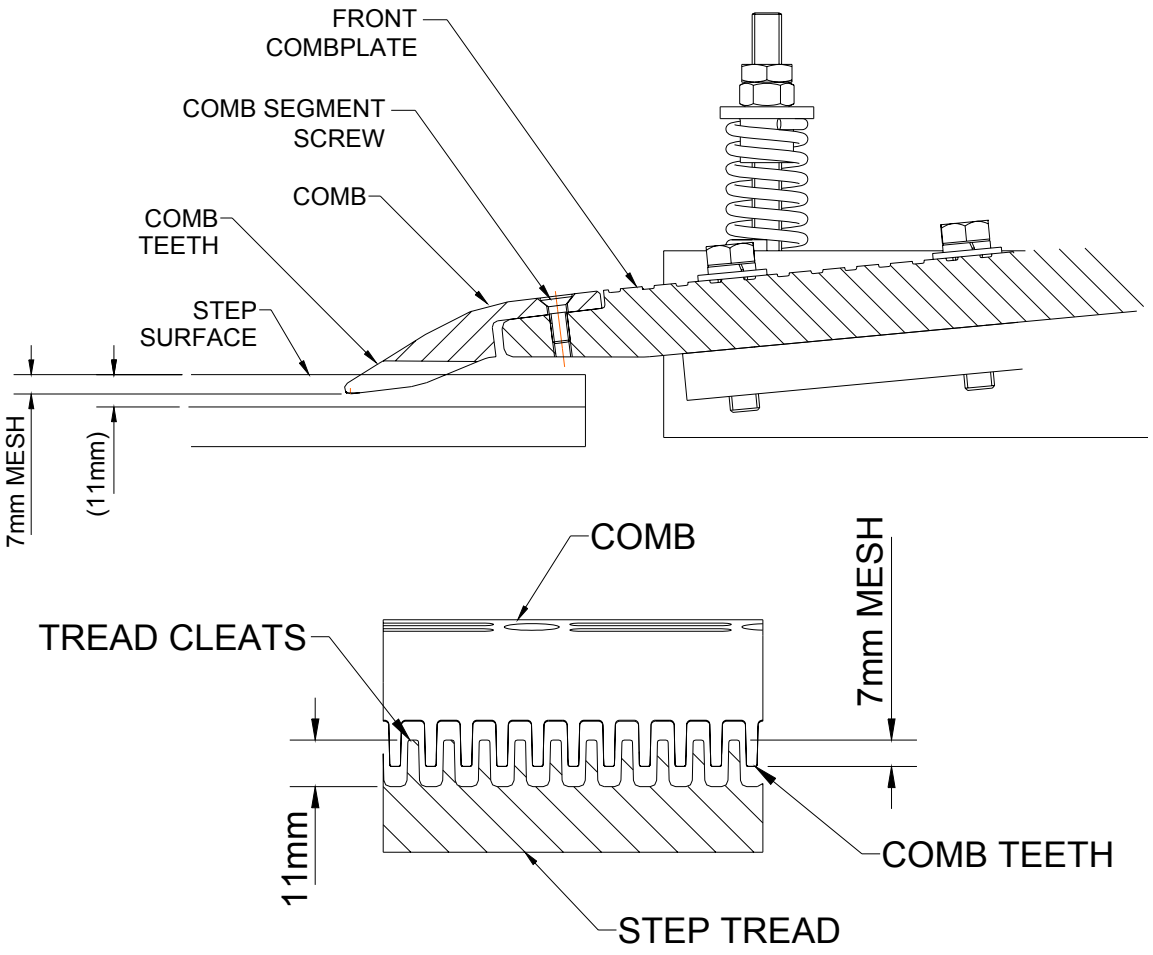


Figure D-3 Combfingers

D.5 STEP GUIDE ROLLERS

The guide wheels are attached to the truss. They are located on either side of the combfingers. They center the steps to mesh with the combfingers and to prevent breakage.

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Combfingers
- Combplate
- Floorplate
- Step Guide Rollers

D.6 COMBFINGERS ADJUSTMENT

Inspect and adjust the combfinger (comb) segments as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Check each comb section for broken combfingers and cracks.
    - Replace combfinger segments if damaged.
3. Check for missing screws and replace, if needed.
4. Remove foreign objects that have become wedged between the combfingers or between the combfingers and the step.
5. Inspect alignment and centering position of the comb and steps.
    - Center and align comb, if necessary.
    - Loosen mounting bolts “A” to move the front combplate side-to-side to mesh the comb with the step teeth.
6. Tighten all combfinger screws.

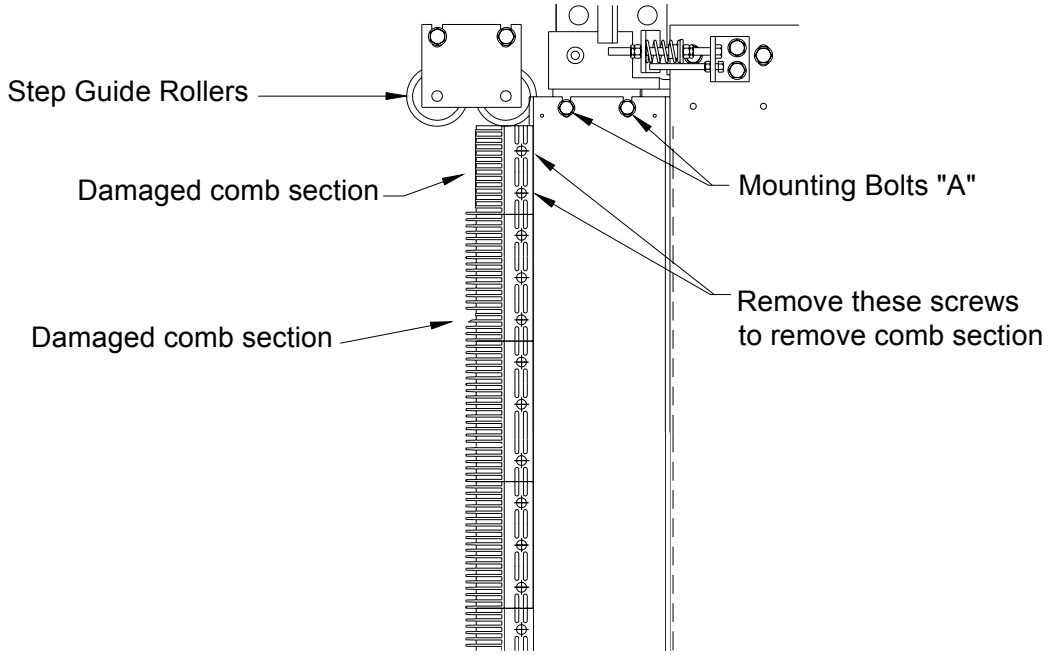


Figure D-4 Combfingers Adjustment

D.7 COMBPLATE ADJUSTMENT

Inspect and adjust the combplates as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Check the condition of the combplate assembly.
    - Be sure there are no large gouges or cracks.
3. Clean the combplate.
    - Remove all foreign objects, gum, oil, and grease.
4. Verify that the 6mm [0.24”] gap between the front and rear combplate is clear of debris to allow the front combplate to move if a force is applied to it.

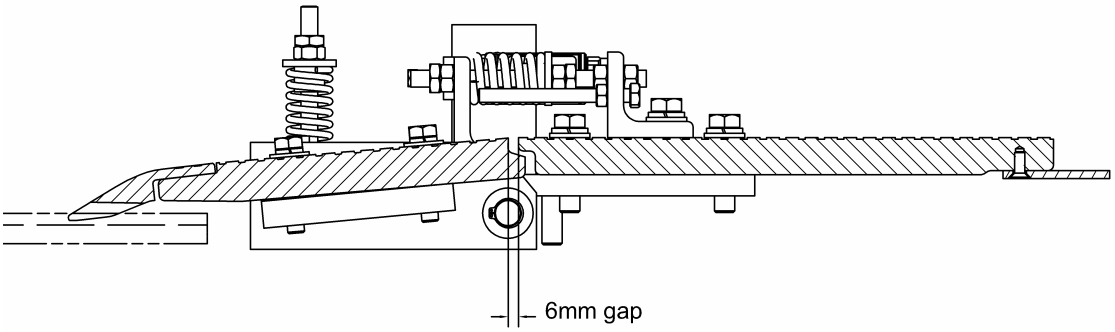


Figure D-5 Combplate Adjustment

D.8 FLOORPLATE ADJUSTMENT

Maintain and adjust the floorplates as follows:

1. Check the condition of the floorplates.
    - The floorplate joints should be even, and the floorplates should be firm and quiet when walked on.
2. Clean the floorplates.

D.9 STEP GUIDE ROLLER ADJUSTMENT

Inspect and adjust the step guide rollers as follows:

1. Observe the steps entering the combfingers.
2. Watch for any shifting or interference with the combfingers.
3. Press the Emergency Stop button to stop the escalator.
4. Remove the newel interior panels (refer to Mechanical Section G) to access the mounting bolts.
5. Check the condition of the roller.
    - Be sure the rubber wheel is in good condition.
6. Check that the mounting bolts are tight.
7. Check that the guide roller is making proper contact with the step.
    - Do not over tighten the rollers. They should only make light contact.

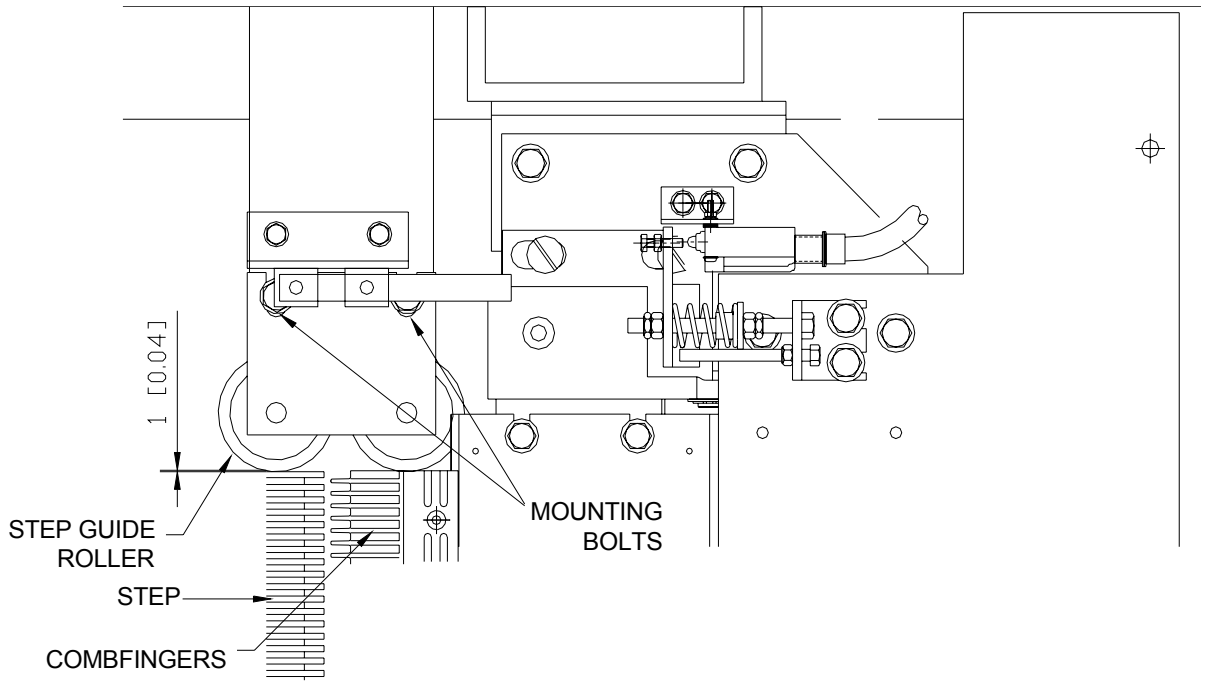


Figure D-6 Step Guide Roller Adjustment

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Combfingers
- Combplate Assembly
- Floorplates
- Step Guide Rollers

D.10 COMBFINGER REMOVAL/REPLACEMENT

Remove and replace the combfingers as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the screws that mount the combfinger segments to the combplate.
3. Remove the combfinger segment.
    - Make a note of any shims that are used.
4. Replace the combfinger segment by centering the fingers in the step tread.
    - Make sure the combfingers are meshing with the step ridges 7mm (.28”). Shim, if necessary.
5. Apply removable thread locker to the screws and tighten the combfinger segments down.

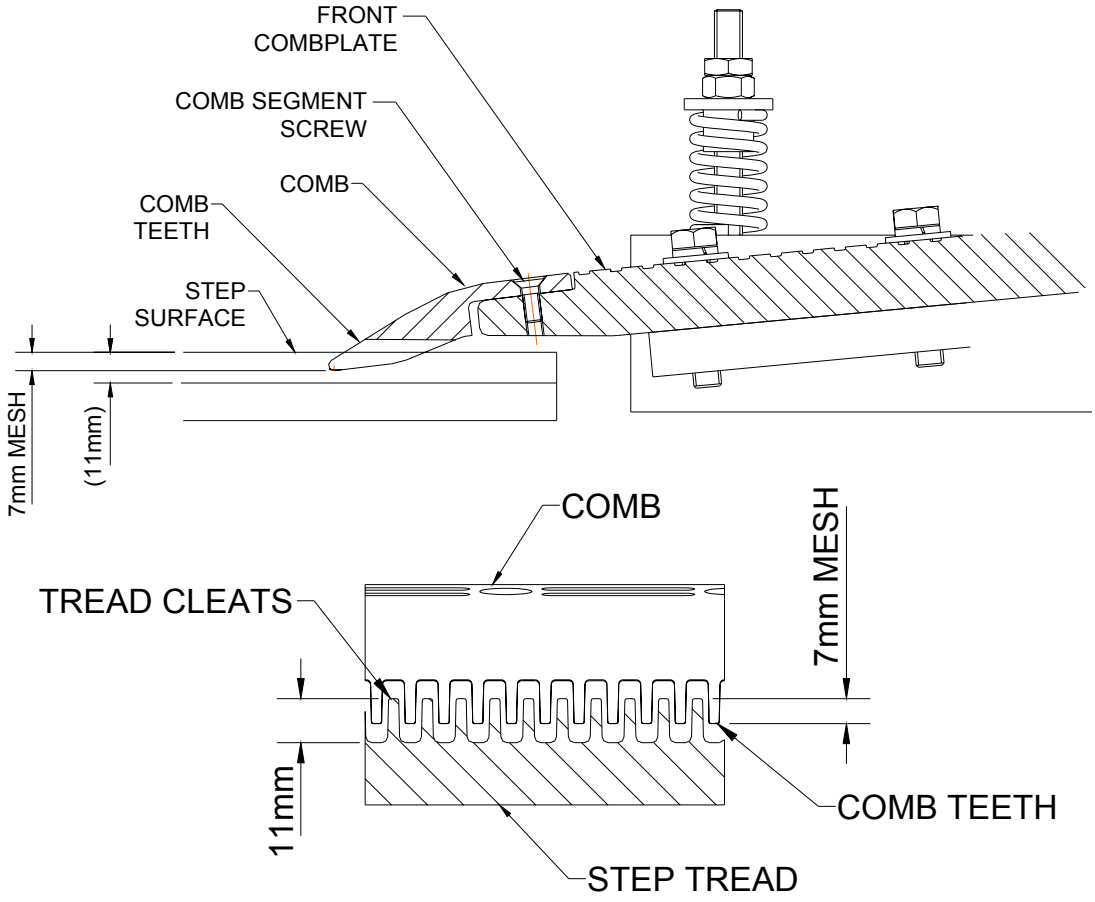


Figure D-7 Combfinger Removal

D.11 COMBPLATE REMOVAL/REPLACEMENT

Remove and replace the combplate as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the newel interior panels (Mechanical Section G).
3. Disconnect the wiring and conduit from the comb light.
4. Remove the skirt panel above the combplate assembly area (Mechanical Section G).
5. Disconnect the wiring and conduit from the comb impact switches.
6. Remove the combfinger segments to prevent damage.
7. To remove just the front combplate, remove two (2) bolts “A” on each side.
   OR
   To remove the entire combplate assembly, remove the two (2) bolts on each side connecting the combplate assembly to the truss.
8. Replace the combplate assembly in reverse order of removal.

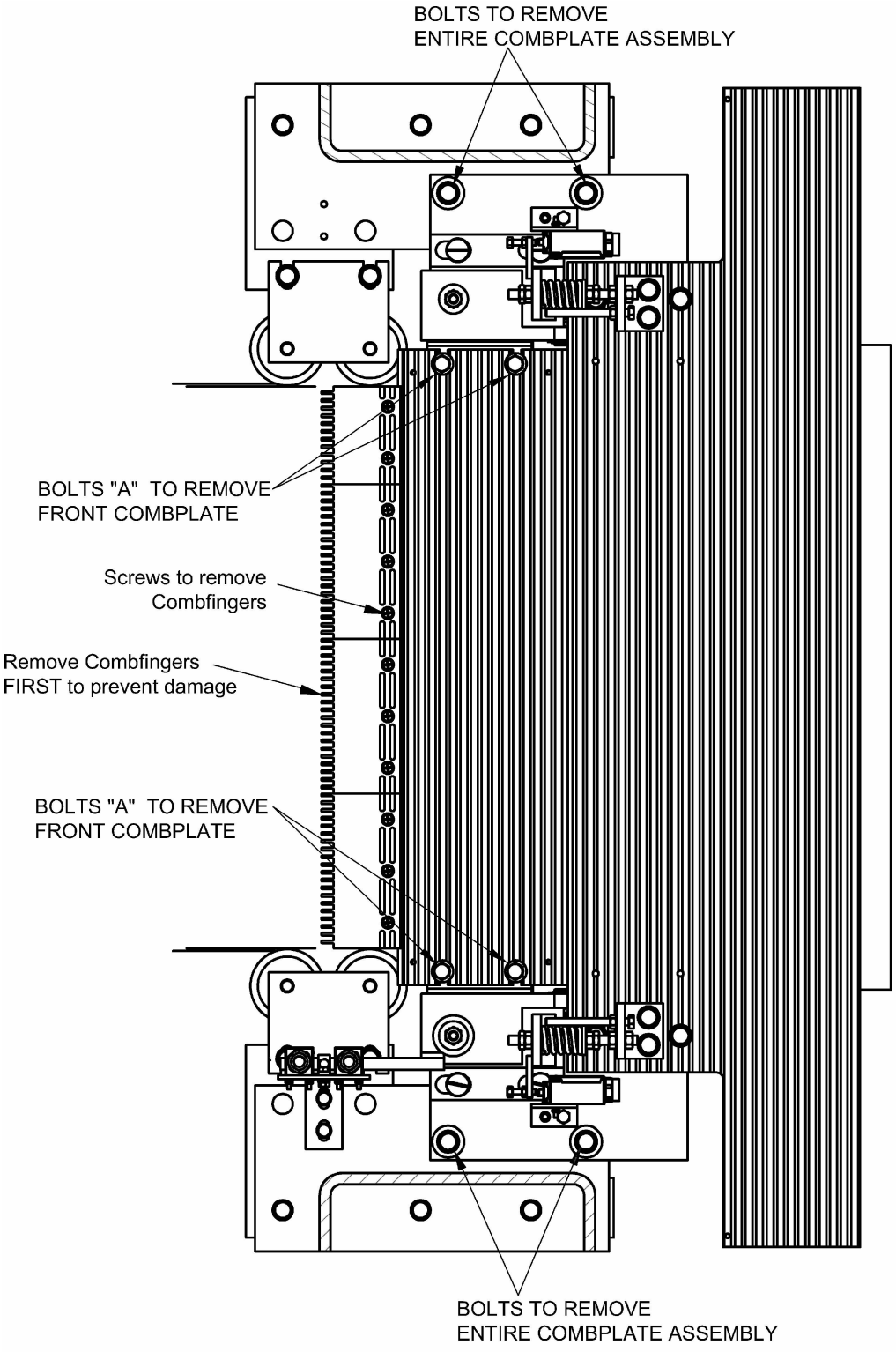


Figure D-8 Combplate Removal

D.12 FLOORPLATE REMOVAL/REPLACEMENT

Remove and replace the floorplates as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Completely remove the 8 screws through floorplates ①, ②, and ③.
    - Floorplates ① and ② are joined and can be removed together.
    - Floorplates ③ and ④ are joined and can be removed together.
3. Replace the floorplates in reverse order of removal.
    - When tightening down the floorplate, do not overtighten.

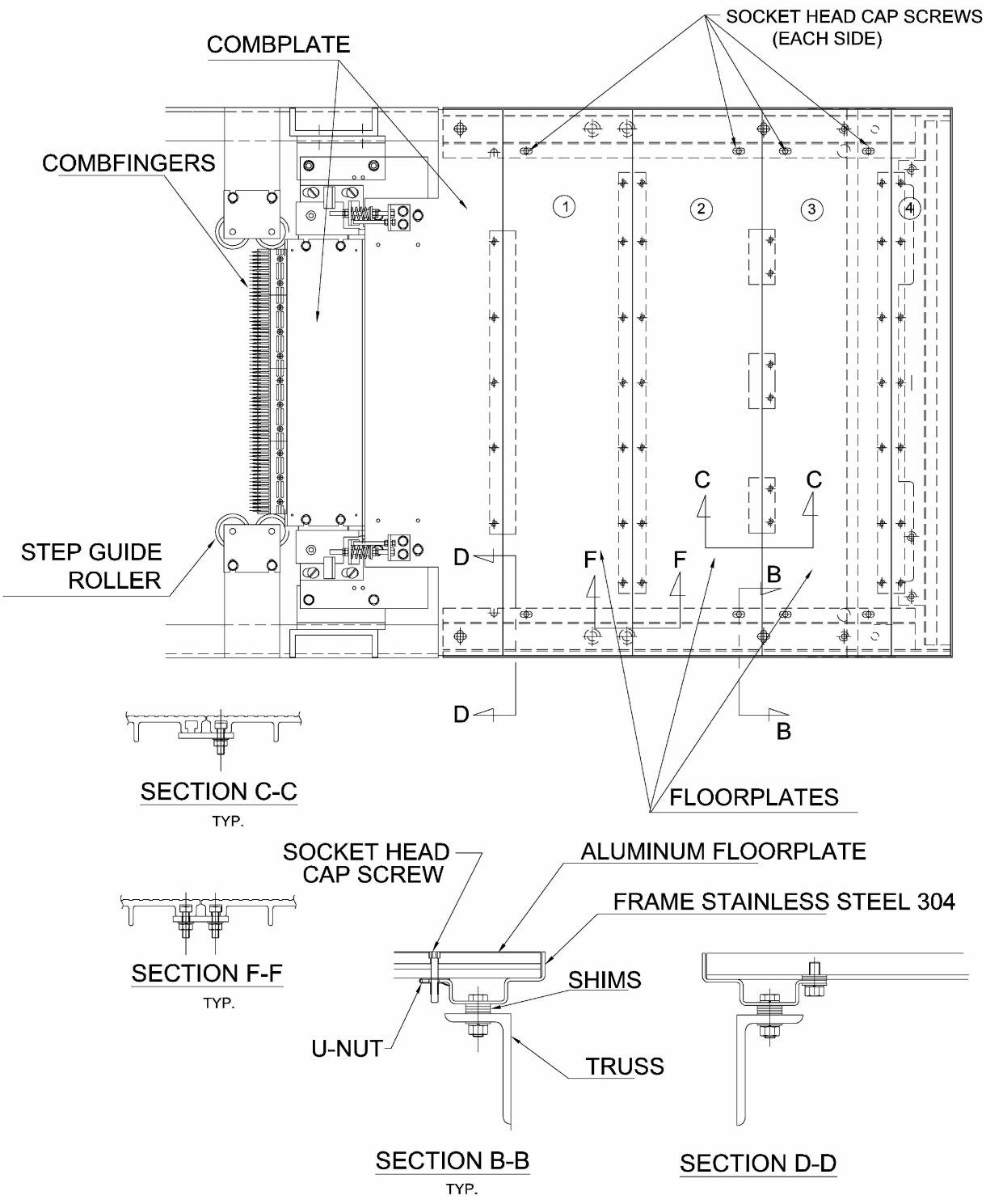


Figure D-9 Floorplate Removal

D.13 STEP GUIDE ROLLER REMOVAL/REPLACEMENT

Remove and replace the step guide rollers as follows:

1. Press the Emergency Stop button to stop the escalator.
2. Remove the newel interior panels adjacent to the combfingers (Mechanical Section G).
3. Remove two (2) mounting bolts from each step guide roller bracket.
4. Remove the step guide roller assembly.
5. Replace the step guide rollers in reverse order of removal.
6. Adjust, as needed, to ensure proper step alignment entering the combfingers.

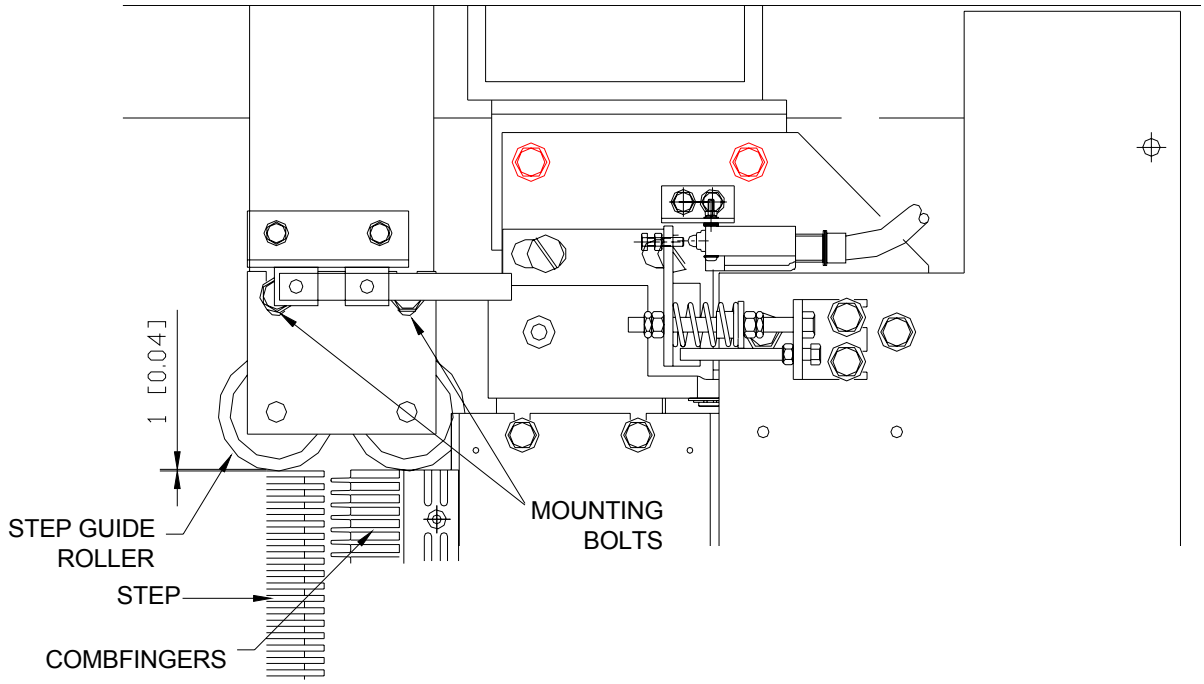


Figure D-10 Step Guide Roller Removal

E) HANDRAIL SYSTEM

PREPARATIONS FOR SAFE MAINTENANCE

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- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

E.1 HANDRAIL DRIVE SYSTEM

The handrails are constructed of black laminated rubber with white 0.75" round white markers spaced 2' apart, with steel tension wire, and a canvas backed traction surface. The molded handrails provide a smooth attractive surface. The handrail is highly resistant to abrasions, cuts, and UV light discoloration, resulting in longer life.

The handrail drive system is a traction drive system and receives its power from the main drive system. To optimize the contacts between the drive sheaves and the handrail, a series of intermediate rollers and tensioning devices maintain the handrail tension and trueness throughout the handrail routing.

The handrail guidance consists of a formed steel guide connected to the exterior of the balustrade. Rollers are added to the upper curve and sheaves at the newel ends to reduce friction. Formed steel roller guides, located along the truss, provide guidance inside the escalator. A handrail tension device with rollers is adjusted to take up slack due to stretching.

The handrail is routed around the handrail drive sheave, over the support rollers, through the take-up devices, the handrail guide, the return guide, and back to the handrail drive sheave.

The handrail drive sheave is connected by chain via a handrail middle drive shaft to the main drive shaft and is the driving power of the handrails. The first handrail drive chain is a #100 chain connecting the middle handrail drive sprocket to the handrail drive sprocket on the main drive shaft. The two handrail drive sheaves are connected to sprockets, which are driven by a #80 chain connection to the middle handrail drive shaft. The handrail retaining rollers apply pressure to increase traction and prevent slippage. Return guides support and guide the handrail along the return side.

An anti static device discharges static electricity from the handrail. Brushes are installed under the upper end of the escalator. These brushes lightly touch the handrail surface to draw off any static electricity.

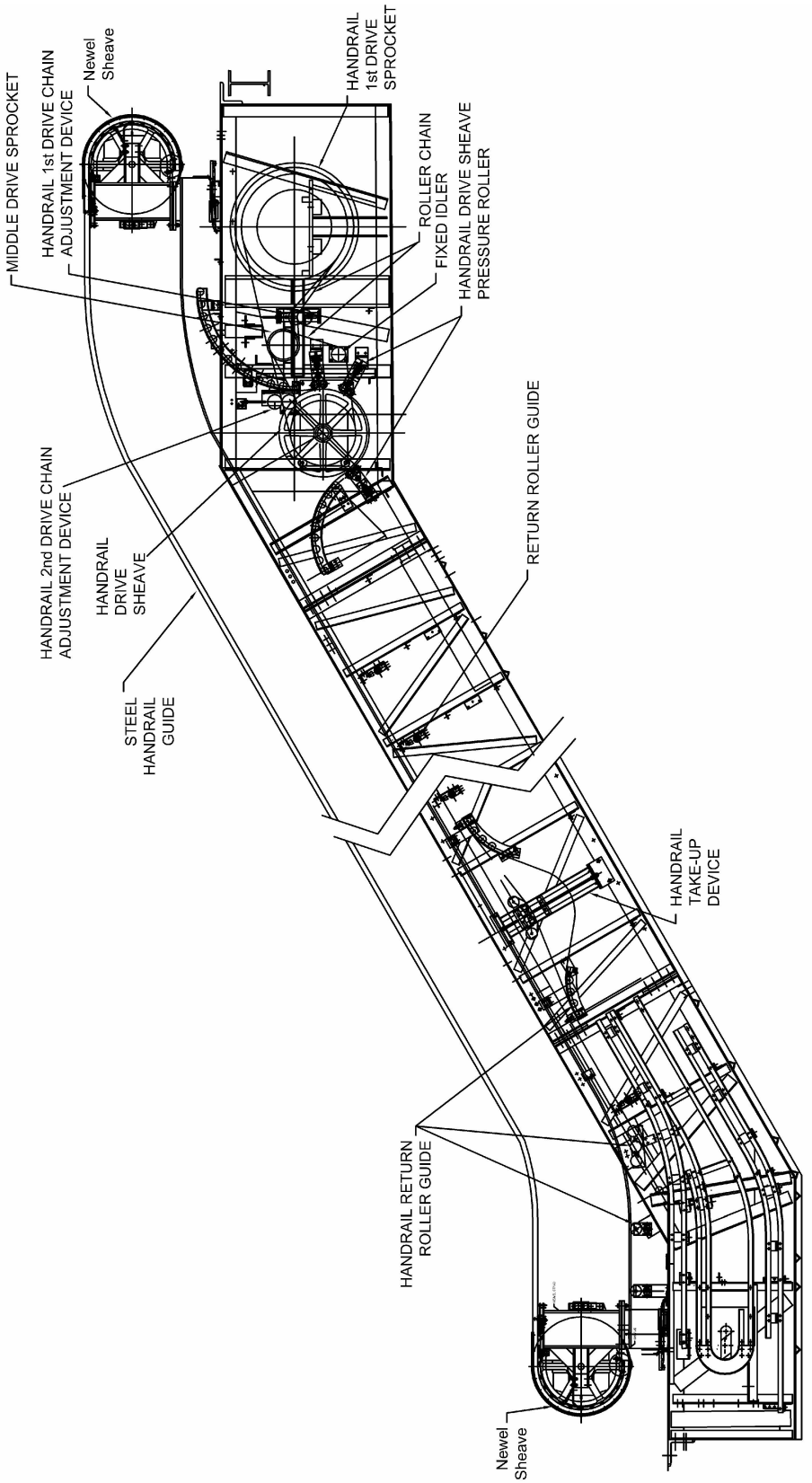


Figure E-1 Handrail Drive System and Tension Device

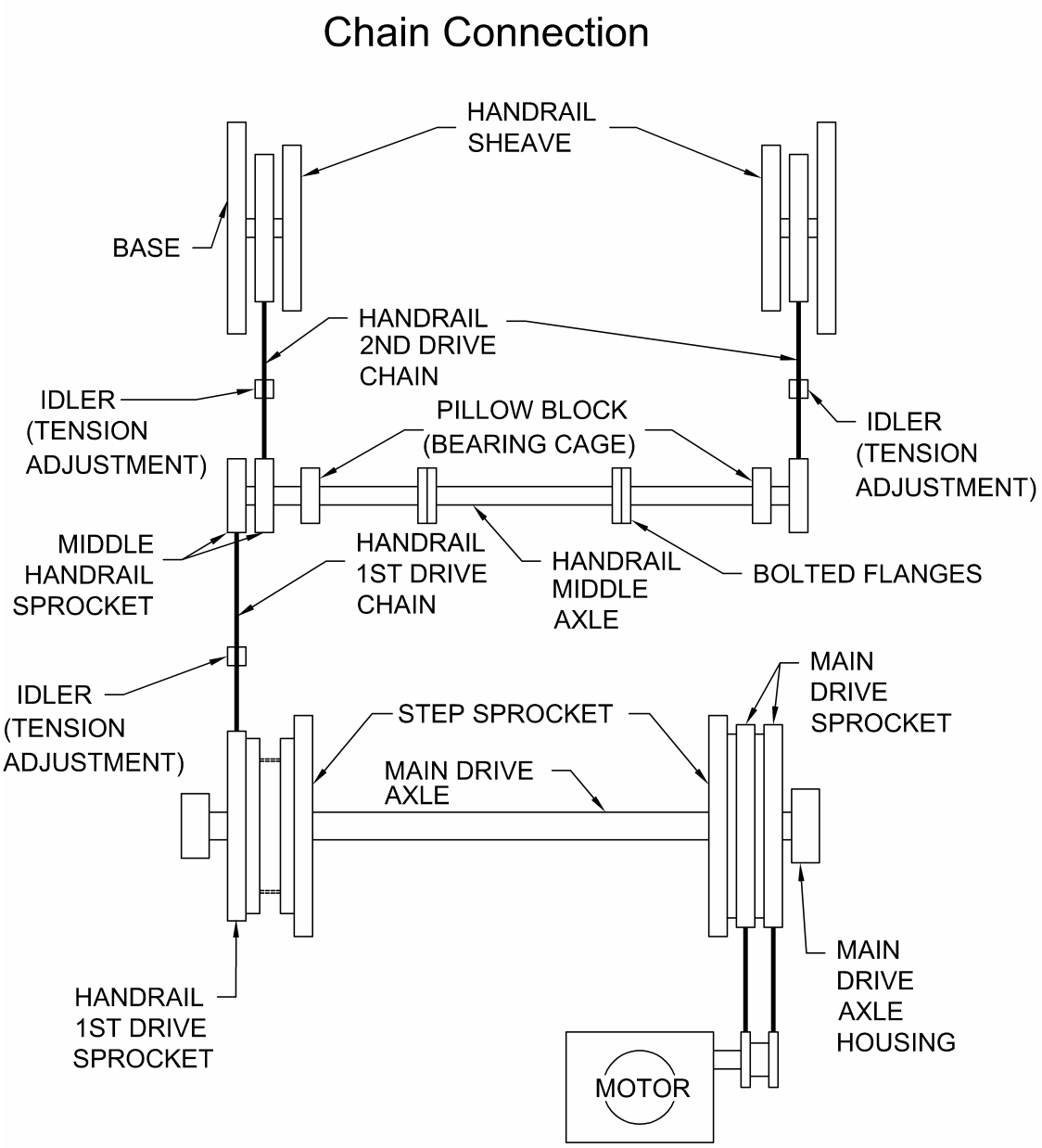


Figure E-2 Chain Connections

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Handrail
- Handrail Drive Chain
- Take-Up Device
- Return Guides
- Handrail Drive Sheave Pressure Rollers
- Handrail System Bearing Lubrication

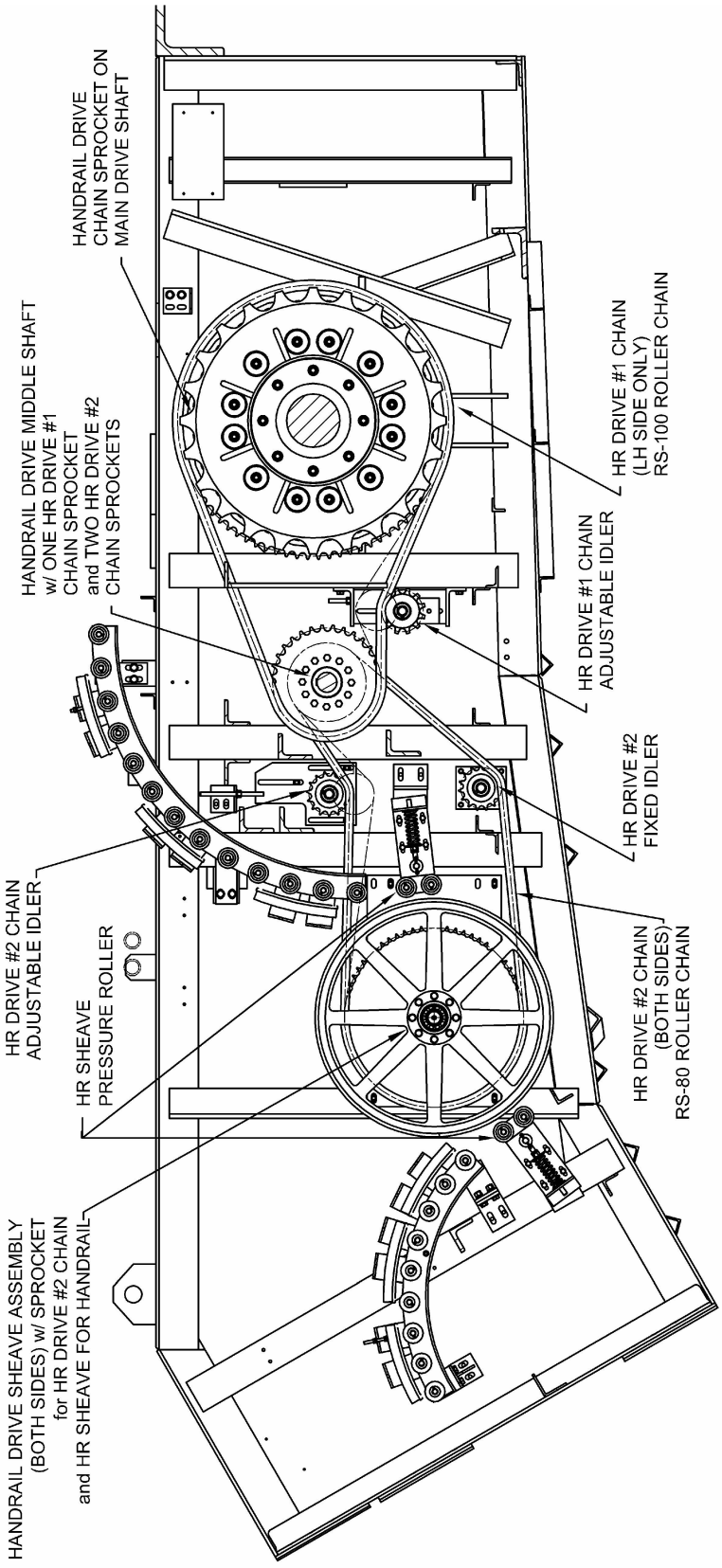


Figure E-3 Handrail Drive System

E.2 HANDRAIL ADJUSTMENT

Inspect and adjust the handrail as follows:

1. Perform the lead/lag check:
    - Run the escalator in the UP direction and check whether the handrail lags behind the step or leads in front of the step for the length of the escalator.
    - If the handrail lags behind the step, adjust the take-up device. (Refer to take-up device procedures in this section).
    - If the handrail leads the step by more than the allowable values (given below), verify that the number of teeth on the handrail drive sprocket and the diameter of the handrail drive sheave are correct. Replace as needed.

Rise (FT)	ALLOWANCE VALUE (IN)	
	LEAD	LAG
15	7	0
24	11.5	0
35	17	0

Figure E-4 Handrail Lead/Lag

2. Check tension in the handrail by pulling on the spring force gauge.
    - If the tension is less than 70 pounds, adjust take-up device and pressure rollers.
3. Clean handrail with water.
    - Wipe with a dry cloth.
    - When gum, grease, or heavy dirt exists, clean with an ethyl alcohol soaked cloth.
    - After alcohol evaporates, wipe with dry cloth.
4. Apply “Rubber Shine” on handrail surface and wipe handrail with a dry cloth.

E.3 HANDRAIL DRIVE CHAIN ADJUSTMENT

Inspect and adjust the handrail drive chain as follows.

E.3.1 Check Handrail Drive Chain Slack

Check for the proper chain slack as follows:

1. Measure lengths along the first and second handrail drive chains on the chain side that does NOT contain the adjustable idler.
   Refer to Figure E-3.
   - Measure the handrail first drive chain length “L” along the top – from the point on the chain at right angles to the center of the handrail drive sprocket on the main drive shaft to the point on the chain at right angles to the center of the handrail drive middle shaft.
     Then measure the slack.
   - Measure the handrail second drive chain length ”L” in one of two places – from the point at right angles to the center of the handrail drive sheave/sprocket to the point at right angles to the center of the handrail second drive fixed idler OR from the point at right angles to the center of the handrail second drive fixed idler to the point at right angles to the center of the handrail drive middle shaft.
     Then measure the slack.
2. Measure the slack in each length of chain.
   - Slack should be approximately 2% of length “L”.

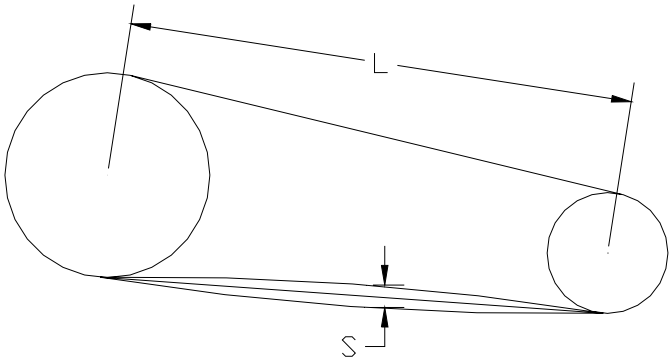


Figure E-5 Handrail Drive Chain Slack

3. Take up any excessive slack in each chain by adjusting the associated handrail drive chain adjustable idler.

E.3.2 Check Handrail Drive Chain Elongation

Check for overly stretched handrail drive chain as follows:

1. Measure handrail drive chain elongation.
    - Measure six links as shown using calipers.
    - Record L1 and L2.
    - Calculate chain elongation ("E") using the following:

      L = (L1 + L2) / 2
      E (%) = ((L – S) / S) X 100 (where "S" = standard length)
    - If E (%) > 1.5%, replace the chain.
2. Replace the chain if it is abnormally stretched.

6 LINKS MEASUREMENT	1st HANDRAIL DRIVE CHAIN #100	2nd HANDRAIL DRIVE CHAIN #80
STANDARD LENGTH (IN)	7.50	6.00
ALLOWABLE LENGTH (IN)	7.61	6.09

Figure E-6 Handrail Drive Chain Stretch

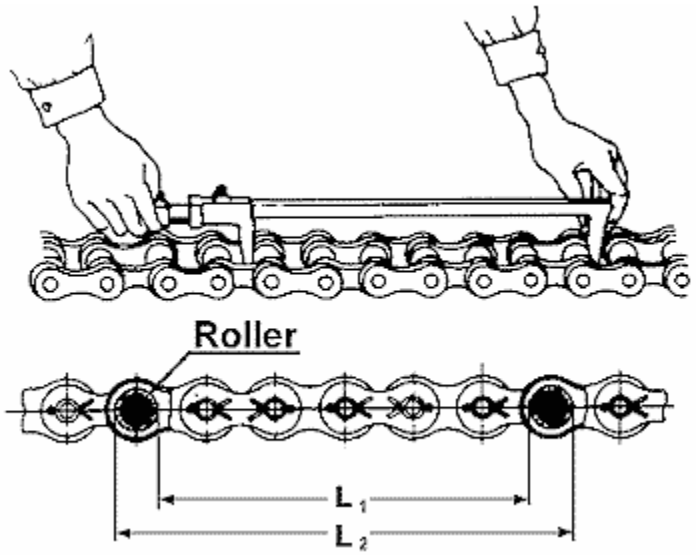


Figure E-7 Handrail Drive Chain Link Measurement

E.4 HANDRAIL TAKE-UP DEVICE ADJUSTMENT

Adjust the handrail take-up device as follows:

1. Loosen the lock nut, near the top, of the threaded rod against the bracket.
2. Turn the upper-pinned nut until the take-up device achieves the proper tension in the handrail.
    - The take-up device moves up and down the threaded rod.
3. Tighten upper lock nut.
4. Recheck handrail tension.

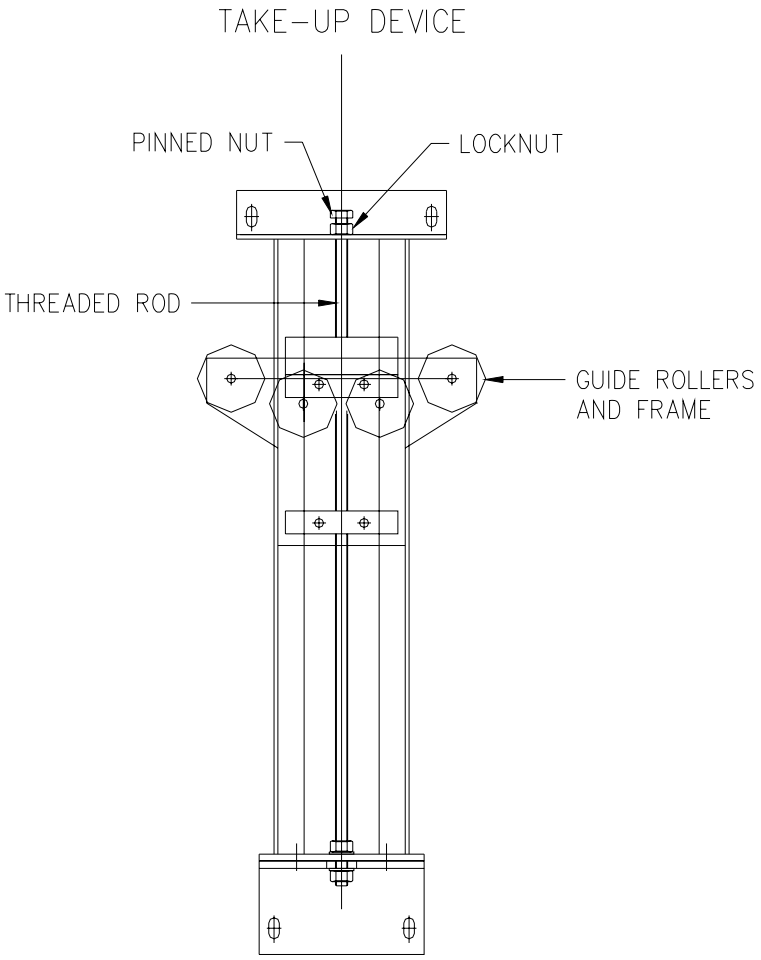


Figure E-8 Handrail Take-Up Device

E.5 RETURN GUIDE ADJUSTMENT

Inspect and maintain the return guides as follows:

1. Remove handrail from return guides. (Refer to handrail removal/replacement procedures.)
2. Clean grease and dirt from guides.
3. Check for abnormal wear on steel guides (as shown below). Replace as needed.
4. Replace handrails on return guides.

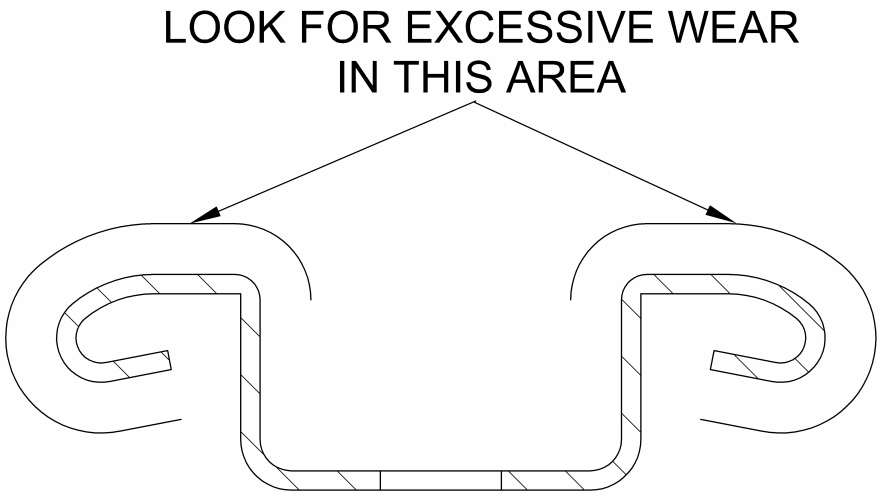
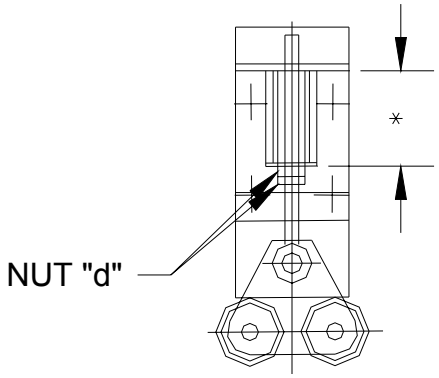


Figure E-9 Handrail Return Guide

E.6 HR DRIVE SHEAVE PRESSURE ROLLER ADJUSTMENT

Adjust the handrail drive sheave pressure roller as follows:

1. Increase or decrease the spring force by adjusting nut “d” to change spring length.



* - STANDARD VALUE
81mm [3.19 IN.]

LIMIT VALUE
75mm [2.95 IN.]

SOLID COMPRESSED HEIGHT
68mm [2.68 IN.]

FREE LENGTH
110mm [4.33 IN.]

Figure E-10 Handrail Drive Sheave Pressure Roller

2. After adjustment, lock nut “d”.

E.7 HANDRAIL SYSTEM BEARING LUBRICATION

Adjust the handrail system bearing lubrication as follows:

1. Add Mobilith AW2 (green) or equivalent grease to upper zerk fitting panel.
    - These fittings lubricate bearings in the upper newel sheave, handrail drive, and main drive.
    - Bearings in the handrail middle drive shaft, handrail drive chain idlers, and rollers are SEALED and require no external lubrication.
2. Add Mobilith AW2 (green) or equivalent grease to lower zerk fitting panel.
    - This fitting lubricates bearings in the lower newel sheave.

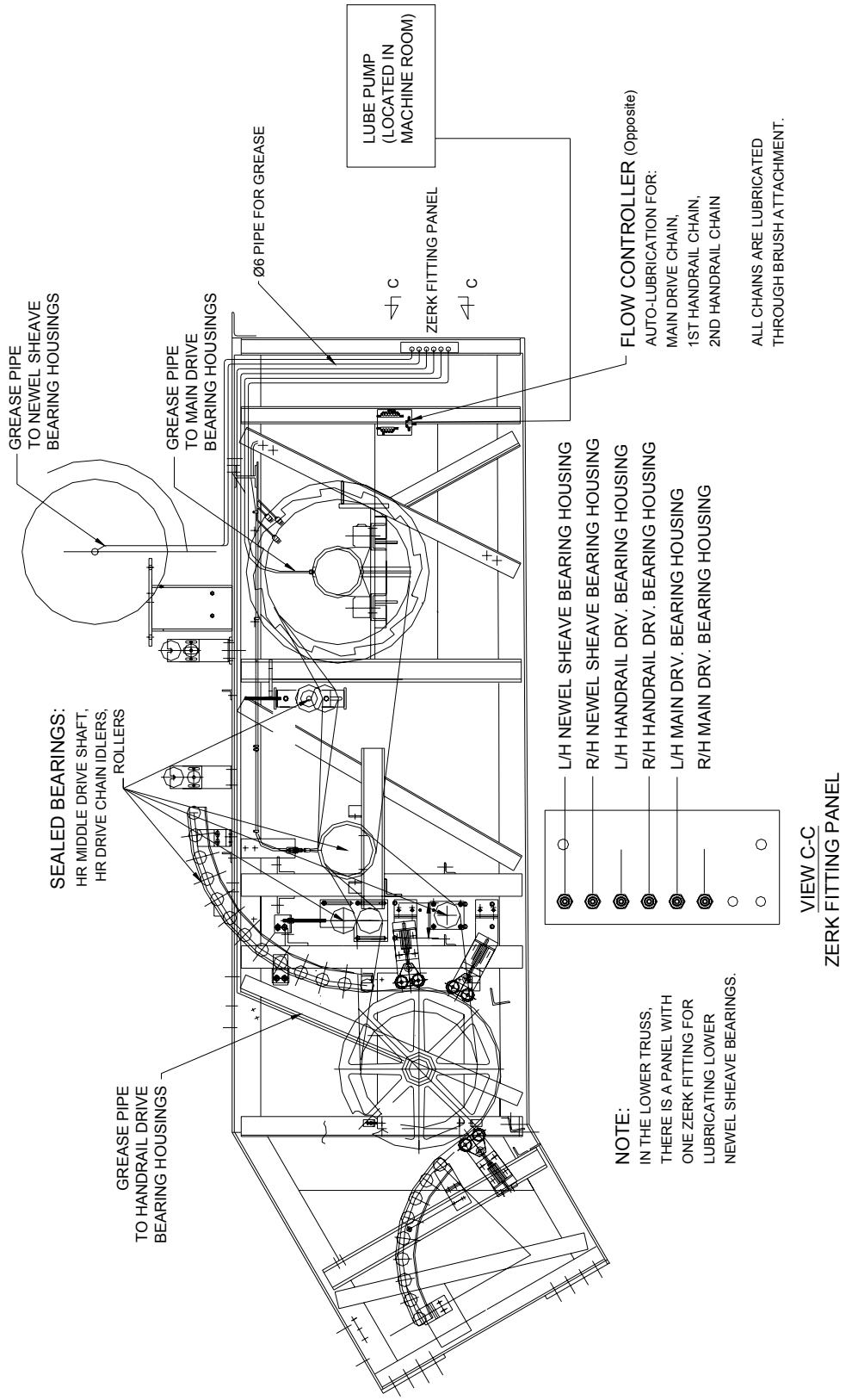


Figure E-11 Handrail System Bearing Lubrication

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Handrail
- Partially Removed Handrail
- Handrail Drive Sheave/Sprocket
- Handrail Middle Drive Shaft
- Handrail Return Roller Guides
- Handrail Drive Sheave Pressure Rollers
- Take-up Device
- First Handrail Drive Chain
- Second Handrail Drive Chain

E.8 HANDRAIL REMOVAL/REPLACEMENT

Remove and replace the handrail as follows:

1. Remove half of the escalator steps. (Refer to Mechanical Section F.)
2. Remove all skirt panels and interior panels. (Refer to Mechanical Section G.)
3. Remove upper and lower handrail entry devices. (Refer to Section B in the Electrical Section.)
4. Raise handrail take-up (tension) device to its uppermost position.
5. Remove handrail drive sheave. (Refer to handrail drive sheave removal/replacement procedures in this section.)
6. Remove handrail guides on the return side by loosening the nut and sliding out through the open slot in the bracket.
7. Remove the handrail at the lower curve by peeling the handrail off of the handrail steel guide.
8. Continue to remove the handrail by peeling it off of the guide.
    - Once the handrail is off, remove it from the truss.
9. Replace handrail in the reverse order of removal.
    - Adjust take-up device to maintain the proper tension in the handrail.
    - Check the handrail tension and lead/lag.

E.8.1 Reinstalling a Partially Removed Handrail

Reinstall a handrail that has come off the exposed section of balustrade (possibly due to vandalism) as follows:

1. While the handrail is off, check the condition of the handrail guides.
2. If the handrail has come off past the handrail entry device, then:
    - Remove the handrail guard.
    - Place handrail back on guides.
3. Slip the handrail over the steel guides (and guide rollers where applicable) in the following order:
    - Lower newel
    - Lower curve
    - Upper newel
    - Incline up to the upper curve
    - Upper curve

    NOTE: It will require extra force to pull the slack to the upper curve and finish slipping the handrail over the steel guide.
4. Check the handrail tension and lead/lag.

E.9 HANDRAIL DRIVE SHEAVE/SPROCKET REMOVAL/REPLACEMENT

Remove and replace the handrail drive sheave and sprocket as follows:

1. Remove five steps. (Refer to Mechanical Section F.)
2. Move the step opening to the handrail second drive chain section, until the master link is accessible.
3. Release the spring force by loosening nut “d” of the handrail drive sheave pressure roller.
4. Remove four “A” bolts and remove handrail drive sheave.
5. Remove handrail second drive chain.
6. Remove C-clip from handrail drive shaft.
7. Slide handrail drive sprocket off shaft and remove from the truss.
8. Replace handrail drive sheave and sprocket in the reverse order of removal.

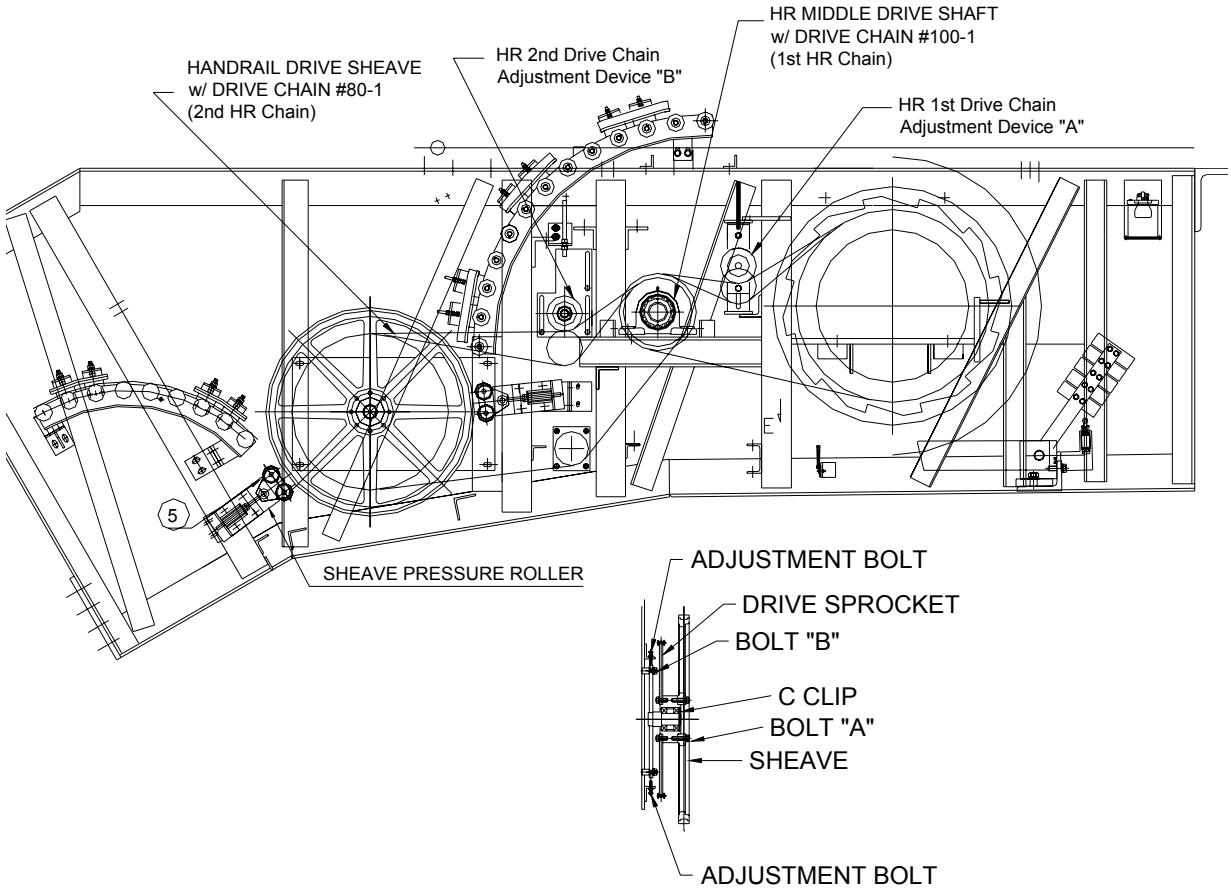


Figure E-12 Handrail Drive Component Removal

E.10 HANDRAIL MIDDLE DRIVE SHAFT REMOVAL/REPLACEMENT

Remove and replace the handrail middle drive shaft as follows:

1. Remove five steps. (Refer to Mechanical Section F.)
2. Slacken the handrail drive chains by moving the sprocket position on handrail first and second drive chain adjustment devices “A” and “B”.
3. Remove handrail drive chains. (Refer to handrail drive chain removal/replacement procedures in this section.)
4. Remove bolts on flanges to remove middle section of middle drive shaft.
5. Loosen the push bolts used to position the middle drive shaft pillow blocks horizontally.
6. Remove the fasteners for the middle drive shaft pillow blocks.
7. Remove each end of the middle drive shaft using a hoist.
8. Replace the handrail middle drive shaft in the reverse order of removal.
9. Use a straight edge to align sprockets with the handrail drive sprocket on the main drive shaft and the handrail drive sprockets connected to the handrail drive sheaves.
10. Adjust the chain tension to get the proper slack (2% of length “L”). (Refer to handrail drive chain adjustment procedures in this section.)

E.11 HANDRAIL RETURN ROLLER GUIDES REMOVAL/REPLACEMENT

Remove and replace the handrail return roller guides as follows:

1. Remove interior panel and skirt panel adjacent to roller guide. (Refer to Mechanical Section G.)
2. Remove retaining ring.
3. Slide roller off.
4. Replace roller.
5. Replace retaining ring.

E.12 HANDRAIL DRIVE SHEAVE PRESSURE ROLLERS REMOVAL/REPLACEMENT

Remove and replace the handrail drive sheave pressure rollers as follows:

1. Remove five steps. (Refer to Mechanical Section F.)
2. Move step opening to handrail drive sheave pressure roller section to be removed.
3. Loosen nut to take pressure off of handrail.
4. Remove four bolts connecting handrail drive sheave pressure rollers to bracket.
5. Remove handrail drive sheave pressure rollers.
6. Replace handrail drive sheave pressure rollers in the reverse order of removal.
7. Tighten nut “d” until spring length is 81mm [3.19”].

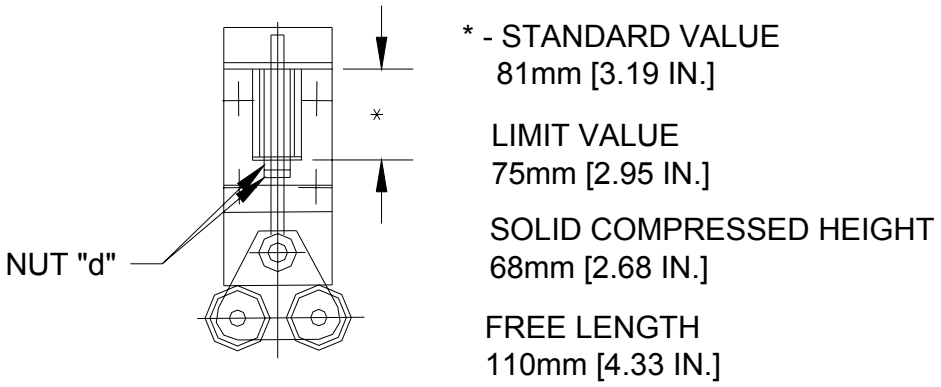


Figure E-13 Handrail Drive Sheave Pressure Roller Removal

E.13 TAKE-UP DEVICE REMOVAL/REPLACEMENT

Remove and replace the handrail take-up device as follows:

1. Remove four steps. (Refer to Mechanical Section F.)
2. Move step opening to handrail take-up device to be removed.
3. Remove interior panels and skirt panels adjacent to take-up device. (Refer to Mechanical Section G.)
4. Loosen handrail take-up device and remove handrail from take-up device.
5. Remove bolts connecting take-up device to bracket.
6. Remove take-up device.
7. Replace take-up device in the reverse order of removal.

E.14 FIRST HANDRAIL DRIVE CHAIN REMOVAL/REPLACEMENT

Remove and replace the first handrail drive chain as follows:

1. Remove five steps. (Refer to step removal/replacement procedures in Mechanical Section F.)
2. Move the step opening to the handrail first drive chain section, until the master link is accessible.
3. Loosen the handrail drive chain tension by moving the adjustment sprocket “a” to its lowest position. (Refer to Figure E-12.)
4. Disconnect the handrail drive chain at the master link and remove.
5. Replace first handrail drive chain in the reverse order of removal. Chain slack should be 2% of length “L” after adjustment.

E.15 SECOND HANDRAIL DRIVE CHAIN REMOVAL/REPLACEMENT

Remove and replace the second handrail drive chain as follows:

1. Remove five steps. (Refer to Mechanical Section F.)
2. Move the step opening to the handrail second drive chain section, until the master link is accessible.
3. Loosen the handrail drive chain tension by moving the adjustment sprockets “b” to their highest position. (Refer to Figure E-12.)
4. Disconnect the handrail drive chain at the master link and remove.
5. Replace second handrail drive chain in the reverse order of removal. Chain slack should be 2% of length “L” after adjustment.

F) STEPS, STEP CHAIN, AND LUBRICATOR

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
  - Safety glasses
  - Safety shoes
  - Protective clothing
  - Gloves

EQUIPMENT OPERATION

F.1 STEPS

The steps are 24”-wide die-cast aluminum. The step assembly is composed of a tread, a riser, two yokes, and two step wheels. The 4 ¼” step wheel assemblies have sealed bearings and are bolted to the yokes.

Each step is stamped on the riser and tread with “New York City Transit” “Contract E-34011”.

The steps are connected and driven by the step chain and supported and guided by the step chain wheel and step wheel tracks and a chain guide assembly. The upper part of the yoke provides a locking pin and seating area where the step attaches to the step chain axle.

The vertical rise between steps is 8”. The horizontal distance between the noses of the steps is 16”. The step design will allow the steps to be removed without disturbing the balustrades or disassembling any part of the chain.

The chain can be run for inspection and cleaning without the steps.

Yellow 2” demarcation stripes are painted on all four edges of each step and on the nose of the riser.

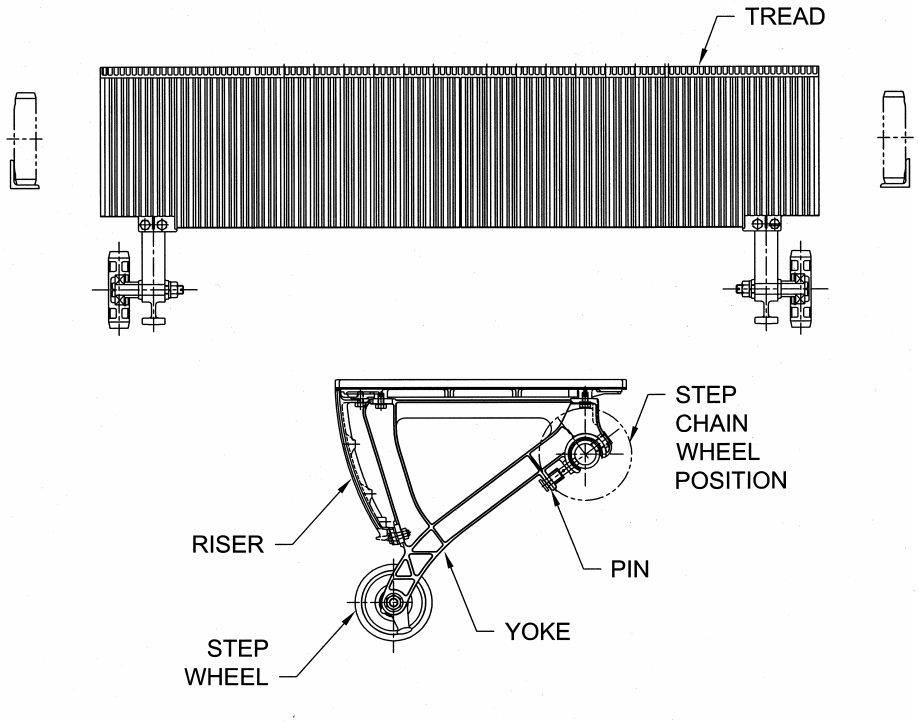


Figure F-1 Step

F.2 STEP CHAINS

Endless roller-type 36-ton lube-free step chains are provided on each side of the steps. These chains form a loop the length of the truss and are driven by the step chain sprockets on the main drive shaft.

The chain link can be disconnected at every link by removing the retaining ring.

The step chains require no lubrication. They are constructed with case-hardened steel pins and an oil impregnated bronze brush. Seals between the inner and outer link plates protect against intrusion of foreign matter entering the area between the pin and bushing and between the bushing and the protection roller.

The step axles connect matched pairs of left hand and right hand step chain units. These are pre-assembled before installation into the truss.

Step chain wheels on each side of each axle support the chain and the back edge of the step. The step chain wheels are 5 1/8” polyurethane rollers with die cast aluminum hubs and sealed ball bearings.

The step chain and axle assemblies are pulled through steel tracks that guide the step as the escalator makes a complete cycle.

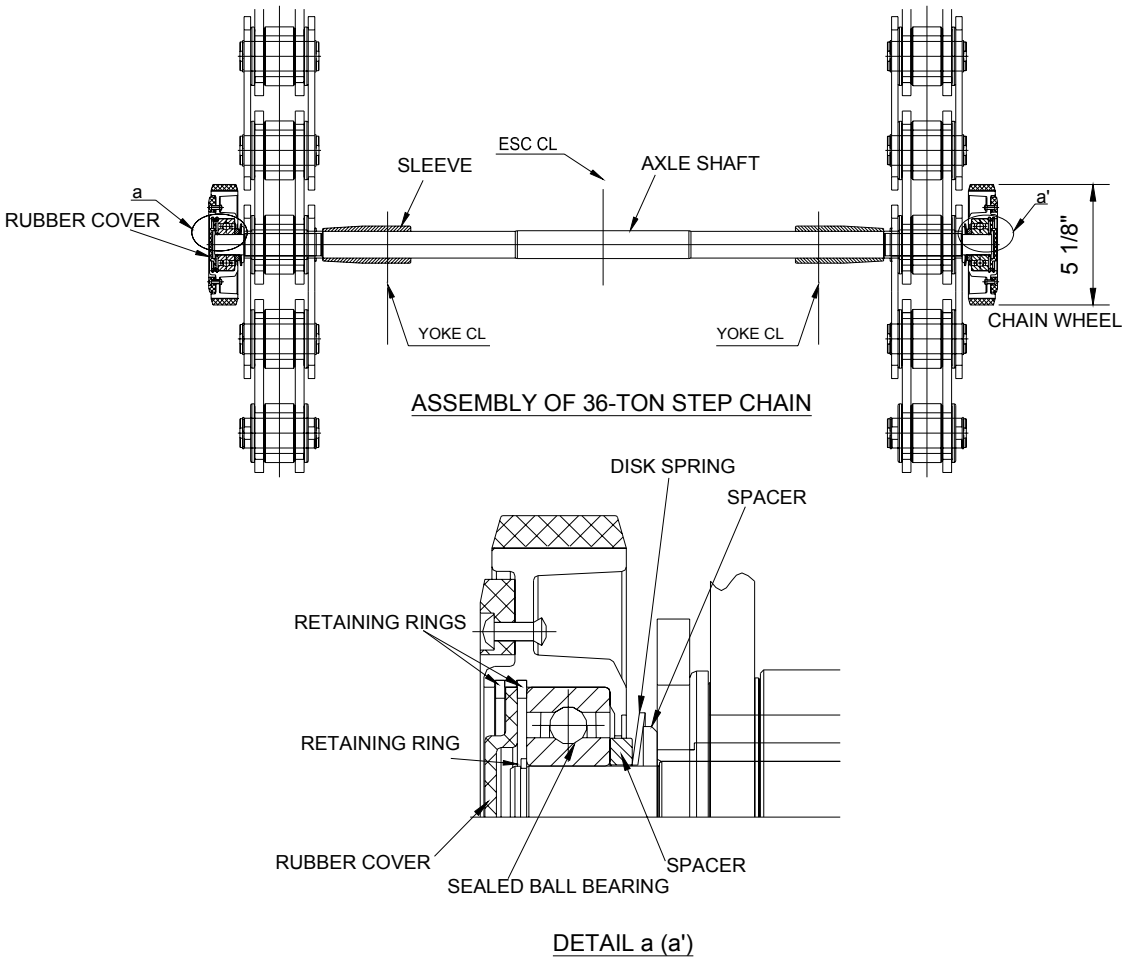


Figure F-2 Lube-Free Step Chain

F.3 LUBRICATION

The automatic lubrication system is designed to supply lubrication oil to the main drive chain, handrail chains, and step chain area. All chains are lubricated through brush attachments.

In addition, a panel is provided for remote manual greasing of the handrail drive bearing housings and main drive bearing housings.

The automatic lubrication device consists of a lubrication pump, flow controls, and piping. The pump unit, with a 15-liter capacity reservoir and oil level switch, is located on the machine room wall.

The PLC is used to control the pump motor. The lubrication device is pre-set for an interval time of 20 hours and a lubricating duration of 130 seconds. Both the time between oiling and the duration may be adjusted using the PLC.

The pump delivery pressure is set at 215 pounds per square inch.

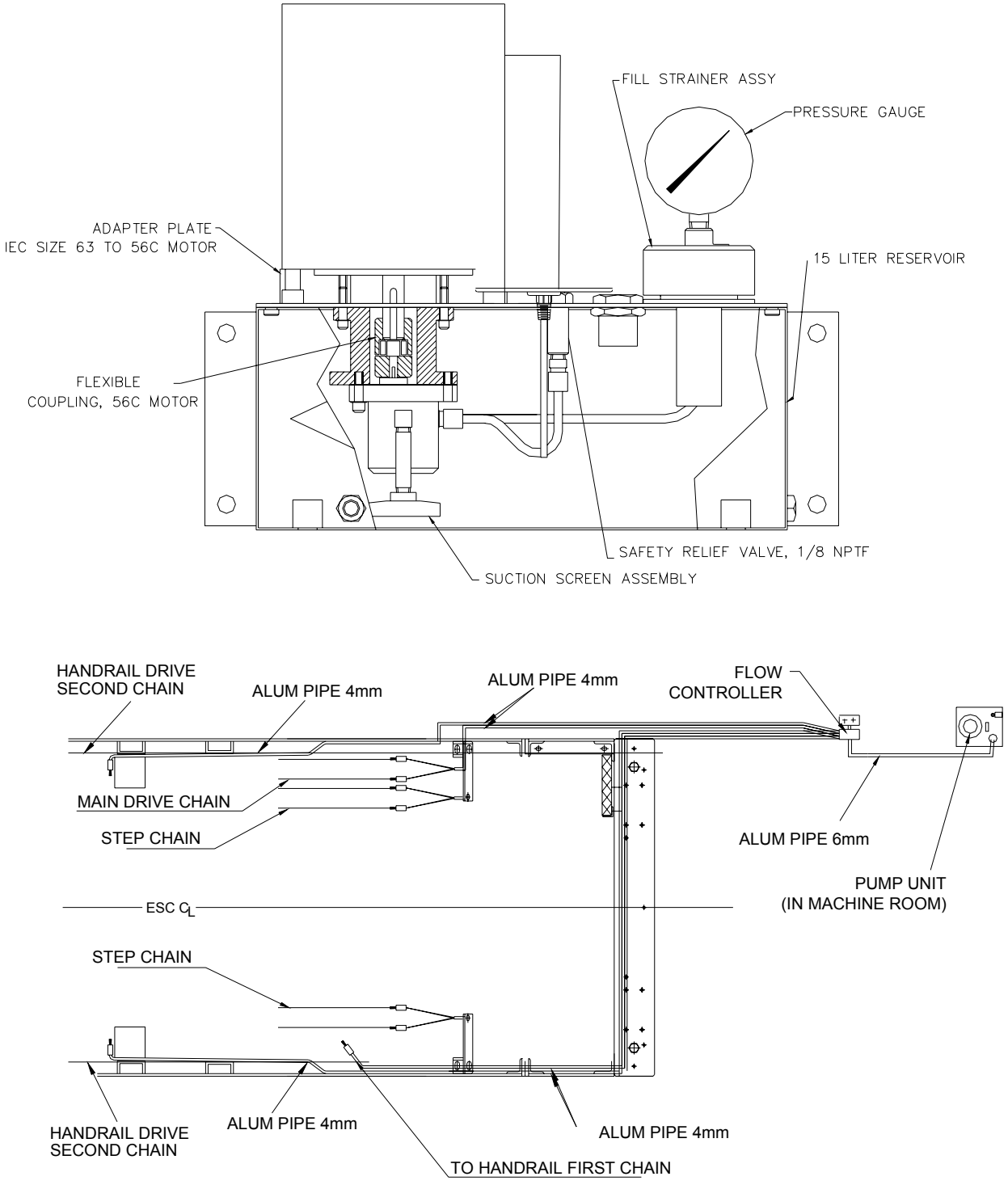


Figure F-3 Lubrication System

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Steps
- Lubricator

F.4 STEP ADJUSTMENT

Inspect and adjust the steps as follows:

1. Observe steps for shifting, interference, or misalignment.
2. Inspect each step for damage to riser, tread, or yokes.
    - Replace if damaged.
3. Remove floorplates.
4. Adjust step by shimming if shifting or interference was reported.
    - To insert shims, move the sleeve on step axle, insert shim, lock sleeve back in position.
5. Apply grease on the Phenolic guide shoe of the step chain wheel.
6. Tighten step roller nuts and examine for worn or damaged wheels.
    - Replace as needed.
7. Verify the clearance of step to comb as the step moves through the turnaround.
8. Check clearance between the steps and skirt panels. Clearance should be 3mm [0.12”].
    - If clearance is incorrect on all steps, adjust skirt panel. (Refer to Mechanical Section G.)
9. Check clearance between steps.
    - If over 4mm[0.16”], replace step chain.
10. Inspect and clean the step chain.

F.5 LUBRICATOR ADJUSTMENT

Inspect and adjust the auto lubricator as follows:

1. Remove five steps.
2. Clean lubricator brush tips to remove lint and dirt.
3. Verify position of tubing to deliver oil to chain properly.
4. Examine tubing & manifold for cracks and leaks.
    - Replace as needed.
5. Open lubricator panel cover to check if pump is not operating.
6. Check wiring connections around lubricator box and each automatic lubricating area. Make sure they are not loose or broken.
7. Close lubricator panel cover.
8. Replace steps.

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Steps
- Step Wheel
- Step Chain
- Step Chain Wheel
- Lubricator

F.6 STEP REMOVAL/REPLACEMENT

Remove and replace the steps as follows:

1. Remove upper or lower floorplates.
2. Position the step so that the opening in the step wheel turn track is not blocked and the lock pin “B” and sleeve are accessible.
3. Loosen setscrews “A” one full turn on each side of the step.
4. Pull pin “B” using the step-pin lifter and turn the sleeve one half turn to prevent the pin from going back into the hole in the sleeve.
5. Hold the step with one hand and move the sleeves toward the center of the axle to release the yokes.
6. Grab the step with two hands and raise and rotate the step until the step wheels can be removed through the opening in the turn track.
7. Steps are marked with the contract number. If removing all of the steps, mark the first and second steps and corresponding axles.
8. Replace steps in the reverse order of removal.
9. The sleeve is properly seated when an audible click occurs as the pin goes into the hole on the sleeve.
10. Tighten the setscrews “A” and make sure the shaft can be turned by hand. If not, loosen the setscrews until the shaft turns by hand.

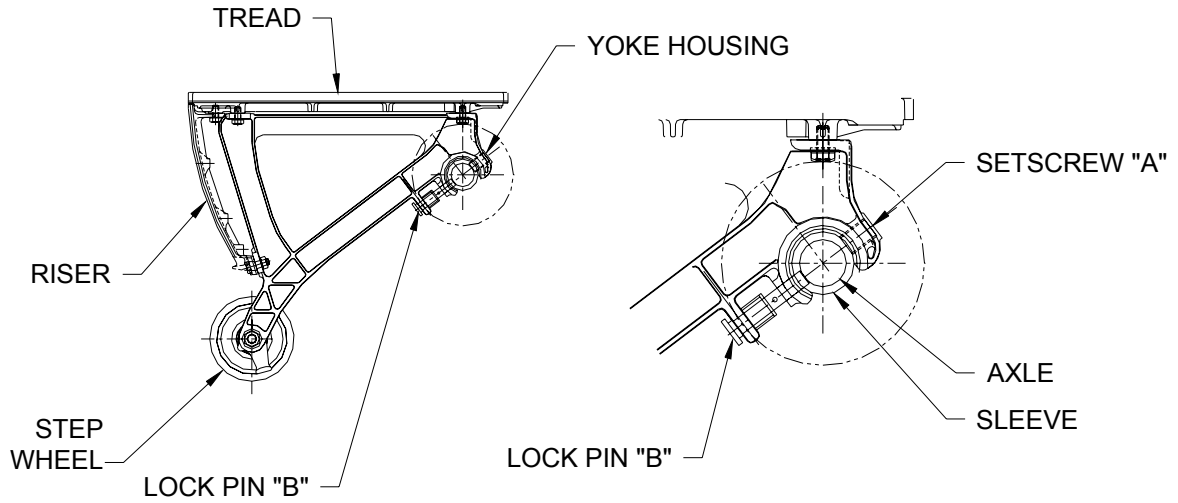


Figure F-4 Step Removal

F.7 STEP WHEEL REMOVAL/REPLACEMENT

Remove and replace the step wheels as follows:

1. Follow the step removal/replacement procedure to remove the step through the turn track.
2. Loosen and remove step wheel nut and lock-washer.
3. Remove step wheel and axle assembly.
4. Replace with new step wheel and axle assembly.
5. Apply Loctite Threadlocker or equivalent to thread of axle.
6. Tighten down the step wheel’s lockwasher and nut.
7. Reinstall the step.

F.8 STEP CHAIN REMOVAL/REPLACEMENT

Remove and replace the step chain as follows:

1. Remove all steps.
2. Remove the chain guards at the lower end by removing four bolts on each side.
3. Loosen tension carriage spring completely and disconnect step chain.
4. Operate escalator DOWN at inspection speed until the last chain link is below the main drive sprocket.
5. Bind rope to the axle below the step chain joint and disconnect chain.
6. Remove step chain slowly.
7. Mark each section of the step chain with a sequence number. Record information on paper.
8. Replace step chain in the reverse order of removal.

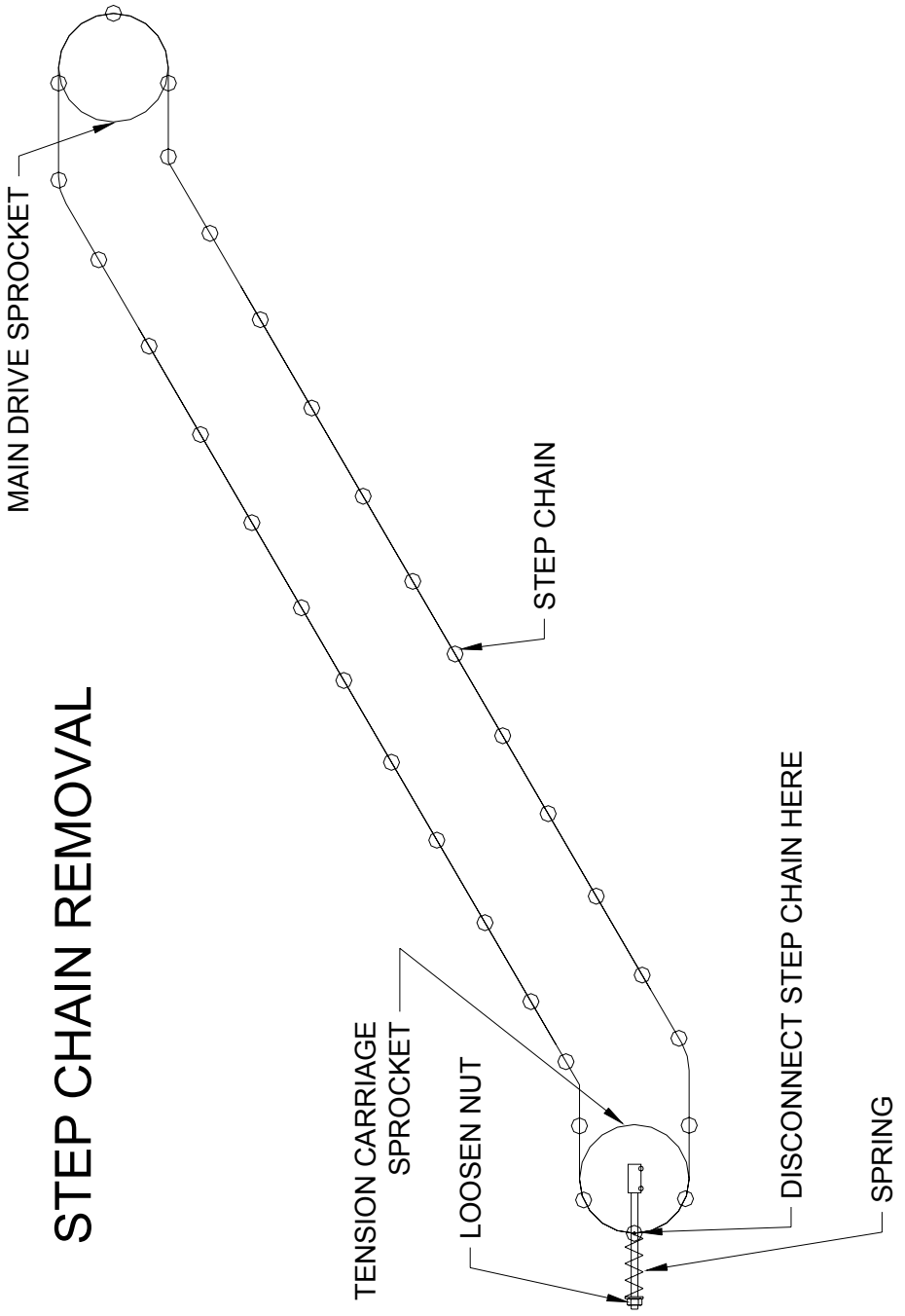


Figure F-5 Step Chain Removal

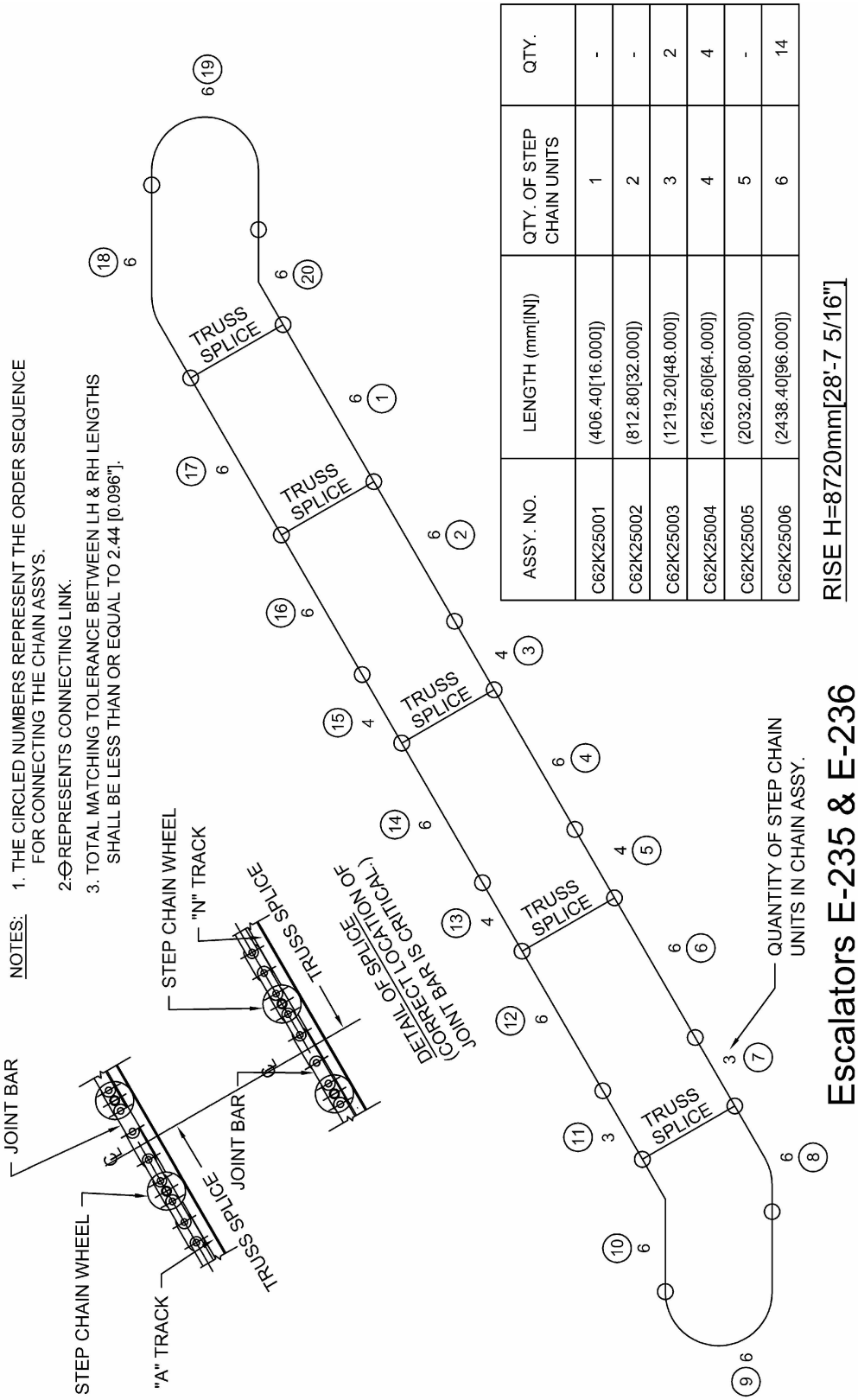


Figure F-6 Step Chain Assignment - E-235 & E-236

F.9 STEP CHAIN ROLLER REMOVAL/REPLACEMENT

Remove and replace the step chain roller (wheel) as follows:

1. Move roller to N-track cut out section in upper truss machine room.
2. Remove retaining ring around the rubber end of the step chain axle shaft.
3. Remove rubber insert covering the bearings.
4. Remove the retaining ring around the step chain axle.
5. Pull off the step chain roller (wheel).
6. Replace step chain roller in the reverse order of removal.

F.10 LUBRICATOR

Remove and replace the auto-lubricator pump as follows:

1. Disconnect wiring at lubricator terminator terminal box.
2. Disconnect main supply pipe fitting at lubricator pump unit.
3. Remove four mounting screws holding the auto-lubricator to the bracket or wall and remove lubricator unit.
4. Drain the oil from the lubrication system into a clean container (if the oil is clean and will be re-used immediately).
5. Replace lubricator in the reverse order of removal.
6. Refill the lubricator tank with the drained oil and/or new oil (Mobil DTE medium or equivalent) up to the full mark on the oil level sight glass.
7. The pressure is set by the manufacturer at 215 psi. Check that the oil comes out in a constant thin stream by pressing the pump test button. If it is dripping, raise the pressure by turning the pressure-adjusting valve with a screwdriver.

G) BALUSTRADE, INTERIOR PANELS, SKIRTS, NEWELS ENDS, & DECK MOLDINGS

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
  Safety glasses
  Safety shoes
  Protective clothing
  Gloves

EQUIPMENT OPERATION

G.1 BALUSTRADES

The balustrades consist of individual interior panels, skirt panels, newel moldings, deck moldings, and handrail guides.

The interior panels are made from 11 gauge, #4 finish, type 304 stainless steel sheets. The vertical skirt panels are made of 11 gauge, type 304 stainless steel with black teflon and are set 3mm [0.12”] away from the step on both sides. They extend above and below the step to barricade passengers from the interior of the escalator.

Safety strips (skirt brushes) are continuous strands of brushes that are mounted to the skirt panels along the upper edge of the steps. The brushes deflect and guide limbs and clothing away from the gap between the step and skirt panel.

The balustrade brackets are located just above the skirt panels and support the interior panels along both sides of the escalator.

Interior panels consist of curve, incline, and newel sections. The interior panels are held in place with retainer clips so that they may be removed quickly.

The deck moldings are located above the interior panels, directly under the handrail guide. They are mounted onto the balustrade brackets and support the handrail guide.

Newel ends are located at the upper and lower curved ends of the escalator. Control switches are mounted to the newel ends.

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Skirt Panels, Interior Panels, Deck Moldings, and Newel Ends
- Step/Skirt Clearance

G.2 SKIRT PANEL, INTERIOR PANEL, DECK MOLDING, AND NEWEL END ADJUSTMENT

Adjust the skirt panels, interior panels, deck moldings, and newel ends as follows:

1. Tighten loose screws and replace missing screws.
2. Make sure joints are smooth to prevent clothes from catching.
3. Clean outer surface with a damp cloth, wiping in the hairline direction.
    - Remove moisture from panel surface with a dry cloth.
    - Note: Wiping surface in a circular motion ruins the hairline finish and allows stains to accumulate.
4. Apply silicone spray to skirt panels to reduce friction in case of step contact with skirt.

G.3 STEP/SKIRT CLEARANCE

Adjust the step/skirt clearance as follows:

1. Verify that steps are shimmed properly so that they follow the same path.
2. Check that track is properly aligned.
3. Verify that a 3mm [0.12”] gap is maintained between the skirt panel and step.
4. If constant gap is not maintained, the skirt panel must be adjusted.
5. Remove interior panels above section to be adjusted. (Refer to interior panel removal/replacement procedures in this section.)
6. Loosen fasteners connecting skirt frame to bracket and adjust until 3mm [0.12”] gap is achieved. Tighten fasteners.
7. Readjust skirt switches if necessary.
8. Replace interior panels.

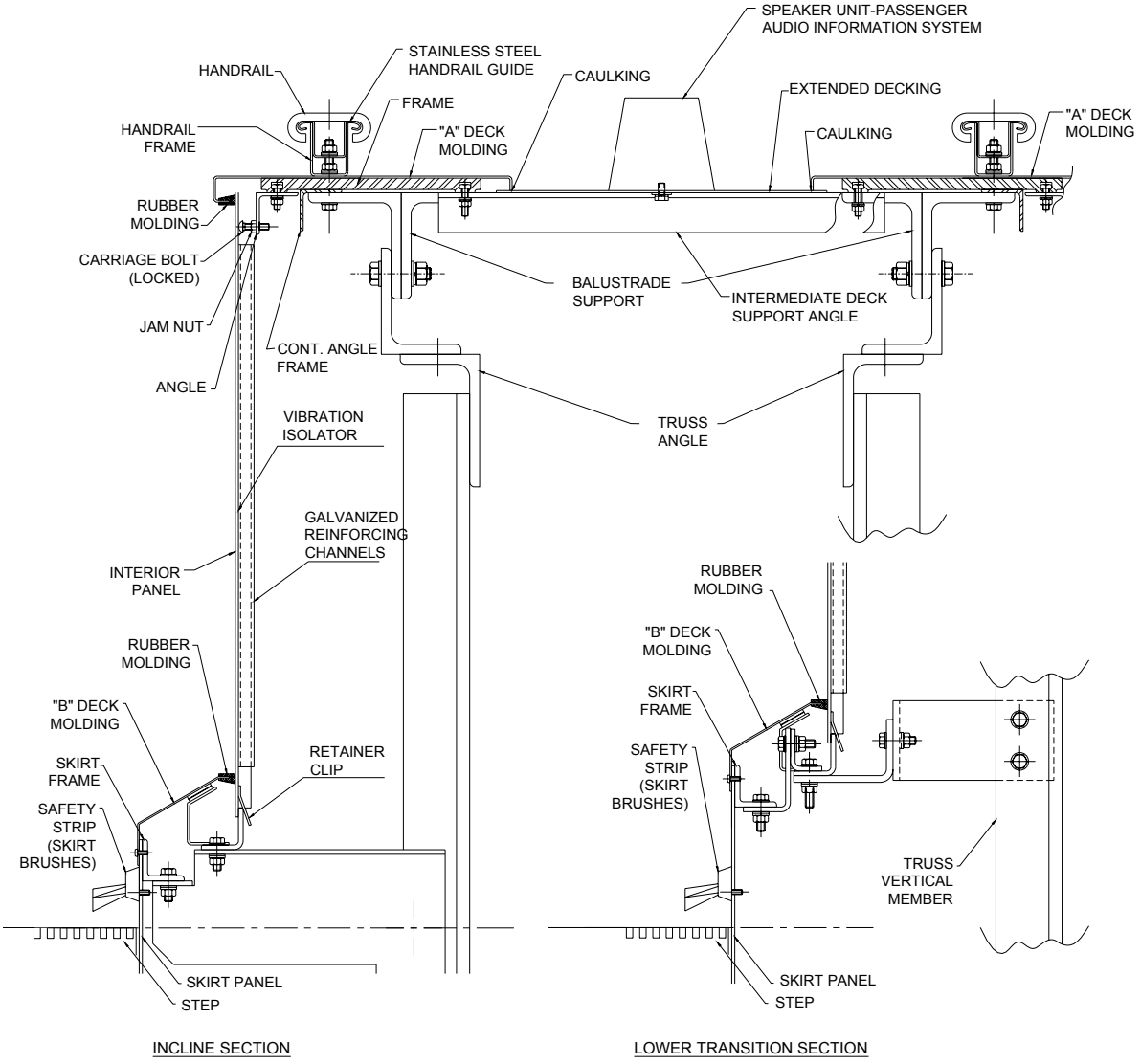


Figure G-1 Skirt Panel, Interior Panel, and Deck Moldings

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Interior panels
- Newel Interior Panels
- Skirt panels / Safety Strips
- Handrail Guides
- Deck Moldings
- Newel Ends

G.4 INTERIOR PANEL REMOVAL/REPLACEMENT

Remove and replace the interior panels as follows:

1. Attach suction cups to straight section of interior panels.
    - The curved section cannot be removed until adjacent straight section is removed.
2. Lift panel up.
3. Push panel bottom inward (away from steps).
4. Lower panel and remove top end first.
5. Replace interior panels in the reverse order of removal.

G.5 NEWEL INTERIOR PANELS REMOVAL/REPLACEMENT

Remove and replace the newel interior panels as follows:

1. Remove interior panels adjacent to newel interior panel.
2. Only the newel end interior panels require removing screws.
3. Remove deck molding covering the joint of newel skirt panel and newel interior panel.
4. Remove two flathead screws connecting interior panel to skirt frame.
5. Attach suction cups and slide panel out of newel curve and remove.
6. Replace the newel interior panels in the reverse order of removal.

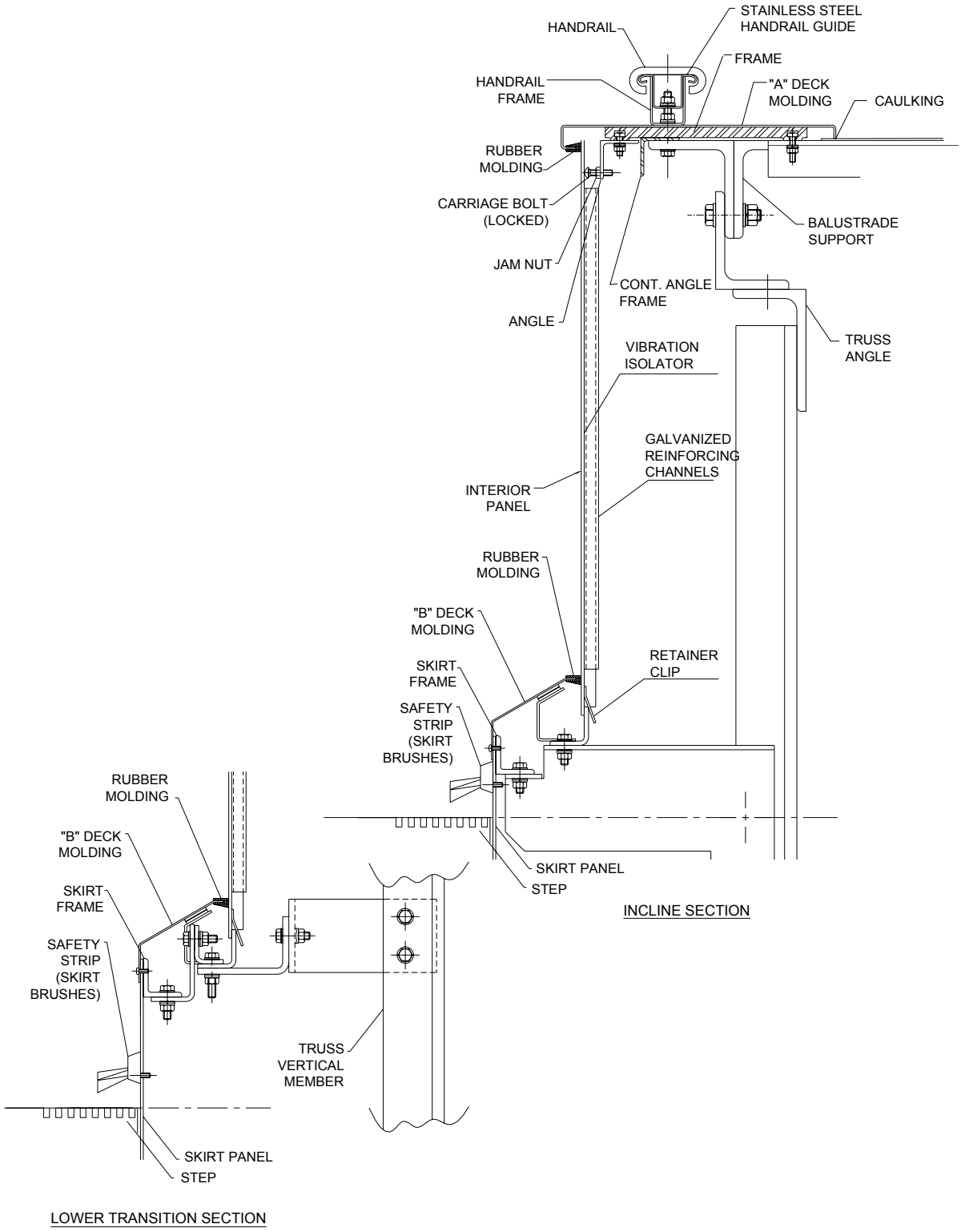


Figure G-2 Interior Panel Removal

G.6 SKIRT PANELS / SAFETY STRIPS REMOVAL/REPLACEMENT

Remove and replace the skirt panels and safety strips as follows:

1. Remove interior panels above the skirt panels that are being removed. (Refer to interior panel removal/replacement procedures in this section.)
2. Remove B molding strip to uncover mounting screws at the top of the skirt.
3. Unscrew safety strips for replacement.
4. Loosen the fastenings and rotate the joint plate by hand. This plate joins one skirt panel to the next.
5. Attach suction cups to the skirt panel.
6. Pull the panels up to release the clips from the lower skirt frame and remove.
7. Replace skirt panels in the reverse order of removal.

G.7 HANDRAIL GUIDES REMOVAL/REPLACEMENT

Remove and replace the handrail guides as follows:

1. Remove handrail.
   (Refer to handrail removal/replacement procedures in Mechanical Section E.)
2. Remove nuts connecting handrail guides to “A” molding.
3. Remove handrail guides.
4. Replace handrail guides in the reverse order of removal.

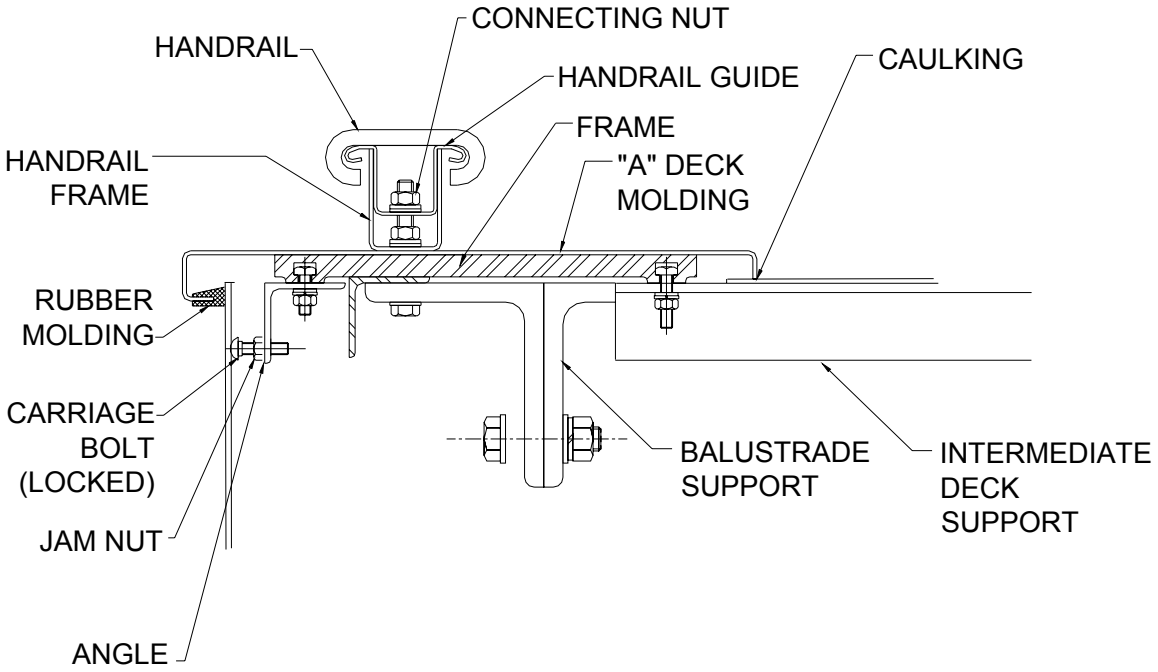


Figure G-3 Handrail Guide Removal

G.8 DECK MOLDING REMOVAL/REPLACEMENT

Remove and replace the “A” deck molding as follows:

1. Remove handrail. (Refer to handrail removal/replacement procedures in Mechanical Section E.)
2. Remove handrail guides. (Refer to handrail guide removal/replacement procedures in this section.)
3. Remove bolts connecting deck moldings to balustrade supports and brackets.
4. Remove deck moldings.
5. Replace deck moldings in the reverse order of removal.

G.9 NEWEL ENDS REMOVAL/REPLACEMENT

Remove and replace the newel ends as follows:

1. Remove handrail. (Refer to handrail removal/replacement procedures in Mechanical Section E.)
2. Remove safety devices, operation panel, and emergency stop on the face of the newel ends and disconnect wiring.
3. Remove bolts connecting newel ends to newel base bracket.
4. Remove newel ends.
5. Replace newel ends in the reverse order on removal.

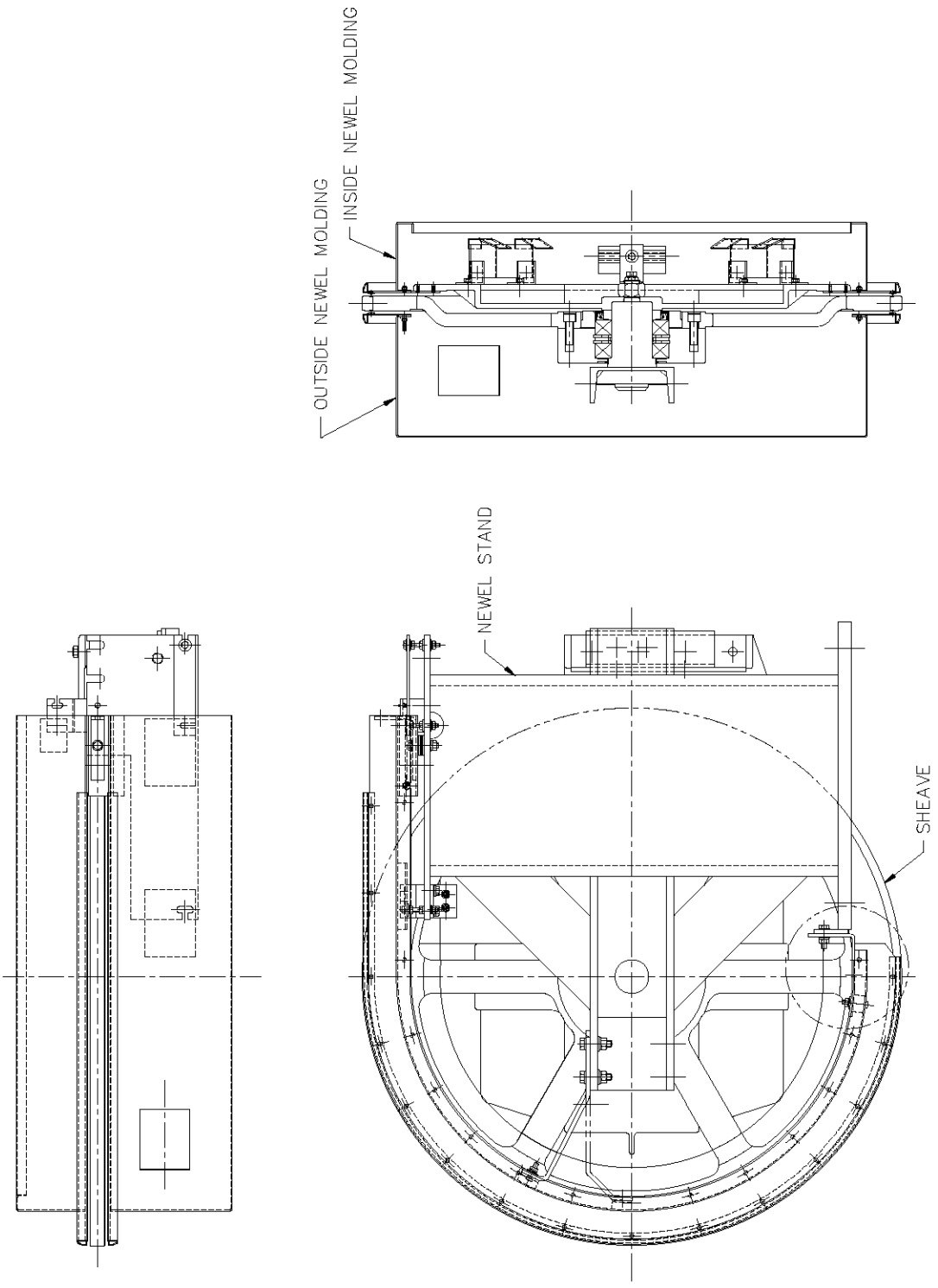


Figure G-4 Deck Molding and Newel End

ELECTRICAL SECTION

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CONTRACT E-34011
HERALD SQUARE
PHASE IV ESCALATORS
E-235 & E-236

TABLE OF FIGURES

A) ELECTRICAL CONTROLS

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

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- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

ESCALATOR CONTROL SYSTEM

A.1 CONTROLLER ENCLOSURE

Normally, there is no reason to get inside the controller enclosure. The escalator can be operated, maintained, and repaired by using just the switches and indicators on the front of the controller.

The front of the right enclosure door contains the PLC's LCD display, hourmeter, reset light and switch, key switches for mode selection and the inverter, indicator lights for various operation modes, and a button to test the LED indicators on the opposite door.

The front of the left enclosure door contains LED fault indicator lights associated with the safety switches in the system.

A.1.1 Main Disconnect Handle

The main disconnect handle turns the main circuit breaker off and on. It is connected to the door locking mechanism.

The controller doors cannot be opened unless the main disconnect handle is in the OFF position. The handle can be padlocked in the OFF position.

To reset the main circuit, move the main disconnect handle to OFF and then to ON.

A.1.2 Door Locking Mechanism

The controller has two doors. They cannot be opened unless the main disconnect handle is in the OFF position.

The right door must be opened first. The right door handle has a latch to keep the handle from vibrating open. Use a straight screwdriver to turn the latch clockwise and turn the handle at the same time to open the door. When the right door is open, the left door can be opened.

Either door can be closed first. The handle on the right door has to be straight down before the main disconnect handle can be turned on.

When the right door is open, a lever just inside the door can be pushed down and the main disconnect handle can be turned on.

A.1.3 Hourmeter

There are two hourmeters mounted on the right enclosure door.

The left-hand hourmeter records how many hours the escalator has run UP since new. The right-hand hourmeter records how many hours the escalator has run DOWN since new. There is no way to reset them.

A.1.4 PLC LCD Fault Display

The PLC's LCD fault display on the right enclosure door is an Allen-Bradley Panelview 600 with a touch screen display.

When the escalator is powered up, the START SCREEN display will come on. The screen will remain ON while the escalator is powered up.

From this Start Screen, additional screens of control can be accessed.

A.1.4.1 Start Screen

When the program starts, the Main Screen appears. The Start Screen displays the name of the station, the escalator ID number, and the following screen selections:

- Status Screen
- Fault History
- Status History
- Set Stopping Limits
- Set Lubricator
- Sleep Mode Status
- Inverter Status

Press a selection to display the selected screen.

A.1.4.2 Status Screen

1. The top of the Status Screen shows the escalator name, the date and time. At the far right is a touch pad for returning to the Main Screen.
2. The screen shows the Motor RPM, the Stopping Distance, and the Motor Amperage.
3. The mode will be Key Start or Maintenance.
4. The status will be Running UP, Running DOWN, or Stopped.
5. The PLC LCD display readout will show System Healthy during normal operation of the escalator. When a fault does occur, the cause of the fault will be displayed.
6. On the bottom line, speedometers show the running speed of each handrail and the step band. The speed is shown in feet per minute. Two markers at the outer segment of the dial show the minimum and maximum settings for the speed of that device. Below each meter is a digital readout of the speed.
7. Press Up arrow in the top right corner to return to the Main Screen.

A.1.4.3 Fault History Screen

Each fault is listed along with a date and time stamp of the last activation of the fault. There are 20 pages of faults with 5 faults per page – for a total of 100 faults.

Press Next or Prev to move through the entire list of faults.

Press Top to return to the first page of faults (ie: most recent).

Press Up arrow in the top right corner to return to the Main Screen.

A.1.4.4 Set Stopping Limits

This screen requires the user to supply a password to access. This screen allows the user to change the stopping distance lengths (in inches) before a warning or a shutdown occurs.

Press Up arrow in the top right corner to return to the Main Screen.

A.1.4.5 Status History Screen

This screen is identical to the Fault History Screen but includes all events (like Resets, Starts, Stops, etc.) instead of Faults alone.

Press Up arrow in the top right corner to return to the Main Screen.

A.1.4.6 Set Lubricator Screen

This screen allows the user to change the interval between automatic lubrications (in hours) and to control how long the lubrication lasts. This screen also provides a pushbutton to test the lubricator system.

Press Up arrow in the top right corner to return to the Main Screen.

A.1.4.7 Inverter ON/OFF Screen

This screen requires the user to supply a password to access. This screen allows the user to enable (turn ON) the inverter to power the escalator or to disable (turn OFF) the inverter to run across the line.

Press Up arrow in the top right corner to return to the Main Screen.

NOTE: The escalator will NOT run on Inspection with the inverter disabled.

A.1.4.8 Sleep Mode Status Screen

This screen shows the current status (Normal Run, Sleep Mode, or Inspection). It also shows the sleep mode status (enabled/disabled – which is controlled by a key switch), the pre-set time delay, and the current counting sleep mode time (which counts seconds of inactivity up to activating sleep mode at the pre-set time delay).

In addition, this screen shows the status of the two upper passenger detectors (UPD) and two lower passenger detectors (LPD).

With sleep mode enabled, Green indicates that sleep mode should activate as expected. Red indicates that sleep mode will NOT be activated.

The sleep mode time delay can be changed by pressing the sleep mode configure button on the screen. The screen is password-protected and allows you to change the pre-set time delay before you enter sleep mode.

Press Up arrow in the top right corner to return to the Main Screen.

A.1.5 RESET Button

The RESET button on the right enclosure door will light up when the controller needs resetting.

To reset the controller, press the RESET button. If the escalator is ready to run, the light will go off. Otherwise, the light will stay on.

To test a door button, press it to turn its light on. Door button lights can be safely tested while the escalator is running.

A.1.5.1 Reset Conditions in Maintenance Mode

While in Maintenance (inspection) Mode, the escalator will stop if a critical safety switch opens or if a serious problem occurs while it is running.

In this case, the RESET light will not come on.

The escalator won't run with the safety switch open. When the switch closes, the escalator will restart if the direction button on the inspection station is released and pressed again.

The controller does not have to be reset when the escalator is in Maintenance Mode.

If the RESET light was on and the escalator was in Key Start Mode before the key was switched to Maintenance Mode, the RESET button must be pressed before the escalator will run.

A.1.6 Operation Mode Selection

Key switches are provided on the right enclosure door to initiate the Key Start Mode of operation or the Maintenance (inspection) Mode of operation.

A.1.6.1 Key Start Mode

While the key switch is in the Key Start Mode position, the escalator will stop if a critical safety switch opens or a serious problem occurs while it is running. The escalator will not re-start until the problem is fixed and the RESET button is pressed. Some of the critical switches can reset themselves, but a maintenance person must reset the controller.

A.1.6.2 Maintenance (Inspection) Mode

When the key switch is turned to place the escalator in Maintenance (inspection) Mode, the controller checks that one inspection station and one blind plug are plugged in. Otherwise, the escalator won't start and the Maintenance Socket Fault light will be on. The PLC’s LCD display screen doesn't show any messages. The light will go off when one inspection station and one blind plug are plugged in.

When the escalator is in Maintenance (inspection) Mode, the escalator can only be started using an inspection station. Turning the key on the controller door from Maintenance Mode to Key Start Mode will stop the escalator if it is running.

If a safety switch opens when the key is in Maintenance Mode, the audible alarm will sound. The alarm will stop when the switch closes. If the switch stays open, the alarm will stop after two seconds. Use the alarm to help adjust the safety switches.

A.1.7 Sleep Mode Enable

On the right enclosure door, the sleep mode key switch is turned to the Sleep Mode Enable position to place the escalator in sleep mode. In this mode, the escalator slows down after a pre-set time delay of inactivity and resumes normal speed when sensors detect a passenger on the landing.

The other key position is Sleep Mode Disable, during which the escalator maintains its normal speed.

A.1.8 Indicator Lights on Right Enclosure Door

LED indicator lights are provided on the right enclosure door for the following.

A.1.8.1 Mode Indicators

Separate lights indicate if the escalator is in Key Start Mode of operation or Maintenance (inspection) Mode of operation.

The Key Start Mode light will be on when the key is in the Key Start position. The Maintenance (inspection) Mode light will be on when the key is in the Maintenance Mode position.

A.1.8.2 Direction Indicators

When the escalator is run in Key Start Mode, one of the direction indicator lights – Escalator Running UP or Escalator Running DOWN – will come on. The light stays off in Maintenance Mode.

A.1.8.3 Sleep Mode Indicator

The Sleep Mode indicator light will come on when the escalator enters Sleep Mode.

Sleep Mode runs the escalator at a reduced speed of 15 FPM during periods of inactivity. When a passenger enters the landing plate area, Sleep Mode is disengaged and the escalator resumes its full speed.

A.1.9 Test Indicators Button

Pressing the Test Indicators button on the right enclosure door will activate all the LED indicators on the controller doors.

A.1.10 LED Fault Indicators

On the left controller enclosure door, LED fault indicator lights are provided for each safety and monitoring device.

All faults triggered are indicated and retained until the fault is cleared and the Reset button is pressed.

A.2 JUNCTION BOXES/SERVICE SWITCHES

Mounted on the lower truss is the Lower Junction Box (LJB), which has terminals for making connections, a socket for plugging in an inspection station, a pit stop switch, and an audible alarm.

The Upper Junction Box (UJB) with terminals for making connections is mounted outside the upper truss. The Upper Service Switch (USS) in the upper truss has the socket for plugging in an inspection station, a pit stop switch, and an audible alarm.

There are smaller junction boxes located in the step band. These only have terminals for making connections.

A.2.1 Inspection Station Socket

To run the escalator in maintenance mode, unscrew one of the blind plugs on the inspection station socket and screw in the inspection station.

NOTE: Only one inspection station can be plugged in at one time. The escalator will NOT run under these circumstances:

- If two inspection stations are plugged in.
- If one inspection station is plugged in and the opposite blind plug is not securely in place in the inspection socket.

When maintenance is complete, unscrew the inspection station plug and screw in the blind plug.

A.2.2 Blind Plug

Install both blind plugs when maintenance is done.

A.2.3 Audible Alarm

The audible alarm sounds under the following conditions:

- The emergency stop button cover is lifted.
  To prevent nuisance alarms, the alarm will not sound for more than 60 seconds.
- The smoke detector is set off while the escalator is running.
- The handrail is off speed.
- A safety switch is opened while the escalator is in Maintenance Mode. The alarm sounds until the switch closes. If the switch stays open, the alarm will stop after two seconds. Use the alarm to help adjust the safety switches.
- If a person enters the escalator in the wrong direction when the escalator is in sleep mode, the alarm sounds three times.

A.2.4 Pit Stop Switches

A red mushroom-shaped PIT STOP switch is in each end of the truss, just below the last floorplate where it is easy to reach.

Push the PIT STOP switch to open the safety string. Pull or turn the PIT STOP switch to reset the safety string.

If the PIT STOP switch is pushed in, the steel padlocking attachment will hold it in. There is a hole for a padlock.

A.2.5 Inspection Station

The inspection station has a plug, a cable, and a box with two pushbuttons and a red mushroom-shaped STOP switch. The plug screws into the sockets on the junction box (lower) and service switch (upper).

Push the STOP switch in to open the safety string. Turn the STOP switch clockwise to let it pop out and reset the safety string.

When the STOP switch is out, pressing the UP button continuously causes the escalator to move up, and pressing the DOWN button continuously causes the escalator to move down. The escalator stops when the button is released or the STOP button is pressed.

NORMAL SEQUENCE OF OPERATION

A.3 NORMAL OPERATION

A.3.1 Engaging the Main Line

Engaging the main line supplies power to the Phase Failure/Phase Sequence monitor and the control transformer primary windings.

1. The main line 208VAC supplies the power to the brake circuit rectifier.
2. The control transformer 120VAC secondary windings supply power to the outlet for the UPS, the Voltage Sensing Relay, the motor contactor control circuits, and the lubricator control circuit.
3. The UPS provides power to:
   - The PLC power supplies
   - The 24VDC power supply for the escalator control system (PS1)
4. The PLC runs its program, which turns on the power to the safety devices and controls the escalator.
5. When the PLC detects that PS1 has come on, the PLC:
   - Supplies power to the safety relay circuit.
   - Monitors the control switches and safety devices.
   - Controls the escalator, the LED displays on the doors, and the PLC LCD display.
6. An external 120VAC supplies power to the DAS system and the fluorescent lighting circuits.

A.3.2 Starting the Escalator

The PLC checks inputs. If all the safety devices are good and all old faults have been reset, the escalator can be started.

A.3.2.1 Safety Checks at Key Start

The escalator will not run when in Key Start mode.

When the starting button is pressed while the direction key is turned, the PLC performs the following safety checks:

1. At start-up, PLC output `0:15/1` is turned OFF and a N.C. contact from CPS1 is read at `I:16.0/1` as ON.
2. On start-up, PLC output `0:15/2` is turned OFF and a N.C. contact from CPS2 is read at `I:16.0/2` as ON.
3. On start-up, PLC output `0:15/0` is turned OFF and N.C. contact string consisting of 1E1, 1E2, 2E1, 2E2, 2E3 is read at `I:16.0/0`.
4. On start-up, PLC output `0:15/5` is turned OFF and N.C. contact of 6T is read at `I:16.0/5`.
5. On start-up, PLC output `0:15/3` is turned OFF and N.C. contact of GIL is read at `I:16.0/3`.
6. On start-up, PLC output `0:6/3` is turned OFF and N.C. string of safety string relays is read at `I:16.0/6`.
7. On start-up, PLC output `0:6/7` is turned OFF and a N.C. contact of 4E is read at `I:16.0/7`.
8. On start-up, handrail relays HR1, HR2, and HRX are OFF and the N.C. contacts of HR1, HR2, and HRX are read at `I:16.0/8`.

A.3.2.2 Safety Check Faults

The following faults may be displayed during the Safety Check:

1. Combplate Stop Lower Relay Fault
2. Combplate Stop Upper Relay Fault
3. E-Stop Relay Fault
4. 6T Start Relay Fault
5. Gate Switch
6. Inspection
7. Safety String
8. 4E

To resolve these faults, refer to Electrical Section D) Troubleshooting.

A.3.2.3 Normal Operations

Normal operation is as follows:

1. The PLC registers the direction.
2. A software timer set to 10 seconds starts.
3. An alternating warning alarm sounds.
4. If the Panelview screen is set to Inverter Disable, the PLC turns on one of the motor direction contactors, an across-the-line contactor, and the #6T relay.

   If the Panelview screen is set to Inverter Enable, the PLC turns on a direction input to the inverter, an inverter contactor, and the #6T relay.
5. When the contactors close, power is supplied to the motor and the main brake, releasing the main brake and back-up brake. Time = 0.10.
6. The PLC confirms that the Main Brake Released Switch is closed and the Back-up Brake Released Switch is closed.
7. The escalator accelerates to contract speed.
8. Time = 3.90 seconds, the PLC begins checking step band speed and continues to check until the escalator is shut off.
9. Time = 8.0 seconds, the PLC begins checking handrail speed. The alternating alarm is silenced. The escalator continues to run until it is shut off.

A.3.3 Running the Escalator

While the escalator is running, the PLC does the following on every scan:

- Checks the 3-phase supply, the 120VAC supply, and the control system 24VDC supply.
- Checks the mode selection switch in the door.
- Checks the inspection plugs and the safety switches.
- Checks the drive motor temperature and vibration level.
- Turns on the LEDs in the door, when required.
- Checks the step band speed and both handrail speeds.
- Checks that both brakes are released.
- Sets the data for the PLC LCD display.
- Checks status of all circuit breakers.
- Assembles and writes data to the serial connection to the data acquisition system.
- Checks Sleep Mode Enable switch in the door.
- Checks for ON/OFF of inverter mode and enter inverter mode on next start-up.

A.3.4 Stopping the Escalator

While the escalator is stopping, the PLC determines the cause of stoppage and displays it in the PLC LCD display and on the LEDs in the controller door. It calculates the slide of the escalator through the brake.

In addition, it determines whether the escalator requires maintenance before it can be restarted.

A.3.4.1 Stop Buttons

When one of the emergency stop or pit stop switches is pressed:

- The inputs to that stop switch's relay and PLC both drop.
- The supply for the motor contactor coils is disconnected.
- The PLC turns off the motor contactor outputs.

  OR

  If the inverter is active, the inverter direction signals are removed and the inverter output is turned off and the inverter is disconnected from the motor when contactor de-energizes.
- Power is disconnected from the main brake coil and (2 seconds later) from the back-up brake coil.
- The PLC puts a message on the PLC LCD display and turns on the door LED for that switch.
- The PLC flashes that switch's LED until the escalator is restarted or the reset button is pressed.

A.3.4.2 Safety Trip

When one of the safety devices trips:

- The inputs to that switch's relay and PLC both drop.
- The safety relay #4E drops.
- The supply for the motor contactor coils is disconnected.
- The PLC turns off the motor contactor outputs.

  OR

  If the inverter is active, the inverter direction signals turn off, the inverter output turns off, and the PLC turns off the inverter contactor.
- Power is disconnected from the main brake coil and (2 seconds later) from the back-up brake coil.
- The PLC puts a message on the PLC LCD display and turns on the door LED for that switch.
- The PLC begins checking that the switch has been reset.
- If the switch has been reset, the PLC causes that switch's LED to flash.
- If the switch has been reset and the reset button has been pressed, the PLC causes the LED to go off.

A.3.4.3 Main Drive Chain Safety Sequence

If the main drive chain switch opens, the system performs the Safety Trip sequence (above).

In addition, the pawl brake mechanically operates:

- When the main drive chain breaks, a counterweighted pawl brake arm falls into position and will engage a ratchet gear on the main drive sprocket.
- This pawl arm will mechanically lock the main drive sprocket and prevent further motion.
- At the same time, the broken drive chain switch (which is held actuated by the retracted pawl brake are) comes off pressure and opens when the main drive chain breaks and the pawl arm falls into position to engage the main drive ratchet gear.

A.3.4.4 Step Band Safety Sequence

If the escalator detects that the step band speed is more than 140% of the contract speed:

- The PLC turns off the motor contactor outputs.
  OR
  In the case of an inverter, the PLC turns off direction to the inverter and turns off the inverter contactor.
- Power is disconnected from the main brake coil and (2 seconds later) from the back-up brake coil.
- The PLC puts a message on the PLC LCD display and turns on the door LED for step band speed fault.
- If the reset button has been pressed, the PLC turns the LED off.

A.4 SLEEP MODE OPERATION

Sleep Mode runs the escalator at a reduced speed of 15 FPM during periods of inactivity.

Sensors at the upper and lower landing plate areas of the escalator monitor for the presence of passengers.

The photoelectric sensors both transmit infrared light toward the reflector and receive the reflected light.

After a preset time delay of inactivity, the control system slows the drive to the sleep mode speed of 15 feet per minute. When a passenger passes through the infrared light beam, the control system responds to the broken light by disengaging Sleep Mode and returning the escalator to the 90 feet per minute speed.

If a person tries to enter an escalator from the wrong end, the escalator returns to normal speed and sounds the alarm signal three times.

The sensors will receive only reflected light from the specially designed reflector. Shiny objects such as mirrors and stainless briefcases will not reflect the light in a way that the receiver could detect.

The device is fail-safe in that any vandalism or failure of the sensor will result in the escalator running continuously at full speed since the receiver must be working normally before going into Sleep Mode.

A.4.1 Status Cell Displays

Four cells on the Sleep Mode Status screen display the status of the Sleep mode sensors (detectors). There are two upper and two lower detectors for each escalator.

“LPD” refers to a Lower Passenger Detector.
”UPD” refers to a Upper Passenger Detector.

Normal conditions display GREEN cells indicating “**OK**”.
Fault conditions display RED cells indicating “**BLKED**” (Blocked) or “**OPEN**” faults.

Figure A-1 Sleep Mode Status Screen

A.4.2 Sleep Mode Displays for Normal Operations

Normal Operations for SLEEP MODE

DISPLAY	OPERATION MODE	MEANING: ENTRY * SENSORS	MEANING: EXIT * SENSORS	INITIAL SYSTEM ACTION	FINAL SYSTEM ACTION
All cells are GREEN. LPD1 OK / UPD1 OK LPD2 OK / UPD2 OK	In RUN for some time	Both ON	Both ON	Waits for Sleep Mode delay.	Decels, Goes to Sleep speed.
	Decelerating to SLEEP mode	One OFF	Both ON	Discontinues Decel.	Accels, Goes to Run speed.
	Decelerating to SLEEP mode	Both ON	One OFF	Discontinues Decel.	Gives warning; Beeps horn; Delay; Beeps horn; Delay; Beeps horn; Acels; Goes to Run speed.
	Accelerating to RUN mode	One OFF	Both ON	Continues Accel.	Goes to Run speed.
	Accelerating to RUN mode	One OFF	One OFF	Continues Accel.	Goes to Run speed.
	In SLEEP for some time	One OFF	Both ON	Discontinues Sleep Mode.	Acels, Goes to Run speed.
	In SLEEP for some time	Both ON	One OFF	Discontinues Sleep Mode.	Gives warning; Beeps horn; Delay; Beeps horn; Delay; Beeps horn; Acels; Goes to Run speed.
NOTE: The cycling of the working sensor can be set to a number of blocked/open cycles before the fault is set for the non-working sensor.	* When escalator is running DOWN: UPPER landing sensors are "ENTRY" and LOWER landing sensors are "EXIT".				
	* When escalator is running UP: LOWER landing sensors are "ENTRY" and UPPER landing sensors are "EXIT".				
	"Both ON" = NORMAL CONDITION = Both sensors are ON (OPEN) at both ends. This means no passenger is present because the reflected beam has NOT been broken (BLOCKED). "One OFF" = At least one of the reflected beams has been broken (BLOCKED), indicating a passenger is present.				

Figure A-2 Chart: Normal Operations for Sleep Mode

A.4.3 Sleep Mode Fault Displays for UP Travel

Sleep Mode Faults for UP Travel (in RUN or SLEEP Mode)

STATUS CELL DISPLAY **BLOCKED (BLKED)** & **OPEN Faults** display in **RED.** **Normal (OK)** conditions display in **GREEN**.	**LOWER ENTRY SENSORS**	**UPPER EXIT SENSORS**	**CAUSE** System Action // User Action
UPD1 BLKED / **UPD2 OK** or **UPD1 OK** / **UPD2 BLKED** LPD1 & LPD2 are BOTH GREEN.	Sensors are both Blocked or both Open.	1 blocked **>** 2 min, 1 cycles On/Off.	**One Exit sensor always blocked.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
LPD1 BLKED / **LPD2 OK** or **LPD1 OK** / **LPD2 BLKED** UPD1 & UPD2 are BOTH GREEN.	1 blocked **>** 2 min, 1 cycles On/Off.	Sensors are both Blocked or both Open.	**One Entry sensor always blocked.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
UPD1 OPEN / **UPD2 OK** or **UPD1 OK** / **UPD2 OPEN** LPD1 & LPD2 are BOTH GREEN.	Sensors are both Blocked or both Open.	1 stays open **>** 2 min, 1 cycles On/Off.	**One Exit sensor always open.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
LPD1 OPEN / **LPD2 OK** or **LPD1 OK** / **LPD2 OPEN** UPD1 & UPD2 are BOTH GREEN.	1 stays open **>** 2 min, 1 cycles On/Off.	Both blocked **>** threshold *	**One Entry sensor always open.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.

*** Threshold = Sensitivity set at sensor and fixed response time.**

NOTE: The cycling of the working sensor can be set to a number of blocked/open cycles before the fault is set for the non-working sensor.

Figure A-3 Chart: Sleep Mode Faults for UP Travel

A.4.4 Sleep Mode Fault Displays for DOWN Travel

Sleep Mode Faults for DOWN Travel (in RUN or SLEEP Mode)

STATUS CELL DISPLAY **BLOCKED (BLKED)** & **OPEN Faults** display in **RED.** **Normal (OK)** conditions display in **GREEN**.	**UPPER ENTRY SENSORS**	**LOWER EXIT SENSORS**	**CAUSE** System Action // User Action
LPD1 BLKED / **LPD2 OK** or **LPD1 OK** / **LPD2 BLKED** UPD1 & UPD2 are BOTH GREEN.	Sensors are both Blocked or both Open.	1 blocked **>** 2 min, 1 cycles On/Off.	**One Exit sensor always blocked.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
UPD1 BLKED / **UPD2 OK** or **UPD1 OK** / **UPD2 BLKED** LPD1 & LPD2 are BOTH GREEN.	1 blocked **>** 2 min, 1 cycles On/Off.	Sensors are both Blocked or both Open.	**One Entry sensor always blocked.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
LPD1 OPEN / **LPD2 OK** or **LPD1 OK** / **LPD2 OPEN** UPD1 & UPD2 are BOTH GREEN.	Sensors are both Blocked or both Open.	1 stays open **>** 2 min, 1 cycles On/Off.	**One Exit sensor always open.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.
UPD1 OPEN / **UPD2 OK** or **UPD1 OK** / **UPD2 OPEN** LPD1 & LPD2 are BOTH GREEN.	1 stays open **>** 2 min, 1 cycles On/Off.	Both blocked **>** threshold *	**One Entry sensor always open.** Disables Sleep Mode; Goes to Run Mode. // Clear fault to re-enable Sleep Mode; Realign or replace sensor.

*** Threshold = Sensitivity set at sensor and fixed response time.**

NOTE: The cycling of the working sensor can be set to a number of blocked/open cycles before the fault is set for the non-working sensor.

Figure A-4 Chart: Sleep Mode Faults for DOWN Travel

A.5 CIRCUITS AND RELAYS

A.5.1 Ground Fault Monitor Relay

The Ground Fault Monitor Relay (GFM and GFCT) detects small current leaks to ground, such as faulty motor insulation, that are not large enough to trip a circuit breaker.

A.5.2 Phase Failure/Phase Sequence Relay

The Phase Failure/Phase Sequence Relay (#NPR) detects the phase reversal or phase loss of the incoming mainline power. If there is no phase loss or phase reversal, the LED on the #NPR will be lit.

A.5.3 Transformer Primary Circuit

The controller transformer receives a 208VAC single-phase input from two of the three phases from the main circuit breaker (CB1) power. This input voltage is protected by a 12amp circuit breaker (CB7).

A.5.4 Transformer Secondary Circuits

The controller transformer supplies 120VAC single-phase output to power the PLC, indicator lights, etc.

A.5.5 Main Brake Power Supply

The Main Brake requires 90VDC, which is supplied by rectifying the transformer 120VAC to 90VDC through a diode bridge (DB1). A 3-amp circuit breaker (CB8) protects the circuit from shorts and overloads.

A.5.6 Main Brake Circuit

There are two spring-applied brakes, the main and the backup. They both are actuated and released almost at the same time by the PLC.

When stopping, the main brake is dropped and, 2 seconds later, the backup brake is released. The backup may be released sooner if the main brake, because of excess travel, is not operating to stop the escalator within limits.

A.5.7 Lubricator System

The Lubricator System circuit is connected to the transformer 120VAC output tap through a 5-amp circuit breaker (CB2). The PLC controls the frequency and duration of the lubricating pump's operation. The pump controller does not receive power when the escalator is not running.

A.5.8 Interior Lights

A switch turns on the fluorescent lights inside the controller when the controller's right door is open. The voltage powering the fluorescent lights is from an external power supply. So, opening CB1 will not cause the lights to shut off.

A.5.9 Uninterruptible Power Supply Circuit

Every controller contains one or two Uninterruptible Power Supplies (UPS). Should the #VTS drop for any reason (power failure, blown circuit breaker, etc.), the UPSs keep the PLC LCD display, PLC, DC power supplies, etc. powered up for at least five seconds. During those five seconds:

- The UPS(s) in the controller(s) beep regularly.
- The PLC turns off the motor contactors and the inverter.
- The PLC disconnects the power supply to the motor contactor coils.
- The motor contactors and the brake control relay (#6 and #6A) disconnect the power to the main brake coil and the backup brake coil.
- The PLC sends a message to the PLC LCD display.
- The PLC turns on the "Loss of Controller Power" LED and the "Reset" button LED.

The UPS will keep the controller systems supplied with power until its internal battery runs down. The UPS is recharged when #VTS is picked.

A.5.10 Main Safety String Circuit

The Main Safety String Circuit is a 24VDC series of relays, timers, and PLC outputs that are energized by the inputs to the PLC and the safety devices in the escalator.

Relay #4E is picked if all of these relays, timers, and PLC outputs are picked.

The system may detect non-existent faults in the first two seconds of escalator power-up. During that time the PLC program prevents faults from registering and the escalator from starting.

The controller supplies 24VDC voltage to each of the escalator safety devices in the truss. If a safety device does not detect a fault, the related contact remains closed. The closed contact allows the 24VDC to pick the corresponding relay, timer, or energize a PLC input.

The PLC also has an internally programmed safety string that mirrors the function of the physical relays and timers. This provides redundancy for added safety.

If either versions of the safety string detect a fault:

- The PLC turns off the motor contactor coils.
- The PLC disconnects the power supply to the motor contactor coils and inverter.
- The motor contactor coils and the brake control relay disconnect power to the main brake coil.
- The PLC puts a message on the PLC LCD display.
- The PLC turns on a particular door LED and the “Reset” button LED. Which LED comes on is determined by which input to the PLC dropped.
- Once the fault is fixed, the door LED changes from solid to flashing.
- Once the “Reset” button is pressed, the PLC turns off all flashing fault LED’s. If no faults remain the “Reset” button LED is also turned off.

A.5.11 Safety String Reset Circuit

If the Main Safety String Circuit drops, relay #4E drops. The escalator will not start until relay #4E is picked and the manual "Reset" button is pressed.

A.5.12 Audible Alarm Circuit

The PLC turns on the alarm and the alarms sounds when:

- The emergency stop cover is lifted.
- The escalator is started.
- The smoke alarm is set off.
- Before the escalator is stopped for incorrect handrail speed. If the PLC detects a handrail that is off-speed for more than two seconds, it will turn on the alarm and stop the escalator.
- If a person enters the escalator in the wrong direction when the escalator is in sleep mode, the alarm sounds three times.

A.5.13 Missing Step Detector Circuit

Proximity detectors are located at the upper and lower ends of the escalator truss. So long as each of these detects the sides of the escalator's steps, they complete a circuit to the safety string.

If a step is not detected, the circuit to the safety string opens, stopping the escalator. When the escalator runs in inspection mode the Missing Step Detector Circuit is bypassed.

A.5.14 Inspection Station and Blind Plug Circuits

The escalator has two basic modes of operation – automatic and manual.

Automatic, or revenue operation, is the regular commercial operation of the escalator at full speed or, if sleep mode is in effect, at a slow speed. Manual, or inspection operation, is the operation of the escalator at slow speed, with the Missing Step Detector Circuit bypassed.

Plugging an inspection station into either the lower junction box or upper service switch places the escalator into inspection mode. While in inspection mode, the escalator can only be run from an inspection station.

The escalator will not run if two inspection stations are plugged in at the same time. A blind plug must be inserted in the inspection socket when an inspection station is not plugged in, or the escalator will not run.

A.5.15 Motor Contactor Control Circuit

The main components in the Motor Contactor Control Circuit are:

- The two motor contactors (#1 and #2)
- The across-the-line (#7) and inverter (#5) contactors
- The inverter
- The hourmeters
- The PLC controlled relay (#6T)
- The PLC

The PLC controls when and which of the other components are picked.

- By picking #6 and #6A, the brake is released.
- When the escalator runs “UP” and the brake is released, the PLC picks the Up-Direction Motor Contactor (#1) and the across-the-line contactor (#7) and the “UP” hourmeter runs.
- When the escalator runs “DOWN” and the brake is released, the PLC picks the Down-Direction Motor Contactor (#2) and the across-the-line contactor (#7) and the “DOWN” hourmeter runs.
- When the escalator runs in inspection mode, the PLC picks either contactor #1 (UP) or #2 (DOWN).

Lockout circuits prevent the following contactors from picking simultaneously:

- Contactors #1 (UP) and #2 (DOWN) in revenue mode.
- Contactors #5 (Inverter) and #7 (Across-the-Line).

The escalator requires ten seconds to ramp up to full speed.

A.5.16 Main Drive Shaft Encoder Circuit

An encoder mounted on the main drive shaft sends pulses to the PLC, based on how fast the main drive shaft is spinning.

The PLC counts these pulses and compares them with the minimum and maximum pulses the PLC should receive from the encoder. If the pulse rate is too low or too high, the PLC will stop the escalator.

A.5.17 Motor Temperature Sensing Circuit

The Motor Temperature Sensing Circuit uses a series of thermistors (temperature sensitive resistors) inside the motor and a resistor (THR) in series with 15VDC applied. The PLC determines the voltage drop across the resistor and uses it to calculate the motor temperature.

If the PLC calculates that the motor temperature is above 154° Celsius, it stops the escalator.

A.5.18 Motor Vibration Monitoring Circuit

The Motor Vibration Monitoring Circuit registers motor vibration. If excessive vibration continues for over one minute, a fault is registered in Fault History and the indicator LED turns on. If the vibration is reduced to an acceptable level, the LED flashes.

A.5.19 Handrail Speed Encoder Circuits

Two encoders, one for each handrail, send pulses to the PLC, based on the handrail speed.

The PLC counts the pulses from each encoder and compares them with the minimum and maximum number it should receive from the encoders. If the pulse rate from either encoder is too high or low, the PLC will stop the escalator.

A.5.20 Faultfinder Display Circuits

There are several red LEDs on the outside of the controller's left door. If the PLC and the Main Safety String Circuit both detect a fault in the escalator, the PLC will turn on one more of these LEDs in addition to the LED on the "Reset" button.

When the fault is fixed, the LED on the door will blink. When the "Reset" button is pressed, the PLC will turn off all flashing LEDs. If no faults remain, the PLC will turn off the "Reset" button LED.

A.5.21 PLC LCD Display Power and Communication Circuits

In the event of a power loss, the UPS powers the PLC LCD fault displays.

An RS-485 communication cable runs from the PLC to the Allen-Bradley PanelView fault display.

A.5.22 Inspection Operation Control Circuits

The Inspection Operation Control Circuits are located in both the controller and in the inspection station.

Plugging an inspection station into either the lower junction box or upper service switch places the escalator into inspection mode. While in inspection mode, the escalator can only be run from an inspection station.

A.5.23 Inspection Operation Safety Circuits

Additional safety precautions in manual, or inspection mode:

- Only one inspection station may be used at a time. The escalator will not run if two inspection stations are plugged in at the same time or if one inspection station is plugged in and the opposite blind plug is missing.
- Only one inspection station direction button may be used at a time. The escalator will not run if the “Up” and “Down” buttons are pressed at the same time.
- A blind plug must be inserted in the inspection socket when an inspection station is removed. The escalator will not run if a blind plug is missing.
- Both a lockout circuit and the PLC do this.

B) SAFETY SWITCHES

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

There are many safety devices located throughout the escalator. They are controlled and monitored by the controller and PLC LCD display (fault indicator) panel.

Operation of the following safety devices are described below:

- Broken Step Chain device
- Skirt Obstruction device
- Step Sag (Level) device
- Step Up-Thrust device
- Missing Step device
- Handrail Entry device
- Broken Handrail device
- Displaced Handrail device
- Handrail Speed device
- Comb Impact / Comb Stop devices
- Broken Drive Chain device
- Emergency Stop button
- Operating Panel switch
- Motor Vibration monitor
- Sleep Mode Sensors/Reflectors

B.1 BROKEN STEP CHAIN DEVICE

The broken step chain devices, located on each side in the lower end of the escalator, stop the escalator and apply the brake when the step chain breaks or stretches.

When the step chain breaks or stretches:

- The tension carriage moves toward the lower end of the escalator.
- The kicker moves, tripping the lever arm of the manual reset limit switch. The kicker is mounted to the carriage rod.
- The switch cuts power to the motor and brake.

An accident or kink in the step chain, causing the tension carriage to move towards the upper end, will also trip the switch. An operator must pull the manual reset button on the switch and press the safety switch reset button in the controller before the escalator may be restarted.

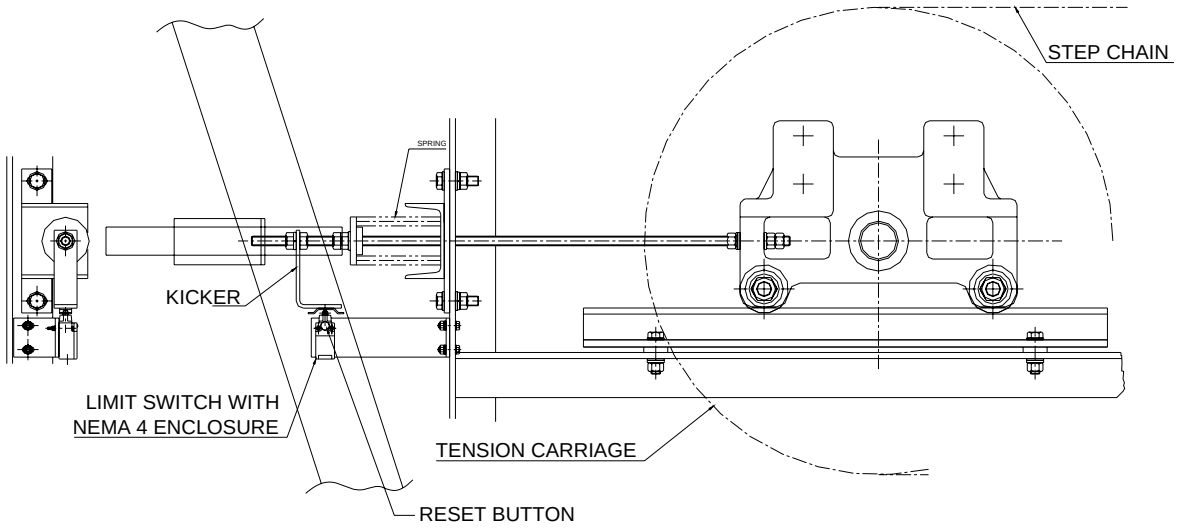


Figure B-1 Broken Step Chain device

B.2 SKIRT OBSTRUCTION DEVICE

The skirt obstruction switches are plunger-type limit switches located behind the skirt panel in the incline and at the upper and lower transition points. Per side, there are three skirt switches on the lower truss area, one in the middle of the incline, and two on the upper truss.

These devices cut power to the motor and brake when a foreign object is wedged between the skirt panel and step.

The switch resets itself when the object is removed. An operator must press the reset button on the controller before the escalator can be restarted.

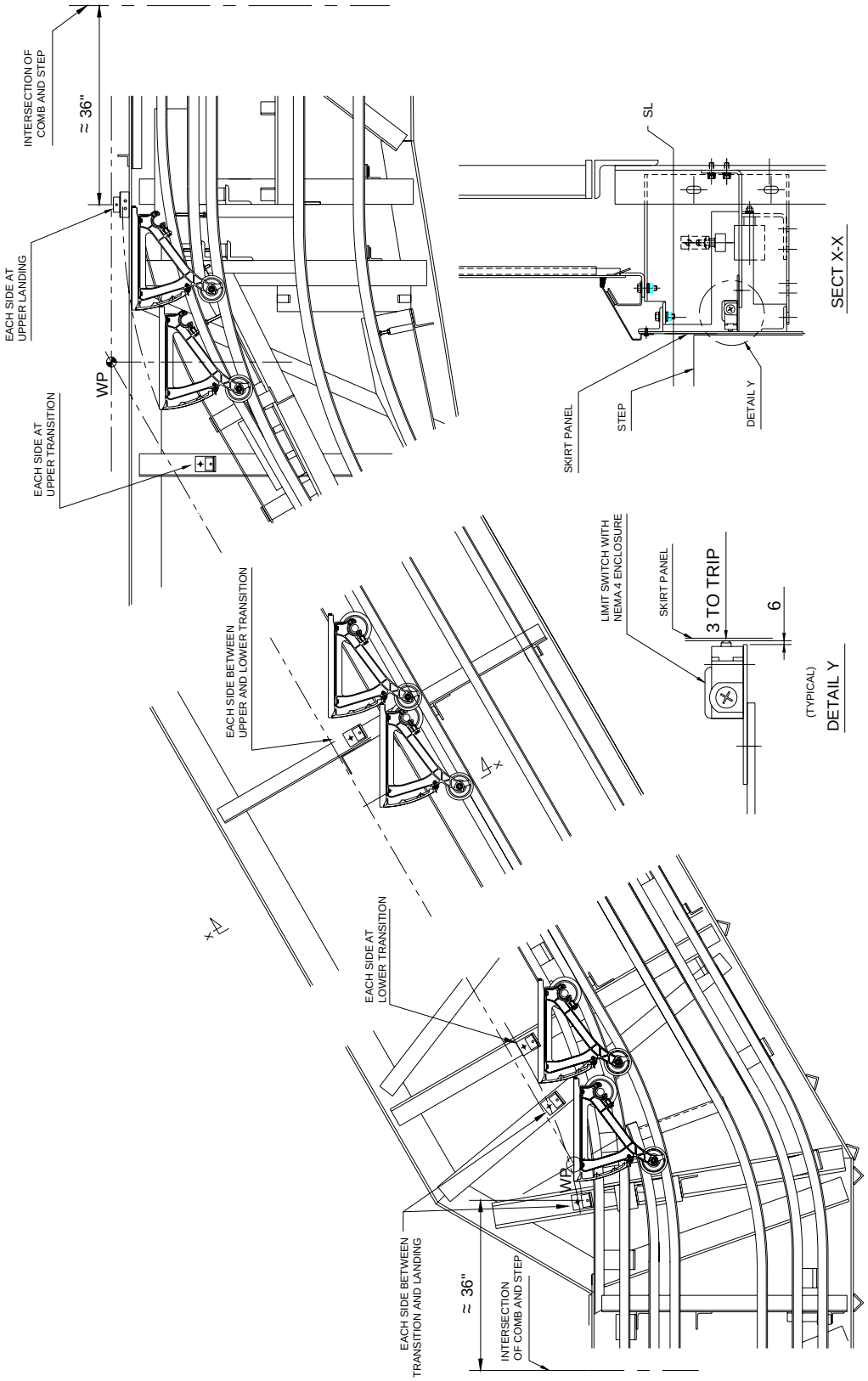


Figure B-2 Skirt Obstruction device

B.3 STEP SAG (LEVEL) DEVICE

The step sag devices stop the escalator when a step experiences a downward displacement of 3mm [0.125”] or more at either side of the step riser or the step chain axle.

There are four step level devices, two at the upper end of the escalator and two at the lower end of the escalator.

When a step experiences sufficient downward displacement, a rotary limit switch is tripped, cutting power to the motor and brake and stopping the escalator before the step enters the combplate. An operator must press the reset button in the controller before the escalator may be restarted.

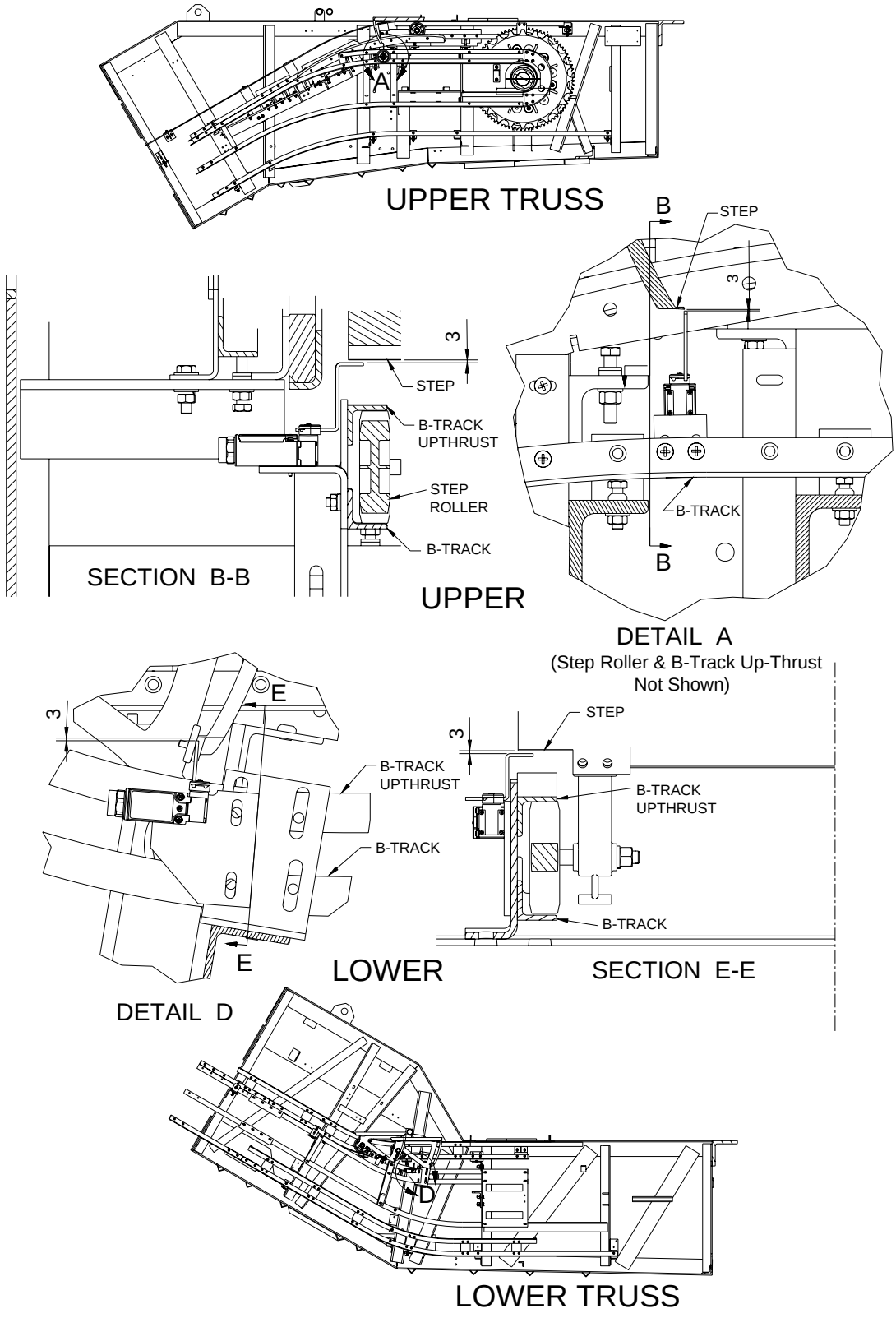


Figure B-3 Step Sag device

B.4 STEP UP-THRUST DEVICE

The step up-thrust safety devices stop the escalator when a step is forced upward before entering the combplate, to prevent the step from crashing into the combplate. There are two of these devices in the lower portion of the escalator.

When an obstruction caught between the steps forces the riser up, the top of the step wheel contacts the limit switch hinge plate, which trips the limit switch. This cuts power to the motor and brake and stops the escalator. An operator must press the reset button in the controller before the escalator may be restarted.

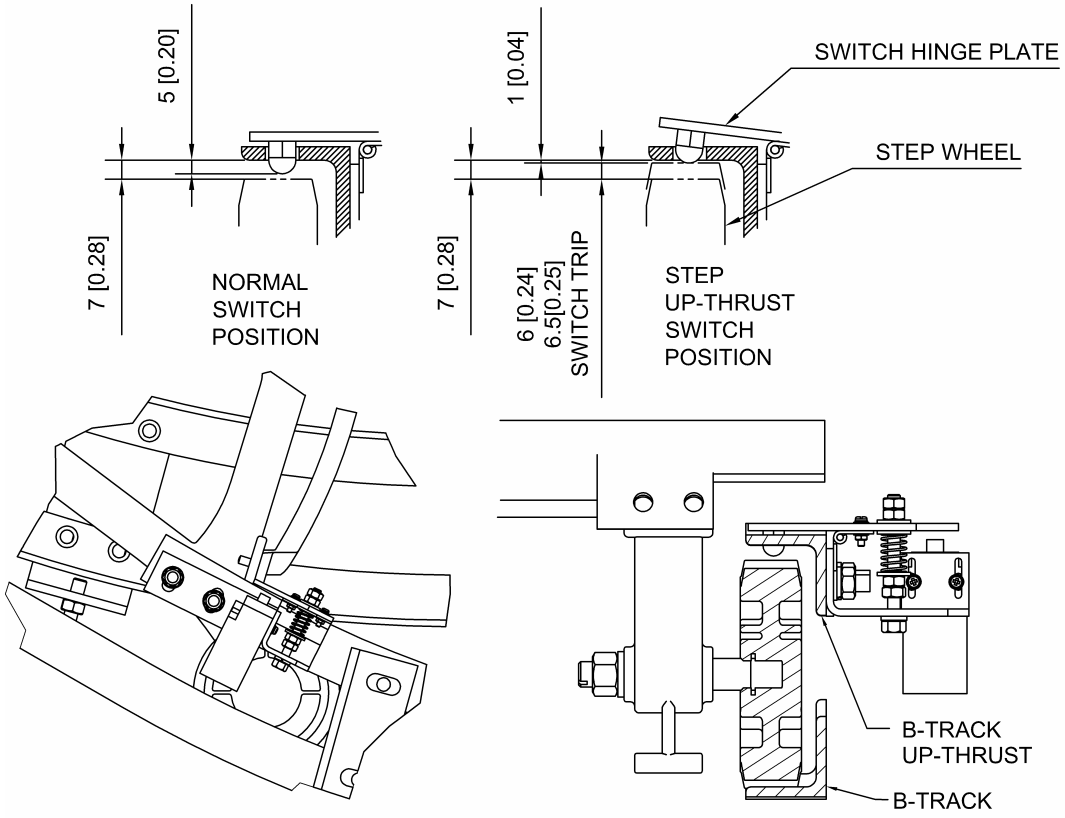


Figure B-4 Step Up-Thrust device

B.5 MISSING STEP DEVICE

The missing step devices are inductive proximity sensors that detect if a step is missing. They are located at both ends of the escalator on the return side, just before the turnaround, mounted on a plane level with the tread.

As the steps pass, the sensor detects the tread edge. If the sensor does not detect a tread, the circuit opens and stops the escalator before the missing step section emerges from the combplate. An operator must push the reset button in the controller before the escalator may be restarted.

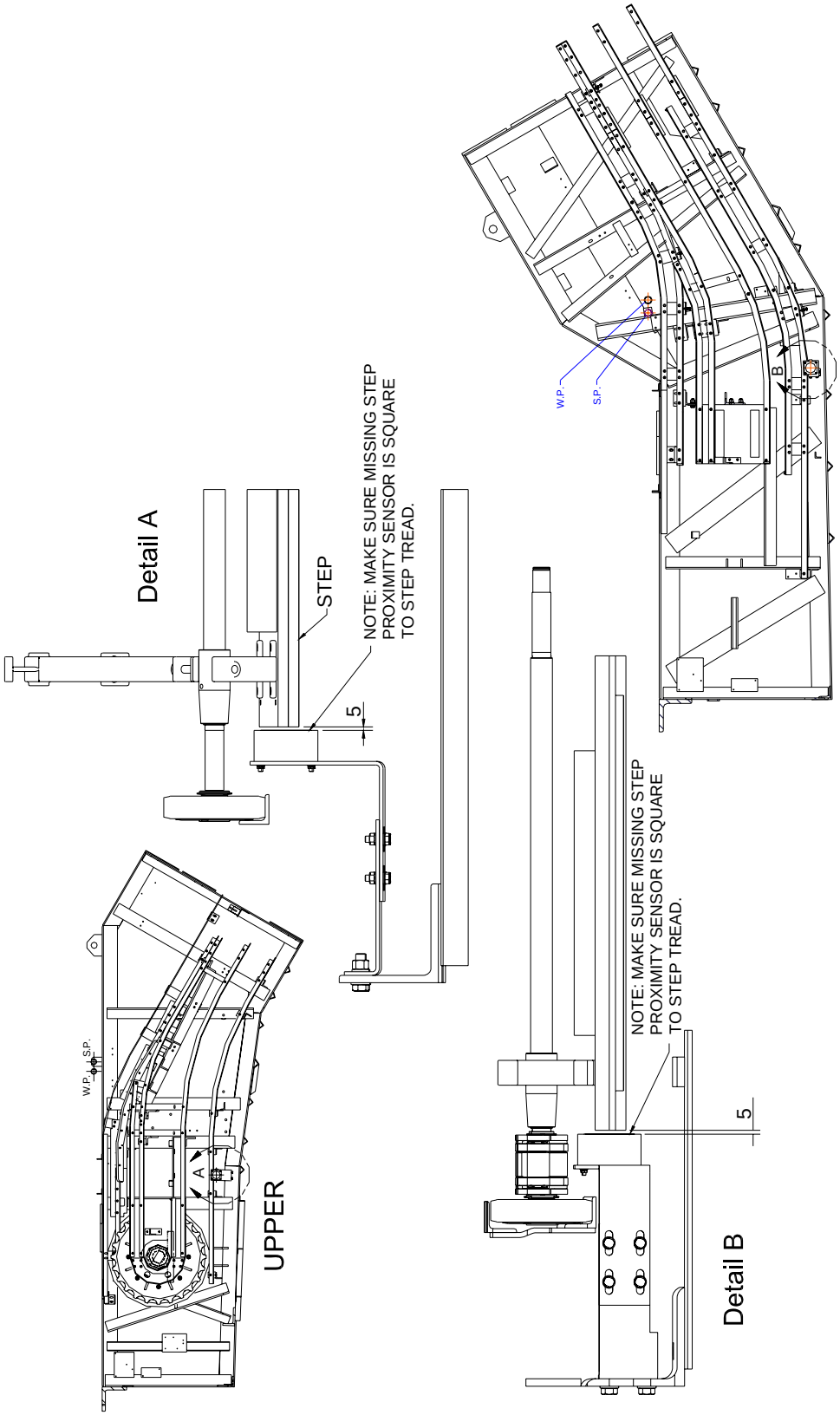


Figure B-5 Missing Step device

B.6 HANDRAIL ENTRY DEVICE

The handrail entry devices are plunger-type limit switches that stop the escalator when an object is caught between the handrail and handrail guard. They are located at each newel.

When an object pushes against the spring-loaded handrail guard, the guard depresses a switch, cutting power to the motor and brake and stopping the escalator. An operator must press the reset button in the controller before restarting the escalator.

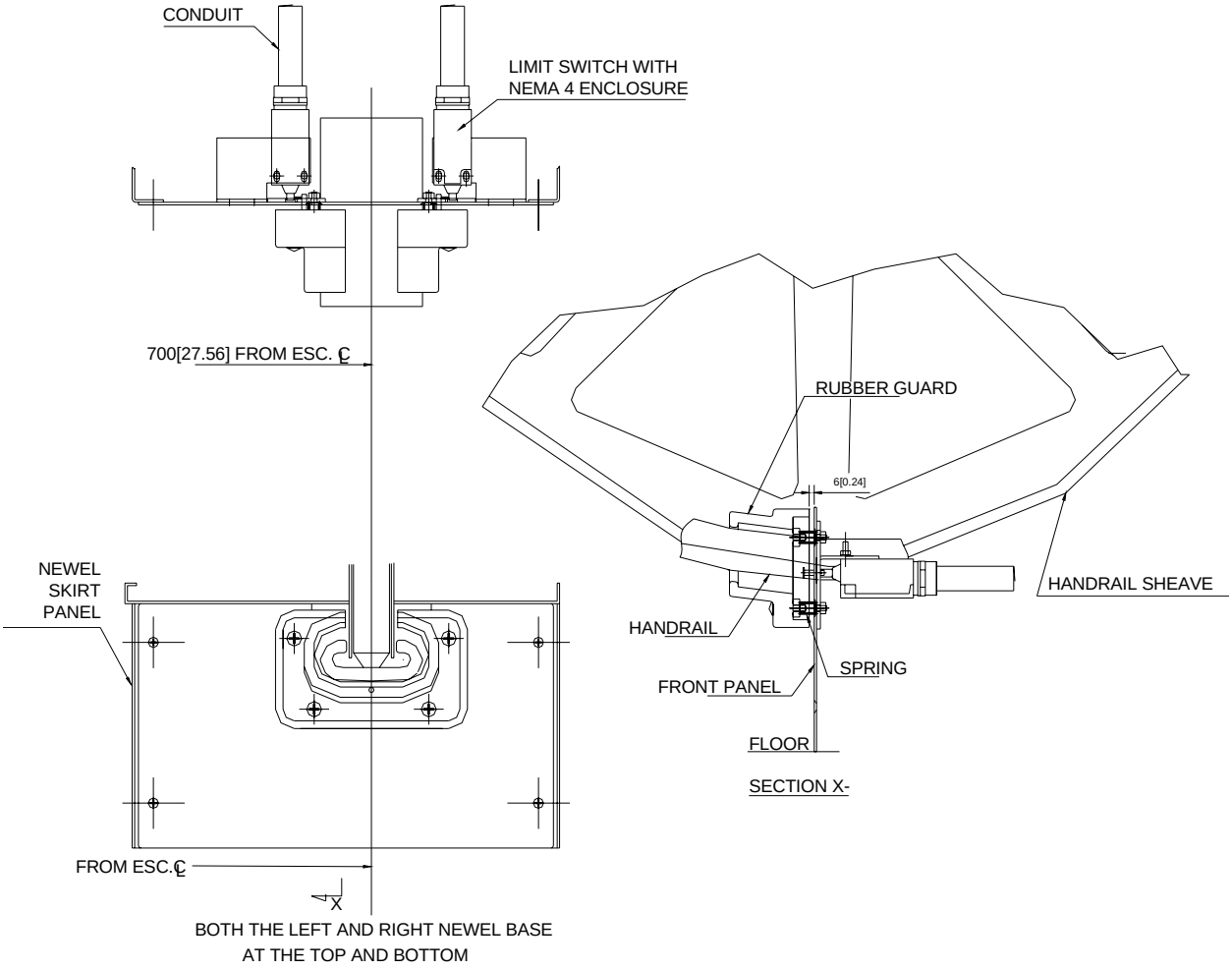


Figure B-6 Handrail Entry device

B.7 BROKEN HANDRAIL DEVICE

The broken handrail device stops the escalator when the handrail loses tension or breaks.

A hinged roller is held up by handrail tension. When a handrail is excessively stretched or broken, it loses tension, causing the roller bracket to fall until it depresses a limit switch. This cuts power to the motor and brake and stops the escalator. An operator must push the reset button in the controller before restarting the escalator.

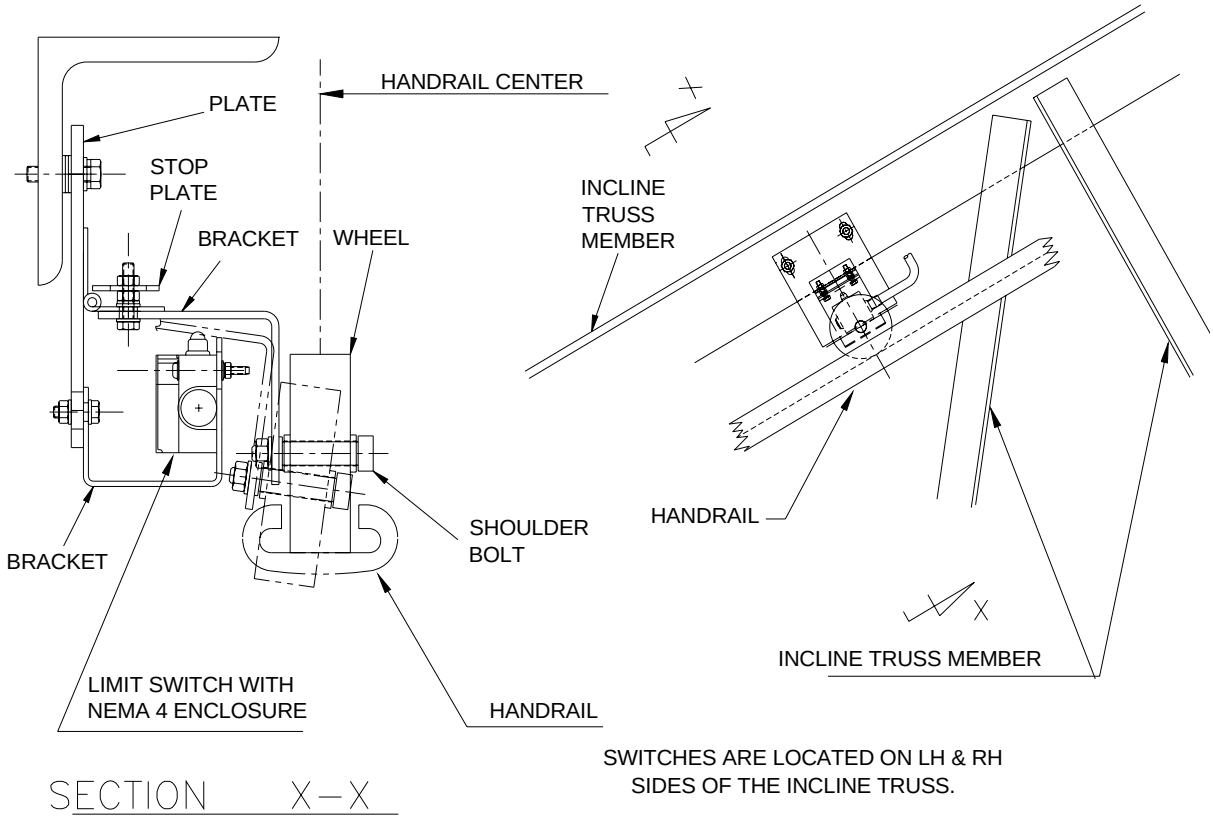


Figure B-7 Broken Handrail device

B.8 DISPLACED HANDRAIL DEVICE

The displaced handrail devices stop the escalator when either handrail becomes displaced from the handrail guide. The devices are located on the underside of each handrail inside the handrail guide in the transition curve of the lower truss.

A cam follower type roller, which is mounted to an actuator rod, tracks along the underside of the handrail. Under normal conditions, the handrail holds down the actuator rod against one end of a lever that is counterweighted on the opposite end.

If the handrail becomes displaced, the actuator rod moves up from the force of the counterweight, and the rotating lever depresses a limit switch that signals the escalator to stop. An operator must push the reset button in the controller before restarting the escalator.

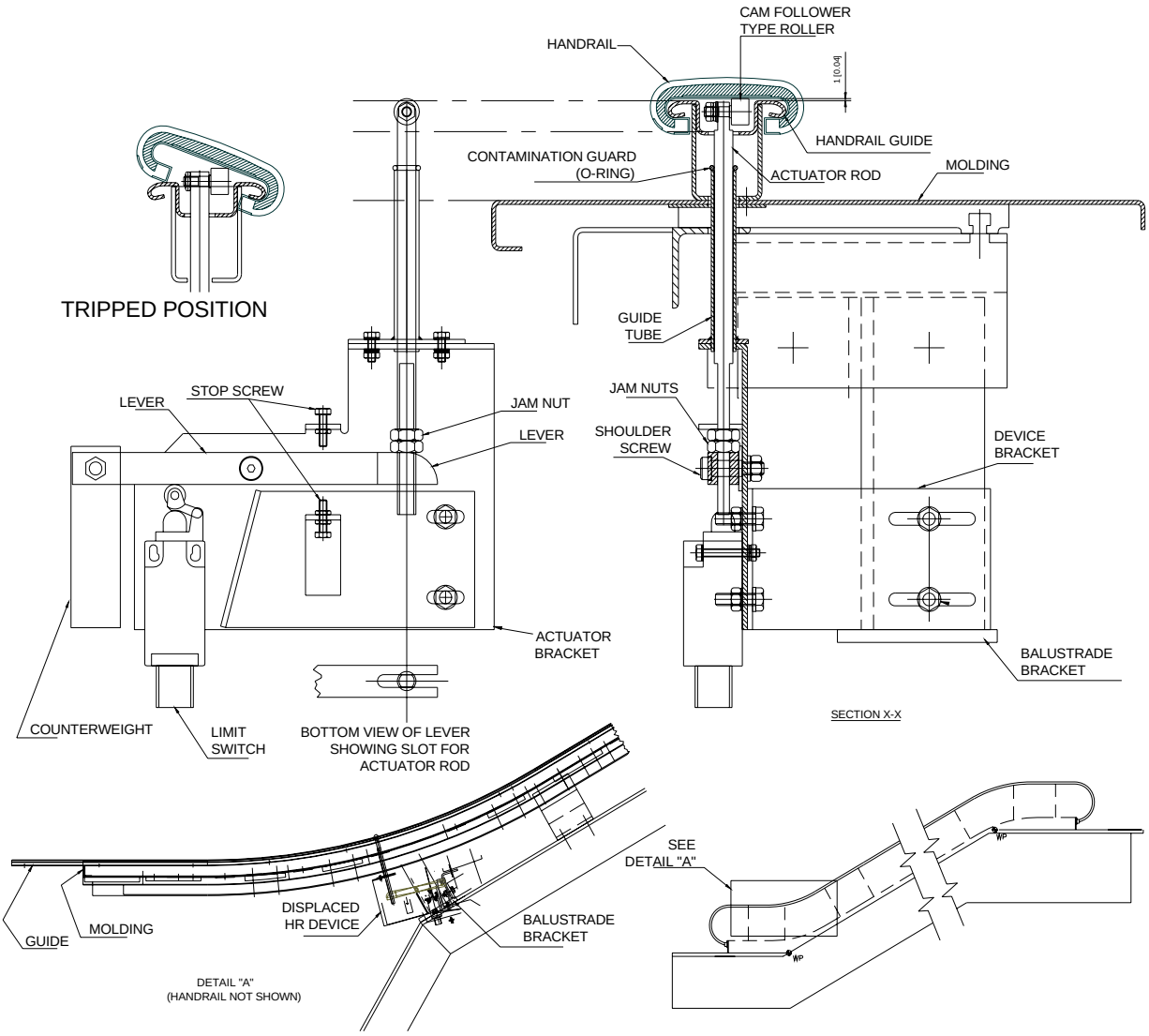


Figure B-8 Displaced Handrail device

B.9 HANDRAIL SPEED DEVICE

The handrail speed device is a Stegmann 24 VAC encoder with a wheel mounted to it, which rolls on the handrail. The encoder and wheel pivot on a bracket. The weight of the assembly, slow speed, and rubber-to-rubber contact between the wheel and handrail allow accurate measurement of speed without slippage.

If handrail speed is 10% - 15% off contract speed, the system sounds as alarm. If the handrail speed is more than 15% off (less than 85% or more than 115% of contract speed), the handrail speed device cuts power to the motor and brake, stopping the escalator. An operator must push the reset button in the controller before restarting the escalator.

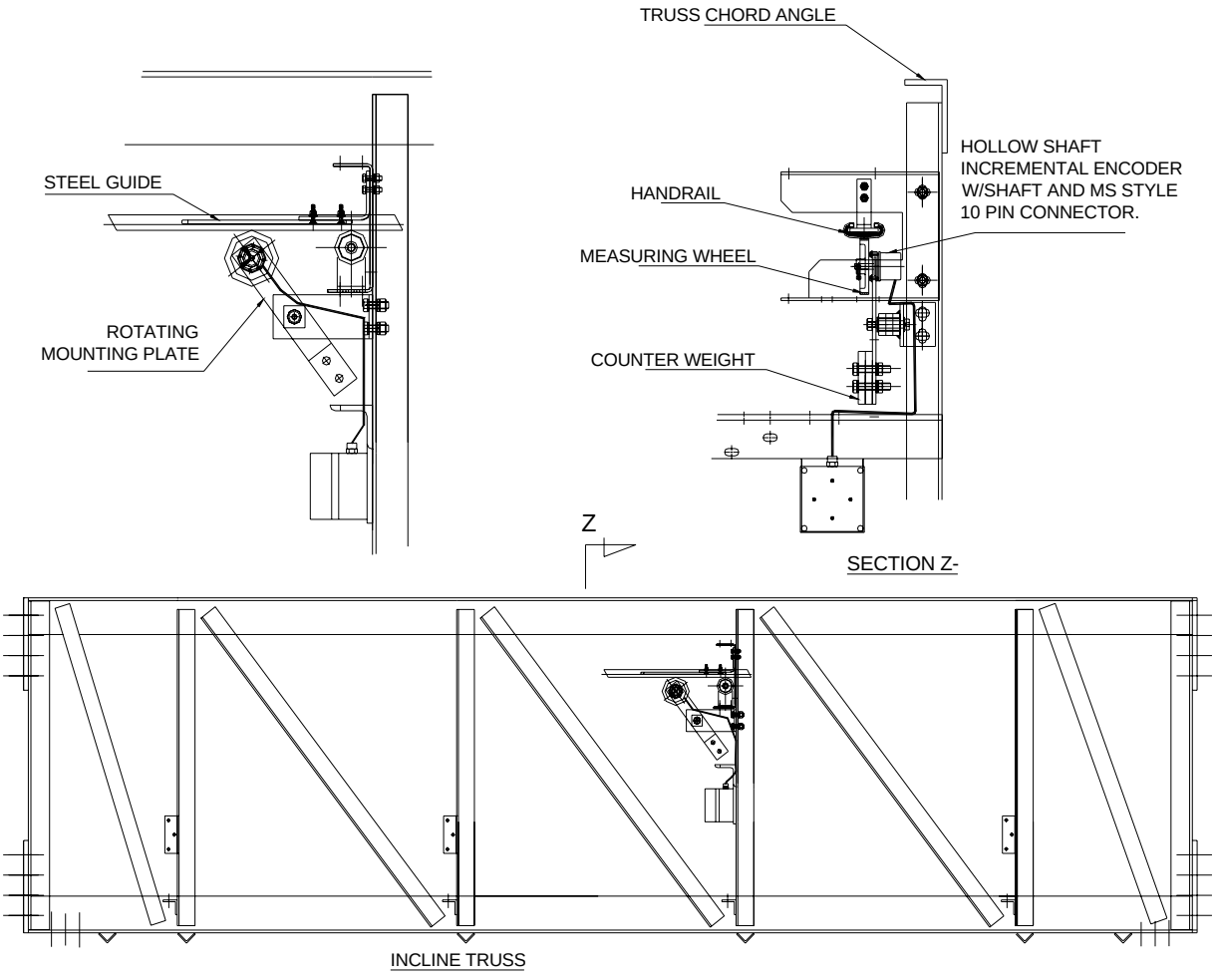


Figure B-9 Handrail Speed device

B.10 COMB IMPACT/COMB STOP DEVICES

The comb switches stop the escalator when an object is wedged between the combplate and step. They are located behind the skirt panel.

The horizontal tripping force is 200 lbs at a side and 400 lbs at the center. When a horizontal load is applied along the front edge of the combplate, the combplate slides back until the horizontal comb impact (switch “C”) trips. A 6mm gap between the sliding combplate and the stationary landing plate is maintained.

When standing at the top or bottom of the escalator and facing the nearest combplate, the vertical springs on the right and left-hand sides are different.

The right-hand spring actuates the comb stop switch (switch “A”), which does not require manual reset at the controller when opened.

The left-hand spring actuates the vertical comb step impact device (switch “B”), which does require a reset at the controller when opened. The stiffer left-hand spring is held 2 mm above the surface of the combplate bracket and is used for the 150 lbs comb impact device requirement.

When a load is applied vertically to the bottom of the comb teeth:

- The combplate rotates.
- The right-hand spring resists the load until the comb stop switch is tripped.
- As the load increases past the comb stop tripping point, both springs work together to resist the load.
- When the 2mm gap between the left-hand spring and the combplate bracket is closed, the comb impact device is tripped.

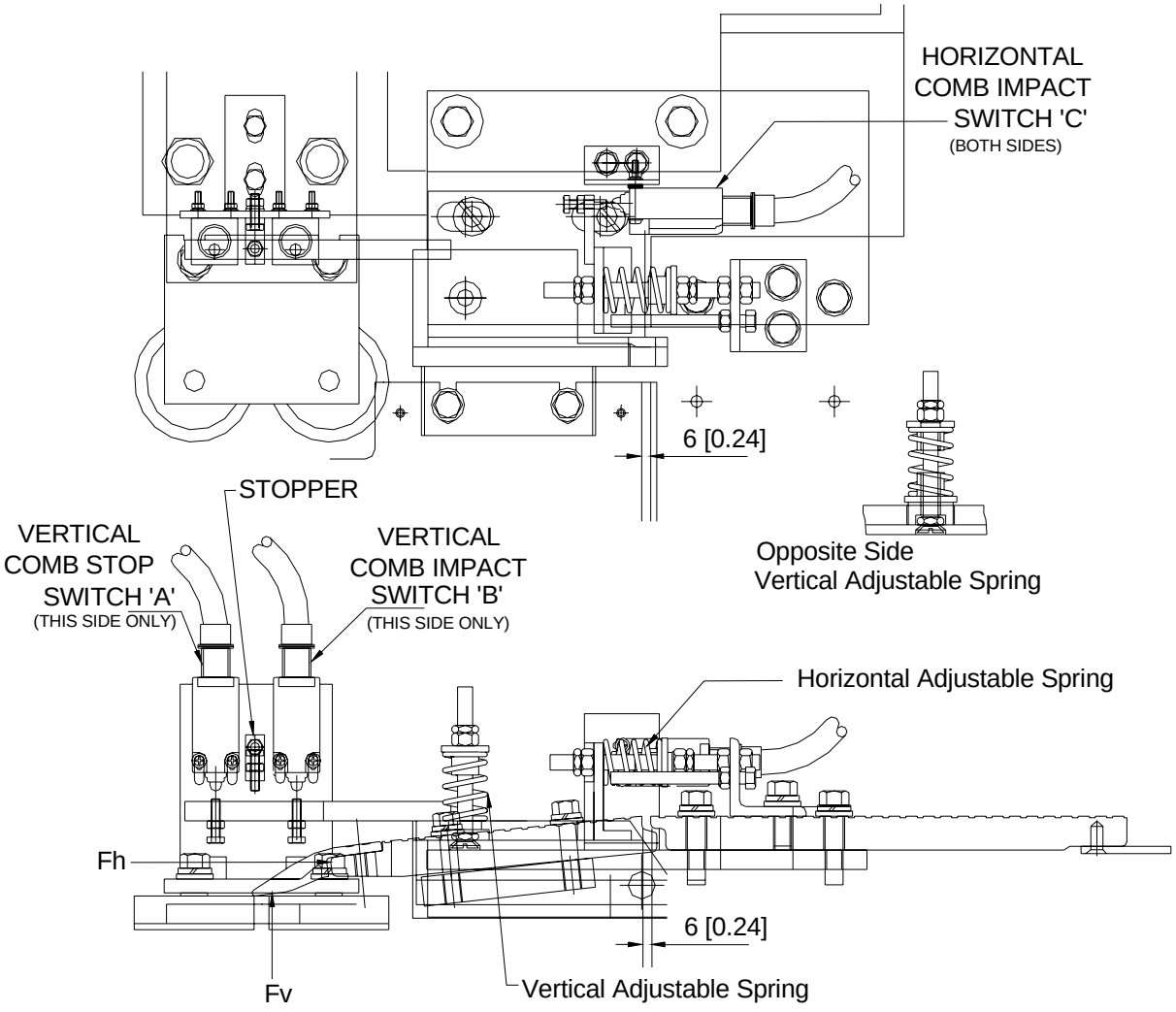


Figure B-10 Comb Impact/Comb Stop devices

B.11 BROKEN DRIVE CHAIN DEVICE

The broken drive chain device is part of the pawl brake assembly (main drive shaft brake) which locks the main drive shaft when a break in the main drive chain is detected.

The broken drive chain device (also called pawl monitoring limit switch) monitors the position of the pawl's weighted lever. As the lever drops, the limit switch is triggered, cutting power to the drive machine and machine brake just before the pawl engages the ratchet.

Refer to Mechanical Section B for complete information on the pawl brake.

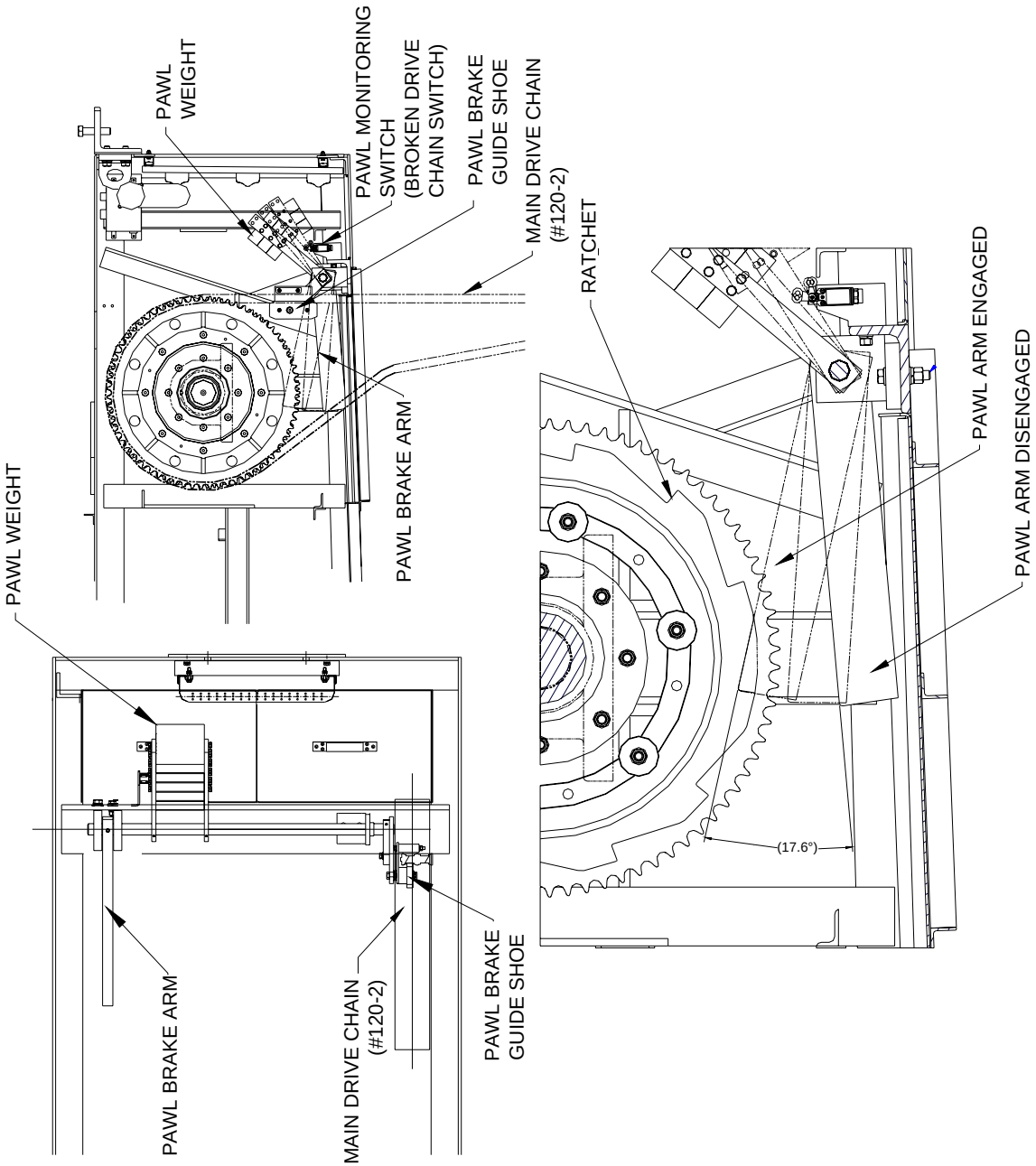


Figure B-11 Broken Drive Chain device

B.12 EMERGENCY STOP BUTTON

The emergency stop buttons are manually operated red momentary push buttons that stop the escalator immediately for emergencies. They are located at the upper and lower landings on the right-hand side when facing the escalator.

If the cover on an emergency stop button is lifted for access to the button, a limit switch, which is in contact with the cover, will sound an alarm for a maximum of 60 seconds.

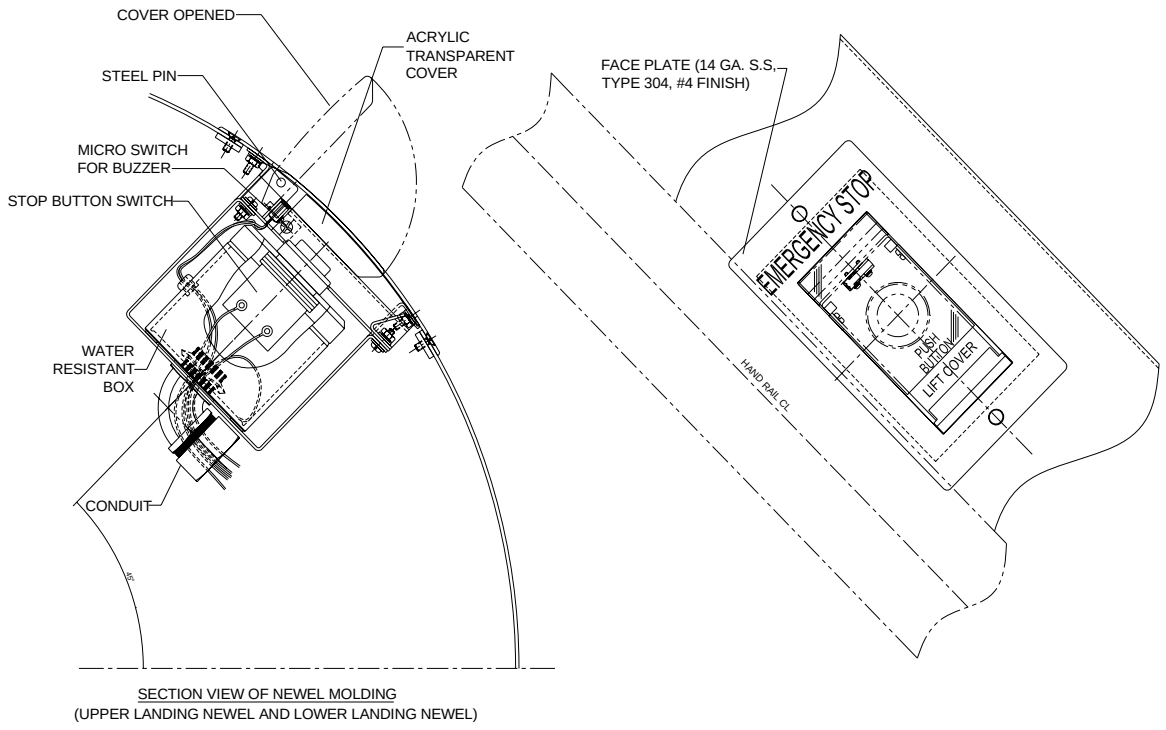


Figure B-12 Emergency Stop Button

B.13 STARTING STATION (OPERATION PANEL)

The starting station (operation panel)switches control the start and direction of escalator travel. They are located in the upper and lower newel of the escalator and include a keyed cover.

These keyed cylinder cams trip the momentary contact toggle switches that control the start and direction of escalator travel. An operator must hold the push button and turn the key in the desired direction at the same time.

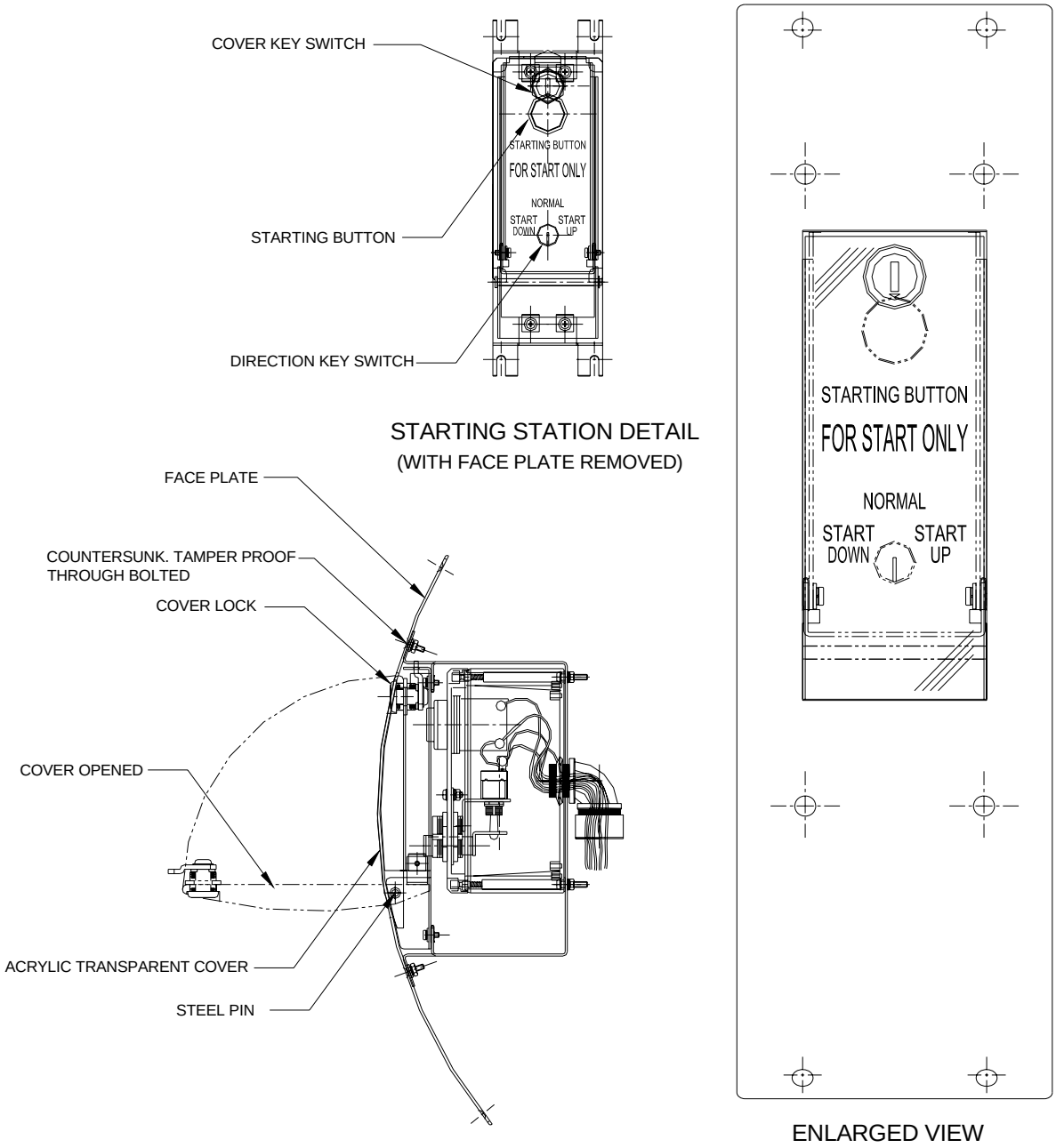


Figure B-13 Starting Station (Operation Panel)

B.14 VIBRATION MONITOR

This device monitors the vibration of the escalator motor.

If the vibration rises above a predetermined level, a warning lamp will be turned on and the central office will be notified. However, the escalator will not shut down due to excessive vibration.

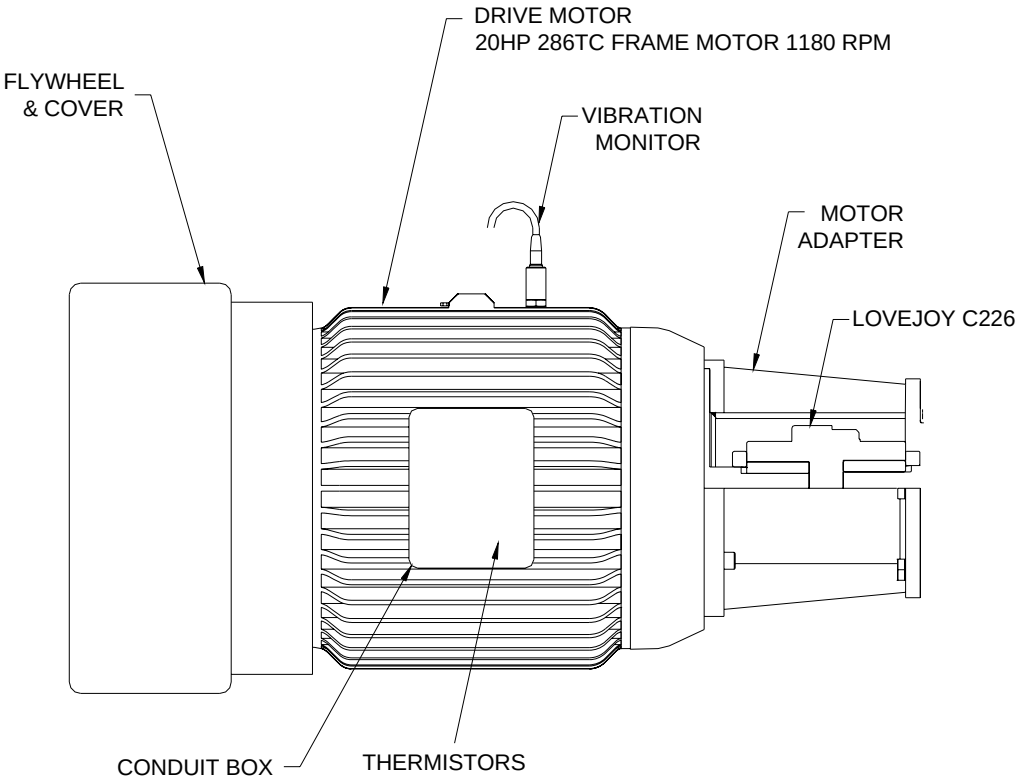


Figure B-14 Vibration Monitor

B.15 SLEEP MODE SENSORS/REFLECTORS

Sleep Mode runs the escalator at a reduced speed of 15 FPM during periods of inactivity.

Sensors at the upper and lower landing plate areas of the escalator monitor for the presence of passengers.

The photoelectric sensors both transmit infrared light toward the reflector and receive the reflected light.

After a preset time delay of inactivity, the control system slows the drive to the sleep mode speed of 15 feet per minute. When a passenger passes through the infrared light beam, the control system responds to the broken light by disengaging Sleep Mode and returning the escalator to the 90 feet per minute speed.

The sensors will receive only reflected light from the specially designed reflector. Shiny objects such as mirrors and stainless briefcases will not reflect the light in a way that the receiver could detect.

The device is fail-safe in that any vandalism or failure of the sensor will result in the escalator running continuously at full speed since the receiver must be working normally before going into Sleep Mode.

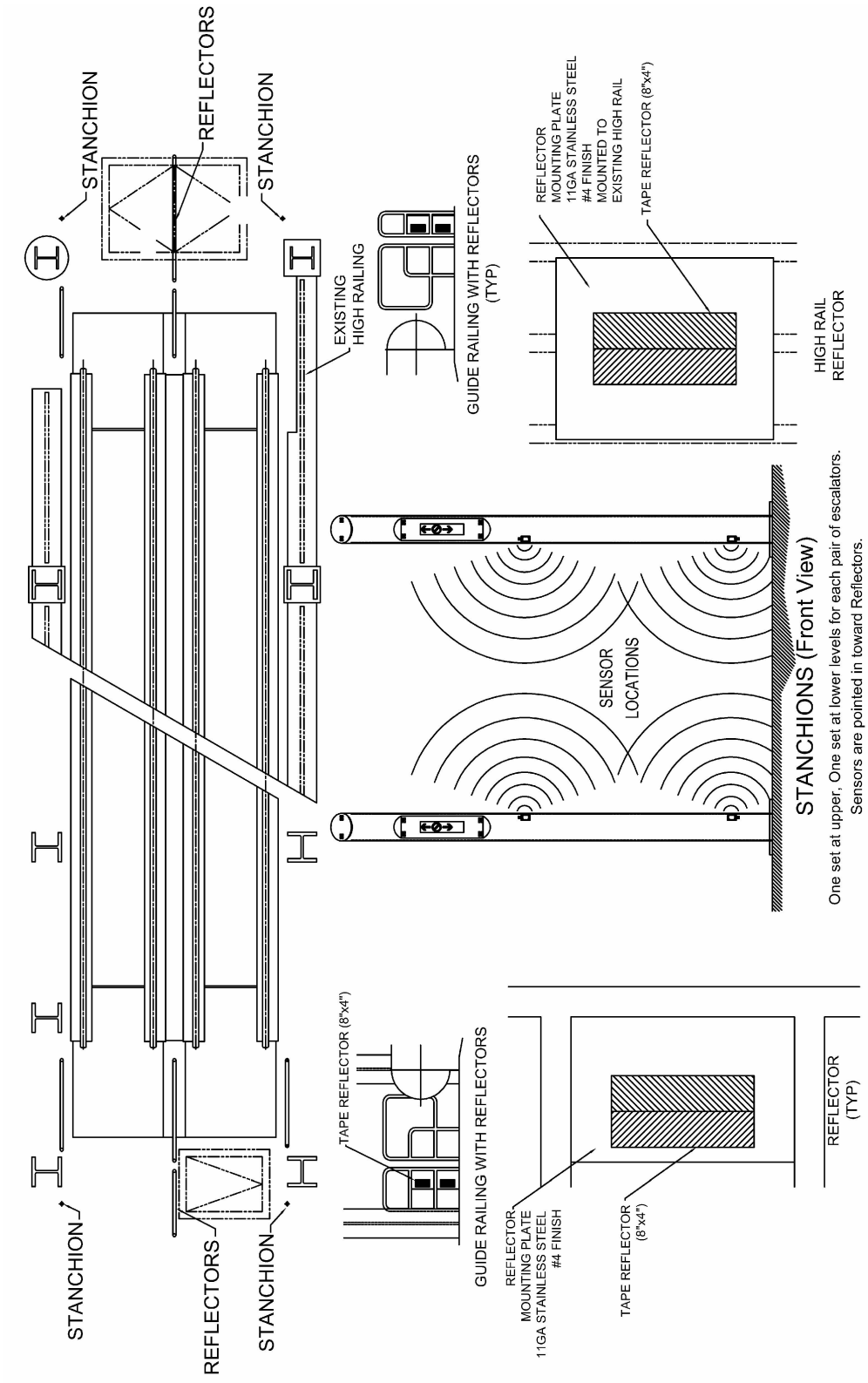


Figure B-15 Sleep Mode Sensors/Reflectors – E-235 & E-236

ADJUSTMENT PROCEDURES

Adjustment procedures are provided for the following:

- Broken Step Chain device
- Skirt Obstruction device
- Step Sag (Level) device
- Step Up-Thrust device
- Missing Step device
- Handrail Entry device
- Broken Handrail device
- Displaced Handrail device
- Handrail Speed device
- Comb Impact / Comb Stop devices
- Emergency Stop button
- Starting Station (Operation Panel)
- Sleep Mode Sensors

B.16 BROKEN STEP CHAIN DEVICE ADJUSTMENT

Inspect and adjust the broken step chain device as follows:

1. Depress the switch actuator until the switch trips.
   - An audible clicking noise should be heard.
2. Verify that the switch works by trying to start the escalator.
   - If switch is working properly, the escalator will not start.
3. Reset the broken step chain device by pulling the reset button on the switch and pressing the reset button in the controller.
4. Verify that the roller lever is centered in the kicker.
   - If not centered, loosen lock nuts of the kicker and move sideways until roller lever is centered.
   - The clearance between the roller lever and kicker should be 1-2mm (0.04-0.08”).
5. Adjust spring length, if necessary.
   - A tag marked with the tension carriage spring length setting is tied to the rod.
6. Check for loose or broken wires. Replace if necessary.

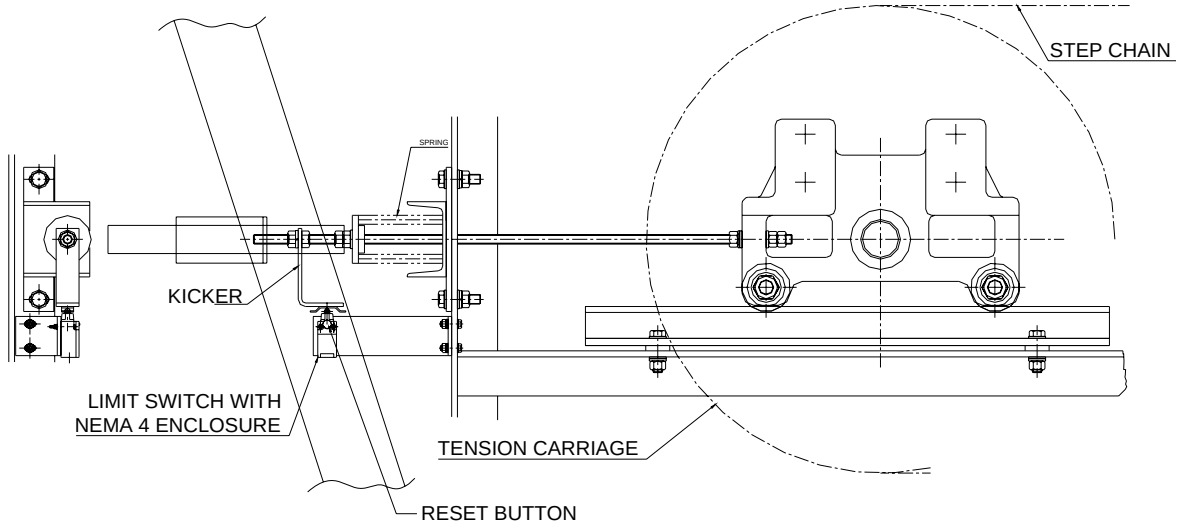


Figure B-16 Broken Step Chain Device Adjustment

B.17 SKIRT OBSTRUCTION DEVICE ADJUSTMENT

Inspect and adjust the skirt obstruction device as follows:

1. Place a 3mm shim between the skirt panel and the skirt switch plunger. Verify that the switch trips.
2. Verify the escalator will not start with the switch tripped.
3. Check for loose or broken wires. Replace as needed.
4. Restart the escalator at the operating control panel. (Refer to starting station testing/adjusting procedures later in this section.)

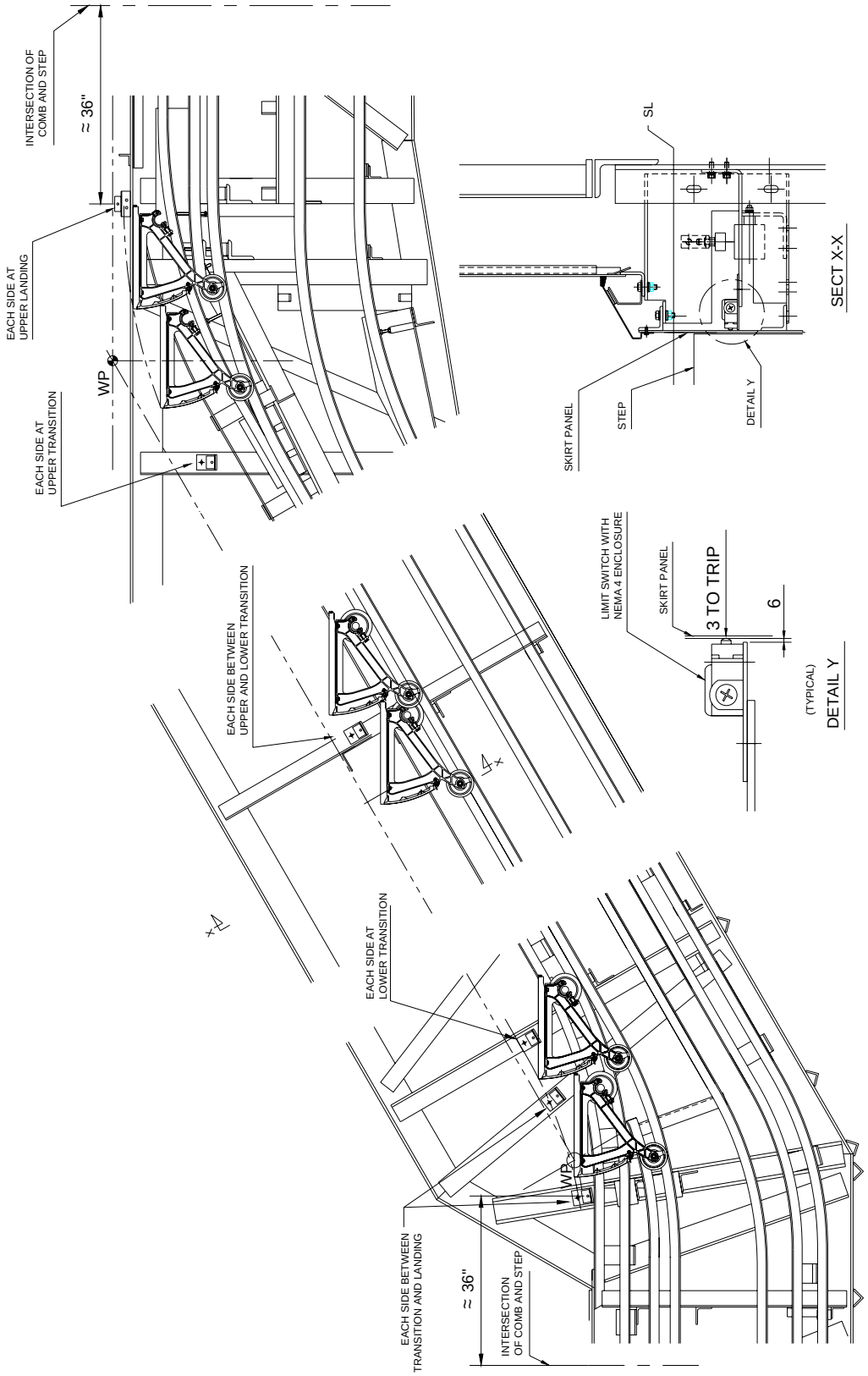


Figure B-17 Skirt Obstruction Device Adjustment

B.18 STEP SAG (LEVEL) DEVICE ADJUSTMENT

Inspect and adjust the step sag device as follows:

1. Remove one step (refer to Mechanical Section F).
2. Move the step opening to the step sag device.
3. Adjust step position so that the gap between the riser and the switch can be measured. The gap should be 3mm [0.12”]. Adjust switch position, if necessary.
4. Trip the switch and verify that the escalator will not start until the reset button in the controller is pushed.

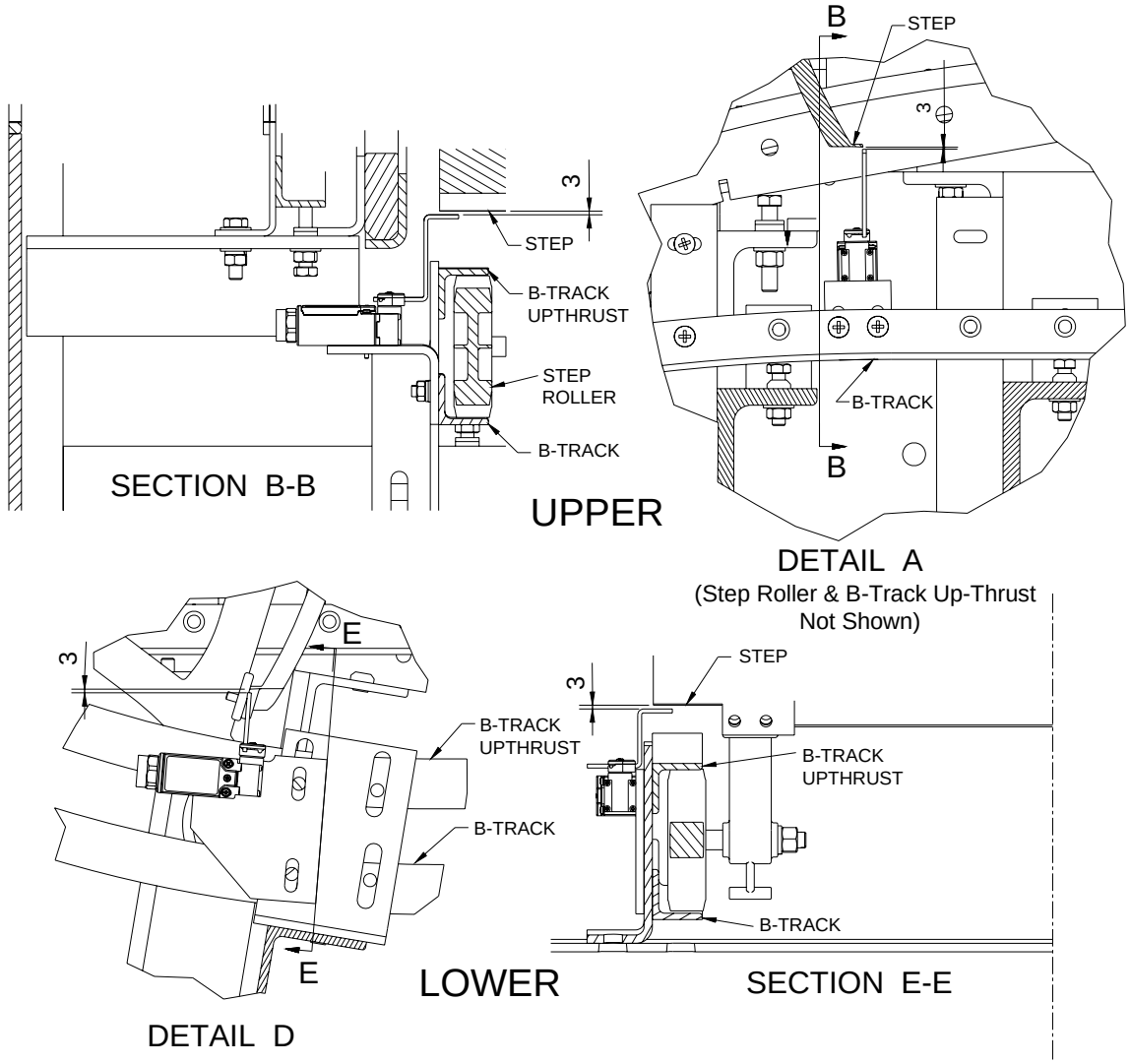


Figure B-18 Step Sag Device Adjustment

B.19 STEP UP-THRUST DEVICE ADJUSTMENT

Inspect and adjust the step up-thrust device as follows:

1. Run escalator at inspection speed in the DOWN direction.
2. With escalator moving towards the combplate, grip riser edge of tread with pliers as the step approaches the lower transition.
3. Hold onto the handrail with the other hand.
4. Lift the riser as it approaches the combfingers.
5. Verify that the switch stops the escalator.
   - If the escalator does not stop, measure the following and adjust the height of the switch, if necessary.
   - The clearance between the top of the step wheel and the surface of the B Track Upthrust should be 7mm [0.28”].
   - The clearance between the top of the limit switch plunger and the hinge plate should be 4.2mm [0.16”].
6. Check for loose or broken wires.

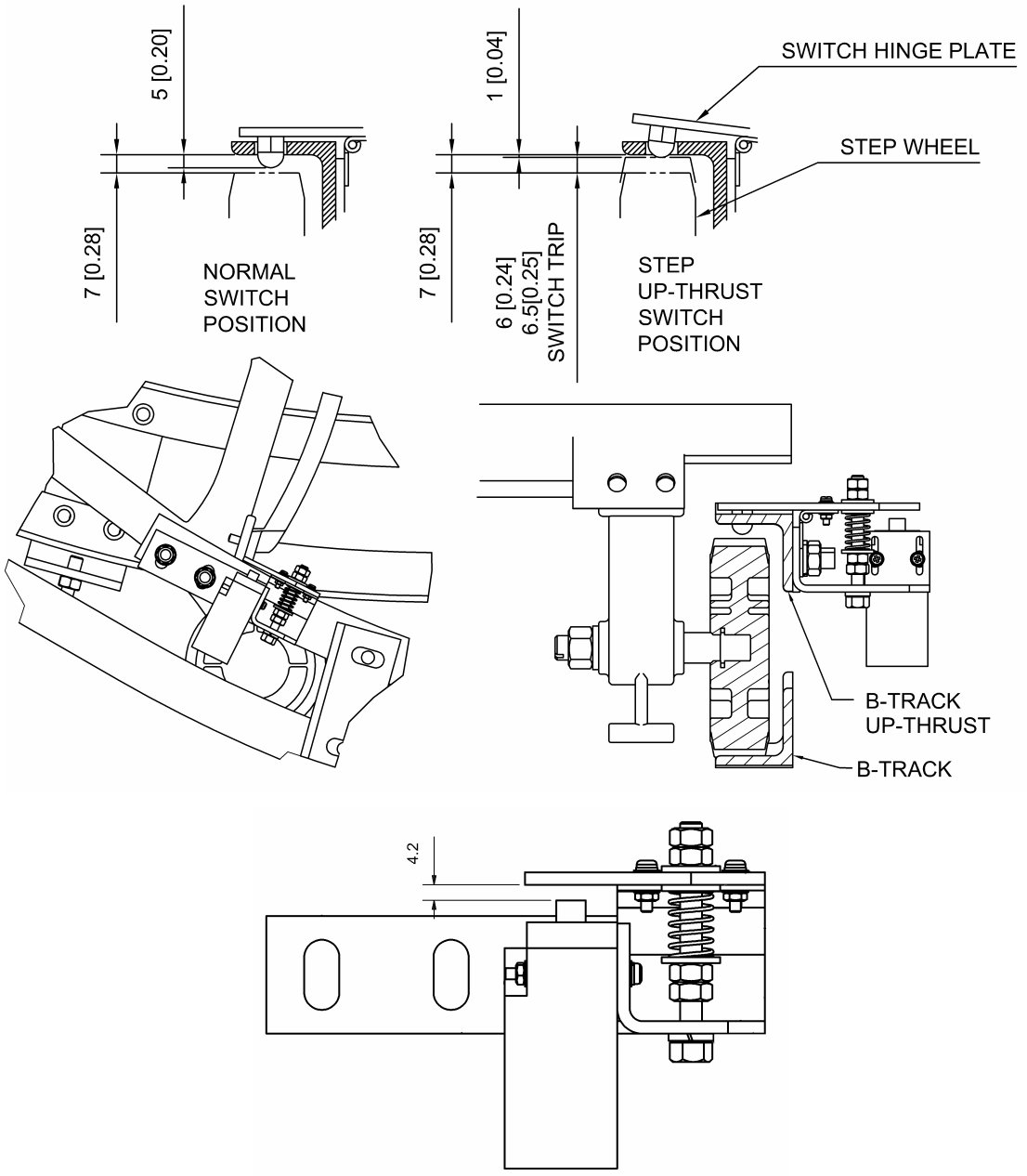


Figure B-19 Step Up-Thrust Device Adjustment

B.20 MISSING STEP DEVICE ADJUSTMENT

Inspect and adjust the missing step device as follows:

1. Remove one step (refer to Mechanical Section F).
2. Run the escalator and verify that the escalator stops when the missing step section reaches the proximity sensor.
3. Verify that the escalator will not start until the reset button in the controller is pressed.
4. If the escalator does not stop when a missing step passes the proximity sensor, check if there is any metal near the sensing face and remove it.
5. If there is no metal, check the wiring. Replace wiring as needed.
6. If the escalator shuts down repeatedly, check that the proximity sensors are in the correct position.

   The sensor should be square to the step tread, with a clearance of 5mm.
7. Replace the step.

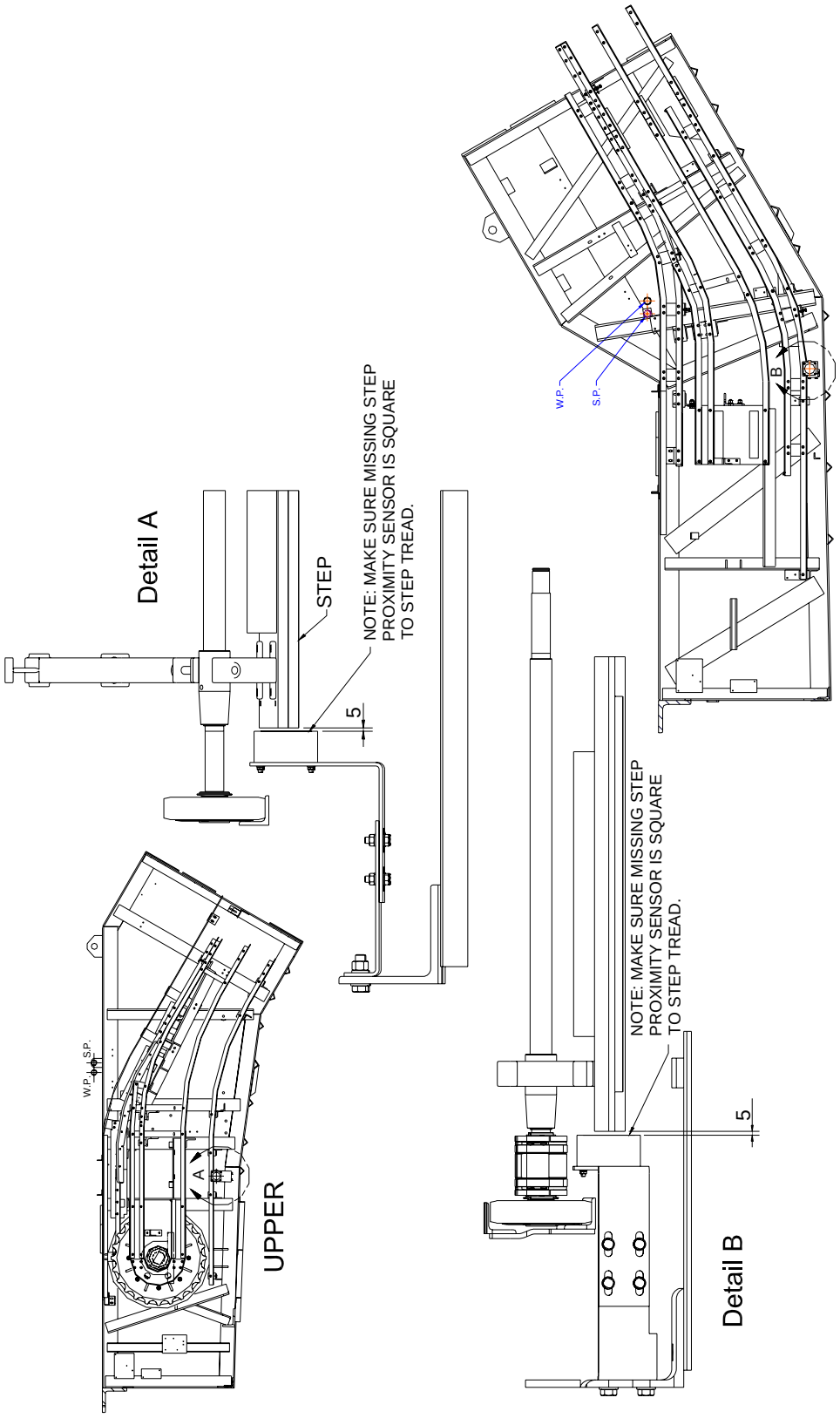


Figure B-20 Missing Step Device Adjustment

B.21 HANDRAIL ENTRY DEVICE ADJUSTMENT

Inspect and adjust the handrail entry device as follows:

1. Use a spring scale to push the guard rubber and verify that it requires 7 lbs of force to trip the switch.
   - If the required force too high, loosen the “A” screw to reduce it.
   - If the required force too low, tighten the “A” screw to increase it.
   - Retest the switch.
2. Check the clearances of 6mm [0.24”] between the handrail and guard rubber . Adjust if necessary.

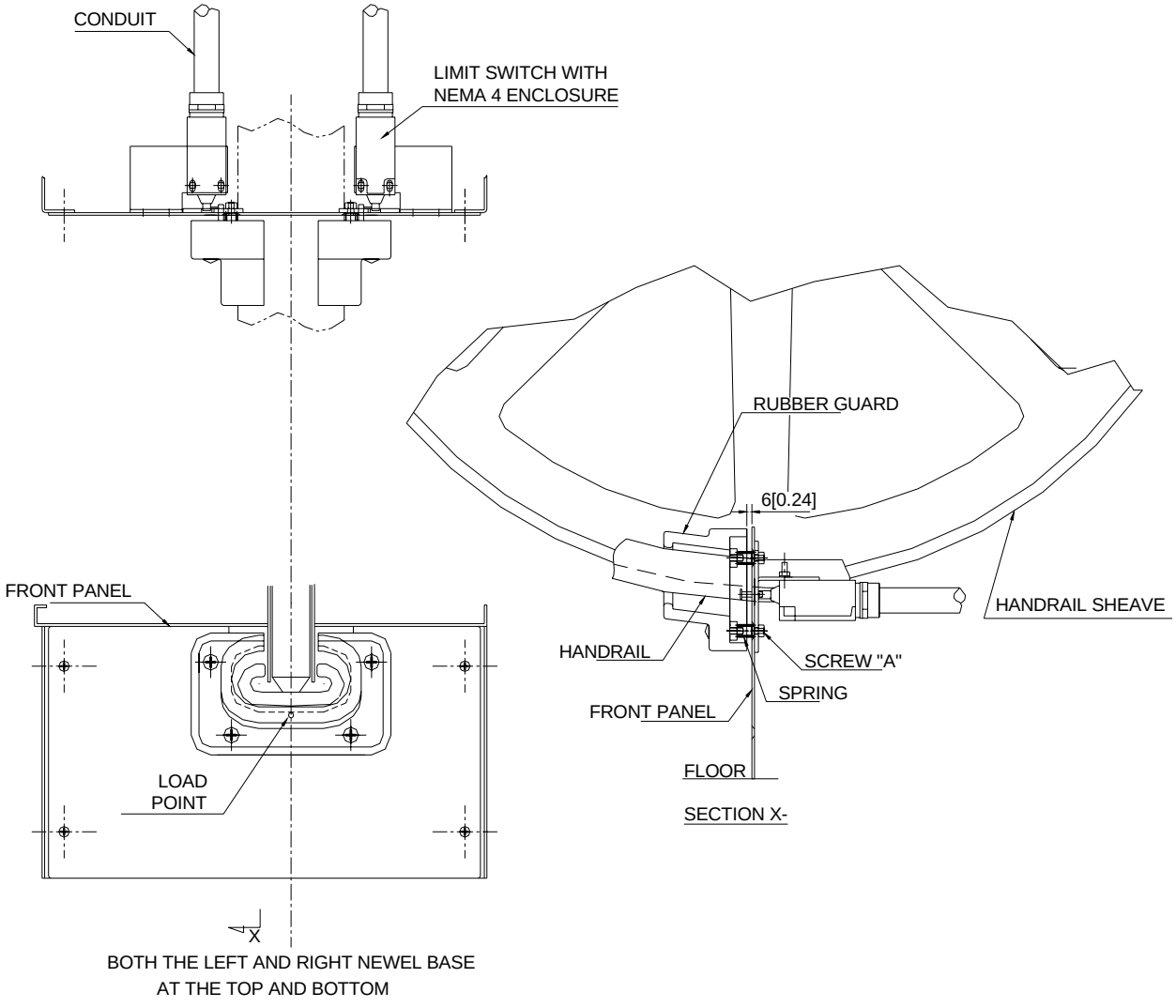


Figure B-21 Handrail Entry Device Adjustment

B.22 BROKEN HANDRAIL DEVICE

Inspect and adjust the broken handrail device as follows:

1. Remove the interior panel adjacent to the broken handrail device (refer to Mechanical Section G).
2. Depress the limit switch plunger.
3. Verify that the escalator will not start until the reset button in the controller is pushed.
4. Verify that the roller (wheel) and bracket pivot freely.
5. Verify that the roller is centered in the handrail.

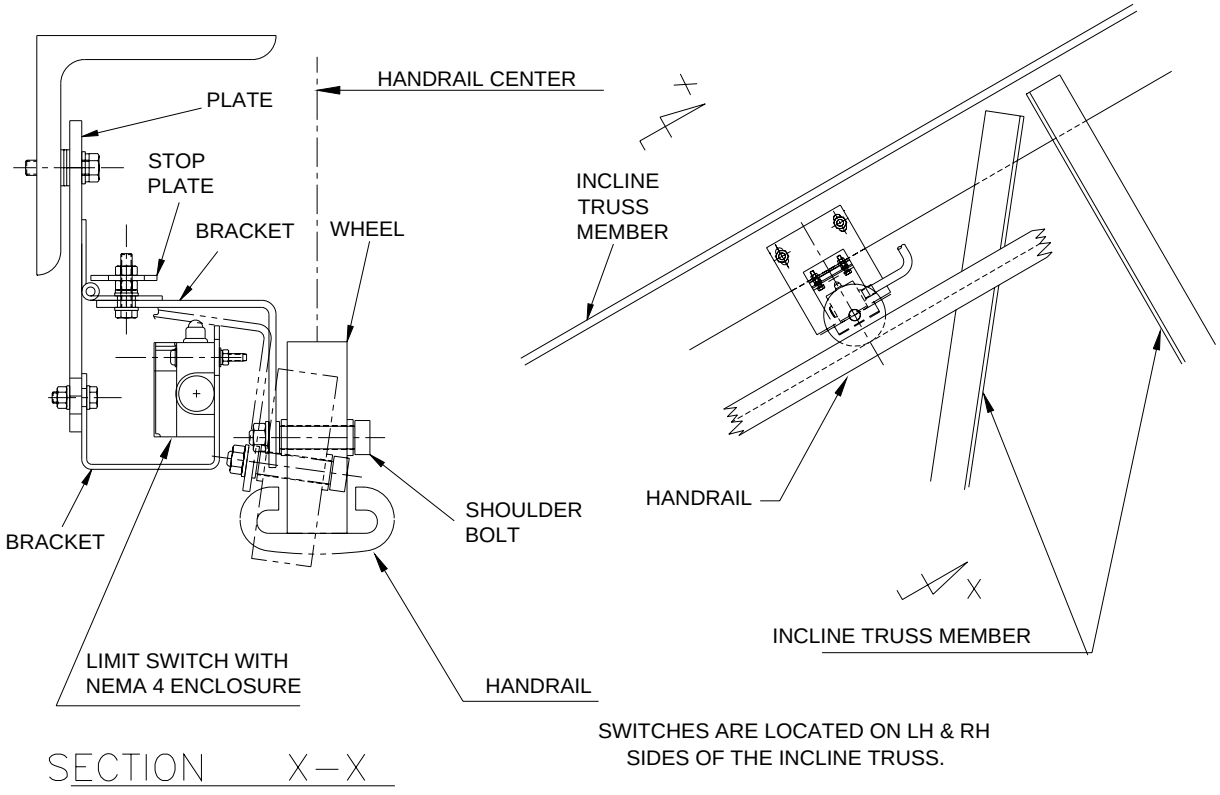


Figure B-22 Broken Handrail Device Adjustment

B.23 DISPLACED HANDRAIL DEVICE ADJUSTMENT

Inspect and adjust the displaced handrail device as follows:

1. The limit switch in the displaced handrail device should be activated when the handrail is removed in this area.
   - If it does not activate, adjust the stop screw against the lever until the limit switch is depressed and activated.
2. The limit switch should be deactivated when the handrail is in its normal operating position on the handrail guide.
   - If the switch is still activated, adjust the jam nuts on the actuator rod until the switch is deactivated.
   - The lever will be approximately parallel or square to the bracket when the limit switch is deactivated.

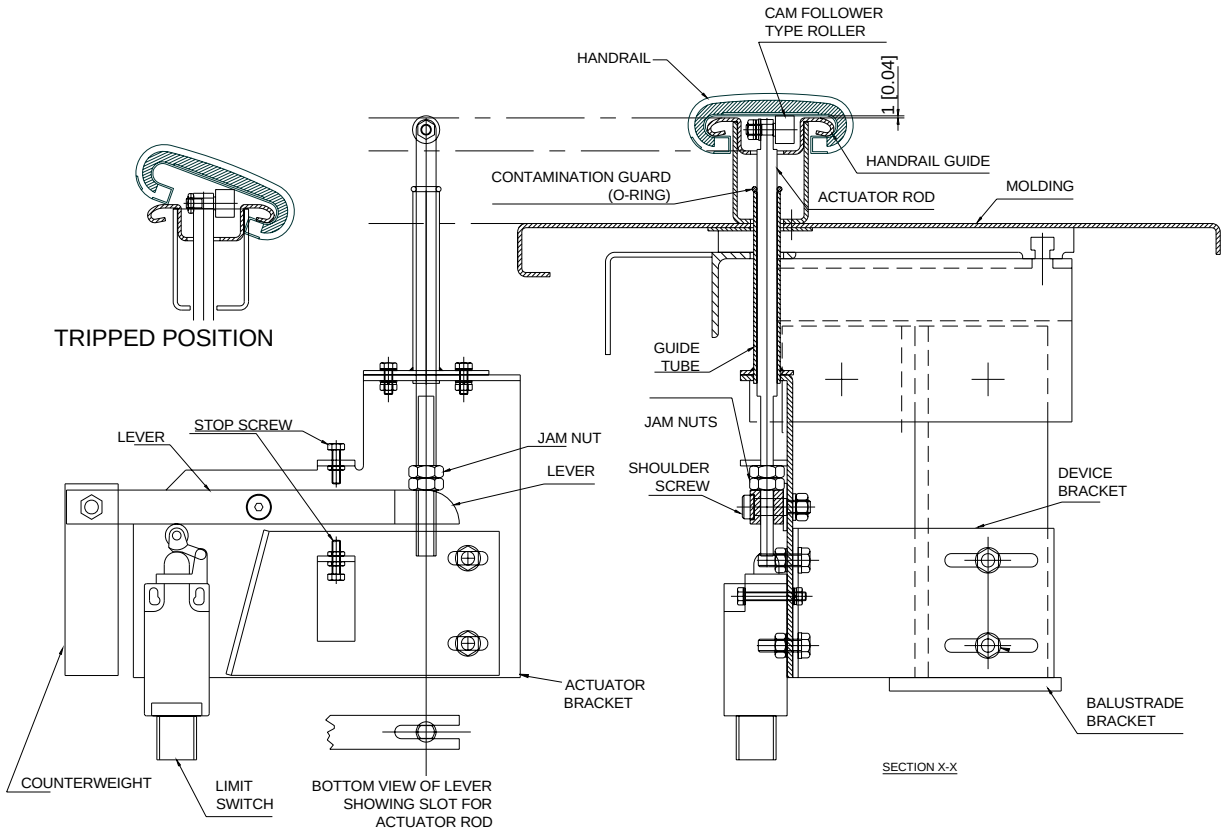


Figure B-23 Displaced Handrail Device Adjustment

B.24 HANDRAIL SPEED DEVICE ADJUSTMENT

Inspect and adjust the handrail speed device as follows:

1. Clean the wheel and the handrail.
2. Adjust the wheel position for best contact with the handrail.
3. Verify that the encoder and bracket rotate freely.

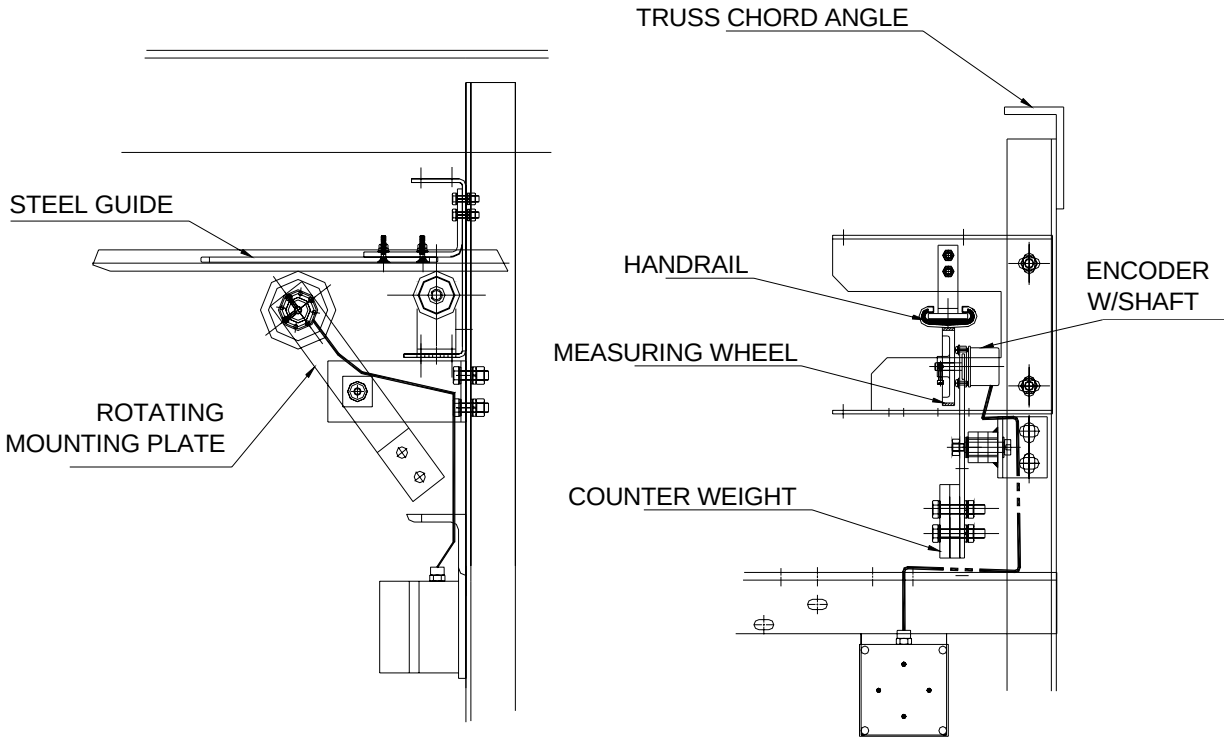


Figure B-24 Handrail Speed Device Adjustment

B.25 COMB IMPACT/COMB STOP DEVICE ADJUSTMENT

Test and adjust the comb impact and comb stop devices as follows.

B.25.1 Test Vertical Comb Impact and Comb Stop Switches

1. Remove a comb section in the middle and each side of the combplate.
2. Remove one step and position the opening at the comb.
3. Attach a bracket to the comb. This is for attaching a scale that reads 45 – 400 lbs.

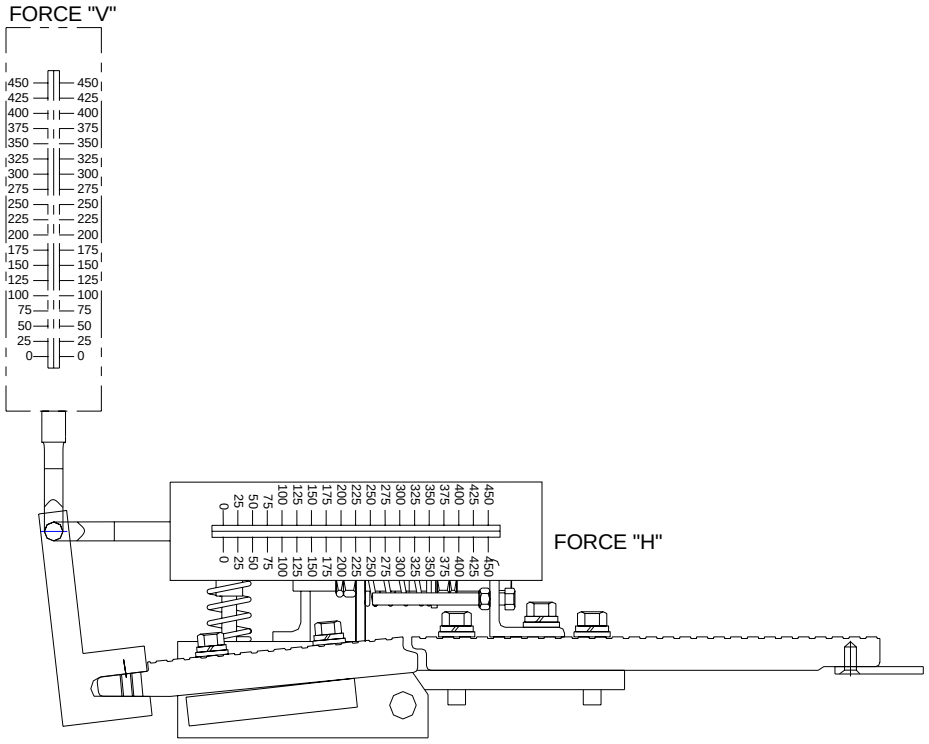
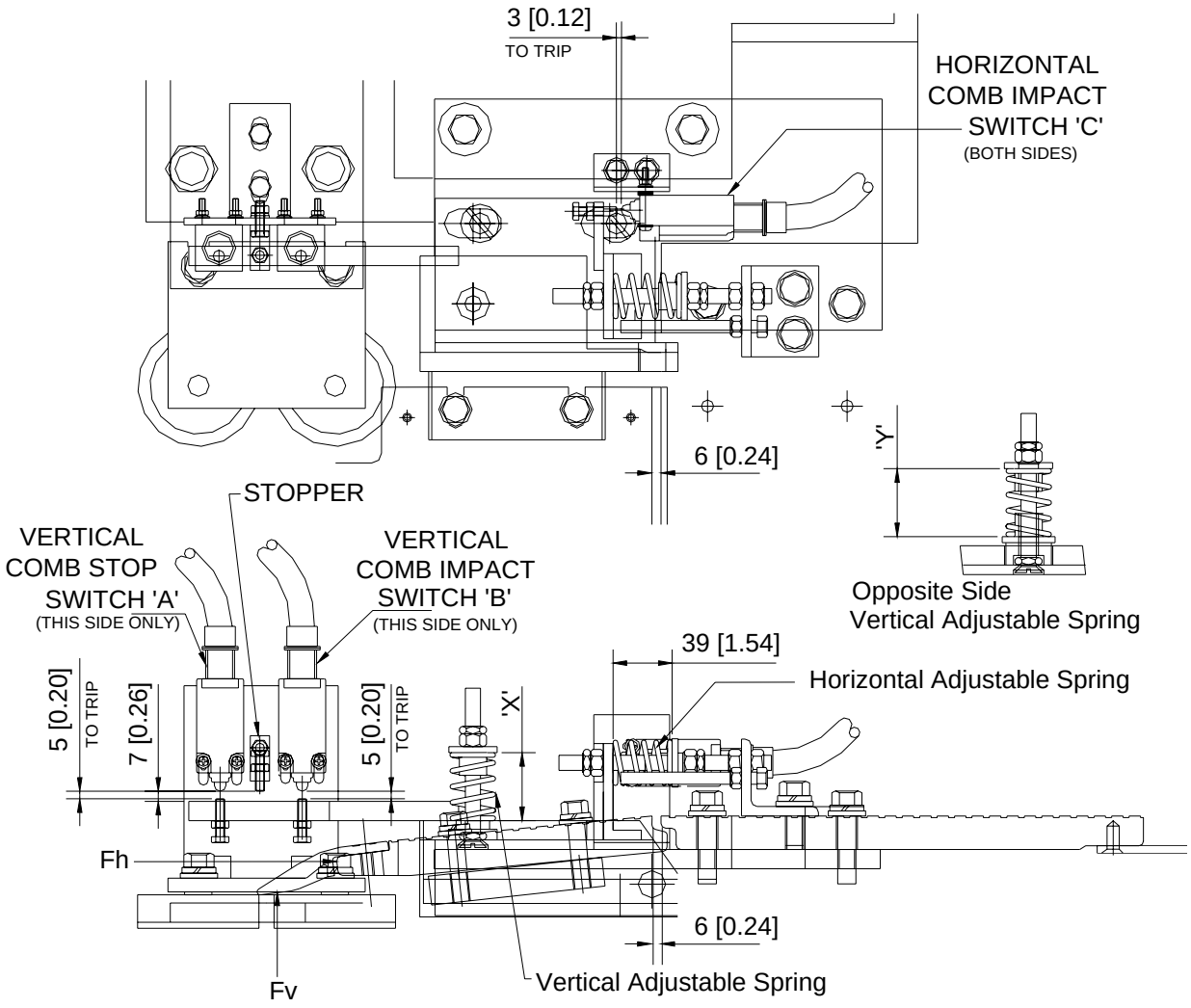


Figure B-25 Comb Bracket and Scale

4. Manipulate the switches to verify that the escalator will not start when a switch is tripped.
5. Check for broken or loose wiring.
6. Verify that the gap between the front and rear combplate is clear of debris (to allow the combplate to move if a force is applied).
7. Attach the scale to the comb bracket and slowly pull vertically to test the comb stop and the vertical comb impact.
   - Use a multimeter to determine when each switch trips.
   - The comb stop switch (which is the vertical switch furthest from the comb) should trip at or just under 45 lbs for a 24” step and 60 lbs for a 40” step applied vertically at the center edge of the combplate.
   - The vertical comb impact switch (which is the vertical switch closest to the comb) should trip at 130 to 150 lbs applied vertically at the center edge of the combplate.
   - Verify that the comb does not disengage from the step while testing in the vertical direction.
   - Adjust the stopper as needed to maintain mesh-for-mesh depth and measurement (refer to Mechanical Section D).

B.25.2 Test Horizontal Comb Impact Switch

1. Pull the scale horizontally at each side close to the skirt to verify that the switch trips between 180 and 200 lbs.
2. Pull the scale horizontally at the center to verify that the switch trips between 360 and 400 lbs.



1) HORIZONTAL COMB IMPACT (SWITCH "C") SHOULD TRIP WHEN Fh IS 180 - 200 LB APPLIED AT EITHER SIDE OR Fh IS 360 - 400 LB APPLIED AT THE CENTER OF THE COMBPLATE.

2) VERTICAL COMB IMPACT (SWITCH "B") SHOULD TRIP WHEN Fv IS 130 - 150 LB APPLIED VERTICALLY AT THE CENTER EDGE OF THE COMBPLATE.

3) COMB STOP (SWITCH "A") SHOULD TRIP WHEN Fv IS 40 - 45 LB.

4) VERTICAL SPRING ADJUSTMENT:

	"X"	"Y"
24" STEP	39mm [1.54"]	38mm [1.50"]
40" STEP	36mm [1.42"]	42mm [1.65"]

Figure B-26 Comb Impact & Comb Stop Device Adjustment

B.25.3 Adjust Vertical Comb Stop Switch

1. Use feeler gauges to verify that the distance to trip the switch is correct and measure the compressed spring height on the lighter right-hand spring.
2. If the load required to trip the switch is too low, increase the spring force and retest.
3. If the load required to trip the switch is too high, reduce the spring force and retest.

B.25.4 Adjust Vertical Comb Impact Switch

1. Use feeler gauges to verify that the distance to trip the switch is correct and measure the compressed spring height on the stiffer left-hand spring.
2. If the load required to trip the switch is too low, increase the spring force and retest.
3. If the load required to trip the switch is too high, reduce the spring force and retest.

B.25.5 Adjust Horizontal Comb Impact Swith

1. Use feeler gauges to verify that the distance to trip the switch on each side is correct and measure the compressed spring length on the each horizontal spring.
2. Verify that the gap between the front and rear combplate is 6mm.
3. If the load required to trip the switch is too low, increase the spring force and retest.
4. If the load required to trip the switch is too high, reduce the spring force and retest.

B.26 EMERGENCY STOP BUTTON ADJUSTMENT

Inspect and adjust the emergency stop button as follows:

1. Check that the emergency stop switch cover is intact and that the writing is legible.
2. Lift cover to verify that alarm sounds.
3. Press the emergency stop button to verify that escalator stops, then release.
4. Restart escalator at starting station (operation panel).
   - Insert key, turn to the desired direction and hold, then depress "START" button until the escalator starts.
   - Verify that the escalator is operating in the desired direction within 10 seconds.

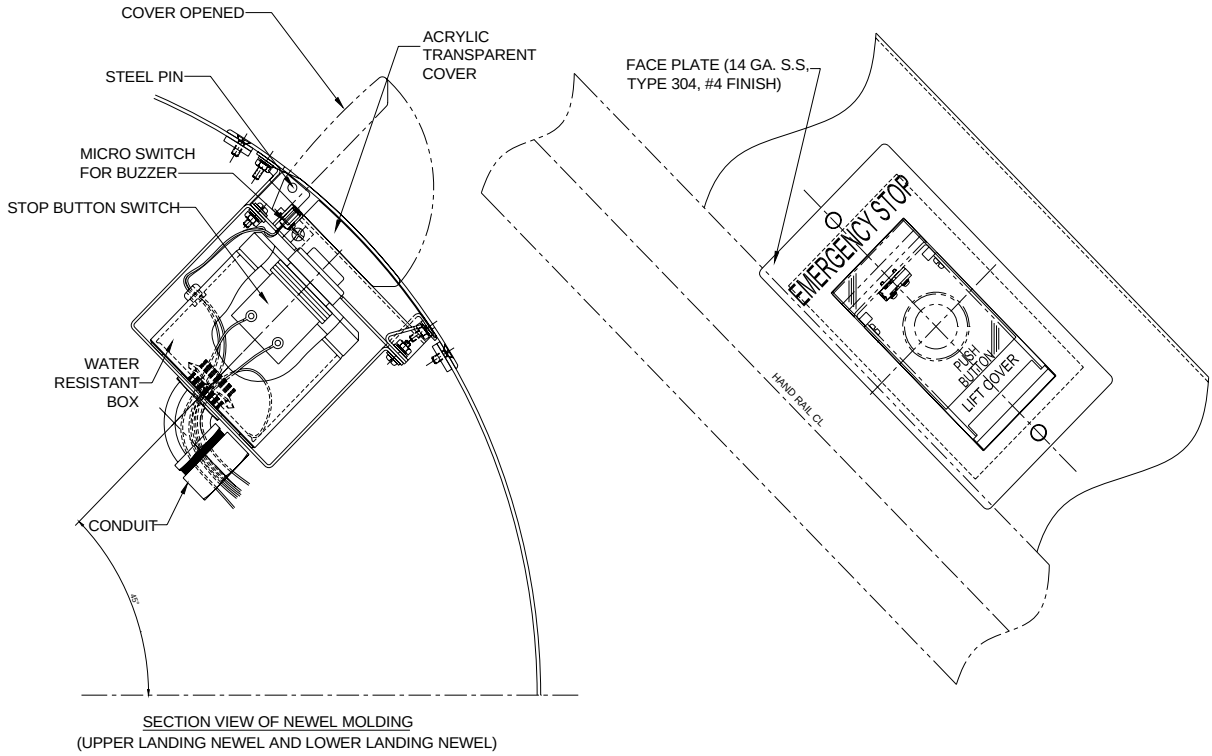


Figure B-27 Emergency Stop Button Adjustment

B.27 STARTING STATION ADJUSTMENT

Test and adjust the starting station (operation panel) as follows:

1. Verify that starting station switches are correctly labeled.
2. While the escalator is running, insert key into the direction cylinder and turn to the opposite direction of travel.
   - Verify that escalator does not change direction. Safeties built into the controller should prevent this.
3. Stop the escalator.
   - Activate the Emergency “STOP” button.
   - Verify that escalator stops.
4. Restart the escalator.
   - Turn the key to the desired direction (UP or DOWN) and hold. Depress the start button.
   - Verify that the escalator is traveling in the correct direction within 10 seconds.

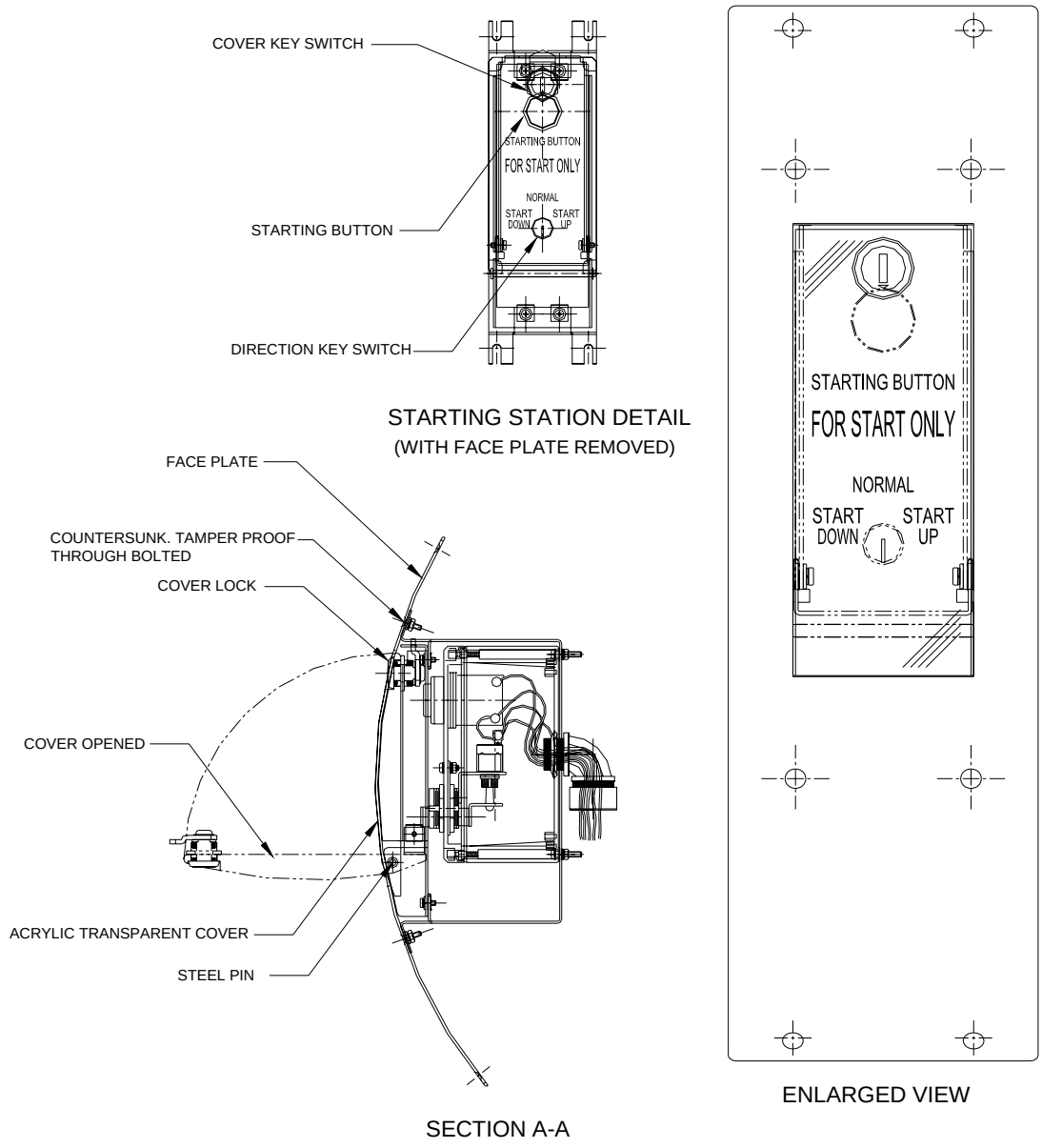


Figure B-28 Starting Station (Operation Panel) Adjustment

B.28 SLEEP MODE SENSOR ADJUSTMENT

Test and adjust the sleep mode sensors as follows:

1. On the PanelView fault display, go to the “Sleep Mode Status” screen to determine the sleep mode status for the current day/time as well as the time delay.
   - If sleep mode is not enabled for that day/time, turn the selector on the right Controller door to Enable Sleep Mode.
   - To avoid a long delay before Sleep Mode is engaged, reset the Time Delay to a shorter interval. Go to the “Sleep Mode Configuration” screen. A password is required.
2. With the escalator barricaded, wait for the sleep mode to engage after the time delay.
3. Verify that sleep mode is engaged and that the escalator slows to 15 FPM.
   - If sleep mode does not engage, troubleshoot the sleep mode system. Refer to troubleshooting in Electrical Section D.
4. With the escalator running in sleep mode, put your hand in the path of the sleep mode’s sensor to interrupt the infrared light beam.
5. Verify that sleep mode is disengaged and that the escalator returns to normal operating speed.
   - If sleep mode does not disengage, check and adjust the alignment of the sensors and reflectors.

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Broken Step Chain device
- Skirt Obstruction device
- Step Sag (Level) device
- Step Up-Thrust device
- Missing Step device
- Handrail Entry device
- Broken Handrail device
- Displaced Handrail device
- Handrail Speed device
- Comb Impact / Comb Stop devices
- Emergency Stop button
- Starting Station (Operation Panel)
- Sleep Mode Sensors/Reflectors

B.29 BROKEN STEP CHAIN DEVICE REMOVAL/REPLACEMENT

Remove and replace the broken step chain device as follows:

1. Remove lower floorplates (refer to Mechanical Section D).
2. Disconnect the wiring from the switch.
3. Remove two screws to remove switch.
4. Replace the broken step chain device in the reverse order of removal. (Refer to broken step chain device testing/adjusting procedures in this section.)

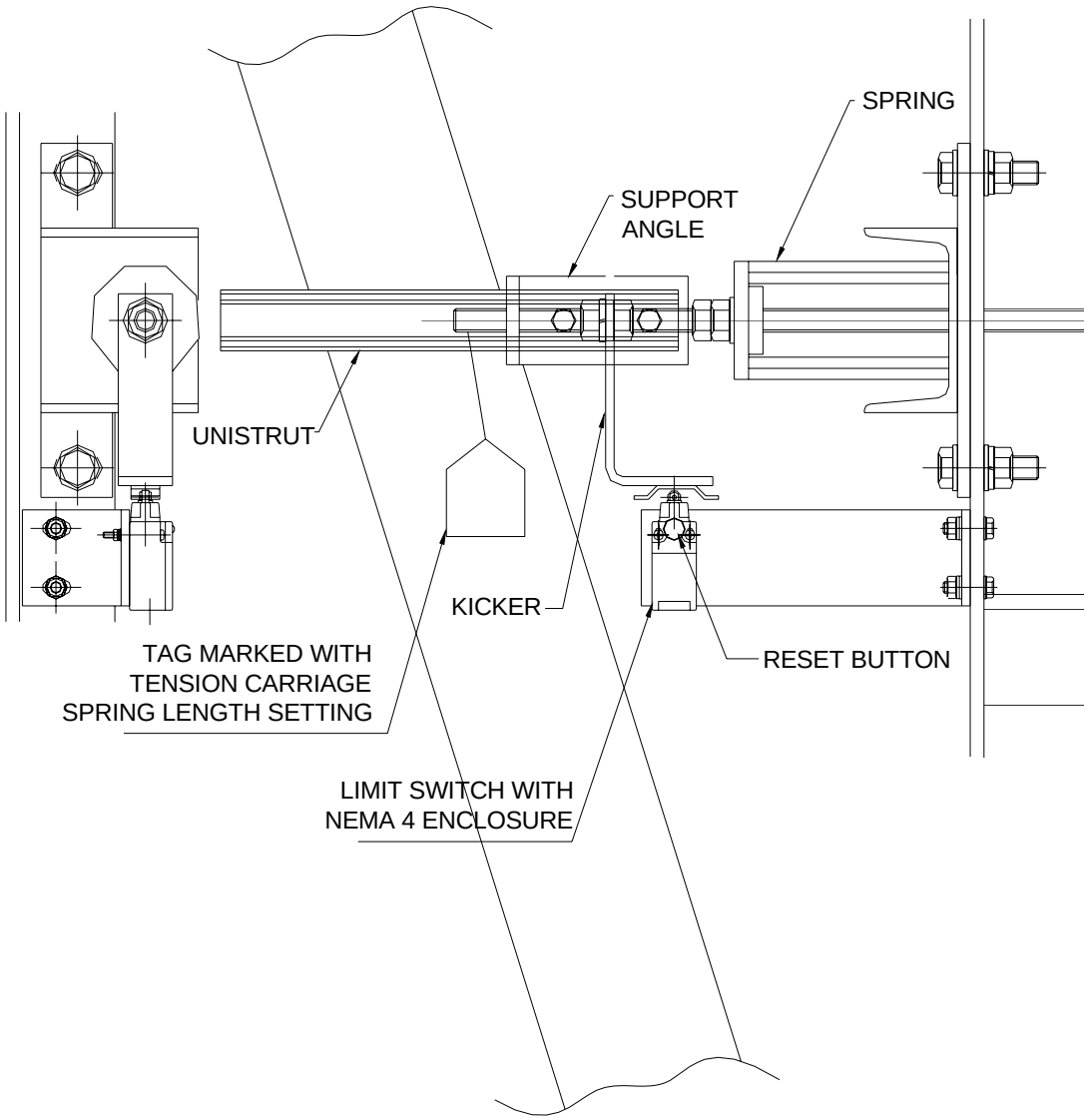


Figure B-29 Broken Step Chain Device Removal

B.30 SKIRT OBSTRUCTION DEVICE REMOVAL/REPLACEMENT

Remove and replace the skirt obstruction device as follows:

1. Remove interior panel above the switch to be replaced. (Refer to Mechanical Section G.)
2. Remove two screws connecting the skirt switch to the bracket.
3. Disconnect wiring from the skirt switch and remove switch.
4. Replace the skirt switch in the reverse order of removal. (Refer to skirt obstruction device testing/adjusting procedures in this section.)

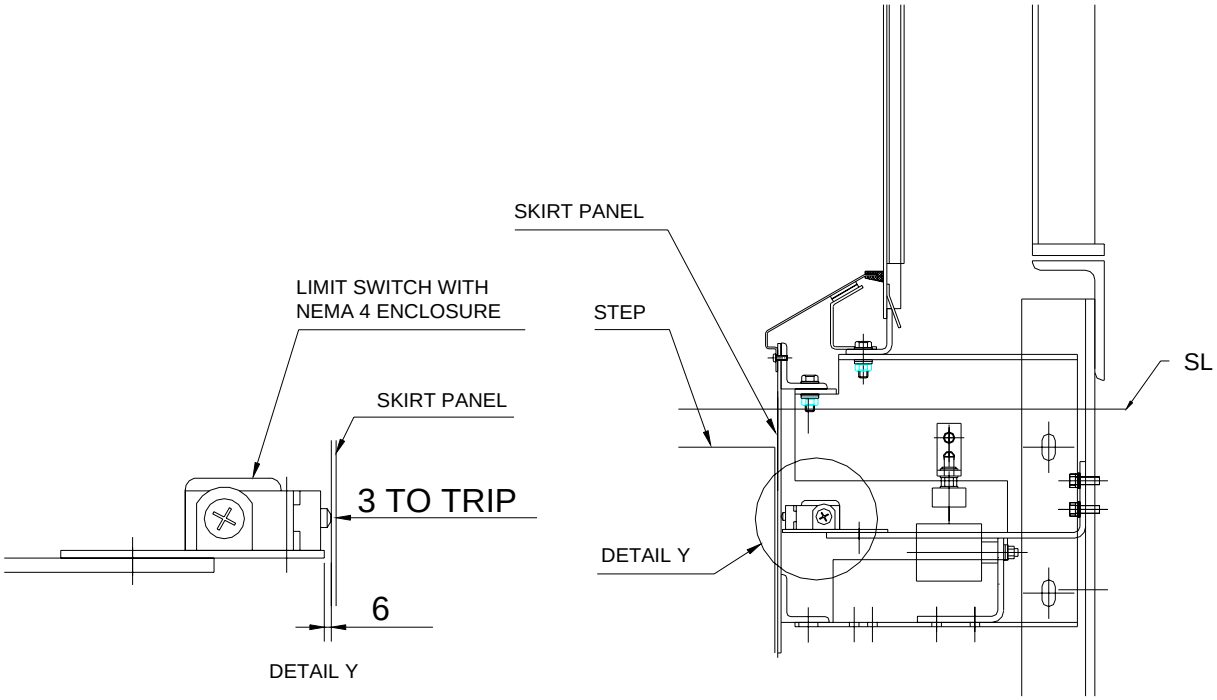


Figure B-30 Skirt Obstruction Device Removal

B.31 STEP SAG DEVICE REMOVAL/REPLACEMENT

Remove and replace the step sag (level) device as follows:

1. Remove one step. (Refer to Mechanical Section F.)
2. Move missing step section to the location of the switch to be replaced.
3. Remove two screws and nuts to remove switch from bracket.
4. Disconnect wiring from the switch.
5. Replace the step sag device in the reverse order of removal. (Refer to step sag device testing/adjusting procedures in this section.)

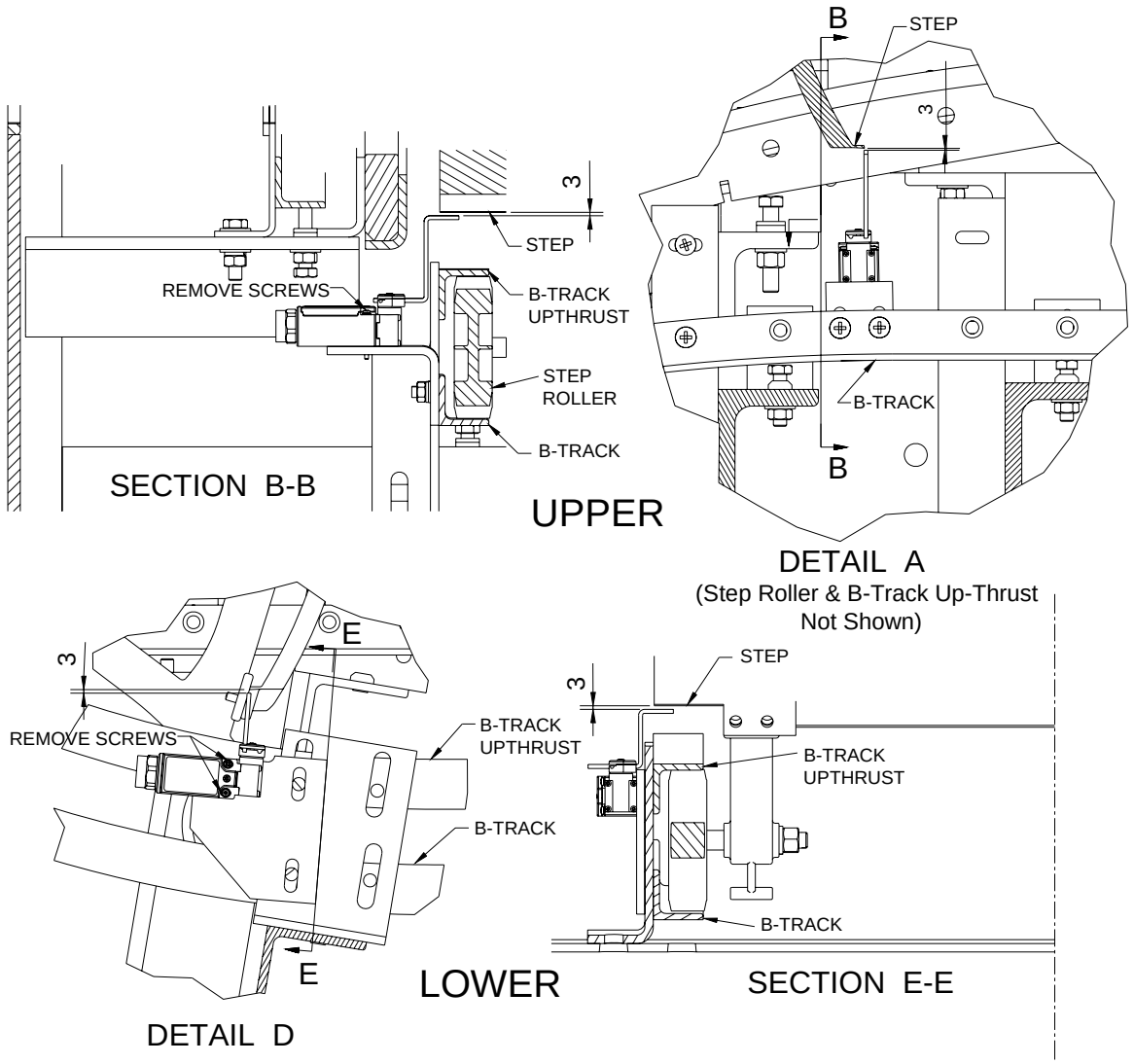


Figure B-31 Step Sag Device Removal

B.32 STEP UP-THRUST DEVICE REMOVAL/REPLACEMENT

Remove and replace the step up-thrust device as follows:

1. Remove two steps. (Refer to Mechanical Section F.)
2. Move missing step section to the step up-thrust device switch to be replaced.
3. Remove the switch by removing two screws and nuts from bracket connected to the B Track Upthrust.
4. Disconnect wiring from the switch.
5. Replace the step upthrust switch in the reverse order of removal.
6. Verify that the switch trips.
7. Verify the following clearance :
   - 7mm [0.28”] gap between the top of the step wheel and the surface of the B Track Upthrust.
   - 4.2mm [0.16”] gap between the top of the limit switch plunger and the hinge plate.

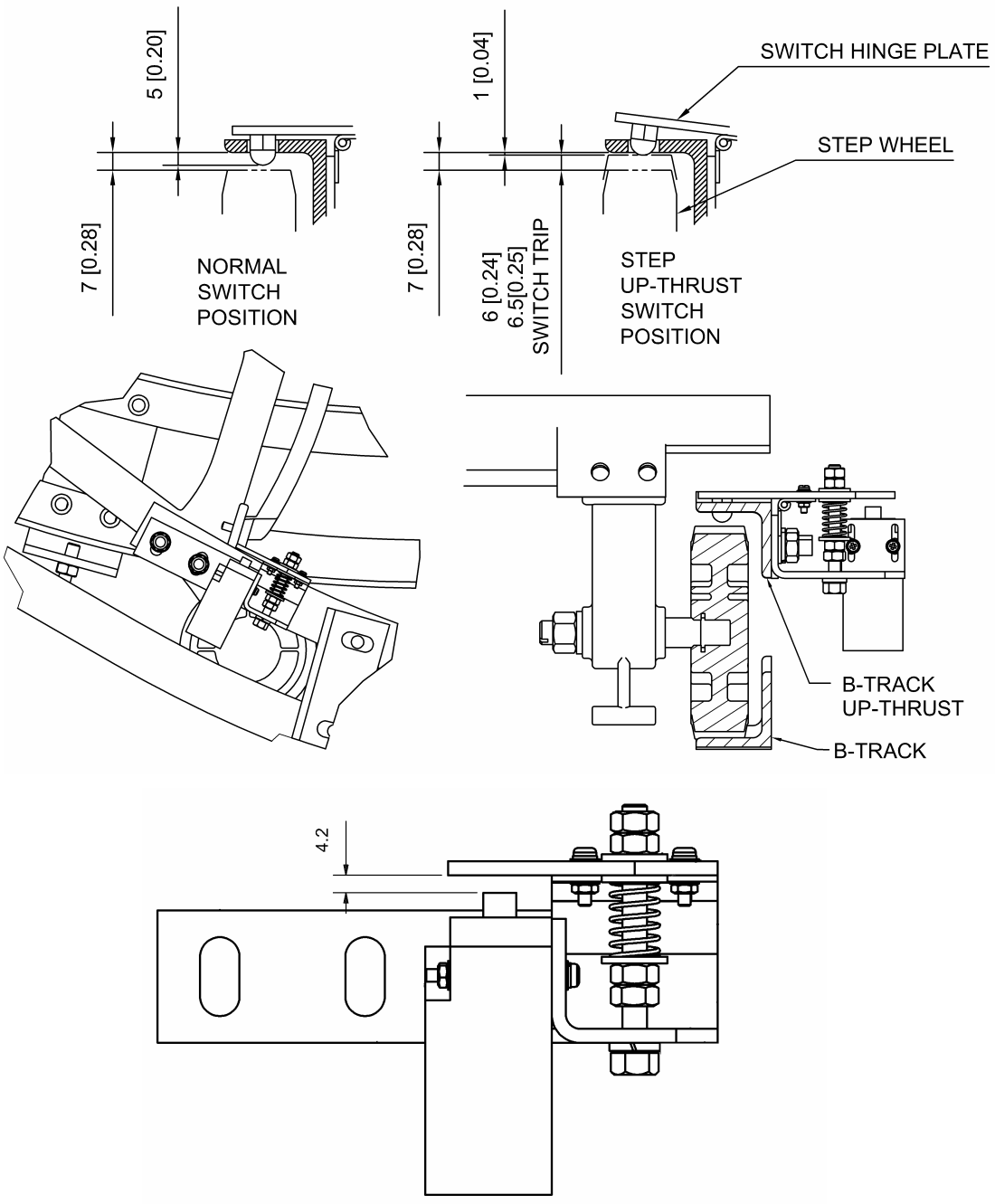


Figure B-32 Step Up-Thrust Device Removal

B.33 MISSING STEP DEVICE REMOVAL/REPLACEMENT

Remove and replace the missing step device as follows:

1. Remove eight steps. (Refer to Mechanical Section F.)
2. Move missing step section to the upper or lower end, whichever requires work, and make sure that the missing step device can be accessed.
3. Disconnect wiring and conduit from switch.
4. Remove missing step device by removing four screws and nuts.
5. Replace missing step device in the reverse order of removal. (Refer to missing step device testing/adjusting procedures in this section.)

B.34 HANDRAIL ENTRY DEVICE REMOVAL/REPLACEMENT

Remove and replace the handrail entry device as follows:

1. Remove the four screws holding the rubber guard in position on the front panel.
2. Remove the flexible C-shaped guard rubber from around the handrail.
3. Replace screws to prevent losing screws and springs.
4. Remove the four screws to remove the front panel assembly.
5. Disconnect conduit and wiring from the two limit switches.
6. Remove two screws from bracket to remove handrail entry switch.
7. Replace the handrail entry device in the reverse order of removal.
8. Tighten screws to set 6mm []0.24”] gap between guard and front panel.
9. Test (refer to handrail entry device testing/adjusting procedures in this section).

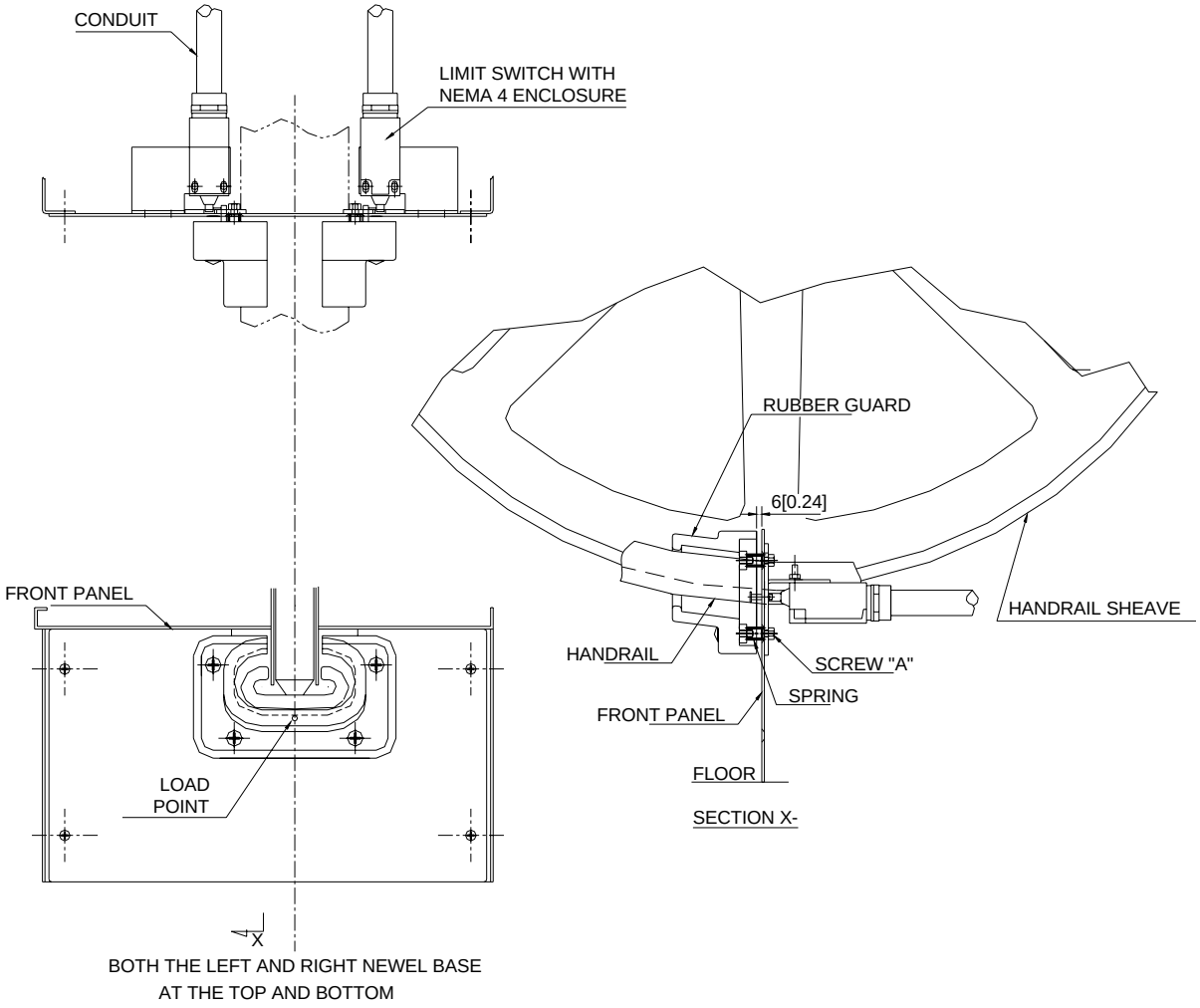


Figure B-33 Handrail Entry Device Removal

B.35 BROKEN HANDRAIL DEVICE REMOVAL/REPLACEMENT

Remove and replace the broken handrail device as follows:

1. Remove two steps. (Refer to Mechanical Section F).
2. Move missing step section to access the broken handrail device.
3. Remove skirt panel adjacent to the switch to be replaced. (Refer to Mechanical Section G.)
4. Remove two screws and nuts to remove the broken handrail switch.
5. Disconnect wiring from the switch.
6. Remove two bolts and nuts from the hinged bracket to remove roller assembly.
7. Replace the broken handrail device in the reverse order of removal. (Refer to broken handrail device testing/adjusting procedure in this section.)

B.36 DISPLACED HANDRAIL DEVICE REMOVAL/REPLACEMENT

Remove and replace the displaced handrail device as follows:

1. Remove interior panel in lower truss transition curve area, near the displaced handrail device. (Refer to Mechanical Section G.)
2. Pry the handrail off the guide above the displaced handrail device.
3. Lift out the actuator rod with the roller through the top of the handrail guide while, at the same time, removing the jam nuts on the rod below the guide.
4. Disconnect the wiring to the limit switch.
5. Remove two mounting fasteners holding the displaced handrail device sub-assembly to the mounting bracket and remove the device.
6. Position new device on the mounting bracket so the guide tube on the device is centered through the holes in the molding and handrail guide.
7. Replace the mounting fasteners and secure the device.
8. Connect the limit switch wiring.
9. Feed the actuator rod through the top of the guide tube and attach jam nuts high enough to allow the rod to protrude through the slot in the lever.
10. Adjust jam nuts so the actuator rod roller is 1mm above the top of handrail guide and the lever is approximately parallel or square to the bracket.
11. Test and adjust the device. (Refer to displaced handrail device testing/adjusting procedures in this section.)

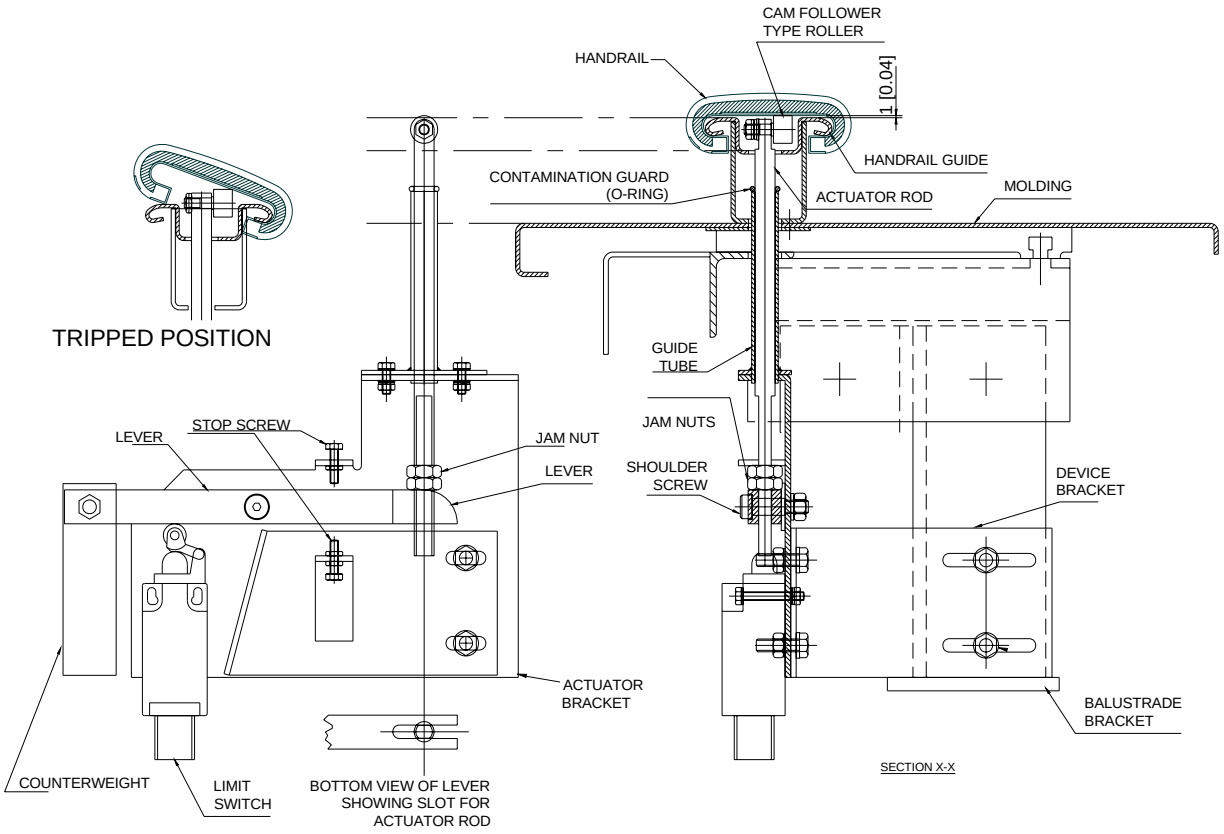


Figure B-34 Displaced Handrail Device Removal

B.37 HANDRAIL SPEED DEVICE REMOVAL/REPLACEMENT

Remove and replace the handrail speed device as follows:

1. Remove interior panel above the handrail speed device. (Refer to Mechanical Section G.)
2. Remove nut from shoulder bolt.
3. Remove washer and slide plate off of bolt.
4. Loosen setscrews and remove encoder wheel.
5. Remove four screws and nuts to remove encoder.
6. Replace the handrail speed device in the reverse order of removal.
7. Verify that conduit does not pull on assembly, preventing full weight of assembly from contacting the handrail. (Refer to handrail speed device testing/adjusting procedures in this section.)

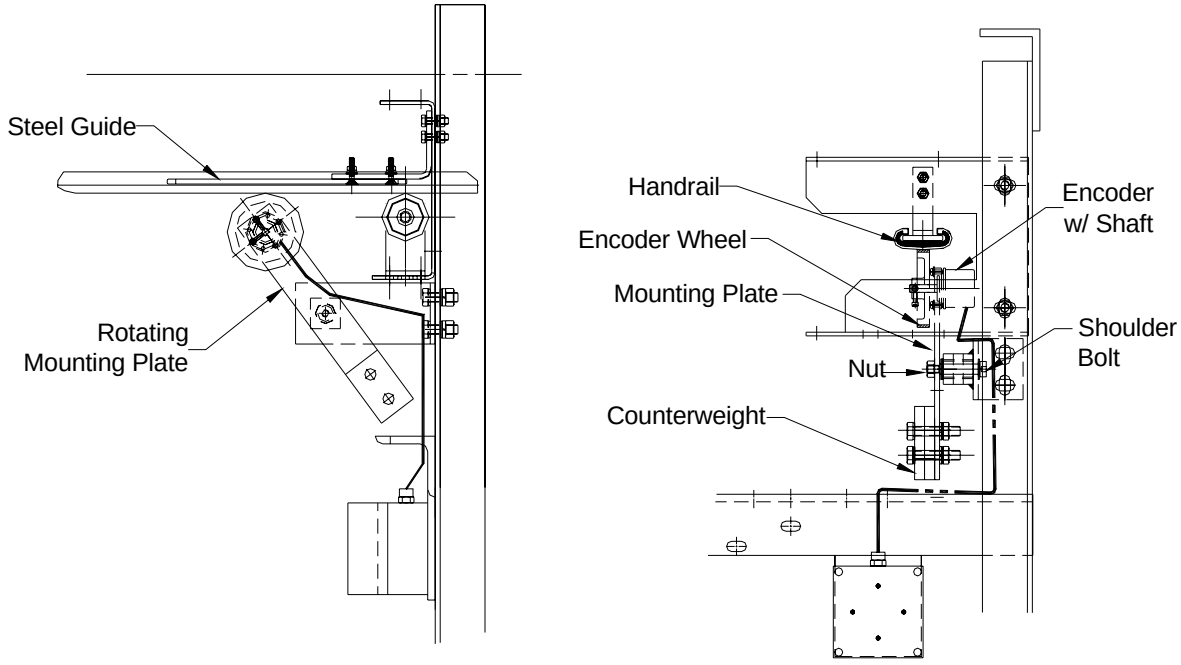


Figure B-35 Handrail Speed Device Removal

B.38 COMB IMPACT AND STOP SWITCH REMOVAL/REPLACEMENT

Remove and replace the comb impact device and comb stop device as follows:

1. Remove the “B” molding and skirt panels around the combplate area. (Refer to Mechanical Section G.)
2. Disconnect wiring from switch.
3. Remove switch from mounting bracket.
4. Replace switch in reverse order.

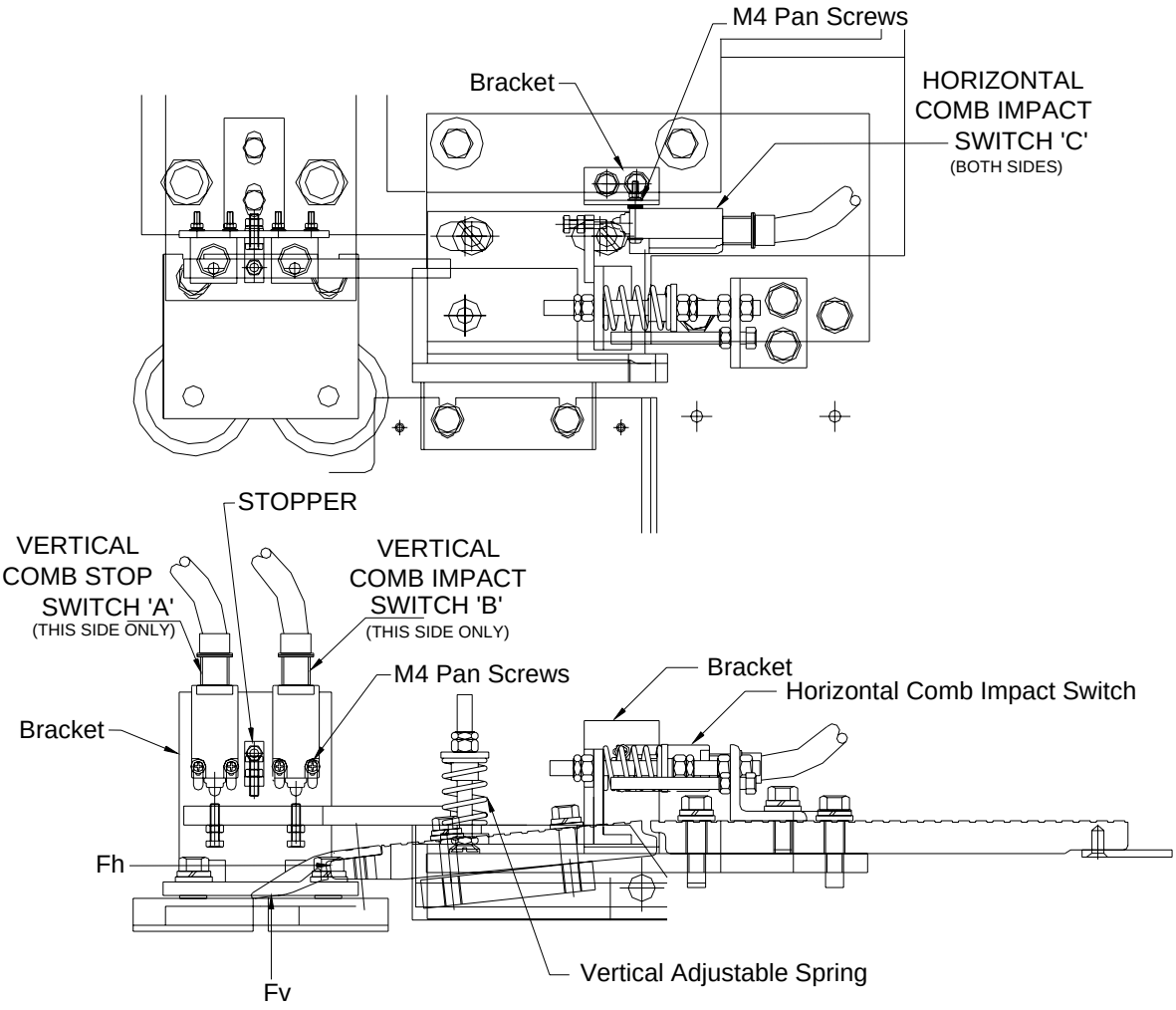
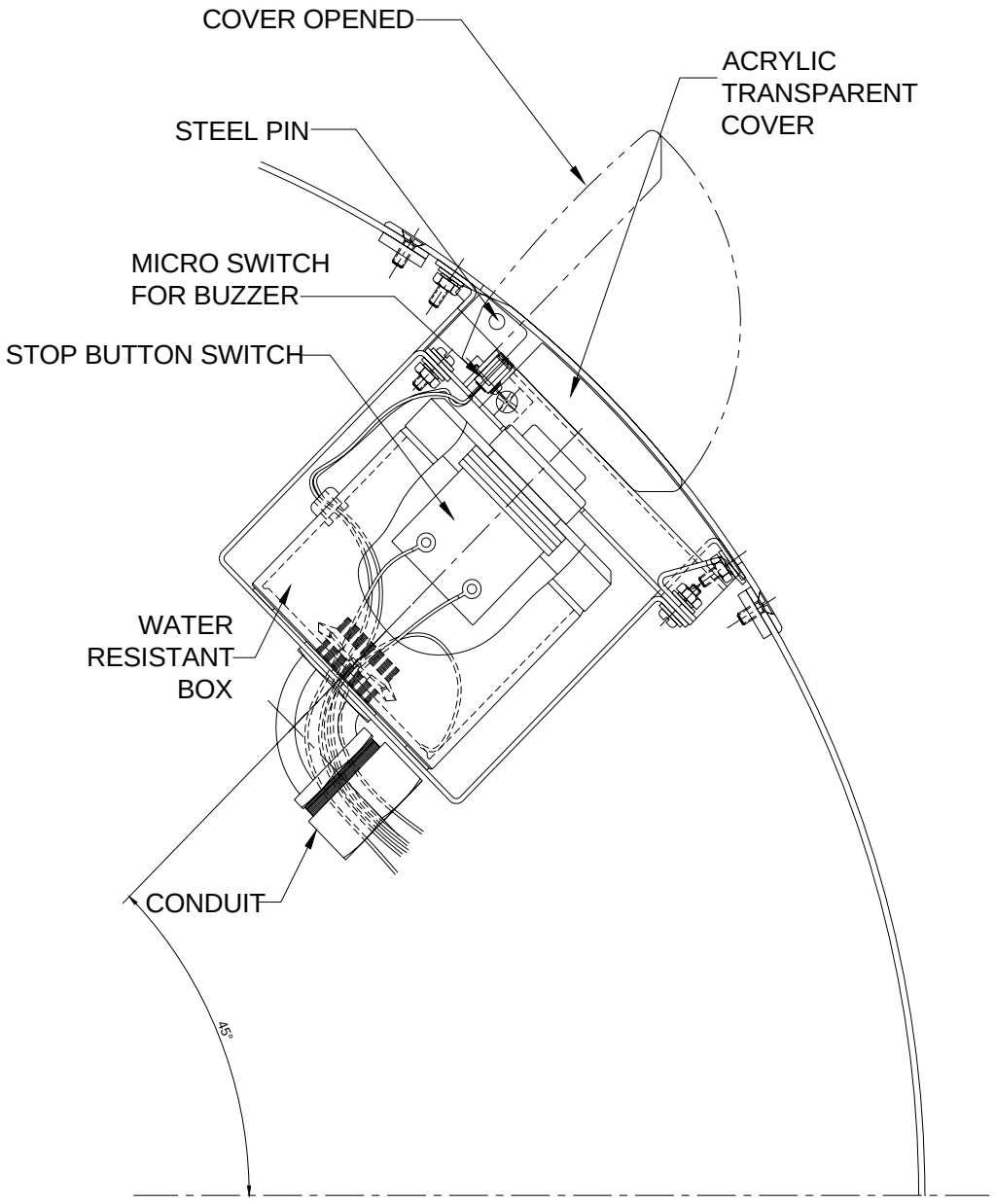


Figure B-36 Comb Impact/Comb Stop Device Removal

B.39 EMERGENCY STOP BUTTON REMOVAL/REPLACEMENT

Remove and replace the emergency stop button as follows:

1. Remove two screws, mounting the assembly to the newel molding.
2. Remove nuts on backside of faceplate and cover assembly.
3. Remove box cover.
4. Remove screws mounting box to bracket.
5. Disconnect wiring and conduit from push button.
6. Disconnect wiring from limit switch.
7. Remove two screws to remove limit switch.
8. Replace emergency stop button in the reverse order of removal. (Refer to emergency stop button testing/adjusting procedures in this section.)



SECTION VIEW OF NEWEL MOLDING
(UPPER LANDING NEWEL AND LOWER LANDING NEWEL)

Figure B-37 Emergency Stop Button Removal

B.40 STARTING STATION REMOVAL/REPLACEMENT

Remove and replace the starting station (operation panel) as follows:

1. Remove the four tamper proof screws holding the starting station assembly in place and remove from newel panel.
2. Remove four nuts from panel cover and remove operation panel from operation box assembly.
3. Remove faceplate.
4. Remove four nuts mounting the box to the bracket.
5. Remove box lid with switches.
6. Remove toggle switch from switch bracket and disconnect wiring.
7. Remove two screws from cam and remove cam from key cylinder.
8. Remove nut and spacer from key cylinder and remove from faceplate.
9. Remove push button switch.
10. Replace the operation panel switch in the reverse order of removal.
11. Place toggle switch between cam.
12. Verify that the cam trips the switch in both directions when operated. Adjust if necessary. (Refer to starting station switch testing/adjusting procedures in this section.)

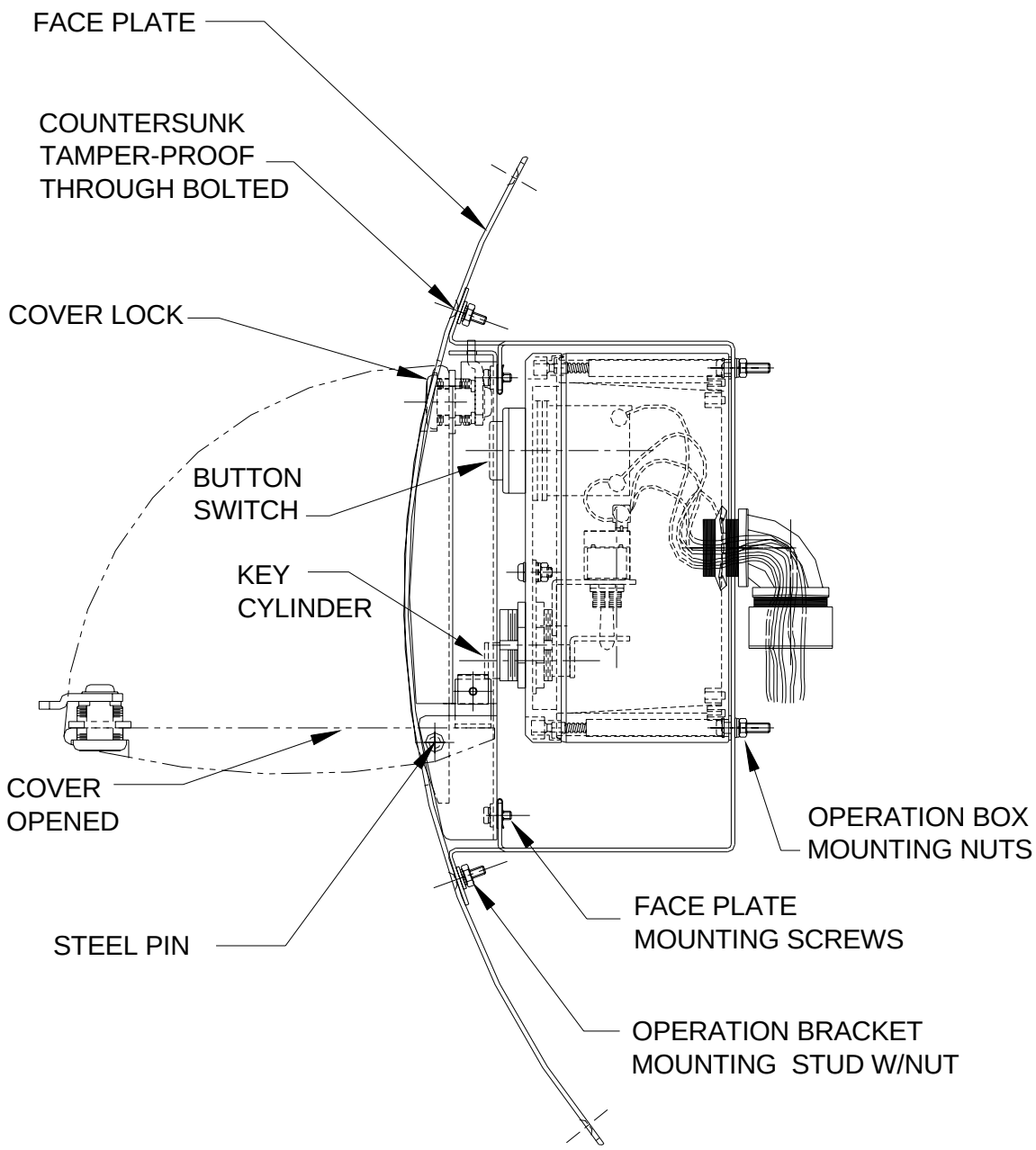


Figure B-38 Starting Station (Operation Panel) Removal

B.41 SLEEP MODE SENSOR REMOVAL/REPLACEMENT

Remove and replace the sleep mode sensors as follows:

1. Remove the tamper resistant screws holding the faceplate over the sleep mode sensors and remove faceplate.
2. Remove the screws holding the sensors in place.
3. Disconnect wiring running to junction box.
4. Remove sensors.
5. Replace sensors in reverse order of removal. Align and test. (Refer to sleep mode sensor testing/adjusting procedures in this section.)

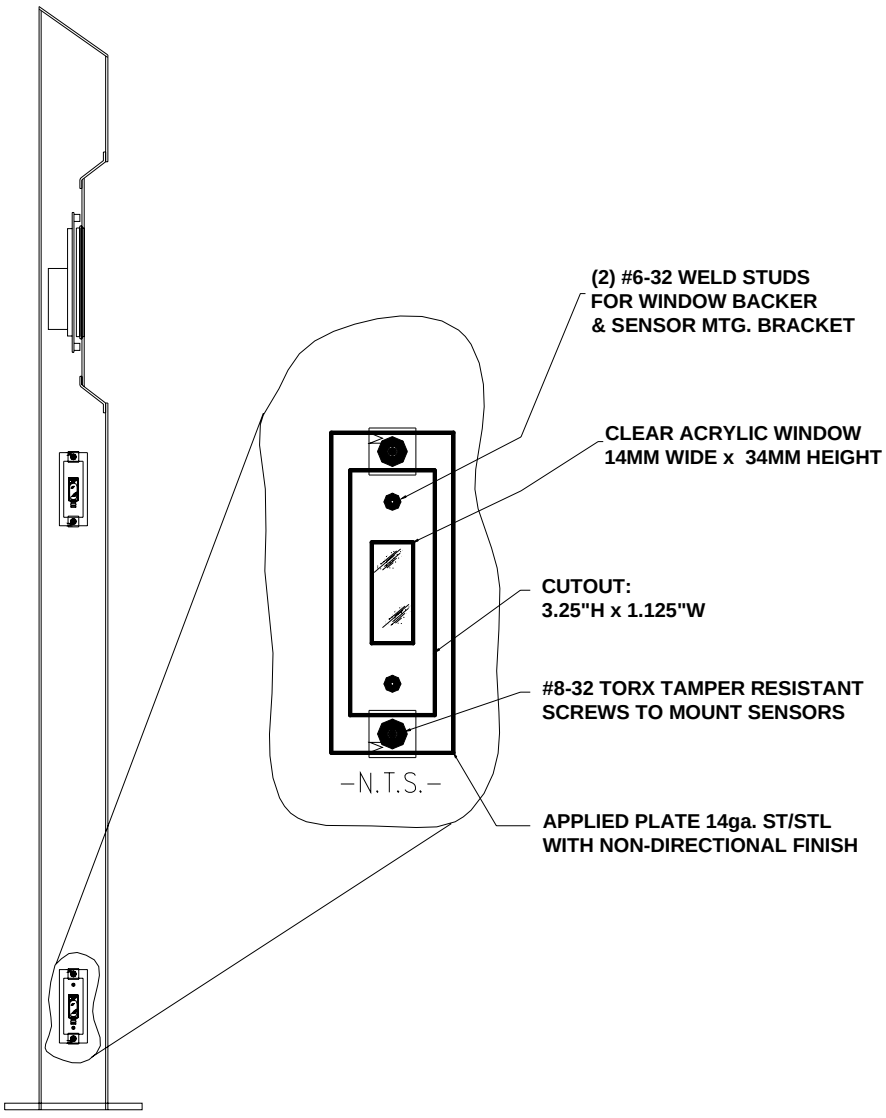


Figure B-39 Sleep Mode Sensor Removal

C) LIGHTING

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

EQUIPMENT OPERATION

Various lighting is provided to ensure visibility for safety and maintenance purposes.

C.1 COMB LIGHTS

Comb lights are located in the end skirts, above the upper and lower combfingers. They illuminate the area where the steps and combfingers meet with fluorescent lights.

The comb lights are on the escalator lighting circuit.

C.2 STEP DEMARCATION LIGHTS

Step demarcation lights are located at the upper and lower ends of the escalator. These green fluorescent lights illuminate the small gap between steps to show step separation for safe riding.

They are provided to prevent passengers from stepping on the gap between adjacent steps.

The demarcation lights are on the machine room lighting circuit.

REMOVAL AND REPLACEMENT PROCEDURES

Removal and replacement procedures are provided for the following:

- Comb Lights
- Demarcation Lights

C.3 COMB LIGHTS REMOVAL/REPLACEMENT

Remove and replace the comb lights as follows:

1. Use a tamper-proof screwdriver to remove four screws from stainless steel lens hold down plate surrounding comb lights. Remove plate.
2. Remove four screws connecting lens to light housing and remove lens.
3. Remove bulb.
4. Remove screw to take reflector/cover off to expose ballast.
5. Disconnect wiring from ballast.
6. Remove speed nuts and remove ballast.
7. Remove newel interior panel above the comb light section to be removed. (Refer to Mechanical Section G.)
8. Remove bolts from bracket connection to skirt frame.
9. Remove comb light assembly.
10. Replace comb lights in the reverse order of removal.

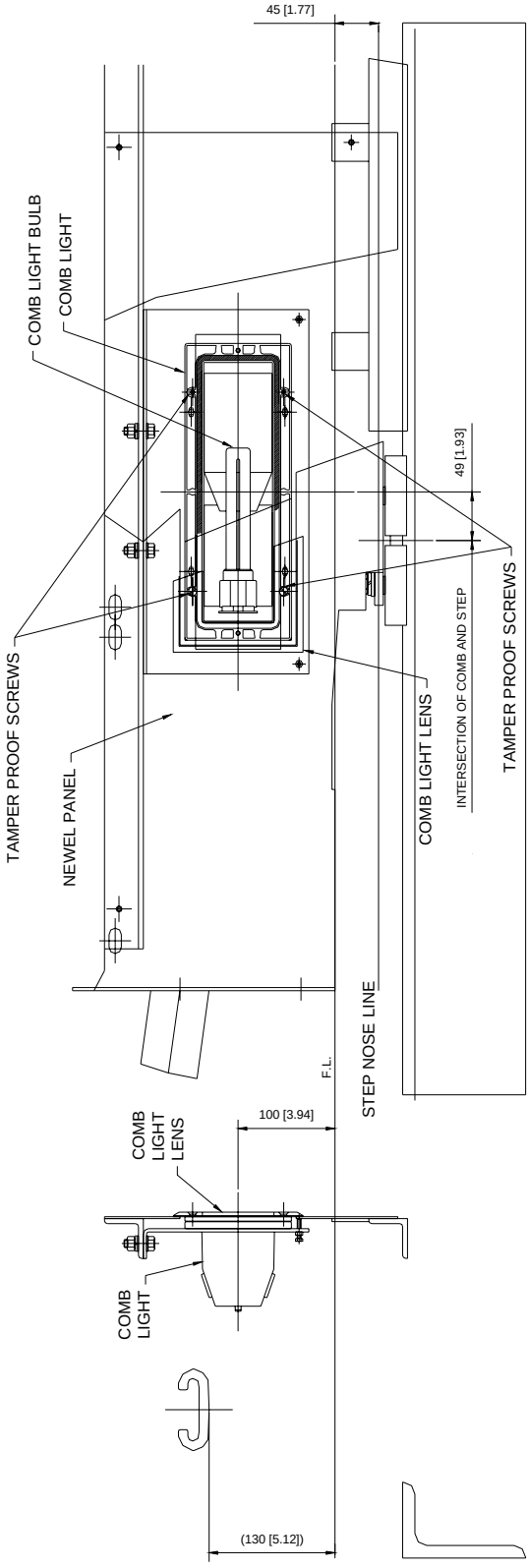


Figure C-1 Comb Light Removal

C.4 DEMARCATION LIGHTS REMOVAL/REPLACEMENT

Remove and replace the step demarcation lights as follows:

1. Remove three steps. (Refer to Mechanical Section F.)
2. Move missing step section above the demarcation light to be removed.
3. Unlatch four clamps on the sides of the demarcation light cover and remove.
4. Remove light bulb and remove green plastic sleeve.
5. Turn and remove fastener on each end of cover plate.
6. Disconnect wiring from ballast.
7. Remove speed nuts from ballast.
8. Remove ballast.
9. Replace demarcation lights in reverse order of removal.

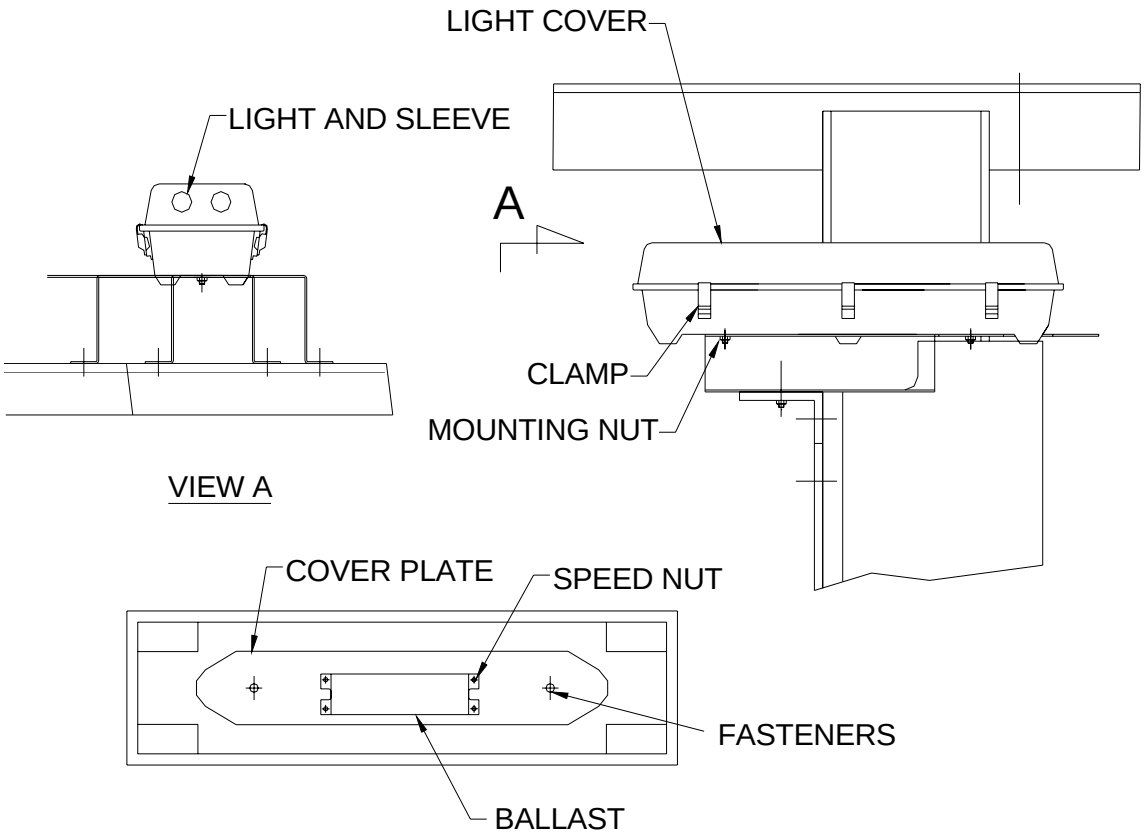


Figure C-2 Demarcation Light Removal

D) TROUBLESHOOTING

PREPARATIONS FOR SAFE MAINTENANCE

Before beginning any service or maintenance to or even near an escalator, the maintenance worker **MUST** take safety precautions to protect one's self, co-workers, and the riding public. The work supervisor will provide general procedures for ensuring safety, but the maintenance worker must understand the equipment and the necessary steps for safely maintaining it.

- Always lock and tag out the main power disconnect before performing any adjustment, inspection, lubrication, repair, or service to the equipment.

- Always lock and tag out the heating power disconnects, the auxiliary power disconnects, and the emergency power disconnects before working near the heating or lighting equipment.

- Always barricade both ends of the escalator before beginning any type of work. Barricades must be in place whenever floorplates or steps are removed.

- Always keep safety circuits in operation.

- Always ensure that no bystanders are near the escalator while it is being started.

- Never assume a circuit is de-energized. Always use a circuit tester before beginning to work.

- Electrical troubleshooting may require the testing of live high-voltage circuits. Qualified electricians and their helpers must only perform this.

- When disconnecting the main drive chain or performing maintenance on the brake(s), always set the step chain locking device.

- Always run steps at inspection speed using the remote control device.

- The following should be worn while working on the escalator:
    1. Safety glasses
    2. Safety shoes
    3. Protective clothing
    4. Gloves

CIRCUIT TROUBLESHOOTING

The faultfinder panel will troubleshoot itself. However, there are still cases where basic troubleshooting will be required.

The following section discuss common problems that occur in the equipment electrical circuits and tips on troubleshooting.

D.1 SHUNT TRIP CIRCUIT BREAKER – EARTH LEAKAGE PROTECTIVE RELAY

Normal:

- The circuit breaker provides short circuit protection to the motor, motor wiring, and power control devices.
- A time delay characteristic allows the motor to be started without nuisance tripping of the circuit breaker, while protecting against short circuits.
- An operating coil permits the circuit breaker to be tripped on a signal from other equipment.
- A ground-fault-monitor circuit connected to the shunt trip circuit, provides protection from ground faults in the controller wiring.

The control handle on the outside of the controller enclosure operates the main circuit breaker. The circuit breaker control handle must be in the OFF position before the controller door can be opened.

After the door is opened, maintenance personnel operate a safety latch while switching the circuit breaker to turn the circuit on for troubleshooting or testing.

Closing the enclosure door automatically resets the circuit breaker safety interlock. The circuit breaker trips if a current flowing through it exceeds the value set by the time-delay characteristic. Operating the handle on the outside of the controller resets the breaker.

Troubleshooting:

- Press the “Push to Test” button to trip the circuit breaker.

D.2 PHASE PROTECTION CIRCUIT

Normal:

A phase detection relay monitors the incoming 3-phase power. If the phasing is correct, the relay closes contacts to signal a safe-to-run condition. If the phasing is not correct, or if a phase is lost, the relay opens contacts to signal an unsafe-to-run condition.

Troubleshooting:

- Substitute a known good relay or use a commercial phase tester to confirm that the problem is in the circuit.
- If the contacts do not close when 3-phase power is applied, confirm that the fuses are good.
- Confirm that the phasing is correct.
- If phasing is correct, confirm that all three phases are furnishing adequate power under load and that motor phases are drawing approximately equal amounts of current.

D.3 MOTOR POWER CIRCUIT

Normal:

- The power circuit is operated by the PLC as directed by the operating switches, inspection station, and condition of the safety devices.
- Two reversing motor contactors determine escalator-operating direction or direction signals to the inverter.
- The inverter will allow a gentle start.
- An overload relay protects the drive motor from long-term overloading.

The PLC software controls the activation of the contactors and the inverter. To prevent a faulted solid-state component from applying power to a motor contactor, the control circuit receives power from a safety string. The exact operation is documented in the PLC software source code.

Troubleshooting:

- Confirm that the PLC is receiving a starting command. Repair inputs as required.
- Confirm that the controller is not faulted because of a safety switch or PLC fault. Reset as required.
- Confirm that all safety relays are picked, and all safety inputs are good at the PLC terminals. Reset as required.
- Confirm that the PLC is beginning a start sequence. Investigate software.
- Confirm that overload relays are reset. Repair/reset as required.
- Confirm that motor power is available at the controller output terminals. Repair as required.
- Repair motor wiring or motor as required.

D.4 CONTROLLER POWER CIRCUIT TRANSFORMER

Normal:

The control transformer receives 208VAC nominal input power and supplies 120VAC output for various appliances including the PLC, power supply, indicator lights, etc.

The input voltage of 208VAC is taken from two of the three phases of the control power wiring.

The output line neutral is bonded to the controller panel, which is in turn bonded to the building ground.

Troubleshooting:

- Confirm that the input fuses are good and that 208VAC is applied. Repair as required.
- Confirm that the output fuses are good and that the output voltage is correct. Repair as required.

D.5 DC BRAKE CIRCUIT

Normal:

- The power from the 120VAC output of the control transformer is rectified by a diode bridge and limited by a MOV surge suppressor, producing 90 VDC.
- When appropriate contacts (#6 and #6A and #BBR) are picked, DC power is applied to the main Mayr brake release solenoids.
- When contact #6 and #6A and #BBR are picked, the brake solenoids pick, releasing the brake.

Troubleshooting:

- The main DC brake circuit cannot be activated unless one of the following contact combinations is picked at the same time:
  - #1, #7, and #6.
  - #2, #7, and #6.
  - #5 and #6.

  In addition, the backup brake also will pick with the main brake when the following contact combination is picked at the same time:
  - #BBR and #6A.

  Refer to the straight-line diagrams for test points and confirm that the brake power circuit is operating correctly.
- If DC brake power is not available, confirm that there is 120VAC output at the transformer and that the circuit breakers are not tripped. Repair/replace transformer as required and reset circuit breakers.
- Confirm the presence of 120VAC at the AC terminals of the diode bridge.
- Confirm the presence of 90VDC at the + and - terminals of the diode bridge. If there is no voltage, replace the diode bridge.
- If brake power is available, disconnect the motor from the controller to prevent the motor from starting.
- Using jumpers, pick #1 or #2 and #7, #6; then confirm that power is being applied to the DC brake coils.
- Using jumpers, pick #BBR and #6A; then confirm that power is being applied to the DC brake.
- If power is being applied to DC brake coils, repair/replace DC brake-coils as required.

D.6 LUBRICATOR CIRCUIT

Normal:

The lubricator circuit is connected to 120VAC electrical power from the control transformer. The PLC controls the frequency and duration of lubricating pump operation.

When the escalator is not running, the pump can not be energized. When the escalator is started, power is supplied to the pump controller.

The lubricator lubrication frequency and duration can be controlled and tested through the PLC's LCD display.

Troubleshooting:

- Confirm that power is being supplied to the PLC when the escalator is running. Check and replace fuses as needed.
- Confirm that the pump motor will run when power is applied to the motor. Repair/replace as required.

D.7 EMERGENCY STOP AND PIT STOP SWITCHES

Opening any of these switches disables the motor controller circuits and sends a signal to the PLC.

D.8 SAFETY STRING

Normal:

When any of the safety devices are activated, an input signal is sent to the PLC and a relay in the safety string is dropped. This breaks the string and drops relay #4E.

Troubleshooting:

- If relay #4E is picked, identify the fault by examining the PLC's LCD display and the LED indicator lights. Investigate the failed circuits and switches.

D.9 MISSING STEP CIRCUIT

Normal:

If any of the missing step proximity detectors does not detect a step in the upper or lower truss while the escalator is running in Key Start Mode, a relay in the safety string will drop, causing the escalator to stop.

When the escalator is in Maintenance (inspection) Mode, the Missing Step Circuit is disabled.

Troubleshooting:

- If the escalator stops from a missing step fault and there are no missing steps, verify that the detector step distance is adjusted correctly.

D.10 ALARM CIRCUIT

Normal:

The audible alarm sounds:

- When the emergency stop cover is lifted.
- As a warning before the escalator is stopped for incorrect handrail speed.
- When the smoke alarm is set off.
- When entering or leaving Run mode.
- When someone enters escalator in the wrong direction during Sleep mode.

In addition:

- When the cover to the emergency stop button at the escalator newel is lifted, the PLC acts on the signal to turn on the audible alarm.
- When the PLC detects a handrail whose speed is out of specification for more than two seconds, the PLC turns on the audible alarm and stops the escalator.

Troubleshooting:

- If the alarm does not sound when the cover is opened, confirm that power is applied to the controller.
- Check the limit switch as outlined in Electrical Section A. Check the switch and alarm circuits. Note that the alarm will not turn on for more than 60 seconds at a time.

D.11 INSPECTION STATION

Normal:

- When an inspection station is plugged in, the escalator can only be run with that inspection station.
- During inspection operation, all safety switches except for the missing step monitors remain effective.
- Revenue operation is not permitted when an inspection station is connected.
- The escalator will not operate if there are inspection stations at both the upper and lower trusses.

Troubleshooting:

- If the escalator will not run with the inspection station, check if there is another inspection station plugged in or if the blind plug is removed at the other end.
- Check the LED indicators for any safety switches that might have tripped. Reset safety if needed.
- Try another inspection station.
- Check wiring in the junction box for loose connections and/or the plug and inspection station for loose wiring.
- Inspect PLC for correct inputs for inspection operation.

D.12 CONTROL VOLTAGE SENSOR

Normal:

If the voltage at L2Y is not 95VAC, the contact between L2Y and L20 will not close. This prevents the controller from operating the motor at reduced voltage.

Troubleshooting:

- If L2Y has no voltage, check that CB3 has not tripped. Reset CB3 if necessary.
- If L2Y has voltage other than 120VAC, check the transformer and fuses. Replace fuses or transformer if necessary.
- If L20 has voltage other than 120VAC, check both #VTS and transformer. Replace VTS if necessary.

D.13 PROGRAMMABLE LOGIC CONTROLLER (PLC)

Normal:

Power indicator, along with various input and output indicators, should be on.

Troubleshooting:

- If PLC does not come on, check #VTS and CB3. Reset circuit breaker if required. Further information on troubleshooting and operation of the PLC can be found in the PLC's manufacturer's manual located in the vendor manual binder.

D.14 24VDC POWER SUPPLY

Normal:

24VDC should be across the PS1's +V1 and –V1 terminals.

Troubleshooting:

- If 24VDC is not present, check #VTS and CB3.
- If #VTS and CB3 check out OK, check manufacturer's manual in the vendor manual binder.
- Confirm that 24VDC is applied to C3+.

D.15 HANDRAIL SPEED SAFETY CIRCUIT

Normal:

The PLC determines the handrail encoders' speed by comparing them to the main drive encoder speed.

The HSCE2 card in slot 9 also sets and resets timer #HR-T and relays #HR1 and #HR2 as a backup to the PLC logic.

Troubleshooting:

- If a handrail fault is registered falsely or too soon, or the escalator does not stop when the handrail speed is off for 2 seconds:
    - Check the wiring to the encoders.
    - Check the PLC cards in slots 7 and 9.
    - Reset, repair, or replace as necessary.

D.16 GOVERNOR SPEED ENCODER CIRCUIT

Normal:

- The PLC compares the main drive encoder speed to what it should be. If there is a significant change in escalator speed, the escalator will stop and the safety string will open.
- The HSCE card in slot 7 controls the physical relay #NRO, which acts as a backup to the PLC logic.

Troubleshooting:

- If speed faults are not registered correctly, check the wiring to the PLC card in slot 7 and the encoder.
- Check that the encoder is making good contact with the drive axle. See testing and adjustment for further information.

CONTROLLER SETTING DATA

D.17 TIMERS

#HR-T	2.1 seconds

D.18 OVER CURRENT RELAY

#1-OCR	42 amps 63 amps	Herald Square Phase II Herald Square Phase III & IV

D.19 FUSES

FBR-1, 2	A70QS35-4-IL

D.20 CIRCUIT BREAKERS

CB1	FAL-34060 FAL-34090
CB2, CB3, CB5	1492-GS1G050-H1
CB4	1492-GS1G020-H1
CB6 10A-1 pole	60110
CB7 13A-2 pole	60145
CB8 3A-2 pole	1492-SP2C030
CB9	1492-GS3G030-H1
CB10 1A-3 pole	60169

D.21 INVERTER SETTINGS

D.21.1 Essential Set-Up Parameters

The following chart provides the essential set-up parameters for the PowerFlex 70 drive used as the inverter.

The complete list of parameters is provided in the “PowerFlex 70 Adjustable Frequency AC Drive – User Manual” provided in Volume 3 Vendor Manauls of this set. For more information, please refer to Appendix B (page 5) “Viewing and Editing Parameters” of that manual.

HERALD SQUARE 2881 -- POWER FLEX 70 INVERTER SETTINGS					
ORDER of PARAMETER ENTRY				DRIVE KEYPAD ENTRY	
FILE	GROUP	NO.	PARAMETERS DESCRIPTION	VALUE	DESCRIPTION
E	Utility	196	Param Access Lvl-1 Advanced	1	Parameter Access Level- Advanced
E	Utility	201	Language	1	Display Language of LCD HIM- English
B	Motor Data	41	Motor NP Volts	208	Motor Name Plate Volts
B	Motor Data	42	Motor NP FLA (E221-E224) (10 HP 208 V)	31	Motor Name Plate Full Load Amps(E221-E224)
B	Motor Data	42	Motor NP FLA (E229-E236) (20 HP 208 V)	60	Motor Name Plate Full Load Amps(E229-E236)
B	Motor Data	43	Motor NP Hertz	60	Motor Name Plate Hertz
B	Motor Data	44	Motor NP RPM	1170	Motor Name Plate RPM
C	Speed Command	90	Speed Ref A Sel	17	Preset Spd7- see #107- Sel. Preset Speed 7
C	Speed Command	93	Speed Ref B Sel	11	Preset Spd1- see #101- Sel. Preset Speed 1(Deflt)
C	Speed Command	101	Preset Speed 1- see 364 Digital In4 Sel	10	Speed for Preset #1 in Hz (Sleep Mode Speed)
C	Speed Command	102	Preset Speed 2- see 365 Digital In5 Sel	10	Speed for Preset #2 in Hz (Inspection Mode Speed)
C	Speed Command	103	Preset Speed 3- 364 +365 Digital 4+5 Sel	60	Speed for Preset #3 in Hz (Run Speed)
C	Speed Command	107	Preset Speed 7- In1 & In2 Off	0	Speed for Preset #7 in Hz (Zero Speed)
D	Dynamic Control	140	Accel Time 1	4	Acceleration Time for all Speeds (sec)
D	Dynamic Control	142	Decel Time 1	4	Deceleration Time for all Speeds (sec)
D	Dynamic Control	146	S Curve %	10	Percentage of accel or decel applied as S Curve
D	Dynamic Control	155	Stop Mode A	0	Active Stop Mode A- Coast
D	Dynamic Control	161	Bus Reg Mode A	2	Dynamic Brake
D	Dynamic Control	162	Bus Reg Mode B	2	Dynamic Brake
D	Dynamic Control	163	DB Resistor Type	1	Dynamic Brake Resistor- External Resistor
J	Inputs & Outputs	361	Digital In1 Sel	8	Run Forward
J	Inputs & Outputs	362	Digital In2 Sel	9	Run Reverse
J	Inputs & Outputs	363	Digital In3 Sel	2	Clear Faults
J	Inputs & Outputs	364	Digital In4 Sel	15	Speed Sel 1- see #93- Speed Ref B Sel
J	Inputs & Outputs	365	Digital In5 Sel	16	Speed Sel 2- see #102- Sel. Preset Speed 2
J	Inputs & Outputs		Both- Digital In4 Sel + Digital In5 Sel High	n/a	Preset 3- see #103- Sel. Preset Speed 3
J	Inputs & Outputs		Both- Digital In4 Sel + Digital In5 Sel Off	n/a	Preset 0 - See #90 - Speed Ref A Sel
J	Inputs & Outputs	366	Digital In6 Sel	1	Enable, Remove Jumper at J10, ENBL JMP
J	Inputs & Outputs	380	Digital Out1 Sel	1	Fault (Default)
J	Inputs & Outputs	384	Digital Out2 Sel	12	At Torque
J	Inputs & Outputs	385	Digital Out2 Level	1	Amps
E	Utility	196	Param Access Lvl- 0 Basic	0	Parameter Access Level- Basic
Note: Remove Jumpers JP2-JP3; JP3B-JP3A Otherwise Drive will cause a ground fault					

Figure D-1 Inverter Settings

D.21.2 Changing Parameters on Inverter Drive

Use the inverter drive keypad to make the following changes.

D.21.2.1 Change Access Level to Advanced Level

1. Press the Menu button.
    - You exit Drive Mode and enter Program Mode.
      The keypad screen displays “OPERATION”.
2. Press the UP arrow key.
    - The keypad screen displays “A-INITIALIZE”.
3. Press the Data Enter key.
    - The keypad screen displays “A1-00 SELECT LANGUAGE”.
4. Press the UP arrow key.
    - The keypad screen displays “A1-01 ACCESS LEVEL”.
5. Press the Data enter key.
    - The keypad screen displays “0 OPERATION ONLY”.
6. Press the UP arrow key.
    - The keypad screen displays “1 USER LEVEL”.
7. Press the UP arrow key once more.
    - The keypad screen displays “2 ADVANCED LEVEL”.
8. Press the Data Enter key.
    - You have now changed the access level to Advanced Level.
9. To exit, press the Menu key.

D.21.2.2 Change Acceleration and Deceleration Parameters in Advanced Level

Change Acceleration Time Value

1. Press the Menu button.
    - You exit Drive Mode and enter Program Mode. The keypad screen displays “OPERATION”.
2. Press the UP arrow key.
    - The keypad screen displays “A-INITIALIZE”.
3. Press the UP arrow key once more.
    - The keypad screen displays “PROGRAMMING”.
4. Press the Data Enter key.
    - The keypad screen displays “B- APPLICATION”.
5. Press the UP arrow key.
    - The keypad screen displays “C-TUNING”.
6. Press the Data Enter key.
    - The keypad screen displays “C1-ACCEL/DECEL”.
7. Press the Data Enter key once more.
    - The keypad screen displays “C1-01 ACCELERATION TIME1”.
8. Press the Data Enter key once more.
    - The keypad screen displays the Acceleration Time1 value with a cursor highlighting a changeable digit.
9. Change digit values to the desired new value.
    - To increase the digit value, press the UP arrow key.
    - To decrease the digit value, press the DOWN arrow key.
    - To move to the next digit, use the Reset key, which also has a right-pointing arrow to move the cursor one digit to the right.
    - The cursor wraps around to the leftmost digit when the Reset key is pressed to advance the cursor beyond the last rightmost digit.

10. Once the new value is displayed, accept and store it OR exit without storing it.

    - To **accept** and store it, press the Data Enter once.
      This stores the new value in the drive.

      Now press the ESC key to exit and progress to the next item.
      The keypad screen displays the task you are exiting (in this case “C1-01 ACCELERATION TIME1”).
    - To **exit without storing** the new value, press the ESC key.
      The keypad screen displays the task you are exiting (in this case “C1-01 ACCELERATION TIME1”).

Change Deceleration Time Value

(Continued from previous task)

11. From the “C1-01 ACCELERATION TIME1” display, press the UP arrow key.
    - The keypad screen displays “C1-02 DECELERATION TIME2”.
12. Press the Data Enter key.
    - The keypad screen displays the Deceleration Time2 value with a cursor highlighting a changeable digit.
13. Change the deceleration digit values as needed (as described in Acceleration Time #9 above).
14. Accept and store the new deceleration value OR exit without storing (as described in Acceleration Time #10 above).
    - After ESC is pressed, the keypad screen displays “C1-02 DECELERATION TIME2”.

Change S-Curve Acceleration START Time

(Continued from previous task)

15. From the “C1-02 DECELERATION TIME2” display, press the UP arrow key.
    - The keypad screen displays “C2 S-CURVE ACC/DEC”.
16. Press the Data Enter key.
    - The keypad screen displays “C2-01 S-CURVE ACCEL START”.
17. Press the Data Enter key.
    - The keypad screen displays the S-curve value for the start of acceleration with a cursor highlighting a changeable digit.
18. Change the S-curve acceleration start digit values as needed (as described in Acceleration Time #9 above)
19. Accept and store the new S-curve acceleration start value OR exit without storing (as described in Acceleration Time #10 above)
    - After ESC is pressed, the keypad screen displays “C2-01 S-CURVE ACCEL START”.

Change S-Curve Acceleration END Time

(Continued from previous task)

20. From the “C2-01 S-CURVE ACCEL START” display, press the UP arrow key.
    - The keypad screen displays “C2-02 S-CURVE ACCEL END”.
21. Press the Data Enter key.
    - The keypad screen displays the S-curve value for the end of the acceleration with a cursor highlighting a changeable digit.
22. Change the S-curve acceleration end digit values as needed (as described in Acceleration Time #9 above)
23. Accept and store the new S-curve acceleration end value OR exit without storing (as described in Acceleration Time #10 above)
    - After ESC is pressed, the keypad screen displays “C2-02 S-CURVE ACCEL END”.

Change S-Curve Deceleration START Time

(Continued from previous task)

24. From the “C2-02 S-CURVE ACCEL END” display, press the UP arrow key.
    - The keypad screen displays “C2-03 S-CURVE DECEL START”.
25. Press the Data Enter key.
    - The keypad screen displays the S-curve value for the start of deceleration with a cursor highlighting a changeable digit.
26. Change the S-curve deceleration start digit values as needed (as described in Acceleration Time #9 above)
27. Accept and store the new S-curve deceleration start value OR exit without storing (as described in Acceleration Time #10 above)
    - After ESC is pressed, the keypad screen displays “C2-03 S-CURVE DECEL START”.

Change S-Curve Deceleration END Time

(Continued from previous task)

28. From the “C2-03 S-CURVE DECEL START” display, press the UP arrow key.
    - The keypad screen displays “C2-04 S-CURVE DECEL END”.
29. Press the Data Enter key.
    - The keypad screen displays the S-curve value for the end of the deceleration with a cursor highlighting a changeable digit.
30. Change the S-curve deceleration end digit values as needed (as described in Acceleration Time #9 above)
31. Accept and store the new S-curve deceleration end value OR exit without storing (as described in Acceleration Time #10 above)
    - After ESC is pressed, the keypad screen displays “C2-04 S-CURVE DECEL END”.
32. Press the Menu button.
    - You return to the topmost level.

D.21.2.3 Change Speeds in Advanced Level

Change SLEEP Speed

1. Press the Menu button.
    - You exit Drive Mode and enter Program Mode. The keypad screen displays “OPERATION”.
2. Press the UP arrow key.
    - The keypad screen displays “A-INITIALIZE”.
3. Press the UP arrow key once more.
    - The keypad screen displays “PROGRAMMING”.
4. Press the Data Enter key.
    - The keypad screen displays “B- APPLICATION”.
5. Press the UP arrow key.
    - The keypad screen displays “C-TUNING”.
6. Press the UP arrow key once more.
    - The keypad screen displays “D-Reference”.
7. Press the Data Enter key .
    - The keypad screen displays “D1-01 FREQUENCY REFERENCE1”.
8. Press the UP arrow key .
    - The keypad screen displays “D1-02 FREQUENCY REFERENCE2”. This is the Sleep Speed parameter.
9. Press the Data Enter key.
    - The keypad screen displays the D1-02 Sleep Speed reference value in Hertz with a cursor highlighting a changeable digit.
10. Change digit values to the desired new value.
    - To increase the digit value, press the UP arrow key.
    - To decrease the digit value, press the DOWN arrow key.
    - To move to the next digit, use the Reset key, which also has a right-pointing arrow to move the cursor one digit to the right.
    - The cursor wraps around to the leftmost digit when the Reset key is pressed to advance the cursor beyond the last rightmost digit.

11. Once the new value is displayed, accept and store it OR exit without storing it.

    - To **accept** and store it, press the Data Enter once.
      This stores the new value in the drive.

      Now press the ESC key to exit and progress to the next item.
      The keypad screen displays the task you are exiting (in this case "D1-02 FREQUENCY REFERENCE2").
    - To **exit without storing** the new value, press the ESC key.
      The keypad screen displays the task you are exiting (in this case "D1-02 FREQUENCY REFERENCE2").

Change INSPECTION Speed

(Continued from previous task)

12. From the "D1-02 FREQUENCY REFERENCE2" display, press the UP arrow key.
    - The keypad screen displays "D1-03 FREQUENCY REFERENCE3". This is the Inspection Speed parameter.
13. Press the Data Enter key.
    - The keypad screen displays the D1-03 Inspection Speed reference value in Hertz with a cursor highlighting a changeable digit.
14. Change the D1-03 Inspection Speed values as needed (as described in Sleep Speed #10 above)
15. Accept and store the new D1-03 Inspection Speed value OR exit without storing (as described in Sleep Speed #11 above)
    - After ESC is pressed, the keypad screen displays "D1-03 FREQUENCY REFERENCE3".

Change RUN Speed

(Continued from previous task)

16. From the “D1-03 FREQUENCY REFERENCE3” display, press the UP arrow key.
    - The keypad screen displays “D1-04 FREQUENCY REFERENCE4”. This is the Run Speed parameter.
17. Press the Data Enter key.
    - The keypad screen displays the D1-04 Run Speed reference value in Hertz with a cursor highlighting a changeable digit.
18. Change the D1-04 Run Speed values as needed (as described in Sleep Speed #10 above)
19. Accept and store the new D1-04 Run Speed value OR exit without storing (as described in Sleep Speed #11 above)
    - After ESC is pressed, the keypad screen displays “D1-04 FREQUENCY REFERENCE4”.
20. To make a final exit, press the Menu button.
    - The keypad screen displays “OPERATION”.
21. To return to the Drive mode, press the Data Enter key.

TROUBLESHOOTING FLOWCHARTS

This section provides the following troubleshooting flowcharts:

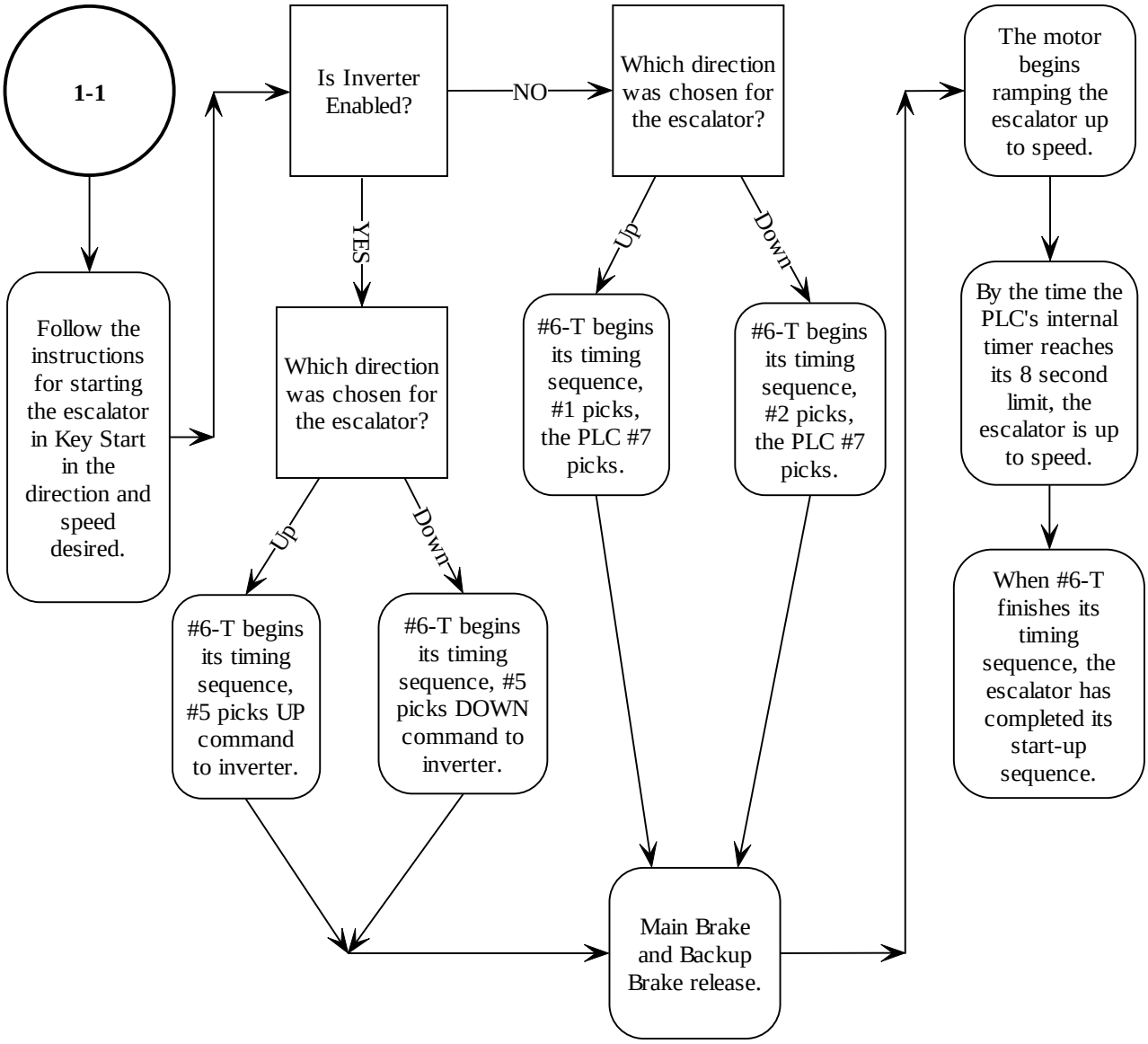
55-1 Lighting & Utility Circuit Breaker CB5 has tripped
57-1 Transformer Circuit Breaker CB7 has tripped
58-1 Brake Coil Circuit Breaker has tripped pg.1
58-2 Brake Coil Circuit Breaker has tripped pg.2
58-3 Brake Coil Circuit Breaker has tripped pg.3
60-1 Phase Relay Circuit Breaker has tripped
61-1 Fluorescent Light does not turn ON
62-1 Main Brake does not release or apply when commanded pg.1
62-2 Main Brake does not release or apply when commanded pg.2
64-1 Lubricator does not run as scheduled
65-1 PLC Power Supply is not ON
66-1 Annunciator is displaying a communications error
68-1 Alarms do not sound when they are supposed to
69-1 A fault occurred, but the fault LED did not turn ON
72-1 Escalator will not run while in Service Mode pg.1
72-2 Escalator will not run while in Service Mode pg.2
72-3 Escalator will not run while in Service Mode pg.3
72-4 Escalator will not run while in Service Mode pg.4
72-5 Escalator will not run while in Service Mode pg.5
73-1 Escalator will not run while in Key Start Mode pg.1
73-2 Escalator will not run while in Key Start Mode pg.2
73-3 Escalator will not run while in Key Start Mode pg.3
73-4 Escalator will not run while in Key Start Mode pg.4
74-1 LED for PS1 is not ON
76-1 Troubleshooting the #VTS
77-1 Troubleshooting the Annunciator
78-1 Troubleshooting Line Pxx
79-1 Troubleshooting the Safety String
100-1 A fault LED is ON
101-1 Fault LED "Top Combplate Switch" is ON
102-1 Fault LED "Bottom Combplate Switch" is ON
103-1 Fault LED "Top Combplate Step Impact Switch" is ON
104-1 Fault LED "Bottom Combplate Step Impact Switch" is ON
105-1 Fault LED "Top Left Step Sag Monitor" is ON
106-1 Fault LED "Top Right Step Sag Monitor" is ON
107-1 Fault LED "Bottom Left Step Sag Monitor" is ON
108-1 Fault LED "Bottom Right Step Sag Monitor" is ON
109-1 Fault LED "Top Left Skirt Obstruction Contact" is ON
110-1 Fault LED "Top Right Skirt Obstruction Contact" is ON
111-1 Fault LED "Incline Left Skirt Obstruction Contact" is ON
112-1 Fault LED "Incline Right Skirt Obstruction Contact" is ON
113-1 Fault LED "Bottom Left Skirt Obstruction Contact" is ON
114-1 Fault LED "Bottom Right Skirt Obstruction Contact" is ON

115-1 Fault LED "Top Missing Step Monitor" is ON
116-1 Fault LED "Bottom Missing Step Monitor" is ON
117-1 Fault LED "Lower Step Upthrust Monitor" is ON pg.1
117-2 Fault LED "Lower Step Upthrust Monitor" is ON pg.2
117-3 Fault LED "Lower Step Upthrust Monitor" is ON pg.3
119-1 Fault LED "Left Broken Handrail Switch" is ON
120-1 Fault LED "Right Broken Handrail Switch" is ON
121-1 Fault LED "Left Broken Step Chain Switch" is ON
122-1 Fault LED "Right Broken Step Chain Switch" is ON
123-1 Fault LED "Top Left Handrail Entry Contact" is ON
124-1 Fault LED "Top Right Handrail Entry Contact" is ON
125-1 Fault LED "Bottom Left Handrail Entry Contact" is ON
127-1 Fault LED "Broken Drive Chain Contact" is ON
128-1 Fault LED "Upper Maintenance Safety Switch" is ON
129-1 Fault LED "Lower Maintenance Safety Switch" is ON
130-1 Fault LED "Machine Room Maint. Safety Switch" is ON
131-1 Fault LED "Top Emergency Stop Button" is ON pg.1
131-2 Fault LED "Top Emergency Stop Button" is ON pg.2
132-1 Fault LED "Bottom Emergency Stop Button" is ON pg.1
132-2 Fault LED "Bottom Emergency Stop Button" is ON pg.2
133-1 Fault LED "Escalator Speed Monitor" is ON
134-1 Fault LED "Left Handrail Speed Monitor" is ON
135-1 Fault LED "Right Handrail Speed Monitor" is ON
136-1 Fault LED "Phase Failure/Phase Reversal Monitor" is ON
137-1 Fault LED "Anti-Reversal Device" is ON
138-1 Fault LED "Mech. Step Chain Locking Device" is ON pg.1
138-2 Fault LED "Mech. Step Chain Locking Device" is ON pg.2
139-1 Fault LED "Motor Current Overload" is ON
140-1 Fault LED "Circuit Breaker Fault" is ON pg.1
140-2 Fault LED "Circuit Breaker Fault" is ON pg.2
140-3 Fault LED "Circuit Breaker Fault" is ON pg.3
140-4 Fault LED "Circuit Breaker Fault" is ON pg.4
141-1 Fault LED "Motor Overheating Monitor" is ON
142-1 Fault LED "Main Brake Lining Monitor" is ON
144-1 Fault LED "Main Brake Release Monitor" is ON
145-1 Fault LED "Smoke Sensor" is ON
146-1 Fault LED "Motor Vibration Monitor" is ON
147-1 Fault LED "Loss of Controller Power" is ON pg.1
147-2 Fault LED "Loss of Controller Power" is ON pg.2
148-1 Fault LED "Maintenance Socket Fault" is ON pg.1
148-2 Fault LED "Maintenance Socket Fault" is ON pg.2
148-3 Fault LED "Maintenance Socket Fault" is ON pg.3

149-1 Fault LED "Inverter Fault" is ON
150-1 Fault LED "Stopping Distance Fault" is ON
151-1 Fault LED "Low Gearbox Oil" is ON
153-1 Fault LED "Low Lubricator Oil" is ON
154-1 Fault LED "Left Displaced Handrail Device" is ON
155-1 Fault LED "Right Displaced Handrail Device" is ON
156-1 Fault LED "Rolling Shutter Device" is ON
157-1 Fault LED "Overheated Brake Resistor" is ON
158-1 Fault LED "Sleep Mode Sensor Failure" is ON
160-1 Fault LED "BackUp Brake Lining Monitor" is ON
161-1 Fault LED "BackUp Brake Release Monitor" is ON

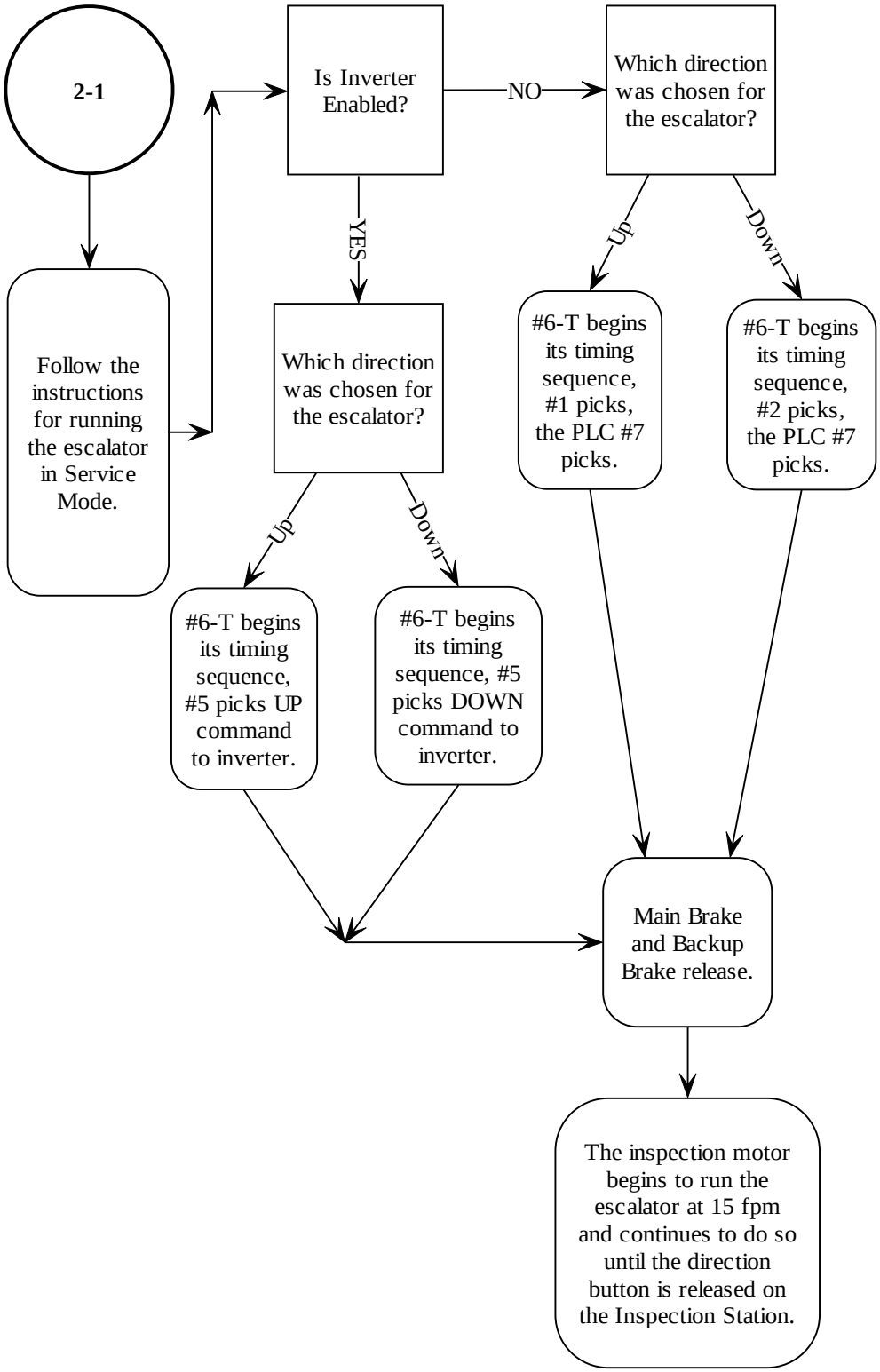
1-1 Sequence of events in Key Start Mode

1-1 SEQUENCE OF EVENTS IN KEY START MODE



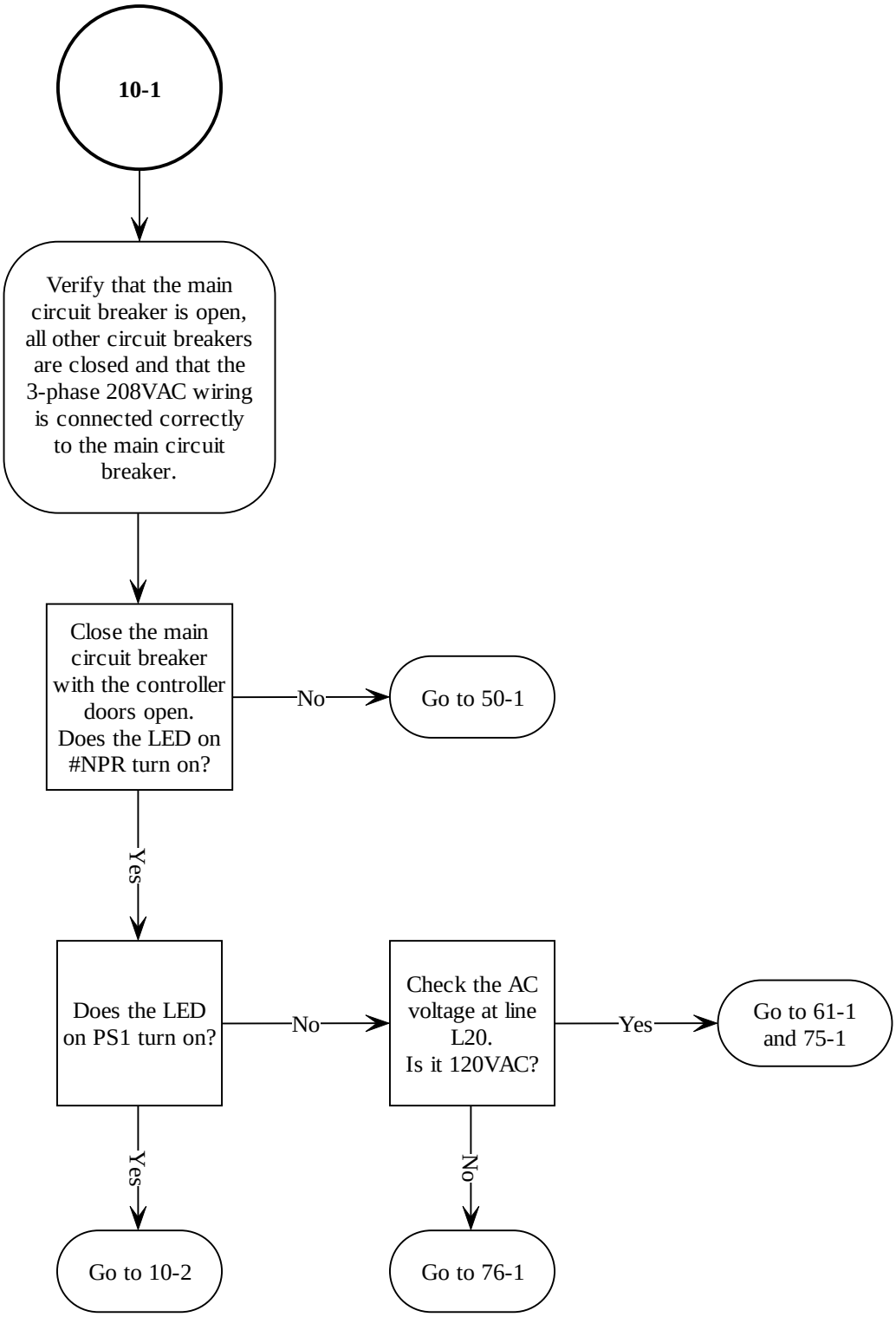
2-1 Sequence of events in Service Mode

2-1 SEQUENCE OF EVENTS IN SERVICE MODE



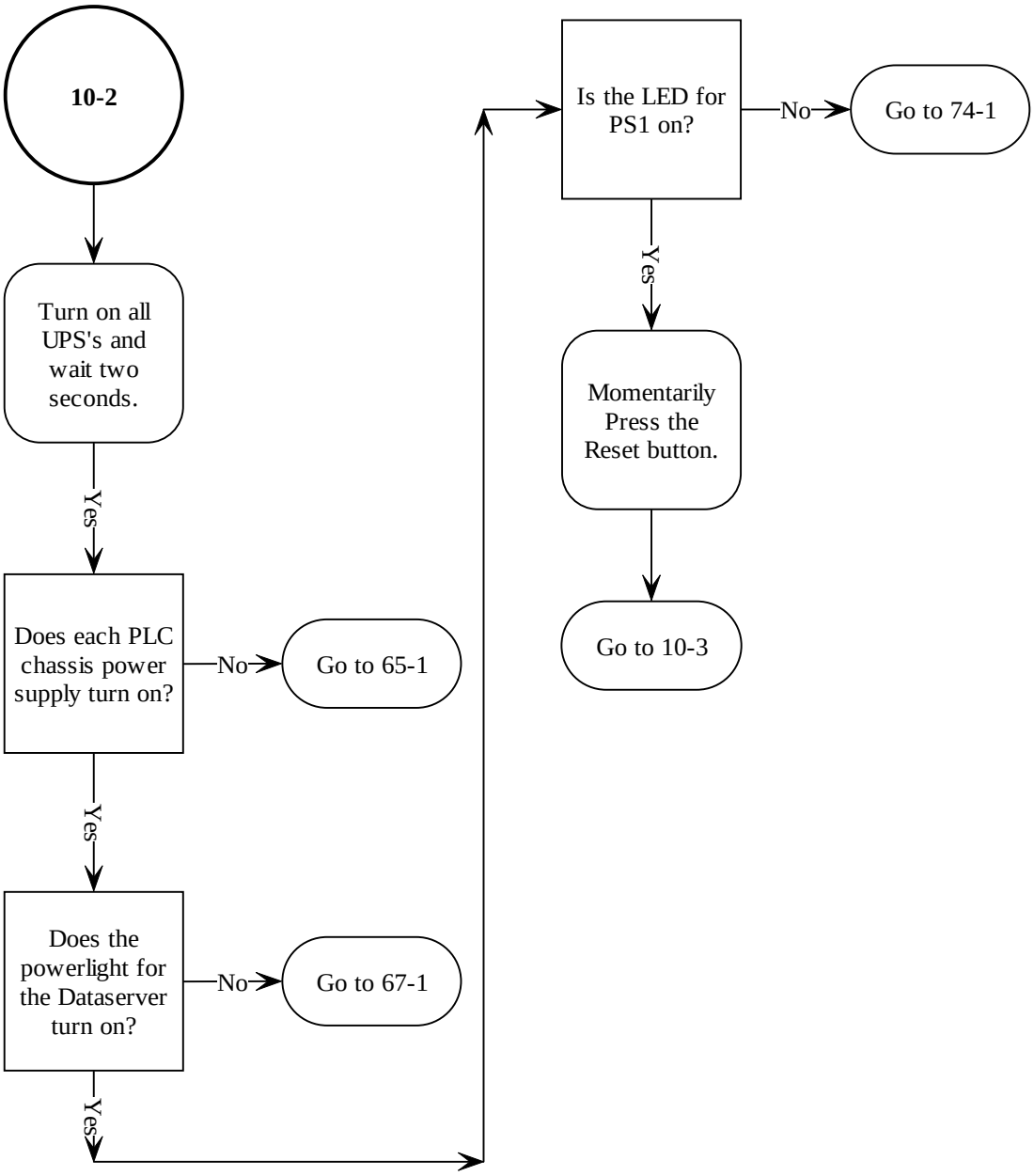
10-1 Powering Up Sequence pg.1

10-1 POWERING UP SEQUENCE pg.1



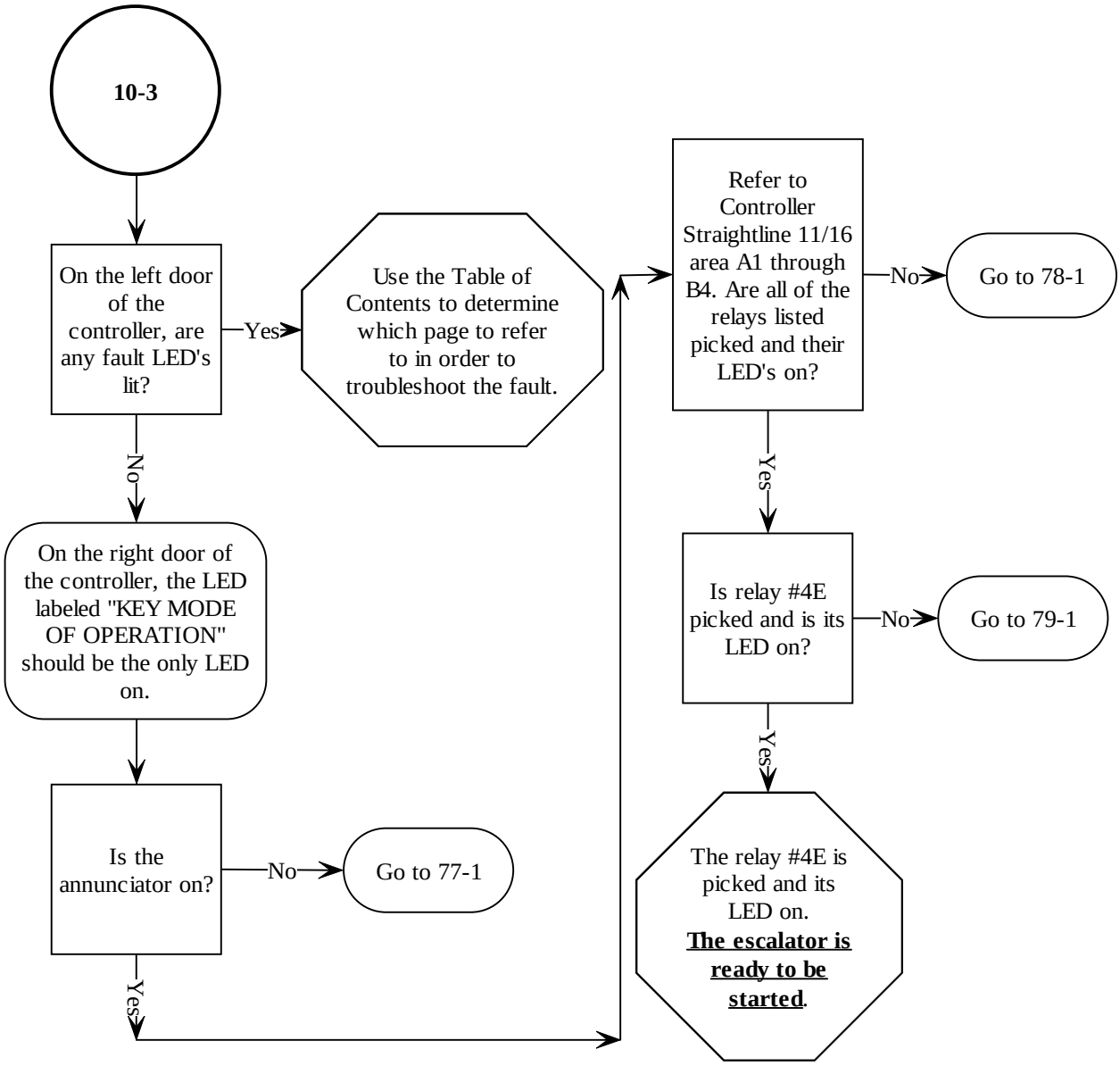
10-2 Powering Up Sequence pg.2

10-2 POWERING UP SEQUENCE pg.2

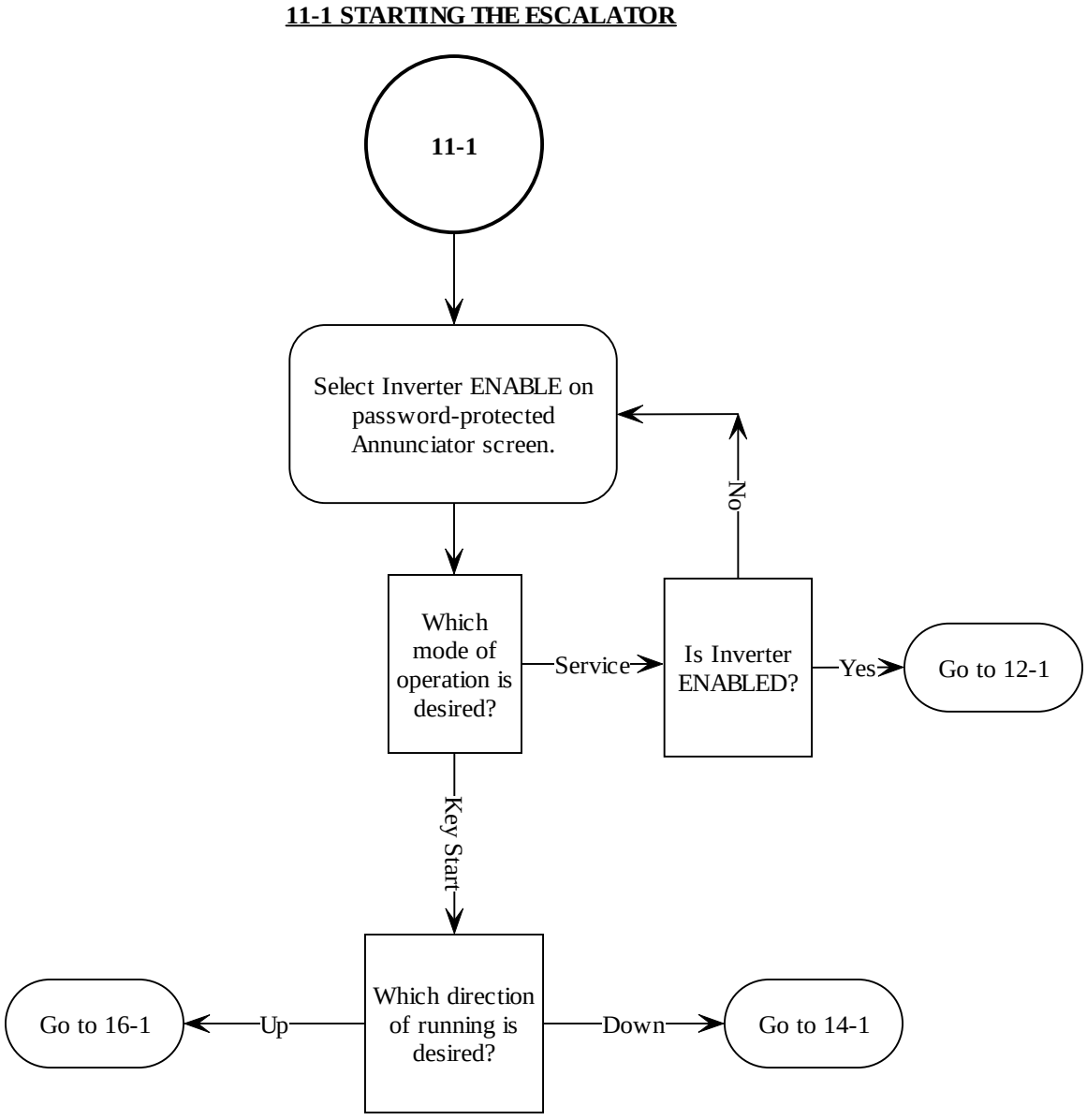


10-3 Powering Up Sequence pg.3

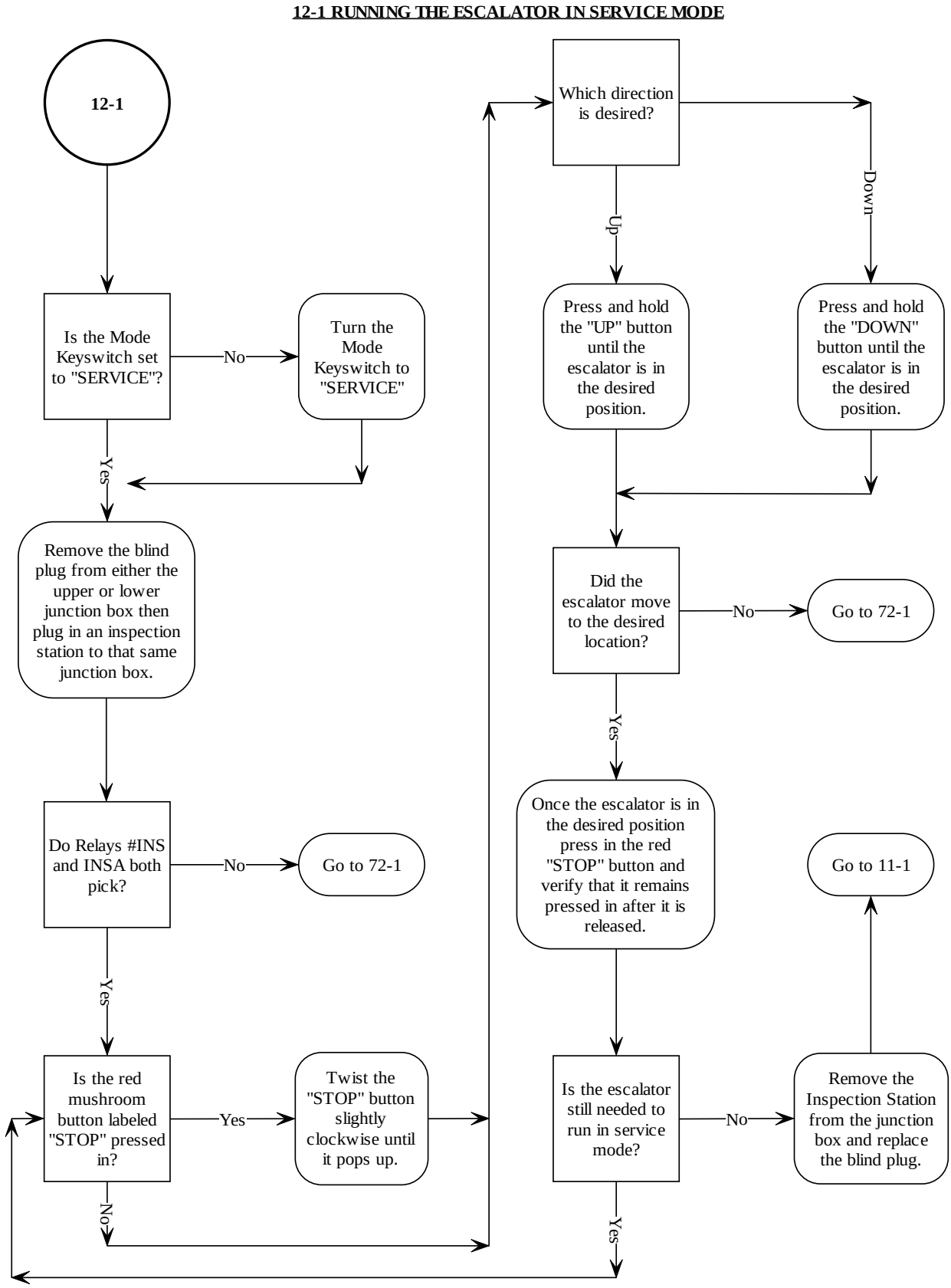
10-3 POWERING UP SEQUENCE pg.3



11-1 Starting the Escalator

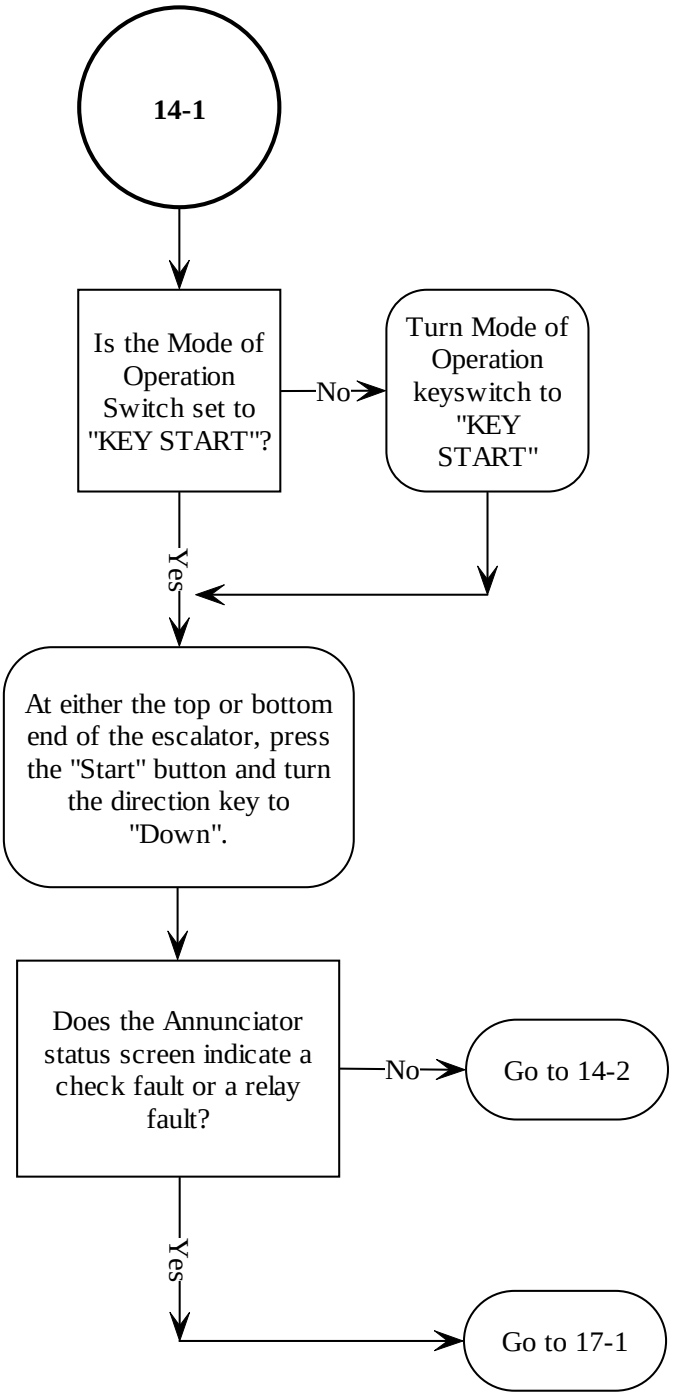


12-1 Running the Escalator in Service Mode



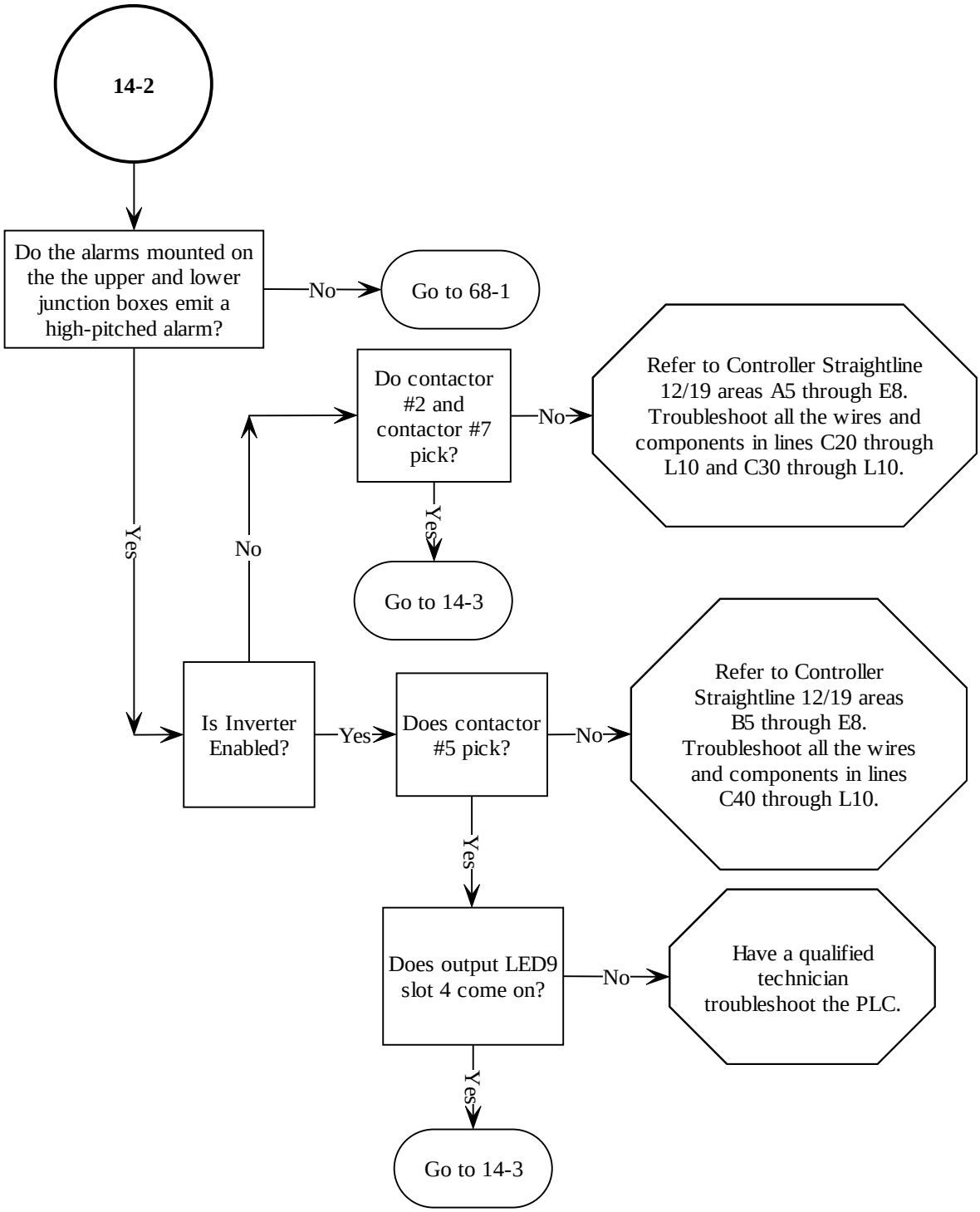
14-1 Running the Escalator DOWN pg.1

14-1 RUNNING THE ESCALATOR DOWN pg.1



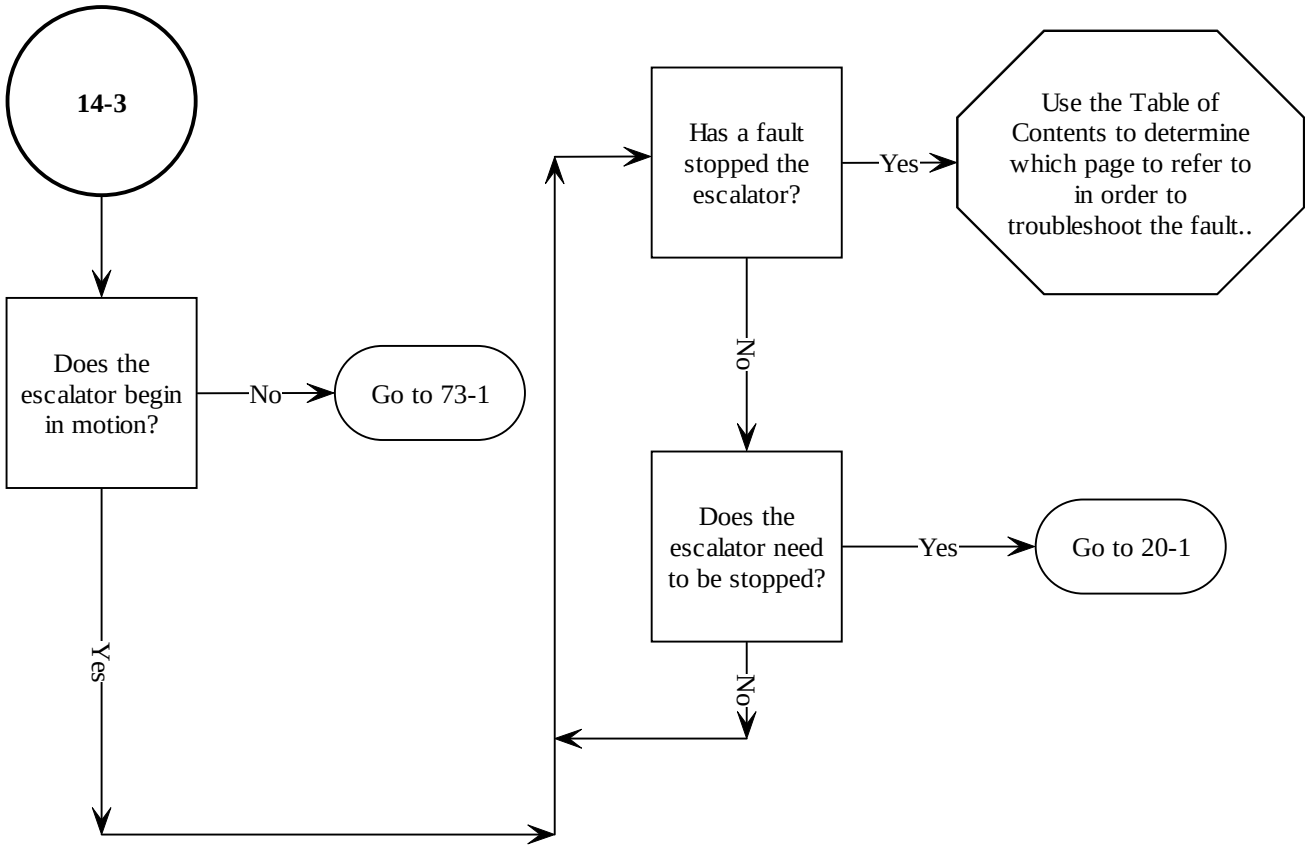
14-2 Running the Escalator DOWN pg.2

14-2 RUNNING THE ESCALATOR DOWN pg.2



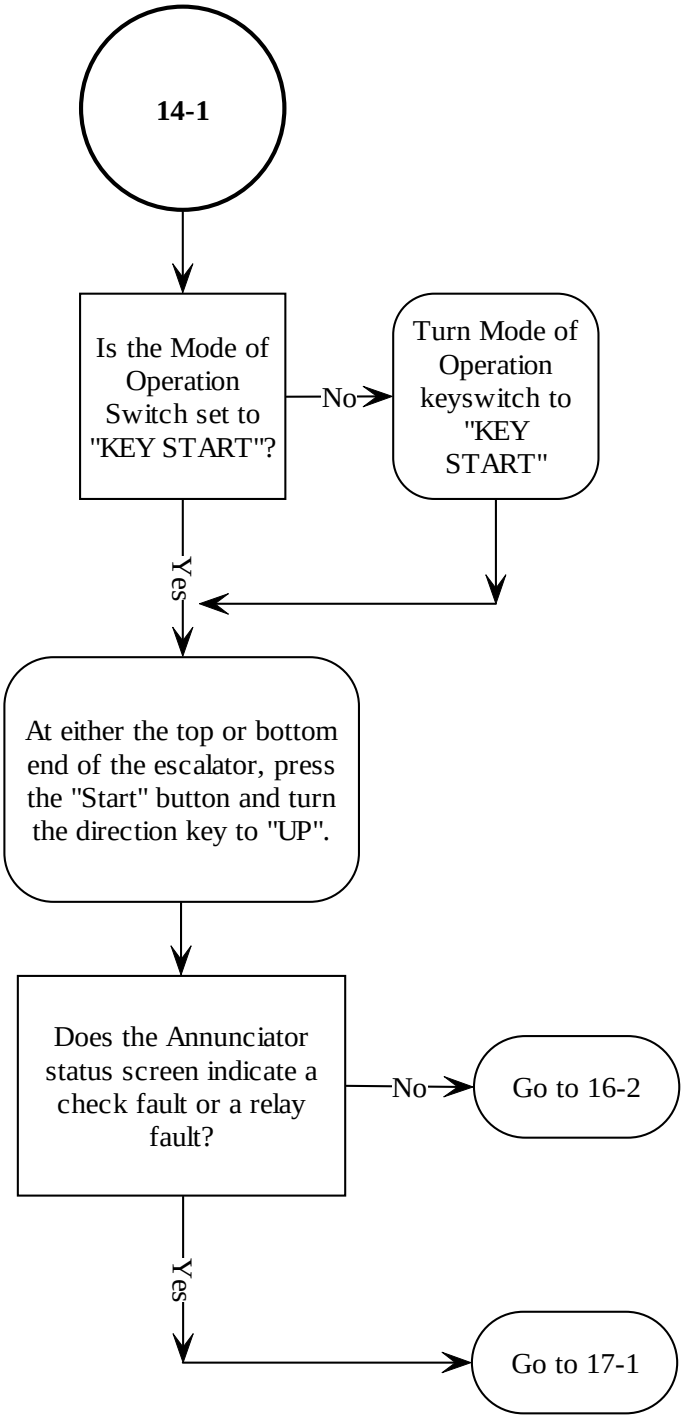
14-3 Running the Escalator DOWN pg.3

14-3 RUNNING THE ESCALATOR DOWN pg.3



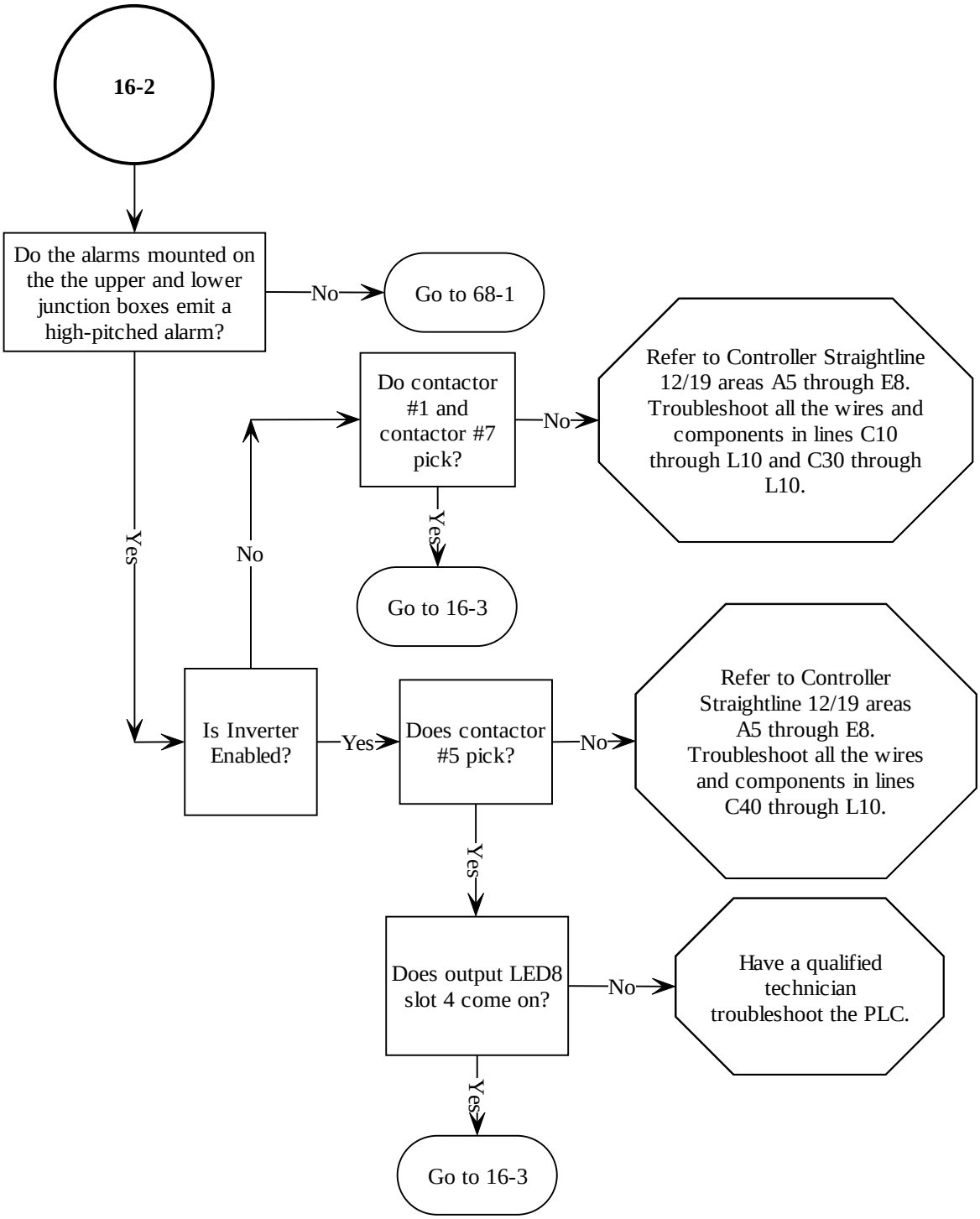
16-1 Running the Escalator UP pg.1

16-1 RUNNING THE ESCALATOR UP pg.1



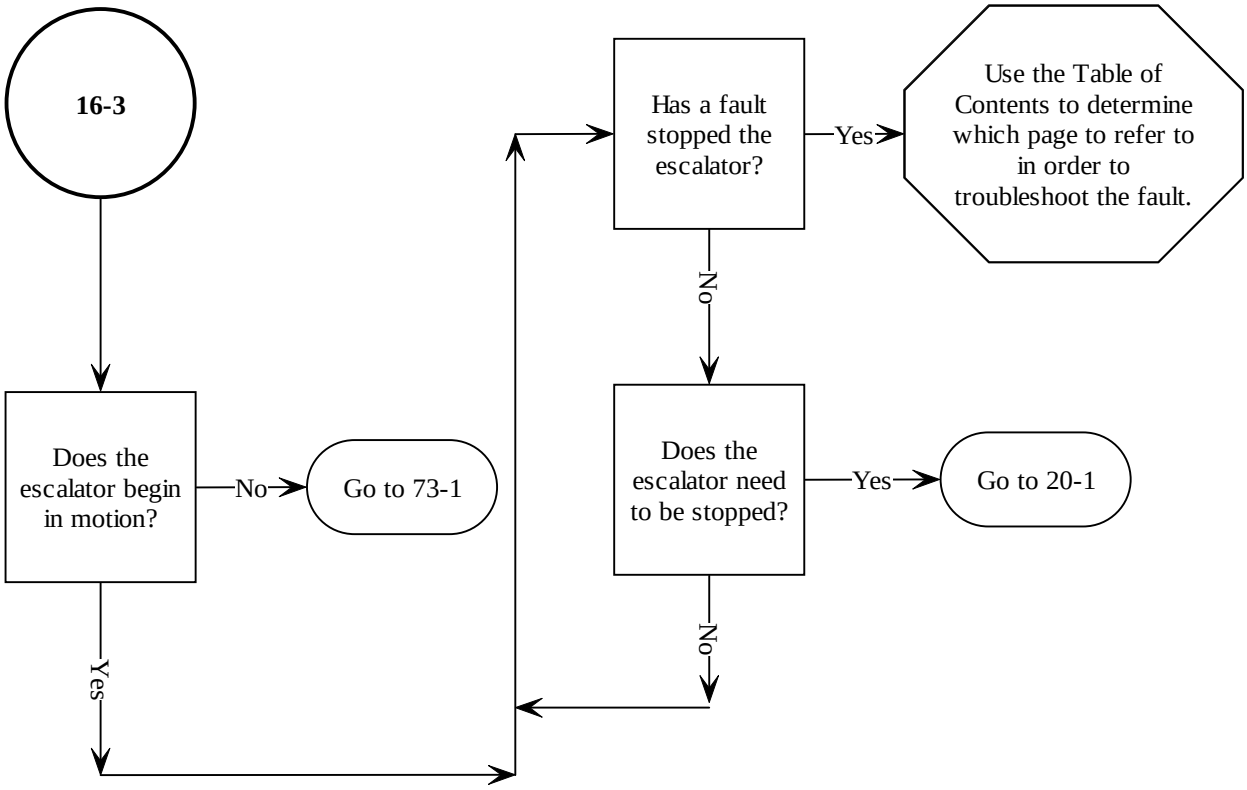
16-2 Running the Escalator UP pg.2

16-2 RUNNING THE ESCALATOR UP pg.2



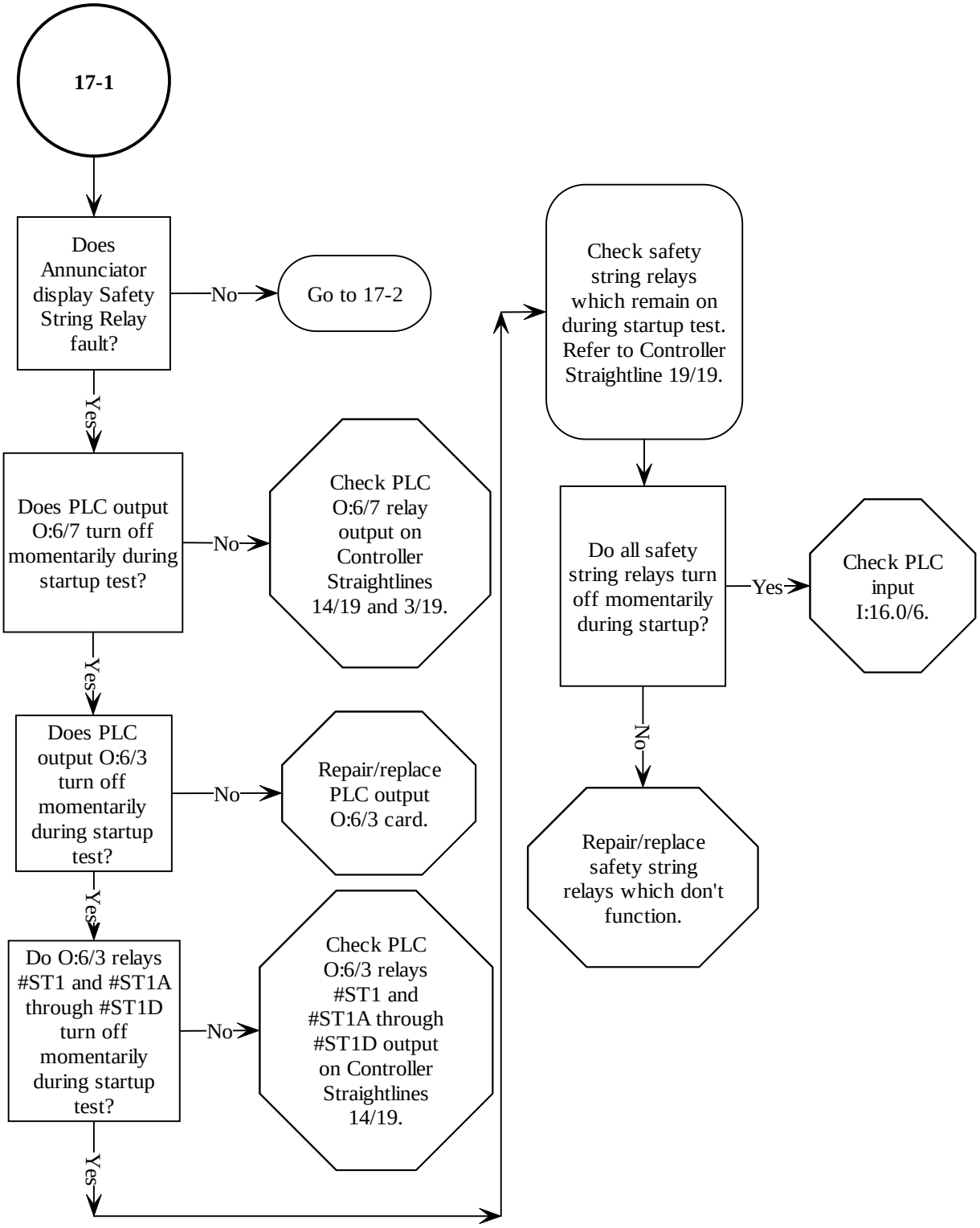
16-3 Running the Escalator UP pg.3

16-3 RUNNING THE ESCALATOR UP pg.3



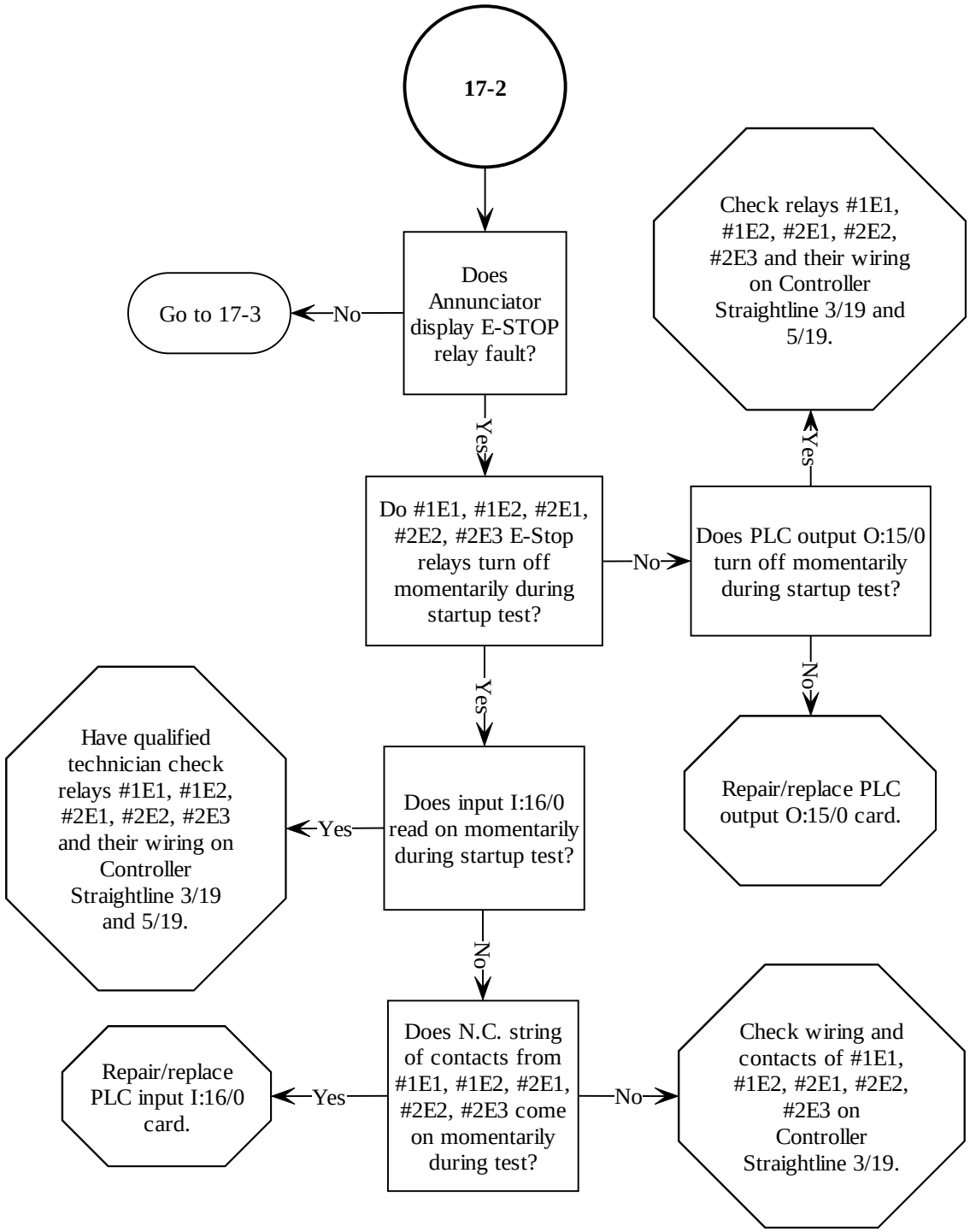
17-1 Starting Fault (Safety String Relay) has occurred pg.1

17-1 STARTING FAULT (Safety String Relay) HAS OCCURRED pg.1



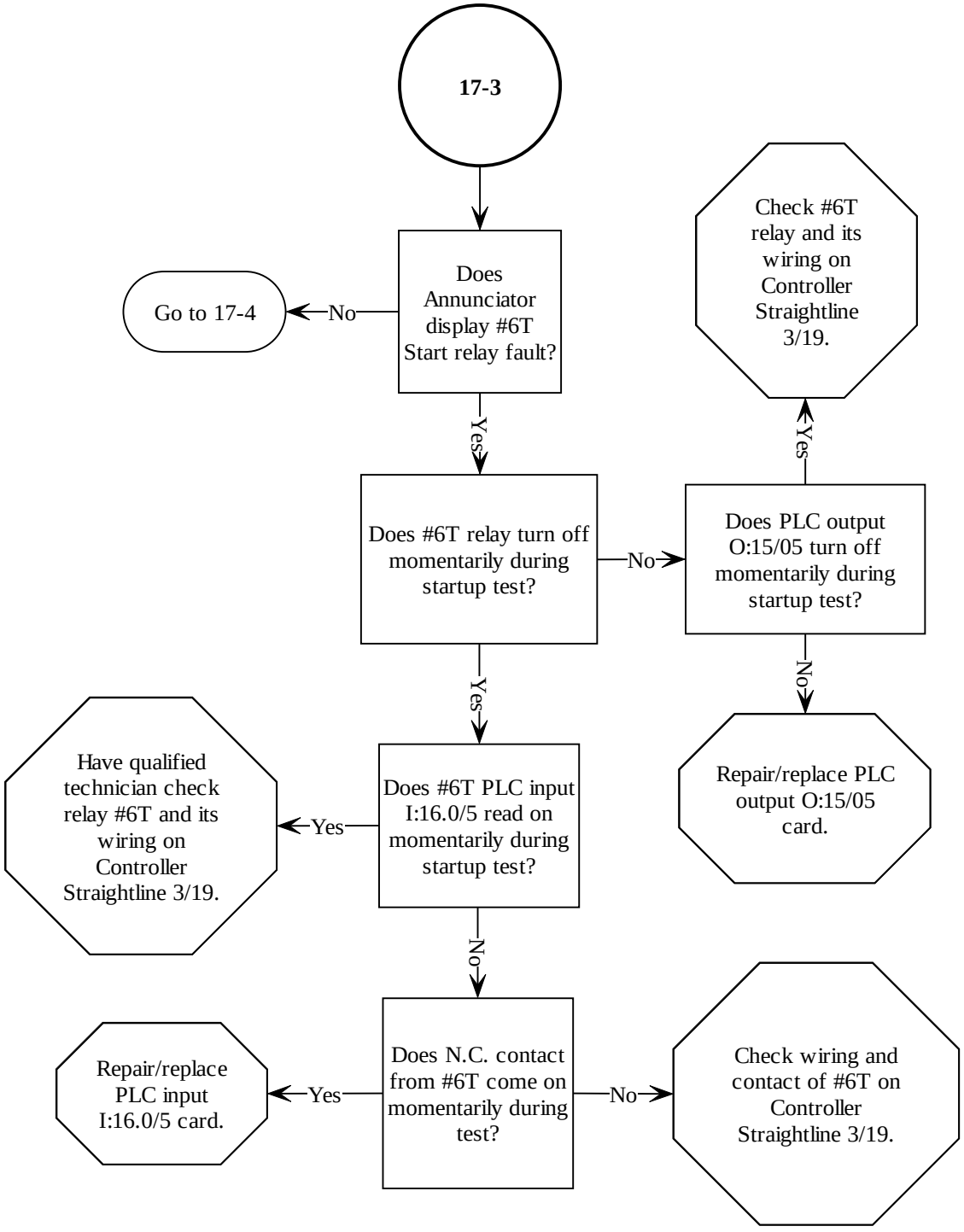
17-2 Starting Fault (E-STOP Relay) has occurred pg.2

17-2 STARTING FAULT (E-Stop Relay) HAS OCCURRED pg.2



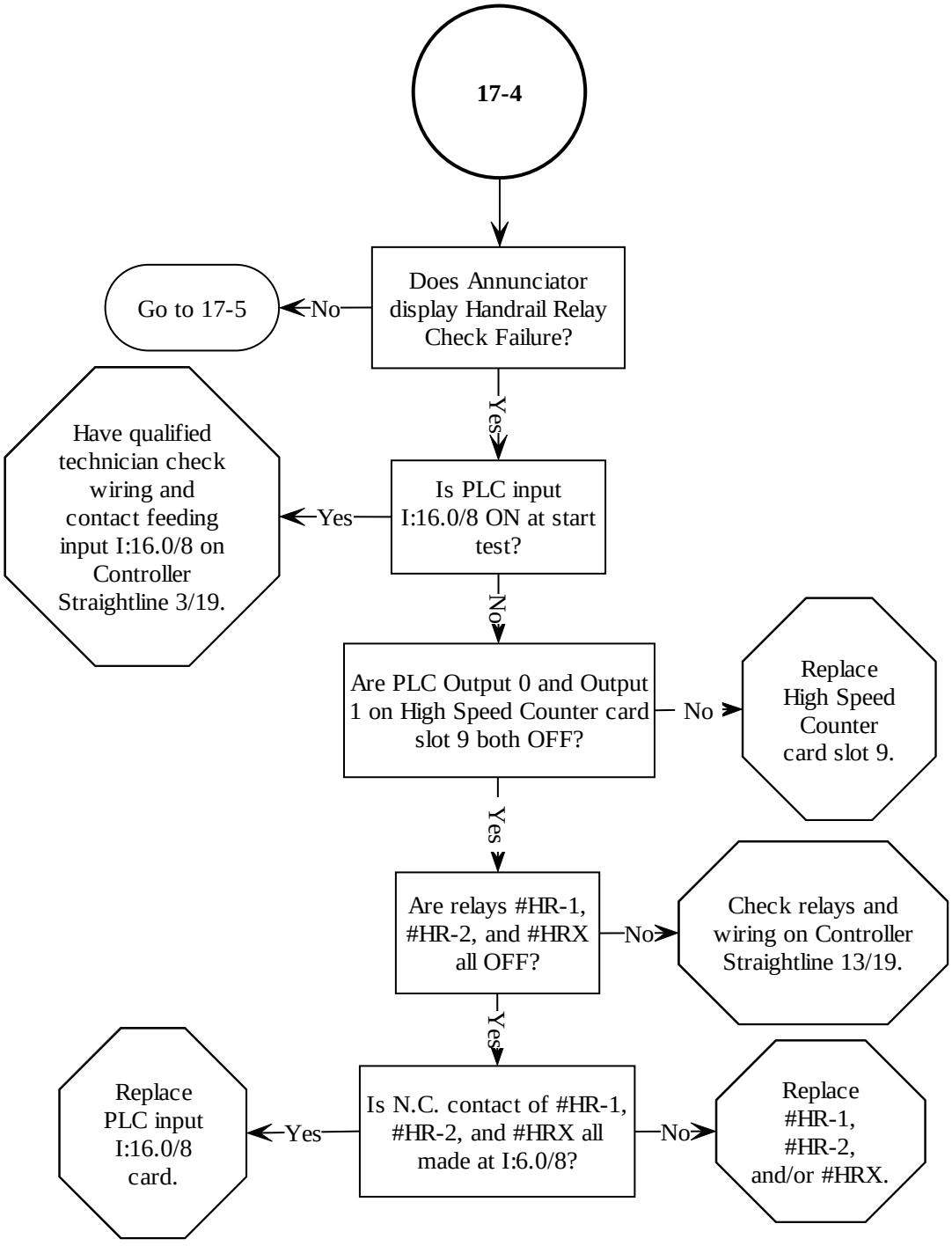
17-3 Starting Fault (#6T Start Relay) has occurred pg.3

17-3 STARTING FAULT (#6T Start Relay) HAS OCCURRED pg.3



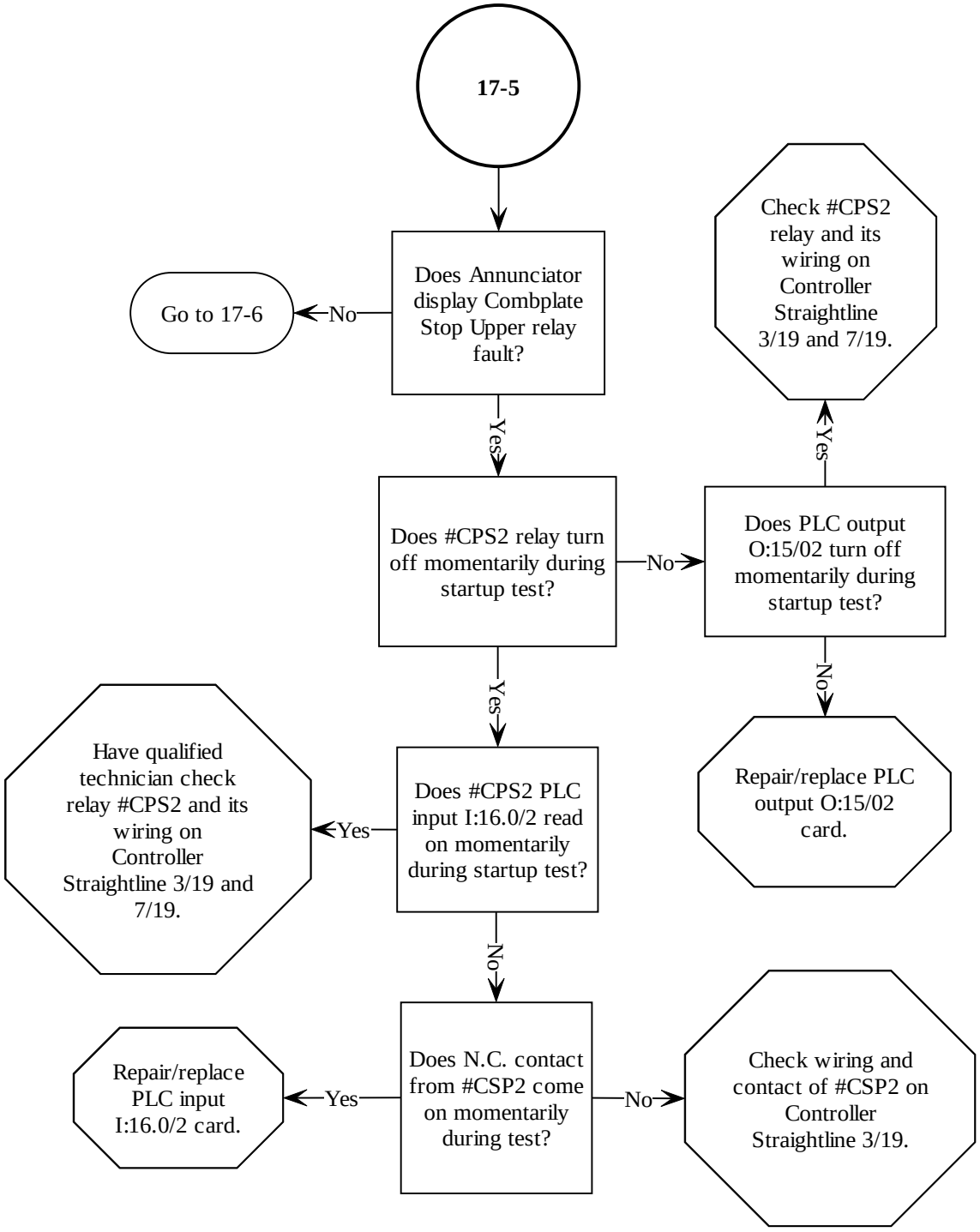
17-4 Starting Fault (Handrail Relay Check Failure) has occurred pg.4

17-4 STARTING FAULT (Handrail RelayCheck Failure) HAS OCCURRED pg.4



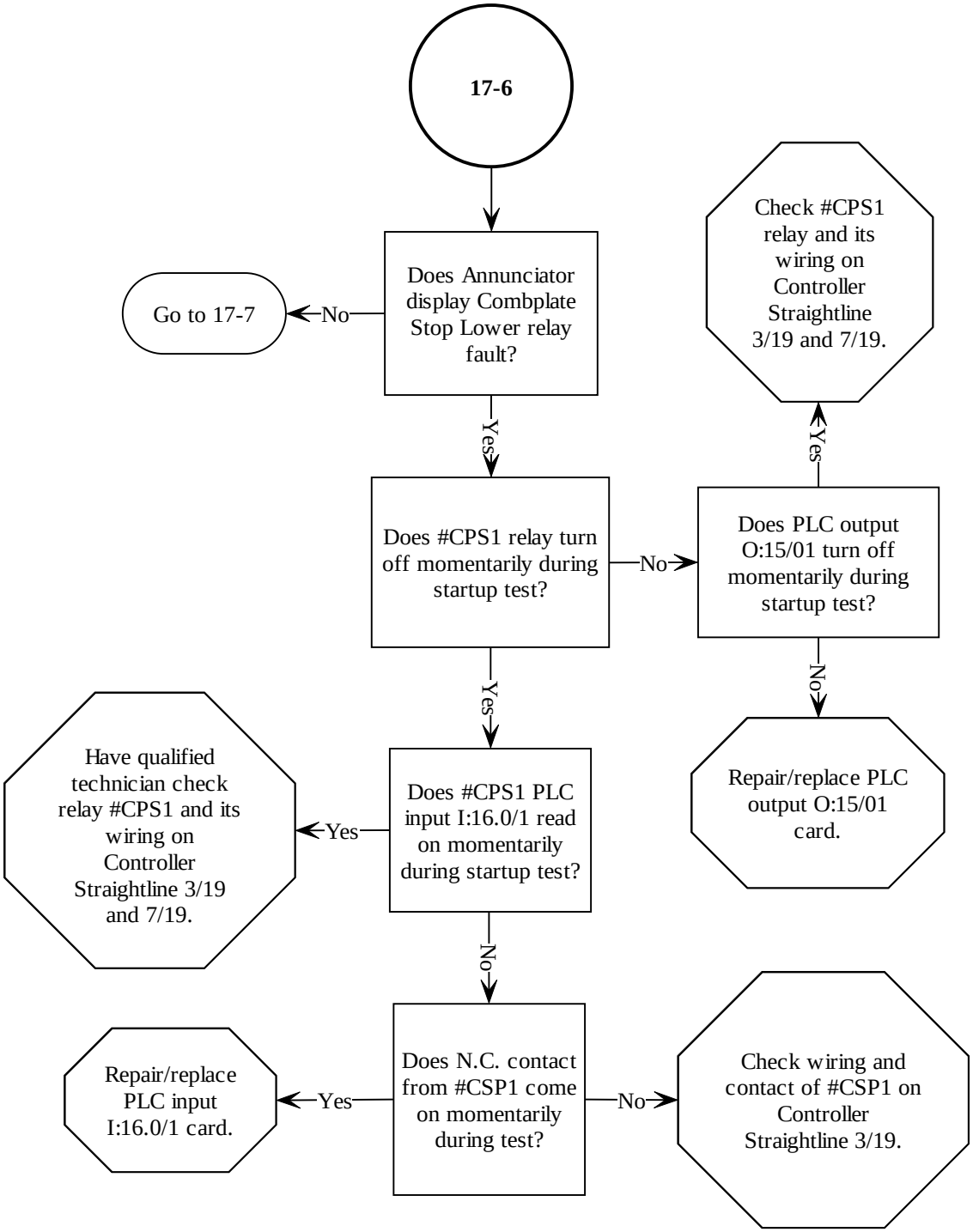
17-5 Starting Fault (Combplate Stop Upper Relay) has occurred pg.5

17-5 STARTING FAULT (Combplate Stop Upper Relay) HAS OCCURRED pg.5



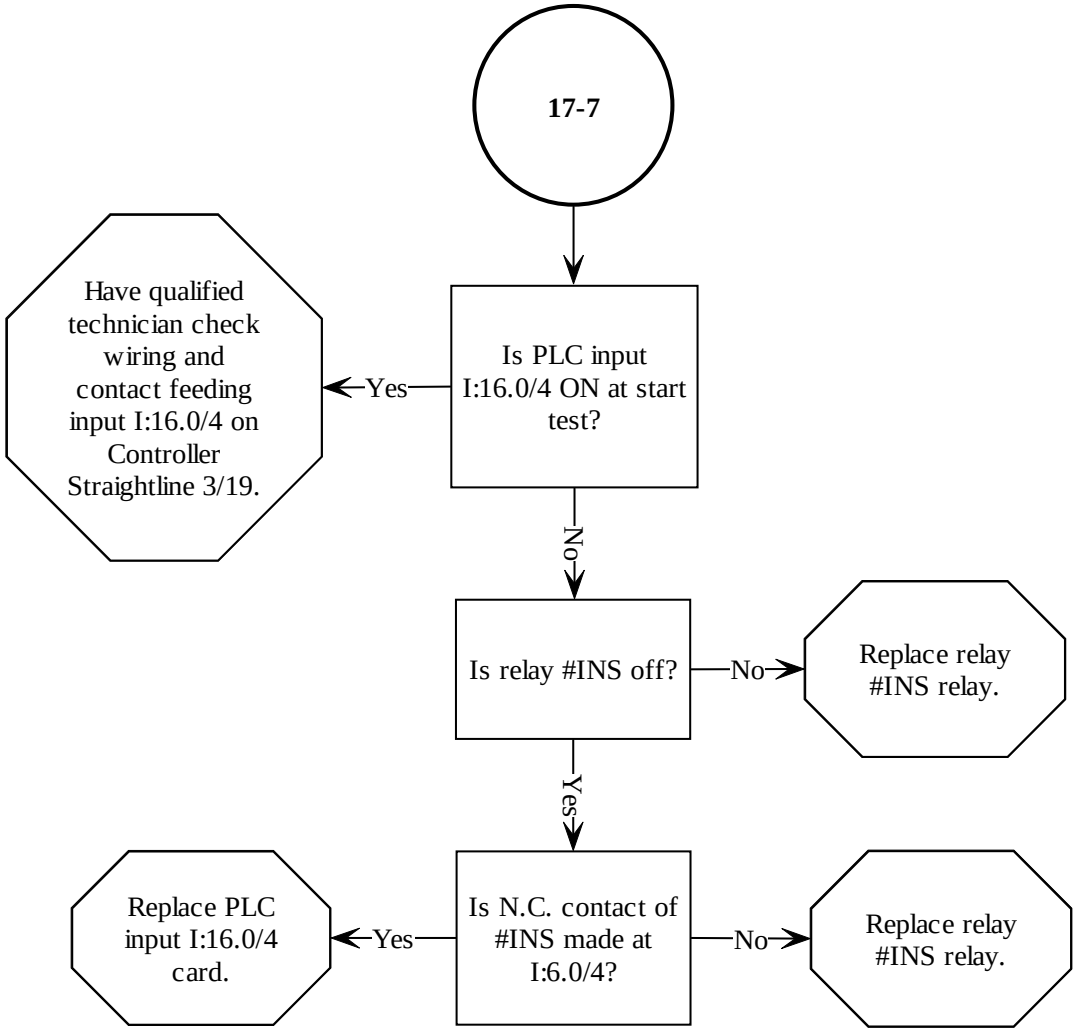
17-6 Starting Fault (Combplate Stop Lower Relay) has occurred pg.6

17-6 STARTING FAULT (Combplate Stop Lower Relay) HAS OCCURRED pg.6



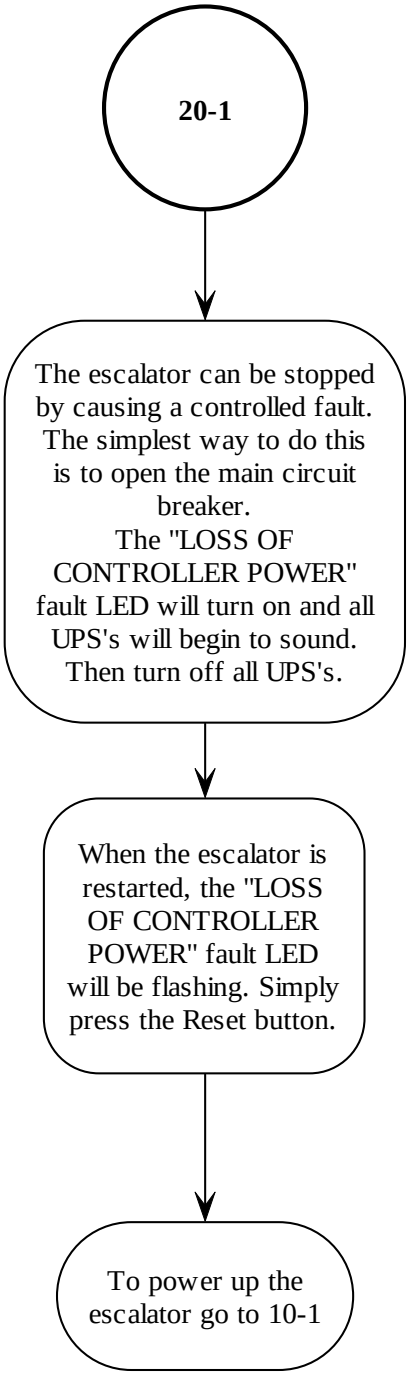
17-7 Starting Fault (Inspection Relay) has occurred pg.7

17-7 STARTING FAULT (Inspection Relay) HAS OCCURRED pg.7

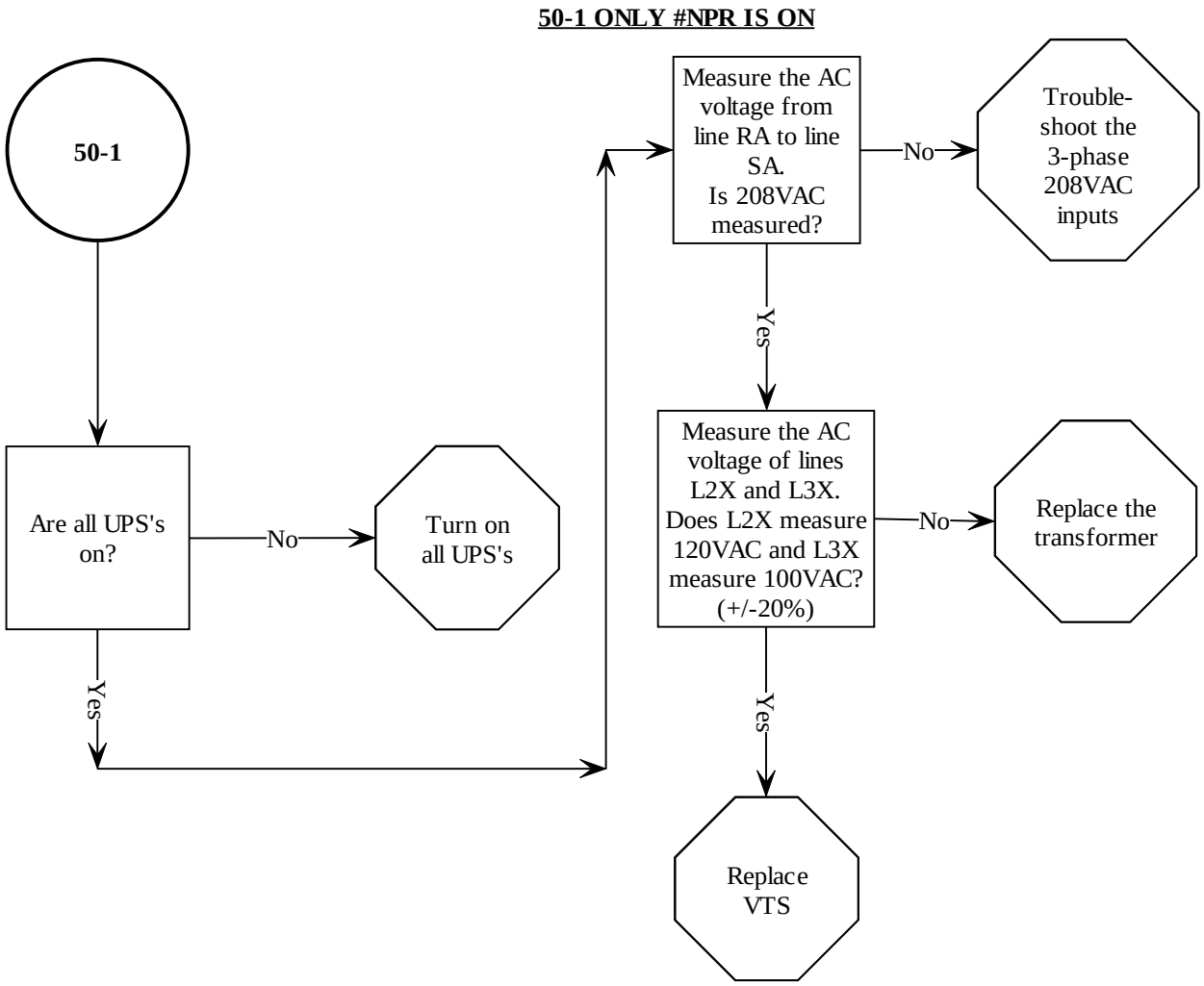


20-1 Stopping the Escalator

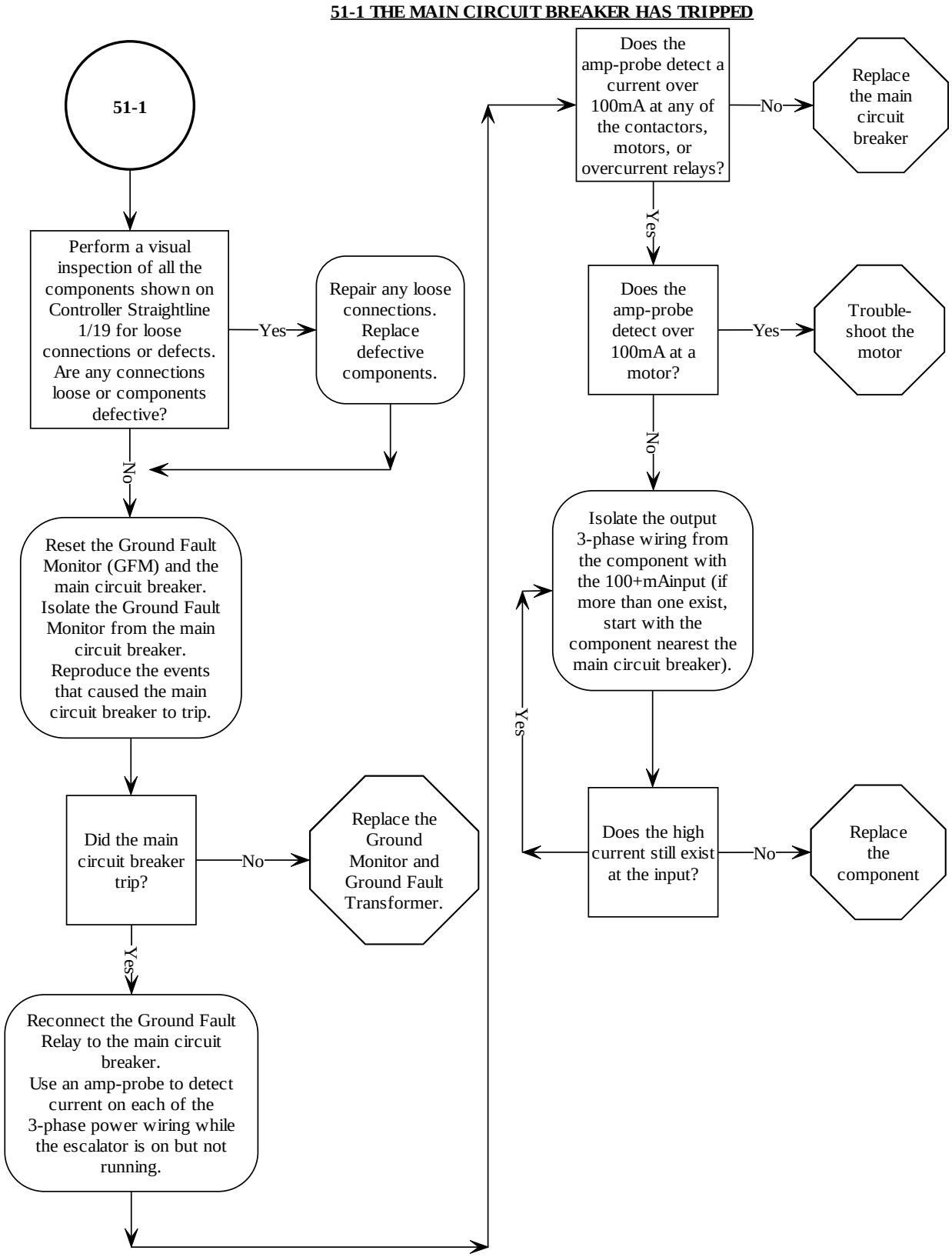
20-1 STOPPING THE ESCALATOR



50-1 Only #NPR is ON

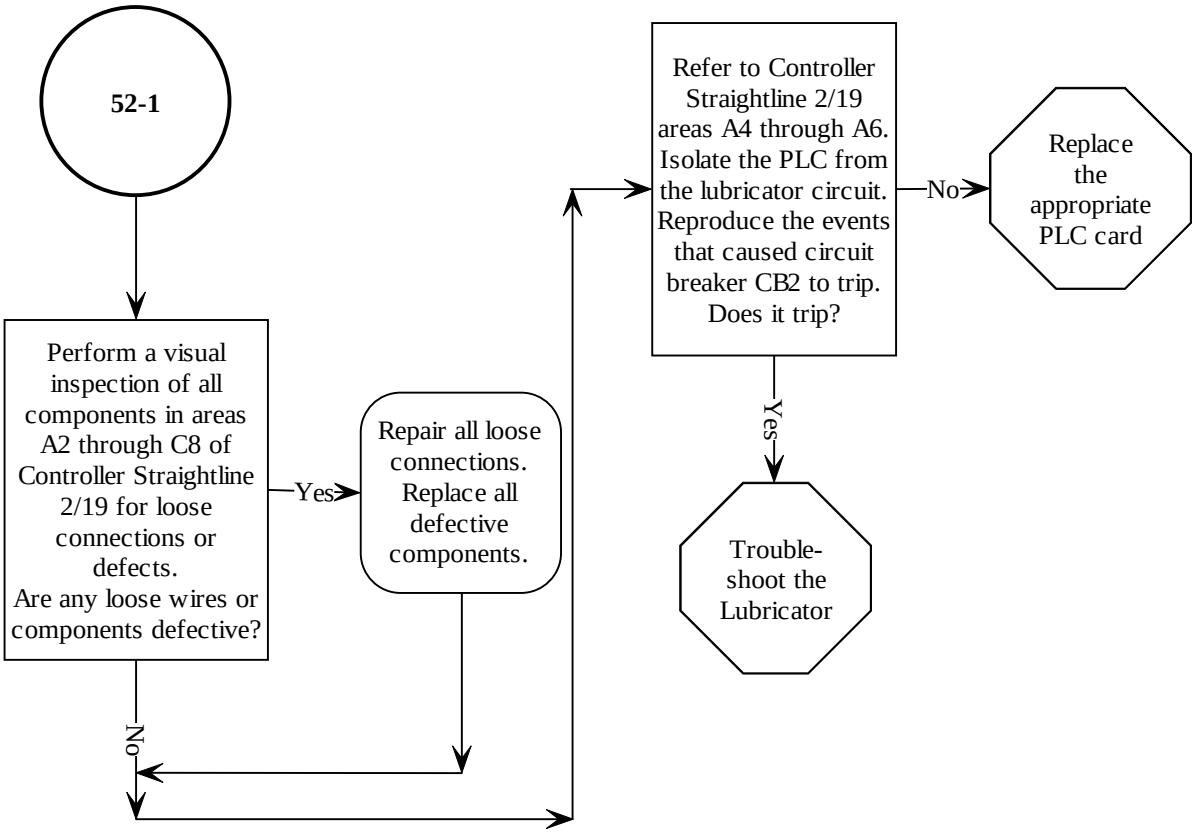


51-1 Main Circuit Breaker has tripped

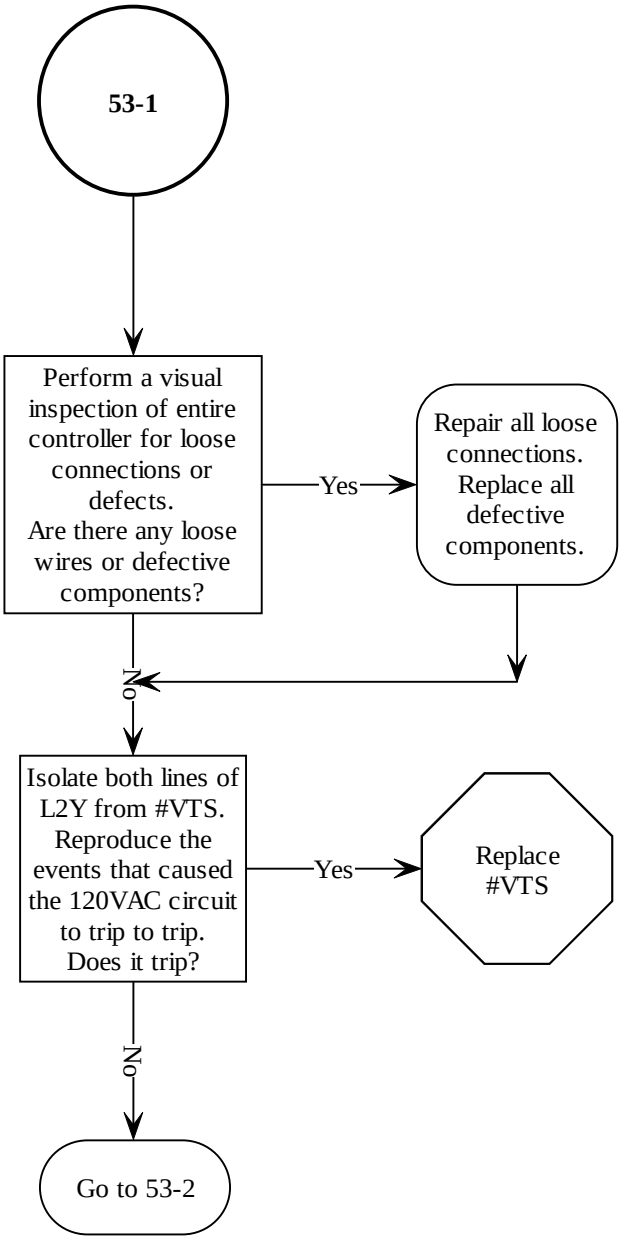


52-1 120VAC Circuit Breaker CB2 has tripped

52-1 THE 120VAC CIRCUIT BREAKER CB2 HAS TRIPPED

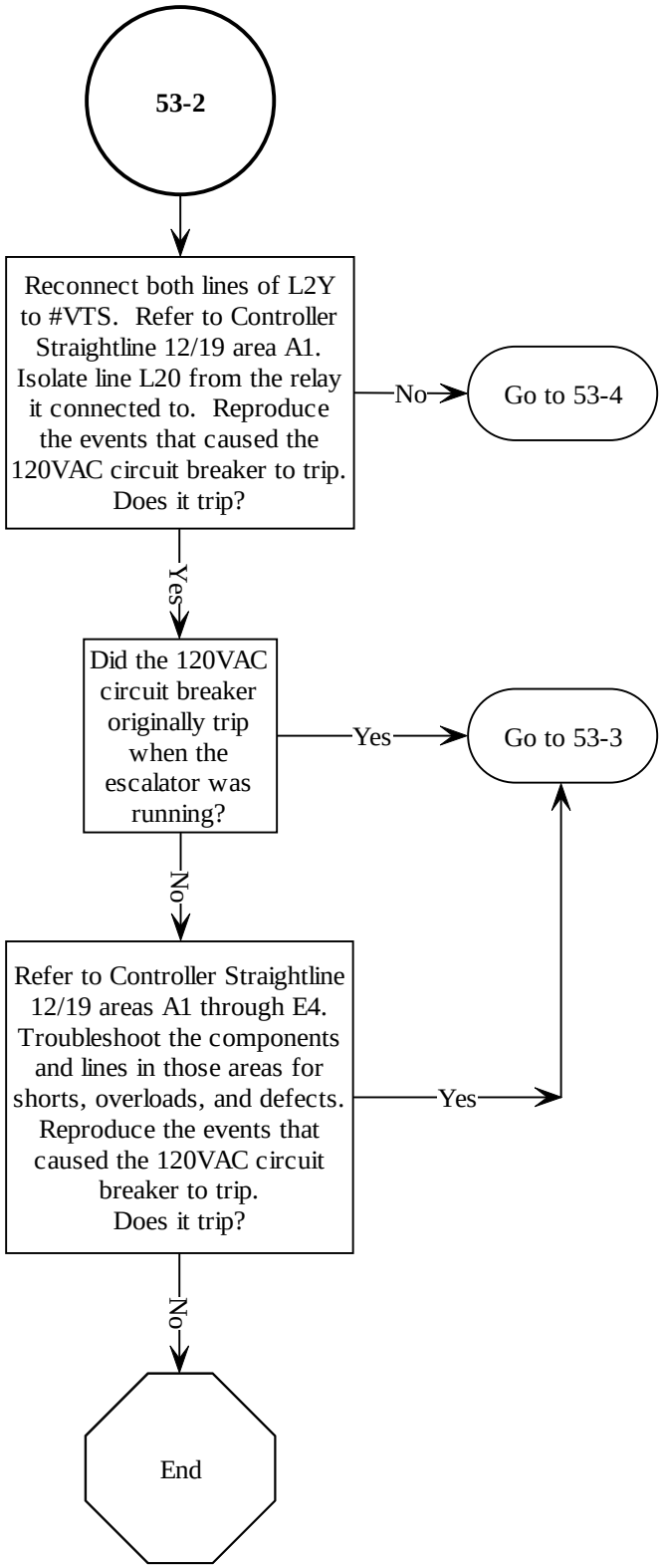


53-1 THE 120VAC CIRCUIT BREAKER CB3 HAS TRIPPED pg.1



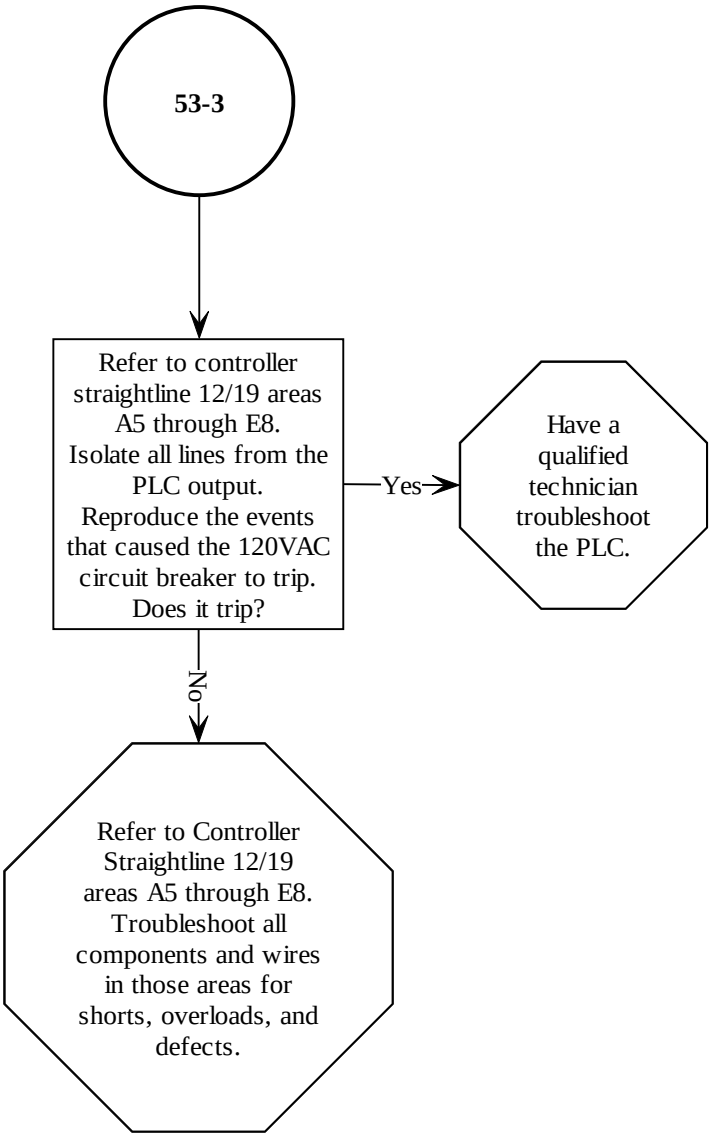
53-2 120VAC Circuit Breaker CB3 has tripped pg.2

53-2 THE 120 VAC CIRCUIT BREAKER CB3 HAS TRIPPED pg.2



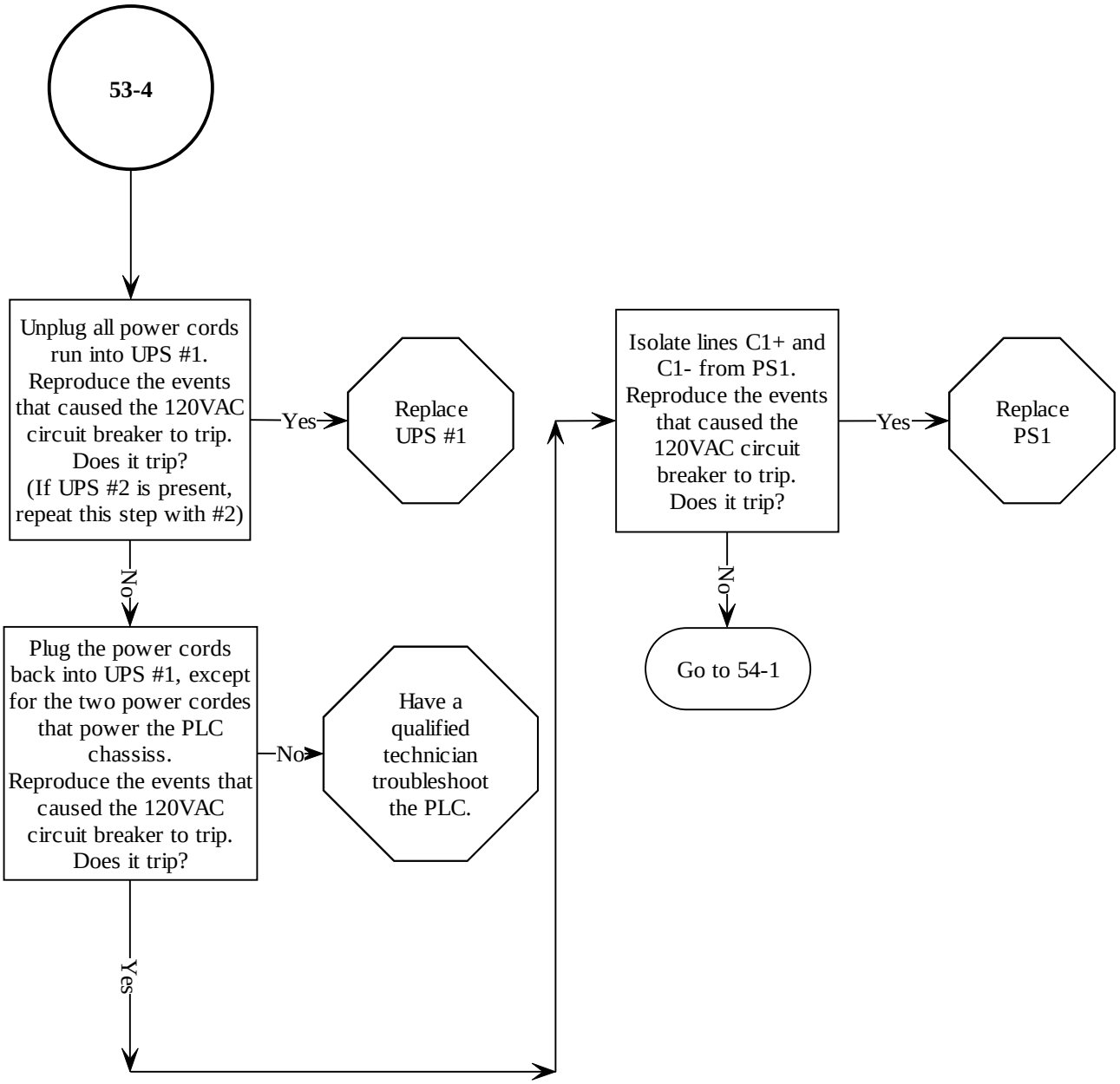
53-3 120VAC Circuit Breaker CB3 has tripped pg.3

53-3 THE 120VAC CIRCUIT BREAKER CB3 HAS TRIPPED pg.3

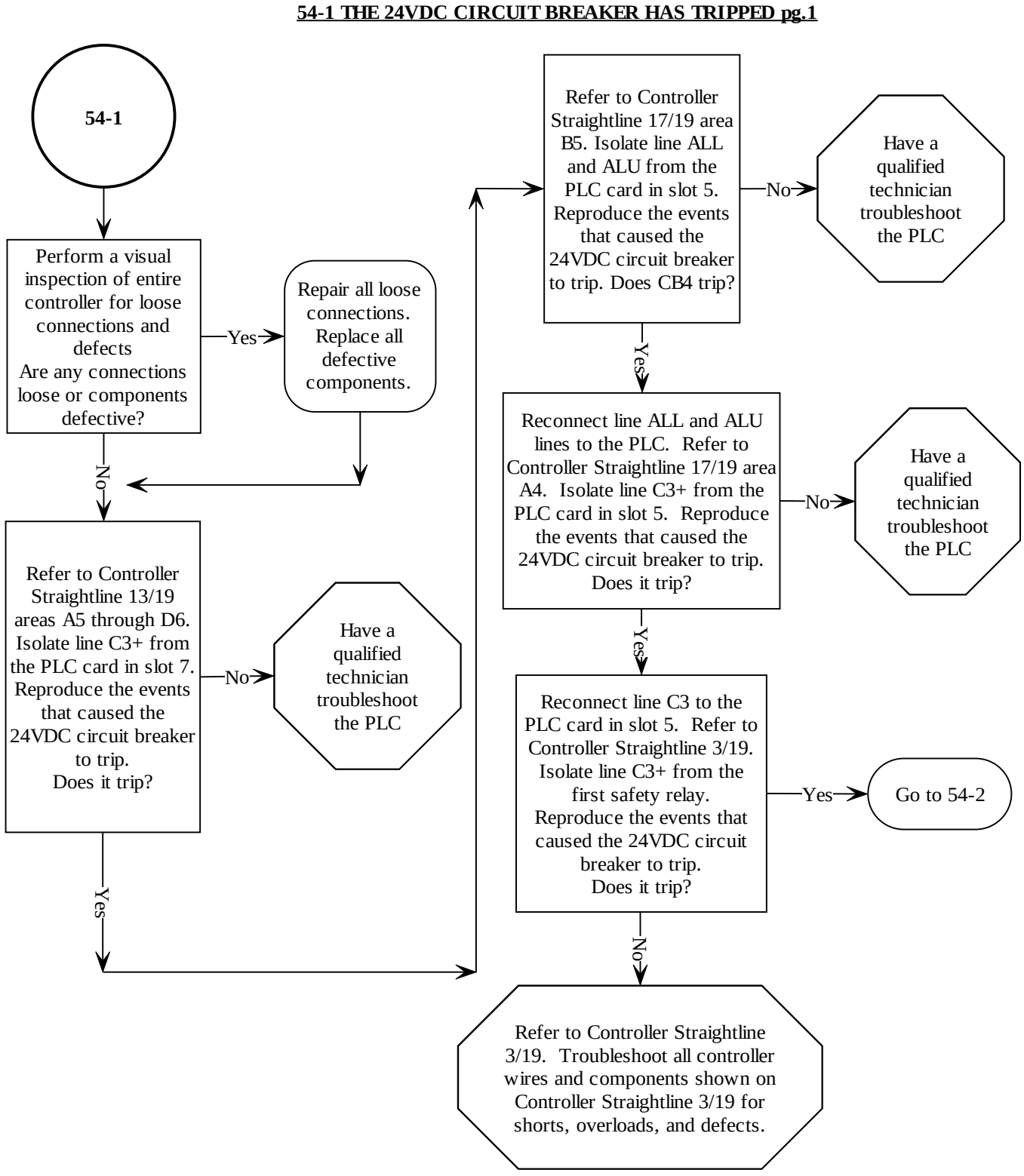


53-4 120VAC Circuit Breaker CB3 has tripped pg.4

53-4 THE 120VAC CIRCUIT BREAKER CB3 HAS TRIPPED pg.4

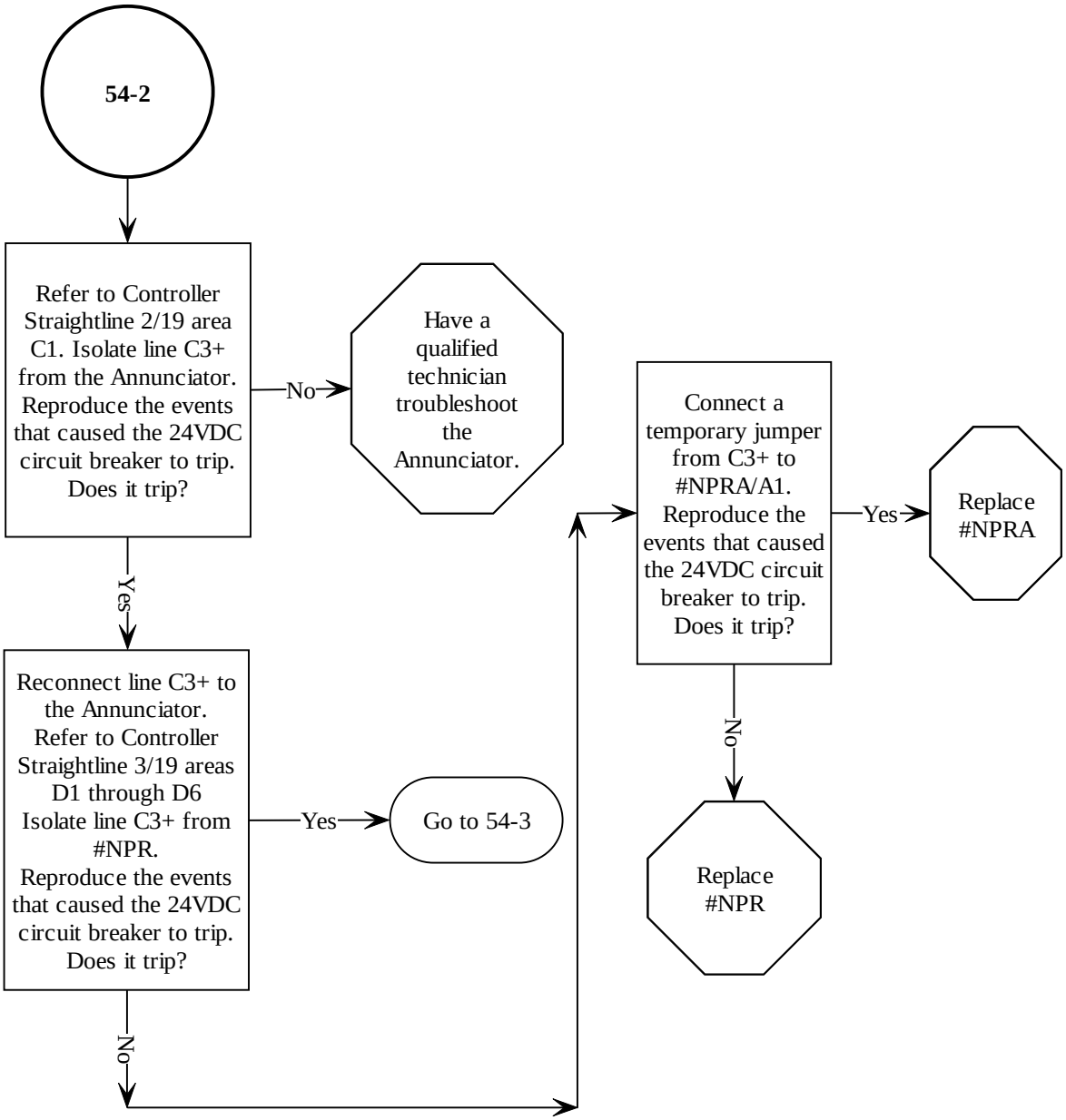


54-1 24VDC Circuit Breaker has tripped pg.1



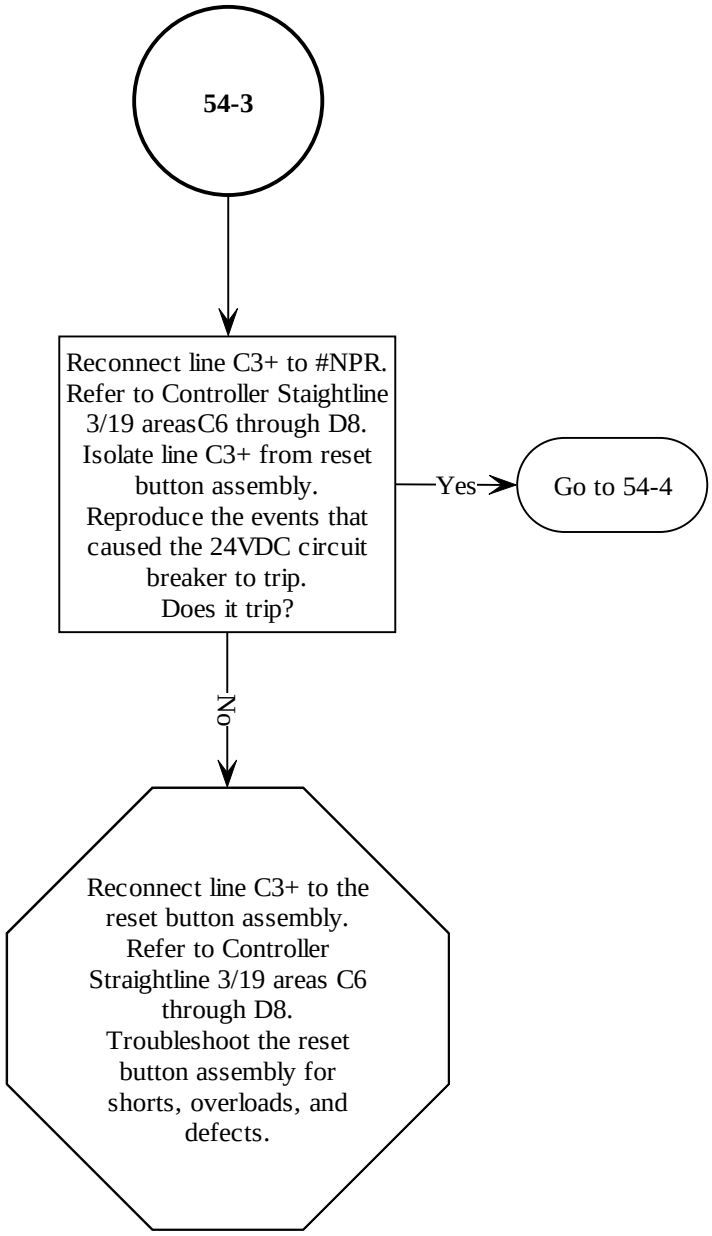
54-2 24VDC Circuit Breaker has tripped pg.2

54-2 THE 24VDC CIRCUIT BREAKER HAS TRIPPED pg.2



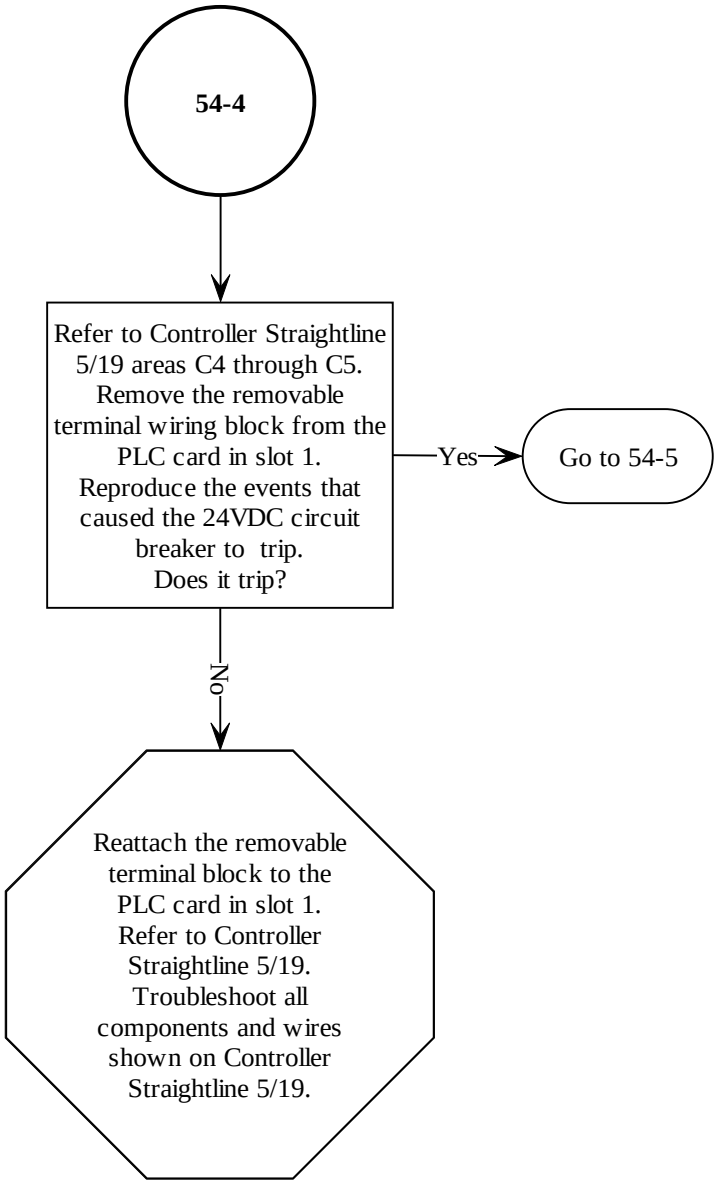
54-3 24VDC Circuit Breaker has tripped pg.3

54-3 THE 24VDC CIRCUIT BREAKER HAS TRIPPED pg.3



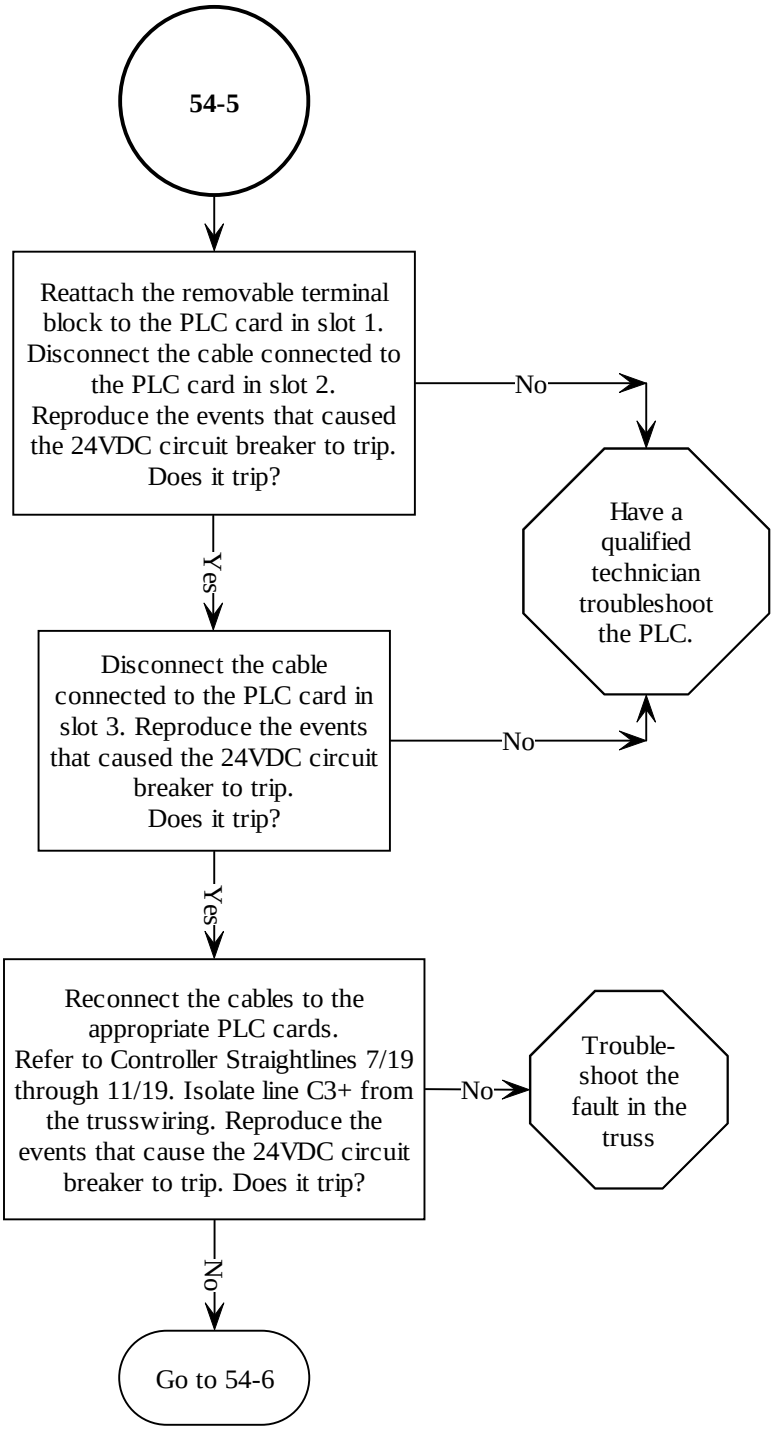
54-4 24VDC Circuit Breaker has tripped pg.4

54-4 THE 24VDCD CIRCUIT BREAKER HAS TRIPPED pg.4

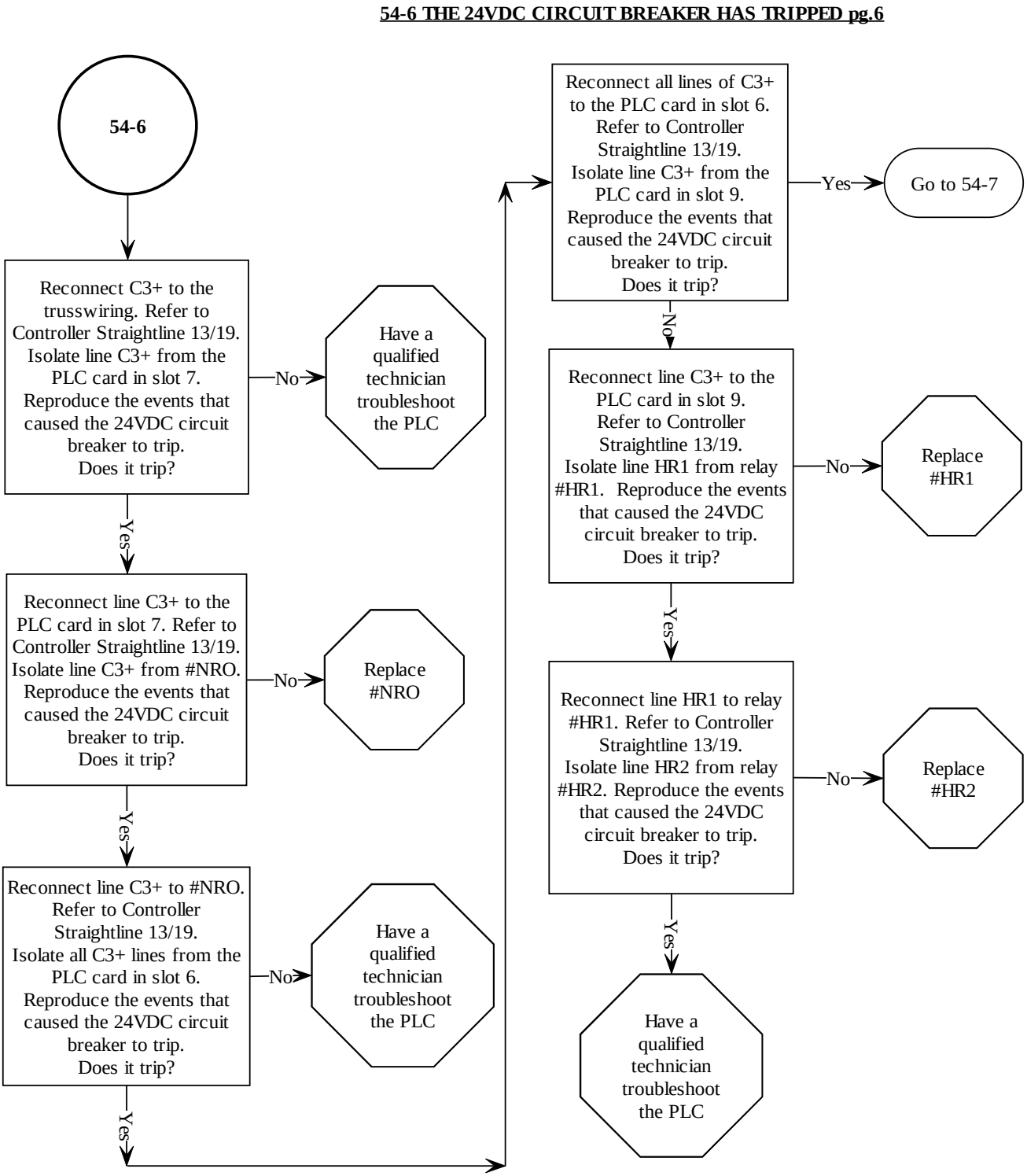


54-5 24VDC Circuit Breaker has tripped pg.5

54-5 THE 24VDC CIRCUIT BREAKER HAS TRIPPED pg.5

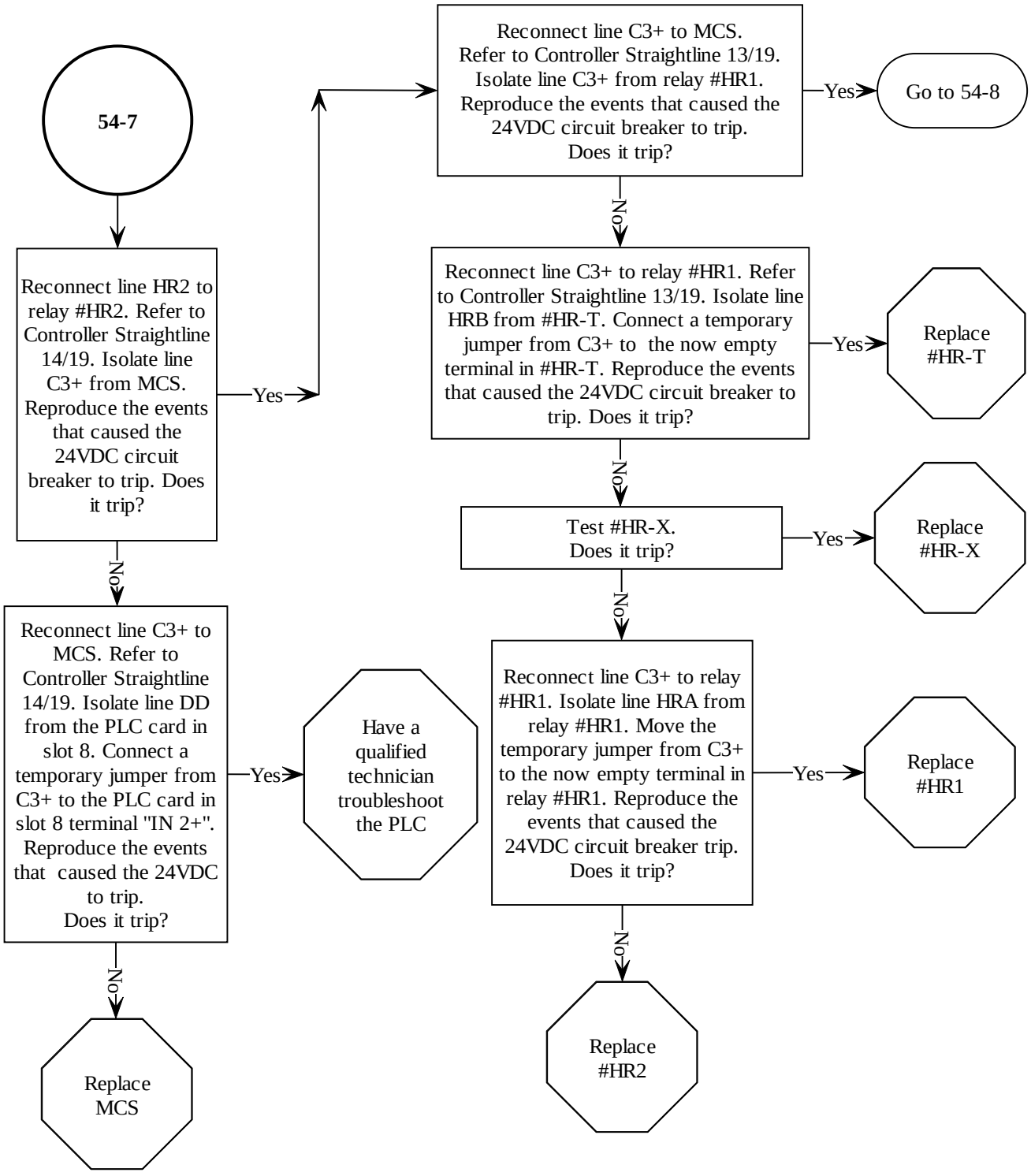


54-6 24VDC Circuit Breaker has tripped pg.6



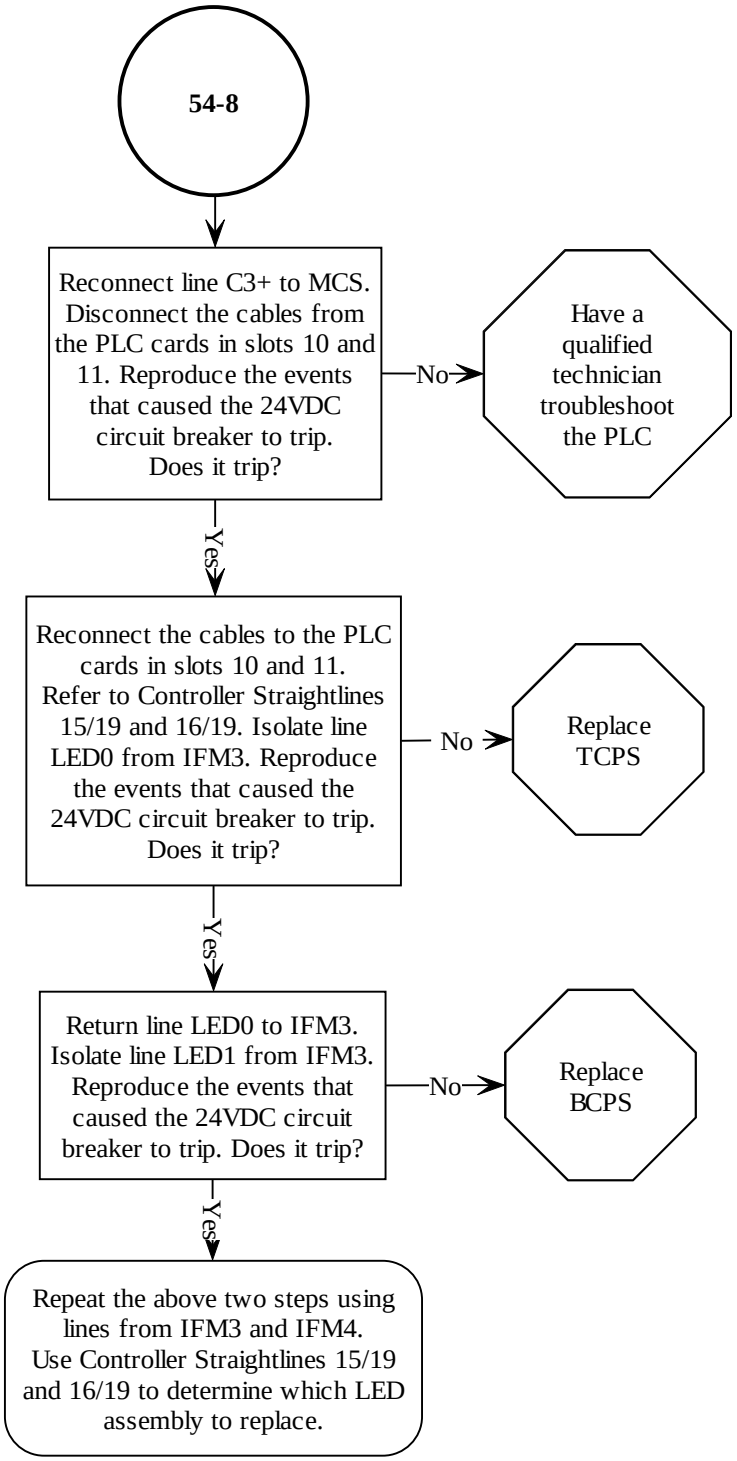
54-7 24VDC Circuit Breaker has tripped pg.7

54-7 THE 24VDC CIRCUIT BREAKER HAS TRIPPED pg.7



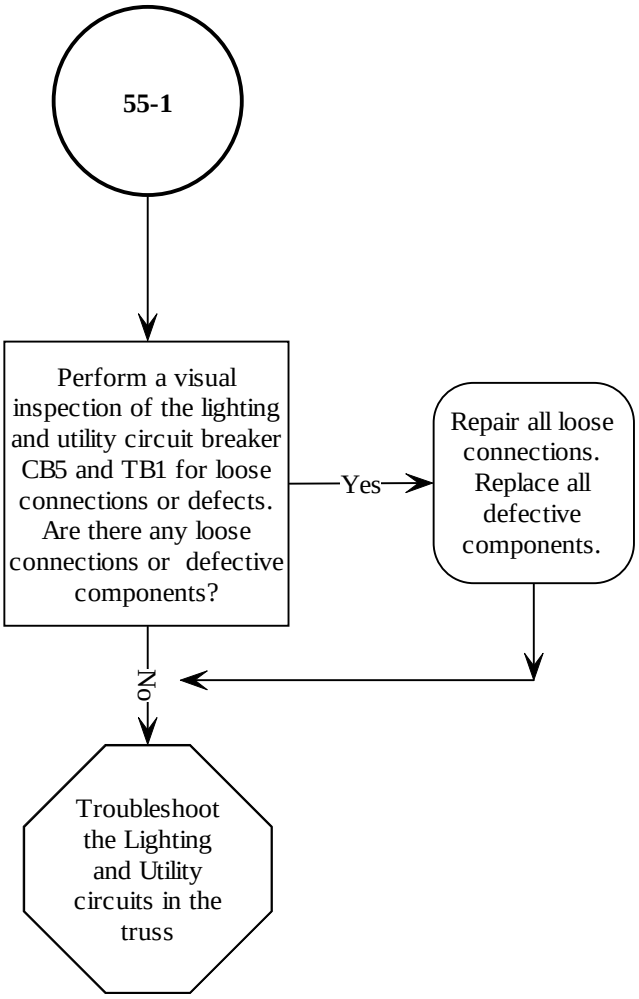
54-8 24VDC Circuit Breaker has tripped pg.8

54-8 THE 24VDC CIRCUIT BREAKER HAS TRIPPED pg.8



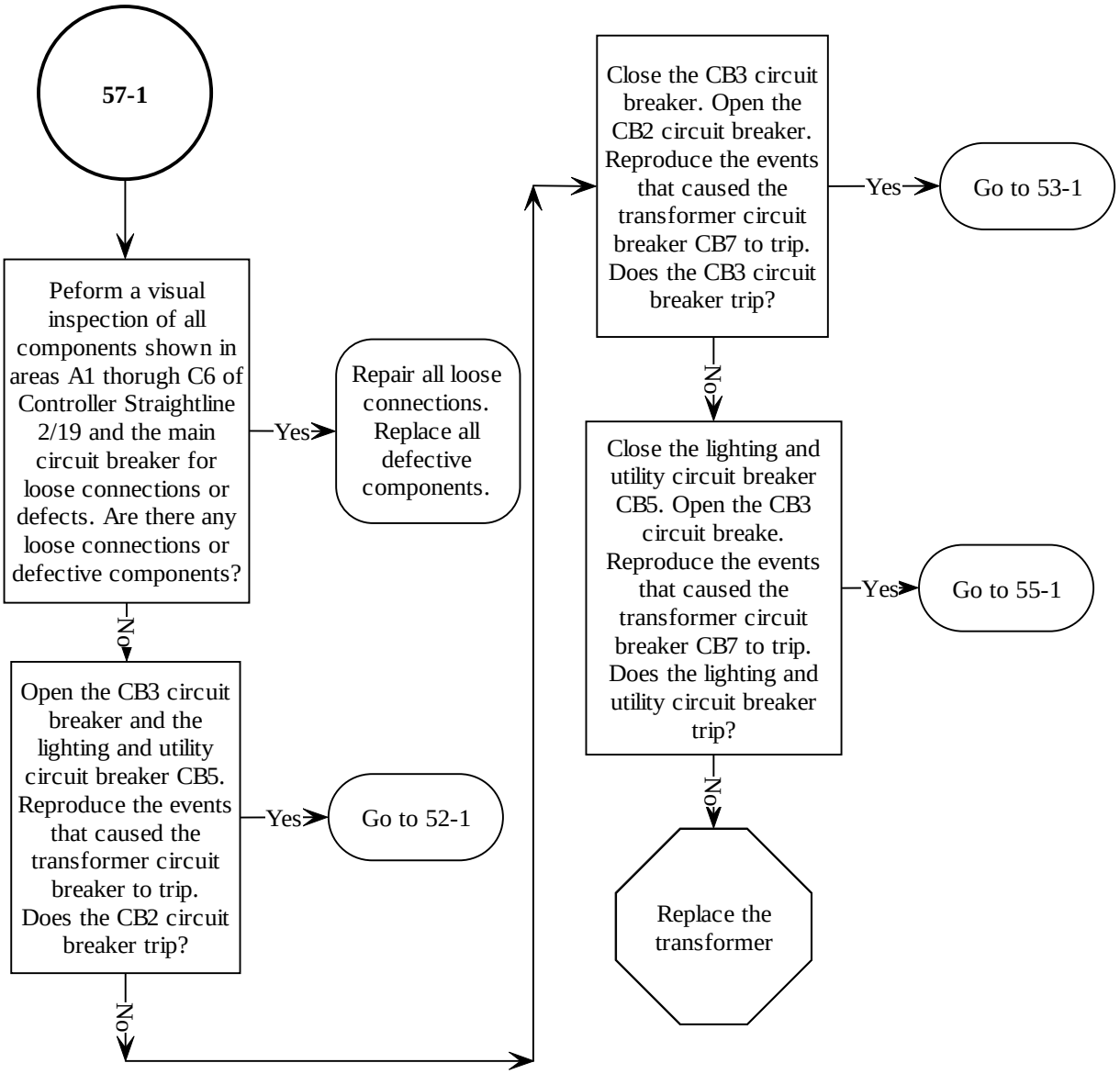
55-1 Lighting & Utility Circuit Breaker CB5 has tripped

55-1 THE LIGHTING AND UTILITY CIRCUIT BREAKER CB5 HAS TRIPPED



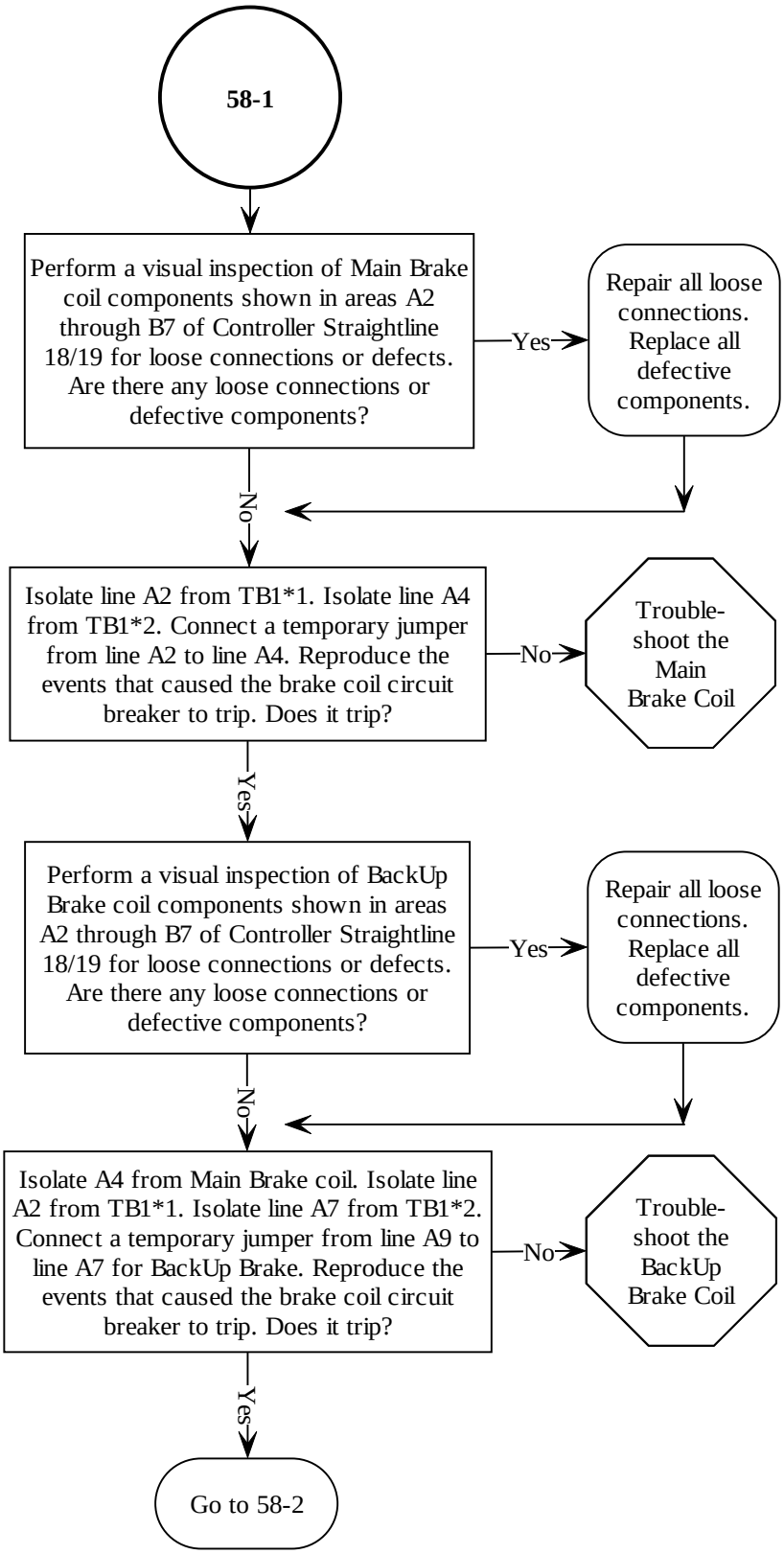
57-1 Transformer Circuit Breaker CB7 has tripped

57-1 THE TRANSFORMER CIRCUIT BREAKER CB7 HAS TRIPPED

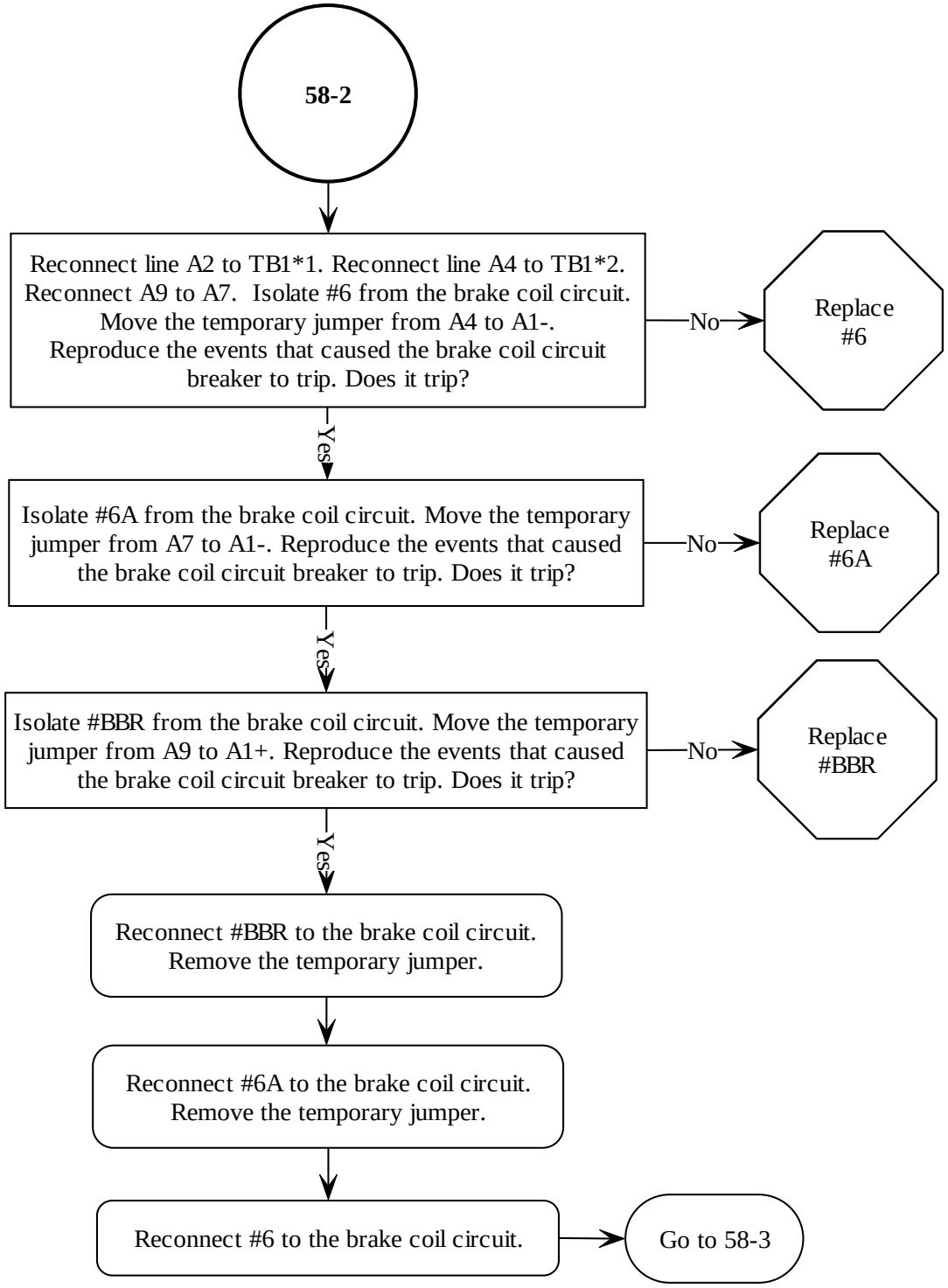


58-1 Brake Coil Circuit Breaker has tripped pg.1

58-1 THE BRAKE COIL CIRCUIT BREAKER HAS TRIPPED pg.1

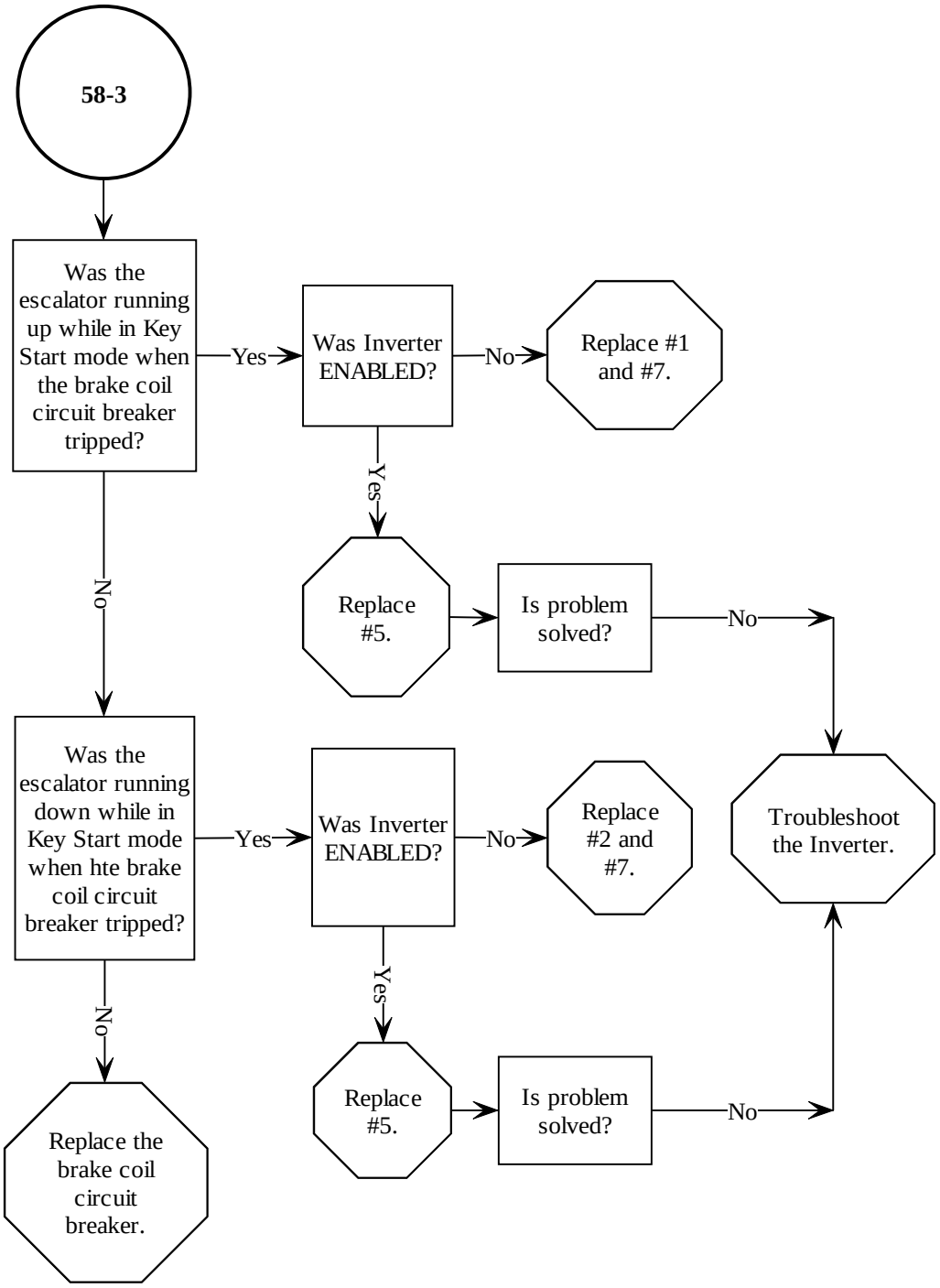


58-2 THE BRAKE COIL CIRCUIT BREAKER HAS TRIPPED pg.2



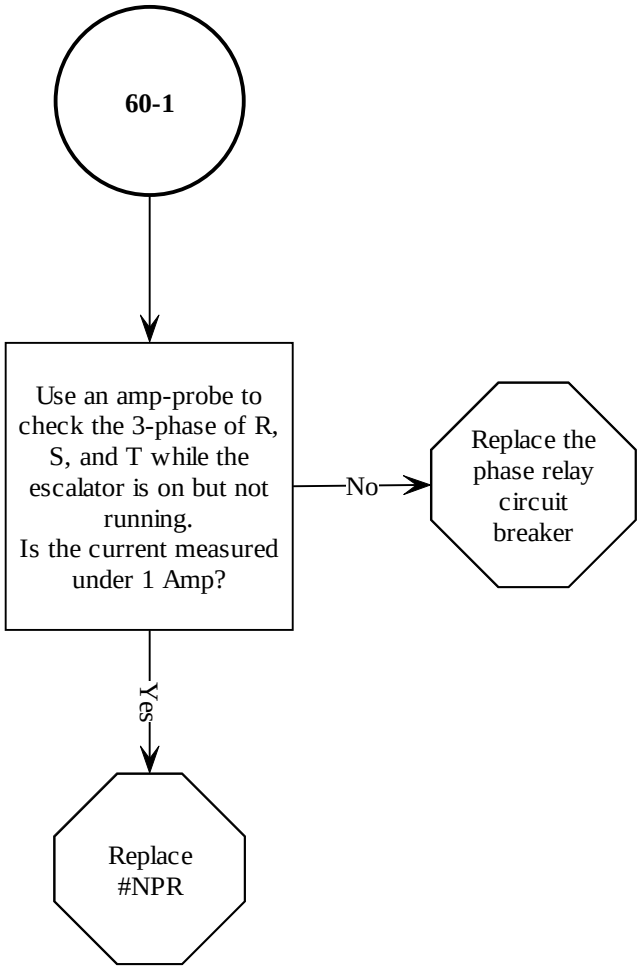
58-3 Brake Coil Circuit Breaker has tripped pg.3

58-3 THE BRAKE COIL CIRCUIT BREAKER HAS TRIPPED pg3



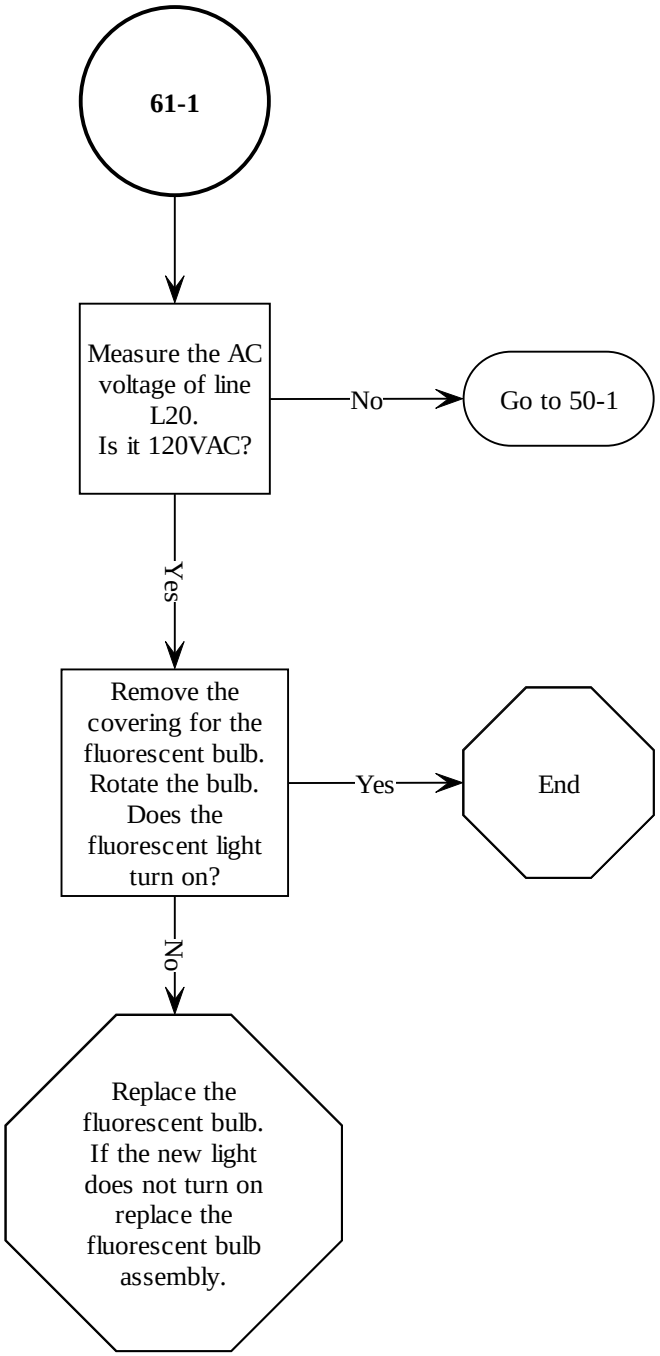
60-1 Phase Relay Circuit Breaker has tripped

60-1 THE PHASE RELAY CIRCUIT BREAKER HAS TRIPPED

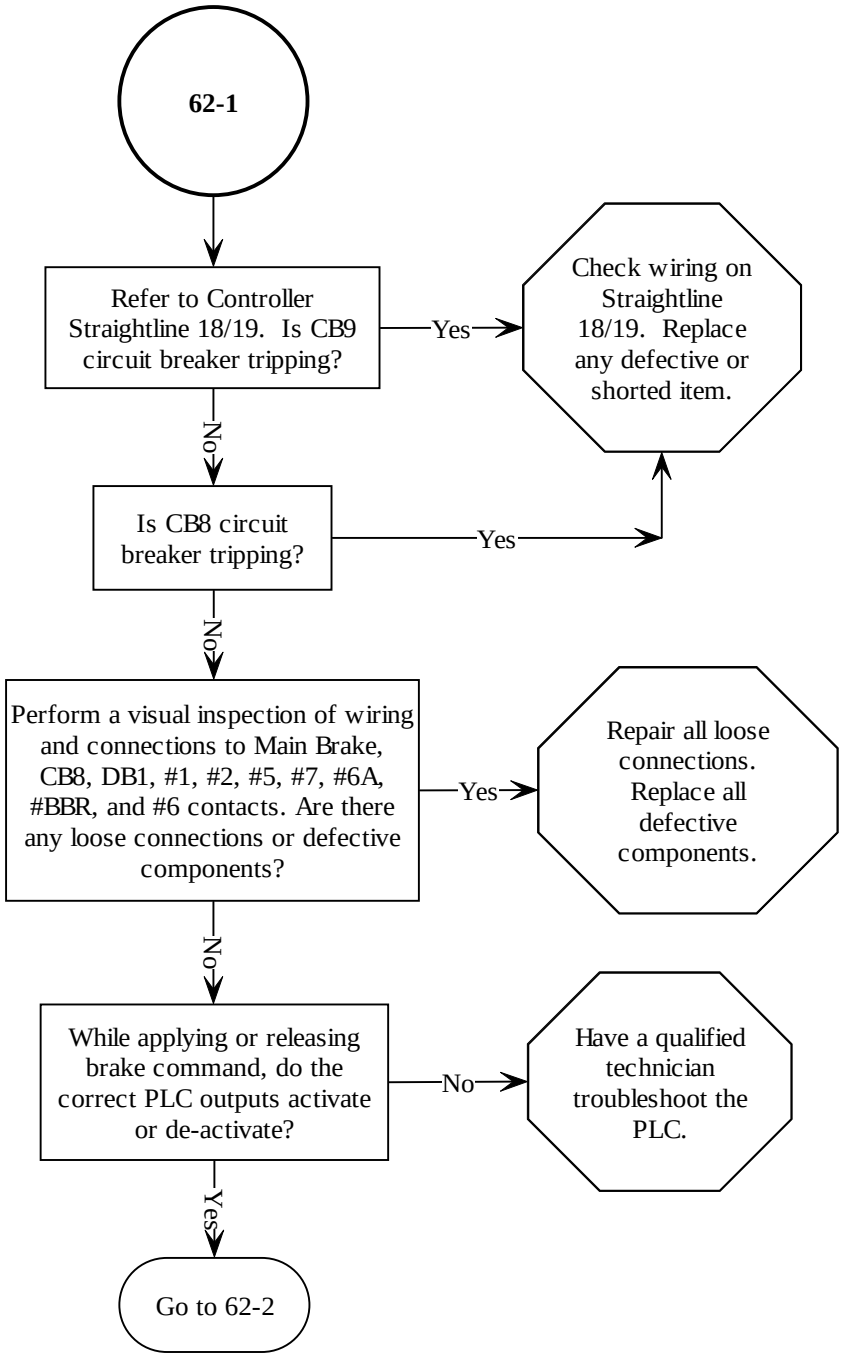


61-1 Fluorescent Light does not turn ON

61-1 THE FLUORESCENT LIGHT DOES NOT TURN ON

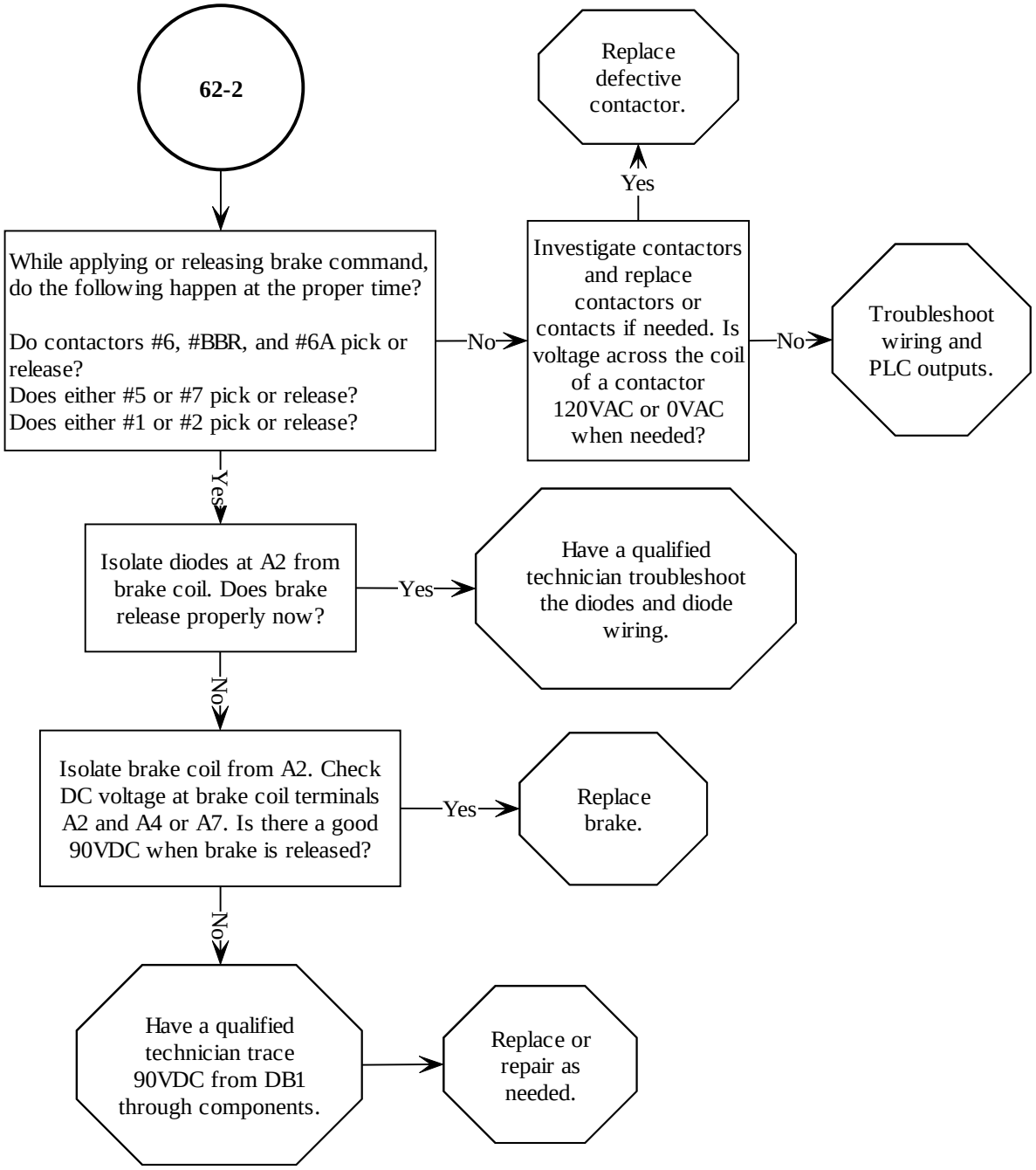


62-1 THE MAIN BRAKE DOES NOT RELEASE OR APPLY WHEN COMMANDED pg.1



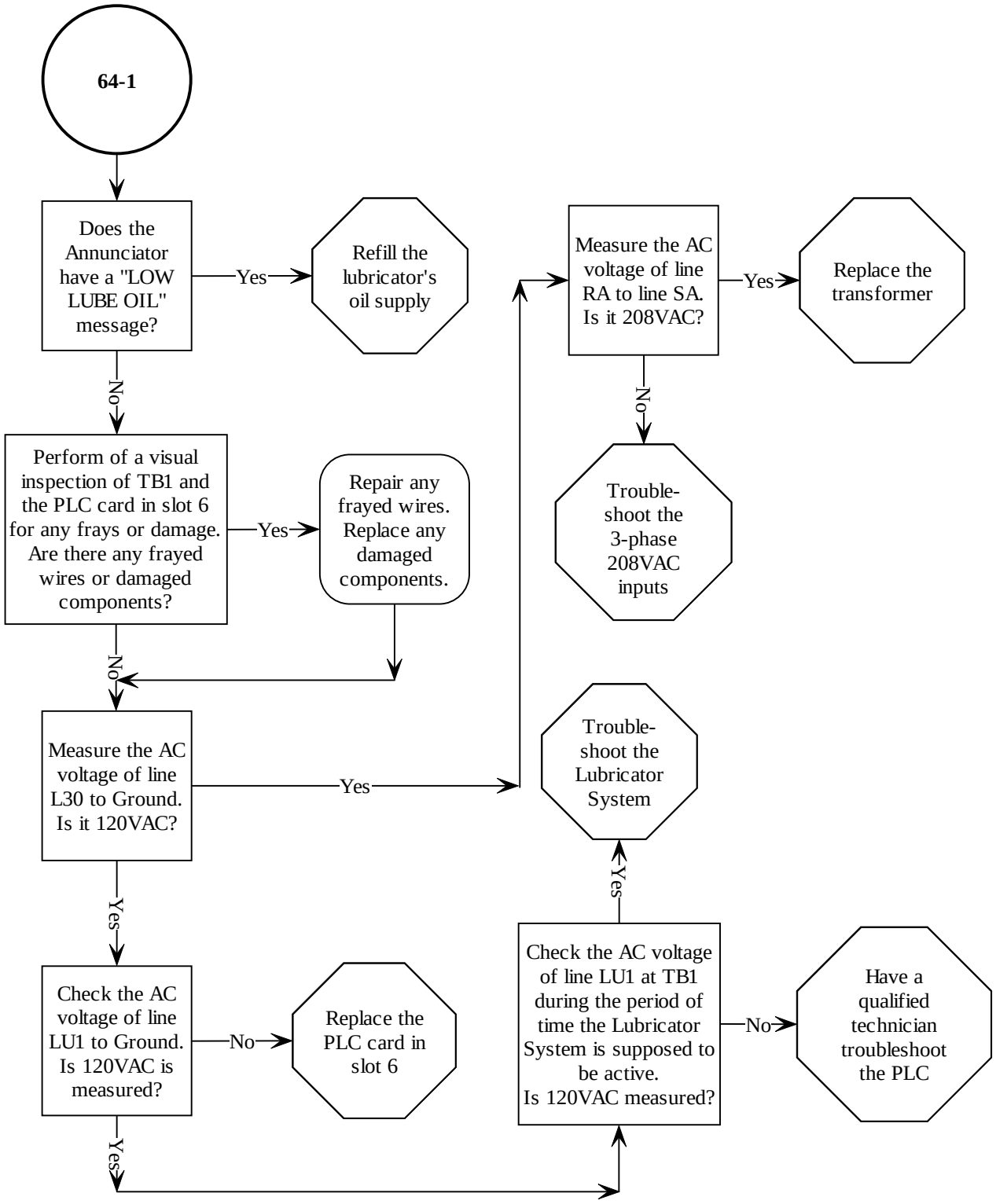
62-2 Main Brake does not release or apply when commanded pg.2

62-2 THE MAIN BRAKE DOES NOT RELEASE OR APPLY WHEN COMMANDED pg.2



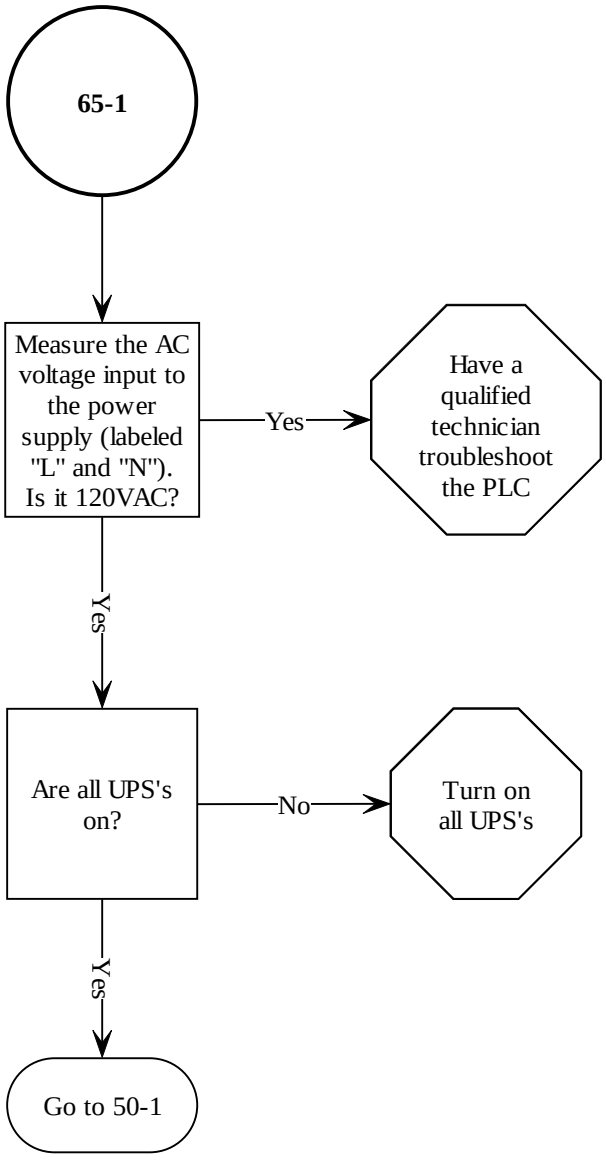
64-1 Lubricator does not run as scheduled

64-1 THE LUBRICATOR DOES NOT RUN AS SCHEDULED



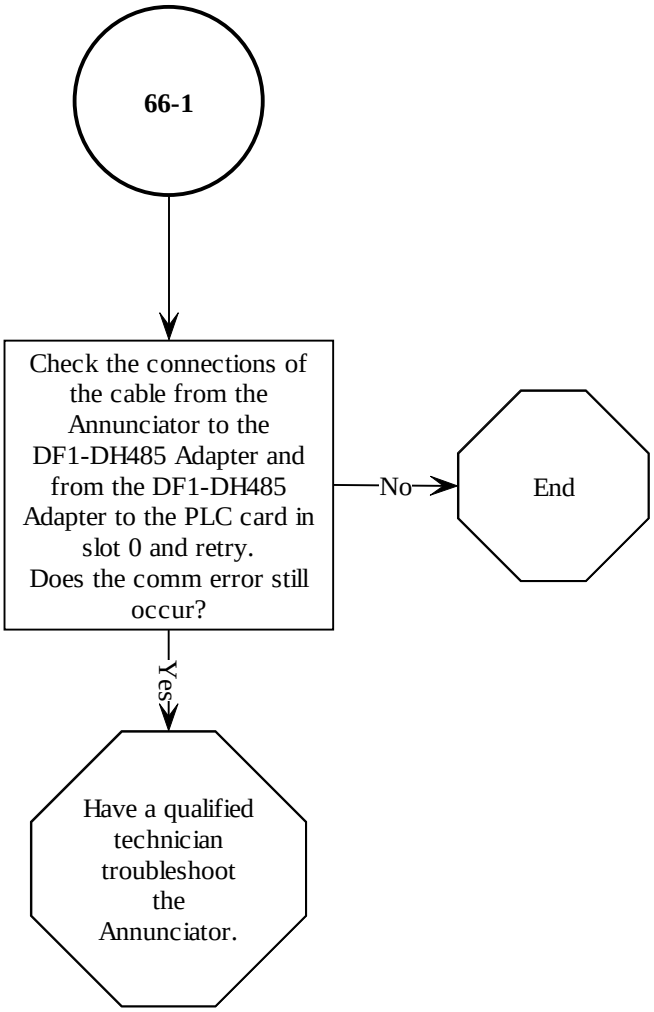
65-1 PLC Power Supply is not ON

65-1 A PLC POWER SUPPLY IS NOT ON



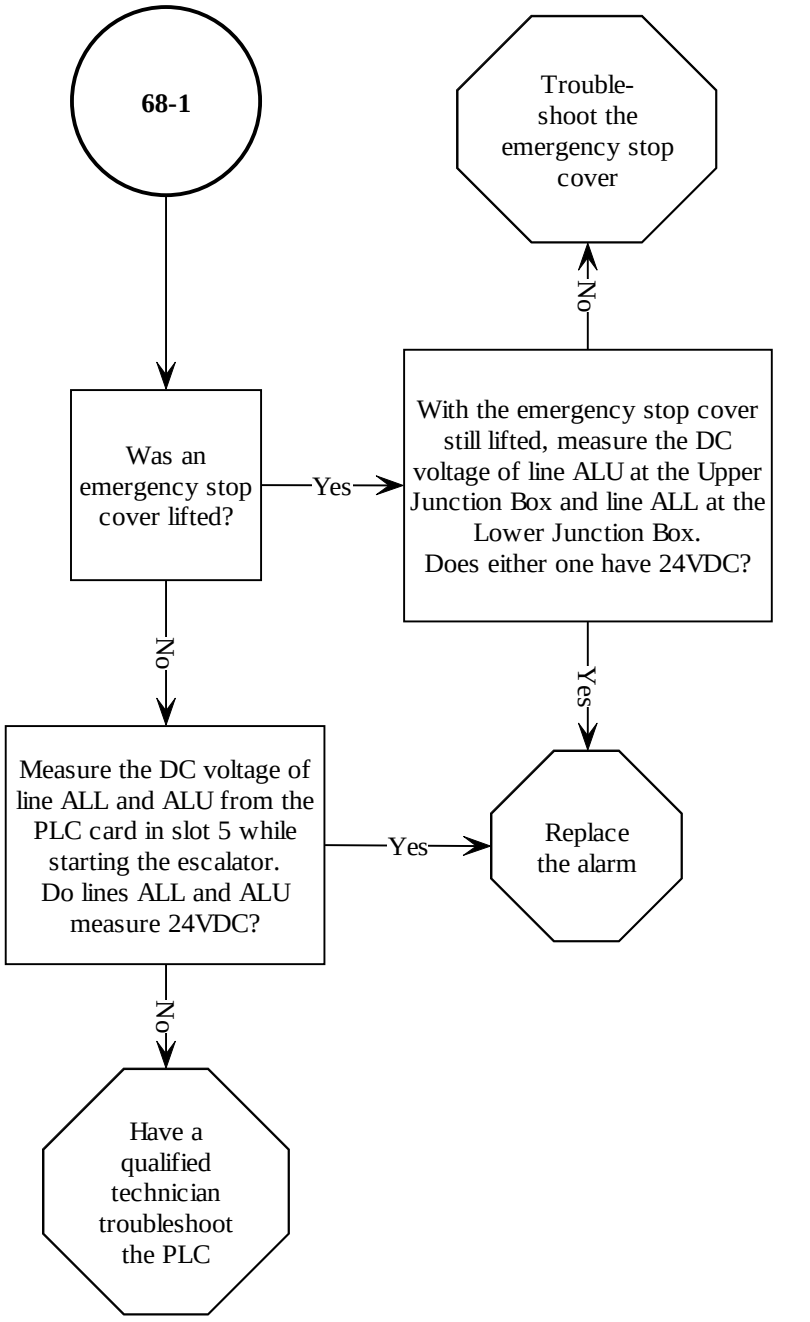
66-1 Annunciator is displaying a communications error

66-1 THE ANNUNCIATOR IS DISPLAYING A COMMUNICATIONS ERROR



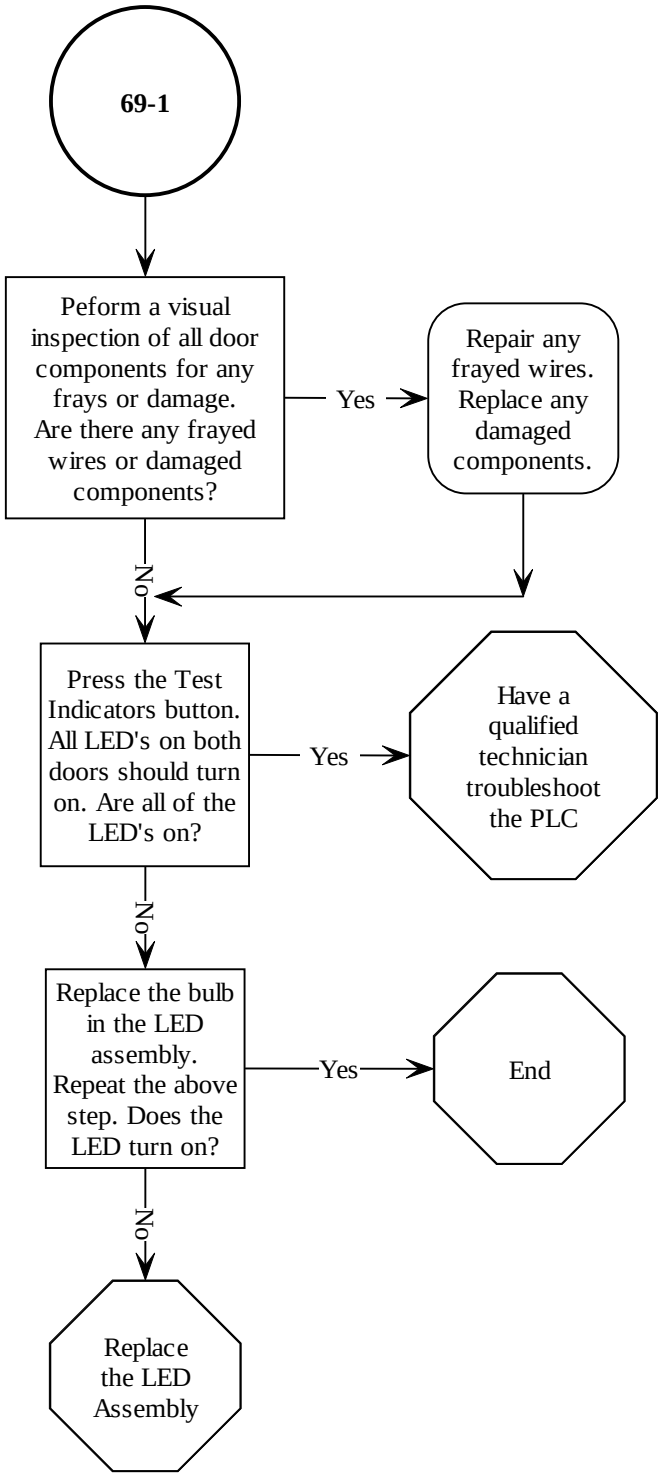
68-1 Alarms do not sound when they are supposed to

68-1 THE ALARMS DO NOT SOUND WHEN THEY ARE SUPPOSED TO



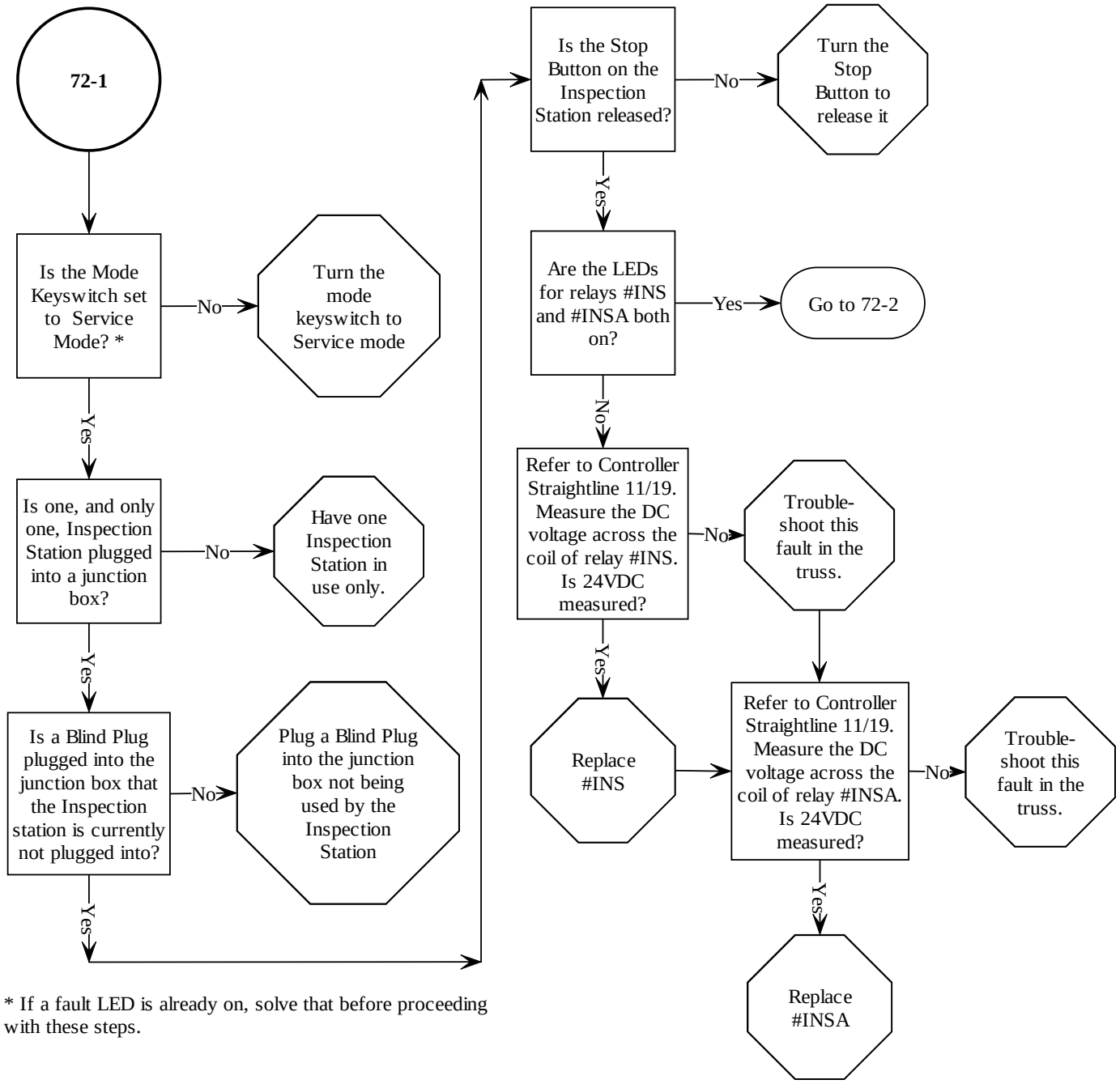
69-1 A fault occurred, but the fault LED did not turn ON

69-1 A FAULT OCCURRED, BUT THE FAULT LED DID NOT TURN ON



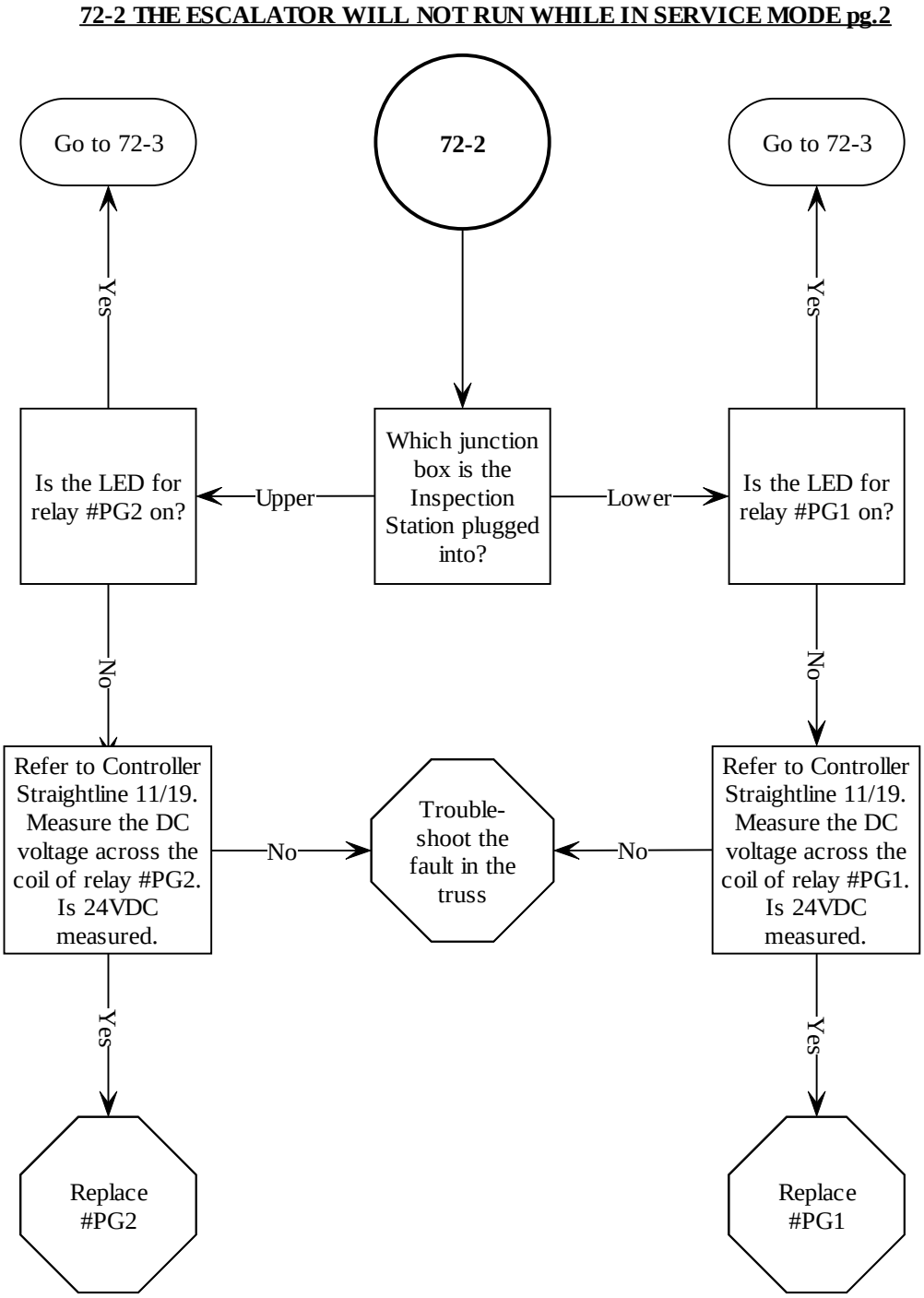
72-1 Escalator will not run while in Service Mode pg.1

72-1 THE ESCALATOR WILL NOT RUN WHILE IN SERVICE MODE pg.1



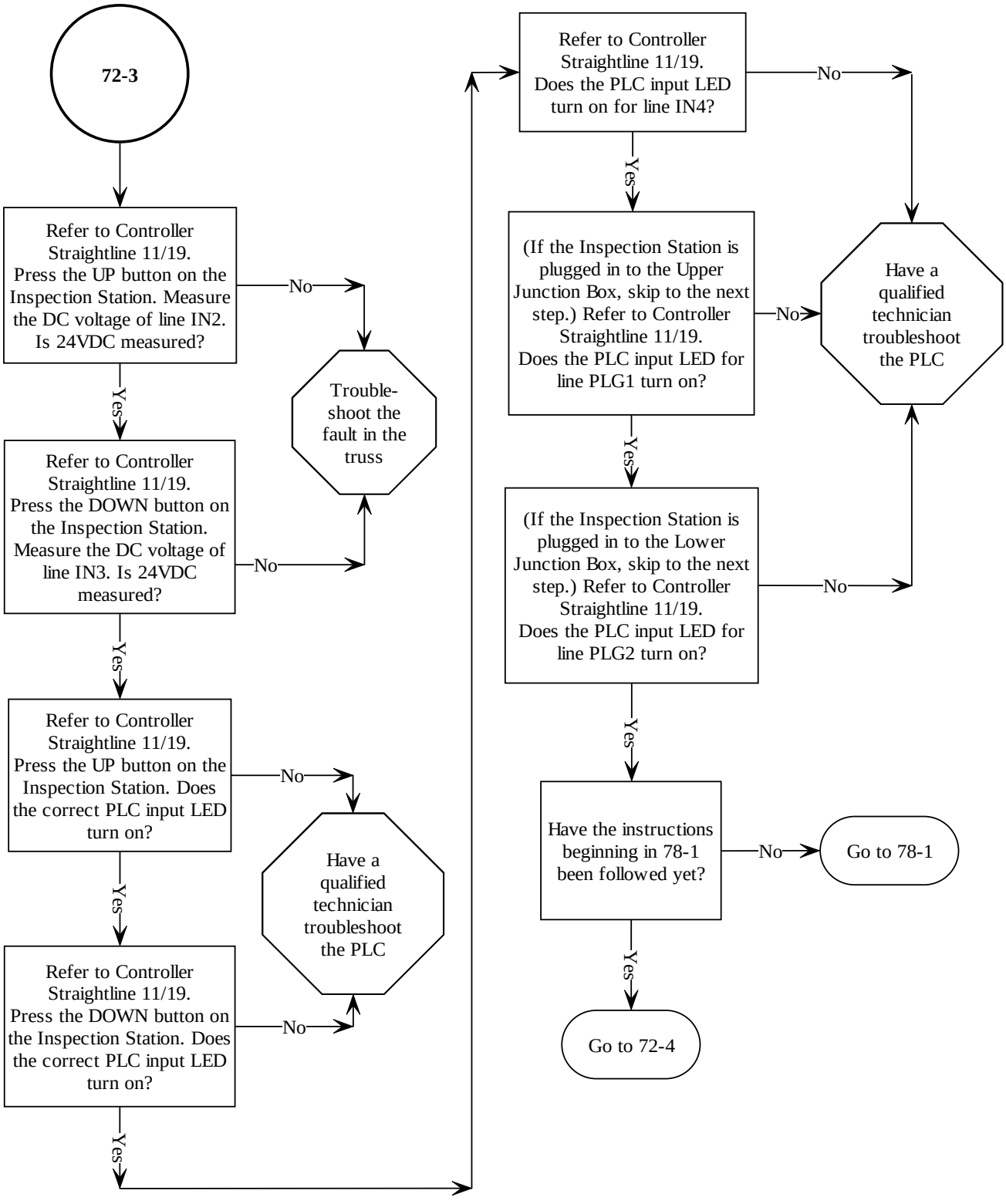
* If a fault LED is already on, solve that before proceeding with these steps.

72-2 Escalator will not run while in Service Mode pg.2



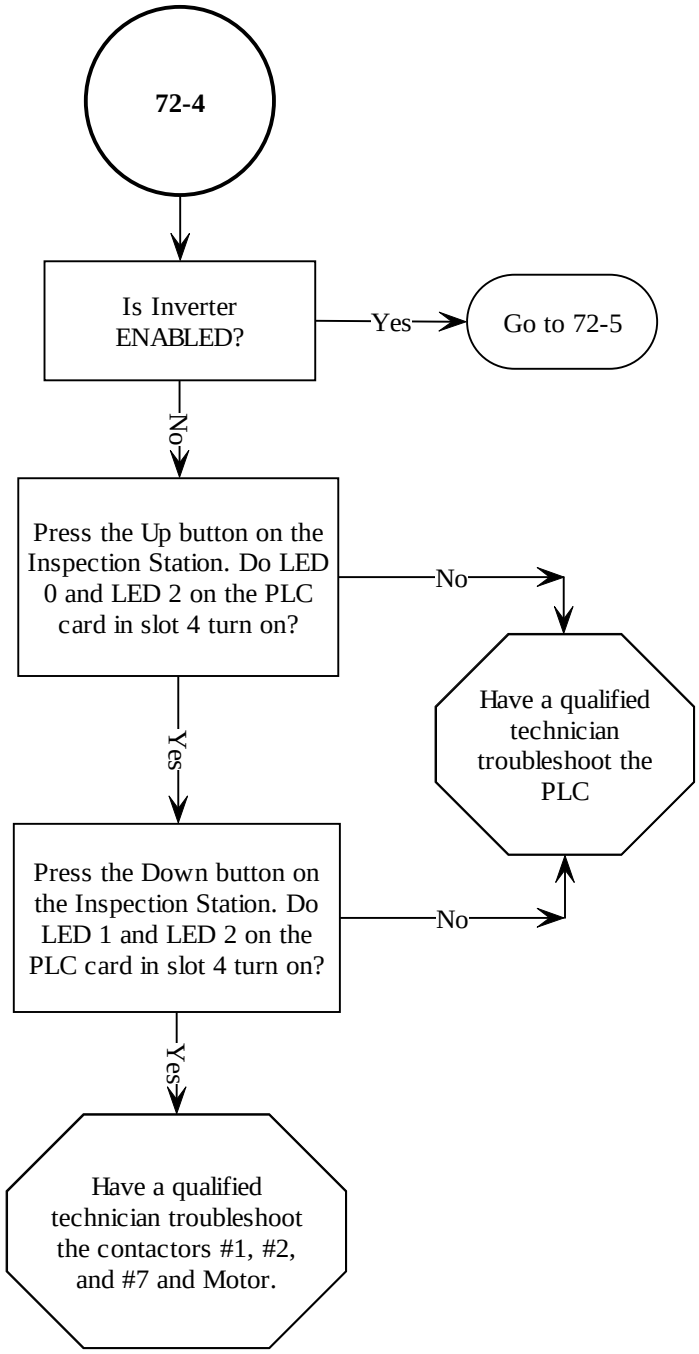
72-3 Escalator will not run while in Service Mode pg.3

72-3 THE ESCALATOR WILL NOT RUN WHILE IN SERVICE MODE pg.3



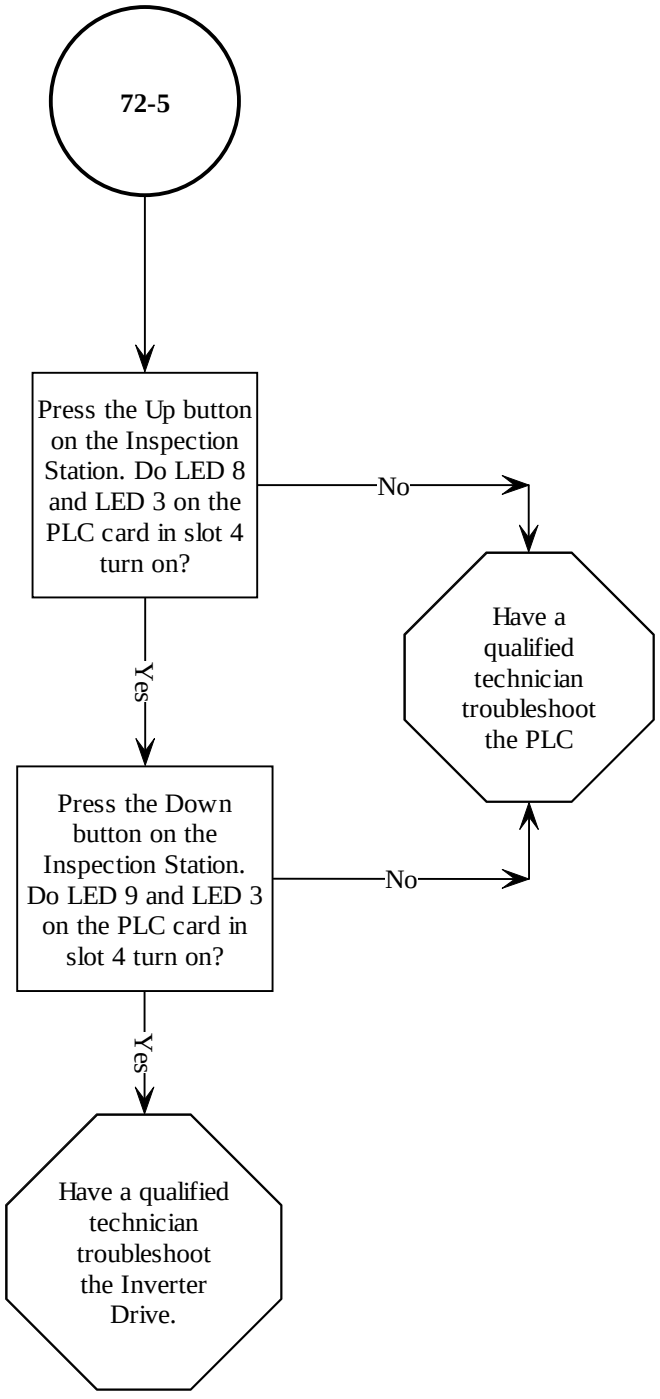
72-4 Escalator will not run while in Service Mode pg.4

72-4 THE ESCALATOR WILL NOT RUN WHILE IN SERVICE MODE pg.4



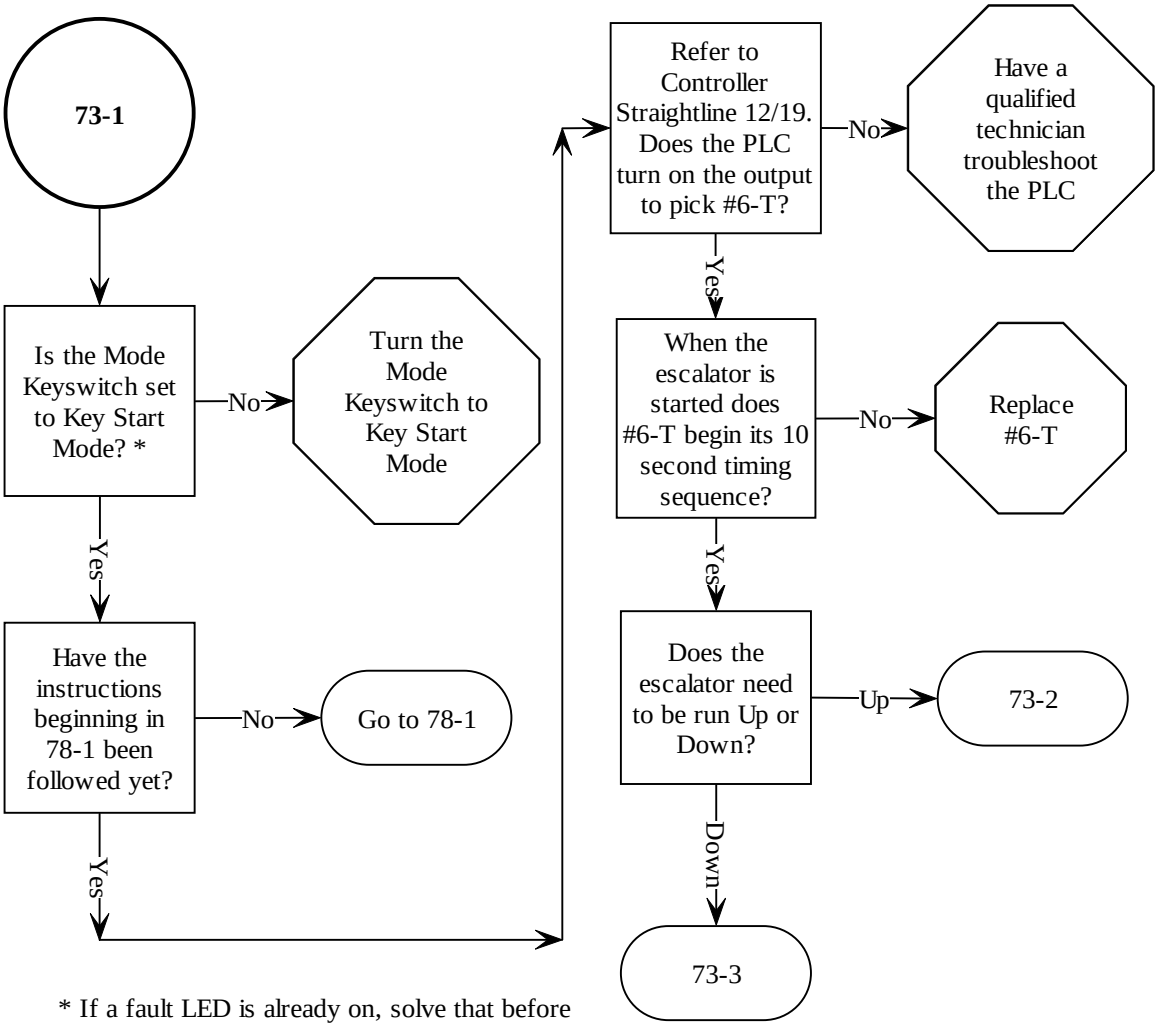
72-5 Escalator will not run while in Service Mode pg.5

72-5 THE ESCALATOR WILL NOT RUN WHILE IN SERVICE MODE pg.5



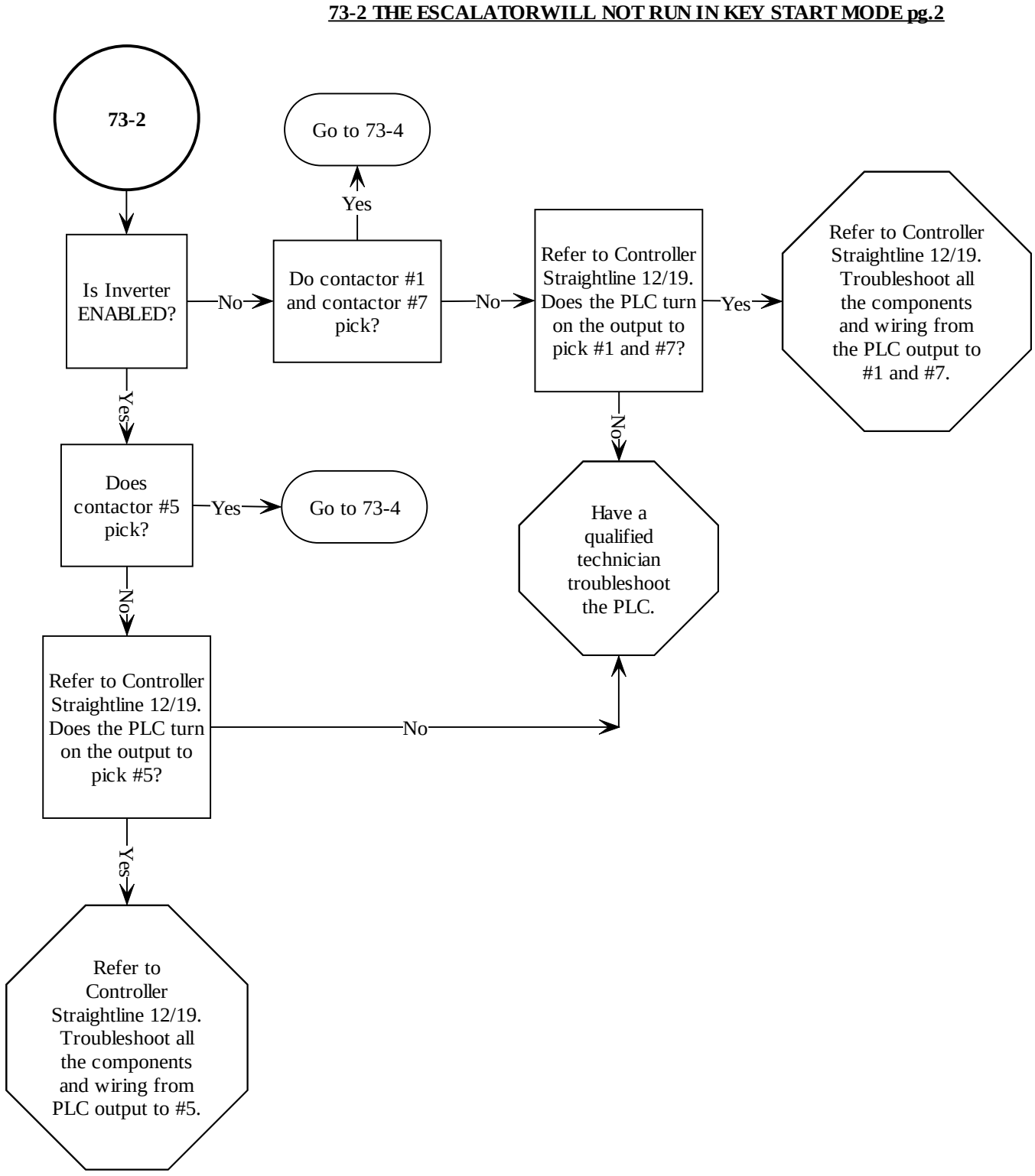
73-1 Escalator will not run while in Key Start Mode pg.1

73-1 THE ESCALATOR WILL NOT RUN IN KEY START MODE pg.1



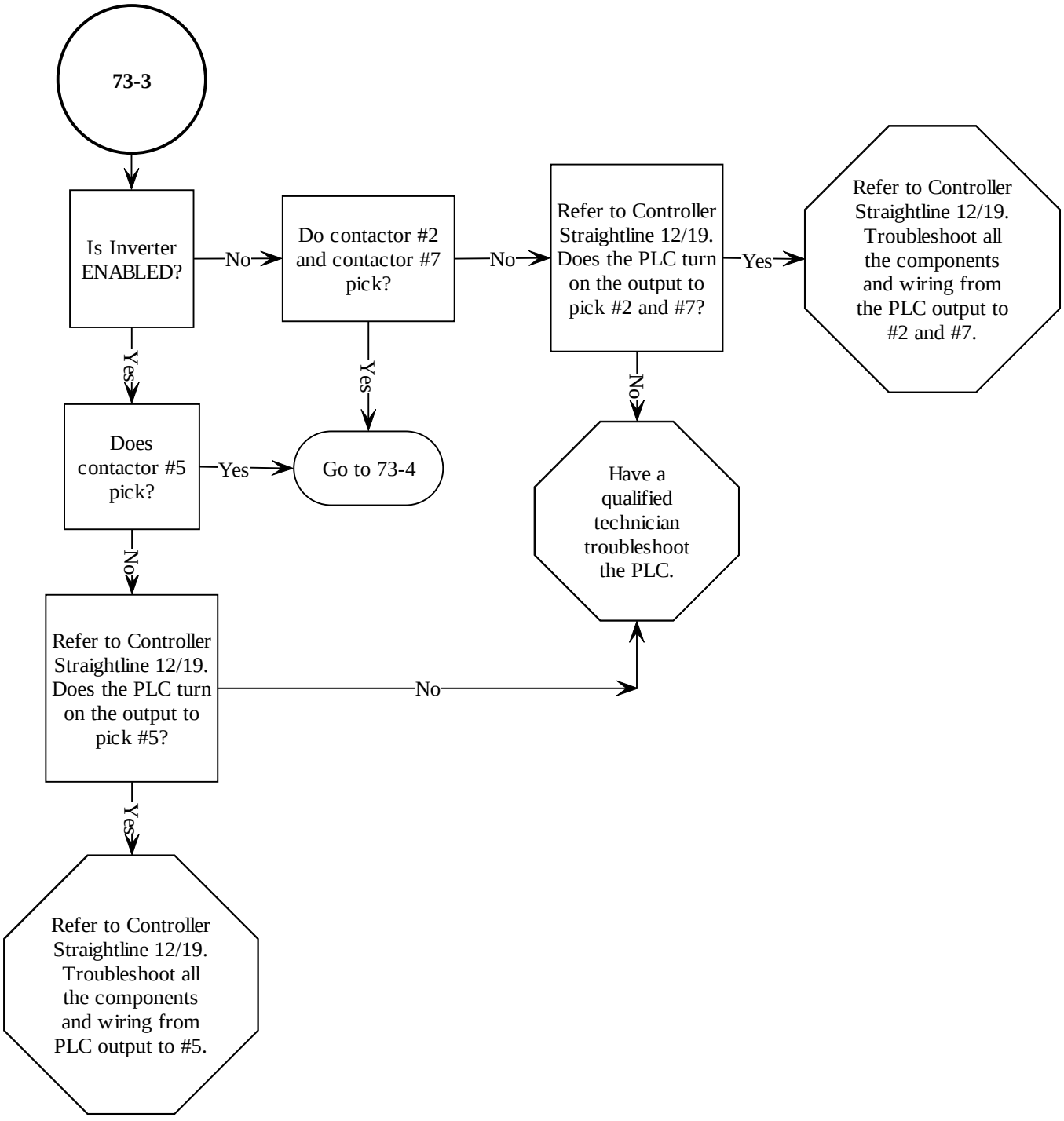
* If a fault LED is already on, solve that before proceeding with these steps.

73-2 Escalator will not run while in Key Start Mode pg.2



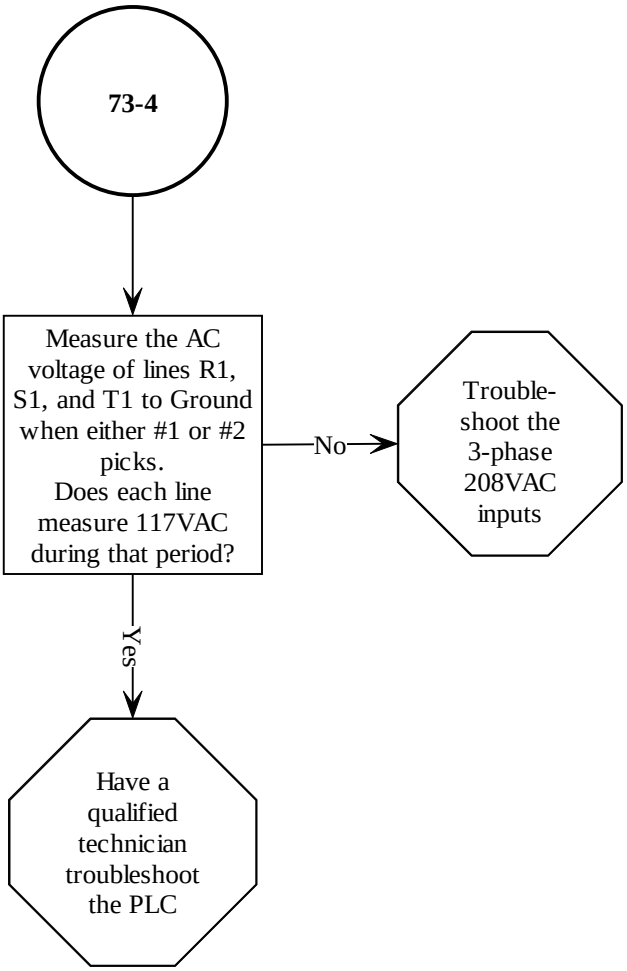
73-3 Escalator will not run while in Key Start Mode pg.3

73-3 THE ESCALATORWILL NOT RUN IN KEY START MODE pg.3

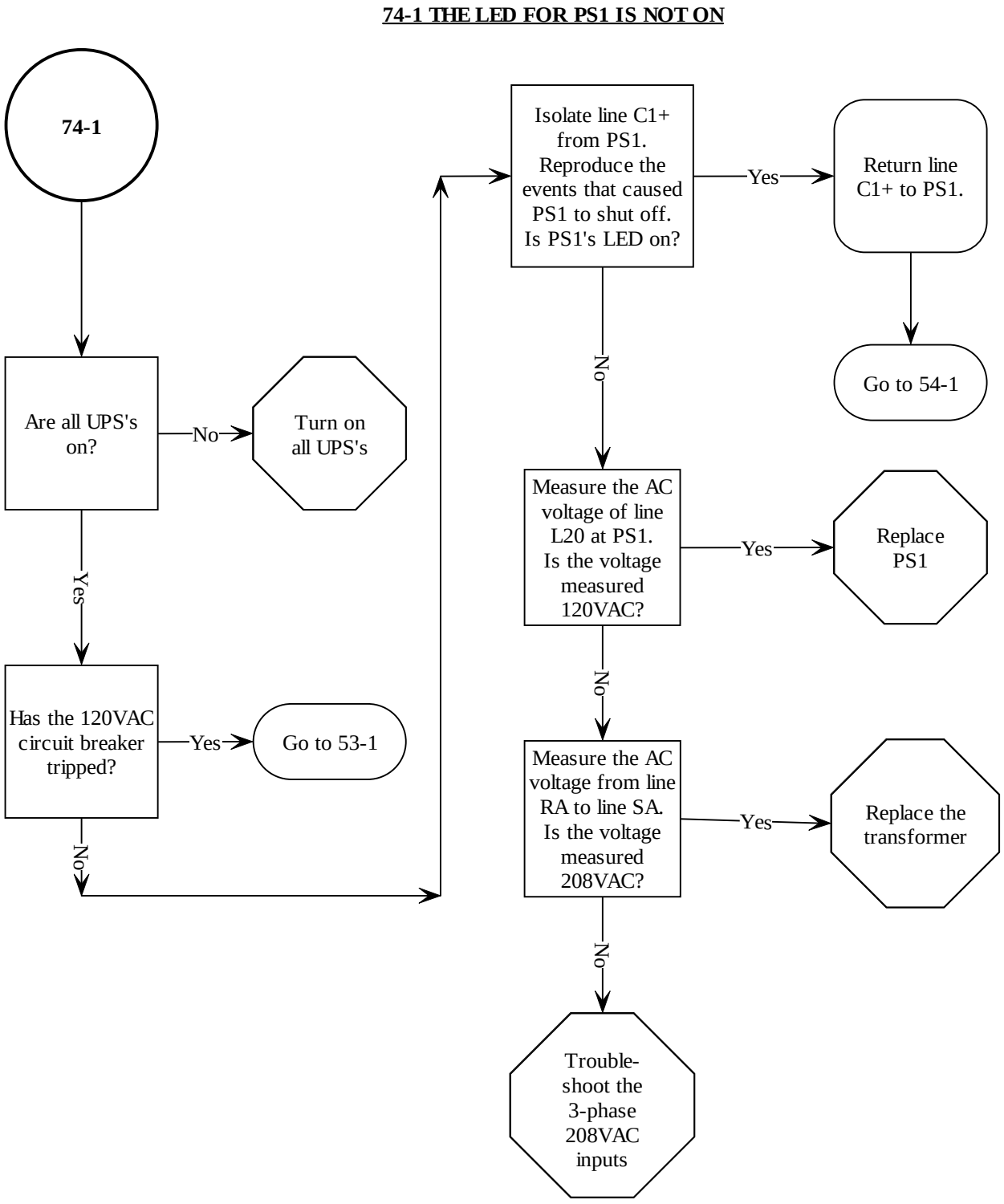


73-4 Escalator will not run while in Key Start Mode pg.4

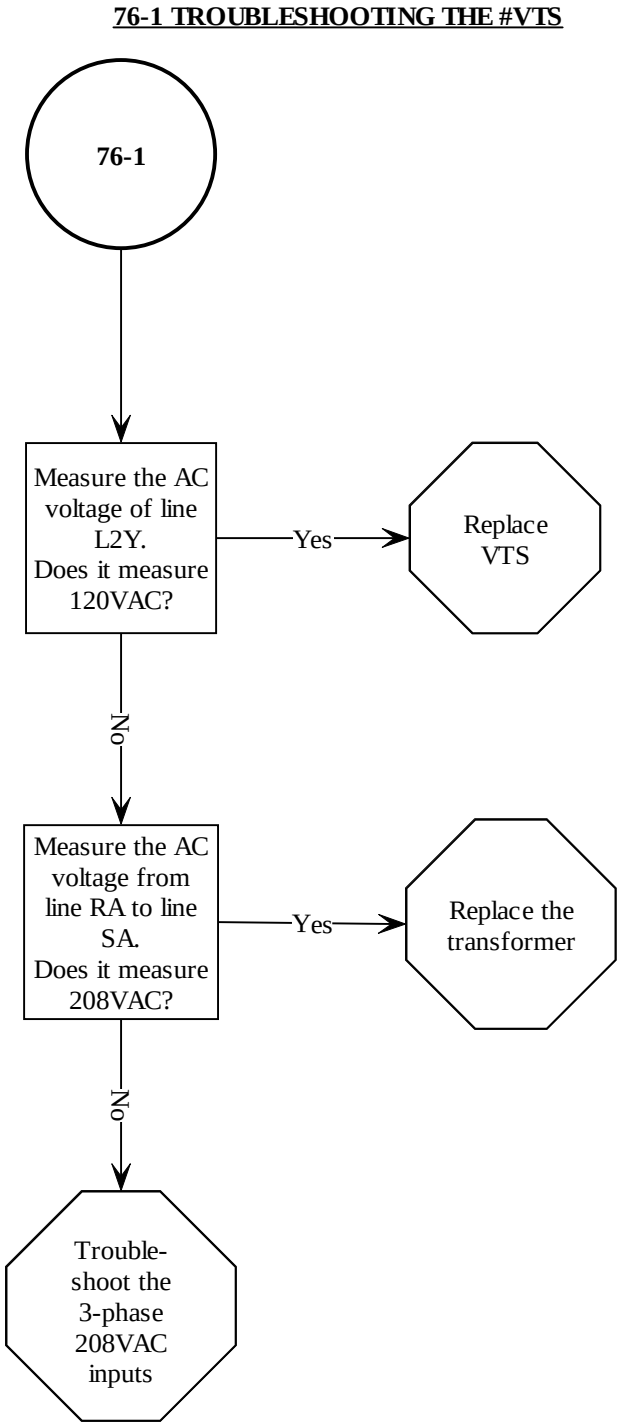
73-4 THE ESCALATOR WILL NOT START IN KEY START MODE pg.4



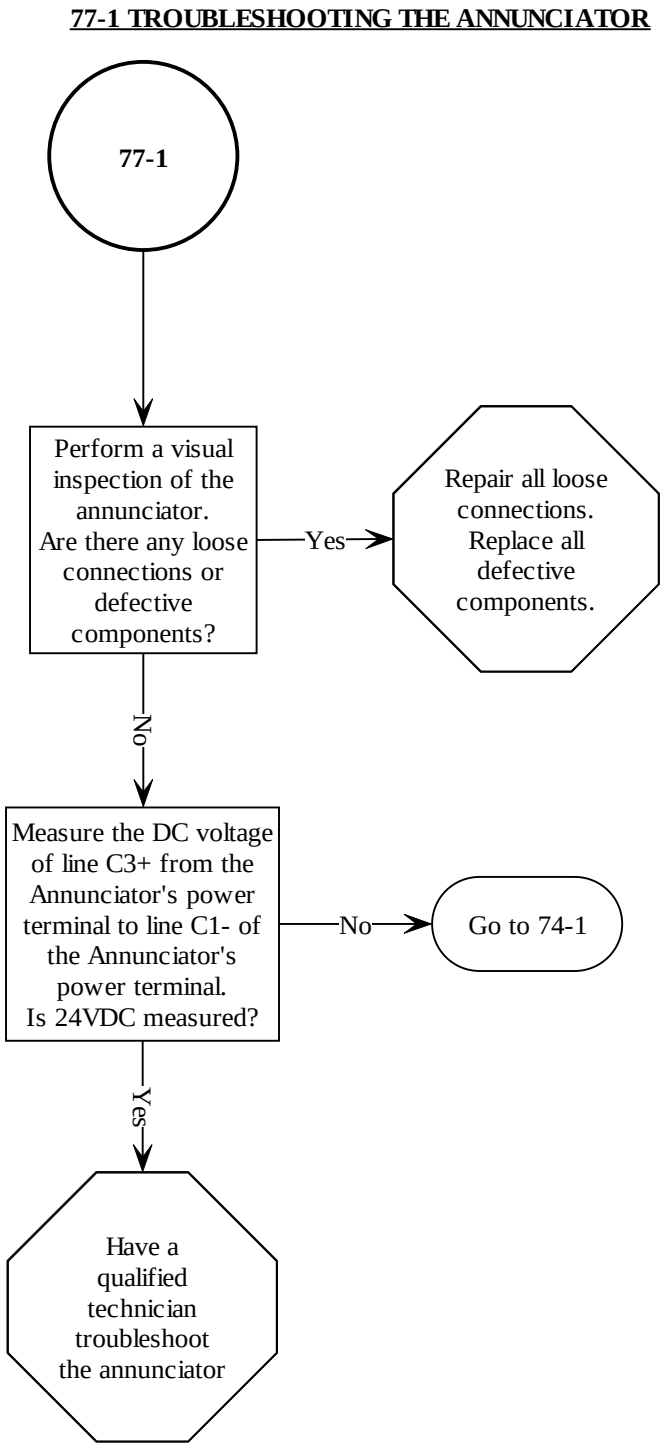
74-1 LED for PS1 is not ON



76-1 Troubleshooting the #VTS

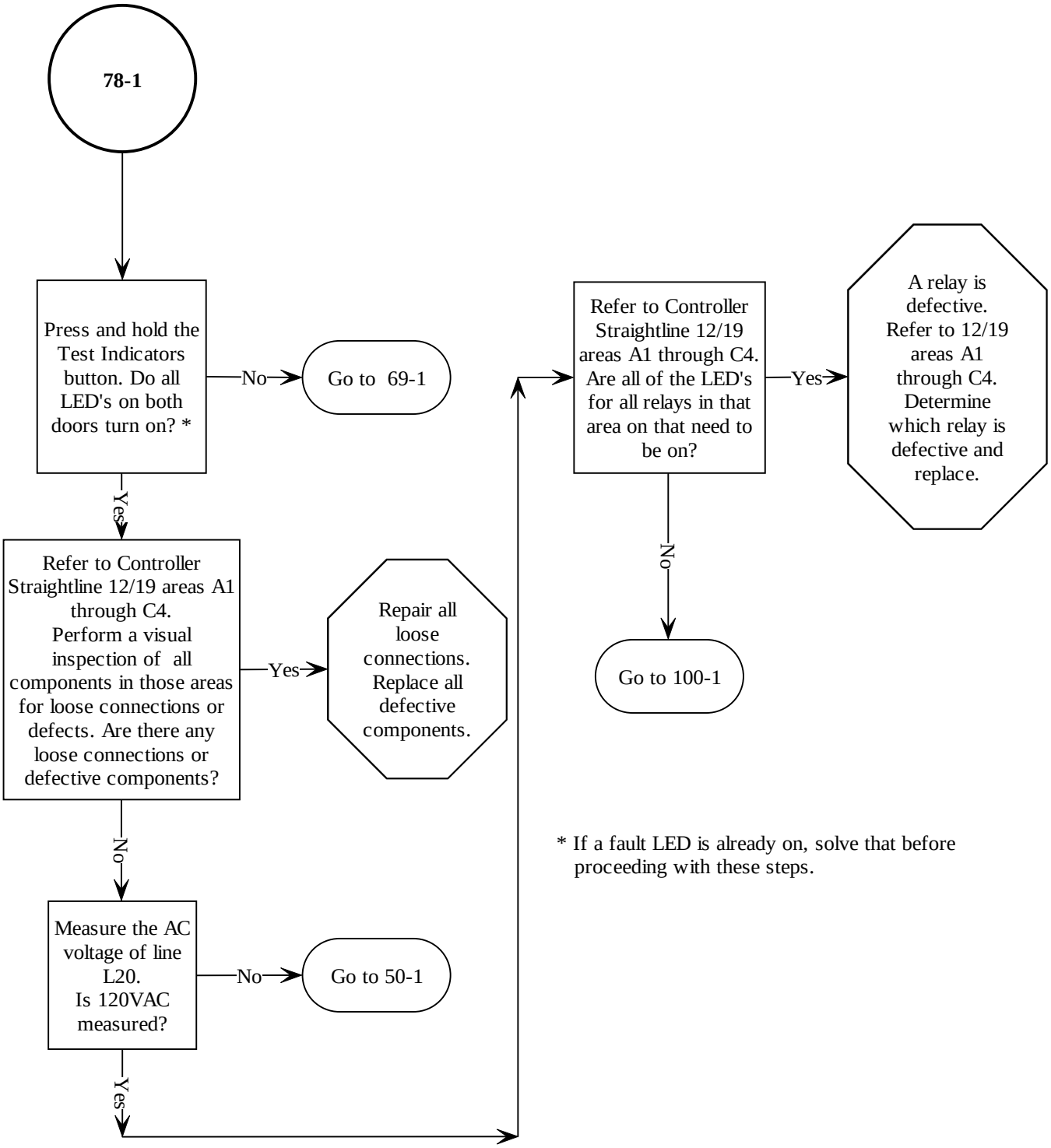


77-1 Troubleshooting the Annunciator



78-1 Troubleshooting Line Pxx

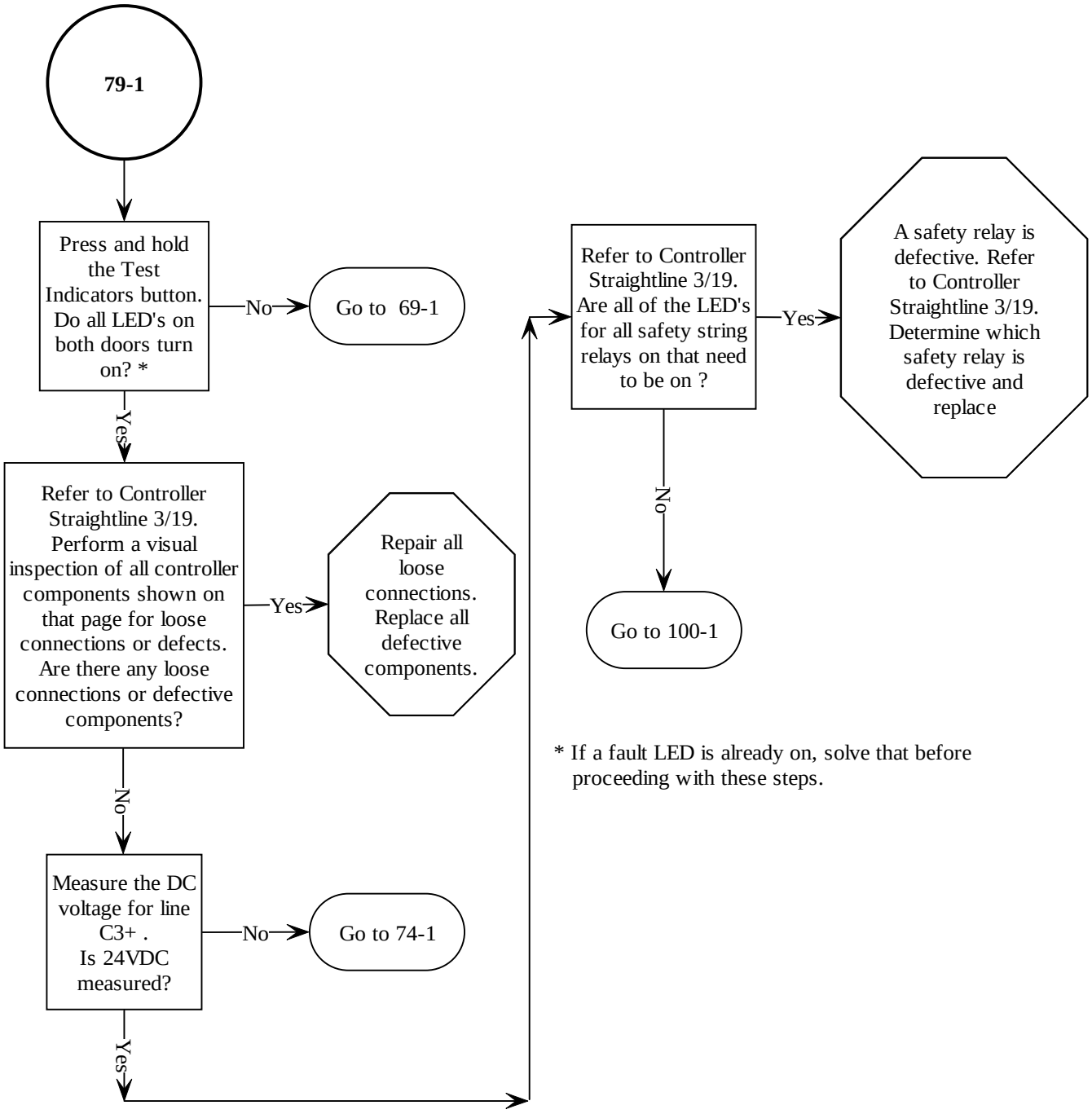
78-1 TROUBLESHOOTING LINE Pxx



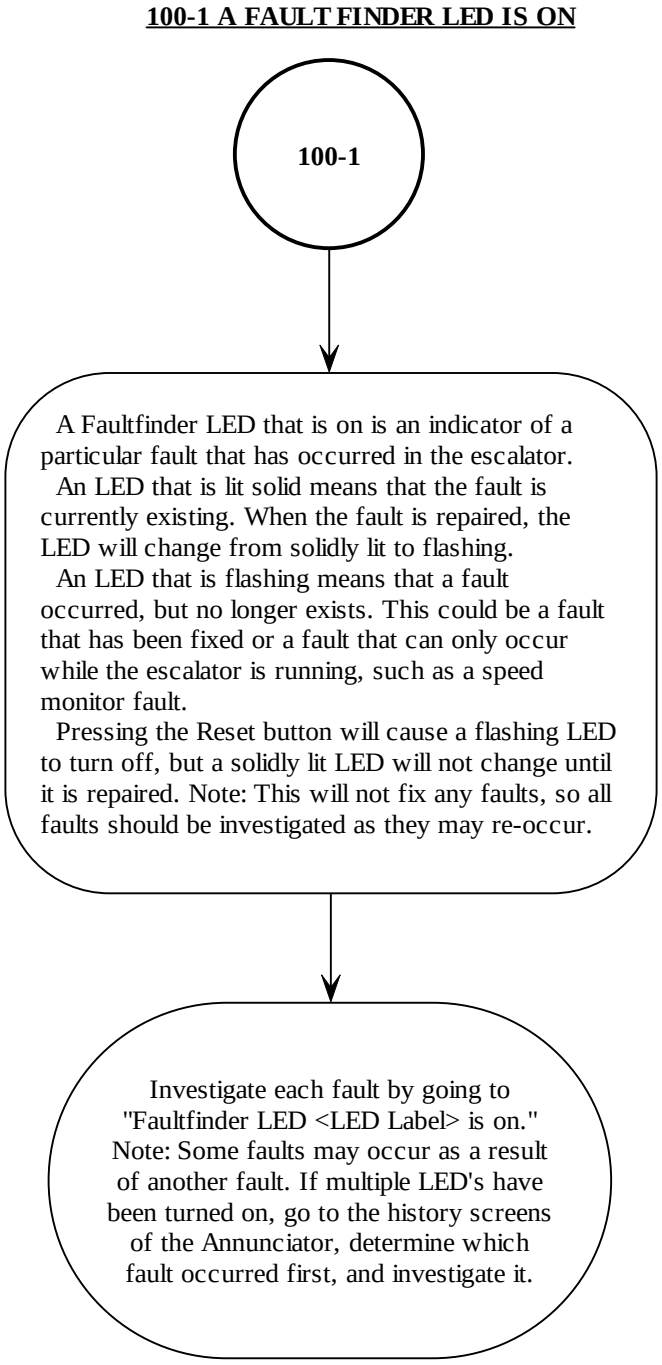
* If a fault LED is already on, solve that before proceeding with these steps.

79-1 Troubleshooting the Safety String

79-1 TROUBLESHOOTING THE SAFETY STRING

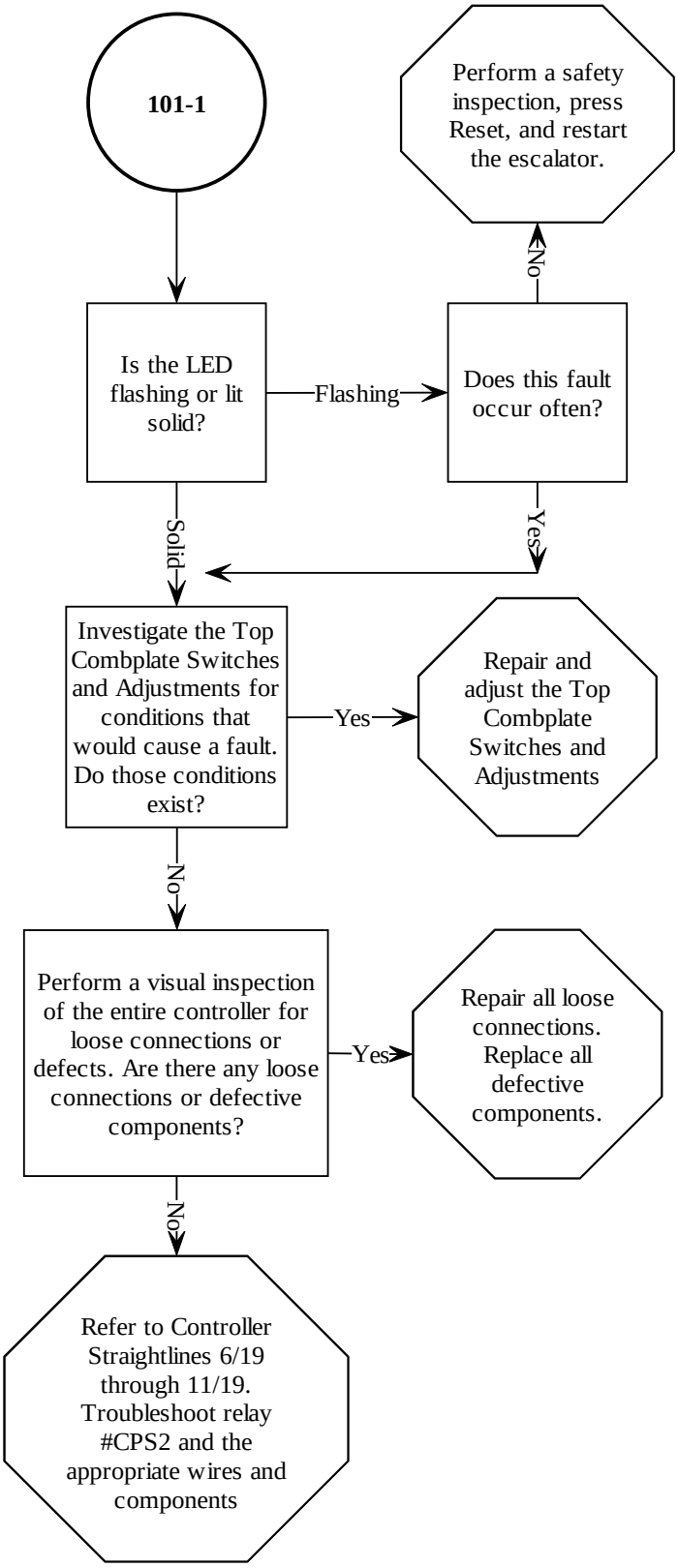


100-1 A fault LED is ON



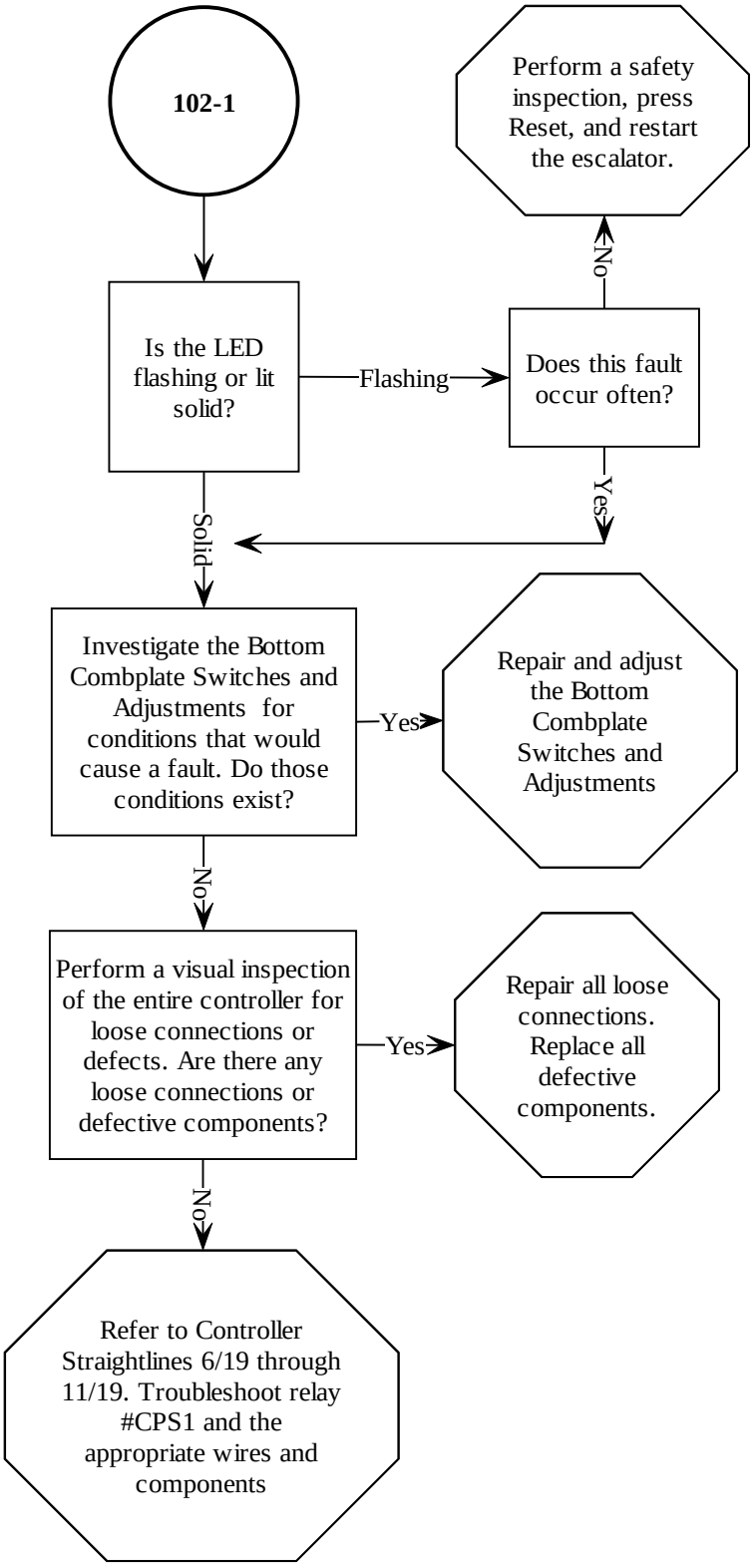
101-1 Fault LED "Top Combplate Switch" is ON

101-1 FAULTFINDER LED "TOP COMBPLATE SWITCH" IS ON



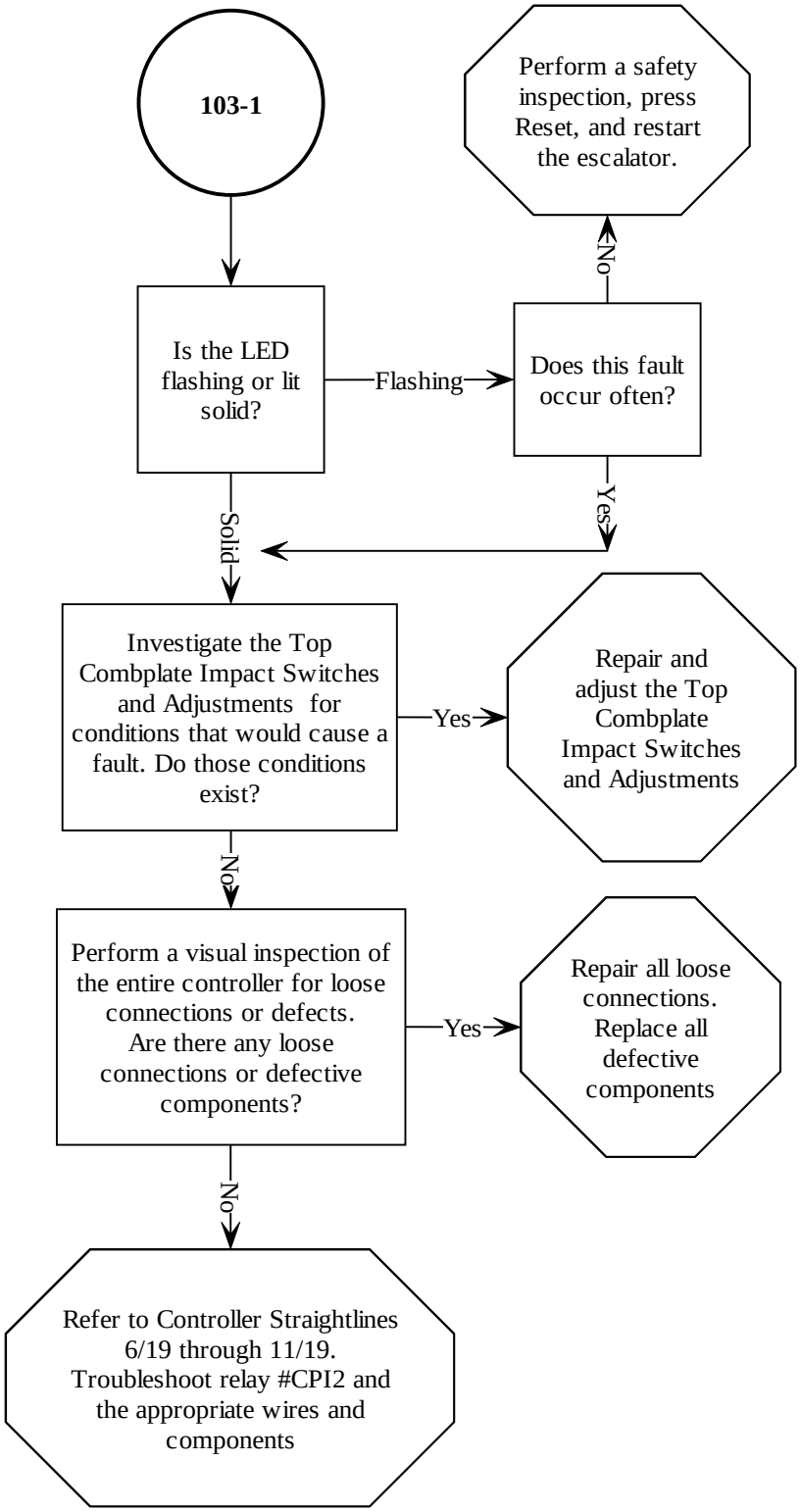
102-1 Fault LED "Bottom Combplate Switch" is ON

102-1 FAULTFINDER LED "BOTTOM COMBPLATE SWITCH" IS ON



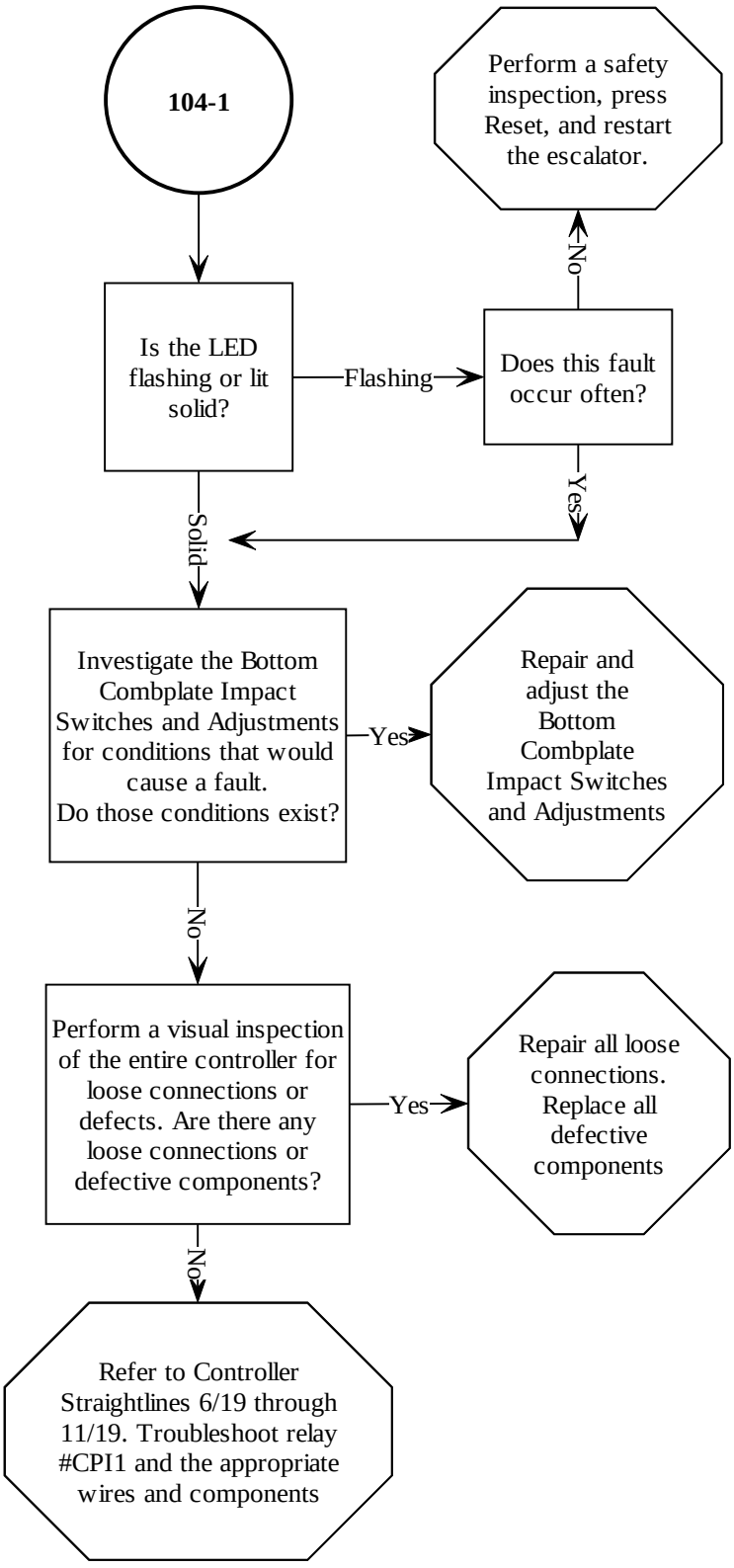
103-1 Fault LED "Top Combplate Step Impact Switch" is ON

103-1 FAULTFINDER LED "TOP COMBPLATE STEP IMPACT DEVICE" IS ON



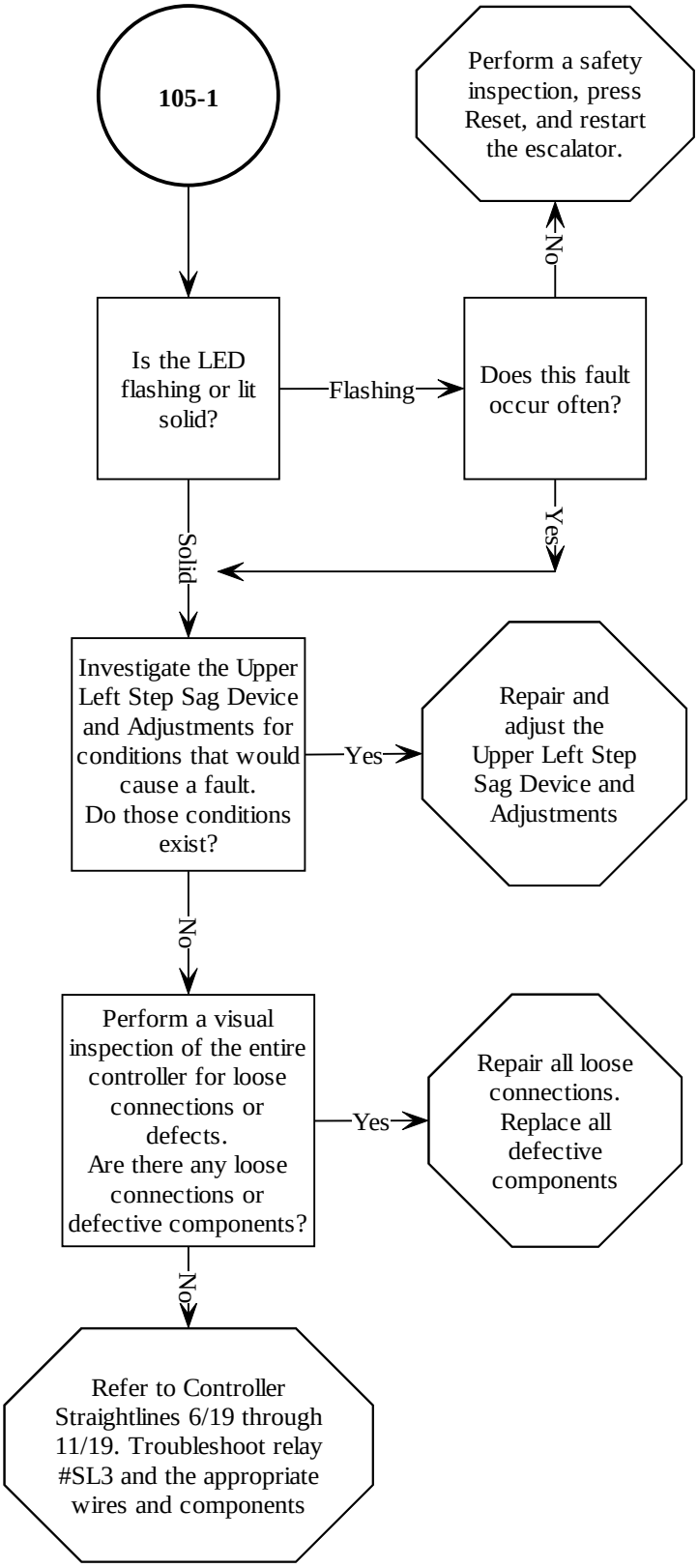
104-1 Fault LED "Bottom Combplate Step Impact Switch" is ON

104-1 FAULTFINDER LED "BOTTOM COMBPLATE STEP IMPACT DEVICE" IS ON



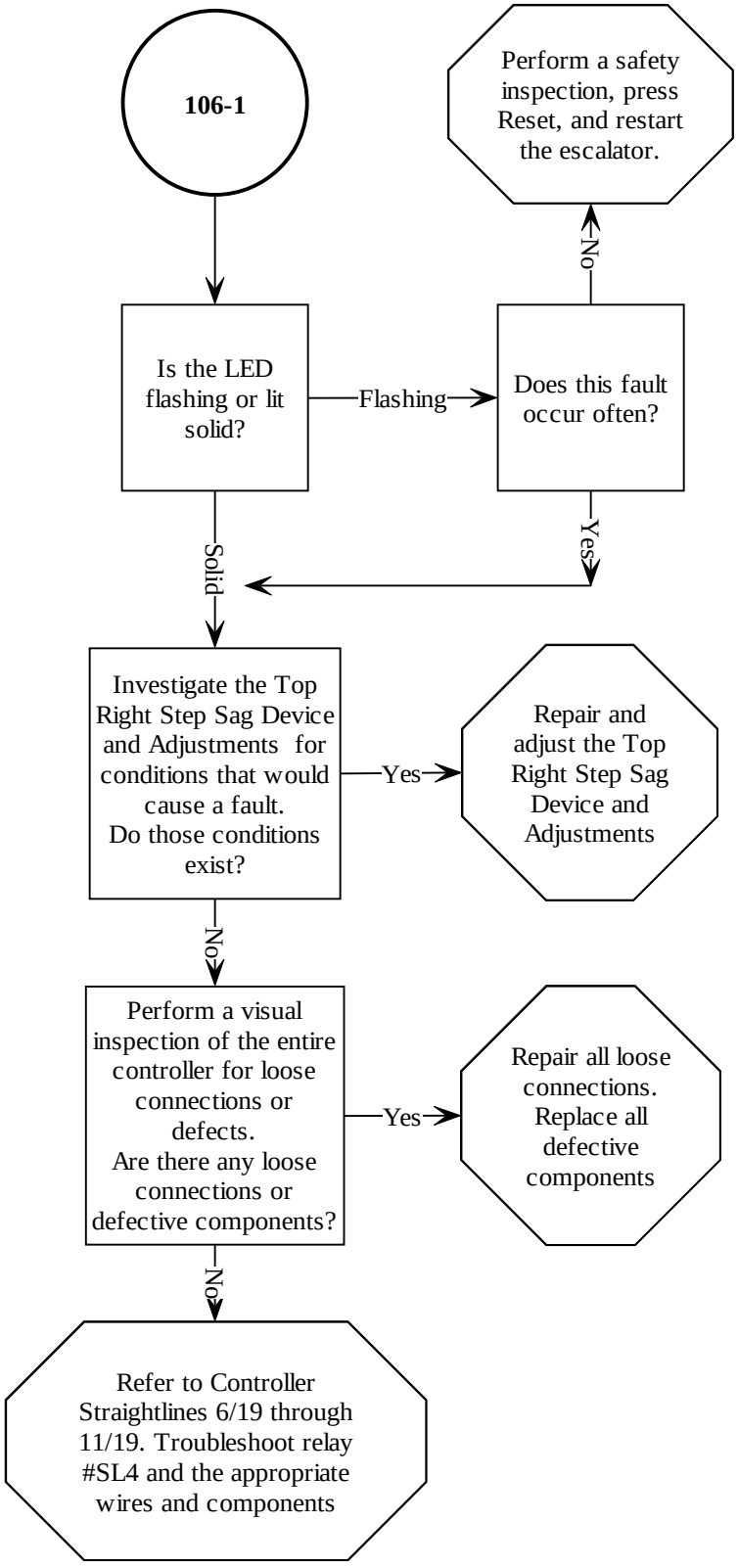
105-1 Fault LED "Top Left Step Sag Monitor" is ON

105-1 FAULTFINDER LED "TOP LEFT STEP SAG MONITOR" IS ON



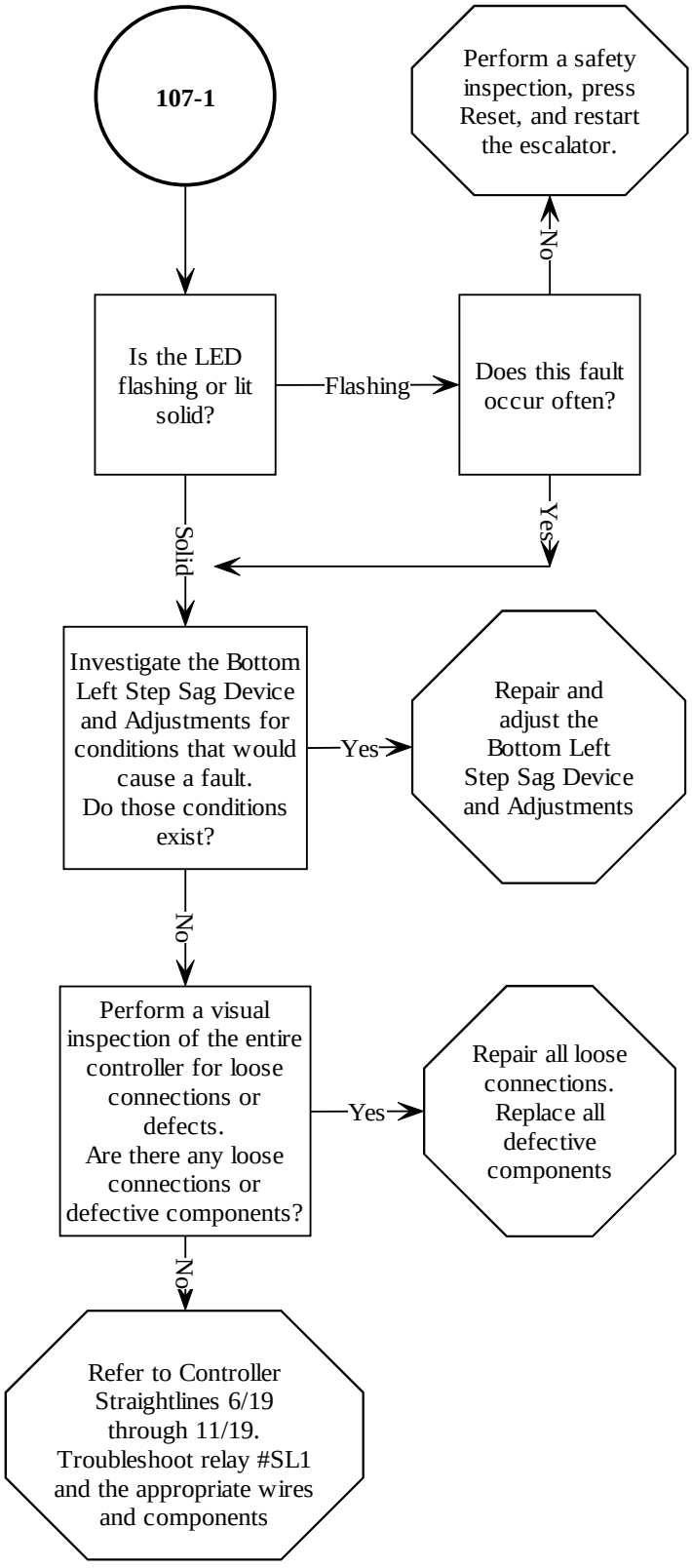
106-1 Fault LED "Top Right Step Sag Monitor" is ON

106-1 FAULTFINDER LED "TOP RIGHT STEP SAG MONITOR" IS ON



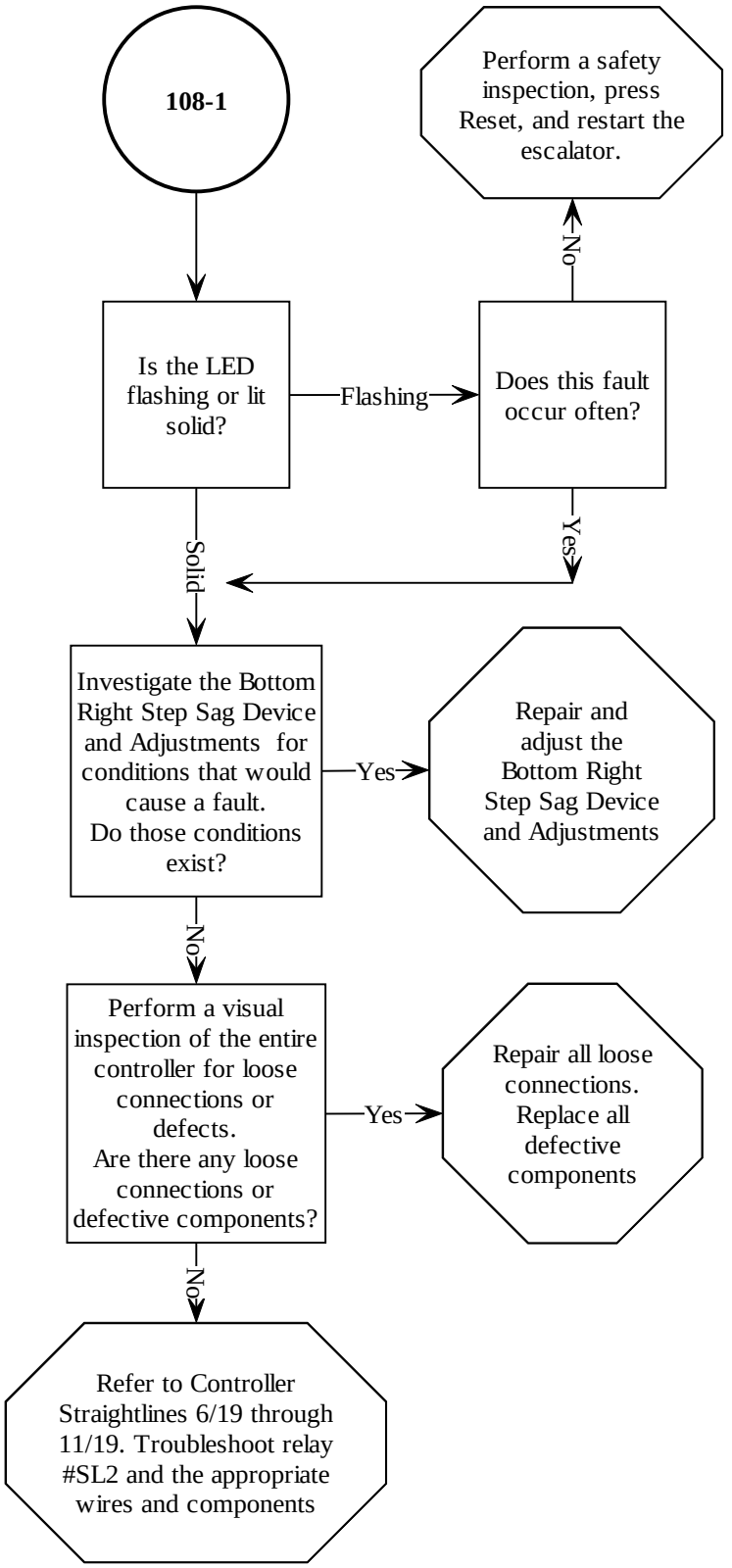
107-1 Fault LED "Bottom Left Step Sag Monitor" is ON

107-1 FAULTFINDER LED "BOTTOM LEFT STEP SAG MONITOR" IS ON



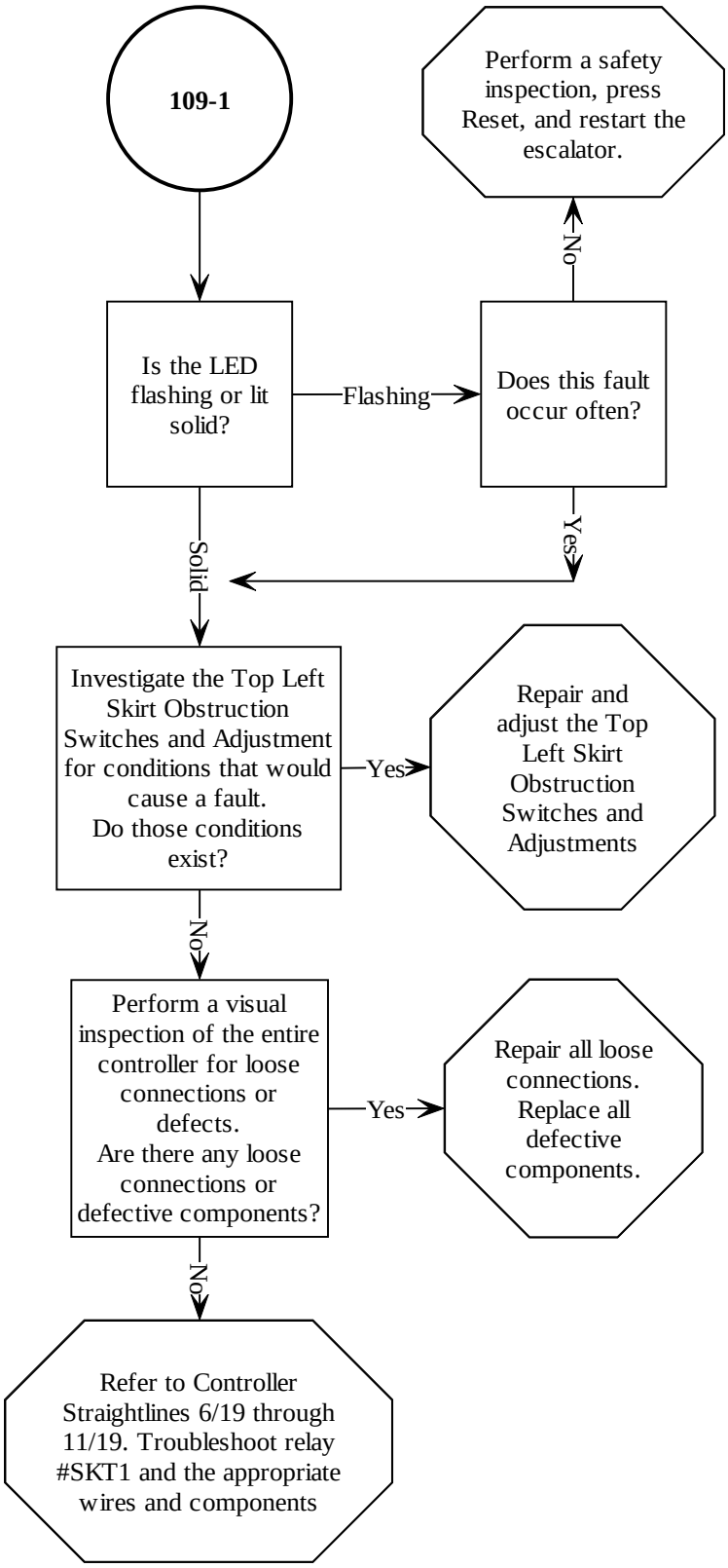
108-1 Fault LED "Bottom Right Step Sag Monitor" is ON

108-1 FAULTFINDER LED "BOTTOM RIGHT STEP SAG MONITOR" IS ON



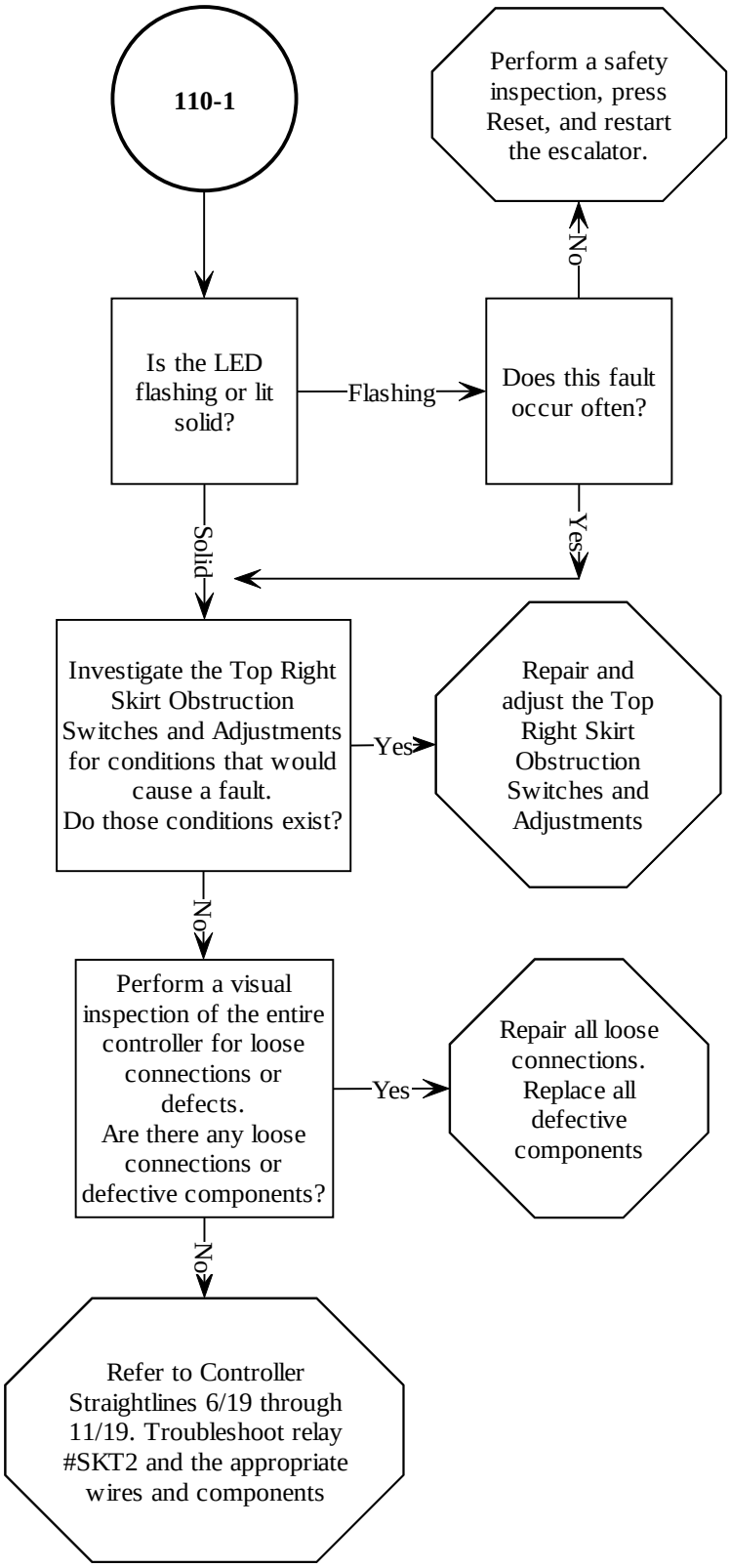
109-1 Fault LED "Top Left Skirt Obstruction Contact" is ON

109-1 FAULTFINDER LED "TOP LEFT SKIRT OBSTRUCTION CONTACT" IS ON



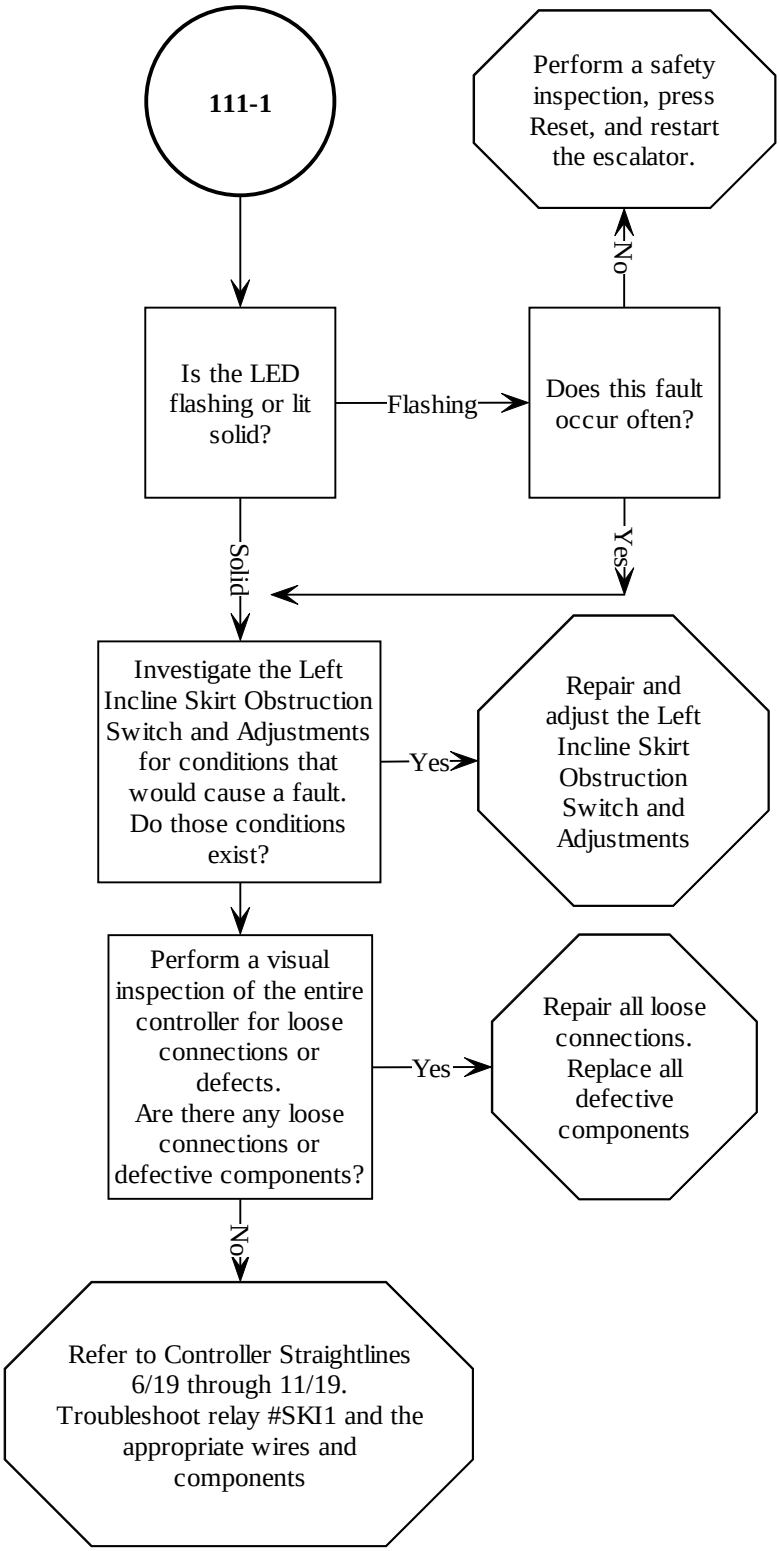
110-1 Fault LED "Top Right Skirt Obstruction Contact" is ON

110-1 FAULTFINDER LED "TOP RT. SKIRT OBSTRUCTION CONTACT" IS ON



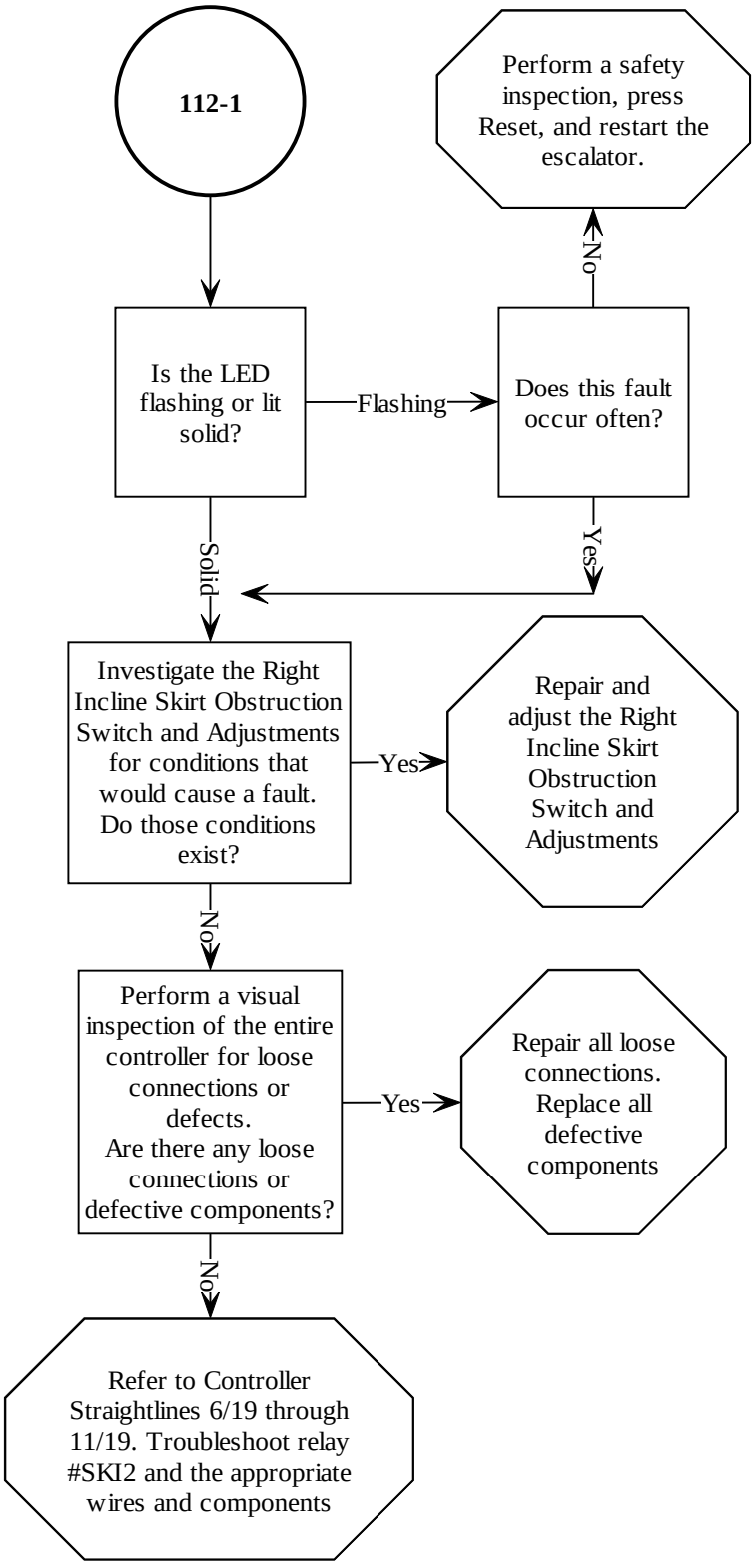
111-1 Fault LED "Incline Left Skirt Obstruction Contact" is ON

111-1 FAULTFINDER LED "INC. LT. SKIRT OBSTRUCTION CONTACT" IS ON



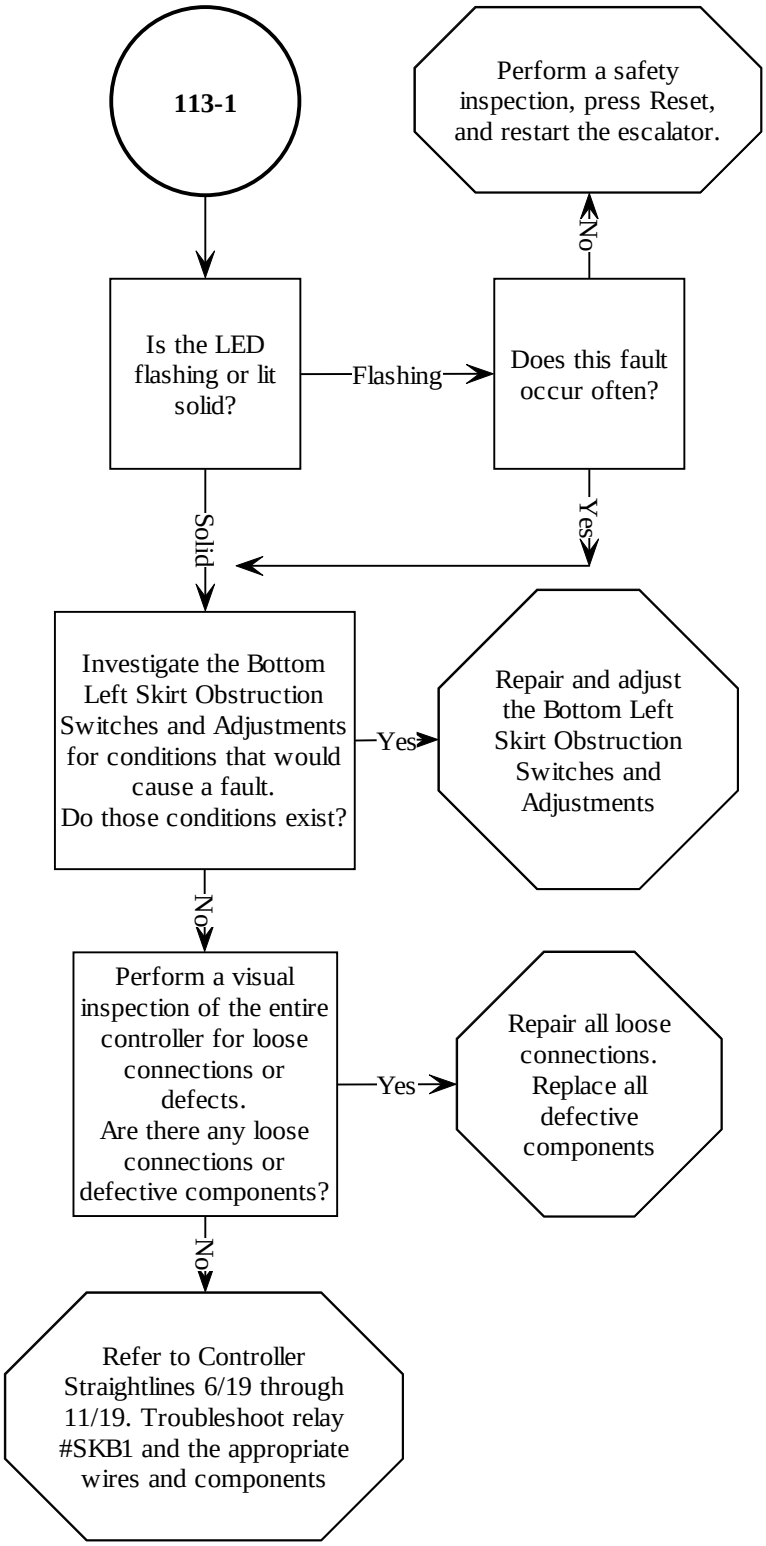
112-1 Fault LED "Incline Right Skirt Obstruction Contact" is ON

112-1 FAULTFINDER LED "INC. RT. SKIRT OBSTRUCTION CONTACT" IS ON



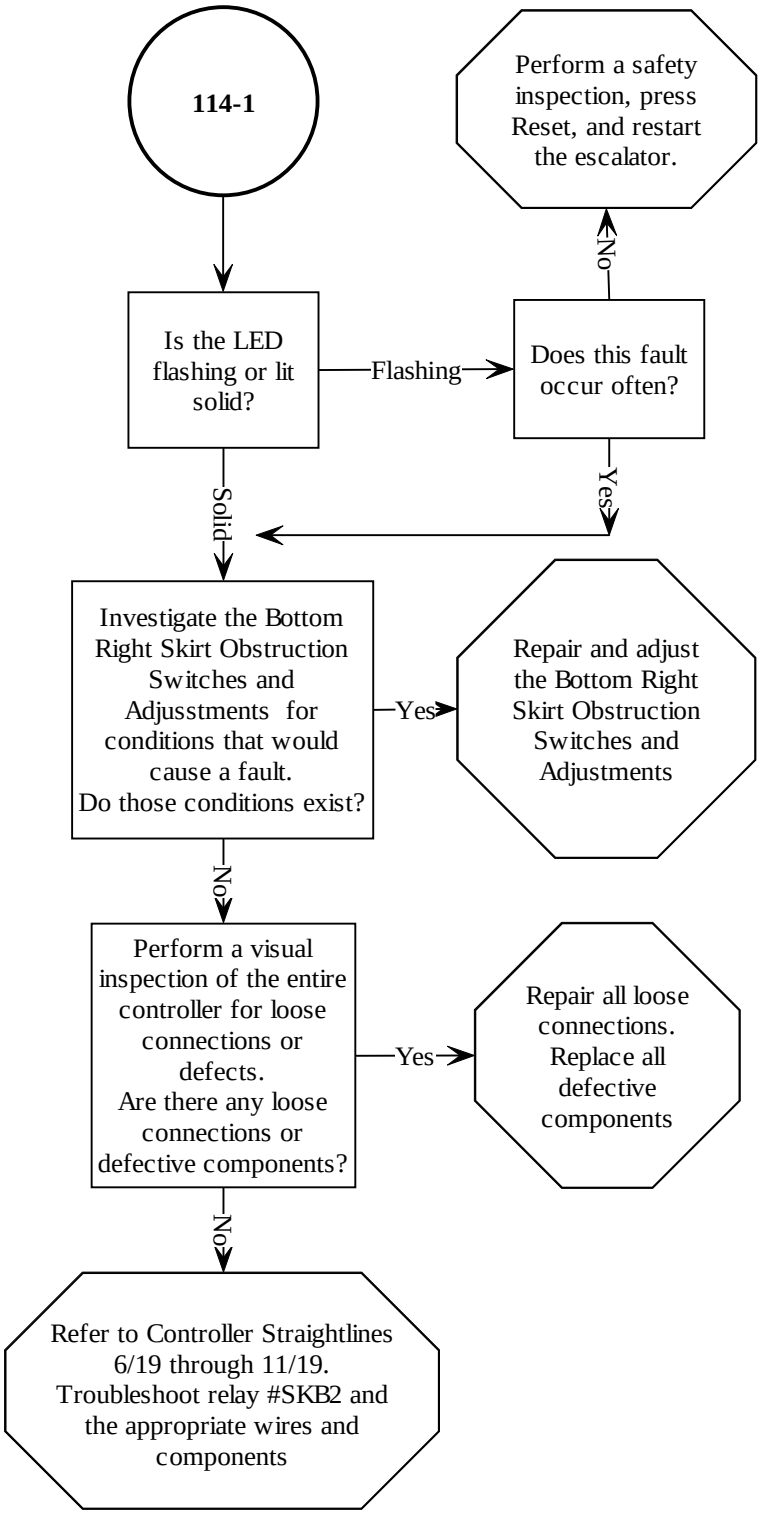
113-1 Fault LED "Bottom Left Skirt Obstruction Contact" is ON

113-1 FAULTFINDER LED "BOT. LT. SKIRT OBSTRUCTION CONTACT" IS ON



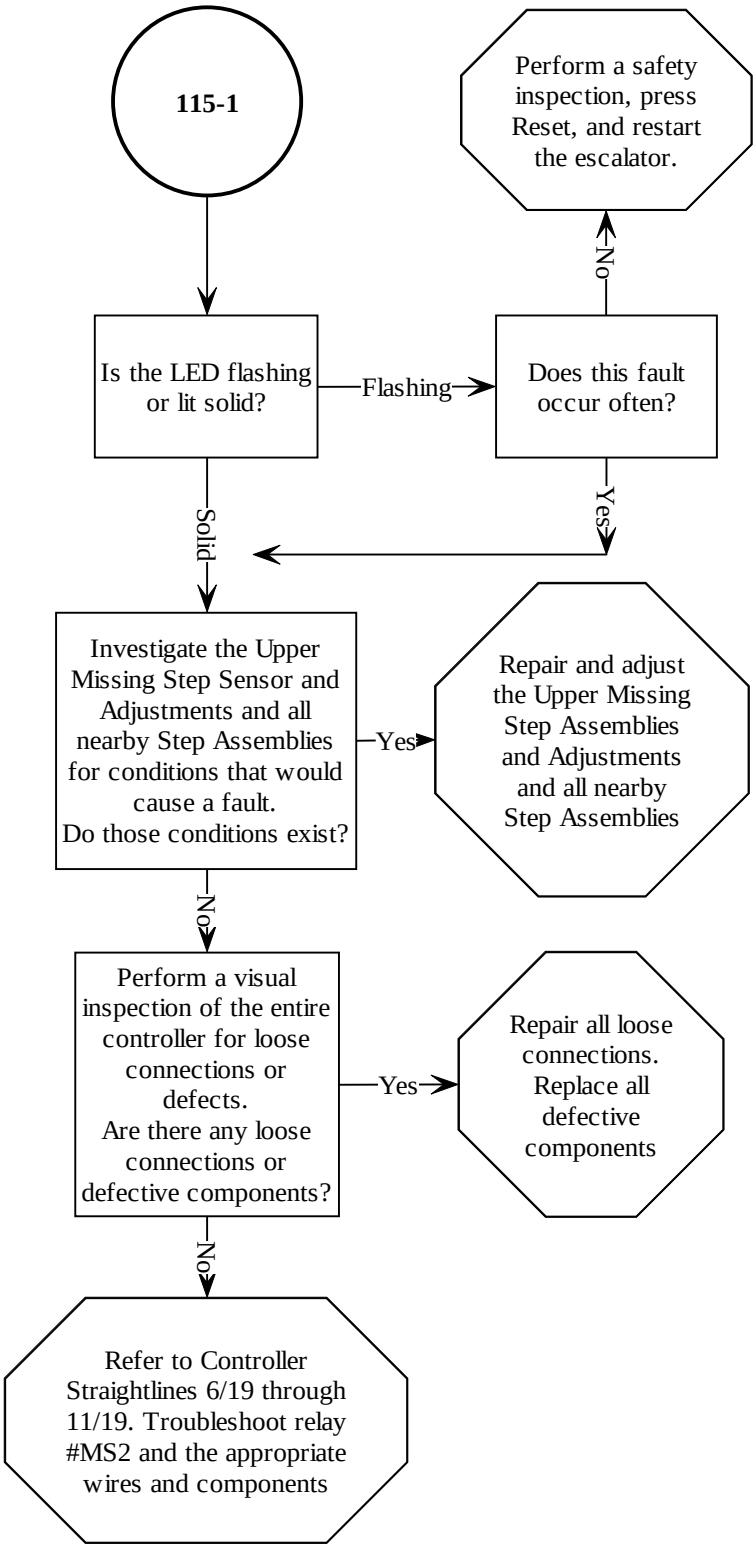
114-1 Fault LED "Bottom Right Skirt Obstruction Contact" is ON

114-1 FAULTFINDER LED "BOT. RT. SKIRT OBSTRUCTION CONTACT" IS ON



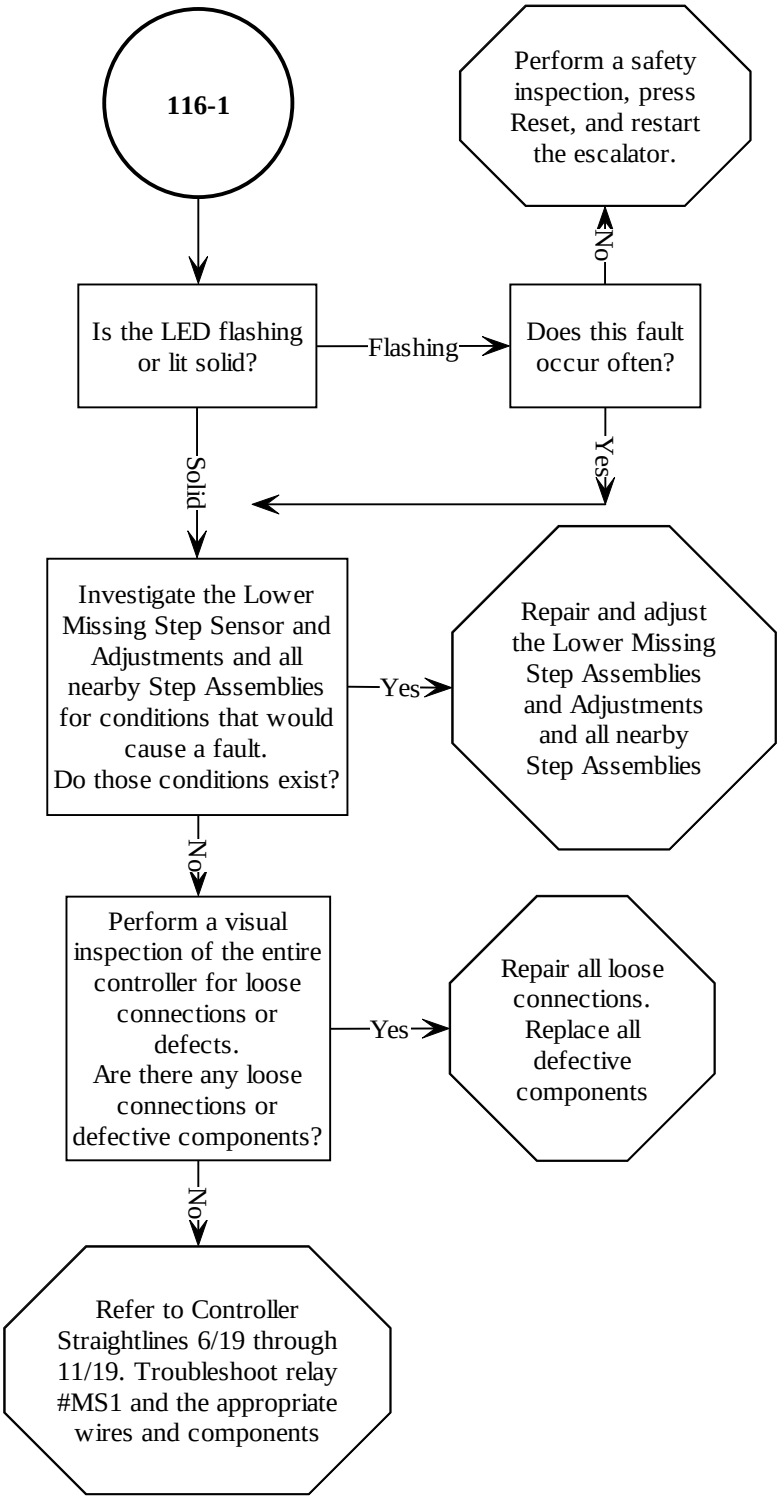
115-1 Fault LED "Top Missing Step Monitor" is ON

115-1 FAULTFINDER LED "TOP MISSING STEP MONITOR" IS ON



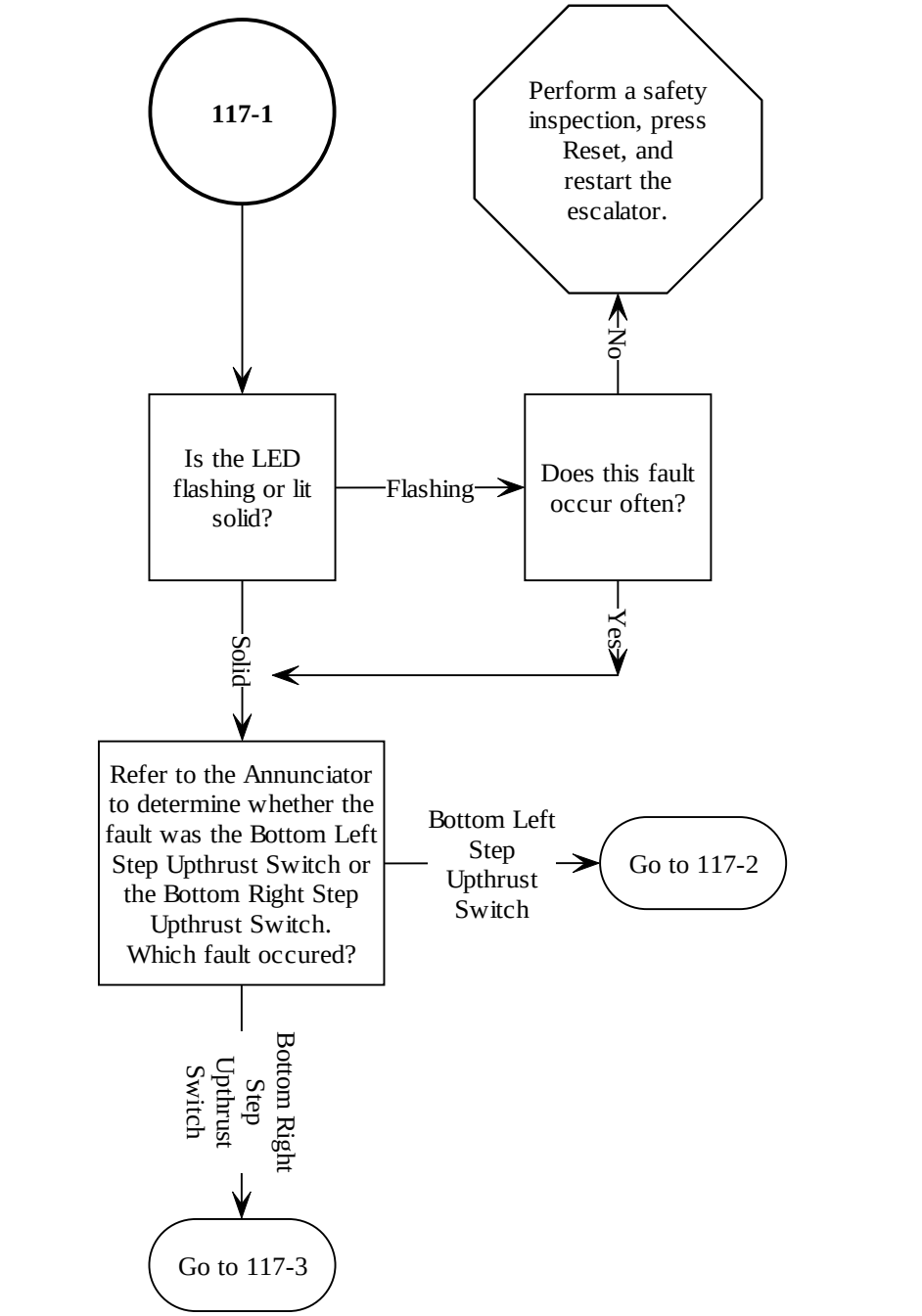
116-1 Fault LED "Bottom Missing Step Monitor" is ON

116-1 FAULTFINDER LED "BOTTOM MISSING STEP MONITOR" IS ON



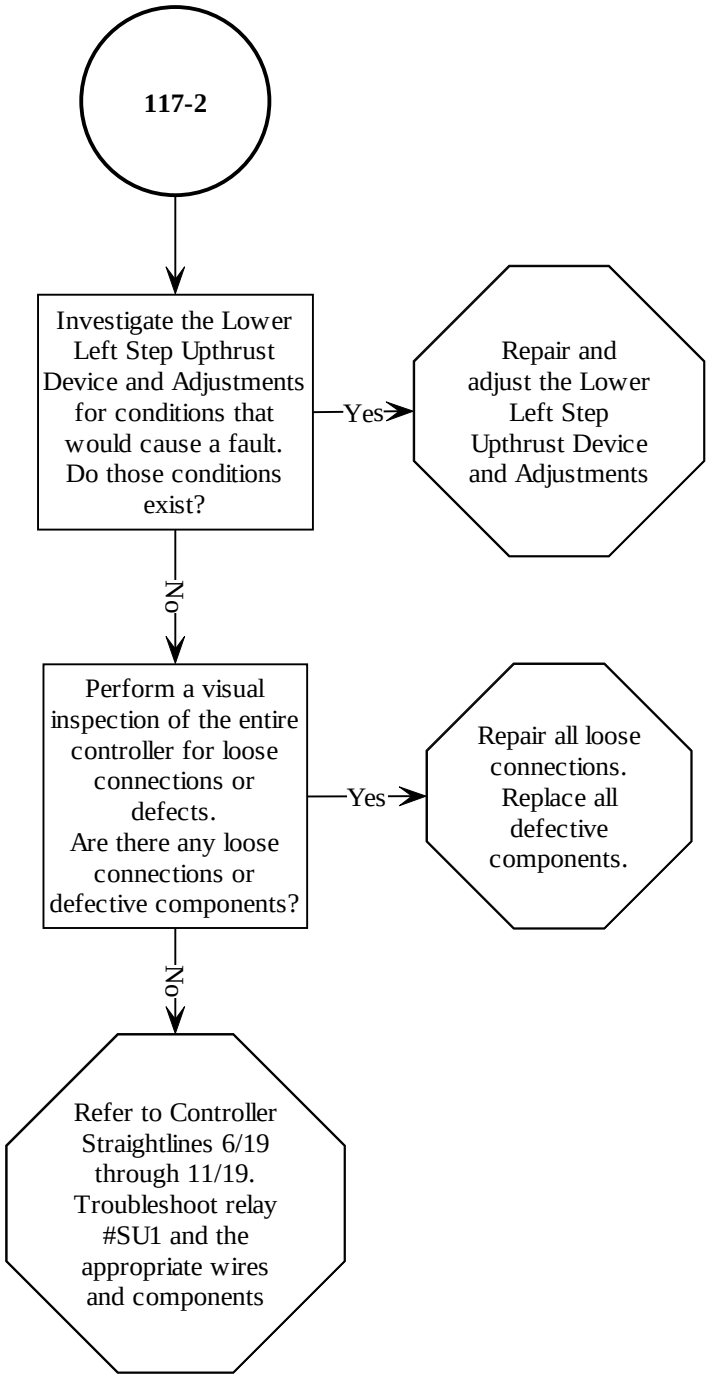
117-1 Fault LED "Lower Step Upthrust Monitor" is ON pg.1

117-1 FAULTFINDER LED "LOWER STEP UPTHRUST MONITOR" IS ON pg.1



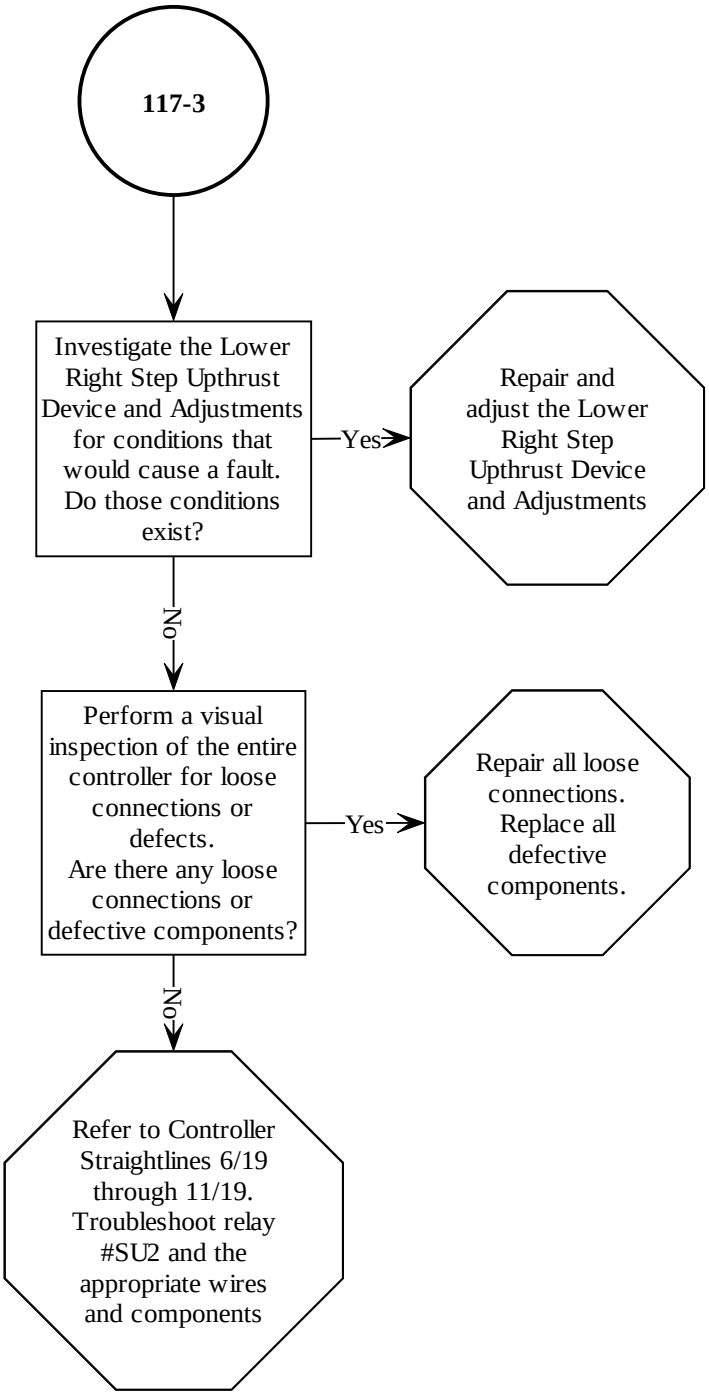
117-2 Fault LED "Lower Step Upthrust Monitor" is ON pg.2

117-2 FAULTFINDER LED "LOWER STEP UPTHRUST MONITOR" IS ON pg.2



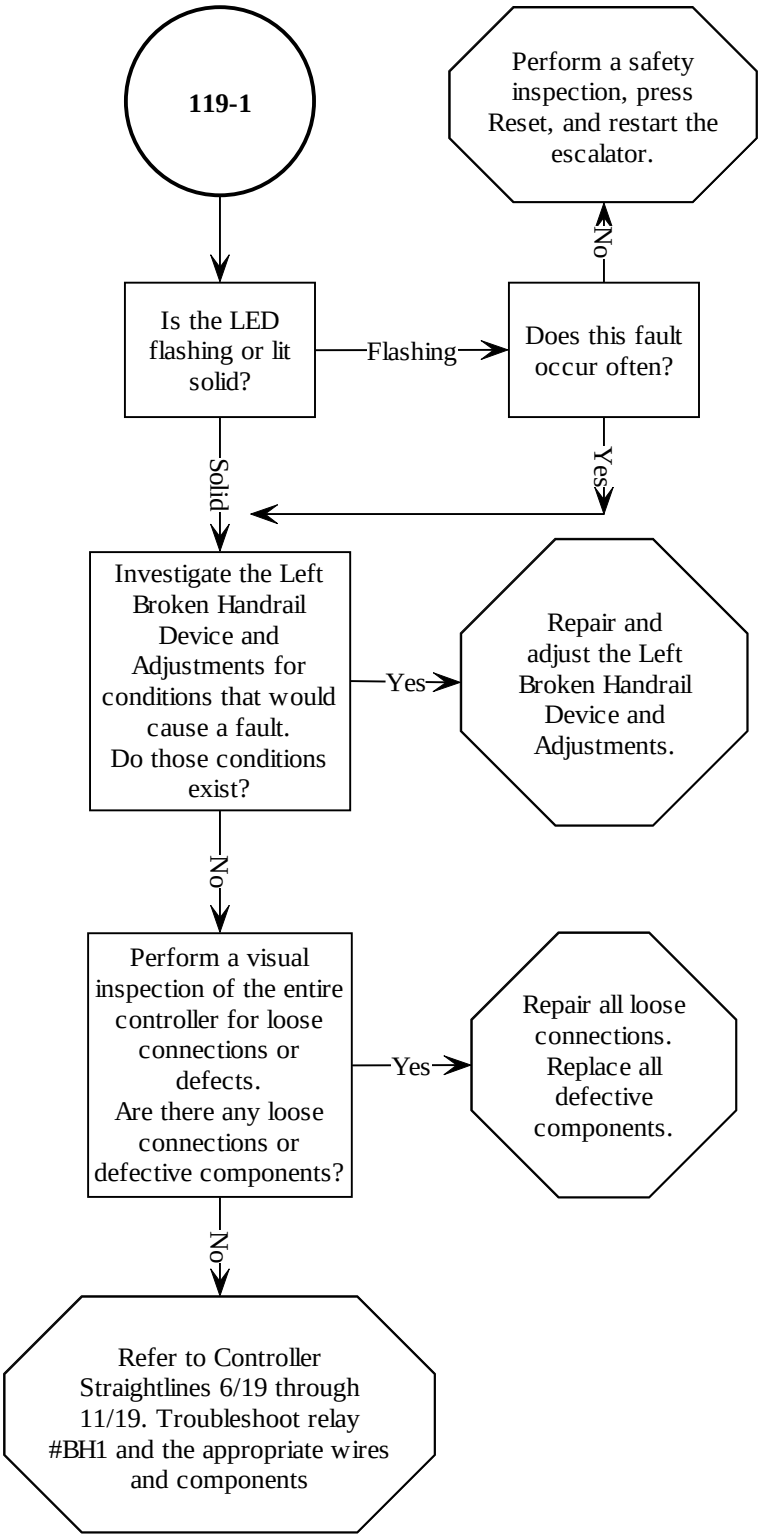
117-3 Fault LED "Lower Step Upthrust Monitor" is ON pg.3

117-3 FAULTFINDER LED "LOWER STEP UPTHRUST MONITOR" IS ON pg.3



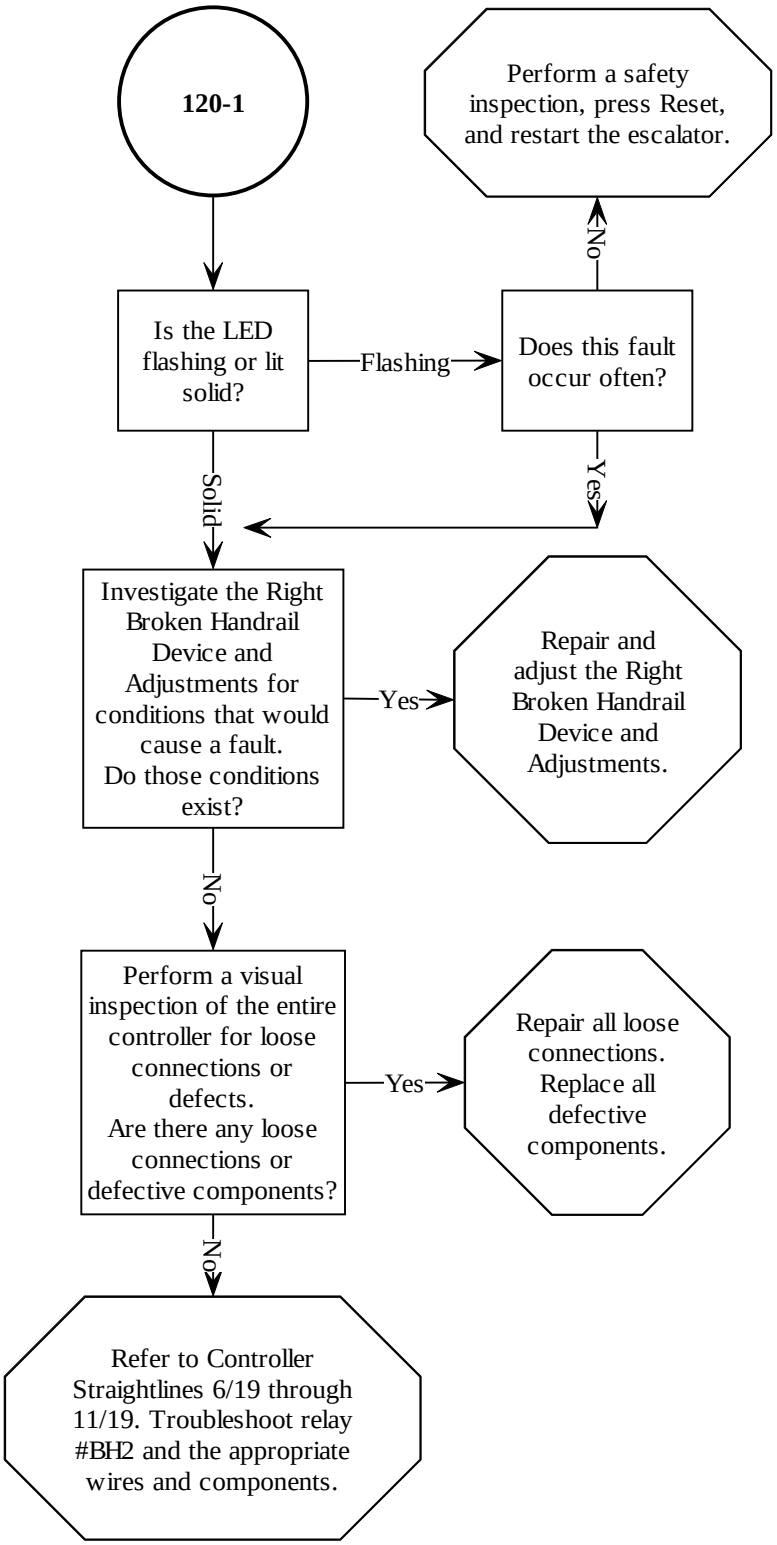
119-1 Fault LED "Left Broken Handrail Switch" is ON

119-1 FAULTFINDER LED "LEFT BROKEN HANDRAIL SWITCH" IS ON



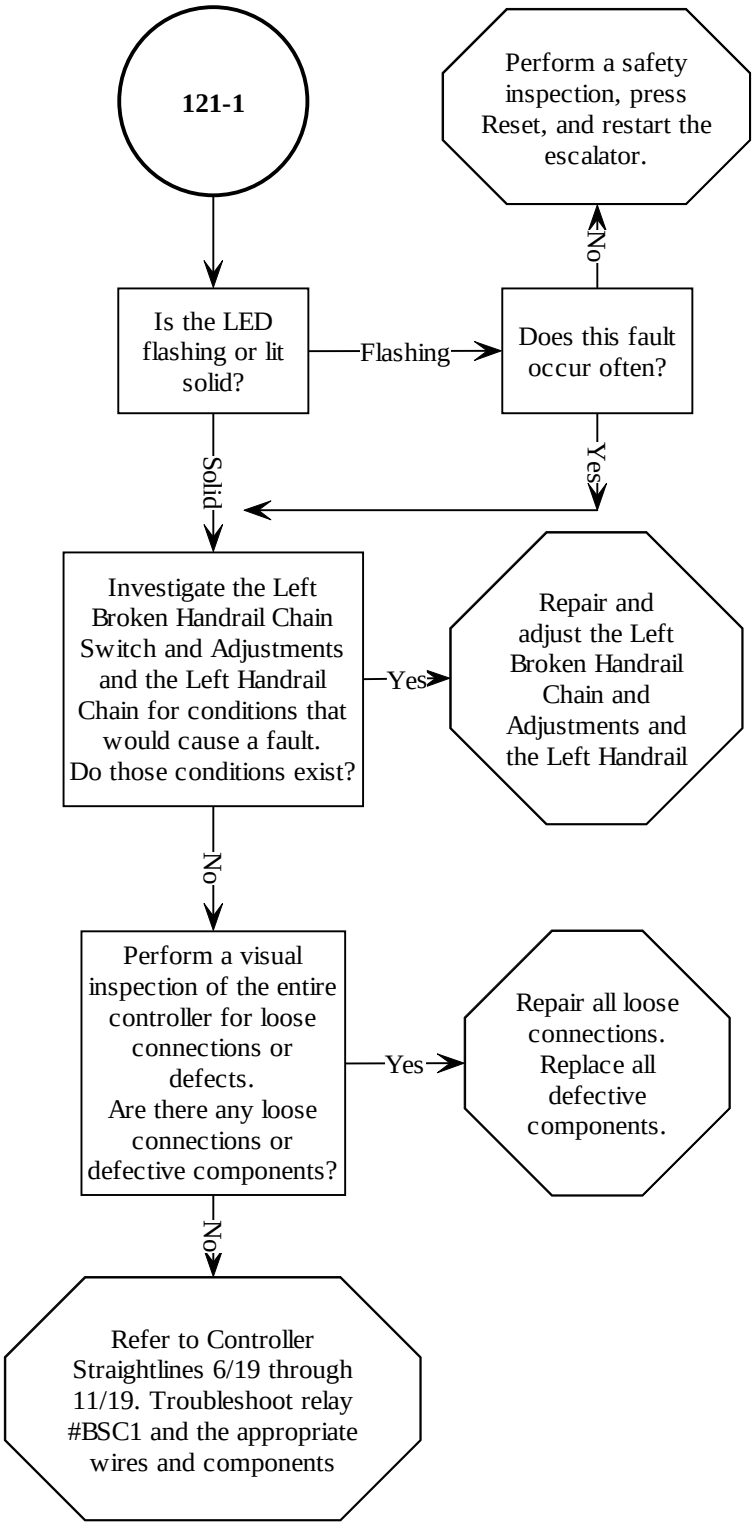
120-1 Fault LED "Right Broken Handrail Switch" is ON

120-1 FAULTFINDER LED "RIGHT BROKEN HANDRAIL SWITCH" IS ON



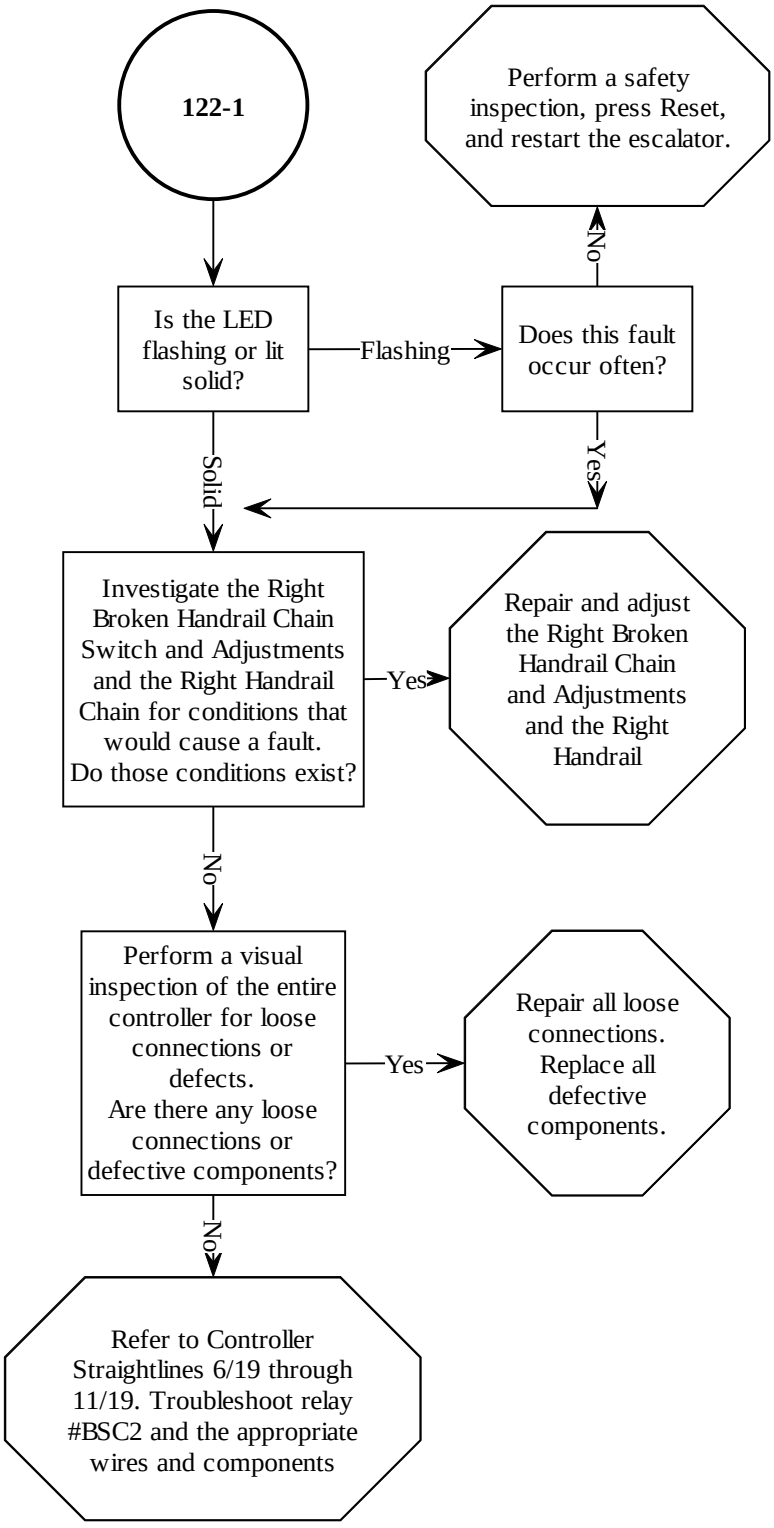
121-1 Fault LED "Left Broken Step Chain Switch" is ON

121-1 FAULTFINDER LED "LEFT BROKEN STEP CHAIN SWITCH" IS ON



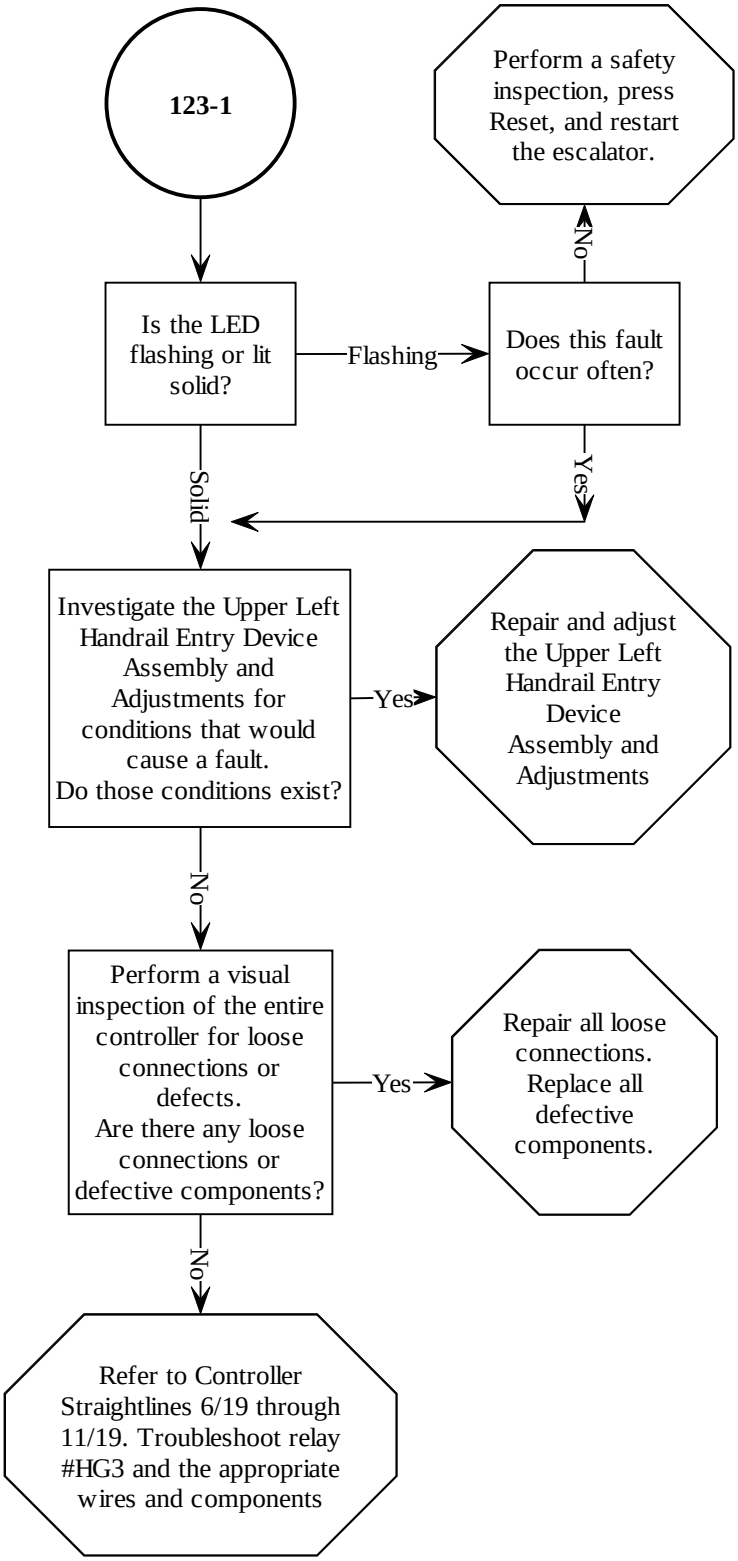
122-1 Fault LED "Right Broken Step Chain Switch" is ON

122-1 FAULTFINDER LED "RIGHT BROKEN STEP CHAIN SWITCH" IS ON



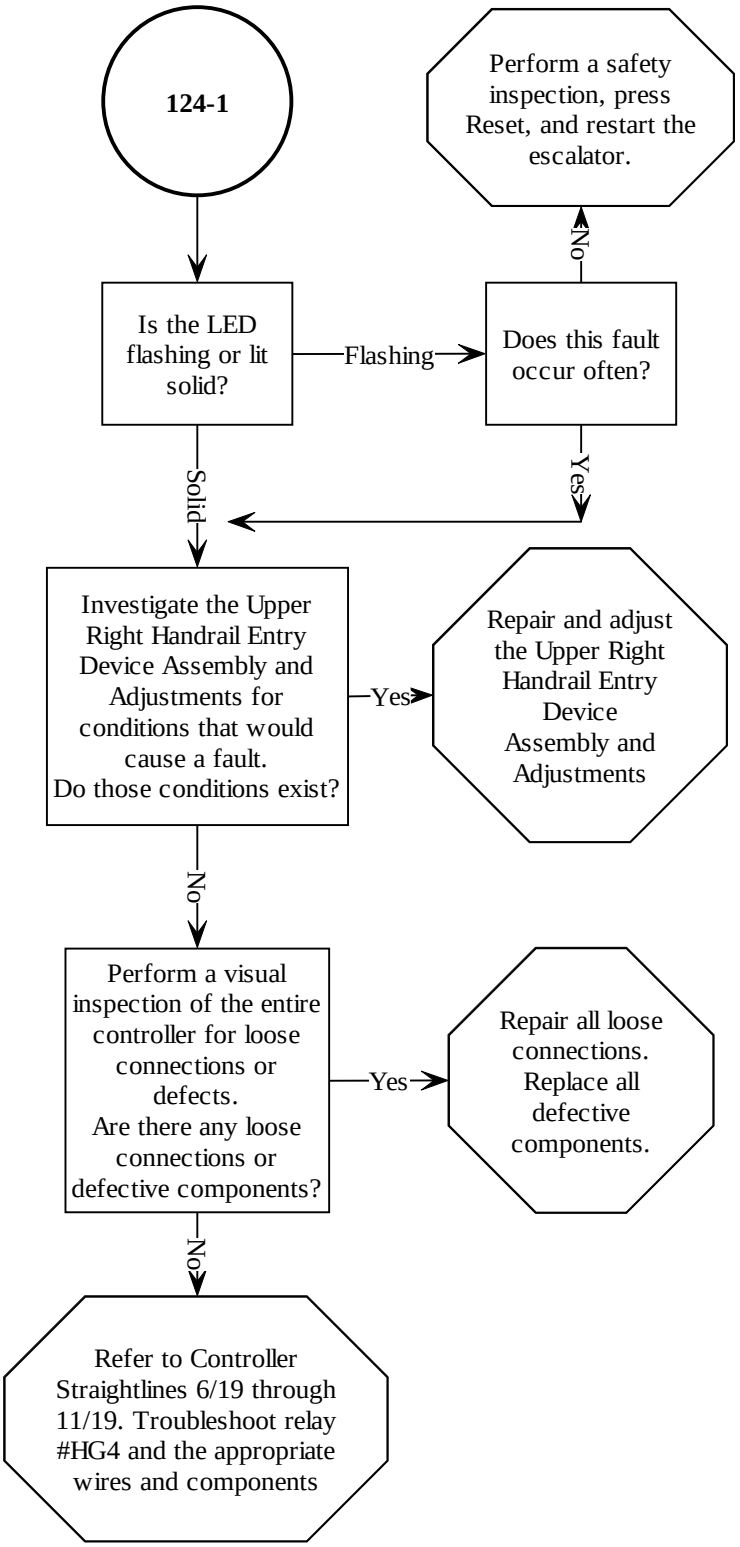
123-1 Fault LED "Top Left Handrail Entry Contact" is ON

123-1 FAULTFINDER LED "TOP LEFT HANDRAIL ENTRY CONTACT" IS ON



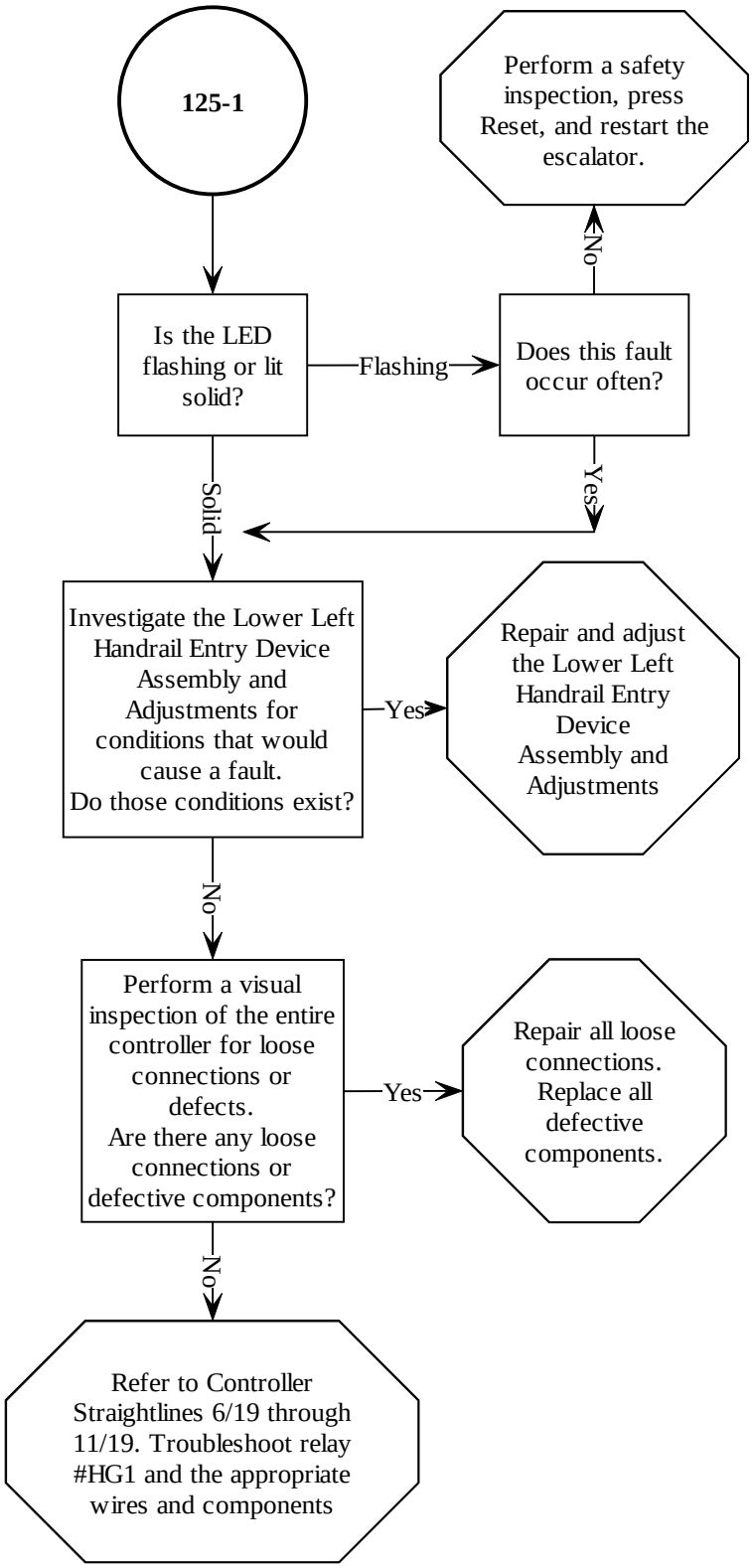
124-1 Fault LED "Top Right Handrail Entry Contact" is ON

124-1 FAULTFINDER LED "TOP RIGHT HANDRAIL ENTRY CONTACT" IS ON



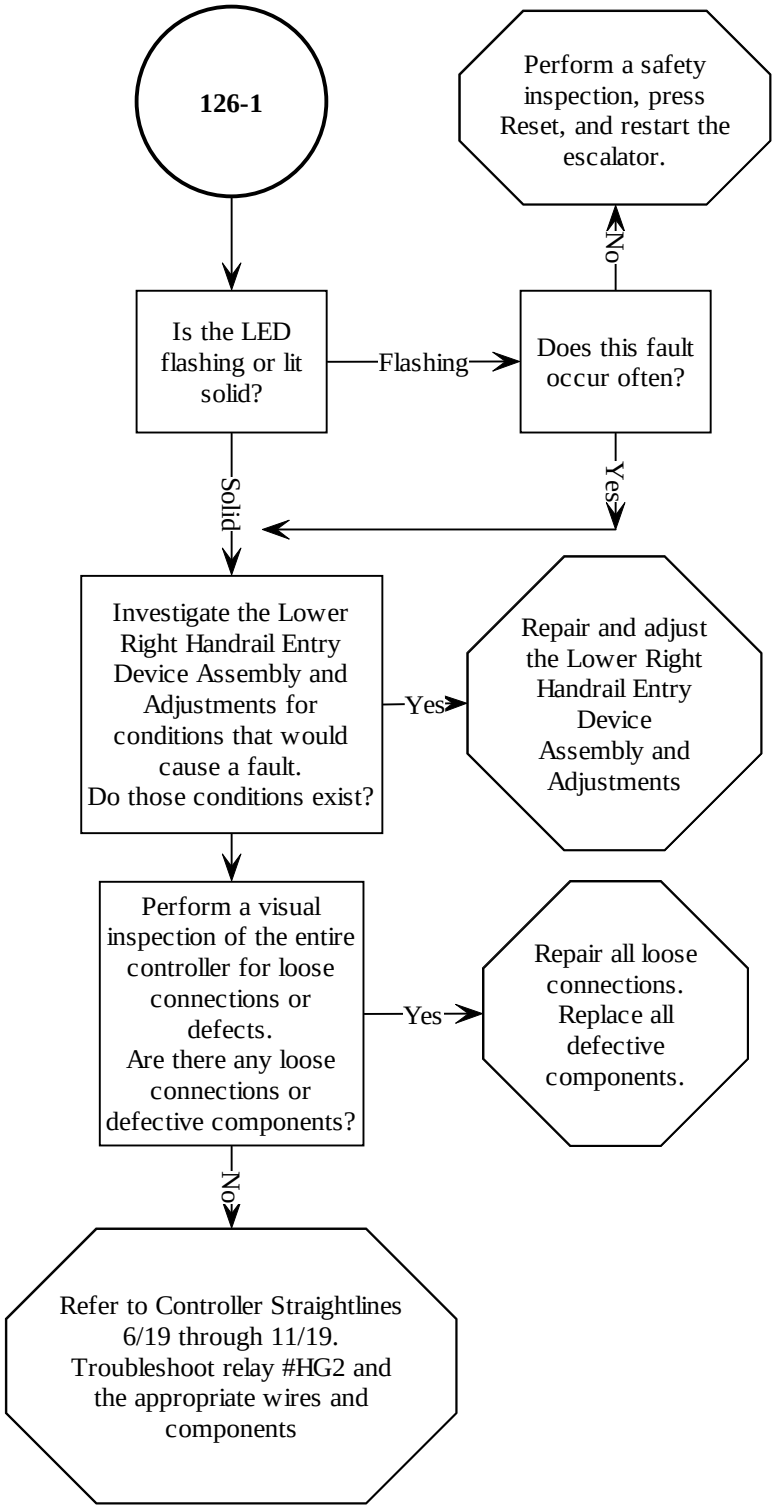
125-1 Fault LED "Bottom Left Handrail Entry Contact" is ON

125-1 FAULTFINDER LED "BOTTOM LEFT HANDRAIL ENTRY CONTACT" IS ON



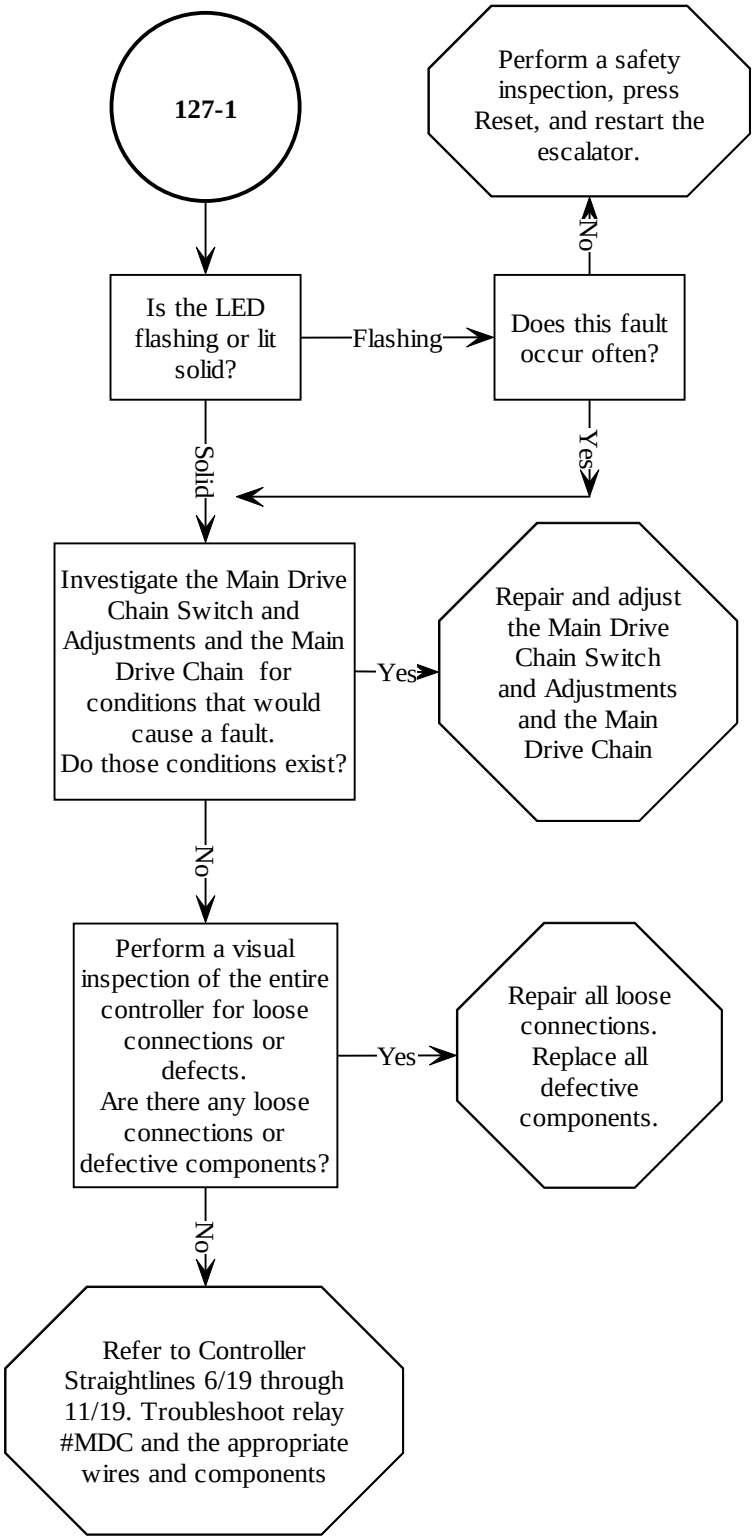
126-1 Fault LED "Bottom Right Handrail Entry Contact" is ON

126-1 FAULTFINDER LED "BOTTOM RIGHT HANDRAIL ENTRY CONTACT" IS ON



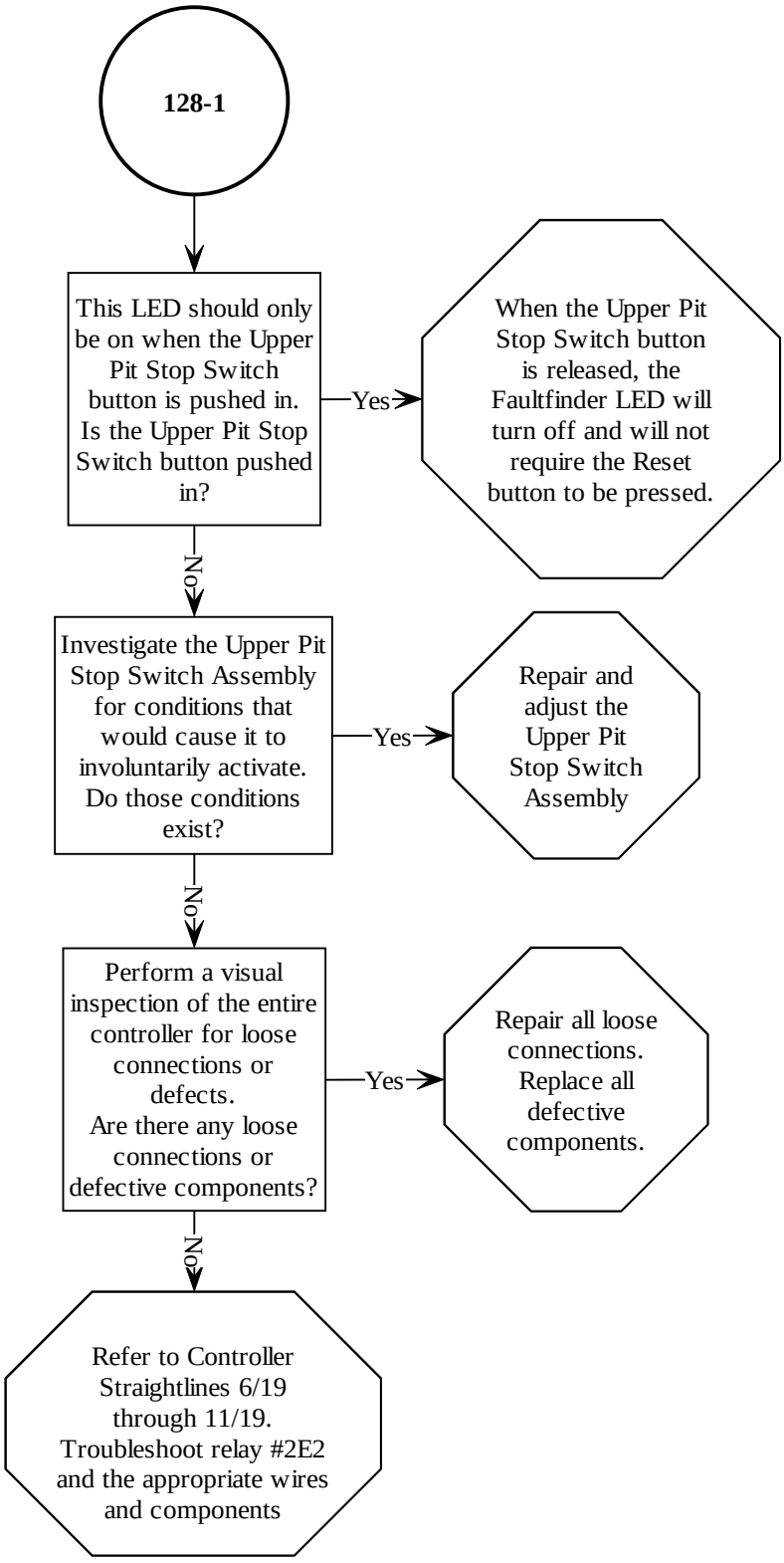
127-1 Fault LED "Broken Drive Chain Contact" is ON

127-1 FAULTFINDER LED "BROKEN DRIVE CHAIN CONTACT" IS ON



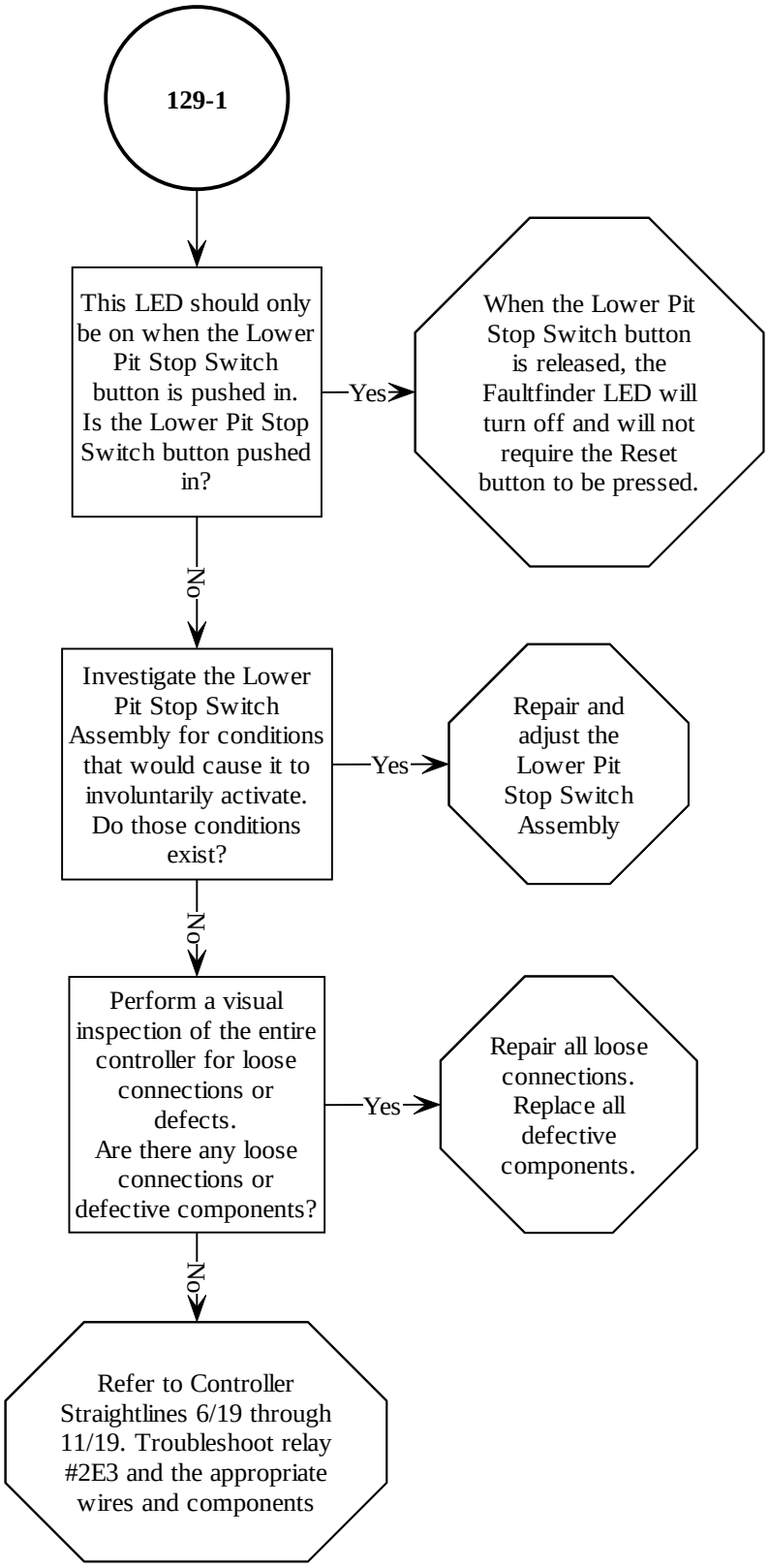
128-1 Fault LED "Upper Maintenance Safety Switch" is ON

128-1 FAULTFINDER LED "UPPER MAINTENANCE SAFETY SWITCH" IS ON



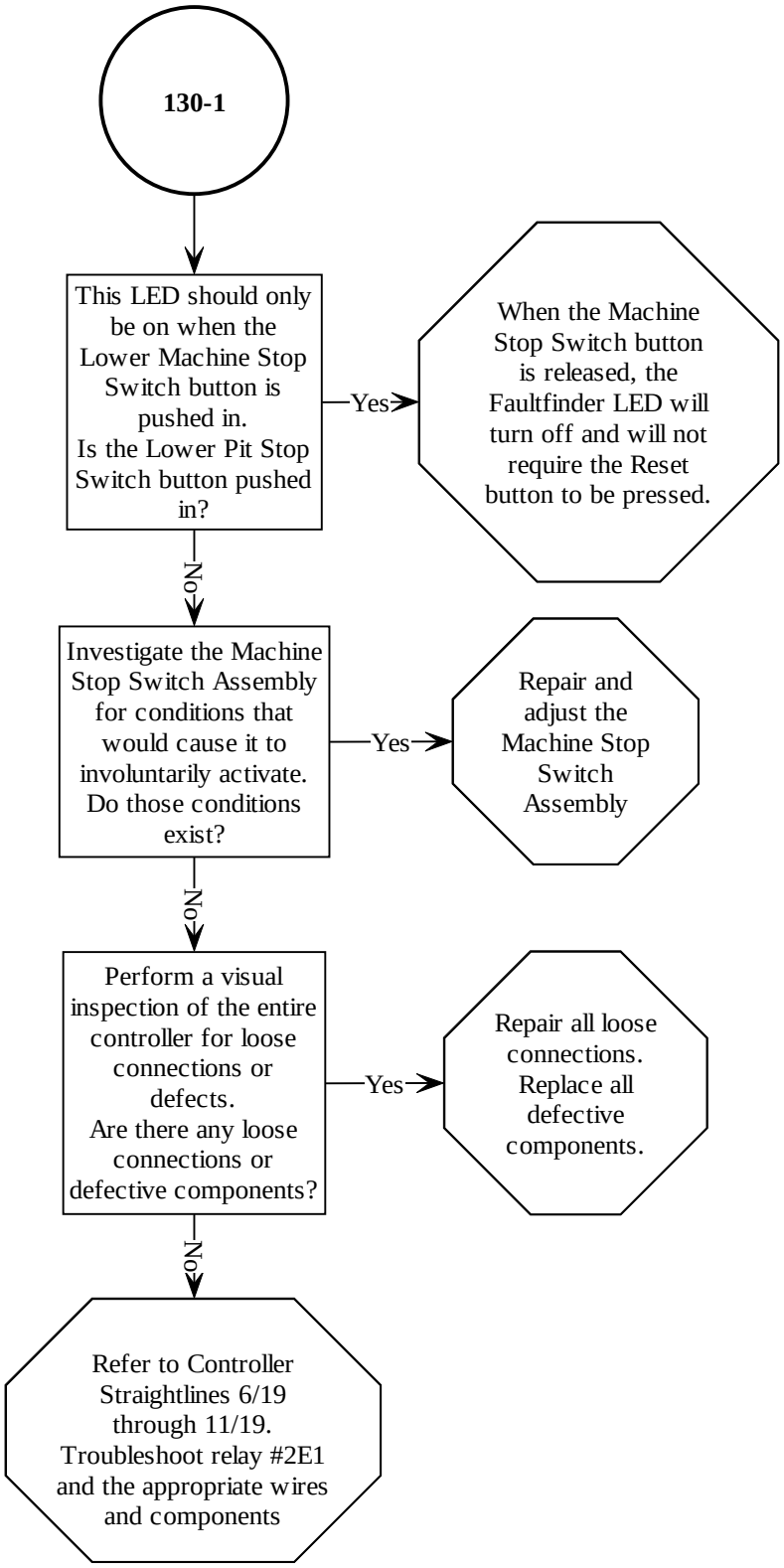
129-1 Fault LED "Lower Maintenance Safety Switch" is ON

129-1 FAULTFINDER LED "LOWER MAINTENANCE SAFETY SWITCH" IS ON



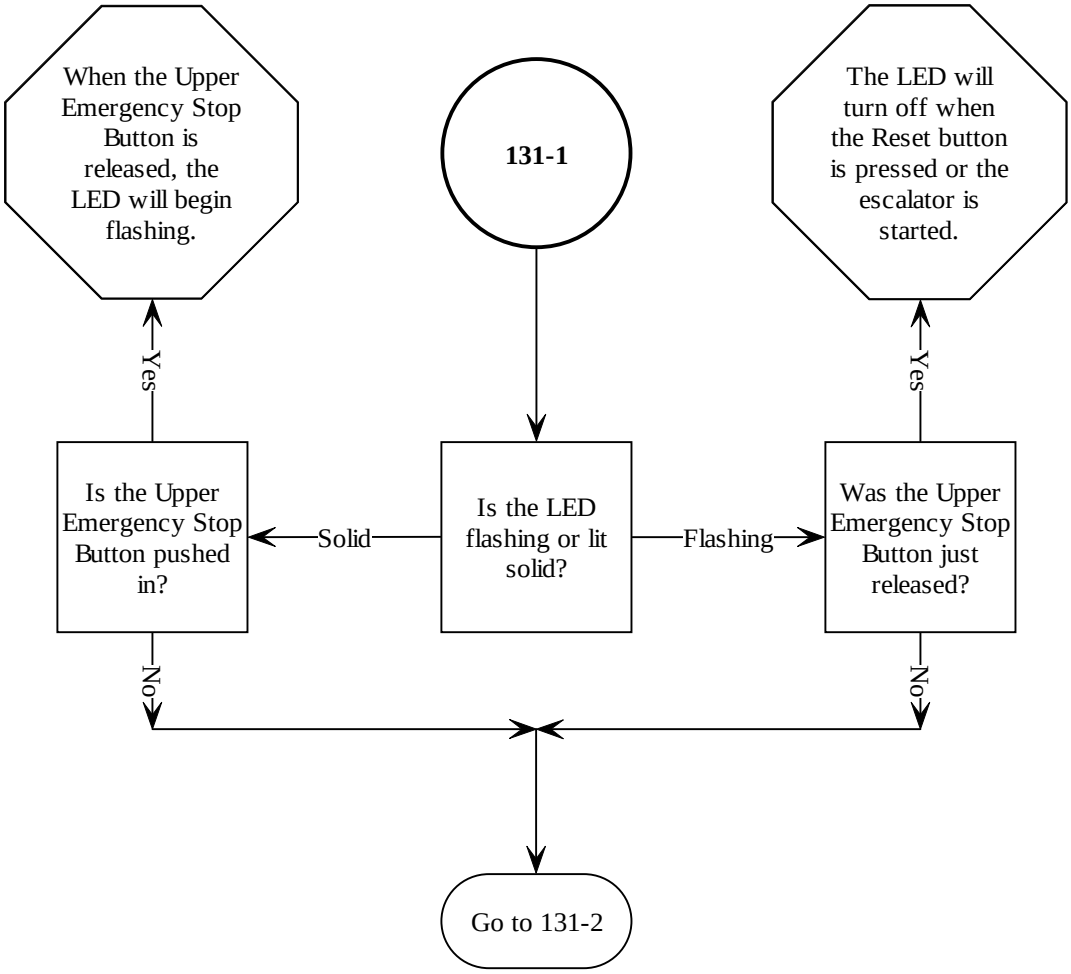
130-1 Fault LED "Machine Room Maint. Safety Switch" is ON

130-1 FAULTFINDER LED "MACHINE ROOM MAINTENANCE SAFETY SWITCH" IS ON



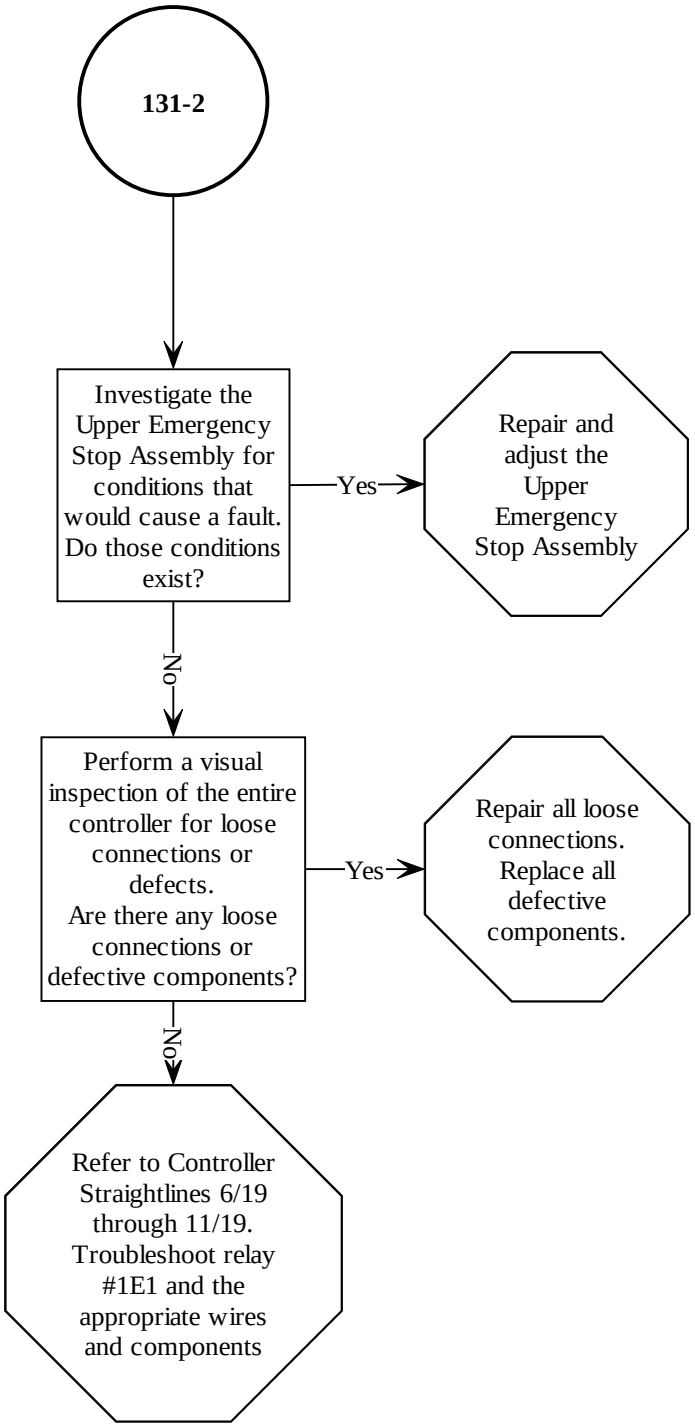
131-1 Fault LED "Top Emergency Stop Button" is ON pg.1

131-1 FAULTFINDER LED "TOP EMERGENCY STOP BUTTON" IS ON pg.1



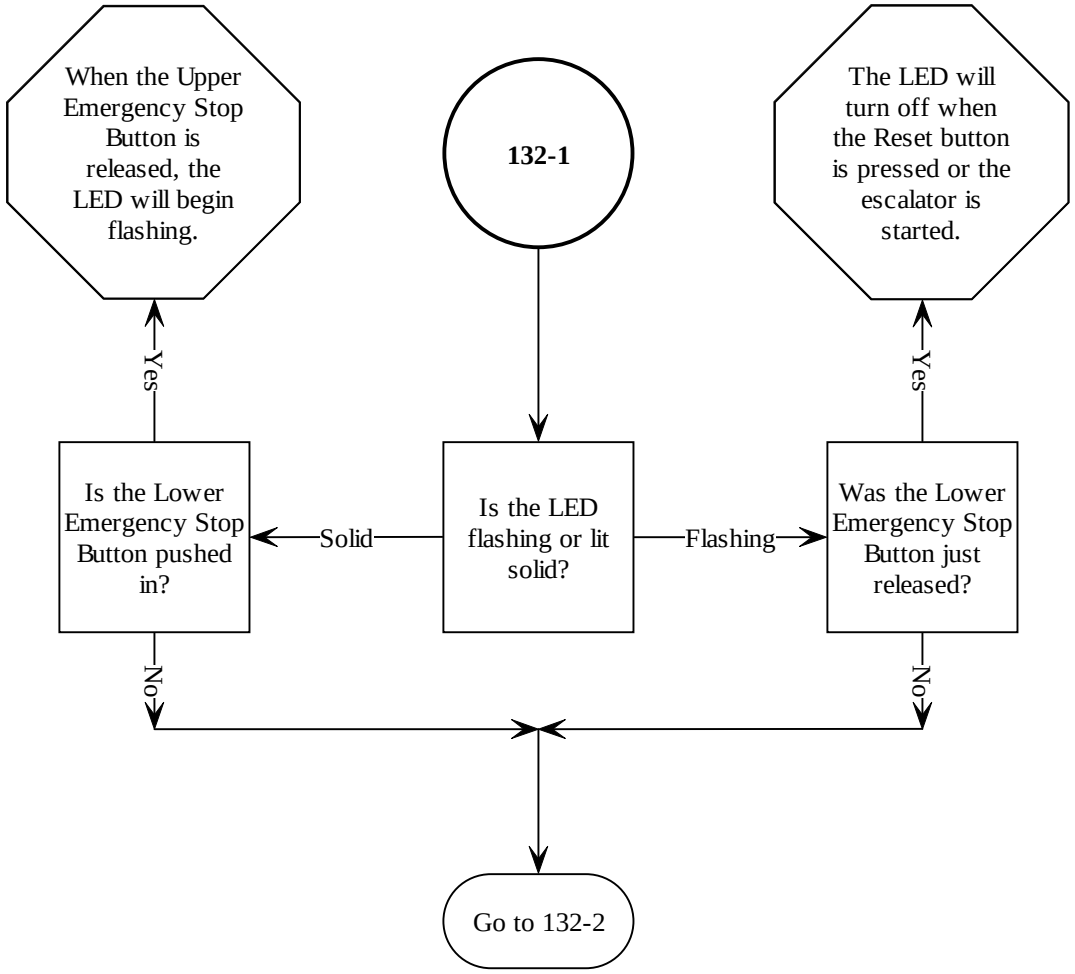
131-2 Fault LED "Top Emergency Stop Button" is ON pg.2

131-2 FAULTFINDER LED "TOP EMERGENCY STOP BUTTON" IS ON pg.2



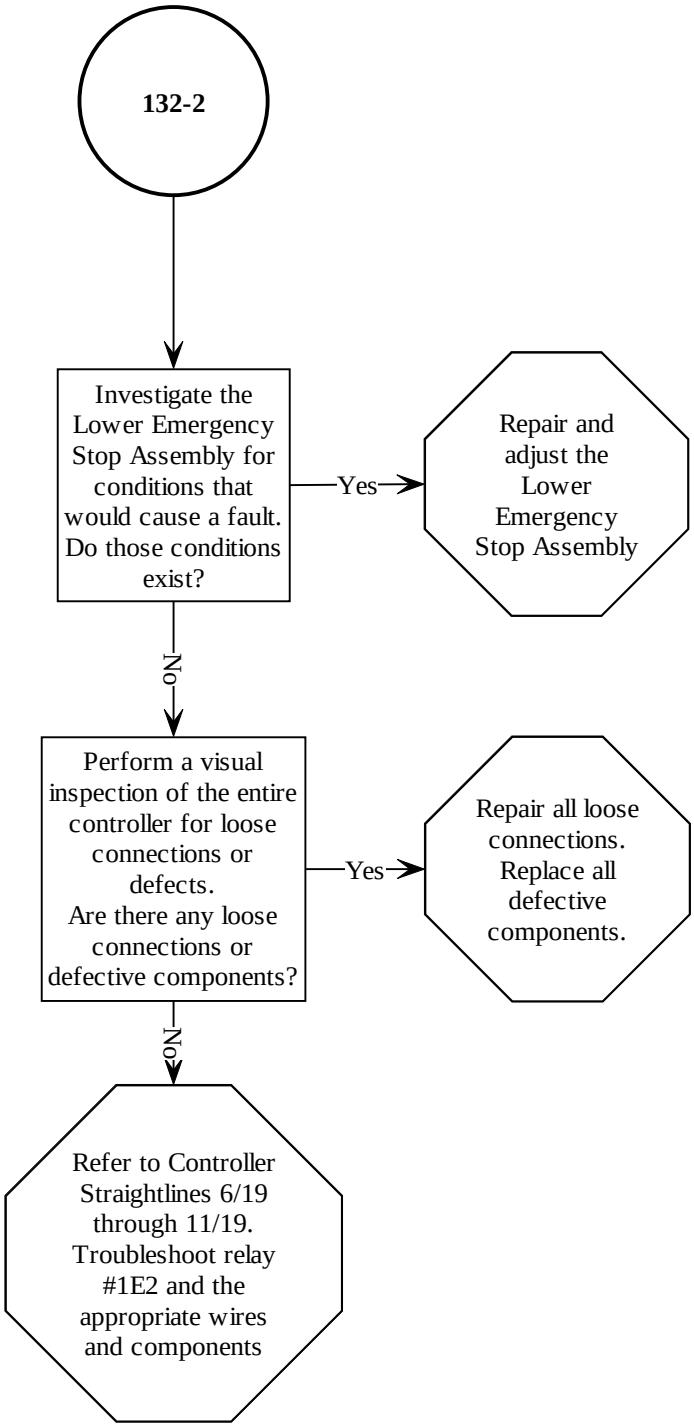
132-1 Fault LED "Bottom Emergency Stop Button" is ON pg.1

132-1 FAULTFINDER LED "BOTTOM EMERGENCY STOP BUTTON" IS ON pg.1



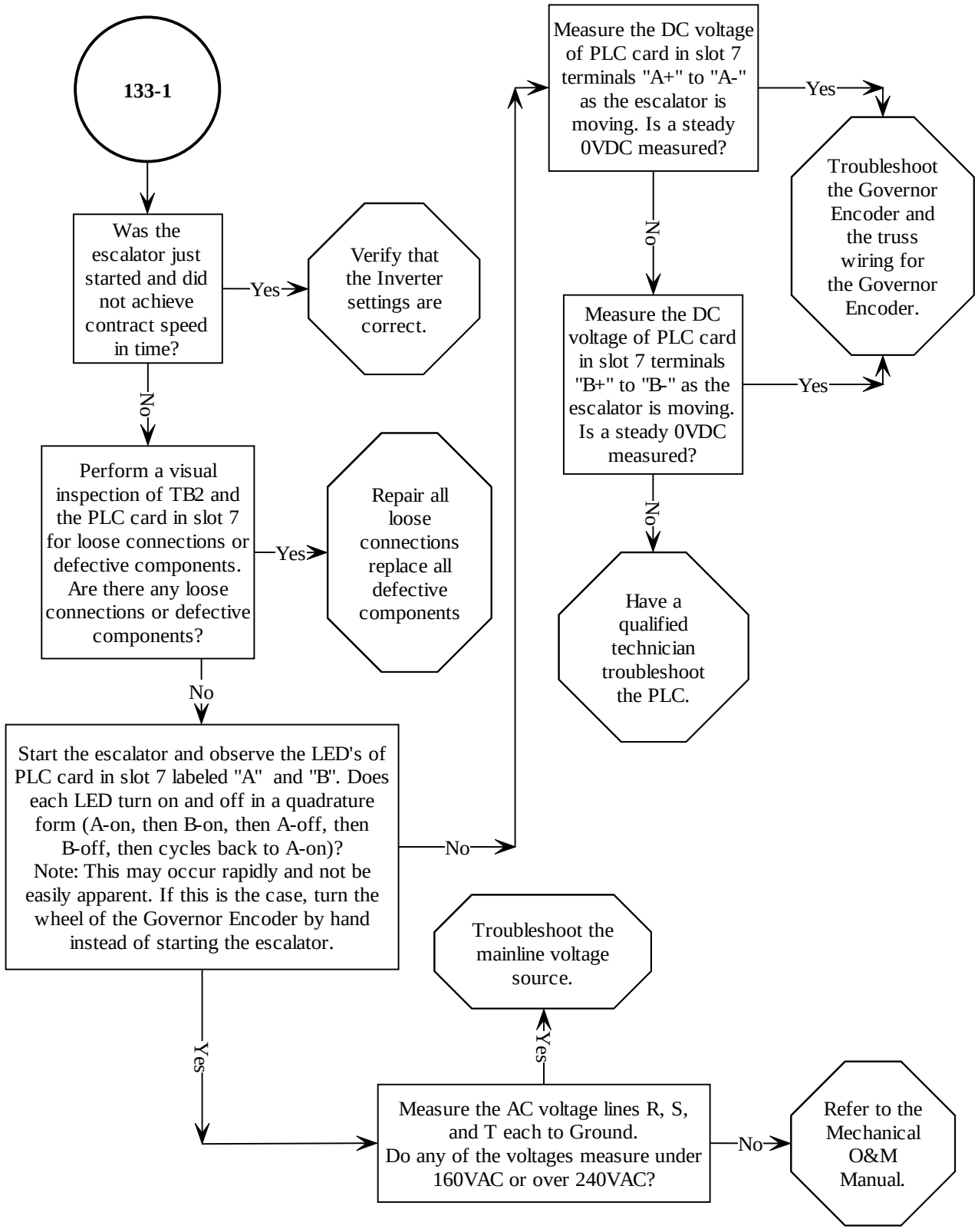
132-2 Fault LED "Bottom Emergency Stop Button" is ON pg.2

132-2 FAULTFINDER LED "BOTTOM EMERGENCY STOP BUTTON" IS ON pg.2



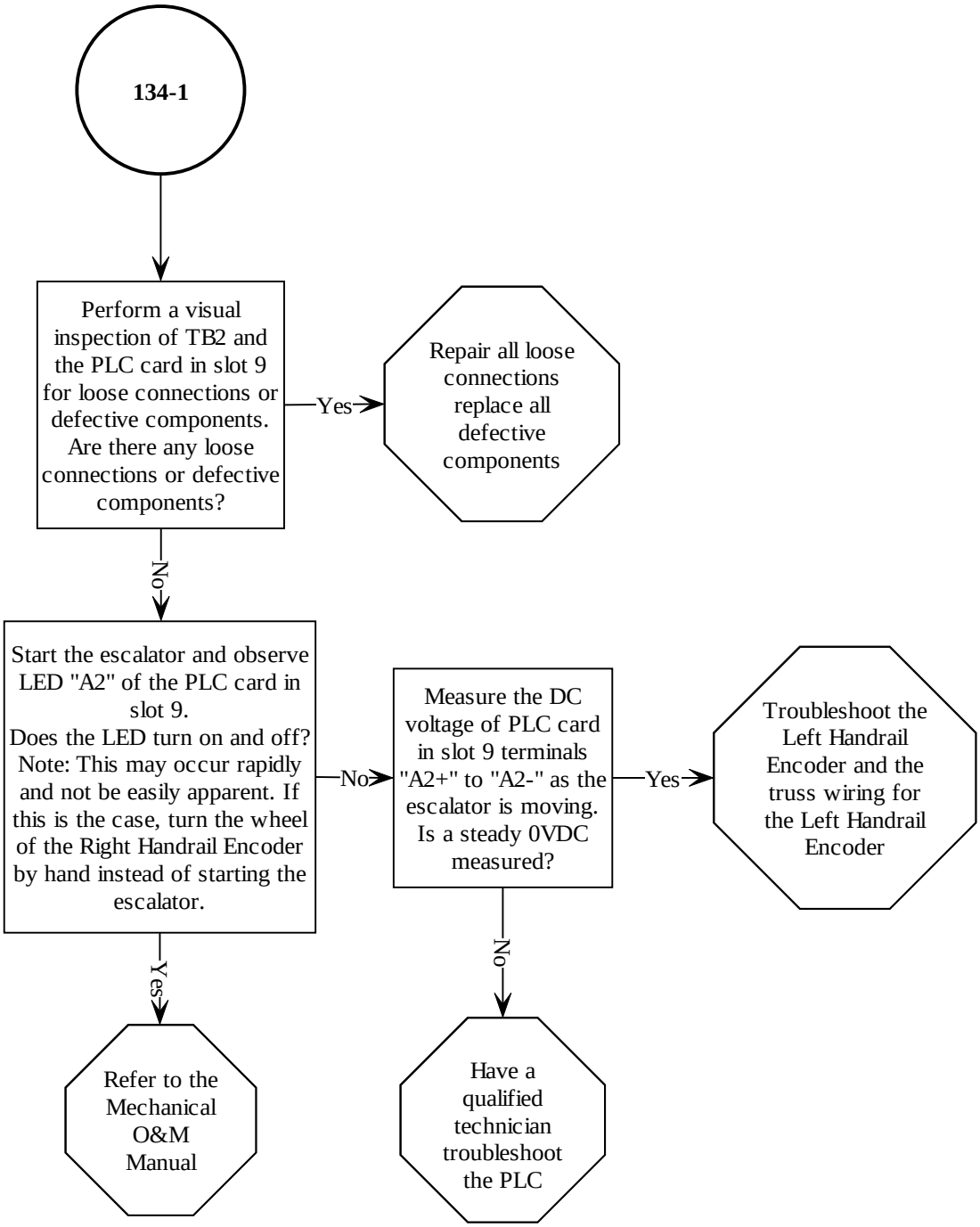
133-1 Fault LED "Escalator Speed Monitor" is ON

133-1 FAULTFINDER LED "ESCALATOR SPEED MONITOR" IS ON



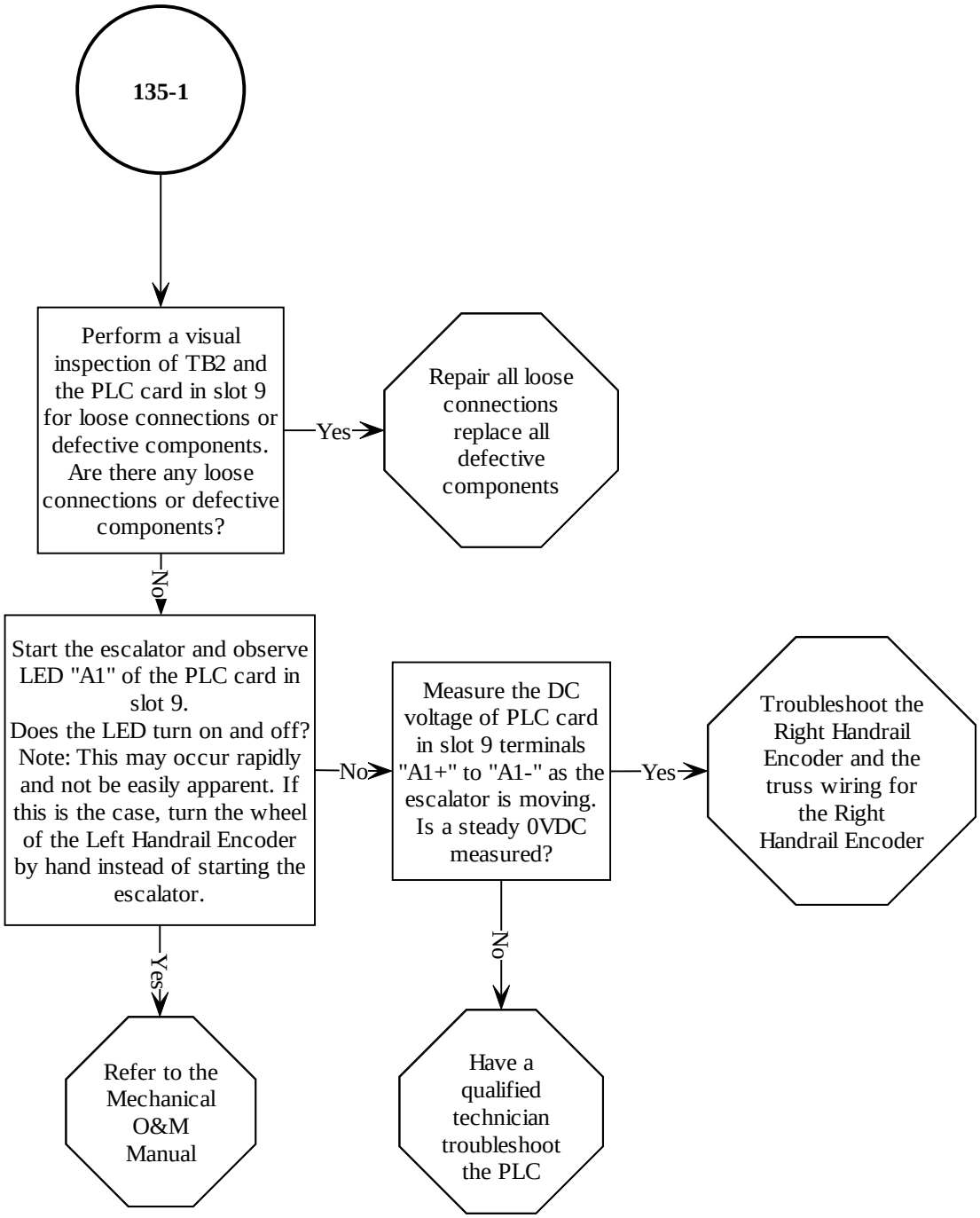
134-1 Fault LED "Left Handrail Speed Monitor" is ON

134-1 FAULTFINDER LED "LEFT HANDRAIL SPEED MONITOR" IS ON



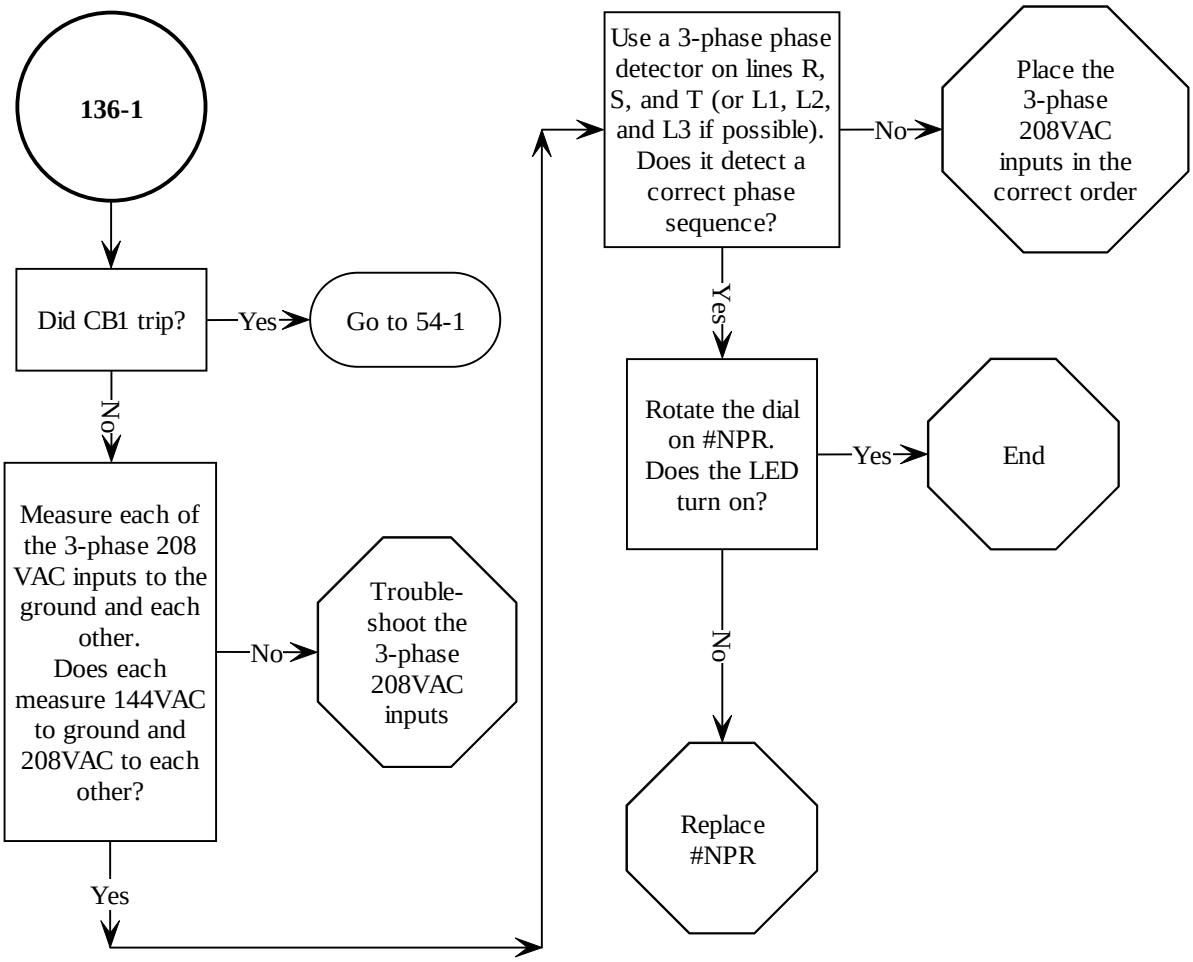
135-1 Fault LED "Right Handrail Speed Monitor" is ON

135-1 FAULTFINDER LED "RIGHT HANDRAIL SPEED MONITOR" IS ON



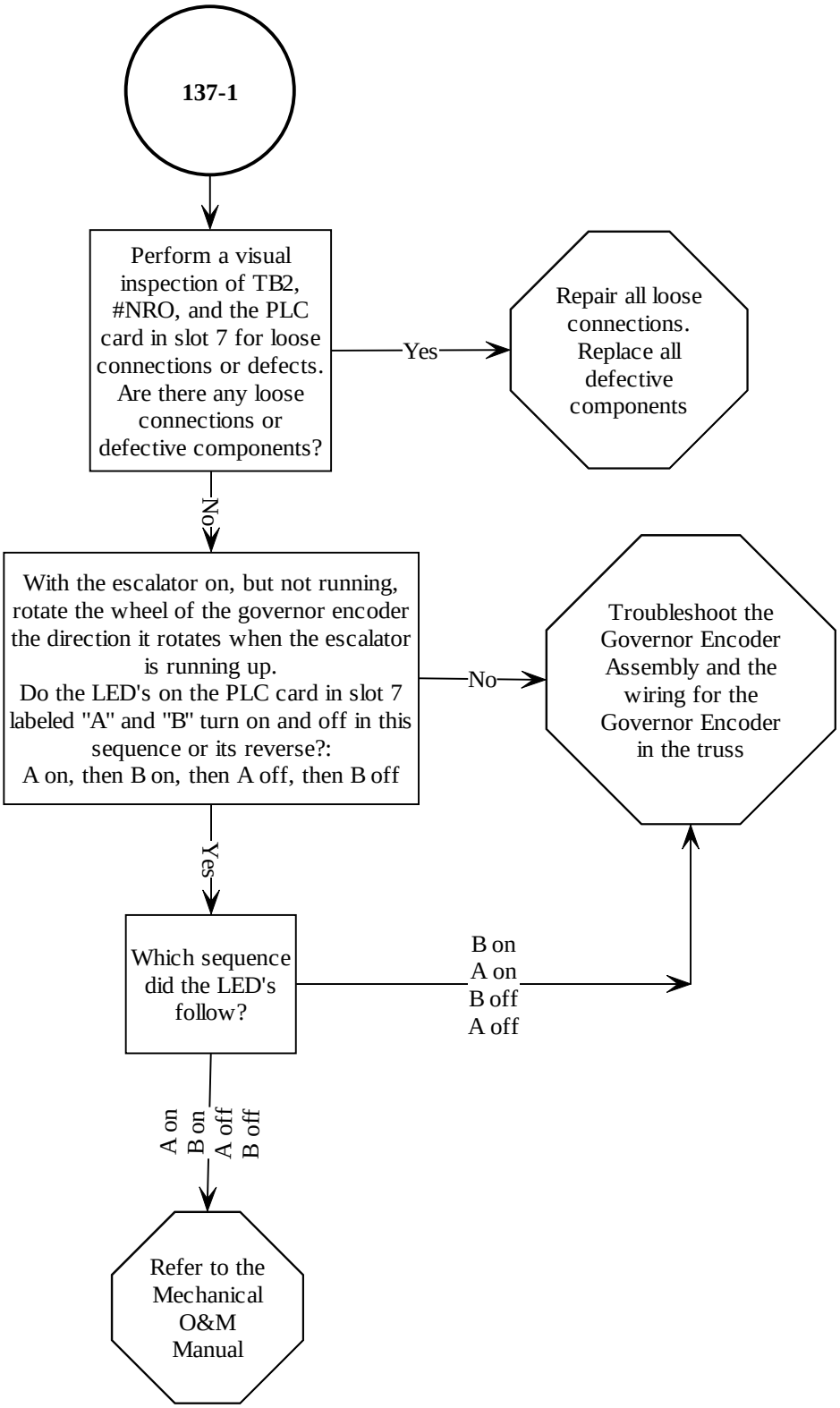
136-1 Fault LED "Phase Failure/Phase Reversal Monitor" is ON

136-1 FAULTFINDER LED "PHASE FAILURE / PHASE REVERSAL MONITOR" IS ON



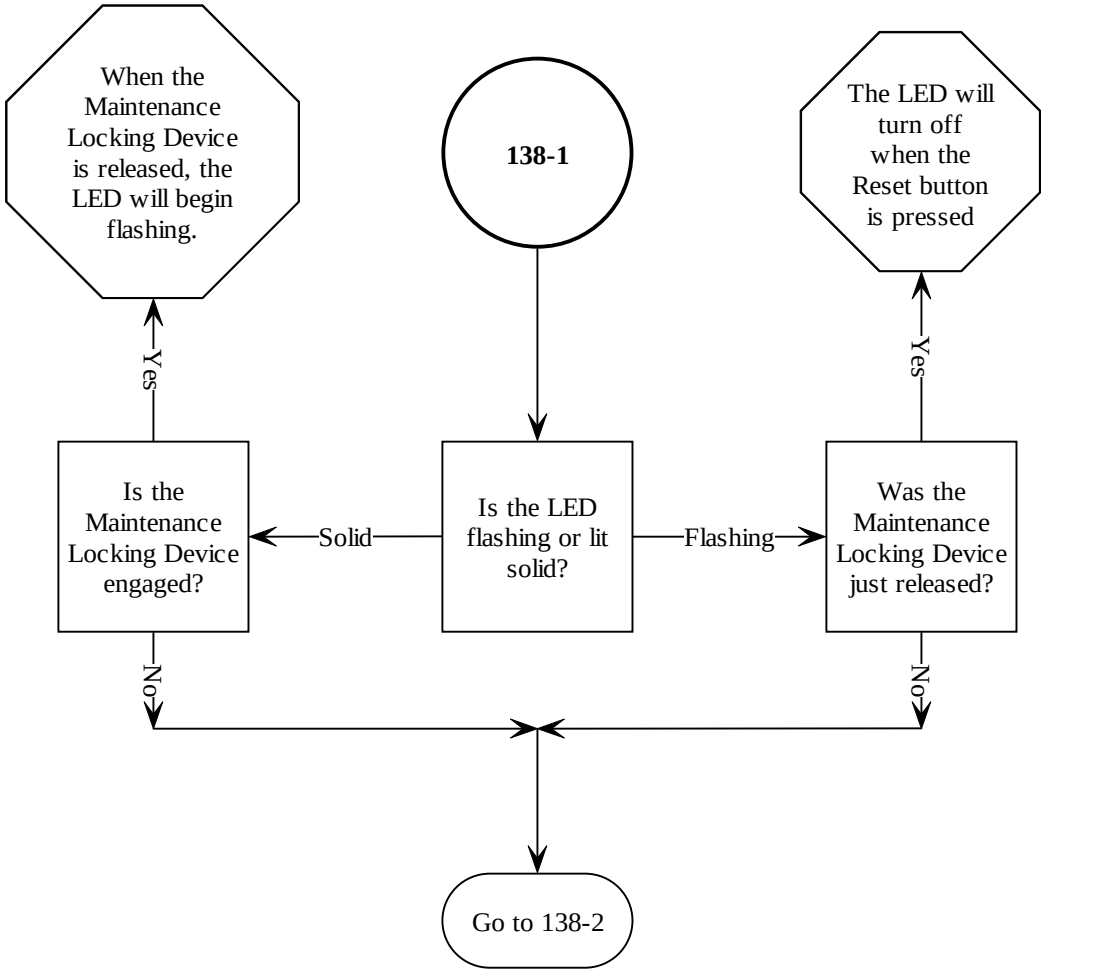
137-1 Fault LED "Anti-Reversal Device" is ON

137-1 FAULTFINDER LED "ANTI-REVERSAL DEVICE" IS ON



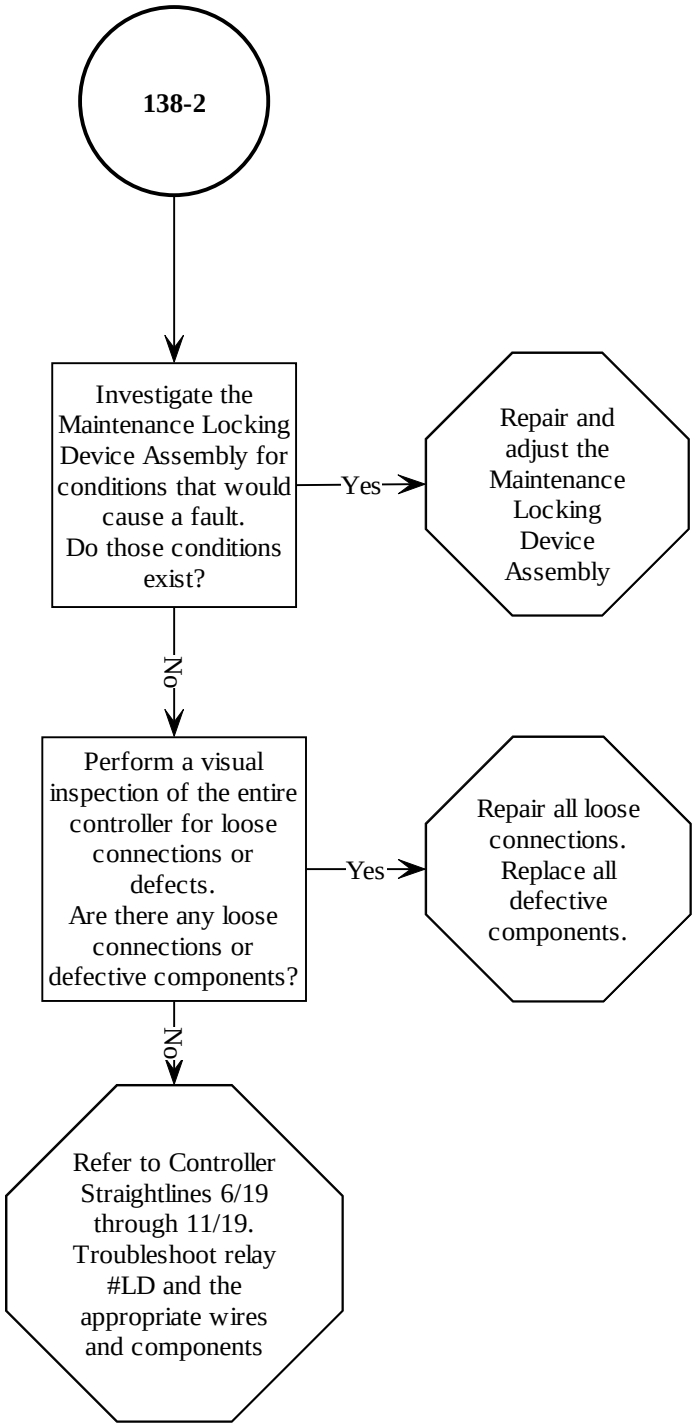
138-1 Fault LED "Mech. Step Chain Locking Device" is ON pg.1

138-1 FAULTFINDER LED "MECHANICAL STEP CHAIN LOCKING DEVICE" IS ON pg.1



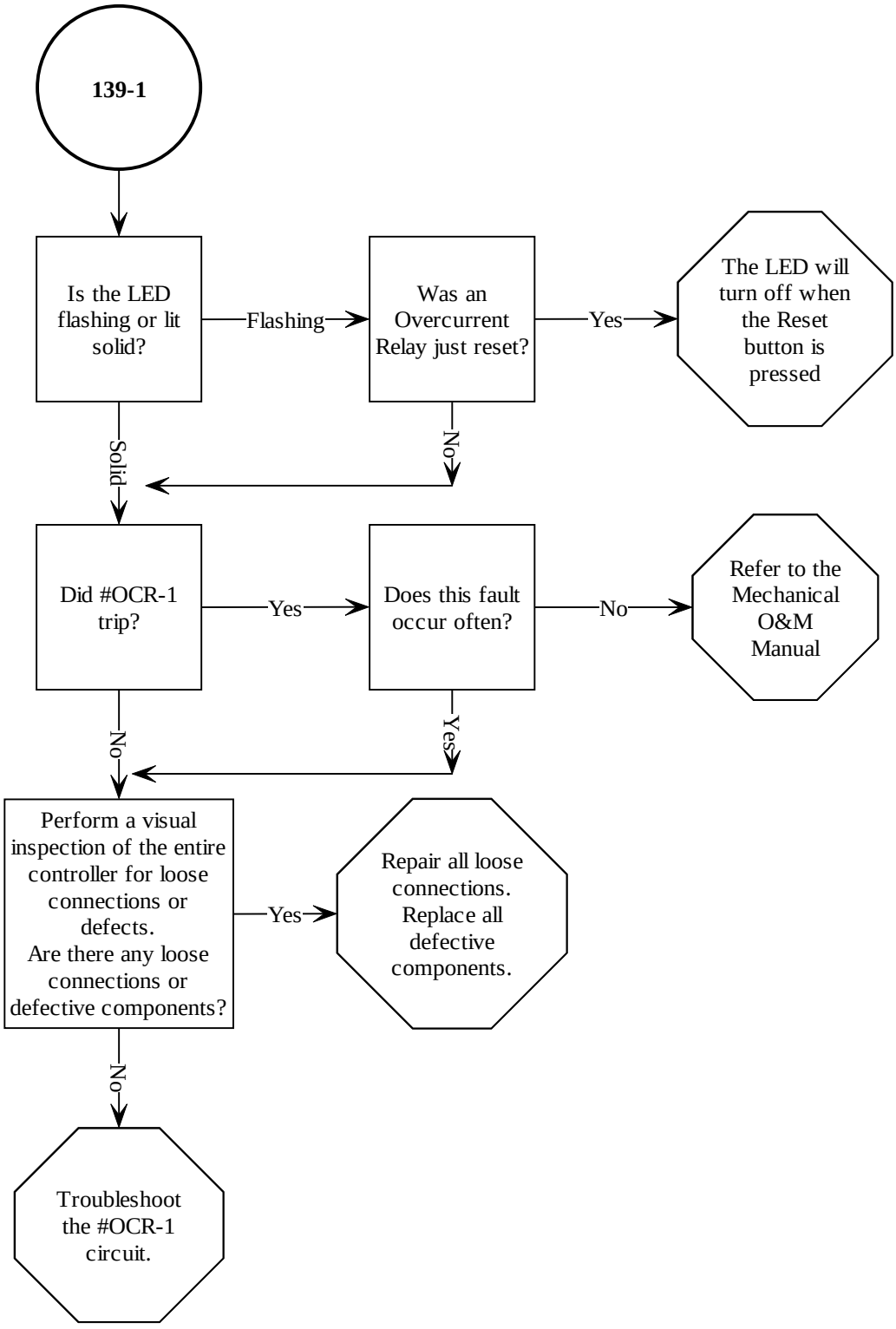
138-2 Fault LED "Mech. Step Chain Locking Device" is ON pg.2

138-2 FAULTFINDER LED "MECHANICAL STEP CHAIN LOCKING DEVICE" IS ON pg.2



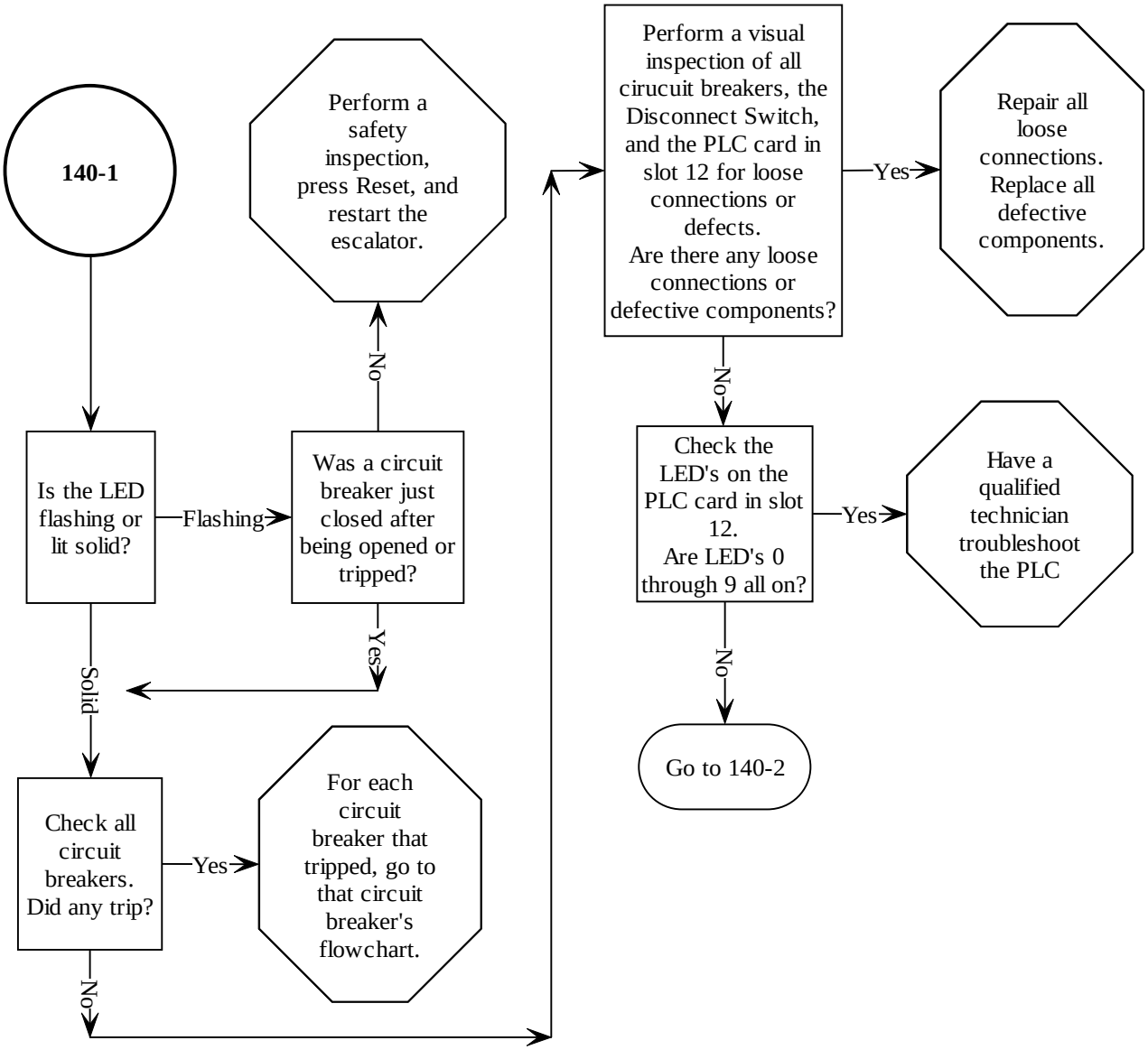
139-1 Fault LED "Motor Current Overload" is ON

139-1 FAULTFINDER LED "MOTOR CURRENT OVERLOAD" IS ON



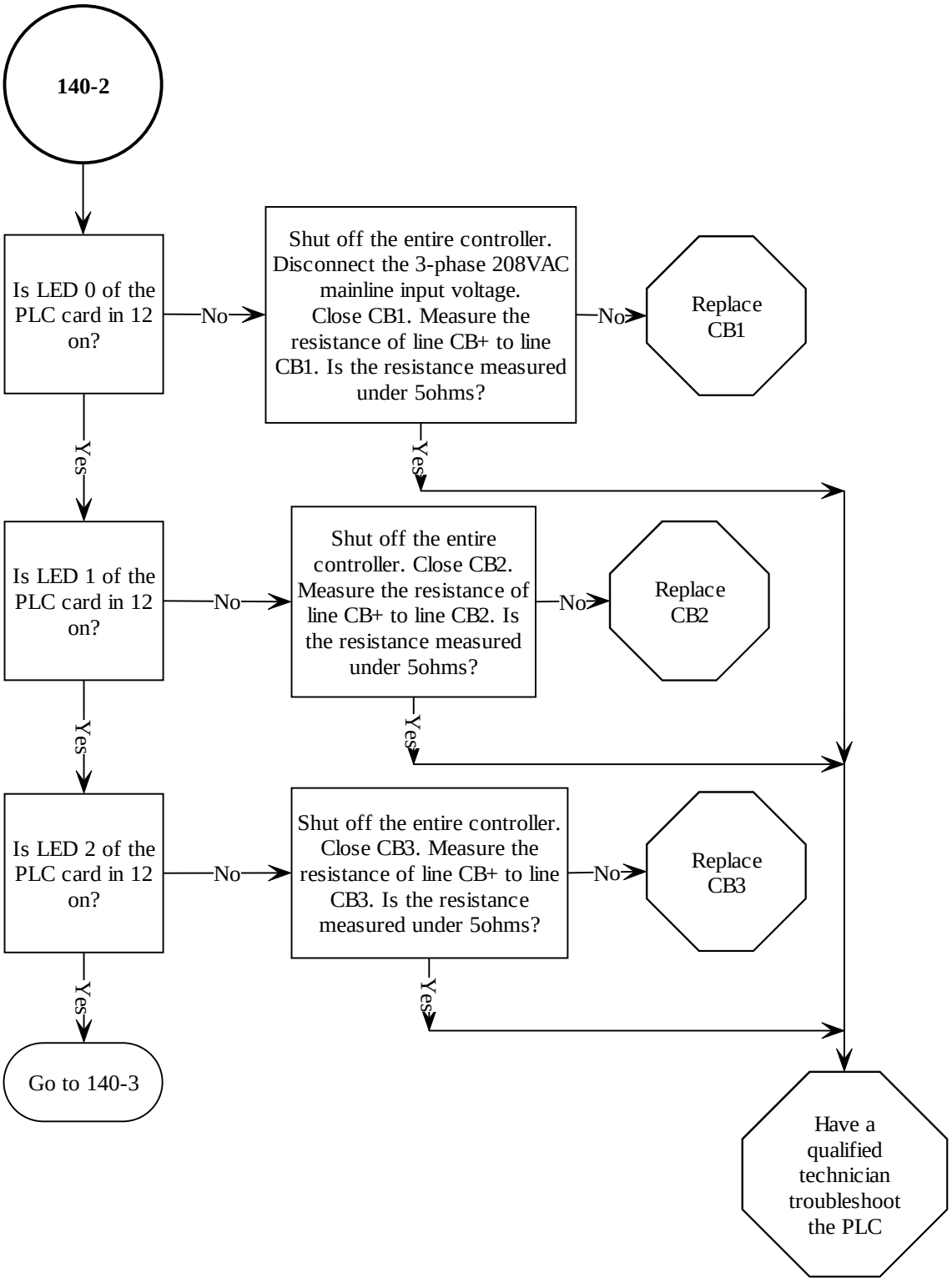
140-1 Fault LED "Circuit Breaker Fault" is ON pg.1

140-1 FAULTFINDER LED "CIRCUIT BREAKER FAULT" IS ON pg.1



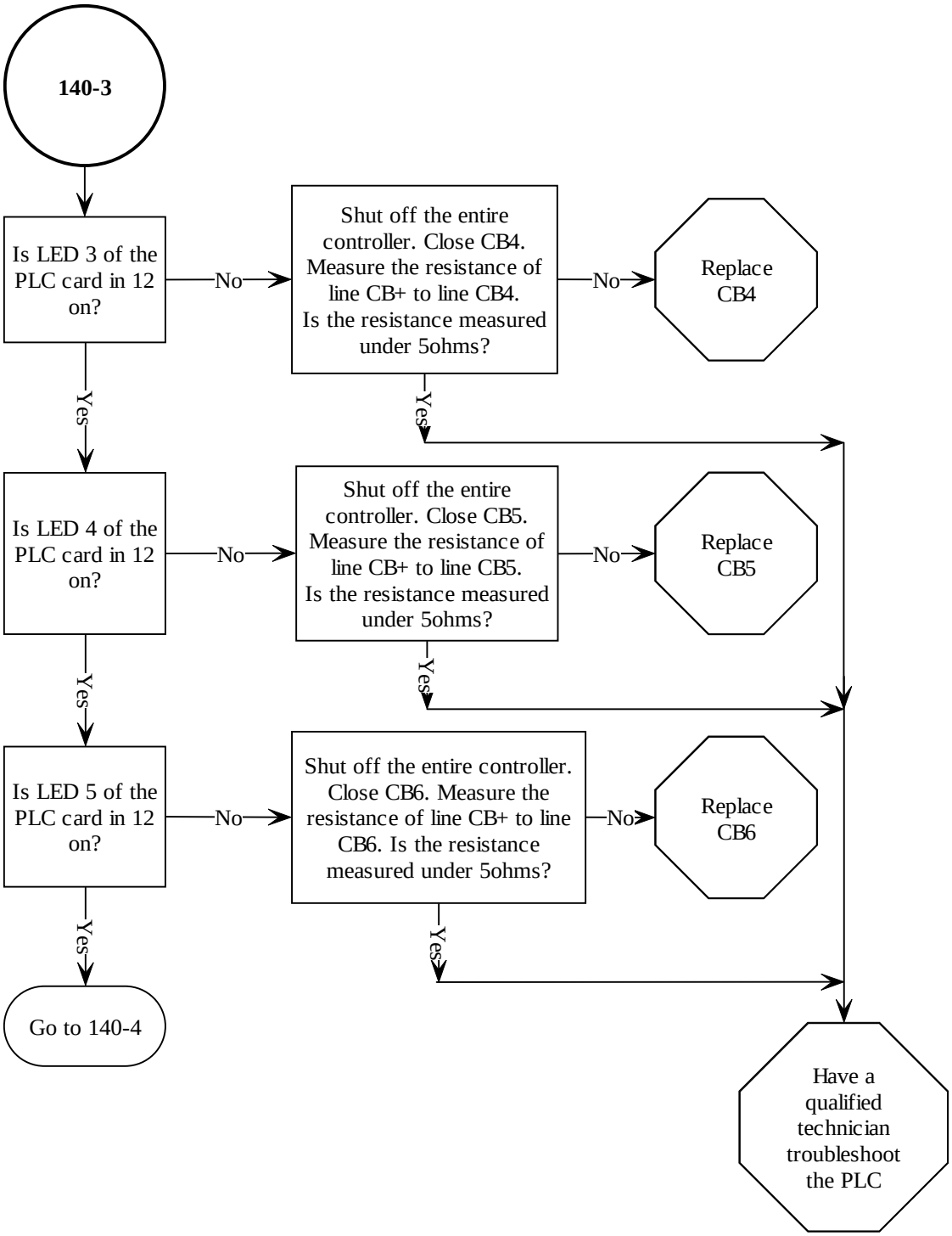
140-2 Fault LED "Circuit Breaker Fault" is ON pg.2

140-2 FAULTFINDER LED "CIRCUIT BREAKER FAULT" IS ON pg.2



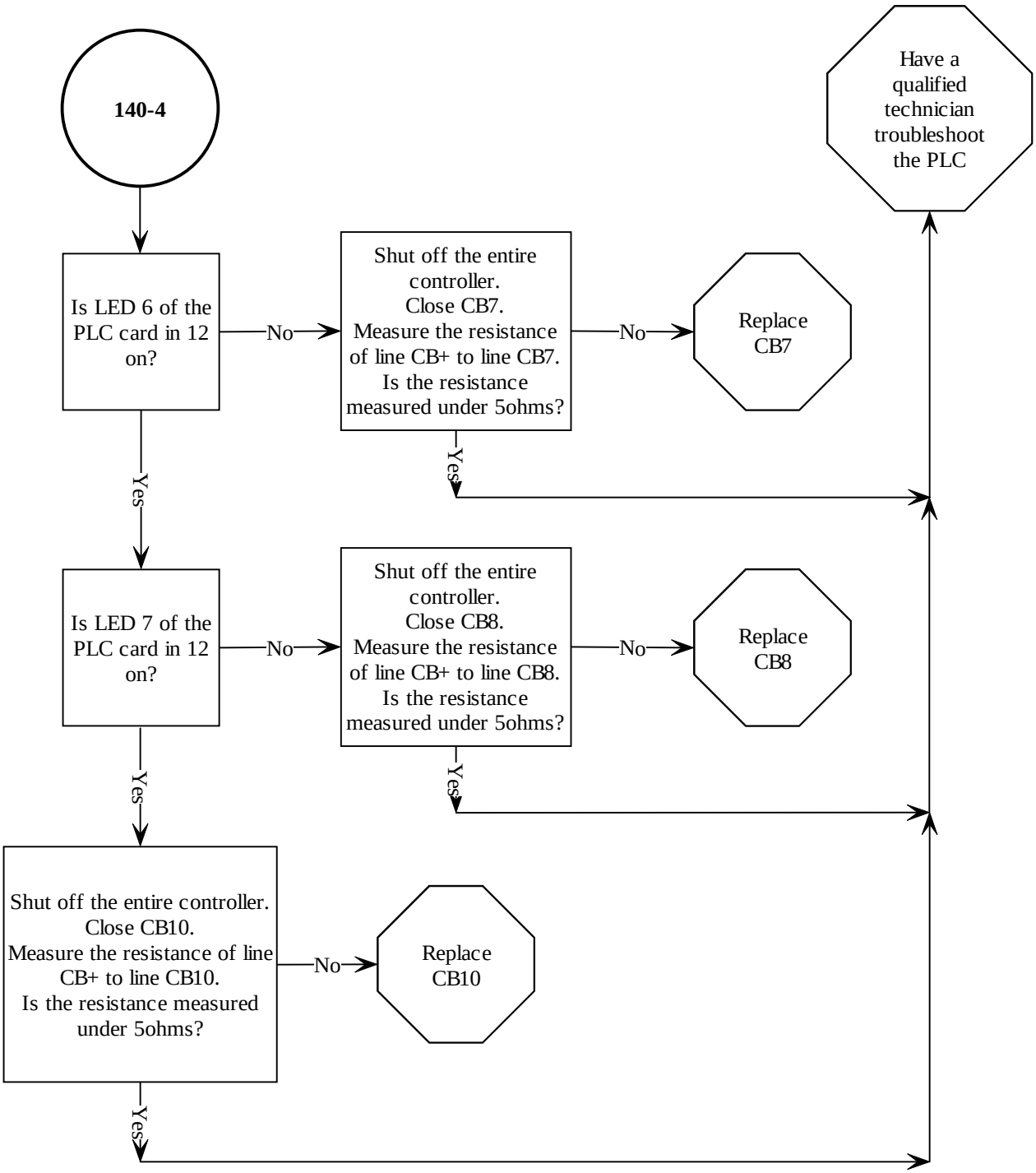
140-3 Fault LED "Circuit Breaker Fault" is ON pg.3

140-3 FAULTFINDER LED "CIRCUIT BREAKER FAULT" IS ON pg.3



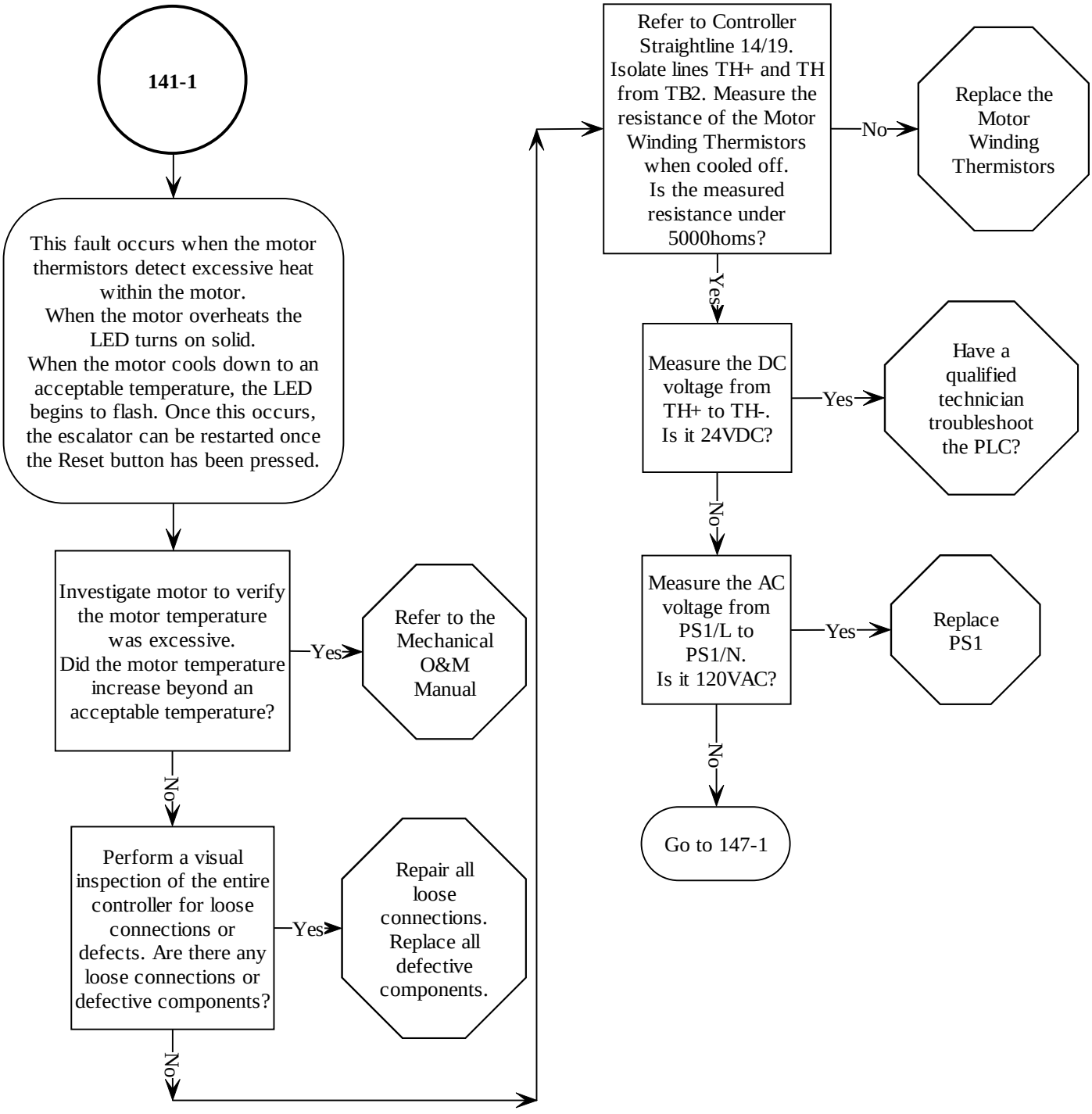
140-4 Fault LED "Circuit Breaker Fault" is ON pg.4

140-4 FAULTFINDER LED "CIRCUIT BREAKER FAULT" IS ON pg.4



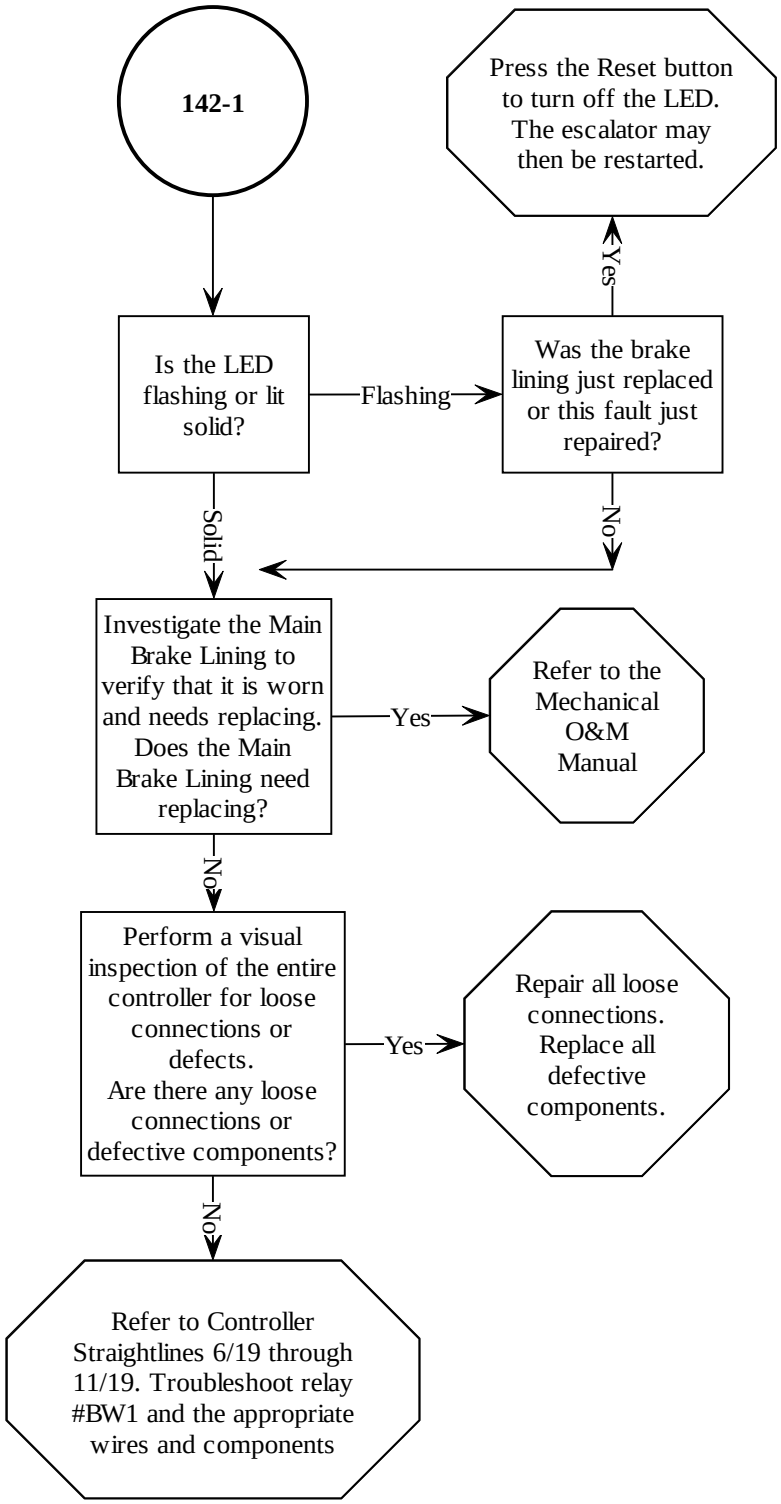
141-1 Fault LED "Motor Overheating Monitor" is ON

141-1 FAULTFINDER LED "MOTOR OVERHEATING MONITOR" IS ON



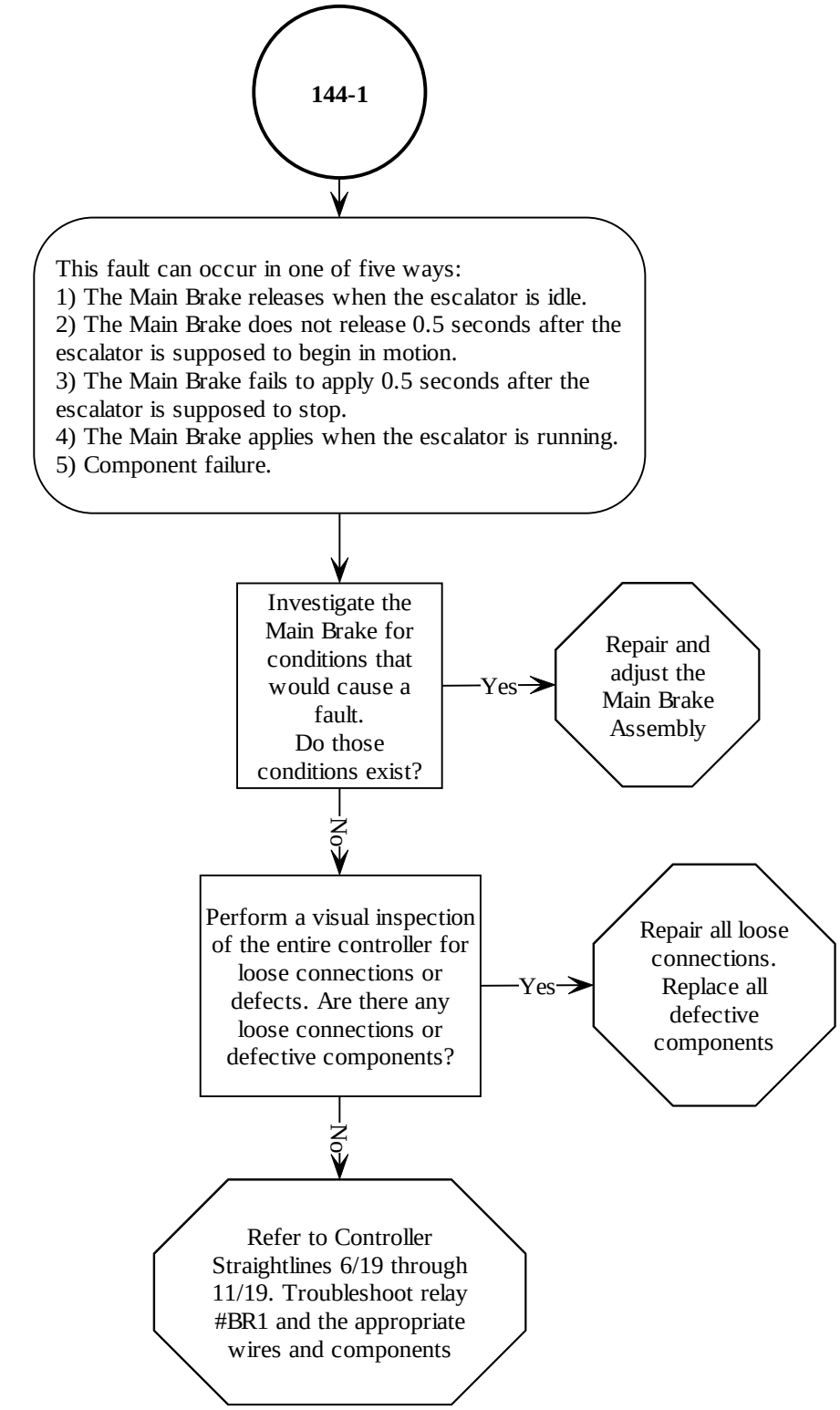
142-1 Fault LED "Main Brake Lining Monitor" is ON

142-1 FAULTFINDER LED "MAIN BRAKE LINING MONITOR" IS ON



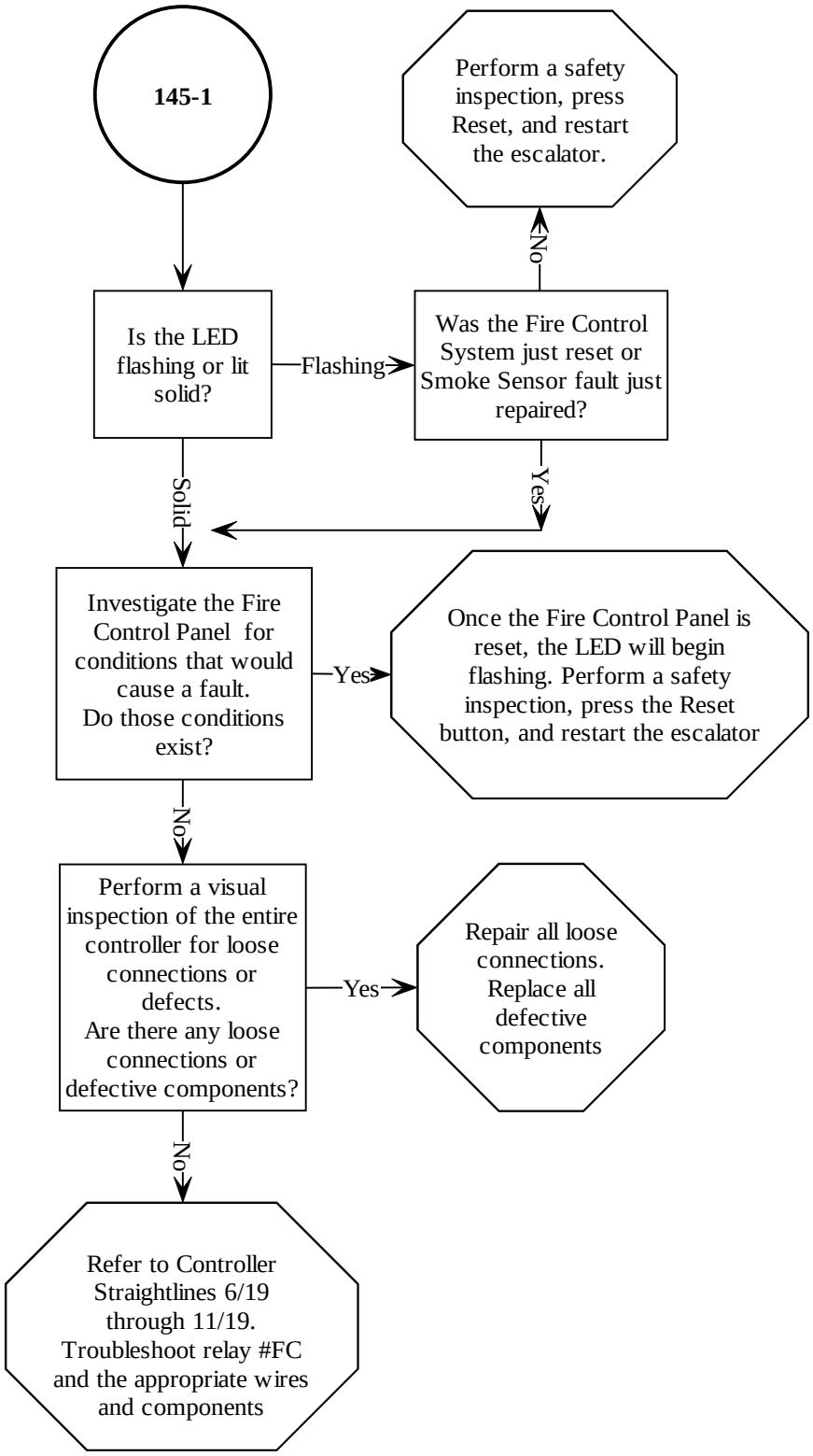
144-1 Fault LED "Main Brake Release Monitor" is ON

144-1 FAULTFINDER LED "MAIN BRAKE RELEASE MONITOR" IS ON



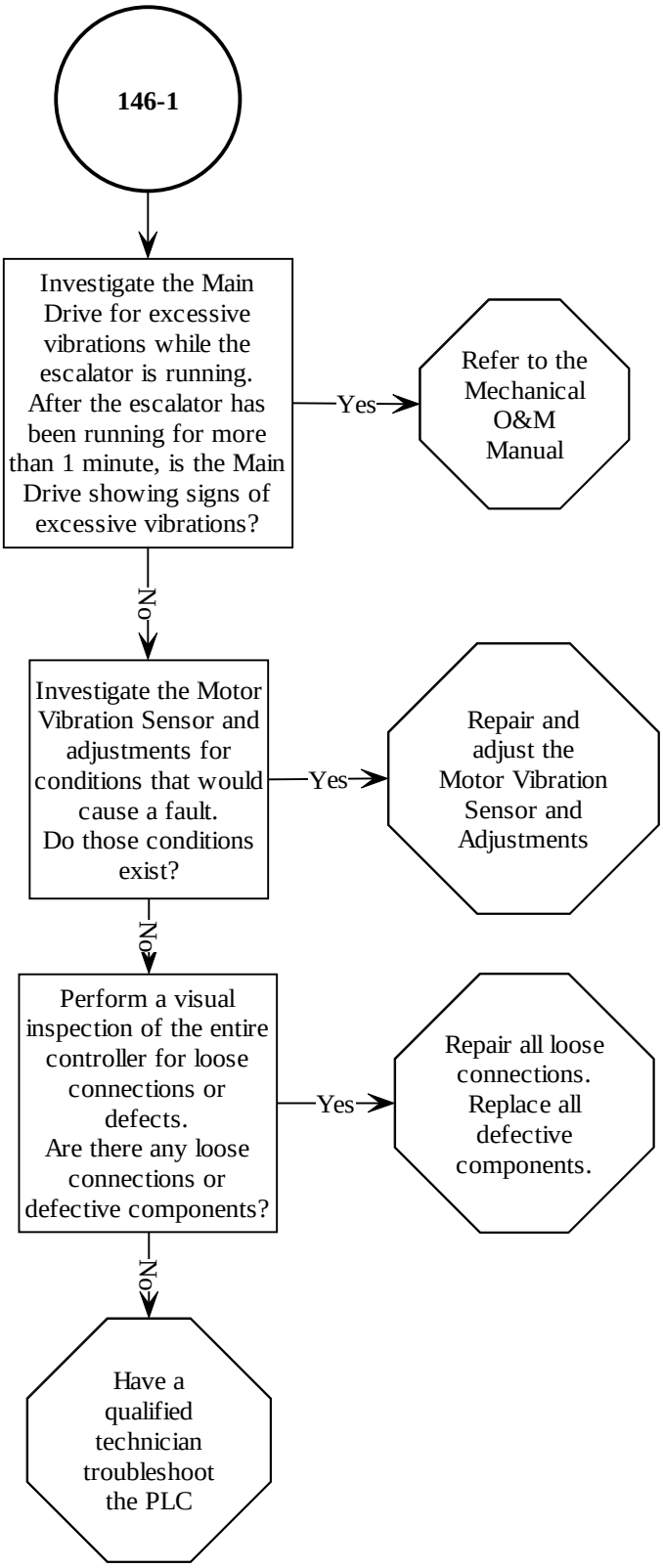
145-1 Fault LED "Smoke Sensor" is ON

145-1 FAULTFINDER LED "SMOKE SENSOR" IS ON



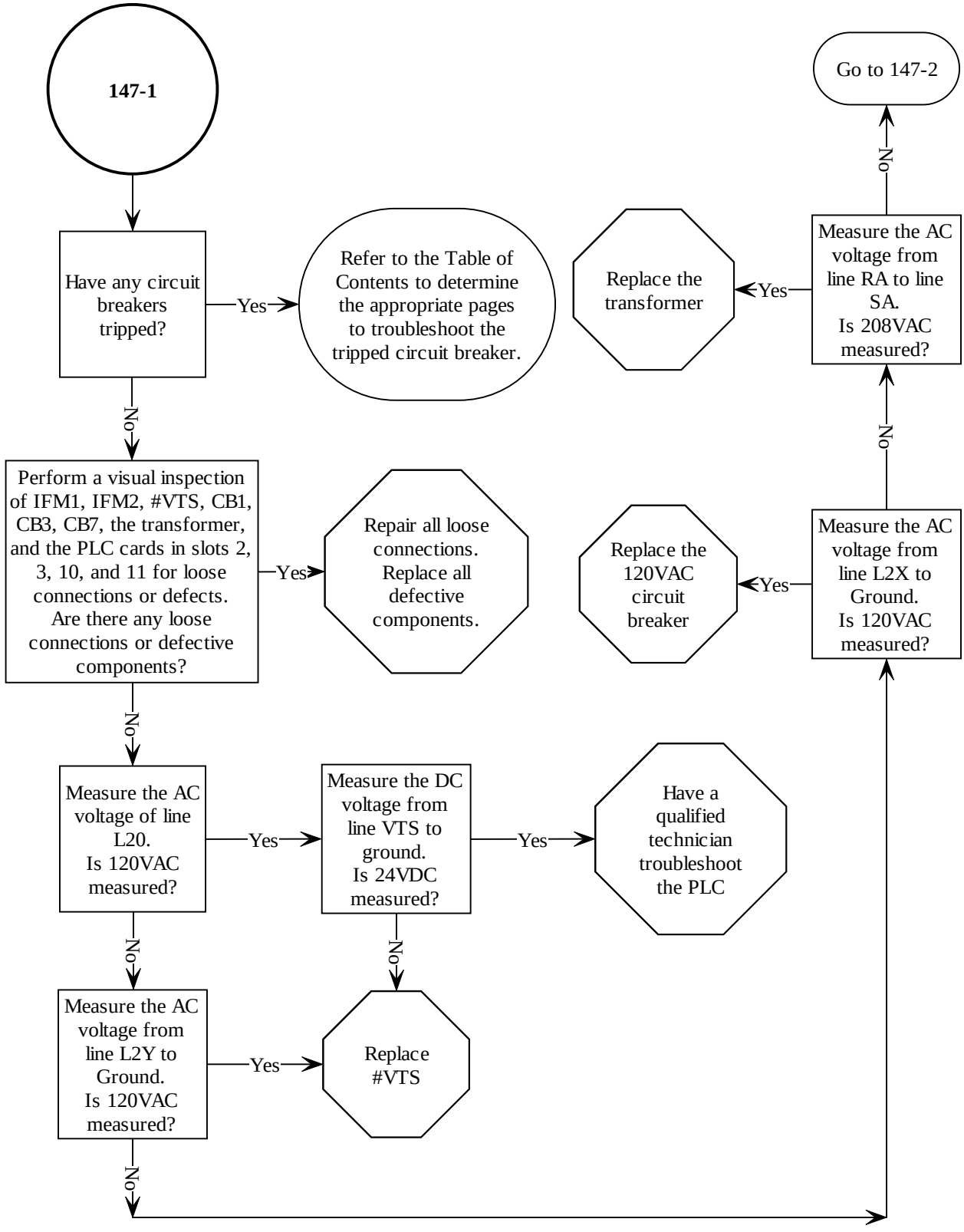
146-1 Fault LED "Motor Vibration Monitor" is ON

146-1 FAULTFINDER LED "MOTOR VIBRATION MONITOR" IS ON



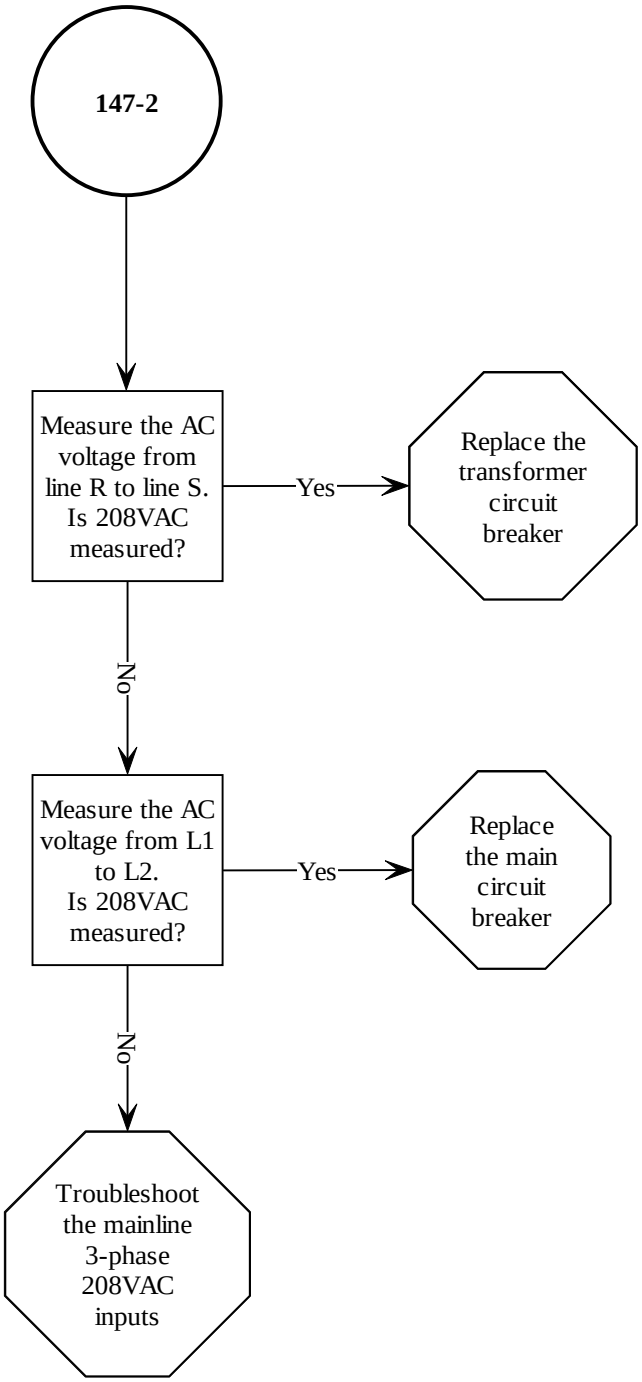
147-1 Fault LED "Loss of Controller Power" is ON pg.1

147-1 FAULTFINDER LED "LOSS OF CONTROLLER POWER" IS ON pg.1



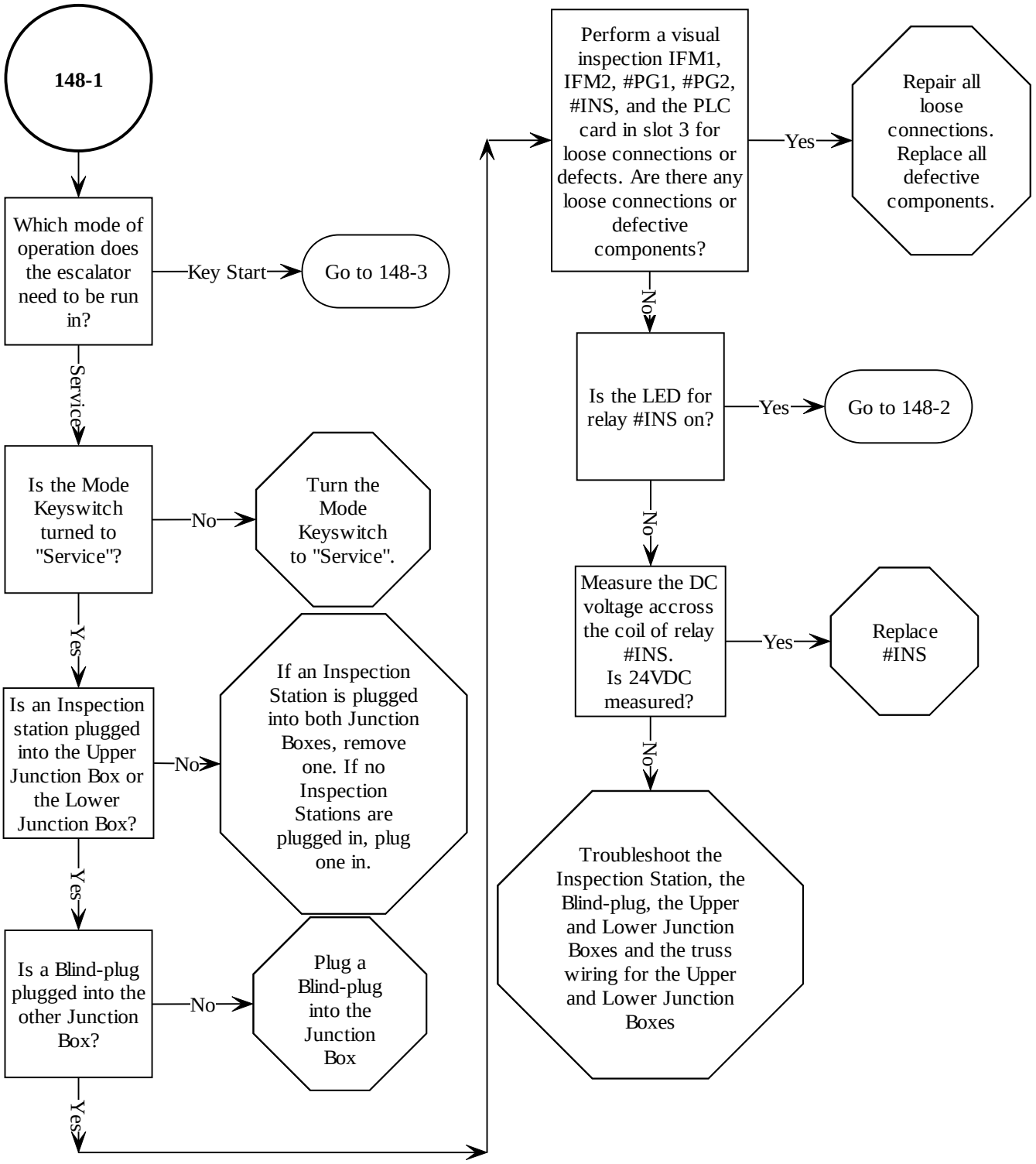
147-2 Fault LED "Loss of Controller Power" is ON pg.2

147-2 FAULTFINDER LED "LOSS OF CONTROLLER POWER" IS ON pg.2



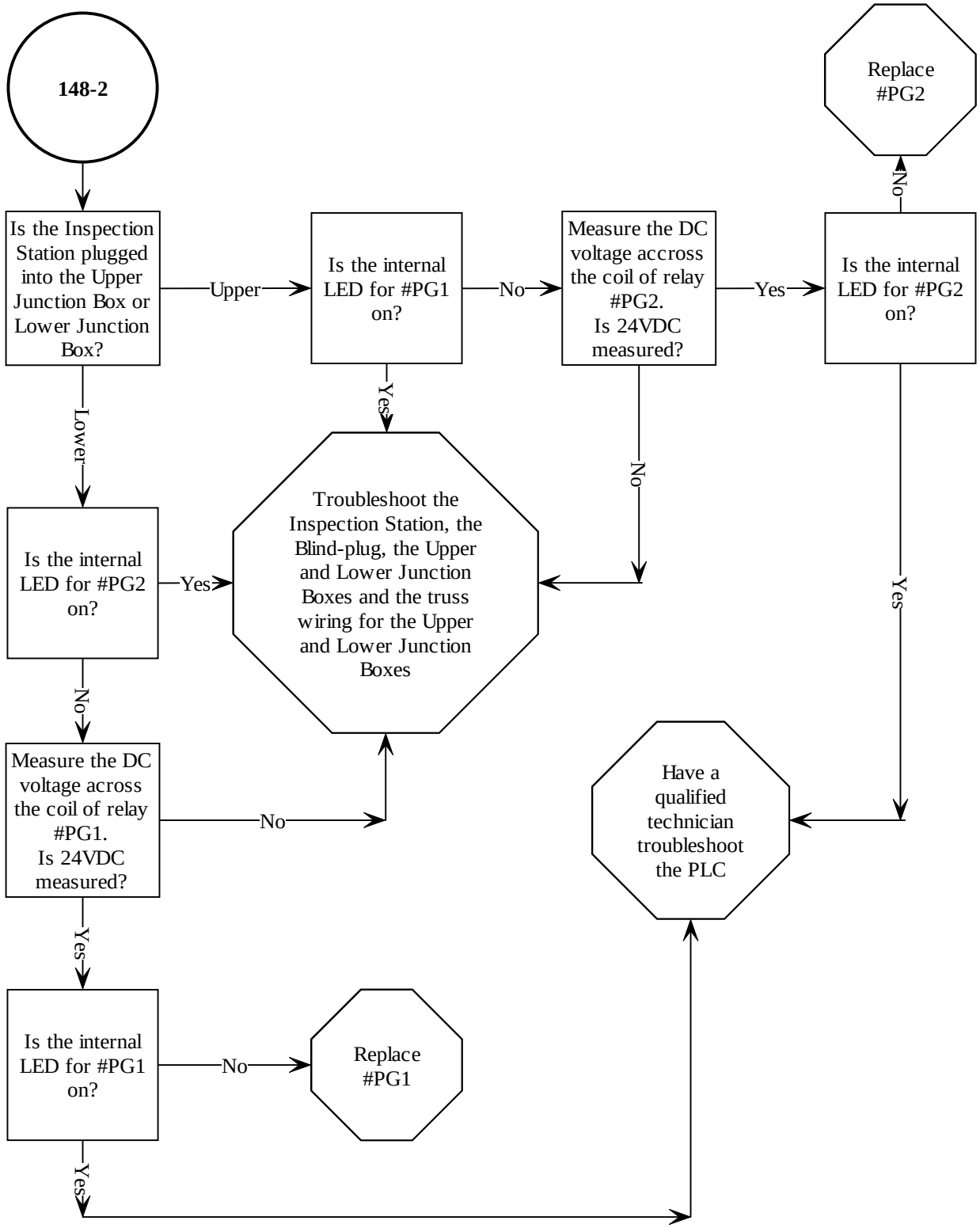
148-1 Fault LED "Maintenance Socket Fault" is ON pg.1

148-1 FAULTFINDER LED "MAINTENANCE SOCKET FAULT" IS ON pg.1



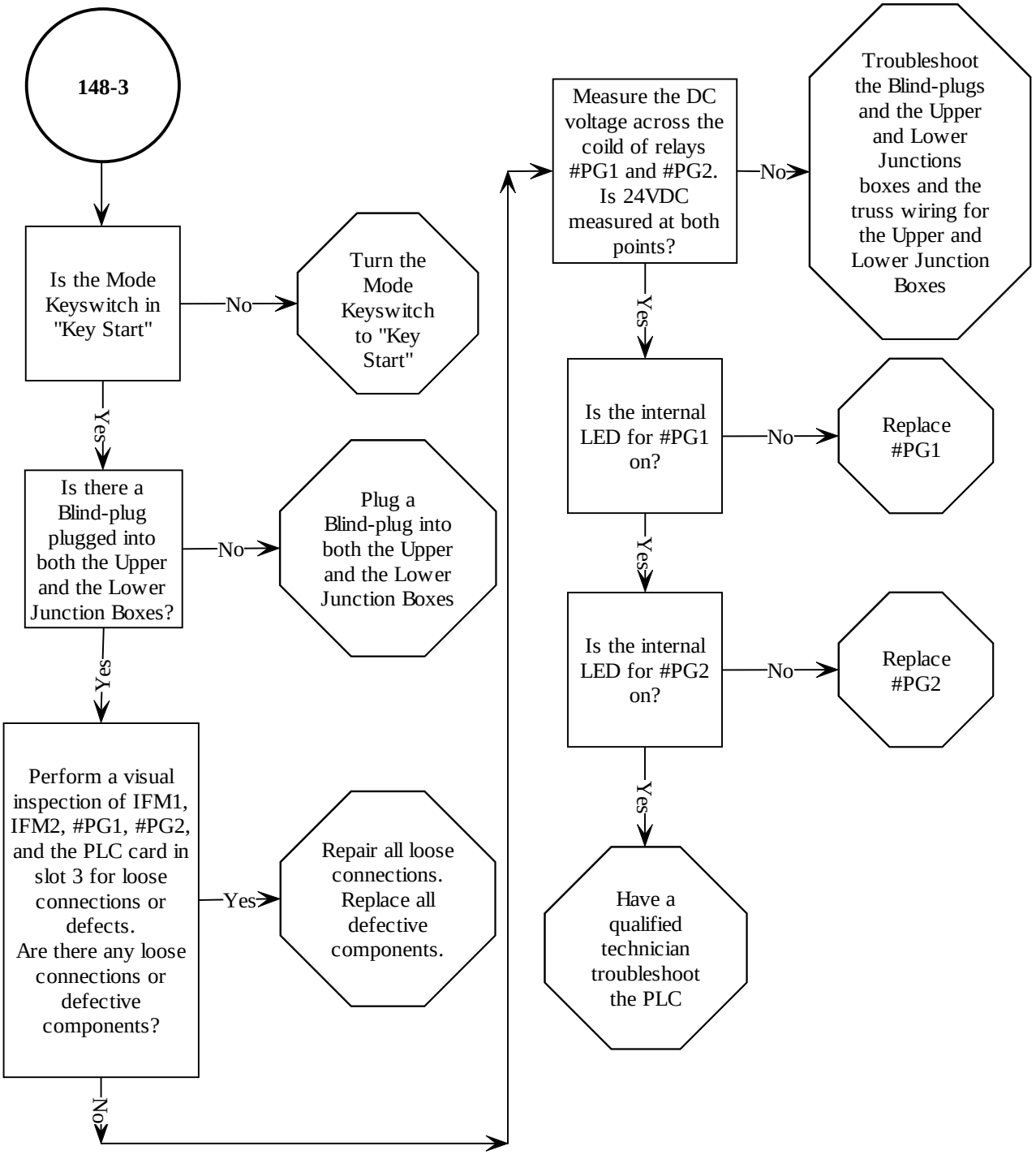
148-2 Fault LED "Maintenance Socket Fault" is ON pg.2

148-2 FAULTFINDER LED "MAINTENANCE SOCKET FAULT" IS ON pg.2



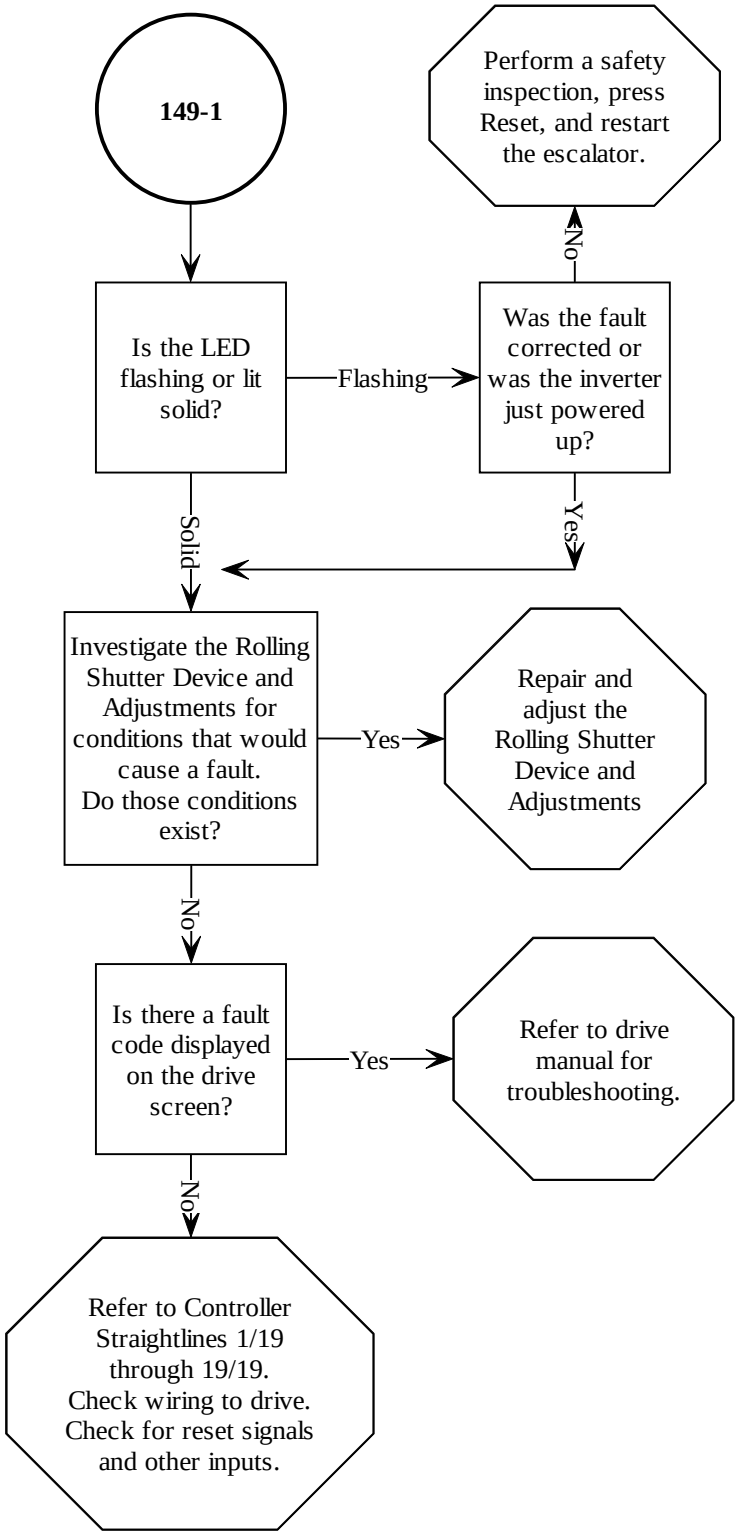
148-3 Fault LED "Maintenance Socket Fault" is ON pg.3

148-3 FAULTFINDER LED "MAINTENANCE SOCKET FAULT" IS ON pg.3



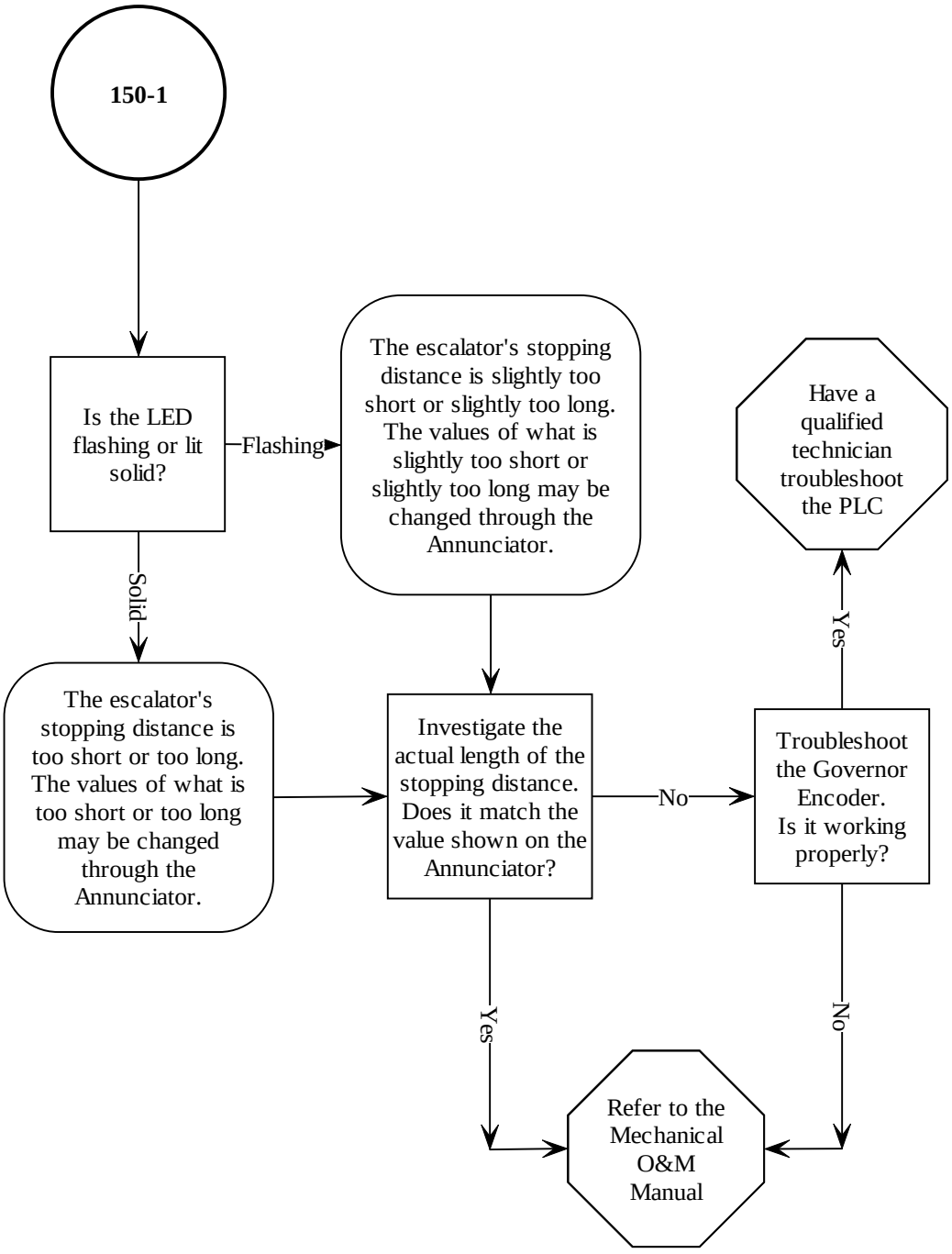
149-1 Fault LED "Inverter Fault" is ON

149-1 FAULTFINDER LED "INVERTER FAULT" IS ON



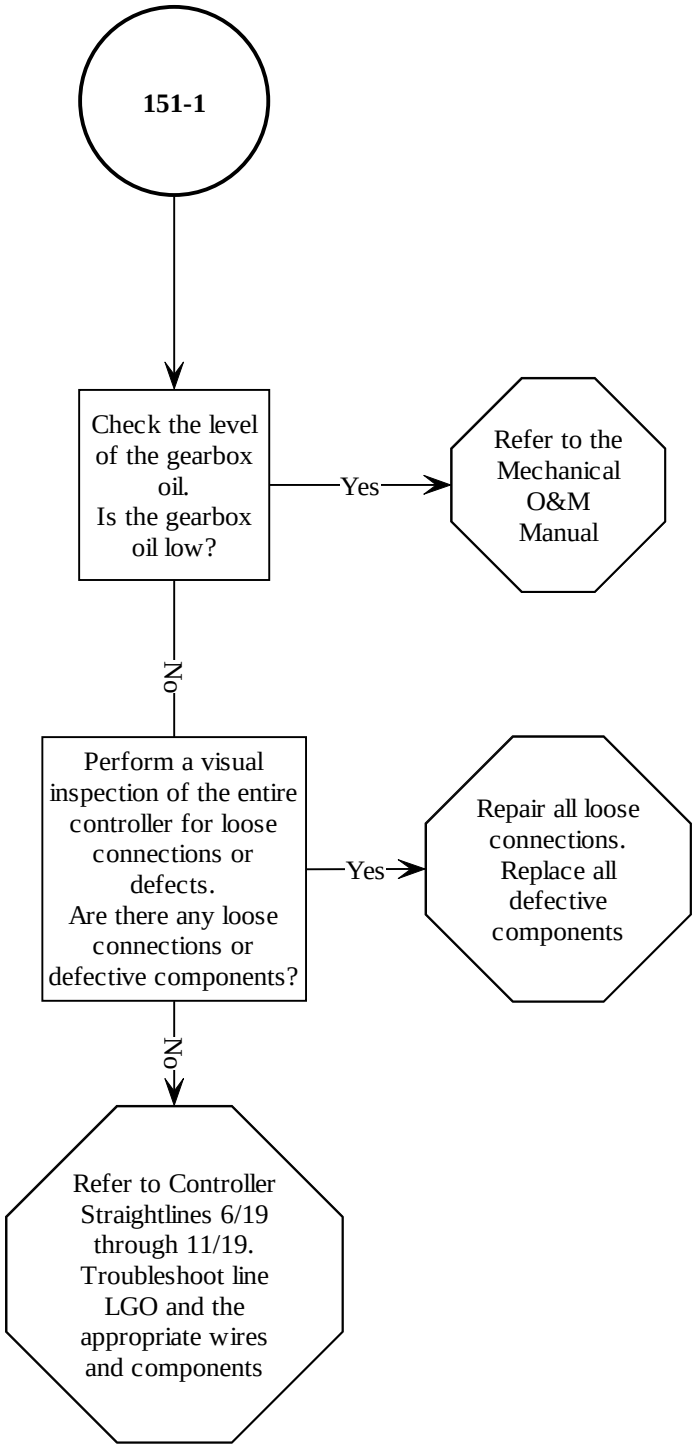
150-1 Fault LED "Stopping Distance Fault" is ON

150-1 FAULTFINDER LED "STOPPING DISTANCE FAULT" IS ON



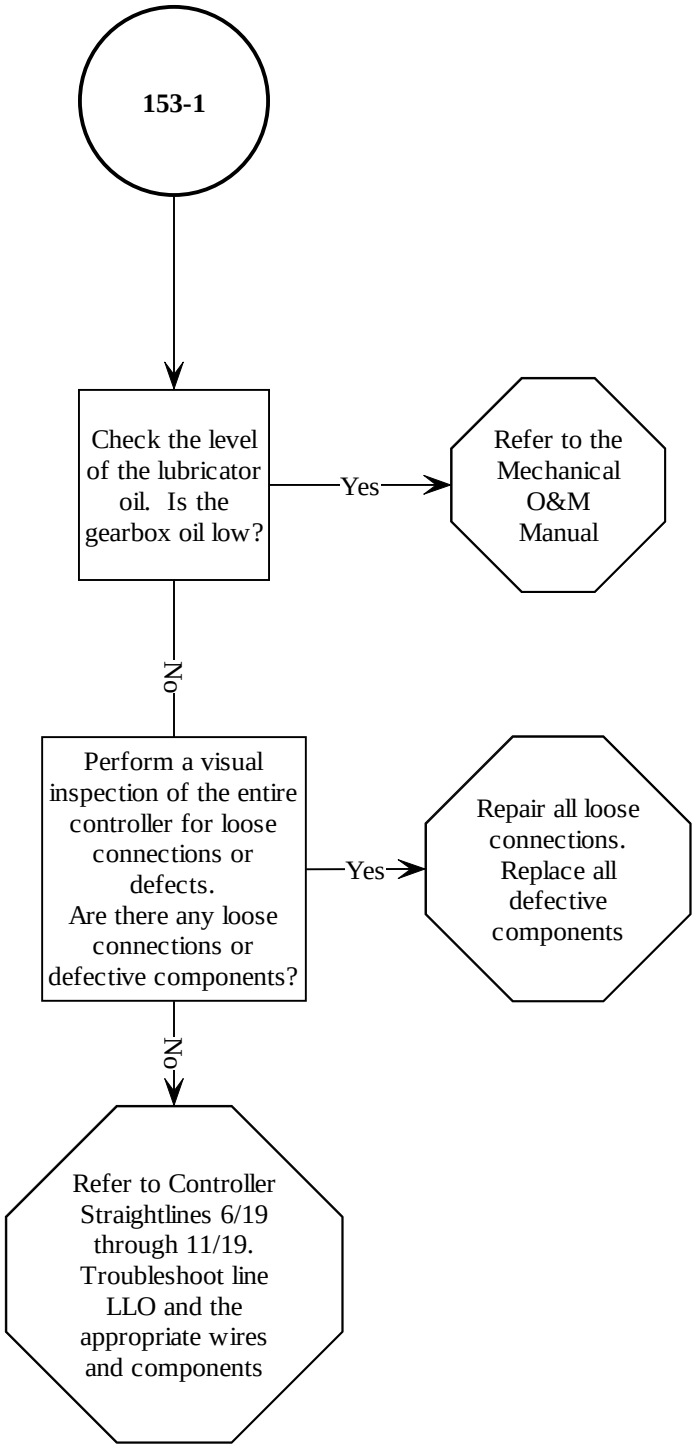
151-1 Fault LED "Low Gearbox Oil" is ON

151-1 FAULTFINDER LED "LOW GEARBOX OIL" IS ON



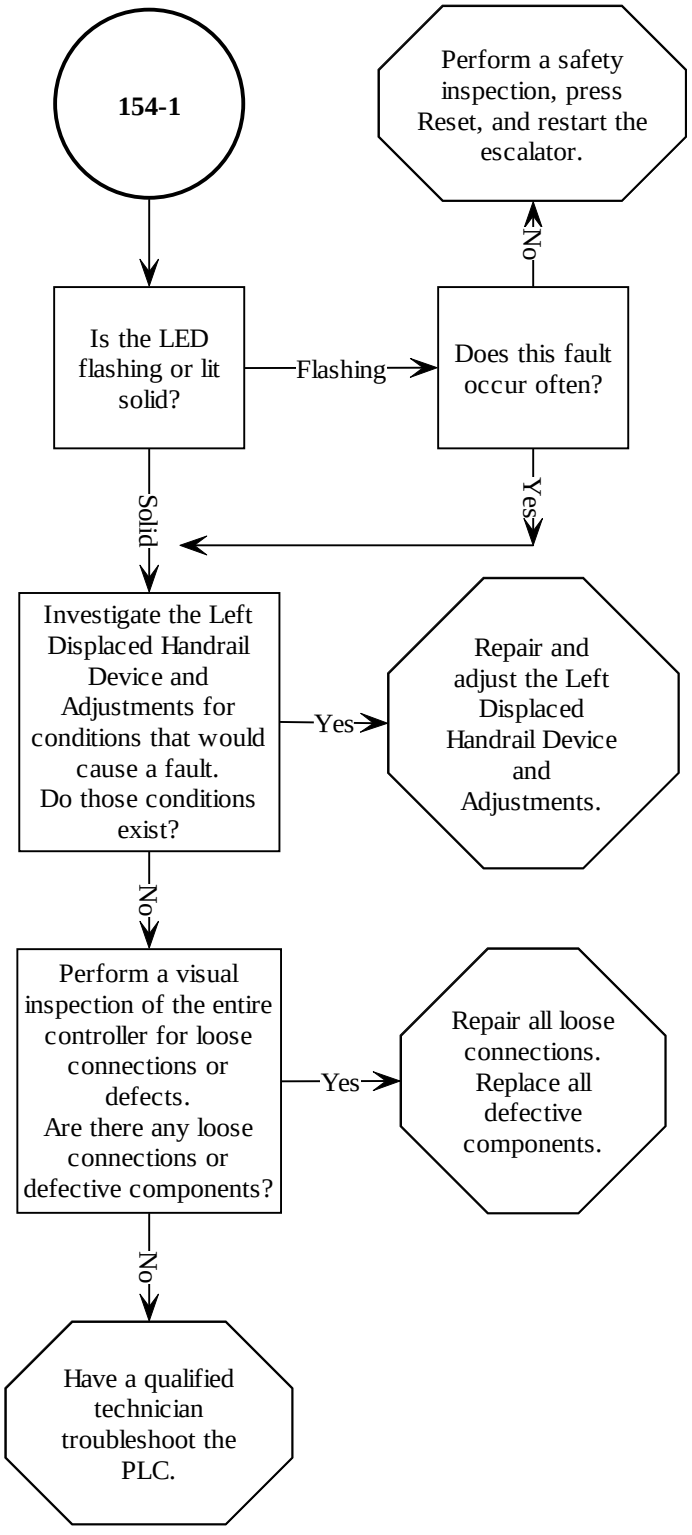
153-1 Fault LED "Low Lubricator Oil" is ON

153-1 FAULTFINDER LED "LOW LUBRICATOR OIL" IS ON



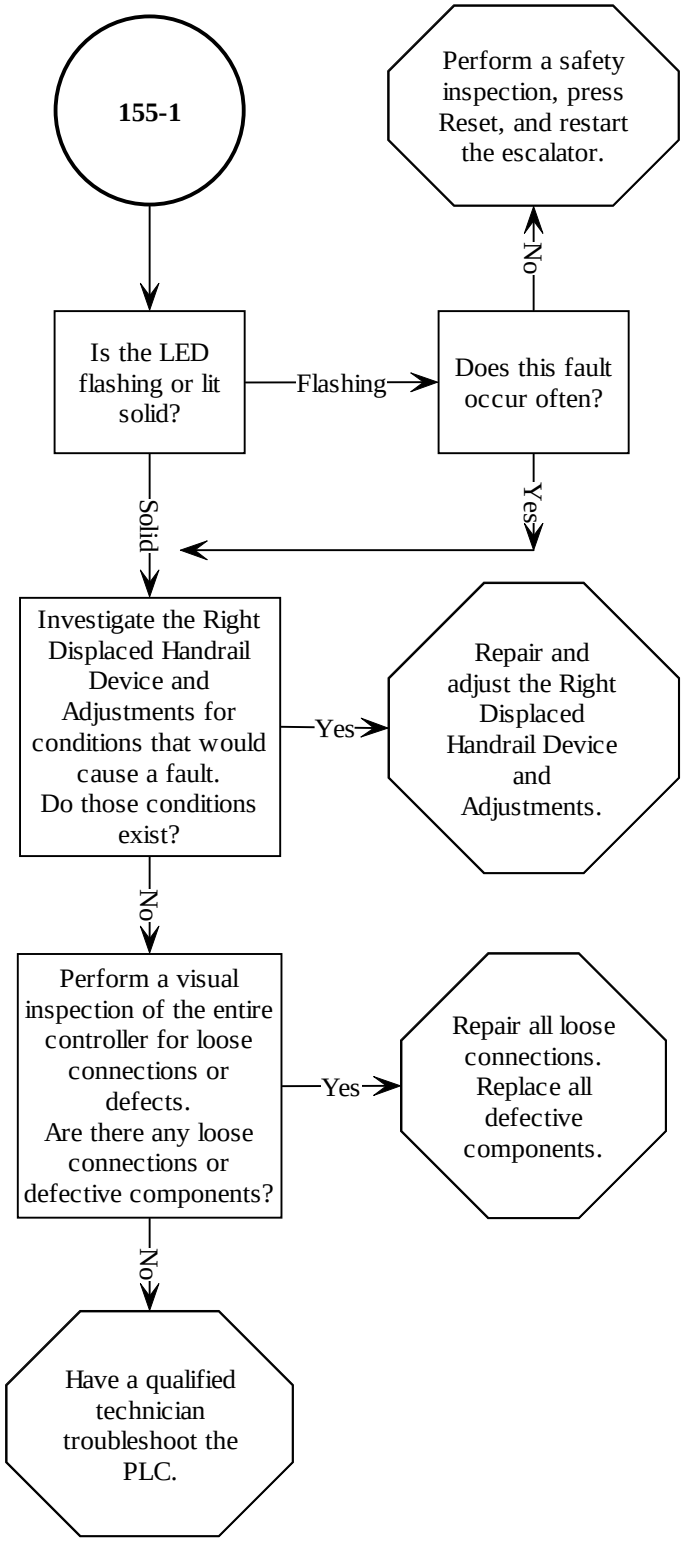
154-1 Fault LED "Left Displaced Handrail Device" is ON

154-1 FAULTFINDER LED "LEFT DISPLACED HANDRAIL SWITCH" IS ON



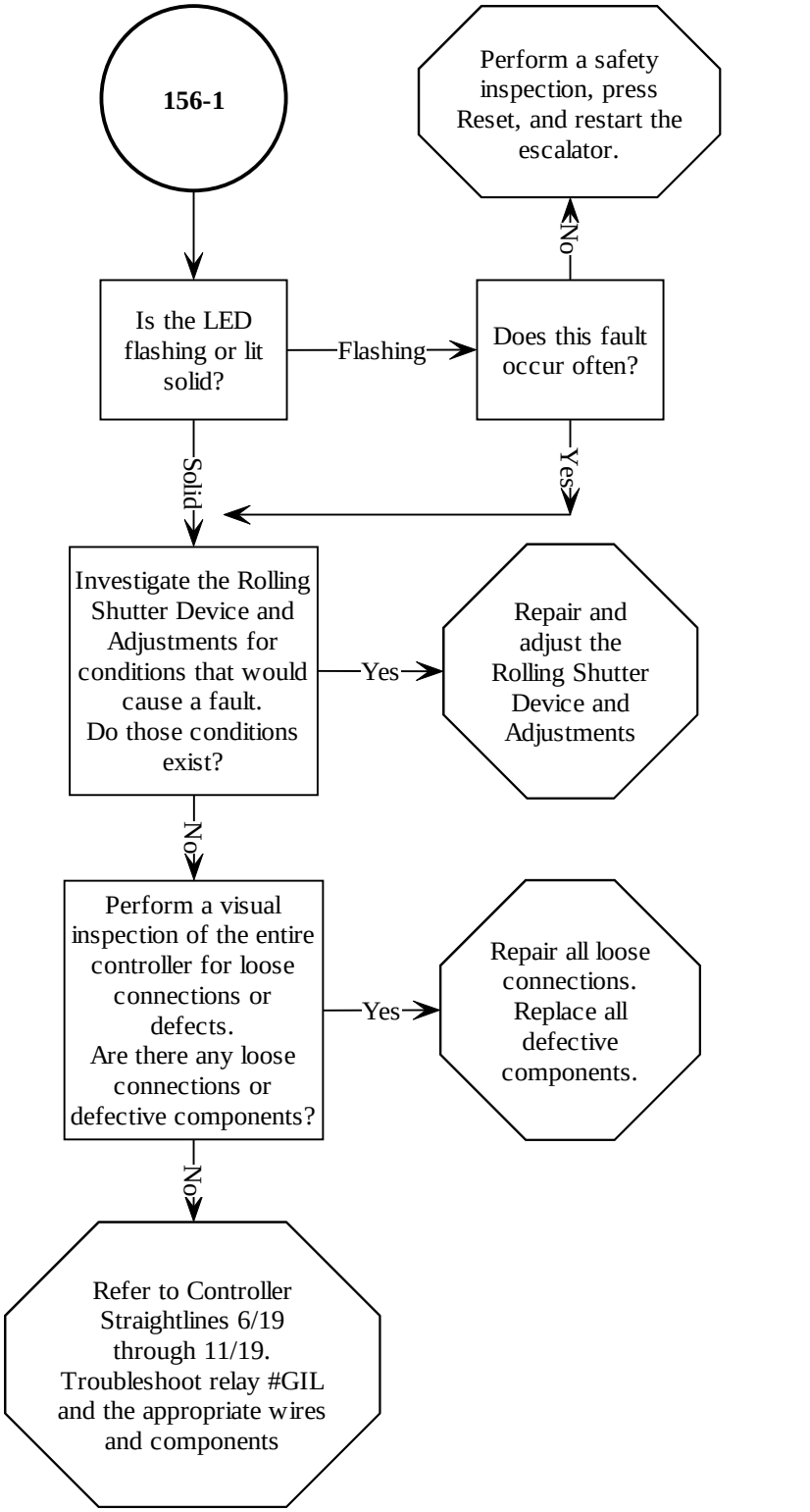
155-1 Fault LED "Right Displaced Handrail Device" is ON

155-1 FAULTFINDER LED "RIGHT DISPLACED HANDRAIL SWITCH" IS ON



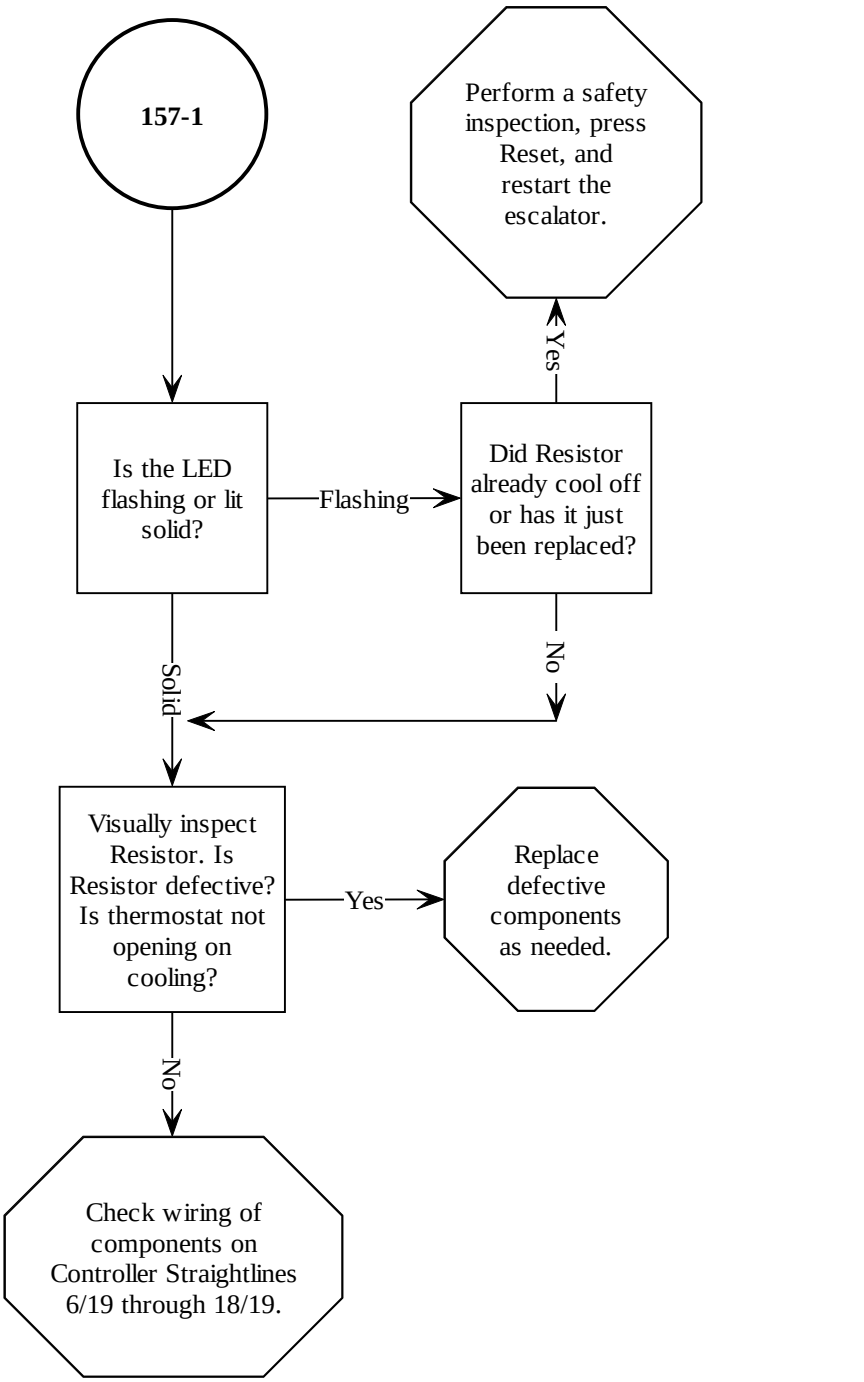
156-1 Fault LED "Rolling Shutter Device" is ON

156-1 FAULTFINDER LED "ROLLING SHUTTER DEVICE" IS ON



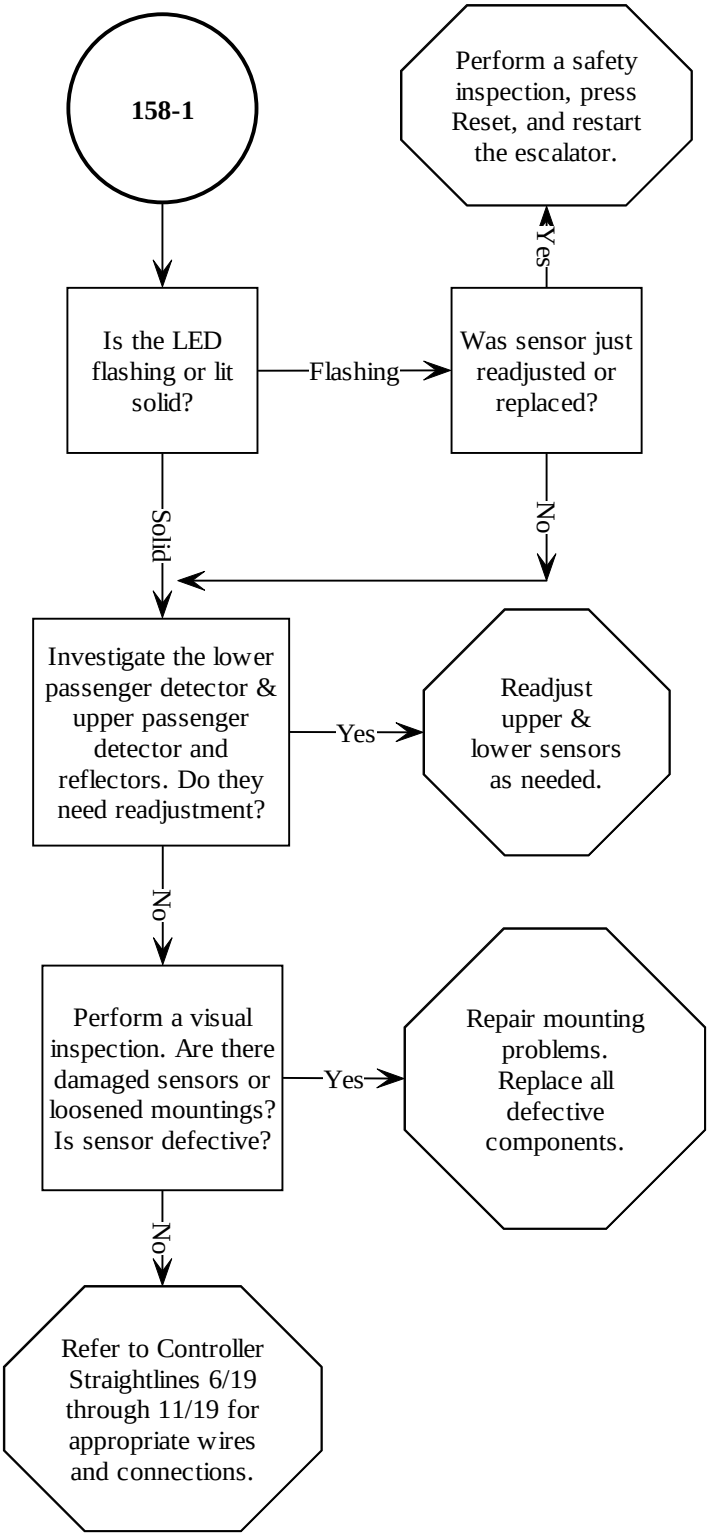
157-1 Fault LED "Overheated Brake Resistor" is ON

157-1 FAULTFINDER LED "OVERHEATED BRAKE RESISTOR" IS ON



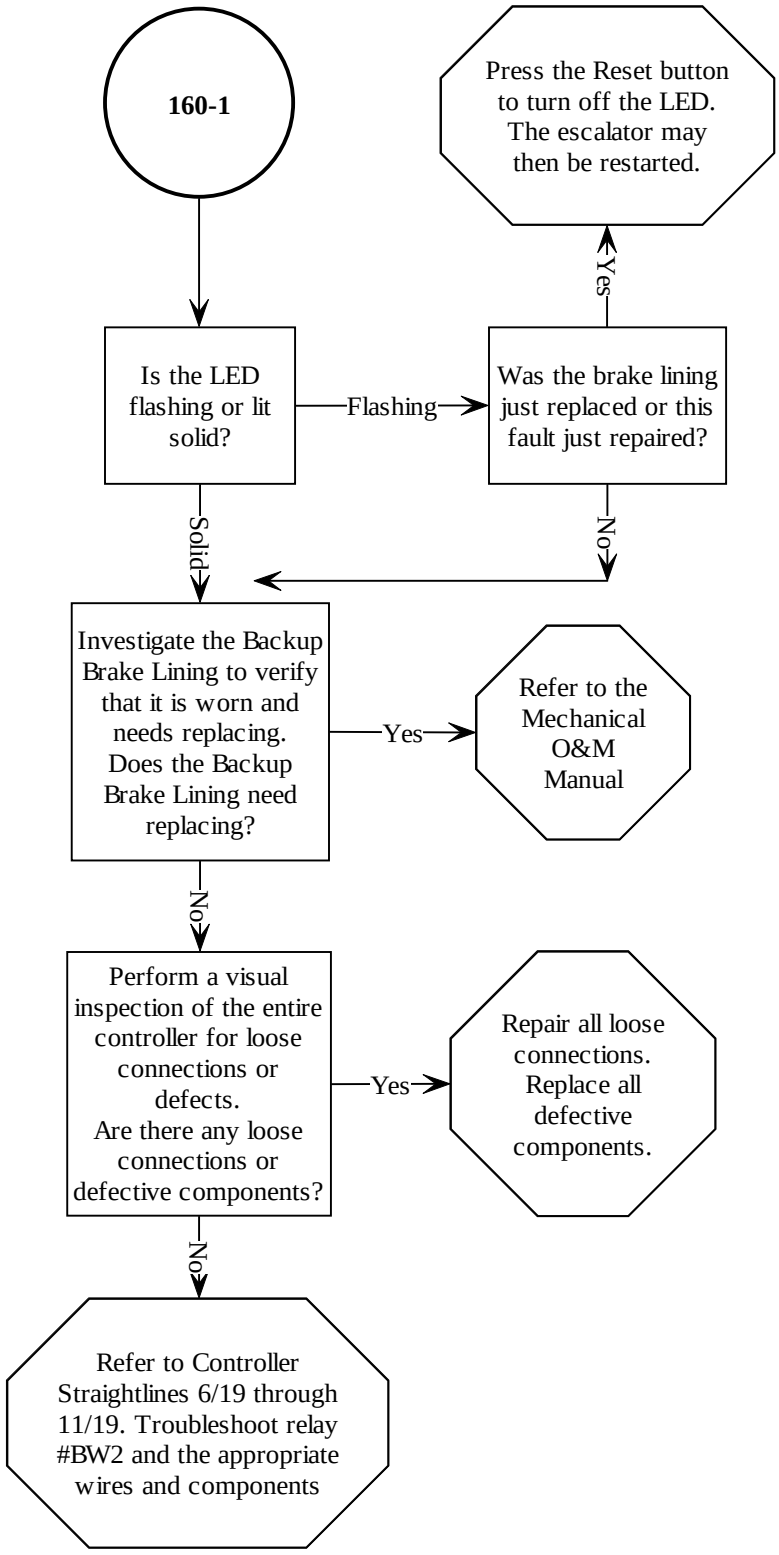
158-1 Fault LED "Sleep Mode Sensor Failure" is ON

158-1 FAULTFINDER LED "SLEEP MODE SENSOR FAILURE" IS ON



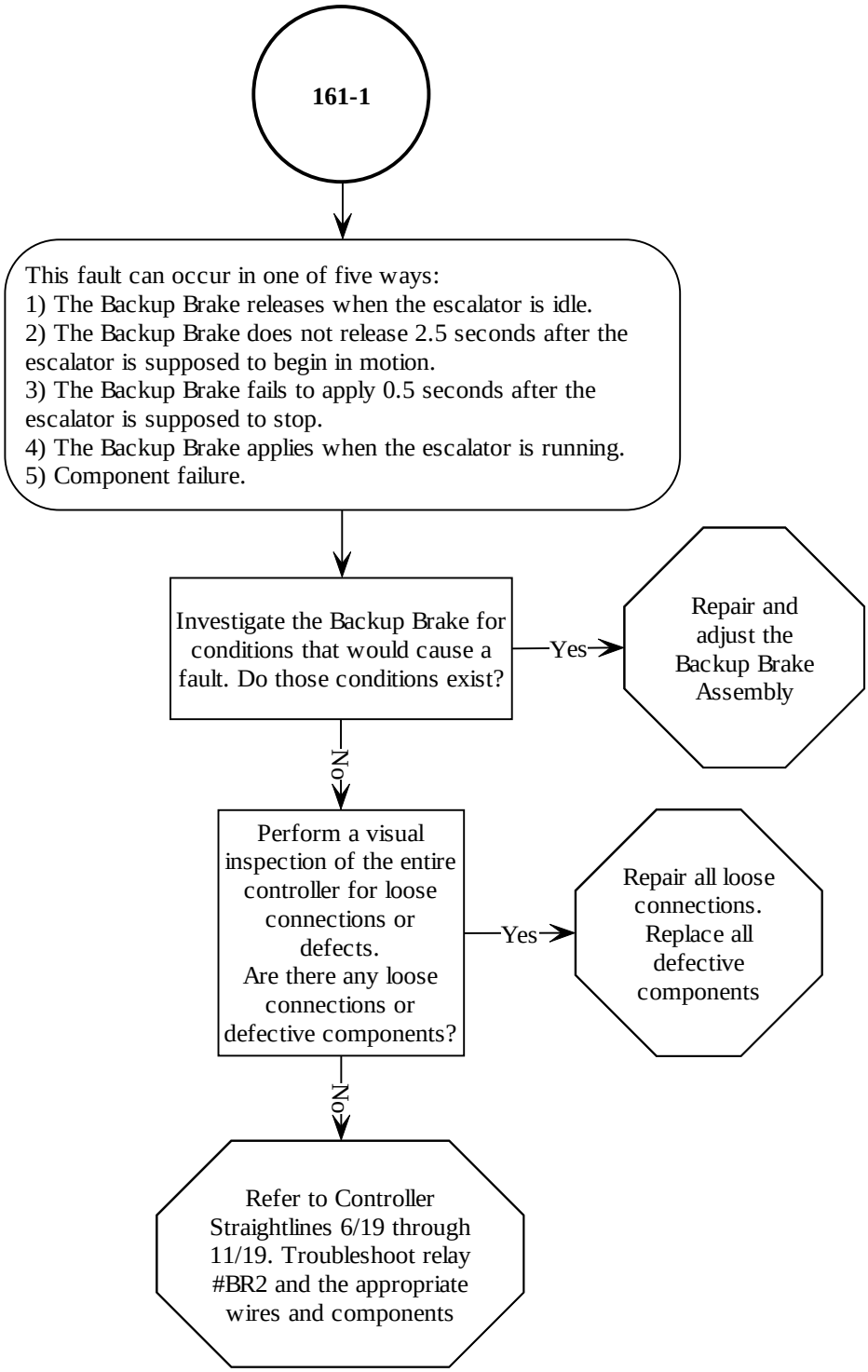
160-1 Fault LED "BackUp Brake Lining Monitor" is ON

160-1 FAULTFINDER LED "BACKUP BRAKE LINING MONITOR" IS ON



161-1 Fault LED "BackUp Brake Release Monitor" is ON

161-1 FAULTFINDER LED "BACKUP BRAKE RELEASE MONITOR" IS ON



SERVICE SCHEDULE

FREQUENCY	COMPONENT	DESCRIPTION
BI-WEEKLY	Combfingers	Clean, check condition and alignment
	Combplate	Clean plate and gap
	Floorplate	Clean
	Handrail	Lead/Lag check, clean and check fit
	Steps and Wheels	Check condition, Check alignment, Examine wheels, Tighten step nuts, Clean
	Lubricator	Check oil level and fill, if needed
MONTHLY	Coupling	Check for vibration and noise, Check spider condition
	Main Drive Chain	Check for abnormal wear and/or corrosion, Check that the chain is adequately lubricated
	Skirt Panels	Check clearance between steps, Clean.
	Safety Strips	Check condition
	Deck Moldings	Clean
	Interior Panels	Clean
	Newel Ends	Clean
	Combfingers	Tighten screws
	Step Guide Rollers	Check alignment
	Handrail Drive Chains	Check condition
	Gear Reducer	Check oil level
	Step Chain	Check condition. Check tension

FREQUENCY	COMPONENT	DESCRIPTION
QUARTERLY	Encoder Assembly	Check for smooth contact between edge of shaft and roller. Clean roller and main drive shaft
	Gear Reducer	Check bearing and oil seal condition
	Main Drive Shaft	Check for sprocket wear
	Tension Carriage	Check condition
	Main Drive Chain	Check for proper chain slack
	Machine Brake	Check torque, check operation
	Comb Switches	Check tripping forces
	Handrail Drive Chains	Check chain elongation and tension
	Take-up Device	Check handrail tension
	Newel Rollers	Check rotation
	Handrail Drive Sheave Pressure Rollers	Check spring force

FREQUENCY	COMPONENT	DESCRIPTION
SEMI-ANNUALLY	Lubricator	Check pump
	Pawl Brake Switch	Check operation
	Machine Brake	Check condition, check brake pads
	Step Chain Locking Device	Check operation
	Step Chain Track	Clean track rails
	Step Roller Track	Clean track rails
	Up-thrust Guides	Clean track rails
	Chain Guide Assembly	Clean guides, check for excessive wear
	Turnaround	Clean track rails
	Handrail Guides	Check condition, clean, check fit
	Return Guides	Check for abnormal wear, clean
	Steps and Wheels	Grease step wheel shoe
	Lubricator	Clean lubricator brushes, check tubing condition

FREQUENCY	COMPONENT	DESCRIPTION
ANNUALLY	Motor	Replenish grease with Chevron SRI #2
	Main Drive Shaft	Add grease to grease fittings using Mobilith AW2 (green) or equivalent
	Tension Carriage	Add grease to grease fittings using Mobilith AW2 (green) or equivalent
	Handrail System Bearing Lubrication	Add grease to bearing
	Gear Reducer	Change oil using Mobil Glygoyle 320 synthetic oil (or equivalent synthetic with Fujitec engineering approval)

COMPONENT CLEARANCE AND ADJUSTMENTS

In the Herald Square Mechanical sections.

COMPONENT CLEARANCE

Component	Clearance/Adjustment mm [in]	Section & Page
Main Drive Chain (RS 120-2)	2% of “L” length	A-27
Tension Carriage Spring Adjustment	See tag	A-24
A-Track (wheel – track)	0.5 [0.02] clearance	C-5
B-Track (wheel – track)	7 [0.28] clearance	C-5
M-Track (wheel – track)	7 [0.28] clearance	C-5
N-Track (wheel – track)	1 [0.04] clearance	C-5
Up-Thrust, Upper and Lower Track	1-2.5 [0.04-0.10] gap	C-11
Up-Thrust, Lower Curve	0.25-0.75 [0.01-0.03] gap	C-11
Up-Thrust, Incline Track	6 [0.24] gap	C-11
Step Guide Rollers	1 [0.04] gap	D-13
Combplate (front – rear combplate)	6 [0.24]	D-12
Combfingers (comb teeth – tread cleats)	7 [0.28] mesh 11 [0.43]	D-15
Handrail Drive Chain, 1st Chain RS 100	3 [0.12] stretch 2% of “L” length slack	E-10 E-9
Handrail Drive Chain, 2nd Chain RS 80	2.3 [0.09] stretch 2% of “L” length slack	E-10 E-9
Handrail Drive Sheave Pressure Roller (standard length of spring)	81 [3.19]	E-13
Steps (between steps) (steps – skirt panels)	4 [0.16] 3 [0.12]	F-9

SAFETY SWITCH ADJUSTMENTS

In the Herald Square Electrical Safety Switches section.

Safety Switch	Adjustment / Gap mm [inches]	Section & Page
Broken Step Chain Device (roller – kicker)	1-2 [0.04-0.08]	B-27
Skirt Safety Switch	3 [0.12]	B-28
Step Level Device (riser – switch)	3 [0.12]	B-30
Step Up-thrust Device (limit switch – hinge plate) (top of step wheel – B-Track upthrust)	 4.2 [0.16] 7 [0.28]	 B-31
Missing Step Device	5 [0.20]	B-33
Handrail Entry Device	6 [0.24]	B-35
Broken Handrail Device	NA	B-36
Displaced Handrail Device (roller – above top of HR guide)	 1 [0.04]	 B-37
Handrail Speed Device	Self Adjusting	B-39
Vertical Comb Impact (Switch “B”) to trip	5 [0.20]	B-39-42
Horizontal Comb Impact (Switch “C”) to trip	3 [0.12]	B-39-42
Vertical Comb Stop (Switch “A”) to trip	5 [0.20]	B-39-42

LUBRICATION SCHEDULE – HERALD SQUARE

Component	Lubricant	Schedule
Main Gear Box	Mobil Glygoyle 320 Or Klübersynth UH1 6-320	Annually
Motor Bearings	Chevron SRI #2	Annually
Handrail Drive Bearings	Mobilith AW2 (green)	Annually
Tension Carriage Bearings	Mobilith AW2 (green)	Annually
Main Drive Shaft Bearings	Mobilith AW2 (green)	Annually
Newel Sheave Bearings	Mobilith AW2 (green)	Annually
Step Chain	Mobil DTE Medium	Daily (automatic)
Main Drive Chain	Mobil DTE Medium	Daily (automatic)
Handrail Drive Chain, 1st & 2nd	Mobil DTE Medium	Daily (automatic)
Step Chain Wheel Guide Shoe	Mobilith AW2	Quarterly

ESCALATOR OPERATIONS
AND MAINTENANCE MANUAL

VENDOR MANUALS
VOLUME 2

FINAL

NEW YORK CITY TRANSIT AUTHORITY
HERALD SQUARE PHASE IV
(HS 11/12)

CONTRACT No. E-34011
ESCALATOR No. E235, E236

PLC CONTROLLER MANUALS

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HERALD SQUARE
PHASE IV ESCALATORS
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VOLUME 2

VENDOR MANUALS (1 OF 2)

PLC CONTROLLER MANUALS

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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Europe/Middle East/Africa: Rockwell Automation, Herman-Heinrich-Gossen-Strasse 3, 50858 Köln, Germany, Tel: 49 (0) 2234 379410, Fax: 49 (0) 2234 3794164
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 6356 9077, Fax: (65) 6356 9011

Publication 2711-UM014E-EN-P - November 2004
Supersedes Publication 2711-UM014D-EN-P - August 2003

Carefully read and understand this Instruction Manual prior to installation, operation and maintenance of your motor.

1. SAFETY DEPENDS ON YOU

Lincoln Inverter Vector Duty motors are designed and manufactured with safety in mind. However, your overall safety can be increased by properly installing, operating and maintaining the motor. Read and observe all instructions, warnings and specific safety precautions included in this manual and THINK BEFORE YOU ACT!

2. RECEIVING AND INSPECTION

Check packing list and inspect motor to make certain no damage has occurred in shipment. Claims for any damage done in shipment must be made by the purchaser against the transportation company.

Turn the motor shaft by hand to be certain that it rotates freely. Be careful not to cut yourself on the shaft keyway; it is razor sharp!

Check the nameplate for conformance with power supply and control equipment requirements.

3. HANDLING

⚠ WARNING

FALLING EQUIPMENT can injure.

- **Lift only with equipment of adequate lifting capacity.**
- **If so equipped, use lift ring(s) on the motor to lift ONLY the motor and accessories mounted by Lincoln.**

If so equipped, use lift ring(s) on the motor to lift only the motor and accessories mounted by Lincoln. Do not use the lift ring(s) to lift the motor along with additional equipment such as pumps, compressors or other driven machinery.

In case of assemblies on a common base, the motor lift ring(s) CANNOT be used to lift the assembly and base but, rather, the assembly should be lifted by a sling around the base or by other lifting means provided on the base. In all cases, care should be taken to assure lifting in the direction intended in the design of the lifting means. Likewise, precautions should be taken to prevent hazardous overloads due to deceleration, acceleration or shock forces.

4. STORAGE

Motor stock areas should be clean, dry, vibration free and have a relatively constant ambient temperature. For added bearing protection while the motor is in storage, turn the motor shaft every six months.

A motor stored on equipment and component equipment prior to installation should be kept dry and protected from the weather. If the equipment is exposed to the atmosphere, cover the motor with a water-proof cover. Motors should be stored in the horizontal position with drains operable and positioned in the lowest point. CAUTION: Do not completely surround the motor with the protective covering. The bottom area should be open at all times.

Windings should be checked with a megohm-meter (Megger) at the time equipment is put in storage. Upon removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point necessitates electrical or mechanical drying. Note the sensitivity of properly connected megohm-meters can deliver erroneous values. Be sure to carefully follow the megohm-meter's operating instructions when making measurements.

All external motor parts subject to corrosion, such as shaft and other machined surfaces, must be protected by applying a corrosion-resistant coating.

5. INSTALLATION

For maximum motor life, place the motor in a clean, dry, well ventilated place easily accessible for inspecting, cleaning and lubricating. The temperature of the surrounding air should not exceed 104°F (40°C) except for motors with nameplates indicating a higher allowable maximum ambient temperature.

⚠ WARNING

MOVING PARTS can injure.

- **BEFORE starting motor, be sure shaft key is captive.**
- **Consider application and provide guarding to protect personnel.**

5.1 INSTALLATION – MECHANICAL

Base

Mount the motor on a firm foundation or base sufficiently rigid to prevent excessive vibration. On foot-mounted motors use bolts through all four feet and if necessary properly shim to prevent undue stress on the motor frame and to precision align the unit.

Position

Standard Inverter Duty and Vector Duty motors may be mounted in any position. The radial and thrust load capacity of the motor's bearing system provides for this feature.

Drains

All motors have drain holes located in the end brackets. As standard, drains are in place for the horizontal with feet down mounting position. Other positions may require either rotation of the end brackets or drilling additional holes to attain proper drainage. Be sure existing drain or vent holes do not permit contaminant entry when motor is mounted in the other positions.

Additional drain holes exist near bearing cartridge in both end brackets of 280T - 440T steel frame motors. The drain holes are closed with a plastic plug. When the motor is vertically mounted, the plug located in the lower end bracket must be removed. TEFC motors: to access the plug on blower end, simply remove the shroud; on some models, it is necessary to also take off the blower. To take off the blower, loosen and remove the nut and washer(s) on the shaft. Note the blower is keyed to the shaft. Reverse the process to assemble.

Drive – Power Transmission

The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible. Do not drive the unit on the shaft as this will damage the bearings. Coat the shaft lightly with heavy oil before installing pulley.

Belt Drive: Align the pulleys so that the belt(s) will run true. Consult the belt manufacturer's catalog for recommended tension. Properly tension the belt; excessive tension will cause premature bearing failure. If possible, the lower side of the belt should be the driving side. On multiple belt installations be sure all belts are matched for length.

Chain Drive: Mount sprocket on the shaft as close to the shaft shoulder as possible. Align the sprockets so that the chain will run true. Avoid excessive chain tension.

Gear Drive and Direct Connection: Accurate alignment is essential. Secure motor and driven unit rigidly to the base. Shims may be needed to achieve proper alignment.

Excessive motor vibration may result if the full length of the motor shaft key is not completely engaged by the coupling or sheave. For these situations, adjustment of the key length is required.

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power supply before installing or servicing motor.**
- **Motor lead connections can short and cause damage or injury if not well secured and insulated.**
- **Use washers, lock washers and the largest bolt size which will pass through the motor lead terminals in making connections.**
- **Insulate the connection, equal to or better than the insulation on the supply conductors.**
- **Properly ground the motor — see GROUNDING.**

5.2 INSTALLATION – ELECTRICAL

Check power supply to make certain that voltage, frequency and current carrying capacity are in accordance with the motor nameplate.

The proper branch circuit supply to a motor should include a disconnect switch, short circuit current fuse or breaker protection, motor starter (controller) and correctly sized thermal elements or overload relay protection.

Short circuit current fuses or breakers are for the protection of the branch circuit. Starter or motor controller overload relays are for the protection of the motor.

Each of these should be properly sized and installed per the National Electrical Code and local codes.

Properly ground the motor – See 5.3 GROUNDING.

Terminal Box – Standard

Remove the appropriate knockout. For terminal boxes without a knockout, either a threaded power-conduit entry hole is provided or the installer is responsible for supplying a correctly sized hole.

The majority of terminal boxes can be rotated in place to allow power lead entry from the 3, 6, 9 or 12 o'clock position.

Terminal Box – Oversized (option)

The oversized terminal box for 143T thru 256T frame motors may be rotated in 180° increments. Conduit entry hole diameter is suitable for conduit per Table 1.

Table 1 — Conduit Entry Hole Sizes

Frame Size	Nominal Size of Conduit
143T-184T	0.75"
213T-215T	1.00"
254T-256T	1.25"

The installer is responsible for adding the appropriate conduit entry hole in oversize terminal boxes on frames 284T-445T. Care must be taken to avoid damaging the motor leads and to keep foreign objects from entering the motor. The terminal box cannot be rotated in place.

Terminal Strip (option)

The oversized terminal box may be supplied with motor leads connected to a terminal strip. This feature facilitates terminal connections.

Drive Motor Connection

Reference the lead connection diagram located on the motor nameplate or inside the terminal box cover.

Contact Customer Service at 1-800-668-6748 (phone),
1-888-536-6867 (fax) or mailbox@lincolnmotors.com (e-mail) for a copy of across-the-line and reduced voltage start connection diagrams.

Blower Motor and Connection (TEBC models only)

The blower motor is designed for use with single or three phase, utility generated, sinusoidal **(non-inverter)** power. Check the blower motor nameplate for voltage and phase capability.

Frame sizes 182T-256T only: The blower (fan) should always turn in a counter-clockwise direction when looking at the blower (fan) end of the motor. Counter-clockwise rotation of the blower directs air through the motor with the air exiting at the shaft end. If the rotation is not correct, disconnect the power and correct as follows:

1. Single phase blower motors – check for correct wiring of the run capacitor.
2. Three phase blower motors – interchange any two input phases to the blower motor.

Single Phase Blower Motor (TEBC models only)

The single phase motor is a capacitor run design. It is necessary to provide this capacitor rated for 400 VAC in the control cabinet. Capacitor sizes and other performance data are given in Table 2. Connect motor to input power per diagram inside condulet cover. NOTE: Motor has automatic thermal overload protection.

Three Phase Blower Motor (TEBC models only)

Check the blower motor nameplate for voltage ratings and appropriate connection diagrams. Leads for built-in thermostat are yellow in color. Performance data is given in Table 2.

Table 2 — Blower Motor Ratings

Frame Size	115/1/60			230/460/3/60	
	Run Cap µF	FLA	LRA	FLA	LRA
182T-215T	8	0.7	2.4	0.22/0.11	1.2/0.6
254T-256T	16	1.7	6.3	0.50/0.25	2.0/1.0
284T-326T				1.32/0.66	11.0/5.5
364T-445T				3.8/1.9	26.4/13.2

Space Heater (option)

Leads for space heaters are identified as H1 and H2. Heater voltage and watts are marked on the motor nameplate and should be checked prior to connection to power source.

Feedback – Encoder or Digital Tachometer (option)

The encoder is a precision industrial electronic shaft feedback device. Care should be taken when wiring this device to insure reliable operation. This is done to isolate the low level feedback signals from the electrical "noise" induced by the power leads to the motor and blower motor. It is important that the feedback wires be run in a separate conduit from other wiring to insure reliable operation. Follow the wiring specification and practices of the drive supplier.

Table 3 — Feedback Device Characteristics

Characteristic	Feedback Device		
	Dynapar H25 Dynapar H2O	Dynapar HS 35	BEI H25
Operating Temp.	–40° to +85°C	0° to +100°C	0° to +80°C
Minimum Storage Temp.	–40° to +90°C	–40° to +100°C	–25° to +90°C
Enclosure	NEMA 4		
Code	Incremental		
Power Supply	5 to 26 VDC, 120mA Max.	5 to 26 VDC, 100mA Max.	5 VDC, 150mA Max.
Output Current	Differential line driver: 40mA Sink/Source	Differential line driver: 40mA Sink/Source	Differential line driver: 40mA Sink/Source
Output Format	2 channel quadrature with marker and complements	2 channel quadrature with marker and complements	2 channel quadrature with marker

⚠ CAUTION

- **DO NOT TAMPER WITH FEEDBACK DEVICE MOUNTING MECHANISMS BECAUSE IT MAY CAUSE MALFUNCTION OF FEEDBACK DEVICE.**

Connection Diagram 1 - BEI Encoders

ABZ (C)	LEAD
A	YEL
B	BLUE
Z	ORN
+V	RED
OV	BLK
CASE	GRN
$\overline{A}$	W-YEL
$\overline{B}$	W-BLUE
$\overline{Z}$	W-ORN

Connection Diagram 2 - Dynapar Encoder

Function	Color
A	BRN
B	ORN
Z	YEL
+VOLTAGE	RED
N/C	-
COMMON	BLK
CASE GND	GRN
A NOT	BRN/WHT
B NOT	ORN/WHT
Z NOT	YEL/WHT

Thermostat (standard)

Leads for thermostats (normally closed, automatic reset contacts) are identified as P1 and P2. Connect these to a relay or signaling device. Motor line current cannot be handled by the thermostat. Failure to connect the thermostat leads to the proper relay or signaling device will void the motor warranty.

Table 5 — Thermostat Contact Ratings

Voltage (60 Hz)	110V	220V
Max. Cont. Current (amps)	3.0	1.5
Min. Cont. Current (amps)	0.2	0.1

Thermistor (option)

Leads for thermistors are identified as P3 and P4. Thermistors require connection to Texas Instruments® Control Module Model 32AA or its equivalent for proper operation. This item may be purchased from Lincoln.

Brake (option)

Carefully read and fully understand the instructions supplied by the brake manufacturer (see inside of brake housing or separate sheet). Contact the brake manufacturer for additional information.

5.3 GROUNDING

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Connect the motor frame to a good earth ground per the National Electrical Code and local codes to limit the potential to ground in the event of contact between live electrical parts and the metal exterior.**

Lincoln motors may be electrically connected to earth ground using a terminal box mounting screw or a separate grounding screw when provided. Both are accessible inside the mounted terminal box. When a bronze mounting screw is supplied, always use it as the grounding point. In making the ground connection, the installer should make certain that there is a good electrical connection between the grounding lead and the motor.

6. OPERATION

⚠ WARNING

MOVING PARTS can injure.

- **Before starting the motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off and causing bodily injury.**
- **Keep away from moving parts.**

ELECTRIC SHOCK can kill.

- **Do not operate with covers removed.**
- **Do not touch electrically live parts.**

Three-phase squirrel-cage induction motors will operate on *sinusoidal power* successfully, but not necessarily in accordance with nameplate ratings, at voltages ±10% nameplated value at the design frequency.

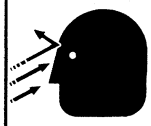
After checking that the shaft key is secure, operate the motor free of load and check the direction of rotation. If the motor rotates in the wrong direction, interchange any two supply leads. Also, check the input current to make sure it is approximately the same as the idle amps value listed on the nameplate. If everything appears to be satisfactory, continue to next paragraph.

Couple the motor to its load and operate it for a minimum of one hour. During this period, check for any unusual noise or thermal conditions. Check the actual operating current to be sure that the nameplate current times service factor is not exceeded for steady continuous loads.

MAXIMUM SAFE SPEED

The maximum mechanically safe operating speed is stamped on the nameplate and must not be exceeded under any condition. The drive system must hold the maximum speed, under any load condition including no load, within the maximum safe speed. Drive systems whose design characteristics inherently prevent the motor from exceeding the Motor Maximum Safe Operating Speed must prevent the motor from exceeding the Maximum Safe Speed if a single component failure should occur.

⚠ WARNING



MOVING PARTS can injure.

- **Do not operate the motor at speeds above the motor maximum safe speed.**
- **Operating the motor above maximum safe speed may cause parts to be ejected resulting in bodily injury.**
- **All motor driven components must be designed by the machine builder to operate safely at the motor maximum safe speed listed on the nameplate.**

THE MACHINE BUILDER IS RESPONSIBLE FOR INSURING THAT DRIVEN MACHINERY AND ALL DRIVETRAIN MECHANISMS NOT SUPPLIED BY LINCOLN ELECTRIC AND PROCESS LINE MATERIAL ARE CAPABLE OF SAFE OPERATION AT THE MOTOR MAXIMUM SAFE SPEED.

VOLTS/HERTZ SETTINGS

Motor overheating may be caused by improper "boost" or "volts/hertz" settings of the drive. Care should be taken when adjusting these parameters that the motor does not become magnetically saturated. Signs of magnetic saturation are increased motor "electrical" noise (humming), increased current draw and rapid motor heating.

7. MAINTENANCE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Internal parts of the motor may be at line potential even when it is not rotating.**
- **Disconnect all input power to the drive and motor before performing any maintenance.**

Lincoln Inverter Duty motors are designed and manufactured for long motor life expectancy and trouble-free operation.

Periodically inspect the motor for excessive dirt, friction or vibration. Dust may be blown from an inaccessible location using compressed air. Keep the ventilation openings clear to allow free passage of air. Make sure the drain holes in the motors are kept open and the shaft slinger is positioned against the end bracket. Grease or oil can be wiped by using a petroleum solvent.

Overheating of the bearings caused by excessive friction is usually caused by one of the following factors:

1. Bent shaft.
2. Excessive belt tension.
3. Excessive end or side thrust from the gearing, flexible coupling, etc.
4. Poor alignment.
5. Contamination.

Damaging vibrations can be caused by loose motor mountings, motor misalignment resulting from the settling or distortion of the foundation, or it may be transmitted from the driven machine. Vibration may also be caused by excessive belt or chain tension.

7.1 BEARING SYSTEM – SIZES AND LUBRICATION

Lincoln Inverter Duty motors have a high quality, premium design bearing system. Bearing sizes and enclosures are identified on most motor nameplates. The majority are double-shielded, deep-groove ball bearings. Double-sealed ball bearings are used on some motors in frame sizes 56, 143T and 145T.

⚠ CAUTION

- **LUBRICANT SHOULD BE ADDED AT A STEADY MODERATE PRESSURE. IF ADDED UNDER HEAVY PRESSURE BEARING SHIELD(S) MAY COLLAPSE.**
- **DO NOT OVER GREASE.**

Lubrication instructions and/or grease specifications provided on the motor supersede the following information.

In general, the motor's bearing system has sufficient grease to last indefinitely under normal service. Where the motor is used in dirty, wet or corrosive atmospheres, it is advisable to add one-quarter ounce of grease per bearing every three months. Use a good quality, rust inhibited polyurea-based grease, such as Chevron SRI #2. A lithium-based greases are not compatible with polyurea based greases; mixing the two types may result in the loss of lubrication.

When adding lubricant, keep all dirt out of the area. Wipe the fitting completely clean and use clean grease dispensing equipment. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

If the motor is equipped with a relief port or tube, make certain it is open and free of caked or hardened grease. Before replacing relief plugs, allow excess grease or pressure to vent by running the motor for several minutes after lubrication.

7.2 PARTS

All parts should be ordered from Authorized Motor Warranty Stations. Call your Lincoln Sales Office for location and phone number. A "Service Directory" geographically listing all Authorized Motor Warranty Stations is available; request Bulletin SD-6. These shops stock GENUINE Lincoln replacement parts and have factory trained personnel to service your motor.

8. WHO TO CALL

For the location and phone number of the Lincoln Sales and Technical Support Office nearest you, check your local Yellow Pages (consumer and business-to-business) or call 1-800-MOTOR-4-U (1-800-668-6748) or visit us on the web at www.lincolnmotors.com.

9. WARRANTY

Lincoln Motors, the Seller, warrants all standard new Inverter Duty and Vector Duty motors and accessories thereof against defects in workmanship and material, provided the equipment has been properly cared for, and operated under normal conditions. All warranty periods begin on the date of shipment to the original purchaser and are as follows:

Product Description	Warranty Period
Inverter Duty and Vector Duty motors	Five Years
Factory installed feedback devices and cooling fan motors	Two Years

If the Buyer gives the Seller written notice of any defects in equipment within any period of the warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth there are no guarantees or warranties with respect to accessories or equipment, either expressed or arising by option of law or trade usage or otherwise implied, including with limitation the warranty of merchantability, all such warranties being waived by the Buyer.

Lincoln™ MOTORS

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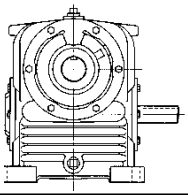
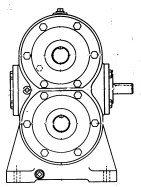
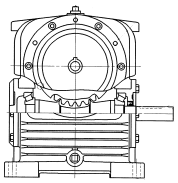
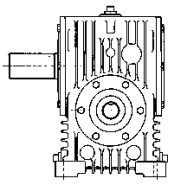
E-Mail: mailbox@lincolnmotors.com

IM494 December 1999

Sizes 15 - 80
Single Reduction Speed Reducer
Assembly Instructions

Cone Drive Double Enveloping Worm Gear Units

TEXTRON

Power Transmission

Table of Contents

Introduction

This specification covers the assembly and disassembly of Cone Drive standard worm gear speed reducers and gearsets. It applies to single reduction reducers and standard or low backlash gearsets.

This manual assumes the person performing the assembly and disassembly has experience with servicing transmission equipment. Always use lifting equipment with heavy lifting capability. Standard tools used for the assembly and disassembly of reducers may be used to perform the instructions in this manual. A bearing press will also be necessary to install bearings and gears.

CALL CONE DRIVE TOLL FREE:
Sales Phone: 888-99-4 Cone
Sales Fax: 888-907-Cone
Parts & Service: 888-726-Cone
Parts Fax: 888-916-Cone

Cone Drive

Cone Drive Parts & Service Options

Field Service

Experienced Cone Drive personnel are available to make sure that your Cone Drive reducer is ready to give you the reliable duty for which it was designed.

To arrange for service, please call us toll free at 888-726-Cone, or ask for the field service extension.

Remanufacturing Center

Cone Drive's Remanufacturing Center at our Traverse City manufacturing facility is capable of any level of rebuild. For information, please call us toll free at 888-726-Cone, or ask for the rebuild service extension.

Technical Information

Assembly drawings of your reducer or technical assistance is available from Cone Drive.

Maintenance Workshops

Cone Drive's workshops are the most comprehensive technical educational program in the worm gear industry. We offer a variety of hands-on experience with double-enveloping worm gear speed reducers and gearsets, and teach valuable assembly, repair, and installation techniques.

At an advanced level, field simulation is balanced with classroom instruction at the Cone Drive Training Center and Dynamometer Test Facility. We can provide intensive training and individual attention is provided by Cone Drive engineers, technicians, and field service personnel.

Our programs focus on assembly, repair and installation, lubrication, reducer selection and rating, bearing setting, trouble shooting, and failure analysis.

The Controlling Dimensions

The controlling dimensions for the proper assembly of Cone Drive gearsets are: worm end position, gear side position and center distance. Since these dimensions are held during the manufacture of gearsets, these same dimensions should be maintained within the specified limits to properly locate the worm and gear in the housing at assembly.

Variations in housing flange face dimensions affect the end position of the worm and side position of the gear. We compensate for these variations by inserting shims between the bearing cap or carrier flange face and the housing bore face. The shims are adjusted to centralize the worm and gear in the housing.

Tolerances

The recommended tolerance limits for the controlling dimensions, (worm end position, gear side position, and center distance) are shown.

center distance	tolerances (+/-)
up to 6"	.001
6" to 8"	.002

figure 1

Errors In Angularity

Errors in angularity between the worm and gearshaft, beyond permissible limits, cannot be corrected by altering any of the locating dimensions. Care should be taken that the housing bores for the worm shaft and gear shaft are machined square with each other within .004" per linear foot.

Shims and Shim Sets

Shims are used in Cone Drive gear units both to properly position the worm and gear within the gear housing (see "Assembly Instructions"), and to set the desired bearing end-play or pre-load (see Recommended Tapered Roller Bearing Settings).

The shims also serve as gaskets for the bearing caps and carriers. As spare or replacement parts, the shims are packaged as "shim sets".

Each shim set includes an assortment of shims which are color coded according to thickness as shown in figure 2.

color	*thickness*	*color*	*thickness*
Yellow	.020"	Blue	.005"
Brown	.010"	Green	.003"

figure 2

Grease Packed Bearings

Bearings that are at least partially submerged in oil or oiled by internal oil scoops do not require special maintenance. However, bearings that are not lubricated as above require grease lubrication. Grease fittings and internal retainers are furnished when required, see figure 6. They should be greased with a high quality lithium base NLGI #2 or NLGI #3 bearing grease at normal maintenance intervals depending on the duty cycle of the reducer.

Adjustment of Bearing Settings

Opposed mounted single row tapered roller bearings require adjustment for end play. Select proper worm bearing setting according to RPM from figure 3.

Recommended Tapered Roller Bearing Settings

Single Reduction Reducer Worm Bearing Settings

Reducer Size (center distance)	***Worm Speed (1,000 - 2,000 RPM)***	***Worm Speed (2,001 - 3,600 RPM)***
15 to 35 (1.500" to 3.500")	.003 +/- .001	.005 +/- .001
40 to 60 (4.000" to 6.000")	.004 +/- .001	.006 +/- .001
70 to 80 (7.000" to 8.000")	.006 +/- .001	.007 +/- .001

figure 3

Notes:

a. Settings shown in figure 3 are axial looseness.

b. All gear bearings up to and including 8.000" C.D. are set to a pre-load of (-).001+/-.001 for output speeds of 350 RPM or less. Contact Application Engineering for gear bearing settings for speeds in excess of 350 RPM.

c. 7.000" and 8.000" C.D. prior to 1980 have preset worm bearings.

d. These bearing settings are for standard and special reducers unless otherwise specified on the assembly drawing.

e. If low backlash is critical, some applications may require reduced settings. Contact Cone Drive Application Engineering for review.

"O" Markings

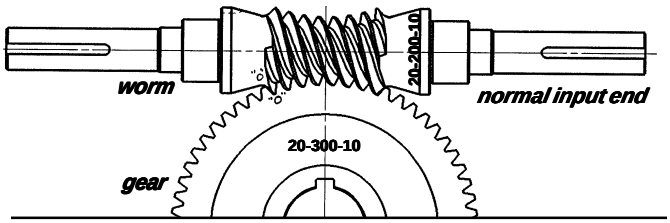
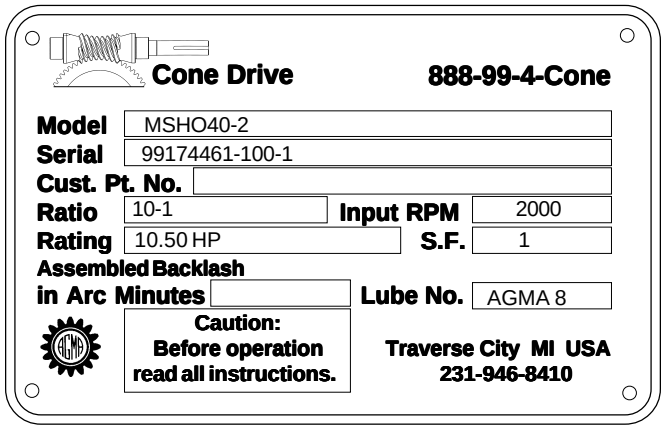


figure 4

"O markings will appear on all multiple threaded worm gearsets that have been lapped and all multiple threaded worm gearsets with low backlash. When "O" markings are present, care should be taken during assembly to ensure that the "O" marks are properly aligned. As indicated in figure 4, when properly aligned, the "O" stamped worm thread will pass through the "O" stamped space between two gear teeth.

Preparation for Rebuild

Applies to 1.5" through 8.0" Center Distance Single Reduction Speed Reducers.
When calling for parts, please reference reducer model number and serial number.
To properly identify a Cone Drive speed reducer we must have the reducer model number and serial number.



Cone Drive Reducer Nameplate
Line #1 -Reducer Model Number
example: MSH040-2.
Line #2 -Serial Number
example: 99174461-100-1.
year manufactured (99)
Cone Drive order number (174461)
order item number (100)
item sequence number (1)
Line #3 -Customer Part Number when required.
Line #4 -Ratio and Input Speed
Line #5 -Reducer Rating and Service Factor
Line #6 -Assembled Backlash and Lubricant No.

Drawings and Parts Lists
Assembly drawings, detail drawings, and parts lists for all units are available from Cone Drive. An assembly drawing is required to rebuild the reducer. Note positions of input and output shafts, breather and oil level plug. A photograph of the reducer before disassembly will be helpful.

Lubrication

Contact Cone Drive for lubrication list.

CALL CONE DRIVE TOLL FREE:
Sales Phone: 888-99-4 Cone
Sales Fax: 888-907-Cone
Parts & Service: 888-726-Cone
Parts Fax: 888-916-Cone

Oil Level

Cone Drive reducers are furnished with a bronze colored hex head pipe plug to indicate oil level. An oil level tag is affixed to the unit near the oil level indicator. Oil level should always be checked with the unit stopped. **Cone Drive reducers are all shipped without oil**. However, WhisperDrive units and Model RG units are shipped with oil**.**

Disassembly Instructions

1. Remove reducer from machine.
Caution: follow machine manufacturer's recommendations, making sure to remove all load from the reducer before removing reducer from machine.
2. Drain oil
3. Clean outside of housing
4. Position reducer on bench with gearshaft up.
5. Remove one (1) gear carrier making sure the shim packs stay with the carrier for determining the amount of new shims to use as a starting point when reassembling reducer.
6. Lift gearshaft assembly out of housing.
7. Wipe off excess oil.
8. Reposition housing so worm is pointing up.
9. Remove one (1) worm bearing carrier making sure shim pack stays with the carrier for determining the amount of new shims to use as a starting point when reassembling the reducer.

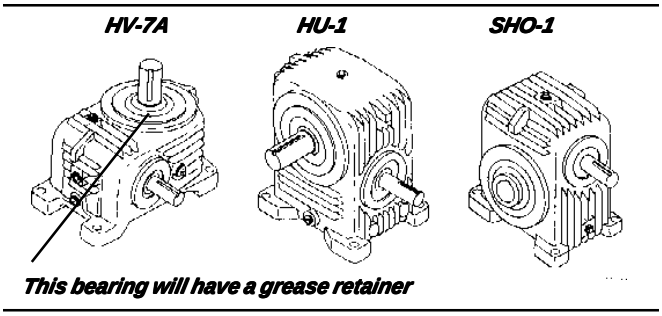


figure 5

10. Lift worm out of housing.
11. Remove remaining worm and gear carriers from housing making sure shims stay with carriers.
12. Remove bearing cups from all carriers.
13. Remove oil seals from open caps and carriers.
14. Clean inside of housing and carriers.
15. Discard old parts, i.e. bearings, seals, and gearset.

Assembly Instructions

Applies to 1.5" through 8.0" Center Distance Single Reduction Speed Reducers.
1. Refer to prints and parts lists for parts breakdown.
2. Check gearset for matched set numbers. The worm and gear must have the same set number.
3. Determine the hand of assembly of the speed reducer which is the relationship between the input and output shaft. This can be found on the name tag as part of the model number (see figure 5), the assembly drawing or from the reducer to be rebuilt.
4. All speed reducers 3" C.D. and larger with a vertical worm or gearshaft will have a grease retainer under the upper bearing cone on the shaft. The grease retainer must be installed with the rim toward the bearing cone, as shown in figure 6. When a grease retainer is used under a bearing, you must add .024" shims to the carrier on that bearing.
5. A 10 ton press will be required for installing the bearings and gear for reducers as large as 3.5" C.D. and a 50 ton press for reducers as large as 8.0" C.D. Press the bearing cups into the worm and gear carriers. Press the grease

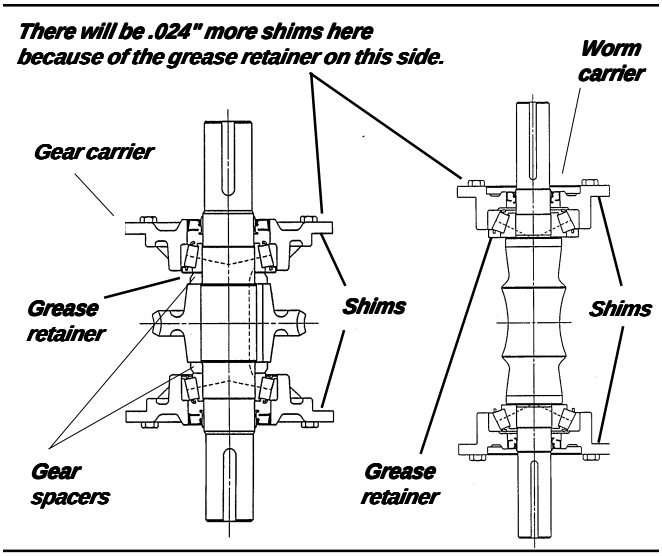


figure 6

retainer (if required) and bearing cones onto the worm. Press the gear, gear spacers (if required), grease retainer (if required), and bearing cones onto the gearshaft.

Bearing Settings

1. The first step for checking bearing settings is to assemble one (1) gear carrier starting with the same number of shims as with old reducer or the nomimal shim thickness caled for on the assembly drawing. Install the gearshaft assembly and bolt the remaining gear carrier and shims into the housing. Rotate the shaft while tapping on the end to seat the bearing rollers. Check the gear bearing setting with an indicator as shown in figure 7. With the dial indicator set at zero, pull up on the shaft while watching the dial indicator. Add or subtract shims as necessary to achieve the proper bearing setting shown in figure 3. The shims should be equal under both carriers so that the worm and gear are centered in the housing, unless there is a grease retainer being used.

2. Remove one (1) gear carrier and the gear shaft assembly from the housing. Note: Keep track of the amount of shims needed under the carrier.

3. The next step is to install the worm assembly into the housing and check the bearing settings in the same manner as the gear assembly. The recommended bearing settings can be found in figure 3, paying attention to reducer size and worm speed. When finished with the bearing settings the worm should be left in the speed reducer.

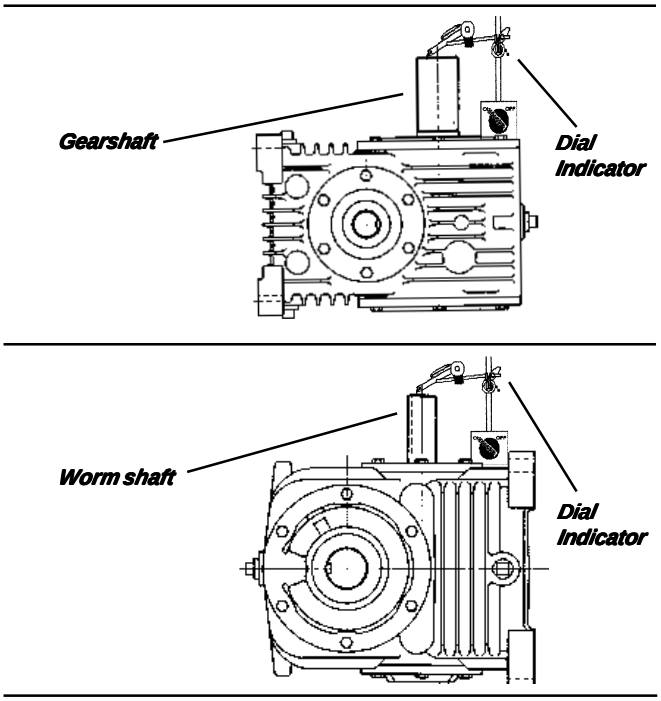


figure 7

Contact Pattern

1. Coat gear teeth and worm threads with a nondrying contact paste. Caution: On some multiple threaded worms, a zero marking will be on the worm and gear. These must be matched during the assembly of the gear and the worm. (refer to "O" marking in figure 4).

2. Install gearshaft assembly into the housing. Replace gear carrier and shims.

3. Rotate the worm shaft by hand until the gear has made one or more revolutions in each direction. Remove gear shaft assembly from the housing to observe the pattern on both the worm and gear.

4. The gearset must be positioned properly at assembly to obtain the desired contact between the worm threads and gear teeth. If the gearset is properly aligned, contact will be approximately as shown by the shaded portions in figures 9 or 13, depending on ratio. The correct pattern is symmetrical with respect to the centerline of the worm and the gear but will vary with ratio. The correct pattern for ratios 5:1 to 25:1 are shown in figures 9 and 10, and for ratios 30:1 to 70:1 see figures 13 and 14.

(discussion continues on page 10)

Sample Contact Patterns for 5:1 - 25:1 Ratios

Correct contact pattern for 5:1 - 25:1 ratio before running-in.

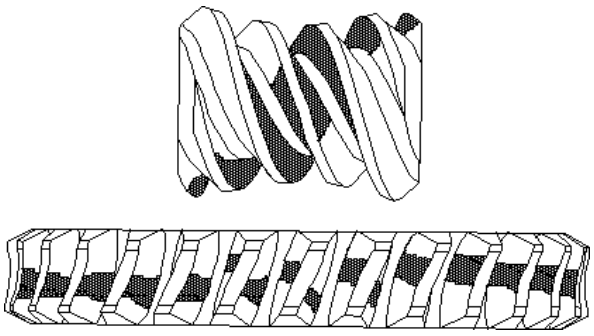


figure 9

Correct contact for 5:1 - 25:1 ratio pattern after running-in.

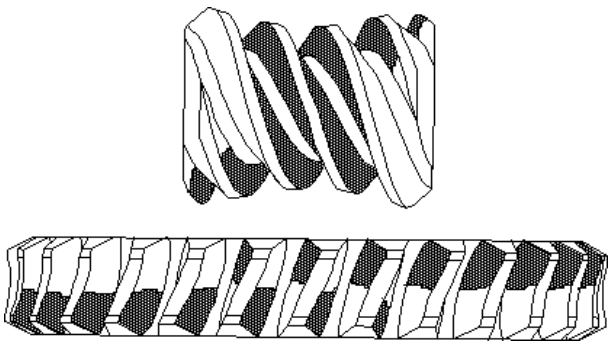


figure 10

How to correct 5:1 - 25:1 ratio for worm off end position.

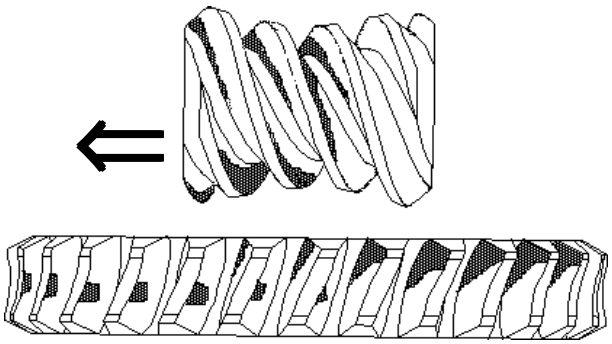


figure 11

How to correct 5:1 - 25:1 ratio for gear off side position.

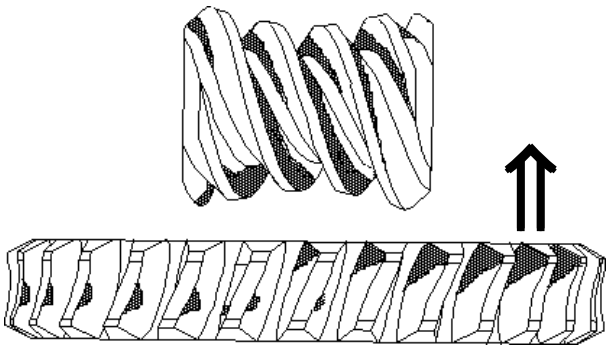


figure 12

Sample Contact Patterns for 30:1 - 70:1 Ratios

Correct contact pattern for 30:1 - 70:1 ratio before running-in.

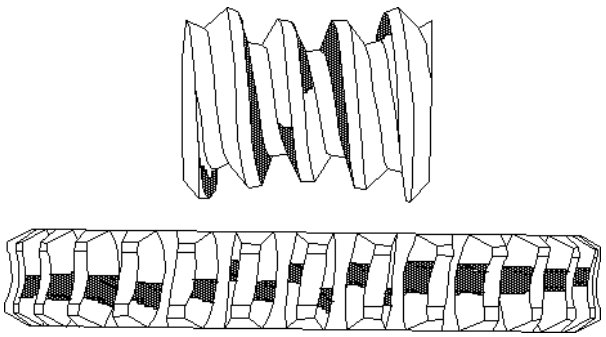


figure 13

Correct contact for 30:1 - 70:1 ratio pattern after running-in.

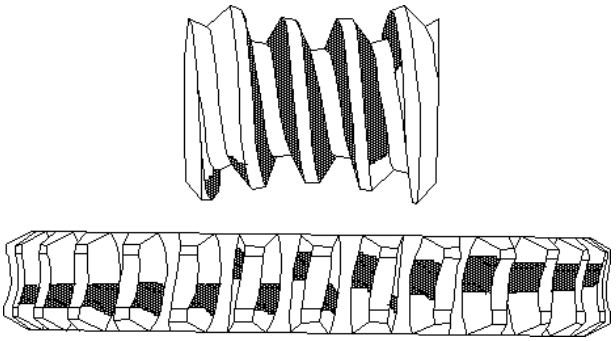


figure 14

How to correct 30:1 - 70:1 ratio for worm off end position.

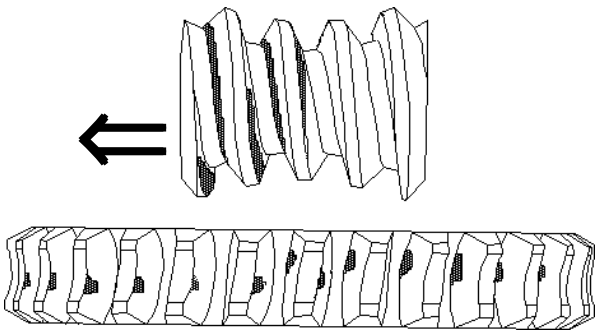


figure 15

How to correct 30:1 - 70:1 ratio for gear off side position.

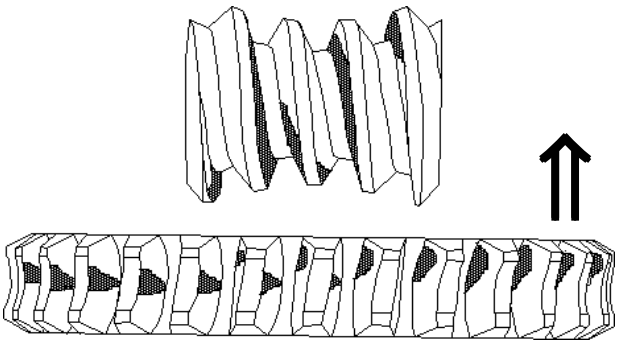


figure 16

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Parts & Service: 888-726-Cone
Parts Fax: 888-916-Cone

Contact Pattern (continued)

5. All of the illustrations, figures 11, 12, 15, and 16, show a misalignment of the gear set.

6. Correct any misalignment by removing shims from one bearing cap or carrier and adding an equal amount to the opposite cap or carrier. See figure 6.

7. If contact is similar to figures 11 or 15, the worm is out of position. Move the worm in the direction indicated by the arrow. If the contact pattern is opposite to that shown move the worm in the opposite direction.

8. If contact is similar to figures 12 or 16, the gear is off side position. Move the gear in the direction indicated by the arrow. If the contact pattern is opposite to that shown, move the gear in the opposite direction.

9. Install pipe plugs, oil level indicator, all bolts, and grease fittings if applicable. Bolt, torque settings can be found on the print or contact Cone Drive.

10. Install wear ring type oil seals. The wear ring should be assembled onto the shaft by tapping against the flange. A piece of round tubing works well as an assembly tool. Note: Tubing must clear the sealing surface of the wear ring which will expand up to .007" when pressed onto the shaft. Tap the oil seal into the cap or carrier and thus onto the wear ring using a liberal amount of grease on the lip of the seal and the wear ring.

Note: Be sure the outer lip of the seal is completely onto the sealing surface of the wear ring. See drawing, figure 8, for position of wear ring. The dimension for positioning the wear ring is indicated on the reducer assembly drawing.

11. Fill the speed reducer to the proper oil level with a recommended lubricant from the Cone Drive Approved List of Lubricants.

12. Special applications and older style speed reducers may use different assembly techniques.

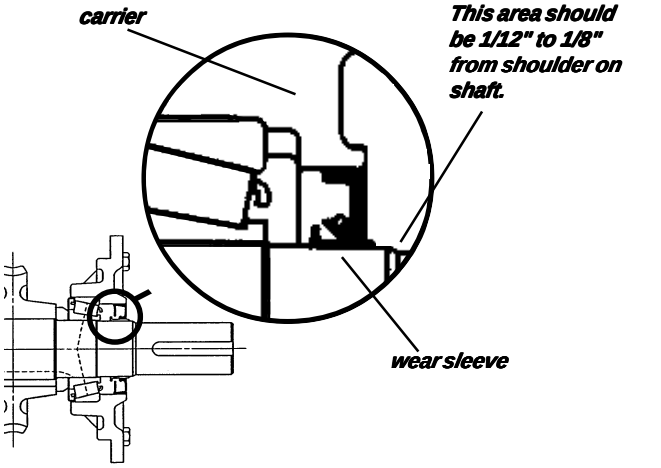

figure 8

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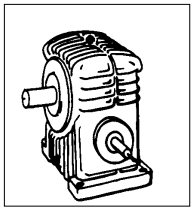
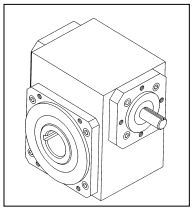
Trouble Shooting Guide

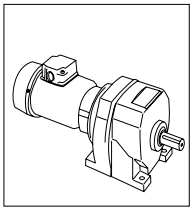
PROBLEM	***EFFECT***	***CAUSE***	***SOLUTION***
Decrease in efficiency	Wear & scoring of worm threads and gear teeth	Improper lubricant	Replace gearset, bearings and oil seals. Select correct lubricant from approved lube list.
Decrease in efficiency	Wear & scoring of worm threads and gear teeth	External torque overload	Eliminate overload, replace gearset, bearings and oil seals or select larger reducer.
Reducer runs hot	Wear & scoring of worm threads and gear teeth	Improper or insufficient lubricant	Replace gearset, bearings and oil seals. Select correct lubricant from approved lube list.
Reducer runs hot	Wear & scoring of worm threads and gear teeth	Input power exceeds thermal rating	Replace gearset, bearings and oil seals. Add Auxillary cooling or select larger reducer.
Reducer seizes up	Gearset and/or bearings running hot	Oil seal leaks	Check condition of gearset and bearings, replace if necessary. Replace oil seals.
Reducer seizes up	Bearings run hot	Tight bearings	Check condition of bearings, replace if needed. Shim bearings per bearing setting instructions.
Reducer seizes up	Bent worm or swedged gear teeth	External torque overload	Eliminate overload, replace gearset, bearings and oil seals or select larger reducer.
Loss of ratio	Broken worm threads or gear teeth	External torque overload	Eliminate overload, replace gearset, bearings and oil seals or select larger reducer.
Reducer comes loose from mounting	Broken reducer feet or foot bolts	External overload	Eliminate overload and replace reducer, if necessary, with same size or larger reducer.
Knocking noise from reducer	Bent gear tooth	External torque overload	Eliminate overload, replace gearset, bearings and oil seals or select larger reducer.
Squealing noise from reducer	Damaged bearing	Improper installation or inadequate lube	Replace bearings and oil seals.



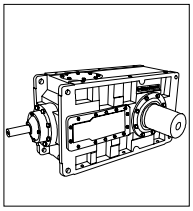
Cone Drive
Double Enveloping design in single, double, and triple reduction types.



WhisperDrive
Servo Precision Gearhead in three precision levels.



Series M
In Line Helical Geared Motors and Reducers.



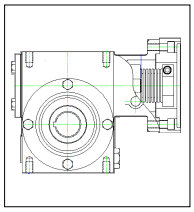
Series G
Helical parallel shaft and Bevel Helical right angle drive gear units.

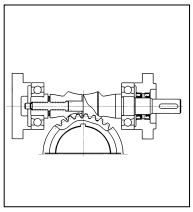
Model RG
Right Angle Gearhead in two precision levels.

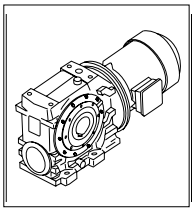
AccuDrive
Zero Backlash Gearing for positive rotational positioning.

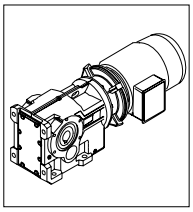
Series C
Right angle drive Helical Worm Geared Motors and Reducers.

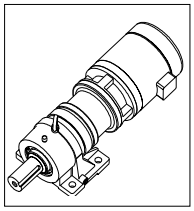
Series K
Right angle Helical Bevel Helical Geared Motors and Reducers.



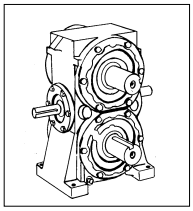




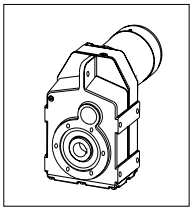




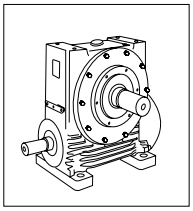
Series Q
In Line Planetary Geared Motors and Reducers.



DuoDrive
Dual Gears on parallel output shafts.



Series F
Parallel Helical shaft mounted geared motors and reducers.



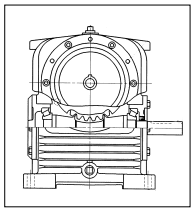
Series A
Worm Gear units and geared motors in single and double reduction types.

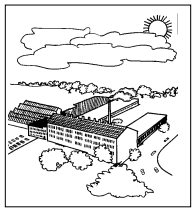
Extruder Drive
Rugged duty reducer takes high screw pressure.

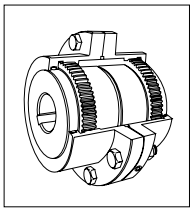
Remanufacturing Center
Fast turnarounds on rebuilds or preventative maintenance, warranteed service.

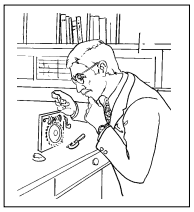
Series X
Nylicon and Cone Ring Type flexible coupling, Gear Type rigid and flexible couplings.

Gear Institute
Gearing's most comprehensive technical educational programs.









TEXTRON
Power Transmission

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888-99-4 Cone -Toll Free Sales, 888-726-Cone -Parts & Service
975 Dillingham Road, Pickering ON L1W 3B2 Canada, 905-420-4141 -Phone, 905-420-9513 -Fax
888-Radicon -Toll Free Sales, 800-295-3749 -Parts & Service

Lubrication, Installation, Operation & Maintenance Instructions For Cone Drive Speed Reducers

Cone Drive double enveloping worm gear speed reducers are used throughout Industry to provide smooth and quiet speed reduction. When properly selected, applied and maintained, they will provide optimum performance.

IMPORTANT: In any applications of Cone Drive Products where breakage, damage, disconnection, any other malfunction of any drive train component, or excessive wear could result in personal injury or property damage, a fail safe device capable of stopping and holding the load in the event of such an occurrence must be incorporated after the drive train.

THE FOLLOWING INFORMATION IS FOR YOUR PROTECTION. PLEASE READ CAREFULLY.

1. Do not attempt to install or operate this reducer until all of these instructions are read and thoroughly understood. If you have any questions, please contact Cone Drive.

2. The horsepower or output torque capacity of this reducer and the service factor (maximum allowable operating cycle) are stamped on the reducer nameplate. **These values are not to be exceeded as overloading can result in reducer failure.**
   Exceeding the rating and duty cycle will void the warranty. Please contact Cone Drive with any questions regarding rating and service factors.

3. Each reducer is specifically arranged to operate at the input speed specified on the nameplate. If the input speed is not specified by the customer, it is set up for 1750 RPM and service factor 1.0. Do not operate the reducer at speeds or under service other than specified on the nameplate without contacting Cone Drive for specific instructions on oil level location and bearing settings.

4. Do not alter the reducer in any way without approval from Cone Drive.

5. This reducer has moving mechanical components and connected electrical devices, operating under high voltage to achieve its intended purpose. Operation and repair should only be done by qualified personnel.

6. Before servicing a speed reducer, the main electrical disconnect must be moved to and **locked** in the off-position. The person performing the work should **post on that disconnect a warning to others not to turn on the power.**

7. It is normal for the reducer to operate at a housing temperature of up to 200° F. To prevent burns, proper guards or shields must be provided by the purchaser or user to prevent personnel from touching the reducer.

8. Cone Drive products are furnished without guard covers. It is the responsibility of the purchaser or user to provide guards for all exposed shafting, couplings, sprockets, sheaves, belts, chains, clutches, and any other moving parts in accordance with current local, state and federal requirements.

9. Failure to follow the instructions contained in this bulletin may result in unit failure, property damage or personal injury.

Finish Coat Painting

Cone Drive speed reducers are furnished with a prime coat of paint on exterior housing surfaces. The reducer should be painted with a finish coat to protect the housing exterior, particularly if subjected to outdoor service, periodic washdown or harsh environments.

Mask all shafts, oil seals, tags, name plates, oil level stickers, breathers, gauges etc. before painting. (Painting seal lips can result in oil leakage.)

Installation

IMPORTANT: Unless otherwise specified on the reducer or in accompanying documentation, all Cone Drive speed reducers are shipped without oil and must be filled to the oil level gage or plug with the **proper** oil before start-up. See the following section on lubrication.

1. The speed reducer must be securely mounted to a rigid flat foundation or base plate. If necessary, shim under the reducer feet to provide a flat mounting surface.

2. Bolt the reducer to the foundation or mounting base using the largest diameter bolt that will fit through the foot holes of the reducer. **Be sure to use a bolt in all available mounting feet holes.** If the reducer will be subjected to heavy chain pull or thrust loading, **heat treated** mounting bolts must be used to prevent stretching and loosening of the bolts.

3. The input and output shafts of the reducer should be coupled to the motor and driven shafts with flexible couplings and the reducer aligned with these shafts within ±.001". Solid or rigid couplings should be avoided. Failure to properly align shafts and the use of solid couplings can result in excessive coupling and bearing wear, shaft deflection and eventual failure of one (1) or more of the components.

4. Couplings, sheaves and sprockets should be mounted on the reducer shafts carefully. Do not pound or hammer them onto the shafts as this will damage bearings and oil seals.

5. Sprockets and sheaves should be mounted as close to the reducer as possible and "V" belts and chains adjusted to the proper tension to keep bearing loading and shaft deflection to a minimum. Too much tension in belts and improper location of sheaves and sprockets will lead to excessive chain pull, bearing wear and shaft deflection. For specific information on chain pull capacity, shaft stress and bearing life please contact Cone Drive.

6. **NOTE:** Exposed metal parts are coated with a commercial rust inhibitor. This rust inhibitor must be removed prior to installation. Failure to do so may result in difficulty in assembling close tolerance mating components.

6. **Before starting motor** review motor rotation, reducer rotation and required direction of driven machine to insure that the motor is wired for proper direction of rotation. In many instances a machine must run in one direction and failure to wire the motor properly can result in damage to the driven machine.

7. **IMPORTANT:** Fill unit to proper level with recommended oil. Grease all fittings with recommended grease (see section on lubrication). In the case of double or triple reduction reducers, be sure to fill each reduction stage to the proper oil level. Note: Some reducers may have been factory filled. Read all tags.

NOTE: All reducers are built for **one** mounting position, i.e.; floor mounted or wall mounted with worm vertical up or ceiling mounted, etc. If the reducer is to be mounted in any position other than the position for which it was furnished, contact Cone Drive for information on relocating oil level, grease packing bearings, etc., before start-up. If a reducer is operated in a mounting position other than the position for which it was assembled, reducer failure may occur from improper oil level or grease fitting location resulting in lack of lubrication to the gearset and bearings.

Start-Up

1. After the reducer has been properly mounted, aligned **and lubricated**, it is ready for start-up.

2. Make sure driven machine is clear of all obstructions and all safety guards and covers are in place, according to appropriate local, state and federal requirements. If possible, turn motor shaft by hand to confirm drive system is operating freely and in correct direction of rotation.

3. Jog motor to confirm proper rotation.

4. Operate reducer with minimum load for approximately 15 minutes (in both directions if applicable) to seat gears, bearings, and oil seals.

Operation

1. All reducers require a few hours of "run-in" under load to achieve optimum efficiency. During this initial run-in the reducer will probably run warmer than normal and draw more current than after the run-in period. Reducers operating at a very low load or speed will take much longer to run-in and even if operated continuously at low load or speed may never achieve the efficiency that they would if operated at or near their catalog rating.

2. **IMPORTANT:** Normal reducer operating temperature measured on the oil sump area of the housing should not exceed 100º F above ambient temperature or 200º F. If the reducer operating temperature exceeds 200º F, shut down the unit and contact Cone Drive. Excessive oil sump temperature is indicative of overloading, misalignment, or improper or marginal lubrication. Continuous operation of the reducer with the oil sump temperature above 200º F will result in breakdown of the oil and failure of the reducer.

Maintenance

1. The reducer oil level should be checked weekly and the recommended oil added as required to maintain the proper oil level.

2. Oil should be changed as outlined in the lubrication section.

3. All grease fittings should be lubricated with the recommended grease once per month.

4. The reducer, particularly finned areas and fan covers, should be kept clean to allow maximum heat dissipation.

5. All reducer and foundation bolts should be checked for tightness after three (3) months of service and annually thereafter.

6. If a reducer has to be repaired, contact Cone Drive for detailed instructions, blueprints, parts lists, etc. If it is necessary field service is available.

7. If a reducer is to be returned, contact Cone Drive for instructions and a returned material authorization (RMA) number.

Storage Recommendations For Cone-Drive Speed Reducers

If a reducer is to be stored or shut down for more than 30 days, it should be protected from water condensation and corrosion as follows:

Any enclosed system of gearing is subject to water condensation on the inside of the reducer caused by fluctuating ambient temperatures. This condensation can cause severe rusting of the worm and bearings which could lead to premature failure of the reducer. However, this condition can be easily prevented by following the recommendations outlined for various storage conditions. If the reducer is furnished with a motor, follow the motor manufacturers recommendations for motor preservation.

1. **Standard Shipping Procedure - Protection for Maximum Storage Duration of 30 Days.**
Cone Drive speed reducers are treated inside using a rust inhibitor, the exterior is painted with one coat of primer, and all exposed shafting coated with a rust preventative prior to shipment. This procedure is intended to protect the reducers during shipment and short term inside storage for a maximum period of thirty (30) days after shipment.

2. **Long Term Storage (Indoors) for Periods up to One Year.** (a) Fill the reducer completely full with one of the lubricants shown on our approved list of lubricants. A copy of this lubricant list is shipped with each unit. (b) Rotate the wormshaft and gearshaft at least once per month to keep the seals from sticking to the wear rings and/or shafts. (c) If it is not practical to rotate the wormshaft periodically we recommend purchasing a spare set of oil seals to have on hand in the event of seal leakage at start-up. (d) Before putting the reducer into service, lower the oil in the reducer to the proper operating oil level.

3. **Long Term Storage (Outdoors) for Periods Up to One Year.** Proceed as in (2) with the following additions. (a) After filling the unit with oil, plug the breather hole with a pipe plug and wire the breather to the unit. (b) Paint the outside of the unit with a finish coat of paint. (Reducer from the factory is prime coated only.) (c) Coat all exposed shafting with a long term rust preventative.

4. **Extended Storage Periods Exceeding One Year.** (a) Immediately after receipt of the reducer treat the inside of the reducer with "Olin Chemicals Corp. - Dichan® 100 Vapor-Phase Corrosion Inhibitor for Ferrous Metals" by adding an amount specified by Olin Chemical, through the breather. Observe all Olin Chemicals Corp. cautions and warnings when handling this material. Plug the reducer and wire the breather to the unit. (b) Paint the exterior of the unit with a finish coat of paint. (c) Coat all exposed shafting with a long term rust preventative. (d) Place the unit in a heavy plastic bag treated with Dichan® 100 powder. Seal the bag air tight. (e) Crate the unit and cover the crate to keep out water. (f) Purchase a spare set of oil seals to have on hand at start-up

Lubrication Data

Lubrication is very important for successful operation of Cone Drive gearsets and speed reducers. Inadequate lubrication can result in increased power consumption, added maintenance and gearset failure. Please review the following recommendations and the "Approved List of Lubricants" shipped with all Cone Drive gearsets and speed reducers. Cone Drive recommends only those lubricants listed or any lubricant which meets all the requirements of AGMA (American Gear Manufacturers Association) 9004-D94 "Lubrication of Industrial Enclosed Gear Drives" as it applies to double enveloping worm gearing. Use of other lubricants can result in gearset failure which will not be covered under warranty. See reducers nameplate for the recommended lubricant.

Type of Oil
Performance is based on synthetic lubricants. Using a mineral oil will reduce the mechanical power and output torque ratings by 25%.

Ambient Temperature
The oils shown in the table on the following page are for use in an ambient temperature range of approximately 15° to 125°F with the low end of the range depending on the pour point of the specific oil used. If the ambient temperature will be below or above this range please contact Cone Drive for specific recommendations on proper lubricant as well as proper oil seal and shim materials.

Oil Sump Temperatures
The maximum recommended oil sump temperature is 200°F. Where reducers will be used at maximum ambient and full catalog rating. Contact Cone Drive for lubrication recommendations.

Sludge
It is necessary that the oil be clean and free from sludge at all times to obtain long life from a gear unit. Sludge in gear units may be caused by excessive heat, from dust and dirt and other contaminates and by the presence of moisture or chemical fumes. Therefore, every precaution should be taken to prevent water and foreign particles from entering the gear case.

Cone Drive Reducers are Shipped without Oil.
At assembly all reducers are treated with a rust inhibitor. This treatment coats all internal parts and will protect the reducer for a period of 30 days. If the unit is to be stored longer than 30 days, see long term storage instructions.

Oil Change
If an approved synthetic lubricant is used, it should be changed after 5000 hours of operation or once per year, whichever occurs first. These change intervals are recommended for units operating under favorable conditions. Where operating conditions are severe, such a rapid rise and fall in temperature of the gear case with accompanied sweating of the inside walls and resulting formation of sludge, or where operation is in moist or dusty atmospheres, or in the presence of chemical fumes or extended running at sump temperatures in excess of 180° F, it may be necessary to change the oil at intervals of one to three months. It is recommended a sampling program be established with your lubricant manufacturer where reducers are exposed to the severe operating conditions, mentioned above.

Oil Level
Cone Drive reducers are furnished with a bronze colored hex head pipe plug to indicate oil level. An oil level tag is affixed to the unit near the oil level indicator. Oil level should always be checked with the unit stopped. Estimated oil capacities for standard reducers, are listed in this section.

Double and Triple Reductions Reducers.
These units utilize separate housings and are furnished with separate oil sumps. It is important that all sumps are filled to the proper oil level.

Grease Packed Bearings
Bearings that are at least partially submerged in oil do not require special maintenance. However, bearings that are not submerged in oil require grease lubrication. Grease fittings and internal retainers are furnished when required. They should be greased with a high quality lithium base NLGI #2 or NLGI #3 bearing grease at normal maintenance intervals depending on the duty cycle of the reducer.

Extreme Pressure (E.P.) Lubricants
Extreme Pressure (E.P.) lubricants or cylinder oils with sulphur-phosphorus additives are not acceptable and should not be used in Cone Drive Speed reducers or worm gearing.

Oil Capacities

Approximate Capacities in Quarts & Gallons

SINGLE REDUCTION REDUCERS - FLOOR MOUNTED POSITION

UNIT SIZE		20	25	30	35	40	50	60	70	80	100	120
WORM OVER GEAR	HO SHO	1 Qt.	1 1/2 Qt.	2 1/2 Qt.	1 Gal.	1 1/2 Gal.	2 1/2 Gal.	3 3/4 Gal.	6 1/2 Gal.	10 1/2 Gal.	19 Gal.	45 Gal.
	ALT OIL LEVEL	1/2 Qt.	1 Qt.	1 1/2 Qt.	2 1/2 Qt.	1 Gal.	1 3/4 Gal.	2 1/2 Gal.	4 Gal.	6 1/2 Gal.	12 1/2 Gal.	26 Gal.
WORM UNDER GEAR	HU	1/2 Qt.	1 Qt.	1 1/2 Qt.	3 1/2 Qt.	1 1/2 Gal.	2 1/4 Gal.	3 1/2 Gal.	5 1/4 Gal.	7 3/4 Gal.	15 Gal.	30 Gal.
	SHU											
VERTICAL OUTPUT SHAFT	HV SHV	1 Qt.	1 Qt.	1 1/2 Qt.	2 1/2 Qt.	1 Gal.	1 3/4 Gal.	2 3/4 Gal.	5 Gal.	6 1/2 Gal.	14 Gal.	26 Gal.

DOUBLE REDUCTION REDUCERS - FLOOR MOUNTED POSITION

UNIT SIZE	20 30	20 35	25 40	25 50	30 60	30 70	35 70	40 70	40 80	50 100	60 120
OO-UO-VO OOS-UOS-VOS	3 Qt.	1 1/2 Gal.	1 3/4 Gal.	2 3/4 Gal.	4 1/4 Gal.	7 Gal.	7 1/4 Gal.	7 1/2 Gal.	11 1/2 Gal.	20 3/4 Gal.	47 1/2 Gal.
OU-UU-VU	2 1/2 Qt.	1 Gal.	1 3/4 Gal.	2 1/2 Gal.	4 Gal.	5 1/4 Gal.	5 1/2 Gal.	6 Gal.	8 1/2 Gal.	16 Gal.	30 Gal.
OUS-UUS-VUS			1 1/4 Gal.	2 Gal.	3 1/4 Gal.	6 1/4 Gal.	6 1/2 Gal.	7 Gal.	9 3/4 Gal.	18 1/2 Gal.	34 Gal.
OV-UV-VV OVS-UVS-VVS	2 Qt.	2 Qt.									

GEARMOTORS & HELICAL/WORM REDUCERS - ALL POSITIONS

UNIT SIZE		25	30	35	40	50	60	70	80
ALL MODELS MOUNTED WITH WORM UNDER GEAR	STANDARD SHAFT	2 Qt.	2 1/2 Qt.	1 1/4 Gal.	2 1/4 Gal.	3 Gal.	4 1/2 Gal.	7 Gal.	8 1/2 Gal.
	HOLLOW SHAFT								
ALL MODELS MOUNTED WITH WORM OVER GEAR		1 1/2 Qt.	1 1/4 Gal.	2 Gal.	2 1/4 Gal.	4 Gal.	5 Gal.	9 Gal.	11 Gal.
ALL MODELS MOUNTED WITH VERTICAL OUTPUT SHAFT		2 1/2 Qt.	3 1/2 Qt.	1 1/2 Qt.	2 1/4 Gal.	3 Gal.	3 3/4 Gal.	8 Gal.	10 1/2 Gal.
ALL MODELS MOUNTED WITH INPUT END UP		4 Qt.	1 1/4 Gal.	2 1/4 Gal.	3 Gal.	5 1/4 Gal.	6 3/4 Gal.	13 1/2 Gal.	16 Gal.
ALL MODELS MOUNTED WITH INPUT END DOWN		3 1/2 Qt.	1 Gal.	1 3/4 Gal.	2 1/2 Gal.	3 1/2 Gal.	4 3/4 Gal.	8 3/4 Gal.	10 1/2 Gal.

BEARING GREASE:
High quality lithium base NLGI #2 or NLGI #3

NOTES:

Note #1 - The listed synthetic lubricants are acceptable for use in force feed lubrication systems or other special applications.

Note #2 - Worm gears operating at a sliding velocity in excess of 10 m/s (2,000 ft. per min.) may require force feed lubrication. For force feed lubrication recommendations, see our Product Catalog or contact our Application Engineers.

Note #3 - If a reducer is to be operated at an input rpm other than that shown on the name plate, contact our Application Engineers for recommendations.

Note #4 - Pour point of the oil used should be 5° C (9° F) less than the minimum ambient temperature expected. For special temperature or operating conditions, contact our Application Engineers for the proper lubrication selection.

APPROVED SYNTETHIC LUBRICANTS:					
BRAND NAME:	Uptime SHC634 Synthetic Lubricant	Emery-2843 synthetic Lubricant	Keystone KSL-367 Synthetic Lubricant	Mobil SHC634 Synthetic Lubricant	Pinnacle 460 Synthetic Lubricant
MANUFACTURER:	Distributed by Textron Industrial Gears expressly from Mobil Oil company	Henkel Corp./Emery Group	Keystone/Atochem	Mobil Oil Corp.	Texaco Lubricants Co.

IMPORTANT: Do not overfill units. Fill to center line of oil gauge or to pipe plug identified with oil level sticker. Oil capacities will vary due to mounting positions or type of gearshaft mounting used, such as solid shaft, hollow shaft or spread bearings. Each reducer is built and oil levels are set at the factory for a specific mounting position.

TEXTRON
POWER TRANSMISSION

240 E. 12th Street,
P.O. Box 272
Traverse City,
MI 49685-0272

Form #22389 11-00

Installation and Operating Instructions for ROBA-stop®-M Brake Type 891.065.1 Size 250

In a special design
Article number: 8162515
according to drawing: E070 09 036 000 0 10

Please read and observe this Operating Instruction carefully!
A possible malfunction or failure of the brake and any damage may be caused by not observing it.

Table of contents:

Manufacturer's declaration

The product is to be seen as an option or component for installation into machines or equipment according to the machinery directive 98/37/EC.
The machinery (product) must not be put into service until the machinery (product) into which it is to be incorporated has been declared in conformity with the provisions of the applicable EC directive.

The product corresponds to the low-voltage directives 73/23/EEC.
The observance of the relevant EMV-guideline 89/336/EEC is to be guaranteed.

Installation and Operating Instructions for ROBA-stop®-M Brake Type 891.065.1 Size 250

mayr® Antriebstechnik

Safety regulations

With this safety regulations no claim on completeness is raised!

Attention!
Hazardous conditions when contacting hot connections and components.

Only qualified and well-trained specialists should work on the units to avoid any personal injury or damage to machinery.
Danger!

If the electromagnetic brake is used in an improper way.

If the electromagnetic brake has been modified or reconverted.

If the relevant standards of the safety or installation conditions are not observed.

Attention!
The installation and operating instructions must be read carefully and all safety regulations observed before installation and initial operation as danger to personnel and damage to machinery may be caused.
The electromagnetic brakes are developed and manufactured in conformance with the temporally known rules of the technology and they are basically considered as fail-safe at the time of the delivery.

Attention:

Based on the guideline 94/9/EC (ATEX-guideline) this product is not suitable for the application in potential explosive areas without evaluation of the conformity.

Observe!

- ❒ Only qualified and well trained specialists who are familiar with the transport, installation, initial start-up, maintenance and operation of the units as well as with the relevant standards may carry out the corresponding works.
- ❒ Technical data and indications (Type tag and documentation) are to be kept absolutely.
- ❒ Connection of the supply voltage according to the Type tag.
- ❒ Supply connections must not be released and assembly, maintenance or repair must not be made when the unit is energized.
- ❒ Electrical leads must not be under tension when connected.
- ❒ Check current carrying components regarding damage before installation. Current carrying components must not be in contact with water or other liquids.
- ❒ The braking torque does not exist any more, if the friction lining and/or friction surface come into contact with oil or grease.

Intended use

mayr®-brakes are determined for the use in machines and equipment and may only be used for the ordered and confirmed purpose.

The use beyond of the corresponding technical indications is considered as incorrect.

Notes to the electromagnetic compatibility (EMV)

There are no emissions from the listed single components within the meaning of the EMV-guideline 89/336/EEC, however, increased interference levels can occur when working components are operated outside their specification limits as for example, energising the brake with rectifiers, phase demodulators or ROBA®-switch in the line side. Therefore, the installation and operating instructions must be read carefully the EMV-guidelines are to be observed.

Conditions of the unit

The catalogue values are reference values, which can deviate in some cases. When selecting the brake, site of installation, braking fluctuations, permissible friction work, behaviour during run-in, wear and ambient conditions are to be carefully checked and agreed with the unit manufacturer.

Observe!

- ❒ The mounting and connecting dimensions at the site of installation must match to the size of the brake.
- ❒ The brakes are designed for a relative switch on period of 100 %.
- ❒ The brakes are designed for a dry running only. Should oil, grease, water or similar materials come in contact with the friction surfaces the braking torque could be reduced.
- ❒ The braking torque depends on the corresponding running-in condition of the brake.
- ❒ The metallic surface of the brake is protected against corrosion arranged by the factory.

Protection class I

The protection is not only based on the basis isolation, but that all conductive components must be connected with the protective conductor (PE) of the fixed installation. In case the basis isolation fails, no contact voltage can remain existing.
(VDE 0580).

Protection IP 54:

Dust-tight and protection against contact as well as protection against spraying water from all directions.
The thread ends of the fixing screws (9.1) can be sealed to the intermediate flange (5) by the customer.
The protection IP 65 can be achieved by this measure.

Ambient temperature –20 °C up to +40 °C

Attention!

The torque could be severely reduced in case of temperatures over or under the freezing point due to dewing. The user must provide corresponding counter measures.

Thermal class F (+155 °C)

The magnetic coil as well as the casting compound is designed for a max. operating temperature of +155 °C.

Installation and Operating Instructions for ROBA-stop®-M Brake Type 891.065.1 Size 250

mayr® Antriebstechnik

Safety regulations

With this safety regulations no claim on completeness is raised!

Necessary protective measures to be undertaken by the user:

Cover all moving parts to prevent personnel injury as squeezing and seizing.
Cover dangerously hot magnetic parts to prevent contact.
Attach a conductive connection between magnetic part and electrical conductor (PE) of the fixed installation (protection class I) to prevent electrical shock and inspection conforming to standards of the unified protective connection to all contactable metal components.
Protection against high inductive cut-off peaks according to VDE 0580/2000-07, par. 4.6 by fitting varistors, spark quenching units or similar, in order to prevent damage of coil insulations or the burn-off of the switching contact (this protection is included in the *mayr*®-rectifiers).
Provide additional necessary safety measures against corrosion of the brake, if they are used in extreme ambient conditions or in the open with direct atmospheric influences.

Measures against freezing from armature disc and rotor with high humidity and deep temperatures.

Following directives, standards and instructions have been used:

98/37/EC	Machinery directive
73/23/EEC	Low voltage directive
89/336/EEC	EMV-guideline
DIN VDE 0580	Electromagnetic units and components, general regulations

Following standards are to be observed:

EN292-1 and 2	Security of machines
DIN EN61000-6-4	Noise emission
DIN EN61000-6-2	Interference resistance
EN60204	Electrical equipment of machines

Liability

- ❒ The information, notes and technical data indicated in the documentation were at the time of printing on the latest state.
  Claims on brakes already supplied cannot be made valid from it.
- ❒ Liability for damages and breakdowns is not taken over, with
  - ignoring the installation and operating instructions,
  - improper use of the brakes,
  - arbitrary modification of the brakes,
  - inappropriate working at the brakes,
  - handling or operating errors.

Guarantee

- ❒ The warranty conditions correspond to the sales and supply conditions of Chr. Mayr GmbH + Co. KG.
- ❒ Defects are to be advised immediately after detection to *mayr*®.

Test mark

CE corresponding to the low voltage directive 73/23/EEC.

Marking

mayr®-components are clearly identified by means of the content of the Type tags:

Manufacturer

***mayr*®**

Designation/Type

Article No.

Series number

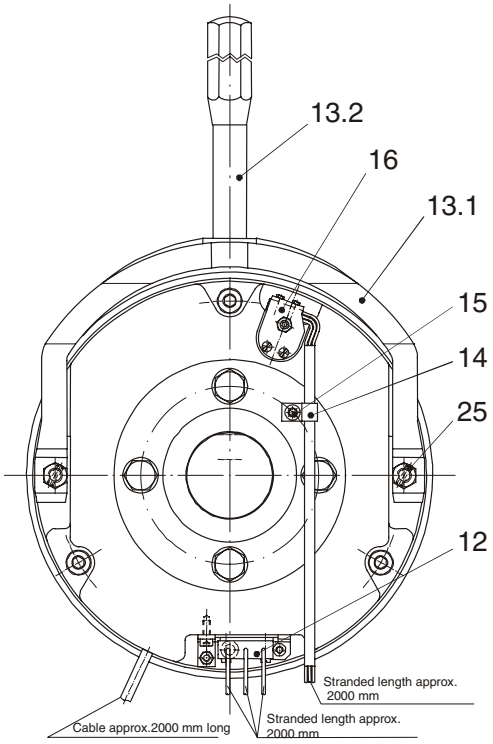


Fig. 1

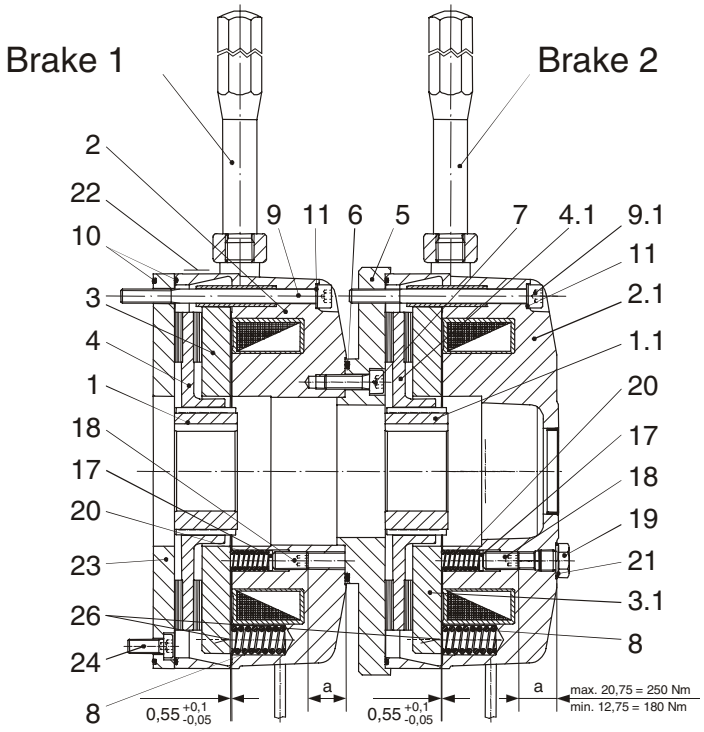


Fig. 2

Parts List

Only mayr® original parts are to be used

1	Hub 1	12.2	Angle	16.4	Hexagon nut M2
1.1	Hub 2	12.3	Bolt	16.5	Bolt
2	Brake body 1	12.4	Cap screw M4x8	16.6	Hexagon nut M4
2.1	Brake body 2	12.5	Bellows	16.7	Cap screw M3x6
3	Armature disc 1	12.6	Hexagon nut M4	16.8	Setscrew M5x8
3.1	Armature disc 2	12.7	Cap screw M3x12	16.9	Hexagon nut M5
4	Rotor 1	12.8	Hexagon nut M5	16.10	Bellows
4.1	Rotor 2	12.9	Setscrew M5x10	17	Washer
5	Intermediate flange	12.10	Cap screw M4x8	18	Setscrew M10x20
6	O-ring	13	Hand release	19	Screw plug M12x1,5
7	Cap screw M10x35	13.1	Switch bracket	20	Thrust spring
8	Thrust spring	13.2	Hand release rod	21	Copper seal ring
9	Cap screw M10x130	14	Cable clip	22	Type tag
9.1	Cap screw M10x110	15	Cap screw M5x8	23	Flange plate
10	O-ring	16	Release monitoring	24	Cap screw M10x30
11	U-seal	16.1	Micro switch	25	Dowel pin D4x16
12	Wear inspection	16.2	Angle	26	Shoulder screw
12.1	Micro switch	16.3	Cap screw M2x10		

Installation and Operating Instructions for ROBA-stop®-M Brake Type 891.065.1 Size 250

mayr® Antriebstechnik

1. Design

ROBA-stop®-M are spring loaded electromagnetic fail safe brakes designed as double brake, in which two brakes operating independently from each other provide high operational security.

2. Function

The ROBA-stop®-M brake is a spring loaded electromagnetic safety brake.

Spring loaded:
In a de-energised condition thrust springs (8) press against the armature discs (3/3.1). The rotors (4/4.1) are held stationary between the armature discs (3/3.1) and the flange plate (23) with brake 1 or intermediate flange (5) with brake 2. The hubs (1/1.1) are braked via the toothing between rotor (4/4.1) and hub (1/1.1).

Electromagnetic:
The armature discs (3/3.1) are attracted to the brake bodies (2/2.1) against the spring pressure by the magnetic force of the coil in the brake bodies(2/2.1). The brakes are released and the hubs (1/1.1) are able to rotate freely.

Safety brakes:
The ROBA-stop®-M brakes reliably and safely when the current has been switched off, in case of “emergency OFF”, or due to power failure.

3. Delivery range / Delivery condition

The scope of supply or the delivery condition must immediately be checked after receipt of the shipment.
mayr® does not overtake any guarantee for faults complained subsequently.

Transportation damages must immediately be advised to the forwarder.
Recognizable faults / incompleteness of the shipment must immediately be advised to the manufacturing company.

4. Technical data

Nominal voltage per single brake:	104 V
Nominal rating per single brake:	119 W
Protection	IP54
Switch-on duration:	100 %
Connection:	2 x 0,88 mm^2
Braking torque:	2 x 180 – 2 x 250 Nm
Max. speed:	3000 rpm
Mass:	??? kg
Ambient temperature:	-20 °C - +40 °C
Tightening torque Pos. 7 / 9 / 9.1 / 24:	48 Nm
Rotor thickness new (Pos. 4 und 4.1):	16,8 mm
Rotor thickness min. (Pos. 4 und 4.1);	??,? mm
Hand release force per brake with 155 Nm	350 N
Hand release force per brake with 140 Nm	315 N
Hand release force per brake with 124 Nm	280 N
Hand release force per brake with 108 Nm	250 N

5. Assembly conditions

- ❒ The eccentricity of the shaft end relative to the fixing hole P.C.D. must not exceed 0,2 mm.
- ❒ The positioning tolerance of the threads for the cap screws (5 and 9) must not exceed 0,2 mm.
- ❒ The deviation in the true running of the screw-on surface to the shaft must not exceed the permissible true running tolerance acc. to DIN 42955 of 0,1 mm.
  Larger deviations can cause a drop of the torque, continuous wear of the rotor (4/4.1) and overheating.
- ❒ The screw-on surface must be in the diameter ≥ to the outer diameter of the brake.
- ❒ The fits from hub (1/1.1) and shaft are to be selected in such a way that a widening in the toothing of the hub (1/1.1) is not possible. A widening of the toothing causes a clamping of the rotor (4/4.1) at the hub (1/1.1) and following a functional problem of the brake, (recommended hub – shaft fit H7/k6).
- ❒ Position the hub (1/1.1) in such a way that the toothing of the rotor (4/4.1) is fully supports.
- ❒ Rotor (4/4.1) and braking surfaces must be free of oil and grease.

6. Brake assembly (Figs. 1 and 2)

6.1 Mount gear hub 1 (1) to the shaft and lock it axially (supporting length of the key over the complete hub).

6.2 Attach flange plate (23) with cap screws (24) at the mounting wall
(**observe tightening torque 48 Nm).**

6.3 Manually push rotor 1 (4) with a slight pressure over the geared hub 1 (1).
An easy going of the toothing is to be observed.

6.4 Mount gear hub 2 (1.1) to the shaft and lock it axially (supporting length of the key over the complete hub).

6.5 Attach brake 1 (2) at the flange plate (23) using cap screws (9)
(**observe tightening torque 48 Nm**).

6.6 Attach intermediate flange (5) using cap screws (7) at the brake body 1 (2)
(**observe tightening torque 48 Nm**).

6.7 Manually push rotor 2 (4.1) over the gear hub 2 (1.1) with a slight pressure. An easy running of the toothing has to be observed.

6.8 Attach brake 2 (2.1) at the intermediate flange (5) using cap screws (9.1)
(**observe tightening torque 48 Nm**).

7. Braking torque adjustment (Figs. 2 and 3)

ROBA-stop®-M brakes are adjusted to the braking torque requested from the customer in the factory.

However, the braking torque can be adjusted in the torque range from 108 – 155 Nm per brake by the customer at any time.

Adjustment of the braking torque with brake 1:

1) Dismantle brake 2 and intermediate flange (5) contrary to the item brake assembly.
2) Uniformly adjust all four setscrews (18) to the required dimension "a" (acc. to adjusting diagram, Fig. 3).
3) Assemble brake 2 according to brake assembly again.

Adjustment of the braking torque with brake 2:

1) Unscrew screw plug (19) with copper seal ring (21.
2) Uniformly adjust all four setscrews (18) to the required dimension "a" (acc. to adjusting diagram, Fig. 3).
3) Screw in screw plug (19) with copper seal ring (21) again.

The adjustment is made by means of an Allan key SW5.
The braking torque is increased by a clockwise rotation and decreased by an anti-clockwise rotation.

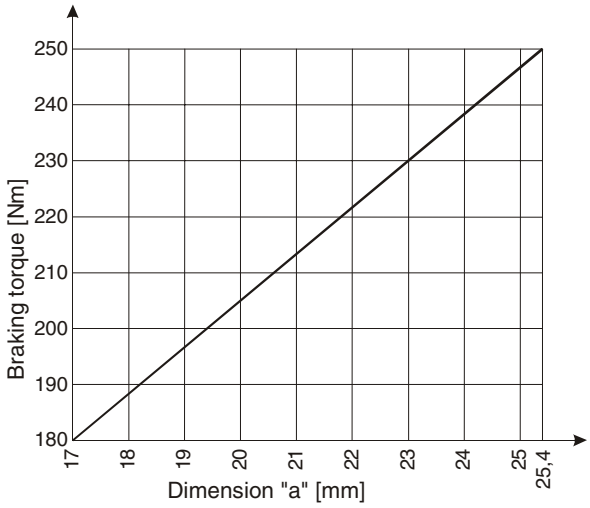


Fig. 3: Adjusting diagram

8. Brake inspection

The braking torque is only achieved after the run-in process has been carried out.
The braking torque (switching torque) is the torque acting on the shafting with a slipping brake at a running speed of 1 m/s referred to the mean friction radius (according to DIN VDE 0580/10.94).

9. Hand release (Fig. 1)

The hand release is assembled and adjusted in the factory!

10. Electrical connection

The coil voltage is indicated on the Type tag. Additionally it is stamped on the brakes (2 and 2.1).
The brakes are designed according to Euro-voltage DIN IEC 60038.
DC current is necessary for the operation.
It can be generated by means of transformer-rectifier, half-wave or bridge rectifiers.
Switching can be made in DC current or AC current sides.
A faster connection time, however, is obtained by switching in the DC side (engagement of the brake).
If a faster disconnection time is required, a special fast acting rectifier is necessary.
In this case please contact our factory.
Attention!
When switching off electromagnetic units spikes may occur which can cause damage to the units and must be damped therefore.
Due to this damping the connection times indicated in the catalogue can be slower.
Protection of the voltage supply according to the power values must be provided.
The brakes are designed for a relative switch-on period of 100 %.

Installation and Operating Instructions for ROBA-stop®-M Brake Type 891.065.1 Size 250

mayr® Antriebstechnik

11. Release monitoring

The release monitoring is assembled and set at the factory.

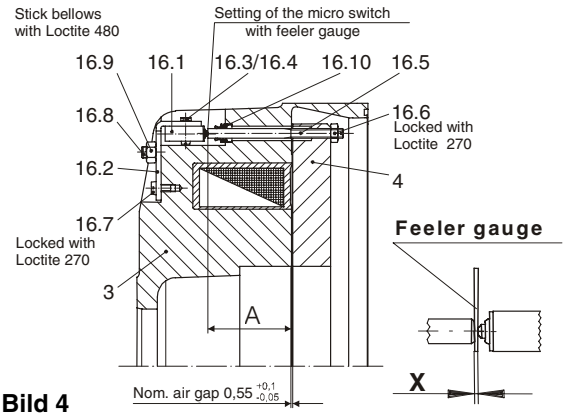


Bild 4

Function!

When the magnetic coil in the coil carrier (3) is energised the armature disc (4) is attracted to the coil carrier (3), the micro switch (16.1) gives signal, the brake is released.

Assembly (Fig. 4):

Attention!!! Brake must not be connected to supply voltage.

- ❑ Put Loctite 270 at the thread of the bolt (16.5), manually screw it into the armature disc (4) **at the magnetic coil side** to the **dim. "A" = 45,5 $_{-0,3}$** (Fig. 4) and lock it with a hexagon nut (16.6).
- ❑ Stick bellows (16.10) into the coil carrier (3) with Loctite 480 and let it **harden**.
- ❑ Put Uhu 300 Endfest on the micro switch (16.1) and screw it with cap screws (16.3) and hexagon nuts (16.4) at the angle (16.2) (M_A= 0,2Nm).
- ❑ Screw angle (16.2) incl. the micro switch (16.1) using cap screws (16.7) to the coil carrier (3). Lock cap screws (16.7) with Loctite 270.
- ❑ Slightly screw set screw (16.8) with attached hexagon nut (16.9) into the angle (16.2) (max. 3 revolutions)
- ❑ Check the coil carrier (3) as to correct and complete spring configuration.
- ❑ Screw armature disc (4) with both shoulder screws (until contact) at the coil carrier (3).
  Attention!
  Carefully arrange the assembly, when guiding the bolt (16.5) through the bellows (16.10) (no damage), slightly grease the bolt.
  Check the air gap!

Adjustment and inspection of the micro switch:

Attention!!! Brake must not be connected to supply voltage.

- ❑ Screw the brake at the suitable device.
- ❑ Connect signal lamp or inspection unit (adjustment diode inspection) at the micro switch (16.1) (make contact = black and blue).
- ❑ Push feeler gauge **dimension "X"= 0,2 mm** between switch tappet and bolt, (see Fig. 4), **inspection lamp must signal "ON".**
- ❑ Screw in the setscrew (16.8) using an Allan key (in a clockwise direction) so far until the **inspection lamp signals "OFF".**
- ❑ Lock the setscrew (16.8) with a hexagon nut (16.9), remove the feeler gauge.

Operational check with feeler gauge (Fig. 4):

- ❑ Push feeler gauge **dim. "X" = 0,3 mm** between switch tappet and bolt, see Fig. 4 (observe straight position of the switch tappet), energise the brake, de-energise the brake: **inspection lamp must signal "ON".**
- ❑ Push feeler gauge **dim. "X" = 0,2 mm** between switch tappet and bolt,
  energise brake: **inspection lamp must signal "ON".**
  brake de-energised: **inspection lamp must signal "OFF".**

Operational check without feeler gauge:

- ❑ brake de-energised: **inspection lamp must signal "OFF".**
- ❑ brake energised: **inspection lamp must signal "ON".**

Attention!!!

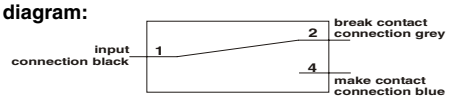
Mark the positions 16.3, 16.4, 16.6, 16.7, 16.8 and 16.9 with securing lacquer against unauthorized adjustment.

Table 1: switch capacity

AC switch capacity		DC switch capacity	
Voltage [VAC]	Resistance load [A/R_{load}]	Voltage [VDC]	Resistance load [A/R_{load}]
125	5	up to 30	5
250	5	125	0,5

minimum switch capacity: 0,12VA (> 12V, > 10mA)
contact material: silver

Wiring diagram:



12. Wear monitoring

The wear monitoring is assembled and set at the factory.

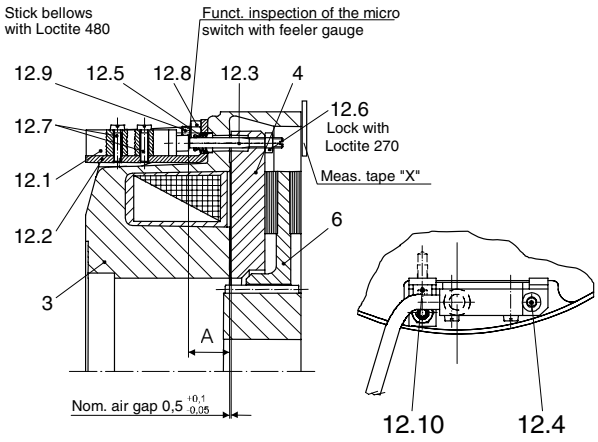


Fig. 5

Function!

The nominal air gap “a” (Table 2) between coil carrier (3) and armature disc (4) is increased due to the wear of the rotor (6). When the limiting air gap acc. to Table 2 is achieved, the contact of the micro switch (12.1) switches over and gives signal. The rotor (6) must be exchanged.

Assembly (Fig. 5):

Attention!!! Brake must not be connected to supply voltage.

- ❑ Stick bellows (12.5) into the coil carrier (3) with Loctite 480 and let it **harden**.
- ❑ Put Uhu 300 Endfest on the micro switch (12.1) and screw it with cap screws (12.7) at the angle (12.2). Lock cap screws (12.7) with Loctite 270.
- ❑ Screw angle (12.2) incl. the micro switch (12.1) using cap screws (12.4) at the coil carrier (3). Lock cap screws (12.4) with Loctite 270.
- ❑ Screw the cap screw (12.10) through the elongated hole in the angle (12.2) into the coil carrier (3), tighten and slightly unscrew it again.
- ❑ Screw in the setscrew (12.9) with the attached hexagon nut (12.8) into the angle (12.2) to the dimension **"0,8$^{+0,3}$"** and lock it with the hexagon nut (12.8).
- ❑ Manually preset bolt (12.3) in the armature disc (4) to the **dimension "A"** (Fig. 5/Table 2) **at the coil side** and lock it with hexagon nut (12.6).
- ❑ Check coil carrier (3) as to correct and complete spring configuration.
- ❑ Screw the armature disc (4) with both shoulder screws (until contact) at the coil carrier (3).
  Attention!
  Carefully arrange the assembly, when guiding the bolt (12.3) through the bellows (12.5) (no damage), slightly grease the bolt.
  Check the air gap!

Adjustment and inspection of the micro switch (in the factory):

Attention!!! Brake must not be connected to any supply voltage.

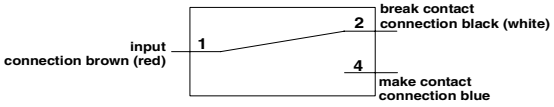
- ❑ Screw the brake at a suitable device and put measuring tape "X" (3 x 120°) between coil carrier (3) and device according to Table 2.
- ❑ Connect inspection lamp or measuring instrument (adjustment diode inspection) at the micro switch (12.1) (break contact = black (white) and brown (red). **Inspection lamp must signal "OFF".**
- ❑ Screw in set screw (12.9) using an Allan key (in a clockwise direction) so far until **inspection lamp signals "ON".**
- ❑ Lock set screw (12.9) with a hexagon nut (12.8).
- ❑ Tighten cap screw (12.10).

Operational check (Fig. 5):

1. Push feeler gauge **dimension = 0,05 mm** between switch tappet and bolt (12.3), see Fig.5 (observe straight position of the switch tappet), energise brake, de-energise brake: **Inspection lamp must signal "OFF".**

   => Inspection without feeler gauge
2. Brake de-energised: **Inspection lamp must signal "ON".**
3. Brake energised: **Inspection lamp must signal "OFF".**

Wiring diagram:



Attention!!!
Mark the positions 12.4, 12.6, 12.7, 12.8 and 12.9 with securing lacquer against unauthorized adjustment.

Remove measuring tape before initial operation.

Table 2: Brake adjustment / Switch capacity

Dim. "A" [mm]	Nom. air gap [mm]	Limit air gap [mm]	Meas. tape "X" [mm]
17 $^{+1}$	0,55	1,´1	0,45

AC switch capacity		DC switch capacity	
Voltage [VAC]	Resistance load [A/R_{Last}]	Voltage [VDC]	Resistance load [A/R_{Last}]
250	6	125	0,5
		250	0,25

minimum switch capacity: 0,12VA (> 12V, > 10mA)
contact material: silver

13. Maintenance

ROBA-stop®- M brakes are virtually maintenance free.
However, the rotors (4 and 4.1) are part which can be worn down.
However the rotors (4 and 4.1) are robust and wear resistant ensuring a very long brake service life.
In case, however, the rotors (4 and 4.1) are worn down due to a high friction work and, therefore, the function of the brake is not guaranteed any more, the brake can be brought again to its original condition by changing the rotor. Therefore, the rotor thickness should be controlled in the course of the regularly executed inspection intervals. The wear condition of the rotors (4 and 4.1) is determined by checking the release voltage, or by measuring the rotor thickness with the dismantled brake.
The release voltage may only amount to max. 90 % of the nominal voltage for a warm brake.
The minimum rotor thickness amounts to **??,? mm.**

Exchange of the rotors (4 and 4.1):
(Attention: the brake must be free of any load)
The exchange of the rotors is carried out contrary to the sequence of the brake assembly (item 6.
When exchange the rotors the following must be observed:

a.) Clean brake (remove abrasive dust using compressed air)

b.) Check the armature discs (3 and 3.1) as to wear and plane-parallelity, (intense scoring must not exist), exchange the armature discs (3 and 3.1), if necessary (observe correct spring assembling).

c.) Measure the thickness of the new rotors (4 and 4.1). (Set-dimension in a new condition 15,3 – 0,05).

d.) Push rotors (4 and 4.1) onto the hubs (1 and 1.1) and check them as to radial play. If there is clearance in the toothing between hub and rotor, pull off the corresponding hub from the shaft and replace it.

Afterwards attach the brake at the flange plate (23) again as described under item 6 (brake assembly).
(observe the tightening torque 48 Nm)

Attention!
To guarantee a correct brake function the minimum rotor thickness of **??,? mm** must not be below that value.

This has to be observed for an operation with a fast acting rectifier or in case of reduced braking torques especially.

14. Disposal

Electronic components
(rectifier / ROBA®-switch / micro switch):

The not disassembled products can be supplied to the material utilization according to EAK 150106 (mixed material) or via the household waste (code No. 200301) to the disposal.

The components of our Electromagnetic Brakes must separately be supplied to the utilisation due to the different material components. Additionally the legal instructions are to be observed. Code numbers can change with the kind of the separation (metal, plastic and cable).

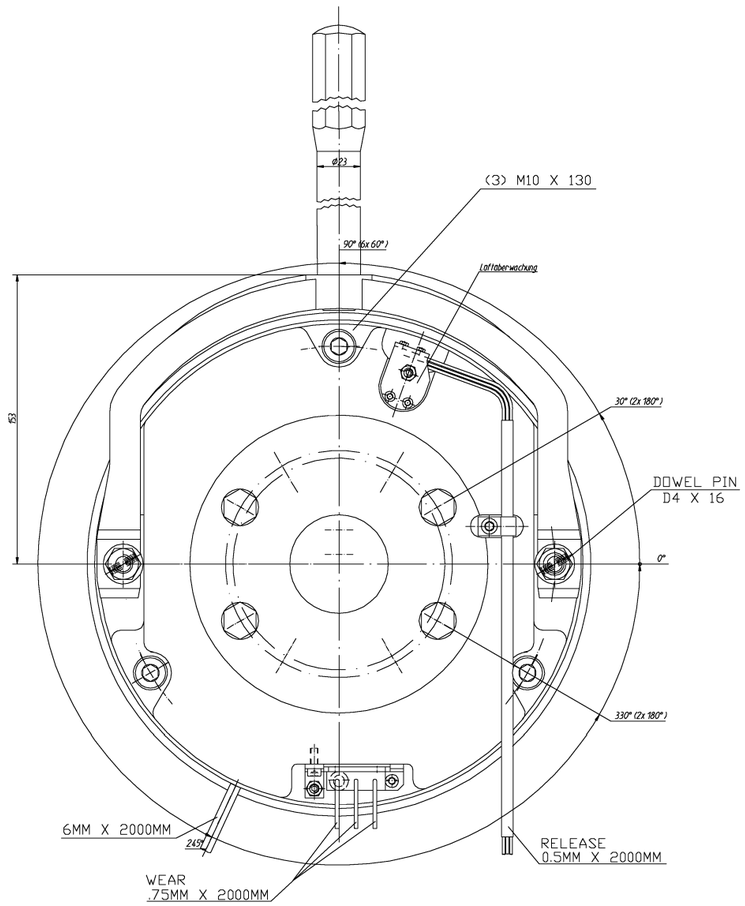
Brake body made of steel with coil/cable and all other steel components:
Scrap (Code No. 160117)

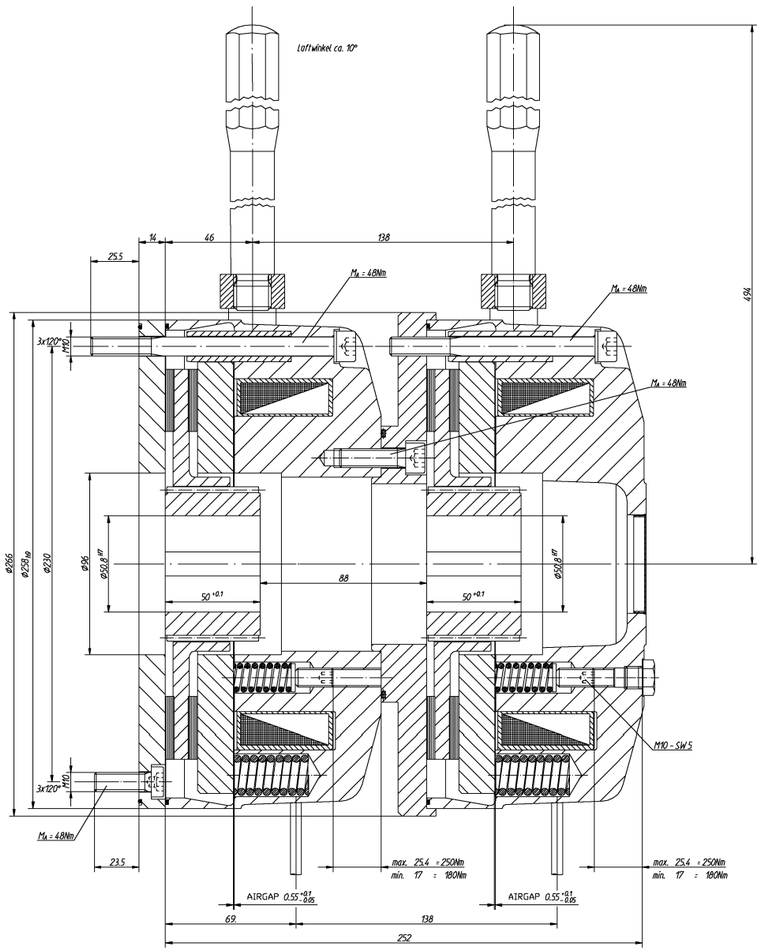
Brake rotor (steel or aluminium with friction lining):
Brake linings (Code No. 160112)

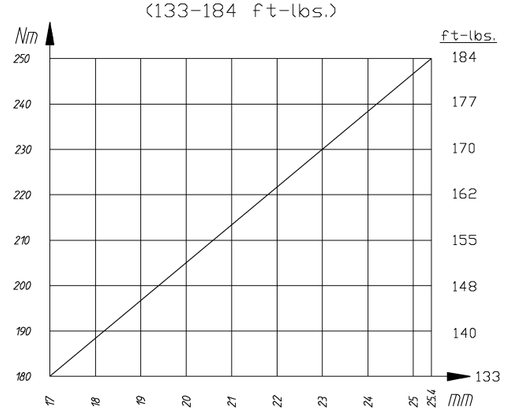
Seals, O-rings, V-Seal, Elastomere, Terminal boxes (PVC):
Plastic (Code No. 160119)

Breakdowns:

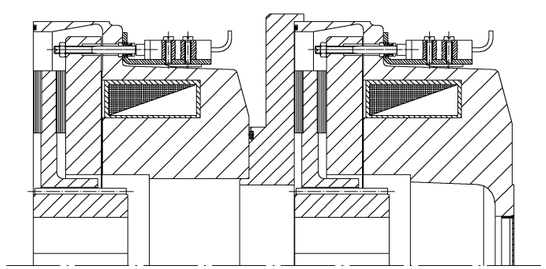
Failures	Possible reasons	Solution
Brake does not release	❑ False voltage measured at the rectifier	❑ Apply correct voltage
	❑ Rectifier failed	❑ Exchange rectifier
	❑ Air gap too big (rotor worn down)	❑ Replace rotor
	❑ Coil interrupted	❑ Exchange brake
	❑ Brake is getting too warm	❑ Use fast acting rectifier
Motor does not brake	❑ Clearance of the shoulder screw (26) is not available any more (rotor is worn down over the minimum thickness of 14,5 mm).	❑ Exchange rotor
Brake engages with delay	❑ Brake is switched to A.C. side	❑ Switch to D.C. side



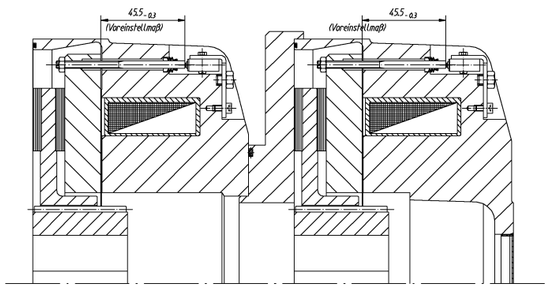




WEAR MONITORING



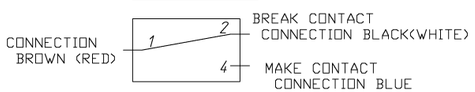
RELEASE MONITORING



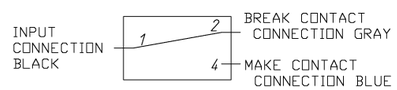
TORQUE / RELEASE FORCE

BRAKE TORQUE		HAND RELEASE	
250Nm	184ft.-lbs.	350N	79lbf
225Nm	166ft.-lbs.	315N	71lbf
200Nm	148ft.-lbs.	280N	63lbf
180Nm	133ft.-lbs.	250N	56lbf

POWER OFF



POWER OFF



Nut nach MN001-10/1

RSM 250/891.065.1 SO 104V
M=2x180-250Nm LS: 0,5-0,65

E070090360000.10

8162515

391374

DRAWING NO.: RS-0021-P

Änd.-Nr. 3 vom 28.02.2014

Allen-Bradley

PowerFlex® 70

Adjustable Frequency AC Drive

Standard and Enhanced Control

Firmware Versions
Standard Control: 2.xxx
Enhanced Control: 2.xxx-3.xxx

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **http://www.rockwellautomation.com/literature**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc. is prohibited.

Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

The information below summarizes the changes to the PowerFlex 70 User Manual since the February 2005 release.

Parameter Updates

The following parameters have been added or updated with firmware version 3.002.

Parameter	Number	Description	Page
[Torque Estimate]	015	New	3-12
[Motor OL Mode]	050	New	3-14
[Mtr OL Trip Time]	221	New	3-42
[Drive Status 3]	222	New	3-42
[Status 3 @ Fault]	223	New	3-42
[Spd Err Filt BW]	448	New	3-28
[Fiber Control]	620	New	3-59
[Fiber Status]	621	New	3-59
[Sync Time]	622	New	3-59
[Traverse Inc]	623	New	3-59
[Traverse Dec]	624	New	3-59
[Max Traverse]	625	New	3-59
[P Jump]	626	New	3-59
[Motor NP RPM]	044	Updated	3-13
[Stop/Brk Mode A/B]	155, 156	Updated	3-30
[Start Inhibits]	214	Updated	3-40
[Last Stop Source]	215	Updated	3-41
[Digital Inx Sel]	361-366	Updated	3-55
[Digital Outx Sel]	380, 384	Updated	3-57

Additional Manual Updates

Description of New or Updated Information	Page
Catalog number explanation updated	P-5
External filter information added	1-24
Parameters 140 [Accel Time 1] and 141 [Accel Time 2] minimum value corrected to 0.0 Secs.	3-29
Parameters 142 [Decel Time 1] and 143 Decel Time 2] minimum value corrected to 0.0 Secs.	3-29
Conversion formula added to description of parameter 244-250 [Fault x Time].	3-45
Fast Brake application note added.	C-6

Notes:

Table of Contents

Overview

The purpose of this manual is to provide you with the basic information needed to install, start-up and troubleshoot the PowerFlex 70 Adjustable Frequency AC Drive.

Who Should Use this Manual?

This manual is intended for qualified personnel. You must be able to program and operate Adjustable Frequency AC Drive devices. In addition, you must have an understanding of the parameter settings and functions.

What Is Not in this Manual

The *Power*Flex 70 User Manual is designed to provide only basic start-up information. For detailed drive information, please refer to the *PowerFlex Reference Manual*, publication PFLEX-RM001…. The reference manual is included on the CD supplied with your drive or is also available online at **http://www.rockwellautomation.com/literature**.

Reference Materials

The following manuals are recommended for general drive information:

Title	Publication	Available Online at …
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives	DRIVES-IN001…	**www.rockwellautomation.com/literature**
Preventive Maintenance of Industrial Control and Drive System Equipment	DRIVES-TD001…	
Safety Guidelines for the Application, Installation and Maintenance of Solid State Control	SGI-1.1	
A Global Reference Guide for Reading Schematic Diagrams	100-2.10	
Guarding Against Electrostatic Damage	8000-4.5.2	

For detailed PowerFlex 70 information:

Title	Publication	Available …
PowerFlex Reference Manual	PFLEX-RM001…	on the CD supplied with the drive or at **www.rockwellautomation.com/literature**

For Allen-Bradley Drives Technical Support:

Title	Online at …
Allen-Bradley Drives Technical Support	**www.ab.com/support/abdrives**

Manual Conventions

- In this manual we refer to the PowerFlex 70 Adjustable Frequency AC Drive as; drive, PowerFlex 70 or PowerFlex 70 Drive.
- To help differentiate parameter names and LCD display text from other text, the following conventions will be used:
  - Parameter Names will appear in [brackets].
    For example: [DC Bus Voltage].
  - Display Text will appear in “quotes.” For example: “Enabled.”
- The following words are used throughout the manual to describe an action:

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not recommended

Drive Frame Sizes

Similar PowerFlex 70 drive sizes are grouped into frame sizes to simplify spare parts ordering, dimensioning, etc. A cross reference of drive catalog numbers and their respective frame size is provided in Appendix A.

General Precautions

ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, "Guarding Against Electrostatic Damage" or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors, such as, undersizing the motor, incorrect or inadequate AC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC terminal of the Power Terminal Block and the -DC test point (refer to Chapter 1 for locations). The voltage must be zero.

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected together via 1202 cables. Unpredictable behavior can result if two or more devices are connected in this manner.

ATTENTION: A risk of injury or equipment damage exists in firmware version 1.011 and earlier. When there is a combination of long shielded motor cables, high source impedance, low speed, light motor load and parameter 190 [Direction Mode] is set to "Unipolar" or "Bipolar," an unexpected change in motor direction may occur. If these conditions exist, choose one of the following corrective actions:

- Set parameter 190 to "Reverse Dis"
- Set parameters 161 and 162 to "Disabled"
- Install a properly sized Dynamic Brake resistor

ATTENTION: Nuisance tripping may occur in Standard Control firmware version 1.011 and earlier due to unstable currents. When using a motor that is connected for a voltage that is different from the drive (e.g., using a 230V connected motor with a 460V drive) the following adjustment must be made to "Stability Gain" using DriveExplorer software and a personal computer.

$$\frac{\text{Motor Nameplate Voltage}}{\text{Drive Rated Voltage}} \times 128$$

Any adjustment made to "Stability Gain" must be manually restored if the drive is reset to defaults or is replaced.

If unstable currents are still present after making the adjustment, contact the factory for assistance.

ATTENTION: The "adjust freq" portion of the bus regulator function is extremely useful for preventing nuisance overvoltage faults resulting from aggressive decelerations, overhauling loads, and eccentric loads. It forces the output frequency to be greater than commanded frequency while the drive's bus voltage is increasing towards levels that would otherwise cause a fault; however, it can also cause either of the following two conditions to occur.

1. Fast positive changes in input voltage (more than a 10% increase within 6 minutes) can cause uncommanded positive speed changes; however an "OverSpeed Limit" fault will occur if the speed reaches [Max Speed] + [Overspeed Limit]. If this condition is unacceptable, action should be taken to 1) limit supply voltages within the specification of the drive and, 2) limit fast positive input voltage changes to less than 10%. Without taking such actions, if this operation is unacceptable, the "adjust freq" portion of the bus regulator function must be disabled (see parameters 161 and 162).
2. Actual deceleration times can be longer than commanded deceleration times; however, a "Decel Inhibit" fault is generated if the drive stops decelerating altogether. If this condition is unacceptable, the "adjust freq" portion of the bus regulator must be disabled (see parameters 161 and 162). In addition, installing a properly sized dynamic brake resistor will provide equal or better performance in most cases.

Note: These faults are not instantaneous and have shown test results that take between 2 and 12 seconds to occur.

Catalog Number Explanation

Position Number

1-3	4	5-7	8	9	10	11	12	13	14	15	16
20A	B	2P2	A	3	A	Y	Y	N	N	C	0
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*

a

Drive

Code	Type
20A	PowerFlex 70

b

Voltage Rating

Code	Voltage	Ph.
B	240V ac	3
C	400V ac	3
D	480V ac	3
E	600V ac	3

c1

ND Rating

208V, 60 Hz Input

Code	Amps	kW (Hp)
2P2	2.5	0.37 (0.5)
4P2	4.8	0.75 (1.0)
6P8	7.8	1.5 (2.0)
9P6	11	2.2 (3.0)
015	17.5	4.0 (5.0)
022	25.3	5.5 (7.5)
028	32.2	7.5 (10)
042	43	11 (15)
054	62.1	15 (20)
070	78.2	18.5 (25)

c2

ND Rating

240V, 60 Hz Input

Code	Amps	kW (Hp)
2P2	2.2	0.37 (0.5)
4P2	4.2	0.75 (1.0)
6P8	6.8	1.5 (2.0)
9P6	9.6	2.2 (3.0)
015	15.3	4.0 (5.0)
022	22	5.5 (7.5)
028	28	7.5 (10)
042	42	11 (15)
054	54	15 (20)
070	70	18.5 (25)

c3

ND Rating

400V, 50 Hz Input

Code	Amps	kW (Hp)
1P3	1.3	0.37 (0.5)
2P1	2.1	0.75 (1.0)
3P5	3.5	1.5 (2.0)
5P0	5.0	2.2 (3.0)
8P7	8.7	4.0 (5.0)
011	11.5	5.5 (7.5)
015	15.4	7.5 (10)
022	22	11 (15)
030	30	15 (20)
037	37	18.5 (25)
043	43	22 (30)
060	60	30 (40)
072	72	37 (50)

c4

ND Rating

480V, 60 Hz Input

Code	Amps	kW (Hp)
1P1	1.1	0.37 (0.5)
2P1	2.1	0.75 (1.0)
3P4	3.4	1.5 (2.0)
5P0	5.0	2.2 (3.0)
8P0	8.0	3.7 (5.0)
011	11	5.5 (7.5)
014	14	7.5 (10)
022	22	11 (15)
027	27	15 (20)
034	34	18.5 (25)
040	40	22 (30)
052	52	30 (40)
065	65	37 (50)

c5

ND Rating

600V, 60 Hz Input

Code	Amps	kW (Hp)
0P9	0.9	0.37 (0.5)
1P7	1.7	0.75 (1.0)
2P7	2.7	1.5 (2.0)
3P9	3.9	2.2 (3.0)
6P1	6.1	4.0 (5.0)
9P0	9.0	5.5 (7.5)
011	11	7.5 (10)
017	17	11 (15)
022	22	15 (20)
027	27	18.5 (25)
032	32	22 (30)
041	41	30 (40)
052	52	37 (50)

d

Enclosure

Code	Enclosure
A	Panel Mount - IP 20, NEMA Type 1
C	Wall/Machine Mount = IP66, NEMA Type 4X/12 for indoor use only
F	Flange Mount - Front Chassis = IP 20, NEMA Type 1; Rear Heatsink = IP66, UL Type 4X/12 for indoor/outdoor use
G	Wall/Machine Mount - IP54, NEMA Type 12

e

HIM ✶

Code	Interface Module
0	Blank Cover
2	Digital LCD
3	Full Numeric LCD
5	Prog. Only LCD
8 ❄	Wireless Interface Module

✶ IP66, NEMA Type 4X/12 (Enclosure Code C) is available only with HIM Codes 0, 3, 5, or 8.

❄ HIM Code 8 is available only with IP66, NEMA Type 4X/12 enclosures.

Position Number

1-3	*4*	*5-7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
20A	**B**	**2P2**	**A**	**3**	**A**	**Y**	**Y**	**N**	**N**	**C**	**0**
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*

f

Documentation	
Code	**Type**
A	English User Manual and Multi-Language Quick Start
N	No Manual

g

Brake IGBT	
Code	**w/Brake IGBT**
Y	Yes

h

Internal Brake Resistor	
Code	**w/Resistor**
Y	Yes
N	N o

i

Emission Class	
Code	**Rating**
A	Filtered✶ A⊕ & B Frames (Optional) C, D, & E Frames (Standard)
N	Not Filtered✶ A & B Frames (Optional) C, D, & E Frames

✶ 600V Frames A through D available only without filter (Cat. Code N). 600V Frame E available only with filter (Cat. Code A).

⊕ Increases size to Frame B.

j

Comm Slot	
Code	**Version**
C	ControlNet (Coax)
D	DeviceNet
E	EtherNet/IP
R	RIO
S	RS485 DF1
N	None

k

Control & I/O		
Code	**Control**	**Safe-Off**
N	Standard	N/A
C	Enhanced	No
G ✶	Enhanced	Yes

✶ Not available as factory installed option for 600V ratings.

l

Feedback	
Code	**Feedback**
N	N/A
0	None
1	5V/12V Encoder

Installation/Wiring

This chapter provides information on mounting and wiring the PowerFlex 70 Drive.

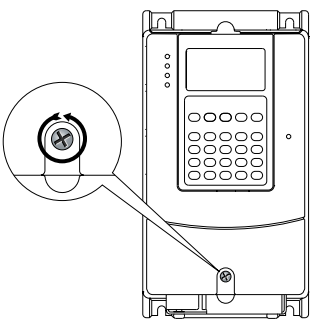
Most start-up difficulties are the result of incorrect wiring. Every precaution must be taken to assure that the wiring is done as instructed. All items must be read and understood before the actual installation begins.

ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation, Inc. cannot assume responsibility for the compliance or the noncompliance to any code, national, local or otherwise for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

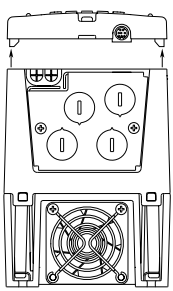
Opening the Cover

IP 20 (NEMA Type 1)

1. Loosen cover screw.

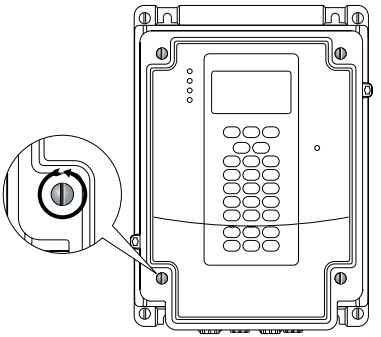


2. Pull cover straight off chassis to avoid damaging connector pins.

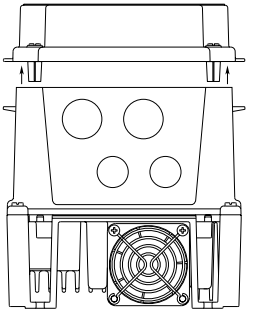


IP 66 (NEMA Type 4X/12)

1. Loosen the cover screws.



2. Pull cover straight off chassis.



Important: Torque cover screws to 0.79 N-m (7 lb.-in.).

Mounting Considerations

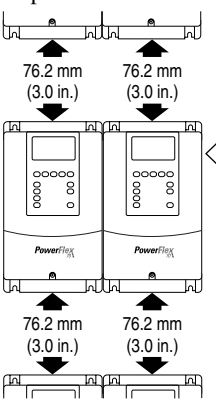
Maximum Surrounding Air Temperature

Enclosure Rating	Temperature Range
Open Type, IP 20, NEMA Type 1 & Flange Mount	0 to 50 degrees C (32 to 122 degrees F)
IP 66 & NEMA Type 4X/12	0 to 40 degrees C (32 to 104 degrees F)
IP 54 & NEMA Type 12	0 to 40 degrees C (32 to 104 degrees F)

Important: Some drives are equipped with an adhesive label on the top of the chassis. Removing the adhesive label from the drive changes the NEMA enclosure rating from Type 1 Enclosed to Open Type.

Minimum Mounting Clearances

Specified vertical clearance requirements are intended to be from drive to drive. Other objects can occupy this space; however, reduced airflow may cause protection circuits to fault the drive. In addition, inlet air temperature must not exceed the product specification.



Clearances apply to all PowerFlex 70 Drives:

- Panel Mount
- Flange Mount
- NEMA Type 4X/12

AC Supply Source Considerations

PowerFlex 70 drives are suitable for use on a circuit capable of delivering up to a maximum of 200,000 rms symmetrical amperes, and a maximum of 600 volts.

ATTENTION: To guard against personal injury and/or equipment damage caused by improper fusing or circuit breaker selection, use only the recommended line fuses/circuit breakers specified in Appendix A.

If a system ground fault monitor (RCD) is to be used, only Type B (adjustable) devices should be used to avoid nuisance tripping.

Unbalanced, Ungrounded, Resistive or B Phase Grounded Distribution Systems

If phase to ground voltage will exceed 125% of normal line to line voltage or the supply system is ungrounded, refer to the *Wiring and Grounding Guidelines for AC Drives* (publication DRIVES-IN001).

ATTENTION: PowerFlex 70 drives contain protective MOVs and common mode capacitors that are referenced to ground. These devices must be disconnected if the drive is installed on an ungrounded, resistive or B phase grounded distribution system. See page 1-11 for jumper locations.

Input Power Conditioning

Certain events on the power system supplying a drive can cause component damage or shortened product life. These conditions are divided into 2 basic categories:

1. **All drives**
   - The power system has power factor correction capacitors switched in and out of the system, either by the user or by the power company.
   - The power source has intermittent voltage spikes in excess of 6000 volts. These spikes could be caused by other equipment on the line or by events such as lightning strikes.
   - The power source has frequent interruptions.
2. **5 HP or Less Drives (in addition to "1" above)**
   - The nearest supply transformer is larger than 100kVA or the available short circuit (fault) current is greater than 100,000A.
   - The impedance in front of the drive is less than 0.5%.

If any or all of these conditions exist, it is recommended that the user install a minimum amount of impedance between the drive and the

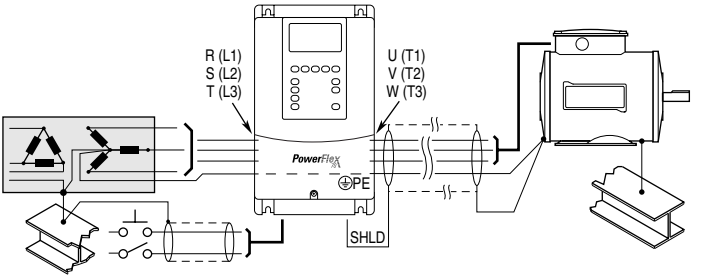
source. This impedance could come from the supply transformer itself, the cable between the transformer and drive or an additional transformer or reactor. The impedance can be calculated using the information supplied in the *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001….

General Grounding Requirements

The drive Safety Ground - PE must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be periodically checked.

For installations within a cabinet, a single safety ground point or ground bus bar connected directly to building steel should be used. All circuits including the AC input ground conductor should be grounded independently and directly to this point/bar.

Figure 1.1 Typical Grounding



Safety Ground - PE

This is the safety ground for the drive that is required by code. This point must be connected to adjacent building steel (girder, joist), a floor ground rod or bus bar (see above). Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Shield Termination - SHLD

The Shield terminal (see Figure 1.2 on page 1-8) provides a grounding point for the motor cable shield. The **motor cable** shield should be connected to this terminal on the drive (drive end) and the motor frame (motor end). A shield terminating cable gland may also be used.

When shielded cable is used for **control and signal wiring**, the shield should be grounded at the source end only, not at the drive end.

RFI Filter Grounding

Using an optional RFI filter may result in relatively high ground leakage currents. Therefore, the **filter must only be used in installations with grounded AC supply systems and be permanently installed and solidly grounded** (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked. Refer to the instructions supplied with the filter.

Fuses and Circuit Breakers

The PowerFlex 70 can be installed with either input fuses or an input circuit breaker. National and local industrial safety regulations and/or electrical codes may determine additional requirements for these installations. Refer to Appendix A for recommended fuses/circuit breakers.

ATTENTION: The PowerFlex 70 does not provide branch short circuit protection. Specifications for the recommended fuse or circuit breaker to provide protection against short circuits are provided in Appendix A.

Power Wiring

ATTENTION: National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Cable Types Acceptable for 200-600 Volt Installations

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than 15 mils (0.4 mm/0.015 in.). Use copper wire only. Wire gauge requirements and recommendations are based on 75 degree C. Do not reduce wire gauge when using higher temperature wire.

Unshielded

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 mils and should not have large variations in insulation concentricity.

Shielded/Armored Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC Drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations or a high degree of communications / networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance that the motor can be located from the drive without the addition of motor protective devices such as terminator networks. Refer to Reflected Wave in *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics and chemical resistance. In addition, a braided shield should be included and be specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has four (4) XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required and reduce the overall drive performance. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Table 1.A Recommended Shielded Wire

Location	Rating/Type	Description
Standard (Option 1)	600V, 90°C (194°F) XHHW2/RHW-2 Anixter B209500-B209507, Belden 29501-29507, or equivalent	• Four tinned copper conductors with XLPE insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 600V, 90°C (194°F) RHH/RHW-2 Anixter OLF-7xxxxx or equivalent	• Three tinned copper conductors with XLPE insulation. • 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90°C (194°F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds on #10 AWG and smaller.

EMC Compliance

Refer to EMC Instructions on page 1-21 for details.

Cable Trays and Conduit

If cable trays or large conduits are to be used, refer to guidelines presented in *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001.

ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will help minimize the possible shock hazard from “cross coupled” motor leads.

Motor Cable Lengths

Typically, motor lead lengths less than 30 meters (approximately 100 feet) are acceptable. However, if your application dictates longer lengths, refer to *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* for details.

Single-Phase Input Power

The PowerFlex 70 drive is typically used with a three-phase input supply. The drive has been listed by U.L. to operate on single-phase input power with the following requirement:

- Output current is derated by 50% of the three-phase ratings identified in Tables A.B through A.D.

Power Terminal Block

Figure 1.2 Typical Power Terminal Block Location (B Frame Shown)

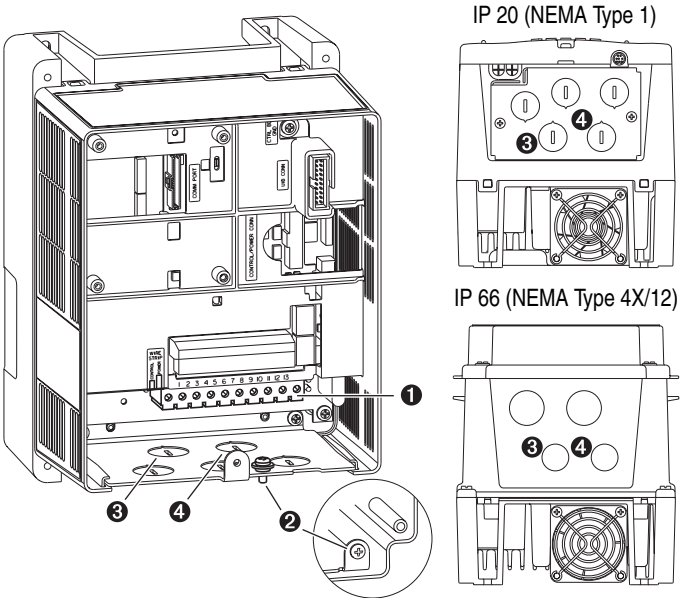


Table 1.B Power Terminal Block Specifications

No.	Name	Description	Frame	Wire Size Range[1] Maximum	Wire Size Range[1] Minimum	Torque Maximum	Torque Recommended
❶	Power Terminal Block	Input power and motor connections	A, B, & C	3.5 mm^2 (12 AWG)	0.3 mm^2 (22 AWG)	0.66 N-m (5.5 lb.-in.)	0.6 N-m (5 lb.-in.)
			D	8.4 mm^2 (8 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
			E	25.0 mm^2 (3 AWG)	2.5 mm^2 (14 AWG)	2.71 N-m (24 lb.-in.)	2.71 N-m (24 lb.-in.)
❷	SHLD terminal	Terminating point for wiring shields	All	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

Table 1.C Wire Routing Recommendations

No.	Description
❸	Suggested entry for incoming line wiring.
❹	Suggested entry for motor wiring.

Cable Entry Plate Removal

If additional wiring access is needed, the Cable Entry Plate on all drive Frames can be removed. Simply loosen the screws securing the plate to the heat sink and slide the plate out.

Figure 1.3 Frames A-D Power Terminal Block and DC Bus Test Points

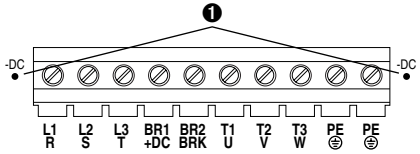
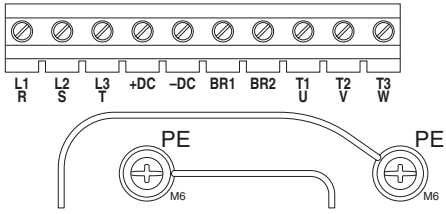
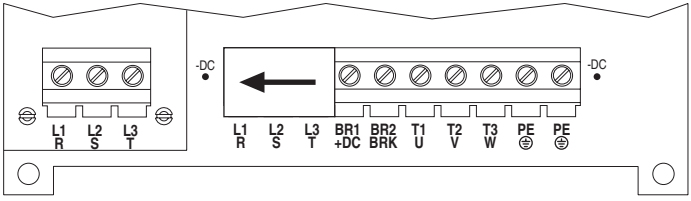


Figure 1.4 Frame E Power Terminal Block



Terminal	Description	Notes
R	R (L1)	AC Line Input Power
S	S (L2)	AC Line Input Power
T	T (L3)	AC Line Input Power
BR1	DC Brake	DB Resistor Connection - **Important:** Do not connect both an internal and external DB resistor at the same time. This may violate the minimum allowed DB resistance and cause drive damage.
BR2	DC Brake	
U	U (T1)	To Motor
V	V (T2)	To Motor
W	W (T3)	To Motor
PE	PE Ground	
PE	PE Ground	
-DC	DC Bus (–)	❶ Test point on Frames A-D located to the left or right of the Power Terminal Block. Frame E has a dedicated terminal.
+DC	DC Bus (+)	

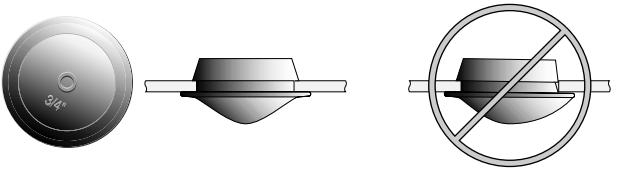
Figure 1.5 Power Input Terminals on Frame B with Internal RFI Filter Option



IP66 (NEMA Type 4X/12) Installations

Use the plugs supplied with IP66 (NEMA Type 4X/12) rated drives to seal unused holes in the conduit entry plate.

Important: Completely seat the plug inner rim for the best seal.



Using Input/Output Contactors

Input Contactor Precautions

ATTENTION: A contactor or other device that routinely disconnects and reapplies the AC line to the drive to start and stop the motor can cause drive hardware damage. The drive is designed to use control input signals that will start and stop the motor. If an input device is used, operation must not exceed one cycle per minute or drive damage will occur.

ATTENTION: The drive start/stop/enable control circuitry includes solid state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hardwired stop circuit may be required to remove the AC line to the drive. An auxiliary braking method may be required.

Output Contactor Precaution

ATTENTION: To guard against drive damage when using output contactors, the following information must be read and understood. One or more output contactors may be installed between the drive and motor(s) for the purpose of disconnecting or isolating certain motors/loads. If a contactor is opened while the drive is operating, power will be removed from the respective motor, but the drive will continue to produce voltage at the output terminals. In addition, reconnecting a motor to an active drive (by closing the contactor) could produce excessive current that may cause the drive to fault. If any of these conditions are determined to be undesirable or unsafe, an auxiliary contact on the output contactor should be wired to a drive digital input that is programmed as “Enable.” This will cause the drive to execute a coast-to-stop (cease output) whenever an output contactor is opened.

Disconnecting MOVs and Common Mode Capacitors

PowerFlex 70 drives contain protective MOVs and common mode capacitors that are referenced to ground. To guard against drive damage, these devices should be disconnected if the drive is installed on an ungrounded distribution system where the line-to-ground voltages on any phase could exceed 125% of the nominal line-to-line voltage. To disconnect these devices, remove all the jumper(s) shown in the figure and table below. See the *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001, for more information on ungrounded system installation.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before removing/installing jumpers. Measure the DC bus voltage at the +DC terminal of the Power Terminal Block and the -DC test point. The voltage must be zero.

Figure 1.6 Typical Jumper Locations (C Frame Shown)

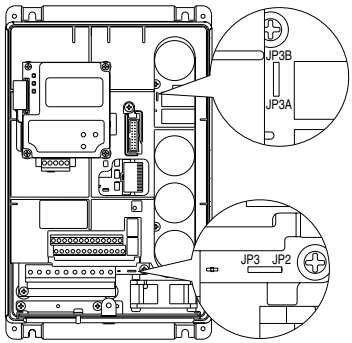
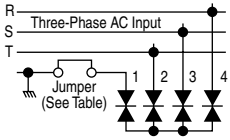
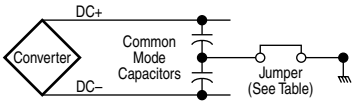


Figure 1.7 Phase to Ground MOV Removal



Frame	Jumper	Removes
A, B, C and D	JP3 – JP2	MOV to Ground
E	JP2 – JP1	MOV and Line to Line Capacitors to Ground

Figure 1.8 Common Mode Capacitors to Ground Removal



Frame	Jumper	Removes
A	N/A	
B	JP6 – JP5	Common Mode Capacitors to Ground
C and D	JP3B – JP3A	Common Mode Capacitors to Ground
E	JP3 – JP4	Common Mode Capacitors to Ground

I/O Wiring

Important points to remember about I/O wiring:

- Use copper wire only. Wire gauge requirements and recommendations are based on 75 degree C. Do not reduce wire gauge when using higher temperature wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).

Important: I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

ATTENTION: Configuring an analog input for 0-20mA operation and driving it from a voltage source could cause component damage. Verify proper configuration prior to applying input signals.

ATTENTION: Hazard of personal injury or equipment damage exists when using bipolar input sources. Noise and drift in sensitive input circuits can cause unpredictable changes in motor speed and direction. Use speed command parameters to help reduce input source sensitivity.

Signal and Control Wire Types

Table 1.D Recommended Signal Wire

Signal Type	Wire Type(s)	Description	Minimum Insulation Rating
Analog I/O	Belden 8760/9460 (or equiv.)	0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain(1).	300V, 75-90 degrees C (167-194 degrees F)
	Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded for remote pot only.	
Encoder	Belden 9728 (or equiv.)	0.196 mm^2 (24 AWG), individually shielded.	
EMC Compliance	Refer to EMC Instructions on page 1-21 for details.		

(1) If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

Table 1.E Recommended Control Wire for Digital I/O

	Wire Type(s)	Description	Minimum Insulation Rating
Unshielded	Per US NEC or applicable national or local code	—	300V, 60 degrees C (140 degrees F)
Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	

I/O Terminal Block

Figure 1.9 Typical I/O Terminal Block Location (B Frame Shown)

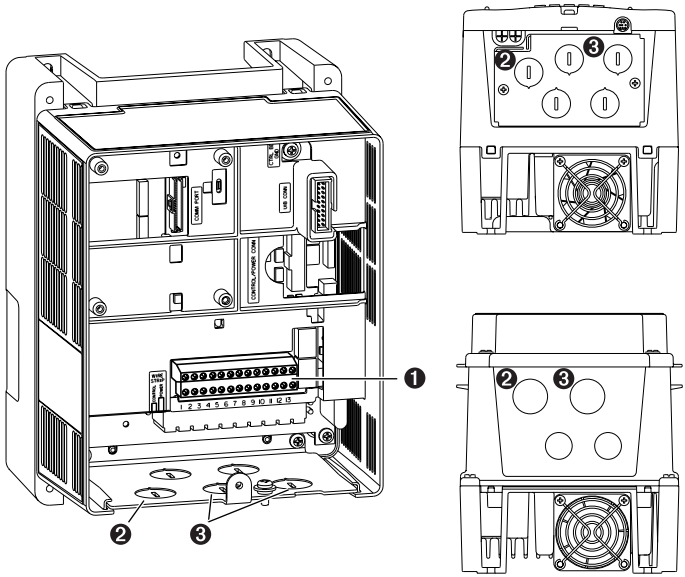


Table 1.F I/O Terminal Block Specifications

No.	Name	Description	Wire Size Range(1)		Torque	
			Maximum	Minimum	Maximum	Recommended
❶	I/O Terminal Block	Signal & control connections	1.5 mm^2 (16 AWG)	0.05 mm^2 (30 AWG)	0.55 N-m (4.9 lb.-in.)	0.5 N-m (4.4 lb.-in.)

(1) Maximum / minimum that the terminal block will accept - these are not recommendations.

Table 1.G Wire Routing Recommendations

No.	Description
❷	Suggested entry for communication wiring.
❸	Suggested entry for I/O and control wiring.

Figure 1.10 I/O Terminal Positions

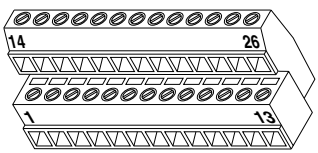


Table 1.H I/O Terminal Designations – Standard and Enhanced Control

No.	Signal	Factory Default	Description	Related Param.
1	Digital In 1	Stop – CF (CF = Clear Fault)	11.2 mA @ 24V DC 19.2V minimum on state 3.2V maximum off state Important: Use only 24V DC, not suitable for 115V AC circuitry. Inputs can be wired as sink or source.	361 - 366
2	Digital In 2	Start		
3	Digital In 3	Auto/Man		
4	Digital In 4	Speed Sel 1		
5	Digital In 5	Speed Sel 2		
6	Digital In 6	Speed Sel 3		
7	24V Common	–	Drive supplied power for Digital In1-6 inputs. See examples on page 1-18. 150mA maximum load.	
8	Digital In Common	–		
9	+24V DC	–		
10	+10V Pot Reference	–	2 k ohm minimum load.	
11	Digital Out 1 – N.O.(1)	NOT Fault	Max Resistive Load: 250V AC / 30V DC, 50 VA / 60 Watts Max Inductive Load: 250V AC / 30V DC, 25 VA / 30 Watts Minimum DC Load: 10 µA, 10 mV DC	380 - 387
12	Digital Out 1 Common			
13	Digital Out 1 – N.C.(1)	Fault		
14	Analog In 1 (– Volts)	(2) Voltage – Reads value at 14 & 15	Non-isolated, 0 to +10V, 10 bit, 100k ohm input impedance.(3)	320 - 327
15	Analog In 1 (+ Volts)			
16	Analog In 1 (– Current)		Non-isolated, 4-20mA, 10 bit, 100 ohm input impedance.(3)	
17	Analog In 1 (+ Current)			
18	Analog In 2 (– Volts)	(2) Voltage – Reads value at 18 & 19	Isolated, bipolar, differential, 0 to +10V unipolar (10 bit) or ±10V bipolar (10 bit & sign), 100k ohm input impedance.(4)	
19	Analog In 2 (+ Volts)			
20	Analog In 2 (– Current)		Isolated, 4-20mA, 10 bit & sign, 100 ohm input impedance.(4)	
21	Analog In 2 (+ Current)			
22	10V Pot Common Analog Out (– Volts) Analog Out (– Current)	(2) Output Freq	0 to +10V, 10 bit, 10k ohm (2k ohm minimum) load. 0 to 20mA, 10 bit, 400 ohm maximum load.(5) Referenced to chassis ground.	340 - 344
23	Analog Out (+ Volts) Analog Out (+ Current)		Common if internal 10V supply (terminal 10) is used.	
24	Digital Out 2 – N.O.(1)	Run	See description at No.s 11-13.	380 - 387
25	Digital Out 2 Common			
26	Digital Out 2 – N.C.(1)	NOT Run		

(1) Contacts shown in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.

(2) These inputs/outputs are dependent on a number of parameters. See “Related Parameters.”

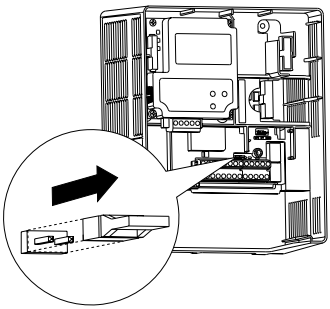
(3) Differential Isolation - External source must be less than 10V with respect to PE.

(4) Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

(5) Analog output current is only available with Enhanced Control drives.

Hardware Enable Circuitry (Enhanced Control Only)

By default, the user can program a digital input as an Enable input. The status of this input is *interpreted by drive software*. If the application requires the drive to be disabled *without* software interpretation, a hardware enable configuration can be utilized. This is done by removing the enable jumper (ENBL JMP) and wiring the enable input to "Digital In 6" (see below).



1.Remove drive cover as described on pages 1-1 and 1-2.

2.Locate and remove the Enable Jumper on the Main Control Board (see diagram).

3.Wire Enable to "Digital In 6" (see Table 1.H).

4.Verify that 366 [Digital In6 Sel] is set to option 1 "Enable".

Safe Off Board (Enhanced Control Only)

The PowerFlex Safe-Off board, when used with suitable safety components, provides protection according to EN 954-1:1997; Category 3 for safe off and protection against restart. The PowerFlex safe off option is just one safety control system. All components in the system must be chosen and applied correctly, to achieve the desired level of operator safeguarding.

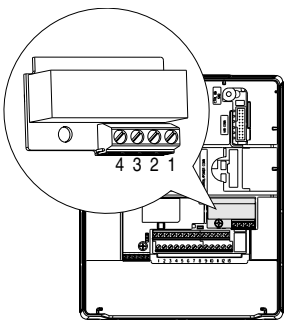


Table 1.I Terminal Description

No.	Signal	Description
1	Monitor - N.C.	Normally closed contacts for monitoring relay status. Maximum Resistive Load: 250V AC / 30V DC / 50 VA / 60 Watts Maximum Inductive Load: 250V AC / 30V DC / 25 VA / 30 Watts
2	Common - N.C.	
3	+24V DC	Connections for user supplied power to energize coil.
4	24V Common	

For detailed information on installing and wiring a safety relay system, refer to the *DriveGuard® Safe-Off Option for PowerFlex AC Drives User Manual*, publication PFLEX-UM001….

Important: If the Safe-Off board is removed from the drive, pins 3 and 4 of the Safe-Off Connector must be jumpered for the drive to run. If the Safe-Off board or the jumper is not installed, and the drive is commanded to run, an F111 "Enable Hardware" fault will occur.

Encoder Interface (Enhanced Control Only)

The PowerFlex Encoder Interface can source 5 or 12 volt power and accept 5 or 12 volt single ended differential inputs.

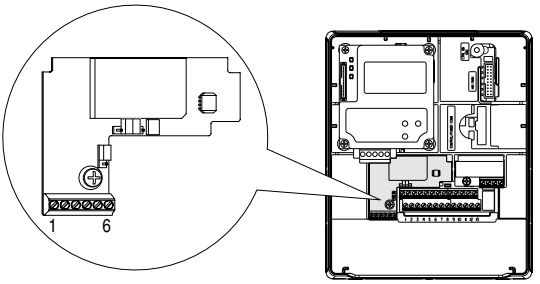


Table 1.J Terminal Description

No.	Signal	Description
1	5-12V Power	Internal power source 250 mA (isolated).
2	Power Return	
3	Encoder B (NOT)	Single channel or quadrature B input.
4	Encoder B	
5	Encoder A (NOT)	Single channel or quadrature A input.
6	Encoder A	

Figure 1.11 Jumper Settings

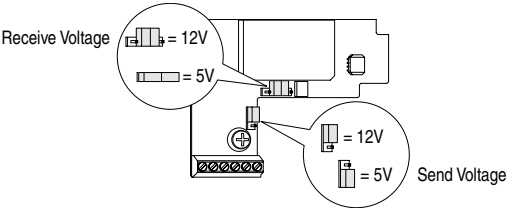
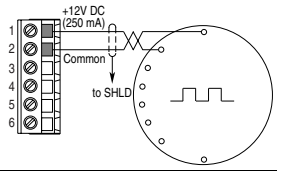
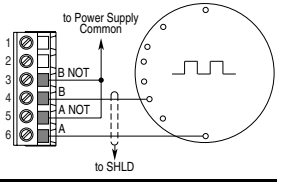
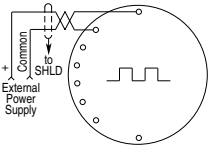
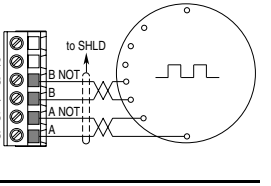
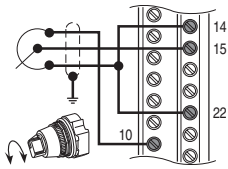
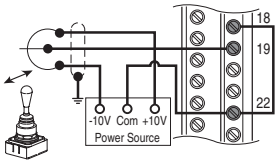
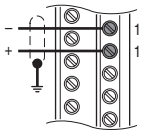
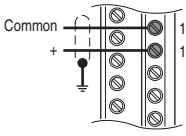
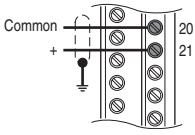
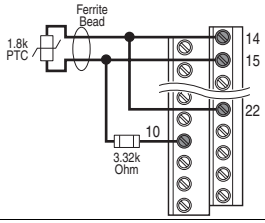
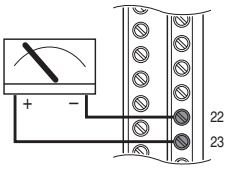


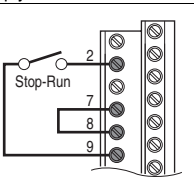
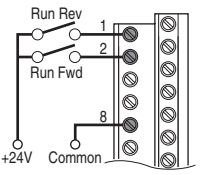
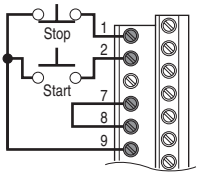
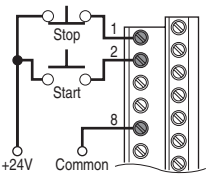
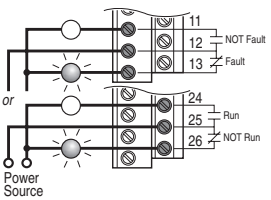
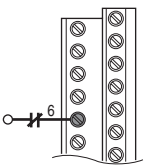
Figure 1.12 Sample Encoder Wiring

I/O	Connection Example
Encoder Power – Internal Drive Power Internal (drive) 12V DC, 250mA	
Encoder Signal – Single-Ended, Dual Channel	

I/O	Connection Example
Encoder Power – External Power Source	
Encoder Signal – Differential, Dual Channel	

I/O Wiring Examples

Input/Output	Connection Example	Required Parameter Settings
Potentiometer Unipolar Speed Reference 10k Ohm Pot. Recommended (2k Ohm minimum)		Select Speed Reference source: Param. 090 = 1 “Analog In 1” Adjust Scaling: Param. 091, 092, 322, 323 Check Results: Param. 016
Joystick Bipolar Speed Reference ±10V Input		Set Direction Mode: Param. 090 = 2 “Analog In 2” Param. 190 = 1 “Bipolar” Adjust Scaling: Param. 091, 092, 325, 326 Check Results: Param. 017
Analog Input Bipolar Speed Reference ±10V Input		Adjust Scaling: Param. 091, 092, 325, 326 Check Results: Param. 017
Analog Input Unipolar Speed Reference 0 to +10V Input		Adjust Scaling: Param. 091, 092, 325, 326 Check Results: Param. 017
Analog Input Unipolar Speed Reference 4-20 mA Input		Configure Input for Current: Param. 320, Bit #1 = 1 “Current” Adjust Scaling: Param. 091, 092, 325, 326 Check Results: Param. 017
Analog Input, PTC PTC OT set > 5V PTC OT cleared < 4V PTC Short < 0.2V		Set Fault Config 1: Param. 238, Bit #7 = 1 “Enabled” Set Alarm Config 1: Param. 259, Bit #11 = 1 “Enabled”
Analog Output Unipolar 0 to +10V Output. Can Drive a 2k Ohm load (25 mA short circuit limit) 0-20 mA Output. 400 Ohm maximum load.		Select Source Value: Param. 342 Adjust Scaling: Param. 343, 344

Input/Output	Connection Example	Required Parameter Settings
2 Wire Control Non-Reversing	Internal Supply 	Disable Digital Input 1: Param. 361 = 0 “Not Used” Set Digital Input 2: Param. 362 = 7 “Run”
2 Wire Control Reversing	External Supply 	Set Digital Input 1: Param. 361 = 9 “Run Reverse” Set Digital Input 2: Param. 362 = 8 “Run Forward”
3 Wire Control	Internal Supply 	Use factory default parameter settings.
3 Wire Control	External Supply 	Use factory default parameter settings.
Digital Output Form C Relays Energized in Normal State.		Select Source: Param. 380, 384
Enable Input Shown in enabled state.		Standard Control Configure with parameter 366 Enhanced Control Configure with parameter 366 For dedicated hardware Enable: Remove Enable Jumper (see page 1-15)

Speed Reference Control

"Auto" Speed Sources

The drive speed command can be obtained from a number of different sources. The source is determined by drive programming and the condition of the Speed Select digital inputs, Auto/Manual digital inputs or reference select bits of a command word.

The default source for a command reference (all speed select inputs open or not programmed) is the selection programmed in [Speed Ref A Sel]. If any of the speed select inputs are closed, the drive will use other parameters as the speed command source.

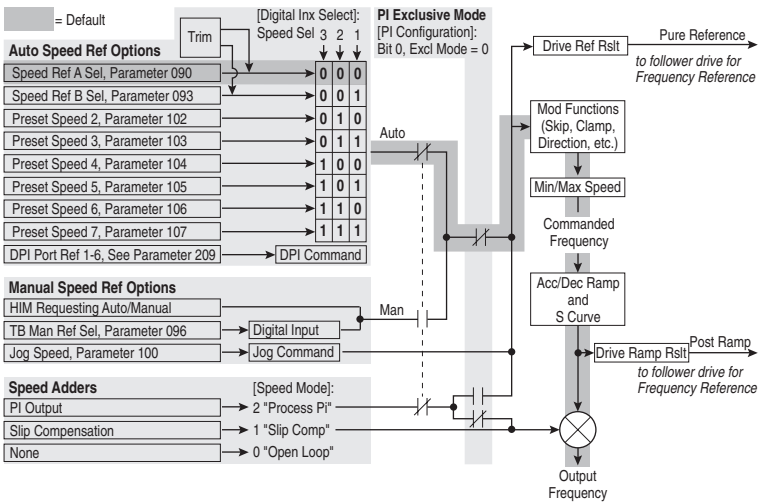
"Manual" Speed Sources

The manual source for speed command to the drive is either the HIM requesting manual control (see ALT Functions on page B-2) or the control terminal block (analog input) if a digital input is programmed to "Auto/Manual".

Changing Speed Sources

The selection of the active Speed Reference can be made through digital inputs, DPI command, jog button or Auto/Manual HIM operation.

Figure 1.13 Speed Reference Selection Chart (1)



(1) To access Preset Speed 1, set [Speed Ref A Sel] or [Speed Ref B Sel] to "Preset Speed 1".

Auto/Manual Examples

PLC = Auto, HIM = Manual

A process is run by a PLC when in Auto mode and requires manual control from the HIM during set-up. The Auto speed reference is issued by the PLC through a communications module installed in the drive. Since the internal communications is designated as Port 5, [Speed Ref A Sel] is set to “DPI Port 5” with the drive running from the Auto source.

Attain Manual Control

- Press ALT then Auto/Man on the HIM.
  When the HIM attains manual control, the drive speed command comes from the HIM speed control keys or analog potentiometer.

Release to Auto Control

- Press ALT then Auto/Man on the HIM again.
  When the HIM releases manual control, the drive speed command returns to the PLC.

PLC = Auto, Terminal Block = Manual

A process is run by a PLC when in Auto mode and requires manual control from an analog potentiometer wired to the drive terminal block. The auto speed reference is issued by the PLC through a communications module installed in the drive. Since the internal communications is designated as Port 5, [Speed Ref A Sel] is set to “DPI Port 5” with the drive running from the Auto source. Since the Manual speed reference is issued by an analog input (“Analog In 1 or 2”), [TB Man Ref Sel] is set to the same input. To switch between Auto and Manual, [Digital In4 Sel] is set to “Auto/ Manual”.

Attain Manual Control

- Close the digital input.
  With the input closed, the speed command comes from the potentiometer.

Release to Auto Control

- Open the digital input.
  With the input open, the speed command returns to the PLC.

Auto/Manual Notes

1. Manual control is exclusive. If a HIM or Terminal Block takes manual control, no other device can take manual control until the controlling device releases manual control.
2. If a HIM has manual control and power is removed from the drive, the drive will return to Auto mode when power is reapplied.

EMC Instructions

CE Conformity[1]

Conformity with the Low Voltage (LV) Directive and Electromagnetic Compatibility (EMC) Directive has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. PowerFlex Drives comply with the EN standards listed below when installed according to the instructions in this manual and the *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*, publication DRIVES-IN001.

CE Declarations of Conformity are available online at: **http://www.ab.com/certification/ce/docs**.

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations

EMC Directive (89/336/EEC)

- EN61800-3 Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods.

General Notes

- If the adhesive label is removed from the top of the drive, the drive must be installed in an enclosure with side openings less than 12.5 mm (0.5 in.) and top openings less than 1.0 mm (0.04 in.) to maintain compliance with the LV Directive.
- The motor cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents.
- Use of line filters in ungrounded systems is not recommended.
- PowerFlex drives may cause radio interference if used in a residential or domestic environment. The installer is required to take measures to prevent interference, in addition to the essential requirements for CE compliance provided in this section, if necessary.
- Conformity of the drive with CE EMC requirements does not guarantee an entire machine or installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.
- PowerFlex drives generate conducted low frequency disturbances (harmonic emissions) on the AC supply system.

[1] CE Certification testing has not been completed for 600 Volt class drives.

General Notes (continued)

- When operated on a public supply system, it is the responsibility of the installer or user to ensure, by consultation with the distribution network operator and Rockwell Automation if necessary, that applicable requirements have been met.

Essential Requirements for CE Compliance

Conditions 1-6 listed below **must be** satisfied for PowerFlex drives to meet the requirements of **EN61800-3**.

1. Standard PowerFlex 70 CE compatible Drive.
2. Review important precautions/attention statements throughout this manual before installing the drive.
3. Grounding as described on page 1-5.
4. Output power, control (I/O) and signal wiring must be braided, shielded cable with a coverage of 75% or better, metal conduit, or equivalent attenuation.
5. All shielded cables should terminate with the proper shielded connector.
6. Conditions in Table 1.K or 1.L.

Table 1.K PowerFlex 70 EN61800-3 EMC Compatibility

Frame	Drive Description	Second Environment				First Environment Restricted Distribution
		Restrict Motor Cable to 40 m (131 ft.)	*Internal Filter Option*	*External Filter*	*Input Ferrite* (1)	
A	Drive Only	✔		✔		Refer to *Table 1.L*
	with any Comm Option	✔		✔		
	with Remote I/O	✔		✔	✔	
B	Drive Only	✔	✔			
	with any Comm Option	✔	✔			
	with Remote I/O	✔	✔		✔	
C	Drive Only	✔				
	with any Comm Option	✔				
	with Remote I/O	✔			✔	
D	Drive Only	✔				
	with any Comm Option	✔				
	with Remote I/O	✔			✔	
E	Drive Only	✔				
	with any Comm Option	✔				
	with Remote I/O	✔			✔	

(1) Input cables through a Ferrite Core (Frames A, B and C Fair-Rite #2643102002 or equivalent, Frames D and E Fair-Rite #2643251002 or equivalent).

Table 1.L PowerFlex 70 EN61800-3 First Environment Restricted Distribution

Frame	Drive Description	First Environment Restricted Distribution				
		Restrict Motor Cable to:	*Internal Filter Option*	*External Filter (1)*	*Comm Cable Ferrite (2)*	*Common Mode Core (3)*
A	Drive Only	40 m (131 ft.)	–	✔	–	–
	Drive with any Comm Option	40 m (131 ft.)	–	✔	–	–
	Drive with Remote I/O	40 m (131 ft.)	–	✔	✔	–
B	Drive Only	12 m (40 ft.)	✔	–	–	–
	Drive with any Comm Option	12 m (40 ft.)	✔	–	–	–
	Drive with Remote I/O	12 m (40 ft.)	✔	–	✔	–
C	Drive Only	12 m (40 ft.)	–	–	–	✔
	Drive with any Comm Option	12 m (40 ft.)	–	–	–	✔
	Drive with Remote I/O	12 m (40 ft.)	–	–	✔	✔
D	Drive Only	12 m (40 ft.)	–	–	–	–
	Drive with any Comm Option	12 m (40 ft.)	–	–	–	–
	Drive with Remote I/O	12 m (40 ft.)	–	–	✔	–
E	Drive Only	30 m (98 ft.)	–	✔	–	–
	Drive with any Comm Option	30 m (98 ft.)	–	✔	–	–
	Drive with Remote I/O	30 m (98 ft.)	–	✔	✔	–

(1) External filters for First Environment installations and increasing motor cable lengths in Second Environment installations are available. Roxburgh models KMFA (RF3 for UL installations) and MIF or Schaffner FN3258 and FN258 models are recommended. Refer to Table 1.M and **http://www.deltron-emcon.com** and **http://www.mtecorp.com** (USA) or **http://www.schaffner.com**, respectively.

(2) Two turns of the blue comm option cable through a Ferrite Core (Frames A, B, C Fair-Rite #2643102002, Frame D Fair-Rite #2643251002 or equivalent).

(3) Refer to the 1321 Reactor and Isolation Transformer Technical Data publication, 1321-TD001x for 1321-Mxxx selection information.

Table 1.M PowerFlex 70 Recommended Filters

Manufacturer	Frame	Manufacturer Part Number(1)	Class A (Meters)	Class B (Meters)	Manufacturer Part Number(1)	Class A (Meters)	Class B (Meters)
Deltron	A	KMF306A	25	25	–	–	–
	B w/o Filter	KMF310A	50	25	–	–	–
	B w/Filter	KMF306A	100	50	MIF306	–	100
	C	KMF318A	–	150	–	–	–
	D	KMF336A	150	5	MIF330	–	150
	D w/o DC CM Capacitor	KMF336A	–	50	–	–	–
	E	–	–	–	MIF3100	–	30
Schaffner	A	FN3258-7-45	–	50	–	–	–
	B w/o Filter	FN3258-7-45	100	50	–	–	–
	B w/Filter	FN3258-7-45	–	100	–	–	–
	C	FN3258-16-45	–	150	–	–	–
	D	FN3258-30-47	0	0	FN258-30-07	–	150
	D w/o DC CM Capacitor	FN3258-30-47	–	150	–	–	–
	0	FN3258-16-45	–	150	–	–	–
	1	FN3258-30-47	–	150	–	–	–
	2	FN3258-42-47	50	50	–	–	–
	2 w/o DC CM Capacitor	FN3258-42-47	150	150	–	–	–
	3	FN3258-75-52	100	100	–	–	–
	3 w/o DC CM Capacitor	FN3258-75-52	150	150	–	–	–

(1) Use of these filters assumes that the drive is mounted in an EMC enclosure.

Start Up

This chapter describes how you start up the PowerFlex 70 Drive. Refer to Appendix B for a brief description of the LED and LCD HIM (Human Interface Module).

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed**. **Remove Power** including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to the drive. Correct the malfunction before continuing.

Prepare For Drive Start-Up

Before Applying Power to the Drive

❑ **1.** Confirm that all inputs are connected to the correct terminals and are secure.

❑ **2.** Verify that AC line power at the disconnect device is within the rated value of the drive.

❑ **3.** Verify that control power voltage is correct.

The remainder of this procedure requires that a HIM be installed. If an operator interface is not available, remote devices should be used to start up the drive.

Important: When power is first applied, the HIM may require approximately 5 seconds until commands are recognized (including the Stop key).

Applying Power to the Drive

❑ **4.** Apply AC power and control voltages to the drive.

If any of the six digital inputs are configured to "Stop – CF" (CF = Clear Fault) or "Enable," verify that signals are present or the drive will not start. Refer to Alarm Descriptions on page 4-7 for a list of potential digital input conflicts.

If a fault code appears, refer to Chapter 4.

If the STS LED is not flashing green at this point, refer to Status Indicators and their indications below.

❑ **5.** Proceed to Start-Up Routines.

Status Indicators

Figure 2.1 Drive Status Indicators (Typical)

#	Name	Color	State	Description
❶	STS (Status)	Green	Flashing	Drive ready, but not running and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow See page 4-7	Flashing, Drive Stopped	An inhibit condition exists, the drive cannot be started. Check parameter 214 [Start Inhibits].
			Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check parameter 211 [Drive Alarm 1].
			Steady, Drive Running	A continuous type 1 alarm condition exists. Check parameter 211 [Drive Alarm 1].
		Red See page 4-3	Flashing	A fault has occurred.
			Steady	A non-resetable fault has occurred.
❷	PORT	Refer to the Communication Adapter User Manual.		Status of DPI port internal communications (if present).
	MOD			Status of communications module (when installed).
	NET A			Status of network (if connected).
	NET B			Status of secondary network (if connected).

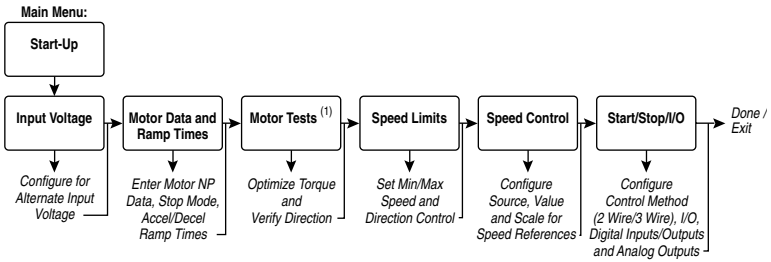
Start-Up Routines

The PowerFlex 70 is designed so that start up is simple and efficient. If you have an LCD HIM, two start-up methods are provided, allowing the user to select the desired level needed for the application.

- **S.M.A.R.T. Start**
  This routine allows you to quickly set up the drive by programming values for the most commonly used functions (see below).

- **Assisted Start Up**
  This routine prompts you for information that is needed to start up a drive for most applications, such as line and motor data, commonly adjusted parameters and I/O. With Enhanced Control, two levels of Assisted Start Up are provided; Basic and Detailed.

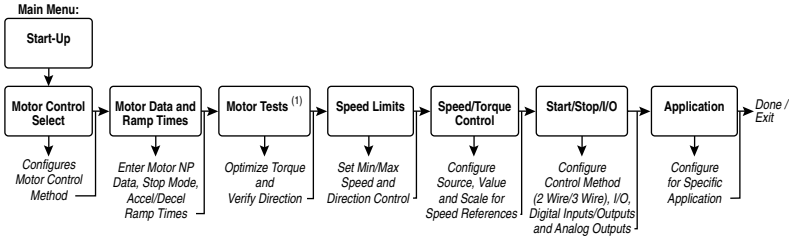
Figure 2.2 Standard Control Start Up Menu



If you do not have an LCD HIM, you must set parameters individually using the LED HIM or other configuration tools, Refer to Chapter 3 for parameters.

Important: Power must be applied to the drive when viewing or changing parameters. Previous programming may affect the drive status when power is applied.

Figure 2.3 Enhanced Control Start Up Menu



(1) During "Motor Tests" the drive may modify some parameter values. It may be necessary to review previously set values.

Running S.M.A.R.T. Start

During a Start Up, the majority of applications require changes to only a few parameters. The LCD HIM on a PowerFlex 70 drive offers S.M.A.R.T. start, which displays the most commonly changed parameters. With these parameters, you can set the following functions:

S - Start Mode and Stop Mode
M - Minimum and Maximum Speed
A - Accel Time 1 and Decel Time 1
R - Reference Source
T - Thermal Motor Overload

To run a S.M.A.R.T. start routine:

Step	Key(s)	Example LCD Displays
1. Press ALT and then Esc (S.M.A.R.T). The S.M.A.R.T. start screen appears. 2. View and change parameter values as desired. For HIM information, see Appendix B. 3. Press Esc to exit the S.M.A.R.T. start.	ALT Esc Esc	F-> Stopped Auto SMART List: Digital In2 Sel Stop Mode A Minimum Speed

Running an Assisted Start Up

Important: This start-up routine requires an LCD HIM.

The Assisted start-up routine asks simple yes or no questions and prompts you to input required information. Access Assisted Start Up by selecting “Start Up” from the Main Menu.

To perform an Assisted Start-Up

Step	Key(s)	Example LCD Displays
1. In the Main Menu, press the Up Arrow or Down Arrow to scroll to “Start Up”. 2. Press Enter.	▲ ▼ ↵	F-> Stopped Auto 0.0 Hz Main Menu: Memory Storage Start Up Preferences

Programming and Parameters

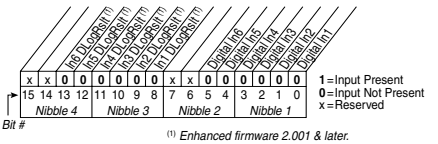
Chapter 3 provides a complete listing and description of the PowerFlex 70 parameters. The parameters can be programmed (viewed/edited) using an LED or LCD HIM (Human Interface Module). As an alternative, programming can also be performed using DriveExplorer™ or DriveExecutive™ software and a personal computer. Refer to Appendix B for brief descriptions of the LED and LCD Human Interface Modules.

About Parameters

To configure a drive to operate in a specific way, drive parameters may have to be set. Three types of parameters exist:

- **ENUM Parameters**
  ENUM parameters allow a selection from 2 or more items. The LCD HIM will display a text message for each item. The LED HIM will display a number for each item.
- **Bit Parameters**
  Bit parameters have individual bits associated with features or conditions. If the bit is 0, the feature is off or the condition is false. If the bit is 1, the feature is on or the condition is true.
- **Numeric Parameters**
  These parameters have a single numerical value (i.e. 0.1 Volts).

The example on the following page shows how each parameter type is presented in this manual.

❶ File	❷ Group	❸ No.	❹ Parameter Name & Description	❺ Values	❻ Related
UTILITY (File E)	Drive . . .	198	**[Load Frm Usr Set]** Loads a previously saved set of parameter values from a selected user set location in drive nonvolatile memory to active drive memory.	Default: 0 "Ready" Options: 0 "Ready" 1 "User Set 1" 2 "User Set 2" 3 "User Set 3"	199
	Diagnostics	216	**[Dig In Status]** Status of the digital inputs.  (1) *Enhanced firmware 2.001 & later.*	
MOTOR . . .	Torq . . .	059	E C **[SV Boost Filter]** Sets the amount of filtering used to boost voltage during Sensorless Vector operation.	Default: 500 Min/Max: 0/32767 Units: 1	

No.	Description
❶	**File** – Lists the major parameter file category.
❷	**Group** – Lists the parameter group within a file.
❸	**No.** – Parameter number. = Parameter value can not be changed until drive is stopped. 32 = 32 bit parameter. E C 32 = 32 bit parameter in Enhanced Control drives only. FV = Parameter only displayed when [Motor Cntl Sel] is set to "4."
❹	**Parameter Name & Description** – Parameter name as it appears on an LCD HIM, with a brief description of the parameters function. Standard = This parameter is specific to Standard Control drives. E C = This parameter will only be available with Enhanced Control drives.
❺	**Values** – Defines the various operating characteristics of the parameter. Three types exist.

ENUM	Default:	Lists the value assigned at the factory. "Read Only" = no default.
	Options:	Displays the programming selections available.
Bit	Bit #:	Lists the bit place holder and definition for each bit.
Numeric	Default:	Lists the value assigned at the factory. "Read Only" = no default.
	Min/Max: Units:	The range (lowest and highest setting) possible for the parameter. Unit of measure and resolution as shown on the LCD HIM.
	Important: Some parameters will have two unit values: • Analog inputs can be set for current or voltage with 320 [Anlg In Config]. • Values that pertain to Enhanced Control drives only will be indicated by "E C."	
	Important: When sending values through DPI ports, simply remove the decimal point to arrive at the correct value (i.e. to send "5.00 Hz," use "500").	

❻	**Related** – Lists parameters (if any) that interact with the selected parameter. The symbol "i" indicates that additional parameter information is available in Appendix C.

How Parameters are Organized

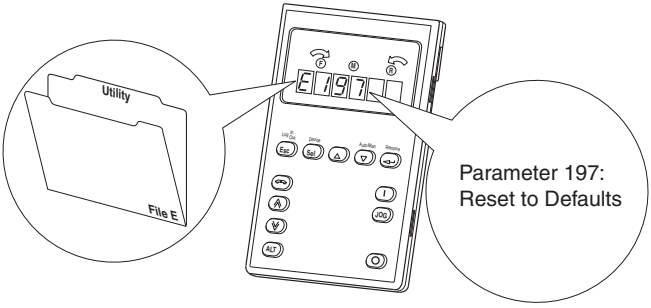
LED HIM (Human Interface Module)

The LED HIM displays parameters in **Numbered List** order. Parameters are accessed by first selecting the file letter then a parameter number.

Important: The PowerFlex 70 Enhanced Control drive does not support the LED HIM.

File Letter Designations

The LED HIM identifies each parameter by File Letter and Parameter Number.



LCD HIM (Human Interface Module)

The LCD HIM displays parameters in a **File-Group-Parameter** or **Numbered List** view order. To switch display mode, access the Main Menu, press ALT then Sel while cursor is on the parameter selection. In addition, using 196 [Param Access Lvl], the user has the option to display *all* parameters, commonly used parameters or diagnostic parameters.

Control Options

Two different control options are available for the PowerFlex 70; Standard and Enhanced. Standard Control drives provide Volts per Hertz and Sensorless Vector operation. Enhanced Control drives support the addition of FVC Vector Control, DriveGuard Safe Off option and more.

File-Group-Parameter View

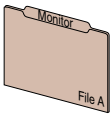
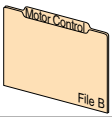
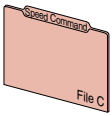
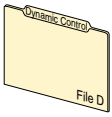
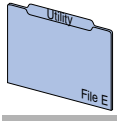
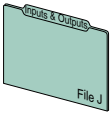
This simplifies programming by grouping parameters that are used for similar functions. The parameters are organized into 6 files in Basic Parameter view or 7 files in Advanced Parameter view. Each file is divided into groups, and each parameter is an element in a group. By default, the LCD HIM displays parameters by File-Group-Parameter view.

Numbered List View

All parameters are in numerical order.

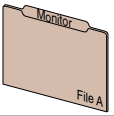
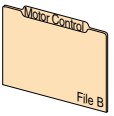
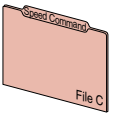
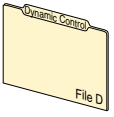
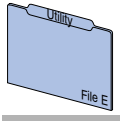
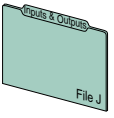
Basic Parameter View – Standard Control

Parameter 196 [Param Access Lvl] set to option 0 “Basic.”

File	Group	Parameters					
Monitor 	Metering	Output Freq Commanded Freq Output Current DC Bus Voltage	001 002 003 012				
Motor Control 	Motor Data	Motor NP Volts Motor NP FLA Motor NP Hertz	041 042 043	Motor NP RPM Motor NP Power Mtr NP Pwr Units	044 045 046	Motor OL Hertz	047
	Torq Attributes	Torque Perf Mode Maximum Voltage	053 054	Maximum Freq Autotune	055 061		
Speed Command 	Spd Mode & Limits	Minimum Speed Maximum Speed	081 082				
	Speed References	Speed Ref A Sel Speed Ref A Hi Speed Ref A Lo	090 091 092	Speed Ref B Sel Speed Ref B Hi Speed Ref B Lo	093 094 095	TB Man Ref Sel TB Man Ref Hi TB Man Ref Lo	096 097 098
	Discrete Speeds	Jog Speed Preset Speed 1-7	100 101-107				
Dynamic Control 	Ramp Rates	Accel Time 1 Accel Time 2	140 141	Decel Time 1 Decel Time 2	142 143	S Curve %	146
	Load Limits	Current Lmt Sel Current Lmt Val	147 148				
	Stop/Brake Modes	Stop Mode A Stop Mode B	155 156	DC Brk Lvl Sel DC Brake Level DC Brake Time	157 158 159	Bus Reg Mode A Bus Reg Mode B DB Resistor Type	161 162 163
	Restart Modes	Start At PowerUp	168	Auto Rstrt Tries	174	Auto Rstrt Delay	175
	Power Loss	Power Loss Mode	184	Power Loss Time	185		
Utility 	Direction Config	Direction Mode	190				
	Drive Memory	Param Access Lvl Reset To Defalts	196 197	Load Frm Usr Set Save To User Set	198 199	Language	201
	Diagnostics	Start Inhibits	214	Dig In Status	216	Dig Out Status	217
	Faults	Fault Config 1	238				
Inputs & Outputs 	Analog Inputs	Anlg In Config	320	Analog In1 Hi Analog In1 Lo	322 323	Analog In2 Hi Analog In2 Lo	325 326
	Analog Outputs	Analog Out1 Sel Analog Out1 Hi Analog Out1 Lo	342 343 344				
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel Dig Out1 Level	380 381	Digital Out2 Sel Dig Out2 Level	384 385		

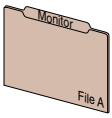
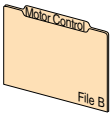
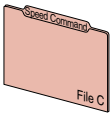
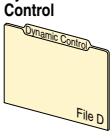
Basic Parameter View – Enhanced Control

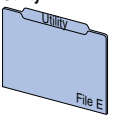
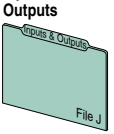
Parameter 196 [Param Access Lvl] set to option 0 “Basic.”

File	Group	Parameters					
Monitor 	Metering	Output Freq Commanded Freq Output Current Torque Current DC Bus Voltage Commanded Torque**	001 002 003 004 012 024				
Motor Control 	Motor Data	Motor NP Volts Motor NP FLA Motor NP Hertz	041 042 043	Motor NP RPM Motor NP Power Mtr NP Pwr Units	044 045 046	Motor OL Hertz Motor Poles	047 049
	Torq Attributes	Motor Cntl Sel Maximum Voltage Maximum Freq	053 054 055	Autotune Autotune Torque** Inertia Autotune**	061 066 067	Torque Ref A Sel** Torque Ref A Hi** Torque Ref A Lo** Pos Torque Limit** Neg Torque Limit**	427 428 429 436 437
	Speed Feedback	Motor Fdbk Type** Encoder PPR**	412 413				
Speed Command 	Spd Mode & Limits	Feedback Select	080	Minimum Speed Maximum Speed	081 082		
	Speed References	Speed Ref A Sel Speed Ref A Hi Speed Ref A Lo	090 091 092	Speed Ref B Sel Speed Ref B Hi Speed Ref B Lo	093 094 095	TB Man Ref Sel TB Man Ref Hi TB Man Ref Lo	096 097 098
	Discrete Speeds	Jog Speed 1	100	Preset Speed 1-7	101-107	Jog Speed 2	108
Dynamic Control 	Ramp Rates	Accel Time 1 Accel Time 2	140 141	Decel Time 1 Decel Time 2	142 143	S Curve %	146
	Load Limits	Current Lmt Sel	147	Current Lmt Val	148		
	Stop/Brake Modes	Stop/Brk Mode A Stop/Brk Mode B	155 156	DC Brake Lvl Sel DC Brake Level DC Brake Time	157 158 159	Bus Reg Mode A Bus Reg Mode B DB Resistor Type	161 162 163
	Restart Modes	Start At PowerUp	168	Auto Rstrt Tries	174	Auto Rstrt Delay	175
	Power Loss	Power Loss Mode	184	Power Loss Time	185		
Utility 	Direction Config	Direction Mode	190				
	Drive Memory	Param Access Lvl Reset To Defalts	196 197	Load Frm Usr Set Save To User Set	198 199	Language	201
	Diagnostics	Start Inhibits	214	Dig In Status	216	Dig Out Status	217
	Faults	Fault Config 1	238				
Inputs & Outputs 	Analog Inputs	Anlg In Config	320	Analog In 1 Hi Analog In 2 Hi	322 325	Analog In 1 Lo Analog In 2 Lo	323 326
	Analog Outputs	Analog Out1 Sel	342	Analog Out1 Hi Analog Out1 Lo	343 344		
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel Digital Out2 Sel	380 384	Dig Out1 Level Dig Out2 Level	381 385		

Advanced Parameter View – Standard Control

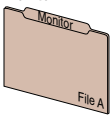
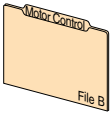
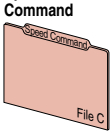
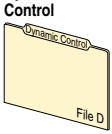
Parameter 196 [Param Access Lvl] set to option 1 “Advanced.”

File	Group	Parameters					
Monitor 	Metering	Output Freq	001	Output Voltage	006	MOP Frequency	011
		Commanded Freq	002	Output Power	007	DC Bus Voltage	012
		Output Current	003	Output Powr Fctr	008	DC Bus Memory	013
		Torque Current	004	Elapsed MWh	009	Analog In1 Value	016
		Flux Current	005	Elapsed Run Time	010	Analog In2 Value	017
	Drive Data	Rated kW	026	Rated Amps	028		
		Rated Volts	027	Control SW Ver	029		
Motor Control 	Motor Data	Motor Type	040	Motor NP RPM	044	Motor OL Factor	048
		Motor NP Volts	041	Motor NP Power	045		
		Motor NP FLA	042	Mtr NP Pwr Units	046		
		Motor NP Hertz	043	Motor OL Hertz	047		
	Torq Attributes	Torque Perf Mode	053	Compensation	056	Autotune	061
		Maximum Voltage	054	Flux Up Mode	057	IR Voltage Drop	062
		Maximum Freq	055	Flux Up Time	058	Flux Current Ref	063
	Volts per Hertz	StAcc Boost	069	Break Voltage	071		
		Run Boost	070	Break Frequency	072		
Speed Command 	Spd Mode & Limits	Speed Mode	080	Overspeed Limit	083	Skip Frequency 3	086
		Minimum Speed	081	Skip Frequency 1	084	Skip Freq Band	087
		Maximum Speed	082	Skip Frequency 2	085		
	Speed References	Speed Ref A Sel	090	Speed Ref B Sel	093	TB Man Ref Sel	096
		Speed Ref A Hi	091	Speed Ref B Hi	094	TB Man Ref Hi	097
		Speed Ref A Lo	092	Speed Ref B Lo	095	TB Man Ref Lo	098
	Discrete Speeds	Jog Speed	100				
		Preset Speed 1-7	101-107				
	Speed Trim	Trim In Select	117	Trim Hi	119		
		Trim Out Select	118	Trim Lo	120		
	Slip Comp	Slip RPM @ FLA	121	Slip RPM Meter	123		
		Slip Comp Gain	122				
	Process PI	PI Configuration	124	PI Integral Time	129	PI Status	134
		PI Control	125	PI Prop Gain	130	PI Ref Meter	135
		PI Reference Sel	126	PI Lower Limit	131	PI Fdback Meter	136
		PI Setpoint	127	PI Upper Limit	132	PI Error Meter	137
		PI Feedback Sel	128	PI Preload	133	PI Output Meter	138
Dynamic Control 	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S Curve %	146
		Accel Time 2	141	Decel Time 2	143		
	Load Limits	Current Lmt Sel	147	Drive OL Mode	150		
		Current Lmt Val	148	PWM Frequency	151		
		Current Lmt Gain	149				
	Stop/Brake Modes	Stop Mode A	155	DC Brake Level	158	Bus Reg Mode A	161
		Stop Mode B	156	DC Brake Time	159	Bus Reg Mode B	162
		DC Brake Lvl Sel	157	Bus Reg Gain	160	DB Resistor Type	163
	Restart Modes	Start At PowerUp	168	Flying StartGain	170	Auto Rstrt Delay	175
		Flying Start En	169	Auto Rstrt Tries	174		
	Power Loss	Power Loss Mode	184				
		Power Loss Time	185				

File	Group	Parameters					
Utility 	Direction Config	Direction Mode	190				
	HIM Ref Config	Save HIM Ref Man Ref Preload	192 193				
	MOP Config	Save MOP Ref MOP Rate	194 195				
	Drive Memory	Param Access Lvl Reset To Defalts Load Frm Usr Set	196 197 198	Save To User Set Reset Meters Language	199 200 201	Voltage Class Drive Checksum	202 203
	Diagnostics	Drive Status 1 Drive Status 2 Drive Alarm 1 Drive Alarm 2 Speed Ref Source Start Inhibits Last Stop Source Dig In Status	209 210 211 212 213 214 215 216	Dig Out Status Drive Temp Drive OL Count Motor OL Count Fault Frequency Fault Amps Fault Bus Volts Status 1 @ Fault	217 218 219 220 224 225 226 227	Status 2 @ Fault Alarm 1 @ Fault Alarm 2 @ Fault Testpoint 1 Sel Testpoint 1 Data Testpoint 2 Sel Testpoint 2 Data	228 229 230 234 235 236 237
	Faults	Fault Config 1 Fault Clear	238 240	Fault Clear Mode Power Up Marker	241 242	Fault 1-4 Code Fault 1-4 Time	243-249 244-250
	Alarms	Alarm Config 1	259				
Communication 	Comm Control	DPI Data Rate Drive Logic Rslt	270 271	Drive Ref Rslt Drive Ramp Rslt	272 273		
	Masks & Owners	Logic Mask Start Mask Jog Mask Direction Mask Reference Mask Accel Mask Decel Mask	276 277 278 279 280 281 282	Fault Clr Mask MOP Mask Local Mask Stop Owner Start Owner Jog Owner Direction Owner	283 284 285 288 289 290 291	Reference Owner Accel Owner Decel Owner Fault Clr Owner MOP Owner Local Owner	292 293 294 295 296 297
	Datalinks	Data In A1-D2 Data Out A1-D2	300-307 310-317				
Inputs & Outputs 	Analog Inputs	Anlg In Config Anlg In Sqr Root	320 321	Analog In 1 Hi Analog In 1 Lo Anlg In 1 Loss	322 323 324	Analog In 2 Hi Analog In 2 Lo Anlg In 2 Loss	325 326 327
	Analog Outputs	Anlg Out Absolut Analog Out1 Sel	341 342	Analog Out1 Hi Analog Out1 Lo	343 344		
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel Dig Out1 Level Dig Out1 OnTime Dig Out1 OffTime	380 381 382 383	Digital Out2 Sel Dig Out2 Level Dig Out2 OnTime Dig Out2 OffTime	384 385 386 387		

Advanced Parameter View – Enhanced Control

Parameter 196 [Param Access Lvl] set to option 1 "Advanced."

File	Group	Parameters					
Monitor 	Metering	Output Freq	001	Output Powr Fctr	008	Torque Estimate	015 3.x
		Commanded Freq	002	Elapsed MWh	009	Analog In1 Value	016
		Output Current	003	Elapsed Run Time	010	Analog In2 Value	017
		Torque Current	004	MOP Frequency	011	Ramped Speed	022
		Flux Current	005	DC Bus Voltage	012	Speed Reference	023
		Output Voltage	006	DC Bus Memory	013	Commanded Torque**	024
		Output Power	007	Elapsed kWh	014	Speed Feedback	025
	Drive Data	Rated kW	026	Rated Amps	028		
		Rated Volts	027	Control SW Ver	029		
Motor Control 	Motor Data	Motor Type	040	Motor NP RPM	044	Motor OL Factor	048
		Motor NP Volts	041	Motor NP Power	045	Motor Poles	049
		Motor NP FLA	042	Mtr NP Pwr Units	046	Motor OL Mode	050 3.x
		Motor NP Hertz	043	Motor OL Hertz	047		
	Torq Attributes	Motor Cntl Sel	053	Autotune	061	Torque Ref A Hi**	428
		Maximum Voltage	054	IR Voltage Drop	062	Torque Ref A Lo**	429
		Maximum Freq	055	Flux Current Ref	063	Torque Setpoint1**	435
		Compensation	056	Ixo Voltage Drop	064	Pos Torque Limit**	436
		Flux Up Mode	057	Autotune Torque**	066	Neg Torque Limit**	437
		Flux Up Time	058	Inertia Autotune**	067	Control Status**	440
		SV Boost Filter	059	Torque Ref A Sel**	427	Torq Current Ref**	441
	Volts per Hertz	StAcc Boost*	069	Break Voltage*	071		
		Run Boost*	070	Break Frequency*	072		
	Speed Feedback	Motor Fdbk Type	412	Enc Pos Feedback	414	Fdbk Filter Sel**	416
		Encoder PPR	413	Encoder Speed	415	Notch FilterFreq**	419
						Notch Filter K**	420
Speed Command 	Spd Mode & Limits	Feedback Select	080	Skip Frequency 1	084	Skip Freq Band	087
		Minimum Speed	081	Skip Frequency 2	085	Speed/Torque Mod**	088
		Maximum Speed	082	Skip Frequency 3	086	Rev Speed Limit	454
		Overspeed Limit	083				
	Speed References	Speed Ref A Sel	090	Speed Ref B Sel	093	TB Man Ref Sel	096
		Speed Ref A Hi	091	Speed Ref B Hi	094	TB Man Ref Hi	097
		Speed Ref A Lo	092	Speed Ref B Lo	095	TB Man Ref Lo	098
	Discrete Speeds	Jog Speed 1	100	Preset Speed 1-7	101-107	Jog Speed 2	108
	Speed Trim	Trim % Setpoint	116	Trim In Select	117	Trim Hi	119
				Trim Out Select	118	Trim Lo	120
	Slip Comp	Slip RPM @ FLA	121	Slip Comp Gain*	122	Slip RPM Meter	123
	Process PI	PI Configuration	124	PI Lower Limit	131	PI Output Meter	138
		PI Control	125	PI Upper Limit	132	PI BW Filter	139
		PI Reference Sel	126	PI Preload	133	PI Deriv Time	459
		PI Setpoint	127	PI Status	134	PI Reference Hi	460
		PI Feedback Sel	128	PI Ref Meter	135	PI Reference Lo	461
		PI Integral Time	129	PI Fdback Meter	136	PI Feedback Hi	462
		PI Prop Gain	130	PI Error Meter	137	PI Feedback Lo	463
	Speed Regulator	Ki Speed Loop**	445	Spd Err Filt BW	448 3.x	Total Inertia**	450
		Kp Speed Loop**	446	Speed Desired BW**	449	Speed Loop Meter**	451
		Kf Speed Loop**	447				
Dynamic Control 	Restart Modes	Powerup Delay	167	Auto Rstrt Tries	174	Wake Level	180
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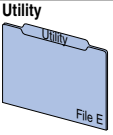
Utility 	Direction Config	Direction Mode	190				
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	Security	PortMask Act	595	Write Mask Act	597	Logic Mask Act	598
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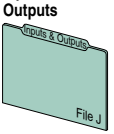
Inputs & Outputs 	Analog Inputs	Anlg In Config	320	Analog In 1 Lo	323	Analog In 2 Lo	326
		Anlg In Sqr Root	321	Analog In 1 Loss	324	Analog In 2 Loss	327
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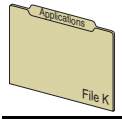
		Digital Out1 Sel	380	Dig Out1 OffTime	383	Dig Out2 OnTime	386
		Dig Out1 Level	381	Digital Out2 Sel	384	Dig Out2 OffTime	387
Applications[3.x] 	Fiber Functions[3.x]	Fiber Control	620[3.x]	Traverse Inc	623[3.x]	P Jump	626[3.x]
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* These parameters will only be displayed when parameter 053 [Motor Cntl Sel] is set to option "2 or 3."

** These parameters will only be displayed when parameter 053 [Motor Cntl Sel] is set to option "4."

[3.x] Firmware 3.002 & later only.

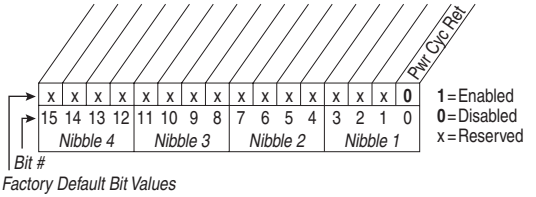
Monitor File (File A)

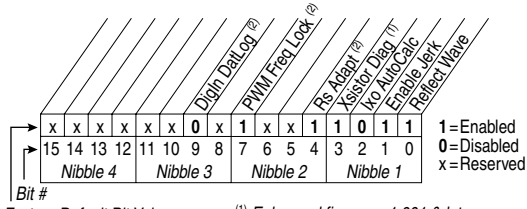
File A	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MONITOR (File A)	Metering	001	**[Output Freq]** Output frequency present at T1, T2 & T3 (U, V & W)	Default: Read Only Min/Max: –/+[Maximum Freq] Units: 0.1 Hz	
		002	**[Commanded Freq]** Value of the active frequency command.	Default: Read Only Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	
		003	**[Output Current]** EC 32 The total output current present at T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated Amps × 2 Units: 0.1 Amps 0.01 Amps EC	
		004	**[Torque Current]** EC 32 The amount of current that is in phase with the fundamental voltage component.	Default: Read Only Min/Max: Drive Rating × –2/+2 Units: 0.1 Amps 0.01 Amps EC	
		005	**[Flux Current]** EC 32 The amount of current that is out of phase with the fundamental voltage component.	Default: Read Only Min/Max: Drive Rating × –2/+2 Units: 0.1 Amps 0.01 Amps EC	
		006	**[Output Voltage]** Output voltage present at terminals T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated Volts Units: 0.1 VAC	
		007	**[Output Power]** EC 32 Output power present at T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated kW × 2 Units: 0.1 kW 0.01 kW EC	
		008	**[Output Powr Fctr]** Output power factor.	Default: Read Only Min/Max: 0.00/1.00 Units: 0.01	
		009	**[Elapsed MWh]** 32 Accumulated output energy of the drive.	Default: Read Only Min/Max: 0.0/429496729.5 MWh Units: 0.1 MWh	
		010	**[Elapsed Run Time]** 32 Accumulated time drive is outputting power.	Default: Read Only Min/Max: 0.0/429496729.5 Hrs Units: 0.1 Hrs	
		011	**[MOP Frequency]** Value of the signal at MOP (Motor Operated Potentiometer).	Default: Read Only Min/Max: –/+[Maximum Frequency] Units: 0.1 Hz	
		012	**[DC Bus Voltage]** Present DC bus voltage level.	Default: Read Only Min/Max: 0.0/Drive Rating Based Units: 0.1 VDC	
		013	**[DC Bus Memory]** 6 minute average of DC bus voltage level.	Default: Read Only Min/Max: 0.0/Drive Rating Based Units: 0.1 VDC	

File A	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MONITOR (File A)	Metering	014 32	E C **[Elapsed kWh]** Accumulated output energy of the drive.	Default: Read Only Min/Max: 0.0/429496729.5 kWh Units: 0.1 kWh	
		015	E C v3 **[Torque Estimate]** Estimated motor torque output as percent of motor rated torque.	Default: Read Only Min/Max: –/+800.0 % Units: 0.1 %	
		016 017	**[Analog In1 Value]** **[Analog In2 Value]** Value of the signal at the analog inputs.	Default: Read Only Min/Max: 0.000/20.000 mA –/+10.000V Units: 0.001 mA 0.001 Volt	
		022	E C **[Ramped Speed]** The value shown is the value after the accel/decel ramp but prior to any corrections supplied by slip comp, PI, etc.	Default: Read Only Min/Max: –/+500.0 Hz Units: 0.1 Hz	
		023	E C **[Speed Reference]** Summed value of ramped speed and Process PI.	Default: Read Only Min/Max: –/+500.0 Hz Units: 0.1 Hz	
		024 FV	E C v2 **[Commanded Torque]** Final torque reference value after limits & filtering are applied. % motor rated torque.	Default: Read Only Min/Max: –/+800.0% Units: 0.1%	053
		025	E C v2 **[Speed Feedback]** Value of actual motor speed, measured by encoder feedback or estimated.	Default: Read Only Min/Max: –/+500.0 Hz Units: 0.1 Hz	053
	Drive Data	026 32	**[Rated kW]** Drive power rating.	Default: Read Only Min/Max: 0.37/15.0 kW 0.00/300.00 kW E C Units: 0.01 kW	
		027	**[Rated Volts]** The drive input voltage class (208, 240, 400 etc.).	Default: Read Only Min/Max: 208/600 Volt 0.0/6553.5 Volt E C Units: 0.1 VAC	
		028	**[Rated Amps]** The drive rated output current.	Default: Read Only Min/Max: 1.1/32.2 Amps 0.0/6553.5 Amps E C Units: 0.1 Amps	
		029	**[Control SW Ver]** Main Control Board software version.	Default: Read Only Min/Max: 0.000/65.256 0.0/65.535 E C Units: 0.001	196

Motor Control File (File B)

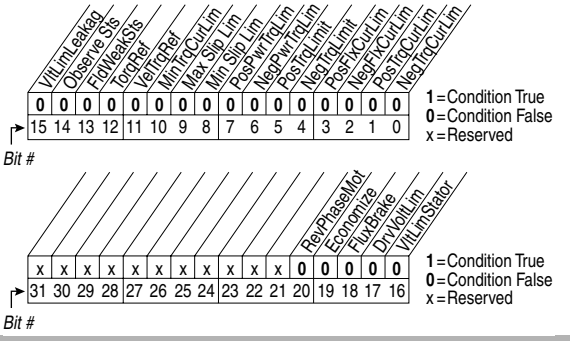
File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Motor Data	040	**[Motor Type]** Set to match the type of motor connected.	Default: 0 "Induction" Options: 0 "Induction" 1 "Synchr Reluc" 2 "Synchr PM"	
		041	**[Motor NP Volts]** Set to the motor nameplate rated volts.	Default: Drive Rating Based Min/Max: 0.0/[Rated Volts] Units: 0.1 VAC	
		042	**[Motor NP FLA]** Set to the motor nameplate rated full load amps.	Default: Drive Rating Based Min/Max: 0.0/[Rated Amps] × 2 Units: 0.1 Amps	047 048
		043	**[Motor NP Hertz]** Set to the motor nameplate rated frequency.	Default: Drive Rating Based Min/Max: 5.0/400.0 Hz 5.0/500.0 Hz EC Units: 0.1 Hz	
		044	**[Motor NP RPM]** Set to the motor nameplate rated RPM.	Default: Drive Rating Based Min/Max: 60/30000 RPM Units: 1 RPM	
		045	**[Motor NP Power]** Set to the motor nameplate rated power. 32 (1) See [Mtr NP Pwr Units]	Default: Drive Rating Based Min/Max: 0.00/100.00 0.00/412.48 EC Units: 0.01 kW/HP(1)	046
		046	**[Mtr NP Pwr Units]** Selects the motor power units to be used.	Default: Drive Rating Based Options: 0 "Horsepower" 1 "kiloWatts"	
		047	**[Motor OL Hertz]** Selects the output frequency below which the motor operating current is derated. The motor thermal overload will generate a fault at lower levels of current.	Default: Motor NP Hz/3 Min/Max: 0.0/500.0 Hz Units: 0.1 Hz	042 220
		048	**[Motor OL Factor]** Sets operating level for motor overload. Motor FLA x OL Factor = Operating Level	Default: 1.00 Min/Max: 0.20/2.00 Units: 0.01	042 220
		049	EC **[Motor Poles]** Defines the number of poles in the motor.	Default: 4 Min/Max: 2/40 Units: 2 Pole	

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Motor Data	050	E C v3 **[Motor OL Mode]** If "0," [Drive OL Count], P219 is reset to zero by a drive reset or a power cycle. If "1," the value is maintained. A "1" to "0" transition resets [Drive OL Count] to zero.  *Factory Default Bit Values*		219
	Torq Attributes	053	Standard **[Torque Perf Mode]** Sets the method of motor torque production.	Default: 0 "Sensrls Vect" Options: 0 "Sensrls Vect" 1 "SV Economize" 2 "Custom V/Hz" 3 "Fan/Pmp V/Hz"	062 063 069 070
			E C **[Motor Cntl Sel]** Sets the method of motor control used in the drive. **Important:** "FVC Vector" mode requires autotuning of the motor, both coupled and uncoupled to the load. (1) Enhanced firmware 2.001 & later.	Default: 0 "Sensrls Vect" Options: 0 "Sensrls Vect" 1 "SV Economize" 2 "Custom V/Hz" 3 "Fan/Pmp V/Hz" 4 "FVC Vector"(1)	
		054	**[Maximum Voltage]** Sets the highest voltage the drive will output.	Default: Drive Rated Volts Min/Max: Rated Volts × 0.25/Rated Volts Units: 0.1 VAC	
		055	**[Maximum Freq]** Sets the highest frequency the drive will output. Refer to parameter 083 [Overspeed Limit].	Default: 110.0 or 130.0 Hz Min/Max: 5.0/400.0 Hz 5.0/500.0 Hz E C Units: 0.1 Hz	083

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Torq Attributes	056	**[Compensation]** Enables/disables correction options.  *Factory Default Bit Values* (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.* Option Descriptions Reflect Wave — Disables reflected wave overvoltage protection for long cable lengths. (typically enabled). Enable Jerk — In non-FVC Vector modes, disabling jerk removes a short S-curve at the start of the accel/decel ramp. Ixo AutoCalc — Not functional – reserved for future enhancements. Xsistor Diag — Disables power transistor power diagnostic tests which run at each start command. Rs Adapt — FVC w/Encoder Only - Disabling may improve torque regulation at lower speeds (typically not needed). Mtr Lead Rev — Reverses the phase rotation of the applied voltage, effectively reversing the motor leads. PWM Freq Lock — Keeps the PWM frequency from decreasing to 2 kHz at low operating frequencies in FVC Vector mode without encoder.		411
		057	**[Flux Up Mode]** Auto = Flux is established for a calculated time period based on motor nameplate data. [Flux Up Time] is not used. Manual = Flux is established for [Flux Up Time] before acceleration.	Default: 0 "Manual" Options: 0 "Manual" 1 "Automatic"	053 058
		058	**[Flux Up Time]** Sets the amount of time the drive will use to try and achieve full motor stator flux. When a Start command is issued, DC current at current limit level is used to build stator flux before accelerating.	Default: 0.00 Secs Min/Max: 0.00/5.00 Secs Units: 0.01 Secs	053 058
		059	E C **[SV Boost Filter]** Sets the amount of filtering used to boost voltage during Sensorless Vector operation.	Default: 500 Min/Max: 0/32767 Units: 1	

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Torq Attributes	061	**[Autotune]** Provides a manual or automatic method for setting [IR Voltage Drop] and [Flux Current Ref], which affect sensorless vector performance. Valid only when parameter 53 is set to "Sensrls Vect," "SV Economize" or "FVC Vector" "Ready" (0) = Parameter returns to this setting following a "Static Tune" or "Rotate Tune." It also permits manually setting [IR Voltage Drop] and [Flux Current Ref]. "Static Tune" (1) = A temporary command that initiates a non-rotational motor stator resistance test for the best possible automatic setting of [IR Voltage Drop]. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. Used when motor cannot be rotated. "Rotate Tune" (2) = A temporary command that initiates a "Static Tune" followed by a rotational test for the best possible automatic setting of [Flux Current Ref]. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. **Important:** Used when motor is uncoupled from the load. Results may not be valid if a load is coupled to the motor during this procedure. **ATTENTION:** Rotation of the motor in an undesired direction can occur during this procedure. To guard against possible injury and/or equipment damage, it is recommended that the motor be disconnected from the load before proceeding. "Calculate" (3) = This setting uses motor nameplate data to automatically set [IR Voltage Drop] and [Flux Current Ref].	Default: 3 "Calculate" Options: 0 "Ready" 1 "Static Tune" 2 "Rotate Tune" 3 "Calculate"	053 062
		062	**[IR Voltage Drop]** Value of voltage drop across the resistance of the motor stator at rated motor current. Used only parameter 53 is set to "Sensrls Vect", "SV Economize" or "FVC Vector."	Default: Drive Rating Based Min/Max: 0.0/[Motor NP Volts]×0.5 Units: 0.1 VAC	053 061
		063	**[Flux Current Ref]** Value of amps for full motor flux. Used only when parameter 53 is set to "Sensrls Vect", "SV Economize" or "FVC Vector."	Default: Drive Rating Based Min/Max: [Motor NP FLA] × 0.05/ [Motor NP FLA] × 0.9 Units: 0.01 Amps	053 061
		064	E C v2 **[IXo Voltage Drop]** Value of voltage drop across the leakage inductance of the motor at rated motor current. Used only when parameter 53 is set to "FVC Vector."	Default: Based on Drive Rating Min/Max: 0.0/Motor NP Volts Units: 0.1 VAC	
		066	E C v2 **[Autotune Torque]** Specifies motor torque applied to the motor during the flux current and inertia tests performed during an autotune.	Default: 50.0% Min/Max: 0.0/150.0% Units: 0.1%	053

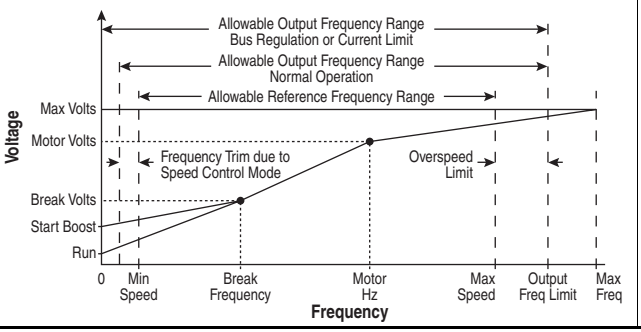
File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Torq Attributes	067	E C v2 **[Inertia Autotune]** Provides an automatic method of setting [Total Inertia]. This test is automatically run during Start-Up motor tests. **Important:** Use when motor is coupled to the load. Results may not be valid if the load is not coupled to the motor during this procedure. "Ready" = Parameter returns to this setting following a completed inertia tune. "Inertia Tune" = A temporary command that initiates an inertia test of the motor/load combination. The motor will ramp up and down, while the drive measures the amount of inertia.	Default: 0 "Ready" Options: 0 "Ready" 1 "Inertia Tune"	053 450
		427	E C v2 **[Torque Ref A Sel]** Selects the source of the external torque reference to the drive. How this reference is used is dependent upon [Speed/Torque Mod]. (1) See *Appendix B* for DPI port locations.	Default: 0 "Torque Setpt" Options: 0 "Torque Setpt" 1 "Analog In 1" 2 "Analog In 2" 3-17 "Reserved" 18-22 "DPI Port 1-5"(1) 23 "Reserved" 24 "Disabled"	053
		428	E C v2 **[Torque Ref A Hi]** Scales the upper value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 100.0% Min/Max: –/+800.0% Units: 0.1%	053
		429	E C v2 **[Torque Ref A Lo]** Scales the lower value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 0.0% Min/Max: –/+800.0% Units: 0.1%	053
		435	E C v2 **[Torque Setpoint1]** Provides an internal fixed value for Torque Setpoint when [Torque Ref Sel] is set to "Torque Setpt."	Default: 0.0% Min/Max: –/+800.0% Units: 0.1%	053
		436	E C v2 **[Pos Torque Limit]** Defines the torque limit for the positive torque reference value. The reference will not be allowed to exceed this value.	Default: 200.0% Min/Max: 0.0/800.0% Units: 0.1%	053
		437	E C v2 **[Neg Torque Limit]** Defines the torque limit for the negative torque reference value. The reference will not be allowed to exceed this value.	Default: –200.0% Min/Max: –800.0/0.0% Units: 0.1%	053

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Torq Attributes	440	E C v2 **[Control Status]** FV Displays a summary status of any condition that may be limiting either the current or the torque reference.  	Read Only	053
		441	E C v2 **[Torq Current Ref]** FV Displays the torque current reference value that is present at the output of the current rate limiter (parameter 154).	Default: Read Only Min/Max: –/+3276.7 Amps Units: 0.1 Amps	053
	Volts per Hertz	069	**[Start/Acc Boost]** Sets the voltage boost level for starting and acceleration when “Custom V/Hz” mode is selected. Refer to parameter 083 [Overspeed Limit].	Default: Drive Rating Based Min/Max: 0.0/[Motor NP Volts] × 0.25 Units: 0.1 VAC	053 070
		070	**[Run Boost]** Sets the boost level for steady state or deceleration when “Fan/Pmp V/Hz” or “Custom V/Hz” modes are selected. Refer to the diagram at parameter 083.	Default: Drive Rating Based Min/Max: 0.0/[Motor NP Volts] × 0.25 Units: 0.1 VAC	053 069
		071	**[Break Voltage]** Sets the voltage the drive will output at [Break Frequency]. Refer to parameter 083 [Overspeed Limit].	Default: [Motor NP Volts] × 0.25 Min/Max: 0.0/[Motor NP Volts] Units: 0.1 VAC	053 072
		072	**[Break Frequency]** Sets the frequency the drive will output at [Break Voltage]. Refer to parameter 083 [Overspeed Limit].	Default: [Motor NP Hertz] × 0.25 Min/Max: 0.0/[Maximum Freq] Units: 0.1 Hz	053 071

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Speed Feedback	412	E C v2 **[Motor Fdbk Type]** Selects the encoder type; single channel or quadrature. Options 1 & 3 detect a loss of encoder signal (when using differential inputs) regardless of the [Feedback Select], param. 080 setting. For FVC Vector mode, use a quadrature encoder only (option 0/1). If a single channel encoder is used (option 2/3) in sensorless vector or V/Hz mode, select "Reverse Dis" (option 2) in param. 190.	Default: 0 "Quadrature" Options: 0 "Quadrature" 1 "Quad Check" 2 "Single Chan" 3 "Single Check"	
		413	E C v2 **[Encoder PPR]** Contains the encoder pulses per revolution. For improved operation in FVC Vector mode, PPR should be ≥ (64 x motor poles).	Default: 1024 PPR Min/Max: 1/20000 PPR Units: 1 PPR	
		414	E C v2 **[Enc Pos Feedback]** Displays raw encoder pulse count. For single channel encoders, this count will increase (per rev.) by the amount in [Encoder PPR]. For quadrature encoders this count will increase by 4 times the amount defined in [Encoder PPR].	Default: Read Only Min/Max: –/+2147483647 Units: 1	
		415	E C v2 **[Encoder Speed]** Provides a monitoring point that reflects speed as seen from the feedback device.	Default: Read Only Min/Max: –/+500.0 Hz Units: 0.1 Hz	
		416	E C v2 **[Fdbk Filter Sel]** Selects the type of feedback filter desired. "Light" uses a 35/49 radian feedback filter. "Heavy" uses a 20/40 radian feedback filter.	Default: 0 "None" Options: 0 "None" 1 "Light" 2 "Heavy"	
		419	E C v2 **[Notch FilterFreq]** FV Sets the center frequency for an optional 2-pole notch filter. Filter is applied to the torque command. "0" disables this filter.	Default: 0.0 Hz Min/Max: 0.0/500.0 Hz Units: 0.1 Hz	053
		420	E C v2 **[Notch Filter K]** FV Sets the width for the 2-pole notch filter.	Default: 0.3 Min/Max: 0.1/0.9 Units: 0.1	053

Speed Command File (File C)

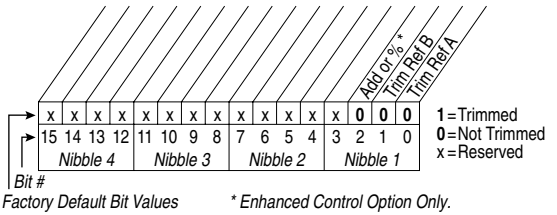
File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Spd Mode & Limits	080	**Standard [Speed Mode]** Sets the method of speed regulation.	Default: 0 "Open Loop" Options: 0 "Open Loop" 1 "Slip Comp" 2 "Process PI"	121 thru 138
			EC [Feedback Select] Selects the source for motor speed feedback. Note that all selections are available when using Process PI. "Open Loop" (0) - no encoder is present, and slip compensation is not needed. "Slip Comp" (1) - tight speed control is needed, and encoder is not present. "Encoder" (3) - an encoder is present. "Simulator" (5) - Simulates a motor for testing drive operation & interface check.	Default: 0 "Open Loop" Options: 0 "Open Loop" 1 "Slip Comp" 2 "Reserved" 3 "Encoder" 4 "Reserved" 5 "Simulator"	
		081	**[Minimum Speed]** Sets the low limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: 0.0 Hz Min/Max: 0.0/[Maximum Speed] Units: 0.1 Hz	092 095
		082	**[Maximum Speed]** Sets the high limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: 50.0 or 60.0 Hz (Dependent on voltage class) Min/Max: 5.0/400.0 Hz 5.0/500.0 Hz EC Units: 0.1 Hz	055 083 091 094 202
		083	**[Overspeed Limit]** Sets the incremental amount of the output frequency (above [Maximum Speed]) allowable for functions such as slip compensation. [Maximum Speed] + [Overspeed Limit] must be ≤ [Maximum Freq]	Default: 10.0 Hz Min/Max: 0.0/20.0 Hz Units: 0.1 Hz	055 082

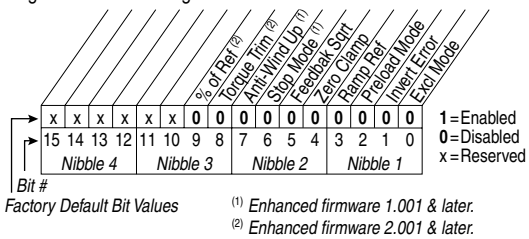
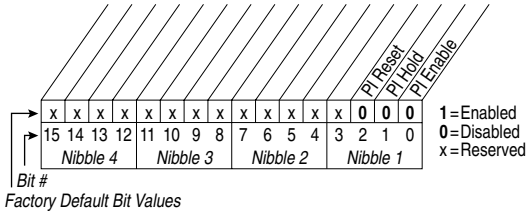


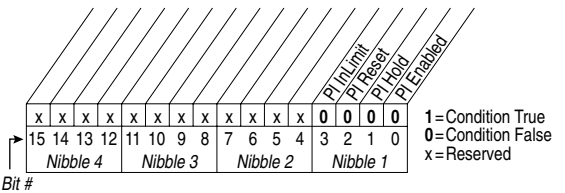
File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Spd Mode & Limits	084 085 086	**[Skip Frequency 1]** **[Skip Frequency 2]** **[Skip Frequency 3]** Sets a frequency at which the drive will not operate.	Default: 0.0 Hz Default: 0.0 Hz Default: 0.0 Hz Min/Max: –/+500.0 Hz Units: 0.1 Hz	087
		087	**[Skip Freq Band]** Determines the bandwidth around a skip frequency. [Skip Freq Band] is split, applying 1/2 above and 1/2 below the actual skip frequency. The same bandwidth applies to all skip frequencies.	Default: 0.0 Hz Min/Max: 0.0/30.0 Hz Units: 0.1 Hz	084
		088 FV	E C v2 **[Speed/Torque Mod]** Selects the torque reference source. "Zero Torque" (0) - torque command = 0. "Speed Reg" (1) - drive operates as a speed regulator. "Torque Reg" (2) - an external torque reference is used for the torque command. "Min Torq/Spd" (3) - selects the smallest algebraic value to regulate to when the torque reference and torque generated from the speed regulator are compared. "Max Torq/Spd" (4) - selects the largest algebraic value when the torque reference and the torque generated from the speed regulator are compared. "Sum Torq/Spd" (5) - selects the sum of the torque reference and the torque generated from the speed regulator. **ATTENTION:** The speed of the drive could reach [Maximum Speed] + [Overspeed Limit] to meet required torque when any of the torque modes have been selected. Equipment damage and/or personal injury may result.	Default: 1 "Speed Reg" Options: 0 "Zero Torque" 1 "Speed Reg" 2 "Torque Reg" 3 "Min Torq/Spd" 4 "Max Torq/Spd" 5 "Sum Torq/Spd"	053
		454	E C **[Rev Speed Limit]** Sets a limit on speed in the negative direction. A value of zero disables this parameter and uses [Min Speed] for minimum speed.	Default: 0.0 Hz Min/Max: –[Max Speed]/0.0 Hz Units: 0.1 Hz	

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Speed References	090	**[Speed Ref A Sel]** Selects the source of the speed reference to the drive unless [Speed Ref B Sel] or [Preset Speed 1-7] is selected. For more information on selecting a speed reference source, see Figure 1.13 on page 1-19. (1) See Appendix B for DPI port locations. (2) Enhanced Control Drives Only.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2" 3-7 "Reserved" 8 "Encoder" 9 "MOP Level" 10 "Reserved" 11 "Preset Spd1" 12 "Preset Spd2" 13 "Preset Spd3" 14 "Preset Spd4" 15 "Preset Spd5" 16 "Preset Spd6" 17 "Preset Spd7" 18 "DPI Port 1"(1) 19 "DPI Port 2"(1) 20 "DPI Port 3"(1) 21 "Reserved" 22 "DPI Port 5"(1) 23-29 "Reserved" 30 "HighRes Ref"(2)	002 091 thru 093 101 thru 107 117 thru 120 192 thru 194 213 272 273 320 361 thru 366
		091	**[Speed Ref A Hi]** Scales the upper value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	082
		092	**[Speed Ref A Lo]** Scales the lower value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	081
		093	**[Speed Ref B Sel]** See [Speed Ref A Sel].	Default: 11 "Preset Spd1" Options: See [Speed Ref A Sel]	See 090
		094	**[Speed Ref B Hi]** Scales the upper value of the [Speed Ref B Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	093
		095	**[Speed Ref B Lo]** Scales the lower value of the [Speed Ref B Sel] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	090 093

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Speed References	096	**[TB Man Ref Sel]** Sets the manual speed reference source when a digital input is configured for "Auto/Manual." (1) "Analog In 2" is not a valid selection if it was selected for any of the following: - [Trim In Select] - [PI Feedback Sel] - [PI Reference Sel] - [Current Lmt Sel]	Default: 1 "Analog In 1" Options: 1 "Analog In 1" 2 "Analog In 2"(1) 3-8 "Reserved" 9 "MOP Level"	097 098
		097	**[TB Man Ref Hi]** Scales the upper value of the [TB Man Ref Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	096
		098	**[TB Man Ref Lo]** Scales the lower value of the [TB Man Ref Sel] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	096
	Discrete Speeds	100	Standard **[Jog Speed]** Sets the output frequency when a jog command is issued.	Default: 10.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	
			E C **[Jog Speed 1]** Sets the output frequency when Jog Speed 1 is selected.	Default: 10.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	
		101 102 103 104 105 106 107	**[Preset Speed 1]** **[Preset Speed 2]** **[Preset Speed 3]** **[Preset Speed 4]** **[Preset Speed 5]** **[Preset Speed 6]** **[Preset Speed 7]** Provides an internal fixed speed command value. In bipolar mode direction is commanded by the sign of the reference.	Default: 5.0 Hz 10.0 Hz 20.0 Hz 30.0 Hz 40.0 Hz 50.0 Hz 60.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	090 093
		108	E C **[Jog Speed 2]** Sets the output frequency when Jog Speed 2 is selected.	Default: 10.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Speed Trim	116	EC **[Trim % Setpoint]** Adds or subtracts a percentage of the speed reference or maximum speed. Dependent on the setting of [Trim Out Select], parameter 118.	Default: 0.00% Min/Max: –/+200.00% Units: 0.01%	090 093
		117	**[Trim In Select]** Specifies which analog input signal is being used as a trim input.	Default: 2 "Analog In 2" Options: See [Speed Ref A Sel]	090 093
		118	**[Trim Out Select]** Specifies which speed references are to be trimmed.  *Factory Default Bit Values* * *Enhanced Control Option Only.*	117 119 120
		119	**[Trim Hi]** Scales the upper value of the [Trim In Select] selection when the source is an analog input.	Default: 60.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 % EC	082 117
		120	**[Trim Lo]** Scales the lower value of the [Trim In Select] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 % EC	117
	Slip Comp		**Important:** Parameters in the Slip Comp Group are used to enable and tune the Slip Compensation Regulator. In order to allow the Slip Compensation Regulator to control drive operation, parameter 080 must be set to 1 "Slip Comp".		
		121	**[Slip RPM @ FLA]** Sets the amount of compensation to drive output at motor FLA. If the value of parameter 061 [Autotune] = 3 "Calculate" changes made to this parameter will not be accepted.	Default: Based on [Motor NP RPM] Min/Max: 0.0/1200.0 RPM Units: 0.1 RPM	061 080 122 123
		122	**[Slip Comp Gain]** Sets the response time of slip compensation.	Default: 40.0 Min/Max: 1.0/100.0 Units: 0.1	080 121 122
		123	**[Slip RPM Meter]** Displays the present amount of adjustment being applied as slip compensation.	Default: Read Only Min/Max: 0.0/300.0 RPM –/+300.0 RPM EC Units: 0.1 RPM	080 121 122

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Process PI		**Important:** Parameters in the Process PI Group are used to enable and tune the PI Loop. Standard To allow the PI Loop to control drive operation, parameter 080 must be set to 2 "Process PI".		
		124	**[PI Configuration]** Sets configuration of the PI regulator.  *Factory Default Bit Values* (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.*		124 thru 138
		125	**[PI Control]** Controls the PI regulator.  *Factory Default Bit Values*		080
		126	**[PI Reference Sel]** Selects the source of the PI reference. (1) Enhanced Control Drives Only.	Default: 0 "PI Setpoint" Options: 0 "PI Setpoint" 1 "Analog In 1" 2 "Analog In 2" 3-7 "Reserved" 8 "Encoder" 9 "MOP Level" 10 "Master Ref" 11-17 "Preset Spd1-7" 18-20 "DPI Port 1-3" 21 "Reserved" 22 "DPI Port 5" 23-29 "Reserved" 30 "HighRes Ref"(1)	124 thru 138
		127	**[PI Setpoint]** Provides an internal fixed value for process setpoint when [PI Reference Sel] is set to "PI Setpoint."	Default: 50.00% Min/Max: –/+100.00% of Maximum Process Value Units: 0.01%	124 thru 138

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Process PI	128	**[PI Feedback Sel]** Selects the source of the PI feedback.	Default: 2 "Analog In 2" Options: See [PI Reference Sel].	124 thru 138
		129	**[PI Integral Time]** Time required for the integral component to reach 100% of [PI Error Meter]. Not functional when the PI Hold bit of [PI Control] = "1" (enabled). A value of zero disables this parameter	Default: 2.00 Secs Min/Max: 0.00/100.00 Secs Units: 0.01 Secs	124 thru 138
		130	**[PI Prop Gain]** Sets the value for the PI proportional component. PI Error × PI Prop Gain = PI Output	Default: 1.00 Min/Max: 0.00/100.00 Units: 0.01	124 thru 138
		131	**[PI Lower Limit]** Sets the lower limit of the PI output.	Default: –[Maximum Freq] –100% EC Min/Max: –/+400.0 Hz –/+800% EC Units: 0.1 Hz 0.1% EC	124 thru 138
		132	**[PI Upper Limit]** Sets the upper limit of the PI output.	Default: +[Maximum Freq] 100% EC Min/Max: –/+400.0 Hz –/+800.0% EC Units: 0.1 Hz 0.1% EC	124 thru 138
		133	**[PI Preload]** Sets the value used to preload the integral component on start or enable.	Default: 0.0 Hz 100.0% EC Min/Max: [PI Lower Limit]/ [PI Upper Limit Units: 0.1 Hz 0.1% EC	124 thru 138
		134	**[PI Status]** Status of the Process PI regulator.  	Read Only	124 thru 138
		135	**[PI Ref Meter]** Present value of the PI reference signal.	Default: Read Only Min/Max: –/+100.00% Units: 0.01%	124 thru 138

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Process PI	136	**[PI Fdback Meter]** Present value of the PI feedback signal.	Default: Read Only Min/Max: –/+100.00% Units: 0.01%	124 thru 138
		137	**[PI Error Meter]** Present value of the PI error.	Default: Read Only Min/Max: –/+100.00% Units: 0.01%	124 thru 138
		138	**[PI Output Meter]** Present value of the PI output.	Default: Read Only Min/Max: –/+100.0 Hz –/+800.0% EC Units: 0.1 Hz 0.1% EC	124 thru 138
		139	EC v2 **[PI BW Filter]** *Firmware 2.001 & later* – Provides filter for Process PI error signal. The output of this filter is displayed in [PI Error Meter]. Zero will disable the filter.	Default: 0.0 R/s Min/Max: 0.0/240.0 R/s Units: 0.1 R/s	137
		459	EC v2 **[PI Deriv Time]** Refer to formula below: $PI_{Out} = KD\ (Sec) \times \frac{d_{PI\ Error}\ (\%)}{d_t\ (Sec)}$	Default: 0.00 Secs Min/Max: 0.00/100.00 Secs Units: 0.01 Secs	
		460	EC **[PI Reference Hi]** Scales the upper value of [PI Reference Sel] of the source.	Default: 100.0% Min/Max: –/+100.0% Units: 0.1%	
		461	EC **[PI Reference Lo]** Scales the lower value of [PI Reference Sel] of the source.	Default: –100.0% Min/Max: –/+100.0% Units: 0.1%	
		462	EC **[PI Feedback Hi]** Scales the upper value of [PI Feedback] of the source.	Default: 100.0% Min/Max: –/+100.0% Units: 0.1%	
		463	EC **[PI Feedback Lo]** Scales the lower value of [PI Feedback] of the source.	Default: 0.0% Min/Max: –/+100.0% Units: 0.1%	
	Speed Regulator	445	EC v2 **[Ki Speed Loop]** FV Controls the integral error gain of the speed regulator. The drive automatically adjusts [Ki Speed Loop] when a non-zero value is entered for [Speed Desired BW] or an autotune is performed. Typically, manual adjustment of this parameter is needed only if system inertia cannot be determined through an autotune. [Speed Desired BW] is set to "0" when a manual adjustment is made to this parameter.	Default: 7.8 Min/Max: 0.0/4000.0 Units: 0.1	053

File C	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND (File C)	Speed Regulator	446 FV	E C v2 **[Kp Speed Loop]** Controls the proportional error gain of the speed regulator. The drive automatically adjusts [Kp Speed Loop] when a non-zero value is entered for [Speed Desired BW] or an auto-tune is performed. Typically, manual adjustment of this parameter is needed only if system inertia cannot be determined through an autotune. [Speed Desired BW] is set to "0" when a manual adjustment is made to this parameter.	Default: 6.3 Min/Max: 0.0/200.0 Units: 0.1	053
		447 FV	E C v2 **[Kf Speed Loop]** Controls the feed forward gain of the speed regulator. Setting the Kf gain greater than zero reduces speed feedback overshoot in response to a step change in speed reference.	Default: 0.0 Min/Max: 0.0/0.5 Units: 0.1	053
		448 FV	E C v3 **[Spd Err Filt BW]** Sets the bandwidth of a speed error filter used in FVC Vector mode. A setting of 0.0 disables the filter.	Default: 200.0 R/s Min/Max: 0.0/2000.0 R/s Units: 0.1 R/s	053
		449 FV	E C v2 **[Speed Desired BW]** Sets the speed loop bandwidth and determines the dynamic behavior of the speed loop. As bandwidth increases, the speed loop becomes more responsive and can track a faster changing speed reference. Adjusting this parameter will cause the drive to calculate and change [Ki Speed Loop] and [Kp Speed Loop] gains.	Default: 0.0 Radians/Sec Min/Max: 0.0/250.0 Radians/Sec Units: 0.1 Radians/Sec	053
		450 FV	E C v2 **[Total Inertia]** Represents the time in seconds, for a motor coupled to a load to accelerate from zero to base speed, at rated motor torque. The drive calculates Total Inertia during the autotune inertia procedure. Adjusting this parameter will cause the drive to calculate and change [Ki Speed Loop] and [Kp Speed Loop] gains.	Default: 0.10 Secs Min/Max: 0.01/600.0 Secs Units: 0.01 Secs	053
		451 FV	E C v2 **[Speed Loop Meter]** Value of the speed regulator output. When in FVC mode, units are in percent.	Default: Read Only Min/Max: –/+800.0%/Hz Units: 0.1%/Hz	053 121

Dynamic Control File (File D)

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Ramp Rates	140 141	**[Accel Time 1]** **[Accel Time 2]** Sets the rate of accel for all speed increases. $\frac{\text{Max Speed}}{\text{Accel Time}}$ = Accel Rate	Default: 10.0 Secs 10.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	142 143 146 361 thru 366
		142 143	**[Decel Time 1]** **[Decel Time 2]** Sets the rate of decel for all speed decreases. $\frac{\text{Max Speed}}{\text{Decel Time}}$ = Decel Rate	Default: 10.0 Secs 10.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	140 141 146 361 thru 366
		146	**[S Curve %]** Sets the percentage of accel or decel time that is applied to the ramp as S Curve. Time is added, 1/2 at the beginning and 1/2 at the end of the ramp.	Default: 0.0% Min/Max: 0.0/100.0% Units: 0.1%	140 thru 143
	Load Limits	147	**[Current Lmt Sel]** Selects the source for the adjustment of current limit (i.e. parameter, analog input, etc.).	Default: 0 "Cur Lim Val" Options: 0 "Cur Lim Val" 1 "Analog In 1" 2 "Analog In 2"	146 149
		148	**[Current Lmt Val]** Defines the current limit value when [Current Lmt Sel] = "Cur Lim Val."	Default: [Rated Amps] × 1.5 (Equation approximates default value.) Min/Max: Drive Rating Based Units: 0.1 Amps	147 149
		149	**[Current Lmt Gain]** Sets the responsiveness of the current limit.	Default: 250 Min/Max: 0/5000 Units: 1	147 148
		150	**[Drive OL Mode]** Selects the drive's response to increasing drive temperature.	Default: 3 "Both–PWM 1st" Options: 0 "Disabled" 1 "Reduce CLim" 2 "Reduce PWM" 3 "Both–PWM 1st"	219
		151	**[PWM Frequency]** Sets the carrier frequency for the PWM output. Drive derating may occur at higher carrier frequencies. For derating information, refer to the *PowerFlex Reference Manual*, publication PFLEX-RM001….	Default: 4 kHz Min/Max: 2, 3, 4, 5, 6, 7, 8, 9, 10 kHz 2, 4, 8, 12 kHz EC Units: 1 kHz	

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Load Limits	152	E C v2 **[Droop RPM @ FLA]** Selects amount of droop that the speed reference is reduced when at full load torque. Zero disables the droop function. Setting parameter 080 to 0 is recommended when using the Droop function.	Default: 0.0 RPM Min/Max: 0.0/200.0 RPM Units: 0.1 RPM	
		153	E C v2 **[Regen Power Lim]** FV Sets the maximum power limit allowed to transfer from the motor to the DC bus. When using an external dynamic brake, set this parameter to its maximum value.	Default: –50.0% Min/Max: –800.0/0.0% Units: 0.1%	053
		154	E C v2 **[Current Rate Lim]** FV Sets the largest allowable rate of change for the current reference signal. This number is scaled in percent of maximum motor current every 250 microseconds.	Default: 400.0% Min/Max: 1.0/800.0% Units: 0.1%	053
		189	E C **[Shear Pin Time]** Sets the time that the drive is at or above current limit before a fault occurs. Zero disables this feature.	Default: 0.0 Secs Min/Max: 0.0/30.0 Secs Units: 0.1 Secs	
	Stop/Brake Modes	145	E C **[DB While Stopped]** Enables/disables dynamic brake operation. Disabled = DB will only operate when drive is running. Enable = DB operates whenever drive is energized.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
		155 156	Standard **[Stop Mode A]** Standard **[Stop Mode B]** Active stop mode. [Stop Mode A] is active unless [Stop Mode B] is selected by digital inputs programmed for "Stop Mode B." (1) When using options 1 or 2, refer to the Attention statements at [DC Brake Level].	Default: 1 "Ramp" Default: 0 "Coast" Options: 0 "Coast" 1 "Ramp"(1) 2 "Ramp to Hold"(1) 3 "DC Brake"	157 158 159 361 thru 366
			E C v2 **[Stop/Brk Mode A]** E C v2 **[Stop/Brk Mode B]** See description above.	Default: 1 "Ramp" Default: 0 "Coast" Options: 0 "Coast" 1 "Ramp"(1) 2 "Ramp to Hold"(1) 3 "DC Brake" 4 "Fast Brake" E C v3	
		157	**[DC Brake Lvl Sel]** Selects the source for [DC Brake Level].	Default: 0 "DC Brake Lvl" Options: 0 "DC Brake Lvl" 1 "Analog In 1" 2 "Analog In 2"	155 156 158 159

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Stop/Brake Modes	158	**[DC Brake Level]** Defines the DC brake current level injected into the motor when "DC Brake" is selected as a stop mode. The DC braking voltage used in this function is created by a PWM algorithm and may not generate the smooth holding force needed for some applications. Refer to the *PowerFlex Reference Manual*, publication PFLEX-RM001…. **Important:** Frame E drives may be limited to less than 150% depending on the setting of parameter 151 [PWM Frequency].	Default: [Rated Amps] Min/Max: 0/[Rated Amps] × 1.5 (Equation yields approximate maximum value.) Units: 0.1 Amps	
			ATTENTION: If a hazard of injury due to movement of equipment or material exists, an auxiliary mechanical braking device must be used. **ATTENTION:** This feature should not be used with synchronous or permanent magnet motors. Motors may be demagnetized during braking.		
		159	**[DC Brake Time]** Sets the amount of time DC brake current is "injected" into the motor.	Default: 0.0 Secs Min/Max: 0.0/90.0 Secs Units: 0.1 Secs	155 thru 158
		160	Standard **[Bus Reg Gain]** E C **[Bus Reg Ki]** Sets the responsiveness of the bus regulator.	Default: 450 Min/Max: 0/5000 Units: 1	161 162
		161 162	**[Bus Reg Mode A]** **[Bus Reg Mode B]** Active bus regulation mode. Choices are dynamic brake, frequency adjust or both. Sequence is determined by programmed value or digital input programmed for "Bus Reg Md B." Dynamic Brake Setup If a dynamic brake resistor is connected to the drive, both these parameters must be set to either option 2, 3 or 4. Refer to the Attention statement on page P-4 for important information on bus regulation.	Default: 1 "Adjust Freq" 4 "Both-Frq 1st" Options: 0 "Disabled" 1 "Adjust Freq" 2 "Dynamic Brak" 3 "Both-DB 1st" 4 "Both-Frq 1st"	160 163 361 thru 366
			ATTENTION: The drive does not offer protection for externally mounted brake resistors. A risk of fire exists if external braking resistors are not protected. External resistor packages must be self-protected from over temperature or the protective circuit shown in Figure C.1 on page C-1 (or equivalent) must be supplied.		

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Stop/Brake Modes	163	**[DB Resistor Type]** Selects whether the internal or an external DB resistor will be used. If a dynamic brake resistor is connected to the drive, [Bus Reg Mode x], A, B or Both (if used), must be set to either option 2, 3 or 4. **ATTENTION:** The drive does not offer protection for externally mounted brake resistors. A risk of fire exists if external braking resistors are not protected. External resistor packages must be self-protected from over temperature or the protective circuit shown in Figure C.1 on page C-1, or equivalent, must be supplied. **ATTENTION:** Equipment damage may result if a drive mounted (internal) resistor is installed and this parameter is set to "External Res." Thermal protection for the internal resistor will be disabled, resulting in possible device damage.	Default: 0 "Internal Res" 2 "None" E C Options: 0 "Internal Res" 1 "External Res" 2 "None"	161 162
		164	E C **[Bus Reg Kp]** Proportional gain for the bus regulator. Used to adjust regulator response.	Default: 1500 Min/Max: 0/10000 Units: 1	
		165	E C **[Bus Reg Kd]** Derivative gain for the bus regulator. Used to control regulator overshoot.	Default: 1000 Min/Max: 0/10000 Units: 1	
		166	E C v2 **[Flux Braking]** Set to use an increase in the motor flux current to increase the motor losses, and allow a faster deceleration time when a chopper brake or regenerative capability is not available. Can be used as a stopping or fast deceleration method.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Restart Modes	167	E C **[Powerup Delay]** Defines the programmed delay time, in seconds, before a start command is accepted after a power up.	Default: 0.0 Secs Min/Max: 0.0/30.0 Secs Units: 0.1 Secs	
		168	**[Start At PowerUp]** Enables/disables a feature to issue a Start or Run command and automatically resume running at commanded speed after drive input power is restored. Requires a digital input configured for Run or Start and a valid start contact. **ATTENTION:** Equipment damage and/or personal injury may result if this parameter is used in an inappropriate application. Do not use this function without considering applicable local, national and international codes, standards, regulations or industry guidelines.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
		169	**[Flying Start En]** Enables/disables the function which reconnects to a spinning motor at actual RPM when a start command is issued.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	170
		170	**[Flying StartGain]** Sets the response of the flying start function.	Default: 4000 Min/Max: 20/32767 Units: 1	169
		174	**[Auto Rstrt Tries]** Sets the maximum number of times the drive attempts to reset a fault and restart. **ATTENTION:** Equipment damage and/or personal injury may result if this parameter is used in an inappropriate application. Do not use this function without considering applicable local, national and international codes, standards, regulations or industry guidelines.	Default: 0 Min/Max: 0/9 Units: 1	175
		175	**[Auto Rstrt Delay]** Sets the time between restart attempts when [Auto Rstrt Tries] is set to a value other than zero.	Default: 1.0 Secs Min/Max: 0.5/30.0 Secs Units: 0.1 Secs	174

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Restart Modes	178	E C v2 **[Sleep Wake Mode]** Enables/disables the Sleep/Wake function. **Important:** When enabled, the following conditions must be met: • A proper value must be programmed for [Sleep Level] & [Wake Level]. • A speed reference must be selected in [Speed Ref A Sel]. • At least one of the following must be programmed (and input closed) in [Digital Inx Sel]; "Enable," "Stop=CF," "Run," "Run Forward," "Run Reverse."	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Direct" (Enabled) 2 "Invert" (Enabled)(7)	

ATTENTION: Enabling the Sleep-Wake function can cause unexpected machine operation during the Wake mode. Equipment damage and/or personal injury can result if this parameter is used in an inappropriate application. Do Not use this function without considering the information below and in Appendix C. In addition, all applicable local, national & international codes, standards, regulations or industry guidelines must be considered

Conditions Required to Start Drive(1)(2)(3)

Input	After Power-Up	After a Drive Fault		After a Stop Command
		Reset by Stop-CF, HIM or TB	*Reset by Clear Faults (TB)*	*HIM or TB*
Stop	Stop Closed Wake Signal	Stop Closed Wake Signal New Start or Run Cmd.(4)	Stop Closed Wake Signal	Stop Closed Direct Mode Analog Sig. > Sleep Level(6) Invert Mode Analog Sig. < Sleep Level(6) New Start or Run Cmd.(4)
Enable	Enable Closed Wake Signal(4)	Enable Closed Wake Signal New Start or Run Cmd.(4)	Enable Closed Wake Signal	Enable Closed Direct Mode Analog Sig. > Sleep Level(6) Invert Mode Analog Sig. < Sleep Level(6) New Start or Run Cmd.(4)
Run Run For. Run Rev.	Run Closed Wake Signal	New Run Cmd.(5) Wake Signal	Run Closed Wake Signal	New Run Cmd.(5) Wake Signal

(1) When power is cycled, if all of the above conditions are present after power is restored, restart will occur.

(2) If all of the above conditions are present when [Sleep-Wake Mode] is "enabled," the drive will start.

(3) The active speed reference is determined as explained in Speed Reference Control on page 1-19. The Sleep/Wake function and the speed reference may be assigned to the same input.

(4) Command must be issued from HIM, TB or network.

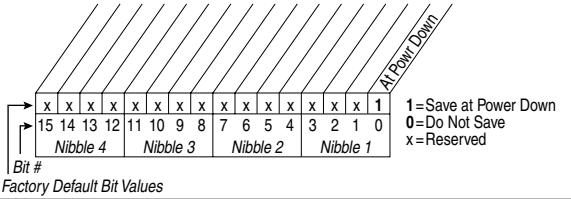
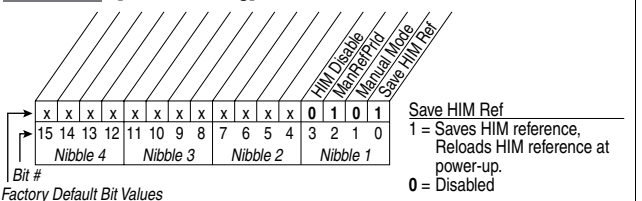
(5) Run Command must be cycled.

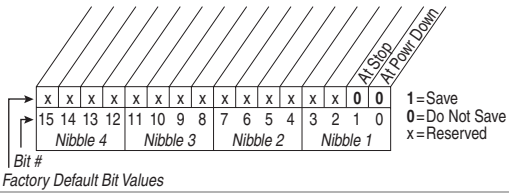
(6) Signal does not need to be greater than wake level.

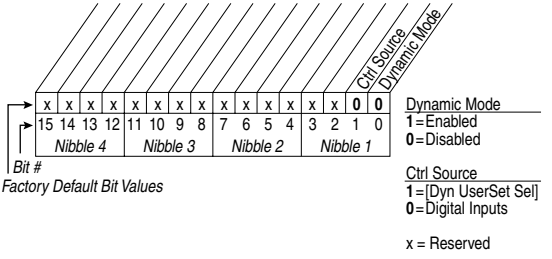
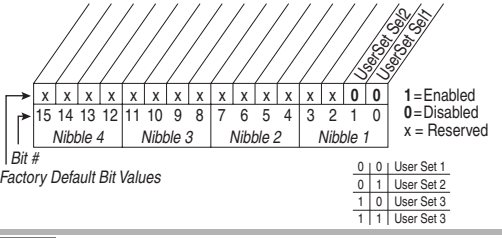
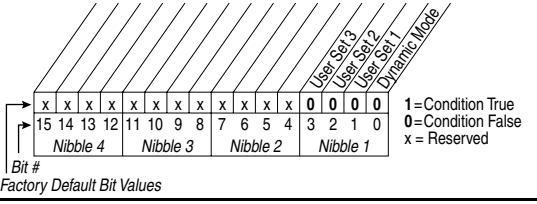
(7) Enhanced firmware 2.001 & later. For Invert function, refer to [Analog In x Loss].

File D	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (File D)	Restart Modes	179	E C v2 **[Sleep Wake Ref]** Selects the source of the input controlling the Sleep-Wake function.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2"	
		180	E C v2 **[Wake Level]** Defines the analog input level that will start the drive.	Default: 6.000 mA, 6.000 Volts Min/Max: [Sleep Level]/20.000 mA [Sleep Level]/10.000 Volts Units: 0.001 mA 0.001 Volts	181
		181	E C v2 **[Wake Time]** Defines the amount of time at or above [Wake Level] before a Start is issued.	Default: 1.0 Secs Min/Max: 0.0/1000.0 Secs Units: 0.1 Secs	180
		182	E C v2 **[Sleep Level]** Defines the analog input level that will stop the drive.	Default: 5.000 mA, 5.000 Volts Min/Max: 4.000 mA/[Wake Level] 0.000 Volts/[Wake Level] Units: 0.001 mA 0.001 Volts	183
		183	E C v2 **[Sleep Time]** Defines the amount of time at or below [Sleep Level] before a Stop is issued.	Default: 1.0 Secs Min/Max: 0.0/1000.0 Secs Units: 0.1 Secs	182
	Power Loss	177	E C v2 **[Gnd Warn Level]** Sets the level at which a ground warning fault will occur. Configure with [Alarm Config 1].	Default: 3.0 Amps Min/Max: 1.0/5.0 Amps Units: 0.1 Amps	259
		184	**[Power Loss Mode]** Sets the reaction to a loss of input power. Power loss is recognized when: • DC bus voltage is ≤ 73% of [DC Bus Memory] and [Power Loss Mode] is set to "Coast". • DC bus voltage is ≤ 82% of [DC Bus Memory] and [Power Loss Mode] is set to "Decel".	Default: 0 "Coast" Options: 0 "Coast" 1 "Decel" 2 "Continue" E C	013 185
		185	**[Power Loss Time]** Sets the time that the drive will remain in power loss mode before a fault is issued.	Default: 0.5 Secs Min/Max: 0.0/60.0 Secs Units: 0.1 Secs	184
		187	E C v2 **[Load Loss Level]** Sets the percentage of motor nameplate torque at which a load loss alarm will occur.	Default: 200.0% Min/Max: 0.0/800.0% Units: 0.1%	211 259
		188	E C v2 **[Load Loss Time]** Sets the time that current is below the level set in [Load Loss Level] before a fault occurs.	Default: 0.0 Secs Min/Max: 0.0/300.0 Secs Units: 0.1 Secs	187

Utility File (File E)

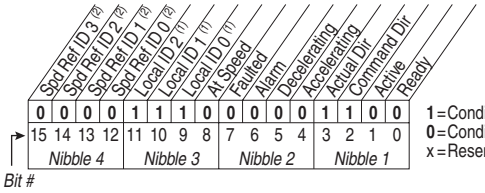
File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Direction Config	190	**[Direction Mode]** Selects the method for changing drive direction. **Mode** / **Direction Change** Unipolar / Drive Logic Bipolar / Sign of Reference Reverse Dis / Not Changable	Default: 0 "Unipolar" Options: 0 "Unipolar" 1 "Bipolar" 2 "Reverse Dis"	320 thru 327 361 thru 366
	HIM Ref Config	192	**Standard** **[Save HIM Ref]** Enables a feature to save the present frequency reference value issued by the HIM to Drive memory on power loss. Value is restored to the HIM on power up.  *Factory Default Bit Values*		
			E C **[AutoMan Cnfg]**  *Factory Default Bit Values* Save HIM Ref 1 = Saves HIM reference, Reloads HIM reference at power-up. **0** = Disabled Manual Mode **1** = HIM has exclusive Start & Jog control in Manual mode. **0** = Disabled ManRefPrld **1** = Preloads auto reference into HIM upon Auto to Manual transition. **0** = Disabled HIM Disable **1** = HIM does not start drive. **0** = HIM starts drive x = Reserved		
		193	**Standard** **[Man Ref Preload]** Enables/disables a feature to automatically load the present "Auto" frequency reference value into the HIM when "Manual" is selected. Allows smooth speed transition from "Auto" to "Manual."	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	MOP Config	194	**[Save MOP Ref]** Enables/disables the feature that saves the present MOP frequency reference at power down or at stop.  *Factory Default Bit Values*		
		195	**[MOP Rate]** Sets rate of change of the MOP reference in response to a digital input.	Default: 1.0 Hz/s Min/Max: 0.2/[Maximum Freq] Units: 0.1 Hz/s	
	Drive Memory	196	**[Param Access Lvl]** Selects the parameter display level. Basic = Reduced param. set Advanced = Full param. set	Default: 0 "Basic" Options: 0 "Basic" 1 "Advanced" 2 "Reserved" EC	
		197	**[Reset To Defalts]** Resets all parameter values (except parameters 196, 201 & 202) to defaults. Option 1 resets drive to factory settings. Options 2 and 3 will reset drive to alternate voltage and current rating.	Default: 0 "Ready" Options: 0 "Ready" 1 "Factory" 2 "Low Voltage" 3 "High Voltage"	
		198	**[Load Frm Usr Set]** Loads a previously saved set of parameter values from a selected user set location in drive nonvolatile memory to active drive memory.	Default: 0 "Ready" Options: 0 "Ready" 1 "User Set 1" 2 "User Set 2" 3 "User Set 3"	199
		199	**[Save To User Set]** Saves the parameter values in active drive memory to a user set in drive nonvolatile memory.	Default: 0 "Ready" Options: 0 "Ready" 1 "User Set 1" 2 "User Set 2" 3 "User Set 3"	198
		200	**[Reset Meters]** Resets selected meters to zero.	Default: 0 "Ready" Options: 0 "Ready" 1 "MWh" 2 "Elapsed Time"	
		201	**[Language]** Selects the display language when using an LCD HIM. This parameter is not functional with an LED HIM.	Default: 0 "Not Selected" Options: 0 "Not Selected" 1 "English" 2 "Français" 3 "Español" 4 "Italiano" 5 "Deutsch" 6 "Reserved" 7 "Português" 8-9 "Reserved" 10 "Nederlands"	

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Drive Memory	202	**[Voltage Class]** Configures the drive current rating and associates it with the selected voltage (i.e. 400 or 480V). This parameter is normally used when downloading parameter sets.	Default: Based on Drive Cat. No. Options: 2 "Low Voltage" 3 "High Voltage"	
		203	**[Drive Checksum]** Provides a checksum value that indicates whether or not a change in drive programming has occurred.	Default: Read Only Min/Max: 0/65535 Units: 1	
		204	E C v2 **[Dyn UsrSet Cnfg]** Enables/Disables dynamic selection of user parameter sets. **Important:** In dynamic mode, changes to the parameters are not saved to nonvolatile storage. Switching user sets restores the values last saved before enabling dynamic mode.  	
		205	E C v2 **[Dyn UsrSet Sel]** Selects user set if [Dyn UsrSet Cnfg] = xxx xx11.  	
		206	E C v2 **[Dyn UserSet Actv]** Read Only Indicates the active user set and if the operation is dynamic or normal.  	

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	209	**[Drive Status 1]**	Read Only	210

Present operating condition of the drive.

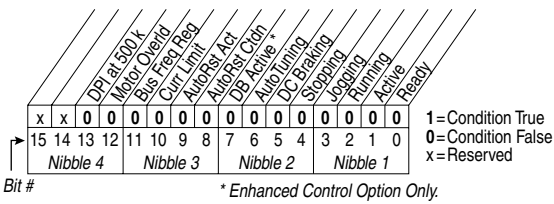


Bits (2)				
15	14	13	12	Description
0	0	0	0	Ref A Auto
0	0	0	1	Ref B Auto
0	0	1	0	Preset 2 Auto
0	0	1	1	Preset 3 Auto
0	1	0	0	Preset 4 Auto
0	1	0	1	Preset 5 Auto
0	1	1	0	Preset 6 Auto
0	1	1	1	Preset 7 Auto
1	0	0	0	TB Manual
1	0	0	1	Port 1 Manual
1	0	1	0	Port 2 Manual
1	0	1	1	Port 3 Manual
1	1	0	0	Port 4 Manual
1	1	0	1	Port 5 Manual
1	1	1	0	Port 6 Manual
1	1	1	1	Jog Ref

Bits (1)			
11	10	9	Description
0	0	0	Port 0 (TB)
0	0	1	Port 1
0	1	0	Port 2
0	1	1	Port 3
1	0	0	Port 4
1	0	1	Port 5
1	1	0	Port 6
1	1	1	No Local Control

210	**[Drive Status 2]**													Read Only		209

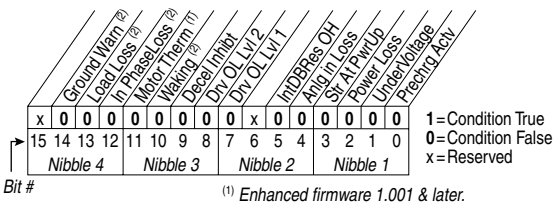
Present operating condition of the drive.



* *Enhanced Control Option Only.*

211	**[Drive Alarm 1]**													Read Only		212

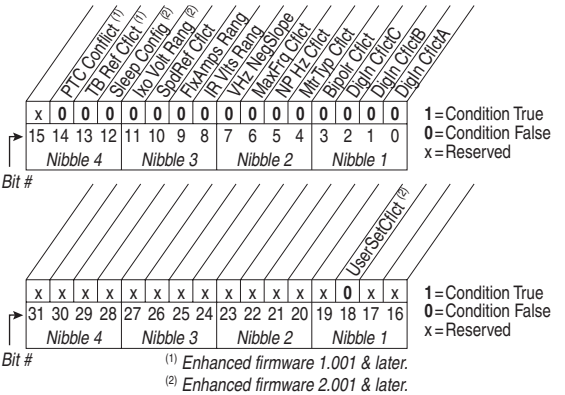
Alarm conditions that currently exist in the drive.



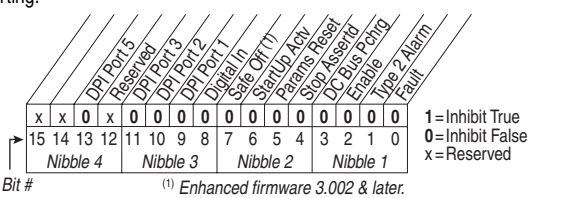
(1) *Enhanced firmware 1.001 & later.*

(2) *Enhanced firmware 2.001 & later.*

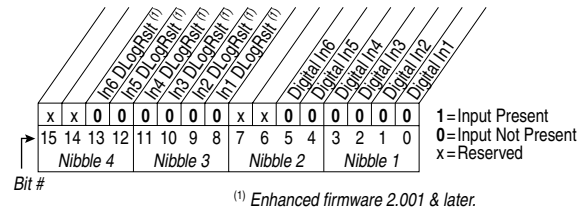
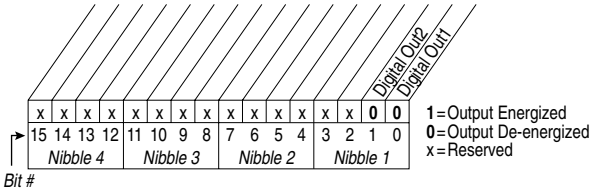
File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	212	**[Drive Alarm 2]** Alarm conditions that currently exist in the drive.	Read Only	211
		213	**[Speed Ref Source]** Displays the source of the speed reference to the drive. (1) Enhanced Control Drives Only.	Default: Read Only Options: 0 "PI Output" 1 "Analog In 1" 2 "Analog In 2" 3-7 "Reserved" 8 "Encoder" 9 "MOP Level" 10 "Reserved" 11 "Preset Spd1" 12 "Preset Spd2" 13 "Preset Spd3" 14 "Preset Spd4" 15 "Preset Spd5" 16 "Preset Spd6" 17 "Preset Spd7" 18 "DPI Port 1" 19 "DPI Port 2" 20 "DPI Port 3" 21 "Reserved" 22 "DPI Port 5" 23-29 "Reserved" 30 "HighRes Ref"(1)	090 093 096 101
		214	**[Start Inhibits]** Displays the inputs currently preventing the drive from starting.	Read Only	

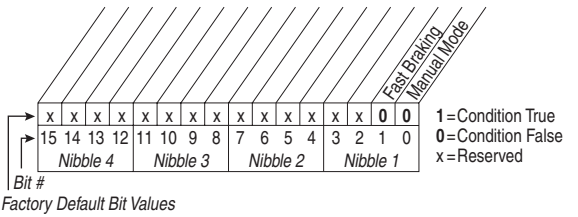
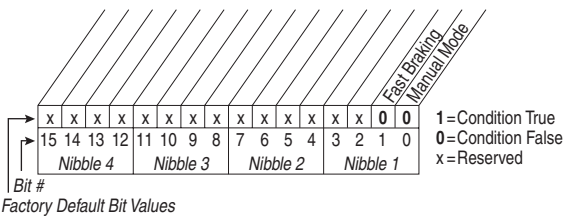


(1) *Enhanced firmware 1.001 & later.*
(2) *Enhanced firmware 2.001 & later.*

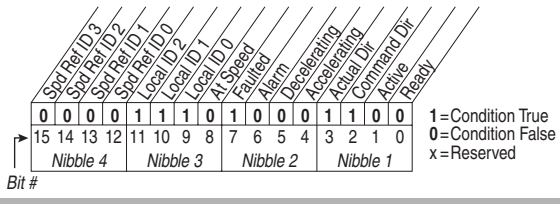


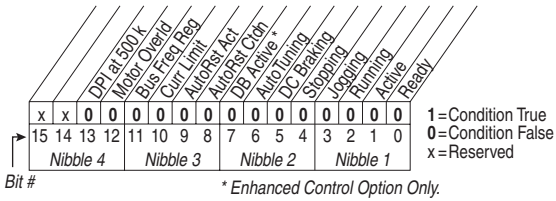
(1) *Enhanced firmware 3.002 & later.*

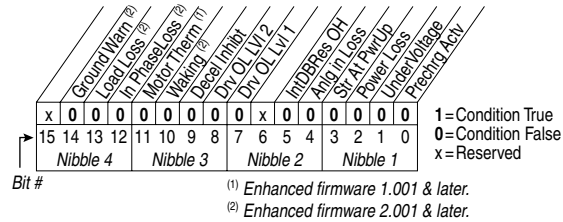
File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	215	**[Last Stop Source]** Displays the source that initiated the most recent stop sequence. It will be cleared (set to 0) during the next start sequence.	Default: Read Only Options: 0 "Pwr Removed" 1 "DPI Port 1" 2 "DPI Port 2" 3 "DPI Port 3" 4 "Reserved" 5 "DPI Port 5" 6 "Reserved" 7 "Digital In" 8 "Fault" 9 "Not Enabled" 10 "Sleep" 11 "Jog" 12 "Autotune" EC 13 "Precharge" EC 14 "Safe Off" EC v3	361 362 363 364 365 366
		216	**[Dig In Status]** Status of the digital inputs.  (1) *Enhanced firmware 2.001 & later.*	Read Only	361 thru 366 411
		217	**[Dig Out Status]** Status of the digital outputs.  	Read Only	380 thru 384
		218	**[Drive Temp]** Present operating temperature of the drive power section.	Default: Read Only Min/Max: –/+100 degC 0.0/100.0% EC Units: 1.0 degC 0.1% EC	

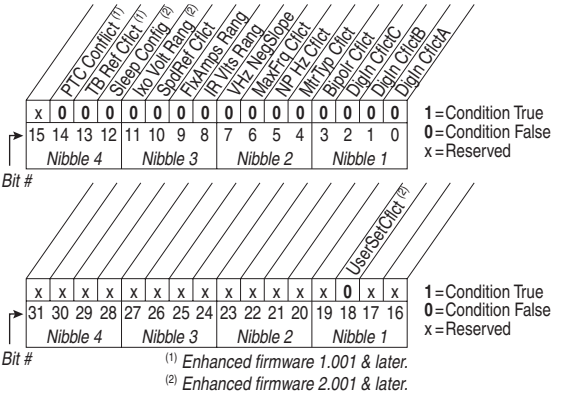
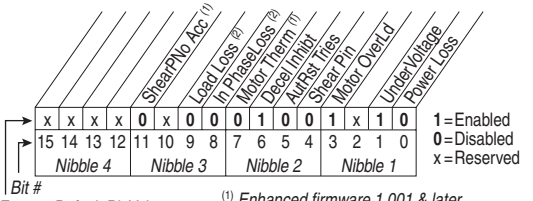
File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	219	**[Drive OL Count]** Accumulated percentage of drive overload. Continuously operating the drive over 100% of its rating will increase this value to 100% and cause a drive fault or foldback depending on the setting of [Drive OL Mode].	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	150
		220	**[Motor OL Count]** Accumulated percentage of motor overload. Continuously operating the motor over 100% of the motor overload setting will increase this value to 100% and cause a drive fault.	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	047 048
		221	E C v3 **[Mtr OL Trip Time]** Amount of time before a drive Overload fault(F64) occurs if the load condition remains constant. A value of 99999 means that the drive is operating under the overload level.	Default: Read Only Min/Max: 0/99999 Units: 1	220
		222	E C v3 **[Drive Status 3]** Present operating condition of the drive. Manual Mode - See *Manual Speed Sources* on page 1-19. Fast Braking - Fast Braking is active, see [Stop/Brk Mode A] on page 3-30.  *Factory Default Bit Values*	Read Only	
		223	E C v3 **[Status 3 @ Fault]** Captures and displays [Drive Status 3] bit pattern at the time of the last fault.  *Factory Default Bit Values*	Read Only	

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	224	**[Fault Frequency]** Captures and displays the output speed of the drive at the time of the last fault.	Default: Read Only Min/Max: 0.0/+[Maximum Freq] Units: 0.1 Hz	225 thru 230
		225	**[Fault Amps]** Captures and displays motor amps at the time of the last fault.	Default: Read Only Min/Max: 0.0/[Rated Amps] × 2 Units: 0.1 Amps	224 thru 230
		226	**[Fault Bus Volts]** Captures and displays the DC bus voltage of the drive at the time of the last fault.	Default: Read Only Min/Max: 0.0/Max Bus Volts Units: 0.1 VDC	224 thru 230
		227	**[Status 1 @ Fault]** Captures and displays [Drive Status 1] bit pattern at the time of the last fault.	Read Only	209 224 thru 230
		228	**[Status 2 @ Fault]** Captures and displays [Drive Status 2] bit pattern at the time of the last fault.	Read Only	210 224 thru 230
		229	**[Alarm 1 @ Fault]** Captures and displays [Drive Alarm 1] at the time of the last fault.	Read Only	211 224 thru 230



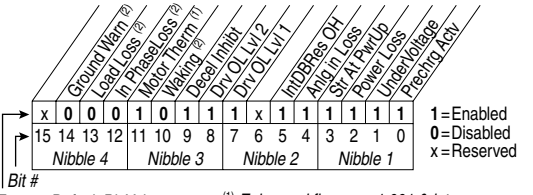




File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Diagnostics	230	**[Alarm 2 @ Fault]** Captures and displays [Drive Alarm 2] at the time of the last fault.  (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.*	Read Only	212 224 thru 230
		234 236	**[Testpoint 1 Sel]** **[Testpoint 2 Sel]** Selects the function whose value is displayed value in [Testpoint x Data]. These are internal values that are not accessible through parameters. See Testpoint Codes and Functions on page 4-11 for a listing of available codes and functions.	Default: 499 Min/Max: 0/999 0/65535 EC Units: 1	
		235 237 EC 32	**[Testpoint 1 Data]** **[Testpoint 2 Data]** The present value of the function selected in [Testpoint x Sel].	Default: Read Only Min/Max: 0/65535 –/+2147483647 EC Units: 1	
	Faults	238	**[Fault Config 1]** Enables/disables annunciation of the listed faults.  *Factory Default Bit Values* (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.*		
		240	**[Fault Clear]** Resets a fault and clears the fault queue.	Default: 0 "Ready" Options: 0 "Ready" 1 "Clear Faults" 2 "Clr Flt Que"	

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Faults	241	**[Fault Clear Mode]** Enables/disables a fault reset (clear faults) attempt from any source. This does not apply to fault codes which are cleared indirectly via other actions.	Default: 1 "Enabled" Options: 0 "Disabled" 1 "Enabled"	
		242	**[Power Up Marker]** 32 Elapsed hours since initial drive power up. This value will rollover to 0 after the drive has been powered on for more than the max value shown. For relevance to most recent power up see [Fault x Time].	Default: Read Only Min/Max: 0.0000/429496.7295 Hrs Units: 0.0001 Hrs	246
		243 245 247 249	**[Fault 1 Code]** **[Fault 2 Code]** **[Fault 3 Code]** **[Fault 4 Code]** A code that represents the fault that tripped the drive. The codes will appear in these parameters in the order they occur ([Fault 1 Code] = the most recent fault).	Default: Read Only Min/Max: 0/9999 0/65535 EC Units: 0	
		244 246 248 250	**[Fault 1 Time]** **[Fault 2 Time]** **[Fault 3 Time]** **[Fault 4 Time]** 32 The time between **initial** drive power up and the occurrence of the associated trip fault. Can be compared to [Power Up Marker] for the time from the most recent power up. [Fault x Time] – [Power Up Marker] = Time difference to the most recent power up. A negative value indicates fault occurred before most recent power up. A positive value indicates fault occurred after most recent power up. To convert this value to the number days, hours, minutes and seconds, the following formula may be used: Fault x Time / 24 hours = (# of days).(remaining time) Remaining Time x 24 hours = (# of hours).(remaining time) Remaining Time x 60 minutes = (# of minutes).(remaining seconds) Remaining Time x 60 seconds = (# of seconds) Result = (# of days).(# of hours).(# of minutes).(# of seconds) Example: 1909.2390 Hrs / 1 Day/24 Hrs = 79.551625 Days 0.551625 Days x 24 Hrs/Day = 13.239 Hrs 0.239 Hrs x 60 Min/Hr = 14.34 Min 0.34 Min x 60 Sec/Min = 20.4 Secs	Default: Read Only Min/Max: 0.0000/429496.7295 Hrs Units: 0.0001 Hrs	242

File E	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY (File E)	Alarms	259	**[Alarm Config 1]** Enables/disables alarm conditions that will initiate an active drive alarm.		



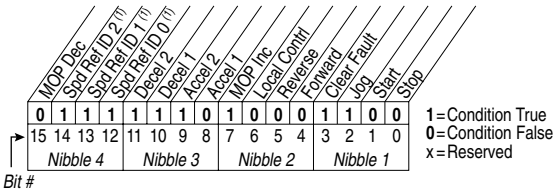
Factory Default Bit Values

(1) *Enhanced firmware 1.001 & later.*

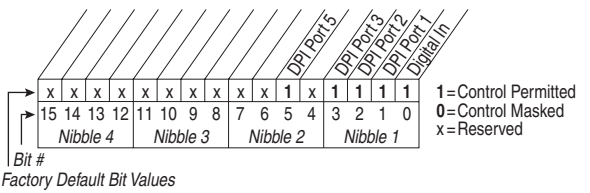
(2) *Enhanced firmware 2.001 & later.*

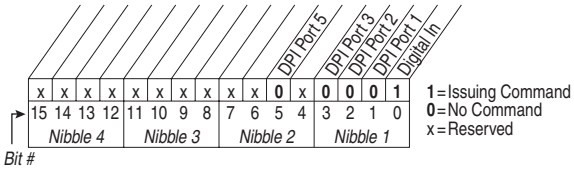
Communication File (File H)

File H	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATION (File H)	Comm Control	270	**[DPI Data Rate]** Sets the baud rate for attached drive peripherals. When changing this value the drive must be reset for the change to take affect.	Default: 0 "125 kbps" Options: 0 "125 kbps" 1 "500 kbps"	
		271	**[Drive Logic Rslt]** The final logic command resulting from the combination of all DPI and discrete inputs. This parameter has the same structure as the product-specific logic command received via DPI and is used in peer to peer communications.	Read Only	
		272	**[Drive Ref Rslt]** Present frequency reference scaled as a DPI reference for peer to peer communications. The value shown is the value prior to the accel/decel ramp and any corrections supplied by slip comp, PI, etc.	Default: Read Only Min/Max: –/+32767 Units: 1	
		273	**[Drive Ramp Rslt]** Present frequency reference scaled as a DPI reference for peer to peer communications. The value shown is the value after the accel/decel ramp but prior to any corrections supplied by slip comp, PI, etc.	Default: Read Only Min/Max: –/+32767 Units: 1	

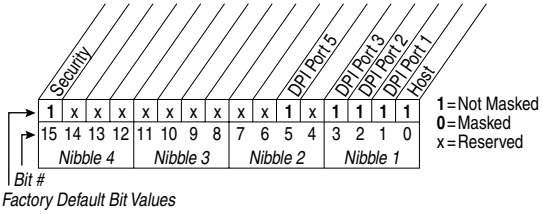
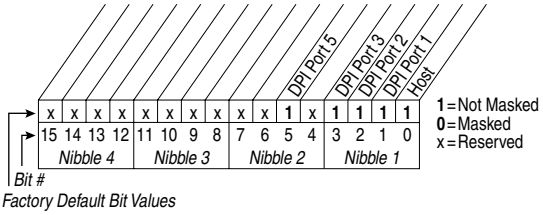
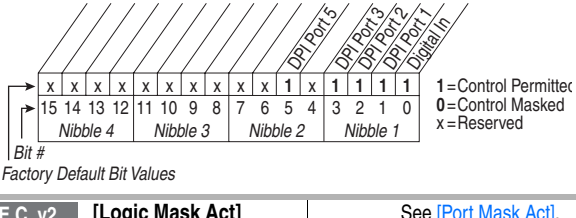


Bits(1)			
14	13	12	Description
0	0	0	No Command - Man. Mode
0	0	1	Ref A Auto
0	1	0	Ref B Auto
0	1	1	Preset 3 Auto
1	0	0	Preset 4 Auto
1	0	1	Preset 5 Auto
1	1	0	Preset 6 Auto
1	1	1	Preset 7 Auto

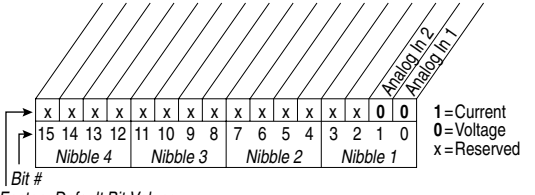
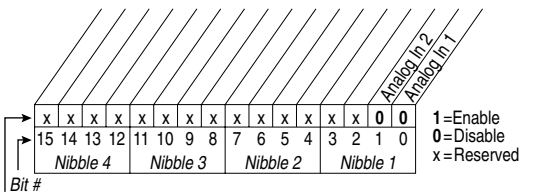
File H	Group	No.	Parameter Name and Description See page 3-2 for symbol descriptions	Values	Related
COMMUNICATION (File H)	Comm Control	274	E C **[DPI Port Select]** Selects which port reference value will appear in [DPI Port Value].	Default: 0 "Not Used" Options: 0 "Not Used" 1 "DPI Port 1" 2 "DPI Port 2" 3 "DPI Port 3" 4 "Reserved" 5 "DPI Port 5"	
		275	E C **[DPI Port Value]** Value of the DPI reference selected in [DPI Port Sel].	Default: Read Only Min/Max: –/+32767 Units: 1	
		298	E C **[DPI Ref Select]** Scales DPI on [Maximum Freq] or [Maximum Speed]. This will adjust the resolution of the DPI reference.	Default: 0 "Max Freq" Options: 0 "Max Freq" 1 "Max Speed"	
	Masks & Owners	276	**[Logic Mask]** Determines which adapters can control the drive when 598, bit 15 is set to "1." If the bit for an adapter is "0," the adapter will have no control functions except for stop.  *Factory Default Bit Values*	288 thru 297
		277	**[Start Mask]** Controls which adapters can issue start commands.	See [Logic Mask].	288 thru 297
		278	**[Jog Mask]** Controls which adapters can issue jog commands.	See [Logic Mask].	288 thru 297
		279	**[Direction Mask]** Controls which adapters can issue forward/reverse direction commands.	See [Logic Mask].	288 thru 297
		280	**[Reference Mask]** Controls which adapters can select an alternate reference; [Speed Ref A, B Sel] or [Preset Speed 1-7].	See [Logic Mask].	288 thru 297
		281	**[Accel Mask]** Controls which adapters can select [Accel Time 1, 2].	See [Logic Mask].	288 thru 297
		282	**[Decel Mask]** Controls which adapters can select [Decel Time 1, 2].	See [Logic Mask].	288 thru 297
		283	**[Fault Clr Mask]** Controls which adapters can clear a fault.	See [Logic Mask].	288 thru 297

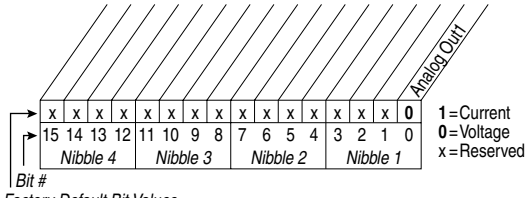
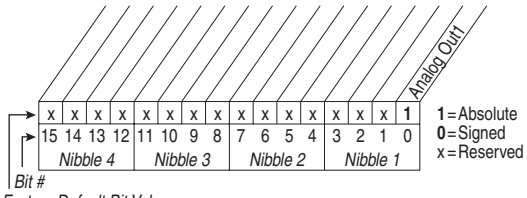
File H	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATION (File H)	Masks & Owners	284	**[MOP Mask]** Controls which adapters can issue MOP commands to the drive.	See [Logic Mask].	288 thru 297
		285	**[Local Mask]** Controls which adapters are allowed to take exclusive control of drive logic commands (except stop). Exclusive "local" control can only be taken while the drive is stopped.	See [Logic Mask].	288 thru 297
		288	**[Stop Owner]** Adapters that are presently issuing a valid stop command.  	Read Only	276 thru 285
		289	**[Start Owner]** Adapters that are presently issuing a valid start command.	See [Stop Owner].	276 thru 285
		290	**[Jog Owner]** Adapters that are presently issuing a valid jog command.	See [Stop Owner].	276 thru 285
		291	**[Direction Owner]** Adapter that currently has exclusive control of direction changes.	See [Stop Owner].	276 thru 285
		292	**[Reference Owner]** Adapter that has the exclusive control of the command frequency source selection.	See [Stop Owner].	276 thru 285
		293	**[Accel Owner]** Adapter that has exclusive control of selecting [Accel Time 1, 2].	See [Stop Owner].	140 276 thru 285
		294	**[Decel Owner]** Adapter that has exclusive control of selecting [Decel Time 1, 2].	See [Stop Owner].	142 276 thru 285
		295	**[Fault Clr Owner]** Adapter that is presently clearing a fault.	See [Stop Owner].	276 thru 285
		296	**[MOP Owner]** Adapters that are currently issuing increases or decreases in MOP command frequency.	See [Stop Owner].	276 thru 285

File H	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATION (File H)	Masks & Owners	297	**[Local Owner]** Adapter that has requested exclusive control of all drive logic functions. If an adapter is in local lockout, all other functions (except stop) on all other adapters are locked out and non-functional. Local control can only be obtained when the drive is not running.	See [Stop Owner].	276 thru 285
	Datalinks	300 301 ◯	**[Data In A1] -** Link A Word 1 **[Data In A2] -** Link A Word 2 Parameter number whose value will be written from a communications device data table. Parameters that can only be changed while drive is stopped cannot be used as Datalink inputs. Entering a parameter of this type will "Disable" the link. Refer to your communications option manual for datalink information.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/545 EC 0/598 EC v2 Units: 1	
		302 303 ◯	**[Data In B1] -** Link B Word 1 **[Data In B2] -** Link B Word 2	See [Data In A1] - Link A Word 1.	
		304 305 ◯	**[Data In C1] -** Link C Word 1 **[Data In C2] -** Link C Word 2	See [Data In A1] - Link A Word 1.	
		306 307 ◯	**[Data In D1] -** Link D Word 1 **[Data In D2] -** Link D Word 2	See [Data In A1] - Link A Word 1.	
		310 311	**[Data Out A1] -** Link A Word 1 **[Data Out A2] -** Link A Word 2 Parameter number whose value will be written to a communications device data table.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/545 EC 0/598 EC v2 Units: 1	
		312 313	**[Data Out B1] -** Link B Word 1 **[Data Out B2] -** Link B Word 2	See [Data Out A1] - Link A Word 1.	
		314 315	**[Data Out C1] -** Link C Word 1 **[Data Out C2] -** Link C Word 2	See [Data Out A1] - Link A Word 1.	
		316 317	**[Data Out D1] -** Link D Word 1 **[Data Out D2] -** Link D Word 2	See [Data Out A1] - Link A Word 1.	
		308 32	EC **[HighRes Ref]** Used as a high resolution, 32 bit reference with Datalinks. –/+[Maximum Freq] or –/+[Maximum Speed] = 2147418112	Default: 0 Min/Max: –/+2147483647 Units: 1	090 093 126 128 213 298

File H	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATION (File H)	Security	595	E C v2 **[Port Mask Act]** Active status for port communication.  *Factory Default Bit Values*		
		596	E C v2 **[Write Mask Cfg]** Enables/disables write access (parameters, etc.) for ports. Changes to this parameter only become affective upon power cycle, drive reset or when 597, bit 15 transitions from “1” to “0.”  *Factory Default Bit Values*		
		597	E C v2 **[Write Mask Act]** Active status of write access for ports. Bit 15 determines if network security is controlling the write mask instead of 596.	See [Port Mask Act].	
		276	**[Logic Mask]** Determines which adapters can control the drive when 597, bit 15 is set to “1”. If the bit for a port is set to “0,” the port will have no control functions except for stop.  *Factory Default Bit Values*		288 thru 297
		598	E C v2 **[Logic Mask Act]** Active status of logic mask for ports. Bit 15 determines if network security is controlling the logic mask instead of 276.	See [Port Mask Act].	

Inputs & Outputs File (File J)

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Analog Inputs	320	**[Anlg In Config]** Selects the mode for the analog inputs.  *Factory Default Bit Values*		322 323
		321	**[Anlg In Sqr Root]** Enables/disables the square root function for each input.  *Factory Default Bit Values*		
		322 325	**[Analog In 1 Hi]** **[Analog In 2 Hi]** Sets the highest input value to the analog input x scaling block.	Default: 10.000 Volt 10.000 Volt Min/Max: 4.000/20.000 mA Standard, 0.000/20.000 mA EC, –/+10.000V, Units: 0.000/10.000V 0.001 mA, 0.001 Volt	091 092
		323 326	**[Analog In 1 Lo]** **[Analog In 2 Lo]** Sets the lowest input value to the analog input x scaling block.	Default: 0.000 Volt 0.000 Volt Min/Max: 4.000/20.000 mA, 0.000/10.000V (No. 323), –/+10.000V (No. 326) Units: 0.000/10.000V, 0.001 mA, 0.001 Volt	091 092
		324 327	**[Analog In 1 Loss]** **[Analog In 2 Loss]** Selects drive action when an analog signal loss is detected. Signal loss is defined as an analog signal less than 1V or 2mA. The signal loss event ends and normal operation resumes when the input signal level is greater than or equal to 1.5V or 3mA.	Default: 0 "Disabled" 0 "Disabled" Options: 0 "Disabled" 1 "Fault" 2 "Hold Input" 3 "Set Input Lo" 4 "Set Input Hi" 5 "Goto Preset1" 6 "Hold OutFreq"	091 092

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Analog Outputs	340	**E C [Anlg Out Config]** Selects the mode for the analog outputs.  *Factory Default Bit Values*		
		341	**[Anlg Out Absolut]** Selects whether the signed value or absolute value of a parameter is used before being scaled to drive the analog output.  *Factory Default Bit Values*		342
		342	**[Analog Out1 Sel]** Selects the source of the value that drives the analog output.	Default: 0 "Output Freq" Options: See Table	001 002 003 004 005 007 006 012 135 136 137 138 220 219 024 441 023 025 015 377

Options		[Analog Out1 Lo] Value *Param. 341= Signed*	 *Param. 341 = Absolute*	[Analog Out1 Hi] Value
0	"Output Freq"	–[Maximum Speed]	0 Hz	+[Maximum Speed]
1	"Command Freq"	–[Maximum Speed]	0 Hz	+[Maximum Speed]
2	"Output Amps"	0 Amps	0 Amps	200% Drive Rated
3	"Torque Amps"	–200%	0 Amps	200% Drive Rated
4	"Flux Amps"	0 Amps	0 Amps	200% Drive Rated
5	"Output Power"	0 kW	0 kW	200% Drive Rated
6	"Output Volts"	0 Volts	0 Volts	120% Drive Rated
7	"DC Bus Volts"	0 Volts	0 Volts	200% Drive Rated
8	"PI Reference" (1)	–100%	0%	100%
9	"PI Feedback"	–100%	0%	100%
10	"PI Error"	–100%	0%	100%
11	"PI Output"	–800%	0%	800%
12	"%Motor OL"	0%	0%	100%
13	"%Drive OL"	0%	0%	100%
14	"CommandedTrq:" (3)	–800%	0%	800% Motor Rated
15	"MtrTrqCurRef" (1)(3)	–200%	0 Amps	200% Motor Rated
16	"Speed Ref" (3)	–[Maximum Speed]	0 Hz	[Maximum Speed]
17	"Speed Fdbk" (3)	–[Maximum Speed]	0 Hz	[Maximum Speed]
19	"Torque Est" (1)(3)	–800%	0%	800% Motor Rated
24	"Param Cntl" (1)(2)			
25	"SpdFdBk NoFilt" (1)	–[Maximum Speed]	0 Hz	[Maximum Speed]

(1) Refer to Option Definitions on page 3-58.
(2) Enhanced firmware 1.001 & later.
(3) Enhanced firmware 2.002 & later.

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Analog Outputs	343	**[Analog Out1 Hi]** Sets the analog output value when the source value is at maximum.	Default: 10.00 Volts Min/Max: 0.00/10.00 Volts 0.00/20.00 mA EC Units: 0.01 Volt 0.01 mA EC	340 342
		344	**[Analog Out1 Lo]** Sets the analog output value when the source value is at minimum.	Default: 0.00 Volts Min/Max: 0.00/10.00 Volts 0.00/20.00 mA EC Units: 0.01 Volt 0.01 mA EC	340 342
		354	EC **[Anlg Out1 Scale]** Sets the high value for the range of analog out scale. Entering 0.0 will disable this scale and max scale will be used. Example: If [Analog Out Sel] = "Commanded Trq," a value of 150 = 150% scale in place of the default 800%.	Default: 0.0 Min/Max: [Analog Out1 Sel] Units: 0.01	
		377	EC **[Anlg Out1 Setpt]** Controls the analog output value from a communication device. Example Set [Data In A1] to "377" which will be the value from the communication device.	Default: 0.00 Volts Min/Max: 0.00/10.00 Volts 0.00/20.00 mA EC Units: 0.01 Volt 0.01 mA EC	340

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Digital Inputs	361 362 363 364 365 366	**[Digital In1 Sel]** **[Digital In2 Sel]** **[Digital In3 Sel]** **[Digital In4 Sel]** **[Digital In5 Sel]** **[Digital In6 Sel]**(7)	Default: 4 "Stop – CF"(1) Default: 5 "Start" Default: 18 "Auto/ Manual" Default: 15 "Speed Sel 1" Default: 16 "Speed Sel 2" Default: 17 "Speed Sel 3"	
			Selects the function for the digital inputs.	Options: 0 "Not Used" 1 "Enable"(6) 2 "Clear Faults"(1) 3 "Aux Fault" 4 "Stop – CF"(1) 5 "Start"(9)(11) 6 "Fwd/ Reverse"(9) 7 "Run"(10) 8 "Run Forward"(10) 9 "Run Reverse"(10) 10 "Jog"(9) "Jog1"(4) 11 "Jog Forward" 12 "Jog Reverse" 13 "Stop Mode B" 14 "Bus Reg Md B" 15-17 "Speed Sel 1-3"(2) 18 "Auto/ Manual"(8) 19 "Local" 20 "Acc2 & Dec2" 21 "Accel 2" 22 "Decel 2" 23 "MOP Inc"(12) 24 "MOP Dec"(12) 25 "Excl Link"(12) 26 "PI Enable" 27 "PI Hold" 28 "PI Reset" 29 "Reserved" 30 "Precharge En"(4)(12) 31-33 "Spd/Trq Sel1-3"(3)(13) 34 "Jog 2"(4) 35 "PI Invert"(4) 36-40 "Reserved" 41-42 "UserSet Sel1-2"(5) 43 "Run Level"(5)(12) 44 "RunFwd Level"(5)(12) 45 "RunRev Level"(5)(12) 46 "Run w/Comm"(5)(12) 47-57 "Reserved" 58 "Sync Enable"(13) 59 "Traverse Ena"(13)	100 156 162 096 140 194 380 125 088 108 124 205 620

(1) When [Digital Inx Sel] is set to option 2 "Clear Faults" the Stop button cannot be used to clear a fault condition.

(2)

3	2	1	"Speed Sel 1-3"
0	0	0	Reference A
0	0	1	Reference B
0	1	0	Preset Speed 2
0	1	1	Preset Speed 3
1	0	0	Preset Speed 4
1	0	1	Preset Speed 5
1	1	0	Preset Speed 6
1	1	1	Preset Speed 7

To access Preset Speed 1, set [Speed Ref A Sel] or [Speed Ref B Sel] to "Preset Speed 1".

(3)

3	2	1	"Spd/Trq Sel1-3"
0	0	0	Zero Torque
0	0	1	Spd Reg
0	1	0	Torque Reg
0	1	1	Min Spd/Trq
1	0	0	Max Spd/Trq
1	0	1	Sum Spd/Trq
1	1	0	Absolute
1	1	1	Zero Trq

(4) Enhanced Control Drives Only.

(5) Enhanced Firmware V2.001 and later.

(6) Opening an "Enable" input will cause the motor to coast-to-stop, ignoring any programmed Stop modes.

(7) A dedicated hardware enable input is available via a jumper selection. Refer to page 1-15 for further information.

(8) Auto/Manual - Refer to Figure 1.13 on page 1-19 for details.

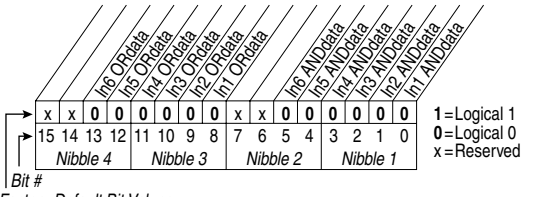
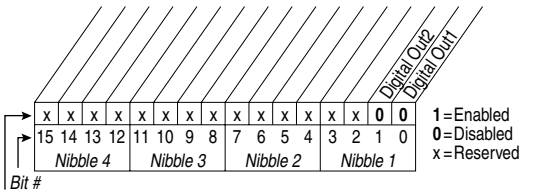
(9) Typical 3-Wire Inputs - Requires that only 3-wire functions are chosen. Including 2-wire selections will cause a type 2 alarm.

(10) Typical 2-Wire Inputs - Requires that only 2-wire functions are chosen. Including 3-wire selections will cause a type 2 alarm.

(11) A "Dig In ConflictB" alarm will occur if a "Start" input is programmed without a "Stop" input. Type 2 Alarms - Some digital input programming may cause conflicts that will result in a Type 2 alarm. Example: [Digital In1 Sel] set to 5 "Start" in 3-wire control and [Digital In2 Sel] set to 7 "Run" in 2-wire. Refer to Alarm Descriptions on page 4-7 for information on resolving this type of conflict.

(12) Refer to Option Definitions on page 3-58.

(13) Enhanced Firmware V3.002 and later.

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Digital Inputs	411	E C **[DigIn DataLogic]** Provides data to the logical operations that will be done with the digital inputs when parameter 056 is set to option 9 “DigIn DatLog”.  *Factory Default Bit Values*	056
	Digital Outputs	379	E C **[Dig Out Setpt]** Controls output relays (CRx) when parameter 380 or 384 is set to option 30 “Param Cntl”.  *Factory Default Bit Values*	

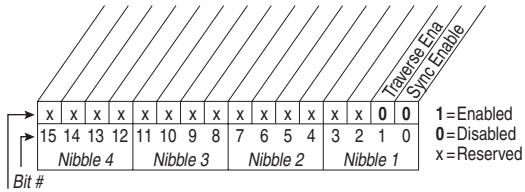
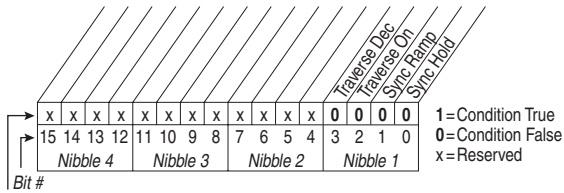
File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values			Related
INPUTS & OUTPUTS (File J)	Digital Outputs	380 384	**[Digital Out1 Sel]** **[Digital Out2 Sel]** Selects the drive status that will energize a (CRx) output relay. (1) Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed. Refer to page 1-14. (2) Activation level is defined in [Dig Outx Level] below. (3) Enhanced Control Drives Only. (4) Enhanced Firmware V3.002 and later.	Default: Options:	1 4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31-57 58 59	"Fault" "Run" "Fault"(1) "Alarm"(1) "Ready" "Run" "Forward Run" "Reverse Run" "Auto Restart" "Powerup Run" "At Speed" "At Freq"(2) "At Current"(2) "At Torque"(2) "At Temp"(2) "At Bus Volts"(2) "At PI Error"(2) "DC Braking" "Curr Limit" "Economize" "Motor Overld" "Power Loss" "Input 1 Link" "Input 2 Link" "Input 3 Link" "Input 4 Link" "Input 5 Link" "Input 6 Link" "PI Enabled"(3) "PI Hold"(3) "Drive Overld"(3) "Param Cntl"(3) ""Reserved" "Manual Mode"(4) "Fast Braking"(4)	381 385 382 383 002 001 003 004 218 012 137 157 147 053 048 184
		381 385	**[Dig Out1 Level]** **[Dig Out2 Level]** Sets the relay activation level for options 10 – 15 in [Digital Outx Sel]. Units are assumed to match the above selection (i.e. "At Freq" = Hz, "At Torque" = Amps).	Default: Min/Max: Units:	0.0 0.0 0.0/819.2 0.1		380
		382 386	**[Dig Out1 OnTime]** **[Dig Out2 OnTime]** Sets the "ON Delay" time for the digital outputs. This is the time between the occurrence of a condition and activation of the relay.	Default: Min/Max: Units:	0.0 Secs 0.0 Secs 0.0/600.0 Secs 0.1 Secs		380

File J	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS (File J)	Digital Outputs	383 387	**[Dig Out1 OffTime]** **[Dig Out2 OffTime]** Sets the "OFF Delay" time for the digital outputs. This is the time between the disappearance of a condition and de-activation of the relay.	Default: 0.0 Secs 0.0 Secs Min/Max: 0.0/600.0 Secs Units: 0.1 Secs	380

Selected Option Definitions – [Analog Outx Sel], [Digital Inx Sel], [Digital Outx Sel]

Option	Description	Related
At Speed	Relay changes state when drive has reached commanded speed.	380
Excl Link	Links digital input to a digital output if the output is set to "Input 1-6 Link."	361
Input 1-6 Link	When Digital Output 1 is set to of these (i.e. Input 3 Link) in conjunction with Digital Input 3 set to "Excl Link," the Digital Input 3 state (on/off) is echoed in the Digital Output 1.	380
Manual Mode	Either the HIM or I/O Terminal Block (analog input) has control of the speed reference.	380
MOP Dec	Decrements speed reference as long as input is closed.	361
MOP Inc	Increments speed reference as long as input is closed.	361
MtrTrqCurRef	Torque producing current reference.	342
Param Cntl	Parameter controlled analog output allows PLC to control analog outputs through data links. Set in [AnlgX Out Setpt], parameters 377-378.	342
Param Cntl	Parameter controlled digital output allows PLC to control digital outputs through data links. Set in [Dig Out Setpt], parameter 379.	342
PI Reference	Reference for PI block (see Process PI for Standard Control on page C-11).	342
Precharge En	Forces drive into precharge state. Typically controlled by auxiliary contact on the disconnect at the DC input to the drive.	361
Run Level RunFwd Level RunRev Level	Provides a run level input. They do not require a transition for enable or fault, but a transition is still required for a stop.	
Run w/Comm	Allows the comms start bit to operate like a run with the run input on the terminal block. Ownership rules apply.	
SpdFdBk NoFilt	Provides an unfiltered value to an analog output. The filtered version "Speed Fdbk" includes a 125 ms filter.	342
Sync Enable	The fiber feature Synchronized Speed Change has been enabled. Allows a coordinated change in drive speeds to change machine speed.	622
Torque Est	Calculated percentage of rated motor torque.	342
Traverse Enable	The Traverse function has been enabled. This adds a triangle wave and square wave modulation to the speed reference.	623 624 625 626

Applications File (File K)

File K	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
APPLICATIONS (File K)	Fiber Functions	620	E C v3 **[Fiber Control]** Controls the Sync and Traverse functions.  *Factory Default Bit Values*		
		621	E C v3 **[Fiber Status]** Read Only Status of Sync and Traverse functions.  *Factory Default Bit Values*		
		622	E C v3 **[Sync Time]** The time to ramp from the "held speed reference" to the current speed reference, after the Sync input is de-energized.	Default: 0.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	
		623	E C v3 **[Traverse Inc]** Sets the time period of increasing frequency.	Default: 0.00 Secs Min/Max: 0.00/30.00 Secs Units: 0.01 Secs	
		624	E C v3 **[Traverse Dec]** Sets the time period of decreasing frequency.	Default: 0.00 Secs Min/Max: 0.00/30.00 Secs Units: 0.01 Secs	
		625	E C v3 **[Max Traverse]** Sets the amplitude of the triangle wave speed modulation.	Default: 0.00 Hz Min/Max: 0.00/Maximum Speed Units: 0.01 Hz	
		626	E C v3 **[P Jump]** Sets the amplitude of the square wave speed modulation.	Default: 0.00 Hz Min/Max: 0.00/Maximum Speed Units: 0.01 Hz	

Parameter Cross Reference – by Name

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Troubleshooting

Chapter 4 provides information to guide you in troubleshooting the PowerFlex 70. Included is a listing and description of drive faults (with possible solutions, when applicable) and alarms.

Faults and Alarms

A fault is a condition that stops the drive. There are three fault types.

Type	Fault Description	
①	Auto-Reset Run	When this type of fault occurs, and [Auto Rstrt Tries] (see page 3-33) is set to a value greater than "0," a user-configurable timer, [Auto Rstrt Delay] (see page 3-33) begins. When the timer reaches zero, the drive attempts to automatically reset the fault. If the condition that caused the fault is no longer present, the fault will be reset and the drive will be restarted.
②	Non-Resettable	This type of fault normally requires drive or motor repair. The cause of the fault must be corrected before the fault can be cleared. The fault will be reset on power up after repair.
③	User Configurable	These faults can be enabled/disabled to annunciate or ignore a fault condition.

An alarm is a condition that, if left untreated, may stop the drive. There are two alarm types.

Type	Alarm Description	
①	User Configurable	These alarms can be enabled or disabled through [Alarm Config 1] on page 3-46.
②	Non-Configurable	These alarms are always enabled.

Drive Status

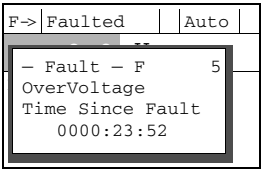
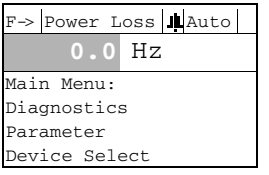
The condition or state of your drive is constantly monitored. Any changes will be indicated through the LEDs and/or the HIM (if present).

LED Indications

See page 2-2 for information on LED status indicators.

HIM Indication

The LCD and LED HIMs also provide visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following. • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press Esc to regain HIM control. The LED HIM reports the fault condition by displaying the specific fault code.	LCD HIM  LED HIM 
Drive is indicating an alarm. The LCD HIM immediately reports the alarm condition by displaying the following. • Alarm name (Type 2 alarms only) • Alarm bell graphic	LCD HIM  LED HIM No indication.

Manually Clearing Faults

Step	Key(s)
1. Press Esc to acknowledge the fault. The fault information will be removed so that you can use the HIM.	Esc
2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.	
3. After corrective action has been taken, clear the fault by one of these methods. • Press Stop • Cycle drive power • Set parameter 240 [Fault Clear] to "1." • "Clear Faults" on the HIM Diagnostic menu.	

Fault Descriptions

Table 4.A Fault Types, Descriptions and Actions

Fault	No.	Type(1)	Description	Action
Analog In Loss	29	① ③	An analog input is configured to fault on signal loss. A signal loss has occurred. Configure with [Anlg In 1, 2 Loss] on page 3-52.	1. Check parameters. 2. Check for broken/loose connections at inputs.
Anlg Cal Chksum	108		The checksum read from the analog calibration data does not match the checksum calculated.	Replace drive.
Auto Rstrt Tries	33	③	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of [Flt RstRun Tries]. Enable/Disable with [Fault Config 1] on page 3-44.	Correct the cause of the fault and manually clear.
AutoTune Aborted	80		Autotune function was canceled by the user or a fault occurred.	Restart procedure.
Auxiliary Input	2	①	Auxiliary input interlock is open.	Check remote wiring.
Decel Inhibit	24	③	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.	1. Verify input voltage is within drive specified limits. 2. Verify system ground impedance follows proper grounding techniques. 3. Disable bus regulation and/or add dynamic brake resistor and/or extend deceleration time.
Drive OverLoad	64		Drive rating of 110% for 1 minute or 150% for 3 seconds has been exceeded.	Reduce load or extend Accel Time.

Fault	No.	Type[1]	Description	Action
Drive Powerup E C v2	49		No fault displayed. Used as a Power Up Marker in the Fault Queue indicating that the drive power has been cycled.	
Enable Hardware E C	111		Safe-Off board is not installed and pins 3 and 4 of the Safe-Off Connector are not jumpered.	Install Safe-Off board or jumper pins 3 and 4.
			Safe-Off board has failed.	Replace Safe-Off board.
			Hardware enable circuitry failed.	Replace control board.
Encoder Loss E C v2	91		One or both encoder channel signals is missing.	1. Check Wiring. 2. Replace encoder.
Excessive Load	79		Motor did not come up to speed in the allotted time during autotune.	1. Uncouple load from motor. 2. Repeat Autotune.
Faults Cleared E C v2	52		No fault displayed. Used as a marker in the Fault Queue indicating that the fault clear function was performed.	
Flt QueueCleared E C v2	51		No fault displayed. Used as a marker in the Fault Queue indicating that the clear queue function was performed.	
FluxAmpsRef Rang	78		The value for flux amps determined by the Autotune procedure exceeds the programmed [Motor NP FLA].	1. Reprogram [Motor NP FLA] with the correct motor nameplate value. 2. Repeat Autotune.
Heatsink OvrTemp	8	①	Heatsink temperature exceeds 100% of [Drive Temp].	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excess load.
HW OverCurrent	12	①	The drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper DC boost setting, DC brake volts set too high or other causes of excess current.
Incompat MCB-PB	106	②	Drive rating information stored on the power board is incompatible with the main control board.	Load compatible version files into drive.
Input Phase Loss E C v2	17		The DC bus ripple has exceeded a preset level.	Check incoming power for a missing phase/blown fuse.
IR Volts Range	77		"Calculate" is the autotune default and the value determined by the autotune procedure for IR Drop Volts is not in the range of acceptable values.	Re-enter motor nameplate data.
IXo VoltageRange E C v2	87		Voltage calculated for motor inductive impedance exceeds 25% of [Motor NP Volts].	1. Check for proper motor sizing. 2. Check for correct programming of [Motor NP Volts], parameter 41. 3. Additional output impedance may be required.
Load Loss E C v2	15		Drive output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].	1. Verify connections between motor and load. 2. Verify level and time requirements.

Fault	No.	Type(1)	Description	Action
Motor OverLoad	7	① ③	Internal electronic overload trip. Enable/Disable with [Fault Config 1] on page 3-44.	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by [Motor NP FLA].
Motor Thermistor E C	16		Thermistor output is out of range.	1. Verify that thermistor is connected. 2. Motor is overheated. Reduce load.
Overspeed Limit	25	①	Functions such as Slip Compensation or Bus Regulation have attempted to add an output frequency adjustment greater than that programmed in [Overspeed Limit].	Remove excessive load or overhauling conditions or increase [Overspeed Limit].
OverVoltage	5	①	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.
Parameter Chksum	100	②	The checksum read from the board does not match the checksum calculated.	1. Restore defaults. 2. Reload User Set if used.
Params Defaulted	48		The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
Phase U to Grnd	38		A phase to ground fault has been detected between the drive and motor in this phase.	1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. Replace drive.
Phase V to Grnd	39			
Phase W to Grnd	40			
Phase UV Short	41		Excessive current has been detected between these two output terminals.	1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace drive.
Phase VW Short	42			
Phase UW Short	43			
Port 1-5 DPI Loss	81-85		DPI port stopped communicating. A SCANport device was connected to a drive operating DPI devices at 500k baud.	1. If adapter was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, adapters, Main Control Board or complete drive as required. 2. Check HIM connection. 3. If an adapter was intentionally disconnected and the [Logic Mask] bit for that adapter is set to “1”, this fault will occur. To disable this fault, set the [Logic Mask] bit for the adapter to “0.”
Port 1-5 Adapter	71-75		The communications card has a fault.	Check DPI device event queue and corresponding fault information for the device.

Fault	No.	Type[1]	Description	Action
Power Loss	3	① ③	DC bus voltage remained below 85% of nominal for longer than [Power Loss Time]. Enable/ Disable with [Fault Config 1] on page 3-44.	Monitor the incoming AC line for low voltage or line power interruption.
Pwr Brd Chksum1	104		The checksum read from the EEPROM does not match the checksum calculated from the EEPROM data.	Clear the fault or cycle power to the drive.
Pwr Brd Chksum2	105	②	The checksum read from the board does not match the checksum calculated.	1. Cycle power to the drive. 2. If problem persists, replace drive.
Replaced MCB-PB	107	②	Main Control Board was replaced and parameters were not programmed.	1. Restore defaults. 2. Reprogram parameters.
Shear Pin	63	③	Programmed [Current Lmt Val] has been exceeded. Enable/ Disable with [Fault Config 1] on page 3-44.	Check load requirements and [Current Lmt Val] setting.
SW OverCurrent	36	①	Drive output current has exceeded the 1ms current rating. This rating is greater than the 3 second current rating and less than the hardware overcurrent fault level. It is typically 200-250% of the drive continuous rating.	Check for excess load, improper DC boost setting. DC brake volts set too high.
Trnsistr OvrTemp	9	①	Output transistors have exceeded their maximum operating temperature.	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excessive load.
UnderVoltage	4	① ③	DC bus voltage fell below the minimum value of 509V DC at 600V input, 407V DC at 400/ 480V input or 204V DC at 200/ 240V input. Enable/Disable with [Fault Config 1] on page 3-44.	Monitor the incoming AC line for low voltage or power interruption.
UserSet1 Chksum	101	②	The checksum read from the user set does not match the checksum calculated.	Re-save user set.
UserSet2 Chksum	102	②		
UserSet3 Chksum	103	②		

(1) See page 4-1 for a description of fault types.

Table 4.B Fault Cross Reference

No.(1)	Fault
2	Auxiliary Input
3	Power Loss
4	UnderVoltage
5	OverVoltage
7	Motor Overload
8	Heatsink OvrTemp
9	Trnsistr OvrTemp
12	HW OverCurrent
15	Load Loss
16	Motor Thermistor
17	Input Phase Loss
24	Decel Inhibit
25	OverSpeed Limit
29	Analog In Loss
33	Auto Rstrt Tries
36	SW OverCurrent

No.(1)	Fault
38	Phase U to Grnd
39	Phase V to Grnd
40	Phase W to Grnd
41	Phase UV Short
42	Phase UW Short
43	Phase VW Short
48	Params Defaulted
49	Drive Powerup
51	Flt QueueCleared
52	Faults Cleared
63	Shear Pin
64	Drive Overload
71-75	Port 1-5 Adapter
77	IR Volts Range
78	FluxAmpsRef Rang

No.(1)	Fault
79	Excessive Load
80	AutoTune Aborted
81-85	Port 1-5 DPI Loss
87	IXo VoltageRange
91	Encoder Loss
100	Parameter Chksum
101	UserSet1 Chksum
102	UserSet2 Chksum
103	UserSet3 Chksum
104	Pwr Brd Chksum1
105	Pwr Brd Chksum2
106	Incompat MCB-PB
107	Replaced MCB-PB
108	Anlg Cal Chksum
111	Enable Hardware

(1) Fault numbers not listed are reserved for future use.

Clearing Alarms

Alarms are automatically cleared when the condition that caused the alarm is no longer present.

Alarm Descriptions

Table 4.C Alarm Descriptions and Actions

Alarm	No.	Type(1)	Description
Analog in Loss	5	①	An analog input is configured for “Alarm” on signal loss and signal loss has occurred.
Bipolar Conflict	20	②	Parameter 190 [Direction Mode] is set to “Bipolar” or “Reverse Dis” and one or more of the following digital input functions is configured: “Fwd/Reverse”, “Run Forward”, “Run Reverse”, “Jog Forward”, or “Jog Reverse”.
Decel Inhibit	10	①	Drive is being inhibited from decelerating.

Alarm	No.	Type(1)	Description
Dig In ConflictA	17	②	Digital input functions are in conflict. Combinations marked with a "●" will cause an alarm.

	Acc2/Dec2	Accel 2	Decel 2	Jog	Jog Fwd	Jog Rev	Fwd/Rev
Acc2 / Dec2		●	●				
Accel 2	●						
Decel 2	●						
Jog					●	●	
Jog Fwd				●			●
Jog Rev				●			●
Fwd / Rev					●	●	

Dig In ConflictB	18	②	A digital Start input has been configured without a Stop input or other functions are in conflict. Combinations that conflict are marked with a "●" and will cause an alarm.						

	Start	Stop–CF	Run	Run Fwd	Run Rev	Jog	Jog Fwd	Jog Rev	Fwd/ Rev
Start			●	●	●		●	●	
Stop–CF									
Run	●			●	●		●	●	
Run Fwd	●		●			●			●
Run Rev	●		●			●			●
Jog				●	●				
Jog Fwd	●		●						
Jog Rev	●		●						
Fwd / Rev				●	●				

Dig In ConflictC	19	②	More than one physical input has been configured to the same input function. Multiple configurations are not allowed for the following input functions.		
			Forward/Reverse	Run Reverse	Bus Regulation Mode B
			Speed Select 1	Jog Forward	Acc2 / Dec2
			Speed Select 2	Jog Reverse	Accel 2
			Speed Select 3	Run	Decel 2
			Run Forward	Stop Mode B	
Drive OL Level 1	8	①	The calculated IGBT temperature requires a reduction in PWM frequency. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.		
Drive OL Level 2	9	①	The calculated IGBT temperature requires a reduction in Current Limit. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.		
FluxAmpsRef Rang	26	②	The calculated or measured Flux Amps value is not within the expected range. Verify motor data and rerun motor tests.		
Ground Warn E C v2	15	①	Ground current has exceeded the level set in [Gnd Warn Level].		
In Phase Loss E C v2	13	①	The DC bus ripple has exceeded the level in [Phase Loss Level].		
IntDBRes OvrHeat	6	①	The drive has temporarily disabled the DB regulator because the resistor temperature has exceeded a predetermined value.		

Alarm	No.	Type(1)	Description
IR Volts Range	25	②	The drive auto tuning default is “Calculate” and the value calculated for IR Drop Volts is not in the range of acceptable values. This alarm should clear when all motor nameplate data is properly entered.
IXo VoltageRange E C v2	28	②	Motor leakage inductance is out of range.
Load Loss E C v2	14		Output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].
MaxFreq Conflict	23	②	The sum of [Maximum Speed] and [Overspeed Limit] exceeds [Maximum Freq]. Raise [Maximum Freq] or lower [Maximum Speed] and/or [Overspeed Limit] so that the sum is less than or equal to [Maximum Freq].
Motor Thermistor E C	12		[Fault Config 1] or [Alarm Config 1] Bit 7 “Motor Therm” is enabled and the analog Input voltage is <0.2 Volts or >5.0 Volts.
Motor Type Cflct	21	②	[Motor Type] has been set to “Synchr Reluc” or “Synchr PM” and one or more of the following exist: • [Torque Perf Mode] = “Sensrls Vect,” “SV Economize” or “Fan/Pmp V/Hz.” • [Flux Up Time] is greater than 0.0 Secs. • [Speed Mode] is set to “Slip Comp.” • [Autotune] = “Static Tune” or “Rotate Tune.”
NP Hz Conflict	22	②	Fan/pump mode is selected in [Torq Perf Mode] and the ratio of [Motor NP Hertz] to [Maximum Freq] is greater than 26.
Power Loss	3	①	Drive has sensed a power line loss.
Precharge Active	1	①	Drive is in the initial DC bus precharge state.
PTC Conflict E C	31		[Fault Config 1] or [Alarm Config 1] Bit 7 “Motor Therm” is enabled and Analog In 1 is set to milliamperes.
Sleep Config E C v2	29	②	Sleep/Wake configuration error. With [Sleep-Wake Mode] = “Direct,” possible causes include: drive is stopped and [Wake Level] < [Sleep Level]. “Stop=CF,” “Run,” “Run Forward,” or “Run Reverse.” is not configured in [Digital Inx Sel].
Speed Ref Cflct	27	②	[Speed Ref x Sel] or [PI Reference Sel] is set to “Reserved”.
Start At PowerUp	4	①	[Start At PowerUp] is enabled. Drive may start at any time within 10 seconds of drive powerup.

Alarm	No.	Type(1)	Description
TB Man Ref Cflct E C	30		Occurs when: • "Auto/Manual" is selected (default) for [Digital In3 Sel], parameter 363 *and* • [TB Man Ref Sel], parameter 96 has been reprogrammed. No other use for the selected analog input may be programmed. Example: If [TB Man Ref Sel] is reprogrammed to "Analog In 2," all of the factory default uses for "Analog In 2" must be reprogrammed (such as parameters 90, 117, 128 and 179). See also Auto/Manual Examples on page 1-20. To correct: • Verify/reprogram the parameters that reference an analog input *or* • Reprogram [Digital In3] to another function or "Unused."
UnderVoltage	2	①	The bus voltage has dropped below a predetermined value.
UserSet Conflict E C v2	51	②	[Digital Inx Sel] values differ in different user sets.
VHz Neg Slope	24	②	[Torq Perf Mode] = "Custom V/Hz" and the V/Hz slope is negative.
Waking E C v2	11	①	The Wake timer is counting toward a value that will start the drive.

(1) See page 4-1 for a description of alarm types.

Table 4.D Alarm Cross Reference

No.(1)	Alarm
1	Precharge Active
2	UnderVoltage
3	Power Loss
4	Start At PowerUp
5	Analog in Loss
6	IntDBRes OvrHeat
8	Drive OL Level 1
9	Drive OL Level 2
10	Decel Inhibit
11	Waking

No.(1)	Alarm
12	Motor Thermistor
13	In Phase Loss
14	Load Loss
15	Ground Warn
17	Dig In ConflictA
18	Dig In ConflictB
19	Dig In ConflictC
20	Bipolar Conflict
21	Motor Type Cflct
22	NP Hz Conflict

No.(1)	Alarm
23	MaxFreq Conflict
24	VHz Neg Slope
25	IR Volts Range
26	FluxAmpsRef Rang
27	Speed Ref Cflct
28	Ixo Vlt Rang
29	Sleep Config
30	TB Man Ref Cflct
31	PTC Conflict
51	UserSet Conflict

(1) Alarm numbers not listed are reserved for future use.

Testpoint Codes and Functions

Code Selected in [Testpoint x Sel]	Function Whose Value is Displayed in [Testpoint x Data]
1	DPI Error Status
2	Heatsink Temperature
3	Active Current Limit
4	Active PWM Frequency
5	Lifetime MegaWatt Hours(1)
6	Lifetime Run Time
7	Lifetime Powered Up Time
8	Lifetime Power Cycles
9	Life MegaWatt Hours Fraction(1)
10	Life MegaWatt Hours Fraction Units(1)
11-99	Reserved for Factory Use

(1) Use the equation below to calculate total Lifetime MegaWatt Hours.

$$\left(\frac{\text{Value of Code 9}}{\text{Value of Code 10}} \times 0.1\right) + \text{Value of Code 5} = \text{Total Lifetime MegaWatt Hours}$$

Common Symptoms and Corrective Actions

Drive does not Start from Start or Run Inputs wired to the terminal block.

Cause(s)	Indication	Corrective Action
Drive is Faulted	Flashing red status light	Clear fault. • Press Stop • Cycle power • Set [Fault Clear] to 1 (See page 3-44) • "Clear Faults" on the HIM Diagnostic menu
Incorrect input wiring. See page 1-17 for wiring examples. • 2 wire control requires Run, Run Forward, Run Reverse or Jog input. • 3 wire control requires Start and Stop inputs • Jumper from terminal 7 to 8 is required.	None	Wire inputs correctly and/or install jumper.
Incorrect digital input programming. • Mutually exclusive choices have been made (i.e., Jog and Jog Forward). • 2 wire and 3 wire programming may be conflicting. • Exclusive functions (i.e, direction control) may have multiple inputs configured. • Stop is factory default and is not wired.	None	Program [Digital Inx Sel] for correct inputs. (See page 3-55) Start or Run programming may be missing.
	Flashing yellow status light and "DigIn CflctB" indication on LCD HIM. [Drive Status 2] shows type 2 alarm(s).	Program [Digital Inx Sel] to resolve conflicts. (See page 3-55) Remove multiple selections for the same function. Install stop button to apply a signal at stop terminal.

Drive does not Start from HIM.

Cause(s)	Indication	Corrective Action
Drive is programmed for 2 wire control. HIM Start button is disabled for 2 wire control.	None	If 2 wire control is required, no action is necessary. If 3 wire control is required, program [Digital Inx Sel] for correct inputs. (See page 3-55)

Drive does not respond to changes in speed command.

Cause(s)	Indication	Corrective Action
No value is coming from the source of the command.	LCD HIM Status Line indicates “At Speed” and output is 0 Hz.	1. If the source is an analog input, check wiring and use a meter to check for presence of signal. 2. Check [Commanded Freq] for correct source. (Param #002, page 3-11)
Incorrect reference source has been programmed.	None	3. Check [Speed Ref Source] for the source of the speed reference. (Param #213, page 3-40) 4. Reprogram [Speed Ref A Sel] for correct source. (Param #090, page 3-22)
Incorrect Reference source is being selected via remote device or digital inputs.	None	5. Check [Drive Status 1], bits 12 and 13 for unexpected source selections. (Param #209, page 3-39) 6. Check [Dig In Status] to see if inputs are selecting an alternate source. (Param #216, page 3-41) 7. Reprogram digital inputs to correct “Speed Sel x” option. (See page 3-55)

Motor and/or drive will not accelerate to commanded speed.

Cause(s)	Indication	Corrective Action
Acceleration time is excessive.	None	Reprogram [Accel Time x]. (See page 3-29)
Excess load or short acceleration times force the drive into current limit, slowing or stopping acceleration.	None	Check [Drive Status 2], bit 10 to see if the drive is in Current Limit. (See page 3-39) Remove excess load or reprogram [Accel Time x]. (See page 3-29)
Speed command source or value is not as expected.	None	Check for the proper Speed Command using Steps 1 through 7 above.
Programming is preventing the drive output from exceeding limiting values.	None	Check [Maximum Speed] (Param #082, page 3-20) and [Maximum Freq] (Param #055, page 3-14) to assure that speed is not limited by programming.

Motor operation is unstable.

Cause(s)	Indication	Corrective Action
Motor data was incorrectly entered or Autotune was not performed.	None	1. Correctly enter motor nameplate data. 2. Perform “Static” or “Rotate” Autotune procedure. (Param #061, page 3-16)

Drive will not reverse motor direction.

Cause(s)	Indication	Corrective Action
Digital input is not selected for reversing control.	None	Check [Digital Inx Sel] (See page 3-55). Choose correct input and program for reversing mode.
Digital input is incorrectly wired.	None	Check input wiring. (See page 1-14)
Direction mode parameter is incorrectly programmed.	None	Reprogram [Direction Mode] for analog "Bipolar" or digital "Unipolar" control. (Param #190, page 3-36)
Motor wiring is improperly phased for reverse.	None	Switch two motor leads.
A bipolar analog speed command input is incorrectly wired or signal is absent.	None	1. Use meter to check that an analog input voltage is present. 2. Check wiring. (See page 1-17) Positive voltage commands forward direction. Negative voltage commands reverse direction.

Stopping the drive results in a Decel Inhibit fault.

Cause(s)	Indication	Corrective Action
The bus regulation feature is enabled and is halting deceleration due to excessive bus voltage. Excess bus voltage is normally due to excessive regenerated energy or unstable AC line input voltages. Internal timer has halted drive operation.	Decel Inhibit fault screen. LCD Status Line indicates "Faulted".	1. See Attention statement on Preface-4. 2. Reprogram bus regulation (parameters 161 and 162) to eliminate any "Adjust Freq" selection. 3. Disable bus regulation (parameters 161 and 162) and add a dynamic brake. 4. Correct AC input line instability or add an isolation transformer. 5. Reset drive.

Supplemental Drive Information

Specifications

Category	Specification						
Protection	**Drive**	**200-208V**	**240V**	**380/400**	**480V**	**600V**	**690V**
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC	
	AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC	
	Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC	
	Bus Undervoltage Output Shutoff:	300VDC	300VDC	407V DC	407V DC	508V DC	
	Bus Undervoltage Fault Level:	160VDC	160VDC	300VDC	300VDC	375VDC	
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
	All Drives						
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip Software Current Limit: Hardware Current Limit: Instantaneous Current Limit:	 20-160% of rated current 200% of rated current (typical) 220-300% of rated current (dependent on drive rating)					
	Line transients:	up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					
	Power Ride-Thru:	15 milliseconds at full load					
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical					
	Ground Fault Trip:	Phase-to-ground on drive output					
	Short Circuit Trip:	Phase-to-phase on drive output					
Environment	Altitude:	1000 m (3300 ft) max. without derating					
	Maximum Surrounding Air Temperature without derating: IP20, NEMA Type 1: Flange Mount: IP66, NEMA Type 4X/12:	 0 to 50 degrees C (32 to 122 degrees F) 0 to 50 degrees C (32 to 122 degrees F) 0 to 40 degrees C (32 to 104 degrees F)					
	Storage Temperature (all const.):	–40 to 70 degrees C (–40 to 158 degrees F)					
	Atmosphere	**Important:** Drive **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.					
	Relative Humidity:	5 to 95% non-condensing					
	Shock:	15G peak for 11ms duration (±1.0 ms)					
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak					

Category	Specification				
Agency Certification	**Type 1, IP30**	**Flange Type**	**Type 4X/12, IP66**		
	✔	✔	✔	cULus	Listed to UL508C and CAN/CSA-C2.2 No. 14-M91
		✔			Listed to UL508C for plenums (Rear heatsink only)
	✔	✔	✔	CE	Marked for all applicable European Directives (1) EMC Directive (89/336/EEC) EN 61800-3 Adjustable Speed electrical power drive systems Low Voltage Directive (73/23/EEC) EN 50178 Electronic Equipment for use in Power Installations
	✔	✔	✔	N223	Certified to AS/NZS, 1997 Group 1, Class A
			✔	NSF	Certified to Criteria C-2, 1983.
	✔	✔	✔	EMC TÜV EN 50178 TÜV Rheinland FS	Certified to EN 954-1, Category 3 for 240V, 400V, and 480V ratings of PowerFlex 70 Enhanced Control with DriveGuard Safe-Off option.
	✔	✔	✔		TUV Approved to EN 954-1, Category 3 for 600V ratings of PowerFlex 70 Enhanced Control with DriveGuard Safe-Off option.
	The drive is also designed to meet the appropriate portions of the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. IEC 146 - International Electrical Code.				

Electrical	Voltage Tolerance:	–10% of minimum, +10% of maximum. See page C-14 for Full Power and Operating Range.
	Frequency Tolerance:	47-63 Hz.
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.
	Displacement Power Factor (all drives):	0.98 across speed range.
	Efficiency:	97.5% at rated amps, nominal line volts.
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.
	Max. Short Circuit Current Rating: Using Recommended Fuse or Circuit Breaker Type	Maximum short circuit current rating to match specified fuse/circuit breaker capability.
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives.
	Carrier Frequency:	2, 3, 4, 5, 6, 7, 8, 9 & 10 kHz Standard. 2, 4, 8 & 12 kHz EC. Drive rating based on 4 kHz.
	Output Voltage Range:	0 to rated motor voltage
	Output Frequency Range:	0 to 400 Hz Standard. 0 to 500 Hz EC.
	Frequency Accuracy Digital Input: Analog Input:	 Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.

Category	Specification	
Control *(continued)*	Frequency Control - Speed Regulation	with Slip Compensation (V/Hz Mode) 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth
		with Slip Compensation (Sensorless Vector Mode) 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
		with feedback (Sensorless Vector Mode) EC 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
	Speed Control - Speed Regulation	without feedback (Vector Control Mode) EC 0.1% of base speed across 120:1 speed range 120:1 operating range 30 rad/sec bandwidth
		with feedback (Vector Control Mode) EC 0.001% of base speed across 120:1 speed range 1000:1 operating range 125 rad/sec bandwidth
	Torque Regulation	without feedback +/-10% EC
		with feedback +/-5% EC
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and vector control.
	Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.
	Accel/Decel:	Two independently programmable accel & decel times. Each time may be programmed from 0-3600 seconds in 0.1 sec. increments
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds
	Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.
	Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.
Encoder	Type:	Incremental, dual channel
	Supply:	5V/12V Configurable +/-5%
	Quadrature:	90° +/-27° at 25° C.
	Duty Cycle:	50% +10%
	Requirements	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), single-ended or differential and capable of supplying a minimum of 10 mA per channel. The Encoder Interface Board accepts 5V or 12V DC square-wave with a minimum high state voltage of 3.5V DC (5V mode) and 7.0V DC (12V mode). Maximum low state voltage is 1V DC (for both 5V and 12V modes). Maximum input frequency is 250 kHz.

(1) Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Communication Configurations

Typical Programmable Controller Configurations

Important: If block transfers are programmed to continuously write information to the drive, care must be taken to properly format the block transfer. If attribute 10 is selected for the block transfer, values will be written only to RAM and will not be saved by the drive. This is the preferred attribute for continuous transfers. If attribute 9 is selected, each program scan will complete a write to the drives non-volatile memory (EEprom). Since the EEprom has a fixed number of allowed writes, continuous block transfers will quickly damage the EEprom. Do Not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter User Manual for additional details.

Logic Command/Status Words

Figure A.1 Logic Command Word

Logic Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Command**	**Description**
															x	Stop[1]	0 = Not Stop 1 = Stop
														x		Start[1][2]	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
				x	x											Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
	x	x	x													Reference Select[3]	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

(1) A “0 = Not Stop” condition (logic 0) must first be present before a “1 = Start” condition will start the drive. The Start command acts as a momentary Start command. A “1” will start the drive, but returning to “0” will not stop the drive.

(2) This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).

(3) This Reference Select will not function if a digital input (parameters 361-366) is programmed for “Speed Sel 1, 2 or 3” (option 15, 16 or 17). When using the Logic Command Word for the speed reference selection, always set Bit 12, 13 or 14. Note that Reference Selection is “Exclusive Ownership” see [Reference Owner] on page 3-49.

Figure A.2 Logic Status Word

Logic Bits															Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control[1]	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference Source	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

(1) See “Owners” on page 3-49 for further information.

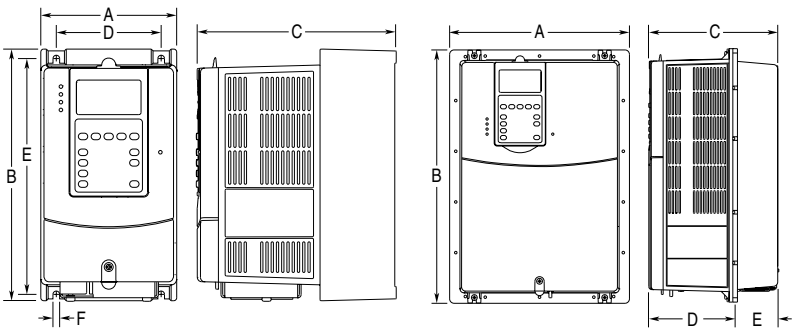
Dimensions

Table A.A PowerFlex 70 Frames

Output Power		Frame Size								
		208-240V AC Input			400-480V AC Input			600V AC Input		
kW ND (HD)	HP ND (HD)	*Not Filtered*	*Filtered*	*IP66 (4X/12)*	*Not Filtered*	*Filtered*	*IP66 (4X/12)*	*Not Filtered*	*Filtered*	*IP66 (4X/12)*
0.37 (0.25)	0.5 (0.33)	A	B	B	A	B	B	A	–	B
0.75 (0.55)	1 (0.75)	A	B	B	A	B	B	A	–	B
1.5 (1.1)	2 (1.5)	B	B	B	A	B	B	A	–	B
2.2 (1.5)	3 (2)	B	B	B	B	B	B	B	–	B
4 (3)	5 (3)	–	C	D	B	B	B	B	–	B
5.5 (4)	7.5 (5)	–	D	D	–	C	D	C	–	D
7.5 (5.5)	10 (7.5)	–	D	D	–	C	D	C	–	D
11 (7.5)	15 (10)	–	D	D	–	D	D	D	–	D
15 (11)	20 (15)	–	E	E	–	D	D	D	–	D
18.5 (15)	25 (20)	–	E	E	–	D	D	–	–	–
22 (18.5)	30 (25)	–	–	–	–	D	D	–	–	–
30 (22)	40 (30)	–	–	–	–	E	E	–	–	–
37 (30)	50 (40)	–	–	–	–	E	E	–	–	–

Figure A.3 PowerFlex 70 Frames A-E

IP20/66 (NEMA Type 1/4X/12) **Flange Mount**



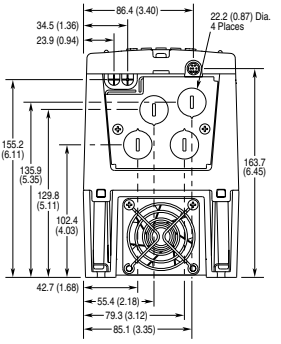
Dimensions are in millimeters and (inches).

Frame	A	B	C	D	E	F	Weight (1) *kg (lbs.)*
IP20 / NEMA Type 1							
A	122.4 (4.82)	225.7 (8.89)	179.8 (7.08)	94.2 (3.71)	211.6 (8.33)	5.8 (0.23)	2.71 (6.0)
B	171.7 (6.76)	234.6 (9.24)	179.8 (7.08)	122.7 (4.83)	220.2 (8.67)	5.8 (0.23)	3.60 (7.9)
C	185.0 (7.28)	300.0 (11.81)	179.8 (7.08)	137.6 (5.42)	285.6 (11.25)	5.8 (0.23)	6.89 (15.2)
D	219.9 (8.66)	350.0 (13.78)	179.8 (7.08)	169.0 (6.65)	335.6 (13.21)	5.8 (0.23)	9.25 (20.4)
E	280.3 (11.04)	555.8 (21.88)	207.1 (8.15)	200.0 (7.87)	491.0 (19.33)	6.9 (0.27)	18.60 (41.0)
IP66 / NEMA Type 4X/12							
B	171.7 (6.76)	239.8 (9.44)	203.3 (8.00)	122.7 (4.83)	220.2 (8.67)	5.8 (0.23)	3.61 (8.0)
D	219.9 (8.66)	350.0 (13.78)	210.7 (8.29)	169.0 (6.65)	335.6 (13.21)	5.8 (0.23)	9.13 (20.1)
E	280.3 (11.04)	555.8 (21.88)	219.8 (8.65)	200.0 (7.87)	491.0 (19.33)	6.9 (0.27)	18.60 (41.0)
Flange Mount							
A	156.0 (6.14)	225.8 (8.89)	178.6 (7.03)	123.0 (4.84)	55.6 (2.19)	–	2.71 (6.0)
B	205.2 (8.08)	234.6 (9.24)	178.6 (7.03)	123.0 (4.84)	55.6 (2.19)	–	3.60 (7.9)
C	219.0 (8.62)	300.0 (11.81)	178.6 (7.03)	123.0 (4.84)	55.6 (2.19)	–	6.89 (15.2)
D	248.4 (9.78)	350.0 (13.78)	178.6 (7.03)	123.0 (4.84)	55.6 (2.19)	–	9.25 (20.4)
E	280.3 (11.04)	555.8 (21.88)	207.1 (8.15)	117.2 (4.61)	89.9 (3.54)	–	18.60 (41.0)

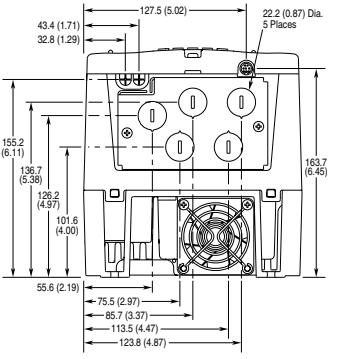
(1) Weights include HIM and Standard I/O.

Figure A.4 PowerFlex 70 IP20 / NEMA Type 1 Bottom View Dimensions

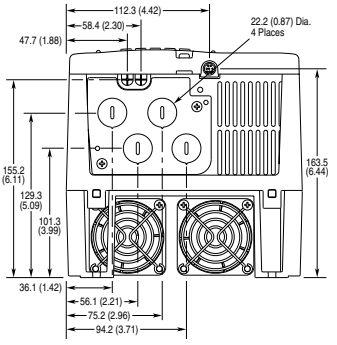
Frame A



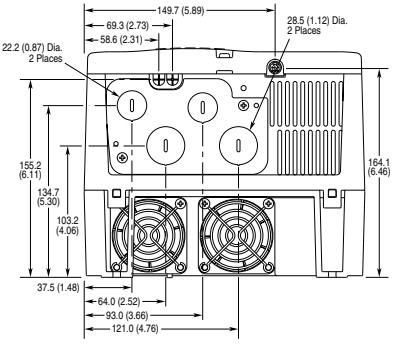
Frame B



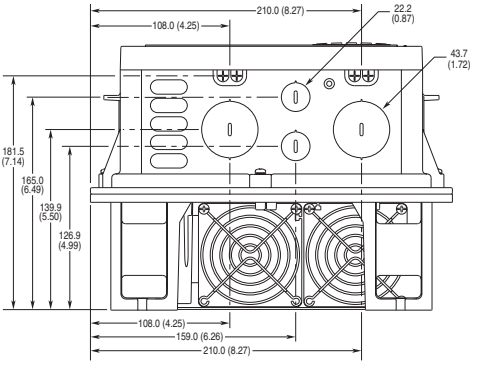
Frame C



Frame D

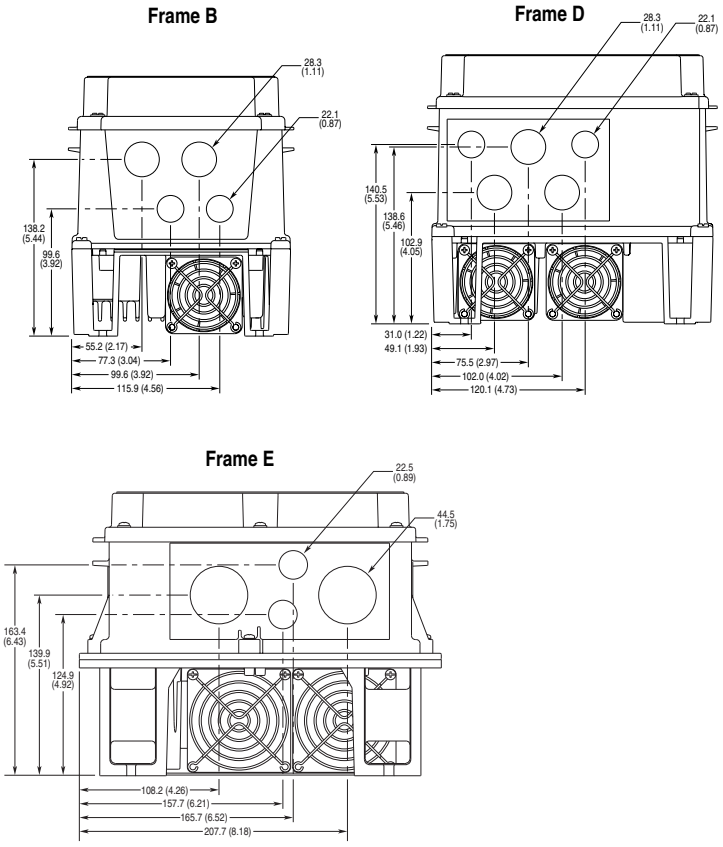


Frame E



Dimensions are in millimeters and (inches).

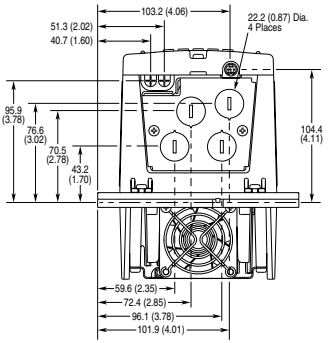
Figure A.5 PowerFlex 70 IP 66 (NEMA Type 4X/12) Bottom View Dimensions



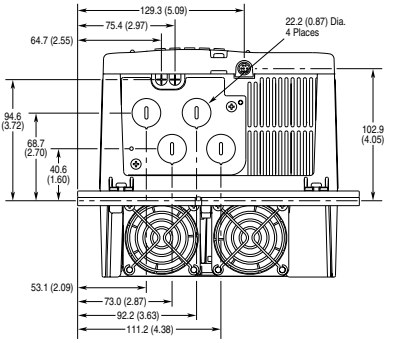
Dimensions are in millimeters and (inches).

Figure A.6 PowerFlex 70 Flange Mount Bottom View Dimensions

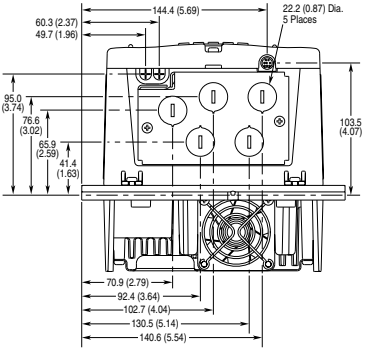
Frame A



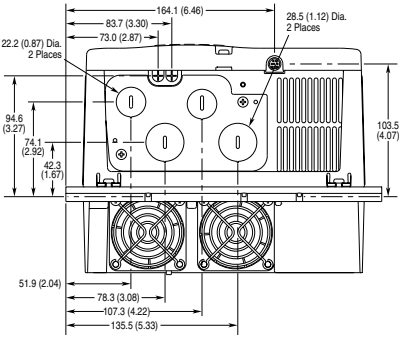
Frame C



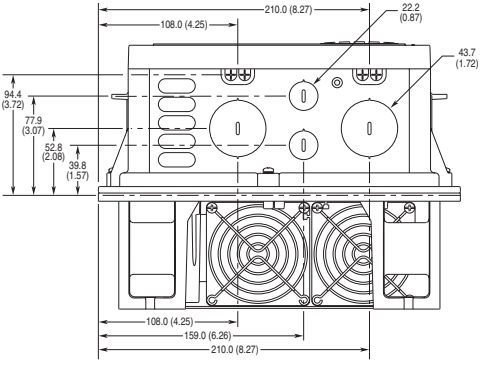
Frame B



Frame D



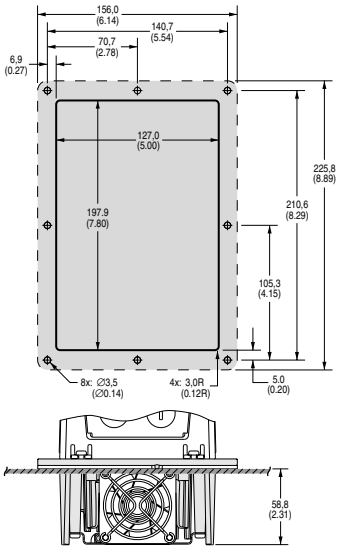
Frame E



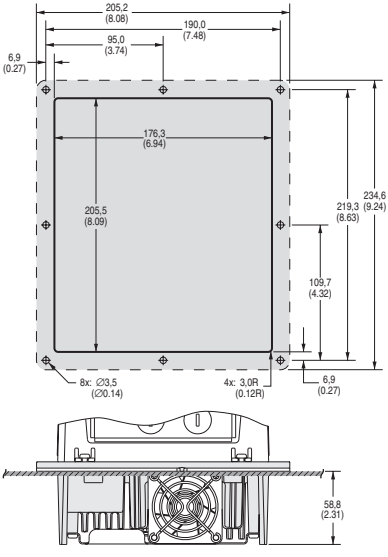
Dimensions are in millimeters and (inches).

Figure A.7 PowerFlex 70 Cutout Dimensions

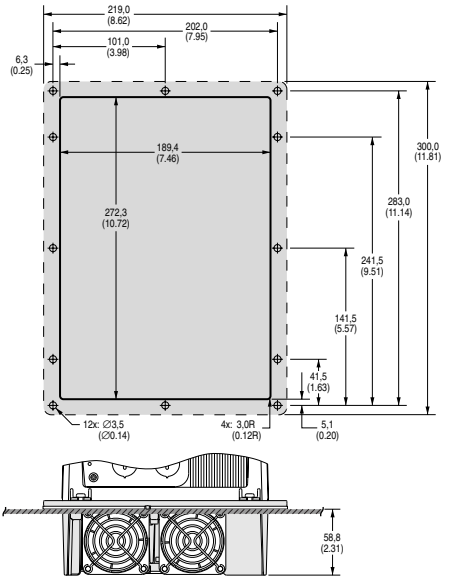
Frame A



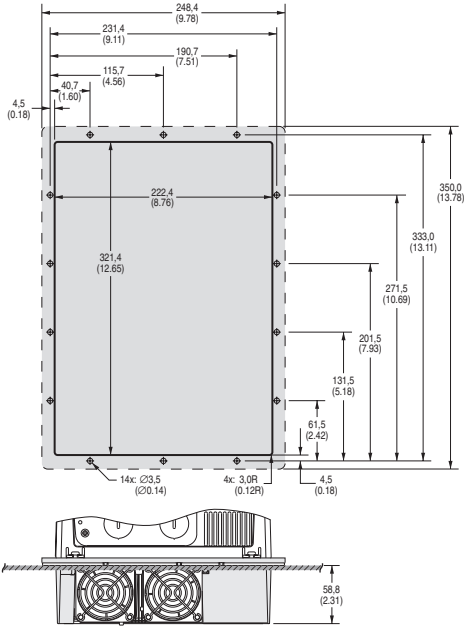
Frame B



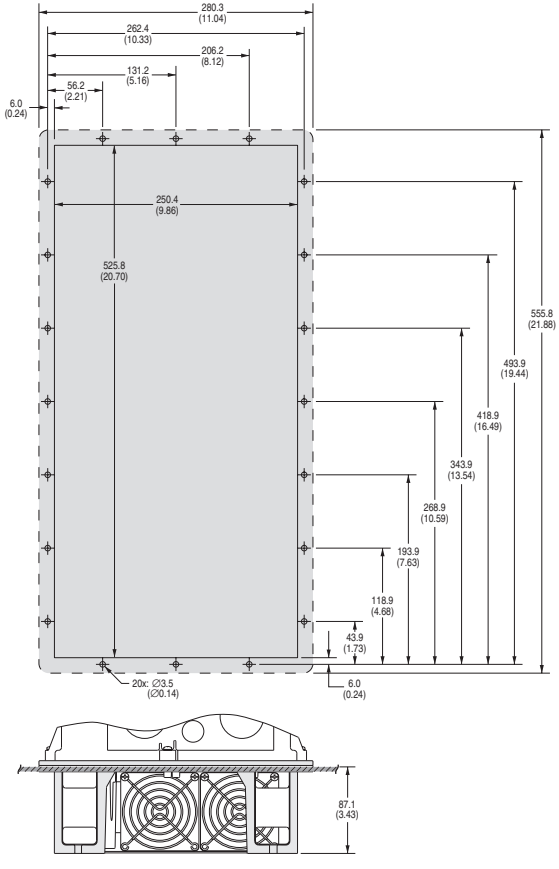
Frame C



Frame D



Frame E


280.3
(11.04)
262.4
(10.33)
206.2
(8.12)
131.2
(5.16)
56.2
(2.21)
6.0
(0.24)
250.4
(9.86)
525.8
(20.70)
555.8
(21.88)
493.9
(19.44)
418.9
(16.49)
343.9
(13.54)
268.9
(10.59)
193.9
(7.63)
118.9
(4.68)
43.9
(1.73)
20x: Ø3.5
(Ø0.14)
6.0
(0.24)
87.1
(3.43)

Output Devices

For information on output devices such as output contactors, cable terminators and output reactors refer to the *PowerFlex Reference Manual*, publication PFLEX-RM001….

Drive, Fuse & Circuit Breaker Ratings

The tables on the following pages provide drive ratings (including continuous, 1 minute and 3 second) and recommended AC line input fuse and circuit breaker information. Both types of short circuit protection are acceptable for UL and IEC requirements. Sizes listed are the recommended sizes based on 40 degree C and the U.S. N.E.C. Other country, state or local codes may require different ratings.

Fusing

If fuses are chosen as the desired protection method, refer to the recommended types listed below. If available amp ratings do not match the tables provided, the closest fuse rating that exceeds the drive rating should be chosen.

- IEC – BS88 (British Standard) Parts 1 & 2 [1], EN60269-1, Parts 1 & 2, type gG or equivalent should be used.
- UL – UL Class CC, T, RK1 or J must be used.

Circuit Breakers

The “non-fuse” listings in the following tables include both circuit breakers (inverse time or instantaneous trip) and 140M Self-Protecting Motor Starters. **If one of these is chosen as the desired protection method**, the following requirements apply.

- IEC and UL – Both types of devices are acceptable for IEC and UL installations.

[1] Typical designations include, but may not be limited to the following; Parts 1 & 2: AC, AD, BC, BD, CD, DD, ED, EFS, EF, FF, FG, GF, GG, GH.

Table A.B 208/240 Volt AC Input Protection Devices (See page A-17 for Notes)

Drive Catalog Number	Frame[1]	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker[4]	Motor Circuit Protector[6]	140M Motor Starter with Adjustable Current Range[7] [8]			
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min.[2]	Max.[3]	Min.[2]	Max.[3]	Max.[5]	Max.[5]	Available Catalog Numbers[9]			
208 Volt AC Input																		
20AB2P2	A	0.5	0.33	2.9	1.1	2.5	2.7	3.7	6	6	6	10	15	7	140M-C2E-B40	140M-D8E-B40	–	–
20AB4P2	A	1	0.75	5.6	2	4.8	5.5	7.4	10	10	10	17.5	15	7	140M-C2E-B63	140M-D8E-B63	–	–
20AB6P8	B	2	1.5	10	3.6	7.8	10.3	13.8	15	15	15	30	30	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AB9P6	B	3	2	14	5.1	11	12.1	16.5	20	25	20	40	40	30	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AB015	C	5	3	16	5.8	17.5	19.2	26.6	20	35	20	70	70	30	140M-C2E-C20	140M-D8E-C20	140M-F8E-C20	–
20AB022	D	7.5	5	23.3	8.3	25.3	27.8	37.9	30	50	30	100	100	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140-CMN-2500
20AB028	D	10	7.5	29.8	10.7	32.2	37.9	50.6	40	70	40	125	125	50	–	–	140M-F8E-C32	140-CMN-4000
20AB042	D	15	10	39.8	14.3	43	55.5	74	60	100	60	175	175	70	–	–	140M-F8E-C45	140-CMN-6300
20AB054	E	20	15	57.5	20.7	62.1	72.4	96.6	80	125	80	200	200	100	–	–	–	140-CMN-6300
20AB070	E	25	20	72.3	26.0	78.2	93.1	124	90	175	90	300	300	100	–	–	–	140-CMN-9000
240 Volt AC Input																		
20AB2P2	A	0.5	0.33	2.5	1.1	2.2	2.4	3.3	3	4.5	3	8	15	3	140M-C2E-B25	140M-D8E-B25	–	–
20AB4P2	A	1	0.75	4.8	2	4.2	4.8	6.4	6	9	6	15	15	7	140M-C2E-B63	140M-D8E-B63	–	–
20AB6P8	B	2	1.5	8.7	3.6	6.8	9	12	15	15	15	25	25	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AB9P6	B	3	2	12.2	5.1	9.6	10.6	14.4	20	20	20	35	35	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AB015	C	5	3	13.9	5.8	15.3	17.4	23.2	20	30	20	60	60	30	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AB022	D	7.5	5	19.9	8.3	22	24.4	33	25	45	25	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140-CMN-2500
20AB028	D	10	7.5	25.7	10.7	28	33	44	35	60	35	110	110	50	–	–	140M-F8E-C32	140-CMN-4000
20AB042	D	15	10	38.7	16.1	42	46.2	63	50	90	50	150	150	50	–	–	140M-F8E-C45	140-CMN-6300
20AB054	E	20	15	49.8	20.7	54	63	84	60	100	60	200	200	100	–	–	–	140-CMN-6300
20AB070	E	25	20	64.5	26.8	70	81	108	90	150	90	275	275	100	–	–	–	140-CMN-9000

Table A.C 400/480 Volt AC Input Protection Devices (See page A-17 for Notes).

Drive Catalog Number	Frame[1]	kW *(400V)* HP *(480V)* Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker[4]	Motor Circuit Protector[6]	140M Motor Starter with Adjustable Current Range[7] [8]			
		ND	*HD*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min.[2]*	*Max.[3]*	*Min.[2]*	*Max.[3]*	*Max.[5]*	*Max.[5]*	*Available Catalog Numbers[9]*			
400 Volt AC Input																		
20AC1P3	A	0.37	0.25	1.6	1.1	1.3	1.4	1.9	3	3	3	5	15	3	140M-C2E-B16	–	–	–
20AC2P1	A	0.75	0.55	2.5	1.8	2.1	2.4	3.2	4	6	4	8	15	7	140M-C2E-B25	140M-D8E-B25	–	–
20AC3P5	A	1.5	1.1	4.3	3	3.5	4.5	6	6	6	6	12	15	7	140M-C2E-B63	140M-D8E-B63	–	–
20AC5P0	B	2.2	1.5	6.5	4.5	5	5.5	7.5	10	10	10	20	20	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AC8P7	B	4	3	11.3	7.8	8.7	9.9	13.2	15	17.5	15	30	30	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AC011	C	5.5	4	11	7.6	11.5	13	17.4	15	25	15	45	40	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AC015	C	7.5	5.5	15.1	10.4	15.4	17.2	23.1	20	30	20	60	60	20	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AC022	D	11	7.5	21.9	15.2	22	24.2	33	30	45	30	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140-CMN-2500
20AC030	D	15	11	30.3	21	30	33	45	40	60	40	120	120	50	–	–	140M-F8E-C32	140-CMN-4000
20AC037	D	18.5	15	35	24.3	37	45	60	50	80	50	125	140	50	–	–	140M-F8E-C45	140-CMN-4000
20AC043	D	22	18.5	40.7	28.2	43	56	74	60	90	60	150	160	70	–	–	–	140-CMN-6300
20AC060	E	30	22	56.8	39.3	60	66	90	80	125	80	225	240	80	–	–	–	140-CMN-6300
20AC072	E	37	30	68.9	47.8	72	90	120	90	150	90	250	280	100	–	–	–	140-CMN-9000
480 Volt AC Input																		
20AD1P1	A	0.5	0.33	1.3	1.1	1.1	1.2	1.6	3	3	3	4	15	3	140M-C2E-B16	–	–	–
20AD2P1	A	1	0.75	2.4	2	2.1	2.4	3.2	3	6	3	8	15	3	140M-C2E-B25	140M-D8E-B25	–	–
20AD3P4	A	2	1.5	3.8	3.2	3.4	4.5	6	6	6	6	12	15	7	140M-C2E-B40	140M-D8E-B40	–	–
20AD5P0	B	3	2	5.6	4.7	5	5.5	7.5	10	10	10	20	20	15	140M-C2E-B63	140M-D8E-B63	–	–
20AD8P0	B	5	3	9.8	8.4	8	8.8	12	15	15	15	30	30	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AD011	C	7.5	5	9.5	7.9	11	12.1	16.5	15	20	15	40	40	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AD014	C	10	7.5	12.5	10.4	14	16.5	22	20	30	20	50	50	20	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AD022	D	15	10	19.9	16.6	22	24.2	33	25	45	25	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	–
20AD027	D	20	15	24.8	20.6	27	33	44	35	60	35	100	100	50	–	–	140M-F8E-C32	140-CMN-2500
20AD034	D	25	20	31.2	25.9	34	40.5	54	40	70	40	125	125	50	–	–	140M-F8E-C45	140-CMN-4000
20AD040	D	30	25	36.7	39.7	40	51	68	50	90	50	150	150	50	–	–	140M-F8E-C45	140-CMN-4000
20AD052	E	40	30	47.7	39.7	52	60	80	60	110	60	200	200	70	–	–	–	140-CMN-6300
20AD065	E	50	40	59.6	49.6	65	78	104	80	125	80	250	250	100	–	–	–	140-CMN-9000

Table A.D 600 Volt AC Input Protection Devices

Drive Catalog Number	Frame[1]	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker[4]	Motor Circuit Protector[6]	140M Motor Starter with Adjustable Current Range[7] [8]			
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min.[2]	Max.[3]	Min.[2]	Max.[3]	Max.[5]	Max.[5]	Available Catalog Numbers[9]			
600 Volt AC Input																		
20AE0P9	A	0.5	0.33	1.3	1.3	0.9	1.1	1.4	3	3	3	3.5	15	3	140M-C2E-B16	–	–	–
20AE1P7	A	1	0.75	1.9	2	1.7	2	2.6	3	6	3	6	15	3	140M-C2E-B25	140M-D8E-B25	–	–
20AE2P7	A	2	1.5	3	3.1	2.7	3.6	4.8	4	6	4	10	15	7	140M-C2E-B40	140M-D8E-B40	–	–
20AE3P9	B	3	2	4.4	4.5	3.9	4.3	5.9	6	8	6	15	15	7	140M-C2E-B63	140M-D8E-B63	–	–
20AE6P1	B	5	3	7.5	7.8	6.1	6.7	9.2	10	12	10	20	20	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AE9P0	C	7.5	5	7.7	8	9	9.9	13.5	10	20	10	35	35	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–
20AE011	C	10	7.5	9.8	10.1	11	13.5	18	15	20	15	40	40	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–
20AE017	D	15	10	15.3	15.9	17	18.7	25.5	20	35	20	60	60	30	140M-C2E-C20	140M-D8E-C20	140M-F8E-C20	–
20AE022	D	20	15	20	20.8	22	25.5	34	25	45	25	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140-CMN-2500
20AE027	D	25	20	24.8	25.7	27	33	44	35	60	35	100	100	50	–	–	140M-F8E-C25	140-CMN-2500
20AE032	D	30	25	29.4	30.5	32	40.5	54	40	70	40	125	125	50	–	–	140M-F8E-C32	140-CMN-4000
20AE041	E	40	30	37.6	39.1	41	48	64	50	90	50	150	150	100	–	–	140M-F8E-C45	140-CMN-4000
20AE052	E	50	40	47.7	49.6	52	61.5	82	60	110	60	200	200	100	–	–	–	140-CMN-6300

(1) For IP 66 (NEMA Type 4X/12) enclosures, drives listed as Frame A increase to Frame B and drives listed as Frame C increase to Frame D.

(2) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.

(3) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(4) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(5) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.

(6) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(7) Bulletin 140M with adjustable current range should have the current trip set to the minimum range that the device will not trip.

(8) Manual Self-Protected (Type E) Combination Motor Controller, UL listed for 208 Wye or Delta, 240 Wye or Delta, 480Y/277 or 600Y/347. Not UL listed for use on 480V or 600V Delta/Delta systems.

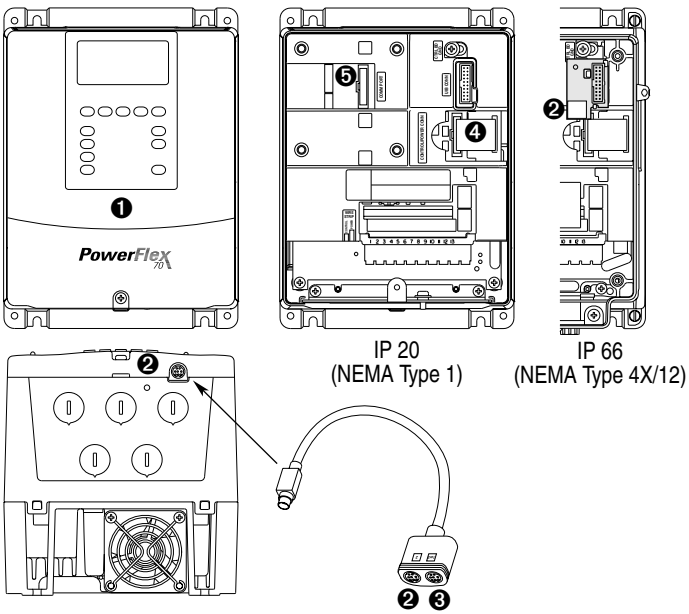
(9) The AIC ratings of the Bulletin 140M Motor Protector may vary. See publication 140M-SG001B-EN-P.

Notes:

HIM Overview

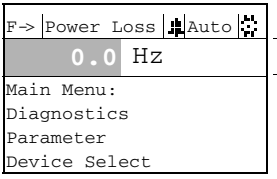
External and Internal Connections

The PowerFlex 70 provides a number of cable connection points (B Frame shown).



No.	Connector	Description
1	DPI Port 1	HIM connection when installed in cover.
2	DPI Port 2	Cable connection for handheld and remote options.
3	DPI Port 3	Splitter cable connected to DPI Port 2 provides additional port.
4	Control / Power Connection	Connection between control and power boards.
5	DPI Port 5	Cable connection for communications adapter.

LCD Display Elements

Display	Description
	Direction | Drive Status | Alarm | Auto/Man | Information Commanded or Output Frequency Programming / Monitoring / Troubleshooting

ALT Functions

To use an ALT function, press the ALT key, release it, then press the programming key associated with one of the following functions:

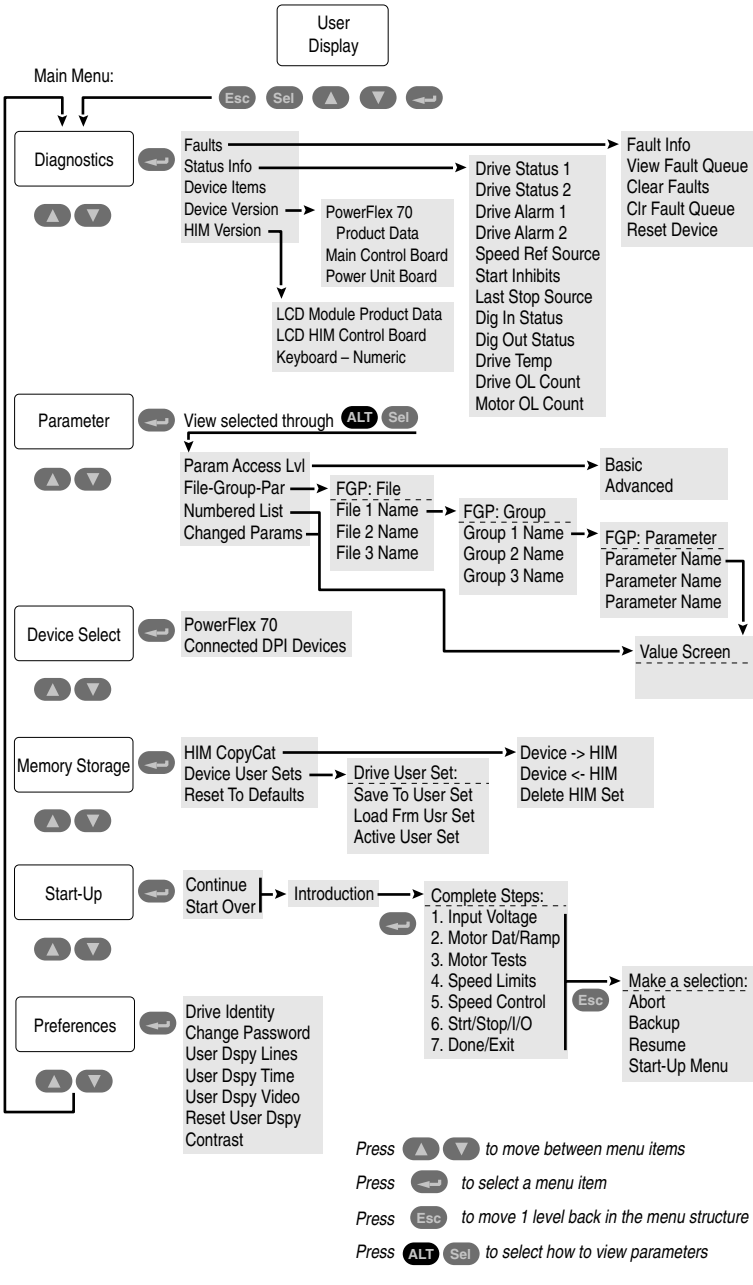
ALT Key and then ...			Performs this function ...	HIM Type
ALT	Esc	S.M.A.R.T.	Displays the S.M.A.R.T. screen.	LCD only
	Esc	Log In/Out	Log in to change parameter settings. Log out to protect parameter settings. Change a password.	LED only
	Sel	View	Allows the selection of how parameters will be viewed or detailed information about a parameter or component.	LCD only
	Sel	Device	Select a connected adapter for editing.	LED only
	▲	Lang	Displays the language selection screen.	LCD only
	▼	Auto / Man	Switches between Auto and Manual Modes.	LCD and LED
	↵	Remove	Allows HIM removal without causing a fault if the HIM is not the last controlling device and does not have Manual control of the drive.	LCD and LED
	.	Exp	Allows value to be entered as an exponent. (Not available on PowerFlex 70.)	LCD only
	+/–	Param #	Allows entry of a parameter number for viewing/ editing.	LCD only

Removing the HIM

The HIM can be removed while the drive is powered. Normally, the drive issues a fault when the HIM is removed because it detects that a device is missing.

Important: HIM removal is only permissible in Auto mode. If the HIM is removed while in Manual mode or the HIM is the only remaining control device, a fault will occur.

Menu Structure



Diagnostics Menu

When a fault trips the drive, use this menu to access detailed data about the drive.

Option	Description
Faults	View fault queue or fault information, clear faults or reset drive.
Status Info	View parameters that display status information about the drive.
Device Version	View the firmware version and hardware series of components.
HIM Version	View the firmware version and hardware series of the HIM.

Parameter Menu

Refer to Viewing and Editing Parameters on page B-5.

Device Select Menu

Use this menu to access parameters in connected peripheral devices.

Memory Storage Menu

Drive data can be saved to, or recalled from, User and HIM sets.
User sets are files stored in permanent nonvolatile drive memory.
HIM sets are files stored in permanent nonvolatile HIM memory.

Option	Description
HIM Copycat Device -> HIM Device <- HIM	Save data to a HIM set, load data from a HIM set to active drive memory or delete a HIM set.
Device User Sets	Save data to a User set, load data from a User set to active drive memory or name a User set.
Reset To Defaults	Restore the drive to its factory-default settings.

Start Up Menu

See Chapter 2.

Preferences Menu

The HIM and drive have features that you can customize.

Option	Description
Drive Identity	Add text to identify the drive.
Change Password	Enable/disable or modify the password.
User Dspy Lines	Select the display, parameter, scale and text for the User Display. The User Display is two lines of user-defined data that appears when the HIM is not being used for programming.
User Dspy Time	Set the wait time for the User Display or enable/disable it.
User Dspy Video	Select Reverse or Normal video for the Frequency and User Display lines.
Reset User Dspy	Return all the options for the User Display to factory default values.

Viewing and Editing Parameters

The PowerFlex 70 drive is initially set to Basic Parameter View. To view all parameters, set parameter 196 [Param Access Lvl] to option 1 "Advanced". Parameter 196 is not affected by the Reset to Defaults function.

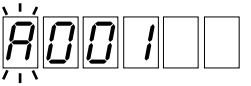
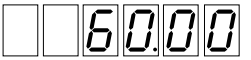
LCD HIM

Step	Key(s)	Example Displays
1. In the Main Menu, press the Up Arrow or Down Arrow to scroll to "Parameter."	or	
2. Press Enter. "FGP File" appears on the top line and the first three files appear below it.		FGP: File Monitor Motor Control Speed Reference
3. Press the Up Arrow or Down Arrow to scroll through the files.	or	
4. Press Enter to select a file. The groups in the file are displayed under it.		FGP: Group Motor Data Torq Attributes Volts per Hertz
5. Repeat steps 3 and 4 to select a group and then a parameter. The parameter value screen will appear.		FGP: Parameter Maximum Voltage Maximum Freq Compensation
6. Press Enter to edit the parameter.		
7. Press the Up Arrow or Down Arrow to change the value. If desired, press Sel to move from digit to digit, letter to letter, or bit to bit. The digit or bit that you can change will be highlighted.	or Sel	FGP: Par 55 Maximum Freq 60.00 Hz 25 <> 400.00
8. Press Enter to save the value. If you want to cancel a change, press Esc.		
9. Press the Up Arrow or Down Arrow to scroll through the parameters in the group, or press Esc to return to the group list.	or Esc	FGP: Par 55 Maximum Freq 90.00 Hz 25 <> 400.00

Numeric Keypad Shortcut

If using a HIM with a numeric keypad, press the ALT key and the +/– key to access the parameter by typing its number.

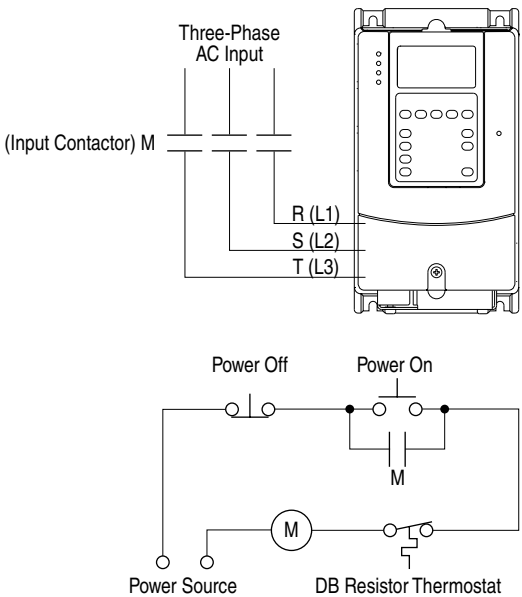
LED HIM - Standard Control Only

Step	Key(s)	Example Displays
1. Press Esc until the Output Frequency screen appears. This screen displays the frequency of the drive if it is running. If the drive is stopped, it will display 0.	Esc	
2. Press Enter. The parameter that was last viewed appears. Its file letter will flash.	Enter	
3. Press the Up Arrow or Down Arrow to scroll through the files.	Up or Down	
4. Press Enter to enter a file. The right digit will then flash.	Enter	
5. Press the Up Arrow or Down Arrow to scroll through the parameters that are in the file. An "n" appears after a number if a parameter is a bit parameter that is divided into nibbles.	Up or Down	
6. Press Enter to view the value of a parameter or nibble. Its value will be displayed. If you do not want to edit the value, press Esc to return to the parameter list.	Enter	
7. Press Enter to enter edit mode. The right digit will flash if it can be edited.	Enter	
8. Press the Up Arrow or Down Arrow to change the value. If desired, press Sel to move from digit to digit or bit to bit. The digit or bit that you can change will flash. To change a sign in a signed value, press Sel to move the cursor to the left-most digit. Then, press the Up Arrow or Down Arrow to scroll to the desired sign.	Up or Down Sel	
9. Press Enter to save the value. If you want to cancel a change, press Esc. The value will stop flashing to indicate that you are no longer in edit mode.	Enter	
10. Press Esc to return to the parameter list.	Esc	

Application Notes

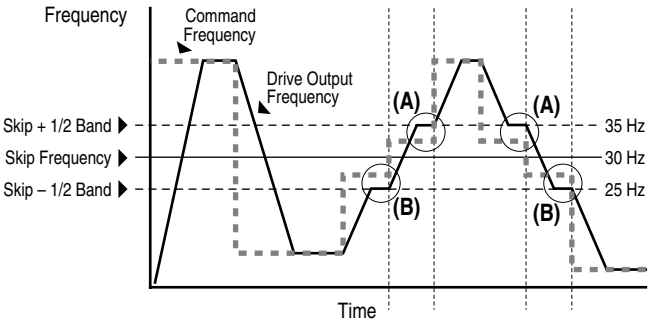
External Brake Resistor

Figure C.1 External Brake Resistor Circuitry



Skip Frequency

Figure C.2 Skip Frequency



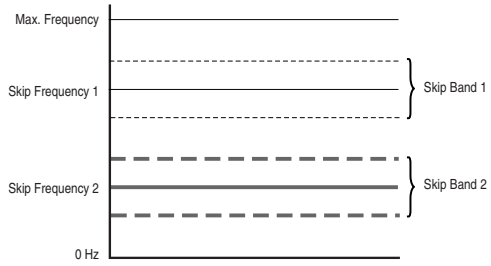
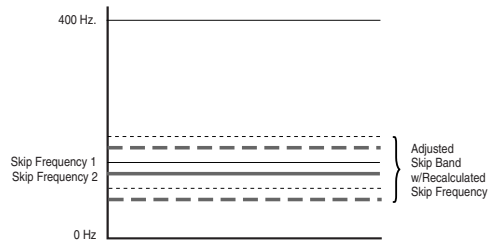
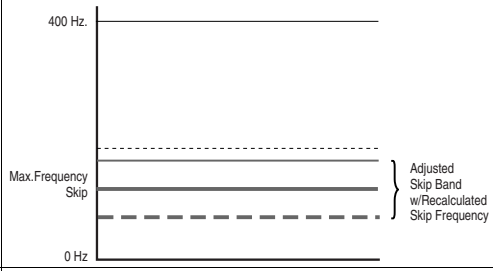
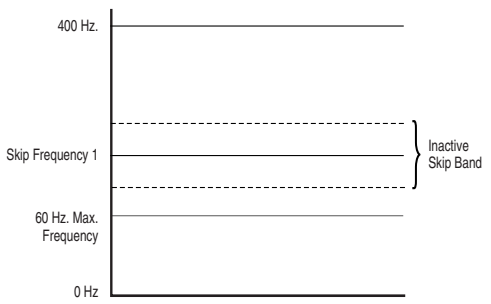
Some machinery may have a resonant operating frequency that must be avoided to minimize the risk of equipment damage. To assure that the motor cannot continuously operate at one or more of the points, skip frequencies are used. Parameters 084-086, ([Skip Frequency 1-3]) are available to set the frequencies to be avoided.

The value programmed into the skip frequency parameters sets the center point for an entire “skip band” of frequencies. The width of the band (range of frequency around the center point) is determined by parameter 87, [Skip Freq Band]. The range is split, half above and half below the skip frequency parameter.

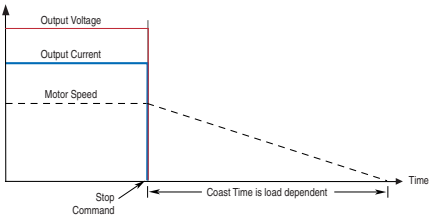
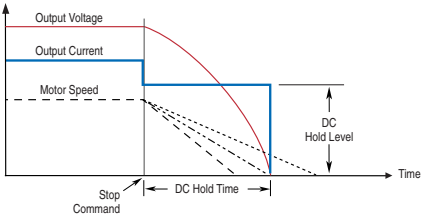
If the commanded frequency of the drive is greater than or equal to the skip (center) frequency and less than or equal to the high value of the band (skip plus 1/2 band), the drive will set the output frequency to the high value of the band. See (A) in Figure C.2.

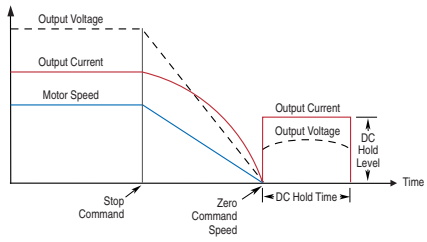
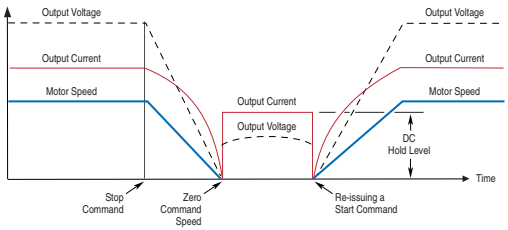
If the commanded frequency is less than the skip (center) frequency and greater than or equal to the low value of the band (skip minus 1/2 band), the drive will set the output frequency to the low value of the band. See (B) in Figure C.2.

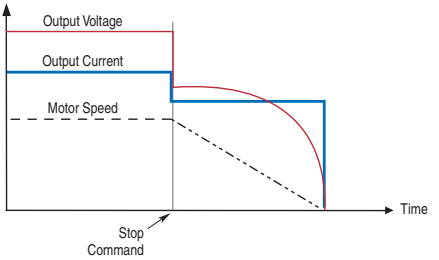
Acceleration and deceleration are not affected by the skip frequencies. Normal accel/decel will proceed through the band once the commanded frequency is greater than the skip frequency. See (A) & (B) in Figure C.2. This function affects only continuous operation within the band.

Skip Frequency Examples	
The skip frequency will have hysteresis so the output does not toggle between high and low values. Three distinct bands can be programmed. If none of the skip bands touch or overlap, each band has its own high/low limit.	
If skip bands overlap or touch, the center frequency is recalculated based on the highest and lowest band values.	
If a skip band(s) extend beyond the max frequency limits, the highest band value will be clamped at the max frequency limit. The center frequency is recalculated based on the highest and lowest band values.	
If the band is outside the limits, the skip band is inactive.	

Stop Mode

Mode	Description
Coast to Stop	 This method releases the motor and allows the load to stop by friction. 1. On Stop, the drive output goes immediately to zero (off). 2. No further power is supplied to the motor. The drive has released control. 3. The motor will coast for a time that is dependent on the mechanics of the system (inertia, friction, etc).
Brake to Stop	 This method uses DC injection of the motor to Stop and/or hold the load. 1. On Stop, 3 phase drive output goes to zero (off) 2. Drive outputs DC voltage on the last used phase at the level programmed in [DC Brake Level] Par 158. This voltage causes a “stopping” brake torque. If the voltage is applied for a time that is longer than the actual possible stopping time, the remaining time will be used to attempt to hold the motor at zero speed. 3. DC voltage to the motor continues for the amount of time programmed in [DC Brake Time] Par 159. Braking ceases after this time expires. 4. After the DC Braking ceases, no further power is supplied to the motor. The motor may or may not be stopped. The drive has released control. 5. The motor, if rotating, will coast from its present speed for a time that is dependent on the mechanics of the system (inertia, friction, etc).

Mode	Description
Ramp to Stop	 This method uses drive output reduction to stop the load. 1. On Stop, drive output will decrease according to the programmed pattern from its present value to zero. The pattern may be linear or squared. The output will decrease to zero at the rate determined by the programmed [Maximum Freq] and the programmed active [Decel Time x] 2. The reduction in output can be limited by other drive factors such as bus or current regulation. 3. When the output reaches zero the output is shut off. 4. The motor, if rotating, will coast from its present speed for a time that is dependent on the mechanics of the system (inertia, friction, etc).
Ramp to Hold	 This method combines two of the methods above. It uses drive output reduction to stop the load and DC injection to hold the load at zero speed once it has stopped. 1. On Stop, drive output will decrease according to the programmed pattern from its present value to zero. The pattern may be linear or squared. The output will decrease to zero at the rate determined by the programmed [Maximum Freq] and the programmed active [Decel Time x] 2. The reduction in output can be limited by other drive factors such as bus or current regulation. 3. When the output reaches zero 3 phase drive output goes to zero (off) and the drive outputs DC voltage on the last used phase at the level programmed in [DC Brake Level] Par 158. This voltage causes a “holding” brake torque. 4. DC voltage to the motor continues until a Start command is reissued or the drive is disabled. 5. If a Start command is reissued, DC Braking ceases and the drive returns to normal AC operation. If an Enable command is removed, the drive enters a “not ready” state until the enable is restored.

Mode	Description
Fast Brake	 This method uses drive output reduction to stop the load. 1. On Stop, the drive output will decrease according to the programmed pattern from its present value to zero at the rate determined by the programmed active [Decel Time x]. This is accomplished by lowering the output frequency below the motor speed where regeneration will not occur. This causes excess energy to be lost in the motor. 2. The reduction in output can be limited by other drive factors such as bus or current regulation. 3. When the output reaches very near zero, DC brake will automatically be used to complete the stop then the output is shut off.

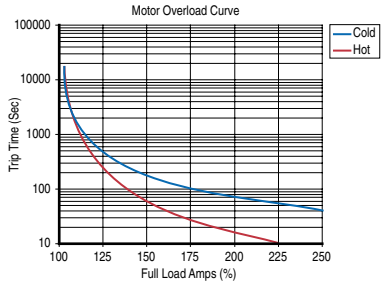
Motor Overload

For single motor applications the drive can be programmed to protect the motor from overload conditions. An electronic thermal overload I^2T function emulates a thermal overload relay. This operation is based on three parameters; [Motor NP FLA], [Motor OL Factor] and [Motor OL Hertz] (parameters 042, 048 and 047, respectively).

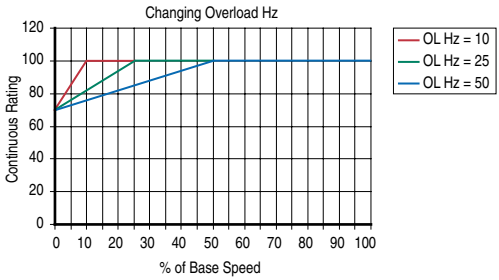
[Motor NP FLA] is multiplied by [Motor OL Factor] to allow the user to define the continuous level of current allowed by the motor thermal overload. [Motor OL Hertz] is used to allow the user to adjust the frequency below which the motor overload is derated.

The motor can operate up to 102% of FLA continuously. If the drive had just been activated, it will run at 150% of FLA for 180 seconds. If the motor had been operating at 100% for over 30 minutes, the drive will run at 150% of FLA for 60 seconds. These values assume the drive is operating above [Motor OL Hertz], and that [Motor OL Factor] is set to 1.00.

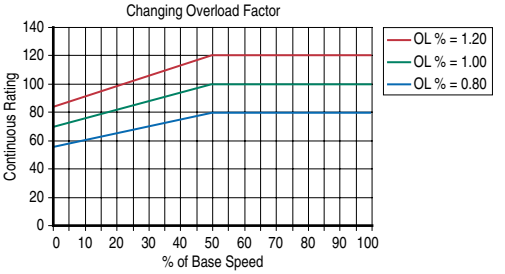
Operation below 100% current causes the temperature calculation to account for motor cooling.



[Motor OL Hertz] defines the frequency where motor overload capacity derate should begin. The motor overload capacity is reduced when operating below [Motor OL Hertz]. For all settings of [Motor OL Hertz] other than zero, the overload capacity is reduced to 70% at an output frequency of zero.



[Motor NP FLA] is multiplied by [Motor OL Factor] to select the rated current for the motor thermal overload. This can be used to raise or lower the level of current that will cause the motor thermal overload to trip. The effective overload factor is a combination of [Motor OL Hertz] and [Motor OL Factor].



Motor Overload Memory Retention Per 2005 NEC

The PowerFlex 70 EC (Firmware Revision 3.002 or greater) has the ability to retain the motor overload count at power down per the 2005 NEC motor overtemp requirement. A parameter has been added to provide this functionality. To Enable/Disable this feature, refer to the information below.

File B	Group	No.	Parameter Name and Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Motor Data	050	E C v3 **[Motor OL Mode]** If "0," [Drive OL Count], P219 is reset to zero by a drive reset or a power cycle. If "1," the value is maintained. A "1" to "0" transition resets [Drive OL Count] to zero. Pwr Cyc Rst x x x x x x x x x x x x x x x **0** 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 *Nibble 4* *Nibble 3* *Nibble 2* *Nibble 1* *Bit #* *Factory Default Bit Values*	**1** = Enabled **0** = Disabled x = Reserved	219

Start At PowerUp

When Start At Powerup in 2 wire control is configured, the drive will start if all start permissive conditions are met (within 10 seconds of drive power being applied), and the terminal block start input (Run, Run Forward or Run Reverse for 2-wire) is closed. An alarm will be annunciated from application of power until the drive actually starts, indicating the powerup start attempt is in progress.

The powerup start attempt will be aborted if any of the following occurs anytime during the 10-second start interval:

- A fault condition occurs
- A Type 2 alarm condition occurs
- The terminal block programmed enable input is opened
- All terminal block run, run forward, or run reverse, inputs are canceled
- A Stop request (from any source) is received

If the drive has not started within the 10 second interval, the powerup start attempt will be terminated.

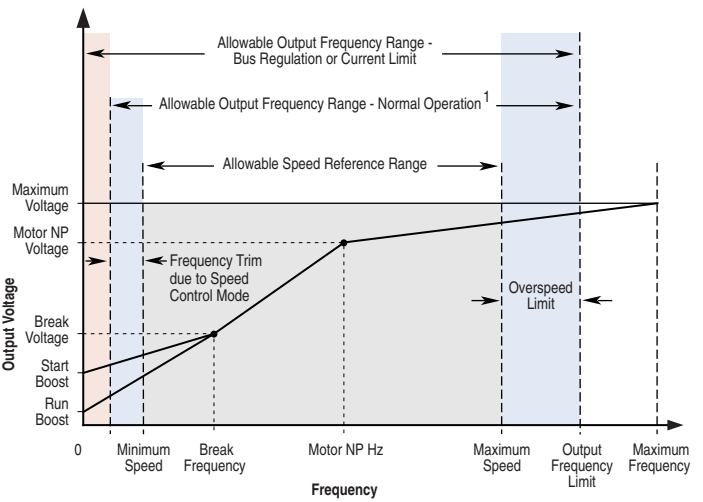
Overspeed

Overspeed Limit is a user programmable value that allows operation at maximum speed, but also provides an “overspeed band” that will allow a speed regulator such as encoder feedback or slip compensation to increase the output frequency above maximum speed in order to maintain maximum motor speed.

The figure below illustrates a typical Custom V/Hz profile. Minimum Speed is entered in Hertz and determines the lower speed reference limit during normal operation. Maximum Speed is entered in Hertz and determines the upper speed reference limit. The two “Speed” parameters only limit the speed reference and not the output frequency.

The actual output frequency at maximum speed reference is the sum of the speed reference plus “speed adder” components from functions such as slip compensation.

The Overspeed Limit is entered in Hertz and added to Maximum Speed and the sum of the two (Speed Limit) limit the output frequency. This sum (Speed Limit) must is compared to Maximum Frequency and an alarm is initiated which prevents operation if the Speed Limit exceeds Maximum Frequency.



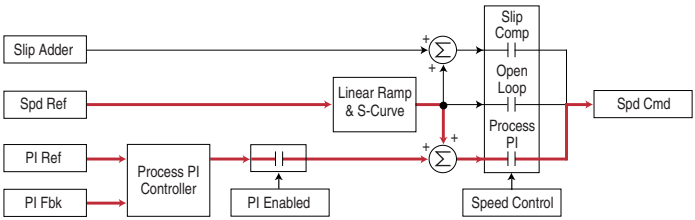
Note 1: The lower limit on this range can be 0 depending on the value of Speed Adder

Process PI for Standard Control

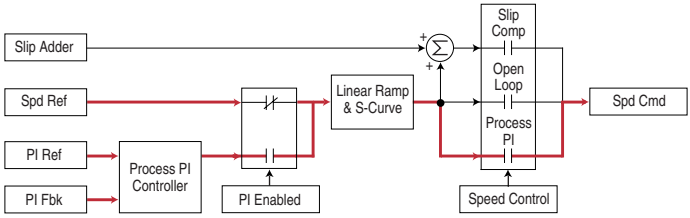
The internal PI function of the PowerFlex 70 provides closed loop process control with proportional and integral control action. The function is designed for use in applications that require simple control of a process without external control devices. The PI function allows the microprocessor of the drive to follow a single process control loop.

The PI function reads a process variable input to the drive and compares it to a desired setpoint stored in the drive. The algorithm will then adjust the output of the PI regulator, changing drive output frequency to try and make the process variable equal the setpoint.

It can operate as trim mode by summing the PI loop output with a master speed reference.

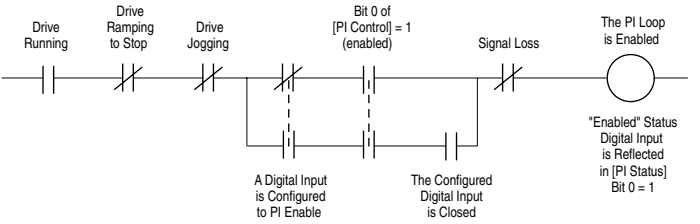


Or, it can operate as control mode by supplying the entire speed reference. This method is identified as “exclusive mode”



PI Enable

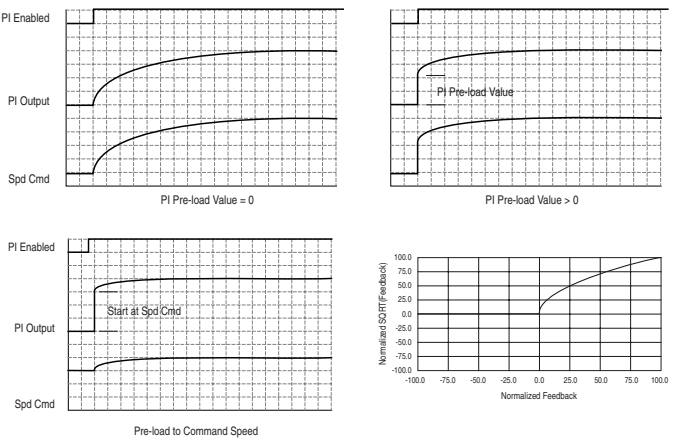
The output of the PI loop can be turned on (enabled) or turned off (disabled). This control allows the user to determine when the PI loop is providing part or all of the commanded speed. The logic for enabling the PI loop is shown in below.

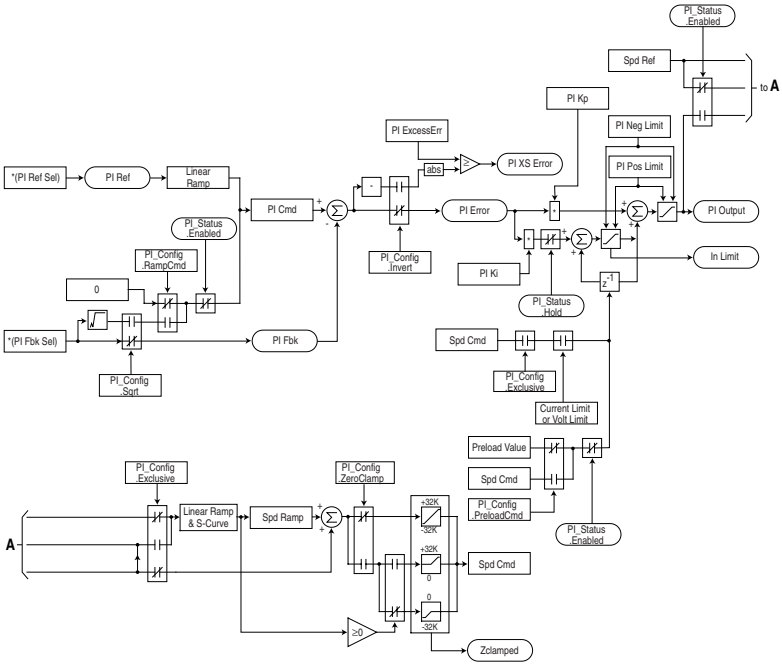


The drive must be running for the PI loop to be enabled. The loop will be disabled when the drive is ramping to a stop, jogging or the signal loss protection for the analog input(s) is sensing a loss of signal.

If a digital input has been configured to “PI Enable,” two events are required to enable the loop: the digital input must be closed AND bit 0 of the PI Control parameter must be = 1.

If no digital input is configured to “PI Enable,” then only the Bit 0 = 1 condition must be met. If the bit is permanently set to a “1”, then the loop will become enabled as soon as the drive goes into “run”.

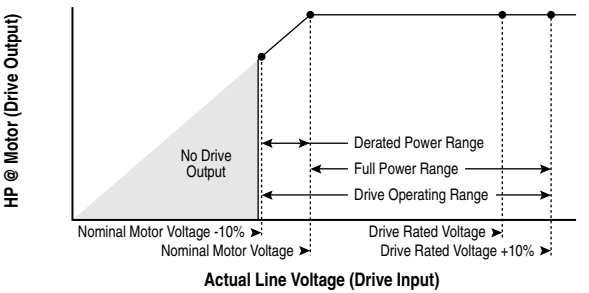



PI_Status Enabled
Spd Ref
to A
PI Kp
PI Neg Limit
PI ExcessErr
PI Pos Limit
*(PI Ref Sel)
PI Ref
Linear Ramp
PI Cmd
PI XS Error
PI Error
PI Output
PI_Status Enabled
PI_Config RampCmd
PI_Config Invert
In Limit
PI Ki
0
PI_Status Hold
*(PI Fbk Sel)
PI Fbk
Spd Cmd
PI_Config Sqrt
PI_Config Exclusive
Current Limit or Volt Limit
Preload Value
PI_Config Exclusive
PI_Config ZeroClamp
Spd Cmd
PI_Config PreloadCmd
A
Linear Ramp & S-Curve
Spd Ramp
PI_Status Enabled
+32K
-32K
Spd Cmd
Zclamped

Voltage Tolerance

Drive Rating	Nominal Line Voltage	Nominal Motor Voltage	Drive Full Power Range	Drive Operating Range
200-240	200	200†	200-264	180-264
	208	208	208-264	
	240	230	230-264	
380-400	380	380†	380-528	342-528
	400	400	400-528	
	480	460	460-528	
500-600	600	575†	575-660	432-660

Drive Full Power Range =	Nominal Motor Voltage to Drive Rated Voltage + 10%. Rated current is available across the entire Drive Full Power Range
Drive Operating Range =	Lowest† Nominal Motor Voltage - 10% to Drive Rated Voltage + 10%. Drive Output is linearly derated when Actual Line Voltage is less than the Nominal Motor Voltage

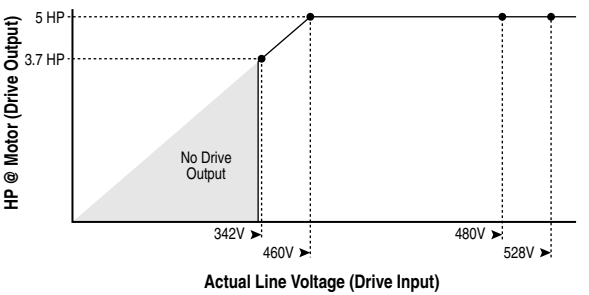


Example:

Calculate the maximum power of a 5 HP, 460V motor connected to a 480V rated drive supplied with 342V Actual Line Voltage input.

- Actual Line Voltage / Nominal Motor Voltage = 74.3%
- 74.3% × 5 HP = 3.7 HP
- 74.3% × 60 Hz = 44.6 Hz

At 342V Actual Line Voltage, the maximum power the 5 HP, 460V motor can produce is 3.7 HP at 44.6 Hz.



A

E

F

G

H

I

R

S

T

U

V

W

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ESCALATOR OPERATIONS
AND MAINTENANCE MANUAL

REPLACEMENT PARTS
VOLUME 4

FINAL

NEW YORK CITY TRANSIT AUTHORITY
HERALD SQUARE PHASE IV
(HS 11/12)

CONTRACT No. E-34011
ESCALATOR No. E235, E236

TABLE OF CONTENTS

CONTRACT E-34011
HERALD SQUARE
PHASE IV ESCALATORS
E-235 & E-236

VOLUME 4

REPLACEMENT PARTS

A) DRIVE MACHINERY & MOTORS & TENSION CARRIAGE

Main Drive Installation

See Fig. A-1a for Main Drive Installation.
Escalator No. E235, E236
Assembly used in: C62C1-2881A1 (HS L01, M01)

MAIN DRIVE INSTALLATION C62C1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62L25002	MAIN DRIVE, ASSY, 36 TON, 24" STEP, LUBE-FREE CHAIN	1	
2	D62L10001	BEARING, SPLIT - FLOATING EXPANSION TYPE	1	CRAFT BEARING, S1 BCH 105mm FL BP
3	D62L10002	BEARING, SPLIT - HELD FIXED TYPE	1	CRAFT BEARING, S1 BCH 105mm HD BP
4	D00902111	BOLT, HEX, M24 (P=3.0) X 160, FULL	8	
5	D00903010	NUT, HEX, M24 (P=3.0)	12	
6	D00907010	WASHER,FLAT,M24	8	
7	D00908010	WASHER,LOCK,M24	4	
8	D61012008	SHIM	40	
9	D61012009	SHIM	40	

Main Drive Assembly

See Fig. A-1b for Main Drive Assembly.
Escalator No. E235, E236
Assembly used in: C62L25002 (HS L01, M01)

MAIN DRIVE ASSEMBLY C62L25002				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62L26002	SHAFT, MAIN DRIVE, ASSY.	1	
2	C62L31001	RATCHET, ASSY, MAIN DRIVE	1	
3	D00902075	BOLT, HEX, M16 (P=2.0) X 120	6	
4	D00907008	WASHER,FLAT,M16	36	
5	D62J26001	SPROCKET, MAIN DRIVE, 67T.	1	
6	D62J37001	WASHER, RETAINING, SPRING	6	
7	D62J38001	SPRING, DISC	12	McMaster-Carr #96445K384
8	D62J41001	SCREW, SHOULDER, 20mm	24	
9	D62J42001	NUT, NYLON, M16	30	
10	D62L28001	SPROCKET, STEP CHAIN, DRIVE SIDE	1	
11	D62L29001	SPROCKET, STEP CHAIN, BRAKE SIDE	1	
12	D62L30001	SPROCKET, HANDRAIL DRIVE	1	
13	D62L42001	BUFFER, SPROCKET	48	

Tension Carriage Installation

See Fig. A-2a for Tension Carriage Installation.
Escalator No. E235, E236
Assembly used in: C62M1-2881E1 (HS L01, M01)

TENSION CARRIAGE INSTALLATION C62M1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62B67001	ROLLER,TENSION CARRIAGE,ASSY	1	
2	C62B68001	ROLLER,TENSION CARRIAGE,ASSY	1	
3	C62B76001	RAIL, TENSION CARRIAGE, ASSY	2	
4	C62L14001	TENSION CARRIAGE, ASSY, 36 TON	1	
5	C62M24001	BRACKET,TENSION CARRIAGE,ASSY	2	
6	C62M27001	BASE,TENSION CARRIAGE,ASSY	1	
7	C62M27002	BASE,TENSION CARRIAGE,ASSY	1	
8	C62M30001	BASE,TENSION CARRIAGE,ASSY	1	
9	C62M30002	BASE,TENSION CARRIAGE,ASSY	1	
10	C62M39001	SCALE,TENSION CARRIAGE,ASSY	1	
11	C62M39002	SCALE,TENSION CARRIAGE,ASSY	1	
12	D00002005	WASHER, FLAT, NARROW, 5/16	24	
14	D00005028	3/8-16 X 1-3/4 HEX HEAD CAP SCREW	4	
15	D00153001	NUT,LOCKING,NYLON INSERT,M8	18	
16	D00902026	BOLT, HEX, M6 (P=1.00) X 25	16	
17	D00902031	BOLT, HEX, M8 (P=1.25) X 16, FULL	4	
18	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	20	
19	D00902036	BOLT, HEX, M8 (P=1.25) X 40, FULL	4	
20	D00902049	BOLT, HEX, M10 (P=1.50) X30	10	
21	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	8	
22	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	6	
23	D00902084	BOLT, HEX, M16 (P=2.0) X 60	8	
24	D00903004	NUT, HEX, M6 (P=1.0)	18	
25	D00903005	NUT, HEX, M8 (1.25)	34	
26	D00903006	NUT,HEX,M10 (P=1.5)	26	
27	D00903007	NUT,HEX,M12 (P=1.75)	6	
28	D00903008	NUT,HEX,M16 (P=2.0)	18	

See Fig. A-2a for Tension Carriage Installation.
Escalator No. E235, E236
Assembly used in: C62M1-2881E1 (HS L01, M01)

TENSION CARRIAGE INSTALLATION C62M1-2881E1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
29	D00905046	SCREW,MACH,FLT/PH,M6(P=1)X16SS	2	
30	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	16	
31	D00905064	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	8	
32	D00905081	SCREW,MACHINE,FLT/SL.M10 (P=1.5) x 30	20	
33	D00907004	WASHER,FLAT,M6	30	
34	D00907005	WASHER,FLAT,M8	52	
35	D00907006	WASHER,FLAT,M10	40	
36	D00907007	WASHER,FLAT,M12	20	
37	D00907008	WASHER,FLAT,M16	22	
38	D00908004	WASHER,LOCK,M6	18	
39	D00908005	WASHER,LOCK,M8	34	
40	D00908006	WASHER,LOCK,M10	18	
41	D00908007	WASHER,LOCK,M12	14	
42	D00908008	WASHER,LOCK,M16	10	
43	D61012003	SHIM, 28 GA. (.38 THK.)	8	
44	D61012004	SHIM, 16 GA. (1.5 THK.)	10	
45	D61764001	NUT, UNISTRUT	2	UNISTRUT #P1008T
46	D62B08001	PLATE,TENSION CARRIAGE	2	
47	D62B23001	RUBBER,TENSION CARRIAGE	2	McMaster-Carr #8507K54
48	D62B29001	POINTER,TENSION CARRIAGE	2	
49	D62B38001	SPACER,TENSION CARRIAGE	2	
50	D62B39001	SPACER,TENSION CARRIAGE	6	
51	D62B52001	BRACKET,TENSION CARRIAGE	2	
52	D62B59001	BRACKET,TENSION CARRIAGE	2	
53	D62B62001	FRAME,TENSION CARRIAGE	1	
54	D62B65001	FRAME,TENSION CARRIAGE	1	
55	D62B66003	FRAME,TENSION CARRIAGE	1	
56	D62B69001	FRAME,TENSION CARRIAGE	2	
57	D62B70001	BRACKET,TENSION CARRIAGE	2	
58	D62H28001	TURN TRACK, TRACK	1	
59	D62H28002	TURN TRACK, TRACK	1	

See Fig. A-2a for Tension Carriage Installation.
Escalator No. E235, E236
Assembly used in: C62M1-2881E1 (HS L01, M01)

TENSION CARRIAGE INSTALLATION C62M1-2881E1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
60	D62L38001	TAG, SPRING LENGTH	1	
61	D62L38002	WIRE, SPRING TAG	1	
62	D62M1-2881A1	SPRING, TENSION CARRIAGE	2	McMaster-Carr #96485K222
63	D62M1-2881A2	THREADED ROD, M16x2, 1000mm	2	McMaster-Carr #94185A175
64	D62M16001	RAIL, TENSION CARRIAGE	2	
65	D62M17001	A-TRACK,TENSION CARRIAGE	1	
66	D62M17002	A-TRACK,TENSION CARRIAGE	1	
67	D62M18001	B & M-TRACK,TENSION CARRIAGE	2	
68	D62M18002	B $ M-TRACK,TENSION CARRIAGE	2	
69	D62M19001	B-UP THRUST,TENSION CARRIAGE	1	
70	D62M19002	B-UP THRUST,TENSION CARRIAGE	1	
71	D62M20001	M-UP THRUST,TENSION CARRIAGE	1	
72	D62M20002	M-UP THRUST,TENSION CARRIAGE	1	
73	D62M21001	A-FRAME,TENSION CARRIAGE	2	
74	D62M22001	B-FRAME,TENSION CARRIAGE	1	
75	D62M22002	B-FRAME,TENSION CARRIAGE	1	
76	D62M23001	M-FRAME,TENSION CARRIAGE	1	
77	D62M23002	M-FRAME,TENSION CARRIAGE	1	
78	D62M33001	PLATE,TENSION CARRIAGE	2	
79	D62M34001	BASE,TENSION CARRIAGE	2	
80	D62M42001	ANGLE, SUPPORT, TENSION CARRIAGE	2	
81	D62M55001	PLATE, GREASE POINT, LOWER NEWEL	2	
82	D68437001	FITTING, 6mm x 1/8NPT	4	Parker #FBMB6-1/8
83	D68511001	COUPLING, ANCHOR	2	Parker #207ACBHS-2
84	D68512001	FITTING, LUBE, 90 DEG, 1/8NPT	2	Alemite #1613-B
85	C62K5-2881A1	ASSY, SPRING WASHER	2	

Tension Carriage Assembly

See Fig. A-2b for Tension Carriage Assembly.
Escalator No. E235, E236
Assembly used in: C62L14001 (HS L01, M01)

TENSION CARRIAGE ASSEMBLY C62L14001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00003010	WASHER, LOCK, 1	4	
2	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	4	
3	D00908007	WASHER,LOCK,M12	4	
4	D00915060	RING, RETAINING, EXTERNAL S-60	2	
5	D00915110	RING, RETAINING, INTERNAL R-110	2	
6	D62B54001	ROLLER, TENSION CARRIAGE	4	McMaster-Carr #6318K13
7	D62K21001	MACHINING, SPROCKET, TENS. CARR.	2	
8	D62K45001	FRAME, TENSION CARRIAGE	1	
9	D62K45002	FRAME, TENSION CARRIAGE	1	
10	D62L15001	SHAFT, TENSION CARRIAGE, 24" STEP	1	
11	D62L16001	PLATE, TENSION CARRIAGE	2	
12	D62L17001	BEARING, One Side of Bearing Sealed Only	4	NSK 6212-DU
13	D62L18001	SPACER, BEARING, TENSION CARRIAGE	2	
14	D62L19001	COLLAR, TENSION CARRIAGE	2	
15	D68481001	PLUG, PIPE, 1/8 NPT	2	McMaster-Carr #4638K821
16	D62L42001	BUFFER, SPROCKET	48	

Machine Idler Assembly

See Fig. A-3 for Machine Idler Assembly.
Escalator No. E235, E236
Assembly used in: C62B3-2881E1 (HS L01, M01)

MACHINE IDLER ASSEMBLY C62B3-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62B5-2881E2	WELDMENT, IDLER, MACHINE	1	
2	C62B5-2881E9	WELDMENT, IDLER, MACHINE	1	
3	C62B6-2881E3	IDLER, MACHINE, SHAFT, ASS"Y	1	
4	D00902084	BOLT, HEX, M16 (P=2.0) X 60	3	
5	D00903009	NUT, HEX, M20 (P=2.5)	2	
6	D00907008	WASHER,FLAT,M16	3	
7	D00907009	WASHER,FLAT,M20	2	
8	D00908008	WASHER,LOCK,M16	3	
9	D00915100	RING, RETAINING,R-100	1	
10	D00915245	RING,RETAINING,S-45,STNSTL	1	
11	D01006038	BEARING	2	NSK 6309DDU
12	D62B6-2881E3	SPROCKET, IDLER, 120-2, 18T	1	

Machine Installation

See Fig. A-4a for Machine Installation.
Escalator No. E235, E236
Assembly used in: C62B1-2881L1 (HS L01, M01)

MACHINE INSTALLATION C62B1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62B1-2881L2	MACHINE, 20HP NO BASE,w/BRAKE	1	
2	C62M59001	IDLER, TAKE-UP	1	See (H) Electrical Components
3	C65641001	PIT DISCONNECT SWITCH	1	See (H) Electrical Components
4	C65A4-D345A1	JUNCTION BOX ASSY	1	
5	D00003006	WASHER, LOCK, 3/8	4	
6	D00005022	3/8-16 X 1-1/2 HEX HEAD CAP SCREW	4	
7	D00902009	BOLT, HEX, M4 (P=0.7) X16, FULL	4	
8	D00902025	BOLT, HEX, M6 (P=1.00) X 20, FULL	4	
9	D00902027	BOLT, HEX, M6 (P=1.00) X 35, FULL	8	
10	D00902047	BOLT, HEX, M10 (P=1.50) X20	2	
11	D00902049	BOLT, HEX, M10 (P=1.50) X30	2	
12	D00902050	BOLT, HEX, M10 (P=1.50) X 35	2	
13	D00902051	BOLT, HEX, M10 (P=1.50) X 40	8	
14	D00902067	BOLT, HEX, M12 (P=1.75) X 45, FULL	4	
15	D00902089	BOLT, HEX, M20 (P=2.5) X 60, FULL	8	
16	D00902090	BOLT, HEX, M20 (P=2.5) X 80, FULL	8	
17	D00902098	BOLT, HEX, M20 (P=2.5) X 100, FULL	4	
18	D00903002	NUT, HEX, M4 (P=0.7)	4	
19	D00903004	NUT, HEX, M6 (P=1.0)	4	
20	D00903006	NUT,HEX,M10 (P=1.5)	12	
21	D00903007	NUT,HEX,M12 (P=1.75)	4	
22	D00903009	NUT, HEX, M20 (P=2.5)	12	
23	D00907002	WASHER,FLAT,M4	4	
24	D00907004	WASHER,FLAT,M6	13	
25	D00907006	WASHER,FLAT,M10	22	
26	D00907009	WASHER,FLAT,M20	20	
27	D00907009	WASHER,LOCK,M4	4	

See Fig. A-4a for Machine Installation.
Escalator No. E235, E236
Assembly used in: C62B1-2881L1 (HS L01, M01)

MACHINE INSTALLATION C62B1-2881L1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
28	D00908004	WASHER,LOCK,M6	12	
29	D00908006	WASHER,LOCK,M10	14	
30	D00908007	WASHER,LOCK,M12	4	
31	D00908009	WASHER,LOCK,M20	12	
32	D00918009	NUT, JAM,M20 (P=2.5)	8	
33	D61012003	SHIM, 28 GA. (.38 THK.)	24	
34	D61012004	SHIM, 16 GA. (1.5 THK.)	12	
35	D61764001	NUT, UNISTRUT	4	UNISTRUT #P1008T
36	D61781001	LADDER, OFFSET RUNG	1	McMaster-Carr #7983T35
37	D61F1-2881A4	UNISTRUT, TRUSS, LOWER	2	
38	D61NA-2881D9	BRACKET, MACHINE E-STOP	1	
39	D61NA-2881E4	FASTENER, GRATING	8	McMaster-Carr #6268T26
40	D61NA-2881L10	GRATING, UPPER TRUSS	1	
41	D61NA-2881L11	GRATING, UPPER TRUSS	1	
42	D61NA-2881L9	ANGLE, GRATING SUPPORT	2	
43	D61SA-2881A5	COVER, ACCESS, DRIP PAN	1	
44	D62B4-2881L1	CHAIN, MAIN DRIVE, RS120-2	1	
45	D65644001	VIBRATION SENSOR	1	PCB PIEZOTRONICS #640A10 (Industrial 4~20 mA)

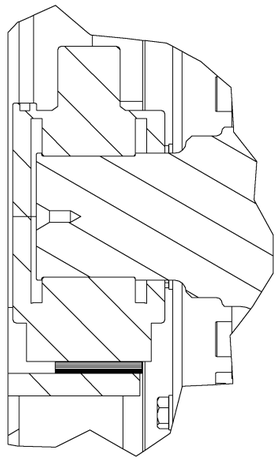
Machine Assembly

See Fig. A-4b and Fig. A-4c for Machine Assembly.
Escalator No. E235, E236
Assembly used in: C62B1-2881L2 (HS L01, M01)

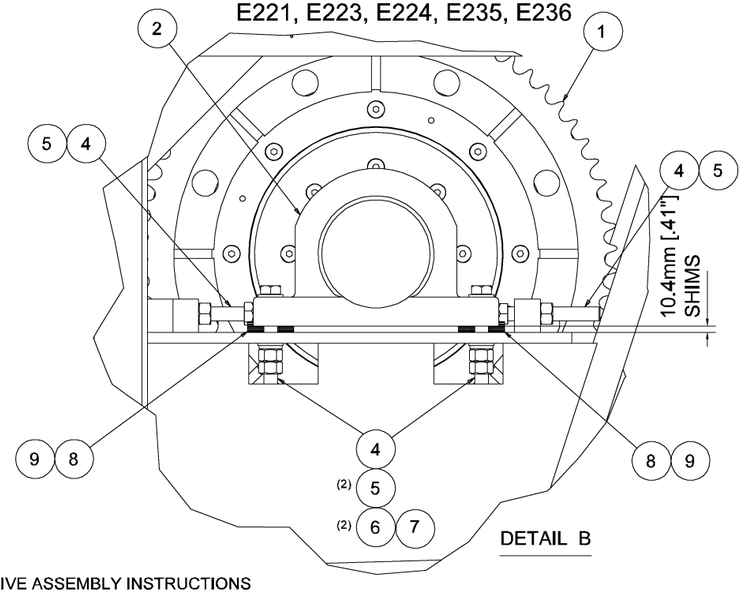
MACHINE ASSEMBLY C62B1-2881L2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62B1-2881E3	ASSEMBLY, INSPECTION COVER	1	
2	C62L82001	BRAKE, ELECTROMAGNETIC, ASSY	1	MAYR, RSM 250/891.065.1 SO 104V
3	C62L83002	MACHINE, CONE, 20 HP (NO BASE)	1	CONE, MODEL CMHU57604-5
4	D00005049	BOLT, HEX 5/8-11 UNC x 2" (GRADE 5)	1	
5	D00904020	SCREW, MACHINE, PAN/PH, M4 (P=0.7)	4	
6	D00907002	WASHER,FLAT,M4	4	
7	D62B8-2881E1	COVER, OIL LEVEL SENSOR	1	
8	D62B8-2881E3	COVER, BRAKE SWITCH	2	
10	D61NA-2881F1	3/4-14 NPT BRASS PIPE NIPPLE	1	
11	D61NA-2881F2	3/4-14 NPT PIPE COUPLING	1	

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11334	DATE	APPROVED

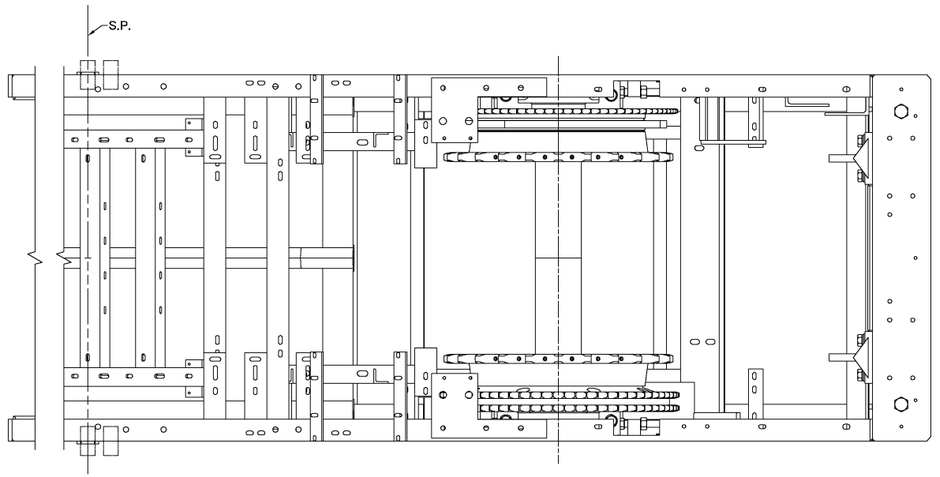
MAIN DRIVE INSTALLATION
Assembly C62C1-2881A1
E221, E223, E224, E235, E236

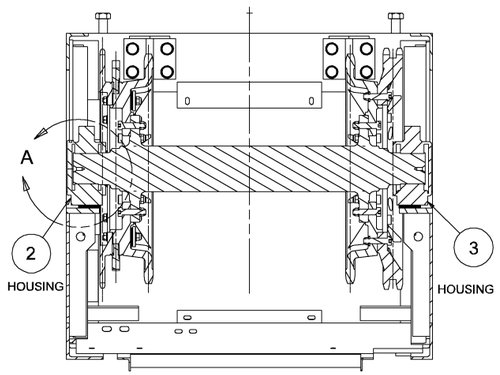


DETAIL A



DETAIL B





SECTION X-X

MAIN DRIVE ASSEMBLY INSTRUCTIONS

1) CHECK MAIN DRIVE SHAFT ENDS FOR DAMAGE DURING SHIPMENT.

2) INSERT MAIN DRIVE SHAFT (WITHOUT BEARINGS) CAREFULLY INTO TRUSS, AND KEEP SUSPENDED FOR BEARING INSTALLATION.

3) DISASSEMBLE SPLIT BEARINGS, KEEPING MATING PARTS TOGETHER. NOTE THE FIXED BEARING (ITEM 3) MUST BE INSTALLED ON MAIN DRIVE CHAIN SIDE, AND FLOATING BEARING (ITEM 2) IS INSTALLED ON HANDRAIL SPROCKET SIDE.

4) INSTALL SPLIT BEARINGS ON SHAFT AS FOLLOWS:

A) PLACE HALVES OF INNER RACE ON MAIN SHAFT, OBSERVING MATCH MARKS. ASSEMBLE TWO CLAMPING RINGS OVER EACH INNER RACE, WITH CLAMP RING SPLITLINE 45 DEGREES FROM THE INNER RACE SPLITLINE. NOTE THAT THERE WILL BE A GAP AT THE INNER RACE.

B) TORQUE SOCKET HEAD CAP SCREWS ON THE CLAMP RINGS TO 6.5 FT-LBS. LIGHTLY TAP CLAMPING RINGS WITH A RUBBER MALLET TO SEAT AND RETIGHTEN.

C) COAT THE INNER RACE, ROLLER CAGE AND THE AREA WHERE THE SEAL CONTACTS THE SHAFT WITH GREASE. PLACE THE ROLLER CAGE AROUND THE INNER RACE AND INSERT THE TWO JOINT CLIPS.

D) FILL CARTRIDGE HOUSING HALVES AND SEAL SURFACE WITH GREASE AND INSTALL OVER ROLLER GAGE. INSERT BLANKING PLATE IN ITEM 3 BEARING ONLY. CLOSE CARTRIDGE AND TIGHTEN (4) BOLTS.

E) FILL PEDESTAL BASE AND CAP WITH GREASE, AND GREASE SPHERICAL OUTER SURFACE OF CARTRIDGE. INSTALL PEDESTAL BASE WITH CARTRIDGE LOCATING PIN 45 DEG. FROM VERTICAL, POINTING TOWARDS TRUSS UPPER SUPPORT ANGLE. INSTALL PEDESTAL CAP AND TIGHTEN CAP BOLTS.

5) PLACE LOCATING BOLTS AND NUTS (ITEM 4 AND 5) IN POSITION. SET MAIN DRIVE ASSEMBLY (1) IN POSITION ON TRUSS, INSTALLING SHIMS (ITEMS 8 AND 9) AND LOCATING BOLTS (ITEM 4) TO SET VERTICAL AND HORIZONTAL DIMENSIONS TO STEP CHAIN SPROCKET O.D. AS SHOWN.

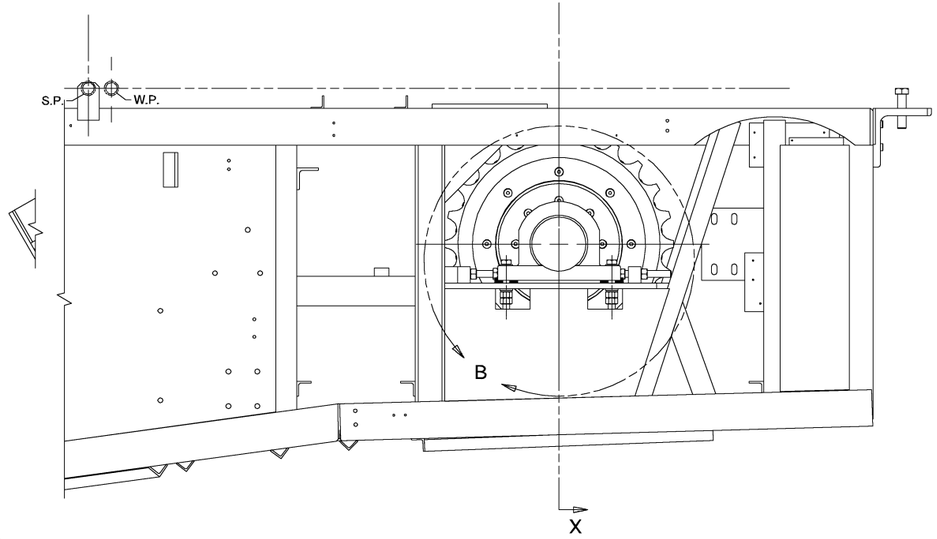
6) ADJUST MAIN SHAFT TO SET LATERAL DIMENSION SHOWN TO INSIDE OF STEP CHAIN SPROCKET ON MAIN DRIVE CHAIN SIDE.

7) ADJUST THE FLOATING PEDESTAL BASE (ITEM 2 ONLY) TO SET SHAFT END DIMENSION SHOWN IN DETAIL A. CONFIRM BOTH PEDESTAL BASES ARE IN LINE WITH TRUSS.

8) INSTALL PEDESTAL AND LOCATING BOLTS (ITEM 4) AND TIGHTEN NUTS (ITEM 5). RECHECK ASSEMBLY DIMENSIONS AND REPEAT STEPS 5-7 IF NECESSARY.

9) REMOVE PEDESTAL CAP ON FLOATING BEARING (ITEM 2), OPEN CARTRIDGE AND INSTALL BLANKING PLATE. FILL BEARING WITH GREASE, REASSEMBLE CARTRIDGE, PEDESTAL CAP AND TIGHTEN BOLTS.

10) USING CARTRIDGE GREASE FITTING, ADD GREASE TO FILL BEARING. CLEAN EXCESS GREASE FROM OUTSIDE OF BEARING.



Assembly C62C1-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN. MILLER	DATE 8/19/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/19/2004	TITLE: MAIN DRIVE INSTALLATION
	APVD. APPERSON	DATE 8/19/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 A01, C01, D01	SCALE: (1:10)	SIZE: D
		DWG. NO.: Fig. A-1a	REV.

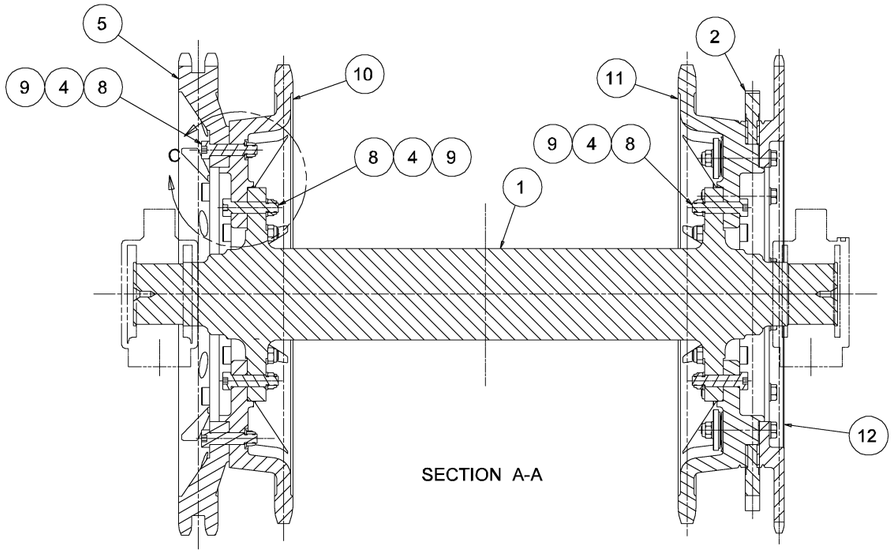
REVISION HISTORY				
REV	DESCRIPTION ECN#10385		DATE	APPROVED

*** CAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***

MAIN DRIVE ASSEMBLY
Assembly C62L25002, C62L25009
36 Ton, 24" Step, Lube-free Chain

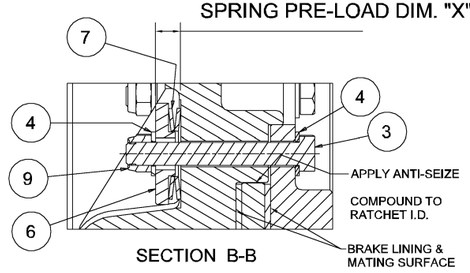
~002 = E221, E223, E224, E235, E236

~009 = E229, E230, E231, E232, E233, E234

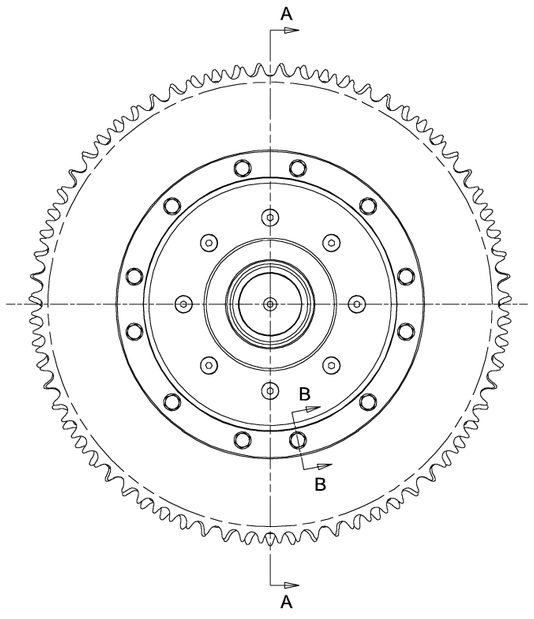


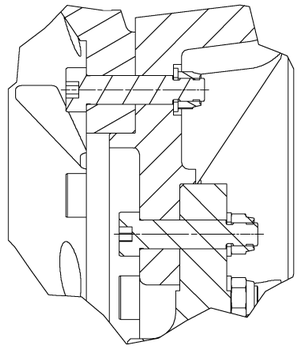
SECTION A-A

SPRING PRE-LOAD DIM. "X"

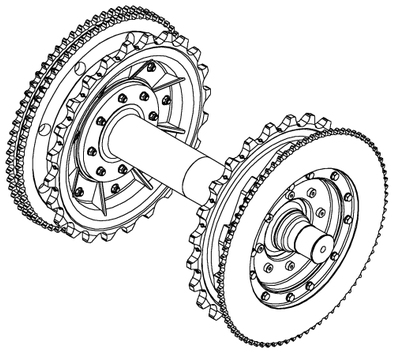


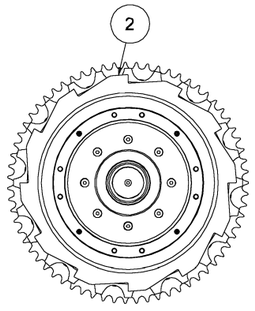
SECTION B-B





DETAIL C



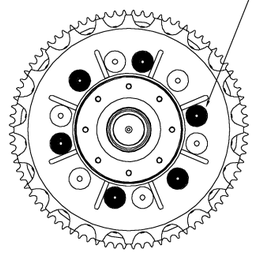


BRAKE SIDE END VIEW

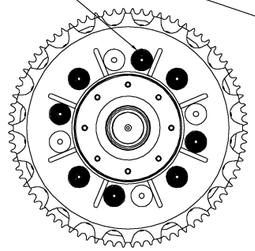
HANDRAIL DRIVE SPROCKET REMOVED TO SHOW MOUNTING DIRECTION OF RATCHET

PART NO.	SPRING PRE-LOAD DIM. "X" +/-0.10mm [+/-0.004in]	ESCALATOR RISE (FT) MIN	MAX	NO. SPRING SETS	
C62L25001	17.1 [0.673]	10.2	12.1	6	
C62L25002	17.0 [0.669]	12.2	14.0	6	← E221, E223, E224, E235, E236
C62L25003	16.9 [0.665]	14.1	16.0	6	
C62L25004	16.8 [0.661]	16.1	17.9	6	
C62L25005	16.9 [0.665]	17.8	20.2	8	
C62L25006	16.8 [0.661]	20.3	22.8	8	
C62L25007	16.7 [0.657]	22.9	25.4	8	
C62L25008	16.6 [0.653]	25.5	28.4	8	
C62L25009	16.8 [0.661]	28.5	32.6	12	← E229, E230, E231, E232, E233, E234
C62L25010	16.7 [0.657]	32.7	36.5	12	
C62L25011	16.6 [0.653]	36.6	40.4	12	
C62L25012	16.5 [0.650]	40.5	44.2	12	

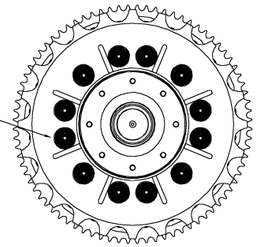
SHADED POSITION INDICATES LOCATION OF SPRING SET



6 SPRING SETS
C62L250001~C62L250004



8 SPRING SETS
C62L250005~C62L250008



12 SPRING SETS
C62L250009~C62L250012

Assembly C62L25009

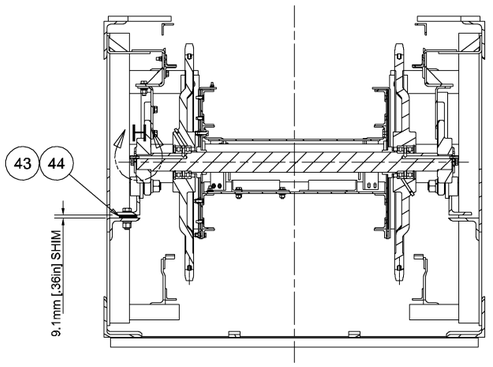
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HET	DATE 3/18/04	FUJITEC AMERICA, INC.			
	CHKD. JDS	DATE 3/18/04	TITLE MAIN DRIVE ASSEMBLY			
	APVD. KAA	DATE 3/18/04				
JOB TITLE	JOB NO. STD		SCALE 1=5	SIZE D	DWG. NO. Fig. A-1b	REV. A

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***

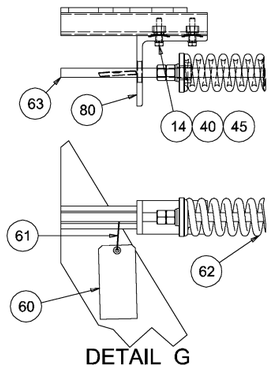
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 13512	DATE	APPROVED
A	[A1] UPDATED BALLOONS TO SHOW CORRECT PARTS	ECN NO. 13668	06/09/06	SHUPE
B	[B1] REPLACED SPRING WASHER WITH NEW PART	13850	09/1 1/06	SHUPE
C	[C1] REVISED BALOONS FOR 66, 68, 70, 72, 75, AND 77	14311	3/28/07	SHUPE

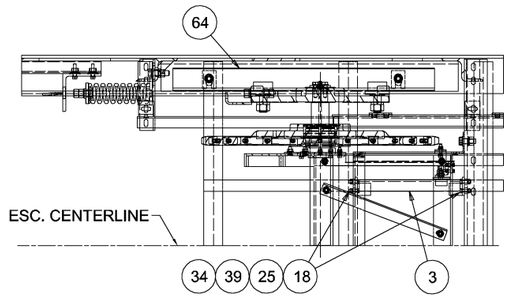
TENSION CARRIAGE INSTALLATION
Assembly C62M1-2881E1 (1 of 2)
24" Step
E229, E230, E231, E232, E233, E234, E235, E236



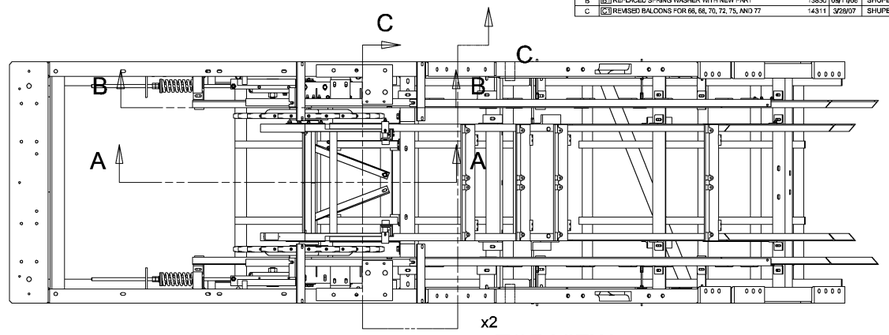
SECTION C-C



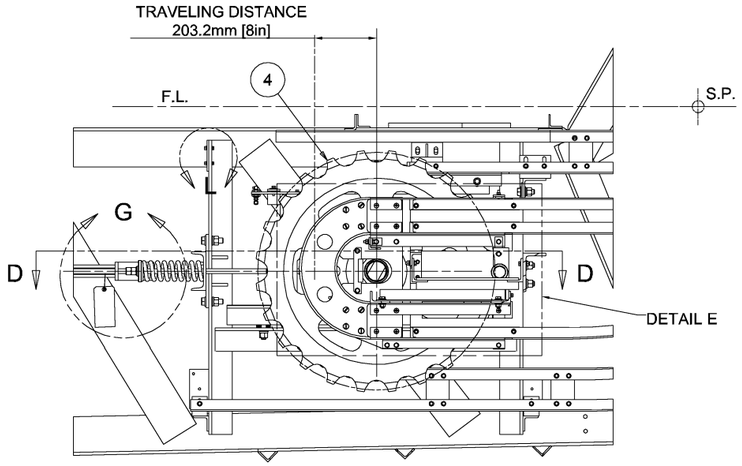
DETAIL G



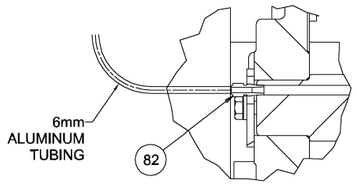
SECTION D-D



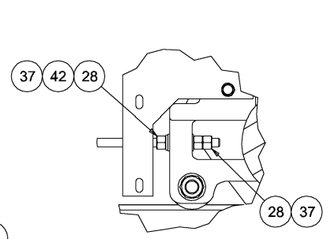
TOP VIEW



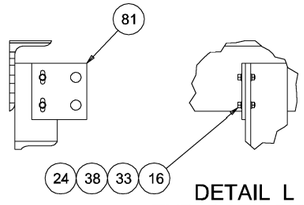
SECTION A-A



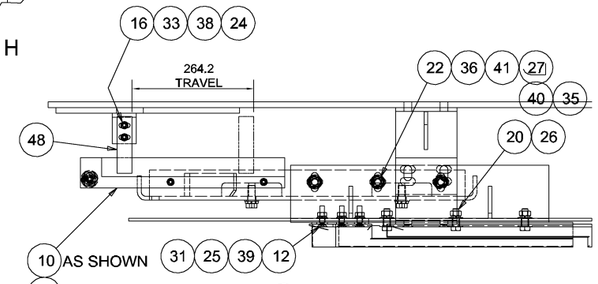
DETAIL H

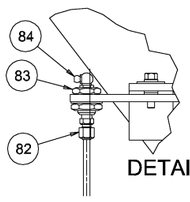


DETAIL K

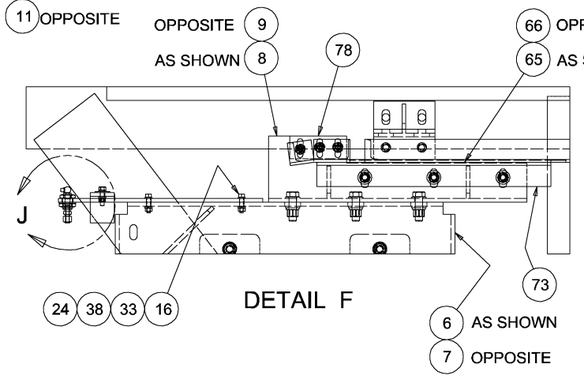


DETAIL L
TYP. BOTH SIDES

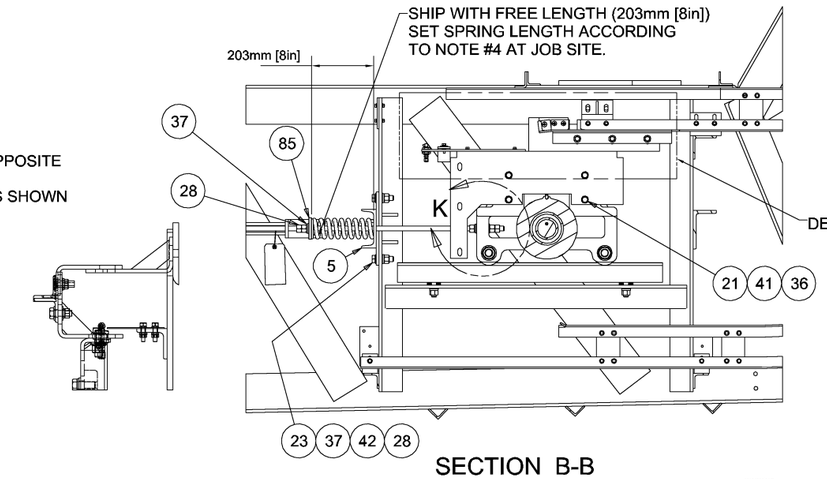




DETAIL J



DETAIL F



SECTION B-B

NOTE:
1. MAKE SURE THAT RETURN GUIDE UNIT HAS SMOOTH MOVEMENT IN BACKWARD AND FORWARD ALONG WITH SPROCKET UNIT IN DESIGNED TRAVELING RANGE (8").
2. AFTER ALIGNMENT IS COMPLETED, SHORT PIECES OF TRACKS (A, B and M) SHOULD BE WELDED TO BACK-UP FRAMES.
3. APPLY RUST PREVENTATIVE OIL TO STEEL ROLLERS.
4. SET TENSION SPRING (ITEM 62) LENGTH AT JOB SITE AS FOLLOWS,

   H=ESCALATOR RISE, X=SPRING LENGTH
   6.6m<H<=8.3m [27.2 ft], X=150mm [5.91 in]

5. HAND STAMP 'SPRING LENGTH SETTING _____mm' ON METAL TAG
6. ITEM NO. SHOWN IN ( ) IS FOR OPPOSITE HAND.

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C62M1-2881E1

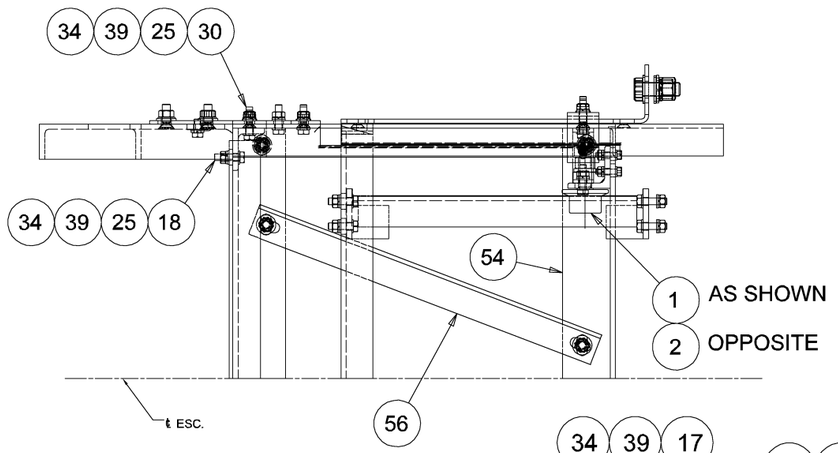
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER 4/13/2006	FUJITEC AMERICA, INC.	
	CHKD. SHUPE 4/13/2006	TITLE	TENSION CARRIAGE INSTALL
	APVD. SUGIMOTO 4/13/2006		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 E01-M01	SCALE (1:20)	SIZE D / DWG. NO. Fig. A-2a / REV. C

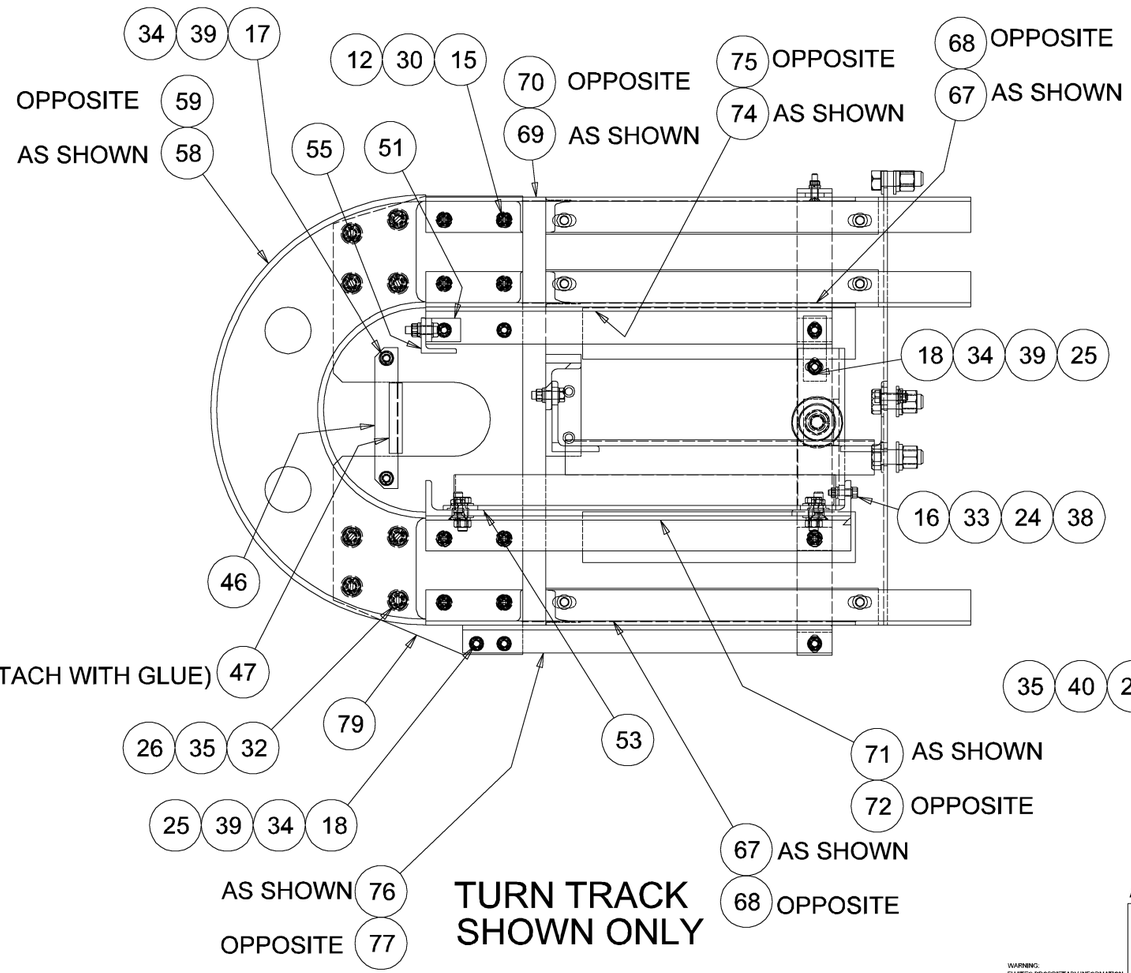
*** CAD – MANUAL REVISIONS NOT PERMITTED ***

REVISION HISTORY

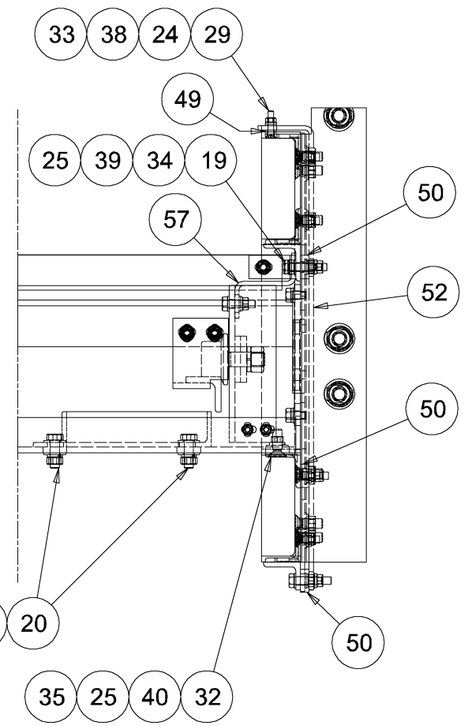
REV	DESCRIPTION	ECN NO. 11261	DATE	APPROVED

TENSION CARRIAGE INSTALLATION
Assembly C62M1-2881E1 (2 of 2)
24" Step
E229, E230, E231, E232, E233, E234, E235, E236





TURN TRACK SHOWN ONLY



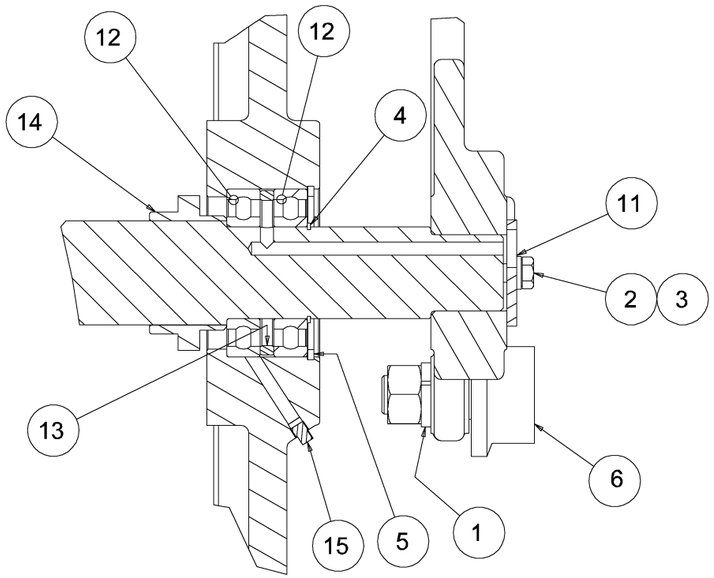
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C62M1-2881E1

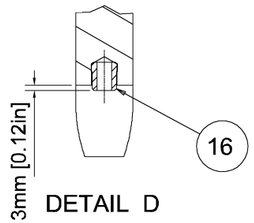
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 4/13/2006	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 4/13/2006	TITLE: TENSION CARRIAGE INSTALL
	APVD. APPERSON	DATE 4/13/2006	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 E01-M01	SCALE (1:20)	SIZE D
		DWG. NO. Fig. A-2a	REV. C

*** CAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN#10385	DATE	APPROVED
A	A1 WAS 20 TON	ECN#11168	7/1/04	HET

TENSION CARRIAGE ASSEMBLY
Assembly C62L14001
E221, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

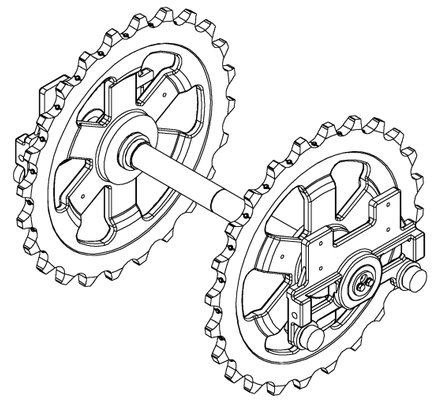


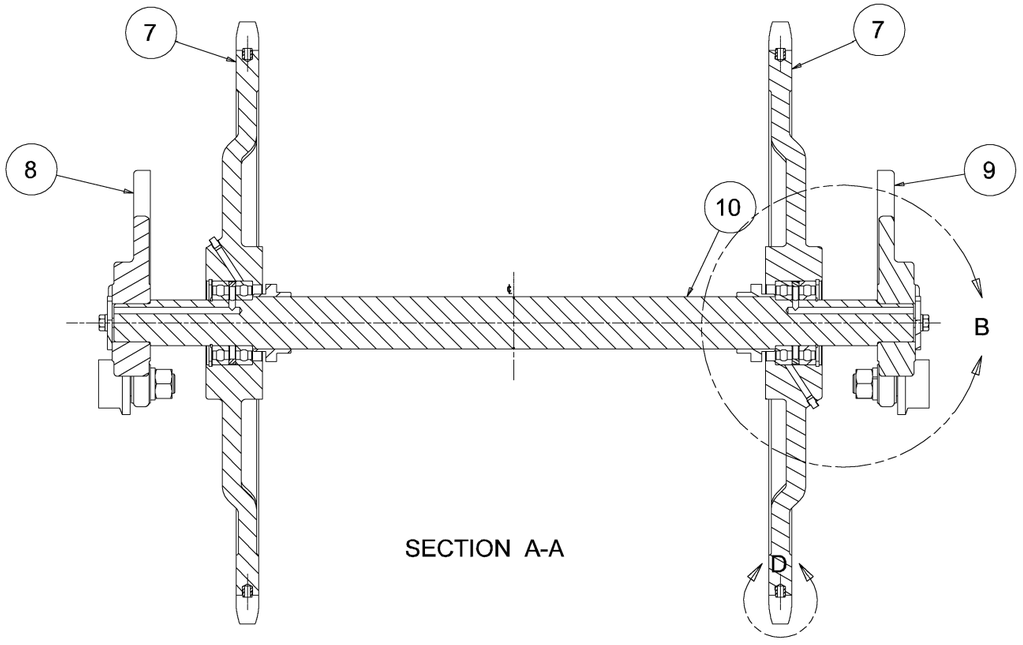
DETAIL B

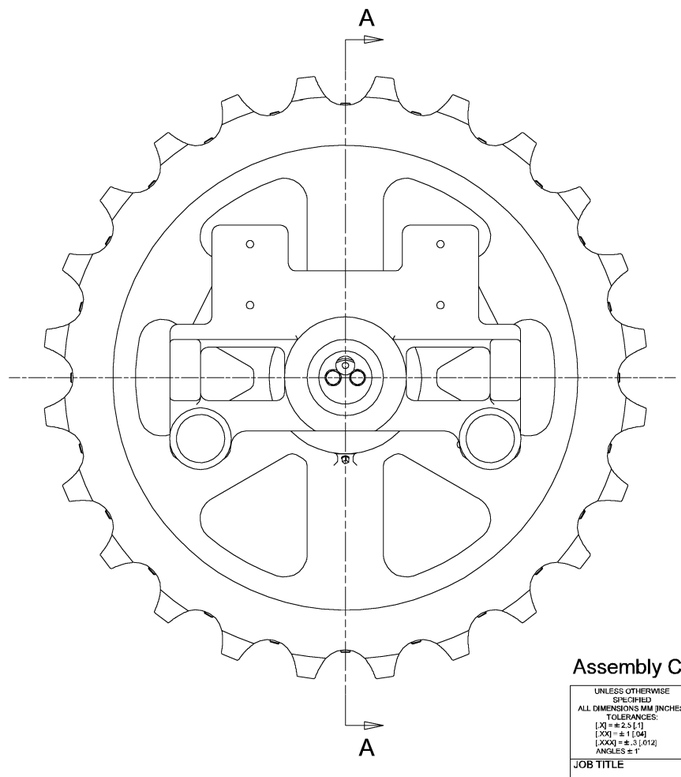


DETAIL D

TYP. BOTH SPROCKETS





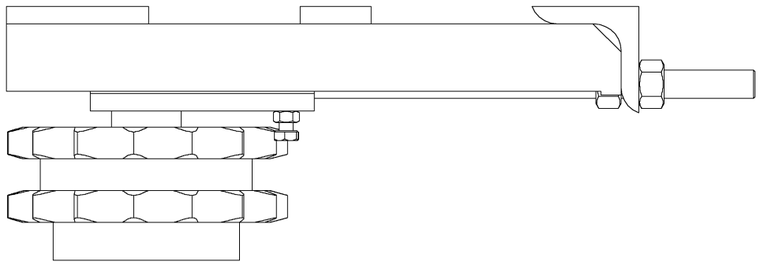


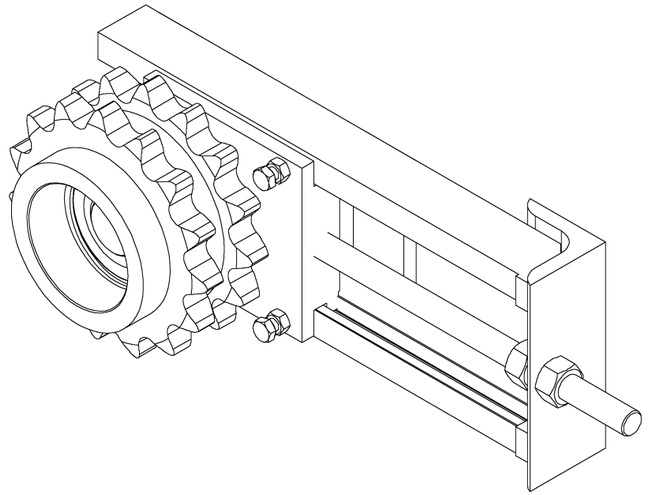
Assembly C62L14001

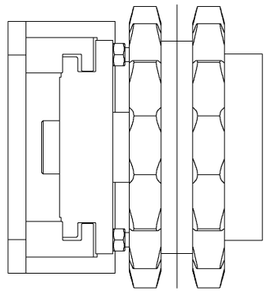
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HET	DATE 2/26/04	FUJITEC AMERICA, INC.			
	CHKD. JDS	DATE 2/26/04	TITLE TENSION CARRIAGE, ASSY, 36 TON			
	APVD. KAA	DATE 2/26/04				
JOB TITLE	JOB NO. STD		SCALE 1=5	SIZE D	DWG. NO. Fig. A-2b	REV. A

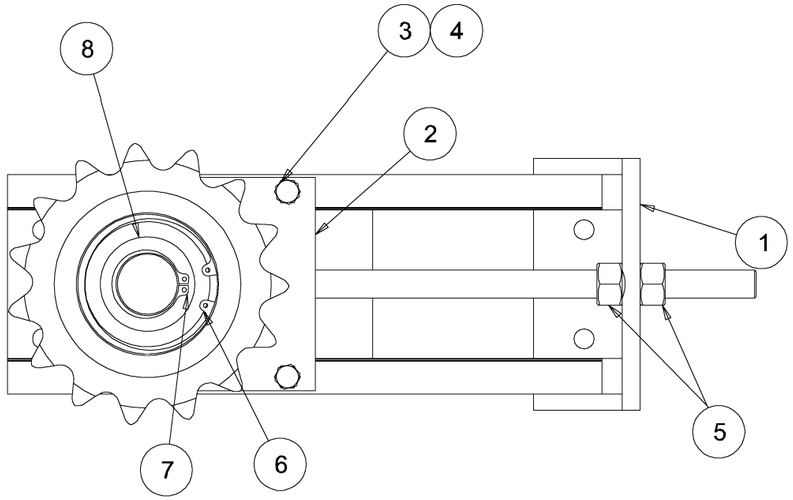
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION ECN# 11945		DATE	APPROVED

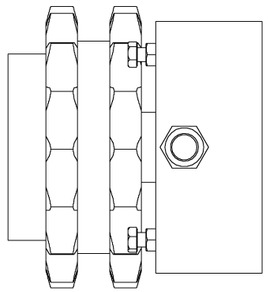
MACHINE IDLER ASSEMBLY
Assembly C62M59001
E221, E222, E235, E236











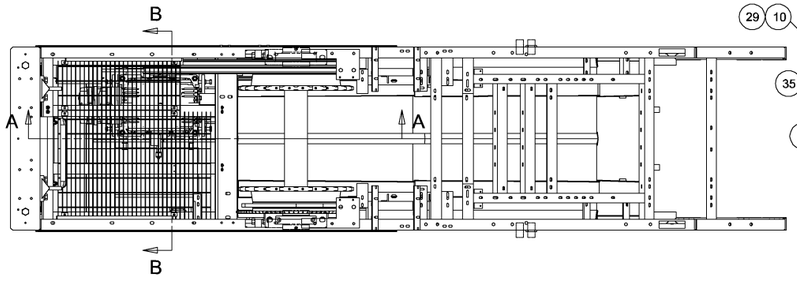
NOTE:
GREASE INSIDE GROOVE OF ITEM 1 TO ENSURE FULL RANGE OF MOTION FOR BASE IN FRAME.

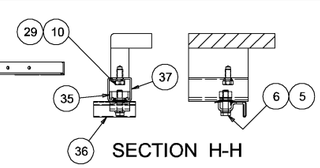
C62M59001

GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 2/16/05	FUJITEC AMERICA, INC.
	CHKD. JDS	DATE 2/16/05	TITLE: IDLER, TAKE-UP
	APVD. JDS	DATE 2/16/05	
JOB TITLE	JOB NO. STD		SCALE 1:00=4:00 / SIZE B / DWG. NO. Fig. A-3 / REV.

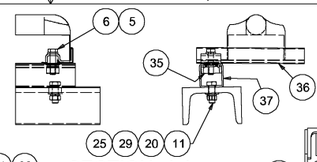
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13271	DATE	APPROVED
A	ADDED QTY (1) D61NA-2861L9 FOR SUPPORT	ECN NO. 13623	05/23/06	SHUPE

MACHINE INSTALLATION
Assembly C62B1-2881L1
E235 & E236

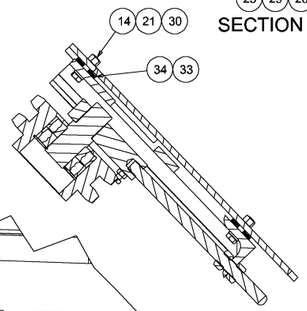




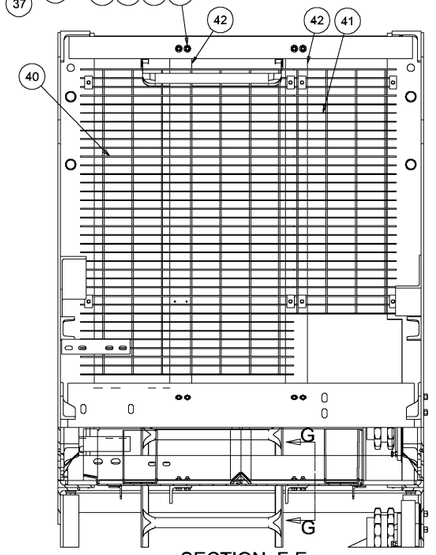
SECTION H-H



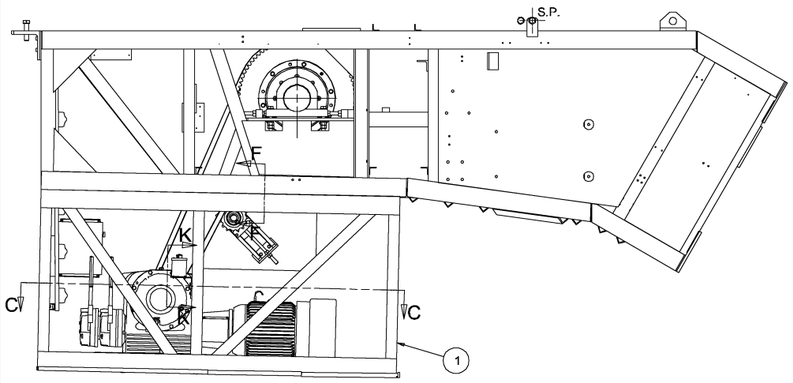
SECTION J-J

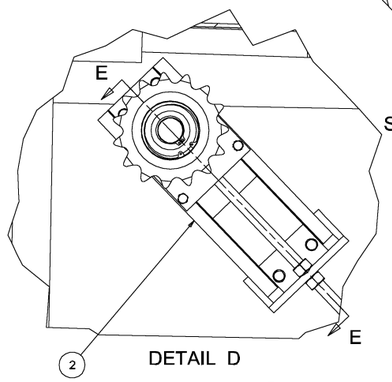


SECTION E-E

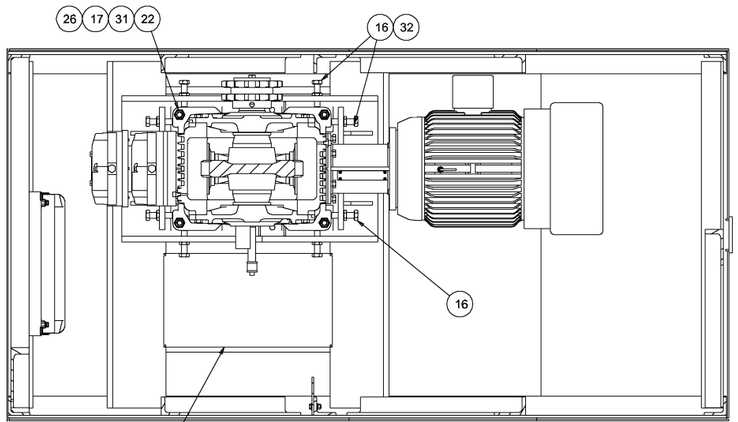


SECTION F-F

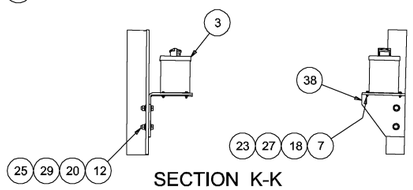




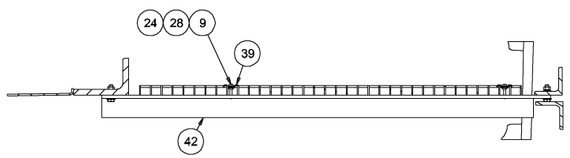
DETAIL D



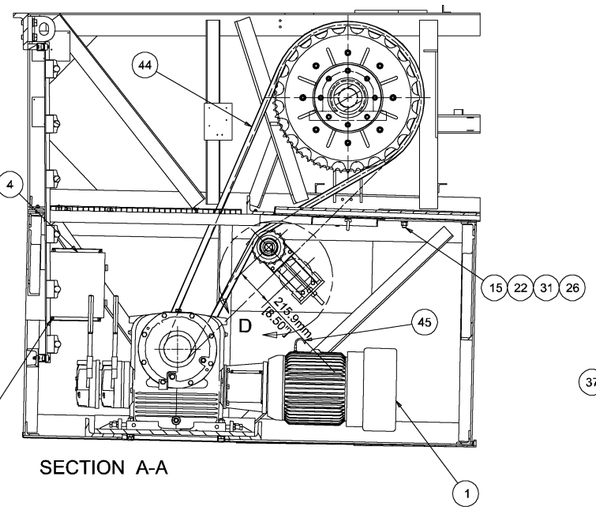
SECTION C-C



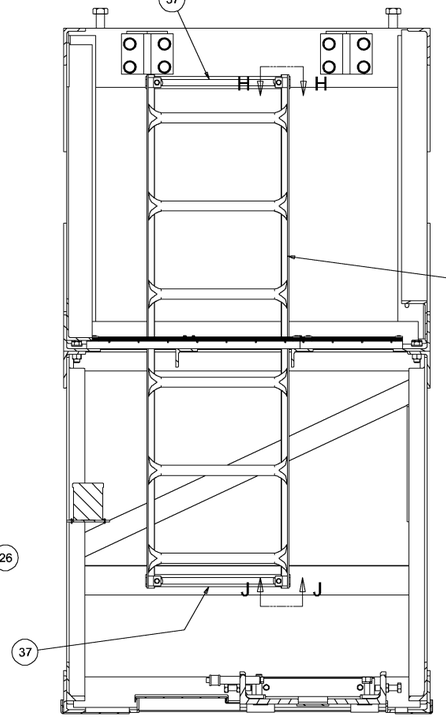
SECTION K-K



SECTION G-G



SECTION A-A



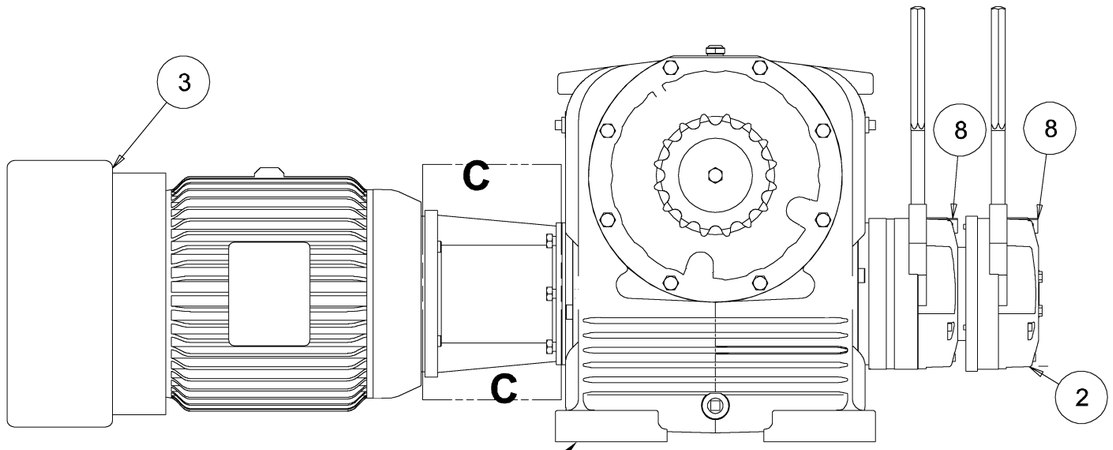
SECTION B-B

ASSEMBLY C62B1-2881L1

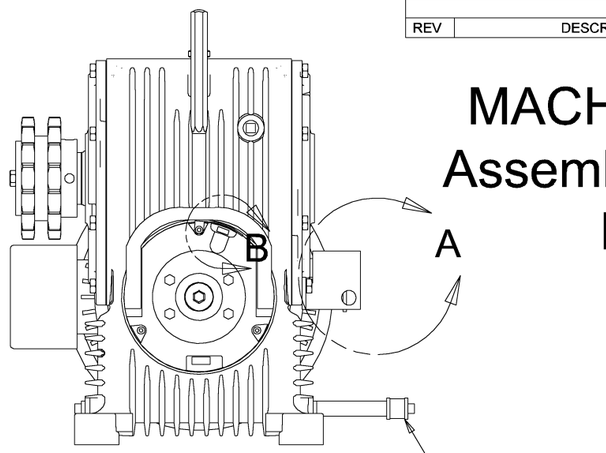
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 11/1/2005	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 11/1/2005	TITLE MACHINE INSTALLATION	
	APVD. SUGIMOTO	DATE 11/1/2005		
JOB TITLE NYCTA HERALD SQ.	JOB NO. 2881 L01/M01		SCALE (1:20)	SIZE D
			DWG. NO. Fig. A-4a	REV. A

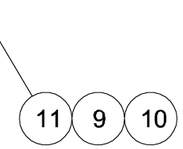
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13271	DATE	APPROVED

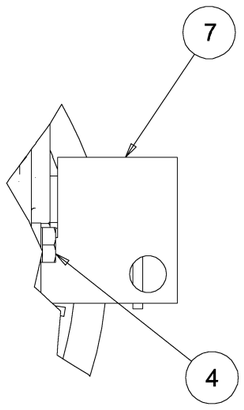
MACHINE ASSEMBLY
Assembly C62B1-2881L2
E235, E236



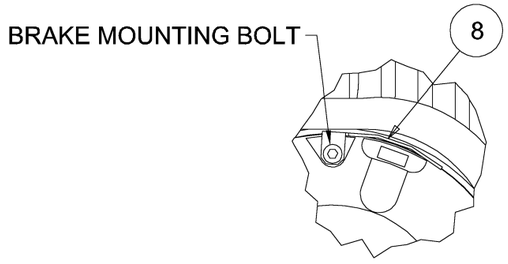
FOR 2881-L01 AND 2881-M01:
REMOVE BASE SUPPLIED
BY CONE DRIVE



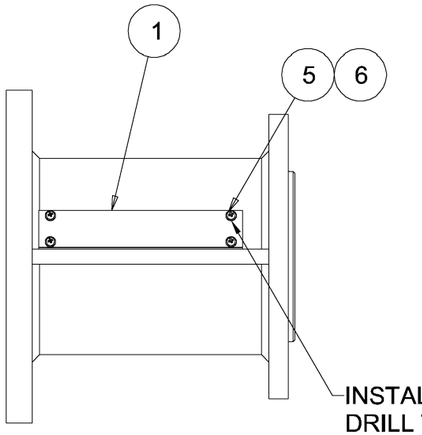




DETAIL A



DETAIL B



INSTALL COVER PLATE OVER SLOT.
DRILL THROUGHT HOLES AND TAP FOR M4 SCREW

DETAIL C

NOTES:

1) INSTALL BRAKES ACCORDING TO BRAKE INSTALLATION MANUAL SUPPLIED WITH BRAKES.

2) TO INSTALL ITEM #7: REMOVE GEARBOX SIDE PLATE MOUNTING BOLT. BOLT ITEM #7 TO GEARBOX WITH ITEM #4. APPLY LOC-TITE #271 OR EQUIV. AND TIGHTEN BOLT TO 120~145 FT-LBS.

ASSEMBLY C62B1-2881L2

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS (mm) TOLERENCES: GENERAL TOL. SEE EN-ES-001	DWN HARPER	DATE 1/17/2006	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 1/17/2006	TITLE: Machine 20HPw/Brake,No Base
	APVD. SUGIMOTO	DATE 1/17/2006	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE (1:10) / SIZE B / DWG. NO. Fig. A-4b / REV.

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN#10669	DATE	APPROVED

MANUFACTUER'S NOTES:

NOTE #1: USE SPECIAL WORM BEARING SETTINGS OF +.003 TO +.005 INCH AND GEAR BEARING SETTING OF -.002 TO .000 INCH.

NOTE #2: APPLY ALL SEALANTS AND ADHESIVES IN ACCORDANCE WITH C.G.S. 1.19 & 271 LOCTITE ALL BOLTS.

NOTE #3: FILL REDUCER TO PROPER OIL LEVEL WITH "MOBIL GLYGOYLE 320" AND RUN MOTOR FOR NORMAL RUN-IN TEST AND VIBRATION TEST. VIBRATION MUST NOT EXCEED 0.06 IN/SEC RMS MEASURED AT TOP OF GEARBOX AND TOP OF MOTOR.

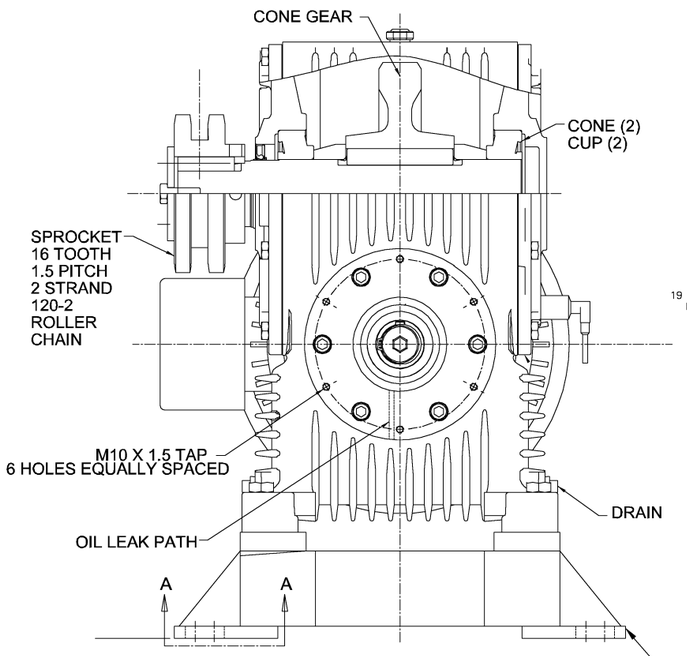
NOTE #4: REMOVE BREATHER AFTER TESTING AND PLUG UNIT TO SHIP WITH BREATHER WIRED TO UNIT. ALSO WIRE (2) 101142 BOLTS TO UNIT FOR CUSTOMER TO REPLACE EYE BOLTS.

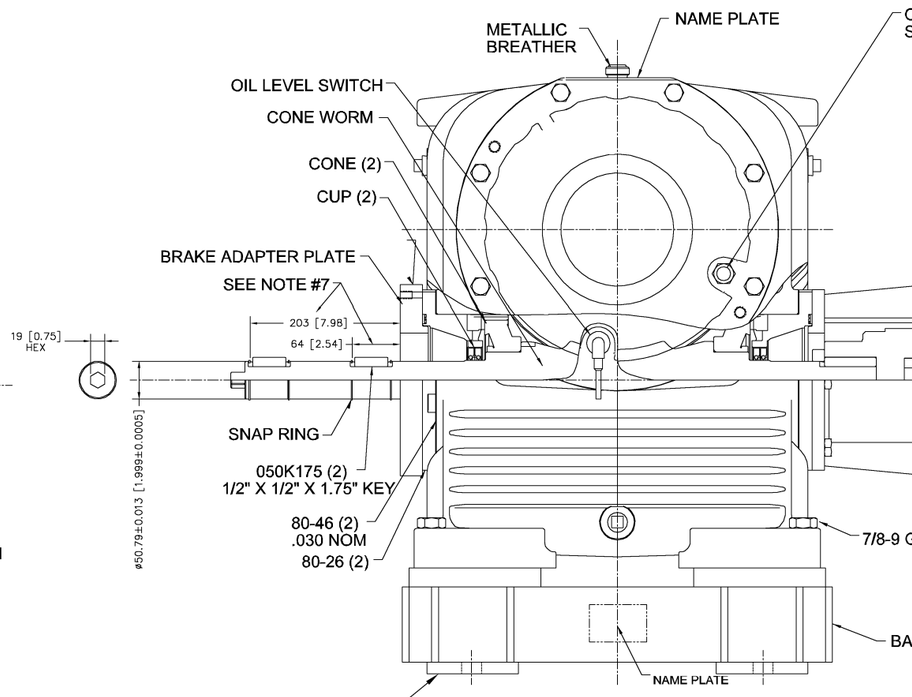
NOTE #5: TOTAL MACHINE INERTIA AT INPUT SHAFT Wk^2=50.0 LB-FT^2.

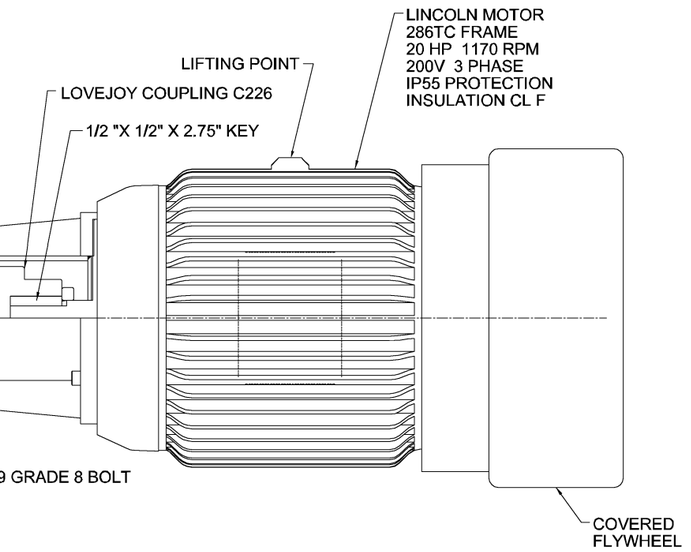
NOTE #6: PAINT UNIT, INCLUDING MOTOR AND FLYWHEEL COVER, NOT FLYWHEEL.

NOTE #7: DIMENSIONS TO INSIDE OF SNAP RINGS.

MACHINE
Assembly C62L83001, C62L83002
001 = E229, E230, E231, E232, E233, E234
002 = E235, E236

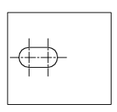






FLOOR MOUNTED
MODEL CMHU57604-5
25 TO 1 RATIO

** FOR C63L83002
NO BASE OR MOUNTING BOLTS



SECTION A-A

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

ASSEMBLY C62L83001, 002

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN CHARVILLE	DATE 11/16/04	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 11/16/04	
	APVD. APPERSON	DATE 11/16/04	TITLE MACHINE, CONE, 20 HP
JOB TITLE	JOB NO. STD		SCALE 1.00=5.00 / SIZE D / DWG. NO. Fig. A-4c / REV. A

B) BRAKES

Machine Brake Assembly

See Fig. B-1a for Machine Brake Assembly.
Escalator No. E235, E236
Assembly used in: C62L82001 (HS L01, M01)

MACHINE BRAKE ASSEMBLY C62L82001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D62M11001	BRAKE, MACHINE, SIZE 250	1	MAYR E010009
2	D62M12001	BRAKE, MACHINE, SIZE 250, BACK-UP	1	MAYR E010009
3	D62M13001	ROTOR, BRAKE, SIZE 250	2	MAYR 1920471

Machine Brake Manual Release Tool

See Fig. B-1b for Machine Brake Manual Release Tool.
Escalator No. E235, E236
Assembly used in: C62Z1-2881B1 (HS L01, M01)

MACHINE BRAKE MANUAL RELEASE TOOL C62Z1-2881B1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D62Z1-2881B2	BRAKE RELEASE EXTENSION, 10HP, LONG	1	
2	D62Z1-2881B3	BRAKE RELEASE EXTENSION, 10HP, SHORT	1	
3	D62Z1-2881A4	TURNBUCKLE, W/ EYE & EYE ENDS	2	McMaster-Carr #30125T3
4	D62Z1-2881A5	PIN, CLEVIS, 5/16" DIA, 2" LG W/ COTTER	2	McMaster-Carr #97245A664

Pawl Brake Installation (Broken Drive Chain Device)

See Fig. B-2a for Pawl Brake Installation.
Escalator No. E235, E236
Assembly used in: C65W1-2881L1 (HS L01, M01)

PAWL BRAKE INSTALLATION C65W1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65W1-2881L2	PAWL BRAKE, ASSY.	1	
2	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
3	D00902078	BOLT, HEX, M16 (P=2.0) X 80	2	
4	D00902082	BOLT, HEX, M16 (P=2.0) X 45	2	
5	D00902084	BOLT, HEX, M16 (P=2.0) X 60	2	
6	D00903002	NUT, HEX, M4 (P=0.7)	2	
7	D00903007	NUT,HEX,M12 (P=1.75)	2	
8	D00903008	NUT,HEX,M16 (P=2.0)	4	
9	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)	2	
10	D00907002	WASHER,FLAT,M4	2	
11	D00907007	WASHER,FLAT,M12	4	
12	D00907008	WASHER,FLAT,M16	10	
13	D00908002	WASHER,LOCK,M4	2	
14	D00908007	WASHER,LOCK,M12	2	
15	D00908008	WASHER,LOCK,M16	6	
16	D65900001	LIMIT SWITCH, ROLLER LEVER (PAWL MONITORING SWITCH or BROKEN DRIVE CHAIN SWITCH)	1	ABB, LS35P41D11
17	D65W1-2881A4	BRACKET, SWITCH, PAWL BRAKE	1	

Pawl Brake Assembly

See Fig. B-2b for Pawl Brake Assembly.
Escalator No. E235, E236
Assembly used in: C65W1-2881L2 (HS L01, M01)

PAWL BRAKE ASSEMBLY C65W1-2881L2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65W3-2881A1	BRACKET, PAWL BRAKE	1	
2	D00013004	NUT,JAM,1/2"-13 UNC	1	
3	D00153001	NUT,LOCKING,NYLON INSERT,M8	4	
4	D00902040	BOLT, HEX, M8 (P=1.25) X 75, FULL	2	
5	D00902043	BOLT, HEX, M8 (P=1.25) X 90	2	
6	D00902048	BOLT, HEX, M10 (P=1.50) X 25	12	
7	D00902050	BOLT, HEX, M10 (P=1.50) X 35	1	
8	D00907005	WASHER,FLAT,M8	6	
9	D00907006	WASHER,FLAT,M10	1	
10	D00907008	WASHER,FLAT,M16	4	
11	D00908006	WASHER,LOCK,M10	13	
12	D00913026	PIN, SPRING, M6x50	3	
13	D00913030	PIN, SPRING, M10x100	1	
14	D65724001	BRONZE BEARING	3	BOSTON BEARING, B2226-8
15	D65W2-2881A4	LEVER, PAWL BRAKE	1	
16	D65W2-2881A5	SHOE, PAWL BRAKE	1	
17	D65W2-2881A6	STOPPER, PAWL BRAKE	1	
18	D65W2-2881A7	SPACER, PAWL BRAKE	1	
19	D65W2-2881A8	SCREW, SHOULDER, 5/8" DIA. 2.5" LG.	1	
20	D65W2-2881A9	BEARING,SLEEVE,BRNZ, 5/8"ID X 2" LG	1	McMASTER-CARR, 6391K445
21	D65W2-2881L1	SHAFT, PAWL BRAKE	1	
22	D65W2-2881L2	BAR, PAWL BRAKE	1	
23	D65W4-2881A2	ANGLE,BRACKET,PAWL BRAKE	1	
24	D65W4-2881A3	LEVER, PAWL BRAKE	2	
25	D65W4-2881A4	WEIGHT, PAWL BRAKE	3	
26	D65W4-2881A6	PLATE, PAWL BRAKE	1	
27	D65W4-2881A7	BAR, PAWL BRAKE	1	

Step Chain Locking Device Assembly

See Fig. B-3a for Step Chain Locking Device Assembly.
Escalator No. E235, E236
Assembly used in: C65W2-2881A1 (HS L01, M01)

STEP CHAIN LOCKING DEVICE ASSEMBLY C65W2-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C61A3-2881A3	WELDMENT, BRACKET, LOCKING DEVICE	1	
2	C65969001	STEP CHAIN LOCKING DEVICE, 36 TON	1	
3	D00902084	BOLT, HEX, M16 (P=2.0) X 60	8	
4	D00903008	NUT,HEX,M16 (P=2.0)	8	
5	D00907008	WASHER,FLAT,M16	12	
6	D00908008	WASHER,LOCK,M16	8	

Step Chain Locking Device

See Fig. B-3b for Step Chain Locking Device.
Escalator No. E235, E236
Assembly used in: C65969001 (HS L01, M01)

STEP CHAIN LOCKING DEVICE ASSEMBLY C65969001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65950001	FRAME WELDMENT	1	
2	C65967001	PIN WELDMENT, 36 TON CHAIN	1	
3	D65908001	LIMIT SWITCH	1	ABB, #LS35P31B11
4	D65955001	SPACER	1	
5	D00904014	SCREW, MACHINE, PAN/SL, M4 (P=0.7) X 50	2	
6	D65959001	QUICK-RELEASE PIN	1	McMaster-Carr #92384A096
7	D65960001	LANYARD	1	
8	D00904020	SCREW, MACHINE, PAN/PH, M4 (P=0.7) X 12	1	

Speed Governor Device Assembly

See Fig. B-4a for Speed Governor Device Assembly.
Escalator No. E235, E236
Assembly used in: C65L1-2881A1 (HS L01, M01)

SPEED GOVERNOR DEVICE ASSEMBLY C65L1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65L1-2881A2	ENCODER ASSEMBLY	1	
2	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	2	
3	D00903005	NUT, HEX, M8 (1.25)	2	
4	D00907005	WASHER,FLAT,M8	2	
5	D00908005	WASHER,LOCK,M8	2	

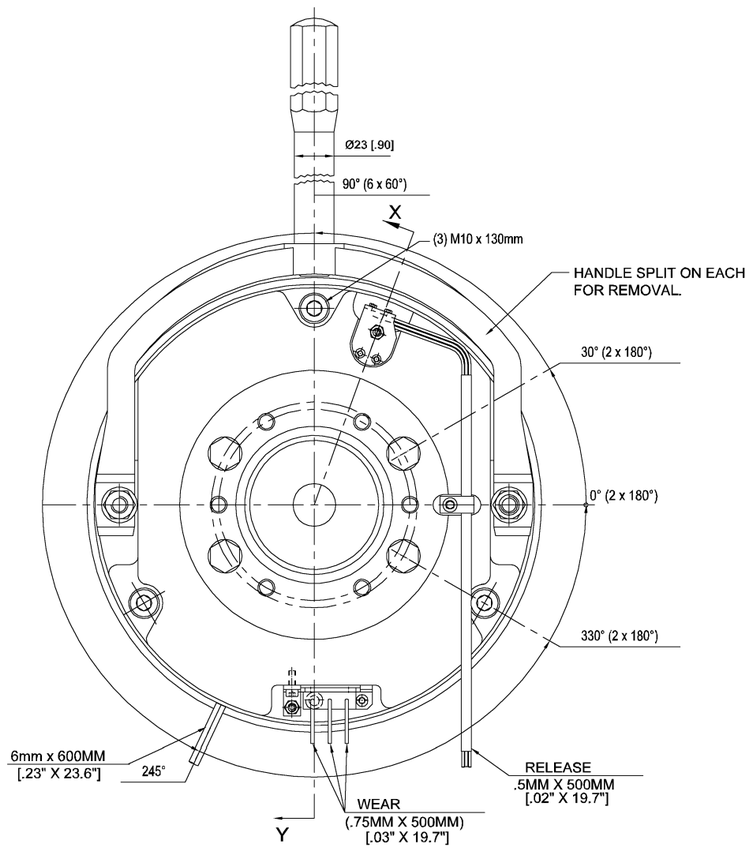
Governor Encoder Assembly

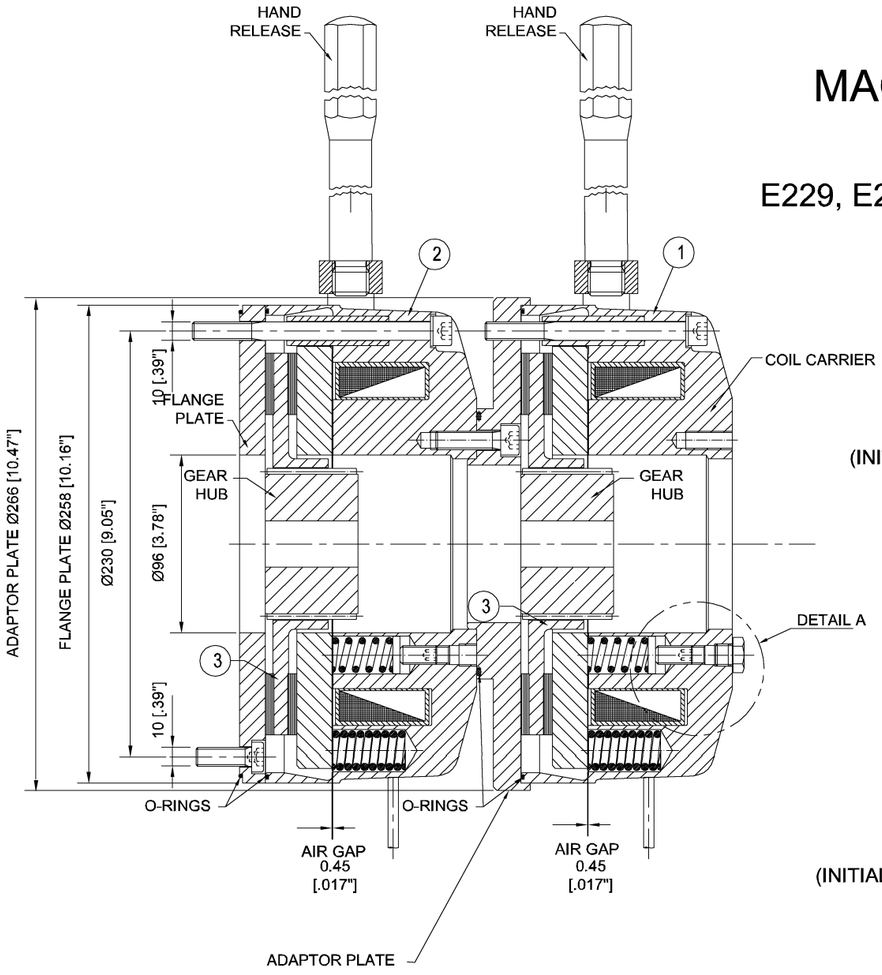
See Fig. B-4b for Governor Encoder Assembly.
Escalator No. E235, E236
Assembly used in: C65L1-2881A2 (HS L01, M01)

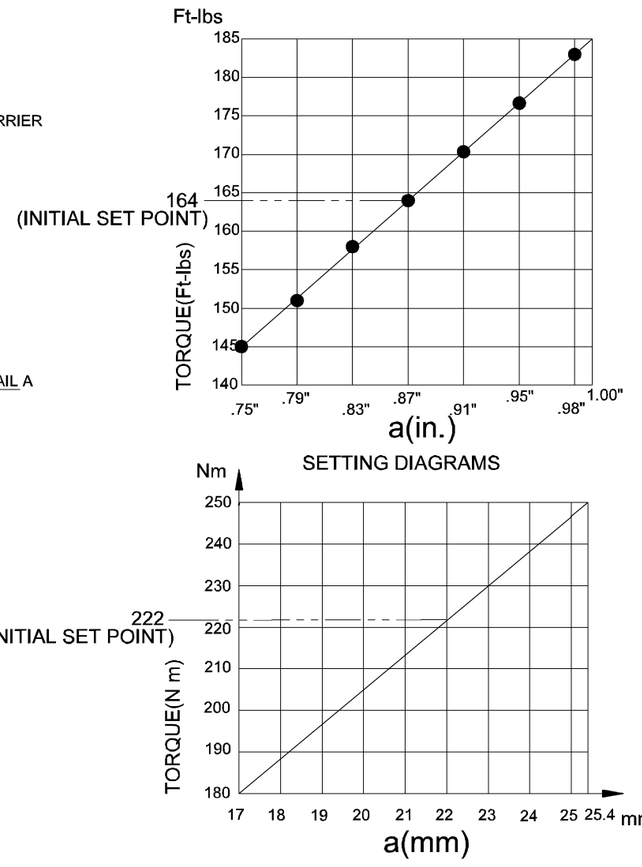
GOVERNOR ENCODER ASSEMBLY C65L1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65L1-2881A4	ENCODER ARM WELDMENT	1	
2	D00902010	BOLT, HEX, M4 (P=0.7), FULL	4	
3	D00902027	BOLT, HEX, M6 (P=1.00) X 35, FULL	1	
4	D00903002	NUT, HEX, M4 (P=0.7)	4	
5	D00903004	NUT, HEX, M6 (P=1.0)	1	
6	D00907002	WASHER,FLAT,M4	8	
7	D00908002	WASHER,LOCK,M4	4	
8	D00918008	NUT, JAM, M16 (P=2.0)	1	
9	D62B24001	SHOULDER BOLT	1	
10	D62B25001	BRONZE BEARING	2	PEER, #BM2020FB
11	D62B26001	THRUST WASHER	2	McMASTER-CARR, #5906K522
12	D62B37001	WHEEL, ENCODER	1	STEGMANN, #6-412004-00
13	D65926001	ENCODER, HR SPEED DEVICE	1	STEGMANN, Encoder #6-113032-0600 Cable # 6-413033-0015
14	D65L1-2881A3	ENCODER MOUNTING BRACKET	1	

*** ACAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN#11159	DATE	APPROVED

MACHINE BRAKE ASSEMBLY
Assembly C62L82001
E229, E230, E231, E232, E233, E234, E235, E236



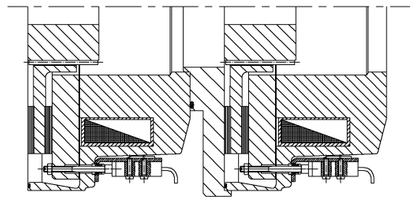




SETTING DIAGRAMS

WEAR

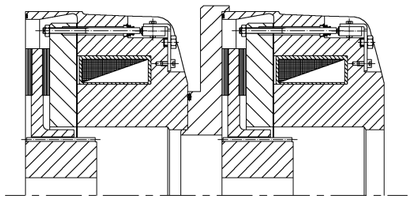
MFG:MICROPRECISION
MP320VXW-IMS27/3 75/050 SID
(SEE NOTE#3)



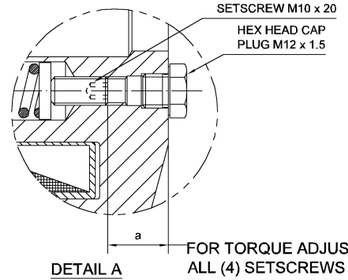
SECTION Y

RELEASE

MFG:BURGESS
V4NS



SECTION X



DETAIL A

FOR TORQUE ADJUSTMENT:
ALL (4) SETSCREWS MUST BE SET
TO EQ. "a" DIMENSIONS. (SEE GRAPH)

NOTES:
1) PROTECTION - IP65
2) SURFACE - ZINC PHOSPHATED
3) WEAR MONITOR SWITCH:
THE WEAR SWITCH SHALL GIVE A SIGNAL WHEN A ROTOR THICKNESS OF 16.25mm [0.64"] IS ACHIEVED.
(INITIAL ROTOR THICKNESS IS 16.8mm [0.66"])
4) BRAKE SHALL HAVE RELEASE MONITORING SWITCH.
5) TORQUE SET BY ADJUSTING M10 SETSCREWS TO DIM "a".
6) MFR. BY: MAYR CORP.

See Fig. A-4b for Machine and Brake Installation.

PART NO:	C62L82001
MFR:	MAYR CORP.
MFR P/N:	RSM 250/891.065.1 SO 104V

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C62L82001

GENERAL TOLERANCES SEE EN-ES-01	DWN SHUPE	DATE 07/29/04	FUJITEC AMERICA, INC.
	CHKD. APPERSON	DATE 07/29/04	
	APVD. APPERSON	DATE 07/29/04	TITLE: BRAKE, ASSY
JOB TITLE	JOB NO. STD		SCALE 1.00=2.00 / SIZE D / DWG. NO. Fig. B-1a / REV. -

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11663	DATE	APPROVED

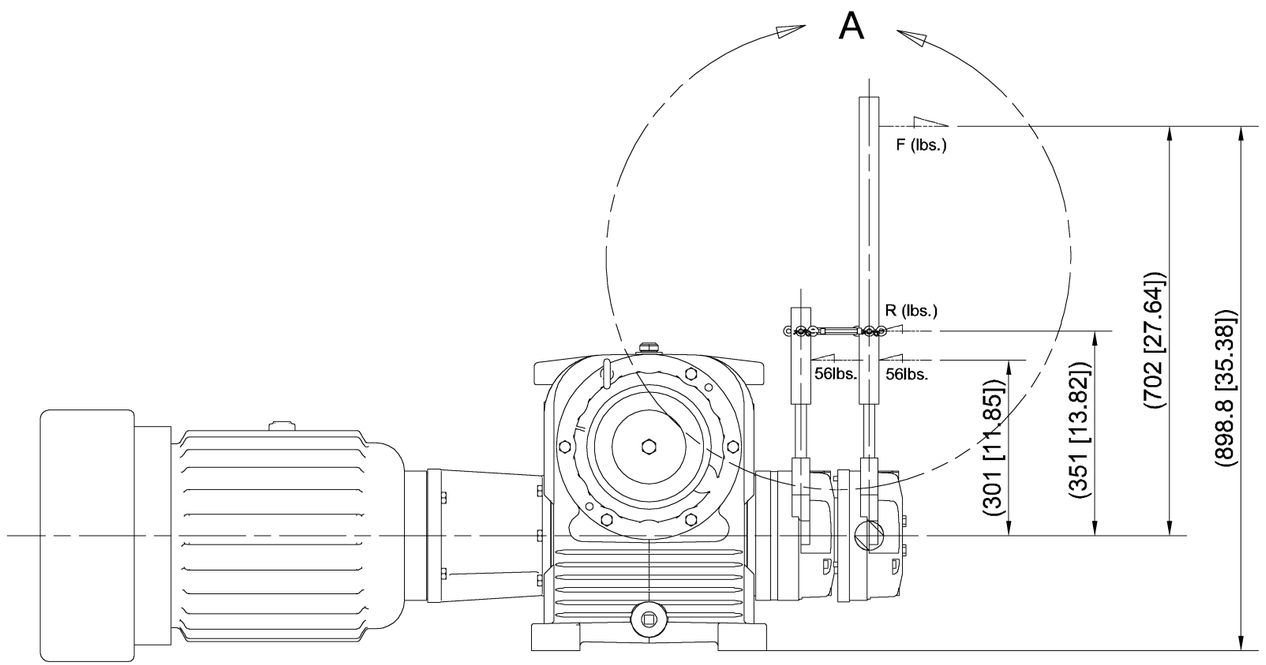
MANUAL BRAKE RELEASE TOOL, 10HP
Assembly C62Z1-2881B1
E221, E222, E223, E224, E235, E236

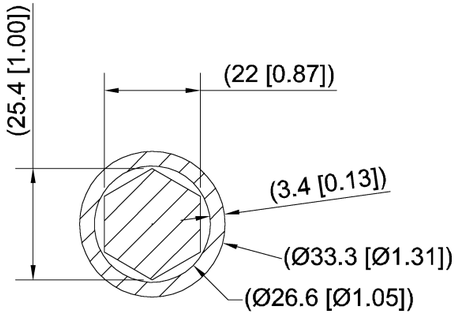
RELEASE FORCE CALCULATION:

FORCE REQUIRED TO MANUAL RELEASE ONE BRAKE
*(SET FOR 95 FT-LBS) = 56 LBS

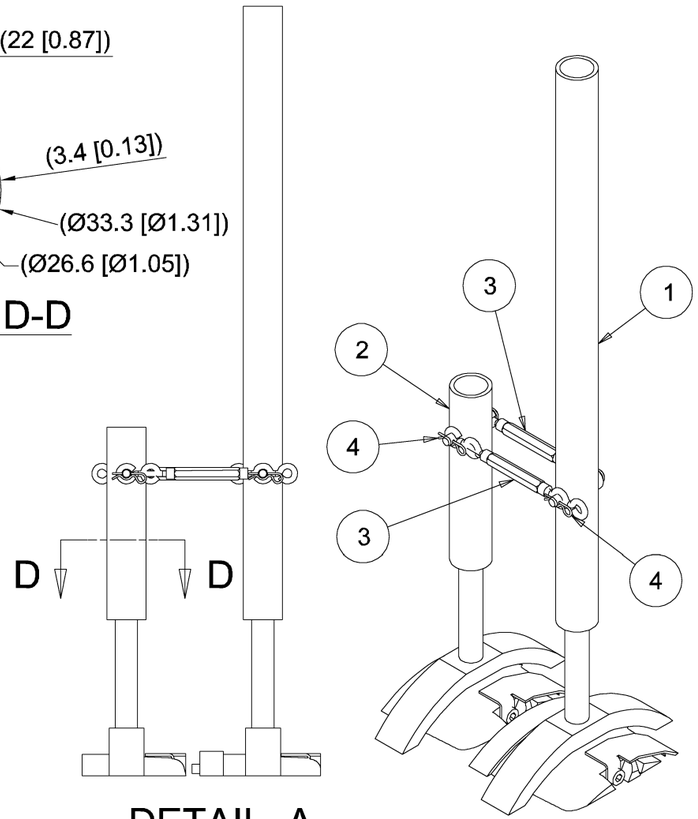
RESULTANT LOAD (R) OF SHORT EXTENTION ON TURNBUCKLE:
R = (56 LBS X 11.85 IN) / (13.82 IN)
R = 48 LBS

FORCE (F) NEEDED TO RELEASE BOTH BRAKES:
F = [(48 LBS X 13.82 IN) + (56 LBS X 11.85 IN)] / (27.64 IN)
F = 48 LBS





SECTION D-D



DETAIL A

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

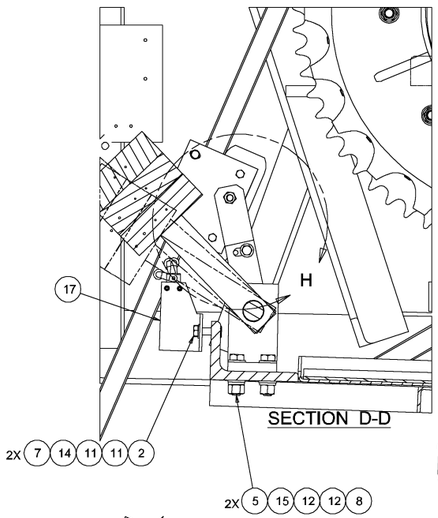
NOTES:

1.) TOOL INTENDED FOR MANUAL RELEASE OF BOTH PRIMARY AND SECONDARY MAIN BRAKES SIMULTANEOUSLY FOR TESTING ONLY. REMOVE WHEN NOT IN USE.

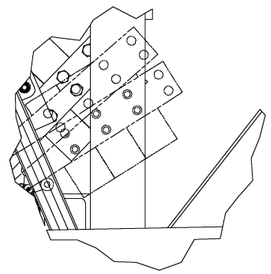
C62Z1-2881B1

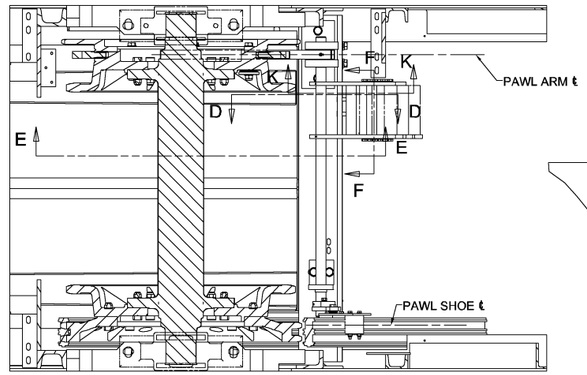
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 3/15/2005	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 3/15/2005	TITLE: MAN. BRAKE RELEASE TOOL
	APVD. SHUPE	DATE 3/15/2005	
JOB TITLE: NYCT	JOB NO.: 2881		SCALE: (1:10) / SIZE: B / DWG. NO.: Fig. B-1b / REV.

PAWL BRAKE INSTALLATION
Assembly C65W1-2881L1
E235, E236

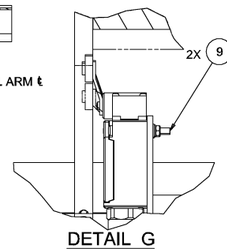


SECTION D-D

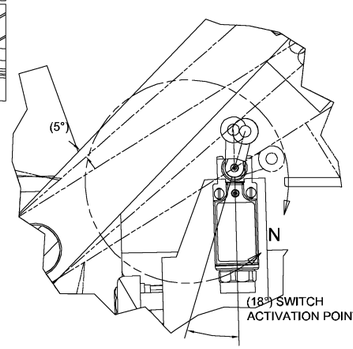

DETAIL L



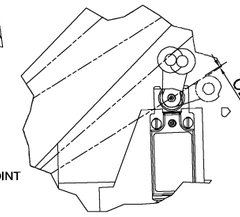
SECTION A-A

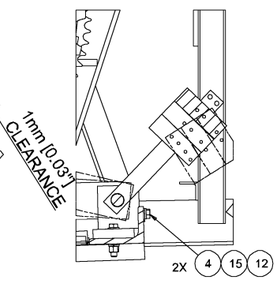


DETAIL G

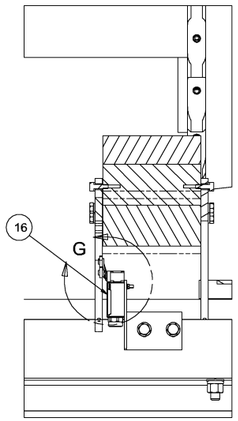


DETAIL J
(SWITCH ACTIVATION POSITION)

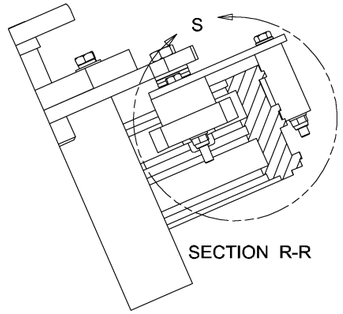

DETAIL N
(MAX. PAWL POSITION)



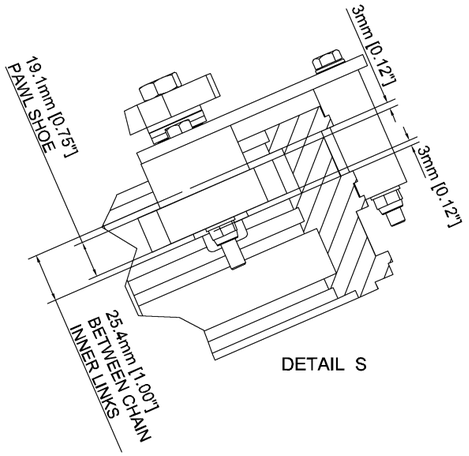
SECTION K-K



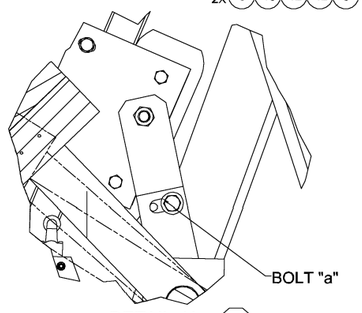
SECTION F-F



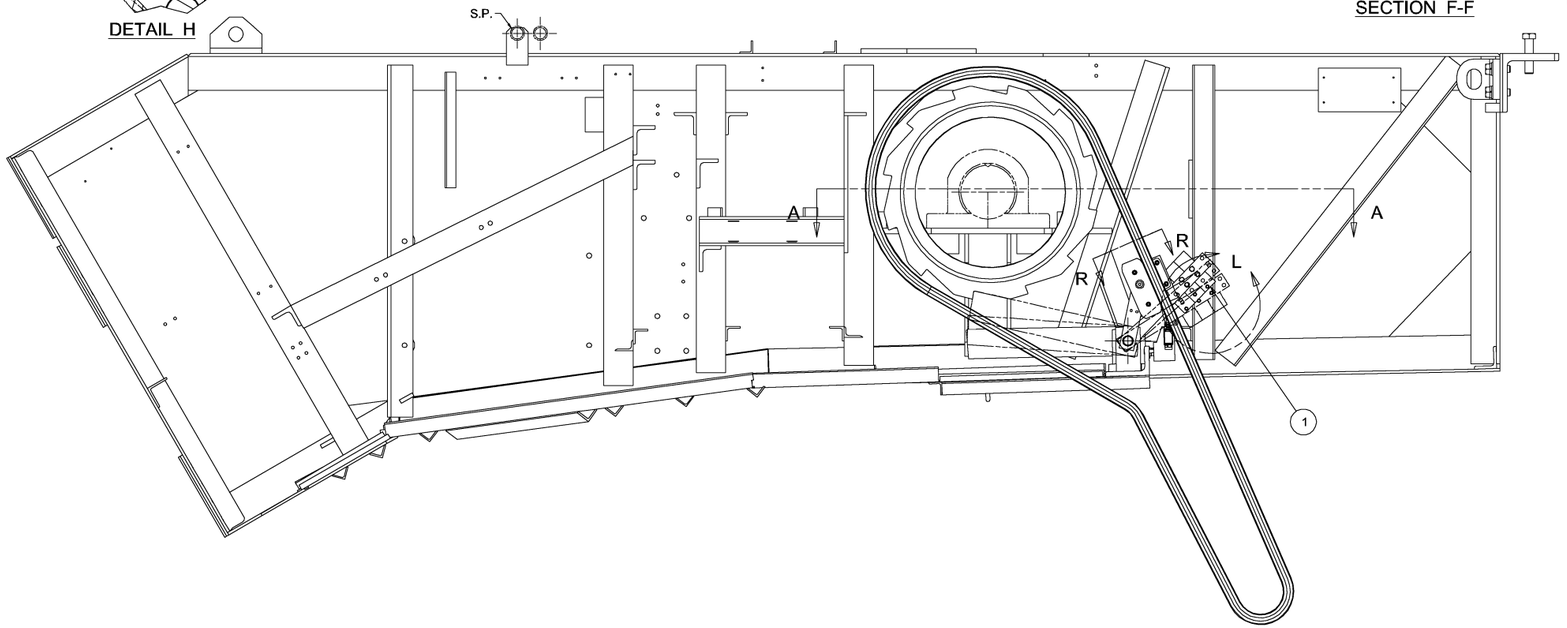
SECTION R-R

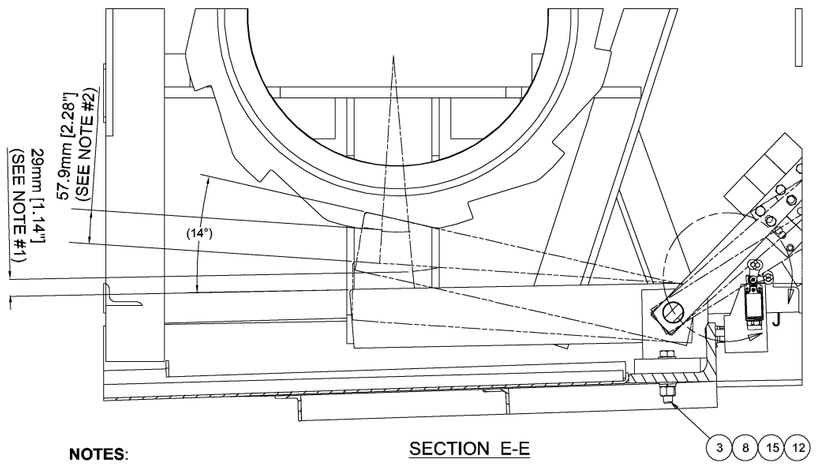


DETAIL S



DETAIL H





SECTION E-E

NOTES:

1. CLEARANCE BETWEEN PAWL AND THE RATCHET'S OUTER DIAMETER MUST BE 132mm[5.2"] MIN., WHEN THE SHOE IS PLACED. ADJUST WITH BOLT "a" (SEE DETAIL "H").

2. FOR LIMIT SWITCH ADJUSTMENT CONFIRM THE FOLLOWING TWO ITEMS:
   (1) THE SWITCH ACTIVATES WHEN THE DISTANCE BETWEEN PAWL AND THE RATCHET'S OUTER DIAMETER IS 55+/-3mm [2.16+/- .12"] (SEE DETAIL "J") .
   (2) PAWL CAN REACH THE BOTTOM OF RATCHET TOOTH.

3. ADJUST PAWL BRAKE ASSEMBLY SIDE TO SIDE SO THAT THE PAWL SHOE EQUALLY CLEARS THE CHAIN INNER LINK PLATES AS SHOWN (SEE DETAIL "C").

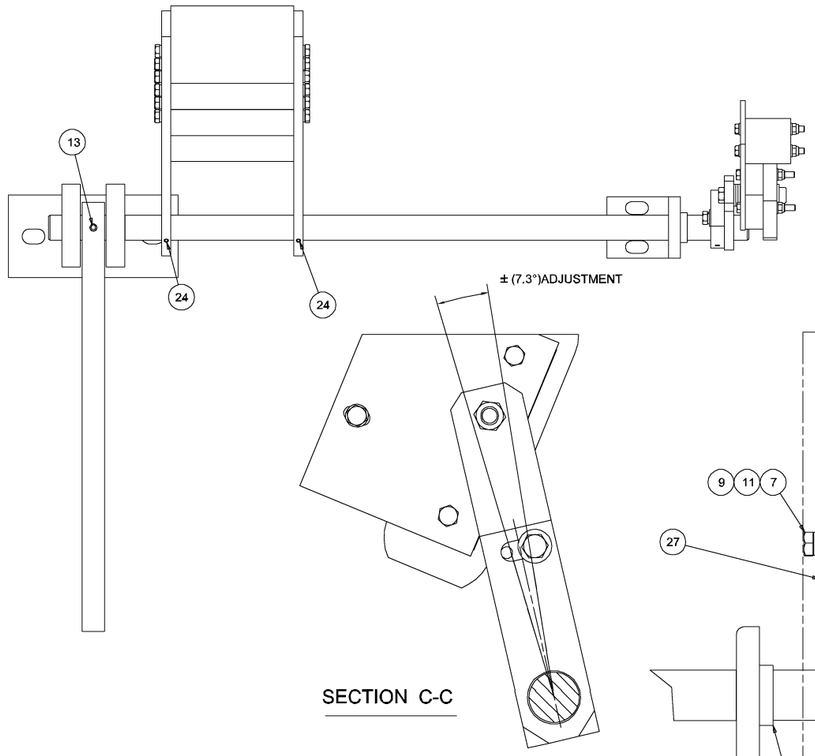
4. VERIFY PAWL OVERLAPS THE RATCHET (SIDE TO SIDE) WITH PAWL ENGAGED.

Assembly C65W1-2881L1

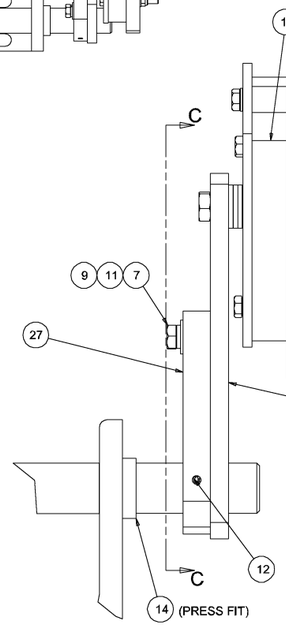
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 1/20/2006	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 1/20/2006	TITLE	INSTALLATION, PAWL BRAKE
	APVD. SUGIMOTO	DATE 1/20/2006		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE (1:10)	SIZE D
			DWG. NO. Fig. B-2a	REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13271	DATE	APPROVED

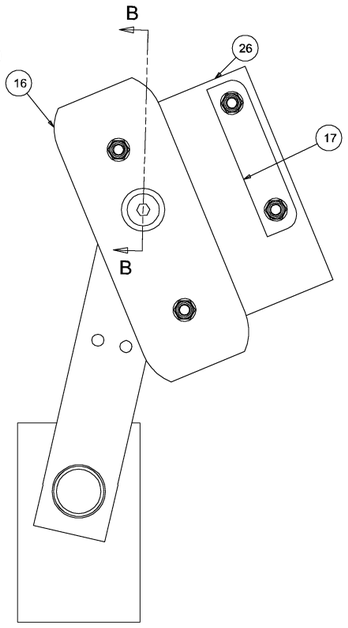
PAWL BRAKE ASSEMBLY
Assembly C65W1-2881L2
E235, E236

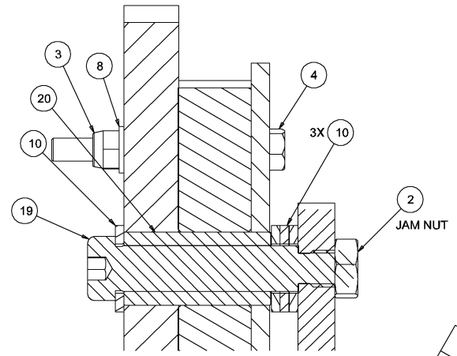


SECTION C-C

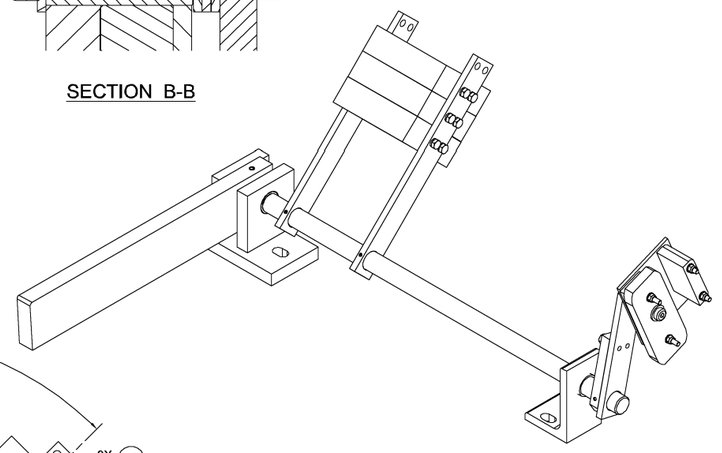


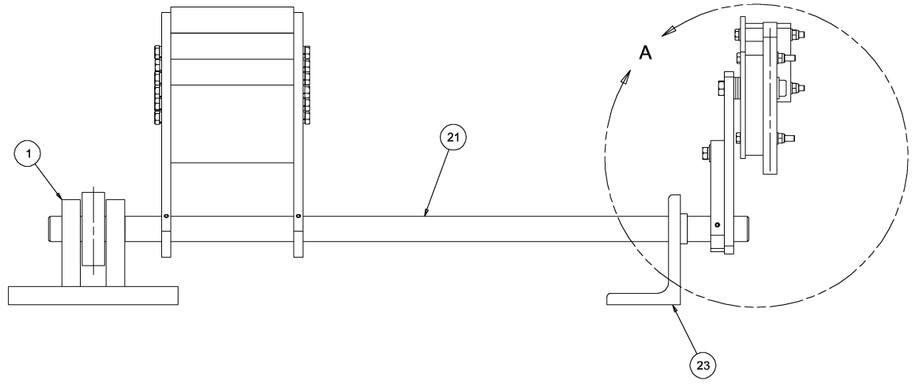
DETAIL A

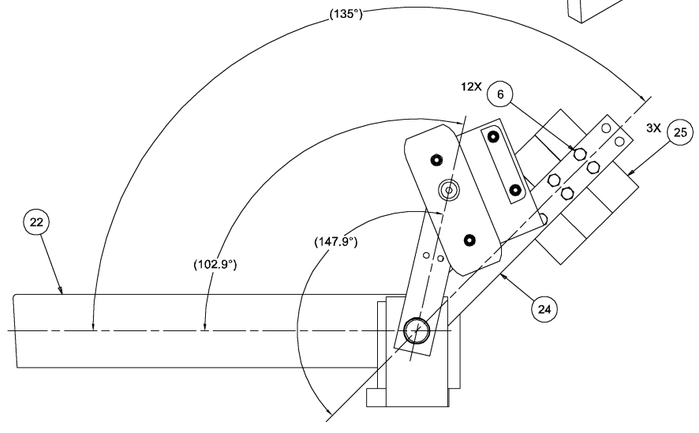




SECTION B-B





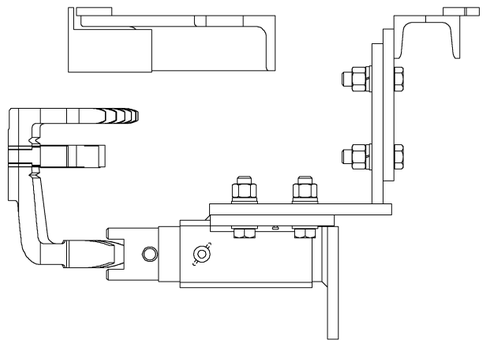


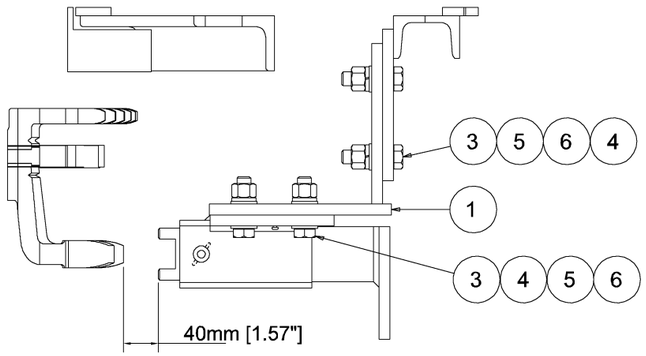
Assembly C65W1-2881L2

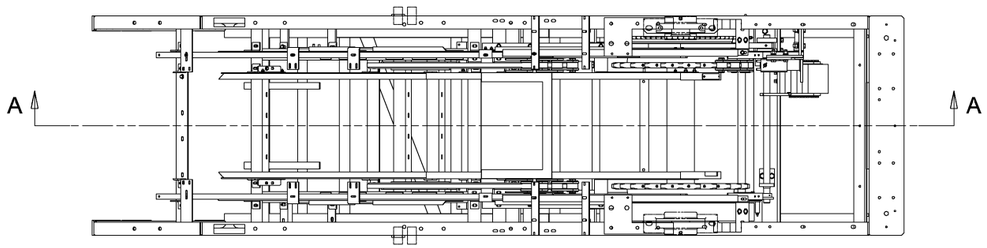
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 1/20/2006	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 1/20/2006	TITLE	PAWL BRAKE, ASSY.
	APVD. SUGIMOTO	DATE 1/20/2006		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE (1:5)	SIZE D
			DWG. NO. Fig. B-2b	REV.

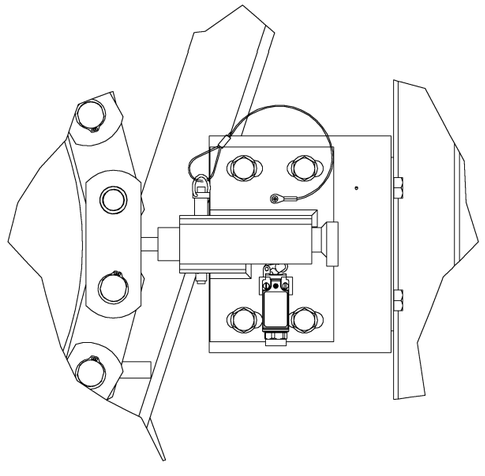
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

STEP CHAIN LOCKING DEVICE ASSEMBLY
Assembly C65W2-2881A1
E221, E222, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236

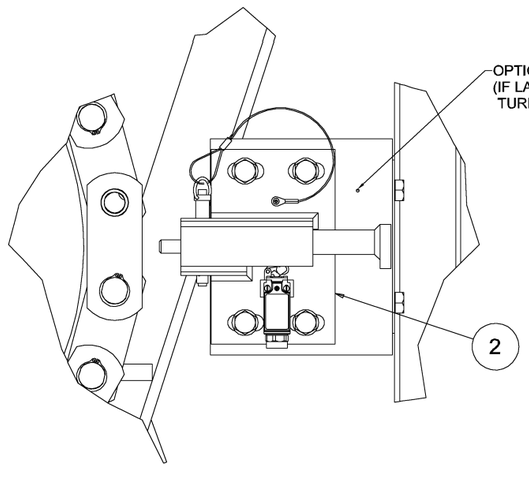




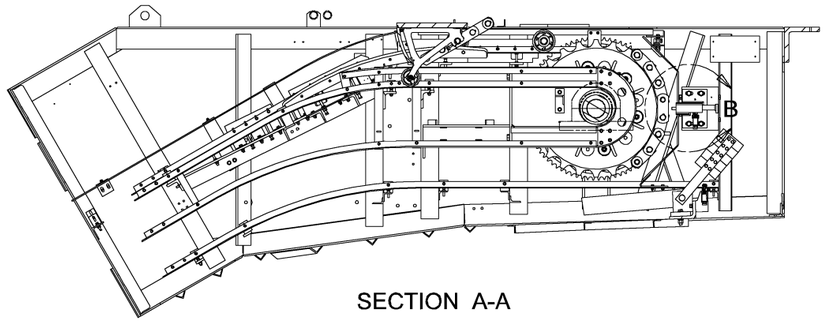




DETAIL B
ENGAGED



DETAIL B
DISENGAGED



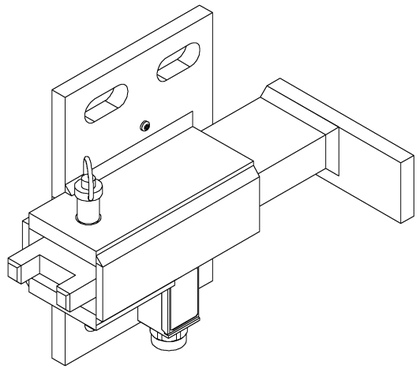
SECTION A-A

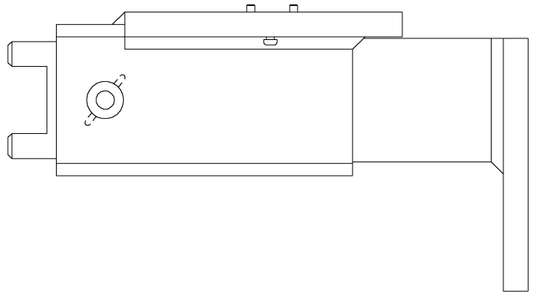
Assembly C65W2-2881A1

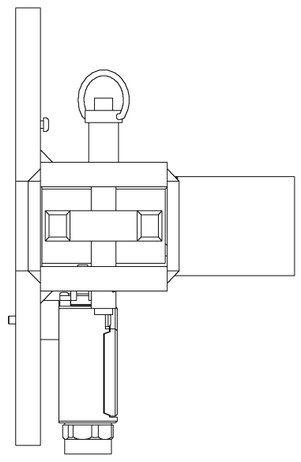
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 8/25/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/25/2004	TITLE: STEP CHAIN LOCKING DEVICE
	APVD. APPERSON	DATE 8/25/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 A01~M01		SCALE (1:20) / SIZE D / DWG. NO. Fig. B-3a / REV. A

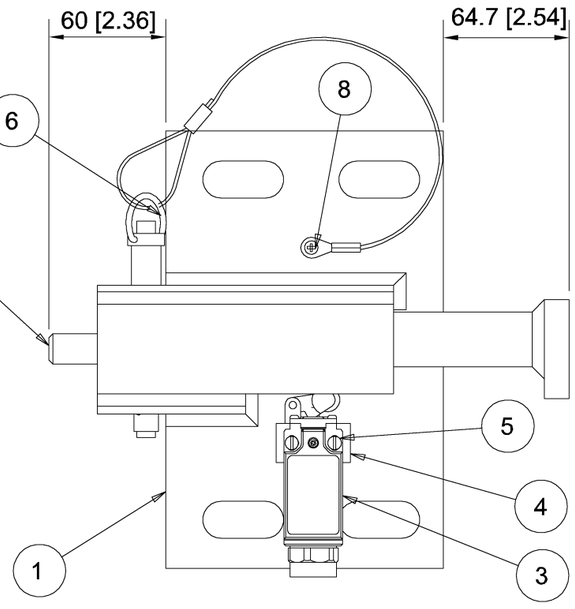
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 10321	DATE	APPROVED

STEP CHAIN LOCKING DEVICE
Assembly C65969001
36-ton Chain
E221, E222, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

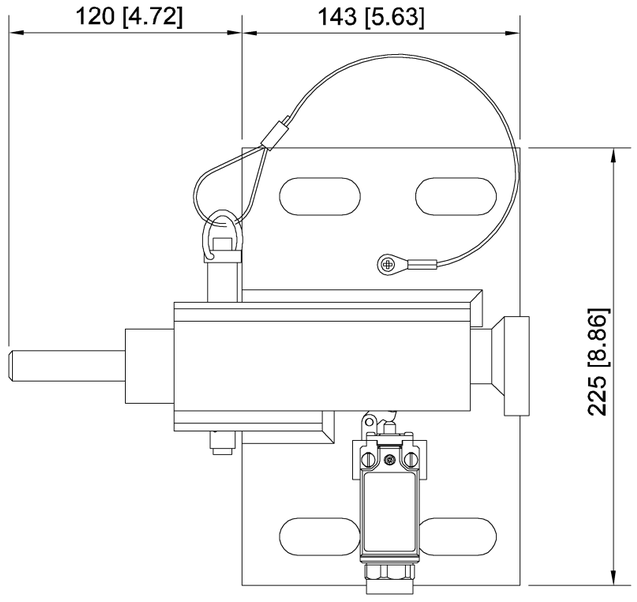








DISENGAGED POSITION



ENGAGED POSITION

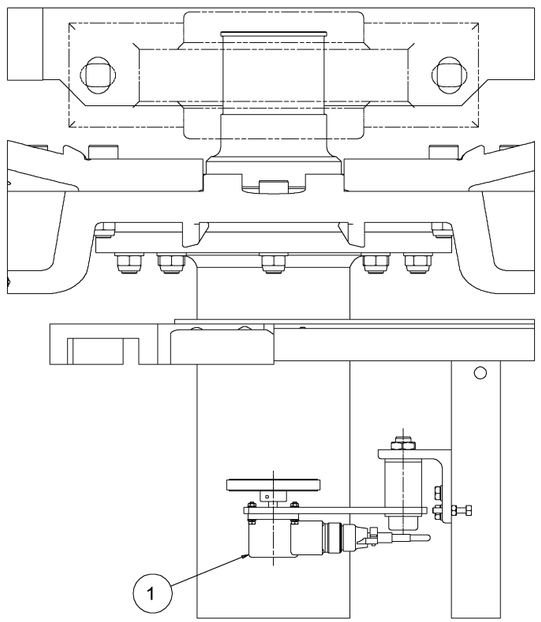
All Dimensions MM [IN]

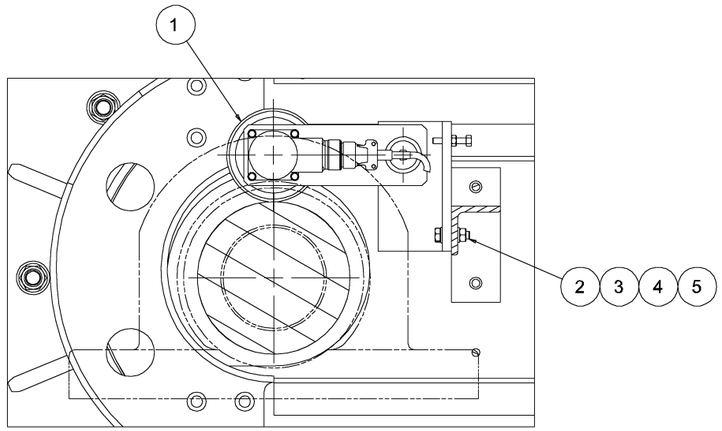
Assembly C65969001

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 4/8/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 4/8/2004	TITLE: STEP CHAIN LOCKING DEVICE
	APVD. APPERSON	DATE 4/8/2004	
JOB TITLE	JOB NO. STD		SCALE (1:3) / SIZE B / DWG. NO. Fig. B-3b / REV.

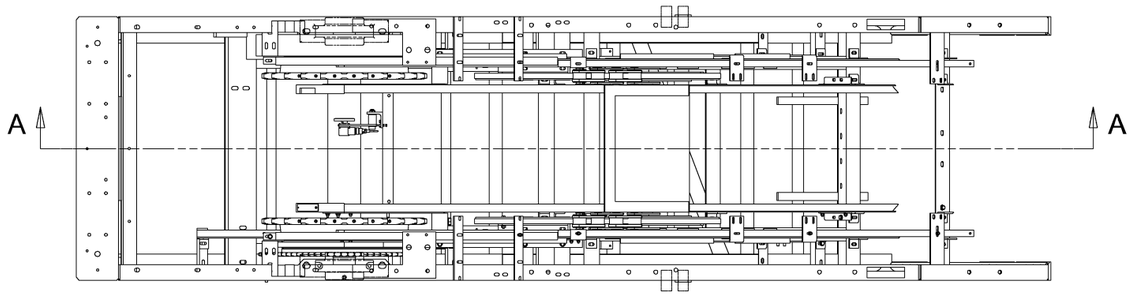
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

SPEED GOVERNOR DEVICE ASSEMBLY
Assembly C65L1-2881A1
E221, E222, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236





DETAIL B



SECTION A-A

NOTE:

FOR 90 FT/MIN (.46 METER/SECOND) STEP BAND SPEED
ENCODER AT 600 PULSES/REV
ENCODER OUTPUT =183.6 PULSES/SEC

Assembly C65L1-2881A1

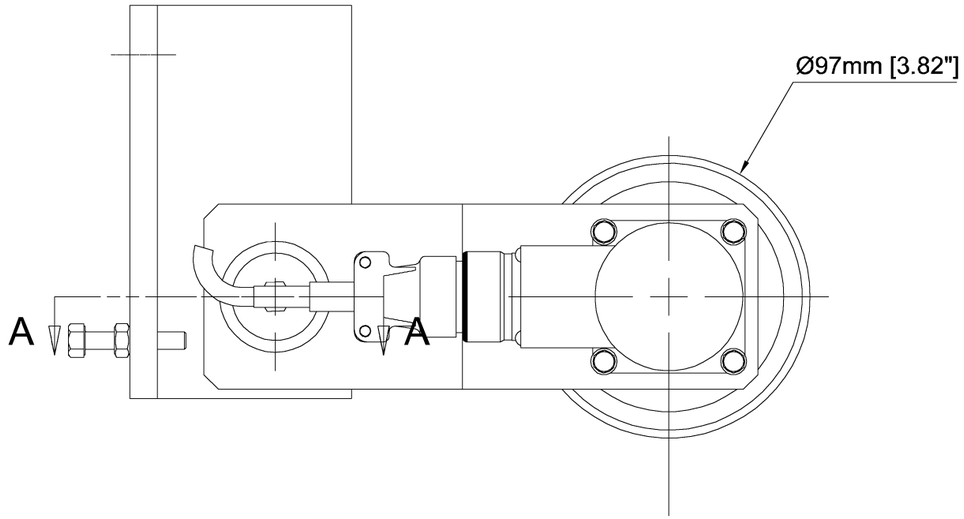
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/2/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/2/2004	TITLE: SPEED GOVERNOR
	APVD. APPERSON	DATE 9/2/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01	SCALE: (1:20)	SIZE: D
DWG. NO.: Fig. B-4a	REV.: A		

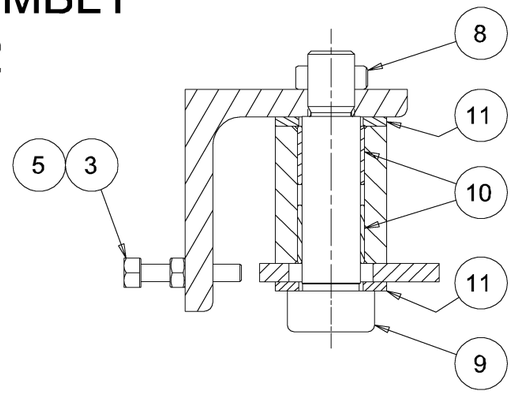
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

GOVERNOR ENCODER ASSEMBLY

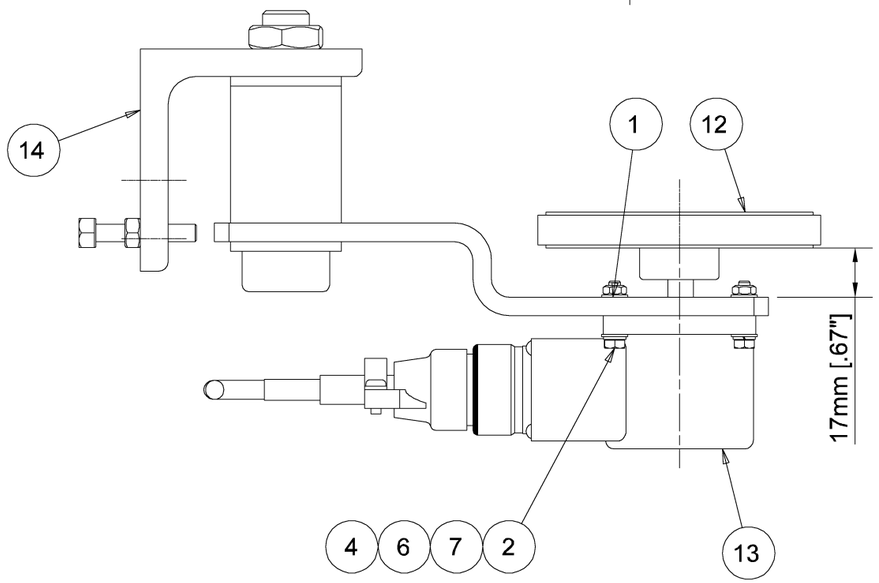
Assembly C65L1-2881A2

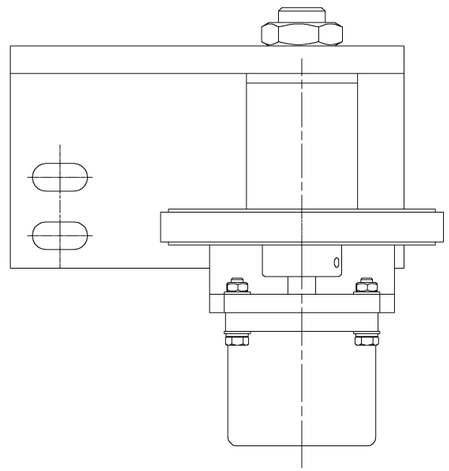
E221, E222, E223, E224,
E229, E230, E231, E232,
E233, E234, E235, E236

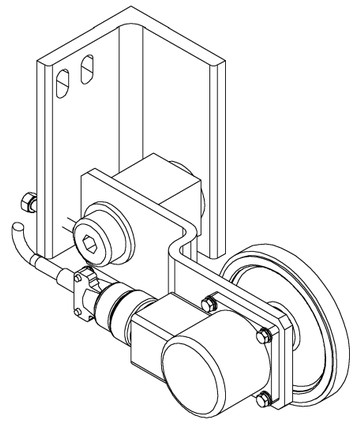




SECTION A-A







Assembly C65L1-2881A2

NOTE:
USE A LOCKING COMPOUND OR
A "LOCK-TITE" TYPE LIQUID ON SHOULDER
BOLT, THREAD, AND NUT.

GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/2/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/2/2004	TITLE: ENCODER ASSEMBLY
	APVD. APPERSON	DATE 9/2/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE (1:2) / SIZE B / DWG. NO. Fig. B-4b / REV. A

C) TRACK

Upper Track Assembly

See Fig. C-1 for Upper Track Assembly.
Escalator No. E235, E236
Assembly used in: C62F1-2881A1 (HS L01, M01)

UPPER TRACK ASSEMBLY C62F1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62F1-2881A3	A-TRACK, UPPER, ASSY	1	
2	C62F1-2881A4	A-TRACK, UPPER, ASSY	1	
3	C62F1-2881A7	A-TRACK, UP-THRUST, ASSY	1	
4	C62F1-2881A8	A-TRACK, UP-THRUST, ASSY	1	
5	C62F4-2881A3	ANGLE, TRACK, ASS"Y	1	
6	D68W1-2881A4	BRACKET, CHAIN GUARD	2	
7	D00153002	NUT,LOCKING,NYLON INSERT,M10	16	
8	D00902008	BOLT, HEX, M4 (P=0.7) X12, FULL	1	
9	D00902050	BOLT, HEX, M10 (P=1.50) X 35	10	
10	D00902051	BOLT, HEX, M10 (P=1.50) X 40	60	
11	D00902054	BOLT, HEX, M10 (P=1.5) X 60, FULL	2	
12	D00902056	BOLT, HEX, M10 (P=1.5) X 80, FULL	12	
13	D00902057	BOLT, HEX, M10 (P=1.5) X 110, FULL	2	
14	D00902059	BOLT, HEX, M10 (P=1.50) X 90	2	
15	D00902061	BOLT, HEX, M12 (P=1.75) X 65, FULL	4	
16	D00902072	BOLT, HEX, M12 (P=1.75) X 120, FULL	4	
17	D00902089	BOLT, HEX, M20 (P=2.5) X 60, FULL	4	
18	D00902141	BOLT, HEX, M10 (P=1.50) X 120	2	
19	D00902142	BOLT, HEX, M10 (P=1.50) X 55	14	
20	D00902143	BOLT, HEX, M12 (P=1.75) X 150, FULL	4	
21	D00903005	NUT, HEX, M8 (1.25)	106	
22	D00903006	NUT,HEX,M10 (P=1.5)	104	
23	D00903007	NUT,HEX,M12 (P=1.75)	12	
24	D00903009	NUT, HEX, M20 (P=2.5)	4	
25	D00905061	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	4	
26	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	104	
27	D00905064	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	2	
28	D00905081	SCREW,MACHINE,FLT/SL.M10 (P=1.5) x 3(	16	
29	D00907002	WASHER,FLAT,M4	1	

See Fig. C-1 for Upper Track Assembly.
Escalator No. E235, E236
Assembly used in: C62F1-2881A1 (HS L01, M01)

UPPER TRACK ASSEMBLY C62F1-2881A1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
30	D00907005	WASHER,FLAT,M8	106	
31	D00907006	WASHER,FLAT,M10	138	
32	D00907007	WASHER,FLAT,M12	8	
33	D00907009	WASHER,FLAT,M20	12	
34	D00908002	WASHER,LOCK,M4	1	
35	D00908005	WASHER,LOCK,M8	106	
36	D00908006	WASHER,LOCK,M10	70	
37	D00908009	WASHER,LOCK,M20	4	
38	D00936002	NUT,T-SLOT,METRIC,M10	32	
39	D00936003	NUT,T-SLOT,METRIC,M12	12	
40	D62010001	BRACKET, TRACK	20	
41	D62159001	BRACKET, TRACK	6	
42	D62161001	BRACKET, TRACK	2	
43	D62F1-2881A9	A-TRACK, UP-THRUST	2	
44	D62F2-2881A1	B-TRACK, UPPER	1	
45	D62F2-2881A2	B-TRACK, UPPER	1	
46	D62F2-2881A3	B-TRACK, UP-THRUST	1	
47	D62F2-2881A4	B-TRACK ,UP-THRUST	1	
48	D62F2-2881A5	M-TRACK, UPPER	1	
49	D62F2-2881A6	M-TRACK, UPPER	1	
50	D62F2-2881A7	N-TRACK, UPPER	1	
51	D62F2-2881A8	N-TRACK, UPPER	1	
52	D62F3-2881A2	BRACKET, TRACK	4	
53	D62F3-2881A5	RAIL, TRACK	1	
54	D62F3-2881A6	RAIL, TRACK	1	
55	D62F3-2881A7	BRACKET, A-TRACK UPPER	1	
56	D62F3-2881A8	BRACKET, A-TRACK, UPPER	1	
57	D62F3-2881A9	BRACKET, TRACK	2	
58	D62F4-2881A1	BASE, TURN TRACK	2	

See Fig. C-1 for Upper Track Assembly.
Escalator No. E235, E236
Assembly used in: C62F1-2881A1 (HS L01, M01)

UPPER TRACK ASSEMBLY C62F1-2881A1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
59	D62F4-2881A6	BRACKET, TRACK	2	
60	D62F4-2881A7	BRACKET, TRACK	2	
61	D62F4-2881A9	BRACKET, TRACK	2	
62	D62F5-2648A1	COVER, TURN TRACK	1	
63	D62F5-2881A1	PLATE, B-TRACK	2	
64	D62F6-2881A1	BRACKET, A-TRACK, LH	1	
65	D62F6-2881A2	BRACKET, A-TRACK, RH	1	
66	D62F6-2881A3	BRACKET, A-TRACK, LH	1	
67	D62F6-2881A4	BRACKET, A-TRACK, RH	1	
70	D62H28002	TURN TRACK, TRACK	1	
71	D62H28003	TURN TRACK, TRACK	1	
72	D62L56001	BRACKET, CHAIN GUIDE	1	
73	D62L56002	BRACKET, CHAIN GUIDE	1	
74	D62L58001	CHAIN GUIDE	2	
75	D62L70001	BRACKET, CHAIN GUIDE, UPPER	1	
76	D62L70002	BRACKET, CHAIN GUIDE, UPPER	1	
77	D62L71001	BRACKET, CHAIN GUIDE, MIDDLE	1	
78	D62L71002	BRACKET, CHAIN GUIDE, MIDDLE	1	
79	D62L72001	BRACKET, CHAIN GUIDE, LOWER	1	
80	D62L72002	BRACKET, CHAIN GUIDE, LOWER	1	
81	D00908007	WASHER,LOCK,M12	4	
82	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	4	

Lower Track Assembly

See Fig. C-2 for Lower Track Assembly.
Escalator No. E235, E236
Assembly used in: C62H1-2881A1 (HS L01, M01)

LOWER TRACK ASSEMBLY C62H1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62F13001	BRACKET, TRACK, ASSY.	8	
2	C62H0-2881A1	BRACKET, TRACK, ASSY	2	
3	C62H1-2881A5	BRACKET, TRACK, ASSY	1	
4	C62H7-2881A1	A-TRACK UP-THRUST ASSY.	1	
5	C62H7-2881A2	A-TRACK UP-THRUST ASSY	1	
6	D62010001	BRACKET, TRACK	12	
7	D62159001	BRACKET, TRACK	4	
8	D62161001	BRACKET, TRACK	2	
9	D62233001	BRACKET, TRACK	4	
10	D62422001	BRACKET, TRACK	1	
11	D62422002	BRACKET, TRACK	1	
12	D62552001	M8 THREADED ROD 190mm	4	
13	D62552002	M8 THREADED ROD 310mm	2	
14	D62F15001	BRACKET, TRACK	16	
15	D62H0-2881A2	BRACKET, TRACK	2	
16	D62H1-2881A1	BASE PLATE, TRACK	1	
17	D62H1-2881A2	BASE PLATE, TRACK	1	
18	D62H1-2881A3	SPACER	6	
19	D62H1-2881A4	BRACKET, TRACK	2	
20	D62H1-2881A8	BRACKET, TRACK	1	
21	D62H1-2881A9	BRACKET, TRACK	1	
22	D62H2-2881A1	B-TRACK, LOWER	1	
23	D62H2-2881A2	B-TRACK, LOWER	1	
24	D62H3-2881A1	M-TRACK, LOWER	1	
25	D62H3-2881A2	M-TRACK, LOWER	1	
26	D62H4-2881A1	B-TRACK, LOWER UP-THRUST	1	
27	D62H4-2881A2	B-TRACK, LOWER UP-THRUST	1	
28	D62H5-2881A1	A-TRACK, LOWER	1	
29	D62H5-2881A2	A-TRACK, LOWER	1	

See Fig. C-2 for Lower Track Assembly.
Escalator No. E235, E236
Assembly used in: C62H1-2881A1 (HS L01, M01)

LOWER TRACK ASSEMBLY C62H1-2881A1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
30	D62H6-2881A1	N-TRACK, LOWER	1	
31	D62H6-2881A2	N-TRACK, LOWER	1	
32	D62H8-2881A1	N-TRACK, LOWER UP-THRUST	1	
33	D62H8-2881A2	N-TRACK, LOWER UP-THRUST	1	
34	D62H9-2881A1	EXTENSION, A-TRACK, LOWER UP-THRUST	1	
35	D62H9-2881A2	EXTENSION, A-TRACK, LOWER UP-THRUST	1	
36	D00002008	WASHER, FLAT, NARROW, 5/8	12	
37	D00002105	WASHER,FLAT,WIDE,5/16	24	
38	D00002106	WASHER,FLAT,WIDE,3/8	40	
39	D00153001	U-NUT, M8	12	
40	D00902034	BOLT, HEX, M8 (P=1.25) X 30	4	
41	D00902047	BOLT, HEX, M10 (P=1.5) X 20	16	
42	D00902049	BOLT, HEX, M10 (P=1.5) X 30	4	
43	D00902051	BOLT, HEX, M10 (P=1.5) X 40	34	
44	D00902056	BOLT, HEX, M10 (P=1.5) X 80	6	
45	D00902066	BOLT, HEX, M12 (P=1.75) X 40	6	
46	D00902082	BOLT, HEX, M16 (P=2.0) X 45	6	
47	D00903005	NUT, HEX, M8 (P=1.25)	156	
48	D00903006	NUT, HEX, M10 (P=1.5)	44	
49	D00903007	NUT, HEX, M12 (P=1.75)	6	
50	D00903008	NUT,HEX,M16 (P=2.0)	6	
51	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	164	
52	D00907005	WASHER,FLAT,M8	156	
53	D00907007	WASHER,FLAT,M12	12	
54	D00908005	WASHER,LOCK,M8	166	
55	D00908006	WASHER,LOCK,M10	24	
56	D00908007	WASHER,LOCK,M12	6	
57	D00908008	WASHER,LOCK,M16	6	
58	D00919003	NUT,HEX,CONNECTION, M8 (P=1.25)	6	
59	D00936002	NUT,T-SLOT,METRIC,M10	24	

Incline #1 Track Assembly

See Fig. C-3a for Incline #1 Track Assembly.
Escalator No. E235, E236
Assembly used in: C62G1-2881E1 (HS L01, M01)

INCLINE #1 TRACK ASSEMBLY C62G1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D62G3-2881E1	A,B TRACK	2	
2	D62G3-2881E2	A,B TRACK	2	
3	D62G3-2881E3	M TRACK	1	
4	D62G3-2881E4	M TRACK	1	
5	D62G3-2881E5	N TRACK	1	
6	D62G3-2881E6	N TRACK	1	
7	D62G2-2881E1	A-TRACK, UP-THRUST	2	
8	D62147001	PLATE, UPTHRUST, TRACK	2	
9	C62A3-2881E1	BRACKET, TRACK ASSY.	4	
10	C62A3-2881E2	BRACKET, TRACK, ASSY	4	
11	D62429001	BRACKET, TRACK	4	
12	D62A5-2881E1	BRACKET, SKIRT FRAME	4	
13	D62010001	BRACKET, TRACK	20	
14	D62159001	BRACKET, TRACK	12	
15	D62161001	BRACKET, TRACK	8	
16	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	16	
17	D00902036	BOLT, HEX, M8 (P=1.25) X 40, FULL	8	
18	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	152	
19	D00907005	WASHER,FLAT,M8	200	
20	D00908005	WASHER,LOCK,M8	176	
21	D00903005	NUT, HEX, M8 (1.25)	176	
22	D00902051	BOLT, HEX, M10 (P=1.50) X 40	60	
23	D00902056	BOLT, HEX, M10 (P=1.5) X 80, FULL	12	
24	D00907006	WASHER,FLAT,M10	112	
25	D00908006	WASHER,LOCK,M10	72	
26	D00903006	NUT,HEX,M10 (P=1.5)	72	
27	D00936002	NUT,T-SLOT,METRIC,M10	28	
28	D62L49001	CONNECTOR, TRACK	32	

See Fig. C-3a for Incline #1 Track Assembly.
Escalator No. E235, E236
Assembly used in: C62G1-2881E1 (HS L01, M01)

INCLINE #1 TRACK ASSEMBLY C62G1-2881E1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
29	D62L50001	A,B TRACK EXTENSION	2	
30	D62L50002	A,B TRACK EXTENSION	2	
31	D62M10001	A,B TRACK EXTENSION	2	
32	D62M10002	A,B TRACK EXTENSION	2	
33	D62M14001	M,N TRACK EXTENSION	4	
34	D62M14002	M,N TRACK EXTENSION	4	

Incline #2 and #3 Track Assembly

See Fig. C-3b for Incline #2 and #3 Track Assembly.
Escalator No. E235, E236
Assembly used in: C62G1-2881E2 (HS L01, M01)

INCLINE #2 and #3 TRACK ASSEMBLY C62G1-2881E2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D62G3-2881E1	A,B TRACK	2	
2	D62G3-2881E2	A,B TRACK	2	
3	D62G3-2881E3	M TRACK	1	
4	D62G3-2881E4	M TRACK	1	
5	D62G3-2881E5	N TRACK	1	
6	D62G3-2881E6	N TRACK	1	
7	D62G2-2881E1	A-TRACK, UP-THRUST	2	
8	D62147001	PLATE, UPTHRUST, TRACK	4	
9	D62010001	BRACKET, TRACK	20	
10	D62159001	BRACKET, TRACK	12	
11	D62161001	BRACKET, TRACK	8	
12	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	152	
13	D00907005	WASHER,FLAT,M8	152	
14	D00908005	WASHER,LOCK,M8	152	
15	D00903005	NUT, HEX, M8 (1.25)	152	
16	D00902051	BOLT, HEX, M10 (P=1.50) X 40	60	
17	D00902056	BOLT, HEX, M10 (P=1.5) X 80, FULL	12	
18	D00907006	WASHER,FLAT,M10	112	
19	D00908006	WASHER,LOCK,M10	72	
20	D00903006	NUT,HEX,M10 (P=1.5)	72	
21	D00936002	NUT,T-SLOT,METRIC,M10	32	
22	D62L49001	CONNECTOR, TRACK	16	
23	D62M10001	A,B TRACK EXTENSION	2	
24	D62M10002	A,B TRACK EXTENSION	2	
25	D62M14001	M,N TRACK EXTENSION	2	
26	D62M14002	M,N TRACK EXTENSION	2	

Incline #4 Track Assembly

See Fig. C-3c for Incline #4 Track Assembly.
Escalator No. E235, E236
Assembly used in: C62G1-2881L4 (HS L01, M01)

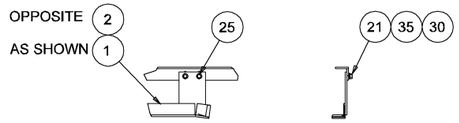
INCLINE #4 TRACK ASSEMBLY C62G1-2881L4				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00902051	BOLT, HEX, M10 (P=1.50) X 40	60	
2	D00902056	BOLT, HEX, M10 (P=1.5) X 80, FULL	12	
3	D00903005	NUT, HEX, M8 (1.25)	152	
4	D00903006	NUT,HEX,M10 (P=1.5)	72	
5	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	152	
6	D00907005	WASHER,FLAT,M8	152	
7	D00907006	WASHER,FLAT,M10	112	
8	D00908005	WASHER,LOCK,M8	152	
9	D00908006	WASHER,LOCK,M10	72	
10	D00936002	NUT,T-SLOT,METRIC,M10	32	
11	D62010001	BRACKET, TRACK	20	
12	D62147001	PLATE, UPTHRUST, TRACK	4	
13	D62159001	BRACKET, TRACK	12	
14	D62161001	BRACKET, TRACK	8	
15	D62G2-2881L2	A-TRACK, UP-THRUST	2	
16	D62G3-2881L10	M TRACK	1	
17	D62G3-2881L11	N TRACK	1	
18	D62G3-2881L12	N TRACK	1	
19	D62G3-2881L7	A,B TRACK	2	
20	D62G3-2881L8	A,B TRACK	2	
21	D62G3-2881L9	M TRACK	1	
22	D62L49001	CONNECTOR, TRACK	16	
23	D62L51001	A,B TRACK EXTENSION	2	
24	D62L51002	A,B TRACK EXTENSION	2	
25	D62M14001	M,N TRACK EXTENSION	2	
26	D62M14002	M,N TRACK EXTENSION	2	

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

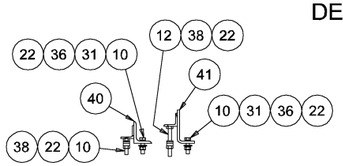
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 13945	DATE	APPROVED

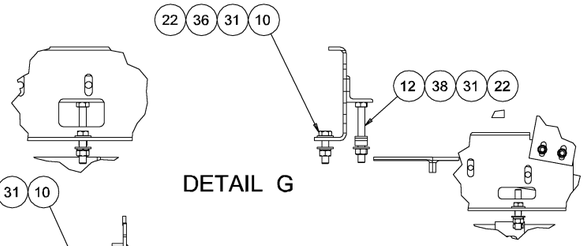
UPPER TRACK ASSEMBLY
Assembly C62F1-2881A1 (1 of 2)
E221, E223, E223, E229, E230, E231, E232, E233, E234, E235, E236



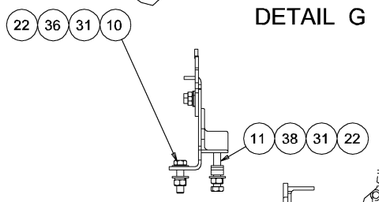
DETAIL D



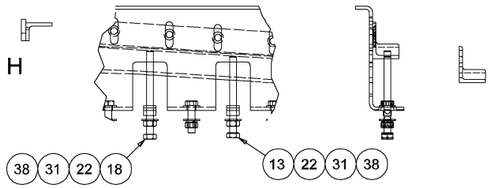
SECTION F-F



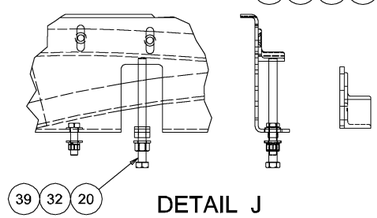
DETAIL G



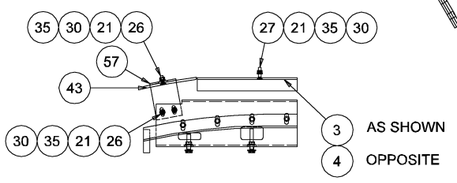
DETAIL H



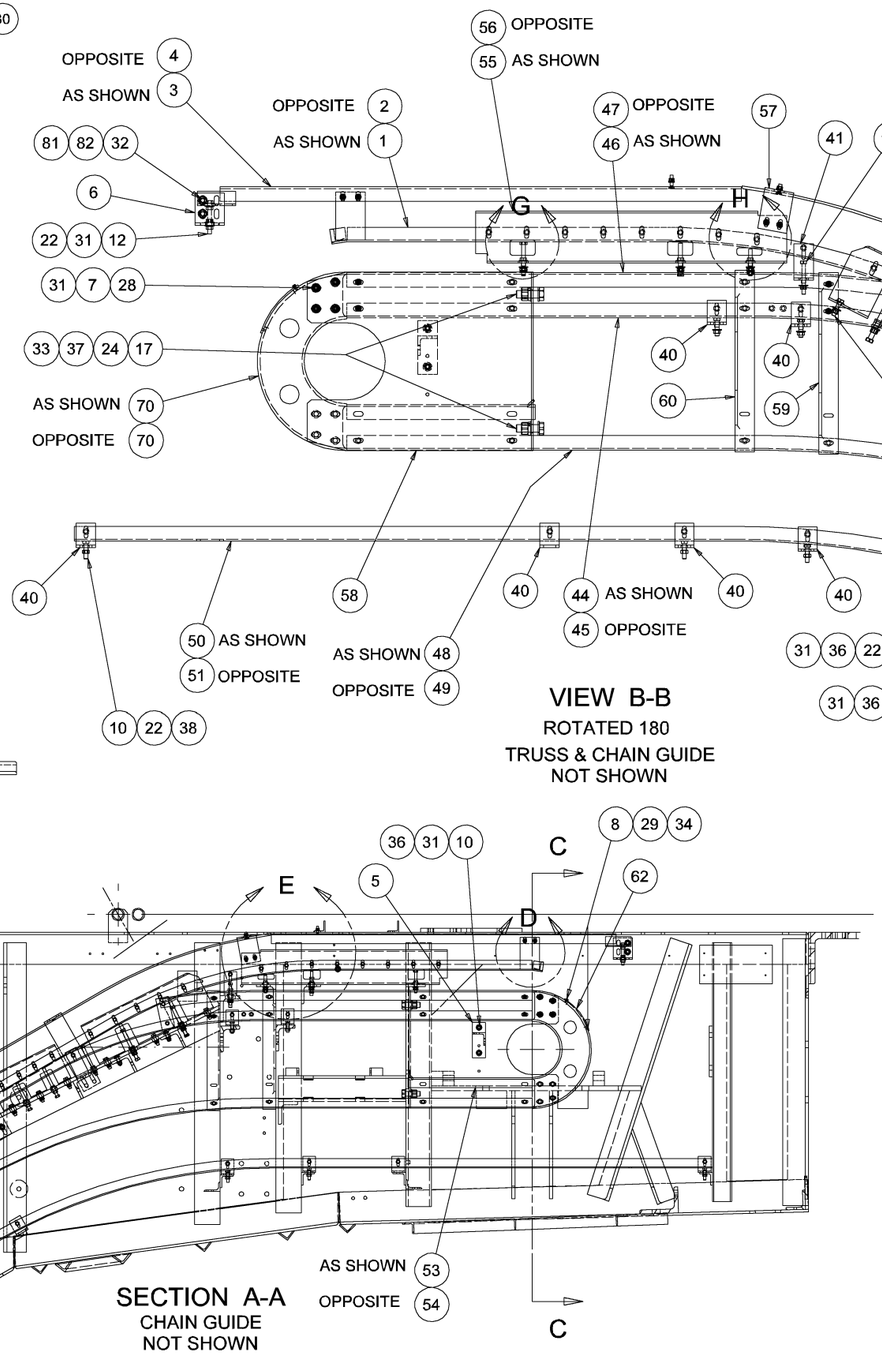
DETAIL K



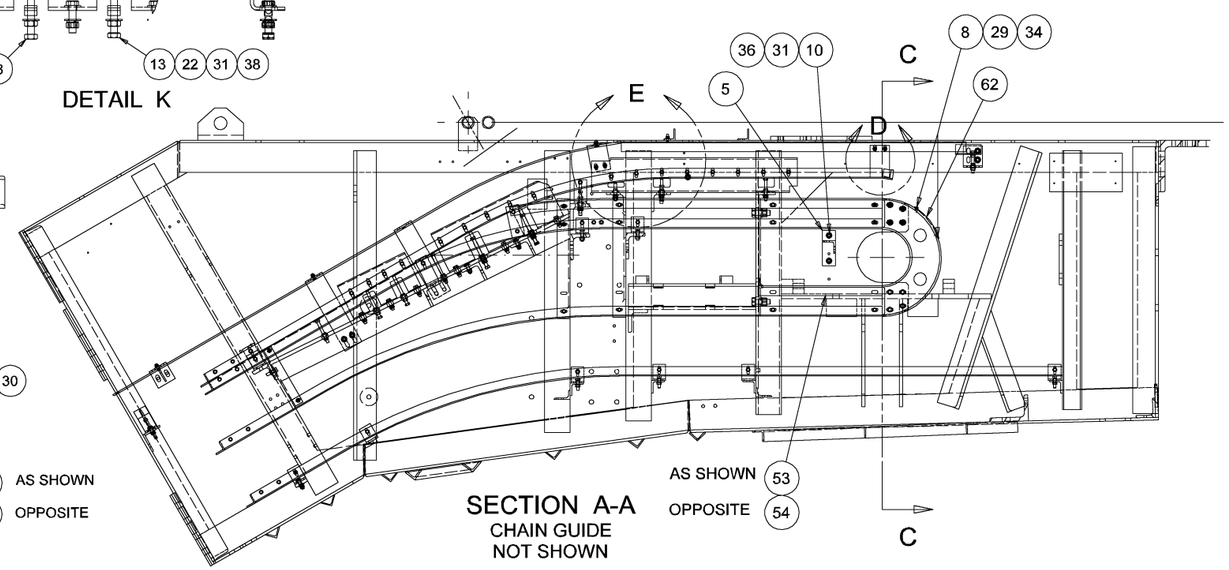
DETAIL J



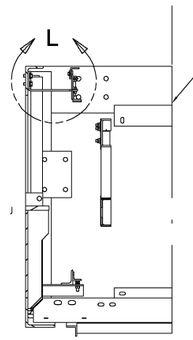
DETAIL E



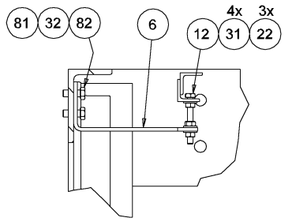
VIEW B-B
ROTATED 180
TRUSS & CHAIN GUIDE NOT SHOWN



SECTION A-A
CHAIN GUIDE NOT SHOWN



SECTION C-C



DETAIL L

Assembly C62F1-2881A1 (1 of 2)

GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 7/28/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 7/28/2004	TITLE: TRACK, UPPER, ASSY
	APVD. APPERSON	DATE 7/28/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01		SCALE (1:15) / SIZE D / DWG. NO. Fig. C-1 / REV. A

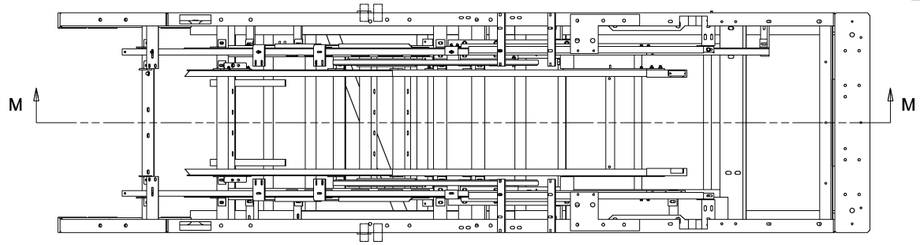
*** CAD – MANUAL REVISIONS NOT PERMITTED ***

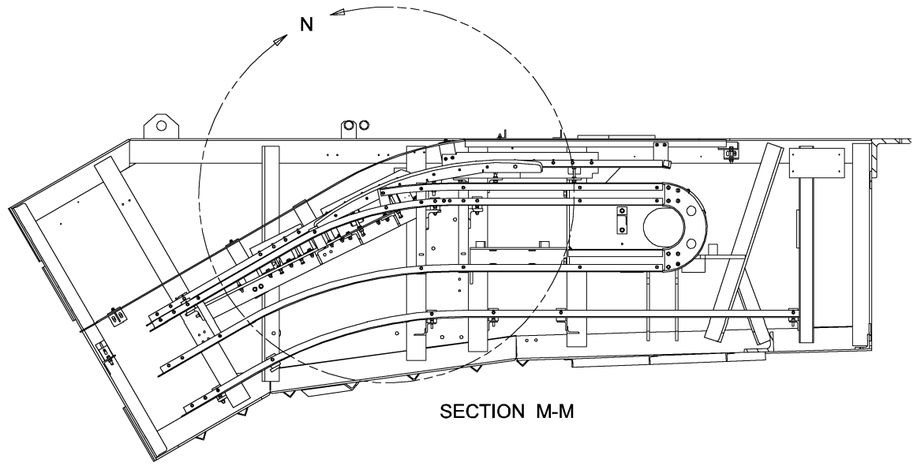
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 19945	DATE	APPROVED

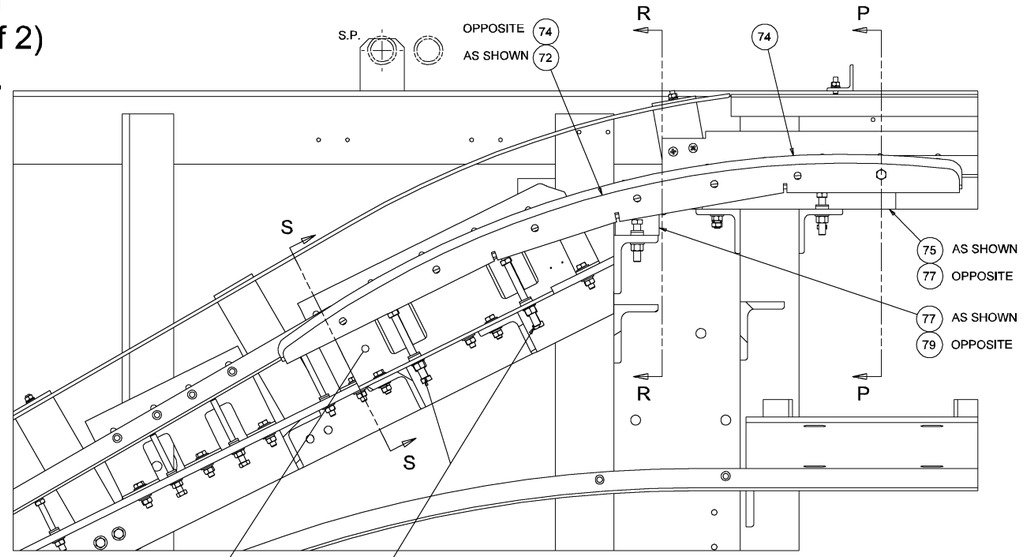
UPPER TRACK ASSEMBLY
Assembly C62F1-2881A1 (2 of 2)

E221, E223, E223, E229, E230, E231, E232,
E233, E234, E235, E236

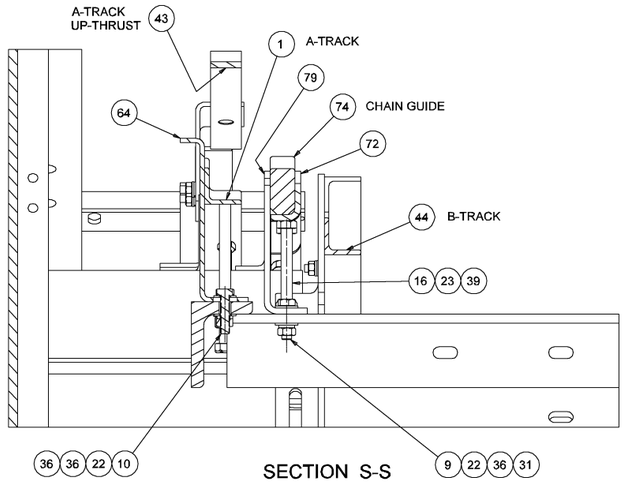




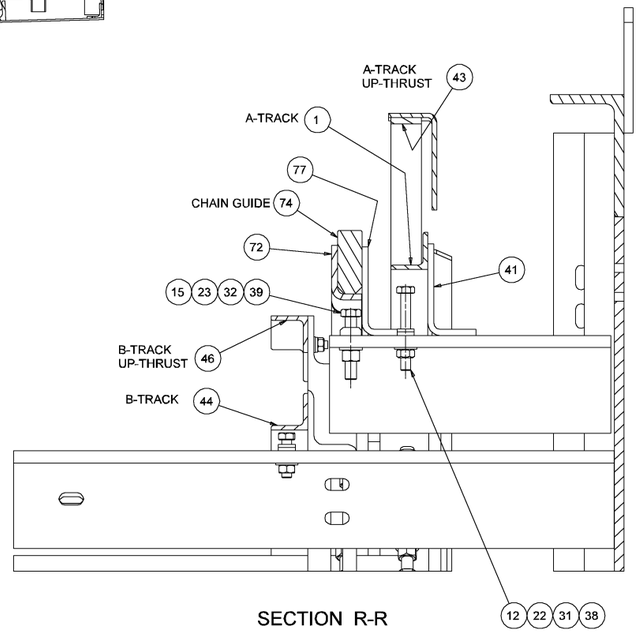
SECTION M-M



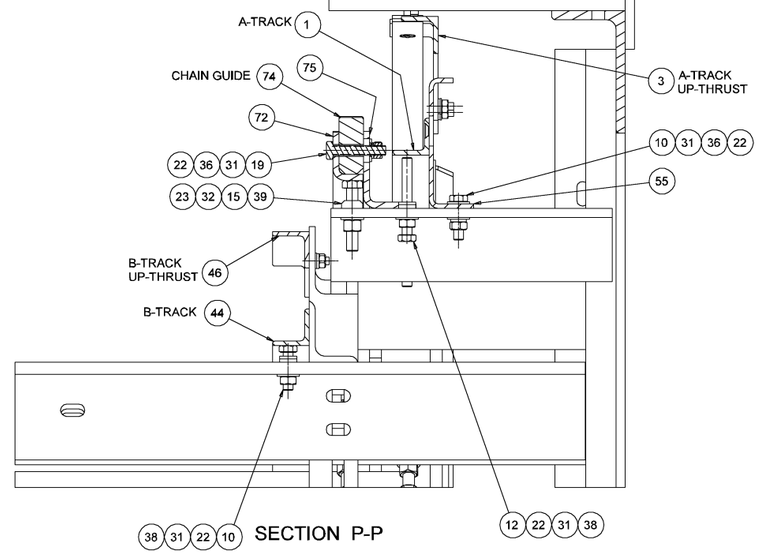
DETAIL N
B-TRACK NOT SHOWN



SECTION S-S



SECTION R-R



SECTION P-P

Assembly C62F1-2881A1 (2 of 2)

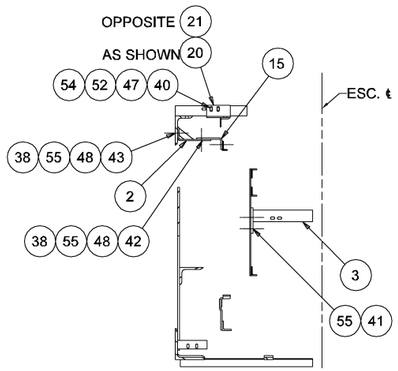
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 7/28/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 7/28/2004	TITLE: TRACK, UPPER, ASSY
	APVD. APPERSON	DATE 7/28/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01		SCALE (1:15) / SIZE D / DWG. NO. Fig. C-1 / REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

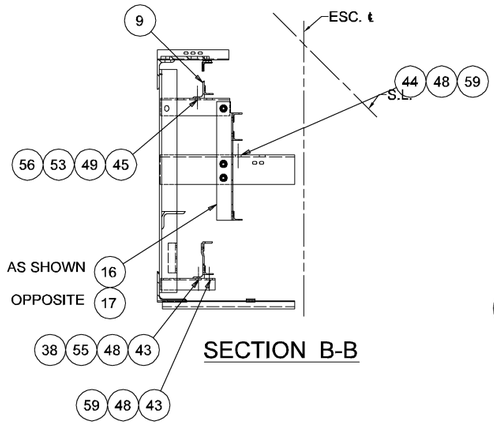
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 11293	DATE	APPROVED

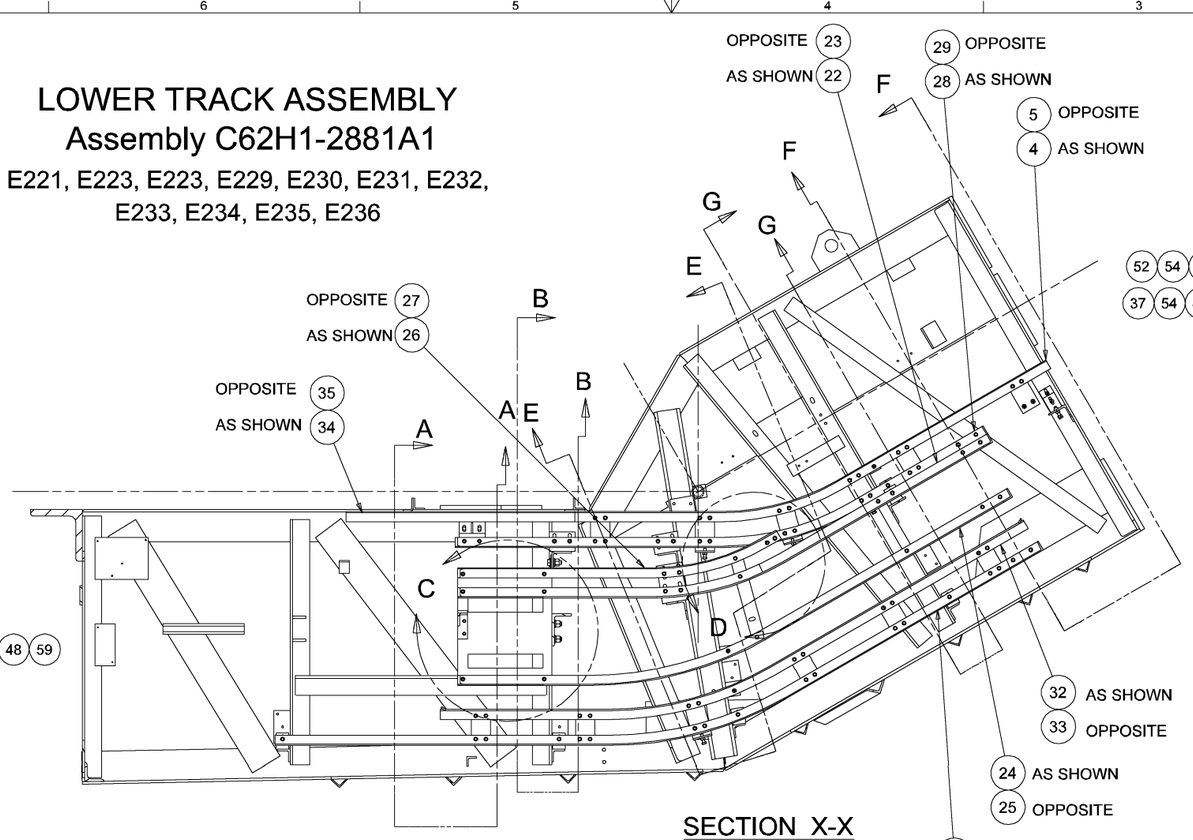
LOWER TRACK ASSEMBLY
Assembly C62H1-2881A1
E221, E223, E223, E229, E230, E231, E232, E233, E234, E235, E236



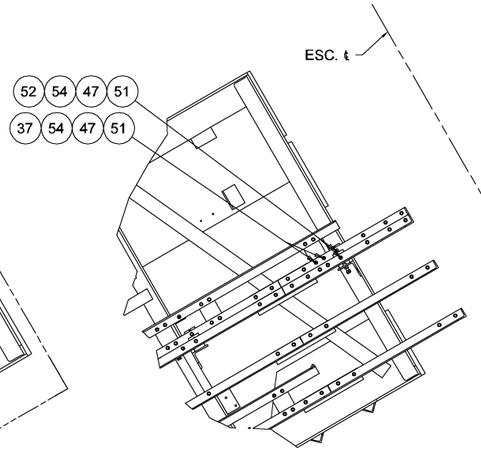
SECTION A-A



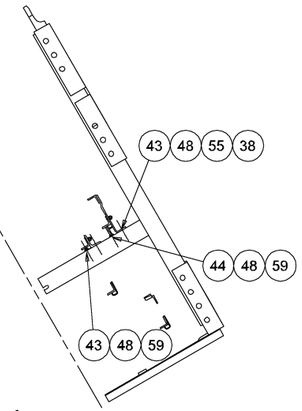
SECTION B-B



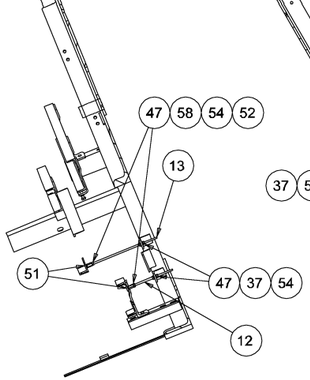
SECTION X-X



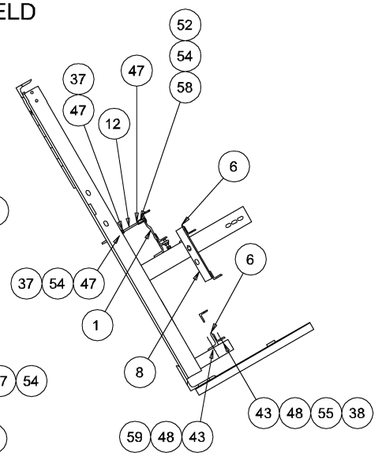
TRACK CONNECTION IN THE FIELD



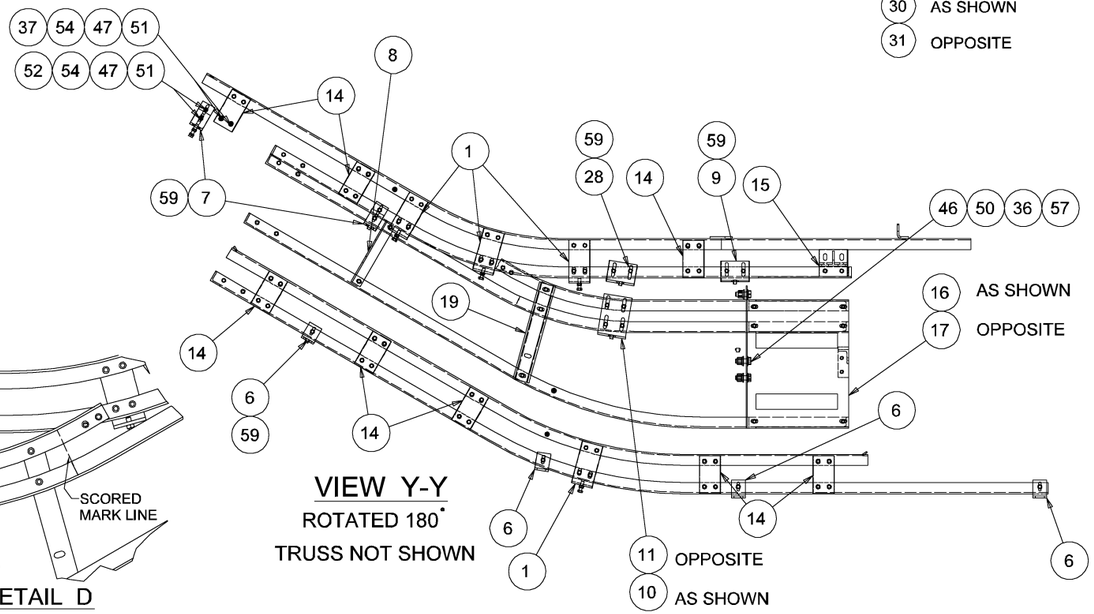
SECTION F-F



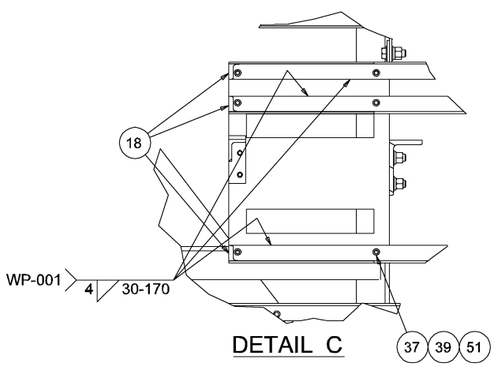
SECTION E-E



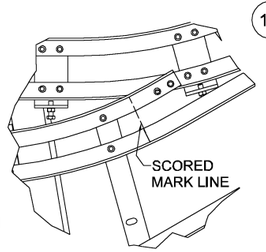
SECTION G-G



VIEW Y-Y
ROTATED 180°
TRUSS NOT SHOWN



DETAIL C



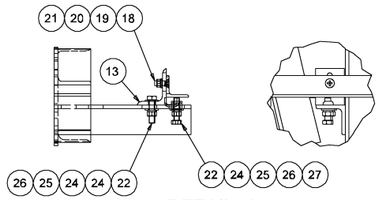
DETAIL D

Assembly C62H1-2881A1

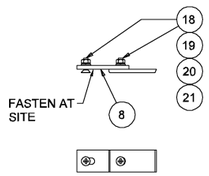
GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER 8/9/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE 8/9/2004	TITLE	TRACK, LOWER, ASSEMBLY
	APVD. APPERSON 8/9/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 A01	SCALE (1:15)	SIZE D
		DWG. NO. Fig. C-2	REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11288	DATE	APPROVED

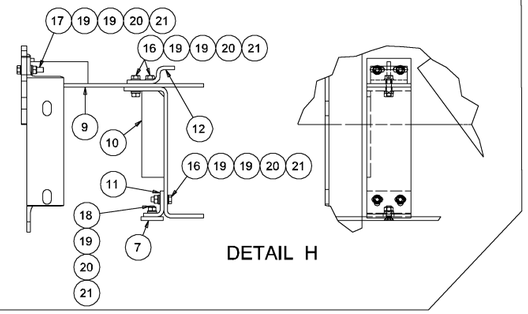
INCLINE #1 TRACK ASSEMBLY
Assembly C62G1-2881E1
E229, E230, E231, E232, E233, E234, E235, E236



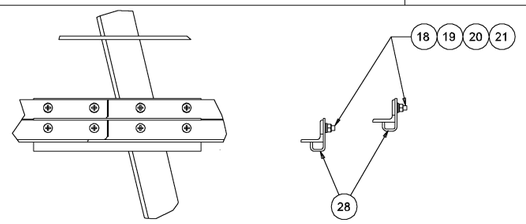
DETAIL A



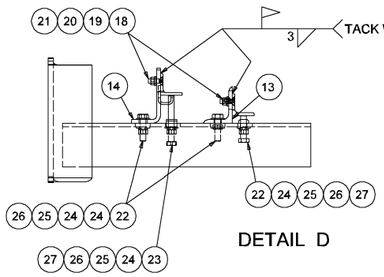
DETAIL B



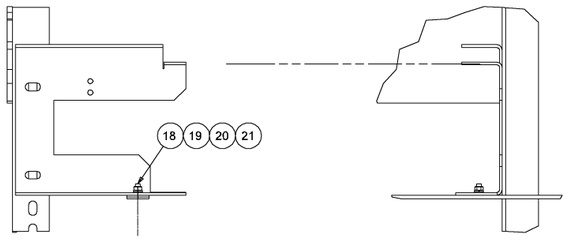
DETAIL H



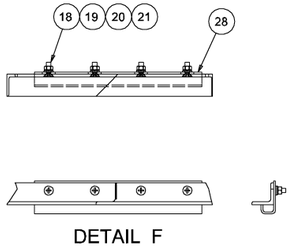
DETAIL C



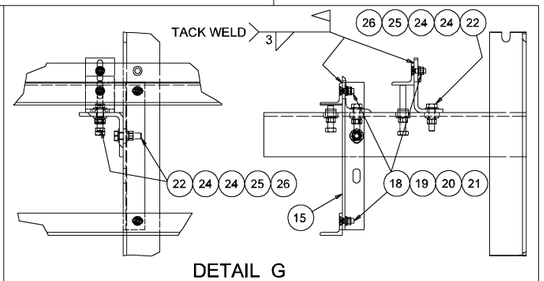
DETAIL D



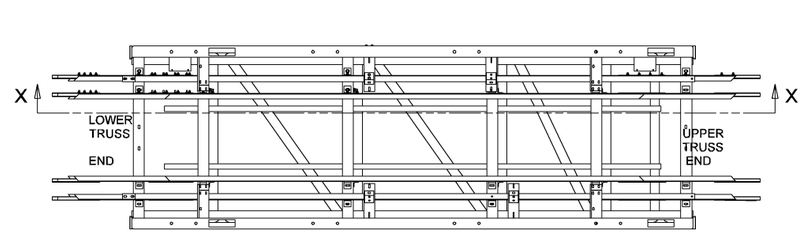
DETAIL E



DETAIL F



DETAIL G



TOP VIEW


SECTION S-S

SECTION X-X


SECTION U-U


SECTION P-P


SECTION V-V

Assembly C62G1-2881E1

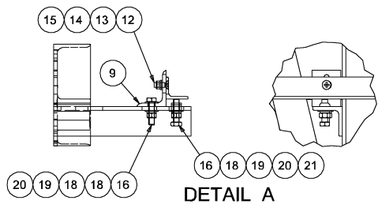
GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 8/6/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/6/2004	TITLE: TRACK ASSY.INC. TRUSS 1
	APVD. APPERSON	DATE 8/6/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 E01		SCALE (1:20) / SIZE D / DWG. NO. Fig. C-3a / REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

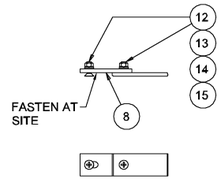
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 11288	DATE	APPROVED

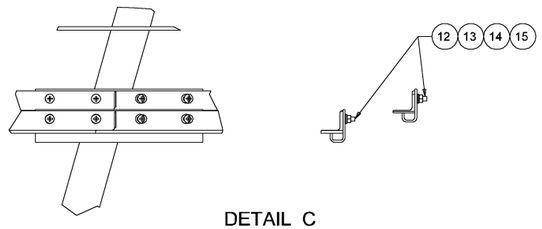
INCLINE #2 and #3 TRACK ASSEMBLY
Assembly C62G1-2881E2
E229, E230, E231, E232, E233, E234, E235, E236



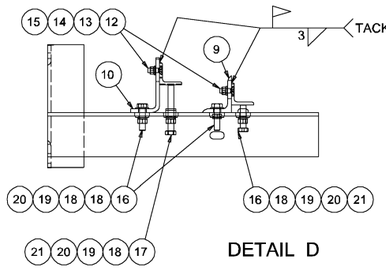
DETAIL A



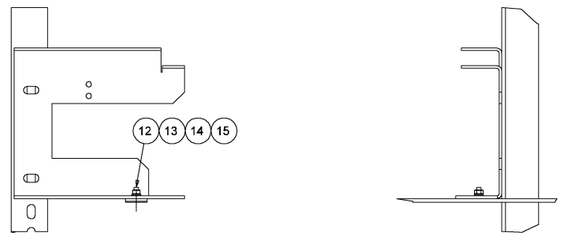
DETAIL B



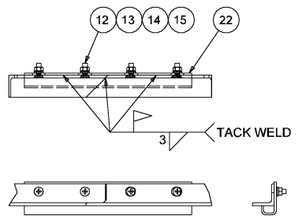
DETAIL C



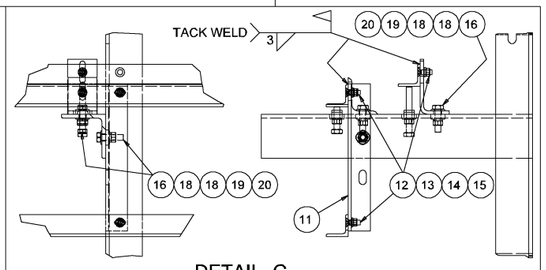
DETAIL D



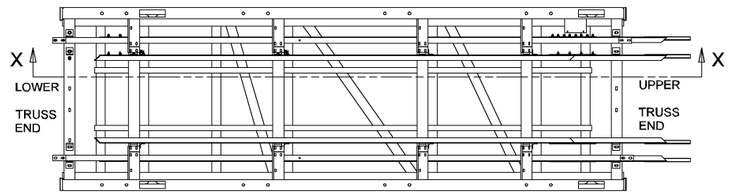
DETAIL E



DETAIL F



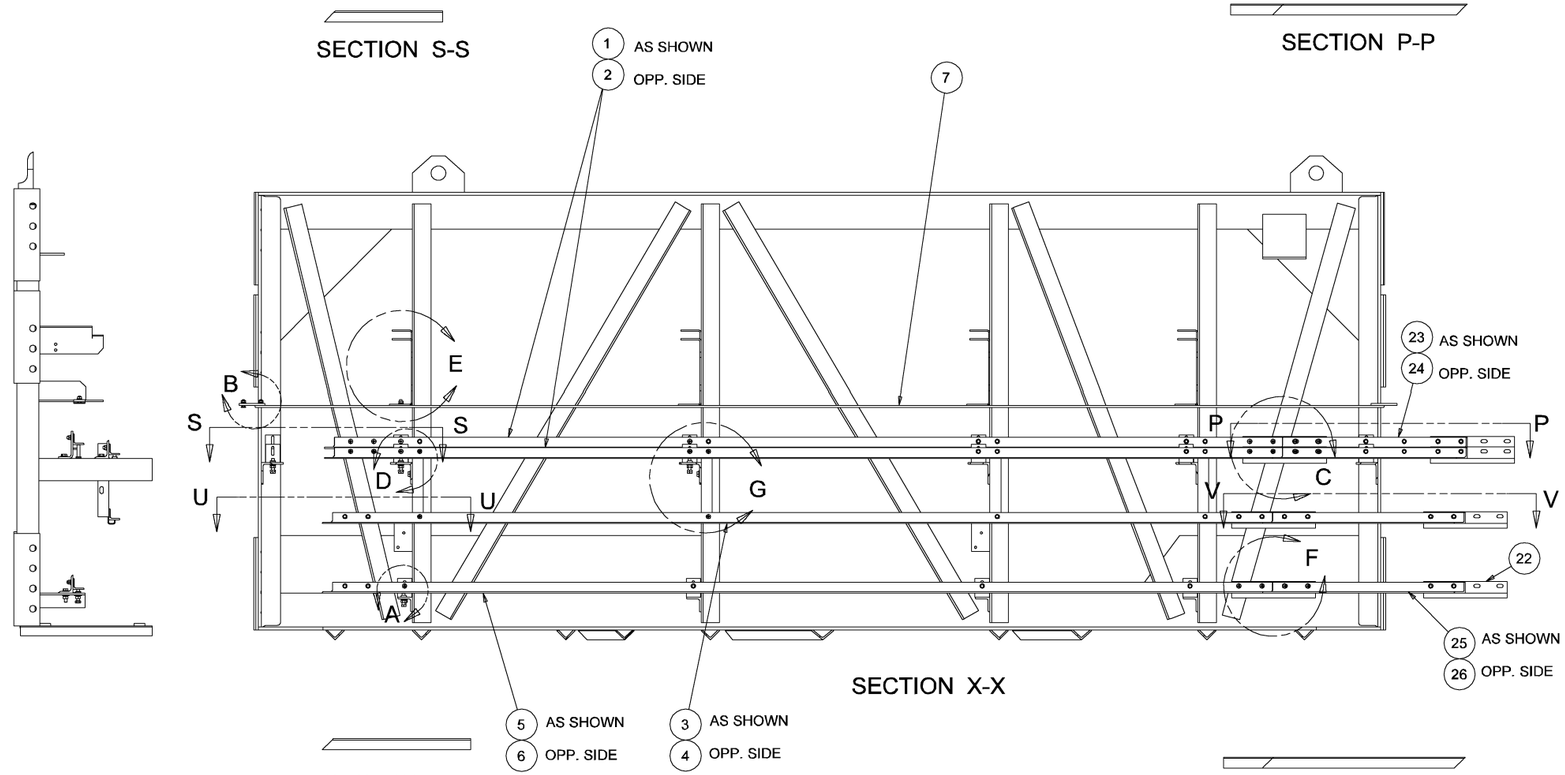
DETAIL G



TOP VIEW

SECTION S-S

SECTION P-P



SECTION X-X

SECTION U-U

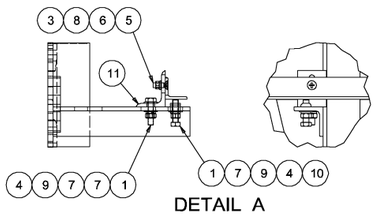
SECTION V-V

Assembly C62G1-2881E2

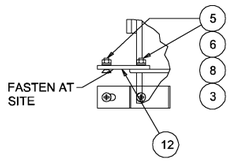
GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 8/6/2004	FUJITEC AMERICA, INC.
	CHKD SHUPE	DATE 8/6/2004	TITLE: TRACK ASSY.,INC. TRUSS 2 & 3
	APVD. APPERSON	DATE 8/6/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 E01	SCALE (1:20)	SIZE D
		DWG. NO. Fig. C-3b	REV. A

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13271	DATE	APPROVED

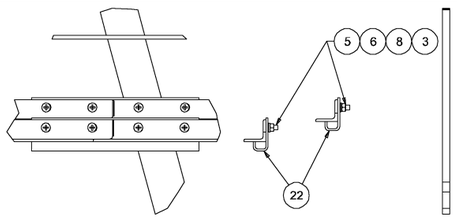
INCLINE #4 TRACK ASSEMBLY
Assembly C62G1-2881L4
E235, E236



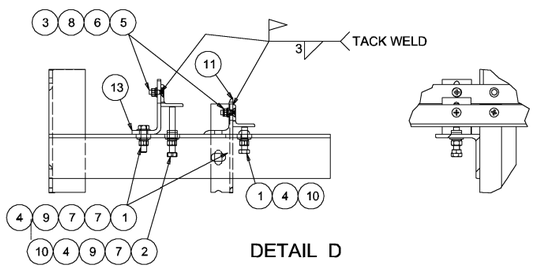
DETAIL A



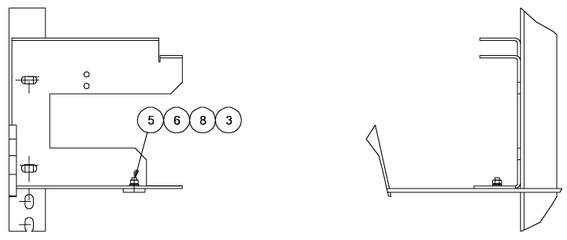
DETAIL B



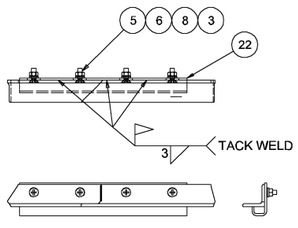
DETAIL C



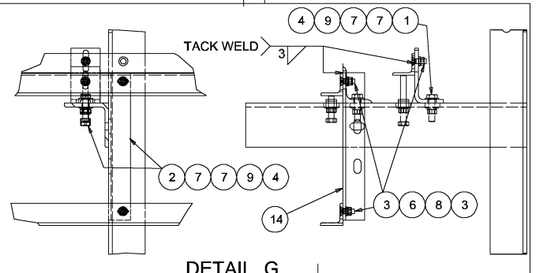
DETAIL D



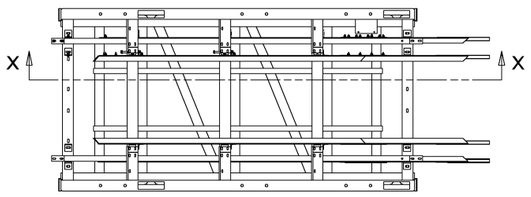
DETAIL E



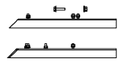
DETAIL F



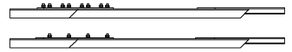
DETAIL G



TOP VIEW



SECTION S-S



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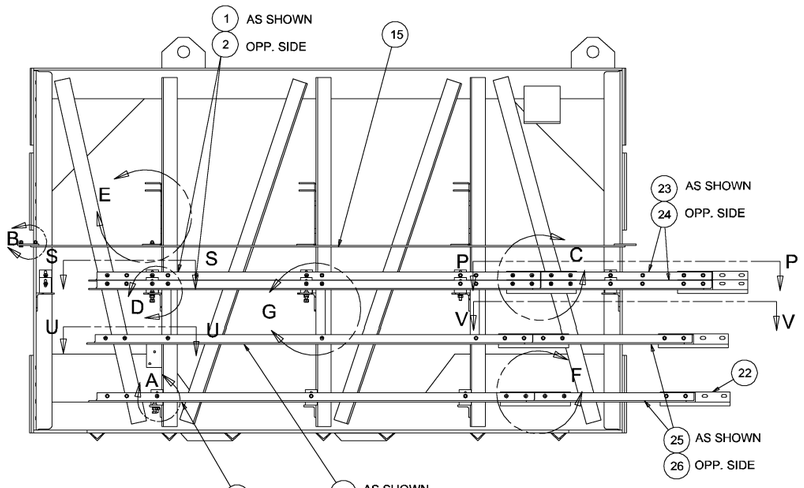
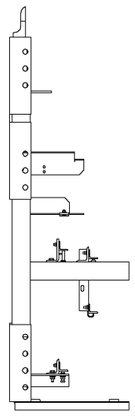


SECTION U-U

SECTION X-X

SECTION V-V



Assembly C62G1-2881L4

GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 10/28/2005	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 10/28/2005	TITLE	
	APVD. SUGIMOTO	DATE 10/28/2005	TRACK ASSY.,INC. TRUSS 4	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE (1:20)	SIZE D
			DWG. NO. Fig. C-3c	REV.

D) LANDING PLATES

Upper Floorplate Installation

See Fig. D-1a for Upper Floorplate Installation.
Escalator No. E235, E236
Assembly used in: A63L4-2881L1 (HS L01, M01)

UPPER FLOORPLATE INSTALLATION A63L4-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C63L3-2881E1	FLOORPLATE ASSY., 24" STEP	3	
2	D00002107	WASHER, FLAT, WIDE, 1/2	19	
3	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	2	
4	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	5	
5	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	6	
6	D00903007	NUT,HEX,M12 (P=1.75)	6	
7	D00908007	WASHER,LOCK,M12	8	
8	D00966001	U-NUT, 5/16-18 UNC	22	McMaster-Carr #94850A150
9	D00970001	SCREW, SOCKET HEAD, 5/16-18 X 2, STAINLESS	22	McMaster-Carr #92196A591
10	D61012003	SHIM, 28 GA. (.38 THK.)	41	
11	D61012004	SHIM, 16 GA. (1.5 THK.)	52	
12	D63M1-2881L1	FRAME, FLOORPLATE	1	
13	D63M1-2881L2	FRAME, FLOORPLATE	1	
14	D63M2-2881L1	FRAME, FLOORPLATE	1	

Lower Floorplate Installation

See Fig. D-2a for Lower Floorplate Installation.
Escalator No. E235, E236
Assembly used in: A63L4-2881L2 (HS L01, M01)

LOWER FLOORPLATE INSTALLATION A63L4-2881L2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C63L3-2881E1	FLOORPLATE ASSY., 24" STEP	1	
2	C63L3-2881L4	FLOORPLATE ASSY., 24" STEP	1	
3	D00002107	WASHER, FLAT, WIDE, 1/2	13	
4	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	2	
5	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	5	
6	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	6	
7	D00903007	NUT,HEX,M12 (P=1.75)	7	
8	D00907007	WASHER,FLAT,M12	7	
9	D00908007	WASHER,LOCK,M12	13	
10	D00966001	U-NUT, 5/16-18 UNC	18	McMaster-Carr #94850A150
11	D00970001	SCREW, SOCKET HEAD, 5/16-18 X 2, STAINLESS	18	McMaster-Carr #92196A591
12	D61012003	SHIM, 28 GA. (.38 THK.)	82	
13	D61012004	SHIM, 16 GA. (1.5 THK.)	69	
14	D63L3-2881E1	FLOORPLATE, 24" STEP	1	
15	D63M1-2881L3	FRAME, FLOORPLATE	1	
16	D63M1-2881L4	FRAME, FLOORPLATE	1	
17	D63M2-2881E1	FRAME, FLOORPLATE	1	

Upper Filler Floorplate Assembly

See Fig. D-3a for Upper Filler Floorplate Assembly.
Escalator No. E235, E236
Assembly used in: A63L5-2881L2 (HS L01, M01)

UPPER FILLER FLOORPLATE ASSEMBLY A63L5-2881L2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
*1	C63L7-2881E6	FLOORPLATE, ASSY	2	
*2	C63L7-2881E7	FLOORPLATE, ASSY	1	
3	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	2	
4	D00903005	NUT, HEX, M8 (1.25)	2	
5	D00907005	WASHER,FLAT,M8	4	
6	D00908005	WASHER,LOCK,M8	2	
7	D00966001	U-NUT, 5/16-18 UNC	24	McMaster-Carr #94850A150
8	D00970001	SCREW, SOCKET HEAD, 5/16-18 X 2, STAINLESS	24	McMaster-Carr #92196A591
*9	D63L7-2881E7	FRAME, FLOORPLATE, REAR	1	
10	D63L7-2881L5	FRAME, FLOORPLATE	1	
11	D63L7-2881L6	FRAME, FLOORPLATE	1	
*12	D63L8-2881L5	FLOORPLATE, 24" STEP	1	
		* = These parts to be manufactured and shipped separately after field measurements.		

Lower Filler Floorplate Assembly

See Fig. D-3b for Lower Filler Floorplate Assembly.
Escalator No. E235, E236
Assembly used in: A63L5-2881L1 (HS L01, M01)

LOWER FILLER FLOORPLATE ASSEMBLY A63L5-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
*1	C63L7-2881E6	FLOORPLATE, ASSY	1	
*2	C63L7-2881E7	FLOORPLATE, ASSY	1	
*3	C63L7-2881L7	FLOORPLATE, ASSY	1	
4	C63L9-2881E1	RAILING BRACKET, ASSY	1	
5	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	2	
6	D00903005	NUT, HEX, M8 (1.25)	2	
7	D00907005	WASHER,FLAT,M8	4	
8	D00908005	WASHER,LOCK,M8	2	
9	D00966001	U-NUT, 5/16-18 UNC	20	McMaster-Carr #94850A150
10	D00970001	SCREW, SOCKET HEAD, 5/16-18 X 2, STAINLESS	20	McMaster-Carr #92196A591
11	D63253001	CLAMP, PIPE	1	
*12	D63L7-2881E8	FRAME, FLOORPLATE, REAR	1	
13	D63L7-2881J1	FRAME, FLOORPLATE	1	
14	D63L7-2881J2	FRAME, FLOORPLATE	1	
		* = These parts to be manufactured and shipped separately after field measurements.		

Combplate Installation

See Fig. D-4a for Combplate Installation.
Escalator No. E235, E236
Assembly used in: A63L1-2881G1 (HS L01, M01)

COMBPLATE INSTALLATION A63L1-2881G1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C63L1-2881A1	COMBPLATE ASSEMBLY	1	
2	C63252001	COMB SWITCH ASSEMBLY	1	
3	C63262001	STEP GUIDE ROLLER ASS"Y.	2	
4	D63007002	COMB	3	
5	D63167001	COMB, 24" STEP	1	
6	D00002107	WASHER, FLAT, WIDE, 1/2	4	
7	D00902031	BOLT, HEX, M8 (P=1.25) X 16, FULL	2	
8	D00902065	BOLT, HEX, M12 (P=1.75) X 35, FULL	4	
9	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	4	
10	D00905044	SCREW,MACH,FLT/PH,M6(P=1)X16SS	11	
11	D00907005	WASHER,FLAT,M8	2	
12	D00907007	WASHER,FLAT,M12	8	
13	D00908005	WASHER,LOCK,M8	2	
14	D00908007	WASHER,LOCK,M12	8	

Combplate (Horizontal Switch) Assembly

See Fig. D-4b for Combplate (Horizontal Switch) Assembly.
Escalator No. E235, E236
Assembly used in: C63L1-2881A1 (HS L01, M01)

COMBPLATE (Horizontal Switch) ASSEMBLY C63L1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C63178001	BRACKET, COMB ASSY.	1	
2	C63179001	BRACKET, COMB ASSY.	1	
3	D63051001	SCREW, COMBPLATE	4	
4	D63074001	PLATE, COMBPLATE	1	
5	D63075001	PLATE, COMBPLATE	2	
6	D63085001	GUIDE, SPRING, COMBPLATE	2	
7	D63086001	BRACKET, COMBPLATE, LH	1	
8	D63087001	BRACKET, COMBPLATE, RH	1	
9	D63093001	SPRING, COMBPLATE	2	
10	D63107001	ROD, THREADED, M10 X 140	2	
11	D63174001	COMBPLATE, 24" STEP	1	
12	D63191001	BRACKET, SWITCH	2	
13	D63251001	COMBPLATE	1	
14	D65922001	LIMIT SWITCH	2	ABB, #LS35P11D11
15	D00902026	BOLT, HEX, M6 (P=1.00) X 25	4	
16	D00902031	BOLT, HEX, M8 (P=1.25) X 16, FULL	4	
17	D00902044	BOLT, HEX, M8 (P=1.25) X 90, FULL	2	
18	D00902052	BOLT, HEX, M10 (P=1.5) X 50, FULL	4	
19	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	4	
20	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	4	
21	D00903002	NUT, HEX, M4 (P=0.7)	4	
22	D00903004	NUT, HEX, M6 (P=1.0)	4	
23	D00903005	NUT, HEX, M8 (1.25)	2	
24	D00903006	NUT,HEX,M10 (P=1.5)	8	
25	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)	4	
26	D00905034	SCREW,MACH,FLT/PH,M6(P=1)X16	5	
27	D00907002	WASHER,FLAT,M4	8	
28	D00907005	WASHER,FLAT,M8	4	

See Fig. D-4b for Combplate (Horizontal Switch) Assembly.
Escalator No. E235, E236
Assembly used in: C63L1-2881A1 (HS L01, M01)

COMBPLATE (Horizontal Switch) ASSEMBLY C63L1-2881A1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
29	D00907006	WASHER,FLAT,M10	4	
30	D00907007	WASHER,FLAT,M12	8	
31	D00908002	WASHER,LOCK,M4	4	
32	D00908005	WASHER,LOCK,M8	4	
33	D00908006	WASHER,LOCK,M10	4	
34	D00908007	WASHER,LOCK,M12	8	
35	D00918006	NUT, JAM, M10	4	

Combplate (Vertical Switch) Assembly

See Fig. D-4c for Combplate (Vertical Switch) Assembly.
Escalator No. E235, E236
Assembly used in: C63252001 (HS L01, M01)

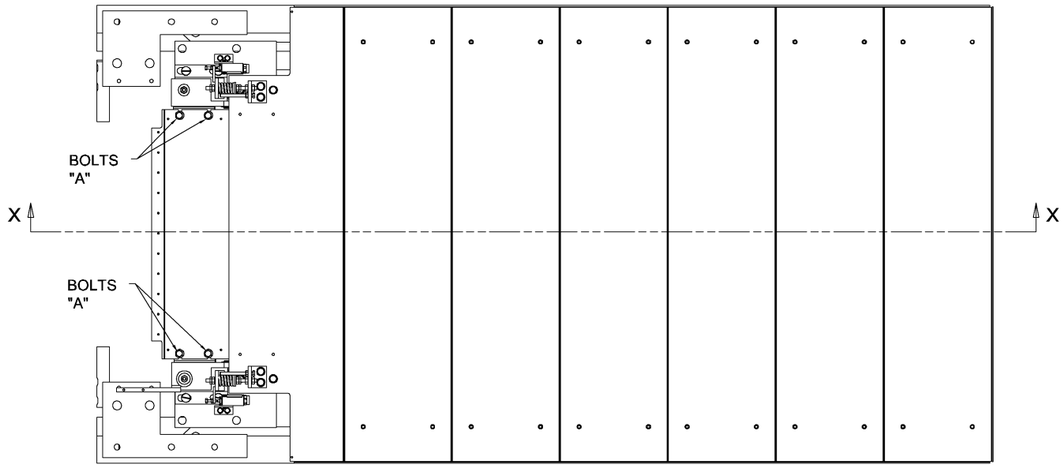
COMBPLATE (Vertical Switch) ASSEMBLY C63252001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D63190001	BRACKET, SWITCH	1	
2	D63194001	BRACKET, COMB IMPACT SWITCH	1	
3	D65922001	LIMIT SWITCH	2	ABB, #LS35P11D11
4	D00902025	BOLT, HEX, M6 (P=1.00) X 20, FULL	2	
5	D00903002	NUT, HEX, M4 (P=0.7)	4	
6	D00903004	NUT, HEX, M6 (P=1.0)	2	
7	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)	4	
8	D00907002	WASHER,FLAT,M4	8	
9	D00907004	WASHER,FLAT,M6	1	
10	D00908002	WASHER,LOCK,M4	4	
11	D00908004	WASHER,LOCK,M6	1	

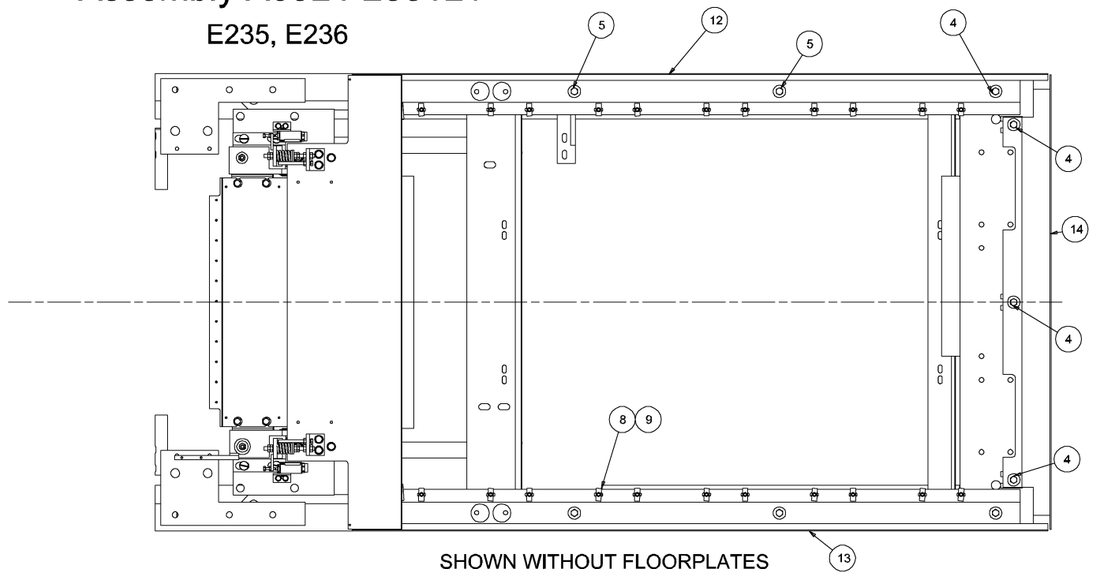
*** CAD – MANUAL REVISIONS NOT PERMITTED ***

REVISION HISTORY

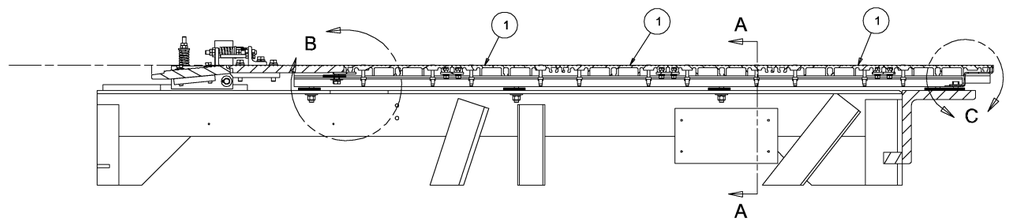
REV	DESCRIPTION	ECN NO. 13345	DATE	APPROVED
A	(A) ADDED MOUNTING SLOT AND FASTENERS	ECN NO. 13623	052206	SHUPE

UPPER FLOORPLATE INSTALLATION
Assembly A63L4-2881L1
E235, E236

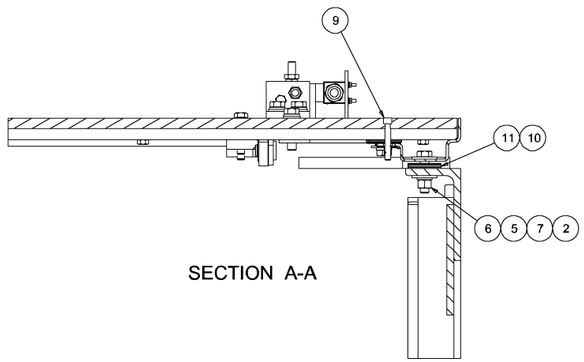




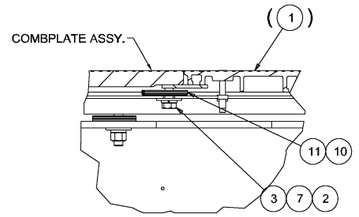
SHOWN WITHOUT FLOORPLATES



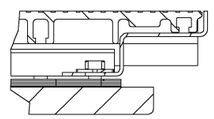
DETAIL SECTION X-X



SECTION A-A



DETAIL B



DETAIL C

NOTES:

1) ITEMS 2-11 ARE CONTAINED IN, "KIT, HARDWARE" A63LX-2881L1

2) REMOVE LIFTING HOOKS ON END ANGLE PRIOR TO INSTALLING FLOORPLATES.

3) LOOSEN BOLTS "A" TO MOVE FRONT COMBPLATE SIDE TO SIDE TO MESH COMB AND STEP TEETH.

4) TO REMOVE FLOORPLATE REMOVE SOCKET HEAD CAP SCREWS, ITEM #16

5) WHEN TICHTENING DOWN FLOORPLATE, DO NOT OVERTIGHTEN

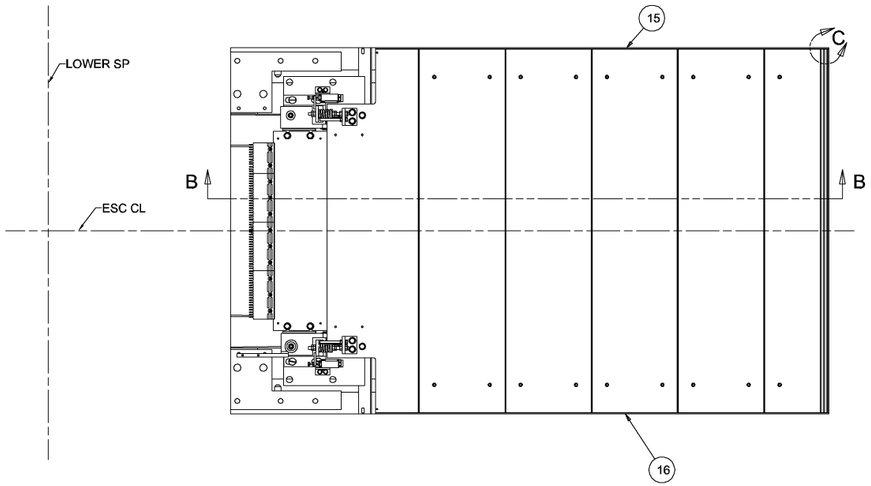
Assembly A63L4-2881L1

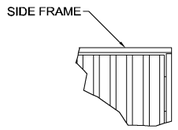
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS (mm)	DWN HARPER	DATE 12/28/2005	FUJITEC AMERICA, INC.
TOLERENCES: GENERAL TOL. SEE EN-ES-001	CHKD. SHUPE	DATE 12/28/2005	TITLE: FLOORPLATE, UPPER, INST
	APVD. SUGIMOTO	DATE 12/28/2005	
JOB TITLE: NYCT HERALD SQ.	JOB NO. 2881 L01/M01	SCALE (1:8)	SIZE D
		DWG. NO. Fig. D-1a	REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

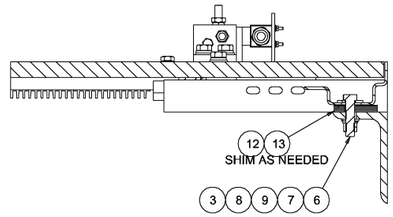
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 13345	DATE	APPROVED



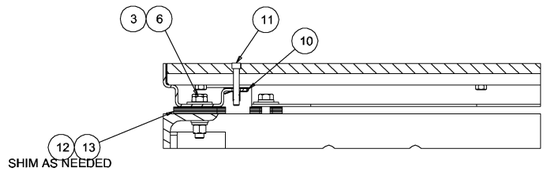


DETAIL C
(TYP. 2 SIDES)

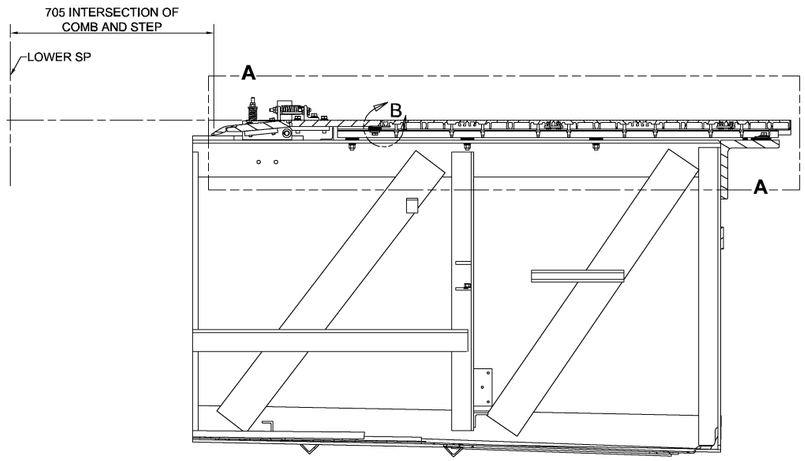


SECTION Z-Z

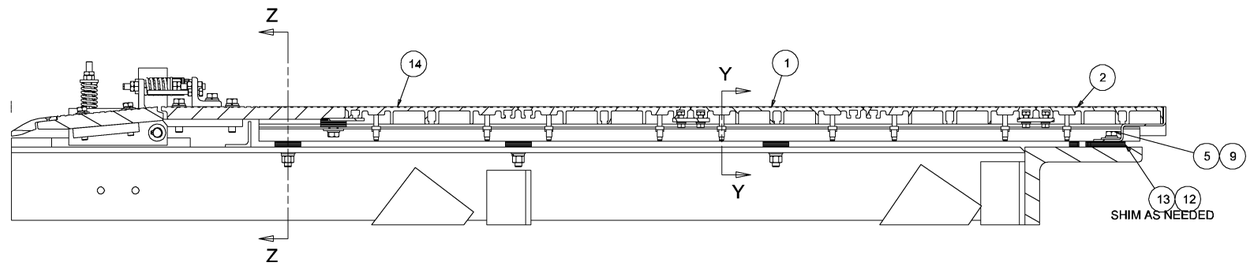
LOWER FLOORPLATE INSTALLATION
Assembly A63L4-2881L2
E235, E236



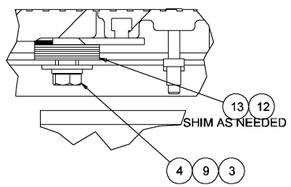
SECTION Y-Y



SECTION B-B



DETAIL A



DETAIL B

NOTES:

1) ITEMS #3-13 ARE CONTAINED IN "KIT, HARDWARE" A63LX-2881L2.

2) TO REMOVE FLOORPLATE, REMOVE SOCKET HEAD CAP SCREWS, ITEM #16

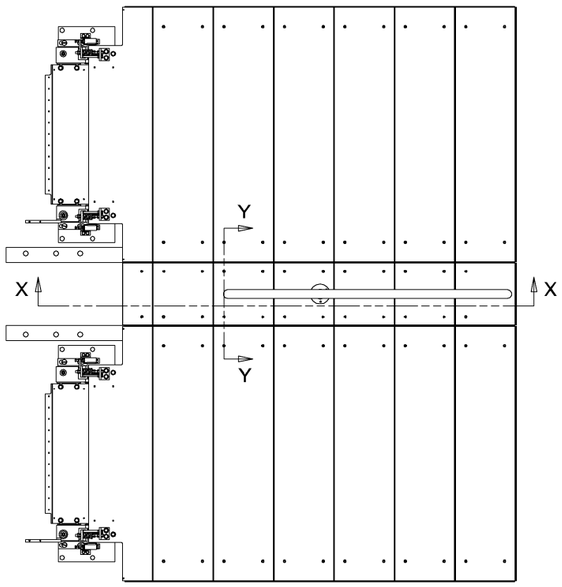
3) WHEN TIGHTENING DOWN FLOORPLATE, DO NOT OVERTIGHTEN.

Assembly A63L4-2881L2

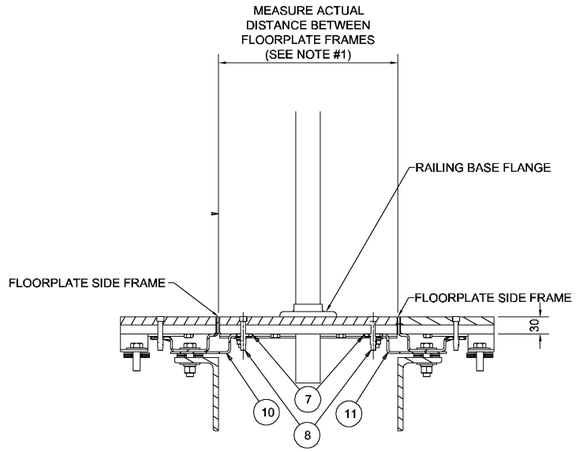
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS (mm) TOLERENCES: GENERAL TOL. SEE EN-ES-001	DWN HARPER	DATE 1/30/2006	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 1/30/2006	TITLE: FLOORPLATE, LOWER, INST
	APVD. SUGIMOTO	DATE 1/30/2006	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 J01/M01	SCALE: (0.06:1)	SIZE: D — DWG. NO.: Fig. D-2a — REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13346	DATE	APPROVED

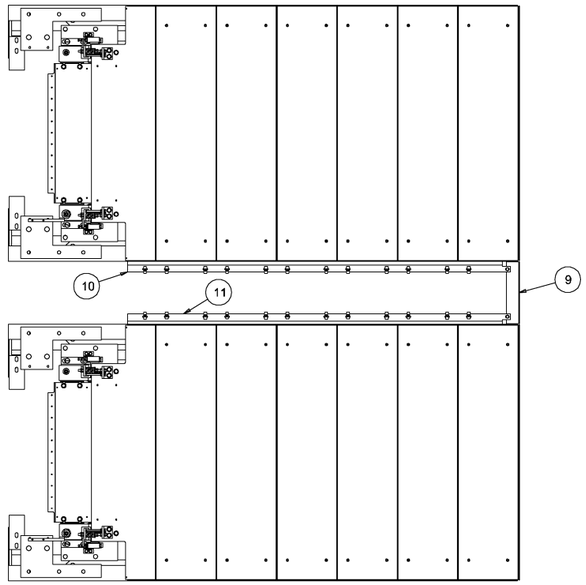
UPPER FILLER FLOORPLATE
Assembly A63L5-2881L2
E235, E236



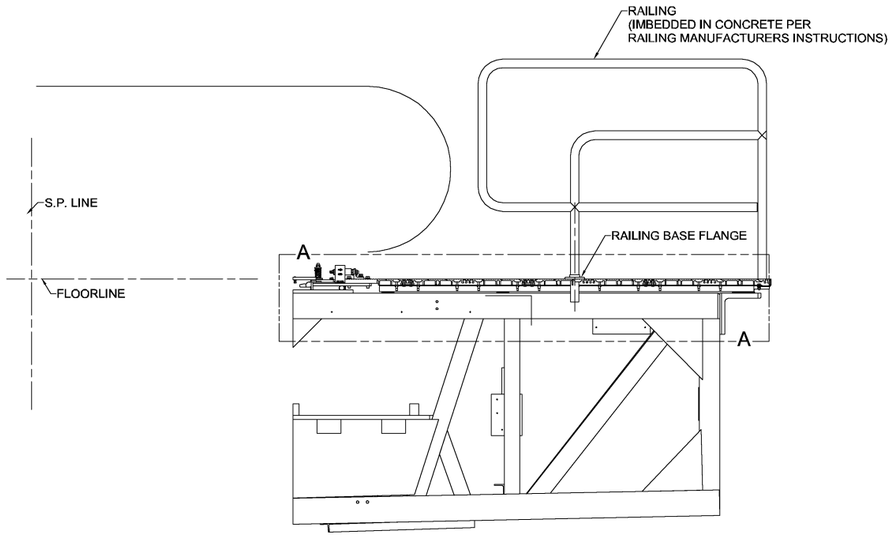
TOP VIEW (WITH FLOORPLATES)



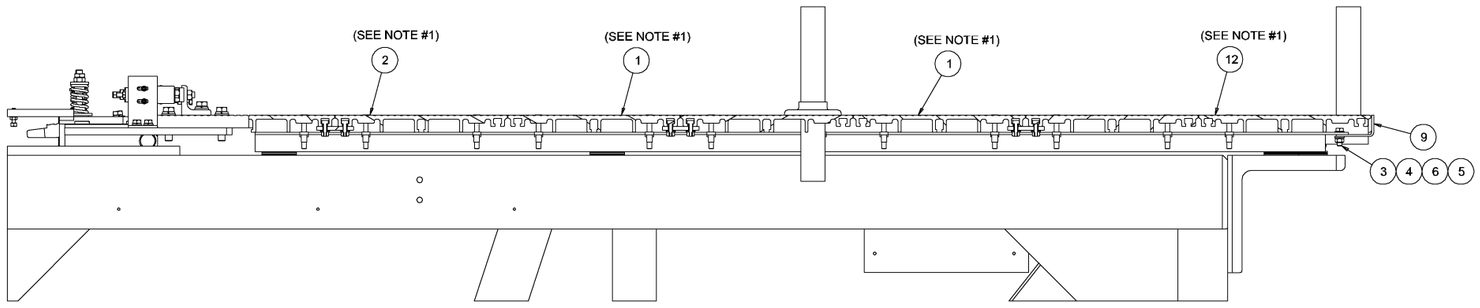
SECTION Y-Y



TOP VIEW (FLOORPLATES REMOVED)



SECTION X-X



DETAIL A

NOTES:

1) MEASURE ACTUAL DISTANCE BETWEEN FLOORPLATE FRAMES. RELAY INFORMATION BACK TO OHIO PLANT TO MANUFACTURE CUSTOM JOB PARTS (SHOULD MATCH LOWER TRUSS DIMENSIONS)

2) INSTALL ITEMS 10, 11 AT SAME TIME AS FLOORPLATE FRAMES. (SEE A63L4-2881L1)

* ITEMS TO BE MANUFACTURED AND SHIPPED AFTER FIELD MEASUREMENTS

Assembly A63L5-2881L2

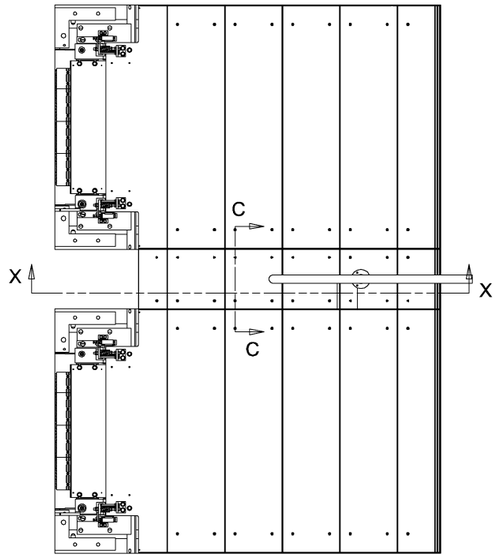
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS (mm)	DWN HARPER	DATE 12/28/2005	FUJITEC AMERICA, INC.
TOLERENCES: GENERAL TOL. SEE EN-ES-001	CHKD. SHUPE	DATE 12/28/2005	TITLE: FLOORPLATE, ASSY, UPPER
	APVD. SUGIMOTO	DATE 12/28/2005	
JOB TITLE: NYCT HERALD SQ.	JOB NO. 2881 L01/M01	SCALE (0.07:1)	SIZE D
		DWG. NO. Fig. D-3a	REV.

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***

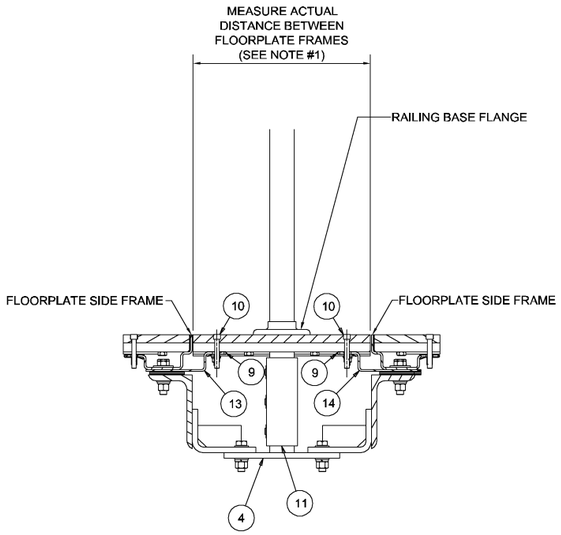
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 13345	DATE	APPROVED

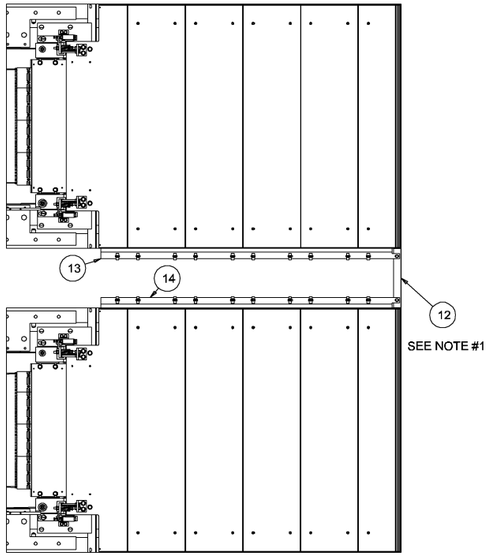
LOWER FILLER FLOORPLATE
Assembly A63L5-2881L1
E235, E236



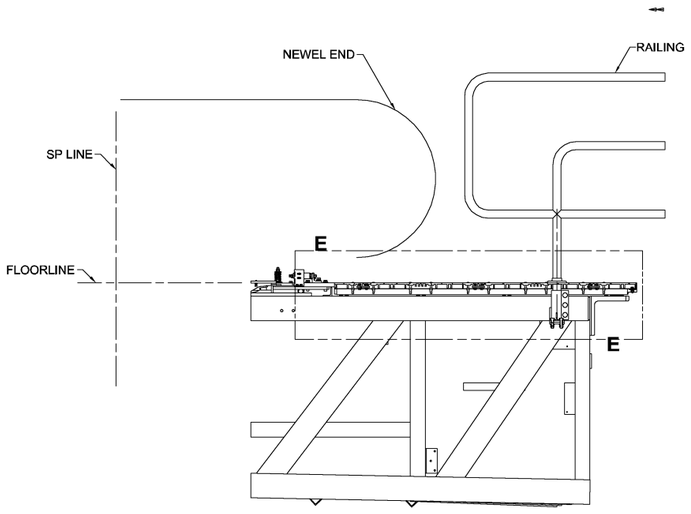
FLOORPLATE TOP VIEW



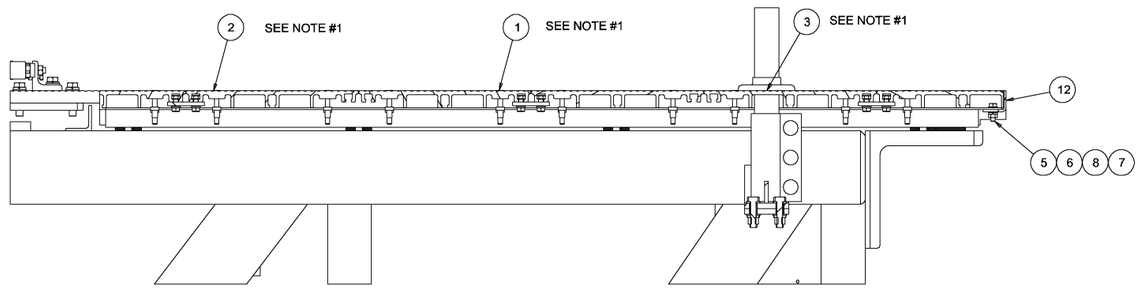
SECTION C-C



TOP VIEW (FLOORPLATES REMOVED)



SECTION X-X



DETAIL A

NOTES:

1) MEASURE ACTUAL DISTANCE BETWEEN FLOORPLATE FRAMES. RELAY INFORMATION TO OHIO PLANT TO MANUFACTURE CUSTOM JOB PARTS. (SHOULD MATCH UPPER TRUSS DIMENSIONS)

2) INSTALL ITEMS 13 & 14 AT SAME TIME AS FLOORPLATE FRAMES (SEE DRAWING A63L4-2881L2)

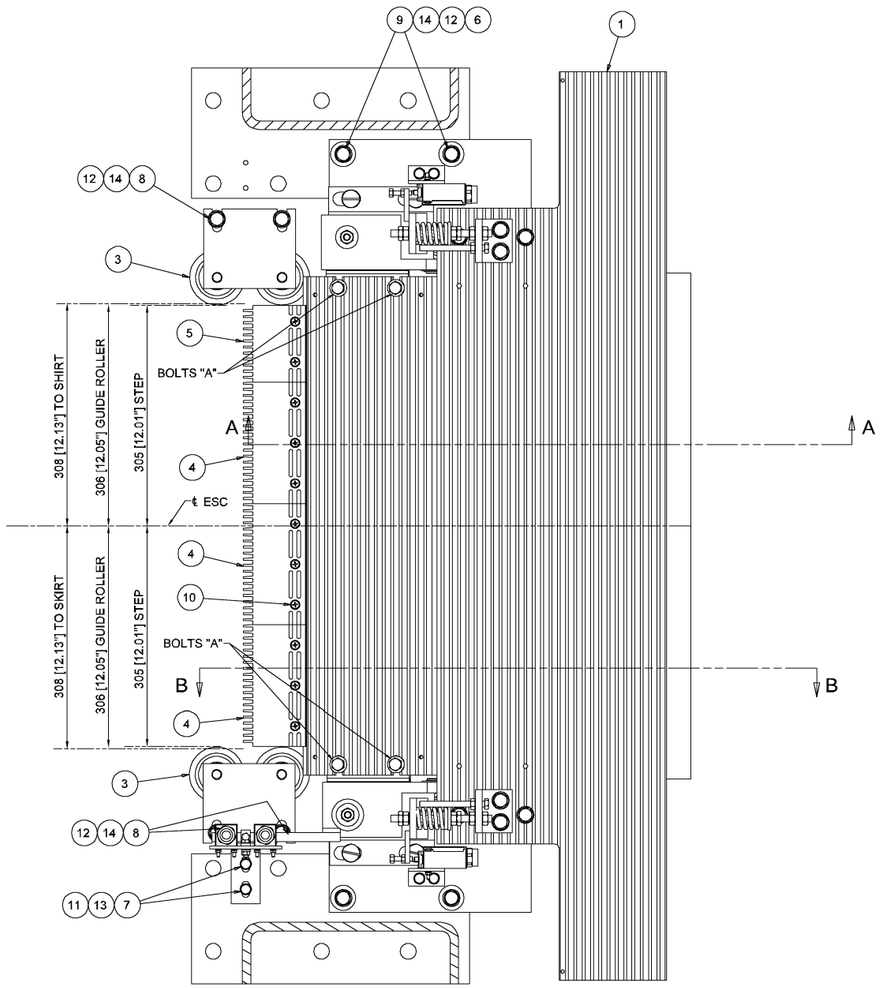
* ITEMS TO BE MANUFACTURED AND SHIPPED AFTER FIELD MEASUREMENTS

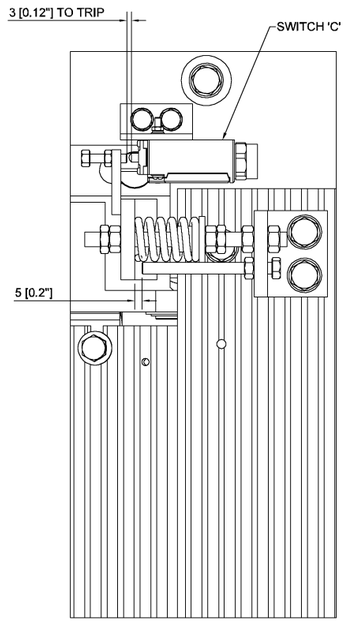
Assembly A63L5-2881L1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS (mm) TOLERENCES: GENERAL TOL. SEE EN-ES-001	DWN HARPER	DATE 1/27/2006	FUJITEC AMERICA, INC.
	CHKD SHUPE	DATE 1/27/2006	TITLE: LOWER FILLER FLOORPLATES
	APVD. SUGIMOTO	DATE 1/27/2006	
JOB TITLE: NYCT HERALD SQ.	JOB NO. 2881 L01/M01	SCALE (1:20)	SIZE D
		DWG. NO. Fig. D-3b	REV.

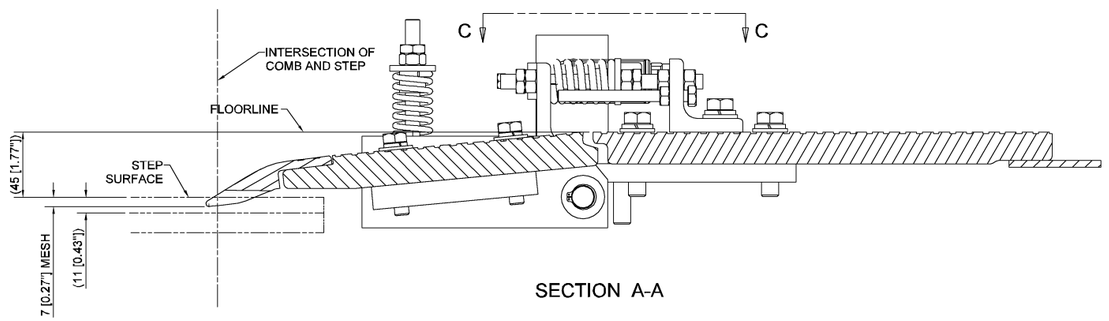
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11681	DATE	APPROVED

COMBPLATE INSTALLATION
Assembly A63L1-2881G1
E221, E223, E224, E231, E232, E233, E234, E235, E236

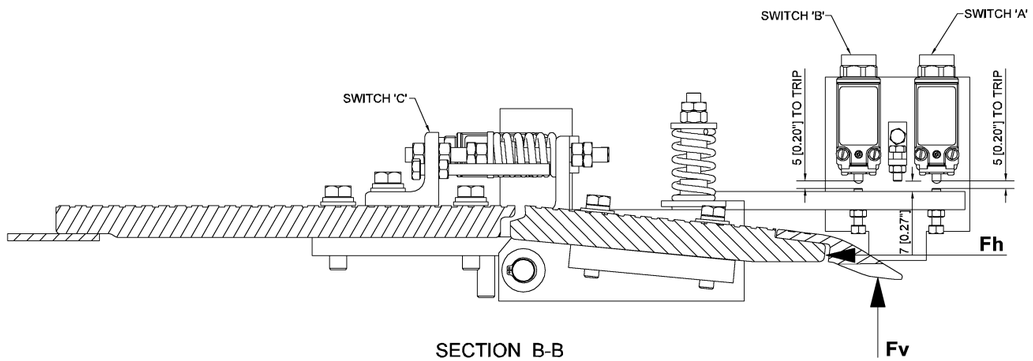




VIEW C-C



SECTION A-A



SECTION B-B
ROTATED 180˚

NOTES:

1) ITEMS 6~14 CONTAINED IN "KIT, HARDWARE" A63LX-2881B1.

2) SWITCH 'C' SHOULD TRIP WHEN Fh IS 180 - 200 LBf (801 - 890 N) APPLIED AT EITHER SIDE OR Fh IS 360-400 LBf (1601 - 1779 N) APPLIED AT THE CENTER OF THE COMBPLATE.

3) SWITCH 'A' SHOULD TRIP WHEN Fv IS 45LBf (200 N) APPLIED VERTICALLY AT THE CENTER EDGE OF THE COMBPLATE.

4) SWITCH 'B' SHOULD TRIP WHEN Fv IS 130 - 150 LBf (578 - 667 N) APPLIED VERTICALLY AT THE CENTER EDGE OF THE COMBPLATE.

5) VERIFY THAT EACH SIDE MOVES EQUAL DISTANCES WHEN FORCE IS APPLIED. ADJUST SPRINGS AS NEEDED. NOTE, SPRING ADJUSTMENT FOR EACH SIDE IS NOT THE SAME.

6) INSTALL CONDUIT & FITTINGS PER JOB SPECS. WIRE PER JOB WIRING DIAGRAM.

7) LOOSEN BOLTS "A" TO MOVE FRONT COMBPLATE SIDE TO SIDE TO MESH COMB AND STEP TEETH.

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

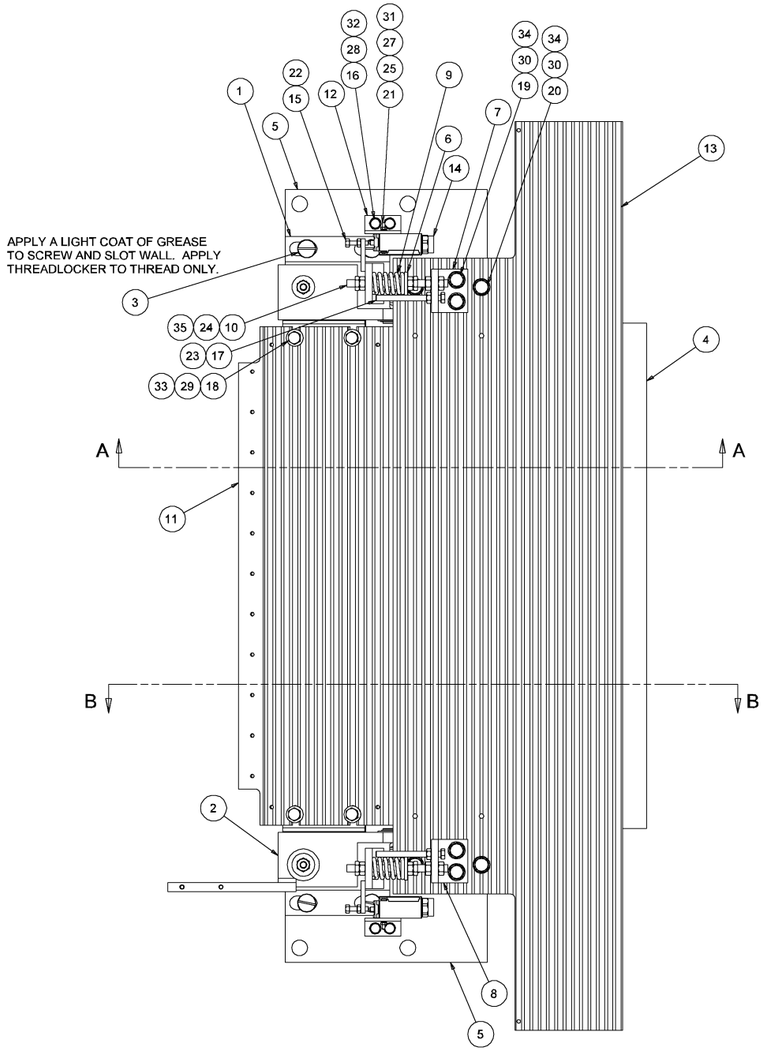
Assembly A63L1-2881G1

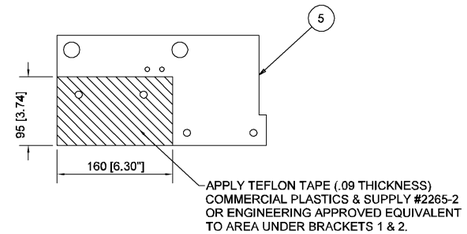
GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 11/10/2004	FUJITEC AMERICA, INC.		
	CHKD. SHUPE	DATE 11/10/2004	TITLE COMBPLATE INSTALLATION		
	APVD. APPERSON	DATE 11/10/2004			
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 G01~H01		SCALE (0.06:1)	SIZE D	DWG. NO. Fig. D-4a / REV. B

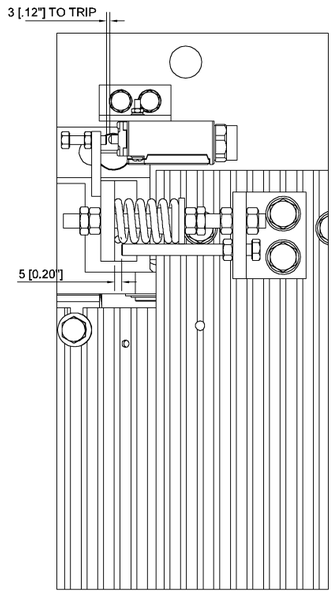
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11477	DATE	APPROVED

COMBPLATE (Horizontal Switch) ASSEMBLY
Assembly C63L1-2881A1

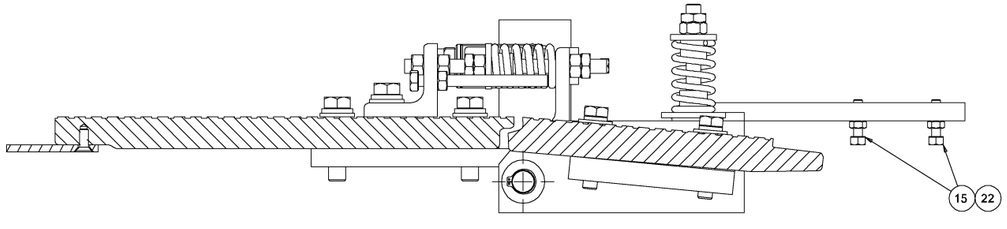
E221, E223, E224, E231, E232, E233, E234, E235, E236



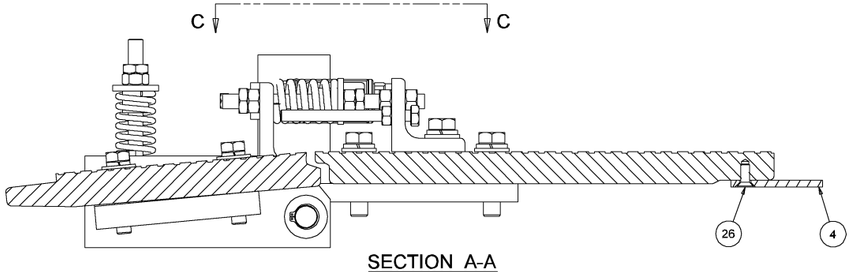




VIEW C-C



SECTION B-B
ROTATED 180°



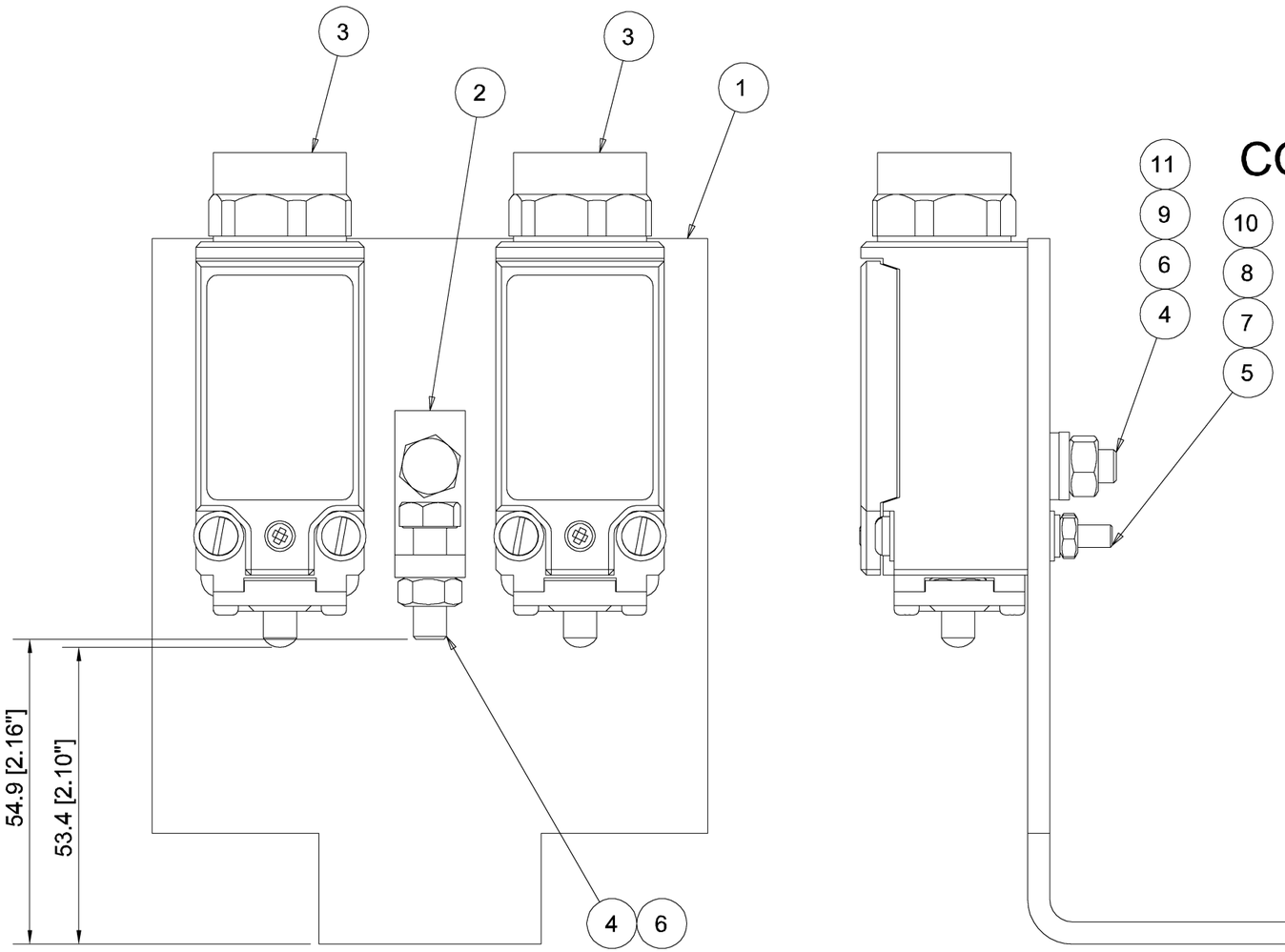
SECTION A-A

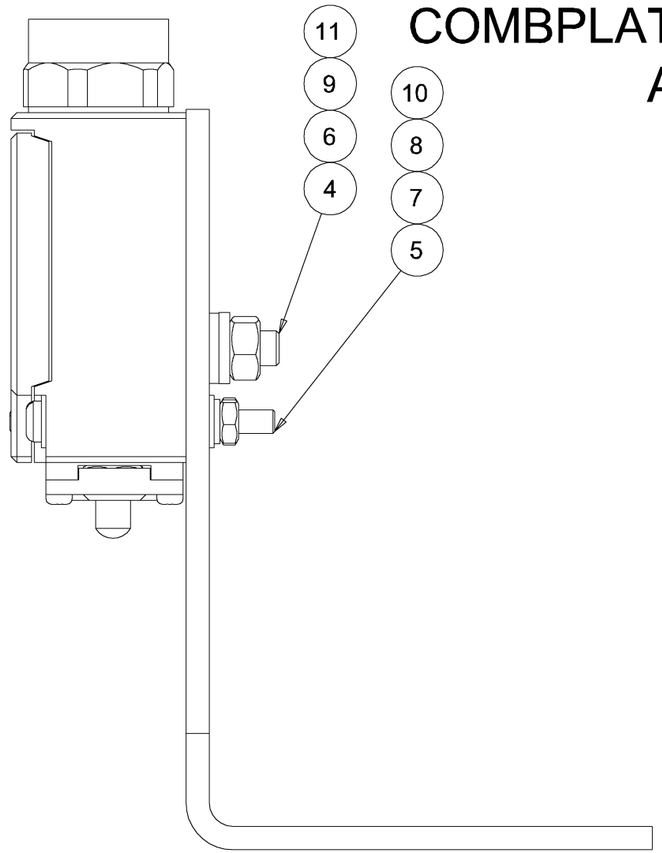
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C63L1-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN. MILLER	DATE 9/30/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/30/2004	TITLE: COMBPLATE ASSEMBLY
	APVD. APPERSON	DATE 9/30/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 A01		SCALE (0.06:1) / SIZE D / DWG. NO. Fig. D-4b / REV.

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11476	DATE	APPROVED





COMBPLATE (Vertical Switch) ASSEMBLY
Assembly C63252001

E221, E222, E223, E224,
E229, E230, E231, E232,
E233, E234, E235, E236

UNLESS OTHERWISE
SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C63252001

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 10/1/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 10/1/2004	TITLE: COMB SWITCH ASSEMBLY
	APVD. APPERSON	DATE 10/1/2004	
JOB TITLE	JOB NO. STD		SCALE (1:1) / SIZE B / DWG. NO. Fig. D-4c / REV.

E) HANDRAIL SYSTEM

Handrail Drive Assembly

See Fig. E-1a for Handrail Drive Assembly.
Escalator No. E235, E236
Assembly used in: C62K1-2881A1 (HS L01, M01)

HANDRAIL DRIVE ASSEMBLY C62K1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62G19001	PINCH, ROLLER, ASS"Y	2	
2	C62G19002	PINCH, ROLLER, ASS"Y	2	
3	C62K13001	HANDRAIL DRIVE SHEAVE, ASSY	2	
4	C62K2-2881A1	IDLER, HANDRAIL DRIVE, ASS"Y	1	
5	C62K82001	IDLER, HANDRAIL DRV. ASS"Y	2	
6	C62K88001	IDLER, HANDRAIL DRV, ASS"Y	1	
7	C62K88002	IDLER, HANDRAIL DRV, ASS"Y	1	
8	C62L01001	GUIDE, HANDRAIL DRIVE ASS"Y	1	
9	C62L01002	GUIDE, HANDRAIL DRIVE ASS"Y	1	
10	C62L74001	(MIDDLE) SHAFT, HR DRIVE ASS"Y	1	
11	C62M36001	GUIDE, HANDRAIL DRIVE, ASS"Y	1	
12	C62M36002	GUIDE, HANDRAIL DRIVE, ASS"Y	1	
13	D00902036	BOLT, HEX, M8 (P=1.25) X 40, FULL	16	
15	D00902063	BOLT, HEX, M12(P=1.75) X 25	28	
16	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	22	
17	D00902067	BOLT, HEX, M12 (P=1.75) X 45, FULL	10	
18	D00902144	BOLT, HEX, M16 (P=2.0) X 160, PART	4	
19	D00903005	NUT, HEX, M8 (1.25)	52	
20	D00903007	NUT,HEX,M12 (P=1.75)	16	
21	D00903008	NUT,HEX,M16 (P=2.0)	4	
23	D00907007	WASHER,FLAT,M12	80	
24	D00907008	WASHER,FLAT,M16	8	
26	D00908007	WASHER,LOCK,M12	64	
27	D00908008	WASHER,LOCK,M16	4	

See Fig. E-1a for Handrail Drive Assembly.
Escalator No. E235, E236
Assembly used in: C62K1-2881A1 (HS L01, M01)

HANDRAIL DRIVE ASSEMBLY C62K1-2881A1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
29	D00918009	NUT, JAM,M20 (P=2.5)	22	
30	D62372002	THREADED INSERT	18	
31	D62372003	THREADED INSERT	4	
34	D62G54001	BRACKET, HANDRAIL DRIVE	1	
35	D62G55001	BRACKET, HANDRAIL DRIVE	1	
36	D62K4-2881A1	CHAIN #1, HANDRAIL DRIVE, RS-100 LH side only, Chain length 3429 (135"), 108 pitches, clip of connecting link on inner side	1	US TSUBAKI
37	D62K4-2881A2	CHAIN #2, HANDRAIL DRIVE, RS-80 Both sides, Chain length 3479.8 (137"), 137 pitches, clip of connecting link on inner side	2	US TSUBAKI
38	D62L04001	BRACKET, HANDRAIL DRIVE	2	

Middle Handrail Drive Shaft Assembly

See Fig. E-1b for Middle Handrail Drive Shaft Assembly.
Escalator No. E235, E236
Assembly used in: C62L74001 (HS L01, M01)

MIDDLE HANDRAIL DRIVE SHAFT ASSEMBLY C62L74001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00153003	NUT,LOCKING,NYLON INSERT,M12	24	
2	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	4	
3	D00902069	BOLT, HEX, M12 (P=1.75) X 55, FULL	12	
4	D00902070	BOLT, HEX, M12 (P=1.75) X 100, FULL	12	
5	D00908005	WASHER,LOCK,M8	4	
6	D62D69001	PILLOW BLOCK BALL BEARING, 60mm	2	NSK, #UKP213+H2313X
7	D62E22001	COUPLING, SHAFT, SHRINK DISK	2	B-LOC WK 80-12
8	D62K63001	SPROCKET, HANDRAIL DRIVE	2	
9	D62K95001	COVER, HANDRAIL DRIVE ASS"Y	2	
10	D62L75001	SHAFT, HANDRAIL DRIVE, RH	1	
11	D62L76001	SHAFT, HANDRAIL DRIVE, MIDDLE	1	
12	D62L77001	SHAFT, HANDRAIL DRIVE, LH	1	
13	D62L78001	SPROCKET, HANDRAIL DRIVE	1	
14	D62L79001	HUB, HANDRAIL DRIVE	1	
15	D62L80001	KEY, 11x18x60	1	
16	D62M43001	HUB, HANDRAIL DRIVE	1	
17	D62M44001	KEY, 11x18x40	1	

Handrail Idler Assembly

See Fig. E-1c for Handrail Idler Assembly.
Escalator No. E235, E236.
Assembly used in: C62K2-2881A1 (HS L01, M01)

HANDRAIL IDLER ASSEMBLY C62K2-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62K3-2881A1	BRACKET, HANDRAIL DRIVE	1	
2	C62K3-2881A5	BRACKET, HANDRAIL DRIVE	1	
3	C62K3-2881A9	PLATE ASSY, HANDRAIL DRIVE	1	
4	D62K2-2881A3	SPROCKET, HANDRAIL DRIVE ASS"Y	1	
5	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
6	D00903007	NUT,HEX,M12 (P=1.75)	2	
7	D00908007	WASHER,LOCK,M12	2	
8	D00915025	RING, RETAINING, S25 STN. STL.	1	
9	D00915052	RING, RETAINING,R-52	1	
10	D01006034	BEARING	2	NSK, #6205ZZ

Handrail Drive Sheave Assembly

See Fig. E-1d for Handrail Drive Sheave Assembly.
Escalator No. E235, E236
Assembly used in: C62K13001 (HS L01, M01)

HANDRAIL DRIVE SHEAVE ASSEMBLY C62K13001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62L09001	BASE, HANDRAIL DRIVE	1	
2	C62K15001	SHEAVE ASSY, HANDRAIL DRIVE	1	
3	D00902064	BOLT, HEX, M12 (P=1.75) X 30, FULL	8	
4	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	8	
5	D00908007	WASHER,LOCK,M12	16	
6	D00915040	RING, RETAINING, S-40, STN STL	1	
7	D00915080	RING, RETAINING, R-80	1	
8	D01006039	BEARING	2	NSK, #6208LU
9	D62G08001	SPACER, BEARING	1	
10	D62G11001	SHIM, HANDRAIL DRIVE	1	
11	D62L06001	SPROCKET, HR DRIVE, #80, 66T	1	
12	D62L08001	HUB, HANDRAIL DRIVE	1	
13	D68398001	1/8 NPT ST Zerk	1	Advanced Industrial Prod. # HI-R-1/8

Lower Return Roller Assembly

See Fig. E-2a for Lower Return Roller Assembly.
Escalator No. E235, E236.
Assembly used in: C62N1-2881E1 (HS L01, M01)

LOWER RETURN ROLLER ASSEMBLY C62N1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62M53001	ROLLER, RETURN GUIDE, ASSY.	1	
2	C62M53002	ROLLER, RETURN GUIDE, ASSY.	1	
3	C62M54001	ROLLER, RETURN ROLLER, ASSY.	2	
4	C62H50001	RETURN ROLLER, ASSY.	2	
5	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	12	
6	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	4	
7	D00902068	BOLT, HEX, M12 (P=1.75) X 50, FULL	18	
8	D00903005	NUT, HEX, M8 (1.25)	12	
9	D00903007	NUT,HEX,M12 (P=1.75)	22	
10	D00907005	WASHER,FLAT,M8	24	
11	D00907007	WASHER,FLAT,M12	44	
12	D00908005	WASHER,LOCK,M8	12	
13	D00908007	WASHER,LOCK,M12	22	
14	D62F91001	RETURN GUIDE	2	
15	D62F93001	BRACKET, RETURN GUIDE	1	
16	D62F93002	BRACKET, RETURN GUIDE	1	
17	D62H49001	BRACKET, RETURN GUIDE	2	
18	D62L48001	BRACKET, RETURN ROLLER	1	
19	D62L48002	BRACKET, RETURN ROLLER	1	
20	D62N3-2881E1	BRACKET, RETURN ROLLER	2	

Incline Return Roller Assembly

See Fig. E-2b for Incline Return Roller Assembly.
Escalator No. E235, E236
Assembly used in: C62N1-2881L2 (HS L01, M01)

INCLINE RETURN ROLLER ASSEMBLY C62N1-2881L2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C62H50001	RETURN ROLLER, ASSY	2	
2	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	100	
3	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	56	
4	D00903005	NUT, HEX, M8 (1.25)	100	
5	D00903007	NUT,HEX,M12 (P=1.75)	56	
6	D00907005	WASHER,FLAT,M8	200	
7	D00907007	WASHER,FLAT,M12	112	
8	D00908005	WASHER,LOCK,M8	100	
9	D00908007	WASHER,LOCK,M12	56	
10	D62F79001	RETURN GUIDE	6	
11	D62H49001	BRACKET, RETURN GUIDE	26	
12	D62L48001	BRACKET, RETURN ROLLER	13	
13	D62L48002	BRACKET, RETURN ROLLER	13	
14	D62N2-2881E1	HANDRAIL RETURN GUIDE	2	
15	D62N2-2881E3	HANDRAIL RETURN GUIDE	2	
16	D62N2-2881E4	RETURN GUIDE	2	
17	D62N2-2881L2	HANDRAIL RETURN GUIDE	2	

Broken Handrail Device Switch Assembly

See Fig. E-4b for Broken Handrail Device Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65A09001 (HS L01, M01)

BROKEN HANDRAIL DEVICE SWITCH C62A09001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65A10001	PLATE, BROKEN HANDRAIL	1	
2	D65A11001	HINGE	1	
3	D65922001	LIMIT SWITCH	1	ABB, #LS35P11D11
4	D65A08001	BRACKET	1	
5	D65A12001	BRACKET	1	
6	D65622001	WHEEL, BROKEN HANDRAIL	1	McMASTER-CARR, #2781T54
7	D65623001	PLATE, STOP	1	
8	D65593002	BOLT, SHOULDER	1	McMASTER-CARR, #90298A718
9	D00907007	WASHER,FLAT,M12	2	
10	D00903006	NUT,HEX,M10 (P=1.5)	1	
11	D00908006	WASHER,LOCK,M10	1	
12	D00902025	BOLT, HEX, M6 (P=1.00) X 20, FULL	2	
13	D00907004	WASHER,FLAT,M6	12	
14	D00908004	WASHER,LOCK,M6	8	
15	D00903004	NUT, HEX, M6 (P=1.0)	6	
16	D00902027	BOLT, HEX, M6 (P=1.00) X 35, FULL	2	
17	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)	2	
18	D00903002	NUT, HEX, M4 (P=0.7)	2	
19	D00907002	WASHER,FLAT,M4	4	
20	D00908002	WASHER,LOCK,M4	2	
21	D00902024	BOLT, HEX, M6 (P=1.00) X 15, FULL	2	

Handrail Speed Device Installation

See Fig. E-5a for Handrail Speed Device Installation.
Escalator No. E235, E236
Assembly used in: C65P1-2881E1 (HS L01, M01)

HANDRAIL SPEED DEVICE INSTALLATION C65P1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65A07001	H.R. SPEED DEVICE ASSY	1	See next page.
2	C65A07002	H.R. SPEED DEVICE ASSY.	1	See next page.
3	D00902050	BOLT, HEX, M10 (P=1.50) X 35	4	
4	D00907006	WASHER,FLAT,M10	8	
5	D00908006	WASHER,LOCK,M10	4	
6	D00903006	NUT,HEX,M10 (P=1.5)	4	

Handrail Speed Device Encoder Assembly

See Fig. E-5b for Handrail Speed Device Encoder Assembly.
Escalator No. E235, E236
Assembly used in: C65A07001 and C65A07002 (HS L01, M01)

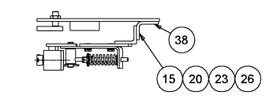
HANDRAIL SPEED DEVICE ENCODER ASSEMBLY C65A07001 & C65A07002					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 001**	**QTY 002**
1	C65607001	MOUNTING BRACKET		1	1
2	D65608001	ENCODER MOUNTING ARM		1	1
4	D65592001	COUNTER WEIGHT		2	2
5	D62B37001	WHEEL, ENCODER	STEGMANN, #6-412004-00	1	1
6	D00902054	BOLT, HEX, M10 (P=1.5) X 60, FULL		2	2
7	D00907006	WASHER,FLAT,M10		2	2
8	D00903006	NUT,HEX,M10 (P=1.5)		2	2
9	D00908006	WASHER,LOCK,M10		2	2
10	D00001006	NUT, HEX, 3/8-16		1	1
11	D65593001	SHOULDER BOLT	McMASTER-CARR, #90298A720	1	1
12	D65594001	THRUST WASHER	McMASTER-CARR, #5906K513	3	3
13	D00006004	PAN HEAD, #6-32 x 1.00		4	4
14	D00003001	WASHER, LOCK, #6		4	
14	D00002001	WASHER, FLAT, NARROW, #6			4
15	D00002001	WASHER, FLAT, NARROW, #6		4	
15	D00001001	NUT, HEX, #6-32			4
16	D00001001	NUT, HEX, #6-32		4	
16	D00003001	WASHER, LOCK, #6			4
17	D65926001	ENCODER, HR SPEED DEVICE	STEGMANN, Encoder #6-113032-0600 Cable # 6-413033-0015	1	1

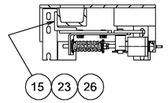
Handrail

See Fig. E-6a for Handrail.
Escalator No. E235, E236
Part No. used in: D64A1-2881L1 (HS L01, M01)

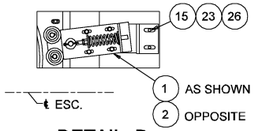
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13979	DATE	APPROVED

HANDRAIL DRIVE ASSEMBLY
Assembly C62K1-2881A1
E221, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

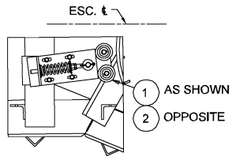


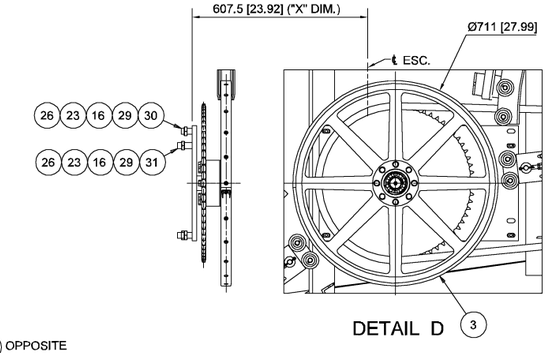


SECTION C-C

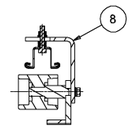


DETAIL B

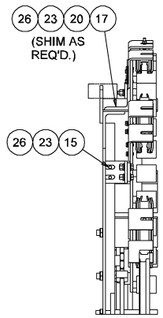


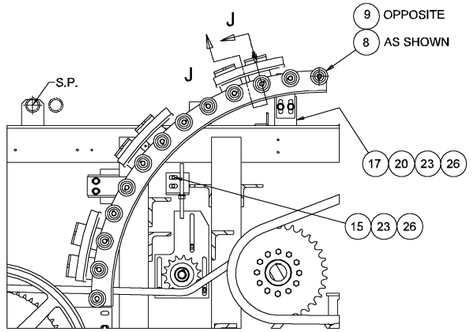


DETAIL D



SECTION J-J





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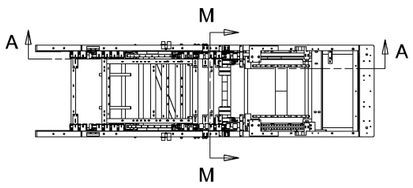
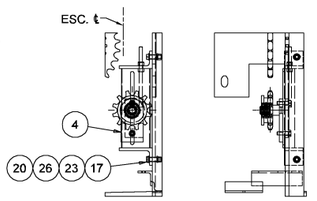
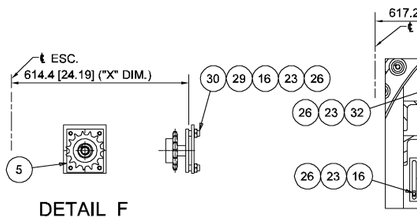




DETAIL E



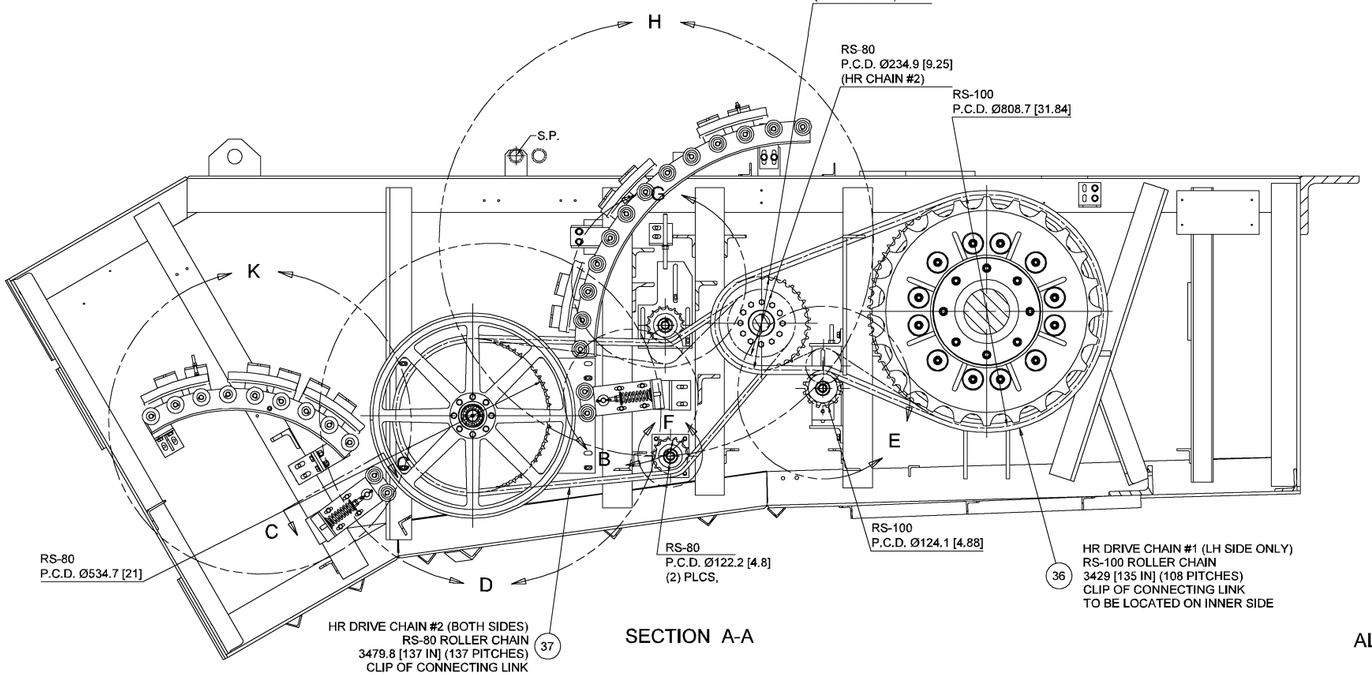
DETAIL F

DETAIL G

RS-100
P.C.D. Ø323.9 [12.75]
(HR CHAIN #1)

RS-80
P.C.D. Ø234.9 [9.25]
(HR CHAIN #2)

RS-100
P.C.D. Ø808.7 [31.84]



RS-80
P.C.D. Ø534.7 [21]

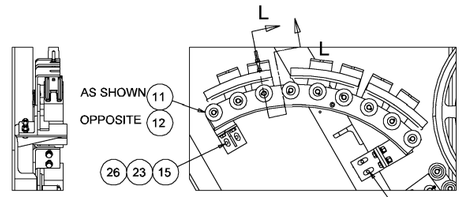
RS-80
P.C.D. Ø122.2 [4.8]
(2) PLCS,

RS-100
P.C.D. Ø124.1 [4.88]

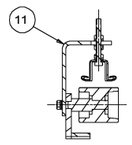
HR DRIVE CHAIN #1 (LH SIDE ONLY)
RS-100 ROLLER CHAIN
3429 [135 IN] (108 PITCHES)
CLIP OF CONNECTING LINK
TO BE LOCATED ON INNER SIDE
36

HR DRIVE CHAIN #2 (BOTH SIDES)
RS-80 ROLLER CHAIN
3479.8 [137 IN] (137 PITCHES)
CLIP OF CONNECTING LINK
TO BE LOCATED ON INNER SIDE
37

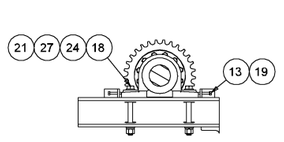
SECTION A-A



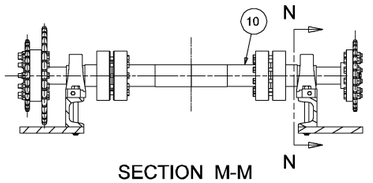
DETAIL K



SECTION L-L



SECTION N-N



SECTION M-M

NOTES:
(FACTORY)
1.) ADJUST THREADED INSERT TO PROPER DIMENSIONS BY MEASURING "X" DIM.
2.) SET ITEMS AS SHOWN IN SECTION VIEWS.
3.) CHECK TO CONFIRM "X" DIMENSION.
4.) ASSEMBLE JAM NUT TO THREADED INSERT ON OUTSIDE OF TRUSS AND SPOT WELD TO SESECURE.

(JOB SITE)
1.) ADJUST THE SPRING LENGTH ON THE PINCH ROLLERS AT THE HR DRIVE SHEAVE:
STANDARD: 71mm [2.79]
LIMIT: 65mm [2.56]
2.) CONFIRM HANDRAIL DRIVE FORCE AT THE UPPER NEWEL SECTION IS 70 LBf (311 N) OR MORE (DOWN DIRECTION).

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C62K1-2881A1

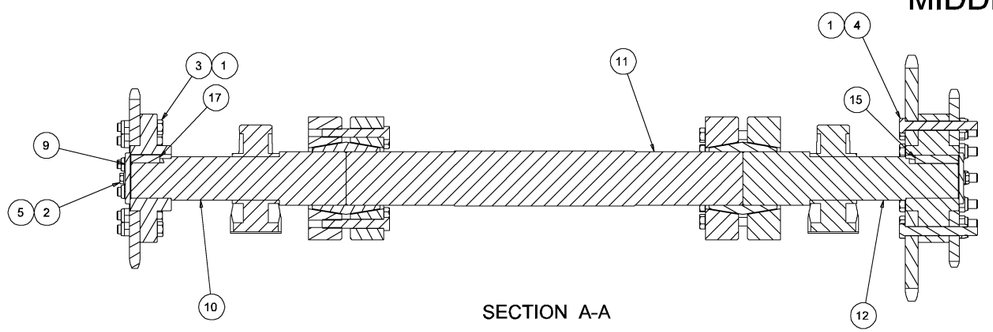
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 8/17/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/17/2004	TITLE: HANDRAIL DRIVE ASSEMBLY
	APVD. APPERSON	DATE 8/17/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01	SCALE (1:40)	SIZE D / DWG. NO. Fig. E-1a / REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11325	DATE	APPROVED

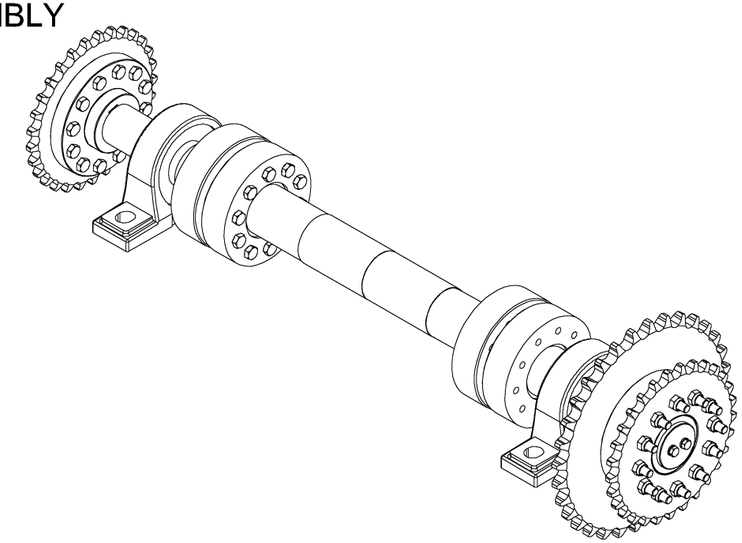
MIDDLE HANDRAIL DRIVE SHAFT ASSEMBLY

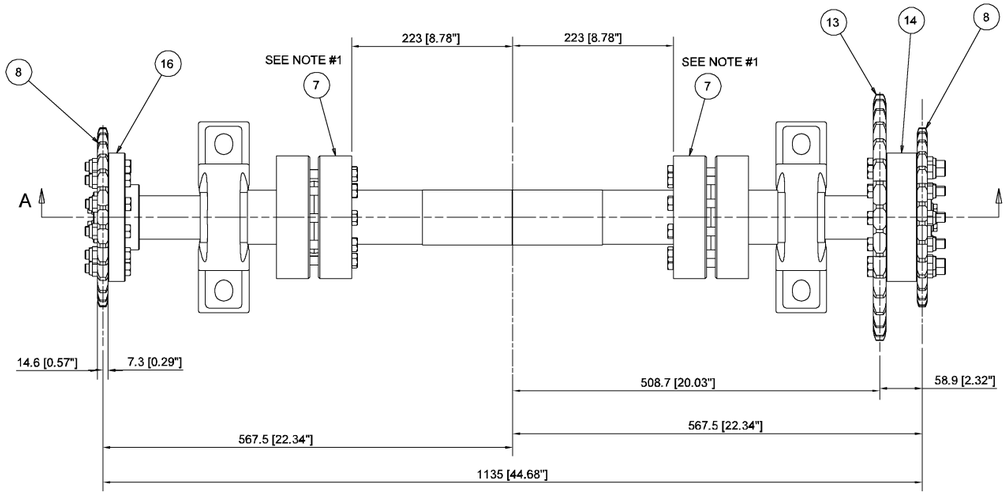
Assembly C62L74001

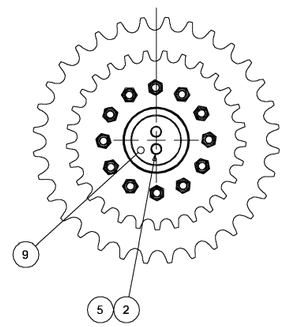
E221, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236



SECTION A-A







NOTES:

1) INSTALLATION STEPS FOR SHAFT COUPLING:
   a) CAREFULLY CLEAN SHAFTS AND COUPLING BORE WITH A SOLVENT DEGREASER BEFORE MOUNTING COUPLING ON SHAFTS.
   b) BUTT THE ENDS OF THE SHAFTS TOGETHER AND LOCATE COUPLING SO IT IS CENTERED OVER THE ENDS OF THE SHAFTS.
   c) HANDTIGHTEN THREE EQUALLY SPACED LOCKING SCREWS AND MAKE SURE OUTER COLLARS OF COUPLING ARE PARALLEL TO EACH OTHER. CONFIRM LENGTH OF ASSEMBLED SHAFT IS WITHIN TOLERANCE. HANDTIGHTEN THE REMAINING LOCKING SCREWS.
   d) USE TORQUE WRENCH AND EQUALLY TIGHTEN SCREWS ONE AFTER ANOTHER IN A CLOCKWISE SEQUENCE USING ONLY 1/4 TURNS UNTIL TIGHTENING TORQUE OF 77 LBS-FT (104 Nm) IS OBTAINED.
   e) RESET TORQUE WRENCH AND CONFIRM THAT NO SCREW TURNS AT 74 LBS-FT (100.3 Nm).
   f) APPLY FINISH [N07001006] RUST PREVENTATIVE OIL TO ALL EXTERNAL SURFACES OF COUPLING.

2) USE ASSEMBLY JIG, ALIGN AND FIX THE SHAFT AND THE PILLOW BLOCK IN WORKSHOP. (SEE MOUNTING BEARING FOR FURTHER INSTRUCTIONS)

3) TIGHTEN BOLTS TO TORQUE OF 43.4~57.9 LBS-FT (58.8~78.5 Nm).

4) BEFORE SHIPPING, APPLY A PRETREATING SOLVENT DEGREASING TO THE MACHINED FACES AND OTHER MACHINED SURFACES. SECONDLY, APPLY A RUST PREVENTION TREATMENT.

5) REMOVAL: LOOSEN LOCKING SCREWS IN SEVERAL STAGES BY USING 1/2 TURNS, FOLLOWING A CLOCKWISE SEQUENCE UNTIL COUPLING CAN BE MOVED OR TURNED ON SHAFTS. DO NOT REMOVE SCREWS COMPLETELY.

6) RE-INSTALLATION: SEE ITEM 1 FOR INSTALLATION INSTRUCTIONS. BE SURE ALL PARTS ARE THOROUGHLY CLEAN AND RELUBRICATE WITH THE FOLLOWING OR SIMILAR LUBRICANTS:
   a) TAPER INTERFACES: MOLYKOTE 321 R-SPRAY, G RAPID-SPRAY OR PASTE OR EQUIVALENT.
   b) THREADS & SCREW HEAD CONTACT AREA: MULTIPURPOSE GREASE MOLYKOTE BR-2 OR EQUIVALENT.

MOUNTING A BEARING UNIT WITH AN ADAPTER ASSEMBLY INSTRUCTIONS

1) FIRST CHECK THAT THE RIGIDITY AND FLATNESS OF THE MOUNTING SURFACE ARE SATISFACTORY FOR THE OPERATING CONDITIONS.

2) FIT THE SLEEVE INTO THE SHAFT WHILE EXPANDING IT WITH A SCREW DRIVER INSERTED INTO THE SLOT. MOVE THE SLEEVE TO A POINT WHERE THE CENTER OF THE TAPERED PORTION CORRESPONDS TO THAT OF THE LARGER DIAMETER END TO SECURE A TIGHTER FIT.

3) INSERT THE WASHER AND THEN FASTEN THE NUT LIGHTLY BY HAND.

4) FIT THE HOUSING TO THE MOUNTING BASE, SET THE CORRECT DISTANCE BETWEEN UNITS, AND CONFIRM THE AXIAL CLEARANCE OF THE BEARING BEFORE FINALLY TIGHTENING THE MOUNTING BOLTS. TEMPORARILY MOUNT A REFERENCE RING AND THEN MEASURE THE DIFFERENCE BETWEEN THE RING AND THE END FACE OF THE BEARING WITH A BAR GAUGE OR INSIDE MICROMETER. THIS WILL FACILITATE ACCURATE POSITIONING OVER A LONG DISTANCE.

5) TIGHTEN THE NUT BY TURNING IT 70° TO 100° WITH A TORQUE SPANNER TO FIX THE BEARING AND SLEEVE TO THE NUT. TIGHTEN THE PILLOW BLOCK TO SET POINT 108.33 LBS/FT (146.88 N/m).
TO PREVENT THE NUT FROM LOOSENING, BEND ONE OF THE TABS OF THE WASHER INTO A NOTCH IN THE NUT.

6) FINALLY, ROTATE THE SHAFT BY HAND AND CONFIRM THAT IT TURNS SMOOTHLY.

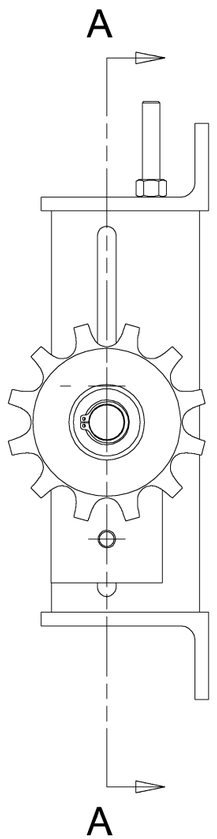
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS MM [INCHES]

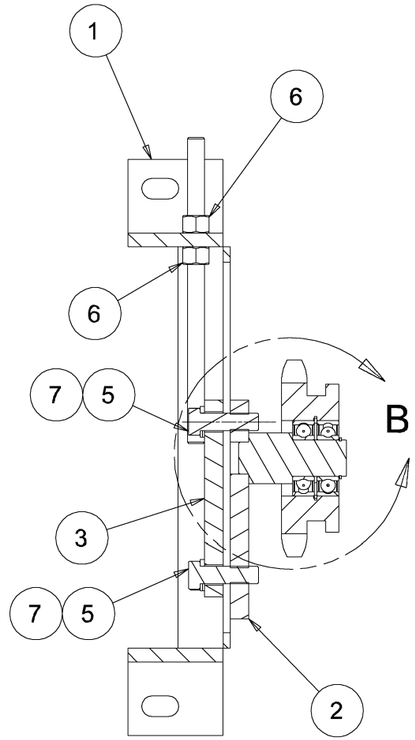
Assembly C62L74001

GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 8/18/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/18/2004	TITLE: MIDDLE HR DRIVE SHAFT Assy
	APVD. APPERSON	DATE 8/18/2004	
JOB TITLE	JOB NO. STD		SCALE (1:4) / SIZE D / DWG. NO. Fig. E-1b / REV.

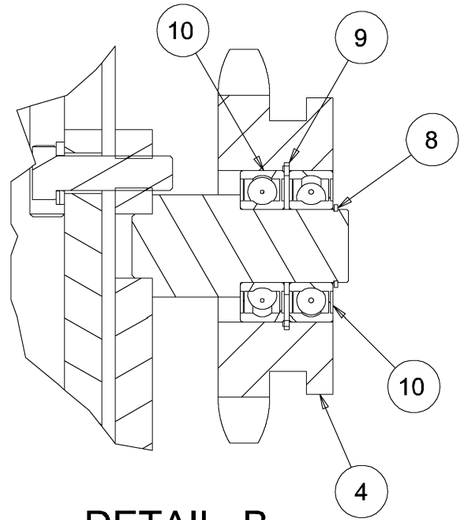
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 10979	DATE	APPROVED

HANDRAIL DRIVE IDLER ASSEMBLY
Assembly C62K2-2881A1
E221, E222, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

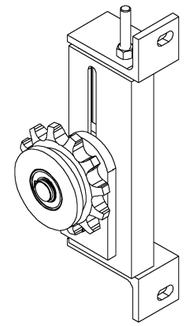




SECTION A-A



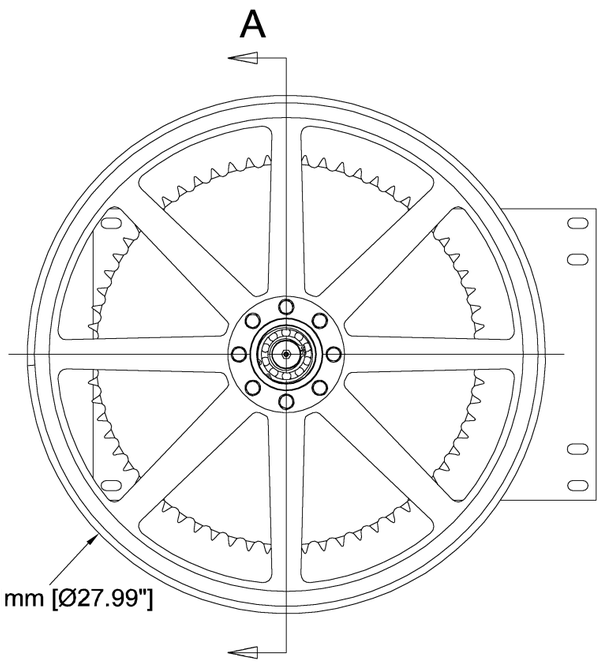
DETAIL B

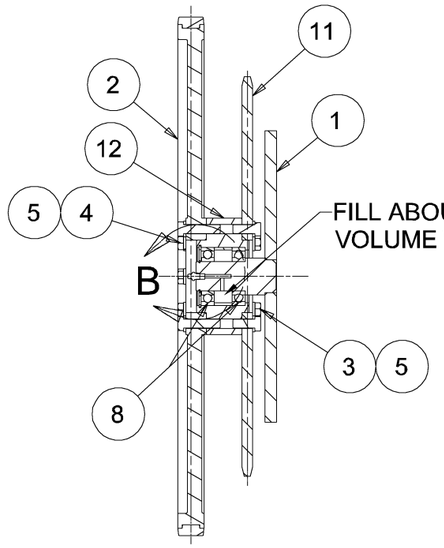


Assembly C62K2-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 8/17/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/17/2004	TITLE: HANDRAIL DRIVE IDLER ASS'Y
	APVD. APPERSON	DATE 8/17/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01		SCALE (1:4) / SIZE B / DWG. NO. Fig. E-1c / REV.

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 10426	DATE	APPROVED

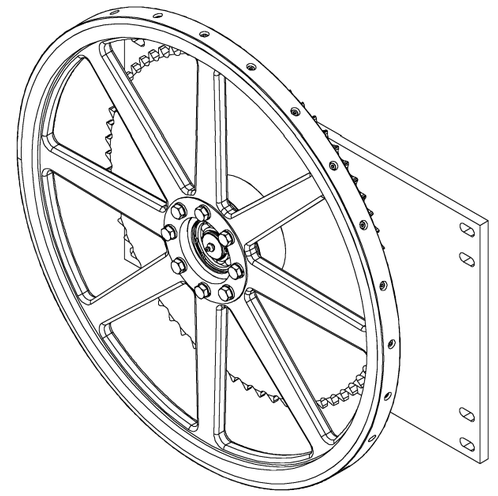


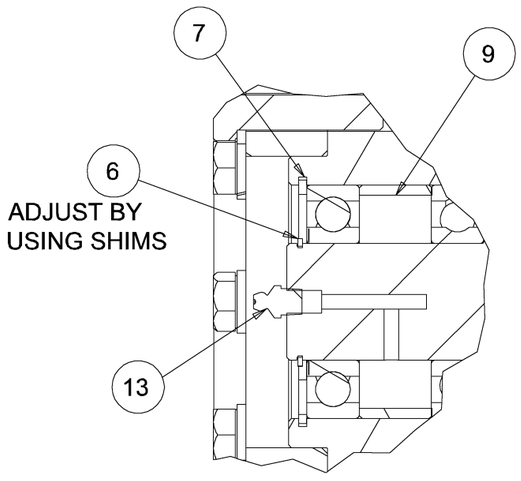


SECTION A-A

HANDRAIL DRIVE SHEAVE ASSEMBLY
Assembly C62K13001

E221, E222, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236





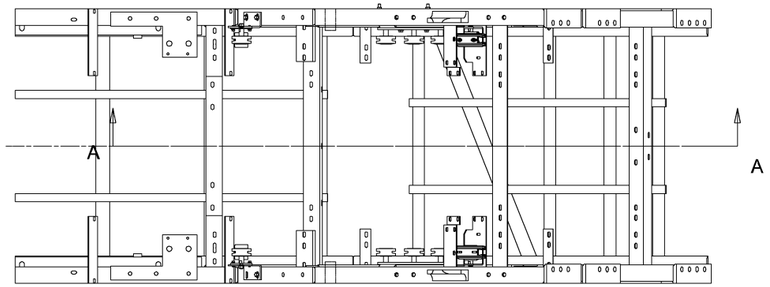
DETAIL B

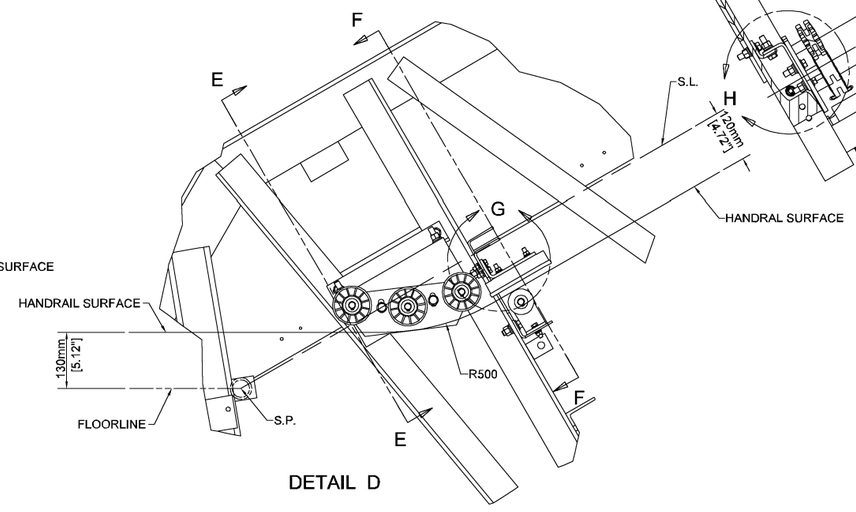
Assembly C62K13001

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN SHUPE	DATE 2/6/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 2/6/2004	TITLE HANDRAIL DRIVE SHEAVE, ASSY
	APVD. APPERSON	DATE 2/6/2004	
JOB TITLE	JOB NO. STD		SCALE (1:8) / SIZE B / DWG. NO. Fig. E-1d / REV.

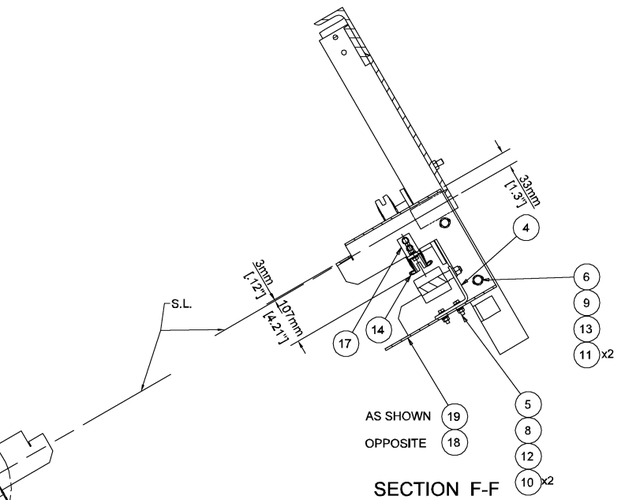
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11327	DATE	APPROVED

LOWER RETURN ROLLER ASSEMBLY
Assembly C62N1-2881E1
E221, E229, E230, E231, E232,
E233, E234, E235, E236

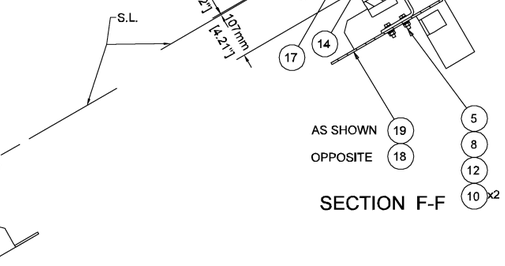




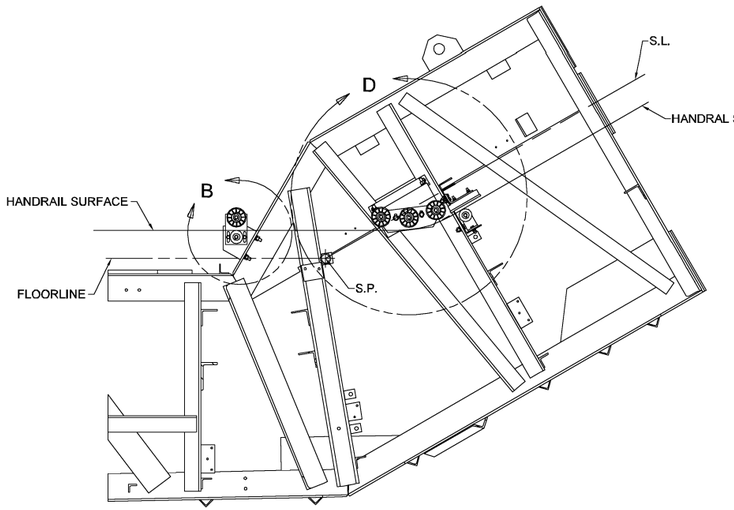
DETAIL D



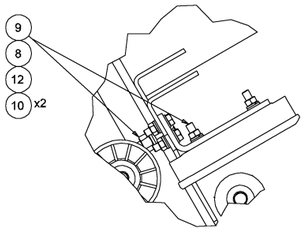
SECTION F-F



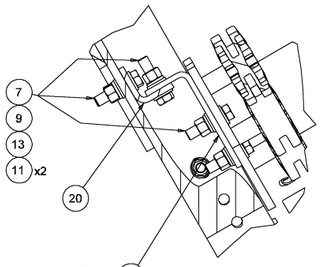
SECTION E-E



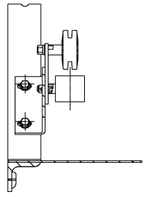
SECTION A-A

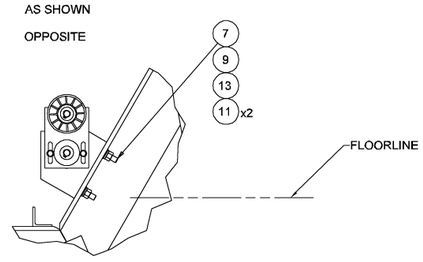


DETAIL G



DETAIL H





DETAIL B

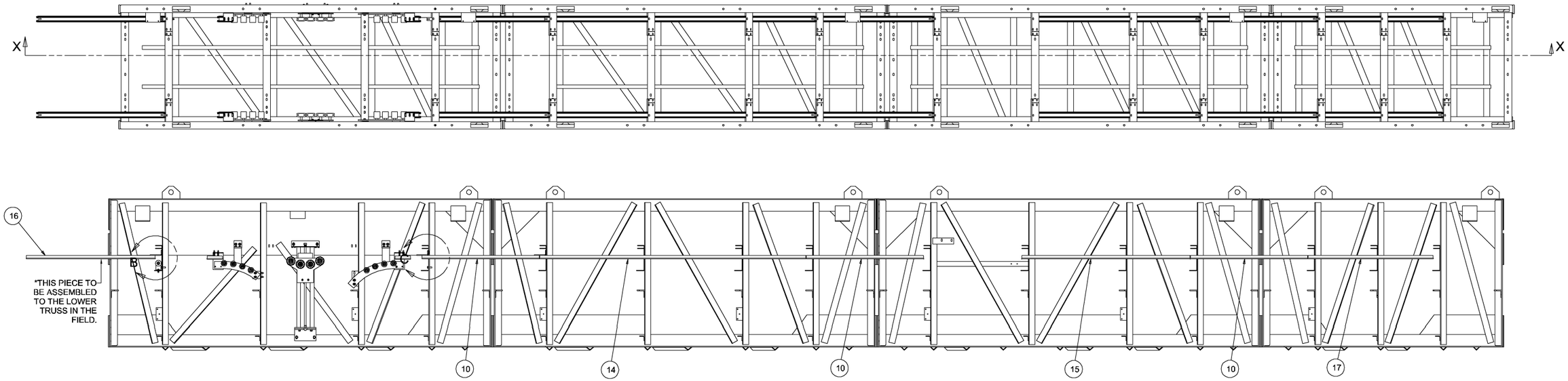
UNLESS OTHERWISE
SPECIFIED
ALL DIMENSIONS MM [INCHES]

Assembly C62N1-2882E1

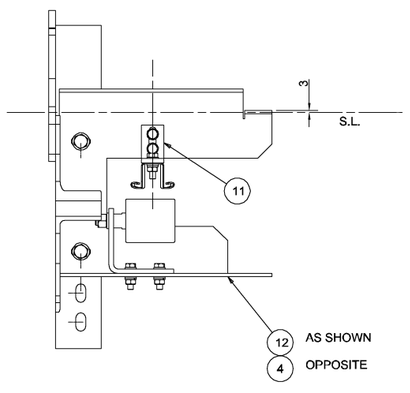
GENERAL TOLERANCE SEE EN-ES-001	DWN KADONO	DATE 8/17/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/17/2004	TITLE: LOWER RETURN ROLLER ASS'Y
	APVD. APPERSON	DATE 8/17/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881		SCALE (0.08.1) / SIZE D / DWG. NO. Fig. E-2a / REV. A

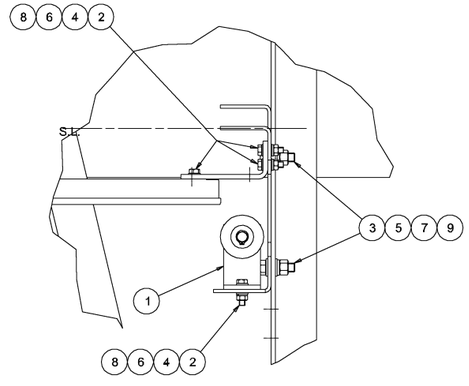
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13271	DATE	APPROVED

INCLINE RETURN ROLLER ASSEMBLY
Assembly C62N1-2881L2
E235, E236

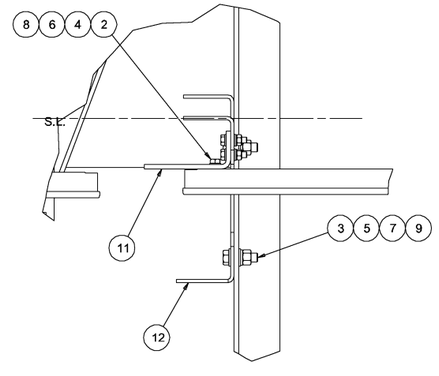


SECTION X-X





DETAIL B



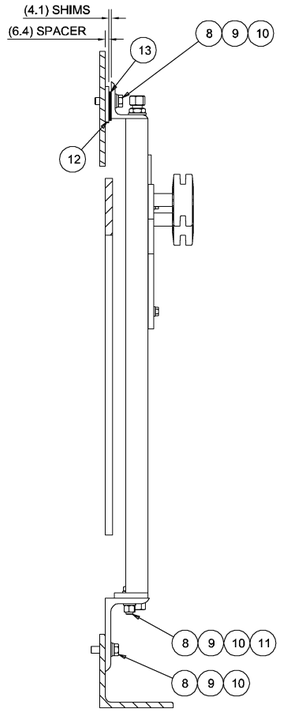
DETAIL C

Assembly C62N1-2881L2

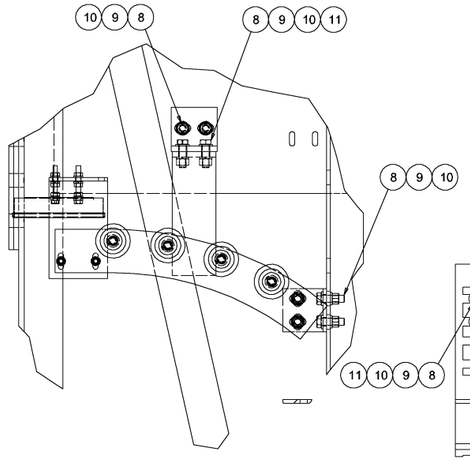
GENERAL TOLERANCE SEE EN-ES-001	DWN. HARPER	DATE 11/2/2005	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 11/2/2005	TITLE	
	APVD. SUGIMOTO	DATE 11/2/2005	INCLINE RETURN ROLLER ASSY	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE (1:20)	SIZE D
			DWG. NO. Fig. E-2b	REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 10932	DATE	APPROVED
A	A WAS C62E89001	ECN#12086	3/18/05	HET

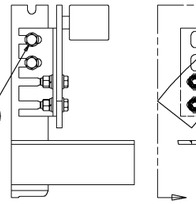
HANDRAIL TAKE-UP (TENSION) DEVICE ASSEMBLY
Assembly C62L52001
E221, E235, E236



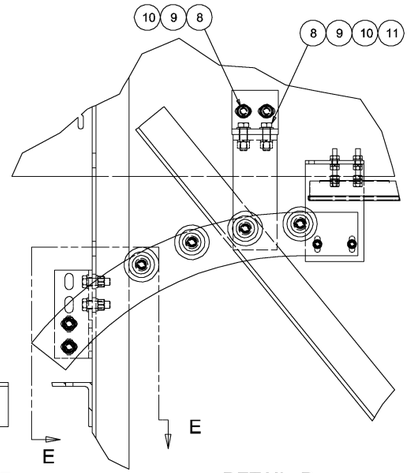
SECTION B-B



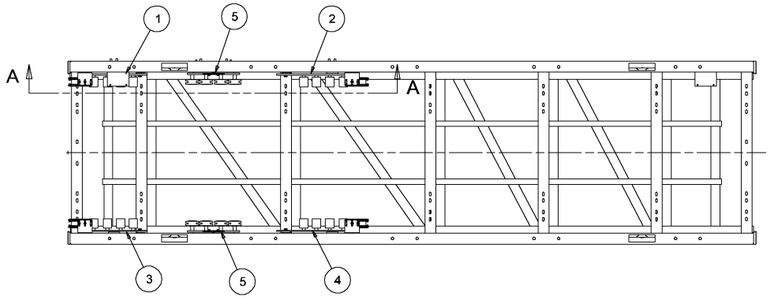
DETAIL C

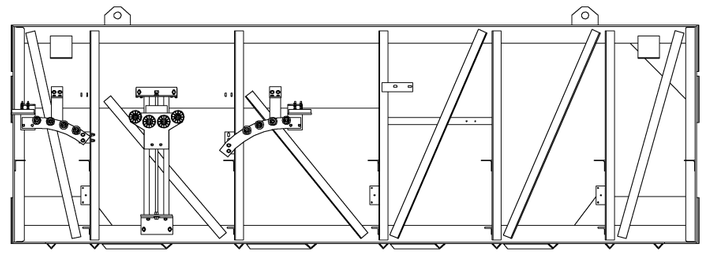


SECTION E-E



DETAIL D





ADJUSTMENT OF HANDRAIL TAKE-UP (FIELD WORK)

1. BEFORE SETTING HANDRAIL, PULL TAKE-UP ROLLER UP TO HIGHEST POSITION IF NOT ALREADY DONE IN PLANT.
2. ON COMPLETION OF HANDRAIL SETTING, PULL DOWN TAKE-UP DEVICE SO THAT THE ROLLERS ARE CENTERED ON THE HANDRAIL.
3. CONFIRM HANDRAIL RETAINING ROLLERS HAVE BEEN SET AT THE HANDRAIL DRIVE SHEAVE.
4. RUN THE ESCALATOR IN THE DOWN DIRECTION FOR 30 SECONDS AND STOP. PULL THE HANDRAIL AT THE UPPER NEWEL AS SHOWN IN FIGURE 1: 5-10mm [.2~.4"] WITH 40 LBS (178 N) OF FORCE.
5. NOW CONFIRM THAT THE DRIVING FORCE OF THE HANDRAIL SHOULD BE FROM 70 LBS (311 N) OR MORE, IN CASE OF DISSATISFACTION, RE-ADJUST THE HANDRAIL RETAINING ROLLERS.
6. IF THE HANDRAIL DOES NOT SATISFY ITEM 5, RE-ADJUST TAKE-UP ROLLER BY USING THE METHOD IN ITEM 4. NOW THERE IS NO NEED TO ADJUST THE HANDRAIL RETAINING ROLLER.

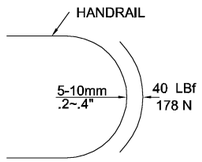
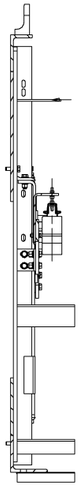
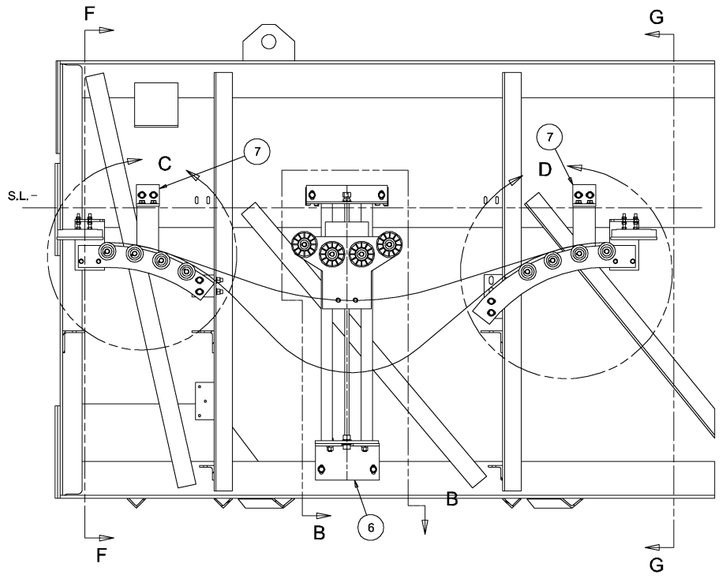


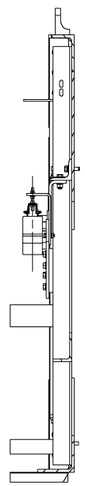
FIGURE 1



SECTION F-F



SECTION A-A



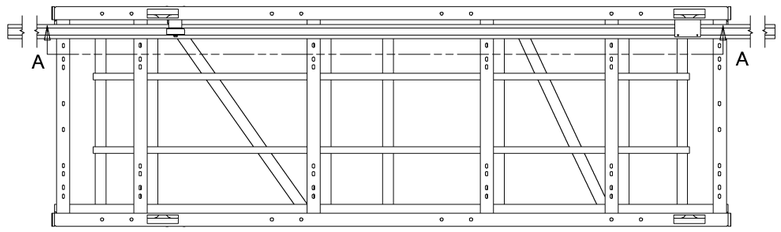
SECTION G-G

Assembly C62L52001

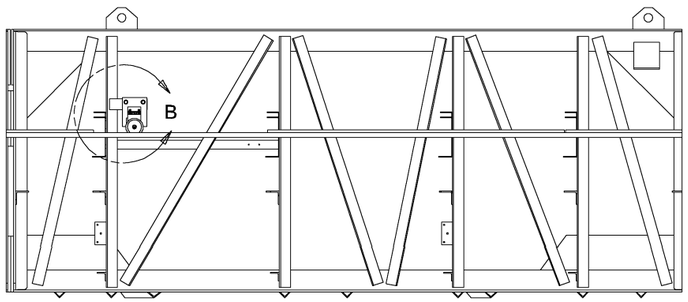
GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 5/13/2004	FUJITEC AMERICA, INC.
	CHKD SHUPE	DATE 5/13/2004	TITLE: HANDRAIL TENSION DEVICE
	APVD APPERSON	DATE 5/13/2004	
JOB TITLE	JOB NO. STD	SCALE (1:20)	SIZE D
		DWG. NO. Fig. E-3a	REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11351	DATE	APPROVED

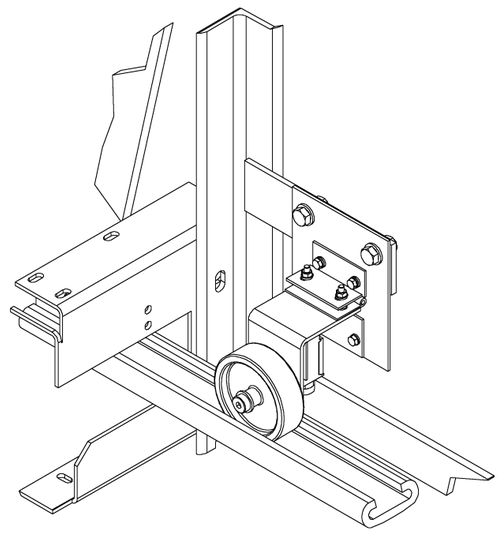
BROKEN HANDRAIL DEVICE ASSEMBLY
Assembly C65N1-2881E1
E229, E230, E231, E232,
E233, E234, E235, E236

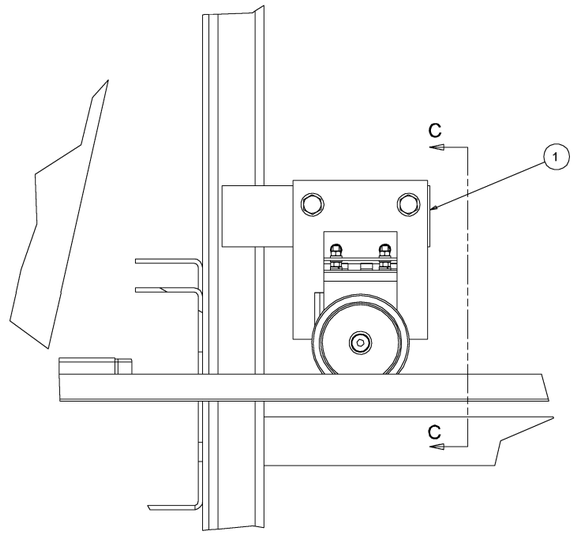


INCLINE TRUSS 3

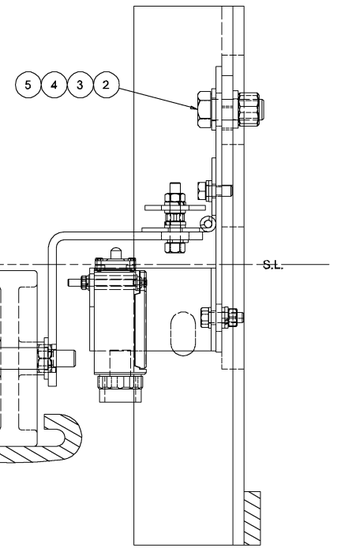


SECTION A-A





DETAIL B



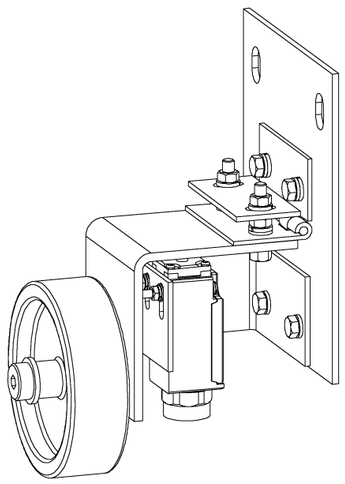
SECTION C-C

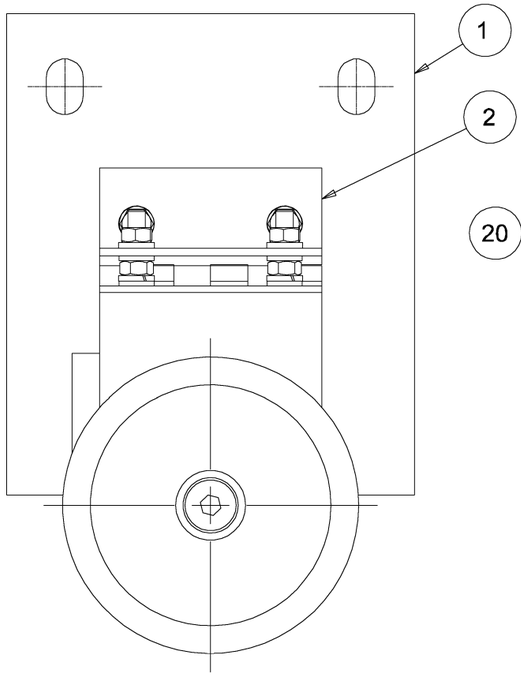
Assembly C65N1-2881E1

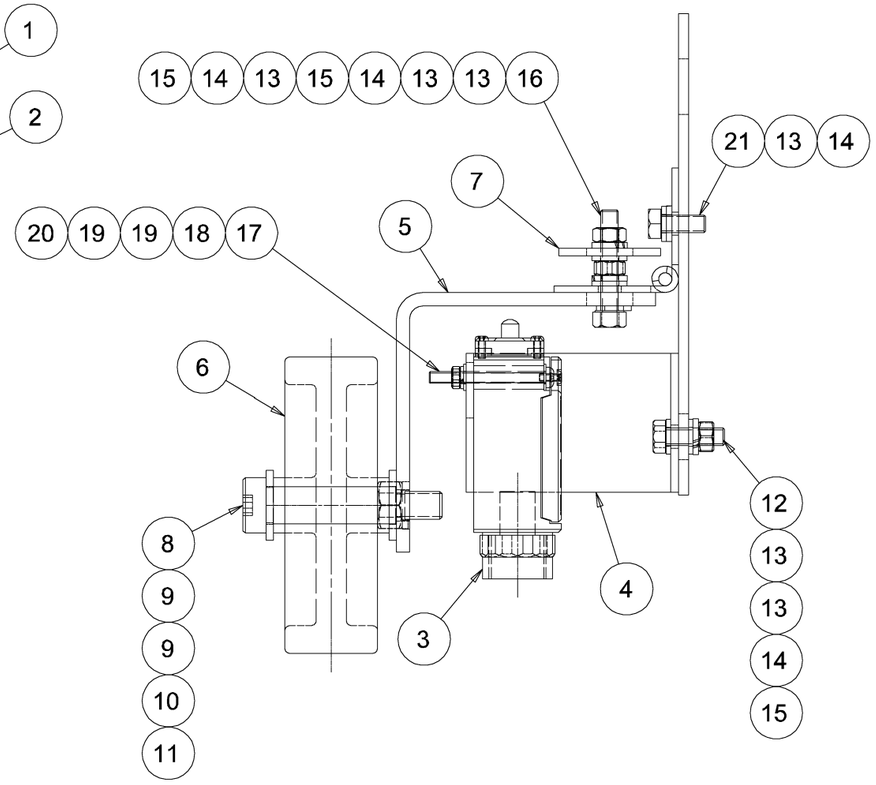
GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 8/19/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 8/19/2004	TITLE BROKEN HANDRAIL DEVICE	
	APVD. APPERSON	DATE 8/19/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 E01		SCALE (0.06:1)	SIZE D
			DWG. NO. Fig. E-4a	REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 10932	DATE	APPROVED

BROKEN HANDRAIL DEVICE SWITCH ASSEMBLY
Assembly C65A09001
E221, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236





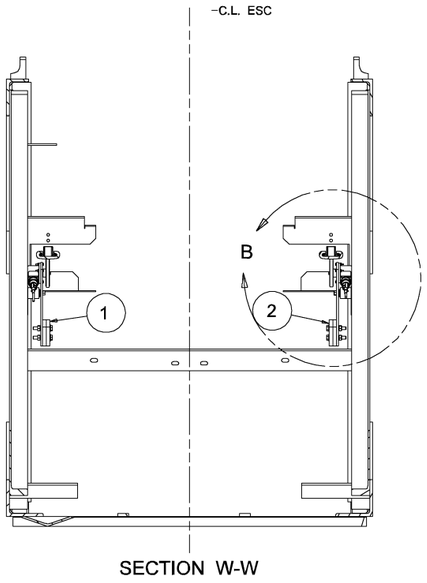


Assembly C65A09001

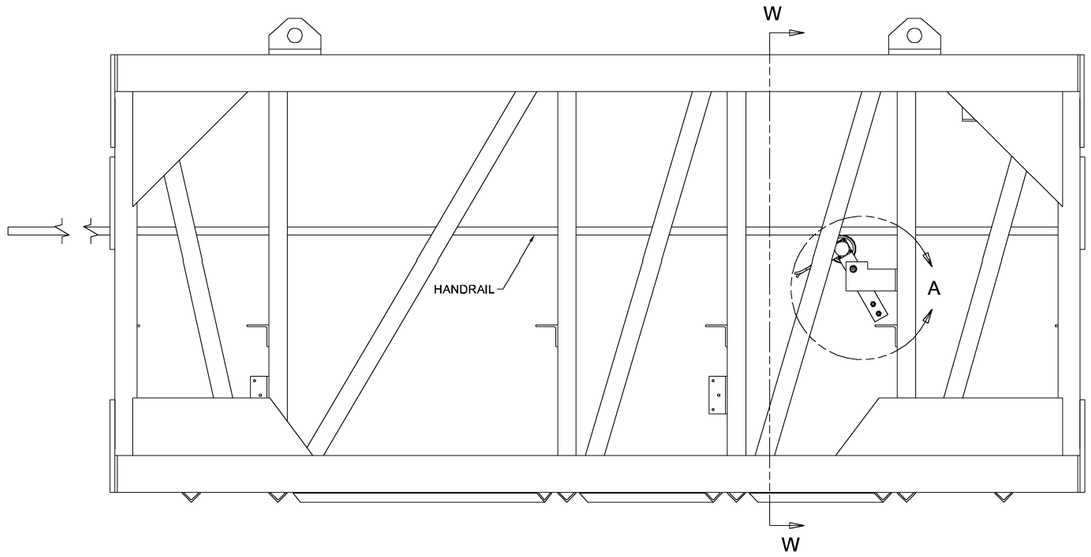
GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 5/18/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 5/18/2004	TITLE: BROKEN HR DEVICE SWITCH
	APVD. APPERSON	DATE 5/18/2004	
JOB TITLE	JOB NO. STD		SCALE (1:2) / SIZE B / DWG. NO. Fig. E-4b / REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11351	DATE	APPROVED

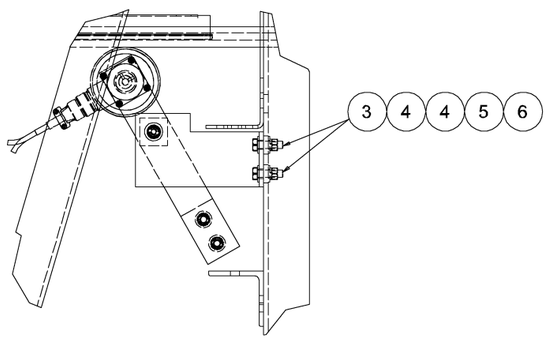
HANDRAIL SPEED DEVICE INSTALLATION
Assembly C65P1-2881E1
E229, E230, E231, E232,
E233, E234, E235, E236



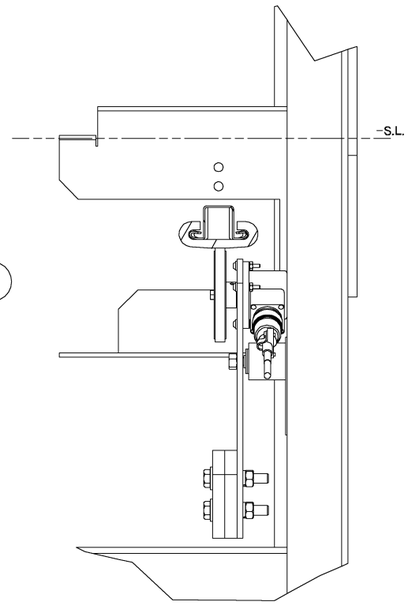
SECTION W-W



INCLINE TRUSS 4



DETAIL A



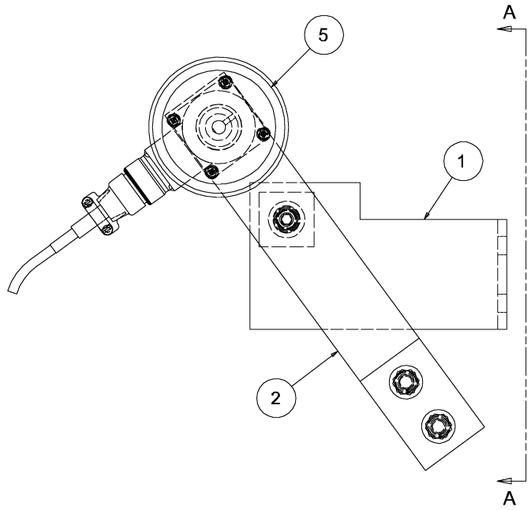
DETAIL B

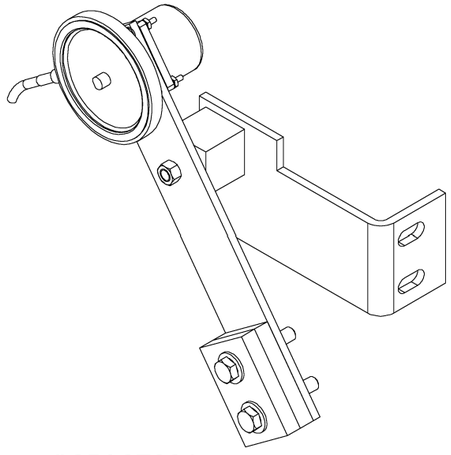
Assembly C65P1-2881E1

GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 8/25/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/25/2004	TITLE: HANDRAIL SPEED DEVICE
	APVD. APPERSON	DATE 8/25/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 E01		SCALE: (1:10) / SIZE: D / DWG. NO.: Fig. E-5a / REV.

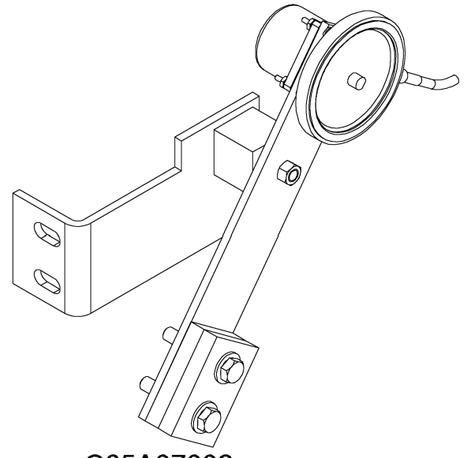
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 19932	DATE	APPROVED

HANDRAIL SPEED DEVICE ENCODER ASSEMBLY
Assembly C65A07001 and C65A07002
E221, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236



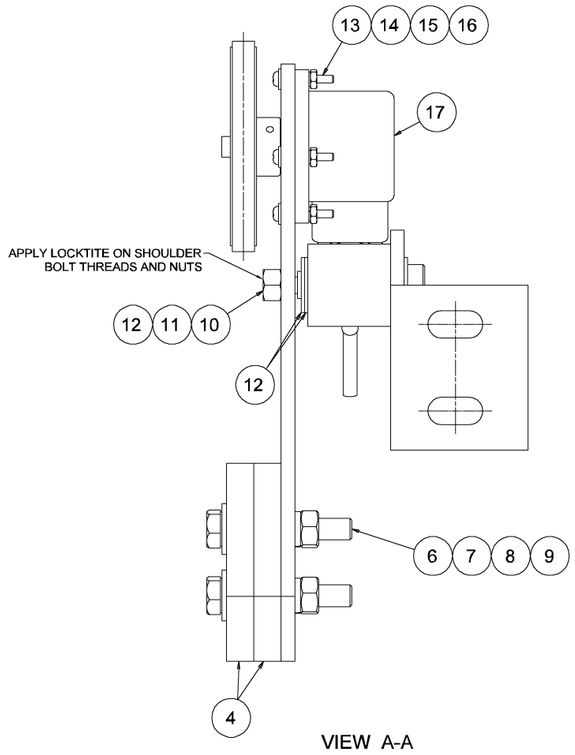


C65A07001



C65A07002

NOTE: VERIFY THAT MOUNTING ARM IS FREE TO ROTATE.



VIEW A-A

Assembly C65A07001 and C65A07002

GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 5/17/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 5/17/2004	TITLE	H.R. SPEED DEVICE ASSY.
	APVD. APPERSON	DATE 5/17/2004		
JOB TITLE	JOB NO. STD		SCALE (1:2) / SIZE D / DWG. NO. Fig. E-5b / REV.	

*** ACAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13345	DATE	APPROVED
A	A1 ADDED NOTE	ECN NO. 13412	02/03/06	SHUPE

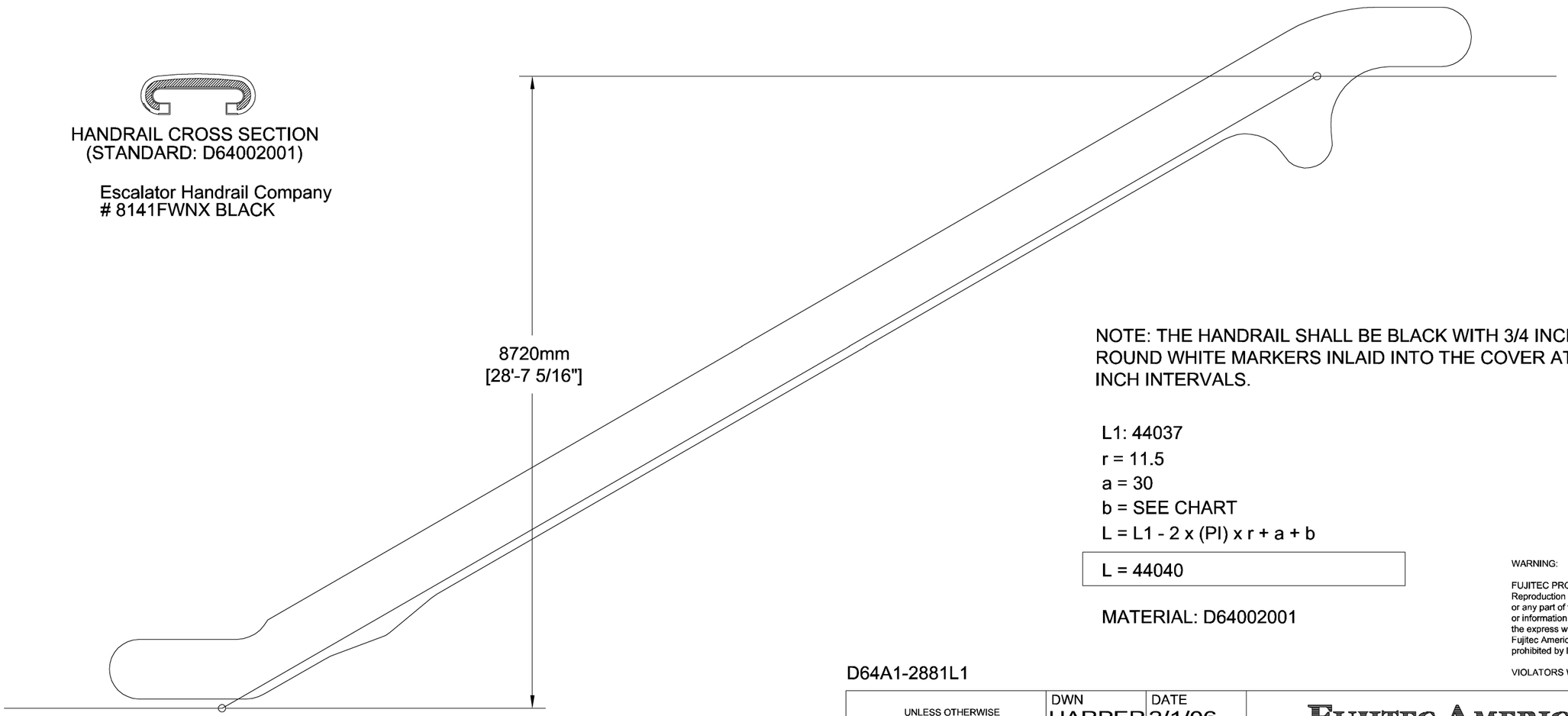
L1:	0-30m	30-50m	50-70m	70-90m	90-110m
b VALUE	35mm	45mm	55mm	65mm	75mm

HANDRAIL
Part No. D64A1-2881L1

E235, E236

HANDRAIL CROSS SECTION
(STANDARD: D64002001)

Escalator Handrail Company
8141FWNX BLACK



NOTE: THE HANDRAIL SHALL BE BLACK WITH 3/4 INCH ROUND WHITE MARKERS INLAID INTO THE COVER AT 24 INCH INTERVALS.

L1: 44037
r = 11.5
a = 30
b = SEE CHART
L = L1 - 2 x (PI) x r + a + b

L = 44040

MATERIAL: D64002001

D64A1-2881L1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HARPER	DATE 2/1/06	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 2/1/06	TITLE HANDRAIL, STANDARD
	APVD. SUGIMOTO	DATE 12/05/05	
JOB TITLE HERALD SQUARE NYCT	JOB NO. 2881 L01/M01		SCALE 1/60 / SIZE B / DWG. NO. Fig. E-6a / REV. A

F) STEPS, STEP CHAIN, and LUBRICATOR

Step Yoke Assembly

See Fig. F-1b for Step Yoke Assembly.
Escalator No. E235, E236
Assembly used in: C63212001 (HS L01, M01)

STEP YOKE ASSEMBLY, 24-INCH C63212001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D63021001	YOKE, MACHINING	1	
2	D00134121	SCREW,SET,M12(P=1.75)X18,CUP	1	
3	D00907006	WASHER,FLAT,M10	1	
4	D00912026	PIN,COTTER,M3.2X25,STN STL	1	
5	D63062001	SPRING,STEP	1	
6	D63063001	PIN,STEP	1	

Step Chain Assignment

See Fig. F-2b for Step Chain Assignment.
Escalator No. E235, E236
Assembly used in: C62A1-2881L1 (HS L01, M01)

STEP CHAIN ASSIGNMENT C62A1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
	C62K25003	48" STEP CHAIN ASSEMBLY, 3 UNIT	2	
	C62K25004	64" STEP CHAIN ASSEMBLY, 4 UNIT	4	
	C62K25006	96" STEP CHAIN ASSEMBLY, 6 UNIT	14	

Lubricator Installation

See Fig. F-3a for Lubricator Installation.
Escalator No. E235, E236.
Assembly used in: A68H1-2881A1 (HS L01, M01)

LUBRICATOR INSTALLATION A68H1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D68393001	LUBE PUMP	1	TRABON, 115V/1 Phase/60Hz, 3.2 Gal Tank, 12CIPM Pump, Sight Gauge, Level Switch, Pressure Gauge
2	D68395001	6mm COPPER TUBING	1	
3	D68397001	PIPE SADDLE	40	Trabon #FD01020-AIP
4	D68510001	FITTING, LUBRICATION, 1/8 NPT	4	Alemite #1610-BL
5	D68511001	COUPLING, ANCHOR	4	Parker #207ACBHS-2
6	D68437001	FITTING, 6mm X 1/8 NPT	4	Parker #FBMB6-1/8
7	D68513001	FITTING, 90 DEG, 6mm X 1/8 NPT	4	Parker #CBMB6-1/8
8	D68454001	COMPRESSION NUT	4	
9	D68455001	COMPRESSION SLEEVE	4	
10	D68405001	LUBE ORIFACE, TYPE B	4	TRABON #464-030-003
11	D68406001	LUBE BRUSH W/ ADAPTOR	4	OIL RITE A-2256-2-SS
12	D64436001	COPPER TUBING	24FT	
13	D68H3-2881A1	BRACKET, LUBE BRUSH	2	
14	D68403001	FITTING, 4mm X 1/8 NPT	4	Parker #FBMB4-1/8
15	D00902050	BOLT, HEX, M10X35	4	
16	D00907006	WASHER, FLAT, M10	4	
17	D00908006	WASHER, LOCK, M10	4	

Lubricator Assembly

See Fig. F-3b for Lubricator Assembly.
Escalator No. E235, E236.
Assembly used in: C68H1-2881A2 (HS L01, M01)

LUBRICATOR ASSEMBLY C68H1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D68393001	LUBE PUMP	1	TRABON, 115V/1 PHASE/60Hz, 3.2 GAL TANK, 12CIPM PUMP, SIGHT GAUGE, LEVEL SWITCH, PRESSURE GAUGE
2	D68395001	6mm COPPER TUBING	1	
4	D68397001	PIPE SADDLE	30	Trabon #FD01020-AIP
5	D68510001	FITTING, LUBRICATION, 1/8 NPT	4	Alemite #1610-BL
6	C68459001	ANCHOR, TEE, ASSY.	1	A-03017
7	D68511001	COUPLING, ANCHOR	4	Parker #207ACBHS-2
8	C68493001	MANIFOLD ASSY., 6-PORT	1	
9	D68403001	FITTING, 4mm, 1/8 NPT MALE	6	Parker #FBM B4-1/8
10	C68494001	MANIFOLD ASSY, 8 PORT	1	
12	D68406001	LUBE BRUSH W/ADAPTOR	6	Oil Rite #A-2256-2-SS
13	D68436001	4mm COPPER TUBING	1	
14	D68437001	FITTING, 6mm, 1/8 NPT MALE	8	Parker #FBMB6-1/8
15	D68H2-2881A1	MOUNTING PLATE	1	
16	D68H3-2881A1	BRACKET, LUBE BRUSH	1	
17	D68H3-2881A2	BRACKET, LUBE BRUSH	1	
18	D68H3-2881A3	BRACKET, LUBE BRUSH	2	
19	D00902031	BOLT, HEX, M8 (P=1.25) X 16, FULL	1	
20	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	4	
21	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	4	
22	D00907005	WASHER,FLAT,M8	8	
23	D00908005	WASHER,LOCK,M8	9	
24	D00903005	NUT, HEX, M8 (1.25)	4	
25	D00902026	BOLT, HEX, M6 (P=1.00) X 25	4	
26	D00902027	BOLT, HEX, M6 (P=1.00) X 35, FULL	2	

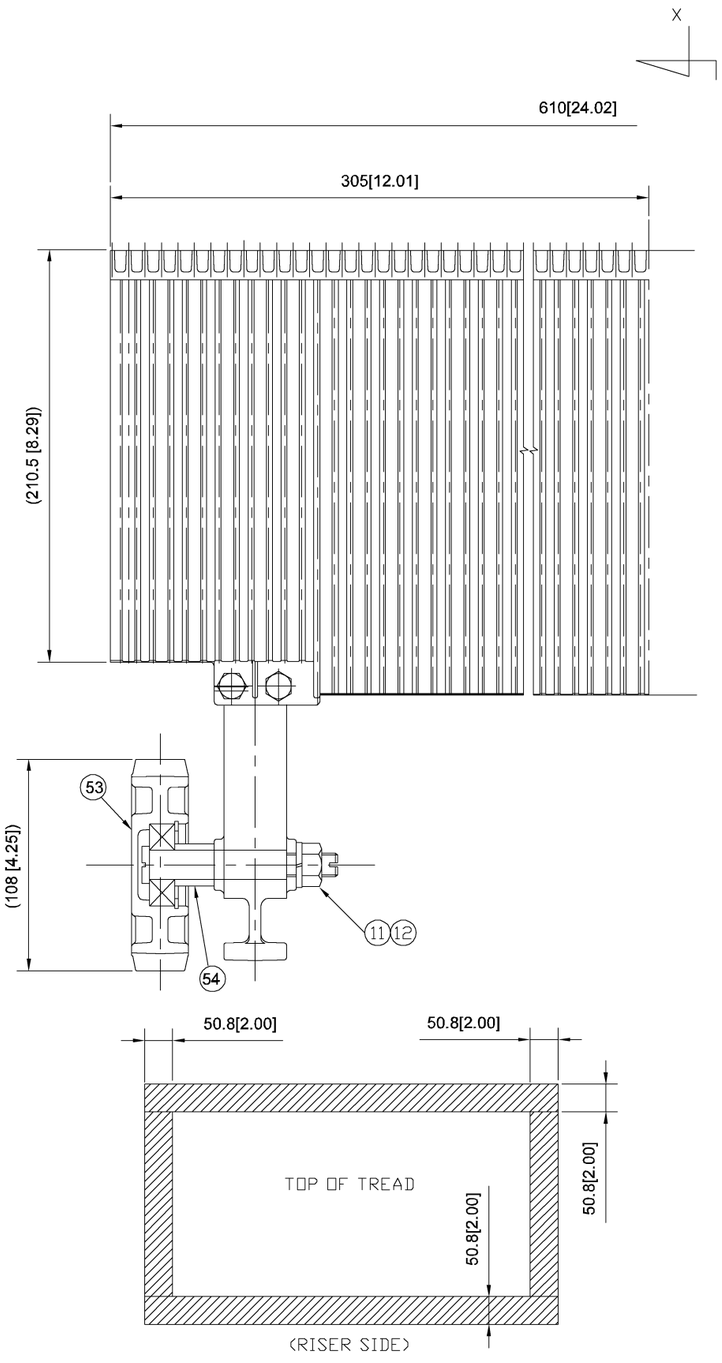
See Fig. F-3b for Lubricator Assembly.
Escalator No. E235, E236.
Assembly used in: C68H1-2881A2 (HS L01, M01)

LUBRICATOR ASSEMBLY C68H1-2881A2 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
27	D00908004	WASHER,LOCK,M6	6	
28	D00902067	BOLT, HEX, M12 (P=1.75) X 45, FULL	2	
29	D00907007	WASHER,FLAT,M12	4	
30	D00908007	WASHER,LOCK,M12	2	
31	D00903007	NUT,HEX,M12 (P=1.75)	2	

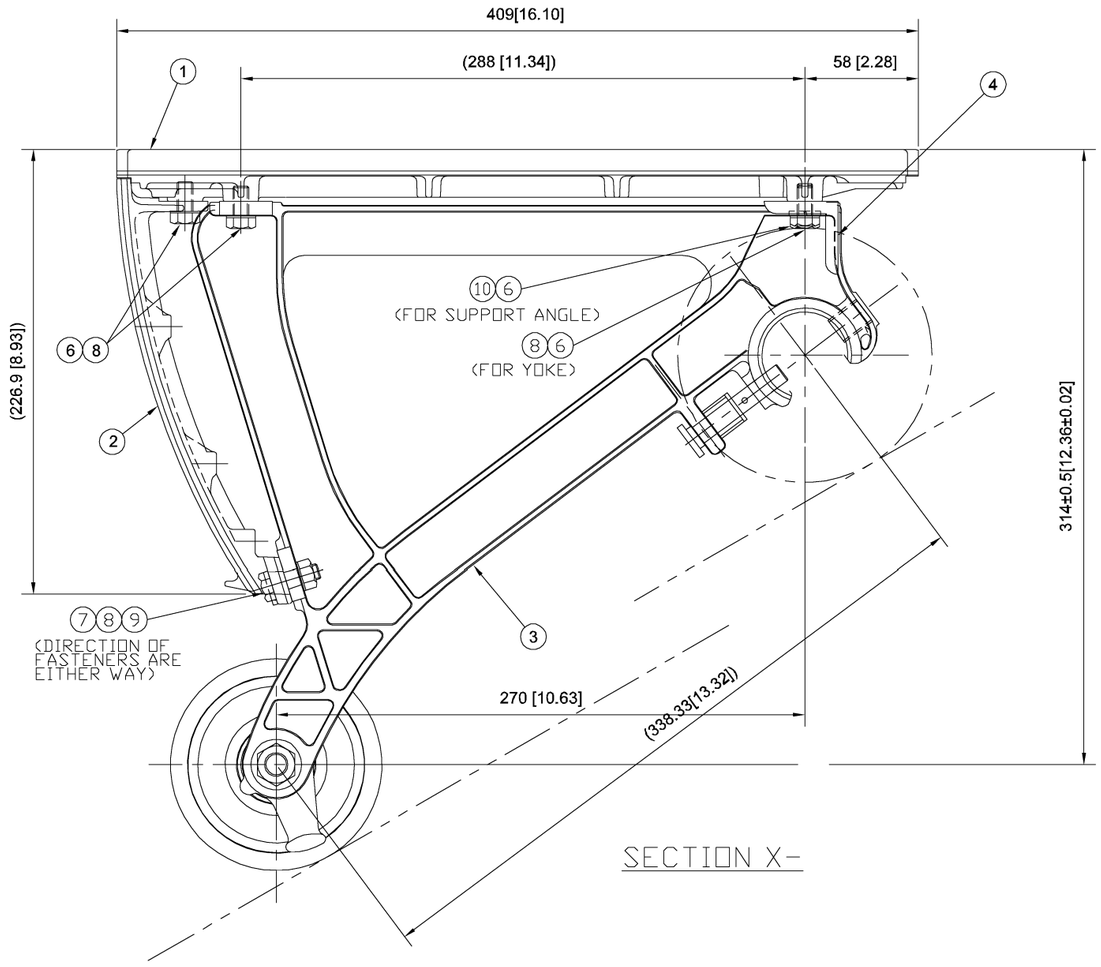
*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN#11987	DATE	APPROVED

STEP ASSEMBLY, 24"
Assembly C63268001

E221,E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236



2" WIDE YELLOW PAINT DEMARCATION ON TREAD



SECTION X-

ALL DIMENSIONS MM [IN]

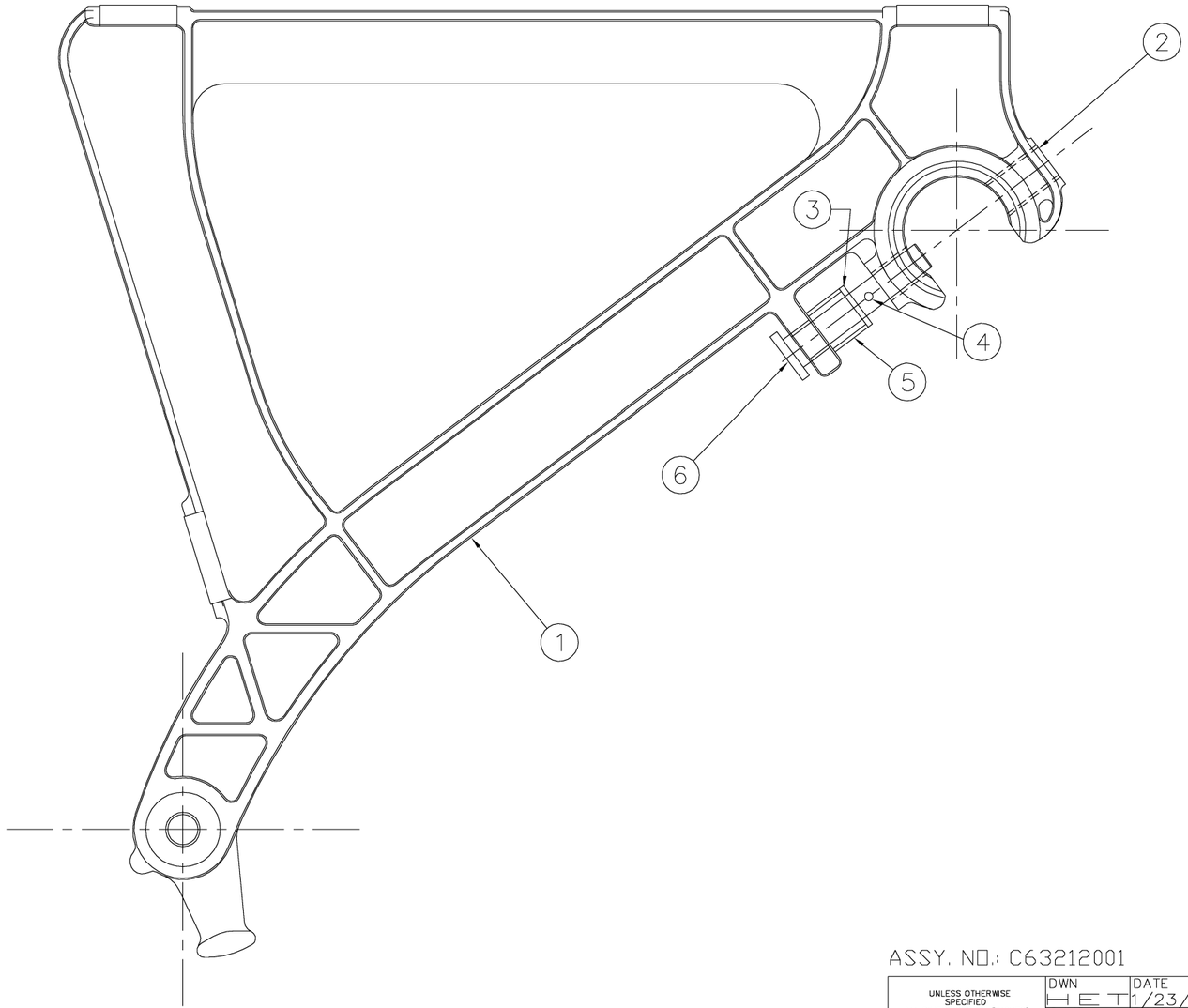
ASSY. NO.: C63268001

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES. [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN SHUPE	DATE 02/09/05	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 02/09/05	
	APVD. SUGIMOTO	DATE 02/09/05	TITLE STEP,ASS'Y,24"WIDE
JOB TITLE	JOB NO. STD		SCALE 1.00:2.00 / SIZE C / DWG. NO. Fig. F-1a / REV. B

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION SDP#2729	DATE	APPROVED

STEP YOKE ASSEMBLY
Assembly C63212001

E221, E222, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236



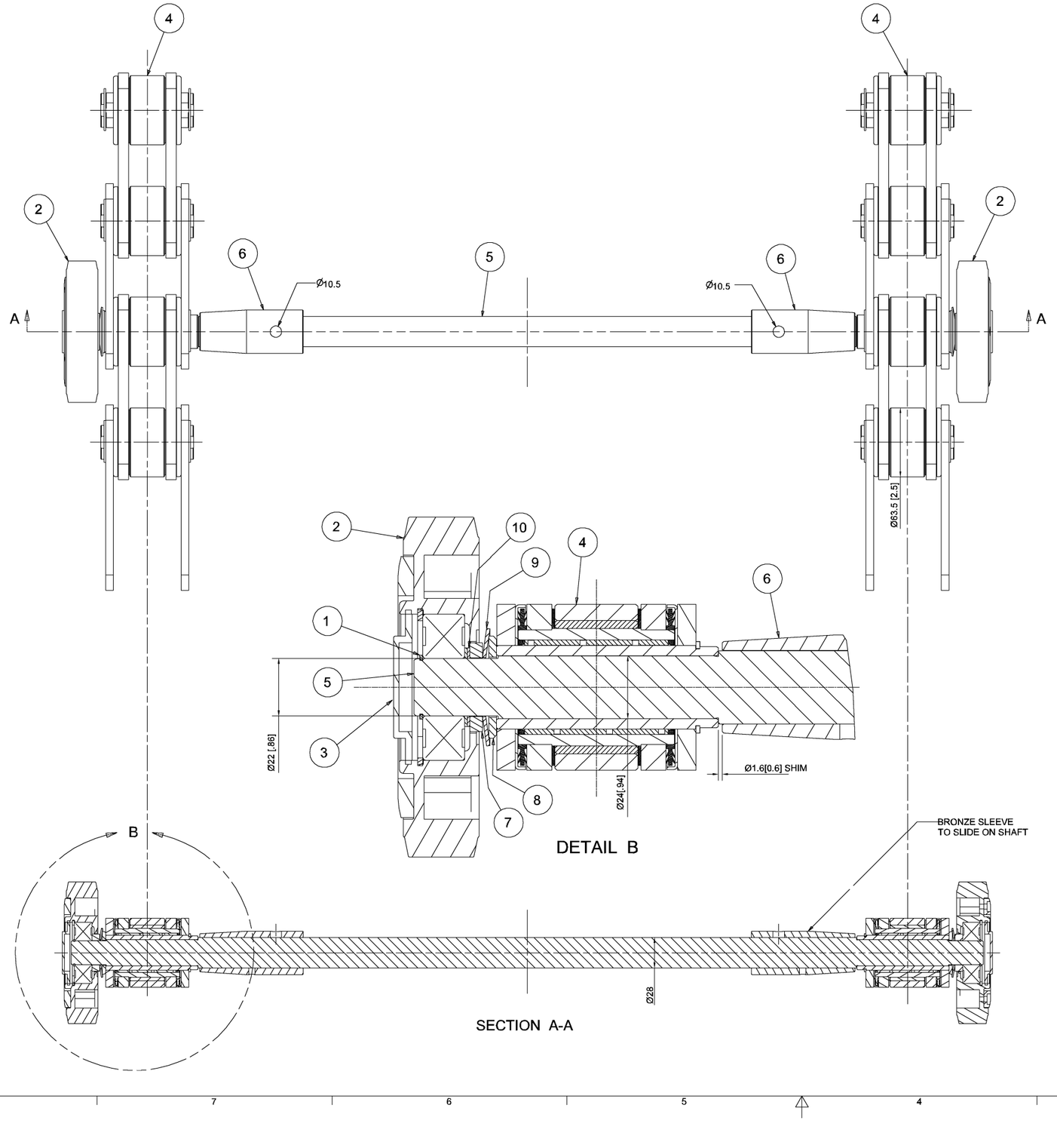
ASSY. NO.: C63212001

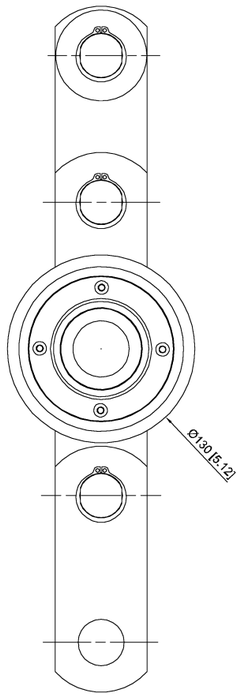
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ±2.5 [.1] ANGLES ±1° [.XX] = ±1 [.04] [.XXX]= ±.3 [.012]	DWN HET DATE 1/23/03 CHKD. JDS DATE 1/23/03 APVD. TSU DATE 1/23/03	FUJITEC AMERICA, INC.	
JOB TITLE	JOB NO. STD	TITLE YOKE,SUB-ASSY	
		SCALE 1.00: 2.00 / SIZE C / DWG. NO. Fig. F-1b	REV. —

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

REVISION HISTORY

REV	DESCRIPTION	ECN NO. 10573	DATE	APPROVED





24" STEP CHAIN ASSEMBLY
36-ton, Lube-Free
Assembly C62K25001 ~ 006

E221,E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

DETAIL B

SECTION A-A

1 STEP CHAIN UNIT SHOWN

PART NO.	NO. OF STEP UNITS	CHAIN LENGTH
C62K25001	1	406.4 [16]
C62K25002	2	812.8 [32]
C62K25003	3	1219.2 [48]
C62K25004	4	1625.6 [64]
C62K25005	5	2032.0 [80]
C62K25006	6	2438.4 [96]

ALL DIMENSIONS MM [IN]

Assembly C62K25001 ~ 6

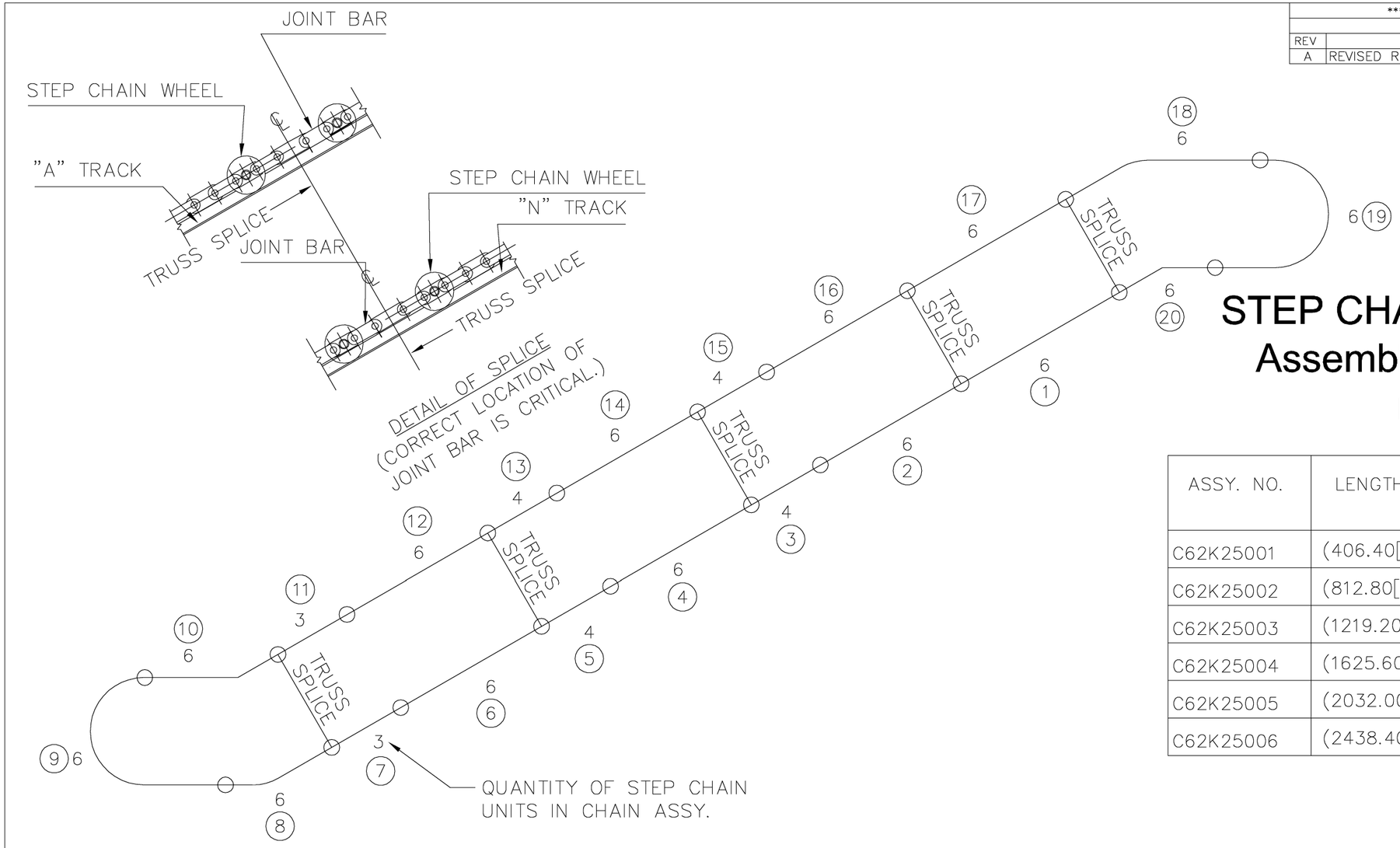
GENERAL TOLERANCE SEE EN-ES-001	DWN: HET	DATE: 12/23/2003
	CHKD: SHUPE	DATE: 12/23/2003
	APVD: APPERSON	DATE: 12/23/2003
JOB TITLE	JOB NO.: STD	

FUJITEC AMERICA, INC.

TITLE: 24" STEP CHAIN ASSY

SCALE	SIZE	DWG. NO.	REV.
(1:2)	B	Fig. F-2a	

*** ACAD -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	REVISED RISE ECN NO. 13534	04/26/06	SHUPE



STEP CHAIN ASSIGNMENT
Assembly C62A1-2881L1
E235, E236

ASSY. NO.	LENGTH (mm[IN])	QTY. OF STEP CHAIN UNITS	QTY.
C62K25001	(406.40[16.000])	1	–
C62K25002	(812.80[32.000])	2	–
C62K25003	(1219.20[48.000])	3	2
C62K25004	(1625.60[64.000])	4	4
C62K25005	(2032.00[80.000])	5	–
C62K25006	(2438.40[96.000])	6	14

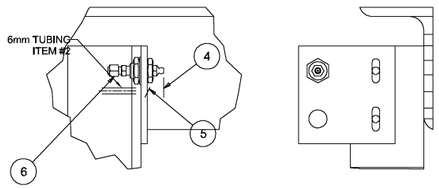
RISE H=8720mm[28'-7 5/16"]

NOTES:
1. THE CIRCLED NUMBERS REPRESENT THE ORDER SEQUENCE FOR CONNECTING THE CHAIN ASSYS.
2. ⊖ REPRESENTS CONNECTING LINK.
3. TOTAL MATCHING TOLERANCE BETWEEN LH & RH LENGTHS SHALL BE LESS THAN OR EQUAL TO 2.44 [0.096"].

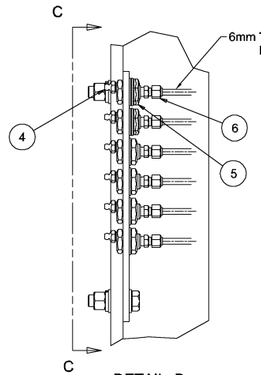
C62A1-2881L1

	DWN SHUPE	DATE 07/06/04	FUJITEC AMERICA, INC.
	CHKD. APPERSON	DATE 07/06/04	TITLE ASSIGNMENT OF STEP CHAIN
	APVD. APPERSON	DATE 07/06/04	
JOB TITLE NYCTA HS	JOB NO. 2881 L01/M01		SCALE NONE / SIZE B / DWG. NO. Fig. F-2b / REV. A

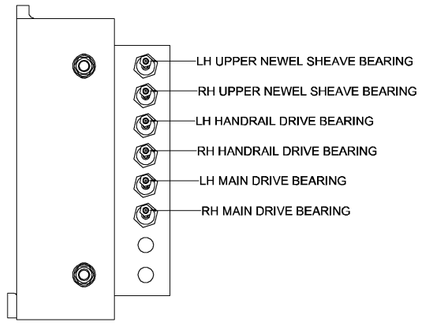
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11840	DATE	APPROVED



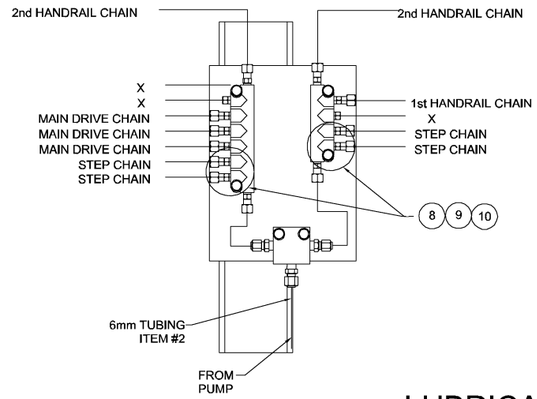
DETAIL F
SCALE 0.33 : 1
(LOWER TRUSS)



DETAIL B
SCALE 1 / 3
(UPPER TRUSS)

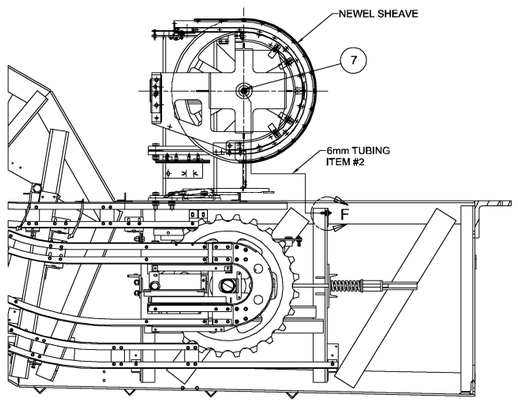


VIEW C-C
SCALE 1 / 3
(UPPER TRUSS)

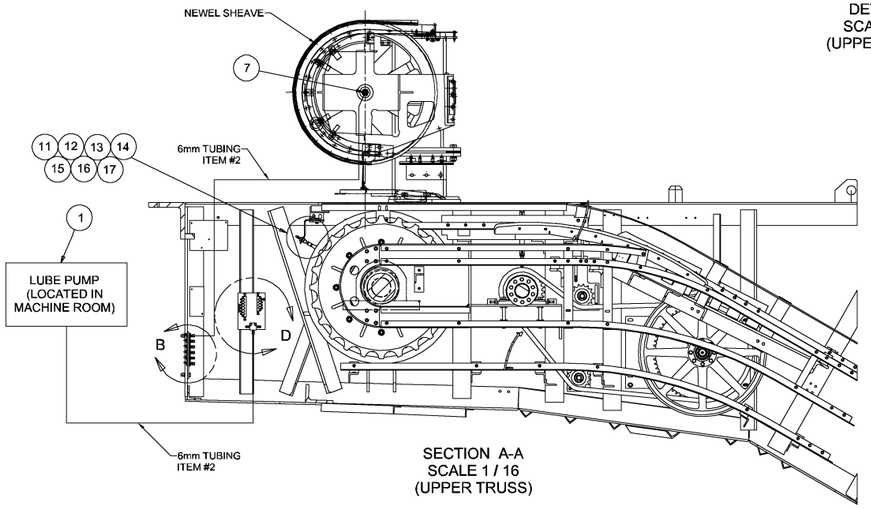


DETAIL D
SCALE 1 / 3
(UPPER TRUSS)

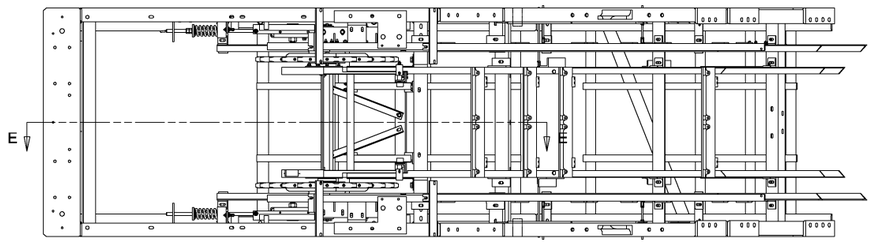
LUBRICATOR INSTALLATION
Assembly A68H1-2881A1
E235, E236



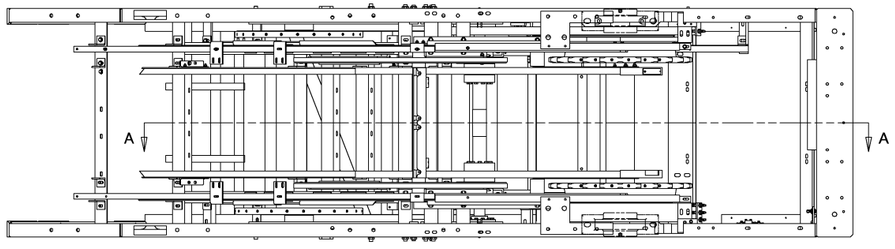
SECTION E-E
SCALE 1 / 16
(LOWER TRUSS)



SECTION A-A
SCALE 1 / 16
(UPPER TRUSS)



LOWER TRUSS



UPPER TRUSS

NOTES:

1.) ITEMS #1~7 ARE CONTAINTED IN KIT #C68491003.

2.) SEE DRAWING #C68491 FOR A SCHEMATIC REPRESENTAION OF THE SYSTEM.

3.) FILL THE GREASE PIPE WITH GREASE (MOBILITH AW2 OR THE EQUIVALENT).

4.) PIPE SADDLES CAN BE LOCATED AS NEEDED TO INSURE STABILITY OF LUBRICATION PIPING. UNLESS OTHERWISE NOTED.

A68H1-2881A1

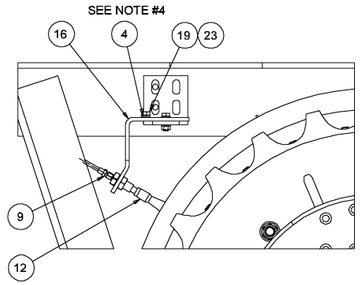
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 12/30/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 12/30/2004	TITLE: LUBRICATOR INSTALLATION	
	APVD. APPERSON	DATE 12/30/2004		
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881		SCALE (1:16)	SIZE D
			DWG. NO. FIG. F-3a	REV. B

*** CAD – MANUAL REVISIONS NOT PERMITTED ***

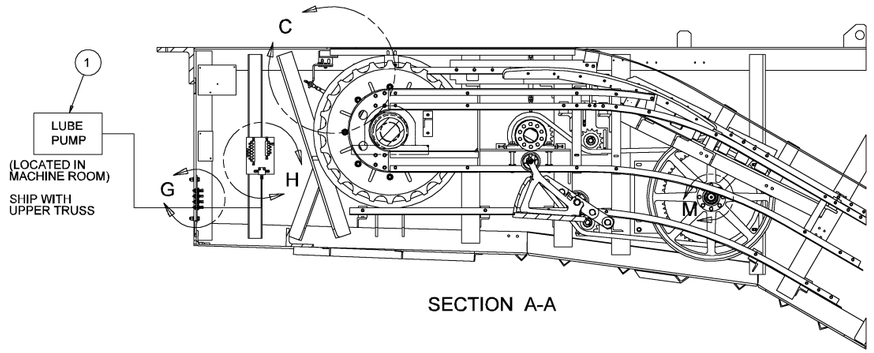
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 11317	DATE	APPROVED

LUBRICATOR ASSEMBLY
Assembly C68H1-2881A2
E235, E236

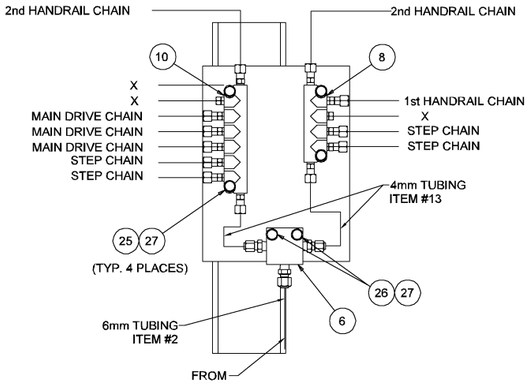


DETAIL C
(MAIN DRIVE CHAIN)

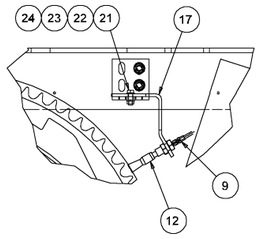


SECTION A-A

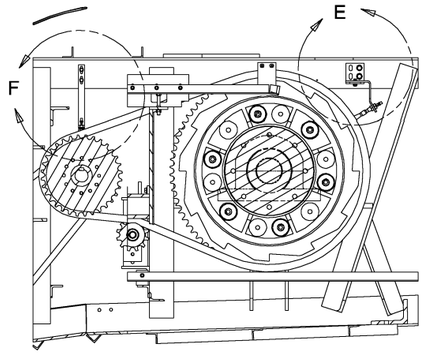
FLOW CONTROLLER



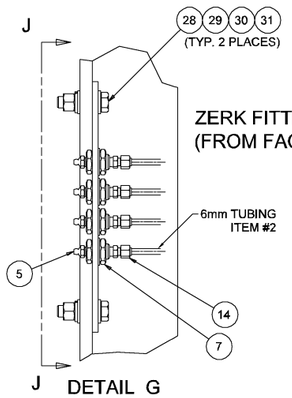
DETAIL H



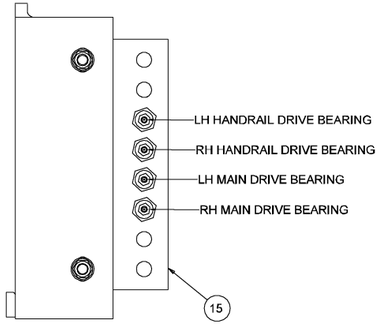
DETAIL E
(HR DRIVE FIRST CHAIN)



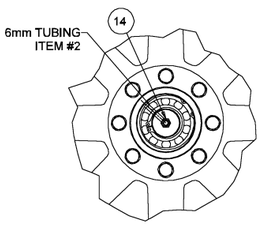
SECTION B-B



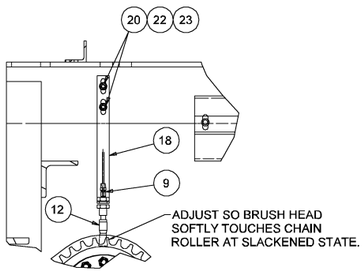
J DETAIL G



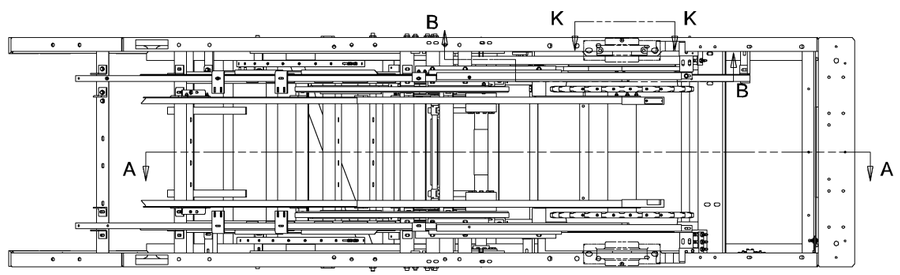
VIEW J-J

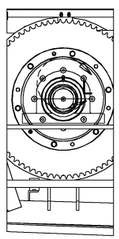


DETAIL M

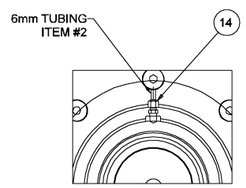


DETAIL F
(HR DRIVE SECOND CHAIN)
2 PLACES





VIEW K-K



DETAIL L

NOTES:

1.) ITEMS #1~14 ARE CONTAINTED IN KIT #C68491003.

2.) SEE DRAWING #C68491 FOR A SCHEMATIC REPRESENTAION OF THE SYSTEM.

3.) FILL THE GREASE PIPE WITH GREASE (MOBILITH AW2 OR THE EQUIVALENT) IN FACTORY.

4.) PIPE SADDLES CAN BE LOCATED AS NEEDED TO INSURE STABILITY OF LUBRICATION PIPING. UNLESS OTHERWISE NOTED.

Assembly C68H1-2881A2

GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 8/13/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/13/2004	TITLE: LUBRICATOR ASSEMBLY
	APVD. APPERSON	DATE 8/13/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881	SCALE (1:16)	SIZE D
		DWG. NO. Fig. F-3b	REV. B

G) BALUSTRADE, INTERIOR PANELS, SKIRTS, NEWEL ENDS, & DECK MOLDING

"A" Molding

See Fig. G-1a for "A" Molding.
Escalator No. E235, E236
Assembly used in: A64B1-2881L1 (HS L01, M01)

"A" MOLDING A64B1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D64A46001	STEEL GUIDE, A MOLDING, UPPER	2	
2	D64735002	STEEL GUIDE,(A)-MOLDING	2	
3	D64B2-2881A1	STEEL GUIDE, (A) MOLDING	2	
4	D64B2-2881E1	STEEL GUIDE, (A) MOLDING	4	
5	D64B2-2881E2	STEEL GUIDE, (A) MOLDING	2	
6	D64B2-2881L1	STEEL GUIDE,(A) MOLDING	2	
	C64BX-2881L1	HARDWARE, A MOLDING, #13~21	1	
13	D00902027	BOLT,HEX,M6(P=1.0)X35,FULL	80	
14	D00903004	NUT,HEX,M6(P=1.0)	80	
15	D00908004	WASHER,LOCK,M6	80	
16	D00907004	WASHER,FLAT,M6	98	
17	D00902038	BOLT,HEX,M8(P=1.25)X50,FULL	84	
18	D00902040	BOLT HEX M8(P=1.25)X75	2	
19	D00902041	BOLT HEX M8(P=1.25)X80	8	
20	D00903005	NUT,HEX,M8(P=1.25)	190	
21	D00908005	WASHER,LOCK,M8	182	
22	D00907006	WASHER,FLAT,M10	284	

See Fig. G-1a for "A" Molding.
Escalator No. E235, E236
Assembly used in: A64B1-2881L1 (HS L01, M01)

"A" MOLDING A64B1-2881L1 (continued)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
	P64B1-2881L1	F/J PARTS, A MOLDING, #51~61	1	
51	C64A81001	UPPER CURVE A MOLDING	1	
52	C64A81002	UPPER CURVE A MOLDING	1	
53	C64B12001	LOWER CURVE A MOLDING	1	
54	C62B12002	LOWER CURVE A MOLDING	1	
55	C64B17001	INCLINE A MOLDING	3	
56	C64B17002	INCLINE A MOLDING	3	
57	C64B60001	INCLINE A MOLDING	2	
58	C64B60002	INCLINE A MOLDING	2	
59	C64B4-2881L1	INCLINE A MOLDING	1	
60	C64B4-2881L2	INCLINE A MOLDING	1	

"B" Molding

See Fig. G-2a for "B" Molding.
Escalator No. E235, E236
Assembly used in: A64C1-2881L1 (HS L01, M01)

"B" MOLDING A64C1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00956004	SCREW, TMPRPRF, FL/ HD, M4 (P=0.7	122	
2	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	44	
3	D00903005	NUT, HEX, M8 (1.25)	44	
4	D00907005	WASHER,FLAT,M8	88	
5	D00908005	WASHER,LOCK,M8	44	
6	C64A42001	BRACKET, B-MOLDING, ASSY	4	
7	C64A40001	BRACKET, B-MOLDING, ASSY	20	
8	D64A13001	RUBBER, B-MOLDING	140 FT	
9	D64A11001	CAP, (B) MOLDING	2	
10	D64A11002	CAP, (B) MOLDING	2	
	P64C1-2881L1	F/J PARTS KIT, B MOLDING, #51~61	1	
51	C64A33001	B-MOLDING, NEWEL, ASSY	1	
52	C64A33002	B-MOLDING, NEWEL, ASSY	1	
53	C64A35001	B-MOLDING, NEWEL, ASSY	1	
54	C64A35002	B-MOLDING, NEWEL, ASSY	1	
55	C64A36001	B-MOLDING, LOWER, ASSY	1	
56	C64A36002	B-MOLDING, LOWER, ASSY	1	
57	C64A34001	B-MOLDING, UPPER, ASSY	1	
58	C64A34002	B-MOLDING, UPPER, ASSY	1	
59	C64A32001	B-MOLDING, INCLINE, ASSY	12	
60	C64C2-2881L1	B-MOLDING, INCLINE, ASSY	1	
61	C64C2-2881L2	B-MOLDING, INCLINE, ASSY	1	

Newel Molding

See Fig. G-3a for Newel Molding.
Escalator No. E235, E236
Assembly used in: A64R1-2881E1 (HS L01, M01)

NEWEL MOLDING A64R1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00902026	BOLT, HEX, M6 (P=1.00) X 25	6	
2	D00902048	BOLT, HEX, M10 (P=1.50) X 25	4	
3	D00902088	BOLT, HEX, M20 (P=2.5) X 50, FULL	6	
4	D00902090	BOLT, HEX, M20 (P=2.5) X 80, FULL	12	
5	D00903004	NUT, HEX, M6 (P=1.0)	4	
6	D00903009	NUT, HEX, M20 (P=2.5)	12	
7	D00907004	WASHER,FLAT,M6	2	
8	D00907006	WASHER,FLAT,M10	4	
9	D00907009	WASHER,FLAT,M20	30	
10	D00908004	WASHER,LOCK,M6	6	
11	D00908006	WASHER,LOCK,M10	4	
12	D00908009	WASHER,LOCK,M20	18	
13	D00931004	SASH SCREW, M4 X 16, STAINLESS	2	
14	D00002005	WASHER, FLAT, NARROW, 5/16	8	
15	D61017003	SHIM (50% EXTRA)	48	
16	D61017004	SHIM (50% EXTRA)	60	
	P64R1-2881E1	F/J PARTS, #51~58		
51	C64R2-2881E2	NEWEL MOLDING, ASS"Y	1	
52	C64R2-2881E1	NEWEL MOLDING, ASS"Y	1	
53	D64A80001	FRONT PANEL, NEWEL MOLDING	1	
54	D64A80002	FRONT PANEL, NEWEL MOLDING	1	
55	D64A72001	STAND	1	
56	D64A72002	STAND	1	
57	C64568001	STEEL GUIDE, ASS"Y	2	
58	D64R3-2881E1	BRACKET, NEWEL MOLDING	2	

Newel Molding Assembly

See Fig. G-3b for Newel Molding Assembly.
Escalator No. E235, E236
Assembly used in: C64R2-2881E1 and C64R2-2881E2 (HS L01, M01)

NEWEL ASSEMBLY C64R2-2881E1 & C64R2-2881E2					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY E1**	**QTY E2**
1	C64A62001	NEWEL STAND		1	-
1	C64A62002	NEWEL STAND		-	1
2	C64534002	SHEAVE, NEWEL MOLDING		1	1
3	D64536001	HUB, NEWEL MOLDING		1	1
4	D64537001	SPACER, NEWEL MOLDING		1	1
5	D64538001	SPACER, NEWEL MOLDING		1	1
6	D64803001	PLATE, NEWEL MOLDING		1	-
6	D64803002	PLATE, NEWEL MOLDING		-	1
7	C64A76001	NEWEL MOLDING, OUTSIDE, ASS"Y		1	-
7	C64A77001	NEWEL MOLDING, OUTSIDE, ASS"Y		-	1
8	C64A54001	NEWEL MOLDING, INSIDE, ASS"Y		1	-
8	C64A54002	NEWEL MOLDING, INSIDE, ASS"Y		-	1
9	D64A69001	BRACKET, NEWEL MOLDING		1	1
10	D64A71001	BRACKET, NEWEL MOLDING		-	1
11	D64R2-2881E3	BRACKET, NEWEL MOLDING		1	-
11	D64R2-2881E4	BRACKET, NEWEL MOLDING		-	1
12	D64559001	BRACKET, NEWEL MOLDING		1	-
12	D64559002	BRACKET, NEWEL MOLDING		-	1
13	D64560001	BRACKET, NEWEL MOLDING		1	-
13	D64560002	BRACKET, NEWEL MOLDING		-	1
14	D64A67001	BRACKET, NEWEL MOLDING		1	1
15	D64A68001	BRACKET, NEWEL MOLDING		1	-
15	D64A68002	BRACKET, NEWEL MOLDING		-	1
16	D64563001	PLATE, NEWEL MOLDING		1	1

See Fig. G-3b for Newel Molding Assembly.
Escalator No. E235, E236
Assembly used in: C64R2-2881E1 and C64R2-2881E2 (HS L01, M01)

NEWEL ASSEMBLY C64R2-2881E1 & C64R2-2881E2 (continued)					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY E1**	**QTY E2**
17	D64564001	BRACKET, NEWEL MOLDING		1	-
17	D64564002	BRACKET, NEWEL MOLDING		-	1
18	D64565001	BRACKET, NEWEL MOLDING		1	1
19	D64566001	BRACKET, NEWEL MOLDING		1	1
20	D64A70001	BRACKET, NEWEL MOLDING		4	4
21	C64A60001	BRACKET, NEWEL MOLDING		2	2
23	D64507001	SPACER, NEWEL STAND		1	1
24	(Z391C49)	SHIMS(SUS304)		5	5
25	(Z391C50)	SHIMS(SUS304)		28	28
26		CIRCLIP(R-110)		2	2
27		SEAL NOK T.C. TYPE AAE3842A0	JIS, # D8511013	1	1
28		V-RING(V-70A)		1	1
29		BEARING	NSK, #6212DU	2	2
30	D68057004	GREASE FITTING		1	1
31		U-NUT M24 (FINE THREAD P=2)		1	1
32		HB12x35		6	6
33		SASH M4x10(D=6)		15	15
34		B6x16		8	8
35		B6x20		12	12
36		B6x25		4	4
37		B6x50		4	4
38		P6x35(SUS304)		2	2
39		M6N1		28	28
40		M6 LOCK WASHER		34	34
41		M6 FLAT WASHER		10	10

See Fig. G-3b for Newel Molding Assembly.
Escalator No. E235, E236
Assembly used in: C64R2-2881E1 and C64R2-2881E2 (HS L01, M01)

NEWEL ASSEMBLY C64R2-2881E1 & C64R2-2881E2 (continued)					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY E1**	**QTY E2**
42	(Z391B22)	SHIMS		38	38
44		B8x80		1	1
45		B8x20		4	4
46		B8x40		1	1
47		M8N1		2	2
48		M8 LOCK WASHER		6	6
49		M8 FLAT WASHER		4	4
50		B10x20		2	2
51		B10x40		11	11
52		M10N1		9	9
53		M10 LOCK WASHER		13	13
54		M10 FLAT WASHER		24	24
55		M10 TWA		2	2
57	D64A73001	BRACKET, NEWEL MOLDING		1	1
58	D64A74001	BRACKET,(NEWEL)MOLDING		1	1
59	D64A75001	BRACKET, NEWEL MOLDING		1	-
60		P6x40(SUS304)		2	2

Interior Panels

See Fig. G-4a for Interior Panels.
Escalator No. E235, E236
Assembly used in: A64K1-2881L1 (HS L01, M01)

INTERIOR PANEL A64K1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C64K1-2881E1	INTERIOR PANEL, NEWEL, LOWER	1	
2	C64K1-2881E2	INTERIOR PANEL, NEWEL, LOWER	1	
3	C64K1-2881E3	INTERIOR PANEL, NEWEL, UPPER	1	
4	C64K1-2881E4	INTERIOR PANEL, NEWEL, UPPER	1	
5	C64K1-2881E5	INTERIOR PANEL, LOWER TRANSITION	1	
6	C64K1-2881E6	INTERIOR PANEL, LOWER TRANSITION	1	
7	C64K1-2881E7	INTERIOR PANEL , UPPER TRANSITION	1	
8	C64K1-2881E8	INTERIOR PANEL, UPPER TRANSITION	1	
9	C64K1-2881E9	INTERIOR PANEL, INCLINE	20	
10	C64K1-2881L0	INTERIOR PANEL, INCLINE	4	
11	D64K5-2881E1	PLATE	2	
12	D64K5-2881E2	PLATE	2	
	A64KX-2881L1	KIT, HARDWARE	1	
13	D64411001	MOLDING,INTERIOR PANEL	4	
14	D00902033	BOLT,HEX,M8(P=1.25)X25,FULL	16	
15	D00903005	NUT,HEX,M8(P=1.25)	16	
16	D00907005	WASHER,FLAT,M8	32	
17	D00908005	WASHER,LOCK,M8	16	
18	D00904019	M4 X 8 (P=0.7) PAN/PH MS	26	
19	D00908002	WASHER,LOCK,M4	26	
20	D64A52001	CARRIAGE BOLT,M6x25	130	
21	D64A52002	CARRIAGE BOLT,M6x55	4	

Skirt Panels

See Fig. G-5a for Skirt Panels.
Escalator No. E235, E236
Assembly used in: A64M1-2881L1 (HS L01, M01)

SKIRT PANEL A64M1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C64M2-2881E1	SKIRT PANEL ASSY, LOWER CURVE LH	1	
2	C64M2-2881E2	SKIRT PANEL ASSY, LOWER CURVE RH	1	
3	C64M2-2881E3	SKIRT PANEL ASSY, UPPER CURVE LH	1	
4	C64M2-2881E4	SKIRT PANEL ASSY, UPPER CURVE RH	1	
5	C64M2-2881E5	SKIRT PANEL ASSY, INCLINE 2400 LH	5	
6	C64M2-2881E6	SKIRT PANEL ASSY, INCLINE 2400 RH	5	
7	C64M2-2881L7	SKIRT PANEL ASSY, INCLINE 1370 LH	2	
8	C64M2-2881L8	SKIRT PANEL ASSY, INCLINE 1370 RH	2	
9	C64M2-2881E9	SKIRT PANEL ASSY, INCLINE 1150 LH	1	
10	C64M2-2881E0	SKIRT PANEL ASSY, INCLINE 1150 RH	1	
	C64MX-2881L1	KIT, HARDWARE, #11~15	1	
11	D00931005	SCREW,MACHINE,SASH,M4*16,BLACK	56	
12	D00956001	SCREW,TMPRPRF,FL/HD,M3X16	18	
13	D00903001	NUT,HEX,M3(P=0.5)	18	
14	D00907002	WASHER,FLAT,M4	18	
15	D00908001	WASHER,LOCK,M3	18	

Newel Skirt Panel

See Fig. G-6 for Newel Skirt Panel.
Escalator No. E235, E236
Assembly used in: A64N1-2881E1 (HS L01, M01)

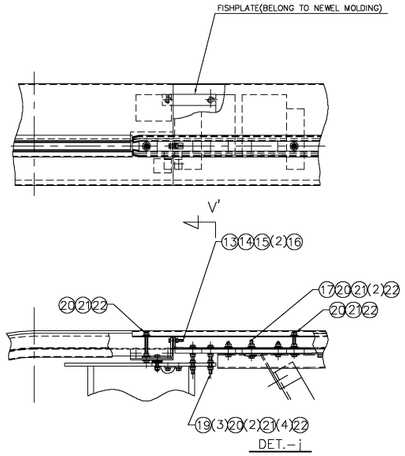
NEWEL SKIRT PANEL A64N1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C64N2-2881E1	PANEL ASSY, NEWEL SKIRT	2	
2	C64N2-2881E2	PANEL ASSY, NEWEL SKIRT	2	
3	D64616001	BRACKET,NEWEL SKIRT PANEL	2	
4	D64617001	BRACKET,NEWEL SKIRT PANEL	2	
5	D64618001	BRACKET,NEWEL SKIRT PANEL	4	
	C64NX-2881E1	KIT, HARDWARE, #6~12	1	
6	D00902032	BOLT,HEX,M8(P=1.25)X20,FULL	8	
7	D00908005	WASHER,LOCK,M8	8	
8	D00907005	WASHER,FLAT,M8	8	
9	D00902025	BOLT,HEX,M6(P=1.0)X20,FULL	8	
10	D00908004	WASHER,LOCK,M6	8	
11	D00907004	WASHER,FLAT,M6	8	
12	D00931005	SCREW,MACHINE,SASH,M4*16,BLACK	24	

Skirt Brushes

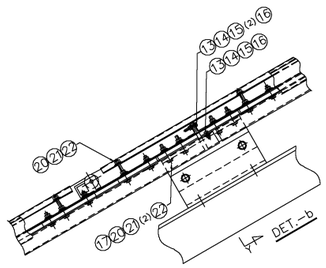
See Fig. G-7a for Skirt Brushes.
Escalator No. E235, E236
Assembly used in: A64T1-2881L1 and A64T1-2881L2 (HS L01, M01)

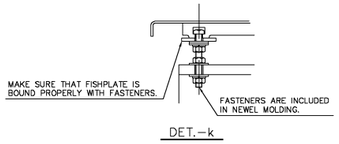
*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION		DATE	APPROVED
A	QTY WAS (14) NOW (4)	ECN NO. 13747	07/12/06	SHUPE

"A" MOLDING INSTALLATION
Assembly A64B1-2881L1
E235, E236

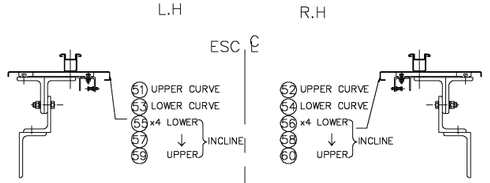


DET.–j

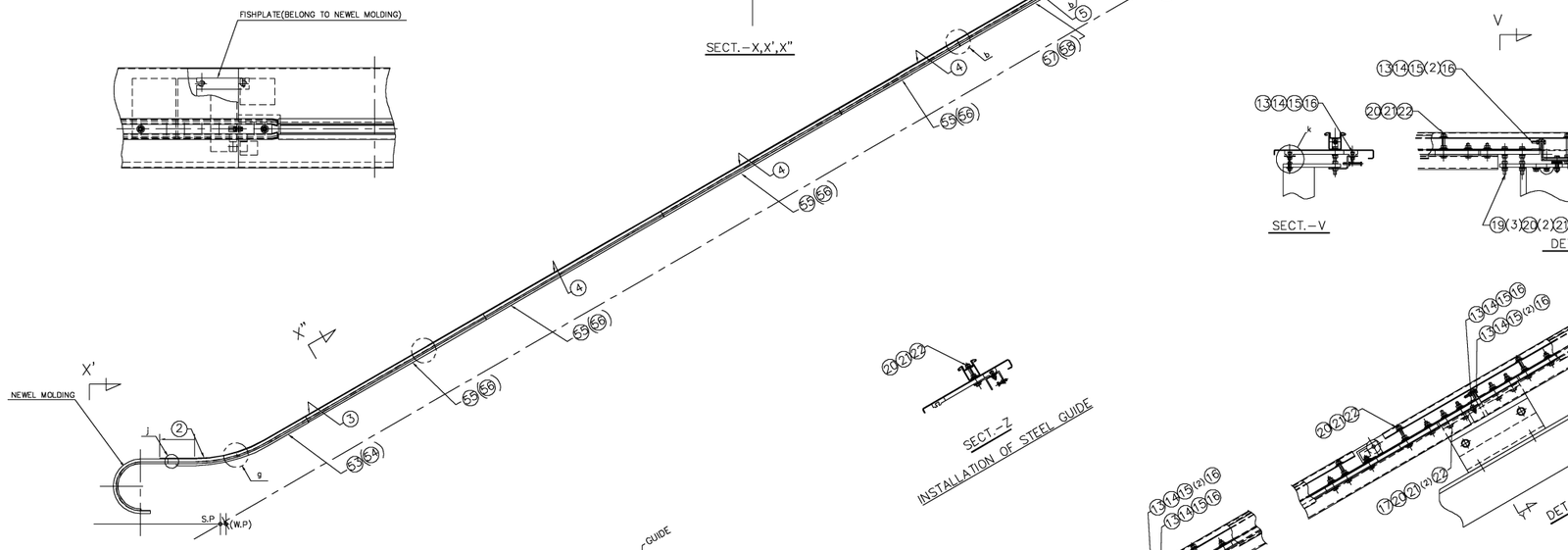


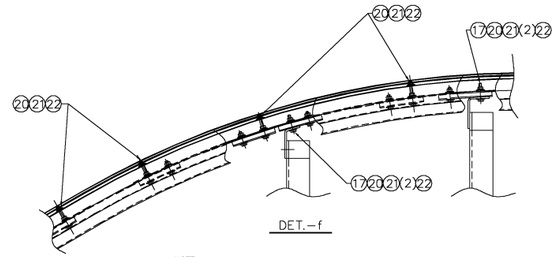


DET.–k



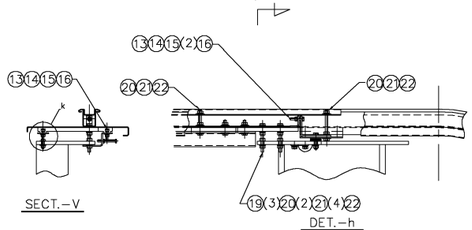
SECT.–X,X',X"





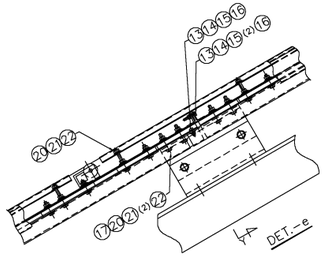
DET.–f

NOTE:
IN CASE THAT UPPER CURVE A-MOLDING (ITEM No. 51 & 52) COMES WITH STEEL ROLLER GUIDES, REMOVE ALL OF THEM AND CHANGE M8 BOLT LENGTH AS PER DRAWING, N64B2-2881E1.

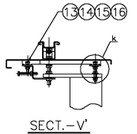


SECT.–V
DET.–h

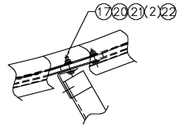
SECT.–Z
INSTALLATION OF STEEL GUIDE



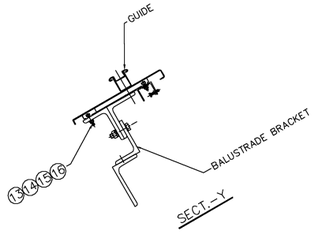
DET.–e



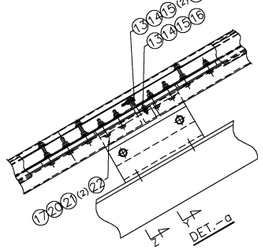
SECT.–V'



DET.–g



SECT.–Y



DET.–g

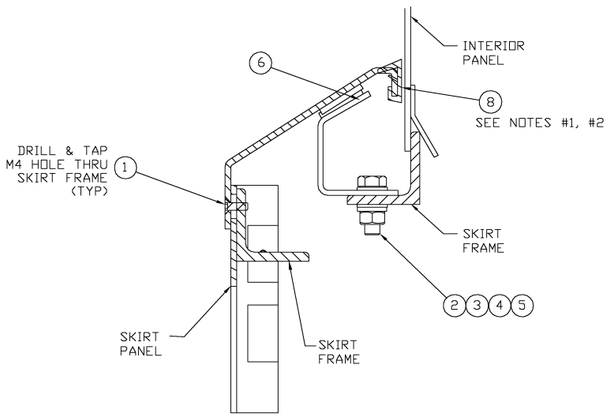
NOTE:
1. KIT, HARDWARE C64BX-2881L1 ITEMS (13) ~ (21) ARE INCLUDED

ASSY. NO: A64B1-2881L1

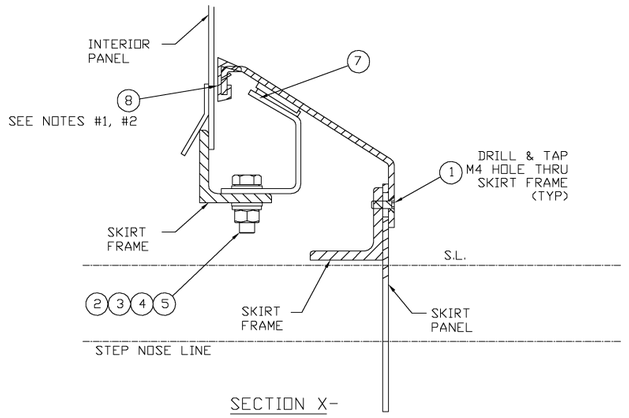
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ±1°	DWN HARPER	DATE 11/14/05	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 11/14/05	
	APVD. SUGIMOTO	DATE 11/14/05	TITLE (A) MOLDING, INST
JOB TITLE NYCTA HS	JOB NO. 2881 L/M	SCALE 1.0=40.0	SIZE D / DWG. NO. Fig. G-1a / REV. A

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN#13188	DATE	APPROVED

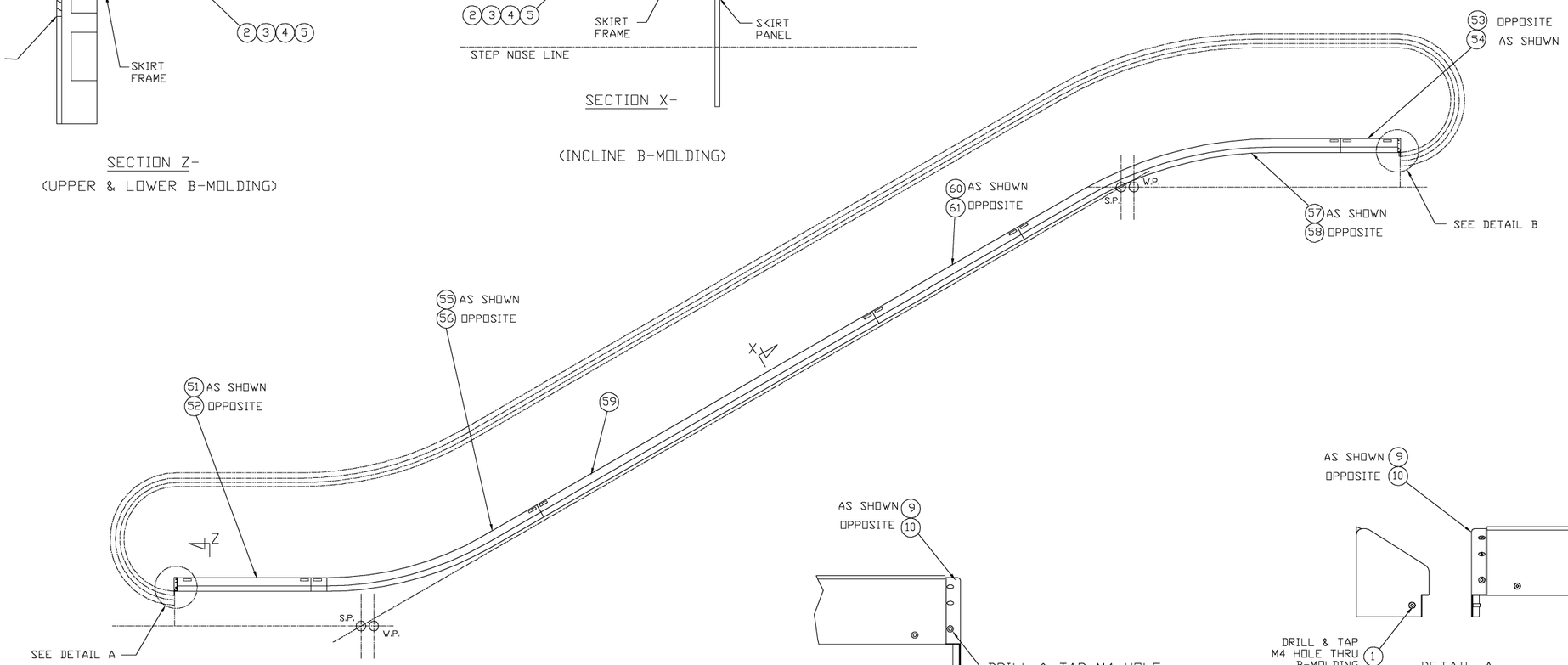
"B" MOLDING INSTALLATION
Assembly A64C1-2881L1
E235, E236

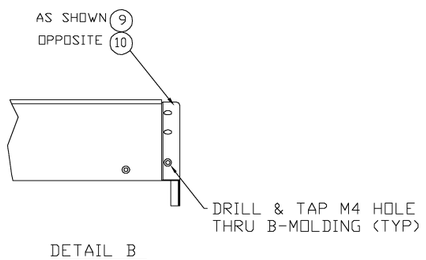


SECTION Z-
(UPPER & LOWER B-MOLDING)

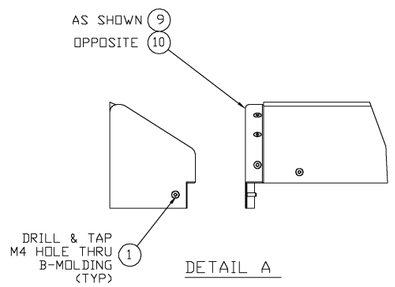


SECTION X-
(INCLINE B-MOLDING)





DETAIL B



DETAIL A

NOTES:

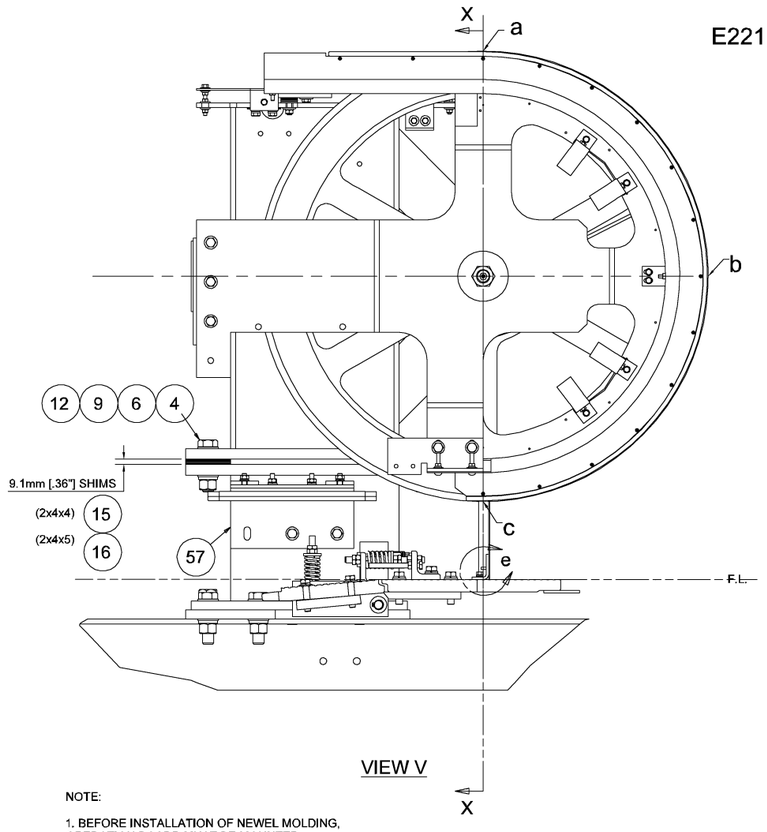
1.) CUT RUBBER AT B-MOLDING JOINTS.
2.) ATTACH RUBBER MOLDING WITH DEVCON ZIP GRIP HV2200 ADHESIVE OR EQUIVALENT.
3.) ALL HARDWARE LOCATED IN KIT, HARDWARE C64BX-2881L1.

INST. NO. : A64C1-2881L1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ±2.5 [.1] ANGLES [.XX] = ±1 [.04] ±1° [.XXX]= ±.3 [.012]	DWN SHUPE	DATE 01/04/06	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 01/04/06	
	APVD. SHUPE	DATE 01/04/06	TITLE: B MOLDING, INST.
JOB TITLE: NYCTA	JOB NO. 2881		SCALE 1.00=15.0 / SIZE D / DWG. NO. Fig. G-2a / REV. —

*** CAD – MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN NO.	DATE	APPROVED

NEWEL MOLDING INSTALLATION
Assembly A64R1-2881E1
E221, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236

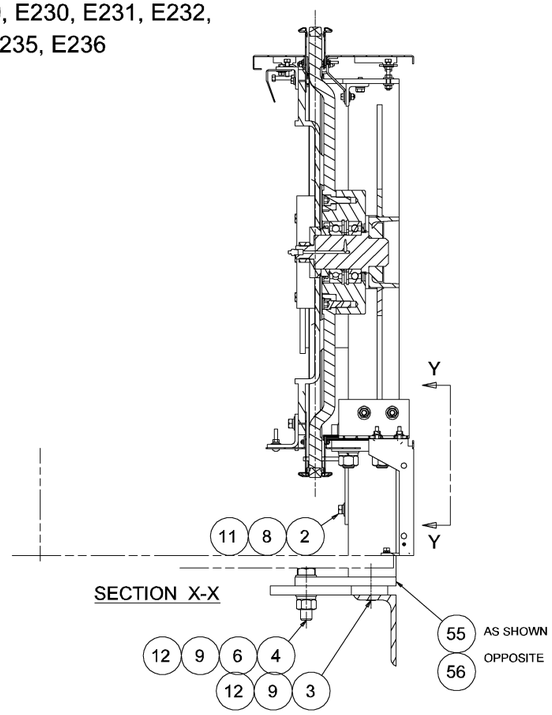


VIEW V

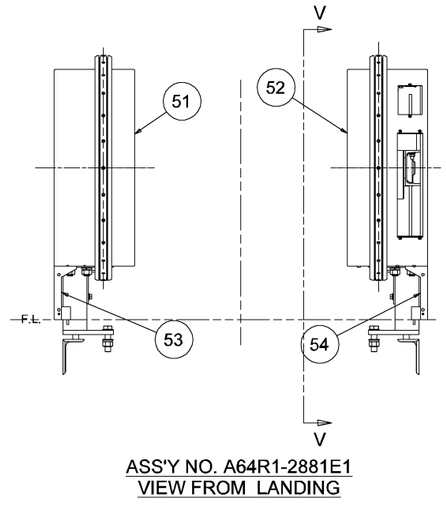
X

NOTE:

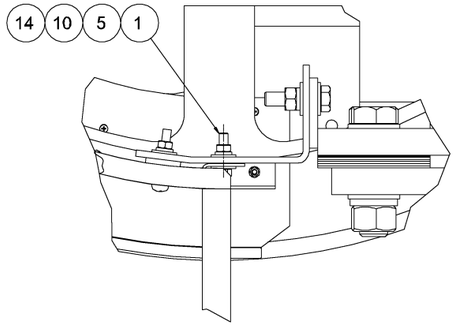
1. BEFORE INSTALLATION OF NEWEL MOLDING, OPERATION BOARD MUST BE MOUNTED.



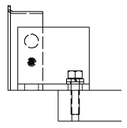
SECTION X-X



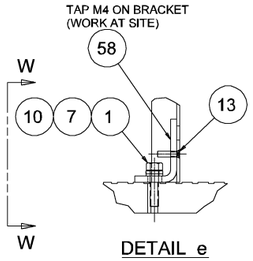
ASS'Y NO. A64R1-2881E1
VIEW FROM LANDING



VIEW Y-Y



VIEW W-W



DETAIL e

Assembly A64R1-2881E1

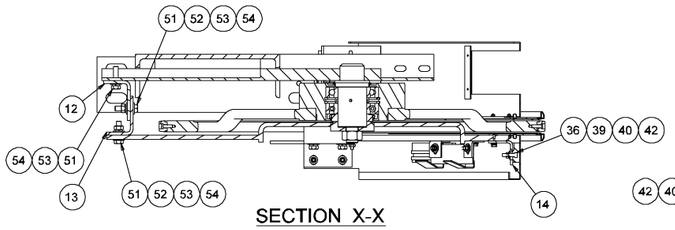
GENERAL TOLERANCE SEE EN-ES-001	DWN. KADONO DATE 6/25/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE DATE 6/25/2004	TITLE	NEWEL MOLDING, INST.
	APVD. APPERSON DATE 6/25/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881	SCALE (1:10) SIZE D	DWG. NO. Fig. G-3a REV. A

REVISION HISTORY				
REV	DESCRIPTION	SDP NO.	DATE	APPROVED
A	REDRAWN IN INVENTOR	ECN NO. 11817	1/25/05	MILLER

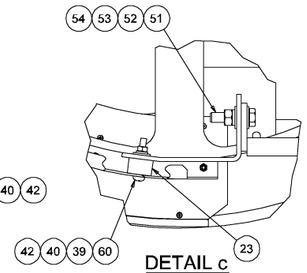
*** CAD – MANUAL REVISIONS NOT PERMITTED ***

NEWEL MOLDING ASSEMBLY
Assembly C64R2-2881E1 and C64R2-2881E2

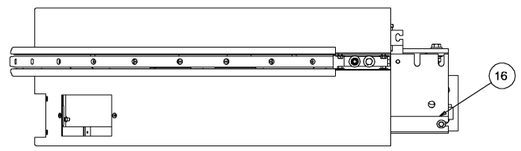
E221, E223, E224, E229, E230, E231, E232,
E233, E234, E235, E236

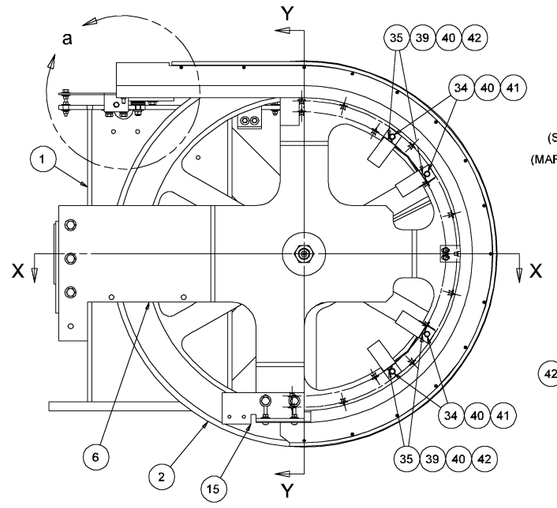


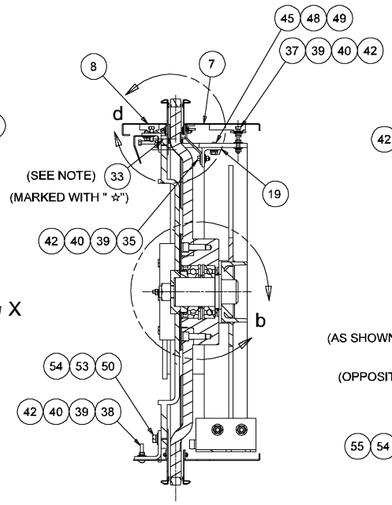
SECTION X-X



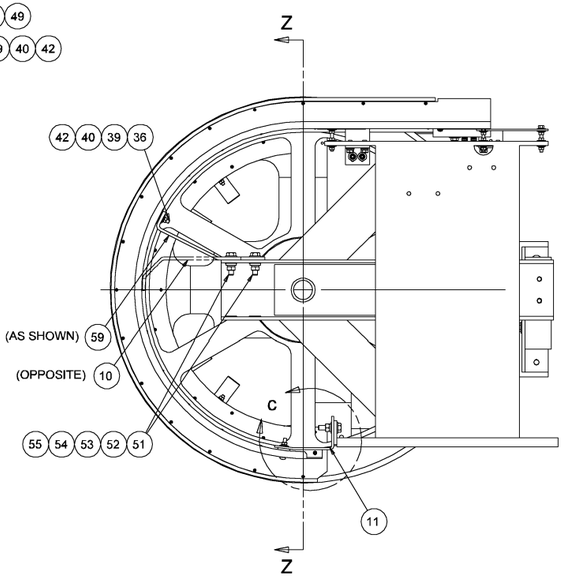
DETAIL c

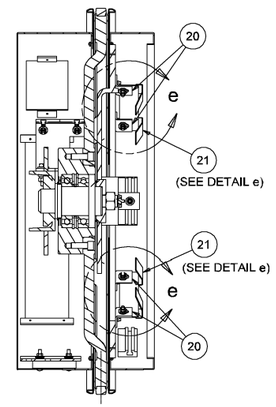




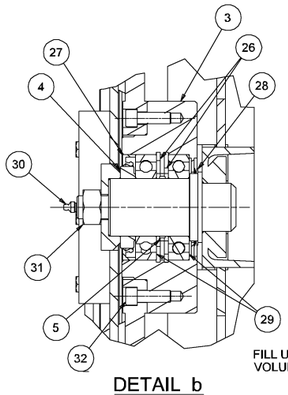


SECTION Y-Y



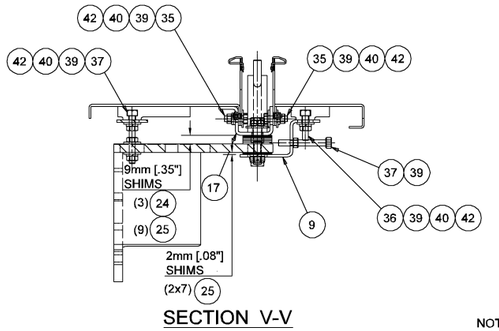


SECTION Z-Z

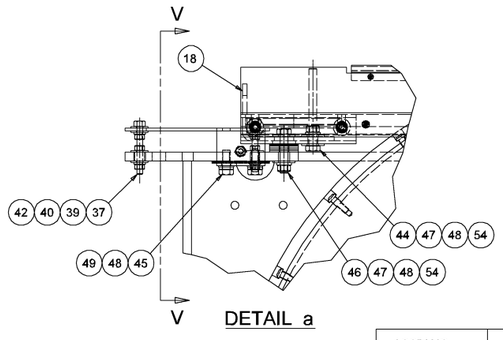


FILL UP 90% OF CHAMBER VOLUME WITH GREASE.

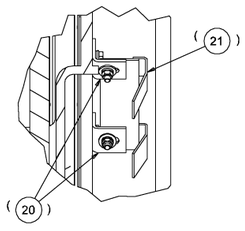
DETAIL b



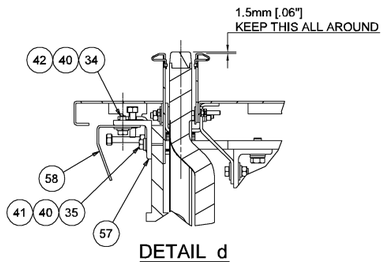
SECTION V-V



DETAIL a



DETAIL e
(SET AS SHOWN ABOVE)



DETAIL d

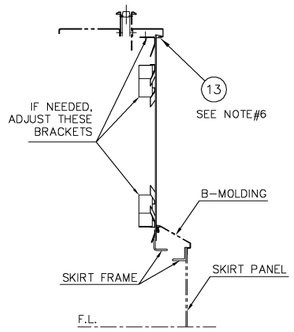
ASS'Y NO.	FORM
C64R2-2881E1	AS SHOWN
C64R2-2881E2	OPPOSITE

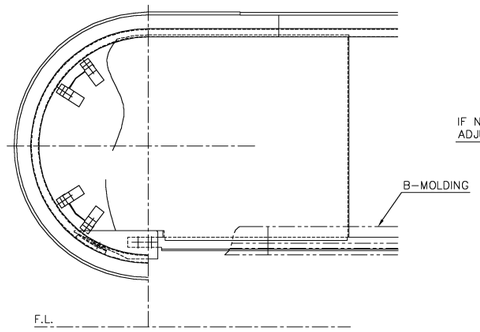
NOTE:
APPLY GLUE TO SPECIFIED FASTENERS TO PREVENT LOOSENING.
(TB1401B (THREE BOND) or EQUIVALENT)

Assembly C64R2-2881E1 and C64R2-2881E2 — MANUFACTURED BY F/J

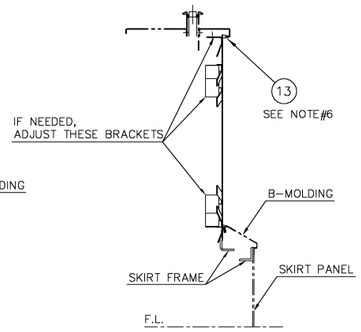
GENERAL TOLERANCE	DWN KADONO	DATE 06/25/04	FUJITEC AMERICA, INC.
SEE TN NO.	CHKD. SHUPE	DATE 06/25/04	TITLE: NEWEL MOLDING, ASS'Y
TN-K2-0014	APVD. APPERSON	DATE 06/25/04	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881		SCALE (1:6) / SIZE D / DWG. NO. Fig. G-3b / REV. A

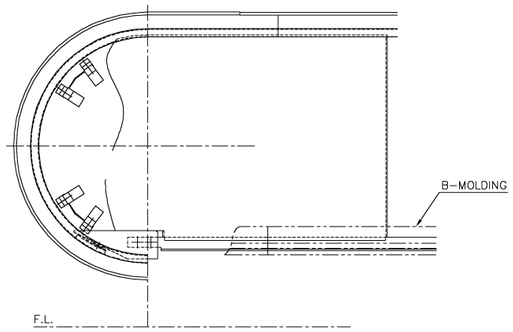
AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED				
REVISION HISTORY				ECN# 13345
REV		DESCRIPTION	DATE	APPROVED
A	A1	REVISED QTY RELEASED OF ECN NO. 13390	02/27/06	SHUPE



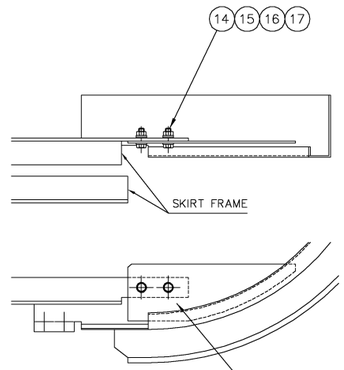


DETAIL OF LOWER NEWEL SECTION





DETAIL OF UPPER NEWEL SECTION

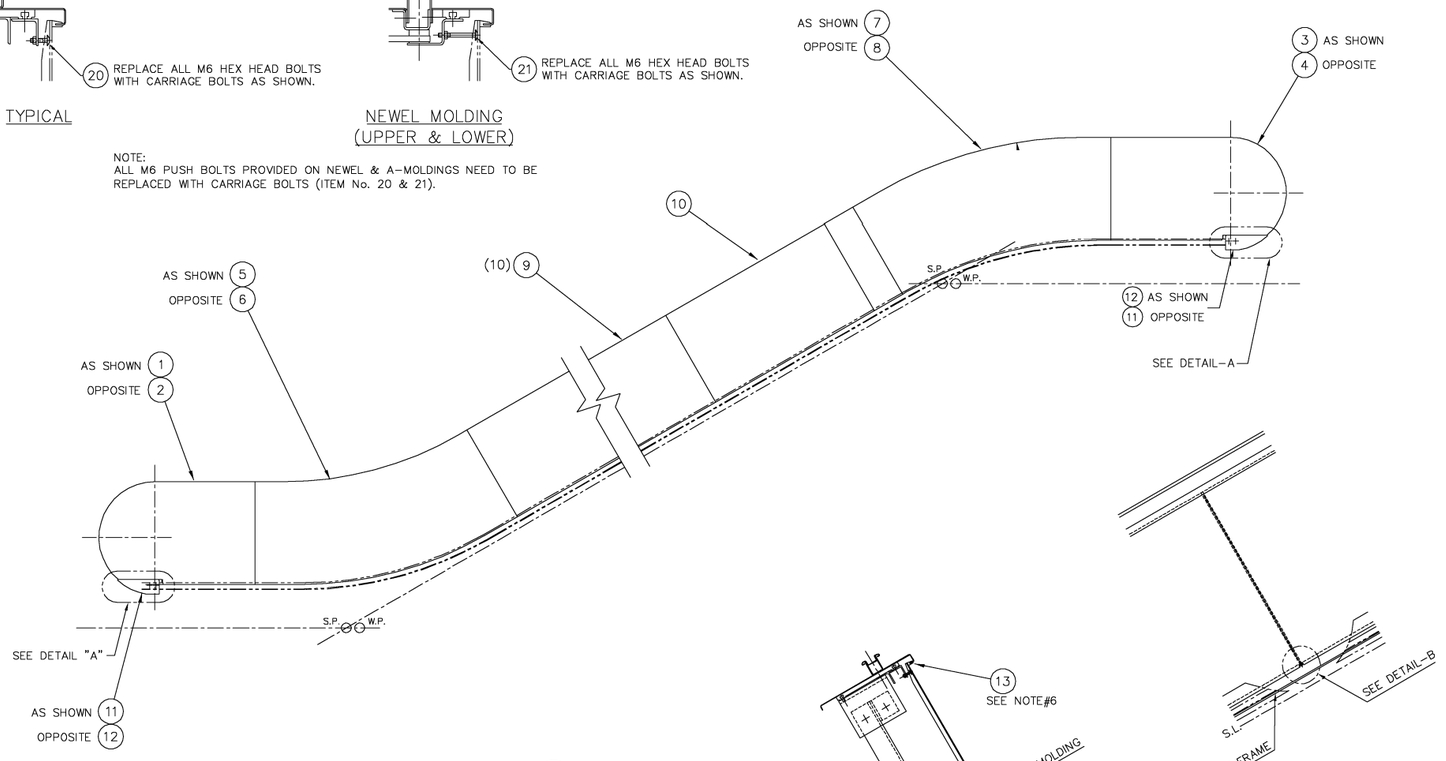


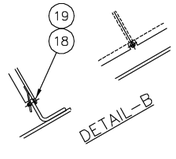
DETAIL-A

TYPICAL

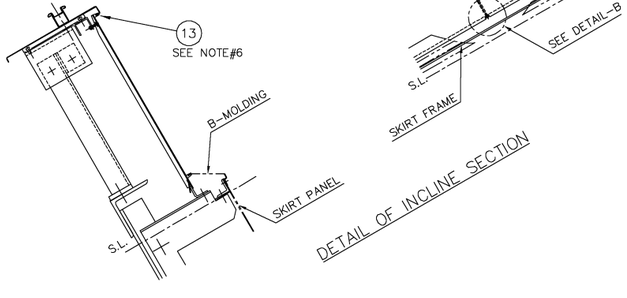
NEWEL MOLDING (UPPER & LOWER)

NOTE:
ALL M6 PUSH BOLTS PROVIDED ON NEWEL & A-MOLDINGS NEED TO BE REPLACED WITH CARRIAGE BOLTS (ITEM No. 20 & 21).





DETAIL-B

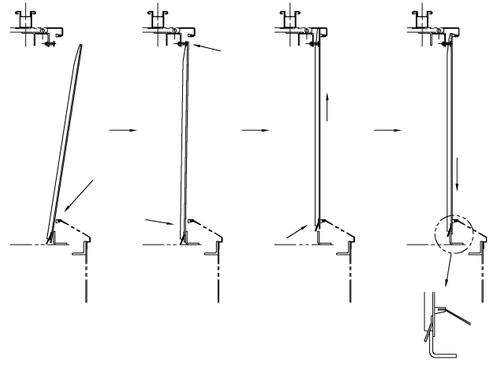


DETAIL OF INCLINE SECTION

INTERIOR PANEL INSTALLATION
Assembly A64K1-2881L1
E235, E236

-HOW TO INSTALL-

1. INSERT BOTTOM FIRST.
2. STAND PANELS TILL UPPER HITS PUSH-BOLTS.
3. LIFT PANELS UP TO UNDERNEATH OF A-MOLDING.
4. PUT PANELS DOWN ON THE SKIRT FRAME AND MAKE SURE THAT PANELS ARE IN POSITION.
5. ATTACH RUBBER MOLDING WITH DEVCON ZIP GRIP HV2200 ADHESIVE OR EQUIVALENT.
6. ITEMS 13~21 CONTAINED IN "KIT, HARDWARE" A64KX-2881L1.

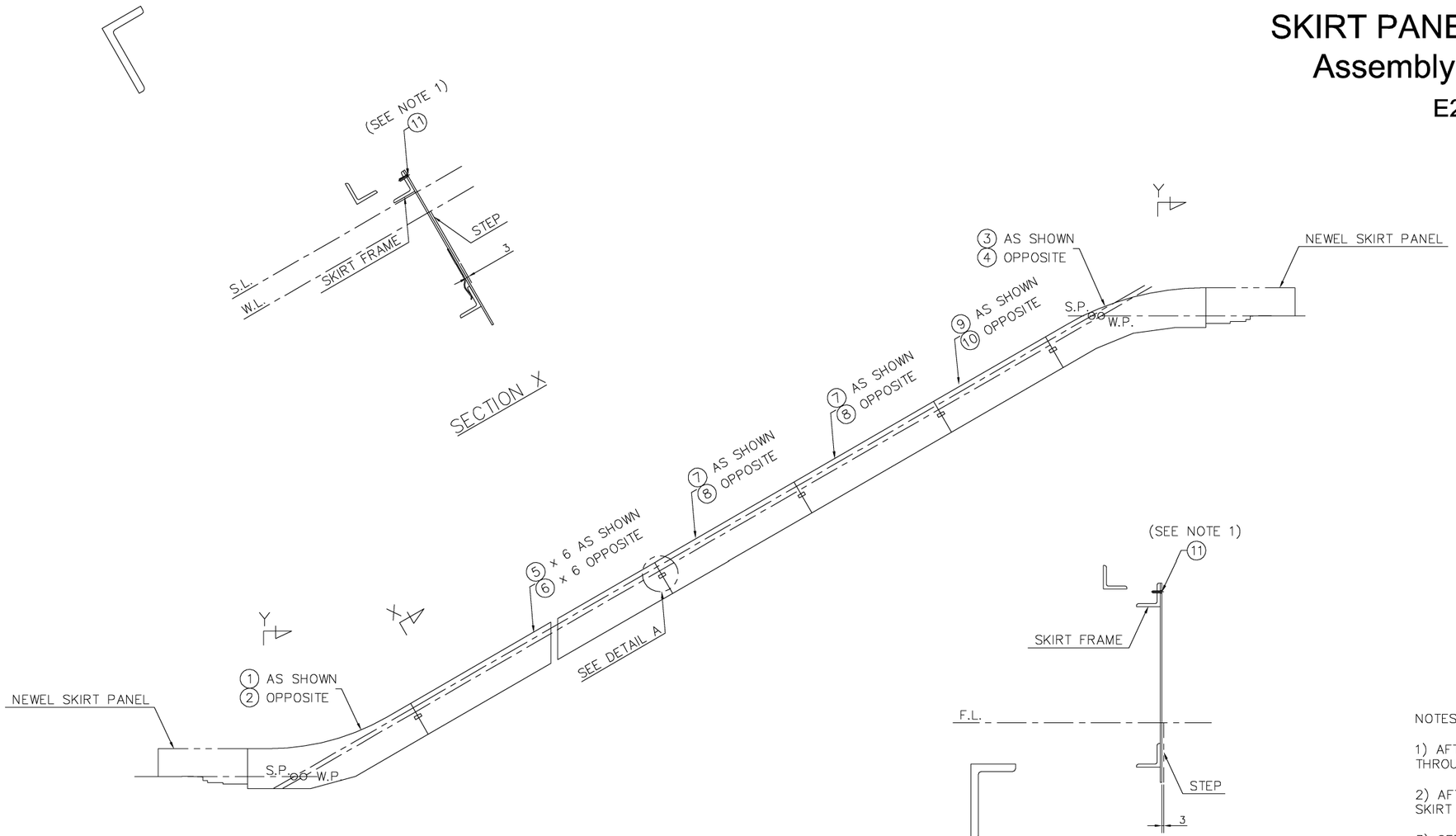


A64K1-2881L1

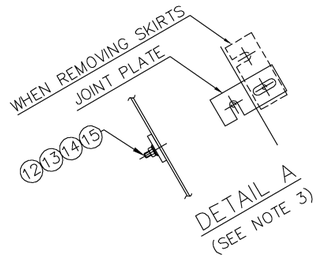
GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 11/14/05	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 11/14/05	TITLE INTERIOR PANEL INSTALLATION
	APVD. SUGIMOTO	DATE 11/14/05	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE 1/20 | SIZE D | DWG. NO. Fig. G-4a | REV. A

AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 13345
REV	DESCRIPTION	DATE	APPROVED

SKIRT PANEL INSTALLATION
Assembly A64M1-2881L1
E235, E236



SECTION Y



NOTES:

1) AFTER ALIGNING SKIRTS, TAP M4 HOLES ON THE FRAME THROUGH ø4.2 HOLES OF SKIRT PANELS.

2) AFTER SETTING SKIRTS, MEASURE REMAINING SPACE AND CUT SKIRT TO FIT. EDGE MUST BE CLEAN AND PERPENDICULAR.

3) SET JOINT PLATE REFERRING TO DETAIL A IN CASE OF REMOVING SKIRTS, LOOSEN THE SCREW AND TURN IT TO THE POSITION SHOWN IN CHAIN LINE.

4) HARDWARE KIT C64MX-2881L1 INCLUDES ITEMS 11-15.

A64M1-2881L1

GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 11/14/05	FUJITEC AMERICA, INC.
	CHK'D. SHUPE	DATE 11/14/05	TITLE SKIRT PANEL INSTALLATION
	APV'D. SUGIMOTO	DATE 11/14/05	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 L01/M01		SCALE 1/20 | SIZE D | DWG. NO. Fig. G-5a | REV. —

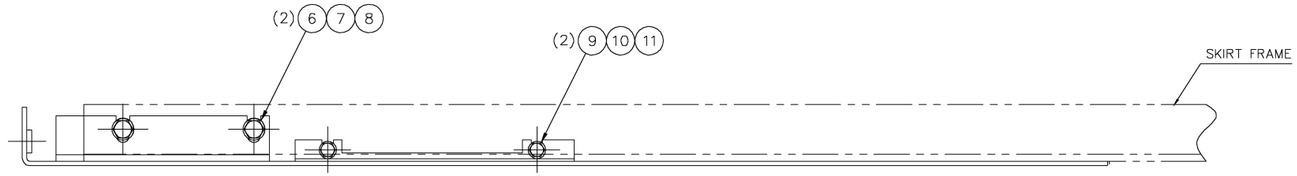
AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 11466
REV	DESCRIPTION	DATE	APPROVED

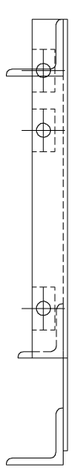
NEWEL SKIRT PANEL
Assembly A64N1-2881E1
E221, E222, E223, E224, E229, E230, E231, E232, E233, E234, E235, E236

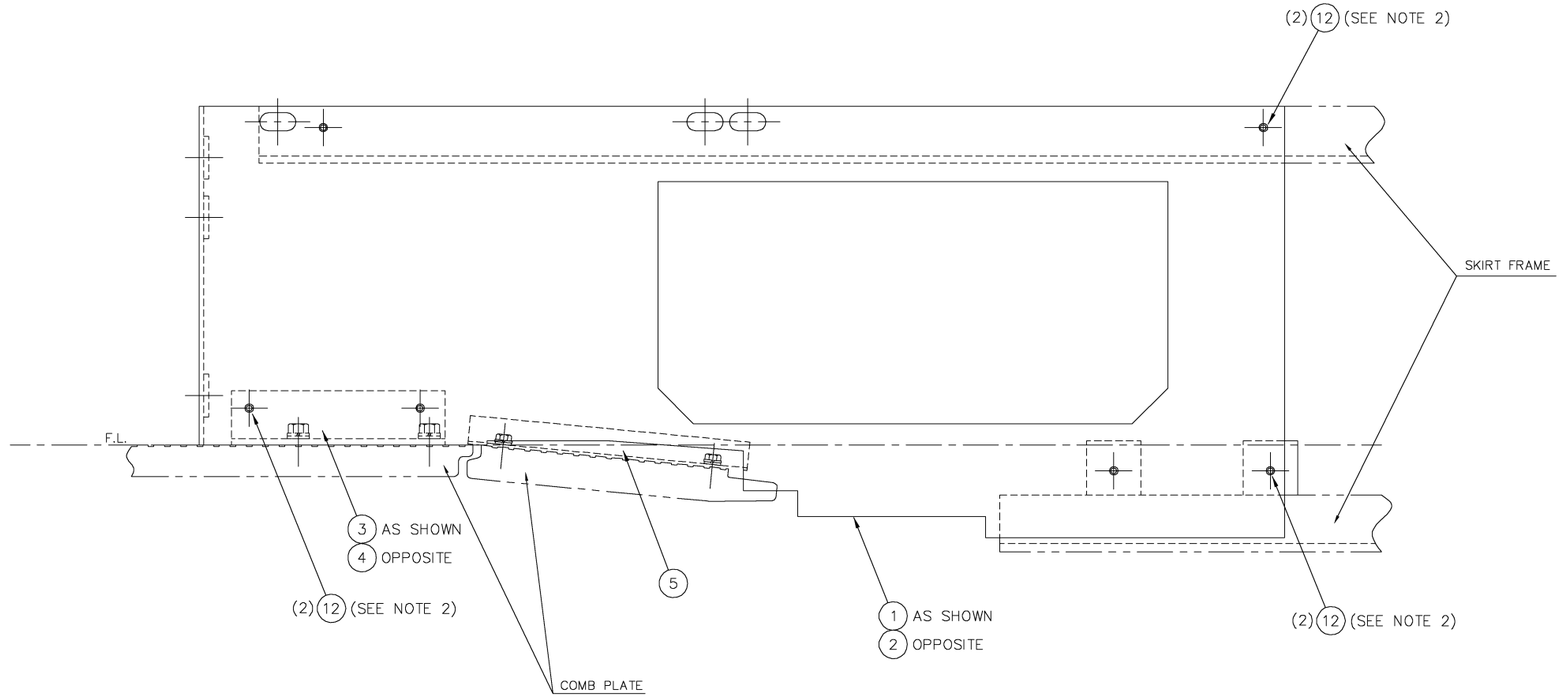
NOTES:

1.) ITEMS 6~12 CONTAINED IN KIT, HARDWARE C64NX-2881E1.

2.) TAP M4 HOLES ON ANGLES THROUGH HOLES OF SKIRT PANEL.







Assembly A64N1-2881E1

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9-24-04	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9-24-04	TITLE NEWEL SKIRT PANEL INSTALLATION
	APVD. APPERSON	DATE 9-24-04	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 E01~F01		SCALE 1/2 | SIZE D | DWG. NO. Fig. G-6 | REV. —

H) ELECTRICAL

Lower Step Up-Thrust and Step Level Device Assemblies

See Fig. H-1a for Lower Step Up-Thrust and Step Level Device Assemblies.
Escalator No. E235, E236
Assembly used in: C65S1-2881A2 (HS L01, M01)

LOWER STEP UP-THRUST & STEP LEVEL ASSEMBLIES C65S1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65924001	STEP UP-THRUST DEVICE, ASSEMBLY	1	See next page.
2	C65924002	STEP UP-THRUST DEVICE, ASSEMBLY	1	See next page.
3	C65S1-2881A3	STEP LEVEL DEVICE ASSY.	1	See page H-4.
4	C65S1-2881A4	STEP LEVEL DEVICE ASSY.	1	See page H-4.
5	D00903005	NUT, HEX, M8 (1.25)	4	
6	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	4	
7	D00907005	WASHER,FLAT,M8	4	
8	D00908005	WASHER,LOCK,M8	4	

Lower Step Up-Thrust Switch Assembly

See Fig. H-1b for Lower Step Up-Thrust Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65924001 and C65924002 (HS L01, M01)

LOWER STEP UP-THRUST SWITCH ASSEMBLY C65924001 & C65924002					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 001**	**QTY 002**
1	C65927001	PLATE, SWITCH, ASSEMBLY		1	
1	C65927002	PLATE, SWITCH ACTUATOR, ASSY			1
2	C65925001	BRACKET, UP-THRUST DEVICE, ASSY		1	
2	C65925002	BRACKET, UP-THRUST DEVICE, ASSY			1
3	D00002004	WASHER, FLAT, NARROW, 1/4"		3	3
4	D00902029	BOLT, HEX, M6 (P=1.00) X 60, FULL		1	1
5	D00903001	NUT, HEX, M3 (P=0.5)		4	4
6	D00903004	NUT, HEX, M6 (P=1.0)		4	4
7	D00904004	SCREW, MACHINE, PAN/SL, M3 (P=0.5)		2	2
8	D00904010	SCREW, MACHINE, PAN/PH, M3 (P=0.5)		2	2
9	D00907001	WASHER,FLAT,M3		8	8
10	D00908001	WASHER,LOCK,M3		4	4
11	D00908004	WASHER,LOCK,M6		1	1
12	D65754001	SPRING, COIL	Lee Spring #LC-038G-5	1	1
13	D65922001	SWITCH, LIMIT	ABB, #LS35P11D11	1	1

Lower Step Level Switch Assembly

See Fig. H-1c for Lower Step Level Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65S1-2881A3 and C65S1-2881A4 (HS L01, M01)

LOWER STEP LEVEL SWITCH ASSEMBLY C65S1-2881A3 & C65S1-2881A4					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY A3**	**QTY A4**
1	D65976001	LIMIT SWITCH	ABB, #LS35P72B11	1	1
2	D65S1-2881A2	PLATE, SAFETY SWITCH		1	1
3	D65S1-2881A3	TRIP WIRE, LIMIT SWITCH		1	1
4	D00904010	SCREW, MACHINE, PAN/PH, M3 (P=0.5)		2	2
5	D00907001	WASHER,FLAT,M3		2	2
6	D00908001	WASHER,LOCK,M3		2	2

Upper Step Level Switch Assembly

See Fig. H-1d for Upper Step Level Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65S1-2881A1 (HS L01, M01)

UPPER STEP LEVEL SWITCH ASSEMBLY C65S1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00903005	NUT, HEX, M8 (1.25)	4	
2	D00904010	SCREW, MACHINE, PAN/PH, M3 (P=0.5)	4	
3	D00905062	SCREW,MACHINE,FLT/PH,M8 (P=1.25)	4	
4	D00907001	WASHER,FLAT,M3	4	
5	D00907005	WASHER,FLAT,M8	4	
6	D00908001	WASHER,LOCK,M3	4	
7	D00908005	WASHER,LOCK,M8	4	
8	D65976001	LIMIT SWITCH	2	ABB, #LS35P27B11
9	D65S1-2881A1	TRIP WIRE, LIMIT SWITCH	2	
10	D65S1-2881A4	BRACKET, SAFETY SWITCH	2	

Upper Missing Step Device Assembly

See Fig. H-2a for Upper Missing Step Device Assembly.
Escalator No. E235, E236
Assembly used in: C65R1-2881A1 (HS L01, M01)

UPPER MISSING STEP DEVICE ASSEMBLY C65R1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	4	
2	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
3	D00903002	NUT, HEX, M4 (P=0.7)	4	
4	D00903005	NUT, HEX, M8 (1.25)	4	
5	D00903007	NUT,HEX,M12 (P=1.75)	2	
6	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)	4	
7	D00907002	WASHER,FLAT,M4	4	
8	D00907005	WASHER,FLAT,M8	4	
9	D00907007	WASHER,FLAT,M12	2	
10	D00908002	WASHER,LOCK,M4	4	
11	D00908005	WASHER,LOCK,M8	4	
12	D00908007	WASHER,LOCK,M12	2	
13	D65698001	SENSOR, INDUCTIVE PROXIMITY	1	PEPPER+FUCHS, #NJ50-FP-E2-P4 / 27680S
14	D65R1-2881A1	BRACKET, MISSING STEP, UPPER, INSIDE	1	
15	D65R1-2881A2	BRACKET,MISSING STEP,UPPER	1	

Lower Missing Step Device Assembly

See Fig. H-2b for Lower Missing Step Device Assembly.
Escalator No. E235, E236
Assembly used in: C65R1-2881A2 (HS L01, M01)

LOWER MISSING STEP DEVICE ASSEMBLY C65R1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65698001	SENSOR, INDUCTIVE PROXIMITY	1	PEPPER+FUCHS, #NJ50-FP-E2-P4 / 27680S
2	D65R1-2881A3	BRACKET, MISSING STEP, LOWER, INSIDE	1	
3	D65R1-2881A4	BRACKET,MISSING STEP,LOWER	1	
4	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)	4	
5	D00907002	WASHER,FLAT,M4	4	
6	D00908002	WASHER,LOCK,M4	4	
7	D00903002	NUT, HEX, M4 (P=0.7)	4	
8	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	4	
9	D00907005	WASHER,FLAT,M8	4	
10	D00908005	WASHER,LOCK,M8	4	
11	D00903005	NUT, HEX, M8 (1.25)	4	
12	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
13	D00907007	WASHER,FLAT,M12	2	
14	D00908007	WASHER,LOCK,M12	2	
15	D00903007	NUT,HEX,M12 (P=1.75)	2	

Broken Step Chain Device Assembly

See Fig. H-3a for Broken Step Chain Device Assembly.
Escalator No. E235, E236
Assembly used in: C65X1-2881A1 (HS L01, M01)

BROKEN STEP CHAIN DEVICE ASSEMBLY C65X1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65917001	LIMIT SWITCH, MANUAL RESET	2	ABB, #LS35P13D11-R
2	C65919001	BRACKET, BROKEN STEP CHAIN, ASSY	2	
3	D65X1-2881A1	BRACKET, BROKEN STEP CHAIN DEVICE	2	
4	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)	4	
5	D00907002	WASHER,FLAT,M4	8	
6	D00903002	NUT, HEX, M4 (P=0.7)	4	
7	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	4	
8	D00907005	WASHER,FLAT,M8	4	
9	D00908005	WASHER,LOCK,M8	4	
10	D00903008	NUT,HEX,M16 (P=2.0)	4	

Upper Skirt Obstruction Device Assembly

See Fig. H-4a for Upper Skirt Obstruction Device Assembly
Escalator No. E235, E236
Assembly used in: C65J1-2881A1 (HS L01, M01)

UPPER SKIRT OBSTRUCTION DEVICE ASSEMBLY C65J1-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65J3-2881A6	SWITCH, SKIRT SAFETY, ASSY, UPPER	2	See next page.
2	C65J3-2881A8	SWITCH, SKIRT SAFETY, ASSY, UPPER	2	See next page.
3	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	8	
4	D00907005	WASHER,FLAT,M8	8	
5	D00908005	WASHER,LOCK,M8	8	

Upper Skirt Obstruction Switch Assembly

See Fig. H-4b for Upper Skirt Obstruction Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65J3-2881A6 and C65J3-2881A8 (HS L01, M01)

UPPER SKIRT OBSTRUCTION SWITCH ASSEMBLY C65J3-2881A6 & C65J3-2881A8					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 006**	**QTY 008**
1	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL		2	2
2	D00903002	NUT, HEX, M4 (P=0.7)		2	2
3	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)		2	2
4	D00907002	WASHER,FLAT,M4		4	4
5	D00907005	WASHER,FLAT,M8		2	2
6	D00908002	WASHER,LOCK,M4		2	2
7	D00908005	WASHER,LOCK,M8		2	2
8	D65916001	LIMIT SWITCH	ABB, #LS65M11D11	1	1
9	D65J3-2881A7	BRACKET, SKIRT SAFETY, UPPER		1	
9	D65J3-2881A8	PLATE, SKIRT SAFETY			1
10	D65J3-2881A8	PLATE, SKIRT SAFETY		1	
10	D65J3-2881A9	BRACKET, SKIRT SAFETY, UPPER			1

Lower Skirt Obstruction Device Assembly

See Fig. H-4c for Lower Skirt Obstruction Device Assembly
Escalator No. E235, E236
Assembly used in: C65J1-2881A2 (HS L01, M01)

LOWER SKIRT OBSTRUCTION DEVICE ASSEMBLY C65J1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65J3-2881A7	SWITCH, SKIRT SAFETY, ASSY, LOWER	2	See next page.
2	C65J3-2881A9	SWITCH, SKIRT SAFETY, ASSY, LOWER	2	See next page.
3	C65J5-2881A1	SWITCH, SKIRT SAFETY, ASSY, LOWER	1	See page H-13.
4	C65J5-2881A2	SWITCH, SKIRT SAFETY, ASSY, LOWER	1	See page H-13.
5	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	8	
6	D00902033	BOLT, HEX, M8 (P=1.25) X 25, FULL	4	
7	D00903005	NUT, HEX, M8 (1.25)	4	
8	D00907005	WASHER,FLAT,M8	12	
9	D00908005	WASHER,LOCK,M8	12	

Lower Skirt Obstruction Switch Assembly

See Fig. H-4d for Lower Skirt Obstruction Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65J3-2881A7 and C65J3-2881A9 (HS L01, M01)

LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY C65J3-2881A7 & C65J3-2881A9					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 007**	**QTY 009**
1	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL		2	2
2	D00903002	NUT, HEX, M4 (P=0.7)		2	2
3	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)		2	2
4	D00907002	WASHER,FLAT,M4		4	4
5	D00907005	WASHER,FLAT,M8		2	2
6	D00908002	WASHER,LOCK,M4		2	2
7	D00908005	WASHER,LOCK,M8		2	2
8	D65916001	SWITCH, LIMIT	ABB, #LS65M11D11	1	1
9	D65J3-2881A5	BRACKET, SKIRT SAFETY, LOWER		1	
9	D65J3-2881A8	PLATE, SKIRT SAFETY			1
10	D65J3-2881A8	PLATE, SKIRT SAFETY		1	
10	D65J3-2881A6	BRACKET, SKIRT SAFETY, LOWER			1

Lower Skirt Obstruction Switch Assembly

See Fig. H-4e for Lower Skirt Obstruction Switch Assembly.
Escalator No. E235, E236
Assembly used in: C65J5-2881A1 and C65J5-2881A2 (HS L01, M01)

LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY
C65J5-2881A1 & C65J5-2881A2

ITEM NO.	FUJITEC PART NO.	DESCRIPTION	MANUFACTURER & PART NO. (if applicable)	QTY A1	QTY A2
1	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL		2	2
2	D00903002	NUT, HEX, M4 (P=0.7)		2	2
3	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)		2	2
4	D00907002	WASHER,FLAT,M4		4	4
5	D00907005	WASHER,FLAT,M8		2	2
6	D00908002	WASHER,LOCK,M4		2	2
7	D00908005	WASHER,LOCK,M8		2	2
8	D65916001	SWITCH, LIMIT	ABB, #LS65M11D11	1	1
9	D65J5-2881A3	BRACKET, SKIRT SAFETY, LOWER		1	
9	D65J5-2881A4	BRACKET, SKIRT SAFETY, LOWER			1
10	D65J5-2881A5	PLATE, SKIRT SAFETY		1	1

Incline Skirt Obstruction Switch Assembly

See Fig. H-4f for Incline Skirt Obstruction Switch Assembly
Escalator No. E235, E236
Assembly used in: C65J1-2881E3 (HS L01, M01)

INCLINE SKIRT OBSTRUCTION DEVICE ASSEMBLY C65J1-2881E3				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65J4-2648A2	BRACKET, SKIRT SAFETY	2	
2	D65J4-2881A1	BRACKET, SKIRT SAFETY	2	
3	D65916001	SWITCH, LIMIT	2	ABB, #LS65M11D11
4	D00902034	BOLT, HEX, M8 (P=1.25) X 30, FULL	4	
5	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	4	
6	D00908005	WASHER,LOCK,M8	8	
7	D00907005	WASHER,FLAT,M8	8	
8	D00904021	SCREW, MACHINE, PAN/PH, M4 (P=0.7)	4	
9	D00903002	NUT, HEX, M4 (P=0.7)	4	
10	D00908002	WASHER,LOCK,M4	4	
11	D00907002	WASHER,FLAT,M4	8	

Handrail Entry Device Assembly

See Fig. H-5a for Handrail Entry Device Assembly.
Escalator No. E235, E236
Assembly used in: A64A48001 (HS L01, M01)

HANDRAIL ENTRY DEVICE ASSEMBLY A64A48001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C64A49001	FACE PLATE, HANDRAIL ENTRY, ASS"Y	2	See next page.
2	C64A49002	FACE PLATE, HANDRAIL ENTRY, ASS"Y	2	See next page.
3	D64090001	GUARD, HANDRAIL ENTRY	4	
4	D00905011	SCREW, MACHINE, FLT/PH, M4 (P=0.7) x 10	16	
5	D00965001	WASHER, FLAT, #10 USS, BLACK OXIDE	16	
6	D00969001	SCREW,MACH.,PAN HD/PH,M5x25, BLACK OXIDE	16	Fabory #24810.050.025

Handrail Entry Faceplate Assembly

See Fig. H-5b for Handrail Entry Faceplate Assembly.
Escalator No. E235, E236
Assembly used in: C64A49001 and C64A49002 (HS L01, M01)

HANDRAIL ENTRY FACEPLATE ASSEMBLY C64A49001 & C64A49002					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 001**	**QTY 002**
1	C64A50001	FRONT PANEL,HANDRAIL ENTRY DEVICE		1	-
1	C64A50002	FRONT PANEL,HANDRAIL ENTRY DEVICE		-	1
2	D64A17001	LIMIT SWITCH	ABB, #LS35P11B11	2	2
3	D64A18001	PLATE,HANDRAIL ENTRY DEVICE		2	2
4	D64A19001	BRACKET,HANDRAIL ENTRY DEVICE		2	2
5	D64A20001	PIN,HANDRAIL ENTRY DEVICE		4	4
6	D64A21001	SPRING, HANDRAIL DRIVE	McMaster-Carr #94125K631	4	4
7	D00001002	NUT, HEX, #8-32		4	4
8	D00002002	WASHER, FLAT, NARROW, #8		4	4
9	D00003002	WASHER, LOCK, #8		4	4
10	D00903002	NUT, HEX, M4 (P=0.7)		4	4
11	D00903003	NUT, HEX, M5 (P-0.8)		4	4
12	D00904017	SCREW, MACHINE, PAN/SL, M4 (P=0.7)		4	4
13	D00907002	WASHER,FLAT,M4		4	4
14	D00908002	WASHER,LOCK,M4		4	4

Displaced Handrail Device Installation

See Fig. H-6a for Displaced Handrail Device Installation.
Escalator No. E235, E236
Assembly used in: A65N2-2881E1 (HS L01, M01)

DISPLACED HANDRAIL DEVICE INSTALLATION A65N2-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65992001	DISPLACED HANDRAIL SUB-ASSY (RH)	1	See next page.
2	C65993001	DISPLACED HANDRAIL SUB-ASSY (LH)	1	See next page.
3	D65A06001	BRACKET, DISPLACED HANDRAIL DEVICE	1	
4	D65A06002	BRACKET, DISPLACED HANDRAIL DEVICE	1	
5	D00902025	BOLT, HEX, M6 (P=1.00) X 20, FULL	8	
6	D00903004	NUT, HEX, M6 (P=1.0)	8	
7	D00907004	WASHER,FLAT,M6	8	
8	D00908004	WASHER,LOCK,M6	8	

Displaced Handrail Device (RH, LH)

See Fig. H-6b for Displaced Handrail Device (RH, LH).
Escalator No. E235, E236
Assembly used in: C65992001 and C65993001 (HS L01, M01)

DISPLACED HANDRAIL DEVICE (RH, LH) C65992001 & C65993001					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY 992**	**QTY 993**
1	C65996001	BRACKET ASSY, DISPLACED HR DEVICE		1	-
1	C65996002	BRACKET ASSY, DISPLACED HR DEVICE			1
2	C65995001	GUIDE, DISPLACED HR DEVICE		1	1
3	C65994001	ACTUATOR ASSY, DISPLACED HR DEVICE		1	1
4	D65908001	LIMIT SWITCH	ABB, #LS35P31B11	1	1
5	D65A03001	GUIDE BLOCK, DISPLACED HR DEVICE		1	1
6	D65A04001	LEVER, DISPLACED HR DEVICE		1	1
7	D65A05001	COUNTERWEIGHT, DISPLACED HR DEVICE		1	1
8	D00003004	WASHER, LOCK, 1/4		1	1
9	D00013002	JAM NUT, HEX, 1/4"-20		1	1
10	D00902008	BOLT, HEX, M4 (P=0.7) X12, FULL		4	4
11	D00902009	BOLT, HEX, M4 (P=0.7) X16, FULL		2	2
12	D00902014	BOLT, HEX, M4 (P=0.7) X 40, FULL		2	2
13	D00902028	BOLT, HEX, M6 (P=1.00) X 40, FULL		1	1
14	D00903002	NUT, HEX, M4 (P=0.7)		2	2
15	D00903003	NUT, HEX, M5 (P-0.8)		1	1
16	D00907002	WASHER,FLAT,M4		6	6
17	D00907004	WASHER,FLAT,M6		1	1
18	D00908002	WASHER,LOCK,M4		6	6
19	D00908004	WASHER,LOCK,M6		1	1
20	D00918002	JAM NUT, HEX, M4 (P=0.7)		4	4
21	D65884001	SHOULDER BOLT, 5/16 X 5/8 LG	McMASTER-CARR, #90298A580	1	1

Anti-Static Device Assembly

See Fig. H-7a for Anti-Static Device Assembly.
Escalator No. E235, E236
Assembly used in: A68Z5-2310A1 (HS L01, M01)

ANTI-STATIC DEVICE ASSEMBLY A68Z5-2310A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C68Z5-2310A2	ANTI-STATIC BRUSH,ASS'Y	2	
2	C68Z5-2310A3	ANTI-STATIC BRUSH,ASS'Y	2	

Anti-Static Brush Assembly

See Fig. H-7b for Anti-Static Brush Assembly.
Escalator No. E235, E236
Assembly used in: C68Z5-2310A2 and C68Z5-2310A3 (HS L01, M01)

ANTI-STATIC BRUSH ASSEMBLY C68Z5-2310A2 & C68Z5-2310A3					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY A2**	**QTY A3**
1	D68Z5-2310A4	BRACKET, ANTI-STATIC		1	1
2	D68Z5-2310A5	BRUSH, ANTI-STATIC	TAKK Industries Inc. #5605-060	1	1
3	D00902009	BOLT,HEX,M4(P=0.7)X16,FULL		2	2
4	D00903002	NUT,HEX,M4(P=0.7)		3	3
5	D00907002	WASHER,FLAT,M4		6	6
6	D00908002	WASHER,LOCK,M4		3	3
7	D00902014	BOLT,HEX,M4(P=0.7)X40,FULL		1	1

Operation Panel Installation

See Fig. H-8a for Operation Panel Installation.
Escalator No. E235, E236
Assembly used in: C65A19001 (HS L01, M01)

OPERATION PANEL INSTALLATION C65A19001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65A20001	OPERATION BOX ASSY.	1	
2	D65929001	FACEPLATE,OPERATION BOARD	1	
3	D00906005	SCREW,TAMPERPROOF,FLT,M4X16	4	
4	D00903002	NUT,HEX,M4(P=0.7)	4	
5	D00907002	WASHER,FLAT,M4	4	
6	D00908002	WASHER,LOCK,M4	4	

Operation Box Assembly

See Fig. H-8b for Operation Box Assembly.
Escalator No. E235, E236
Assembly used in: C65A20001 (HS L01, M01)

OPERATION BOX ASSEMBLY C65A20001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65A21001	COVER ASSY, OPERATION BOARD	1	
2	C65A22001	BOX ASSY, OPERATION BOARD	1	
3	D00006007	SCREW,MACHINE,PAN/PH,#6-32X3/8	4	
4	D00002001	WASHER,FLAT,NARROW,#6	4	
5	D00003001	WASHER,LOCK,#6	4	
6	D00029007	NUT,#6-32	4	Tinnerman #C8091-632

Operation Board Box Assembly

See Fig. H-8c for Operation Board Box Assembly.
Escalator No. E235, E236
Assembly used in: C65A22001 (HS L01, M01)

OPERATION BOARD BOX ASSEMBLY C65A22001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65596001	BOX,OPERATION BOARD	1	
2	D65930001	BRACKET,OPERATION BOARD	1	
3	D65522001	KEY CYLINDER,OPERATION BOARD	1	Yale # C910A
4	D65697001	TOGGLE SWITCH,OPERATION BOARD	1	Carlingswitch #6GC5S-73
5	D65647001	LOCK PLATE,OPERATION BOARD	1	
6	D65696001	SWITCH BRACKET,OPERATION BOARD	1	
7	D65652001	CAM,OPERATION BOARD	1	
8	D65624001	BUTTON SWITCH,OPERATION BOARD	1	Fuji Electric #AR30E0R-10W
9	D06041001	CONNECTOR,LIQUIDTIGHT,90,1/2"	1	RACO #3542
10	D05418001	SPADE TERMINAL AWG 18-22	6	
11	D05415002	TERMINAL CONNECTOR AWG 18-22	1	
12	RV0181	WIRE,18 AWG,MTW,GREEN	25 ft	
13	RV0183	WIRE,18 AWG,MTW,BLUE	0.3 ft	
14	RM1004	CABLE,HOISTWAY 4 COND.,600V	25 ft	
15	D00904021	MS,PAN/PH,M4(P=0.7)X 20	6	
16	D00903002	NUT,HEX,M4(P=0.7)	6	
17	D00907002	WASHER,FLAT,M4	12	
18	D00908002	WASHER,LOCK,M4	6	
19	D00006002	SCREW,MACHINE,PAN/PH,#6-32 X .50	1	
20	D00002001	WASHER,FLAT,NARROW,#6	2	
21	D00003001	WASHER,LOCK,#6	1	
22	D00029007	NUT, #6-32	1	TINNERMAN #C8091-632
23	D00044011	SCREW,MACHINE,FLT/SL,#4-40x.25	2	
24	D00044012	SCREW,MACHINE,FLT/SL,#3-48x.18	2	

Emergency Stop Switch Installation

See Fig. H-9a for Emergency Stop Switch Installation.
Escalator No. E235, E236
Assembly used in: A65U1-2881E1 (HS L01, M01)

EMERGENCY STOP SWITCH INSTALLATION A65U1-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65981001	EMERGENCY STOP,ASS'Y	2	See next page.
2	D00923020	SCREW, M4 (P=0.7) X 10, SS	4	

Emergency Stop Assembly

See Fig. H-9b for Emergency Stop Assembly.
Escalator No. E235, E236
Assembly used in: C65981001 (HS L01, M01)

EMERGENCY STOP ASSEMBLY C65981001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65982001	FACEPLATE,EMERGENCY STOP, ASS"Y	1	
2	D06041001	CONNECTOR,LIQUIDTIGHT,90,1/2"	1	RACO #3542
3	D65146001	BUTTON SWITCH, EMERGENCY STOP	1	FUJI ELECTRONICS CO. # AR30E0R-11R
4	D65152001	MICRO SWITCH, EMERGENCY STOP	1	OMRON, D2SW-3L1H
5	D65984001	COVER PLATE, EMERGENCY STOP	1	
6	D65985001	BRACKET, EMERGENCY STOP	1	
7	D65986001	BRACKET, EMERGENCY STOP	1	
8	D65987001	BRACKET, EMERGENCY STOP	1	
9	D65988001	COVER, EMERGENCY STOP	1	
10	D65989001	PIN, EMERGENCY STOP	1	McMaster-Carr #92735A165
11	D65990001	BOX, EMERGENCY STOP	1	
12	D00001001	NUT, HEX, #6-32	11	
13	D00002001	WASHER, FLAT, NARROW, #6	16	
14	D00003001	WASHER, LOCK, #6	11	
15	D00006002	SCREW, MACHINE, PAN/PH, #6-32 x .50	6	
16	D00006003	SCREW, MACHINE, PAN/PH, #6-32 x .75	1	
17	D00903002	NUT, HEX, M4 (P=0.7)	4	
18	D00903022	NUT, HEX, M2 (P=0.4)	2	
19	D00904015	SCREW, MACHINE, PAN/PH, M4 (P=0.7)	4	
20	D00907002	WASHER,FLAT,M4	4	
21	D00908002	WASHER,LOCK,M4	4	
22	RV0180	WIRE,18 AWG,THHN,BLACK	20 ft	
23	RV0181	WIRE,18 AWG,THHN,GREEN	20 ft	
24	RV0183	WIRE,18 AWG,MTW,BLUE	20 ft	
25	RV0185	WIRE,18 AWG,MTW,WHITE	20 ft	
26	RV0186	WIRE,18 AWG,THHN,ORANGE	20 ft	
27	D05415002	TERMINAL CONNECTOR AWG 18-22	3	

Information Speaker System

See Fig. H-10a for Information Speaker System.
Escalator No. E235, E236.
Assembly used in: A68K1-2881L1 (HS L01, M01)

INFORMATION SPEAKER SYSTEM A68K1-2881L1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D68450001	SPEAKER, AUDIO INFO SYSTEM	7	SOUND VIEW ELECTRONICS MODEL #EAS-70V655
2	D00005006	BOLT HEX 1/4-20X5/8	14	
3	D00002004	WASHER,FLAT,NARROW,1/4	24	
4	D00003004	WASHER,LOCK,1/4	24	
5	C68453001	ENCLOSURE ASSEMBLY	1	Amplifier: BOGEN TPU35B. Recorder: RACOM 900S
6	C68267001	BAGGAGE STOP,ASSY	5	
7	D00001004	NUT,HEX,1/4-20	10	

Audio Information Enclosure

See Fig. H-10b for Audio Information Enclosure.
Escalator No. E235, E236
Assembly used in: C68453001 (HS L01, M01)

Audio Information Speaker

See Fig. H-10c for Audio Information Speaker.
Escalator No. E235, E236
Assembly used in: D68450001 (HS L01, M01)

Upper Electrical Arrangement

See Fig. H-11a for Upper Electrical Arrangement.
Escalator No. E235, E236.
Assembly used in: C68X3-2881C1 (HS L01, M01)

UPPER ELECTRICAL ARRANGEMENT C68X3-2881C1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C68506001	KIT, RECEPTACLE (See Section I)	1	
2	C68508001	KIT, MAINTENANCE LIGHT (See Section I)	1	
3	C68507001	KIT, SWITCH, 20A (See Section I)	1	
4	C65A4-2666A1	SERVICE SWITCH (w/Pit Disconnect)	1	See next page.
5	C65641001	MACHINE DISCONNECT SWITCH	1	See page H-28.
6	C65A2-2666A1	UPPER JUNCTION BOX (UJB)	1	See page H-28.
7	D68X3-2881A5	BRACKET, ELECTRICAL COMPONENT	1	
8	C68XX-2881A1	WIRE KIT, SNGL HOOD (0')	1	
9	C68XX-2881A2	WIRE KIT, DBL HOOD (0')	2	
10	C68XX-2881A3	WIRE KIT, SNGL HOUSE (18')	1	
11	C68XX-2881A5	WIRE KIT, DBL HOUSE (18')	1	
12	C68XX-2881A7	WIRE KIT, DBL FULL (18')	1	
13	D00902025	BOLT,HEX,M6(P=1.0)X20,FULL	4	
14	D00902027	BOLT,HEX,M6(P=1.0)X35,FULL	12	
15	D00904060	SCREW,MACHINE,PAN/PH,M6(P=1.0)	10	
16	D00907004	WASHER,FLAT,M6	36	
17	D00908004	WASHER,LOCK,M6	30	
18	D00903004	NUT,HEX,M6(P=1.0)	20	
19	D00902050	BOLT HEX M10(P=1.5)X35	4	
20	D00907006	WASHER,FLAT,M10	8	
21	D00908006	WASHER,LOCK,M10	6	
22	D00903006	NUT,HEX,M10(P=1.5)	6	
23	C65A6-2881A1	JUNCTION BOX 3 (JB3)	1	See page H-29.
24	D68X3-2881A4	BRACKET, JUNCTION BOX	1	
25	D00902026	BOLT HEX M6(P=1.0)X25	4	
26	D00902051	BOLT HEX M10(P=1.50)X40	2	
27	D68X3-2881A6	PLATE, ELECTRICAL COMPONENT	1	

Upper Service Switch

See Fig. H-11b for Upper Service Switch.
Escalator No. E235, E236
Assembly used in: C65A4-2666A1 (HS L01, M01)

UPPER SERVICE SWITCH C65A4-2666A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D68318001	ENCLOSURE	1	Hoffman #L-SC201512SS
3	D05A81001	PANEL, SERVICE SWITCH	1	
4	D00117003	INSERT,THREADED,KNURLED,#8-32	2	
5	D05876001	TERMINAL BLK., 19P	1	
6	D00006011	SCREW,MACHINE,PAN/PH,#8-32 X .50	2	
7	D00003002	WASHER,LOCK,#8	2	
8	D00002002	WASHER,FLAT,NARROW,#8	2	
9	D05934001	RECEPTACLE, 6 POLE	1	Bradharrison #1R6G04A20A120
10	D05950001	CAP, 65-0086	1	Bradharrison #65-0086
11	D05886002	SONALERT	1	MALLORY, #SC628AN
12	D00006030	SCREW,MACHINE,PAN/PH,#4-40 X .50	4	
13	D00122001	NUT,KEP LOCK,#4-40	4	
14	D05887001	LEGEND PLATE	1	A-B #800E-35RE262K
15	D05888001	STOP BUTTON OPERATOR	1	A-B #800EP-MTY
16	D05A07001	SAFETY CONTACT BLOCK	1	A-B # 800E3LX01S
18	D05729001	NAMEPLATE, SERVICE SW.	1	
19	D05891001	PADLOCK ATTACHMENT	1	A-B #800E-AML1
20	D05953001	MOUNTING KIT	1	Hoffman #L-MFKSS
21	D06033001	JUMPER BAR, 2-POLE	3	TAPCO #264-402
22	D05932001	SHORTING PLUG	1	Bradharrison #V41795

Machine Disconnect Switch

See Fig. H-11c for Machine Disconnect Switch.
Escalator No. E235, E236
Assembly used in: C65641001 (HS L01, M01)

MACHINE DISCONNECT SWITCH C65641001				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D65645001	ENCLOSURE	1	
2	D05887001	LEGEND PLATE	1	A-B #800E-35RE262K
3	D05888001	STOP BUTTON OPERATOR	1	A-B #800EP-MTY
4	D05A07001	SAFETY CONTACT BLOCK	1	A-B # 800E3LX01S
5	D05891001	PADLOCK ATTACHMENT	1	A-B #800E-AML1

Upper Junction Box (UJB)

See Fig. H-11d for Upper Junction Box (UJB).
Escalator No. E235, E236
Assembly used in: C65A2-2666A1 (HS L01, M01)

UPPER JUNCTION BOX (UJB) C65A2-2666A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05894001	ENCLOSURE	1	Hoffman # A-1614NFSS
2	D05895001	PANEL	1	
3	C65A7-2666A1	TERMINAL STRIP	3	
4	D06033001	JUMPER BAR, 2-POLE	6	TAPCO #264-402
5	D05729001	NAMEPLATE	1	

Junction Box (JB3)

See Fig. H-11e for Junction Box (JB3).
Escalator No. E235, E236
Assembly used in: C65A6-2881A1 (HS L01, M01)

JUNCTION BOX (JB3) C65A6-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05B47007	ENCLOSURE, ST. STL., 14x12x6	1	Hoffman #A-1412NFSS
2	D05B49007	PANEL, 10.88 x 12.75	1	
3	C65A7-2666A1	TERMINAL STRIP	3	
4	D06033001	JUMPER BAR, 2-POLE	6	TAPCO #264-402

Lower Electrical Arrangement

See Fig. H-11f for Lower Electrical Arrangement.
Escalator No. E235, E236.
Assembly used in: C68X2-2881A1 (HS L01, M01)

LOWER ELECTRICAL ARRANGEMENT C68X2-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C68506001	KIT, RECEPTACLE (See Section I)	1	
2	C68507001	KIT, SWITCH MAINTENANCE (See Section I)	1	
3	C68508001	KIT, MAINTENANCE LIGHT (See Section I)	1	
4	C65A3-2881A1	LOWER JUNCTION BOX (LJB) (w/Pit Disconnect)	1	See next page.
5	C65A4-D345A1	JUNCTION BOX 1 (JB1)	1	See next page.
6	D68X3-2881A1	MOUNTING PLATE, JUNCTION BOX	1	
7	D68X3-D345A2	BRACKET, JUNCTION BOX	1	
8	C68XX-2881A4	WIRE KIT, DOUBLE HOUSE (15 " WIRE)	1	
9	D00902026	BOLT, HEX, M6 (P=1.00) X 25	4	
10	D00904060	SCREW, MACHINE, PAN/SL, M6 (P=1.0) x 12	6	
11	D00907004	WASHER,FLAT,M6	8	
12	D00908004	WASHER,LOCK,M6	10	
13	D00903004	NUT, HEX, M6 (P=1.0)	4	
14	D00902032	BOLT, HEX, M8 (P=1.25) X 20, FULL	4	
15	D00908005	WASHER,LOCK,M8	4	
16	D00902065	BOLT, HEX, M12 (P=1.75) X 35, FULL	2	
17	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
18	D00907007	WASHER,FLAT,M12	6	
19	D00908007	WASHER,LOCK,M12	4	
20	D00903007	NUT,HEX,M12 (P=1.75)	4	

Lower Junction Box (LJB)

See Fig. H-11g for Lower Junction Box (LJB).
Escalator No. E235, E236
Assembly used in: C65A3-2881A1 (HS L01, M01)

LOWER JUNCTION BOX (LJB) C65A3-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05C17001	ENCLOSURE, STN STL, 18x16x8	1	
2	D05C18001	PANEL, JUNCTION BOX	1	
4	D05934001	RECEPTACLE, 6 POLE	1	Bradharrison #1R6G04A20A120
5	D05932001	SHORTING PLUG	1	Bradharrison #W00V41782
6	D05886002	SONALERT	1	MALLORY, #SC628AN
12	D05887001	LEGEND PLATE	1	A-B #800E-35RE262K
13	D05891001	PADLOCK ATTACHMENT	1	A-B #800E-AML1
14	D05888001	STOP BUTTON OPERATOR	1	A-B #800EP-MTY
15	D05A07001	SAFETY CONTACT BLOCK	1	A-B # 800E3LX01S
17	C65A7-2666A1	TERMINAL STRIP	2	
18	D05729001	NAMEPLATE, SERVICE SW.	1	
19	D06033001	JUMPER BAR, 2-POLE	4	TAPCO #264-402

Junction Box (JB1)

See Fig. H-11h for Junction Box (JB1).
Escalator No. E235, E236
Assembly used in: C65A4-D345A1 (HS L01, M01)

JUNCTION BOX (JB1 and JB2B)				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05B47007	ENCLOSURE, ST. STL., 14x12x6	1	Hoffman #A-1412NFSS
2	D05B49007	PANEL, 10.88 x 12.75	1	
3	D05876001	TERMINAL BLK., 19P	1	

Incline Electrical Arrangement

See Fig. H-11i for Incline Electrical Arrangement.
Escalator No. E235, E236.
Assembly used in: C68X4-2881E1 (HS L01, M01)

INCLINE ELECTRICAL ARRANGEMENT C68X4-2881E1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	C65A5-D345A1	INCLINE JUNCTION BOX #2A (JB2A)	1	See next page.
2	C65A4-D345A1	INCLINE JUNCTION BOX #2B (JB2B)	1	See next page.
3	D68X3-D345A2	BRACKET, JUNCTION BOX	1	
4	D68X3-2881A2	BRACKET, JUNCTION BOX	1	
5	C68XX-2881A6	WIRE KIT, DOUBLE FULL (15 " WIRE)	5	
6	D00902026	BOLT, HEX, M6 (P=1.00) X 25	8	
7	D00902027	BOLT, HEX, M6 (P=1.00) X 35, FULL	20	
8	D00907004	WASHER,FLAT,M6	56	
9	D00908004	WASHER,LOCK,M6	28	
10	D00903004	NUT, HEX, M6 (P=1.0)	28	
11	D00902051	BOLT, HEX, M10 (P=1.50) X 40	2	
12	D00907006	WASHER,FLAT,M10	4	
13	D00908006	WASHER,LOCK,M10	2	
14	D00903006	NUT,HEX,M10 (P=1.5)	2	
15	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
16	D00907007	WASHER,FLAT,M12	4	
17	D00908007	WASHER,LOCK,M12	2	
18	D00903007	NUT,HEX,M12 (P=1.75)	2	

Junction Box (JB2A)

See Fig. H-11j for Junction Box (JB2A).
Escalator No. E235, E236
Assembly used in: C65A5-D345A1 (HS L01, M01)

JUNCTION BOX (JB2A) C65A5-D345A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05B47007	ENCLOSURE, ST. STL., 14x12x6	1	Hoffman #A-1412NFSS
2	D05B49007	PANEL, 10.88 x 12.75	1	
3	D05876001	TERMINAL BLK., 19P	2	

Junction Box (JB2B)

See Fig. H-11h for Junction Box (JB2B).
Escalator No. E235, E236
Assembly used in: C65A4-D345A1 (HS L01, M01)

Data Server Assembly

See Fig. H-11k for Data Server Assembly.
Escalator No. E235.
Assembly used in: C65A2-2881A1 (HS L01)

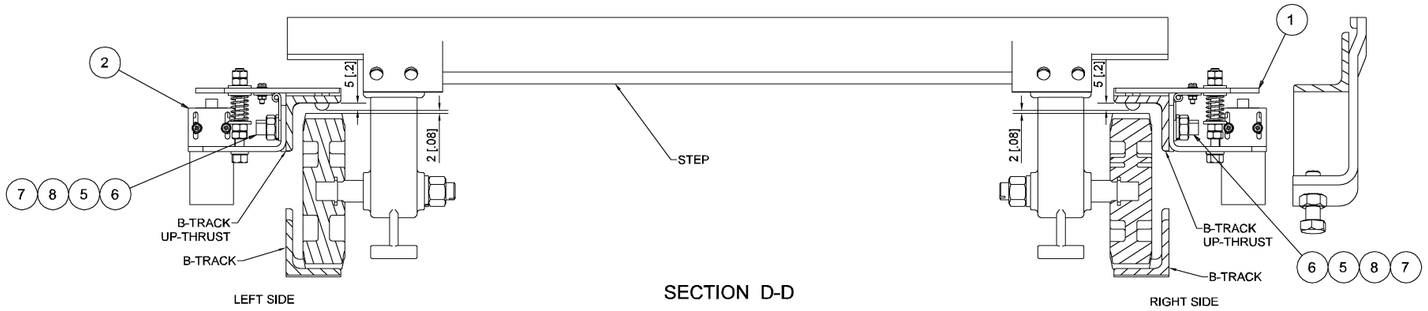
DATA SERVER ASSEMBLY C65A2-2881A1				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D05AC-2881A1	ENCLOSURE	1	Hoffman #C-SD20212SS
2	D05AD-2881A1	PANEL	1	Hoffman #CP2020
3	D05AH-2245A1	HOFFMAN MOUNTING KIT	1	Hoffman #C-MFKSS
4	D05560000	DIN RAIL, SLOTTED, 2 METER	0.15	
5	D05993001	OUTLET	1	Phoenix #EM-DUO-120/15
6	C65A2-2038A1	DATA SERVER	1	
7	D05C7-2038A1	UPS	1	APC #BF500
8	D05A3-2881A1	BRACKET, UPS TRAY	1	
9	D05A4-2881A1	END PIECE, UPS TRAY	2	

Sleep Mode Stanchion Sensor Installation

See Fig. H-12a for Sleep Mode Stanchion Sensor Installation.
Escalator No. E235, E236.
Assembly used in: 2881-AB-437a (HS L01, M01)

SLEEP MODE STANCHION SENSOR INSTALLATION 2881-AB-437					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY RH**	**QTY LH**
1		STANCHION - RIGHT HAND (NOT SHOWN)	EPCO, #46B26 P01	1	0
2		STANCHION - LEFT HAND	EPCO, #46B26 P02	0	1
3		DOT MATRIX DISPLAY	E-MOTIVE SD4016S #10L24 P01	1	1
4		DATA SENSOR	BALLUFF BOS-S41 SERIES #10L25 P01	2	2
5		WINDOW FOR LED DISPLAY	EPCO, #46B22 P01	1	1
6		BACKER FOR LED DISPLAY WINDOW	EPCO, #46B23 P02	1	1
7		WINDOW FOR SENSOR	EPCO, #46B24 P01	2	2
8		BACKER/MOUNTING BRACKET FOR SENSOR	EPCO, #46B25 P01	2	2

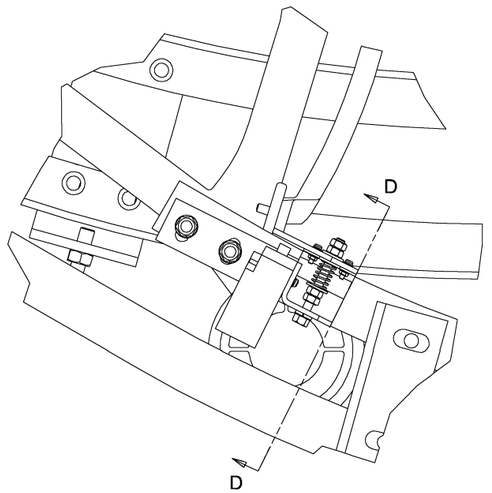
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED



SECTION D-D

LOWER STEP UP-THRUST and STEP LEVEL DEVICE ASSEMBLIES Assembly C65S1-2881A2

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



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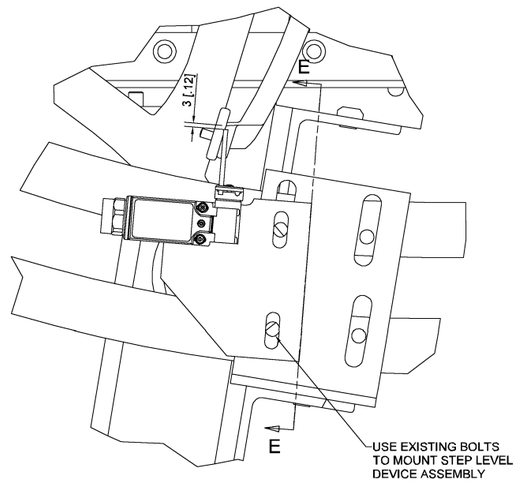

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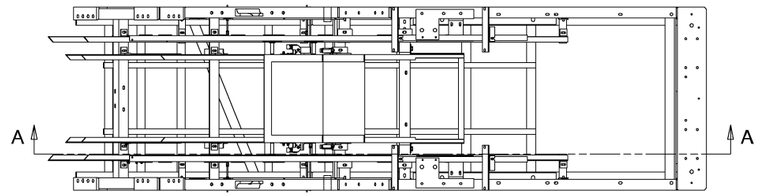
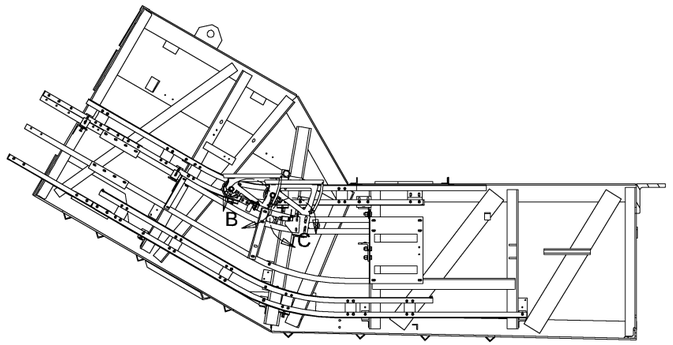
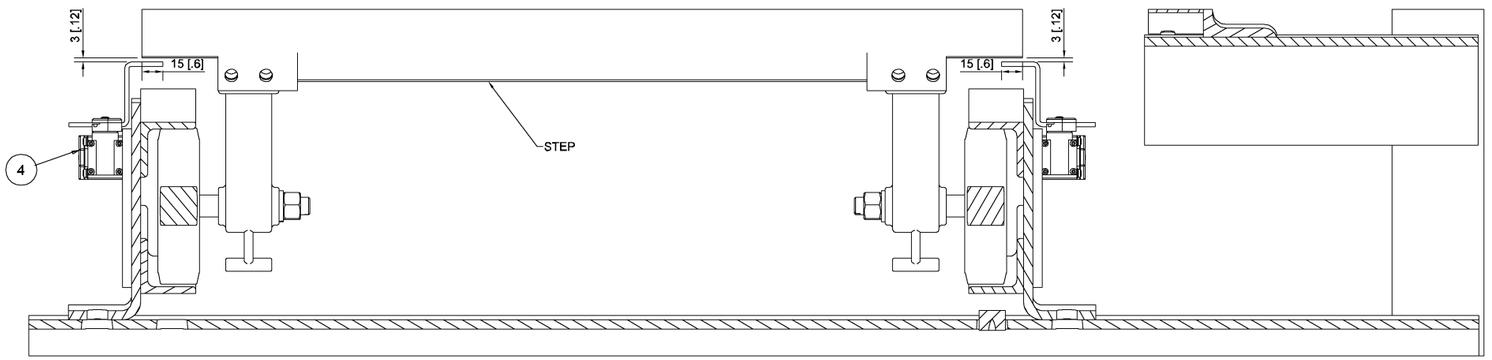




SECTION A-A



SECTION E-E

DIMENSIONS MM [IN]

Assembly C65S1-2881A2

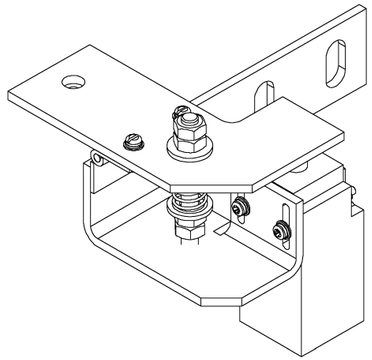
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/9/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/9/2004	TITLE: Lower Step Up-Thrust, Step Level
	APVD. APPERSON	DATE 9/9/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE (1:20) / SIZE D / DWG. NO. Fig. H-1a / REV. A

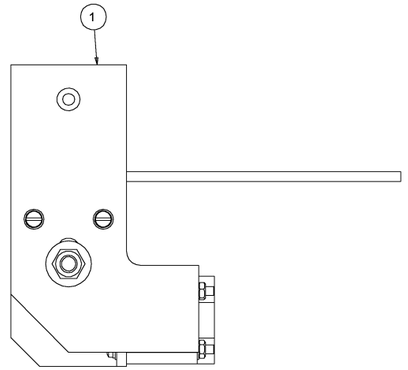
REVISION HISTORY				
REV	DESCRIPTION ecn#10563		DATE	APPROVED

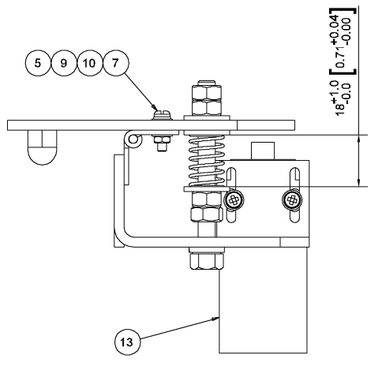
*** CAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***

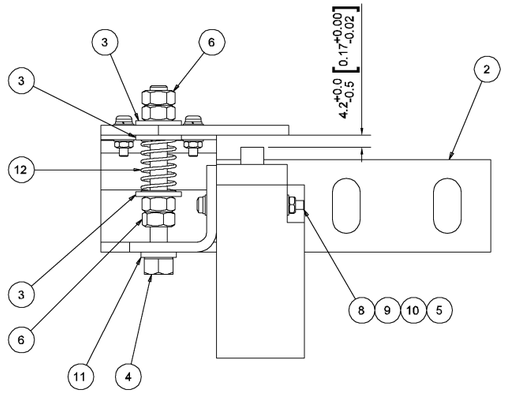
LOWER STEP UP-THRUST SWITCH ASSEMBLY
Assembly C66924001

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





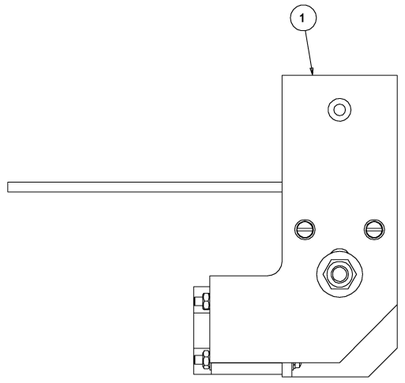


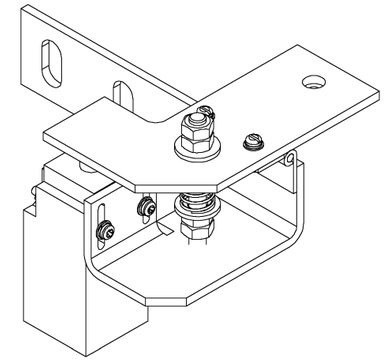


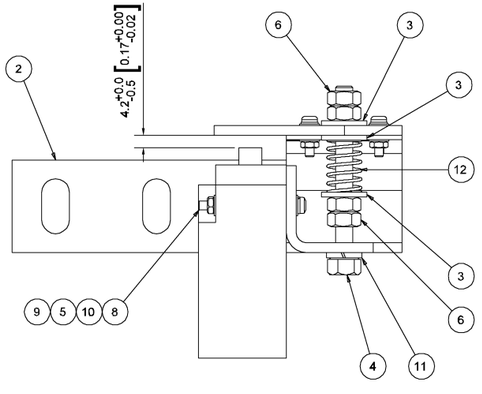
DIMENSIONS MM [IN]

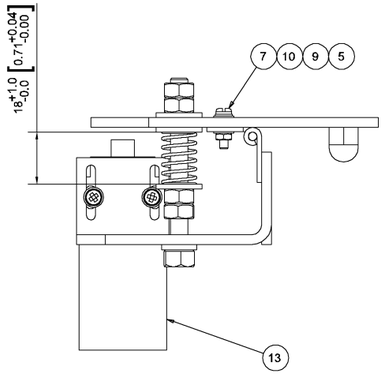
LOWER STEP UP-THRUST SWITCH ASSEMBLY
Assembly C66924002

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236









DIMENSIONS MM [IN]

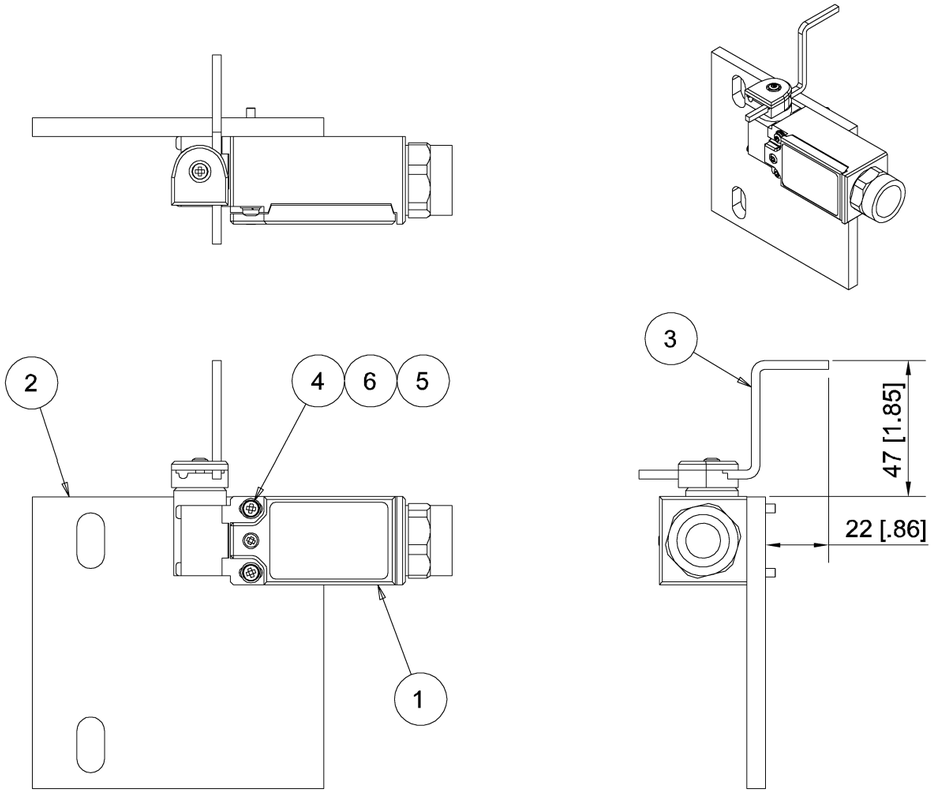
Assembly C65924001 and C65924002

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HET	DATE 2/12/04	FUJITEC AMERICA, INC.
	CHKD. KADONO	DATE 2/12/04	TITLE Lower Step Up-Thrust Switch Assembly
	APVD. KAA	DATE 2/12/04	
JOB TITLE	JOB NO. STD		SCALE 1.00=1.00 / SIZE D / DWG. NO. Fig. H-1b / REV. A

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

LOWER STEP LEVEL SWITCH ASSEMBLY
Assembly C65S1-2881A3

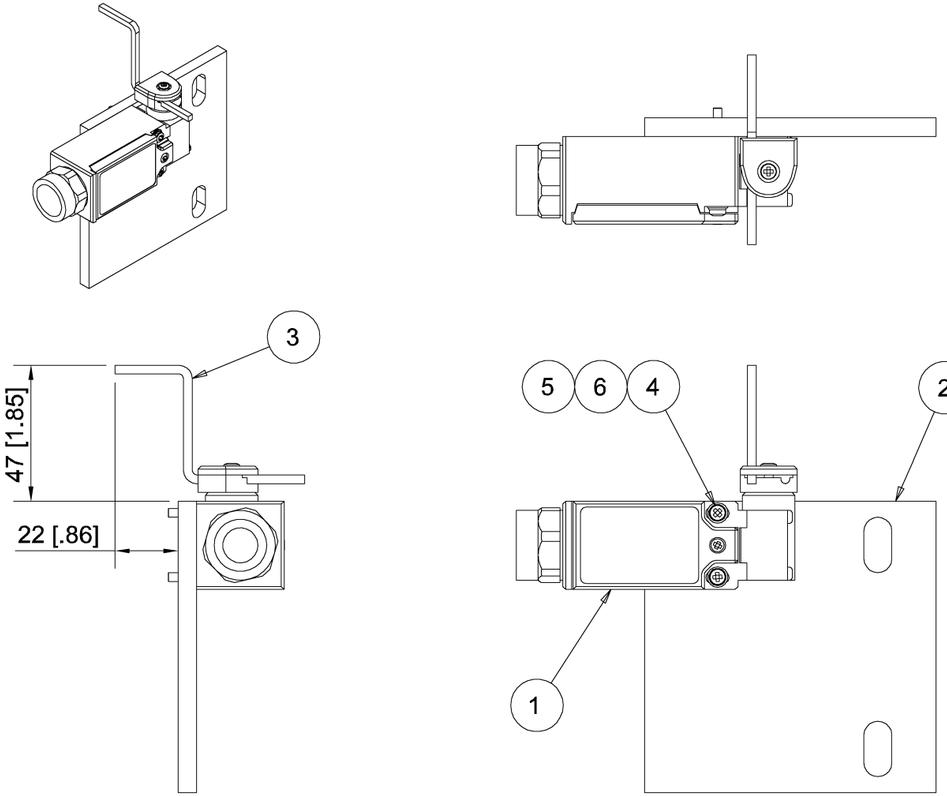
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



DIMENSIONS MM [IN]

LOWER STEP LEVEL SWITCH ASSEMBLY
Assembly C65S1-2881A4

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



DIMENSIONS MM [IN]

Assembly C65S1-2881A3 and C65S1-2881A4

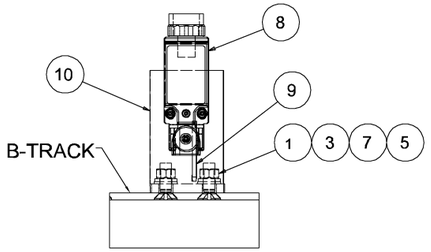
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/9/2004	FUJITEC AMERICA, INC.		
	CHKD. SHUPE	DATE 9/9/2004	TITLE Lower Step Level Switch Assembly		
	APVD. APPERSON	DATE 9/9/2004			
JOB TITLE NYCTA HERALD SQ.	JOB NO. 2881 A01~M01		SCALE (1:2)	SIZE B	DWG. NO. Fig. H-1c / REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

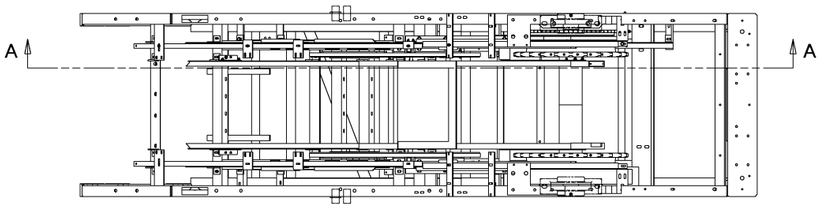
UPPER STEP LEVEL SWITCH ASSEMBLY

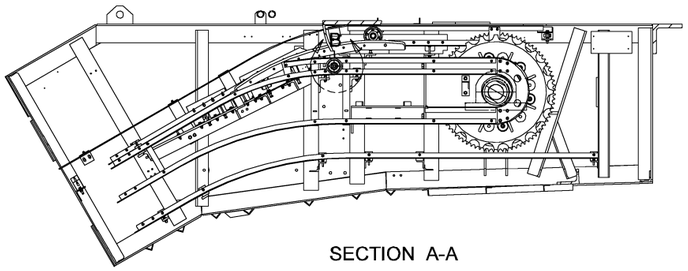
Assembly C65S1-2881A1

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

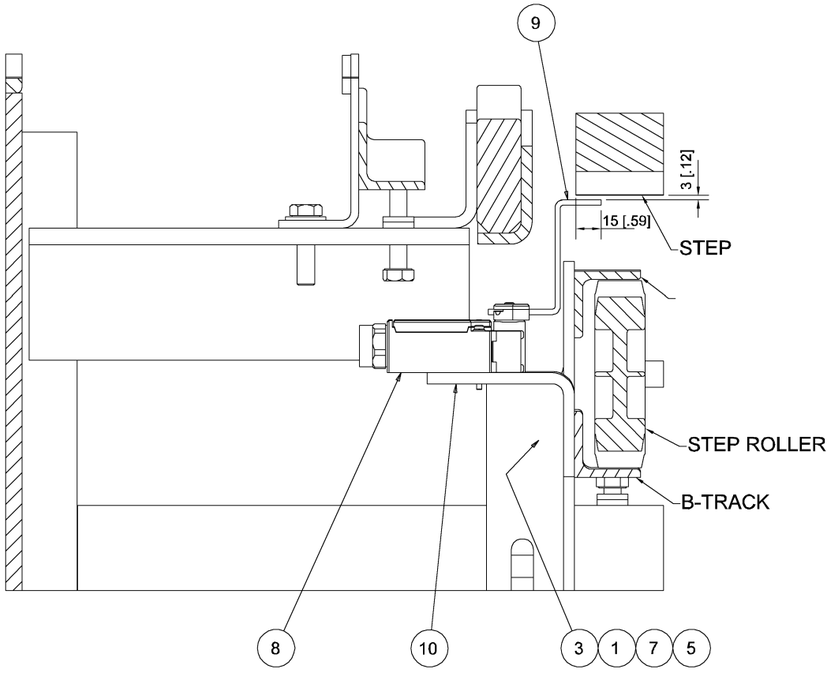


SECTION F-F
TRUSS NOT SHOWN

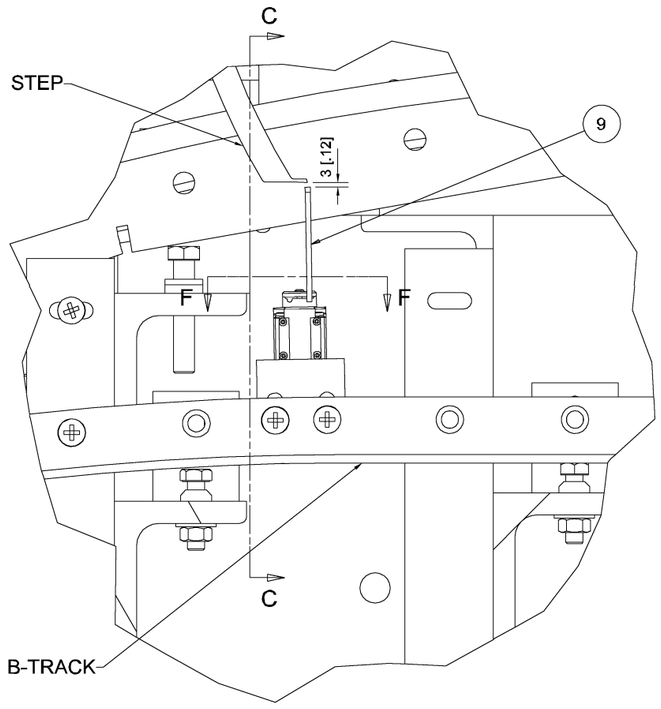




SECTION A-A



SECTION C-C



DETAIL B
STEP ROLLER
&
B-TRACK UP-THRUST
NOT SHOWN

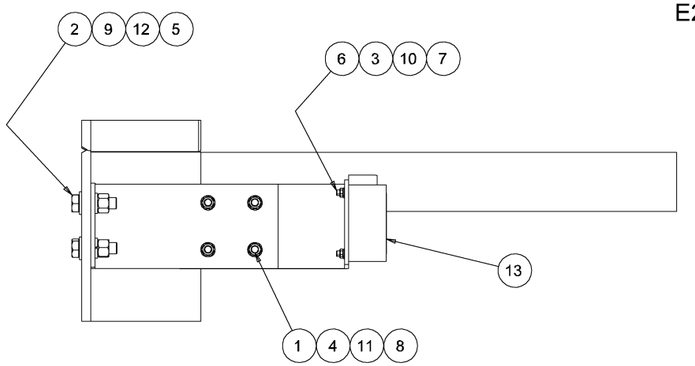
DIMENSIONS MM [IN]

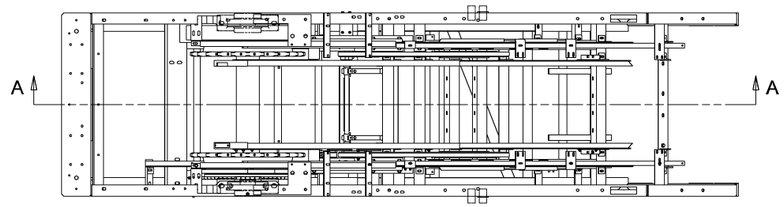
Assembly C65S1-2881A1

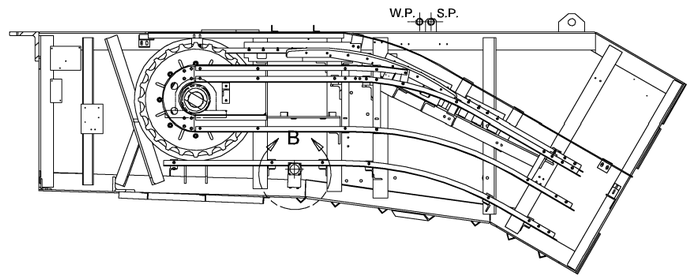
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 8/31/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/31/2004	TITLE: Upper Step Level Switch Assembly
	APVD. APPERSON	DATE 8/31/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE (1:20) / SIZE D / DWG. NO. Fig. H-1d / REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

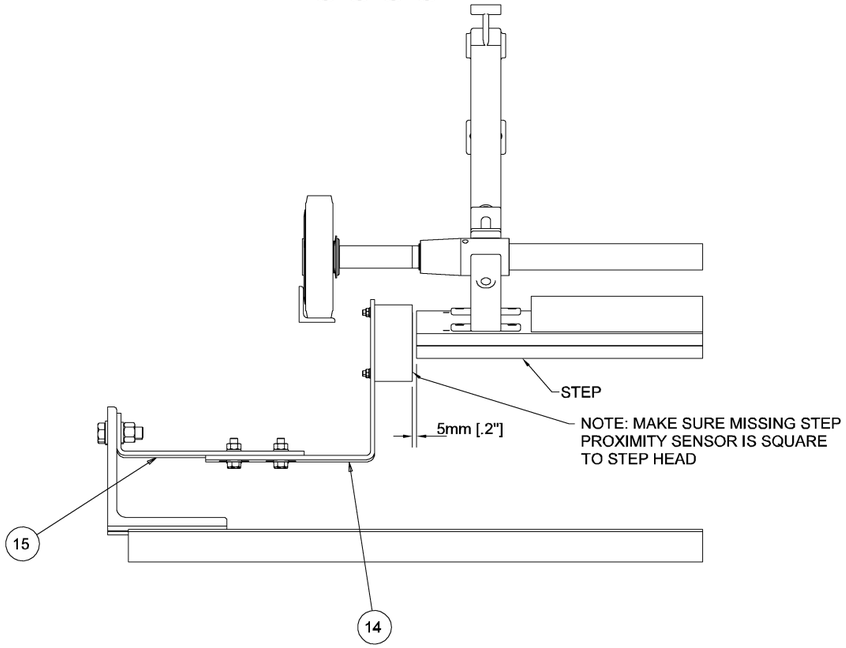
UPPER MISSING STEP DEVICE ASSEMBLY
Assembly C65R1-2881A1
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

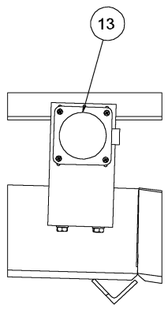






SECTION A-A





DETAIL B

Assembly C65R1-2881A1

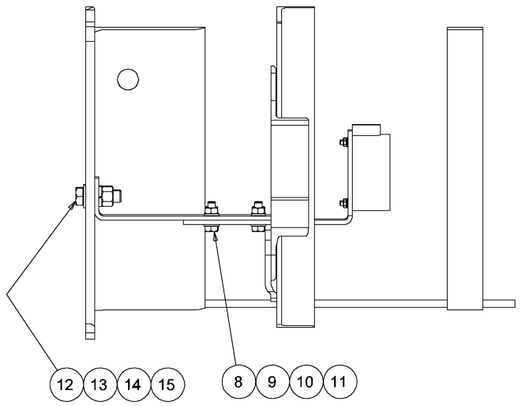
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 9/1/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 9/1/2004	TITLE: UPPER MISSING STEP DEVICE	
	APVD. APPERSON	DATE 9/1/2004		
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE: (1:20)	SIZE: D
			DWG. NO.: Fig. H-2a	REV.: B

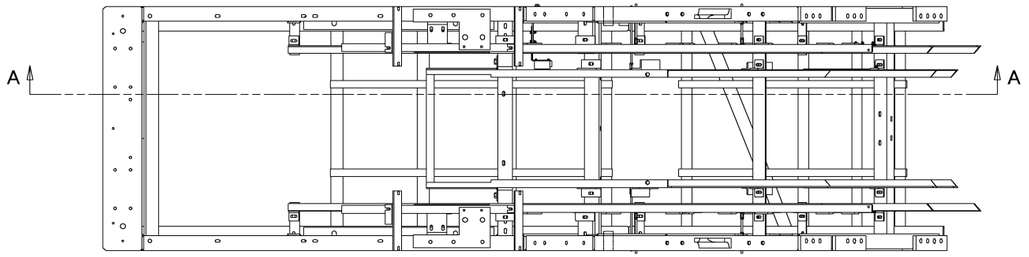
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

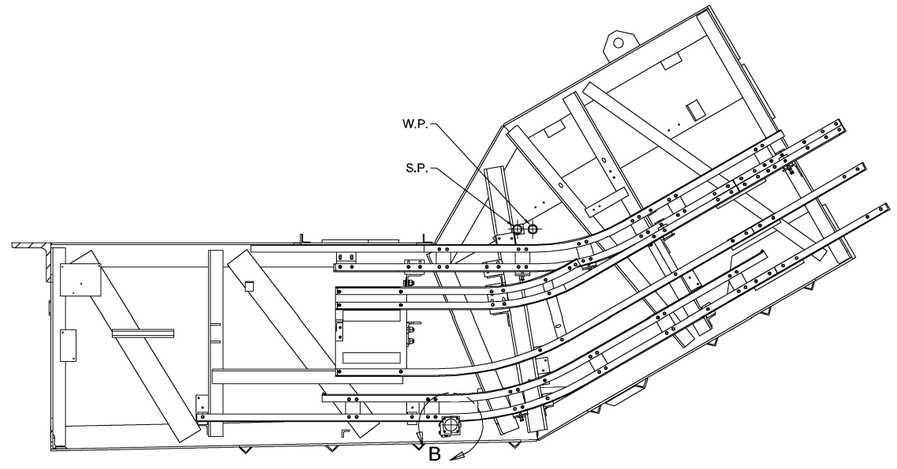
LOWER MISSING STEP DEVICE ASSEMBLY

Assembly C65R1-2881A2

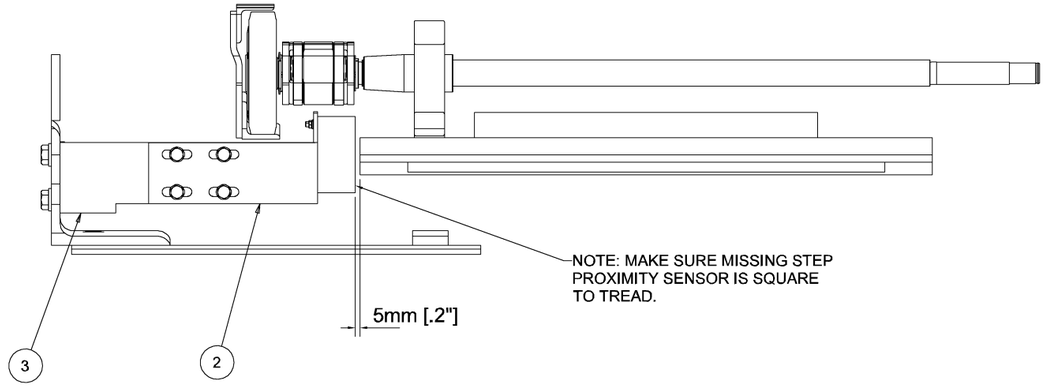
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

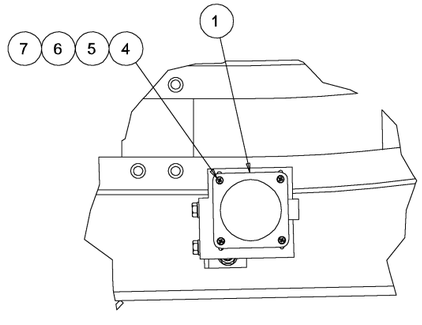






SECTION A-A





DETAIL B

Assembly C65R1-2881A2

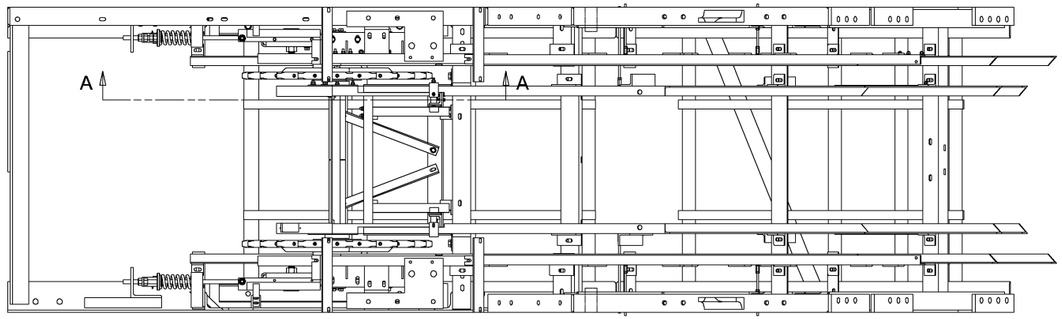
GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 9/9/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 9/9/2004	TITLE: LOWER MISSING STEP DEVICE	
	APVD. APPERSON	DATE 9/9/2004		
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 A01~M01		SCALE (1:15)	SIZE D
			DWG. NO. Fig. H-2b	REV. A

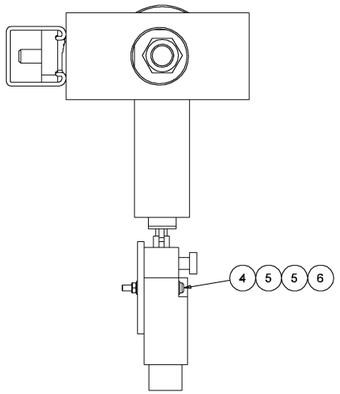
*** CAD – MANUAL REVISIONS NOT PERMITTED ***

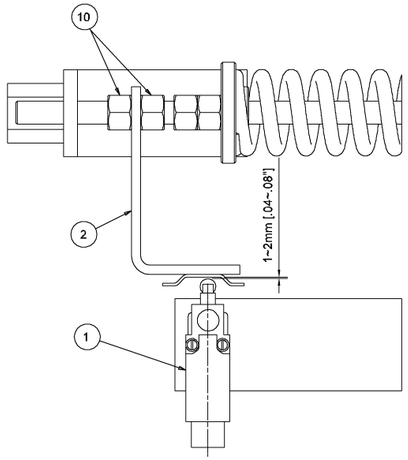
REVISION HISTORY

REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

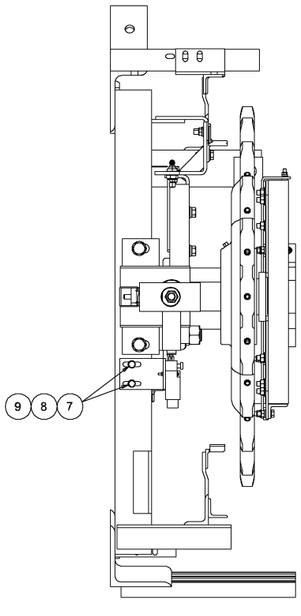
BROKEN STEP CHAIN DEVICE ASSEMBLY
Assembly C65X1-2881A1
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

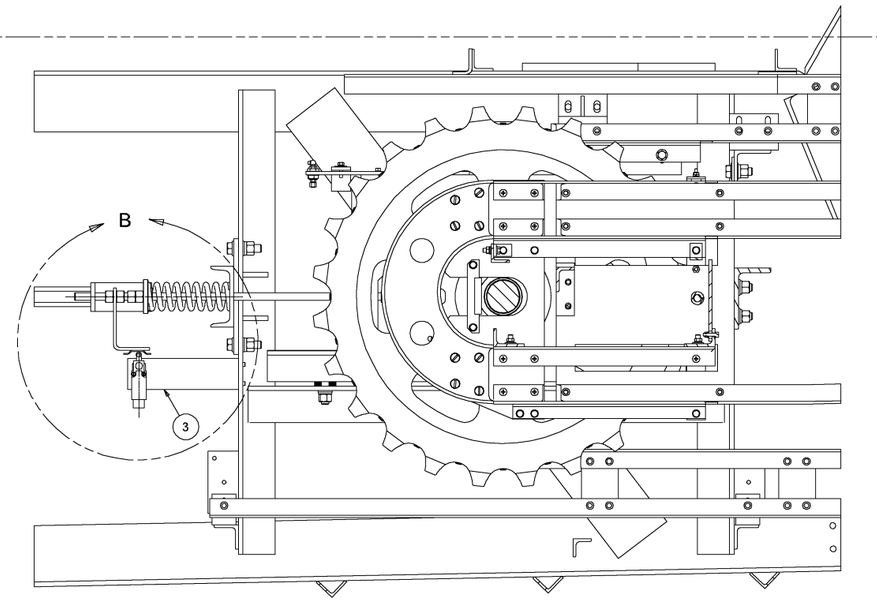






DETAIL B





SECTION A-A

NOTES: (1~3 SHOULD BE DONE IN THE PLANT AND 4 IN THE FIELD)

1.) ADJUST THE ELEVATION OF THE LIMIT SWITCH TO MAKE 1 mm [.04in] CLEARANCE BETWEEN THE ROLLER (SWITCH ACTUATOR) AND THE KICKER.

2.) VERIFY THAT THE KICKER CAN ACTUATE THE LIMIT SWITCH WHEN IT IS MOVED FORWARD AND BACKWARD.

3.) INSTALL CONDUIT & FITTINGS PER JOB SPECS. WIRE PER JOB WIRING DIAGRAM.

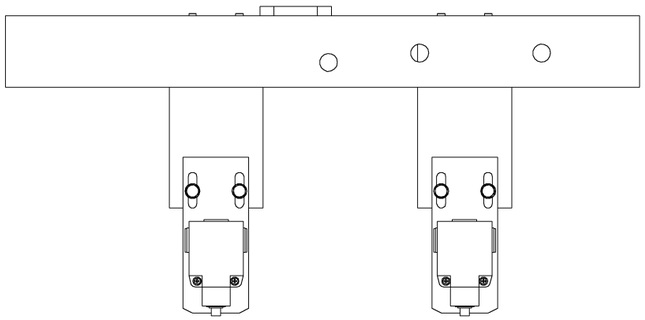
4.) DURING NORMAL ESCALATOR OPERATION, VERIFY THAT THERE IS 1~2 mm [.04~.08in] CLEARANCE BETWEEN THE ROLLER (SWITCH ACTUATOR) AND THE KICKER.

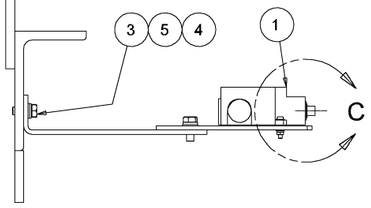
Assembly C65X1-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 9/10/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 9/10/2004	TITLE	BROKEN STEP CHAIN DEVICE
	APVD. APPERSON	DATE 9/10/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 A01~M01		SCALE (1:12)	SIZE D / DWG. NO. Fig. H-3a / REV.

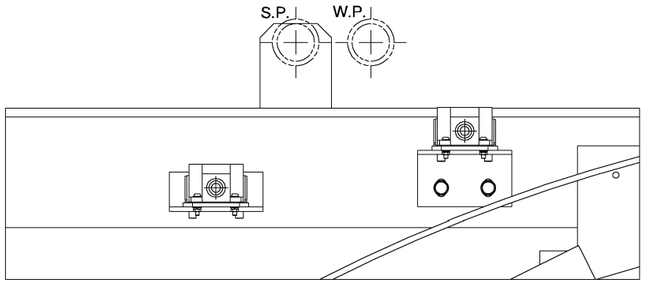
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11345	DATE	APPROVED

UPPER SKIRT OBSTRUCTION DEVICE ASSEMBLY
Assembly C65J1-2881A1
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

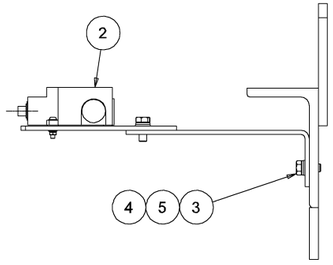




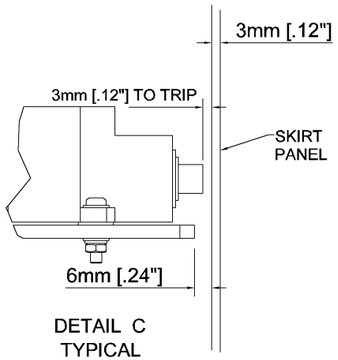
FIRST SWITCH VIEW



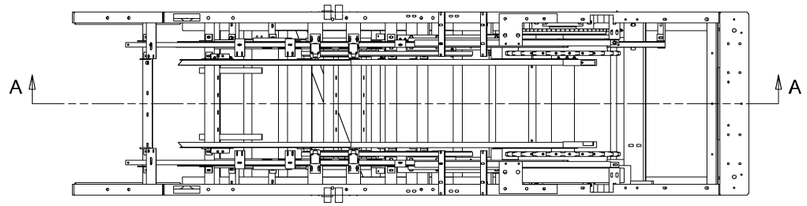
DETAIL B
TYP. BOTH SIDES

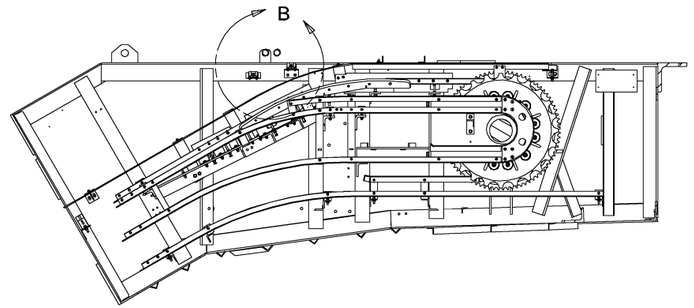


SECOND SWITCH VIEW



DETAIL C
TYPICAL





SECTION A-A

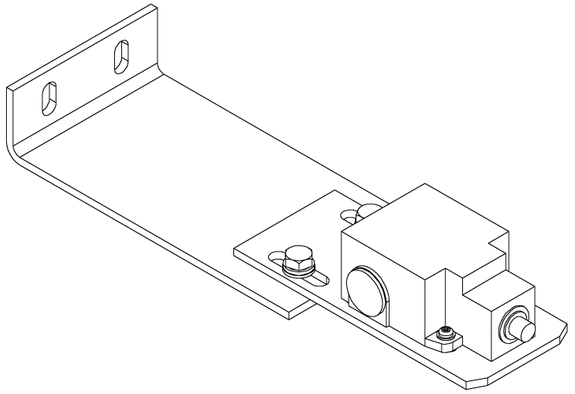
Assembly C65J1-2881A1

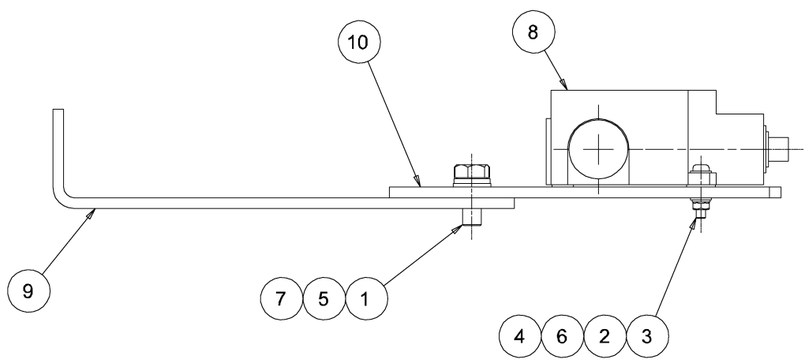
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 8/25/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 8/25/2004	TITLE: Upper Skirt Obstruction Dev. Ass'y	
	APVD. APPERSON	DATE 8/25/2004		
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE: (1:20)	SIZE: D
			DWG. NO.: Fig. H-4a	REV.: A

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

UPPER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J3-2881A6

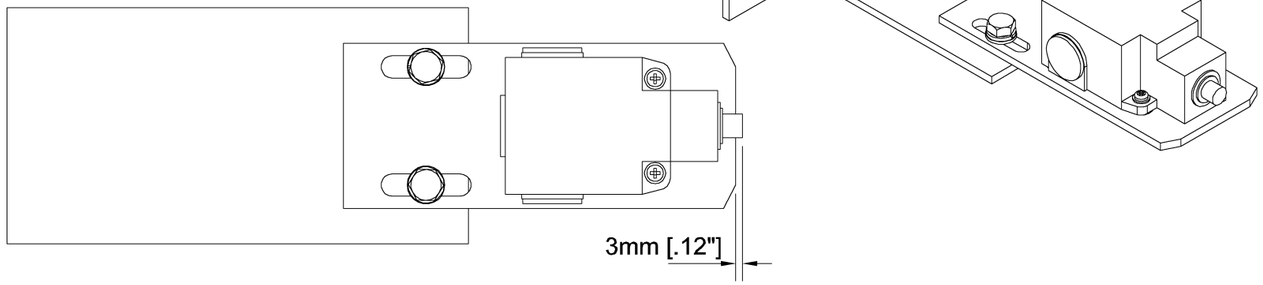
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





UPPER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J3-2881A8

E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



Assembly C65J3-2881A6 and C65J3-2881A8

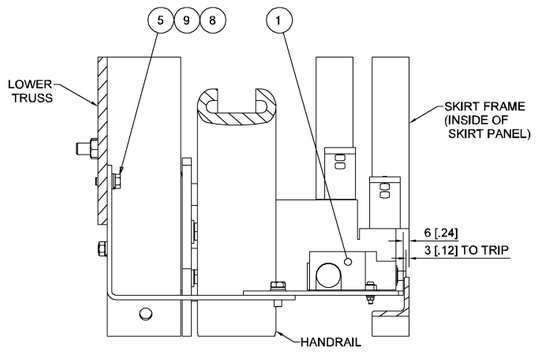
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/9/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/9/2004	TITLE: Upper Skirt Obstruct. Switch Assy
	APVD. APPERSON	DATE 9/9/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01~M01	SCALE (1:2)	SIZE B / DWG. NO. Fig. H-4b / REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

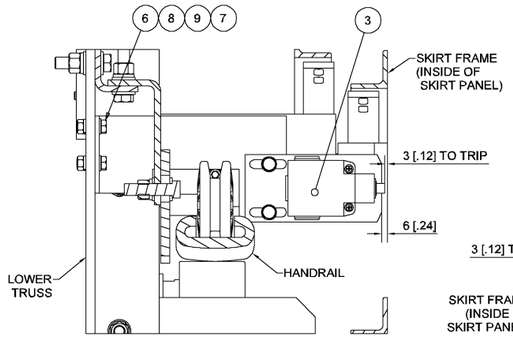
LOWER SKIRT OBSTRUCTION DEVICE ASSEMBLY

Assembly C65J1-2881A2

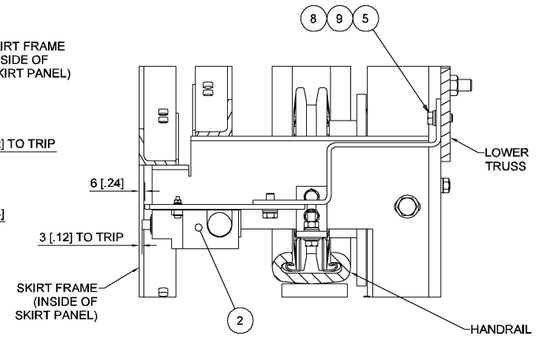
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



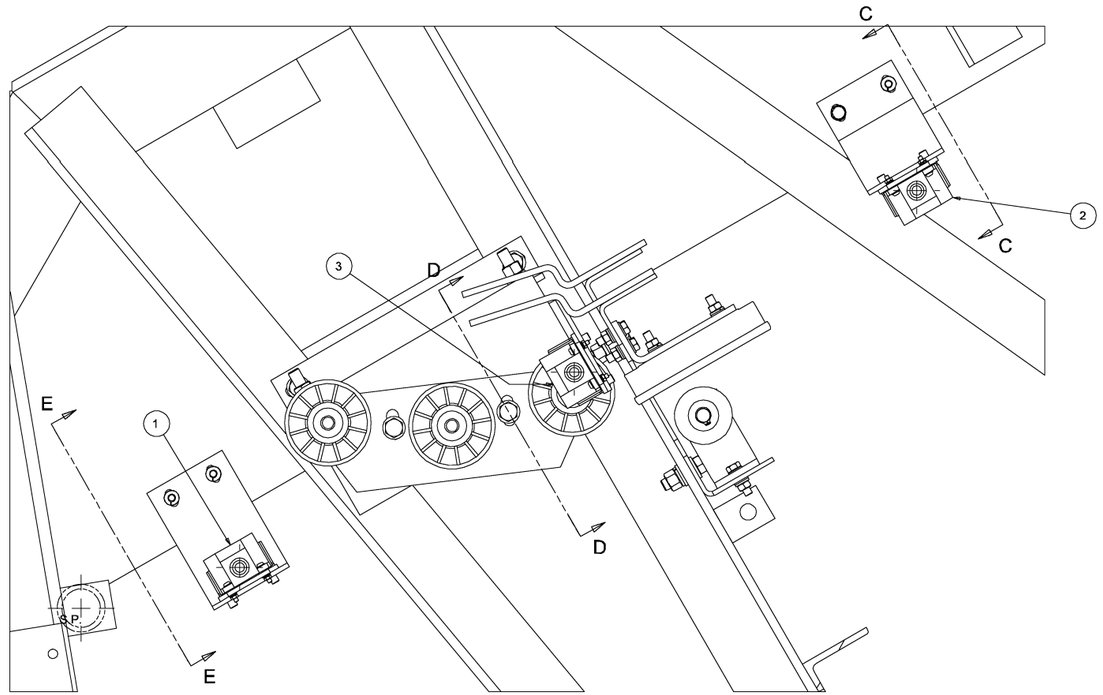
SECTION E-E



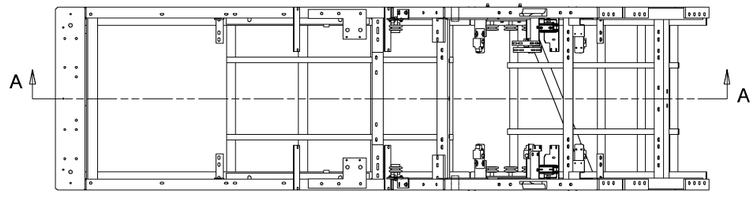
SECTION D-D

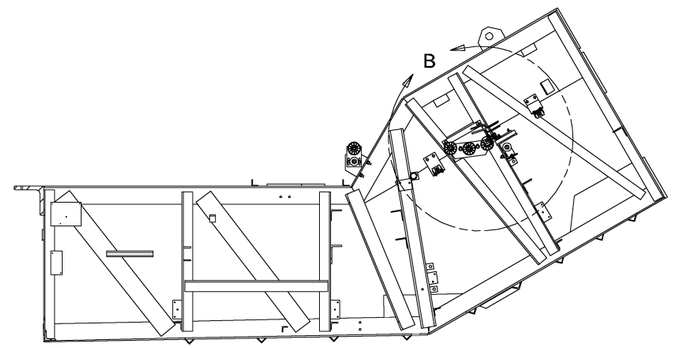


SECTION C-C



DETAIL B





SECTION A-A

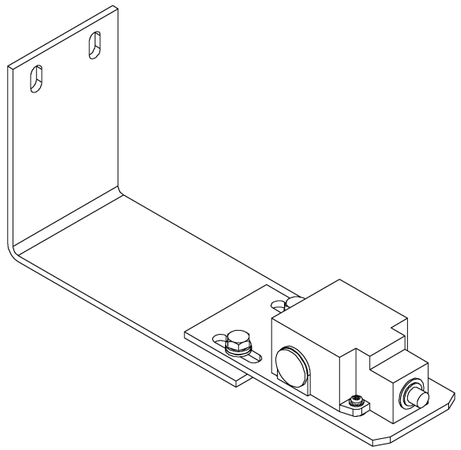
DIMENSIONS IN MM [IN]

Assembly C65J1-2881A2

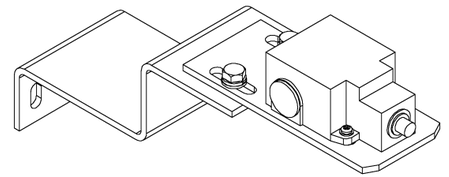
GENERAL TOLERANCE SEE EN-ES-001	DWN. HET	DATE 9/13/2004	FUJITEC AMERICA, INC.			
	CHKD. SHUPE	DATE 9/13/2004	TITLE: Lower Skirt Obstruction Dev. Assy			
	APVD. APPERSON	DATE 9/13/2004				
JOB TITLE: NYCTA HERALD SQ.	JOB NO.: 2881 A01~M01		SCALE: (1:20)	SIZE: D	DWG. NO.: Fig. H-4c	REV.: A

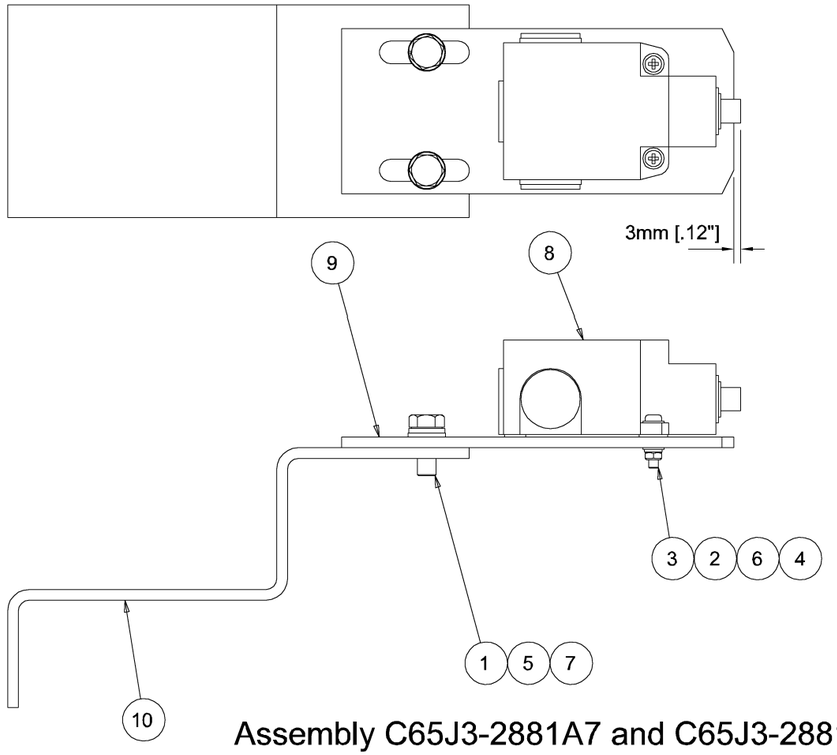
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J3-2881A7
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J3-2881A9
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





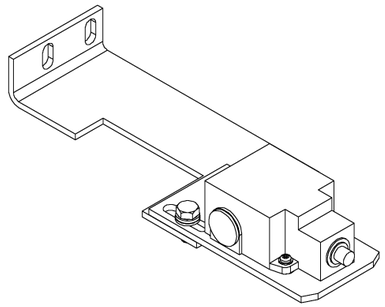
Assembly C65J3-2881A7 and C65J3-2881A9

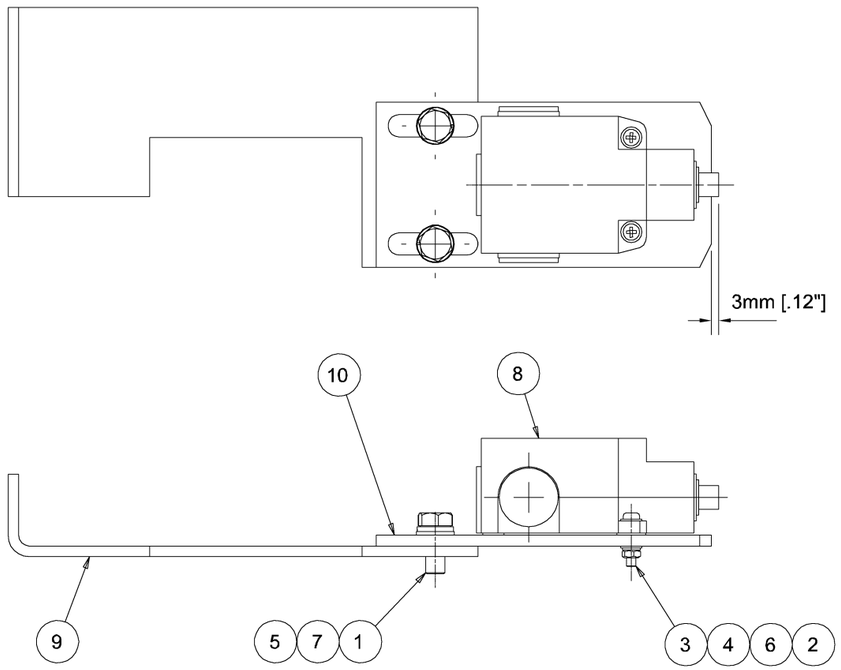
GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/9/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/9/2004	TITLE: Lower Skirt Obstruct. Switch Assy
	APVD. APPERSON	DATE 9/9/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01~M01		SCALE (1:2) / SIZE B / DWG. NO. Fig. H-4d / REV.

*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11411	DATE	APPROVED

LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J5-2881A1

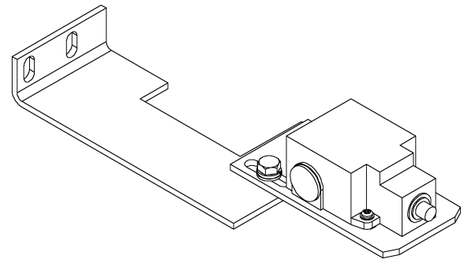
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

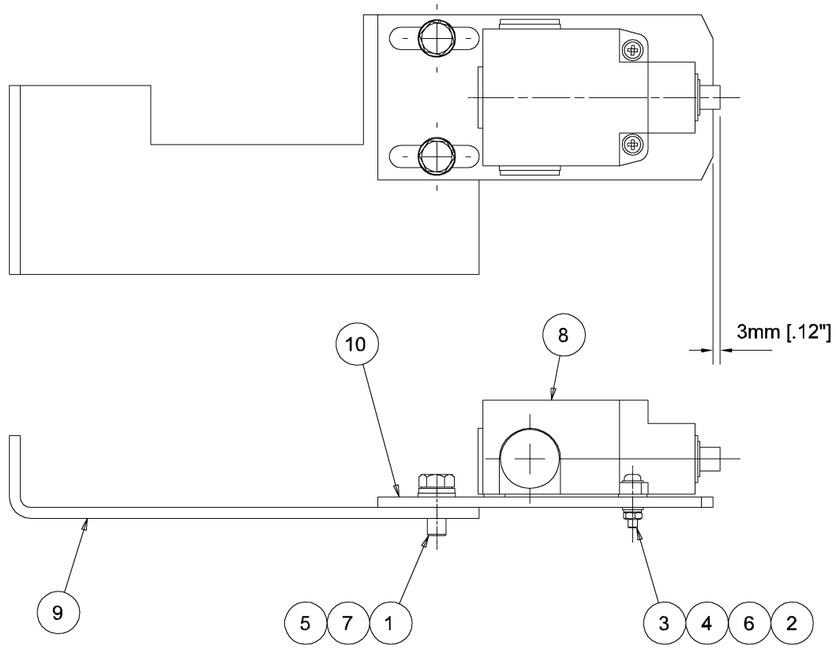




LOWER SKIRT OBSTRUCTION SWITCH ASSEMBLY
Assembly C65J5-2881A2

E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





Assembly C65J5-2881A1 and C65J5-2881A2

GENERAL TOLERANCE SEE EN-ES-001	DWN HET	DATE 9/9/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/9/2004	TITLE: Lower Skirt Obstruct. Switch Assy
	APVD. APPERSON	DATE 9/9/2004	
JOB TITLE: NYCTA HERALD SQ.	JOB NO. 2881 A01~M01		

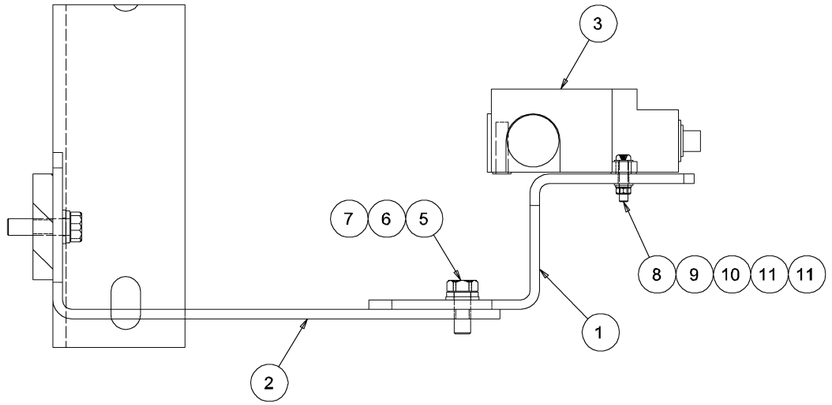
SCALE	SIZE	DWG. NO.	REV.
(1:2)	B	Fig. H-4e	

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 19875	DATE	APPROVED

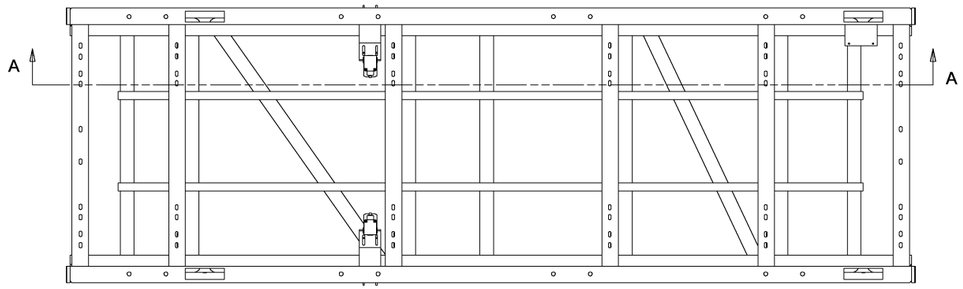
INCLINE SKIRT OBSTRUCTION DEVICE ASSEMBLY

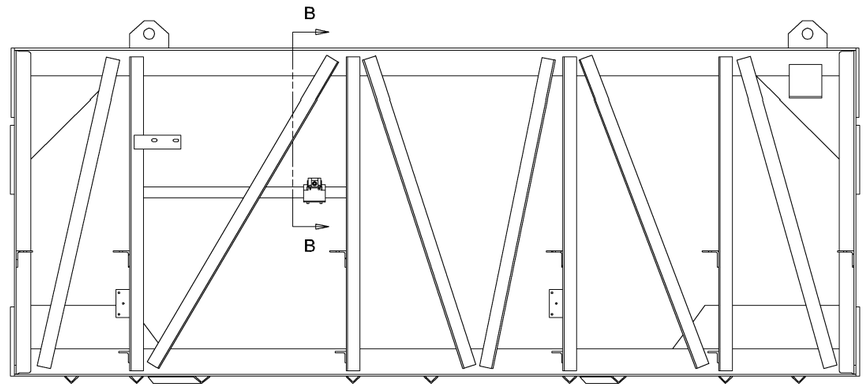
Assembly C65J1-2881E3

E229, E230, E231, E232
E233, E234, E235, E236

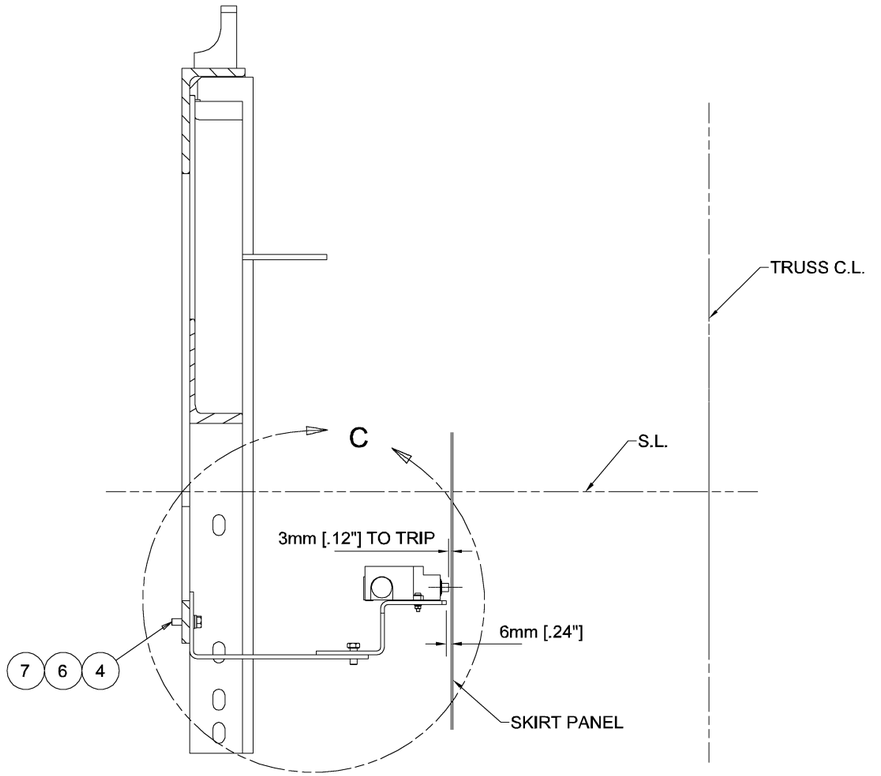


DETAIL C





SECTION A-A



SECTION B-B

NOTES:

1.) PRIOR TO INSTALLATION OF SKIRT PANEL, THE SWITCH SHOULD BE SET BASED ON UPPER AND LOWER SKIRT FRAME FACE AND FINE ADJUSTMENTS MADE AFTER INSTALLING SKIRT PANEL.

2.) MAKE SURE THAT THE CONDUIT DOES NOT INTERFERE WITH HANDRAIL OR STEP CHAIN.

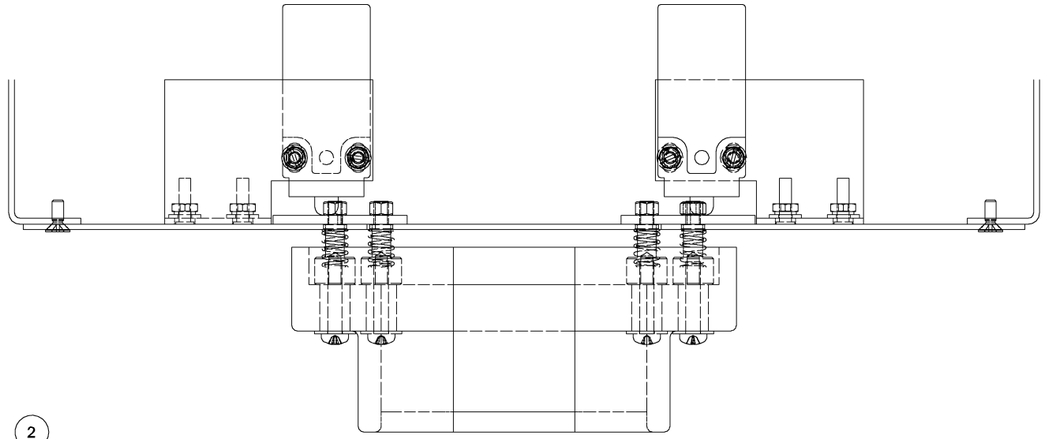
3.) THE SKIRT SWITCH PLUNGER SHOULD **NOT** BE IN CONTACT WITH THE SKIRT AT ALL TIMES.

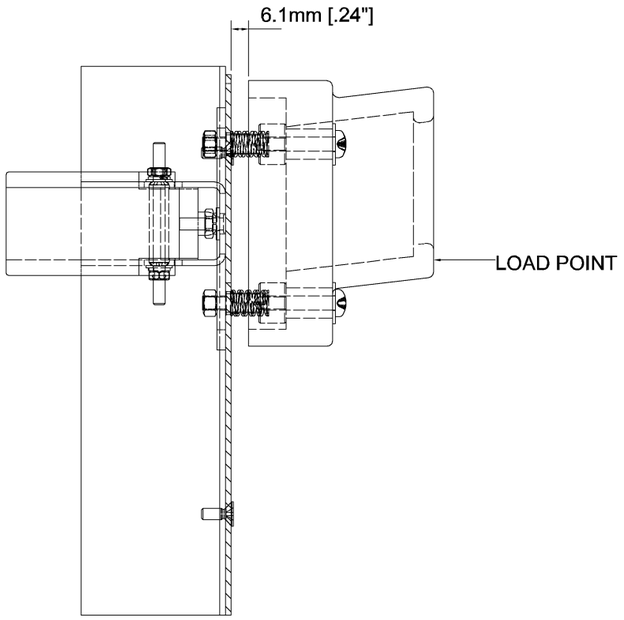
Assembly C65J1-2881E3

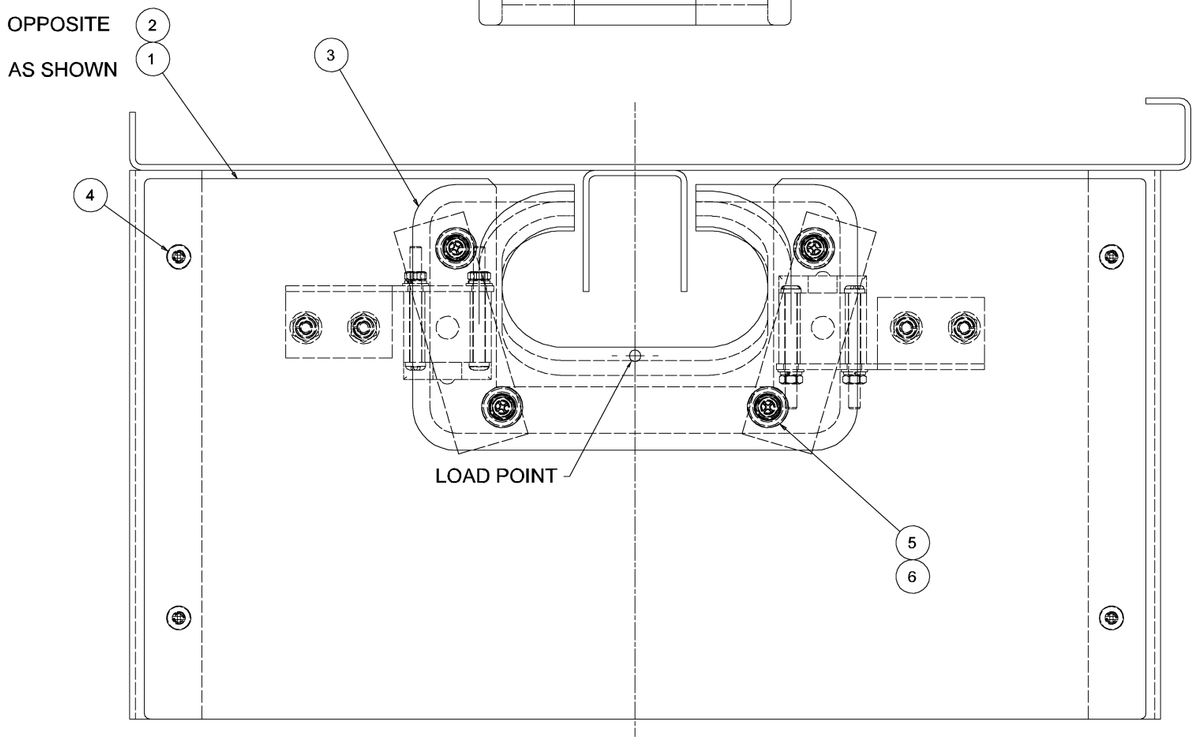
GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 8/25/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/25/2004	TITLE: Incline Skirt Obstruct. Switch Assy
	APVD. APPERSON	DATE 8/25/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 E01	SCALE (1:12)	SIZE D
		DWG. NO. Fig. H-4f	REV. A

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11410	DATE	APPROVED

HANDRAIL ENTRY DEVICE ASSEMBLY
Assembly A64A48001
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236







NOTES:

1) IF HANDRAIL CONTACTS WITH HANDRAIL GUARD RUBBER, ADJUST IT BY CUTTING THE RUBBER.

2) ADJUST THE SWITCHES, IF NECESSARY, SO THAT THE SWITCH WILL TRIP WHEN ABOUT 10 LB (44.5N) LOAD IS APPLIED ON THE LOAD POINT.

3) THIS DRAWING SHOWS C64A49001 INSTALLED ON LEFT HAND SIDE WHEN VIEWED FROM LANDING FACING ESCALATOR.

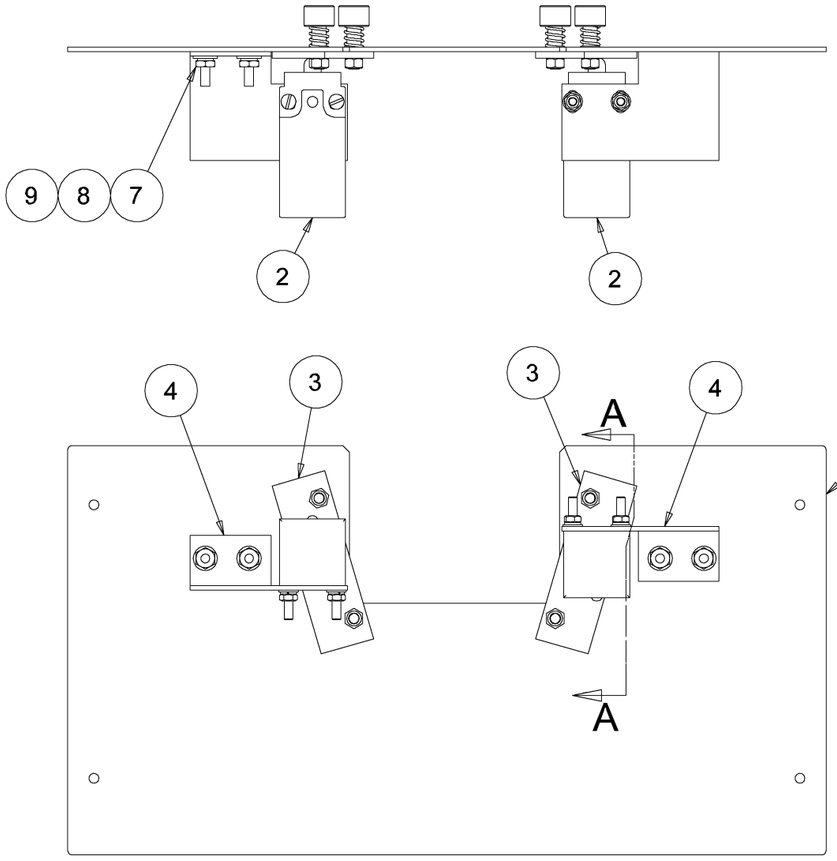
4) C64A49002, NOT SHOWN, IS INSTALLED ON RIGHT HAND SIDE WHEN VIEWED FROM LANDING FACING ESCALATOR.

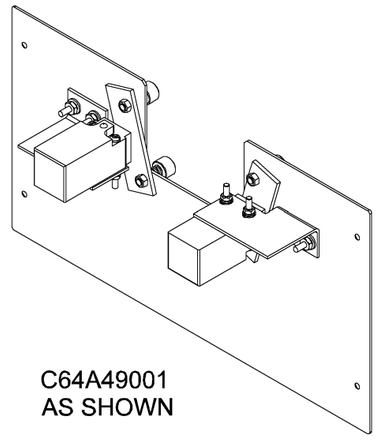
Assembly A64A48001

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9/8/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 9/8/2004	TITLE	
	APVD. APPERSON	DATE 9/8/2004	HANDRAIL ENTRY DEVICE ASSY	
JOB TITLE	JOB NO. STD		SCALE (1:1) / SIZE D / DWG. NO. Fig. H-5a / REV. A	

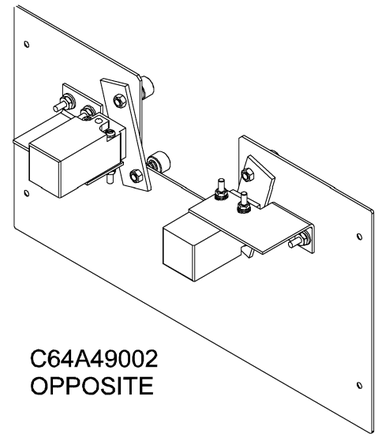
*** CAD -- MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11410	DATE	APPROVED

HANDRAIL ENTRY FACEPLATE ASSEMBLY
Assembly C64A49001 and C64A49002
E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

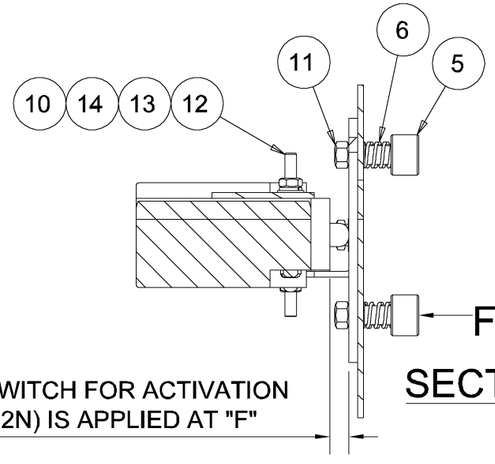




C64A49001
AS SHOWN



C64A49002
OPPOSITE



SET EACH SWITCH FOR ACTIVATION
WHEN 5 lbf (22N) IS APPLIED AT "F"

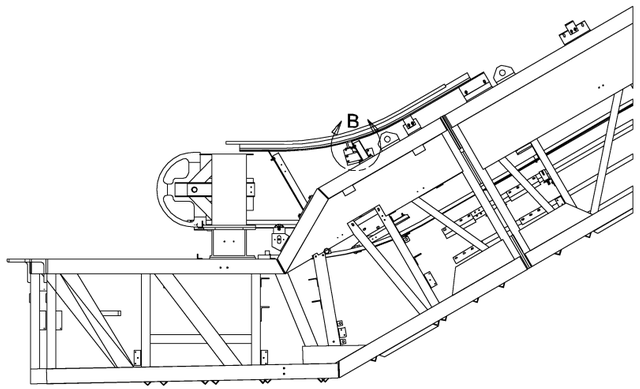
SECTION A-A

Assembly C64A49001 and C64A49002

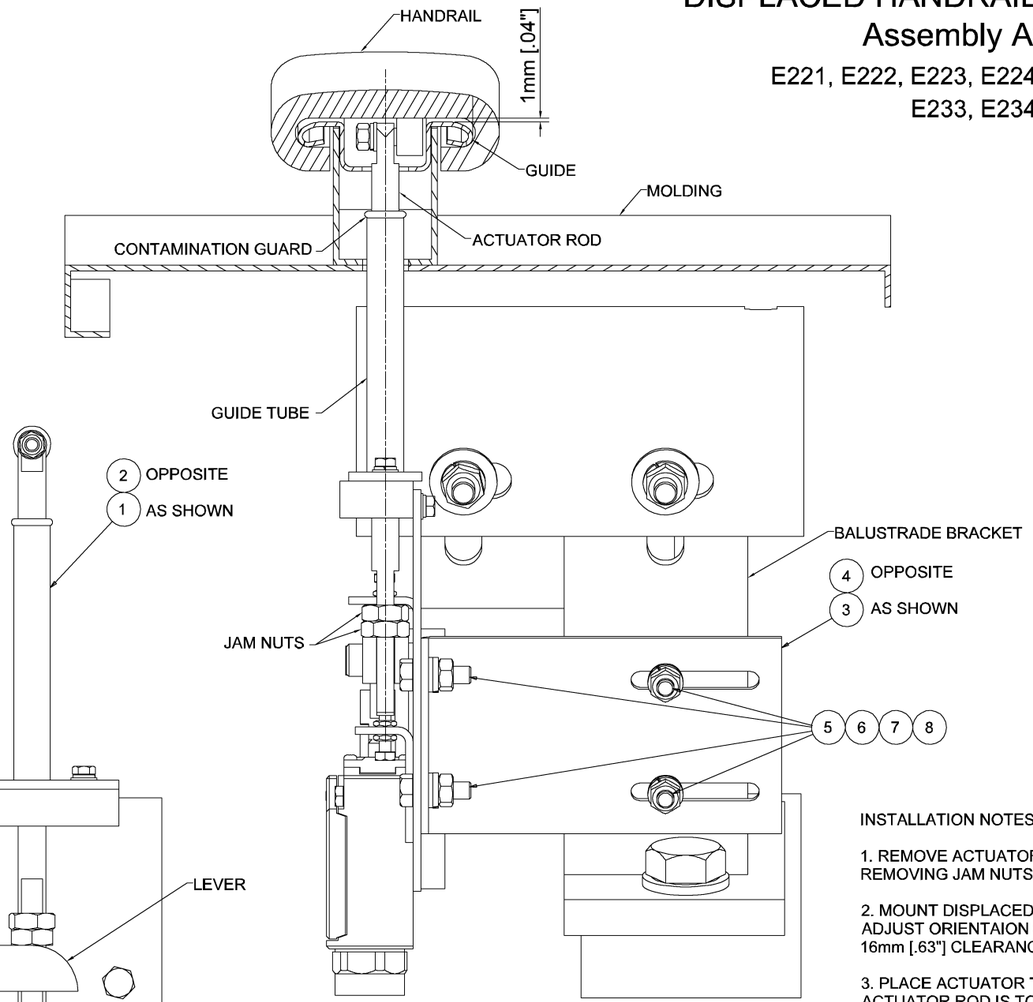
GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9/8/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/8/2004	TITLE: HR ENTRY FACEPLATE ASS'Y
	APVD. APPERSON	DATE 9/8/2004	
JOB TITLE	JOB NO. STD		SCALE (0.38:1) / SIZE B / DWG. NO. Fig. H-5b / REV.

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11439	DATE	APPROVED

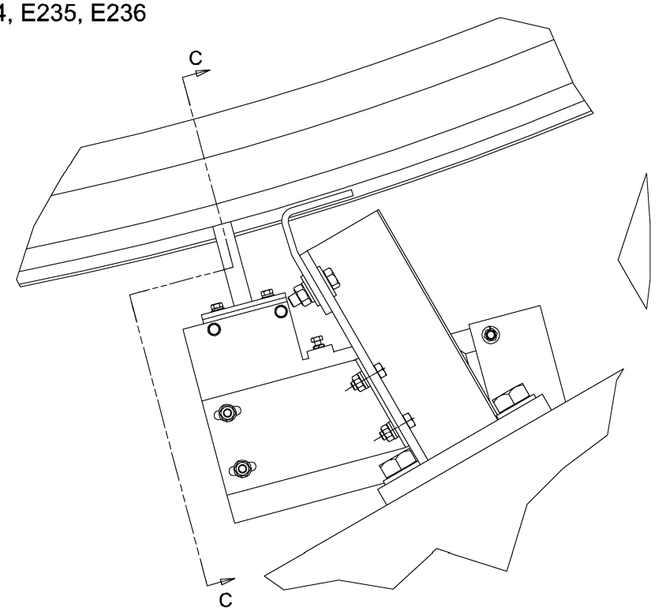
DISPLACED HANDRAIL DEVICE INSTALLATION
Assembly A65N2-2881E1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



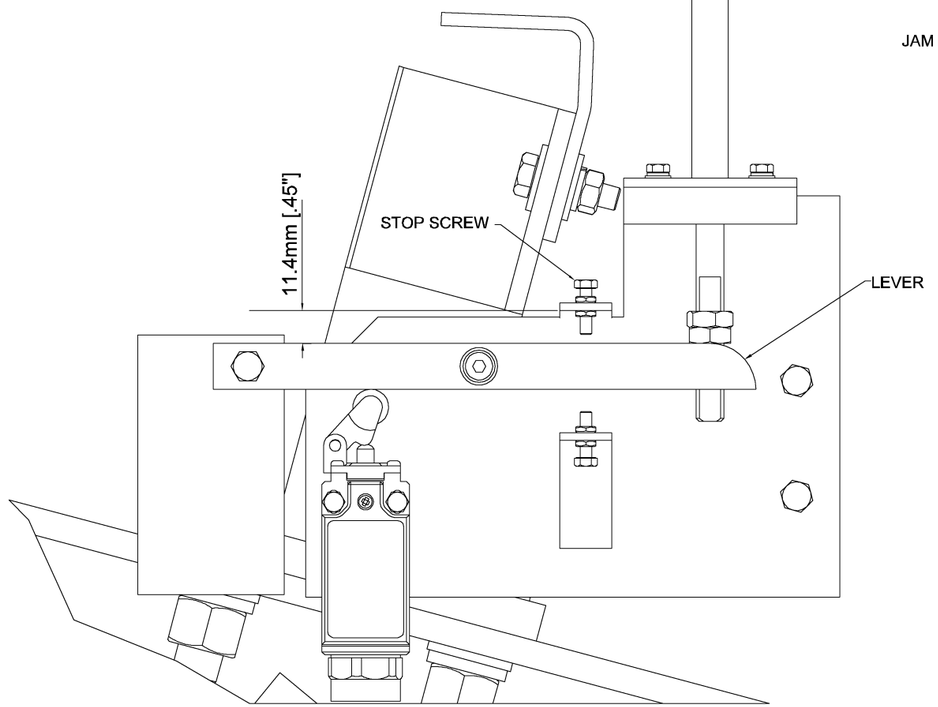
VIEW A-A



SECTION C-C



DETAIL B



INSTALLATION NOTES:

1. REMOVE ACTUATOR ROD FROM DISPLACED HANDRAIL SUB-ASSY (ITEMS #1 & #2) BY REMOVING JAM NUTS.

2. MOUNT DISPLACED HR SUB-ASSY TO BALUSTRADE BRACKET WITH BRACKET (ITEMS #3 & #4). ADJUST ORIENTAION OF SUB-ASSY SO ACTUATOR GUIDE IS LOCATED APPROX. CENTER IN 16mm [.63"] CLEARANCE HOLES.

3. PLACE ACTUATOR THRU HANDRAIL GUIDE AND INTO LEVER OF DISPLACED HR SUB-ASSY. ACTUATOR ROD IS TO SLIDE FREELY INSIDE OF GUIDE TUBE.

4. WITH HANDRAIL REMOVED, ADJUST STOP SCREW UNTIL LIMIT SWITCH IS ACTIVATED.

5. ADJUST ACTUATOR LENGTH WITH JAM NUTS UNTIL ROLLER IS APPROX. 1mm [.04"] ABOVE TOP OF HANDRAIL GUIDE AND LEVER IS APPROX. PARALLEL TO BRACKET AT 11.4mm [.45"] DIMENSION SHOWN.

Assembly A65N2-2881E1

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9/13/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 9/13/2004	TITLE	DISPLACED HR DEVICE INSTALL
	APVD. APPERSON	DATE 9/13/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 A01		SCALE (1:50)	SIZE D
			DWG. NO. Fig. H-6a	REV.

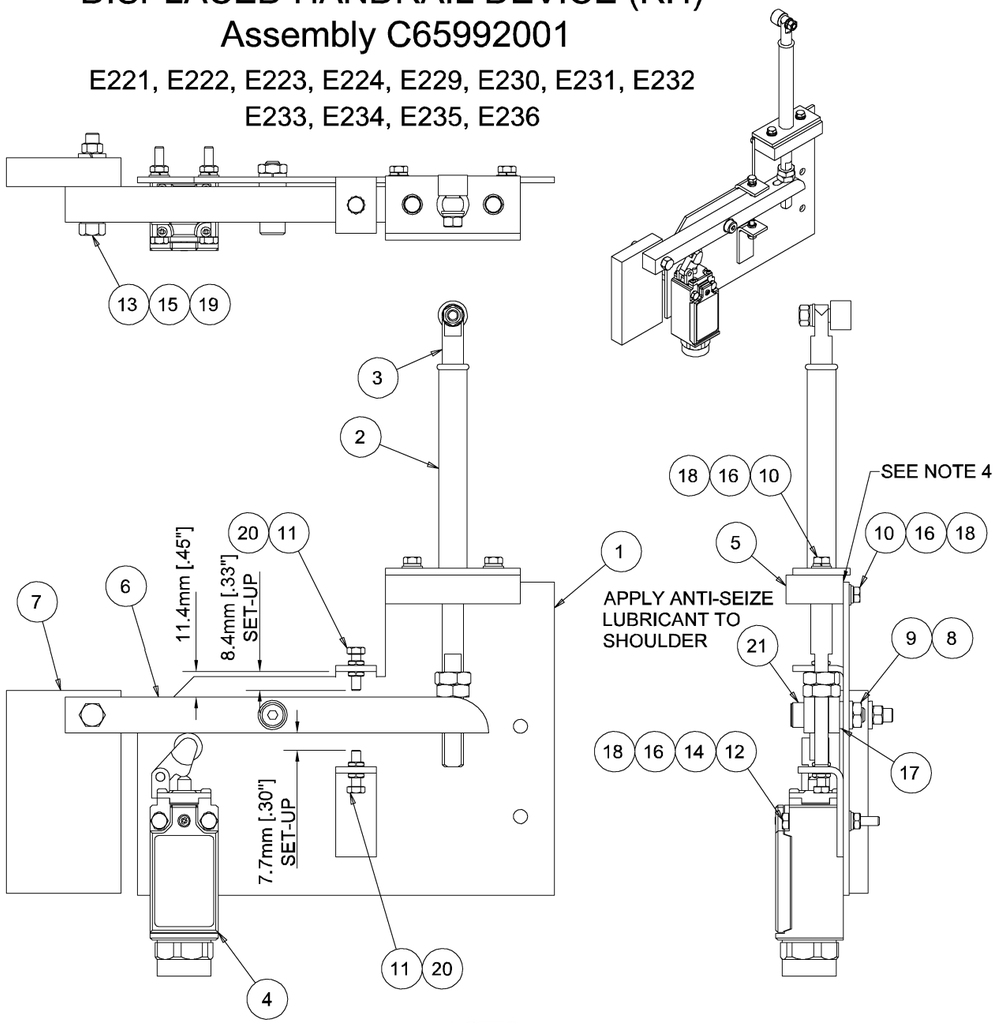
REV	DESCRIPTION	ecn#10563	DATE	APPROVED

*** CAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***

REVISION HISTORY

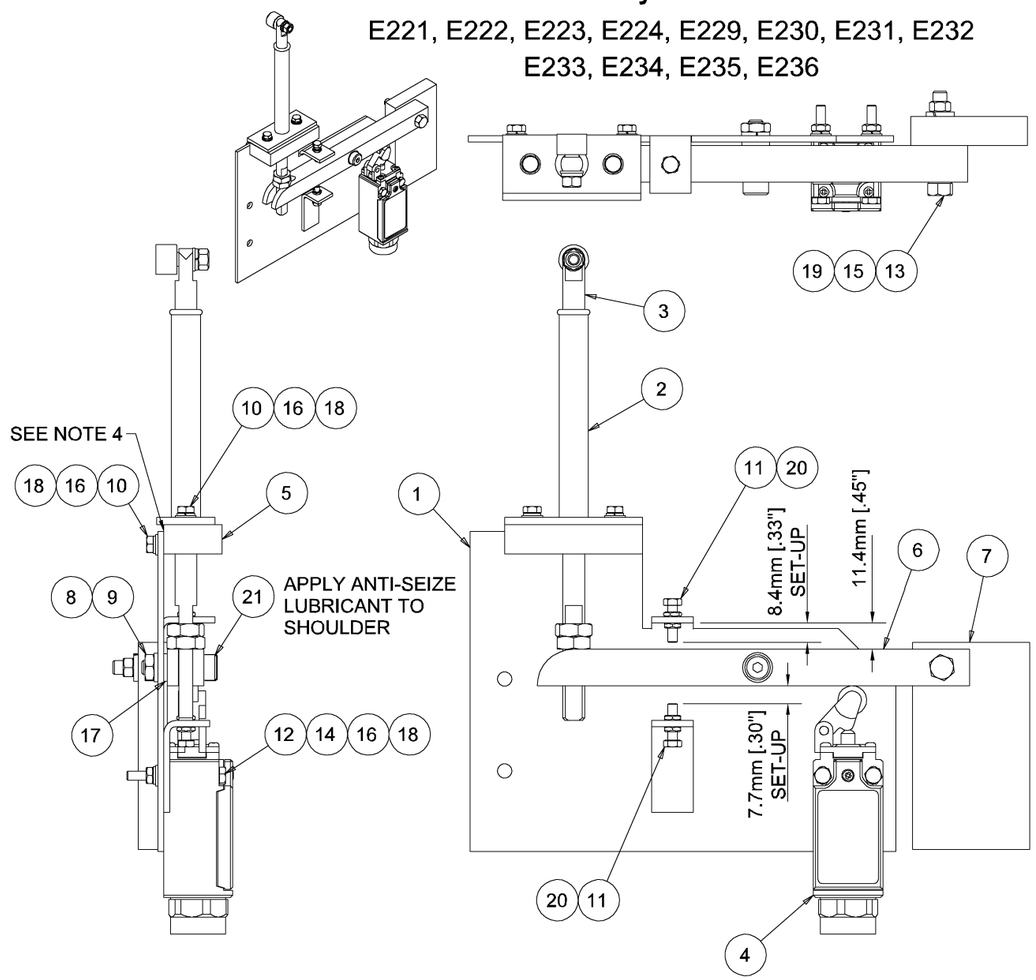
DISPLACED HANDRAIL DEVICE (RH)
Assembly C65992001

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



DISPLACED HANDRAIL DEVICE (LH)
Assembly C65993001

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



NOTES:

1. LEVER (ITEM #6) TO ROTATE FREELY AFTER ASSEMBLY.

2. LOCATE LIMIT SWITCH (ITEM #4) TO LEVER (ITEM #6) AS SHOWN WITH LEVER TO 11.4mm [.45"] DIMENSION.

3. ADJUST STOP SCREWS (ITEM #11) TO 8.4mm [.33"] & 7.7mm [.30"] SET-UP DIMENSION AS SHOWN.

4. PLACE ACTUATOR ASSY (ITEM #3) IN DEVICE AS SHOWN. CHECK IF ACTUATOR ROD IS ON CENTER TO SLOT IN LEVER (ITEM #6). ASSEMBLY SHOULD MOVE FREELY AND NOT BIND WHEN ACTUATOR ROD IS PUSHED. IF ACTUATOR ROD POSITION IS NOT CORRECT, SHIM OR GRIND GUIDE BLOCK (ITEM #5) TO CENTER ROD. ACTUATOR ASSY MUST BE REMOVED FOR INSTALLATION IN ESCALATOR.

DIMENSIONS IN MM [IN]

Assembly C65992001 and C65993001

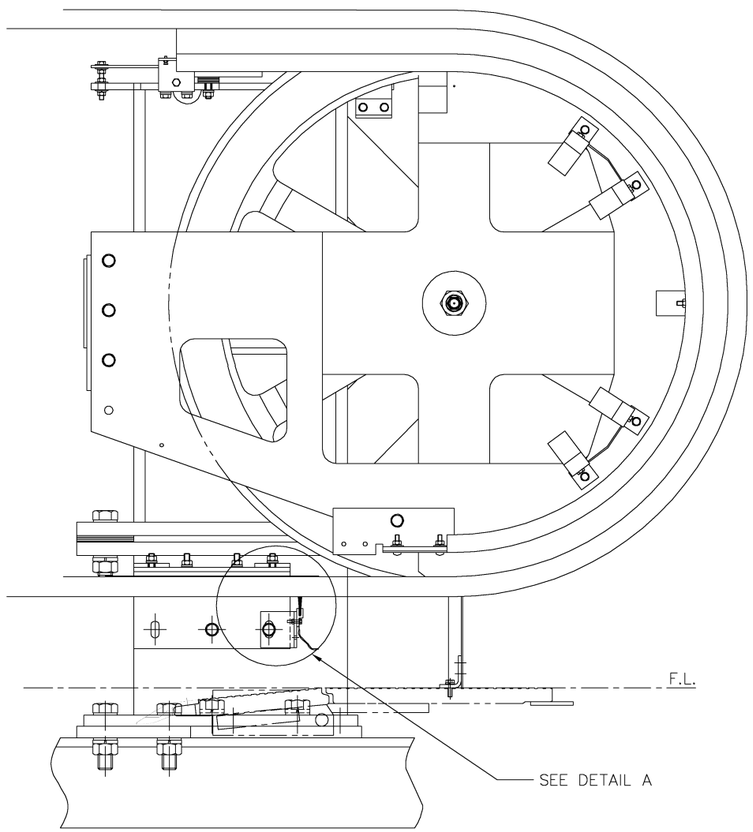
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HET / DATE 2/12/04	FUJITEC AMERICA, INC.
	CHKD. KADONO / DATE 2/12/04	TITLE: Displaced HR Device (RH, LH) Assy
JOB TITLE	APVD. KAA / DATE 2/12/04	
	JOB NO. STD	SCALE 1.00=1.00 / SIZE D / DWG. NO. Fig. H-6b / REV. A

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***

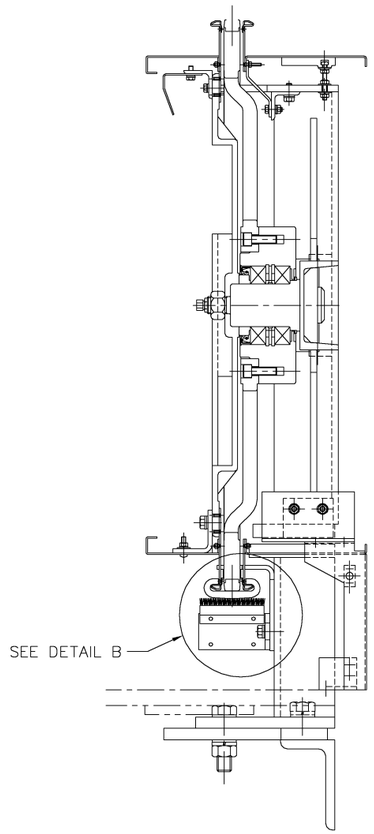
REVISION HISTORY

REV	DESCRIPTION	DATE	APPROVED

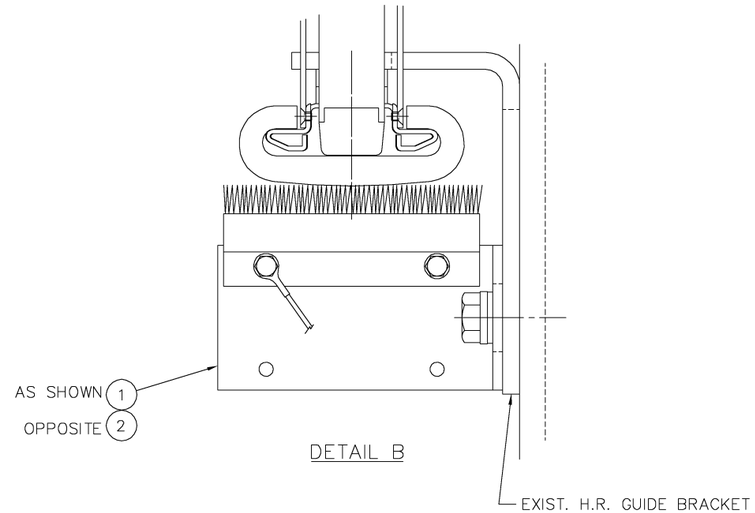
ANTI-STATIC DEVICE ASSEMBLY
Assembly A68Z5-2310A1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



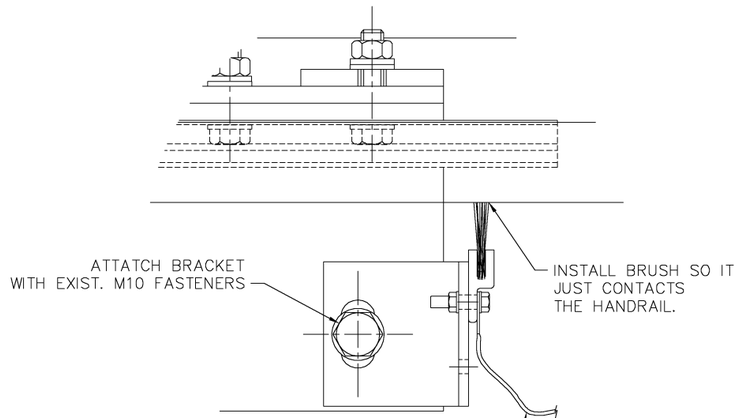
UPPER LEFT NEWEL
(LOWER RIGHT NEWEL)
SHOWN



NOTE:
1. INSTALL BRUSH ASS'Y ON ALL 4 NEWELS PER EACH ESCALATOR.
2. ADJUST BRACKET SO THE BRUSH JUST CONTACTS THE HANDRAIL.



DETAIL B



DETAIL A

Assembly A68Z5-2310A1

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE [INCHES] [SOLIDWORKS]
[X] = ± 0.0 [.1] ANGLES ±1°
[.XX] = ± .1 [.03]
[.XXX] = ± .1 [.01]

DWN	CHARVILLE	DATE 06/05/03
CHKD.	APPERSON	DATE 06/05/03
APVD.	TSUCHIHATA	DATE 06/05/03

JOB TITLE: NYCTA
JOB NO.

FUJITEC AMERICA, INC.

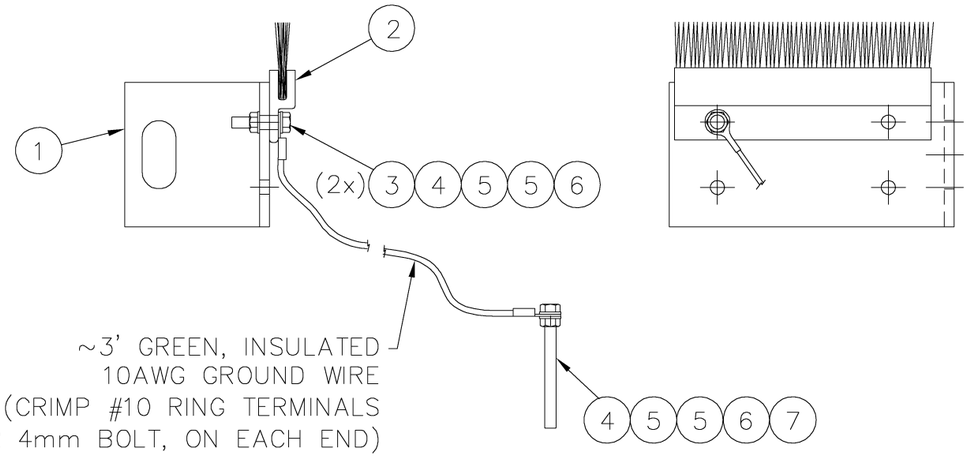
TITLE: ANTI-STATIC DEVICE ASS'Y

SCALE	SIZE	DWG. NO.	REV.
1.00=4.00	D	Fig. H-7a	–

*** ACAD -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

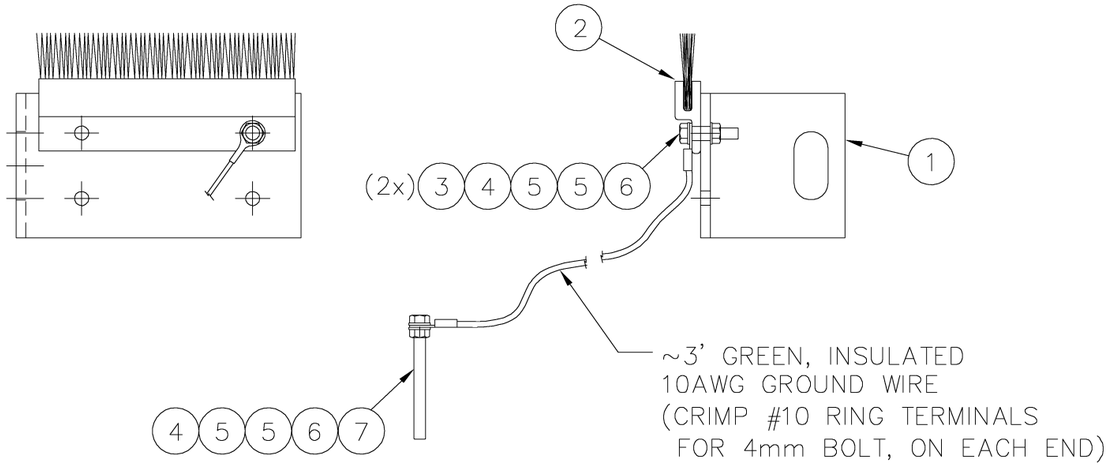
ANTI-STATIC BRUSH ASSEMBLY
Assembly C68Z5-2310A2

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



ANTI-STATIC BRUSH ASSEMBLY
Assembly C68Z5-2310A3

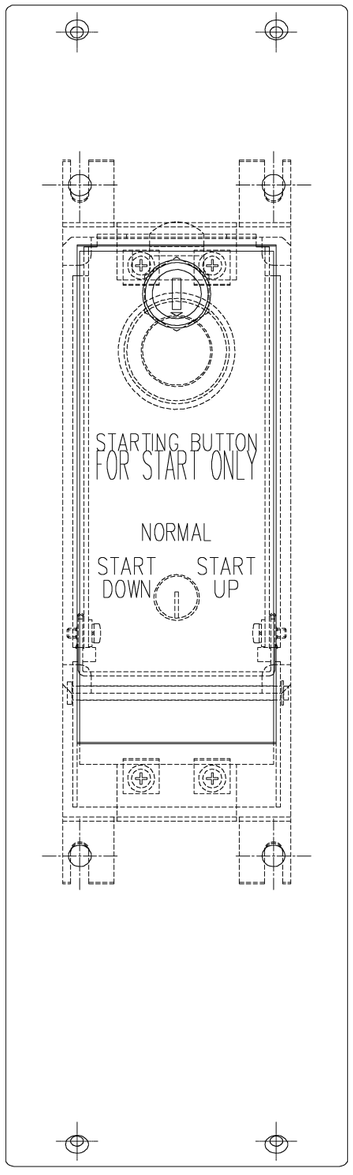
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

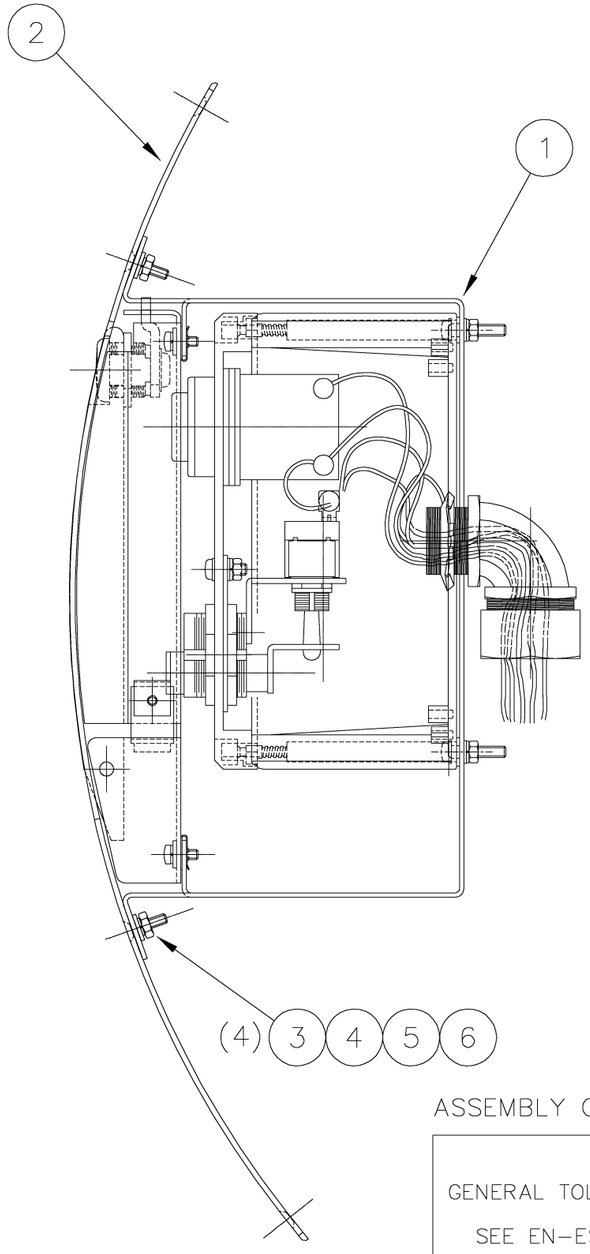


ASSEMBLY C68Z5-2310A2 and C68Z5-2310A3

GENERAL TOL. SEE TN NO. TN-K2-0014	DWN CHARVILLE	DATE 06/05/03	FUJITEC AMERICA, INC.
	CHKD. APPERSON	DATE 06/05/03	TITLE: ANTI-STATIC BRUSH ASS'Y
	APVD. TSUCHIHATA	DATE 06/05/03	
JOB TITLE: NYCTA	JOB NO.		SCALE: 1:00=2:00 / SIZE: B / DWG. NO.: Fig. H-7b / REV.: —

AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 11412
REV	DESCRIPTION	DATE	APPROVED





OPERATION PANEL INSTALLATION
Assembly C65A19001

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

ASSEMBLY C65A19001

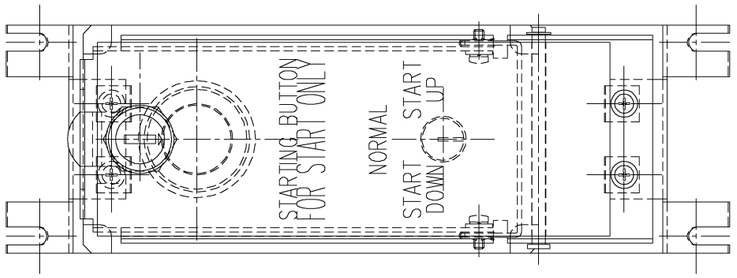
GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9-3-04
	CHKD. SHUPE	DATE 9-3-04
	APVD. APPERSON	DATE 9-3-04
JOB TITLE	JOB NO. STD	

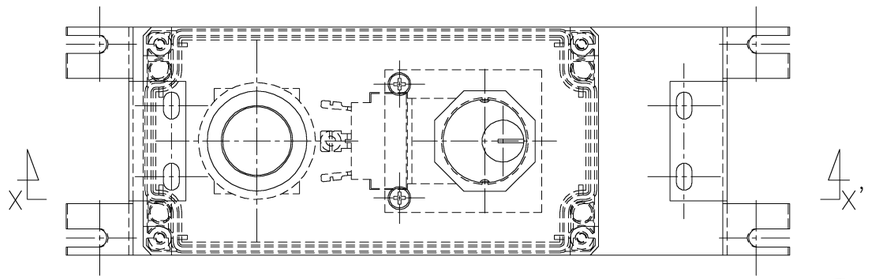
FUJITEC AMERICA, INC.

TITLE OPERATION PANEL INSTALL.

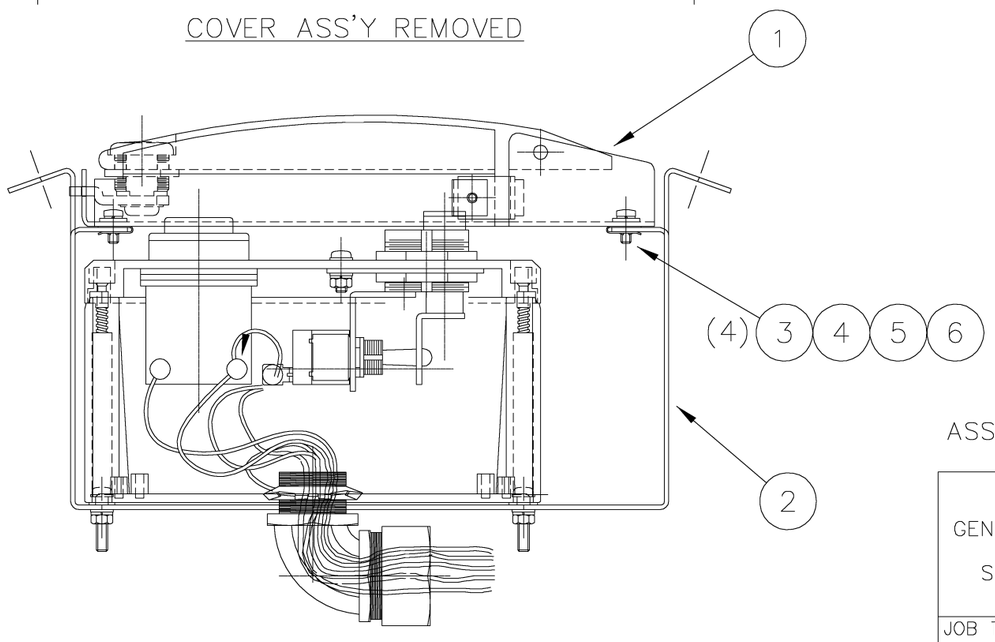
SCALE	SIZE	DWG. NO.	REV.
1/2	B	Fig. H-8a	—

AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 11412
REV	DESCRIPTION	DATE	APPROVED





COVER ASS'Y REMOVED



SECTION X–X'

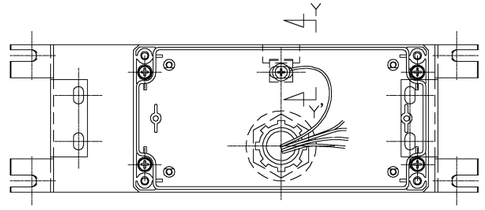
OPERATION BOX ASSEMBLY
Assembly C65A20001
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

ASSEMBLY C65A20001

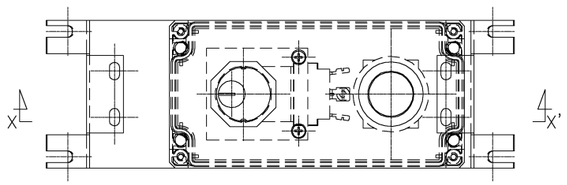
GENERAL TOLERANCE SEE EN–ES–001	DWN MILLER	DATE 9–3–04	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9–3–04	TITLE OPERATION BOX ASSEMBLY
	APVD. APPERSON	DATE 9–3–04	
JOB TITLE	JOB NO. STD		SCALE 1/2 / SIZE B / DWG. NO. Fig. H–8b / REV. —

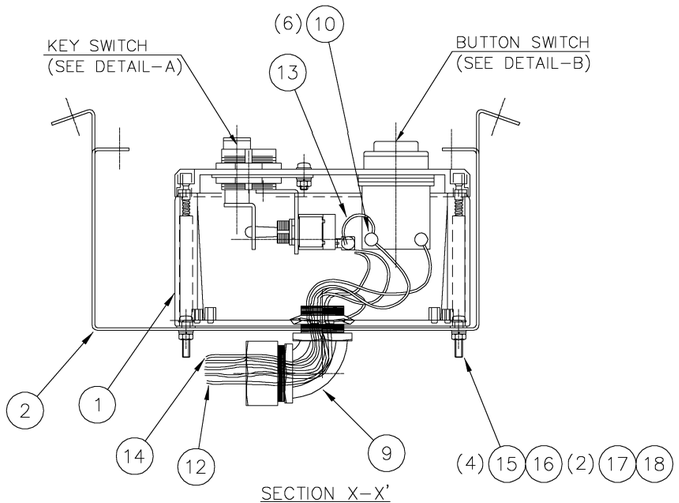
AUTOCAD DRAWING -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 11412
REV	DESCRIPTION	DATE	APPROVED

OPERATION BOARD BOX ASSEMBLY
Assembly C65A22001
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

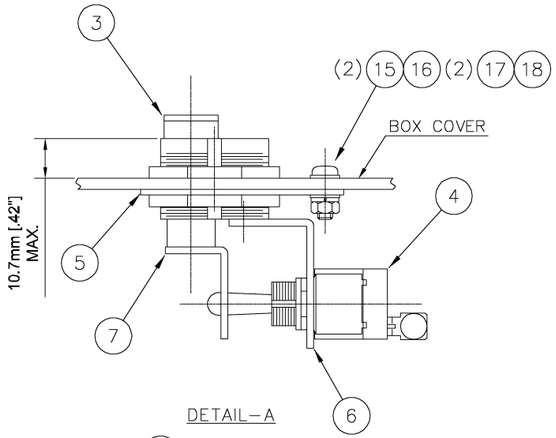


FACE PLATE AND BOX COVER REMOVED

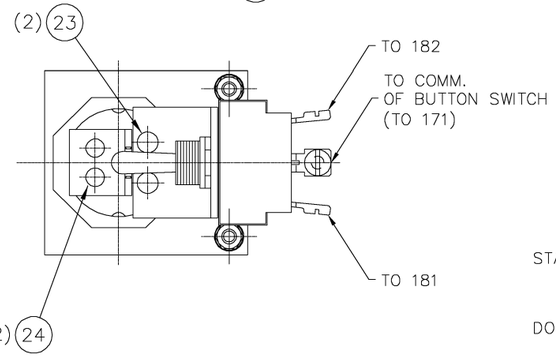


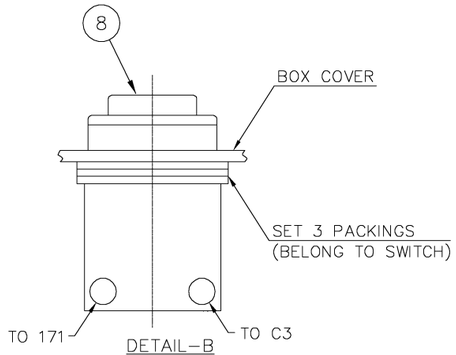


SECTION X-X'

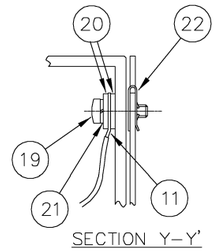


DETAIL-A





DETAIL-B



SECTION Y-Y'

	CORE No.		LINE No. UPPER	LINE No. LOWER
START	START	1	C3	C3
	COMM	2	171	171
DOWN/UP	COMM	2	171	171
	UP	3	181	181
	DOWN	4	182	182
GROUND	G		G	G

OPERATION BOARD WIRING
REFERENCE: D65650 FOR KEY SWITCH WIRING CONNECTION
DETAIL: SEE WIRING DIAGRAM

NOTE: AFTER CONNECTION OF ELECTRICAL WIRES, SEAL THE TERMINAL WITH SILICINE COMPOUND "GE RTV 150" OR EQUIVALENT.

ASSEMBLY C65A22001

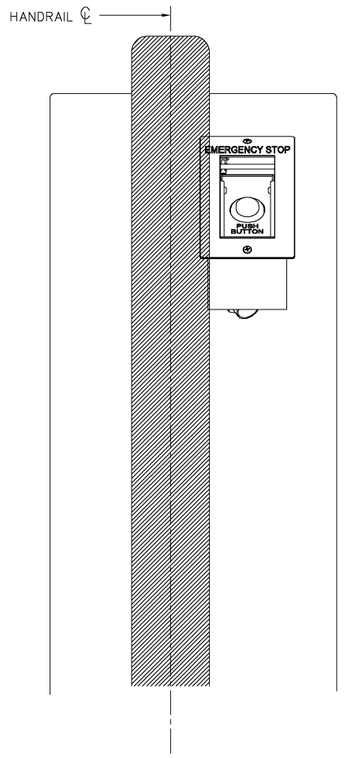
GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 9-3-04	
	CHKD. SHUPE	DATE 9-3-04	
	APVD. APPERSON	DATE 9-3-04	
JOB TITLE	JOB NO. STD		

FUJITEC AMERICA, INC.

TITLE: OPERATION BOARD BOX ASS'Y

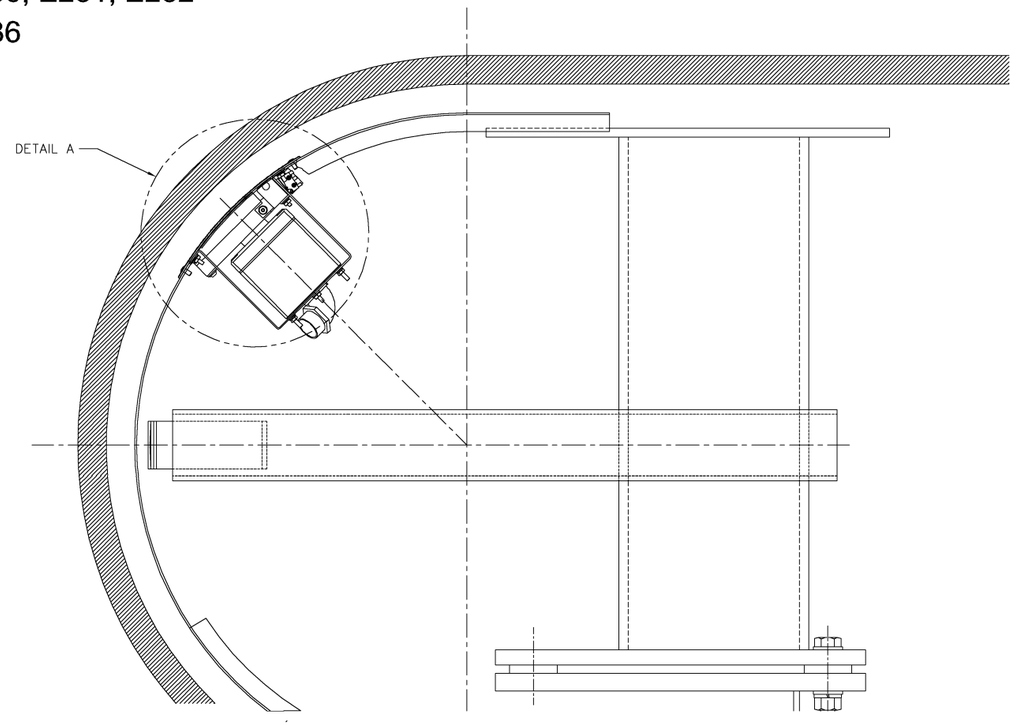
SCALE	SIZE	DWG. NO.	REV.
1/2	C	Fig. H-8c	—

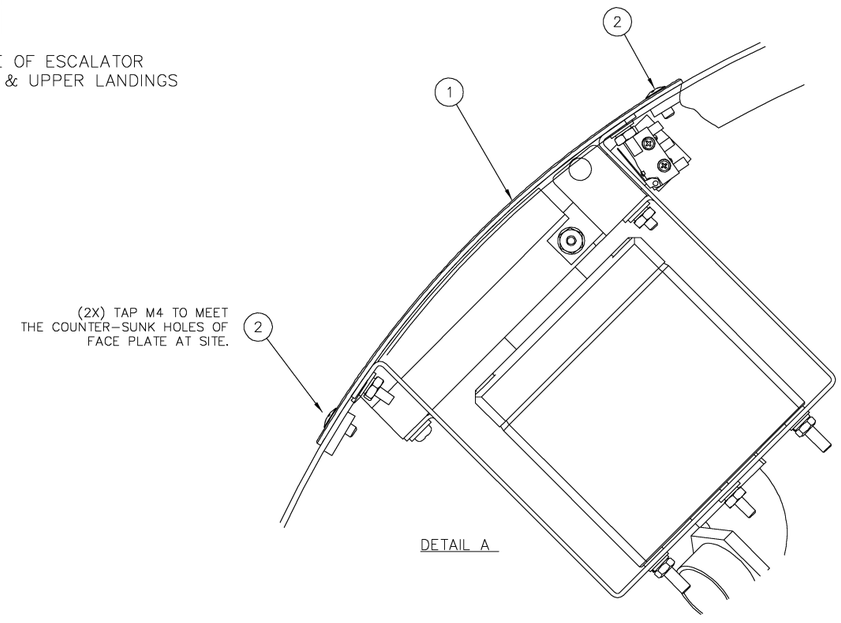
AUTOCAD DRAWNG -- MANUAL REVISIONS NOT PERMITTED			
REVISION HISTORY			ECN# 11546
REV	DESCRIPTION	DATE	APPROVED



RIGHT-HAND SIDE OF ESCALATOR
VIEWED FROM LOWER & UPPER LANDINGS

EMERGENCY STOP SWITCH INSTALLATION
Assembly A65U1-2881E1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





ASSEMBLY A65U1-2881E1

GENERAL TOLERANCE SEE EN-ES-001	DWN MILLER	DATE 10-8-04
	CHKD. SHUPE	DATE 10-8-04
	APVD. APPERSON	DATE 10-8-04
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881	

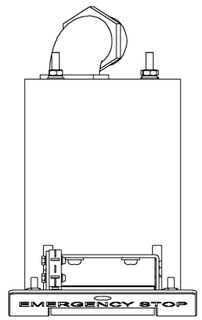
FUJITEC AMERICA, INC.

TITLE: EMERGENCY STOP SWITCH INSTALLATION

SCALE	SIZE	DWG. NO.	REV.
1/3	D	Fig. H-9a	—

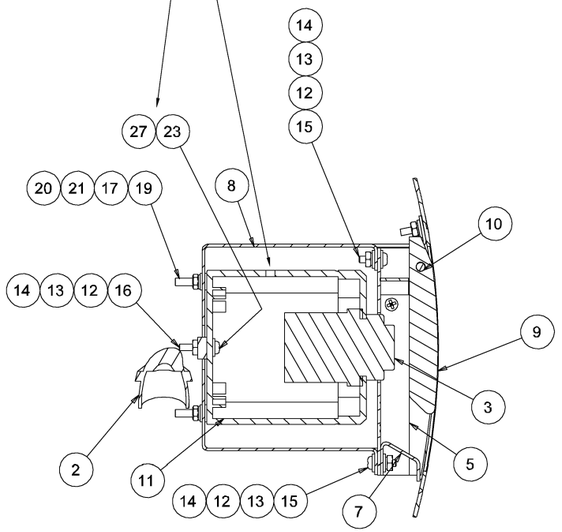
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 13996	DATE	APPROVED

EMERGENCY STOP ASSEMBLY
Assembly C6598001
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

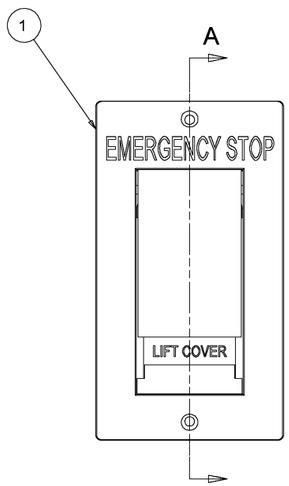


ATTACH GREEN WIRE(ITEM 23) FOR GROUNDING WITH TERMINAL CONNECTOR(ITEM 27)

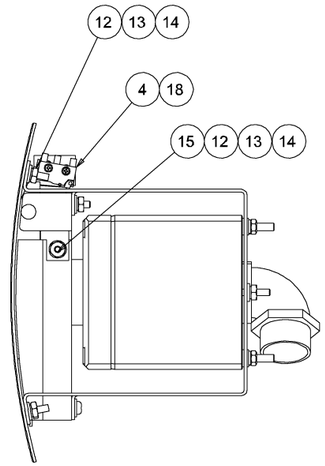
HOLE FOR MICRO SWITCH WIRES. SEAL WITH SILICONE COMPOUND AFTER WIRING. LEAVE ENOUGH SLACK ON WIRES BETWEEN MICRO SWITCH AND THIS HOLE.

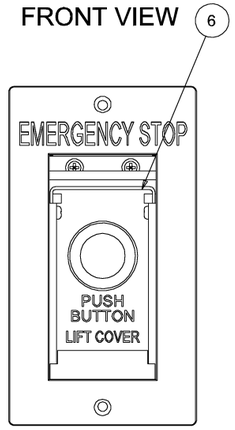


SECTION A-A

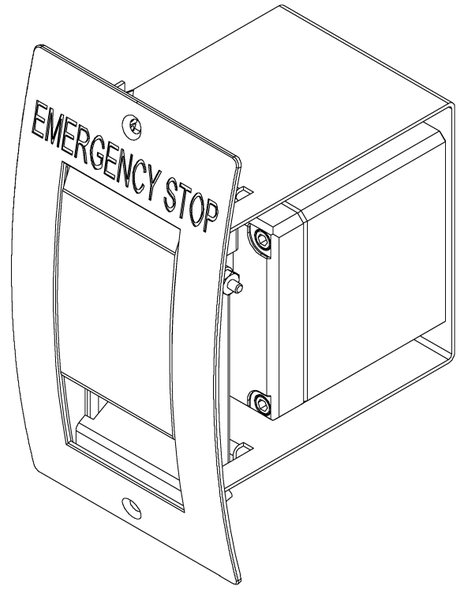


FRONT VIEW

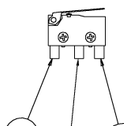




FRONT VIEW
WITH COVER REMOVED



MICRO SWITCH

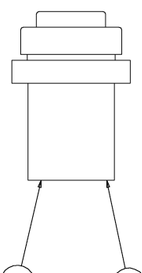


BLUE WIRE(ITEM 24) TO COMM TERMINAL. CUT OFF

BLACK WIRE(ITEM 22) TO N.C. TERMINAL.

SOLDER WIRES ONTO TERMINALS OF SWITCH. THE SOLDERED CONNECTION SHOULD BE SEALED WITH SILICONE COMPOUND GE RTV160 OR EQUIVALENT.

BUTTON SWITCH



ORANGE WIRE(ITEM 26) TO TERMINAL 1 WITH TERMINAL CONNECTOR(ITEM 27).

WHITE WIRE(ITEM 25) TO TERMINAL 2 WITH TERMINAL CONNECTOR(ITEM 27).

Assembly C6598001

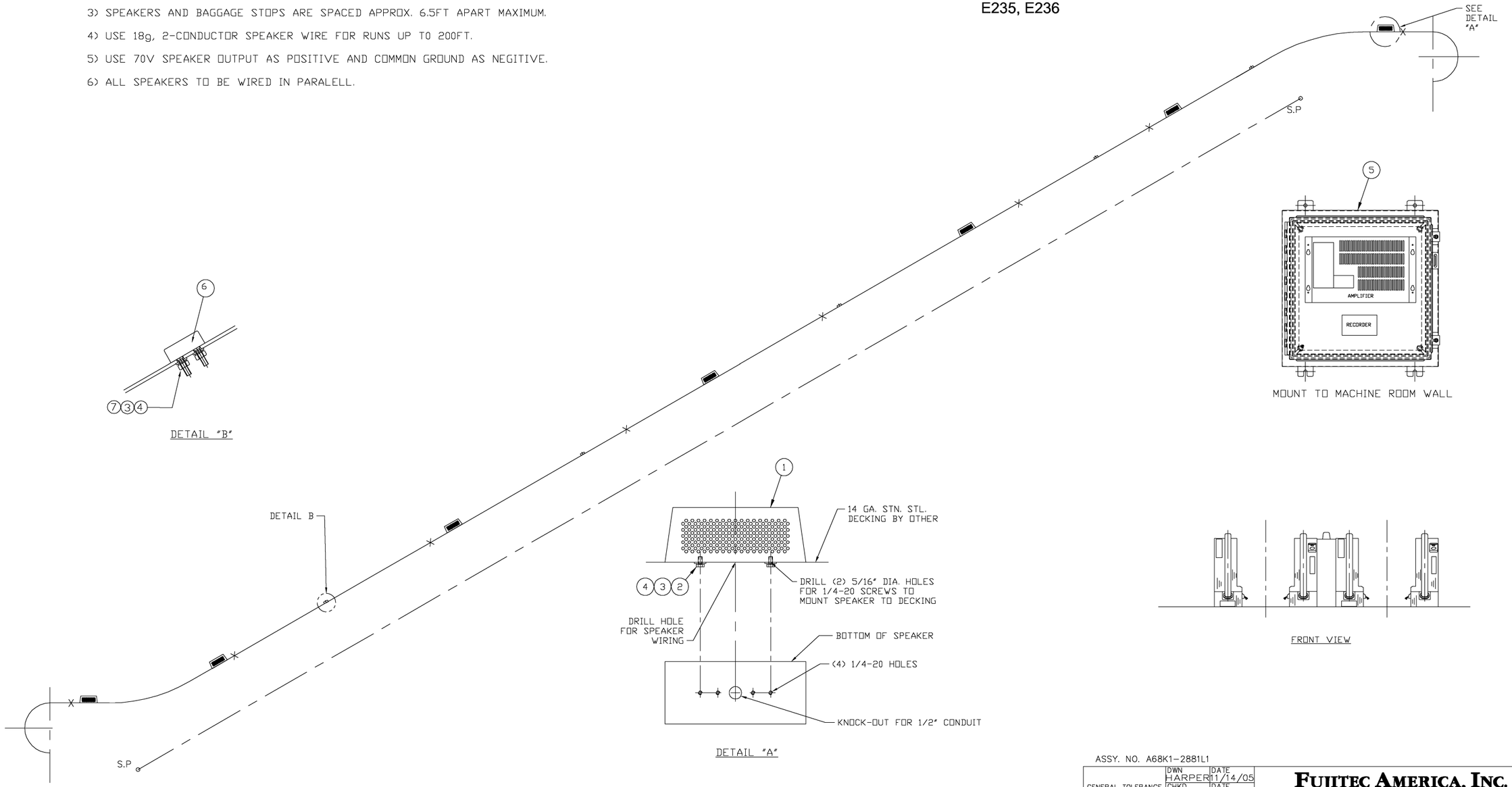
GENERAL TOLERANCE SEE EN-ES-001	DWN KADONO	DATE 5/6/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 5/6/2004	TITLE EMERGENCY STOP ASS'Y	
	APVD. APPERSON	DATE 5/6/2004		
JOB TITLE	JOB NO. STD		SCALE (1:2)	SIZE D
			DWG. NO. Fig. H-9b	REV. A

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN# 13345	DATE	APPROVED

NOTE:

1) POINT WITH X MARK INDICATES THE JOINT OF "A" MOLDING.
2) SPEAKERS TO ALTERNATE WITH BAGGAGE STOPS.
3) SPEAKERS AND BAGGAGE STOPS ARE SPACED APPROX. 6.5FT APART MAXIMUM.
4) USE 18g, 2-CONDUCTOR SPEAKER WIRE FOR RUNS UP TO 200FT.
5) USE 70V SPEAKER OUTPUT AS POSITIVE AND COMMON GROUND AS NEGITIVE.
6) ALL SPEAKERS TO BE WIRED IN PARALELL.

INFORMATION SPEAKER SYSTEM
Assembly A68K1-2881L1
E235, E236



MOUNT TO MACHINE ROOM WALL

DETAIL "B"

DETAIL "A"

FRONT VIEW

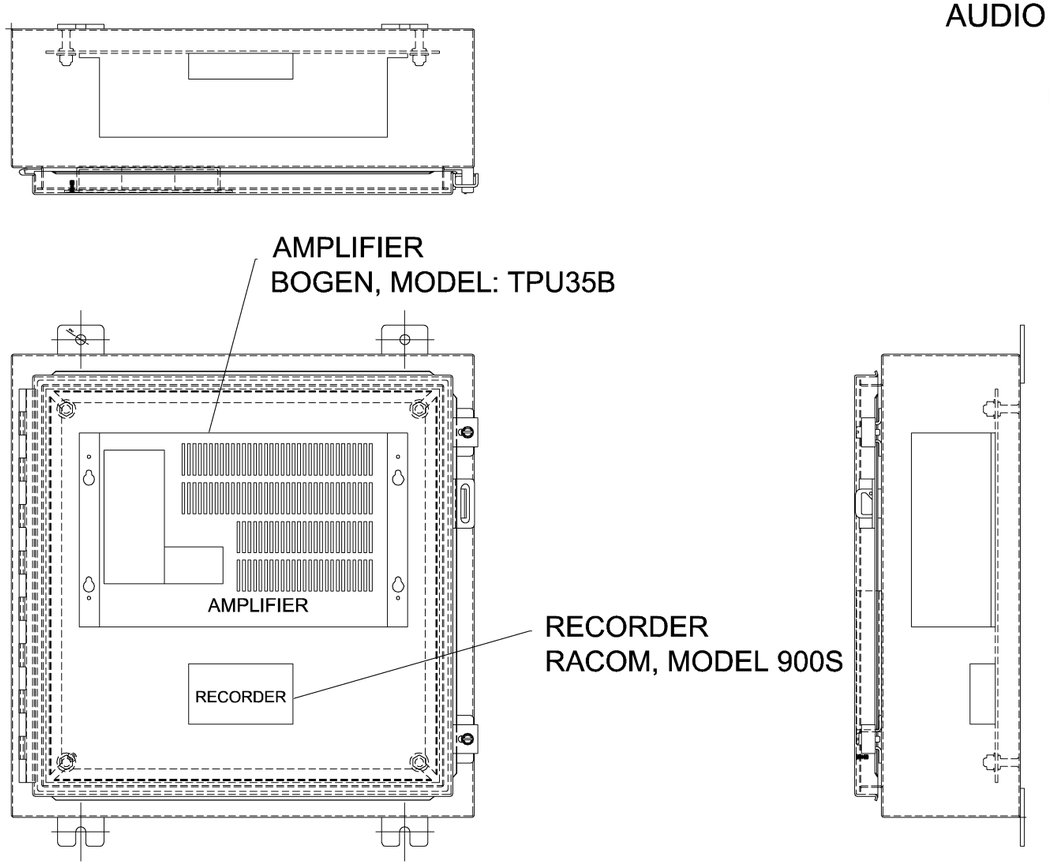
ASSY. NO. A68K1-2881L1

GENERAL TOLERANCE SEE EN-ES-001	DWN HARPER	DATE 11/14/05	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 11/14/05	TITLE: INFORMATION SPEAKER SYSTEM
	APVD. SUGIMOTO	DATE 11/14/05	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 L01/M01		SCALE: 1.00=25.00 / SIZE: D / DWG. NO.: Fig. H-10a / REV.: -

*** ACAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN#11496	DATE	APPROVED

AUDIO INFORMATION SYSTEM ENCLOSURE
Assembly C68453001

E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

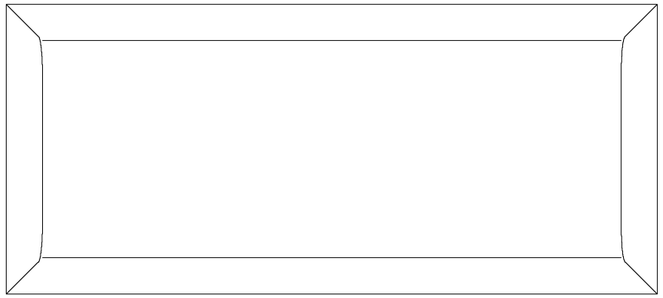


ENCLOSURE ASSEMBLY
PART NUMBER: C68453001
VENDOR: SOUNDVIEW ELECTRONICS
VENDOR P/N: Repeater Series # EAS 1.2E

ASSY. NO. C68453001

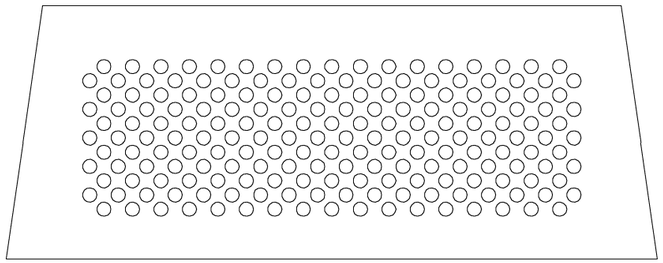
GENERAL TOLERANCE SEE EN-ES-001	DWN SHUPE	DATE 09/30/04	FUJITEC AMERICA, INC.
	CHKD. APPERSON	DATE 09/30/04	
	APVD. APPERSON	DATE 09/30/04	TITLE: AUDIO INFORMATION ENCLOSURE
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 E01~H01		SCALE 1.00=25.00 / SIZE D / DWG. NO. Fig. H-10b / REV. -

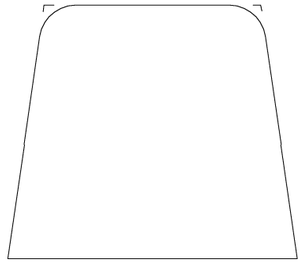
*** ACAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION ECN#11496	DATE	APPROVED



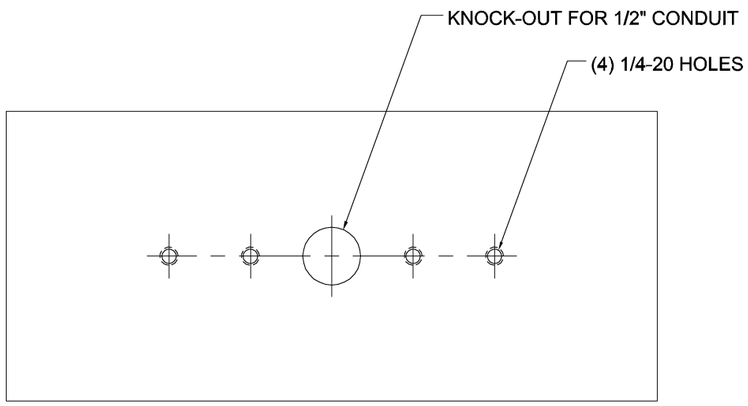
AUDIO INFORMATION SPEAKER
Assembly D68450001

E221, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236





SOURCE:
SOUND VIEW ELECTRONICS
MODEL #EAS-70V655



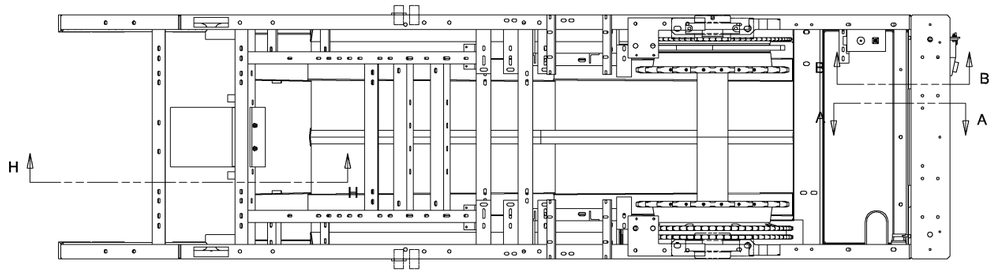
PART NO. D68450001

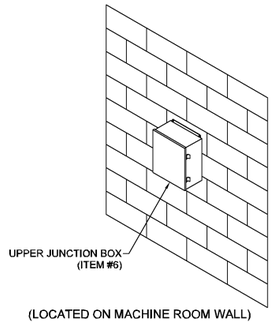
SPEAKER DESIGNED TO REPLACE BAGGAGE STOPS.
THIS DESIGN FOR SIDE BY SIDE ESCALATOR APPLICATIONS.
USE 18g, 2-CONDUCTOR SPEAKER WIRE FOR RUNS UP TO 200 FT.
USE 70-VOLT SPEAKER OUTPUT AS POSITIVE AND COMMON GROUND AS NEGATIVE.
ALL SPEAKERS TO BE WIRED IN PARALLEL.

ASSY. NO. D68450001

GENERAL TOLERANCE SEE EN-ES-001	DWN SHJPE	DATE 09/30/04	FUJITEC AMERICA, INC.
	CHKD. APPERSON	DATE 09/30/04	TITLE: AUDIO INFORMATION SPEAKER
	APVD. APPERSON	DATE 09/30/04	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 E01~H01		SCALE 1.00=25.00 / SIZE D / DWG. NO. Fig. H-10c / REV. -

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11377	DATE	APPROVED



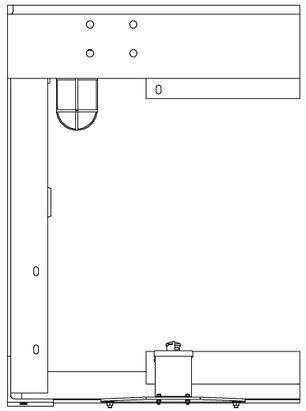


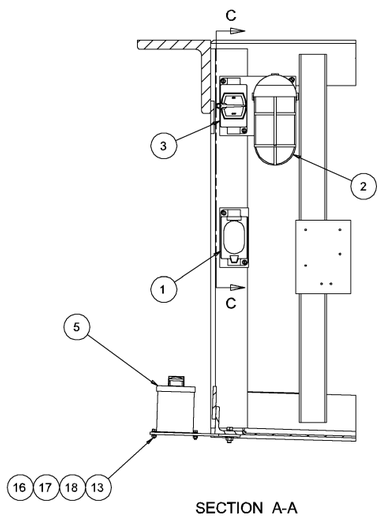
(LOCATED ON MACHINE ROOM WALL)

UPPER TRUSS ELECTRICAL ARRANGEMENT

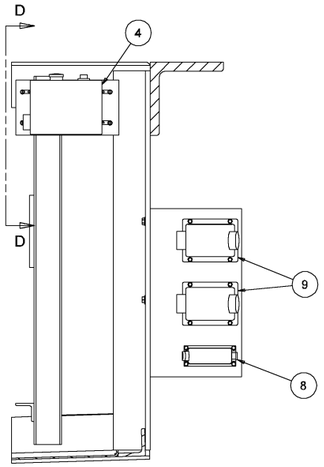
Assembly C68X3-2881C1

E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

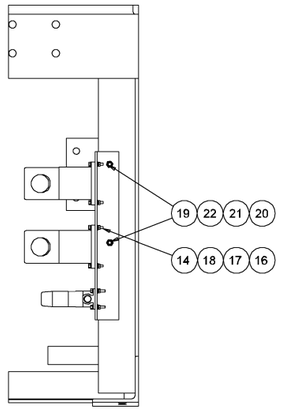


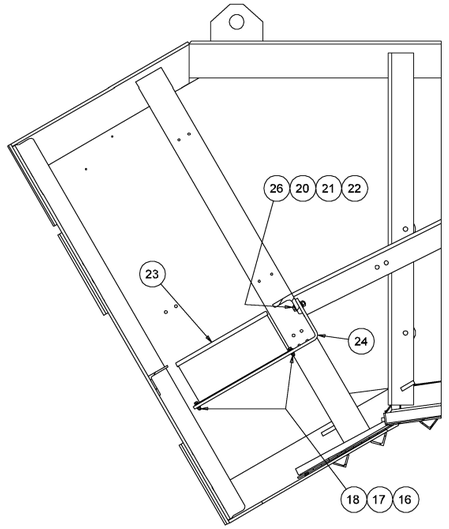


SECTION A-A
(ROTATED 180 °)

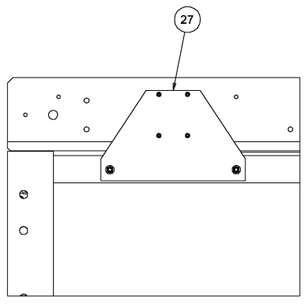


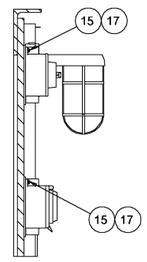
SECTION B-B



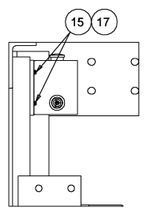


SECTION H-H





SECTION C-C

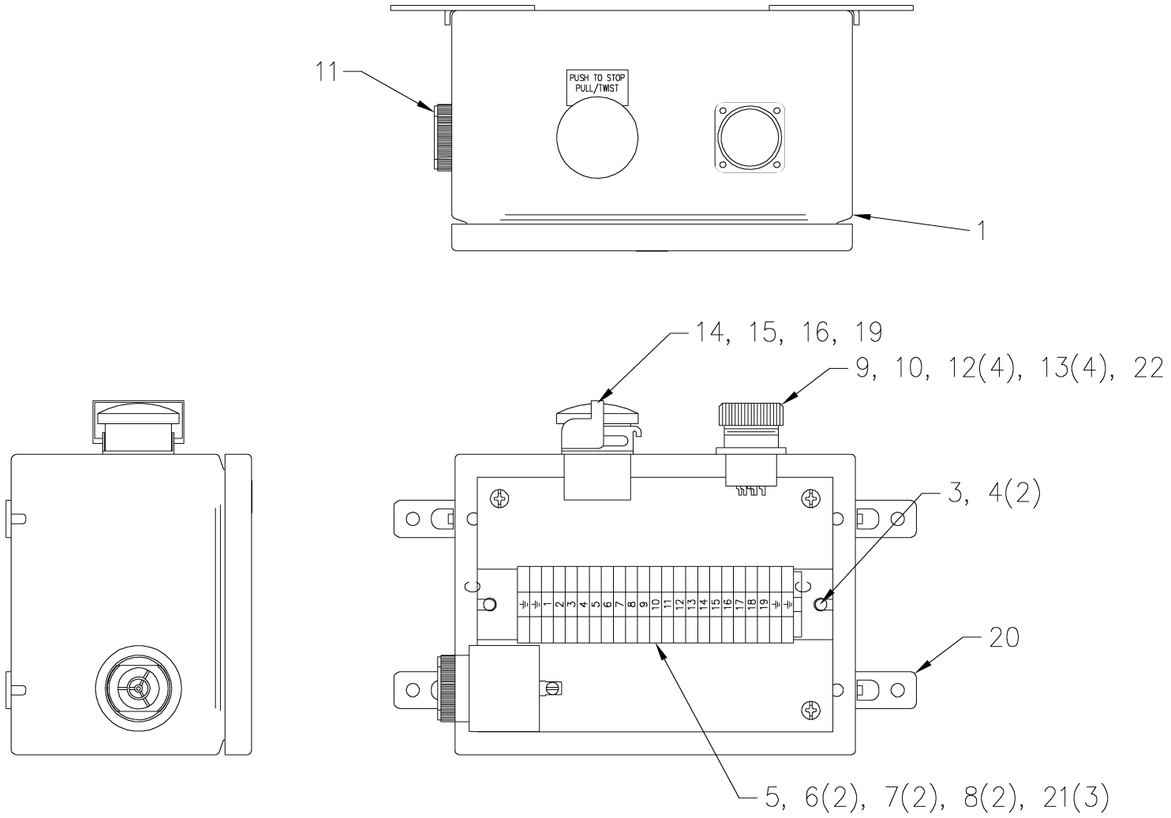


VIEW D-D

Assembly C68X3-2881C1

GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 9/1/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 9/1/2004	TITLE: Upper Electrical Arrangement
	APVD. APPERSON	DATE 9/1/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO. 2881 C01~M01		SCALE (1:15) / SIZE D / DWG. NO. Fig. H-11a / REV. C

REVISION HISTORY				
REV	DESCRIPTION	SDP	DATE	APPROVED



UPPER SERVICE SWITCH
Assembly C65A4-2666A1

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

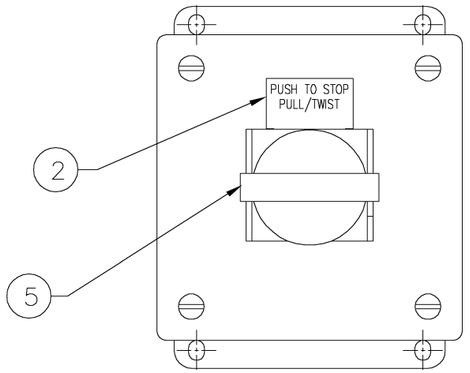
ATTACH NAMEPLATE 18 TO COVER.
CENTER NAMEPLATE VERTICALLY AND HORIZONTALLY.
FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

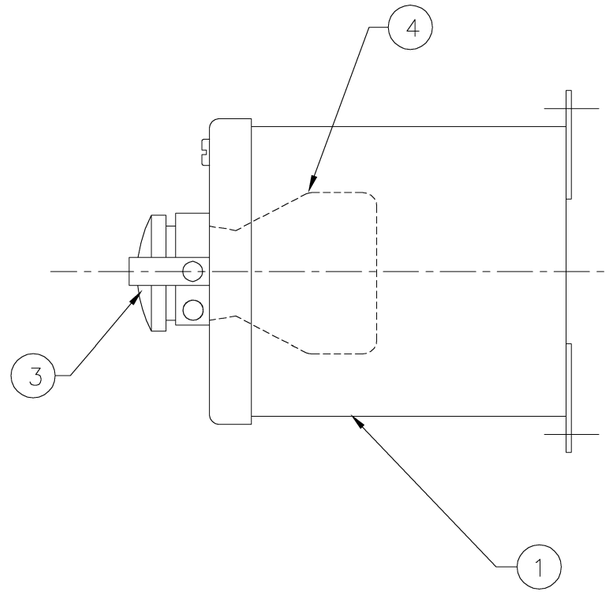
Assembly C65A4-2666A1

	DWN BY: NESTER	DATE 9/29/03	FUJITEC AMERICA, INC.	
	CHKD BY: OGG	DATE 9/29/03	TITLE ESCALATOR SERVICE SWITCH ASSEMBLY	
	APVD BY: TOTO	DATE 9/29/03		
JOB TITLE	JOB NO. 2666		SCALE NTS	SIZE B
			DWG. NO. Fig. H-11b	REV.

*** ACAD -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION SDP#2097	DATE	APPROVED

MACHINE DISCONNECT SWITCH
Assembly C65641001
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



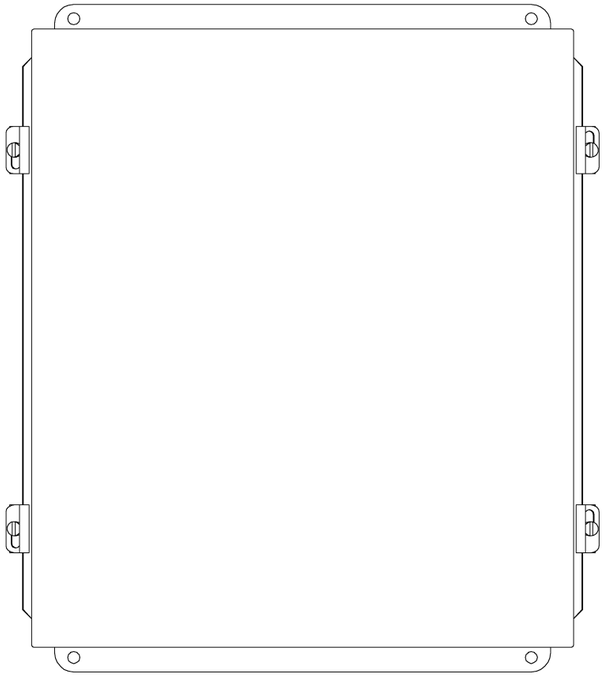


ASSY NO. C65641001

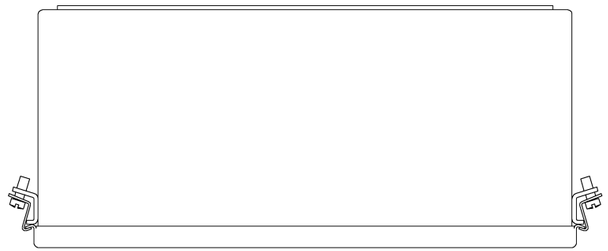
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ± 1° [.XXX] = ± .3 [.012]	DWN BIBLIN	DATE 5/26/00	FUJITEC AMERICA, INC.
	CHKD. MONFREDA	DATE 5/26/00	TITLE MACHINE DISCONNECT SWITCH
	APVD. TSUCHIHATA	DATE 5/26/00	
JOB TITLE	JOB NO. STD		SCALE 1:00=2:00 / SIZE B / DWG. NO. Fig. H—11c / REV. A

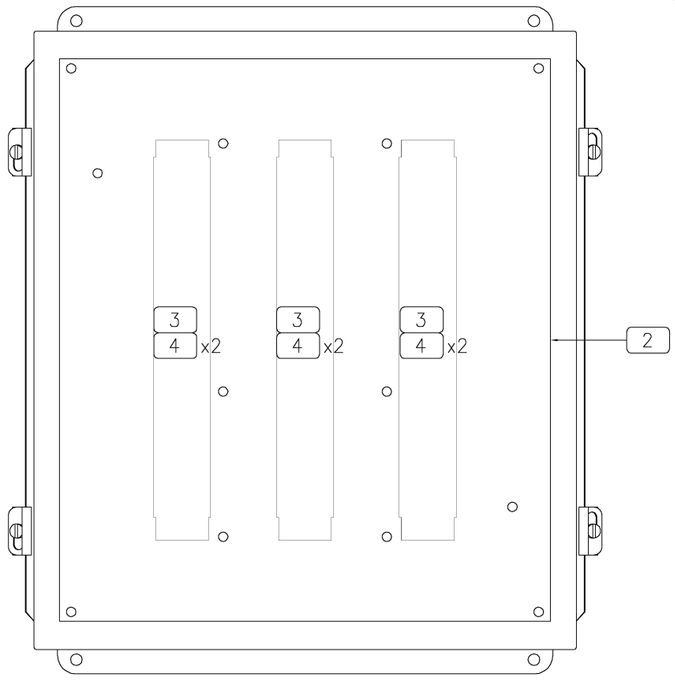
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

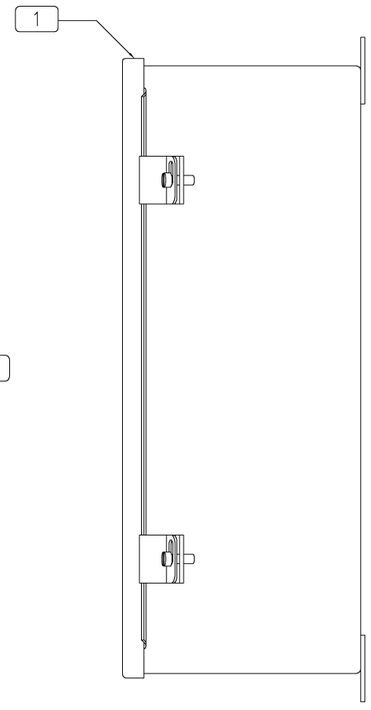
UPPER JUNCTION BOX (UJB)
Assembly C65A2-2666A1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



MOUNTING HOLE POSITIONS







FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

ATTACH NAMEPLATE 5 TO COVER.
CENTER NAMEPLATE HORIZONTALLY AND VERTICALLY.

Assembly C65A2-2666A1

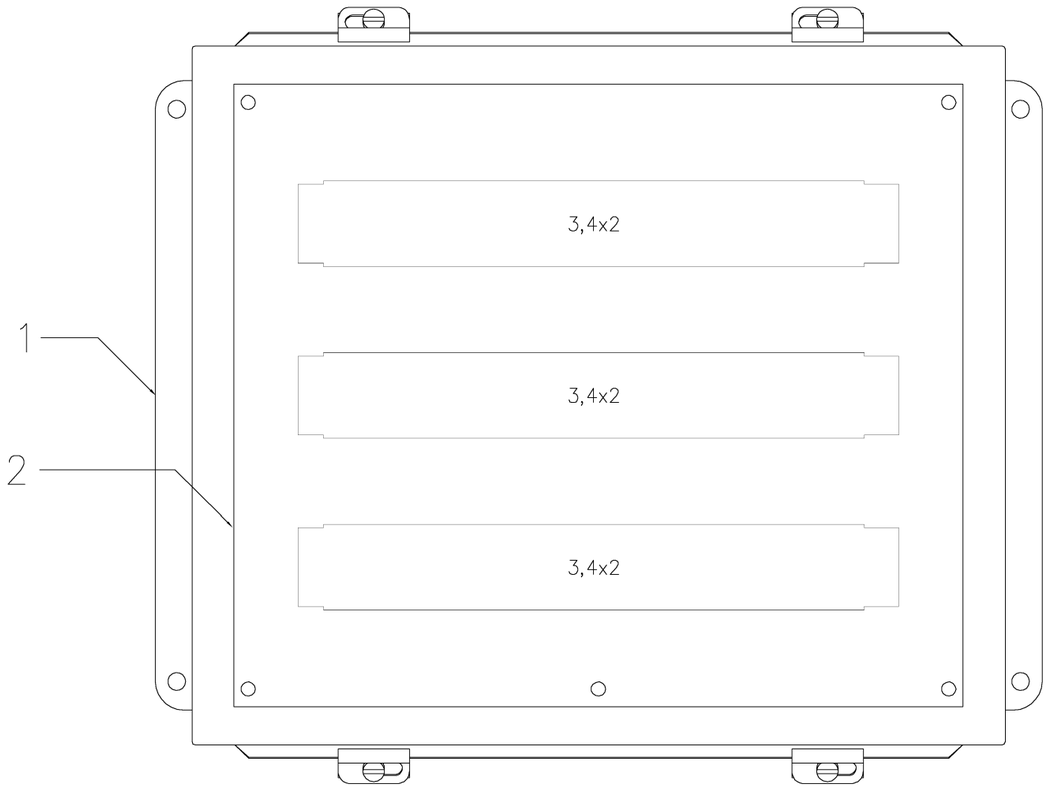
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ± 1° [.XXX] = ± .3 [.012]	DWN BY: NESTER	DATE 9/29/03
	CHKD BY: OGG	DATE 9/29/03
	APVD BY: TOTO	DATE 9/29/03
JOB TITLE NYCTA GUN HILL	JOB NO. 2666	

FUJITEC AMERICA, INC.

TITLE			
UPPER JUNCTION BOX ASSEMBLY			
SCALE	SIZE	DWG. NO.	REV.
NTS	B	Fig. H-11d	

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

JUNCTION BOX 3 (JB3)
Assembly C65A6-2881A1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

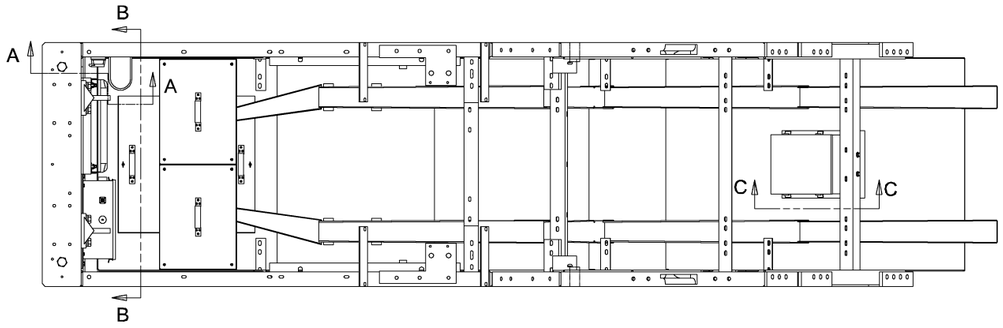


FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

Assembly C65A6-2881A1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ±1°	DWN BY: NESTER	DATE 12/1/04	FUJITEC AMERICA, INC.
	CHKD BY: WOESTE	DATE 12/1/04	TITLE: JUNCTION BOX #3
	APVD BY: SHUPE	DATE 12/1/04	
JOB TITLE: NYCTA HERALD SQUARE	JOB NO.: 2881		SCALE: NTS / SIZE: B / DWG. NO.: Fig. H-11e / REV.: –

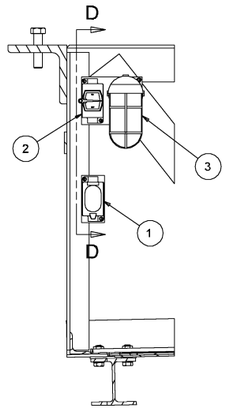
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11377	DATE	APPROVED



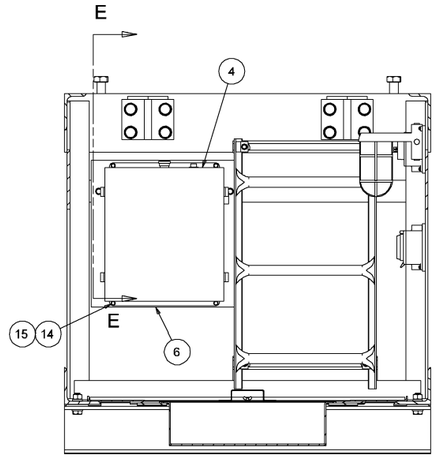
LOWER TRUSS ELECTRICAL ARRANGEMENT

Assembly C68X2-2881A1

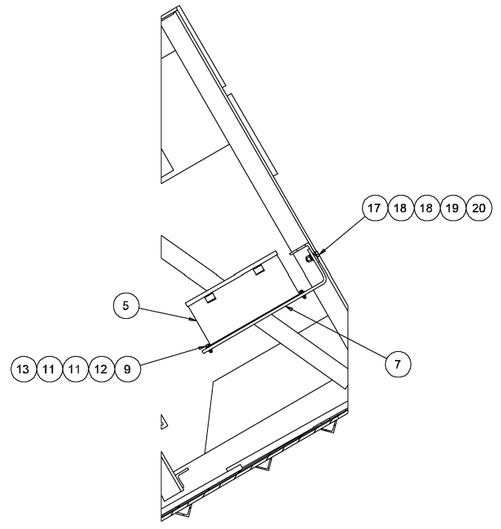
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



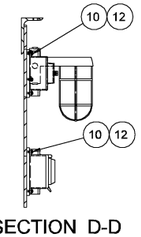
SECTION A-A



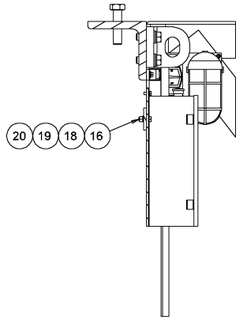
SECTION B-B



SECTION C-C



SECTION D-D

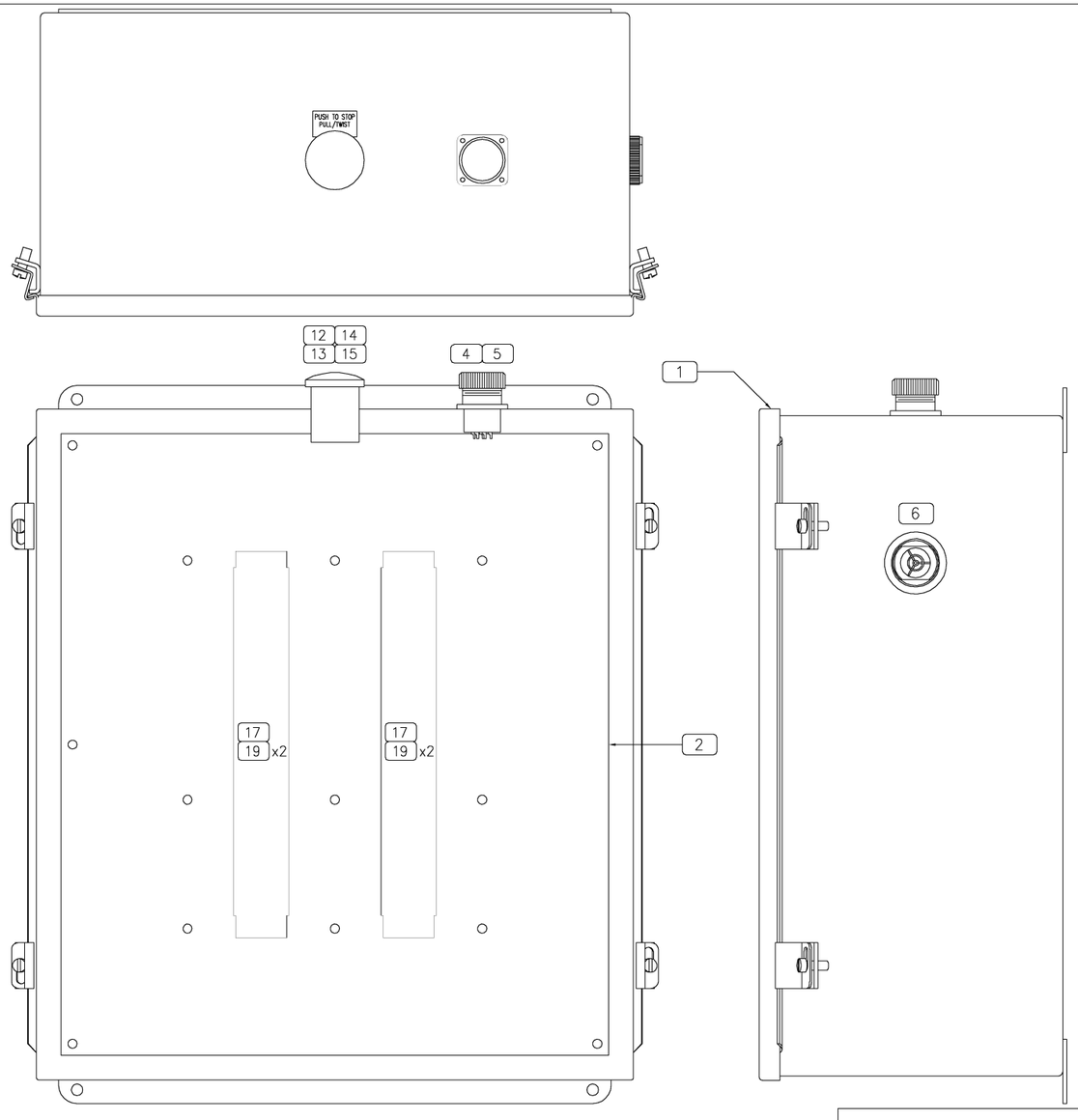


SECTION E-E

Assembly C68X2-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN BARRETT	DATE 8/30/2004	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 8/30/2004	TITLE Lower Electrical Arrangement	
	APVD. APPERSON	DATE 8/30/2004		
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881 E01~M01		SCALE (1:15)	SIZE D
			DWG. NO. Fig. H-11f	REV.

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



LOWER JUNCTION BOX (LJB)
Assembly C65A3-2881A1
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

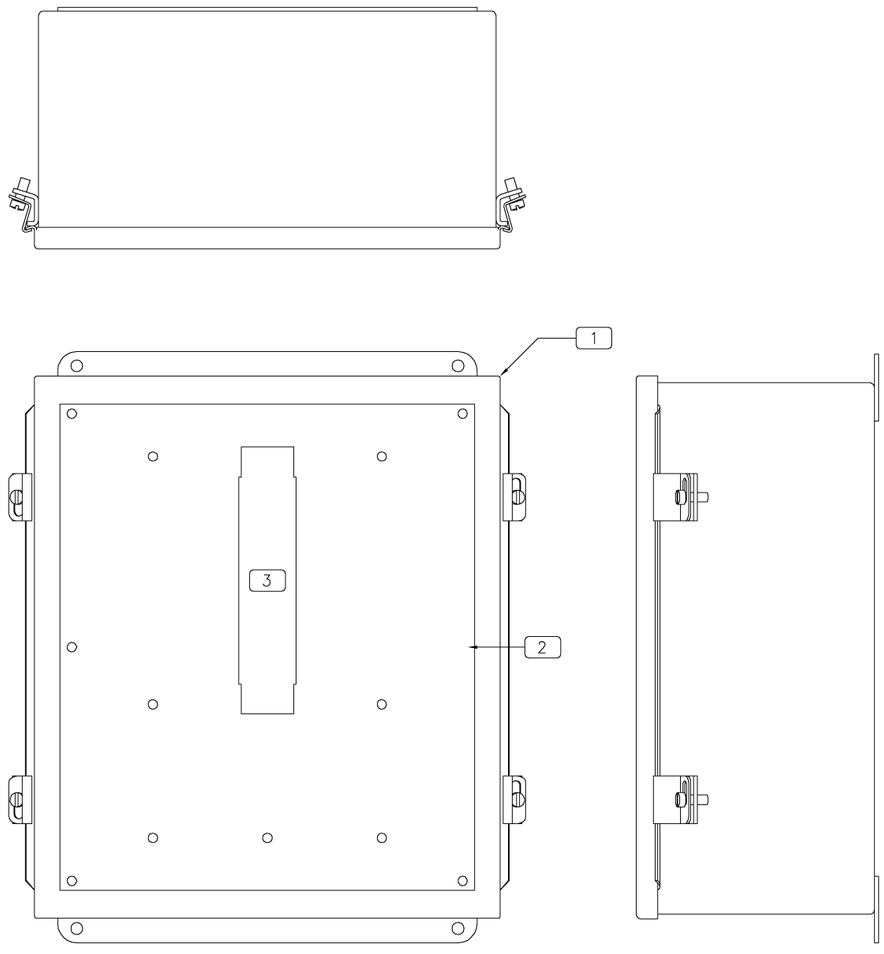
Assembly C65A3-2881A1

FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

ATTACH NAMEPLATE 18 TO COVER.
CENTER NAMEPLATE HORIZONTALLY AND VERTICALLY.

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ±1° [.XXX]= ± .3 [.012]	DWN BY: NESTER	DATE 7/27/04	FUJITEC AMERICA, INC.
	CHKD BY: WOESTE	DATE 7/27/04	TITLE: LOWER JUNCTION BOX ASSEMBLY
	APVD BY: SUGIMOTO	DATE 7/27/04	
JOB TITLE: NYCTA HERALD SQUARE	JOB NO.: 2881		SCALE: NTS / SIZE: B / DWG. NO.: Fig. H-11g / REV.: –

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

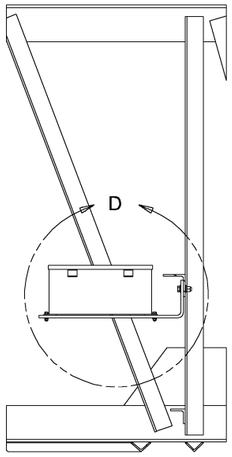
JUNCTION BOX (JB1 and JB2B)
Assembly C65A4-D345A1

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

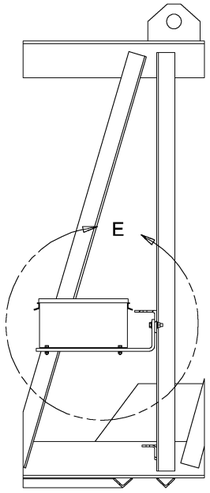
Assembly C65A4-D345A1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ±1° [.XXX] = ± .3 [.012]	DWN BY: NESTER	DATE 7/7/04	FUJITEC AMERICA, INC.
	CHKD BY: OGG	DATE 7/7/04	TITLE: JUNCTION BOX ASSEMBLY
	APVD BY: SUGIMOTO	DATE 7/7/04	
JOB TITLE: FUJITEC AMERICA	JOB NO.: DRD-345		SCALE: NTS / SIZE: B / DWG. NO.: Fig. H-11h / REV.: A

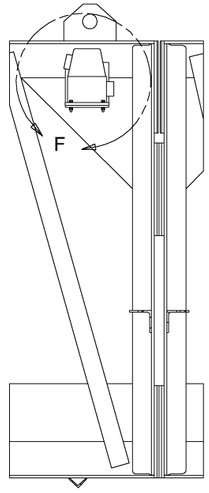
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11377	DATE	APPROVED



SECTION A-A

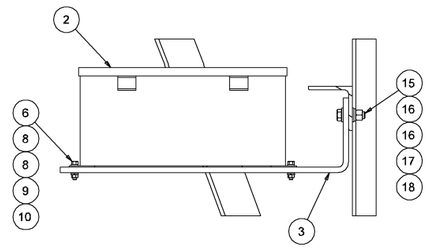


SECTION B-B

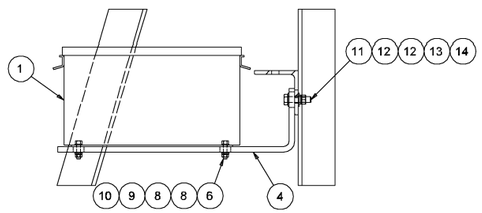


SECTION C-C

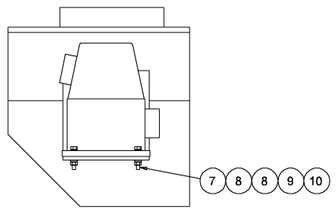
INCLINE TRUSS ELECTRICAL ARRANGEMENT
Assembly C68X4-2881E1
E229, E230, E231, E232, E233, E234, E235, E236



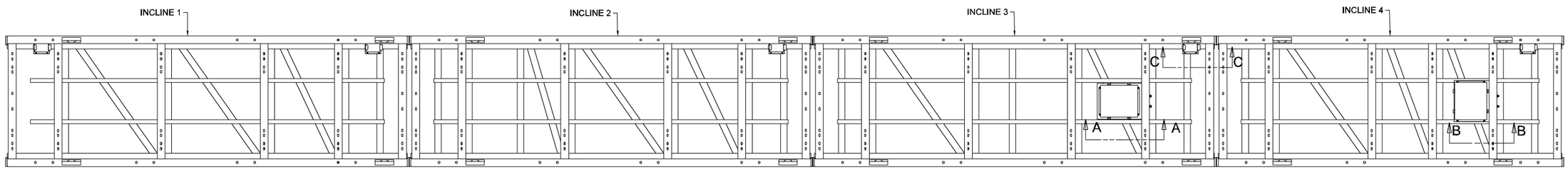
DETAIL D



DETAIL E



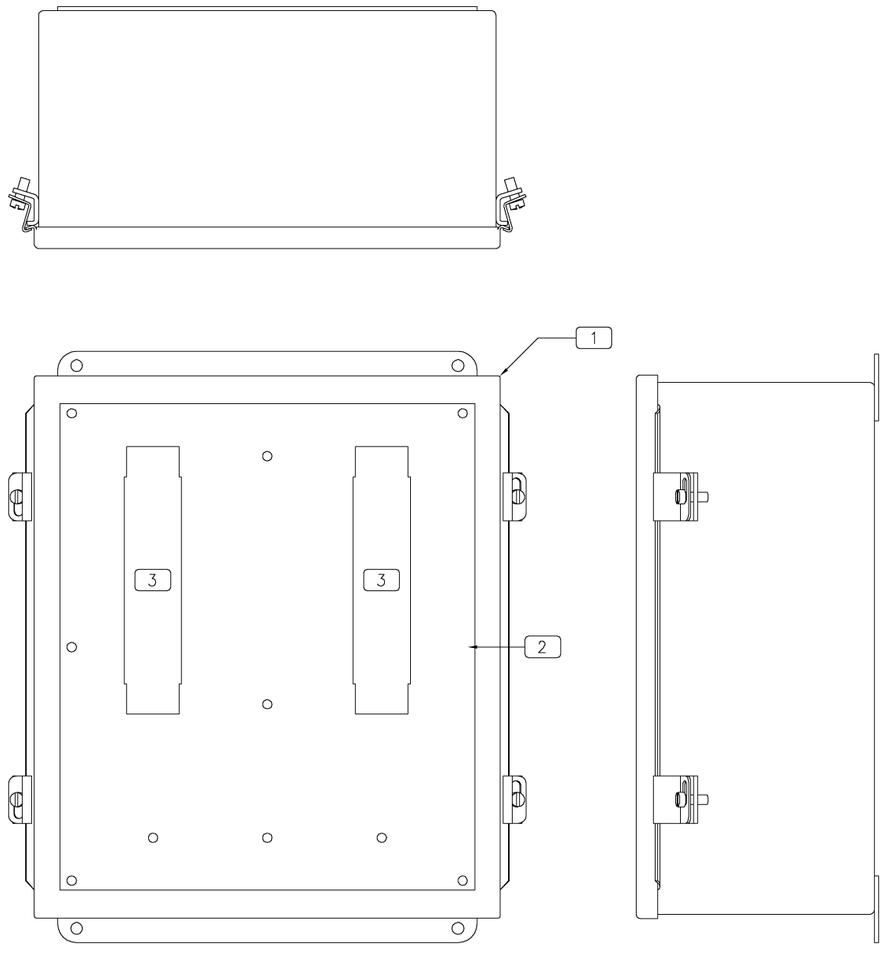
DETAIL F



Assembly C68X4-2881E1

GENERAL TOLERANCE SEE EN-ES-001	DWN. BARRETT	DATE 8/31/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/31/2004	TITLE: Incline Electrical Arrangement
	APVD. APPERSON	DATE 8/31/2004	
JOB TITLE: NYCT HERALD SQUARE	JOB NO.: 2881 E01~M01		SCALE (1:20) / SIZE D / DWG. NO. Fig. H-11i / REV. A

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



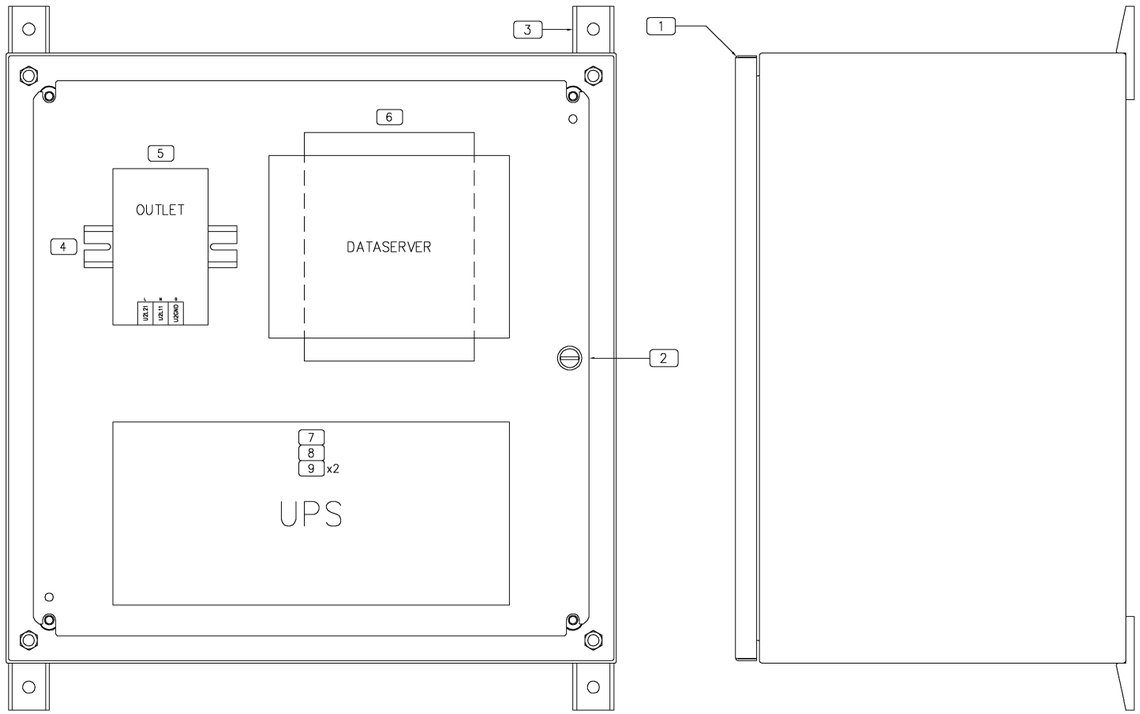
JUNCTION BOX (JB2A)
Assembly C65A5-D345A1

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

Assembly C65A5-D345A1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ±1° [.XXX] = ± .3 [.012]	DWN BY: NESTER	DATE 7/7/04	FUJITEC AMERICA, INC.
	CHKD BY: OGG	DATE 7/7/04	TITLE: JUNCTION BOX ASSEMBLY
	APVD BY: SUGIMOTO	DATE 7/7/04	
JOB TITLE: FUJITEC AMERICA	JOB NO.: DRD-345		SCALE: NTS / SIZE: B / DWG. NO.: Fig. H-11j / REV.: A

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED



FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

DATA SERVER ASSEMBLY
Assembly C65A2-2881A1
E221, E223, E229, E231, E233, E235

Assembly C65A2-2881A1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] ANGLES [.XX] = ± 1 [.04] ±1° [.XXX]= ± .3 [.012]	DWN BY: NESTER	DATE 7/27/04	FUJITEC AMERICA, INC.
	CHKD BY: WOESTE	DATE 7/27/04	TITLE: DATASERVER ASSEMBLY WITH ENCLOSURE
	APVD BY: SUGIMOTO	DATE 7/27/04	
JOB TITLE: NYCTA HERALD SQUARE	JOB NO.: 2881		SCALE: NTS / SIZE: B / DWG. NO.: Fig. H-11k / REV.: –

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11959	DATE	APPROVED

NOTE: ITEM #1 NOT SHOWN (SENSORS ARE LOCATED ON OPPOSITE SIDE)

2

STAINLESS STEEL CAP WELDED
NON-DIRECTIONAL FINISH
(BREAK ALL SHARP EDGES)

2.0"

FLAT HEAD TORX TAMPER RESISTANT

NOTE: COVER MUST BE REMOVABLE FOR INSTALLATION & SERVICING OF THE DOT MATRIX DISPLAY AND THE SENSOR

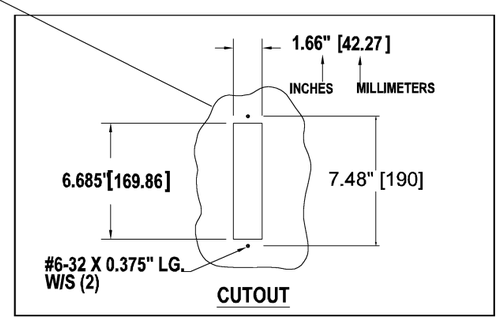
3
5
6

SEE DETAIL "A-A" APPLIED PLATE MTG. BRACKET DETAIL

DOT MATRIX DISPLAY PLATE MOUNTED FLUSH TO BRACKET

–DETAIL "A–A"–

64.0"

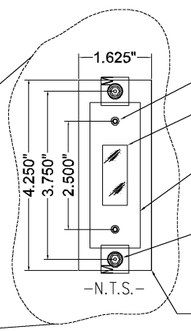


CUTOUT

4
7
8

4.000" DIA. STAINLESS STEEL TUBE, 1/8" WALL, SATIN NON-DIRECTIONAL

(2) #6-32 WELD STUDS FOR WINDOW BACKER & SENSOR MTG. BRACKET



CLEAR ACRYLIC WINDOW 14MM WIDE x 34MM HEIGHT TOLERANCE: +.005 -.000

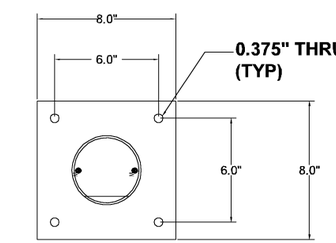
CUTOUT: 3.25"H x 1.125"W

#8-32 TORX TAMPER RESISTANT SCREWS TO MOUNT SENSORS (.187"DIA THRU HOLE - C'SK .330"DIA)

APPLIED PLATE 14ga. ST/STL WITH NON-DIRECTIONAL FINISH (ALL SHARP EDGES MUST BE GROUND SMOOTH).

4.0"

WELD AND GRIND FLUSH (TYP)

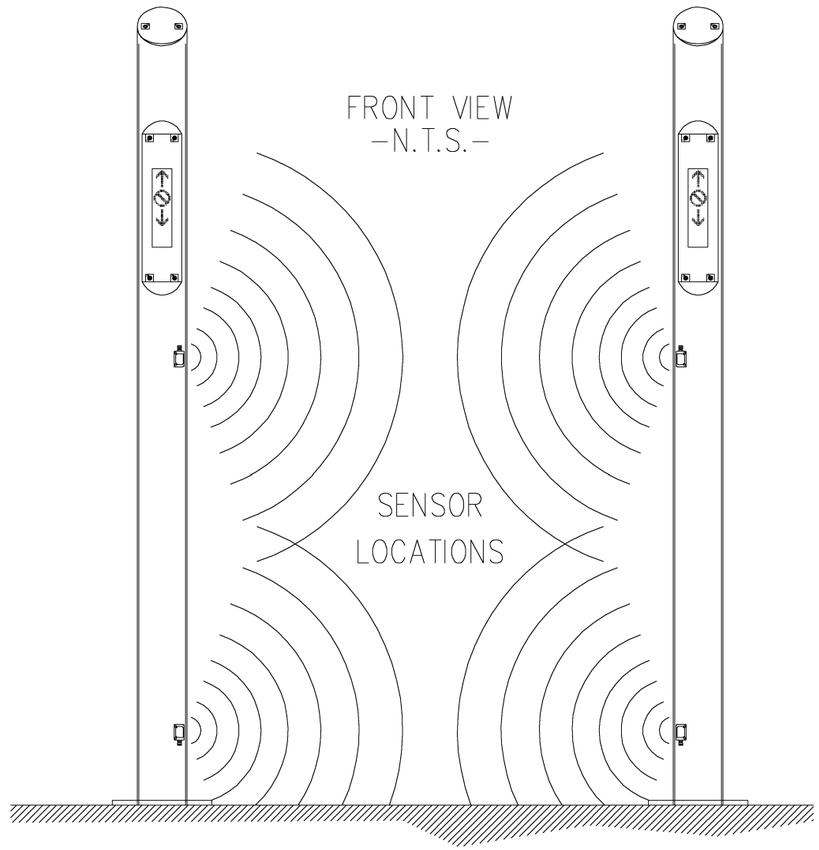


STANCHION BASE

SLEEP MODE STANCHION SENSOR INSTALLATION

Assembly 2881-AB-437a

E233, E234, E235, E236



Assembly 2881-AB-437a

GENERAL TOLERANCE SEE EN-ES-001	DWN KADONO	DATE 2/7/2005	FUJITEC AMERICA, INC.	
	CHKD. SHUPE	DATE 2/7/2005	TITLE	
	APVD. SHUPE	DATE 2/7/2005	SLEEP MODE SENSOR INSTALL	
JOB TITLE NYCT HERALD SQUARE	JOB NO. 2881		SCALE (1:10)	SIZE D
			DWG. NO. Fig. H-12a	REV.

I) LIGHTING

Lower Demarcation Light Assembly

See Fig. I-1b for Lower Demarcation Light Assembly.
Escalator No. E235, E236
Assembly used in: C68B1-2881A2 (HS L01, M01)

LOWER DEMARCATION LIGHT ASSEMBLY C68B1-2881A2				
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**QTY**	**MANUFACTURER & PART NO. (if applicable)**
1	D00001013	NUT, HEX, 1/4-28, GRADE B	2	
2	D00003004	WASHER, LOCK, 1/4	2	
3	D00902066	BOLT, HEX, M12 (P=1.75) X 40, FULL	2	
4	D00903007	NUT,HEX,M12 (P=1.75)	2	
5	D00907007	WASHER,FLAT,M12	4	
6	D00908007	WASHER,LOCK,M12	2	
7	D68078001	LAMP FIXTURE,DEMARC.(EXTERIOR)	1	Mercury #M401-220-Q-DR-HPF(120V), Thomas Day-Brite #VWLE220-120
8	D68079001	LAMP	2	METALUX, #F20T12
9	D68080001	LAMP COVER	2	
10	D68B2-2881A2	BRACKET, DEM. LIGHT, UPPER	1	

Maintenance Light, Switch, and Receptacle

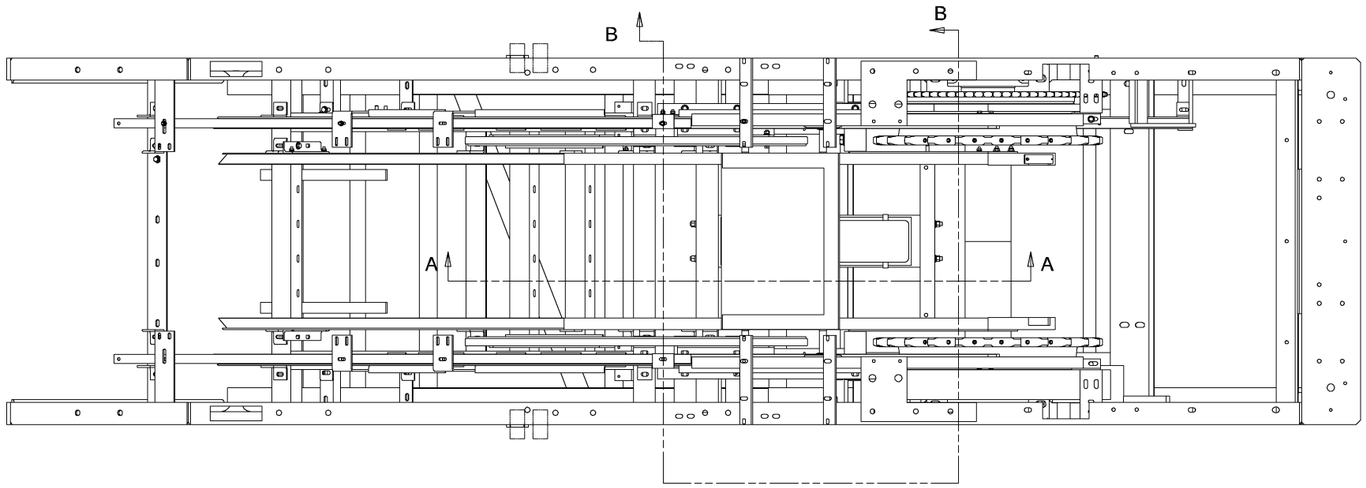
See Fig. I-3 for Maintenance Light, Switch, and Receptacle.
Escalator No. E235, E236.
Assembly used in: Excerpts from C68X3-2881C1 (Upper) and
C68X2-2881A1 (Lower) (HS L01, M01)

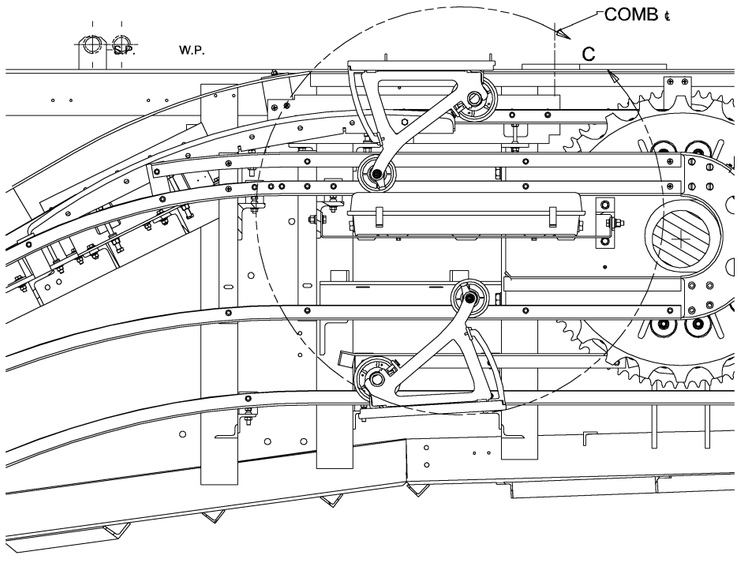
MAINTENANCE LIGHT, SWITCH, RECEPTACLE Excerpts C68X3-2881C1 (Upper) & C68X2-2881A1 (Lower)					
ITEM NO.	**FUJITEC PART NO.**	**DESCRIPTION**	**MANUFACTURER & PART NO. (if applicable)**	**QTY Upper**	**QTY Lower**
1	C68506001	MAINTENANCE RECEPTACLE KIT		1	1
	D68504001	BOX, OUTLET	O-Z Gedney #FSC-1-75	1	1
	D68445001	COVER, GFCI	O-Z Gedney #FS-1-GFCA	1	1
	D68276001	RECEPTACLE,GFCI,	Pass & Seymour #2091-1	1	1
2	C68507001	MAINTENANCE SWITCH KIT		1	1
	D68504001	BOX, OUTLET	O-Z Gedney #FSC-1-75	1	1
	D68274001	SWITCH	Pass & Seymour #20AC1	1	1
	D68444001	COVER, SWITCH	O-Z Gedney #FS-1-WSCA	1	1
3	C68508001	MAINTENANCE LIGHT KIT		1	1
	D68505001	LIGHT, MAINTENANCE	McMASTER-CARR, #14915K54 120vac/60Hz	1	1
	D68446001	15W FLUORESCENT LAMP	SYLVANIA, 15W #CF15EL/830/MED	1	1
4	D00904060	SCREW, MACHINE, PAN/SL, M6 (P=1.0)x12		6	6
5	D00908004	WASHER, LOCK, M6		6	6

*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11371	DATE	APPROVED

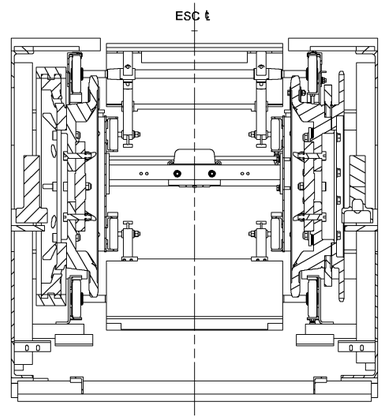
UPPER DEMARCATION LIGHT ASSEMBLY
Assembly C68B1-2881A1

E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

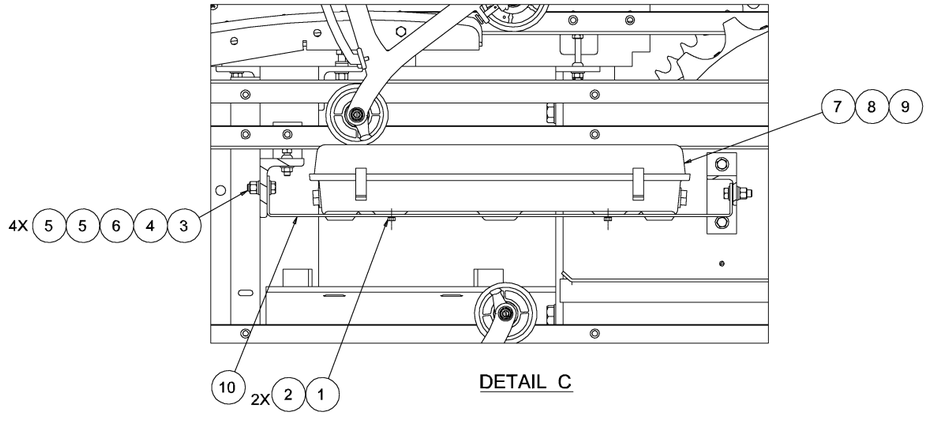




SECTION A-A



SECTION B-B



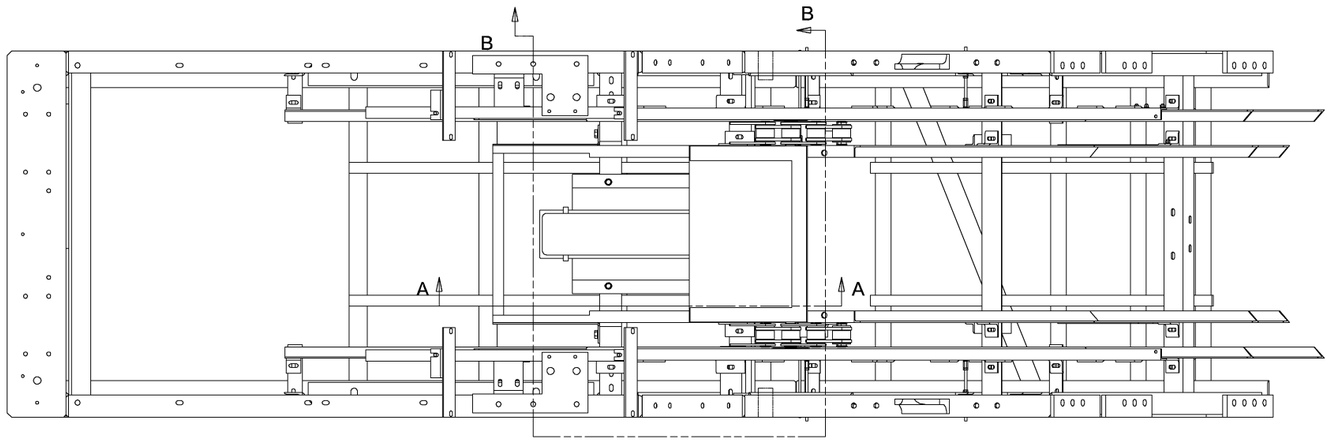
DETAIL C

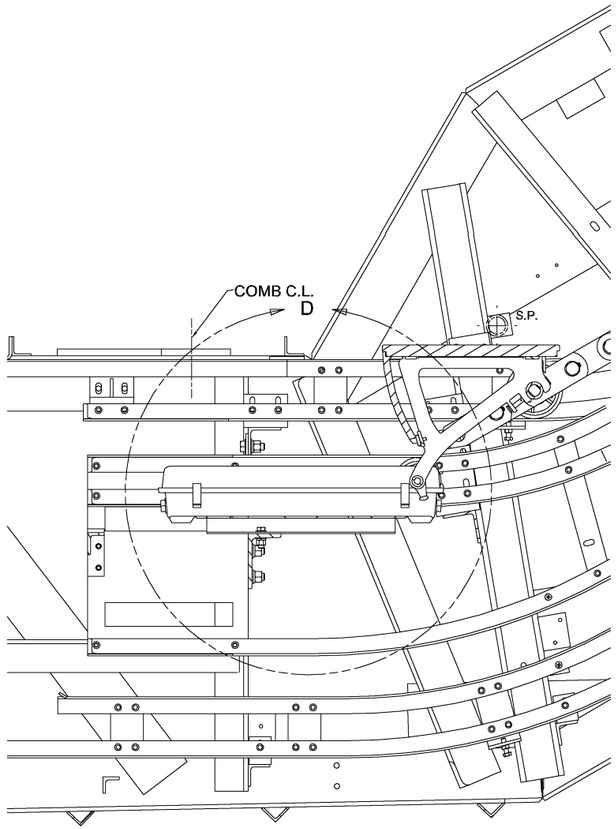
Assembly C68B1-2881A1

GENERAL TOLERANCE SEE EN-ES-001	DWN. CHARVILLE	DATE 8/25/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/25/2004	TITLE: DEMARCATION LIGHT, UPPER
	APVD. APPERSON	DATE 8/25/2004	
JOB TITLE: NYCT HERALD SQ.	JOB NO.: 2881 A01~L01		SCALE (1:10) / SIZE D / DWG. NO. Fig. I-1a / REV.

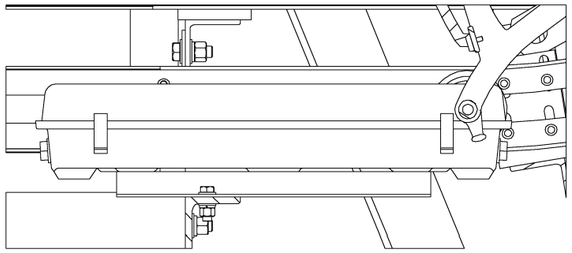
*** CAD – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ECN NO. 11371	DATE	APPROVED

LOWER DEMARCATION LIGHT ASSEMBLY
Assembly C68B1-2881A2
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236

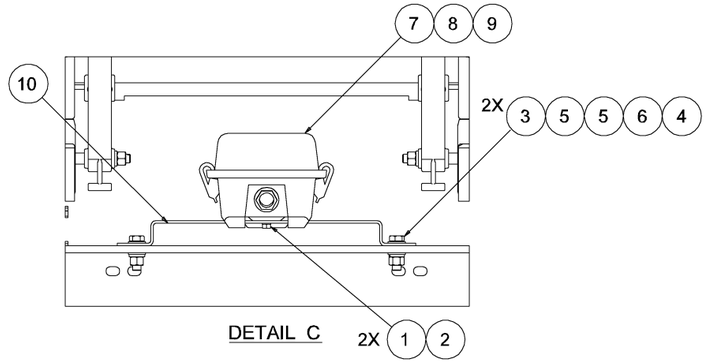




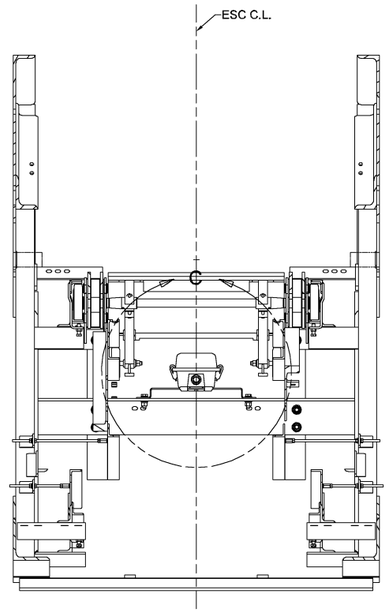
SECTION A-A



DETAIL D



DETAIL C



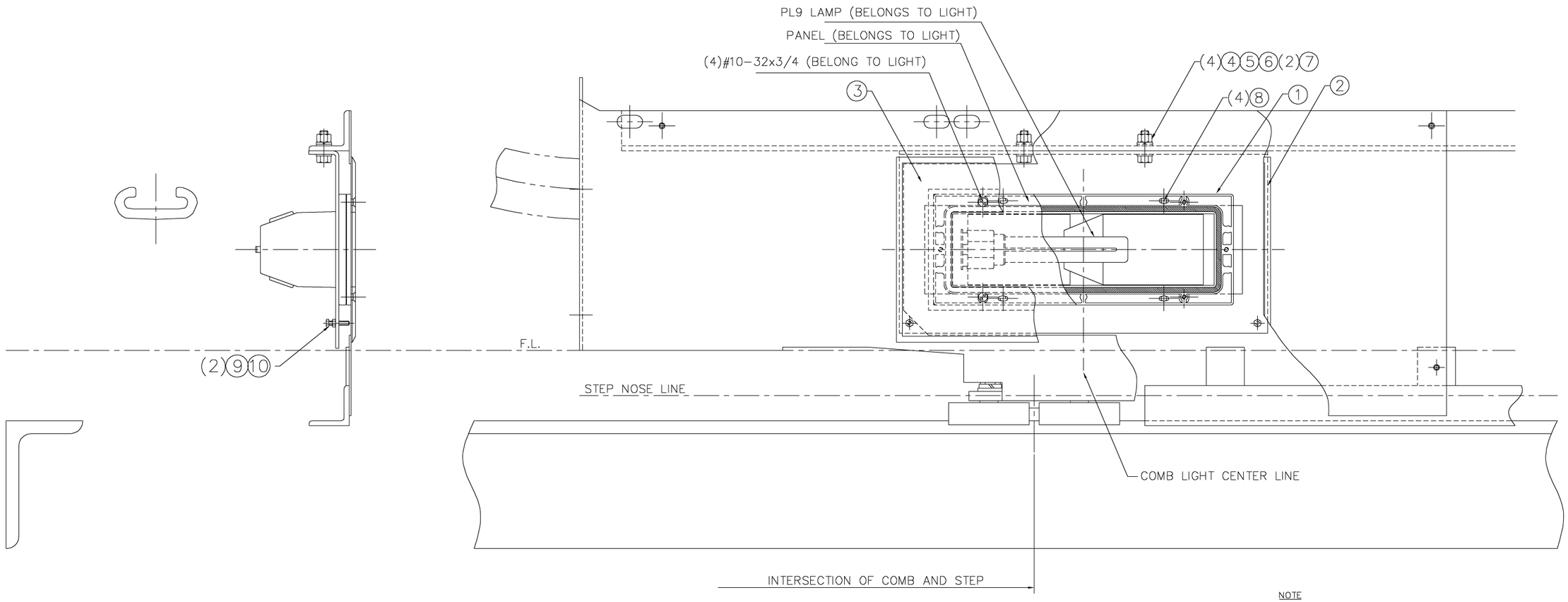
SECTION B-B

Assembly C68B1-2881A2

GENERAL TOLERANCE SEE EN-ES-001	DWN CHARVILLE	DATE 8/30/2004	FUJITEC AMERICA, INC.
	CHKD. SHUPE	DATE 8/30/2004	TITLE: DEMARCATION LIGHT, LOWER
	APVD. APPERSON	DATE 8/30/2004	
JOB TITLE: NYCT HERALD SQ.	JOB NO. 2881 A01~L01	SCALE (1:10)	SIZE D
		DWG. NO. Fig. I-1b	REV.

*** ACAD DRAWING -- MANUAL REVISIONS NOT PERMITTED ***			
REVISION HISTORY			
REV	DESCRIPTION SDP#2845	DATE	APPROVED

COMB LIGHT INSTALLATION
Assembly A68465001
E221, E222, E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



NOTE

THIS DWG REPRESENTS LEFT HANDLE OF LOWER AND RIGHT HANDLE OF UPPER.

ASSY# A68465001

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ±1°	DWN SHUPE	DATE 06/30/03
	CHKD. APPERSON	DATE 06/30/03
	APVD. TSUCHIHATA	DATE 06/30/03
JOB TITLE	JOB NO. STD	

FUJITEC AMERICA, INC.

TITLE: COMB LIGHT, INST.

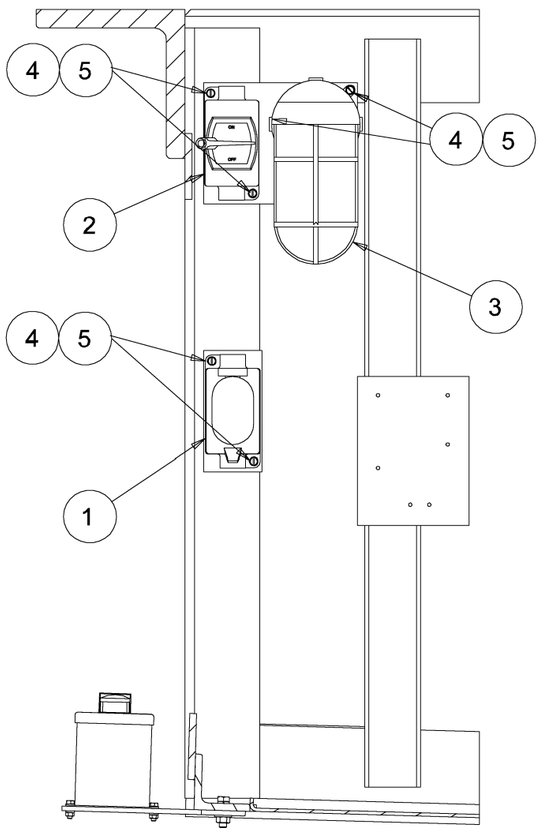
SCALE	SIZE	DWG. NO.	REV.
1.00=2.00	D	Fig. 1-2	-

*** CAD DRAWING – MANUAL REVISIONS NOT PERMITTED ***				
REVISION HISTORY				
REV	DESCRIPTION	ecn#10563	DATE	APPROVED

UPPER MAINTENANCE LIGHT ASSEMBLY

Assembly excerpts C68X3-2881C1

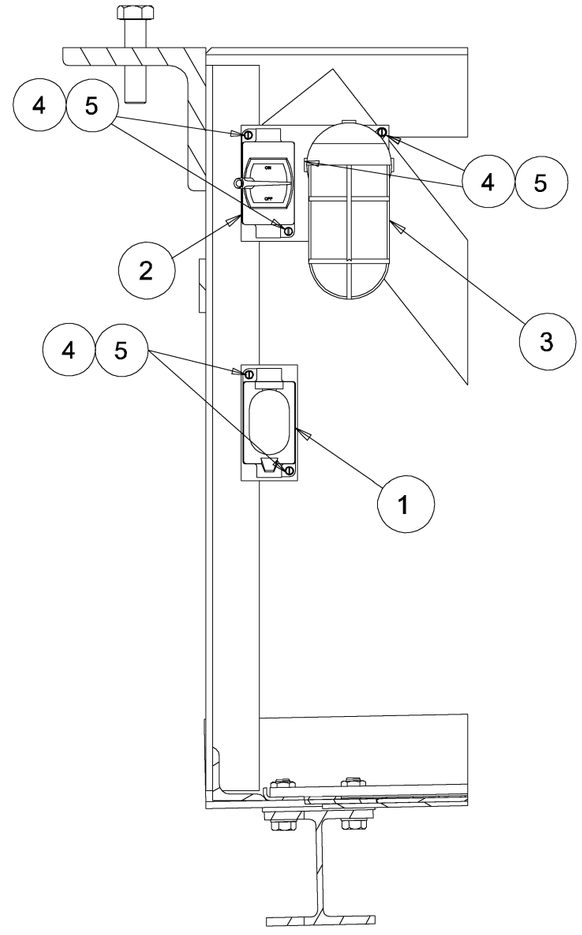
E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



LOWER MAINTENANCE LIGHT ASSEMBLY

Assembly excerpts C68X2-2881A1

E223, E224, E229, E230, E231, E232
E233, E234, E235, E236



Assembly excerpts C68X3-2881C1 and C68X2-2881A1

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS MM [INCHES] TOLERANCES: [.X] = ± 2.5 [.1] [.XX] = ± 1 [.04] [.XXX] = ± .3 [.012] ANGLES ± 1°	DWN HET	DATE 2/12/04	FUJITEC AMERICA, INC.
	CHKD. KADONO	DATE 2/12/04	TITLE Maintenance Light Assembly
	APVD. KAA	DATE 2/12/04	
JOB TITLE	JOB NO. STD		SCALE 1.00=1.00 / SIZE D / DWG. NO. Fig.I-3 / REV. A

NYCTA PROJECT HERALD SQUARE

Contract E-34011

Electrical Parts List for Herald Square

Prices Subject to Change Without Notice

Part Name	Fujitec Part No.	Manufacturer	Manufacturer Part No.	NYCTA No.	Recommended Stock Qty.	Quantity Ordered	Unit Price	Sub-Total
ENCLOSURE	D05A1-2881A1	HOFFMAN	A-60X4912SSLP				$ 7,820.28	$ -
PANEL	D05A2-2881A1	FAI					$ 250.16	$ -
ADAPTER	D05CH-2038A1	HOFFMAN	A-21SDA		1		$ 134.16	$ -
HANDLE MECHANISM	D05994001	SQUARE D	9422-A2		1		$ 106.28	$ -
FLUORESCENT LIGHT ENCLOSURE	D05A9-2666A1	HOFFMAN	ALF16D12R		1		$ 148.14	$ -
SHUNT TRIP CIRCUIT BREAKER	D05A6-2881A1	SQUARE D	FAL34060-1021-1212		2		$ 723.50	$ -
MEMORY MODULE	D05965001	ALLEN BRADLEY	1747-M13		2		$ 417.20	$ -
INPUT MODULE	D05961002	ALLEN BRADLEY	1746-IB16		2		$ 337.68	$ -
RELAY MODULE	D05961005	ALLEN BRADLEY	1746-OW16		2		$ 467.46	$ -
OUTPUT MODULE	D05961007	ALLEN BRADLEY	1746-OX8		2		$ 380.94	$ -
HIGH SPEED COUNTER MODULE	D05961008	ALLEN BRADLEY	1746-HSCE		4		$ 748.20	$ -
ANALOG INPUT MODULE	D05961010	ALLEN BRADLEY	1746-NI4		2		$ 792.82	$ -
MULTICHANNEL HIGH SPEED COUNTER MODULE	D05961009	ALLEN BRADLEY	1746-HSCE2		4		$ 1,372.34	$ -
OUTPUT MODULE	D05961006	ALLEN BRADLEY	1746-OB32		2		$ 711.62	$ -
CABLE	D05CD-2038A1	ALLEN BRADLEY	1746-C7		1		$ 126.76	$ -
POWER SUPPLY	D05540006	COSEL	R100U-24-N		2		235.96	
							$	$ -
POWER CORD	D05GH-2038A1	GRAINGER	2W522		1		$ 9.66	$ -
ELECTRICAL HAZARD LABLE	D54296001	SETON	23082				$ 2.86	$ -
WARNING LABLE	D05598001	VISIONMARK					$ 1.42	$ -
LABEL	D05676001	VISIONMARK					$ 1.72	$ -
CABLE	D05958003	ALLEN BRADLEY	1492-CABLE025-H		1		$ 221.84	$ -
TRANSFORMER, 208 VAC	D05A21001	ACME	TA-2-54524		1		$ 454.18	$ -
1 POLE, 5 AMP, CIRCUIT BREAKER	D05A7-2112A1	ALLEN BRADLEY	1492-GS1G050-H1		2		$ 118.68	$ -
1 POLE, 3 AMP, CIRCUIT PROTECTOR	D05AA-2881A1	ALLEN BRADLEY	1492-GS1G030-H1		2		$ 121.54	$ -
PHASE REVERSAL RELAY	D05550002	SSAC	PLR240A		2		$ 114.16	$ -
BASE FOR PHASE REVERSAL RELAY	D05551001	SSAC	OT48		1		$ 4.96	$ -
VOLTAGE SENSOR	D05A03001	P&B	CSJ-38-71010		2		$ 214.74	$ -

Part Name	Fujitec Part No.	Manufacturer	Manufacturer Part No.	NYCTA No.	Recommended Stock Qty.	Quantity Ordered	Unit Price	Sub-Total
SOCKET FOR VOLTAGE SENSOR	D05A02001	P&B	27E891		1		$ 8.28	$ -
TIMER SOCKET	D05849001				1		$ 10.56	$ -
TIMER, DELAY OFF, 2-SEC MAX	D05AE-2666A1	RK ELECTRONICS	COB-24D-2-2S		2		$ 227.90	$ -
2-POLE, 24VOLT DC RELAY	D05987001	OMRON	G2R-2-SN		12		$ 33.54	$ -
RELAY BASE	D05990001	OMRON	P2RF-08-E		1		$ 13.66	$ -
1-POLE, 24VDC RELAY	D05A01002	ALLEN BRADLEY	700-HLT1Z24		2		$ 24.92	$ -
GFCI OUTLET	D05993003	LEVITON	8598-DIN		1		$ 99.40	$ -
TERMINAL BLOCK, 19-POLE	D05876001				1		$ 56.46	$ -
DIODE	D05736001		IN4004		12		$ 0.08	$ -
INTERFACE MODULE	D05959001	ALLEN BRADLEY	1492-IFM40F				$ 167.96	$ -
UPS TRAY BRACKET	D05A3-2881A1	FAI					$ 26.80	$ -
UPS TRAY END	D05A4-2881A1	FAI					$ 83.96	$ -
UNINTERRUPTIBLE POWER SUPPLY	D05C7-2038A1	APC	BF500		1		$ 245.88	$ -
GROUND LUG	D05606003	BARBEY ELECTRONICS	K2A29U				$ 8.84	$ -
PANELVIEW 600 - TOUCHSCREEN ONLY	D05969004	ALLEN BRADLEY	A-B 2711-T6C2L1		1		$ 3,688.32	$ -
CABLE	D05963001	ALLEN BRADLEY	A-B 1747-C10		1		$ 86.56	$ -
HOURMETER	D05BM-2038A1	ENM	T50B2		1		$ 38.38	$ -
HOURMETER GASKET	D05BN-2038A1	ENM	A40047-S		1		$ 4.60	$ -
RED ILLUMINATED, EXTENDED PUSH BUTTON	D05979001	ALLEN BRADLEY	800EP-LE4		1		$ 12.66	$ -
2 POSITION KEYSWITCH	D05D1-2038A1	ALLEN BRADLEY	800EP-KM23		1		$ 63.22	$ -
METAL MOUNTING LATCH	D05889001	ALLEN BRADLEY	800E-A2L				$ 8.26	$ -
NORMALLY OPEN CONTACT BLOCK	D05971001	ALLEN BRADLEY	800E-2X10		2		$ 15.40	$ -
NORMALLY CLOSED CONTACT BLOCK	D05890001	ALLEN BRADLEY	800E-2X01		2		$ 15.40	$ -
LATCH	D05970001	ALLEN BRADLEY	800E-2DL3R		2		$ 72.24	$ -
RED PILOT LIGHT	D05980001	ALLEN BRADLEY	800EP-P4		6		$ 10.54	$ -
LATCH	D05970003	ALLEN BRADLEY	800E-2DL3A		1		$ 72.24	$ -
AMBER PILOT LIGHT	D05980003	ALLEN BRADLEY	800EP-P5		2		$ 10.54	$ -
LATCH	D05970002	ALLEN BRADLEY	800E-2DL3G		1		$ 72.24	$ -
GREEN PILOT LIGHT	D05980002	ALLEN BRADLEY	800EP-P3		2		$ 10.54	$ -
HOLE PLUG	D05976001	ALLEN BRADLEY	800E-NE8				$ 8.70	$ -
INSPECTION STATION	C65877001	FAI			1		$ 1,215.16	$ -
MOTOR CURRENT SENSOR	D05A31001	F. W. Bell	PC-200		1		$ 332.44	$ -
LABEL "UP"	D05938001	FAI					$ 17.30	$ -
LABEL "DOWN"	D05938002	FAI					$ 17.30	$ -
JUMPER BAR 2-POLE	D06033001						$ 0.86	$ -
DIN RAIL, SLOTTED, 2 METERS	D05560000	WAGO	210-112				$ 18.56	$ -
SHRINK LABELS 1/2" YELLOW (2000 Labels Per Roll)	D05B96004	PANDUIT	LHS50Y2				$ 1,061.30	$ -
SHRINK LABELS 1/8" YELLOW (1000 Labels Per Roll)	D05B96002	PANDUIT	LHS12Y4				$ 397.00	$ -
FLUORESCENT BULB 12"	D05AA-2666A1	MIDWEST EQUIPMENT	F8T5CW		2		$ 14.12	$ -
PRINTER RIBBON	D05B97001	PANDUIT	TTRH-BL				$ 79.02	$ -
LOCKING RING	D05B19001	ALLEN BRADLEY	800E-AR3		2		$ 2.62	$ -
RECTIFIER 400C	D05541002				2		$ 2.64	$ -
SURGE ABSORBER	D05531006		ENC201D-20A		6		$ 8.34	$ -
RESISTOR, 270 OHMS, 16 WATTS	D05A84001	MILWAUKEE	12M-16-270		1		$ 32.26	$ -
TERMINAL STRIP, 2-POLE	D05A85001						$ 3.62	$ -
TERMINAL BLOCK, 36-POLE	D05799001						$ 80.08	$ -
POWER TERMINAL BLOCK	D05AD-2410A1	MARATHON	1423572				$ 19.56	$ -
AUX CONTACT	D05B31002	ABB	CAL5-11B		3		$ 46.06	$ -
INTERLOCKED CONTACTOR	D05AL-2881A1	ABB	A63M-30-10-84		1		$ 467.62	$ -
GROUND FAULT MONITOR	D05C09001	BENDER	RCMA473L6		1		$ 1,315.28	$ -

Part Name	Fujitec Part No.	Manufacturer	Manufacturer Part No.	NYCTA No.	Recommended Stock Qty.	Quantity Ordered	Unit Price	Sub-Total
TERMINAL BLOCK, 64-POLE	D05800001						$ 118.92	$ -
RELAY SOCKET, 4-POLE	D05C60001	OMRON	PS7A-10F-ND				$ 40.28	$ -
FORCE GUIDED RELAY, 4-POLE	D05C62002	OMRON	GS7A-2A2B		6		$ 36.12	$ -
FORCE GUIDED RELAY, 4-POLE	D05C62001	OMRON	GS7A-3A1B		6		$ 36.12	$ -
RELAY SOCKET, 6-POLE	D05C61001	OMRON	PS7A-14F-ND				$ 41.02	$ -
FORCE GUIDED RELAY, 6-POLE	D05C63001	OMRON	GS7A-5A1B		6		$ 48.92	$ -
CIRCUIT BREAKER, 2-POLE, 13 AMPS	D05B7-2881A1	SQUARE D	60145		1		$ 139.86	$ -
CIRCUIT BREAKER, 3-POLE, 1 AMP	D05B8-2881A1	SQUARE D	60168		1		$ 220.04	$ -
CIRCUIT BREAKER AUX CONTACT	D05B9-2881A1	SQUARE D	MG26925		1		$ 34.12	$ -
CIRCUIT BREAKER, 2-POLE, 3 AMPS	D05AY-2881A1	ALLEN BRADLEY	1492-SP2C030		1		$ 113.82	$ -
CIRCUIT BREAKER AUX CONTACT	D05AZ-2881A1	ALLEN BRADLEY	1492-ASPH3		1		$ 40.04	$ -
GROUNDING BAR	D05C70001	SQUARE D	PK7GTA				$ 7.38	$ -
CIRCUIT BREAKER, 1-POLE, 10 AMPS	D05B6-2881A1	SQUARE D	60110		1		$ 64.82	$ -
LABEL "USE FUSES TYPE…"	D05C68001						$ 41.94	$ -
LABEL "WARNING: CAPACITIVE…"	D05C69001						$ 41.94	$ -

NYCTA PROJECT HERALD SQUARE

Contract E-34011

Mechanical Parts List for Herald Square

Prices Subject to Change Without Notice

Part Name	Fujitec Part No.	Manufacturer	Manufacturer Part No.	NYCTA No.	Recommended Stock Qty.	Quantity Ordered	Unit Price	Sub-Total
STEP CHAIN, 24", 36 TON, 1 UNIT	C62K25001	KETTEWOLFE			20		1,287.72	
STEP CHAIN, 24", 36 TON, 4 UNITS	C62K25004	KETTEWOLFE			20		5,150.84	
STEP CHAIN, 24", 36 TON, 6 UNITS	C62K25006	KETTEWOLFE			20		7,726.32	
MAIN DRIVE SHAFT 24"	D62J17001	FUJITEC					9,711.70	
SHIM, STEP CHAIN	D62L97001	FUJITEC			200		0.94	
RING DISTANCE	D62L87001	FUJITEC			100		2.96	
WASHER, STEP CHAIN	D62L88001	FUJITEC			50		2.44	
WHEEL, STEP CHAIN	D62424001	FUJITEC			10		42.26	
DISK SPRING	D62L89001	FUJITEC			50		6.74	
COMB	D63007002	FUJITEC			40		34.68	
COMB 24"	D63167001	FUJITEC			20		165.62	
FLOORPLATE PANEL ASSEMBLY	C63L3-2881E1	FUJITEC					1,135.96	
BEARING (HR DRIVE ASSEMBLY)	D01006039	NSK	6208LU		4		20.86	
HR CHAIN, #100, 108 PITCH	D62K4-2881A1	US TSUBAKI			2		407.06	
HR CHAIN, #80, 137 PITCH	D62K4-2881A2	US TSUBAKI			2		265.32	
PILLOW BLOCK HANDRAIL, MID DRIVE	D62D69001	FUJITEC			5		180.42	
RUBBER, HANDRAIL DRIVE SHEAVE	D62E63001	FUJITEC			5		168.28	
SPRING, RETAINING, ROLLER	D62G28001	FUJITEC					13.52	
SPROCKET, HANDRAIL, DRIVE	D62K63001	FUJITEC			2		473.56	
SPROCKET, HANDRAIL MID DRIVE	D62L78001	FUJITEC			2		683.04	
HANDRAIL RETURN GUIDE, STEEL (1320mm)	D62N2-2881E4	FUJITEC					267.68	
HANDRAIL RETURN GUIDE, STEEL	D62F91001	FUJITEC					152.64	
HANDRAIL RETURN GUIDE, STEEL (1200mm)	D62F79001	FUJITEC					152.64	
HANDRAIL RETURN GUIDE, STEEL (1720mm)	D62N2-2881E3	FUJITEC					199.96	
ROLLER GUIDE	C62M54001	FUJITEC			10		1,610.00	
ROLLER GUIDE	C62M53001	FUJITEC			10		780.64	
ROLLER GUIDE	C62M53002	FUJITEC			10		780.64	
ROLLER GUIDE	C62H50001	FUJITEC			10		227.92	
NEWEL SHEAVE BEARING	D01006040	NSK	6212LU		5		20.96	
NEWEL INTERIOR PANEL, LOWER	C64K1-2881E1	FUJITEC					492.76	
NEWEL INTERIOR PANEL, LOWER	C64K1-2881E2	FUJITEC					492.76	
UPPER PANEL	C64K1-2881E7	FUJITEC					557.04	
UPPER PANEL	C64K1-2881E8	FUJITEC					557.04	
LOWER PANEL	C64K1-2881E5	FUJITEC					662.20	
LOWER PANEL	C64K1-2881E6	FUJITEC					662.20	
INCLINE PANEL	C64K1-2881E9	FUJITEC					4,745.48	
NEWEL SKIRT PANEL	C64N2-2881E1	FUJITEC					1,543.04	
NEWEL SKIRT PANEL	C64N2-2881E2	FUJITEC					1,543.04	
SKIRT PANEL, LOWER	C64M2-2881E1	FUJITEC					749.44	
SKIRT PANEL, LOWER	C64M2-2881E2	FUJITEC					749.44	

Part Name	Fujitec Part No.	Manufacturer	Manufacturer Part No.	NYCTA No.	Recommended Stock Qty.	Quantity Ordered	Unit Price	Sub-Total
NEWEL INTERIOR PANEL, UPPER	C64K1-2881E3	FUJITEC					494.60	
NEWEL INTERIOR PANEL, UPPER	C64K1-2881E4	FUJITEC					494.60	
SKIRT PANEL, UPPER	C64M2-2881E3	FUJITEC					791.08	
SKIRT PANEL, UPPER	C64M2-2881E4	FUJITEC					791.08	
INCLINE SKIRT PANEL	C64M2-2881E5	FUJITEC					818.56	
INCLINE SKIRT PANEL	C64M2-2881E6	FUJITEC					818.56	
INCLINE SKIRT PANEL	C64M2-2881E9	FUJITEC					791.04	
INCLINE SKIRT PANEL	C64M2-2881E0	FUJITEC					1,510.96	
RUBBER MOLDING	D64411001	FUJITEC			2		191.88	
BRUSH, LUBE	D68406001	FUJITEC			4		97.52	
MANIFOLD, 6 PORT	C68493001	FUJITEC					221.48	
LUBRICATOR, PUMP UNIT	D68393001	FUJITEC			4		2,529.36	
GREASE NIPPLE, LUBE	D68510001	FUJITEC					0.68	
COPPER PIPE, 4mm DIA.	D68436001	FUJITEC					3.22	
COPPER PIPE, 6mm DIA.	D68395001	FUJITEC					6.08	
ANCHOR TEE, ASSY	C68459001	FUJITEC					68.82	
STEPS 24"	C63268001	FUJITEC			50		1,024.92	
BEARING, SPLIT	D62L10001	CRAFT			1		2,203.76	
BEARING, SPLIT	D62L10002	CRAFT			1		2,203.76	
MACHINE - 20HP	C62L83001	CONE			1		29,949.90	
MAIN DRIVE CHAIN - 24"	D62B4-2881E1	FUJITEC			1		1,503.16	
SPROCKET, MAIN DRIVE	D62J26001	FUJITEC			1		12,692.76	
RUBBER MOLDING	D64A13001	FUJITEC					2.60	
MANIFOLD, 8 PORT	C68494001	FUJITEC					221.48	
BRAKE, SIZE 250	C62L82001	MAYR					7,079.96	
CHAIN, MAIN DRIVE	D62B4-2881G1	FUJITEC					1,310.80	

HARDWARE DIN LIST (Metric)

PART No.	DESCRIPTION	FINISH	CLASS	DIN No.
D00902011	Metric Bolt, Hex, M4(P=0.7)x25, full	Zinc Plated	8.8	931
D00902025	Metric Bolt, Hex, M6(P=1.0)x20, full	Zinc Plated	8.8	933
D00902026	Metric Bolt, Hex, M6(P=1.0)x25	Zinc Plated	8.8	933
D00902027	Metric Bolt, Hex, M6(P=1.0)x35, full	Zinc Plated	8.8	933
D00902031	Metric Bolt, Hex, M8(P=1.25)x16	Zinc Plated	8.8	933
D00902032	Metric Bolt, Hex, M8(P=1.25)x20, full	Zinc Plated	8.8	933
D00902033	Metric Bolt, Hex, M8(P=1.25)x25, full	Zinc Plated	8.8	933
D00902034	Metric Bolt, Hex, M8(P=1.25)x30, full	Zinc Plated	8.8	933
D00902035	Metric Bolt, Hex, M8(P=1.25)x30,thread 22mm lng	Zinc Plated	8.8	933
D00902036	Metric Bolt, Hex, M8(P=1.25)x40, full	Zinc Plated	8.8	933
D00902038	Metric Bolt, Hex, M8(P=1.25)x50, full	Zinc Plated	8.8	933
D00902041	Metric Bolt, Hex, M8(P=1.25)x80	Zinc Plated	8.8	933
D00902044	Metric Bolt, Hex, M8(P=1.25)x90, full	Zinc Plated	8.8	933
D00902047	Metric Bolt, Hex, M10(P=1.50)x20	Zinc Plated	8.8	933
D00902049	Metric Bolt, Hex, M10(P=1.50)x30	Zinc Plated	8.8	933
D00902050	Metric Bolt, Hex, M10(P=1.50)x35	Zinc Plated	8.8	933
D00902051	Metric Bolt, Hex, M10(P=1.50)x40	Zinc Plated	8.8	933
D00902052	Metric Bolt, Hex, M10(P=1.50)x50, full	Zinc Plated	8.8	933
D00902056	Metric Bolt, Hex, M10(P=1.50)x80, full	Zinc Plated	8.8	933
D00902063	Metric Bolt, Hex, M12(P=1.75)x25	Zinc Plated	8.8	933
D00902064	Metric Bolt, Hex, M12(P=1.75)x30, full	Zinc Plated	8.8	933
D00902065	Metric Bolt, Hex, M12(P=1.75)x35	Zinc Plated	8.8	933
D00902066	Metric Bolt, Hex, M12(P=1.75)x40, full	Zinc Plated	8.8	933
D00902068	Metric Bolt, Hex, M12(P=1.75)x50	Zinc Plated	8.8	933
D00902071	Metric Bolt, Hex, M12(P=1.75)x60	Zinc Plated	8.8	933
D00902081	Metric Bolt, Hex, M16(P=2.00)x40	Zinc Plated	8.8	933
D00902082	Metric Bolt, Hex, M16(P=2.00)x45	Zinc Plated	8.8	933
D00902084	Metric Bolt, Hex, M16(P=2.00)x60	Zinc Plated	8.8	933

PART No.	DESCRIPTION	FINISH	CLASS	DIN No.
D00902085	Metric Bolt, Hex, M16(P=2.00)x70, full	Zinc Plated	8.8	933
D00902086	Metric Bolt, Hex, M16(P=2.00)x200, full	Zinc Plated	8.8	933
D00902088	Metric Bolt, Hex, M20(P=2.50)x50, full	Zinc Plated	8.8	933
D00902089	Metric Bolt, Hex, M20(P=2.50)x60	Zinc Plated	8.8	933
D00902090	Metric Bolt, Hex, M20(P=2.50)x80, full	Zinc Plated	8.8	933
D00902081	Metric Bolt, Hex, M20(P=2.50)x90, full	Zinc Plated	8.8	933
D00902108	Metric Bolt, Hex, M24(P=3.00)x100, full	Zinc Plated	8.8	933
D00902109	Metric Bolt, Hex, M24(P=3.00)x120, full	Zinc Plated	8.8	933
D00904003	Screw, Machine, Pan Head, Slot, M3(P=0.50)x10	Zinc Plated	4.8	85
D00904008	Screw, Machine, Pan Head, Phillips, M3(P=0.50)x30	Zinc Plated	4.8	7985
D00904017	Screw, Machine, Pan Head, Slot, M4(P=0.70)x40	Zinc Plated	4.8	85
D00904019	Screw, Machine, Pan Head, Phillips, M4(P=0.70)x8	Zinc Plated	4.8	7985
D00904020	Screw, Machine, Pan Head, Phillips, M4(P=0.70)x12	Zinc Plated	4.8	7985
D00904023	Screw, Machine, Pan Head, Phillips, M5(P=0.80)x12	Zinc Plated	4.8	7985
D00905044	Screw, Machine, Flat Head, Phillips, M6(P=1.00)x16, Stainless Steel	Stainless Steel	70	963
D00905046	Screw, Machine, Flat Head, Phillips, M6(P=1.00)x30, Stainless Steel	Stainless Steel	70	963
D00905060	Screw, Machine, Flat Head, Phillips, M8(P=1.25)x16	Zinc Plated	4.8	965
D00905062	Screw, Machine, Flat Head, Phillips, M8(P=1.25)x25	Zinc Plated	4.8	965
D00905064	Screw, Machine, Flat Head, Phillips, M8(P=1.25)x35	Zinc Plated	4.8	965
D00905081	Screw, Machine, Flat Head, Slot, M10(P=1.50)x30	Zinc Plated	4.8	963
D00931002	Screw, Machine, Flat Head, Phillips, M4(P=0.70)x11.5, Brass	Brass	CU2/CU3	966
D00931004	Screw, Machine, Flat Head, Phillips, M4(P=0.70)x16, Stainless Steel	Stainless Steel	70	966
D00906004	Screw, Machine, Flat Head, Tamperproof, M4(P=0.70)x10 Stainless Steel	Stainless Steel	70	963
D00903002	Nut, Hex, M4(P=0.70)	Zinc Plated	8	934
D00903004	Nut, Hex, M6(P=1.00)	Zinc Plated	8	934
D00903005	Nut, Hex, M8(P=1.25)	Zinc Plated	8	934
D00903006	Nut, Hex, M10(P=1.50)	Zinc Plated	8	934
D00903007	Nut, Hex, M12(P=1.75)	Zinc Plated	8	934
D00903008	Nut, Hex, M16(P=2.00)	Zinc Plated	8	934
D00903009	Nut, Hex, M20(P=2.50)	Zinc Plated	8	934
D00903010	Nut, Hex, M24(P=3.00)	Zinc Plated	8	934
D00903019	Nut, Hex, M16(P=2.00), Left/Hand	Zinc Plated	8	934
D00922005	Nut, Wing, M8(P=1.25)	Zinc Plated	4	-

PART No.	DESCRIPTION	FINISH	CLASS	DIN No.
D00907001	Flat Washer, M3	Zinc Plated	-	433
D00907002	Flat Washer, M4	Zinc Plated	-	433
D00907003	Flat Washer, M5	Zinc Plated	-	433
D00907004	Flat Washer, M6	Zinc Plated	-	433
D00907005	Flat Washer, M8	Zinc Plated	-	433
D00907006	Flat Washer, M10	Zinc Plated	-	433
D00907007	Flat Washer, M12	Zinc Plated	-	433
D00907008	Flat Washer, M16	Zinc Plated	-	433
D00907009	Flat Washer, M20	Zinc Plated	-	433
D00907010	Flat Washer, M24	Zinc Plated	-	433
D00908001	Lock Washer, M3	Zinc Plated	-	127B
d00908002	Lock Washer, M4	Zinc Plated	-	127B
D00908003	Lock Washer, M5	Zinc Plated	-	127B
D00908004	Lock Washer, M6	Zinc Plated	-	127B
D00908005	Lock Washer, M8	Zinc Plated	-	127B
D00908006	Lock Washer, M10	Zinc Plated	-	127B
D00908007	Lock Washer, M12	Zinc Plated	-	127B
D00908008	Lock Washer, M16	Zinc Plated	-	127B
D00908009	Lock Washer, M20	Zinc Plated	-	127B
D00908010	Lock Washer, M24	Zinc Plated	-	127B
D00911010	Lock Washer, M8, External Star	Zinc Plated	350-425(HV10)	6797A
D00912026	Pin, Cotter, M3.2x25, Stainless, Steel	Stainless Steel		94
D00913028	Pin, Spring, Metric, M3x18	Stainless Steel	55 Si 7	1481
D00915012	Ring, Retaining, Shaft, 12mm	Zinc Plated	-	471
D00915075	Ring, Retaining, Bore, 75mm	Zinc Plated	-	472
D00915222	Ring, Retaining, Shaft, 22mm, Stainless Steel	Stainless Steel	-	471
D00915245	Ring, Retaining, Shaft, 45mm, Stainless Steel	Stainless Steel	-	471
D00915256	Ring, Retaining, Bore, 56mm	Zinc Plated	-	472

Bearing List

Herald Square - Contract E-34011

PART No.	DESCRIPTION	MFR
D01006040	Bearing, Roller Ball, 6212LU, (Newel Sheave bearing)	NSK
D62L10001	Split Bearing, Floating Expansion Type, S1 BCH 105mm FL BP (Main Drive)	CRAFT
D62L10002	Split Bearing, Held Fixed Type, S1 BCH 105mm HD BP (Main Drive)	CRAFT
D62L17001	Bearing (one side of bearing sealed only), 6212-DU (Tension Carriage)	NSK
D01006038	Bearing, 6803DDU sealed both sides (Machine Idler)	NSK
D65724001	Bronze Bearing, B2226-8 (Pawl Brake)	BOSTON
D62B25001	Bronze Bearing, #BM2020FB (Governor Encoder)	PEER
D62D69001	Pillow Block #UKP213-H2313X, (Handrail Drive Middle Shaft)	NSK
D01006034	Bearing, Roller Ball, 6205ZZ, (Handrail Drive Idler)	NSK
D01006039	Bearing, Roller Ball, 6208LU, (Handrail Drive Sheave)	NSK

ESCALATOR OPERATIONS
AND MAINTENANCE MANUAL

ELECTRICAL DRAWINGS
VOLUME 5

FINAL

NEW YORK CITY TRANSIT AUTHORITY
HERALD SQUARE PHASE IV
(HS 11/12)

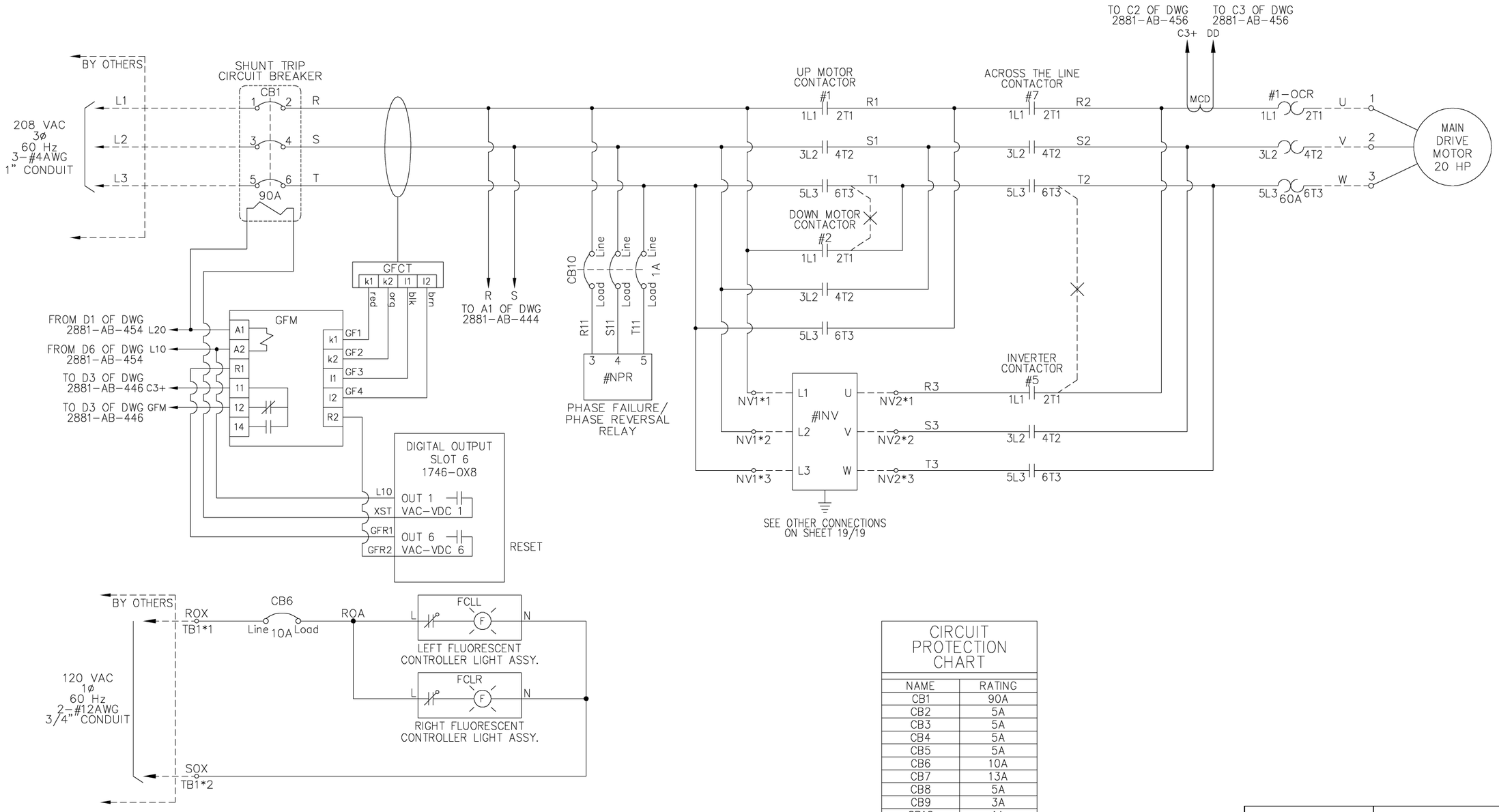
CONTRACT No. E-34011
ESCALATOR No. E235, E236

TABLE OF CONTENTS

CONTRACT E-34011
HERALD SQUARE
PHASE IV ESCALATORS
E-235 & E-236

VOLUME 5

ELECTRICAL DIAGRAMS



CIRCUIT PROTECTION CHART

NAME	RATING
CB1	90A
CB2	5A
CB3	5A
CB4	5A
CB5	5A
CB6	10A
CB7	13A
CB8	5A
CB9	3A
CB10	1A

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 1/19

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8600; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

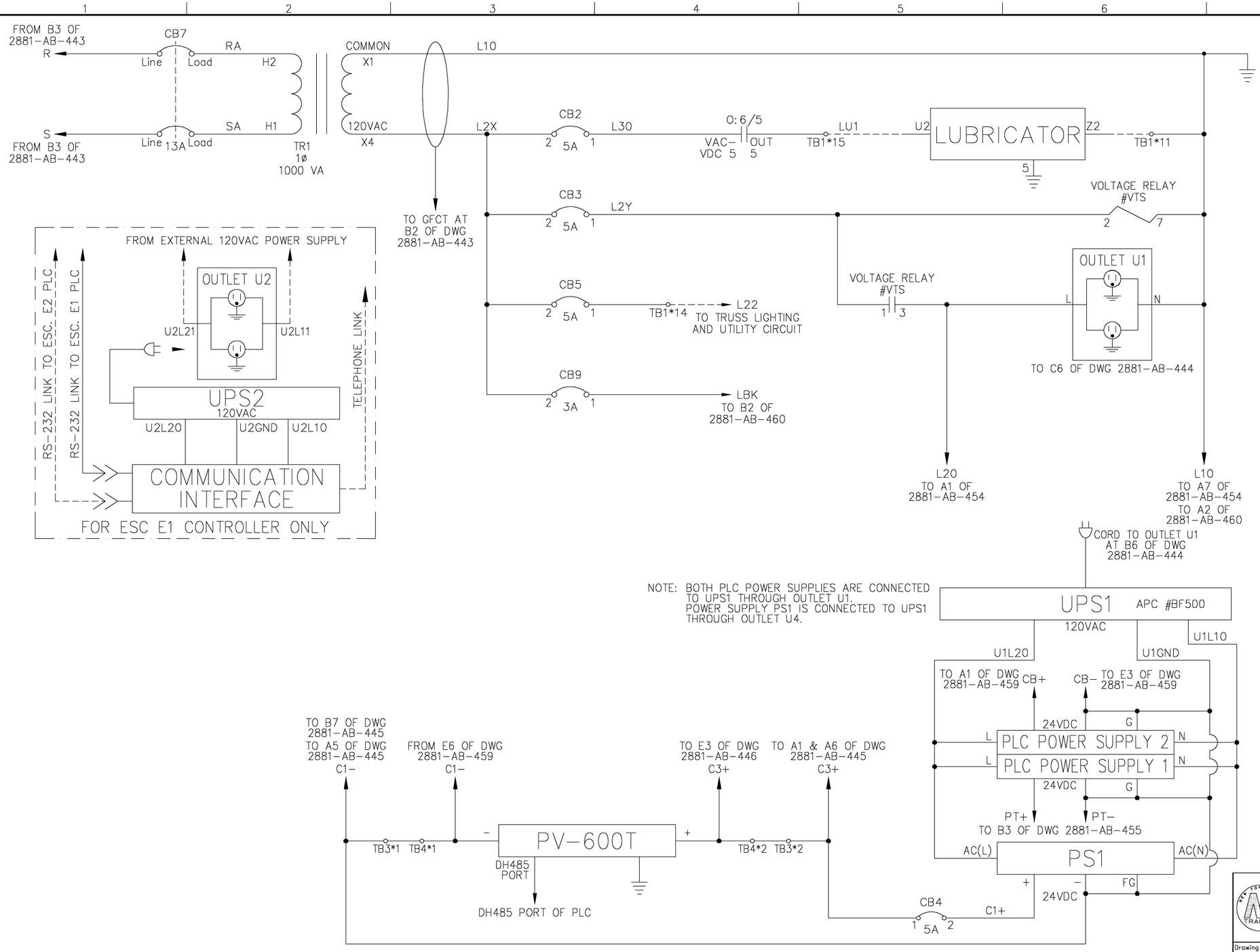
SIGNATURE DATE

DRAWN BY	DATE:	CHECKED BY	DATE:
S. Nester	3/30/07	J. Shupe	3/30/07

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-443**



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TEL: (513)932-8000; FAX: (513)933-5502

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SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 2/19

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-444**

FROM D5 OF DWG 2881-AB-444 C3+

PLC STATUS OUTPUT O:6/7 F0 — VAC VDC 7 / OUT 7

STEP UPTHRUST RELAY LL #SU1 (33/34) F1
STEP UPTHRUST RELAY LR #SU2 (33/34) F2
SKIRT SWITCH RELAY BOTTOM LEFT #SKB1 (33/34) F3
SKIRT SWITCH RELAY BOTTOM RIGHT #SKB2 (33/34) F4
SKIRT SWITCH RELAY INCLINE LEFT #SKI1 (33/34) F5
SKIRT SWITCH RELAY INCLINE RIGHT #SKI2 (33/34) F6
SKIRT SWITCH RELAY TOP LEFT #SKT1 (33/34) F7

SKIRT SWITCH RELAY TOP RIGHT #SKT2 (33/34) F8
BROKEN STEP CHAIN RELAY LEFT #BSC1 (33/34) F11
BROKEN STEP CHAIN RELAY RIGHT #BSC2 (33/34) F12
COMBPLATE IMPACT RELAY LOWER #CPI1 (33/34) F13
COMBPLATE IMPACT RELAY UPPER #CPI2 (33/34) F14
HANDRAIL GUARD RELAY LL #HG1 (33/34) F15
HANDRAIL GUARD RELAY LR #HG2 (33/34) F16
HANDRAIL GUARD RELAY UL #HG3 (33/34) F17

HANDRAIL GUARD RELAY UR #HG4 (33/34) F18
MAIN DRIVE CHAIN RELAY #MDC (33/34) F19
PHASE MONITORING RELAY #NPRA (3/4) F20
STEP LEVEL RELAY LL #SL1 (33/34) F21
STEP LEVEL RELAY LR #SL2 (33/34) F22
STEP LEVEL RELAY UL #SL3 (33/34) F23
STEP LEVEL RELAY UR #SL4 (33/34) F24

MISSING STEP RELAY LOWER #MS1 (33/34) F25
MISSING STEP RELAY UPPER #MS2 (33/34) F26
HANDRAIL FAULT AUX RELAY #HRX (33/34) F27
NON-REVERSAL OUTPUT RELAY #NRO (33/34) F28
LEFT BROKEN HANDRAIL RELAY #BH1 (33/34) F29
RIGHT BROKEN HANDRAIL RELAY #BH2 (33/34) F30
DISPLACED HANDRAIL RELAY LEFT #DH1 (33/34) F33
DISPLACED HANDRAIL RELAY RIGHT #DH2 (33/34) F99

INSPECTION RELAY #INS (23/24)
STARTING DELAY RELAY #6T (11/12)

SAFETY FAULT RELAY #4E (0/1)

TO C3 OF DWG 2881-AB-446

FROM D2 OF DWG 2881-AB-444 C1-

PLC CARD 15 PLC O:15 — VAC-VDC 0 / OUT 0

E-STOP CHECK RELAY #EST (EST; 0/1)

PLC CARD 15 PLC — VAC-VDC 5 / OUT 5

STARTING DELAY RELAY #6T (6T; 0/1)

PHASE MONITORING DEVICE #NPR (1/8)

PHASE MONITORING RELAY #NPRA (NPR; A1/A2)

UPPER E-STOP SWITCH #1E1 (11/12) EST1
LOWER E-STOP SWITCH #1E2 (12/11) EST2
MACHINE STOP SWITCH #2E1 (11/12) EST3
UPPER PIT STOP SWITCH #2E2 (12/11) EST4
LOWER PIT STOP SWITCH #2E3 (11/12) EST5

COMBPLATE STOP RELAY LOWER #CPS1 (11/12) CPS1Z
COMBPLATE STOP RELAY UPPER #CPS2 (11/12) CPS2Z
INSPECTION RELAY #INS (11/12) INZ
STARTING DELAY RELAY #6T (21/22) 6TZ

LEFT HANDRAIL RELAY #HR1 (11/12) HRZ1
RIGHT HANDRAIL RELAY #HR2 (11/12) HRZ2
STOP SWITCH RELAY #HRX (11/12) HRZ

DIGITAL INPUT SLOT 16 1746-IB16
IN 0 — EST5
IN 1 — CPS1Z
IN 2 — CPS2Z
IN 3
IN 4 — INZ
IN 5 — 6TZ
IN 8 — HRZ
DC COM

C3+ TO A2 OF DWG 2881-AB-446

C1- TO A5 OF DWG 2881-AB-446

FROM D5 OF DWG 2881-AB-444 C3+ — FROM D4 OF DWG 2881-AB-453 SC

EMERGENCY STOP BUTTON COVER LOWER AR1
EMERGENCY STOP BUTTON COVER UPPER AR2

FROM C6 OF DWG 2881-AB-459 ALL — FROM D2 OF DWG 2881-AB-445 C1-

AL1 (AL) + − TB1*4

FROM C6 OF DWG 2881-AB-459 ALU

AL2 (AL) + −

UL = UPPER LEFT
UR = UPPER RIGHT
LL = LOWER LEFT
LR = LOWER RIGHT

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TEL: (513)932-8000; FAX: (513)933-5592

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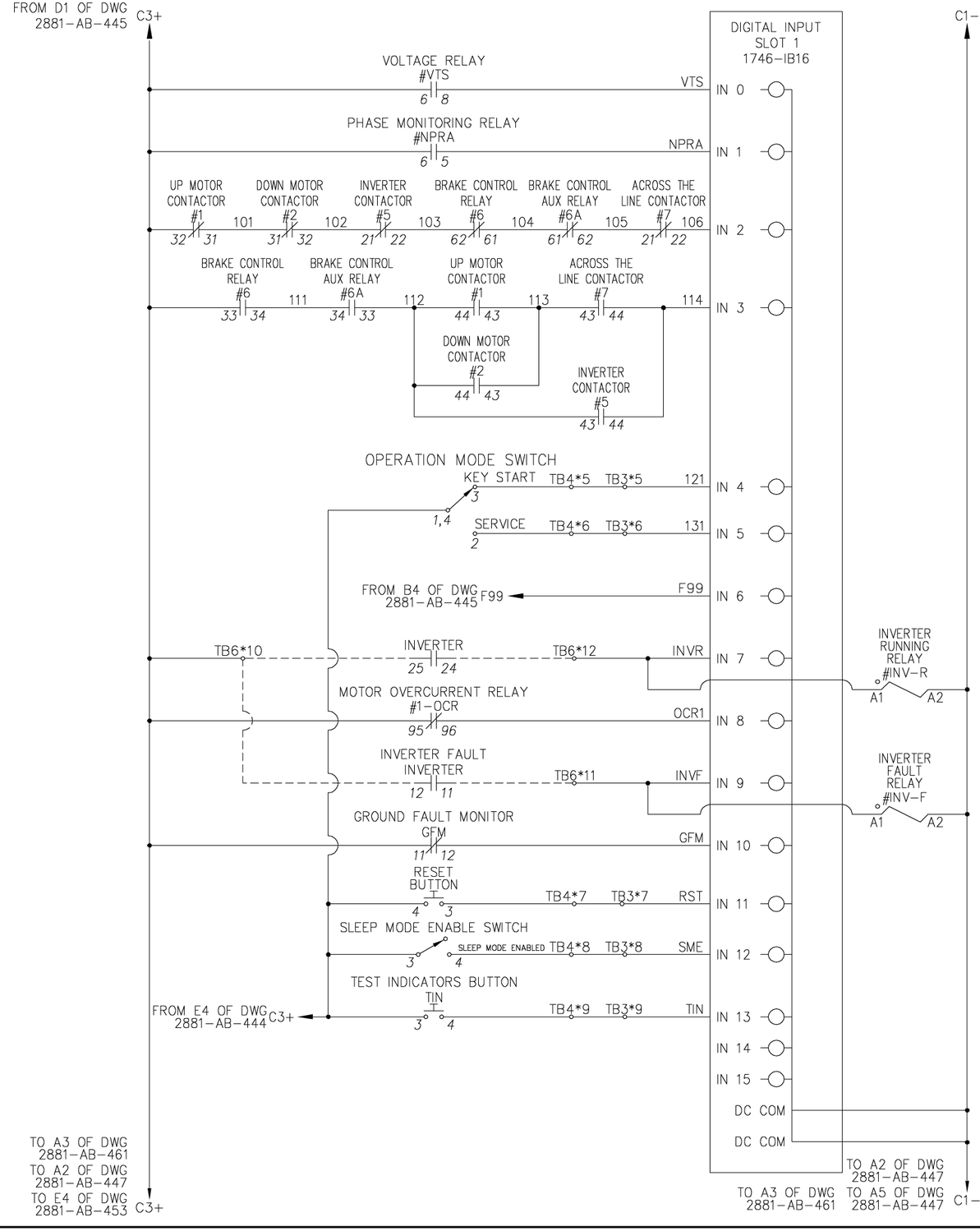
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

SIGNATURE DATE

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. 2881-AB-445



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34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 4/19

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-446**

FROM E5 OF DWG 2881-AB-446 C1-

FROM E2 OF DWG 2881-AB-446 C3+

FROM E5 OF DWG 2881-AB-446 C1-

DIGITAL INPUT SLOT 2 1746-IB16

DC COM

TB1*5

UPPER START BUTTON

LOWER START BUTTON

TB5*1 — 171 — IN 0

TB5*2 — 181 — IN 1

UPPER KEY SWITCH UP / DOWN

LOWER KEY SWITCH UP / DOWN

TB5*3 — 182 — IN 2

EMERGENCY STOP SWITCH RELAY UPPER #1E1 (1 / 0)

UPPER E-STOP

TB5*4 — P22 — IN 3

P22A

E-STOP TEST RELAY #EST (24 / 23)

EMERGENCY STOP SWITCH RELAY LOWER #1E2 (1 / 0)

LOWER E-STOP

TB5*5 — P32 — IN 4

P32A

E-STOP TEST RELAY #EST (34 / 33)

MAINTENANCE STOP SWITCH RELAY #2E1 (1 / 0)

MACHINE STOP SWITCH HELD CLOSED

TB5*6 — P42 — IN 5

P42A

E-STOP TEST RELAY #EST (44 / 43)

UPPER PIT STOP SWITCH RELAY #2E2 (1 / 0)

UPPER PIT STOP SWITCH HELD CLOSED

TB5*7 — P52 — IN 6

P52A

E-STOP TEST RELAY #EST (54 / 53)

LOWER PIT STOP SWITCH RELAY #2E3 (1 / 0)

LOWER PIT STOP SWITCH HELD CLOSED

TB5*8 — P62 — IN 7

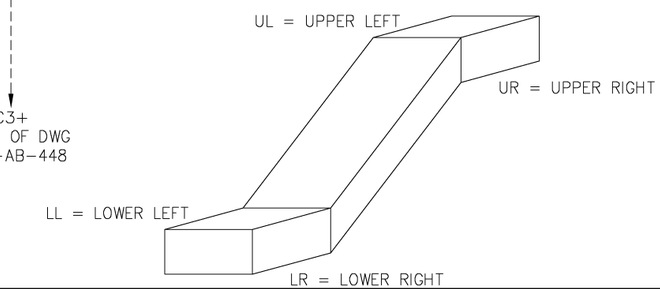
P62A

E-STOP TEST RELAY #EST (64 / 63)

C1- TO A2 OF DWG 2881-AB-448

C3+ TO A2 OF DWG 2881-AB-448

C1- TO A6 OF DWG 2881-AB-448



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8600; FAX: (513)933-5592

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 5/19

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

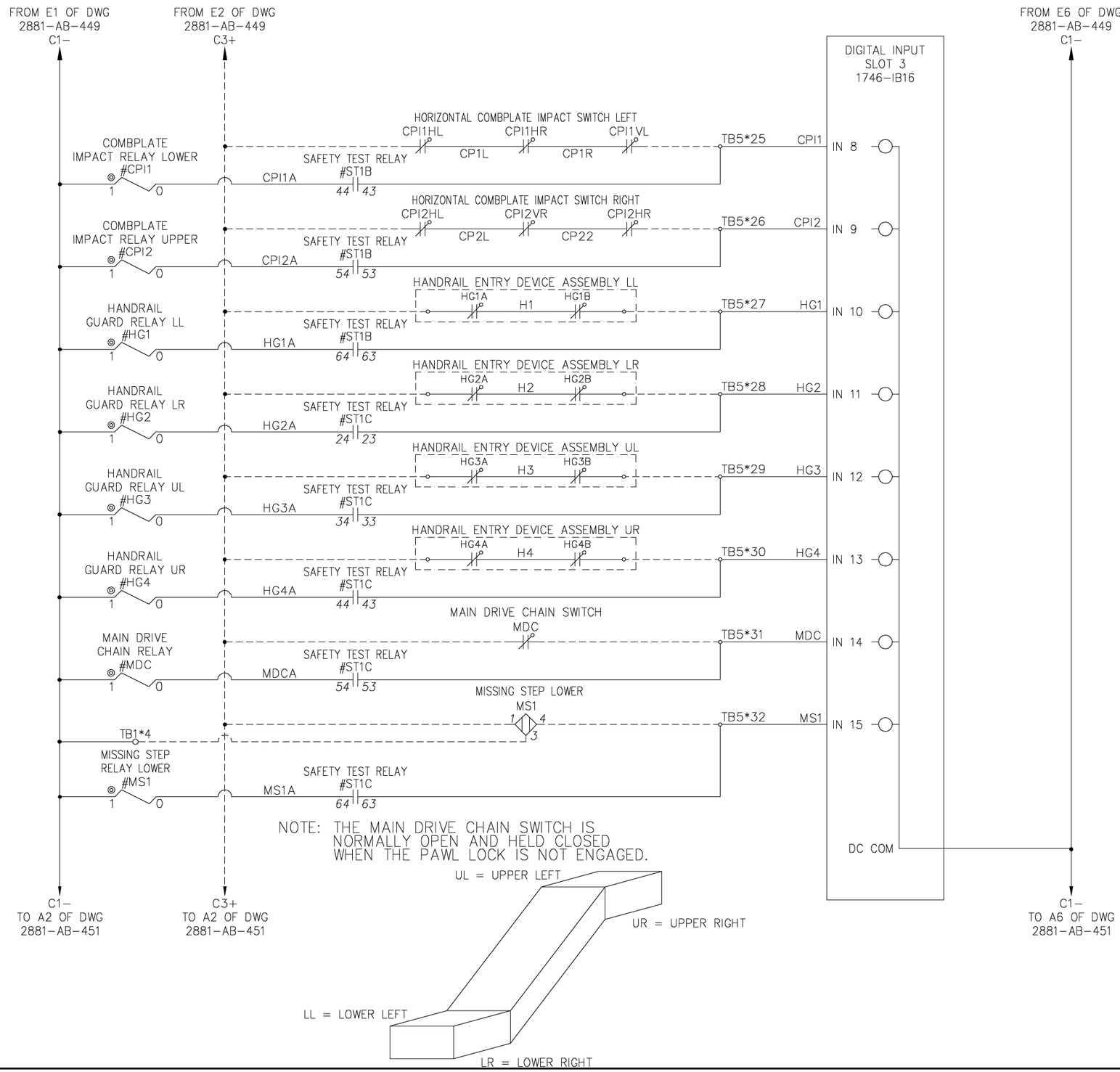
SIGNATURE — DATE

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER — DATE:

DRAWING NO. **2881-AB-447**



NOTE: THE MAIN DRIVE CHAIN SWITCH IS NORMALLY OPEN AND HELD CLOSED WHEN THE PAWL LOCK IS NOT ENGAGED.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Pelve
Lewisen, Ohio 43634
TEL: (513)932-8600; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

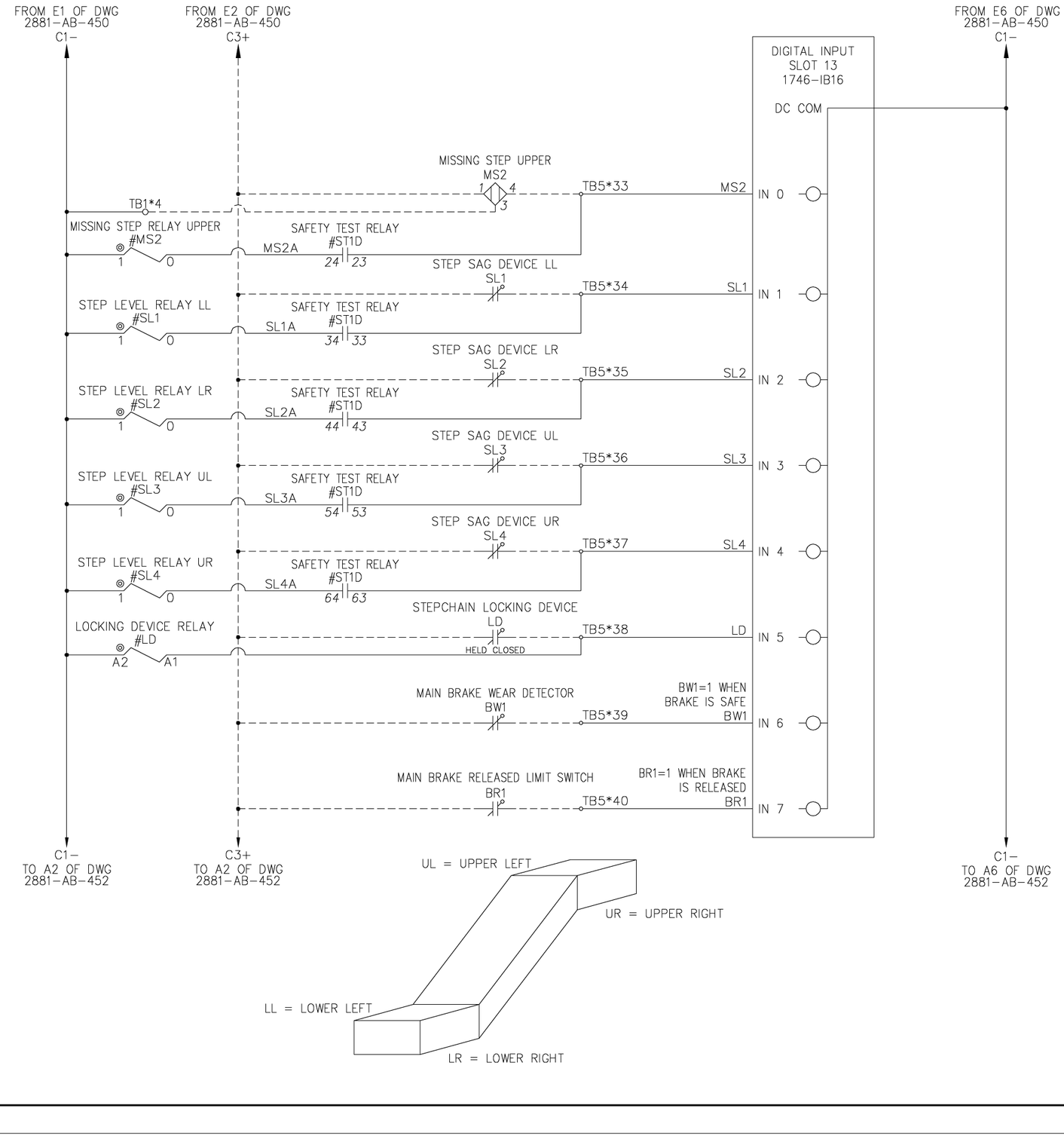
34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 8/19

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. 2881-AB-450



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 9/19

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

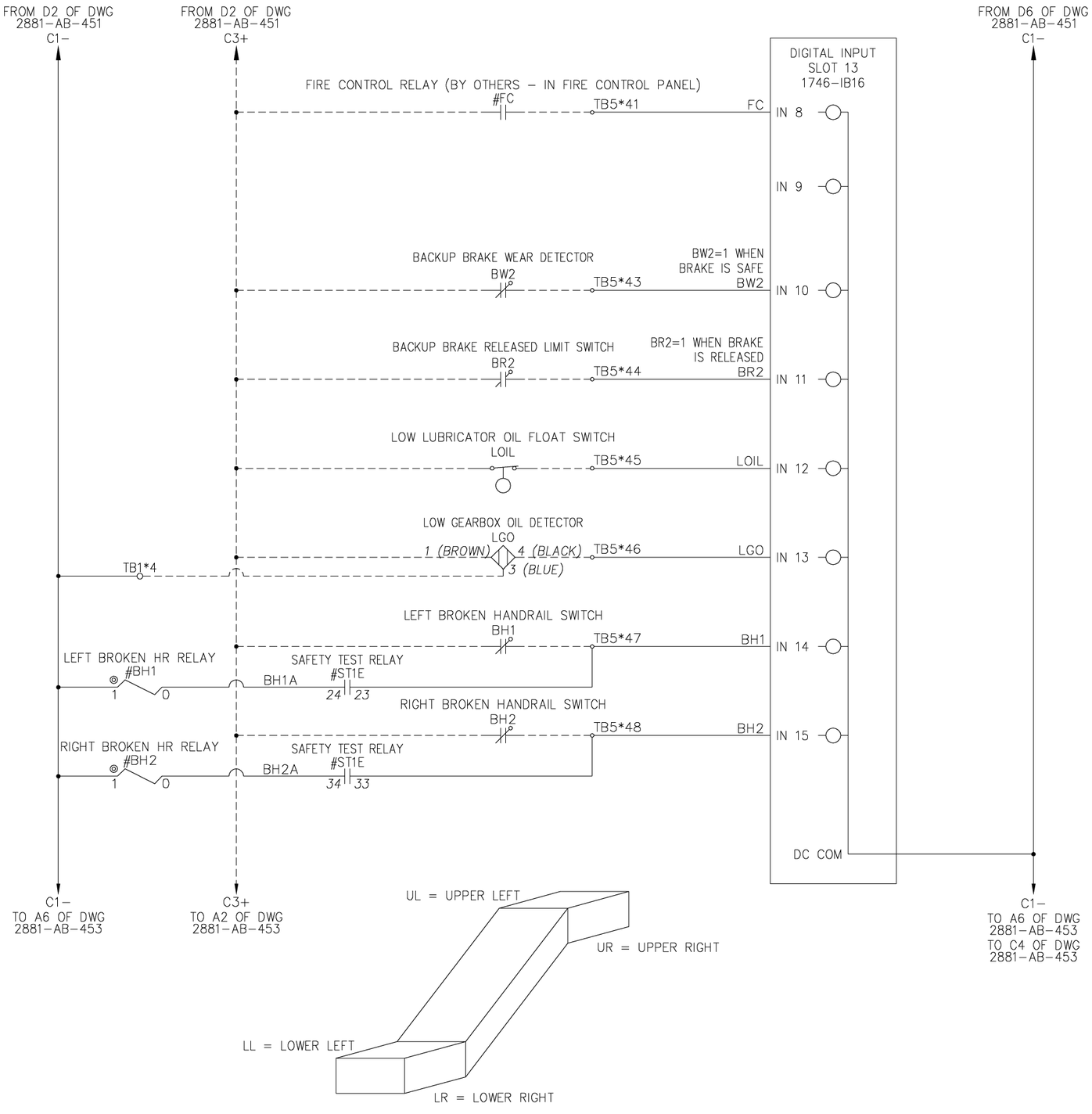
SIGNATURE DATE

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-451**



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 10/19

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

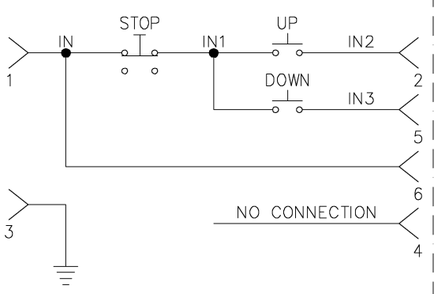
DRAWING NO. **2881-AB-452**

FROM D2 OF DWG 2881-AB-452 C3+

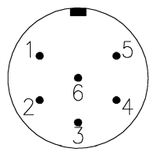
FROM D2 & D6 OF DWG 2881-AB-452 C1-

DIGITAL INPUT SLOT 14 1746-IB16

PORTABLE CONTROL STRAIGHTLINE

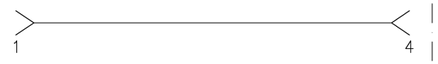


INSPECTION STATION CABLE TERMINATIONS

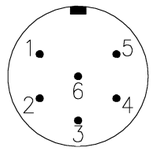


1: WHITE; IN
2: RED; IN2
3: GREEN; GROUND
4: ORANGE; NOT USED
5: BLACK; IN3
6: BLUE; IN

BLIND PLUG STRAIGHTLINE



BLIND PLUG TERMINATIONS



1 AND 4 ARE CONNECTED INTERNALLY

UPPER INSPECTION STATION SOCKET

LOWER INSPECTION STATION SOCKET

TB5*49 — IN2 — IN 0

TB5*50 — IN3 — IN 1

TB5*51 — IN4 — IN 2

PLC CARD 15 PLC — VAC-VDC 4 — OUT 4

INSPECTION RELAY #INS — 0 — 1

TB5*52 — PLG1 — IN 3

UPPER BLIND PLUG RELAY #PG1 — A1 — A2

TB5*53 — PLG2 — IN 4

LOWER BLIND PLUG RELAY #PG2 — A1 — A2

C1- FROM D6 OF DWG 2881-AB-452

IN 5

IN 6

TO A7 OF DWG 2881-AB-445 ← TB5*56 — SC — IN 7

LOWER PASSENGER DETECTOR #1 LPD1 — TB5*57 — LPD1 — IN 8

UPPER PASSENGER DETECTOR #1 UPD1 — TB5*58 — UPD1 — IN 9

LOWER PASSENGER DETECTOR #2 LPD2 — TB5*59 — LPD2 — IN 10

UPPER PASSENGER DETECTOR #2 UPD2 — TB5*60 — UPD2 — IN 11

C3+ ← FROM E2 OF DWG 2881-AB-446 — TB5*64 — C3+ — IN 15

DC COM

DC COM

C3+ TO D1 OF DWG 2881-AB-455

C1- TO D2 OF DWG 2881-AB-455

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8800; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE — DATE

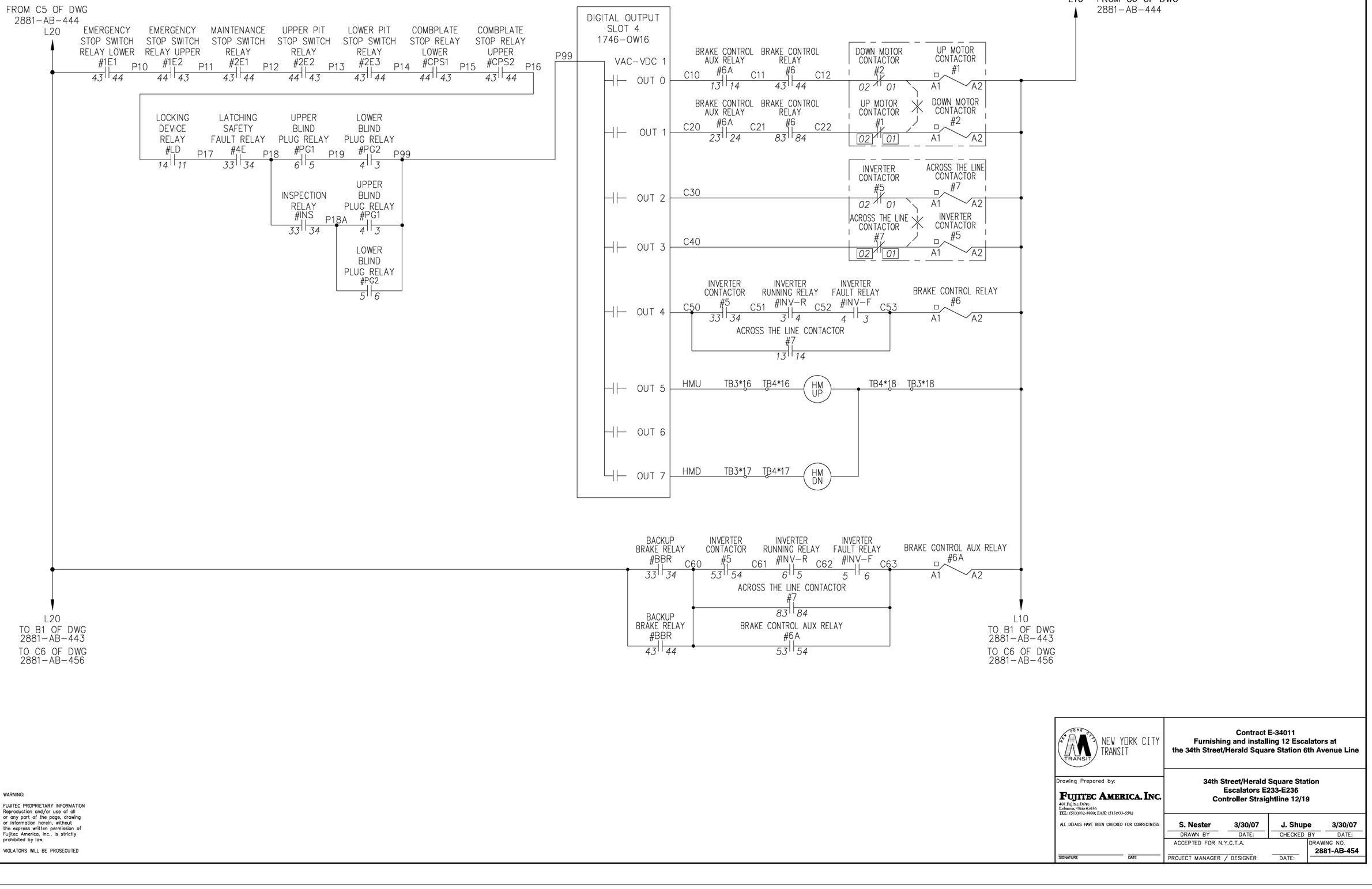
34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 11/19

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER — DATE:

DRAWING NO. **2881-AB-453**



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 12/19

Drawing Prepared by:
FUJITEC AMERICA, INC.
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TEL: (513)932-8000; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

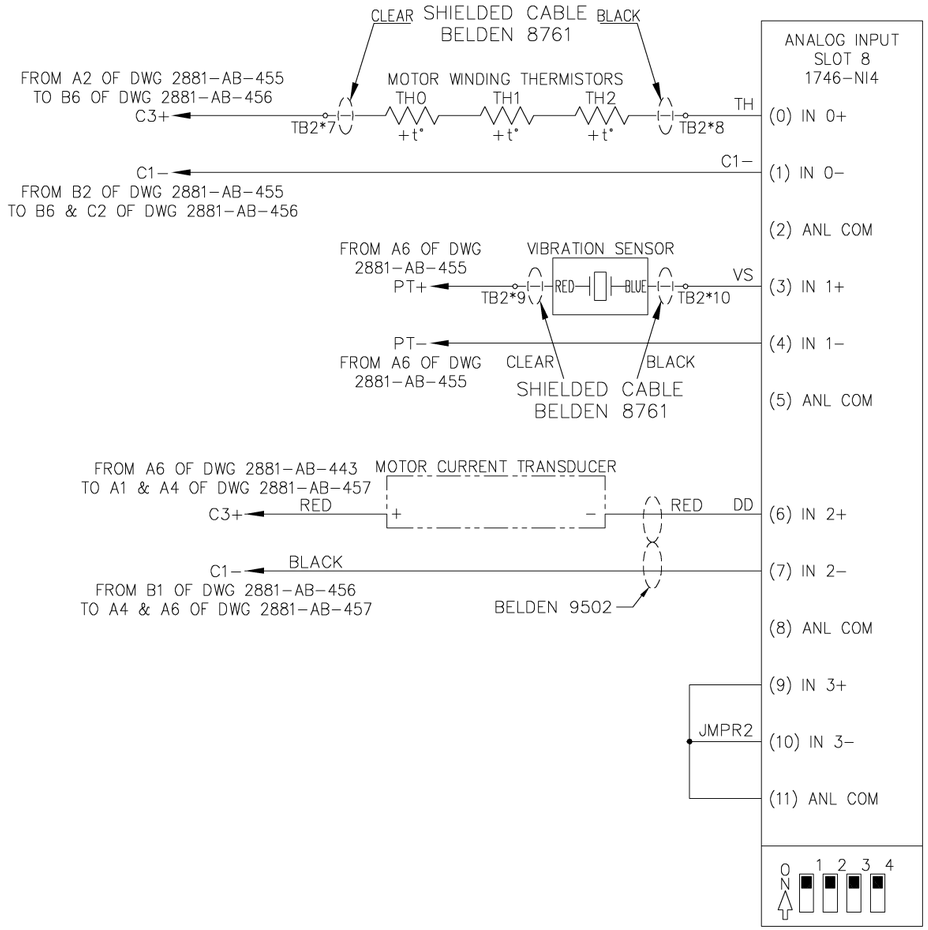
SIGNATURE DATE

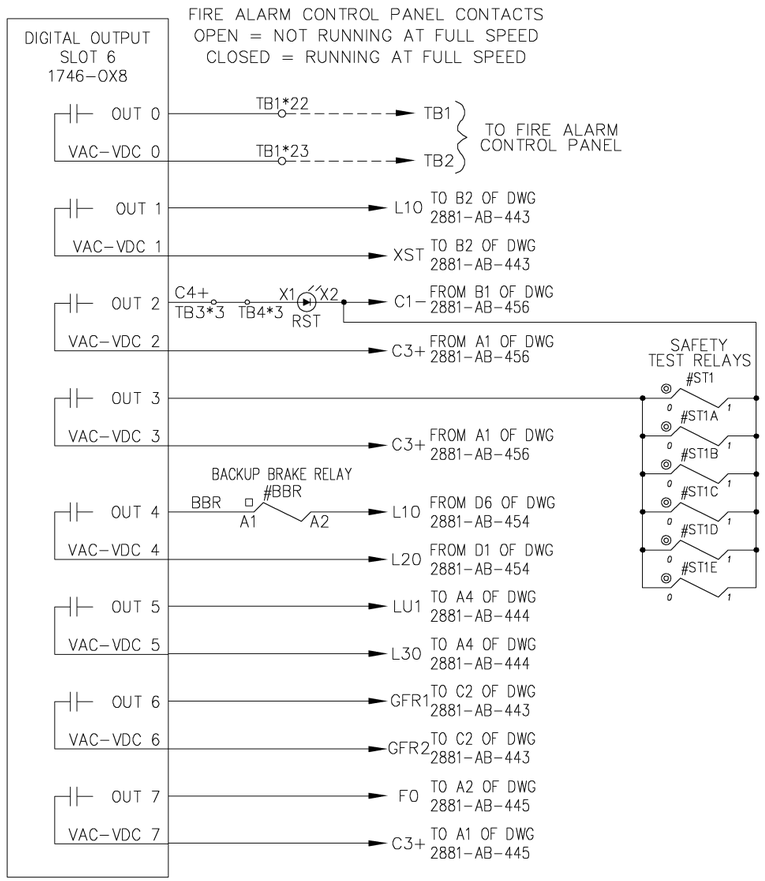
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-454**





NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 14/19

Drawing Prepared by:
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ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-456**

FROM C2 OF DWG 2881-AB-456
TO A1 OF DWG 2881-AB-458
C3+

DIGITAL OUTPUT
SLOT 10
1746-OB32

IFM3*VDC1 — VDC 1
IFM3*VDC1 — VDC 1

OUT 0	LED0	IFM3*0	TCPS-LED	Top Comb Plate Switch
OUT 1	LED1	IFM3*1	BCPS-LED	Bottom Comb Plate Switch
OUT 2	LED2	IFM3*2	TCPSID-LED	Top Comb Plate Step Impact Device
OUT 3	LED3	IFM3*3	BCPSID-LED	Bottom Comb Plate Step Impact Device
OUT 4	LED4	IFM3*4	TLSSM-LED	Top Left Step Sag Monitor
OUT 5	LED5	IFM3*5	TRSSM-LED	Top Right Step Sag Monitor
OUT 6	LED6	IFM3*6	BLSSM-LED	Bottom Left Step Sag Monitor
OUT 7	LED7	IFM3*7	BRSSM-LED	Bottom Right Step Sag Monitor
OUT 8	LED8	IFM3*8	TLSOC-LED	Top Left Skirt Obstruction Contact
OUT 9	LED9	IFM3*9	TRSOC-LED	Top Right Skirt Obstruction Contact
OUT 10	LED10	IFM3*10	ILSOC-LED	Incline Left Skirt Obstruction Contact
OUT 11	LED11	IFM3*11	IRSOC-LED	Incline Right Skirt Obstruction Contact
OUT 12	LED12	IFM3*12	BLSOC-LED	Bottom Left Skirt Obstruction Contact
OUT 13	LED13	IFM3*13	BRSOC-LED	Bottom Right Skirt Obstruction Contact
OUT 14	LED14	IFM3*14	TMSM-LED	Top Missing Step Monitor
OUT 15	LED15	IFM3*15	BMSM-LED	Bottom Missing Step Monitor

COM 1 — IFM3*COM1
COM 1 — IFM3*COM1

C1-
TO A3 OF DWG
2881-AB-458

FROM C2 OF DWG
2881-AB-456
C1-

FROM C2 OF DWG 2881-AB-456
TO A4 OF DWG 2881-AB-458
C3+

DIGITAL OUTPUT
SLOT 10
1746-OB32

IFM3*VDC2 — VDC 2
IFM3*VDC2 — VDC 2

OUT 16	LED16	IFM3*16	LSUM-LED	Lower Step Upthrust Monitor
OUT 17				
OUT 18	LED18	IFM3*18	LBHS-LED	Left Broken Handrail Switch
OUT 19	LED19	IFM3*19	RBHS-LED	Right Broken Handrail Switch
OUT 20	LED20	IFM3*20	LBSCS-LED	Left Broken Step Chain Switch
OUT 21	LED21	IFM3*21	RBSCS-LED	Right Broken Step Chain Switch
OUT 22	LED22	IFM3*22	LHSM-LED	Left Handrail Speed Monitor
OUT 23	LED23	IFM3*23	RHSM-LED	Right Handrail Speed Monitor
OUT 24	LED24	IFM3*24	TLHEC-LED	Top Left Handrail Entry Contact
OUT 25	LED25	IFM3*25	TRHEC-LED	Top Right Handrail Entry Contact
OUT 26	LED26	IFM3*26	BLHEC-LED	Bottom Left Handrail Entry Contact
OUT 27	LED27	IFM3*27	BRHEC-LED	Bottom Right Handrail Entry Contact
OUT 28	LED28	IFM3*28	ESM-LED	Escalator Speed Monitor
OUT 29	LED29	IFM3*29	ARD-LED	Anti-Reversal Device
OUT 30	LED30	IFM3*30	PF/PRM-LED	Phase Failure/Phase Reversal Monitor
OUT 31	LED31	IFM3*31	BDCC-LED	Broken Drive Chain Contact

COM 2 — IFM3*COM2
COM 2 — IFM3*COM2

C1-
TO A6 OF DWG
2881-AB-458

FROM C2 OF DWG
2881-AB-456
C1-

ABBREVIATIONS

TCPS	Top Comb Plate Switch
BCPS	Bottom Comb Plate Switch
TCPSID	Top Comb Plate Step Impact Device
BCPSID	Bottom Comb Plate Step Impact Device
TLSSM	Top Left Step Sag Monitor
TRSSM	Top Right Step Sag Monitor
BLSSM	Bottom Left Step Sag Monitor
BRSSM	Bottom Right Step Sag Monitor
TLSOC	Top Left Skirt Obstruction Contact
TRSOC	Top Right Skirt Obstruction Contact
ILSOC	Incline Left Skirt Obstruction Contact
IRSOC	Incline Right Skirt Obstruction Contact
BLSOC	Bottom Left Skirt Obstruction Contact
BRSOC	Bottom Right Skirt Obstruction Contact
TMSM	Top Missing Step Monitor
BMSM	Bottom Missing Step Monitor
LSUM	Lower Step Upthrust Monitor
LBHS	Left Broken Handrail Switch
RBHS	Right Broken Handrail Switch
LBSCS	Left Broken Step Chain Switch
RBSCS	Right Broken Step Chain Switch
LHSM	Left Handrail Speed Monitor
RHSM	Right Handrail Speed Monitor
TLHEC	Top Left Handrail Entry Contact
TRHEC	Top Right Handrail Entry Contact
BLHEC	Bottom Left Handrail Entry Contact
BRHEC	Bottom Right Handrail Entry Contact
ESM	Escalator Speed Monitor
ARD	Anti-Reversal Device
PF/PRM	Phase Failure/Phase Reversal Monitor
BDCC	Broken Drive Chain Contact
LED	Light Emitting Diode
R	Red

NEW YORK CITY TRANSIT

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8800, FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE — DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

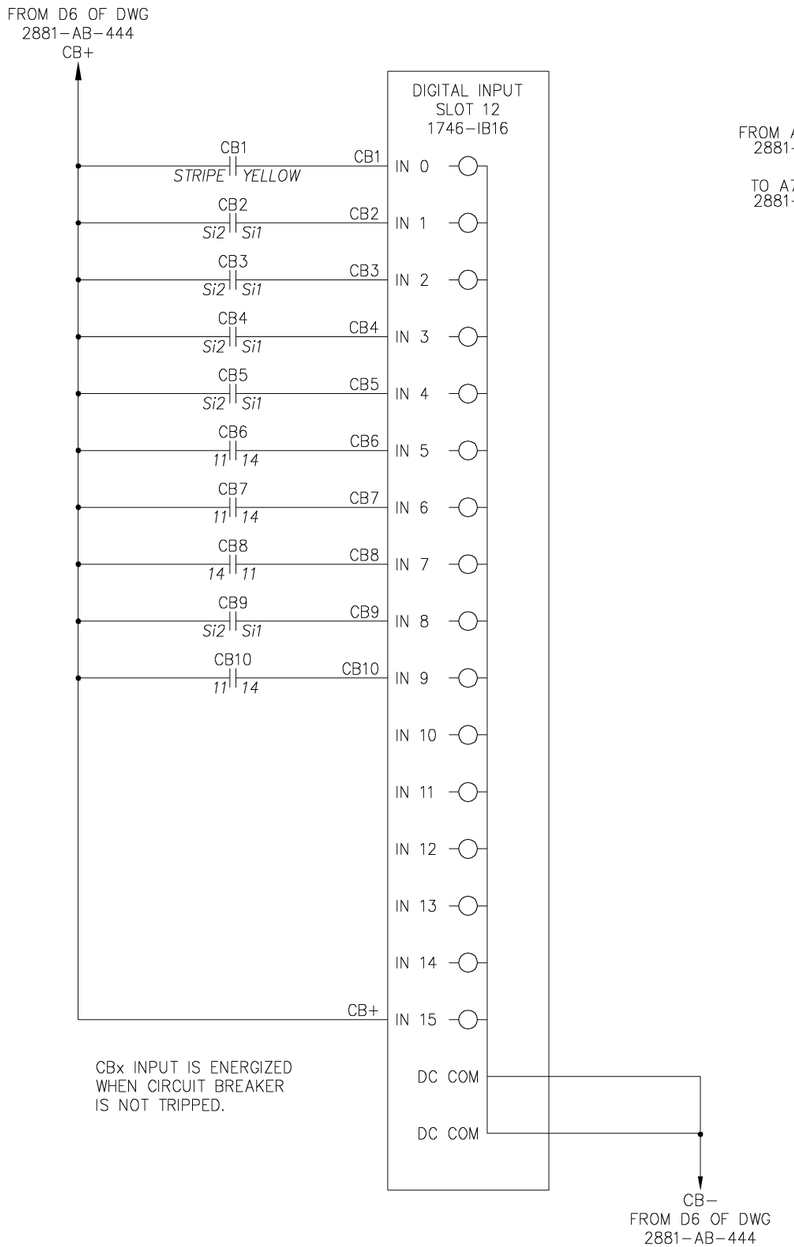
34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 15/19

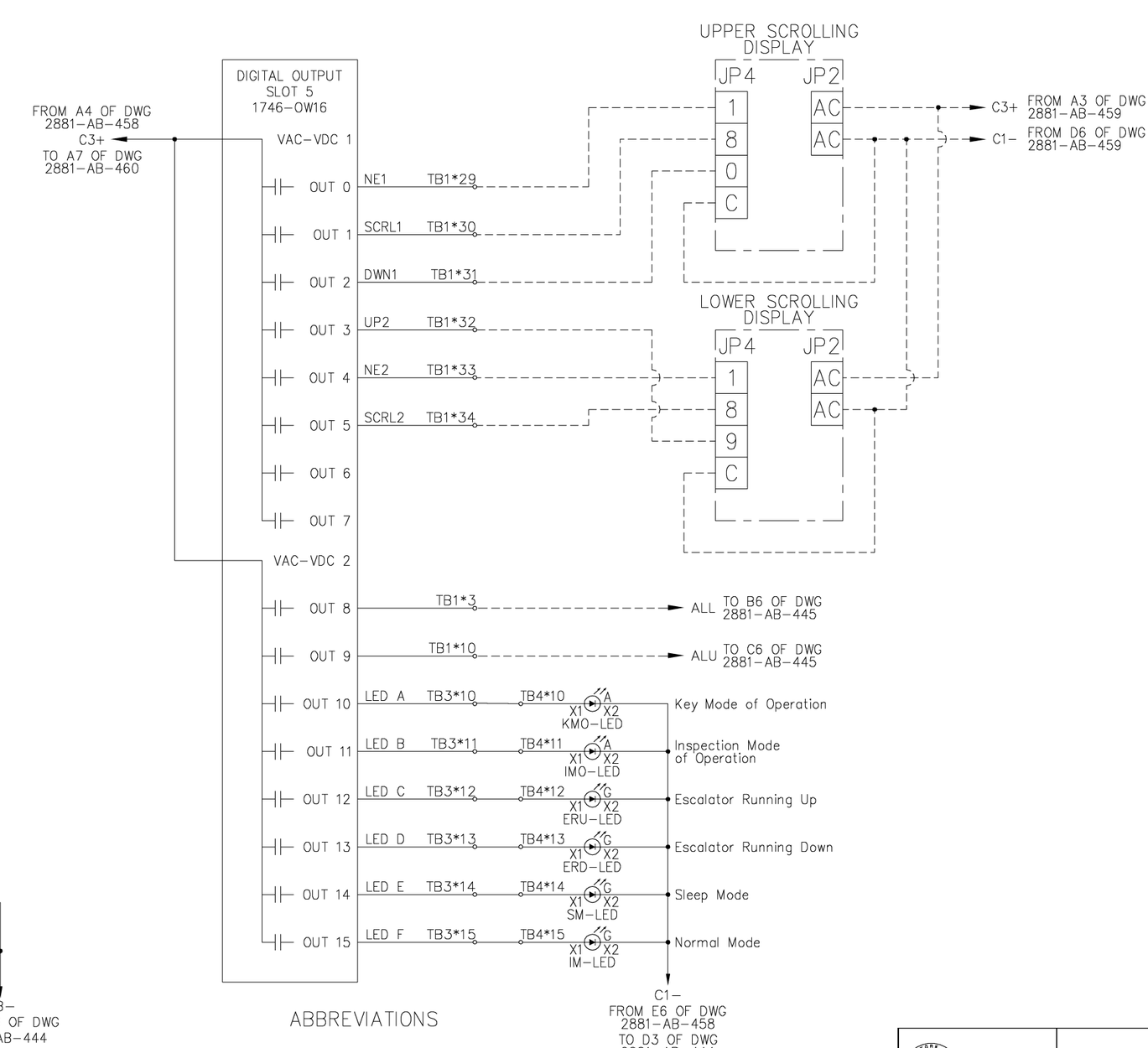
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER — DATE:

DRAWING NO. **2881-AB-457**





ABBREVIATIONS

KMO	Key Mode of Operation
IMO	Inspection Mode of Operation
ERU	Escalator Running Up
ERD	Escalator Running Down
SM	Sleep Mode
NM	Normal Mode
LED	Light Emitting Diode
A	Amber
G	Green

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 17/19

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8800; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

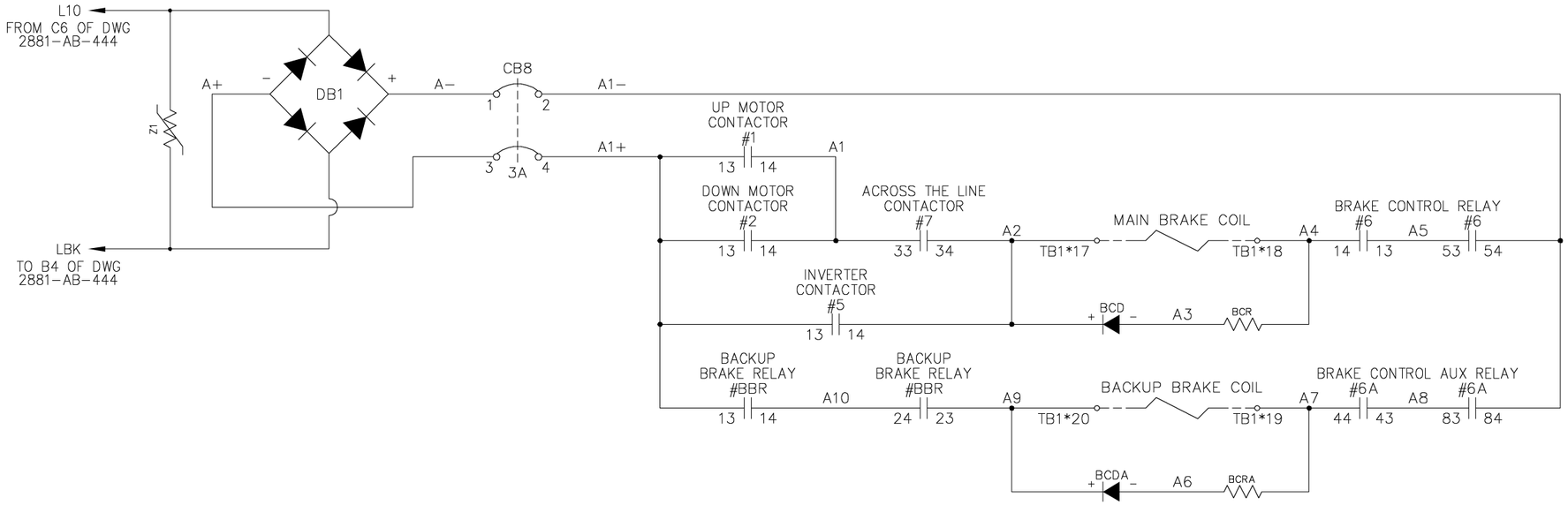
SIGNATURE DATE

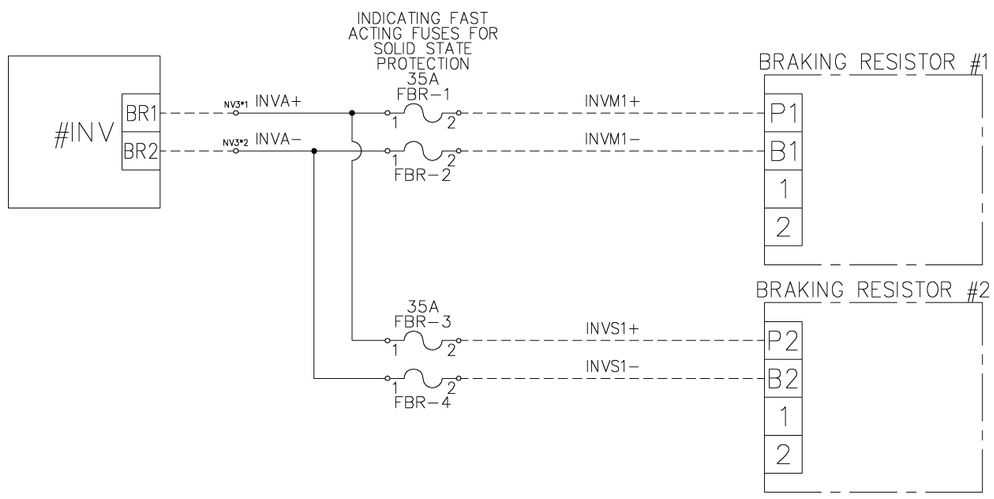
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-459**





NEW YORK CITY TRANSIT

Drawing Prepared by:

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Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Straightline 18/19

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO.
2881-AB-460

LINE # — WIRING ASSEMBLED AT FACTORY

LINE # — WIRING ASSEMBLED AT JOB SITE

ELECTRICAL CONNECTION

NO ELECTRICAL CONNECTION

FUSE

1–POLE CIRCUIT BREAKER

2–POLE CIRCUIT BREAKER

3–POLE CIRCUIT BREAKER

2–POLE SINGLE THROW SWITCH

NORMALLY OPEN CONTACT SET

NORMALLY CLOSED CONTACT SET

NORMALLY OPEN LIMIT SWITCH

NORMALLY CLOSED LIMIT SWITCH

PROXIMITY DETECTOR

GROUND

AL — AUDIBLE ALARM

L — LIGHT

LED

TRANSFORMER WITH TAP

NORMALLY OPEN MOMENTARY PUSHBUTTON SWITCH

NORMALLY CLOSED MOMENTARY PUSHBUTTON SWITCH

2–POSITION MAINTAINED PUSH–PULL SWITCH

3–POSITION NORMALLY OPEN SWITCH

DIODE

DIODE BRIDGE

RESISTANCE

SURGE ABSORBER

COIL

RELAY WITH INTEGRAL LED

RELAY WITH INTEGRAL LED AND SURGE DIODE

CONTACTOR WITH INTEGRAL dV/dt

JACK

RECEPTACLE

TERMINAL

LATCH
COILS OF LATCHING RELAY
RELEASE

TWISTED SHIELDED CABLE

PRESSURE SWITCH

VIBRATION SENSOR

DIP SWITCH

JUMPER

THERMOSTAT

THREE PHASE MOTOR

M — MULTIPLE CONNECTOR

VARISTOR

MECHANICAL INTERLOCK

FAN

OTHER EQUIPMENT

AVR	regulated power supply
PLC	programmable logic controller
DB1	bridge rectifier
Z1	surge absorber
UPS	uninterruptable power supply
PV–600T	touchscreen display

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8800; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE — DATE

34th Street/Herald Square Station
Escalators E233–E236
Symbols & Abbreviations

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

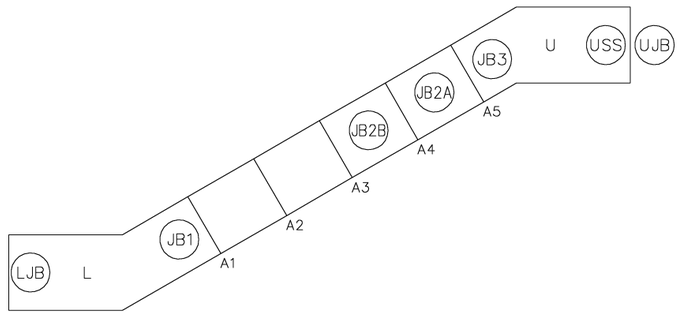
ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER — DATE:

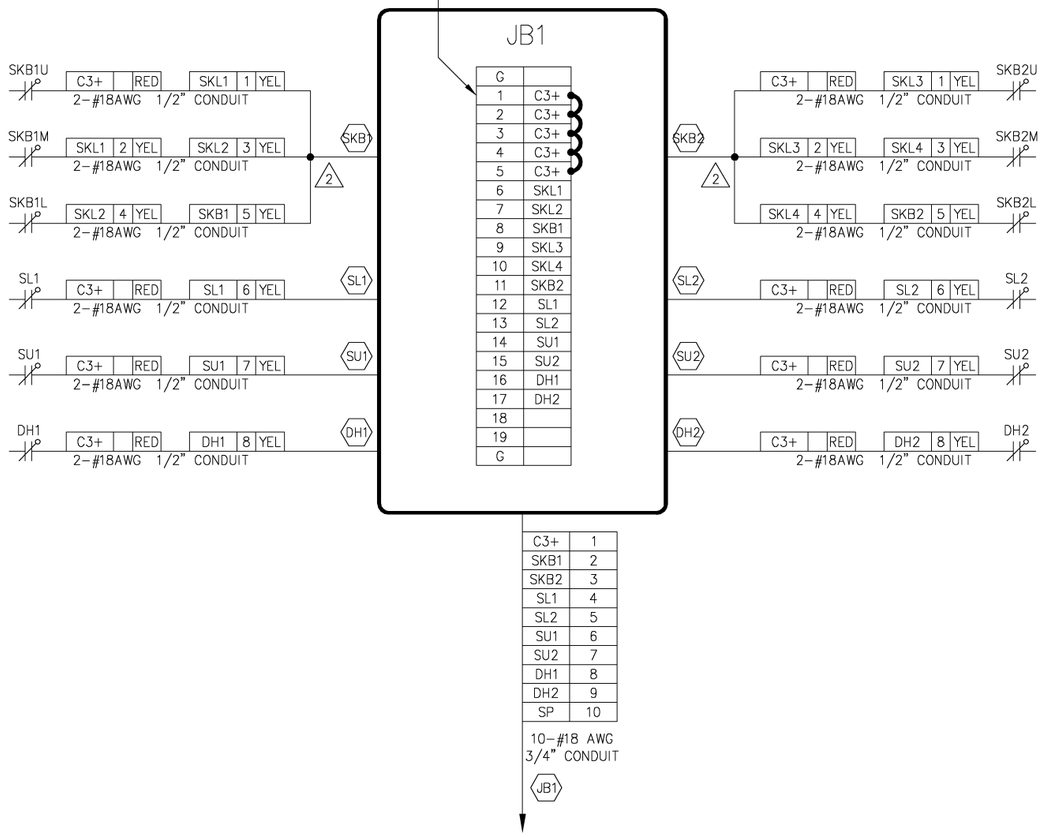
DRAWING NO. **2881-AB-462**

ESCALATOR LEFT SIDE

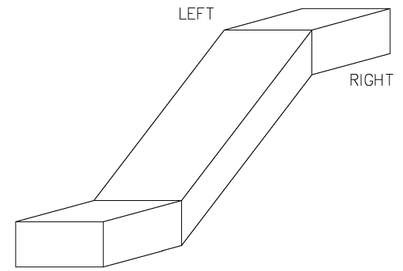
ESCALATOR RIGHT SIDE



C3+ FROM JUNCTION BOX 3



TO LOWER JUNCTION BOX



SIECOR WOJxx-18 PRENUMBERED YELLOW WIRE USED TO CONNECT SWITCHES AS INDICATED. CONDUIT RUNS ARE COLLECTED AT JUNCTION BOXES OR CONDUIT BODIES AS REQUIRED. CONDUCTORS ARE CONTINUOUS FROM THE DEVICE TO A TERMINAL STRIP.

ALL FACTORY WIRING IS ON THE RIGHT SIDE OF THE TERMINAL BLOCKS. ALL FIELD WIRING IS ON THE LEFT SIDE OF THE TERMINAL BLOCKS.

NOTE:
ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE FROM THE DEVICE TERMINALS TO A TERMINAL STRIP.
WIRE SPLICES ARE NOT PERMITTED.
CONDUIT SIZES ARE MINIMUMS.
) DENOTES JUMPER WIRE
SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING
UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.
DENOTES TWISTED PAIR OF CONDUCTORS

⬡ CONDUIT RUNS MARKED AS INDICATED

△ O-Z GEDNEY T-50 TYPE T CONDUIT BODY AND BS-50S DOMED CONDUIT BODY COVER USED TO SPLIT CONDUIT.
NUMBER INDICATES QUANTITY.

NEW YORK CITY TRANSIT

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TEL: (513)932-8000; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

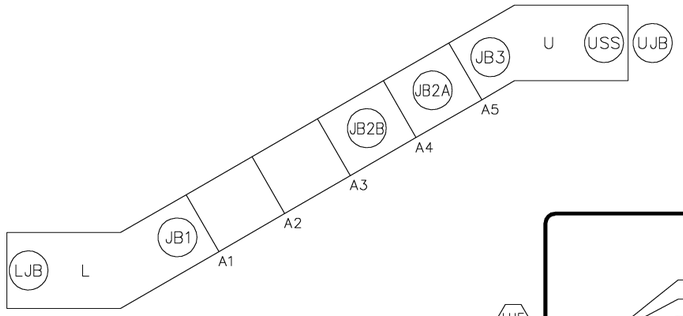
34th Street/Herald Square Station
Escalators E233-E236
Junction Box #1
Wiring & Piping

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-466**

ESCALATOR LEFT SIDE



TO JB3

JB2A

C3+	1	SKI2	5
BH1	2	SPARE	6
BH2	3	SPARE	7
SKI1	4		

G	GRN

7–#18 AWG
2–BELDEN 9502
G–#18 AWG
3/4" CONDUIT

LEFT HANDRAIL ENCODER ← M — LHE

JB2A

	G		
RED	1	PT+	RED
BLACK	2	PT–	BLACK
WHITE	3	HL+	WHITE
BLUE	4	HL–	BLACK
GREEN	5		
ORANGE	6		
DRAIN	7	DRAIN	DRAIN
	8		
	9		
RED	10	PT+	RED
BLACK	11	PT–	BLACK
WHITE	12	HR+	WHITE
BLUE	13	HR–	BLACK
GREEN	14		
ORANGE	15		
DRAIN	16	DRAIN	DRAIN
	17		
	18		
	19		
	G		

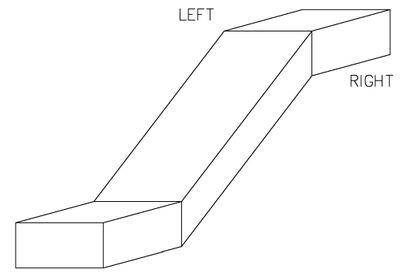
1

2

G	
1	C3+
2	SKI1
3	SKI2
4	BH1
5	BH2
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
G	

C3+ FROM JUNCTION BOX 3

ESCALATOR RIGHT SIDE



RHE → M → RIGHT HANDRAIL ENCODER

JB2B

C3+	1
BH1	2
BH2	3
SKI1	4
SKI2	5
SPARE	6
SPARE	7

G	GRN

7–#18 AWG
G–#18 AWG
3/4" CONDUIT

JB2B

	G	
	1	C3+
	2	C3+
	3	C3+
	4	SKI1
	5	SKI2
	6	C3+
	7	C3+
	8	BH1
	9	BH2
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	G	

SKI1 — C3+ | RED | SKI1 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — SKI1

BH1 — C3+ | RED | BH1 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — BH1

SKI2 — C3+ | RED | SKI2 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — SKI2

BH2 — C3+ | RED | BH2 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — BH2

SIECOR WOJxx–18 PRENUMBERED YELLOW WIRE USED TO CONNECT SWITCHES AS INDICATED. CONDUIT RUNS ARE COLLECTED AT JUNCTION BOXES OR CONDUIT BODIES AS REQUIRED. CONDUCTORS ARE CONTINUOUS FROM THE DEVICE TO A TERMINAL STRIP.

NOTE:
ALL FACTORY WIRING IS ON THE RIGHT SIDE OF THE TERMINAL BLOCKS.
ALL FIELD WIRING IS ON THE LEFT SIDE OF THE TERMINAL BLOCKS.

NOTE:
ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE FROM THE DEVICE TERMINALS TO A TERMINAL STRIP.
WIRE SPLICES ARE NOT PERMITTED.
CONDUIT SIZES ARE MINIMUMS.
DENOTES JUMPER WIRE
SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING
UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.
DENOTES TWISTED PAIR OF CONDUCTORS

CONDUIT RUNS MARKED AS INDICATED

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Junction Box #2A & #2B
Wiring & Piping

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

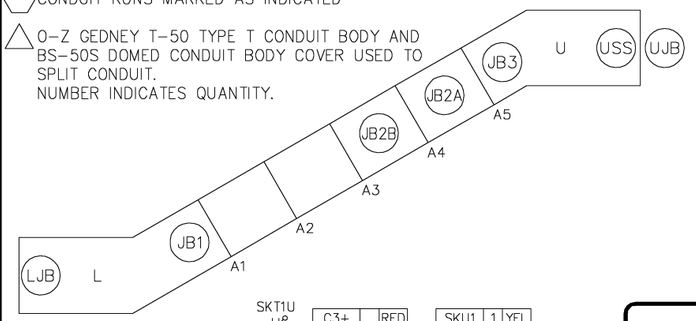
ACCEPTED FOR N.Y.C.T.A.
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. 2881-AB-467

ESCALATOR LEFT SIDE

CONDUIT RUNS MARKED AS INDICATED

0–Z GEDNEY T–50 TYPE T CONDUIT BODY AND BS–50S DOMED CONDUIT BODY COVER USED TO SPLIT CONDUIT.
NUMBER INDICATES QUANTITY.



TO USS

C3+	1	PLG1	9
ALU	2	C1–	10
IN2	3	SP	11
IN3	4	SP	12
IN4	5	SP	13
MDC	6	SP	14
LD	7	SP	15
P52	8	SP	16

GND	G

16–#18 AWG
G–#18 AWG
3/4" CONDUIT

USS

TO UPPER JUNCTION BOX

2–BELDEN 9502
1–BELDEN 9503
3/4" CONDUIT

JBE

JB3

CABLE JB3A			
171	1	HG3	9
181	2	HG4	10
182	3	IN2	11
ALU	2	IN3	12
C1–	5	IN4	13
C3+	6	LD	14
CPI2	7	MDC	15
CPS2	8	MS2	16

CABLE JB3B			
P22	1	SL4	9
P52	2	SP	10
PLG1	3	SP	11
SKI1	4	SC	12
SKI2	5	BH1	13
SKT1	6	BH2	14
SKT2	7	UPD1	15
SL3	8	UPD2	16
	G	GRN	

2x 16 & 1x 7 #18 AWG
G–#18 AWG
1 1/4" CONDUIT

CABLE JB3C	
SP	1
SP	2
SP	3
SP	4
SP	5
SP	6
SP	7

ESCALATOR RIGHT SIDE

NOTE:
ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE FROM THE DEVICE TERMINALS TO A TERMINAL STRIP.
WIRE SPLICES ARE NOT PERMITTED.
CONDUIT SIZES ARE MINIMUMS.
DENOTES JUMPER WIRE — DENOTES 2–POLE JUMPER
SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING
UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG
DENOTES TWISTED PAIR OF CONDUCTORS

NOTE:
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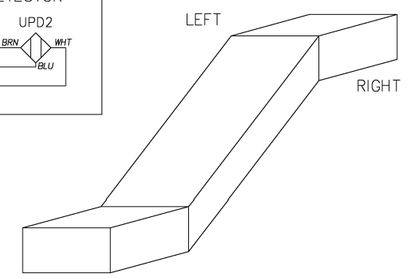
ALL FIELD WIRING IS ON THE LEFT SIDE OF THE TERMINAL BLOCKS.



SKT1U — C3+ | RED | SKU1 | 1 | YEL — 2–#18 AWG 1/2" CONDUIT — SKT1
SKT1L — SKU1 | 2 | YEL | SKT1 | 3 | YEL — 2–#18 AWG 1/2" CONDUIT — 1
SL3 — C3+ | RED | SL3 | 1 | YEL — 2–#18 AWG 1/2" CONDUIT — SL3

PASSENGER DETECTOR
UPD1: BRN, WHT, BLU; C1–, C3+

BRN	BLU	WHT	BLK
C3+	C1–	UPD1	SPARE

CONNECTOR CABLE 1/2" CONDUIT — UPD

HG3A — C3+ | RED | H3 | 5 | YEL — 2–#18 AWG 1/2" CONDUIT — HG3
HG3B — H3 | 6 | YEL | HG3 | 7 | YEL — 2–#18 AWG 1/2" CONDUIT — 1

CPI2HL — C3+ | RED | CP2L | 1 | YEL — 2–#18 AWG 1/2" CONDUIT — CP2L

OPERATION BOARD
UPPER START BUTTON: C3+, 171
UP: C3+, 181
DOWN: 182, G

1	2	3	4	
C3+	171	181	182	G

4–#18 AWG
G–#18 AWG
1/2" CONDUIT — UOB

EMERGENCY STOP
AR2: BLU, BLK — SC, C3+
UPPER E–STOP: BLK, WHT, GRN — C3+, P22, G

1	2	3	4	
C3+	SC	P22	SPARE	G

4–#18 AWG
G–#18 AWG
1/2" CONDUIT — UES

JB3

TB3A		TB3B		TB3C		
	⏚		⏚		⏚	
	⏚		⏚		⏚	
1	C3+	1	C3+	1	C3+	
1	C3+	1	C3+	1	C3+	
2	C3+	2	C3+	2	C3+	
2	C3+	2	C3+	2	C3+	
3		3		3	PT+	RED
4	CPS2	4	C1–	4	PT–	BLACK
5	CP2L	5	IN2	5	GA+	WHITE
6	CP22	6	IN3	6	GA–	BLACK
7		7	IN4	7	GB+	GREEN
8	CPI2	8	P52	8	GB–	BLACK
9	H3	9	PLG1	9	DRAIN	DRAIN
10	HG3	10	SKI1	10		
11	H4	11	SKI2	11	PT+	RED
12	HG4	12	LD	12	PT–	BLACK
13	SKU1	13	MDC	13	HL+	WHITE
14	SKU2	14		14	HL–	BLACK
15	SKT1	15		15		
16	SKT2	16		16		
17	SL3	17		17	DRAIN	DRAIN
18		18		18		
19	SL4	19		19	PT+	RED
20		20		20	PT–	BLACK
21	171	21		21	HR+	WHITE
22	181	22		22	HR–	BLACK
23	182	23		23		
24	ALU	24		24		
25	P22	25		25	DRAIN	DRAIN
26	MS2	26		26		
27	SC	27		27		
28	BH1	28		28		
29	BH2	29		29		
30	UPD1	30	UPD2	30		
31	C3+	31	C3+	31	C3+	
	C3+		C3+		C3+	
32	C3+	32	C3+	32	C3+	
	C3+		C3+		C3+	
	⏚		⏚		⏚	
	⏚		⏚		⏚	

TO USS

C3+ FROM UPPER JUNCTION BOX

C3+ TO JUNCTION BOX 2

SKT2U — C3+ | RED | SKU2 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — SKT2
SKT2L — SKU2 | 2 | YEL | SKT2 | 3 | YEL — 2–#18AWG 1/2" CONDUIT — 1
SL4 — C3+ | RED | SL4 | 1 | YEL — 2–#18AWG 1/2" CONDUIT — SL4

BRN	BLU	WHT	BLK
C3+	C1–	UPD2	SPARE

CONNECTOR CABLE 1/2" CONDUIT — UPD2

PASSENGER DETECTOR
UPD2: BRN, WHT, BLU; C3+, C1–, UPD2

MDE — MAIN DRIVE ENCODER — M

HG4A — C3+ | RED | H4 | 7 | YEL — 2–#18AWG 1/2" CONDUIT — HG4
HG4B — H4 | 8 | YEL | HG4 | 9 | YEL — 2–#18AWG 1/2" CONDUIT — 1

CPS2R — C3+ | RED | CPS2 | 1 | YEL — 2–#18 AWG 1/2" CONDUIT
CPI2HR — CP22 | 2 | YEL | CPI2 | 3 | YEL — 2–#18AWG 1/2" CONDUIT — 2
CPI2VR — CP2L | 4 | YEL | CP22 | 5 | YEL — 2–#18 AWG 1/2" CONDUIT

1	2	3	4	
C3+	C1–	MS2	SPARE	

4–#18 AWG 1/2" CONDUIT — MS2

MISSING STEP DETECTOR
MS2: C3+, C1–, MS2

2–BELDEN 9502
7–#18 AWG
G–#18 AWG
3/4" CONDUIT — JB2A

TO JB2A

C3+	1	SKI2	5
BH1	2	SPARE	6
BH2	3	SPARE	7
SKI1	4	GND	G

SIECOR WOJxx–18 PRENUMBERED YELLOW WIRE USED TO CONNECT SWITCHES AS INDICATED. CONDUIT RUNS ARE COLLECTED AT JUNCTION BOXES OR CONDUIT BODIES AS REQUIRED. CONDUCTORS TO BE CONTINUOUS FROM THE DEVICE TO A TERMINAL STRIP.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE — DATE

34th Street/Herald Square Station
Escalators E233–E236
Junction Box #3
Wiring & Piping

DRAWN BY	DATE:	CHECKED BY	DATE:
S. Nester	3/30/07	J. Shupe	3/30/07

ACCEPTED FOR N.Y.C.T.A. — PROJECT MANAGER / DESIGNER — DATE:

DRAWING NO. **2881-AB-468**

ESCALATOR LEFT SIDE

ESCALATOR RIGHT SIDE

SIECOR WOJxx–18 PRENUMBERED YELLOW WIRE USED TO CONNECT SWITCHES AS INDICATED. CONDUIT RUNS ARE COLLECTED AT JUNCTION BOXES OR CONDUIT BODIES AS REQUIRED. CONDUCTORS TO BE CONTINUOUS FROM THE DEVICE TO A TERMINAL STRIP.

NOTE:
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ALL FIELD WIRING IS ON THE LEFT SIDE OF THE TERMINAL BLOCKS.

TO CONTROLLER

JB4

A2	1
A4	2
A7	3
A9	4
C3+	5
BR1	6
BR2	7
BW1	8
BW2	9
LGO	10
SP	11
C1–	12
SP	13
SP	14
SP	15
SP	16

BELDEN 8761: C3+ CLR; TH BLK

BELDEN 8761: PT+ CLR; VS BLK

G	GRN

16–#18 AWG
2–BELDEN 8761
G–#18 AWG
1" CONDUIT

JB4

G	GND
1	C3+
2	C3+
3	C3+
4	C3+
5	SP
6	C1–
7	BR2
8	LGO
9	A9
10	C3+
11	TH
12	PT+
13	VS
14	BW1
15	BR1
16	A2
17	A4
18	A7
19	BW2
G	GND

C3+ FROM CONTROLLER

LOW GEARBOX OIL DETECTOR
MS2
LGO
C1–
C3+
3–#18 AWG 1/2" CONDUIT
C3+ 1 BRN
C1– 3 BLU
LGO 4 BLK

MOTOR WINDING THERMISTORS
C3+ CLR TH BLK
1–BELDEN 8761 1/2" CONDUIT

VIBRATION SENSOR
PT+ RED VS BLU
1–BELDEN 8761 1/2" CONDUIT

A2 BRN A4 BLU — 2–#18AWG 1/2" CONDUIT — MOTOR BRAKE

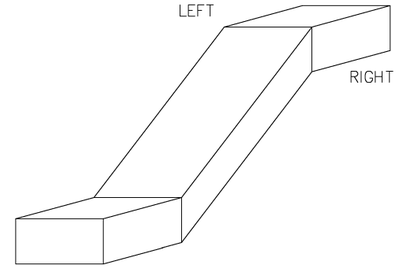
A9 BRN A7 BLU — 2–#18AWG 1/2" CONDUIT — BACKUP BRAKE

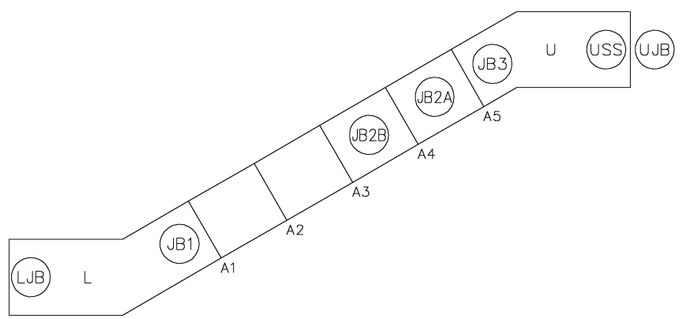
C3+ RED BW1 BLU — 2–#18AWG 1/2" CONDUIT — BW1

C3+ RED BW2 BLU — 2–#18AWG 1/2" CONDUIT — BW2

C3+ BLK BR1 1 BLU — 2–#18AWG 1/2" CONDUIT — BR1

C3+ BLK BR2 1 BLU — 2–#18AWG 1/2" CONDUIT — BR2





NOTE:
ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE FROM THE DEVICE TERMINALS TO A TERMINAL STRIP.
WIRE SPLICES ARE NOT PERMITTED.
CONDUIT SIZES ARE MINIMUMS.
DENOTES JUMPER WIRE
SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING
UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.
DENOTES TWISTED PAIR OF CONDUCTORS

CONDUIT RUNS MARKED AS INDICATED

O–Z GEDNEY T–50 TYPE T CONDUIT BODY AND BS–50S DOMED CONDUIT BODY COVER USED TO SPLIT CONDUIT.
NUMBER INDICATES QUANTITY.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8600; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

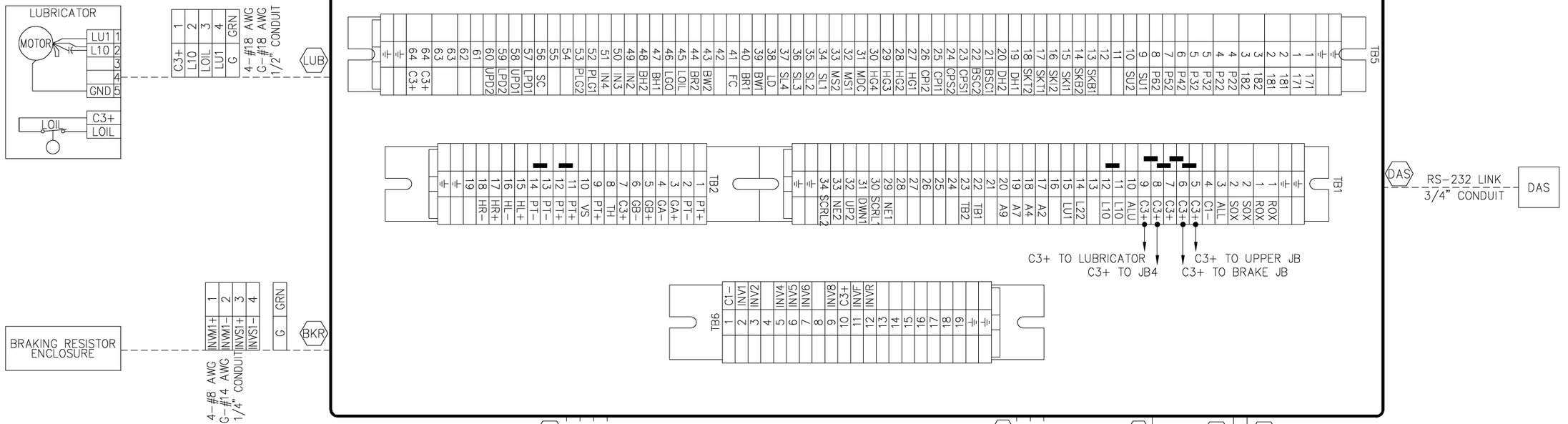
SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233–E236
Junction Box #4
Wiring & Piping

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. 2881-AB-469



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NOTE:

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DENOTES JUMPER WIRE — DENOTES 2–POLE JUMPER

SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING

UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.

DENOTES TWISTED PAIR OF CONDUCTORS

CONDUIT RUNS MARKED AS INDICATED

O–Z GEDNEY T–50 TYPE T CONDUIT BODY AND BS–50S DOMED CONDUIT BODY COVER USED TO SPLIT CONDUIT. NUMBER INDICATES QUANTITY.

10

CABLE 10A	
171	1
181	2
182	3
ALL	4
BSC1	5
BSC2	6
C1–	7
C3+	8
CPI1	9
CPI2	10
CPS1	11
CPS2	12
HG1	13
HG2	14
HG3	15
HG4	16

CABLE 10B	
P62	1
PLG1	2
PLG2	3
SKB1	4
SKB2	5
SKI1	6
SKI2	7
SKT1	8
SKT2	9
SL1	10
SL2	11
SL3	12
SL4	13
SU1	14
SU2	15
P42	16

BELDEN 9502	
PT+	RED
PT–	BLK
HL+	WHT
HL–	BLK
DRAIN	BARE

BELDEN 9502	
PT+	RED
PT–	BLK
HR+	WHT
HR–	BLK
DRAIN	BARE

BELDEN 9503	
PT+	RED
PT–	BLK
GA+	WHT
GA–	BLK
GB+	GRN
GB–	BLK
DRAIN	BARE

CABLE 10C	
IN2	1
IN3	2
IN4	3
LD	4
MDC	5
MS1	6
MS2	7
P22	8
P32	9
P52	10
SP	11
SP	12
SP	13
SP	14
SP	15
SP	16

CABLE 10D	
ALU	1
DH1	2
DH2	3
SC	4
BH1	5
BH2	6
LPD1	7
UPD1	8
LPD2	9
UPD2	10
SP	11
SP	12
SP	13
SP	14
SP	15
SP	16

G	GRN

4x 16–#18 AWG
2–BELDEN 9502
1–BELDEN 9503
G–#18 AWG
2" CONDUIT

TO UPPER JUNCTION BOX

BELDEN 8761	
C3+	CLR
TH	BLK

BELDEN 8761	
PT+	CLR
VS	BLK

A2	1
A4	2
A7	3
A9	4
C3+	5
BR1	6
BR2	7
BW1	8
BW2	9
LGO	10
SP	11
C1–	12
SP	13
SP	14
SP	15
SP	16

G	GRN

16–#18 AWG
2–BELDEN 8761
G–#18 AWG
1" CONDUIT

JB4

TO JB4

DRV

INVA+	1
INVA–	2

INV1	1
INV2	2
INV6	3
INV4	4
INV5	5
INV8	6
C1–	7
C3+	8
INVF	9
INVR	10
SP	11
SP	12
SP	13
SP	14
SP	15
SP	16

G	GRN

16–#18 AWG
2–#8 AWG
G–#14 AWG
1 1/4" CONDUIT

DRIVE INVERTER ENCLOSURE

DRVP

R	1
S	2
T	3

3–4 AWG
1" CONDUIT

DRVM

R3	1
S3	2
T3	3

3–4 AWG
1" CONDUIT

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

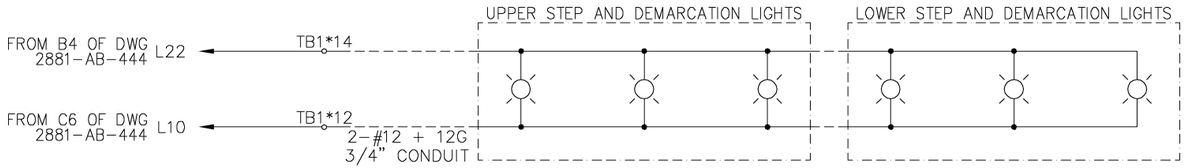
34th Street/Herald Square Station
Escalators E233–E236
Machine Room
Wiring & Piping

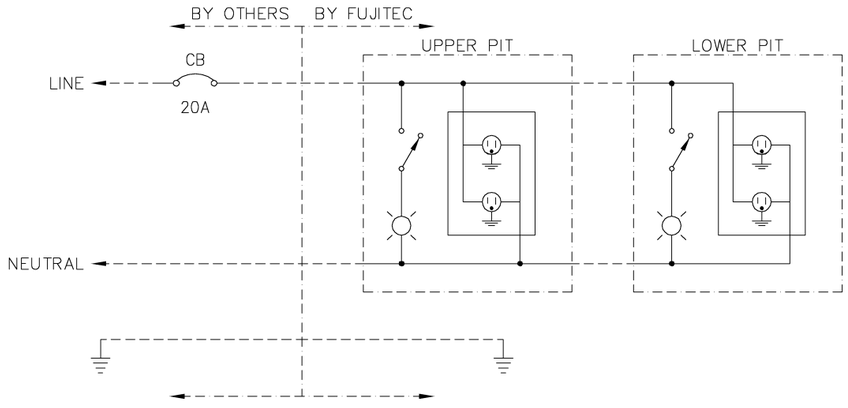
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-470**





ALL WIRING IS 2-#14AWG + 14G UNLESS OTHERWISE NOTED.

ALL DEVICES SUPPLIED WITH A GROUNDING POINT ARE GROUNDED TO UTILITY JUNCTION BOXES USING 14AWG GREEN WIRE.

CONDUIT SIZES ARE MINIMUM.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Lighting & Utility Detail

Drawing Prepared by:
FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

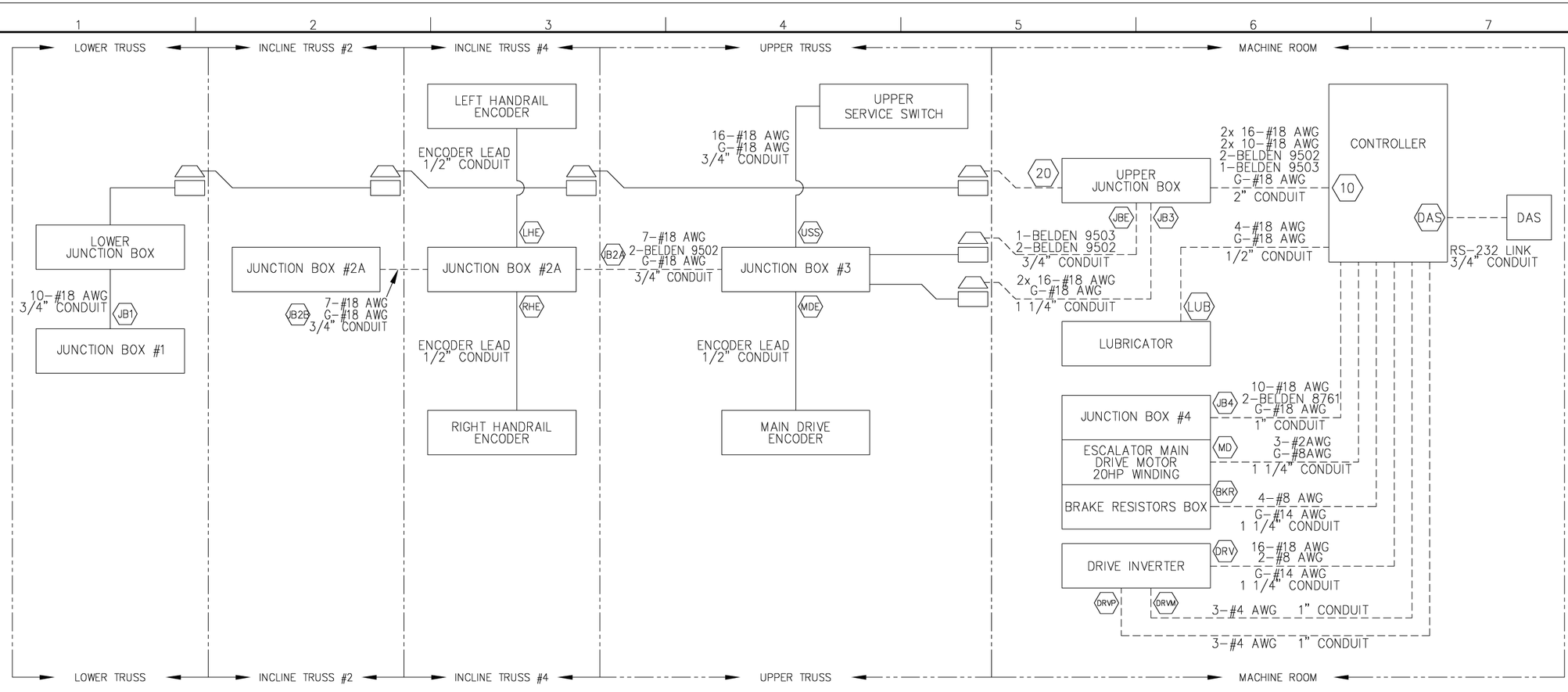
SIGNATURE DATE

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

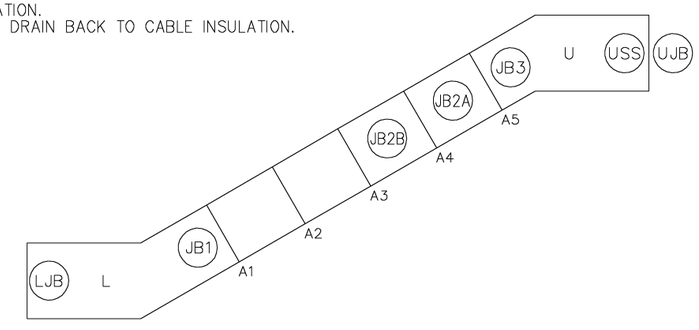
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO.
2881-AB-471



NOTE: UNLESS SHOWN OTHERWISE–
ALL WIRING IS THHN OR THWN 75°C Cu.
ALL CONDUIT SIZES ARE MINIMUMS.
TRUSS ASSEMBLY IS BONDED TO NEAREST STRUCTURAL STEEL USING BLACKBURN SP8SL SERVICE POST CONNECTORS AND 4/0 Cu CONDUCTOR.
SLACK IS ALLOWED FOR ESCALATOR MOVEMENT.
SHIELDED CABLES ARE BELDEN 9502, BELDEN 9503, OR 8761 AS REQUIRED BY APPLICATION.
FOR CABLE CONNECTIONS AT TEMPERATURE AND VIBRATION SENSORS, TRIM SHIELD AND DRAIN BACK TO CABLE INSULATION.

NOTE:
ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE
FROM THE DEVICE TERMINALS TO A TERMINAL STRIP.
WIRE SPLICES ARE NOT PERMITTED EXCEPT WHEN CONNECTING PRE–WIRED DEVICES.
CONDUIT SIZES ARE MINIMUMS.
DENOTES JUMPER WIRE
SOLID LINE INDICATES FACTORY WIRING
DASHED LINE INDICATES FIELD WIRING
UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.
DENOTES TWISTED PAIR OF CONDUCTORS



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8600; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Sensor & Power Wiring & Piping

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-472**

UPPER JUNCTION BOX TO LOWER JUNCTION BOX

TERMINAL NUMBER	LINE NUMBER	COLOR	TERMINAL NUMBER	LINE NUMBER	COLOR
1	C3+	YELLOW	25	ALL	YELLOW
2	171	YELLOW	26	C1–	YELLOW
3	181	YELLOW	27	SL1	YELLOW
4	182	YELLOW	28	SL2	YELLOW
5	P32	YELLOW	29	IN2	YELLOW
6	P62	YELLOW	30	IN3	YELLOW
7	SU1	YELLOW	31	IN4	YELLOW
8	SU2	YELLOW	32	PLG2	YELLOW
9	SKB1	YELLOW	33	MS1	YELLOW
10	SKB2	YELLOW	34	DH1	YELLOW
11	BSC1	ORANGE	35	DH2	ORANGE
12	BSC2	ORANGE	36	SC	ORANGE
13	CPS1	ORANGE	37	LPD1	ORANGE
14	CPI1	ORANGE	38	LPD2	ORANGE
15	HG1	ORANGE	39	SP	ORANGE
16	HG2	ORANGE	40	SP	ORANGE
17	SP	YELLOW	41	–	–
18	SP	YELLOW	42	–	–
19	SP	YELLOW	43	–	–
20	SP	YELLOW	44	–	–
21	SP	YELLOW	45	–	–
22	SP	YELLOW	46	–	–
23	SP	YELLOW	47	–	–
24	–	–	48	–	–
GROUND	G	GREEN	GROUND	G	GREEN

16–#18 AWG (rows 1–16)

7–#18 AWG (rows 17–23)

HOOD W/ FEMALE INSERT

TO LOWER JUNCTION BOX

TO UPPER JUNCTION BOX

HOUSING W/ MALE INSERT

2x16 & 1x 7 #18 AWG
G–#18 AWG
1 1/4" CONDUIT

UPPER JUNCTION BOX TO JUNCTION BOX #3 CONNECTOR #1

TERMINAL NUMBER	LINE NUMBER	COLOR	TERMINAL NUMBER	LINE NUMBER	COLOR
1	171	YELLOW	25	P22	YELLOW
2	181	YELLOW	26	P52	YELLOW
3	182	YELLOW	27	PLG1	YELLOW
4	ALU	YELLOW	28	SKI1	YELLOW
5	C1–	YELLOW	29	SKI2	YELLOW
6	C3+	YELLOW	30	SKT1	YELLOW
7	CPI2	YELLOW	31	SKT2	YELLOW
8	CPS2	YELLOW	32	SL3	YELLOW
9	HG3	YELLOW	33	SL4	YELLOW
10	HG4	YELLOW	34	SP	YELLOW
11	IN2	ORANGE	35	SP	ORANGE
12	IN3	ORANGE	36	SC	ORANGE
13	IN4	ORANGE	37	BH1	ORANGE
14	LD	ORANGE	38	BH2	ORANGE
15	MDC	ORANGE	39	UPD1	ORANGE
16	MS2	ORANGE	40	UPD2	ORANGE
17	SP	YELLOW	41	–	–
18	SP	YELLOW	42	–	–
19	SP	YELLOW	43	–	–
20	SP	YELLOW	44	–	–
21	SP	YELLOW	45	–	–
22	SP	YELLOW	46	–	–
23	SP	YELLOW	47	–	–
24	–	–	48	–	–
GROUND	G	GREEN	GROUND	G	GREEN

16–#18 AWG (rows 1–16)

7–#18 AWG (rows 17–23)

HOOD W/ FEMALE INSERT

TO JUNCTION BOX #3

TO UPPER JUNCTION BOX

HOUSING W/ MALE INSERT

2x16 & 1x 7 #18 AWG
G–#18 AWG
1 1/4" CONDUIT

UPPER JUNCTION BOX TO JUNCTION BOX #3 CONNECTOR #2

TERMINAL NUMBER	LINE NUMBER	COLOR
1	PT+	RED
2	PT–	BLACK
3	HL+	WHITE
4	HL–	BLACK
5	DRAIN	BARE
6	–	–
7	–	–
8	–	–
9	–	–
10	PT+	RED
11	PT–	BLACK
12	HR+	WHITE
13	HR–	BLACK
14	DRAIN	BARE
15	–	–
16	–	–
17	–	–
18	PT+	RED
19	PT–	BLACK
20	GA+	WHITE
21	GA–	BLACK
22	GB+	GREEN
23	GB–	BLACK
24	DRAIN	BARE
GROUND	G	GREEN

BELDEN 9502 (LEFT HANDRAIL) (rows 1–5)

BELDEN 9502 (RIGHT HANDRAIL) (rows 10–14)

BELDEN 9503 (GOVERNOR) (rows 18–24)

HOOD W/ FEMALE INSERT

TO JUNCTION BOX #3

TO UPPER JUNCTION BOX

HOUSING W/ MALE INSERT

2–BELDEN 9502
1–BELDEN 9503
G–#18 AWG
3/4" CONDUIT

SIECOR WOJxx–18 PRENUMBERED YELLOW WIRE USED TO CONNECT SWITCHES AS INDICATED. CONDUIT RUNS ARE COLLECTED AT JUNCTION BOXES OR CONDUIT BODIES AS REQUIRED. CONDUCTORS ARE CONTINUOUS FROM THE DEVICE TO A TERMINAL STRIP.

NOTE:

ALL CONNECTIONS ARE CONTINUOUS LENGTHS OF WIRE FROM THE DEVICE TERMINALS TO A TERMINAL STRIP. WIRE SPLICES ARE NOT PERMITTED. CONDUIT SIZES ARE MINIMUMS.

DENOTES JUMPER WIRE — DENOTES 2–POLE JUMPER

SOLID LINE INDICATES FACTORY WIRING

DASHED LINE INDICATES FIELD WIRING

UNLESS OTHERWISE NOTED, CONDUIT IS 1/2" AND WIRE IS 18AWG.

DENOTES TWISTED PAIR OF CONDUCTORS

THIS END TOWARDS CONDUIT FITTING

FEMALE INSERT: 1 13 / 2 14 / 3 15 / 4 16 / 5 17 / 6 18 / 7 19 / 8 20 / 9 21 / 10 22 / 11 23 / 12 24

FEMALE INSERT: 25 37 / 26 38 / 27 39 / 28 40 / 29 41 / 30 42 / 31 43 / 32 44 / 33 45 / 34 46 / 35 47 / 36 48

MALE INSERT: 37 25 / 38 26 / 39 27 / 40 28 / 41 29 / 42 30 / 43 31 / 44 32 / 45 33 / 46 34 / 47 35 / 48 36

MALE INSERT: 13 1 / 14 2 / 15 3 / 16 4 / 17 5 / 18 6 / 19 7 / 20 8 / 21 9 / 22 10 / 23 11 / 24 12

THIS END TOWARDS CONDUIT FITTING

AS SEEN FROM TERMINATION SIDE OF CONNECTOR

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5592

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE — DATE

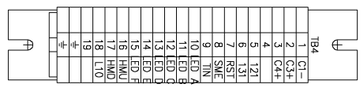
34th Street/Herald Square Station
Escalators E233–E236
Conduit Connectors

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER — DATE:

DRAWING NO. **2881-AB-474**



PV-600T

C3+ C1- GND

DH-485 COM. PORT 485

HOURMETER DOWN

HMD L10

HOURMETER UP

HMU L10

RESET

C1- X2 (-) LED X1 (+) C4+ | C3+ 4 PB 3 RST

MODE SWITCH

121 3 PB 4 C3+ | 131 2 PB 1 C3+

SLEEP MODE ENABLE SWITCH

C3+ 3 PB 4 SME | 2 PB 1

KEY OPERATION

C1- X2 (-) LED X1 (+) LED A

RUNNING UP

C1- X2 (-) LED X1 (+) LED C

SLEEP MODE

C1- X2 (-) LED X1 (+) LED E

INSPECTION OPERATION

C1- X2 (-) LED X1 (+) LED B

RUNNING DOWN

C1- X2 (-) LED X1 (+) LED D

NORMAL MODE

C1- X2 (-) LED X1 (+) LED F

TEST INDICATORS BUTTON

TIN 4 PB 3 C3+

RIGHT ENCLOSURE DOOR

LEFT ENCLOSURE DOOR

VIEW IS FROM THE INSIDE OF THE DOOR

BRSSM (C1- X2 (-) LED X1 (+) LED7) | BLSSM (LED6) | TRSSM (LED5) | TLSSM (LED4) | BCPSID (LED3) | TCPSID (LED2) | BCPS (LED1) | TCPS (LED0)

BMSM (LED15) | TMSM (LED14) | BRSOC (LED13) | BLSOC (LED12) | IRSOC (LED11) | ILSOC (LED10) | TRSOC (LED9) | TLSOC (LED8)

RHSM (LED23) | LHSM (LED22) | RBSCS (LED21) | LBSCS (LED20) | RBHS (LED19) | LBHS (LED18) | LSUM (LED16)

BDCC (LED31) | PF/PRM (LED30) | ARD (LED29) | ESM (LED28) | BRHEC (LED27) | BLHEC (LED26) | TRHEC (LED25) | TLHEC (LED24)

MBRM (LED39) | MBLM (LED38) | MOM (LED37) | MCOR (LED36) | MSCLD (LED35) | MMSS (LED34) | LMSS (LED33) | UMSS (LED32)

MSF (LED47) | LCP (LED46) | MVM (LED44) | BESB (LED43) | TESB (LED42) | SS (LED41)

LLO (LED55) | RDH (LED54) | LDH (LED53) | SSKS (LED52) | LGO (LED51) | CBF (LED50) | SDF (LED49) | IF (LED48)

BBRM (LED59) | BBLM (LED58) | DCF (LED56)

IFM3

C1-	C1-	LED15	15	COM1	C1-	LED31	31	COM2	COM1	C1-	LED14	14	LED30	30	COM2	COM1	C1-	LED13	13	LED29	29	COM2	COM1	C1-	LED12	12	LED28	28	COM2	COM1	C1-	LED11	11	LED27	27	COM2
C3+	C3+	LED10	10	VDC1	C1-	LED26	26	VDC2	VDC1	C3+	LED9	9	LED25	25	VDC2	VDC1	C3+	LED8	8	LED24	24	VDC2	VDC1	C3+	LED7	7	LED23	23	VDC2	VDC1	C3+	LED6	6	LED22	22	VDC2
C3+	C3+	LED5	5	VDC1	C1-	LED21	21	VDC2	VDC1	C3+	LED4	4	LED20	20	VDC2	VDC1	C3+	LED3	3	LED19	19	VDC2	VDC1	C3+	LED2	2	LED18	18	VDC2	VDC1	C3+	LED1	1	LED17	17	VDC2
C3+	C3+	LED0	0	VDC1	C1-	LED16	16	VDC2	VDC1																											

IFM4

C1-	C1-	LED47	47	COM1	C1-		31	COM2	COM1			13		30	COM2	COM1			12		29	COM2	COM1			11		28	COM2	COM1	C3+	LED45	45	VDC2
C3+	C3+	LED44	44	VDC1	C1-	LED43	43	VDC2	VDC1	C3+	LED42	42	VDC2	VDC1	C3+	LED41	41	VDC2	VDC1	C3+	LED40	40	VDC2	VDC1	C3+	LED39	39	VDC2	VDC1	C3+	LED38	38	VDC2
C3+	C3+	LED37	37	VDC1	C3+	LED36	36	VDC2	VDC1	C3+	LED35	35	VDC2	VDC1	C3+	LED34	34	VDC2	VDC1	C3+	LED33	33	VDC2	VDC1	C3+	LED32	32	VDC2	VDC1	C3+	LED31	31	VDC2
C3+	C3+	LED30	30	VDC1	C3+	LED29	29	VDC2	VDC1	C3+	LED28	28	VDC2	VDC1	C3+	LED27	27	VDC2	VDC1	C3+	LED26	26	VDC2	VDC1	C3+	LED25	25	VDC2	VDC1	C3+	LED24	24	VDC2
C3+	C3+	LED23	23	VDC1	C3+	LED22	22	VDC2	VDC1	C3+	LED21	21	VDC2	VDC1	C3+	LED20	20	VDC2	VDC1	C3+	LED19	19	VDC2	VDC1	C3+	LED18	18	VDC2	VDC1	C3+	LED17	17	VDC2
C3+	C3+	LED16	16	VDC1																														

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VIOLATORS WILL BE PROSECUTED

NEW YORK CITY TRANSIT

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ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Faultfinder Line Number Table

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-475**

DEVICE	QTY.	DESCRIPTION	FAI PART NO.	VENDOR	VENDOR PART NO.	COMMENTS
1	1	CONTROLLER ENCLOSURE	D05A1-2881A1	HOFFMAN	A-60X4912SSLP	MODIFIED A-60X4912SSLP ENCLOSURE
2	1	CONTROLLER PANEL	D05A2-2881A1	HOFFMAN	A-60P48	CONTROLLER PANEL
3	2	CONTROLLER SIDE PLATE, UPPER	D05C1-2881A1	FAI	D05C1-2881A1	11GA STAINLESS STEEL
4	2	CONTROLLER SIDE GASKET, UPPER	D05C1-2881A2	FAI	D05C1-2881A2	
5	2	CONTROLLER SIDE PLATE, LOWER	D05C1-2881A3	FAI	D05C1-2881A3	11GA STAINLESS STEEL
6	2	CONTROLLER SIDE GASKET, LOWER	D05C1-2881A4	FAI	D05C1-2881A4	
7	1	ADAPTER	D05CH-2038A1	HOFFMAN	A-21SDA	DOOR HANDLE ADAPTER KIT
8	1	CIRCUIT BREAKER DISCONNECT HANDLE	D05994001	SQUARE-D	9422-A2	CIRCUIT BREAKER DISCONNECT HANDLE
9	1	AUX CONTROLLER PANEL	C65A7-2881A1	FAI	C65A7-2881A1	ADDITIONAL CONTROL RELAYS
10	1	CONTROLLER NAMEPLATE	D05N1-2881A1	FAI	D05N1-2881A1	CONTROLLER NAMEPLATE LABEL
11	1	LABEL: DANGER, ELECTRICAL HAZARD...	D54296001	FAI	D54296001	...AUTHORIZED PERSONNEL ONLY
12	1	LABEL: WARNING, MORE THAN ONE LIVE...	D05598001	FAI	D05598001	...CIRCUIT, SEE DIAGRAM
13	1	LABEL: SUITABLE FOR USE ON A CIRCUIT...	D05676001	FAI	D05676001	...CAPABLE OF DELIVERING NOT MORE THAN ___ RMS...
14	1	LABEL: USE FUSES TYPE...	D05C68001	VISIONMARK	D05C68001	CSA REQUIRED LABEL
15	1	LABEL: WARNING CAPACITIVE...	D05C69001	VISIONMARK	D05C69001	CSA REQUIRED LABEL
16	1	LABEL: "UP"	D05938001	FAI	D05938001	3" x 1.5"
17	1	LABEL: "DOWN"	D05938002	FAI	D05938002	3" x 1.5"
18	1	SLOTTED DINRAIL	D05560000	WAGO	210-112	2.6 METERS, 35mm STANDARD
19	2	40C INTERFACE MODULE	D05959001	ALLEN-BRADLEY	1492-IFM40F	INTERFACE MODULES
20	58	22mm LATCH AND RED LED	D05970001	ALLEN-BRADLEY	800E-2DL3R	22mm LATCH AND RED LED
21	56	22mm RED LAMP COVER	D05980001	ALLEN-BRADLEY	800EP-P4	22mm RED LAMP COVER
22	8	22mm HOLE PLUG	D05976001	ALLEN-BRADLEY	800E-NE8	22mm HOLE PLUG
23	8	LOCKING RING	D05B19001	ALLEN-BRADLEY	800E-AR3	FOR 22mm DOOR LEDS
24	2	PUSHBUTTON WITH LED	D05979001	ALLEN-BRADLEY	800EP-LE4	RESET BUTTON
25	2	KEYSWITCH OPERATOR	D05D1-2038A1	ALLEN-BRADLEY	800EP-KM23	KEY START/SERVICE MODE KEYSWITCH
26	2	22mm LATCH	D05889001	ALLEN-BRADLEY	800E-A2L	22mm LATCH
27	5	22mm CONTACT N.O.	D05971001	ALLEN-BRADLEY	800E-2X10	22mm CONTACT N.O.
28	2	22mm CONTACT N.C.	D05890001	ALLEN-BRADLEY	800E-2X01	22mm CONTACT N.C.
29	4	22mm LATCH AND AMBER LED	D05970003	ALLEN-BRADLEY	800E-2DL3A	22mm LATCH AND AMBER LED
30	4	22mm AMBER LAMP COVER	D05980003	ALLEN-BRADLEY	800EP-P5	22mm AMBER LAMP COVER
31	2	22mm LATCH AND GREEN LED	D05970002	ALLEN-BRADLEY	800E-2DL3G	22mm LATCH AND GREEN LED
32	2	22mm GREEN LAMP COVER	D05980002	ALLEN-BRADLEY	800EP-P3	22mm GREEN LAMP COVER
33	1	TOUCHSCREEN	D05969004	ALLEN-BRADLEY	2711-T6C2L1	PANELVIEW 600, COLOR TOUCHSCREEN
34	1	COMM CABLE 6'	D05963001	ALLEN-BRADLEY	1747-C10	PLC TO TOUCHSCREEN COMM CABLE
35	2	HOURMETER	D05BM-2038A1	ALLIED ELECTRONICS	207-0002	MECHANICAL HOURMETER
36	2	HOURMETER GASKET	D05BN-2038A1	ALLIED ELECTRONICS	207-0005	HOURMETER GASKET
37	2	FLUORESCENT LIGHT ENCLOSURE	D05A9-2666A1	HOFFMAN	A-LF16D12R	FLUORESCENT LIGHT ENCLOSURE
38	2	FLUORESCENT BULB	D05AA-2666A1	MIDWEST EQUIPMENT	F8T5CW	12" SOFT-WHITE BULB
39	4	TERMINAL BLK., 19P	D05876001	TAPCO	D05876001	TERMINAL BLK., 19P
40	1	TERMINAL STRIP	D05799001	TAPCO	D05799001	36-POLE
41	1	TERMINAL STRIP	D05800001	TAPCO	D05800001	64-POLE
42	7	JUMPER BAR, 2-POLE	D06033001	WAGO	264-402	JUMPER BAR, 2-POLE
43	3	GROUNDING LUG	D05606003	BURNDY	K2A29U	GROUNDING LUG
44	1	GROUNDING BAR	D05C70001	SQUARE-D	PK7GTA	7-POLES
45	1	CIRCUIT BREAKER	D05A7-2881A1	SQUARE-D	FAL34090-1021-1212	MAIN CONTROLLER CIRCUIT BREAKER
46	1	CIRCUIT BREAKER DISCONNECT OPERATOR	D05995001	SQUARE-D	9422-RN1	CIRCUIT BREAKER DISCONNECT OPERATOR
47	4	CIRCUIT BREAKER	D05A7-2112A1	ALLEN-BRADLEY	1492-GS1G050-H1	1 POLE, 5 AMPS
48	1	CIRCUIT BREAKER	D05B6-2881A1	SQUARE-D	60110	10 AMPS, 1-POLE
49	3	CIRCUIT BREAKER AUX CONTACT	D05B9-2881A1	SQUARE-D	MG26925	1 N.O. CONTACT
50	1	CIRCUIT BREAKER	D05B7-2881A1	SQAURE-D	60145	13 AMPS, 2-POLES
51	1	CIRCUIT BREAKER	D05AY-2881A1	ALLEN-BRADLEY	1492-SP2C030	3 AMPS, 2-POLES
52	1	CIRCUIT BREAKER AUX CONTACT	D05AZ-2881A1	ALLEN-BRADLEY	1492-ASPH3	1 N.O. x 1 N.C. CONTACT
53	1	CIRCUIT PROTECTOR	D05AA-2881A1	ALLEN-BRADLEY	1492-GS1G030-H1	1 POLE, 3 AMPS
54	1	CIRCUIT BREAKER	D05B8-2881A1	SQUARE-D	60168	1 AMP, 3-POLES
55	1	GROUND-FAULT TRANSFORMER	D05C09002	BENDER	W2-A62B	GROUND-FAULT TRANSFORMER
56	1	GROUND FAULT MONITOR	D05C09001	RCM	RCMA473L6	GFM
57	1	PLC CHASSIS	D05960003	ALLEN-BRADLEY	1746-A10	10 SLOT CAPACITY

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

34th Street/Herald Square Station
Escalators E233-E236
Controller Device List 1/2

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

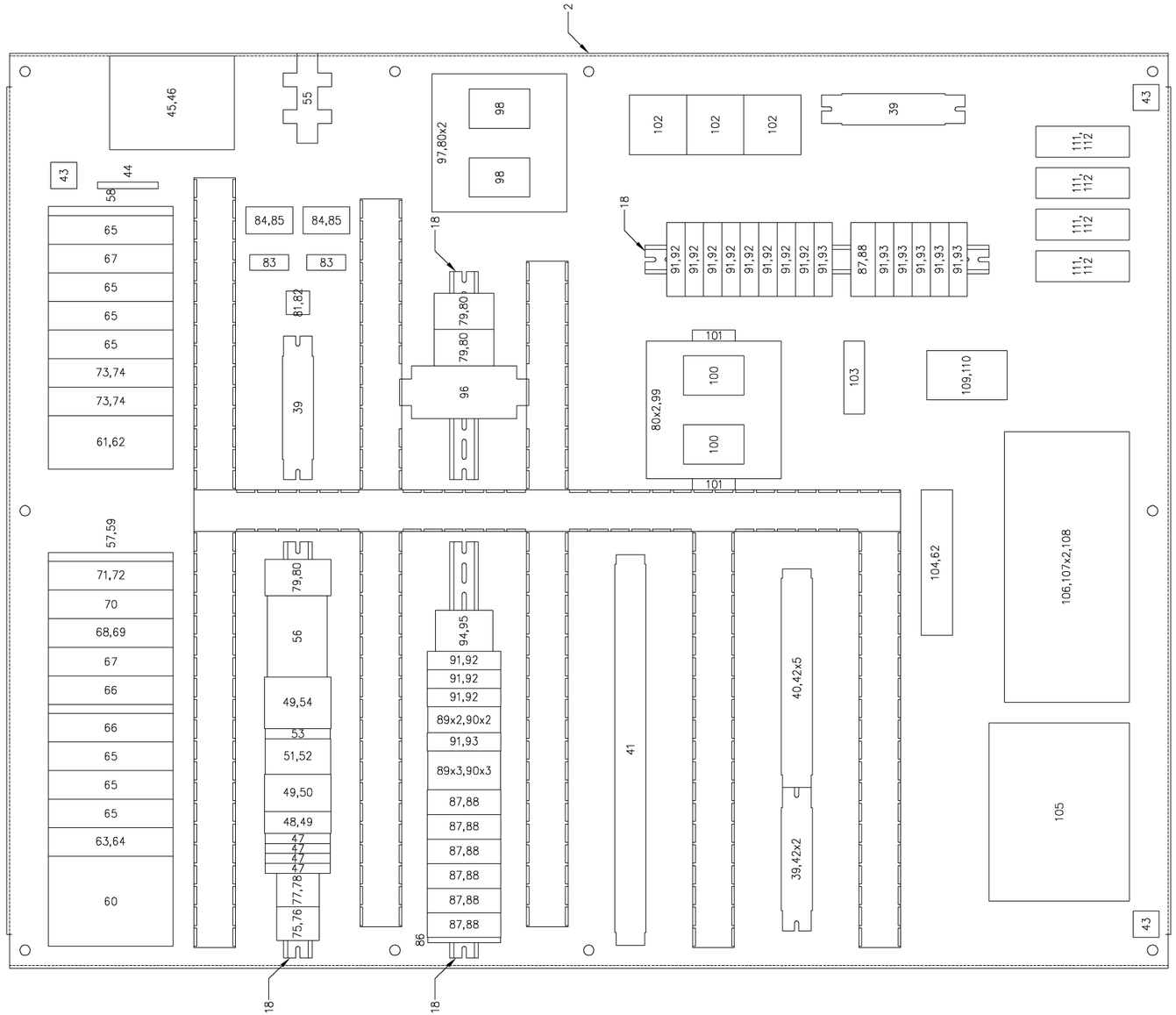
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

SIGNATURE _____ DATE _____

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER _____ DATE: _____

DRAWING NO. **2881-AB-476**



NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

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FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL.: (513)932-8000; FAX: (513)933-5582

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE _____ DATE _____

34th Street/Herald Square Station
Escalators E233-E236
Control Panel Device Layout

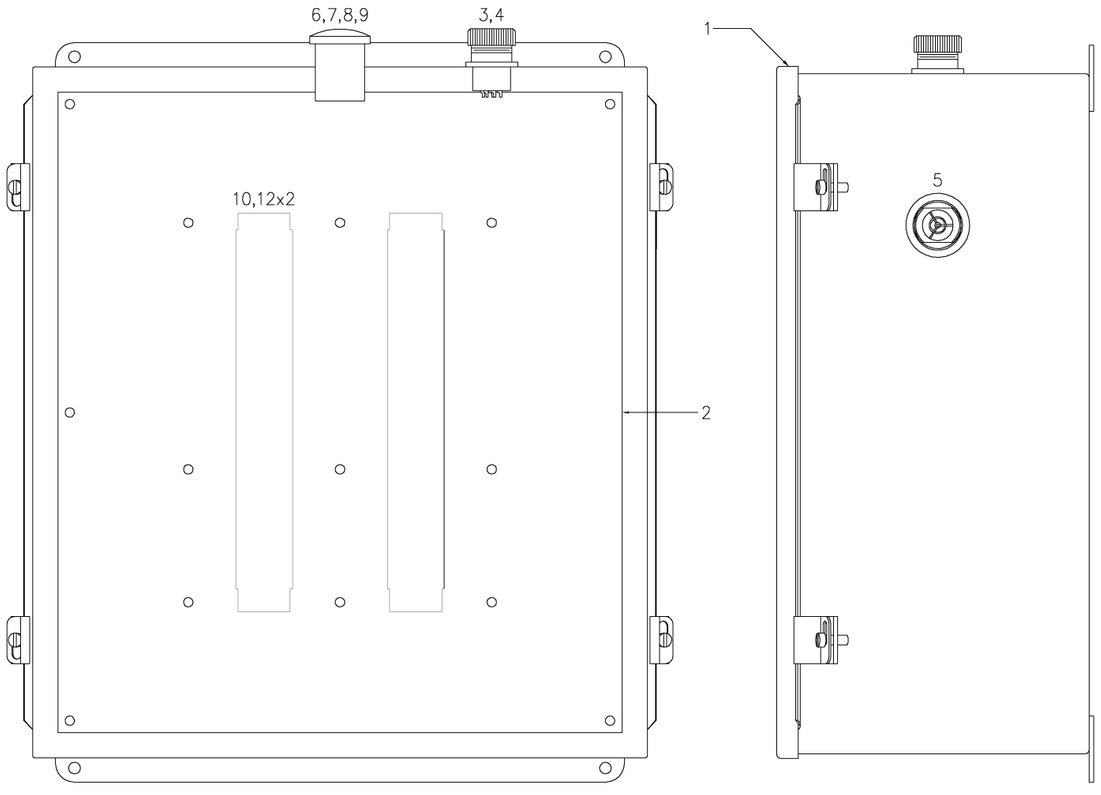
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER _____ DATE: _____

DRAWING NO. **2881-AB-479**

DEVICE	QTY.	DESCRIPTION	FAI PART NO.	VENDOR	VENDOR PART NO.	COMMENTS
1	1	ENCLOSURE	D05C17001	HOFFMAN	CUSTOM	STAINLESS STEEL, 18:x16"x8"
2	1	PANEL	D05C18001	HOFFMAN	D05C18001	14GA GALVANIZED, 16 7/8"x14 7/8"
3	1	RECEPTACLE	D05934001	BRADHARRISON	1R6G04A20A120	6-POLES
4	1	SHORTING PLUG	D05932001	BRADHARRISON	W00V41782	PINS 1 & 4 SHORTED
5	1	SONALERT	D05886002	MALLORY	SC628AN	24VDC
6	1	LEGEND PLATE	D05887001	ALLEN-BRADLEY	800E-35RE262K	"PUSH TO STOP..."
7	1	PADLOCKING ATTACHMENT	D05891001	ALLEN-BRADLEY	800E-AML1	FOR LOCK-OUT/TAG-OUT
8	1	OPERATOR	D05888001	ALLEN-BRADLEY	800EP-MT4	RED MUSHROOM PUSHBUTTON
9	1	SAFETY CONTACT BLOCK	D05A07001	ALLEN-BRADLEY	800E3LX01S	NORMALLY CLOSED MAINTAINED SWITCH
10	2	TERMINAL STRIP	C65A7-2666A1	FAI	C65A7-2666A1	MODIFIED WAGO 36-POLE TERMINAL STRIP
11	1	NAMEPLATE	D05729001	VISIONMARK	D05729001	SERVICE SWITCH NAMEPLATE, NOT SHOWN
12	4	JUMPER BAR	D06033001	TAPCO	264-402	2-POLE, GREY



FRONT VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

NEW YORK CITY TRANSIT

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-1000; FAX: (513)933-5582

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE _____ DATE _____

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Lower Junction Box
Assembly

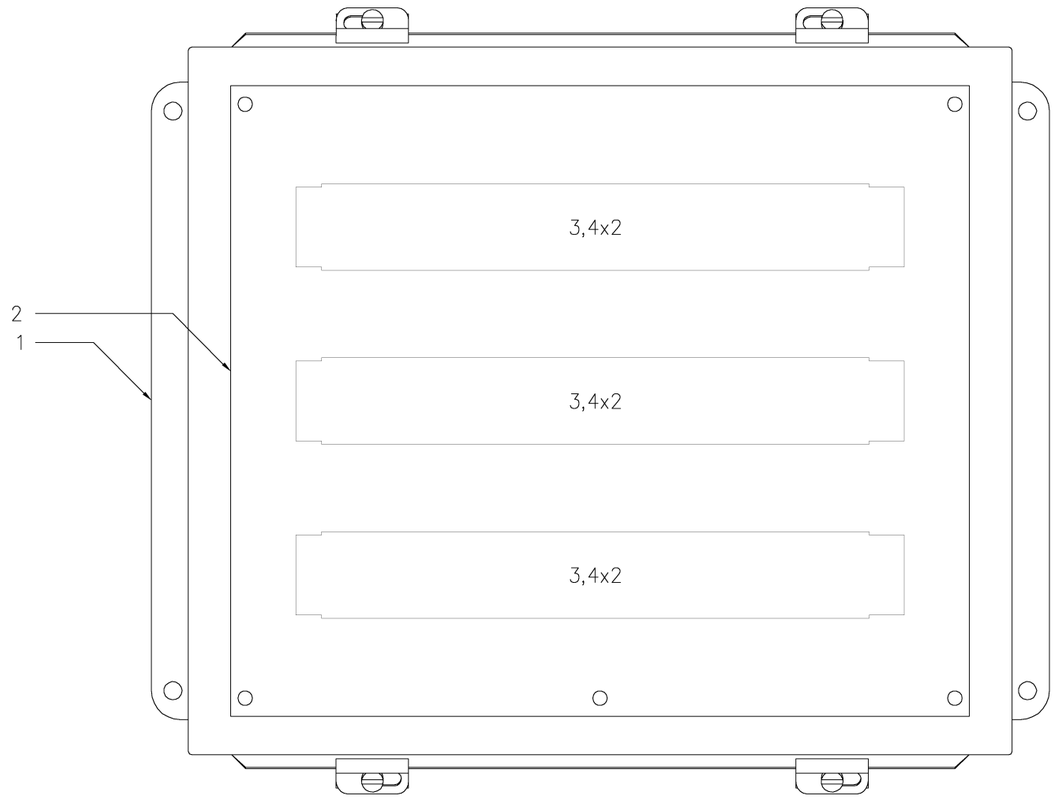
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER _____ DATE: _____

DRAWING NO. **2881-AB-480**

DEVICE	QTY.	DESCRIPTION	FAI PART NO.	VENDOR	VENDOR PART NO.	COMMENTS
1	1	ENCLOSURE	D05B47007	HOFFMAN	A-1412NFSS	STAINLESS STEEL, 14"x12"x6"
2	1	PANEL	D05B49007	FAI	D05B49007	14GA GALVANIZED, 12 3/4"x10 7/8"
3	3	TERMINAL STRIP	C65A7-2666A1	FAI	C65A7-2666A1	MODIFIED WAGO 36-POLE TERMINAL STRIP
4	6	JUMPER BAR	D06033001	TAPCO	264-402	2-POLE, GREY



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NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Incline Junction Box #3
Assembly

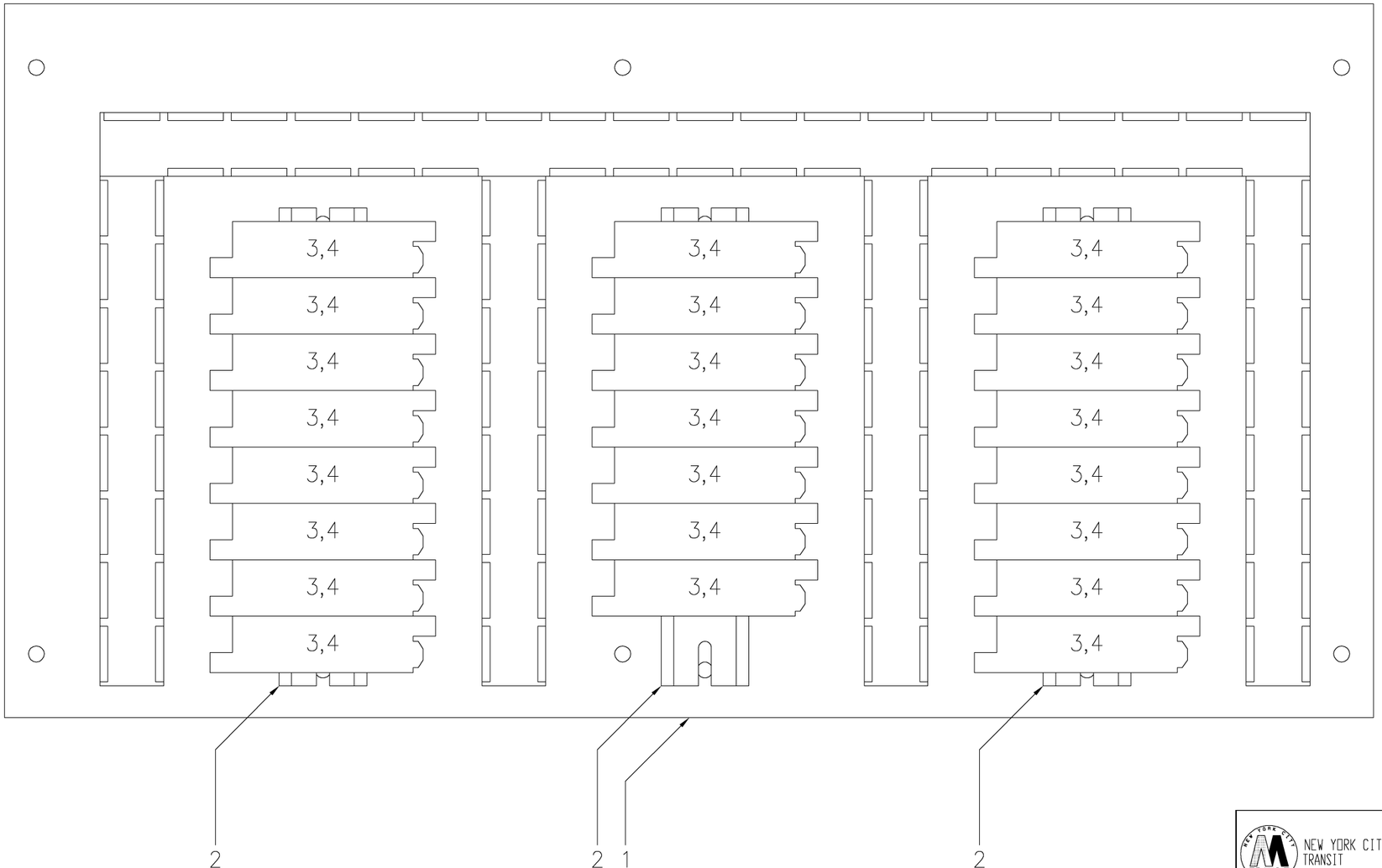
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-481**

DEVICE	QTY.	DESCRIPTION	FAI PART NO.	VENDOR	VENDOR PART NO.	COMMENTS
1	1	AUC CONTROLLER PANEL	D05B5-2881A1	FAI	D05B5-2881A1	12GA GALVANIZED, 21.5" X 11.21"
2	0.3	SLOTTED DINRAIL	D05560000	WAGO	210-112	2.6 METERS, 35mm STANDARD
3	23	RELAY SOCKET	D05C60001	OMRON	PS7A-10F-ND	LED-INDICATOR, FORCE-GUIDED
4	23	RELAY	D05C62001	OMRON	G7SA-3A1B	4-POLES 3/1, 24VDC, FORCE-GUIDED



NEW YORK CITY TRANSIT

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8800; FAX: (513)933-5592

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SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

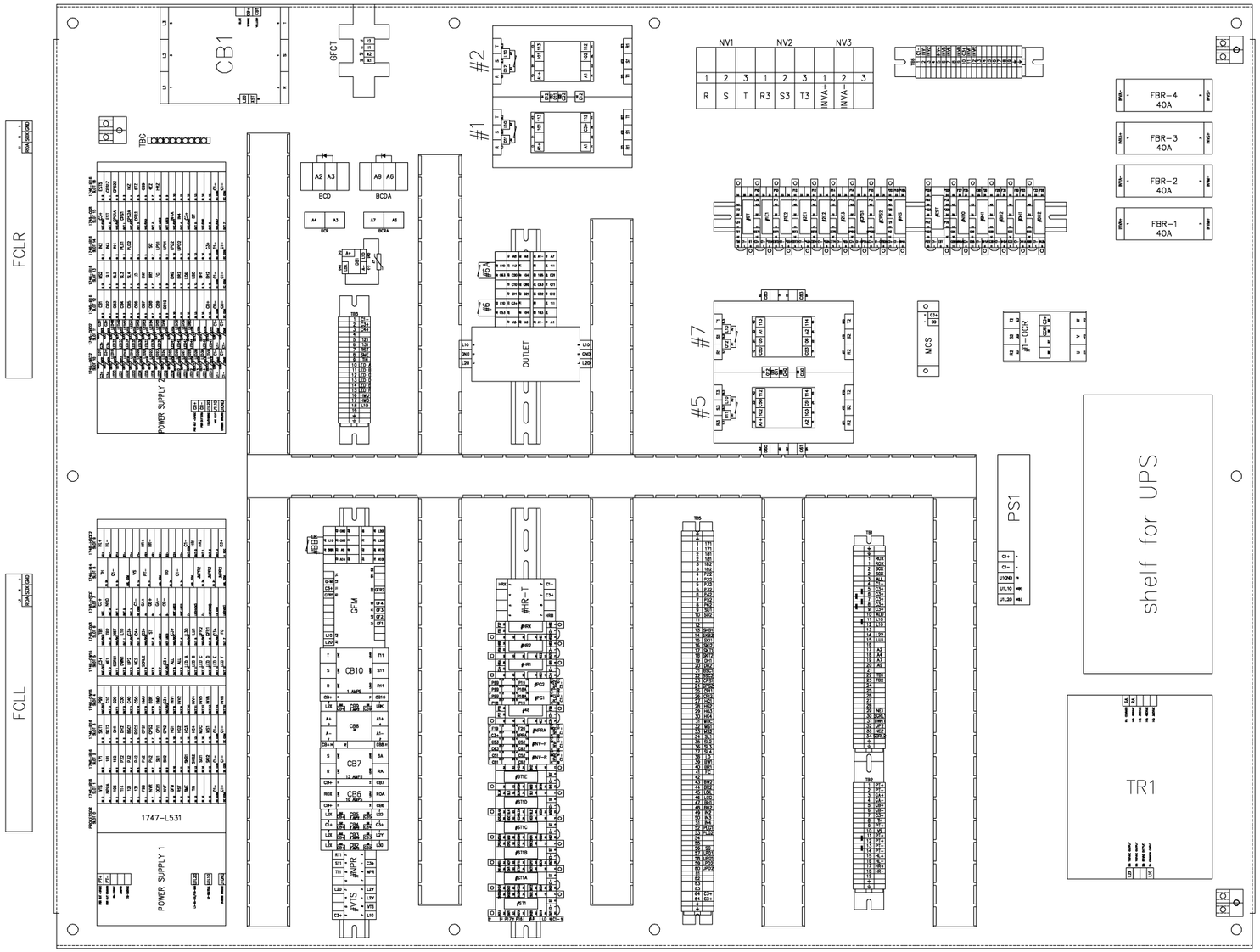
34th Street/Herald Square Station
Escalators E233-E236
Aux Controller Panel
Assembly

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-482**



FOR LARGER PRINT LINE NUMBER TABLE
DRAWINGS REFER TO 2881−AB−484−490.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table

Drawing Prepared by:
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Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

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S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

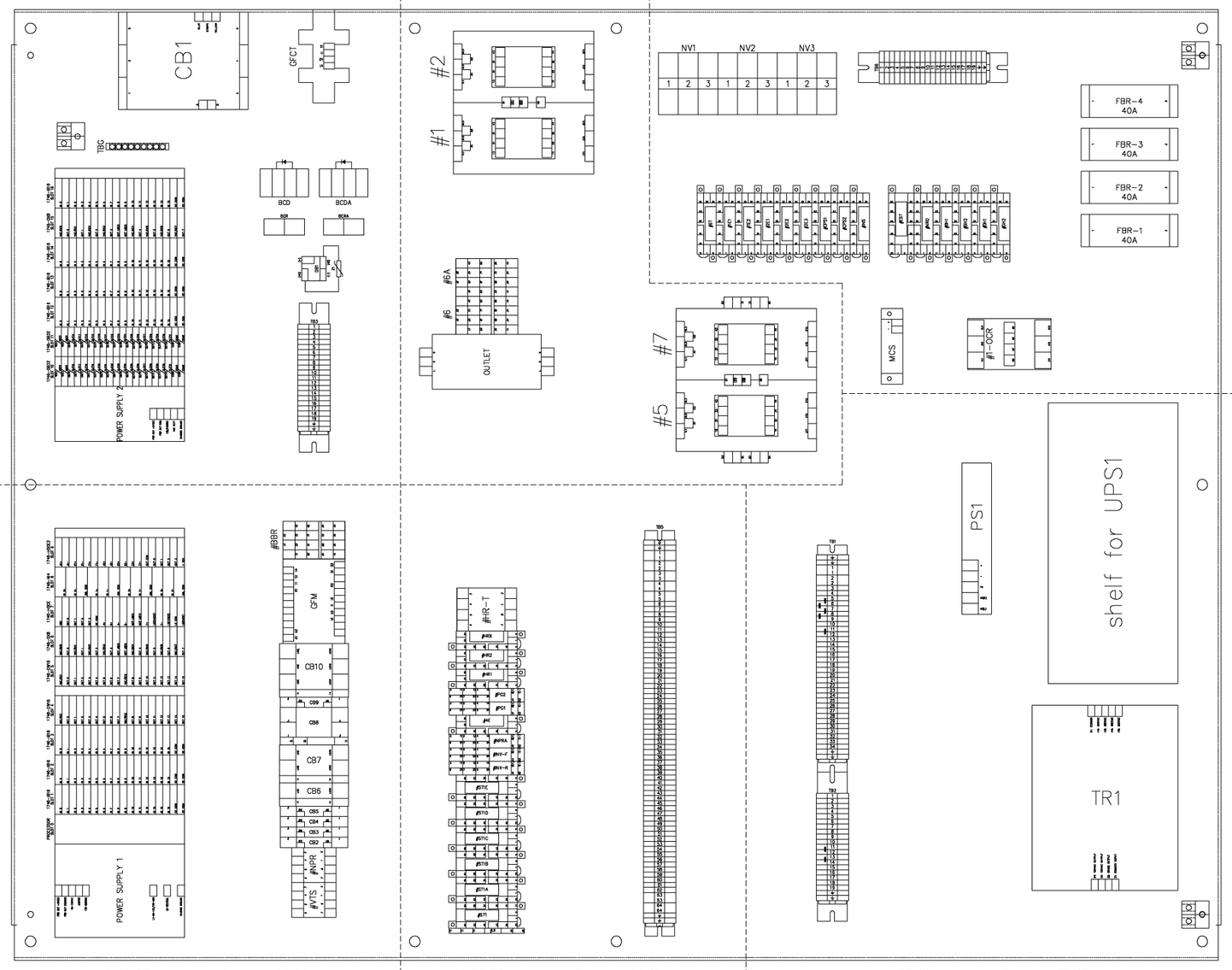
ACCEPTED FOR N.Y.C.T.A.

SIGNATURE DATE

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-483**

2881-AB-485 | 2881-AB-486 | 2881-AB-487



2881-AB-488 | 2881-AB-489 | 2881-AB-490

NEW YORK CITY TRANSIT

Drawing Prepared by:

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Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Master Chart

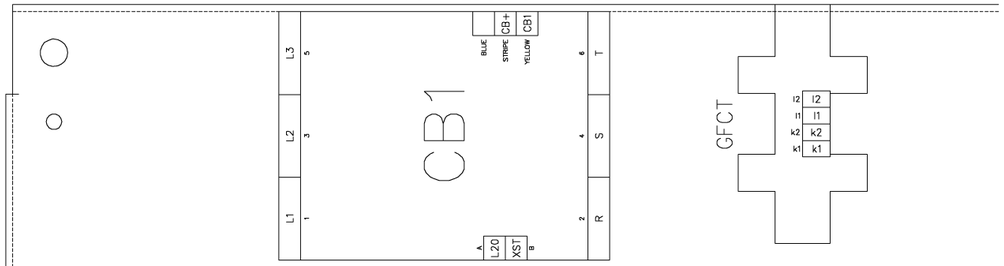
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

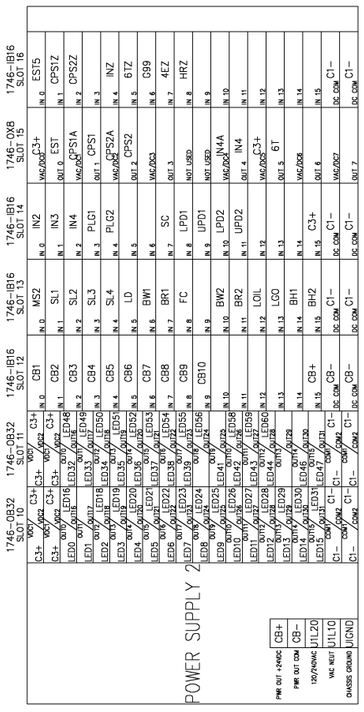
ACCEPTED FOR N.Y.C.T.A.

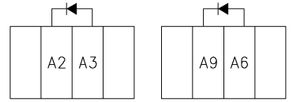
PROJECT MANAGER / DESIGNER DATE:

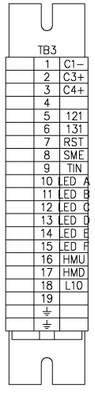
DRAWING NO. **2881-AB-484**

RIGHT EDGE OF PANEL









NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

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Lebanon, Ohio 45036
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SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Section 1/6

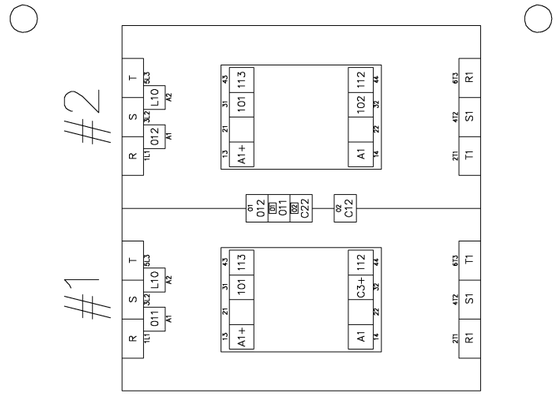
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

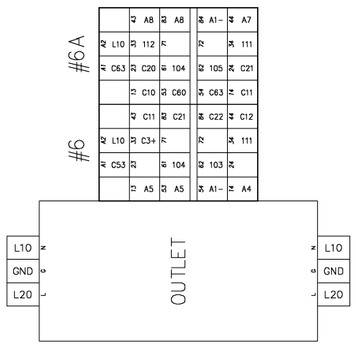
ACCEPTED FOR N.Y.C.T.A.

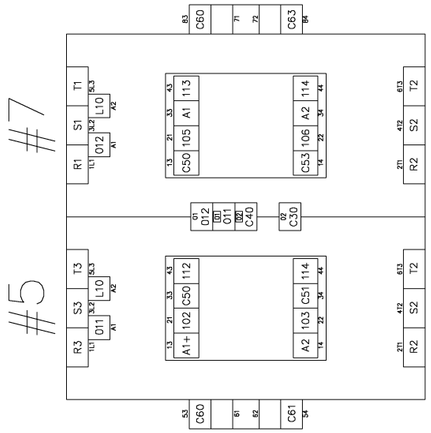
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-485**

RIGHT EDGE OF PANEL







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SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Section 2/6

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

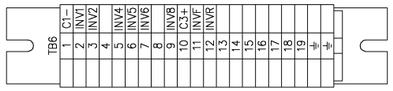
ACCEPTED FOR N.Y.C.T.A.

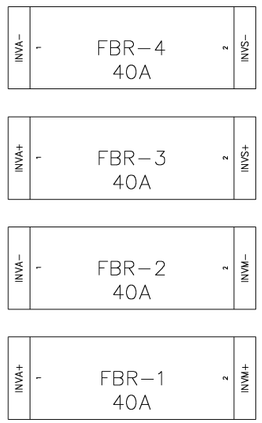
PROJECT MANAGER / DESIGNER DATE:

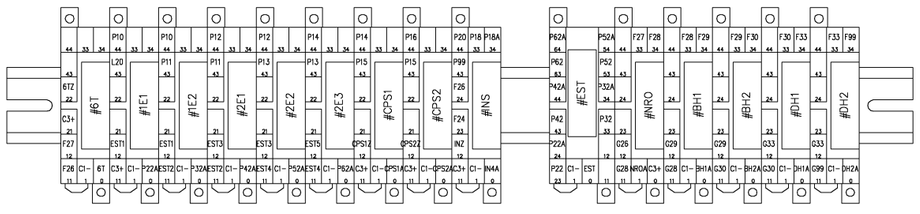
DRAWING NO.
2881-AB-486

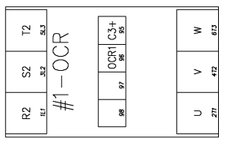
RIGHT EDGE OF PANEL

NV1			NV2			NV3		
1	2	3	1	2	3	1	2	3
R	S	T	R3	S3	T3	INVA+	INVA−	









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Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

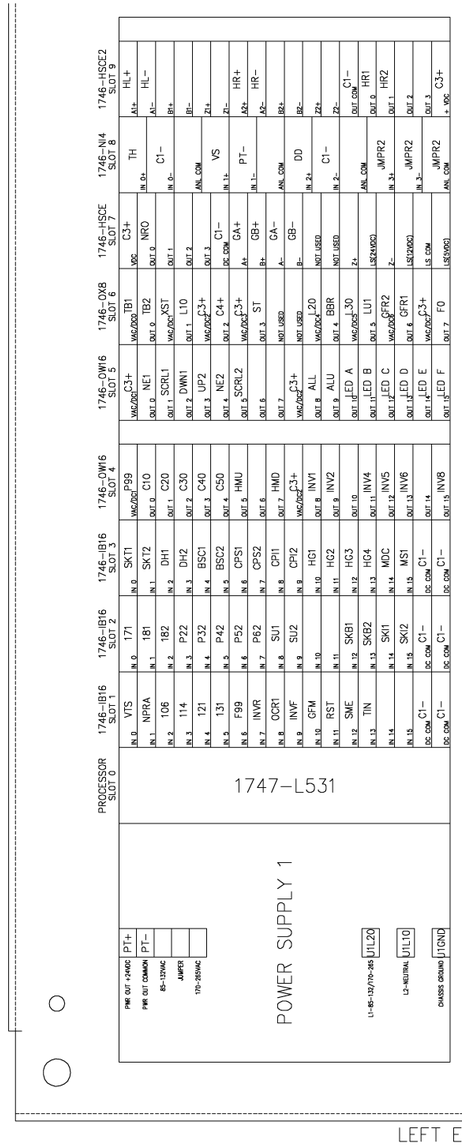
34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Section 3/6

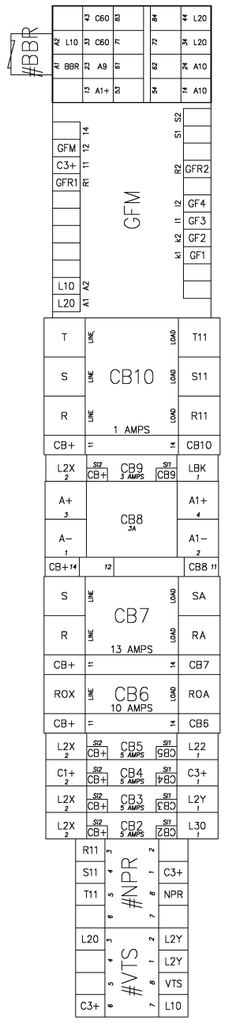
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-487**





LEFT EDGE OF PANEL

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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SIGNATURE DATE

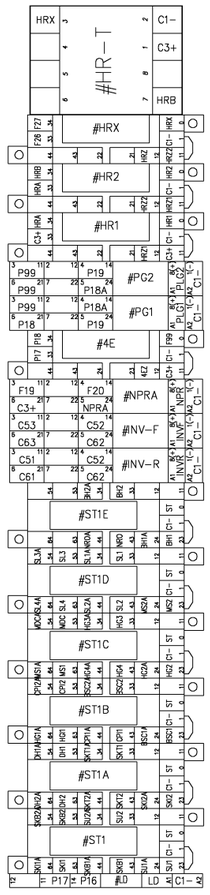
34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Sectoin 4/6

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO.
2881-AB-488



TB5

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1	171
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3	182
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4	P22
5	P32
5	P32
6	P42
7	P52
8	P62
9	SU1
10	SU2
11	
12	
13	SKB1
14	SKB2
15	SKI1
16	SKI2
17	SKT1
18	SKT2
19	DH1
20	DH2
21	BSC1
22	BSC2
23	CPS1
24	CPS2
25	CPI1
26	CPI2
27	HG1
28	HG2
29	HG3
30	HG4
31	MDC
32	MS1
33	MS2
34	SL1
35	SL2
36	SL3
37	SL4
38	LD
39	BW1
40	BR1
41	FC
42	
43	BW2
44	BR2
45	LOIL
46	LGO
47	BH1
48	BH2
49	IN2
50	IN3
51	IN4
52	PLG1
53	PLG2
54	
55	
56	SC
57	LPD1
58	UPD1
59	LPD2
60	UPD2
61	
62	
63	
63	
64	C3+
64	C3+
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LEFT EDGE OF PANEL

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

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SIGNATURE DATE

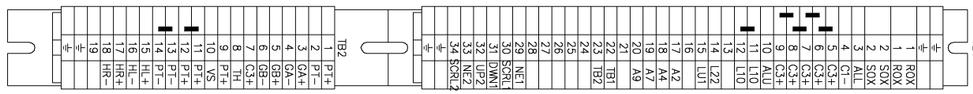
34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Section 5/6

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

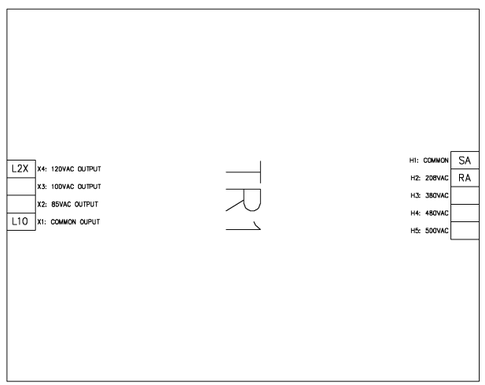
ACCEPTED FOR N.Y.C.T.A.

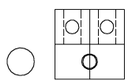
PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-489**



LEFT EDGE OF PANEL





NEW YORK CITY TRANSIT

Drawing Prepared by:

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Lebanon, Ohio 45036
TEL: (513)932-3000; FAX: (513)933-5502

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SIGNATURE DATE

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

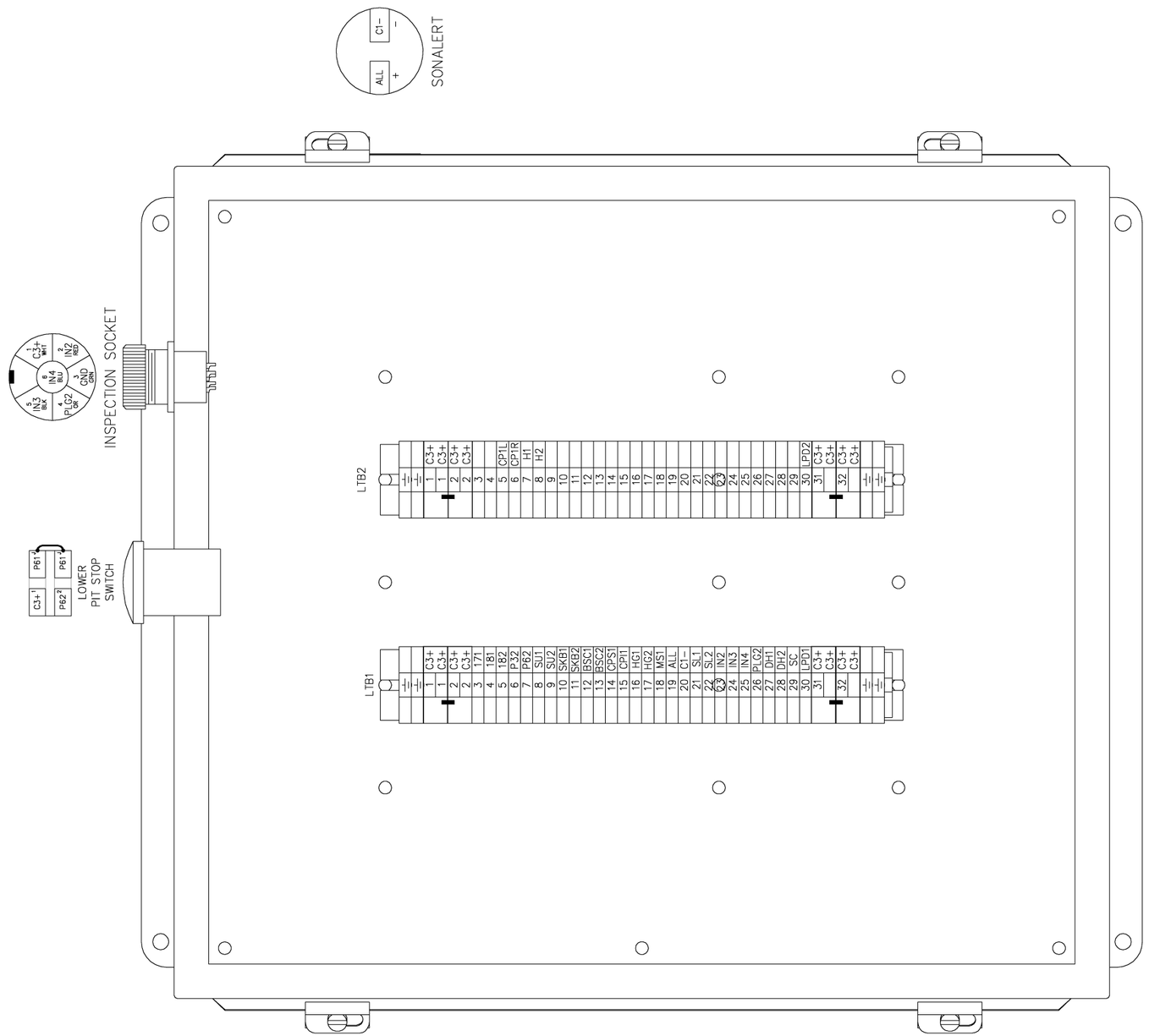
34th Street/Herald Square Station
Escalators E233-E236
Controller Line Number Table
Section 6/6

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-490**



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NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8600; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

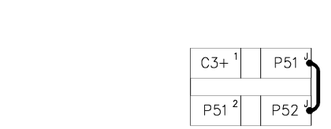
34th Street/Herald Square Station
Escalators E233-E236
Lower Junction Box
Line Number Table

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

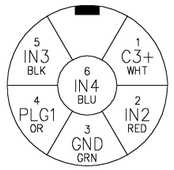
ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

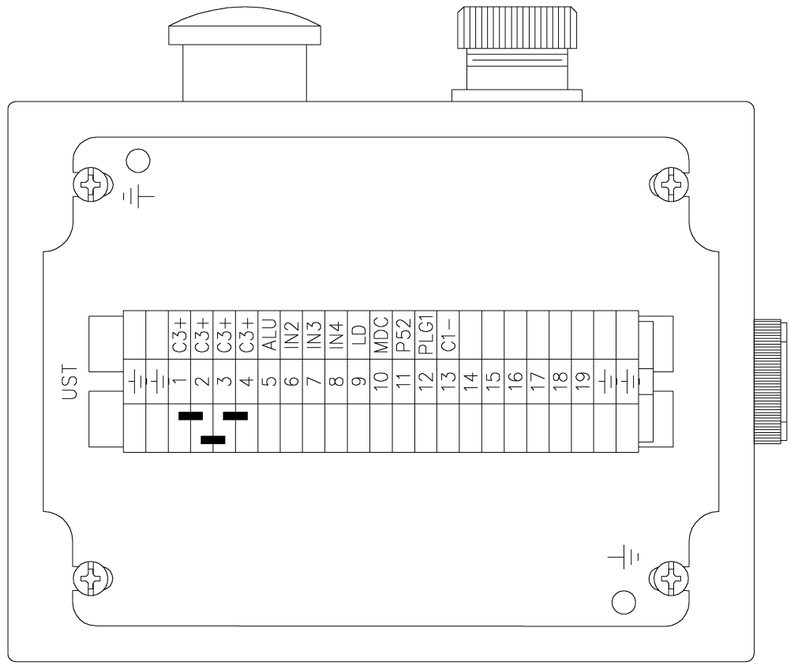
DRAWING NO. **2881-AB-491**

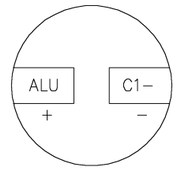


UPPER
PIT STOP
SWITCH



INSPECTION SOCKET





SONALERT

VIEW SHOWN WITH COVER REMOVED FOR CLARITY.

NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

FUJITEC AMERICA, INC.
401 Fujitec Drive
Lebanon, Ohio 45036
TEL: (513)932-8000; FAX: (513)933-5502

ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

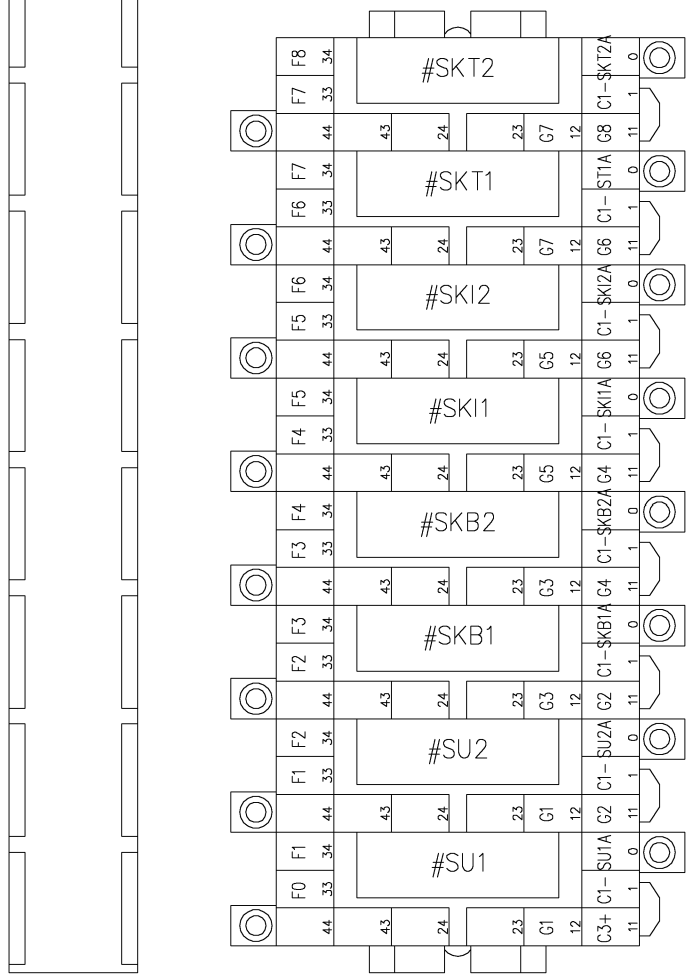
34th Street/Herald Square Station
Escalators E233-E236
Upper Service Switch
Line Number Table

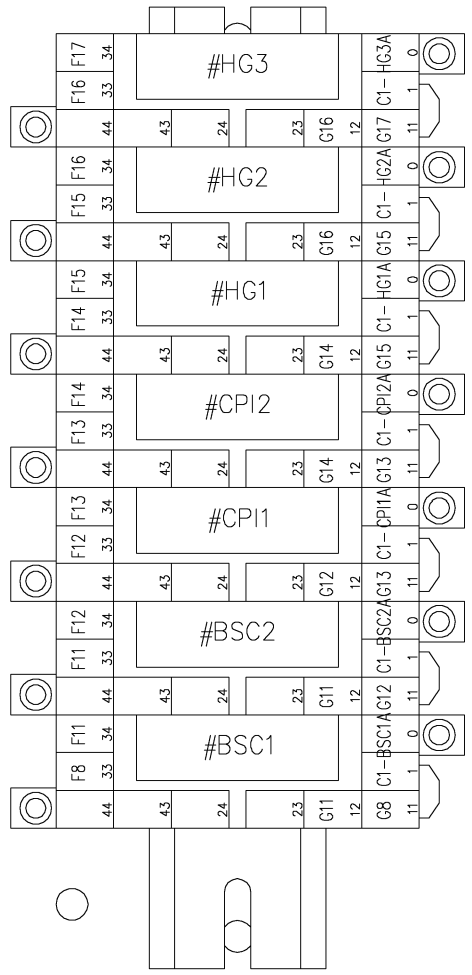
S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

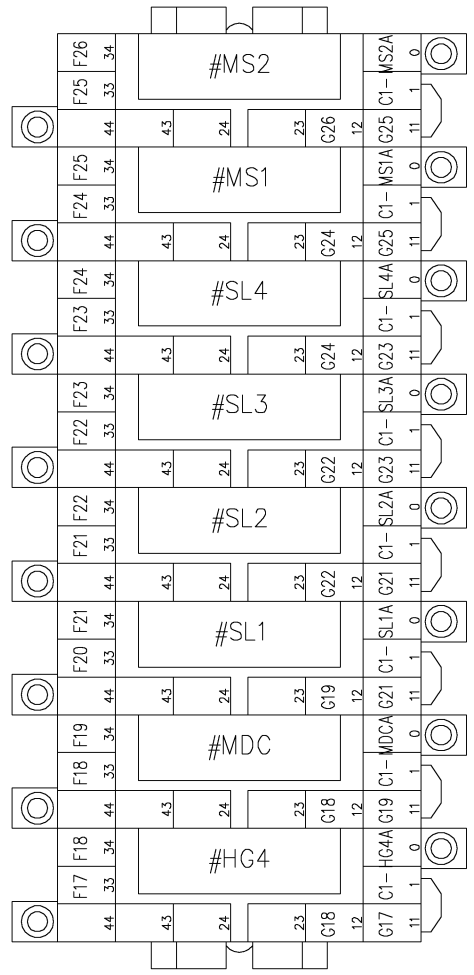
ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWNG NO. **2881-AB-492**







NEW YORK CITY TRANSIT

Contract E-34011
Furnishing and installing 12 Escalators at the 34th Street/Herald Square Station 6th Avenue Line

Drawing Prepared by:

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401 Fujitec Drive
Lebanon, Ohio 45036
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ALL DETAILS HAVE BEEN CHECKED FOR CORRECTNESS

SIGNATURE DATE

34th Street/Herald Square Station
Escalators E233-E236
Aux Controller Panel
Line Number Table

S. Nester	3/30/07	J. Shupe	3/30/07
DRAWN BY	DATE:	CHECKED BY	DATE:

ACCEPTED FOR N.Y.C.T.A.

PROJECT MANAGER / DESIGNER DATE:

DRAWING NO. **2881-AB-493**