Carbody

Troubleshooting

Course 308

Participant Guide

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Rail Car Training Consortium

FOR SME REVIEW

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MODULE 1

Troubleshooting The Carbody

Outline

Outcome and Objectives

This module presents a general overview to inspection and maintenance tasks on major components of the rail vehicle's carbody. Following the completion of this module, the participant should be able to complete the objectives with an accuracy of 75% or greater:

- Recall general steps for troubleshooting the carbody interior.
- Analyze and identify possible corrective actions for troubleshooting common carbody interior symptoms.
- Interpret a flowchart to recall troubleshooting practices and strategies.

Key Terms

- Emergency Light Fixtures
- Flowcharts
- Train Control Display (TCD)

Abbreviations

APTA	American Public Transportation Association
HRV	Heavy Rail Vehicle
LRV	Light Rail Vehicle
OTE	On-track Equipment
PPE	Personal Protective Equipment
RTS	Rail Transportation System

1-1 OVERVIEW TO TROUBLESHOOTING

Like all troubleshooting courses in the Rail Car Training Consortium series, this course on troubleshooting the carbody builds on the principles outlined in Course 300 *Troubleshooting Principles.* In that course the participant is presented with an overview of the troubleshooting process along with related general strategies, tips and pitfalls. Troubleshooting in that course is defined as "a systematic approach to find the source of a problem in an effort to restore an operation or process." In other words, troubleshooting is complex problem solving in a methodical and organized manner and an orderly and logical approach is required.

General Approach to Troubleshooting

When troubleshooting the carbody interior, there are four general steps to take:

1. Obtain as much information about the problem as possible. Make every attempt to understand the malfunction, including the event conditions (weather, location, etc.) and whether the problem is local (one car or married pair) or trainline (more than one car or system affected).

2. If the problem can be duplicated, do so and leave it in the failed state before attempting any sort of troubleshooting. This step serves two purposes:

    a. It identifies the nature of the problem and verifies the information in the trouble report.

    b. It provides a knowledgeable starting point, eliminating any random attempts to correct the fault condition.

> **Note**
>
> When a fault is identified, it is important to retain the fault condition. Avoid the impulse to cycle faulty equipment until it becomes operative. The fault might clear itself temporarily but the problem could reoccur.

3. After the problem has been duplicated (captured in its failed state), it is usually necessary to isolate the problem. It is possible to isolate the system causing the problem through use of control indicators and external indicator lights. A combination of systems may be affected, so check all enunciators, indicators, and circuit breakers.

4. When the failed part has been located, install a new part and verify it is operational before returning the vehicle to service.

This course gets right into troubleshooting common reported problems with the rail vehicle's carbody. This course draws on the many years of combined experience of the subject matter experts in the Consortium as well as resources from their agencies. By the time you are taking this course, you would have already inspected, maintained, and even applied troubleshooting to

1-2 CARBODY INTERIOR

Operator Cab

The most common problems reported with the operator cab are the malfunctions of the cab heat and the operator seat. Please note that windshield wiper troubleshooting is discussed in the Section 1-2. Tables 1 and 2 suggest troubleshooting these issues.

Table 1
Malfunctioning Heater Troubleshooting Table

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
Operator reports cab heater is not functioning.	If no recent issues but a heater exchange, may be faulty car wires.	Probe carbody with multimeter; Monitor voltage with heater on.	Replace heater as soon as possible.
	High ambient heat.	Visually inspect carbody; Visually inspect ducting.	

Table 2
Operator Seat Troubleshooting

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
Operator seat is not adjusting.	Faulty motor/terminals switch/micro switch/ push buttons?	Conduct voltage check; Conduct pressure check.	Repair/remove/replace faulty wires/parts. Follow-up check during parking inspection.
	Gas spring/sprig; Faulty/leaking solenoids.	Check hose connection.	Repair/remove/replace faulty wires/parts. Follow-up check during parking inspection.
	Non/poorly lubricated; Dirty switches.	Inspect switches, move seat up & down.	Repair/remove/replace/clean faulty wires/parts. Follow-up check during parking inspection.
Suspension bounces excessively.	Shock absorber seals worn.	Check shocks.	Replace shocks.
Air leak from seat.	• Air line is leaking at connector, bulkhead fitting. • Air line is cut.	Manually check for air leaks.	• Tighten or reconnect a fitting. • Replace air line. • Replace valve.

Water Leaks

Water leaking into the rail car is a common problem that may the result of several causes.

Table 4
Water Leak Troubleshooting Table

SYMPTOM	PROBABLE CAUSE	TESTS AND CHECKS	CORRECTIVE ACTION
There is evidence of corrosion around screws, water trails or pools of water, indicating a water leak.	There is a hole in the roof of the carbody.	Run the carbody through a car wash, use a hose, spray suspected areas (water test).	Use sealant material (Flex tape, putty, etc.)
	There is a hole in the window seals of the carbody.	Manually examine areas for wetness.	Repair/replace any holes in sealant.
	There is a hole in the HVAC unit, or a clog in the HVAC drains.	Inspect HVAC unit for any ruptures or openings.	If HVAC drip pan drains are clogged, clean out the drains.
	There is a hole in the door seals of the carbody.		Repair/replace any holes in sealant.

Interior Lighting

Maintenance and troubleshooting procedures for lighting equipment are dependent on the make, model, type of the rail car as well as the standard operating procedures of the rail transportation system.

Troubleshooting interior lights first involves making sure that the malfunctions are not the result of power distribution and/or wiring faults in the rail car. For example, if several main interior light fixtures are out, power may have been lost on an entire light string. Refer to the rail car OEM manual to identify the main light fixtures on electrical series circuit.

Learning Application 1B

From the OEM manuals of the rail cars on which you work, locate schematic and/or electrical diagrams of the interior lighting system. See Figure 2 which is of the vehicles used by PATCO, the rapid transit third rail system that runs between Philadelphia, Pennsylvania and Camden County, New Jersey.

Why would you need to consult these types of diagrams when troubleshooting interior lighting?

1-3 CARBODY EXTERIOR

Exterior Lighting

With exterior lighting – head lights, tail lights, indicator lights – the symptom where the light does not illuminate are probably caused by:

1. Defective lamp.
2. Cracked lens.
3. Water ingress.

The corrective action for each of these probable causes is to replace the component.

Flowcharts for Troubleshooting

Figure 2 and Figure 3 are **flowcharts** – diagrams that represents a workflow or process with different shapes as various outcomes from a series of decisions – that can help the rail car technician troubleshoot common problems with the windshield heating element and the windshield washer.

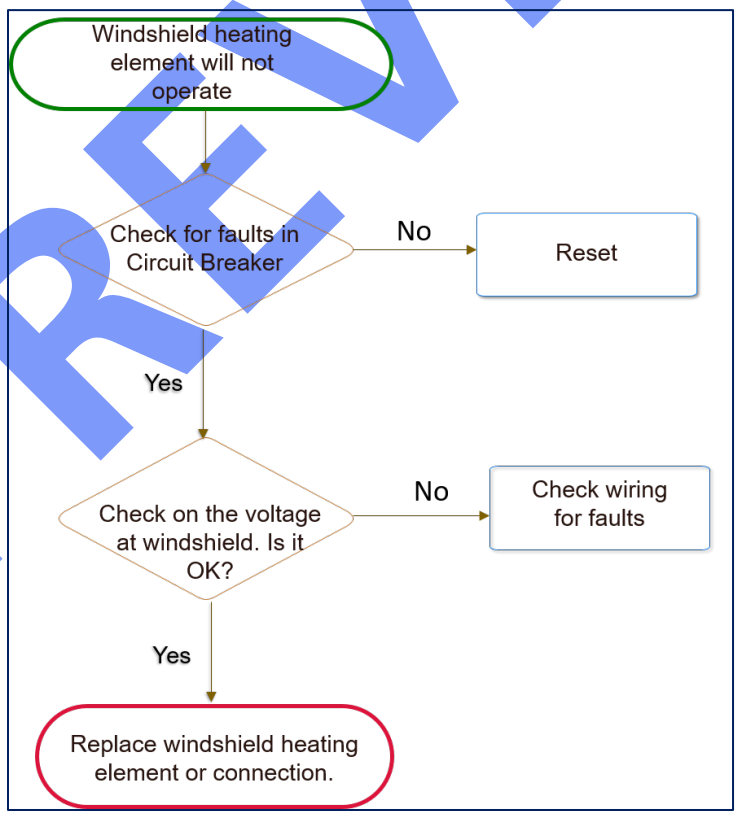

Figure 3 Flow Chart for Troubleshooting Inoperative Electrical Windshield Heater