

Troubleshooting Rail Vehicle Couplers

Course 301



PARTICIPANT GUIDE

 RAIL CAR TRAINING CONSORTIUM

Rail Vehicle Couplers

Troubleshooting

Course 301

Participant Guide

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REVISION INDEX

Any additions, deletions, or revisions are to be listed below.

Revision No.	Date	Section	Description of Change	Revision Author

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HOW TO USE THE PARTICIPANT GUIDE

Purpose of the Course

Course 301, *Troubleshooting Rail Vehicle Coupler*, provides participants with common troubleshooting scenarios a rail car may experience when working with couplers.

Approach of the Book

Each course module begins with an outline, a statement of purpose and objectives, and a list of key terms. The outline will discuss the main topics to be addressed in the module. A list of *key terms* identifies important terminology that will be introduced in this module. *Learning objectives* define the basic skills, knowledge, and abilities course participants should be able to demonstrate to show that they have learned the material presented in the module. *Exercises* are built in throughout the course materials to assist the participants in learning and reviewing key information.

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MODULE 1

Troubleshooting the Coupler

Outline

- 1-1 Overview
- 1-2 Failure to Couple
- 1-3 Failure to Uncouple
- 1-4 Mechanical Coupler Common Problems
- 1-5 Electrical Coupler Common Problems
- 1-6 Pneumatic Coupler Common Problems
- 1-7 Summary

Purpose and Objectives

The purpose of this module is to provide participants with an overview to on troubleshooting the rail vehicle coupler.

Following the completion of this module, the participant should be able to complete the objectives with an accuracy of 75% or greater:

- Explain how to troubleshoot common problems when the coupler fails to couple
- Explain how to troubleshoot common problems when the coupler fails to uncouple
- Explain how to troubleshoot common problems with the Mechanical Coupler
- Explain how to troubleshoot common problems with the Electrical Coupler
- Explain how to troubleshoot common problems with the Pneumatic Coupler

Key Terms

- Failure
- Mechanical
- Couple
- Electrical
- Uncouple
- Pneumatic

1-1 OVERVIEW

Like all troubleshooting courses in the Rail Car Training Consortium series, this course on Couplers 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 Course 300 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.

This course gets right into troubleshooting common reported problems with the rail vehicle’s coupler. 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 the rail vehicle’s coupler. You are therefore encouraged to draw on your own experiences as you go through this course.

Because there are many variations in rail car types and systems, this course cannot be a one-size-fits-all course on troubleshooting all types of couplers on rail cars. Rather, the goal of this course is to highlight common troubleshooting scenarios that the rail car technician can analyze and apply to similar situations at his or her transportation agency. For the participant therefore, the approach to this course should be that of potentially reproducing the problem, applying their agency’s tools to the problem, and finally synthesizing their knowledge and skills.

Course 301 jumps right into troubleshooting mechanical, electrical and pneumatic coupler components. A troubleshooting table is presented with three columns:

- Symptom
- Probable Cause
- Corrective Action

Symptom	Probable Cause	Corrective Action

The tables presented are useful however, additional agency specific information may be needed. Therefore, participants are encouraged to add their notes and observations to these tables during training. Additionally, this course will not cover all scenarios for troubleshooting the coupler, but will discuss the most common problems.

1-2 FAILURE TO COUPLE

The chart below identifies some common problems with the coupler when it fails to couple. It should also be noted that, in some instances, the vehicle will experience a soft couple, in which there is not enough force to actually couple. The vehicles may look as if they are coupled together, however, when the operator pulls out, the trains will come apart. The pins will lose contact and the train will not move because trainline signals have been lost. On some newer model trains, a train control display in the operator's cab will signal there is a failure and go into emergency mode.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Automatic coupling fails	Coupler not in proper position	Cycle coupler until it is in proper position
	Corrosion on pins and mating devices	Clean and lubricate (<i>if corrosion is bad enough, may need to overhaul</i>)
	Debris in the coupler	Clean
	Mechanical damage (hook, linkage springs)	Repair and replace, as necessary
Agency Specific:		
Agency Specific:		

1-3 FAILURE TO UNCOUPLE

When rail cars fail to fully uncouple from one another, the electrical heads disconnect but the mechanical heads do not. Therefore, the vehicle cannot take off from position. Below are some common troubleshooting problems when the vehicle fails to uncouple completely.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Manual uncoupling fails	Broken components	Replace broken components
	Frozen couplers	Thaw out couplers – couplers are brought into the shop to warm up. Sometimes, cleaners are used to help.
Automatic uncoupling fails	Valves (leaking valves, damaged valves)	Replaced
	Linear actuator motor	Replaced
	Circuit breakers popping (there is too much current to run the motor)	Replaced
	Corroded gear boxes	Replaced
Electrical uncoupling fails	Electrical head	Replaced
	Frozen pins	Coupler heater not operating. May just need to be thawed out.
	Linear actuator/motor	Replaced
	Valves (leaking valves, damaged valves)	Replaced

Agency Specific:		
Agency Specific:		

1-4 MECHANICAL COUPLER COMMON PROBLEMS

The chart below provides common problems with the mechanical coupler. As troubleshooting is often specific to the individual agency, participants should take notes where there are any differences than what is explained below.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Coupler heads do not go back to original share	Wear and tear	Replace grommet (rubber seal)
Physical damage to hook and eye	<ul style="list-style-type: none"> • Hook and eye may be mechanically stuck • Broken spring attached to hook plate • Corrosion and dirt 	<ul style="list-style-type: none"> • Clean • Replace
Couplers not locking	Lock is damaged	Replace
Damage to alignment horn	<ul style="list-style-type: none"> • Damage to horn due to hitting object • Wear and tear 	<ul style="list-style-type: none"> • Visually check for damage • Remove and replace
Hard couple	Excessive force due to coupling at speed greater than 5mph	Visual inspection of coupler components to check for physical damage
Coupler not centering	Centering device damaged; causes excessive noise	Replace
Train comes to stop without indication and/or	Trainline cables <ul style="list-style-type: none"> • Physically worn due to hitting debris on tracks • Corrosion 	Replace cables

door loop not operating		
Agency Specific:		
Agency Specific:		

1-5 ELECTRICAL COUPLER COMMON PROBLEMS

The chart below provides common problems with the electrical coupler. As troubleshooting is often specific to the individual agency, participants should take notes where there are any differences than what is explained below.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Electrical heads filled with water	Seals are damaged	Replace seals
Trainline signal does not transfer from vehicle to vehicle	<ul style="list-style-type: none"> • Electrical pins <ul style="list-style-type: none"> ○ Issue with pin height ○ Pins stuck 	<ul style="list-style-type: none"> • Clean pins • Replace pins
Pin heads freeze up in cold weather	<ul style="list-style-type: none"> • Electrical coupler heaters not working 	*difficult problem to diagnose. By the time vehicle gets to the shop, pins unfreeze.
Actuation for coupling head; does not actuate or release	May be electrical or pneumatic issue <ul style="list-style-type: none"> • Electrical <ul style="list-style-type: none"> ○ Loose connector ○ Broken wire causing ground • Pneumatic <ul style="list-style-type: none"> ○ Solenoid valve may not be working 	<ul style="list-style-type: none"> • Repair or replace wire/connector • Repair or replace valve
	Gear boxes attached to actuator fill up with water	

Mating Coupler face not detected	Proximity switch <ul style="list-style-type: none"> • Jammed • Dirt, debris 	<ul style="list-style-type: none"> • Clean • Replace
Temperature switch failed	Electrical heater (the coupler is hot)	Replace temperature switch
Agency Specific:		
Agency Specific:		

1-6 PNEUMATIC COUPLER COMMON PROBLEMS

Troubleshooting on the pneumatic coupler is fairly limited. A few

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cars are not coupling	Solenoid valve not working	Replace solenoid valve
	Hose damaged from debris on ground	Replace hose
Pneumatic uncoupling device is not working	Seals are worn or damaged causing air to leak. Air does not transfer from one coupler to another	Replace seals
Agency Specific:		
Agency Specific:		

1-7 TROUBLESHOOTING SCENARIOS



Below are two troubleshooting scenarios a rail car technician may encounter on the job. Work together to find a solution to each problem.

Scenario 1

Problem: The electrical coupler heads will not move into, or out of position and therefore, there is no trainline communication. How would you troubleshoot the problem?

Solution:

Scenario 2

Problem: A “No brake” communication is made to OCC that there is no propulsion. Determine which vehicle is causing the problem.

Solution:

1-8 SUMMARY

This module guided the participant through common troubleshooting scenarios which included: failure to couple, failure to uncouple, problems with the mechanical, electrical and pneumatic coupler. The participant was also provided opportunities to work through two troubleshooting scenarios he may experience on the job. As troubleshooting is not a one-size fits all approach, the participant was strongly encouraged to take agency specific notes for future reference.