

Introduction and Overview to Couplers

Course 101



PARTICIPANT GUIDE

 RAIL CAR TRAINING CONSORTIUM

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MODULE 1

Introduction and Overview to Couplers

Outline

- 1-1 Overview to Couplers**
- 1-2 Types of Couplers**
- 1-3 Coupler Components Overview**
- 1-4 Summary**

Purpose and Objectives

The purpose of this module is to provide participants with an overview to the principle of operation of couplers and different types of couplers used on rail vehicles.

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

- Explain the principle of operation of couplers
- Identify different types of couplers
- Explain the general definition of coupler components

Key Terms

- Coupler
- Automatic
- Manual
- Buckeye
- Scharfenburg
- Tomlinson

1-1 OVERVIEW TO COUPLERS

Couplers provide a mechanical, electrical and/or pneumatic connection between rail vehicles, which allows for trainline communication. Couplers may be **Automatic** or **Manual**. The automatic coupler enables automatic coupling of railway vehicles. Coupling of two units is achieved without manual assistance by driving one unit up to a second unit. Automatic coupling is even possible, if the two units horizontally and vertically are not in alignment. The coupler permits coupled trains to negotiate vertical and horizontal curves and allows rotational movements. Each coupler assembly is provided with electric heads to achieve electric coupling. Uncoupling is done automatically by remote control from the driver's cab or manually from trackside. After uncoupling and separation of the cars, the coupler is again ready to couple.

Coupler Functions:

- Provides a mechanical connection between two rail cars
- Provides electrical connection between two rail cars
- Allows for travel on vertical and horizontal curves
- Allows rotational movement

Automatic couplers couple and uncouple vehicle with the assistance of electro-pneumatic energy. The process to automatically couple vehicles is started from within the operator's cab. Automatic couplers have a manual option, as a back-up.

Manual couplers do not use the electro-pneumatic function. Manual couplers are able to couple without assistance but do require the uncoupling process to be done manually, at train-side. The steps and procedures for automatically and manually coupling and uncoupling vehicles will be discussed in a later module.

Vehicles may use the process of automatic or manual coupling and uncoupling. Regardless, the coupling function allows for trainline communication between vehicles, which includes:

- Door controls
- Network
- Propulsion and Brakes

Figure 1.1, provided by PATCO, shows a front and side view of the coupler's location on the rail vehicle.

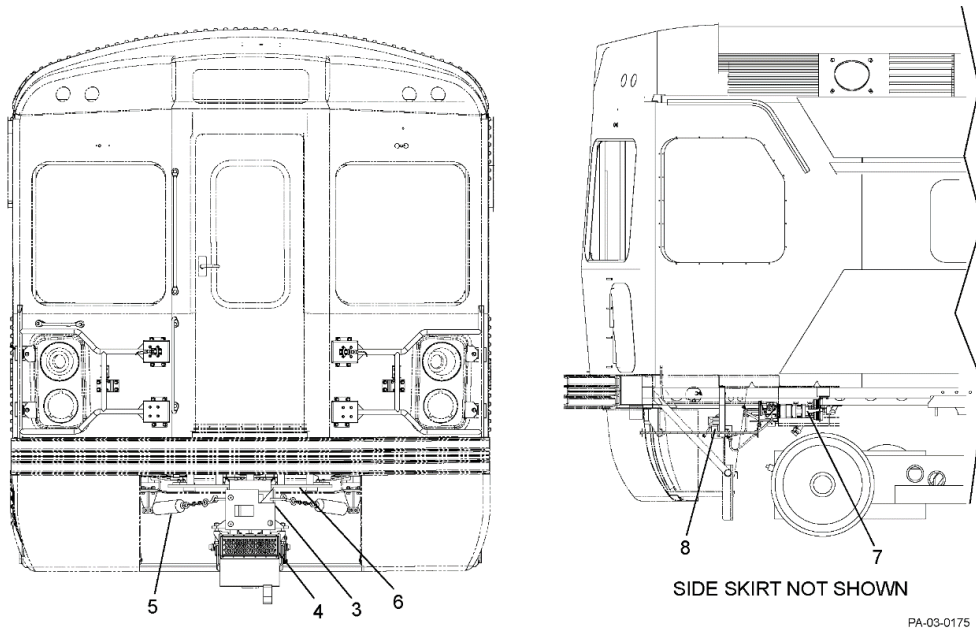


Figure 1.1, Coupler Location, Courtesy of Patco

1-2 TYPES OF COUPLERS

This course will cover three main types of couplers; Scharfenburg, Tomlinson and Buckeye. Although the theory of all couplers is the same, different types of couplers will have varying components and functions. Below you will find a high-level overview of each type of coupler. Subsequent Modules will go into much greater detail and explain each individual component on the specific type of coupler.

The Scharfenburg Coupler

The Scharfenburg automatic coupler is a design widely used on European multiple unit rolling stock of all types, ranging from high speed trains to light rail vehicles. The coupler has a mechanical portion with pneumatic and electrical connections. The units are coupled by pushing one onto the other. The electrical contacts mounted under the mechanical coupler are protected by a cover when uncoupled. The electrical contacts can be mounted on the sides of the coupler.

One of the earliest tight coupling mechanisms was the Scharfenburg coupler, (developed in 1903) which is still widely used. Its most serious problem is that it's not very strong, limited to about 1,000 tons, and thus only suitable for slower-speed passenger trains (not high-speed trains, and definitely not freight trains).

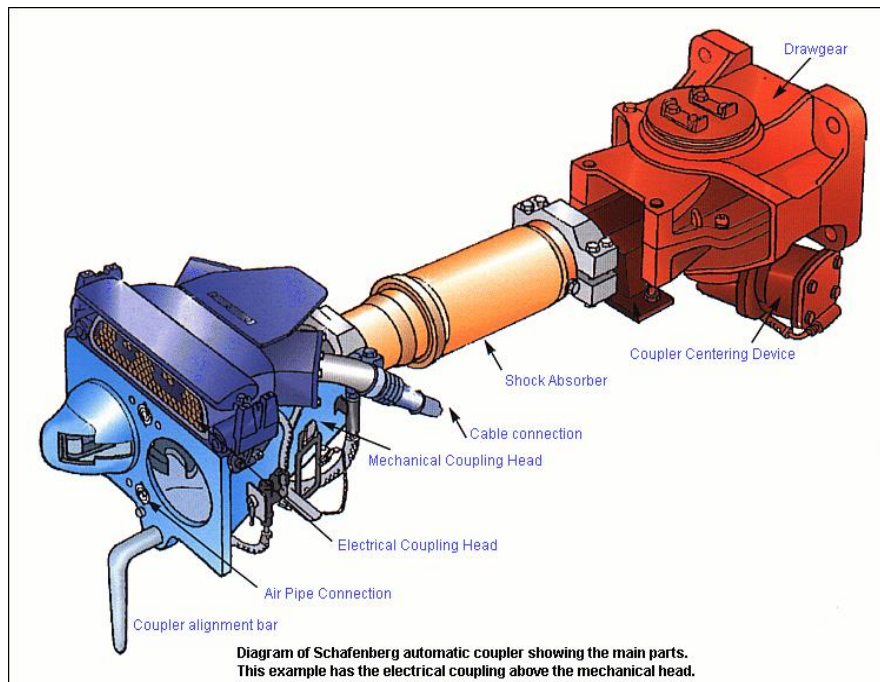


Figure 1.2 Scharfenburg Coupler

The Tomlinson Coupler

The Tomlinson coupler was developed by the Ohio Brass Company for mass transit. This coupler consists of two squared metal hooks that engage with each other in a larger rectangular frame with the air line connections above and below. The Tomlinson is the most widely used fully automatic heavy rail coupler in North America.



Figure 1.3 Tomlinson Coupler

The Buckeye Coupler

In 1873, Eli H. Janney patented a knuckle style coupler that was to become the standard for the freight car couplers used even today. The coupler had a bifurcated draw head and a revolving hook, which, when brought in contact with another coupler, would automatically interlock with its mate.

The Janney coupler had several advantages over link and pin couplers. Not only did it alleviate the problem of loose parts that plagued the link and pin coupler, it also allowed rail workers to couple and uncouple cars without having to go between the cars to guide the link and set the pin. One commentator described the automatic coupling operation as follows:

“While the cars were apart, the brakeman had to make sure the knuckle of the coupler on the waiting car stood in an open position and that the pin had been lifted into its set position. When the opposite coupler was closed and locked in position, the brakeman was able to stand safely out of the way and signal the engineer to move the cars together. When the knuckle of the coupler of the moving car hit the lever arm of the revolving knuckle on the open coupler, it revolved around the locked one, while concurrently the locking pin dropped automatically from its set position into the coupler, locking the knuckle in place. Although the brakeman had to set up the entire situation by hand, the actual locking operation was automatic and did not require the brakeman to stand between the cars.”

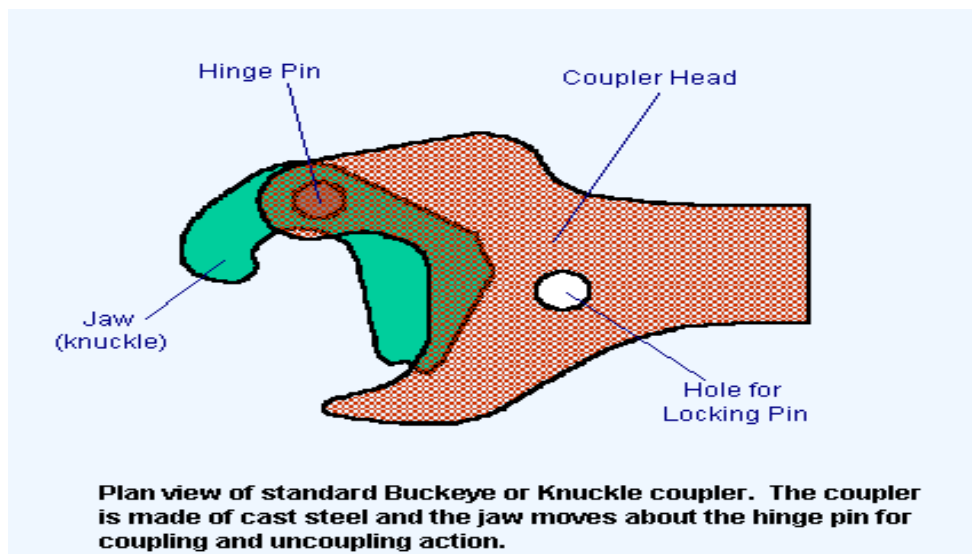


Figure 1.4 Buckeye Coupler

1-3 COUPLER COMPONENTS OVERVIEW

This section will provide a high-level overview of the coupler components. Specific nomenclature and functions will be discussed in later modules. The following table is divided into pneumatical, electrical and pneumatic components of the automatic coupler.

COMPONENT	DEFINITION
MECHANICAL PARTS TO THE COUPLER	
Anchorage Device:	Attaches the automatic coupler to the car underbody coupler assembly
Centering Device:	Positions the coupler in the center location of the uncoupled end of a car, both vertically and horizontally
Draft Gear:	Protects the railcar by absorbing energy associated with pushing, pulling, starting, stopping and coupling
Guiding Horn:	Helps to guide the coupler into place during the coupling process
Latching Device:	Helps to “latch” the male and female cones on the mechanical coupler head
Mechanical Coupler Head:	Ensures mechanical connection of two vehicles
Suspension:	Holds coupler parallel to running rails
Uncoupling Device:	Allows for the uncoupling of vehicles
ELECTRICAL PARTS TO THE COUPLER	
Coupler Control:	<ul style="list-style-type: none"> • Uncoupling switch – Operates coupler release (solenoid valve/actuator) • Solenoid valves – supplies air to uncouple cylinder (rotary switch, actuator) • Coupler control cutout – isolates electrical signals
Electrical Coupler Head:	Houses the electrical pins
Electrical Head Door:	Covers the electrical pins
Electrical Pins:	Electrical contacts which may be fixed or moving
Heater:	Keeps pins dry and prevents from freezing

Linear Actuator:	Moves coupler head into place
Proximity Switch:	Allows the coupler head to move into position
Rotary Switch:	Electrically connects coupler head wiring to carbody
Trainline Cables:	Connects coupler heads to carbody
PNEUMATIC PARTS TO THE COUPLER	
Air Filter:	Prevents moisture, debris and contaminants from accumulating in the pneumatic coupler airline
Air Lines:	Carry pneumatic air to the electric and mechanical coupler
Impulse Valve:	Controls multiple valve functions by means of pneumatic air
Tappet Valve:	Transmits pneumatic air between rail car vehicles during the coupling process

1-4 SUMMARY

This Module provided the learner with the theory of operation of rail vehicle couplers. A brief history and overview of three types of couplers; Scharfenburg, Tomlinson and Buckeye was provided. General definitions for coupler components was also provided and can serve as a reference point for future needs.

MODULE 2

The Scharfenburg Coupler

Outline

2-1 Overview to the Scharfenburg Coupler

2-2 Mechanical Parts to the Scharfenburg Coupler

2-3 Electrical Parts to the Scharfenburg Coupler

2-4 Pneumatic Parts to the Scharfenburg Coupler

2-5 Future of Technology

2-6 Summary

Purpose and Objectives

The purpose of this module is to provide participants with an overview to the mechanical, electrical and pneumatic parts to the Scharfenburg Coupler.

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

- Identify and explain the function of mechanical components to the Scharfenburg Coupler
- Identify and explain the function of electrical components to the Scharfenburg Coupler
- Identify and explain the function of pneumatic components to the Scharfenburg Coupler

Key Terms

- Coupler Head
- Latching Device
- Centering Device
- Draft Gear
- Uncoupling Device
- Suspension Attachment
- Switches
- Cables
- Linear Actuator
- Valves
- Electrical Pins

2-1 OVERVIEW TO THE SCHARFENBURG COUPLER

Module 2 will discuss components specific to the Scharfenburg Coupler. In an effort to show how all mechanical components are related in context, this module will use line diagrams from the Scharfenburg Coupler used at CATS, in addition to photos provided by Rail Car Consortium Member Agencies.

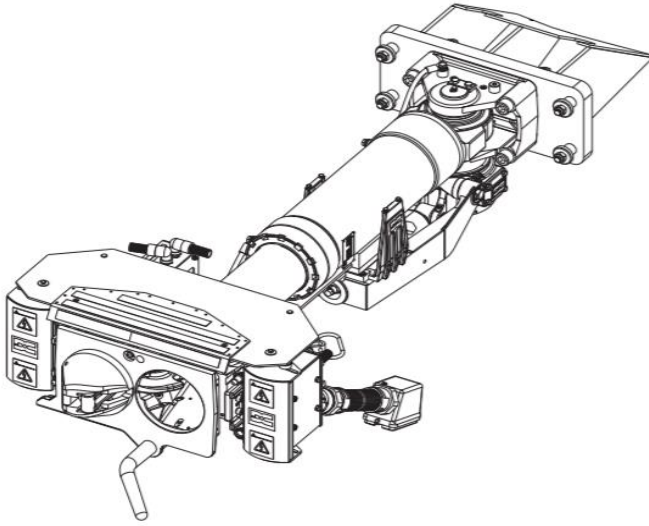


Figure 2.1, Scharfenburg Coupler, Courtesy of CATS

This Module will be divided into three sections; mechanical, electrical and pneumatic parts to the Scharfenburg coupler. The chart below identifies the components which will be discussed in each section.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	

Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

2-2 MECHANICAL PARTS TO THE SCHARFENBURG COUPLER

Mechanical Coupler Head

The mechanical coupler head ensures the mechanical connection of two vehicles. The mechanical heads have a male and female cone, which allow for automatic alignment and coupling. The **block**, which is outlined in red in **Figure 2.2**, houses the hook and link.

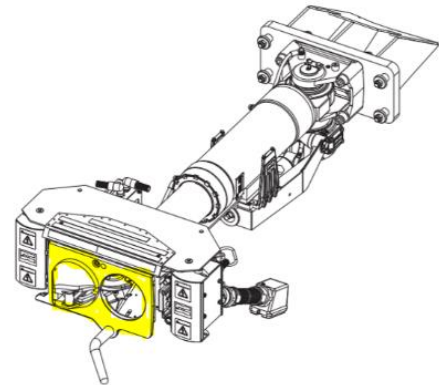
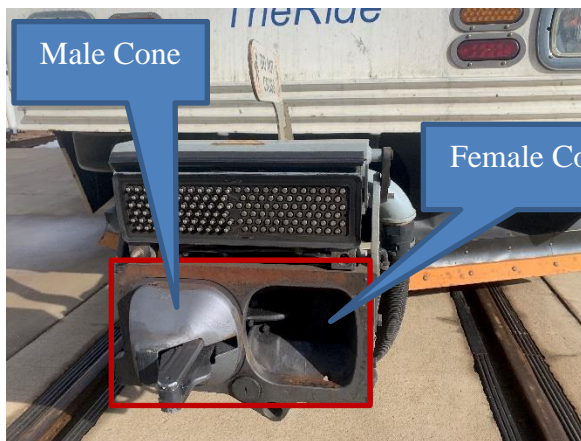


Figure 2.2 Mechanical Coupler Head, Courtesy of RTD

Latching Device

The Coupling **Link** and **Hook Plate** make up the latching device on the mechanical coupler. They are encased in the coupler head, when coupled, for protection from the environment. The traction loads are transmitted through the coupling link and hook plate to the buffer assembly.

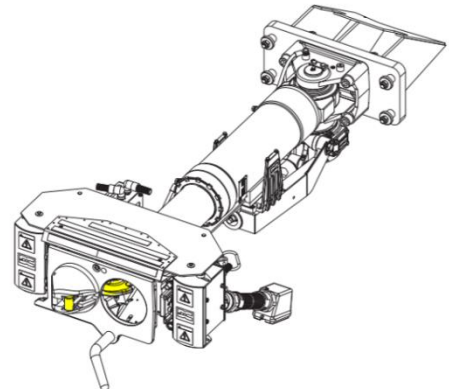
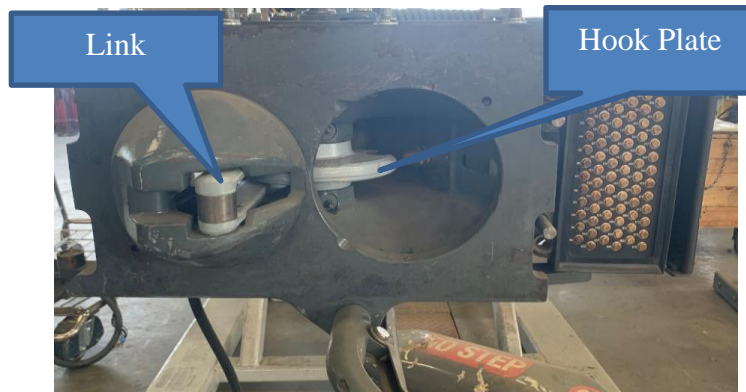


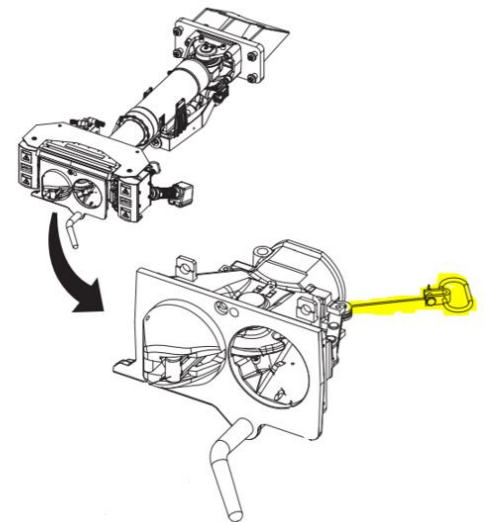
Figure 2.3 Latching Device, Courtesy of SacRT

Uncoupling Device

The **uncoupling device** enables the release of the coupler locks. It may be a handle, lever or cable with lever. The uncoupling process is initiated from the operator's cab, by pressing the *uncouple* button. When the uncoupling process is initiated, the uncouple motor is powered on and turns the hooked plate and releases the links on the latching device. Manual uncoupling can also be accomplished in the event of an emergency or a failure with the uncoupling device, by means of an **uncoupling handle**.



Figure 2.4 Uncoupling Handle, Courtesy of RTD



Suspension Attachment

The suspension attachment is intended to transfer the movement of the linear actuator to the electrical coupler(s) and hold the coupler parallel to the running rails. It consists of a bridge, operating arms, latch and connecting shaft. The suspension attachment is located on both sides of the mechanical coupler.

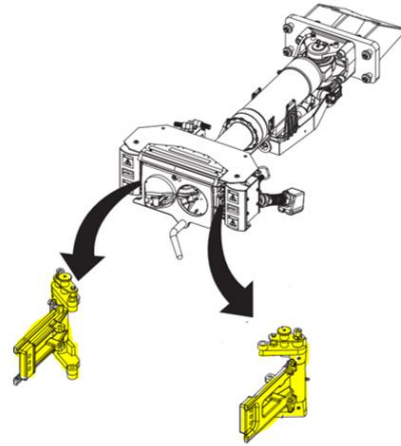


Figure 2.5 Suspension Attachment, Courtesy of CATS

Centering Device

The coupler **Centering Device** is intended to position the coupler in the center location of the uncoupled end of a car, both vertically and horizontally. This allows the coupler to remain in the correct position for when automatic coupling happens. The centering device's purpose is also to prevent the coupler from swinging during transit, when uncoupled. It also allows navigation of curves, when coupled. The centering device may consist of springs (coil), links and hydraulic shocks.

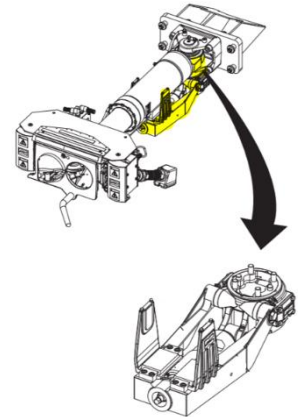


Figure 2.6 Centering Device, Courtesy of RTD

Cushioning Device

The cushioning device can also be referred to as the draft gear. The Cushioning Device's function is to protect the railcar by absorbing energy associated with pushing, pulling, starting, stopping and coupling. The cushioning device connects the coupler face to the carbody. The main components of the cushioning device include:

- Buffer
- Bearing Bracket
- Shear pin
- Rubber bushing
- Shocks (gas, hydraulic)

The **Buffer** is connected to the **bearing bracket**. The Buffer's function is to absorb as much of the buff and draft loads as possible. The buffer cushions compressions of the rail vehicle. The bearing bracket allows the coupler to move horizontally and vertically.



Figure 2.7 Draft Gear, Courtesy of SACRT

There are **Shear Pins** located on the rear end of the buffer. If the maximum shear force is exceeded, the shear pins will shear, allowing the buffer to be additionally compressed.

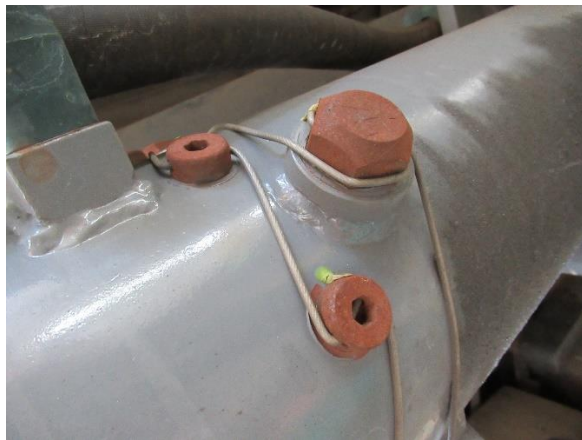


Figure 2.8 Shear Pins, Courtesy of SacRT

Buff Load vs. Draft Load

Buff and Draft loads are forces that are applied to the coupler in all modes of transit; acceleration, deceleration, turning and reverse direction. **Buff Load** is the pushing force applied to the coupler. An example is the trailing car is going to want to push the leading car. **Draft Load** is the pulling force applied to the coupler. Buff and Draft loads are absorbed by the cushioning device. **Figure 2.9** shows example of buff and draft force.

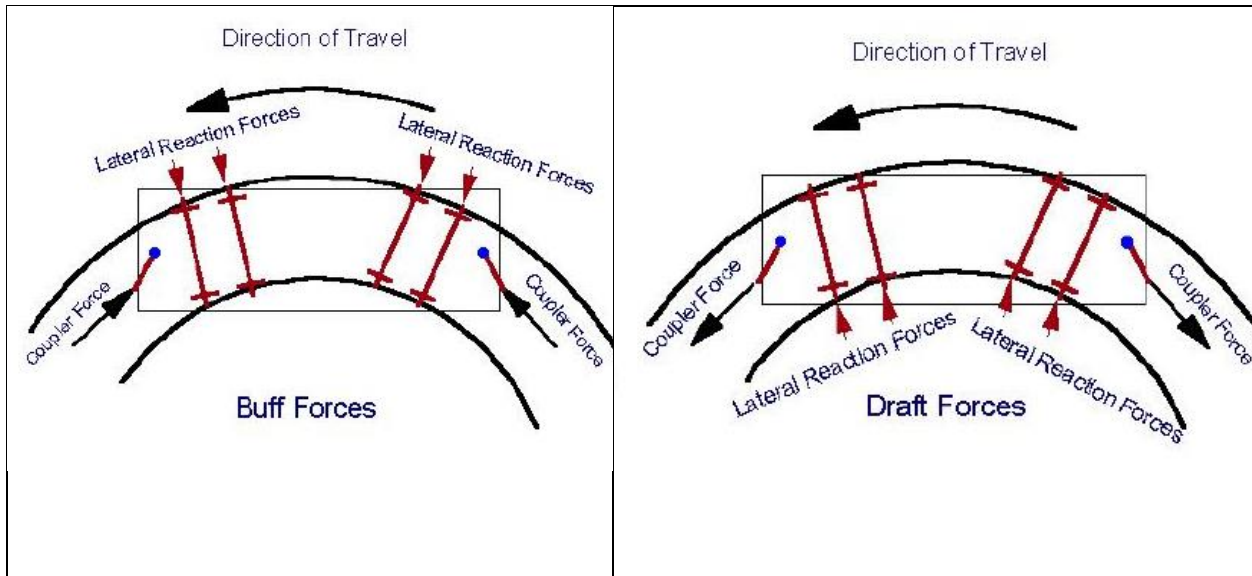


Figure 2.9 Buff and Draft Force, Courtesy of BART

In the event of excessive buff force, such as a collision, the load is absorbed by the **deformation unit**. The deformation unit provides protection for the vehicle structure. The deformation unit is located between the mechanical coupler and the draft gear. If a collision does happen, the deformation tube expands, which allows the coupler to compress and absorb the excessive force. The deformation unit is not repairable and must be replaced when activated.

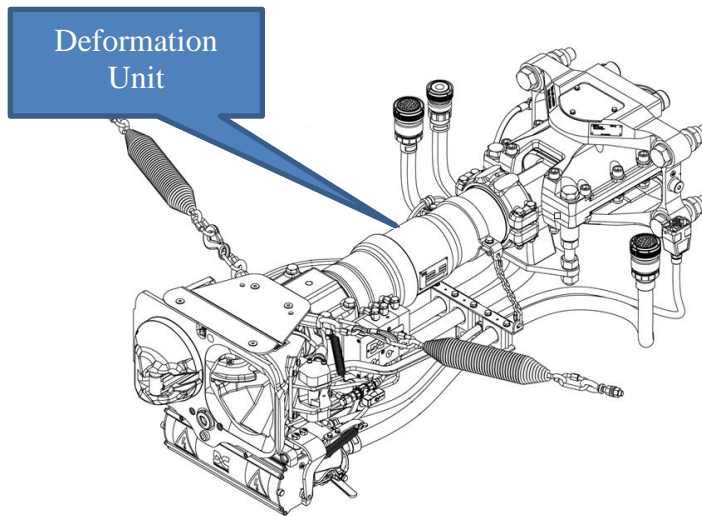


Figure 2.10 Deformation Unit, Courtesy of BART

Anchorage Device

At the rear of the mechanical coupler, the anchorage device, which consists of the mounting plate with shear bolts, attaches the automatic coupler to the car underbody coupler assembly. It allows for vertical, lateral and roll movement. **Figure 2.11** shows an example of mounting bolts that can be found on an anchorage device. The anchorage device will also consist of a tail eye socket. The draft gear sits in the **tail eye socket** and pivots side to side. The tail eye socket is mounted to the anchorage device.

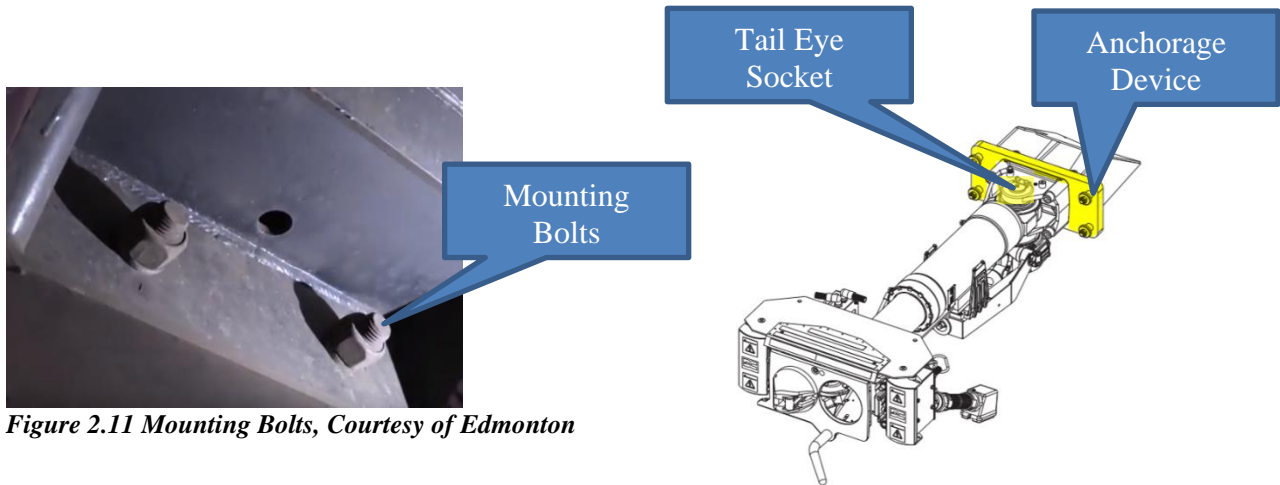


Figure 2.11 Mounting Bolts, Courtesy of Edmonton

Alignment Components

Alignment components on the Coupler include a **horn**, also referred to as a guiding horn. The horn is mounted on the coupler head face. The horn helps to increase the gathering range. The gathering range is a specific horizontal or vertical limit in which coupling cars is possible. The horn helps to guide the coupler within the designated gathering range. If coupling on curves, the gathering range is reduced. The coupler also has **guide pins** and **guide bushings** on its front face to help automatically align when two cars are coupling together.

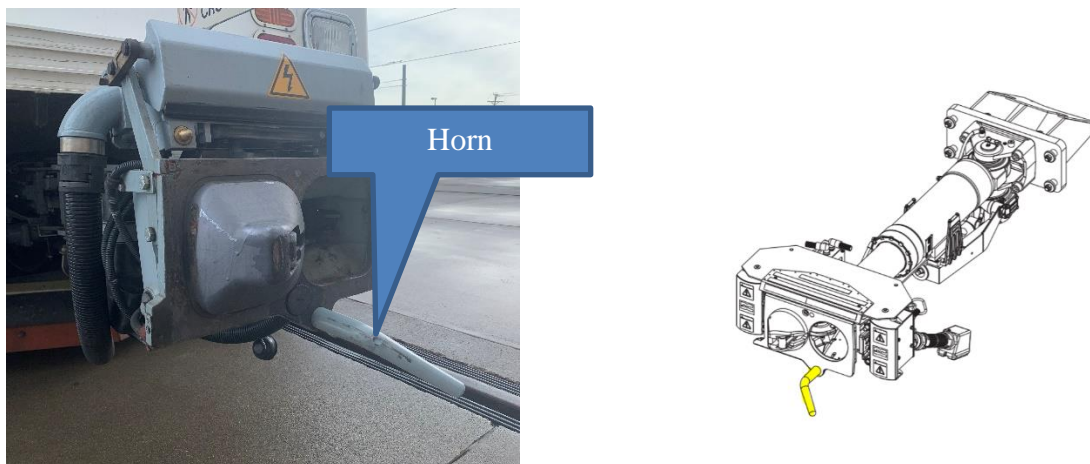


Figure 2.12 Horn, Courtesy of RTD

The male and female cones ensure the gathering of the couplers as the cars are coupled. The horn helps to increase the gathering range. The diagram below provides an example of the gathering range on straight track. The gathering range is reduced on curves.

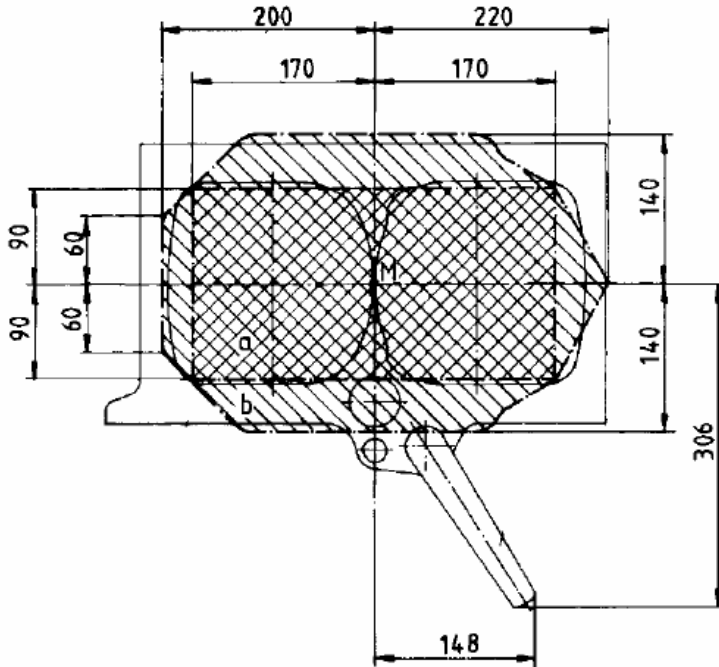


Figure 2.13 Gathering Range, Courtesy of RTD



Learning Application 2.1 – Gathering Range

With the help of your instructor, identify the gathering range for the coupler on straight track. Afterwards, identify the gathering range on curved track.

2-3 ELECTRICAL PARTS TO THE SCHARFENBURG COUPLER

When coupled, the electrical coupler provides electrical trainline communication and signals between vehicle. This section will discuss components specific electrical coupler. In an effort to show how all components are related in context, this module will use line diagrams from the Scharfenburg Coupler used at BART, in addition to photos provided by Rail Car Consortium Member Agencies.

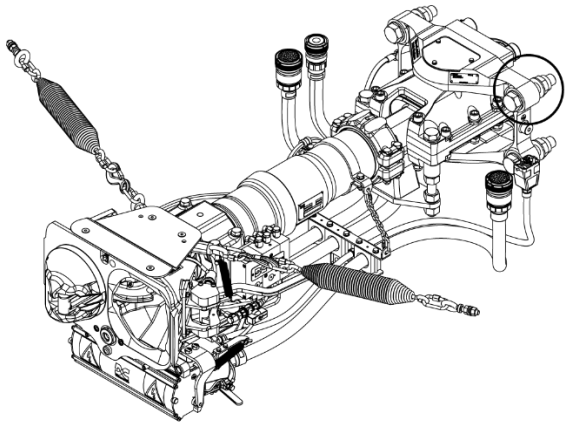


Figure 2.14 Scharfenburg Coupler, Courtesy of BART

Electrical Coupler Head

The coupler may have one or two electrical coupler heads. The electrical coupler head houses the electrical pins. Electrical coupler heads can be actuated into place by air or electric motor. They can also be non-moveable with spring loaded pins. The Scharfenburg electrical coupler head is mounted to the suspension attachment on the mechanical coupler.

Figure 2.15 shows one electrical coupler located on top of the mechanical coupler

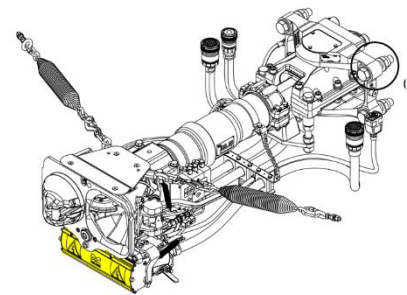
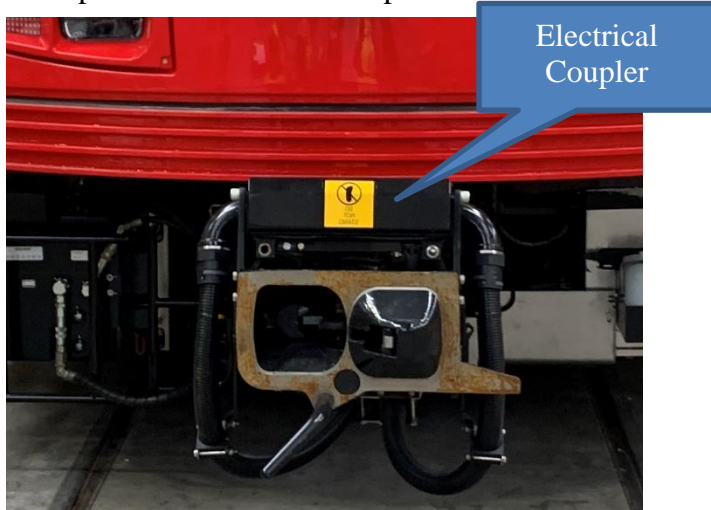


Figure 2.15 Electrical Coupler Head, Courtesy of SDMTS

Electrical Pins

The electrical coupler has electrical pins which provide electrical contacts, and are located in an insulating block. The electrical pins can be fixed contacts or moving (spring-loaded) contacts. The flat pins are fixed. As an example, rail vehicle communication pins are fixed. The pins mate with each other during the coupling process. A seal and an electrical coupler door protect the electrical pins from the elements of the environment.

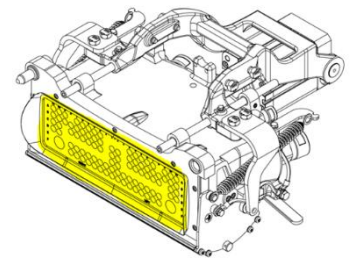


Figure 2.17 Electrical Pins, Courtesy of RTD

Electrical Coupler Door

The electrical coupler door covers the electrical pins when the car is uncoupled. The electrical coupler door opens and closes automatically during the coupling and uncoupling process.

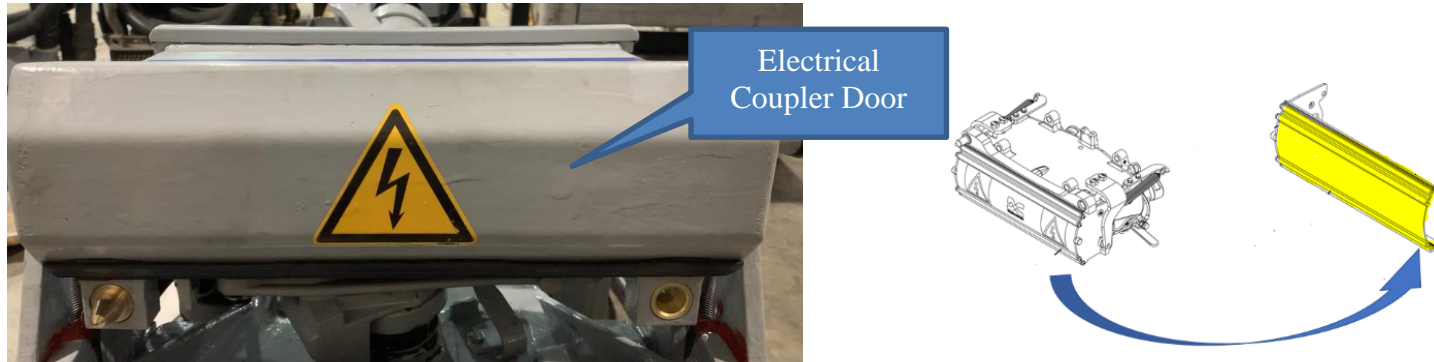


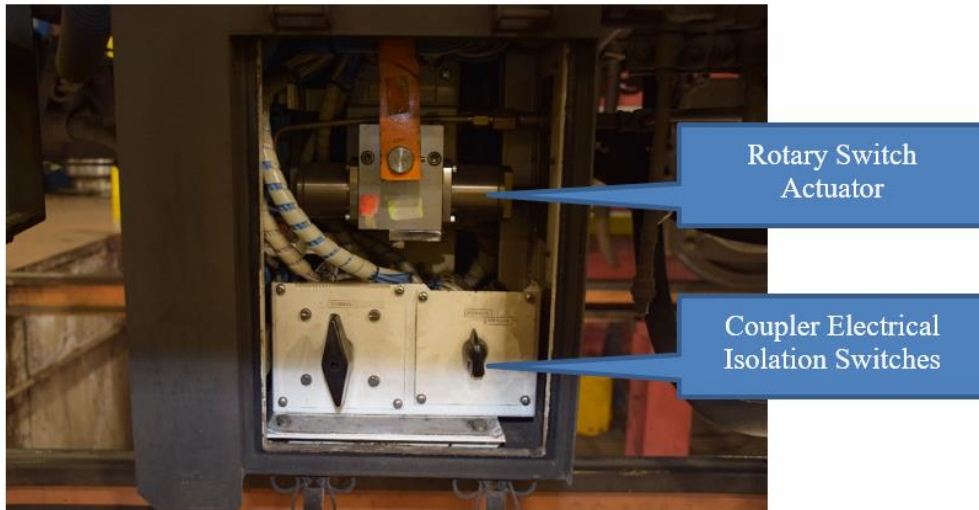
Figure 2.18 Electrical Coupler Door, Courtesy of RTD

Coupler Switches

Proximity and Rotary switches are part of the electrical coupler assembly.

Proximity Switches allow the coupler head(s) to move into position. The proximity switch tells the coupler control system when one car is mechanically coupled to another car, and next, the electrical coupling must happen. When the mechanical coupling process is initiated, the proximity switch will throw the link and hook plate into position, so they are able to latch. When the uncoupling process is initiated, the proximity switch sends a signal to the coupler control system and energizes the pneumatic valve to deactivate and uncouple the electrical coupler. After the electrical portion is uncoupled, the mechanical uncoupling process can begin. The proximity switch is located on the face of the coupler.

Rotary Drum Switches electrically connect coupler head wiring to the carbody trainline. When the solenoid valve is activated, the rotary switch will throw to either couple or uncouple the vehicle. The switch can either electrically or pneumatically connect or disconnect to couple/uncouple. The rotary switch is located under the car.



Trainline Cables

Trainline Cables connect coupler heads to the carbody. Trainline cables provide connectivity of the electrical signals used to control and operate the train.

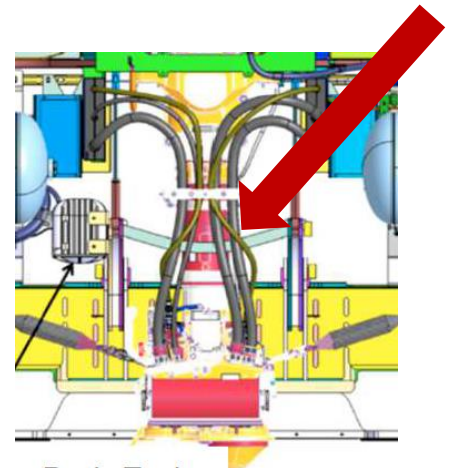


Figure 2.19 Trainline Cables, Courtesy of RTD

Electrical Linear Actuator

The electrical linear actuator is mounted to the actuator attachment, which is located one on each side of the mechanical coupler. It advances and retracts the guide pins during the coupling and uncoupling process to move the head into place. The linear actuator can be electrically actuated or pneumatically actuated. It can be disconnected from the attachment for manual operation of the electrical coupler.

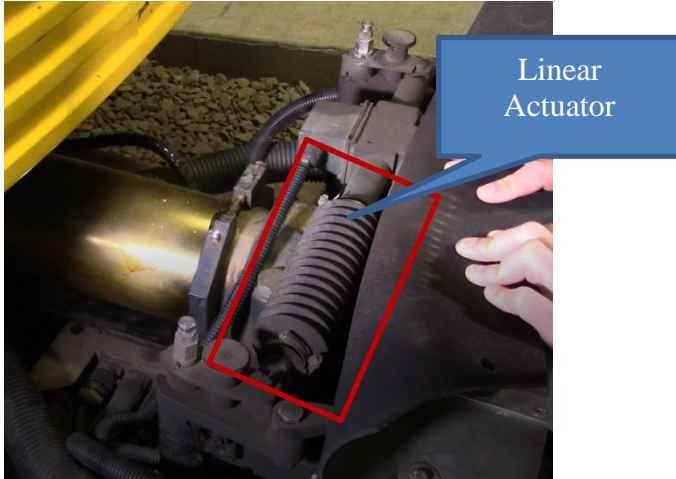


Figure 2.20, Linear Actuator, Courtesy of Metro Transit



Learning Application 2.2 – Electrical Linear Actuator

Explain how the electrical linear actuator works on the trains at your agency. Is the linear actuator electrically or pneumatically actuated?

Electrical Coupler Heater

An electrical coupler heater is only used at agencies that experience colder weather. The electrical heater is intended to keep the electrical pins dry and from freezing.



Figure 2.21, Electrical Heater, Courtesy of Metro Transit

Coupler Control Unit

The Coupler Control Unit includes the Uncoupling Switch, Solenoid Valves and Coupler Control Cutout. For purpose of this training, the coupler control unit will be discussed under the electrical section, but it is important to note, it can be either electrical or pneumatic. Refer to your agency to determine if these components are electrical or pneumatic.

The **uncoupling switch** operates the coupler release and initiates uncoupling. The operator initiates both electrical and mechanical uncoupling of the coupler.

The **solenoid valve** controls airflow to the rotary drum switch. The solenoid valve is mounted to both the A and B car. During the coupling process, and after the electrical couplers have coupled, the solenoid valve receives a signal that indicates air pressure should be applied to the rotary drum switch. It closes and connects specific trainline signals to the electrical coupler. The same process will happen for the uncoupling process. Before the electrical couplers are uncoupled, the solenoid valve receives a signal which indicates air pressure to the rotary drum switch is open and disconnects specific trainline signals from reaching the electrical couplers.

The **coupler control cutout** isolates electrical signals so the vehicle cannot send certain signals from one car to another. The coupler control cutout is located in the operator's cab.



Learning Application 2.3 Coupler Control Unit – Electrical or Pneumatic

Determine if the Coupler Control Unit switches are electrical or pneumatic. Place an **X** in the correct box. Space is provided for agency specific notes.

SWITCH	ELECTRICAL	PNEUMATIC	NOTES
Uncoupling Switch			
Solenoid Valve			
Coupler Control Cutout			

2-4 PNEUMATIC PARTS TO THE SCHARFENBURG COUPLER

Tappet Valve

The tappet valve is used to transmit pneumatic air between rail car vehicles during the coupling process.

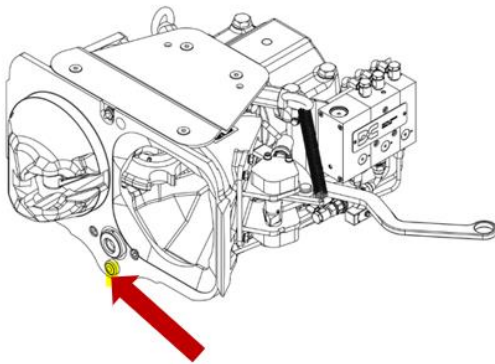


Figure 2.22 Tappet Valve, Courtesy of CATS

Impulse Valve

The impulse valve controls multiple valve functions by means of pneumatic air.

Air Lines

Air lines carry pneumatic air to the electric and mechanical coupler.

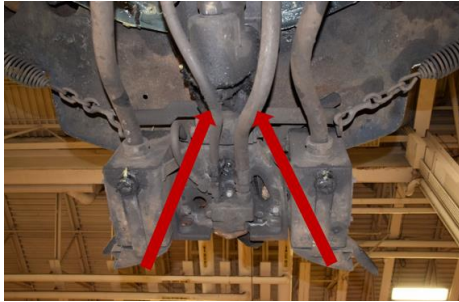


Figure 2.23 Air Lines, Courtesy of GCRTA

Air Filter

The air filter prevents moisture, debris and contaminants from accumulating in the pneumatic coupler airline. Contaminants that could damage the pneumatic devices include, but are not limited to, lubricant particles ejected by the compressor, dirt particles and small water droplets.

2-5 FUTURE OF TECHNOLOGY

Some agencies are beginning to implement new and innovative ethernet attachments to their existing couplers. By doing so, it makes the transmission of large quantities of data easier. The ethernet couple can be attached the side, top or bottom of the existing coupler. The ethernet coupler is compatible with both electrical and pneumatic couplers. This coupler is contactless and therefore, does not cause any mechanical wear creating a longer life and cost savings.

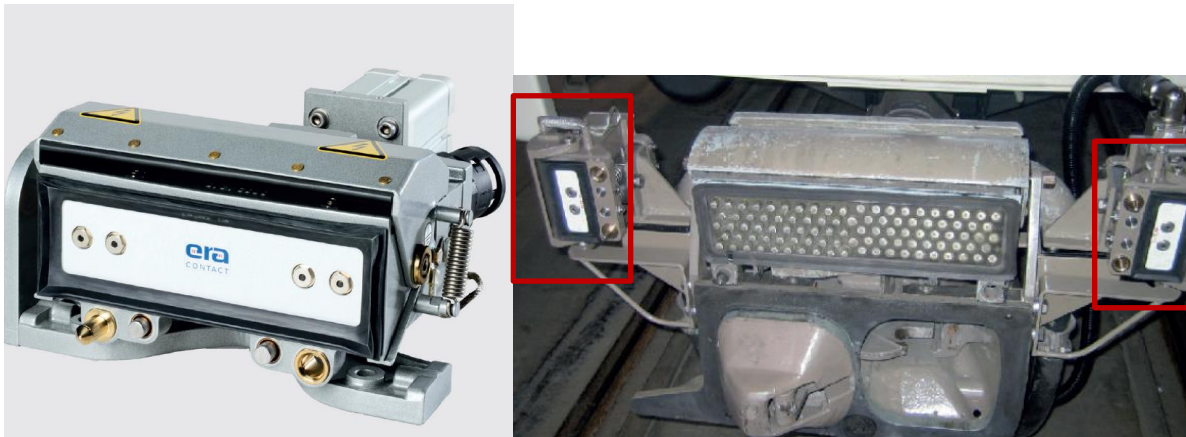


Figure 2.24, Ethernet Coupler, Courtesy of Edmonton

2-6 SUMMARY

This Module provided the participant with a more in depth look into the mechanical, electrical and pneumatic parts to the Scharfenburg Coupler. As always, refer to your specific agencies as nomenclature and component functions may slightly differ.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	
Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

MODULE 3

The Tomlinson Coupler

Outline

3-1 Overview to the Tomlinson Coupler

3-2 Mechanical Parts to the Tomlinson Coupler

3-3 Electrical Parts to the Tomlinson Coupler

3-4 Pneumatic Parts to the Tomlinson Coupler

3-5 Summary

Purpose and Objectives

The purpose of this module is to provide participants with an overview to the mechanical, electrical and pneumatic parts to the Tomlinson coupler.

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

- Identify and explain function of mechanical components to the Tomlinson Coupler
- Identify and explain function of electrical components to the Tomlinson Coupler
- Identify and explain function of pneumatical components to the Tomlinson

Key Terms

- Coupler Head
- Latching Device
- Centering Device
- Draft Gear
- Uncoupling Device
- Suspension Attachment
- Switches
- Cables
- Linear Actuator
- Valves
- Electrical Pins

3-1 OVERVIEW TO THE TOMLINSON COUPLER

Module 2 will discuss components specific to the Tomlinson Coupler. In an effort to show how all components are related in context, this module will use line diagrams from the Tomlinson Coupler used at WMATA, in addition to photos provided by Rail Car Consortium Member Agencies.

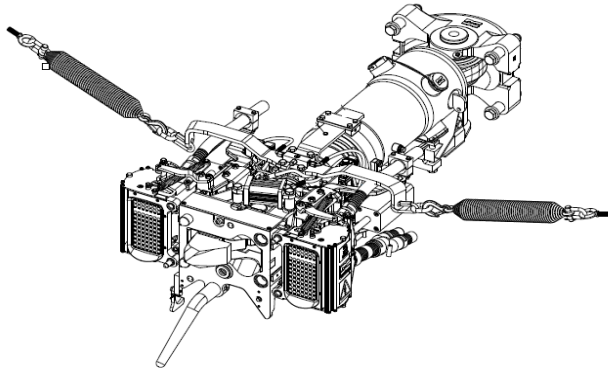


Figure 3.1 Tomlinson Coupler, Courtesy of WMATA

This Module will be divided into three sections; mechanical, electrical and pneumatic parts to the Tomlinson coupler. The chart below identifies the components which will be discussed in each section.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	
Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

3-2 MECHANICAL PARTS TO THE TOMLINSON COUPLER

Mechanical Coupler Head

The mechanical coupler head ensures the mechanical connection of two vehicles. The mechanical heads have a male and female cone, which allow for automatic alignment. The **block**, which is outlined in red in **Figure 3.2**, houses the hook and link.

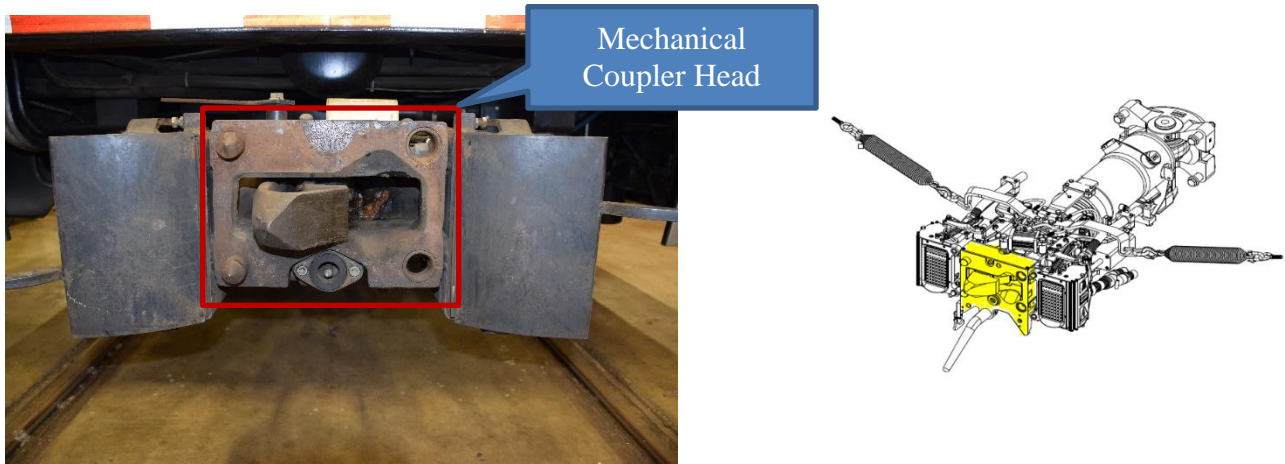


Figure 3.2 Mechanical Coupler Head, Courtesy of GCRTA

Latching Device

The Coupling **Hook** and **Spring** make up the latching device on the mechanical coupler. They are encased in the coupler head, when coupled, for protection from the environment.

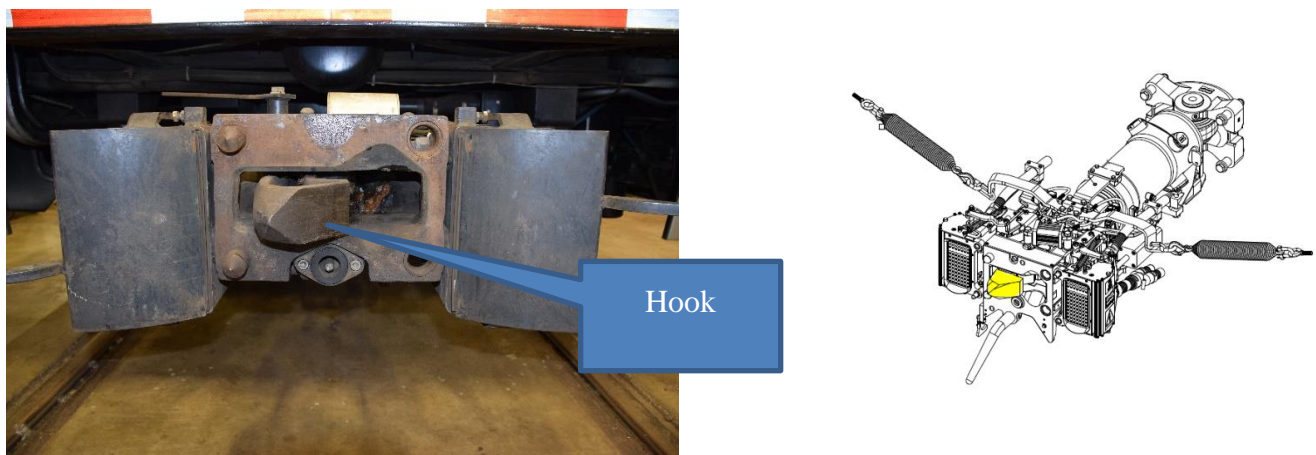


Figure 3.3 Latching Device, Courtesy of GCRTA

Uncoupling Cylinder

The uncoupling process starts immediately after the command is made (in the cab, by pressing a button on the dash). When the uncoupling command is given, the following happens:

1. The linear actuator actuates and the electrical couplers begin to retract
2. After the electrical couplers are fully retracted, the signal is given to begin actuation of the linear actuator for mechanical uncoupling
3. When the mechanical coupler is fully uncoupled, the vehicles can then be separated

The uncoupling cylinder is located on top of the mechanical coupler. It receives the mechanical uncouple signal only after the electrical coupler has been uncoupled. The uncoupling device may also be a handle, lever or cable with lever. Manual uncoupling can also be accomplished in the event of an emergency or a failure with the uncoupling device, by means of an uncoupling handle.

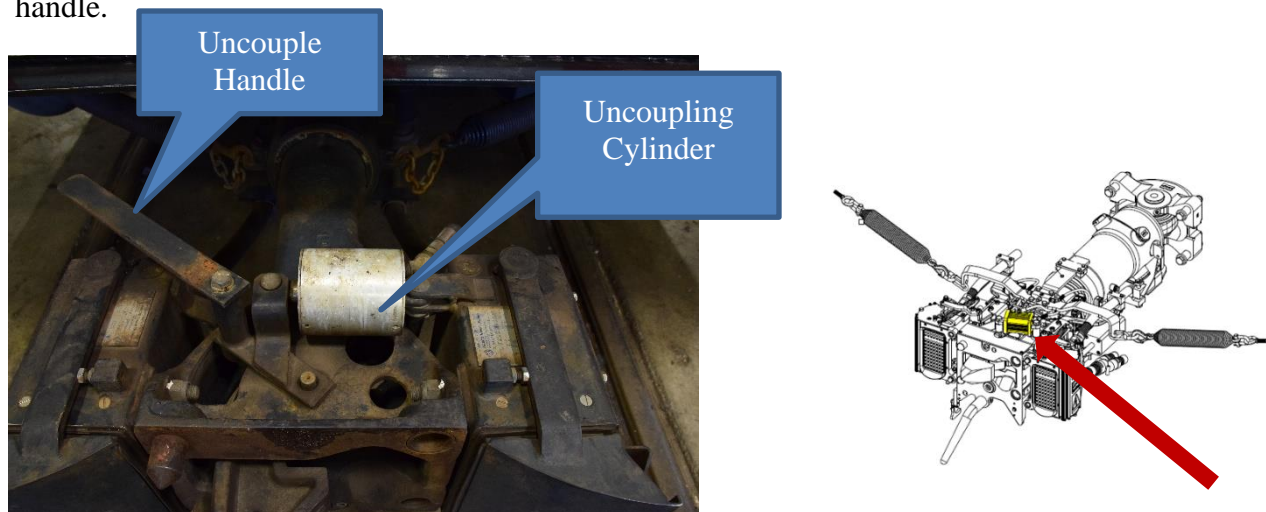


Figure 3.4 Uncoupling Cylinder, Courtesy of GCRTA

Centering Device

The coupler **Centering Device** is intended to position the coupler in the center location of the uncoupled end of a car, both vertically and horizontally. This allows the coupler to remain in the correct position for when automatic coupling happens. The centering device's purpose is also to prevent the coupler from swinging during transit, when uncoupled. It also allows navigation of curves, when coupled. The centering device may consist of springs (coil), links and hydraulic shocks.

The main function of the **centering springs** on the Centering Device is to keep the automatic coupler in a centered position to allow for the coupling of vehicles. The springs are able to be disconnected, if needed. The springs consist of an eyebolt, connecting links, chain, hook, tension spring and chain connector. If the coupler is misaligned, and exceeds the gathering range, the coupler can be manually released, by way of the centering springs.

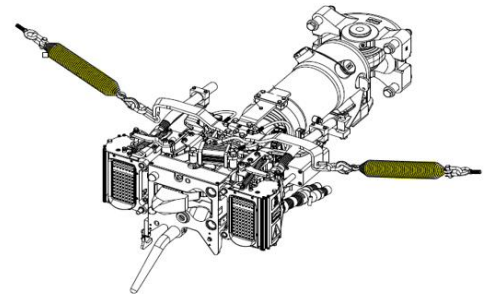


Figure 3.5 Centering Springs, Courtesy of GCRTA

Cushioning Device

The cushioning device consists of the draft gear, buffer, bearing bracket, leaf spring and leaf spring holder.

Draft Gear

The Draft Gear's function is to protect the railcar by absorbing energy associated with pushing, pulling, starting, stopping and coupling. The main components of the draft gear include:

- Buffer
- Bearing Bracket
- Leaf Spring
- Leaf Spring holder
- Shear bolts

The **Buffer** is connected to the **bearing bracket**. The Buffer's function is to absorb as much of the buff and draft loads as possible. The bearing bracket allows the coupler to move horizontally and vertically, and is the attachment point for the coupler to the car underbody anchor assembly.

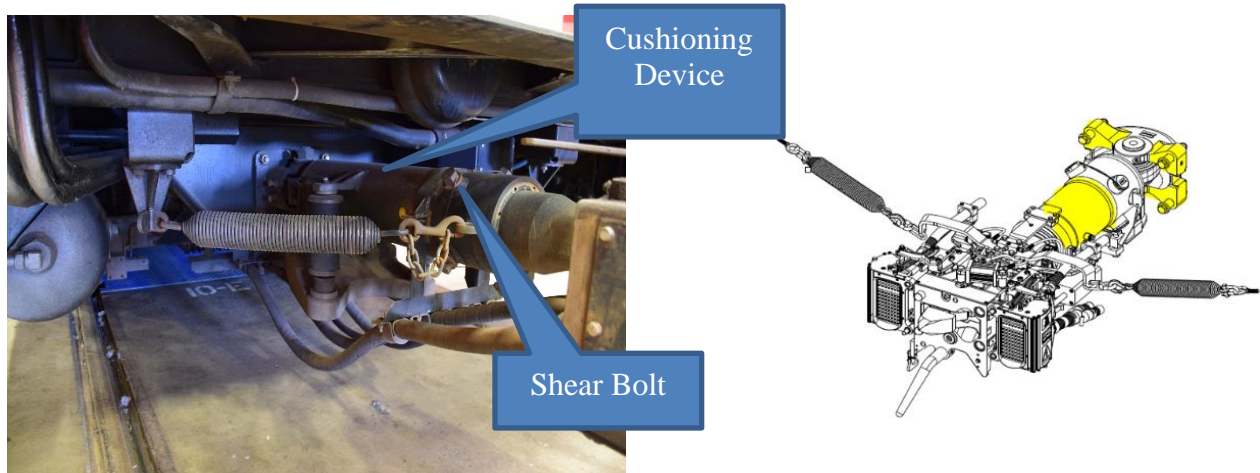


Figure 3.6 Cushioning Device, Courtesy of GCRTA

The **Leaf Spring** holds the coupler parallel to the running rails and is intended to transfer the movement of the linear actuator to the electrical coupler(s). The leaf spring is attached to the **leaf spring holder**. The leaf spring holder is mounted to the pivot shaft.

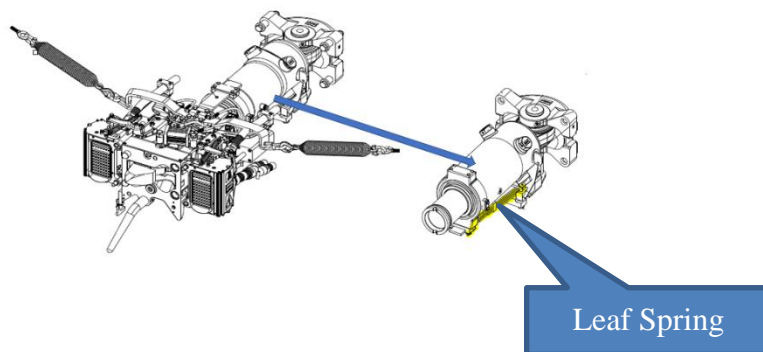


Figure 3.7 Leaf Spring, Courtesy of

Buff and Draft Loads

The images below show the Tomlinson Buffer under buff and draft loads. Buff and Draft loads are forces that are applied to the coupler in all modes of transit; acceleration, deceleration, turning and reverse direction. **Buff Load** is the pushing force applied to the coupler. An example is the trailing car is going to want to push the leading car. **Draft Load** is the pulling force applied to the coupler. An example is as the lead car pulls away it wants to pull. Buff and draft loads are absorbed by the draft gear.

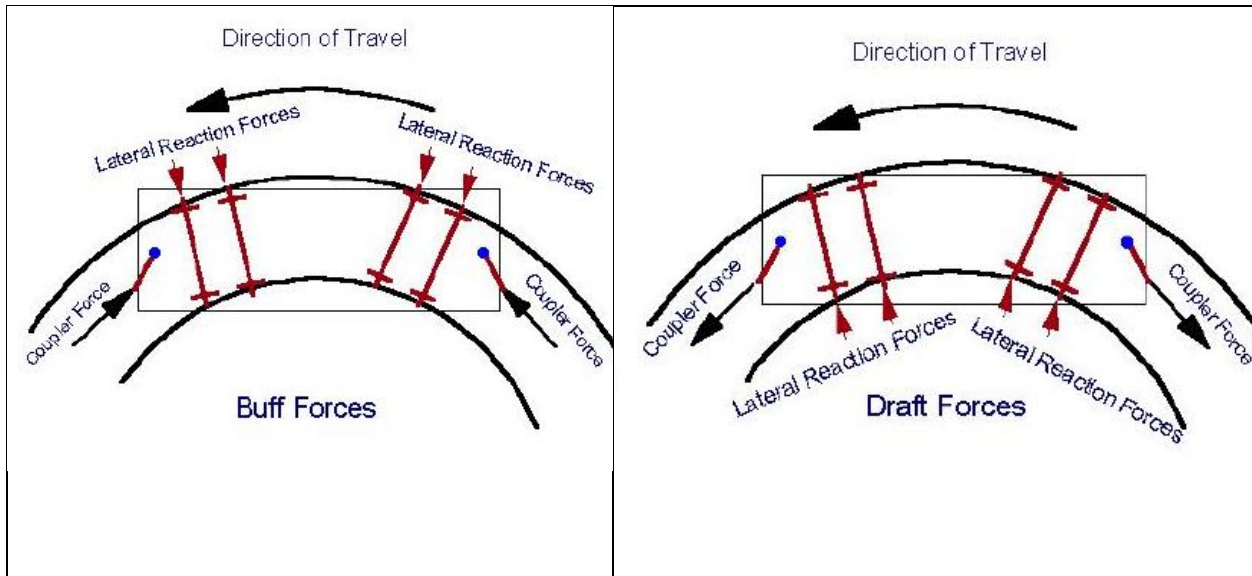


Figure 3.8 Buff and Draft Load, Courtesy of

Anchorage Device

At the rear of the mechanical coupler, the anchorage device, which consists of the mounting plate with shear bolts, attaches the automatic coupler to the car underbody coupler assembly. It allows for vertical, lateral and roll movement. The anchorage device will also consist of a tail eye socket. The draft gear sits in the **tail eye socket** and pivots side to side. The tail eye socket is mounted to the anchorage device.

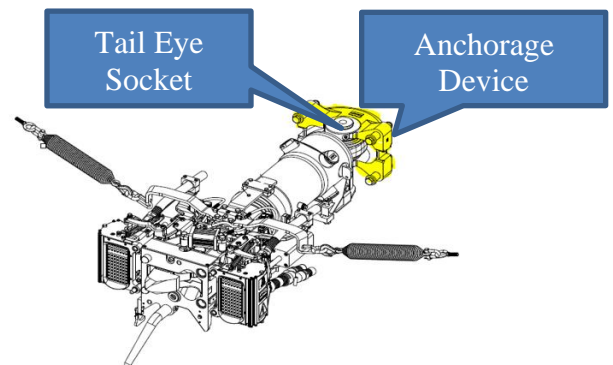
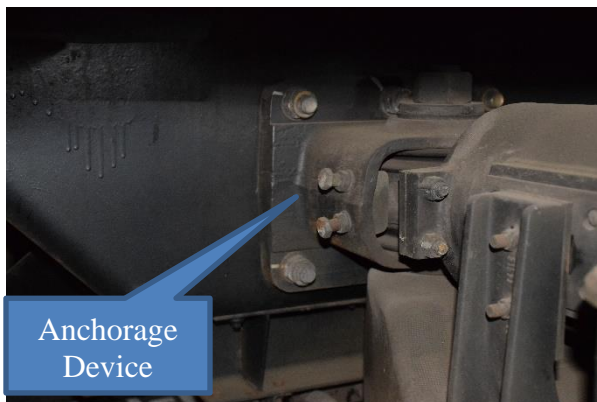


Figure 3.9 Anchorage Device Courtesy of GCRTA

Alignment Components

Alignment components on the Coupler include a **horn**, also referred to as a guiding horn. The horn is mounted on the coupler head face. The horn helps to increase the gathering range. The gathering range is a specific horizontal or vertical limit in which coupling cars is possible. The horn helps to guide the coupler within the designated gathering range. If coupling on curves, the gathering range is reduced. The coupler also has **guide pins** and **guide bushings** on its front face to help automatically align when two cars are coupling together.

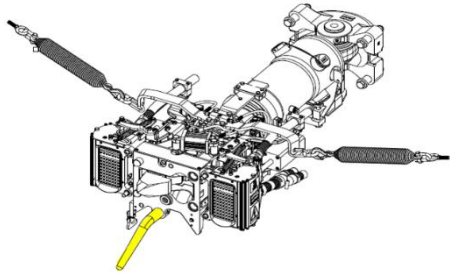


Figure 3.10 Horn Courtesy of WMATA

The male and female cones ensure the gathering of the couplers as the cars are coupled. The horn helps to increase the gathering range. The diagram below provides an example of the gathering range on straight track. The gathering range is reduced on curves.

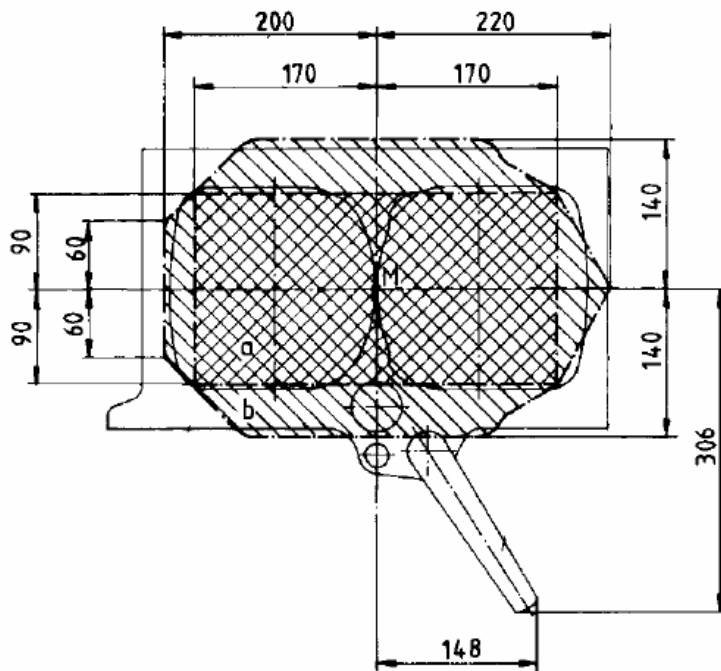


Figure 3.11 Gathering Range, Courtesy of RTD



Learning Application 3.1 – Gathering Range

With the help of your instructor, identify the gathering range for the coupler on straight track. Afterwards, identify the gathering range on curved track.

3-3 ELECTRICAL PARTS TO THE TOMLINSON COUPLER

When coupled, the electrical coupler provides electrical trainline communication and signals between vehicle. This section will discuss components specific electrical coupler.

Electrical Coupler Head

The coupler may have one or two electrical coupler heads. The electrical coupler head houses the electrical pins. Electrical coupler heads can be actuated into place by air or electric motor. They can also be non-moveable with spring loaded pins. The Tomlinson electrical coupler head is mounted to the suspension attachment on the mechanical coupler.

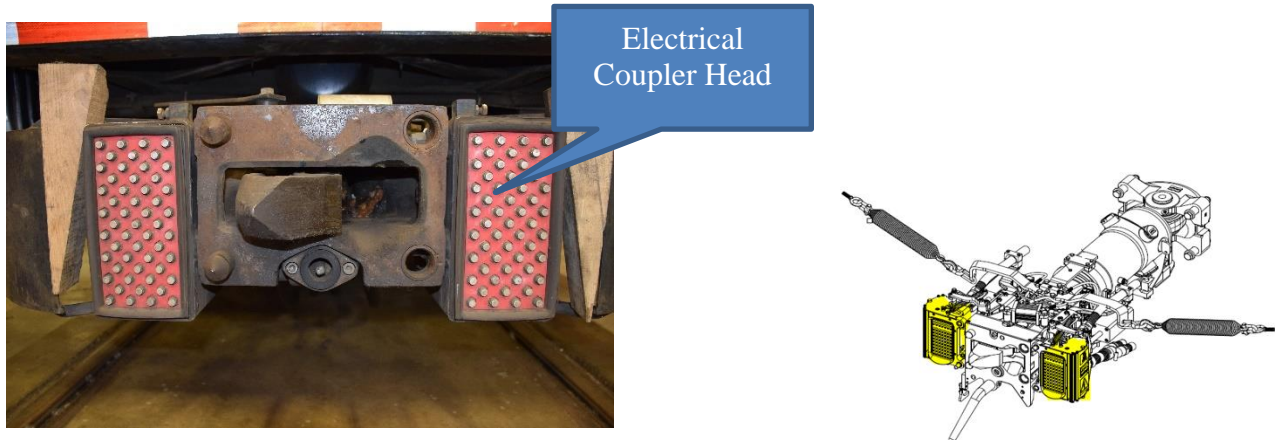


Figure 3.12 Electrical Coupler Head, Courtesy of GCRTA

Electrical Pins

The electrical coupler has electrical pins which provide electrical contacts, and are located in an insulating block. The electrical pins can be fixed contacts or moving (spring loaded) contacts. The flat pins are fixed. As an example, rail vehicle communication pins are fixed. The pins mate with each other during the coupling process. A seal and an electrical coupler door protect the electrical pins from the elements of the environment.

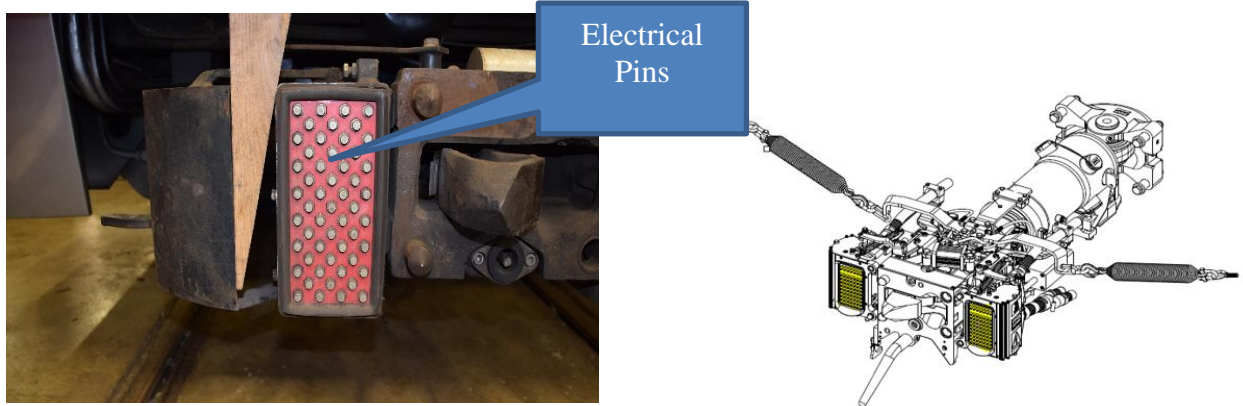


Figure 3.13 Electrical Pins, Courtesy of GCRTA

Electrical Coupler Door

The electrical coupler door covers the electrical pins when the car is uncoupled. The electrical coupler door opens and closes automatically during the coupling and uncoupling process.

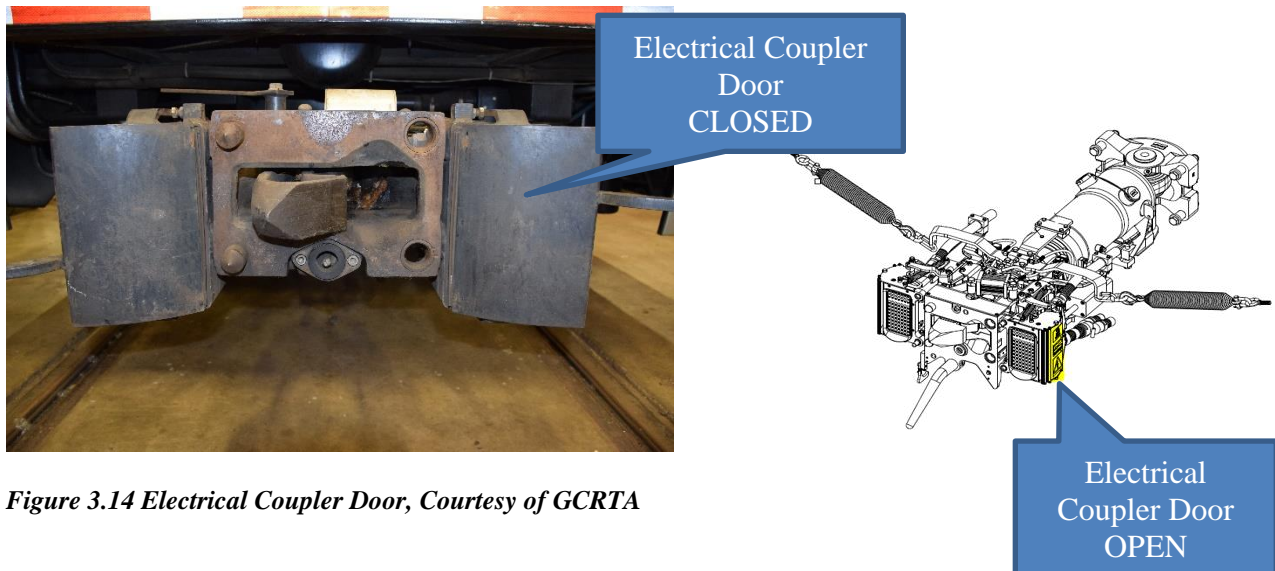


Figure 3.14 Electrical Coupler Door, Courtesy of GCRTA

Coupler Switches

Proximity and Rotary switches are part of the electrical coupler assembly.

Proximity Switches allow the coupler head(s) to move into position. The proximity switch tells the coupler control system when one car is mechanically coupled to another car, and next, the electrical coupling has to happen. When the mechanical coupling process is initiated, the proximity switch will throw the link and hook plate into position so they are able to latch. When the uncoupling process is initiated, the proximity switch sends a signal to the coupler control system and energizes the pneumatic valve to deactivate and uncouple the electrical coupler. After the electrical portion is uncoupled, the mechanical uncoupling process can begin. The proximity switch is located on the face of the coupler.

Rotary Drum Switches electrically connect coupler head wiring to the carbody trainline. When the solenoid valve is activated, the rotary switch will throw to either couple or uncouple the vehicle. The switch can either electrically or pneumatically connect or disconnect to couple/uncouple. The rotary switch is located under the car.

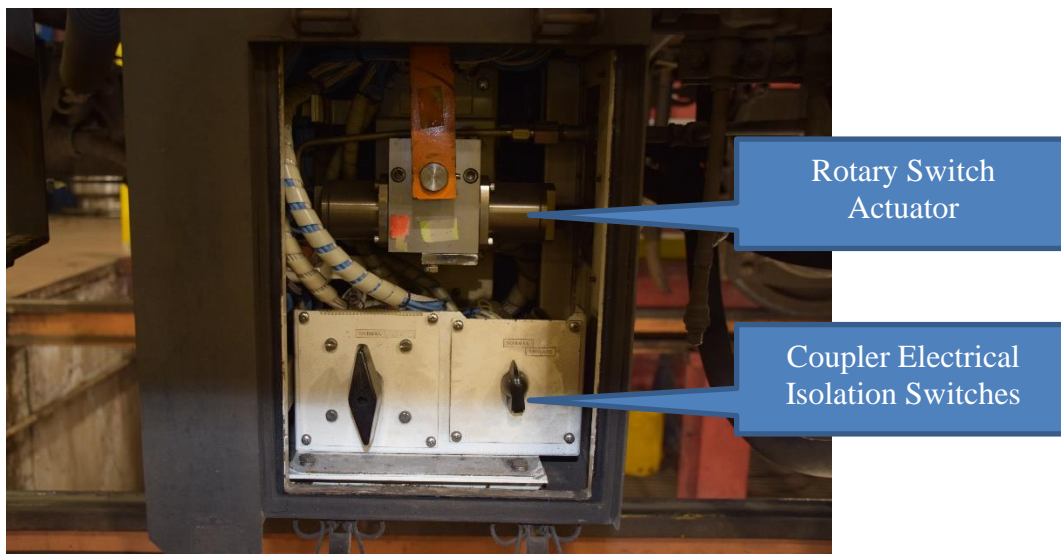


Figure 3.15 Rotary Switches, Courtesy of GCRTA

Trainline Cables

Trainline Cables connect coupler heads to the carbody. Trainline cables provide connectivity of the electrical signals used to control and operate the train.

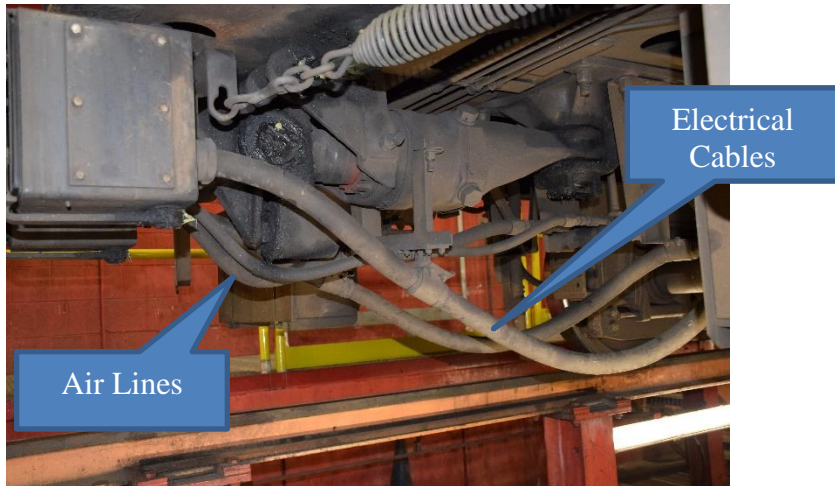


Figure 3.16 Electrical Cables, Courtesy of GCRTA

Electrical Linear Actuator

The electrical linear actuator is mounted to the actuator attachment, which is located one on each side of the mechanical coupler. It advances and retracts the guide pins during the coupling and uncoupling process to move the head into place. The linear actuator can be electrically actuated or pneumatically actuated. It can be disconnected from the attachment for manual operation of the electrical coupler.



Learning Application 3.2 – Electrical Linear Actuator

Explain how the electrical linear actuator works on the trains at your agency. Is the linear actuator electrically or pneumatically actuated?

Electrical Coupler Heater

An electrical coupler heater is only used at agencies that experience colder weather. The electrical heater is intended to keep the electrical pins dry and from freezing.



Figure 3.17 Coupler Heater, Courtesy of Metro Transit

Coupler Control Unit

The Coupler Control Unit includes the Uncoupling Switch, Solenoid Valves and Coupler Control Cutout. For purpose of this training, the coupler control unit will be discussed under the electrical section but it is important to note, it can be either electrical or pneumatic. Refer to your agency to determine if these components are electrical or pneumatic.

The **uncoupling switch** operates the coupler release and initiates uncoupling. The operator initiates both electrical and mechanical uncoupling of the coupler.



Figure 3.18 Uncouple Switch, Courtesy of GCRTA

The **solenoid valve** controls airflow to the rotary drum switch. The solenoid valve is mounted to both the A and B car. During the coupling process, and after the electrical couplers have coupled, the solenoid valve receives a signal that indicates air pressure should be applied to the rotary drum switch. It closes and connects specific trainline signals to the electrical coupler. The same process will happen for the decoupling process. Before the electrical couplers are

uncoupled, the solenoid valve receives a signal which indicates air pressure to the rotary drum switch is open and disconnects specific trainline signals from reaching the electrical couplers. The number of solenoid valves may vary by agency. For example, there are 3 solenoid valves on the Tomlinson coupler used at VTA.

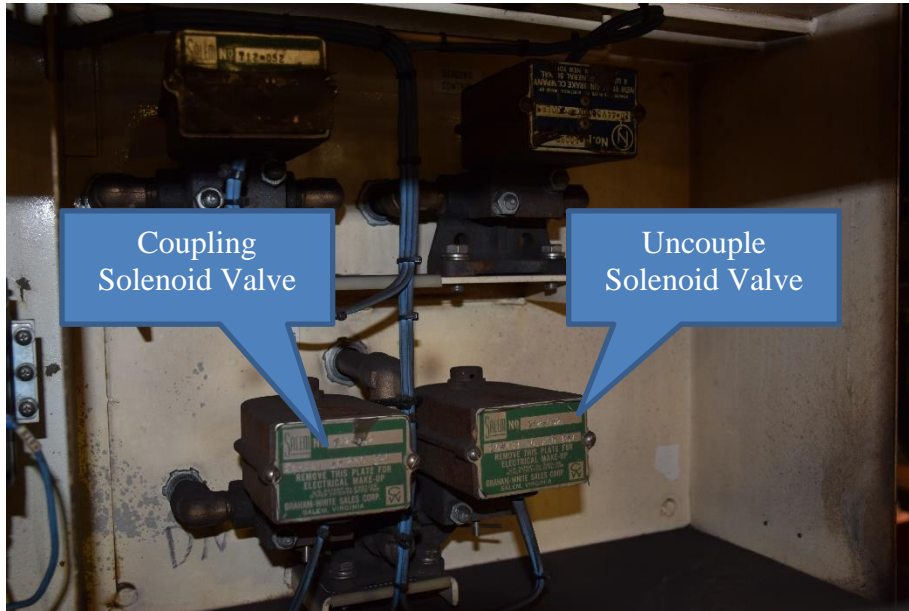


Figure 3.19 Solenoid Valve, Courtesy of GCRTA

The **coupler control cutout** isolates electrical signals so the vehicle cannot send certain signals from one car to another. The coupler control cutout is located in the operator’s cab. At some agencies, the coupler control cutout may also be referred to, and perform the same functions, as the rotary switch.



Learning Application 3.3; Coupler Control Unit – Electrical or Pneumatic

Determine if the Coupler Control Unit switches are electrical or pneumatic. Place an **X** in the correct box. Space is provided for agency specific notes.

SWITCH	ELECTRICAL	PNEUMATIC	NOTES
Uncoupling Switch			
Solenoid Valve			
Coupler Control Cutout			

3-4 PNEUMATIC PARTS TO THE TOMLINSON COUPLER

Tappet Valve

The tappet valve is used to transmit pneumatic air between rail car vehicles during the coupling process.

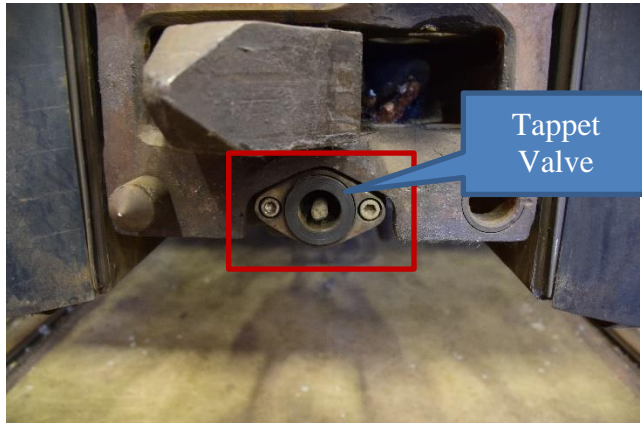


Figure 3.20 Tappet Valve, Courtesy of GCRTA

Impulse Valve

The impulse valve controls multiple valve functions by means of pneumatic air.

Air Lines

Air lines carry pneumatic air to the electric and mechanical coupler

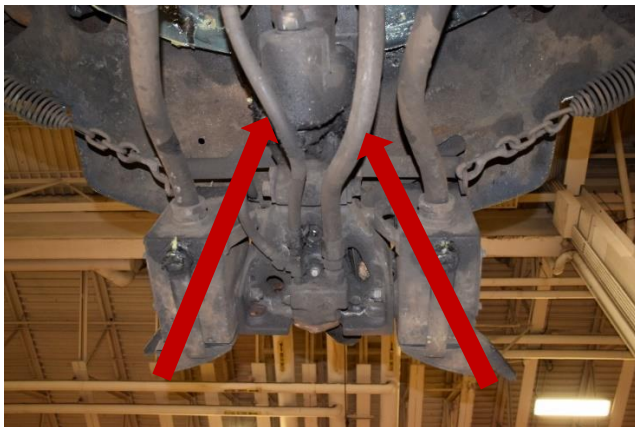


Figure 3.21 Air Lines, Courtesy of GCRTA

Air Filter

The air filter prevents moisture, debris and contaminants from accumulating in the pneumatic coupler airline. Contaminants that could damage the pneumatic devices include, but are not limited to, lubricant particles ejected by the compressor, dirt particles and small water droplets.

3-5 SUMMARY

This Module provided the participant with a more in depth look into the mechanical, electrical and pneumatic parts to the Tomlinson Coupler. As always, refer to your specific agencies as nomenclature and component functions may slightly differ.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	
Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

MODULE 4

The Buckeye Coupler

Outline

- 4-1 Overview
- 4-2 Mechanical Parts to the Buckeye Coupler
- 4-3 Electrical Parts to the Buckeye Coupler
- 4-4 Pneumatic Parts to the Buckeye Coupler
- 4-5 Summary

Purpose and Objectives

The purpose of this module is to provide participants with an overview to the mechanical, electrical and pneumatic parts to the Buckeye coupler.

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

- Identify and explain function of mechanical components to the Buckeye Coupler
- Identify and explain function of electrical components to the Buckeye Coupler
- Identify and explain function of pneumatical components to the Buckeye Coupler

Key Terms

- Coupler Head
- Latching Device
- Centering Device
- Draft Gear
- Uncoupling Device
- Suspension Attachment
- Switches
- Cables
- Linear Actuator
- Valves
- Electrical Pins

4-1 OVERVIEW TO THE BUCKEYE COUPLER

Module 4 will discuss components specific to the Buckeye coupler. This Module is divided into three sections; mechanical, electrical and pneumatic parts to the Buckeye coupler. The chart below identifies the components which will be discussed in each section.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	
Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

4-2 MECHANICAL PARTS TO THE BUCKEYE COUPLER

The Buckeye coupler has two major mechanical assemblies; a semi-permanent drawbar and a mechanical coupler with drawbar assembly.



Figure 4.1 Buckeye Coupler, Courtesy of CTA

The Buckeye **Mechanical Coupler with Drawbar Assembly** has three main components that allow for effective use:

- Mechanical Coupler Head Assembly
- Drawbar Assembly
- Yoke Assembly

The **Mechanical Coupler Head Assembly** ensures the mechanical connection of two vehicles. The Buckeye mechanical coupler head is fitted with a drawbar assembly that couples and uncouples married pairs and absorbs normal buff and draft loads. There is also an emergency release, which absorbs forces in excess of 90,000 lbs. The three main components of the mechanical coupler with drawbar assembly include; coupler head assembly, drawbar assembly and yoke assembly.

The **Drawbar Assembly** houses other components of the mechanical coupler. The drawbar assembly allows for horizontal movement of the coupler head assembly by allowing it to swing along the radial carrier bar. The drawbar assembly allows the coupler heads to remain coupled when the train is moving around a curve. The drawbar assembly also allows for some vertical movement through the use of a yoke assembly.

The **Yoke Assembly** allows the train to rock side to side. There are three rubber draftgears as part of the yoke assembly. These absorb shocks. Movement under normal buff and draft loads from the yoke assembly is limited by an emergency release ring in the drawbar assembly. Buff and draft loads of more than 90,000 pounds will result in shear bolts shearing to allow for additional movement. There are a total of 4 shear bolts.

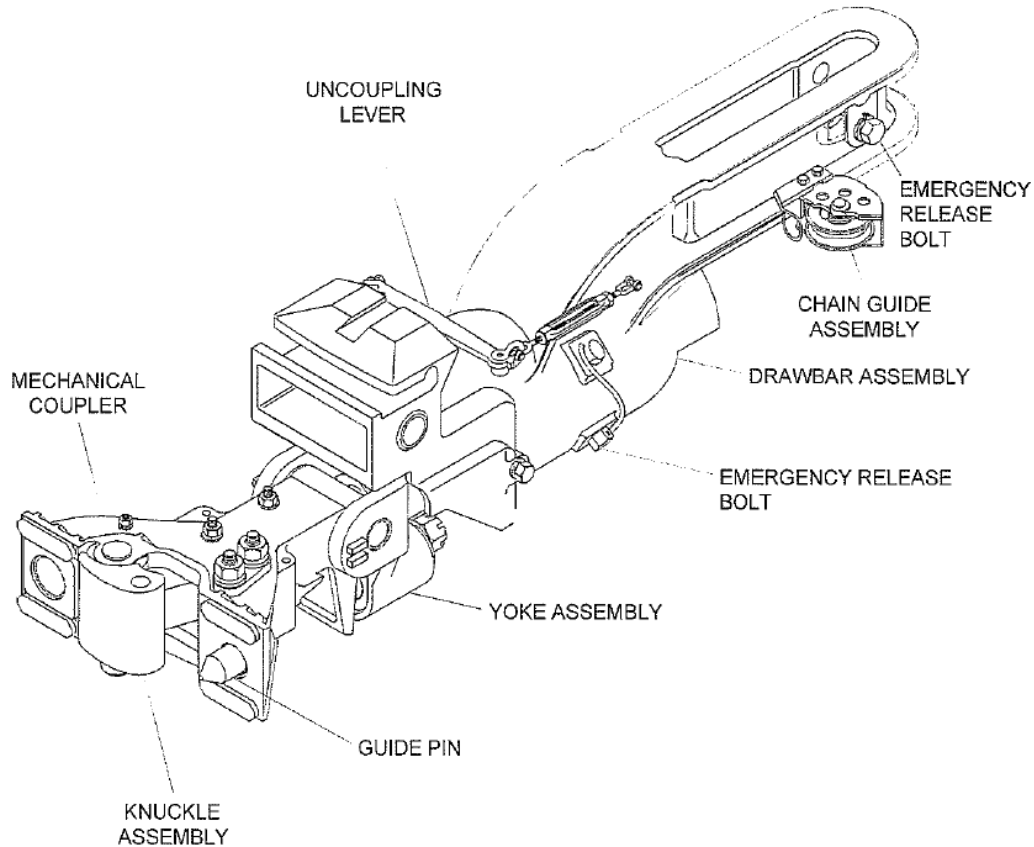


Figure 4.2 Mechanical Coupler with Drawbar Assembly, Courtesy of CTA

4-3 ELECTRICAL PARTS TO THE BUCKEYE COUPLER

When coupled, the electrical coupler provides electrical trainline communication and signals between vehicle. This section will discuss components specific electrical coupler.

Electrical Coupler Head

The coupler may have one or two electrical coupler heads. The electrical coupler head houses the electrical pins. Electrical coupler heads can be actuated into place by air or electric motor. They can also be non-moveable with spring loaded pins. The Tomlinson electrical coupler head is mounted to the suspension attachment on the mechanical coupler.

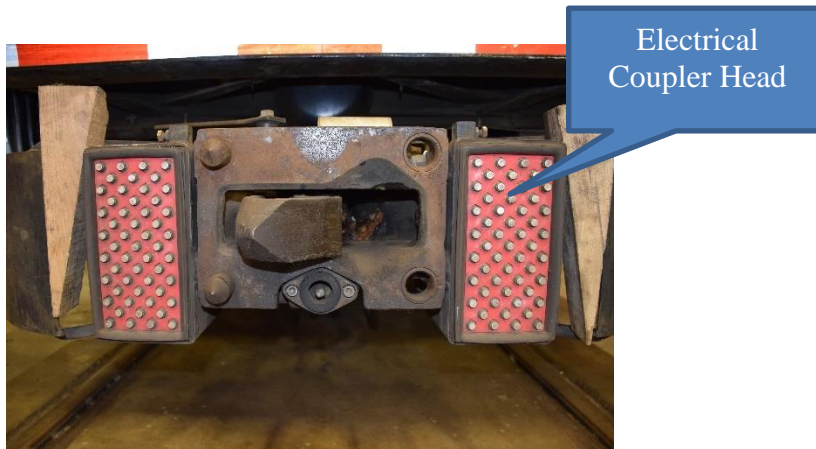


Figure 4.3 Electrical Coupler Head, Courtesy of GCRTA

Electrical Pins

The electrical coupler has electrical pins which provide electrical contacts, and are located in an insulating block. The electrical pins can be fixed contacts or moving (spring loaded) contacts. The flat pins are fixed. As an example, rail vehicle communication pins are fixed. The pins mate with each other during the coupling process. A seal and an electrical coupler door protect the electrical pins from the elements of the environment.

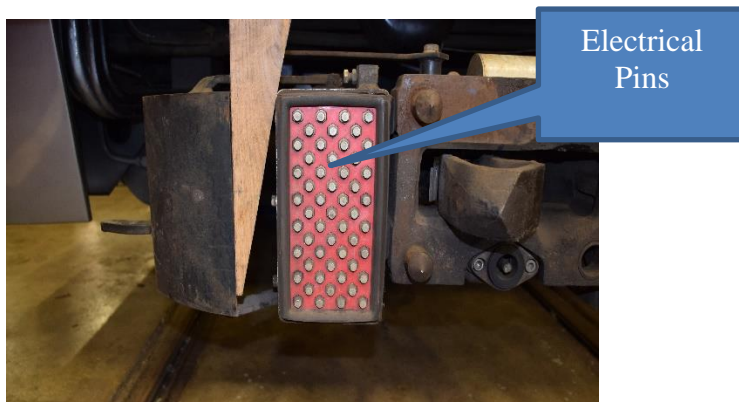


Figure 4.4 Electrical Pins, Courtesy of GCRTA

Electrical Coupler Door

The electrical coupler door covers the electrical pins when the car is uncoupled. The electrical coupler door opens and closes automatically during the coupling and uncoupling process.

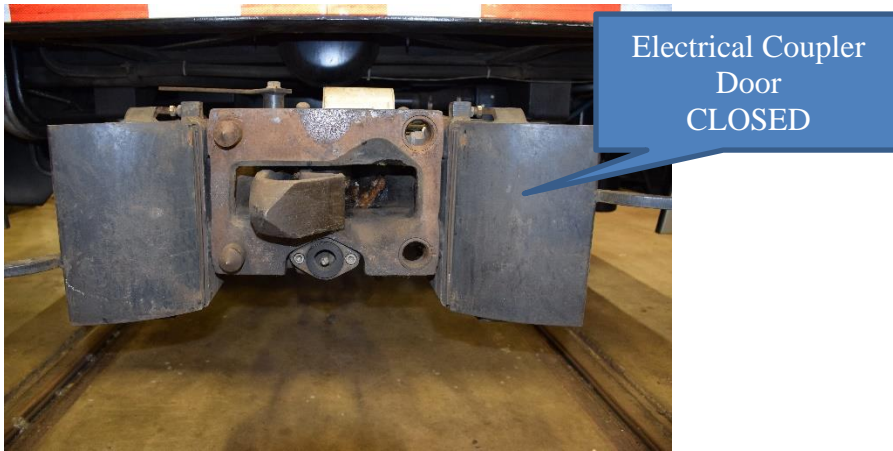


Figure 4.5 Electrical Coupler Door, Courtesy of GCRTA

Coupler Switches

Proximity and Rotary switches are part of the electrical coupler assembly.

Proximity Switches allow the coupler head(s) to move into position. The proximity switch tells the coupler control system when one car is mechanically coupled to another car, and next, the electrical coupling has to happen. When the mechanical coupling process is initiated, the proximity switch will throw the link and hook plate into position so they are able to latch. When the uncoupling process is initiated, the proximity switch sends a signal to the coupler control system and energizes the pneumatic valve to deactivate and uncouple the electrical coupler. After the electrical portion is uncoupled, the mechanical uncoupling process can begin. The proximity switch is located on the face of the coupler.

Rotary Drum Switches electrically connect coupler head wiring to the carbody trainline. When the solenoid valve is activated, the rotary switch will throw to either couple or uncouple the vehicle. The switch can either electrically or pneumatically connect or disconnect to couple/uncouple. The rotary switch is located under the car.

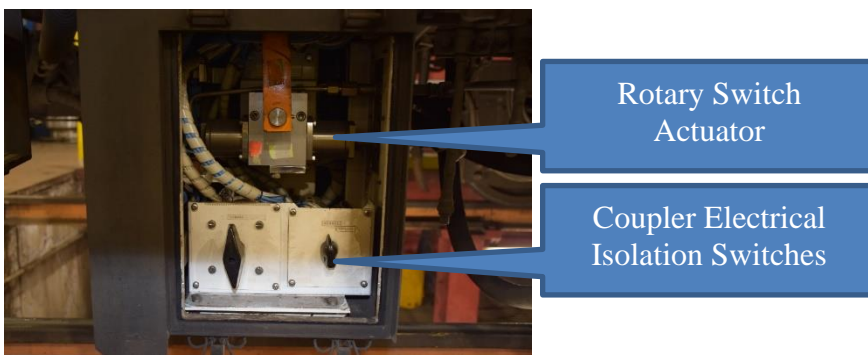


Figure 4.6 Rotary Switches, Courtesy of GCRTA

Trainline Cables

Trainline Cables connect coupler heads to the carbody. Trainline cables provide connectivity of the electrical signals used to control and operate the train.

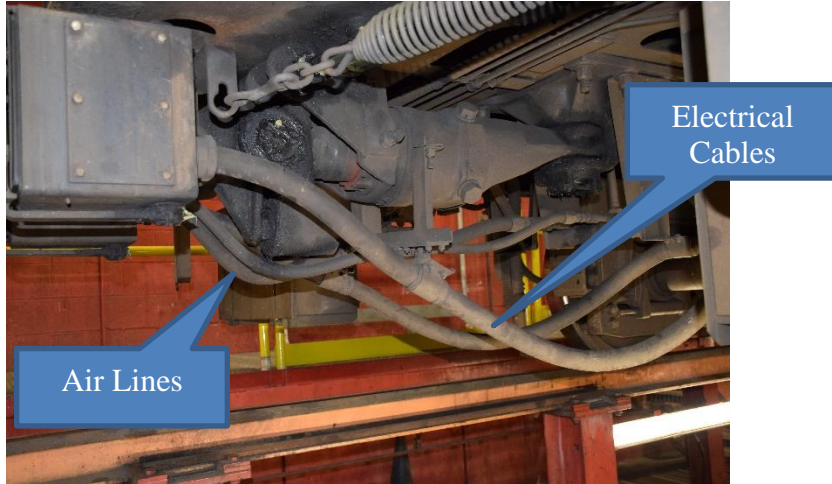


Figure 4.7 Electrical Cables, Courtesy of GCRTA

Electrical Linear Actuator

The electrical linear actuator is mounted to the actuator attachment, which is located one on each side of the mechanical coupler. It advances and retracts the guide pins during the coupling and uncoupling process to move the head into place. The linear actuator can be electrically actuated or pneumatically actuated. It can be disconnected from the attachment for manual operation of the electrical coupler.



Learning Application 4.1 – Electrical Linear Actuator

Explain how the electrical linear actuator works on the trains at your agency. Is the linear actuator electrically or pneumatically actuated?

Electrical Coupler Heater

An electrical coupler heater is only used at agencies that experience colder weather. The electrical heater is intended to keep the electrical pins dry and from freezing.



Figure 4.8 Coupler Heater, Courtesy of Metro Transit

Coupler Control Unit

The Coupler Control Unit includes the Uncoupling Switch, Solenoid Valves and Coupler Control Cutout. For purpose of this training, the coupler control unit will be discussed under the electrical section but it is important to note, it can be either electrical or pneumatic. Refer to your agency to determine if these components are electrical or pneumatic.

The **uncoupling switch** operates the coupler release and initiates uncoupling. The operator initiates both electrical and mechanical uncoupling of the coupler.



Figure 4.9 Uncouple Switch, Courtesy of GCRTA

The **solenoid valve** controls airflow to the rotary drum switch. The solenoid valve is mounted to both the A and B car. During the coupling process, and after the electrical couplers have coupled, the solenoid valve receives a signal that indicates air pressure should be applied to the rotary drum switch. It closes and connects specific trainline signals to the electrical coupler. The same process will happen for the decoupling process. Before the electrical couplers are

uncoupled, the solenoid valve receives a signal which indicates air pressure to the rotary drum switch is open and disconnects specific trainline signals from reaching the electrical couplers. The number of solenoid valves may vary by agency. For example, there are 3 solenoid valves on the Tomlinson coupler used at VTA.

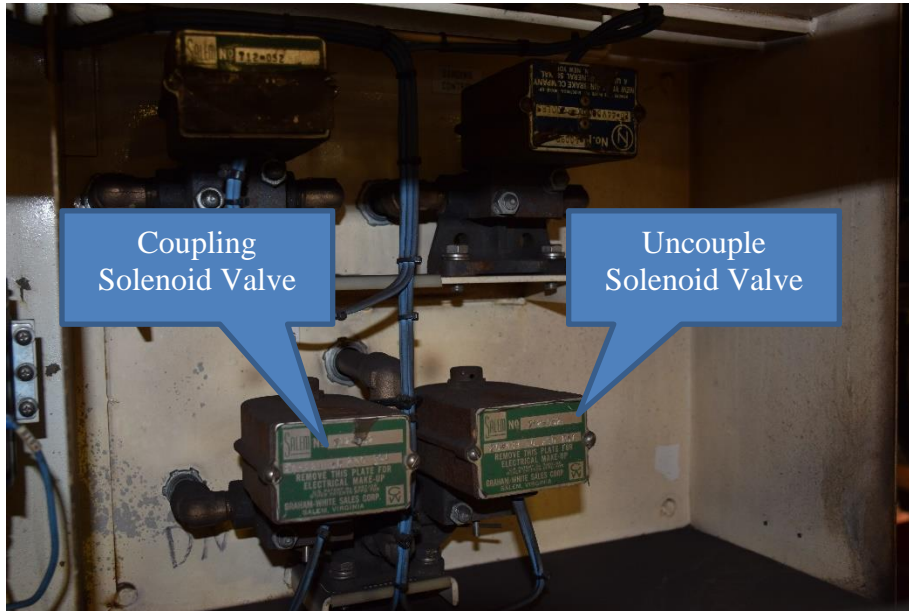


Figure 4.10 Solenoid Valve, Courtesy of GCRTA

The **coupler control cutout** isolates electrical signals so the vehicle cannot send certain signals from one car to another. The coupler control cutout is located in the operator’s cab. At some agencies, the coupler control cutout may also be referred to, and perform the same functions, as the rotary switch.



Learning Application 4.2; Coupler Control Unit – Electrical or Pneumatic

Determine if the Coupler Control Unit switches are electrical or pneumatic. Place an **X** in the correct box. Space is provided for agency specific notes.

SWITCH	ELECTRICAL	PNEUMATIC	NOTES
Uncoupling Switch			
Solenoid Valve			
Coupler Control Cutout			

4-4 PNEUMATIC PARTS TO THE BUCKEYE COUPLER

Tappet Valve

The tappet valve is used to transmit pneumatic air between rail car vehicles during the coupling process.

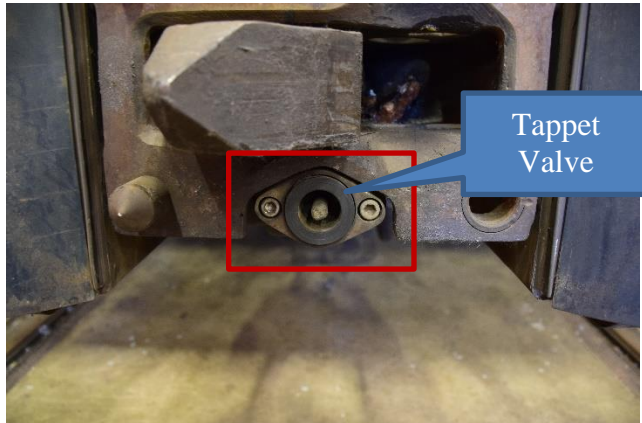


Figure 4.11 Tappet Valve, Courtesy of GCRTA

Impulse Valve

The impulse valve controls multiple valve functions by means of pneumatic air.

Air Lines

Air lines carry pneumatic air to the electric and mechanical coupler

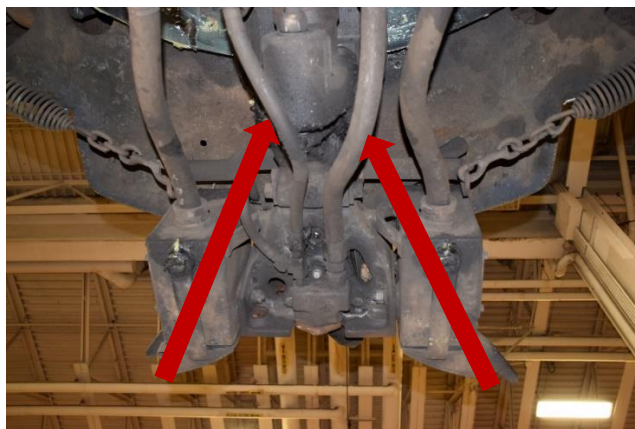


Figure 4.12 Air Lines, Courtesy of GCRTA

Air Filter

The air filter prevents moisture, debris and contaminants from accumulating in the pneumatic coupler airline. Contaminants that could damage the pneumatic devices include, but are not limited to, lubricant particles ejected by the compressor, dirt particles and small water droplets.

4-5 SUMMARY

This Module provided the participant with a more in depth look into the mechanical, electrical and pneumatic parts to the Buckeye Coupler. As always, refer to your specific agencies as nomenclature and component functions may slightly differ.

COMPONENTS		
MECHANICAL	ELECTRICAL	PNEUMATIC
Mechanical Coupler Head	Electrical Coupler Head	Tappet Valve
Latching Device	Electrical Pins	Impulse Valve
Uncoupling Device	Electrical Coupler Door	Air Lines
Suspension Attachment	Coupler Switches	Air Filter
Centering Device	Trainline Cables	
Draft Gear	Electrical Linear Actuator	
Anchorage Device	Electrical Coupler Heater	
Alignment Components	Coupler Control Unit	

MODULE 5

Operating a Coupler

Outline

5-1 Overview

5-2 Coupling a Vehicle

5-3 Uncoupling a Vehicle

5-4 Summary

Purpose and Objectives

The purpose of this module is to provide participants with the processes for automatically and manually coupling and uncoupling a rail vehicle.

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

- Explain the procedure for automatically coupling a rail vehicle.
- Explain the procedure for automatically uncoupling a rail vehicle.
- Explain the procedure for manually uncoupling a rail vehicle.

Key Terms

- Automatic
- Couple
- Manual
- Uncouple

5-1 OVERVIEW

Coupling or uncoupling can be achieved automatically or manually. Automatic couplers couple and uncouple with assistance of electro-pneumatic energy. The function for coupling and uncoupling is started from within the cab. Manual couplers do not use electro-pneumatic energy for coupling and uncoupling. Manual couplers can couple without assistance. The uncoupling procedure requires personnel to perform the uncoupling actions at train-side.

Coupling or uncoupling vehicles can only occur with:

- Authorization from OCC
- A qualified Rail Operations employee
- LRVs that have couplers that are in good working order

Coupling or uncoupling can only occur when it is safe to do so and when couplers can be properly aligned for a solid buff. Coupling and uncoupling should be avoided on hills and curves when possible.

5-2 COUPLING A VEHICLE

Procedures for coupling a vehicle will vary slightly by agency but will all follow the same general process as described below. Be sure to always refer to your agency's specific guidelines before beginning the coupling process.

Coupling is accomplished at low speeds without assistance and creates a rigid, fully attached connection between vehicles.

- Conduct visual inspection and walk around of the stationary LRV to ensure that no blue flags are displayed, or obstructions are present to prevent a safe coupling. Visually inspect both couplers from the ground for correct alignment and readjust couplers if necessary. Verify coupler state:
 - Centered
 - Open (for manual couplers)
 - Ready for coupling (for automatic couplers)
- Ensure that the Key switch on the stationary LRV is in the OFF position. The stationary LRV must be AUXED ON.
- Activate LRV cab facing the stationary LRV and move the Mode Selector Switch to the "Forward" position.
- Ensure that all employees assisting in the coupling are in a safe position and that the correct hand signal is given.
- Perform safety stops at 5 feet and 1 foot from the stationary LRV before coupling.

- Ring bell twice before proceeding with coupling.
- Move the Master Controller handle to power position and slowly (1- 3 mph) bring the LRVs together until they meet firmly and buff.
- Ensure that coupling is complete and successful by observing that the Train Operator Display (TOD) shows both LRV icons illuminated, confirming that both LRVs are mechanically and electrically coupled.
- Perform a pull test to ensure the LRVs are securely coupled. Conduct a roll test and brake test within 10 feet of coupling to ensure that the brakes are operating properly.



Learning Application 5.1 – Coupling Process

After reviewing the coupling process stated above, discuss as a class the similarities and differences in the process at your agency. Space is provided to take notes for future reference.

5-3 UNCOUPLING A VEHICLE

Procedures for uncoupling a vehicle will vary slightly by agency but will all follow the same general process as described below. Be sure to always refer to your agency’s specific guidelines before beginning the uncoupling process.

Automatic Uncoupling

- Activate cab facing the LRV to be uncoupled.
- Lift the cover on the UNCOUPLE button and depress the push-button.
- Replace the safety cover on the UNCOUPLE button.

- Move the Mode Selector Switch to the "O" position.
- Remove key and move to the lead cab. Key up and move selector switch to the forward position.
- Ensure that all employees assisting in the uncoupling are in a safe position and that the proper hand signal is given.
- Check monitors to ensure train is clear, ring bell twice before moving.
- Move the Master Control handle to power position to slowly (1- 3 mph) separate the LRVs (**not to exceed 1 – 2 feet**).
- Ensure that uncoupling is complete and successful by observing that the TOD shows one (1) LRV icon illuminated, confirming that both LRVs are mechanically and electrically uncoupled.
- Deactivate the cab.



Learning Application 5.2 – Automatic Uncoupling Process

After reviewing the coupling process stated above, discuss as a class the similarities and differences in the process at your agency. Space is provided to take notes for future reference.

Manual Uncoupling

- Activate cab facing the LRV to be uncoupled.
- Lift the cover on the UNCOUPLE button and depress the push-button.
- On the operating and the stationary LRV coupler heads, pull the uncoupling handle out to position the coupling link.
- Move the Mode Selector Switch to the "O" position. Remove key and move to the lead cab. Key up and move selector switch to the forward position.
- Ensure that all employees assisting in the uncoupling are in a safe position and that the correct hand signal is given.
- Check monitors to ensure train is clear, ring bell twice before moving.
- Move the Master Control handle to power position to slowly (1- 3 mph) separate the LRVs (**not to exceed 1 – 2 feet**).
- Ensure that uncoupling is complete and successful by observing that the TOD shows one LRV icon illuminated confirming that both LRVs are mechanically and electrically uncoupled.



Learning Application 5.3 – Manual Uncoupling Process

After reviewing the coupling process stated above, discuss as a class the similarities and differences in the process at your agency. Space is provided to take notes for future reference.

5-4 SUMMARY

This Module provided the participant with the general processes and procedures for coupling and uncoupling a coupler. As procedures will vary by agency and make of coupler, it is important to always refer to agency specific material prior to coupling and uncoupling a coupler.

MODULE 6

Inspection and Maintenance Tools

Outline

6-1 Overview

6-2 Inspection and Maintenance Tools Used for the Coupler

6-3 Summary

Purpose and Objectives

The purpose of this module is to provide participants with an understanding of the necessary tools used to inspect and maintain the rail vehicle's coupler.

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

- List and explain function of tools used to inspect and maintain the coupler

Key Terms




- Gauges
- Hand Tools
- Wrench
- Digital Voltmeter
- Lubricant

6-1 OVERVIEW





The rail car technician will use various tools to perform door maintenance and inspections. This Module will present some of the common tools used across the Consortium’s rail agencies. This Module will not go into detail on all tools a rail car technician will use within the scope of their job duties. Therefore, refer to your agency for a complete list of tools necessary to perform assigned tasks.


For a complete list of tools used in the inspection and maintenance of rail car vehicles, refer to Rail Car Consortium Course 100.

6-2 COMMON TOOLS USED FOR INSPECTION AND MAINTENANCE

TOOL	FUNCTION	PICTURE	AGENCY NOTES
Go/No-Go Gauge	Checks all mechanical ware		
Height Gauge	Checks standard height for vehicle		
Tape Measure	Verifies proper height adjustment of coupler		

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<p>Grease Gun and Grease</p>	<p>Used for lubrication of moving parts</p>		
<p>Hand Tools (wrenches, screwdrivers)</p>	<p>Used for general maintenance of coupler</p>		
<p>Nylon Brush</p>	<p>Used to clean electrical pins</p>		
<p>Torque Wrench</p>	<p>Used to verify proper nut and bolt tension</p>		
<p>Cleaning Solution/Lubricant</p>	<p>Used for general cleaning Used for coupler face, hook, as per OEM</p>		

Digital Voltmeter	Checks for electrical continuity		
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6-3 SUMMARY

This Module provided the participant with a list of tools used for the inspection and maintenance of all types of couplers. In some cases, more specialized tools may be needed. Always refer to your agency for specific information. A full list of tools the rail car technician will use in the scope of his job can be found in Course 100.