



Operations Training Manual

Pennsylvania Trolley Museum
Washington PA. 15301



2018 Edition

Acknowledgements:

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This manual is part of the streetcar operations training program at Pennsylvania Trolley Museum.

This manual is issued to:

Badge Number: _____

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OPENING AND CLOSING THE MUSEUM

OPENING THE MUSEUM FOR OPERATION

- Clock in using the electronic time card.
- Check the substation blackboard for special notices regarding any operating restrictions that may exist. These are also located on the operations webpage if you wish to check them before your arrival.
- Get a radio and perform the appropriate “call sign” - WPLD 754 (this must be transmitted over channel 1 at the beginning and end of the operating day.) Even if you are the only crew at the museum, take a radio so that others may communicate with you if they arrive while you are on a run.
- Put up the U.S. and state flags.
- Turn on the substation.
- Make sure that work equipment and cars in storage are adequately closed to the public with doors closed or barricades in place.
- Unlock and disarm the hallway door into the events room to give patrons access to the restrooms for the day. Check rest rooms for towels, toilet paper, and soap. If supplies are needed inform the office staff.
- Perform the walk-around inspection of the service car(s). Move car to apron in front of carbarn and complete the walk-around inspection.
- Complete your line check, inspect the line for any fallen debris, damaged overhead or track, and other obstacles that may hinder service. Return the car to the Richfol platform when you have completed your line check. Be sure to note what direction the first trip is scheduled for to prepare the service car for departure.
- If using a second car, repeat inspection and stage it for departure.
- Sweep and dust the service car(s) as necessary.

SAFETY AND SECURITY OF THE BUILDINGS DURING OPERATION

- Advise patrons they are prohibited from roaming in the carbarn or car shop, but that tours may be available upon request.
- If there are no workers in the car shop, but you intend to conduct shop tours, do not open the shop until you are ready to enter with visitors.
- Be aware of the public and use good judgment in dealing with them. Use the opening and closing of building doors as part of your tour presentation, emphasizing the museum’s concern for safety and security.

CLOSING THE MUSEUM

- Shut off the air compressors, drain condensation from the air tanks (where possible).
- Make sure all trolley poles are down.
- Ensure operating handles have been returned to the ammo box located in their respective car.
- Make sure the lights are off when leaving.
- Shut off lights in building, and check that doors are lock and alarm is set.
- Turn off trolley power.
- Return radios to the cabinet in the substation. Check to make sure that all other radios are off and properly seated in the charger.
- Take down the flags.
- Make a thorough check of all doors to see that they are locked:
 - Substation
 - Events room (security system, all doors)
 - Brown shelter
 - Visitor center (security system)
 - Shop building (security system)
- Place car condition reports, if any, in the maintenance supervisor's mailbox.
- Record your hours worked on your timecard.

DISPATCHING

A dispatcher or supervisor of the day will be assigned to oversee all special events and other operations as necessary. The dispatcher will exercise general supervision of operators, conductors and docents to be certain that they fully understand and observe the rules. The dispatcher will give special attention to the prompt and regular movement of the streetcars according to the current timetable, and will make frequent inspections of equipment. The dispatcher will have jurisdiction at all times over movements of all rolling stock, crew assignments and car assignments. The dispatcher should be available to assist visitors with questions they may have and direct traffic flow around boarding areas. The dispatcher should assist patrons as they wait for, board, and exit the streetcars.

Museum Store personnel do not serve as dispatcher. When a dispatcher is on duty, all radio communication with car crews is to be done through the dispatcher. Communication is not to be conducted directly between the museum store and operating crews or directly between streetcars unless instructed by the dispatcher to do so, or unless an emergency exists. During weekday operation in the period between Memorial Day and Labor Day when there is no scheduled dispatcher, one of the staff members will generally serve as dispatch if there is more than one streetcar on the line. When only one car is active, the operating crew shall determine movement of the streetcar.

TIMEKEEPING PROCEDURE

Timekeeping is necessary in order to obtain a record of the volunteer hours that you work for the PTM. This information is used to support grant applications to foundations, corporations and government. It is used to help in future museum planning, and is also required by the Internal Revenue Service in our reports to them (individual names are not divulged).

Although no pay is involved, timekeeping of the volunteer hours is very important to the success of the Museum's fund-raising efforts. Donors want to know the extent of the Association's investment including our "sweat equity," in projects being or to be funded. Honest and complete time reporting is every member's responsibility.

Working at the Museum

Upon arrival at the Museum, first go to the substation and "clock in" by filling out a job card. At the end of the day, record your hours worked and the code for your job duty that day.

Working away from the Museum

When you perform work for the museum away from the site, record your time by hand or electronically using a computer. Once again, be sure to list what you worked on.

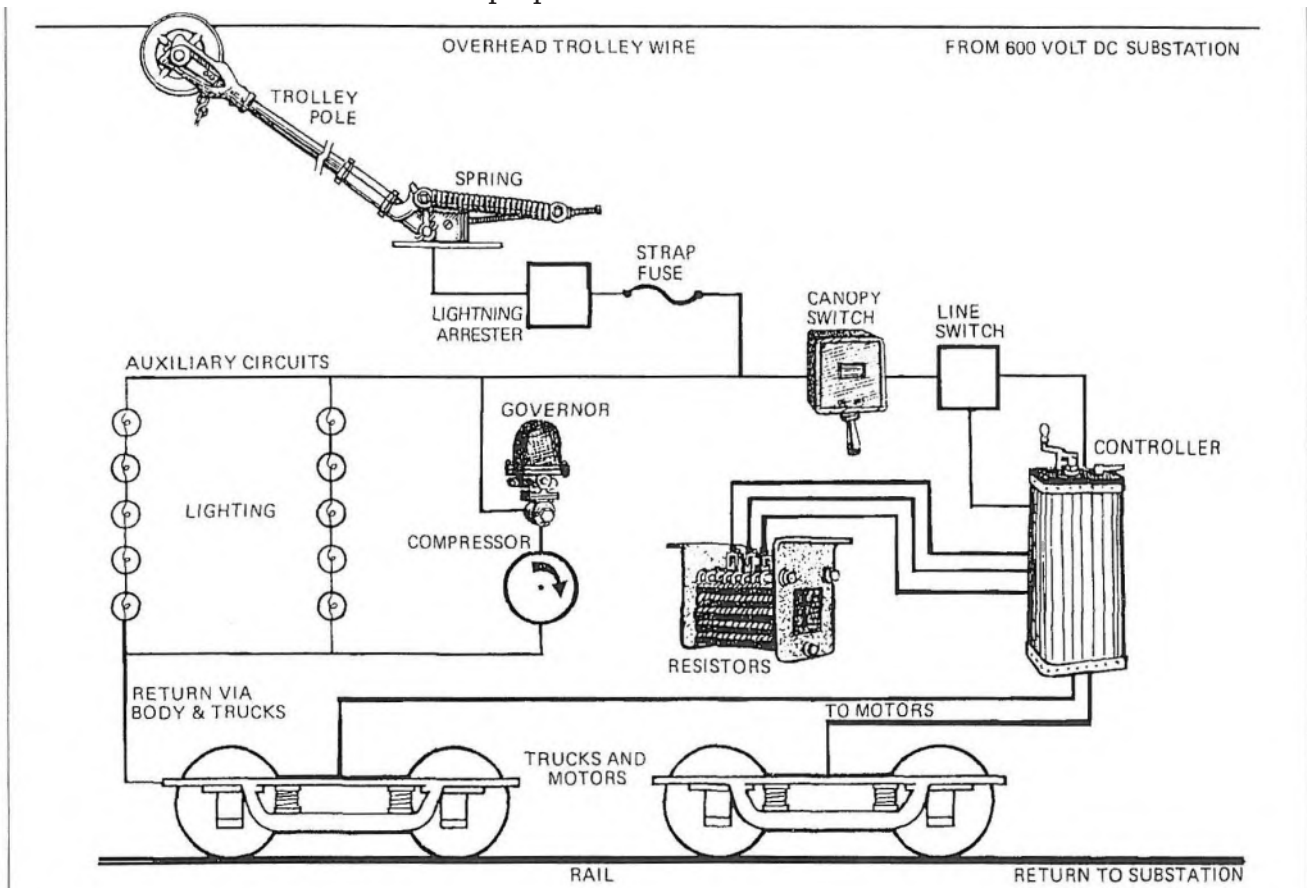
OPERATION OF ELECTRIC CARS

The purpose of this section is to help each operator understand more clearly the functions of the equipment. This section includes the following:

- How Trolleys Work
- Braking
- Other Important Information

HOW TROLLEYS WORK

Refer to the diagram below which traces the path of electricity through a trolley car and illustrates the various components used to operate the car. The trolley pole collects power from the wire and supplies it to the car while permitting the car to move freely over the rails. After the trolley pole are protection devices designed to protect the entire car. The lightning arrestor protects against high voltage surges which may be transmitted through the trolley wire. The strap fuse protects against high current which may result from a short circuit in other parts of the electrical system. Following the protection devices are auxiliary circuits. These circuits are for lights, heaters, the air compressor, and low current control power used on some cars. Each of these circuits has an on-off switch to connect them to the main power supplied by the trolley. The main overhead or canopy switch is a high current on-off switch that connects power to the motors through the controller. The controller, line switch, and resistors are devices that control the motors which propel the car.



How Trolleys Work Diagram

Procedures in this manual are to be used only in conjunction with operator qualification. Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

The controller is a master switch that controls current to the motors through the resistors during acceleration. It also incorporates a switch that reverses the motors. This switch is operated by a key that locks the control handle in the off position when removed from the controller. With the key pushed forward on the controller, the motor circuit is set for forward direction, and the control handle can be moved. Pulling the key back on the controller does the same for reverse direction. Moving the control handle in a clockwise motion switches circuits at various points through the resistors which limit motor current to safe levels when the car is accelerating. The line switch is a high current switch under the car that protects the switches in the controller.

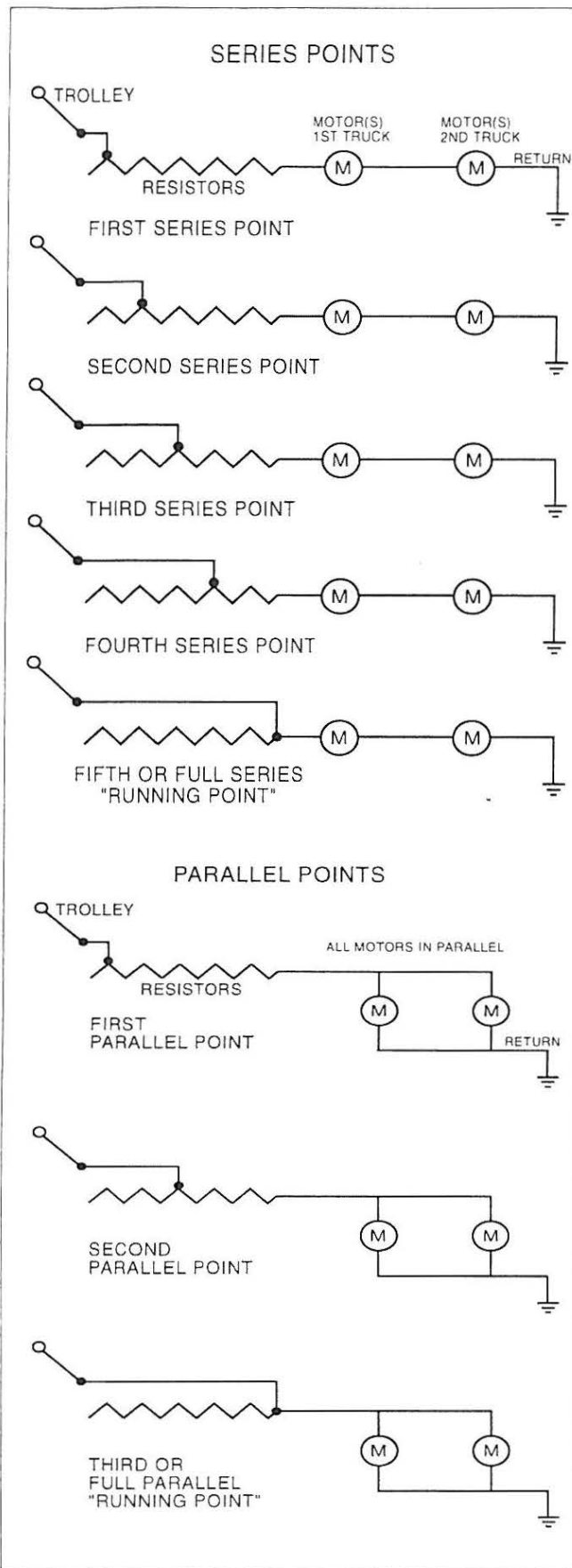
Traction motors used on electric railways are designed to produce the greatest torque or turning force when at a stall. The various control points on the controller allow the torque from the motors to be applied to the wheels in a gradual manner during starting and acceleration of the car. Refer to the Motor Control Diagram. In this diagram two motors are shown, one motor for each truck. This is a simplified diagram and the one motor can represent two motors per truck on a four-motor car where the two motors per truck are permanently wired in parallel.

The circuits, as connected by advancing the controller through the various points, can be divided into two parts. The first points are called series points because the motors are connected in series as the controller is advanced through this section of the controller. In the second part the points are called parallel points because the motors are connected in parallel as the controller is advanced through this section. In the first series point all of the resistors are in the circuit. The car will begin to roll and will accelerate, but the speed will be slow. To increase speed the controller is advanced to the second point, which reduces the amount of resistance in the circuit, and the car accelerates to a faster speed. This notching up procedure is repeated until the last series point is reached on the controller. This point is called “full series” because there are no resistors in the circuit, and each motor is running on 300 volts equally divided across the 600-volt line. This is the first of two “free running” points. In “full series” the car can run indefinitely without wasting electricity as heat dissipated by the resistors, and without danger of burning out the resistors. To further increase speed, the controller is advanced through a gap called “transition” to the parallel points. In the first parallel point the resistors are back in the circuit and the car accelerates because each motor is running on a voltage higher than 300 volts. As the controller is further advanced, more resistance is removed until the last “full parallel” point is reached. In the “full parallel” position there are no resistors in the circuit and each motor is running on the full line voltage of 600 volts. This is the second “free running” point where electrical efficiency is reached. In “full parallel” the car will reach its maximum speed, called “balancing speed”, where the rolling friction equals the torque produced by the motors. In “full series” the car will operate at approximately one-half its maximum speed.

MOTOR CONTROL

The proper notching up of the controller is part of the skill of being a good operator. The points on the controller can be felt as the control handle is advanced. There are notches in the controller that line up the handle at the correct position for each point of the series and parallel circuits. A good operator will feel when the control handle is properly in the notch which reduces arcing of the controller contacts, will advance the control handle through transition from series to parallel quickly and will notch off to the “power off” position quickly in one motion. The line switch will disconnect the motors as soon as the control handle is moved counterclockwise, eliminating arcing when the controller is reset to the “power off” position. The control handle must be moved all the way off, then advanced to the first series point before the line switch will reconnect the motor circuit.

Operators should remember that when the resistors are in the circuit, they are wasting power on every notch except on the two “free running” points. Therefore, the careful operator notches up smoothly and safely without dawdling on the resistance notches. The car is soon up to speed and the operator



Motor Control Diagram

can shut off power and coast. Coasting as much as possible saves electricity. The careful operator is always thinking safety and knows the condition of the rail.

On wet or slippery rail the wheels will easily spin. Correct for a spinning wheel immediately by notching off until the wheel stops spinning and grips the rail, then notch up more slowly to prevent further spinning. Good judgment on the part of the operator provides a smooth safe ride for our patrons.

BRAKING

There are three basic types of braking used on hand control streetcars:

- Direct mechanical, or hand brakes
- Air brakes
- Dynamic, or regenerative electric brakes

All cars use at least one of these; most cars have provisions for two and some have all three.

Handbrakes - handbrakes are generally used in emergencies when all other systems fail. The operator must always be sure the hand brakes are off before moving a car. The hand brake is wound clockwise to apply and counterclockwise to release.

Air Brakes - The basic components of an air brake system are the compressor, reservoir, brake valve, brake cylinder, and brake shoes. The compressor, driven by an electric motor, compresses air up to the necessary air pressure. As system pressure reaches the prescribed level, the compressor motor automatically shuts off, starting again only when pressure becomes sufficiently low. The reservoir stores compressed air. On the bottom of each reservoir, or tank, is a drain valve. The reservoir should be drained when the car is put away after each day's use, to remove condensation which accumulates in the tank. On rainy days it is wise to open the drain valve for a few seconds every two hours, as condensation builds up more rapidly. Be sure to only drain the tank when the car is on level track or properly secured to prevent it from rolling away. The brake valve controls pressure in the brake cylinder by admitting air from the reservoir,

or by exhausting air from the cylinder into the atmosphere. There are two main types of brake valves - manual lapping and self-lapping. The brake cylinder employs a piston to convert air pressure into direct mechanical pressure against the brake shoes. The brake shoes do the actual stopping by bearing against the wheels, one shoe per wheel. They are usually made of cast iron, with a surface having a high coefficient friction, and will withstand the heat generated while stopping. If brake smell occurs while running, chances are the brakes are dragging.

In PCC cars equipped with air brakes, the brake shoes are lined with a fibrous composite similar to that of automobile brake pads. This material has even a greater coefficient of friction than that of cast iron. While brakes are applied by air pressure, they are released by a large spring, which brings the brake shoes, linkages and brake cylinder back to their “released” positions when pressure is released from the cylinder. A useful item is an air pressure gauge. A gauge with only one needle indicates only reservoir pressure, but some cars have gauges with two hands. One shows reservoir pressure while the other shows brake cylinder pressure. The cylinder pressure indication is useful in getting the feel of how much air to use in stopping.

Depending on the car, safe operating pressure will be 60 to 110 pounds per square inch (PSI). If a reading is quite low (40 psi or less), trouble is indicated and the car should not be moved. A dangerously high pressure (125-130 psi) could mean that the compressor has failed to shut off. In this event, turn off the compressor immediately.

STOPPING WITH AIR BRAKES: MANUAL LAPPING

A manual lapping brake valve has three pipes connected to it. One pipe is to the reservoir, another to the brake cylinder, and the third is open to the atmosphere. In the “lap” position, no action takes place. All valve passages are closed, and the pressure (or the lack of it) in the brake cylinder remains constant. In the “apply” position, air rushes from the reservoir to the brake cylinder. If the handle is left in “apply,” after several seconds the cylinder pressure will equal the reservoir pressure. In the “release” position, the line from the reservoir is closed and the cylinder line is opened to the atmosphere. As the handle is held in “release,” the pressure in the cylinder escapes to the atmosphere and the brake shoes return to their relaxed position.

The proper way to stop a car is “one application, two releases.” Here’s how it works:

When approaching a stop, move the brake valve handle to “apply” and hold it there for a second or two, admitting enough air to the cylinder to begin braking. Immediately return the handle to “lap.” If there is an air gauge with a cylinder pressure hand, the initial pressure might be about 30 psi. When the valve remains in “lap,” the cylinder pressure remains constant, and the car begins to slow down. Braking friction increases as the speed between two rubbing surfaces decreases, and the constant braking pressure will have a greater effect as the car slows down.

If the cylinder pressure remains the same, the rate of deceleration will continue to increase until the car grinds to a jerky, strenuous halt. This causes undue strain on the car and the passengers.

The stop can be made smoother by releasing about one-third of the pressure when the car reaches about one-third of its original speed (one release). This will slow the rate of deceleration to a more comfortable level. However, if this new pressure is maintained, the car will still stop with a jerk, so when the car is almost stopped, release about half the remaining air (second release) to bring the car to a nice, easy stop. After the car is completely stopped, full air pressure should be applied to the cylinder to insure that it stays stopped. Be cautious when using this technique not to release too much air. If too much air is released, more must be reapplied. The reapplication may be more than enough, thus requiring another release. This is known as “fanning” and should be avoided.

STOPPING WITH AIR BRAKES: SELF-LAPPING VALVES

This type of valve makes the operator's job much easier. It allows for faster, smoother, and more accurate control of braking, and reduces the waste of air. The braking pressure is controlled by a pressure regulator in the brake valve itself. The position of the handle sets the regulator pressure, and as long as the handle remains in one position, the braking pressure for that setting is automatically maintained.

In this type of system, the extreme left position of the brake handle releases all air, setting the brake pressure to zero, or "full release." The extreme right position provides full emergency braking. Positions in between provide varying degrees of pressure for normal service stops.

The same basic principles explained in the section on manual lapping hold true in stopping a trolley equipped with a self-lapping brake valve. Upon approaching a stop, move the brake handle to the right, toward "full apply," stopping in a position which admits a reasonably large amount of pressure into the brake cylinder. When a cylinder pressure gauge is provided, an adequate pressure will measure from 30 to 35 PSI. As the rate of deceleration increases, move the handle a little to the left to reduce the pressure. Keep the handle there until the car is nearly stopped. When the car is nearly stopped, move the handle still farther to the left to smooth the final stop. As soon as the car is completely stopped, move the handle to "full apply" and leave it there until ready to move again.

With practice, operators will find that they are able to stop at the exact spot desired by releasing just the right amount of air at just the right time. Most cars equipped with self-lapping brake controls also have a safety feature known as a "deadman" valve, usually incorporated into the controller handle. This valve must be held down at any time that the brake valve is not in the "full apply" position. If it should be released while coasting or accelerating, or even during light braking, an emergency air relay will be tripped, and all available air pressure from the reservoir will be applied to the brake cylinder. It takes some effort to hold the deadman down, as it was designed so that an unconscious body could not readily hold it down; hence its name and purpose. When preparing to leave a car so equipped, move the brake handle to "full apply" (the position where the handle can be removed) before releasing the deadman.

SMOOTH OPERATION OF AIR BRAKES

The following are some tips for the smooth operation of air brakes:

When starting cars, move the brake handle all the way from "full apply" to "full release." As the air is releasing, pull on the first point of power. The pressure which has not yet escaped from the cylinder will cushion the start, preventing a jerk. In addition, this practice prevents the car from rolling backwards on a grade, and helps prevent the wheels from spinning on wet rails.

- Plan your stops and learn to judge distances.
- Avoid "fanning" the air.
- Release some air as the car is coming to a stop.
- **Never** leave a manual lapping valve in "lap" position when parking a car - leave it in the "full apply" position.

EMERGENCY DYNAMIC BRAKING

Dynamic braking can be obtained on cars with “K” and “HL” controllers via a sequence of emergency operations, should normal braking fail. This is strictly an emergency procedure. The dynamic braking effect cannot be controlled; it is either all or nothing. This is “regenerative braking,” where the motors are used as generators and will generally only slow the car to 3-4 MPH. Once emergency dynamic braking starts, it is necessary to wind up the hand brake to bring the car to a full stop. Additional information can be found in the “Emergency Procedures” section of this manual.

STARTING THE CAR

If wheels begin to spin when starting from a stop, notch the controller off, and notch on and off a few times to get allow the car to begin to move. It can also be helpful to apply 10 to 20 pounds of air to the brakes before applying power. The air should be held until the car has started to move successfully under its own power. If necessary, sand can be placed on the track to assist the car in starting.

STOPPING THE CAR

All wheels of a streetcar must be turning for the fastest possible stop, and this is especially true on slippery rails. In a slide, the only contact of friction is the very small area between the wheel and the rail. Normally, the friction contact is the much larger area between the wheel and the brake shoe. If a slide begins, correct it at once. Follow the procedures outlined in the emergency procedures section.

OTHER IMPORTANT INFORMATION

BELL & WHISTLE SIGNALS

Bell or Whistle/Horn signals are given for various reasons around PTM. When a piece of equipment is about to move a signal is given with a bell (or whistle/horn in lieu of a bell). Two bells means the piece of equipment is about to move in the forward direction relative to the operator, three bells means a reverse movement, or opposite the direction relative to the operator. If operating a single-ended car from the rear or “backup” controller, a signal of three bells should be given before moving the car. One ring of the bell signals a stop. The word “gong” found at various points in the text refers to the bell.

Another common signal is the crossing warning. When approaching a crossing, equipment must signal with the sounding of a whistle or horn. The pattern - . - , or two long signals, one short and one long, should be used when crossing North Main Street. Some specialty equipment is not equipped with whistles or horns, in this case special procedures must be followed when crossing North Main Street.

TROLLEY CATCHERS AND RETRIEVERS

All of the electric passenger streetcars at PTM are equipped with either a “catcher” or a “retriever” to catch or retrieve the trolley pole should it come off the wire. While catchers are a relatively basic mechanism that simply stops the rope when it begins to rapidly leave the spool, retrievers are more complex. When tripped, a retriever’s internal spring retracts the rope into it with tremendous force, pulling the pole down away from the wire. For this reason, it is important to avoid any rapid movement of the rope. *If you feel the retriever grab, let go immediately!* Never wrap the rope around the hands when resetting a retriever. Resetting the retriever after it has tripped is achieved by pulling rope out of the retriever until the spring is rewound. This can be a very difficult task, ask for help if you’re unsure what to do. Cars at PTM equipped with retrievers include PST 14, 66, and 78; PRCo 1711, and WP 832.

THE “LIFE GUARD”

This is a basket-like device which hangs several inches above the rails beneath the front of several of the cars at the Pennsylvania Trolley Museum. It gets its name from its purpose - to prevent a fallen person from being caught under the wheels. Directly in front of the life guard hangs a wooden or light metal framework. Any obstruction on the track will strike this rack first, releasing a trip mechanism which lowers the life guard against the rails. The life guard then scoops up the obstruction. If this mechanism ever trips, find out why. Once an obstruction is cleared, the mechanism can be reset by stepping down hard on the plunger which has risen six or eight inches above the floor near the controls.

OVERHEAD

Operators should be familiar with the trolley wire system above them. The details of overhead construction can be easily seen, and the operator should take time to visually inspect it. Operators need to have enough knowledge of the overhead to spot something that is loose or broken.

Operators should also be aware of obstacles in the wire such as section insulators and contactors. Sections insulators are the devices used to isolate different power sources or permit a section of wire to be turned off independently. Operators should always cross section insulators and contactors with power off to prevent arcing, and/or damaging surges to the electrical equipment. Reapply power only after the obstacle has been cleared. Operators will be able to recognize its passing by the blinking of the car lights and/or the often audible thump from the trolley pole.

TRACK

As with the overhead, operators should be familiar enough with the track to recognize problems. Be especially careful at switch points. Any obstruction in a switch may cause the points not to close completely. Never apply sand in the area of switch points. Sand can cause switch points to bind and not completely close. When observing track conditions, look for loose or broken joints. Look for washouts, especially along the creek. If there is an obstruction on the track, no matter how small, do not run over it. Stop the car, remove it, and then proceed. Make note if something has fallen on the track, it may also have damaged the overhead wires. If there is any doubt about any section of track, do not operate the car over it. Notify the Dispatcher, if no dispatcher is on duty, notify the office staff.

THE WHEELCHAIR LIFT

The wheelchair lift must be used anytime a wheelchair bound visitor is loaded onto a streetcar. At present, there are only 2 cars that are to be used for wheelchairs, 2711 and 66. There are two wheelchair lifts on the property, one at Richfol platform (stored next to the substation) and one inside the Trolley Display Building. The wheelchair lift is to be used only on a smooth concrete surface, do not attempt to take it into gravel or other uneven areas. To move the lift, pull back on the brake release and hold it while maneuvering. Stage the wheelchair lift in the loading area before the patron is ready to board. Below you will find brief instructions on how to operate the lift. The instructions for operation are also covered in a diagram attached to the wheelchair lift.

To prepare for passenger(s):

1. Raise the lift a few inches and fold the wheels.
2. Lower the lift back to the ground.
3. Release and lower the ramp.

When a passenger is ready to board:

1. Have them or a handler maneuver the chair onto the lift.
2. Raise and latch the ramp.
3. Release the crank and lift them onto the car.
4. Once at the proper height:
5. Lock the lift crank.
6. Unlatch and lower the ramp onto the deck of the car.
7. Reverse procedures to return the lift to ground level.
8. Park the lift with wheels folded.

**Ground
Loading
Ramp**



EMERGENCY PROCEDURES

Safe operation is our foremost purpose under all circumstances. The best intentions of providing a safe, smooth ride can, however, be upset by some sudden occurrence, and for this eventuality the operator must be prepared to act just as surely as if he or she were providing a normal, smooth stop.

These emergencies involve:

- Necessity for fastest possible stop because of an obstruction on the track, derailment, object caught on the car, etc.
- Failure of normal braking.
- Controller stuck in the “on” position.
- Car sliding when brake has been applied.

This section describes the procedures to be followed in the event of each of the above, with the various types of equipment.

This section includes the following information:

- Fastest Possible Stop.
- Stopping when Standard Brakes Fail.
- Controller Stuck in the “On” Position.
- Car Slide after Application of Brakes.

FASTEST POSSIBLE STOP:

The following descriptions for fastest possible stops are applicable only if the car does not begin to slide. If the car does start to slide during a full brake application, continue with the procedures described below. A sliding car will not stop as fast as one with the wheels turning in a heavy but controlled brake application.

All Conventional Cars:

1. Move air brake handle into full braking or emergency braking position.

PCC Cars:

1. Push brake pedal to the floor, latching it there.

Cars with “B” Controls and no air brakes (PRCo M37, BVT 1):

1. Move the controller handle to the full braking position.
2. Drop sand.
3. Apply the handbrake.

STOPPING WHEN THE STANDARD BRAKES FAIL

All conventional cars with “K” controllers (PRC 4145 & 4398, PRT 5326, NOPSI 832, 1758, WP 832, CSR 2227)

1. Move the controller to the “off” position.
2. Move reverse handle to the direction opposite the car’s movement.
3. Move main overhead switch to the “off” position.
4. Move the controller to the full parallel position.
5. Wind up the hand brake. (Do not move the reverse handle again until the car has come to a complete stop.)

All conventional cars with controls using a “Master” Controller (PST 66 & 78, PRC 3756 Rear Controls)

1. Move the controller to the “off” position.
2. Move reverse handle to the direction opposite the car’s direction of movement.
3. Quickly move the controller to the first point, then off again.
4. Wind up the hand brake. (Do not move the reverse handle again until the car has come to a complete stop.)

PRC 3756 (front controls only): Rear controller see steps above for “Master” Controller.

1. Move the controller to the “off” position.
2. Move the dynamic brake handle 90 degrees toward you.
3. Wind up the hand brake. (Do not move the dynamic brake handle back until the car has completely stopped.)

Foot Control Cars:

1. Latch the brake pedal to the floor.
2. Move the reverse handle to the “handle out” position.
3. Wind up the hand brake if the car is so equipped.

CONTROLLER STUCK IN THE “ON” POSITION

Hand Control Cars:

1. Move the main overhead switch to the “off” position.
2. Apply full braking, if necessary.

Foot Control Cars:

1. Push brake pedal to the floor latching it there.
2. If power continues “on,” turn off the MG switch.
3. Pull the pole if possible.

CAR SLIDES AFTER THE APPLICATION OF BRAKES

Hand Control Cars:

1. Fully release the brakes.
2. Apply one notch of power.
3. Re-apply brakes gradually.
4. Shut off power as the car comes to a stop.

Foot Control Cars:

1. Push brake pedal to floor. On PCC cars this will activate the rail brake. (Buzzer will sound or Gong will ring when the rail brakes are activated).

DESCRIPTIVE NOTES FOR OPERATING PASSENGER CARS

The following section contains detailed guides of operating passenger cars here at PTM. As a general rule, before operating a car, complete a brief inspection of the exterior and interior for any safety or repair issues. Perform a visual inspection of the running gear. Look under the car to determine if there appears to be anything loose or dragging on the ground. If you see any deficiencies, do not move the car and prepare a maintenance report.

PITTSBURGH RAILWAYS 4145

The 4100 series cars were the last high floor cars built for use on the Pittsburgh Railways Company lines. They were built by the Pressed Steel Car Company in McKees Rocks, PA. These big heavy cars were designed to pull double truck low-floor trailers and served Pittsburgh Railway's busiest routes. Car 4145 entered service on November 25, 1911 and operated into the late 1930s when delivery of the first PCC cars rendered cars of this type surplus.

Because of their heavy construction the Pittsburgh Railways converted about a dozen 4000s and 4100s for use as snow scraping and towing cars in 1940. 4145 was renumbered M459 and placed into service as a snow scraper. It served in this capacity until the closing of the Craft Avenue car house in 1967 when it was declared surplus and placed on the scrap list.



Fortunately it was acquired by the Magee Museum of Transportation and moved to Bloomsburg, PA in 1968. There, Edward Blossom and his restoration team took the car and transformed it back into an operating passenger car. Unfortunately in 1972, Hurricane Agnes spawned storms in the northeastern United States that inundated the museum and destroyed the streetcar line and soaked the entire collection of transportation artifacts, including 4145.

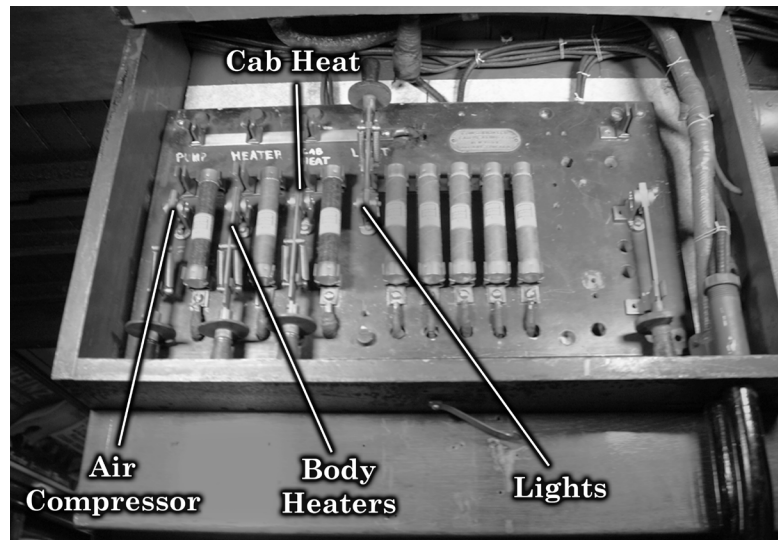
In 1973 the museum was disbanded and the collection was sold to the highest bidders. It was at this time that Gerald Brookins purchased 4145 for his private "Trolleyville" operation near North Olmstead, Ohio. Trolleyville was successful through 2003 when the family of Mr. Brookins sold the property. At this time 4145 was moved to a lakefront location near the Rock and Roll Hall of Fame where the cars were placed on display pending construction of a museum building and re-opening operations along the Cleveland RTA's Waterfront light rail line.

In 2009 without sufficient financing the museum reverted to Brookins Family ownership and a consortium of electric railway museums put together a plan that saw the collection disbanded to the various groups. At this time the generosity of longtime PTM volunteer David Carpenter provided funding for this car to come to Arden for restoration as a wide-gauge operating exhibit, retaining all of the beautiful work done in Bloomsburg forty years earlier.

In 2010 PTM shop volunteers in conjunction with Lyons Industries rebuilt the trucks and returned them to the proper 5'-2½" gauge so that the car could again operate on its home track here at the museum. The car was officially rolled out on its 100th Birthday, November 25, 2011 with Santa Claus on board and Dave Carpenter at the helm.

Start Up Procedures

1. Ensure the reverser is not in the controller then put up the pole.
2. Turn the compressor on, this is located in the control box behind the operator's seat. *NOTE: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
3. Retrieve the handles from the ammo box.
4. Put brakes in full apply position.
5. Make sure the handbrake is released before attempting to move the car.

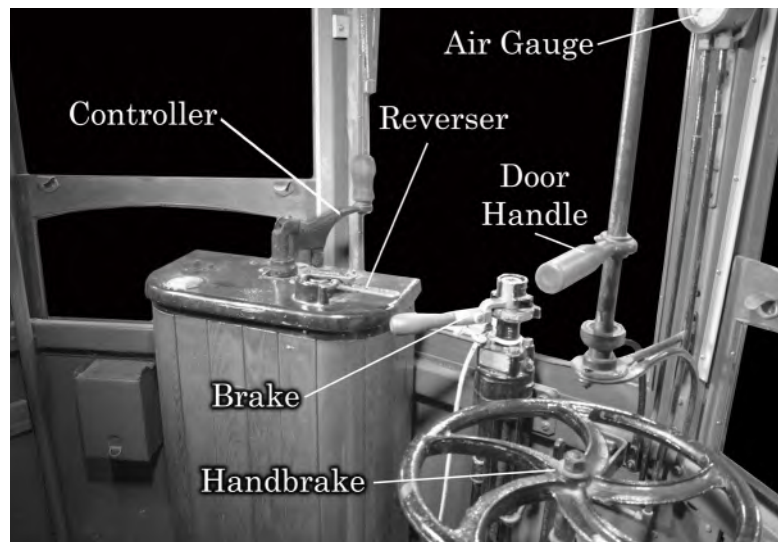


4145 - Switch Cabinet

General Operating Procedures

1. 4145 is equipped with a "K" controller with no deadman. There are 5 points in series and 4 in parallel.
2. 4145 is equipped with manual lapping brakes with an emergency apply position. See section Stopping with Air Brakes - Manual Lapping for more information.
3. A minimum of two crew members (operator and conductor) is required to operate this car with passengers.

Door Operation and Passenger Loading and Unloading



4145 - Controls

1. All doors are manually operated.
2. The front doors are operated by the handle located next to the brake valve.
3. The rear doors are operated from the conductor's seat on the rear platform of the car, the upper handle controls the left hand set of doors while the lower handle controls the right hand set of doors. *Note: This car is very high off the ground, making stepping into it a challenge for some visitors (and volunteers). Be sure to exercise caution and be ready to assist patrons as they enter the car.*

Heating and Ventilation

1. Clerestory windows can be opened to provide additional ventilation on hot days.
2. Knife switches for the heat are located in the box directly behind the operator.

Lights

1. Lights are controlled by a knife switch located in the cabinet behind the motorman.
2. Headlight is wired in series with interior lights.

Backing the Car

1. Reversing this car requires 2 people. Do not attempt to back up the car without someone watching out the rear window or from the ground.
2. Place the reverser in the “reverse” position.
3. Sound the bell three (3) times.

Emergency and Special Procedures

1. 4145 is equipped with a “K” controller. Refer to the Emergency Procedures section for information on dealing with potential emergency situations.
2. Car does not run:
 - a. Check to see that main overhead switch is in the “on” position.
 - b. Check to see that the control switch (CTRNL/RESET) for controller is in the “on” (right) position.
 - c. Reset the line switch.
3. Lifeguard
 - a. Be aware of the lifeguard’s position at all times, it swings wide away from the car and can potentially become tangled in obstacles.



4145 - Conductor's Stand

Power Down Procedures:

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the car barn.
2. Turn off compressor.
3. Return brake and reverser handles to the ammo box.
4. Lower the pole.

PITTSBURGH RAILWAYS 4398



Pittsburgh Railway Company (PRCo) had 1,056 low-floor cars of varying types with 4398 and 3756 the lone survivors. The car was one of 213 double-end, low-floor cars, it was built in 1917 and had a design life of about 20 years. The car spent its last years operating out of Glenwood Car House and was assigned to the 99 Glassport-Evans Ave route. In 1950, a loop was installed in Glassport and PCC cars replaced 4398 and other low-floor cars on that end of the line. When service was abandoned on Evans Avenue in 1952 the car was retired. It was kept in storage for emergencies until the museum purchased it in 1956. It was used for special excursions in 1958 and subsequently moved to the museum in 1960. Cars like 4398 were known as “safety cars” because they added safety features such as a deadman and door interlocks to keep the car from moving while a door was open. Car 4398’s restoration is the most extensive in the Museum’s history. Over 30,000 hours were spent rebuilding this car.

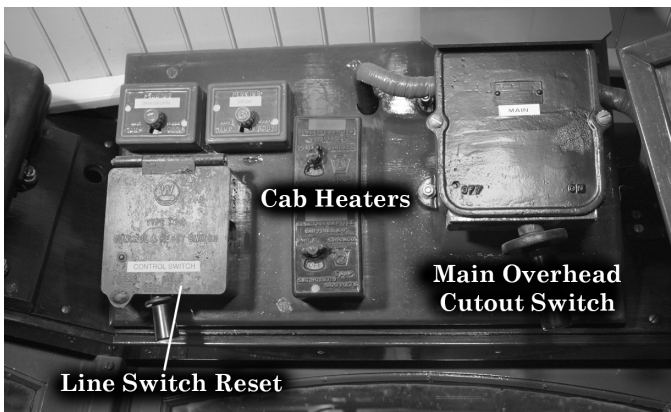
Start Up Procedures

1. Ensure reverser is not in the controller then put up the rear pole.
2. Turn on battery switch above electrical cabinet on #1 end, left side.
3. Check the transfer switch, located in the control cabinet. If switch is not set for the direction that you will be going, change it to the correct position. The “up” position is the #1 end and the down position is the #2 end.
4. Turn the compressor on, this is located in the control box above the operator’s seat on the #1 end. *NOTE: This is a knife switch with a spring mechanism to lessen arcing when opening the*

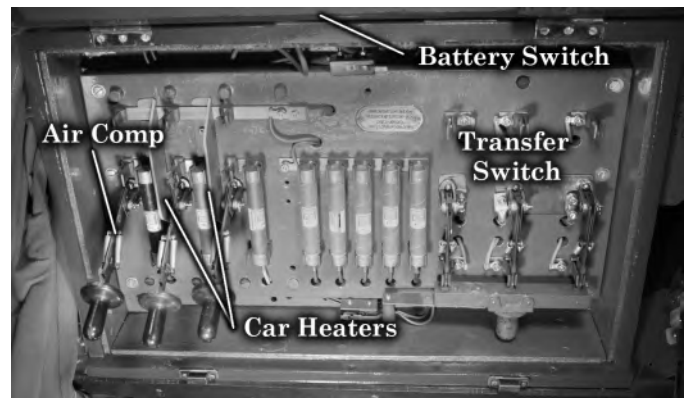


4398-#1 end switch locations.

Procedures in this manual are to be used only in conjunction with operator qualification. Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.



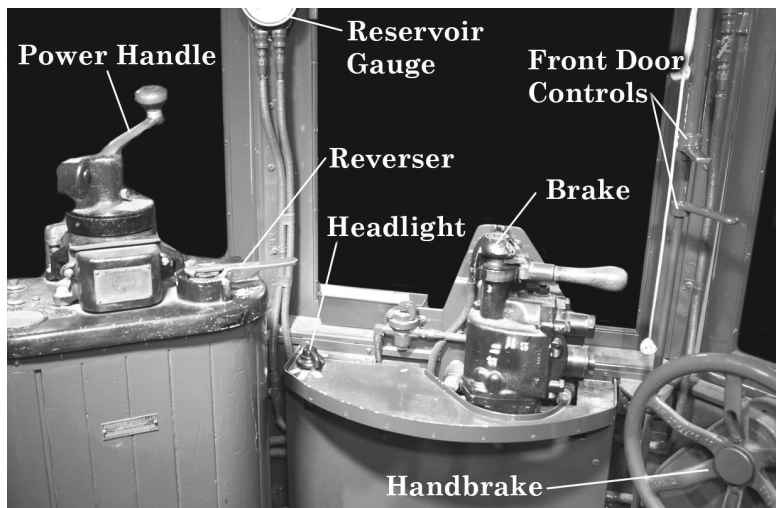
4398 Overhead Switch Panel



4398-Control Cabinet

switch. This box contains areas that are electrically "hot". Exercise caution when turning switches on or off.

5. Move the control/reset switch to the reset position and then back to the on position.
6. Perform the brake changeover procedure (described under Changing Ends).
7. Make sure the handbrakes at both ends are released before attempting to move the car.



4398 - Controls

General Operating Procedure

1. 4398 is equipped with a "K" controller with a "deadman". The controller handle must be depressed unless the brake handle is in the "full application" position. The foot deadman pedal may also be used, but the controller handle must be held down first before you can use the foot deadman pedal (charging the system). Once the foot deadman pedal is depressed, the controller handle can be released. There are five (5) notches in series and three (3) notches in parallel.
2. 4398 is equipped with self-lapping brakes. The brake full application position (all the way to the right) also allows insertion and removal of the brake handle. *See section Stopping with Air Brakes - Self Lapping for more information.*

Door Operations & Passenger Loading and Unloading

1. The front doors are opened/closed by using the two handles to the right of the operator.
 - a. The top handle opens the #1 (left) set of doors.
 - b. The lower handle opens if the #2 (right) set of doors.
 - c. On the exterior of the car, on the door side of the anti-climber, there is a small black lever. This lever is attached to the #2 door linkage and can be used to open and close the #2 doors from the outside of the car (when there is sufficient pressure in the air tanks).
2. The center doors are opened/closed by using the push buttons located on the front door engine cabinet above the door handles. The top button opens the doors and the bottom button closes

the doors. The center doors should be closed before moving the car. If the car is started with the center doors left open, the car will move before the doors automatically close. Never close the center doors without making sure that these doors are clear of passengers. As general procedure, the center doors should only be used if there is someone (conductor on the car or someone on the platform) to visually observe that the doors are clear before they are closed.



4398 - Door Control

Heating and Ventilation

1. Heat for passenger area is controlled by the knife switches in the electrical cabinet at the #1 end of the car. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
2. Heat for the operator's cab is controlled by the switches above the center window at the #1 end #2 end of the car.
3. Clerestory windows can be opened to provide additional ventilation on hot days.
4. Turn off all heaters at least 30 minutes before the car is placed in the car barn.

Lights

1. Car body lights are controlled by two snap switches located as follows:
 - a. #1 end: Mounted on the upper side of the electrical cabinet.
 - b. #2 end: Above if the leftmost cab window.
2. Headlights are controlled by the three-position switch on dash to the left of the brake valve. The battery switch must be on for the headlights to operate. During night operations, be sure that the headlight is in the low beam position when approaching platforms and when meeting cars at passing locations.
3. Marker lights are on when the battery switch is closed. Direction is controlled by the transfer switch.

Changing Ends

1. Place brakes in full apply position.
2. Switch the trolley poles.
3. Close all doors. The front doors should close when you transfer control to the other end of the car. If there is anyone in the doorways, they could be injured when the doors close. If the center doors are open and you transfer control to the other end of the car, you will no longer be able to close the center doors since the door control switch for the former front end of the car will no longer be operative.
4. If you are on the #1 end, throw the transfer switch.

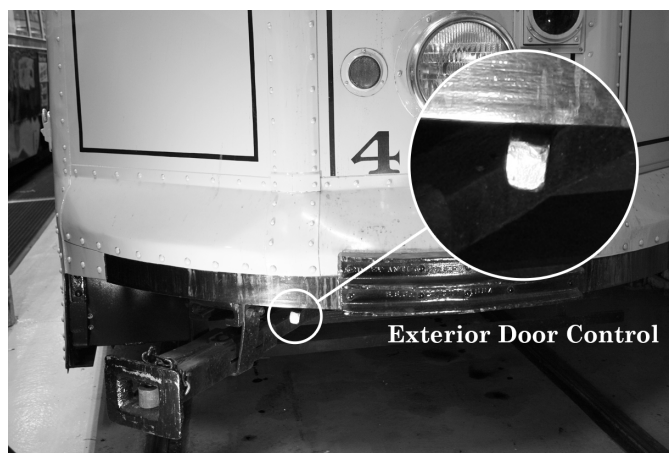
5. Move handles to the other end.
6. If the #1 end is the new front-end, throw the transfer switch.
7. Switch the brake and door controls to the new front end by these steps:
8. Hold down the controller handle.
9. Release the brakes and wait. When you hear a second “chuff” or release of air, you may reapply the brakes and release the deadman. This “chuff” sound is the brake system recognizing this brake valve is now active.
10. Return brake handle to full application position and release the deadman.

Emergency and Special Procedures

1. 4398 is equipped with “K” controller. Refer to the Emergency Procedures section for information on dealing with potential emergency situations.
2. Car does not run:
 - a. Check to see that main overhead switches on both ends are in the “on” (right) positions.
 - b. Reset the line switch using the control switch (CTRNL/RESET.)
 - c. Check to see that the center doors are closed.
 - d. The car may be in “emergency”. Release the brakes and wait for a minute or until you hear a second “chuff” or release of the brake system. This means the car has come out of “emergency” and is ready to operate.
3. LifeGuard
 - a. If the LifeGuard drops, stop the car as soon as possible and manually lift the LifeGuard back into the locked position.

Power Down Procedure

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the car barn.
2. Turn off the compressor.
3. When putting the car in the Car Barn, set the transfer switch to the new front end and perform the brake switchover process.
4. Turn off the battery switch.
5. Return the handles to their ammo box.
6. Exit car through door #2 (from new front end in Car Barn) and use the external control (in front of car) to close the door.
7. Lower the pole.
8. Drain condensation from the air tanks.



4398 - Exterior door control

PITTSBURGH RAILWAYS 3756



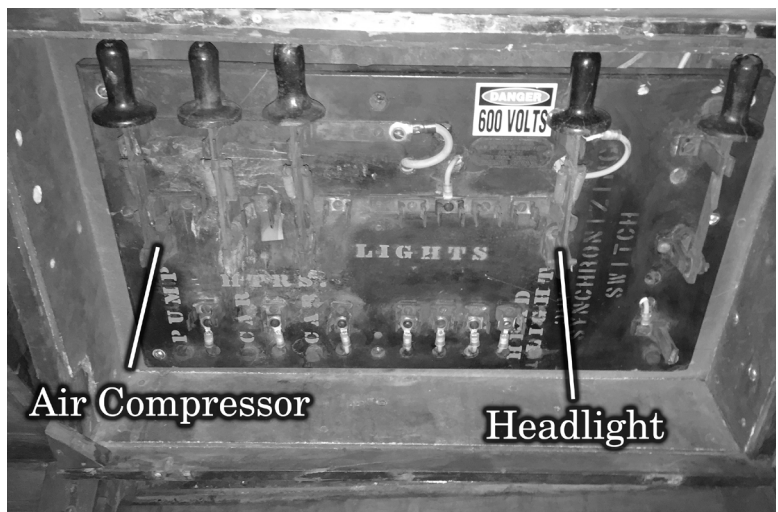
Pittsburgh Railway 3756 is one of a group of twenty cars purchased in 1925 to replace older, heavier wooden interurban cars on the Washington and Charleroi lines. These cars were fitted with couplers and multiple-unit controls so they could be operated on two-car trains. This, however, proved unpopular with both company and riders and the cars were ultimately withdrawn from this service.

As originally built, these cars had a separate smoking compartment and a lavatory. During World War II, the first nine cars of the group (including 3756) were equipped with a left-hand front door and assigned to service on the 23 line, which served the shipyards on Neville Island. Many of the car stops on the island would require patrons to alight on a busy highway were it not for the extra door.

The car was selected for preservation from over 200 available cars shortly before the move to the present museum site in 1954. While it is essentially a single-ended car, 3756 is equipped with operating controls between the rear seats, which simplified moves inside car houses and coupling of multiple unit trains. This feature allowed the car to be operated, to some degree, as a double-ended car in service at the museum.

Start Up Procedures

1. Ensure reverser is not in the controller then put up pole.
2. Insert brake handle on front end and place in apply position.
3. Turn the compressor on, this is located in the control box above the operator's seat. *NOTE: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
4. For operations, it is necessary to install the portable headlight. To place the headlight:

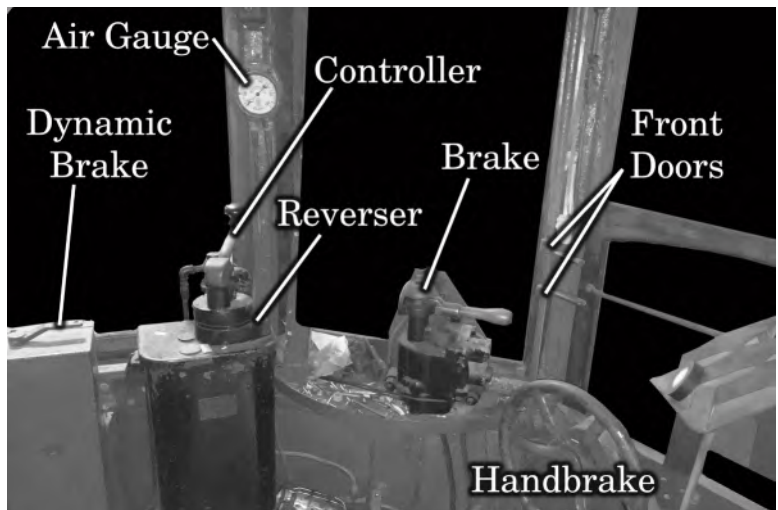


3756 - Control box

- a. Ensure the knife switch for the headlight (located in the control box) is off or "open".
 - b. Retrieve the "Golden Glow" headlight from behind the operator's seat and mount it to the front of the car. *The headlight grounds electricity to the car body so it is very important to mount the light BEFORE plugging it in.*
 - c. Carefully insert the plug into the socket located below and to the left of the anti-climber.
 - d. Close the knife switch and the light will come on.
5. Make sure the handbrake is released before attempting to move the car. *Note: the handbrake should only be used in an emergency situation.*

General Operating Procedure

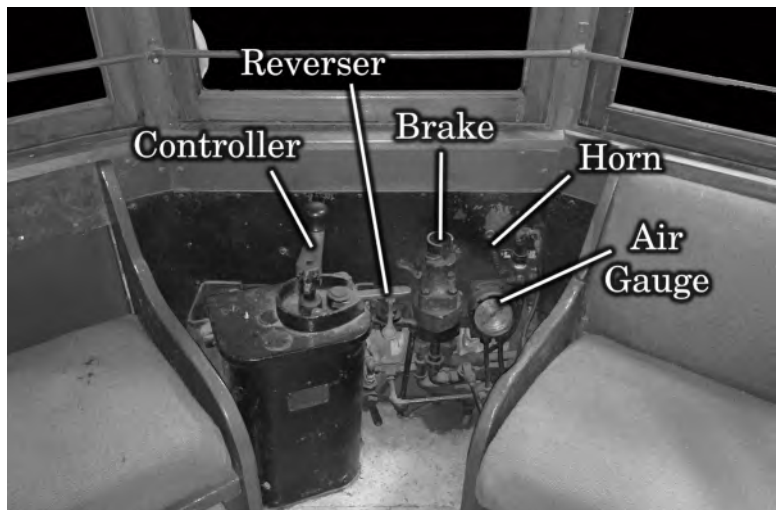
1. Operating from the front controller
 - a. 3756 is equipped with Westinghouse HL Control with a deadman. The controller handle must be depressed unless the brake handle is in the "full application" position. The foot deadman pedal may also be used, but the controller handle must be held down first before you can use the foot deadman pedal. Once the foot deadman pedal is depressed, the controller handle can be released. The Controller has five (5) notches in series and four (4) notches in parallel.



3756 - Front Controls

- b. 3756 is equipped with self-lapping air brakes on the front end, read the section above on Stopping with Air brakes - Self lapping.

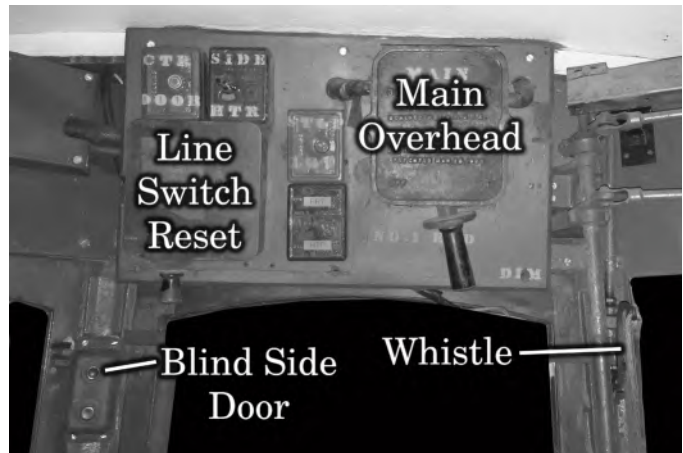
2. Operating from the rear controller
 - a. There is no deadman on the rear controller.
 - b. The rear brake valve is manual lapping, read the section above on Stopping with Air brakes - Manual lapping.



3756 - Rear Controls

Door Operations & Passenger Loading and Unloading

1. The front doors are operated from 2 handles located on a post next to the brake valve, the top handle opens the #1 or front pair of doors, the lower handle opens the #2 or back pair of doors.
2. The center doors are opened/closed by using the push buttons located on the front door engine cabinet above the door handles. The top button opens the doors and the bottom button closes the doors. The center doors should be closed before moving the car. A door interlock will prevent the car from drawing power if the center doors are left open. Never close the center doors without making sure that these doors are clear of passengers. As general procedure, the center doors should only be used if there is someone (conductor on the car or someone on the platform) to visually observe that the doors are clear before they are closed.



3756 - Overhead Switches

3. The blind side door is operated by the door controls located on the front window post above the air gauge.

Heating and Ventilation

1. Heat for the operator's cab is controlled by the switch at the left front of the operator's cab.
2. There is no functional heat in the passenger area.
3. Clerestory windows can be opened to provide additional ventilation on hot days.
4. Turn off all heaters at least 30 minutes before the car is placed in the car barn.

Lights

1. The headlight and interior lights are controlled by switches located in the control box.

Changing Ends

1. Place brakes in full apply position.
2. Remove the brake handle and reverser and move it to the other end of the car. Insert the brake handle and re-apply brakes.

Emergency and Special Procedures

1. 3756 is equipped with “HL” control. Refer to the Emergency Procedures section for information on dealing with potential emergency situations
2. 3756 has the unusual feature of a dynamic brake switch, which may be used in lieu of the way one would initiate dynamic braking on an HL control car. To use it, shut the main controller off, and move the dynamic brake handle clockwise 90°.
3. Car does not run:
 - a. Check to see if the Main Control Switch and the Line Control Switch are in the “On” position.
 - b. Check to see if center doors are closed.
 - c. Reset the control breaker.
 - d. The car may be in emergency. Release the brakes and wait for a secondary release of air indicating the brake system has reset.

Power Down Procedure

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the car barn.
2. Turn off the compressor.
3. Return brake, reverser, and door handles to the ammo box.
4. If it was in use, remove the portable headlight. To do so:
 - a. Open the knife switch for the headlight (located in the control box). *This box contains areas that are electrically “hot”. Exercise extreme caution when turning any switch on or off.*
 - b. Carefully remove the plug from the socket located below and to the left of the anti-climber. *The headlight grounds the electricity to the car body so it is very important to unplug it BEFORE removing the headlight.*
 - c. Remove the “Golden Glow” headlight and return it to its storage place behind the operator’s seat. Ensure the glass lens is facing the wall.
5. Lower the pole.
6. Drain the air tank.

NEW ORLEANS PUBLIC SERVICE 832



Car 832 was build for New Orleans Public Service Incorporated (NOPSI) in 1923 by the Perley Thomas Company of High Point, North Carolina. In 1947 this car was featured in Life Magazine when Tennessee Williams play “A Streetcar Named Desire” debuted on Broadway. This car was regularly assigned to service on the Desire line. Although the Desire line quit operation in 1948, the play and the subsequent movie continue to bring fame to New Orleans streetcars.

By 1964 only two streetcar lines remained in operation in New Orleans: Canal Street and St. Charles Avenue. Early that year the decision was made to convert the Canal Street line to bus operation and retain the St. Charles Avenue line as a tourist attraction. That freed 40 cars, most of which were eventually scrapped. Before scrapping the cars, NOPSI offered them to any interested group willing to pay the moving costs. The fact that 832 was made famous on the cover of Life Magazine in 1947, its compatibility of track gauge and the age and excellent condition of the car had moved PTM to express interest in this car long before it was removed from service. Because of its long-standing interest, PTM was given the first choice of the cars being retired. New Orleans 832 was delivered to the museum atop a railroad flat car in June 1964 and was immediately placed into operation.

Start Up Procedures

1. Ensure reverser is not in the controller then put up rear pole.
2. Turn the compressor on using the snap switch located in the control box adjacent to the left hand doors on the #1 end.
3. Retrieve the handles from the ammo box.
4. Put brakes in apply position.
5. Ensure the headlight is set for the proper direction.
6. Check that all four doors are properly closed.
7. Make sure the handbrakes at both ends are released before attempting to move the car.

General Operating Procedures

1. 832n is equipped with a “K” controller and no deadman, with four (4) series and four (4) parallel points.
2. 832n is equipped with manual lapping brakes. See section Stopping with Air Brakes - Manual Lapping for more information.
3. When removing brake handle, the brake must be in full apply position for a minimum of 10 seconds before removing the brake handle. When installing brake handle, always fully apply the brakes.



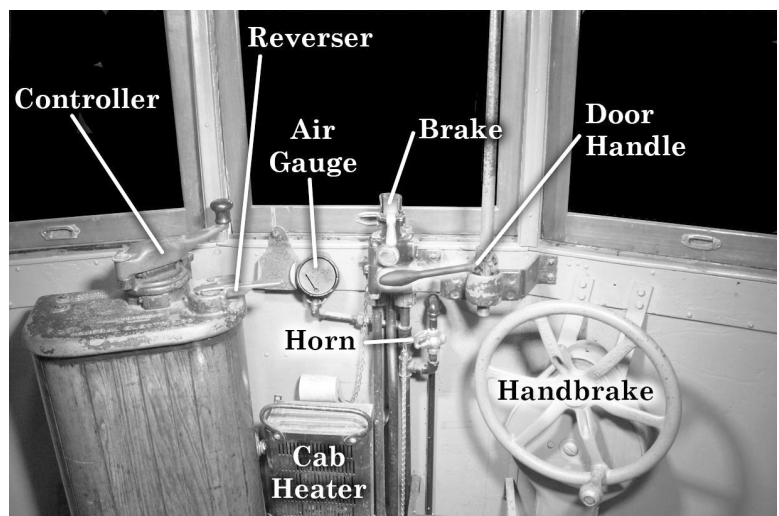
832n - Switch Cabinet

Door Operation and Passenger Loading and Unloading

1. Door operations are manual with the handle for the right door at the front and the handle for the left door on the pole behind the operator. There is only one door handle for each end of the car so the handle has to be moved when changing which set of doors are opened (right or left).
2. There is no door interlock, always verify all doors are fully closed and latched before moving the car.

Heating and Ventilation

1. There are cab heaters but no heaters in the passenger area.
2. Cab heaters are controlled by switches located behind the controller on each end.
3. Turn off all heaters at least 30 minutes before the car is placed in the car barn.



832n - Controls

Lights

1. The headlight, headlight changeover, and interior light switches are located in the the control box adjacent to the bulkhead on the #1 end.

Changing Ends

1. Place brakes in full apply position.
2. Switch the trolley pole.
3. Move brake handle and reverser to the other end and re-apply the brakes.
4. Transfer the headlight.

Emergency and Special Procedures

1. 832n is equipped with a “K” controller. Refer to the Emergency Procedures section for information on dealing with potential emergency situations.
2. Car does not run:
 - a. Check the line switch controls on both ends of the car.
 - b. Ensure the main overhead switch is in the “On” position.

Power Down Procedures:

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the car barn.
2. Turn off compressor.
3. Return brake and reverser handles to the ammo box.
4. Lower the pole.
5. Drain air tank.

WEST PENN RAILWAYS 832



Car 832 represents the Cincinnati Car Company's patented "curved side" design. A dozen of these lightweight, "curved-side" cars were acquired for West Penn Railway's Allegheny Valley Street Railway during the winter of 1929-30. Introduced on Valentine's Day 1930, they afforded patrons the finest accommodations of the day on the routes between Aspinwall, New Kensington and Natrona. Company accountants liked them too, because they required one crewman instead of two.

After the Valley Route was abandoned in 1937, the cars were moved to the company's "Coke Region" division, where they ran on routes to Latrobe, Fairchance, Phillips and South Connellsville. 832 was the last of the series in service, finishing up on the South Connellsville route at the end of rail operations in 1952.

832 was the second car acquired for the Museum and was trucked from West Penn's Connellsville car house to Charleroi car house on the Pittsburgh Railways system in February 1953. In May 1953 the car was operated on a special fundraising "fantrip" and brought from Charleroi to Ingram Car House.

February 7, 1954, West Penn 832 was moved under its own power with Pittsburgh Railways M1 and 3756, to its new home in Washington County along the former Washington interurban right-of-way near the village of Arden.

Seven years of outdoor storage took its toll on 832. By the time the museum started operation in 1962 the car was inoperative and extensive repairs were undertaken. Work on the car was sporadic until 2010 when the restoration effort became the focus of a Transportation Enhancement Grant. A restoration plan was written and bids were received for execution of the work from interested firms. In August 2010 the car and its assorted parts were shipped to Brookville Corporation in Brookville Pennsylvania and work commenced.

West Penn 832 entered service in 2018, following 7 years of intensive work by shop volunteers. This included work on the controls, braking, wiring, roof and the interior finishing of the car.

Start Up Procedures

1. Ensure reverser is not in the controller then put up rear pole. This car is equipped with a retriever.
2. Insert brake handle on front end and place in full apply position.
3. Set left front door engine valve to “on” position. It is a good idea to check rear door engine valve to be sure it is in the “on” position.
4. Turn on compressor. When pressure reaches about 50 PSI, system will charge and air gauges will register the pressure.
5. Ensure the headlight is set to the proper direction.
6. Make sure the handbrakes at both ends are released before attempting to move the car.



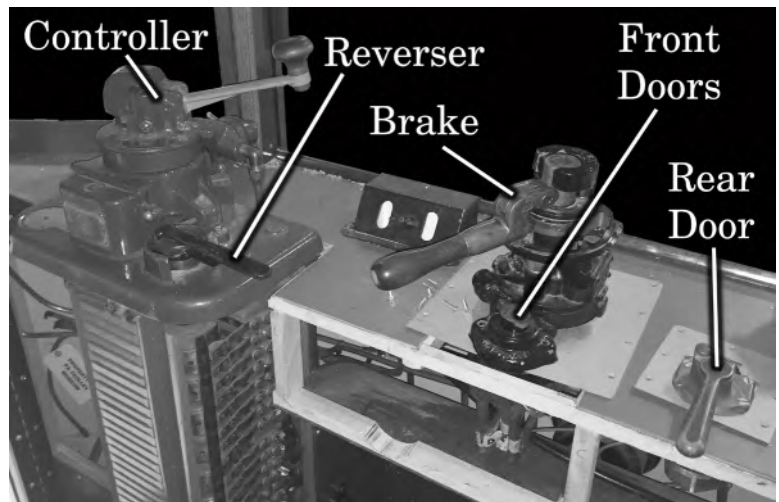
832w - #1 End Switch Cabinet

General Operating Procedure

1. 832w is equipped with “K” Control with a “deadman”. The controller has five (5) series and four (4) parallel points. The controller handle must be depressed unless the brake handle is in the “full application” position.
2. 832w is equipped with manual lapping brakes with an emergency apply position (far right) and a “door open” position. See section Stopping with Air Brakes - Manual lapping for more information.

Door Operations & Passenger Loading and Unloading

1. Doors are opened and closed using the door controls located at both ends of the cars.
2. Door controls are integral with the brake valve, the brake handle must be in the “door open” position in order to open a door. A door interlock is connected through the door engine, and will prevent the car from drawing current if any doors are open. *Note: all doors close when the brake handle is removed. Do not remove the brake handle while passengers are leaving or entering the car.*
3. The front doors are opened by placing the brake valve in the “door open” position, (about 5 o'clock) front door handle's position controls what doors open. In the center position, both front doors will open.
4. The rear right door is the only rear door that can be opened from the operating end. Use the rear door control to open this door.



832w - Controls

Procedures in this manual are to be used only in conjunction with operator qualification.

Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

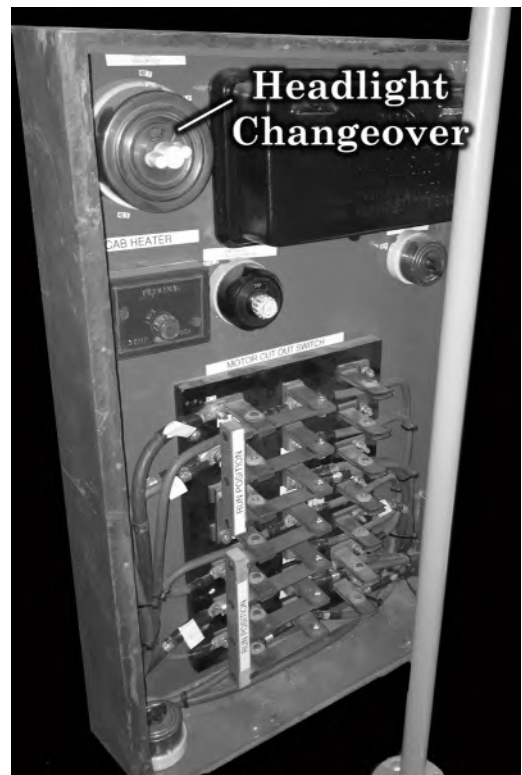
5. Be aware when closing the rear door, first checking to ensure it is clear of passengers. As a general rule, only use rear doors if there is someone visually observing to verify the doors are clear before they are closed.

Heating and Ventilation

1. Heat for passenger compartment is controlled by two snap switches in the compartment to the right the operator on the #1 end of the car. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
2. Heat for operator's cabs is controlled by a switch in the compartment to the right of the operator on both ends.
3. Turn off all heaters at least 30 minutes before the car is placed in the car barn.

Lights

1. Interior lights are controlled by a switch in the cabinet to the right of the operator on the #1 end.
2. Headlight dimmer switch is located next to the air gauge on the dash.
3. Headlight changeover switch (2 clicks) is located in the switch cabinet on the #2 end.



832w - #2 End Switch Cabinet

Changing Ends

1. Place brakes in full apply position.
2. Switch the trolley pole.
3. Move brake and door handles to the other end and re-insert the handles. Place the brakes in the full apply position.
4. Transfer the headlight.

Emergency and Special Procedures

1. 832w is equipped with "K" control. Refer to the Emergency Procedures section for information on potential emergency situations.
2. Car does not run:
 - a. Check to see if the main overhead breaker is in the "On" position.
 - b. Check to see if all doors are closed including checking the to see that the door engine valves are in the "On" position.
 - c. The car may be in emergency, check the air gauge, if it reads "0" air pressure, place the reverser in the "forward" position, hold down the deadman and release the brakes. Wait for a secondary release indicating the brake system has reset.

Power Down Procedures:

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the carbarn.
2. Turn off the compressor.
3. Exit through a door at the end of the car facing the car barn doors. Set the door engine valve to the "Off" position (aka "balancing" the doors), this will ensure no one gets "locked" out when the car is next used.
4. Return brake and reverser to the handles box.
5. Lower the pole.
6. Drain the air tank.

RIO DE JANIERO TRAMWAYS 1758



Open-sided trolley cars were extremely popular in the early days of the 20th Century, as they offered the public the pleasure of a cool ride on hot summer evenings, and carried millions of passengers to amusement parks, which often were owned by the streetcar companies. As automobiles became popular and competed for street space, the open car became a safety issue, and most fell into disuse by about 1930.

Car 1758 was built about 1911 by Rio de Janeiro Tramway, Light & Power Co. in Brazil, under license from J. G. Brill Co., who supplied the plans and a kit of metal parts for the car. Labor and wood were obtained locally. Originally the car was equipped to haul trailers in the South American city. Though Pittsburgh Railways never operated large double-truck open cars, similar (though slightly longer) cars were operated by West Penn Railways in Westmoreland and Fayette Counties.

This car is one of twelve brought to the United States in 1965 under the auspices of the Association of Railway Museums and initially operated at the now-defunct Magee Transportation Museum in Bloomsburg, PA. The car later had three additional owners before being purchased at auction by PTM in 2006. It was rehabilitated in the museum's shop, for appearance and for re-gauging, the latter necessitating considerable engineering and fabrication of new structural and mechanical equipment.

Start Up Procedures

1. Ensure reverser is not in the controller then put up rear pole.
2. Turn on the compressor.
3. Ensure the headlight is set to the correct end.
4. Make sure the handbrakes at both ends are released before attempting to move the car.

General Operating Procedure

1. 1758 is equipped with a “K” controller with no deadman, there are five (5) notches in series and three (3) notches in parallel.
2. 1758 is equipped with a self lapping brake valve. Read the section above on Stopping with Air brakes - Self lapping.
3. 1758 should not be operated in inclement weather conditions (rain, cold or high wind).

Passenger Loading & Unloading

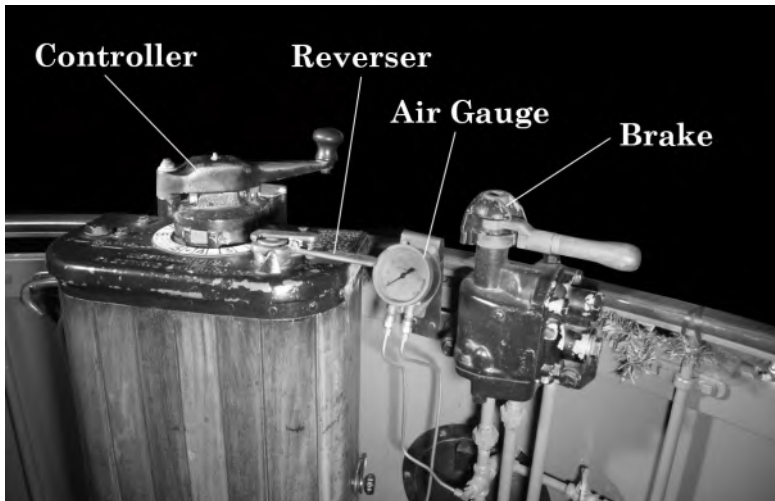
1. Both the operator and the conductor are responsible for passenger loading and unloading.
2. When tickets are being punched, operator should explain safe loading procedures and conductor should punch the tickets. Punching of tickets should not interfere with the safety instructions.
3. Passengers must be instructed to not step on the toe board (painted yellow on top) when boarding and leaving the passenger compartment and to hold on to the yellow grab bars.
4. Passengers should be advised to leave the passenger compartment either backwards or sideways and to hold onto the yellow grab bars. Children shall not sit on the outboard end of the bench seats while the car is in motion. If there are adults on the bench, children should sit between them.
5. Changing direction of seats should be accomplished with care, ensuring not to drop the seat.

Safe Operating Procedures

1. A minimum of two crew members (operator and conductor) is required to operate this car with passengers.
2. While the car is in motion, no one (passenger or crew) may be on the running boards.
3. While the car is in motion, the conductor must be on the rear platform facing forward. The



1758 - Switches



1758 - Controls

conductor's responsibility is to monitor passenger safety and he/she shall not be talking to passengers or performing other activities not related to safe operations.

4. When the conductor observes an unsafe condition (ex. passenger standing or a child on the end of the bench), the conductor should correct them, and may utilize the megaphone to get the attention of the passengers.
5. If it is necessary for other reasons to stop the car, the conductor should use the whistle pedal at the back of the car to signal the conductor to stop the car.
6. Use multiple short blasts of the whistle to signal for an immediate stop.

Lights

1. Controls for interior lights and headlights are behind operator on #1 end of the car.

Changing Ends

1. Place brakes in full apply position.
2. Switch the trolley poles.
3. Move handles to the other end and reinsert then return brake handle to full application position.
4. Transfer the headlight.

Emergency and Special Procedures

1. 1758 is equipped with a "K" controller. Refer to the Emergency Procedures section for information on potential emergency situations.
2. Car does not run:
 - a. Check to see that Line Switch Controls on both ends of the car are in the "On" (right) position.
3. Emergency stopping of car by Conductor (from rear platform).
 - a. Put Line Control Switch in the "off" (right) position.
 - b. Apply hand brake as tightly as possible.

Power Down Procedure

1. Turn off the compressor.
2. Return the handles to the ammo box.
3. Change the headlight over.
4. Lower the pole.
5. Drain the air tank.

CINCINNATI STREET RAILWAYS 2227



Car 2227 represents the standard design used for Cincinnati streetcars built between 1911 and 1920. In 1919, the Cincinnati Traction Company placed an order with the Cincinnati Car Company for 105 double truck closed deck roof cars to be numbered 2200 through 2304. Car 2227 from this order was in service for most of the time until abandonment of all streetcar operations in Cincinnati on April 29, 1951. In 1948, after the abandonment of streetcar service on the line 2227 served, it was converted to a sand car, and renumbered S-223.

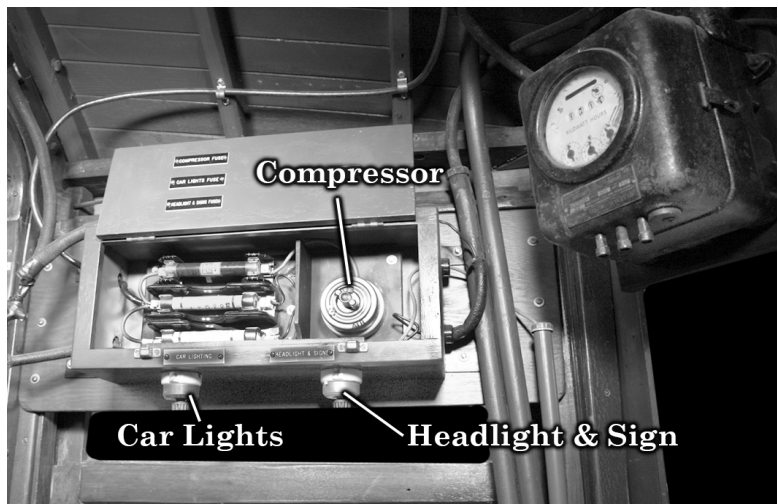
After abandonment of all streetcar service in 1951, a group of railfans in the Dayton area saved the car, and worked for many years to find a permanent home for it. On Labor Day 1964, the car was donated and deeded to Gerald Brookins of Trolleyville in Olmsted Falls, OH. The body of the car was moved to Trolleyville where it underwent a lengthy restoration and was substantially restored. It operated for the public for the first time at Trolleyville's Trolleyfest celebration in 1998. In the years before Trolleyville was closed, many visitors enjoyed riding the only operating Cincinnati Street Railway car in existence.

PTM acquired the car in 2009 after the unfortunate closure of Trolleyville. In 2010, generous contributions by Cincinnati streetcar fans allowed re-gauging and rebuilding of the trucks so that the car could be put in operation. This work was accomplished with thorough planning and the able assistance of Lyons Industries in Ebensburg, Pennsylvania. In addition, PTM volunteers worked over 2000 hours to rebuild mechanical and electrical equipment that have allowed the rebuilt trucks to work flawlessly.

Procedures in this manual are to be used only in conjunction with operator qualification.
Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

Start Up Procedures

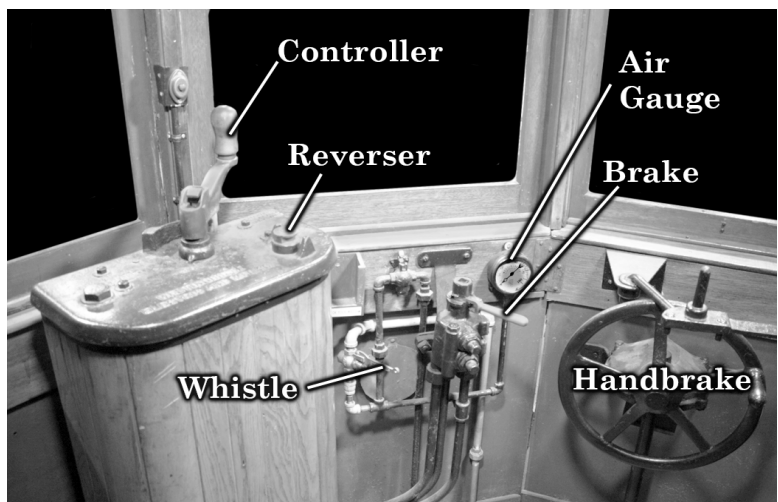
1. Ensure reverser is not in controller then put up pole. *Note: This car is equipped with 2 poles, the right hand pole is always to be used, the left hand pole cannot be moved.*
2. Turn the compressor on using the switch located in the cabinet above the side window in the operator's area.
3. Retrieve the reverser from the ammo box.
4. Put brakes in full apply position.
5. Make sure the handbrake is released before attempting to move the car.



2227 - Switch Box

General Operating Procedures

1. 2227 has "K" controller with four (4) series and four (4) points in parallel.
2. 2227 is equipped with manual lapping brakes. See section *Stopping with Air Brakes - Manual Lapping* for more information.
3. A minimum of two crew members (operator and conductor) is required to operate this car with passengers.



2227 - Controls

Door Operation & Passenger Loading and Unloading

1. All doors are manually operated.
2. The front doors are operated by the handle located next to the brake valve.
3. The rear doors are operated from the conductor's seat on the rear platform of the car, the left handle controls the left hand set of doors while the right handle controls the right hand set of doors.
4. 2227 is very high off the ground, making stepping into it a challenge for some visitors (and volunteers). Be sure to exercise caution and be ready to assist patrons as they enter the car.



2227 - Conductor's Stand

Heating and Ventilation

1. There is a cab heater but no heaters in the passenger area.
2. Turn off all heaters at least 30 minutes before the car is placed in the car barn.

Lights

1. Body lights, headlight and marker lights are controlled by switches in the box located above the side window in the operator's area.

Backing the Car

1. Reversing this car requires 2 people. Do not attempt to back up the car without someone watching out the rear window or from the ground.
2. Place the reverser in the "reverse" position.
3. Sound the bell three (3) times.

Emergency and Special Procedures

1. 2227 is equipped with a K controller. Refer to the Emergency Procedures section for information on dealing with potential emergency situations.
2. Car does not run:
 - a. Check the line switch control.

Power Down Procedures:

1. If the car heater was used, it must be turned off for at least 30 minutes before the car can be put into the car barn.
2. Turn off compressor.
3. Return reverser handle to the ammo box.
4. Lower the pole.
5. Drain air tank.

PHILADELPHIA RAPID TRANSIT 5326



Car 5326 is one of a group of 135 such cars built in 1923 by the J.G. Brill Company for the Philadelphia Rapid Transit Company. Just as Pittsburgh Railways had favored one car design for many years, so too had PRT favored the general design of cars like 5326, to the point where they had over 2,000 cars representing several variations of the same basic design. Brill had built so many cars for PRT over the years that a track was built from the street outside into the Brill plant just for the delivery of new cars!

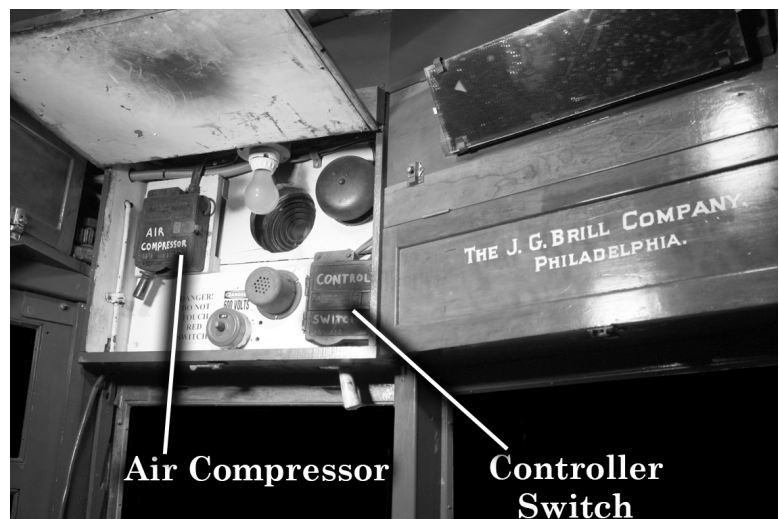
Because Philadelphia lacks Pittsburgh's hills, the cars didn't need to be as powerful. 5326 has only two motors to drive it, while most of the museum's other eight wheel cars have four motors. In order to get maximum traction from the two powered axles, a distinctive design of truck was used, having two small unpowered "pony" wheels and two larger "driver" wheels.

In April 1958, car 5326 had the distinction of being the first trolley car to ever travel the Pennsylvania Turnpike (even if it was on a truck trailer), as it moved to its new home in Washington, PA. While many of the cars at the museum are the lone survivors of their type, this is not true of 5326.

Restoration of this car, initiated in 1976 as part of the United States Bicentennial celebration, was made possible by a grant from the Pennsylvania Department of Transportation and the Southeastern Pennsylvania Transportation Authority. The extensive work undertaken to return this car to its 1923 appearance spanned a five year period, included overhauling its controls and running gear, and undoing all of the "modernization" applied in 1941. This "labor of love" required more than 3,000 hours of labor by museum volunteers who donated their weekends and vacations to the preservation of history.

Start Up Procedures

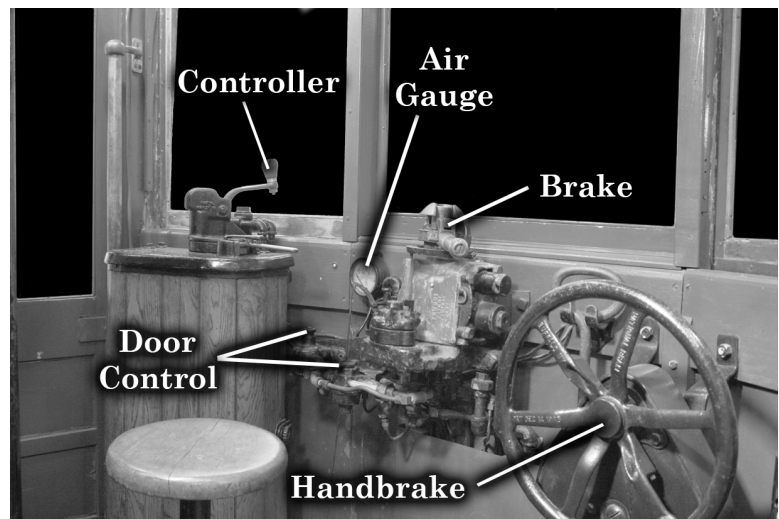
1. Ensure reverser is not in the controller then put up rear pole.
2. Retrieve the handles from the ammo box. Insert brake handle on front end and place in the “door open” position.
3. Turn on compressor. The air compressor switch is in the control box on the #1 end of the car, above the controller.
4. Ensure the headlight is set to the proper direction.
5. Make sure the handbrakes at both ends are released before attempting to move the car.



5326 - Switch Cabinet

General Operating Procedure

1. 5326 is equipped with a K controller with deadman valves. The control handle must be depressed at all times when operating to prevent the car from falling into “emergency” and coming to an abrupt stop. The Controller has five (5) notches in series and four (4) in parallel.
2. Brakes are self lapping with an emergency position (far right) and a door open position. See section Stopping with Air Brakes - Self lapping for more information.



5326 - Controls

3. The windows on this car are held open by spring brass, it is important you warn visitors to keep clear of the windows as they may fall unexpectedly.
4. Be aware that all doors close when the brake handle is removed. Do not remove the brake handle while passengers are leaving or entering the car.

Door Operation & Passenger Loading and Unloading

1. Doors are opened and closed using the door controls located at both ends of the cars.
2. Door controls are integral with the brake valve, the brake handle must be in the “door open” position in order to open a door. A door interlock is connected through the door engine, and will prevent the car from drawing current if any doors are open. *Note: All doors close when the brake handle is removed. Do not remove the brake handle while passengers are leaving or entering the car.*
3. The door interlock prevents the car from drawing power with the doors open.

4. Be aware when closing the rear doors, first checking to ensure they are clear of passengers.

Heating and Ventilation

1. Some of the upper sash windows can be opened for extra ventilation during the summer months.

2. Heat for passenger compartment is controlled by three (3) knife switches found in a box mounted on the bulkhead on the #2 end of the car.

Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.

3. Heat for the operator's cab is controlled by the switches below the left hand windows at the front of the car.

4. Turn off all heaters at least 30 minutes before the car is placed in the car barn.



5326 - Heater Switch Box

Lights

1. The switches for the interior lights and sign-box light transfer are in the box above the left doors on the #2 end of the car.
2. The headlight transfer switch is located above the blind side doors on the #1 end.

Changing Ends

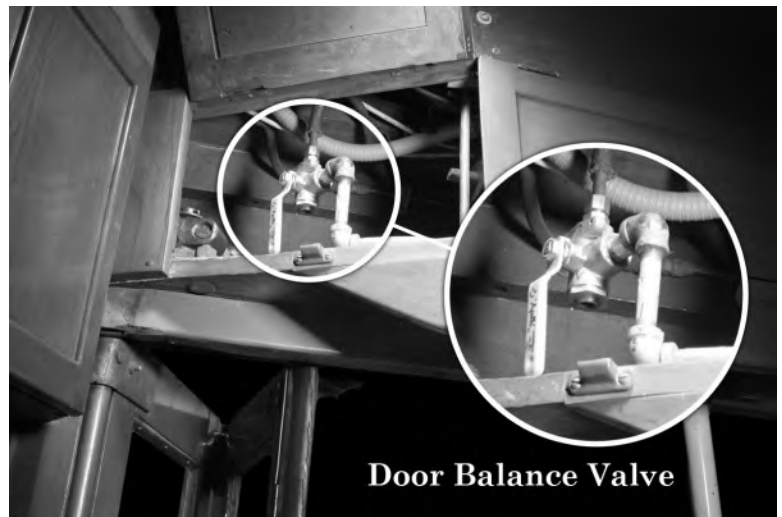
1. Place brakes in full apply position.
2. Change the poles.
3. Transfer the headlight. *Note: At present both headlights are on at all times, so there is no need to transfer.*
4. Move brake handle to the other end and re-insert. Place the brake handle in the "door open" position.

Emergency and Special Procedures

1. 5326 is equipped with "K" controller. Refer to the Emergency Procedures section for information on dealing with potential emergency situations.
2. Car does not run:
 - a. Check to see if the main overhead breaker is in the "On" position.
 - b. Check to see if all doors are closed including checking the to see that the door valve engines are in the "On" position.

Power Down Procedures

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the carbarn.
2. Turn off the compressor.
3. Return the controller, brake and reverser handles to the ammo box.
4. Exit through the right door at the end of the car facing the car barn doors. Set the door engine valve to the “off” position (aka “balancing” the doors), this will ensure no one gets “locked” out when the car is next used.
5. Lower the pole.
6. Drain the air tank.



5326 - Door Balance Valve in the “balanced” position

PHILADELPHIA SUBURBAN 66



Philadelphia Suburban Transportation Company. (P&WCT) car 66 was one of 32 center entrance steel cars placed in service between 1919 and 1926. Car 66 was built by J.G. Brill and put into service in 1926. These cars represented a significant departure from their predecessors. Wicker seats replaced high-back velvet seats and separate compartments for smoking and non-smoking were eliminated. While still requiring a two person crew to operate a single car (motorman and conductor), these cars could be combined into two-car multi-unit trains allowing a three person crew to operate the combined cars. During the 1930s, Philadelphia Suburban Transit Company (the successor to P&WCT) began using one-person cars to handle base service. Car 66 continued to be used for as rush hour and emergency service until 1970 when SEPTA (Southeastern Pennsylvania Transit Authority) declared the car surplus. The car was transported to the Pennsylvania Trolley Museum where it was refurbished.

Start Up Procedures

1. Ensure reverser is not in the controller then put up rear pole. This car is equipped with a retriever.
2. If the doors are closed, enter the car through one of the Operator's cab doors. **DO NOT MANUALLY OPEN THE CENTER DOORS.** See *Door Operations & Passenger Loading and Unloading* section for more information on the doors.
3. Retrieve the handles from the ammo box. Insert brake handle on front end and place in apply position.
4. Turn on compressor located on the bulkhead in the #1 end cab.
5. Set the headlight to proper direction using the switch located above the center doors.
6. Make sure the handbrakes at both ends are released before attempting to move the car.



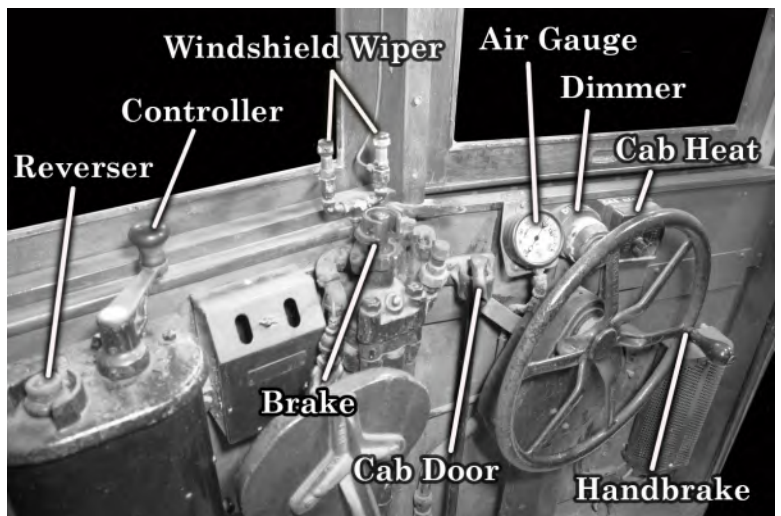
66 - Operator's Cab Exterior Door Control



66 - Air Compressor Switch

General Operating Procedure

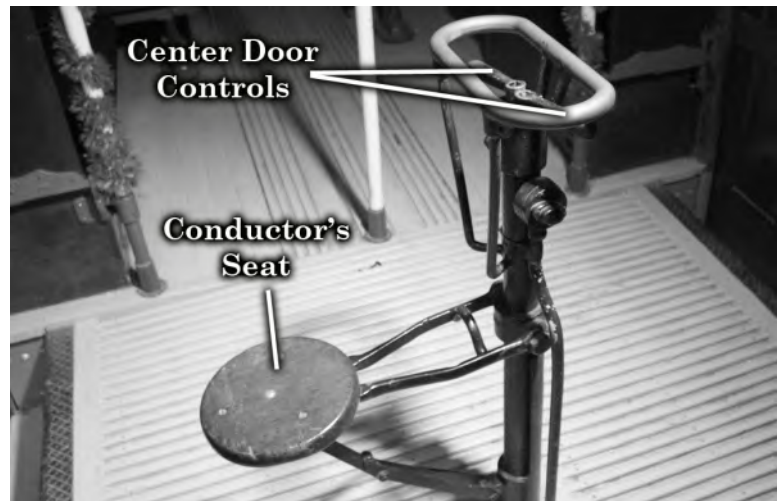
1. Car 66 is equipped with HL control with no deadman. The controller has five (5) notches in series and four (4) notches in parallel.
2. 66 is equipped with manual lapping brakes with an emergency apply position (far right). See section *Stopping with Air Brakes - Manual Lapping* for more information.
3. A minimum of two crew members (operator and conductor) is required to operate this car with passengers. Because of this, the control switches are distributed between the operator's cabs and the conductor's station.
4. Door interlocks will prevent the car from taking power unless the center doors are fully closed. Low intensity indicator lights to the right of the controller indicate when the door is closed (light is on when door is closed).



66 - Controls

Door Operations & Passenger Loading and Unloading

- Center (passenger) doors are opened and closed using the door controls at the conductor's station in the middle of the car. When you are facing a set of doors, the handle on the right controls this set of doors. Be sure that the step is all the way down before allowing passengers to enter or leave the car.
- Do not manually open or close the center doors. Turn on the compressor and wait until there is sufficient pressure (25 to 30 psi) to open or close the doors.
- The exterior door in each of the Operator's cabs are controlled by the handle in the operator's cab. Always ensure the floor trap is closed before closing the door.
- If there is sufficient pressure in the air tank, you can operate the cab door from the outside by pushing or pulling on the linkage that is located just to the left of steps. If you are attempting to close the doors via the linkage and it won't move, go into the operator's cab and move the handle from the far left position. Do not confuse the linkage for the door with the valve linkage lever for the airbrake line to the coupler which is located just to the rear of the door control linkage.
- The operator's cab doors can be opened and closed manually if there is not sufficient pressure in the air tank to open or close them via the lever. Use these doors to enter and leave the car at the start and end of operations.



66 - Conductor's Stand Door Control

Heating and Ventilation

- Heat for the passenger compartment is controlled by the three (3) knife switches located in a box to the left of the center doors. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
- Heat for the operator's cab is controlled by the switch at the left front of the cab.
- Turn off all heaters at least 30 minutes before the car is placed in the car barn.
- The windows on this car are held open by spring brass, it is important you warn visitors to keep clear of the windows as they may fall unexpectedly.



66 - Heater Switch Box

Lights

1. The interior lights, headlights, and headlight transfer (2 clicks) are controlled by switches above the center doors.
2. Headlights can be dimmed by using the switch located behind the handbrake in the operator's cab. When operating at night, be sure to dim the headlight when approaching platforms or other cars.



66 - Headlight Switches

Changing Ends

1. Place brakes in full apply position.
2. Switch poles.
3. Transfer the headlight.
4. Move brake handle to other end of the car and re-apply brakes.

Emergency and Special Procedures

1. 66 is equipped with "HL" control. Refer to the Emergency Procedures section for information on potential emergency situations.
2. Car does not run:
 - a. Check to see if the Main Control Switch and the Line Control Switch are in the "On" position.
 - b. Check to see if center doors are closed.

Power Down Procedure

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the car barn.
2. Turn off the compressor.
3. When putting the car in the Car Barn exit through the motorman's door at the end of the car facing the Car Barn doors.
4. Return brake, reverser, and door handles to the ammo box.
5. Lower the pole.
6. Drain the air tank.

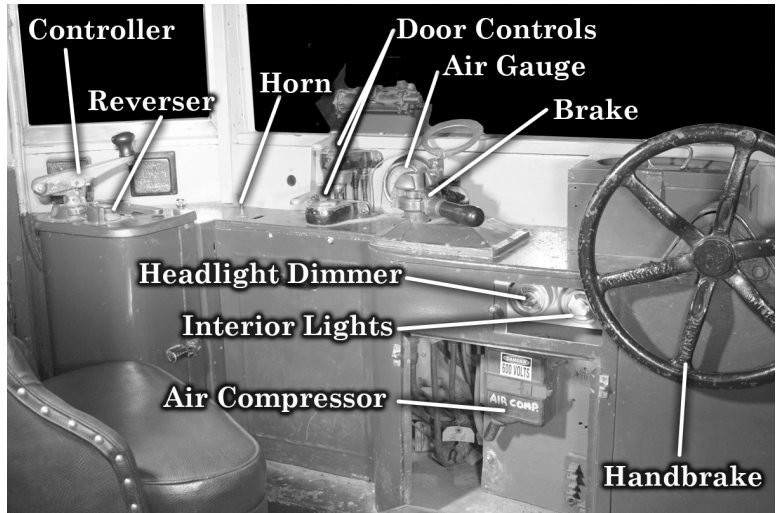
PHILADELPHIA & WEST CHESTER TRACTION COMPANY 78



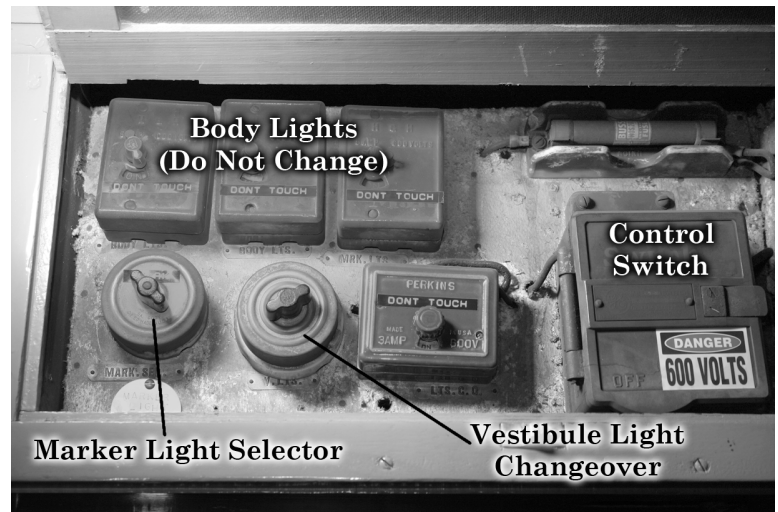
Car 78 was one of 10 cars purchased in two groups from Brill in 1932-33. These one man, lightweight cars were in an attempt to combat a sharp decline in riders and revenue. These cars were designed for one-man operation, equipped for high speed service, and employed lightweight aluminum construction. They were cheaper to operate and used less power. Their high speed equipment cut the operating times and made the service more attractive. These improvements combined with fare reductions and consolidation of other competing forms of transit in the area enabled the building of one of the most successful privately owned transportation companies in the country. A consolidation of streetcar and bus operations by P&WCT in the early 1930s gave rise to changing the corporate name to Philadelphia Suburban Transportation Company and the Red Arrow Lines logo was adopted. Car 78 was in service until 1982. During its last 15 years, the car was used primarily for rush hour service. After being withdrawn from service, the car was acquired by the museum in September 1982.

Start Up Procedures

1. Ensure reverser is not in the controller then put up rear pole. This car is equipped with a retriever.
2. Retrieve the handles from the handles box on the #1 end.
3. Insert brake handle into the front end and place in full apply position.
4. Insert door handles on front end and set right front door to the open position.
5. Set left front door engine valve to “on” position. It is a good idea to check rear door engine valve to be sure it is in the “on” position.
6. Turn on the air compressor. When pressure reaches about 50 PSI, the system will charge and air gauges will register the pressure.
7. Ensure the headlight is set to the proper direction.
8. Ensure the vestibule light is set to the rear platform (#1 End Control Cabinet)
9. The marker lights are set independently on each end. The rear of the car should display red while the front displays green. The current setting is indicated by colored lights on the dash panel in front of the operator.



78 - Controls & Air Compressor



78 - #1 End Control Cabinet

10. Make sure the handbrakes at both ends are released before attempting to move the car.

General Operating Procedure

1. 78 is equipped with General Electric PC Control. The control is equipped with a deadman so the controller handle must be depressed unless the brake handle is in the “full application” position. The foot deadman pedal may also be used. It is recommended that you use the foot release during normal operations so that you can sound the horn with your left hand while keeping your right hand on the brake controller. There are three points on the controller that activate 19 points on the controller under the car.
 - a. Point 1 (Switching) activates point 1 on the controller. This point is used for starting the car from a stop, and moving the car through the yard and when parking in the carbarn.
 - b. Point 2 (Series) activates points 2 thru 10 on the controller. When placed in Point 2, the car will automatically accelerate to full series.

Procedures in this manual are to be used only in conjunction with operator qualification. Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

- c. Point 3 (Parallel) activates points 11 thru 19 on the controller. When placed in Point 3, the car will automatically accelerate to full parallel.
2. Brakes are self lapping with an emergency apply position (far right). See section *Stopping with Air Brakes - Self lapping* for more information.

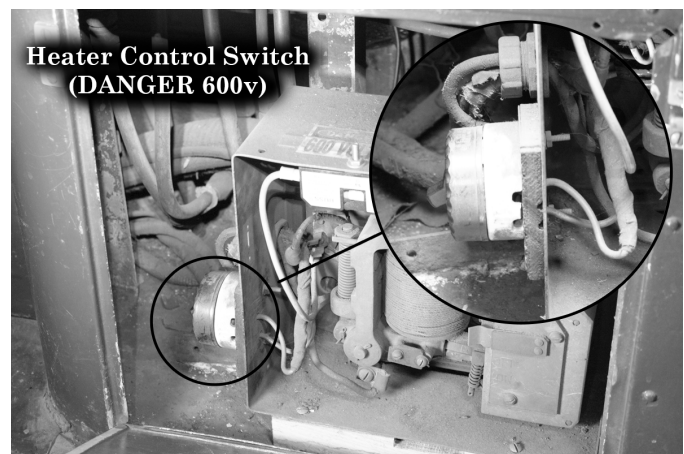
Door Operations & Passenger Loading and Unloading

1. Doors are opened and closed using the door controls located at both ends of the cars.
2. Door interlocks will prevent the car from taking power unless all doors are fully closed. The car will not take power with the doors open. The door interlock is connected through the door engines and if any of the door engine supply valves are off (balanced), the car will not draw power.
3. Be aware when closing the rear doors, first checking to ensure they are clear of passengers. As a general rule, only use rear doors if there is someone visually observing to verify the doors are clear before they are closed.

78 - Door Controls

Heating and Ventilation

1. Heat for passenger compartment is controlled by a switch in the compartment below the operator controls on the #2 end of the car. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
2. Heat for the motorman's cab is controlled by the switches below the left hand windows at the front of the car.
3. Turn off all heaters at least 30 minutes before the car is placed in the Car Barn.



78 - Heater Switch

Lights

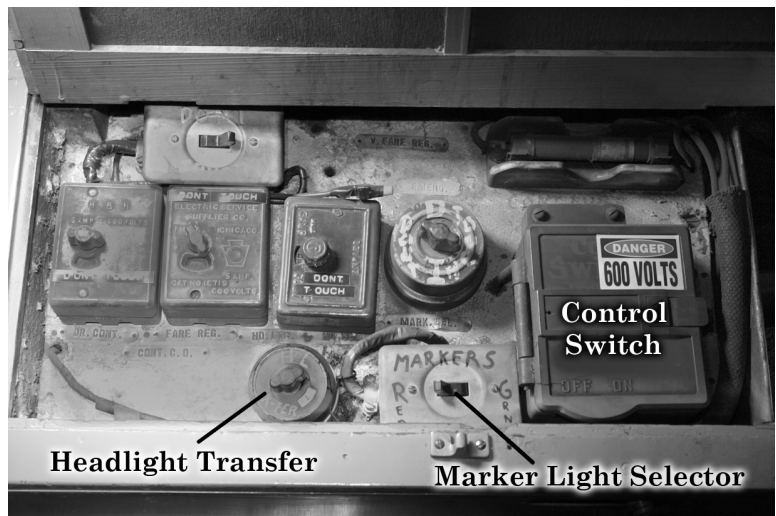
1. Car body and marker lights are controlled by switches in cabinets above and to the left of the operator.
2. Interior lights are controlled by the right hand switch located behind the sliding door located just to the left of each hand brake.
3. Headlight dimmer switch is the left hand switch located behind the sliding door located just to the left of each hand brake.
4. Headlight transfer switch is located in the upper cabinet on the #2 end.

Changing Ends

1. Place brakes in full apply position.
2. Change the trolley pole.
3. Move brake and door handles to the other end and re-insert the handles. Place the brakes in the full apply position.
4. Transfer the headlight.

Emergency and Special Procedures

1. 78 is equipped with HL control. Refer to the Emergency Procedures section for information on potential emergency situations.



78 - #2 End Control Cabinet

2. Car does not run:
 - a. Check to see if the main overhead breaker is in the “On” position.
 - b. Check to see if all doors are closed including checking the to see that the door valve engines are in the “On” position.
 - c. The car may be in emergency, check the air gauge, if it reads “0” air pressure, place the reverser in the ‘forward position’, hold down the deadman and release the brakes. Wait for a secondary ‘chuff’ indicating the brakes have released.

Power Down Procedures:

1. If any of the car heaters were used, the heaters must be off for at least 30 minutes before the car can be put into the carbarn.
2. Turn off the compressor.
3. Exit through the large door at the end of the car facing the car barn doors. Set the door engine valve to the “off” position (aka “balancing” the doors), this will ensure no one gets “locked” out when the car is next used.
4. Return brake, reverser, and door handles to the handles box.
5. Lower the pole.
6. Drain the air tank.



78 - Door Balancing Valve in the “balanced” position

PHILADELPHIA SUBURBAN 14 & 24



The St. Louis cars were delivered in May and June 1949 and represent what many consider to be the last interurban cars built in America. Their arrival permitted Red Arrow to retire a group of Jewett-built interurbans dating to 1913, and several two-man center door cars like cars 66 & 73. While these cars are equipped with the same high-speed running gear as the Brilliners, they also have multiple unit capabilities (can be coupled together in pairs) and two-way radios. These important features were required to expand service along the rapidly developing West Chester line, which operated on single track over the majority of its 19-mile length.

In 1954, the widening of Pennsylvania Route 3 brought the decision to abandon the line to West Chester, after which the “Louies” became the mainstay of operation for the remaining rail lines. Cars 14 and 24 were withdrawn from regular service in September 1982 following acceptance of 29 new LRVs by SEPTA.

Two St. Louis-built cars were selected for preservation here at the Museum because they demonstrate the operation of streetcars in multiple unit. Work on 14 was the most complex trolley restoration undertaken by our crews at the time. Pennsylvania Trolley Museum volunteers began work on this project in the summer of 1997 and returned to car to service at the Museum in June 2004.

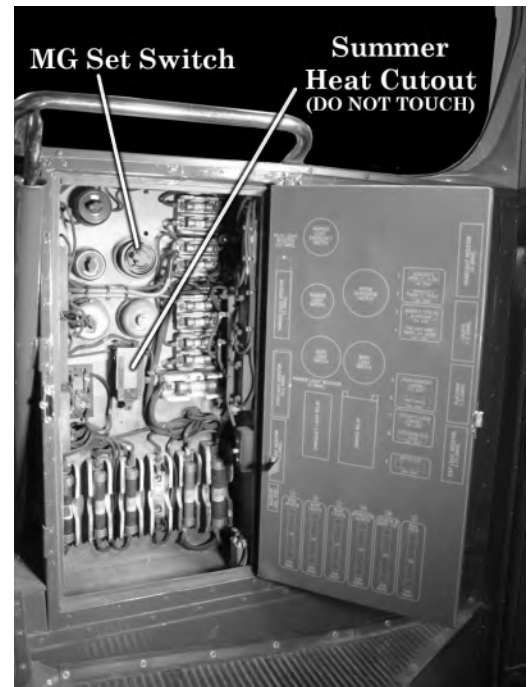
Start up Procedure

1. Place the rear pole on the wire. This car is equipped with a retriever.
2. Turn the battery switch on. This is located in a slot on the outside of the "A" (#1) end of the car in the opening just behind the double doors. The car will not run without the batteries turned on.
3. Enter the car. All doors are balanced when the hook is in the "handle out" (center) position. They can be easily opened or closed by hand.



14 - Battery Switch

4. Open the equipment locker door just below the "A" #1 end windshields. It contains numerous fuses and switches. Locate the large snap switch marked MG SET on the location guide pasted inside the locker door, and turn this switch on. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
 - a. If the batteries are not turned on, the MG will not start.
 - b. If the battery switch is on and the MG will not come on, the batteries may be discharged. Observe the voltmeter on the dashboard to be sure it reads between 30 volts and 38 volts. If it does not read within this range do not attempt to run the car. Follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.



14 - Switch Cabinet

5. Retrieve the reverser handle from the handles box located on the "B" (#2) end of the car.
6. The changeover switch must be set to the end you wish to run from. This switch is located at the #1 end in the dashboard below the right window, above the switch cabinet. Insert the square protrusion on the bottom of the reverser hook into the switch, and turn all the way until the marks line up with the end from which you wish to run. Make sure the switch is turned all the way.
7. Make sure the handbrakes at both ends are released before attempting to move the car. The chain that hangs from the bracket should be protruding only slightly from the mechanism. If the brakes seem to be dragging, or if the car stops while going through tight curves, check the handbrakes at both ends.

General Operating Procedure

1. 14 & 24 operate much like PCC or other foot control cars, the main difference being that they have three positions on the accelerator pedal. When the accelerator is depressed slightly, it engages “switching” or the 1st point. When depressed further, the pedal engages “low rate” acceleration, when depressed to the floor, “high rate” acceleration is engaged. *Avoid running for prolonged periods in switching point.*

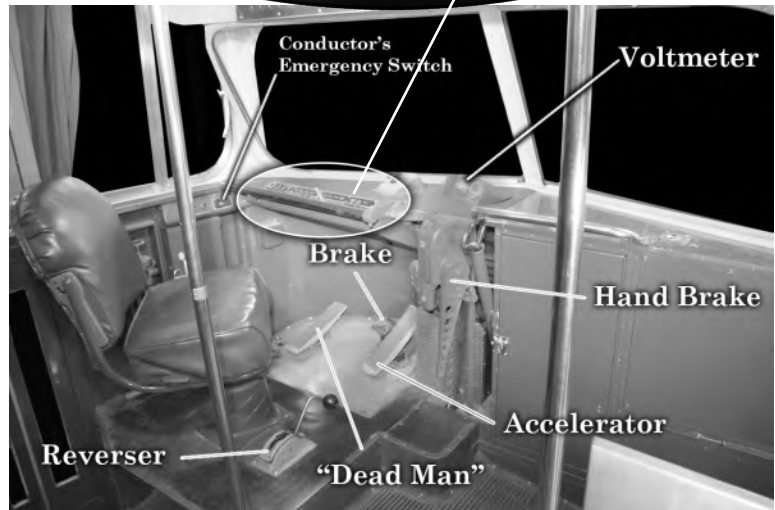
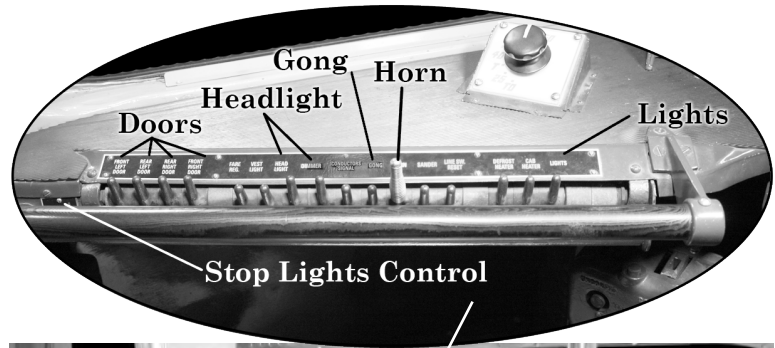
2. Familiarize yourself with the gang switch panel, and be aware of where commonly used switches such as the doors, gong, and horn are located. Up, or toward the windshield, is the ‘on’ position for gang switches. Be aware, some switches are not active when the reverser handle is in center “handle out” position.

3. The reverser handle, or hook, is inserted into the center of the reverser slot on the floor to the right of the operator’s seat. The reverser “wing” must face forward. The reverser hook has 3 positions. *When placing the car in forward, reverse, or “handle out” position, depress the brake pedal slightly, this will free up the linkage and make the handle much easier to move.*

- a. Forward: This position is all the way toward the front. In this position the car will move in the forward direction and the hook is captured.
- b. Handle Out: This is the middle position, in which the hook is positioned directly up and down and is where the hook can be inserted or removed. Throwing the hook to this position while the car is in motion will result in an emergency stop.
- c. Reverse: This is all the way toward the back. In this position the car will move in the reverse direction, and the hook is captured.

4. There are three pedals on the floor in front of the operator.

- a. The left pedal is a Deadman pedal and must be depressed whenever the car is operated from this end. Do not release this pedal when the car is in motion or an emergency stop will occur.
- b. The middle pedal is the Brake, and has an adjustable braking rate, depending on how far down it is pressed.
- c. The right pedal is the Accelerator. The accelerator has three positions. When depressed slightly, the accelerator will engage “switching” or the 1st point. When depressed further, the pedal engages “low rate” acceleration, and when depressed to the floor it engages “high rate” acceleration. *Avoid running for prolonged periods in switching point.*



14 - Controls & Gang Switch

5. Coast by releasing the accelerator pedal completely to avoid accidentally falling into “switching point”. Coast as much as possible.
6. To brake, press down the Brake pedal. As with an automobile, the harder you press the brake, the more brake you will get. The brakes have a tendency to grab, so be ready to back off slightly should this occur. Pressing this pedal to the floor puts the car into emergency. Remember that braking at an unnecessarily high rate is uncomfortable to your passengers and can cause flat spots on the wheels should they lock up.

Door Operation and Passenger Loading & Unloading

1. Doors are operated from 4 switches on the gang switch panel. Each door is marked with their corresponding door, i.e. Front Right Door
2. The doors are interlocked to remove all power to the motors when open. The car cannot run with doors open. Develop the habit of holding the door switches between your thumb and forefinger so that if a passenger attempts to board as you are closing the door, you can immediately reopen it.

Heat & Ventilation

1. A thermostat controls the opening and closing of damper fans for ventilation in warmer months.
2. Heat is also controlled by the thermostat inside the car. When the temperature drops below a certain point, the thermostat will automatically turn the heat on. Note: During summer months the heat is ‘cut out’, and will not function even if the temperature drops below the thermostat’s range. If the heat is not working on a cold day, follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.
3. There is a cab heater located at the operator’s feet at each end of the car.
4. Turn off cab heaters at least 30 minutes before the car is placed in the Car Barn.

Lights

1. Interior light switches are located on the gang switch panel in front of the operator. If the interior lights are off, “emergency” battery lights in the center of the aisle turn on.
2. The headlight and dimmer switches are located adjacent to each other on the gang switch panel.
3. A switch for the red stop lights is located to the left of the gang switch panel along the wall. This switch will manually engage the lights.
4. The marker lights are controlled by the change over switch.

Changing ends

1. Place the car in service latch. Remove the reverser.
2. If you were operating from the “A” (#1) end, insert the hook in the changeover switch and set to the “B” (#2) end.
3. Change poles. When the reverser is removed, all doors balance, you can re-enter the car at the new front end.
4. If you were previously operating from the “B” (#2) set the changeover switch to the “A” (#1) end.

Emergency and Special Procedures

1. 14 and 24 are equipped with air brakes, in the event of brake failure follow the emergency procedures for foot control cars at the beginning of the manual.
2. Brake pedal lock - When pushed all the way in, the brake pedal can rock back to lock in place and hold the car in “emergency”. To unlock the pedal, place your foot on it and gently rock it forward.
3. Car does not run.
 - a. If the battery switch is on and the MG will not come on, the batteries may be discharged. Observe the voltmeter on the dashboard to be sure it reads between 30 volts and 38 volts. If it does not read within this range do not attempt to run the car. Follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.
 - b. Ensure the changeover switch is set to the end you’re attempting to operate from.
 - c. Ensure the reverser is fully engaged for the direction in which you wish to operate.
 - d. The car may be in emergency, place car back into service latch and attempt again.
 - e. Ensure the “Conductor’s Emergency Switch” is in the “off” position.

Power Down Procedure

1. Ensure pedals are properly service latched.
2. When putting the car in the car barn, set the transfer switch to the new front end.
3. Return the reverser to the handles box located on the “B” (#2) end.
4. Turn off the MG set.
5. Turn off the battery switch by pushing the lever to the left. Leaving the switch on will cause the batteries to discharge.
6. Close the doors manually.
7. Lower the pole.
8. Drain the air tank.

PITTSBURGH RAILWAYS 1138 - COMING SOON!



Car 1138 is a very early example of a PCC streetcar – one of 201 cars delivered to Pittsburgh Railways in the first two years of production. The PCC car represented a major leap in streetcar design – it was designed to effectively compete with the automobile (which it could out-accelerate) through improvements in engineering and performance, not to mention style.

Acquired by the Pennsylvania Trolley Museum in 1961, 1138 was restored by volunteers in the late 60s and again in 2000, this time to its mid-1950s appearance. It is one of three PCC cars heavily overhauled through the courtesy of Adtranz (now Bombardier Transportation) in their Elmira, New York facility.

PITTSBURGH RAILWAYS 1711



Car 1711 is one of the last 100 units, delivered in 1948-49, and differs in many ways from the cars that came before it. From the outside, the most distinctive changes included the sealed windows (to prevent accidents) with small standee windows in a row above. On the front of the car, bright triangular wings again outlined the headlight and small dash lights flanked the top corners. On the roof, a cowl running the length of the roof provided intake for the car's ventilation system. Inside, a new seating arrangement allowed all of the passengers to face forward, while four large Sturtevant fans punctuated the ceiling, providing fresh air in lieu of openable windows.

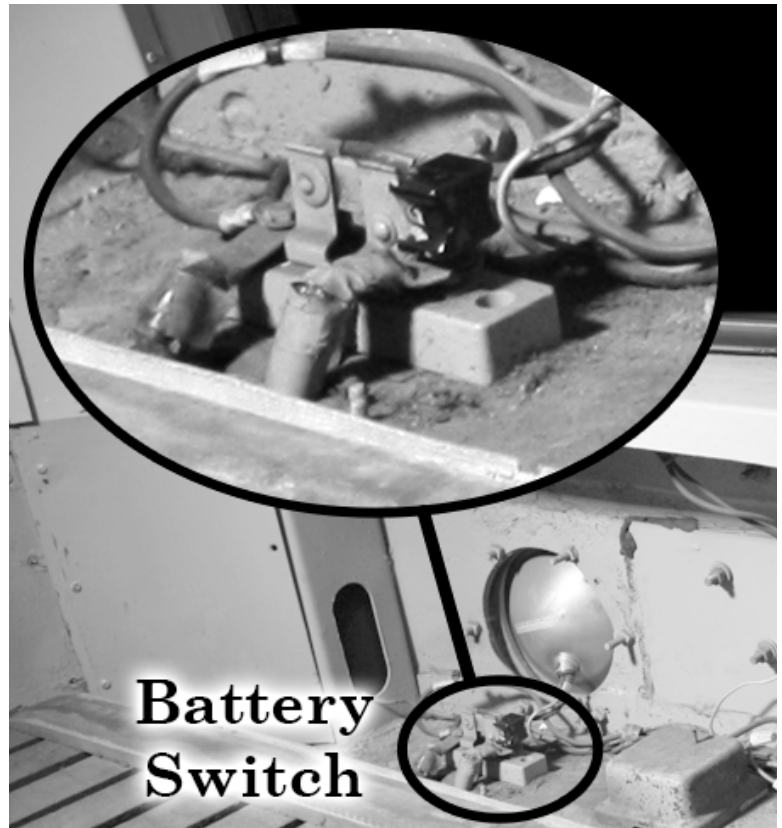
A special group of 1700s (numbers 1700-1724) were equipped with special running gear for service on Pittsburgh Railways' long Charleroi and Washington interurban lines: a package shelf in place of the first seat behind the operator, a ticket printer, an emergency tool kit, a spare trolley pole secured in special brackets on the roof and a roof-mounted headlight. After acceptance, 1711 was one of seven cars assigned to Tylerdale car house in Washington. It was chosen for preservation at PTM because it operated on the line which became our museum home, and also because it was historically significant as the last car to carry regular passengers from Washington to Pittsburgh early on the morning of August 30, 1953.

Car 1711 was retired from active service in August 1988, and acquired from Port Authority Transit in April 1990. On the way to the museum, 1711 was detoured to the BarrCannon Body Company in Meadowlands, PA, where workmen overhauled it inside and out, under the watchful eye of founding member George Tucker, who also generously donated the cost of the work performed.

Subsequently, 1711 was sent to the Adtranz (now Bombardier) facility in Elmira, NY for a complete structural rebuild. During that process, the interior was restored to the original 1949 appearance.

Start up Procedure

1. Ensure reverser is not in then put up pole.. This car is equipped with a retriever.
2. Enter the car and walk to the rear. Move the left rear seatback. Close the battery knife switch to turn the batteries on.
3. Walk to the front of the car. Turn on the interior lights (gang switch) and move the front door switches on. Open the front breaker panel door near the power pedal and turn on all the breakers except Aux Heat and Heat/Ceiling Fans. On is toward the windshield. *NOTE: You may turn on the heat/ceiling fans if the weather warrants it.*
4. The MG set will come on when the breaker is turned on. If it does not, the car is out of order and must not be run. Complete the power down procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
5. Retrieve the two reverse handles (“hooks”) from the ammo box located behind the operator’s seat. The hook with the silver knob is for the backup controller while the hook with the black knob is for the front controller.
6. Note the voltage on the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.



1711 - Battery Switch

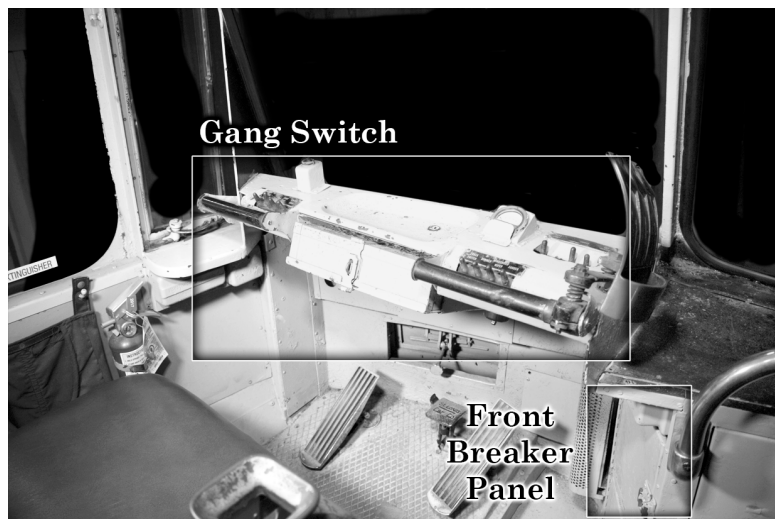


1711 - Front Breaker Panel

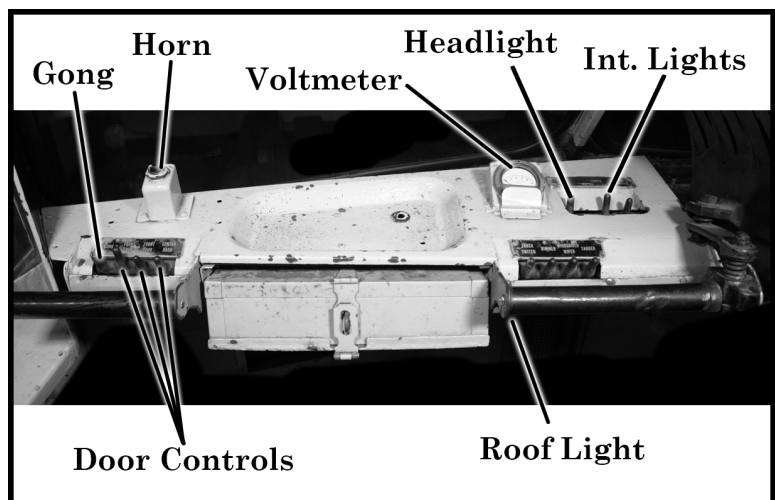
General Operating Procedure

1. Operating from the Front Controller.

- a. Verify that the backup controller changeover switch is set to the front controller position. If it is not, the front controller will not work.
- b. The left pedal is a Deadman pedal and must be depressed whenever the car is operated from this end. Do not release this pedal when the car is in motion or an emergency stop will occur.
- c. The middle pedal is the Brake, and has an adjustable braking rate, depending on how far down it is pressed (like an automobile).
- d. The right-most pedal is the Accelerator. Also like an automobile, the farther down you press this pedal, the faster the car will accelerate.
- e. The reverser is located on the floor along the right of the seat. It has three positions:
 - i. Remove/Emergency: This position is all the way toward the front, and is where the hook can be inserted or removed. Throwing the hook to this position while the car is in motion will result in an emergency stop and may possibly damage the car.
 - ii. Forward: This is the middle position, in which the hook is positioned directly up and down. In this position the car will move in the forward direction, and the hook is captured.
 - iii. Reverse: This is all the way toward the back. In this position the car will move in the reverse (backup) direction, and the hook remains captured.



1711 - Controls



1711 - Gang Switch

- f. Coast by returning the accelerator pedal to the resting position.
- g. To brake, press down the brake pedal. As with an automobile, the harder you press the brake, the more brake you will get. Pressing the brake pedal completely down puts the car into Emergency and should not be done unless an emergency stop is required.
- h. To back up, pull the hook back as far as it will go. Backing up from the front controller should be done only in an emergency situation. Do not attempt to back up this car from the front controller without someone watching out the rear window. Return the hook to the Forward position after the backup move has been completed.

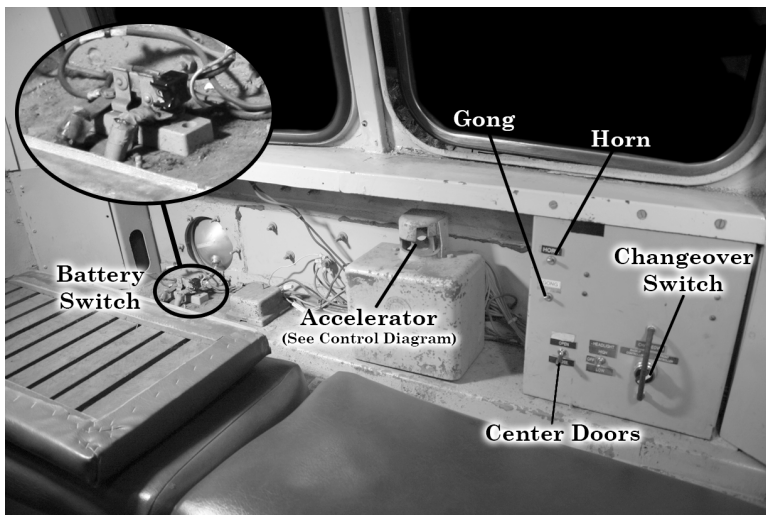
2. Operating from the Rear Controller.

- a. Insert the front reverse lever (on the proper handle, the knob points toward the front doors) in the reverser slot (on the floor to the right of the operator's seat) and push all the way back towards the rear of the car .

- b. Close all doors using the Gang Switches. Walk to the rear of the car.

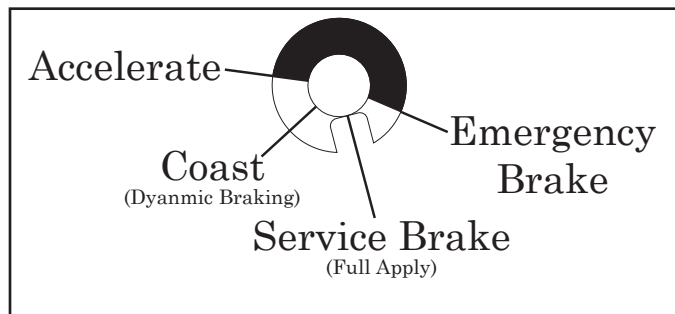
- c. At the backup control panel, set the Controller switch to backup position.

- d. Insert the backup hook into the backup controller.



1711 - Backup Controller

- e. The Center Door switch is interlocked with the backup controller. The doors will not open if the controller is in the accelerate or coast positions. If the doors are open and the control handle is moved into accelerate or coast, the doors will automatically close but the car will not move.



1711 - Control Diagram

- f. The backup controller has four operating positions or points. These are:

- i. **Service Brake** - This is the only position where the hook can be inserted or removed, and is the braking position to use for normal service stops. This position gives a fully blended braking force, changing from dynamic brake to drum friction brakes as the speed drops. The drum brakes hold the car when it is stopped. Service Brake position functions the same as the brake pedal at the front end of the car, with the exception that there is only one braking rate available.
- ii. **Emergency Brake** - This is one position to the right of Service Brake. Here the maximum brake force is obtained. Full dynamic brakes, full drum friction brakes, and full track brakes are applied. A warning buzzer will also sound when this position is selected. Do not use this braking position unless there is an emergency requiring the fastest possible stop.
- iii. **Coast** - This is one position to the left of Service Brake. In this position, all of the brakes in the car are released. When the car is in motion, power is removed and a slight braking force will be noted.
- iv. **Accelerate** - This is two positions to the left of Service Brake. In this position power is applied and the drum controller accelerates the car.

- g. Before backing the car, sound three rings of the gong or blasts of the horn. *Note: The Horn*

and Gong switches are spring loaded.

- h. Move the hook to the left through coast position to accelerate. The car will now begin accelerating.
- i. Allow the car to accelerate to the desired speed. The hook can then be moved to the Coast position. Doing this will make for a smooth ride.
- j. To accelerate again, move the hook one click left to Accelerate. When the desired speed is reached move one click right to Coast.
- k. To brake the car, move the hook to Service Brake. Note that there is a constant, non-adjustable dynamic braking rate. Good operators will practice stopping using the Service Brake to develop a feel for the stopping distance.
- l. Always move back into Coast when traveling underwire frogs, contactors and/or section insulators. Remember that you are “back-poling”.
- m. If an emergency stop is required, move the handle quickly to the extreme right emergency brake position. Maximum braking will occur, and the buzzer will sound. After the car has stopped move the controller to the Service Brake position to hold the car.
- n. The hook can be moved between positions as often as needed. There are no restrictions, and to maintain speed it will be necessary to frequently go between Accelerate and Coast positions.

Passenger Loading & Unloading

1. Front controls - Doors are controlled by 3 switches on the gang switch panel. Switches are marked for their respective doors. The two front doors are each on individual switches, while the center doors are controlled by one switch. *Note: You should develop the habit of holding the switches between the thumb and forefinger when closing the doors; this way the reverse operation is quick should it be needed. Use the mirrors to view the center door area to verify that they are clear.*
2. Rear controls - Only the center doors can be controlled from the backup controller. The switch is labeled on the backup controller box.
3. The center doors are interlocked with the power circuit; the car will not draw power with the center doors open.

Heating & Ventilation

1. The Heat/Ceiling Fans breaker controls the ceiling fans. The fans will come on if it is above 70 degrees. Unless the fans are desired, leave the breaker off. If this breaker is on and it is cold outside, the under car vent dampers will automatically direct waste heat from the control resistors up into the car, instead of venting it outside, after the car has been run awhile. The Aux Heat breaker turns on the baseboard 600-volt resistance heating. It comes on only if the Heat/Ceiling Fans breaker is also on. Aux Heat should be used only when it is very cold outside.
2. The Cab Heater switch on the gang switch panel activates the resistance heater in front of the operator’s feet. Use it as needed, but never put the car away with this switch on.
3. Turn off all heaters at least 30 minutes before the car is placed in the Car Barn.

Lights

1. Interior lights are controlled by a switch on the gang switch panel.
2. The headlight and dimmer switches are located on the gang switch panel.
3. The dash lights come on when the headlight is on.
4. The roof headlight is controlled from a switch located under the gang switch panel.

Changing Ends

1. Changing from the front controller to the backup controller.
 - a. While holding the brake pedal about 2/3 of the way in, slowly release the Deadman.
 - b. Slowly release the brake. It will latch about 4 inches from the floor, in the Service Latch position.
 - c. Push the reverse lever in the reverser slot (under the motorman seat) all the way back towards the rear of the car.
 - d. Close all the doors using the Gang Switches. Verify that the “Cab Heat” gang switch is away from the windshield. Walk to the rear of the car.
 - e. Follow the instructions for the operation of the backup controller.
2. Changing from backup controller to front controller.
 - a. With the backup controller set to Service Brake, remove the backup hook.
 - b. Verify that the center doors are closed.
 - c. Set the Controller switch on the backup control panel to the front controller position.
 - d. Replace the seat cushions.
 - e. At the front of the car, set the reverse handle in the middle position (straight up and down). This sets the reverser to the forward direction.
 - f. The car is now ready to be operated from the front.

Emergency and Special Procedures

1. 1711 is an all electric car, in the event of brake failure follow the emergency procedures for foot control cars at the beginning of the manual.
2. Brake pedal lock - When pushed all the way in, the brake pedal can rock back to lock in place and hold the car in “emergency”. To unlock the pedal, place your foot on it and gently rock it forward.
3. Car does not run
 - a. Ensure the MG set is turned on.
 - b. If the battery switch is on and the MG will not come on, the batteries may be discharged. If this is the case, do not attempt to run the car. Follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.

-
- c. Check the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
 - d. Ensure the switch on the backup controller is set to whichever end you desire to operate from.
 - e. Ensure the reverser is fully engaged for the direction in which you wish to operate.

Power Down Procedure

1. If any of the car heaters were used, they must be off for at least 30 minutes before the car can be put into the carbarn.
2. Ensure the pedals are properly service latched.
3. Remove the hook and return both to the ammo box.
4. Close all the doors except the first door.
5. Open all of the breakers in the front breaker panel.
6. Open the battery knife switch behind the left rear seat.
7. Check the backup control panel. Ensure the controller switch should be set to front; the center doors switch should be down.
8. Ensure the back seat cushion is replaced.
9. Exit via the front doors, manually closing them behind you.
10. Lower the pole.

PORT AUTHORITY TRANSIT 4004



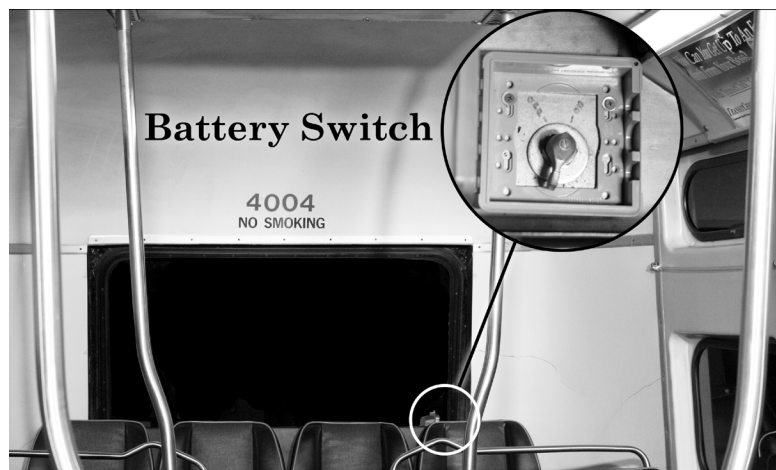
When some of Pittsburgh's South Hills trolley lines were being upgraded to light rail standards and new equipment was being purchased, the Port Authority undertook a program to remanufacture 1949-vintage PCC cars for use on the Library and Overbrook routes. At the time these lines were not being rebuilt and required operation using the smaller lighter cars traditionally used on these lines.

Originally slated to include 45 cars, the program ended with only a dozen rebuilds, due to cost realities. Those that were finished, however, were essentially new cars, with all-new electrical and running gear of the type and style that they were originally equipped.

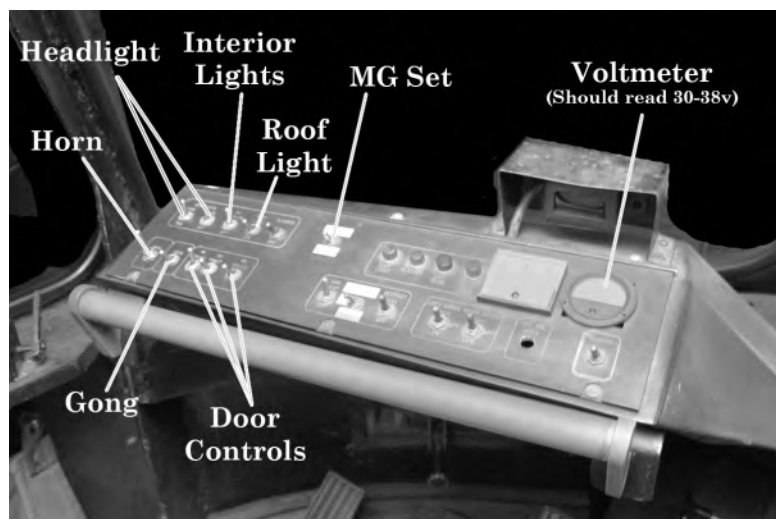
In September 1999 car 4004 was the last PCC to operate in revenue service, ending 63 years of PCC car operation in Pittsburgh. It was donated to the Pennsylvania Trolley Museum by the Port Authority, who generously stored the car until the new Trolley Display Building was completed, and then repainted it before delivery.

Start up Procedure

1. Put up the pole.
2. Enter the car and walk to the rear. Behind the rightmost seat there is a small plastic box, open the cover and turn the battery switch on.
3. Walk to the front of the car. Turn on the MG set located on the gang switch panel.
4. The MG set should come on when the switch is turned on. If it does not, the car is out of order and must not be run. Complete the power down procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
5. Retrieve the reverser hook from the ammo box located behind the operator's seat.
6. Note the voltage on the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.



4004 - Battery Switch Location



4004 - Gang Switch

General Operating Procedure

1. The left pedal is the Deadman pedal and must be depressed whenever the car is operated. Do not release this pedal when the car is in motion or an emergency stop will occur.
2. The middle pedal is the Brake, and has an adjustable braking rate, depending on how far down it is pressed (like an automobile).
3. The right-most pedal is the Accelerator. Also like an automobile, the farther down you press this pedal, the faster the car will accelerate.
4. The reverser is located on the floor along the right of the seat. It has three positions:
 - a. Remove/Emergency: This position is all the way toward the front, and is where the hook can be inserted or removed. Throwing the hook to this position while the car is in motion will result in an emergency stop and may possibly damage the car.
 - b. Forward: This is the middle position, in which the hook is positioned directly up and down. In this position the car will move in the forward direction, and the hook is captured.

- c. Reverse: This is all the way toward the back. In this position the car will move in the reverse (backup) direction, and the hook remains captured.
5. Coast by returning the accelerator pedal to the resting position.
6. To brake, press down the brake pedal. As with an automobile, the harder you press the brake, the more brake you will get. Pressing the brake pedal completely down puts the car into Emergency and should not be done unless an emergency stop is required.
7. To back up, pull the hook back as far as it will go. Do not attempt to back up the car without someone watching out the rear window or on the ground. Before backing the car, sound three rings of the gong or blasts of the horn.

Door Operation and Passenger Loading & Unloading

1. Doors are controlled by 3 switches on the gang switch panel. Switches are marked for their respective doors. The two front doors are each on individual switches, while the center doors are controlled by one switch. *Note: You should develop the habit of holding the switches between the thumb and forefinger when closing the doors; this way the reverse operation is quick should it be needed. Use the mirrors to view the center door area to verify that they are clear.*
2. The center doors are interlocked with the power circuit; the car will not draw power with the center doors open.

Heat & Ventilation

1. A thermostat controls the opening and closing of damper fans for ventilation in warmer months.
2. Heat is also controlled by the thermostat inside the car. When the temperature drops below a certain point, the thermostat will automatically turn the heat on.
3. During summer months the heat is “cut out”, and will not function even if the temperature drops below the thermostat’s range. If the heat is not working on a cold day, follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.
4. The Cab Heater switch on the gang switch panel activates the resistance heater in front of the operator’s feet. It must be turned off at least 30 minutes before putting the car in the carbarn.

Lights

1. Interior lights are controlled by a switch on the gang switch panel.
2. The headlight and dimmer switches are located on the gang switch panel.
3. The roof headlight is controlled by a switch on the gang switch panel.

Backing the Car

1. Reversing this car requires 2 people. Do not attempt to back up the car without someone watching out the rear window or from the ground.
2. Place the Reverser in the reverse position.
3. Sound the bell three (3) times.

Emergency and Special Procedures

1. 4004 is an all electric car, in the event of brake failure follow the emergency procedures for foot control cars at the beginning of the manual.
2. Car will not run.
 - a. Check to see the MG set is turned on.
 - b. If the battery switch is on and the MG will not come on, the batteries may be discharged. If this is the case, do not attempt to run the car. Follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.
3. Check the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
4. Ensure the reverser is fully engaged for the direction in which you wish to operate.

Power Down Procedure

1. If the cab heater was used, it must be off for at least 30 minutes before the car can be put into the carbarn.
2. Ensure the pedals are properly service latched.
3. Remove the hook and return it to the ammo box.
4. Close all the doors except the first door.
5. Turn the MG off.
6. Turn the battery switch off.
7. Exit via the front doors, manually closing them behind you.
8. Lower the pole.

PHILADELPHIA TRANSPORTATION Co. 2711



Philadelphia Transportation Company (PTC) had a large fleet of PCC streamliners, of which 2711 represents one of the more recent. Originally built for service on the busy 23-Germantown Avenue line, the car came equipped for 2-man operation – almost unheard of in 1947, but traffic on the route more than covered the extra operating cost.

As PTC gave way to SEPTA (Southeastern Pennsylvania Transportation Authority) in 1968, the 2700's continued in service and remained after several trolley lines had been discontinued. Because of their age, many cars went through a general overhaul rebuilding in the 1980s to extend their useful life another ten years, including the replacement of the hand-cranked windows with school bus style windows and seating from scrapped former transit buses. But once that time was up and new cars were acquired, streetcar operation was sharply curtailed and the cars were surplus.

In 1999 car 2711 was acquired by PTM for the purpose of having a wheelchair accessible car for operations. The generosity of corporate partner Adtranz (now Bombardier), that built people mover cars and components in nearby West Mifflin, allowed the car to be taken from Philadelphia to their factory in Elmira, New York where crews restored it to the original 1947 appearance. As a work car, 2711 had many of its seats removed which facilitated reworking of the interior.

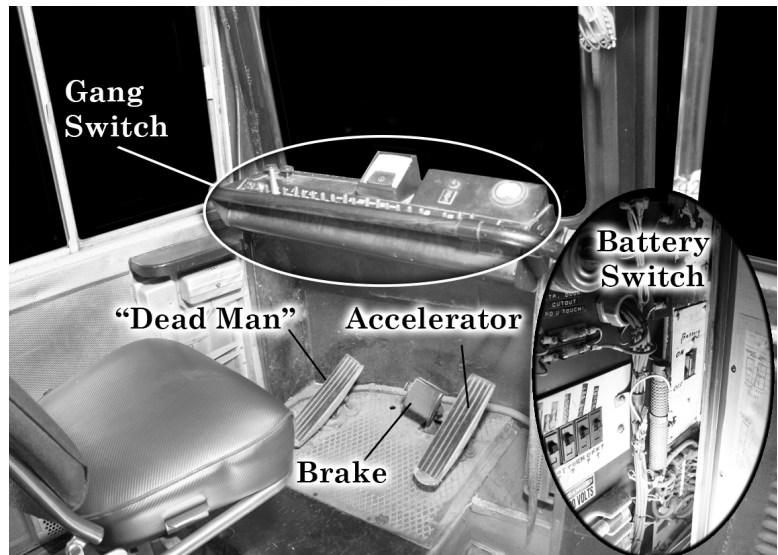
Start up Procedure

1. Put the pole up.
2. Retrieve the reverser hook from the ammo box located behind the operator's seat.
3. Turn on the battery located in the dash compartment in the front of the car, behind the "Danger 600V" sign. *Note: This box contains areas that are electrically "hot". Exercise extreme caution when turning any switch on or off.*
4. Turn on the MG set located on the gang switch panel.
5. The MG set should come on when the switch is turned on. If it does not, the car is out of order and must not be run. Complete the power down procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
6. Note the voltage on the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.

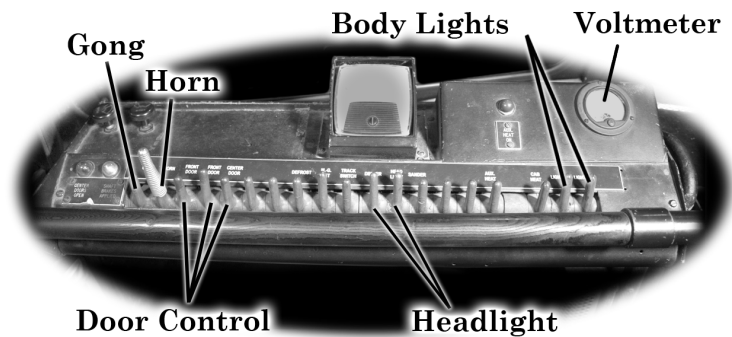
General Operating Procedure

1. Operating from the Front Controller.

- a. Verify that the backup controller changeover switch is set to the front controller position. If it is not, the front controller will not work.
- b. The left pedal is a Deadman pedal and must be depressed whenever the car is operated from this end. Do not release this pedal when the car is in motion or an emergency stop will occur.
- c. The middle pedal is the Brake, and has an adjustable braking rate, depending on how far down it is pressed (like an automobile).
- d. The right-most pedal is the Accelerator. Also like an automobile, the farther down you press this pedal, the faster the car will accelerate.
- e. The reverser is located on the floor along the right of the seat. It has three positions:



2711 - Controls & Battery Switch

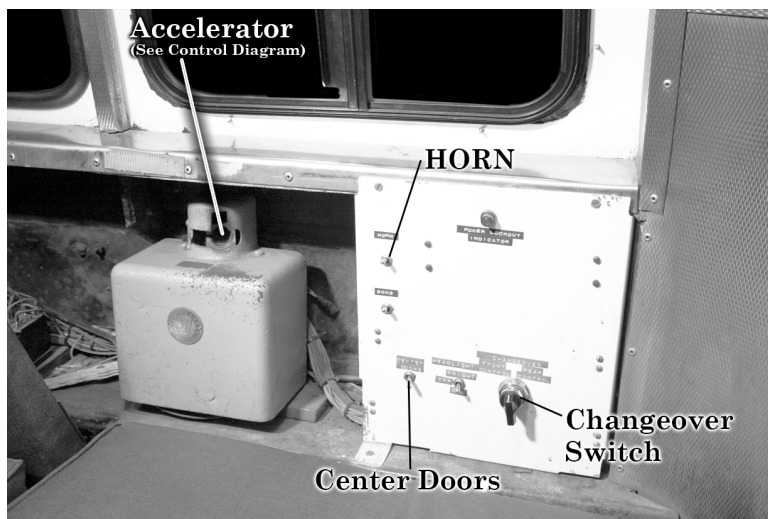


2711 - Gang Switch

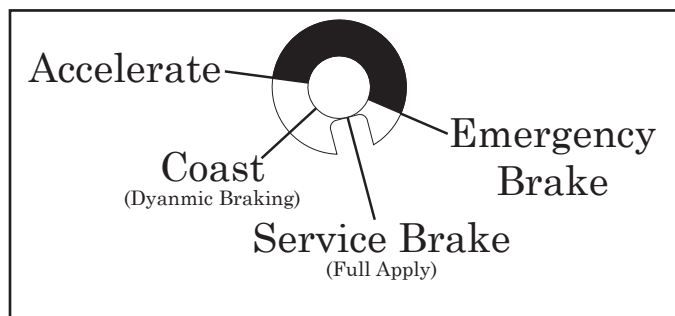
- i. Remove/Emergency: This position is all the way toward the front, and is where the hook can be inserted or removed. Throwing the hook to this position while the car is in motion will result in an emergency stop and may possibly damage the car.
 - ii. Forward: This is the middle position, in which the hook is positioned directly up and down. In this position the car will move in the forward direction, and the hook is captured.
 - iii. Reverse: This is all the way toward the back. In this position the car will move in the reverse (backup) direction, and the hook remains captured.
- f. Coast by returning the accelerator pedal to the resting position.
 - g. To brake, press down the Brake pedal. As with an automobile, the harder you press the brake, the more brake you will get. Pressing the brake pedal completely down puts the car into Emergency and should not be done unless an emergency stop is required.
 - h. To back up, pull the hook back as far as it will go. Backing up from the front controller should be done only in an emergency situation. Do not attempt to back up this car from the front controller without someone watching out the rear window. Return the hook to the Forward position after the backup move has been completed.

2. Operating from the Rear Controller.

- a. Insert the front reverse lever (on the proper handle, the knob points toward the front doors) in the reverser slot (on the floor to the right of the operator's seat) and push all the way back towards the rear of the car .
- b. Close all doors using the gang switches. Walk to the rear of the car.
- c. At the backup control panel, set the Controller switch to backup position.
- d. Insert the backup hook into the backup controller.
- e. The Center Door switch is interlocked with the backup controller. The doors will not open if the controller is in the accelerate or coast positions. If the doors are open and the control handle is moved into accelerate or coast, the doors will automatically close but the car will not move.



2711 - Back-up Controller



2711 - Control Diagram

- f. The backup controller has four operating positions or points. These are:
 - i. Service Brake - This is the only position where the hook can be inserted or removed,

Procedures in this manual are to be used only in conjunction with operator qualification.

Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

and is the braking position to use for normal service stops. This position gives a fully blended braking force, changing from dynamic brake to drum friction brakes as the speed drops. The drum brakes hold the car when it is stopped. Service Brake position functions the same as the brake pedal at the front end of the car, with the exception that there is only one braking rate available.

- ii. Emergency Brake - This is one position to the right of Service Brake. Here the maximum brake force is obtained. Full dynamic brakes, full drum friction brakes, and full track brakes are applied. A warning buzzer will also sound when this position is selected. Do not use this braking position unless there is an emergency requiring the fastest possible stop.
 - iii. Coast - This is one position to the left of Service Brake. In this position, all of the brakes in the car are released. When the car is in motion, power is removed and a slight braking force will be noted.
 - iv. Accelerate - This is two positions to the left of Service Brake. In this position power is applied and the drum controller accelerates the car.
- g. Before backing the car, sound three rings of the gong or blasts of the horn. *Note: The Horn and Gong switches are spring loaded.*
 - h. Move the hook to the left through Coast position to accelerate. The car will now begin accelerating.
 - i. Allow the car to accelerate to the desired speed. The hook can then be moved to the Coast position. Doing this will make for a smooth ride.
 - j. To accelerate again, move the hook one click left to Accelerate. When the desired speed is reached move one click right to Coast.
 - k. To brake the car, move the hook to Service Brake. Note that there is a constant, non-adjustable dynamic braking rate. Good operators will practice stopping using the Service Brake to develop a feel for the stopping distance.
 - l. Always move back into Coast when traveling underwire frogs, contactors and/or section insulators. Remember that you are “back-poling”.
 - m. If an emergency stop is required, move the handle quickly to the extreme right emergency brake position. Maximum braking will occur, and the buzzer will sound. After the car has stopped move the controller to the Service Brake position to hold the car.
 - n. The hook can be moved between positions as often as needed. There are no restrictions, and to maintain speed it will be necessary to frequently go between Accelerate and Coast positions.

Door Operation and Passenger Loading & Unloading

1. Front controls - Doors are controlled by 3 switches on the gang switch panel. Switches are marked for their respective doors. The two front doors are each on individual switches, while the center doors are controlled by one switch. *Note: You should develop the habit of holding the switches between the thumb and forefinger when closing the doors; this way the reverse operation is quick should it be needed. Use the mirrors to view the center door area to verify that they are clear.*
2. Rear controls - Only the center doors can be controlled from the backup controller. The switch is labeled on the backup controller box.
3. Develop the habit of holding the switches between the thumb and forefinger when closing the doors; this way the reverse operation is quick should it be needed. Use the mirrors to view the center door area to verify that they are clear.
4. The center doors are interlocked with the power circuit; the car will not draw power with the center doors open.

Wheelchair Safety Procedures

1. To allow wheelchairs to board through the center doors, you must remove the middle stanchion. This is done by pulling out the cotter pin in the top anchor pin, removing the anchor pin, and then pulling the stanchion straight up. Immediately replace the anchor pin in it's slot and re-insert the cotter pin. The stanchion should be stored in the substation until reinstalled.
2. The hand-operated wheelchair lift is used to load patrons onto 2711. Wheelchairs cannot be directly transferred from a van and truck because of the outward folding center doors. Wheelchair lift details are discussed elsewhere in this manual.
3. Remind wheelchair attendants that they must duck to get in through the center doors if they're pushing a wheelchair. Patrons in wheelchairs should clear without a problem.
4. The side-facing bench seats and the table fold against the wall to allow space for the wheelchairs. Simply raise the bench seats until the yellow release handle latches (pull the yellow handles to release the seats for lowering). The table folds downwards; lift, fold up and latch the legs under the top, then gently allow it to swing down to the side of the car. There is no latch holding the table to the wall.
5. Wheelchairs can be placed next to the windows in any open location. They may not be placed in the aisle ways so as to impede access. For safety reasons, aisle ways must be kept clear at all times when moving the car. Up to 10 wheelchairs can be accommodated without blocking the aisles.
6. There are no wheelchair tie downs on 2711. Ensure that the brakes are properly set on all wheelchairs before moving the car.
7. Wheelchairs must be set facing the front of the car.
8. When operating with wheelchair bound patrons, give them the most comfortable ride possible. Try to avoid fast starts and stops and/or jerky movements.
9. A two-person crew is required at all times when transporting wheelchairs. The conductor should be watching the wheelchair bound patron(s) at all times when the car is in motion.

Heat & Ventilation

1. The heat is controlled by a thermostat. If it is cold outside, the under car vent dampers will automatically direct waste heat from the control resistors up into the car, instead of venting it outside, after the car has been run awhile.
2. The Aux Heat switch turns on the baseboard 600-volt resistance heating. Aux Heat should be used only when it is very cold outside.
3. The Cab Heater switch on the gang switch panel activates the resistance heater in front of the operator's feet. Use it as needed, but never put the car away with this switch on.

Lights

1. Interior lights are controlled by a switch on the gang switch panel.
2. The headlight and dimmer switches are located on the gang switch panel.

Changing Ends

1. Changing from the front controller to the backup controller.
 - a. While holding the brake pedal about 2/3 of the way in, slowly release the Deadman.
 - b. Slowly release the brake. It will latch about 4 inches from the floor, in the Service Latch position.
 - c. Push the reverse lever in the reverser slot (under the motorman seat) all the way back towards the rear of the car.
 - d. Close all the doors using the Gang Switches. Verify that the "Cab Heat" gang switch is away from the windshield. Walk to the rear of the car.
 - e. Follow the instructions for the operation of the backup controller.
2. Changing from backup controller to front controller.
 - a. With the backup controller set to Service Brake, remove the backup hook.
 - b. Verify that the center doors are closed.
 - c. Set the Controller switch on the backup control panel to the front controller position.
 - d. Replace the seat cushions.
 - e. At the front of the car, set the reverse handle in the middle position (straight up and down). This sets the reverser to the forward direction.
 - f. The car is now ready to be operated from the front.

Emergency and Special Procedures

1. 2711 is an all electric car, in the event of brake failure follow the emergency procedures for foot control cars at the beginning of the manual.
2. Car does not run.
 - a. Ensure the MG set is turned on.
 - b. If the battery switch is on and the MG will not come on, the batteries may be discharged. If this is the case, do not attempt to run the car. Follow the power down procedure to secure the car, make note of the problem on the chalkboard in the substation, and complete a car condition report form.
 - c. Check the dashboard voltmeter. It should be between 33 and 40 volts (ideal: 37 volts). If the voltage is not within this range the car is out of order and must not be used. Complete the shutdown procedure, record the malfunction on the chalkboard in the substation and complete a car condition report form.
 - d. Ensure the switch on the backup controller is set to whichever end you desire to operate from.
 - e. Ensure the reverser is fully engaged for the direction in which you wish to operate.

Power Down Procedure

1. If the cab heater was used, it must be off for at least 30 minutes before the car can be put into the carbarn.
2. Ensure the pedals are properly service latched.
3. Remove the hook and return both to the ammo box.
4. Close all the doors except the first door.
5. Turn MG off.
6. Turn the battery switch off.
7. Check the backup control panel. Ensure the controller switch should be set to front and the center doors switch should be set to “close”.
8. Ensure the back seat cushion(s) are in place.
9. Exit via the front doors. Manually close them behind you.
10. Lower the pole.

ELECTRIC POWER

Overview

Trolley line power is provided at 600 volts direct current (DC) through the overhead wire. It is generated from alternating current (AC) electricity provided from West Penn Power using three rectifiers. Two of these are located at the East site substation and one at the West site substation adjacent to the Richfol stop. These three rectifiers are integrated into a single system as follows:

- One of the two rectifiers at the east site substation is the primary power source.
- The rectifier in the West site substation is used for load balancing purposes and comes on-line automatically as needed. The decision as to when this rectifier is used does not involve operations personnel.

Control of the entire power system is integrated using a radio communications system. Power can be turned on and off from the West Site (Richfol) substation by pressing the red button on the wall to turn the power on or by pressing the green button to turn the power off. However these buttons only work if the blue remote light is on. If the blue light is not lit, it will be necessary operate the east substation, for more information refer to “Trolley Line Power Operating Procedures” on the operations webpage.

Important Safety Warning

There are a number of cabinets at both substations that are part of the power management system. There are no controls or other components in these cabinets that are part of the regular operating procedures for the power system. These cabinets contain components that are not protected, contain high voltage and amperage and may be energized even when the trolley line power is turned off. The contents of these cabinets are extremely dangerous. **UNDER NO CIRCUMSTANCES ARE INDIVIDUALS OTHER THAN THE DESIGNATED POWER & SIGNAL DEPARTMENT PERSONNEL ALLOWED TO OPEN THESE CABINETS.** In addition, many of the cabinets contain a protection mechanism that will cause the power to be turned off should the cabinet be opened. However, even with the power turned off, there will still be components in these cabinets that are energized and dangerous.

RADIO PROCEDURE

Two-way Radio Operation

ALWAYS TAKE A RADIO WITH YOU WHEN OPERATING A CAR

Because of the concern for safety, Pennsylvania Trolley Museum makes use of two-way radios an integral part of its operation. Use of these radios is licensed and regulated by the Federal Communications Commission and we must adhere strictly to FCC rules. Radios, like any other piece of valuable equipment, are to be used and cared for properly and professionally.

Portable radios of the type used at the Museum have a number of controls which you need to become familiar with.

- On-Off/Volume: As its name implies, this knob turns the unit on and off, and also controls the loudness. Set the volume so that you can hear radio transmissions clearly, but not so loud that they are easily understood by your passengers.
- Channel Selector:
 - Channel 1 is used for everyday trolley operations.
- The Push-to-Talk button is depressed to transmit a message to other units.
 - Hold this button down for at least one full second before speaking. At all other times, the radio will receive messages. Improper usage of this device causes incomplete and garbled messages to transmit. Be careful as you hold the unit, or when you set the unit down, that the key is not accidentally depressed.
- Hold the radio, with the plastic “grillwork” speaker facing you, about three inches from your mouth. If you are too far away, the radio will not pick up your voice; if you are too close, your voice will sound fuzzy, garbled, or unrecognizable.
- Do not put your mouth on the speaker; it is unnecessary and unsanitary. Speak clearly and distinctly. When your message is complete, be sure to release the keypad; failure to do so will prevent you from receiving any response, and will also interfere with or obscure communication between any other radios in use on the channel.

TWO-WAY RADIO USAGE

1. Only museum operators, instructors, maintenance crews or other authorized personnel are to use the radio system.
2. Upon removing a radio from the cabinet you are responsible for it. Don't leave it unattended. Transfer it only to an operator who is replacing you, or return it (turned off) to the cabinet in the substation.
3. Friends, relatives, guests, and passengers are not to have access to radios at any time.
4. Keep communications reasonably discreet. Although radio volume controls must be set high enough to hear communications above ambient noise, don't turn your radio up so loud that the passengers can hear every word.
5. Personal messages or horseplay on the radio is forbidden.
6. Never use obscenities on the radio. This is forbidden by the Federal Communications Commission (FCC) of which you are using a licensed channel. Loss of the Museum's frequencies, fines, and imprisonment are possible due to the deliberate misuse of radio frequencies and equipment.
7. Always consider that your transmissions are under scrutiny. We do not have exclusive use of the frequency to which we are assigned. Our transmissions can easily be picked up by inexpensive scanners, and of course the FCC monitors all radio services.
8. Although the radios are built sturdily, they are not shockproof. Do not bang them around or drop them.

Batteries

Multiple radio charging stations are located in the radio cabinet in the substation. To recharge, place and properly seat the radio in the charger, ensure the radio is turned off. Upon inserting a radio in the charger, the red "charging" light will come on indicating the radio is now charging. When the charge cycle is complete, the light will be green, indicating that the radio is ready for service.

Security

When you have finished using a radio for the day, please return them their charger in the radio cabinet. This will insure that there will always be charged radios available for operators and crews. Always keep the radios in your possession, both to prevent them from being lost or stolen and to enable other personnel to remain in contact with you.

Communication

Transmissions on museum radios must be professional, courteous, and as brief as possible. Generally, personal names are not used; rather, car numbers, assignment titles (such as "Dispatcher") or badge numbers should be used. Personal messages are permissible only as they may relate to the operation. Horseplay and profanity are strictly forbidden. The first and last transmissions of the day are to include the use of our call sign - WPLD 754, which is prominently displayed on the radio cabinet. The call sign should be repeated periodically (hourly), or when radios have been silent for an extended period of time. A first transmission of the day might be: "WPLD 754, Pennsylvania Trolley Museum commencing daily operation; standby for radio check". The FCC encourages the use of "Ten Codes" to reduce transmission time, the most commonly used "10 codes" include:

- 10-4 - Acknowledged and understood
- 10-20 - Current Location

RADIO COMMUNICATION EXAMPLES

Typical communication between Dispatch and the operators of rail equipment is illustrated as follows:

Example: Passenger car operating on time table meets unscheduled work equipment on opposite bound movement.

1. Dispatcher knows the location of the passenger car from the time table.
2. The work equipment operator has requested the move from the dispatcher.

Dispatch: "Dispatch to car 832, are you leaving Arden Loop on time?"

Op. 832: "10-4 Dispatch, leaving on time."

Dispatch: "832 you are clear to Fairgrounds. Once there, hold for a meet with M283."

Op. 832: "10-4 Dispatch, 832 clear to Fairgrounds, hold for a meet with M283."

Dispatch: "Dispatch to M283, you are clear to Fairgrounds. Hold at Fairgrounds for a meet with car 832."

Op. M283: "10-4 Dispatch, M283 clear to Fairgrounds, hold at Fairgrounds for a meet with car 832."

3. Car 832 meets M283 at Fairgrounds.

Op. 832: "832 to Dispatch, meet complete, request clearance to Richfol Platform."

Dispatch: "10-4, 832 you are clear to Richfol."

Op. 832: "10-4 Dispatch, clear to Richfol."

Dispatch: "Dispatch to M283, you are clear to Arden Loop spur track. Call me when you want clearance inbound."

Op. M283: "10-4 Dispatch, clear to Arden Loop spur. Will call for inbound clearance."

Example: Passenger car operating on time table encounters a signal malfunction.

1. Once the operator identifies the car number, the dispatcher knows the approximate location of the car from the time table, and what traffic is in front and behind the car.
2. In this case there is no traffic in front of the car.

Op. 5326: "5326 to Dispatch, dark signal leaving Fairgrounds Siding outbound."

Dispatch: "10-4 5326, you are clear to Arden Loop. Call me for clearance before making your inbound move."

Op. 5326: "10-4 Dispatch, clear to Arden Loop, will call for inbound clearance."

3. 5326 moves from Fairgrounds to Arden Loop.

Op. 5326: "5326 to Dispatch, request clearance from Arden Loop to Richfol Platform."

Dispatch: "10-4 5326, you are clear to Fairgrounds Siding only. Hold at Fairgrounds for a meet with M210. M210 will work on signal repair."

Op. 5326: "10-4 Dispatch, 5326 clear to Fairgrounds only, hold at Fair Grounds Siding for a meet with M210."

4. M210 meets car 5326 at Fairgrounds Siding.

Op. 5326: "5326 to Dispatch, meet with M210 complete, request clearance to Richfol Platform."

Dispatch: "10-4 5326, you are clear to Richfol. Dispatch to M210, you are clear to work on signals from Fairgrounds to Arden Loop. Next outbound car leaves Richfol at 2:50. Call me with your location at 2:45 to arrange the meet."

Op. M210: "10-4 Dispatch, will call at 2:45."

Procedures in this manual are to be used only in conjunction with operator qualification.

Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

Example: Instruction car not on time table is held for move by regular scheduled car operating on time table.

1. Instruction car 14 is given clearance by dispatch to run from track eleven to McClane and back to county home siding as instruction requires.
2. Regular scheduled car 66 running on the time table departs Richfol outbound to McClane.
3. Five minutes before car 66 departs, Dispatch contacts car 14.

Dispatch: "Dispatch to 14, what's your 20?"

Inst. 14: "This is 14, we are outbound approaching Allison."

Dispatch: "10-4 car 14, proceed to McClane loop and hold for a meet with car 66."

Inst. 14: "10-4 dispatch, car 14 will hold at McClane for a meet with car 66."

Dispatch: "Dispatch to 66, be advised that car 14 is holding at McClane, proceed per timetable."

Op. 66: "10-4 dispatch, 14 holding at McClane, 66 to proceed per timetable."

Dispatch: "Dispatch to 14, after your meet with 66 you're clear to return to track 11."

Inst. 14: "10-4 Dispatch, 14 will return to track 11 after a meet with 66."

4. 66 departs Richfol on time and proceeds to McClane, when 66 has cleared the main line 14 departs inbound.

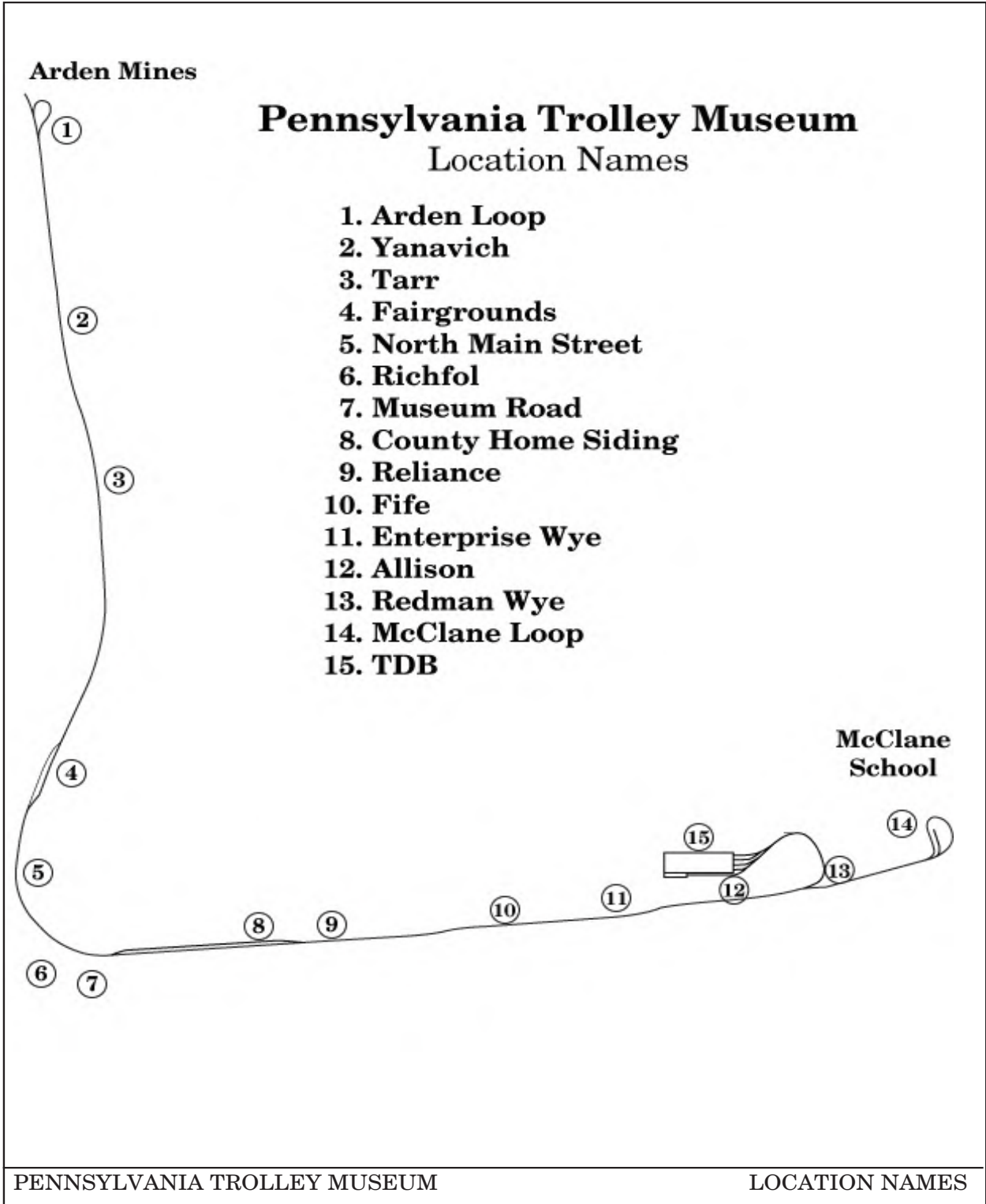
Dispatch: "Dispatch to 66, after your meet with 14 you may resume operation at a safe following distance."

Op. 66: "10-4 dispatch, 66 resuming operation at a safe following distance."

LOCATION/STOP DESIGNATIONS

A set of uniform location designations has been adopted for use on the railway. Please become familiar with them, a map which shows key locations and/or stops has been provided. Along the railway, signs are in place identifying each location. They are attached to the closest appropriate line pole and are duplicated in both directions.

Please keep the following points in mind at all times when using radios:



Procedures in this manual are to be used only in conjunction with operator qualification. Performed by a PTM Instructor. Operator is not allowed to operate a specific car until qualified by an instructor.

INCIDENT & ACCIDENT PROCEDURES



POLICY AND PROCEDURES FOR REPORTING INCIDENTS & ACCIDENTS

It is the policy of the Pennsylvania Trolley Museum that incidents and vehicle accidents be reported in accordance with the procedures as defined in this document. These reports are important to the museum and failure to file accurate reports in a timely manner can result in disciplinary action against employees and volunteers.

Incidents

An incident is defined as a situation, other than a vehicle accident, that represents a violation of museum policies OR a deviation from normal museum operating procedures. Incidents include, but are not limited to:

- Complaint or problem involving the public.
- Theft or loss of property.
- Operational problem(s) other than those situations for which another reporting mechanism exists.
- Illnesses or injuries staff or volunteer issue(s).

As a general rule, any situation that requires follow-up action or has the potential to require follow up action should be considered to be an incident. Situations which represent routine operating occurrences OR are of a minor nature that can be easily resolved OR do not require or have to potential to require follow-up action should be considered not to be incidents and do not require incident reports. If a museum volunteer or staff member is unsure as to whether or not a situation requires an incident report then they should check with the appropriate department manager or the Executive Director to determine if a report is required.

PROCEDURES FOR REPORTING INCIDENTS

1. In most situations, a single incident report, prepared by the person with the most knowledge in relation to the incident, should be sufficient. However, if substantial disagreement exists between the persons involved in or witnessing an incident, then each person should prepare an incident report. The Executive Director or other persons assigned to address an incident may request that others involved in or witnessing an incident prepare a report.
2. PTM volunteers and staff will use the INCIDENT REPORT form for the purpose of reporting incidents. In addition, other persons who are involved in or witness an incident and who wish to make a report may use an INCIDENT REPORT form for their report.
3. Reports should be prepared as soon as possible after an incident occurs; however, a person requiring medical attention or other assistance should not delay the receiving of appropriate assistance for the purpose of preparing a report.
4. Reports that (a) only involve one department and (b) involve incidents that can be resolved by a department manager and (c) do not involve the public or illness or injury, should be directed to the appropriate department manager (ex. a report involving power or signal equipment should go the Power and Signals Manager). Otherwise the report should go to the Executive Director who will determine the appropriate party to address the situation.
5. When possible, reports should be delivered to the department manager or Executive Director. If this delivery is not possible, the report should be placed in the box provided for this purpose in the West sub-station and the department manager or the Executive Director should be notified (by phone or e-mail, as appropriate) of the presence of the report.
6. Reports can be reviewed by the appropriate department manager or the Executive Director or by other parties designated by the museum (ex. museum attorney) for purposes of clarity or completeness of the report. The person preparing a report may be asked to clarify information or provide additional information. However, the person preparing a report should not change or be asked to change the facts, events and observations that they are reporting.
7. No person, other than the person preparing a report, should change, add to or delete from a report and the contents of incident reports should be treated as confidential information.
8. Incident reports must identify the person preparing the report and be signed by this person. Anonymous reports will be considered to be hearsay and, in most situations, hearsay is not considered to be creditable information.

Accidents

While accidents are to be actively avoided, no one is immune from them. An active policy of careful operation practice and situational awareness should help prevent you from becoming involved in an accident.

In the event of an accident involving PTM equipment, an operator or operators involved will follow the appropriate procedures below:

1. Remain calm.
2. Stop the car immediately. Contact the Dispatcher or museum official in charge as soon as possible. Do not move the car until instructed to do so, unless the car is in danger and/or its movement would endanger human life.
3. Determine the extent of injuries, if any. This includes trolley passengers and crew, as well as pedestrians and occupants of other vehicles. Render or direct first aid to any injured parties.
4. If anyone appears the slightest bit shaken by the accident, request an ambulance. The museum official or his/her designee will call for the appropriate emergency personnel. The trolley operator will remain at the scene.
5. Make sure any injured persons have been attended to, distribute the courtesy cards and pencils contained in the emergency packet with the first aid kit. Endeavor to have all passengers completely fill in the card. Please do not permit passengers to leave the car until they have filled out the card, unless they are in peril. Assure the passengers that the card is to record their presence and that it is not a release. The information may be required for a police report and is confidential.
6. Cooperate fully with the police. Answer their questions honestly. It is not necessary to volunteer any information that is not requested.
7. Do not make any statements about the accident to anyone but the police and museum officers. This includes passersby, visitors, or the media. Anything you say could be improperly interpreted.
8. Fill out an accident report before going off duty. Forms may be found in the substation. Personally hand deliver the report to the museum official in charge. An incident is any occurrence that does not involve vehicle collisions. They include, but are not limited to, non-vehicle accidents, injuries, complaints of illness and vandalism.

Vehicle Accidents

A vehicle accident is defined as a situation in which injury and/or property damage occurs and: A vehicle (rail or non-rail) owned or operated by PTM is involved in the situation OR A PTM volunteer or staff member, while conducting PTM business, is involved in the situation as the operator of or passenger in a vehicle or is hit by a vehicle.

For purposes of applying this policy:

- A vehicle accident that occurs while a volunteer or staff member is commuting to or from the museum and does not involve a vehicle that is owned or operated by the museum is not considered to be museum business and does not require a vehicle accident report.

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- Damage that occurs to a PTM vehicle that is not in motion and does not involve another vehicle and does not result in injury is considered to be an incident instead of a vehicle accident.

PROCEDURES FOR REPORTING VEHICLE ACCIDENTS

- Each PTM volunteer or staff member who is involved in or who witnesses a vehicle accident should prepare a VEHICLE ACCIDENT REPORT form. In addition, other persons who are involved in or witness a vehicle accident and who wish to make a report may use a VEHICLE ACCIDENT REPORT form for their report.
- Reports should be prepared on an individual basis without consultation between the people preparing reports as to what occurred, etc.
- Reports should be prepared as soon as possible after an accident occurs; however, a person requiring medical attention or other assistance should not delay the receiving of appropriate assistance for the purpose of preparing a report.
- If possible, reports should be delivered directly to the Executive Director or, in the absence of the Executive Director, the Museum President. However, if this is not possible or if this will significantly delay the delivery of a report, then the report should be mailed or delivered to the Executive Director or Museum President using another appropriate and confidential mechanism.
- Reports should be reviewed by the Executive Director and can be reviewed by other parties designated by the museum (ex. museum attorney) for purposes of clarity or completeness of the report. The person preparing a report may be asked to clarify information or provide additional information. However, the person preparing a report should not change or be asked to change the facts, events and observations that they are reporting.
- No person, other than the person preparing a report, should change, add to or delete from a report and the contents of accident reports should be treated as confidential information.

GLOSSARY

CAR CONTROLS

Automatic Acceleration Controller - Similar in function to a “K” controller, except that this controller operates a secondary control mechanism that automatically times the power application. P&WCT 78 has an automatic acceleration controller.

Braking Points - The points of a “B” controller through which electric braking is applied.

“B” Controller - Similar to the “K” type, though larger, “B” controllers also controls electric braking in addition to motor power. BVT 1 has a “B” controller.

Canopy Switch (Main Overhead) - A large combination manual switch and automatic over-current circuit breaker which shuts off motor power. Usually located directly over the motorman’s head. In some cases (PRT 5326, for example) it is a small switch which shuts off power only to remote control circuits or the line switch.

Controller - A system of electrical switches used to control current to the motors.

Free Running Points - “Full Series” or “Full Parallel.” At either of these points there are no resistors in the motor circuit, and the car can run indefinitely without resistors overheating.

“HL” Controls - The master/remote control systems in cars such as PRCo 3756 or PSTCo 66. “HL” refers to the high/low current of the remote and master controllers, respectively.

“K” Controller- The large, “drum” type controller located on the motorman’s platform which controls forward and reverse power to the motors. PTC 5326 has a “K” controller.

Line Switch - An electrical contactor, located beneath the car, which turns trolley power to the motor circuit on and off. It is operated by a set of low-current contacts in the controller.

Master Controller - The system of switches, or motorized drum, which actually controls the motor current in a multiple-unit or remote control system. When individual switches are used, each switch is operated magnetically or pneumatically from the remote controller. Similarly, a motorized drum controller can be advanced by a remote control. PRCo 3756 has a Westinghouse master controller that uses switches; PST 66 has a similar General Electric controller. MVT 3000 has an electro-pneumatic master control system. PCC cars have an electric master control drum .

No.1 End - On a double-ended car, this is normally the end where switches for lights, compressor, control, end changing, etc. are located.

No.2 End - On a double-ended car, this is the end opposite to the No. 1.

Parallel Points - Those control points, three or four in number, in which the motors are connected in parallel.

Point - One of several positions on a hand operated controller. Marked by detents on the top of the controller, they indicate spots where certain sequences of contacts are made for certain (usually acceleration) functions.

Power Points - The points of a controller through which power is applied to the motors.

Remote Controller - The small, hand-operated controller used by the motorman to advance the master controller in a multiple-unit or remote control system. This unit, mounted in the operator's cab, is much smaller than a "K" or "B" controller. Although it is similar in function to the full size controllers, a remote controller switches low voltage, low current electricity that moves the master controller, instead of the actual motor current.

Resistors or Resistor Grids - A series of cast iron grids which are used in conjunction with the controller to limit current flow to the motors while accelerating.

Series Points - Those control points, four or five in number, in which the motors or motor sets are connected in series.

Strap (ribbon) Fuse - Often referred to as the roof fuse because it is mounted on the roof of most cars that have one. This is a thin, replaceable strip of copper designed to melt in the event of extreme short circuit. Serving mainly as a backup, this device should not "blow" if the car's other fuses and breakers are working properly.

Switching Point - For cars with automatic accelerating controls, this is the first point on the controller. In the switching point, the car will move slowly and will not accelerate beyond a brisk walk.

Unit Switch - One of the several remotely operated, high current switches that make up a master controller.

BRAKES

Application - Each time air is admitted into the brake cylinder.

Brake Valve - On cars equipped with air brakes, this is a hand operated valve which controls the application and release of air to and from the air brake cylinder.

Deadman - A valve or switch, either incorporated into the controller handle or foot operated (or both). In the event of the incapacitation of the operator, his or her foot or hand will slip from the deadman, causing the car to come to an emergency stop.

Dynamic Brake - a method of braking in which the traction motors are reversed and used to generate electricity which is dissipated in the resistor grids to help slow down the car.

Fanning - The improper habit of continually moving between "apply" and "release" until the car stops.

Hand Brake - A wheel or handle which manually applies pressure to the brake shoes through a direct mechanical linkage.

Lap - The position on a manual lapping brake valve at which air is neither being applied to or being released from the cylinder.

Manual-Lapping Valve - A brake valve in which the pressure in the brake cylinder is controlled by the length of time the handle is held in the "apply" or "release" position before returning it to the "lap", or neutral, position.

Release - Each time air is released from the brake cylinder.

Self-Lapping Brake Valve - A brake valve in which the pressure to the brake cylinder is set by the position of the brake handle. While the handle is in one position, the pressure is maintained by a pressure regulator built into the valve.

OVERHEAD

Section Insulator - A device spliced into the trolley wire which permits a section of wire to be disconnected, or two power supply systems to be separated. The insulating section is made of wood, about eight inches long.

Wire Frog - The cast device attached to the overhead wires to guide the trolley wheel through the junction of two trolley wires at a track switch.

Ear - A brass clip used to suspend the trolley wire from a supporting span wire without obstructing the trolley wheel's movement.

Substation - A general term used to describe all of the equipment involved in providing high voltage direct current trolley power.

Overhead - A general term encompassing the trolley wire, its system of suspension and all associated hardware.

TRACK

Ballast - The crushed stone or slag that support the ties and keeps the track from moving out of line, while still permitting water to drain.

Gauge - The distance between rails. Standard (railroad) gauge is 4' 8-1/2". Track gauge at the Pennsylvania Trolley Museum is 5' 2-1/2".

Girder Rail - Larger than T-rail, girder rail has a flangeway rolled into it, making it more suitable for paved trackage.

Guide Rail - An extra rail added to the inside of curves to prevent derailment.

Frog - The cast or fabricated junction where two rails cross after a switch.

Rail Bond - A short length of copper cable attached or welded to each rail end at a rail joint. Its purpose is to electrically bridge the gap in the rail to improve the ground return for trolley power.

Switch - The movable point (for a girder rail switch) or points (for an open trackage switch) which guides the car to one of two tracks.

Switch Machine - The device used to move the switch points of an open track switch.

T-Rail - Symmetrically shaped rail used mainly in open (non-paved) track.

Tie - The large wooden beam that supports the rails and holds them in gauge.

Turnout - The complete assembly of a switch, switch machine, frog, and associated hardware.

MOVEMENTS

Bump - When one operating car arrives behind another at a stop and “pushes” or requires the waiting car to leave the stop.

Expedite - Quick acceleration of a car to operating speed in order to shorten trip duration.

Gong - Refers to the sound made when the bell is rung.

Hold - Command given when a car is to wait for certain circumstance before it departs.

Meet - A planned arrangement when one operating car encounters another along a passing siding or other area of track that allows the cars to pass and continue on their way.

One bell - A signal indicating a piece of equipment to stop or a signal indicated a piece of equipment is stopped or “holding”.

Two bells - A signal indicating a piece of equipment is about to move in the forward direction relative to the operator.

Three bells - A signal indicating a piece of equipment is about to make a reverse movement, or opposite the direction relative to the operator.

Crossing Signal - Refers to the signal used at the approach to a road crossing. Equipment must signal with the sounding of a whistle or horn. The pattern – – • – , or two long blasts followed by one short and one long, should be used when crossing a main road.

Thank you for operating with us!

