Pennsylvania Trolley Museum
Washington, PA

Operator's Training Manual

PENNSYLVANIA
TROLLEY MUSEUM
Washington, PA

1998 Edition

Acknowledgments:

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Contents

Opening and Closing The Museum

Opening the Museum for Operation

____ 1. Punch your time card.

____ 2. **Check the Substation blackboard for special notices regarding any operating restrictions that may exist.**

____ 3. Open the rest rooms and check towels, toilet paper and soap. Additional supplies are in the gray cabinet in the substation.

____ 4. Put up the flag and open the door of the Brown Shelter.

____ 5. Make sure that work equipment and cars in storage are adequately closed to the public with doors closed or barricades in place.

____ 6. Turn on the substation (See Section 4). Be certain to watch the ammeter (far right) for excessive load.

____ 7. Open the carbarn and **immediately turn on the aisle lights and disarm the security system**. You have 30 seconds to complete this. Open the track doors, making certain to store the door bars in safe locations.

____ 8. Perform the walk-around inspection insofar as possible. Move car to apron in front of car house and complete walk-around inspection. Use the checklist provided. Be sure to **drain water from the air tanks.**

____ 9. Move the service car to the platform.

____ 10. Put up the poles on the cars which will be open for display. Make sure the lights are on and the air compressors are off.

____ 11. Sweep and dust the service car as necessary. Cleaning supplies are located in the gray cabinet in the substation.

____ 11. Before making the first run, sign out a radio and perform a radio check. Even if yours is 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.

Safety and Security of the Buildings During Operation

____ 1. Keep people from wandering unsupervised through the car shop and carbarn when there is not adequate staff for proper supervision.

___ 2. 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.

___ 3. 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

___ 1. After returning all trolley cars to the carbarn, close the doors and windows in all cars to keep out dirt and animals.

___ 2. Shut off the air compressors, drain water from the air tanks (where possible), **loosely** wind up the hand brake on the end of the car facing out of the building, and make sure all trolley poles are down.

___ 3. Bar the doors of the carbarn carefully. **Rearm the security system.** Make sure the lights are off when leaving.

___ 4. Return the operating handles to the rack in the substation whenever you are done moving a car. **Never leave handles in any unattended car.**

___ 5. **Turn off the substation**

___ 6. Return the radio to the cabinet in the substation and sign it back in. Check to make sure that all other radios are returned or otherwise accounted for. If a radio is missing, you can often find it by using another radio (usually the missing radio has been left turned on). If you speak into your radio, you can hear the missing one repeat your voice.

___ 7. Take down the flags.

___ 8. Make sure the water is not running in the outdoor rest rooms, and that there are no smoldering cigarettes in the wastebaskets.

___ 9. Make a thorough check of all doors to see that they are locked:

- ___ substation
- ___ rest rooms
- ___ shower room
- ___ kitchen
- ___ Brown shelter
- ___ carbarn (security system)
- ___ museum store (security system)
- ___ shop building (security system)
- ___ cabooses

___ 10. Place car condition reports, if any, in the maintenance supervisor's mailbox.

___ 11. Punch your time card.

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).

Working at the Museum

Upon arrival at the Museum, go first to the substation and punch in on the time clock. The time card rack is located to the left as you enter; the time clock is next to the door.

If you have not already done so, put your **name** and **membership number** on a blank time card, and then punch your arrival time on it. A supply of blank cards is located to the right of the rack.

Using the time clock is simple. Place the appropriate line on the time card ("IN" or "OUT") immediately under the red rectangle visible through the window. Insert the card as far as it will go and hold it there. Press the button below the card to imprint.

Please do not attempt to adjust or fix the time clock.

Remember to record the code for your work (Museum Store, Car Operations, Trackwork, etc.). A list of project code numbers is posted on the bulletin board. It is not necessary to punch out for breaks. At the end of your day, punch out, calculate your elapsed time, and return your card to the rack.

Please use a time card until it is filled up. Time cards will be collected on an as-needed basis. If your time card is not in the rack, it has been collected – begin a new one. If you fill up a time card, start a new one and use the same slot in the rack.

Working away from the Museum

When you perform work for the museum away from the site, record your time by hand on a time card or a separate sheet of paper. Once again, be sure to list what it was that you worked on.

Report these hours on a regular basis. You can mail them to the museum or leave them in your time card slot.

Note: Figures 1 & 2 on the following pages illustrate the time card instructions and project code numbers posted on the bulletin board beside the time card racks. Always refer to the posted instructions and codes as they may supercede those illustrated here.

01/01/98

Time Cards

Even though 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 the project to be funded. Honest and complete time reporting is every member's responsibility.

The **time clock** is in the substation; the **card rack** is on the wall and a supply of **blank time cards** are next to it.

1. Fill in your **name**, the **year** as the "Date," and your **member number** at the top of the card. Use the card each time *until full*. Leave it in the rack and start a new card in the same rack slot.

2. **Punch in** by placing the right hand edge of the card in the time clock, aligning the top vacant "IN" line with the tab on the clock, and press the button on the front of the clock.

3. **Punch out** when you leave by again placing the right hand edge of the card in the time clock, but aligning "OUT" just above the line where you earlier punched "IN," and press the button on the front of the clock.

4. Opposite these clock stampings, which show the 24-hour time in tenths, in the "ELAPSED TIME" column, subtract the "IN" hours from the "OUT" hours, and write in the elapsed time to the nearest tenth of an hour.

5. On the same line in the "JOB" column, enter the **Job (function or project) Code** from the list on the bulletin board next to the card rack, which best describes what you did today – **no descriptions or abbreviations!** You know best what you did. If you can't find an appropriate number, enter 9090 (miscellaneous). No code = no credit for hours worked!

Note: If you did more than one job today, *either* punch out and back in at the end of each function, or enter more than one job code in the same "JOB" line and show the part of the total elapsed time opposite each job code. **DON'T leave it up to the timekeeper to make the allocation** – he doesn't know what you did! If you stay over night at the Museum, punch out. No credit for bunk duty or commuting time!

6. Return the time card to the rack for your use next time.

7. For those who do work away from the Museum, take a separate blank Job Card, follow steps 1, 4-5, above, but enter the date in the "TIME" column. Place card in the card rack when full, or send to Timekeeper no later than next January 31. See the example of the third entry in the illustration, above left. If you use a computer, return total hours for each Job Code

8. Code 9140 is for *crew hours* (Motormen, Conductors and Docents) during regular operation and special events. All other activity at, or preparing for, special events is code 9060.

9. The "CONTRACT PROJECT" category is for collecting the volunteer hours charged against projects for which we have received funding grants. These numbers will be used until each project is completed, and then they will be withdrawn from the list. All types of work are reported under the one number – for example, wire work, track work, grading, etc. are all reported under the same number. Maintenance and minor construction, however, are Job Codes 9050, 9190, or 9210.

10. Incomplete card entries each year result in hours not included in the year's totals.

Figure 1. Time Card Instructions

"Job" (Function & Project) Codes

Administrative Functions

General Administration 9010
Engineering (not contract project specific) 9065
Exhibits (preparation of) 9068
Fund Raising 9066
Historical Research 9067
Library & Archives 9070
Marketing (including preparation of brochures) ... 9149
Meetings (Board of Directors, regular monthly, ARM, other, including preparation for) 9030
Planning &, Development 9135
Public Education, Presentations 9150
Public Relations, Advertising, Publicity 9151
Publications (historical, produced for sale) 9160
Timekeeping 9200
Trolley Fare Magazine 9230

Car Repair & Restoration

1 West Penn Loco 1
2 Line Car (ex-PRT Sweeper) 2
4 P&WCT Sweeper 4
5 P&WCT Brilliner 5
07 P&WCT Freight Motor 7
14 Red Arrow PCC 14
23 B&LE RR Combine 23
24 Red Arrow PCC 24
M37 PRCo Sweeper 37
39 Motor Car 39
44 Motor Car 44
53A Unity (NYO&W 8323) Caboose 53
M56 PRCo Sweeper 56
66 Red Arrow Center Door 66
B73 Armco Diesel Loco B73
73 Monongahela Caboose M73
78 P&WCT Brill Master Unit 78
94 Shaker Heights PCC 94
115 Harmony Route 115
209 SEPTA Bullet 209
M210 PRCo Line Car 210
274 Mon/WP Interurban 274
M283 PAT Crane Car 283
350 Johnstown Traction 350
M551 PAT Side Dump 551
832 NOPSI N832
832 West Penn W832
880 PAT Tamper 880
1138 PRCo PCC 1138
1711 PRCo PCC 1711
2723 SEPTA PCC 2723
3618 Boston Center Dump 3618
3756 PRCo Low Floor 3756
4398 PRCo Low Floor 4398
5326 PRT City Car 5326

Scheduled Operations

Museum Store (including on-site sales) 9100
Operator Training 9110
Public Operation (Regular service, group tours & special events) Car Crew & Docents 9140
Dispatcher 9141
Special Events (except car crew time, for Trolley & County Fairs, art show, Santa Trolley, etc.) 9060

Materials, Equipment & Supplies

Acquisition: Major Car & Exhibit Items 9187
Parts Management (rolling stock) 9130
Procurement: Parts, Supplies, Tools & Repair Svcs (if not charged to car or project code) 9120

Misc Projects & Maintenance

Activities (Banquet, Fantrips, etc.) 9000
Buildings & Grounds (including equipment) 9050
Members' Day 9080
Miscellaneous **9090**
Power, Overhead, Signals 9190
Shop & Shop Eqpt (Installation & Maintenance) . 9185
Track, Structures, & Equipment 9210

Contract Projects

East End Track Extension (ISTEA) 9902
East Site (buildings) Development 9903
Carbarn Rehabilitation 9905
Rectifier Installation 9907

Figure 2. Job Codes

Using the Telephones

The museum has a telephone system with multiple lines. 724-228-9256 is the publicly advertised number, and this is the line that the answering service is connected to. 724-228-9656 is the line typically used by Museum members calling in, etc.

To make a local call on either line, dial "8", then the number.

You cannot make long distance phone calls from these phones without a telephone company credit card number. To make a long distance call, dial "8", then "0", then the telephone number, then your credit card number. To make a collect call, dial "8", "0", then the number, and the operator will come on the line. You may make "800" calls by dialling "8" first.

Except for the substation, which has one telephone for each number, there is only one phone in each location. However, it is possible to pick up the "other" line from any telephone. If the phone is ringing, and you pick up a phone and get a dial tone, that means that the call is coming in on the other line. To pick up the other line, just dial "*". You cannot switch lines that have already been answered in another location by this procedure, though.

Operation of Electric Cars

Electrical Equipment & Control

The purpose of this section is to help each operator understand more clearly the functions of the equipment in order to know:

A) The correct methods of use
B) The dangers that result from misuse
C) How to use the equipment most professionally

Definitions

Car Controls

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

"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.

"B" Controller - Similar to the "K" type, though larger, "B" controllers also controls electric braking in addition to motor power. Some "B" controllers at the Museum have had their braking feature disabled when air brakes were installed. PRCo 3487 has a "B" controller, with the braking feature disabled.

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. Red Arrow 78 has an automatic acceleration 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.

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 motorman'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.

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

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

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.

Notch or 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. Often the total is 8, though this is not always so.

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

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.

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

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

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.

Strap 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.

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

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

Expedite - Change ends, load passengers, close doors, put car in motion ASAP. Do not violate any rules in so doing.

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.

Brakes

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.

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

Straight Air (or 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. PST 66 has straight air valves; so does New Orleans 832.

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. PRCo 3756 has a self-lapping brake valve in the front end.

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

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

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

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

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.

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. There is a section insulator on track 2 just in front of the carbarn.

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.

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.

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

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

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

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".

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

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.

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.

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

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

Trolley Power

We purchase high-voltage (12,000 v.) AC power from Allegheny Energy. It is reduced by our own transformers to 440 volts 3-phase, which is then fed to our substation, which incorporates silicon diode rectifiers. The output of this system is nominally 550 volts DC.

The positive (+) output of the rectifier is fed to the trolley wire. The rectifier unit is capable of supplying 1140 amperes of current to the trolley line but the DC breaker is usually set lower as a safety factor. It is nonetheless adequate to operate several cars simultaneously in normal service.

The ground return through the rails comes back to the negative (-) side of the rectifier. Redundant safety systems protect against overloads.

On the control panel, a voltmeter indicates the available DC voltage, while an ammeter indicates the current being drawn by the cars. A green light indicates that the system is on and functioning. An emergency "off" button, or "panic button", is provided outside the fence in the substation.

Two alarm bells, one in the carbarn and one in the substation building, indicate if a malfunction or overload occurs, as well as warning that the power is being turned on or off. Their operation is automatic.

The power supply is interlocked to prevent unauthorized operation. Visitors generally should not be permitted to inspect the substation equipment when it is in operation.

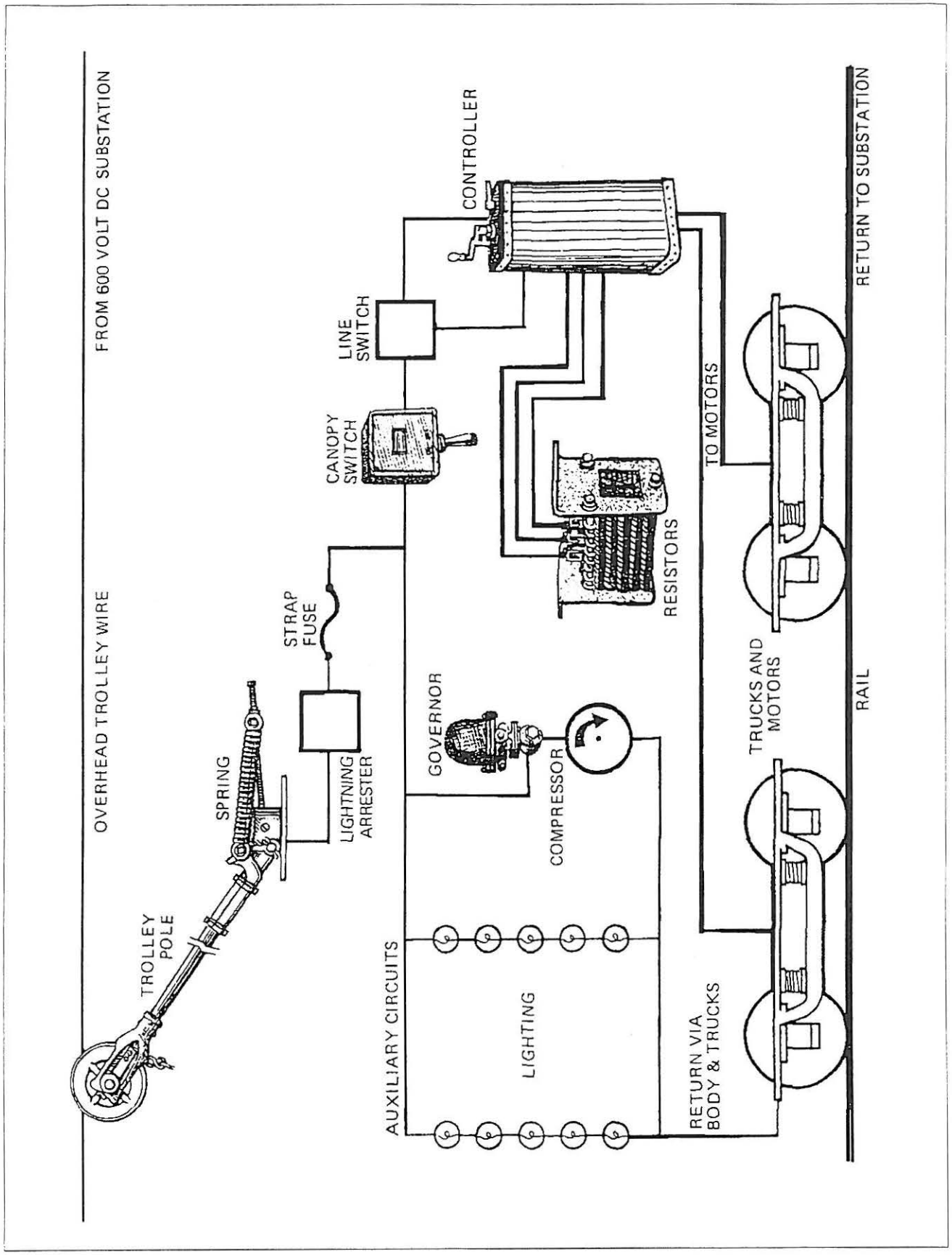


Figure 3. Electrical Equipment and Control

HOW IT WORKS

Refer to Figure 3 which traces the path of electricity through the 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.

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 figure 4 for a Motor Control Circuit Diagram.

In the 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

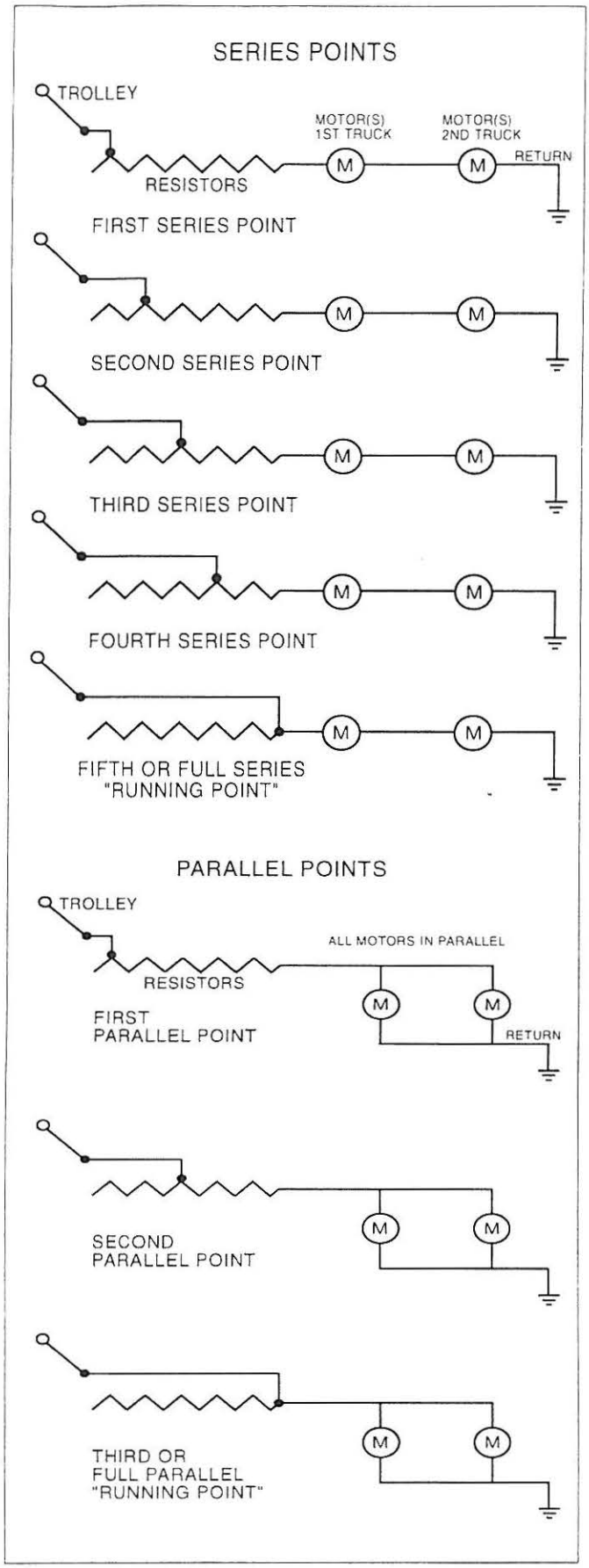


Figure 4. Motor Control Circuit Diagram

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.

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 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:

A) Direct mechanical, or hand brakes
B) Air brakes
C) Dynamic, or regenerative electric brakes

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

At Pennsylvania Trolley Museum, hand brakes are usually used only for parking. They also may be used in emergencies when all other systems fail. The operator must be sure the hand brakes are off before moving a car, and properly set when parking a car.

The hand brake is wound clockwise to apply and counterclockwise to release. When parking a car in the barn, always apply the handbrake on the end of the car facing the barn doors.

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, pumps up 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.

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 - straight air 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 of friction, and will withstand the heat generated while stopping. If brake smell occurs while running, chances are the brakes are dragging.

In PCC cars 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 applies 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 parking.

Depending on the car, safe operating pressure will be 60 to 110 pounds per square inch. 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

Straight Air

A simple straight air 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 (center), 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 (45 degrees right), 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 (45 degrees left), 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 35 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 works undue strains 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.

An operating error is to release too much air. Then air must be reapplied, and the reapplication may be more than enough, thus requiring another release. This is the bad habit of "fanning the air." Air is wasted, causing the compressor, motor axle bearings, and brake rigging to wear prematurely.

Self-Lapping Valves

This type of valve makes the operator's job much easier. It allows faster, smoother, 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 sets the braking pressure at 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 "straight air" 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.

All 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 with Air Brakes

A) 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, the practice prevents the car from rolling backwards on a grade, and helps to prevent the wheels from spinning on wet rails.

B) Plan your stops -- judge distances.

C) Never "fan the air."

D) Release some air as the car is coming to a stop.

E) Never leave a straight air valve in "lap" position when parking a car -- leave it in the "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 emergency procedures are outlined on page 20.

Adverse Track Conditions

When rails are slippery due to rain or snow, leaves, grease or other substances, some slightly different operating techniques may be necessary.

Starting the Car

Never allow the wheels to continue spinning. Notch off the controller, drop some sand and start again.

If the motor spinning is the trailing one, the car must travel 30 feet or so before sand is of any benefit. In this situation, it is usually 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.

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 **at once**. Follow the procedures outlined in the emergency procedures section.

Miscellaneous Information

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

Section insulators are the devices used to isolate different power sources or to permit a section of wire to be turned off separately. The latter is the chief reason for placement of one in the wire over Track 2 in front of the car barn. This makes it possible to work near the wire in the barn without disrupting service elsewhere.

Operators should always cross section insulators with **power off** to prevent arcing, burning of the wooden insulating strip, and damaging surges to the electrical equipment. Reapply power only after the insulator has been cleared. Operators will be able to recognize its passing by the blinking of the car lights and 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. If you inadvertently drop sand on a switch, stop the car and sweep it off.

When observing track conditions, look for loose or broken joints. Look for washouts, especially along Fergus Run (a.k.a. Arden 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. Note that 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.

Emergency Procedures

At **all** times, safe operation is our foremost purpose, and under all circumstances, there is really no need for speed. 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:

1. Necessity for fastest possible stop because of an obstruction on the track, derailment, object caught on the car, etc.
2. Failure of normal braking.
3. Controller stuck in the "on" position.
4. 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.

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 on page 22. **A sliding car will not stop as fast as one with the wheels turning in a heavy but controlled brake application.**

All Conventional Cars, West Penn 1:

1. Move air brake handle into full emergency braking position.
2. Drop sand.

PCC Cars:

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

Cars with "B" Controls and no air brakes (PRCo M37, M56):

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

Stopping when Normal Brakes Fail

All conventional cars without "HL" controls (2, 5326, M210, WP 1, NOPSI 832, M551, 3618):

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. Drop sand.
6. 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 "HL" controls 66, 78, 4; 3756 and M283 (rear controls only):

1. Move the controller to the "off" position.
2. Move reverse handle to the direction opposite the car's movement.
3. Quickly move the controller to the first point, then off again.
4. Drop sand.
5. Wind up the hand brake.

(Do not move the reverse handle again until the car has come to a complete stop.)

Cars 3756 and M283 (front controls only):

1. Move the controller to the "off" position.
2. Move the dynamic brake handle 90 degrees toward you.
3. Drop sand.
4. Wind up the hand brake.

(Do not move the dynamic brake handle back until the car has completely stopped.)

Foot Control Cars:

1. Keep the brake pedal latched to the floor.
2. Move the reverse handle to the neutral position.
3. Drop sand.
4. Wind up the hand brake if 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.
3. Drop sand, 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. Drop sand.

Car is Sliding after Application of Brakes:

Hand Control Cars:

1. Fully release the brakes.
2. Apply one notch of power.
3. Reapply brakes gradually, dropping sand.
4. Power "off" as car comes to a stop.

Foot Control Cars:

1. Push brake pedal to rail brake position.
2. Drop a small amount of sand.

Descriptive Notes on Service Passenger Cars

New Orleans 832

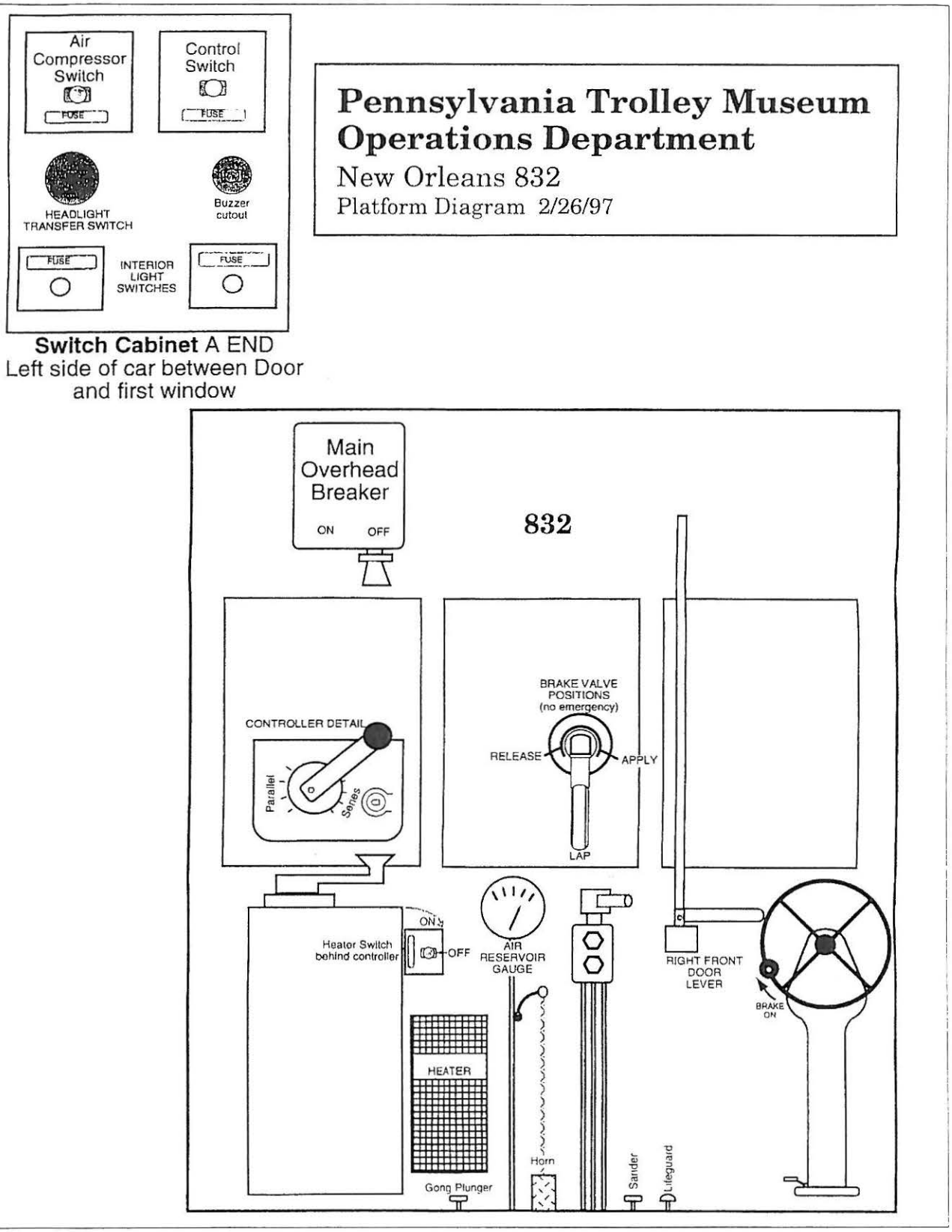


Figure 5. New Orleans 832 Controls

Philadelphia Rapid Transit 5326

PRT 5326 has K controllers with deadman valves in the controller handles. There is no auxiliary foot deadman valve. 5326 has self-lapping brake valves, which can be coupled to the door controls. The car also has control interlocks with the doors; all doors must be completely closed before power can be applied. In our museum operation, ***only use the individual door controls to open and close the doors, rather than the automatic coupling to the brake valve.*** Also, 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.

The air compressor switch is in the control box on the "A" end of the car, above the controller. The switches for the interior lights, signbox light transfer, and headlight transfer are above the left doors on the "B" end of the car. Figures 6 and 7 show the switch and control locations for 5326. Figure 8 is a diagram of the brake handle positions.

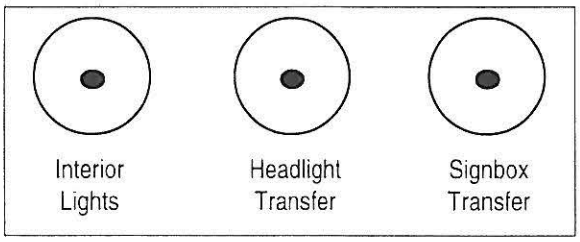


Figure 6. PRT 5326 Light Switches, located above the left door in "B" end of car.

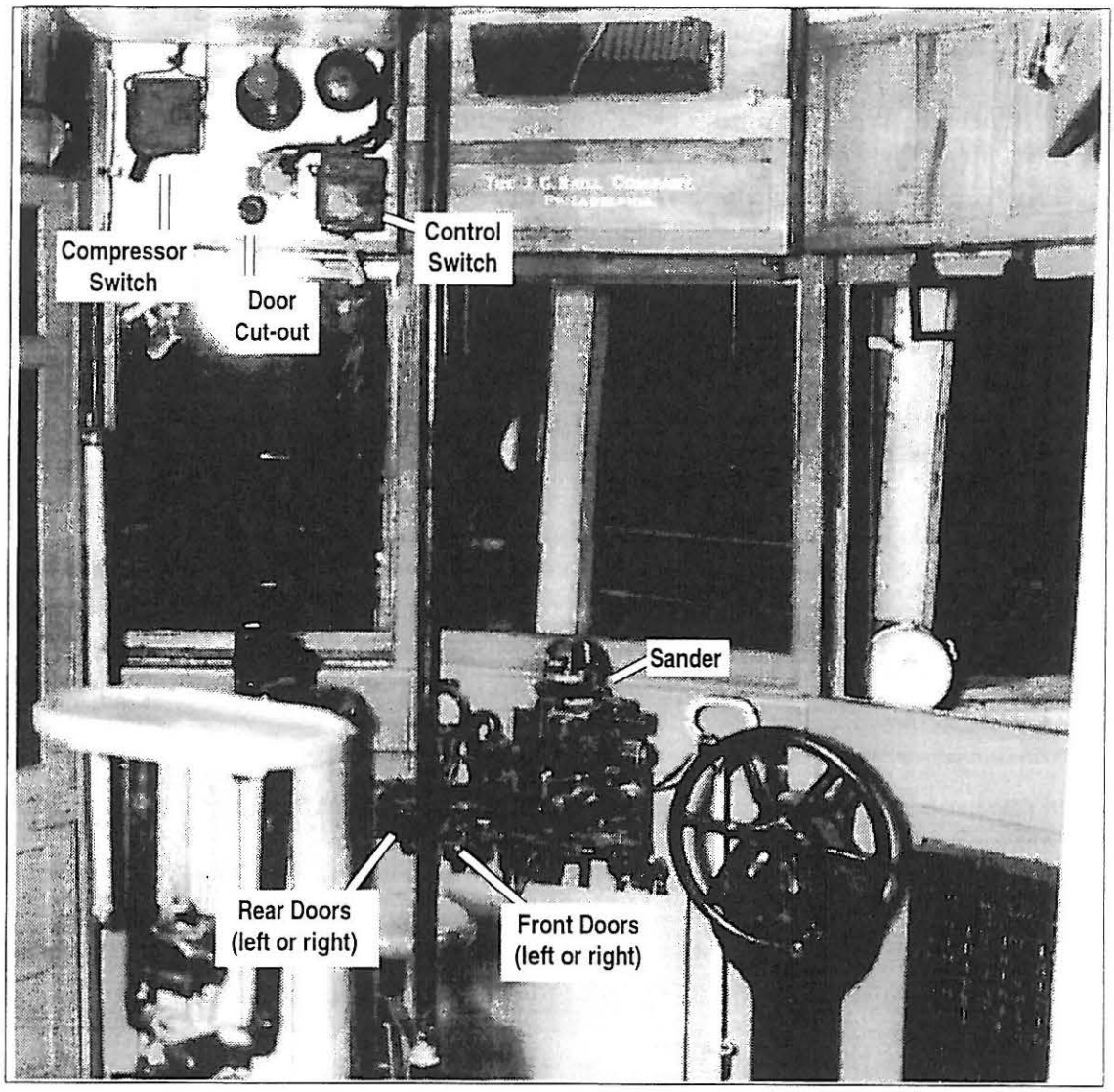


Figure 7. PRT 5326 Controls.

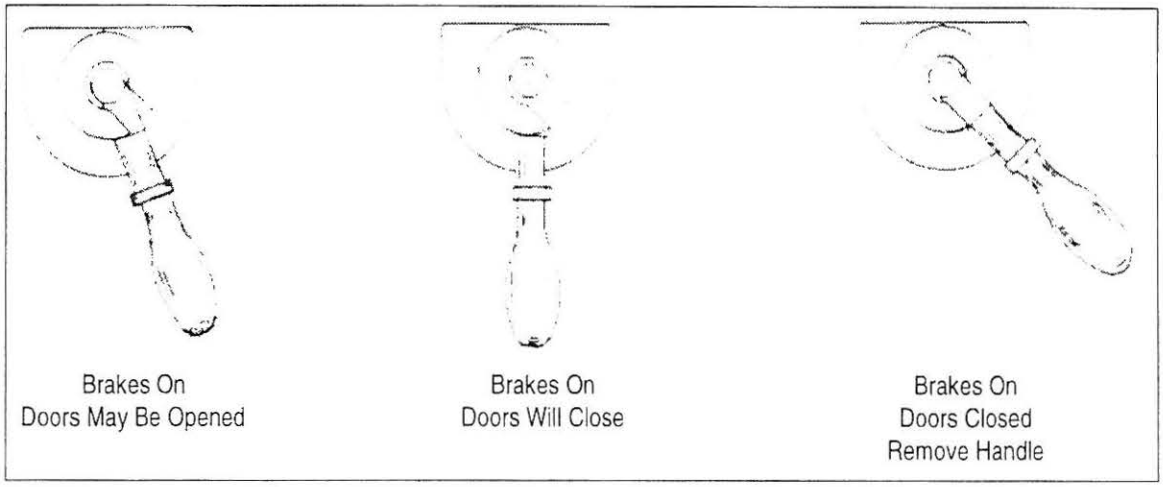


Figure 8. PRT 5326 Brake Handle Positions

Pittsburgh Railways 3756

PRCo. 3756 has Westinghouse HL Control. The front end controller has a deadman valve in the controller handle, and a second deadman valve on a foot treadle. Either may be used. The front end brake valve is self lapping, and there is a sander valve immediately above the brake valve. Below this is also a separate valve for the rear sanders. 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°. Note that the normal method of dynamic braking on an HL control car does work.

Figure 9 shows the location of front end controls and switches. Note the location of the compressor switch. This is a knife switch with a spring mechanism to lessen arcing when opening the switch. Be careful as all switches in this control box are for 600 volt circuits.

Although it is a single ended car, 3756 has a backup controller. There are no deadman features on the back end controls, and the brake valve is NOT self-lapping. You will notice a considerable difference in the brake application rates between the front end and rear end valves.

When parking 3756, be careful as to how tight you wind up the hand brake. The tighter the handbrake is applied, the more strain it places on the front platform. (You may have noticed that it sags somewhat.) Overtightening is the result of making a full brake application, removing the brake handle, and then applying the hand brake until it is snug. As the air bleeds off from the air brake system, the hand brake assumes the full force that the air brakes once applied. As this is considerable, it pulls the front platform down.

The force of full air brakes (90 psi) is not necessary to hold a car at rest when setting the hand brake. When applying the hand brake, make a 30 pound air brake application. With your foot on the deadman treadle, wind up the hand brake until it is snug. Then remove the control handles and turn off the compressor. The resulting force on the front platform will be about a third of that of winding up the hand brake against a full air brake application.

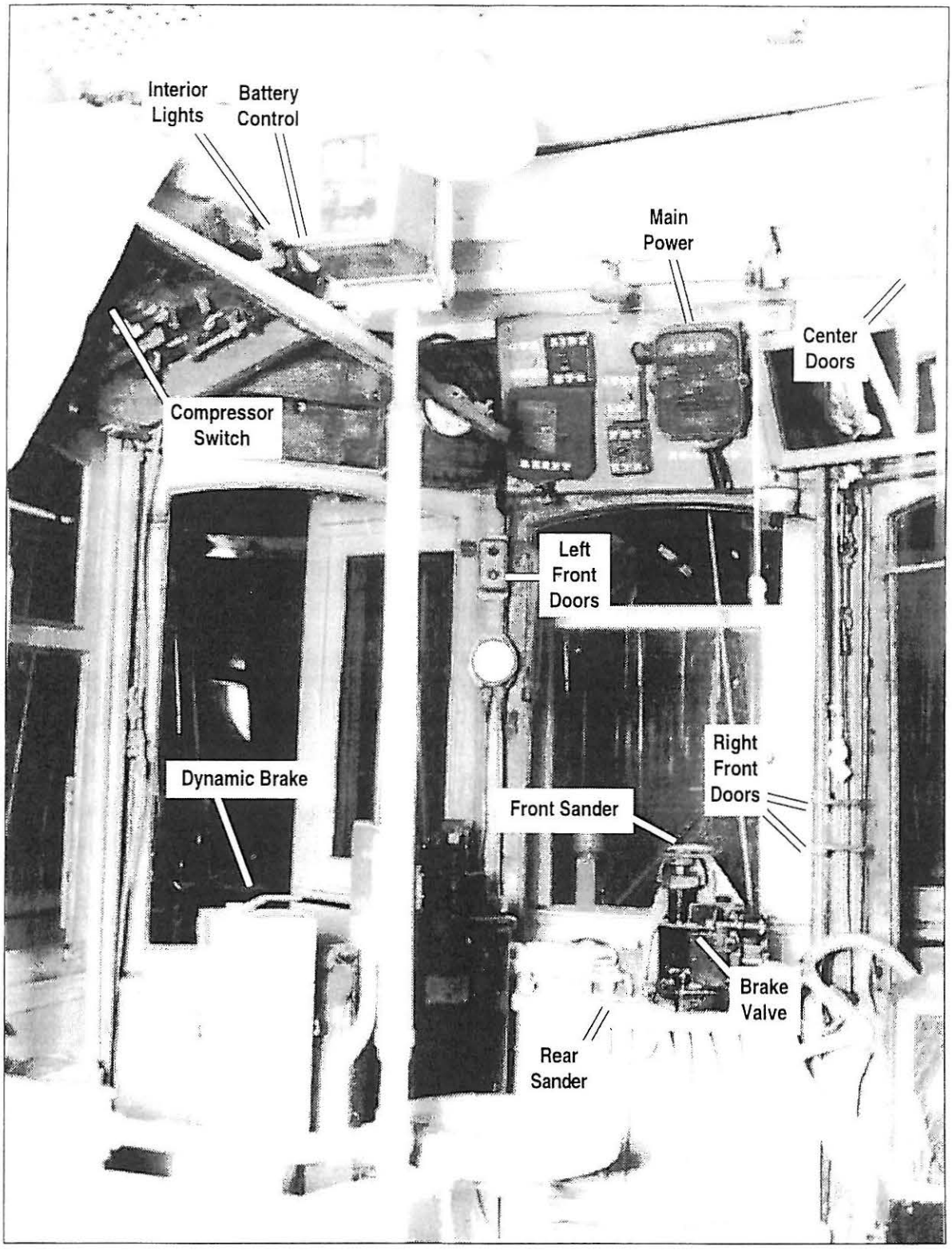


Figure 9. Photograph of Pittsburgh Railways Co. 3756, showing Front Controls.

Philadelphia Suburban Transportation Co. 66

PSTCo 66 has General Electric HL controls and straight air brakes. The controllers and brake valves on both ends of the car are identical. As 66 was intended to be operated by two people, the control switches are distributed between the operator's cabs and the conductor's station. The number 1 operator's cab has, on the rear and side bulkheads, a number of relays and switches. The air compressor switch is located on the rear bulkhead, as seen in Figure 10.

Figure 11 shows the controls and switches in the number 2 motorman's cab. Note that the door control is a linkage to an air valve. One can operate the motorman's cab door from the outside by reaching under the floor and moving the linkage. Do not confuse this with the valve linkage for the airbrake line to the coupler.

As seen in Figure 12, the conductor's switches are interior lights and the headlights. These switches are above the center doors. Of the headlight switches, one turns on the headlight, and the other switches ends.

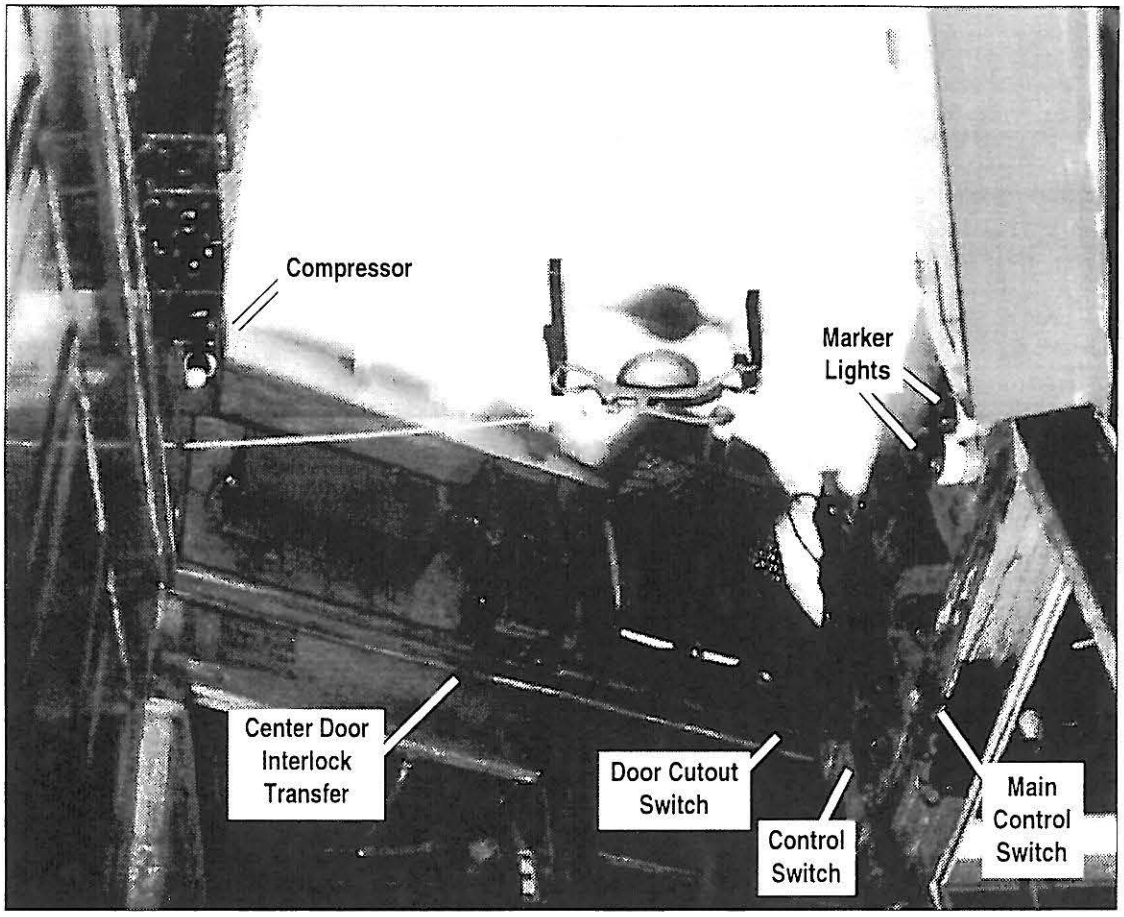


Figure10. PSTCo. 66 Number 1 Motorman's Cab Roof

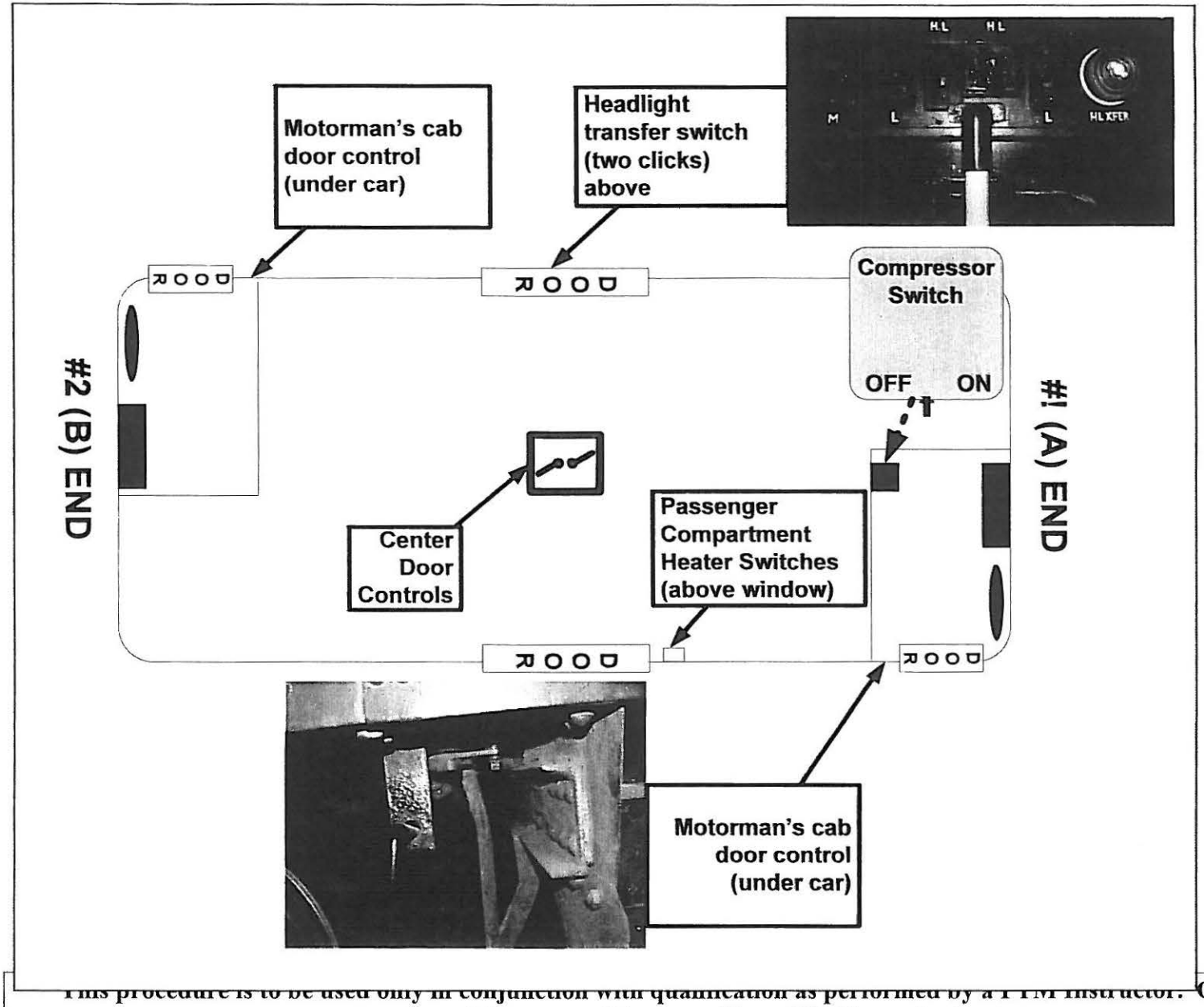
I. History and Background

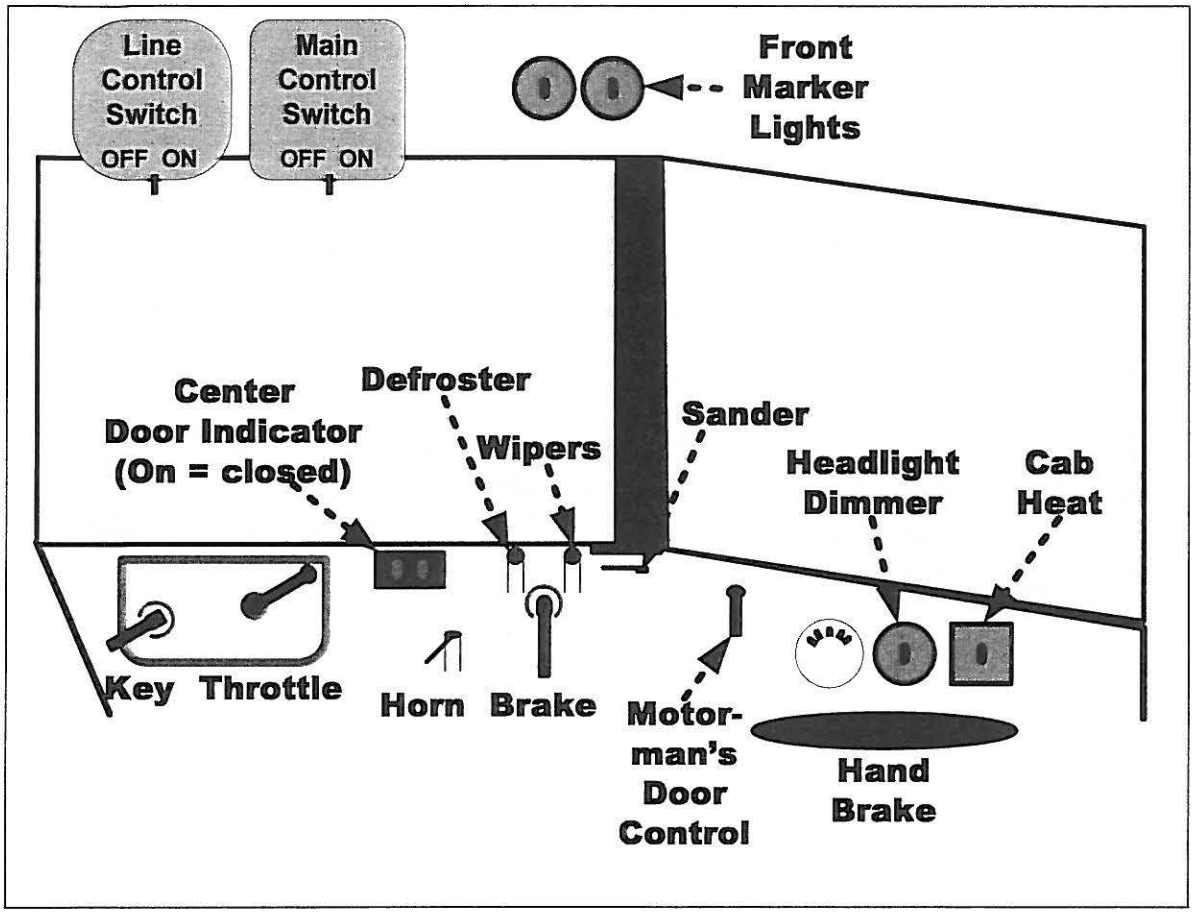
Philadelphia and West Chester Traction Co. (P&WCT) car 66 was one of 32 of these center entrance steel cars placed in service between 1919 and 1926. Car 66 was built by J.G. Brill and put into service in 1926.

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 (South East Pennsylvania Transit Authority) declared the car as surplus The car was transported to the Pennsylvania Trolley Museum where it was refurbished.

II. General Car Orientation





III. Start Up Procedures

1. Inspect the exterior and interior of the car for any safety or repair issues. Perform a visual inspection of the running gear. Are there any loose or missing nuts, bolts or other fasteners? 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 an incident report.
2. Put up rear pole
3. If the doors are closed, enter the car through one of the motorman's compartment doors. DO NOT MANUALLY OPEN THE CENTER DOORS. See Door Operations & Passenger Loading and Unloading section for more information on doors.
4. Insert brake handle on front end and place in Apply position
5. Turn on compressor.
6. Set headlight to proper direction
7. When air pressure reaches 70 PSI, release hand brakes if set (check both front and rear brakes) and remove wheel chock (when ready to move car)

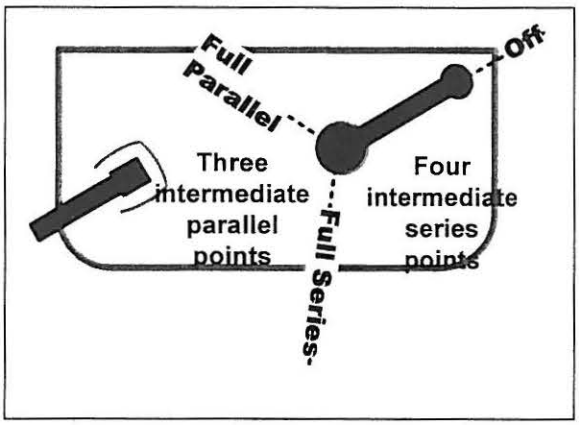
IV. General Operating Procedure

A. Controller, Brakes and General Operations

Car 66 DOES NOT HAVE a deadman and brakes are straight air.

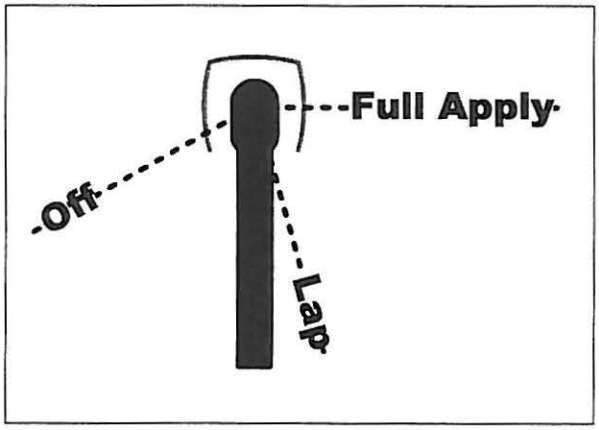
The car has door interlocks that will not let the car move unless the center doors are fully closed. Low intensity indicator lights to the right of the controller indicate when the door is closed (light is on when door is closed).

Controller (HL) has five (5) notches in series and four (4) notches in parallel. Accelerate by progressing through each notch pausing a few seconds at each notch as the car accelerates. Full series and full parallel are the preferred running points.



When you back notch, do it swiftly and return the handle to full off position. After the handle is in the full off position, you can resume notching up to reach/maintain the desired safe speed.

Straight air brakes should be operated as follows:



- Leave the brakes in "full apply" position whenever the car is not moving
- When starting car, place the brake in the "off" position and allow most of the pressure to bleed off before turning on the throttle.
- When car is in motion, and brakes are not needed, brake handle should be in the "off" position.
- When braking is needed, apply sufficient braking to achieve the desired braking effect and then put the brake handle in the "lap" position to maintain this level of braking. Remember that there is a time lag between when to take a braking action (apply or release) and the effect of the braking action is felt.
- As car approaches a full stop, release some of the brake pressure to achieve a smooth stop. When the car is stopped, go to full apply position.

B. 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 door in each of the motorman's compartments are controlled by the handle in the motorman's cab. If the motorman's door is open, do not close the door as long as the platform covering the steps is up.

If there is sufficient pressure in the air tank, you can operate the motorman's door from the outside by pushing or pulling on the linkage that is located just to the left of steps. (See location on diagram on page 2). If you are attempting to close the doors via the linkage and it won't move, go into the motorman'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 motorman's cabin doors can be opened and closed manually when 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.

The "admore" seats at the centre of the car **must not be used for public operations** because of the risk of opening the doors behind a passenger..

C. Heating and Ventilation

Passenger compartment heat is controlled by the three knife switches located in a cabinet near the ceiling at the center of the car. See diagram on page 2 for the location of these switches. Use extreme caution when opening or closing these switches as the cabinet contains exposed areas with 600 volts.

Heat for the motorman's cab is controlled by the switch at the left front of the motorman's cab. See diagram on page 3 for location.

Be sure to turn off all heaters at least 30 minutes before the car is placed in the Car Barn

D. Lights

1. The marker lights and interior lights are controlled by switches in the same area as the headlight transfer switch.

2. Headlights can be dimmed by using the switch located behind the hand brake. See diagram on page 3 for location. When operating at night, be sure to dim the headlight when approaching platforms, other cars or Main Street crossing.

E. Changing Ends

1. Place brakes in full apply position
2. Switch poles
3. Move brake handle to other end of the car an reapply brakes.
4. Transfer headlights by using switch above center door (two clicks).

V. Emergency and Special Procedures

A. Fastest Possible Stop:
1. Move controller to "off" position
2. Full apply of brakes

B. Brake Failure:
1. Move controller to "off" position
2. Move reverse handle to the direction opposite car's movement and do not move again until the car comes to a full stop
3. Quickly move the controller to the Point 1, then off again
4. Wind up hand brake

C. Controller Stuck in an "on" position:
1. Move Main Control Switch to "off" position
2. Apply brakes, as necessary

D. Car Sliding After Application of Brakes:
1. Fully release brakes
2. Apply one point of power
3. Reapply brakes gradually
4. Move controller to "off" position as car comes to a stop

E. Car Does Not Run:
1. Check to see if the Main Control Switch and the Line Control Switch are in the "On" position
2. Check to see if center doors are closed

VI. Shut 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 the compressor
3. Close all car doors and windows
4. 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. 5. Chock the downhill wheels
6. Lower the pole

7. Drain the air tank

VII. Miscellaneous

None

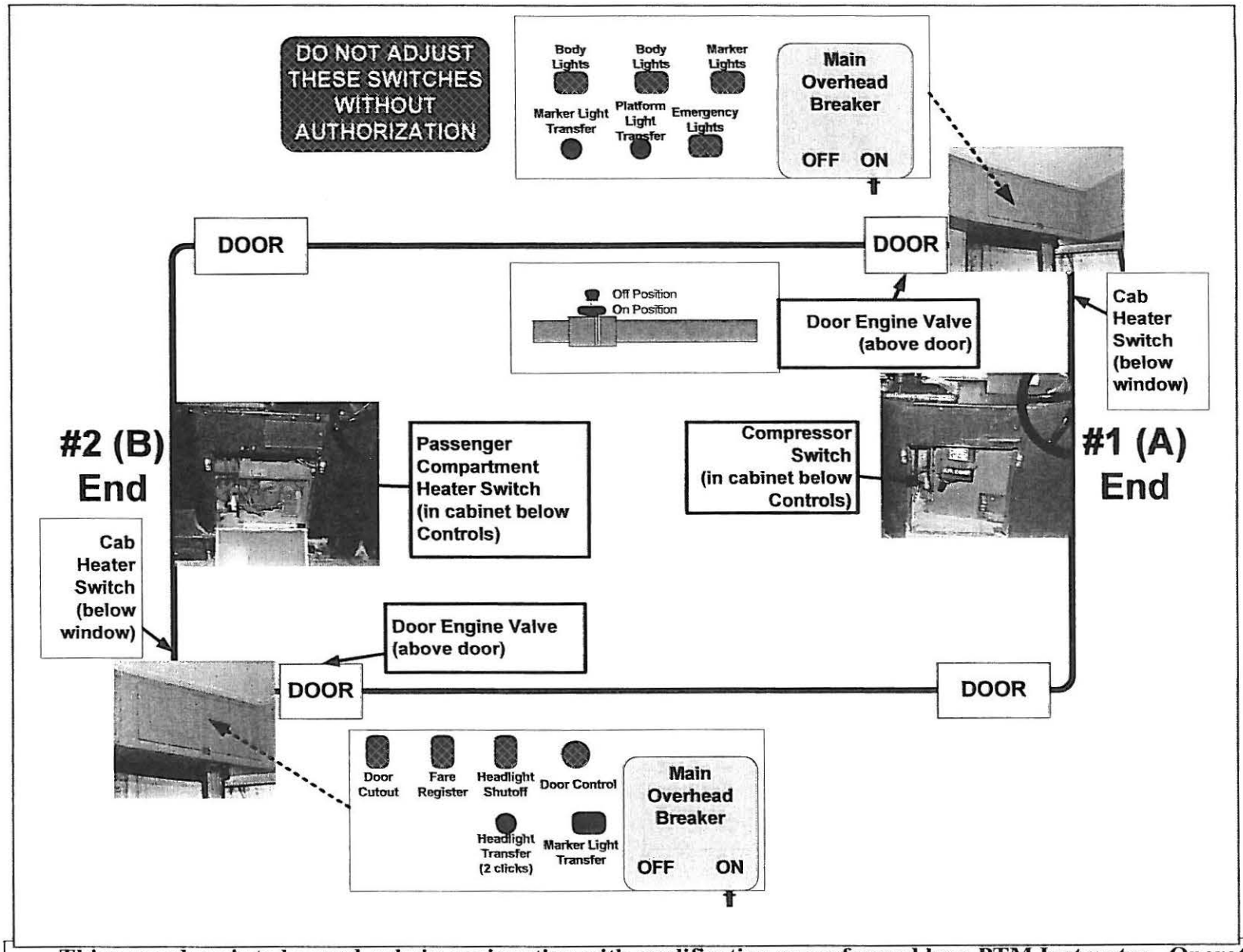
I. History and Background

Philadelphia and West Chester Traction (P&WCT) Car 78 was one of 10 cars purchased from Brill in 1931-32 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. These new cars were cheaper to operate and used less power, while 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 and during the last 15 years, the car was used primarily for in rush hour service. After being withdrawn from service, the car was acquired by the museum in September 1982.

II. General Car Orientation



This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

III. Start Up Procedures

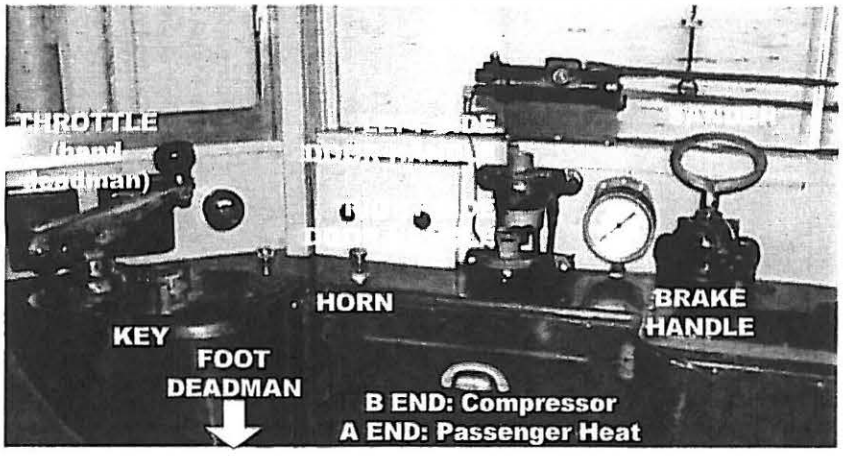
1. Inspect the exterior and interior of the car for any safety or repair issues. Perform a visual inspection of the running gear. Are there any loose or missing nuts, bolts or other fasteners? Look under the car to determine if there appears to be anything loose or dragging on the ground. If you see any deficiencies, do not move the car and prepare an incident report.
2. Put up rear pole
3. Insert break handle on front end and place in Full Service position
4. Insert door handles on front end and set right door to right front door 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 compressor. When pressure reaches about 50 PSI, system will charge and air gauges will register the pressure
7. Set headlight to proper direction
8. When air pressure reaches 70 PSI, release hand brakes if set (check both front and rear brakes) and remove wheel chock (when ready to move car)

Release the hand brake by turning **slightly** in clockwise direction and then **turn slowly** in the counter clock wise direction until released. **Spinning the wheel quickly in the counter clock wise direction *will not* release the brake.**

IV. General Operating Procedure

A. Throttle, Brakes and General Operations

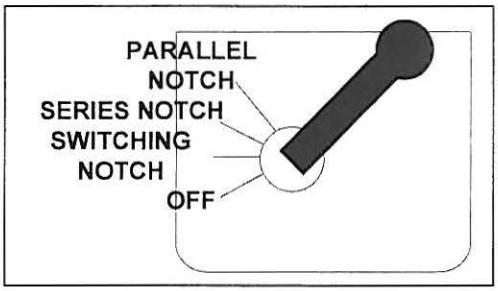
Car has a deadman switch that can be released by either holding down the hand controller or stepping on the foot release at the base of the Controller



This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

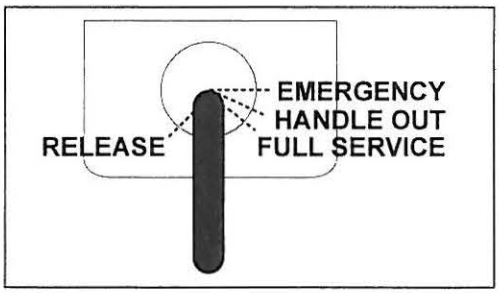
mechanism. It is recommended that you use the foot release during normal operations so that you can sound the horn with your left hand while keeping your right hand on the brake controller.

Car has a General Electric pneumatic cam (PC). There are three points on the controller that activate 19 points on the master controller under the car.



- Point 1 (Switching) activates point 1 on the master controller. This point is used for starting the car from a stop, and moving the car through the yard and when parking in the car barn.
- Point 2 (Series) activates points 1 thru 10 on the master controller. When placed in Point 2, the car will automatically accelerate to full series.
- Point 3 (Parallel) activates points 11 thru 19 on the master controller. When placed in Point 2, the car will automatically accelerate to full parallel.

Brakes are self lapping with an emergency apply position (far right)



Be sure that the reverse handle is engaged (forward or reverse) before releasing the brake valve; otherwise the car go into emergency.

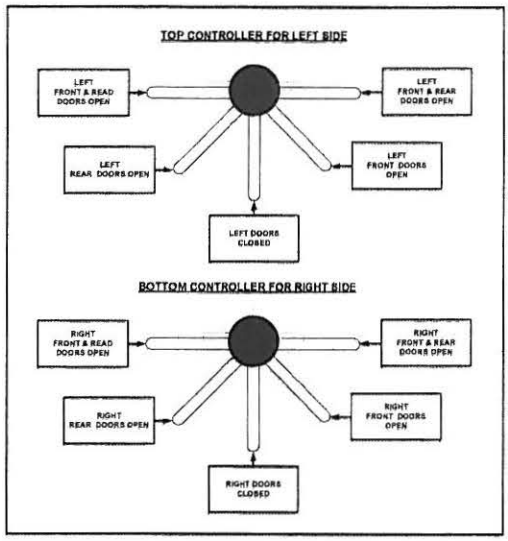
Be sure that the brake valve is in either the full service or handle out positions before releasing the deadman.

B. Door Operations & Passenger Loading and Unloading

Doors are opened and closed using the door controls located at both ends of the cars.

Door controls work independently of the brake valve. The car will not move with the doors open. The door interlock is connected through the door engine and if any of the door engine supply valve are off, the car may not move.

Never close the rear doors without first making sure that these doors are clear of passengers. As a general procedure, the rear doors should only be used if there is someone (conductor on car or someone on platform) to visually observe that the doors are clear before the door is closed.



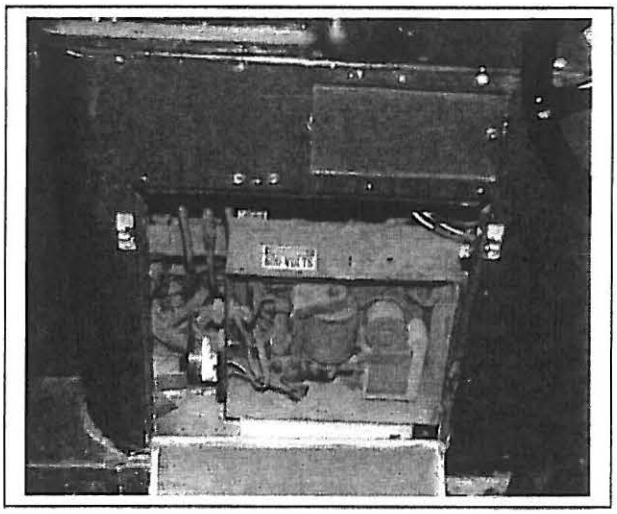
The "admore" seats at the step wells **must not be used for public operations** because the door valves will work at any time and the interlocks that are designed to keep the door from opening when the seats are down are not reliable.

C. Heating and Ventilation

Heating controls are located as follows:

- Heat for passenger compartment is controlled by a switch in the compartment below the operator controls on the #2 (B) end of the car.

THIS COMPARTMENT CONTAINS AREAS THAT ARE ELECTRICALLY "HOT". EXERCISE EXTREME CAUTION WHEN TURNING HEAT ON AND OFF



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

Be sure to turn off all heaters at least 30 minutes before the car is placed in the Car Barn

D. Lights

1. Car body and marker lights are controlled by switches in cabinets as shown on the General Car Orientation diagram. Normally, the only change that is required is to transfer the headlights between ends when reversing the car.
2. Interior lights are controlled by the right hand switch located behind the sliding door located just to the left of each hand brake.

E. Changing Ends

1. Place brakes in full apply position
2. Raise the trolley pole on the new rear end
3. If you are on the #2 (B) end, transfer the headlights by clicking the Headlight Transfer switch in the cabinet on the #2 (B) end.
4. Move brake and door handles to the other end and reinsert handles. Place the brakes in the full apply position.
5. If you are now on the #2 (B) end, transfer the headlights by clicking the Headlight Transfer switch in the cabinet on the #2 (B) end..
6. Pull down the trolley pole at the new front end

V. Emergency and Special Procedures

A. Fastest Possible Stop:
1. Move controller to "off" position
2. Brake valve in emergency position

B. Brake Failure:
1. Move controller to "off" position
2. Move reverse handle to the direction opposite car's movement and do not move again until the car comes to a full stop
3. Quickly move the controller to the Point 1 (yard position), then off again
4. Wind up hand brake

C. Controller Stuck in an "on" position:
1. Move Main Overhead Breaker to "off" position
2. Apply brakes, as necessary

D. Car Sliding After Application of Brakes:
1. Fully release brakes
2. Apply one point of power
3. Reapply brakes gradually
4. Move controller to "off" position as car comes to a stop

E. Car Does Not Run:
1. Check to see if the main overhead breaker is in the "On" position
2. Check to see if all doors are closed including checking the to see that the door valve engines are in the "On" position

VI. Shut 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 the compressor
3. Close all car doors and windows
4. When putting the car in the Car Barn exit through the small door at the end of the car facing the Car Barn doors. Set the door engine valve for the door through which you are exiting to the "Off" position.
5. Chock the downhill wheels
6. Lower the pole
7. Drain the air tank

VII. Miscellaneous

None

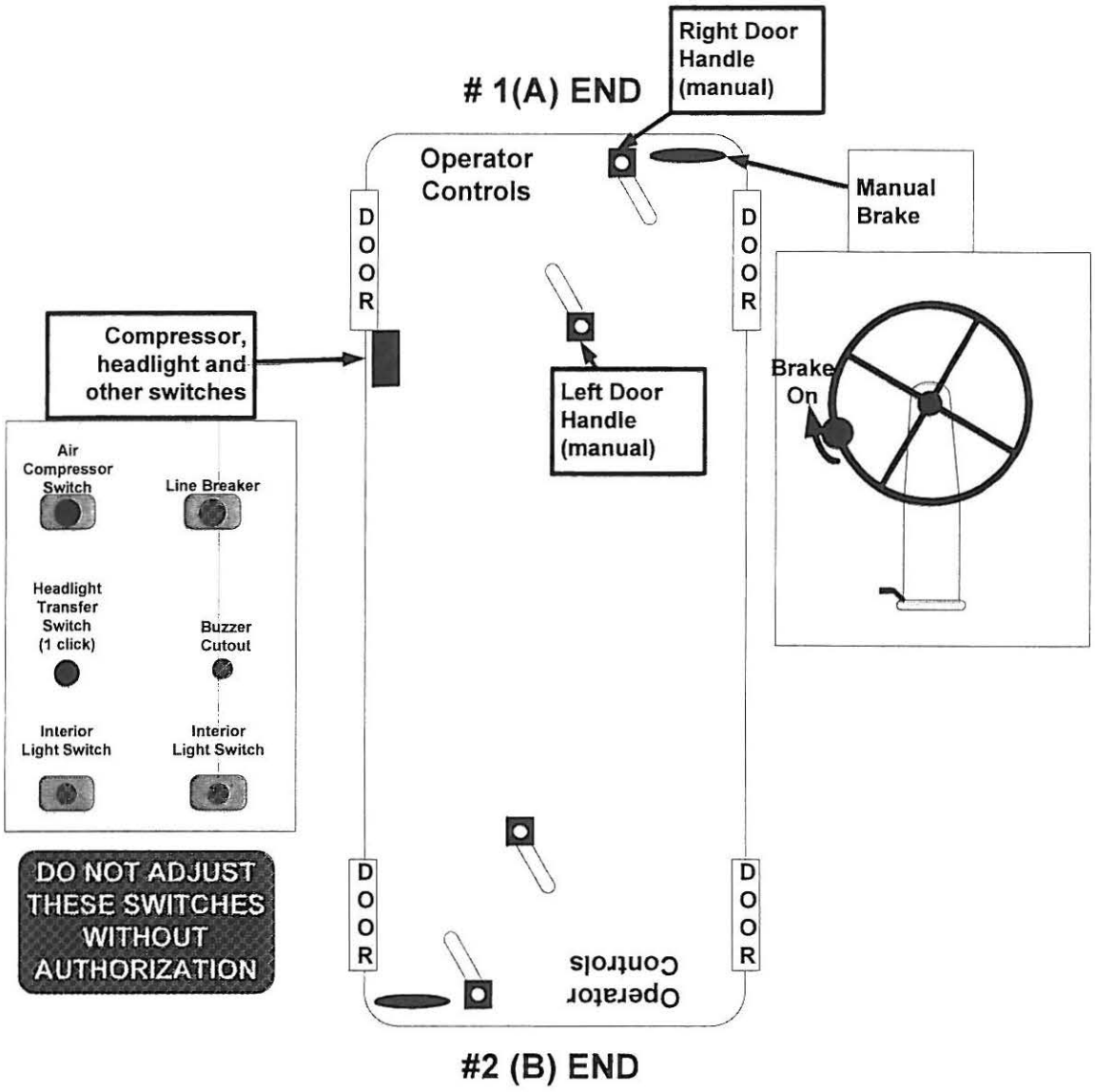
I. History and Background

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 compatibility of track gauge and the age and excellent condition of the car had moved PTM to express interest in this car. Because of its long-standing interest, PTM was given the first choice of the cars being retired.

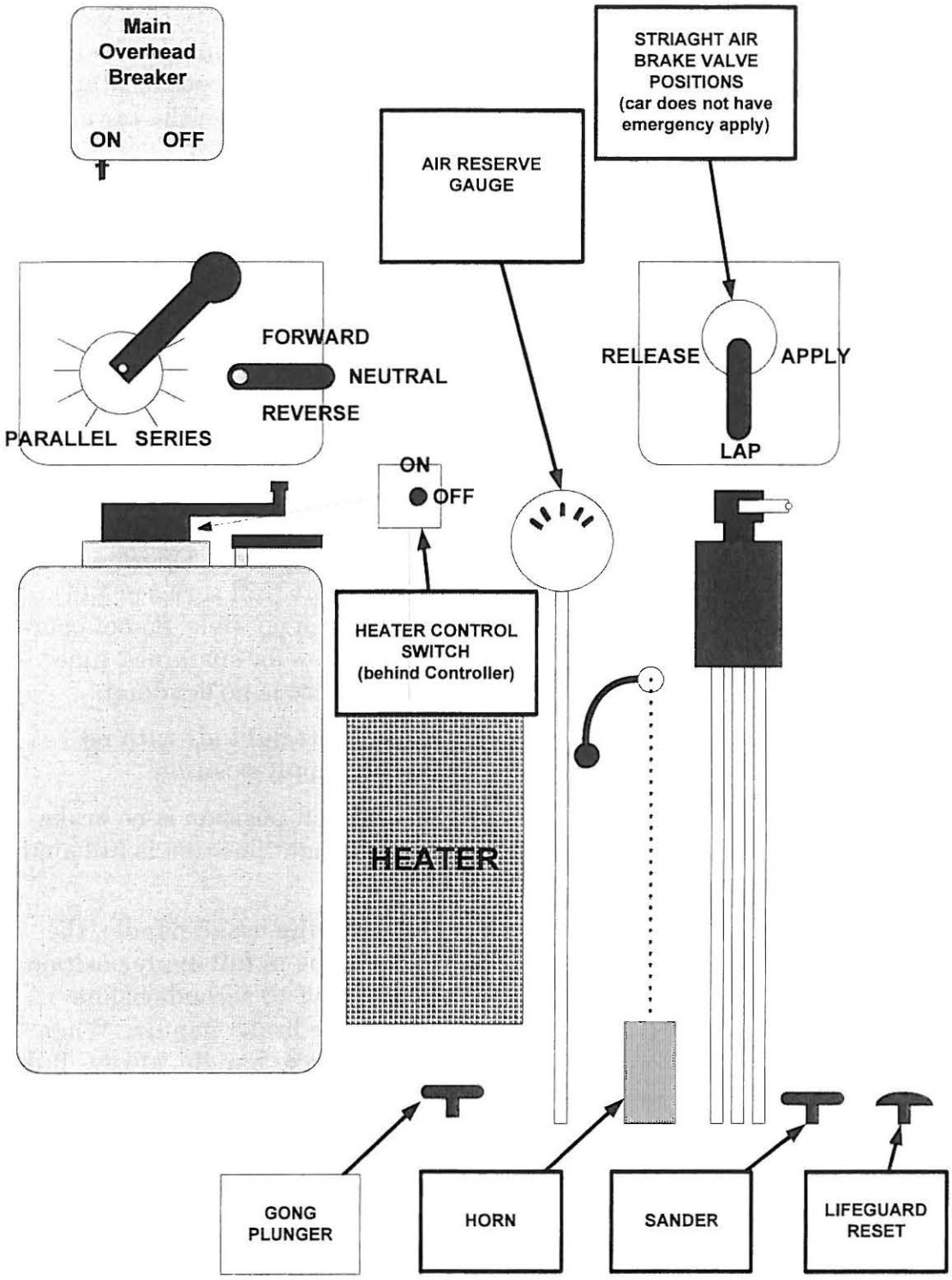
New Orleans 832 was delivered to the museum atop a railroad flat car in June 1964 and was immediately placed into operation.

II. General Car Orientation



This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

Operator Controls (both ends)



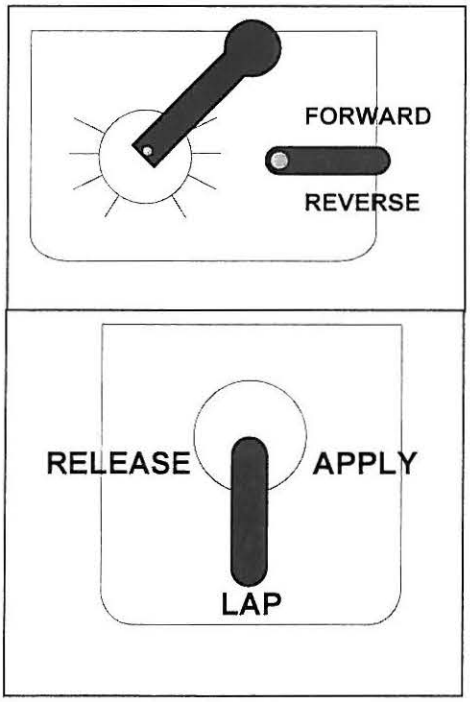
This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

III. Start Up Procedures

1. Inspect the exterior and interior of the car 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 an incident report.
2. Put up rear pole
3. Turn on compressor
4. Put brakes in apply position
5. Set headlight for proper direction
6. Check that all four doors are properly closed
7. When compressor shuts off, release hand brakes if set (check both front and rear brakes) and remove wheel chock (when ready to move car)

IV. General Operating Procedures

A. Controller, Brakes and General Operations



Car has "K" controller with 4 series and 4 parallel points. Operate at free running points (full series or full parallel) when possible; do not operate at other points for sustained time periods. There is no deadman.

Brakes are straight air with no emergency apply position

a. Full left position is no brake
b. Full right position is full apply
c.

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.

B. Door Operation and Passenger Loading and Unloading

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).

There is no door interlock so be sure doors are fully closed before moving the car.

When the car is operated with only a motorman, remove the door handle form the back of the car.

C. Heating and Ventilation

There are heaters for the motorman but no heaters in the passenger areas.

Windows are held up by friction; therefore, be sure to notify passengers to keep head, arms, etc. within car and be vigilant that passengers are following these instructions

D. Lights

See general car orientation diagram for location of light controls.

Headlight switch is a single click.

E. Changing Ends

1. Place brakes in full apply position
2. Switch the trolley pole
3. Move the brake handle and reapply the brakes
4. Reverse the headlight

V. Emergency and Special Procedures

A. Fastest possible stop:
1. Move controller to "off" position
2. Full application of brakes

B. Brake failure:
1. Move controller to "off" position
2. Move reverse handle to the direction opposite car's movement and do not move again until the car comes to a full stop
3. Move main overhead breaker switch to "off" position
4. Move controller to "full parallel" position
5. Wind up hand brake

C. Controller stuck in an "on" position:
1. Move main overhead breaker to "off" position
2. Apply brakes, as necessary

This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

D. Car sliding after application of brakes:
   1. Fully release brakes
   2. Apply one point of power
   3. Reapply brakes gradually
   4. Move controller to "off" position as car comes to a stop

E. Car does not run

   - Check the line switch controls on both ends of the car

VI. Shut Down Procedures:

1. Chock the downhill wheels
2. Turn off compressor
3. Close all windows and doors
4. Remove brake and reverser handles
5. Pull and latch pole
6. Drain air tank

VII. Miscellaneous

None

This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

I. History and Background

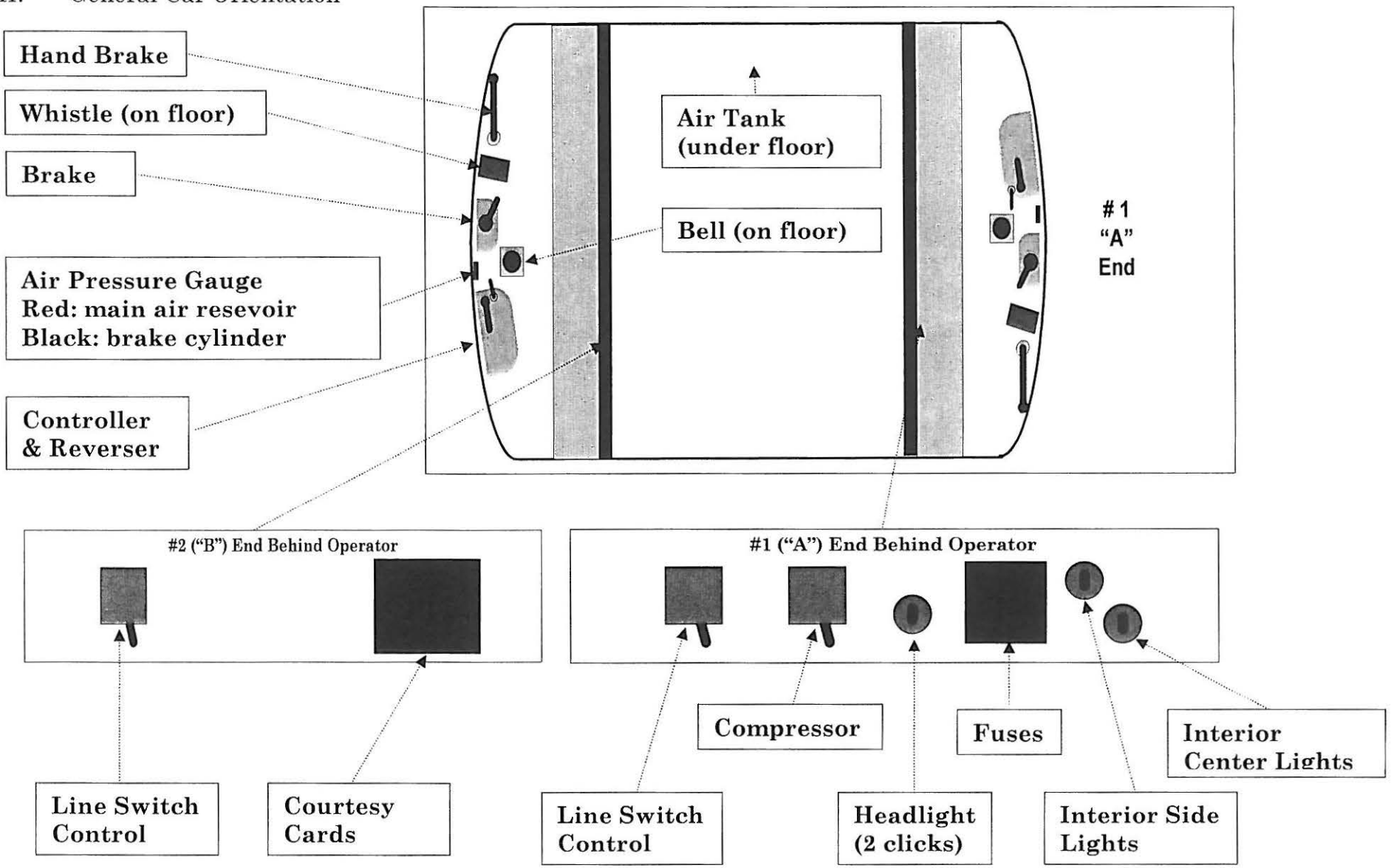
Open-sided trolley cars were extremely popular in the early days of the 20th Century, as they offered the public the pleasure of a cool ride on hot summer evenings, and carried millions of passengers to amusement parks, which often were owned by the streetcar companies. As automobiles became popular 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 regauging, the latter necessitating considerable engineering and fabrication of new structural and mechanical equipment.

II. General Car Orientation



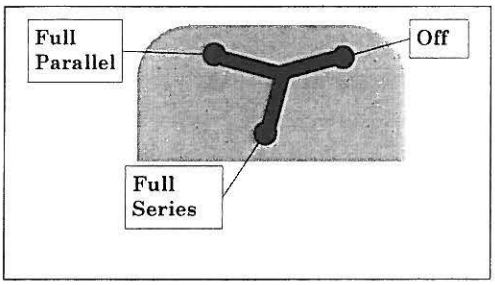
This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

III. Start Up Procedures

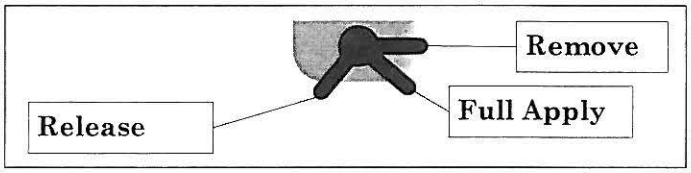
1. Inspect the exterior and interior of the car for any safety or repair issues. Perform a visual inspection of the running gear. Look under the car to determine if there appears to be anything loose or dragging on the ground. If you see any deficiencies, do not move the car and prepare an incident report.
2. Put up trolley pole at rear of car.
3. Turn on the compressor
4. Remove the wheel chock when compressor shuts off.

IV. General Operating Procedure

A. Controller, Brakes and General Operations



There are five (5) notches in series and three (3) notches in parallel. Remember to hit each notch squarely and accurately. Progress through the notches, pausing only 5 or so seconds on each notch as the car gains speed. Full series and full parallel are the preferred running points. When you shut off, do it swiftly and return the handle to the full off position. After the handle is in the full off position, you can resume notching up to reach/maintain the desired safe speed.



The brakes are the self-lapping type. Brakes are fully released when the handle is fully to the left; moving it to the right provides increasing braking pressure. Moving the brake handle a small amount increases or decreases braking pressure as appropriate. You may reduce brake pressure as appropriate as the car comes to a stop, then once stopped, move the handle to the full apply position.

Brake application is reflected in the air pressure gauge. The red needle indicates pressure in the main air resevoir and black shows the pressure in the brake cylinder.

B. Door Operations & Passenger Loading and Unloading

*** See Section VII.A in relation to Safe Operations

C. Heating and Ventilation

*** Not Applicable

D. Lights

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

E. 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. Reverse the headlights by double clicking the headlight swith

V. Emergency and Special Procedures

A. Fastest Possible Stop:

1. Move controller to "off" position
2. Full application of brakes

B. Brake Failure:

1. Move controller to "off" position
2. Move reverse handle to the direction opposite car's movement and do not move again until the car comes to a full stop
3. Move Line Switch Control to "off" position
4. Move controller to "full parallel" position
5. Wind up hand brake

C. Controller Stuck in an "on" position:

1. Move Line Switch Control to "off" (left) position
2. Apply brakes, as necessary

D. Car Sliding After Application of Brakes

1. Fully release brakes
2. Apply one point of power
3. Reapply brakes gradually
4. Move controller to "off" position as car comes to a stop

E. Car does not run:

- Check to see that Line Switch Controls on both ends of the car are in the "On" (right) position

F. Emergency stopping of car by Conductor (from rear of the car)

1. Put Line Control Switch in the "off" (right) position
2. Apply hand brake as tightly as possible

VI. Shut Down Procedures:

1. Chock the downhill wheels
2. Turn off the compressor
3. Lower the pole
4. Drain the outside air tank (see diagram for location)

VII. Miscellaneous

A. Safe Operating Procedures

1. Crew Requirements and Procedures

   a. A minimum of two crew members (operator and conductor) is required to operate the car with passengers.
   b. While the car is in motion, the conductor must be on the rear platform facing forward. **No passengers are allowed** on the conductor's platform. The 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.
   c. At the operator's discretion, no more than two passengers, one of whom must be an adult, can ride on the operator's platform.

2. Passenger Loading/Seating and Unloading

   a. All seatbacks must be placed in the forward facing (direction of travel) position.
   b. **Both the operator and the conductor are responsible** for passenger loading and unloading.
   c. During regular operations, the car should be operated with the safety bar in the down position on the side opposite from where the passengers are loaded and unloaded.

      In situations such as County Fair or the Arts and Crafts show where passengers are loaded and unloaded at Fairgrounds it will be necessary to load passengers from one side at Richfol and the opposite side at Fairgrounds. In these situations, both safety bars can be in the up position. The operator and conductor must be alert at all times to insure that passengers only exit the car on the appropriate (platform) side.

   d. 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.
   e. **Passengers must be instructed to not step on ¾" wide toe-board** (painted yellow on top) when boarding and leaving the passenger compartment and to hold on to the yellow grab bars.

f. Passengers should be advised to leave the passenger compartment either backwards or sideways and to hold onto the yellow grab bars. In addition, passengers should be asked to wait until a crew member can assist them before leaving the car.

g. **Small 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, they should be sitting on the ends of the bench.

h. While the car is in motion, no one (passenger or crew) may be on the running boards.

3. Addressing Unsafe Conditions and Stopping the Car

a. When the conductor observes an unsafe condition (ex. passenger standing or a child on the end of the bench), the conductor should utilize the megaphone to get the attention of the passengers.

b. If the conductor is unable to get the passengers to correct the situation or 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.

i. Use one (1) blast of the whistle to request the car to be stopped at the next platform or other regular location.

ii. Use multiple short blasts of the whistle to signal for an immediate stop.

4. Other Safety Considerations

a. Raising and lowering the passenger compartment bar requires a minimum of three (3) crew members. Care must be taken to raise and lower the bar evenly to prevent binding or bending the bar as this could cause the bar to break. When the bar is raised, be sure that the bar is sitting in the two brass saddles.

b. Changing direction of seats should be accomplished by two crew members (one on each end of seat) and care should be taken to not drop the seat.

c. Running boards are heavy and should remain in the down position.

B. General Open Car Operations

1. Unless other instructions are received from museum management, the car should only be operated in full loop (around both loops) mode.

2. Open car should not be operated in inclement weather conditions (rain, cold or high wind).

I. History and Background

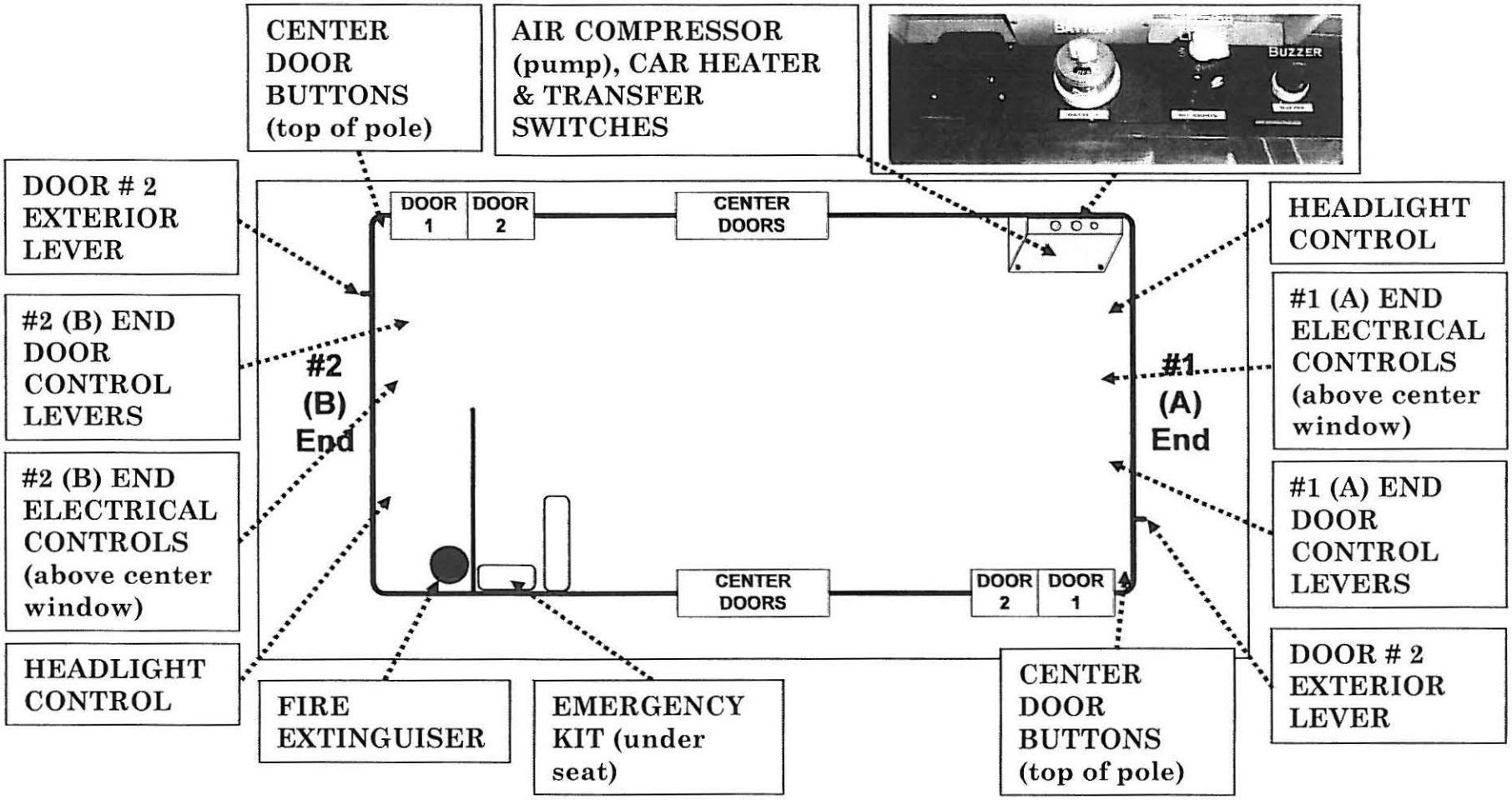
Pittsburgh Railways Company (PRCo) had 1,056 low-floor cars of varying types. 4398 and 3756 are the lone survivors.

4398 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 1952, a loop was installed in Glassport and PCC cars replaced 4398 and other low-floor cars. The car was retired but kept in storage until the museum purchased it in 1956 and subsequently moved it and Car 3487 to Arden in 1960.

Cars like 4398 were known as "safety cars" because they added new 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 have been spent rebuilding this car. The restoration effort was supported by a $256,000 Federal Transport Enhancement Grant as well as funding from the Allegheny Foundation and individual contributions. The value of donated materials and services for the restoration of this car is in excess of $250,000.

II. General Car Orientation

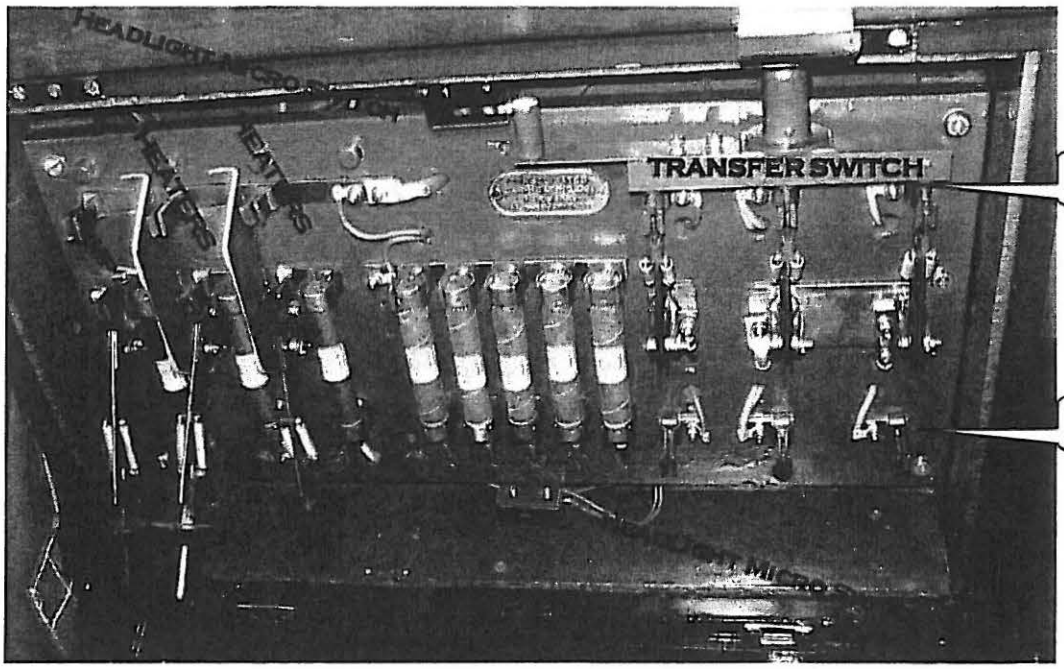


This procedure is to be used only in conjunction with qualification as performed by a PTM Instructor. Operator is not allowed to operate this car until qualified by an instructor.

ELECTRICAL CABINET (Air Compressor/Pump, Car Heaters and Transfer Switch) AT #1 (A) END

The electrical cabinet is located to the left of the operator's position on the #1 (A) end of the car.

Caution: this cabinet contains bare copper knife switches and fuses that are open circuit 600 volt DC. When manipulating the controls in this cabinet it is imperative that you give these steps your full attention. When manipulating these switches use only one hand/arm that is free of metallic jewelry (watchbands, rings, etc.). The other hand should be used to hold the cabinet door and you should not be leaning against any metal stanchions.



This cabinet contains (left to right):

- Air compressor (pump) switch
- Two switches for the car heaters
- Three-bladed transfer switch (for switching car operations between ends)

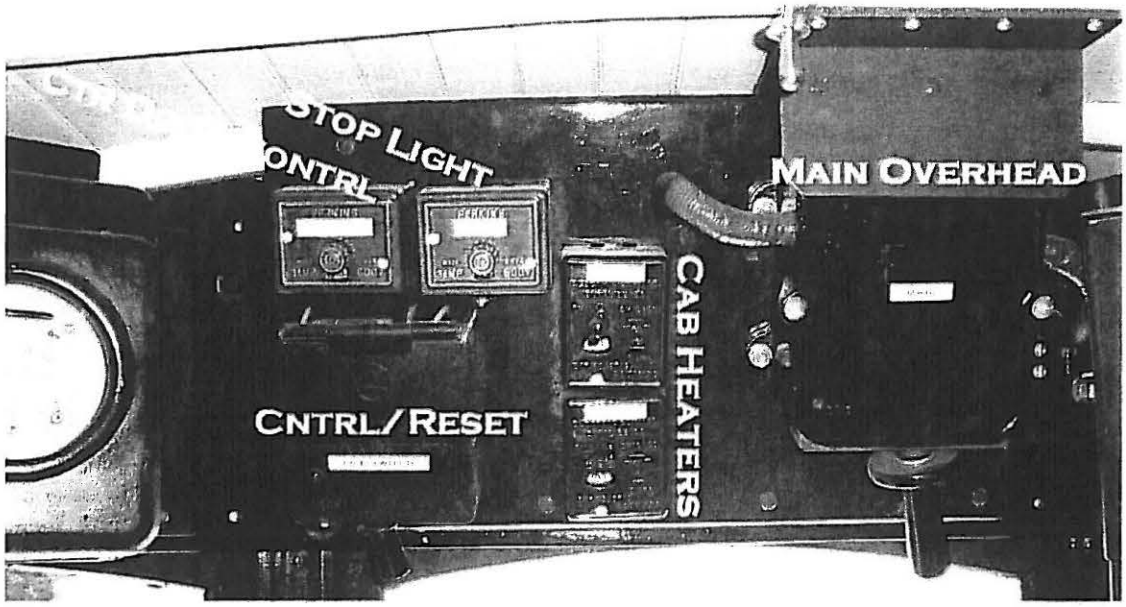
All of these switches will draw an arc if there is a load on the switch.

The best way to open these switches is to firmly wrap your index finger around the handle, then give a quick tug to open the switch. DO NOT LOOK DIRECTLY AT THE SWITCH. It is best if you turn your head a few degrees away from the box once you have a firm grasp on the switch handle and partially lower the lid to protect your face in case of a severe arc. Once your face is shielded, give the switch a quick tug.

The best way to close the switches is to use your thumb and index finger to firmly push the knife blade into the receiving contacts.

CAR ELECTRICAL CONTROLS AT "A" & "B" ENDS

Above the center window on each end of the car are a pair of switches.



The large switch is the main overhead. Leave it alone unless an extreme emergency warrants turning it off. When the handle points to the right, power is fed into the car from the trolley. The switches on both ends are wired in series. Both must be "ON" for power to enter the car.

The smaller switch is the control switch (CNTRL/RESET) for the controller at this end of the car. "ON" (power to the controller) position is to the right. However, if the line switch opens, due perhaps to notching up too quickly or releasing the deadman, this switch must be reset. This switch might also have to be reset as part of the process of starting the car. In order to reset this switch, the car must be stopped, controller off, and brake in full service application position. Move the handle all the way to the left momentarily and immediately return to the "On" (right) position. Holding the switch in the reset (left) position for an extended period of time can cause damage to the line switch. The center position is the "OFF" position.

This panel also contains switches for:

- The center door controlled from this end of the car (do not use this switch to operate doors)
- The stoplight at the other end of the car. LEAVE THE STOPLIGHT ON; do not turn it off.
- The two motorman's cab heaters at this end of the car

III. Start Up Procedures

1. Inspect the exterior and interior of the car for any safety or repair issues. Perform a visual inspection of the running gear. Are there any loose or missing nuts, bolts or other fasteners? 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 an incident report.
2. Put up trolley pole at rear of car.
3. Turn on battery switch above electrical cabinet on #1 (A) end, left side.
4. Check transfer switch. If switch is not set for the direction that you will be going, set the transfer switch to the opposite position. Use the up position for the #1 (A) end and the down position for the #2 (B) end.
5. Turn on the compressor
6. Check to see that the control/reset switch is in the "On" position.
7. Perform the brake changeover procedure (described under Changing Ends). It might be necessary to perform this procedure more than once and to reset the Control switch.
8. Remove the wheel chock when compressor shuts off.

SEE IMPORTANT SAFETY INFORMATION IN RELATION TO ELECTRICAL CABINET BEFORE SETTING THE TRANSFER SWITCH OR THE COMPRESSOR SWITCH

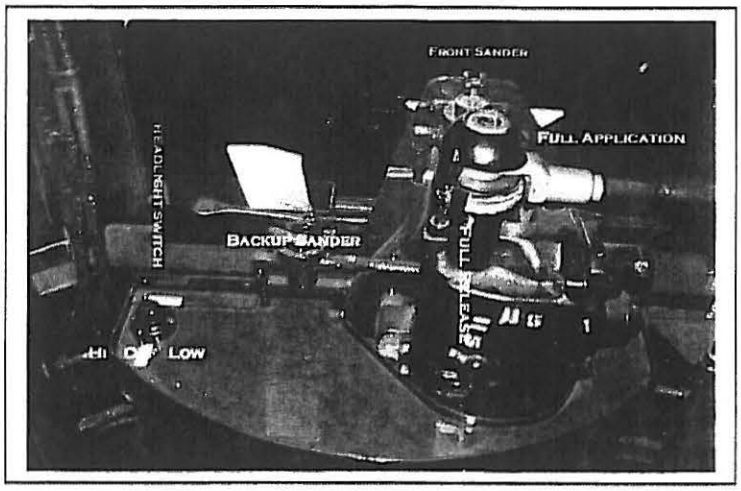
IV. General Operating Procedure

A. Controller, Brakes and General Operations

The controller handle functions as 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.

There are five (5) notches in series and three (3) notches in parallel. Remember to hit each notch squarely and accurately and to progress through the notches, pausing only 5 or so seconds on each notch as the car gains speed. Full series and full parallel are the preferred running points. THERE IS NO PLACE ON OUR RAILROAD WHERE THE USE OF SPEEDS IN EXCESS OF FULL SERIES IS NECESSARY UNDER NORMAL OPERATING CONDITIONS.

When you shutoff, do it swiftly and return the handle to the full off position. After the handle is in the full off position, you can resume notching up to reach/maintain the desired safe speed.



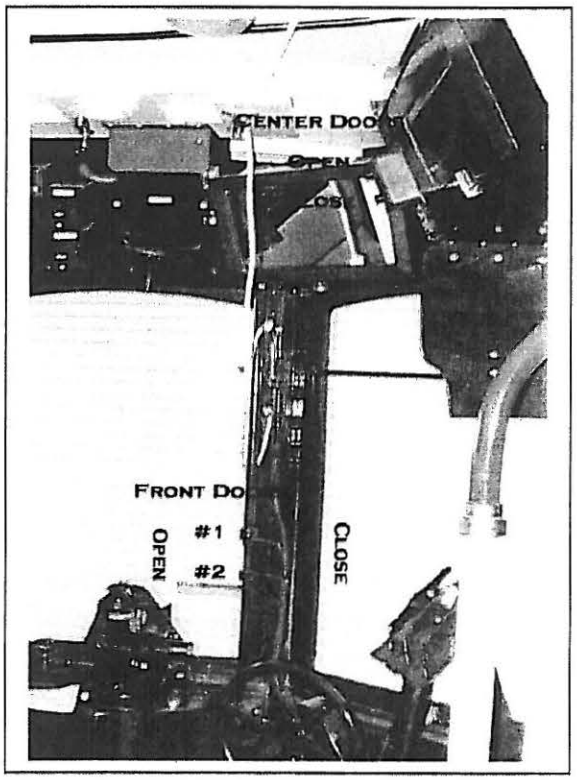
The brake full application position (all the way to the right) also allows insertion and removal of the brake handle.

The brakes are the self-lapping type. Brakes are fully released when the handle points toward the operator; moving it to the right provides increasing braking pressure. Moving the brake handle a small amount increases or decreases braking pressure as appropriate. You may reduce brake pressure as appropriate as the car comes to a stop, then once stopped, move the handle to the full apply position.

Brake application is reflected in the air pressure gauge. Red is reserve and black is for the brake cylinder.

Sand is activated by depressing the circular ring atop the brake valve. Backup sand is applied by depressing the small handle just to the left of the brake valve.

B. Door Operations & Passenger Loading and Unloading



The front doors are opened/closed by using the two handles that are on your right when operating the car. The top handle opens the #1 (front) set of doors and the lower handle opens the #2 (second) set of doors.

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).

The center doors are opened/closed by using the push buttons located on the front door engine cabinet above the door handles. The operator should stand when opening and closing the center doors. 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 a 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 the door is closed.

C. Heating and Ventilation

Heating controls are located as follows:

- Heat for passenger area is controlled by the knife switches in the electrical cabinet at the "A" end of the car
- Heat for the motorman's cab is controlled by the switches above the center window at the "A" and "B" end of the car

SEE IMPORTANT SAFETY INFORMATION IN RELATION TO ELECTRICAL CABINET BEFORE SETTING THE TRANSFER SWITCH OR THE COMPRESSOR SWITCH

Be sure to turn off all heaters at least 30 minutes before the car is placed in the Car Barn

D. Lights

1. Car body lights are controlled by two snap switches located as follows:
   - "A" end: mounted on the upper side of the electrical cabinet
   - "B" end: above the left-most cab window
2. Headlights are controlled by the three-position switch on the left of the dash to the left of the brake valve. The battery switch must be on for the headlights to operate. Handle positions are:
   - Center: off
   - Right: low beam
   - Left: high beam

   NOTE: 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 (see section on changing ends).

E. Changing Ends

1. Place brakes in full apply position.
2. Switch the trolley poles.
3. CLOSE ALL DOORS BEFORE PROCEEDING

Front doors will 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 "A" end, throw the transfer switch at this time.
5. Move handles to the other end and reinsert
6. If the "A" end is the new front-end, throw the transfer switch at this time.
7. Switch the brake and door controls to this end of the car as follows:
   - i. Hold down the controller handle
   - ii. Release the brakes and ***wait a few seconds***. You should hear a "chuff" sound from under the center of the car. This "chuff" sound is the brake system recognizing the fact the other brake valve is now active.
   - iii. Return brake handle to full application position and release the deadman.

You will be unable to exit the car until this procedure is complete. Repeat this procedure if doors do not open.

V. Emergency and Special Procedures

A. Fastest Possible Stop:

1. Move controller to "off" position
2. Full application of brakes

B. Brake Failure:

1. Move controller to "off" position
2. Move reverse handle to the direction opposite car's movement and do not move again until the car comes to a full stop
3. Move line switch to "off" (center) position
4. Move controller to "full parallel" position
5. Wind up hand brake

C. Controller Stuck in an "on" position:

1. Move line switch to "off" (center) position
2. Apply brakes, as necessary

D. Car Sliding After Application of Brakes

1. Fully release brakes
2. Apply one point of power
3. Reapply brakes gradually
4. Move controller to "off" position as car comes to a stop

E. Car does not run:

- Check to see that main overhead switches on both ends are in the "on" (right) positions
- Check to see that the control switch (CTRNL/RESET) for this controller is in the "on" (right) position
- Check to see that the center doors are closed

F. LifeGuard

- If the LifeGuard drops, stop the car as soon as possible and manually lift the LifeGuard back into the locked position. The pedal in the car should not be used for this purposel.

VI. Shut Down Procedures:

SEE IMPORTANT SAFETY INFORMATION IN RELATION TO ELECTRICAL CABINET BEFORE SETTING THE TRANSFER SWITCH OR THE COMPRESSOR SWITCH

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. Close all car doors
4. When putting the car in the Car Barn, set the transfer switch to the new front end and perform the brake switchover process
5. Close all windows and celestry (roof) windows
6. Turn off the battery switch
7. 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
8. Chock the downhill wheels
9. Lower the pole
10. Drain the two air tanks on the left side of the car behind the center door when looking at car from the #1 (A) end

VII. Miscellaneous

None

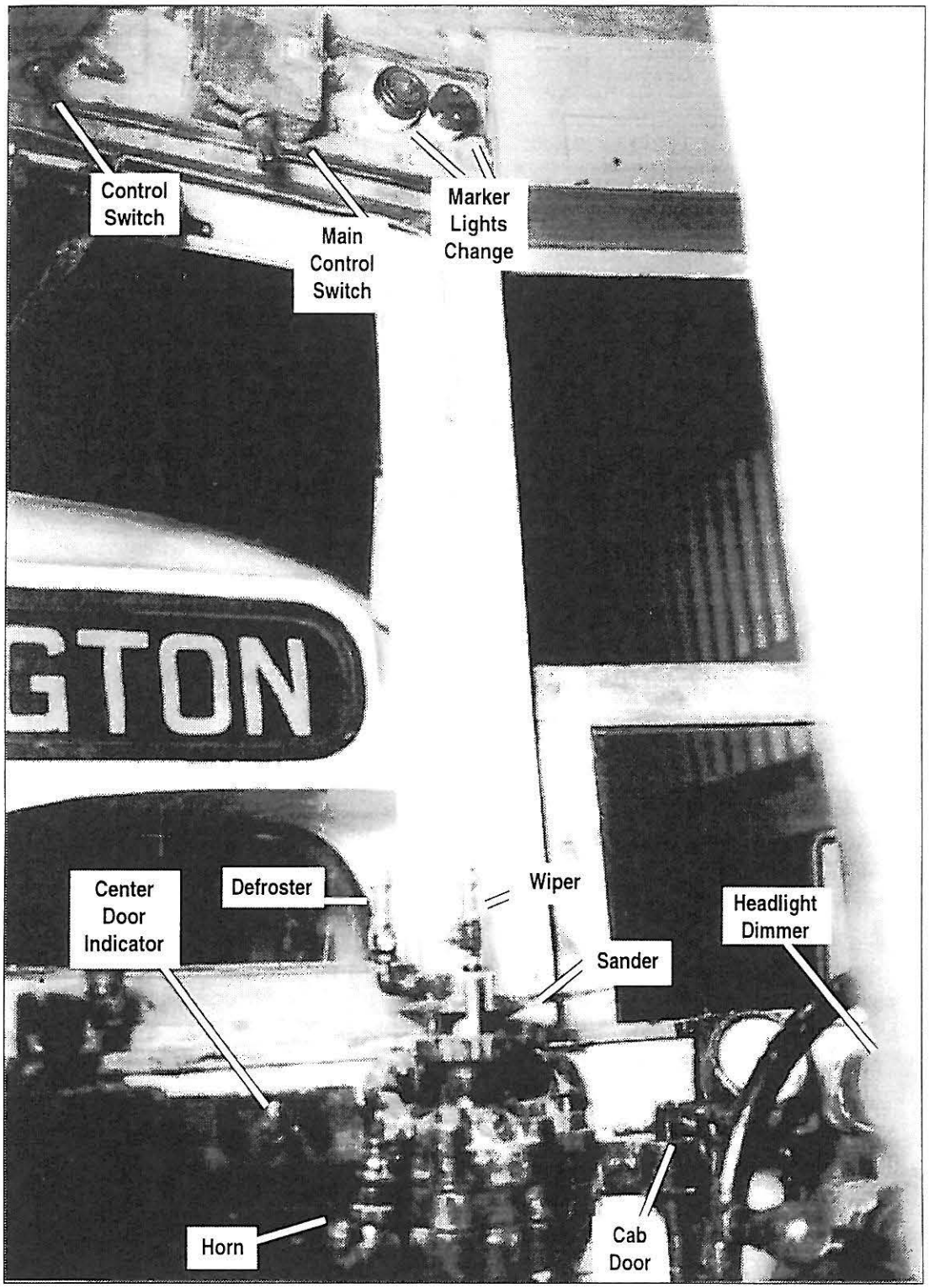


Figure 11. Philadelphia Suburban Transportation Co. 66 Motorman's Cab.

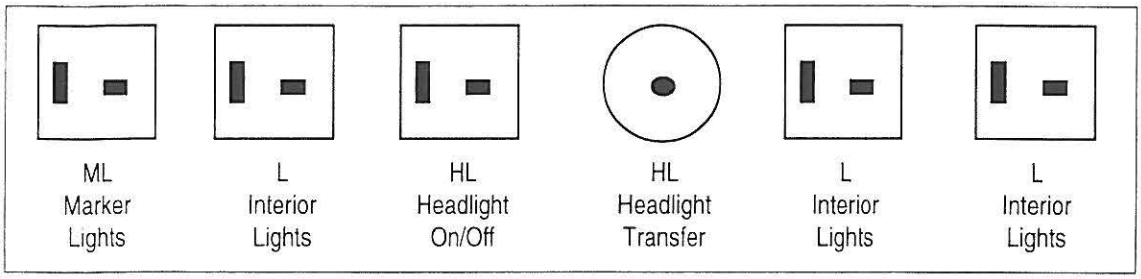


Figure 12. PSTCo. 66 Conductor's Station Light Switches

Car 66 has door interlocks that will not let the car move unless the center doors are completely closed. There is a low intensity indicator light to the right of the controller which will be lit if the doors are closed. Be particularly careful of the center doors when parking 66 in the carbarn. The doors are worn and the center step does not retract all the way. Before parking the car, manually press the steps flush with the sides of the car **to ensure clearance inside the carbarn.**

Philadelphia & West Chester Traction Company 78

Startup:

1. Place the trolley wheel on the wire.
2. Place brake handle and door control handles in respective positions.
3. Set the front right door valve in the R1 position (see diagram).
4. Turn the **compressor** switch **on** (lower cabinet "A" end; see diagram for exact location).
5. Open the **left** front door engine cabinet and turn door engine supply valve 1/4 turn (clockwise) to the on position.
6. When pressure reaches about 50 lb. system will charge and air gauges will register the pressure.
7. The air compressor will stop when the pressure reaches 90 lb. Air is needed for the control as well as brakes, so wait for 70 lb before attempting to move the car.
8. Release the hand brake by turning slightly in clockwise direction, then ***turn slowly*** in the CCW direction until released. The hand brake does not "let go" as with other cars. **Spinning the wheel quickly in the CCW direction*will not* release the hand brake.**

Car operation:

The **compressor** switch is located in the "A" end of the car. The ends are indicated by the appropriate letter stencilled on the cover of the switch cabinets.

Brake Valve:

The brake valve is a self lapping valve. It is very similar to 3756, "A" end but with the addition of an emergency position.

1. Door controls work independently of the brake valve.
2. Be sure to place the brake handle is in the handle out position before releasing the deadman.
3. Be sure that the reverse handle is in forward or reverse before releasing the brake valve. The car will go into emergency if the handle is not engaged when the brakes are released.

Controllers:

The control is General Electric pneumatic cam (PC). There are 3 points on the master controller which actuate a 19 point master controller under the car.

1. **Point 1-Switching.** Activates only point 1 on the master controller. This point is used for starting the car from a stop, and moving the car through yard trackage when shifting or parking.
2. **Point 2-Series.** Activates points 1-10 on the master controller. When placed in the second point the car will automatically accelerate to full series.
3. **Point 3-Parallel**. Activates points 1-19 on the master controller. When placed in the third point the car will automatically accelerate to full parallel.

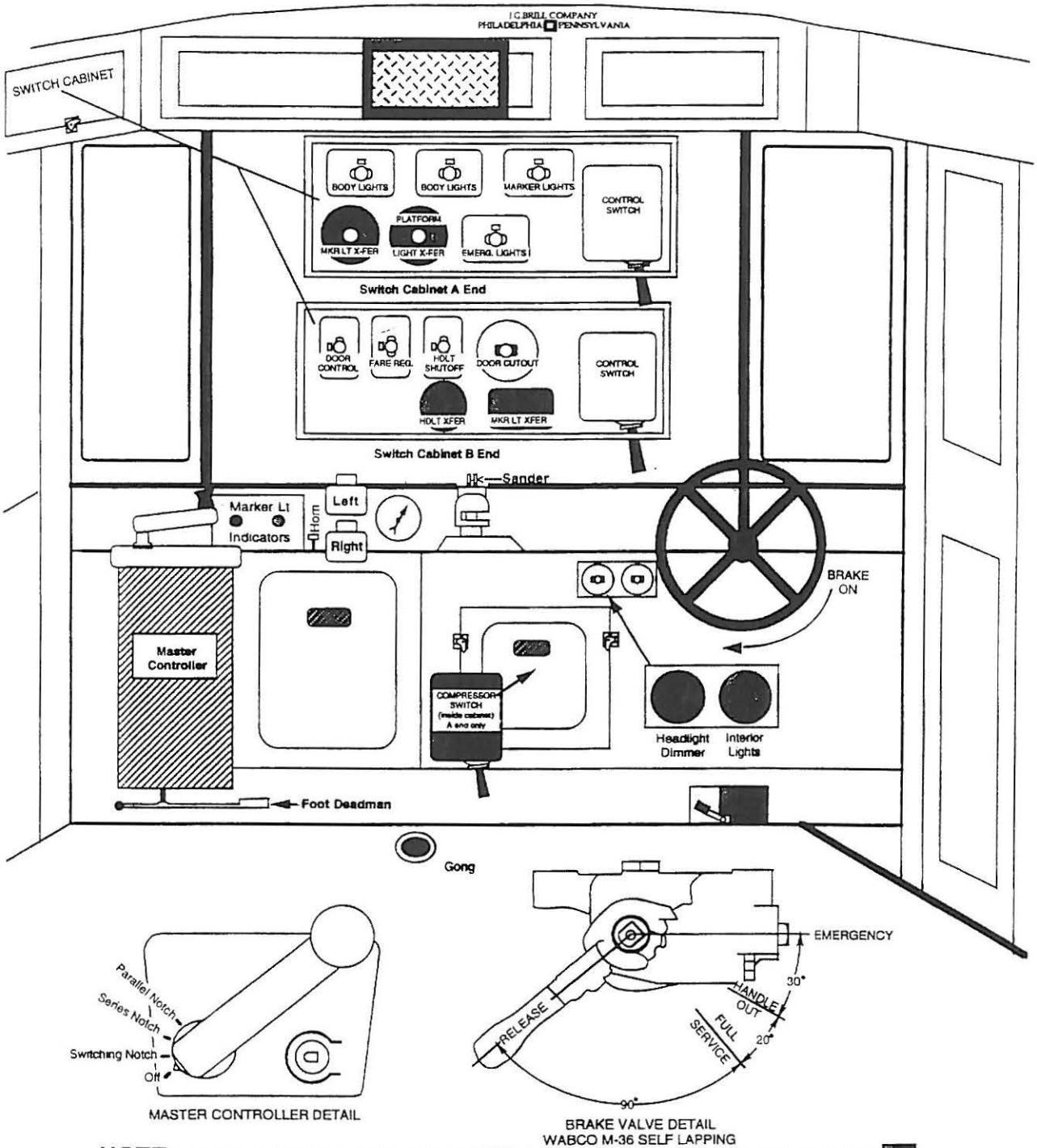
Door Controls:

There are two door control valves located at each end of the car. The valve located at dash level controls the doors to the operator's right, while the upper valve controls the doors to the operator's left.

Each valve has five positions identified in the diagram. On both valves, the R1 position is the one normally used. Moving either valve to this position will open the front door on that respective side. Moving the valve to the R2 position opens both doors on the respective side. The L1 and L2 positions act in the same way as right positions but L1 opens the rear door first.

Because the door control valves are piped to allow opening of any door at any time the "admore" seats at the step wells must not be used for public operation. The interlocks to keep the doors from opening when seats are down are not considered to be reliable.

The car will not move with the doors open. The door interlock is connected through the door engine. Therefore, if any of the door engine supply valves are turned off the car may not move.



NOTE: SWITCHES USED IN NORMAL OPERATION ARE IDENTIFIED BY SHADING

DO NOT ADJUST OTHER SWITCHES WITHOUT AUTHORIZATION

Operating Control Diagram

PENNSYLVANIA TROLLEY MUSEUM
PHILADELPHIA & WEST CHESTER TRACTION CO.
CAR 78 DRAWN BY: BPW 3/94

Figure 13. Car 78 Controls Diagram

Shutdown Procedure:

1. Park the car carefully.
2. Go to opposite end of the car.
3. Open the **left** front door engine cabinet and turn door engine supply valve (1/4 turn counterclockwise) to the off position. When the air bleeds off push doors open.
4. Turn off the air compressor.
5. Wind up the hand brake by turning the wheel clockwise until it is snug. Then press the foot pedal and rachet the wheel 1/4 turn more to lock it on. As with all hand brakes do not overtighten.

Philadelphia Suburban Transportation Co. 14 and 24

POWER UP PROCEDURE

1. Get the reverse handle (hook) from the substation building. Note that a standard Pittsburgh PCC hook will NOT work in these cars.

2. Place the trolley pole on the wire.

   14 and 24 have retrievers, as does car 66. These can grab the rope and pull it in with tremendous force if triggered. Avoid all rapid movements of the rope. If you feel the retriever grab, **let go immediately.** Resetting the retriever after it has tripped is done by pulling rope out of the retriever until the ratchets reset.

3. Turn **on** the battery switch. This is located in a slot on the outside of the "A" end just behind the double doors (see figure 14). Pushing the bar to the right turns **on** the batteries. The car will not run without the batteries turned **on.**

4. Open the doors and enter the car. All doors are balanced when the hook is not in the reverser and set to either the **Forward** or **Reverse** position. They can be easily opened or closed by hand.

5. Open the equipment locker door just below the "A" end windshields (figure 17). 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 **on** this switch. The MG set should come on immediately when this is

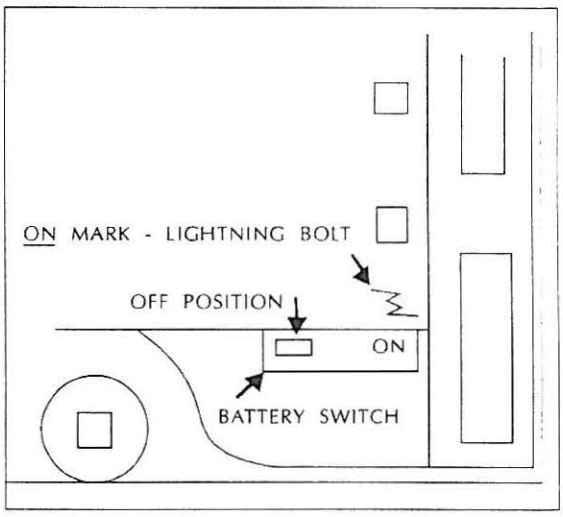


Figure 14. Battery Switch

done. Close the locker door. **Important - Live 600 volt current is present in the equipment locker. For your safety place one hand in your pocket when turning the snap switch.** ***Do not touch anything else while your hand is on or near this switch.***

If the batteries are not turned **on,** the MG will not come on. 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 chalk board in the substation, and complete a car condition report form.

6. Observe the voltmeter on the dashboard (figure 15) 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 chalk board in the substation, and complete a car condition report form.

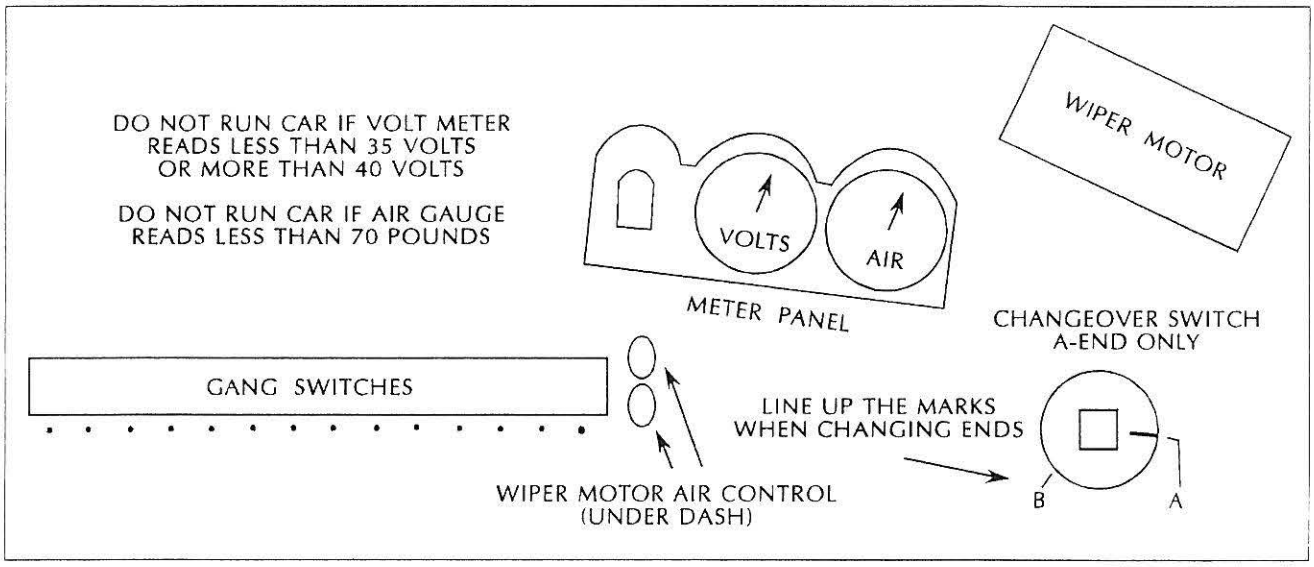


Figure 15. Control Layout – Windshield Area

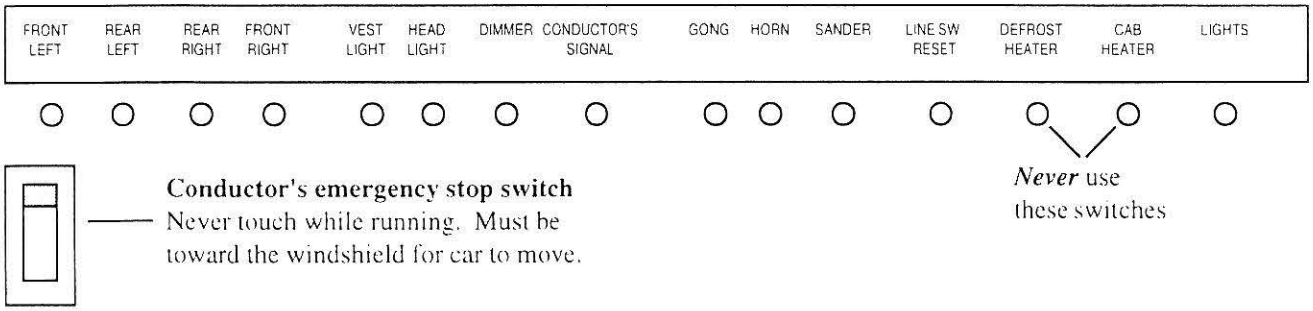


Figure 16. Gang Switch Controls – Detail

7. Be sure the air compressor switch (figure 18) is turned **on.** It is inside the car, under a seat, about 3/5 of the way back from the "A" end of the car, and on the left as you face the "A" end. Remove the seat cushion and examine the snap switch. If it is not **on** it must be turned **on** to run the car.

8. The changeover switch must be set to the end you wish to run from. This switch is located at the "A" end in the dashboard below the right window (figure 15), above the snap switch equipment locker. Insert the square protrusion on the bottom of the 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.

9. When the air pressure gauge (figure 15) at either end of the car indicates about 70 psi, release the handbrakes. This is done by pulling up the small lever on the right of the brake. The brake will release all at once if set. Make sure the handbrakes at **both ends** are released before attempting to move the car. Occasionally the handbrakes will not release all the way. If this happens, the car may bind up and possible refuse to move through tight curves such as the barn ladder track or Arden Loop. If the car stops while going through tight curves, re-release the handbrakes at both ends.

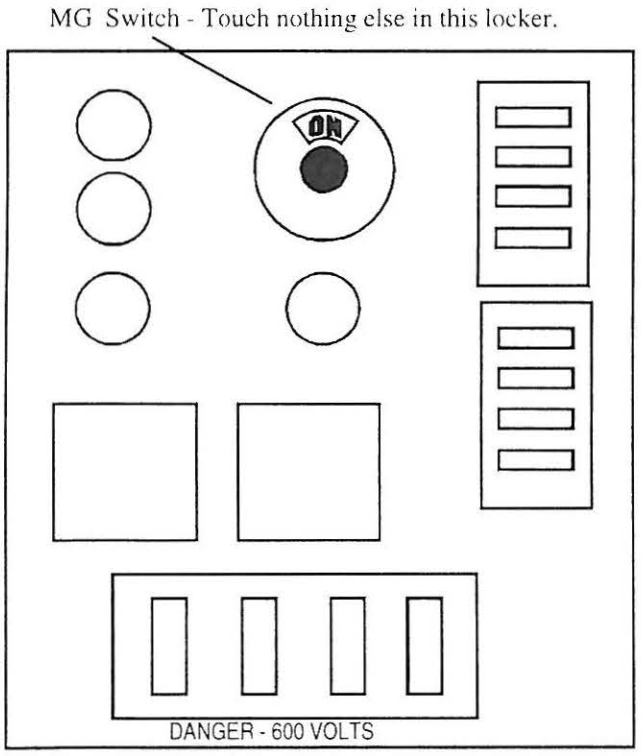


Figure 17. A-End Equipment Locker showing MG Switch Location

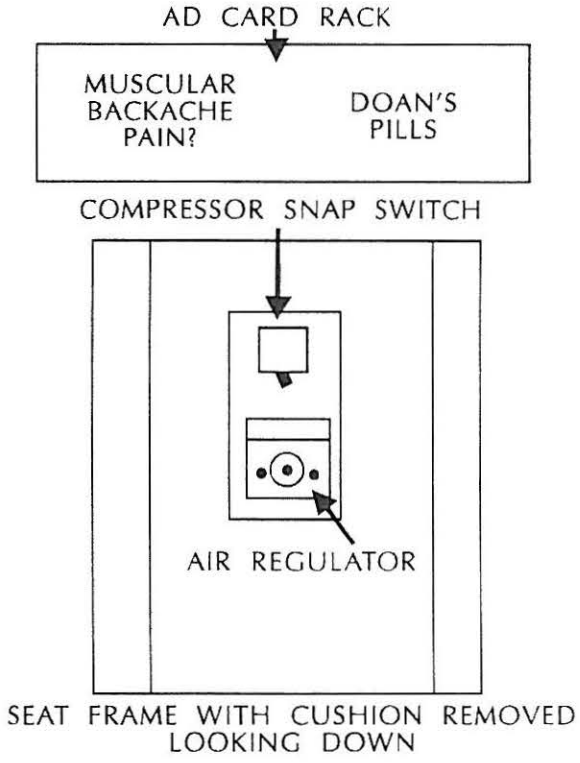


Figure 18. Compressor Switch Location

OPERATION

1. Sit in the motorman's seat. Look at the gang switch panel in front of you (figure 16), and make sure the four door switches at the left end of the panel are **down (closed)**. Locate the **Gong** and **Horn** switches (The **Horn** switch has a spring extension). The **Headlight** switch is on this panel, along with the **Bright/Dim** switch for the high/low beams. Some gang switches are not active when the Hook is not in **Forward** or **Reverse** position.

   Up, or toward the windshield, is the **on** position for the gang switches. Note the location of other switches such as **Conductor's Signal, Sander**, and (interior) **Lights**. ***Do not attempt*** to turn **on** any **Heater** switches.

2. Place the reverser handle, or **hook,** in the floor receptacle on your right beside the seat (figures 19 & 20). Insert it into the reverser with the "wing" facing forward. Push the hook forward as far as it will go. When this is done the car will be ready to run in the forward direction. If a continuous hissing sound of escaping air is heard, the car was not "service latched" properly by the previous operator. See Step 3. **Open doors with the appropriate switches, as required.** If the hook appears to be jammed and doesn't want to move forward, push the brake pedal lightly while pushing the hook forward. This will help in releasing the interlocks.

3. There are three pedals on the floor in front of you (figure 20). The left most pedal is the **Deadman,** the middle the **Brake** and the right pedal the **Accelerator.** Place your right foot on the brake pedal but do not press down. Push the **Deadman** down all the way and hold it down. The brake pedal will try to come up. Hold it down. Releasing the brake pedal at this point will release all car brakes.

4. Close the doors by pulling the door switches toward you. When all doors are closed you are ready to move the car. The doors are interlocked to remove all power to the motors when open. You 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.

5. While holding down the **Deadman** release the **Brake,** sound the gong twice and push the **Accelerator** pedal completely to the floor. The car will now start moving. Release the **Accelerator** pedal when the desired speed is reached. The **Accelerator** pedal ***must*** be pressed ***completely*** to the floor for the car to work properly. While this pedal is depressed the car will continue to accelerate until its top speed is reached. ***Never*** release the **Deadman** pedal when the car is in motion. The car will go into full emergency braking when the **Deadman** is released.

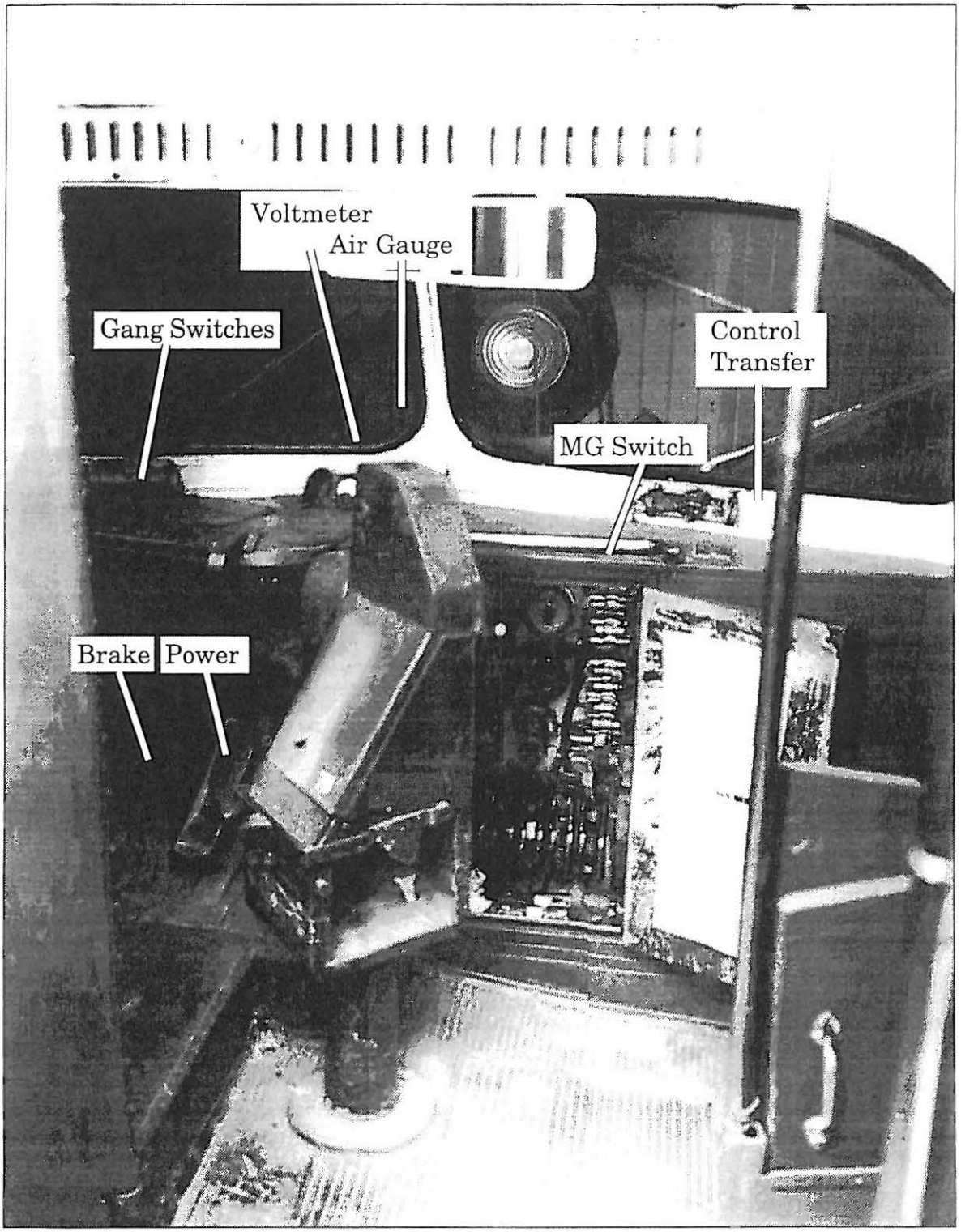


Figure 19. Photograph of PSTCo. 14/24, A-End Controls.

6. Coast by releasing the **Accelerator** pedal. Coast as much as possible.

7. To brake, press down the **Brake** pedal. As with your auto, the harder you press the brake, the more brake you will get. Pressing this pedal completely down puts the car into **Emergency,** and should not be done unless an emergency stop is required. The brakes have a tendency to grab, so be ready to back off on them slightly should this occur. 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.

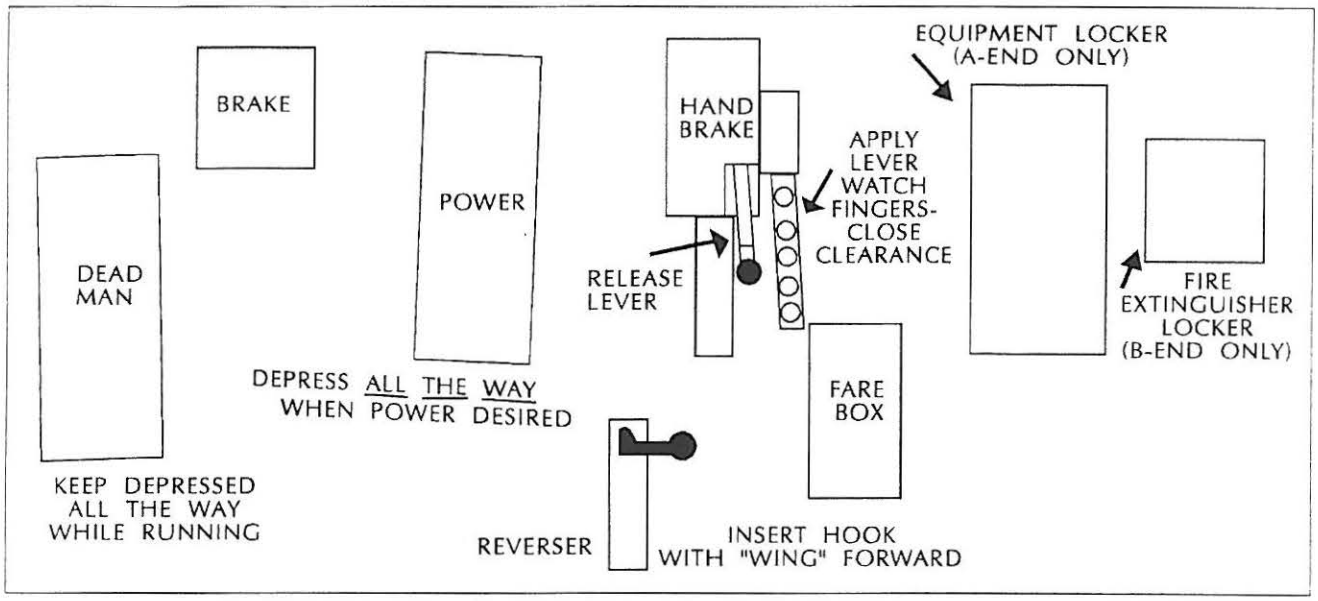


Figure 20. Control Layout, Floor Area

CHANGING ENDS

1. While holding the brake pedal about 2/3 of the way in, **slowly** release the **Deadman** pedal.

2. **Slowly** release the brake. It should latch about 2/5 of the way out. You are now in the **Service Latch** position. Open the right front door **only.** If a continuous hissing of air is heard you are in **Emergency** and the doors will not open. Turn **off** the door switch and repeat the procedure. Be aware that if the **Brake** comes all the way out without latching, you have released all of the brakes and the car may roll.

3. Move the hook back to the middle position; pull it up to remove. The hook cannot be removed until the pedals are service latched. Moving the brake pedal slightly while moving the hook may help in removing it if it appears to be jammed. Never leave the car with the hook in the reverser. Carry it with you as you would another car's reverse handle.

4. **If you were operating from the "A" end:** Insert the hook in the changeover switch and set to the "B" end. Go outside and put up the pole. Walk through the car to the other end.

   If you were operating from the "B" end: Go outside and put the pole up. Walk to the other end of the car and insert the hook into the changeover switch, and set it to the "A" end.

5. Push open the door and go outside and pull down the pole.

6. Sit in the operator's seat and verify that all doors are clear. Verify that all door switches are set to the **Closed** (down) position.

7. Insert the hook into the reverser and push it forward. All doors will close.

8. The car is now ready to move in the other direction.

PREPARING THE CAR FOR PUBLIC DISPLAY

1. Open doors as required.

2. Turn on the interior lights

3. Set the handbrake at the end that the car will likely be operated from next. This is done by repeatedly pulling up the large handle on the brake stand until the cable is tight. Watch your fingers - the clearance between the handle and the farebox is close.

4. Make sure the compressor is turned **off.**.

POWER DOWN

1. Set the handbrake at the end from which the car will likely be next operated.

2. Close all open windows. Don't forget the motorman's windows.

3. Open the "A" end equipment locker door and carefully turn **off** the MG set. (See **Power Up** procedure.)

4. Turn **off** the battery switch by pushing the lever to the left. **Leaving the switch on will cause the batteries to discharge.**

5. Close the doors manually.

6. Pull down the pole.

Pittsburgh Railways Co. 1711

POWER UP PROCEDURE

1. Go to the substation and get the <u>two</u> reverse handles ("hooks") that are needed to run this car - one for the front controller and one for the backup controller.

2. Put the pole up on the car. **Caution** - 1711 has a retriever like car 66. If it grabs the rope, **let go.** Reset by pulling all the rope out and feeding in slowly.

3. Enter the car and walk to the rear. Remove both of the rear seat backs. Close the battery knife switch to turn the batteries **on.**

4. 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 (see figures 21 & 22) and turn **on** all the breakers except **Aux Heat** and

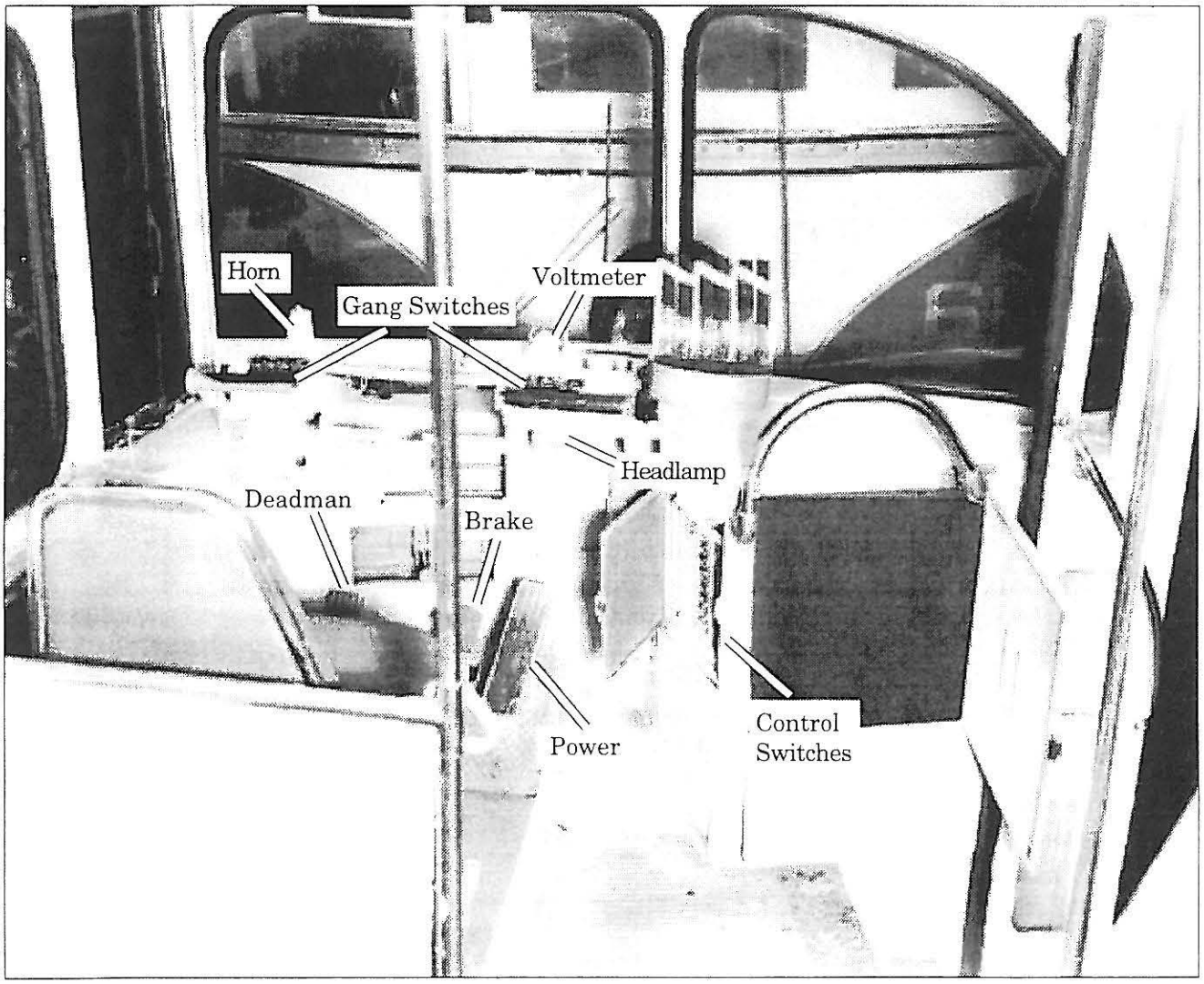


Figure 21. Photograph of Pittsburgh Railways Co. 1711 showing front end controls.

Heat/Ceiling Fans. On is **toward the windshield**. The MG set will come **on** when the top breaker is turned **on.** If it does not, the car is out of order and must not be run, although the car can still be placed on public display. Report all malfunctions on the chalkboard in the substation and complete a car condition report form.

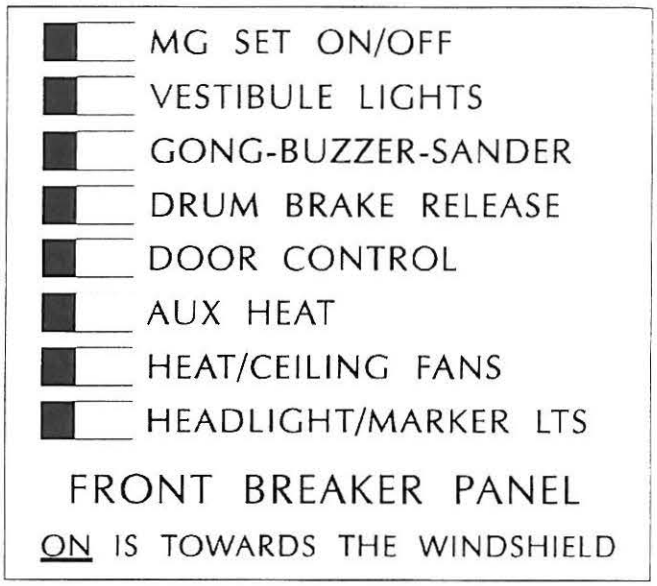


Figure 22. Control Switches

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 this breaker **off.** If this breaker is **on** and it is cold outside, the undercar 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 a while.

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.

5. 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. Make a note of this on the substation chalkboard and power down the car.

OPERATING THE CAR - REAR CONTROLLER

1. Insert the **front hook** in the **front 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.

2. Close all doors using the Gang Switches (figure 21). Walk to the rear of the car.

3. At the backup control panel, set the **Controller** switch to **Backup** position.

4. Insert the **backup hook** into the **backup controller**.

5. The backup control panel is illustrated. Note the following:

   a. The **Horn** and **Gong** switches are spring loaded.

   b. 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.

c. The **Headlight** switch is a three position switch, with the center **off. Up** is the **high** beam; **down** is the **low** beam. Make sure the backup headlight is installed and connected before using this switch.

d. The **Controller** switch has two positions. At 2 o'clock position the front controller is activated and the backup controller is disabled. At the 10 o'clock position the backup controller is enabled and the front controller is cut out.

6. The backup controller has **four** operating positions or points. These are:

a. **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

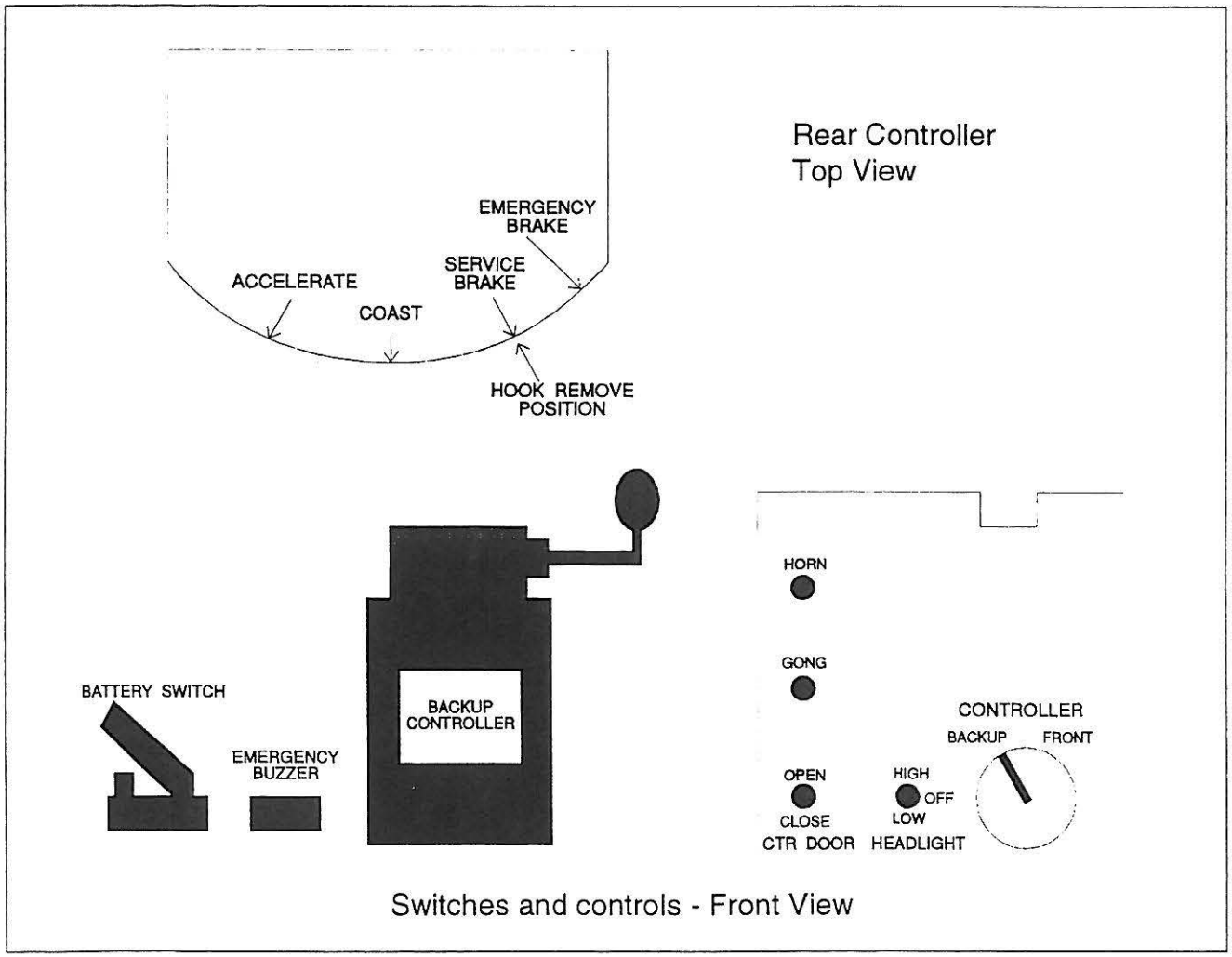


Figure 23. Pittsburgh Railways Company 1711 Rear Controls

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 for braking.

b. **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.**

c. **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.

d. **Accelerate -** This is two positions to the left of **Service Brake.**. In this position power is applied and the drum controller accelerates the car.

7 Sound **three** rings of the gong or blasts of the horn.

8. Move the hook to the left through **Coast** position to **Accelerate.** The car will now begin accelerating.

9. Allow the car to accelerate to the desired speed. The hook can then be moved one position to the right into **Coast.** Doing this will make for a smooth ride.

10. To accelerate again, move the hook one click left to **Accelerate.** When the desired speed is reached move one click right to **Coast.**

11. To brake the car, move the hook to **Service Brake.** Note that there is a constant, non-adjustable braking rate. Good operators will practice stopping using the **Service Brake** to develop a feel for the stopping distance.

12. Always move back into **Coast** when travelling under wire frogs or section insulators. When the car is in **Accelerate** it can be drawing enough power to flash the frog or insulator, possibly causing a dewirement. Remember that you are running **backpole**.

13. 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.

14. 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.

CHANGING FROM BACKUP CONTROLLER TO FRONT CONTROLLER

1. With the backup controller set to **Service Brake,** remove the backup hook and keep it with you.

2. Verify that the center doors are closed and the backup headlight is **off.**

3. Set the **Controller** switch on the backup control panel to the **Front** position (2 o'clock).

4. Replace the seat cushions or hook the safety chain across the handrails on the last set of seats to keep passengers out of the backup controller area.

5. Walk to the front of the car.

6. Set the front hook to the middle position (straight up and down). This sets the reverser to the forward direction.

7. The car is now ready to be operated from the front.

OPERATING THE CAR - FRONT CONTROLLER

1. Verify that the backup controller changeover switch is set to the front controller position. If it is not, the front controller will not work.

2. The pedal arrangement is illustrated.

   a. The left pedal is a **Deadman** pedal and must be depressed whenever the car is run 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 (like an auto).

   c. The right-most pedal is the **Accelerator.** Also like your auto, the farther down you press this pedal, the faster the car will accelerate.

3. The gang switch arrangement is also shown. **On** is **toward the windshield.** Note that there are three main gang switch sections:

   a. Left: **Doors** and **Gong**

      Doors: The two front doors are each on individual switches, while the center doors are controlled by one switch. Develop the habit of holding these 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.

b. Right Near: **Track Switch, Headlight Bright/Dim, Windshield Wiper, Sander**

Track Switch is used to activate an electric switch. Do not hold this switch in the **on** position for an extended period of time or serious damage could occur.

The **Windshield Wiper** should be activated only when the windshield is wet.

The **Sand** switch deposits sand on the rails immediately in front of the leading wheels. Before placing the car into service, check that this occurs and that the sandboxes (located under the front two single seat cushions) are full.

c. Right Far: **Headlights, Interior Lights, Cab Heater**

The **Headlight** should be used whenever the car is in operation. The high beam and/or **Roof Light** may be used at night away from the museum buildings and the highway crossing.

Interior Lights should be **on** whenever the car is operated or is on display for the public.

The **Cab Heater** switch activates the resistance heater in the operator's cab. Use it as needed, but **never** put the car away with this switch **on.**

4. The **Horn** is a button on the dash behind the left gang switch group.

5. The front 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.

OPERATION FROM THE FRONT CONTROLLER

1. Sit in the motorman's seat. Insert the front hook and move it to the vertical position. Be sure that it is securely in the detent; Otherwise, the pedal interlocks may not release the pedals.

2. Close all the doors. The center doors are interlocked with the power circuit; the car can't be moved with the center doors open.

3. Unless needed, verify that the **Cab Heat** switch is **off.**

4. Place your right foot on the **Brake** pedal but do not press down. Push the **Deadman** down all the way and hold it down. The **Brake** pedal will try to come up. Hold it in place, since releasing the **Brake** pedal at this point will release all car brakes.

5. While holding down the **Deadman**, sound two rings on the gong, release the **Brake** and push the **Accelerator** pedal down gradually until the desired rate of acceleration is reached. The car will now start to move Release the **Accelerator** pedal when the desired speed is reached.

   If the **Deadman** pedal when the car is in motion, the car will go into full emergency braking.

6. Coast by releasing the **Accelerator** pedal.

7. To brake, press down the **Brake** pedal. As with your auto, 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.

8. 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.

CHANGING FROM THE FRONT CONTROLLER TO THE BACKUP CONTROLLER

1. While holding the brake pedal about 2/3 of the way in, **slowly** release the **Deadman.**

2. Slowly release the brake. It will latch about 2/5 of the way out, in the **Service Latch** position.

3. Push the Front Hook in the Front Reverser slot (under the seat) all the way back towards the rear of the car.

4. Close all the doors using the Gang Switches (see figure 21). Verify that the "Cab Heat" gang switch is away from the windshield. Walk to the rear of the car.

5. Follow the instructions for the operation of the backup controller.

PREPARING 1711 FOR PUBLIC DISPLAY

1. Put the pole up on the car, and manually open the doors.

2. Turn on the interior lights.

POWER DOWN PROCEDURE

1. Make sure the pedals at the front controller are properly service latched.

2. Remove the hook.

3. Close all the doors except the first door.

4. Open all of the breakers in the front breaker panel.

5. Walk to the rear of the car and open the battery knife switch behind the left seat.

6. Look at the backup control panel. The **Controller** switch should be set to **Front**; the **Center Doors** switch should be **Down,** and the **Headlight** switch should be in the center (**off**) position.

7. Replace the seat back cushions.

8. Walk to the front of the car and exit via the open door. Manually close the door behind you.

9. Pull down and hook the pole.

BACKUP HEADLIGHT

The backup headlight consists of a sealed-beam lamp mounted on a bracket. It mounts into the rear coupler pocket, and the wiring plugs into a twist-lock connecter located undercar.

MOUNTING THE HEADLIGHT

1. Locate pin handle on the right side of the coupler pocket, and raise pin to clear the pocket

2. Insert the headlight bracket into the coupler pocket.

3. Drop the pin, making sure it goes completely through the hole in the headlight mounting and into the other side of the pocket.

4. Make the electrical connection. The receptacle is located under the rear of the car. It is a twist-lock; insert the plug and turn clockwise until it locks (about 1/8 turn). The pins on the plug are of different sizes, so they will connect with the receptacle only one way.

REMOVING THE HEADLIGHT

Reverse the above procedures.

Electric Power

Substation Description

The substation consists of the following controls and panels:

A) AC Circuit Breaker — labeled #3. In the event of a short circuit or other excessive current draw, this device automatically interrupts the flow of AC power to the substation's rectifier. It may be also be operated manually.

B) DC Circuit Breaker — labeled #1. In the event of excessive current flow, this device automatically interrupts the flow of DC power to the trolley wire. It may be operated manually, as well.

C) Control Panel — labeled #2. This panel houses the substation control relays, metering equipment, and controls.

D) Rectifier Panel. This large plexiglas covered panel houses the silicon diodes which convert the incoming alternating current into direct current.

Substation Operation

The various controls of the substation are interlocked to prevent damage to the substation or injury to the operator.

Philadelphia Transportation Co. 2711

2711 is an all-electric PCC and is very similar to 1711. It is also our handicapped - accessible car. Rather than repeating verbatim the various procedures required for 2711, we will here only point out 2711's differences from 1711. Please refer to the 1711 section for reference.

i. POWER UP PROCEDURE

1. **Reverse handles:** There are two handles (hooks), as for 1711. The backup control hook has a special ball (you can also use the silver ball hook from 1711).

2. **Gang Switches on Dash:** As with all PCCs, ON is towards the window. Note that there are two switches that operate the center doors; either one will open/close both door sections.

3. **Pole and Display:** Put the pole on the wire, push open the FRONT door, and go inside the car. Locate the gang switches. The interior light switches (L. INT. LIGHTS and R. INT. LIGHTS) are located on the right side of the gang switch group. Push them both ON (towards the windshield). If putting the car on display, you must also verify that the AUX HEAT and CAB HEAT gang switches are OFF, and that all of the rear seat cushions are in place and the chain is installed across the last row of seats. You may now open all of the doors (manually) and leave the car. Note that it is easier to manually open the center doors from inside, and the front doors from outside. Do not leave any reverse handle(s) in the car if it is on display.

4. **Battery Switch:** The battery switch (breaker) is located in the front of the car, behind the rightmost dash door. This breaker must be ON to start the MG set and move the car (and must be turned OFF when you're putting the car on display or up for the night). First step is to locate the MG SET gang switch on the dash and make sure it is OFF (towards you). Refer to the photographs. The battery switch is a big, bulky breaker that's really located behind the divider between the two doors, but accessed from the rightmost dash door. Close the frontmost car door by hand and open the rightmost dash door. As with car 24, there is 600 volts present in this locker. So for safety, keep your other hand behind your back and don't hold onto anything with it when you reach in. Push the black handled breaker UP all the way, and then close the rightmost dash door (very important to close this door, as the car front door leaf will hit into it when it opens.)

   Do not open the leftmost dash door or touch any of the small breakers located there. All of these breakers must be ON at all times. And, do not touch the snap switch located there, as throwing this cuts out many of the safety interlocks, including the one on the center doors. If you run with the outfolding center doors open, you will smash them, so the interlock here is your insurance policy.

5. **Starting MG Set:** Verify that there is no reverse handle (hook) in the reverser next to the seat, and that both dash doors are CLOSED. Make sure no one is boarding/leaving the car. Locate the MG SET gang switch, and push it ON (towards the windshield). The MG should start. (The doors may move depending on the gang switch settings.)

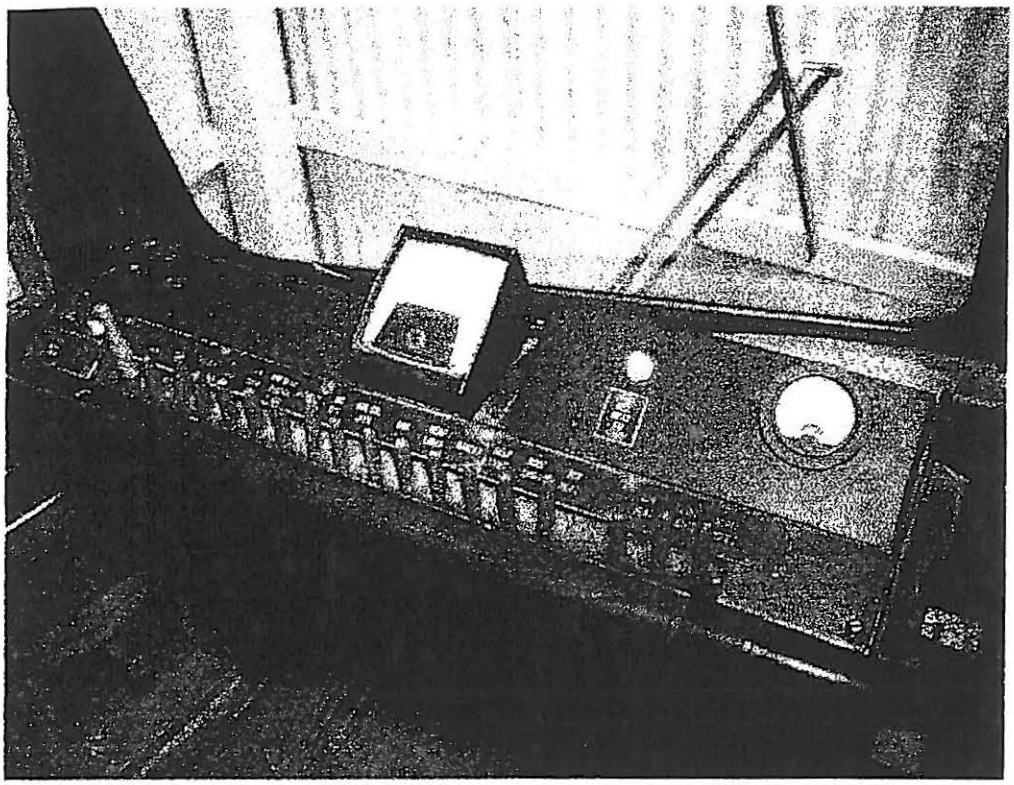


Figure 1 - 2711 Dash and Gang Switches

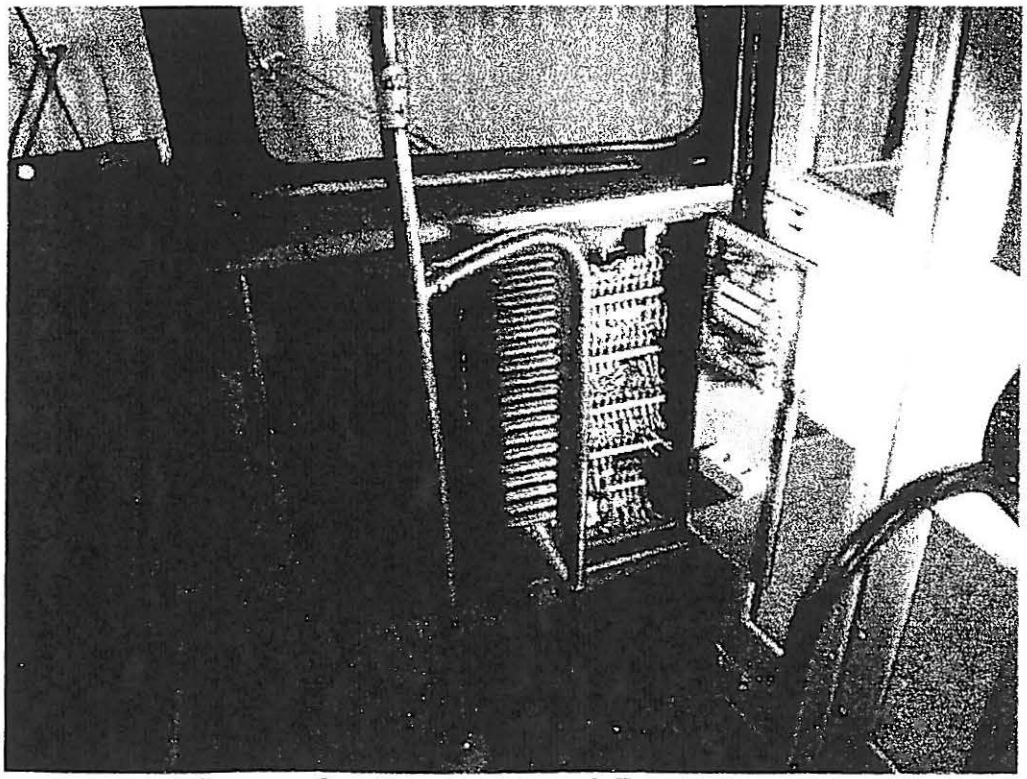


Figure 2 - Right Hand Dash Door -
Battery Breaker is behind vent panel

6. **Dashboard Lights:** Verify that the red and yellow lights on the left side of the dash are lit. The red light indicates that the friction brakes are ON, and the yellow indicates that the center doors are ~~CLOSED~~ OPEN. If one or both of these lights are OFF, verify that the car is in service latch (see 1711 write-up) and the center doors are closed. If either light still remains out, contact the dispatcher and do not run the car. Note that when you open the center doors, the yellow light goes out and the power pedal is dead (propulsion power is cut). Never open the center doors when the car is moving! The red light indicating that the friction brakes are applied should go OFF when you release the brakes, and will normally not come ON again until the dynamic brakes fade out and you're almost stopped.

7. **Voltmeter:** This is the round meter located on the left of the dash. It should read between 33 and 40 volts when the MG set is ON. If not, contact the dispatcher and do not run the car. (The other meter is a speedometer).

8. **Heaters:** All of the heaters in this car work. If heat is desired contact the dispatcher, who will adjust/verify that the damper levers located under the seats near the center doors are set for heating. You can also check the board in the substation to see if 2711 has been set up for heat. For heat, push the AUX HEAT gang switch towards the windshield. The green light on the dash should illuminate. Do not turn ON the Aux Heater without first verifying that 2711 has indeed been set up for heat. If the green dash light is ON with the AUX HEAT gang switch turned OFF, or doesn't come on when the switch is thrown, contact the dispatcher and do not run the car.

   The cab heat can be turned on via the CAB HEAT gang switch at any time. When turning this off, throw the switch quickly.

9. **Reverser:** Before inserting the hook in the reverser, walk to the back of the car and verify that the Changeover Switch on the Backup Control Panel is set to "FRONT CONTROL". Walk back to the front and verify that the pedals are in service latch (see 1711 write-up for details). Insert the hook in the reverser (black top one) with the ball pointing under the seat and set for the desired direction of travel (see below). Check the alignment by pushing down on the power pedal and verifying its free travel (make sure car is in service latch before doing this!)

   The hook positions are the same as with 1711:
   - Hook all the way towards the front = Hook Release/Emergency.
   - Hook straight up and down = Forward .
   - Hook all the way towards the rear = Reverse.

10. **Operation:** The operation of 2711 is exactly the same as 1711 in terms of pedals and their layouts, and the backup controller. Refer to the 1711 portion of this manual for details

11. **Backup Controller:** The backup controller in 2711 is exactly the same as in 1711 and functions in exactly the same manner. Refer to the 1711 portion of this manual for details. The right half of the right rear window in 2711 slides open for visibility and access to the

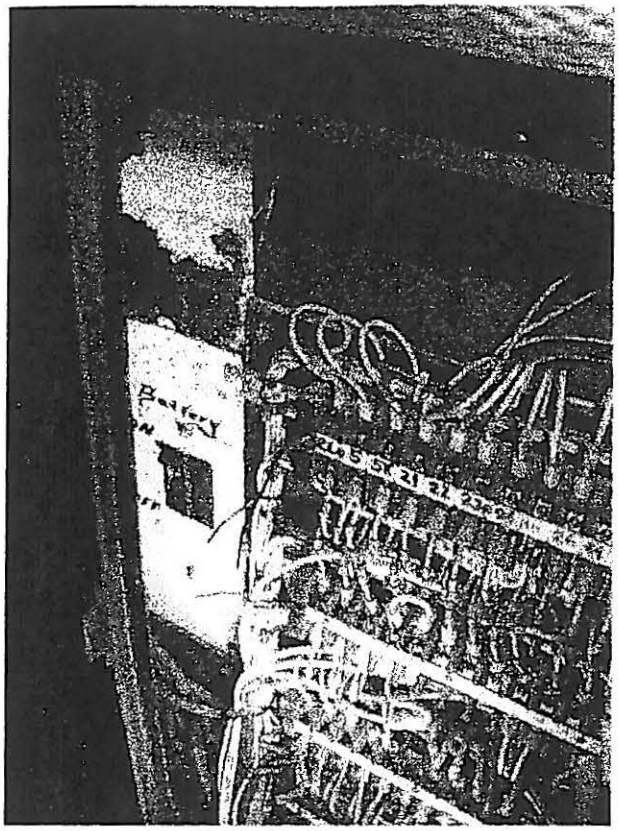


Figure 3 - Battery Breaker

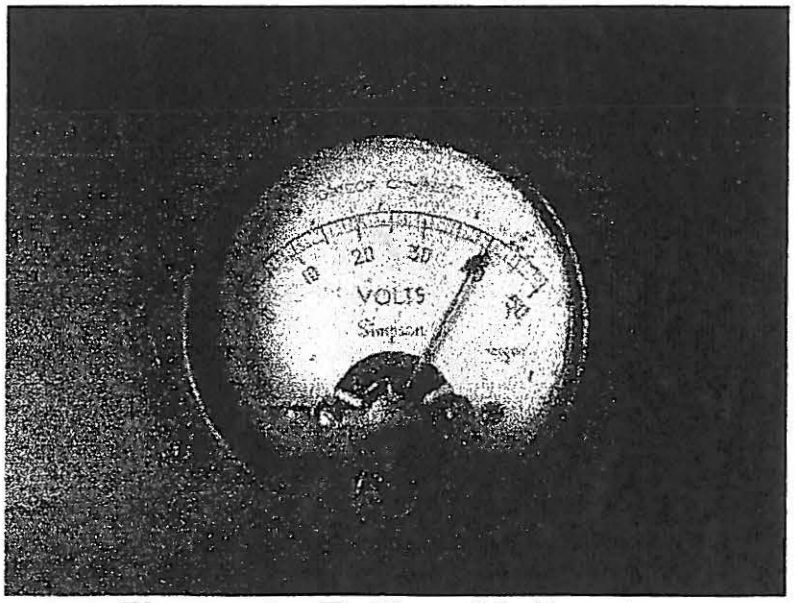


Figure 4 - Battery Voltmeter

pole. Note that if the car is facing out of the carbarn, it will not track most facing wire frogs, especially the ones at Museum Road and Fairgrounds when running from the backup control. Have your conductor turn OFF the MG dash switch before moving the pole if required.

12. **Backup Headlight:** 2711 has its own backup headlight that installs in the rear coupler pocket as in 1711. It has a similar under-car connector. Refer to the 1711 manual for details. Note, however, that the backup headlights for 2711 and 1711 are not interchangeable.

13. **Track Switch:** There is a gang switch on the dash to activate the electric track switch at Museum Road (TRK SW. OPEN). It's operation is the same as that on 1711. Pushing the switch towards the windshield when you pass under the contactor (over the yellow tie) will set the switch to take you into Track 1. Coasting under the contactor will set the switch for the Richfol Platform.

14. **Headlight:** The headlight is turned on with the HEADLIGHT gang switch. Hi/low beam is controlled by the DIM gang switch (towards the windshield is dim). Note that when the headlight is turned ON the dome lights in the ventilators in the center of the car ceiling come on, and the two dome lights above the front door come on when this door is opened. Note that 2711 does not have a roof light.

ii. POWER DOWN PROCEDURE

1. Verify that the backup control Changeover Switch is set to FRONT CONTROL.
2. Close the front doors and open the center doors.
3. Turn OFF the MG set at the gang switch.
4. Open right dash door and turn OFF the battery breaker. Re-close dash door.
5. Turn OFF the interior lights and all other gang switches.
6. Exit by the center door and close the doors by hand. (Did you remember to take both reverse handles?)
7. Pull the pole down and hook to roof of car.

iii. OPERATION

2711 operates just like 1711. But there are special rules you must follow when you are carrying wheelchairs to make their trip safe and pleasant and your job easier:

1. To allow wheelchairs to board through the center doors, you must remove the center door 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 (be careful not to hit the door engine compartment and chip the paint). 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. You must use our hand-operated wheelchair lift as wheelchairs cannot be directly transferred from vans to 2711. Van and truck lifts cannot get close enough because of the outward-folding center doors. Wheelchair lift details are discussed elsewhere in this manual.

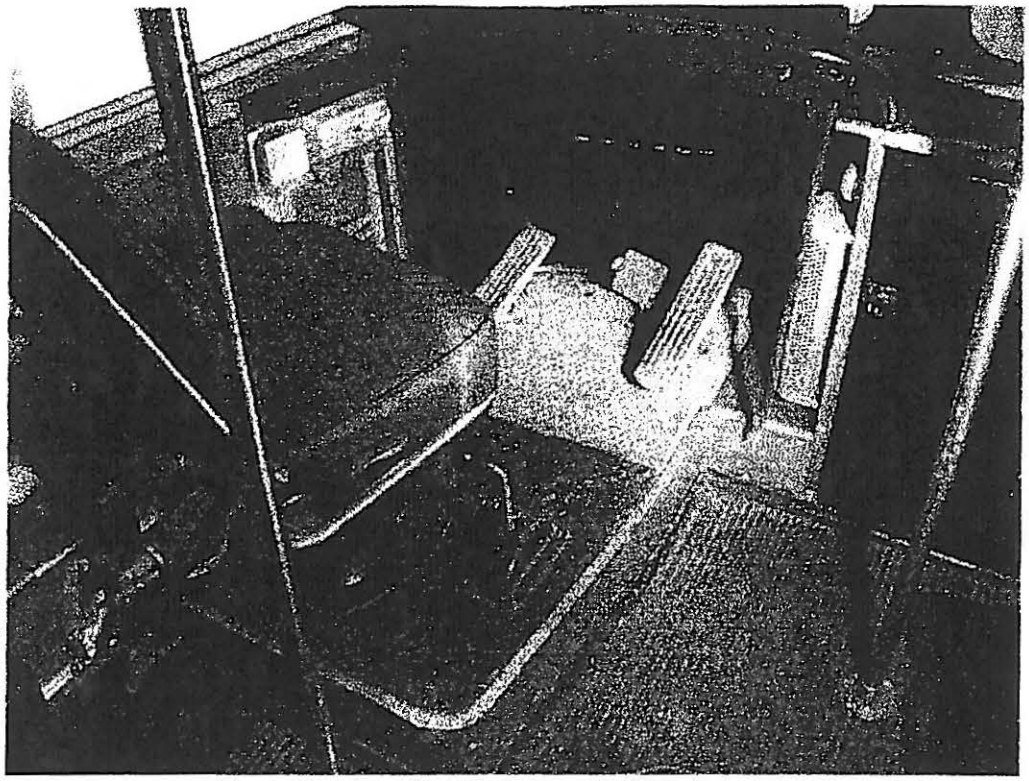


Figure 5 - Pedals and Reverser

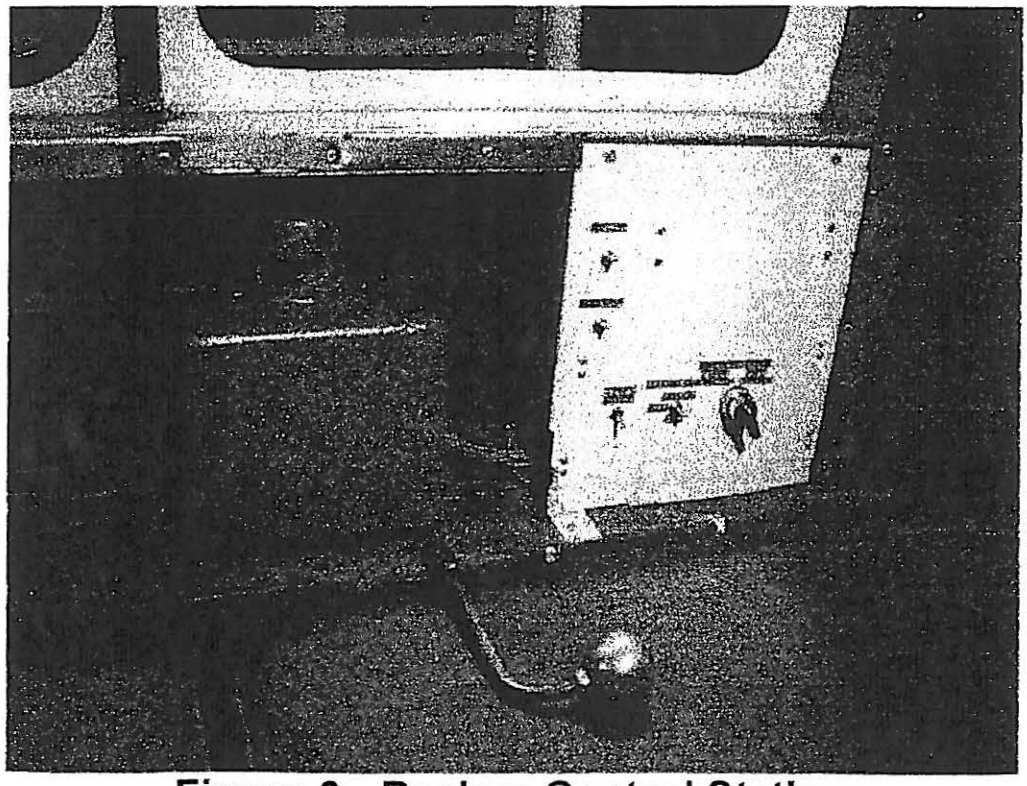


Figure 6 - Backup Control Station

3. Remind wheelchair attendants that they must duck to get in through the center doors if they're pushing a wheelchair! Wheelchair patrons should clear with no 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; have your partner hold it while you fold up and latch the legs under the top, then gently allow it to swing down next 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 aisleways so as to impede access. For safety reasons, aisleways must be kept clear at all times when moving the car! You can accommodate up to 10 wheelchairs without blocking the aisles.

6. We deliberately did not include wheelchair tiedowns. Most transit properties do not use them anymore, and most wheelchair patrons hate them. Thus you must make sure that the brakes are properly set on all wheelchairs before moving the car. This is your responsibility.

7. Wheelchairs must be set facing the front of the car. They may not be set facing transverse (facing the center).

8. When operating with wheelchair patrons, it is your duty to give them the most comfortable ride you can. Avoid fast starts and stops and jerky operation, especially when running from the backup control. And keep the speed down!

9. When operating through the Main Street crossing from the backup control, open the window and stick your head out to get a clear field of view as you do with 1711. You may find it more convenient to remove your hat before doing this. The corner posts in the rear of the car will block your side vision.

10. A two-person crew is required at all times when transporting wheelchairs! The conductor must stand at the far end of the car opposite the operator. The conductor should be watching the wheelchair patron(s) at all times when the car is moving.

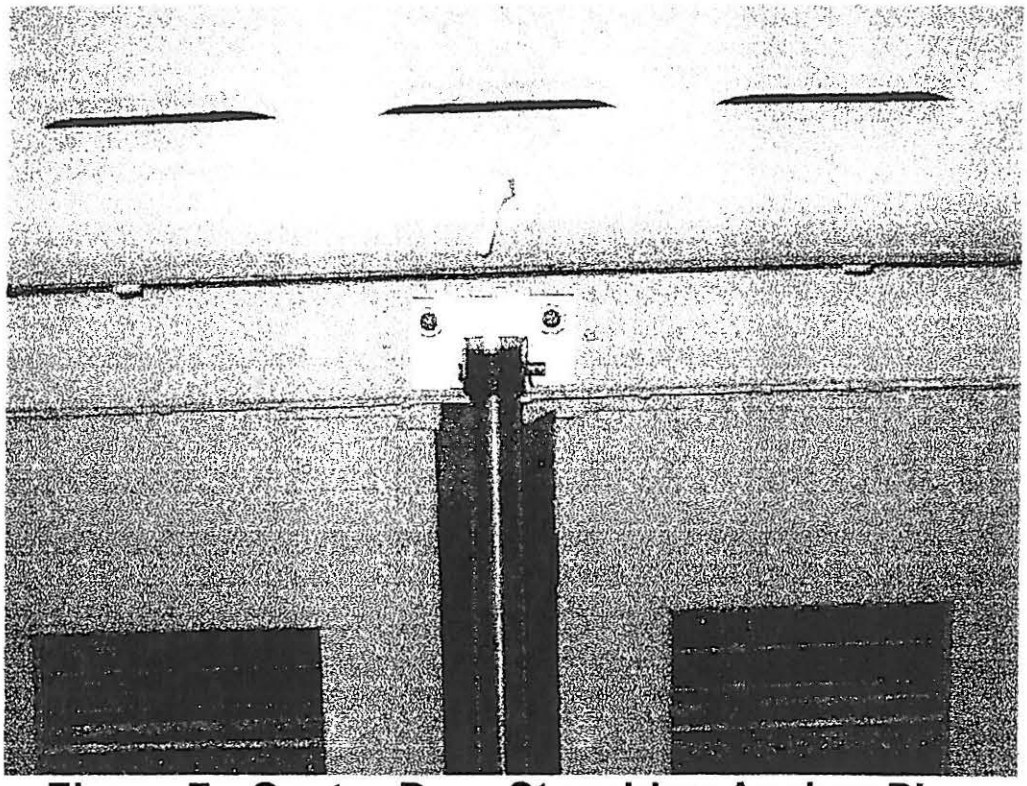


Figure 7 - Center Door Stanchion Anchor Pins

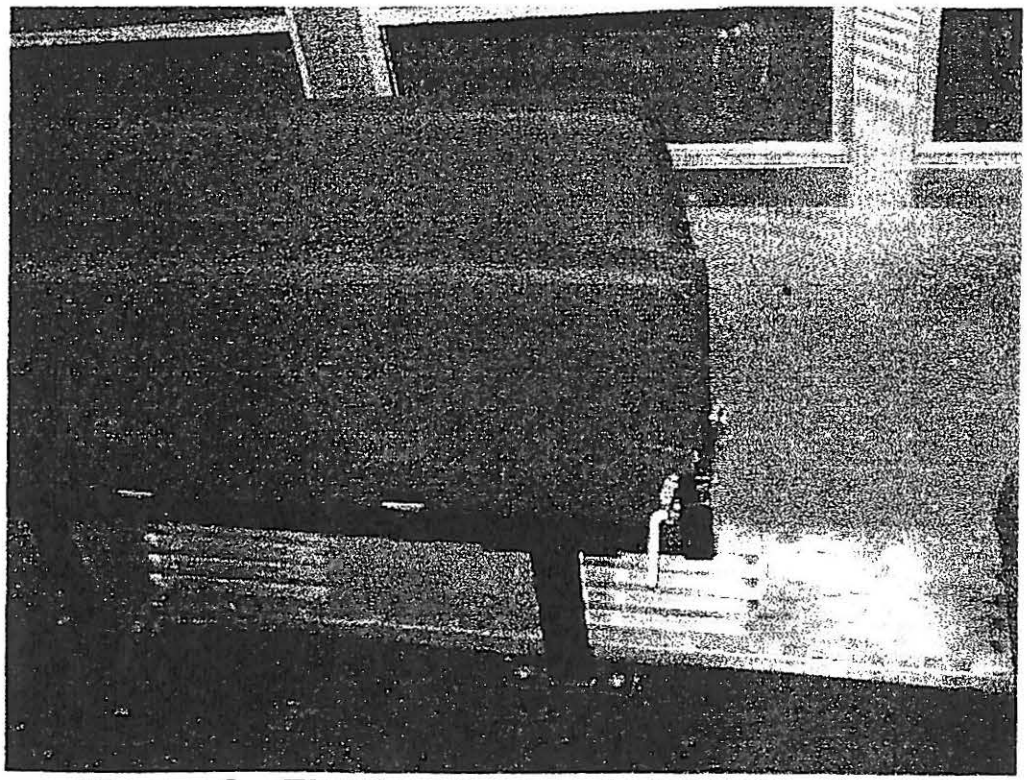


Figure 8 - Flip-Up Seat and Retaining Lever

Start-up sequence

1. Turn the DC breaker (#1) **on** by pushing its large wooden handle upward.

2. Turn on (up) the small toggle switch on the control panel. A loud warning bell will sound, warning that the trolley wire is about to become live. Push the small green button on the control panel to turn off the bell. When all is ready, a green indicator on the control panel will light.

3. Close the AC circuit breaker (#3) by pushing the large red handled switch located on the right side of the box to the **up** position. The AC circuit breaker is sensitive; turn it on slowly. The green light on the control panel will go out, and the red light will come on. The voltmeter should read between 550 and 600 volts.

If for some reason the start-up procedure is followed, but the AC breaker fails to latch in the **on** position (and the bell starts ringing again), press the green button to turn off the bell and start over. If it fails three times, please notify the supervisor.

Shutdown sequence

1. Pull the red handle of the AC circuit breaker (#3) down. The warning bell will sound.

2. Turn off (down) the small toggle switch on the control panel, which turns off the bell.

3. Turn off the DC circuit breaker (#1) by pulling the handle down.

Safety Tips

A) Always keep the cage to the substation locked.

B) In the event of an emergency, the substation can be immediately de-energized by pushing the red emergency shutdown button located to the left of the cage door. (The normal shutdown procedure should then be followed.)

C) In the event of fire, an extinguisher is located near the door of the substation building.

D) Remember that during operation, all substation equipment is live. Do not get curious.

E) The current limiting resistors on the floor can get hot. They should not be covered, nor should air flow to them be obstructed.

If you find a padlock on Breaker #3, it means that work is being performed on the high voltage electrical system. This padlock has only one key, and it will be removed by the person who placed it when it is safe to do so.

Radio Procedure and Dispatching

Two-Way Radio Operation

Because of the concern for safety, Pennsylvania Trolley Museum makes the 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.

Please note that the use of radio equipment does not absolve you of responsibility for safe and professional car operation at the Museum. You are required to know, understand, and obey all rules and regulations. You are expected to know how to operate a car on all areas of trackage under all conditions. This includes understanding and operating under the traditional signal system.

Portable radios of the type used at the Museum have a number of controls which you need to become familiar with. Figure 24 shows the location of these controls; their functions are as follows:

A. 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.

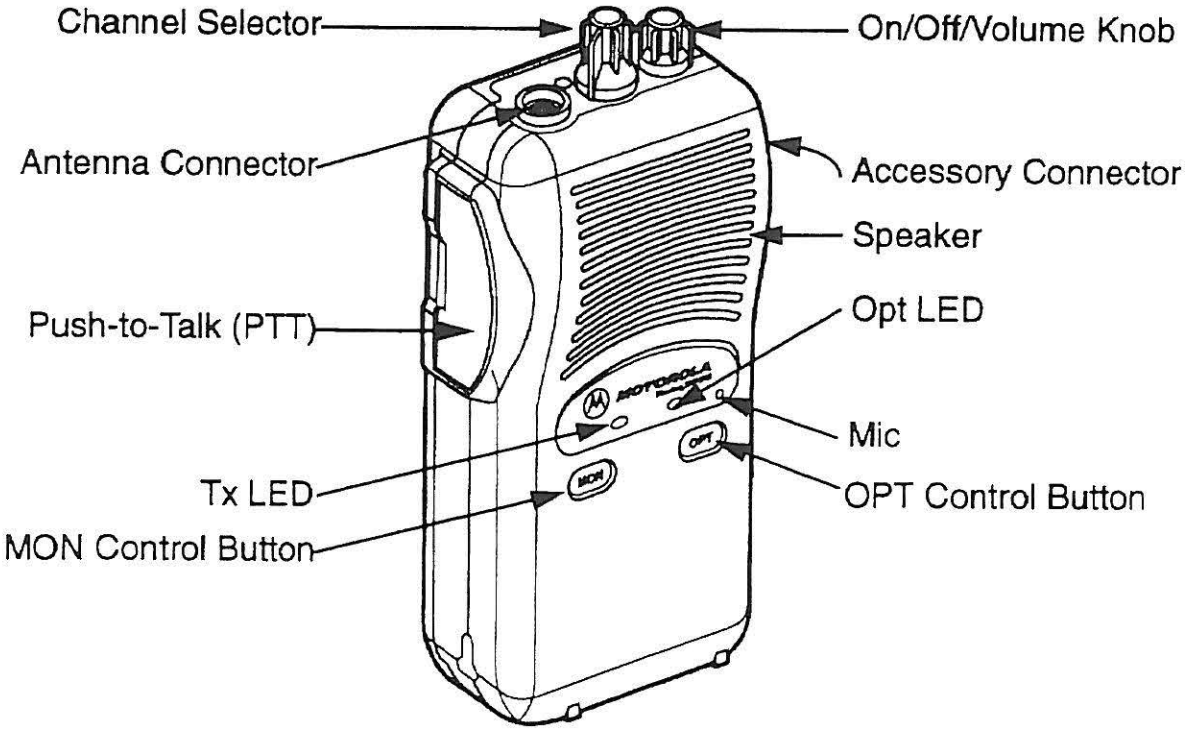


Figure 24. Standard Communications Radio.

B. Channel Selector: This must **always** be set to **"1."**

C. The Push-to-Talk (PTT) 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.

Batteries

A multiple radio charging station is located on the shelf of the radio cabinet in the substation. To recharge, place the entire radio in the charger, **being certain that the radio is turned off.** Upon inserting a radio in the charger, the red "charging" light will light. When the charge cycle is complete, the light will be orange, indicating that the radio is ready for service.

Security

Because of the high price of these units, please return them to the locked metal radio cabinet located in the substation. This will insure that there will always be 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 are to be professional, courteous, and as brief as possible. Generally, personal names are not used; rather, car numbers, assignment titles (such as "Dispatcher") or membership 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 - **WPLD754,** 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: "WPLD754, Pennsylvania Trolley Museum commencing daily operation; standby for radio check".

The FCC encourages the use of "10-codes" to reduce transmission time. These are the

spoken word ten, followed by another number, serving to replace several other words frequently used in radio transmissions. While we do not expect our operators to memorize all of the nearly 100 codes, it is well to become familiar with the most common and most appropriate codes are as follows:

10-1 - Receiving poorly
10-3 - Cease transmitting
10-4 - Received and understood (probably the most frequently used)
10-7 - Out of service
10-8 - Back in service
10-10- Standing by (as in "standing by for further orders")
10-20- What's your location?
10-33- Emergency
10-45- Accident
10-62- Cannot copy your transmission

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 Fair Grounds Siding. Hold at Fair Grounds for a meet with M283."
Op. 832: "10-4 Dispatch, 832 clear to Fair Grounds Siding, hold for a meet with M283."
Dispatch: "Dispatch to M283, you are clear to Fair Grounds Siding. Hold at Fair Grounds for a meet with car 832."
Op. M283: "10-4 Dispatch, M283 clear to Fair Grounds Siding, hold at Fair Grounds for a meet with car 832."

3. Car 832 meets M283 at Fair Grounds Siding.

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 Fair Grounds 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 Fair Grounds to Arden Loop.

   Op. 5326: "5326 to dispatch, request clearance from Arden Loop to Richfol Platform."
   Dispatch: "10-4 5326, you are clear to Fair Grounds Siding only. Hold at Fair Grounds for a meet with M210. M210 will work on signal repair."
   Op. 5326: "10-4 dispatch, 5326 clear to Fair Grounds only, hold at Fair Grounds Siding for a meet with M210."

4. M210 meets car 5326 at Fair Grounds 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: "Dispatch to M210, you are clear to work on signals from Fair Grounds to Arden Loop. Next outbound car leaves Richfol at 2:45. Call me with your location at 2:40 to arrange the meet."
   Op. M210: "10-4 dispatch, will call at 2:40."

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

1. Instruction car 24 is given clearance by dispatch to run from track one to Pittsburgh end of line and back to Museum Road as instruction requires.

2. Regular scheduled car 66 running on the time table departs Richfol outbound to Pittsburgh.

3. Five minutes before car 66 departs, dispatch contacts car 24.

Dispatch: "Dispatch to 24, what is your location?"
Inst. 24: "24 to dispatch, outbound approaching Allison.
Dispatch: "10-4 24, proceed to Pittsburgh end of line, hold at Pittsburgh for car 66."
Inst. 24: "10-4 dispatch, car 24 hold at Pittsburgh for car 66."
Dispatch: "Dispatch to 66, be advised that car 24 is holding at Pittsburgh, proceed per time table."
Op. 66: "10-4 dispatch, 24 holding at Pittsburgh, 66 to proceed per time table.

4. 66 departs Richfol on time proceeds to Pittsburgh end of line and departs inbound on time.

Dispatch: "Dispatch to 24, you may resume instruction operation."
Inst. 24: "10-4 dispatch, 24 resuming operation."

Location/Stop Designations

A set of uniform location designations has been adopted for use on the railway. Please become familiar with the map on the next page (figure 25), which shows each key location or stop and the proper name for that location. 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:

A. Only museum operators, instructors, maintenance crews or other authorized personnel are to use the radio system.

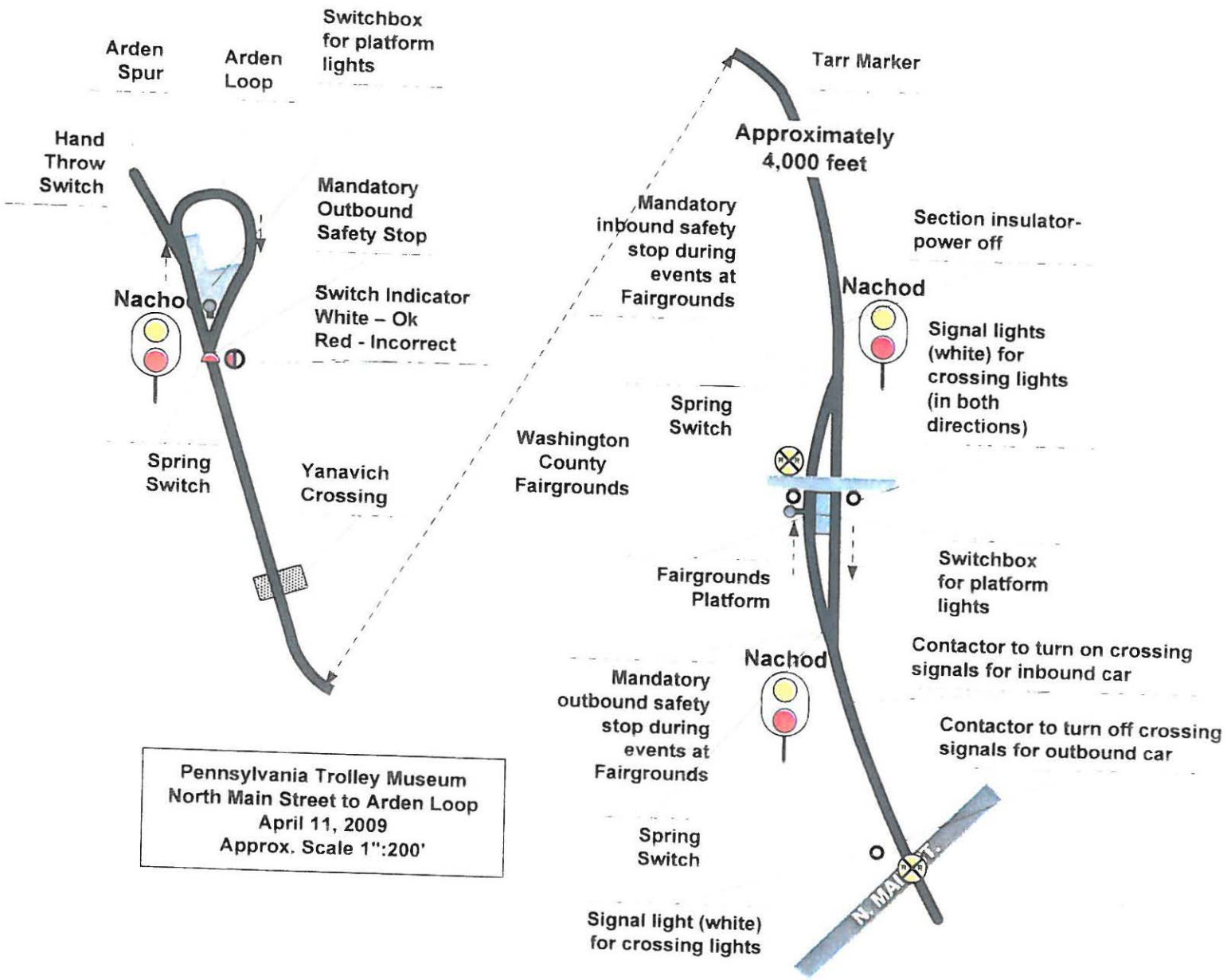
B. Upon removing a radio from the cabinet and signing it out on the form provided, you are responsible for it. Don't leave it unattended. Transfer it only to an operator who is replacing you, or return it (turned off) to the cabinet in the substation and sign it in.

C. Friends, relatives, guests, and **passengers** are not to have access to radios at any time.

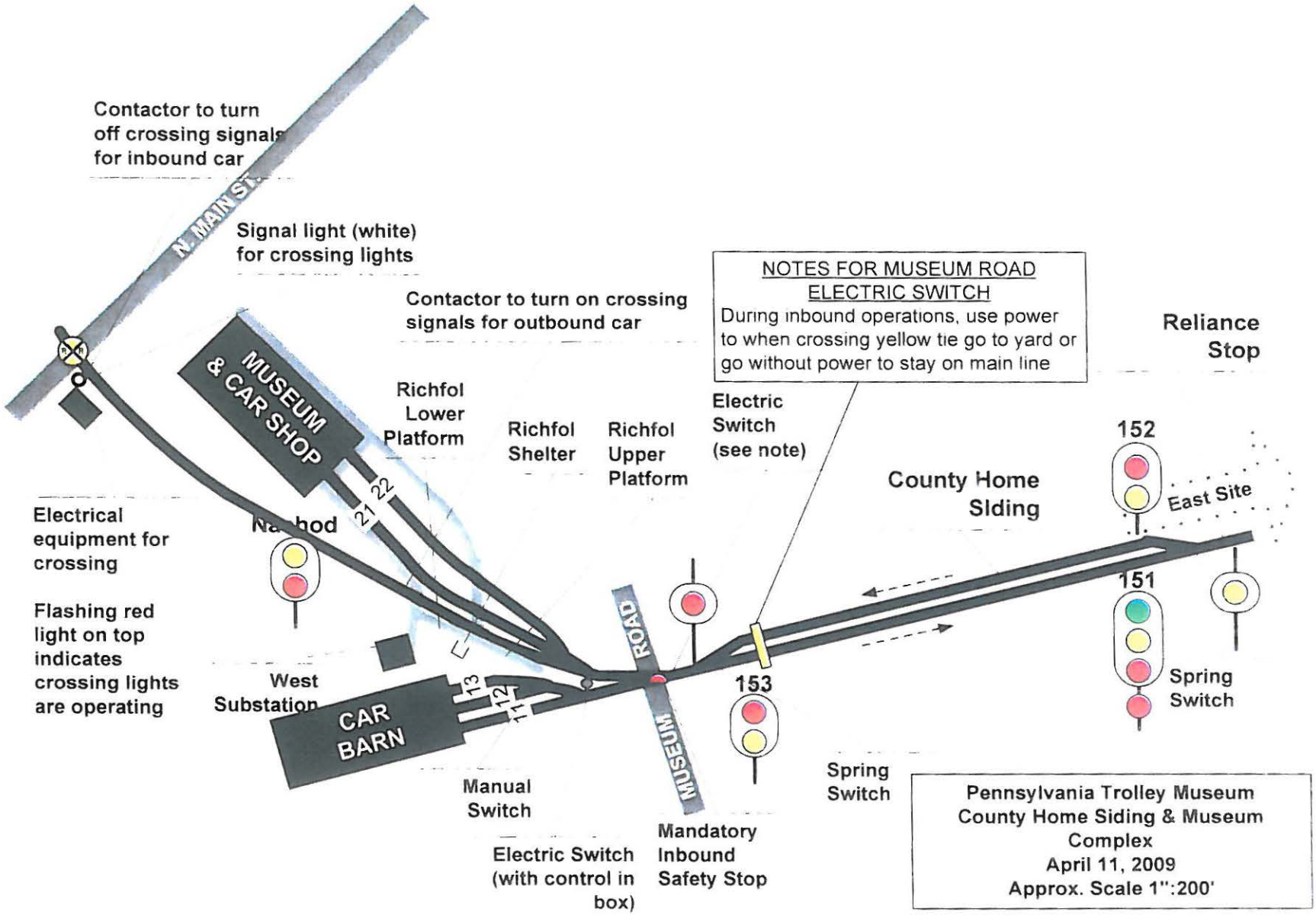
D. Keep communications reasonably discreet. Although radio volume controls must be set high enough to hear communications above ambient noise, don't turn your radio up so loud that the passengers can hear every word.

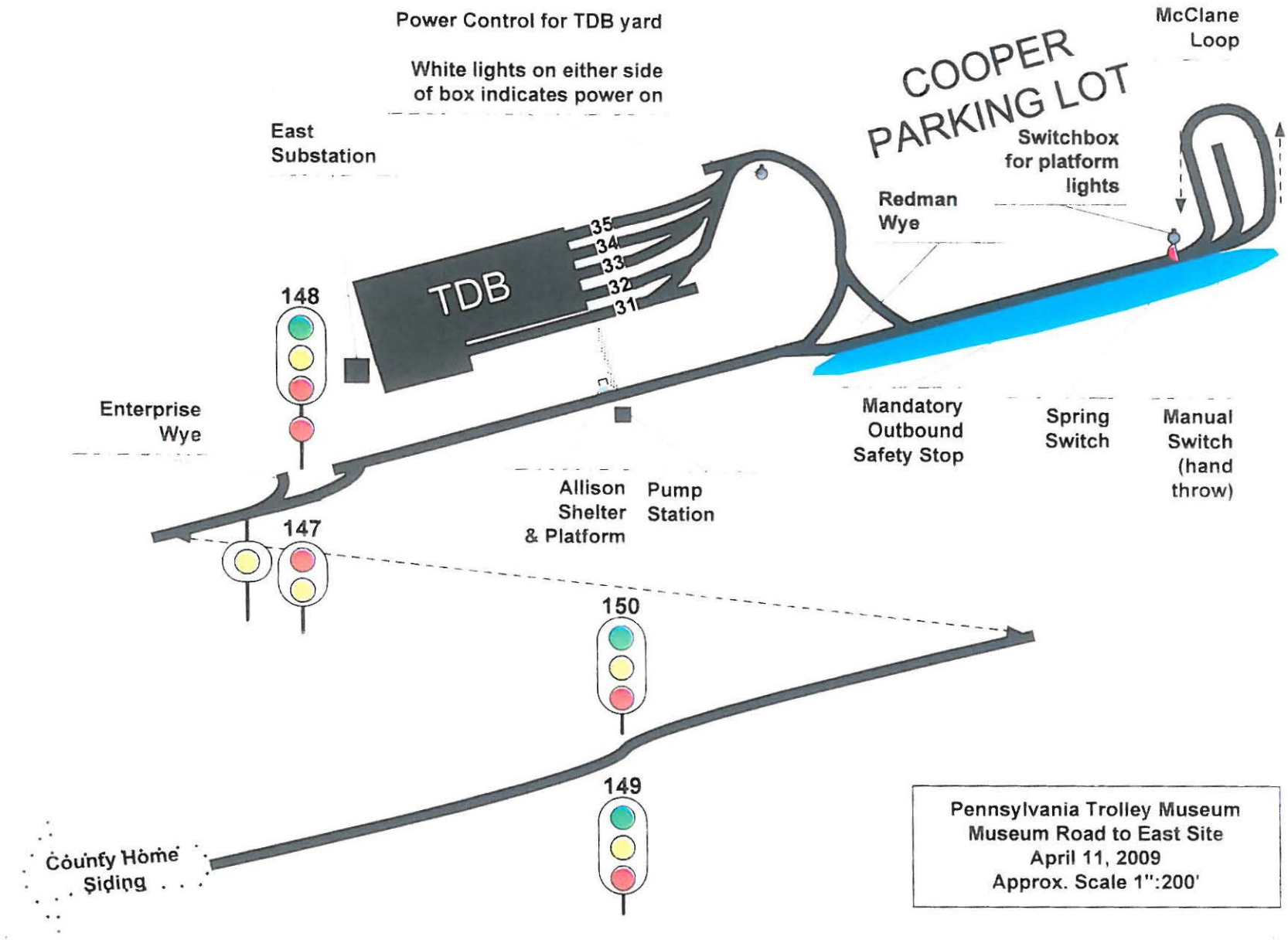
E. Personal messages or horseplay on the radio are forbidden.

F. 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.



Pennsylvania Trolley Museum
North Main Street to Arden Loop
April 11, 2009
Approx. Scale 1":200'


Contactor to turn off crossing signals for inbound car
N. MAIN ST.
Signal light (white) for crossing lights
Contactor to turn on crossing signals for outbound car
NOTES FOR MUSEUM ROAD ELECTRIC SWITCH
During inbound operations, use power to when crossing yellow tie go to yard or go without power to stay on main line
Reliance Stop
MUSEUM & CAR SHOP
Richfol Lower Platform
Richfol Shelter
Richfol Upper Platform
Electric Switch (see note)
152
County Home Siding
East Site
Electrical equipment for crossing
Flashing red light on top indicates crossing lights are operating
West Substation
CAR BARN
13
12
11
21
22
ROAD
MUSEUM
153
151
Spring Switch
Manual Switch
Electric Switch (with control in box)
Mandatory Inbound Safety Stop
Spring Switch
Pennsylvania Trolley Museum
County Home Siding & Museum Complex
April 11, 2009
Approx. Scale 1":200'


Power Control for TDB yard
White lights on either side of box indicates power on
McClane Loop
COOPER PARKING LOT
East Substation
Switchbox for platform lights
Redman Wye
TDB
35
34
33
32
31
148
Enterprise Wye
Mandatory Outbound Safety Stop
Spring Switch
Manual Switch (hand throw)
Allison Shelter & Platform
Pump Station
147
150
149
County Home Siding
Pennsylvania Trolley Museum
Museum Road to East Site
April 11, 2009
Approx. Scale 1":200'

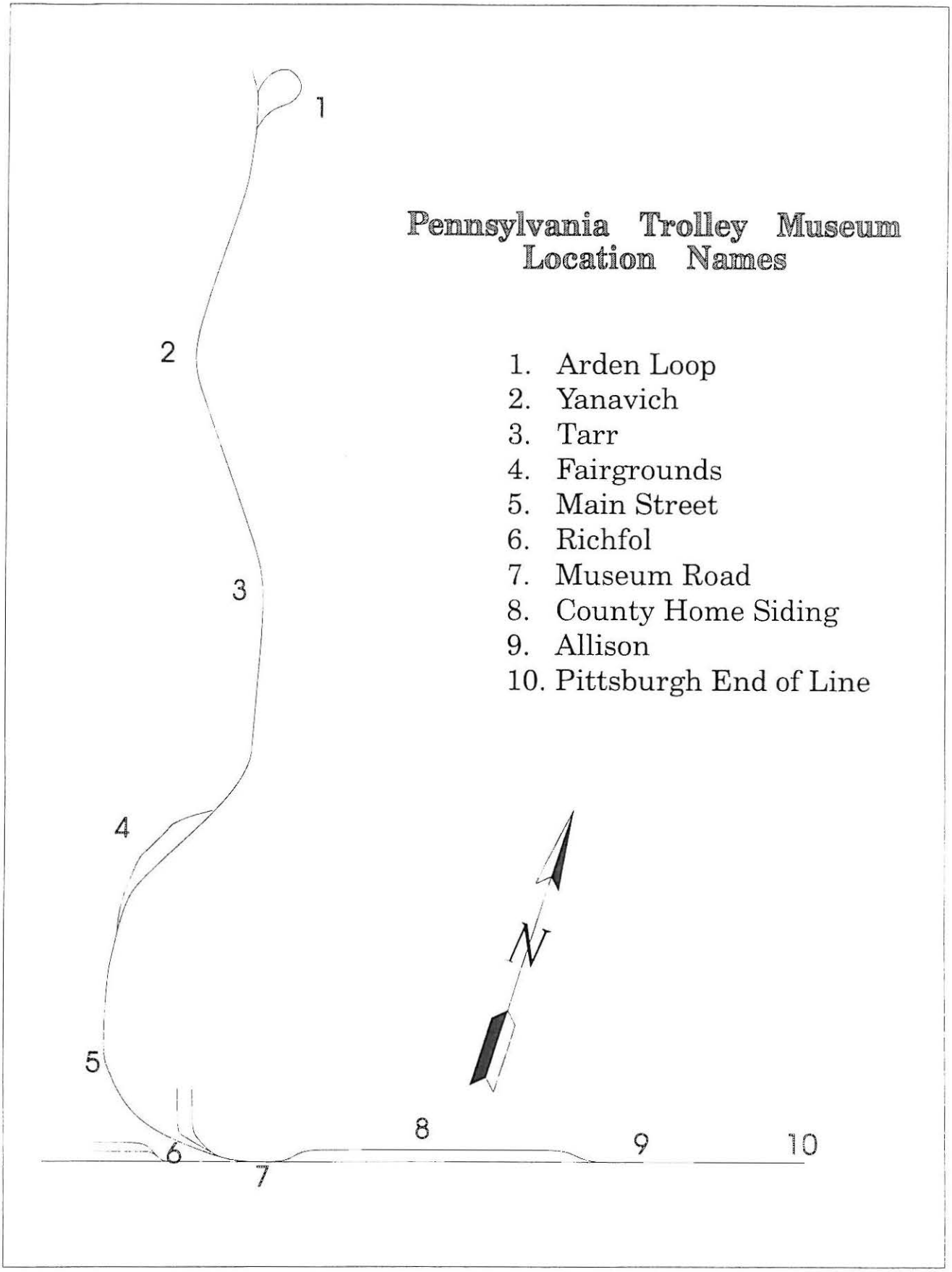


Figure 25. Location Map

G. 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.

H. Although the radios are built sturdily, they are not shockproof. Do not bang them around or drop them.

ALWAYS TAKE A RADIO WITH YOU WHEN YOU OPERATE A CAR.

Dispatching

A **Dispatcher** or **Supervisor of the Day** will be assigned to oversee all weekend, event 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, bulletin boards, books and registers.

The **Dispatcher** will have jurisdiction at all times over movements of all rolling stock, crew assignments and car assignments.

Museum Store personnel may not serve as Dispatcher. 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 other scheduled **Dispatcher**, the Executive Director shall dispatch when there is more than one streetcar on the line. When only one car is active, the operating crew shall determine movement of the streetcar, dependent on visitor attendance.

Tour Dynamics

"If trolleys could talk, what a story they could tell...!"

- Our **business** is preservation and interpretation.
- Our **product** is the **Visitor Experience.**
- It's your job to make it educational **and** enjoyable!
- **The visitors are our guests; treat them as you would house guests.**

Essential Points

1. Establish your authority with a proper uniform.
2. Show visible leadership.
3. Use movement motivation to create a more dynamic tour.
4. Employ good time discipline (18 minutes).
5. Cite our guidebook as a means of enabling them to learn more.

Group Tours

1. Check the group tour sheet to see where the group is from so you can personalize the tour and build rapport with the group.
2. Greet the bus and make contact with the group leader. The welcome them through the public address system in the bus. Point out the location of the rest rooms and stand by as they get off. Have the group leader pay at the Museum Store and get the tickets. Take them through the exhibit if there's time (or do it later if there's not).
3. Lead the group to the trolley and allow them to board. When the ride is over and if a second tour guide is available, try to split them into two groups, one going to the car house and the other to the shop. Switch buildings midway, and after 18 minutes take them to the store.
4. Thank the group leader for coming and suggest that they bring other groups to us. Before the bus leaves, get on board and thank the people through the public address system for coming to visit us. Ask them to tell their friends about us, and have brochures available for this purpose. If it's a school group, give them coupons so they can bring their parents back with them another time.

Accident and Incident Procedures

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

In the event of an accident involving PTM equipment, an operator involved in an accident 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. After 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 above the time clock. 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.

POLICY AND PROCEDURES
FOR REPORTING INCIDENTS AND VEHICLE ACCIDENTS
February 25, 2009

POLICY

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.

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.
- 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:

1. 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.
2. Reports should be prepared on an individual basis without consultation between the people preparing reports as to what occurred, etc.
3. 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.
4. 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.
5. 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.
6. 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.

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
- damage, 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.

ADDIONAL COPIES OF POLICY AND FORMS CAN BE VIEWED AND PRINTED ON THE PTM OPERATIONS WEBSITE (http://ptmops.org)

PENNSYLVANIA TROLLEY MUSEUM
Washington, PA

INCIDENT REPORT

Received by: _____

Date Received: _____

An incident report should be submitted on this form in any situation that represents a deviation from normal museum operating procedures but DOES NOT involve a vehicle accident. Incidents include, but are not limited to events such as those listed in the TYPE OF INCIDENT section below. As a general rule, if an event occurs that requires some follow-up action, then an incident report should be filed.

In situations involving injury or illness, prepare a separate report for each injured or ill person.

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.

See document entitled POLICY AND PROCEDURES FOR REPORTING INCIDENTS AND VEHICLE ACCIDENTS for additional information about Incident Reports including instructions on where to file the report.

REPORT SUBMITTED BY: _____ _____ _____
NAME MEMBER # PHONE #

DATE OF INCIDENT: _____ TIME OF INCIDENT: _____ ☐ AM ☐ PM

LOCATION OF INCIDENT: _____

TYPE OF INCIDENT
- ☐ Complaint or problem involving public
- ☐ Damage, theft or loss of property
- ☐ Operation problem
- ☐ Other _____
- ☐ Illness
- ☐ Injury
- ☐ Staff or Volunteer Issue

SUBJECTS (other than person preparing report) WHO WERE INVOLVED IN INCIDENT:

	NAME	ADDRESS	PHONE #	AGE
1				
2				
3				

DETAILED DESCRIPTION OF INCIDENT ☐ Description on separate Page

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

☐ Continued on additional page

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CAUSE(S) OF INCIDENT (if known): ☐ Cause(s) on separate Page

☐ Continued on additional page

DESCRIBE DAMAGE, ILLNESS OR INJURY (as applicable) ☐ Information on separate Page

☐ Continued on additional page

ACTIONS TAKEN:
- ☐ Contacted 911 for EMS, fire or police assistance – describe responses & times
- ☐ Transported subject to doctor, hospital or other location – describe below
- ☐ Contacted other parties to provide assistance to subject – identify name, address & phone number below and describe results of contact
- ☐ Subject refused assistance – describe assistance that was offered
- ☐ Actions taken are on a separate page

☐ Continued on additional page

WITNESSES: ☐ Additional witnesses on separate page

	NAME	ADDRESS	PHONE #	AGE
1				
2				
3				

SIGNATURE OF PERSON PREPARING REPORT DATE PREPARED DATE SUBMITTED

VEHICLE ACCIDENT REPORT

PENNSYLVANIA TROLLEY MUSEUM Washington, PA

Received by: _____

Date Received: _____

A vehicle accident report should be submitted on this form in the case of any vehicle accident (rail, road, off-road, support equipment, etc.) involving other vehicles, pedestrians and/or stationary objects.

Each PTM member involved in or witnessing an incident should file a separate report. Persons who are not associated with PTM but who were either involved in or witnessed the accident may also use this form (to the extent that it applies to them) to provide information about an accident.

Reports should be submitted directly to the Executive Director immediately after seeking medical attention and/or other required assistance. If this is not possible, mail or otherwise arrange for delivery of the report to the Executive Director.

See document entitled POLICY AND PROCEDURES FOR REPORTING INCIDENTS AND VEHICLE ACCIDENTS for additional information about Vehicle Accident Reports.

REPORT SUBMITTED BY: _____ _____ _____

NAME MEMBER # PHONE #

DATE OF ACCIDENT: _____ TIME OF ACCIDENT: _____ ☐ AM ☐ PM

LOCATION OF ACCIDENT: _____

WEATHER CONDITIONS:
- ☐ Clear
- ☐ Cloudy
- ☐ Rain
- ☐ Snow (sticking to ground)
- ☐ Snow flurries
- ☐ Sleet or Ice
- ☐ Fog/other reduced visibility
- ☐ Other (attach explanation)

RAIL/ROAD CONDITIONS:
- ☐ Dry
- ☐ Wet
- ☐ Icy
- ☐ Snow Covered
- ☐ Muddy
- ☐ Leaf Covered
- ☐ Off-road
- ☐ Other (attach explanation)

If accident occurred at Main Street or Fairgrounds, were crossing signals working?
☐ Yes ☐ No (explain why not)

If accident occurred at Main Street was rail vehicle sounding its horn?
☐ Yes ☐ No (explain why not)

If accident occurred in a signal controlled are (USS or Nachod), did the signals appear to be working properly?
☐ Yes ☐ No (explain why not)

TM VEHICLES (rail, road or other) INVOLVED IN ACCIDENT:

VEHICLE NUMBER	OPERATOR (Name & #)	CONDUCTOR (Name & #)	LOCATION	DIRECTION OF MOVEMENT	ESTIM-ATED SPEED	HEADLIGHT & MARKER LIGHTS ON (explain if No)
						☐ Yes ☐ No
						☐ Yes ☐ No

☐ PTM personnel other than person preparing report on vehicles-identify on separate sheet
☐ Problem with a vehicle prior to accident-explain on separate sheet

NON-PTM VEHICLES INVOLVED IN ACCIDENT:

☐Car ☐Truck ☐Van ☐Bus ☐Motorcycle ☐Bicycle ☐Other _____

VEHICLE: Year _____ Make _____ Model _____ Color _____

License # _____ State _____ VIN (Serial) # _____

Insurance Company _____ Policy Number _____

	NAME	ADDRESS	CITY	STATE	ZIP CODE	PHONE
OWNER						
DRIVER						

DRIVER: License State & #: _____ Birthday _____ # OF PASSENGERS ____

VEHICLE: Location _____ Direction of Movement _____

Point of Impact _____ ____ Additional vehicles on separate form 25Feb09

WITNESSES: ____ Additional witnesses on separate form

NAME	ADDRESS	CITY	STATE	ZIP CODE	PHONE

POLICE ON SCENE: Department _____ Officer(s) Name & Badge #:_____

Citations issued to / for _____

EMS ON SCENE: Department(s) _____

FIRE/RESCUE ON SCENE: _____

NARRATIVE:

Write a narrative of the accident that includes the following sections:

1. Conditions and events leading up to the accident (what where you doing, etc.).
2. Detailed description of the actual accident. Include the actions taken by you (if you were operating one of the vehicles) and the observed actions of other vehicles and/or persons.
3. Results of the accident including injuries, vehicle damage and property damage.
4. Actions taken following the accident including treatment of injured, removal of vehicles (towed, driven, etc.) and assistance (offered and provided) to all parties involved in the accident.
5. Any other information that relates to this accident.

Be factual and concise in writing the narrative. Do not guess or speculate. Report what you did or did not do, what you saw, what you heard (including who said it) and what you were told (including who told it to you). You may substitute a typewritten narrative for a handwritten narrative being sure to sign the type written narrative.

☐ See attached typed narrative

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ ☐ Continued on additional page

_____ _____ _____

SIGNATURE OF PERSON PREPARING REPORT DATE PREPARED DATE SUBMITTED

ACCIDENT & INCIDENT REPORT CONTINUATION PAGE

☐ ACCIDENT
☐ INCIDENT

REPORT SUBMITTED BY: _____ DATE OF ACCIDENT/INCIDENT _____

LOCATION: _____ PAGE #: _____

☐ Continued on additional page

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