Fort Collins Municipal Railway
Equipment Operations Manual

Effective May 1, 2020

Car 21 eastbound on Mountain Ave. providing a charter on June 21, 1989.

Fort Collins Municipal Railway Society
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Welcome Aboard!

Thanks for volunteering with the Fort Collins Municipal Railway (FCMR). We're glad you joined the team on the restored historic Birney Cars 21, 25, and the line from our Mountain Ave. carbarn to City Park and Howes Street.

This manual will acquaint you with our operation, including procedures and rules that we follow to ensure that each trip is safe and enjoyable. If you have questions not answered here, don't hesitate to ask. After becoming familiar with your duties and are ready to work on the car, you'll want to get an account on our online crew schedule. See "Online schedule registration" in Chapter 1. In order for our insurance to be effective, be sure to send in your dues each year and have your newest membership card with you on the car. All volunteers on the car must be active members in our Society prior to the annual spring training/certification events.

Car 21 operating in front of the Avery House in 2017

Manual history

- Conductor training version, April 2006. First complete edition, September 2006
- Edition 2, June 2009; rev: August 2009
- Edition 3, May 2010; Fourth edition, May 2011; Fifth edition, May 2012
- Edition 4, May 2014, Minor rev's.
- Edition 5, May 2015, Appendix H added.
- Edition 6: May 2017: Motorman training checklist added to Appendix C; minor revs.
- Edition 7: May 2018: Revised Chapter and Appendix structure, added to electrical components section. Updated Index. Minor revisions.
- Edition 8: May 2019: Minor revisions and additions
- Edition 9: May 2020: Minor revisions and added operation for car 25

This manual governs Car 21 AND Car 25 operations and replaces instructions in all previous editions, including:

- Motorman and Conductor Training Manual, March 1985; revised August 1988.
- Motorman Training Manual, Third Edition, June 1995.
- Conductor's Manual: 1994, revised 2004.

The latest version of this manual is available at: **www.fortcollinstrolley.org/docs/OpsMnl.pdf** and on the FCMRS crew scheduling home page.

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Introduction

Car 21 boarding Passengers at Howes St (2019)

About the FCMRS

Car #21's restoration was started by a dedicated group of volunteers and is operated by the all-volunteer, non-profit organization, Fort Collins Municipal Railway Society. FCMRS rebuilt 1.6 miles of track, constructed the carbarn on Mountain Avenue, strung the overhead line, built a DC power supply, and sold it all to the City for $3! Our operating and restoration expenses are paid through fares, souvenir sales, membership dues, and donations. Our largest annual expense is insurance. UPDATED

Our Mission

Acting in partnership with the Fort Collins Museum, we operate the Fort Collins Municipal Railway to present a living history of electric public transportation in Fort Collins. We shall preserve, display, operate, and interpret streetcar service, and collect artifacts and information of an educational nature and of significance to the City's electric railway.

We are excited about operating Fort Collins streetcar #25 this year after its long absence. Improvements to the car barn at Mountain Ave have been made to make space for both cars. UPDATED

Be sure to direct anyone interested in joining us to our website listed on the yellow handout available on the car. New and renewal members get an annual membership card with a six-ride pass, plus FCMRS activity updates in our ***Trolley Fare*** newsletter.
For more about us and FCMR history, see our website: **www.fortcollinstrolley.org**

Conductor Kelly Zweifel deboarding passengers at Howes St. in July 2007.

How to Use This Manual

If you're a student motormen or conductor, read this manual completely prior to hands-on training. If you're an experienced volunteer on Car 21, be sure to review all sections labeled NEW! for new information and UPDATED for important changes. You may also find it helpful to review your job procedures at the start of each operating season: motorman's procedures are in Chapter 3 and conductor's procedures are in Chapter 4.

Please pay special attention to information in boxes throughout the manual:

- **Notes:** Provide hints or explains why a particular procedure is needed.
- **Cautions:** Describe where non-compliance could cause damage to equipment.
- **WARNINGS: Identify situations where non-compliance could cause injury or death.**

Note: Motorman and conductor procedures, rules and training described in this manual have been approved by the FCMRS Board to ensure safe and efficient operation. No individual has the authority to deviate from or instruct others to deviate from these procedures.

Chapter 1: General Information

Barn Alarm Procedures

UPDATED

The Mountain Ave barn has an alarm system that is programmed to be automatically enabled. If you need to enter the barn during times other than normal weekend shifts, you will need to deactivate the alarm. Your instructor can provide the required code and password to deactivate the alarm and avoid authorities arriving within minutes. The FCMRS crew scheduling home page also has alarm company information.

Overhead Wire Power Signal

UPDATED

The two-light signal in the barn indicates when the overhead wires in the barn and outside the barn are energized. As explained in Chapter 3, the inside overhead wire is energized whenever the power supply POWER and BREAKER switches are ON. This is indicated by the signal showing red. The overhead wire outside the barn is NOT energized.

Before attempting to leave the barn, the motorman must throw the knife switch on the power-supply cabinet to the LINE position. The green signal indicates that the outside wire is now energized.

WARNING
Never attempt to run the car outside the barn with only the red signal glowing. The green signal should be glowing before leaving the barn. If the green signal is not indicated, and the outside line can be positively determined to be powered, the car can be safely operated. See NOTE below.

WARNING
The Power Switch is locked for safety. When overhead line maintenance is in progress the key to the Power Switch lock should be in possession of personnel at the maintenance site. The red "DO NOT ENERGIZE - LINE WORK IN PROGRESS" sign should be hung on the power switch handle.

Overhead-wire power signal.

Outside Line Test procedure NEW!

NOTE: **Before proceeding with this test, verify brake pressure** and perform "leaving the barn" brake test as normal. To test the outside line power, pull the car forward out of the barn only enough to be able to raise the A end pole past the barn insulator and onto the outside line. **Set the brake**, raise the A pole then Lower the B pole. If the car lights are on, the outside line is powered and the car can be operated, proceed with normal take out steps. If the lights are not on, there is a fault with the outside line. **Lower the A pole**, raise the B pole and return the car to the barn operating from the B end controller. Notify the maintenance crew of this problem.

Our Crew Expectations

Uniform:

Wearing a complete crew uniform on Car 21 and 25 is an important part of our mission:

- Traditional black trainman cap, either summer (recommended) or winter style, with appropriate badge (see below).
- Plain white shirt or blouse, long or short sleeved, with our Society patch sewn on the right sleeve 2 inches down from the shoulder. Your trainer will provide you with a patch.
- Black name tag worn on or over left shirt pocket. Dimensions: 3 in wide X 1 in high. Purchase from Allsports Trophies, or provided by your trainer.
- Black tie, either four-in-hand or clip-on.
- Black socks with long pants or white socks with short pants. Black shoes.
- Plain black pants or skirt. Short black pants in summer are allowed with white socks.
- Black belt (to hold up your pants, support optional money changer and holder for punch or reverser key).
- Optional black or white jacket, sweater, or black vest in cool weather.

Trainman caps and Conductor badges are ordered and purchased from a lead conductor. A historically accurate replica of the original Fort Collins motorman badge can be purchased for $32.

An Original Fort Collins motorman badge.

Behavioral Expectations UPDATED

Thanks for dressing properly. A well-dressed and happy crew shows pride and enjoyment in their job and reflects positively on the City and our Society.

Riders are our customers and should always be treated with courtesy and respect.

All crew volunteers are required to read and follow our ***Volunteer Standards*** guideline available on FCMRS web page.

All crew volunteers must be physically able to perform their required duties.

Check Rides

After completing your initial one-on-one training with your lead motorman or conductor, you'll want to schedule your first work shift on the car. See "Online schedule registration" below. You should be in uniform for your first shift, as explained in the previous section, and be accompanied by either your lead crewperson or another experienced crewperson assigned by your lead. That person will help you through your first shift on the car. Don't hesitate to ask questions or ask for help with your duties on your "first time out." Conductors can refer to the pocket card of basic duties issued during training.
The lead motorman or conductor or someone designated by them will also conduct unscheduled check rides with each crewperson throughout the season in order to observe operation and offer any advice. Don't hesitate to ask questions. We want to help you be successful and enjoy your volunteer experience.

Note: During your first season on the car, try to ride with two or more seasoned crews to see how they handle their duties. While following rules to ensure safe car operation and passenger safety, every motorman operates the car with slight differences and every conductor has differing ways of greeting passengers, delivering historical information and selling souvenirs. You'll find good ideas and learn more about how we do our duties by watching others.

Online Schedule Registration

Once you've been certified to operate the car and your trainer says you're ready for your first streetcar shift, your status in our Volgistics web site will be shown as "certified". This will allow you to see all regular shifts and charter positions available for which you have been certified.

If you are a recertified crew member, your previous Volgistics login (email address) and password will continue to work. If you are a new crew member, you will be sent an email with a link to our Volgistic Volunteer Center website. To login to our volunteer website the first time, click on the link you are given, follow the setup instruction to create a new password and complete the My Profile information page.

After your account is established, and for following logins, proceed to sign up for shifts.

Click on the My Schedule tab, a monthly calendar will display. Days with open tasks that you have been certified for will display "HELP WANTED". Open that date and you can volunteer to fill an open shift. Navigate using Prev Month or Next Month tabs to see more HELP WANTED dates. Days and time you have scheduled yourself for will be shown on the monthly calendar.

To cancel a scheduled shift, go into the Volgistics system and to your calendar. In your calendar click on the date of the shift you need to cancel. Click on your shift and then click on the "Remove Me" button. If you must cancel within a week of a scheduled shift, however, **you** must find a replacement for your shift. Once you have removed yourself from a shift **call the Operations Manager/Scheduler to make sure they know what you have done.**

Operating Season and Hours

We operate for the public on weekend afternoons from May through September, noon to 5 pm, weather permitting. We also operate the same hours on Memorial Day, Independence Day and Labor Day. We maintain the operating schedule on our crew shift scheduling website. To view schedules, go to the Volgistic website, click on a date and the crew assignments for that date will be shown.

If you suspect that the weather could prevent operation, either check with the motorman scheduled for your shift via phone or show up as usual at the barn (first shift) or depot (second shift). Phone numbers are listed on the website, in the depot and on the bulletin board in the Mountain Ave. carbarn.

Note: Weather can change quickly during spring and summer. We can operate safely during mild-to-moderate rain. When a severe storm is imminent or an electrical storm is nearby, however, the motorman should stop the car, lower the pole, switch the Lights and Compressor off, and set the hand brake until the storm has passed. When continuous rain is falling, the motorman may decide to cancel operation and put the car away for the shift or the day; see procedures in Chapter 3.

Hours of Service

Two conductor/motorman teams operate the car on scheduled workdays. The first shift works noon – 2:30 pm. The second shift works 2:30 – 5 pm. Shifts change at the City Park depot. The first-shift motorman needs to report to the car barn at least 45 minutes early to prep the car and have it in City Park by noon. First-shift conductors and depot agents should also check at the barn to ensure that the car is operational before opening the depot. Motorman operating procedures are in Chapter 3. Conductor procedure is in Chapter 4 and Depot Agent info is in Chapter 6.

Dealing with no-shows and no-calls

If a conductor doesn't show for service, the motorman can either work the shift solo or put the car away. Be sure to notify the crew dispatcher (see Call Sheet on the car) so we can follow up and update our crew schedule.

If a motorman doesn't show for service, the conductor should call the motorman. If no response, notify the crew dispatcher and wait for instructions. If this occurs during crew-change time, the previous motorman can choose to continue running the next shift or put the car away.

Stops Along the Line

The regular stops where we board and deboard passengers are City Park depot (also the crew-change point), Shields Street, Loomis Street and Howes Street (downtown).
Always board and deboard passengers on the west side of intersections, and only in the grassy median, not in the street. When westbound, this means opening the door at the back (A end) of the car.

General Rules on the Car

Motormen are responsible for safe car operation. Conductors are primarily responsible for passenger safety while boarding and deboarding and when the car is in motion. Some basic rules:

- **No food, drink or pets on the car**, though the crew may carry bottled water during hot weather.
- **No standing on the seats or in the aisle or sticking arms or heads out the windows**. Conductors remind passengers of this rule at the start of each trip.
- Wheelchairs and strollers are allowed only if able-bodied help is available to lift them on/off the car and they don't block the aisles or access to doors. If passengers are not planning to go into town, equipment may be locked in the depot until passengers return.
- **Service Dogs:**

The Americans with Disabilities Act requires all places open to the public to give access to service dogs and their owners. The ADA allows only two questions: **whether the dog is required because of a disability and what tasks the dog is trained to perform**. It is illegal to request documentation for the dog or to ask the nature of the owner's disability. Emotional support dogs are intended to provide comfort to those with anxiety or other emotional problems. Emotional support dogs are not covered under the ADA and can legally be denied access.

Dealing With Unruly Passengers

If anyone is standing in or on their seat, playing rough or generally unruly, the conductor should either settle them down or have the motorman stop the car until they are safety seated. To ensure passenger safety, the motorman and the conductor have the authority to remove anyone who doesn't behave safely on the car. Simply stop the car and politely help the passenger off on the grassy median. The conductor may return the passenger's fare if asked.

Waiting to Board at City Park Depot (2017)

In Case of Emergency

Reporting Accidents
Whenever an accident occurs, regardless of any resulting injury or damage to the streetcar or other property, the crew must complete an accident report. See Chapter 10 for details.

In the event of an emergency on the car, first take care of your passengers. Unless the motorman has been injured, he/she will immediately call for appropriate help while the conductor assists with any injuries. If there is any possibility of injury or damage to the trolley or other property, **call 911** for help. For a non-emergency situation that you feel is necessary to notify the police department **call 970-419-3273**. Then call the FCMR maintainer listed on the Call Sheet next to the A-end (east-end) controller. Always see to your passengers' comfort.

UPDATED

Handle minor injuries using the first-aid kit kept above the A-end destination box. If passengers wish to exit the car, be sure they do so onto the grassy median, not the street.

If there are any injuries or another vehicle is involved, collect required information using the Accident Report form (see Chapter 10) before leaving the scene. A copy of the form is in the pouch at the B end of the car. File the completed form in the Accident Form folder in the cabinet by the desk in the barn.

To open the door(s) after the car has made an emergency stop: NEW!

- If the motorman tripped the deadman function air pressure is removed from both of the doors:

  Car21: Push the doors outward to open.

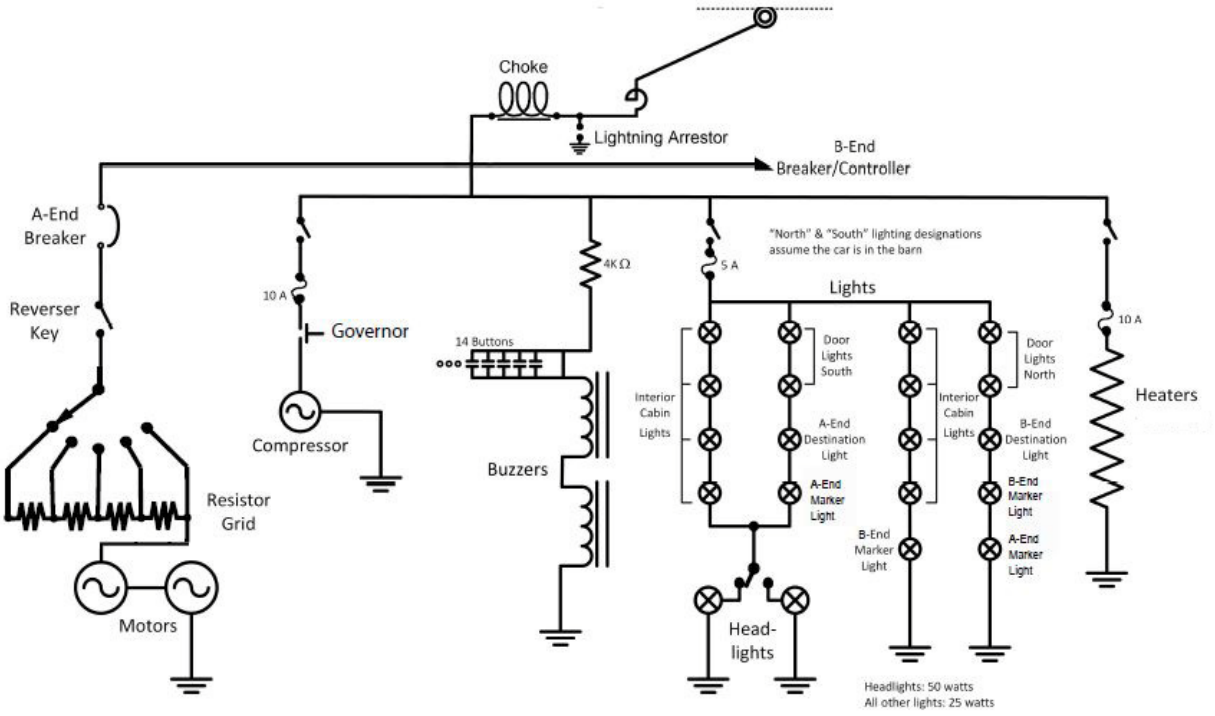
  Car 25: Use the handle on the doors and pull toward you to open.

  -Or-

- Move the brake handle all the way to the right (emergency stop) position to remove air pressure from the doors. Doors can then be opened as described above. Brake valve settings are shown on page 17.

Chapter 2: Street Car Systems and Operation

This chapter explains our cars' various operating systems. Although primarily for motormen, this information is also useful for conductors who frequently field general questions from passenger about the car's workings. See Appendix B for a glossary of streetcar terms.



Street Car Electrical Components

FCMR cars operate on 600 VDC. Our power supply in the W. Mountain Ave. barn converts three-phase 440VAC to 600 VDC. Power is applied to the overhead wire inside the barn when the main switch and main breaker are ON (see photos on page 22). When the LINE switch on the power-supply box is set to LINE, power is also applied to the outside line. As shown above, electric power for the car flows from the power supply in the barn, through the overhead copper wire, through the trolley wheel and pole, to electrical components in the car. The power returns to ground through the rails.

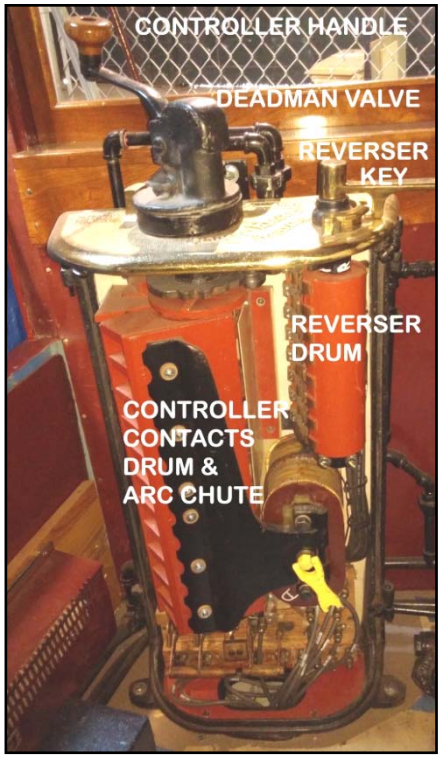
Before entering the car, power encounters a lightning arrestor and choke coil, which smooth any instantaneous electrical surges and route any lightning to ground. Power then goes through a circuit breaker located at each end of the car before entering the controllers. The motorman uses the controller to regulate the speed of the car. **Note:** the heaters shown in the diagram are only installed in car 25.

Trolley Poles

The poles are spring-actuated to keep pressure on the overhead wire, and are controlled through the use of ropes at each end of the car. When a pole is raised, spring pressure keeps it in contact with the wire. If a pole jumps off the wire, the take-up spool engages to prevent the pole from going too high. When a pole separates from the wire, or 'depoles,' the motorman must immediately stop the car and re-mount the pole.

Controllers

DC electric motors have a very low resistance when starting and their apparent resistance increases with speed. Consequently, the amount of current to the motors must be limited when the motors are initially started to prevent burnout. Advancing the controller handle clockwise through the detents, or 'notches', decreases the amount of resistance in the line, causing the motors to accelerate the car.
Our car is normally operated with its motors connected in series with the full line voltage divided between the two motors. The controller can also connect the motors in parallel, so that full line voltage is applied to each motor. Inside the controller stand are two rotary switches, or 'drums.' One drum directs the current through the different resistor grids to control the speed of the car, and the other is controlled by the reverser key to change motor direction.



Controller with cover removed

The reverser key allows the car to travel in reverse (which should be done only when someone is guarding the back of the car) and locks the controller when in the OFF position. For this reason, the motorman must take the reverser key with him/her anytime that the motorman's position is vacated.

WARNING
To ensure that the car cannot be moved improperly, the motorman must always have the reverser key when away from the motorman's station.

The first five notches on the controller handle successively decrease resistance in series with the two series-connected motors and, as such, are called 'series notches'. The 5th notch is called the 'full-series notch' and is where there is no resistance. This is the only notch where it is safe to continuously operate the car since the resistor grid is out of the control circuit.

The second set of notches successively decreases resistance with the motors connected in parallel and are referred to as 'parallel notches.' The last notch, the full-parallel notch, is where the resistor grid out of the circuit. Since our car has a relatively high gear ratio, there is no need to ever run in parallel points as the car would be traveling too fast for safe operation. **We never run faster than a typical bicyclist (15 MPH) anywhere on the line, and even slower at designated 'slow-order' locations, such as at the Mack St. siding and the switch and curve at Roosevelt St., and the switch at the barn.** UPDATED

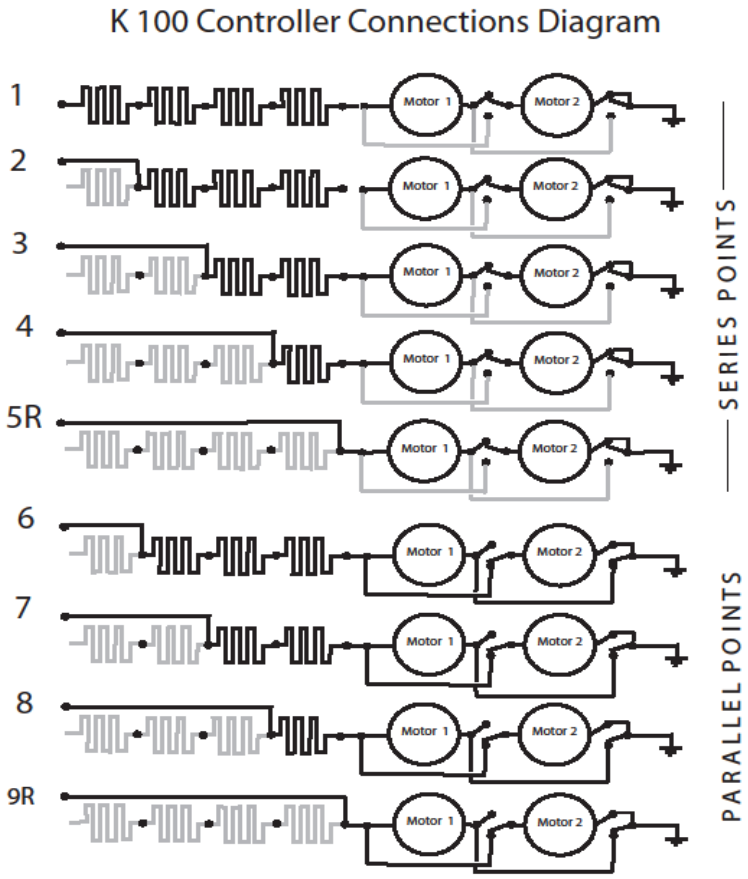
To emphasize, since the full-series or full-parallel points are the only points where there is no current flow through the resistor grid, these are the only notches which the car can be operated for any length of time. Running in other notches causes heating which can easily burn out grid elements. The other notches are used only for accelerating, but never to slow down the car. When we need to limit car speed, we shut the controller OFF and coast rather than operating in an intermediate notch.

When a circuit carrying a large amount of direct current is broken slowly, the current will try to continue flowing by ionizing the air in the recently-formed gap. This is known as 'arcing.' Some arcing occurs when a circuit breaker trips, or when the controller handle is moved through the points. The breaker and the controller have been designed to handle this. Improper use of the controller by the motorman, however, can cause arcing over and above what the controller was designed to handle. Arcing is worse when there is a large current present and the controller handle is moved between notches slowly. The motorman

must minimize arcing whenever possible by moving the controller handle quickly to the OFF position. **Do not 'bump' the car,** that is, moving the car by quickly moving near the first notch and shutting OFF. That pulls an arc which damages the controller's points.

Resistor Grid

The resistor grid is a compact stack of high-power resistors under the car. The stack has several 'taps' at various places, providing a range of resistances selected via the controller. We use the lower notches to attain a desired running speed, then both shut the controller OFF and coast (as we do running downhill) or stay in full series when running uphill. Notches are used to slowly attain a speed rather than to select a speed. In notch 1 the resister grid dissipates 45% of motor current as heat. As a result, maintaining a speed less than full series will require **a series of acceleration and coasting intervals to prevent overheating.**



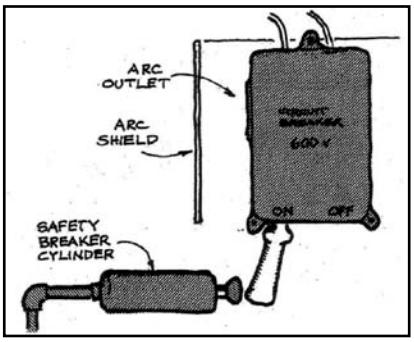
Resistor grid wiring – Car 21and 25

Motors

A 35 horsepower electric motor is attached to each axle on Car 21, and 25 horsepower each on Car 25, with the weight riding on the axle and the truck. The motors contain brass sleeve bearings on which the axles turn. The power is transmitted to the axles by a large reduction gear connecting the motor shaft to the axle. Viscous grease is used in the housing for these two gears. Hatch covers in the car floor allow access to service the motors.

Circuit Breakers

The power supply in the barn and the car are each protected by circuit breakers. The breakers in the barn protect against damage caused by power surges from the power grid. Those in the car protect against problems or accidents within the car. The most-frequent reason being inappropriate use of the controller by the motorman.
A breaker is located at each end of the car to the left of the motorman's head. A breaker automatically trips when the motors draw too much current. The air cylinder next to each breaker will also trip the breakers via the deadman system, as discussed later.



If a circuit breaker malfunctions…
Breakers can be switched OFF manually or they will trip automatically when too much load is placed on the motors. When a breaker trips but doesn't function properly and/or arcing continues more than a second, the motorman must immediately do the following:

1. Shut the controller OFF and let go of the controller handle to initiate an emergency stop.
2. After the car stops, quickly pull down the pole.
3. If needed, help evacuate passengers by pushing the doors open.
4. After any arcing stops, put out any fire using the extinguisher.
5. If conditions permit, set the hand brake to prevent the car from rolling after brake pressure has depleted.
6. After insuring that your passengers are in no danger, contact a maintenance person to evaluate the problem. Phone numbers are listed on the Call Sheet next to the A-end (east-end) controller.

Air Compressor

An electrically powered air compressor is located under the car. It is controlled by a pressure governor switch which turns the compressor ON when pressure in the two air tanks falls below approximately 55 PSI and turns it OFF at 65-70 PSI. Power to the compressor is controlled by a rotary snap switch located on the A end of the car near the circuit breaker. It is protected by a fuse. The pressure governor is located beneath the motorman's seat on the A end of the car. The car must not be operated until the air pressure exceeds 50 PSI.

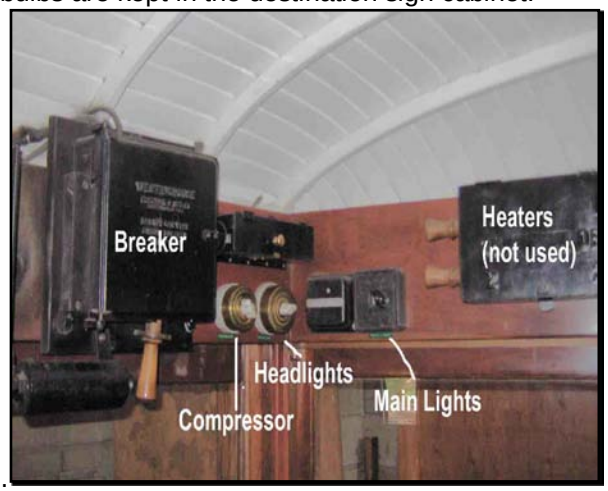
WARNING
DO NOT SWITCH THE COMPRESSOR OFF except in case of an emergency affecting the compressor.
Operating with the compressor off will deplete the brake reservoir causing a no-brakes condition.
If the compressor is turned off, set the hand brake before leaving the motorman's station.

Lighting System

The lighting system consists of interior lights, running lights and headlights. The entire system is controlled by the Main Lights switch just above the motorman on the A-end overhead panel. Headlights are controlled by a snap switch shown at right.

All bulbs are 120 V lamps, with 25 W clear bulbs inside the car and 50 W headlight bulbs. Lights are connected in four 5-bulb series strings, much like old-time Christmas tree lights. There are two strings of interior lights, plus two strings with four interior lights that share the headlights. When one bulb in a string is out, the entire string will be out, requiring the motorman to check all inoperative bulbs to find the one burned out. **HINT**: Hold a piece of white paper behind a bulb and you can see if the filament is open.

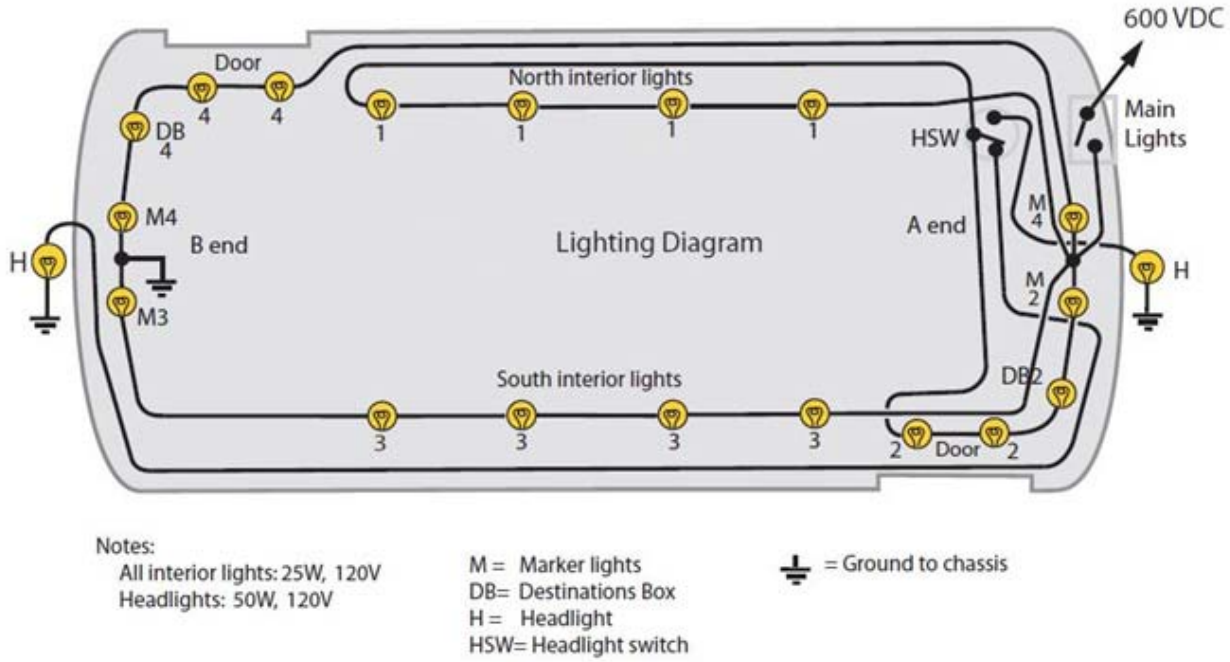
The lighting diagram below shows the lights that are connected in a common series string. Spare bulbs are kept in the destination sign cabinet.



Light control panel at A end of Car 21

NEW!

WARNING
DO NOT ATTEMPT TO CHANGE A BULB WHILE THE WHILE THE MAIN LIGHT SWITCH IS ON.
The light string has 600 volts at the open socket.



Streetcar lighting diagram (simplified)

Buzzer Circuit

Another independently-fused circuit operates the buzzers. A large resistor drops most of the line's 600 VDC. The buttons on the window columns around the car are all connected in parallel so that any one will operate the buzzers at both ends.

Air and Brake System

Our Birney cars, like most heritage streetcars, uses pressurized air to control the wheel brakes, doors and sanders. On our cars, there is also an air-operated 'deadman' circuit that activates all of the above systems when the motorman releases the controller handle. Our cars also use air pressure to operate the wheel flange water system.

As previously described, an electrically driven compressor maintains air pressure in reservoir tanks for operation of the air-driven components. Except for the deadman function and wheel-flange watering system, all air components are controlled by the brake handle at each end of the car. An air-pressure gauge is also located near each brake stand.

Brake Valve

The brake valve has five positions to control brakes, doors and sanders.

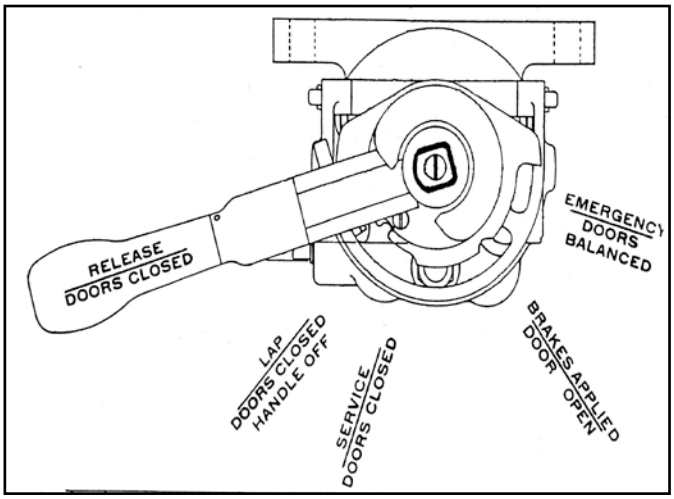
Release -- Holds the brakes off and the doors are closed. Use this position when running.

Lap -- Holds whatever air pressure has been applied to the brake cylinder. Air will not flow into or out of the cylinder. The doors are held closed. This is the only position where the handle may be removed. It is called 'lap' because valve ports are lapped (closed).

Service application -- This is where air is ported into the brake cylinder to apply the brakes. The urgency of the stop is determined by the length of time that the handle is left in this position. The doors are held closed.

Door open -- After the car has stopped, move the handle to the right to open the door. Air pressure continues to be ported to the brakes – the brakes are still applied.

Emergency -- Full brakes are applied, sand is released by the sanding valves, and air pressure is released from door motors so that they can be opened by hand. The car comes quickly to a stop.



Brakestand operating positions.

Deadman Function

The principal of the Safety Car system is that the car is protected from running out of control when the motorman becomes incapacitated. **The motorman must keep the controller handle down whenever the brakes are released**. Pressing down on the controller handle operates the safety pilot valve behind the controller. (The foot valve below each brakestand is currently inoperative.) If the brakes are set, the handle may be safely released. The brakes are 'set' when the brake handle is in one of the brake application positions (Service Application, Door Open or Emergency) *and* the air pressure on the brakes exceeds approximately 50 PSI.

When the handle is released due to an emergency or by mistake, the deadman valve activates, applying full brake pressure, releasing sand, and stopping the motors by tripping circuit breakers at both ends of the car. The car comes quickly to a stop. The compressor still operates, the lights will remain on, and the air pressure is removed from both doors so they can be opened manually.

If the valve is activated either by an emergency or inattentiveness, here's how to recover:

1. Move the brake handle to either the Service Application or Doors Open position.
2. Hold down the controller handle in the OFF position until brake pressure exceeds 50 PSI.
3. Reset the circuit breakers.

Sanding Valves

Pressing down on the brake handle or the foot-operated valve at the base of the brakestand operates the sanders for the wheels closest to the valve. **Note:** there is no foot valve on car 25. Sand is applied to the rails directly in front of the wheels in the direction that the car is traveling. Sand should be applied when the wheels start to slide on the rails when stopping or spin when starting up. Usually short bursts of sand will be sufficient unless in an emergency situation. A clearly-audible hiss will be heard when the sanders are activated

Sand is stored in reservoirs located under the seats above each wheel to supply sand to the sanding valves and tubes. The first-shift motorman checks that each reservoir has 1-2 inches of sand and that the sanders are operating prior to the first run each day. When testing the sanders, collect the sand in the provided pie pans and return it to the reservoirs. Successive-shift motormen should always verify that enough sand is available, especially when the rails may be slippery. Extra sand is kept in the depot.

Other Operating Equipment

Parking (Hand) Brake

For many years prior to the invention of the air-braking system, the hand brake was the sole means of stopping a streetcar. Car size was limited to that which could be stopped by the strength of the motorman. The hand brake in our car is a 'parking brake' and typically not used when the car is stored in the barn. It should be used when the car is left unattended, and wheel chocks or hand brake MUST be set when the car is out of the barn and the compressor is not functioning.

Car 21
To engage the parking brake, raise the handle to horizontal, ratchet the gooseneck handle clockwise until resistance is felt. Then engage the pawl into the ratchet on the floor. Release the pawl to release the brake. Turn the shaft by hand counterclockwise about ½ turn to be sure brake has released

Car 25 NEW!
To engage the parking brake, rotate the handle clockwise until resistance is felt, then engage the pawl into the ratchet. Release the pawl to release the brake. Turn the shaft by hand counterclockwise about ½ turn to be sure brake has released.

Destination Rollers

The destination rollers are located in the small cabinets at each end of the car. Destinations printed on each roll are **City Park, Avery House, Special**, and **Car Barn**. Normally the A end shows **Avery House** and the B end shows **City Park**. For charters or non-revenue operations, set the rollers to **Special**.

Operate the roller by a small brass crank inside the cabinet on car 21, and on the front of the cabinet on car 25. Turn the crank *while pulling outward on the knob* as it is normally held in position by a set of notches and a small spring.

People Counter

As new riders enter the car, the motorman counts them on the counter shown at right. Pull the rope handle down sharply to record each person. The day's total is shown at the top; the bottom number shows the total riders for the car. For car 21 add 200,000 to the bottom number for our total ridership since we began running the restored car in 1985. Car 25's total started at zero in 2020.
The motorman or conductor resets the day counter at the start of each day or prior to boarding a charter or other passenger movement. To reset the counter, pull the brass knob out and turn it clockwise.

Wheel Flange Watering System

When the streetcar system originally operated, they greased the inside of curved rails to prevent excessive noise and wheel wear. The noise is caused by the wheel flanges rubbing against the inside of the rails as the wheels are forced around a turn. In our case, in the absence of dedicated maintenance people and in a time of increased ecological awareness, we have found it more convenient to drop water on the wheel flanges. While our system is historically inaccurate, it's hidden from view.

The water tank is located below the B end of car 21 and below the A end of car 25. Small tubes deliver water to each wheel. A foot valve on the floor to the left of each controller provide water to the wheels. The motorman presses a valve just prior to entering a curve to wet the wheel flanges.

The tank holds enough water for a typical operating day and **must be filled completely** prior to taking the car out for the first shift.

Water foot-valve on floor near each controller.

Safety Catcher

The wooden slatted trip board or 'fence' below the steel bumper at each end of the car will swing back and trigger the release the safety catcher when a person or animal contacts it. The safety catcher then drops down to prevent the person or animal from being rolled over by the car. If the catcher is released, the black foot pedal between the brakestand and the door pushes up. Push the pedal down to reset the catcher to running position before moving the car. Always check the position of the catcher and reset it if necessary prior to operating the car.

Caution
To avoid damaging the catcher or car, **never operate the car with the catcher released** (foot pedal up).

Wheel Bearings and Hotboxes

Our car's axles run on friction bearings which require regular inspection that includes repacking the journal boxes, and adding special journal oil. To ensure that journals do not overheat, the motormen should check for hot journals (hot boxes) during the first trip on each shift.

To check for a hotbox, hold your hand at the side of each journal box; if you can't keep your hand on the box, it's too hot to operate. Let the car sit for 5-10 minutes to cool down. Then check the hotbox again at the other end of the line. If the problem persists, call a maintenance person for help. Do not attempt to service journal boxes unless you've been trained by our maintenance personnel.

Bell

A foot button to activate the trolley bell is mounted on the floor in front of the motorman seat at each end. Stepping on the foot button sharply will ring the bell. The bell may be disabled by pressing down and turning the button clockwise. Operation is restored when the button is turned counter-clockwise.

NOTE:
The car cannot be legally operated with an inoperative bell

Chapter 3: Motorman Operating Procedures

The following procedures have been developed over time to ensure safe car operation and to prevent injury to crew and passengers. These procedures must become habits to ensure safe operation.

Caution

Although conductors may be trained to stop the car and open the doors in the event of an emergency, they should **never attempt to operate the car** unless given permission by the motorman and have passed the annual motorman certification. UPDATED

NOTE: Car 21 and car 25 have differences in their operation and equipment. To ensure safe operation of each car the motorman **must** be cleared by an instructor to operate both cars #21 and # 25 before operating either car without an instructor present. NEW!

Motorman Responsibilities

- **Operate the car in a safe manner**. Motormen report to the Motorman-training Team and to the Crew Dispatcher.
- **Always give the right-of-way** to pedestrians, bicycles and other vehicles.
- **Prepare the car for service** (see below).
- **Lay up the car** in the barn per procedures listed later in this chapter.

Motorman #1 coasting down Mountain Ave.

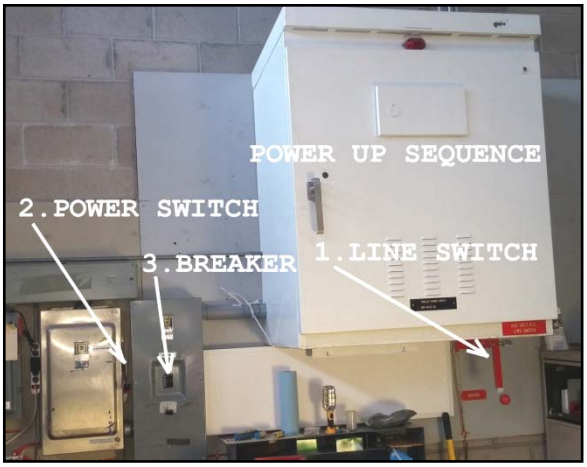
Preparing the Car for Service

To have time to completely check and prepare the streetcar, be sure to arrive at the barn at least 45 minutes prior to the start of operations.

1. To equalize use of cars 21 and 25 maintenance personal will have a sign posted on the power supply indicating the active car, and a sign on the controller of the idle car for the shift. NEW!
2. Make sure that the **A-end pole is properly secured** and that there are no objects in the path of the car. Do not wind the rope around the catcher reel.
3. Place the brake handle on the A-end brakestand and insure that it is in the **DOOR OPEN position** (see page 17). **Do not** put the reverser key in place.
4. **Unhook the B-end pole** and place it on the wire.
5. **Throw the LINE switch** on the power supply cabinet (see photos on next page) to the **LINE** position by pushing up on the rod, connecting the outside overhead line to the power supply. This must be done **before** step 6. UPDATED
6. **Unlock and throw the POWER SWITCH ON** (see photos on next page).

Caution

If the LINE SWITCH is operated *after* power is turned ON, any connection in the car or short to ground along the line will cause an arc at the switch. This could damage the switch and/or power supply. Do not store the padlock on the Power Switch handle as that could prevent quickly switching the supply OFF. UPDATED



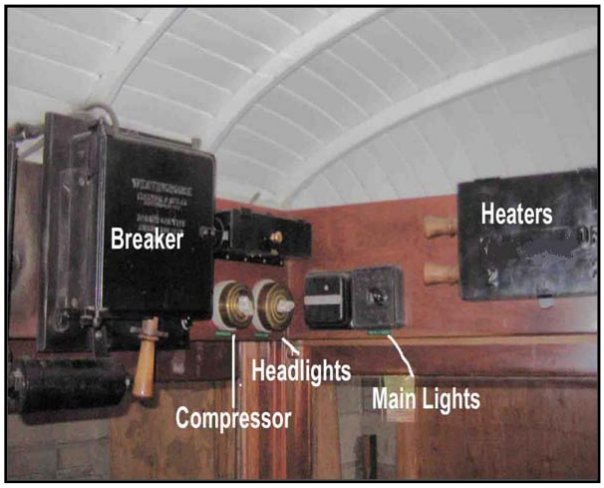
UPDATED

WARNING
The Power Switch is locked for safety. When overhead line maintenance is in progress the key to the Power Switch lock should be in possession of personnel at the maintenance site. The red "DO NOT ENERGIZE - LINE WORK IN PROGRESS" sign should be hung on the power switch handle.

7. Switch the **BREAKER ON**. Verify the Overhead Wire Power Signal is **GREEN**. See Warning on page 7 for trouble shooting if green indication is not on.

Caution
The power supply breaker is arc-protected, and must be switched ON **last** in the sequence

8. **Turn the compressor Switch ON** (left photo below)**.** After water has stopped blowing from the tank under the car, rotate the drain-valve handle ¼ turn clockwise to the horizontal (closed) position.



UPDATED

9. **Check headlights.** Turn the main light switch ON and see that the proper headlight is ON. Switch the headlights to ensure that both work. **Car 21:** rotate the switch clockwise until it clicks, the headlight will switch ends with each click. **Car 25:** Position 1, headlight at A end is on. Position OFF, no headlight is on and the inside lights along the north side of the car are off. Position 2, the B end headlight is on.

Warning NEW!
The car cannot be operated without a functional headlight in the direction of travel.

10. **Check all lights.** Locate and replace any burned-out bulbs. Refer to lighting diagram on page 16. Discard bad bulbs; do not put them back in the destination boxes! Replenish spare bulbs in the destination boxes: six 25 W and two 50 W.

11. **Check the safety catchers.** The reset pedal on each should be down to the floor.

12. Put the society **cell phone** in the pocket next to the A-end door. Per FRA regulation, **do not use any cell phone when operating the car.**

13. Set **destination rollers.**

14. Reset the **people counter to 0**.

15. Verify that the **first-aid kit** and **fire extinguishers** are on board.

16. If needed, **clean the end windows** and **sweep the car floor**.

17. Verify that the overhead-wire power signal shows **GREEN**. If not, verify that the LINE switch is set as shown above. If the green light is not on, refer to the procedure on page 7 to verify that the line is energized.

18. On **car 25**, check the heater switches at the B end of the car. The switches should be in the OFF position except when operating during cold weather. The heater switch at A end of **car 21** is not used NEW!

> **Note:** The motorman should always be aware of unusual noise or unusual operation of the car and error on the cautious side to report a potential problem. NEW!

> NEW! **Caution**
> **ALWAYS** check that the track switches from barn to the main line are aligned correctly for the bay being used

19. Open the barn doors. Use hooks to hold the doors open so they will not hit the car.

Checks Before Leaving Barn Area

1. **Brake test:** When you have at least 50 PSI in the tank, close the door and perform a standing brake test: Hold down the controller handle, release the brakes and set the brake handle to LAP. Pause, and watch the air gauge (black needle) for any leakage from the brake line.

> **WARNING**
> FRA regulations require that we cannot leave the barn area until headlights and sanders are working on each end, and the car passes a standing brake test.

Move the car out of the barn: Releasing the brakes and momentary accelerating on the first notch. Apply brakes and **Stop immediately** to verify brake operation.

2. Continue to move out of the barn: Release the brakes, momentarily move to notch 1. Stop immediately after the trolley coasts through the wire insulator (lights will go out for a moment).

> **Caution**
> Powering through the insulator could cause arcing, burn out lights and/or damage the overhead.

3. **Check sanders**: There should be only 1-2 inches of sand in each box. With pans under the sand tubes, test sanders at each end of the car. Clear clogged sand traps using the auger tools.

> **Note:** Sand is always needed for emergency stops and there is always the possibility of rain later in the day which will make the rails slippery.

4. **Fill the water tank:**

Car 21

The water inlet and valves are under the southwest side of the car. Failure to return the air (yellow-handled) valve to the horizontal position after filling will render the wheel-flange watering system inoperative. **Do not** attempt to fill the water tank until the compressor air pressure is fully charged to prevent water from entering the car air system

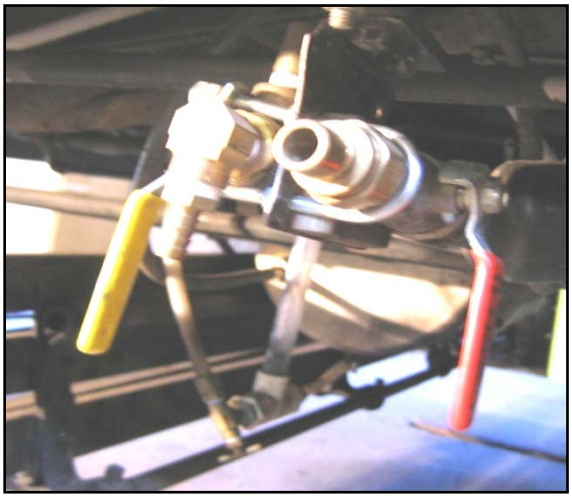
a) Slowly move the air valve (yellow handle) from the horizontal position to the vertical position as shown to relieve air pressure from the tank under the car.

b) Attach the hose from the tank outside the barn to the water inlet. Then turn the water on.

c) Push open the water-fill (red handle) valve. Fill the tank until water flows from the overflow pipe. Close the water-fill valve.

d) Move the air valve back to the ON (horizontal) position.

e) Shut off the water at the source, disconnect the water hose from the car and hang the hose under the tank at the barn.



Car 25 NEW!

The water inlet is under the side of the car, near the A end door.

a) Attach the hose from the tank outside the barn to the water inlet. Then turn the water on.

b) Fill the tank until water flows from the overflow pipe.

c) Shut off the water at the source, disconnect the hose from the car and hang the hose under the tank at the barn.

When all checks have been accomplished, make sure that the barn doors are closed and secured before beginning your shift.

Be sure to **stop and coast slowly through the barn-approach switches!**

Think ahead at all times.
You are in charge of priceless passengers and 8 tons of priceless City equipment!

Operating On the Line

- ✓ **NEVER LEAVE THE CAR UNATTENDED.** NEW!
- ✓ When passengers are aboard, always wait for your conductor's signal to depart.

Caution
Excessive speed through switches or curves can damage wheels or dislodge a wheel bearing. Excessive speed over the rough track at Mack St can cause the trolley wheel to leave the power line.

- ✓ Always have a valid Colorado adult driver's license and certified membership card in possession when operating the car.

WARNING:
Do not turn the compressor off except in case of an emergency affecting the compressor. Operating with the compressor off will deplete the brake reservoir causing a no-brakes condition. If the compressor is turned off and the motorman's station vacated, the hand brake must be set.

WARNING:
Do not allow any standees when car is in motion. The extra strain on the car's suspension could result in broken leaf springs and injuries in case of an accident.

- ✓ **Always run slowly through switches.**

- ✓ **Always lock the switch at Roosevelt.**

- ✓ **When ready to depart** from City Park or Howes St always think through the 5 safety steps:
  1. Headlight on
  2. Reverser in forward
  3. Throttle handle down
  4. Forward pole in down position, check for kids directly in front of the car.
  5. Brake off

WARNING:
Always check for solid ground (lights on) when stopped for passenger loading and unloading. Leaves, sand, or other debris on the rails can cause a dangerous condition when the car is not in solid contact (grounded) with the rails.

- ✓ **Always watch the track for obstructions**, especially the first run of the day.

- ✓ **Always watch** for obstructions to the overhead power line (tree branches, etc.) and for pedestrians and joggers.

- ✓ Assist the conductor to put sign at Howes St on first run, and pick up and store the sign in the depot at the end of the day. C NEW!

- ✓ **Coast through the insulator and the overhead frog at Roosevelt St.**

> **Caution**
> Powering through the insulator or the overhead hardware at a switch can cause arcing and damage overhead hardware.

- ✓ **When running,** keep the brake stand handle in the release position.

- ✓ **When running**, either 'notch up' at a reasonable rate towards full series, or coast

> **Caution**
> Running in any notch other than full series or full parallel builds up heat in the resistor grid and can cause damage if left there for an extended period of time. When slowing the car, always shut the controller completely OFF. Do not "downshift" (notch down) to run slower.

- ✓ When **lightning** is in the area: stop the car, then lower the pole, turn light and compressor switches off, set the hand brake, and close all windows. Explain that you must wait until the lightning has passed to resume safe operation.

- ✓ **Normal track speed**: Except for the slow orders listed below, run no faster than a casual bicyclist on Mountain Ave. Never more than **15 MPH.**
- ✓ Permanent Slow Orders: Traverse switches, Roosevelt St. and the rail at Mack St. at no more than a fast walk.
- ✓ **Check** for overheated journals during your the first trip, as explained on page 20.

> **WARNING**
> **Always keep the reverser key with you to insure against unauthorized operation.**

- ✓ When stopped for a prolonged time, put the reverser key in the neutral position to prevent accidentally moving the car. If you leave the operator's platform, **always take the key with you**.

- ✓ **Make stops** with an initial, moderate brake application followed by smaller applications or partial releases, as necessary. You'll eventually learn to stop with minimal use of air. **To stop the car in an emergency, let go of the controller handle** and let the deadman function do the work.

- ✓ **When the rails are slippery, operate more cautiously** and make longer stops to avoid sliding. Be sure to use sand when stopping on slippery rail.

- ✓ **Always stop at Shields St.** Cross only when the trolley signal shows a vertical bar (|). If the trolley signal is not working or doesn't detect you on the first cycle, wait until you have a fresh green light to cross. In this case, be sure to allow any waiting left-turning cars to pass before crossing. Do not back up and approach the corner again.
- ✓ **Avoid distractions** by not talking with passengers.

- ✓ **STOP IMMEDIATELY when the trolley wheel separates from the overhead wire**. To recover a broken rope, see page 29.

> **WARNING**
> **Do not climb on the car roof to retrieve a vertical pole with the overhead line still energized. To do so puts you in grave danger of electrocution.**

Emergency Stops

Assuming that you have at least 50 PSI air pressure, stop the car in an emergency by either using the deadman function or putting the brake valve into the Emergency position. Each method is explained next.

Use the deadman function (recommended)

Let go of the controller handle. The car will drop sand, open both breakers to remove power from the motors, and stop as fast as possible. The doors will be released so they can be opened by hand.

Use the brake valve

1. **Shut OFF the controller.**
2. If the controller is not **OFF**, stopping distance will be increased. UPDATED
3. Quickly move the brake handle to the far-right (Emergency) position. Full braking will be applied, sand will drop, and the car will stop and the doors will be able to be opened manually. (Because the brake handle has moved through the Door Open position, the near door may start to open. Because air pressure has been released from the door, it can be opened all the way manually). However, if the car is moving too fast and/or is lightly loaded and/or the rails are slippery, the wheels will probably lock up and the car will slide. Once sliding, you must quickly release the brakes, apply sand and re-apply the brakes again.

Caution
You have no stopping control when the car is sliding!

After using either of the above procedures, here's how to recover:

1. Move the brake handle to the Service Application or Doors Open position.
2. Hold down the controller handle in the OFF position until brake pressure exceeds 50 PSI.
3. Reset the circuit breakers. Check the sand boxes. UPDATED

Note: Do not practice the Motor Braking procedure. Repeated motor-braking may damage electrical components.

Emergency Braking with Motors (when air braking is not working)

Motor Braking is needed **ONLY when normal brakes are inoperative**, either by lack of air pressure or damage to the braking system. When the motorman **first** notices a no brake situation follow these steps:

1. Release the controller handle to activate the Deadman function. The breaker will trip, sand released, the door to balance. Braking if available will be applied.
2. Place the reverser key to reverse.
3. Quickly move the controller handle to the first parallel notch (notch 6). The motors will immediately engage each other as a motor-generator set, slowing the car. Adjust the rate of deceleration by increasing the parallel notches.
4. If the car doesn't begin to decelerate when the first parallel notch is selected, manually trip the breaker and procedure as in step 3 above.
5. This procedure rapidly slows the car to a crawl but may not stop it completely. If no air is available to hold the car, set the controller to OFF, and **use the hand brake to stop and hold the car**.
6. Pull the pole, i.e. make **sure** the car is disconnected from the overhead wire.

WARNING
Do not attempt to recover after motor braking has been used! Request maintenance assistance. Phone numbers are listed on the clipboard at the A-end of the car.

If maintenance people clear the car for operation:

1. Return the controller to OFF, reverser to neutral position, and brake handle to the door open position.
2. Turn Compressor and Main Light switch to OFF. Raise the appropriate pole.
3. Reset the breaker(s); turn Compressor and Main Light switches ON.
4. Make sure the compressor is on and operating (pressure is rising). Check the pressure gauge at both ends of the car.
5. Release the hand brake when both needles show pressure is above 50psi.
6. **A new static brake test MUST be performed:** When pressure has increased enough for the compressor to turn off, close the door, release some brake pressure and confirm there is no brake system leakage (black needle) in the lap position. Test the car as if leaving the barn for the start of the day. When air brake is verified to be operating normally, procedure as normal.

WARNING
Do not move the car until air braking has been restored.

Changing Ends

1. After coming to a stop, move the brake handle to the DOOR OPEN position. (When the door is open, releasing the controller handle will not trip the deadman function.)
2. As you leave the operator's position, **take the reverser key with you.**

Caution
Avoid distractions! Interrupting this procedure has been the cause of many back-poling accidents. When the trolley pole is pushed, rather than pulled, (back-poling) it's more likely to bounce off of the line and tangle with a wire cross arm. It is sure to separate from the wire at the Roosevelt Street curve.

3. If you are leaving the A end of the car, change the headlight prior to departing the operator's position. When transferring back to the A end, change the headlight first upon reaching the platform.
4. Change poles: Always put the previously-idle pole on the line **before** taking the currently active (trailing) pole off of the overhead line. **Remember:** You're responsible to ensure that the poles are set properly even if the conductor or someone else assists you.
5. Move the control handles to the other end of the car.
6. Always pick up and discharge passengers from the median side of the car and at the west side of intersections

WARNING
Protect passengers from automobile traffic as much as possible. When traveling west, you'll have to vacate the operator's platform to open the door at the other end of the car.

Laying Up the Car at the End of the Day

1. Open and hook barn doors to the empty bay. Ensure that the barn approach switches are set properly to enter the empty bay. Make sure that there are no obstructions in the barn before entering.

2. Coast through the insulator.

3. Stop the car with the hanging ball just touching the window. This will insure that the car is positioned so A-end pole won't interfere with closing the barn doors.

4. Do not assume that, because the car is stopped, it's safe to release the controller handle. Make sure that the brakes are set before removing the controller handle and reverser key. Then move the brake handle to the A-end, and put it in the DOOR OPEN position.

5. Turn the compressor switch and main light switch to OFF. Exit the car and rotate the compressor air tank drain valve handle clockwise ¼ turn to the vertical (open) position to drain air and blow condensation from the tank.

Note: Always rotating the drain valve handle clockwise prevents it from becoming unscrewed from the valve body.

6. After sufficient air has drained from the tank, the brake handle may be set to lap and removed without the door closing. The drain valve (aka stitzel valve) is left open.

7. Disconnect the power supply:

   a) Switch the Breaker OFF.

   b) Switch main Power Switch OFF and lock it.

   c) Throw the LINE switch to GROUND.

8. Lower and fasten the A-end pole. (Do not leave any pole up.)

9. Store the controller handle, brake handle, and reverser key in their case.

10. Return the cell phone to its charging cradle. Be sure the charge light stays ON.

11. Insure that all lights are turned off in the barn and that all doors are securely locked.

Note: To keep the car in the best working condition always notify maintenance people of a problem or maintenance issue by entering it in the notebook in the barn.

Repairing a Broken Rope

1. Stop the car and locate the emergency bag behind the B-end controller. Put the safety vest on and remove the retrieval rope.

WARNING NEW!
Turn **OFF** the compressor and the lights. Set the hand brake. **Make sure neither pole is in contact with the overhead wire**.

2. Toss one end of the rope over the base of the pole that's off the wire. With help from your conductor or a passenger, slide the rope over the unattached pole, working toward the disconnected trolley wheel until the pole is down and stow it under its retraining hook.

3. Repair the rope if you can: UPDATED

   A.] If the rope is broken or come loose at the end of the pole under the trolley wheel, get a step ladder from the Mountain barn. **NEVER LEAVE THE CAR UNATTENDED. Turn off the power to the overhead wire**. Return to the streetcar and re-attach the rope to the pole. Return the ladder to the barn, and turn on the power to the overhead wire. Return to the streetcar. Place the appropriate pole back on the overhead wire, and power up the car normally. Resume your shift.

   B.] If the rope has broken at some point away from the end of the pole, tie the two ends together. Check that the knot is sufficiently clear of the trolley catcher reel. Place the appropriate pole back on the overhead wire, and power up the car normally. Resume your shift.

   C.] If the rope has broken so close to the catcher reel that any knot would interfere with the normal operation of the reel, call for assistance from maintenance people.

Note: If the operation of the trolley catcher is impeded, the car will de-pole. Do not use the retrieval rope as a substitute for a broken rope.

4. Return the vest and retrieval rope back in the emergency bag.

5. Always notify maintenance of this issue so the rope can be repaired as needed. They are listed on the Call Sheet at the A end of the car.

Chapter 4: Conductor Procedures

The following guidelines and procedures have been developed over time to ensure safe car operation and to prevent injury to crew and passengers. Pay special attention to information in boxes:

- **Notes:** Provide hints or explains why a particular procedure is needed.
- **Cautions:** Describe where non-compliance could cause damage to the streetcar.
- **WARNINGS: Identify situations where non-compliance could cause injury or death.**

While performing his/her duties, the conductor should act as a host to make our guest passengers welcome and comfortable. NEW!

Conductor Responsibilities

The conductor is responsible for:

1. **Passenger safety.** Your primary responsibility is your passengers' safety. You are in charge of passengers when boarding and riding on the car. Understand the safety requirements for a safe trip and explain them to your passengers at the start of each trip: keep everything inside the car windows and do not stand or move around when the car is operating. The motorman will not move the car until you signal to depart.
2. **Collecting fares and managing the cashbox:**
   - Collect a fare or identify a valid pass, token or transfer for each passenger boarding the car. This is typically done on the ground as you board people.
   - Tokens can be used to pay a fare; if a token is taken to pay a fare, do not return it to the passenger as a "souvenir."
   - Transfers are issued when passengers interrupt their round trip.
   - You are responsible for ensuring that all money collected on your shift is deposited in the cashbox except for small amounts required for making change.

Conductor Page greeting new passengers

3. **Streetcar system Interpretation.** Car 21 is a nationally recognized award-winning historic treasure. Most passengers will want to know something about its history, but also will want to enjoy the experience that the ride itself provides. On each trip, present an accurate 2-3 minute talk focusing on the FCMR history and how the cars and track were restored. Tell the motorman when and where you'd like to deliver your talk. If most riders on a trip have ridden the car before and are not interested in hearing the talk again, consider sitting with new riders to answer questions one-on-one.
4. **Promoting souvenirs.** Mention to passengers that souvenirs are available in the depot after the ride. If a depot agent is on duty, he/she will handle the sales. Without a depot agent, you will make the souvenir sales. Try to do this quickly when passengers are waiting to board the car. While our souvenir manager keeps the depot well stocked with merchandise, please note any missing item on the sales tally sheet.

Car Capacity

The car seats 28 adults. Occasionally three kids can occupy a seat. With the motorman's OK, the unused motorman seat can also be used for one or two overflow passengers, provided that the conductor monitors them.

WARNING
To ensure passenger safety and avoid overloading, standees are not allowed on the car.

On busy days the car will fill up and you'll have to leave some people standing in line. For passenger and operational safety, **we do not allow standees on board;** an exception would be offering shelter during a storm when the car is standing still. When leaving people behind, explain as diplomatically as possible that we cannot overload the car for safety reasons. Tell them you will return quickly for them or, if it's the last trip of the day, offer to take one of their party back to retrieve their car. Unless you know that they have alternate transportation, never leave people waiting for you after you depart for the last time from either end of the line.
If the motorman agrees, you may even make an extra run to pick up people left downtown.

Fares and Passes

Standard round-trip fares are:

- Adult: $2.00
- Senior (60+): $1.00
- Child ages 3 through 12: $1.00
- Child under 3 not occupying a seat: free

Society members are issued a membership card including a six-ride pass each year. We also sell 10-ride adult passes for $16 and 10-ride child/senior passes for $8.

Membership card is also a six-ride pass.

Senior & child ten-ride pass.

For individual memberships, punch each ride (not the passenger). For family memberships, punch the card once for the entire family. If a non-lifetime member offers a pass that's completely punched, ask for the appropriate fare. Do not collect used-up membership cards.

Notes: Unused punches on previous-year passes are still good. Local organizations issue passes for special events, such as the Poudre Library's summer-reading program. Be sure to collect each special pass and put them in the cashbox. We return special passes for reimbursement.
Lifetime Passes: We issue a special pass to lifetime members. It's good for unlimited rides for members and their guest and doesn't require punching.

Carrying Pets Not Allowed

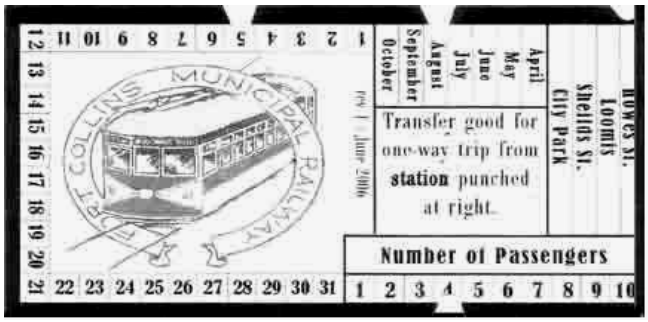
Due to safety concerns we allow service dogs and only pets that are in travel containers. See 'Carrying Pets' guidelines on the Call Sheet next to the A-end controller, and General Rules on the Car on page 10.

Using the Buzzer

The streetcar has buttons between the windows on each side which sound a buzzer next to the motorman. Historically, when the car was operated without a conductor, the buzzer was used to notify the motorman when a passenger wants to deboard. Now, when a passenger wants to deboard, the conductor should verbally notify the motorman. The motorman will stop on the west side of the next regular stop. Always load and unload passengers on the grassy median, never onto the street. The conductor assists passengers off, as needed, and signals the motorman to proceed when all passengers are seated. Don't let folks push the buttons at random, as the buzzer circuit (and the motorman) can be overloaded.

Issuing Transfers

Any passenger can interrupt their round trip by deboarding and reboarding later at the same stop. Issuing a transfer to each group allows them to reboard for the rest of the trip. Most transfers are issued to passengers who walk downtown from Howes St. When issuing transfers for Howes St., either do so while the car is enroute or away from the car at Howes to allow others to easily exit. Be sure to mention that our last departure from Howes St. is 4:40 pm. Since transfers are valid only the day issued, be sure to punch the month, day, number of passengers, and deboarding location as shown at right.



Our transfer is similar to original ones.

Using the Coin Changer

Streetcar conductors carried a coin changer on their belt to quickly make change and to dispense tokens. Although the Fort Collins Birney cars never carried conductors to make change and the motormen probably didn't use changers, we provide a coin changer for you to demonstrate how it was used. Only dispense quarters with our changer since other coins and tokens will get stuck.

Avoid Passengers Talking to the Motorman

To ensure safe operation, please discourage passengers from talking to the motorman while the car is enroute. If this occurs, politely interrupt the conversation and offer to answer any questions away from the motorman's position. ***Don't stand in the front vestibule, especially at the front window or door.*** The motorman needs to watch for traffic from all directions while approaching busy intersections.

Handling Tokens

We minted replicas of two original tokens used by the FCMR. The dime-sized token represents one adult fare and sells for $2.00. The nickel-sized tokens are for kids and sell for $1.00. You'll find some of each in the cashbox. Since each token is worth a fare, don't give them away. Place tokens you collect in the cashbox.

Filling Out the Souvenir Sales Form

When there is not a Depot Agent on duty, the conductor is responsible for souvenir sales. Because we must report souvenir sales to the City and pay City sales tax, we record sales each weekend on a souvenir-sales form. The forms are in the depot. Date it for that weekend and write your name in the column for your shift. Keep close track of the number (not price) of each item you sell.

History Talks

To fulfill our mission of delivering an historical streetcar experience, conductors should give a brief (2-3 minute) history talk on each trip. Try to deliver the talk somewhere on Mountain Ave, but not in City Park on hot summer days. Decide on this with your motorman before your shift begins. Some like to deliver the talk while in the shade eastbound at Shields Street, since we always stop there and it's breezy even

on hot days. Others like to give the talk at Howes St. before departing for the return trip. If you have mostly repeat riders, you may skip a general talk; instead, sit with a few new riders and talk with them. It's your choice.

Try to work the following facts into your talk:

- ✓ Fort Collins streetcars began running in 1908. Car 21 was one of four cars the City bought new in 1919 from American car Company. In May 2019 Car 21 turned 100 years old and has carried over 250,000 passengers since being restored in the 1980's.
- ✓ Car 25 was built in 1922 by Brill Company. It was purchased by FCMR in 1946 from Virginia Transit Company, used in the City of Richmond VA as car 1520. It operated in Fort Collins until the system closed in 1951. Then it travelled to Colorado mountain towns and on to the east coast. It returned to Fort Collins in December of 2007 for restoration, and returned to weekend service in 2020. NEW!
- ✓ Car 25 differs from car 21 by high back leather seat, doors that open inward, grab straps, and slightly longer length. Both cars originally had heaters, but heaters are only installed and operating on car 25.
- ✓ We are a non-profit; fares, membership dues, sales and donations cover our expenses.
- ✓ No City funds were used to restore the cars, rebuild the line, or operate the car. Volunteers, members, and donations provided all labor, money, and materials. We have souvenirs for sale, ranging from 25-cent postcards to pins, prints, streetcar models and clothing. More FCMR history is in Appendix A and on our website (www.fortcollinstrolley.org)

Sample History Talk:

Fort Collins' streetcar system began in 1907 with construction of a line on West Mountain Ave. by the Denver & Interurban Railway, a subsidiary of the Colorado & Southern, now part of the BNSF. Another line went South on College Ave., then East on Pitkin past the old high school to Whedbee, then north on Whedbee to Magnolia, west to Peterson, then north to East Mountain Ave. Streetcar operation began in January 1908.

The first streetcars were heavy, double-truck cars built in Denver. By 1918, the system was losing money and went into default. The City purchased the system after voters approved issuing a $100,000 municipal bond. When the City acquired the line in 1919, it simplified the system by removing the Lindenmeier and old-town lines, and extending the Mountain Ave. line through City Park. They bought four new single-truck Birney safety cars from the American Car CO., St. Louis, MO for about $6500 each to replace the worn-out originals, and began running three cars continuously from 6 am to midnight. The fare was always 5 cents.

Although the City bought five additional cars to supplement the first four, by the early 1950's it was difficult to keep the cars running. The final run occurred on June 30, 1951. By 1953, most of the rails were pulled up. Besides the passing siding at Mack Street, some original rails still remain on East Mountain, Whedbee and other streets in town.

Car 21, the first new car to arrive in 1919, was saved and moved to Library Park, where it sat out in the elements until 1978. The other remaining cars were sold and are in museums or being restored. It took 7 years to restore Car 21. In the 1980's we rebuilt the portion of the Mountain Ave. line you're on now…all with volunteer labor at no cost to the City. Our inaugural run of restored Car 21 occurred on December 29, 1984. We repeated that run 20 years later in 2004

Donations

We gladly accept donations to help support car operation and maintenance. At some point on each trip point out the donation (fare) box at the B end of the car.

A Routine Trip

To help you learn the ropes, here's a typical conductor routine on the car. Also, refer to the Conductor Checklist card kept in the cashbox.

1. Before beginning your shift, discuss teamwork issues with your motorman. See 'Beginning shift checklist' on the next page.

2. When collecting fares at City Park stand on the sidewalk next to the north (A-end) car door. Assist passengers onboard, as needed, for their safety. The motorman counts passengers by ringing the people counter as they board.

3. When the car is full or no more riders are waiting, board the car and welcome your passengers. Give the safety talk.

> **Caution**
> Do not stand inside the front vestibule or any place that obstructs the motorman's view.

4. After verifying that all passengers are seated and no more are approaching the car, give the motormen an OK to depart City Park. Stay near the back of the car to oversee your passengers' safety.

5. When approaching each intermediate stop, watch for any waiting passengers. If you have any, be prepared to collect fares and board your passengers, always from the median side. When all passengers are safety seated, tell the motorman to proceed.

6. When approaching Howes St.:

a) Announce that this is the end of our line, downtown is two blocks farther.

b) If you haven't already done so, mention that transfers are available so they can reboard for the return trip. Mention that the last car leaves about 4:40 pm.

c) Between 1:00 pm and 4:00 pm, mention the City's Victorian Avery House Museum is free and open for visitors.

d) As the car stops, your motorman appreciates when you block the aisle so he/she can exit first to change poles.

e) Stand on the ground at the door to help passengers off the car.

> **WARNING:**
> Always check for solid ground (lights on) when stopped for passenger loading and unloading. Leaves, sand, or other debris on the rails can cause a dangerous condition when the car is not in solid contact (grounded) with the rails.

7. When you're done helping passengers off the car, show passengers how to flip the seat backs for the return trip (if they haven't already done so). Then collect fares from any new passengers and transfers from returning passengers. They may keep the used transfer as a souvenir.

8. After completing business at Howes St., check for any more returning passengers. Then release the car to the motorman for the return trip. During the return trip repeat the safety messages and oversee your passengers' safety.

9. When arriving at City Park:

a) Thank your passengers for riding, tell them to watch their step getting out, mention the donation box, and invite them to look at our souvenirs in the depot.

b) Block the aisle so motorman can exit first to change poles. Then stand on the ground at the door to help passengers off the car.

c) After all passengers have deboarded, and there is not a depot agent, quickly handle any souvenir business and prepare to take new fares when the motorman opens the A-end door.

Shift Checklist

Beginning Shift Checklist

Before beginning your shift...

...you and your motorman should decide how best to handle the routine between trips at City Park, especially during busy times when there is no depot agent. If you have souvenir business, we recommend that the motorman unload people so the conductor can quickly open the depot for business. Other teams may use other procedures as long as the responsibilities to our customers are met:

- Always help passengers off the car.
- Open the depot when you have interest in souvenirs but there's no depot agent.
- Avoid making new passengers stand in line in the hot sun waiting to board the next trip.

✓ Report to the depot by **11:45 am.**

✓ For the first shift, if there is no Depot Agent on duty the conductor will need to:

- Put the bench outside, hang out the flag, and hang the OPEN sign. Open the window shutters.
- Fill out the souvenir sales sheet in the depot with the date and your name.

✓ Ensure that there are transfers and yellow handouts on the car. Extras are in the conductor's cabinet in the depot.

✓ Discuss teamwork issues with your motorman. For example:

- Is it OK to seat children in the unused motorman seat?
- How will you or motorman help deboard passengers at depot if no depot agent present?
- Where will you give the history talk on each trip? At depot? Shady spot along the line?

✓ Retrieve the sign for Howes St. from the depot and put it in the car on first run of the day. Place the sign at Howes St boarding on arrival of first run.

✓ Turn over all cash and coin changer to your relief conductor.

Caution: If there is no depot agent during your shift, the depot must be closed and locked when you are away from the City Park boarding area.

Ending Shift Checklist

The **second-shift** conductor arrives at the City Park depot by **2:15 pm**:

✓ After discussing any operational issues with the first-shift crew, get the cash and optional coin changer. Then begin collecting fares and boarding passengers.

✓ Before departing City Park, discuss with the motorman where you'll give the history talk and who is going to help deboard passengers at the park if there's no depot agent.

✓ During the last run of the day, pick up the signage from Howes St. Store the sign in the depot when arriving back at City Park.

✓ After the run ending the last shift:

- Put paper cash, special passes, etc. in the proper cash bag (Saturday, Sunday or Holiday) put the bag(s) in the cashbox.
- Leave 'seed money' and some change in the tray for the next day.
- Leave the coin changer and punch in the car next to the cashbox.
- Fill out the souvenir sale Sheet in the depot with the date and your name; put the sales sheet and souvenir money in the proper cash bag.
- If there is no Depot Agent: Put bench, flag, and OPEN sign in the depot. Close the shutters and lock up the depot.

Chapter 5: Running Charters

We operate charters during daylight hours anytime we're not operating for the public. We run 40-60 charters a season. Example charters include school and daycare groups, weddings, business gatherings, reunions, birthday parties, and the occasional rail fan group. See the Charter Coordinator for current charter fare and other details.

A charter typically requires only a motorman, though some large groups may need the help of a conductor. To schedule a charter or sign up for upcoming charter work, call or Email our Charter Coordinator (phone number and Email address listed on our website) or leave a message at our barn phone (we're in the phone book).

Motorman Hutchison boarding a school charter in May 2006.

Note: As when scheduling regular weekend shifts, if you cannot fulfill a charter operation within a week of its scheduled date, you must find a replacement and notify the charter scheduler.

Pick-up and Delivery Locations

When you're called to run a charter, be sure you know where and when to pick up and deliver your passengers. Many charters begin and end at City Park. Exceptions are rail fan charters, which may begin at the barn, wedding parties which may be trips to or from the Avery House, or school charters which may start and end at Shields St. Most charters are just for one hour.

Note: Do not allow food, drinks or pets on the car at any time.

Prepping and Putting Away the Car

Be sure to follow the procedures in Chapter 3 and the checklists posted in the barn when getting the car ready and putting the car away. Set the destination rollers to SPECIAL at each end of the car and reset the fare counter.

If your charter is immediately before or after a regularly scheduled operating day, expect to leave or pick up the car at City Park unless you get other instructions. When finishing a charter just before noon on a regularly scheduled day, you must stay with the car until relieved by the scheduled motorman.

Collecting Fares

As you board your charter passengers, be sure to collect the charter fee. If a receipt is requested, use the form kept in the charter money pouch.

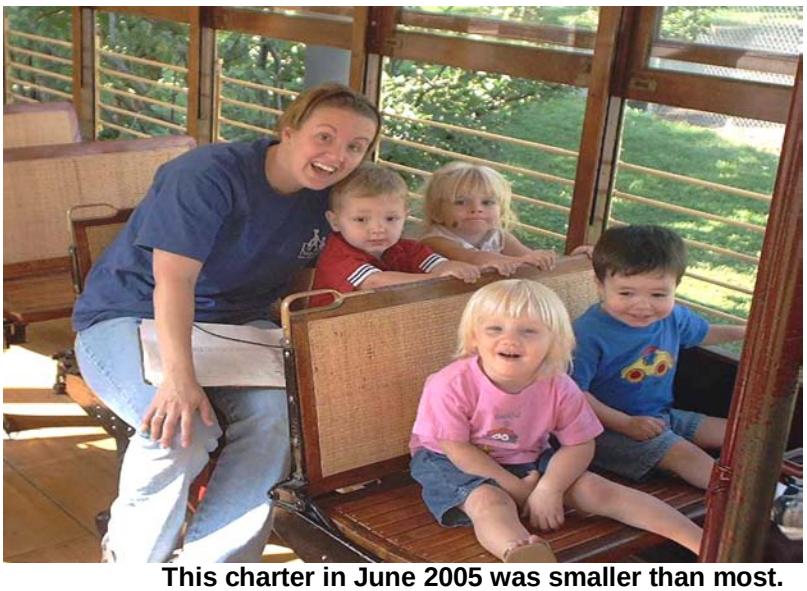
> **Note:** Do not refuse to run the charter due to missing funds. Instead make arrangements for sending the charter fee to the treasurer: PO Box 635, Fort Collins, CO 80522.

After boarding passengers, ring them up on the counter.

Delivering a History Talk

Many charter groups ride the car specifically to learn more about our history and expect a brief talk. Try to tailor your talk to the group's age and interests. For example, preschoolers don't appreciate historical dates but do understand that the car may be older than their grandparents. Adults interested in history enjoy first-hand stories about how the car was restored in 7 years, rebuilt the track, moved 77 trees (they all lived), replanted sod, and repaved 17 intersections in 4 years.
Plan to deliver your talk at an appropriate location (a shady spot is nice in the summer). Provide time for questions afterwards. See Appendix A and experienced conductors for helpful information

> **WARNING**
> **FOR SAFETY, DO NOT GIVE TOURS OF THE CAR BARN WHEN THE CAR IS OUTSIDE.**



This charter in June 2005 was smaller than most.

Chapter 6: Depot Procedures

Depot Agent/Conductor Responsibilities

Having a depot agent on duty is an important job, as they are the first contact for passengers. Also it frees the conductor to assist passengers with boarding. The conductor's job is to, deliver a history talk, and oversee passenger safety on the car. However, if there is no depot agent, the conductor will also assist with souvenir sales.

Duties include:

- Arrive at the depot at least 15 minutes before your shift.
- Putting out the "OPEN" sign, bench, and flag out when arriving at the Depot for the first time that day.
- Open windows and the shutters.
- Selling souvenirs and tokens for rides. Log sales on the Depot Sales form. See below.
- Answering questions about our operation when the car is out on the line.
- If using the "Square Card Reader", please log off before leaving.
- Turning over the souvenir sales money to the conductor at the end of the second shift.
- Take in the "Open" sign, bench, and flag, and place inside the Depot at the end of each day.
- Close the shutters, and set the draw bolt.
- Close and lock the windows.
- Lock-up the Depot.

Souvenir Sales

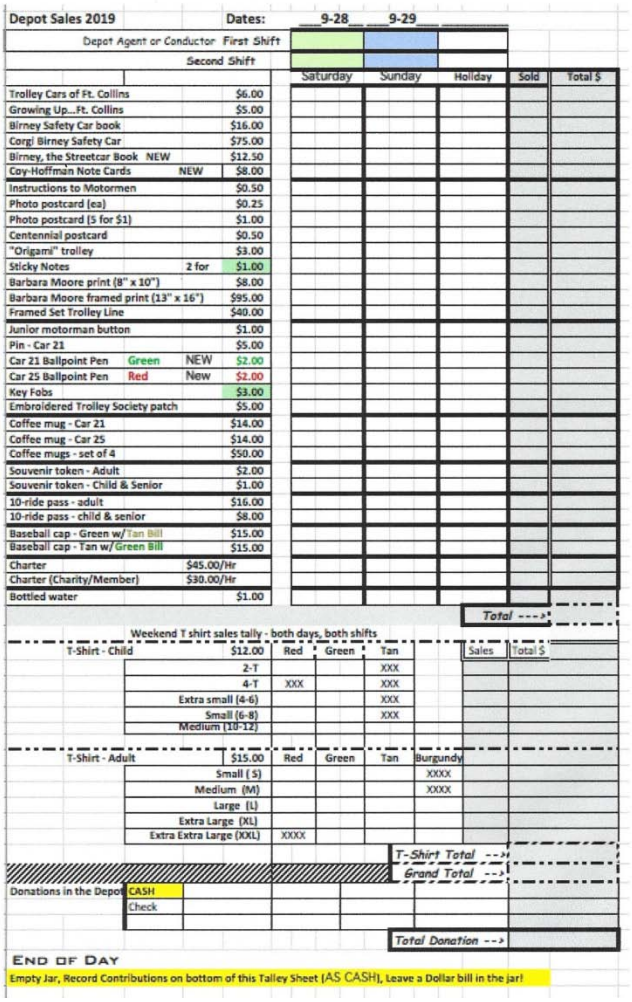
The Depot Sales sheet contains room for the depot agent's or the conductor's name for each shift. Please sign it.

Souvenir items are priced in the display case. Sales tax is included in the price so no tax computations are necessary. Items sold should be taken from stock stored in the metal storage cabinet, or the wood cabinet up front, in the Depot. A tick-mark (tally mark) should be entered on the sales sheet adjacent to each item sold.

A small container of change is stored in the metal cabinet.

A list of available T-shirt sizes and colors is at the bottom of the Depot Sales sheet. Check the actual stock to verify availability. An "X" next to a size line or color column indicates that size and color is not available.

Make a note on the back of the Depot Sales sheet of any items out of stock or needing replenishment.



Depot Sales 2019 Dates: 9-28 9-29

Depot Agent or Conductor First Shift

Second Shift

			Saturday	Sunday	Holiday	Sold	Total $
Trolley Cars of Ft. Collins		$6.00					
Growing Up...Ft. Collins		$5.00					
Birney Safety Car book		$16.00					
Corgi Birney Safety Car		$75.00					
Birney, the Streetcar Book	NEW	$12.50					
Coy-Hoffman Note Cards	NEW	$8.00					
Instructions to Motormen		$0.50					
Photo postcard (ea)		$0.25					
Photo postcard (5 for $1)		$1.00					
Centennial postcard		$0.50					
"Origami" trolley		$3.00					
Sticky Notes	2 for	$1.00					
Barbara Moore print (8" x 10")		$8.00					
Barbara Moore framed print (13" x 16")		$95.00					
Framed Set Trolley Line		$40.00					
Junior motorman button		$1.00					
Pin - Car 21		$5.00					
Car 21 Ballpoint Pen	Green NEW	$2.00					
Car 25 Ballpoint Pen	Red New	$2.00					
Key Fobs		$3.00					
Embroidered Trolley Society patch		$5.00					
Coffee mug - Car 21		$14.00					
Coffee mug - Car 25		$14.00					
Coffee mugs - set of 4		$50.00					
Souvenir token - Adult		$2.00					
Souvenir token - Child & Senior		$1.00					
10-ride pass - adult		$16.00					
10-ride pass - child & senior		$8.00					
Baseball cap - Green w/Tan Bill		$15.00					
Baseball cap - Tan w/Green Bill		$15.00					
Charter		$45.00/Hr					
Charter (Charity/Member)		$30.00/Hr					
Bottled water		$1.00					

Total --->

Weekend T shirt sales tally - both days, both shifts

T-Shirt - Child	$12.00	Red	Green	Tan	Sales	Total $
2-T				XXX		
4-T		XXX		XXX		
Extra small (4-6)				XXX		
Small (6-8)				XXX		
Medium (10-12)						

T-Shirt - Adult	$15.00	Red	Green	Tan	Burgundy
Small (S)					XXXX
Medium (M)					XXXX
Large (L)					
Extra Large (XL)					
Extra Extra Large (XXL)		XXXX			

T-Shirt Total --->

Grand Total --->

Donations in the Depot						
	CASH					
	Check					

Total Donation --->

END OF DAY

Empty Jar, Record Contributions on bottom of this Talley Sheet (AS CASH), Leave a Dollar bill in the jar!

Example Depot Sale sheet

Chapter 7: Motorman Internship Program

The motorman internship program provides an opportunity for members who wish to become motormen on Car 21 to quickly volunteer within our operation. The program also allows us to evaluate the candidate's potential for future contribution, helps with planning for future motorman-training requirements and provides short-term help for other FCMRS departments.

Internship Requirements

A motorman intern must meet these entry requirements:

- At least 21 years old and holds a valid Colorado adult driver's license with no handicap restrictions except need for corrective lenses.
- Active member (any level) of the Society, as shown by an up-to-date membership card.
- Good physical health to remain vigilant during entire volunteer shift to ensure safe operation.
- Able to work in harmony with fellow crewmembers.
- Able to read, write, and communicate clearly in English.
- When working in a barn, provide work clothes, gloves, safety glasses, hearing protection, and steel-toed boots, as needed.
- Able to keep a record of internship work using an Intern Work Record form available from trainers.

Completion Requirements

An intern will need to complete at least 20 hours of approved FCMRS volunteer work before being considered for motorman training. Twelve hours (four shifts) observing/assisting motorman duties on regular weekend operations are required. The remaining time can include work in any of the departments listed on the Intern Work Record, including motormen assistant, conductor, depot agent, Car 21 maintainer, track maintainer and helping restore Car 25. The motorman intern records all work on the Intern Work Record. Each entry on the form must be signed by the motorman or department lead observing the intern's work to validate that work was performed in a satisfactory manner.

After at least 20 hours of satisfactory work has been logged, the intern submits the form to a motorman trainer, who will review the intern's contribution with the motormen and/or department leads involved and other motorman trainers. If the contribution proves satisfactory and the intern appears to be a good candidate for motorman training, the trainer will notify the intern of satisfactory completion and add the intern to list of those eligible for motorman training.

When there is a need for more motormen on the roster, training sessions typically begin in the spring and continue throughout our operating season. The motormen trainers determine when more motormen are needed to fulfill our operations. For more on this program, see one of the FCMRS motorman trainers listed on the crew roster posted in the Mountain Ave. barn.

Chapter 8: Motorman Training Syllabus

The following syllabus is used for the initial qualification of motormen and as a guide for recertification of existing motorman after an absence.

> **Note:** A motorman is not authorized to operate a car he/she has not been certified to operate.

Motorman Training Syllabus
Approved: Feb 2011,revised May 2019.

Part I. Present and discuss the FCMRS and car's history, systems and their functions as outlined in the current Equipment Operations Manual.

On-site, at least an hour. Explain car systems:

A. Electrical:
   1. Motor, resistors, control circuit
   2. Compressor circuit
   3. Lights and buzzer circuits

B. Air system
   1. Brakes, brake stand valve positions, etc.
   2. Doors
   3. Sand

C. Safety system
D. Safety catchers
E. Rail watering
F. Important actions and sequencing of preparing the car and putting the car away

Part II. Hands-on training. Until trainee demonstrates adequate skills

A. Emphasize and demonstrate actions required by safety air systems, switches, and brake stand positions.

B. Brakestand operation and car braking. Trainer operates the controller, student the brakes.
   1. A-end operation, downhill, use brake pressure gauge, run on Mountain Ave. medians only.
   2. Learn partial application using lap position, and braking rate control by time in application position.
   3. Make stops with a minimum (10-15psi) of brake cylinder pressure.
   4. Graduate to stops at designated targets.
   5. B-end, uphill stops. Learn aid of gravity, stopping without gauge feedback.
   6. Learn partial release and the delay involved.

C. When skill has been acquired with brakes, add controller operation.
   1. Acquire habit of keeping controller down when brakes are off.
   2. Learn series steps, location of full-series position.
   3. Learn and practice stepping through positions in keeping with increased car speed and not to move up through steps too quickly.
   4. Learn and practice maintaining a speed less than full series. Emphasize coasting rather than 'notching down.'

D. Operating the car on our route
   1. Making good stops, especially at each end of the line, and changing directions.
      a. Poles
      b. Headlights
   2. Appropriate speed - approximately 15 mph max and a fast walk at Mack St. Discussion of wet/slippery rail operations.
   3. How to negotiate the curve at Roosevelt, from both directions.
   4. Awareness of pedestrians on median and at crossings.
   5. How the signal at Shields St. is supposed to work.
   6. Rules at Shields St. in general.
   7. Operate the car over the entire route (barn to City Park to Howes St)

E. Operational coordination with conductor, dealing with passengers.
F. Guidance and practice in starting up the car and in putting it away.

G. Emergency procedures discussion/demonstration
    1. Electrical fire
        a. Dead man deactivation of motors
        b. Status of doors after dead man activation (open, vs. push open)
        c. Conductor may need to 'pull' pole to totally break current flow
        d. Passenger evacuation
    2. Dead man activation and recovery (demo)
    3. Emergency brake application
        a. Status of doors, (open, vs. push open, etc.)
        b. Difference between emergency brake and dead man activation
    4. Motor braking discussion and demo
        a. Limitations
        b. Dangers
        c. Why we don't practice routinely
        d. Discussion of hand brake and its limitations
    5. Backing up streetcar (demo)
    6. Safety catcher action and its reset.
H. Miscellaneous items
    1. Changing light bulbs - discussion and demo common situations.
    2. Effective use of sanders
        a. Starting/stopping on wet/slippery rail
        b. Unclogging traps
    3. Deciding when not to operate in bad weather
        a. Electrical storm is near
        b. Heavy precipitation
    4. Who to call after an emergency.

Motorman Training Syllabus

Part 1. Present and discuss the FCMRS and car's history. Systems and functions as outlined in the Operation Manual
On site, at least an hour. Explain car systems

- ☐ A. Electrical
  - ☐ 1. Motors, resistors, control circuit
  - ☐ 2. Compressor circuit
  - ☐ 3. Lights and buzzer circuit
- ☐ B. Air system
  - ☐ 1. Brakes, brake stand valve position, etc.
  - ☐ 2. Doors
  - ☐ 3. Sand
- ☐ C. Safety System
- ☐ D. Safety catchers
- ☐ E. Rail Watering
- ☐ F. Important actions and sequencing of preparing the car and putting the car away

Part II. Hands-on training. Until trainee demonstrates adequate skills.

- ☐ A. Emphasize and demonstrate actions required by safety air systems, switches, and brake stand positions
- ☐ B. Brake stand operation and braking. Trainer operates the controller, student the brakes
  - ☐ 1. A end operation, downhill, use brake pressure gage, run on Mountain Ave median only
  - ☐ 2. Learn partial application using lap position, and braking rate control by time in application position
  - ☐ 3. Make stops with a minimum (10-15psi) of brake pressure
  - ☐ 4. Graduate to stop at designated targets
  - ☐ 5. B-end operation, up hill stops. Learn aid of gravity, stopping without gage feedback.
  - ☐ 6. Learn partial release and the delay involved
- ☐ C. When skill has been acquired with brakes, add controller operation
  - ☐ 1. Acquire habit of keeping controller down when brakes are off
  - ☐ 2. Learn series steps, location of full-series position
  - ☐ 3. Learn and practice stepping through positions and not move up through steps too quickly
  - ☐ 4. Learn and practice maintaining a speed less than full series. Emphasize coasting rather than 'notching down'
- ☐ D. Operating the car on our route
  - ☐ 1. Making good stops, especially at each end of the line, and change direction
    - ☐ a. Poles
    - ☐ b. Headlights
  - ☐ 2. Appropriate speed – approximately 15 mph max and fast walk at Mack St. Discuss wet/slippery rail operation
  - ☐ 3. How to negotiate the curve at Roosevelt from both directions
  - ☐ 4. Awareness of pedestrians on median and at crossings
  - ☐ 5. How the signal at Shields St. is supposed to work
  - ☐ 6. Rules at Shields St. in general
  - ☐ 7. Operate car over entire route.
- ☐ E. Operation coordination with conductor, dealing with passengers
- ☐ F. Guidance and practice in starting up the car and putting it away
- ☐ G. Emergency procedures discussion/demonstration
  - ☐ 1. Electrical fire
    - ☐ a. Deadman deactivation of motors
    - ☐ b. Status of doors after deadman activation (open vs. push open)
    - ☐ c. Conductor may need to "pull" pole to totally break current flow
    - ☐ d. Passenger evacuation
  - ☐ 2. Deadman activation and recovery (demo)
  - ☐ 3. Emergency brake operation
    - ☐ a. Status of doors (open vs. push open)
    - ☐ b. Difference between emergency brake and deadman activation
  - ☐ 4. Motor braking discussion and demo
    - ☐ a. Limitations
    - ☐ b. Dangers
    - ☐ c. Why we don't practice routinely
    - ☐ d. Discussion of hand brake and its limitations
  - ☐ 5. Backing up streetcar (demo)
  - ☐ 6. Safety catcher action and reset
- ☐ H. Miscellaneous items
  - ☐ 1. Changing light bulbs - discussion and demo common situations
  - ☐ 2. Effective use of sanders
    - ☐ a. Starting/stopping on wet/slippery rail
    - ☐ b. Unclogging traps
  - ☐ 3. Deciding when not to operate in bad weather
    - ☐ a. Electrical storm near
    - ☐ b. Heavy precipitation
  - ☐ 4. Who to call after an emergency

Chapter 9: Conductor Training Syllabus

This syllabus is used for the initial qualification of conductors and as a guide for recertification of existing conductors after an absence.
Approved: September 2012

Part I. Present and discuss FCMRS and car's history as it applies to passengers**. In classroom:**

A. Car 21 history – Slide show and Trolley Cars of Fort Collins
    1. Up to 1951
    2. Restoration and second life
B. FCMRS history and mission
    1. Introduction into Howes St. car barn
    2. Formation of restoration effort – started before FCMRS
    3. Incorporation of FCMRS to rebuild track and operate car
    4. Key dates in restoration/operations of car
C. Introduction to Car 25
D. Other crew requirements
    1. Must be a member of the FCMRS
    2. Proper uniform – hat, conductor badge, Society patch, tie, and name-tag
    3. On-line getting an account and scheduling of shifts
    4. How to get a replacement after signing up for a specific shift

Part II. Conductor duties – Operations Manual

A. Collect fares, assistance in boarding to passengers, no food/drink allowed
B. Pre-departure safety talk: standing, moving around, hands-and-arms
C. Develop and deliver individual historical presentation 2 – 3 minutes and use of yellow hand-out. (This talk should be tailored to the passengers' needs and is not necessary if there are no new passengers on board as indicated by a show of hands.)
D. Mention need for and issue transfers to people getting off car at Howes St., return by 4:30.
E. At Howes St: assist passengers in switching seats for return trip; mention Avery House open
F. Collect transfers, assist re-boarding of car
G. On return to Depot, mention availability of souvenirs in Depot, watch your step, "Thank you" for riding, and point out donation box
H. At City Park, assist deboarding and selling souvenirs as coordinated with motorman
I. Carrying pets
J. Policy of not allowing "standees" on car.
K. General awareness of passengers/passenger conduct, including eating or drinking.

Part III. Motorman trainer reviews car systems and functions as it applies to conductors as outlined in the Car 21 Operations Manual. (Ensure all students are current Society members.) Ride Car 21 and tour the depot. Demonstrate and explain car systems. On streetcar:

A. Electrical:
    1. Motors (600 volt DC), resistors, control circuits
    2. Compressor circuit
    3. Lights and buzzer circuits
B. Air system:
    1. Brakes, brake stand valve positions
    2. Doors
    3. Sand
    4. Wheel flange watering system
    5. Dead man switch
C. Safety system
    1. Dead man system - demonstration
        a. Disconnect/reconnect breakers
        b. Brake application
        c. Sand application
        d. Effect on doors
        e. Recovery
    2. Safety catchers – demonstration
    3. Parking brake – demonstration

Part IV. Routine procedures and information

A. Introduce the car's operational features (seats reversal, buzzers, ceiling vents, destination boxes, fare counter, window operation, donation box, air compressor, motor access doors, etc.). Plus location of:

1. First aid kit
2. Fire extinguisher
3. Cell phone
1. Emergency contacts list – on clipboard, A end
2. Safety pouch with accident forms/vests/rope

B. Always inform the motorman when it is safe to move the car after each stop

C. Coordinate with motorman at start of shift. Specifically, where will talk be given, where conductor will stand so as not to impede motorman vision, who will deboard passengers, who will sell souvenirs, etc?

D. Where to get hand-outs, transfers, etc. – demonstrate transfer punching and destroy used transfers

E. On-car advertising placards. How much per year, who to contact, etc.

F. Introduction to the cash box. End-of-day money handling/preparation for next conductor

G. Handling strollers and wheelchairs

Part V. Emergency Procedures

A. Motorman incapacitation

1. Use of dead man switch to stop car
2. Setting parking brake
3. Call 9 1 1
4. Call for help with car (emergency contact list on clipboard, A end)

B. Electrical fire

a. "pulling" poles
b. Restrictions on use of fire extinguisher
c. Setting parking brake

C. Evacuating the streetcar

a. Marshall passengers to safe (on median) area
b. Exit using median door, if possible.
c. If street-side evacuation necessary, attempt to control traffic (safety vest in pouch, B end)
d. Possible refund of fares/assistance with transport back to automobiles.
e. Assist motorman in repairing or moving car to barn.

Part VI. Depot procedures

A. How to complete sales sheet

B. Procedures to follow at end of second shift on Sunday

C. "Open" sign and bench.

Part VII. Conductor Evaluations – mention Society policy of periodic supervision by Society Staff.

Part VIII. Minimum requirements for conductors to receive motorman training

A. Minimum of 20 hours of approved work for Society

1. Car 21 maintenance
2. Car 25 restoration
3. Conductor shifts
4. Depot shifts

B. Conductor's responsibility to keep track of hours.

Conductor Waples answering questions in 2006

Waiting for car 21 at Howes Street

Chapter 10: Reporting Accidents

If the streetcar is involved in an auto accident, the motorman's and conductor's first responsibility is to look after the well-being of themselves, their passengers, the driver of the other car, and other by-standers.

The police should be contacted whenever there is a vehicle incident with the streetcar regardless of its severity. This is to provide official, documented records of what happened, who (if anyone) was injured, and the extent of those injuries. Additionally, the police will provide documentation of the extent of the damage to the vehicles involved to help with liability claims in conjunction with the accident.

The parking brake should be set, the car powered down, and the poles lowered as soon as practical.

The motorman and conductor should attempt to get the names of all people connected with the incident. This includes witnesses, the other driver(s) and the passengers. A sheet entitled "FCMRS Accident Report Form" is located in this chapter and a copy of that sheet is contained in the green emergency pouch at the B end of the streetcar. The cover sheet for the streetcar's insurance policy is also contained in the pouch as is an abbreviated checklist for accident reporting.

If conditions permit, the motorman or conductor should use the Society's cell phone to take pictures of the incident. Images showing the damage to the vehicles involved can also be used to adjudicate claims filed as a result. The cell phone should also be used to contact key members of the Society for accident notification and to get assistance. A list of telephone numbers is on the clipboard at the A end of the car. The streetcar should not be moved, or powered up, until the full extent of any damage is known and understood.

The motorman and the conductor involved should not sign any document unless it is for the police and should not admit to any fault even if they believe that the incident was their responsibility. They should not attempt to move the streetcar until specifically cleared to do so by the police. If there is another vehicle involved which requires towing, the streetcar should not be moved until the other vehicle has been towed clear. This is to preclude a claim that the streetcar damaged the other vehicle while the streetcar was being moved.

It is not uncommon that people will experience some level of shock after an accident and they may not be thinking as clearly as they would under normal circumstances. For this reason, an FCMRS Accident Report Form has been prepared and is attached. It includes a checklist, information required, and instructions on where to file the completed forms. A copy of this form is also in the pouch containing the safety vest located at the B end of the streetcar.

FCMRS Accident Report Form

Use this form to collect information on each accident involving our streetcar before leaving the scene. A copy of the form is in the emergency pouch at the B-end of the car.

Accident checklist

- ☐ Determine that you and the streetcar are not in danger of being struck by other vehicles.
- ☐ Call 911. Check for injuries for crew, passengers, and other people involved. List info below.
- ☐ Power-down streetcar, lower poles and set parking brake.
- ☐ Exchange information with any other(s) involved, if applicable. Record names of witnesses and passengers.
- ☐ Don't sign any document unless it is for the police. Do not admit any fault even if you think you are at fault.
- ☐ Don't move streetcar until you are completely sure that it is safe to power up and drive.
- ☐ Don't move streetcar until asked to do so by the police.
- ☐ Call for assistance from trolley staff. Phone numbers are on the clipboard at A-end of car.

Collect required information

Location/time of accident _____

Car #:_____

Crew: Motorman _____

Conductor_____

Other driver information:

Name _____ Phone #_____

Address _____

Driver's license #_____ State _____

Vehicle make/model_____ License plate _____

Insurance carrier_____ Policy #_____

Witnesses _____ Phone # _____
(if any)

_____Phone # _____

Injured parties_____ Phone # _____
(if any)

_____ Phone # _____

_____ Phone # _____

Notes_____

_____

Chapter 11: MoW Operations & Maintenance

This chapter explains operating our Maintenance of Way (MoW) equipment, including motorcars MW01, MW02, and the track cleaner attached to MW02. Also included are routine equipment and right-of-way maintenance tasks.

> **Note:** This chapter cover only Maintenance of Way equipment. A separate document describes routine maintenance and preventive maintenance required for car #21 and #25.

In addition to reviewing this chapter, maintenance personnel must complete hands-on training with the lead track maintainer before operating MoW equipment.

Please pay special attention to information in boxes:

- **Notes:** Provide hints or explains why a particular procedure is needed.
- **Cautions:** Describe where non-compliance could cause damage to equipment.
- **WARNINGS: Identify situations where non-compliance could cause injury or death.**

Starting Motorcar MW02

1. Check fuel (filler at rear of car). You'll need at least 2 inches of fuel in the tank per trip. If the gas can is empty, refill it with regular gas (85 octane).
2. Spray a little chain lube on drive chain below car.
3. Open fuel shut-off valve (under gas tank) a few turns.
4. Set transmission in neutral, set throttle forward (idle), pull choke out, and start engine.

> **Choke settings:** In warm weather, push choke in after engine starts.
> In cold weather, first adjust choke so engine runs smoothly. Push choke in after a minute.

5. Disconnect and unplug the battery charger. Store it on the shelves. Rewind extension cord. Set light switch for car direction: Down for reverse (eastbound) and up for forward. Depress clutch, shift transaxle lever to reverse, shift transmission to 1st gear and move out of barn.

Starting the Track Cleaner

1. Fill cleaner motor's gas tank.
2. Open valve below tank (knob should be vertical).
3. Set choke: Full choke when motor is cold. No choke when motor is warm.
4. Switch motor ON and pull starter chord. See Choke Settings above to keep motor running in cold weather.
5. Spray a little chain lube on cleaner's drive chain.
6. Switch cleaner lift switch (under floorboard) ON. Raise brushes to clear curves.
7. Review the next two sections before cleaning track.

> **Note:** Track-cleaner carburetor may flood itself after switched off in hot weather. To restart, set throttle all the way open (raise lever up), pull starter chord until motor begins to run, then reset throttle to previous slow speed. Do not run motor at fast speed. Do not choke motor when hot.

Operating On the Line

The track cleaner is designed to clean the flangeway inside each rail of dirt and debris and to blow debris off the top of the rails. The operator lowers the brushes just enough so they both settle on the preset guide wheels. Forcing the brushes down further will damage the chain, clutch or cleaner bearings.

- ✓ Trimming trees and bushes – Use the clearance arm mounted on MW02 to identify any bushes or branches that may touch the streetcar.
- ✓ Lube switch stands with motor oil each spring.
- ✓ Pick up any debris that may foul streetcar wheels (metal cans, plastic, branches, etc.)
- ✓ When cleaning track, run the car at idle speed and only in 1st or 2nd gear. Use 1st gear to remove lots of debris, such as in the spring or after heavy rain or strong winds. Use 2nd gear when doing a quick cleaning or when clearing leaves.

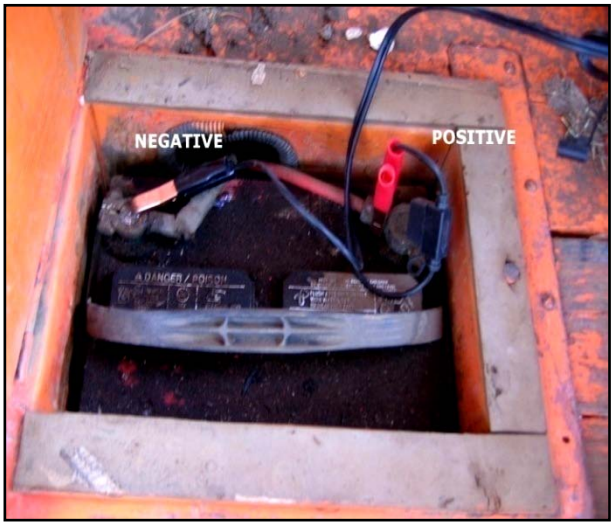
Caution

Do not change cleaner motor speed. The track cleaner is not designed for high-speed operation. Running the cleaner above the preset speed will damage the cleaner.

- ✓ **Set height of brushes** so that the guide wheels just touch the rails. Don't force the brushes down on the rails. When the brushes slow down or stall, raise the brushes a bit and continue cleaning.
- ✓ **When brushes are throwing lots of debris**, back up over the difficult spot with the brushes cleaning the rail, stop and drop the brushes a bit, and make another pass over that section again.
- ✓ **Never change the cleaner motor speed.** High cleaner speed will damage equipment in a short time.
- ✓ Have a valid Colorado driver's license and current membership card in possession when operating the motorcar.
- ✓ **Raise the brushes and run slowly** (no more than walking) through switches and around curves.
- ✓ **Watch the track and overhead for obstructions**. Pick up any plastic, metal or debris stuck to rail since it may foul streetcar brakes.
- ✓ **Track speed:** When cleaning track, operate no faster than a walk. When not cleaning, run no faster than a casual bicyclist (**15 MPH** max.).
- ✓ **When leaving the motorcar,** always switch both motors off, set the brake and take the key with you.
- ✓ **When the motorcar engine warms up,** it tends to have an uneven idle causing the car to surge. Avoid this by opening the throttle a bit.
- ✓ **When done cleaning**, raise the brushes fully and switch the cleaner OFF. DO NOT run the car westbound with the brushes down and the cleaner motor OFF as this will damage the motor's clutch.

Motorcar and Cleaner Shutdown

1. Turn ignition OFF and leave transmission in neutral.
2. Return key to shelf.
3. Close fuel shut off valves for motorcar tank and cleaner-motor tank.
4. Switch cleaner lift switch (under floorboard) OFF.
5. Re-attach the battery charger to the battery as shown. Then plug it in and verify that the red light is flashing.
6. If there were any problems with the motorcar or cleaner, hang the Blue Flag as shown next and attach a note explaining the problem for the maintainer.



Always connect positive (red) clamp first as shown.

WARNING

Take care when connecting the charger. Touching the red lead to the car or the black lead will damage the charger and/or battery. Sparks could also cause a fire if gas vapors are present.

MW01 (foreground) and MW02 outside the Mountain Ave. barn after rebuilding in 2006.

Motorcar and Cleaner Maintenance

NOTES: Put used oil in red jerry cans at southwest corner outside barn. Empty full jerry cans in the oil-recycle tank at the County Landfill.

Parts for motorcar engines are available at farm equipment stores.

Monthly Maintenance Tasks

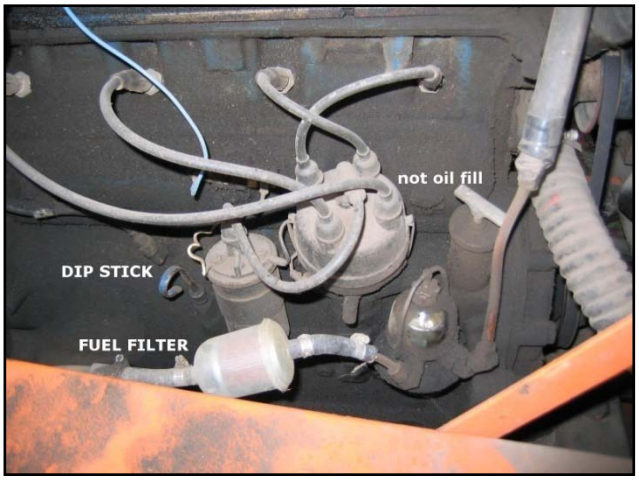
We do these tasks each month during our operating season. Be sure to record any repairs on the chalk board over the bench. All MoW parts and supplies except oils are kept on the shelves next to MW02.

When car is being maintained or is not operable, we hang the FRA-approved Blue Flag as shown next with a note describing the problem. Hang a tag with your name on the flag. Remove the flag only when the car is ready for service again.

The Blue Flag protects equipment from being moved while it's being serviced.

Motorcar maintenance

1. Check motorcar engine oil. If needed, top up with 10W30 or 10W40 oil (kept in yellow cabinet).
2. Check motorcar drive chain. Verify that drive-chain idler is centered between sprockets. Too much slack in the chain will cause it to become clogged with grass and dirt. Plan on tightening the chain by replacing a full link with a half link when the pit is available.
3. Repair idler fastener wire as needed. When over the pit, also lube the four axle bearings and tighten any loose hardware.
4. Check level of coolant. Should be 1" above radiator core. Coolant is kept on top of shelves near MW02.



Fill oil only via breather-cap opening on top of engine. DO NOT add engine oil via access tube shown at right.

Track Cleaner Maintenance

1. Lube cleaner bearings – Rotate brushes while applying grease to ensure even application.
2. Check cleaner's motor oil:
    a) Remove yellow plastic plug with screwdriver. Oil should be no more than 1.5 inch below top of filler opening.
    b) If needed, top up with 30W non-detergent motor oil.
    c) Replace plug snugly (don't over tighten).

Yearly Maintenance Tasks

We do these tasks each off-season. Note all work on the maintenance log (blackboard).

Annual motorcar maintenance (best done when you have access to pit):

1. Change motorcar engine oil and filter (either use the pit or park car at switch for easier access):
    a) Be careful to clean oil-pan drain plug and not to cross-thread plug when replacing it.
    b) Use 4 qts 10W30 detergent oil and a Ford FL1 filter.
2. Smear clean engine oil on filter gasket before installing it. Only hand-tighten filter.
3. Check/top off transmission & transaxle – 90W gear lube.
4. Lube motorcar axle bearings – Jack up end of car to relieve pressure on bearings before adding grease.
5. Lube clutch-lever bearing – access from removable floor boards.
6. Clean & refill air cleaner with 10W30 or 10W40 motor oil.
7. Replace fuel filter. **Do not** remove/clean filter bowl attached to fuel pump!

Annual track-cleaner maintenance

1. Change motor oil (<1 qts 30W non-detergent oil). Fill until oil is visible in filler tube.
2. Clean or replace air filter.
3. Replace fuel filter.
4. If drive chain is skipping sprocket teeth or slapping on shroud, adjust chain tension by removing a link or replacing a link with a half link. Parts are on the shelves next to MW02.
5. Check/tighten/repair any loose fittings.

Adjust brakes (when brake-handle reaches end-of-travel while applying brakes)

1. Shut engine OFF. Set transmission in neutral. Release brakes fully.
2. Note amount of brake slack on each side of car. Make the adjustment on the side with most slack.
3. Remove the brake linkage cotter pin and clevis pin.
4. Loosen one brake-linkage nut while holding the clevis.
5. Rotate the clevis ½ turn.
6. Re-assemble the linkage and test the brakes. If brake handle travel is now sufficient to set brakes, proceed to the next step. If not, repeat step 5 & 6 to adjust the other clevis.
7. When brake travel is correct (brakes should hold car on an incline in the first notch), re-assemble brake linkage and replace cotter pin.

8. Lube all brake linkages with motor oil.

Restock supplies

All MoW supplies except oils are kept on the shelves next to MW02. Purchase supplies as needed:

- 4 qts. – 10W30 detergent motor oil.
- 2 qts – 30W non-detergent motor oil.
- 1 qts – 90W gear lube.
- 1 tube – Lithium grease.
- 2 – In-line fuel filters.
- 1 – Ford FL1A or equivalent spin-on oil filter (same as used on Ford 2.3L Ranger & Mustang engines).
- 1 gallon – general-purpose (green) automotive coolant.

About our MoW Equipment

Unless otherwise labeled, motorcars, pushcars, and all equipment in and around the barns are Society property.

MW01 – Fairmont A-series gangcar built in 1949. MW01 operated on the Great Western Railway based in Loveland. CO until donated to us in 1982. Rebuilt with a Ford 2.3L 4 cyl OHV engine, 4-speed transmission and 4-wheel drive in 2006 (original engine was a Waukesha flat-head crank-starter).

MW02 – Fairmont A-series gangcar built in 1981. MW02 operated on the Canadian National Railway until replaced by hi-rail vehicles in the 1990's. Purchased from an Edmonton, Alberta dealer in 2003. It was converted to 4-wheel drive in 2005. The FCMRS-built track cleaner was added in 2006.

Track Cleaner attached to MW02 – Built in 2003 by former Society Director Les Batman. Materials cost ~$500. It was originally mounted on a pushcar, operated via rope & pulley from motorcar. The track cleaner was mounted to MW02 in 2006. The hydraulic lift added by Bob Hutchison in 2009.

Both motorcars have identical Ford 2.3L 4 cyl OHV engines and drive trains similar to those on Ford M- and N-series tractors. Parts are available from local farm-equipment stores.

Pushcars – We have four 4-wheel work cars donated to us during track rebuilding in the 1980's. The first one was built from a C&S S2-series motorcar frame in the 1970's. It carried track materials and assembled panels of track down the line for the first 2 years of track work. Later, assembled panels were loaded on a flatbed truck for transport to the end-of-track.

Appendix A: Background Information

This appendix offers general information on our operation and local attractions.

About the City Park Depot

Our little depot was a waiting shelter that once served Aggie School (later CSU) students waiting to ride C&S passenger trains. It stood by the track just south of Laurel Street from the mid-1920s through the 1950's.
It was finished inside with sand paint to deter students from writing on the walls.

We rescued the depot from a horse pasture on Overland Trail in the late 1980's, moved it to City Park and restored it. We use the depot to sell souvenirs and tickets. You can also use it to store bikes and strollers while passengers ride the car.

About Those Ads Above the Windows

The advertising cards above the windows in the car are similar to the original ones that businesses paid the City to display. We sell advertising space for $100/year. If a passenger is interested in adding a sign, the conductor should direct them to our website for further information.

About Our Souvenirs

Souvenir sales help us keep Car 21 running. Be sure to mention our souvenirs during each trip. Do all souvenir sales *after* deboarding passengers at City Park. Current prices are posted with the item, most items are in the display case in the depot. Extra stock is in the cabinet in the depot.

About the Avery House

The Avery House, located adjacent to our line near the Howes Street terminal, is the City's Victorian House Museum. As with our operation, the Avery House is owned by the City but run and maintained by a non-profit volunteer organization, the Poudre Landmarks Foundation along with the Avery House Guild. Hostesses from the Guild dress in period costumes and provide free guided tours of the house every Saturday and Sunday afternoon. Be sure to mention the Avery House is open Noon-4 pm.

Are There Other Birney cars?

Of the 6000+ single-truck Birneys manufactured in the USA, less than two dozen like ours exist in museums, the largest collection being six in Australia. The remaining Fort Collins cars are:

- **Car 20** – Pioneer Museum, Minden, NE**.**
- **Car 21** – Operating in Fort Collins since 1984.
- **Car 22** – Restored as car 135 in Colorado Springs.
- **Car 25** – Returns to weekend service in Fort Collins 2020**.**
- **Car 26** – Ford Museum in Dearborn, MI.

You'll find photos of all FCMR cars on our website. Double-truck Birney cars (two sets of wheels) were also manufactured at the same time as the single-truckers. A company in Iowa now makes replica double-truckers for operations such as those in Tampa, Memphis and Little Rock.

Where Did the Birney Cars Run?

Three cars operated daily from 6 am to midnight. They met at the downtown wye (Mountain and College) every 20 minutes (see the next photo). One car ran on a continuous loop, while the other two followed each other 20 minutes apart on the Mountain Ave. line and on the loop in the opposite direction of the loop car:

- **Mountain Ave. Line:** West on Mountain, south on Roosevelt, through the park and back to Mountain just west of the irrigation ditch, back to the downtown wye.
- **The Loop:** East on Mountain to Peterson, south on Peterson to Magnolia, east on Magnolia to Whedbee, south on Whedbee to Pitkin, west on Pitkin to Remington stub (wait in stub track until another car passes), east to College, north on College to the downtown wye. In this photo, the near car is the loop car, while the other car has just returned from the loop in the opposite direction and will head west on Mountain Ave. to City Park.

Where Do Streetcars Run In the USA?

Original, restored and replica streetcars run in Denver, New Orleans, San Francisco, San Diego, San Jose, Portland, OR, Boston, Tampa, Tucson, Dallas, Little Rock, Kenosha, WI, Minneapolis, Philadelphia, and many museums. We have links to many streetcar museums and some heritage-trolley operations on our website.

Do We Get Paid?

Yes, but only by seeing others enjoying riding our living history museum, a streetcar to yesterday.

What's That Noise Under the Car

Our original air compressor automatically provides air to operate brakes, doors, sanders and the controls that Mr. Birney designed into the car so one person could safely operate it.

Car 25 in 1947

A Brief Streetcar History

Considering what remains today, it is almost impossible without otherwise knowing, to appreciate the extent and significance of the impact of the electric streetcar and interurban car during the early 1900's. For some 30 to 40 years the streetcar was the only practical way to get around if you lived in a city and had no room to keep a horse and carriage. Extending streetcar lines was the key to developing new parts of the city.

The electric streetcar was not the result of a single invention, such as the telephone, but was rather the sum of a series of inventions applying the new-found power of electricity to move people about. Horse cars, or small horse-drawn streetcars, today considered quaint, were from the 1820's to the 1880's the best and fastest way to get around in cities. It is hard for us to imagine a day in which 6 miles per hour was a fast pace of travel.

There were several unsuccessful attempts to harness electric power to replace the horse in the horse-car team. One early invention used two overhead wires with a small four-wheel cart rolling along them, pulled or 'trolled' by a power collecting cable. It was called a 'troller', later to be called a 'trolley', and had a bad habit of falling onto and damaging the top of the car. This system was invented by a man named Daft. Enough said. The electric motors were at one stage mounted on the platform at one end of the car, and required careful attention by the operator, who naturally became the *motorman*.

The inventor who did most to bring electric streetcars into practical use was Frank Sprague. His name would be a household word along with Edison and others if he had been of a disposition to see that his inventions were all credited to his name. He shares with Charles van Depoele the credit for inventing the trolley pole method of collecting current in a moving car. His work on motors and their method of mounting in a streetcar resulted in the first really successful streetcar system, located in Richmond, Virginia, in January 1888.

With rapid improvements and key engineering advances, such as the carbon motor commutator brush (which stopped the motors from leaving a trail of brass powder in their tracks), the streetcar took over transportation in the cities. In a few cities this meant taking the place of the short-lived cable car system. Thus the development of the streetcar was coincident with and actually a key incentive for the development of the electric motor, which we now all take for granted. By the turn of the century there were more than 15,000 miles of electrified track and 30,000 streetcars in the United States.
Practical electric power also soon spawned the era of the interurbans, which in many areas competed successfully with steam trains in transporting passengers over intercity and suburban distances. By the First World War, there were 18,000 miles of interurban track in the country, with almost half of that located in the Midwest. Interurban cars commonly traveled in comfort at 60 MPH, and also carried freight and mail. Nevertheless, in the interval between World Wars I and II, electric rail transportation began slowly losing ground in the United States to automobiles and cheap gasoline. Still, several streetcar systems have held their own, and there are still a few in the U.S. today, scattered through the east as well as in San Francisco. Some are called 'light rail' systems, and they don't seem to claim as much affection. To get the flavor of days gone by, visit Melbourne, Australia, or Lisbon, Portugal, for example, as well as the cable car system of San Francisco.

Early electric streetcars were adaptations of horsecars. Traditional car construction was of wood, and the motorman stood outside the passenger compartment in the cold, operating brakes mechanically using a large handle or wheel. From the inadequate strength of the old horsecar design came an era of massive streetcars. This spawned cars that took considerable electric power to run, though the motorman was, thankfully, moved inside. Most cars required a two-person crew. The resulting higher costs and the addition of competition from small motor busses in smaller city lines, begged the need a new type of streetcar. Denver & Interurban car M-106, shown below, was one of six double-truck cars built in Denver by Woeber Coach Co. circa 1907. They operated from 1908 – 1918.


Denver & Interurban cars M-106, and M-103 early Fort Collins cars.
Photo on the left is courtesy the Brewster Family.

What's a 'Birney'?

Between 1910 and 1920, as competition from motor vehicles became more serious, streetcar technology began to adapt to the challenges brought by the automobile and increased costs. The result was a single-truck, one-man, lightweight 'safety' car. Such a car was not exactly a standard design, but was very nearly so. It evolved from the confluence of very similar efforts by several car manufacturers. The name comes from Charles O. Birney, master mechanic of the Stone and Webster Engineering Co. of Boston, which is still in business, who had a large part in the design of this type of car as built by the American Car Company in St. Louis MO and the Brill Company. Credit for finalizing the concept of such a combination of features in a streetcar should actually go to J.M. Bosenbury of the Illinois Traction System, whose design was placed in service in 1913. The name Birney was generally applied to all cars with these key features:

A single power-truck. With increase in size and weight of cars the double truck had become predominant by 1915, and it also generally contributed to a smoother ride. But a single-truck car saved money for small towns and short runs.
One-man operation. A small car with single-door entrance and exit, however, not ideal for urban service during rush hours.
Lightweight construction. There were many engineering features in the Birney cars which saved weight. The simple arch roof maximizes strength with less weight compared to the older deck or clerestory roofs. The steel sides of the car are major structural elements, acting as trusses. The motors are newer lightweight type, and steel members take the place of older more massive wood beams in the sub-floor structure.
Safety equipment. The safety equipment consists of an air-operated interlock between the controller and the brake system in the form of a "deadman" control mechanism. A similar electrical system continues to be used on modern diesel locomotives: The operator must have the controller handle depressed whenever the brakes are not set. Inattention to this will cause the brakes to be automatically applied. In the Safety Car, the brake control does not directly connect with the brake cylinder, but operates through an "emergency" valve. This function also trips the circuit breakers, drops sand, and releases the doors so they can be opened by hand. There's a favorite anecdote in Bendigo, Victoria, Australia, where Birney cars are operated as an historical attraction, about the visit of Prince Charles. His Highness wanted to run the streetcar, which was naturally granted, but the Prince's political instincts conflicted with the instructions of the attendant operator, and in due time he raised his hand from the controller to wave to the crowd. Several dignitaries on the crowded car were thrown to the floor.

More than 6000 Birney-type cars were built between 1916 and 1932. The price new in 1916 was $4500, and rose to over $6500 by 1919 when Fort Collins made its first purchase. Today only a few are running, including six in Australia, and a like number in the USA, with a few more under restoration. Several are just on display, including remaining Fort Collins cars 20 and 26. Most cars were simply burned when city systems closed.

Fort Collins Streetcar Timeline

Birney cars were purchased by the City of Fort Collins in 1919 when the streetcar system was purchased from the Denver and Interurban Co. They were the 'latest thing' at that time, and seemed ideally suited to the needs of a city such as Fort Collins. Here's our streetcar timetable:

1907 – Original streetcar line opened and operated by the Denver & Interurban Railway Company. Two original Fort Collins cars are show on the previous page.
1918 – Denver and Interurban line is in default.
1919 – City purchases the line and renames it Fort Collins Municipal Railway. Original Woeber cars were replaced by new Birney Safety Cars (car 20-23) costing about $6500 each ($100,000 in 2018 dollars). Portions of lines removed and Mountain Ave. line extended through City Park.
1919-1950 – Three cars ran each day from 6 am to midnight on the Mountain Ave. line and the loop, as explained on page 55. Five additional Birney cars were purchased used in the 1920's and 1940's.
1946 – Car 25 purchased.
June 1951 – Although voters continuously approved running the line, the City shut down the line on June 30. Most tracks were removed and most cars sold by 1953. Car 21 moved to Library Park in 1953.
1977 – Fort Collins Junior Women's Club begins effort to revitalize Car 21.
1978 – Car 21 moved back to Howes St. carbarn for restoration.
1980 – FCMRS incorporated as a non-profit to restore the car, rebuild most of the West Mountain Ave. line and operate as an educational demonstration.
1983 – New carbarn built on West Mountain Ave. Track work begins.
Dec. 29, 1984 – Track work completed to the new City Park loading area. First public run carries City officials.
June 1985 – FCMRS begins regular operation to end-of-track, gradually extending eastward on Mountain Ave.
August 1987 – Track work halted west of Meldrum due to power poles blocking right-of-way.
Early 1990s – Track work completed to current Howes St. stop.
Dec. 29, 2004 – 20th anniversary run to celebrate first public run in 1984.
May 2008 – Car 25 returned to Fort Collins after being a 'vacation retreat' in Victor, CO and undergoing some restoration work in Columbia, SC and Charlotte, NC.
Dec. 2019 – The mountain Ave barn was expanded to make space for both car 21, 25 and storage of MoW equipment. Car 25 tested in the Howes St barn.
May 2020 -- Car 25 begins regular weekend operation.

For More Information…

Much has been written on the history of the Fort Collins streetcar system:

- ***Last of the Birneys***, Peyton, E.S., and R.A. Moorman. American Railroad Journal, Golden West Books, 1966, pp. 67-85.
- ***Trolley Cars of Fort Collins***, Peyton, Moorman and Jessen. Available in the depot.
- ***CRM Annual #17*** from the Colorado Railroad Museum, Golden, CO.
- ***Centennial State Trolleys****, Ken Fletcher.* Available from the Colorado Railroad Museum.

Appendix B: Streetcar Terms

A-end, B-end – Terms identifying each end of a railroad car. The A-end contains the primary controls such as main electrical switches and brakes.

Back-poling – Running with the wrong (leading) pole up. This leads to depoling.

Bumping – Repeatedly putting the controller near the first notch and back to OFF. Not going into the first notch before shutting OFF causes a dangerous arc to form that will quickly damage points.

Controller – The device used to control speed and direction of an electric railway car. Also see *Deadman* and Reverse key.

Changer – Multi-barreled coin holder worn by conductors. Transit systems now require exact change.

Catcher Reel (aka Trolley Catcher) – The inertia wheel near the headlight that keeps tension on the rope to prevent depoling. In the event of depoling, the reel will halt rapid unwinding of the rope.

Deadman – A device built into the controller to immediately stop the car in an emergency. If the operator releases the Controller handle without first setting the air brake, the deadman device will set the brakes, drop sand, open the circuit breaker and release the door so it can be opened by hand.

Depoling (aka de-wiring) – Various situations cause the trolley wheel to jump off the overhead wire, such as low-hanging branches and *back-poling*. When this occurs, immediately stop and reset the pole to avoid damaging the pole or overhead wire and hardware.

Fare box – The place where passengers used to drop their fares. We use ours for donations.

Flange way – The space between the inside of the running rail and a grass, pavement or guardrail that provides clearance for the wheel flanges.

Frog – A device used where two running rails intersect and provide flangeways to permit wheels and wheel flanges on either rail to cross the other. Also, the device joining overhead wire above switches.

Gauge – Distance between railheads. The FCMR is standard gauge, 56.5 inches wide.

Guardrail – A rail parallel to the running rails of a track to prevent derailments. They also hold the wheels in proper alignment and prevent flanges from striking the switches or *frogs*.

Hand brake – A manually operated brake used to hold rail cars from moving.

Interurban – A high-speed streetcar line running between urban areas or from urban to rural areas. Called a *radial railway* in Canada.

Light rail or **light rail transit** (**LRT**) **–** A form of urban-rail transit using equipment and infrastructure less massive than used for rapid-transit systems. *Light rail* is the successor term to *streetcar*, *trolley* and *tram.*

Motor braking – An emergency procedure that uses the motors to slow down the car when normal braking is not available. Do not use this except in an emergency.

Motorman – The crewmember responsible for running the streetcar. (Women motormen were called motorettes during World War II. Today all operators are called Motorman, regardless of gender)

Overhead – The wire and supporting assembly that supplies power to the car.
Reverser key – The handle for the reverse switch on the controller.

Tram – European name for a streetcar or trolley car, also used in Asia.

Transfer – A piece of paper punched with date, time and location passenger departed a car, permitting passenger to continue trip at a later time.

Trip board – A wooden board or gate on the front of the streetcar designed to sense an object caught in the path of the car. When struck, it will drop the safety catcher to scoop up the object, such as a person or pet. It's often mistakenly called a cowcatcher or dogcatcher.

Trolley pole, trolley wheel, and troller – The trolley pole reaches from the car roof to the overhead wire to draw electricity. The trolley wheel at the end of the pole rolls along the wire.

Wye – A three-legged track structure allowing each approaching car to take one of two routes. The FCMR had wyes at three intersections: Mountain and College, Mountain and Howes, and Pitkin and Remington.

UPDATED

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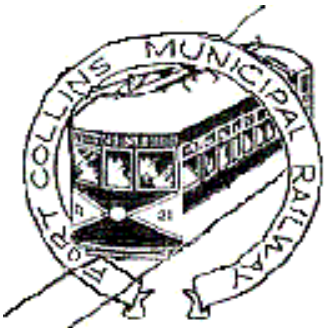

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