

FIRE LIFE SAFETY

DRILL VERSION



Light Rail Technical Training
TTT-RA-0962

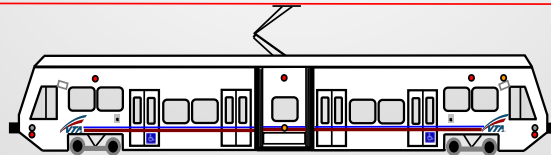
Vehicle Overview

Length: 90'

Height: 11' 8"

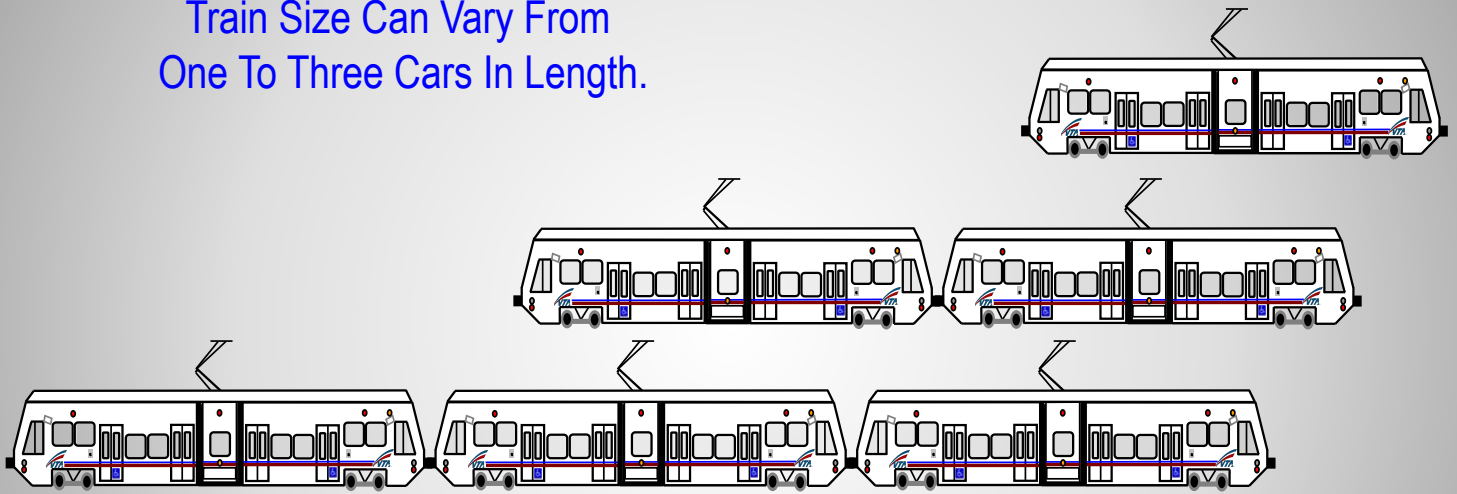
Width: 8' 6"

Weight: 50 Tons
(100,000 lbs)



Vehicle Overview

Train Size Can Vary From
One To Three Cars In Length.

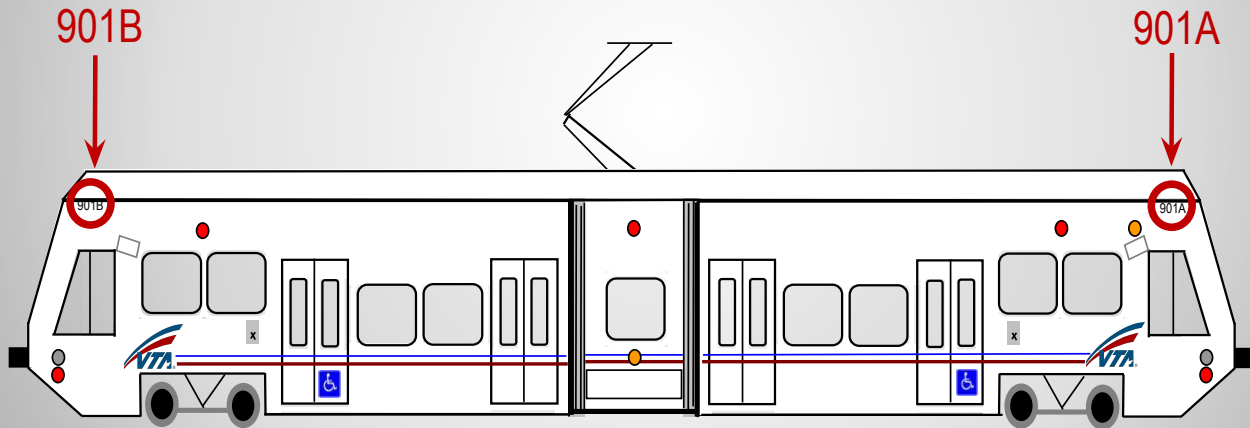


Each Car Can Carry As Many As 242 Passengers.

Most High Voltage Components Are
Located On The Roof.

Vehicle Overview

The cars are identified by a three digit number 900 – 999 with one end identified as the “A” end and the other as the “B” end.



The car numbers are also located inside the car.

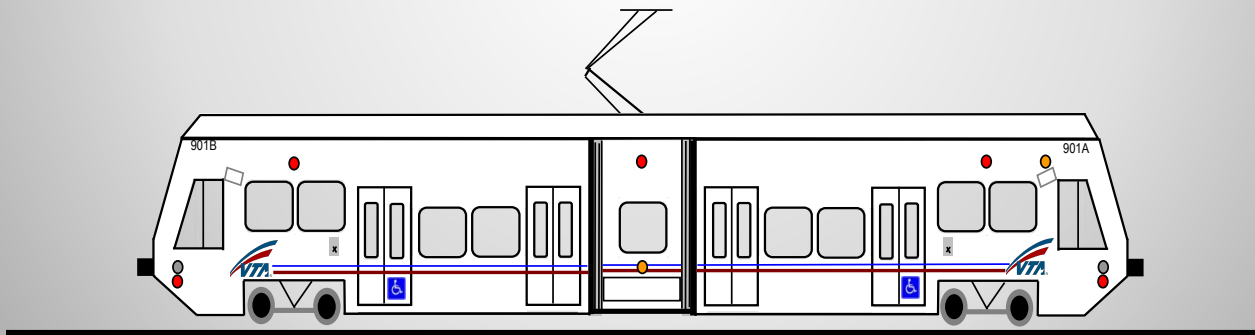
Vehicle Overview

EACH LRV HAS TWO OPERATING CABS.

THE LRV CAN BE OPERATED FROM EITHER END IN BOTH DIRECTIONS

BUT

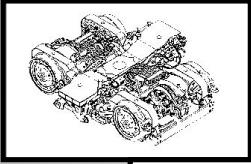
ONLY ONE CAB CAN BE ACTIVE AT A TIME.



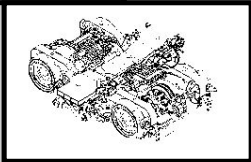
Vehicle Overview

THERE ARE 3 CARBODY SECTIONS - A, B, and C

A



B

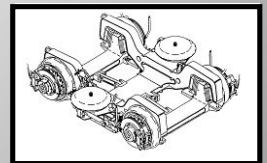


The “A” and “B” ends of the train have motors that utilize an “ON DEMAND” propulsion system. A propulsion converter on the roof sends current ranging from 0-580 (AC) volts to the motors as needed to meet the propulsion demand commanded by the operator. ***When the train is stopped there is no voltage flowing to the motors.***

The “A” and “B” trucks also have a 208 volt (AC) hydraulic brake pump that has voltage present any time the car is powered.

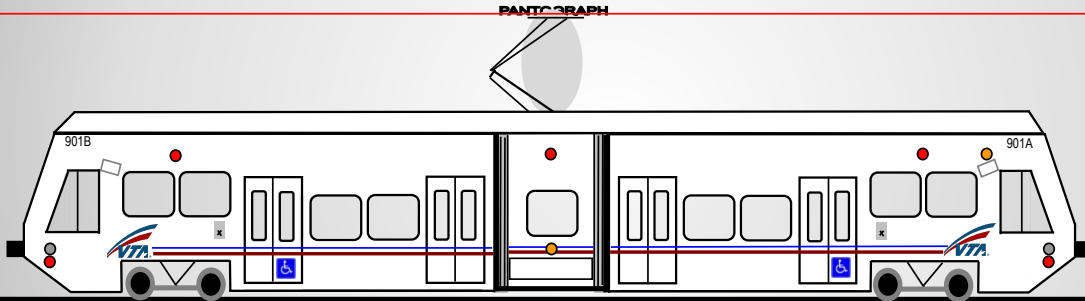
The center truck is hollow to accommodate the low floor design. The carbody section on this truck is free floating and utilizes safety restraints to keep the truck in the proximity of the carbody section in case of a serious collision or derailment.

C



Vehicle Overview

High voltage is present in many places on the roof ranging from 37 volts to 850 volts and is present as long as the overhead wire is energized and the pantograph is in contact with the wire.

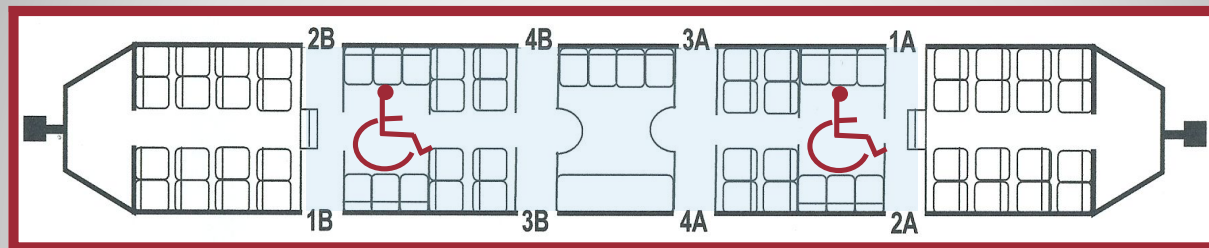


THE TRAIN OPERATES ON THE FOLLOWING VOLTAGES:

- ✓ 850 DC
- ✓ 208 AC
- ✓ 120 AC
- ✓ 37 DC
- ✓ 12 DC
- ✓ VARIABLE AC (0-580)



ACCESSIBILITY

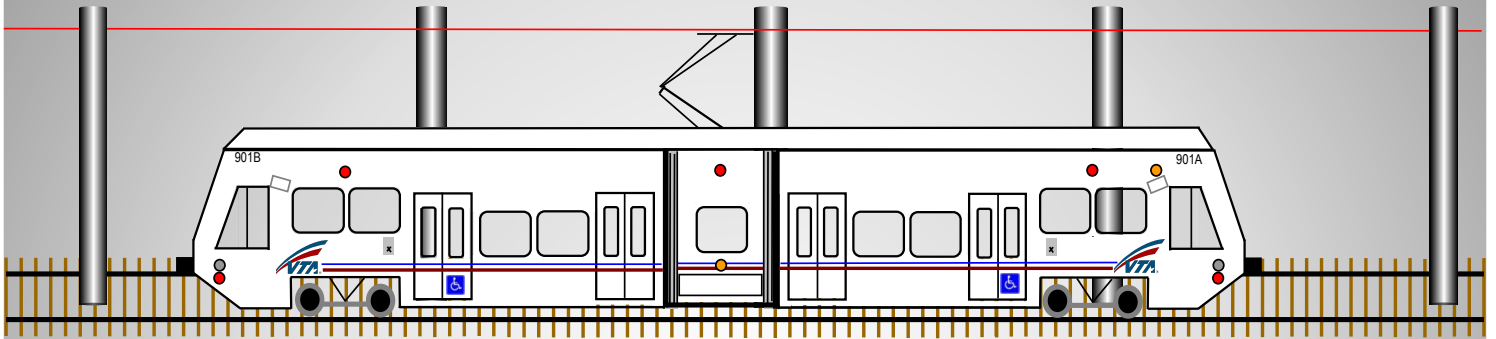


Due to the low floor design of the train and raised station platform, wheelchair boarding is now available on all cars of a train.

Although there are no restraints used on trains there is a designated wheelchair area at each end of the car.

Wheelchairs may be found in any area of the low floor section.

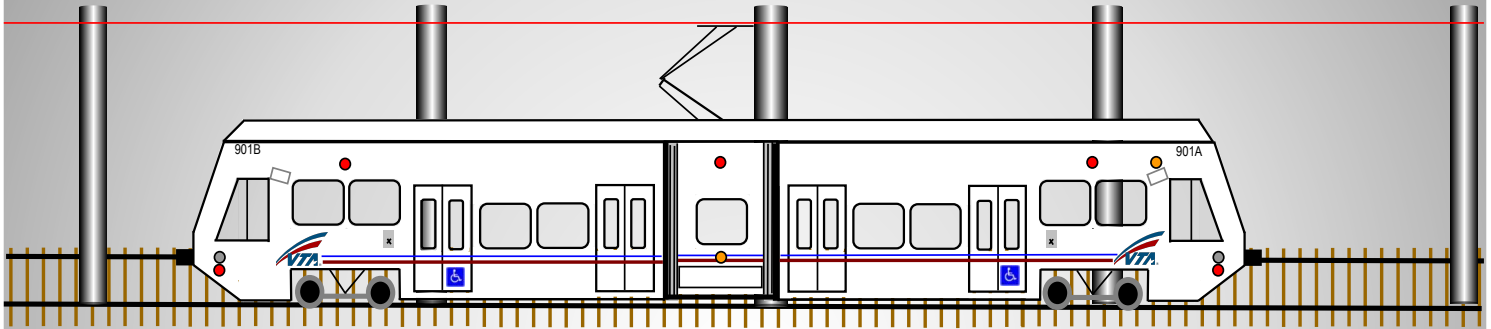
DETERMINING TRAIN SAFETY



CHECK FOR THE FOLLOWING ITEMS:

- At least one truck is in contact with the rail (to ensure proper grounding).
- The overhead wire system is not damaged (broken insulators can result in objects close by becoming energized).
- Damaged Pantograph.
- Severe damage due to a collision or derailment.

REMOVING HIGH VOLTAGE FROM THE TRAIN



OVERHEAD POWER SHOULD BE SHUT DOWN FOR:

Fire Near The Train Or Overhead Wire.

Pantograph Entangled In The Overhead Wire.

Serious Derailment Or Mid-Car Diversion.

The Safest Place For Passengers Is To Remain On Board The Train Due To The Redundant Grounding Systems. Once Ground Straps Have Been Applied to the overhead, The Train Is Safe For Entry And Exit.

REMOVING HIGH VOLTAGE FROM THE TRAIN

Have OCC Turn Off Overhead Power
(OCC will only have an indication power is off.
THIS IS NOT A GUARANTEE!).

OR

Have the Operator lower the pantographs on
ALL cars of the train.



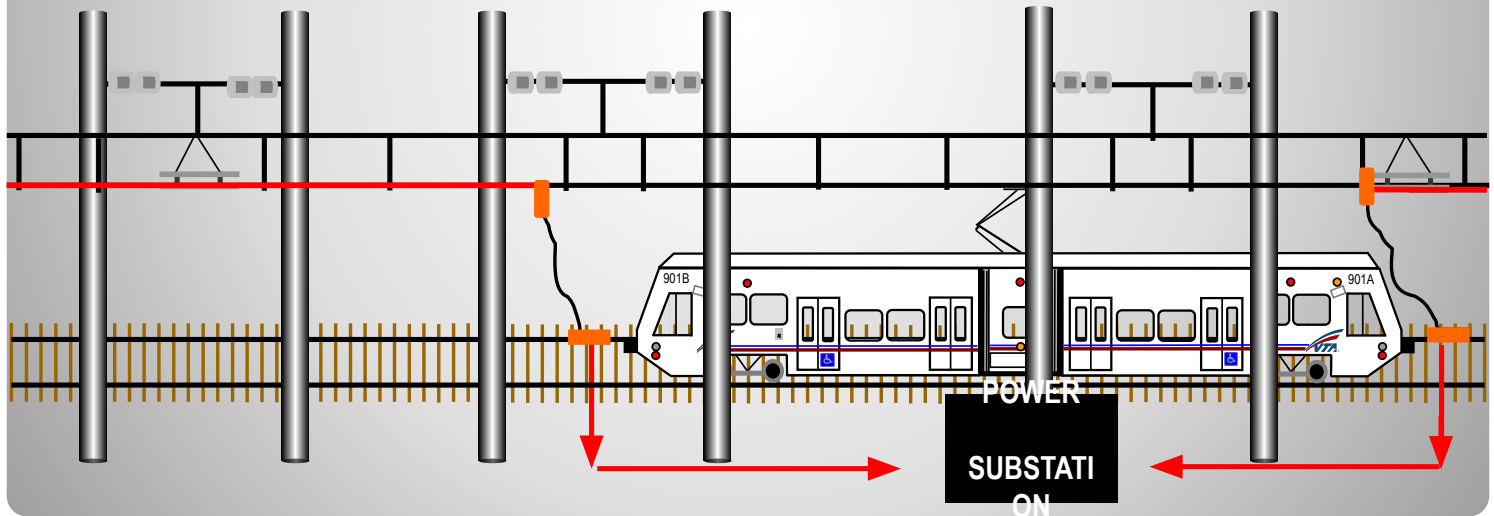
ONCE POWER IS REMOVED FROM THE CAR 37 VOLT BATTERY POWER IS ALL THAT REMAINS.

REMOVING HIGH VOLTAGE FROM THE TRAIN

Once OCC Has Turned Off Power, It Is Not Deemed Safe Until VTA's Power Department Test The Line And Applies Ground Straps. Some Emergency Response Crews Have A DC High Voltage Tester To Verify Power Is Off.

The Ground Straps Must Be Visible To All Personnel In The Affected Area.

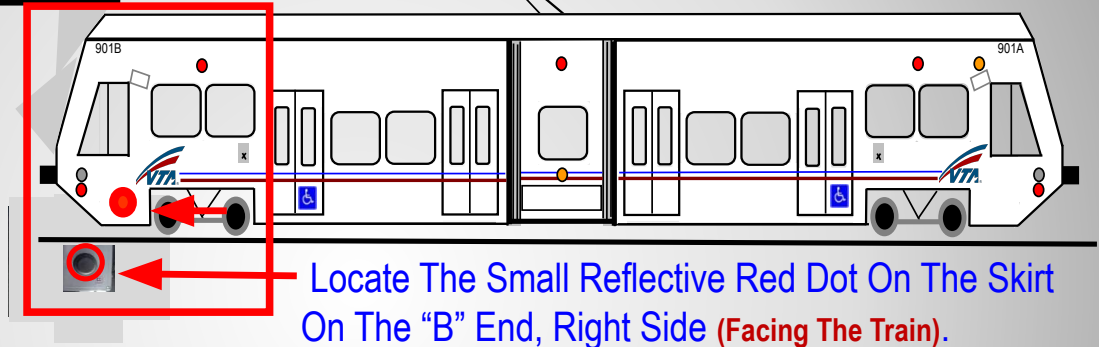
Any Stray Current In The Overhead Will Flow Through The Ground Strap, To The Rail And Return To The Substation.



BATTERY DISCONNECT (OVERLOAD) SWITCH

- Train Operators Must Obtain OCC Approval To Shut Off Battery Power.

Batteries Are Located On The Roof. An Overload Disconnect Switch Is Used To Remove Power From The Ground.

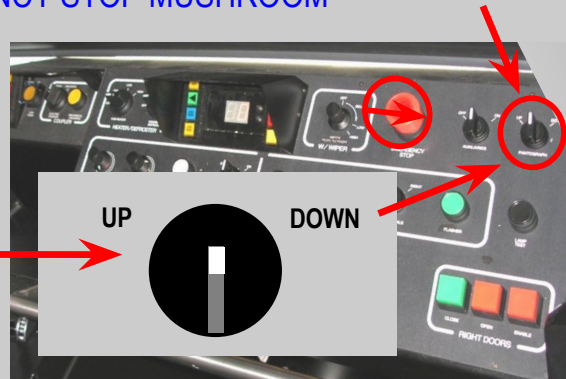


- Access The Disconnect Switch By Reaching Behind The Skirt and Depressing The Plunger Mounted On The Frame.
- Removing Battery Power Renders ALL Train Controls Inoperable. Once Batteries Are Off, The Train Must Be Towed. **Use this as the LAST RESORT!**
- Depressing The Plunger Places An Artificial Overload On The Batteries Causing The Breaker On The Roof To Trip.

Lowering The Pantograph

THE TRAIN'S ELECTRIC PANTOGRAPH CONTROL IS LOCATED IN THE OPERATING CAB TO THE RIGHT OF THE RED EMERGENCY STOP MUSHROOM

TURNING THE PANTOGRAPH CONTROL KNOB CLOCKWISE AND RELEASING WILL LOWER ALL PANTOGRAPHS ON A TRAIN.



VISUALLY CHECK OUTSIDE TO VERIFY WHETHER ALL PANTOGRAPHS ARE FULLY LOWERED

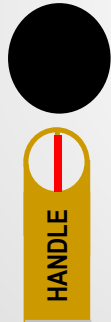
PASSENGER AREA EMERGENCY INTERIOR LIGHTS WILL REMAIN ILLUMINATED WHENEVER PANTOGRAPHS ARE LOWERED FOR AS LONG AS THE BATTERIES LAST.

MANUAL PANTOGRAPH OPERATION

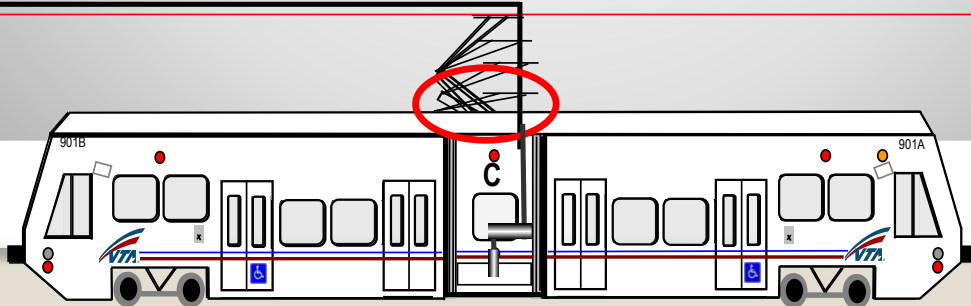
The Handle To Crank The Pantograph Down Is Stored In A Locker Located To The Right Of The Bike Rack In The "C" Section Of The Train, A Crew Key Is Required For Access.



PLACE THE HAND CRANK INTO THE ACCESS HOLE IN THE CEILING



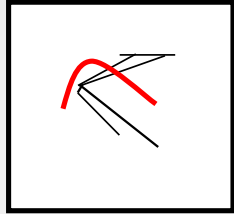
- Applying slight pressure, turn the handle until it locks in position.
- Turn counterclockwise to lower.
- Verify pantograph is off the wire, the pantograph only needs to be lowered enough to clear the wire. It will stay in the position it was cranked to.
- As long as the batteries remain on, the train will maintain emergency lighting, radio use, and door control.



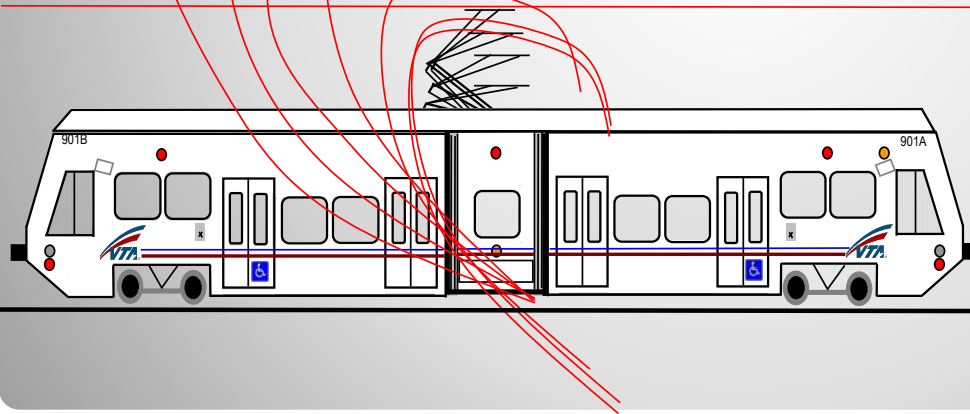
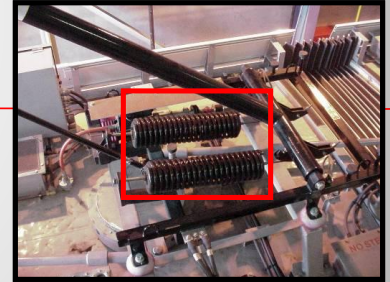
MANUAL PANTOGRAPH OPERATION

The Pantograph May Also Be Lowered By Throwing A Rope Over It And Then securing The Rope.

- Throw The Rope Over The Pantograph.
- Pull Down.
- Tie Off The Rope To Secure.



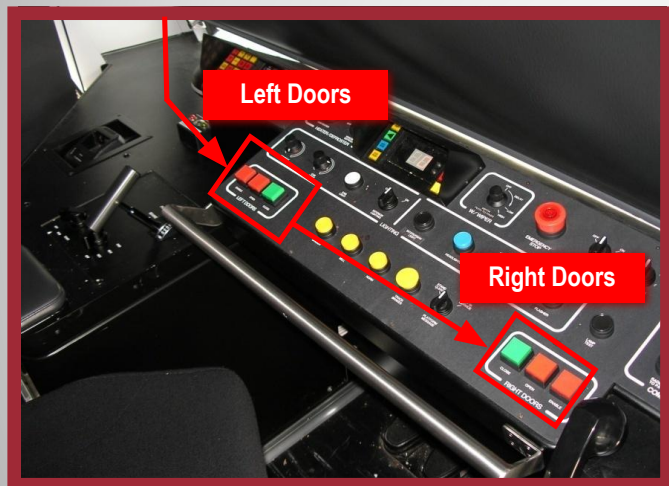
- If It Is Not Secure The Spring Assembly Will Enable The Pantograph To Return To The Overhead.



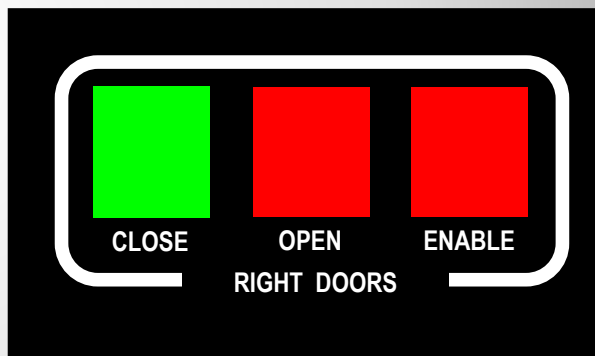
DOOR OPERATION

Opening Passenger Doors From An Operating Cab:

There Are Separate Door Control Buttons On Each Side Of The Console Controlling The Doors On That Side Of The Train .



There Are Three Buttons On Each Set Of Controls .



“**OPEN**” Button Opens All Doors On That Side Of The Train, “**CLOSE**” Closes All Doors On That Side Of The Train. “**ENABLE**” activates the Passenger Touch Pads However The Doors Remain Closed Until One Of The Touch Pads Is Activated. (The Buttons Must Be Depressed For At Least 1.5 Seconds Or The Command Will Fail).

ALL DOORS CAN BE OPENED ON BOTH SIDES OF THE TRAIN AT THE SAME TIME, REGARDLESS OF TRAIN LOCATION.

DOOR OPERATION

❖ All Doors Open (Left, Right, or Both):

Doors will remain open until closed by the operator

❖ Doors Enabled:

Once An Enabled Door Has Been Opened It Will Time Out and Close.

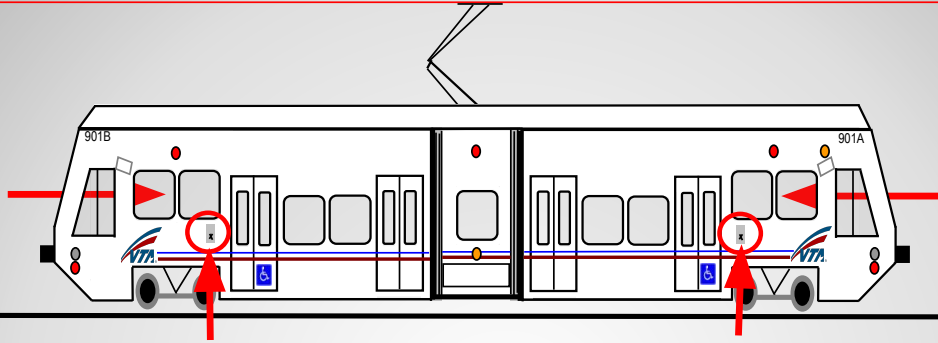
❖ Door LED's Green, Press Door Button To Open.



❖ Door LED's Red, Door Out Of Service.



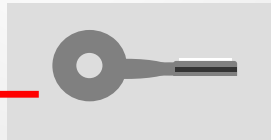
EXTERIOR DOOR OPERATION



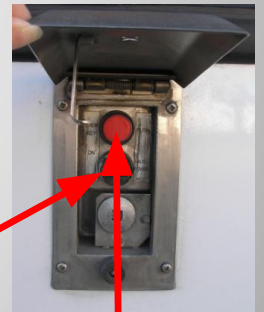
There is a crew key protected "DOOR CONTROL" and "AUXILIARY POWER" control panel located at each of the four corner doors.



Use a crew key to unlock and open cover.

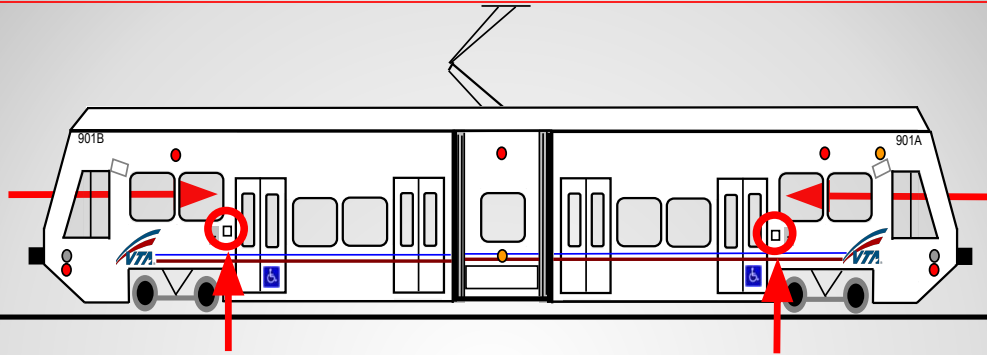


To power the train rotate the black spring loaded "AUXILIARY POWER" switch to on and release. Once powered on there is a 15 to 20 second delay before the doors will function.



Press the red button to open or close the door.

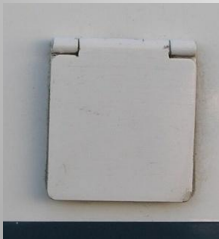
MANUAL DOOR OPERATION



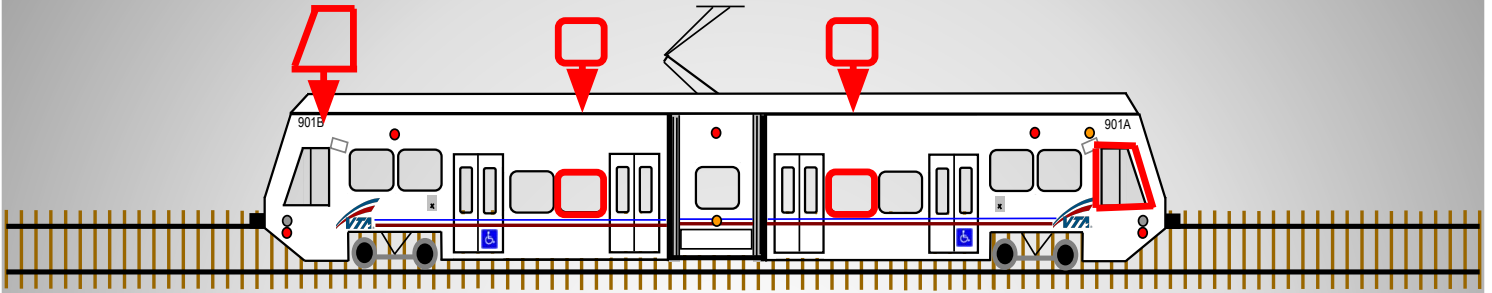
There are manual door releases that will allow the doors to be opened even when the train is not powered. These releases are located at each of the four exterior end doors. These releases are covered with a white metal cover so they blend into the train surface to help avoid false activation by passengers.

To open the door:

- ✓ Lift the cover
- ✓ Break and remove the seal.
- ✓ Turn knob clockwise.
- ✓ Pull Passenger doors open.



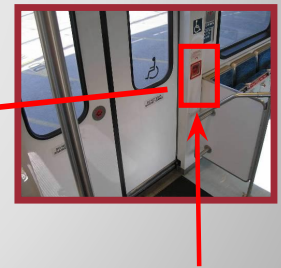
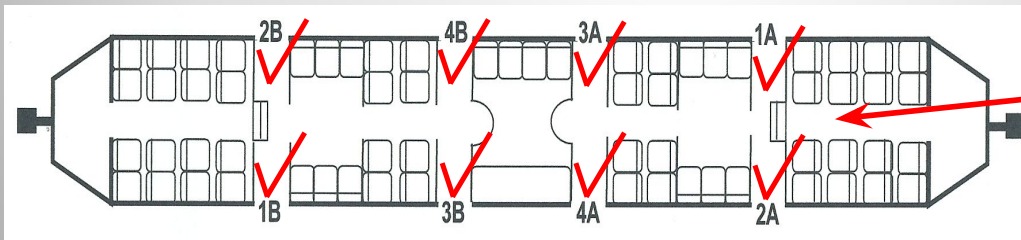
EMERGENCY EGRESS



Each Car Has 6 Emergency Windows:

4 Located In The Passenger Area, 2 In The “A” Section And 2 In The “B” Section Across From Each Other.

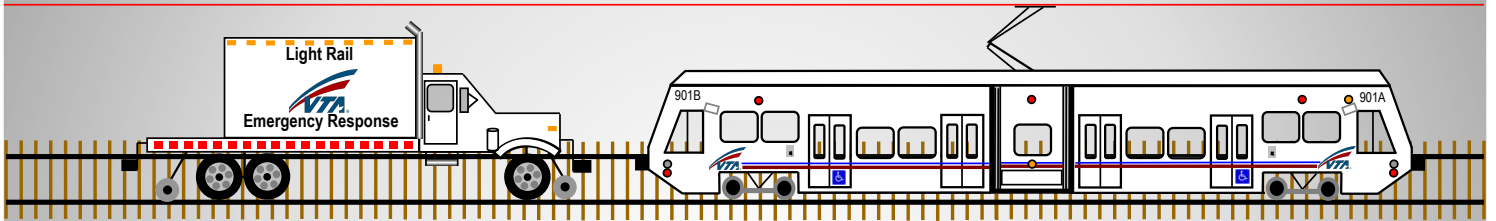
1 In Each Operating Cab On The Right Side



There are also emergency door release controls located at all interior passenger doors.

Activating Any Interior Or Exterior Door Release Will Lock The Train Brakes In A Stop Mode Until The Door Release Is Returned To A Normal Condition.

EMERGENCY RESPONSE CAR MOVER



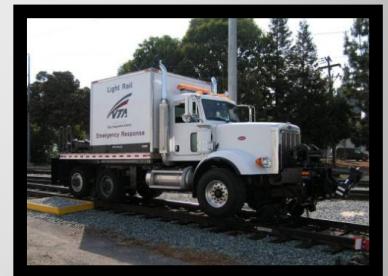
VTA's emergency response **"CAR MOVER"** is equipped for:

✓ Pulling

✓ Pushing

✓ Lifting

✓ Re-railing



EMERGENCY RESPONSE CAR MOVER



The Car Mover Houses Hydraulic Jacks That Can Be Positioned To Raise The Train Within Minutes.

Specific Jacking Points Are Used To Avoid Structural Damage.

Raising The Car More Than Ten Degrees Off Center Will Result In Severe Structural Damage.



LIFTING AND WORKING UNDER THE VEHICLE

This should be done after lowering the pantograph all the way down

- ❖ Air Bags May Be Used To Lift The Car A Few Inches.

 - ❖ Place Air Bags Under The Trucks.

- ❖ Remember When Attempting To Lift From The Center Truck, The Car Body Is Only Attached To The Truck With Safety Restraints.

 - ❖ Shims Or Blocking Will Be Needed If NOT On Embedded Track Or At A Grade Crossing As The “A” Or “B” Trucks Will Be 8 To 10 Inches Above The Top Of The Rail Ties.

- ❖ Caution When Working Under The Train As Train Motors May Be Hot.

 - ❖ Shims And Blocks Can Become Airborne!

SUBSTATIONS - POWER

- P.G.E. input voltage varies between substations within a range of 16,000 to 22,000 volts (AC).
 - The substation then converts the AC voltage to DC voltage.
 - The DC voltage is then sent out to the overhead contact system.
- Each substation powers a specific segment of the overhead. These segments are defined by isolators.
- Insulators are used between the pole support cables and the overhead wire.



SUBSTATIONS - POWER

- The cables hanging from the messenger wire are a combination of support cables and feeder cables that feed the power from the upper wire to the lower wire.
- The trains pantograph contacts the lower wire and pulls power to the train (Contact Wire).
- Return ground cables are installed between the rails and the substation ensuring the trains are grounded as long as there is at least one truck in contact with the rail.



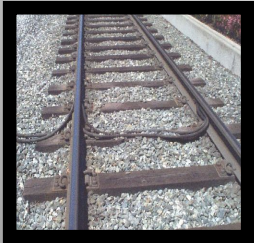
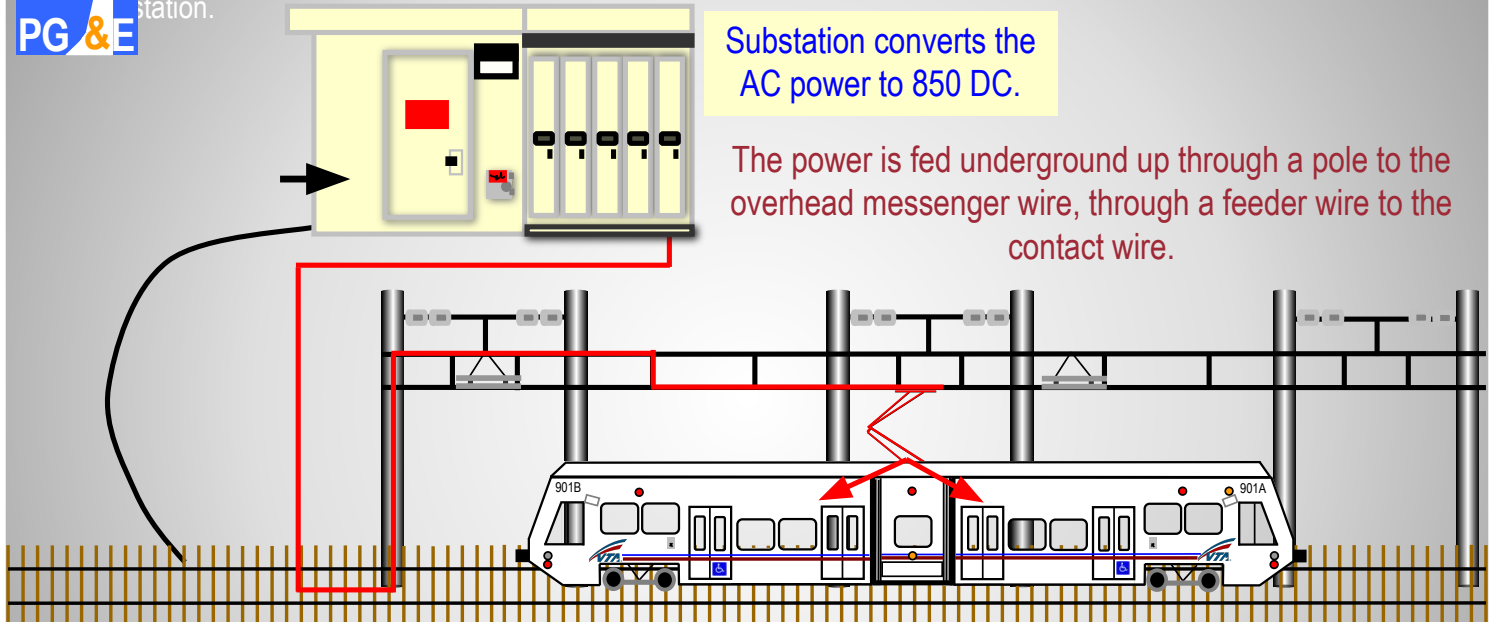


22,000 volts
PG&E to the
station.

Substation - Power Review

Substation converts the
AC power to 850 DC.

The power is fed underground up through a pole to the
overhead messenger wire, through a feeder wire to the
contact wire.



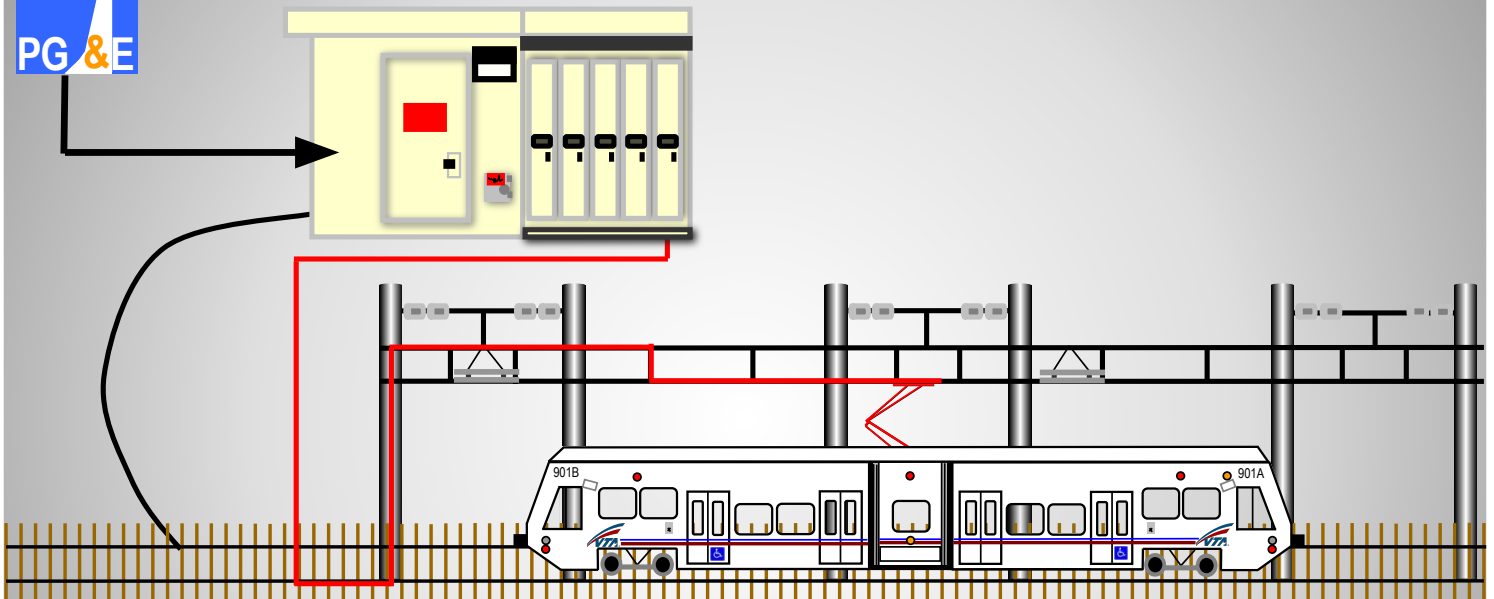
The return grounds attached to
the rail returns to the substation.

The return grounds are redundant
with as many as 4 per location.

The power then travels through the
Pantograph into the train equipment
where the other operating voltages are
produced.



Substation – Power Review



- ALWAYS ASSUME ALL ELECTRICAL COMPONENTS ARE ENERGIZED AT ALL TIMES.
- Never approach or touch a train that has been involved in a collision or derailment until it has been determined that it is safe to do so.
- The momentary “bridging” of an isolator WILL energize a de-energized overhead segment.
- A voltage tester will only give an accurate voltage indication at the PRECISE moment the test is performed and DOES NOT guarantee that power conditions will not change.

POWER SYSTEM FACTS

Overhead Wires & Supports Are:

Energized with 850 to 950 Volts (DC) of current.

Vary in height from 12'9" to 23':

The highest locations are located where public streets cross the tracks.

The lowest location is where the train travels at high speeds and private right-of-Way areas.

Overhead is strung Under 2,000 to 6,000 pounds of tension.

2,000 pounds on straight track, increasing on curve approaches, and up to 6,000 pounds in the curves.

In case of fire the substations contain banks of batteries and may become extremely toxic. .



DC feeder poles and / or other parts of the overhead contact system that have been compromised may become electrified as well as any object that may come into contact with them.

TRACK SWITCHES



Switch Points Can Throw At ANY Time,
Even LONG Before A Train Is Heard Or
Seen!



The Switch Points Will Crush Anything
In Their Path As They Move (Even
Rocks).

It Is Recommended You Always Walk Around Switches, If Absolutely Necessary To
Cross To Do Your Job, Have A VTA Employee Disable The Switch.

Wayside Equipment Rooms And Cabinets

- Contain 8 Volts DC to 440 Volts AC.
- Control Track Signals, Power Switches, Track Circuits, Crossing Gates, & Station Lighting.
- If PG&E suffers a power outage, some trackside components switch to battery back-up power while others become inoperative.