

Installation of Temporary and/or Permanent External Shunts

Purpose

The purpose of this procedure is to outline the steps necessary to use either temporary or permanent external shunts. Temporary shunts are intended as an interim repair when resistance values exceed the maximum allowable limits.

Warning

LOSS OF CONTINUITY CAN AFFECT TRAIN CONTROL, SYSTEM SIGNALING, VEHICLE GROUNDING, AND TIRE INTEGRITY. A COMPLETE TIRE FAILURE COULD CAUSE A VEHICLE DERAILMENT. THUS, IMMEDIATE ACTION IS REQUIRED.

Tools Required

Penn Machine supplied tools:

- (1) CD80 Stud Welder System
- (1) Protractor – Craftsmen #939840
- (1) Rhopoint Corporation Ohmmeter Mdl. #210 with leads

User suggested hand tools:

- (1) Ingersoll-Rand CA200 air grinder 20,000 RPM with sanding disk attachment or similar
- (50) 50 Grit sanding disks
- (1) Ingersoll-Rand Cyclone CA 120 air grinder 1200 RPM or similar
- (50) Cutting wheel for use with air grinders
- (1) Torque wrench, 0-250 in/bls
- (1) 3/8" drive speed wrench
- (2) 10 mm socket 3/8 drive
- (2) 10-mm deep well socket 3/8" drive
- (2) 10 mm combination wrench (open & box)
- (2) Heavy-duty black felt tipped markers
- (1) 100 ft. air hose with fittings
- (1) 100 ft. 12 AWG heavy duty extension cord (110 V)

Installation Procedures and Options

- A) First, you need to determine the amount of clearance available from the tire to the truck frame and/or fender. The preferred temporary installation option is to have the shunts installed on the outside of the tire or the flange side.

However, if there is more clearance on the non-flange side, it is also possible to install the shunts there in most cases. Consideration should be given to preference on shunt location for ease of in-service maintenance access. PMC will assist you in determining the best location for use of both temporary and permanent external shunts.

Penn Machine Company recommends that the wheels on existing fleets, with ohm resistance above maximums, be fitted with threaded stud-welded lugs and external shunts on both the tire and wheel center using a CD80 Stud Welding System and retested. Penn Machine Company will provide the CD80 machine along with a kit for you to facilitate installation of temporary external shunts.

We have also prepared a general video demonstrating the installation procedure, a copy of which is enclosed for your use. Your application may be slightly different. PLEASE READ THIS INSTALLATION PROCEDURE THOROUGHLY, VIEW THE VIDEO AND READ THE CD-80 MANUAL BEFORE ATTEMPTING ANY INSTALLATIONS.

Finally, if you require assistance or instruction in this installation procedure, Penn Machine Company will be pleased to have one of our Customer Service Representatives available to visit your facility to train your maintenance staff in the procedure. Temporary shunt installation is fairly simple and takes only minutes per wheel.

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- B) Preparation and mounting of studs and external shunts.

WARNING:

READ THE MANUAL FOR THE CD-80 STUD WELDER BEFORE USING IT FOR SAFETY AND WARNING PRECAUTIONS. MAKE SURE THE MANUAL'S RECOMMENDED SAFETY EQUIPMENT IS USED DURING WELDING AND THAT YOU FOLLOW YOUR OWN SAFETY STANDARDS IN PERFORMING THIS WORK.

Welding the threaded studs to the wheel center and tire:

1. Clean 3 areas, approximately 120° apart, of the tire and wheel center that is to be modified with external shunts. The bare metal must be exposed where the welding will take place. Also, clean an area where the ground can be fastened to the wheel center and tire. NEVER FASTEN THE GROUND TO RAIL OR TRUCK/CAR BODY.
2. Using a magnetic protractor, if practical, and a magic marker, mark the exact areas on which the shunts will be mounted on both the wheel center and tire. Make sure sufficient area is cleaned for the shunt terminal to make good contact with the wheel center and tire.
3. Using an air gun with a 50 grit grinding disk, remove any feed lines or tool marks where the welding will take place on the wheel center and tire.
4. Clean the locations that were just ground with solvent to remove dust.

Caution: The solvent being used should not come into direct contact with the rubber blocks, as premature failure of the block may result.

5. Prepare the stud welder per the OEM manual.
6. Insert threaded stud into the tip of the stud gun.
7. Line up the stud in the gun in the location desired on the wheel center. Be sure stud is square to the surface. Exert pressure on the stud gun to activate the spring tension and make contact between the threaded stud and the surface of the wheel center.

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8. Hold the stud gun firmly and pull the trigger. The threaded stud will weld to the wheel center surface instantaneously.
9. Visually inspect the stud and weld. Check the CD-80 manual for the proper fastening configuration.
10. Insert another threaded stud into the tip of the stud gun.
11. Line up the next stud location on the tire directly across from the stud you just mounted on the wheel center. Close alignment is important and some care should be taken. After you have determined the specific location, line up the stud gun. Check to be sure the stud is flat and perpendicular to the location for mounting.
12. Hold the stud gun firmly and pull the trigger. The stud will weld to the tire instantaneously.
13. Visually inspect the stud and weld as in operation #9.
14. Repeat steps 6 through 13 for the two remaining locations on the wheel.
15. The welded studs should be checked for mounted integrity. This can be done simply by putting the mounting nut on to the stud by 5-6 threads. Try to bend the stud with a box end wrench. If threaded stud breaks away, it has not been installed properly. Remove stud, re-prepare mounting surface and re-install.
16. **Install the external shunts:**

The external shunt you receive from PMC will have a chamfer in the hole on the flat side of each terminal end. This chamfer is critical. It allows the terminal to clear the base of the stud and the terminal to lie flat.

If the external shunt is not modified, make these modifications before proceeding.
17. To prevent or minimize the possibility of corrosion between the terminal surfaces, use electrical contact paste. Apply a small coating to both the tire or center surface, and the contact surface of the terminal.
(PMC will supply.)

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18. Place the external shunt on the wheel.
19. Install using a Nyloc nut on both threaded studs to hold the external shunt in place. Tighten the Nyloc nut to 4 foot-pounds.
20. Repeat steps 15 through 17 for the two other locations on the wheel.
21. Measure the resistance of the tire to center. The resistance reading should be less than 0.005 ohms. If the resistance is greater than 0.005 ohms, remove the three external shunts and install three new shunts. Re-check for proper resistance, **RESISTANCE VALUES MUST MEET SPECIFICATIONS PRIOR TO GOING INTO SERVICE.**
22. Even though external shunts have been installed, once a week visual inspections should be made to ensure that all shunts are mechanically intact.

NOTE: External shunts can be lost due to poor weldment and/or damage due to track debris.

All resilient wheels with internal shunts should be checked for proper resistance values as outlined in Service Bulletin #998-0001, revised January 2018, as soon as possible, if not already on a regular program.

Also, consideration should be given to a meter check of resistance values for wheels with external shunts at the discretion of the operating transit authority.

The content of this Service Bulletin is intended to be an outline for mounting of temporary external shunts.

Permanent External Shunts

Permanent external shunts should be considered as a long-term upgrade. Contact Penn Machine to discuss permanent modification to tires and wheel centers for your specific application.

If you have any questions regarding this Service Bulletin, please contact Penn Machine.



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