



INSTALLATION, MAINTENANCE, AND
OPERATING MANUAL FOR
THE MCKENZIE VALVE MAGNETIC GAUGE



McKenzie Valve and Machining, LLC provides this document for use by personnel involved with the transportation of commodities in railroad tank cars and the maintenance and repair of tank car magnetic gauge devices. The information contained in this document is intended to aid in the use of this product in a manner that promotes personal safety and environmentally friendly loading and unloading of tank cars.

This document is intended to be used ONLY by personnel trained in the mechanical requirements to operate valves and the procedures for loading and unloading tank cars as required by the American Association of Railroads (AAR), U.S. Department of Transportation Federal Railroad Administration, Transport Canada, Canadian Transportation Agency, Ministry of Communications and Transport (Mexico) and Railway Transportation Regulatory Agency (Mexico) or other jurisdictional agencies.

McKenzie Valve and Machining, LLC provides warnings for potential hazards known to McKenzie Valve and Machining, LLC. These warnings are not intended to override practices and protocols required by the tank car owner or the shipper of the tank car commodity or jurisdictional agencies.

This device is used in numerous services so complete information about the commodity should be obtained, verified, and reviewed before any inspection or maintenance is performed. To avoid exposure to toxic or hazardous conditions and materials, ensure that the direct area and all components are free of hazardous materials before performing any maintenance. During maintenance, use appropriate personal protection equipment based on the service in which the device was used. Residual materials may still be on the device, so appropriate precautions need to be taken.

This document provides detailed instructions regarding the disassembly, inspection, reassembly and testing of the McKenzie Magnetic Gauge Device (MVMG). No deviations to these instructions are recommended by McKenzie Valve and Machining, LLC.

For Product Warranty, please see:

<https://www.mckenzievalve.com/warranty>



TABLE OF CONTENTS

1. PURPOSE4

2. SCOPE4

3. WARNINGS4

4. MCKENZIE VALVE MAGNETIC GAUGE4

5. INSTALLATION TOOLING7

6. INSTALLATION INSTRUCTIONS7

7. OPERATION INSTRUCTIONS 10

8. TROUBLESHOOTING 11

9. DISASSEMBLY TOOLS 13

10. DISASSEMBLY INSTRUCTIONS 13

11. LUBRICANTS 15

12. INSPECTION AND MAINTENANCE 15

13. LEAK TESTING 20

14. GAUGE DEVICE AND/OR ROD REPLACEMENT 21

15. COMPONENT INFORMATION LOCATION 21

16. REVISIONS 22

1. PURPOSE

- 1.1. This document provides generic instructions for the installation, operation, maintenance, assembly and testing of the McKenzie Valve Magnetic Gauge (MVMG).

2. SCOPE

- 2.1. This document applies to the McKenzie Valve Magnetic Gauge with model code MVMG.

3. WARNINGS

- 3.1. This document contains images indicating potential hazards to be avoided using ANSI Z535 requirements.

- 3.2. The Danger hazard is indicated by this symbol and indicates a hazard situation, that if not avoided will result in death or serious injury.



- 3.3. The Warning hazard is indicated by this symbol and indicates a hazard situation, that if not avoided could result in death or serious injury.



- 3.4. The Caution hazard is indicated by this symbol and indicates a hazard situation, that if not avoided could result in minor or moderate injury.



- 3.5. Regulations for the commodity and tank car being used in conjunction with this device must not be violated. This document is not meant to conflict with regulatory obligations.

- 3.6. Installation, maintenance, and operation of this device must be done by qualified personnel.

4. MCKENZIE VALVE MAGNETIC GAUGE

- 4.1. The McKenzie MVMG is shown in Figures 1-3 with components listed in Table 1 and Table 2.
- 4.2. Symbol numbers referenced in this manual correspond with the bill of materials on the total assembly drawing, 516744, which is shown in Table 1. The symbol numbers with "H" in front correspond with the bill of materials for the housing sub-assembly, 516423, shown in Table 2. The "H" was added to the symbol numbers in Table 2 to avoid confusion with the symbol numbers from Table 1.
- 4.3. The float is 7 1/2 inches in diameter. There must be a minimum of 3/4 inch clearance between the outer diameter of the Float (4) and the inner diameter of the tank car nozzle. If there is not sufficient clearance, the device is not compatible with the car.

4.4. Once the device is installed onto the tank car fittings flange, do not store the assembly in a manner where the gauge device takes the load of the assembly's weight. It is not capable of supporting this load.

4.5. Features and Benefits

4.5.1. Universal components for quick and easy replacement

4.5.2. Tongue and groove flange with four 3/4" holes on a 3 1/4" bolt circle

4.5.3. Stainless Steel Construction

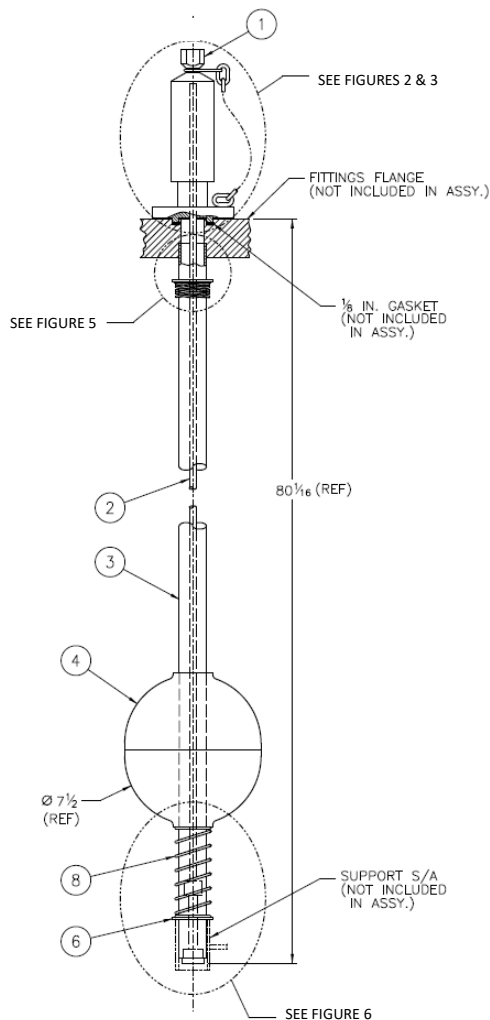


Figure 1: Drawing 516744 Total Assembly

Table 1 - Bill of Material for 516744			
Sym.	Req.	Description	Material
1	1	Housing Assembly	SST
2	1	Gauge Rod	CF
3	1	Guide Tube S/A	304L
4	1	Float	See S/A
5	2	Drive Screws	SST
6	1	Spring Washer	304L
7	1	Outage Conversion Decal	Decal
8	1	Coil Spring	17-7 SST
9	1	Operation Decal	Decal
10	1	Metal Plate, Permanent	304
11	1 or 0	Spacer	304L
12	1	Metal Plate, Part No.	304

Sym #7, #9, and #11 excluded from Figure 1 & 2

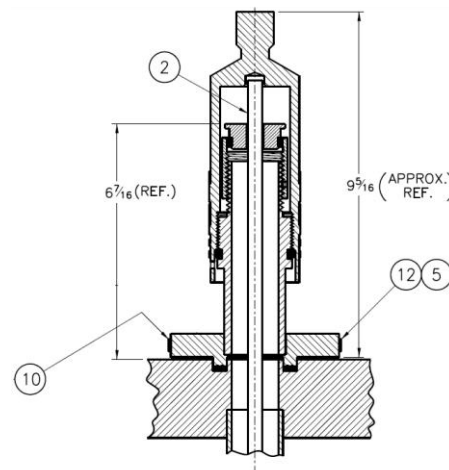


Figure 2: Drawing 516744 Total Assembly Top Section View

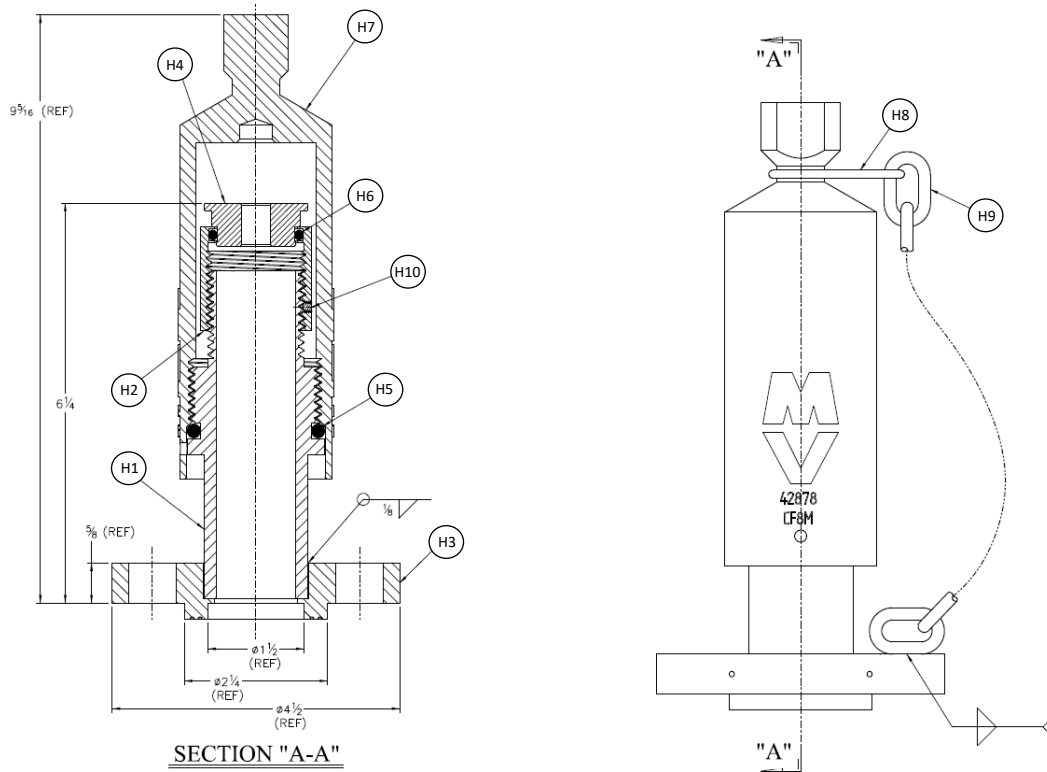


Figure 3: Drawing 516423 Housing Assembly

Table 2 - Bill of Material for Housing Assembly (1) 516423			
Sym.	Req.	Description	Material
H1	1	Gauge Device Housing	304L
H2	1	Adjustment Cap	316L
H3	1	Gauge T&G Flange, 3 1/4" B.C.	304L
H4	1	Adjustment Cap Insert	Nylon
H5	1	#327 O-ring	See S/A
H6	1	#218 O-ring	See S/A
H7	1	Top Cap	316
H8	1	Crush Link	316
H9	1	Chain, 3/16 in, 19 links	316
H10	1	Set Screw, 10-32 UNF x 1/8 in	18-8

5. INSTALLATION TOOLING

- 5.1. 3/32" Allen wrench for the adjustment cap set screw
- 5.2. Tools for measuring the Tank Car flange groove and hole
- 5.3. Tools for cleaning the Tank Car flange groove
- 5.4. Torque wrench and appropriate socket for the joint attaching the Housing Assembly (1) to the fittings flange. 5/8" studs with heavy hex nuts are standard which uses a 1-1/16" socket/wrench.
- 5.5. Volume measuring instrument for antifreeze
- 5.6. Welding machine for guide tube attachment

6. INSTALLATION INSTRUCTIONS

- 6.1. If replacing an existing gauge device, this procedure is contingent that the gauge to be replaced has been removed from the tank car. For instruction on how to remove an existing device, go to the section labeled "Disassembly Instructions" further down in this document.
- 6.2. The technician(s) installing the device must be using PPE appropriate for the site conditions.
- 6.3. Keep all components in their packaging until it is time to install the specific part to avoid damage. Magnetic components can attract metal filings and must be shielded.
- 6.4. Measure the tank car fittings flange and verify the hole, groove, and bolting dimensions match the ones shown in AAR MSRP CIII App. E, Fig. E.18.25. Figure 4 below shows the dimensions for verification.

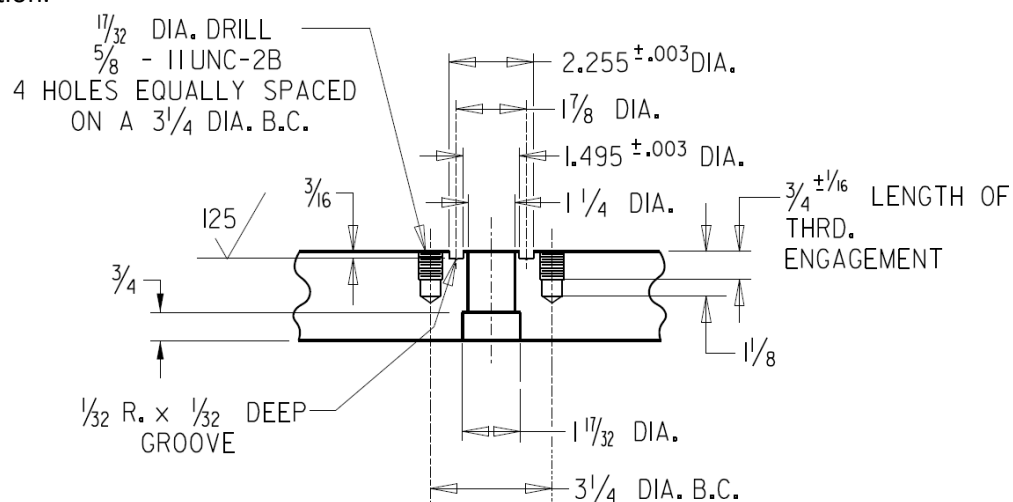


Figure 4: Fittings Flange Dimensions

- 6.5. If a Spacer (11) is specified for your configuration, insert it into the tank car fittings flange's 3/4" deep socket so that it is between the flange and the Guide Tube (3). See Figure 5.

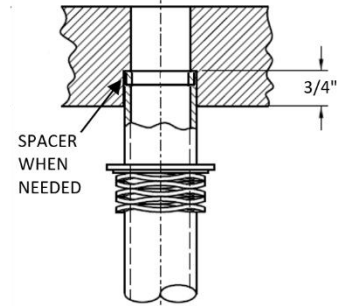


Figure 5: Spacer (11) location

- 6.6. Weld the Guide Tube (3) to the tank car fittings flange according to the assembly drawing. The minimum weld must have a throat diameter of 3/16 inches welded all around and must be done with a qualified procedure. Ensure the Guide Tube (3) is installed 90 degrees to the tank car fittings flange.



- 6.7. Slide the Float (4) onto the Guide Tube (3). Make sure the side labeled "TOP" will vertically be on the top side of the final assembly when installed in the tank car. The heavier side of the Float (4) is the bottom.

- 6.8. Slide the Coil Spring (8) onto the Guide Tube (3).

- 6.9. Slide one Spring Washer (6) onto the Guide Tube (3).

- 6.10. Install the bottom spring support (customer supplied) to hold the Float (4), Coil Spring (8), and Spring Washer (6) in the location specified in Figure 6. The Float (4), Coil Spring (8), and Spring Washer (6) must be protected from damage and weld spatter during support installation. If the bottom spring support is welded, it must be done with a procedure qualified for the installation shop.



- 6.11. After all welding is complete, inspect entire Guide Tube (3) for weld spatter or other defects that would affect the sliding components. If defects exist, they must be blended and filed smooth.

- 6.12. Slide Float (4) over its entire usable span between the two springs and verify there is no binding or interference. If there is a problem, refer to the previous step.

- 6.13. The gauge device utilizes a tongue and groove connection that must meet AAR C-III Appendix E, Figure E.18.25.

- 6.14. Inspect the groove in the flange on the tank car.

- 6.14.1. Ensure the groove is free of any debris.

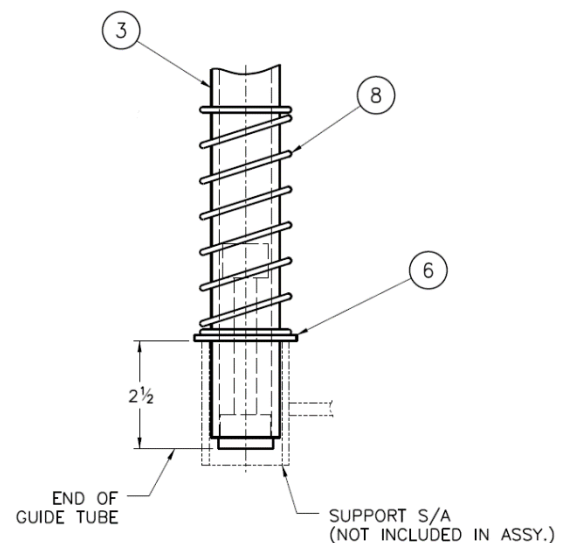


Figure 6: Bottom Spring Support Location

- 6.14.2. Make certain that the dimensions of the groove meet the dimensions of AAR C-III Appendix E, Figure E.18.25.
- 6.14.3. Inspect for any nicks or gouges inside the groove.
- 6.14.4. Correct any dimensional or damage issues before proceeding with installing the Housing Assembly (1).
- 6.15. Install 1/8 inch thick gasket into the groove. The gasket must not bind when inserted into the groove.
- 6.16. Align the bolt holes on the Housing Assembly (1) with the studs or tapped holes (if bolts are used) on the tank car fittings flange and place in position. The Housing Assembly (1) should be level and the tongue and groove connection must not bind.
- 6.17. Install the stud nuts or bolts (whichever is applicable).
- 6.18. Torque nuts or bolts to the requirement of the gasket manufacturer or car owner.
- 6.19. Unscrew the Top Cap (H7) and remove the white Adjustment Cap Insert (H4) by pulling it upward.
- 6.20. Apply 3 oz. of a 50-50 antifreeze mixture (water and ethylene glycol) into the Guide Tube (3).
- 6.21. Ensure the Gauge Rod (2) is free of metal filings on the magnet then slowly lower it into the device. Do not drop the rod.
- 6.22. Re-install the white Adjustment Cap Insert (H4) by firmly pushing it down into its original position. The Adjustment Cap Insert (H4) must push past the O-ring and be level for proper installation. The user will feel it go past the O-ring.
- 6.23. Pull the Gauge Rod (2) upward until it magnetically couples with the Float (4).
- 6.24. With the device in the vertical position, verify the top marking of the Gauge Rod (2) scale is aligned with the top of the white Adjustment Cap Insert (H4). The Gauge Rod (2) and Housing Assembly (1) should be properly indexed upon delivery from the manufacturer.
 - 6.24.1. The best method for accurate gauge reading is specified in Section 7.6
 - 6.24.2. If the marking is not properly aligned, it can be moved +/- 1/4 inch from the nominal 6 1/4 inch dimension shown in Figure 3. Loosen the Set Screw (H10) on the housing, move the Adjustment Cap (H2) within the allowed range to meet proper alignment, re-tighten Set Screw (H10) to be





snug against the housing (approximately 30 in-lbs). The Adjustment Cap (H2) will not freely spin if the Set Screw (H10) is tight.

6.24.2.1. If the gauge rod is too low, spin the Adjustment Cap (H2) clockwise to lower the Adjustment Cap (H2). If the gauge rod is too high, spin the Adjustment Cap (H2) counterclockwise to raise the Adjustment Cap (H2).

6.24.3. If the alignment cannot be obtained within the allowable adjustment range, check the placement of the bottom spring support, and ensure the white Adjustment Cap Insert (H4) is fully seated past the O-ring. If both are correct, contact McKenzie Valve and Machining.

6.25. Once alignment is verified, push down on the Gauge Rod (2) until it is magnetically disengaged and carefully lower the rod into its stored position.

6.26. Screw the Top Cap (H7) on hand-tight.

6.27. Apply the Outage Conversion Decal (7) and Operation Decal (9) to the inside of the tank car fittings cover lid. If there is an existing operation decal from a previous gauge device, remove that decal before applying this new one.

6.28. Install tank car fittings assembly into the tank car.

6.29. This completes the installation of the gauge device.

6.30. Prior to loading the tank car, the device must be checked for leakage per the requirements of the tank owner, shipper, or jurisdictional authority. Leak test recommendations are in Section 13.

7. OPERATION INSTRUCTIONS

7.1. Unscrew the gauge device's Top Cap (H7). If pressure escapes during cap removal, do not fully remove the cap and re-tighten it instead. Report the device as damaged and do not open it. Refer to the Troubleshooting section below. If no pressure is released, fully remove the cap and continue to the next step of these instructions.

7.2. Once the cap is removed, pull the Gauge Rod (2) up as high as it can go. Do a visual inspection of the entire visible rod. If the rod is damaged then it must be replaced.

7.3. Slowly lower the Gauge Rod (2) back into the initial stored position. The rod should be uncoupled from the Float (4) in the stored position.

7.4. Pull the Gauge Rod (2) up and stop once it has magnetically coupled with the Float (4). The rod should be coupled before loading the car.



7.5. During the filling process, observe the scale markings and compare them to the corresponding outage values listed for the commodity being loaded on the Outage Conversion Decal (7).

7.6. For accurate gauge readings:

7.6.1. Pull slightly up on the Gauge Rod (2) but do not uncouple it from the Float (4).

7.6.2. Release the rod very slowly.

7.6.3. Read the scale where it aligns with the top of the white Adjustment Cap Insert (H4).

7.7. Once the car is loaded and all readings are completed, carefully lower the Gauge Rod (2) into its stored position. **Do not drop the rod.** In the stored position, the rod is uncoupled from the float magnet and at its lowest possible point.

7.8. Screw the Top Cap (H7) on hand-tight.

7.9. Operation is complete.

7.10. Note: The Gauge Rod (2) can be removed during the car's steam cleaning but must be reinstalled afterward.

8. TROUBLESHOOTING

Always use the proper PPE for the site and potential hazards of the tank car commodity. Review the tank car stencils for any DANGER or WARNING information.

8.1. Pressure exists when removing Top Cap (H7).

8.1.1. A leak exists below the fittings flange which is causing the pressure under the Top Cap (H7). The area inside the Housing Assembly (1) is not normally pressure retaining.

8.1.2. Vent the tank car of all pressure.

8.1.3. The Guide Tube (3) and its connections must be inspected to detect the leak.

8.1.3.1. To inspect the tube, the car's entire fittings flange must be removed from the car.

- 8.1.3.2. All safety precautions for the customer's repair shop must be followed.
- 8.1.3.3. Clean the parts that have contacted commodity according to the repair shop's procedure for the specific commodity.
- 8.1.3.4. Inspect the device to identify the leakage location using a procedure approved by the repair shop. The suggested procedure is shown in Section 13.2.



8.1.4. If the leak is coming from a faulty weld on the Guide Tube (3), do the following:

- 8.1.4.1. If the faulty weld is at the joint between the tank car fittings flange and the Guide Tube (3), it can be repaired with a qualified weld procedure.
- 8.1.4.2. If the faulty weld is at the joint between the pre-assembled components of the Guide Tube (3) subassembly then the tube must be replaced. Pre-assembled joints include the weld at the bottom of the tube for the stop rod and near the top for the wave spring and its washer. Follow the steps shown in 8.1.5.1 through 8.1.5.3 below.
- 8.1.4.3. In all cases, surfaces must be cleaned and prepared so that the historical commodity contact does not cause safety or welding problems. Note: A hot work permit may be required for this procedure.



8.1.5. If leak is caused by a damaged Guide Tube (3), the tube must be replaced.

- 8.1.5.1. Follow the procedure described in the "Disassembly Instructions" section placed later in this document. The entire device must be disassembled so that the heat used to remove the Guide Tube (3) does not damage the gasket above the fittings flange and the tube can be moved past the lower support bracket.
- 8.1.5.2. Order a new Guide Tube (3) using the part number on the assembly drawing for the device.
- 8.1.5.3. Follow the "Installation Instructions" above in Section 6 to install the gauge device with the new Guide Tube (3). A new gasket must be used between the Housing Assembly (1) and the tank car fittings flange.

8.2. Gauge Rod (2) does not rise with commodity.

- 8.2.1. Verify the Gauge Rod (2) is magnetically coupled with the Float (4). The user should feel it engage when pulled up into position and disengage when pushing it down.
- 8.2.2. Ensure there is enough commodity in the car to interact with the gauge device. The gauge will only read if there is approximately 55 inches or less of outage depending on the commodity.



8.2.3. With the Top Cap (H7) removed, pull the Adjustment Cap Insert (H4) up firmly to remove it and then lift the Gauge Rod (2) out of the device. Inspect the rod for any damage and check the magnet for any cracks.

8.2.3.1. If the rod or magnet is damaged, replace the Gauge Rod (2) with a new one of the same configuration. Carefully install the Gauge Rod (2) then reinstall the Adjustment Cap Insert (H4) by firmly pressing it down till it snaps past the O-ring.

8.2.4. If everything was acceptable in steps 8.2.1 through 8.2.3, then the Float (4) is most likely damaged.

8.2.4.1. Refer to the disassembly steps in Section 10.1 through 10.3 and 10.10 through 10.12.

8.2.4.2. Reassemble with a new Float (4) following steps 6.7 through 6.12.

8.2.4.3. Remove the Top Cap (H7) if not already done and then ensure proper gauge calibration and reinstall the fittings assembly into the tank car with steps 6.23 through 6.29.

8.3. Gasket leaks during leak testing.

8.3.1. Consult gasket manufacturer for recommendations.

8.3.2. If the gasket manufacturer's recommendations do not seal the leak, remove the Housing Assembly (1), and inspect the tongue, groove, and gasket for damage or dimensional errors.

8.3.3. Note: If leak testing is being done with pressure inside of the car or test well, this gasket should not be exposed to pressure. If a leak is occurring, see step 8.1 to solve the primary problem.

9. DISASSEMBLY TOOLS

9.1. Wrench or pull-bar with appropriate socket for the joint attaching the Housing Assembly (1) to the fittings flange. 5/8" studs with heavy hex nuts are standard which uses a 1-1/16" socket/wrench.


9.2. Grinder or gouging machine for weld removal

10. DISASSEMBLY INSTRUCTIONS

10.1. The technician(s) disassembling the device must be using PPE appropriate for the site conditions.

10.2. Vent the tank car of all pressure.

10.3. Remove the fittings assembly from the tank car.

- 10.4. Unscrew the Top Cap (H7).
- 10.5. Pull up on the white Adjustment Cap Insert (H4) to uninstall it.
- 10.6. Lift the Gauge Rod (2) vertically to remove it and store it in a safe place away from potential damage or metal shavings. The magnet on the rod will attract metal shavings if they are in the vicinity.
- 10.7. Remove the component's flange bolting.
- 10.8. Remove the Housing Assembly (1).
- 10.9. Remove the gasket from the groove on the fittings flange. This gasket must be replaced; do not reuse.
- 10.10. Clean the parts that have contacted commodity according to the repair shop's procedure for the specific commodity. This includes but is not limited to the car's fittings flange and all parts of the gauge device that extend below it into the car.
- 10.11. Remove the bottom support bracket near the coil spring. The support brackets are created by the car builder and may need grinding or gouging to remove depending on how the support is made.
 - 10.11.1. Note: A hot work permit may be required for this procedure.
 - 10.11.2. Reminder: Surfaces must be cleaned before bracket removal so that the historical commodity contact does not cause safety problems.
- 10.12. Slide the Spring Washer (6), Coil Spring (8), and Float (4) off of the Guide Tube (3).
- 10.13. The Guide Tube (3) must be removed by grinding or gouging away the weld holding the tube to the fittings flange.
 - 10.13.1. Note: A hot work permit may be required for this procedure.
 - 10.13.2. Reminder: Surfaces must be cleaned before tube removal so that the historical commodity contact does not cause safety problems.
- 10.14. Disassembly is complete.

11. LUBRICANTS

- 11.1. Molykote 111 will be used for the lubrication of O-rings by McKenzie Valve and Machining unless otherwise specified by the customer or drawing. It is the user's responsibility to make certain that the appropriate lubricants used are compatible with the intended service.

12. INSPECTION AND MAINTENANCE

- 12.1. Check the device calibration using the procedure described in Section 6.24 and its sub-sections.
- 12.2. If a weld was performed on the component before shipment from McKenzie Valve and Machining, it should not be repaired unless otherwise stated in this manual. These weld defects require component replacements. If the weld was done by the installer such as the weld between the Guide Tube (3) and the tank car fittings plate, they can be repaired with a procedure qualified by the repair shop.
- 12.3. Magnet Coupling Strength Check
 - 12.3.1. Visually inspect the Gauge Rod (2) magnet for cracks or chips. Check that no commodity has entered the rod which would cause a weight increase. Replace the rod if these problems exist. Clean off metal particles if they have attached to the magnet.
 - 12.3.2. Insert the Gauge Rod (2) into the assembled gauge device. Magnetically couple the rod to the Float (4).
 - 12.3.3. Put the 10 oz test weight (Part Number 114277-01) on the top of the Gauge Rod (2).
 - 12.3.4. Slowly release the rod with the weight on top.
 - 12.3.5. If the Gauge Rod (2) stays engaged with the Float (4) then the magnets are properly working, and the test is complete.
 - 12.3.6. If the Gauge Rod (2) disengages with the Float (4) then replace the Gauge Rod (2) with a new one.
 - 12.3.7. Retest the magnetic connection with steps 12.3.1 through 12.3.5.
 - 12.3.8. If magnetic disengagement still occurs with the new rod, then the Float (4) is malfunctioning and must be replaced with a new one.
 - 12.3.9. Contact McKenzie Valve and Machining if both the Gauge Rod (2) and the Float (4) have been replaced with new versions and still magnetically disengage during the test weight procedure above.



- 12.4. See Section 14 for information about how to order a new Gauge Rod (2) or total device.
- 12.5. All components listed below for inspection and maintenance must be thoroughly cleaned and safe for handling prior to commencing the inspection and maintenance. Procedures used for cleaning and decontamination must meet the standards of the tank car owner, shipper, and jurisdictional authority.

12.5.1. Housing Assembly (1)

- 12.5.1.1. Inspect the assembly and weldments for cracks using a method listed in AAR MSRP C-III [M-1002] Appendix T. Visual inspection is sufficient unless otherwise noted. Replace affected components if defects are detected.

12.5.1.2. Gauge Device Housing (H1)

- 12.5.1.2.1. Inspect for cracks or thread damage. Replace the Housing Assembly (1) if either is noted.

12.5.1.3. Adjustment Cap (H2)

- 12.5.1.3.1. Inspect for cracks, deformation, or other damage.
- 12.5.1.3.2. Inspect the O-ring groove for damage.
- 12.5.1.3.3. Check both thread locations for damage.
- 12.5.1.3.4. Replace the component if any of the defects above are noted.

12.5.1.4. Gauge T&G Flange (H3)

- 12.5.1.4.1. Check the sealing surface for nicks, scratches, gouges, or deformations. Replace the Housing Assembly (1) if the tongue cannot be polished to dimensionally match the manufacturing drawing.
- 12.5.1.4.2. Inspect the entire flange for cracks, deformation, or other damage. Replace the Housing Assembly (1) if defects exist.
- 12.5.1.4.3. If debris exists, clean the surface.

12.5.1.5. Adjustment Cap Insert (H4)

- 12.5.1.5.1. Inspect for cracks, deformation, wear, or other damage.

12.5.1.5.2. Inspect the O-ring groove for damage.

12.5.1.5.3. Make sure the cap sits level when installed in the device.

12.5.1.5.4. Replace the component if any of the defects above are noted.

12.5.1.6. #327 O-ring (H5)

12.5.1.6.1. If the device is being inspected after being in service, replace the O-ring (H5) with a new one. Lubricate with Molykote 111 unless the commodity requires the use of another lubricant.

12.5.1.7. #294 O-ring (H6)

12.5.1.7.1. If the device is being inspected after being in service, replace the O-ring (H6) with a new one. Lubricate with Molykote 111 unless the commodity requires the use of another lubricant.

12.5.1.8. Top Cap (H7)

12.5.1.8.1. Inspect for any cracks or thread damage. Replace the Housing Assembly (1) if either is noted.

12.5.1.8.2. Ensure vent holes are not clogged. Clean them if they have blockage.

12.5.1.9. Crush Link (H8)

12.5.1.9.1. Inspect for any cracks. If the weld joint has a crack, then it can be welded with a procedure qualified by the repair shop. Replace the Housing Assembly (1) if there are cracks elsewhere.

12.5.1.10.Chain (H9)

12.5.1.10.1. Inspect for any cracks or other chain defects. Replace the Housing Assembly (1) if damaged.

12.5.1.11.Set Screw (H10)

12.5.1.11.1. Inspect for thread damage. Replace the screw if damaged and tighten it to be snug against the housing (approximately 30 in-lbs). The Adjustment Cap (H2) will not freely spin if the Set Screw (H10) is tight.

12.5.2. Gauge Rod (2)

- 12.5.2.1. Check the magnet with the procedure in section 12.3.
- 12.5.2.2. Visually inspect the rod for breakage, decal damage, and deterioration.
- 12.5.2.3. Verify heat shrink tubing is not cut or leaking.
- 12.5.2.4. Ensure the rod is straight.
- 12.5.2.5. If any of the defects above are found, replace the Gauge Rod (2).
- 12.5.2.6. If a replacement rod must be ordered, utilize the part number on the rod to ensure an identical rod is provided. See Section 14.

12.5.3. Guide Tube (3)

- 12.5.3.1. Visually inspect for cracks or weld defects. If the weld joint holding the tube to the tank car fittings flange has a defect, then it can be weld repaired with a procedure qualified by the repair shop. Other weld defects call for tube replacement.
- 12.5.3.2. Ensure the tube is straight. If tube is bent, it must be replaced.
- 12.5.3.3. Inspect for weld spatter or other defects that would affect the sliding components. If defects exist, they must be blended and filed smooth.

12.5.4. Float (4)

- 12.5.4.1. Check the magnet strength with procedure in section 12.3.
- 12.5.4.2. Visually inspect the Float (4) for cracks, dents, weld spatter, or other visible damage. If any of these exist, then replace the component.
- 12.5.4.3. Make sure the white bushings on the top and bottom of the Float (4) are intact and not damaged.
- 12.5.4.4. Submerge the Float (4) in warm water and look for bubbles to identify any leaks. If leaks exist, the float must be replaced.
- 12.5.4.5. If there is anything inside the Float (4) that is loose when the Float (4) is shaken, it must be replaced.



12.5.4.6. If the Float (4) is replaced due to any of the defects above, perform another magnet test with the procedure in 12.3.

12.5.5. Drive Screws (5)

12.5.5.1. If the Drive Screws (5) are loose, replace them. If the “Metal Plate, Part No.” (12) is removed, new Drive Screws (5) must be used to reinstall the Metal Plate (12).

12.5.6. Spring Washer (6)

12.5.6.1. Visually inspect the washer for damage. If the washer is deformed then the gauge device should be replaced.

12.5.7. Outage Conversion Decal (7)

12.5.7.1. Visually inspect the decal for damage and legibility. If the decal is not easily legible or has other damage, remove and replace it. The part number for the decal is listed at the top of the decal.

12.5.8. Coil Spring (8)

12.5.8.1. Visually inspect the spring for cracks and yielded deformation. If either have occurred, replace the spring. Lift the float off the spring so that the load is not supported by the spring. With no load on the spring, it must have a free length of 5 inches.

12.5.8.2. If the spring has weld spatter on it, it must be removed.

12.5.9. Operation Decal (9)

12.5.9.1. Replace if damaged. Decal is placed on the inside of the tank car fitting’s housing cover.

12.5.10. Metal Plates (10 & 12)

12.5.10.1. Replace if damaged or illegible.

12.6. Leak test the device per Section 13.

13. LEAK TESTING

13.1. The full assembly should be leak tested once all installation steps are completed following the requirements of the tank owner, shipper, or jurisdictional authority. All leak testing personnel, equipment, and processes must comply with AAR MSRP Section C-III Appendix D and Appendix T. The steps below are two examples of how leak testing could be done.

13.2. Test with Internal Pressure.

13.2.1. Remove the Top Cap (H7) and thread the special leak testing cap (Part Number 114631-01) to the top of the Housing Assembly (1) hand tight. The cap must have an air supply line attached.

13.2.2. Apply 30 psig +10/-0 psig of air through the cap to the inside of the gauge device and use an approved leak detection fluid to check for leaks at all the key joints. The key joints are the gasketed connection at the top of the device, and all the welded areas. Observe the assembly for leakage for at least 90 seconds.



13.2.3. If no leaks exist then the device has been successfully assembled. If leaks do exist, repair or replace as described in the sections above.

13.2.4. Safely remove the pressure, remove the special leak testing cap, and re-attach the Top Cap (H7) hand tight.

13.3. Test with External Pressure.

13.3.1. Remove the Top Cap (H7).

13.3.2. Apply 30 psig +10/-0 psig of air to the inside of the tank car or fittings test well (whichever the device is mounted to).

13.3.3. Thread the special leak testing cap (Part Number 114631-01) to the top of the Housing Assembly (1) hand tight. The cap must have a pressure gauge attached applicable for the test pressure being used.



13.3.4. Observe for 90 seconds. If the pressure gauge indicates a change in pressure, then a leak exists below the fittings flange and must be resolved. If there is no change in pressure, then the device has been successfully assembled.

13.3.5. Safely remove the pressure, remove the special leak testing cap, and re-attach the Top Cap (H7) hand tight.

14. GAUGE DEVICE AND/OR ROD REPLACEMENT

14.1. Replace or Order New Gauge Device

- 14.1.1. For first time application or modified service, fill out form MVMG 1U and submit it with the purchase request.
- 14.1.2. If ordering an identical replacement device with unchanged commodity and car specifications, the part number shown on the “Metal Plate, Part No” (12) can be used to order without needing the MVMG 1U form. Ensure the dash followed by the two digits at the end of the part number are included on the purchase order.

14.2. Replace Rod with No Commodity or Car Changes

- 14.2.1. Order new rod using the part number listed at the top of the existing rod. Rod part number can also be found on the device assembly drawing.

14.3. Modifications for Changing Commodity

- 14.3.1. If changing to a commodity with a different specific gravity or name, the Outage Conversion Decal (7), “Metal Plate, Part No.” (12), and Drive Screws (5) must be replaced. O-rings (H5 & H6) will also be changed during this conversion to refresh the gauge with the current material or change to a new material. Fill out form MVMG 1U and submit it with the purchase request.

15. COMPONENT INFORMATION LOCATION

- 15.1. The Metal Plates (10 & 12) on the rim of the gauge device housing have the main device information such as part number, model number, serial number, etc.
- 15.2. The labels toward the top of the Gauge Rod (2) have the part number and serial number for the rod.

16. REVISIONS

Rev. Date	Section	Revision
10/11/23	N/A	Document Issued
04/10/24	All	Converted from traditional customized gauge to universal gauge
	6.4, 6.12, & 6.13.2	Updated AAR image number reference
	15	Added section 15 and its sub-parts
08/05/24	4.2, Fig 1, Fig 2 & Table 1	Updated total assembly drawing number.
	6.4	Removed socket variation text.
	6.5	Added paragraph and re-sequenced the steps below it.
	Figure 4	Added
	Figure 5 & 6.10	Re-numbered figure and updated references to it.
	8.2.4.2, 8.2.4.3, & 12.1	Updated section 6 step reference numbers.
09/16/24	Table 1 & Figure 2	Updated sym 10 location and added sym 12
	Figure 1	Updated length and integrated figure callouts
	4.5.1	Added content about universal components.
	4.5.3	Moved 4.5.1 content here and removed content about O-rings
	12.5.5.1	Changed metal plate 10 to metal plate 12
	12.5.10	Added sym 12 info
	14.1.2	Changed metal plate 10 to metal plate 12
	14.3.1	Changed metal plate 10 to metal plate 12
03/13/25	15.1	Added sym 12 info
	Figure 3 & Table 2	Removed H11 Oring that was used as weld spacer
	Figure 4	Added figure to replace AAR excerpt
	6.4	Added sentence about Figure 4
	Figure 5 and 6	Re-numbered, previously Figure 4 and 5
	6.5	Updated figure reference from Figure 4 to Figure 5
	6.10	Updated figure reference from Figure 5 to Figure 6