



Use this guide, PL814 (MIV-E), or PL815 (MIV-M) to replace a damaged disc or fix additional leaks in a Hale Manual (MIV-M) or Electric (MIV-E) Master Intake Valve (MIV) when the disc fails to shut off the intake or water is leaking past the disc stem or the MIV fails vacuum testing and troubleshooting has determined that the failure is because the disc is damaged and/or additional leaks are present in the MIV. All referenced documents and plate (PL) drawings are available from the Tech Resource Center on the Hale website (<https://www.haleproducts.com>).

Refer to 029-0020-28-0, MASTER INTAKE VALVE DESCRIPTION, INSTALLATION AND OPERATION MANUAL for additional or more detailed information.

**NOTES:** Always remove old thread locking compound from used fastener threads before installation as the presence of old thread locking compound negatively affects torque.

**Recommended Grease:** Super Lube Food Grade NLGI 2 Synthetic PTFE (Provided) (Aerosol 31040 & 31110 Allowed)

**Recommended Solvent:** Safety Kleen® or Stoddard Solvent (or equivalent)

Table 1. Applicable MIV Kit

Kit Number	Description	Remarks
546-1620-00-0	Manual MIV Disc Replacement Kit	Kit contains a replacement disc and extension shaft (MIV-M prior to 03/2001), seals (disc stem, adapter, and trunnion), gearbox gasket, grease, and new body seals to install the MIV.
546-1620-01-0	Electric MIV Disc Replacement Kit	Kit contains a replacement disc and extension shaft (MIV-E 03/2001 and newer), seals (disc stem, adapter, and trunnion), gearbox gasket, grease, and new body seals to install the MIV.
546-1620-04-0	Manual MIV Disc Replacement Kit	Kit contains a replacement disc and extension shaft (MIV-M 03/2001 and newer), seals (disc stem, adapter, and trunnion), gearbox gasket, grease, and new body seals to install the MIV.
546-1620-05-0	MIV Disc Replacement Kit	Kit contains a replacement disc, seals (disc stem, adapter, and trunnion), gearbox gasket, grease, and new body seals to install the MIV.

**ATTENTION ⚠ CAUTION**

INDICATES A POTENTIALLY HAZARDOUS SITUATION, WHICH IF NOT AVOIDED MAY RESULT IN MINOR OR MODERATE INJURY.

**IMPORTANT ⚠ NOTICE**

ADDRESSES PRACTICES NOT RELATED TO PERSONAL INJURY (EQUIPMENT DAMAGE)

Table 2. Tools And Consumables List

Standard Tools	Special Tools	Consumables
PPE	None	Shop Rag(s) (As Required)
5/16-inch Allen key ( <u>1/</u> )		O-ring Lubricant (See NOTES, page 1.)
7/16-inch Box End Wrench		Grease (See NOTES, page 1.)
5/8-inch Wrench		Suction Extension (Old or Spare)
9/16 inch socket		7/16-14 x 4 inch Long Screw (Quantity 3)
Beaker Bar		7/16-inch Thick Fender Washer (Quantity 3)
Ratchet (and 10 inch Extension)		Loctite 242 (Medium Strength, All-Purpose, Removable, Thixotropic, Blue) (or Equivalent)
1-1/2 inch Socket (or an Extra Long Wrench)		Safety Kleen® or Stoddard Solvent (or Equivalent) (See NOTES, page 1.)
9/16 inch Torque Wrench (23 lb-ft)		Ruler
Torque Wrench (125 lb-ft)		Loctite 596 (or Equivalent)

1/ For older MIVs, using cap screws.

Figure 1 identifies the MIV-E/MIV-M components of interest.

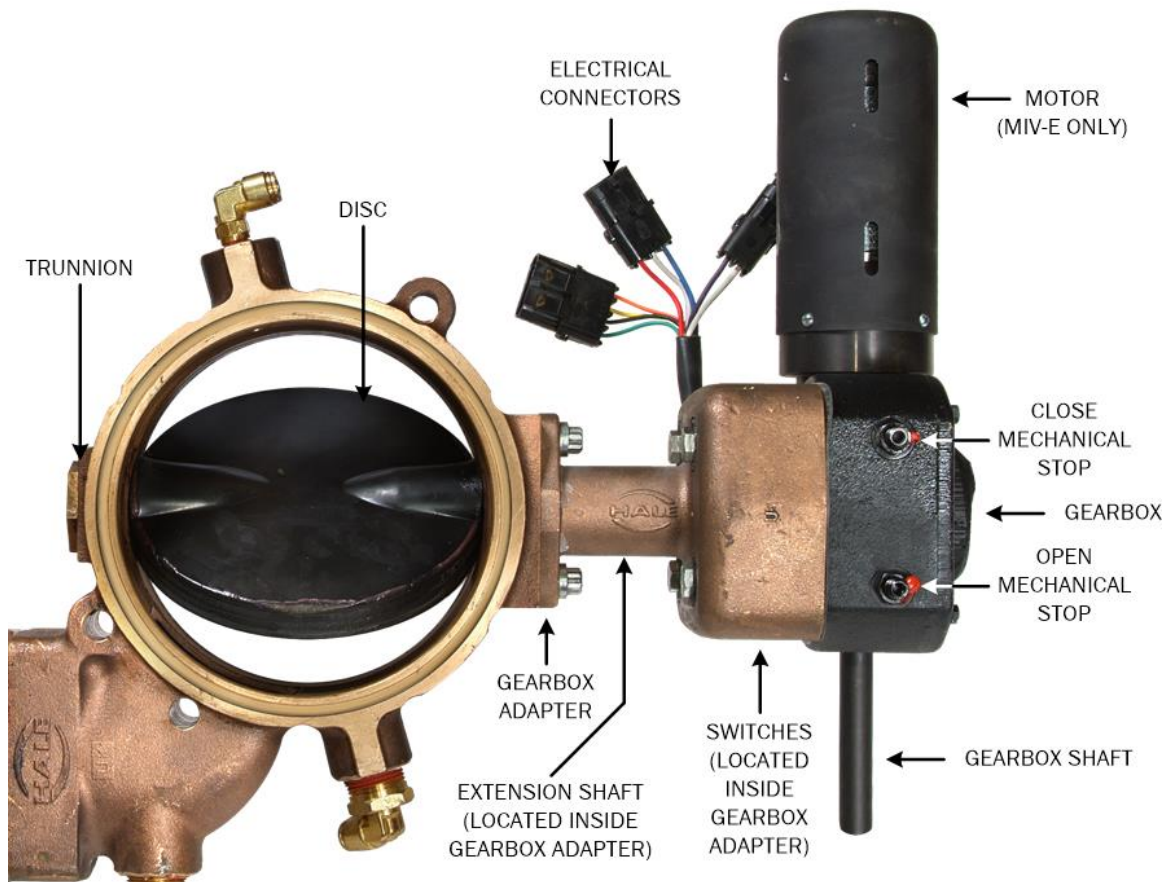


Figure 1.

Perform the following to remove and replace the extension shaft, disc, and associated seals and gasket (see Table 1) of a Hale MIV.

**ATTENTION ⚠ CAUTION** OPERATING A MIV WITHOUT THE INTAKE STRAINER/SUCTION TUBE IN PLACE POSES A PINCH HAZARD. KEEP HANDS CLEAR OF A MIV DISC WHEN OPERATED.

1. Position MIV disc half way between open and closed.
  - a. For a MIV-E, if connected and functional, use panel controls (see Figure 2.) to move MIV disc to a position half way between closed and open. Otherwise, use gearbox shaft to move MIV disc to a position half way between closed and open. (Approximately 5 turns from either the fully open or fully closed position.)

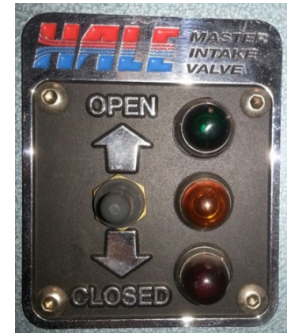


Figure 2.

**NOTE:** If available, installing a handwheel on the shaft makes moving the MIV disc easier.

- b. For a MIV-M, use handwheel to move MIV disc half way between closed and open position. (Approximately five turns from either the fully open or fully closed position.)
2. Remove gearbox adapter (including gear motor assembly). See Figure 1.

- a. Place MIV on a stable work surface with larger bore up and secure as follows.

Option 1 (preferred), secure MIV to an old or spare suction extension using three [3] 7/16-14 x 4 inch long screws and three [3] 7/16-inch thick fender washers; with suction extension that has been clamped (or screwed) to a workbench. Using 5/8-inch wrench, tighten screws.

Option 2, use a stable work surface and cribbing to elevate the MIV so the disc clears the work surface. (Substitute 3/8-inch lag bolts 4-1/2 inches long for the three 7/16-14 x 4 inch long screws to secure the MIV to the work bench.)

- b. Note/match mark gearbox adapter and valve body. (For reassembly purposes.)
  - c. Using 7/16-inch box end wrench (5/16-inch Allen key for older MIVs), loosen two [2] 7/16-14 x 1 inch long 12 point (or cap) screws.
  - d. Remove screws.

**IMPORTANT ⚠ NOTICE** IF THE EXTENSION SHAFT IS REMOVED (OR ALLOWED TO FALL OUT), WHILE THE SHAFT IS IN THE FULLY OPEN OR FULLY CLOSE POSITION THE SWITCHES (THE ROLLERS/ACTUATION LEVERS RIDE ON THE SHAFT INSIDE THE ADAPTER) MAY BE DAMAGED.

- e. Remove valve trunnion. See Figure 1 and Figure 3.

**Note:** The trunnion is located on the bottom of the valve body, secures the disc, and is torqued to 125 ft lbs.

- 1) Using 1-1/2 inch socket and beaker bar (or long wrench), loosen trunnion.
- 2) Remove trunnion.



Figure 3.

3. Remove failed disc.
  - a. Push bottom of disc (where trunnion was removed) out of valve body. See Figure 4.

**NOTE: Use a non-marring hammer to tap disc out if required.**

  - b. Rotate and lift disc out of valve body (so stem clears bore). See Figure 5.



Figure 4.



Figure 5.

**NOTE: Step 4. and Step 5. ONLY apply to kits 546-1620-00-0 and 546-1620-01-0. If installing kit 546-1620-05-0 go to Step 6. (on Page 6).**

4. Remove extension shaft.

**IMPORTANT ▲ NOTICE** IF THE EXTENSION SHAFT IS REMOVED (OR ALLOWED TO FALL OUT), WHILE THE SHAFT IS IN THE FULLY OPEN OR FULLY CLOSE POSITION THE SWITCHES (THE ROLLERS/ACTUATION LEVERS RIDE ON THE SHAFT INSIDE THE ADAPTER) MAY BE DAMAGED.

- a. Place gearbox in half open position. Manually turn gearbox shaft exactly five turns clockwise from fully counterclockwise.

**NOTE: This will place the switch sequencing slot in the extension shaft midway between both sets of switch rollers and avoids damaging the switches.**

- b. Note/match mark gearbox adapter-to-gearbox orientation.
- c. Loosen four [4] 3/8-16 x 2-1/2 inch long gearbox adapter-to-gearbox bolts.
  - 1) Using 9/16 inch socket, extension, and ratchet (set CCW), loosen bolts and back them out from a 1/4 to 1/2 an inch.
  - 2) Do NOT remove bolts (with washers) until instructed. (The bolts are left in place to limit gearbox travel during the next step.)

**NOTE: Avoid pulling the extension shaft out of the gearbox adapter (or letting it fall out). Hold the shaft in place inside the adapter while separating the assembly.**

- d. Remove gearbox.
  - 1) Position assembly with gearbox toward you.
  - 2) Separate gearbox from gearbox adapter but DO NOT REMOVE gearbox until instructed.
  - 3) Remove four gearbox adapter-to-gearbox bolts (with washers).

**NOTE:** Avoid pulling the extension shaft out of the gearbox adapter with the gearbox (or letting it fall out). Hold the shaft in place inside the adapter while separating the gearbox from the gearbox adapter.

- 4) Remove gearbox.
- e. Record (note/photo/match mark) position of sequencing slot in relation to position switches. See Figure 6.
- f. Pull extension shaft out of gearbox adapter.

**NOTE:** If the extension shaft does NOT pull out of the gearbox adapter by hand, inspect the valve body end of the shaft. If the end of the shaft (mates with disc stem) is split the gearbox adapter (and the extension shaft for a MIV-M) will have to be replaced (since the shaft can NOT be removed without damaging the adapter). Contact Hale Products for replacement(s). (Phone: 800 533.3569).

Clean the gearbox, gearbox adapter (mating surfaces), and bolt threads thoroughly. Using a multi-meter, verify both micro switches are functional by checking continuity from the common terminal (COM 1) to the normally open terminal (NO 3) and then activate the switch and check the normally closed terminal (NC 2) on both switches. Inspect wiring and push on terminals for faults (broken, loose, frayed, corroded, etc.) then inspect harness connector and the watertight strain relief connector. See Figure 7.

**NOTE:** If a switch failure is detected, order and install MIV-E/M Switch Replacement Kit (546-1620-02-0).

- 5. Install extension shaft.
  - a. Install new extension shaft. See Figure 8. (Sequencing slots differ; MIV-E is upper shaft.)
    - 1) Apply a thin coat of grease to new extension shaft.
    - 2) Orientate sequencing slot to position between switches (as noted) and square end of shaft toward gearbox.
    - 3) Use shaft to spread switch rollers and then push shaft into bore of gearbox adapter.

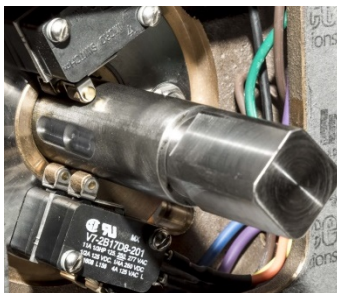


Figure 6. (MIV-E Shown)



Figure 7.



Figure 8. (MIV-M/MIV-E)

- b. Apply new gasket to gearbox adapter.
- c. Align square bore of gearbox with square end of extension shaft.
- d. Push gearbox over extension shaft until gearbox mates with gearbox adapter.

- e. Install four [4] 3/8-16 x 2-1/2 inch long gearbox adapter-to-gearbox bolts.
  - 1) Apply Loctite® 242 (or equivalent) to threads.
  - 2) Hand start all four bolts.
  - 3) Using 9/16 inch socket, extension, and ratchet (set CW), tighten bolts.
  - 4) Using 9/16 inch socket, extension, and torque wrench (set CW), using a crisscross pattern, torque bolts to 23 lb-ft.
- f. Place gearbox in fully open position. Manually turn gearbox shaft fully counterclockwise.

Clean the valve body, remove any mineral deposits/contamination from the bore. Place valve body on stable work surface with tapered side of valve body facing up. Apply grease to entire disc seat area and in front of trunnion bore.

**NOTE: Ensure the MIV is secured on a stable work surface. Using an old (or spare) suction extension with three screws and thick fender washers to secure the MIV is recommended. Additionally recommended is clamping (or screwing) the suction extension to the work surface.**

6. Install new disc as follows.
  - a. Lightly coat stem of new disc with grease.
  - b. Install new O-ring on stem of new disc.
  - c. Place stem of new disc into bore of valve body (at gearbox adapter end). See Figure 5 on Page 4.
  - d. Orient disc to open position. See Figure 4.
  - e. Align bottom of disc with trunnion bore.
  - f. Push disc into place by hand if possible.

**NOTE: Use a non-marring hammer to tap disc in if required. Do NOT damage the end or the side of the new disc.**

- g. Center disc stem in gearbox adapter bore of valve body.

7. Install trunnion.
  - a. Remove and replace trunnion O-ring.
    - 1) Remove existing O-ring from trunnion.
    - 2) Lightly coat trunnion with grease. (Helps prevent O-ring damage during installation.)
    - 3) Install new O-ring on trunnion.
  - b. Screw trunnion into valve body.
    - 1) Hand start trunnion.
    - 2) Using 1-1/2 inch socket and ratchet (set CW), tighten trunnion.
    - 3) Secure (clamp) valve body to bench.
    - 4) Using 1-1/2 inch socket and torque wrench, torque trunnion to 125 lb-ft.

8. Install gearbox adapter (including gearbox).
  - a. Remove existing O-ring.
  - b. Grease bore of valve body and mating surface of adapter. (Prevents O-ring damage and aids assembly.) See Figure 9.
  - c. Install new O-ring.
  - d. Orient adapter to valve body per note/match marks.
  - e. Push adapter into valve body ensuring disc stem and extension shaft mate properly.



**Figure 9.**

- f. Apply Loctite 242 (or equivalent) to two [2] 7/16-14 x 1 inch long 12 point (or cap) screws.
- g. Install screws.
  - 1) Using 7/16-inch wrench (or 5/16 inch Allen key or ball hex socket for cap screws), tighten 12 point (or cap) screws.
  - 2) Using 7/16-inch torque wrench (or 5/16 inch hex socket and torque wrench [set CW]), torque 12 point (or cap) screws to 37 lb-ft.

9. Test MIV.

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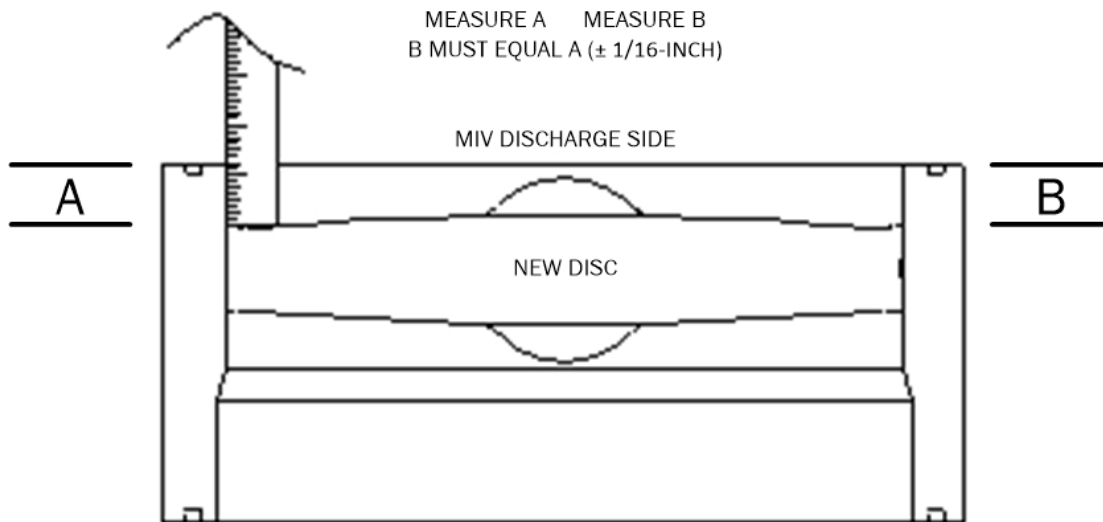
- a. Bench test MIV as follows.
  - 1) For a MIV-E, use panel controls and indicators to exercise MIV thru multiple close/open/close position transitions. See Figure 2.
    - i. At apparatus, connect electrical connectors to MIV per tags.
    - ii. At operator panel, push switch toward CLOSED.
    - iii. Hold switch in CLOSED until red indicator illuminates.
    - iv. Release switch.
    - v. Verify disc position is correct. (B = A ± 1/16-inch [See Figure 10.]
    - vi. Repeat Steps ii thru v (above) except alternate between OPEN (green indicator) and CLOSED (red indicator) several times to verify MIV function and disc positioning.
    - vii. If disc position is NOT correct, perform, **MIV Mechanical Stop Adjustment Procedure** (see Page 9).
  - 2) For a MIV-M, install handwheel and exercise MIV thru multiple close/open/close transitions.
    - i. Using handwheel, close MIV.
    - ii. Verify disc position is correct. (B = A ± 1/16-inch [See Figure 10.]
    - iii. At apparatus, connect electrical connectors to MIV per tags.
    - iv. Repeat Steps i and ii (above) except alternate between OPEN (green indicator) and CLOSED (red indicator) several times to verify MIV function and disc positioning.
    - v. If disc position is NOT correct, perform, **MIV Mechanical Stop Adjustment Procedure** (see Page 9).



- vi. Ensure disc is closed as final transition. (Protects disc and aids in assembly.)
- vii. Remove handwheel if installed.
- b. Install MIV on apparatus per 029-0020-28-0, MASTER INTAKE VALVE DESCRIPTION, INSTALLATION AND OPERATION MANUAL; Section 3, Installation.
- c. Hydrostatically test MIV per 029-0020-28-0, Section 3. (Factory tested to 250 psi [17 Bar]).
- d. Perform vacuum (or dry prime) test per NFPA 1901.
- e. Return MIV to service or troubleshoot (see 029-0020-28-0, Section 6) MIV as required.



**MIV Mechanical Stop Adjustment Procedure**  
 (Only Perform If MIV Fails Testing)



**Figure 10.**

1. Check display operation and disc stop position.
  - a. Operate valve to open position.
  - b. Close valve as follows.
    - 1) If MIV-M, manually operate valve to closed position. (Stop when the red lamp is lit.)
    - 2) If MIV-E, use panel controls (gear motor) to operate valve to closed position. (Allow the switch to stop the disc rotation. Verify lamps sequence from amber to red then the motor stops.)
  - c. Measure difference in disc positions A and B. (See Figure 10.) The disc edges should measure an equal distance (or within  $\pm 1/16$ -inch).
    - 1) If measurements are within specifications, no adjustment is required.  
**Return the valve to service.**
    - 2) If measurements are outside of specifications, continue.

**EXAMPLE:** **A** measures  $5/8$ -inch, then **B** must measure between  $9/16$  and  $11/16$ -inch or adjustment is required.

- 3) Loosen mechanical stop jam nuts then loosen stop screws a couple of turns counterclockwise (CCW).
2. Center gearbox adapter as follows.
  - a. With valve in closed position, loosen gearbox adapter mounting bolts.
  - b. Turn gearbox shaft (by hand)  $1/8$  turn ( $45^\circ$ ) in open direction.
  - c. Tighten mounting bolts.
  - d. Repeat Step 1.
  - e. If measurement is worse than before, loosen gearbox adapter mounting bolts and turn gearbox shaft  $1/4$  turn in opposite direction then tighten mounting bolts.
  - f. Repeat Steps d. and e. until no adjust is required.

3. Adjust closed mechanical stop. See Figure 11.
  - a. If MIV-M, tighten stop screw until it contacts segment gear. **(NOTE: Do NOT over tighten.)**
    - 1) Operate valve in both directions. Check lamp operation and disc stop position, if necessary back out screw a small amount until lamp and stop sequence properly.
    - 2) Tighten jam nut.
    - 3) If applicable, replace rubber plug.
  - b. If MIV-E, tighten stop screw until it contacts segment gear then back out 1/2 to 3/4 turn.
    - 1) Operate valve in both directions. Check lamp operation and disc stop position, verify motor stops electrically and not by mechanical stop. **(NOTE: When the motor stops operating, the gearbox shaft should be able to rotate about 3/4 turn before hitting the mechanical stop.)**
    - 2) If step 1) fails, back out stop screw another 1/4 turn and repeat Step 1) until no adjustment is required.
    - 3) If applicable, replace rubber plug. Otherwise, apply tamper proof sealant (Loctite 596 or equivalent) to jam nuts at stop screw.

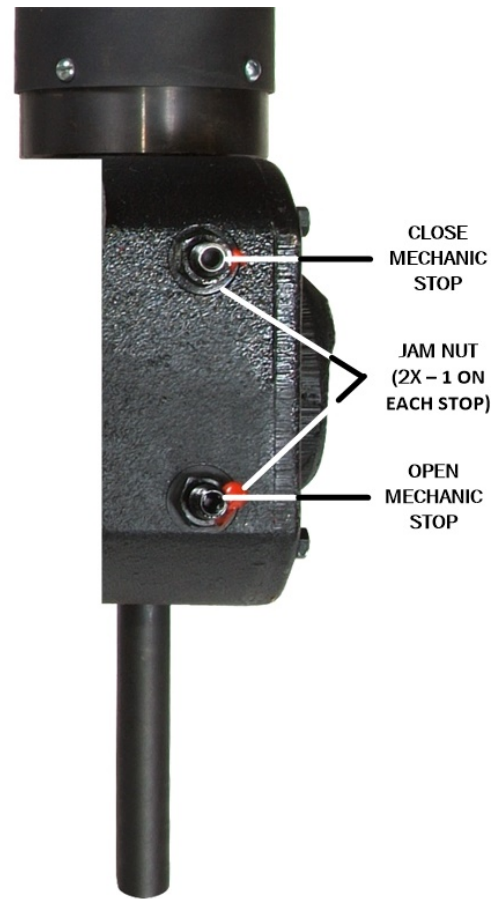


Figure 11.

4. Adjust open mechanical stop. See Figure 11.
  - a. Operate valve to open position.
  - b. If MIV-M, tighten stop screw until it contacts segment gear. **(NOTE: Do NOT over tighten.)**
    - 1) Operate valve in both directions. Check lamp operation and disc open position, if necessary back out screw a small amount until lamp and stop sequence properly.
    - 2) Tighten jam nut.
    - 3) If applicable, replace rubber plug.
  - c. If MIV-E, tighten stop screw until it contacts segment gear then back out 1/2 to 3/4 turn.
    - 1) Electrically operate valve in both directions. Check lamp operation and disc stop position, verify motor stops electrically and not by mechanical stop. **(NOTE: When the motor stops operating, the gearbox shaft should be able to rotate about 3/4 turn before hitting the mechanical stop.)**
    - 2) If step 1) fails, back out stop screw another 1/4 turn and repeat Step 1) until no adjustment is required.
    - 3) Tighten jam nut.
    - 4) If applicable, replace rubber plug. Otherwise, apply tamper proof sealant (Loctite 596 or equivalent) to jam nuts at stop screw. See Figure 11.