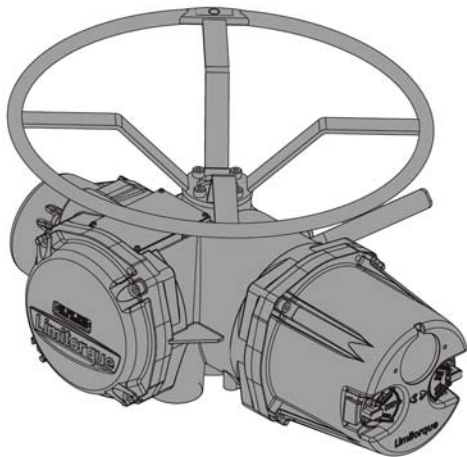




*Limatorque Actuation Systems*

**FCD LMAIM1306-00**  
(Replaces 130-11000)



***Limatorque®***  
*Accutronix MX*  
*Installation and Operation*  
*For MX-05 through MX-140*



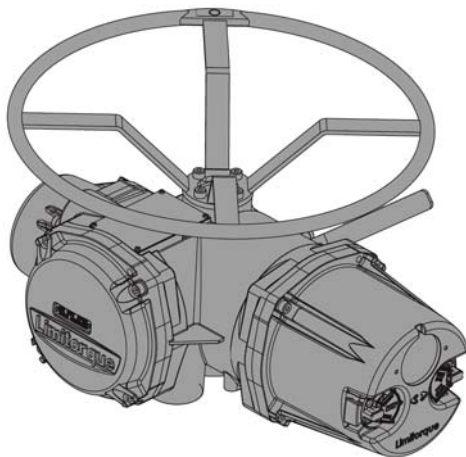
Accutronix MX

# Installation and Operation

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For MX-05 through MX-140

LMAIM1306 Jan. 2004



## **Accutronix MX™ Installation and Operation Manual**

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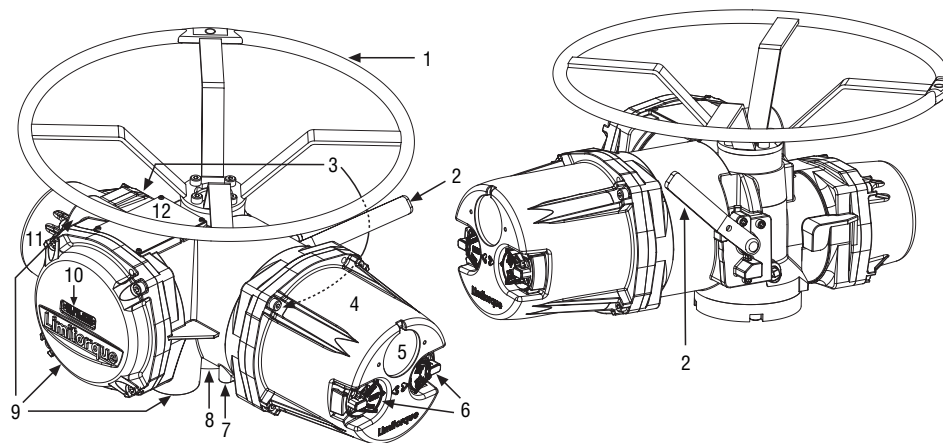
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Figure xi – Accutronix MX actuator



Piece	Description
1	Handwheel
2	Declutch Lever (MX-05)
3	Oil Fill
4	Controls Cover
5	LCD
6	Control Knob
7	Ground Lug
8	Thrust/Torque Base
9	Conduit Entry
10	Terminal Compartment
11	Motor
12	Nameplate

# 1 Important Notes

- Please read this manual in its entirety before attempting to install or operate your MX actuator. A full understanding of the installation and operation options will assist you in installing the actuator in the most effective manner. Limitorque has designed the MX actuator for long life even in the harshest environments. Flexible control and protection options are provided to ensure the actuator meets your requirements.
- All actuator enclosures are sealed by O-rings, and cable entries are supplied with threaded plugs to protect the terminal compartment until the unit is wired. If the actuator cannot be installed immediately, it is recommended that it be stored in a clean, dry place, preferably in an area that is not subject to large fluctuations in temperature.
- Disconnect all incoming power before opening any cover on the actuator. The user/operator must ensure that safe working practices are employed at all times and are in accordance with local or national standards that are enforced at the particular site.
- To install and commission the actuator, only the terminal compartment cover needs to be removed. See **Figure xi, Item 10**. Settings for commissioning the actuator are done externally; therefore, no other

covers need to be removed. The actuator was assembled in ideal dry conditions and the total sealing of the enclosure protects all electrical components against deterioration.

NOTE: Removal of any cover, other than the terminal compartment cover, will invalidate the unit warranty. Exposure of actuator components to an environment that results in deterioration of internal components will also invalidate the unit's warranty.

- During final field installation, ensure that all cable entries are correctly sealed in accordance with National Standards or Regulatory Authorities. All temporary transit plugs must be removed and any unused cable entries closed in an approved manner. See **Section 3.3.3, Sealing Cable/Conduit Entries**.

## 2 Quick Start

Quick Start provides step-by-step instructions for commissioning each Accutronix MX actuator. This information is also available in **Bulletin 130-11005, Quick Start-Up Instructions**. These instructions are for the following:

- Position limits calibration – can be performed one of two ways:
  - Electrical operation: See **Section 2.1.2, Electrical Operation Feature**.
  - Handwheel operation: See **Section 2.1.3, Handwheel Operation Feature**.
- DDC operation: See **Section 2.2, DDC Option**.

When these Quick Start instructions are complete, the position limits will be set and the actuator will be ready for normal operation.

NOTE: The actuator has been configured with all customer-specified parameters and no further calibration should be necessary. If full valve data was not provided when ordering, or if changes are needed for parameters, see **Sections 3.4 and 4, Commissioning the Actuator and Customizing the Actuator**.

### 2.1 Calibrate – Position Limits

1. Install the Accutronix MX actuator on the valve.
2. Refer to the nameplate for the correct main power supply voltage. Switch on the main power to the unit or connect an auxiliary 24 VDC supply to terminal points 37(-) and 38(+).
3. Turn the red knob to the STOP position. The “**SET CLOSE POSITION LIMIT**” message will be displayed. When the red knob is in “**LOCAL**” or “**REMOTE**,” the liquid crystal display (LCD) screen will read “**SET POSITION LIMITS.**”
4. Calibrate end position limits one of two ways:
  - Electrically, using the control panel. See **Section 2.1.2, Electrical Operation Feature**.
  - Manually, using the handwheel. See **Section 2.1.3, Handwheel Operation Feature**.

Once the position limits have been set, the screen message will indicate the valve position as a percentage of the valve opening.

While setting limit switches, place the red selector knob in the “**LOCAL**” position to permit the actuator to run open or closed in push-to-run mode (inching) only.

---

**CAUTION:** Extreme care must be taken as the valve approaches its end position.

---

The unit will not function with the red selector knob in the “**REMOTE**” position until both limit switches are set.

The existing configuration of the actuator/valve parameters may be viewed by entering the “**SETUP**” mode.

### 2.1.1 Entering the Setup Mode

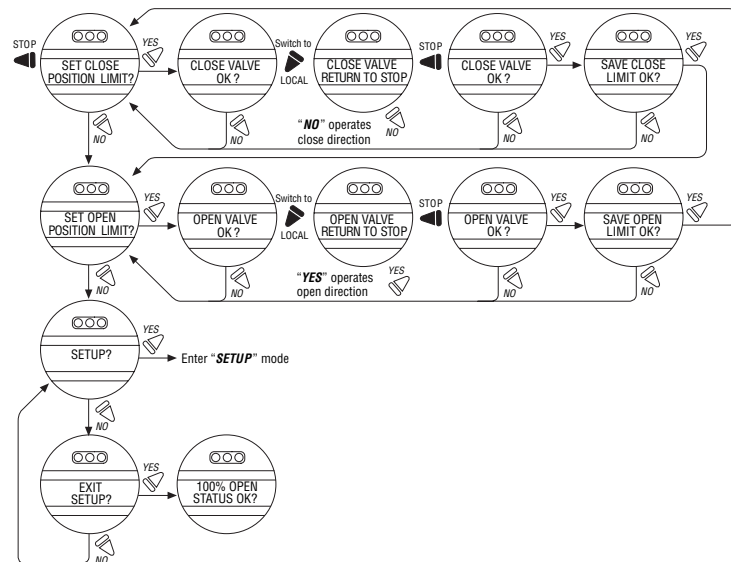
1. Place the red selector knob in the “**STOP**” position.
2. Within 10 seconds, place the black control knob in the “**YES**” position, then the “**NO**” position, then again in the “**YES**” position (in quick succession—approximately one second).
3. The message “**SETUP?**” will appear in the LCD display for 10 seconds.  
If no setup action is taken within 10 seconds, the unit will reset.  
Use the black control knob to answer “**YES**” or “**NO**” to the questions appearing in the display.

### 2.1.2 Electrical Operation Feature

This feature allows for quick and simple calibration. To set the position limits electrically, enter the “**CHANGE SETTINGS**” mode via the “**SETUP**” mode.

1. Enter the “**SETUP**” mode as detailed in **Section 2.1.1, Entering the Setup Mode**.
2. When screen prompt reads “**CHANGE SETTINGS**,” select “**YES**.”
3. The screen will display the “**CHANGE SETTINGS**” mode menu items.  
Select “**NO**” until screen displays “**CHANGE POSITION SETUP**.”
4. Select “**YES**.” “**CLOSE**” or “**OPEN VALVE - OK?**” is displayed.
5. Place the red selector knob in the “**LOCAL**” position. Move the black knob in the intended direction. The LCD screens are shown in **Figure 2.1** on the next page.

Figure 2.1 – Electrical operation



6. When valve has reached desired position, return the red selector switch to “**STOP**” and complete calibration.

The position settings are now complete. The actuator will now function as ordered, and may be run electrically to inspect for correct operation.

### 2.1.3 Handwheel Operation Feature

To set the position limits manually, enter the “**CHANGE SETTINGS**” mode via the “**SETUP**” mode.

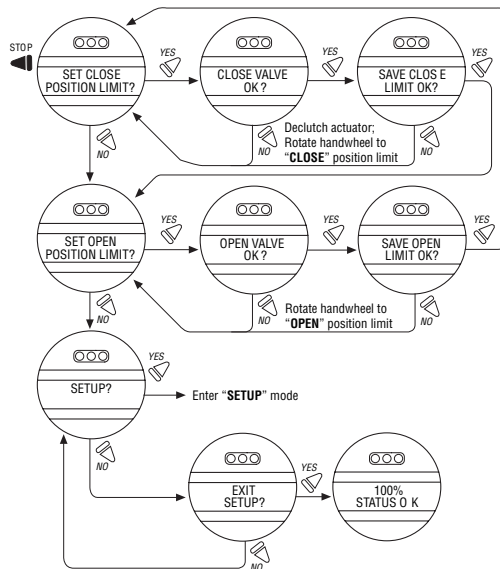
1. Enter the “**SETUP**” mode as detailed in **Section 2.1.1, Entering the Setup Mode**.
2. When LCD reads “**CHANGE SETTINGS?**”, select “**YES**.”
3. The LCD will display the “**CHANGE SETTINGS**” mode menu items. Select “**NO**” until screen displays “**CHANGE POSITION SETUP?**”
4. Select “**YES**.” See **Figure 2.2**. Manually set position limits:
  - a. Close position limit
    1. “**SET CLOSE POSITION LIMIT?**” is displayed.
    2. Select “**YES**.” “**CLOSE VALVE - OK?**” is displayed.

3. Depress the declutch lever, and at the same time slowly rotate the handwheel until the clutch is fully engaged. Release the lever; the clutch will be retained in the handwheel mode by spring-loaded latches.
4. Ensure the valve is fully closed, then move the valve in the open direction for one handwheel turn to allow for coasting of the motor.
5. When the valve is in the desired position, select “**YES**” again. The LCD will read “**SAVE CLOSE LIMIT OK?**”
6. Select “**YES**” if the valve’s close limit position is correct. The close position limit is set.
- b. Open position limit
  1. “**SET OPEN POSITION LIMIT?**” is displayed.
  2. Select “**YES**.” “**OPEN VALVE - OK?**” is displayed.
  3. Depress the declutch lever, and at the same time slowly rotate the handwheel until the clutch is fully engaged. Release the lever; the clutch will be retained in the handwheel mode by spring-loaded latches.
  4. Ensure the valve is fully open, then move the valve in the close direction for one handwheel turn to allow for coasting of the motor.



5. When the valve is in the desired position, select **"YES"** again. The LCD will read **"SAVE OPEN LIMIT OK?"**
6. Select **"YES"** if the valve's open position limit is correct. The open position limit is set.
7. Move the valve in the close direction. The open lamp should extinguish within one turn of the handwheel.
8. Move the valve back in the open direction and check that the open lamp illuminates just before the full open position is reached (approximately  $\frac{1}{2}$  to 1 turn).
9. If the calibration requires adjustment, select **"NO"** at the **"SET CLOSE POSITION LIMIT?"** prompt and repeat the **"SET OPEN POSITION LIMIT?"** routine.
10. Select **"NO"** to exit **"POSITION SETUP?"** or **"YES"** to return to **"SET CLOSE POSITION LIMIT?"**

**Figure 2.2 – Handwheel operation**



## 2.2 DDC Option

The following instructions assume that all DDC option parameters are set with the exception of the address.

1. After setting position limits, remain in the **"SETUP"** mode. If not in the **"SETUP"** mode, enter the **"SETUP"** mode as detailed in **Section 2.1.1, Entering the Setup Mode.**
2. When LCD reads **"CHANGE SETTINGS?"**, select **"YES."**
3. The LCD will display the **"CHANGE SETTINGS"** mode menu items. Select **"NO"** until screen displays **"CHANGE DDC?"** Select **"YES."** LCD will display DDC menu items.
4. Select **"YES"** for each menu item until **"DDC ADDRESS OK?"** appears. Select **"NO."**
5. Enter an address from one to 250 by toggling **"NO"** until the correct address is displayed.

---

**CAUTION:** The network address must be entered in accordance with the user address assignment sheet. This assignment sheet should correspond to the contract specifications. The same address must not be used anywhere else in the same network.

---

The DDC address does not have to be set to exit the setup.

## 2.3 Check the Settings

1. Operate the valve to the fully **"CLOSE"** position. Verify that the **"CLOSE"** (default GREEN) LED illuminates just as the travel limit is reached, and the valve position is displayed as **"0% OPEN."**
2. Operate the valve to the fully **"OPEN"** position. Verify that the **"OPEN"** (default RED) LED illuminates just as the travel limit is reached, and the valve position is displayed as **"100% OPEN."**

## 3 Installation and Operation

### 3.1 Preparing the Stem Nut

The Accutronix MX has two (2) basic base designs:

- Torque-only base, designated by a “B” prefix
- Thrust-only base, designated by an “A” prefix

#### 3.1.1 Type “B” Bases: Torque-only Applications

##### **Standard B4/B4E Base**

The standard MX actuator base is the B4 torque-only. It includes a mounting plate and steel torque nut, which may be machined to fit a valve or gearbox. A B4E torque nut can be provided and may be installed to allow for extended stem acceptance.

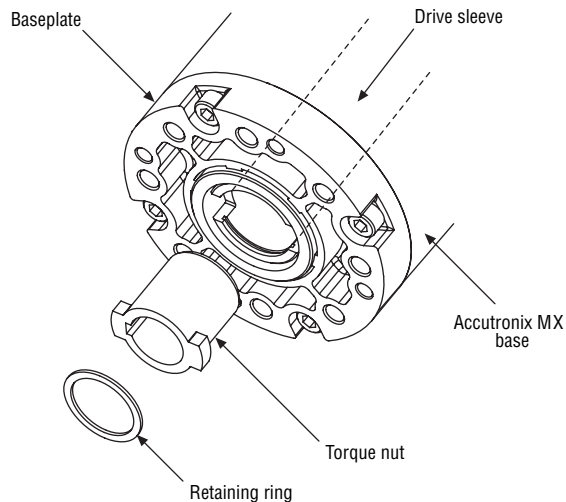
Figure 3.1 – B4 base



Figure 3.2 – B4E base



Figure 3.3 – Exploded view of B4/B4E base (MX-05 shown)



### Disassembly

1. Remove the retaining ring (B4 base) or spiral-wound ring (B4E base) that retains the torque nut in the drive sleeve.
2. Remove the torque nut. If the torque nut is difficult to remove, insert a suitable device into the drive sleeve through bore and gently tap it loose from the handwheel end.
3. Machine the torque nut to suit the valve stem or gearbox input shaft (see **Bulletin 130-30000, MX Performance and Dimensions** for maximum stem capacity). Ensure sufficient clearance for a smooth, sliding fit.

### Reassembly

1. Clean the torque nut thoroughly and lightly grease.
2. Replace the torque nut in the drive sleeve. Ensure the torque nut meshes with the drive lugs.
3. Refit the retaining ring (B4 base) or spiral-wound ring (B4E base).

### Optional B1 Base (not available for MX-85 and MX-140)

An optional torque base assembly may be added to allow for a greater stem acceptance. This base is supplied with a fixed bore and key as defined by ISO 5210.

### Disassembly

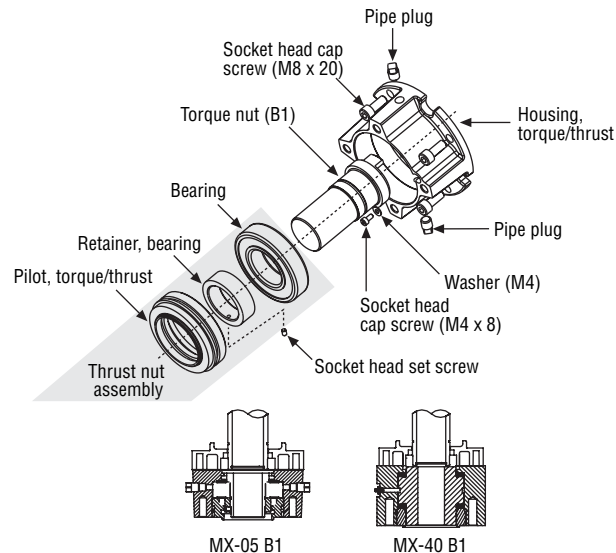
No disassembly is required since the torque nut has been machined to an international standard. Clean the bore and lightly grease.

Figure 3.4 – B1 base



NOTE: Fill base with Nebula EP 0 or Exxon Teresstic SHP320.

Figure 3.5 – Exploded view of B1 base



### 3.1.2 Type “A” Bases: Thrust-only Applications

#### Standard A1/A1E Base

The standard MX actuator thrust base is the A1, and may be bolted directly to the actuator. The thrust base contains a bronze alloy thrust nut that may be machined to suit the valve stem.

An A1E thrust nut can be provided and may be installed to reach shorter stems.

Figure 3.6 – A1 base



#### Disassembly – Units MX-05/10/20/40

Refer to **Figure 3.7**.

Disassembly of the main housing from the base may be recommended to allow the base to remain on the valve if the actuator must be removed for service.

##### *Pilot removal*

MX-10/20: Remove the screw and washer holding the valve pilot to the thrust base and remove pilot.

MX-40: Turn counterclockwise (CCW) and remove.

##### *Thrust bearing and nut removal*

1. Remove the first set of thrust washers and bearing.
2. Remove stem nut.

NOTE: The thrust washers, bearing, and thrust nut may be removed at the same time. The second set of thrust washers and bearing does not have to be removed.

3. Machine the thrust nut to suit the valve stem. Ensure sufficient clearance to avoid unnecessary wear and heating during operation.

## Reassembly – Units MX-05/10/20/40

Refer to **Figure 3.7**.

1. Clean the thrust nut, washers, and bearing(s) thoroughly.
2. Slide second set of thrust washers and bearing in place if removed.

NOTE: Order of assembling thrust washers and bearing must be as follows: washer, thrust bearing, washer.

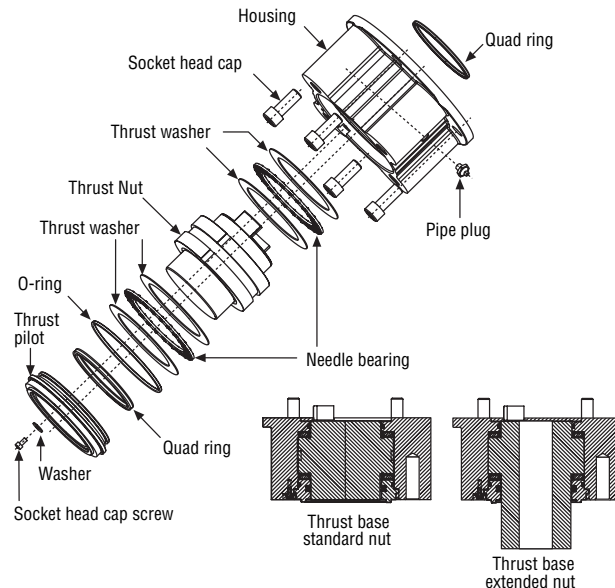
### Pilot installation

MX-05/10/20: Slide pilot into thrust base assembly and secure with washer and screw. Tighten fully.

MX-40: Place pilot into thrust base and turn clockwise (CW) until pilot is tight.

NOTE: Fill base with Nebula EP 0, Conoco Conolith EP 00 or Mobil SHC 632.

**Figure 3.7 – Exploded view of A1/A1E base (MX-05/10/20/40 only)**



### Disassembly – Units MX-85

Refer to **Figure 3.8**.

Disassembly of the main housing from the base may be recommended to allow the base to remain on the valve if the actuator must be removed for service.

#### *Thrust base mounting plate removal*

Remove the six socket head cap screws holding the valve mounting plate to the thrust base housing and remove mounting plate.

#### *Thrust bearing and nut removal*

1. Remove the first set of thrust washers and bearing.
2. Remove stem nut.

NOTE: The thrust washers, bearing, and stem nut may be removed at the same time. The second set of thrust washers and bearing does not have to be removed.

3. Machine the stem nut to suit the valve stem. Ensure sufficient clearance to avoid unnecessary wear and heating during operation.

### Reassembly – Units MX-85

Refer to **Figure 3.8**.

1. Clean the stem nut, washers, and bearing(s) thoroughly.
2. Slide second set of thrust washers and bearing in place if removed.
3. Install stem nut. Lubricate thoroughly.
4. Install first set of thrust washers and bearing.

NOTE: Order of assembling thrust washers and bearing must be as follows: washer, thrust bearing, washer.

NOTE: Fill base with Nebula EP 0, Conoco Conolith EP 00 or Mobil SHC 632.

#### *Thrust baseplate installation*

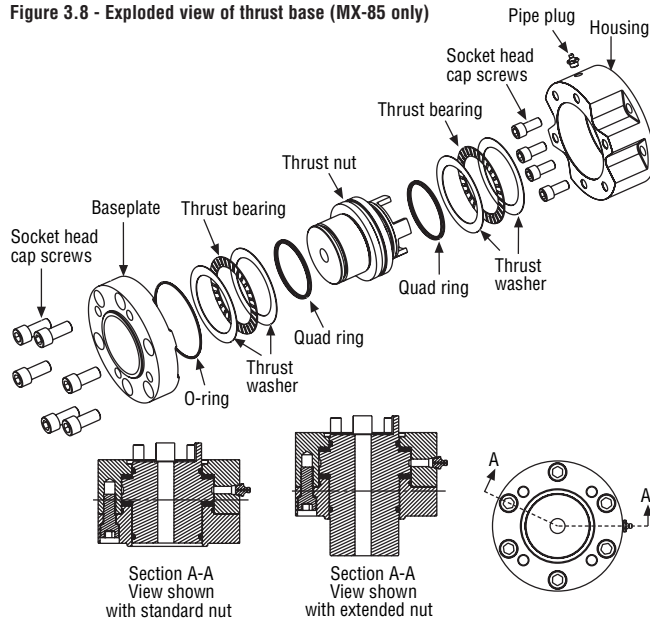
Mount baseplate to thrust base housing and install the six socket head cap screws to the proper torque per **Table 3.1**.



**Table 3.1 - Hardware and torque for thrust base mounting**

Screw Size	Torque	
	ft-lb	N m
M8 or $\frac{5}{16}$ in. (8 mm)	12-14	16-19
M10 or $\frac{3}{8}$ in. (9 mm)	25-30	33-40
M12 or $\frac{1}{2}$ in. (13 mm)	40-50	53-67
M16 or $\frac{5}{8}$ in. (16 mm)	90-100	120-123
M20 or $\frac{3}{4}$ in. (19 mm)	180-200	144-267

NOTE: Screw mounting torque for mounting thrust base to main housing or thrust baseplate to thrust base housing.

**Figure 3.8 - Exploded view of thrust base (MX-85 only)**


**Disassembly – Units MX-140**

Refer to **Figure 3.9**.

Disassembly of the main housing from the base may be recommended to allow the base to remain on the valve if the actuator must be removed for service.

*Pilot removal*

Remove the two screws and washers holding the valve pilot to the thrust base and remove pilot.

*Thrust bearing and nut removal*

1. Remove the first set of thrust washers and bearing.
2. Remove stem nut.

NOTE: The thrust washers, bearing, and stem nut may be removed at the same time. The second set of thrust washers and bearing does not have to be removed.

3. Machine the stem nut to suit the valve stem. Ensure sufficient clearance to avoid unnecessary wear and heating during operation.

**Reassembly – Units MX-140**

Refer to **Figure 3.9**.

1. Clean the stem nut, washers, and bearing(s) thoroughly.
2. Remove pipe plug.
3. Slide second set of thrust washers and bearing in place if removed.
4. Install stem nut. Lubricate thoroughly.
5. Install first set of thrust washers and bearing.
6. Install pipe plug.

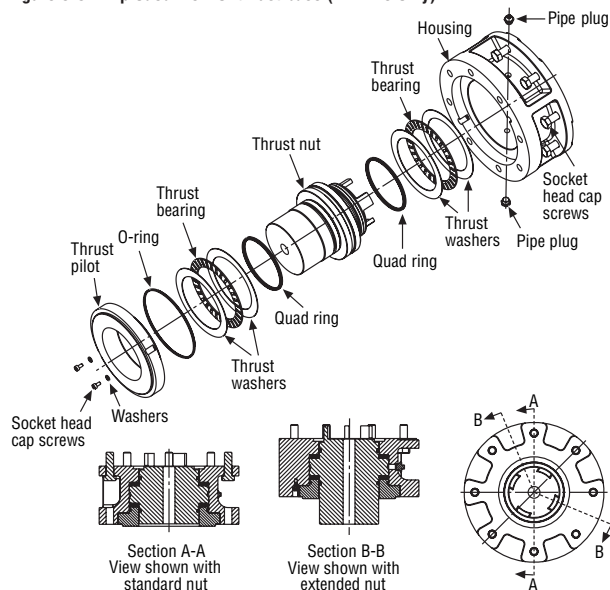
NOTE: Order of assembling thrust washers and bearing must be as follows: washer, thrust bearing, washer.

NOTE: Fill base with Nebula EP 0, Conoco Conolith EP 00 or Mobil SHC 632.

*Pilot installation*

Slide pilot into thrust base assembly and secure with the two washers and screws. Tighten fully.

**Figure 3.9 - Exploded view of thrust base (MX-140 only)**



### 3.1.3 Type “BL” Drive: Splined Drive Application

Steel alloy splined nuts are provided to a standard involute spline category for rising and rotating stem valves per customer requirements. Disassembly and reassembly is the same as the B4 base and the torque nut. See **Section 3.1.1, Type “B” Bases: Torque-only Applications.**

## 3.2 Mechanical Installation onto Valve or Gearbox

NOTE: Refer to **MX Maintenance and Spare Parts bulletin** for more detailed instructions.

Before installing the actuator onto a valve or gearbox, check the following to ease installation:

- Verify that mounting flange is suited dimensionally to mate with the actuator base. Ensure that it is perpendicular to the valve stem or gearbox input shaft.
- Ensure the stem nut mates with the valve stem or input shaft. For screwed nuts, it is advisable to run the stem nut down the entire length of the stem to check for tightness. Keyed or splined shafts should exhibit a smooth, sliding fit with the key installed.
- Ensure there is adequate engagement of the stem nut with the valve stem or input shaft when mounted. Generally, the minimum length of engagement is 1.5 times the diameter of the stem.
- Verify that mounting studs or bolts are the correct length to suit the thickness of the mounting plate.

- Verify hardware specifications for English style:
  - Socket head cap screw per ASTM A 574 and ANSI 18.3.
  - Hex head cap screw per SAE J429 Grade 5.
- Verify hardware specifications for metric style: hex and socket head cap screws per Property Class 12.9.
- Clean and lubricate the valve stem or input shaft.
- Ensure adequate lifting facilities and slings are available at the installation site.

NOTE: Do not use the handwheel to lift the actuator.

### 3.2.1 Mounting (Type “B” Bases): Torque-only

Refer to **Figures 3.1 - 3.5**.

1. Ensure torque nut is secured inside actuator drive sleeve with retaining ring.
2. Lower actuator onto the valve or gearbox stem. Align the stem nut key and keyway with valve or gearbox stem key seat.
3. Verify that the actuator and valve mounting adapter flanges mate correctly.
4. Secure the actuator to the valve mounting adapter with mounting bolts.

### 3.2.2 Removal (Type “B” Bases): Torque-only

Refer to **Figures 3.1 – 3.5**.

1. Remove the bolts that secure the actuator to the valve mounting adapter. If type B1 base is used in addition to the standard type B4 baseplate, you may leave the B1 base attached to the actuator and remove as a unit.
2. Lift the actuator from the actuator mounting adapter.

### 3.2.3 Mounting (Type “A” Bases): Thrust-only

Refer to **Figures 3.6 – 3.9**.

1. The following are two options for mounting the type A base actuator:
  - a. If the type A thrust base was removed from the valve mounting adapter, replace the thrust base onto the valve mounting adapter. Ensure the thrust base stem nut has the lugs positioned upward to engage with the drive sleeve slots when the actuator is reinstalled. Rotate the bronze nut while holding the base steady.  
**or**
  - b. If the thrust base is installed on the valve mounting adapter, proceed to step two.

2. Lower the actuator along the threaded valve stem and onto the valve mounting plate. Ensure the thrust base stem nut lugs properly engage and align with the drive sleeve slots.
3. Install the bolts to secure the actuator to the thrust base assembly.

### 3.2.4 Removal (Type “A” Bases): Thrust-only

1. Remove the bolts that secure the actuator to the thrust base assembly.
2. Remove the type A thrust base by removing the bolts that secure the actuator to the valve mounting adapter.  
**or**  
Leave the type A thrust base mounted to the valve mounting adapter until ready to remount the actuator. The thrust base will maintain valve position provided that the valve stem threads are locking.
3. Lift the complete actuator from the thrust base.

## 3.3 Electrical Connections

Verify that the supply voltage details on the nameplate are correct for this installation. Setup is non-intrusive; therefore, remove only the terminal cover to make electrical connections and to commission the actuator.

---

**▲ WARNING: The removal of any other covers without Limitorque's approval will void the warranty. Limitorque will not accept responsibility for any damage or deterioration that may occur as a result of cover removal.**

---

### 3.3.1 Removing Terminal Cover

Remove the terminal cover as follows:

1. Remove the four cover screws using a 6 mm hexagonal wrench.
2. Remove the cover. XP units have long-spigoted covers and two tapped holes 180° apart. If the XP cover is difficult to remove, fit two of the cover screws into the tapped holes in the cover flange and jack out the cover. Take care to turn the screws by equal increments. Do not lever the cover off with a screwdriver, or similar object, since this may damage the flamepath on an explosionproof unit or the O-ring seal and seating face.

### 3.3.2 Terminal Compartment Documents

The OEM and user installation kits, wiring diagram, and test report are contained in the terminal compartment or with the actuator. Do not place them in the terminal compartment when the electrical connections have been completed.

NOTE: This instruction does not apply to valve manufacturers or similar installers of the actuator onto a valve prior to shipping to site. It is important that these items are available at the final destination site.

### 3.3.3 Sealing Cable/Conduit Entries

The sealing of cables and conduit entries should be done in accordance with National Standards or the Regulatory Authorities that have certified the actuators. This is particularly true for units that are certified for use in hazardous areas where the method of sealing must be to an approved standard and cable glands, reducers, plugs, and adapters must be approved and separately certified. All conduit entries should be sealed against the climatic conditions prevailing on-site, especially if temporary submersion is possible. All unused conduit entries should be sealed with

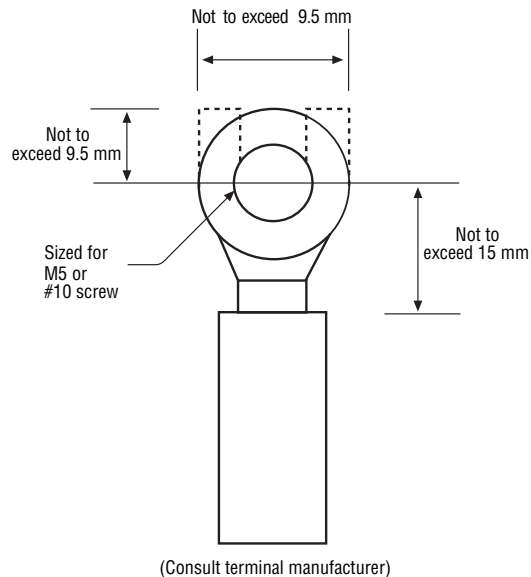
threaded metal plugs. **Plastic plugs are installed by Limatorque for shipping only and must not be used as permanent seals.**

### 3.3.4 Recommended Terminal Connections

#### Power Terminals

Ring tongue connectors used on the power terminals should comply with the dimensions shown in **Figure 3.10**. For Additional information, consult terminal manufacturer.

**Figure 3.10 – Power terminal connector size limitations**



**Figure 3.11** details the allowable voltage and current parameters for the terminal block power terminals.

**Figure 3.11 – Terminal block rating; power terminals**

Power Terminal Maximum Voltage
660 Volt, 25 amp absolute max. AC RMS for points L1, L2, and L3

### Control Terminals

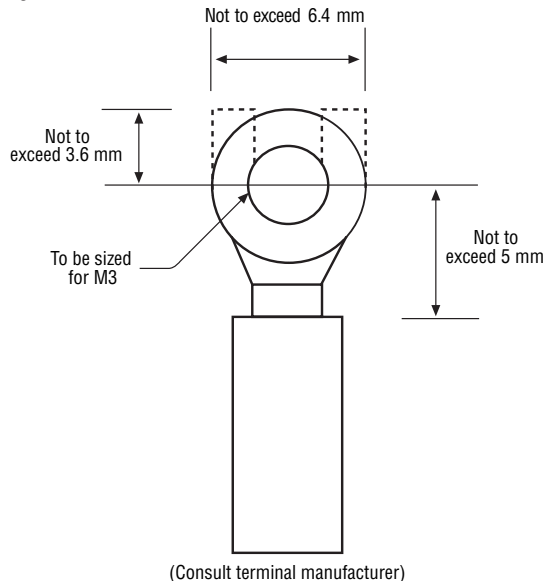
Ring tongue connectors used on the control terminals should comply with the dimensions shown in **Figure 3.12**. For additional information, consult terminal manufacturer.

NOTE: Alternative manufacturers may be substituted only if dimensions are in accordance with **Figure 3.12**.

NOTE: The use of spade terminals is not recommended for secure electrical connections.



**Figure 3.12 – Control terminal connector size limitations**



**Table 3.2** details allowable ring tongue connectors for use on the control voltage terminals.

**Table 3.2 – Control terminals – ring tongue**

Manufacturer	AWG	mm <sup>2</sup>	Part No.
Amp	22-16	.25-1.6	31880
Amp	22-16	.25-1.6	320553
Amp	22-16	.25-1.6	320882
Amp	16-14	1.0-2.6	3324159
Amp	16-14	1.0-2.6	3289968
Amp	12-14	2.0-3.0	1533111
Panduit	22-18	.25-.82	PN18-4-R-C
Panduit	22-18	.25-.82	PN18-4-RN-C
Panduit	16-14	1.0-2.6	PN14-4-R-C
Panduit	16-14	1.0-2.6	PN14-4-RN-C

NOTE: Limitorque recommends the use of the following connector for optimum results: Thomas and Betts #RZ22-6.

NOTE: Alternative manufacturers may be substituted only if the dimensions are in accordance with **Figure 3.12**.

**Table 3.3** lists the maximum allowable voltage and current parameters for the terminal block control terminals.

**Table 3.3 – Terminal block rating; control terminals**

Rating	Control Terminal Maximum Ratings
Type 1	250 Volt, 3 amp / Absolute Max. AC RMS / For Points 1-50
Type 2	250 Volt, 0.1 amp / Absolute Max. AC RMS / For Points 5-10, 15, 16, 21 / 22-30, 39-41, and 45-50
Type 2	250 Volt, 1 amp / Absolute Max. AC RMS / For Points 11-14, 37, and 38
Type 2	250 Volt, 5 amp / Absolute Max. AC RMS / For points 1-4, 17-19, 20, 31-36, 42-44 / Restriction: Points 17 and 19 may not be loaded simultaneously

NOTE: For type 1, all terminals rated to voltages may be simultaneously rated. For type 2, alternatively higher loads may be permitted for some but reduced for others as shown in **Table 3.2**.

### 3.3.5 Termination of Cables

All terminations should be made with insulated ring terminals using the appropriate crimping tool. See **Figures 3.10** and **3.11** for power terminal connection recommendations. See **Figure 3.12** and **Table 3.2, 3.3, or 3.4** for control terminal connection recommendations.

### 3.3.6 Cable Connections

See **Figure 3.14** for connection information.

1. Connect the main power supply cables, including the earth/ground wire using the M5 screws provided.
2. Attach the earth/ground wire to the separate lug on the inside of the terminal compartment.
3. Attach the protective cover included in the OEM bag with the 2.5 mm screws.
4. Use the M3 screws installed in the terminal block to connect the control cables in accordance with the wiring diagram and the project specification.
5. Ensure that all connections are tight, including any spare termination screws that have not been used.

NOTE: A “Customer Connection(s) Diagram” (P/N 100909) sticker is attached to the interior of the terminal compartment cover. This may be removed and user termination numbers inscribed adjacent to Limitorque’s terminal block numbers for field connection reference. The diagram may also be used to assist in locating the terminal block positions. Service and factory contacts are contained on the sticker’s reverse side.

Certification is based on the use of appropriately rated wire for the application. Installation shall be in accordance with the current issue of the applicable national and or local electric code or regulations.

**Table 3.4 – Required ratings for external wires**

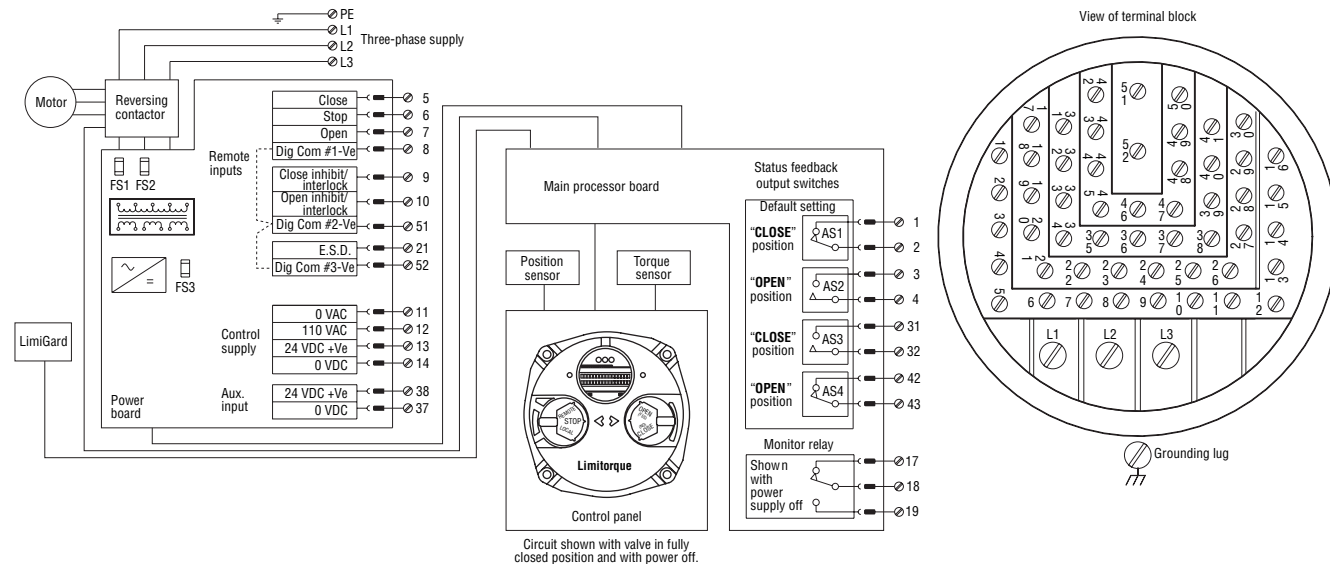
Up to	Use wire rated at least
40°C Ambient	75°C
55°C Ambient	90°C
60°C or 65°C Ambient <sup>1</sup>	105°C

Note 1: Refer to unit nameplate.

Figure 3.13 – View of terminal block



Figure 3.14 – Standard wiring diagram



### 3.3.7 DDC-100 Network Installation

Ensure that the DDC-100 Network cable type is Belden 3074F, Belden 3105, Belden 9841 or another cable that is within 5% of the following specifications.

- Nominal impedance: 120 ohms @ 1 MHz
- Line to shield capacitance: 23.0 pF/ft (75.5 pF/m)
- Line to line capacitance: 12.8 pF/ft (42.0 pF/m)

Using other cables may result in decrease of internodal distance and/or an increase in communication error.

Particular care should be taken when terminating twisted-pair shielded cables in a DDC control network. Avoid nicks, cuts, or abrasions in the insulation of data communication cables, since this may result in inadvertent ground connection. Also, excess cable should be cut, not coiled or looped, to prevent noise induction into the network.

#### Cable Preparation

Prepare the network cable for connection to the MX actuator terminal block as illustrated in **Figures 3.15** through **3.19**.

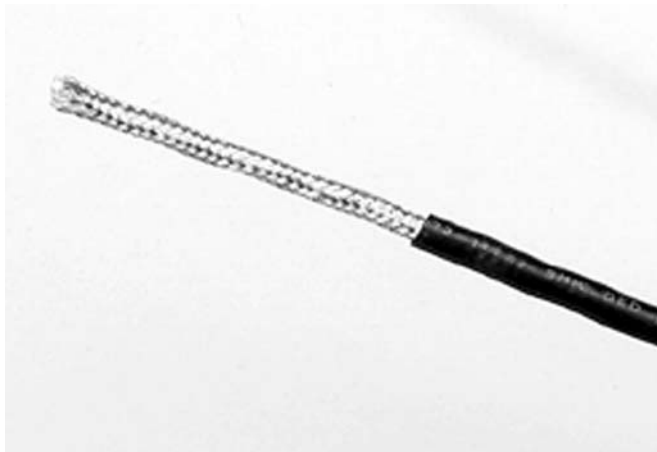
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**CAUTION:** Strip stranded conductors carefully; do not damage the strands. This will weaken the conductor. Do not nick conductors when stripping away the insulation. Nicking stresses the conductor and can cause the conductor to break. This type of damage may not be apparent and failure can occur later without warning.

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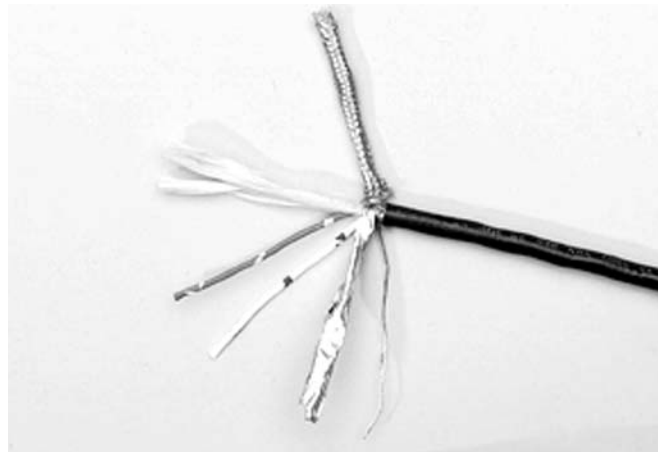
1. Remove 2 to 3 in. (5 to 8 cm) of the outer plastic jacket as shown in **Figure 3.15**. Do not cut or nick the drain wire or the insulated conductors.

**Figure 3.15 – Removing outer plastic jacket**



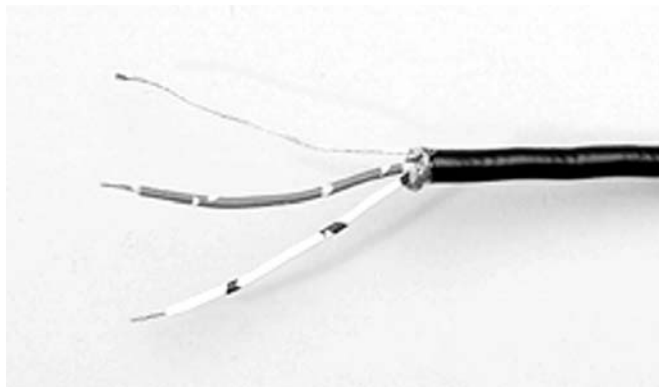
2. Separate the cable parts. Unbraid the braided shield and peel back the foil shield to the same point where the outer jacket was removed as shown in **Figure 3.16**.

**Figure 3.16 – Separating cable parts**



3. Cut away the braided shield and the foil shield. Strip the insulation from the conductors approximately  $\frac{1}{2}$  inch (1 cm) as shown in **Figure 3.17**.
4. Apply heat shrink tubing to insulate the drain wire and to provide stress relief to the cable.

**Figure 3.17 – Stripping conductors and applying heat shrink tubing**



5. Install ring tongue connectors as shown in **Figure 3.18**.

---

**CAUTION: Do not melt the insulation.**

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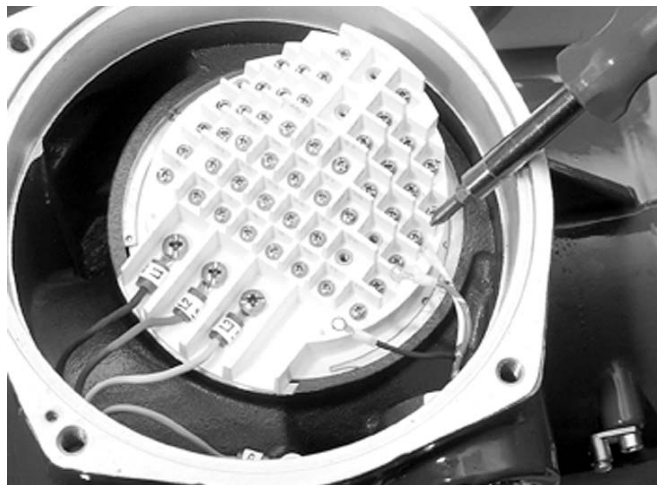
**Figure 3.18 – Ring tongue connectors**





6. Connect the network cables to the MX actuator terminal block as shown in **Figure 3.19**. **Table 3.5** details a connection for the loop topology.

**Figure 3.19** — Connecting network cable to MX terminal block



**Table 3.5** – Loop topology connections

Terminal Block Number	DDC
15	DATA-A1* (+)
16	DATA-A1 (-)
29	DATA-A2* (+)
41	DATA-A2 (-)
30	Surge Protection

In terms of voltage, DATA is positive with respect to DATA\*.

**NOTE:** Ground each segment of the cabling at only one point to prevent ground loops, which can affect system performance. Verify the actuator is properly grounded.

Limiterorque defines an effective local earth ground as a low impedance (less than 5 ohms) path to either:

1. A ground electrode placed in close vicinity to the actuator, which is free of ground loop currents.  
**or**
2. A safety ground that is free of ground loop currents running from the actuator back to the system ground electrode. If the signal wiring is run on aerial cable where it may be exposed to high-energy electrostatic discharge (such as lightning), a low impedance path to ground, which is capable of high current, must be provided a short distance from the actuator as described in No. 1 above.

NOTE: Shielding is not sufficient to prevent induction of stray voltages onto signal leads from the power lines.

A network wiring diagram for a single loop is shown in **Figure 3.20**.

After installation is complete and prior to operation, inspect the network cable and its connection to each field unit for the following:

There should not be:

- Nicks in the insulation—this can cause a short to the grounded shield.
- Cut strands in a stranded conductor—this can cause a poor connection and eventually an open circuit.
- Cable armor shorted to the cable shield/drain wire—this may not be at ground potential and could be subject to lightning surges.
- Shield/drain wire grounded at more than one end of each cable segment (the section between each adjacent actuator on the loop). This will avoid ground loop problems.
- Ground/earth connection except at true ground potential and effective at all times.

### 3.3.8 Foundation Fieldbus Installation

Ensure that the Foundation Fieldbus cable type is Belden 3076F, or another cable that is within 5% of the following specifications.

- Characteristic impedance: 100 ohms @ 31.25 kHz
- Resistance, each wire: 7.32 ohms/1000 ft
- Attenuation: 0.914 dB/1000 ft @ 39 kHz
- Capacitive Unbalance: 3.6 pF/ft

Using other cables may result in decrease of internodal distance and/or an increase in communication error.

Particular care should be taken when terminating twisted-pair shielded cables in a FF control network. Avoid nicks, cuts, or abrasions in the insulation of data communication cables, since this may result in inadvertent ground connection. Also, excess cable should be cut, not coiled or looped, to prevent noise induction into the network.

#### Cable Preparation

Prepare the network cable for connection to the MX actuator terminal block as follows in **Figure 3.15** through **3.19**. **Table 3.6** details connections for Foundation Fieldbus.

Table 3.6 – Foundation Fieldbus connections

Terminal Block Number	FF Function
15	DATA (-)
16	DATA (+)

The shield must be connected to ground or earth at only one place. The cable shield is generally grounded at the power conditioner.

Reference the **Fieldbus Foundation Application Guide 31.25 kbit/s Wiring and Installation** guide for more information on network wiring.

**CAUTION: Strip stranded conductors carefully; do not damage the strands. This will weaken the conductor. Do not nick conductors when stripping away the insulation. Nicking stresses the conductor and can cause the conductor to break. This type of damage may not be apparent and failure can occur later without warning.**

### 3.3.9 Network Wiring – Profibus DP/PA Installation

Profibus is based on RS 485 communication. The standard EN 50170 specifies the cable for use with Profibus DP.

The following specifications need to be fulfilled by the Profibus cable:

**Table 3.7 – Profibus cable specifications**

Parameter	Type – Profibus DP
Impedance	135 to 165 ohm/3 to 20 MHz
Capacity	< 30 pF/m
Resistance	< 110 ohm/km
Wire gauge	> 0.64 mm
Conductor area	> 0.34 mm <sup>2</sup>

The Profibus DP cable is a shielded twisted pair cable.

In general, there are two different types of cables available. The most commonly used cable has solid wire for the Profibus line. When there is a need for more flexibility (bending) and higher environmental resistance, a cable with stranded wire for the Profibus line and special jackets shall be used. Limitorque recommends the use of:

- Belden 3079A Specifications, 22 AWG, shielded, solid two conductor

#### *Key Specifications*

° Capacitance/ft = 8.5 pF

° Nominal Impedance (ohms) – 150.0

Network Wiring - Profibus PA

Please refer to IEC 61158 & ANSI/ISA S.50.02 Part 2-1992 for network wiring guidelines. Refer to **Table 3.6** for connections.

### 3.3.10 Replacing Terminal Cover

Verify that the O-ring seal and spigot joint are clean and in good condition. Lightly coat these items with mineral-based lubricant before replacing the terminal cover and four retaining screws.

### 3.3.11 External Earth/Ground Connections

In order to help meet the local electric codes of the installation, external connection points are provided on the actuator motor and main gear housing for the attachment of earth/ground cables. See **Figure 3.22** and **3.23**. An M5 x 8 screw (not provided) should be used. These are in addition to the ground connection inside the terminal compartment.

**Figure 3.20 – User network connection for loop topology/Typical for all protocols**

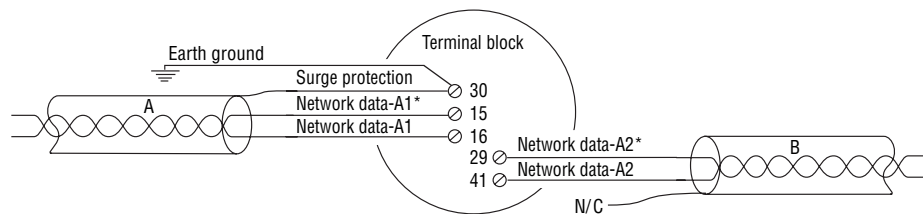


Figure 3.21 – External earth/ground connection – motor

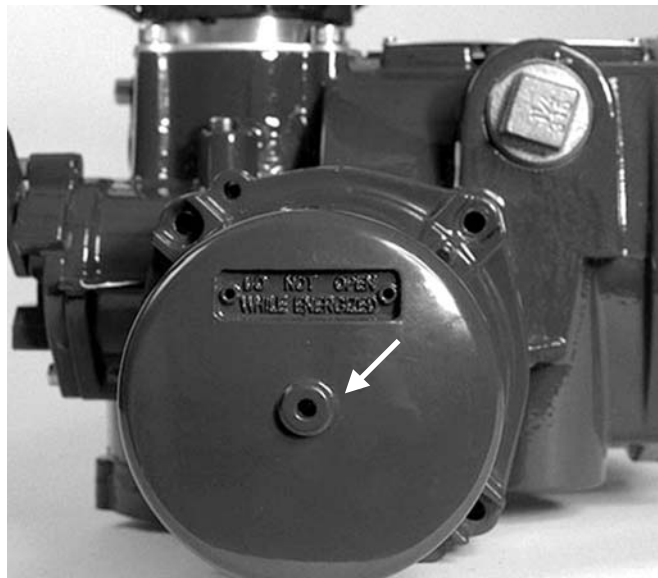
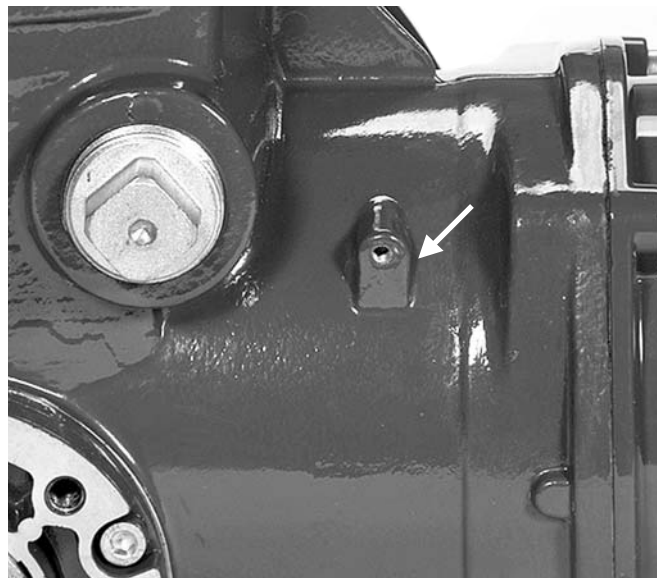


Figure 3.22 – External earth/ground connection – housing



## 3.4 Commissioning the Actuator

Before attempting to commission the actuator, verify that the actuator is installed correctly on the valve and main power is “**ON**.” If the main power is not available, 24 VDC may be connected to terminals 37 and 38. See **Figure 3.13**. However, when using a 24 VDC power source, the actuators have to be positioned manually.

After making the initial electrical connections detailed in **Section 3.3, Electrical Connections**, the MX actuator may be commissioned without removing any covers. No special tools are required. Configuration is accomplished through the use of the LCD and the control knobs mounted on the control panel. See **Figure xi, Items 5 and 6**.

### For positioning the actuator:

1. Place the red knob in the “**LOCAL**” position.
2. Move the black knob to the “**OPEN**” or “**CLOSE**” position.

### For configuring the actuator:

1. Place the red knob in the “**STOP**” position.
2. Move the black knob to the “**YES**” or “**NO**” position and release to answer questions appearing on the LCD display.

The OPEN and CLOSE position limits must be set after the actuator has been mounted on the valve. See **Section 3.4.4, Setting Position Limits**. All other actuator parameters are factory-set either in accordance with a Limatorque standard set of default values (see **Section 3.4.1, Default Configuration Set**) or the requirements specified with the purchase order. Reconfirm these preconfigured settings prior to placing the actuator into service since the requirements of the application may have changed after the manufacture of the actuator. See **Section 3.4.2, View the Existing Settings**.

### 3.4.1 Default Configuration Set

Unless otherwise specified, Accutronix actuators are shipped with the following configuration:

- When Open stopped by position limit; Open seating (position)
- When Close stopped by position limit; Close seating (position)
- Maintained local control; Mode (maintained)
- Clockwise to close; Close direction (CW)

- ESD – Close valve by a closed contact; ESD action (close)
  - Motor thermostat enabled; Thermostat (enabled)
  - No action if inhibit signal present; Priority inhibits > ESD
  - No action in Stop mode; Priority stop > ESD
- Inhibits on; Inhibit status (on)
- Remote control – three-wire maintained
- Password – 100

**Modutronic Option**

Proportional band – 15%  
Deadband – 2%  
Polarity – 20 mA = Open  
Action on loss of signal = Close

**FF Option**

Analog scale = 0-100  
Proportional band – 15%  
Deadband – 2%

**DDC Option**

Modbus RTU protocol  
9600 baud  
Analog scale = 0-100  
Proportional band – 15%  
Deadband – 2%  
Offset – 0 mA

**PB Option**

If the default configuration is acceptable, no further configuring is necessary. If any default setting needs to be changed, see **Section 4, Customizing the Actuator**.

**3.4.2 View the Existing Settings**

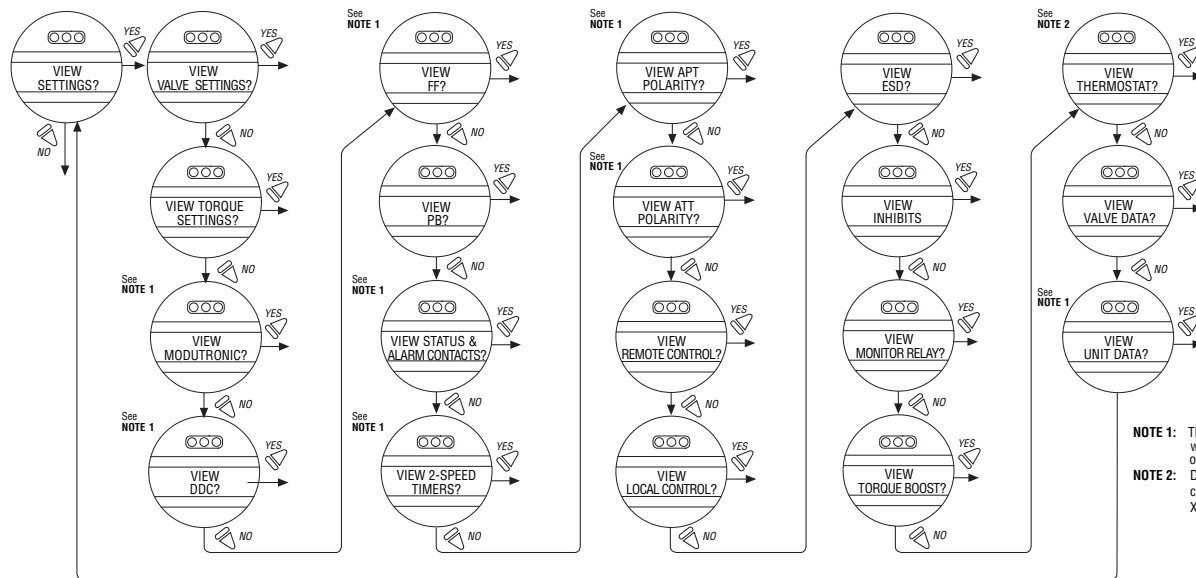
All the existing setup data may be viewed on the LCD display by following a simple step-by-step dialog that may be selected in the following languages: English (default), Spanish, French, German, Italian, and Portuguese.

1. Enter the “**SETUP**” mode as detailed in **Section 2.1.1, Entering the Setup Mode**.
2. Select the dialog language. Toggle “**NO**” to scan the language options. Select “**YES**” when the desired language appears on the LCD.
3. Scan menu selections on LCD and select “**YES**” when “**VIEW SETTINGS**” appears.
4. Scan through the series of displays and answer “**YES**” or “**NO**” at the appropriate prompts. Each display shows the state or value of the existing settings. See **Figure 3.23**.

NOTE: The “**VIEW SETTINGS?**” mode can be accessed without entering a password, but no changes to the settings can be made in this mode.



Figure 3.23 – View settings



### 3.4.3 Entering the Setup Mode

To customize the actuator, view settings, or view diagnostics, the user must enter the **"SETUP"** mode. A three-digit password is required to customize the actuator. All actuators are supplied with the same default password (100). See **Sections 4.2 and 4.3, Password Entry and New Password** for entering and changing password. Main power must be applied to execute the setup procedure. As an alternative, 24 VDC may be connected to terminals 37 and 38 for setup, although actuators must be manually positioned. It is recommended that the actuator be mounted to the valve before commissioning the actuator.

Enter the **"SETUP"** mode as follows:

1. Place the red knob in the **"STOP"** position.
2. Within 10 seconds, place the black control knob in the **"YES"** position, then the **"NO"** position, then again in the **"YES"** position (in quick succession—approximately one second).
3. The LCD will display **"SETUP?"** for 10 seconds. If no action is taken within the 10 seconds, the unit will return to **"STATUS OK."**
4. Using the black knob, answer **"YES"** or **"NO"** to the questions appearing on the LCD display.

NOTE: While in the **"SETUP"** mode, if there is a lapse of 15 minutes from last action, the unit will return to the **"SETUP?"** display. Any changes that have been made will be stored.

5. When configuration is complete, answer **"YES"** to **"EXIT SETUP?"** or move the red knob from **"STOP"** to **"LOCAL"** or **"REMOTE."**

After exiting the **"SETUP"** mode, all settings will automatically be saved to a non-volatile memory and retained, even when power is removed from the actuator. However, if power is removed from the unit while the unit is in **"SETUP"** mode, customization changes will be lost.

### 3.4.4 Setting Position Limits

This section will advise how to configure end-of-travel limits.

The actuator's position limits may be set by manual operation or electrical operation.

---

**▲ WARNING: If the actuator will not move after setting the limits, the limits have been set incorrectly.**

---

#### Set Close Position Limit (Handwheel Operation)

1. Enter the “**SETUP**” mode as detailed in **Section 2.1.1, Entering the Setup Mode**.
2. Enter “**POSITION SETUP?**” routine.
3. From the “**SET CLOSE POSITION LIMIT?**” display, select “**YES**.” “**CLOSE VALVE OK?**” will be displayed on the LCD.
4. Engage manual override as detailed in **Section 3.5.1, Manual Operation**.
5. Ensure that the valve is fully closed.
6. Move the valve in the open direction for one handwheel turn to allow for coasting of the motor.

7. When the valve is positioned correctly, select “**YES**” again. The LCD will display “**SAVE CLOSE LIMIT OK?**”

8. Select “**YES**.”

The close position limit is now calibrated. Check the position limit setting as follows:

1. Move the valve in the open direction. The close lamp should extinguish with approximately one turn of the handwheel.
2. Move the valve back in the close direction and check that the close lamp illuminates just before the full close position is reached (approximately 1/2 to 1 turn).
3. Select “**YES**” at the “**SET OPEN POSITION LIMIT?**” prompt.

If the calibration requires adjustment:

1. Select “**NO**” at the “**SET OPEN POSITION LIMIT?**” prompt.
2. Repeat the “**SET CLOSE POSITION LIMIT?**” routine.

NOTE: The green LED is the default setting for indicating the (CLOSE) position.

#### **Set Open Position Limit (Handwheel Operation)**

1. From the “**SET OPEN POSITION LIMIT?**” display, select “**YES.**” “**OPEN VALVE OK?**” will be displayed on the LCD.
2. Engage manual override as detailed in **Section 3.5.1, Manual Operation.**
3. Ensure that the valve is fully open.
4. Move the valve in the close direction for one handwheel turn to allow for coasting of the motor.
5. When the valve is positioned correctly, select “**YES**” again. The LCD will display “**SAVE OPEN LIMIT OK?**”
6. Select “**YES.**”

The open position limit is now calibrated. Check the open position limit setting as follows:

1. Move the valve in the close direction. The open lamp should extinguish with approximately one turn of the handwheel.
2. Move the valve back in the open direction and check that the open lamp illuminates just before the full close position is reached (approximately ½ to 1 turn).
3. Select “**YES**” at the “**SET OPEN POSITION LIMIT?**” prompt or “**NO**” to exit “**POSITION SETUP?**” dialog.

If the calibration requires adjustment:

1. Select “**NO**” at the “**SELECT CLOSE POSITION LIMIT?**” prompt.
2. Repeat the “**SELECT OPEN POSITION LIMIT?**” routine.

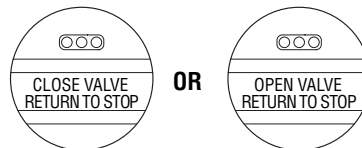
NOTE: The red LED is the default setting for indicating the (CLOSE) position.

### Set Close or Open Position Limit (Electrical Operation)

1. Enter the “**SETUP**” mode detailed in **Section 2.1.1, Entering the Setup Mode**.
2. Enter “**POSITION SETUP?**” routine.
3. During “**CLOSE VALVE - OK?**” or “**OPEN VALVE - OK?**,” move the red knob to “**LOCAL**” and use the “**OPEN**” and “**CLOSE**” switch.

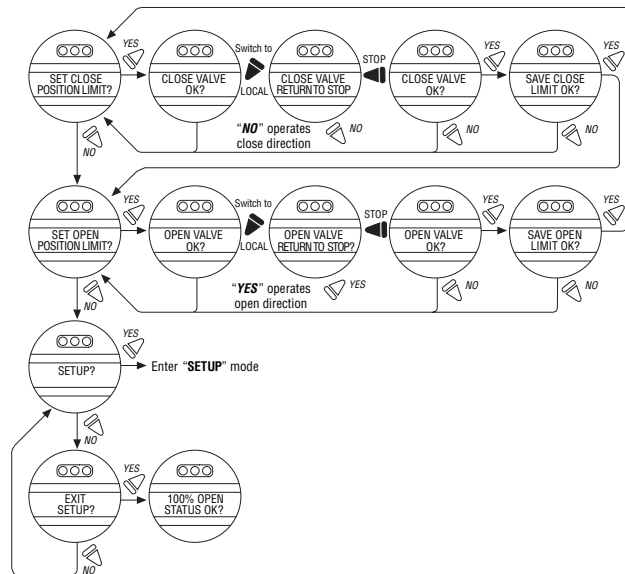
Unit will only operate locally and only in the push-to-run configuration (Inching mode). This does not exit the startup routine—moving red selector knob back to “**STOP**” returns the user to the same message. This permits the valve to be placed at its travel limits and avoids the necessity to use the handwheel. The unit will run while the black knob is engaged with no stop limit when in this mode. Any previously set travel limits will be ignored.

1. Move the red knob to “**LOCAL**” and move the black knob in the intended direction. LCD display will read:



2. Once the “**CLOSE**” or “**OPEN**” valve position limit has been reached, return the red knob to “**STOP**” and complete setting the “**CLOSE**” or “**OPEN**” position limit. See **Figure 3.24**.

Figure 3.24 – Position setup – electrical operation



NOTE: Once the travel limits have been set, the actuator may be operated electrically from the remote inputs. Local maintained operation is also permitted. Check the operation of the actuator to ensure that the torque and limit settings are satisfactory. Place the selector switch in “**LOCAL**” and rotate the “**OPEN/CLOSE**” switch to operate the actuator in the “**MOTOR**” mode.

Moving the red knob from “**STOP**” to “**LOCAL**” or “**REMOTE**” automatically saves to non-volatile memory all the changes that have been made.

## 3.5 Operating the MX Actuator

### 3.5.1 Manual Operation

Figure 3.25 – Declutch lever shows direction of engagement (MX-05 shown)



Operate the actuator with the handwheel as follows:

1. Depress the declutch lever and, at the same time, slowly rotate the handwheel until the clutch is fully engaged.
2. Release the lever and it will return to its original position. The clutch will be retained in the handwheel mode by spring-loaded latches.

Manual operation is now possible and the actuator can only be returned to motor operation by energizing the motor. Energizing the motor will trip the spring-loaded latch and allow the clutch to disengage from the handwheel and re-engage with the gear drive. To prevent unauthorized manual operation of the actuator, the declutch lever may be padlocked in “**MOTOR**” mode. A ½ inch size padlock is recommended.

### 3.5.2 Electrical Operation

Before applying power to the actuator, check that the supply voltage details on the nameplate are correct for this installation. An incorrect supply connected to the actuator terminals could cause fuses to blow or cause permanent damage to the electrical components in the unit. Phase rotation need not be checked since all units are supplied with an Autophase Correction feature. Apply power to the actuator but do not operate the actuator without first checking that it has been set up and configured correctly for its intended application.

### 3.5.3 Local Control

Once the position limits have been set (see **Section 3.4.4, Setting Position Limits**) and the default mode is the maintained mode, the actuator can be controlled locally from the control panel.

1. Place the red selector knob in the **“LOCAL”** position.
2. Select **“OPEN”** or **“CLOSE”** via the black control knob.

If maintained control has been selected, the actuator will continue to run when this control knob is released. The actuator may be stopped at

any time by placing the red selector knob in the **“STOP”** position, or the direction may be reversed or stopped using the black control knob.

If non-maintained control mode (inching) has been selected, the actuator can be inched to any intermediate position by holding the black control knob in the desired position, **“OPEN”** or **“CLOSE,”** for as long as necessary. The actuator will stop when the knob is released.

### 3.5.4 Remote Control

Once the position limits have been set, and **“REMOTE”** mode is enabled:

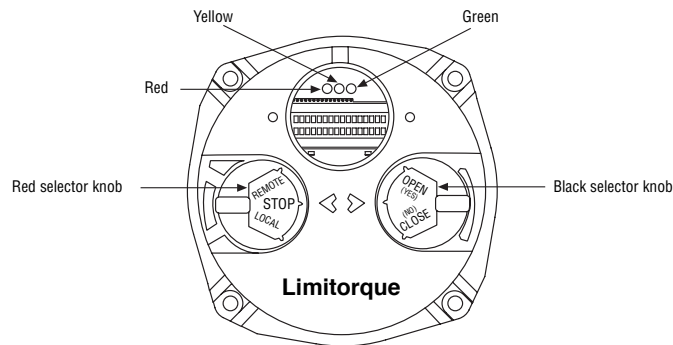
1. Place the red selector knob in **“REMOTE”** to permit command control by a remote device. Local **“OPEN/CLOSE”** mode will be prevented.
2. Rotating the red selector knob to the **“STOP”** position will automatically stop the actuator regardless of the remote control signal unless ESD override has been selected. See **Section 4.14.3, Signal.**



The red selector knob may be locked in or out of any of its three positions, “**LOCAL/STOP/REMOTE**,” using a padlock. A ¼ inch padlock is recommended.

### 3.5.5 Local Indication

Figure 3.26 – Control panel



The LCD displays status and valve position. In normal operation mode, the top line displays “**XX % OPEN**,” while the bottom line displays “**STATUS OK**.” Refer to **Section 4.8, Status and Alarm Contacts** for a list of “**ALARM**” or “**STATUS MESSAGES**.” **Table 3.8** details the LED indicators’ default settings.

Table 3.8 – LED Indicators – default settings

LED Indicator			Operation Description
Yellow	Red	Green	
OFF	ON	OFF	Valve is fully open (Red knob in “ <b>REMOTE</b> ”)
OFF	OFF	ON	Valve is fully close (Red knob in “ <b>REMOTE</b> ”)
OFF	OFF	Blinking	Valve is closing (Red knob in “ <b>REMOTE</b> ”)
OFF	Blinking	OFF	Valve is opening (Red knob in “ <b>REMOTE</b> ”)
ON	OFF	OFF	Actuator in “ <b>REMOTE</b> ” and stopped in mid-travel
Blinking	OFF	OFF	Monitor relay alarm or actuator (red knob) in “ <b>LOCAL</b> ” or “ <b>STOP</b> ”

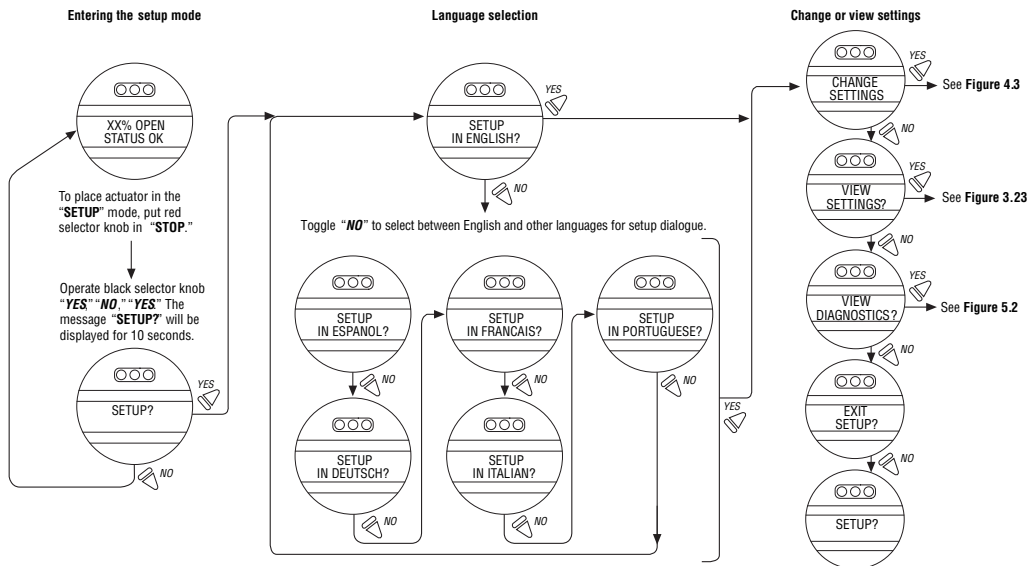
Red and green LED indicators can be reversed. See **Section 4.13, Local Control**.

## 4 Customizing the Actuator

The actuator settings can be customized; i.e., the default settings can be changed and the purchased options can be configured.

Language selection can also be customized. At the “**SETUP IN ENGLISH?**” prompt, select “**NO**” to move between the following languages: English, Spanish, German, French, Italian, and Portuguese.

Figure 4.1 – Entering the setup mode, language selection, and change or view settings menus



## 4.1 Changing the Existing Settings

1. Verify main power is ON.
2. Enter the **“SETUP”** mode as detailed in **Section 2.1.1, Entering the Setup Mode.**
3. Answer **“YES”** to **“Change Settings.”**
4. Enter password if required. See **Section 4.2, Password Entry.** To change any of the existing settings or to set the end-of-travel limits for the Open and Close positions of the valve, it may be necessary to enter a password.
5. Answer **“YES”** or **“NO”** to each of the following groups of setup data. A **“YES”** allows the selected setup data group menu to be displayed. A **“NO”** moves the user to the next setup data group. For details of each data group, see **Sections 4.2 – 4.14.11, Password Entry** through **Motor Thermostat.**
  - Valve setup
  - Torque setup
  - Position setup
  - Modutronic
  - DDC (distributed digital control)
  - FF (Foundation Fieldbus control)
  - PB (Profibus Control)
  - Status and alarm contacts
  - Two-speed timer
  - APT (analog position transmitter)
  - ATT (analog torque transmitter)
  - Remote control
  - Local control
  - ESD (emergency shutdown)
  - Inhibits
  - Diagnostic reset
  - TAG
  - LCD contrast
  - Password
  - Torque boost
  - Thermostat
  - Restricted (consult factory)
6. Make changes in each setup group as desired. Each display shows the state or value of the existing settings. See **Figure 4.3.**

7. When configuration is complete, answer **“YES”** to **“EXIT SETUP?”**  
Alternatively, the **“SETUP”** mode may be terminated at any time by moving the red selector knob from **“STOP”** to **“LOCAL”** or **“REMOTE.”**  
All the changes made so far will automatically be saved.

NOTE: Once you exit this mode and enter either the **“VIEW SETTINGS?”** mode or **“VIEW DIAGNOSTICS?”** mode, the password will need to be entered again to gain access to the **“CHANGE SETTINGS?”** mode in order to make further changes.

Figure 4.2 – Main menu selections

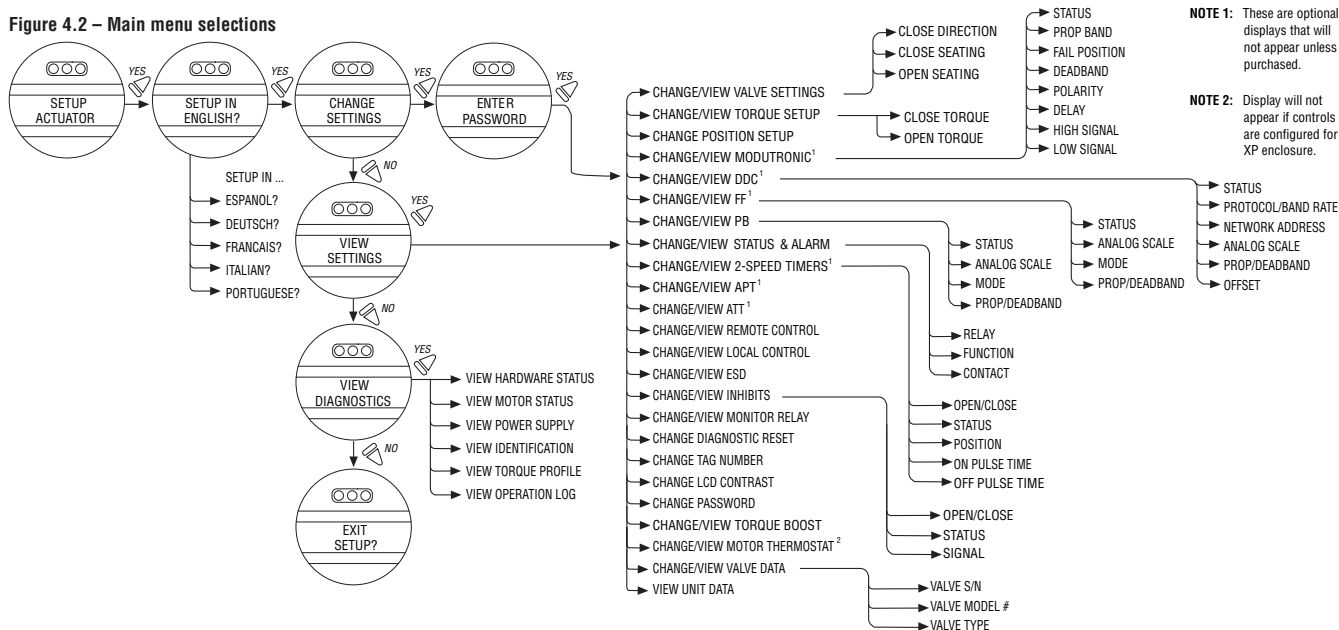
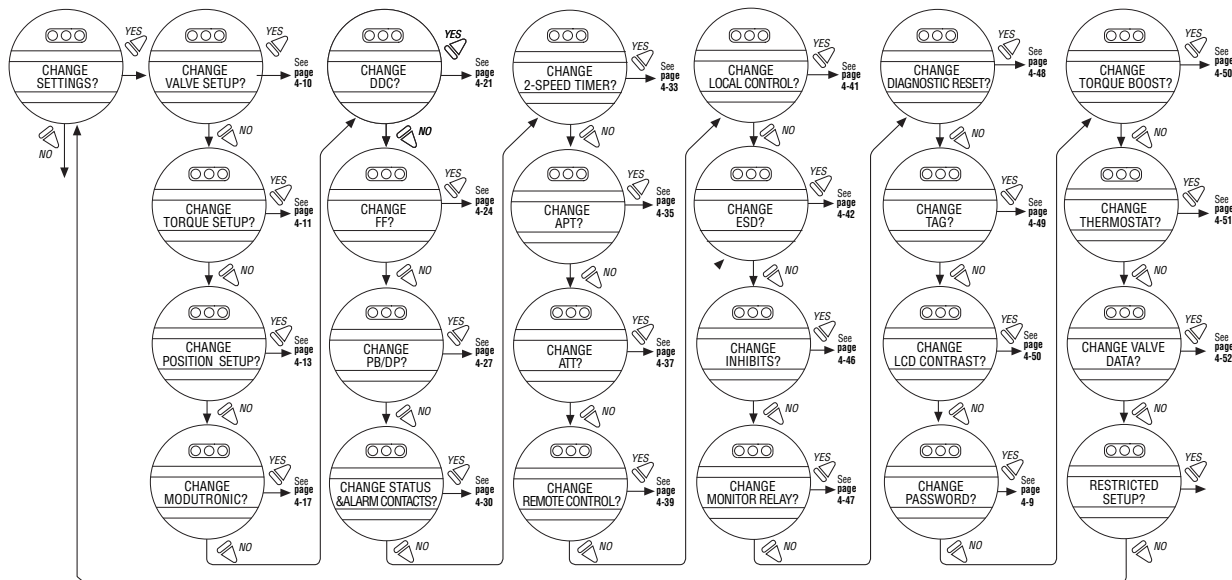


Figure 4.3 – Changing settings



## 4.2 Password Entry

*Default = 100*

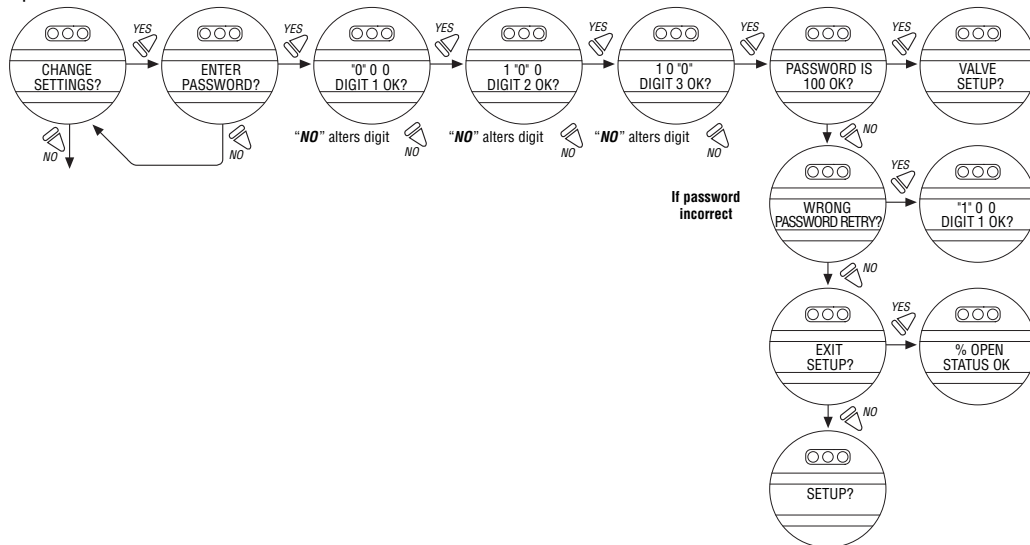
Unauthorized entry to the “**CHANGE SETTINGS?**” mode is prevented by a password protection feature. If password protection is not required, the password may be set to “000.” The user will not be prompted to enter a password when the password is set to “000.”

1. Enter the password digit by digit. The password is a three-digit number, ranging from 000-999. The factory default is 100.
2. If the wrong password is entered, re-enter the correct one. After three attempts to enter the correct password, a recovery screen will appear. The screen will display a serial number that can be used for password recovery. A password recovery service is available. **Contact Limitorque service coordinator at (434) 528-4400.**



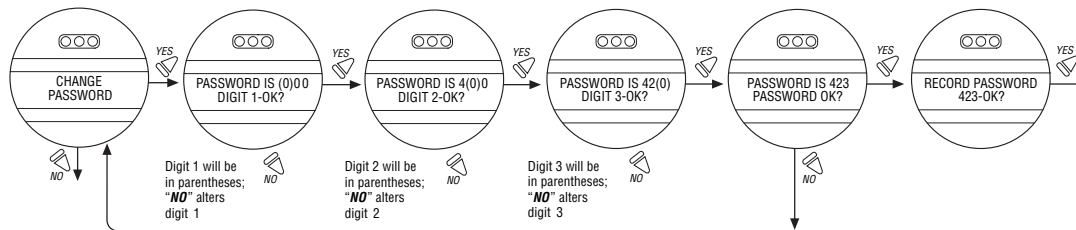
Figure 4.4 – Password entry

If password correct



## 4.3 New Password

Figure 4.5 – New password



The password may be changed from the default of 100 to a customer-selected value as indicated in **Figure 4.5**.

The new password becomes effective as soon as the operator answers **"YES"** to the **"RECORD PASSWORD?"** display.

NOTE: Take care to record the new password in a secure location to ensure its retrieval in the future, yet prevent unauthorized access to the actuator **"SETUP"** routine.

If password protection is not required, the password may be set to "000." The user will not be prompted to enter a password when the password is set to "000."

## 4.4 Valve Setup

Valve setup enables the actuator to be changed to suit the type of valve that it is mounted on.

### 4.4.1 Close Direction

*Default = CW to Close*

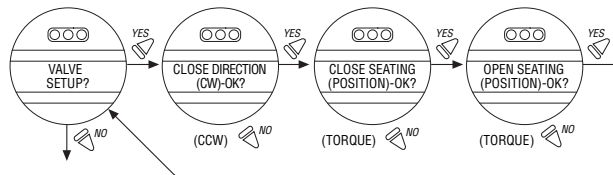
The majority of valves require clockwise (CW) rotation of the actuator drive sleeve when viewed from the handwheel.

1. Engage manual override and check whether the valve closes with CW or CCW rotation of the handwheel.
2. Select “**NO**” until the required direction is displayed, then “**YES**.”

NOTE: If in doubt as to valve seating, consult the valve manufacturer.

NOTE: For torque seated valves, ensure that the “**POSITION**” limit is not set at “**TORQUE**” seat. It is recommended that the “**POSITION**” limit be set approximately one handwheel turn (360°) in the opposite direction from the “**TORQUE**” seat.

Figure 4.6 – Valve setup



### 4.4.2 Close Seating

*Default = Position Seating*

1. Configure the actuator to close on “**TORQUE**” limit for seating valve types such as wedge gate and globe.
2. Select “**POSITION**” limit for valve types such as ball, butterfly, plug, sluice gate, parallel slide, knife gate, and through conduit.
3. Select “**NO**” until the required seating is displayed.
4. Select “**YES**.”

### 4.4.3 Open Seating

*Default = Position Seating*

The majority of valves, regardless of their construction, seat on position limit in the open direction. Some valves are “back-seating” and require torque limit in the open direction.

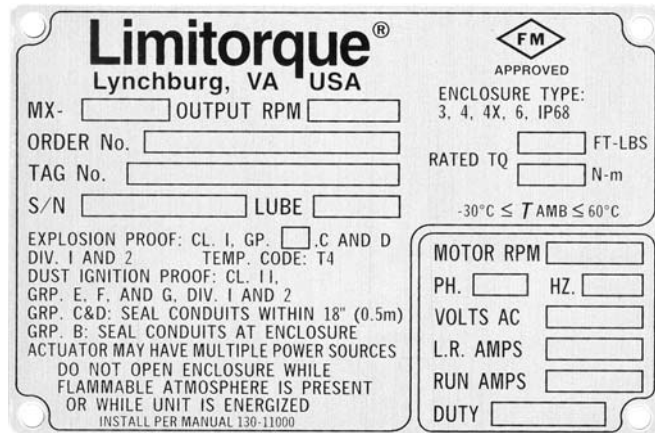
1. Select “**NO**” until the required seating is displayed.
2. Select “**YES**” to return to the “**VALVE SETUP?**” display.

## 4.5 Torque Setup

The output torque can be changed between 40% and 100% of the rated torque as follows:

1. From “**VALVE SETUP?**”, select “**YES**” to enter the “**TORQUE SETUP?**” routine.
2. Select “**YES**” to change the settings.  
If “**NO**” is selected, the “**POSITION SETUP?**” routine will be entered.

Figure 4.7 – Typical XP nameplate



**Limitorque®**  
Lynchburg, VA USA

MX-  OUTPUT RPM

ORDER No.

TAG No.

S/N  LUBE

EXPLOSION PROOF: CL. I, GP. ☐ C AND D  
DIV. I AND 2 TEMP. CODE: T4  
DUST IGNITION PROOF: CL. II,  
GRP. E, F, AND G, DIV. I AND 2  
GRP. C&D: SEAL CONDUITS WITHIN 18" (0.5m)  
GRP. B: SEAL CONDUITS AT ENCLOSURE  
ACTUATOR MAY HAVE MULTIPLE POWER SOURCES  
DO NOT OPEN ENCLOSURE WHILE  
FLAMMABLE ATMOSPHERE IS PRESENT  
OR WHILE UNIT IS ENERGIZED  
INSTALL PER MANUAL 130-11000

APPROVED  
ENCLOSURE TYPE:  
3, 4, 4X, 6, IP68

RATED TQ  FT-LBS  
 N-m

-30°C ≤ T<sub>AMB</sub> ≤ 60°C

MOTOR RPM

PH.  HZ.

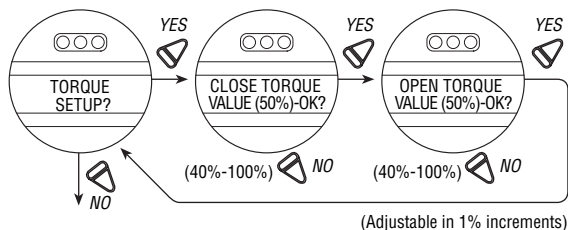
VOLTS AC

L.R. AMPS

RUN AMPS

DUTY

Figure 4.8 – Torque setup



#### 4.5.1 Close Torque Valve or Open Torque Valve

The output torque from the actuator to close or open the valve may be configured between 40% and 100% of the rated torque (as stated on the actuator nameplate), in 1% increments (unless limited by the factory).

##### To Increase the % of Torque Required:

1. Select “**NO**” until the desired % is indicated.
2. Select “**YES**” to save the required torque.

Should the user select a maximum torque setting less than 100% due to valve or gearbox limitations, this selection can be password protected.

##### Future

If the maximum allowable % setting does not equal 100% (e.g. 85%) then the maximum torque value has been limited. This “**TORQUE LIMITED**” value is determined by the factory. It is intended to limit the maximum output torque capability of the actuator in order to prevent possible damage to the valve and actuator resulting from excessive torque. The limited value cannot be changed without consulting the factory. Use the recommended torque value.

## 4.6 Position Setup

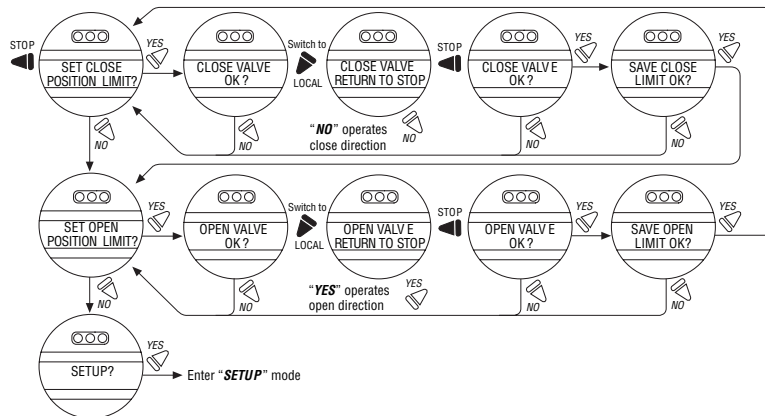
Change Settings Menu. After successfully entering the password, answer “**NO**” to the Change Settings menu prompts until you reach the prompt “**CHANGE POSITION SETUP?**” Answer “**YES.**”

### 4.6.1 Set Position Limits for Electrical Operation

1. Set closed valve position. At the “**CLOSE VALVE-OK?**” prompt, move the red control knob to “**LOCAL.**” Hold the black control knob in the “**CLOSE**” position until the valve has reached the desired position. Move the red control knob to “**STOP.**”
2. Set the open valve position. At the “**OPEN VALVE-OK?**” prompt, move the red control knob to “**LOCAL.**” Hold the black control knob in the “**OPEN**” position until the valve has reached the desired position. Move the red control knob to “**STOP.**”
3. Inspect for correct operation. The position calibration is now complete. The actuator will function as ordered. Inspect for correct operation by running actuator electrically.

Note: For torque seated valves, ensure that the Position limit is not set at torque seat. It is recommended that the Position limit be set approximately one handwheel turn (360°) in the opposite direction from the torque seat.

Figure 4.9 – Electrical operation

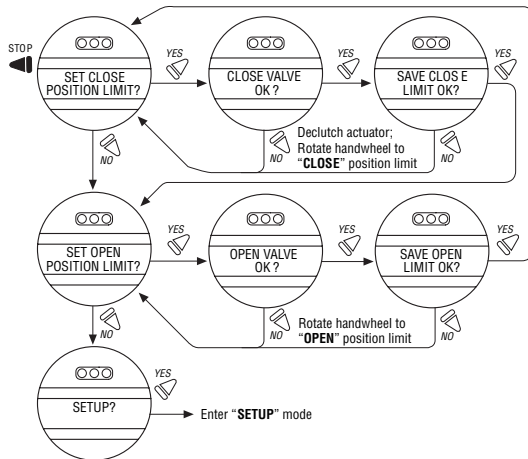


#### 4.6.2 Set Position Limits for Manual Operation

1. Set close position. At **"SET CLOSE POSITION LIMIT?"** answer **"YES."**  
At **"CLOSE VALVE-OK?"** depress declutch lever and slowly rotate handwheel until clutch is fully engaged. Release declutch lever; the clutch will stay in handwheel mode. If the valve is fully closed, move the handwheel one turn in the open direction to allow for coasting of the motor. When valve is in the desired location, select **"YES."** At **"SAVE CLOSE LIMIT-OK?"** select **"YES"** to set the close position or **"NO"** to adjust the setting.
2. Set open position. At **"SET OPEN POSITION LIMIT?"** select **"YES"** to get **"OPEN VALVE-OK?"**. Engage the clutch (see step 1). Valve should be fully opened. Move the handwheel one turn toward the closed position to allow for coasting of the motor. When valve is in the desired location, select **"YES"** again to set the open position or **"NO"** to adjust the setting.
3. Checking the settings. Turn the handwheel and verify that the open and close LED's function correctly (see Checking the Settings). If adjustments are necessary, select **"NO"** to return to **"CHANGE POSITION SETUP?"** and repeat from step 1.



Figure 4.10 – Handwheel operation



## 4.7 Modutronic Option

The Modutronic option enables the actuator to be controlled via a milliamp input signal.

- If the Modutronic option has been purchased, it is automatically calibrated when position limits are set. No further adjustments are required, unless the defaults do not suit the application.

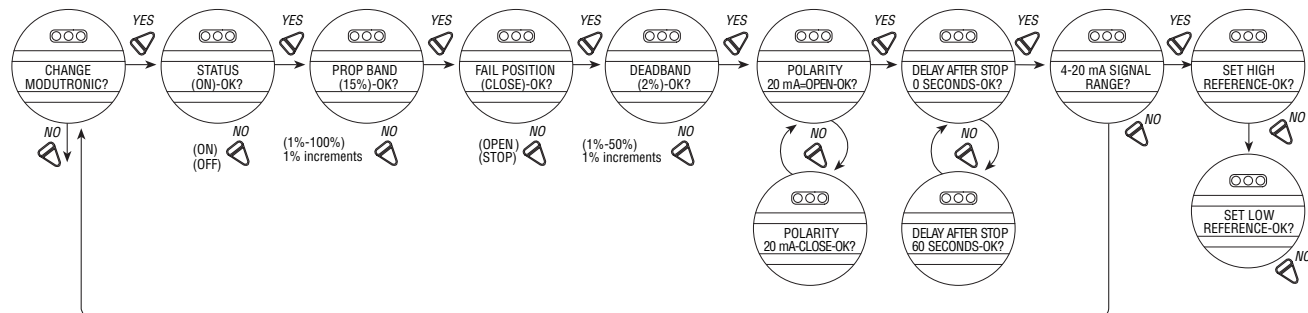
- If the Modutronic option has not been purchased, the screens for changing Modutronic will not be available. **To add the Modutronic option, please consult Limitorque service at (434) 528-4400.**

### 4.7.1 Status

Default = OFF

1. Select “**NO**” to change Modutronic status to “**ON**.” If “**OFF**” is selected, no further menus will be displayed.

Figure 4.11 – Modutronic option



#### 4.7.2 Proportional Band

Proportional band is the range of errors between position and demand signal that will produce reduced speed (pulsing).

*Default = 15%*

To change from the default, select “**NO**” until the required value is displayed. The value is adjustable between 1% and 100%, in 1% increments.

#### 4.7.3 Fail Position

Fail position enables the customer to change the response of the actuator on loss of the milliamp signal.

*Default = “CLOSE” Position*

Fail position takes effect when the signal level falls below 2 mA or above 20.5 mA.

##### To Change the Default Position:

Select “**NO**” to choose whether the valve moves to “**CLOSE**” or “**OPEN**” position, or “**STOP**” (stops) in its present position at the time of signal failure.

#### 4.7.4 Deadband

*Default = 2%*

The deadband should be wide enough to prevent “hunting” of the actuator but as low as possible to give adequate response to changes in the error signal.

##### To Change from the Default:

Select “**NO**” to adjust the value between 1% and 50%, in 1% increments to suit the application.

#### 4.7.5 Polarity (20 mA)

Polarity allows the user to change the valve position corresponding to the maximum milliamp value.

*Default Setting is: 20 mA = Full Open*

Select “**NO**” to select the required position of the valve that is to correspond to the maximum signal level of 20 mA.

Choose between: 20 mA = Full Close or Full Open.

### 4.7.6 Delay After Stop

Default setting = 0 seconds

To change from the default setting, select **"NO"** to adjust the length of delay time after the actuator stops modulating. The delay after stop is adjustable from 0-60 seconds.

### 4.7.7 4-20 mA Signal Range

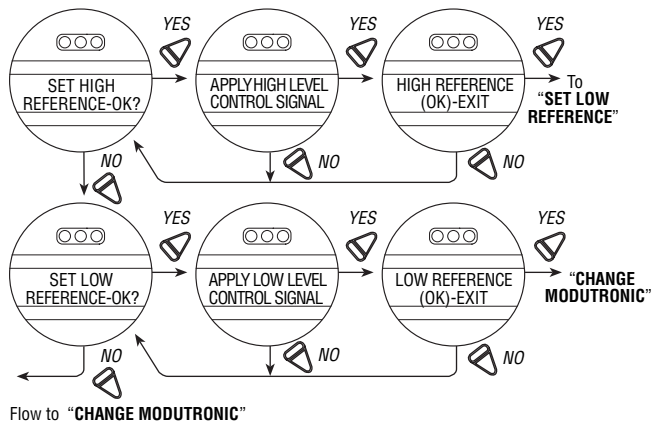
Signal range allows the user to change the signal range from the default range.

Default Setting is for High Reference = 20 mA

Default Setting for Low Reference = 4 mA

To change signal range (i.e. 4 mA-12 mA or 12 mA-20 mA or others) answer **"YES."** Proceed from **"SET HIGH REFERENCE"** to **"SET HIGH REFERENCE - OK?"** A **"YES"** answer will require the use of a calibrator. If no, change to the signal range is required, answer **"NO"** and return to **"CHANGE MODUTRONIC?"** dialog.

Figure 4.12 – Modutronic signals



#### 4.7.8 Set High Reference

*Default = 20 mA*

1. Select “**NO**” to accept pre-existing setting (no change).
2. Select “**YES**” to enter the display “**APPLY HIGH LEVEL CONTROL SIGNAL.**”
3. Apply this signal to terminal 28 and 39 indicated on the wiring diagram.
4. Select “**YES**” again to record this signal as the high reference. See **Figure 4.10.**

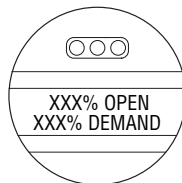
#### 4.7.9 Set Low Reference

*Default = 4 mA*

1. Select “**NO**” to move from “**SET HIGH REFERENCE**” to “**SET LOW REFERENCE.**”
2. Select “**YES**” to enter the display “**APPLY LOW LEVEL CONTROL SIGNAL.**”
3. Using a calibrator, apply the low signal, and select “**YES**” to record this signal as the low reference.

#### 4.7.10 Modutronic LCD Display

When the Modutronic option has been purchased, is set to “**ON**,” and the red selector switch is in “**REMOTE**,” the normal LCD display will read:



XXX% Demand is the percentage value of the milliamp input signal.

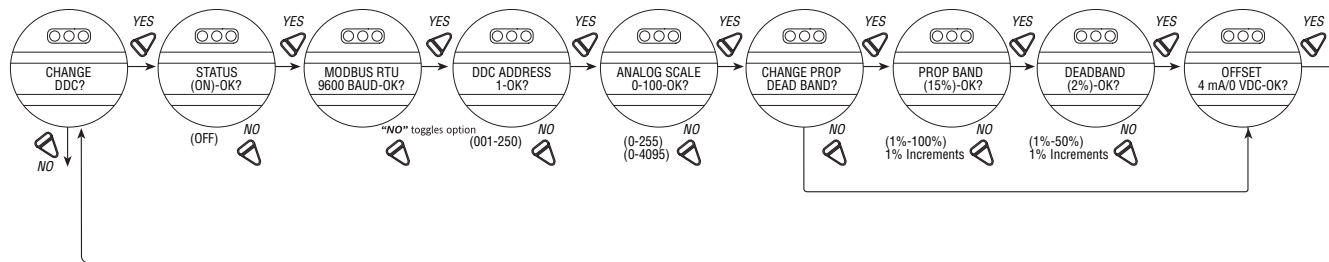
## 4.8 DDC Option

DDC option enables the actuator to be controlled by an RS-485 serial communication signal. If the DDC option has been purchased, it is automatically enabled. The customer must set the DDC address.

NOTE: If the DDC option has not been purchased, the screens for changing DDC will not be available. **To add the DDC option, please consult Limatorque service at (434) 528-4400.**

The Modutronic option is not available with the DDC option. DDC is available with “Move-To” feature. Consult factory for either option.

Figure 4.13 – DDC



MODBUS RTU 4800 BAUD  
 MODBUS RTU 2400 BAUD  
 MODBUS RTU 1200 BAUD  
 MODBUS ASCII 19.2K BAUD  
 MODBUS ASCII 9600 BAUD  
 MODBUS ASCII 4800 BAUD  
 MODBUS ASCII 2400 BAUD  
 MODBUS ASCII 1200 BAUD  
 MODBUS RTU 19.2K BAUD

#### 4.8.1 Status

*Default = ON*

DDC Status enables user to change from the default condition to turn on and off the digital control capability of the actuator.

##### To Change from the Default Setting:

Select “**NO**” to switch DDC to “**OFF**.” If “**OFF**” is selected, no further menus will be displayed.

#### 4.8.2 Network Address

*Default = 1*

Network address allows user to assign a unique network address to an actuator.

1. The network address must be entered in accordance with the Instrument Data Sheet, and care must be taken to ensure that the same address is not used anywhere else in the same network.
2. Select “**NO**” for small incremental changes or hold it continuously in that position for larger changes until the required value is displayed. The address may be set at any value between 001 and 250.

#### 4.8.3 Protocol

*Default = Modbus RTU 9600 Baud*

Protocol changes the communication language/speed from the default to match the application.

##### To Change from the Default Language:

Select “**NO**” to choose between MODBUS, ASCII, or RTU, and the baud rate depending on the design of the DDC system. Refer to the contract documentation.

#### 4.8.4 Analog Scale

*Default = 0-100*

Analog scale allows the user to change the scaling of the analog input from the default.

##### To Change from the Default Range:

Select “**NO**” until the required scale is displayed. 0-255 and 0-4095 counts are available.



#### 4.8.5 Proportional Band

Proportional band is the range of errors between position and demand signal that will produce reduced speed (pulsing).

*Default = 15%*

To change from the default, select “**NO**” until the required value is displayed. The value is adjustable between 1% and 100%, in 1% increments.

#### 4.8.6 Deadband

*Default = 2%*

The deadband should be wide enough to prevent “hunting” of the actuator but as low as possible to give adequate response to changes in the error signal.

##### To Change from the Default Range:

Select “**NO**” to adjust the value between 1% and 50%, in 1% increments to suit the application.

#### 4.8.7 Offset

*Default = 4 mA/0 VDC*

No options are available. Select “**YES.**”

0 mA/0 V is available on all units shipped after 6/01/03.

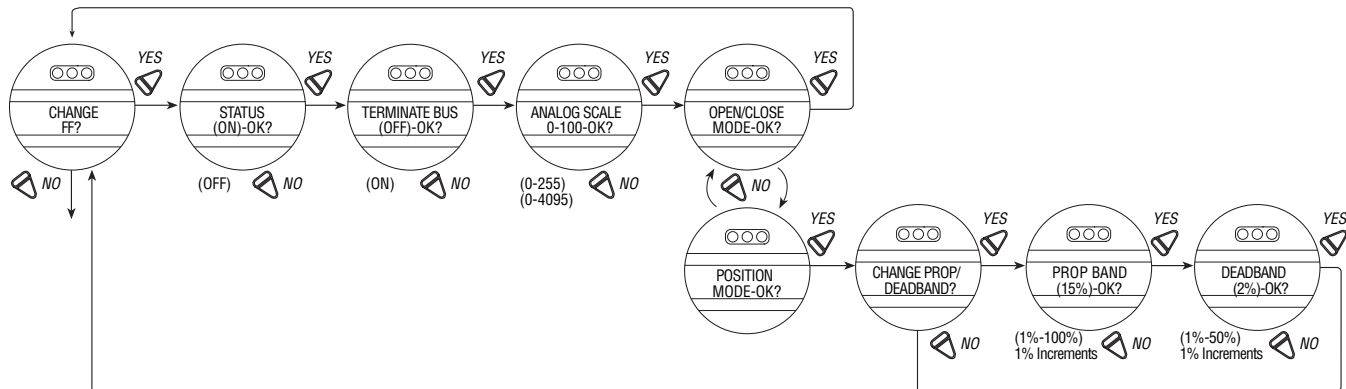
### 4.9 FF Option

FF option enables the actuator to be controlled by a Foundation Fieldbus communications signal. If the option has been purchased, it is automatically enabled. A Fieldbus System configuration tool must be used by the customer to set the FF address.

NOTE: If the FF option has not been purchased, the screens for changing FF will not be available. **To add the FF option, please consult Limitorque service at (434) 528-4400.**

The Modutronic option is not available with the FF option. FF is provided with “Move-To” feature. Consult factory for either option.

Figure 4.14 – FF



#### 4.9.1 Status

*Default = ON*

FF Status enables user to change from the default condition to turn on and off the digital control capability of the actuator.

#### 4.9.2 Terminate Bus

Should a user select to make this unique actuator the termination point for the network, select “**YES**.” If not, then “**NO**.” Default is “**NO**.”

#### 4.9.3 Analog Scale

*Default = 0-100*

Analog scale allows the user to change the scaling of the analog input from the default.

##### To Change from the Default Range:

Select “**NO**” until the required scale is displayed. 0-255 and 0-4095 counts are available.

#### 4.9.4 OPEN/CLOSE Mode

*Default = YES*

To select operation as typically “**OPEN**” or “**CLOSE**,” select “**YES**.” To select operation as position mode, select “**NO**.”

#### 4.9.5 Proportional Band

Proportional band is the range of errors between position and demand signal that will product reduced speed (pulsing).

*Default = 15%*

To change from default, select “**NO**” until the required value is displayed. The value is adjustable between 1% and 100%, in 1% increments.

#### 4.9.6 Deadband

*Default = 2%*

The deadband should be wide enough to prevent “hunting” of the actuator but as low as possible to give adequate response to changes in the error signal.

To change from default, select “**NO**” to adjust the value between 1% and 50%, in 1% increments to suit the application.

## 4.10 PB Option

PB option enables the actuator to be controlled by a Profibus communications signal. If the option has been purchased, it is automatically enabled. A Fieldbus System configuration tool must be used by the customer to set the PB address.

NOTE: If the PB option has not been purchased, the screens for changing PB will not be available. **To add the PB option, please consult Limitorque service at (434) 528-4400.**

The Modutronic option is not available with the PB option. PB is provided with “Move-To” position feature. Consult factory for either option.

Figure 4.15 – Profibus DP

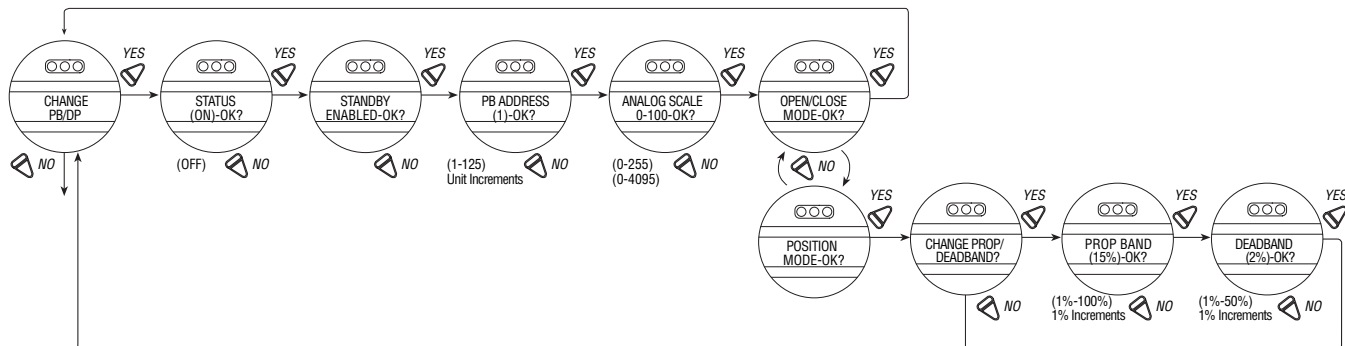
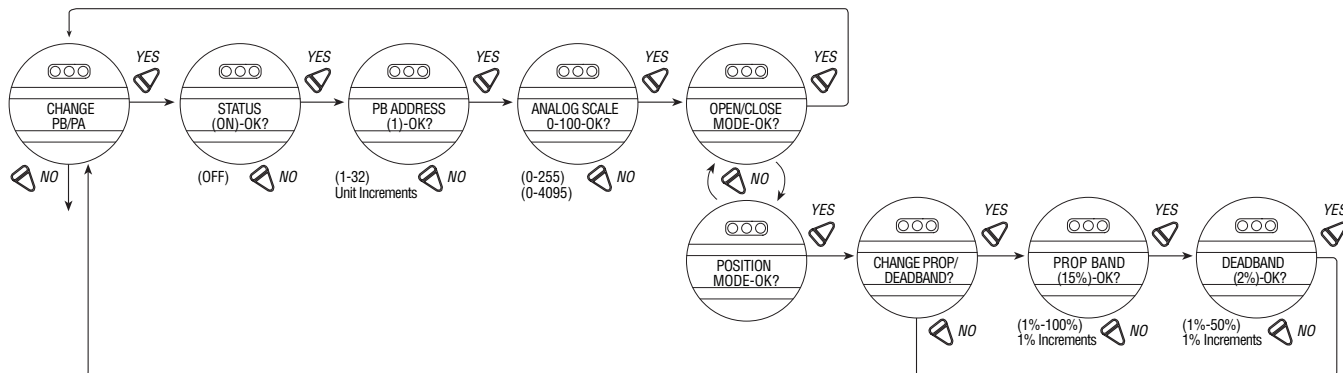


Figure 4.16 – Profibus PA



### 4.10.1 Status

Default = ON

PB Status enables user to change from the default condition to turn on and off the digital control capability of the actuator.

### 4.10.2 Standby

Default = YES (N/A Profibus PA)

To enable redundant switching capability, select “YES.” Network must be able to support this feature and the MX must be wired accordingly.

### 4.10.3 PB Address

*Default = 1*

Network address allows user to assign a unique network address to an actuator.

1. The network address must be entered in accordance with the Instrument Data Sheet, and care must be taken to ensure that the same address is not used anywhere else in the same network.
2. Select **"NO"** for small incremental changes or hold it continuously in that position for larger changes until the required value is displayed. The address may be set at any value between 001 and 125 (DP), or 01 and 32 (PA).

### 4.10.4 Analog Scale

*Default = 0-100*

Analog scale allows the user to change the scaling of the analog input from the default.

#### To Change from the Default Range:

Select **"NO"** until the required scale is displayed. 0-255 and 0-4095 counts are available.

### 4.10.5 OPEN/CLOSE Mode

*Default = YES*

To select operation as typically **"OPEN"** or **"CLOSE,"** select **"YES."** To select operation as position mode, select **"NO."**

### 4.10.6 Proportional Band

Proportional band is the range of errors between position and demand signal that will product reduced speed (pulsing).

*Default = 15%*

To change from default, select **"NO"** until the required value is displayed. The value is adjustable between 1% and 100%, in 1% increments.

### 4.10.7 Deadband

*Default = 2%*

The deadband should be wide enough to prevent "hunting" of the actuator but as low as possible to give adequate response to changes in the error signal.

To change from default, select **"NO"** to adjust the value between 1% and 50%, in 1% increments to suit the application.

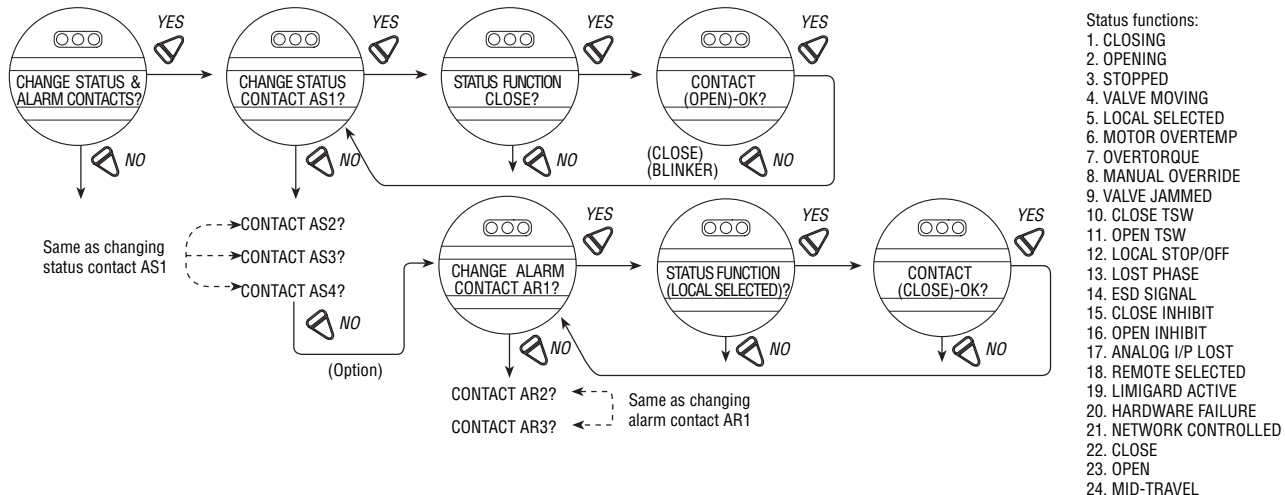
## 4.11 Status and Alarm Contacts

The status and alarm contacts permit wiring to existing contacts for visibility of operation or fault conditions. (See wiring diagram for contact ratings.)

The status contacts (AS) and optional alarm contacts (AR) may be configured to have any one of the following functions:

- **“CLOSING”** – valve closing
- **“OPENING”** – valve opening
- **“STOPPED”** – valve stopped in mid-travel
- **“VALVE MOVING”** – either direction
- **“LOCAL SELECTED”** – red selector knob in **“LOCAL”**
- **“MOTOR OVERTEMP”** – thermistor range exceeded
- **“OVERTORQUE”** – torque exceeded in mid-travel
- **“MANUAL OVERRIDE”** – actuator moved by handwheel
- **“VALVE JAMMED”** – valve can’t move
- **“CLOSE TORQUE SW”** – torque switch trip at **“CLOSED”**
- **“OPEN TORQUE SW”** – torque switch trip at **“OPEN”**
- **“LOCAL STOP/OFF”** – red selector knob at **“STOP”**
- **“LOST PHASE”** – one or more of three phases lost
- **“ESD SIGNAL”** – signal active
- **“CLOSE INHIBIT”** – close inhibit signal active
- **“OPEN INHIBIT”** – open inhibit signal active
- **“ANALOG IP LOST”** – 4-20 mA not present
- **“REMOTE SELECTED”** – red selector in **“REMOTE”**
- **“LIMIGARD ACTIVE”** – (future—LimiGard™ functionality is not affected)
- **“HARDWARE FAILURE”** – indication
- **“NETWORK CONTROLLED”** – permits relay control via DDC, FF, or other network driver
- **“CLOSE”** – valve closed **“(0% OPEN)”**
- **“OPEN”** – valve open **“(100% OPEN)”**
- **“MID-TRAVEL”** – valve position, 1-99% open

Figure 4.17 – Status and alarm contacts





#### 4.11.1 Status and Alarm Contact Default Settings

All actuators are supplied with the following status or alarm (optional) contact default factory settings:

##### Status Contacts

AS1 – Normally closed contact at valve fully Close

AS2 – Normally closed contact at valve fully Open

AS3 – Normally open contact at valve fully Close

AS4 – Normally open contact at valve fully Open

##### Alarm Contacts (Optional/requires I/O board)

AR1 – Normally closed contact when Motor Overtemp

AR2 – Normally closed contact when Remote Selected

AR3 – Normally open contact when Torque Overload

##### To change any of the default settings:

Select **“CHANGE STATUS & ALARM CONTACTS?”** from the **“SETUP”** routine.

Select **“YES”** to enter the **“SETUP”** routine for each individual contact. Select **“NO”** until the particular contact is referenced in the display, then **“YES”** to make the changes.

#### 4.11.2 Status Function

Toggle **“NO”** through the range of functions, as listed, until the desired feature is displayed.

#### 4.11.3 Contact

This mode allows the user to select the state of the contact when the function is active. Select **“NO”** to choose whether the contact is required to be normally closed, normally open, or blinker when the function is active. When “Blinker” has been selected, the contact will switch automatically between open and close (1 second open/1 second close).

#### 4.11.4 Valve Position

This display will appear only if the function **“MID-TRAVEL POSITION”** has been selected. Toggle **“NO”** until the display indicates the required value of percentage **“OPEN”** at which the contact should trip. If the contact has

been selected as normally closed, then it will close when the trip point has been reached, with the actuator moving in the open direction.

#### NOTES:

- Status contacts (AS) are latching type and will remain in their last set position in the event of a main power supply failure.
- Alarm contacts (AR) are non-latching type. They change state with power loss. Their default status, indicated on the last page, is with the power supply off.
- To ensure full status and alarm annunciation at all times, a 24 VDC supply may be connected to the auxiliary input terminals (37 and 38) on the terminal block.

## 4.12 Two-speed Timer (Optional)

The optional two-speed timer extends the operating time of the actuator, in the closing and/or the opening direction, by pulsing the motor ON and OFF. Pulsing may be applied to full valve travel or only a part of it. The ON and OFF pulse times are adjustable.

1. Select **“CHANGE 2-SPEED TIMERS?”**

2. Select **“YES”** to enter the **“CHANGE OPEN TIMER?”** routine.

3. If slow opening is required, select **“YES,”** otherwise select **“NO”** to move into the **“CHANGE CLOSE TIMER?”** routine.

### 4.12.1 Status

Select **“NO”** to switch the timer ON or OFF. If OFF, no further menus will be displayed.

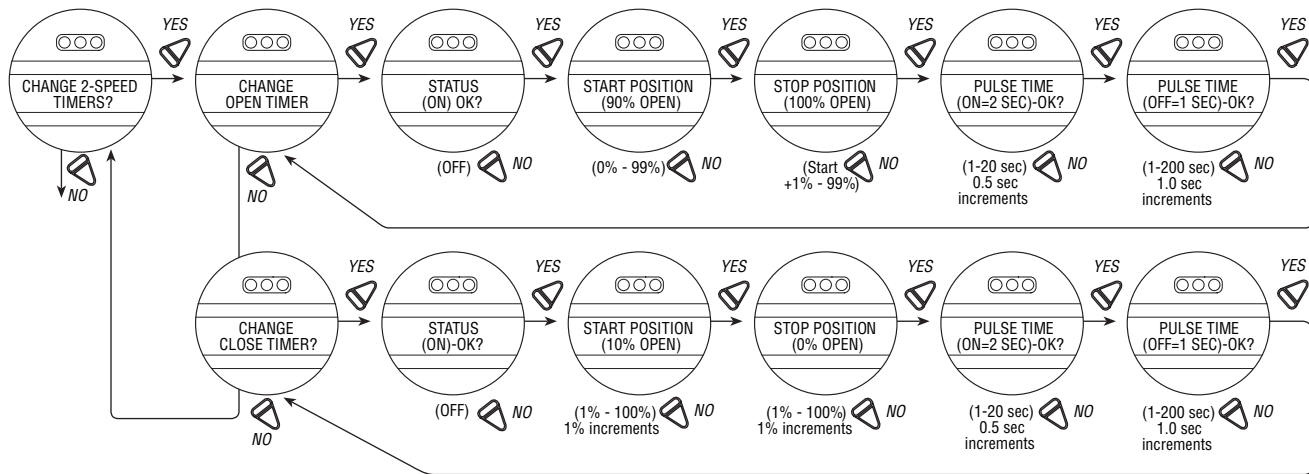
### 4.12.2 Start Position

If the Close or Open timer has been switched ON, pulsing will start when the set point is reached in the selected direction and the actuator will continue pulsing until the valve reaches the desired **“STOP”** position.

Select **“NO”** until the display indicates the required value of percentage OPEN at which the pulsing should start. Adjustable in 1% increments as listed:

Closing = 0% to 99%. Opening = 1% to 100%.

Figure 4.18 – Two-speed timers



### 4.12.3 Stop Position

If the Close or Open timer has been switched ON, pulsing will commence as the valve moves out of its close position and the actuator will continue pulsing until stopped at the set point.

Select “**NO**” until the display indicates the required value of percentage open at which the pulsing should stop. Adjustable in 1% increments as listed:

Closing = 0% to 99%. Opening = 1% to 100%.

### 4.12.4 Pulse Time – ON

This mode allows user to change the ON pulse time from the default setting.

*Default Setting = 2.0 Second*

Select “**NO**” until the required length of ON pulse is displayed. Adjustable between 1 and 20 seconds, in 0.5 second increments.

### 4.12.5 Pulse Time – OFF

This mode allows user to change the OFF pulse time from the default setting.

*Default Setting = 1 Second*

Select “**NO**” until the required length of OFF pulse is displayed. Adjustable between 1 and 200 seconds, in 1.0 second increments.

## 4.13 APT (Analog Position Transmitter) Polarity Option

The APT option provides a 4-20 mA feedback signal proportional to valve position. APT is connected at terminals 45 and 46 for 4-20 mA output. If a 0-10 VDC output is required, use terminals 45 and 47. Consult actuator wiring diagram for details.

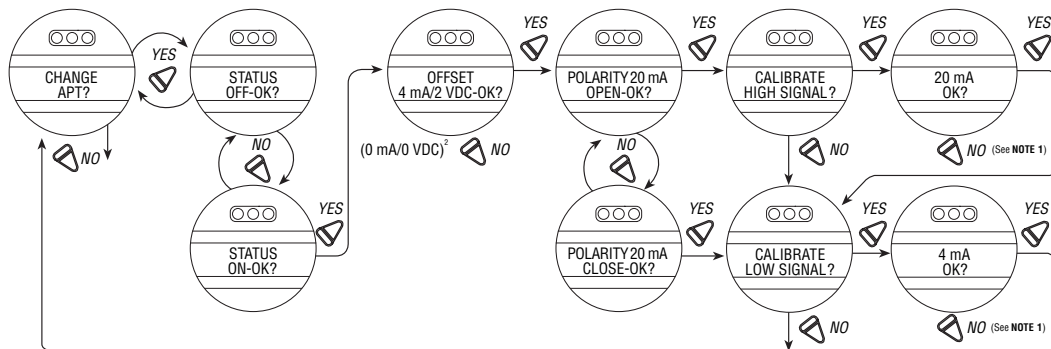
NOTE: If the APT option is turned ON but this option was not purchased, the display will show a hardware fault. An I/O board is required for this option. To purchase, please **contact Limitorque service coordinator at (434) 528-4400**.

During position limit calibration (see **Section 3.4.4, Setting Position Limits**) the APT is automatically calibrated to default settings: *Default = 20 mA OPEN, 4 mA CLOSE*.

### To Customize the Settings:

1. Select **"CHANGE APT?"** from the **"SETUP"** routine. Select **"YES."**
2. Select **"NO"** to select the APT status if OFF. If ON, select **"YES"** to enter the **"OFFSET"** display.
3. Select **"NO"** to select 0 mA/0 VDC<sup>2</sup>. Select **"YES"** to enter the **"POLARITY"** display.
4. Select **"NO"** to choose between:  
20 mA = OPEN  
or  
20 mA = CLOSE **OR**
5. Select **"NO"** to recalibrate new value (low end 3.4-4.5 mA; high end 19.5-21 mA) as shown on meter. New value will not be shown on display.

Figure 4.19 – APT polarity



**NOTE 1:** Depress **"NO"** to recalibrate new value (low end 3.5–4.5 mA; high end 19.5–21 mA) as shown on meter. New value will not be shown on display.

**NOTE 2:** 0 mA/0 VDC is available on units shipped after 6/01/03.

## 4.14 ATT (Torque Transmitter) Polarity Option

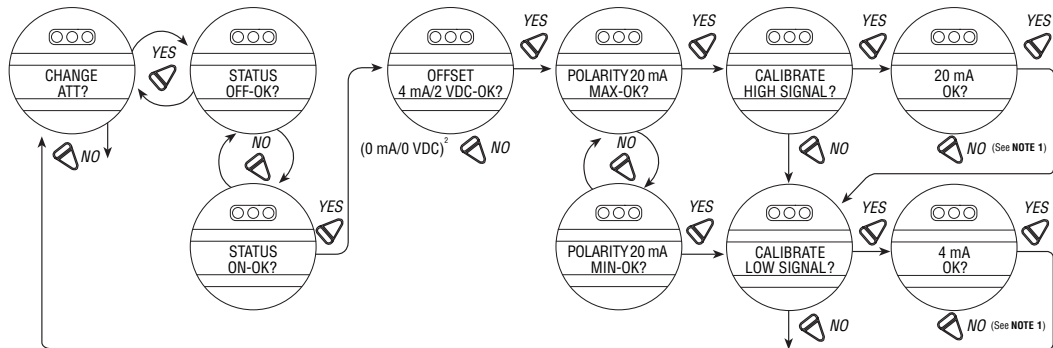
The ATT option provides a 4-20 mA signal proportional to actuator output torque and is for reference only. The signal range is from approximately 40% of rated torque to approximately 100% rated torque. This option is connected at terminals 49 and 50 for 4-20 mA output. If a 0-10 VDC output is required, use terminals 49 and 48. Consult the actuator wiring diagram for details.

NOTE: If the ATT option is turned ON but this option was not purchased, the display will show a hardware fault. An I/O board is required for this option. To purchase, please **contact Limitorque service coordinator at (434) 528-4400**. *Default = 20 mA corresponds to maximum torque; 4 mA corresponds to minimum torque.*

### To Customize the Settings:

1. Select **"CHANGE ATT?"** from the **"SETUP"** routine, then **"YES"** to select ATT status as **"ON"** or **"OFF."**
2. If **"ON"** enter OFFSET display. Select **"NO"** to change to 0 mA/0 VDC.
3. Then **"YES"** to enter the **"POLARITY"** display. Select **"NO"** to choose between:  
20 mA = MAXIMUM TORQUE  
**or**  
20 mA = MINIMUM TORQUE **OR**
4. Select **"NO"** to recalibrate new value (low end 3.4-4.5 mA; high end 19.5-21 mA) as shown on meter. New value will not be shown on display.

**Figure 4.20 – ATT polarity**



**NOTE 1:** Depress “**NO**” to recalibrate new value (low end 3.5–4.5 mA; high end 19.5–21 mA) as shown on meter. New value will not be shown on display.

**NOTE 2:** 0 mA/0 VDC is available on units shipped after 6/01/03.

## 4.15 Remote Control

The actuator may be controlled remotely by two, three, or four wires, depending on the connections made in the terminal compartment of the actuator. Configuration is required during actuator setup.

This setting allows the user to change the mode of remote control from the default setting:

*Default = Three-wire Maintain Control*

1. Select **"CHANGE REMOTE CONTROL?"** from the **"SETUP"** routine.
2. Select **"YES"** to enter the display that indicates the type of remote control selected.
3. Select **"NO"** until the required control is displayed. The selections available are:
  - **Three-wire Maintain Control (default except Modutronic)**  
Requires two momentary contacts for self-maintained control in OPEN or CLOSE direction. (Momentary reverse signal of <1 second duration using the black knob may be used to STOP valve. A duration of >1 second using the black knob will reverse direction.)

- **Three-wire Inching Control**

Requires two "push-to-run" contacts to OPEN or CLOSE the valve, or STOP it in mid-travel.

- **Two-wire Control <sup>1</sup>**

Requires one NO or NC contact. Select **"YES"** for either.

Valve OPENS if signal **"ON."**

**or**

Valve OPENS if signal **"OFF."**

- **Four-wire Control**

Requires three momentary contacts for self-maintained control in OPEN or CLOSE direction, and mid-travel STOP.

- **User Inputs (default Modutronic)**

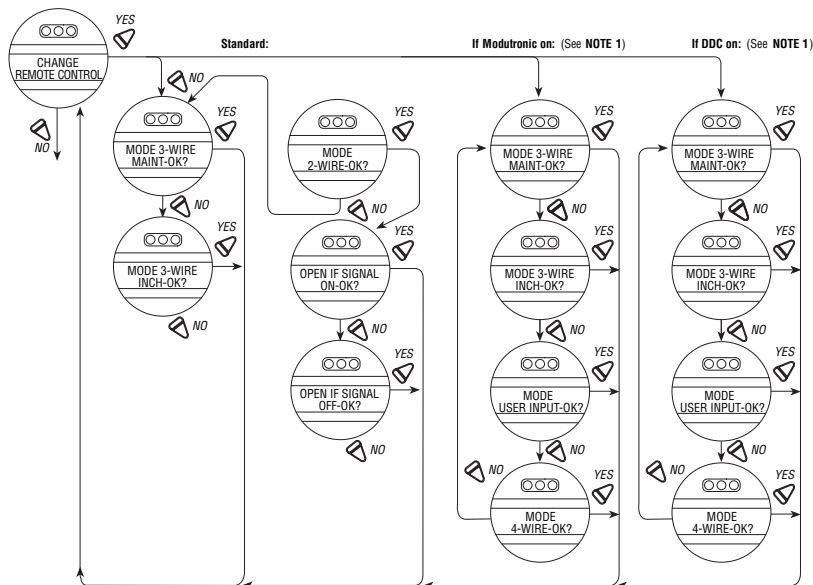
Available in **"DDC"** mode only to provide network status of external volt-free contacts.

4. Select **"YES"** to exit.

NOTE 1: Not available when Modutronic, DDC control or FF control has been software enabled.



Figure 4.21 – Remote control



**NOTE 1:** Two-wire control not permitted.

## 4.16 Local Control

“**LOCAL CONTROL**” mode changes how the local control switches and display are used from the default settings.

*Default = Maintain Mode*

- Maintain mode: the unit will operate continually in either direction when the black knob is actuated and released, until the position of the black knob is changed or the red knob is changed from “**LOCAL**” to either “**STOP**” or “**REMOTE**.”
- Inching mode: the unit will operate only when the black knob is held in the open or close position. If the black knob is released, the unit will stop.

### To Customize the Settings:

1. Select “**CHANGE LOCAL CONTROL?**” from the “**SETUP**” routine.
2. Select “**YES**” to enter the mode display.
3. Select “**NO**” to change from Maintain to Inching control.

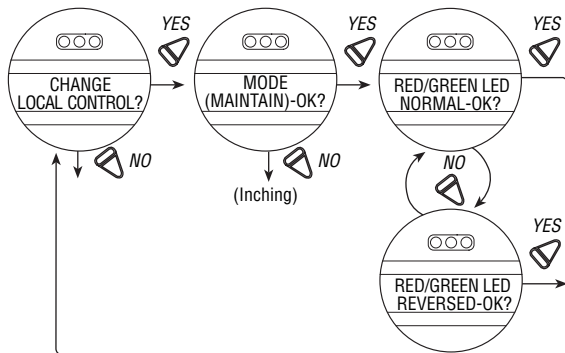
### 4.16.1 LED Customization

This selection allows the customer to change the colors of the LED in open and close mode from the default setting.

*Default = Red-Open/Green-Close*

1. After mode selection, select “**YES**” to change the colors of the LEDs.
2. Select “**NO**” to change from the default to Red-Close/Green-Open.

Figure 4.22 – Local control



## 4.17 ESD (Emergency Shutdown)

An external contact may be used to place the actuator in emergency shutdown mode. An ESD contact may be connected to the actuator to override existing command signals and send the valve to a predetermined position.

### 4.17.1 Status

*Default Setting is: OFF*

**To Change from the Default Setting:**

Select **"NO"** to switch ESD to **"ON."**

NOTE: It is possible to disable ESD while the status is ON by not wiring to the ESD terminal. Consult wiring diagram for details.

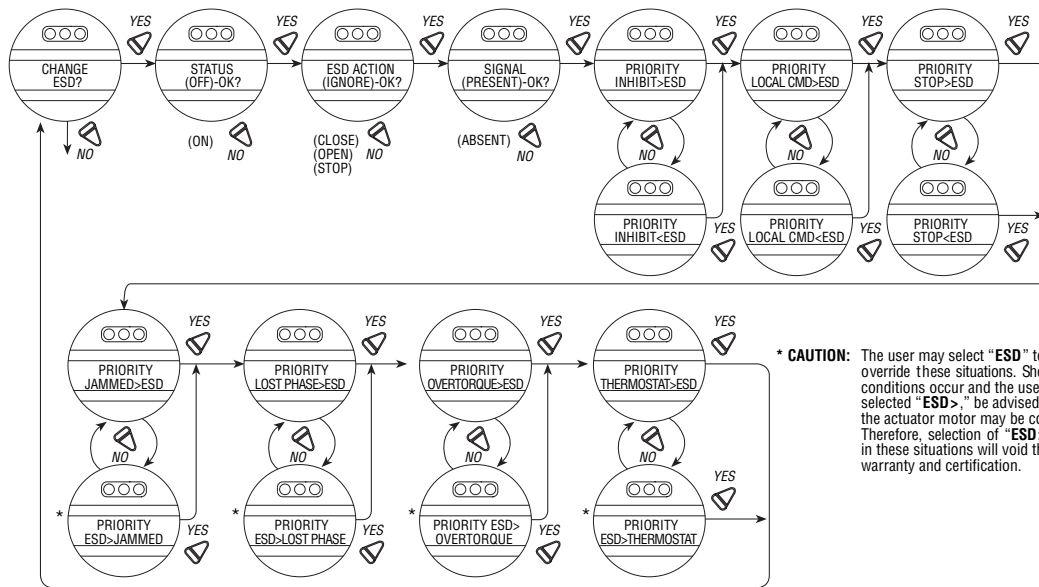
### 4.17.2 ESD Action

*Default Setting is: IGNORE*

**To Change the Setting:**

1. Select **"NO"** to review actuator actions on receipt of an ESD signal.  
Options are: **"CLOSE," "OPEN," "STOP,"** or **"IGNORE."**
2. Select **"YES"** to choose the desired command.

Figure 4.23 – ESD



**\* CAUTION:** The user may select “ESD” to override these situations. Should these conditions occur and the user has selected “ESD,” be advised that the actuator motor may be compromised. Therefore, selection of “ESD” in these situations will void the warranty and certification.

### 4.17.3 Signal

*Default Setting is: PRESENT*

#### To Customize the Setting:

Select “**NO**” to change whether the ESD action should take place when the signal is “**PRESENT**” or “**ABSENT**” from the terminals.

### 4.17.4 ESD Override

It may be desirable that ESD override other events. These events are selectable. The “>” symbol after ESD indicates that ESD will override that particular event. **Sections 4.18 - 4.24, Inhibits through Motor Thermostat** list the choices.

### 4.17.5 Inhibit

*Default = INHIBIT>ESD*

#### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>INHIBIT**” – ESD overrides active inhibit signal
- “**INHIBIT>ESD**” – Active inhibit signal will override ESD

NOTE: Removing the wires to these terminals can disable active inhibits.

### 4.17.6 Local Command

*Default = LOCAL>ESD*

#### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>LOCAL**” – ESD overrides local command to operate actuator
- “**LOCAL>ESD**” – Local command to operate actuator overrides ESD

### 4.17.7 Stop

*Default = STOP>ESD*

#### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>STOP**” – ESD overrides stop command
- “**STOP>ESD**” – Stop command overrides ESD

#### 4.17.8 Jammed Valve\*

*Default = JAMMED VALVE>ESD*

##### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>JAMMED VALVE**” – ESD overrides jammed valve indication
- “**JAMMED VALVE>ESD**” – Jammed valve indication overrides ESD (default)

\* See **CAUTION** on **Figure 4.23**.

#### 4.17.9 Lost Phase\*

*Default = LOST PHASE>ESD*

##### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>LOST PHASE**” – ESD overrides lost phase indication
- “**LOST PHASE>ESD**” – Lost phase indication overrides ESD

\* See **CAUTION** on **Figure 4.23**.

#### 4.17.10 Overtorque\*

*Default = OVERTORQUE>ESD*

##### To Customize the Settings:

Select “**NO**” to choose:

- “**ESD>OVERTORQUE**” – ESD overrides overtorque situation
- “**OVERTORQUE>ESD**” – Overtorque situation overrides ESD

\* See **CAUTION** on **Figure 4.23**.

#### 4.17.11 Motor Thermostat

*Default = ENABLED*

##### To Customize the Settings:

Select “**NO**” to choose:

- “**ENABLED**”
- “**DISABLED**”

NOTE: Disabling the motor thermostat voids all third party certifications including Factory Mutual, CSA, SAA, and CENELEC. Disabling the motor thermostat removes protection from overheating the motor and may cause unsafe conditions.

## 4.18 Inhibits

To inhibit operation of the actuator in the Open and/or the Close direction, connect a contact to the inhibit terminals. To customize setting:

1. Select **"CHANGE INHIBITS?"** from the **"SETUP"** routine.
2. Select **"YES"** to enter the **"CHANGE OPEN INHIBIT?"** display.
3. Select **"YES"** again to configure any changes or **"NO"** to enter the **"CHANGE CLOSE INHIBIT?"**, depending on the requirements of the application.

### 4.18.1 Status

*Default Setting is: OFF*

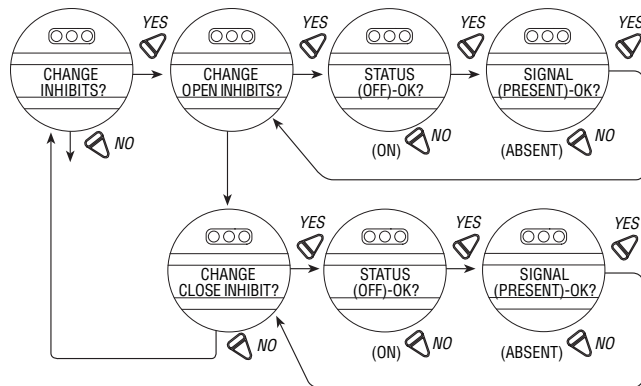
Select **"NO"** to choose whether the inhibit is **"ON"** or **"OFF."**

### 4.18.2 Signal

*Default Setting is: PRESENT*

Select **"NO"** to choose whether the inhibit should be active when the signal is **"PRESENT"** or **"ABSENT"** from the terminals. Consult wiring diagram for connection details.

Figure 4.24 – Inhibits



## 4.19 Monitor Relay

The monitor relay indicates the actuator is available for remote operation. The monitor relay will de-energize on loss of power or if any of the following functions become active:

### • Normal operation

“**LOCAL STOP/OFF**” – Red selector knob in “**STOP/OFF**”

“**LOCAL SELECTED**” – Red selector knob in “**LOCAL**”

### • Fault indication

“**LOST PHASE**” – Single phasing

“**VALVE JAMMED**” – Valve cannot move

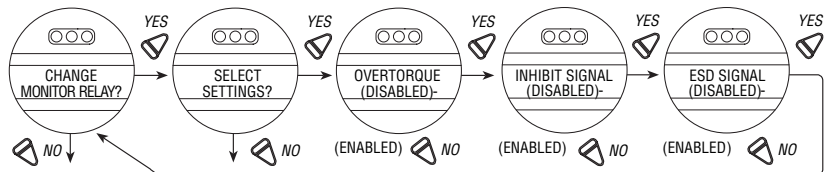
“**MOTOR OVERTEMP**” – Thermistor range exceeded

The yellow LED will blink when monitor relay is de-energized.

These functions are monitored continuously and may not be changed, but an additional three functions may be configured individually during setup.

1. Select “**CHANGE MONITOR RELAY?**” from the “**SETUP**” routine.
2. Select “**YES**” to enter the “**SELECT SETTINGS?**” display. Select “**YES**” to access each of the following three functions:
  - “**OVERTORQUE**” – Torque range exceeded in mid-travel, thermistor temperature exceeded, or malfunction in thermistor
  - “**INHIBIT SIGNAL**” – Inhibit “**ON**” and active
  - “**ESD SIGNAL**” – ESD “**ON**” and active
3. Select “**NO**” to:
  - “**ENABLE**” – will trip monitor relay **or**
  - “**DISABLE**” – will not trip monitor relay.

Figure 4.25 – Monitor relay





## 4.20 Diagnostic Reset

For diagnostic purposes the following parameters are recorded at certain points in the valve travel on every opening and closing stroke:

- Proportional measurements of torque
- Drive sleeve turns
- Contactor operations
- Maximum and minimum voltage
- Motor run time
- Stroke time

To enable the new values to be compared with previous measurements, it is essential to record reference values. Limitorque recommends this be done after the valve has been installed, commissioned, and is operating under normal process conditions, and after a plant shutdown or actuator/valve overhaul. The user may select to reset the torque profile at any time.

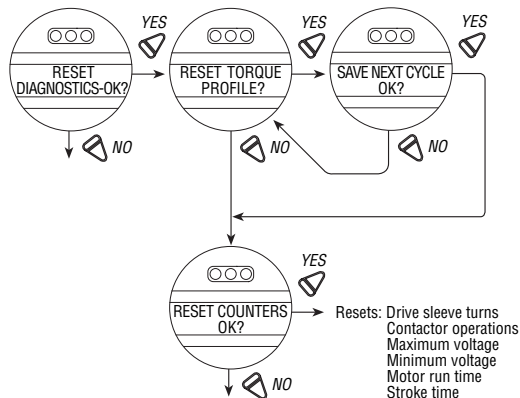
1. Select **"RESET TORQUE PROFILE?"** from the **"RESET DIAGNOSTICS"** routine.
2. Select **"YES"** to enter the **"SAVE NEXT CYCLE?"** display.

3. Select **"NO"** to switch the reset ON or OFF.

After the next complete cycling of the valve, in both the open and close directions, this reset will automatically be switched OFF.

4. Select **"RESET COUNTERS"** to reset all the listed parameters to "0."

Figure 4.26 – Diagnostic reset



## 4.21 TAG Number

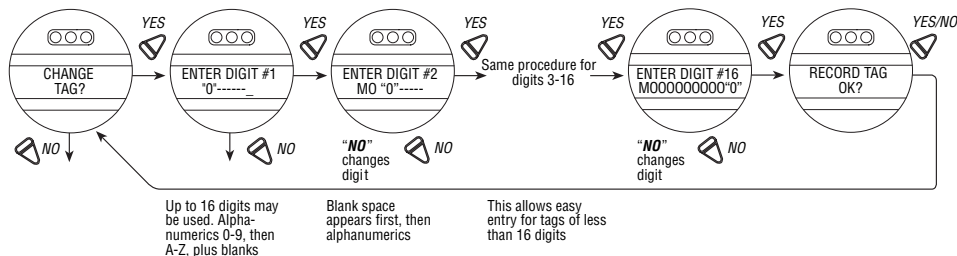
Defaults to blanks.

### To Customize the Setting:

1. Select **"CHANGE TAG?"** from the **"SETUP"** routine.
2. Select **"YES"** to enter the **"ENTER DIGIT"** displays.
3. Select **"NO"** to choose the required number or letter for each digit of the valve tag number, up to a maximum number of 16 digits.

The alphanumeric display scrolls from a symbol set, numerals and then A-Z in the following order: ! " # \$ % @ ' ( ) \* + , - . / 0-9 : ; < = > ? A-Z. There is one blank at each end to enable a tag number with less than 16 digits to be entered clearly. To highlight the digit being entered, a dot appears over the space and the letter above the space disappears.

Figure 4.27 – TAG number

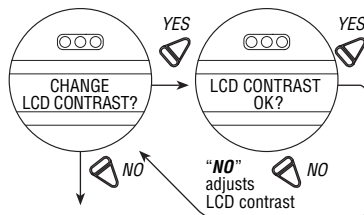


## 4.22 LCD Contrast

Permits adjustment of the viewing contrast of the LCD.

1. Select **"YES"** to enter the **"LCD CONTRAST"** display.
2. Select **"NO"** to adjust contrast to desired level.

Figure 4.28 – LCD contrast

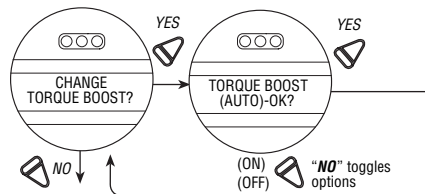


## 4.23 Torque Boost

Default = **"AUTO"**

Torque boost increases the capacity to move valves under conditions of low temperature or extreme valve stiffness. In the default setting, the MX will permit more output torque up to the unit's maximum torque rating when the temperature falls below 32°F (0°C). When configured as ON, torque boost will be present under all conditions regardless of temperature, and when OFF, torque boost will not be present.

Figure 4.29 – Torque boost



## 4.24 Motor Thermostat

If the unit is not explosionproof (XP), the thermostat setting may be customized:

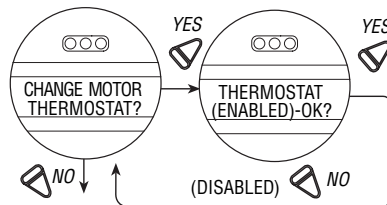
1. Select **"CHANGE THERMOSTAT?"** from the **"SETUP"** routine.
2. Select **"YES"** to enter the **"MOTOR THERMOSTAT"** display.
3. Select **"NO"** to choose between **"ENABLED"** and **"DISABLED."**

In the **"DISABLED"** mode, the motor thermostat is bypassed and detection of an overheated motor does not prevent operation of the actuator. This feature is user-selected when required by the application and may be desirable during critical service.

**NOTE:** If the motor thermostat is disabled, third party certification including Factory Mutual, CSA, SAA, CENELEC, and warranty, will be voided.

Figure 4.30 – Motor thermostat

If unit is not XP



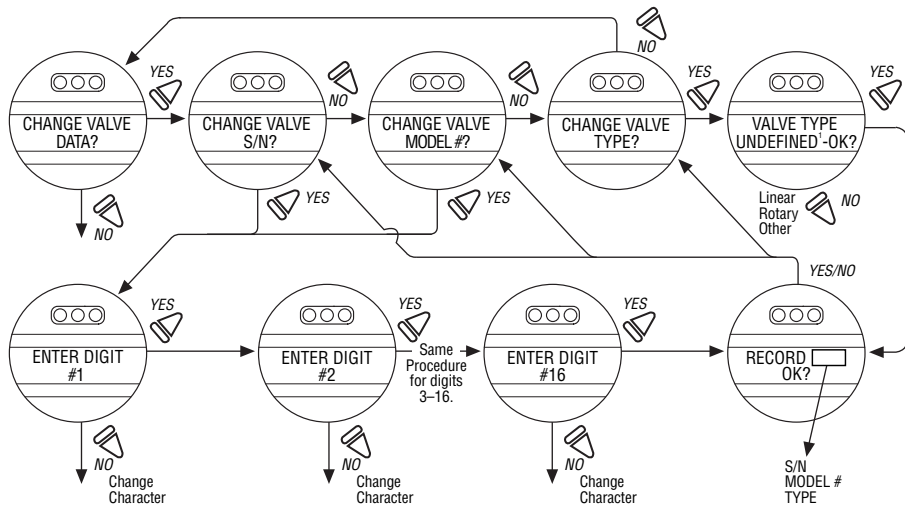
## 4.25 Change Valve Data

“Change Valve Data” allows the user to identify the type of valve the MX actuator is mounted to.

- If **“YES”** then **“CHANGE VALVE S/N?”** Select **“YES”** to **“ENTER DIGIT”** displays.
- Select **“NO”** to choose the required number or letter for each digit of the valve S/N, up to a maximum of 16 digits.
- Select **“YES”** when the desired number or letter is displayed.
- Follow same sequence for **“CHANGE VALVE MODEL #?”**, **“CHANGE VALVE TYPE?”**
- If **“YES”** to **“CHANGE VALVE TYPE?”** then **“VALVE TYPE UNDEFINED-OK?”** is displayed. **“VALVE TYPE UNDEFINED-OK?”** is only shown until the valve type is chosen. In the rare event that the user would need to **“REINITIALIZE”** the MX actuator, the screen will reappear. See

**Figure 5.1.**

The alphanumeric display scrolls from a symbol set, numerals and then A-Z in the following order: ! " # \$ % & ' ( ) \* + , - . / 0-9 : ; < = > @ A-Z. There is one blank at each end to enable a tag number with less than 16 digits to be entered clearly. To highlight the digit being entered, a dot appears over the space and the letter above the space disappears.



**NOTE 1:** Valve type "UNDEFINED" is only shown until the valve type is chosen. After that, it will not be displayed again unless Reinitialized.

## 5 Troubleshooting

**▲ WARNING:** This actuator is non-intrusive. Do not open the control compartment on the actuator unless absolutely necessary. It was sealed in dry, clean conditions in the factory and entry to this compartment should not be necessary. Unauthorized entry could void the warranty.

If the actuator will not operate, before attempting to troubleshoot, verify the following:

- LCD display reads “XX% OPEN,” “STATUS OK.”
- Red selector switch is not in the STOP position.
- All three phases of the main power supply are present at the actuator terminals.
- The supply voltage is the same as that stated on the actuator nameplate.
- 110 VAC is measured at terminals 11 and 12.
- 24 VDC is measured at terminals 13 (+Ve) and 14.

- If 24 VDC power supply is ON, check that the loading does not exceed 5 W across terminals 13 and 14 (remove wires from 11, 12, 13, and 14).
- LCD and LED display on the control panel are illuminated.

If these checks are satisfactory, then attempt to locate the fault using the “**VIEW DIAGNOSTICS**” routine. It is also recommended that the actuator settings be verified using “**VIEW SETTINGS**.”

### 5.1 View Diagnostics Routine

1. Enter “**VIEW DIAGNOSTICS**” as detailed in **Section 5.3, View Diagnostics**.
2. Review the various displays to try to find the reason the actuator will not operate. The displays that may help to isolate the fault are as follows:
  - View Hardware Status
  - View Motor Status
  - View Power Supply

## 5.2 Troubleshooting Problems/ Corrective Action

(Refer to **Bulletin 130-12000, MX Maintenance and Spare Parts** and the standard wiring diagram in the **Section 3.3, Electrical Connections**). We recommend that only Limitorque service personnel perform this operation.

1. Switch off the main power supply and 24 VDC supply at terminals 37 and 38 (if used).
2. Remove control compartment cover (ACP) and protect against the ingress of moisture or dust.
3. Remove any wiring that has been connected to terminals 11, 12, 13, and 14.
4. Switch on main power supply.
5. Measure VAC at 11, 12 – should be 110 VAC. If no power, check fuses FS1, FS2 (600 VAC, 1 A, fast acting, 10.3 x 38.1 mm tube) and FS3 (250 VAC, 0.1A, time delay, 5 x 20 mm glass tube) and replace if necessary. If replacing fuses does not fix the problem, replace damaged board. **Contact Limitorque Service at (434) 528-4400.**
6. Measure VDC at 13, 14 – should be 5 W at 24 VDC. If not, replace damaged board.

7. Replace the control compartment cover (ACP).

### 5.2.1 Actuator Fails to Operate

#### Actuator Fails to Operate from LOCAL Controls

1. Place the red selector knob in “**LOCAL**.”
2. If motor runs but actuator output does not turn, check that declutch lever has returned to motor operation position. See **Section 2.1.2, Electrical Operation Feature**.
3. Check LCD display for following alarms:
  - If motor runs but no actuator movement is detected, check if the display says “**JAMMED VALVE**” and free if necessary.
  - Inhibit signal may be present or absent at the terminals. Check for signal and adjust as necessary. “**INHIBIT ACTIVE**” appears on display.
  - Thermal overload of the motor may have been detected. Check motor for high temperature. Thermal overload is self-resetting when motor cools. “**MOTOR OVERTEMP**” appears on the display.
4. Check to see if the position limits are set incorrectly on top of one another. See **Section 3.4.4, Setting Position Limits**.
5. Check to see if the reversing contact is plugged in correctly.



### Actuator Fails to Operate from REMOTE Controls

1. Check that the actuator will operate from “**LOCAL**.” If not, then carry out the checks described below.
2. Check that the red knob is in “**REMOTE**.”
3. ESD signal may be present or absent at the terminals. Check for signal and adjust as necessary. (“**ESD ACTIVE**” at display.) If actuator previously operated in “**LOCAL**,” then the fault is probably in the remote control circuit. Check the integrity of the cabling and that the connections to the terminals are in accordance with the wiring diagram. If motor runs in “**LOCAL**,” but not “**REMOTE**,” adjust ESD to be greater than local.
4. Confirm correct monitor relay operation. See **Table 3.6**.

### 5.2.2 Jammed Valve Detected

1. Check that position limits have been set correctly. If valve is position-seated, the limits should stop the motor just before the end-of-travel. Recalibrate the position limits if necessary. See **Section 3.4.4, Setting Position Limits**.
2. Check that torque settings are correct for the valve. Recalibrate if necessary. See **Section 4.5, Torque Setup**.

3. Check the condition of the valve and lubrication of the valve stem and thrust bearings. The valve may have remained in the same position for a long time and become corroded internally or externally. Engage manual override and employ the handwheel drive to unseat the valve.
4. Verify that the actuator will now operate the valve. Open and close the valve a few times to check for correct operation throughout the travel.

NOTE: To free a jammed valve from the “**CLOSE**” or “**OPEN**” position, engage manual override and attempt to unseat it using the handwheel drive. If a rising stem valve is jammed in the close position, loosen the fixing bolts that attach the thrust base to the valve. This will release the compression in the drive components and reduce the effort to unjam the valve. Partly open the valve, then retighten the bolts.

### 5.2.3 Actuator Operates but Does Not Drive Valve

1. Verify that the declutch lever has returned to motor-operated position.
2. Verify that the stem nut is fitted correctly in the actuator base.
3. Verify that the stem nut has sufficient engagement with the valve stem.
4. Verify that the key is fitted in bore/keyway applications.

### 5.2.4 Valve Does Not Seat Correctly

1. Verify that any mechanical stops on quarter-turn gearboxes are correctly set.
2. Verify that position limits are calibrated correctly for the valve travel.
3. Verify that the torque-seating valves have been configured to close on torque, not position.
4. Verify that closing torque value has been set high enough to suit the process conditions.
5. Verify that the valve is not obstructed.

### 5.2.5 Status Messages

Normal display status is listed in **Section 3.5.5, Local Indication**. Status or alarm messages are listed below. Once a status or alarm condition occurs, the message will be displayed on the bottom line of the LCS screen until the condition is addressed and cleared. If multiple status or alarm conditions are active, the bottom display will cycle through each screen until the condition is addressed and cleared (one message per four seconds).

#### Status or Alarm Messages

- “---% **OPEN, STATUS OK**” – Normal display
- “---% **OPEN, VALVE JAMMED**” – Valve cannot start moving
- “---% **OPEN, LOST PHASE**” – One of three phases lost
- “---% **OPEN, MOTOR OVERTEMP**” – Thermistor range exceeded
- “---% **OPEN, OVERTORQUE**” – Torque exceeded in mid-travel
- “---% **OPEN, HARDWARE FAILURE**” – Indication
- “---% **OPEN, DDC OFF**” – DDC enabled, but “**OFF**”
- “---% **OPEN, ESD ACTIVE**” – ESD signal present
- “---% **OPEN, INHIBIT ACTIVE**” – Inhibit signal present
- “---% **OPEN, FF OFF**” – FF enabled but “**OFF**”
- “---% **OPEN, PB OFF**” – PB enabled but “**OFF**”

- “---% **OPEN, WARMING UP**” – Warm up delay active  
(cold temperature option)
- “---% **OPEN, NO ANALOG SIGNAL**” – 4-20 mA signal absent (Mod  
enabled, red selector switch in  
“**REMOTE**”)
- “---% **OPEN, DDC COM LOST**” – DDC enabled, signal absent
- “---% **OPEN, FF COM LOST**” – FF enabled, signal absent
- “**SET LIMITS**” – Normal display if red selector knob is in “**LOCAL**” or  
“**REMOTE**” and position limits have not been set
- “**INITIALIZE**” – “**INITIALIZE**” will be displayed if module has no actuator  
configuration. No operation will be permitted until  
initialization has been completed. Refer to “**ROM ERROR**”  
for routine on next page. See **Figure 5.1**.

### RAM Error

The MX processor continually checks RAM for memory corruption errors. If corruption is detected, the processor will force a reset to clear RAM. The LCD will temporarily display the following prior to this reset:

“**XX% OPEN**”  
“**RAM ERROR**”

After the reset, the display will read normally. Any momentary commands (DDC command, momentary pushbutton, etc.) that were not completely executed must be reissued.

### ROM Error

The MX processor continually checks EPROM for memory corruption errors. If corruption is detected, operation is disabled. If the selector switch is in “**LOCAL**” or “**REMOTE**,” the LCD will display the following:  
“**XX% OPEN**”

### “ROM ERROR”

When the selector is placed in “**STOP**,” the unit will require reinitialization and the LCD will display the following dialog:



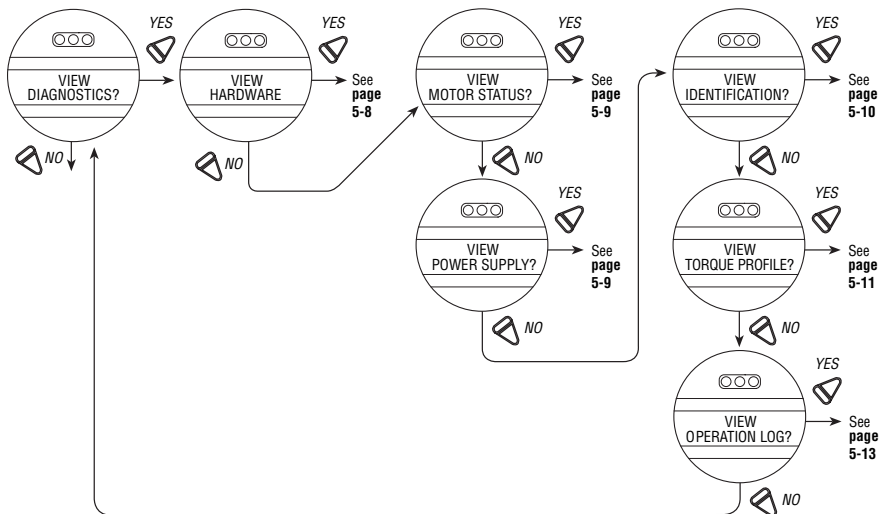
## 5.3 View Diagnostics

A large amount of historical data is stored in the actuator memory and can be retrieved very easily, without the need for password entry. The data is displayed in dialog format.

1. Enter the “**SETUP**” mode routine detailed in **Section 2.1.1, Entering the Setup Mode**.
2. Select “**VIEW DIAGNOSTICS?**”
3. Select “**YES**” to access the first display “**VIEW HARDWARE?**”

NOTE: It is recommended that ALL diagnostics information be recorded prior to contacting an authorized **Limitorque service coordinator at (434) 528-4400**. This information aids in diagnosing any problem the actuator may experience.

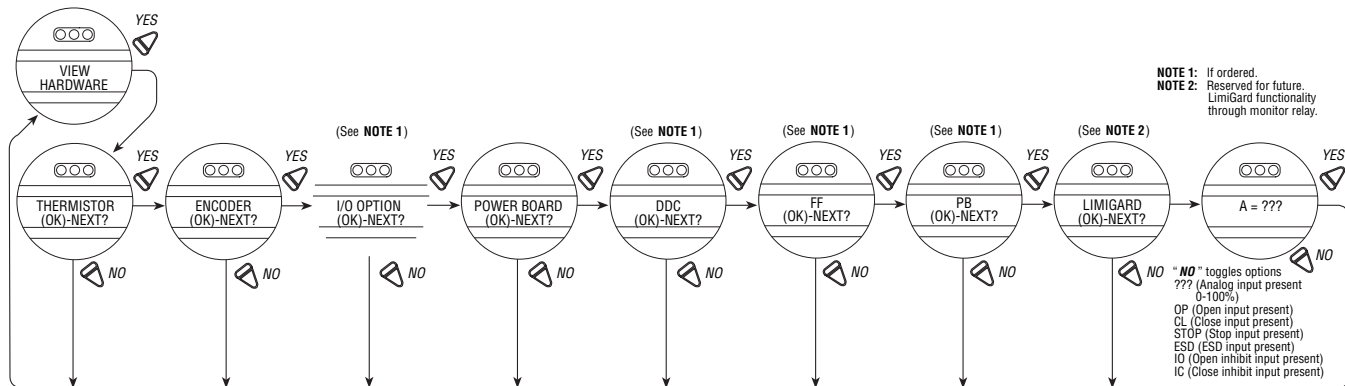
Figure 5.2 – Diagnostic overview



## 5.4 View Hardware Status

Accessing the “VIEW HARDWARE” routine will enable some of the actuator components to be reviewed for their integrity, as indicated below. These components are continuously being monitored.

Figure 5.3 – View hardware status

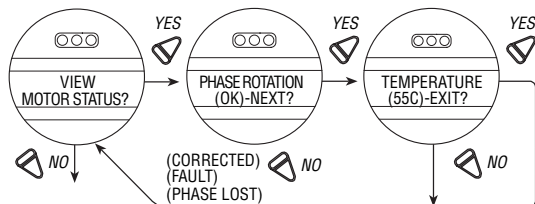


## 5.5 View Motor Status

Viewing “**MOTOR STATUS**” will provide information on the following:

- If the three-phase power supply is connected correctly.
- If autophase correction is in operation.
- If there is a fault or loss of a phase.
- Temperature of the windings in the motor.

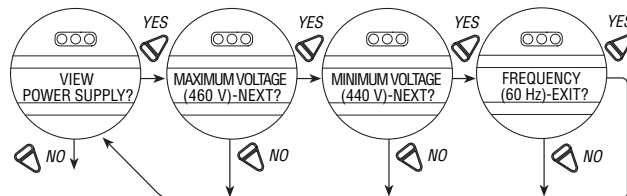
Figure 5.4 – View motor status



## 5.6 View Power Supply

Viewing “**POWER SUPPLY**” will provide historical data on the maximum and minimum voltages that have been applied to the actuator, as well as the frequency of the AC supply. These can be reset. See **Section 4.17, Diagnostic Reset**.

Figure 5.5 – View power supply

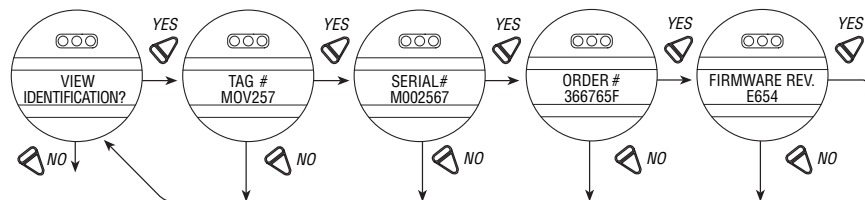


## 5.7 View Identification

In this dialog, the identity of the actuator may be reviewed. This dialog provides valuable information for the ordering of spare parts or checking the specification of the actuator.

NOTE: The serial number, order number, and software revision number were entered at the time of manufacture and cannot be changed on screen. The software revision number is necessary when option boards are ordered.

Figure 5.6 – View identification





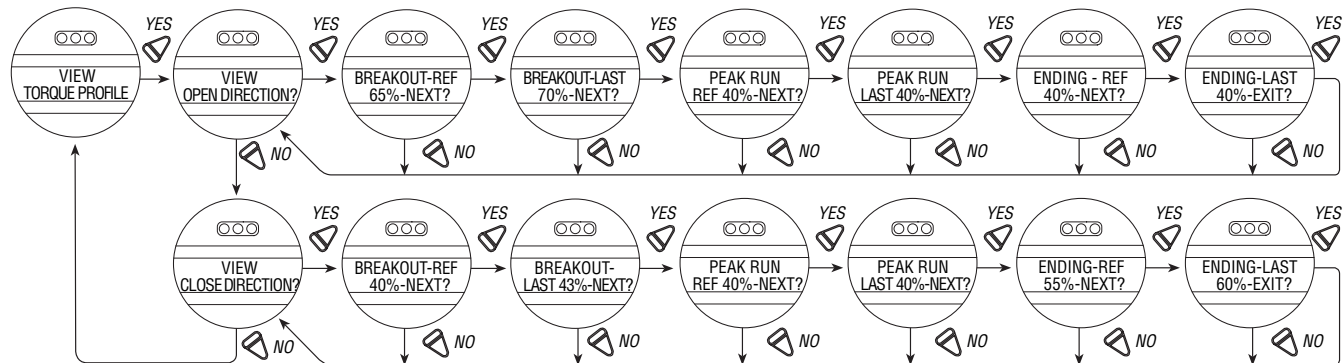
## 5.8 View Torque Profile

The information contained in the “**TORQUE PROFILE**” dialog provides indication of the condition of the valve relative to the last time that the “**DIAGNOSTIC RESET**” reference values were reset. See **Section 4.21, TAG Number**. It can give an indication of a change in the process conditions, such as an increase in pressure.

Details are given for the REFERENCE and the LAST torque, expressed as a percentage of the rated torque (stated on the nameplate, **Figure 4.7**) that occurred at BREAKOUT, ENDING, and PEAK RUNNING for both the opening and closing directions. Torque will be expressed proportionally as a reference only from 40% to 100% inclusive. Initial indication may read 0% until torque exceeds 40% minimum.

- “**BREAKOUT**” – Amount of torque required to unseat the valve.
- “**ENDING**” – Amount of torque required to seat the valve.
- “**PEAK RUNNING**” – Maximum torque detected while cycling from BREAKOUT to ENDING. (Maximum mid-travel torque.)

Figure 5.7 – View torque profile



## 5.9 View Operation Log

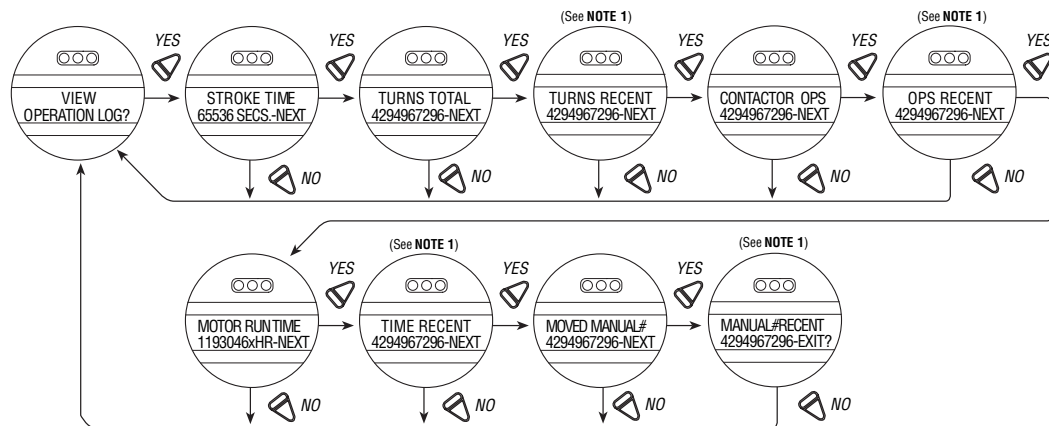
The “**OPERATION LOG**” provides information to assist in the maintenance program for the actuator because it indicates the total number of actuator turns, contactor operations, motor run time, and declutching operations since the actuator was manufactured. These figures may not be reset except in “**RESTRICTED SETUP**.” **Contact factory.**

The LCD screen definitions are as follows:

- “**STROKE TIME**” – Length of time of last actuator operation
- “**TURNS TOTAL**” – Total number of drive sleeve revolutions
- “**TURNS RECENT**” – Number of drive sleeve revolutions since last diagnostic reset. See **Section 4.20, Diagnostic Reset**, for reset diagnostics instructions.
- “**CONTACTOR OPS**” – Total number of contactor operations
- “**OPS RECENT**” – Number of contactor operations since last diagnostic reset. See **Section 4.20, Diagnostic Reset**, for reset diagnostics instructions.
- “**MOTOR RUN TIME**” – Total motor operational time

- “**TIME RECENT**” – Motor operational time since last diagnostic reset. See **Section 4.20, Diagnostic Reset**, for reset diagnostics instructions.
- “**MOVED MANUAL #**” – Total number of times unit has been operated manually
- “**MANUAL # RECENT**” – Number of times unit has been operated manually since last diagnostic reset. See **Section 4.20, Diagnostic Reset**, for reset diagnostics instructions.

Figure 5.8 – View operation log



**NOTE 1:** Resettable –  
See Section 4.20,  
Diagnostic Reset.

## 6 Maintenance

Under normal operating conditions, the MX is a maintenance-free actuator. For ordinary applications, the actuator will require no formal maintenance program. However, if the actuator is used under severe service conditions or operated in a *Hazardous Location*, the following maintenance procedures are required:

1. Check the oil level every 50 hours of operation at a minimum. Where conditions are severe due to frequent operation or high ambient temperatures, a more regular inspection interval should be maintained.
2. Change the gear oil every 100 hours of operation. See Section 6.1: Lubrication.
3. All ball bearings, oil seals, O-rings and quad-rings are to be replaced after 450 hours of operation. See Bulletin 130-12000, MX Maintenance and Spare Parts for disassembly procedures.

Clean and lubricate the valve stem regularly to avoid torque build-up and wear due to silting and corrosion. Infrequent operation can lead to corrosion and contamination of the valve stem thread lubricant. Check any thrust bearings that are fitted to the actuator for proper lubrication at regular intervals. For additional details refer to **Bulletin 130-12000, MX Maintenance and Spare Parts**.

### 6.1 Lubrication

MX actuators are oil-filled, as standard, using Mobil SHC 632. Exxon Teresstic SHP 320 may be used as a direct substitute. These products are synthetic machine oils suitable for ambient temperatures of -20°F to 250°F (-30°C to 120°C). For extreme low temperature conditions (< -30°C to -50°C), an alternative lubricant is available—Petro Canada Syngear 75W-90 with TOS. Consult factory for arctic temperature applications.

#### 6.1.1 Oil Capacities

To avoid pressurization of the gearcase, the following recommended oil capacities should not be exceeded:

- MX-05 – 10 oz. (256 ml)
- MX-10 – 21 oz. (.6 liters)
- MX-20 – 48 oz. (1.4 liters)
- MX-40 – 65 oz. (1.9 liters)
- MX-85 – 192 oz. (5.7 liters)
- MX-140 – 192 oz. (5.7 liters)

### **6.1.2 Checking Oil Level**

*To check the level:*

1. Remove the uppermost filler plug on the gearcase.
2. Check that the level of oil is within 1 inch (25 mm) of the hole (when actuator is mounted with base horizontal).

## 7 Regulatory Information

Declaration of Conformity

Application of Council Directive(s)

89/336/EEC; EMC Directive

98/37/EEC; Machinery Directive

Standard(s) to which Conformity is Declared

Machinery; EN 60204 EMC

EMC; EN 50081-1 & 2

Applicable Emissions Standards; EN 55011:1998

- Radiated emissions; EN 55011:1998 & FCC Part 15, subpart J
- Conducted emissions; EN 55011:1998 & FCC Part 15, subpart J

Applicable Immunity Standards;

IEC EN 61000-6-1:2001

- ESD; IEC 61000-4-1:1995
- Radiated RF Immunity; IEC 61000-4-3:1995
- Fast Transients and Bursts; IEC 61000-4-4:1995
- Voltage Surges; IEC 61000-4-5:1995
- Conducted RF Immunity; IEC 61000-4-6:1996

- Magnetic Field Immunity; IEC 61000-4-8:1993
- Voltage Dips and Interrupts; IEC 61000-4-11:1994

Manufacturer's Name

Limitorque

Manufacturer's Address

5114 Woodall Road  
Lynchburg, VA 24502

Importer's Name

Limitorque International

Importer's Address

Abex Road  
Newbury  
Berkshire, RG14 5EY  
England

Type and Description of Equipment

Valve Actuators

Model Number

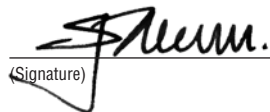
MX Series

Note

Tested with Limitorque products only

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

List as follows:



Stuart Medford

(Full Name)

Regional Director

(Title)

Newbury, England

(Place)

June 1, 2000

(Date)



## 7.1 Conditions for Safe Use - Atex/Cenelec Applications

Atex/Cenelec certification of the Accutronix MX product line is described in Certificate of Conformity SIRA No. 03ATEX1212X. This certificate details specific construction requirements that must be met in order to maintain the XP integrity of the actuator. The socket-head cap screws used with the MX electric valve actuators shall conform to the following requirements:

1. Socket-head cap screws to ISO Class 12.9 shall be used with all Group IIC devices.
2. K-500 Monel socket-head cap screws shall be permitted as an alternative to ISO Class 12.9 socket-head cap screws on all group IIB actuators.
3. A2 or A4 ISO Class 70 Stainless Steel socket-head cap screws shall be permitted as an alternative to ISO Class 12.9 socket-head cap screws or K-500 Monel socket-head cap screws for the motor cover of the Group IIB MX-85 actuators.







Limitorque Actuation Systems



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