



EIM CONTROLS

TEC2000

Installation & Operation Manual



Table of Contents

1	Important Notes	1-1
1.1.	Purpose.....	1-1
1.2.	User Safety.....	1-1
2	Quick Start	2-1
2.1.	Set Position Limits.....	2-1
2.2.	Network Setup.....	2-5
2.3.	Check Settings.....	2-5
3	Installation	3-1
3.1.	Preparing the Stem Nut.....	3-1
3.2.	Mechanical Installation onto the Valve.....	3-2
3.3.	Electrical Connections.....	3-2
3.3.1.	Remove Separate Terminal Chamber (STC) Cover.....	3-2
3.3.2.	Sealing Cable/Conduit Entries.....	3-3
3.3.3.	Recommended Terminal Connections.....	3-3
3.3.4.	Cable Connections.....	3-4
3.3.5.	Replace Terminal Compartment Cover.....	3-4
3.3.6.	External Earth Ground Connections.....	3-4
3.4.	Display Backup Module (DBM) – Optional.....	3-5
3.5.	Discrete Controlled Inputs.....	3-6
3.6.	Auxiliary Control Module (ACM) – Optional.....	3-6
3.6.1.	Wiring the ACM.....	3-7
3.6.2.	Analog Controlled – Power Supply Connections.....	3-10
3.6.3.	External Variable Frequency Drive Wiring.....	3-13
3.6.4.	Network Controlled.....	3-14
3.7.	Auxiliary Relay Module (ARM) Wiring.....	3-15
3.8.	Remote Display Module (RDM) Connection to the Actuator – Optional.....	3-16
3.8.1.	24Vdc Power Source.....	3-17
3.8.2.	115/230Vac Power Source.....	3-17
3.8.3.	Two RDMs (one 24Vdc and one 115/208/220/230 Vac power source).....	3-18
4	Operation	4-1
4.1.	Local Display Module (LDM).....	4-1
4.1.1.	Graphics Display and Message Center.....	4-2
4.1.2.	Control Knob and Selector Knob.....	4-2
4.1.3.	LEDs.....	4-3
4.1.4.	Normal Display Function.....	4-3
4.1.5.	Multi-Port Valve Status Display Functions.....	4-5
4.2.	Remote Display Module (RDM).....	4-5
4.2.1.	RDM Operation with LDM.....	4-5
4.3.	Infrared Controller (IRC) – “Clicker”.....	4-6
4.4.	Initializing the Actuator.....	4-7
4.4.1.	Setting Position Limits.....	4-7

4.4.2.	View Existing Settings.....	4-8
4.5.	Local Control Operation.....	4-11
4.5.1.	Multi-Port Valve Local Control Mode Operation.....	4-12
4.6.	Remote/Auto Control Operation.....	4-12
4.7.	Event Logger.....	4-14

5 Customizing Actuator Settings 5-2

5.1.	Entering Setup Mode.....	5-2
5.2.	Setting Limits.....	5-3
5.3.	Changing Display.....	5-3
5.4.	Transferring File Parameters.....	5-5
5.4.1.	Computer Requirements.....	5-6
5.4.2.	Installation.....	5-6
5.5.	Displaying Unit Parameters.....	5-7
5.6.	Change Settings.....	5-8
5.6.1.	Passcode Entry.....	5-10
5.6.2.	Valve Control Setup.....	5-10
5.6.3.	Set Valve Travel Limits.....	5-12
5.6.4.	Discrete Input Setup.....	5-14
5.6.5.	Discrete Output Setup.....	5-15
5.6.6.	Inhibit and ESD Setup.....	5-20
5.6.7.	Two-Speed Timer Setup.....	5-21
5.6.8.	Analog Setup (Futronic ACM Required).....	5-21
5.6.9.	Network Setup (CAM and Controlinc ACM Required).....	5-25
5.6.10.	Tag Name Setup.....	5-27
5.6.11.	Passcode Setup.....	5-28
5.6.12.	Reload Factory Settings.....	5-28

6 Troubleshooting 6-1

6.1.	Troubleshooting Problems/Corrective Action for Actuator Operation.....	6-1
6.2.	Display Diagnostics.....	6-3
6.2.1.	Display Alarm Log.....	6-4
6.2.2.	Display Torque Profile.....	6-6
6.2.3.	Display Torque Archive.....	6-6
6.2.4.	Display Operation Log.....	6-6
6.2.5.	Display Operation Archive.....	6-7
6.2.6.	Display Hardware.....	6-8

7 Maintenance 7-1

7.1.	Maintenance Schedule.....	7-1
7.2.	Lubrication.....	7-1
7.3.	Pressure Relief.....	7-1
7.4.	Fuse Replacement.....	7-1
7.5.	Battery Replacement – “Clicker”.....	7-2

8 Regulatory Information 8-1

Figures

Figure 2-1 Declutch Lever and Handwheel.....	2-2
Figure 2-2 Settings Limits – Quick Start	2-3
Figure 3-1 Preparing the Stem Nut	3-1
Figure 3-2 Removal of STC Cover	3-3
Figure 3-3 Power Terminal Connections	3-4
Figure 3-4 Control Terminal Connections.....	3-4
Figure 3-5 Earth/Ground Connection.....	3-5
Figure 3-6 ACM Wiring Connections.....	3-10
Figure 3-7 Futronic – Analog Input with External Power Supply	3-10
Figure 3-8 Futronic – Analog Input with Internal Power Supply	3-10
Figure 3-9 Futronic – Analog Output with External Power Supply	3-12
Figure 3-10 Futronic – Analog Output with Internal Power Supply	3-12
Figure 3-11 Controlinc – Analog Input with External Power Supply	3-12
Figure 3-12 Controlinc – Analog Input with Internal Power Supply	3-12
Figure 3-13 Controlinc – Analog Output with External Power Supply.....	3-12
Figure 3-14 Controlinc – Analog Output with Internal Power Supply	3-13
Figure 3-15 STC for VFD Applications	3-13
Figure 3-16 External VFD Control Wiring	3-14
Figure 3-17 ARM Wiring Connections	3-16
Figure 3-18 Connecting RDM Cables to the STC	3-16
Figure 4-1 TEC 2000 Controller	4-1
Figure 4-2 LDM	4-2
Figure 4-3 Normal Display	4-4
Figure 4-4 "Clicker"	4-6
Figure 4-5 View Settings	4-11
Figure 5-1 Setup.....	5-3
Figure 5-2 Change Display	5-5
Figure 5-3 Displaying Unit Parameters.....	5-7
Figure 5-4 Change Settings	5-9
Figure 5-5 Passcode Entry	5-10
Figure 5-6 Valve Control Setup.....	5-11
Figure 5-7 Set Valve Travel Limits	5-12
Figure 5-8 Set Valve Travel Limits for Multi-port Valve Control Mode	5-14
Figure 5-9 Discrete Input Setup.....	5-15
Figure 5-10 Discrete Output Setup	5-18
Figure 5-11 Inhibit and ESD Setup	5-20
Figure 5-12 Two-Speed Timer Setup.....	5-21
Figure 5-13-1 Analog Setup	5-22
Figure 5-14-1 Network Setup	5-26
Figure 5-15 Tag Name Setup	5-28
Figure 5-16 Passcode Setup	5-28
Figure 6-1 Display Diagnostic.....	6-4
Figure 6-2 Display Alarm Log Example.....	6-5
Figure 6-3 Display Torque Profile.....	6-6
Figure 6-4 Display Operation Log	6-7
Figure 6-5 Display Operation Archive	6-7
Figure 6-6 Display Hardware.....	6-8
Figure 7-1 Fuses in the STC	7-2

Tables

Table 3-1 External Power Supply 3-6

Table 3-2 Internal Power Supply..... 3-6

Table 3-3 ACM Wiring Connections - Futronic (Analog Control Module) 3-8

Table 3-4 ACM Installation Connections - Controlinc (Network Control Module)..... 3-9

Table 3-5 Connecting Actuator A to Actuator B 3-15

Table 3-6 ARM Wiring Connections 3-15

Table 3-7 RDM Connections with Internal Power Source..... 3-17

Table 3-8 RDM Connections with External Power Source..... 3-17

Table 3-9 Two RDMs Connected to the Actuator..... 3-18

Table 4-1 LDM Rotating Knobs 4-3

Table 4-2 Normal Display Functions 4-4

Table 4-3 "Multi-port Valve Status" Display Functions 4-5

Table 4-4 RDM and LDM Operation Priority..... 4-6

Table 4-5 Default Configuration Settings..... 4-9

Table 5-1 RS-485 Link Connection 5-6

Table 5-2 Relay Outputs #1 through #5 Configuration 5-16

Table 5-3 Relay Output Function List..... 5-17

Table 5-4 Solid State Output Relays Configuration..... 5-17

Table 5-5 Relay Outputs #9 through #12 Configuration 5-19

1 Important Notes

1.1.Purpose

This installation and operation manual explains how to install, operate, and maintain the TEC 2000 valve actuator.

X *WARNING: Read this manual in its entirety before installing, operating, or performing maintenance on the TEC 2000 valve actuator.*

X *WARNING: Use caution when working on, with, or around valves and actuators. High pressures, forces, voltages, and flammable media can be present.*

X *WARNING: Failure to follow instructions for proper electrical wiring, storage, setup, and maintenance may cause serious injury, damage equipment, or void warranty.*

1.2.User Safety

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read these instructions in their entirety. Failure to observe these safety notices could result in serious bodily injury, damage to the equipment, void of the warranty, or operational difficulty.

Safety notices are presented as follows:

X *WARNING:* Alerts user of potential danger; failure to follow the warning notice could result in serious personal injury or death.

CAUTION: Identifies precautions the user must take to avoid personal injury or equipment damage.

NOTE: Highlights information critical to the user's understanding of the TEC 2000 valve actuator installation or operation.

2 Quick Start

Quick start provides step-by-step instructions for initializing the TEC 2000 actuator. When these instructions are complete, the position limits will be set and the actuator will be ready for normal operation.

NOTE: The actuator has been configured as specified by the customer and no further changes should be required. If full valve data was not provided when ordered, or if changes are needed, see **Section 5, Customizing Actuator Settings**.

XWARNING: Use caution when working on, with, or around valves and actuators. High pressures, forces, voltages, and flammable media can be present.

XWARNING: Verify voltage rating on nameplate before connecting power.

2.1. Set Position Limits

1. Power actuator. The alarm message **"SET LIMITS BEFORE OPERATING"** will be displayed. The alarm icon and the yellow LED will be flashing. Valve position will be displayed as "EE%."
2. Proceed as follows to set the limits. See **Section 5.6.3, Set Valve Travel Limits** for additional details.
 - A. Enter the **"SETUP"** mode.
 1. Place the selector knob in the **STOP** position.
 2. Rotate the control knob to **YES**, then **NO**, then **YES**, then **NO** in rapid succession and then release. The Setup icon will be displayed on the display module and **"SETUP?"** will be displayed on the message center.
 3. Rotate the control knob to **YES**. **"SET LIMITS BEFORE OPERATING"** will be displayed on the message center.
 4. Rotate the control knob to the **LOCAL** position. The message **"CLOSE VALVE THEN SELECT STOP"** will be displayed.
 - B. Set close valve travel limit.

CAUTION: It is recommended the valve be positioned using the handwheel while setting the limits to prevent valve damage.

1. Valve Operation
 - 1a. For **Electrical Operation** use the control knob to move the valve in the close direction. Proceed to Step No. 2.
 - 1b. For **Manual Operation** depress the declutch lever while rotating the handwheel until the clutch is fully engaged. Release the lever. The clutch will be retained in the handwheel mode by spring-loaded latches. Verify the valve is fully closed. Move the valve in the open direction for one handwheel turn to allow for coasting of the motor.
2. When the desired close position is reached, place the selector knob in the **STOP** position. **"ACCEPT CLOSE LIMIT?"** will be displayed.
3. Rotate the control knob to **YES**. **"SELECT LOCAL AND OPEN VALVE"** will be displayed. The close limit is set.

- C. Set open valve travel limit.
 1. Valve Operation
 - 1a. For **Electrical Operation** use the control knob to move the valve in the open direction. Proceed to Step No. 2.
 - 1b. For **Manual Operation** depress the declutch lever while rotating the handwheel until the clutch is fully engaged. Release the lever. The clutch will be retained in the handwheel mode by spring-loaded latches. Verify the valve is fully opened. Move the valve in the close direction for one handwheel turn to allow for coasting of the motor.
 2. When the desired open position is reached, place the selector knob in the **STOP** position. “**ACCEPT OPEN LIMIT?**” will be displayed.
 3. Rotate the control knob to **YES**. “**SAVE LIMITS?**” will be displayed.
 4. Rotate the control knob to **YES**.

The position limits are now set. The actuator will operate in the normal LOCAL and REMOTE modes.

NOTE: The user is not required to exit setup after setting limits for the first time. At the completion of setting the limits the actuator should be in the “**STOP**” mode and the valve should be at its open limit. The LDM should display “100%,” and the RED LED should be ON. The graphics display of the valve should represent full open.

Figure 2-1 Declutch Lever and Handwheel

Declutch Lever

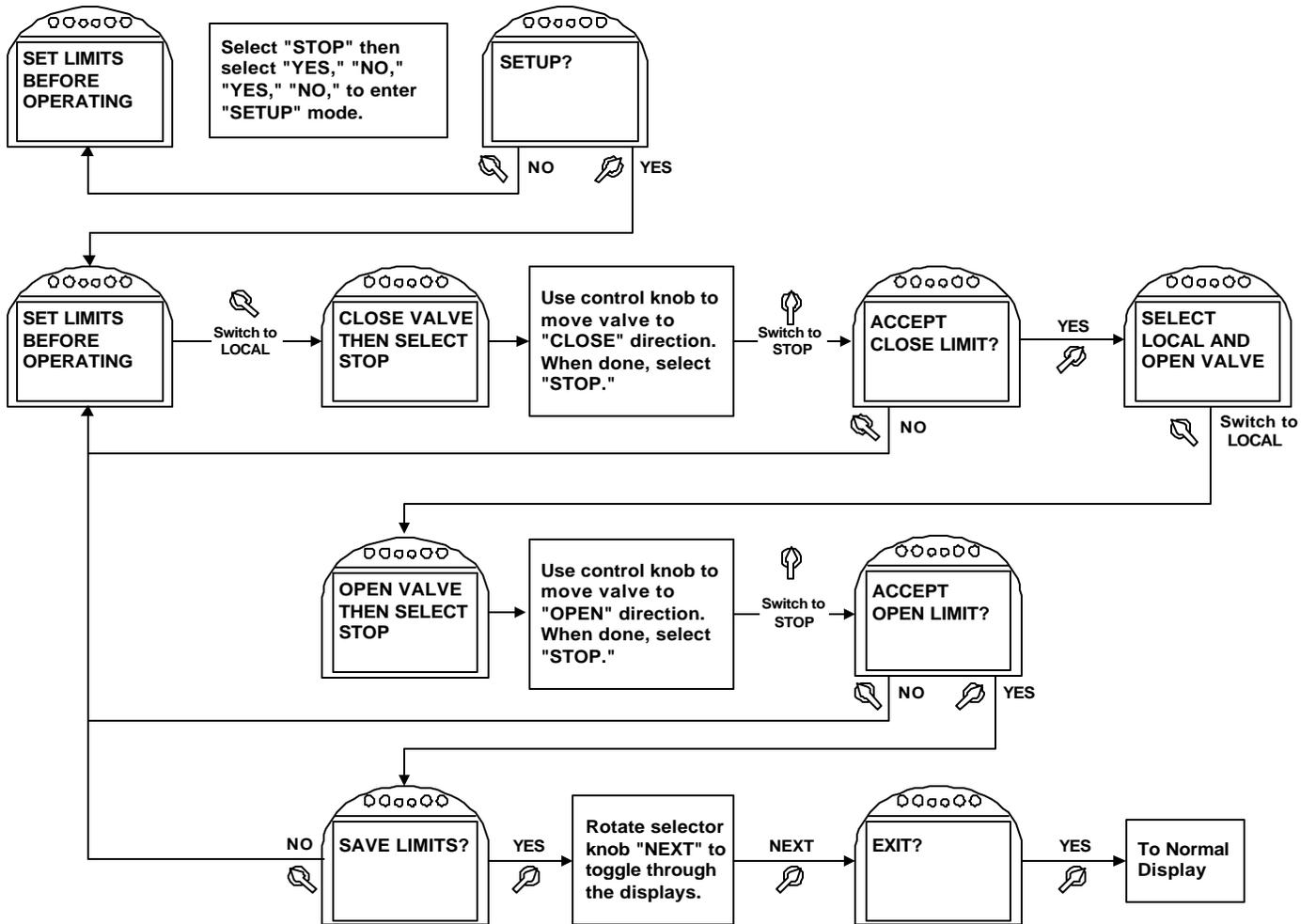


Handwheel

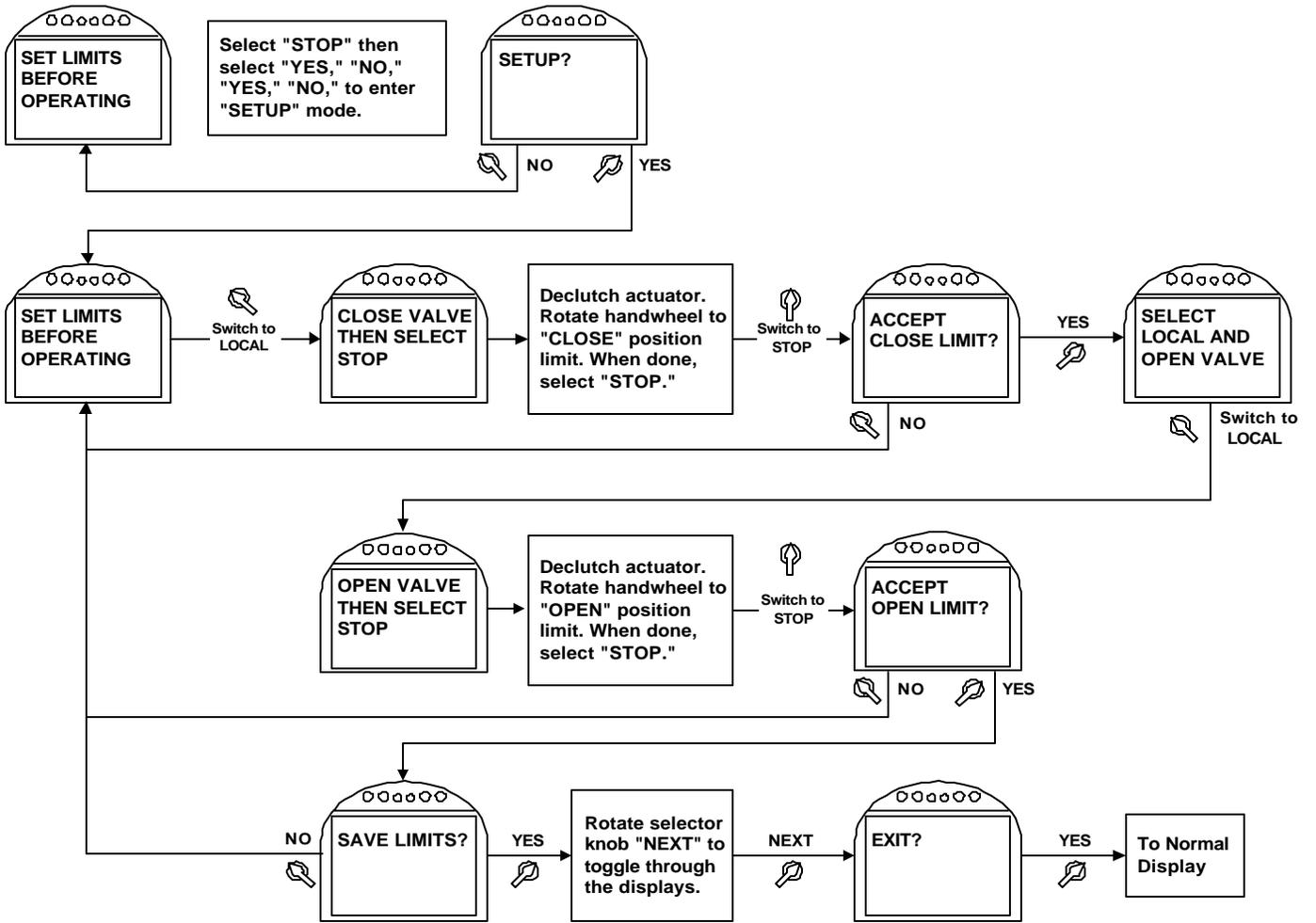


Figure 2-2 Settings Limits – Quick Start

ELECTRICAL OPERATION



HANDWHEEL OPERATION



2.2. Network Setup

This is only applicable if the Controlinc Auxiliary Control Module (ACM) and the Communication Adapter Module (CAM) are installed and enabled. These instructions assume all parameters have been set with the exception of the network node address.

1. Remain in the **“SETUP”** mode.
2. Select **NEXT** to advance through the displays until **“NETWORK SETUP?”** appears.
3. Rotate the control knob to **YES**. **“NETWORK NODE ADDRESS XXX”** appears.
4. Rotate the control knob to **NO** to increment the address numbers. Hold in the **NO** position until the desired address is reached.

NOTE: If the desired address is a lower number than what is displayed, continue to increment the numbers until the highest numbered address is reached. The address numbers will then start with the lowest numbered address and continue to increment.

5. When the correct address is displayed, rotate the control knob to **YES**.

2.3. Check Settings

1. Operate the valve to the fully close position.
2. Verify the green LED is ON (default setting) and 0% is displayed.
3. Operate the valve to the fully open position.
4. Verify the red LED is ON (default setting) and 100% is displayed.

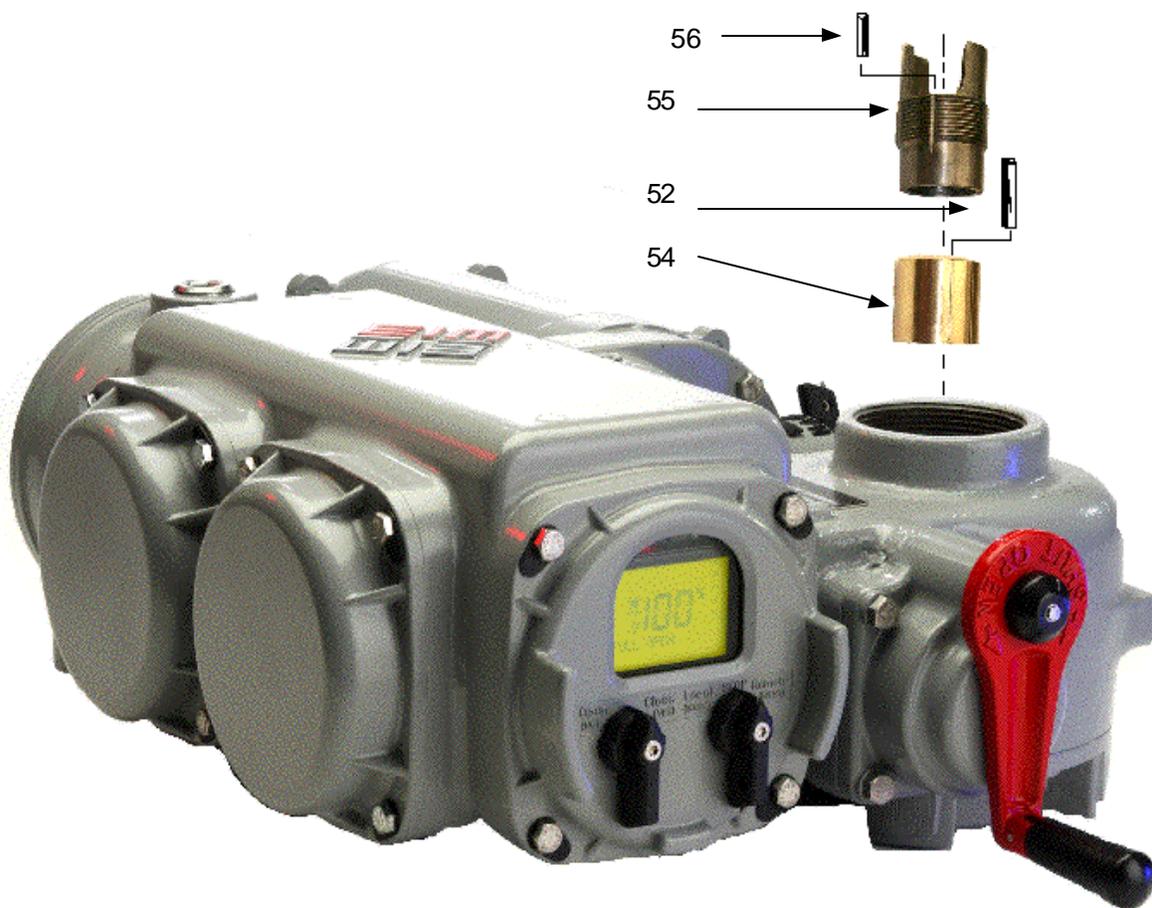
3 Installation

XWARNING: Failure to follow instructions for proper electrical wiring, storage, setup, and maintenance may cause serious injury, damage equipment, or void warranty

XWARNING: Use caution when working on, with, or around valves and actuators. High pressures, forces, voltages, and flammable media can be present.

3.1. Preparing the Stem Nut

Figure 3-1 Preparing the Stem Nut



1. Unscrew **Locknut** (piece #55) while holding **Bronze Stem Nut** (piece #54). Remove the **Stem Nut** and **Key** (piece #52).
2. Lubricate **Stem**. Run **Stem Nut** (piece #54) down **Stem** to verify acme thread fit. Remove **Stem Nut** (piece #54) and set aside.

3.2. Mechanical Installation onto the Valve

1. Lower actuator over **Stem** onto valve flange.
2. Insert the screws thru the valve flange into the actuator and engage at least one full screw diameter deep into the bottom base.
3. Tighten to a preload. 5/16-18UNC = 17 ft-lb, 3/8-16UNC = 50 ft lb, 5/8-11UNC = 225 ft-lb, or 4/4-10UNC = 400 ft lb.

NOTE: Mounting screws are provided only if EIM supplied the adapter. Verify screws are through the adapter; engage a minimum of one screw diameter deep into the actuator base.

4. Screw the **Stem Nut** (piece #54) onto the **Stem** until it enters the **Drive Sleeve**.
5. Place **Key** (piece #52) in line with the **Drive Sleeve Keyway** (piece #54). Insert **Key** (piece #52).
6. Turn the Handwheel in the Open direction to pull the **Stem Nut** (piece #54) into the **Drive Sleeve** until it bottoms out. NOTE: Valve will begin to open.
7. Place the **Locknut** (piece #55) over the **Valve Stem**. Screw the **Locknut** (piece #55) firmly into place against the top of the **Stem Nut** (piece #54) using a drift to tighten.

CAUTION: *Locknut must be screwed very tightly against stem nut.*

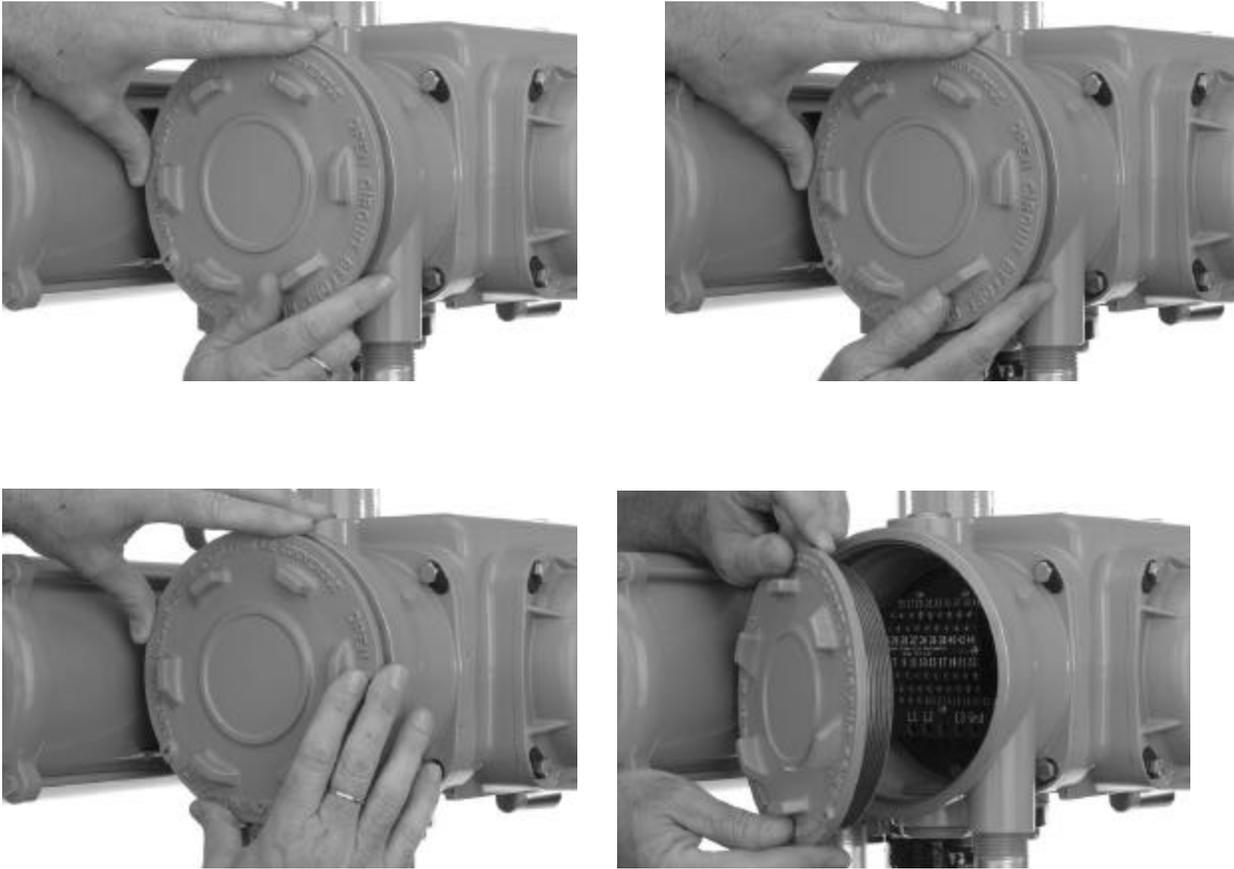
3.3. Electrical Connections

3.3.1. Remove Separate Terminal Chamber (STC) Cover

XWARNING: *Verify power is disconnected before removing STC Cover.*

Remove cover with a strap wrench, drift, or pinch bar by rotating the cover counter-clockwise

Figure 3-2 Removal of STC Cover



3.3.2. Sealing Cable/Conduit Entries

Seal the cable and conduit entries in accordance with the National Electric Code or your country standard and applicable local codes. All conduit entries should be sealed against the site environment. All unused conduit entries must be sealed with threaded metal plugs.

3.3.3. Recommended Terminal Connections

The TEC 2000 terminal block connectors are wire binding screw connectors with rising captive plates. Connections can be made one of three ways:

- ?? Strip and connect bare wire
- ?? Strip and install wire ferrule
- ?? Strip and install crimp-on insulated or non-insulated ring or fork tongue connectors for either M3 control signal terminal block screws or M4 power terminal screws.

1. Loosen terminal block connectors L1, L2, L3 and GND screws with a common or Phillips head screwdriver.
2. If bare wire is being used, strip insulation a maximum of 0.5 inch.
3. Insert wire or wire lug under terminal block connector screw clamps and tighten.

Figure 3-3 details power terminal size and length of bare wire strip. **Figure 3-3** details control terminal size and length of bare wire strip.

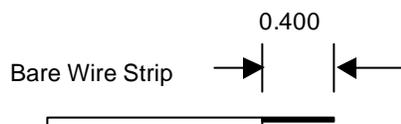
Figure 3-3 Power Terminal Connections

Terminal Size: 0.315 (M3)



Figure 3-4 Control Terminal Connections

Terminal Size: 0.375 (M4)



3.3.4. Cable Connections

1. Connect the main power supply cables, including the earth/ground wire using #1 Phillips or 3/16" slotted tip screwdriver.
2. Attach Earth/ground wire to external ground lug using ¼" (#11) slotted screwdriver
3. Use the barrier strip clamp screws to connect the control wires.
4. Ensure all connections are hand tight, including any unused terminal connections.

The main power supply and ground wire connections are screw size M4. The control connection screw size is M3.

3.3.5. Replace Terminal Compartment Cover

To replace the cover follow the steps detailed in **Section 3.3.1, Remove Separate Terminal Chamber (STC) Cover** in reverse order.

NOTE: Clean electrical enclosure threads thoroughly and lightly grease with a dielectric grease before closing.

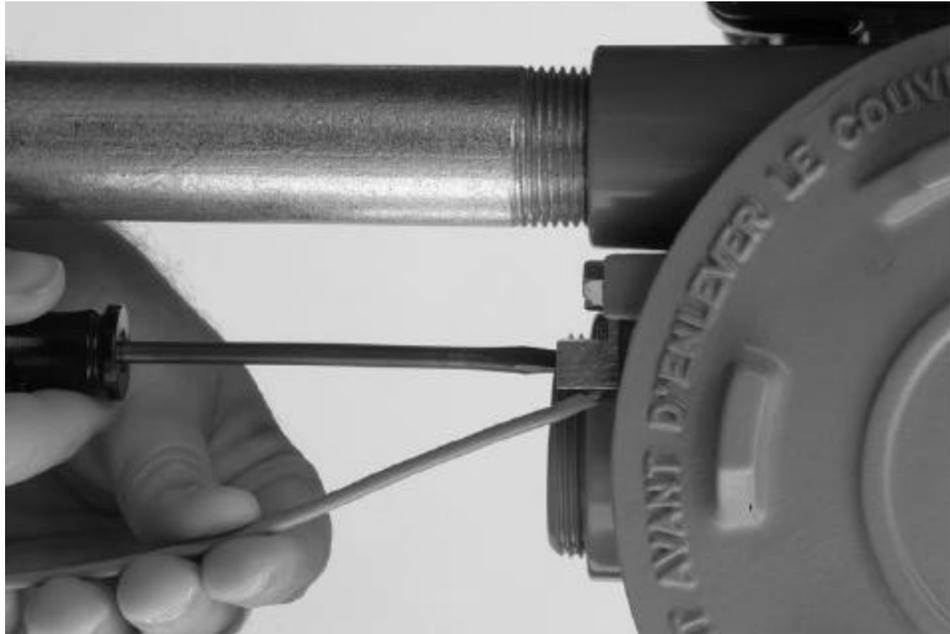
3.3.6. External Earth Ground Connections

External connection points are provided on the actuator motor and main gear housing for attaching earth/ground in accordance with local electric codes for installation cables.

Connect the external earth ground connection as follows.

1. Using a ¼" slotted tip screwdriver back out the 5/16" set screw.
2. Connect 14 AWG or larger earth ground wire; tighten set screw.

Figure 3-5 Earth/Ground Connection



3.4. Display Backup Module (DBM) – Optional

The DBM is a battery pack containing two 9V Lithium battery clips. This battery pack provides power to the electronics, including the real time clock for the event logger, but does not power the motor control circuits or the 24 Vdc power supply. When using this option, all latching type relays on the standard unit and the ARM will continue to operate. This option permits testing or setting up the actuator without applying main power.

The DBM can be provided as an option with the TEC 2000 or it can be purchased later. If purchased separate install as follows. If provided with the TEC 2000 proceed with Step No. 2 to activate.

1. Mount the DBM under the ACM on the cover plate and connect to the CCM via a 3-wire cable.
2. Insert a jumper strap between Terminals 36 and 38 of the STC. The jumper may be removed when setup is complete.

NOTE: The battery should not be enabled until the unit is field commissioned and ready for power to be applied.

The battery can only be replaced with an Uralife U9VL 9V battery. To prevent losing the clock settings install one battery before removing the old one. Two batteries can be installed for extended life.

3.5. Discrete Controlled Inputs

The actuator can be controlled by discrete inputs: two-wire control, three-wire control, four-wire control, and multi-port valve control. Connect the power for these discrete inputs as detailed in **Table 3-1** for external power source. **Table 3-2** details connections for the internal power source. See **Section 3.3, Electrical Connections** for general electrical connection requirements.

Table 3-1 External Power Supply

Terminal Block	Default Function	Alternate Function	Voltage
1	Open	Valve Port A	18-150Vdc or 20-250Vac
2	Close	Valve Port B	18-150Vdc or 20-250Vac
3	Stop	Valve Port C	18-150Vdc or 20-250Vac
4	Common for Control Inputs, Terminals 1-3		0V Common
5	Open Inhibit	Multi-Port Sync	18-150Vdc or 20-250Vac
6	Close Inhibit		18-150Vdc or 20-250Vac
7	ESD		18-150Vdc or 20-250Vac
8	Common for Inhibit and ESD Inputs, Terminals 5-7		0V Common

Table 3-2 Internal Power Supply

Terminal Block	Function
9	24Vdc (+)
10	0V common 24Vdc(-)

3.6. Auxiliary Control Module (ACM) – Optional

The ACM is an optional module used to expand the functionality of the TEC 2000 Actuator. There are several versions of the ACM available: Futronic, Controlinc, and Auxiliary Relay Module (ARM). The Futronic ACM may be used alone or with the ARM stacked on top. The Controlinc ACM is used with a Communication Adapter Module (CAM). The ARM may also be installed alone. Each ACM can be supplied with the TEC 2000 Actuator or provided later as an upgrade.

The Futronic ACM has one 4-20mA analog input and two 4-20mA outputs. Analog Input #1 is the valve position set point. Analog Output #1 is position feedback and Analog Output # 2 is torque. The two analog outputs are used for valve position and torque feedback.

The Controlinc ACM has two analog inputs and one analog output. The analog inputs and output may be used for generic data acquisition and control by the network host or for the closed loop control. The ACM is normally configured to allow the host to control the analog output; the host can write a 12-bit value between 0-4095 via the network to generate a 4-20mA output.

3.6.1. Wiring the ACM

ACM modules may be installed only by factory-trained technicians. Only one Futronic or Controlinc ACM can be installed at a time inside the round cover nearest the display end. The Futronic or Controlinc ACM connects to the Central Control Module (CCM) for logic control functions and to the Separate Terminal Chamber (STC) for user wiring connections.

To wire the ACM connect the wires in accordance with **Table 3-3** and **Table 3-4** as applicable. See **Section 3.3, Electrical Connections** for general electrical connection requirements.

Table 3-3 ACM Wiring Connections - Futronic (Analog Control Module)

STC Terminal	Terminal Name	Function
25	Analog Input #1 (+)	4-20mA Position Set point
26	Analog Input #1 (-)	
27	Analog Output #1 (+)	4-20mA Position Feedback
28	Analog Output #1 (-)	
29	Analog Output #2 (+)	4-20mA Torque Feedback
30	Analog Output #2 (-)	
31	(+) External 24Vdc	Analog Output Power Supply Input
32	Earth Ground	Analog Cable Shield Connection
33	Solid State Output #6	VFD Open Control Output
34	Solid State Output Common	
35	Solid State Output #7	VFD Close Control Output
36	Battery Enable Jumper	
37	Solid State Output #8	VFD Speed Control Output
38	Battery Enable Jumper	

The ARM can be installed with the Futronic ACM by stacking it on top of the Futronic ACM and connecting to the STC. See **Section 3.7, Auxiliary Relay Module (ARM)**.

Table 3-4 ACM Installation Connections - Controlinc (Network Control Module)

TC Terminal	Default Function	Alternate Function
25	Analog Input #1 (+)	Position Setpoint
26	Analog Input #1 (-)	
27	Analog Input #2 (+)	Position Feedback
28	Analog Input #2 (-)	
29	Analog Output #1 (+)	Torque Feedback
30	Analog Output #1 (-)	
31	(+) External 24Vdc	Analog Output Power Supply Input
32	Earth Ground	Analog Cable Shield Connection
33	Solid State Output #6	VFD Open Control Output
34	Solid State Output Common	
35	Solid State Output #7	VFD Close Control Output
36	Battery Enable Jumper	
37	Solid State Output #8	VFD Speed Control Output
38	Battery Enable Jumper	
39	Network Port A (+)	
40	Network Port A Shield	
41	Network Port A (-)	
42	Network Port B (+)	
43	Network Port B Shield	
44	Network Port B (-)	

NOTES:

1. All digital inputs have an input voltage range of 18-150 Vdc or 20-250 Vac.

2. All digital relay outputs are Rated for 5A @ 30 Vdc or 5A @ 250 Vac Resistive, 2A Inductive load.
3. Jumpers can be added between Terminals 8 and 10, Terminals 20 and 22, Terminals 32 and 34, Terminals 36 and 38, and Terminals 40 and 42 but are not required.
4. Emergency Stop requires jumper or normally closed contacts (actuator stops when contacts open.)
5. Remote display communication port is RS-485.
6. If bare wires (without terminals) are connected, remove a maximum of 0.250 inch insulation.

Figure 3-6 ACM Wiring Connections



3.6.2. Analog Controlled – Power Supply Connections

The power sources for analog controlled inputs/outputs are either internal or external. Connect the power supplies as shown in **Figure 3-7** through **Figure 3-14**.

Figure 3-7 Futronic – Analog Input with External Power Supply

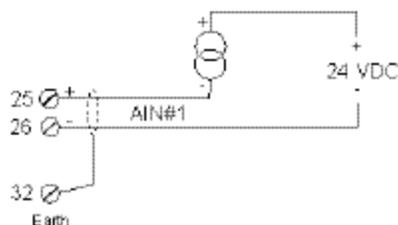


Figure 3-8 Futronic – Analog Input with Internal Power Supply

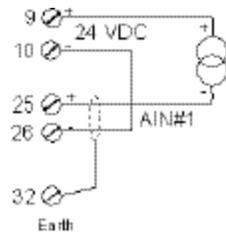


Figure 3-9 Futronic – Analog Output with External Power Supply

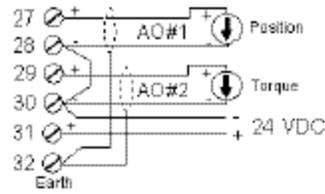


Figure 3-10 Futronic – Analog Output with Internal Power Supply

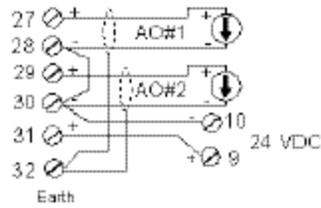


Figure 3-11 Controlinc – Analog Input with External Power Supply

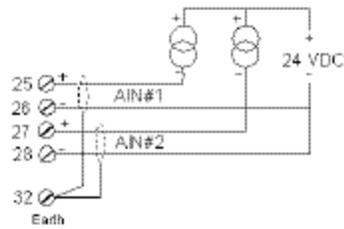


Figure 3-12 Controlinc – Analog Input with Internal Power Supply

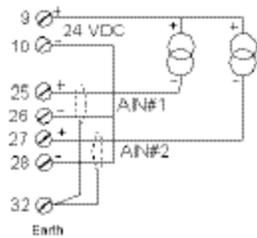


Figure 3-13 Controlinc – Analog Output with External Power Supply

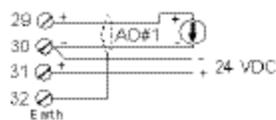
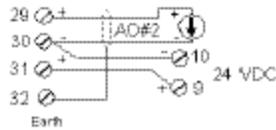


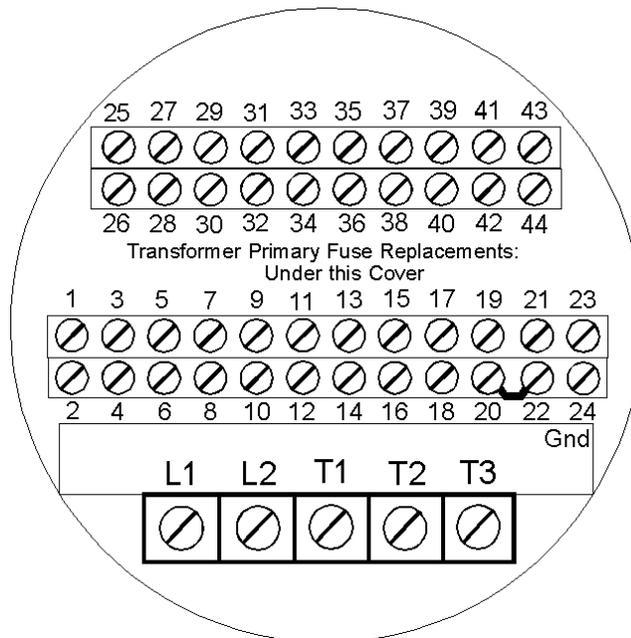
Figure 3-14 Controlinc – Analog Output with Internal Power Supply



3.6.3.External Variable Frequency Drive Wiring

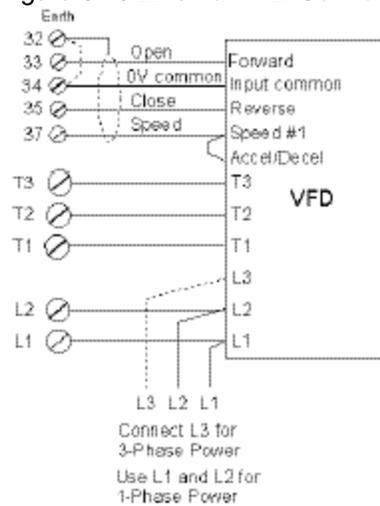
The TEC 2000 must be configured for the VFD applications at the factory. External variable frequency drive (VFD) applications require the STC shown in **Figure 3-15**. For the VFD applications remove the STC Cover, and wire as detailed in **Figure 3-15** STC for VFD Applications .

Figure 3-15 STC for VFD Applications



NOTE: If bare wires (without terminals) are connected to terminals T1, T2, T3, L1 and L3, remove a maximum of 0.500 inch of insulation. Ground wire must be connected to Terminal 24.

Figure 3-16 External VFD Control Wiring



3.6.4. Network Controlled

For the actuator to be network controlled, a Controlinc ACM and a Communication Adapter Module (CAM) must be installed. Each CAM is required for a specific protocol and network topology, and enables the network capability. To install the Controlinc ACM see **Section 3.6.1, Wiring the ACM**.

NOTE: Factory personnel must install the ACM and CAM. These modules (CAMs) may be installed in the field only by factory-trained technicians using a special passcode to enter the “**FACTORY SETUP**” mode.

Connect the actuators as shown in **Table 3-5** for RS-485 redundant bus or E>Net networks. If another protocol is selected then refer to the wiring diagram supplied with the actuator for connections.

NOTE: If E>Net network topology is specified, insert a jumper between Terminals 40 and 42 to connect the network cable shield throughout the network and connect a single point earth ground elsewhere.

See **Section 3.3, Electrical Connections** for general electrical connection requirements.

Table 3-5 Connecting Actuator A to Actuator B

Terminal Block	Function
39	Data Port A (+)
41	Data Port A (-)
40	Shield
43	Data Port B (+)
44	Data Port B (-)
42	Shield

3.7. Auxiliary Relay Module (ARM) Wiring

The ARM can be used with the Futronic ACM or standalone. Only factory-trained technicians may install the ARM.

Connect the ARM within the controller in accordance with **Table 3-6**. See **Section 3.3, Electrical Connections** for general electrical connection requirements.

Table 3-6 ARM Wiring Connections

Terminal Block	Function	Relay Type
39	Relay Output #9	Latching No or NC
40	Common	
41	Relay Output #10	Latching No or NC
42	Relay Output #11	Latching No or NC
43	Common	
44	Relay Output #12	Latching No or NC

Figure 3-17 ARM Wiring Connections



3.8. Remote Display Module (RDM) Connection to the Actuator – Optional

Connect the RDM to the actuator as shown in **Figure 3-18** and in accordance with **Section 3.8.1, 24Vdc Power Source**, or **Section 3.8.2, 115/230Vac Power Source**, depending on the power source. Each RDM can be powered from the actuator, or it can be powered from an external source. If more than one RDM is used, one can receive power from the actuator and the other can receive power from an external source. See **Section 3.3, Electrical Connections** for general electrical connection requirements.

Figure 3-18 Connecting RDM Cables to the STC



3.8.1. 24Vdc Power Source

If the RDM is to receive power from the actuator, connect cable type Belden 8723 or equivalent as detailed in **Table 3-7**. The cable distance is limited to 1,200 feet (366 meters).

NOTE: By using two cables, Belden 8719 or equivalent for power and Belden 9841 or equivalent for RS-485 communication, the distance limitation is increased to 4000 feet (1200 meters).

Table 3-7 RDM Connections with Internal Power Source

RDM Terminal Block Number (DC) – powered by Actuator	Function	TEC 2000 Terminal Block Number
6	24Vdc(+)	9
5	0V Common	10
3	RS-485 (+)	21
1	RS-485 (-)	23
2	Shield	24

3.8.2. 115/230Vac Power Source

If the RDM is receiving power from an external source, connect cable type Belden 9841 or equivalent as detailed in **Table 3-8**.

Table 3-8 RDM Connections with External Power Source

RDM Terminal Block Number	Function	TEC 2000 Terminal Block Number
Line	115/230 Vac 50/60 Hz (+)	-
Neu	0V Common	-
3	RS-485 (+)	21
1	RS-485 (-)	23
2	Shield	24

3.8.3. Two RDMs (one 24Vdc and one 115/208/220/230 Vac power source)

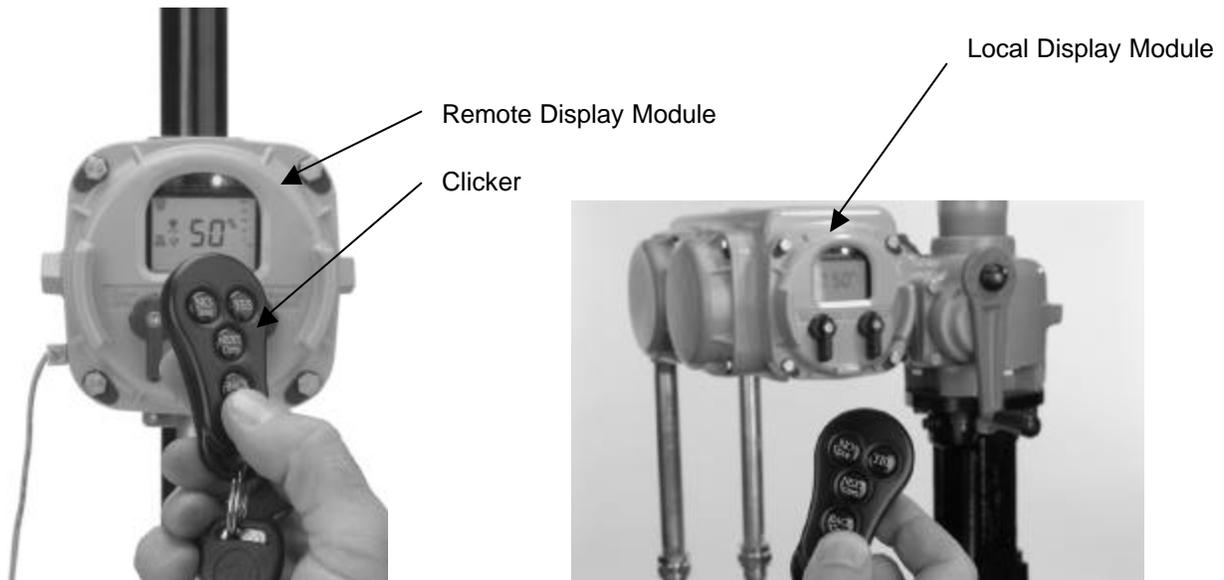
To use two RDMs with one actuator, connect as detailed in **Table 3-9**.

Table 3-9 Two RDMs Connected to the Actuator

RDM	RDM Terminal Block Number	Function	TEC 2000 Terminal Block Number	Cable Type- Belden or Equivalent
RDM #1	Line	115/230 Vac 50/60 Hz (+)	-	20AWG or Larger
	Neu	0V Common	-	20AWG of Larger
	3	RS-485 (+)	21	Belden 9841
	1	RS-485 (-)	23	
	2	Shield	24	
RDM #2	6	24 Vdc 9=0	9	Belden 8719
	5	0V Common	10	
	3	RS-485 (+)	21	Belden 9841
	1	RS-485 (-)	23	
	2	Shield	24	

4 Operation

Figure 4-1 TEC 2000 Controller



4.1. Local Display Module (LDM)

The Local Display module consists of the following as shown in **Figure 4-2**:

- ?? Graphics Display
- ?? Message Center
- ?? Control Knob and Selector Knob
- ?? Three LEDs



4.1.1. Graphics Display and Message Center

The graphics display displays the mode of operation, valve status, position, torque, and alarm symbols. The message center displays actuator setup selections, data entry feedback, and alarm messages. When no alarms are active and the valve is not moving or is not at either limit the message center will be blank.

4.1.2. Control Knob and Selector Knob

The control knob performs normal Open/Stop/Close function in the local control mode and YES/NO function in the **"MONITOR/SETUP"** mode as detailed in **Table 4-1**.

The NO selection increments the displayed value but does not decrement. To decrement continuously hold the NO position until the highest value is reached. The display value will then start at the lowest value and increment from there. If the control knob is held in the NO position for more than 2 seconds the incrementing rate will increase from 0.5 seconds per new value to 0.1 seconds per value.

The selector knob performs normal selector switch Local/Stop/Remote function and alternate Next/Back display function in the **"MONITOR/SETUP"** mode as detailed in **Table 4-1**.

The NEXT and BACK selections are used strictly for cycling through the SETUP displays to locate the desired display or to exit the **"SETUP"** mode.

Table 4-1 LDM Rotating Knobs

Knob	Rotation Direction	Function	Results
Control	Spring return to center	Neutral Position	Completes YES or NO entry cycle. Exception: when knob is held for continuous data entry updates.
	Clockwise (CLOSE)	YES	Accepts the displayed question or data entry. Advances to the next display. Exception: when knob is held for continuous data entry updates.
	Counterclockwise (OPEN)	NO	Rejects displayed question or data. Increments to the next data value or display. Exception: when knob is held for continuous data entry updates.
Selector	STOP	Neutral Position	Sets up entry, completes NEXT or BACK entry cycle. See Note below
	Clockwise (REMOTE)	NEXT	Advances to the next display
	Counterclockwise (LOCAL)	BACK	Returns to the previous display

NOTE: If the selector knob is held in either NEXT or BACK position, the display will scroll.

4.1.3.LEDs

There are three LEDs on the LDM:

- ?? Red
- ?? Green
- ?? Yellow

The default function of these LEDs is detailed in **Table 4-2**.

See **Section 5.6.2, Valve Control Setup** to reverse Red to indicate closed/closing and Green to indicate opened/opening.

4.1.4.Normal Display Function

Figure 4-3 details the display with all segments and icons turned on. The bar graphs, position digits, icons, and LEDs indicate normal activity, i.e., the valve opening, closing, or stopping in mid-travel. The message center remains blank until alarms are active or the valve is opening, closing, full open, or full close.

Table 4-2 details various normal activities and how each is displayed.

Figure 4-3 Normal Display

The valve has stopped and is 36% opened. The yellow LED is ON and the message center is clear.



Table 4-2 Normal Display Functions

Valve Activity	Message Center Top Line	Display Functions			Position Bar Graph	Percent Open "XX%"
		LEDs				
		Yellow	Red	Green		
Fully closed	FULL CLOSE	OFF	OFF	ON	— —	0%
Opening	OPENING	OFF	Blinking	OFF	Flashing in the Open direction	Increments
Stopped	Cleared	ON	OFF	OFF	STOP Icon is Displayed XXX	
					Shows relative openness	% of openness
Fully opened	FULL OPEN	OFF	ON	OFF	— —	100%
Closing	CLOSING	OFF	OFF	Blinking	Flashing in the Close direction	Decrements
Alarm	Alarm Type Displayed – Bottom Line	Blinking	OFF	OFF	Alarm Icon flashes	

4.1.5. Multi-Port Valve Status Display Functions

Table 4-3 details the various activities and how each is displayed when operating in the “MULTI-PORT VALVE” mode.

Table 4-3 "Multi-port Valve Status" Display Functions

Valve Position	Display Functions			Position Bar Graph
	LEDs			
	Yellow	Red	Green	
Port A	OFF	OFF	ON	Valve rotation displayed as 0°
Moving from Port A to B or B to C or C to A	OFF	Blinking	OFF	Flashing in the Open direction Rotation increments
Port B	ON	OFF	OFF	Valve rotation displayed as 90°
Port C	OFF	ON	OFF	Valve rotation is displayed as 180°
Moving from Port A to C or C to B or B to A	OFF	OFF	Blinking	Flashing in the close direction Rotation decrements
Alarm – displayed on the bottom line of the message center	Blinking	OFF	OFF	Alarm Icon flashes

4.2. Remote Display Module (RDM)

The RDM performs the same functions as the LDM.

NOTE: If the RDM does not receive communication messages from the Central Control Module (CCM) within 5 seconds after power is applied, the RDM will display the flashing message “**CCM LINK FAILED**” and all three LEDs will blink. This will also occur if communication is lost for 5 seconds or more.

4.2.1. RDM Operation with LDM

Two RDMs and an LDM can be connected to one actuator. The operation priority is detailed in **Table 4-4**.

Table 4-4 RDM and LDM Operation Priority

Mode of Operation	Selector Switch Position LDM	Selector Switch Position RDM #1	Selector Switch Position RDM#2
STOP	At least one module must have the selector switch in the STOP position.		
LOCAL	At least one module must have the selector switch in the LOCAL position and none have the selector switch in the STOP position.		
REMOTE	All modules must have the selector switch in the REMOTE position.		

4.3. Infrared Controller (IRC) – “Clicker”

(Not available in England or Japan)

The infrared controller, otherwise known as the “Clicker,” is a small key size, hand-held unit with four buttons as shown in **Figure 4-4**. The buttons are labeled as follows:

- ?? YES
- ?? NO – Stop
- ?? NEXT – Open
- ?? BACK – Close

These button functions correspond to the YES, NO, NEXT, and BACK functions of the control knobs on the LDM. The “Clicker” transmits setup commands only and the feedback information is displayed in the LDM LCD or the RDM LCD.

Figure 4-4 “Clicker”



For the “Clicker” to control the actuator:

1. Enter “**SETUP**” mode using the control knobs as defined in **Section 5.1, Entering Setup Mode**.
2. Select “**LOCAL IrDA PORT**” for control mode under Valve Control Setup. See **Section 5.6.2, Valve Control Setup**.
3. Place the selector knob in the REMOTE position.
4. Press the applicable “Clicker” button (Open, Close, Stop) for the desired function while “pointing” the unit at the LDM or the RDM.

4.4. Initializing the Actuator

XWARNING: Check for proper motor rotation to ensure the valve is moving in the proper direction.

4.4.1. Setting Position Limits

Limits *must be set* before operating. The actuator will not operate until limits are set.

NOTE: A passcode is *not* needed for the initial position limit settings. However, any limit setting changes required after initialization require a passcode and are changed via the “**CHANGE SETTINGS**” mode. See **Section 5.6.3, Set Valve Travel Limits**.

CAUTION: It is recommended the valve be positioned using the handwheel while setting the limits to prevent valve damage.

There are two different routines for setting limits. Initial limit settings can be set as described in **Section 2, Quick Start**. Limit settings can be changed as described in **Section 5.6.3, Set Valve Travel Limits**.

Once the limits have been set, check the settings as follows.

For Electrical Operation

1. Run actuator electrically to verify correct operation.

For Manual Operation

1. Move the valve in the close direction. The Red LED should go off and the Green LED should blink within one turn of the handwheel.
2. Move the valve in the open direction. The Green LED should go off and the Red LED should be blinking within ½ to 1 turn of the handwheel.

The actuator will operate in the normal LOCAL and REMOTE modes.

Exit “**SETUP**” mode.

1. Rotate the selector knob to **NEXT** to cycle through the displays until “**EXIT?**” is displayed.
2. Rotate the control knob to **YES**.

4.4.2. View Existing Settings

Unless otherwise specified at the time the order is placed, the TEC 2000 actuator is shipped with the following default configuration settings.

Table 4-5 Default Configuration Settings

Basic Actuator Functions

Valve Control	Discrete Inputs	Discrete Outputs			Inhibit and ESD
		(Relays 1 thru 5)	(ACM Solid State Outputs 6 thru 8)	(ARM Relays 9 thru 12)	
Mode =3-Wire	DI#1 = Active on CLOSED contact	RO#1 = LSO	SSO#6 = VFD Open Control	RO#9 = Lost Power Alarm	Open Inhibit = ON
Close Direction = (Gearing dependant)	DI#2 = Active on CLOSED contact	RO#1 = N.O.	SSO#7 = VFD Close Control	RO#9 = N.O.	Close Inhibit = ON
Seat = Position	DI#3 = Active on OPEN contact	RO#1 = Continuous	SSO#8 = VFD Speed Control	RO#9 = Flashing	Local ESD = ON
Close Torque = 70%	DI#4 = Active on CLOSED contact	RO#2 = LSC		RO#10 = Motor Overload Alarm	Host ESD = ON
Open Torque = 70%	DI#5 = Active on OPEN contact	RO#2 = N.O.		RO#10 = N.O.	Lost Com ESD = OFF
Local Control = Maintained	DI#6 = Active on CLOSED contact	RO#2 = Continuous		RO#10 = Flashing	Close on ESD
Remote Control = Maintained		RO#3 = LSA		RO#11 = Lost Phase Alarm	ESD Override on Thermal = ON
Torque Retry = OFF		RO#3 = N.O.		RO#11 = N.O.	ESD Override on Local = ON
Remote Display 1 = OFF		RO#3 = Continuous		RO#11 = Flashing	ESD Override on Stop = OFF
Remote Display 2 = OFF		RO#4 = LSB		RO#12 = Over Torque Alarm	ESD Override on Inhibit = ON
Close LED = Green Open LED = Red		RO#4 = N.O.		RO#12 = N.O.	ESD Override on Torque = OFF
		RO#4 = Continuous		RO#12 = Flashing	
		RO#5 = MONITOR			
		RO#5 = Continuous			
		LSA Position = 25%			
		LSB Position = 75%			

Two-Speed Timer Default Configuration

Close	Open	Anti-Water Hammer
Mode = ON	Mode = ON	Mode = ON
Start Position = 30%	Start Position = 70%	Start Position = 10%
Stop Position = 1%	Stop Position = 99%	
Pulse ON time = 3.5 Sec	Pulse ON time = 3.5 Sec	Pulse ON time = 3.5 Sec
Pulse OFF time = 5.0 Sec	Pulse OFF time = 5.0 Sec	Pulse OFF time = 5.0 Sec

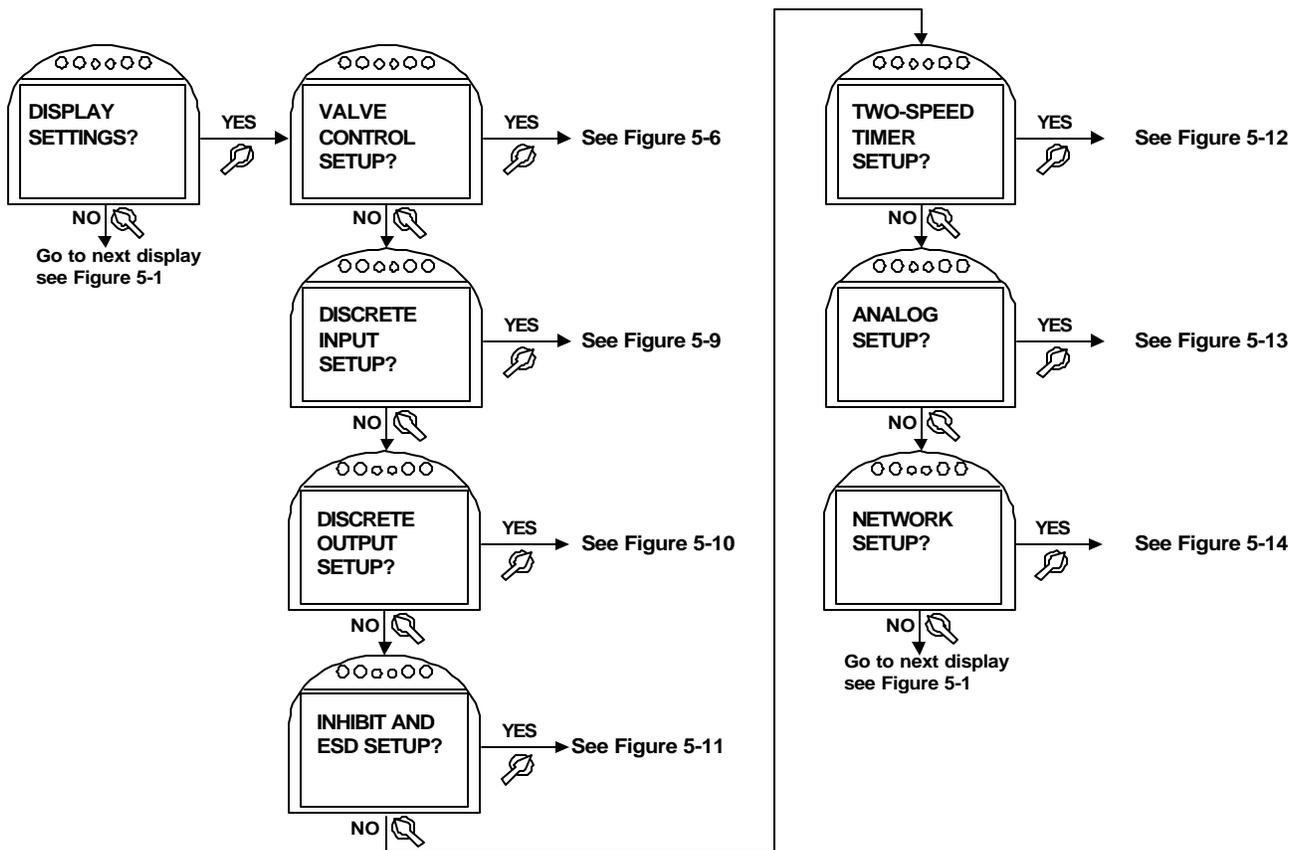
Auxiliary Control Module (ACM) Default Configuration

Analog Control - Futronic	Network Control - Controlinc
Control Bandwidth = 2.0%	Network Node Address = 1
Speed Bandwidth = 5.0%	Response Delay Time = 8mS
Delay Time = 1 Second	Parity = NONE
Input Polarity CLOSE = 4mA	Analog I/O scale = 0-4095
Output Polarity CLOSE = 4mA	
STAYPUT on lost signal	

1. Enter "**SETUP**" mode as detailed in **Step No 2 of Section 2, Quick Start**.
2. Place the selector knob in the NEXT position to advance through each display until "**DISPLAY SETTINGS?**" is displayed.
3. Rotate the control knob to **YES**.
4. Scan through each display selecting **NO** or **YES** and **BACK** or **NEXT** as needed to review the current settings. See **Figure 4-5**.

NOTE: The "**DISPLAY SETTINGS?**" mode can be accessed without entering a passcode; however no changes can be made to the settings in this mode. To make any changes see **Section 5, Customizing Actuator Settings**.

Figure 4-5 View Settings



4.5. Local Control Operation

To locally control the actuator via the LDM or the RDM:

1. Exit **"SETUP"** mode if applicable.
2. Place the selector knob in the LOCAL position.

NOTE: The actuator is shipped configured for inching mode unless specified at the time order is placed; i.e. the actuator is shipped in the "Maintained" mode.

Local Maintained – Inching Mode

3. Place the control knob in either the OPEN or CLOSE position and continue to hold. After 0.5 seconds the actuator will move in the open or close direction.
4. Release the knob to stop the actuator movement. The knob will return to the neutral position.

Local Momentary Mode – Seal-ins Active

3. Place the control knob in either the OPEN or CLOSE position. Momentarily hold for 0.5 seconds and release. The actuator will move in the open or close direction to the end of travel.
4. To stop the actuator movement:
 - ?? Place the selector knob in the STOP position. OR
 - ?? Place the control knob in the opposite direction of the current movement for less than 1.0 second.

NOTE: If the control knob is held in the opposite direction for more than 1.0 second, the actuator will reverse direction after stopping for approximately 0.5 seconds to allow instant reversing without valve plugging or causing high stresses and damages to the actuator.

4.5.1. Multi-Port Valve Local Control Mode Operation

1. Exit “**SETUP**” mode if applicable.
2. Place the selector knob in the LOCAL position.
3. Place the control knob in the OPEN or CLOSE position to move the valve from port to port. In the OPEN position the valve will rotate Port A to Port B to Port C to Port A. In the CLOSE position the valve will rotate Port A to Port C to Port B to Port A.
4. Place the selector knob in the STOP position to stop the valve between ports.

4.6. Remote/Auto Control Operation

Remote control permits the actuator to be controlled via discrete inputs. The actuator is shipped configured for “three-wire control” unless otherwise specified at order placement. There are six additional remote control modes that can be selected via the “**SETUP**” mode.

- ?? Two-wire control
- ?? Four-wire control
- ?? Multi-port valve control
- ?? Local IrDA port control
- ?? Local RS485 port control
- ?? Analog
- ?? Network

For installation details, see **Section 3.5, Discrete Controlled Inputs**.

To control the actuator via discrete inputs:

1. Enter “**SETUP**” mode. See **Section 5.1, Entering Setup Mode**.
2. Use the selector knob (**NEXT/BACK**) to select “**CONTROL MODE**” under “**VALVE CONTROL SETUP?**”
3. Use the control knob (**NO**) to select the desired control mode. See **Section 5.6.2, Valve Control Setup**.
4. Exit “**SETUP**” mode and place selector knob in the REMOTE position.

Remote Maintained – Inching Mode

5. Apply the control signal and maintain. After 0.5 seconds the actuator will move in the open or close direction.
6. Eliminate the control signal to stop the actuator.

Remote Momentary – Seal-ins activated

5. Momentarily pulse either OPEN or CLOSE control signal for 0.5 seconds minimum. The actuator will move in the open or close direction to the end of travel.
6. Momentarily pulse the remote stop signal to stop the actuator movement:

Two-Wire Control

The two-wire control mode uses only one contact to control the valve. When the contact is closed, the valve opens, and when the contact is open, the valve closes. Seal-in is not active for Two-Wire control. The contact open and close status can be reversed in the “**SETUP**” mode. See **Section 5.6.4, Discrete Input Setup**.

Three-Wire Control

The three-wire control mode uses two maintained contacts to open or close the valve. This is an “inching” type mode. Remote seal-ins, “Momentary” mode, may be activated in the “**SETUP**” mode. If the three-wire control is used with the seal-ins activated, the valve cannot be stopped while being remotely controlled; the valve can only be stopped via the inhibit or emergency stop inputs.

Four-Wire Control

The four-wire control mode uses three maintained contacts to open, close, or stop the valve. The default configuration sets the stop input to be active on open contact. The default configuration can be modified in the “**SETUP**” mode. See **Section 5.6.4, Discrete Input Setup**.

Multi-Port Valve Control

The multi-port valve control mode allows remote control of a three-port valve with one inlet port and two outlet ports or a four-port valve with one inlet and three outlet ports. Seal-ins, “Momentary” mode is always active in this mode.

NOTE: Before operating in the REMOTE mode, the three port positions *must* be calibrated; i.e. position limits set. See **Section 5.6.3, Set Valve Travel Limits**.

Multi-port valve synchronization calibrates the actuator to the correct switch position each time the valve rotates through Port A position. An external contact or proximity switch must be wired to source power input to terminals 5 and 8 for valve synchronization with reference to valve Port A.

Local IrDA Port Control

The local IrDA port control mode allows the actuator to be controlled via the IrDA port. The “Clicker” or any device such as a palmtop or laptop with an IrDA port may be used. The “Clicker” or remote device will transmit STOP, OPEN, and CLOSE only.

NOTE: The setup mode cannot be entered via the IrDA port if this mode is selected in the “**SETUP**” mode. “**SETUP**” mode must be entered via the local control knobs and the control mode must be changed to a control mode other than IrDA port before the IrDA port can be used for setup.

Local RS-485 Port Control

The local RS-485 port control mode allows the actuator to be controlled via the RS-485 port. Any device with a RS-485 port and application software to support the EIM proprietary protocol can be used. The remote device is a slave to the CCM and has a slave address of 4. The device can only return STOP, OPEN, CLOSE, and ESD commands. The device can be connected to the same RS-485 link as the RDMs and used simultaneously with the RDMs.

4.7. Event Logger

TBD

5 Customizing Actuator Settings

5.1. Entering Setup Mode

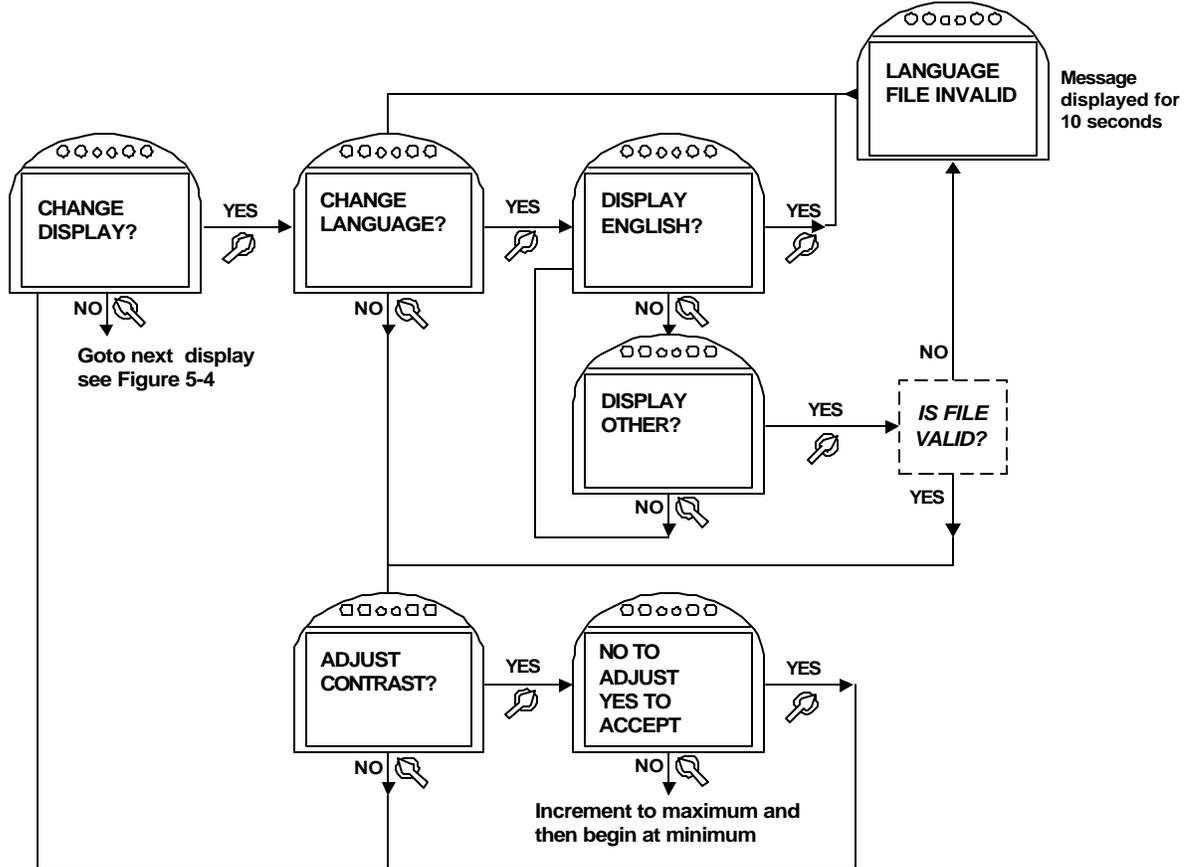
The **“SETUP”** mode must be entered to modify any configuration settings.

1. Place the selector knob in the **STOP** position. Setup may be performed at any one location; i.e. at the LDM or any RDM that is connected.
NOTE: **STOP** button on the Clicker only stops a moving valve.
2. Rotate the control knob to **YES**, then **NO**, then **YES**, then **NO** in rapid succession and then release. **“SETUP”** icon will be displayed on the display module and **“SETUP?”** will be displayed on the message center.
NOTE: Do not hold the knob in any one position longer than 0.5 seconds.
3. Rotate the control knob to **YES**. A series of questions will be displayed as detailed in **Figure 5-1**.
NOTE: If the control knob is placed in the **NO** position or if **NEXT** or **BACK** is selected in lieu of **YES** the display will return to the normal display mode.
4. Use the control knob to answer **“YES”** or **“NO”** to the displayed questions. Use the selector knob, **NEXT** and **BACK**, to advance through the setup selections.
5. When configuring is complete, advance to **“EXIT SETUP?”** Answer **“YES.”** The display will return to normal display model.

NOTE: If a knob entry is not made within 120 seconds, the actuator will exit the **“SETUP”** mode and revert to the normal display.

3. If English is not desired, answer **“YES”** to **“CHANGE LANGUAGE?”** and **“DISPLAY OTHER?”** will appear. The user may change any of the words being displayed on the message center by downloading an alternate language. **“ADJUST CONTRAST?”** will appear.
NOTE: If the language file has not been downloaded or if the file has an error, the message **“LANGUAGE FILE INVALID”** will be displayed for 10 seconds. **“CHANGE LANGUAGE?”** will appear.
4. If contrast adjustment is needed, answer **“YES.”** Then select **NO** and hold until the desired contrast is reached. Select **YES**. **“CHANGE DISPLAY?”** appears.
5. Select **NO** to exit.

Figure 5-2 Change Display



5.4. Transferring File Parameters

The user may transfer certain files to or from the TEC 2000 using a computer with an IrDA port or RS485 port. This requires EIM TecLinc software for displaying, editing, storing, and printing these files. All user instructions for file transfer process are displayed on the external computer screen. No instructions are displayed on the LDM or RDM LCD.

The TEC 2000 is not required to be in **“SETUP”** mode for file transfer. Files may be transferred from the TEC 2000 during normal operation. Files may be transferred to the TEC 2000 only while the selector knob is in the **STOP** position. The TEC 2000 detects the external computer via the IrDA port or RS485 port and automatically establishes communication session.

Available files that may be transferred from the TEC 2000 to a computer are listed below. Only three types of files may be transferred from a computer to the TEC 2000 as listed below. These files do not include any calibration parameters such as display contrast, analog input and output calibration, etc. This process does not require a passcode because the external application software may be passcode protected.

Files that may be transferred from the TEC 2000:

- ?? Diagnostics
- ?? Unit Parameters
- ?? User Settings
- ?? Language
- ?? Factory Settings
- ?? Event Log

Files that may be transferred to the TEC 2000:

- ?? Language
- ?? User Settings - Includes all items under CHANGE SETTINGS except calibration parameters such as display contrast, and analog input or output calibration
- ?? Factory Settings - Includes all items under FACTORY SETUP; accessible only by factory personnel

5.4.1. Computer Requirements

Three different computer systems can be used to transfer files. The minimum requirements of these systems are as follows.

- ?? A PC or laptop with an IrDA port or RS-232 port and a RS-485 adapter; Microsoft® Windows 98, 2000 or NT, and TecLinc MS software *or*
- ?? A laptop or palmtop PC (PDA) with an IrDA port or RS-232 port and RS-485 adapter; Microsoft® Windows CE, and TecLinc CE software *or*
- ?? A Palm or other PDA device with an IrDA, Palm operating system, and TecLinc PLM software

5.4.2. Installation

IrDA link

1. Place the IrDA port of the computer in the line of sight and within one meter of the LDM.

RS-485 link

1. Place the computer within 4000 feet (1,200 meters) of the TEC 2000.
2. Remove the Terminal Chamber Cover to access the STC. Using twisted pair cable, connect the computer to the TEC 2000 as detailed in **Table 5-1**.

Table 5-1 RS-485 Link Connection

STC Terminal	Function
21	(+)
23	(-)

Software

1. Load the applicable software onto the hard drive. See **Section 5.4.1, Computer Requirements**.

NOTE: TecLinc software can be downloaded at www.eim-co.com. If web access is not available, contact your local EIM distributor or EIM directly and request a TecLinc CD.

2. Follow instructions provided with the software.

5.5. Displaying Unit Parameters

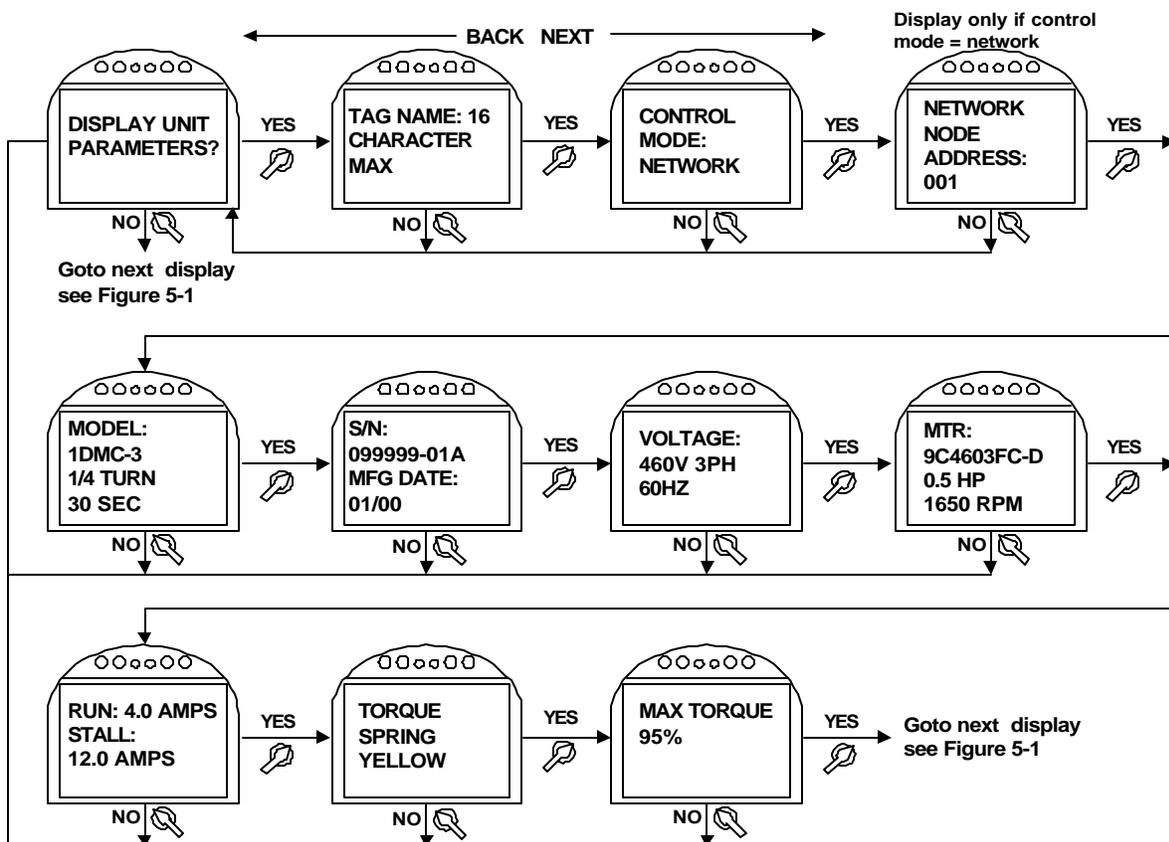
The user may view information on the actuator parameters as follows:

1. At the “**DISPLAY UNIT PARAMETERS?**” prompt answer **YES**.
2. Use the selector knob (**BACK/NEXT**) to view parameters as shown in **Figure 5-3**.

The tag name, method of control, and network address may be entered or changed via the “**Change Settings**” mode. See **Section 5.6**.

All other parameters viewed are factory setup and cannot be changed by the user.

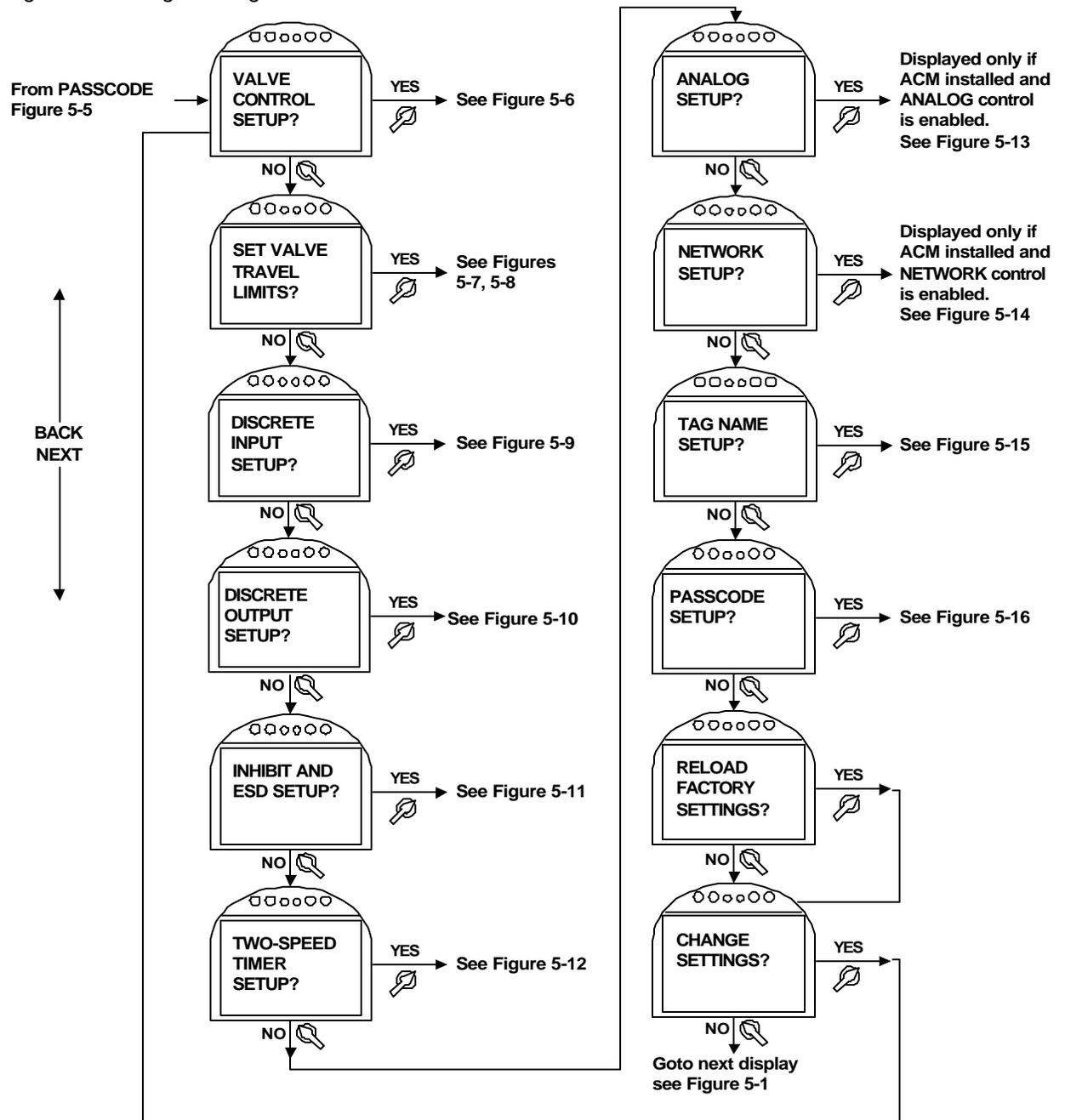
Figure 5-3 Displaying Unit Parameters



5.6.Change Settings

1. Enter **"SETUP"** mode and use the selector knob (**NEXT**) to scroll to **"CHANGE DISPLAY SETTINGS?"**. Answer **"YES."** See **Section 5.1, Entering Setup Mode.**
2. Enter passcode.
NOTE: A passcode *must be* entered to change settings.
3. Use the selector knob (**NEXT/BACK**) to scan the display for the desired setting to change the following:
 - ?? Valve control setup
 - ?? Valve travel limits
 - ?? Discrete input
 - ?? Discrete output
 - ?? Inhibit and ESD
 - ?? Two-speed timer
 - ?? Analog
 - ?? Network
 - ?? Tag name
 - ?? Passcode

Figure 5-4 Change Settings



5.6.1. Passcode Entry

The actuator is shipped with “000” as a passcode. To change the passcode see **Section 5.6.11, Passcode Setup**.

To enter the passcode:

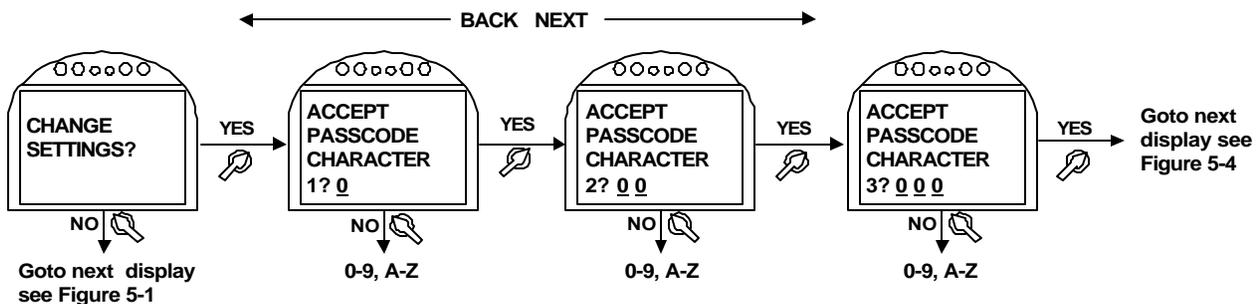
1. At the “**CHANGE SETTINGS?**” prompt answer “**YES.**” “**ACCEPT PASSCODE CHARACTER 1? X**” will appear. “**X**” will be flashing. “**X**” is the first “left most” character in the passcode.
2. If this character is correct, select **YES**. If not select **NO**. Use **NO** to increment from 0-9 and then A-Z until the correct character is displayed. Select **YES**. The second character will flash.

NOTE: When “Z” is displayed the data will rollover to “0” and continue incrementing.

3. Repeat Step No. 2 for the second and third characters.

NOTE: If the passcode is not the correct passcode, the display will return to “**CHANGE SETTINGS?**” display.

Figure 5-5 Passcode Entry

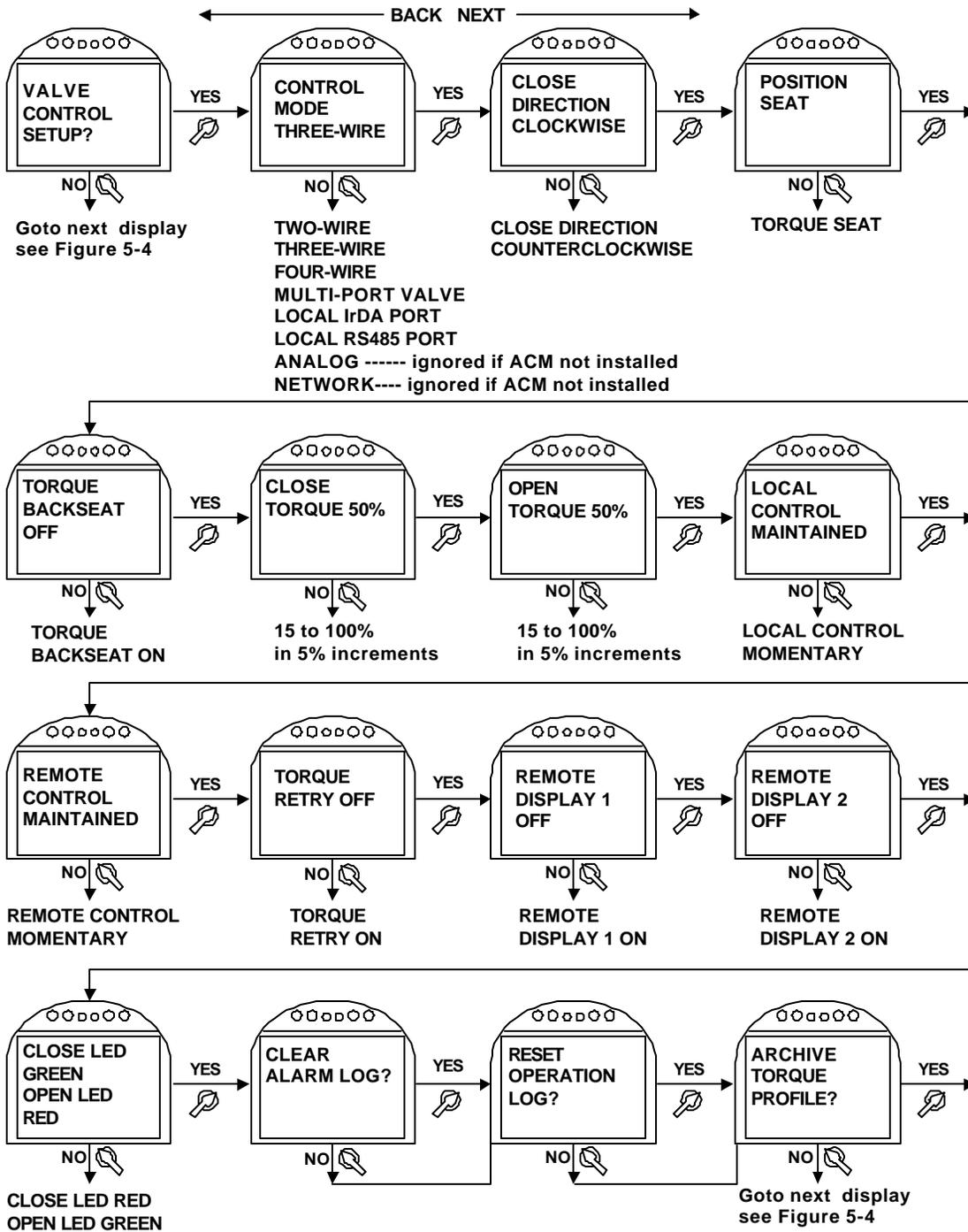


5.6.2. Valve Control Setup

1. At the “**VALVE CONTROL SETUP?**” prompt answer “**YES.**”
2. Use the selector knob (**NEXT/BACK**) to scan the settings until the desired setting is reached. Place the control knob in the **NO** position to increment through each setting’s associated choices. Answer “**YES**” to accept the desired choice. See **Figure 5-6**.

See **Section 4.6, Remote/Auto Control Operation**, for a description of each control mode. If “**MULTI-PORT VALVE**” control mode is selected, the alarm message “**SET LIMITS BEFORE OPERATION**” will be displayed and the yellow LED will flash. See **Section 5.6.3, Set Valve Travel Limits**.

Figure 5-6 Valve Control Setup
Associated choices are listed below each setting.



5.6.3. Set Valve Travel Limits

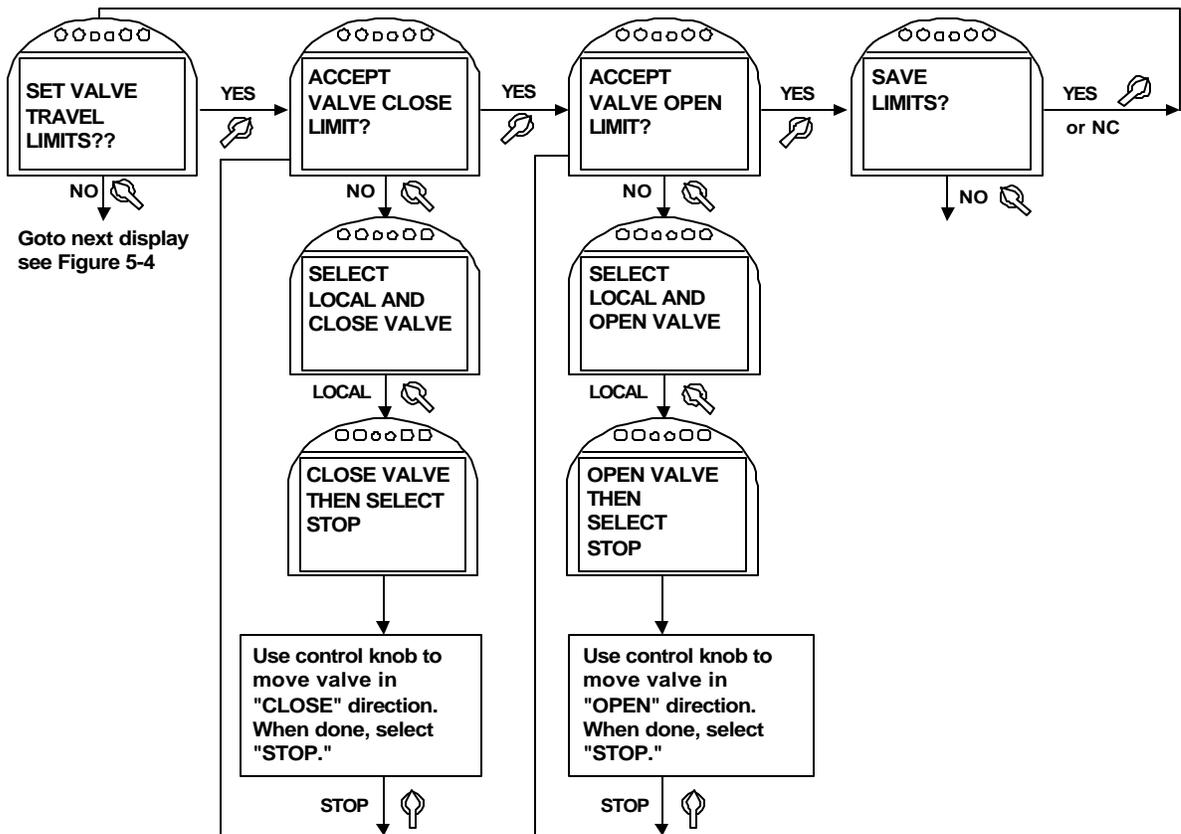
For all control modes except multi-port valve

1. If the close limit is acceptable, answer "YES." If not rotate the selector knob to **LOCAL**.
Close valve to desired limit, rotate selector knob to **STOP**, and answer **YES**.
2. If the open limit is acceptable, answer "YES." If not rotate the selector knob to **LOCAL**.
Open valve to desired limit, rotate selector knob to **STOP**, and answer **YES**.

See Figure 5-7.

Figure 5-7 Set Valve Travel Limits

Normal Operation Mode - Set Limits with Electrical Operation



For the multi-port valve control mode

When "MULTI-PORT VALVE" control mode is selected, the position limits must be set before operating in the "REMOTE" mode.

1. At the "SET VALVE TRAVEL LIMITS" prompt answer "YES."
2. If the Port A limit is acceptable, answer "YES." If not rotate the selector knob to **LOCAL**.
Move the valve to the Port A position, rotate selector knob to **STOP**, and answer "YES" to "ACCEPT VALVE PORT A LIMIT."
3. Repeat Step No. 2 for Port B and Port C.
4. Answer "YES" to "SAVE LIMITS?"

- If an external synchronization switch is wired to Digital Input #5 (close inhibit), select **"MULTI-PORT SYNC ON?"** and answer **"YES."** If not, select **"MULTI-PORT SYNC OFF?"** and answer **"YES."**

Normal Operation Mode - Set Limits with Handwheel Operation

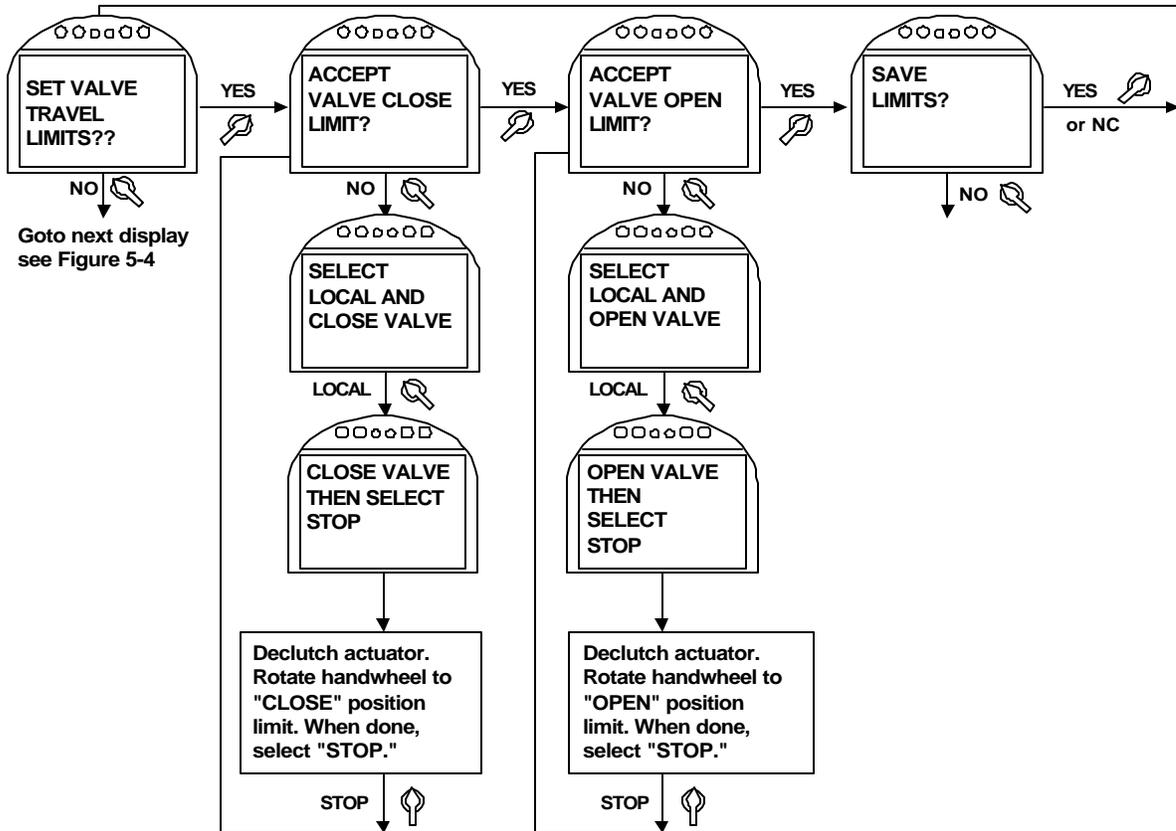
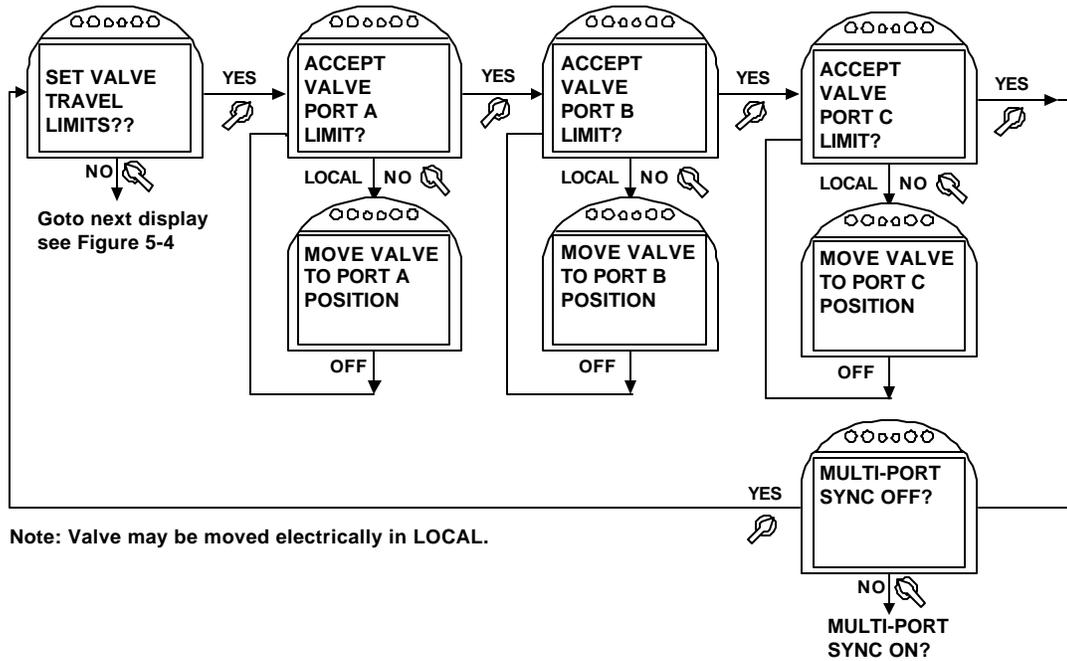


Figure 5-8 Set Valve Travel Limits for Multi-port Valve Control Mode



5.6.4. Discrete Input Setup

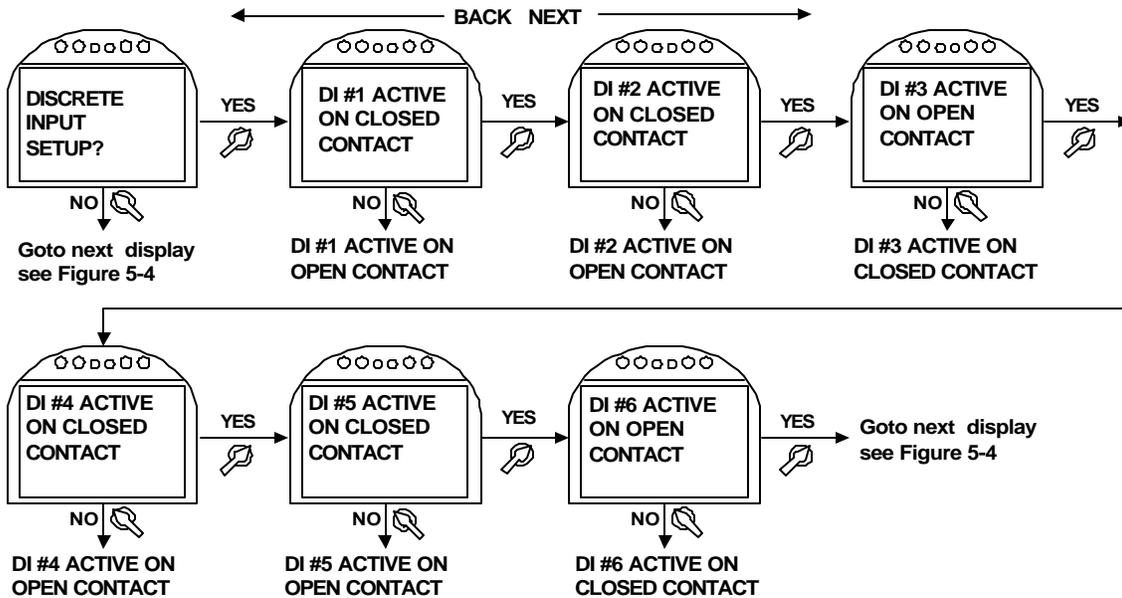
1. At the “**DISCRETE INPUT SETUP**” prompt answer “**YES.**”
2. Use the selector knob (**NEXT/BACK**) to review the setting for each discrete input.
3. For Input D1 #1, use the control knob (**NO**) to select either “active on closed contact” or “active on open contact.” After selection is made, answer “**YES.**”
4. Repeat Step No. 3 for the remaining 5 inputs.

Discrete inputs are used primarily for remote control operation. Refer to **Section 4.6, Remote/Auto Control Operation**, for valve control setup using the discrete inputs.

For connecting a discrete input see **Section 3.5, Discrete Controlled Inputs**.

Figure 5-9 Discrete Input Setup

Configuration of discrete inputs are shown below.



5.6.5. Discrete Output Setup

Relay outputs are used primarily for hardwired status feedback. Each relay may be configured (assigned) to various status, alarm, or control functions. Relay outputs can be configured to be active on the listed alarms/conditions. Relay outputs #1 through #5 are standard and may be configured as shown in **Table 5-2**. Configurable functions are listed in **Table 5-3**.

To configure the relays:

1. At the "DISCRETE OUTPUT SETUP?" prompt answer "YES."
2. Use the selector knob (NEXT/BACK) to review the settings for Discrete Outputs.
3. Use the control knob (NO) to select desired configuration for each relay.

See **Figure 5-10**.

Table 5-2 Relay Outputs #1 through #5 Configuration

Relay	Default Function	Configurable Function	Configure N.O./N.C.	Default Setting	Configure Flashing
RO#1	LSO Valve full OPEN	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#2	LSC Valve full CLOSE	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#3	LSA Intermediate limit in closing direction	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#4	LSB Intermediate limit in opening direction	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#5	Monitor Valve not available	Generic – see NOTE	No	1 N.O. and 1 N.C.	Yes

NOTE: Generic means the control of this relay has been given to the network if a Controlinc card has been installed. The relay will *not* function if the Controlinc card is not installed. Flashing means the output will cycle ON and OFF in one second intervals while the function is active.

Table 5-3 Relay Output Function List

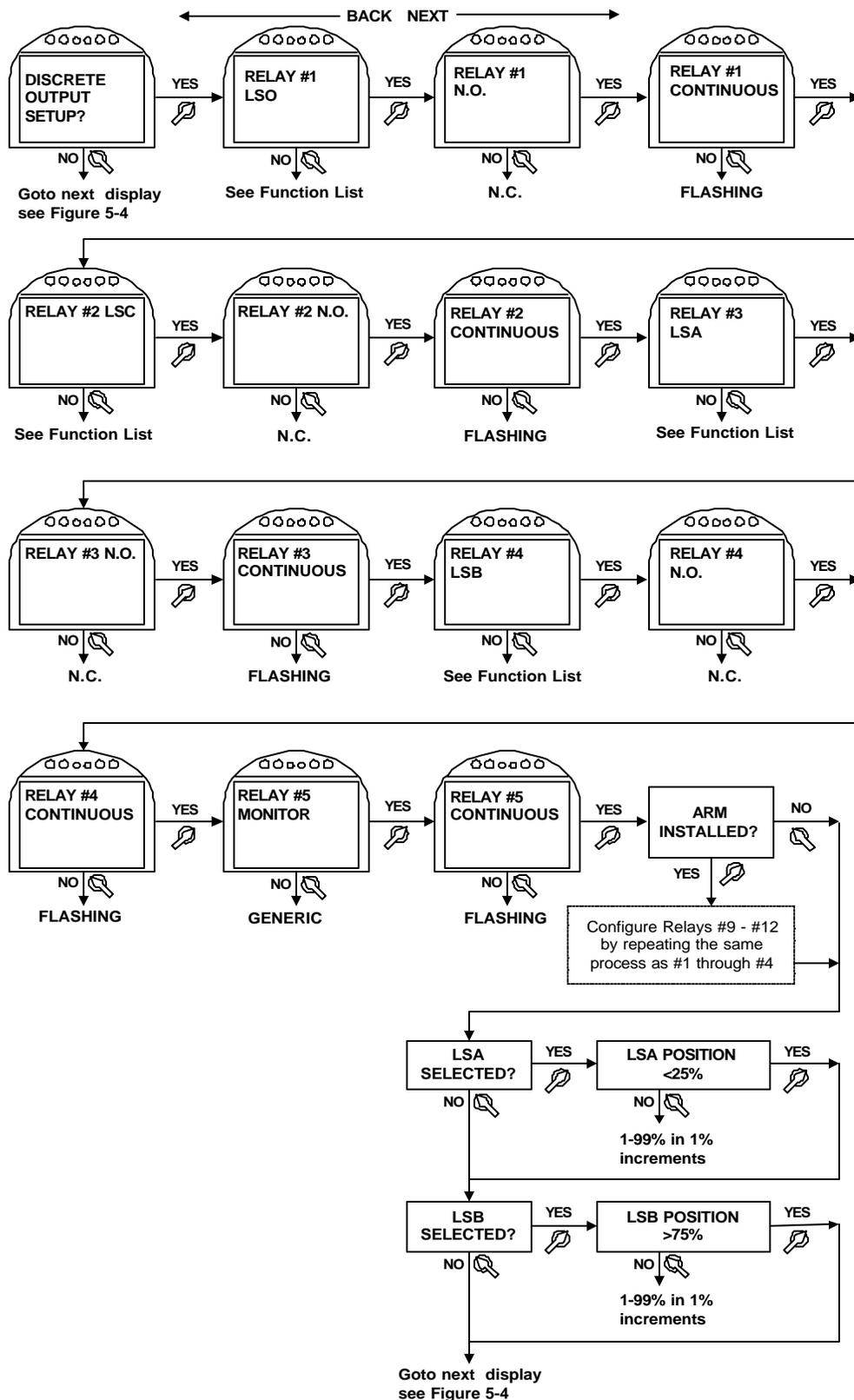
Function List			
LSO (Open limit)	LOW MAIN BATTERY	OVER TORQUE (Open or Close)	CLOSE INHIBIT
LSC (Close limit)	LOCAL	VALVE STALL	LOCAL ESD
LSA (Intermediate limit A)	STOP (SS OFF)	VALVE DRIFT (MOVED BY HANDWHEEL)	ESD ACTIVE
LSB (Intermediate limit B)	REMOTE	LOST POWER	LOST ANALOG
OPENING	EFM (Electronics fault monitor)	MOTOR OVERLOAD	ACTUATOR FAIL
CLOSING	OPEN TORQUE	LOST PHASE	GENERIC (Controlled by Network)
MOVING	CLOSE TORQUE	OPEN INHIBIT	LOW RTC BATTERY

Relays #6 through #8 are Solid State Output relays. These relays are added when an ACM card is installed. These outputs cannot be individually configured. The motor “starter” type selected in the factory setup mode determines the control. See **Table 5-4**.

Table 5-4 Solid State Output Relays Configuration

Relay	Default Function	Alternate Function	Configure N.O./N.C.	Configure Flashing
SSO#6	VFD Open Control	Generic	No	No
SSO#7	VFD Close Control	Generic	No	No
SSO#8	VFD Speed Control	Generic	No	No

Figure 5-10 Discrete Output Setup



Relays #9 through #12 are the auxiliary relays when the Auxiliary Relay Module (ARM) is installed. To configure these relay outputs, follow Step No.1 through No. 3 listed above. See **Table 5-5**.

NOTE: The ARM cannot be added when the Controlinc ACM is installed.

Table 5-5 Relay Outputs #9 through #12 Configuration

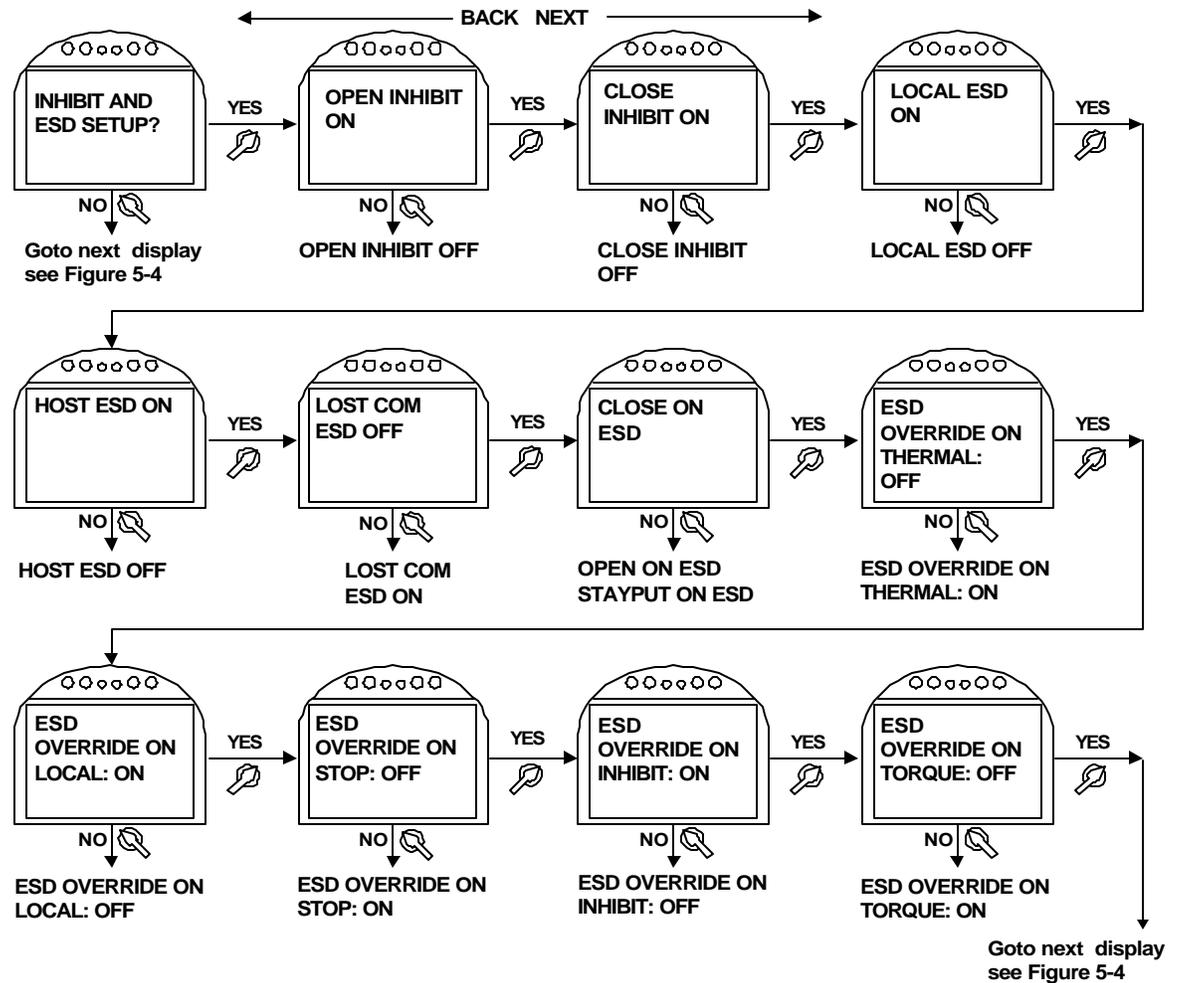
Relay	Default Function	Configurable Function	Configure N.O./N.C.	Default Setting	Configure Flashing
RO#9	Lost Power	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#10	Motor Overload	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#11	Lost Phase	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes
RO#12	Over Torque	See Table 5-3 Relay Output Function List	Yes	N.O.	Yes

5.6.6. Inhibit and ESD Setup

1. At the "INHIBIT AND ESD SETUP?" prompt answer "YES."
2. Use the selector knob (NEXT/BACK) to review the settings for Control Inhibits and Emergency Shut Down.
3. Use the control knob (NO) to select either ON or OFF for each setting; then answer "YES."

Figure 5-11 details each setting.

Figure 5-11 Inhibit and ESD Setup



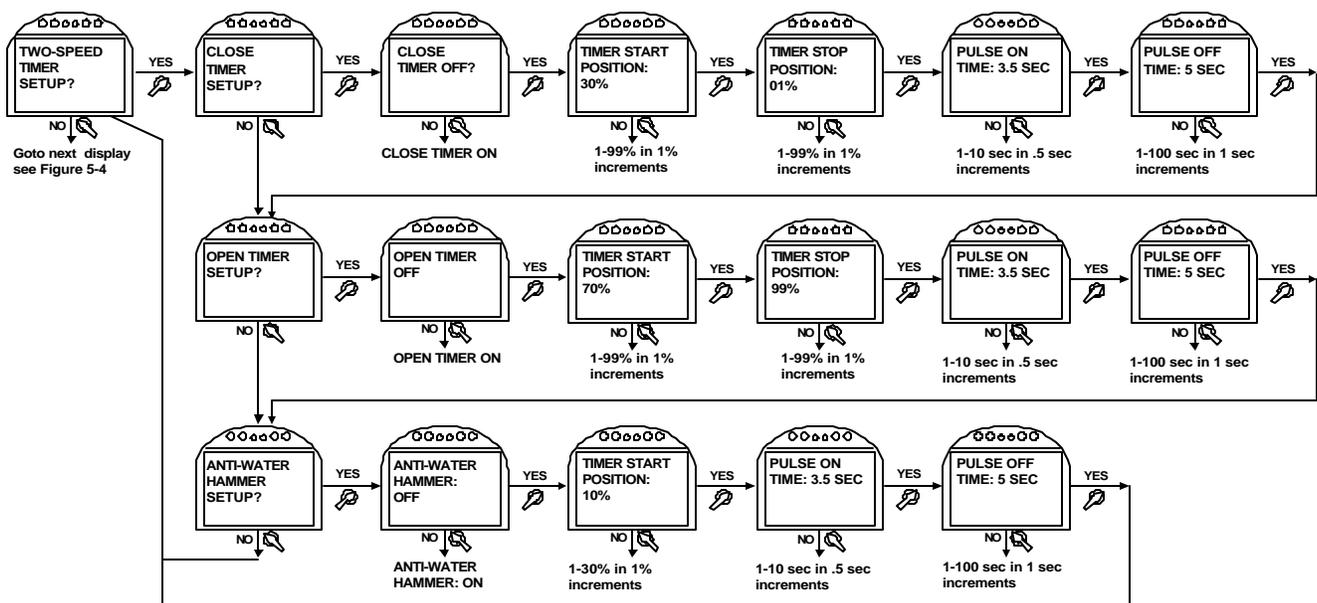
5.6.7. Two-Speed Timer Setup

The two-speed timers can be configured for the actuator to be controlled with different opening and closing times. All configured timers are active in the LOCAL and REMOTE modes.

NOTE: All three timers, close, open, and anti-water hammer, can operate at the same time. If two timer ranges overlap, the anti-water hammer timer overrides all timers.

1. At the **"TWO-SPEED TIMER SETUP?"** prompt answer **"YES."**
2. Use the selector knob (**NEXT/BACK**) to review the settings for each timer.
3. Use the control knob (**NO**) to select either **ON** or **OFF**, increment the position percentage, and pulse time.
4. Answer **"YES"** after each selection. See **Figure 5-12**.

Figure 5-12 Two-Speed Timer Setup



5.6.8. Analog Setup (Futronic ACM Required)

NOTE: Only displayed/applicable if the Futronic ACM is installed and analog control is enabled in the valve control setup. See **Section 5.6.2, Valve Control Setup**.

1. At the **"ANALOG SETUP?"** prompt, answer **"YES."**
2. Use the selector knob (**NEXT/BACK**) to review the settings for analog control.
3. Use the control knob (**NO**) to increment the bandwidths and delay time, to select polarity and lost signal parameters, and to calibrate analog in/out.
4. Answer **"YES"** after each selection. See **Figure 5-13**.

To calibrate analog input, connect a calibrated precision 4-20mA current source to Terminal 25(+) and 26(-) for AIN#1.

To calibrate analog outputs, the user must connect a calibrated precision 4-20mA current meter to Terminals 27(+) and 28(-) for AO#1 or Terminals 29(+) and 30(-) for AO#2

Figure 5-13-1 Analog Setup

NOTE: The actuator senses that the Futronic ACM is installed and adjusts the display sequence to display only one input

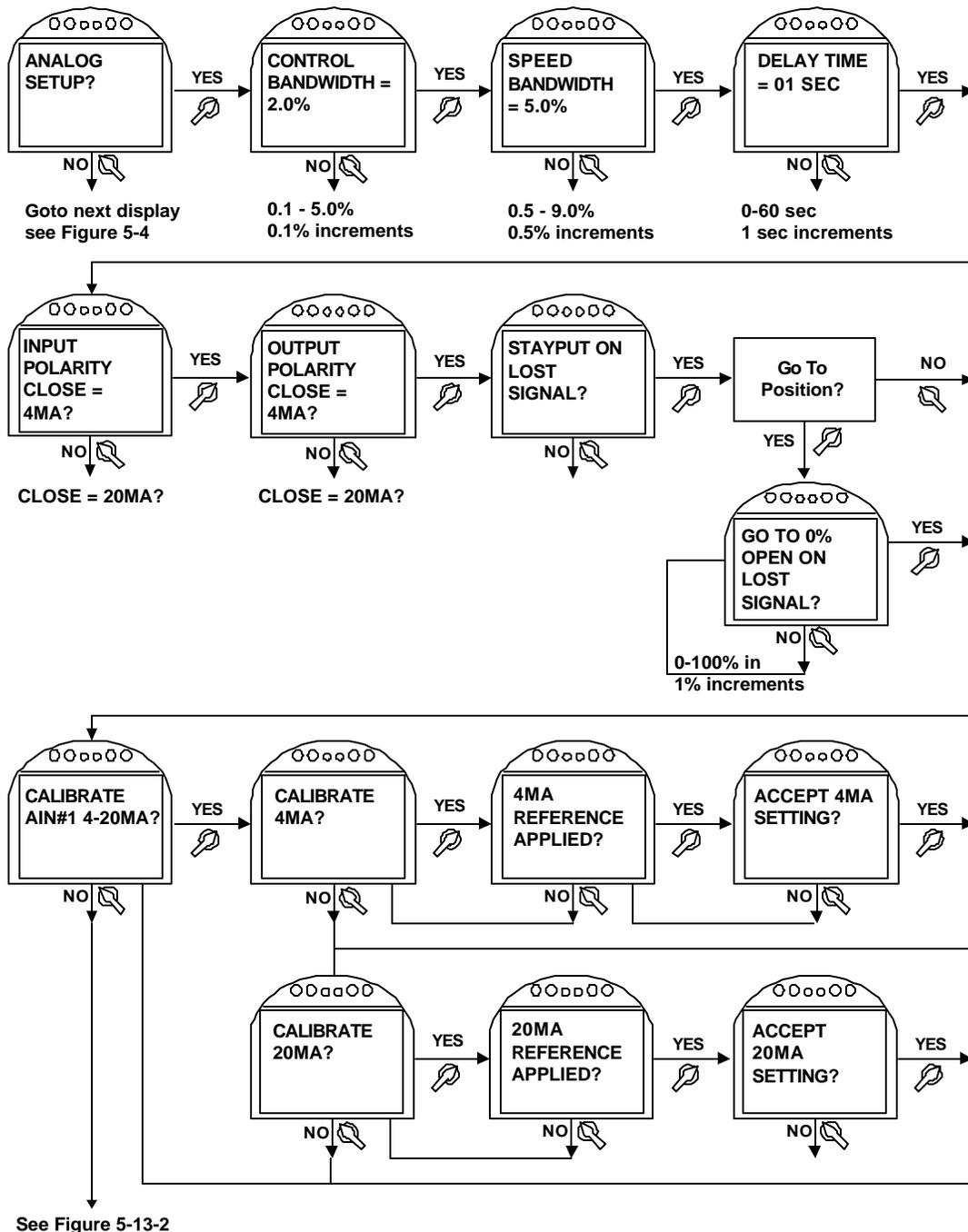


Figure 5-13-2 Analog Setup Continued

From last display in Figure 5-13-1

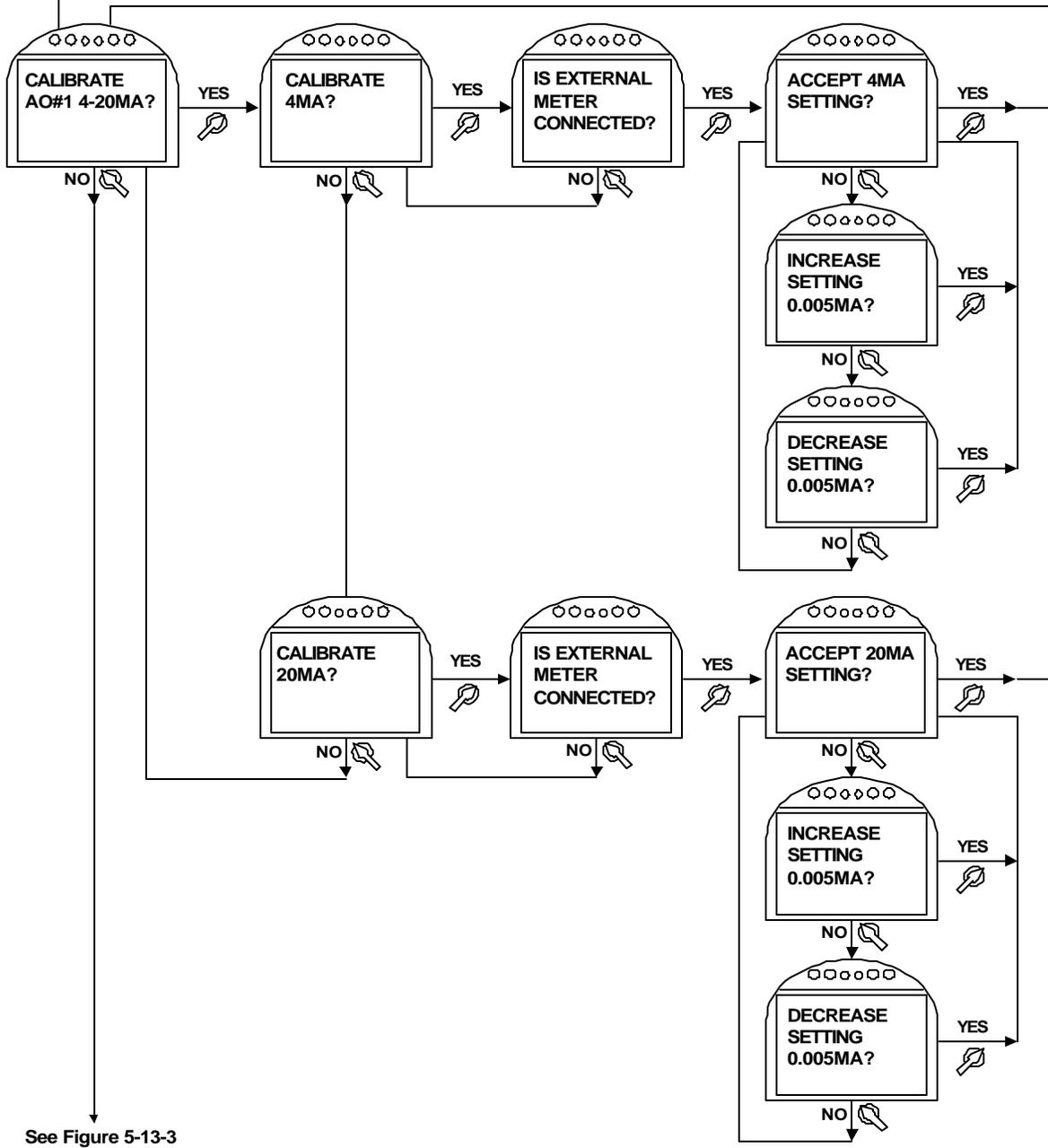
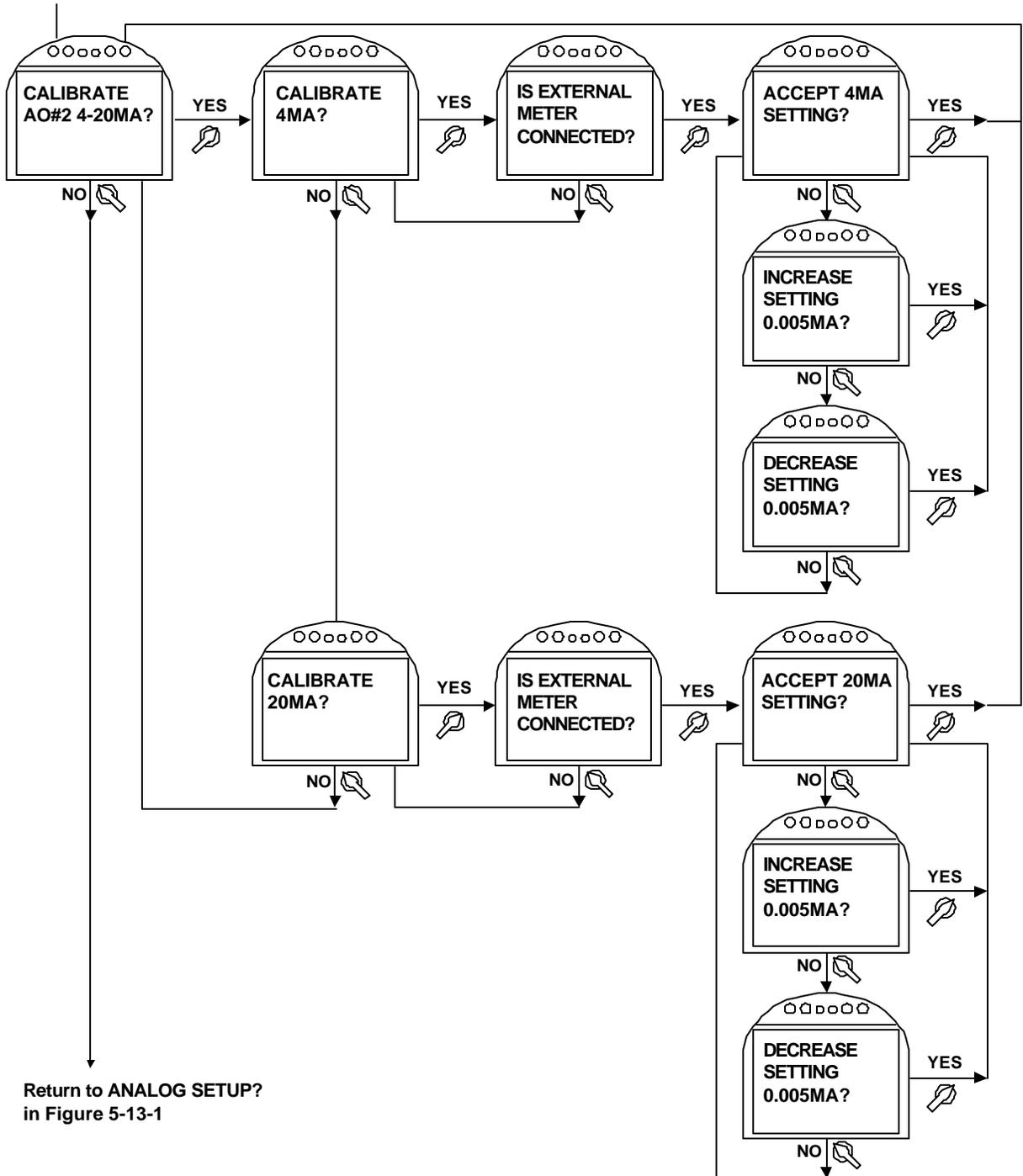


Figure 5-13-3 Analog Setup Continued

From last display in Figure 5-13-2



5.6.9. Network Setup (CAM and Controlinc ACM Required)

NOTE: Only displayed/applicable if the Communication Adapter Module (CAM) and the Controlinc ACM are installed, and the network control is enabled. See **Section 5.6.2, Valve Control Setup**.

1. At the “**NETWORK SETUP?**” prompt, answer “**YES.**”
2. Use the selector knob (**NEXT/BACK**) to review the settings for network control.
3. Use the control knob (**NO**) to increment the node address, response delay, and analog I/O scale, and to select the parity, and analog scale.
4. Answer “**YES**” after each selection.

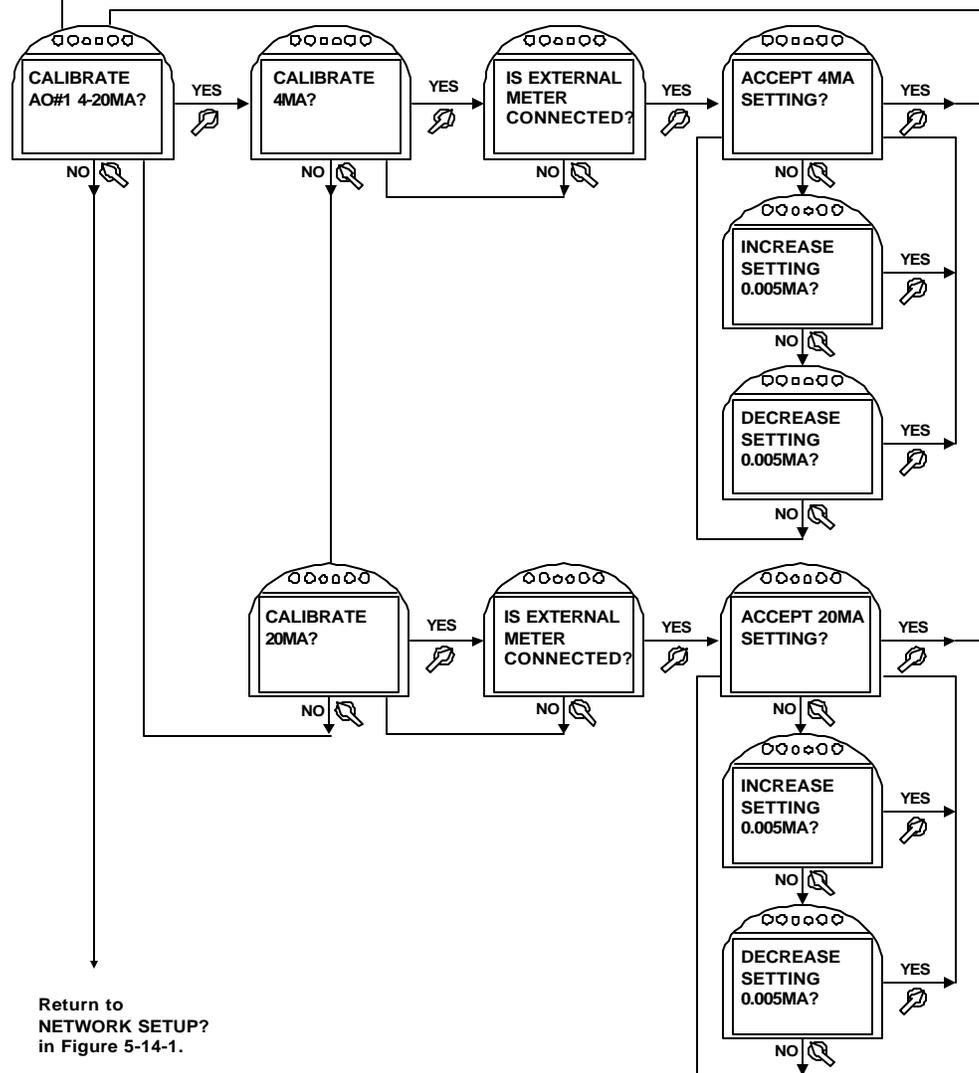
See **Figure 5-14**.

Protocol selection is displayed for information only. Protocol is set at the factory by the selected CAM based on purchase order information. Protocol may not be changed by the user in the field. Only factory technicians may change the CAM or protocol in the field. Baud rate is automatically detected by the Controlinc ACM and no setup is required.

To calibrate analog inputs, the user must connect a calibrated precision 4-20mA current source to Terminals 25(+) and 26(-) for AIN#1 or Terminals 27(+) and 28 (-) for AIN#2. To calibrate analog output, the user must connect a calibrated precision 4-20mA current meter to Terminals 29(+) and 30(-) for AO#1.

Figure 5-14-2 – Network Setup Continued

From last display in
Figure 5-14-1



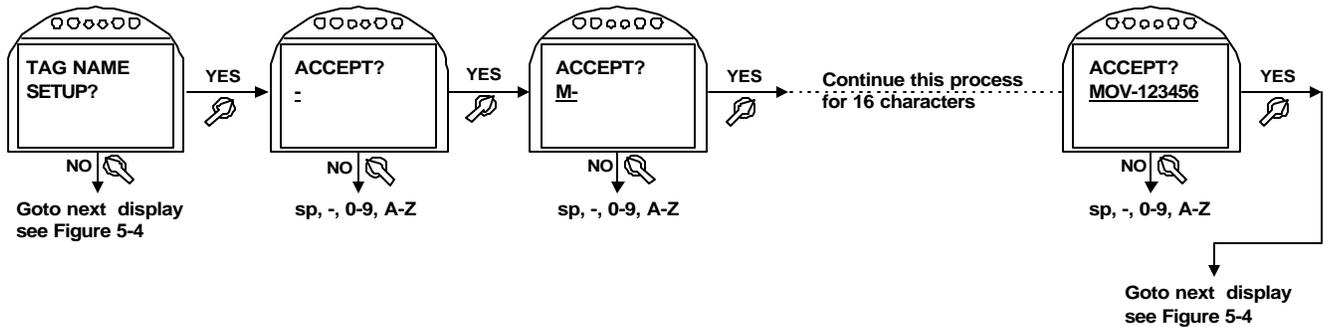
5.6.10. Tag Name Setup

1. At the **"TAG NAME SETUP?"** prompt, answer, **"YES."**
2. Use the control knob (**NO**) to increment the data entry selection for each character.

NOTE: The tag name consists of a maximum of sixteen characters. Spaces and dashes are included in the sequence of "space," ",", "0-9," "A-Z."

3. At the **"ACCEPT?"** prompt, answer, **"YES"** for each character.
4. Use the selector knob (**BACK**) to make changes to the previous characters in the tag name while entering the data.

Figure 5-15 Tag Name Setup



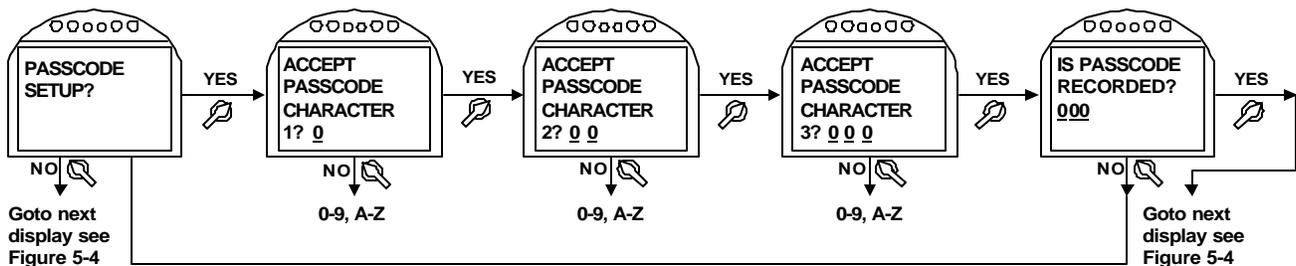
5.6.11. Passcode Setup

The passcode may be changed via the passcode setup sequence.

1. At the “**PASSCODE SETUP?**” prompt, answer “**YES.**”
2. Use the control knob (**NO**) to increment the data entry selections of 0-9 and A-Z for each character. The passcode consists of 3 characters.
3. Use the selector knob (**BACK**) to make changes to the previous characters in the passcode while entering the data.
4. Answer “**YES**” to the “**ACCEPT PASSCODE CHARACTER X? X**” prompt.
5. Repeat Step No. 2 and 3 until all three characters have been entered.

NOTE: This new passcode must be entered the next time changes are made.

Figure 5-16 Passcode Setup



5.6.12. Reload Factory Settings

Factory default settings are saved in program memory and may not be changed. When factory settings are reloaded, the factory default settings are transferred from the memory to the EEPROM. This reloading overwrites any changes made by the user.

Factory default settings are detailed in **Table 4-5**. Factory settings *do not* overwrite valve travel limits or analog calibration.

CAUTION: CLEAR LOGS only clears the alarm log, torque profile, and resets the operation log.

6 Troubleshooting

CAUTION: *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 into this compartment should not be necessary. Unauthorized entry could void the warranty.*

6.1. Troubleshooting Problems/Corrective Action for Actuator Operation

Symptom	Probable Cause	Corrective Action
Motor will not Run	Blown Control Fuse	Check fuse and replace as necessary.
	Open in Control Circuit	Refer to appropriate wiring diagram and check for continuity
	Insulation Resistance Breakdown in Motor	Perform Megger Test
No power available to actuator	Tripped circuit breaker	Reset circuit breaker
Handwheel hard to turn	Valve stem improperly lubricated	Clean out old grease and replace with recommended lubricant
	Actuator lubrication has broken down	Clean out old grease and replace with recommended lubricant
	Valve packing gland too tight	Loosen packing gland nuts as necessary
	Drive sleeve bearing failure	Replace Bearing
	Jammed valve	Refer to valve maintenance
Valve only opens or closes partially with motor	Torque switch setting too low	Check setting and reset if necessary
	Limit switch improperly set	Check switch actuation and recalibrate if necessary
Torque switch is properly set, but actuator Torque's out in mid-travel, open or closed direction	Damaged or bent valve stem	Refer to valve maintenance
	Valve packing too tight	Refer to valve maintenance
	Jammed valve (obstruction in line)	Refer to valve maintenance

Handwheel will not operate valve	Handwheel shaft bearing assembly malfunction	Repair or replace as necessary
	Stripped Gearing	Replace as necessary
	PS shifter position or malfunction	Replace PS shifter or replace gear(s)
	Broken Handwheel Shaft	Repair or replace as necessary
	Broken valve stem of stripped stem nut	Repair or replace as necessary
Motor runs but will not operate the valve	Motor Bearing Assembly malfunction	Repair or replace as necessary
	Stripped gearing	Replace
	Broken valve stem or stripped stem nut	Repair or replace as necessary
	PS shifter position or malfunction	Replace PS assembly

If the LDM does not receive communication messages from the CCM within 5 seconds after power is applied or loses communication for 5 seconds or more, it will display a flashing message "CCM LINK FAILED" and blink all three LEDs.

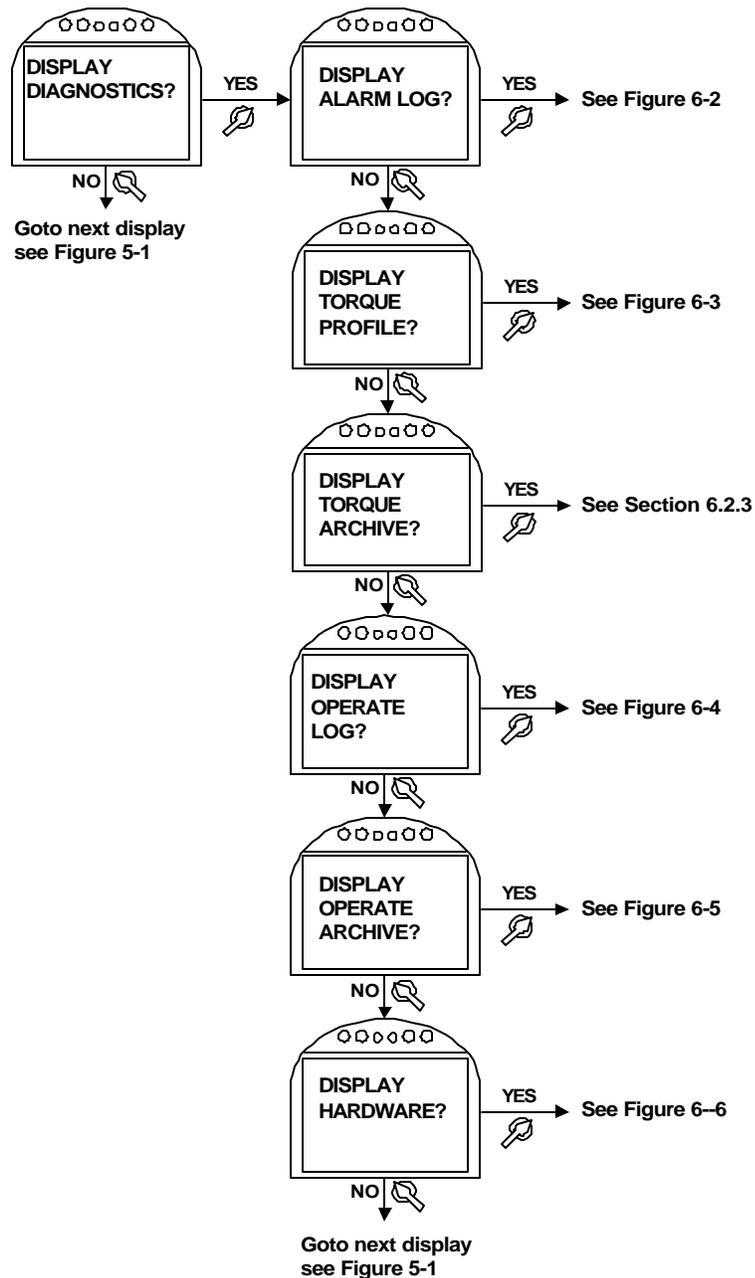
6.2. Display Diagnostics

Displaying diagnostics retrieves historical data that is stored in the actuator's memory. This aids in troubleshooting.

1. At the "**DISPLAY DIAGNOSTICS?**" prompt, answer "**YES.**"
2. Use the selector knob (**NEXT/BACK**) to review the settings. See **Figure 6-1**.

NOTE: When the "SET LIMITS BEFORE OPERATING" alarm is displayed, no other alarms will be displayed until the limits are set.

Figure 6-1 Display Diagnostic



6.2.1. Display Alarm Log

At the time the alarm occurs, the alarm is displayed on the bottom line of the message center. This display lists the last nine alarms that have occurred. The first alarm listed is the most recent to occur. The alarm list progresses from the most recent to the oldest. The following alarms may be displayed.

EFM MONITOR	OPEN INHIBIT
OPEN TORQUE_%	CLOSE INHIBIT
CLOSE TORQUE_%	LOCAL ESD
VALVE STALLED	REMOTE ESD
VALVE DRIFT	LOST AIN1 SIGNAL
POWER FAIL	ACTUATOR FAIL
LOST PHASE	SETUP ERROR
MOTOR OVERLOAD	SET LIMITS BEFORE OPERATING

NOTE: When the “SET LIMITS BEFORE OPERATING” alarm is displayed, no other alarms will be displayed until the limits are set.

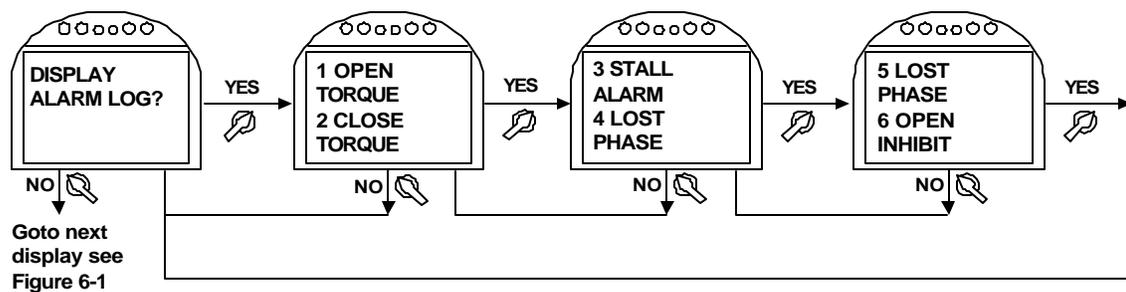
1. At the “**DISPLAY ALARM LOG?**” prompt, answer “**YES.**”

2. Use the selector knob (**NEXT/BACK**) to review the alarms. See **Figure 6-2**.

NOTE: The control knob (**YES/NO**) can be used to view the alarms; however do not cycle the control knob between NO and YES because the unit could display the “**SETUP**” mode.

3. Use the control knob (**NO**) to exit the display.

Figure 6-2 Display Alarm Log Example



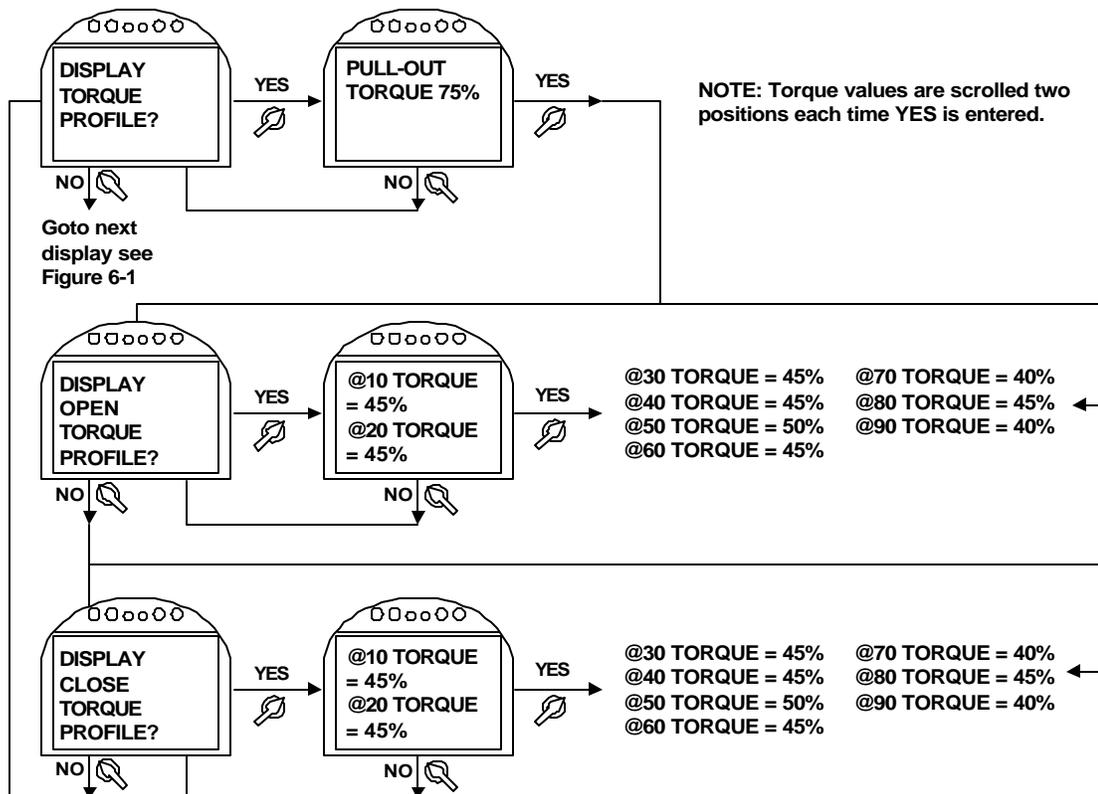
6.2.2. Display Torque Profile

Torque profile is data on the last stroke. Torque data is recorded at 10% intervals of valve travel and is displayed for both open and close directions. Pullout torque is peak torque recorded in the open direction from 0 to 9% while unseating the valve.

1. At the “**DISPLAY TORQUE PROFILE?**” prompt, answer “**YES.**”
2. Use the control knob (**YES**) to review the torque profiles. See **Figure 6-3**.

NOTE: Two positions of torque data are shown for each “**YES**” that is selected.

Figure 6-3 Display Torque Profile



6.2.3. Display Torque Archive

Torque archive is displayed like Torque Profile. Torque archive is the data stored at the time commanded by the user in the “**CHANGE SETTINGS**” mode. See **Section 5.6.2, Valve Control Setup** and **Figure 5-6**.

1. At the “**DISPLAY TORQUE ARCHIVE?**” prompt, answer “**YES.**”
2. See **Section 6.2.2** and **Figure 6-3**.

6.2.4. Display Operation Log

Operate log aids in troubleshooting because it contains the operation data accumulated since the operation log was reset. See **Figure 6-4**.

1. At the “**DISPLAY OPERATE LOG?**” prompt, answer “**YES.**”
2. Use the control knob (**YES**) to review the operate log

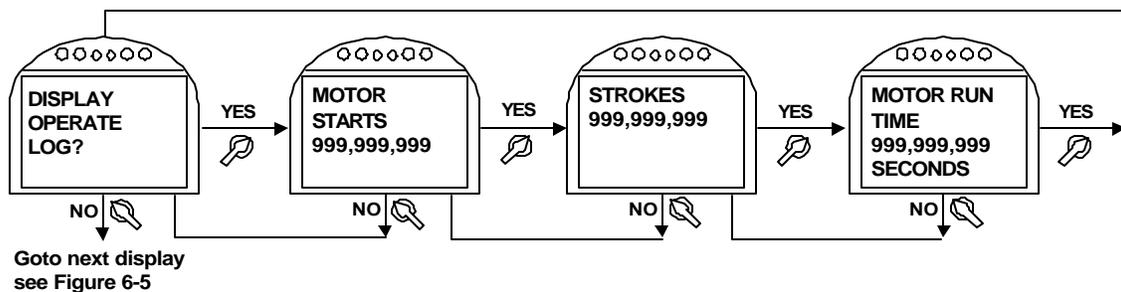
Motor starts value is the number of times the motor has been started. The strokes value displayed is the number of full strokes from limit to limit. Stroke time can be measured as follows:

1. Reset operation log
2. Stroke the valve. Stroke time is equal to the motor run time.
Motor run time is the total motor operational time.

To reset operation log:

1. Enter “**Change Settings**” mode.
2. Select “**VALVE CONTROL SETUP?**”
See **Section 5.6.2, Valve Control Setup.**

Figure 6-4 Display Operation Log

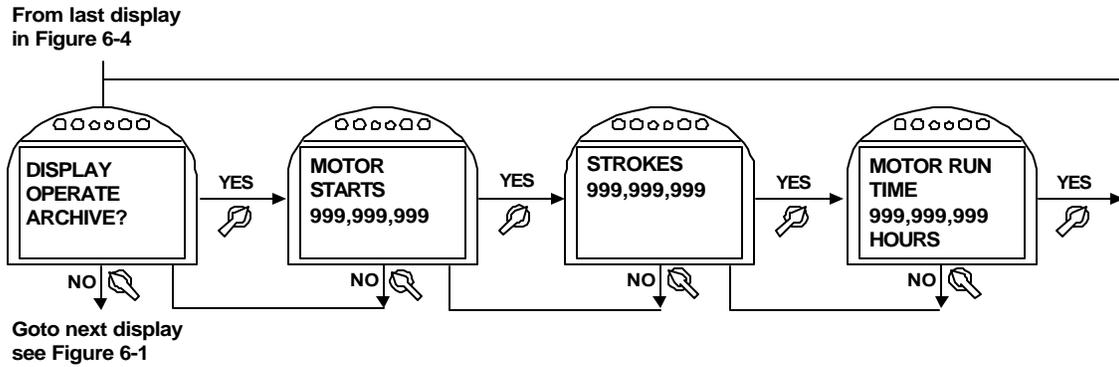


6.2.5. Display Operation Archive

Operation archive displays operation data from the initial commissioning. See **Figure 6-5**. The operation archive *cannot be reset* in the “**CHANGE SETTINGS**” mode. The operation archive can be reset in the “**FACTORY SETUP**” mode; however the actuator must be decommissioned and travel limits must be reset before operating as detailed in **Section 4.4.1, Setting Position Limits.**

1. At the “**DISPLAY OPERATE ARCHIVE**” prompt, answer “**YES.**”
2. Use the control knob (**YES**) to review the operation archive.

Figure 6-5 Display Operation Archive



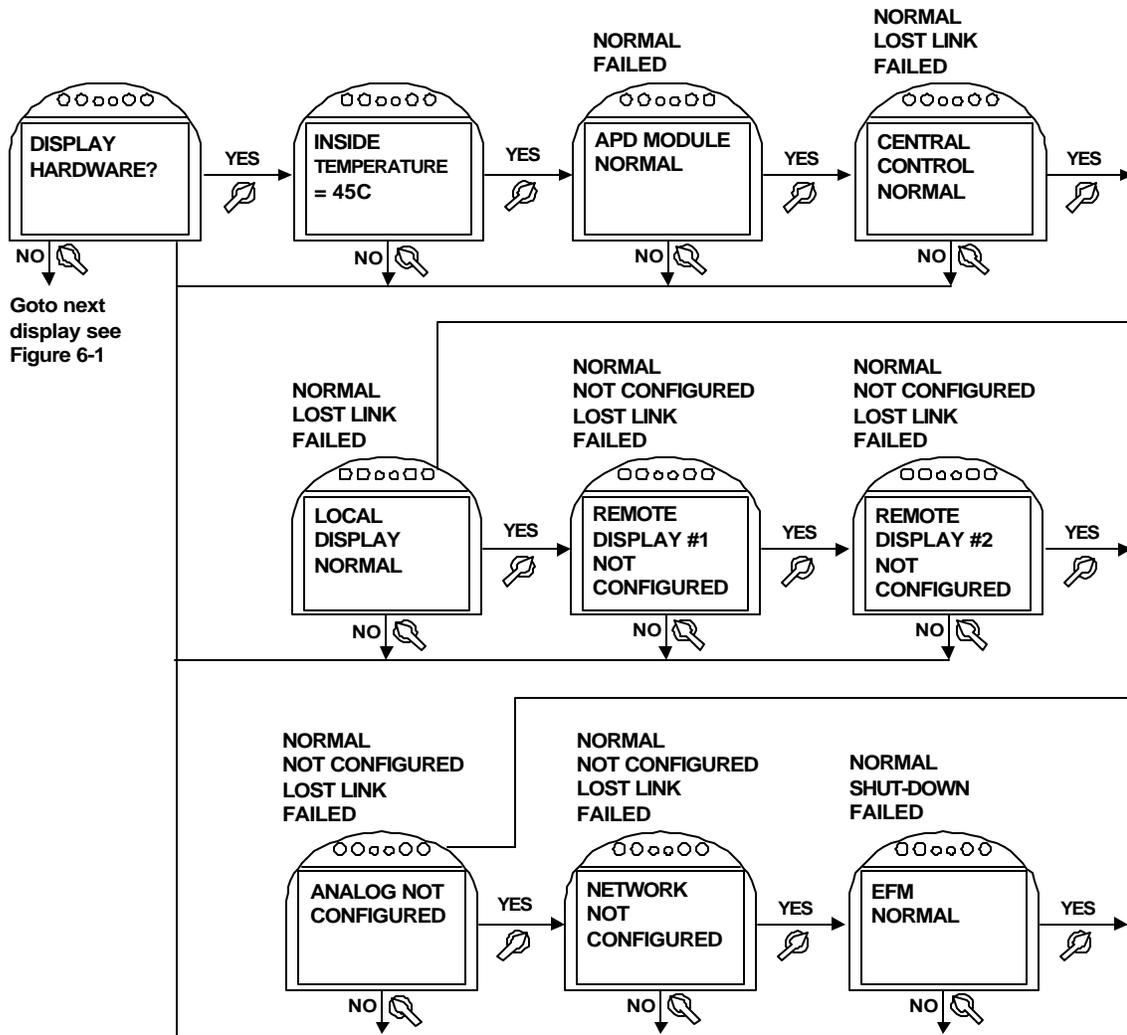
6.2.6. Display Hardware

This display reports the status of the modules and can identify which module is at fault if a problem exists with the actuator. Typical status report can include

- ?? Normal
- ?? Not Configured
- ?? Lost Link
- ?? Failed

1. At the “**DISPLAY HARDWARE?**” prompt, answer “**YES.**”
2. Use the control knob (**YES**) to review the hardware status.

Figure 6-6 Display Hardware



7 Maintenance

7.1. Maintenance Schedule

EIM TEC 2000 Series Actuators have been designed and manufactured to provide years of trouble free service. Minimal maintenance is required.

It is not unusual to experience some minor grease weeping around seals during periods of long storage or inactivity. This is simply a separation of the oil in the compound and is not detrimental to the actuator operation. Once operation has begun, this situation should disappear.

7.2. Lubrication

Normal operation may not require lubricant during the life of the actuator. The basic lubricants used are multi-purpose extreme pressure specially formulated having a molybdenum disulfide additive. For specific information, request **EIM Technical Sheet EIM-025**.

7.3. Pressure Relief

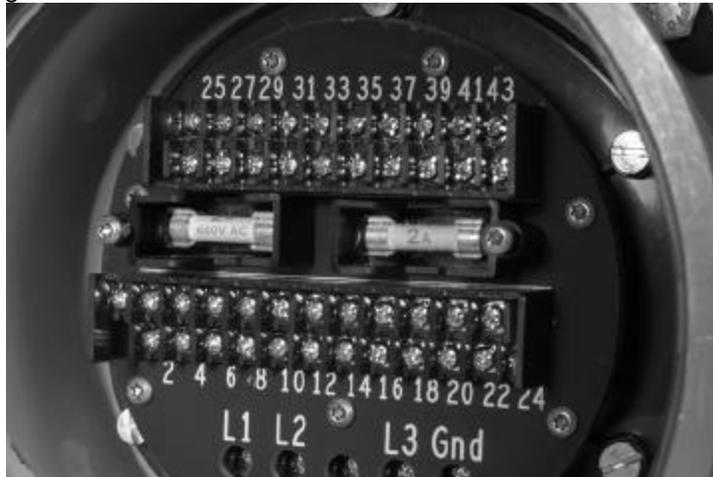
During actuator operation, a small pressure builds up as a result of the gear temperature increase combining with the varied outdoor temperature.

1. After actuator has been located in the field and valve position has been determined, remove ½ NPT plug from the highest ½ NPT vent location on the gearbox.
2. Replace with Relief Vent Fitting Part No. 83385. See **EIM Outline Drawing No. XXX** for possible vent locations

7.4. Fuse Replacement

Two transformer primary fuses are located in the Separate Terminal Compartment (STC). To check or replace fuses, remove fuse cover by loosening the two Torx screws and slip cover out from underneath screws. Replace fuse only with 600V, 2A fuse, Bussmann TDC 600V 2A, EIM P/N 7019900425. Replace fuse cover and snug down screws. Do not over tighten.

Figure 7-1 Fuses in the STC



7.5. Battery Replacement – “Clicker”

1. Insert a coin in the slot on the right hand corner of the key ring end and twist.
2. Slide battery to remove
3. Replace battery Panasonic Part No. CR2031 or equal.

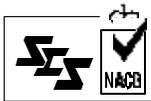
8 Regulatory Information



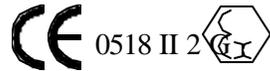
Class I, II, III Div. 1
Groups B, C, D, E, F, G
T4 & T4A @ Ta 60°C, Type 6P



Class I, II, III Div. 1
Groups B, C, D, E, F, G
T4 & T4A @ Ta 60°C, Type 6P



EEx d IIB T4 & 120° (T4)
@ Ta 60°C, IP68
EEx d IIB + H2 T4 @ 120° (T4)
@ Ta 60°C, IP68



Ex d IIB T4 & 120° (T4)
@ Ta 60°C, IP68
Ex d IIB + H2 T4 & 120° (T4)
@ Ta 60°C, IP68



Appendix A

TEC 2000 Assembly Drawing - TBD

EIM E796 document (1st column page 3) “Need to modify referenced M2CP drawing to show TEC 2000 enclosure...”

