



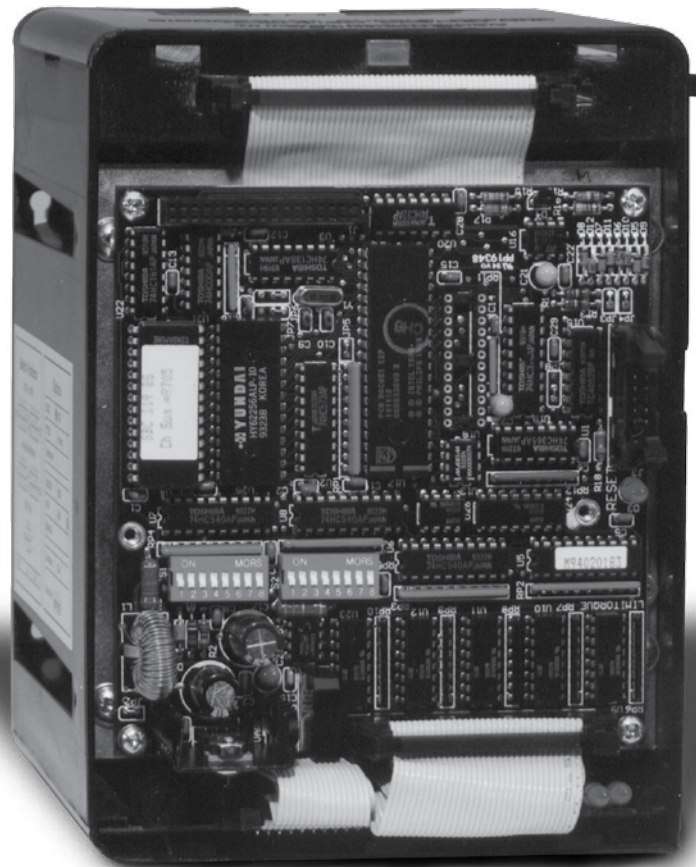
USER INSTRUCTIONS

Limitorque Actuation Systems UEC-3 Universal Electronic Controller

For ROM Version 1.41 or Higher

FCD LMENIM4023-00 – 10/05 (Replaces 440-12000)

***Installation
Operation
Maintenance***



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1

Introduction

NOTE: This manual should be read with the L120 or LY Series Instruction and Maintenance Manual available for easy reference.

1.1 Flowserve Limitorque Valve Control

Flowserve Limitorque's L120 and LY series of actuators are the most advanced valve controls on the market ... the result of many years of development and awareness of our customers' requirements. This manual has been prepared to help you obtain the most benefit from the equipment. It contains instructions on the correct installation of the units and on the proper use of the operating controls.

Limitorque actuators control the opening and closing of the valve and limit the torque and thrust applied to the valve stem. As a result, all valve operating components are protected from overload, improper seating or pipeline obstructions. Limitorque actuators may be mounted on any size of valve in almost any position or location. They are readily adaptable to existing equipment.

1.2 Product Description

The UEC-3 is a microprocessor based controller for the complete range of Limitorque actuators. It provides many protection and control features which are designed to optimize valve control for your facility. The UEC-3 allows each actuator to be individually configured to fit specific customer needs. This configuration may be altered in the field as process requirements change or as the real needs of the actuator are realized.

1.3 UEC-3 Models

1.3.1 UEC-3 (Universal Electronic Controller)

The basic UEC-3 model provides control, indication, alarm, and protection features as listed in Section 2 of this manual. It is intended for use with open/ close or pushbutton throttling valves.

1.3.2 UEC-3-MPC (Modulating Position Controller)

This model is designed to position valves in accordance with a 4-20mA command signal, thereby controlling level, flow, pressure, etc. All the indication, alarm, and protection features of the UEC-3 are retained in this model.

1.3.3 UEC-3-DDC (Distributed Digital Controller)

Digital control via Limitorque's DDC-100 Network is provided by this model. The communication protocol may be either Modbus or BITBUS, and up to 250 Limitorque actuators may be controlled and monitored in a DDC-100 Network. The extensive features included and available with the UEC-3-DDC (DDC-100 UEC Field Unit) are covered in two separate publications -Bulletin 440-20014 for the Modbus version and Bulletin 440-20013 for the BITBUS version.

2

UEC-3 Operational Features

2.1 Jammed Valve Protection

The jammed valve state occurs when the actuator possesses insufficient torque capacity to move the valve from the closed or open position. If a signal is sent to the actuator to open or close the valve, the position limit switch is monitored to see if it resets (see section on Limit Switch Settings in the L120 or LY Instruction Manual). This can only occur if the actuator has rotated sufficiently in the reverse direction (20-50) for the limit switch to trip to its mid-travel state. If no reset is received the unit will automatically initiate the jammed valve sequence.

A signal to reverse the direction is sent for 0.5 second, then a further signal is applied in the initial direction. If the limit switch resets then the valve and the actuator will resume normal operation. If no reset is detected for the second time, the UEC-3 will inhibit any further electrical operation while the signal is maintained and will de-energize the monitor relay to indicate a valve jammed fault.

The jammed valve state can be reset by operating the valve manually with the handwheel. This resets the position limit switch, which is detected by the UEC-3, and normal control is resumed in both 'Remote' and 'Local' modes. It can also be reset by removing the existing signal (if maintained), and then sending another 'Open' or 'Close' command, either in 'Local' or 'Remote' mode. This is not recommended since the valve is already jammed. This feature is not available in MPC mode.

2.2 Anti-Torque Switch Hammer Protection

Torque switch hammer may occur when a 'maintained' control signal is present and the gearing in the actuator is non-locking. The torque switch opens, then recloses, and results in rapid, repeated energizing and de-energizing of the actuator.

Torque switch hammer is prevented by monitoring the torque switch in both the open and close directions. Once the torque switch has operated by the valve hitting an obstruction or, if torque seating is selected, by reaching the end of travel, the actuator will inhibit any further operation in the same direction. If an obstruction is met, the actuator will operate only in the reverse direction. This allows the actuator to back out of any obstruction.

2.3 Instantaneous Reversal

To reverse the direction of travel in either the 'Local' or 'Remote' mode it is not necessary to stop the actuator. The unit has a built-in time delay of 0.5 seconds when the motor is reversed in order to reduce current surges.

2.4 Opto-Isolated Inputs

The use of opto-isolators on all remote control inputs protects the internal control logic circuits from high voltage transients. The current drawn on each externally fed remote signal is 4mA @ 24 Volts DC.

2.5 Motor Thermal Protection

All Limitorque motors are fitted with a thermostat embedded in the windings with normally closed contacts. Should the motor overheat, the contacts will open, de-energizing the contactors and inhibiting any further operation until the motor has cooled sufficiently for the thermostat contacts to close again. The operation of the thermostat may be ignored when a maintained remote ESD signal is present by selection of a DIP switch (see Section 6 for DIP switch settings).

2.6 Emergency Shutdown (ESD) for ROM versions 1.41 or higher

A remote signal can be applied to User Digital Input 0 which will override any other command signal when the actuator is in the REMOTE mode. (Note: If a maintained ESD signal is applied when the actuator is in the LOCAL mode, the signal will be acted upon immediately when the actuator is switched from LOCAL to REMOTE.) If the field unit is equipped with ROM version 1.41 or higher, it can be configured with ESD Override so that a maintained ESD signal will be active in the LOCAL and OFF selector switch positions as well as the REMOTE position. The procedure for changing the ESD Override configuration is given in Section 8.2.

The actuator will act on the ESD signal to close the valve, open the valve, stay-put (stop) or ignore it, depending on the configuration of the unit (See Section 6 for setup information). An active ESD signal will override inhibit signals, Torque Switch trip, local STOP and subsequent commands.

Motor thermostat protection can be bypassed by DIP switch selection so that it is not active during ESD operations. Disabling the motor thermostat voids all third party certifications including Factory Mutual, CSA, SAA, and CENELEC.

If the ESD signal is removed, ESD operation will be terminated by any of the following:

1. Subsequent remote command signal
2. Motor Thermostat trip
3. Torque switch trip
4. Power loss
5. End-of-travel limit switch (if in position seated mode)
6. Switching from REMOTE to LOCAL
7. Pressing the local STOP button when in local or remote mode

Refer to Section 6 for DIP switch settings and connection details.

2.7 Monitor Relay

The monitor relay provides immediate indication of problems that disable valve operation. The relay has a normally open contact and a normally closed contact (1 single-pole double-throw — SPDT — contact).

The relay is energized when the actuator power supply is present and the circuits being monitored are in a normal/healthy state. The Monitor relay automatically reverts to the energized state when monitored faulty states have been corrected. The relay will de-energize if any of the following states occur:

1. Local / Off / Remote selector switch is NOT in 'Remote' mode.
2. A lost phase has been detected.
3. Loss of internal power supply.
4. Motor thermostat has tripped due to the overheating of the motor.
5. Jammed Valve detected
6. Contactor fails to energize. (This is active only while the command signal is present).
7. Either torque switch tripped.

The conditions that cause the relay to de-energize can be configured (see Section 8.6)

2.8 Torque or Position Seating

Either torque or position seating may be selected without any wiring changes by making the appropriate selection on the DIP switches (see Section 6 for DIP switch settings).

When TORQUE SEATING is selected, the position limit switches must still be set to trip at both ends of travel. This enables the logic controls to differentiate between torque switch operation under normal seating conditions and a mid-travel obstruction. Refer to 'L120 or LY Series Instruction and Maintenance Manual' on Torque Switch setting.

For POSITION SEATING see 'L120 or LY Series Instruction and Maintenance Manual' on Limit Switch Setting.

2.9 Electrical Interlock / Inhibit Circuits

The interlocks inhibit electrical operation in either the open or close direction. With the setup switch set to ON (see Section 6 for DIP switch settings and connection details), any signal to open or close the valve will be ignored when there is a remote signal to the 'Open Inhibit' terminal for opening the valve or 'Close inhibit' terminal for closing the valve.

This feature can be used to inhibit electrical operation completely (i.e. functional lockout) or inhibit the actuator until another operation has been completed (i.e. interlock on a sequence control system).

NOTE: This is effective in both the 'local' and 'remote' modes. If an ESD signal is received, the interlocks will be overridden.

2.10 Remote Control Supply

The remote control inputs can be powered by the internal 24 Volt DC supply incorporated in the actuator (maximum external load - 6 Watts). This supply can be used over long distances because the input circuits require a low switching current (max. 4mA), which virtually eliminates problems due to voltage drop and induction. Alternatively, an external control supply in the range of 24 - 125 Volts AC or DC can be used to source the remote inputs.

NOTE: If an external supply greater than 90 volts is to be used, the link (LK1) on the Termination/ Interconnect Board must be removed.

▲ **CAUTION:** Never attempt to connect an external supply to the +24 volt DC or 24 volt DC common terminals (TB1-6 or 7 and TB1-13 or 14).

2.11 Remote Two-, Three- and Four-Wire Control

2.11.1 Two-wire Control

Remote control of the actuator is possible by connecting a single contact (e.g., switch, relay, etc.) between two terminals. When the contact is closed the actuator will travel in one direction and in the reverse direction when the contact is open. The direction of travel is determined by setting the appropriate DIP switch.

2.11.2 Three-wire Control

Three-wire Control can function in two selectable modes:

In the Maintained Mode, the actuator will accept momentary signals to open and close the valve and will continue until the valve fully opens or closes or a signal to reverse direction is received.

In the Inching Mode, the actuator performs the commanded action only while the signal is present. If the OPEN or CLOSE pushbutton is released, the actuator stops. This permits intermediate valve positions between open and closed.

2.11.3 Four-Wire Control

In Four-Wire Control, the actuator responds to OPEN or CLOSE signals in the manner of the Maintained mode explained above. However, in Four-Wire Control a STOP button is added which stops the actuator when pressed. This permits intermediate valve positions between open and closed.

Refer to Section 6 for DIP switch settings and connections for Two-, Three-, or Four-Wire Control.

2.12 Clockwise / Counter Clockwise to ‘Close’ Rotation

This is normally pre-set at the factory in accordance with the customer’s requirements. It can be changed on site by DIP switch selection. The factory default setting is CLOCKWISE to close if no direction is specified when the order is placed.

2.13 Power Supply

2.13.1 Auto Phase Correction

The UEC-3 monitors the phase rotation of the incoming 3-phase supply and automatically corrects the actuator controls to ensure that the motor always runs in the correct direction. The feature is selectable ON/OFF according to customer preference.

A yellow LED (see Figure 5-1 for location) illuminates when the phases are correctly connected. This feature enables the user to check that the phase rotation of the supply is correct.

▲ CAUTION: If the motor is replaced during the life of the actuator, it is important to connect the leads correctly to ensure proper rotation.

2.13.2 Phase Protection

In addition to monitoring phase rotation, the phase discriminator also detects whether all three phases are present. If any phase is lost, then operation of the actuator will be prevented. A red LED on the power supply board illuminates when all three phases are present.

This feature is selectable ON/OFF in later versions of the UEC-3 and UEC-3-MPC. (See Section 6.4)

NOTE: If an ESD signal is received and then one of the phases is lost, the logic controls will ignore the phase protection circuit and attempt to comply with the ESD signal.

2.13.3 Supply Voltage Setting

The transformer voltage setting is factory set for the supply voltage specified at the time of the order and should not require changing.

Table 2.1 – Transformer Voltage Options

	Nominal Tap	
	Type A Standard Transformer	Type B Optional Transformer
LK1	460	575
LK2	405	525
LK3	380	220
LK4	220	115

2.14 Two-Speed Opening and Closing

A two-speed pulsing timer is a standard feature of the UEC-3 and can be selected to operate in the opening and/or the closing direction. This enables the operating time of the valve to be increased for the prevention of hydraulic shocks, (e.g. water hammer) in the pipeline.

For L120 series actuators, pulsing operation will begin when the contacts of Gear Limit Switch 14 are made, and will be the same for both directions of travel. This switch may be set anywhere in the valve travel. For LY units, switch LS9 is used.

The 'ON' and 'OFF' pulse times are factory-set at default levels of 2.0 seconds 'ON' and 10.0 seconds 'OFF' but may be configured to different intervals on receipt of specific details from the user, prior to manufacture. The settings may also be reconfigured on site using a Personal Computer and 'Modsim'. Modsim is a Modbus software package provided by Limitorque. This procedure is described in Section 8.1.

2.15 Local Position / Running Indication

When the actuator is operating, the LED's on the local pushbutton station will 'flash' to indicate the direction of travel. At the end of travel, one LED will change to 'steady' to indicate the valve position and the other LED will turn off.

On a standard pushbutton station the 'state' of the colored LEDs will indicate the following in local or remote mode:

- Red ON / Green OFF = Valve Fully Open
- Red OFF / Green ON = Valve Fully Closed
- Red ON / Green ON = Intermediate Position
- Red ON / Green flashing = Valve Closing
- Red flashing / Green ON = Valve Opening

An alternate configuration can be specified in which:

- Red ON / Green Off = Valve Fully Closed
- Red OFF / Green ON = Valve Fully Open
- Red ON / Green ON = Intermediate Position
- Red ON / Green flashing = Valve Opening
- Red flashing / Green ON = Valve Closing

3

UEC-3-MPC Modulating Position Controller

The UEC-3-MPC is a model of the UEC-3 which accepts a 4-20 mA signal from a set point controller or similar device to position the valve in proportion to the current signal. The UEC-3-MPC contains standard UEC-3 hardware, plus the addition of a feedback potentiometer, analog interface board, and an analog to digital (A/D) converter. All necessary software to run the UEC-3-MPC as a modulating position controller is installed in read-only memory.

The UEC-3-MPC retains all the basic UEC-3 features as set by DIP switches S1 and S2 except for Two-, Three- and Four-Wire Control. The additional configuration required for modulating position control is programmed through an Extended Configuration feature as explained in Section 7. First, this mode is selected by setting three switches on DIP switch S2 to the ON position. Then, other switches on DIP switches S1 and S2 are used to set individual parameters. In this way it is possible to configure the unit step by step, write each selection to memory, and test the response of the actuator to the 4-20 mA analog command signal. When the configuration performs as required, it can be transferred from temporary memory (RAM) to memory which will be retained even with power off (EEPROM). This can be done without the use of any additional equipment, such as setting tool or Personal Computer. The Extended Configuration can also be performed with a Personal Computer and Modsim software.

The following parameters can be configured/calibrated:

- Set OPEN reference: ZERO and SPAN
- Set CLOSE reference: ZERO and SPAN
- Set PROPORTIONAL BAND from 1% to 50% max.
- Set DEADBAND from 1% to 50%
- Set ACTION ON LOSS OF COMMAND; either 'OPEN', 'STOP' or 'CLOSE'.

NOTES: 1) Loss of signal is detected if the analog command falls below 50% of the minimum setting, e.g. 2 mA for a 4-20 mA setting range. 2) The UEC-3-MPC is capable of modulating control over 96% of its range. When the input corresponds to the last 2% of the range on either end of travel, the Field Unit will force the actuator to the limit switch. This can be changed (see Section 8).

As soon as the configuration is completed, the EXTENDED CONFIGURATION mode is switched 'OFF' and the DIP switches S1 and S2 are returned to their correct positions for the basic UEC-3 features selected. Full setting instructions are included in Section 7 of this manual.



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4 Options

4.1 4-20mA Position Transmitter (PT20SD)

The PT20SD is a resistance to current (R/I) signal converter. It utilizes a potentiometer driven from the Mechanical Dial Position Indicator gearing (MDPI) to provide an output of 4-20 mA which is proportional to the output position of the actuator/valve. A D.C. voltage is applied across the potentiometer and a proportion of that voltage is picked off by the wiper. This voltage is proportional to position and is used to drive an operational amplifier. The amplifier circuit has user adjustable controls for setting the 4 mA (zero) and the 20 mA (span) levels at each end of travel. Full calibration instructions are included on Figure 6-8 of this manual.

4.2 Potentiometer

If a potentiometer is fitted, connect as shown in the connection diagram in Figure 6-7.

4.3 Diagnostic Tools

A port is provided as a standard feature for the connection of a Personal Computer (with Modsim software) or the handheld Universal Diagnostic Tool (UDT). The Personal Computer with Modism Software provides an extensive configuration and diagnostic capability for those situations where the use of a Personal Computer is feasible. The UDT provides a compact and easy to use diagnostic capability.

The UDT directly indicates the following states:

Open Torque Switch

The torque switch, in the opening direction, has tripped between position limits.

Close Torque Switch

The torque switch, in the closing direction, has tripped between position limits.

Open Limit Switch

The Open limit switch has tripped.

Close Limit Switch

The Close limit switch has tripped.

Open Inhibit

The Open inhibit signal is present.

Close Inhibit

The Close inhibit signal is present.

Lost Phase

Phase L2 has been lost (If phases L1 or L3 have been lost, the UEC-3 will not be powered).

Reversed Phase

The three phase supply connections are reversed.

Thermostat Tripped

The motor thermostat has tripped due to motor overheating.

ESD Signal Present

An ESD signal is present at the terminals.

Not in Remote Mode

The actuator is in LOCAL or OFF mode.

Close Contactor Failed

The Close contactor failed to operate after being signaled.

Open Contactor Failed

The Open contactor failed to operate after being signaled.

Valve Jammed

The jammed valve sequence has been initiated but has not been successful.

Communication Failure

No communication through the diagnostic port.

5

UEC-3 Control Module

The UEC-3 and UEC-3-MPC Control Module shown in Figure 5-1 contains a set of circuit boards, a contactor, and a set of interconnecting cables. The standard circuit boards are:

5.1 Single Board Computer (SBC)

This board contains a processor and support circuits to perform all monitoring, control, and operator interaction functions. The SBC is shown in Figure 5-2.

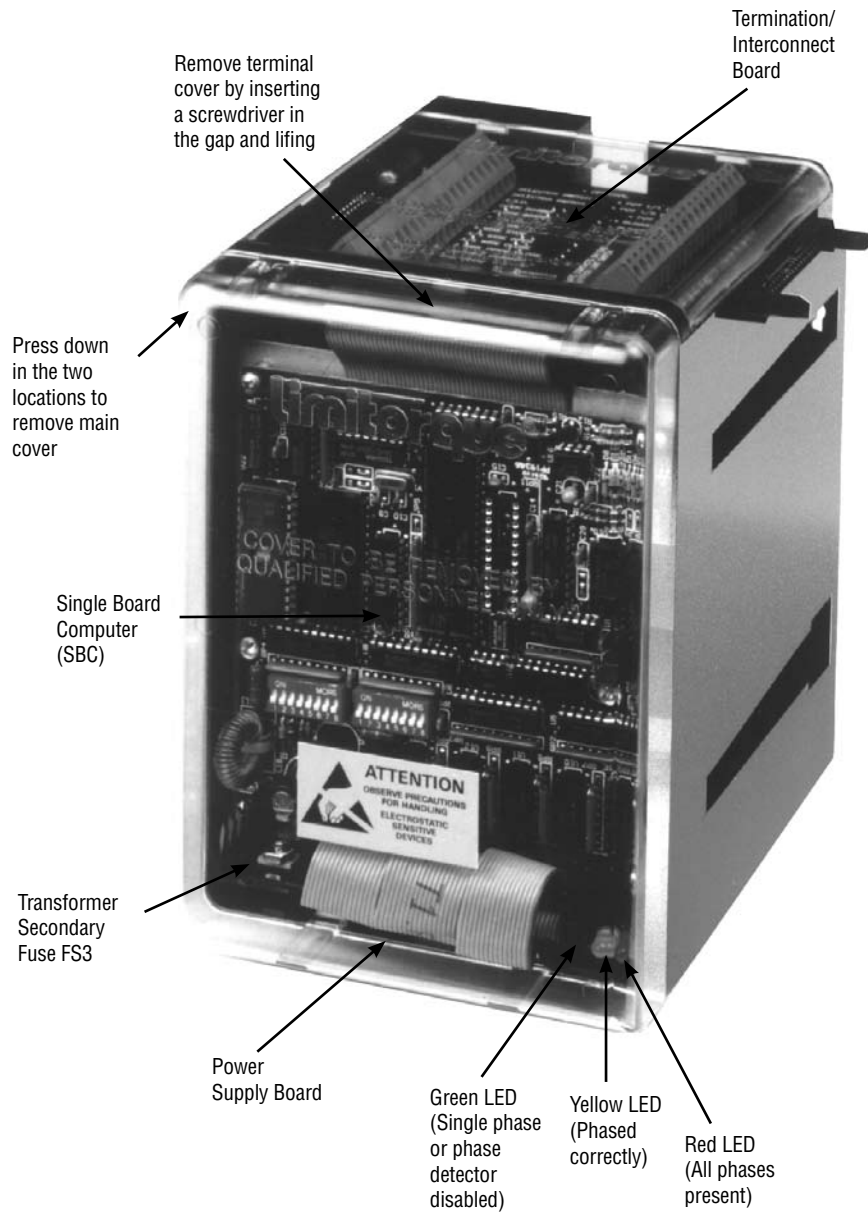
5.2 Power Supply Board

The Power Supply Board provides the voltages required by the Single Board Computer and the Input/Output circuits. There are two versions of this board and both are shown in Figure 5-3.

5.3 Termination/Interconnect Board

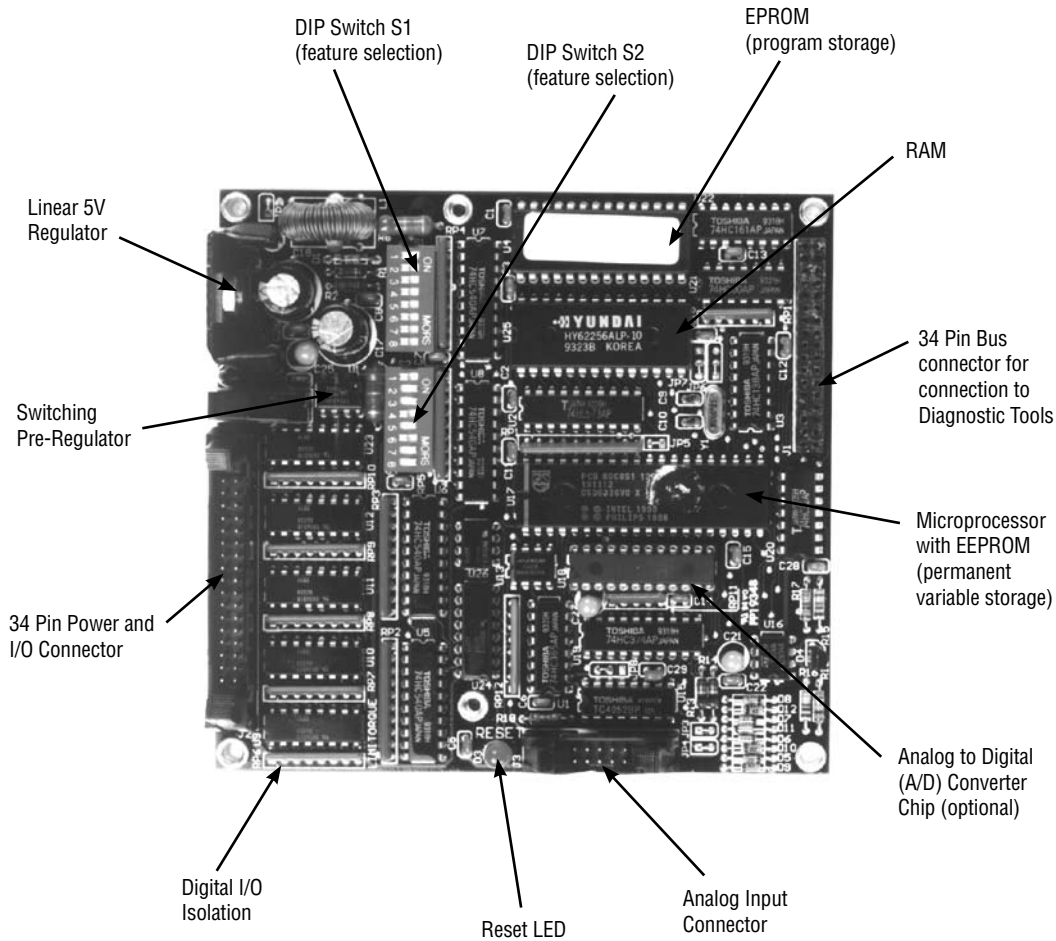
This board contains connectors and terminal strips and serves as the interface between the Control Module and everything outside the Control Module. All user connections are made to this board. The Termination/Interconnect Board is shown in Figure 5-4.

Figure 5.1 – UEC-3 and UEC-3-MPC Control Module



⚠ **DANGER:** Hazardous voltage within the control module. Exercise caution while calibrating the UEC-3 with the actuator control compartment open and power on.

Figure 5.2 – Single Board Computer



NOTE: Reset LED (Red) will be continuously 'ON' when the controller is healthy. A very short 'OFF' pulse, repeated at regular intervals, will indicate a fault within the controller.

Figure 5.3a – Power Supply Board (Earlier Version)

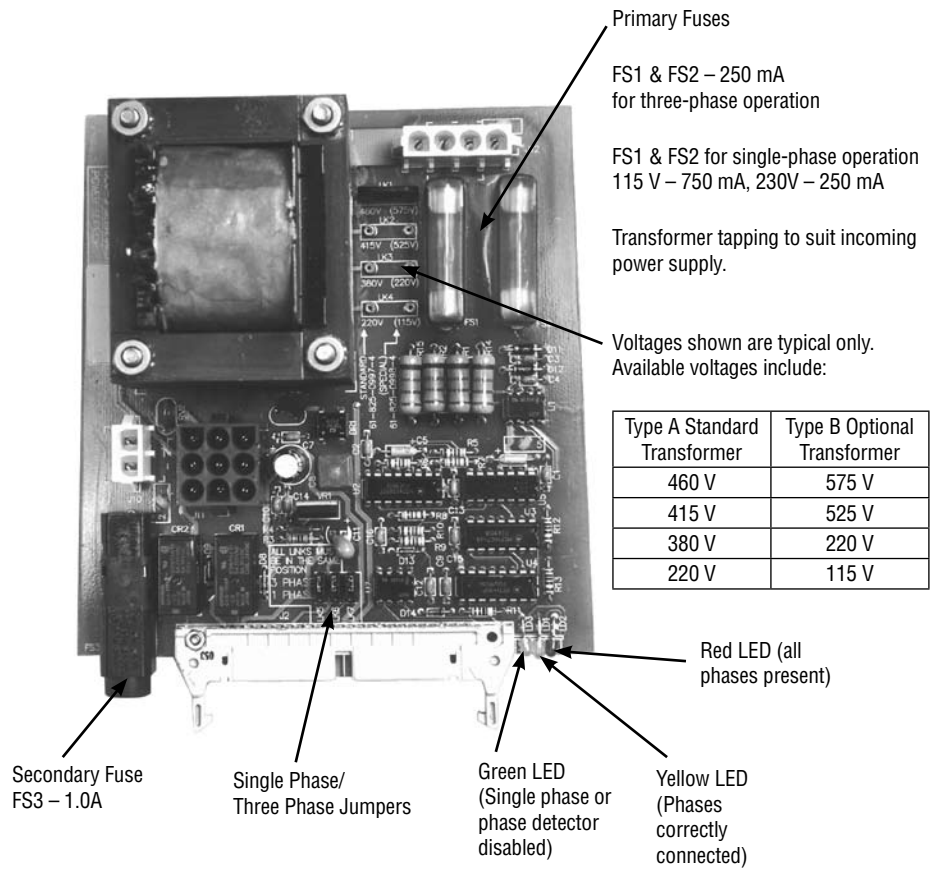


Figure 5.3b – Power Supply Board (Later Version)

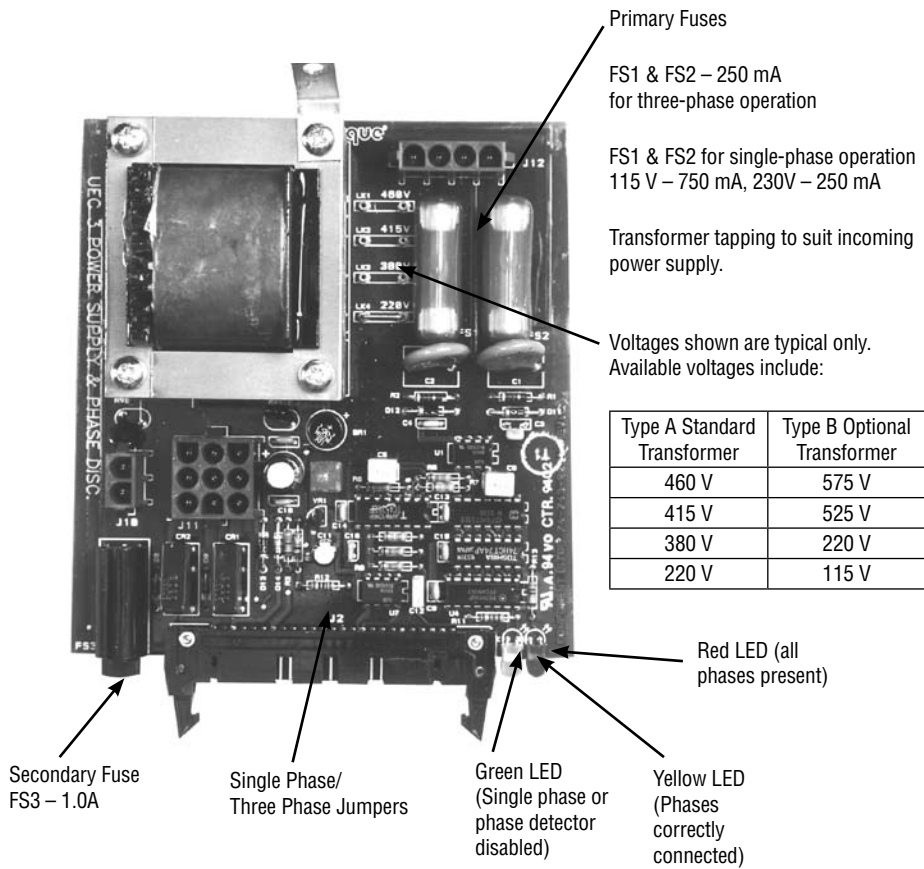


Figure 5.4a – Termination/Interconnect Boards (Earlier Version)

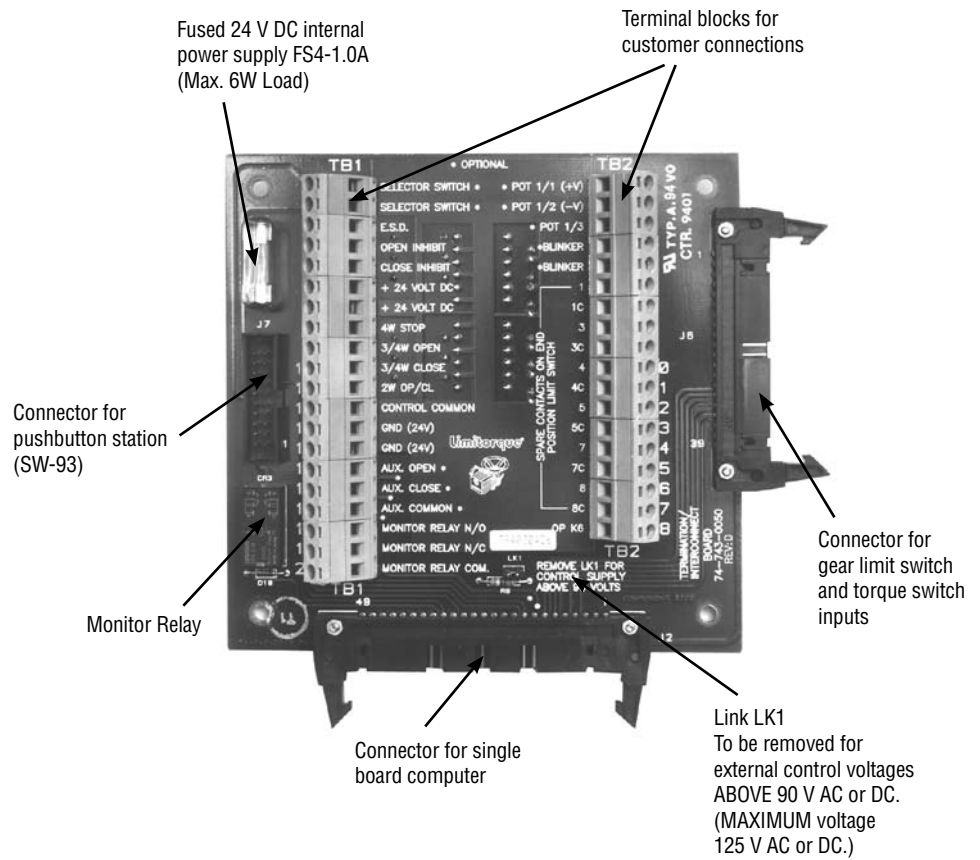
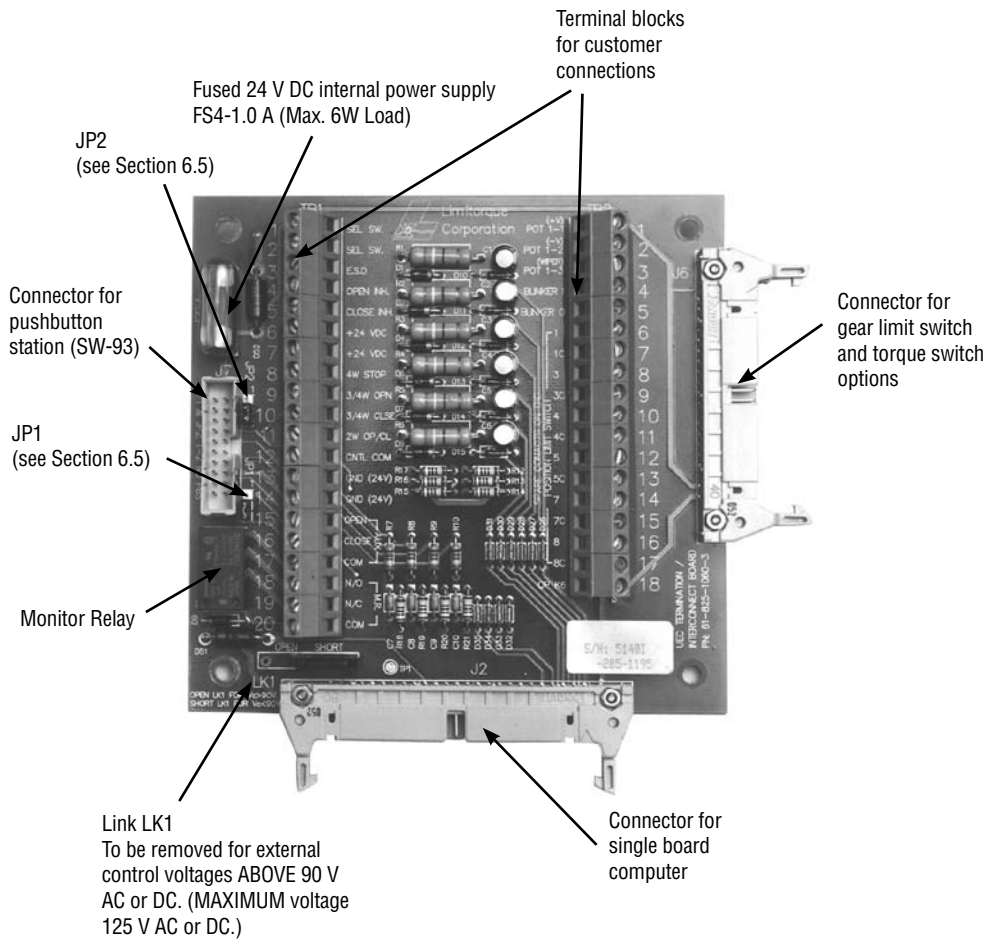


Figure 5.4b – Termination/Interconnect Boards (Later Version)





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6

UEC-3 Set Up – Wiring and Switch Settings

6.1 General Set-Up Information

The actuator must first be set up as instructed in the 'LI20 or LY series Instruction and Maintenance Manual' taking note of the Installation Tips.

This unit should have left the factory set for your requirements. If the requirements were not known at the time or a change is required, the following procedure must be performed.

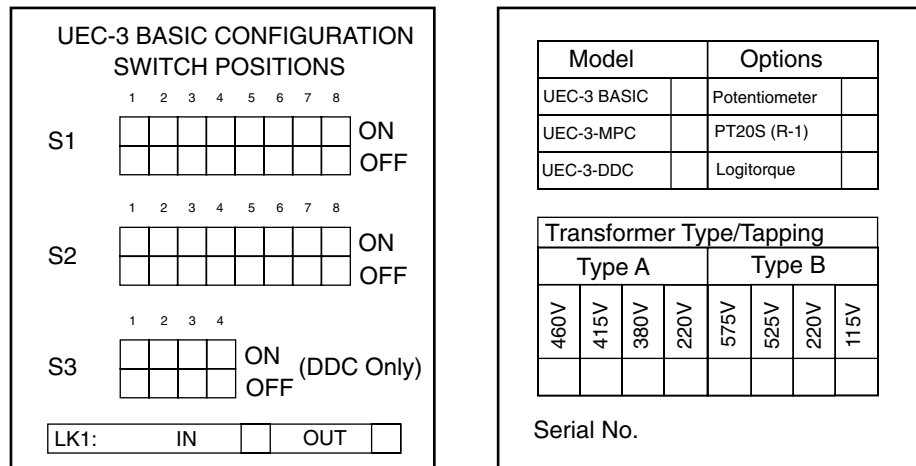
▲ CAUTION: Ensure actuator is isolated from all incoming power.

Remove front cover by pressing down with both thumbs on top edge of cover in the approximate area indicated in Figure 5-1 of this manual. Remove the terminal cover by inserting a screwdriver in the gap as shown on the cover and lifting.

NOTE: Always use a small non-metallic tool to move the DIP switches; NEVER use a pencil.

A label is attached to the side of each Control Module. This label (shown in Figure 6-1) is stamped at the factory to indicate the model, the options installed, the input voltage setting, and the serial number. The portion of the label showing the settings for S1, S2, S3 (DDC only), and LK1 are available for the user to show the specific configuration information.

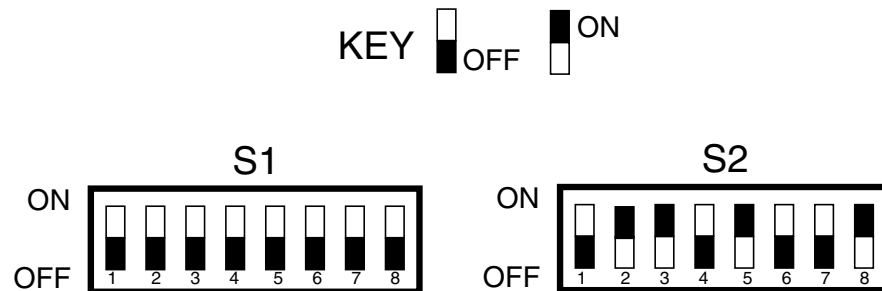
Figure 6.1 – Model, Option and Configuration Identification Label



6.2 Default DIP Switch Settings

If specific configuration details were not provided with the order, the unit was shipped with the DIP switches set to their default positions. Figure 6-2 shows the default settings for S1 and S2 of the UEC-3 and the UEC-3-MPC. The settings for these switches for the UEC-3-DDC are discussed in other manuals.

Figure 6.2 – Default DIP Switch Settings for UEC-3 and UEC-3-MPC



- ‘ESD’ action - ‘CLOSE’ - S1-1,-2
- Local inching - DISABLED - S1-3
- Modulating mode - DISABLED - S1-4
- Slow speed opening - DISABLED - S1-5
- Closing rotation - CLOCKWISE - S1-6
- Thermostat bypass - DISABLED - S1-7
- Interlock / Inhibit - DISABLED - S1-8
- Remote control mode - 4 WIRE - S2-1,-2-3
- Seating method at ‘close’ - POSITION - S2-4
- Autophase control - ENABLED - S2-5
- Slow speed closing - DISABLED - S2-6

NOTE: For a standard UEC-3 always select:

- EEPROM - DISABLED - S2-7
- Software Control - ENABLED - S2-8

NOTE: If changes to the DIP switches are made while power is present at the actuator, it is important to power 'off' and then back 'on' again in order to initialize the changes.

6.3 Wiring and DIP Switch Settings

The functions of each of the switch sections of DIP switches S1 and S2 are given in Figure 6-3 for the UEC-3, and in Figure 7-3 for the UEC-3-MPC.

Configuring the UEC-3 for Two, Three, and Four Wire control is detailed in Figure 6-4.

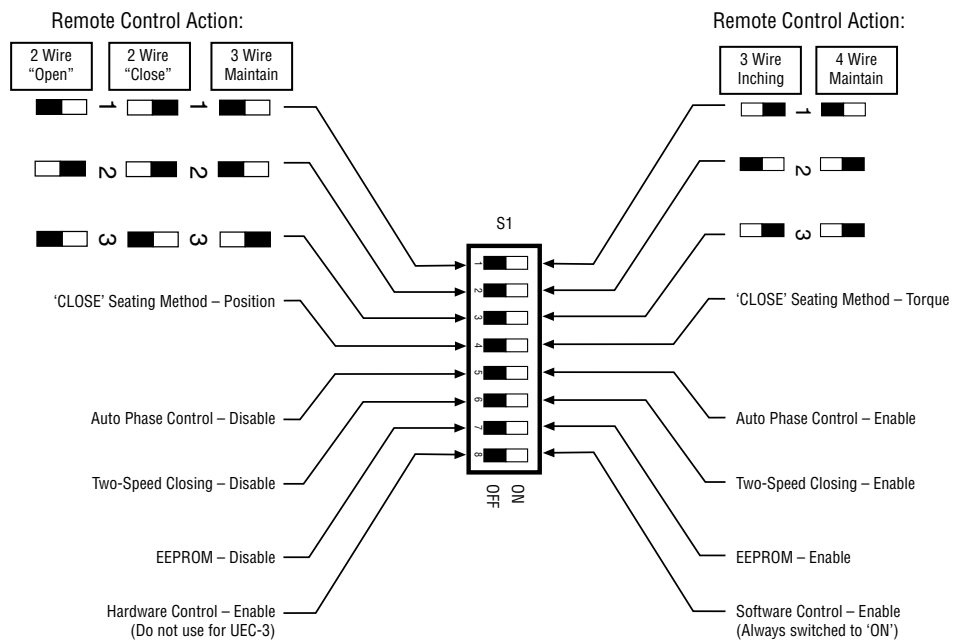
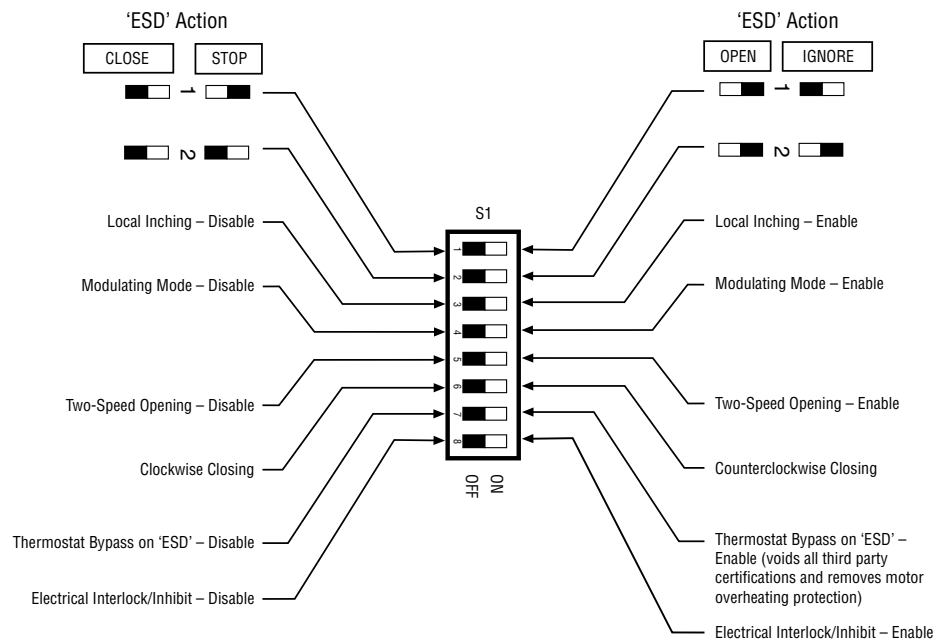
Figure 6-5 gives wiring and switch setting options for Emergency Shutdown (ESD) for the UEC-3 and the UEC-3-MPC.

Electrical Interlock/Inhibit wiring and switch selectable options for the UEC-3 and the UEC-3-MPC are given in Figure 6-6.

Wiring for the Monitor Relay and for the optional Potentiometer are shown in Figure 6-7 for the UEC-3 and the UEC-3-MPC.

Wiring and calibration for the optional PT20SD Position Transducer are given in Figure 6-8.

Figure 6.3 – Functional Key to UEC-3 DIP Switch Settings



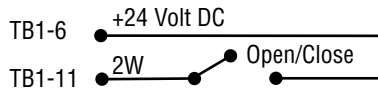
▲ CAUTION: The following features should not be used together. Using these features together can result in unpredictable operation of the unit:

- Modulating control and Two-speed operation
- Torque Seating and Two-speed operation
- Modulating control and two-, three-, or four-wire control
- Torque Seating and Modulating control

Figure 6.4 – UEC-3 Two-, Three- and Four-Wire Control

Internal Control Supply 24 Volt DC - Positive switching only

2 WIRE CONTROL *

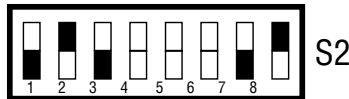


DIP switches can be set to give:
 EITHER - Contact closed - Valve OPENS
 Contact opened - Valve CLOSES
 OR - Contact closed - Valve CLOSES
 Contact opened - Valve OPENS

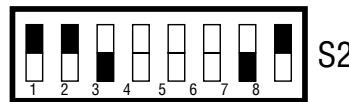
Switch Settings



Contact closed - Valve OPENS

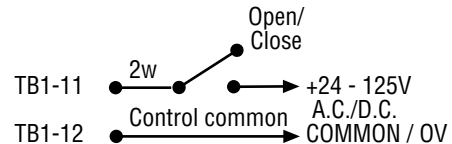


Contact closed - Valve CLOSES



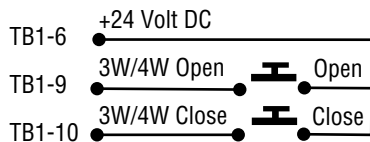
External Control Supply 24 - 125 Volts AC or DC

2 WIRE CONTROL *



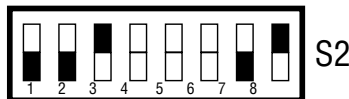
ALL VOLTAGES OVER 90V A.C./D.C. REMOVE LINK (LK1) ON TERMINATION BOARD

3 WIRE CONTROL *

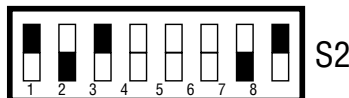


To initiate action - 'Open' or 'Close': Contact to be closed momentarily for MAINTAINED mode or for longer duration (as necessary) in INCHING mode.

3 Wire MAINTAINED control

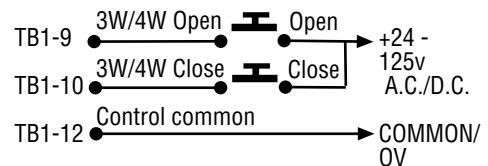


3 Wire INCHING control



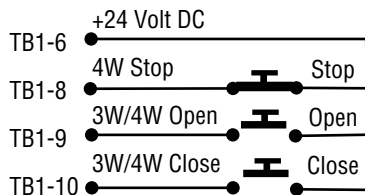
Note: For 'LOCAL' Inching set S1 position 3 to ON - Refer to Fig.6.3

3 WIRE CONTROL *



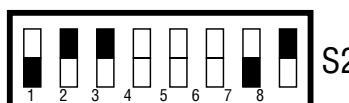
ALL VOLTAGES OVER 90V A.C./D.C. REMOVE LINK (LK1) ON TERMINATION BOARD

4 WIRE CONTROL *

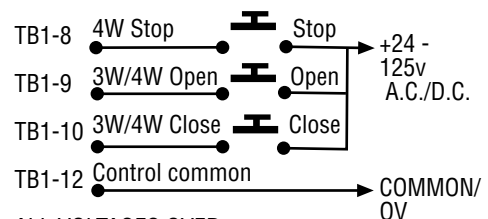


To initiate action - 'Open' or 'Close': Contact to be closed momentarily. 'Stop' contact to be opened momentarily.

4 Wire control with STOP



4 WIRE CONTROL *



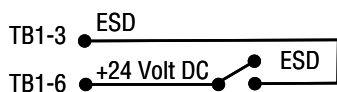
ALL VOLTAGES OVER 90V A.C./D.C. REMOVE LINK (LK1) ON TERMINATION BOARD

*To configure the user inputs, see Section 8.3.

Figure 6.5 – UEC-3 and UEC-3-MPC – Emergency Shutdown (ESD)

Internal Control Supply
24 Volt DC - Positive switching only

Emergency Shut-Down (ESD)



Note:
To initiate 'ESD' action contact to be closed and will only be active when actuator is in 'Remote' mode.

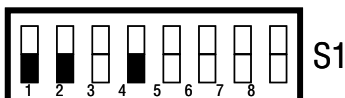
See **Section 2.6** for a description of ESD action.

See **Section 8.3** to configure User Inputs.

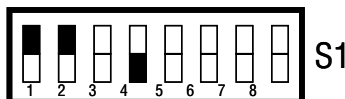
Switch Settings



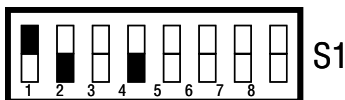
CLOSE on ESD signal



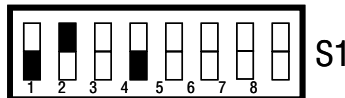
OPEN on ESD signal



STAYPUT or STOP on ESD signal

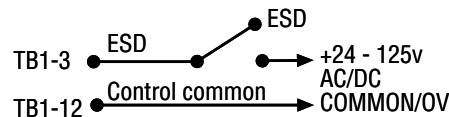


IGNORE ESD signal



External Control Supply
24 - 125 Volts AC or DC

Emergency Shut-Down (ESD)



* ALL VOLTAGES OVER 90V AC/DC
REMOVE LINK (LK1) ON
TERMINATION BOARD

Notes:
1) S2 must be set for the appropriate remote control (See **Fig. 6.4**).

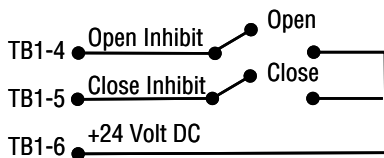
2) Mixed voltages can NOT be used. ESD supply MUST be the same as remote control supply.

3) Same connections and DIP switch settings to be used for UEC-3-MPC.

Figure 6.6 – UEC-3 and UEC-3-MPC – Electrical Interlock/Inhibit

Internal Control Supply
24 Volt DC - Positive switching only

Electrical Interlock / Inhibit

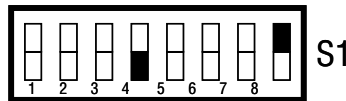


Note:
To initiate INTERLOCK INHIBIT, contact to be closed and remain closed for as long as inhibit is required to be active.

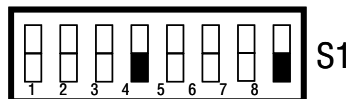
Switch Settings



Enable Open & Close Interlock/Inhibit

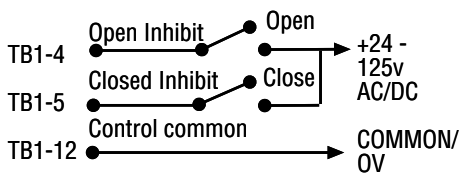


Disable Open & Close Interlock/Inhibit



External Control Supply
24 - 125 Volts AC or DC

Electrical Interlock / Inhibit



* ALL VOLTAGES OVER 90V AC/DC REMOVE LINK (LK1) ON TERMINATION BOARD

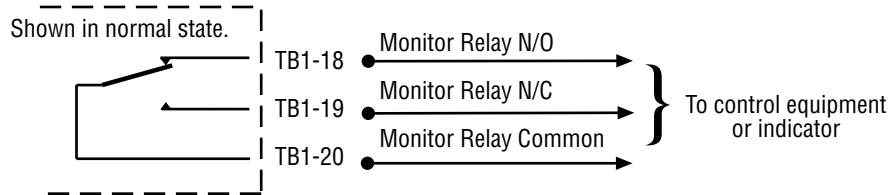
- Notes:
- 1) S2 must be set for the appropriate remote control (See **Figure 6.3** or **Figure 7.3**).
 - 2) Mixed voltages can NOT be used. Inhibit supply MUST be the same as remote control supply.
 - 3) Same connections and DIP switch settings to be used for UEC-3-MPC.
 - 4) See **Section 8.3** to configure User Inputs.

Figure 6.7 – UEC-3 and UEC-3-MPC – Monitor Relay and Optional Potentiometer

Monitor Relay

Relay is energised in NORMAL (healthy) state.

Relay is de-energised in ERROR state.



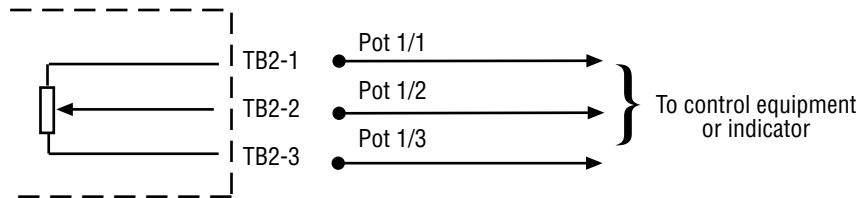
Maximum rated load: 5 A @ 250 VAC : 5 A @ 30 VDC

Notes:
To configure the Monitor Relay acuation conditions, see **Section 8.6.**

Option

Potentiometer (R1)

Standard Potentiometer
1K ohms



Calibration Procedure:

1. Position the actuator to mid-travel (valve at 50% position).
2. Disconnect the potentiometer wiring harness and measure the resistance from each end connection to the center connection.
3. To set the potentiometer to the correct resistance reading, loosen the set screw that retains the spur gear on the potentiometer shaft and rotate the shaft until a reading of 500 ohms is achieved.
4. Tighten the set screw and re-connect the wiring harness.

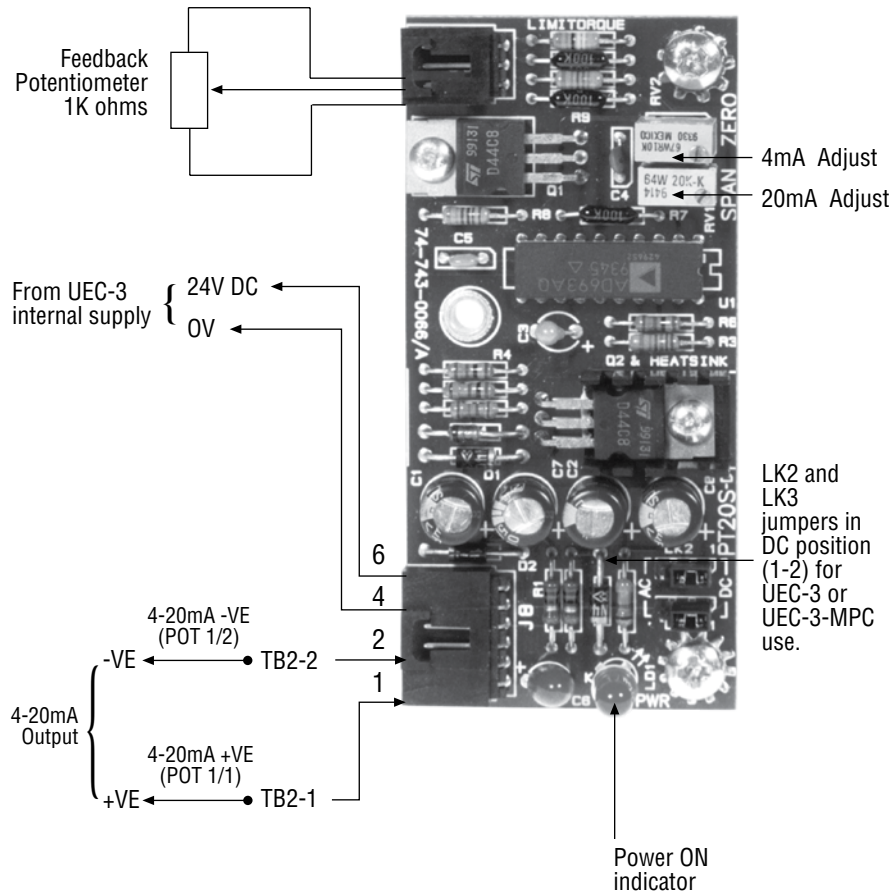
Notes:
1) This option is not available if 4-20MA Transmitter (PT20SD) is fitted. (See **Figure 6-8**)
2) Same connections to be used for UEC-3-MPC.

Figure 6.8 – UEC-3 and UEC-3-MPC – PT20SD (4-20 mA) Position Transducer Wiring

Calibration procedure

1. Position the actuator to mid-travel (valve at 50% Position).
2. Disconnect the potentiometer wiring harness from the PT20SD board and measure the resistance from each end connection to the center connection on the potentiometer.
3. To set the potentiometer to the correct resistance reading, loosen the set screw that retains the spur gear on the potentiometer shaft and rotate the shaft until a reading of 500(ohms) is achieved.
4. Tighten the set screw and re-connect the wiring harness to the PT20SD.
5. Run the actuator fully CLOSED.
6. Calibrate ZERO position by adjusting the zero potentiometer until a 4mA output signal is read at terminals TB2-1 and TB2-2.
7. Run the actuator fully OPEN.
8. Calibrate SPAN position by adjusting the span potentiometer until a 20mA output signal is read at terminals TB2-1 and TB2-2.
9. Repeat steps 5 to 8 and fine tune as necessary.

PT20SD Position Transmitter 4-20mA



Specification

Output signal:	4-20mA
Input potentiometer:	1K (ohms)
Temperature rating:	-40 to +85°C
Linearity error:	± 1% max.
Loop resistance:	370 (ohms) max.
Power:	18 VAC or 24 VDC ± 10% (LK2 and LK3 must be set appropriately)

Important:

Analog inputs must not be connected to earth ground on +VE or -VE terminal.

Note:

Same connections to be used for UEC-3-MPC.

6.4 Phase Protection Jumpers

The phase protection feature can be disabled on most versions of the UEC-3 and UEC-3-MPC Field Units. If the Field Unit is equipped with the later version of the Power Supply Board (See Figure 5-3), this can be accomplished by changing jumpers. Three jumpers are located in a block just above the 50 pin connector, J2. For a three-phase supply, these jumpers are normally placed in the 3-PHASE positions, and for a single-phase supply, they are placed in the 1-PHASE positions. For three-phase operation without phase protection, the jumpers can be placed in the 1-PHASE positions. This will disable the phase protection feature which will be indicated by the green LED when the unit is powered.

6.5 Pushbutton Station Jumpers

There are two jumpers on the Termination/Interconnect Board which must be changed if the Field Unit is to be operated without a pushbutton station. JP1 and JP2 are located to the left of TB1 on Figure 5-4 and should be set as shown below:

JP1 and JP2 Jumper Position	Application
1-2	No pushbutton station
2-3	Operation with SW-93 Pushbutton Station (Default)

7 UEC-3-MPC Set Up

The actuator must first be set up as instructed in the 'L120 or LY Series Instruction and Maintenance Manual' taking note of the Installation Tips.

Because this unit will require individual calibration on site, the calibration is not performed by the factory. Please follow the calibration instructions below very carefully to ensure that you receive optimum performance from the unit.

Remove the front cover by pressing down with both thumbs on top edge of cover in the approximate area indicated in Figure 5-1 of this manual. Remove terminal cover by inserting a screwdriver in the gap as shown on the cover and carefully lifting.

NOTE: Always use a small non-metallic tool to move the DIP switches; NEVER use a pencil.

▲ CAUTION: To perform this calibration, the power must be 'on' to the unit. Hazardous voltages are present in the unit. Exercise caution to avoid electrical shock.

Calibration of the UEC-3-MPC is accomplished by carefully performing three separate procedures:

1. Calibrating the potentiometer.
2. Calibrating the control parameters of the Position Controller in EXTENDED CONFIGURATION MODE.
3. Setting DIP switches to restore UEC-3 functionality.

7.1 Default Levels

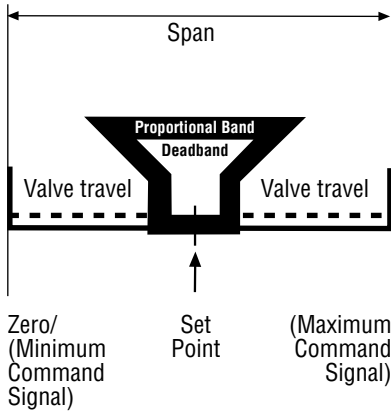
The following default levels are programmed in the Control Module and will provide satisfactory performance in most cases. We recommend not changing these values until the initial calibration has been completed, as below.

- PROPORTIONAL BAND +/- 14% (+/-8.0% for version 1.54 or higher only)
- DEADBAND +/-1.0%

These parameters are defined in Figure 7-1.

Figure 7.1 – UEC-3-MPC Control and Actuator Position Input Wiring

Calibration positions



Definitions

Command Signal - Input signal provided by user to assign desired valve position.

Deadband - Adjust the maximum allowable error signal. (Difference between the Position Command Signal and position Feedback Potentiometer Signal).

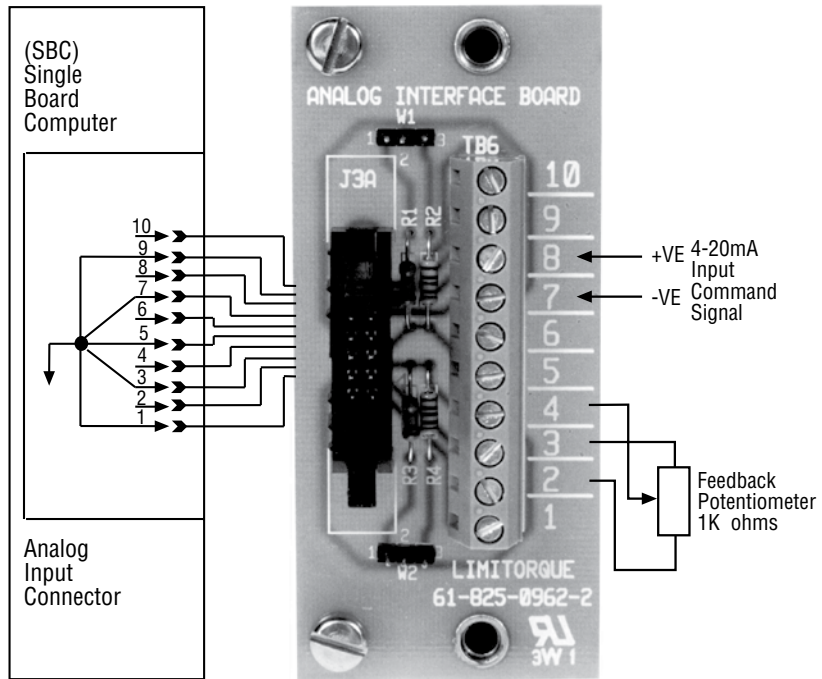
Proportional Band (see Note) - Controls the point on the scale of valve travel that the motor begins the pulsing mode. (Decreasing Proportional Band, increase Gain).

Set Point - Desired stopping position for UEC-3-MPC; determined by the command signal.

Span - Calibrates the UEC-3-MPC to align the Maximum Command Signal (normally 20mA) with the Position Feedback Potentiometer at the open position.

Zero - Calibrates the UEC-3-MPC to align the Minimum Command Signal (normally 4mA) with the Position Feedback Potentiometer at the closed position.

Analog Interface



Jumper Settings

- W1-** not used in UEC-3 or UEC-3-MPC (Jumper position not important.)
- W2 -** Jumper 1-2 for feedback potentiometer.

Important: Analog inputs must not be connected to earth ground on +VE or -VE terminal.

Note: Proportional Band is inversely proportional to Gain.

7.2 Procedure 1: Calibrate Feedback Potentiometer

1. Switch the power to the actuator OFF.
2. Position the actuator to mid-travel (valve at 50% position).
3. Disconnect the potentiometer wiring harness and measure the resistance (ohms) from the wiper to either end of the potentiometer.
4. To set the potentiometer to the correct resistance reading, loosen the set screw on its spur gear and rotate its shaft until a reading of 500 ohms is achieved.
5. Tighten the set screw and reconnect the wiring harness.

7.3 Procedure 2: Calibrate UEC-3-MPC Control Parameters

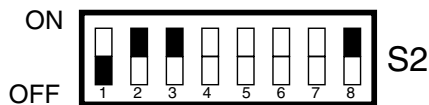
The procedure that is given below is also given in the form of a flow chart in Figure 7-2.

To calibrate the UEC-3-MPC it is necessary to switch the DIP switches to an EXTENDED CONFIGURATION MODE. This mode provides a different set of meanings in software to all the switch positions than those for standard UEC3 functions.

These switches are used to program the performance of the actuator by resetting some of the parameters which are then transferred (written) into the memory of the controller via EEPROM. These parameters can be changed at any time by following the simple steps detailed below:

NOTE: BEFORE proceeding further, we recommend recording the current UEC3 DIP switch configuration for future reference.

6. Ensure that power to the actuator is 'OFF'.

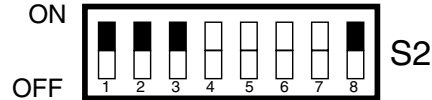


Set S2 as above.

NOTE: At this point switches S2-4,5,6, and 7 should be in the states which are appropriate for the application (see Figure 7-3) unless the unit has been calibrated and only the proportional Band and/or the Deadband is to be adjusted. In this case, S2-7 should be ON at this point.

Switch power to the actuator 'ON'.

- Set in EXTENDED CONFIGURATION MODE. Wait approx. 15 seconds for the completion of 'POWER On Self Test' - LEDs on the pushbutton station will illuminate.



Set switches as above.

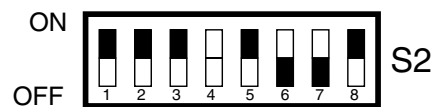
- Set 'SPAN' Reference (Fully Open) - MUST BE SET FIRST.



Set switches as above. With the pushbutton control station set to 'LOCAL', run the actuator to the fully open position. Apply the analog command signal that applies to this position, i.e. 4mA or 20mA (the choice depends upon the application).

Reverse the position of S2-4 to write this setting to RAM, i.e. reverse position of switch, 'OFF' to 'ON' or 'ON' to 'OFF'. Do NOT change command signal until actuator is fully closed.

- Set 'ZERO' Reference (Fully Closed)



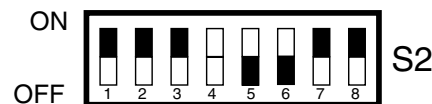
Set switches as above.

Run the actuator to the fully closed position.

NOW apply the analog command signal that applies to this position (i.e. 4mA or 20mA).

Reverse the position of S2-4 to write this setting to RAM.

- Set ACTION ON LOSS OF SIGNAL

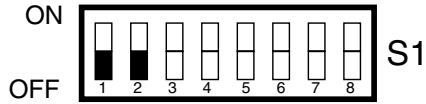


Set switches as above.

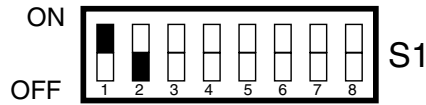
Set the positions of S1-1 and S1-2 to suit the action required of the actuator on loss of analog command signal - detected when signal falls below 50% of 'ZERO' value, i.e. 2mA if 'ZERO' value is 4mA.

The options are shown below:

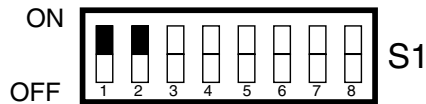
GO TO CLOSE



STOP IN LAST POSITION

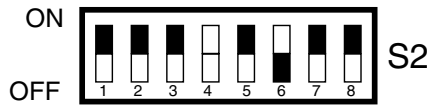


GO TO OPEN



Set switches to correspond to your application and then reverse the position of S2-4.

11. Test RESPONSE TO SIGNAL



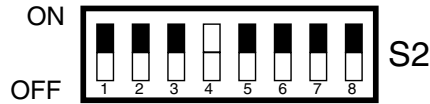
Set switches as above.

Reverse the position of S2-4. Switch selector on pushbutton station to 'REMOTE'.

Apply the external 4-20mA analog command signal and test the operation of the actuator in response to this variable command.

IF PERFORMANCE IS SATISFACTORY then proceed as follows. IF NOT THEN SKIP TO STEP 14.

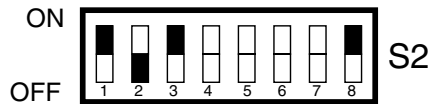
12. Transfer CONFIGURATION from RAM to EEPROM.



Set switches as above.

Reverse the position of S2-4 to transfer all the configuration settings from RAM to the non-volatile EEPROM memory.

13. Exit from the EXTENDED CONFIGURATION MODE.



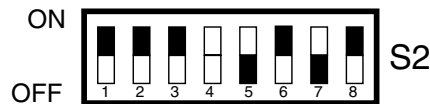
Set switches as above.

Now proceed to set in new parameters on DIP switches S1 and S2 for the basic functioning of the UEC-3. Note that S1-4 MUST be 'ON' to enable MODULATING MODE. All features are available with the exception of two-, three- and four-wire control.

Skip to Section 7.4

IF THE DEFAULT LEVELS FOR PROPORTIONAL BAND AND DEADBAND PROVE TO BE UNSATISFACTORY FOR YOUR APPLICATION THEN PROCEED AS FOLLOWS BEFORE PROCEEDING WITH STEPS 12 AND 13.

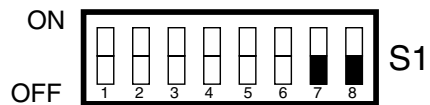
14. Set PROPORTIONAL BAND. This is the point on the scale of valve travel, as a percentage of the full signal range, over which the controller will carry out pulse modulation as the actuator approaches the set point. See Figure 7-1 for a full definition.



Set switches as above.

Now set S1, as shown in Table 7-1, to give the desired value.

NOTE: The default level for PROPORTIONAL BAND was factory set at $\pm 14\%$ ($\pm 8.0\%$ for version 1.54 or higher only).



Reverse the position of S2-4. Repeat Step 11- Test RESPONSE TO SIGNAL.

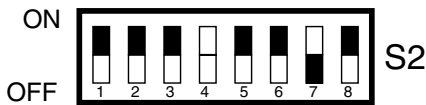
If performance is now satisfactory, proceed to steps 12 and 13.

If not, then either repeat step 14 or proceed to step 15.

Table 7.1 – Table of Values for Proportional Band and Deadband

%	DIP S1 12345678	%	DIP S1 12345678	%	DIP S1 12345678
1	10000000	18	01001000	35	11000100
2	01000000	19	11001000	36	00100100
3	11000000	20	00101000	37	10100100
4	00100000	21	10101000	38	01100100
5	10100000	22	01101000	39	11100100
6	01100000	23	11101000	40	00010100
7	11100000	24	00011000	41	10010100
8	00010000	25	10011000	42	01010100
9	10010000	26	01011000	43	11010100
10	01010000	27	11011000	44	00110100
11	11010000	28	00111000	45	10110100
12	00110000	29	10111000	46	01110100
13	10110000	30	01111000	47	11110100
14	01110000	31	11111000	48	00001100
15	11110000	32	00000100	49	10001100
16	00001000	33	10000100	50	01001100
17	10001000	34	01000100		

15. Set DEADBAND



Set switches as above.

Now set S1, as shown Table 7-1, to give desired DEADBAND.

NOTE: The default level for DEADBAND was factory set at ±1.0%.

Reverse the position of S2-4. Repeat Step 11 - Test RESPONSE TO SIGNAL.

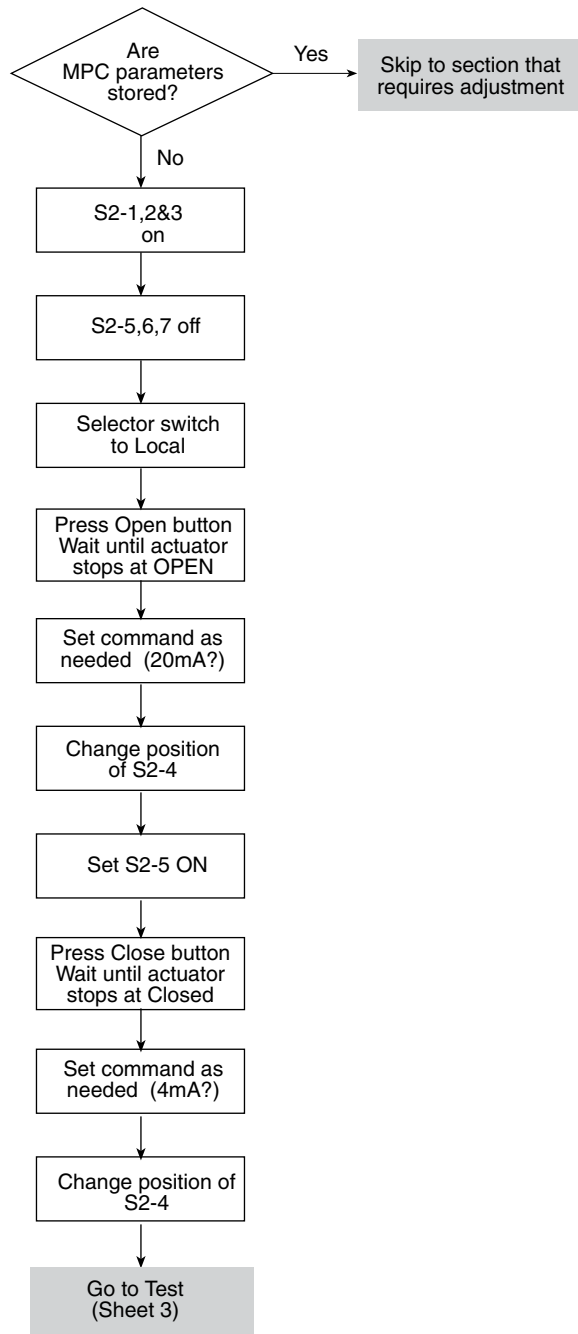
If performance is now satisfactory, proceed to Steps 12 and 13.

If not then repeat Step 15.

NOTE: Before ending this calibration procedure always complete Steps 12 and 13, otherwise all the settings will be lost. Also ensure that power is always 'on' until this has been done.

Figure 7.2a – UEC-3-MPC Calibration Procedure (1 of 3)

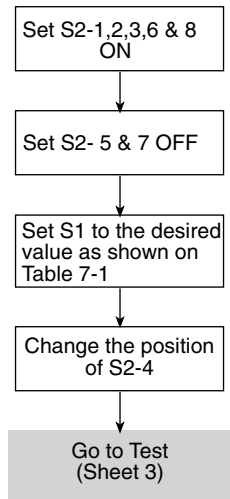
Setting Span and Zero*



NOTE: Span and Zero reference must always be changed together.

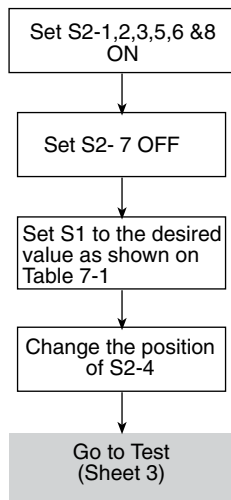
Figure 7.2b – UEC-3-MPC Calibration Procedure (2 of 3)

Set Proportional Band



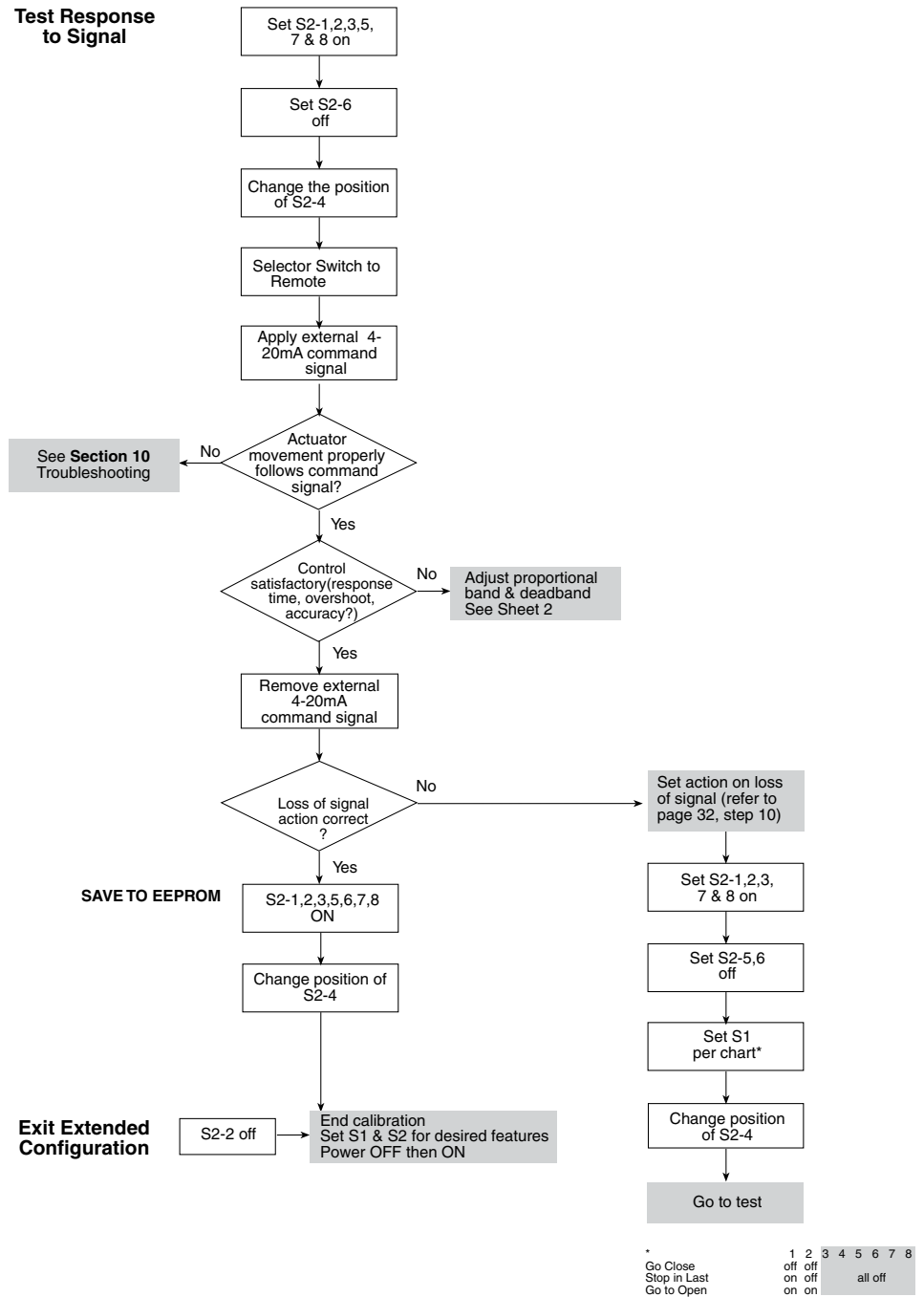
NOTE: The default level for proportional band was factory set at $\pm 14.0\%$.

Set Deadband



NOTE: The default level for deadband was factory set at $\pm 1.0\%$.

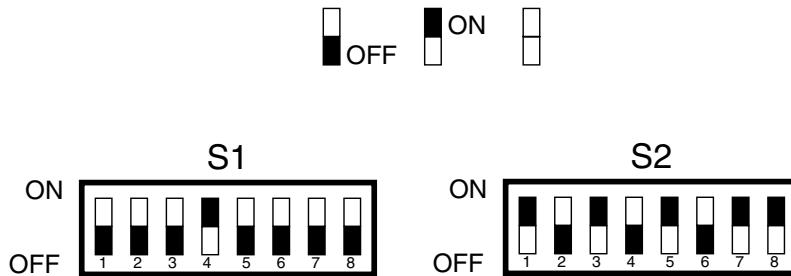
Figure 7.2c – UEC-3-MPC Calibration Procedure (3 of 3)



7.4 Procedure 3: Setting DIP Switches to Restore UEC-3 Functionality

The UEC-3-MPC, while in the modulating mode, retains all the functionality of the UEC-3, with the exception of two-, three-, and four-wire control.

Now proceed to set DIP switches S1 and S2 to suit your requirements. A full list of all available features is shown in Figure 7-3. A typical example of settings that are in common usage is shown below.



- ESD action - 'CLOSE' - S1-1,-2
- Local inching - DISABLED - S1-3
- Modulating mode - ENABLED - S1-4
- Two-speed opening - DISABLED - S1-5
- Closing rotation - CLOCKWISE - S1-6
- Thermostat bypass - DISABLED - S1-7
- Interlock / Inhibit - DISABLED - S1-8
- Default after EXTENDED CONFIGURATION - S2-1,-2,-3
- Seating method at 'close' - POSITION - S2-4
- Autophase control - ENABLED - S2-5
- Two-speed closing - DISABLED - S2-6

NOTE: For A Standard UEC-3 Always Select:

- EEPROM - ENABLED - S2-7
- Software control - ENABLED - S2-8

16. Switch power to the actuator OFF.

17. Set switches to suit your individual requirements.

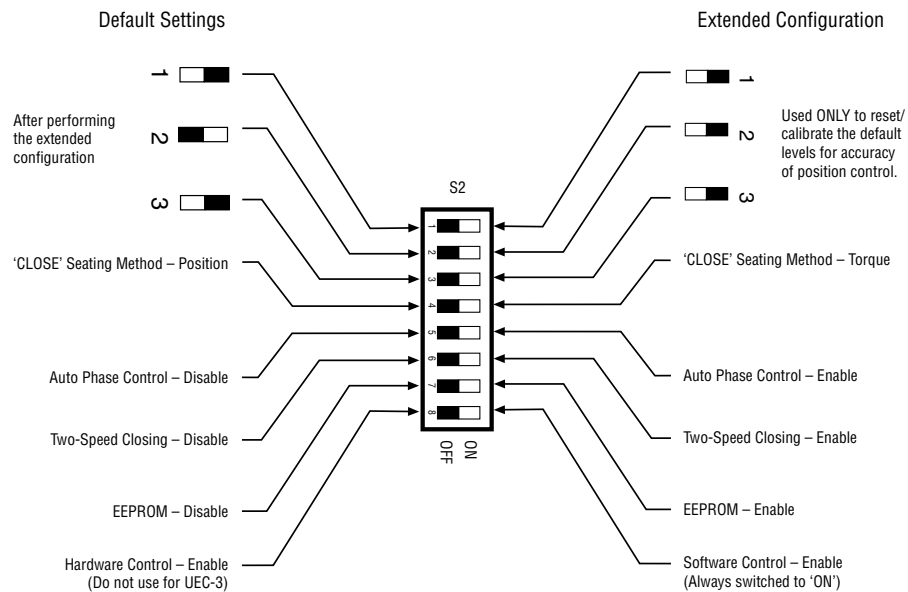
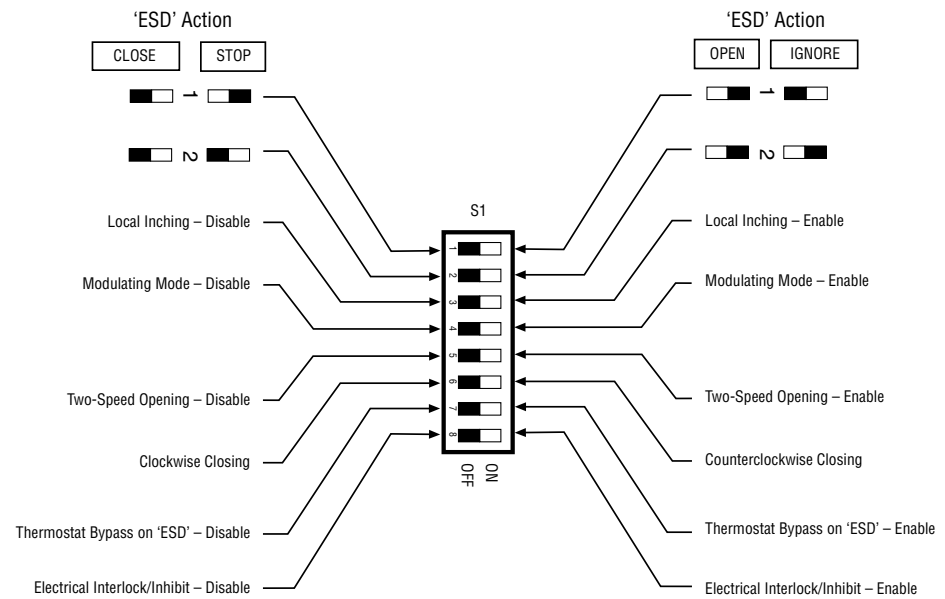
18. Switch power to the actuator ON.

19. Check operation of actuator in LOCAL and REMOTE mode to ensure that correct settings have been made.

20. Record these settings on the label (shown in Figure 6-1) on the outside of the module.

NOTE: If changes to the DIP switches are made while power is present at the actuator, it is important to power 'off' and then back 'on' again in order to initialize the changes.

Figure 7.3 – Functional Key to UEC-3-MPC DIP Switch Settings



▲ CAUTION: The following features should not be used together. Using these features together can result in unpredictable operation of the unit:

- Modulating control and two-speed operation
- Torque seating and two-speed operation
- Modulating control and two-, three- or four-wire control
- Modulating Control and torque seating

8

Extended Configuration by Personal Computer

Almost all of the features of the UEC-3 and UEC-3-MPC Field Units can be configured by changes in DIP switch settings. There are, however, several features whose configuration settings can be changed from default values only by using a personal computer connected to the local serial port of the field unit.

In order to change these settings, several pieces of equipment and two manuals are required. These are listed below:

Equipment Requirements for UEC-3 and UEC-3-MPC Extended Configuration:

- IBM compatible personal computer: Laptop recommended for field use
- Serial Cable: Limitorque P/N 61-825-0931-1 for 9-pin PC serial port connectors or Limitorque P/N 61-825-0932-1 for 25-pin PC serial port connectors
- Serial Interface Adapter: Limitorque P/N 61-825-0951-3
- Modsim Manual: Limitorque Bulletin 435-23001
- Modsim Software version 3.11 or greater: Limitorque P/N EEC-MODSIM
- Optional: Calculator for Hexadecimal to Decimal to Binary conversion and calculations (the Microsoft Windows® calculator program will do this in Scientific Mode)

The subsections below contain descriptions of the features, the reasons for changing the settings, and detailed procedures for changing the settings. These subsections apply to both the UEC-3 and the UEC-3-MPC unless noted otherwise.

Please contact your local service center for assistance with or questions about these changes.

- ▲ **CAUTION:** Extreme care should be taken when changing these settings. Undesirable actuator movement can result if settings are changed incorrectly or are changed to inappropriate values.

8.1 Set the OPEN Speed and Set the CLOSE Speed

8.1.1 Opening and Closing Speed

Slow speed or two-speed operation is often desired to prevent water hammer, cavitation, vibration or other effects of fast valve motion. The UEC-3 implements slow speed operation by jogging the motor (short applications of power to the motor followed by periods of no power to the motor). The default slow speed duty cycle is two seconds of power on followed by 10 seconds of power off. This duty cycle is repeated as long as the OPEN or CLOSE command is asserted.

Two-speed Opening and Closing can be independently selected. DIP switch S1-5 ON enables slow speed Opening, and DIP switch S2-6 ON enables slow speed Closing. Regardless of whether one or both are selected, two-speed is active when actuator Limit Switch 14 is closed.

The values that control the on and off times are stored in register 225 for two-speed opening and in register 226 for two-speed closing. The value of the opening on-time is stored in the high byte of register 225, and the value of the closing on-time is stored in the high byte of register 226. The value of the opening off-time is stored in the low byte of Register 225, and the value of the closing off-time is stored in the low byte of register 226.

The duty cycle can be changed in 50ms increments by using the 06 Modbus command to write values to registers 225 and 226 in the field unit. Increasing the ratio of on-time to off-time speeds the motor up (decreases total operating time). Conversely, decreasing the ratio of on-time to off-time slows the motor down (increases total operating time).

8.1.2 Changing the Opening Slow Speed

1. For the new opening slow speed on-time, calculate the value for register 225 high byte using equation A below. For the new opening slow speed off time, calculate the value for register 225 low byte using equation B below. Add the values calculated by equations A and B. This will be the new value that will be written into register 225.

Equation A

$$\text{New High Byte Value} = (\text{on-time(sec.)}) \times \frac{1000 \text{ msec.}}{1 \text{ sec.}} \times \frac{1}{50 \text{ msec.}} \times 256$$

Equation B

$$\text{New Low Byte Value} = (\text{off-time(sec.)}) \times \frac{1000 \text{ msec.}}{1 \text{ sec.}} \times \frac{1}{50 \text{ msec.}}$$

NOTE: The maximum value for on or off time is 255 units or 12.75 seconds (255 X 50 msec.).

2. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

3. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
4. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.

5. Referring to the Modsim Manual Section 4.6, use the Modbus 06 command to write the combined opening value from Step 1 to Register 225.
6. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
7. If the EEPROM is not already enabled, enable the EEPROM on the field unit by turning S2-7 on.
8. Turn the field unit power off, wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize. Read the value in Register 225. Convert the hexadecimal value displayed to a decimal value and compare to the value obtained in Step 1 above. If the value does not match, repeat the procedure.

8.1.3 Changing the Closing Slow Speed

If a change in the Closing Slow Speed is required, repeat the steps in Section 8.1.2 above except substitute 226 for the register number. Steps 2 through 4 can be omitted if the field unit is already connected to the Personal Computer and Modsim is already communicating with the field unit.

8.2 Configure ESD Override

8.2.1 ESD Override

The ESD Override feature allows a maintained ESD command to override the LOCAL and OFF positions of the selector switch. This feature is normally disabled. To enable ESD Override, the third bit of the high byte of Register 105 must be set to one. To set this bit, the contents of Register 105 must be read, decimal 1024 added to the contents, then the sum is written back into Register 105.

8.2.2 Changing the ESD Override Configuration

1. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

2. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
3. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.
4. Using Modsim Manual Section 4.3, READ Register 105 and record the hexadecimal value.
5. Convert the value from hexadecimal to decimal and record.
6. Add 1024 (decimal) to the value found in Step 5 and record.
7. Using Modsim Manual Section 4.6, WRITE to Register 105 the value obtained in Step 6.
8. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
9. Enable the EEPROM on the field unit by turning S2-7 on.

10. Turn the field unit power off , wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize, then READ Register 105 (see Step 4 above). Verify that the correct bit has been set. This can be verified by converting the contents of Register 105 from hexadecimal to binary and checking the third bit from the right of the high byte. It should be a 1. If the bit has not been set, the procedure should be repeated.
11. Configure the appropriate ESD action for the application, i.e., CLOSE, OPEN etc. Refer to Figure 6-3 or 7-3 as appropriate. The ESD function of the field unit should now be checked for proper operation.

8.3 Configure the User Digital Inputs

8.3.1 Digital Input Mask

In standard UEC-3 software, all the User Digital Inputs, except the Remote Stop input, expect normally open contacts. This section explains how to convert these inputs to expect normally closed contacts.

The inputs use Digital Input Mask A to determine the “sense” of the input. This mask can be changed to invert the sense of the inputs. The procedure given in this section covers how to do this from the Local Serial Port on the actuator.

8.3.2 Changing the Sense of the User Digital Inputs

1. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

2. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
3. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.
4. Using Modsim Manual Section 4.3, read the low byte of Register 107 and record the contents.
5. Using the table below, total the decimal value of all the inputs that will use N.C. (normally closed) inputs (include the Remote Stop input, which by default uses an N.C contact).
6. Use this number in Equation C below and perform the calculation.
7. Using Modsim Manual Section 4.6, write the value obtained from the calculation to Register 107.
8. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
9. Enable the EEPROM in the field unit by turning S2-7 on.
10. Turn the field unit power off, wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize, then read Register 107 (see Step 4 above) and compare the low byte to the original value, and the high byte to the value obtained by summing the decimal values from the chart. If both bytes do not match, restore the original configuration and repeat the procedure.

Table 8.1 – Decimal Value of Digital Input Masks

Add together the decimal value of all inputs that require a N.C. input.

UEC-3, UEC-3-MPC	Decimal Value
Local ESD	1
Open Inhibit	2
Close Inhibit	4
Remote Stop	8*
Remote Open	16
Remote Close	32

*By default, the Remote Stop Input uses a normally closed (N.C.) contact.

Equation C

$$\text{New Value} = (\text{Decimal Sum From Chart}) \times 256 + \text{Old Low Value}$$

Example To set the Local ESD, Open Inhibit, and Close Inhibit of a standard UEC-3 to use normally closed (NC) contacts:

$$\text{New Value} = (8 + 4 + 2 + 1) \times 256 + 22 = 3862$$

8.4 Set the Jam Timer Reload Time

8.4.1 Jam Timer Reload

The jammed valve state and the jammed valve sequence are described in Section 2.1. The Jam Timer Reload is the number of 50 msec. intervals that the actuator is allowed to move inside the limit switch before the jammed valve sequence is initiated. The Jam Timer Reload value is stored in Register 115. The minimum (and default) value is 100 (corresponds to 5 sec.) and the maximum value is 150 (corresponds to 7.5 sec.).

8.4.2 Setting the Jam Timer Reload Time

1. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

2. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
3. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.
4. Calculate the desired Jam Timer Reload Value by dividing the desired time (in seconds) by 0.050. This must be a number between 100 and 150.
5. Using Modsim Manual Section 4.6, write the value just calculated to Register 115.
6. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
7. If the EEPROM is not already enabled, enable the EEPROM on the field unit by turning S2-7 on.

8. Turn the power to the field unit off, wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize. Using Modsim Manual Section 4.3, read Register 115. Verify that the correct value is displayed by comparing it to the value calculated in Step 4. If the value is not correct, the procedure should be repeated.

8.5 Set the Minimum/Maximum Modulating Position (UEC-3-MPC only)

8.5.1 Minimum/Maximum Modulating Position

The UEC-3-MPC controller has a minimum and maximum allowable modulating position. The default values are 2% and 98% of actuator travel. This means that a position command that is less than 2% or greater than 98% will send the UEC-3-MPC running at full speed towards the end of travel on the end closest to the command. If the default values need to be changed, they can be changed by writing new values to Register 118. These must be integer values in 1% increments. The high byte is the minimum modulating position, and the low byte is the maximum modulating position. The default value of Register 118 is 610 decimal (262 hexadecimal).

8.5.2 Changing the Minimum/Maximum Modulating Position

1. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

2. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
3. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.
4. Calculate the new value for Register 118 using Equation D below.
5. Using Modsim Manual Section 4.6, write the value obtained from the calculation to Register 118.
6. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
7. If the EEPROM is not already enabled, enable the EEPROM on the field unit by turning S2-7 on.
8. Turn the power to the field unit off, wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize. Read Register 118. Verify that the correct value is displayed by converting the displayed value from hexadecimal to decimal and compare to the value calculated in Step 4. If the value is not correct, the procedure should be repeated.

Equation D

$$\text{New Value} = (\text{min. mod. position} \times 256) + \text{max. mod. position}$$

Example To eliminate the min and max modulation positions, set the min position at 5% and the maximum to 95%. Using the equation above, you would write a value of 100 to Register 118.

$$\text{New Value} = (5 \times 256) + 95 = 1375 \text{ (557 hex)}$$

8.6 Configure the Monitor Relay Actuation Conditions

8.6.1 Monitor Relay Actuation

The normal state of the Monitor Relay is the energized state when power is applied to the UEC-3 or the UEC-3-MPC. The default list of conditions that will cause the relay to de-energize is given in Section 2.7 of this manual and in the table below. The bit masks that define the conditions for de-energizing this relay are contained in Registers 116 and 117, and the default values are 62304 (F360 hexadecimal) and 03 (03 hexadecimal) respectively. The bit masks and thus the conditions for de-energizing the Monitor Relay can be changed by reprogramming the contents of Registers 116 and 117. The procedure for calculating the new values and changing the bit masks are given below.

8.6.2 Configuring the Monitor Relay Bit Masks

1. Connect the cables and adapters to the UEC-3 local serial port and the PC serial port. Run the Modsim program. (Refer to the the Modsim Manual for details if necessary.)

NOTE: Ensure that the field unit is configured for the application before proceeding. If settings stored in the EEPROM are being used, DIP switch S2-7 must be turned on when the unit is powered up.

2. Using the Modsim Manual Section 3.3.1, select the LOCAL prompt.
3. Using the Modsim Manual Section 3.3.3, establish communication with the field unit.
4. Using the Modsim Manual Section 4.3, read Registers 116 and 117 and record the values in case there is a need to return to this configuration later.
5. Using the table below, total the decimal value of all the events in Column A which should trigger the monitor relay (de-energize the relay).
6. Using the Modsim Manual Section 4.6, write this number to Register 116.
7. Using the table below, total the decimal value of all the events in Column B which should trigger the monitor relay (de-energize the relay).
8. Using the Modsim Manual Section 4.6, write this number to Register 117.
9. Transfer the configuration to the EEPROM by writing the value 7168 to Register 1 (Modsim Manual Section 4.6).
10. If the EEPROM is not already enabled, enable the EEPROM on the field unit by turning S2-7 on.
11. Turn the power to the field unit off, wait 10 seconds then turn the power back on. Wait 15 seconds for the field unit to initialize.
12. Read and record the contents of Registers 116 and 117 (Modsim Manual Section 4.3). Verify that the correct values are in the registers by converting the displayed value of Register 116 from hexadecimal to decimal and compare to the value calculated in Step 5. Then convert the displayed value of Register 117 and compare to the value calculated in Step 7. If the values are not correct, the procedure should be repeated.

Table 8.2 – Decimal Values for Monitor Relay Masks

Add the decimal value of all events that should cause the Monitor Relay to de-energize for each Register.

Events from Register 116	Decimal Value
Opened	1
Closed	2
Stopped	4
Opening	8
Closing	16
Valve Jammed	32
Local Mode	64
Combined Fault	128
Thermal OL Tripped	256
Failure to De-energize	512
Network A Fault	1024
Network B Fault	2048
Open Torque Switch	4096
Close Torque Switch	8192
Manual Operation	16384
Phase Error	32768

Events from Register 117	Decimal Value
Failure to Energize Open	1
Failure to Energize Close	2
Failure to De-energize Open	4
Failure to De-energize Close	8
Phase Loss	16
Phase Reversal	32
Manually Moved— Mid-travel to Open	64
Manually Moved— Open to Mid-travel	128
Manually Moved— Mid-travel to Close	256
Manually Moved— Close to Mid-travel	512
Network ESD Active	1024
Local ESD Active	2048
Reset Since Last Poll	4096
Wrong Rotation	8192
Local Opening	16384
Local Closing	32768

Note: Bold indicates the default values.

Example Calculate the Monitor Relay Masks so that only the following conditions cause the monitor relay to de-energize:

- Open torque switch
- Close torque switch
- Failure to energize open
- Failure to energize close
- Local ESD active

New Value for Register 116 = $4096 + 8192 = 12298$

New Value for Register 117 = $1 + 2 + 2048 = 2051$

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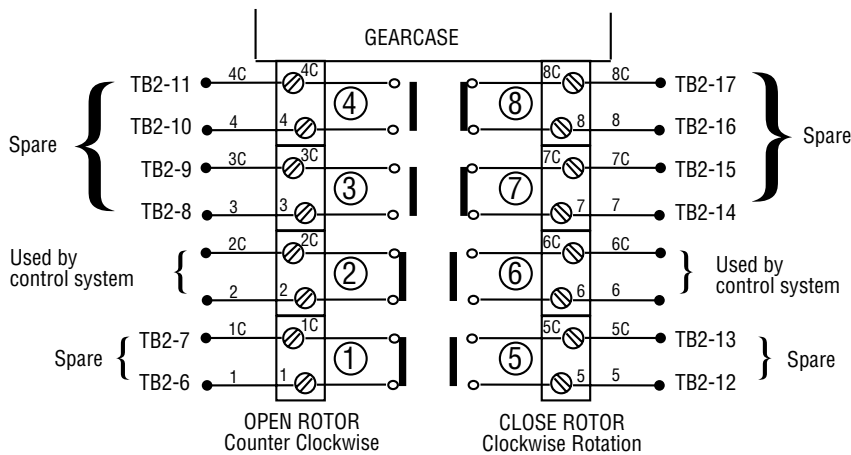
9 Actuator Wiring Details

9.1 L120 Actuator Wiring

NOTES: The illustrations in Figure 9.1a and Figure 9.1b are for a CLOCKWISE CLOSING valve.

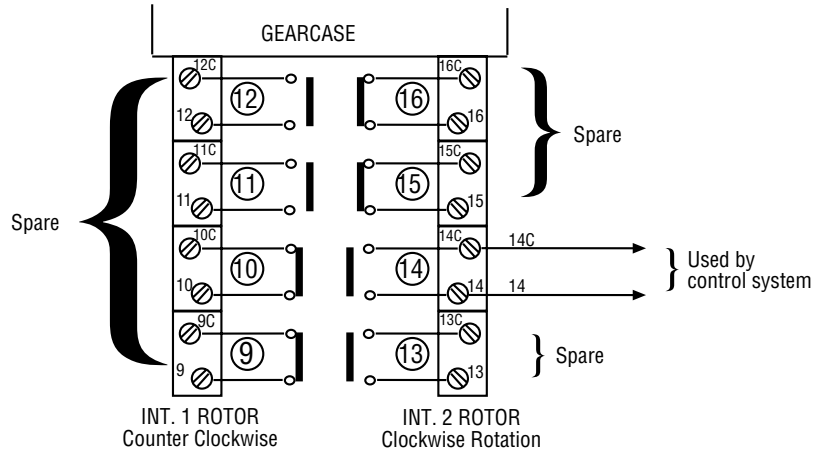
Figure 9.1a – UEC-3 Limit Switch Connections for L120 Series Actuators

Contact Arrangement for Position Limit Switches



Shown with valve in fully OPEN position.

Figure 9.1b – UEC-3 Limit Switch Connections for L120 Series Actuators

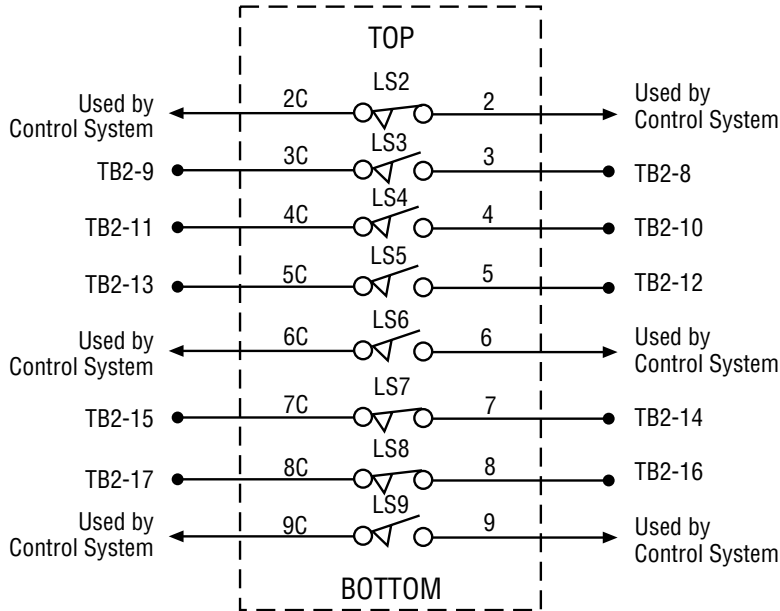


Shown with valve in fully OPEN position.

NOTE: Rotors INT. 1 & INT. 2 can be set at valve position FULL OPEN, FULL CLOSED or any position between. Gear Limit Switch 14 is used to initiate the pulsing mode for slow speed.

9.2 LY Actuator Wiring

Figure 9.2 – UEC-3 Limit Switch Connections for LY Series Actuators



Valve shown in full open position.

Limit Switch Contact Development					
LIMIT SWITCH CONTACT	Valve Position				FUNCTION
	FULL OPEN		FULL CLOSE		
2	■	---	---	---	OPEN LIMIT
3	---	■	■	■	SPARE
4	---	■	■	■	SPARE
5	---	---	---	■	SPARE
6	---	---	---	■	CLOSED LIMIT
7	■	■	---	---	SPARE
8	■	■	---	---	SPARE
9	---	---	■	■	TIMER

NOTES:

1. --- Open Contact
2. ■ Close Contact
3. All limit switch trip points are fully adjustable.
4. Limit Switch LS1 is not fitted to LY units.

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10 Troubleshooting

10.1 Troubleshooting with the Universal Diagnostic Tool (UDT)

The UDT diagnostic tool is a simple plug-in device which automatically reads the information contained in a register in the Single Board Computer. The UDT is powered from the UEC-3 module and does not require a separate battery. The front of the UDT contains 18 LEDs which, when illuminated, indicate the presence of a control, status indication or fault condition. Each LED is accompanied by a brief caption, the meaning of which is described in Table 10-1.

Figure 10.1 – Universal Diagnostic Tool



⚠ WARNING: If the actuator is installed in a hazardous area and has explosion-proof certification, then it will be necessary to comply with specific site regulations regarding the maintenance of equipment. Always follow applicable regulations and procedures when performing work in restricted environments.

10.2 Using the UDT Diagnostic Tool

(For detailed instructions on the use of the UDT, see the UEC-3 and DDC-100 Diagnostic Interface Manual, Bulletin 437-10000.)

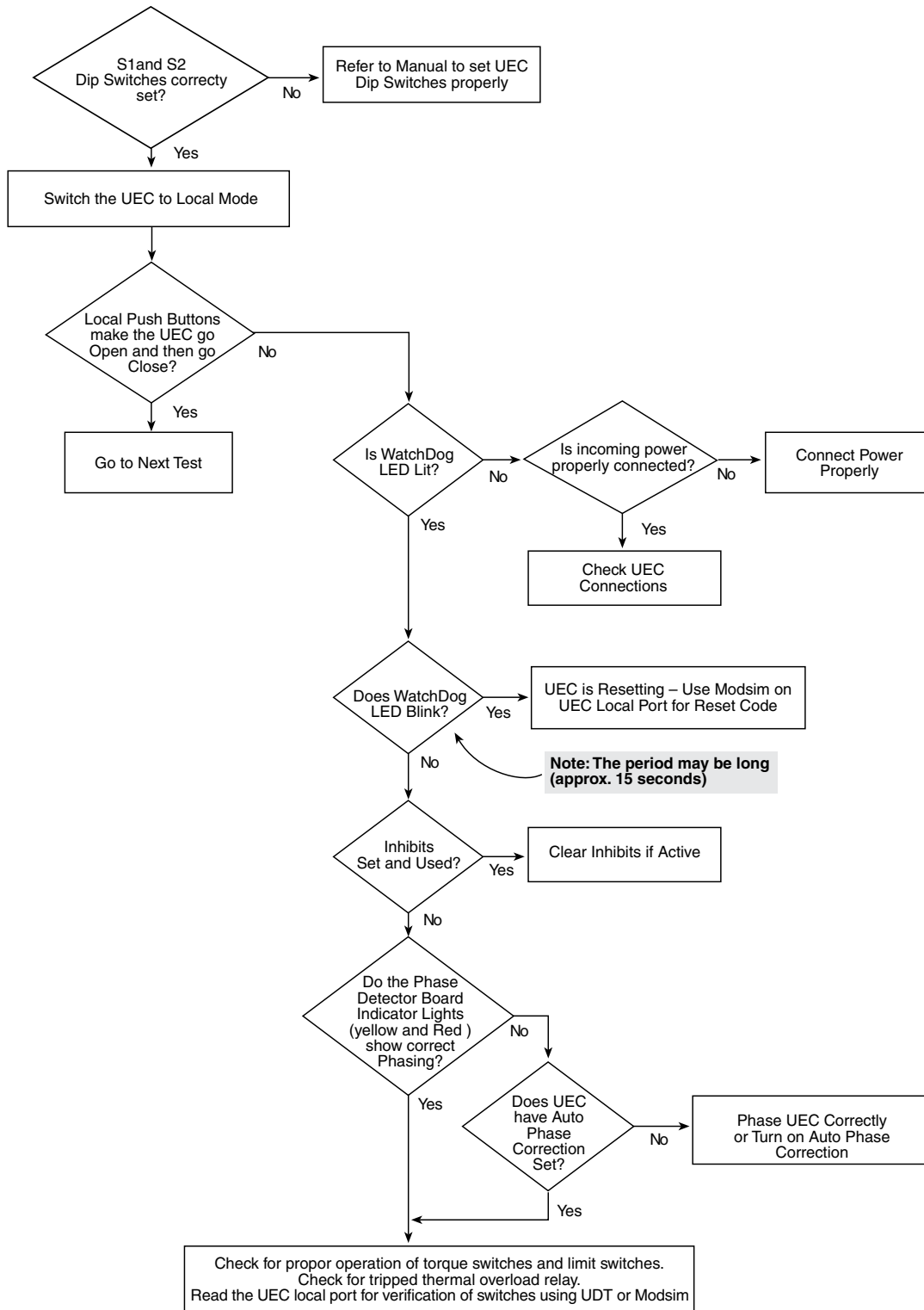
1. Do not isolate power from the actuator, otherwise some of the information contained in the register (memory location) in the Single Board Computer (SBC) may be lost.
2. Carefully remove the main cover of the UEC-3 control module.
3. Attach the serial interface adapter to the 34-Pin connector on the SBC.
4. Plug-in the UDT to the serial interface adapter, using the lead supplied with the tool.
5. Check that power is present at the actuator. The LED 'POWER' should be illuminated.
6. Check that the UEC-3 is functioning correctly. The LED 'RESET' should not be illuminated. A fault condition will be indicated if the LED blinks repetitively.
7. If any of the other 16 LEDs are illuminated check the meaning against the list below and take the necessary action to isolate and remedy the fault condition, if one exists.

Table 10.1 – LED Caption Designations

LED Caption	Explanation
OPEN TS	Torque switch has tripped between the limits, in the opening direction.
CLOSE TS	Torque switch has tripped between the limits, in the closing direction.
OPEN INH	'OPEN' inhibit signal is present at terminal TB1-4
CLOSE INH	'CLOSE' inhibit signal is present at terminal TB1-5
OPEN LS	'OPEN' limit switch has tripped.
CLOSE LS	'CLOSE' limit switch has tripped.
LOST PH	Phase L2 has been lost (If phases L1 or L3 have been lost, the UEC will not be powered .
TH OL	Motor thermostat has tripped due to motor over heating.
ESD	ESD signal is present at terminal TB1-3
LOCAL	Actuator is in LOCAL or OFF mode. Not in REMOTE.
VALVE JAM	The jammed valve signal has been initiated but has not been successful.
CLOSE CONT	'Close' contactor has failed to operate after being signaled.
OPEN CONT	'Open' contactor has failed to operate after being signaled.
REV PH	The three phase supply connections are reversed.
LOCAL COMM	No communication through the diagnostics port.
COMB	Combination fault- only used on UEC-3-DDC. This LED will always be illuminated on UEC-3 and UEC-3-MPC since a DDC 2- wire network is not present.

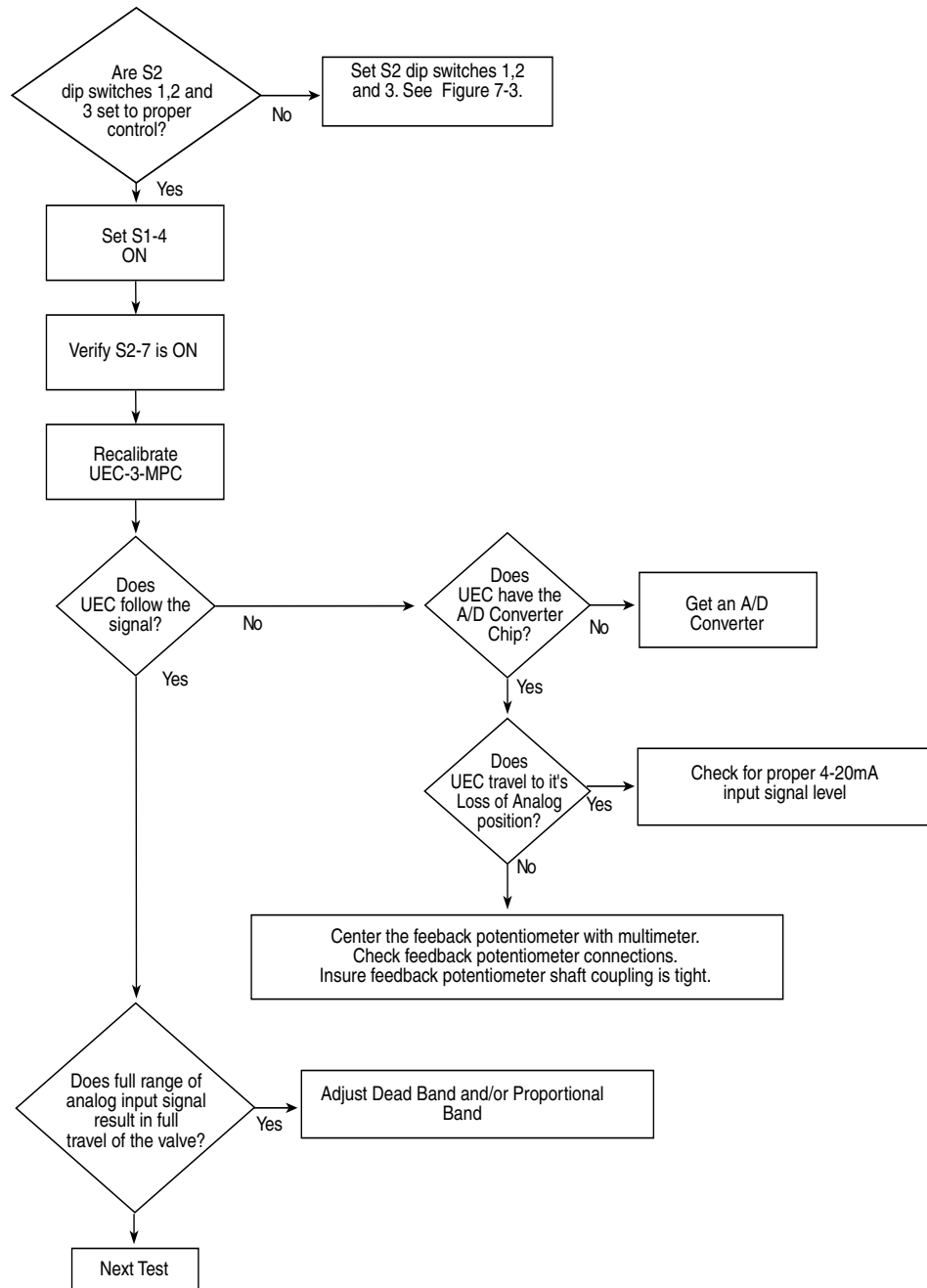
10.3 UEC Troubleshooting – All Models

Figure 10.2 – UEC Troubleshooting Flow Chart – All Models



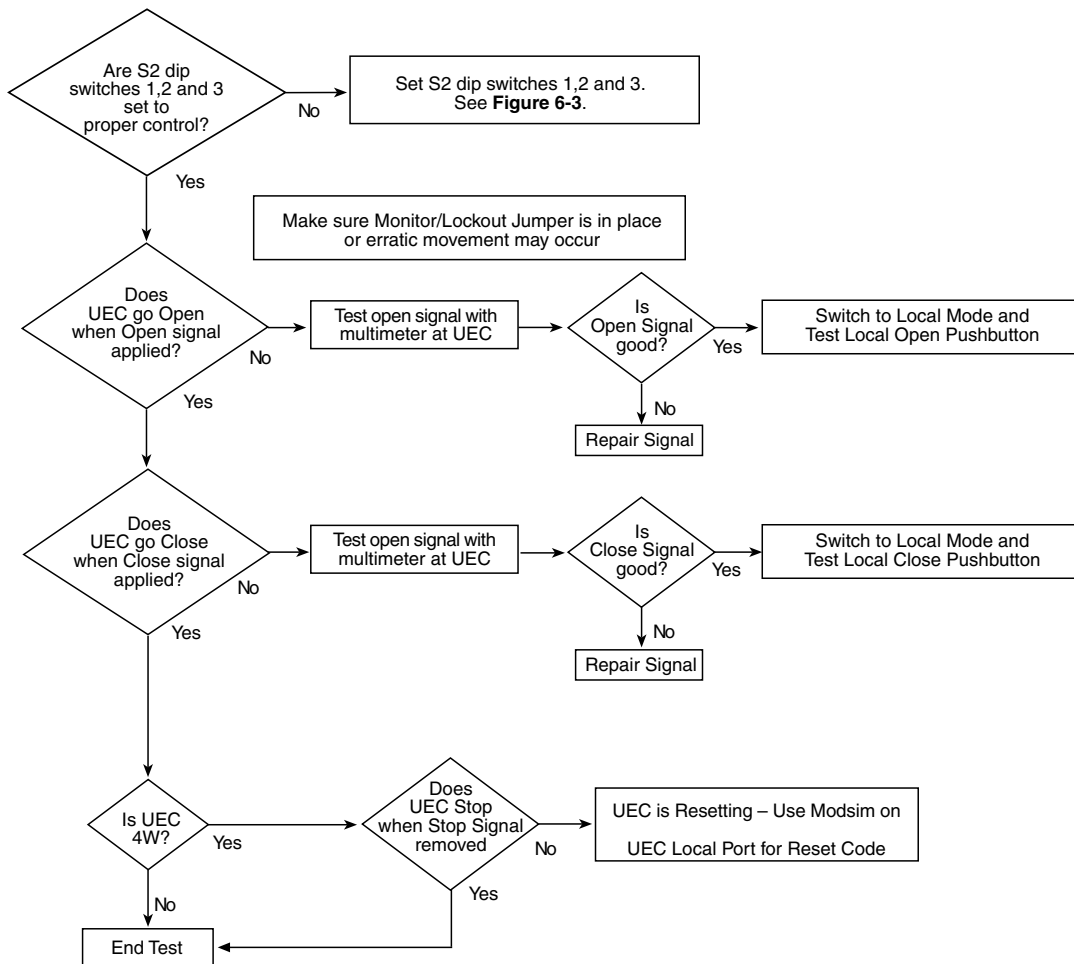
10.4 UEC-3-MPC Troubleshooting

Figure 10.3 – UEC-3-MPC Troubleshooting Flow Chart



10.5 Two-, Three- and Four-Wire Control Troubleshooting

Figure 10.4 – Two-, Three- and Four-Wire Control Troubleshooting Flow Chart



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11 Parts

Table 11.1 – Parts

• Indicates that part is required. ◊ Indicates that part is optional.

Part	Part Number	UEC-3	UEC-3-MPC
Single Board Computer	61-825-1268-4	•	•
Termination/Interconnect Board	61-825-1060-3	•	•
3 Phase Power Supply Board	61-825-1235-4	•	•
Single Phase & Special Power Supply Boards	61-825-1234-4	◊	◊
Primary Fuses (FS1 & FS2) – Three Phase Operation	EF4-TDC11-250MA	•	•
Primary Fuses (FS1 & FS2) – Single Phase Operation	115V	EF3-TDC11-750MA	•
	230V	EF4-TDC11-250MA	•
Control Fuse (FS3)	EF2-5X20MM-1A-250V	•	•
24VDC I/O Power Fuse (FS4)	EF2-5X20MM-1A-250V	•	•
PT 20SD	TM74-743-0066	◊	◊
SBC Analog Board	61-825-0962-2		•
SW93 Pushbutton Station	TM74-790-0033A	•	•
Customer Service Kit	TM0700504	◊	◊
Universal Diagnostic Tool	61-825-0950-3	◊	◊
UDT Serial Interface Adapter	61-825-0951-3	◊	◊
ADC Chip	61-825-0733-1		•

Part Numbers are subject to change as product improvements are introduced. Consult Limitorque for current part numbers.

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Customer Service

For parts or parts information, call your local Limitorque distributor or the Parts Department in Lynchburg, VA, at 804-522-9833. For fastest response, please have the order number and serial number from the actuator available when contacting Limitorque for parts or parts information. This information can be found on a Limitorque label affixed to the main housing of the actuator.

For service information, call your local Limitorque distributor, Blue Ribbon Service Center or the Service Department in Lynchburg, VA, at 804-845-9366. For fastest service, please have the order number and serial number from the actuator available when contacting Limitorque with service questions. This information can be found on a Limitorque label affixed to the main housing of the actuator.



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Related Publications

1. DDC-100 UEC Field Unit (BITBUS) Installation and Operation Manual – Bulletin 440-20013
2. DDC-100 UEC Field Unit (Modbus) Installation and Operation Manual – Bulletin 440-20014
3. Modsim & Modbus Simulation Software Operation Manual – Bulletin 440-20014
4. UEC-3 and DDC-100 Diagnostic Interface Manual – Bulletin 437-10000
5. UEC-3 and UEC-3-MPC Installation and Commissioning Manual – Bulletin 440-12100.



FCD LMENIM4023-00 Printed in USA. (Replaces 440-12000)

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