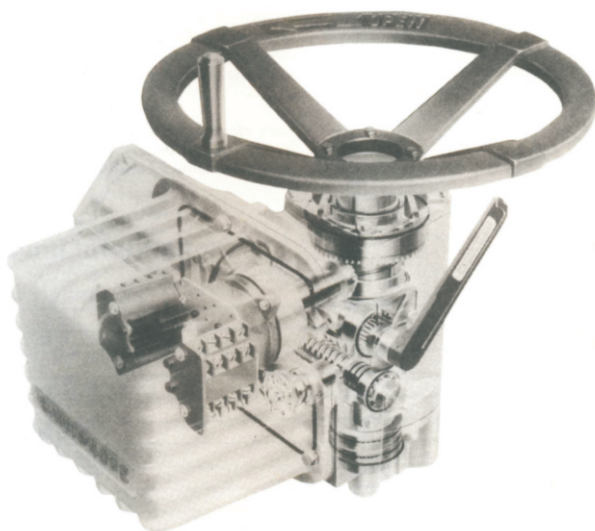


# **L-120 SERIES INSTRUCTION AND MAINTENANCE MANUAL**



**A Product of Limitorque India Ltd.**

Please before you attempt to install or operate your Limitorque Actuator be sure to read this booklet at least once. Always keep it available for quick reference.

# **LIMITORQUE**

## **TYPE L-120**

### **INSTRUCTION & MAINTENANCE MANUAL**

#### **Your Limitorque Valve Control...**

Limatorque's L-120 series of actuators is the most advanced valve control on the market... the result of many years of development and an awareness of our customer's requirements. This booklet has been prepared to help you obtain the most benefit from the equipment. It contains instructions on the installation and maintenance of the units, plus helpful suggestions to enable you to become thoroughly familiar with the location and proper use of the operating controls.

Limatorque 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 pipe line obstructions.

Limatorque controllers may be mounted on any size of valve in almost any position or location. They are readily adaptable to existing equipment.

# PRINCIPLES OF OPERATION

## Description of Motor Operation:

Your Limitorque actuator is always for motor operation whenever the motor is energized.

**DO NOT FORCE THE DECLUTCH LEVER INTO MOTOR OPERATION POSITION - THE LEVER RETURNS TO THIS POSITION AUTOMATICALLY WHEN THE MOTOR IS ENERGIZED. (REFER TO PAGE 6)**

In motor operation, the motor gear set (#s 35 to 38) drives the worm shaft (#15) and worm gear (#21) which in turn rotates the clutch sleeve (#19) by means of driving lugs. The clutch sleeve and worm gear may be assembled to produce either a 'no lost motion or 'hammer blow' effect. The drive sleeve (#25) is keyed to the clutch sleeve and, hence, rotates producing the required output rotary motion.

## Description of Manual Operation:

Counterclockwise rotation of the declutch lever (#9) causes the declutch actuator to lift the clutch sleeve out of engagement with the worm gear. Drive lugs on top of the clutch sleeve engage matching lugs in the handwheel adapter (#26) and, then, latches engage the clutch sleeve in this position. The actuator is now in the handwheel drive option. Energizing the motor at this point will cause the latches to drop out and the spring loaded clutch sleeve re-engages with the lugs on the worm gear. The Actuator is once more in motor operation.

**PLEASE NOTE THAT THE SHIFT FROM MANUAL TO MOTOR OPERATION IS AUTOMATIC AND DOES NOT REQUIRE EXTERNAL POSITIONING OF THE DECLUTCH SHAFT.**

## Torque and Travel Limiting:

The geared limit switch is driven by a bevel gear connected to the upper drive lugs of the clutch sleeve. Thus the limit switch is directly connected to the output of the actuator and, once properly set, remains in step with the valve position regardless of electric or manual operation of Limitorque actuator.

The worm and worm shaft are supported in two rotating spring packs. As torque is generated by the actuator, the worm moves axially against one of the spring packs. Each pack is pre-calibrated and hence, a finite compression represents a

finite torque output. Movement of the worm operates the torque switch which interrupts the power of the motor. The torque switch is adjustable and can be set to operate at pre-determined torque levels.

## Lubrication :

Limitorque actuators are designed with a totally sealed gear case factory-packed with grease. The gear case can be mounted in any position (as all penetrations into it are sealed); however, those mounting positions which would cause vulnerable areas of the operator (e.g., Motor, or switch compartment) to be saturated with lubricant should a seal failure occur, should be avoided if possible.

No seal can remain absolutely tight at all times; therefore, it is not unusual to find a very small amount of weeping around shaft seals - especially during long periods of idleness such as storage. The use of grease minimizes this condition. Should a small amount of weeping be found on start-up, it should be removed with a clean rag. Once the equipment has begun operating, this phenomenon should disappear.

## Factory Lubricants:

Gear Case :	SERVOGEM EP0
Geared Limit :	OKS410
Switch	MoS <sub>2</sub> high Performance Grease of OKS speciality lubricants

## Lubricants Inspection:

It is recommended that all Limitorque actuators be inspected for proper lubrication prior to operating especially if they have been stored for a long period of times.

The frequency of lubrication inspections should be based upon historical data on the installed equipment. Every operator application has its own effect on lubricants and each facility should pattern its inspections around its particular needs. The following schedule of lubrication inspection should be followed until operating experience indicated otherwise.

**Main Gear Case:** Inspect lubrication every 18 Months.

**Geared Limited Switch :** Inspect lubricant every 36 months.

## INSTALLATION TIPS

**Caution :** Do not attempt to store, install or operate your Limitorque Valve Contol without reading the instructions and cautionary notes below.

**Caution :** Do not remove the unit mounting bolts when the unit is mounted on a rising stem valve unless the valve is in the fully open position, or there is not, nor cannot be, any pressure in the line.

**Note :** Limit switches are not factory set by Limitorque. They must be set when the unit is installed on the valve.

## Short Term Storage (Less than one year)

**UNITS ARE NOT FULLY WEATHERPROOF UNTIL PROPERLY INSTALLED ON THE VALVE OR PREPARED FOR STORAGE.**

Units should be stored in a clean, dry, protected warehouse free from excessive vibration and rapid temperature changes. If the units stored outside, they must be stored off the ground, high enough to prevent their being immersed in water or buried by snow.

Connect the internal heaters (if supplied) or place dessicant in the switch compartment. Replace all plastic caps or plugs with pipe plugs and ensure that all covers are tight. If the unit is mounted on a valve and the stem protrudes from unit, a suitable stem cover must be provided.

Unit should be stored with the motor and switch compartment horizontal.

**FAILURE TO COMPLY WITH THESE RECOMMENDED STORAGE PROCEDURES WILL VOID THE WARRANTY. FOR LONGER TERM STORAGE PLEASE CONSULT LIMITORQUE FOR PROCEDURES AND RECOMMENDATIONS.**

### DO :

1. Mount motors on a horizontal plane, if possible.
2. Keep the switch compartment clean and dry.
3. Operate the unit by handwheel only, when initially setting the limit switches.
4. Check all unit wiring to ensure that it coincides with the applicable wiring diagram.
5. Carefully check for correct motor rotation direction. If the motor is driving the valve in the wrong direction, interchange any two leads on three phase motors.

6. Use protective stem cover, check valve stem travel and clearance before mounting covers on rising stem valves.
7. Set up periodic operating schedule for infrequently used valves.
8. Keep the valve stem clean and lubricated.
9. Reset the travel limit switches prior to motor operation if the unit has been dismantled or removed from the valve.

**Caution :** Shut off incoming power before opening switch compartment.

### DO NOT :

1. **Caution :** Do not attempt to work on your Limitorque actuator without first shutting off incoming power.
2. Do not attempt to work on your Limitorque actuator while it is mounted on a torque seated valve.
3. Do not motor operate the valve without first setting or checking the limit switch and motor rotation direction.
4. **DO NOT FORCE THE DECLUTCH LEVER INTO MOTOR OPERATION LEVER WILL AUTOMATICALLY RETURN TO MOTOR OPERATION WHEN MOTOR IS ENERGIZED.**
5. **DO NOT FORCE DECLUTCH LEVER INTO HAND OPERATION. IF THE CLUTCH DOES NOT EASILY ENGAGE, ROTATE HANDWHEEL SLOWLY WHILE OPERATING THE DECLUTCH LEVER.**
6. Do not use abrasive cloth to clean the contacts on the limit and torque switches.
7. Do not torque seat 90° operation valves nor run them against the stops as this may cause damage to the valves.
8. Do not alternately start/stop the motor to open or close a valve which is too tight for normal operation.
9. Do not reset torque switch to a setting higher than the recommended factory maximum.
10. Do not attempt to repair gearing in the limit switch. Replace entire gear frame assembly if necessary.

## TORQUE SWITCH

**CAUTION :** Disconnect all incoming power before opening limit switch compartment or working on the torque switch.

The torque switch is designed to protect the actuator in open and close directions. The switch was set at the factory according to information regarding necessary torque or thrust output that was provided at the time of order

**CAUTION :** A maximum stop setting plate is provided on most units. Do not remove this plate. Do not exceed the setting indicated by this limiter plate without contacting Limitorque.

### Torque Switch Setting Procedure

Before adjusting or installing a torque switch, place the L120 unit in manual mode and release the load on the worm shaft spring pack.

**CAUTION :** Installing or adjusting the torque switch with the operator in a loaded condition will result in a loss of torque protection.

Should the present switch setting require changing, proceed follows :

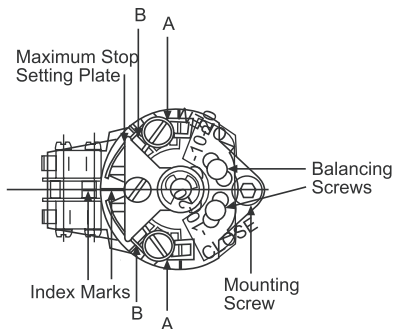
1. For both open or close direction, loosen screw (A) and move pointer (B) to desired position. A higher number indicates a high torque and/or thrust output.
2. Tighten screw (A).
3. Operate the valve electrically to seat valve and to ensure tight shut-off.

## BALANCING PROCEDURE

If the torque switch has been removed from the unit or if a new torque switch is being installed, the torque switch must be rebalanced using the following procedure :

1. Ensure that the unit is in manual mode and load is removed from the wormshaft spring pack.
2. Prior to reinstalling the torque switch, note the open and close torque switch settings.
3. Loosen screws (A) and position both pointers (B) at the # 1 setting, tighten screw (A). In this position the index marks should be aligned. Loosen balancing screws and install the torque switch when properly installed, the base of the torque switch should be flush against the compartment and the hole for the mounting screw should be aligned. Install the mounting screw.
4. Tighten the balancing screws. The switch is now balanced and ready for the pointers to be returned to their original settings.

**CAUTION :** The balancing screws should not be touched except during the balancing procedure.



Micro-Switch Style Torque Switch (fig-1)

## GEARED LIMIT SWITCH

**CAUTION :** The geared limit switch is not preset at the factory and must be adjusted after the actuator has been mounted on its associated equipment.

Disconnect all incoming power to the unit prior to opening the limit switch compartment and adjusting the switch.

Consult the relevant wiring diagram for limit switch contact development. All L120 units are supplied with 8 contact limit switches-4 switches on each of 2 rotors. Two rotors are used for end of travel indication.

### Limit Switch Setting Procedure

1. Open compartment cover (#200).
2. Put the actuator into manual operation and use the handwheel to operate the valve in the "open" direction. While operating the valve, note the direction of the intermediate shaft (B) corresponding to the rotor or rotors to be set.
3. When the valve is fully open, close it one turn of the handwheel to allow for coast of moving parts.
4. Check the contacts of gear limit switch. (Fig.)

**NOTE:** The rotor segments can be separated and rotated through 90 degrees to give various combinations of normally open or normally closed contact for each rotor.

5. Refer contact development wiring diagram and see the contact required at trip position/end position-(NO/NC). follow the Instruction as per requirement as shown given in case I or Case II

**NOTE:** See chart below for maximum number of drive sleeve turns for each unit size. The intermediate shaft (B), shown in **Figure 2**, may take a considerable number of turns before rotor trip occurs.

**Table - Maximum Number of Drive Sleeve Turns for Standard 4-Gear and Optional 5-Gear Limit Switches**

Unit	3-Gear	4-Gear	5-Gear
L120-10	63	630	6300
L120-20	74	740	7400
L120-40	64	640	6400

**WARNING: Potential Explosion Hazard. Do not use a variable speed electric drill for setting the limit switch in an explosive environment.**

Note: For model L120-85- Directions of rotor for setting is reversed.

**CAUTION:** Do not operate the valve when the setting rod (A) is in fully depressed position, loss of the contact setting will occur and the setting rod will be damaged

**CAUTION:** When setting the limit switch rotor segments (cams) using a variable speed electric drill, do not run drill at speeds higher than 200 RPM. Operating the drill at high speeds can damage the gearing within the limit switch.

6. Push in setting rod (A) and turn one quarter turn. The rod will latch in this depressed position.

**CASE-I:-** Trip contacts/end position contact is closed (Generally required if UEC-3 family (fig-2) controller is supplied)

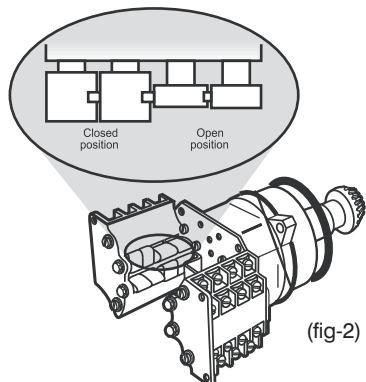
- A If contact is Normally Open (NO):- Rotate the intermediate gear shaft in same direction as noted in Page No. 2 until it becomes normally close (NC)
- B if contact is already Normally Close (NC):- rotate intermediate gear shaft in opposite direction as noted in Point No. 2 until it change.

7. Before moving the valve depress and turn the setting rod (A) one quarter turn to the spring released position. Insert a screwdriver into the intermediate shafts to ensure that they will not move.

8. Operate the valve by handwheel to the fully "close" position, reverse direction by the turn of the handwheel to allow for coast of moving parts.

**CASE- II:-** Trip contact/End position contact is opened generally required if non control unit (NCU) Basic Integral Circuit (BIC) is supplied.

- (a) If contact is Normally Close :- Rotate the intermediate gear shaft is same direction as noted in until it becomes Normally Open (NO).
  - (b) If contact is Normally Open:- Rotate the intermediate gear shaft in opposite direction as noted in until it becomes normally close (NC).
9. Set the other rotors by following steps "1" through "7".



## DRIVE SLEEVE & HOUSING COVER ASSEMBLY

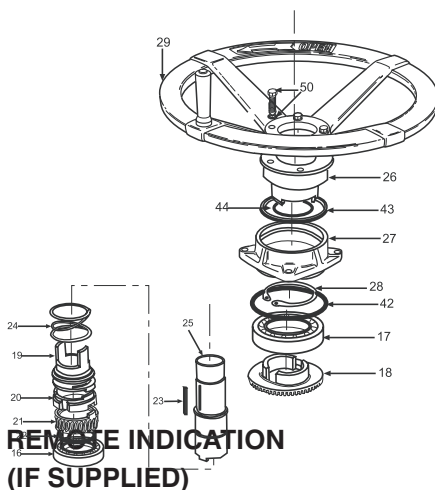
PARTS LITS		
PC NO	QTY.	DESCRIPTION
16	1	BALL BEARING
17	1	BALL BEARING
18	1	DRIVE SLEEVE BEVEL GEAR
19	1	H.W.CLUTCH SLEEVE
20	1	WORM GEAR LUG RING
21	1	WORM GEAR
22	1	RETAINING RING
23	1	KEY
24	1	DECLUTCH SPRING
25	1	DRIVE SLEEVE
26	1	HANDWHEEL ADAPTOR
27	1	HOUSING COVER
28	1	RETAINING COVER
29	1	HANDWHEEL
33	1	HANDWHEEL COVER PLATE
34	1	H.W.COVER PLATE GASKET
42	1	SEAL KIT
50	A/R	HARDWARE

## LOCAL POSITION INDICATION

The local dial position indicator is factory selected to show valve position. The position indicator can only be adjusted when mounted on the valve.

To set the local position indicator:

1. Disconnect all incoming power and removed switch compartment cover.
2. Place the valve in the fully "Close" position.
3. Loosen the round head machine screw which holds the pointer in place, move the pointer to the "0" position, re-tighten the screw.



1. **DISCONNECT ALL INCOMING POWER AND REMOVE SWITCH COMPARTMENT COVER (#200).**

**Note :** The remote position transmitter potentiometer is left disengaged to protect potentiometer from being damaged by accidental rotation of the handwheel prior to installation and setting on the valve.

2. Engage manual operation and move the valve to fully closed position. Note which direction the shaft and gear would be driving the wiper arm on the transmitter.
3. Move the potentiometer wiper to the end of transmitter corresponding to the closed position. Loosen hex nut on the back of potentiometer and slide it in the direction of idler pinion until the pinions are engaged. Retighten hex nut on the back of the potentiometer.
4. With power off connect all wires as per wiring diagram.
5. Turn power on the indicator should now read 0 or 4mA. Calibrate zero potentiometer until a 4mA. output signal is read as terminate
6. Move the valve to fully open position indicator will now read 100% open or 20 mA. Calibrate span potentiometer





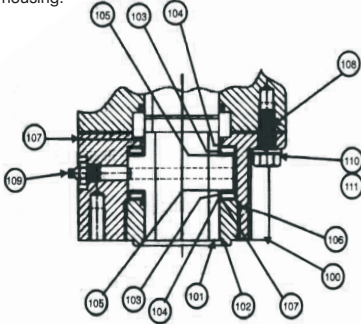
PARTS LITS		
PC NO	QTY.	DESCRIPTION
1	1	HOUSING
2	1	MOTOR ADAPTOR
3	1	ELECTRICAL COMPARTMENT
4	1	SEAL RETAINER
5	1	WORM SHAFT END CAP
6	1**	HSG COVER SHIM SET
7	1	DECLUTCH SHAFT ASSY
9	1	DECLUTCH LEVER
10	1	KEY
11	1	DECLUTCH CAP
15	1	WORM SHAFT ASSEMBLY
19	1	CLUTCH SLEEVE
21	1	WARM GEAR
30	1	NIPPLE FLANGE
31	4**	MOTOR
32	1	DOWELS
35		WORM SHAFT GEAR

PARTS LITS		
PC NO	QTY.	DESCRIPTION
36	1	KEY
37	1	FLEX LOC NUT
38	1	MOTOR PINION
39	1	KEY
40	1	STOP NUT
41	1*	WASHER
42	1	SEALS KIT
46	1	O-RING
47	1	O-RING
50	1	HARDWARE KIT
200	1	COMPARTMENT COVER
300	1	TORQUE SWITCH ASSY.
305	1	GEARED LIMIT SWITCH ASSY.

\* L 120-40 Only  
 \*\* Not Shown

## THRUST BASE DISASSEMBLY

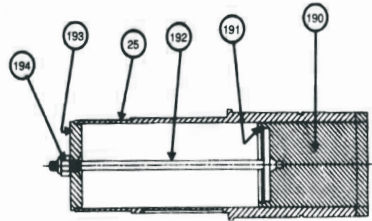
1. If thrust base option is present (#100), remove seal retainer (#102) followed by stem nut (#101) and thrust bearings (#s 103, 104 and 105).
2. Remove four bolts (#110) and lift thrust base from main housing.



PARTS LISTS		
PC NO	QTY.	DESCRIPTION
100	1	BASE HOUSING
101	1	STEM NUT
102	1	SEAL RETAINER
103	2	NEEDLE BEARING
104	2	THRUST WASHER
105	2	THRUST WASHER
106	1	O-RING SEAL
107	2	QUAD RING SEAL
108	1	GASKET
109	1	GREASE FITTING
110	4	HEX HD CAP SCREW
111	4	LOCK WASHER

In order to replace the nut, proceed as follows :

1. Disconnect all incoming power to the unit.
2. Remove actuator from valve
3. Remove seal retainer (#102) followed by stem nut bearings and seals
4. Check the fitment of the new stem nut on the valve stem - Ensure that the nut travels freely without binding.
5. Reassemble the thrust base and remount the actuator on the valve.
6. Remount actuator on thrust base.
7. CAUTION : The limit switches must be reset at this time. Removing the actuator from the valve will have changed the settings - refer to Geared Limit Switch Section of this manual
8. Reconnect power and test for correct functioning.



## TORQUE NUT DISASSEMBLY

The L120 Series actuator can be supplied without the thrust base option for applications requiring torque only. The torque nut is driven by the drive sleeve lugs and held in place by the torque bushing connector.

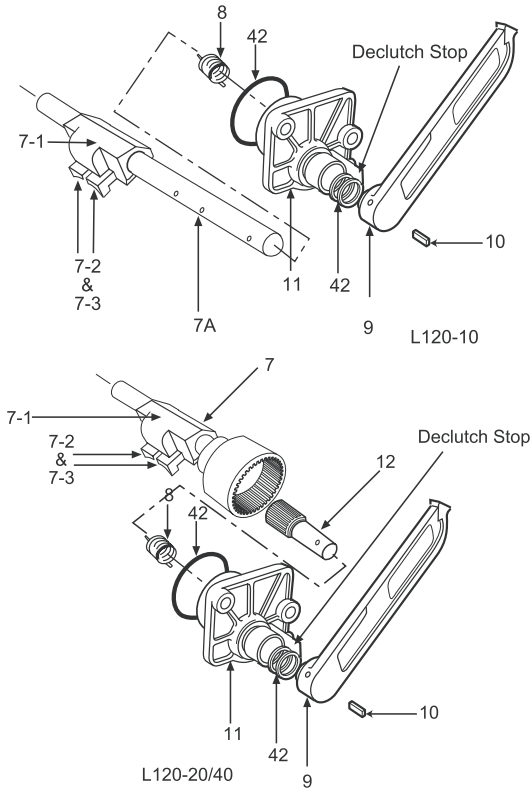
Remove the internal circlips from torque nut (#190). now, it can be removed from the bottom of the drive sleeve (#25).

## STEM NUT REPLACEMENT

This section is applicable only to thrust base applications. Occasionally the stem nut of the operator may need replacing if used in a threaded stem application on rising stem valves.

**NOTE :** This procedure should not be attempted unless the valve is "out of service" and there is no possibility of pressure entering the line.

# DECLUTCH SHAFT ASSEMBLY



PC NO	QTY.	DESCRIPTION
7	1	DECLUTCH SHAFT ASSEMBLY.
7A	1	DECLUTCH SHAFT ASSEMBLY.
7-1	1	DECLUTCH ACTUATOR
7-2 & 7-3	2	DECLUTCH LATCH (LEFT & RIGHT)
8	1	DECLUTCH RETURN SPRING
9	1	DECLUTCH LEVER
10	1	KEY
11	1*	DECLUTCH CAP
12	1	DECLUTCH INPUT PINION
42		SEAL

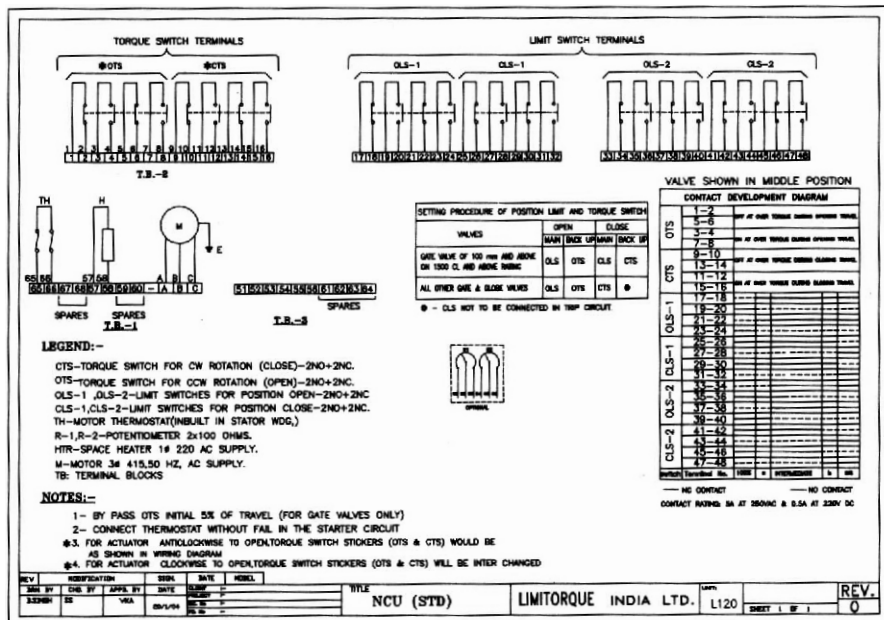
## ELECTRICAL START - UP

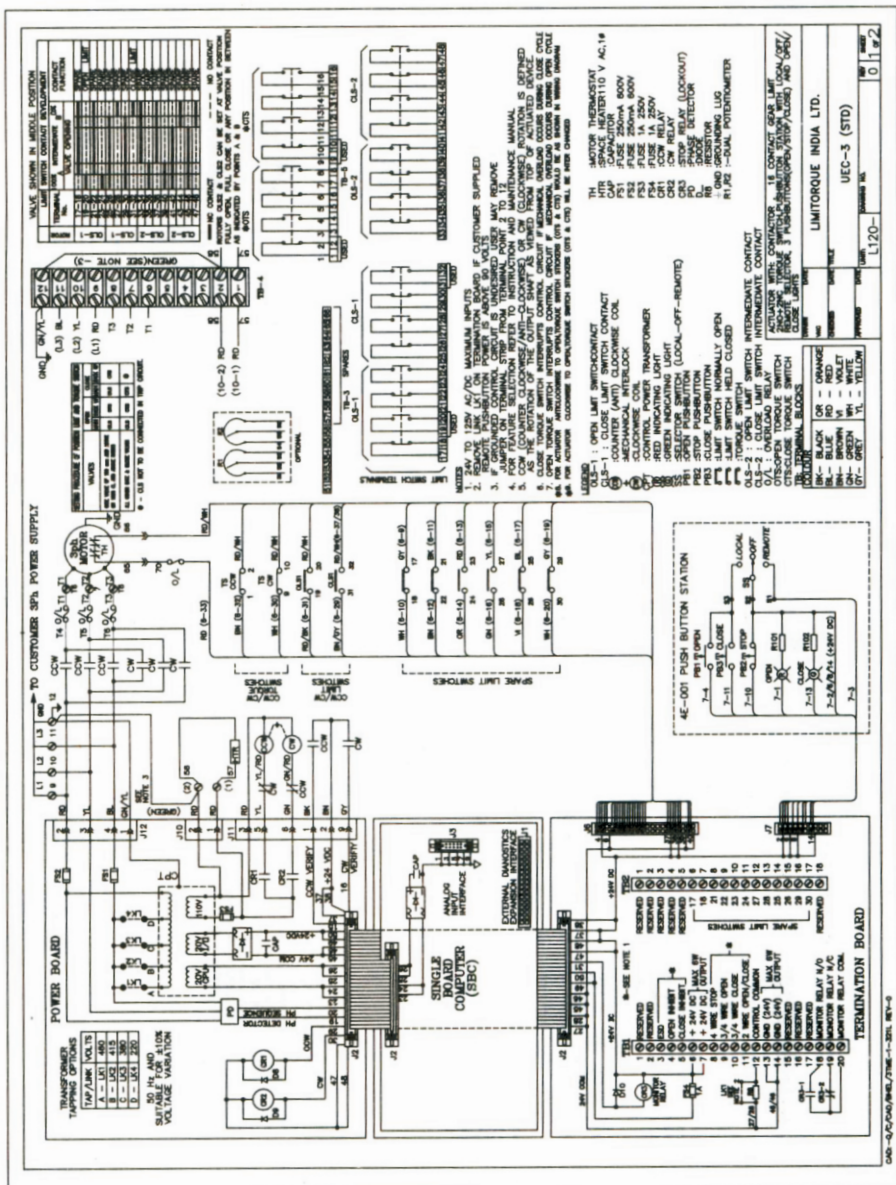
1. Check that the actuator has been correctly lubricated. This is particularly important if the actuator has been in long-term storage.
2. Ensure that the geared limit switch has been correctly set per instructions in this manual. (see Geared Limit Switch Section).
3. If the valve stem (Rising stem applications) is not visible, remove the stem cover or handwheel cover plate so that stem will not damage the hand wheel adaptor housing (PC No. 27) Page No.-6.
4. Engage manual operation and hand crank valve well away from end of travel positions.
5. Turn on power supply and operate the actuator.

6. Check output rotation - if phase rotation is correct, the valve should begin to open. If valve begins to close-stop immediately. Incorrect phase rotation will lead to serious damage if the valve seats.
7. Correct the phase rotation by switching any two of the three power leads for three-phase power.
8. The actuator should now operate correctly and will be stopped at the end of travel positions by torque or limit switch functions. (Premature stopping may be caused by incorrect limit switch of torque switch settings or line obstructions in the valve). Replace stem cover or cover plate.

## TYPICAL WIRING DIAGRAM

The wiring diagram below is a representation of a typical application and may not be applicable to your specific actuator. Please refer to the wiring diagram supplied with your unit to confirm the actual equipment supplied.





# LEC-3 DIP SWITCH SETTINGS



ESD ACTION  
LOCAL INCHING  
MAINTENANCE MODE  
SLOW SPEED OPENING  
CLOSING ROTATION  
THERMOSTAT BYPASS  
INTERLOCK/INHIBIT

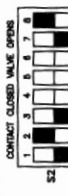
S1-1,1-2  
CLOSE  
DISABLED  
S1-3  
CLOSE  
ENABLED  
S1-4  
CLOSE  
ENABLED  
S1-5  
CLOSE  
ENABLED  
S1-6  
CLOSE  
ENABLED  
S1-7  
CLOSE  
ENABLED  
S1-8  
CLOSE  
ENABLED



REMOTE CONTROL MODE  
SEATING METHOD  
AUTOPILOT CONTROL  
SLOW SPEED CLOSING  
EXTRON (NOTE-5)  
SOFTWARE

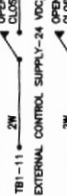
S2-1,2-2,2-3  
CLOSE  
ENABLED  
S2-4  
CLOSE  
ENABLED  
S2-5  
CLOSE  
ENABLED  
S2-6  
CLOSE  
ENABLED  
S2-7  
CLOSE  
ENABLED  
S2-8  
CLOSE  
ENABLED

## 2-WIRE CONTROL

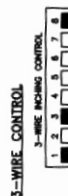


DIP SWITCHES CAN BE SET TO ONE EITHER:  
CONTACT CLOSED VALVE OPENS  
OR:  
CONTACT OPENED VALVE CLOSURES  
OR:  
CONTACT CLOSED VALVE CLOSURES  
CONTACT OPENED VALVE OPENS

INTERNAL CONTROL SUPPLY-24 VDC  
TBI-6 → +24VDC  
TBI-11 → 2W  
TBI-12 → 2W  
EXTERNAL CONTROL SUPPLY-24 VDC/AC/125 VDC/AC(NOTE-2)  
TBI-11 → 2W  
TBI-12 → 2W  
COMMON/0 V

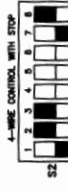


## 3-WIRE CONTROL



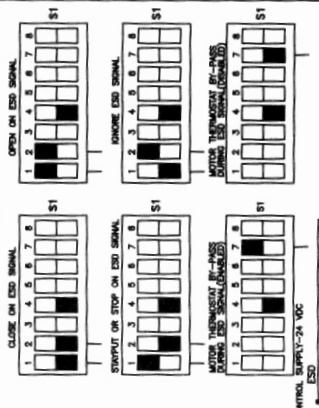
INTERNAL CONTROL SUPPLY-24 VDC  
TBI-6 → +24VDC  
TBI-9 → 3W/4W  
TBI-10 → 3W/4W  
TBI-11 → 3W/4W  
TBI-12 → 3W/4W  
EXTERNAL CONTROL SUPPLY-24 VDC/AC/125 VDC/AC(NOTE-2)  
TBI-9 → 3W/4W  
TBI-10 → 3W/4W  
TBI-11 → 3W/4W  
TBI-12 → 3W/4W  
COMMON/0 V

## 4-WIRE CONTROL



INTERNAL CONTROL SUPPLY-24 VDC  
TBI-6 → +24VDC  
TBI-8 → 3W/4W  
TBI-9 → 3W/4W  
TBI-10 → 3W/4W  
TBI-11 → 3W/4W  
TBI-12 → 3W/4W  
EXTERNAL CONTROL SUPPLY-24 VDC/AC/125 VDC/AC(NOTE-1)  
TBI-8 → 3W/4W  
TBI-9 → 3W/4W  
TBI-10 → 3W/4W  
TBI-11 → 3W/4W  
TBI-12 → 3W/4W  
COMMON/0 V

## EMERGENCY SHUT-DOWN (ESD)



INTERNAL CONTROL SUPPLY-24 VDC  
TBI-3 → ESD  
TBI-6 → +24VDC  
TBI-9 → 3W/4W  
TBI-10 → 3W/4W  
TBI-11 → 3W/4W  
TBI-12 → 3W/4W  
COMMON/0 V

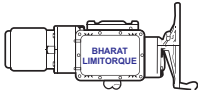
## NOTES:

- LEC-3-WIRE DIP SWITCHES MUST BE FIELD-SET DUE TO CALIBRATION REQUIREMENTS.
- DEFAULT CONTROL POWER SUPPLY IS 24VDC INTERNAL 0V/24-80 VAC/0VDC EXTERNAL LINK MUST BE REMOVED FOR VOLTAGES OF 90/120 VAC/0VDC.
- FOR 'LOCAL' INCHING SET SWITCH 3 ON 'STATION'.
- FOR 'LOCAL' INCHING SET SWITCH 3 ON 'STATION'.
- POSITIVE SWITCHING ONLY.

DIN: BY CHC: TRAPPED: BY DATE: CLIENT: --		TITLE: LEC-3 DIP SWITCH SETTING CHART		LIMITORQUE INDIA LTD.	
Y.X	MM	VVA	---	REV: 0	REV: 0
				SHEET 2 OF 2	

## **OPTIONAL SIDE MOUNTED HAND WHEEL**

**NOT APPLICABLE**



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