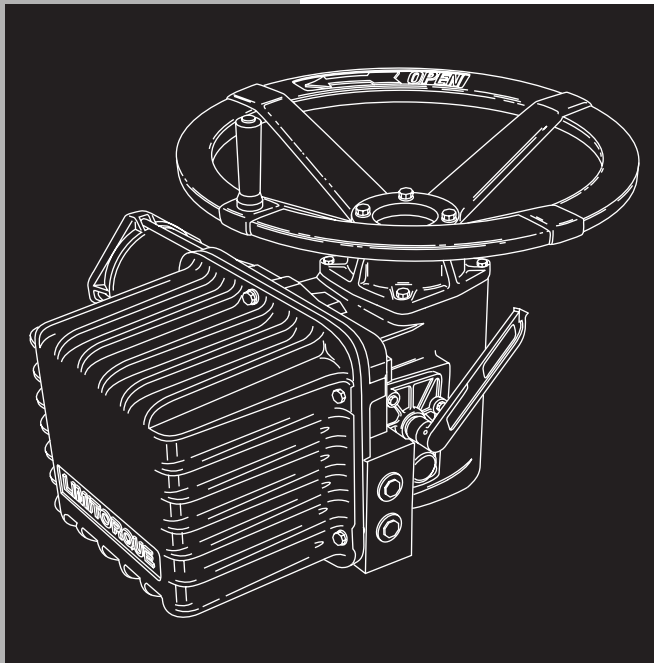


# *Limitorque Actuation Systems*

120-11000  
Rev. E  
September 2002

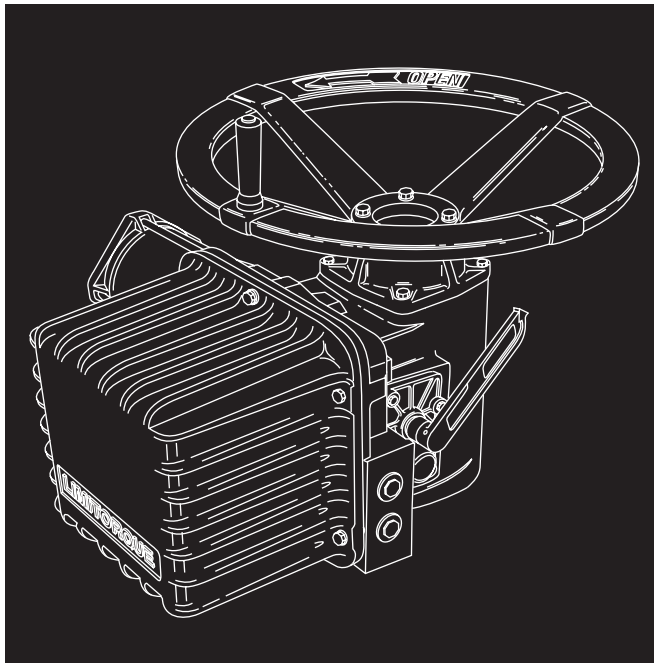


***Limitorque***  
*L120 Series*  
*Installation & Maintenance*  
*for L120-10 through L120-40*



# *Limitorque Actuation Systems*

120-11000  
Rev. E  
September 2002



***Limitorque***  
*L120 Series*  
*Installation & Maintenance*  
*for L120-10 through L120-40*

**L120 Series Installation & Maintenance Manual**

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# 1

## Introduction

### 1.1 Purpose

This Installation and Maintenance Manual explains how to install and maintain the L120-10, L120-20, and L120-40 actuators. Information on installation, disassembly, lubrication, and parts is provided.

### 1.2 User Safety

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read and be familiar with these instructions before attempting installation, operation, or maintenance. Failure to observe these precautions could result in serious bodily injury, damage to the equipment, voiding of the warranty, or operational difficulty.

Safety notices are presented in this manual in three forms:

**▲ WARNING:** Refers to personal safety. Alerts the user to potential danger. Failure to follow warning notices could result in personal injury or death.

**CAUTION:** Directs the user's attention to general precautions that, if not followed, could result in personal injury and/or equipment damage.

**NOTE:** Highlights information critical to the user's understanding of the actuator's installation and operation.

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# 2

## Product Capabilities & Features

**L120 Series actuators operate without modification** in any rising or non-rising stem application for linear action valves.

**The actuators meet rigid safety requirements.** The actuators are available in weatherproof, explosionproof, and submersible configurations.

**The actuators are compatible with a wide range of control options** from stand-alone units with local push-button to open standards-based DDC-100 networks with up to 250 actuators.

**The actuators are designed with integral control packages** including plug-in interconnect boards that increase control functionality for stand-alone or networked units.

**Durable torque overload** is provided in both directions of travel.

### 2.1

#### Initial Inspection & Storage Instructions

---

**▲ WARNING: Read this Installation and Maintenance Manual carefully and completely before attempting to store the actuator. Be aware of the electrical hazards.**

---

## 2.2 Product Identification

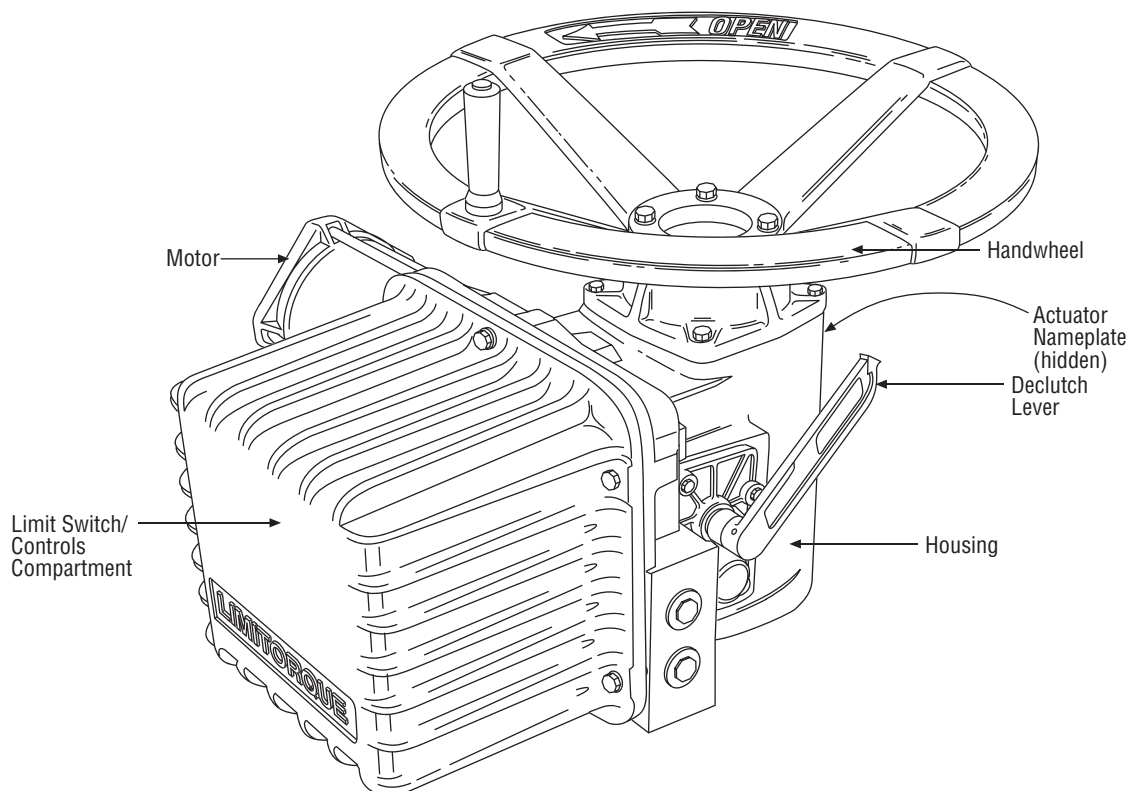
The actuator unit nameplate is located on the back of the unit opposite the limit switch compartment. The nameplate contains the following information:

- Limitorque name
- Point of Manufacture
- Unit Size
- Order Number
- Serial Number
- Customer Tagging
- CE Stamp

The motor nameplate is located on the motor. The nameplate contains the following information:

- |                      |                       |
|----------------------|-----------------------|
| • ID Number          | • Start Torque        |
| • Run Torque         | • Enclosure Type      |
| • RPM                | • Volts               |
| • Full Load Amps     | • Locked Rotor Amps   |
| • Insulation Class   | • Duty                |
| • Horsepower         | • Service Factor      |
| • Phase              | • Cycles              |
| • Motor Code         | • Ambient Temperature |
| • Connection Diagram |                       |

Figure 2.1 – L120-10 through 40



## 2.3 Inspection & Recording

Upon receipt of the actuator, inspect the condition of the equipment and record nameplate information as follows:

1. Carefully remove actuator from shipping carton or skid. Thoroughly examine the equipment for any physical damage that may have occurred during shipment. If damaged, immediately report the damage to the transport company.
2. Record the unit nameplate information for future reference; i.e. ordering parts, obtaining further information.

## 2.4 Storage Procedures

NOTE: The following are our recommended storage procedures to retain maximum product integrity during short-term storage. Failure to comply with recommended procedures will void the warranty. For longer-term storage, contact Limitorque for procedures and recommendations.

### 2.4.1 Short-Term Storage (less than 1 year)

Units are not ***weatherproof*** until properly installed on the valve or prepared for storage.

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

1. Position the actuator in storage with motor and switch compartment horizontal.
2. Connect the internal heaters (if supplied) or place desiccant in the switch compartment.
3. Replace all plastic caps or plugs with pipe plugs and ensure that all covers are tight.
4. If the actuator is mounted on a valve and the stem protrudes from the unit, a suitable stem cover must be provided.

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# 3

## Unit Weights

The approximate L120 actuator weights are provided below:

*Table 3.1 – Unit weights*

Unit Size	Control Types	Drive 1 Weight (lbs/kg)				Drive 2 Weight (lbs/kg)			
		Top HW		Side HW		Top HW		Side HW	
		lbs	kg	lbs	kg	lbs	kg	lbs	kg
L120-10	NCU	100	45	112	51	107	49	119	54
	BIC	115	52	127	58	122	55	134	61
	UEC/CLAMSHELL	140	64	152	69	147	67	159	72
L120-20	NCU	140	64	158	72	153	69	171	78
	BIC	155	70	173	78	168	76	186	84
	UEC/CLAMSHELL	180	82	198	90	193	88	211	96
L120-40	NCU	190	86	216	98	212	96	238	108
	BIC	205	93	231	105	227	103	253	115
	UEC/CLAMSHELL	230	105	256	116	252	114	278	126

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# 4

## Installation Instructions

### 4.1 Safety Precautions

- 
- ▲ **WARNING:** Read this Installation and Maintenance Manual carefully and completely before attempting to install, operate, or troubleshoot the Limitorque L120 actuator.
  - ▲ **WARNING:** Be aware of electrical hazards. Turn off incoming power before working on the actuator and before opening the switch compartment.
  - ▲ **WARNING:** Potential HIGH-PRESSURE vessel – Be aware of high-pressure hazards associated with the attached valve or other actuated device when installing or performing maintenance on your L120 actuator. Do not remove the actuator mounting bolts when the actuator is mounted on a rising stem valve unless the valve is in the FULLY OPEN position and there is NO pressure in the line.
  - ▲ **WARNING:** Do not manually operate the actuator with devices other than installed Handwheel and Declutch Lever. Using force beyond the ratings of the unit and/or using additive force devices such as cheater bars, wheel wrenches, pipe wrenches, or other devices on the actuator Handwheel or Declutch Lever may cause serious personal injury and/or damage to the actuator or valve.
  - ▲ **WARNING:** Do not work on the actuator while it is mounted on a torque-seated valve.
- 

### 4.2 Safety Practices

The following checks should be performed to maintain safe operation of the L120 actuator.

- Mount motors on a horizontal plane, if possible.
- Keep the switch compartment clean and dry.
- Keep the valve stem clean and lubricated.
- Set up periodic operating schedule for infrequently used valves.
- 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 or switch the armature leads on D.C. and single-phase motors.
- Use a protective stem cover. Check valve stem travel and clearance before mounting covers on rising stem valves.
- Verify all unit wiring is in accordance with the applicable wiring diagram, national and local codes, and **Table 4.1**.

*Table 4.1 – Required Rating for External Wiring*

Up to:	Use wire rated at least:
40°C	60°C
60°C	75°C

## 4.3 Initial Actuator Preparation

Replace all molded plastic conduit and top protectors (installed for shipping purposes only) with pipe plugs when installation wiring is complete.

### 4.3.1 Mounting Base

The mounting hole sizes and quantities are as detailed in **Table 4.2**.

*Table 4.2 – Mounting Base Dimensions*

Unit Size	Mounting Holes Quantity	Tap size	
		MSS	ISO
L120-10	4	3/8-16x0.88	M10x1.5x22.4
L120-20	4	5/8-11x1.25	M16x2x32
L120-40	4	5/8-11x1.25	M16x2x32

### 4.3.2 Stem Acceptance

The maximum stem acceptance is provided in **Table 4.3**.

*Table 4.3 – Stem Acceptance*

Unit size	Maximum stem acceptance					
	Drive 2		Drive 1		Drive 1	
	Tapped		Bore		Key	
	inch	mm	inch	mm	inch	mm
L120-10	1.25	32	1.00	25	1/4x3/32	8x6
L120-20	2.25	57	1.875	47	1/2x3/16	14x9
L120-40	2.625	66	2.125	52	1/2x3/16	16x10

## 4.4 Torque Switch

The torque switch is designed to protect the actuator in open and close directions.

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

- Do not use abrasive cloth to clean the contacts on the torque switch.
- Do not torque seat 90° operation valves nor run them against the stops. This may cause damage to the valve.

NOTE: If the actuator has “torqued out,” release torque buildup by operating the unit manually.

### 4.4.1 Setting Torque Switch

The torque switch was set at the factory according to customer-supplied information regarding necessary torque or thrust output that was provided at the time of the order. However, if the setting needs to be adjusted, follow the procedure below:

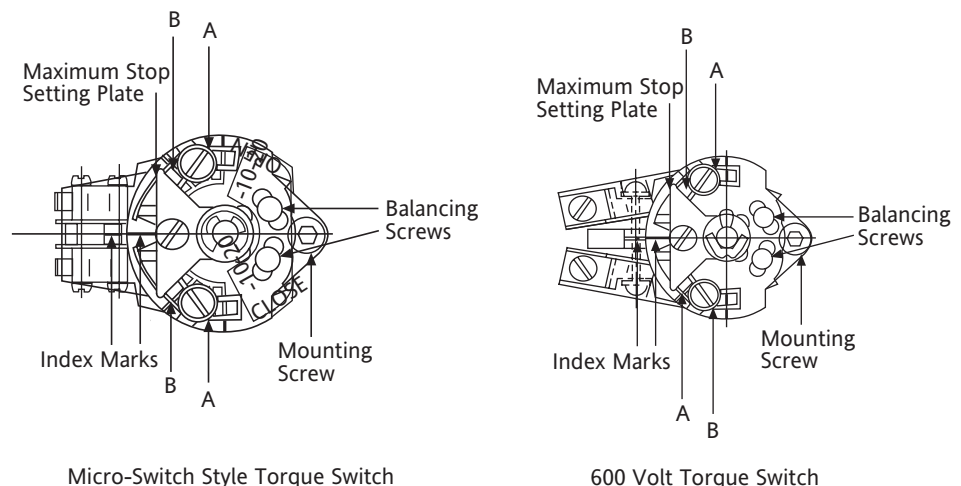
**CAUTION: A torque switch limiter plate is provided on most units.**

- **Removal or modification of the torque switch limiter plate will void the actuator warranty.**
- **Do not exceed the setting indicated by this plate without contacting the Limitorque service department.**
- **Installing or adjusting the torque switch with the operator in a loaded condition will result in a loss of torque protection.**

Item letters correspond to **Figure 4.1**.

1. Place the L120 actuator in manual mode.
2. Release the load on the wormshaft spring pack.
3. For open and close directions, loosen Screw (A) and move Pointer (B) to desired position. A higher number indicates a high torque and/or thrust output.
4. Tighten Screw (A).
5. Operate the valve electrically to seat valve and to ensure tight shut-off.
6. Rebalance torque switch if required.

*Figure 4.1 – Micro-Switch Style Torque Switch & 600 Volt Torque Switch*



#### 4.4.2

#### Balancing Torque Switch

Item letters correspond to **Figure 4.1**.

1. Place the actuator in manual mode.
2. Remove the load from the wormshaft spring pack.
3. Note the open and close torque switch settings prior to re-installing the torque switch.
4. Loosen **screws (A)** and position both **pointers (B)** at the #1 setting, tighten **screw (A)**. In this position the index marks should be aligned.
5. Loosen balancing screws and install the torque switch. The base of the torque switch should be flush against the compartment and the hole for the mounting screw should be aligned.
6. Install the mounting screw.
7. Tighten the balancing screws.

---

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

---

The switch is now balanced and ready for the pointers to be returned to their original settings.

## 4.5 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 associated equipment.

- Disconnect all incoming power to the actuator 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 16-contact limit switches - 4 switches on each of the 4 rotors. Two rotors are used for end of travel indication. The remaining two rotors may be adjusted for any intermediate point of travel.
  - Do not use abrasive cloth to clean the contacts on the limit switch.
  - Do not attempt to repair gearing in the limit switch. Replace entire gear frame assembly if necessary.
- 

### 4.5.1 Setting Limit Switch

NOTE: See chart below for maximum number of drive sleeve turns for each unit size. The intermediate shaft (B), shown in **Figure 4.2**, may take a considerable number of turns before rotor trip occurs.

*Table 4.4 – Maximum Number of Drive Sleeve Turns for Standard 4-Gear and Optional 5-Gear Limit Switches*

Unit Size	4-Gear	5-Gear
L120-10	630	6300
L120-20	740	7400
L120-40	640	6400

---

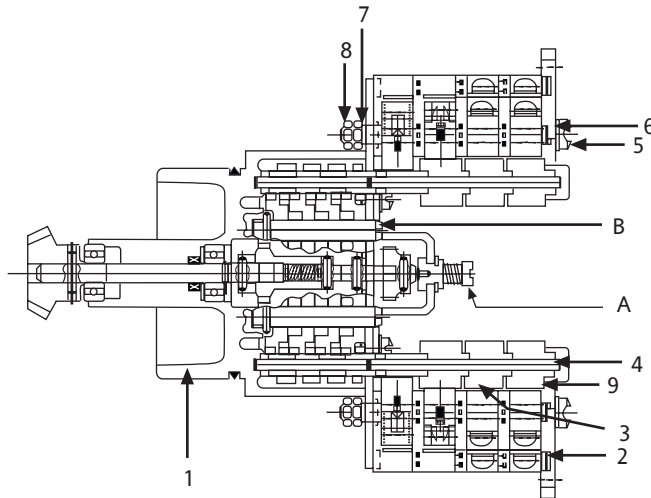
**▲ WARNING:** Potential Explosion Hazard. Do not use a variable speed electric drill for setting the limit switch in an explosive environment.

**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.

---

Set the limit switch as follows. All item letters and piece numbers refer to **Figure 4.2**.

Figure 4.2 – Limit Switch



Piece	Quantity	Description
1	1	Gear Frame Assembly
2	2	8-Switch Contact Block Assy.
3	12	Rotor Segment (short)
4	4	Rotor Shaft
5	4	Machine Screw
6	4	Flat Washer
7	4	Lock Washer
8	8	Hex Nut
9	4	Rotor Segments (long)

Limit Switch

#### 4.5.2 Setting Procedure (Refer to Figure 4.2)

1. Open the Compartment Cover (piece #200 of **Figure 5.2**).
2. Put the actuator into manual operation. 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.

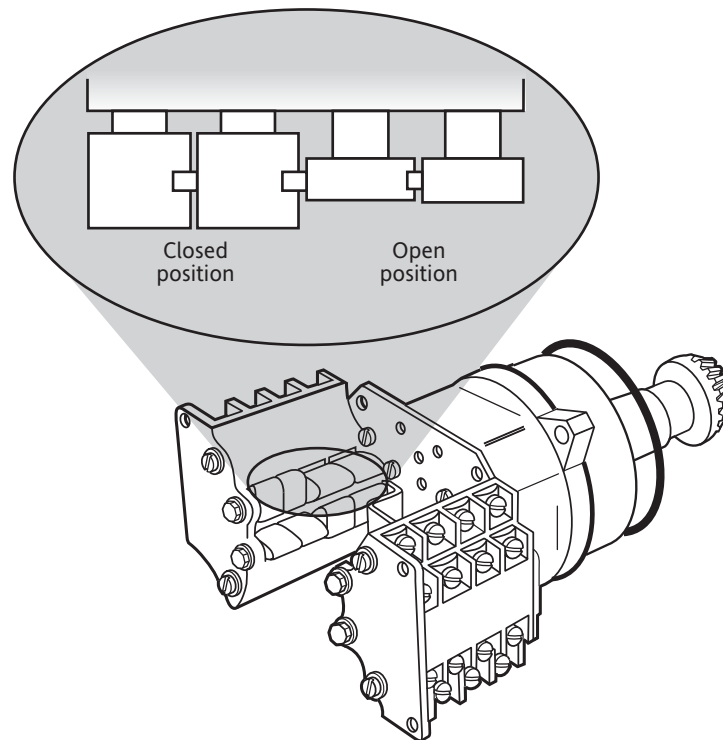
**CAUTION: For highly geared units, one turn of the handwheel will not allow for coast of moving parts. Refer to valve manufacturer setting requirements in these cases.**

4. Push in the Setting Rod (A) and turn one-quarter turn. The rod will latch in this depressed position.
5. Refer to the applicable wiring diagram for contact development. The limit switch contact is closed when the rotor is engaged with the plunger. If the rotor to be set has not turned 90 degrees to operate the plunger, turn the intermediate shaft in the same direction as noted in Step No. 2 until the rotor clearly trips the switches. This rotor is now set correctly.
6. 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.

**CAUTION: Do not operate the valve when Setting Rod (A) is in a fully depressed position. Loss of contact setting will occur and the setting rod will be damaged.**

7. Operate the valve by handwheel to fully “close” position; reverse direction by one turn of the handwheel to allow for coast of moving parts.
8. Set the other rotors by following Steps No. 4 through 6.

Figure 4.3 – Setting the open &amp; closed contacts



### 4.5.3 Combination of Contacts (Refer to Figure 4.2)

The rotor segments can be separated and rotated through 90 degrees to give various combinations of normally open or normally closed contacts to each rotor.

1. Remove Nuts (piece #8) and Fillister Head Machine Screws (piece #5, for a total of 2 fasteners on each side of the switch).
2. Remove complete contact assembly from the back plate.
3. Rearrange cams on the camshaft to produce the required combination of contacts.
4. Replace contact assembly on back-plate (ensuring that the registers fit correctly) and secure with the machine screw and nuts.
5. Set limits according to the procedure above.

## 4.6 Position Indication

### 4.6.1 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 remove **Switch Compartment Cover** (piece #200 of **Figure 5.2**).
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, and re-tighten the screw.

The indicator is now set.

NOTE: The end-of-travel rotors of the geared limit switch activate "Flip-flop" type indicators. This type of indicator will require no further setting after the geared limit switch has been adjusted.

#### 4.6.2 Remote Position Indication

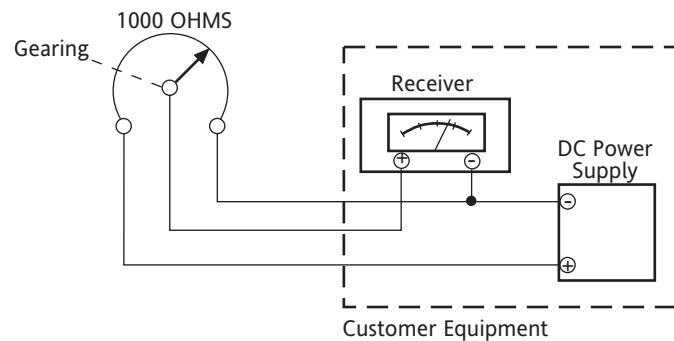
The L120 actuator with a position transmitter (PT20SD) installed, transmits a 4-20mA output signal to a remote position indicator. The PT20SD responds to input of 1K (ohms) potentiometer and can be powered by 18VAC or 24VDC. For more information on this transmitter, see Limerorque Publication 440-30001.

NOTE: The pinion has been left disengaged to prevent damaging of rheostat prior to setting the valve. Set rheostat by turning pinion until the desired reading is obtained. Loosen the hex nut on the back of the rheostat and slide the rheostat in the direction of the idler pinion until pinions are engaged. Do not force engagement of the pinions. Re-tighten hex nut on back of the rheostat. Do not engage pinion until unit and valve have been set.

##### *To Calibrate Position Transmitter (PT20SD)*

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. 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 terminal +VE and -VE.
7. Run the actuator fully OPEN.
8. Calibrate SPAN position by adjusting the span potentiometer until a 20mA output signal is read at terminals +VE and -VE.
9. Repeat steps 5 to 8 and fine-tune as necessary.

Figure 4.4 – 1000 ohm Potentiometer

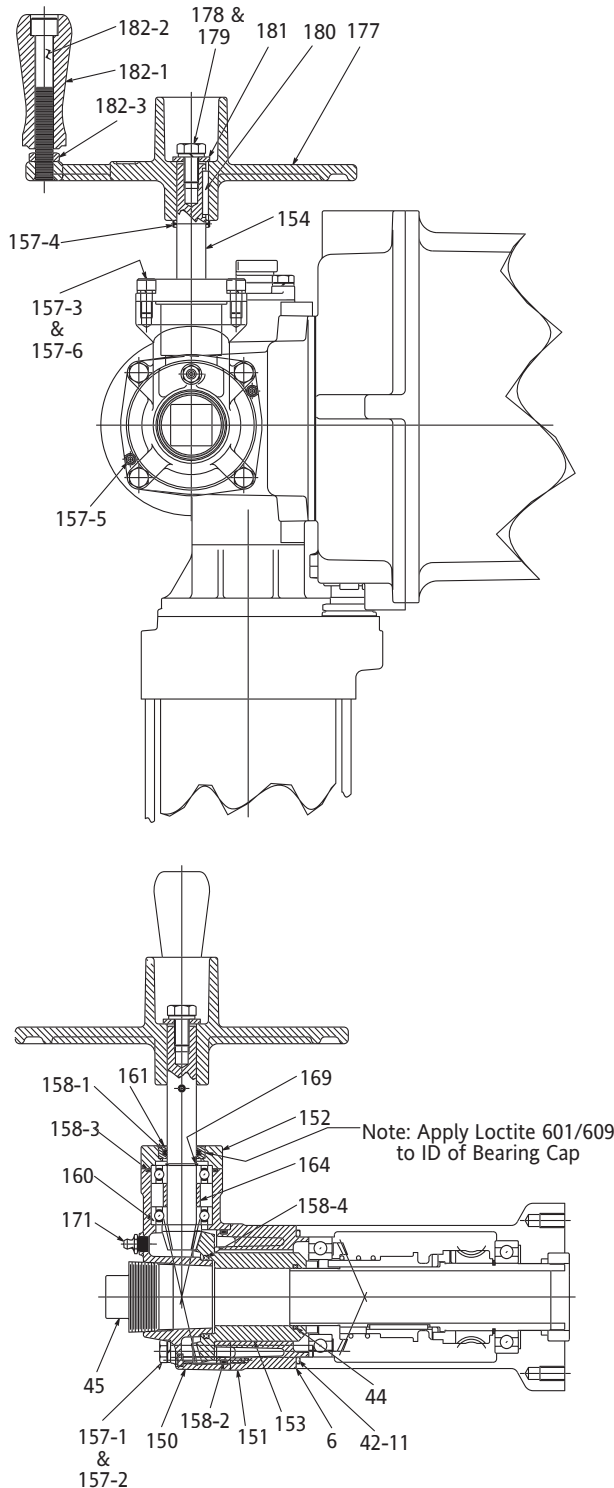


Typical Connection for a 1000 ohm Potentiometer

### 4.7 Optional Side-Mounted Handwheel

For unit sizes L120-10, 20, and 40, the handwheel can be mounted on the side as shown in the following figures.

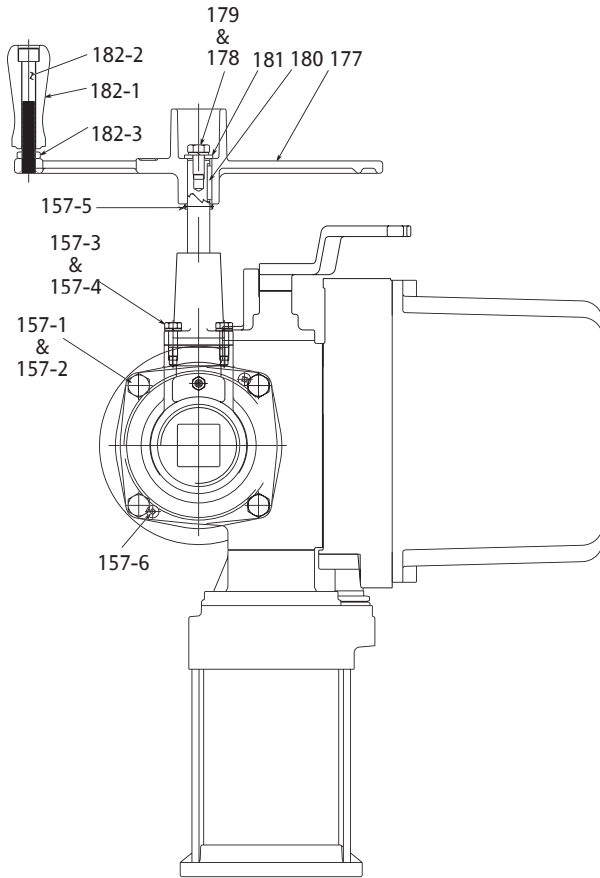
Figure 4.5 – L120-10 parts list, attachment ratio 4.2:1



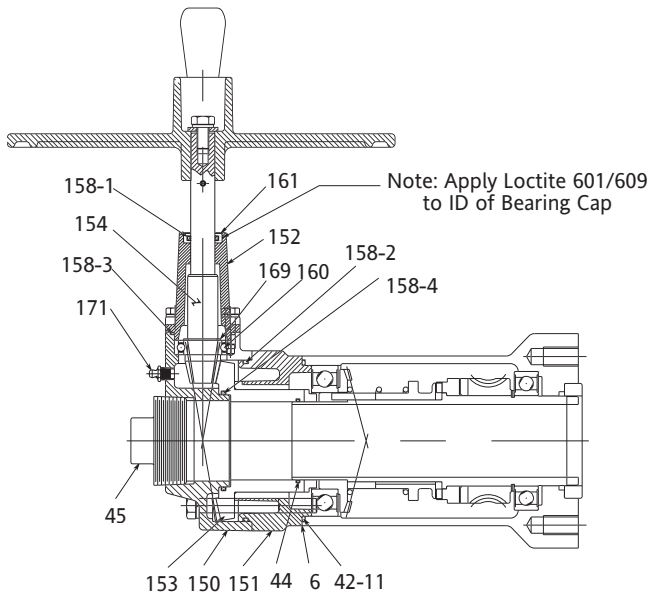
Piece	Quantity	Description
6	1	Housing Cover Shim
42-11	1	O - Ring
44	1	Quad Ring
45	1	Pipe Plug
150	1	Bevel Housing
151	1	Bevel Housing Adapter
152	1	Bearing Cap
153	1	Bevel Gear
154	1	Bevel Pinion Shaft
157-1	4	Hex Head Cap Screw
157-2	4	Lockwasher
157-3	2	Soc Head Cap Screw
157-4	1	Roll Pin
157-5	2	Socket Head Cap Screw
157-6	2	Lockwasher
158-1	1	Quad - Ring
158-2	1	O - Ring
158-3	1	O - Ring
158-4	1	Quad - Ring
160	2	Ball Bearing
161	1	Seal Insert
164	1	Spacer
169	1	Retaining Ring
171	1	Grease Fitting
177	1	Handwheel
178	1	Hex. Head Cap Screw
179	1	Lockwasher
180	1	Key
181	1	Retaining Washer
182-1	1	Handwheel Spinner
182-2	1	Sock. Head Cap Screw
182-3	1	Hex. Jam Nut

Drawing RE: 01-602-0479-4

Figure 4.6 – L120-20 with side-mounted handwheel & parts list, attachment ratio 5.7:1

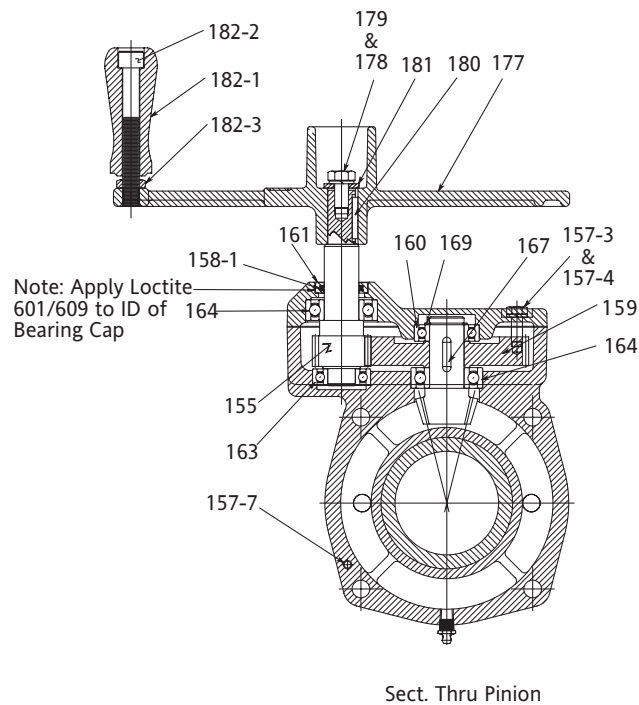


Piece	Quantity	Description
6	1	Housing Cover Shim
42-11	1	O - Ring
44	1	Quad Ring
45	1	Pipe Plug
150	1	Bevel Housing
151	1	Bevel Housing Adapter
152	1	Bearing Cap
153	1	Bevel Gear
154	1	Bevel Pinion Shaft
157-1	4	Hex Head Cap Screw
157-2	4	Lockwasher
157-3	4	Hex Head Cap Screw
157-4	4	Lockwasher
157-5	1	Roll Pin
157-6	2	Socket Head Cap Screw
158-1	1	Quad - Ring
158-2	1	O - Ring
158-3	1	O - Ring
158-4	1	Quad - Ring
160	1	Ball Bearing
161	1	Seal Insert
169	1	Retaining Ring
171	1	Grease Fitting
177	1	Handwheel
178	1	Hex. Head Cap Screw
179	1	Lockwasher
180	1	Key
181	1	Retaining Washer
182-1	1	Handwheel Spinner
182-2	1	Sock. Head Cap Screw
182-3	1	Hex. Jam Nut

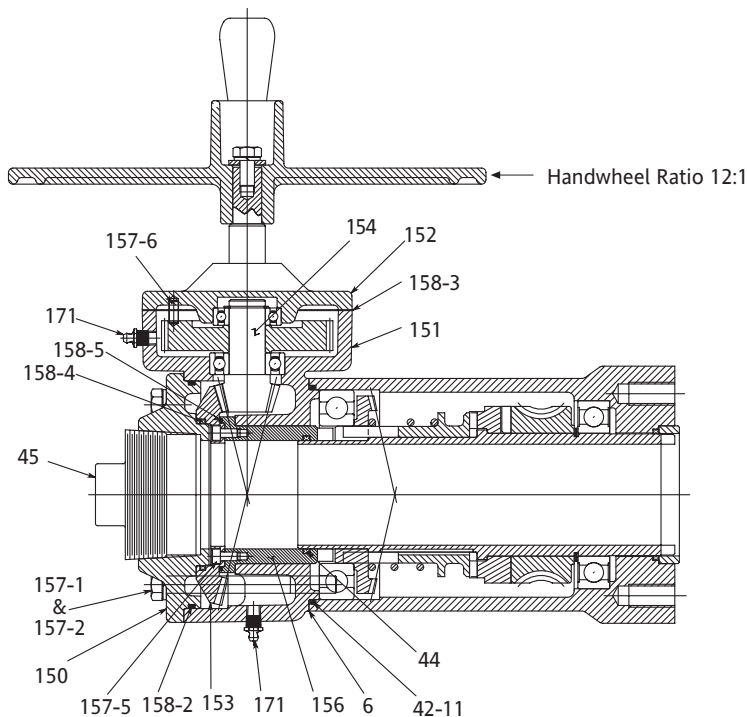


Drawing RE: 01-602-0476-4

Figure 4.7 – L120-40 with side-mounted handwheel & parts list, attachment ratio 12:1



Piece	Quantity	Description
6	1	Housing Cover Shim
42-11	1	O-Ring
44	1	Quad-Ring
45	1	Pipe Plug
150	1	Bevel Housing Cover
151	1	Bevel Housing
152	1	Spur Gear Cover
153	1	Bevel Gear
154	1	Bevel Pinion
155	1	Input Pinion Shaft
156	1	Bevel Gear Adapter
157-1	4	Hex Head Cap Screw
157-2	4	Lockwasher
157-3	4	Hex Head Cap Screw
157-4	4	Lockwasher
157-5	8	Socket Head Cap Screw
157-6	2	Dowel Pin
157-7	1	Socket Head Cap Screw
158-1	1	Quad-Ring
158-2	1	O-Ring
158-3	1	Gasket
158-4	1	Quad-Ring
158-5	1	O-Ring
159	1	Spur Gear
160	1	Ball Bearing
161	1	Seal Insert
163	1	Ball Bearing
164	2	Ball Bearing
167	1	Key
169	1	Retaining Ring
171	1	Grease Fitting
177	1	Handwheel
178	1	Hex. Head Cap Screw
179	1	Lockwasher
180	1	Key
181	1	Retaining Washer
182-1	1	Handwheel Spinner
182-2	1	Sock. Head Cap Screw
182-3	1	Hex. Jam Nut



Drawing RE: 01-602-0460-4

# 5

## Operation

**▲ WARNING:** Do not manually operate the actuator with devices other than installed Handwheel and Declutch Lever. Using force beyond the ratings of the unit and/or using additive force devices such as cheater bars, wheel wrenches, pipe wrenches or other devices on the actuator Handwheel or Declutch Lever may cause serious personal injury and /or damage to the actuator or valve.

**CAUTION:** Do not motor-operate the valve without first setting or checking the limit switch setting and motor direction.

- Do not force the declutch lever into hand operation. If the clutch does not easily engage, rotate handwheel slowly while operating the declutch lever.
- Do not alternately start/stop the motor to open or close a valve which is too tight for normal operation.

### 5.1 Electrical Start-Up

1. Verify that the actuator has been correctly lubricated. This is particularly important if the actuator has been in long-term storage.
2. Verify that the geared limit switch has been correctly set (see **Section 4.5.1, Setting Limit Switch**).
3. If the valve stem is not visible, remove the stem cover or handwheel cover plate to observe output direction of the drive sleeve.
4. Engage manual operation and hand crank the valve well away from end of travel positions.
5. Turn on power supply and push button to “open.”
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 one of two ways:
  - Switch any two of the three power leads for three-phase power, or
  - reverse the armature leads for single-phase or dc power.

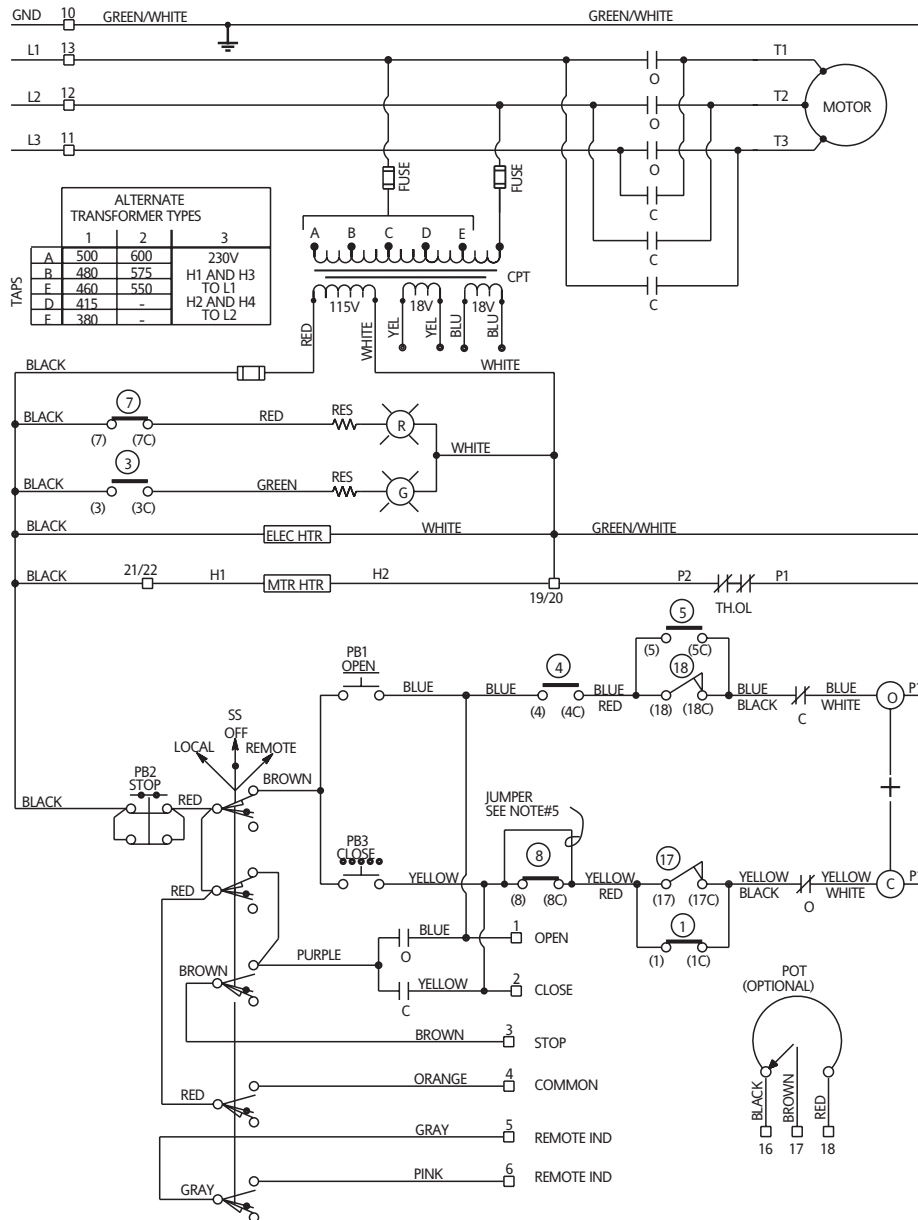
The actuator should operate correctly and will be stopped at the end of travel positions by torque or limit switch functions.

*Table 5.1 – Required Rating for External Wiring*

Up to:	Use wire rated at least:
40°C	60°C
60°C	75°C

**Figure 5.1** 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 actuator to confirm the actual equipment supplied.

Figure 5.1 (one of two) – L120-10 through 40 typical wiring diagram



ALTERNATE TRANSFORMER TYPES			
TAPS	1	2	3
A	500	600	230V
B	480	575	H1 AND H3 TO L1
F	460	550	H2 AND H4 TO L2
D	415	-	
E	380	-	

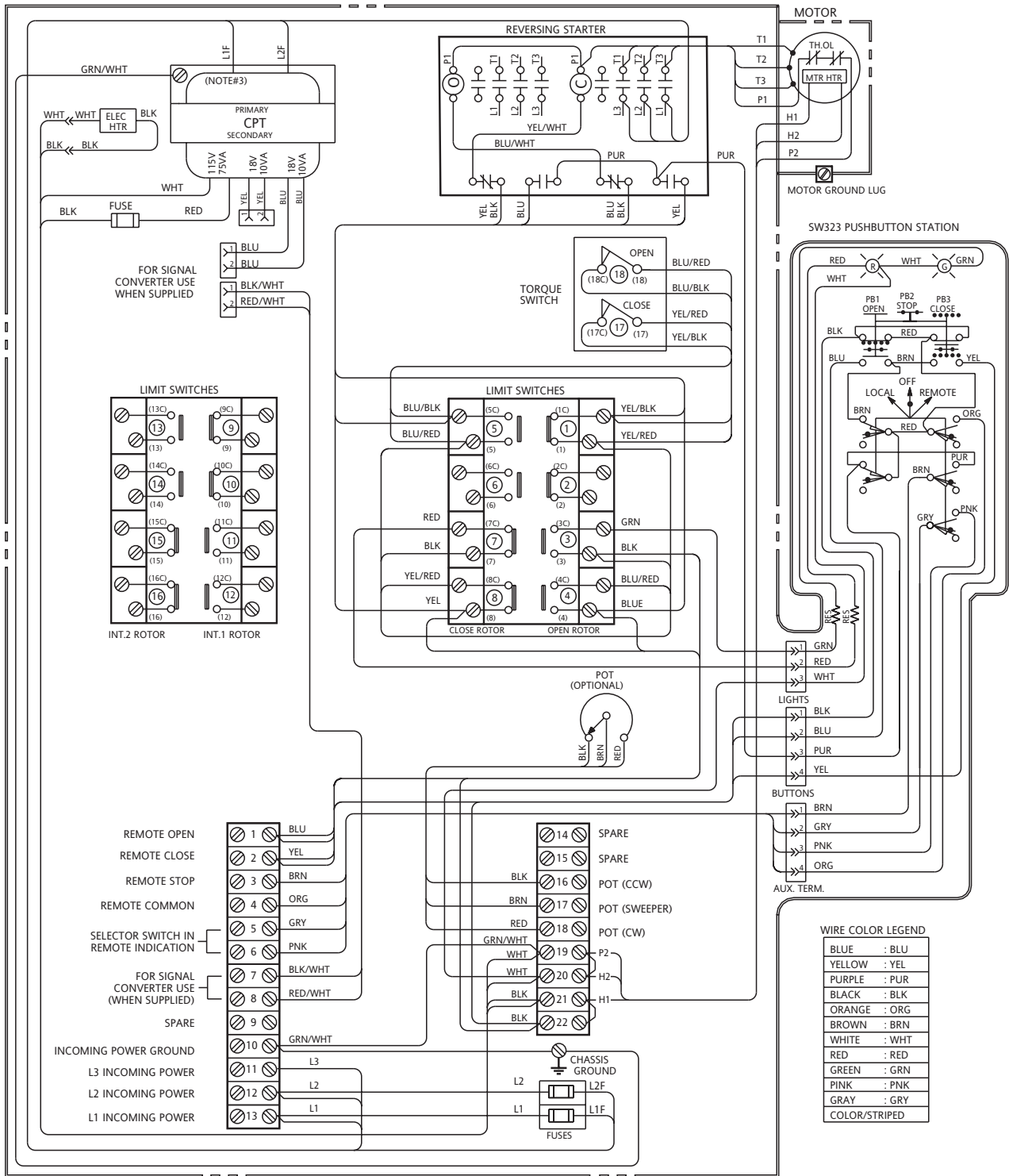
Valve Shown Full Open Position

ROTOR	CONTACT	LIMIT SWITCH CONTACT DEVELOPMENT			FUNCTION
		FULLY OPEN	A	B	
OPEN	1	█	---	---	BY-PASS CIR
	2	█	---	---	SPARE
	3	█	---	---	IND LIGHT
	4	█	---	---	OPEN LIMIT
CLOSE	5	---	---	█	BY-PASS CIR
	6	---	---	█	SPARE
	7	---	---	█	IND LIGHT
	8	---	---	█	CLOSE LIMIT
INT.1	9	---	---	---	SPARE
	10	---	---	---	SPARE
	11	---	---	---	SPARE
	12	---	---	---	SPARE
INT.2	13	---	---	---	SPARE
	14	---	---	---	SPARE
	15	---	---	---	SPARE
	16	---	---	---	SPARE

- 17 CLOSING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING CLOSING CYCLE
  - 18 OPENING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING OPENING CYCLE
- Notes
1. --- OPEN CONTACT
  2. █ CLOSE CONTACT
  3. SEE CERTIFICATION SHEET FOR VOLTAGE SUPPLIED. TRANSFORMER UNUSED WIRES TO BE SEPARATELY COVERED WITH INSULATING HEAT SHRINK TUBING.
  4. ROTORS INT.1 & INT.2 CAN BE SET AT VALVE POSITION FULL OPEN, FULL CLOSED OR ANY POSITION IN BETWEEN AS INDICATED BY POINTS A AND B.
  5. ADD JUMPER ON LS#8 BETWEEN TERMINALS (8) & (8C) FOR TORQUE SEATING VALVES.

- Legend
- O-OPEN CONTACT
  - C-CLOSE CONTACT
  - ⊖ OPENING COIL
  - ⊕ CLOSING COIL
  - CPT-CONTROL POWER TRANSFORMER
  - +MECHANICAL INTERLOCK
  - TH.O.L-THERMAL OVERLOAD CONTACTS
  - ⊗ RED INDICATING LIGHT
  - ⊙ GREEN INDICATING LIGHT
  - SS-SELECTOR SWITCH (LOCAL-OFF-REMOTE)
  - PB1-OPEN PUSHBUTTON
  - PB2-STOP PUSHBUTTON
  - PB3-CLOSE PUSHBUTTON
  - ELEC HTR-COMPARTMENT HEATER
  - MTR HTR-MOTOR HEATER
  - POT-POTENTIOMETER (OPTIONAL SEE CERTIFICATION SHEET IF SUPPLIED)
  - RES-LAMP RESISTORS.

Figure 5.1 (two of two) – L120-10 through 40 typical wiring diagram



Electrical Compartment

## 5.2 Manual Operation

Piece numbers refer to **Figure 5.2**.

Counterclockwise rotation of the **Declutch Lever** (piece #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** (piece #26) and then latches engage the clutch sleeve in this position. The actuator is now in the handwheel driving 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.

NOTE 1: The shift from manual operation to motor operation is automatic and does not require external positioning of the declutch shaft.

NOTE 2: If the declutch mechanism does not engage, rotate handwheel approximately 30-45° and attempt manual engagement. There is a chance that the lugs on the clutch sleeve (piece #19) and handwheel adapter (piece #26) are not correctly aligned.

Figure 5.2 (one of two) – L120-10 through 40 drive sleeve & housing cover parts breakdown

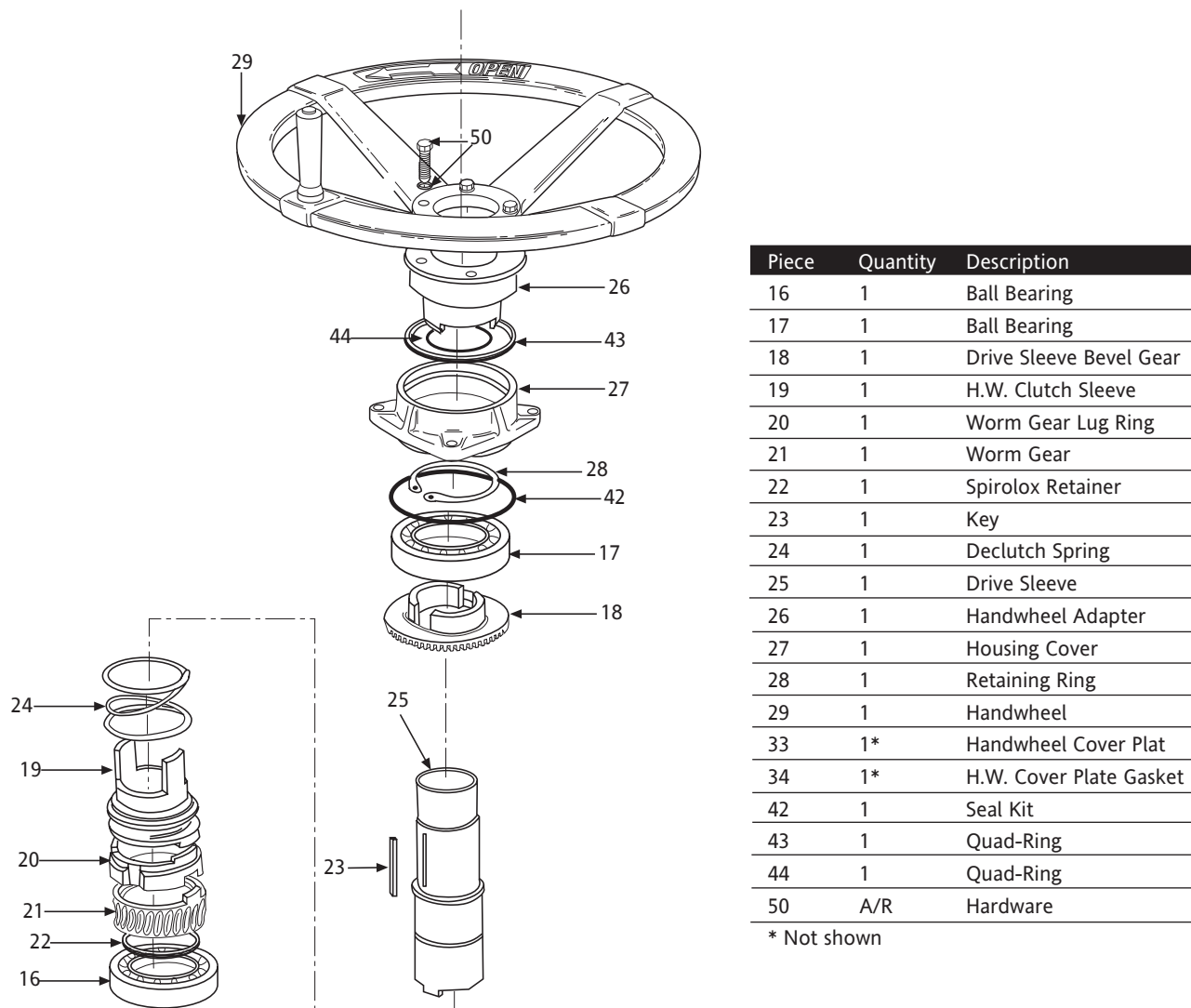
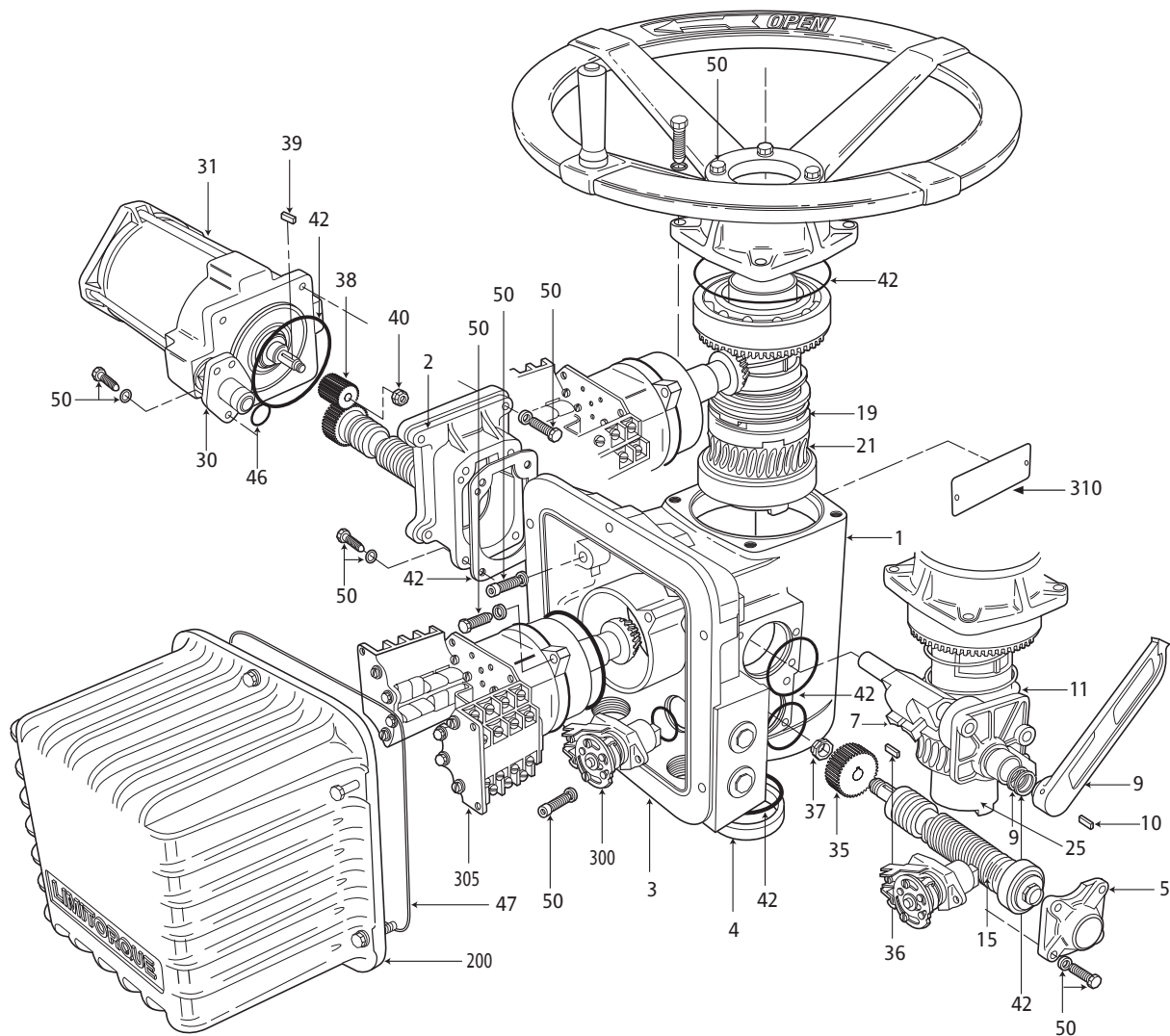


Figure 5.2 (two of two) – L120-10 through 40 parts breakdown



Piece	Quantity	Description
1	1	Housing
2	1	Motor Adapter
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	Roll Pin
11	1	Declutch Cap
15	1	Worm Shaft Assembly
19	1	Clutch Sleeve
21	1	Worm Gear
25	1	Drive Sleeve
30	1	Nipple Flange
31	1	Motor
32	4**	Dowels

Piece	Quantity	Description
35	1	Worm Shaft Gear
36	1	Key
37	1	Flexloc 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
305	1	Geared Limit Switch
310	1	Unit Nameplate

\* L120-40 Only

\*\* Not Shown

## 5.3 Motor Operation

The actuator is always available for motor operation whenever the motor is energized

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**CAUTION: Do not force the declutch lever into motor operation. Lever will automatically return to motor operation when the motor is energized.**

---

Reset the travel limit switches prior to motor operation if the unit has been dismantled or removed from the valve.

Piece numbers refer to **Figure 5.2**.

In motor operation, the **Motor Gear Set** (piece #35 & 38) drives the **Wormshaft** (piece #15) and **Worm Gear** (piece #21) which in turn rotates the **Clutch Sleeve** (piece #19) by means of driving the lugs. The clutch sleeve and worm gear may be assembled to produce either a “no lost motion” or “hammerblow” effect. The **Drive Sleeve** (piece #25) is keyed to the clutch sleeve and hence rotates, producing the required output rotary motion.

## 5.4 Torque & Travel Limiting

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

The worm and wormshaft are supported by two rotating spring packs. As torque is generated by the actuator, the worm moves axially against one of the spring packs. Each pack is precalibrated and hence a finite compression represents a finite torque output. Movement of the worm operates the torque switch, which interrupts the power to the motor. The torque switch is adjustable and can be set to operate at pre-determined torque levels.

# 6

## Maintenance

### 6.1 Lubrication

The L120 series actuators have a totally sealed gear case, factory-lubricated with grease. The gear case can be mounted in any position. However, mounting of the motor or the switch compartment in the down position is not recommended. These mounting positions may result in the operator area being saturated with lubricant if the seal fails.

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. Using grease minimizes this condition as much as possible. If a small amount is weeping at start-up, remove it with a clean cloth. Once the equipment is operating on a regular basis, the weeping should stop.

#### 6.1.1 Lubrication Inspection

Inspect Limitorque L120 series actuators for correct lubrication prior to operating - particularly following a long storage period.

Each application has its own effect on the actuator and the frequency of these inspections should be based on the application and the operating experience. The following lubrication inspection schedule is *recommended* until operating experience indicates otherwise.

**For Gear Case,** inspect lubrication every 18 months or 500 cycles, whichever occurs first.

During an inspection consider the following:

- **Quantity** – Ensure there is enough lubricant so that the Worm and the Worm Gear are totally immersed in grease regardless of the position. To verify, pull out geared limit switch. Level of grease should be within 1/2" from bottom of geared limit switch opening.
- **Quality** – Inspect lubricant for dirt, water or other foreign matter. If any one of these is found:
  1. Flush the actuator with a commercial degreaser/cleaner such as Exxon Varsol #18. This degreaser/cleaner is not corrosive and does not affect the seal materials.
  2. Repack the actuator with fresh lubricant allowing room for grease thermal expansion.
- **Consistency** – Ensure the lubricant is fluid approximating a standard NLGI-0 grade consistency or less. Thinners such as Amoco WAYTAC #31 oil may be added provided the volume of thinner does not exceed 20% of the total lubricant.

#### 6.1.2 Factory Lubricant

**Gear Case:** The L120 series actuator gear case is factory-lubricated with EP-00 calcium complex base grease, suitable for temperatures from -20°F (-29°C) to +250°F (+121°C).

Table 6.1 – Specified Approximate Lubricant Weights

Unit Size	Lbs.	Kg
L120-10	3.3	1.5
L120-20	6.1	2.8
L120-40	8.1	3.7

**Geared Limit Switch:** Permanently lubricated with Beacon 325. Limitorque does not recommend disassembly of the gearbox.

## 6.2 Minimum Lubricant Qualities Required

The standard lubricants used by Limitorque have been proven to be extremely reliable over years of service. Limitorque does not recommend a particular lubricant substitute for the standard lubricants; however, Limitorque does require the following lubricant qualities as a minimum.

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**CAUTION: Do not mix lubricants of a different base chemical. Mixing lubricant bases may cause lubricant properties to be ineffective.**

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The Lubricant must:

- contain an “EP” additive.
- be suitable for the temperature range intended.
- be water and heat-resistant and non-separating.
- not create more than 8% swell in Buna N or Viton.
- not contain any grit, abrasive, or fillers.
- comply with a slump-prefer NLGI-0 grade.
- not be corrosive to steel gears, ball, or roller bearings.
- have a dropping point above 316°F (158°C) for temperature ranges of -20°F (-29°C) to +250°F (+121°C).

## 6.3 Disassemble & Reassemble

---

**CAUTION: Turn off all power services before attempting to perform service on the actuator.**

- **Remove the actuator from the valve for complex work. Minor work, such as replacing geared limit switch, torque switch, or motor, may be readily performed while the actuator is still on the valve.**
  - **Potential High Pressure Vessel. Before removing or disassembling your actuator, ensure that the valve or other actuated device is isolated and is not under pressure.**
- 

NOTE: If the actuator is fitted with a **Thrust Base** (piece #100 of **Figure 6.2**), it is possible to remove the actuator housing while leaving the base on the valve to accept valve thrust. However, it is preferred that the valve be isolated from service and, if it is a rising stem, that the valve be fully open.

## 6.4 Disassemble Unit Sizes L120-10, 20, and 40

Unless otherwise noted, piece numbers refer to the Illustrated Parts Breakdown of **Figure 5.2**.

1. Turn off power to the actuator.
2. Remove electrical **Compartment Cover** (piece #200).
3. Disconnect all electrical leads from the **Torque Switch** (piece #300) and **Geared Limit Switch** (piece #305). Ensure that all leads and terminals are clearly marked to facilitate reassembly.
4. Remove two screws holding limit switch and one holding torque switch. Remove both items.
5. Remove four bolts holding **Motor** (piece #31) and three bolts holding conduit **Nipple Flange** (piece #30). Remove motor, drawing motor leads through switch compartment.
6. Remove **Motor Pinion** (piece #38) by removing **Stop Nut** (piece #40).
7. Remove **Worm Shaft Gear** (piece #35), **Flexloc Nut** (piece #37), and **Worm Shaft End Cap** (piece #5) and draw complete wormshaft assembly from housing.  
NOTE: The wormshaft has been assembled at the factory to obtain the correct pre-load on the spring packs. Do not attempt to disassemble further. If the worm shaft is worn or damaged, it is suggested that the complete wormshaft subassembly be replaced. The actuator must be in motor operation to remove the wormshaft assembly. When the wormshaft is partially out, the disc springs will hit the worm gear. Pull the declutch lever forward slightly without fully engaging the declutch mechanism and the wormshaft will come out.
8. Remove **Declutch Cap** (piece #11).
9. For unit size L120-10, completely withdraw the **Declutch Assembly** (piece #7 of **Figure 6.3**) from the housing. For unit sizes L120-20 and 40, remove **Declutch Input Pinion** (piece #12 of **Figure 6.3**) followed by the **Declutch Assembly** (piece #7 of **Figure 6.3**).
10. Remove **Handwheel** (piece #29) and **Housing Cover** (piece #27) and lift complete drive sleeve subassembly from housing.

## 6.5 Drive Sleeve and Housing Cover Disassembly

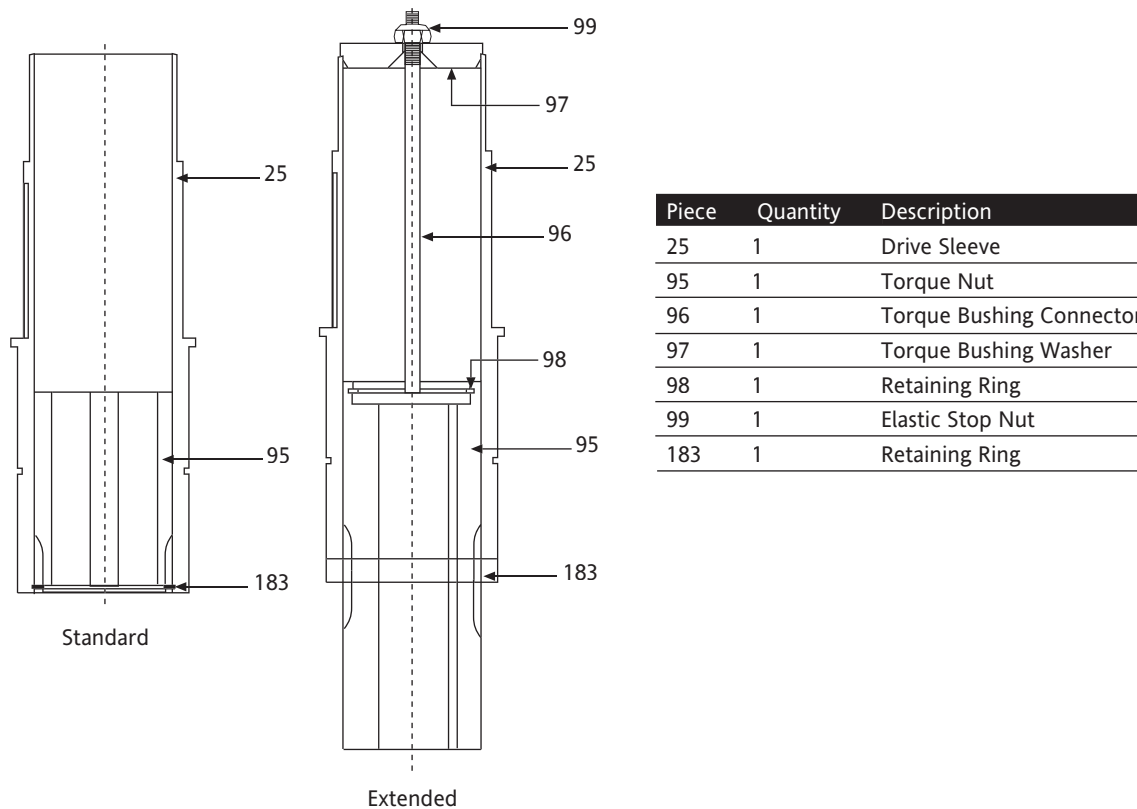
Piece numbers refer to **Figure 5.2**.

1. Remove **Upper Ball Bearing** (piece #17), **Bevel Gear** (piece #18), **Declutch Spring** (piece #24), **Clutch Sleeve** (piece #19), and **Key** (Piece #23).
2. Remove **Lower Ball Bearing** (piece #16).
3. Spirolox **Retainer** (piece #22) may now be removed by inserting small flat blade screwdriver under the end of the ring and prying the first layer from the groove. Continue around the ring until it is free from the groove.
4. Remove the **Worm Gear** (piece #21) and the **Lug Ring** (piece #20).
5. **Handwheel Adapter** (piece #26) and **Seal** (piece #42) can be removed from **Housing Cover** (piece #27) by removing **Retaining Ring** (piece #28).

## 6.6 Torque Nut Disassembly (Drive 1 Option)

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

Figure 6.1 – L120-10 through 40 standard & extended drive sleeve assembly



Unless otherwise stated, piece numbers refer to **Figure 6.1**.

### Standard Drive Sleeve

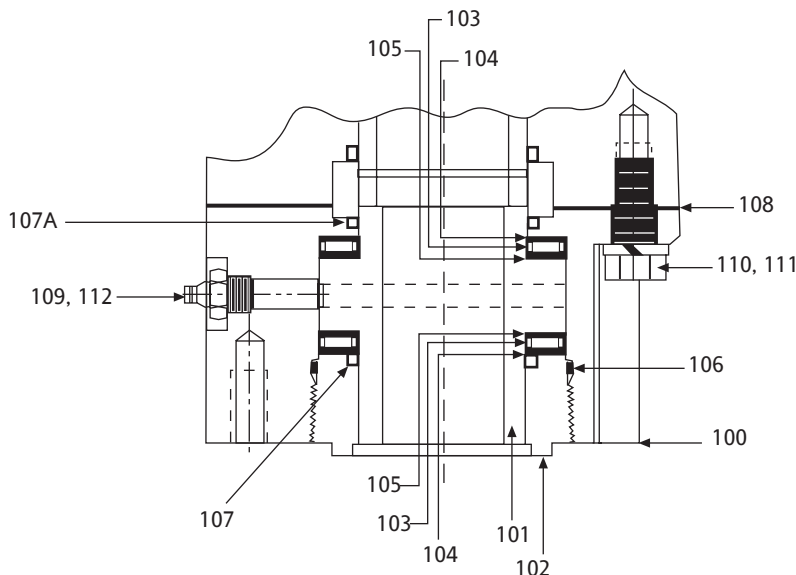
To remove the **Torque Nut** (piece #95), remove **Retaining Ring** (piece #183) and drop the torque nut out the bottom of the **Drive Sleeve** (piece #25 of **Figure 5.2**).

### Optional Drive Sleeve

1. Remove the **Handwheel** (piece #29 of **Figure 5.2**), **Handwheel Cover Plate** (piece #33 of **Figure 5.2**) and **Gasket** (piece #34) to provide access to the **Elastic Stop Nut** (piece #99).
2. Remove the **Elastic Stop Nut** (piece #99) from the **Rod** (piece #1). The **Torque Nut** (piece #95) can now be removed from the bottom of the **Drive Sleeve** (piece #25 of **Figure 5.2**).
3. The **Torque Bushing Connector** (piece #96) can be removed from the torque nut by removing the **Retaining Ring** (piece #98).

## 6.7 Thrust Base Disassembly (Drive 2 Option)

Figure 6.2 – L120-10 through 40 thrust base



**NOTE:** For the L120-10, use the same part number for piece #107 and 107A. For the L120-20 and L120-40, use two different part numbers for piece #107 and 107A.

Piece	Quantity	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	1	Quad-Ring Seal
107A	1	Quad-Ring Seal
108	1	Gasket
109	1	Grease Fitting
110	4	Hex HD Cap Screw
111	4	Lock Washer
112	1	Relief Fitting

Drawing RE: 14-602-0219-2

Piece numbers refer to **Figure 6.2**.

1. If the **Thrust Base** (piece #100) option is present, remove the **Seal Retainer** (piece #102) followed by **Stem Nut** (piece #101).
2. Remove the four **Hex Head Cap Screws** (piece #110) and the **Lift Thrust Base** from the housing.

## 6.8 Stem Nut Replacement—Thrust Base Applications

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

- ▲ **WARNING: Possible Hazardous Voltage.** Turn power OFF before disassembling or removing the actuator from the mounting base. This will prevent accidental start-up during service to the unit.
- ▲ **WARNING: Potential High Pressure Vessel.** Before removing or disassembling the actuator, ensure that the valve or other actuated device is isolated and not under pressure.  
**Caution:** The L120-10 through 40 thrust base contains lubrication.  
 Ensure that EP-00 is replaced when reassembling thrust base.

**NOTE:** Installation and retention of o-rings and quad rings can be eased by applying a small quantity of EP grease to the ring during assembly.

To replace the stem nut:

1. Disconnect all incoming power to the actuator.
2. Remove actuator from the valve.
3. Remove **Seal Retainer** (piece #102 of **Figure 6.2**) followed by stem nut, bearings, and seals.
4. Check the fit 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 the actuator on the thrust base.
7. Removing the actuator from the valve will change the limit switch settings. Reset the limit switch in accordance with **Section 4.5.1, Setting Limit Switch**.
8. Reconnect power.
9. Test for correct functioning.

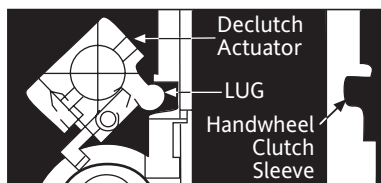
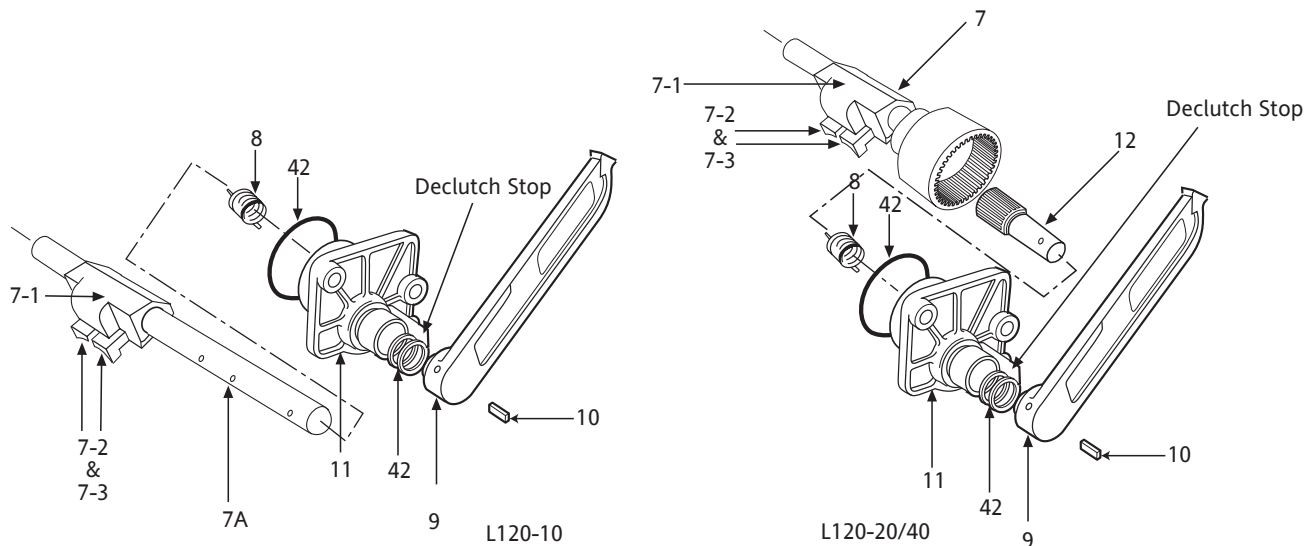
## 6.9 Reassembly

Piece numbers refer to **Figures 5.1, 5.2, 6.1, 6.2, and 6.3**.

1. Install **Lug Ring** (piece #20) onto **Drive Sleeve** (piece #25) followed by the **Worm Gear** (piece #21). Ensure that the worm gear lugs engage with recesses on lug ring.
2. Install **Spirolox retainer** (separate layers of retainer sufficiently to begin threading the retainer into the drive sleeve groove. Continue threading until the retainer is firmly located in the groove).
3. **Install Key** (piece #23) and **Clutch Sleeve** (#19).
4. Add the **Declutch Spring** (piece #24), **Bevel Gear** (piece #18), **Upper Bearing** (piece #17), and **Lower Bearing** (piece #16) to complete the assembly.
5. Replace the drive sleeve assembly into main housing, and secure with the **Housing Cover** (piece #27). Ensure that all the seals are in place.
6. Insert **Wormshaft Assembly** (piece #15) into the housing and locate the bearings in the housing journals. Replace the **Wormshaft Cap** (piece #5).
7. Install the **Wormshaft Gear** (piece #35) and **Flex Loc Nut** (piece #37).

NOTE: It is recommended that a new flex loc nut be used during reassembly.

Figure 6.3 – L120-10 through 40 declutch assembly parts breakdown



Piece	Quantity	Description
7*	1	Declutch Shaft Assembly L120-20/40
7A	1	Declutch Shaft Assembly
7-1	1	Declutch Actuator
7-2 & 7-3	1	Declutch Latch (left & right)
8	1	Declutch Return Spring
9	1	Declutch Lever
10	1	Roll Pin
11	1	Declutch Cap
12*	1	Declutch Input Pinion
42	1	Seal

\*L120-20/40 only

### 6.9.1 Declutch Assembly (L120-10)

8. Install **Declutch Cap** (piece #11) on the **Declutch Shaft** (piece 7A). Ensure that the return spring is located correctly in the endcap.
9. Replace **Declutch Lever** (piece #9) on the shaft with the lever against the stop.
10. While holding the cap steady, rotate the declutch shaft against the spring tension until the holes in the shaft and lever align.
11. Replace complete assembly in main housing. Ensure that the lug on the **Declutch Actuator** (piece #7-1) fits into the groove on the **Handwheel Clutch Sleeve** (piece #19 of Figure 5.2).
12. Secure the declutch cap.

NOTE: When the declutch lever is disengaged against the declutch stop (motor operation position), the **Declutch Actuator** (piece #7-1) should not be in contact with the groove on the **Handwheel Clutch Sleeve** (piece #19 of Figure 5.2).

### 6.9.2 Declutch Assembly (L120-20/40) (Refer to Figure 6.3)

8. Install **Declutch Cap** (piece #11) on the **Declutch Pinion Shaft** (piece #12). Ensure that the return spring is located correctly in the slots.
9. Replace **Declutch Lever** (piece #9) on the pinion and against the stop.
10. While holding the cap steady, rotate the **Pinion Shaft** (piece #12) against the spring tension until the holes in the shaft and lever align.
11. Insert **Roll Pin** (piece #10).
12. Slide **Declutch Shaft** (piece #7) into the housing, ensuring that the **Declutch Shaft** (piece #7) fits correctly into the groove in the **Handwheel Clutch Sleeve** (piece #19 of **Figure 5.2**).
13. Install the declutch cap assembly into the housing finding the nearest tooth on the internal spur gear which will allow the cap to be secured without placing tension on the **Declutch Actuator** (piece #7-1) causing it to rub against the groove in the **Handwheel Declutch Sleeve** (piece #19 of **Figure 5.2**).

### 6.9.3 Install the Motor (Refer to Figure 5.2)

1. Install the **Motor Pinion** (piece #38) and **Elastic Stop Nut** (piece #40) onto the motor shaft. NOTE: The elastic stop nut should not be reused. It is recommended that a new nut be used during reassembly.
2. Install conduit **Nipple Flange** (piece #30) and **Seal** (piece #42) onto the conduit nipple in the flange and secure the motor. Secure the nipple flange.

### 6.9.4 Lubrication Procedure

1. Set unit on mounting base.
2. Grease through the greasing fitting located on the motor adapter, watch for grease entering the housing cavity.
3. Grease through the greasing fitting in the housing cover until the adapter has been completely greased and grease can be seen entering the drive sleeve compartment.
4. Reposition the unit "nameplate down".
5. Finish filling housing cavity through the gear limit switch opening to within 1/2" from the bottom of the gear limit switch opening.

### 6.9.5 Install Geared Limit Switch, Torque Switch and Finish Assembly

1. Install torque and limit switch into the switch compartment housing.  
NOTE: The limit switch must be reset before the actuator is placed back into service. The Torque Switch may need to be rebalanced. If required see **Section 4.4.2, Balancing Torque Switch**.
2. Connect all electrical leads in the switch compartment.
3. Replace the compartment cover, handwheel and thrust base, if applicable, to complete the assembly.

# 7

## How to Order Parts

To order parts or obtain further information about your Limatorque L120 valve actuators, contact your local Limatorque distributor sales office, or:

Limatorque  
5114 Woodall Road  
P.O. Box 11318  
Lynchburg, VA 24506-1318

Telephone (434) 528-4400  
Fax (434) 845-9736

All inquiries or orders must be accompanied by the following information:

1. Unit Size
2. Limatorque Order Number
3. Limatorque Serial Number

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# 8 Regulatory Information

**Declaration of Conformity****Application of Council Directive(s)**

89/336/EEC; EMC Directive

98/37/EEC; Machinery Directive

**Standard(s) to which Conformity is Declared**

Machinery; EN 60204 EMC

- Emissions; EN 50081-1&2, EN 55011, CFR 47
- Immunity; EN 50082-1&2, IEC 801-3 & IEC 801-6 ESD; IEC 801-2
- EFT/Bursts; IEC 801-4
- Surge Immunity; IEC 801-5, ANSI/IEEE C62.41 Mains (power)
- Harmonics; MIL-STD-462, Method CS01 & CS02

**Manufacturer's Name**

Limatorque

**Manufacturer's Address**5114 Woodall Road  
Lynchburg, VA 24502**Importer's Name**

Limatorque International

**Importer's Address**Abex Road  
Newbury  
Berkshire, RG14 5EY  
England**Type & Description of Equipment**

Valve Actuators

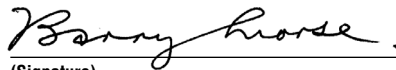
**Model Number**

L120 Series

**Note**

Tested with Limatorque products only

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



(Signature)

Barry Morse

(Full Name)

Internal Sales Manager

(Title)

Newbury, England

Place

November 1, 1999

Date





**Australian Distributor for Limatorque**

Acrodyne Pty Ltd  
14/11 Havelock Road  
Bayswater, Victoria 3153  
Australia  
Phone 03-8727-7800  
Fax 03-9729-8699