



MANUFACTURED IN THE USA

# MODEL 16-25 CASING TONG PRODUCT MANUAL



- SPECIFICATIONS
- MAINTENANCE
- OPERATIONS
- ASSEMBLY

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**WARNING: The equipment described in this manual is a powerful hydro-mechanical tool with exposed rotating components.**

**To avoid serious bodily injury to operating and adjacent personnel and mechanics, the warnings noted on the equipment and in this manual must be read, understood and followed.**

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## General Description

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This manual describes the function, installation, operation and maintenance of the Westco Model 16 hydraulic power tong. In this section, the functions of the tong, system specifications, and options and accessories are described.



Figure 1-1: Functional elements of the Model 16 tong



# Functions

The Westco Model 16 casing tong is a hydraulic motor-driven tong capable of running pipe or casing from 2-3/8 to 16 inches in diameter. With a 32 inch (813mm) handle, the tong can produce up to 25,000 lb.ft. (33,895 Nm) in low gear forward or reverse operation.

An exclusive latch-around (gated), positive-lock jaw system provides sure pipe grip, dynamic balance and safety for personnel and equipment.

The casing tong incorporates a single or tandem gear-type, fixed-displacement, hydraulic motor to provide drive power through a gear box and power train. The heart of the unit is a jaw-closing system that forces the jaws together and rotates them by means of a cam-type rotary gear. The rotary gear is driven by the tow-speed gear train.

In operation, the tong is suspended over the wellbore on a cable. A backup line restrains the tong from moving around the pipe as torque is applied.

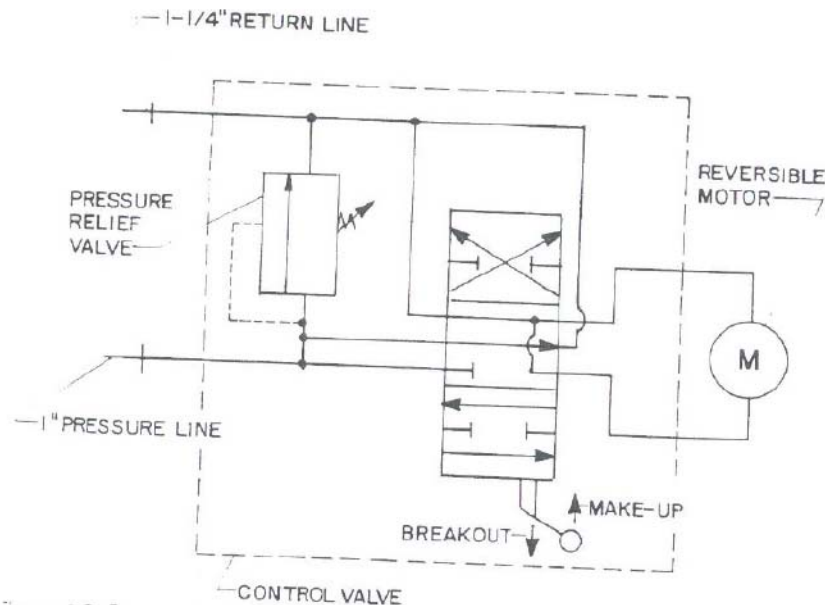


Figure 1-2: Schematic diagram of hydraulic system

## Hydraulic Drive System

Figure 1-2 is a schematic drawing of the hydraulic drive system. Hydraulic pressure from a separate power unit is applied through the hose connectors. To prevent cross-connection of the hoses, the pressure hose is designed to mate with a 1 inch connector and the return hose with a 1-1/4 inch connector.

The throttle handle controls the throttle valve for the unit. Pushing the handle applies pressure to drive the motor forward (for make-up operation) and pulling the handle applies pressure in a reverse direction (for breakout operation). While the handle is in a neutral position, fluid circulates freely through the valve and back to the return line.

The hydraulic motor and other hydraulic components are mounted on the tong case top plate.

## Gear Train and Clutch

Closure and rotation of the pipe-gripping jaws is accomplished by a large rotary gear. Mechanical power is transmitted from the hydraulic motor to turn the rotary gear in either direction.

The rotary gear assembly is a large-diameter gear that has been segmented into three sections with pivotal hinges and a latching mechanism. The assembly is shown in Figure 1-3. The smaller rotary gear segments pivot open to encircle the pipe being worked and then close and latch while working the pipe. The internal diameter of the gear has a cam insert surface for actuating the jaws.

The complete tong gear train is shown in Figure 1-4. The gear train consists of a shiftable two-speed gear box in a separate housing mounted on the tong top plate. The hydraulic motor drives a pinion directly through the high (1:1) or low (1:4.3) ratio of the gear box. The gear box output drives a pinion within the tong case. Through a cluster gear the input pinion drives a pair of rotary idlers which in turn drive the rotary gear.

Shifting from high to low gear ratios is accomplished by lowering the shift lever handle.

## Jaw System

The model 16 tong uses a three-jaw system consisting of two fixed jaws mounted on the major segment. The jaws are rotated and actuated by the combined action of the rotary gear, permanent magnets and reversing pin.

During make-up operations, the pipe to be turned is first enclosed in the tong and the rotary door is closed and latched. Then, with the reversing pin in the make-up position (as described later), the operator pushes the control lever forward to cause the jaws to bite and rotate the pipe. To release the jaws and back off from the pipe, the operator pulls the tong control lever outward.

During breakout operations, the reversing pin is placed in the breakout position so that the jaw bite in the reverse direction. Then the operator pulls the tong control lever to cause the jaws to bite and break out the pipe. Finally, he pushes the lever forward to release the jaws and back them off the pipe.

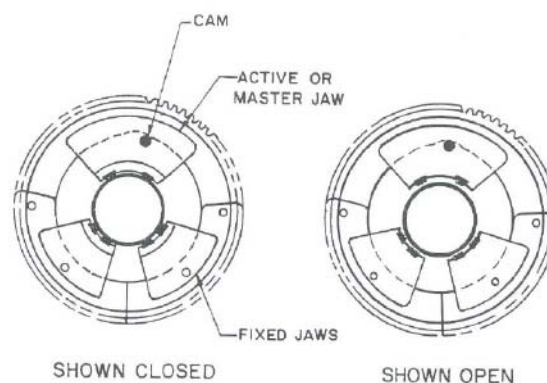


Figure 1-5: Jaw action

As illustrated in Figure 1-5, the jaw-biting action is a function of the rotary gear cam. When the rotary gear rotates, the jaw rollers roll up onto the cam surface and force the jaws to pipe the pipe. Further rotation turns the pipe to make up or break out the joint.

To provide the restraint necessary for camming to occur, permanent magnets are added to the jaws. **The drag induced by the magnets on a plate within the case body is sufficient to permit the jaw roller to push the master jaw into engagement with the pipe. Once the master jaw is engaged, the magnetic drag is overcome, allowing the jaws to rotate with the rotary gear.**

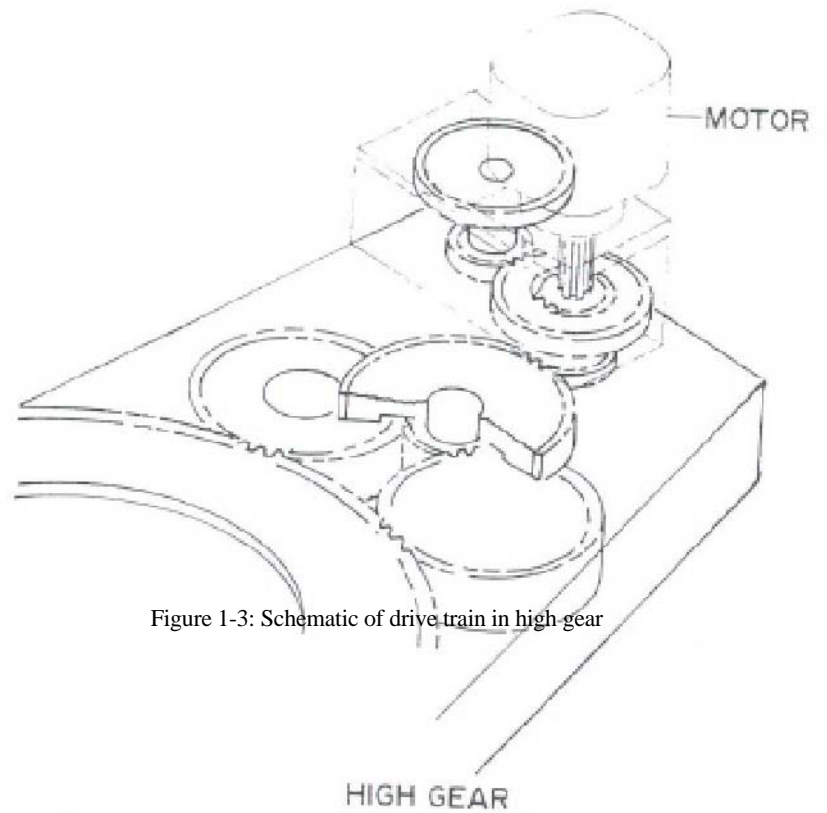
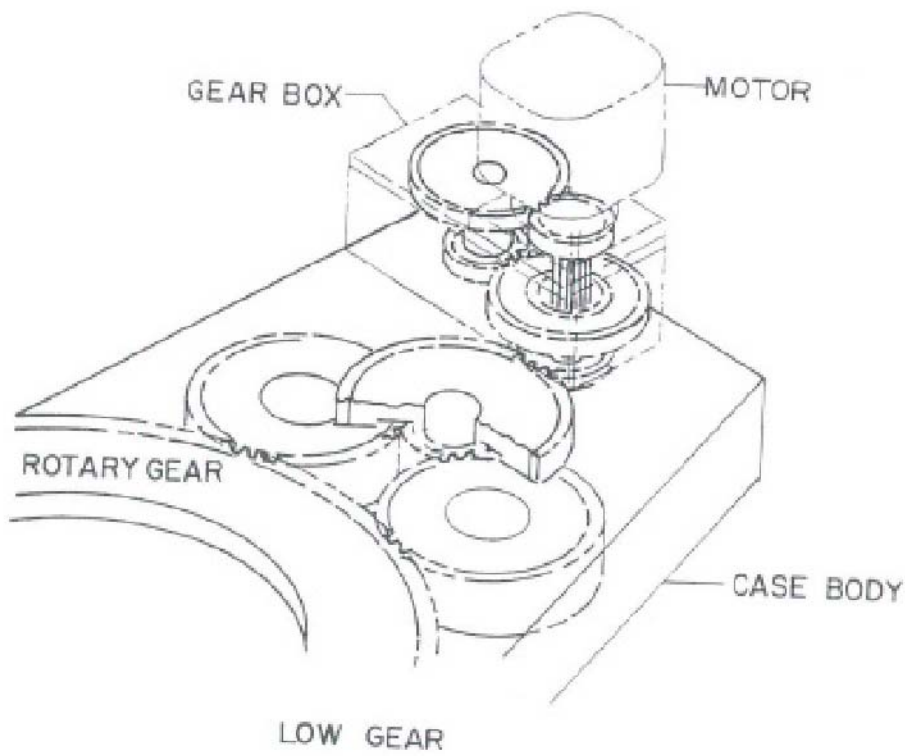


Figure 1-3: Schematic of drive train in high gear

Figure 1-4: Low gear

Figure 1-3: Schematic of drive train in high gear.

Figure 1-4: Low gear



## Specifications

### Hydraulic Power Source

The Model 16 tong is designed to be powered by a hydraulic power source capable of delivering 2,400 psi (175 bar) and 30 gpm (113.6 lpm) for high-torque, low-speed operation.

For high-speed operation the power source should develop 70 gpm (227.1 lpm) at pressure up to 1,000 psi (69 bar). A load-responsive power source should be used for optimum results.

Note that the pressure output (psi) of the power source is related directly to the maximum torque output of the tong. The power source flow output (gpm) is directly related to the output speed of the tong.

Figure 1-6: Westco casing Tong Specifications

Model 16-18	Gear Motor Size (inches)	Maximum Torque lb.ft. (Nm) 30 gpm/2,400 psi (113.6 lpm @ 175 bar)		Maximum rpm 70 gpm/1,000 psi (227.1 lpm @ 69 bar)		Rotary Size (inches)	Factory-Installed Options
		High Gear	Low Gear	High Gear	Low Gear		
113986-004	3	4,500 (6100)	18,500 (25,083)	89	21	13 $\frac{3}{8}$	—
-009	3	4,500 (6100)	18,500 (25,083)	89	21	16	16" rotary
-014	3	4,500 (6100)	18,500 (25,083)	89	21	13 $\frac{3}{8}$	Hyd. lift cyl.
-019	3	4,500 (6100)	18,500 (25,083)	89	21	16	16" rotary Hyd. lift cyl.
-044	3	4,500 (6100)	18,500 (25,083)	89	21	—	—
-049	3	4,500 (6100)	18,500 (25,083)	89	21	—	Hyd. lift cyl.

Model 16-25	Gear Motor Size (inches)	Maximum Torque lb.ft. (Nm) 30 gpm/2,400 psi (113.6 lpm @ 175 bar)		Maximum rpm 70 gpm/1,000 psi (227.1 lpm @ 69 bar)		Rotary Size (inches)	Factory-Installed Options
		High Gear	Low Gear	High Gear	Low Gear		
113986-005	Tandem 2					13 $\frac{3}{8}$	—
-010						16	16" rotary
-015		*Low speed	Low speed	*Low speed	Low speed	13 $\frac{3}{8}$	Hyd. lift cyl.
-020		6,110 (8284)	25,000 (33895)	47	11	16	16" rotary Hyd. lift cyl.
-045		*High speed	High speed	*High speed	High speed	—	—
-050		3,056 (4,142)	12,500 (16,948)	93	22	—	Hyd. lift cyl.

\*High speed and low speed are controlled by a speed control valve, 100175-001.

## Power Tong

The part numbers and performance specifications for the Model 16 tong are listed in Figure 1-6. Figure 1-7 is a typical performance curve for the tong.

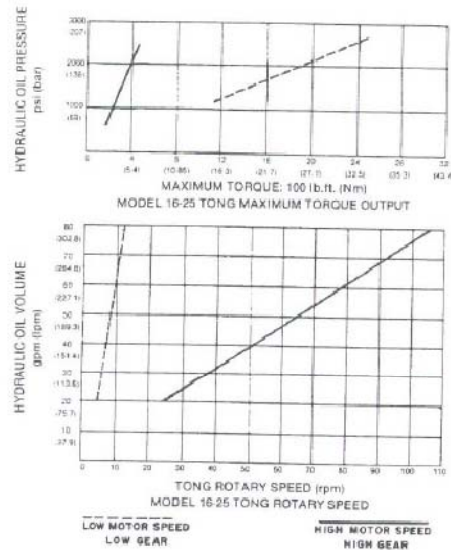


Figure 1-7: Typical performance curve

## Accessories and Options

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### Spring Hanger

The optional spring hanger (part no. 100181-001) (Figure 2-3) permits the tong to move up or down to allow for thread length change in make-up and breakout operations. When used, the spring hanger should be attached directly to and used as a hanger for the tong.

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### Lift Cylinder and Controls

The hydraulic lift cylinder assembly (part no. 103652-001) provides a means for raising and lowering the tong during operations. When a cylinder is ordered with a tong, the tong contains an additional control lever for controlling the lift cylinder up or down. This lever is identical to the tong operating control lever. Pulling the lever outward provides pressure from the hydraulic power unit to operate the lift cylinder upward and thus to raise the tong, whereas pushing the control lever forward operates the cylinder downward to lower the tong. The central lever position is the neutral position.

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### Torque Gauge Assembly

The optional torque gauge assembly part no. 111918-001 for 0 to 30,000 lbs. ft (40,675 Nm); 111918-002 for 0 to 20,000 lbs. ft (27,116Nm) measures the torque exerted while the tong is used in make-up or breakout operations. Consisting of a hydraulic cylinder and torque meter connected by a pressure hose, the torque gauge assembly senses and indicates the torque developed during an operation. For operation, the hydraulic cylinder is connected by a shackle to the rear of the tong. A backup line is connected to the cylinder and is tied off to a solid part of a rig structure to form an angle of 90 degrees to yield accurate torque readings. See Figure 2-2

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### 16 Inch Rotary Gear

The 16 inch rotary gear (part no. 112373-001) is required for working casing larger than 13-3/8 inches in outside diameter.



## Section 2

## Installation

## Equipment Considerations

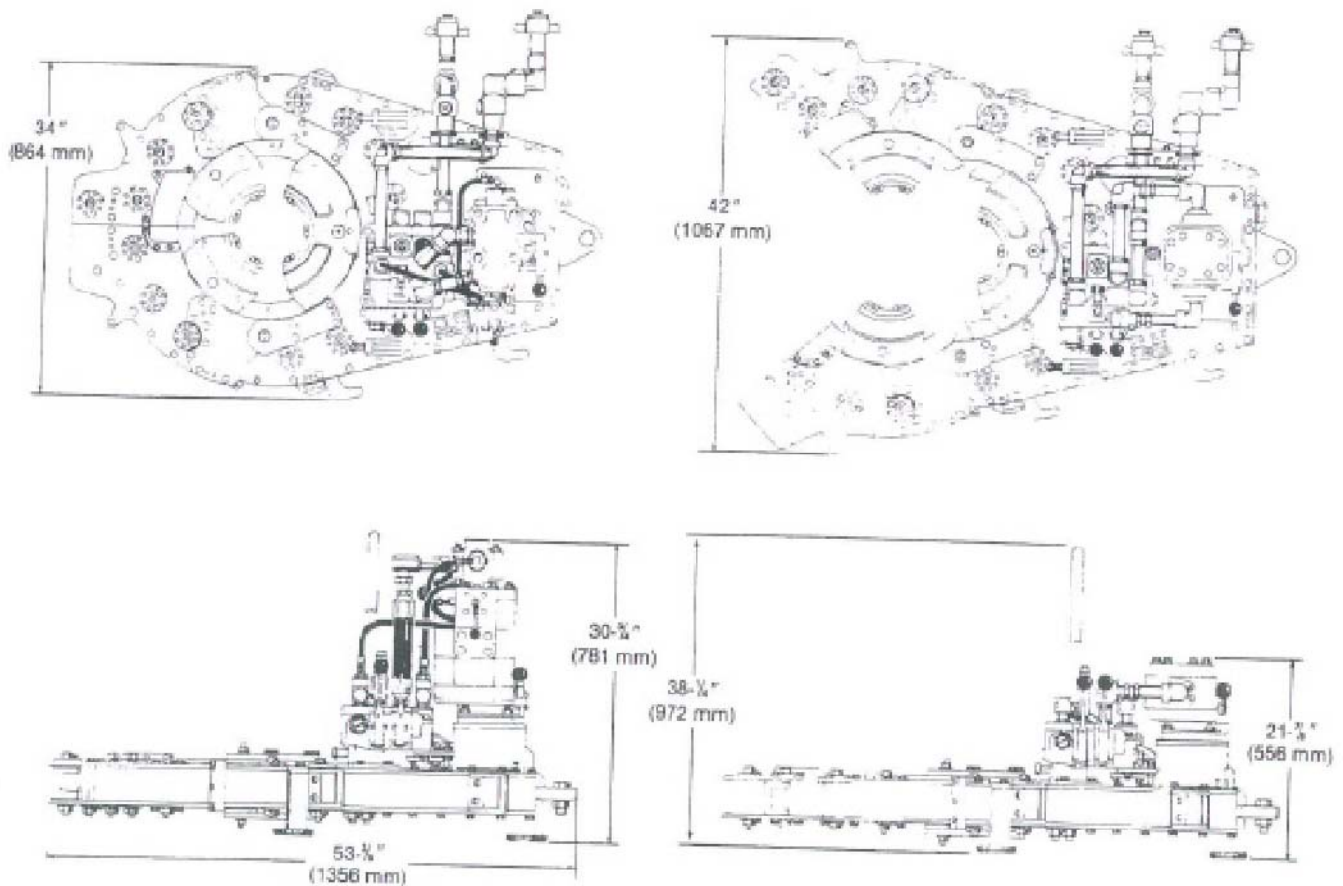
**The Tong**

Replace the jaws that are on the tong with the correct-sized jaws according to the size of pipe being used. Refer to "Jaw Installation and parts" (Section 7) for available jaw sizes and installation procedures.

**WARNING: Do not attempt to change jaws with power unit in operation.**

**Failure to observe proper precautions could result in serious injury.**

Figure 2-1: Tong space requirement



## Hanging the Tong

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The tong is transported to the well site and hung into position as illustrated in Figure 2-3 and as follows:

Connect cable to the tong bail. The tong should be suspended by a steel cable from a point high enough on the derrick to assure easy handling and maneuverability. The hang point should be positioned as near the center of the rotary gear as possible (allowing for hanger offset from tong opening centerline) without interfering with movement of the casing handling tools. The line should anchor securely to the rig frame. If a spring hanger is used, extend the line over a pulley and down to the spring hanger. The tong line should position the tong at the anticipated average height of the joint during use. This will allow the tong to follow the joint during make-up or breakout.

**WARNING: To prevent bodily injury this steel cable must be rated for 4,000 lbs (1814.4 kg) minimum working load.**

If no spring hanger is used, use two pulleys to keep the counterbalance, which weighs approximately 1,200 pounds (544.3 kg), out of the operating area.

The tong must be as near level as practicable for proper operation. When the tong is being leveled, the jaws should have been inserted and the doors closed. For fore and aft leveling, adjust the bolts at the hanger joint on each side of the case, assuring both bolts are in contact with the hanger strut. For side-to-side leveling, move the clevis in the notched insert at the top of the hanger to the required position.

Connect the backup line to the torque gauge to restrain tong rotation and to provide torque readings for operations.

**WARNING: To prevent serious bodily injury secure tong to derrick with a backup line rated to 25,000 pounds (11340 kg) minimum working load.**

If no torque gauge is used, connect the line directly to the backup line bracket. Secure the other end of the backup line to a solid part of the rig to form a 90 degree angle with the tong centerline. Failure to maintain the 90 degree angle will result in torque measurement errors.

## Connecting the Hydraulic Lines

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Hook up the pressure hose to the one-inch fitting on the tong by forcing the connectors together while turning the fitting. Hook up the return hose from the power unit to the 1-1/4 inch connector on the tong in the same manner.

**WARNING: Be sure connectors are completely tight.**

If a lift cylinder is used, connect the hose from the lift cylinder to the connector provided on the tong.

Start the power unit and allow hydraulic fluid to circulate through the tong until fluid reaches operating temperature.

**NOTE:** This period will vary according to the ambient temperature. In severe weather conditions you may need to operate the system for several minutes before using the tong. In warm climates a brief warm-up period is adequate.

While the system warms up, check the connections to be sure that no leaks occur. Retighten connections if leaking.

**NOTE:** Refer to Figure 4-3 in "Maintenance" for recommended hydraulic fluid.

**WARNING: When replacing hydraulic hoses, piping and fittings, be sure replacement components are rated at no less than 3,000 psi (206.8 bar) working pressure and 10,000 psi (689.5 bar) burst pressure.**

## Power

Before installing the tong for field operations, ensure that an appropriate power unit is available and that the power unit is adjusted for use with the tong. To operate the tong within its full capability, the relief valve on the hydraulic power unit should be adjusted to 2,500 psi and the bypass valve to 900 to 1,000 psi. Refer to the power unit manual for the procedure on power unit valve adjustments. Normal care should be exercised in locating the power unit and connecting the tong. Excessive distance between tong and power source will result in pressure losses.

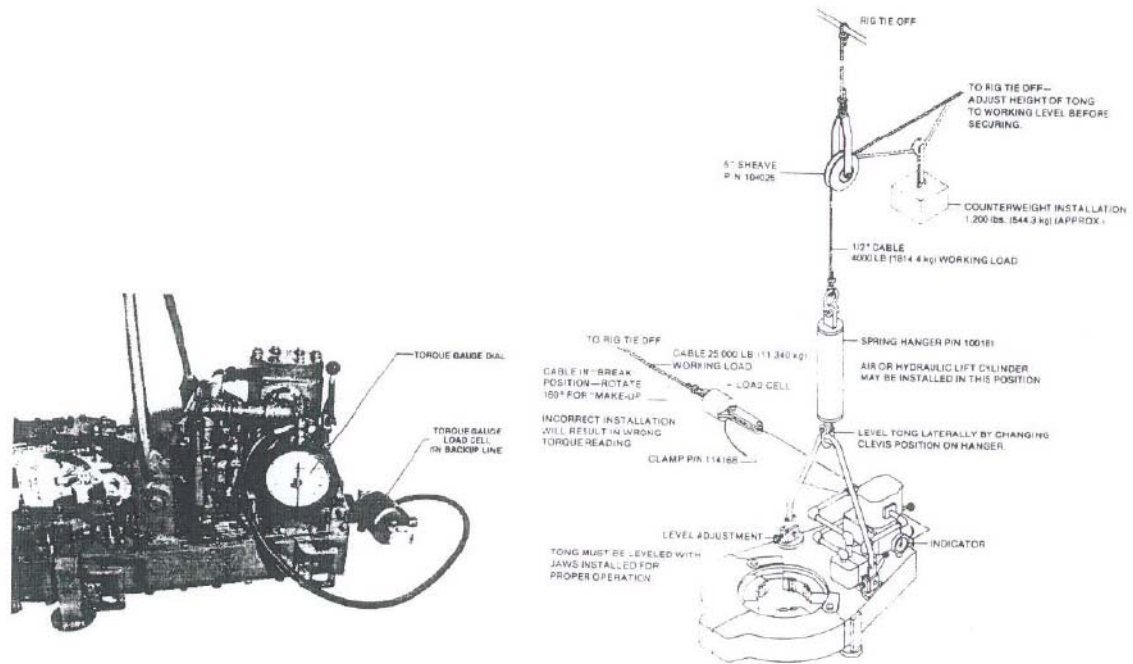


Figure 2-2: Torque gauge

Figure 2-3: Installation of Power Tong

## Accessories

The accessories necessary for the type of operation to be performed must be available.

**Torque Gauge Assembly** - Once installed, the torque gauge assembly becomes an integral part of the unit. To install the torque gauge on the tong, proceed as follows:

1. With mounting screws, mount torque gauge into position on torque Gauge plate (Figure 2-2).
2. Route hose to avoid interference with tong operation.
3. Secure one side of load cell to backup line bracket on rear of tong.

**Lift Cylinder** - If the system is not counterbalanced, a lift cylinder should be used. For lift cylinder operation, the tong must be equipped with an additional valve section. The lift cylinder should be suspended from the line that will hang the tong, as shown in Figure 2-3.

**Spring Hanger** - A typical spring hanger installation is shown in Figure 2-3. For a counterbalanced support line, the spring mount is suspended from the line. When a lift cylinder is used, the spring mount may be installed above or below the lift cylinder as shown in Figure 2-3.

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**Operating Controls and Indicators**

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Before operating the unit, the operator should become thoroughly familiar with the operating controls and gauges. Then, before initial operation and daily thereafter, he should make the recommended adjustments and operational checks,

Figure 3-1 illustrates the operating controls and gauges. Functions of the controls and gauges are described in Figure 3-2.

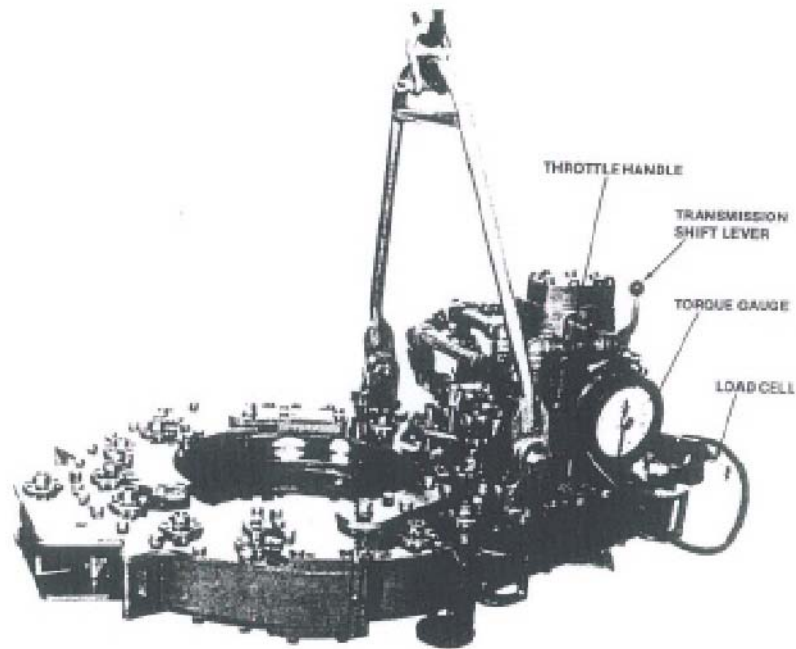


Figure 3-1: Tong controls

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**Preoperating Checks**

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After installing the system, check to be sure that all necessary adjustments are made and that the system is functioning correctly.

Before attempting operation, verify that operating personnel understand proper operation of the tong and the safety requirements. Ensure that all lines and equipment associated with hanging and securing the tong are of adequate size and good condition.

The power unit output pressure must be properly adjusted. Refer to the instruction manual on the power unit and perform the output pressure adjustment procedure for the required pressure.

## Operational Checkout

Before starting a new job, perform the following operations and be sure the tong operates correctly.

Place the reversing pin in the hole on the rotary next to "make."

**NOTE:** For tandem motor tongs, also place the motor selector valve in high speed mode.

Move the shifting lever to the high-speed position (up). Push the throttle handle

Forward and verify that the jaws bite and the rotary turns at high speed.

**NOTE:** Rotary should move 6 inches (152.4 mm) before jaws grip the pipe and torque builds up. If torque is applied before the rotary plunger (Figure 4-1) is out of the pocket, rotary lockup and subsequent case damage may occur.

Pull the throttle handle to neutral and move the shifting lever to the low-speed position (down). Again push the throttle handle and verify that the jaws bite and the rotary turns at low speed.

Return the throttle handle to neutral position.

Use the throttle handle to operate the tong so that the rotary gear is aligned with the doors.

Place the reversing pin in the hole on the rotary next to "break." Repeat the checkout procedure to check breakout operation.

If the lift cylinder is installed, pull the lift cylinder control lever back and verify that the cylinder operates to lift the tong. Then push the lift cylinder control lever forward and verify that the cylinder operates to lower the tong.

Figure 3-2: Operating Controls and Gauges

Control or Gauge	Function
Reversing pin In make hole In break hole	Allows tong to bite when operated clockwise for make-up. Allows tong to bite when operated counterclockwise for breakout.
Shifting lever Up position Center position  Down position	Shifts tong gear train into high-speed position. Neutral position; motor and clutch shaft turn but rotary gear does not rotate. Shifts tong gear train to low speed.
Throttle handle Forward position  Back position	Operates rotary gear clockwise. Make-up or breakout function depends on position of reversing pin. Operates rotary gear counterclockwise. For breakout, head bites and for make-up, head releases. Make-up or breakout function depends on position of reversing pin.
Motor selector valve (tandem motor tongs) Right position Left position	Selects high-speed motor mode. Selects low-speed motor mode.
Torque gauge	Registers torque applied to casing being worked.
Lift cylinder control lever (optional) Forward position Back position	Operates lift cylinder to lower tong. Operates lift cylinder to raise tong.



## Initial Operations

After the tong is transported to the job site, hoisted into operating position, and the backup line attached, leveled and connected with power unit as described in the installation section, proceed as follows:

1. Be sure shifting lever and throttle handle are in neutral position.
2. Start hydraulic power unit.
3. Perform an operational check and make any required adjustments before continuing.
4. Place reversing pin in the make-up hole for make-up operation or in the breakout hole for breakout operation. (See Figure 3-3)

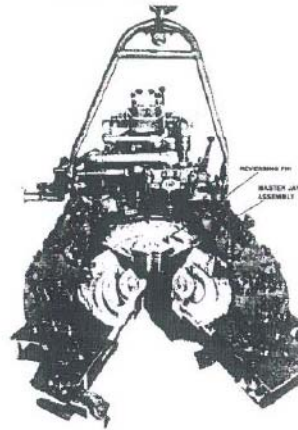


Figure 3-3: Reversing pin

## Positioning Tong and Enclosing Casing

After performing the initial operations, position the tong for the make-up or breakout work to be done. Position the tong at the proper height for gripping casing as follows:

1. If the tong is installed with a counterbalanced system, lift or lower the tong to the desired position.
2. If a lift cylinder is used, operate the lift cylinder control lever (located to the right of tong control lever) to position the tong.

Place the tong on the casing section positioned for make-up or breakout. Close the doors. Then operate the tong as follows:

## Operating the Tong

**WARNING: Be sure no part of the body or clothing is in tong rotary area and no cables or Equipment other than casing are enclosed in the tong. Operator and all other Objects must be clear of backup line and traveling path of tong while in operation.**

Initially select high-speed operation by moving the shifting lever up and the motor selector to the right.

To begin turning the casing clockwise for make-up operation, push the throttle handle forward. To begin turning the casing counterclockwise for breakout operation, pull the throttle handle back.

**CAUTION: Initial gripping action must not occur while plunger is in the cam pocket: damage to the tong may result. If gripping occurs immediately upon initiation of rotary motor (before the plunger is depressed) check jaw roller for proper size (Section 7, p.1) and/or rotate in opposite direction before gripping so that plunger is in depressed position before gripping occurs.**

Once the tong stalls out, release the throttle handle and move the shifting lever and motor selector to the low-speed position.

Operate the throttle handle to complete the torquing operation.

Observe the reading on the torque gauge. When proper torque is obtained, move the throttle handle in the opposite direction to back off. Center the plunger in pocket, open doors and pull tong away from joint.

Reposition casing tong away from rotary table as necessary, and repeat the operating procedures as required for each joint.

After operation, open the doors and push the tong back off the casing.

## Section 4

## Maintenance

Servicing the tong consists of inspection, lubrication, tests and adjustments. Should servicing reveal requirements for repairs, refer to the appropriate procedures in "Troubleshooting, Repair and Overhaul" and "Testing" (Sections 5 and 6).

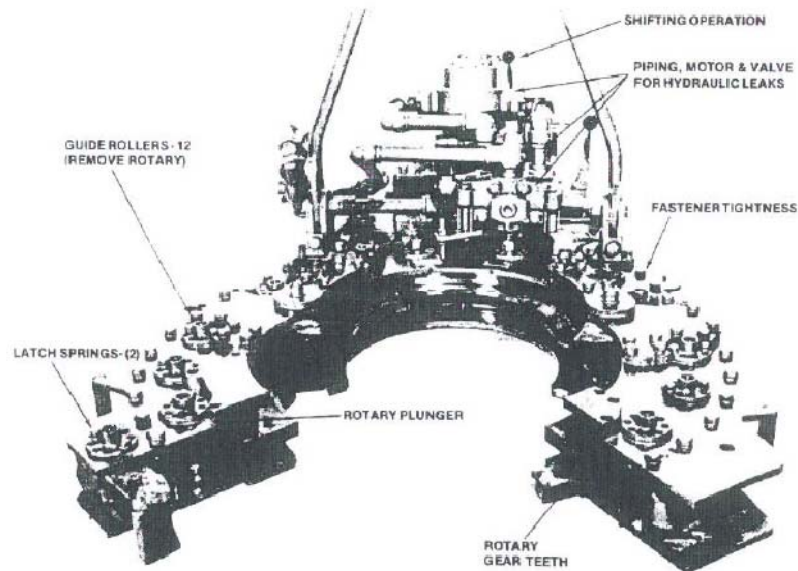


Figure 4-1: Inspection points

### Daily Inspection

Figure 4-1 illustrates the points that should be inspected prior to every job and once every operating day thereafter.

#### Overhaul Equipment

Inspect the unit and its accessories for obvious damage, evidence of hydraulic leaks, etc. Refer to the overhaul procedures for removal and replacement of any faulty parts.

#### Jaw Dies

Inspect jaw dies to be sure that the biting edge is not worn excessively and is capable of biting effectively. Change the dies if necessary.

#### Rotary Gear

Inspect gear teeth for excessive wear, damage or breakage. Replace if more than two adjacent teeth are broken. If excessive wear or breakage is found, inspect all internal gears and grease packing for metal particles and damage.

#### Latch Hook Springs

Springs must exert sufficient force to close latch firmly on the lug. Replace if necessary.

#### Jaw Rollers

Inspect jaw roller for free rotation. Lubricate as described under Jaw Roller Lubrication procedure.

## Monthly Maintenance

Once each month make the following checks and take appropriate corrective action:

1. Check rotary gear guide rollers for wear or breakage, and replace if necessary.
2. Check jaw rollers for wear or breakage, and replace if necessary.
3. Check shifting operation, shifting shaft nuts and shifting shaft detent operation as described in "Tests and Adjustments" in this section.
4. Inspect the rotary gear and internal gears.
5. Examine the rotary plunger for evidence of wear or breakage.
6. Check the oil level in the gear box.
7. Check the torque gauge cylinder for low fluid volume. Fluid level is low if ½ inch or more of the cylinder rod is exposed when under tension.
8. Check all fasteners for tightness.

## Lubrication

Proper lubrication is important to the operation and long life of the tong.

### Hydraulic Fluid Requirements

During normal operation, the tong should remain charged with hydraulic fluid, even when the hydraulic hoses are disconnected.

### Grease Zerts

At the beginning of each job and once every operating day thereafter, use a grease gun to grease the 17 grease zerts. In general, be liberal with grease. Over-greasing will do no harm, whereas greasing too little can result in excessive wear. Figure 4-2 shows the lubrication points, and Figure 4-3 specifies the types of grease to be used.

Grease the tong as follows (numbers enclosed in parentheses refer to grease points identified in Figure 4-2):

1. On top of the top, grease the shifting shaft (19).

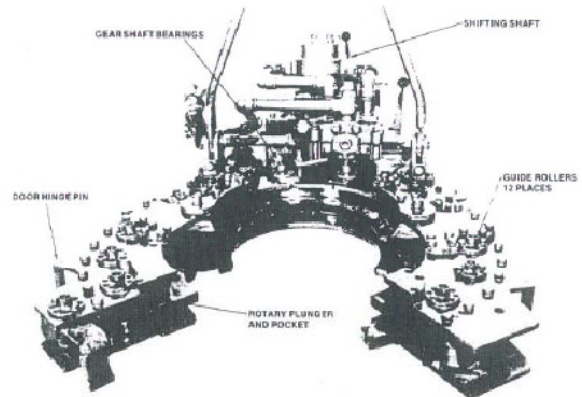


Figure 4-2: Lubrication points

Figure 4-3: Recommended Lubricants

Grease and Oil	Specifications
Gear*	Keystone Company 29X Light or equivalent
Bearing grease*	Texaco Marfak Multi-purpose No. 2 or equivalent
Gear box oil	Exxon GX 85W-140 or equivalent

\*Specifications are listed for average conditions. For applications involving extreme heat or cold, consult Westco engineering for recommendations.

**WARNING:** After applying power to turn rotary gear, disable hydraulic system before proceeding.

2. Grease the three gear bearings.
3. Grease all guide roller bearing zerts (1 through 12; 13 and 14 when present).
4. Pack the rotary plunger and plunger pocket with grease.

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## Gear Grease

To pack the tong with grease, refer to Figure 4-2 and Figure 4-3 and proceed as follows:

**WARNING: Packing the gears while the power unit is operating is extremely dangerous. Failure to observe proper precaution in maintaining this unit could result in serious injury.**

1. Disable the tong by both of the following methods.

**WARNING: Keep hands out of the jaw area while the power unit is operating.**

Disconnect power from the power unit electrical motor or turn off diesel engine as applicable, shift speed lever to neutral and set control lever to neutral.

Disconnect the hydraulic pressure line (1 inch line) from the tong at the hose connector.

2. Remove the rotary gear as described in "Tong Disassembly and Parts" (Section 8).
3. Pack the unit with the specified gear grease (see Figure 4-3) by liberally applying Grease through the back rotary opening in case (Figure 4-2).

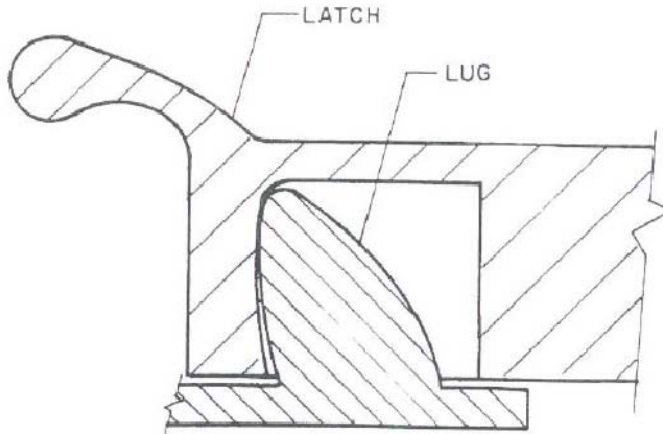


Figure 4-4: Door latch

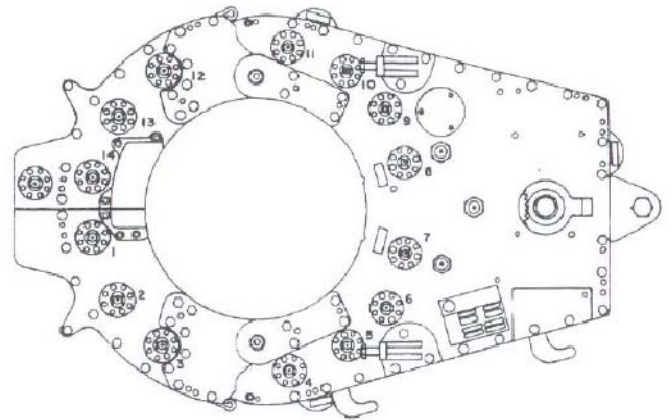


Figure 4-5: Guide roller shaft positions

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## Test and Adjustments

The following tests and adjustments should be made.

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**Door Latch Adjustment** **WARNING: The door latch must be readjusted each time the rotary guide rollers are adjusted.**

The latch hinge pin is an eccentric shaft providing adjustment. The high point of the eccentric is indicated by an arrow. With the rotary in place and six guide rollers adjusted so that the rotary is centered, rotate the latch hinge pin to achieve the latch/lug alignment shown in Figure 4-4.

After adjusting the latch hinge pin, install two bolts and lockwashers to retain adjustment, and tighten the locknut on the bottom of the shaft.

Following adjustment, recheck operation by opening and closing the doors several times. With the doors closed and latched, pull on either door. The latch must not release.

**WARNING: Failure to adjust properly can result in door opening under load, damaging the tong and injuring personnel.**



## Rotary Centering Adjustment

### **WARNING: Proper adjustment of the rotary is essential to tong operation and reliability.**

With the rotary removed and referring to Figure 4-5, loosen locknuts on the shafts at points 1 through 6 and 9 through 14. Remove the bolts and lockwashers from the shafts.

Position the shafts with the high-point arrow located radially away from the rotary.

If half rollers are installed at points 7 and 8, position the high-point arrow radially away from the rotary. Lock the shaft into this position by tightening the locknut and installing two bolts and lockwashers.

Install the rotary assembly and close and latch the doors. Then adjust latch pin until tight on cam and secure shaft in place (to nearest full bolt hole) with bolts and lockwashers.

### **WARNING: Check for gear mesh. Improper meshing of gears can result in tooth breakage.**

1. Use shafts at position 1,4,11 and 14 to position fully the rotary.
2. Rotate shaft 1 counterclockwise until rotary teeth mesh with idler gears.
3. Rotate shaft 4 counterclockwise  $\frac{1}{4}$  turn and then rotate shaft 11 clockwise  $\frac{1}{4}$  turn. Repeat adjustment on shafts 4 and 11 until rotary is snug and positions of high point arrows on these shafts are in approximately the same position in relation to the case opening.
4. Rotate shaft 1 counterclockwise and shaft 14 clockwise simultaneously until rotary is snug and positions of high point arrows on these shafts are in approximately the same position in relation to the tong opening.
5. Rotate shafts 2,3,5 and 6 counterclockwise until cams on shafts make their guide rollers lightly touch rotary.
6. Rotate shafts 9, 10, 11, 12 and 13 clockwise until cams on these shafts make their guide rollers slightly touch rotary.
7. When the guide rollers are snugged up, the high point arrow should be in approximately the same position in relation to the case opening. Readjust to obtain this relationship if necessary.

#### **8. Secure case shafts as follows:**

If any two holes in the shaft shoulders align with tapped holes in top plate for shafts 4, 5, 6, 9, 10 and 11, rotate shafts 4, 5 and 6 clockwise and rotate shafts 9, 10 and 11 counterclockwise  $\frac{1}{4}$  to  $\frac{1}{2}$  shaft shoulder hole. At this point, two opposing shaft shoulder holes should align with two tapped holes in the top plate. (A sharp object is required to align shaft shoulder holes with two of the four tapped holes in the top plate for each shaft).

If the shaft shoulder holes are not in full alignment with two opposing tapped holes in the top plate, rotate shafts 4, 5 and 6 clockwise and rotate shafts 9, 10 and 11 counterclockwise  $\frac{1}{4}$  to  $\frac{1}{2}$  shaft shoulder hole. Pierce the guide roller shaft gasket with a sharp object to locate two opposing shaft shoulder holes which are in full alignment with two of the four tapped holes in the top plate.

After adjustment, secure shafts 4, 5, 6, 9, 10 and 11 with bolts and lockwashers.

#### **9. Secure door shafts as follows:**

For those tongs with tandem 2 inch hydraulic motors, follow procedures in paragraph 8, adjusting shafts 1, 2 and 3 clockwise and shafts 12, 13 and 14 counterclockwise.

For tongs with other motors, use procedures similar to paragraph 8, but adjust  $\frac{1}{2}$  to full hole (rather than  $\frac{1}{4}$  to  $\frac{1}{2}$  hole). Adjust shafts 1, 2 and 3 clockwise while adjusting shafts 12, 13 and 14 counterclockwise. After adjustment, secure shafts 1, 2, 3, 12, 13 and 14 with bolts and lockwashers.

10. Loosen door latch shaft and adjust according to door latch adjustment procedure.

### **WARNING: Bolts prevent loss of adjustments and carry no tension loads. Over-torquing of locknuts or bolts prevents free guide roller rotation.**

11. Open doors and remove rotary. Rotate each roller by hand and check vertical play of rollers. Rollers should rotate with a light uniform drag. Vertical clearance (end play) must be no less than .010 inches and no more than .050 inches. Adjust with the locknut.
  12. Lubricate gears and rollers liberally and reinstall rotary. Check tooth engagement. Install rotary retaining bolts.
  13. Following adjustment, recheck the door latch adjustment and perform a preoperation test per the section "Testing".
- 

### **Shifting Locator Pin Adjustment**

The shifting locator pin that holds the shifting mechanism in the selected speed is adjustable. This adjustment should be checked at the beginning of a job and at the start of each shift thereafter.

To check the operation of the shifting locator pin, raise the shifting handle to the high-speed position and verify that the lever remains in the high-speed position until considerable force is exerted, when it will give way to slide freely to the next position. Repeat this operational check in the low-speed and neutral positions.

When an operational check indicates the need to adjust the shifting locator pin, adjust by tightening the spring plunger body one-half turn. Repeat the locator pin operational check. If additional adjustment is indicated, repeat the adjustment procedure until proper operation is achieved.

### **Storage**

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When not in use, the tong should be stored away from the vicinity of normal drilling operations. For temporary storage, the tong may remain tied off in the rig structure. For extended storage, put the tong in a protective environment.

# Troubleshooting, Repair and Overhaul

## Section 5

### Troubleshooting

Correct any problems encountered with the tong as recommended in Figure 5-1.

### Repair

In general, repair consists of replacing worn or broken parts. When a part is determined to be faulty through either inspection or an operational check, remove the part and replace it with a new one according to the instructions in "Jaw Installation and Parts" and "Tong Disassembly and Parts." The component parts are illustrated and identified in those sections of the manual. After any major repair, the tong should be serviced as described in "Maintenance."

**Figure 5-1: Troubleshooting**

Symptom	Probable Cause	Corrective Action
Tong fails to grip	Wrong size of jaws in tong or wrong rollers in jaw	Install correct jaw and roller assemblies
	Drag magnet does not work	Replace drag magnet
	Dies fail to grip pipe	Clean or replace dies
Jaws come out of neutral cam but will not penetrate pipe	Undersized pipe	Install oversize roller (1/16 inch OD larger)
	Tong not hanging perpendicular to pipe	Adjust bail until tong hangs level
Jaws do not come out of neutral cam	Magnets not strong enough	Replace
	Oversized pipe	Install undersized rollers (1/16 inch OD smaller)
Tong does not develop sufficient torque	Power unit pressure not set high enough	Refer to instruction manual on power unit
	Power unit properly set, but relief valve on tong not set high enough	With pressure gauge in the relief valve "gauge port," stall tong and turn valve relief screw adjustment clockwise until pressure is set correctly
	Relief valve stuck	Check and clean valve Check valve spring Check hydraulic fluid for Cleanliness
	Relief valve leaking	Check valve seats and oil for contaminants
	Faulty tong valve or motor Faulty torque gauge	Repair or replace valve or motor Repair or replace torque gauge

**Figure 5-1: Troubleshooting (Continued)**

Symptom	Probable Cause	Corrective Action
Tong does not develop sufficient torque (continued)	Restriction in hydraulic lines to power unit	Check hydraulic connections and lines for restrictions and obstructions
Motor runs but tong does not rotate	Faulty shifting mechanism	Check shifting mechanism and repair as necessary
	Broken gear	Check for broken gear and replace as necessary
Tong rotates slowly	Power unit flow rate too low	Check power unit
	Reservoir oil level low	Check oil level
	Tong motor wear	Check motor
Tong hangs up under light load	Excessively worn or broken guide roller or idler gear bearing	Replace guide roller or idler gear bearing
Tong rotates when control lever is in neutral	Faulty control valve	Replace control valve
Shifting lever will not remain in high-speed position	Locator pin improperly adjusted	Adjust locator pin
	Groove worn in shifting shaft (by locator pin)	Replace locator pin assembly
	Worn motor shaft	Replace motor
Motor leaks	Faulty shaft seal	Replace motor seal
Oil leaks from gear box	Blown shaft seal or gasket	Replace seals or gasket
Seal presents chronic problem	Plugged case drain	Disconnect end of case drain Connected to valve and clear line
Tong doors fail to open	Rotary is not in proper position	Align reversing pin with proper arrow
	Rotary plunger not functioning	Clean, regrease and check for a point of interference
	Improperly adjusted guide rollers	Adjust guide roller shafts
Rotary jams when making or breaking casing	Rotary plunger in pocket when torque was applied, or torque was applied too rapidly, not allowing plunger to depress	If possible, back up rotary until rotary plunger is in pocket (center front position). Operate per tong hanging instructions in "Installation." If rotary remains jammed, remove tong from pipe as shown below.
		Remove retainer bolt from bottom of each door. Pull open door (opposite door with jammed plunger), taking care to keep rotary closed.
		Placing a pry bar in space between jaws, force top door plate open and off jammed plunger, and open door.

## Overhaul

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Overhaul consists of disassembling the tong, examining each part, replacing any worn or damaged parts and then reassembling the tong. All damaged or worn parts are to be replaced with identical parts as identified in "Tong Disassembly and Parts" (Section 8).

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### **Disassembly**

Disassemble the tong only to the extent required for necessary part replacement and/or overhaul. To disassemble the tong, follow the exploded illustrations in the illustrated parts lists (Section 8).

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### **Reassembly**

Reassemble the component parts in the reverse order of disassembly. Service and adjust according to the maintenance instructions and test according to testing procedures.



A preoperation test of the Westco Model 16 casing tong is recommended subsequent to motor replacement or repair, control valve replacement or repair and major parts replacement.

During the testing operations, the operator should listen for any unusual noises or grinding and Watch for any misalignment or erratic operation.

### Free Run Test

For the free run test, perform a preoperation check (Figure 6-1). During the run test, the rotary should be free run for 15 minutes at both low and high speeds in "make" position, then repeated in "break" position. If anything out of the ordinary is suspected, stop and investigate before proceeding.

To perform free run operation, place the reversing pin in "make" position and place the shifting handle in low-gear position. "Crack" the throttle handle until the rotary attains approximately 10 rpm and hold for two minutes while observing rotary action and listening for any unusual noise. Slowly move the throttle handle to full open position and hold for two minutes. Return the throttle handle to a slightly open position and hold for two minutes. Return the throttle handle to neutral position, place the tong in high gear and repeat the slow-fast-slow sequence three times.

**NOTE:** The rotary plunger will make a click-clack noise as it passes the plunger pocket and the door junctions. This noise is expected when the tong is free running. If unusual noises do occur, check any parts that have just been repaired or replaced for misalignment, rubbing or grinding. Refer to "Troubleshooting".

Repeat the test procedure with the reversing pin in "break" position. Should a problem be indicated during the free run test, correct the problem and repeat the test to assure that the corrective action was effective.

**WARNING:** Under no circumstances should the throttle handle be tied or in any way secured in an operating position.

### Torque-Up Test

Performing the torque test (with jaw installed) normally requires access to a mandrel or test fixture. When a mandrel or test fixture is not available, a test should be run at the first opportunity on "in-hole" pipe or casing (refer to "Operation").

In "make" position, place the shifting handle in low-gear position. (For a tandem-gear motor tong, place the motor selector valve in low-speed position.) Slowly push the throttle handle forward. As the jaws begin gripping the pipe, observe both output torque and input hydraulic pressure to the tong. Output torque should be a direct ratio to input hydraulic pressure according to the ratios shown in Figure 1-6, Section 1, page 5 for the motor size installed on the tong.

Continue pushing the throttle handle forward until approximately 70 percent of the determined maximum torque is reached.

Back off the throttle handle, then advance to the 70 percent maximum torque. Repeat this step once.

Advance the throttle handle and run the pipe up to specified make-up torque. Break out of the joint and rerun to the required joint torque.

### **Figure 6-1: Preoperation Check List**

Door latch operates freely, rotary opens with doors and closes securely.

Shift handle operates freely, is securely mounted, and all cotter keys are in place. Handle stays in selected position.

Throttle handle operates freely, is securely mounted, and all cotter keys are in place. Handle moves to neutral position when released.

Gear box oil is up to level of upper magnetic plug hole.

Gears and rotary are fully lubricated with grease.

Mounting clevis is secure and tong is leveled. All hanging hardware is securely fastened.

All bolts and nuts are tight.

Fluid power source has been connected, and fluid has circulated for 2 minutes.

With shift lever in low gear position (no load) and reversing pin in "make" position, throttle has been advanced slowly (make up) until fully opened for a check of unusual noises.

Jaw installation requirements vary according to the size of pipe to be gripped. Three general jaw configurations are used with the 13-3/8 inch rotary and one configuration with the 16 inch rotary. Jaw sizes available are listed in Figure 7-11.

**WARNING: Do not attempt to remove or install jaws with power connected to the tong. Disconnect the 1 inch hose and turn power unit off prior to replacing jaws.**

Figures 7-1 through 7-8 provide guidance for jaw installation and parts listed as noted:

Figure 7-1 and 7-2	6-5/8 through 13-3/8 inch jaws
Figure 7-3 and 7-4	16 inch jaws
Figure 7-5 and 7-6	4 through 5-1/2 inch jaws
Figure 7-7 and 7-8 jaws	2-3/8 through 3-1/2 inch

During installation, disconnect the 1 inch hydraulic hose (pressure connection) and position the tong to allow access to the underside with both doors fully open.

### Auxiliary Cams

Auxiliary cams are required with jaws for 5-1/2 inch and smaller pipe. One auxiliary cam is required for sizes 4 through 5-1/2 inches. Three auxiliary cams are required for sizes 2-3/8 through 3-1/2 inches.

Install auxiliary cams by sliding the grooved flange onto the rotary flange and securing with the attached retainer pins. The flat faces of the pins must face the rotary strap to provide required clearance.

### Master Jaws

Install the drag magnet by holding the jaw upright and placing the magnet on the retaining pins with the grooved face of the magnet away from the jaw. Hold the magnet in place and slide the jaw onto the rotary or auxiliary cam. Insert the reversing pin to retain the jaw and allow the magnet to rest on the case drag beneath the jaw.

### Front Jaws

Hold the front jaws upright and slide the grooved jaw flange onto the rotary flange. Insert the retainer bolts through the jaws and between the springs in the rotary.

## Jaw Roller Size Check

Each jaw set assembly is provided with a roller sized to run standard new pipe or casing designated by the jaw size. When refurbished, worn or non-standard pipe is used, the jaws may not get a good grip on the pipe because the jaw roller does not move onto the secondary cam surface (come out-of-the-pocket) or conversely, the jaw roller overrides the pocket and goes to its extreme position (Figure 7-9). In either case, not enough force is exerted and the jaws may slip.

A visual indication of this situation is the relative position of the reversing pin in the reversing pin slot. Therefore, whenever beginning a run, the roller size should be checked after stabbing and high torque is applied. As torque reaches the desired maximum (or maximum delivered is less than required), visually check the position of the reversing pin against Figure 7-10.

Correct the indicated condition by using the next larger or smaller jaw roller as Indicated in Figure 7-11.

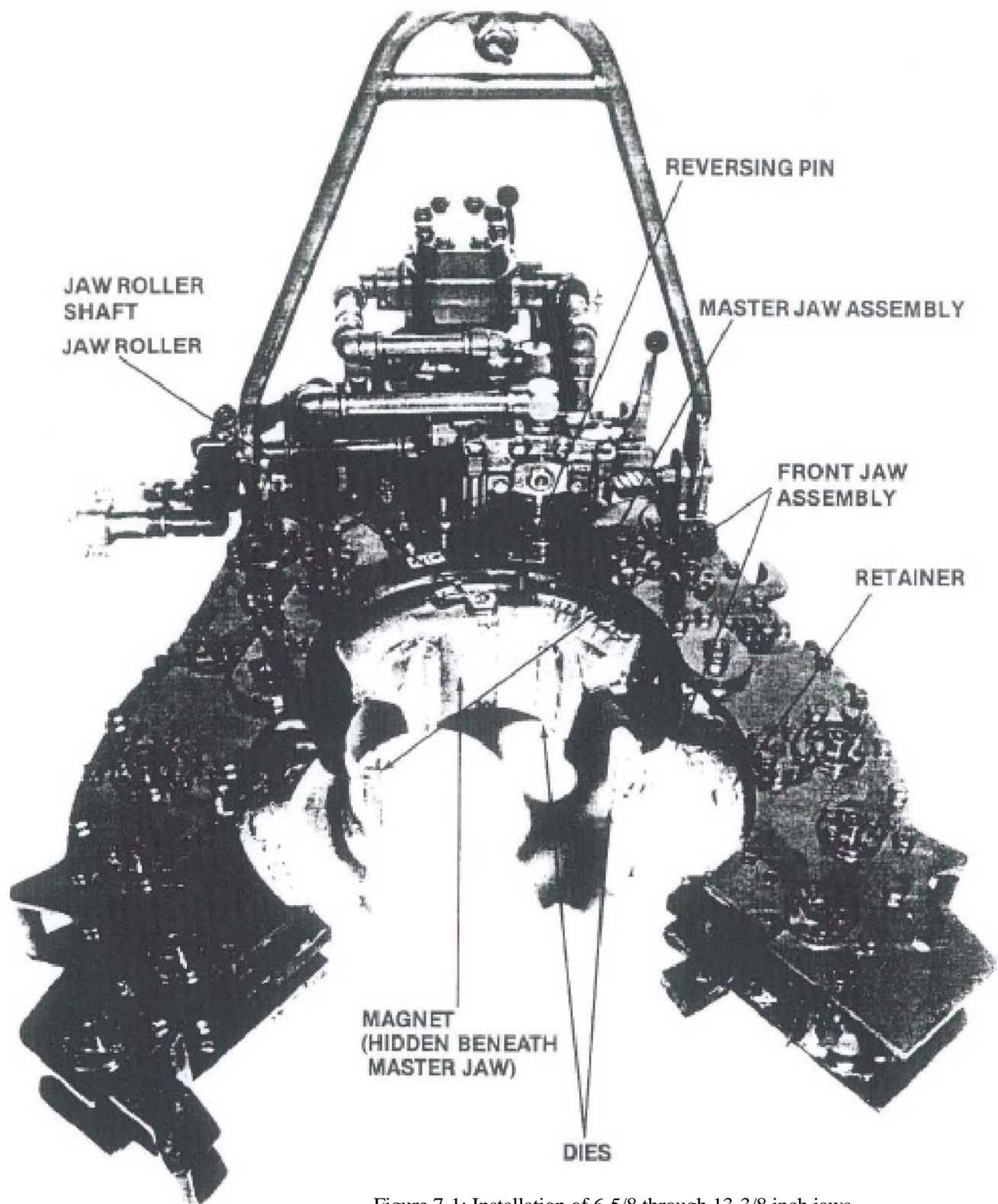


Figure 7-1: Installation of 6-5/8 through 13-3/8 inch jaws

Figure 7-2: Parts for 6 $\frac{1}{8}$ -through 13 $\frac{1}{8}$ -Inch Jaws

Pipe Size (inches)	Part No.	Description	Req'd No. per Jaw Set	Req'd No. per Master Jaw	Req'd No. per Front Jaw
6 $\frac{1}{8}$ -13 $\frac{1}{8}$	100051-001	Reversing Pin	1		
	100178-001	Magnet	1		
6 $\frac{1}{2}$	103757-001	6 $\frac{1}{2}$ " jaw set	X		
	100060-001	6 $\frac{1}{2}$ " master jaw assembly	1	X	
	100076-001	6 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	112166-001	Jaw roller shaft		1	
	100120-001	Contour die		3	2
	100114-001	Retainer			1
	7	103758-001	7" jaw set	X	
100061-001	7" master jaw assembly	1	X		
100077-001	7" front jaw assembly	2		X	
100107-001	Jaw roller — standard		1		
112166-001	Jaw roller shaft		1		
100120-001	Contour die		3	2	
100114-001	Retainer			1	
7 $\frac{1}{2}$	109598-001	7 $\frac{1}{2}$ " jaw set	X		
	100062-001	7 $\frac{1}{2}$ " master jaw assembly	1	X	
	100078-001	7 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	112166-001	Jaw roller shaft		1	
	100120-001	Contour die		3	2
100114-001	Retainer			1	
8 $\frac{1}{2}$	109599-001	8 $\frac{1}{2}$ " jaw	X		
	100063-001	8 $\frac{1}{2}$ " master jaw	1	X	
	100079-001	8 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	112166-001	Jaw roller shaft		1	
	100121-001	Contour die		3	2
100114-001	Retainer			1	
9 $\frac{1}{2}$	103762-001	9 $\frac{1}{2}$ " jaw set	X		
	100064-001	9 $\frac{1}{2}$ " master jaw assembly	1	X	
	100080-001	9 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	112166-001	Jaw roller shaft		1	
	100114-001	Retainer		—	1
100121-001	Contour die		3	2	
10 $\frac{1}{2}$	109587-001	10 $\frac{1}{2}$ " jaw set	X		
	100065-001	10 $\frac{1}{2}$ " master jaw assembly	1	X	
	100081-001	10 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	112166-001	Jaw roller shaft		1	
	100114-001	Retainer		—	1
	100119-001	Contour die		3	—
113145-001	Contour die			2	
11 $\frac{1}{2}$	109588-001	11 $\frac{1}{2}$ " jaw set	X		
	100066-001	11 $\frac{1}{2}$ " master jaw assembly	1	X	
	100082-001	11 $\frac{1}{2}$ " front jaw assembly	2		X
	100107-001	Jaw roller — standard		1	
	113313-001	Jaw roller shaft		1	
	100119-001	Contour die		3	
	100114-001	Retainer			1
113145-001	Contour die			2	

Figure 7-2: Parts for 6 5/8 through 13 3/8 Inch Jaws

Pipe Size (inches)	Part No.	Description	Reqd No. per Jaw Set	Reqd No. per Master Jaw	Reqd No. per Front Jaw
13 3/8	109592-001	13 3/8" jaw set	X		
	100067-001	13 3/8" master jaw assembly	1	X	
	100083-001	13 3/8" front jaw assembly	2		X
	100103-001	Jaw roller-standard		1	
	112167-001	Jaw roller shaft		1	
	100122-001	Flat die		3	
	109602-001	Flat die			2
	100114-001	Retainer			1

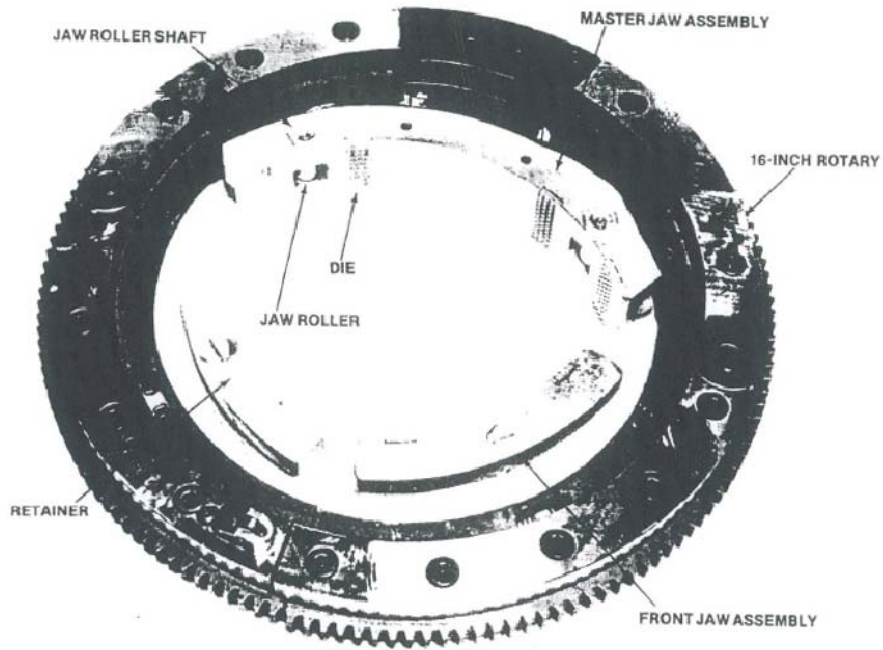


Figure 7-3: Installation of 16 inch jaw

Figure 7-4: Parts for 16 Inch Jaws

Pipe Size (inches)	Part No.	Description	Reqd No. per Jaw Set	Reqd No. per Master Jaw	Reqd No. per Front Jaw
16	109596-001	16" jaw set	X		
	100068-001	16" master jaw assembly	1	X	
	100084-001	16" front jaw assembly	2		X
	103343-001	Reversing pin	1		
	100103-001	Jaw roller-standard		2	
	101079-001	Jaw roller shaft		2	
	103347-001	Flat die		4	2
	101065-001	Retainer			1



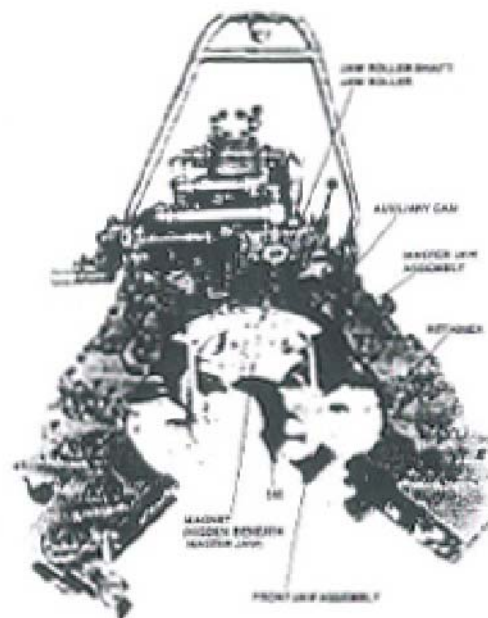


Figure 7-5: Installation of 4- through 5½-inch jaws

Figure 7-6: Parts for 4- through 5½-inch Jaws

Pipe Size (inches)	Part No.	Description	Req'd No. per Jaw Set	Req'd No. per Master Jaw	Req'd No. per Front Jaw
4 to 5½	111821-001	Auxiliary cam assembly	X		
	100051-001	Reversing pin	1		
	100178-001	Magnet	1		
4	100068-001	4" jaw set	X		
	103735-001	4" master jaw assembly	1	X	
	103736-001	4" front jaw assembly	2		X
	100105-001	Jaw roller		1	
	100110-001	Jaw roller shaft		1	
	100118-001	Contour die		3	2
4½	100114-001	Retainer			1
	100069-001	4½" jaw set	X		
	103737-001	4½" master jaw assembly	1	X	
	103738-001	4½" front jaw assembly	2		X
	100105-001	Jaw roller		1	
	100110-001	Jaw roller shaft		1	
5	100118-001	Contour die		3	2
	100114-001	Retainer			1
	100090-001	5" jaw set	X		
	103739-001	5" master jaw assembly	1	X	
	103740-001	5" front jaw assembly	2		X
	100105-001	Jaw roller		1	
5½	100110-001	Jaw roller shaft		1	
	100118-001	Contour die		4	2
	100114-001	Retainer			1
	100091-001	5½" jaw set	X		
	103741-001	5½" master jaw assembly	1	X	
	103742-001	5½" front jaw assembly	2		X
5	100105-001	Jaw roller		1	
	100110-001	Jaw roller shaft		1	
	100118-001	Contour die		3	2
	100114-001	Retainer			1

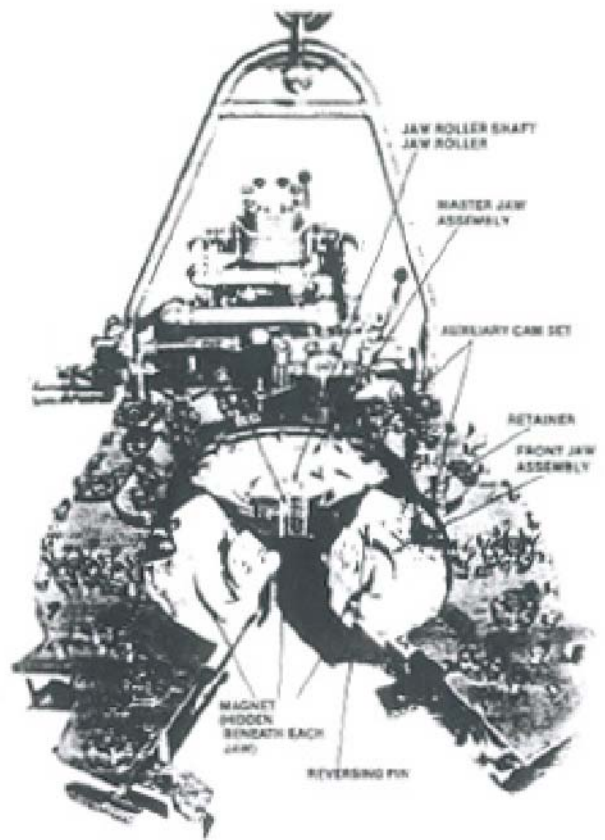


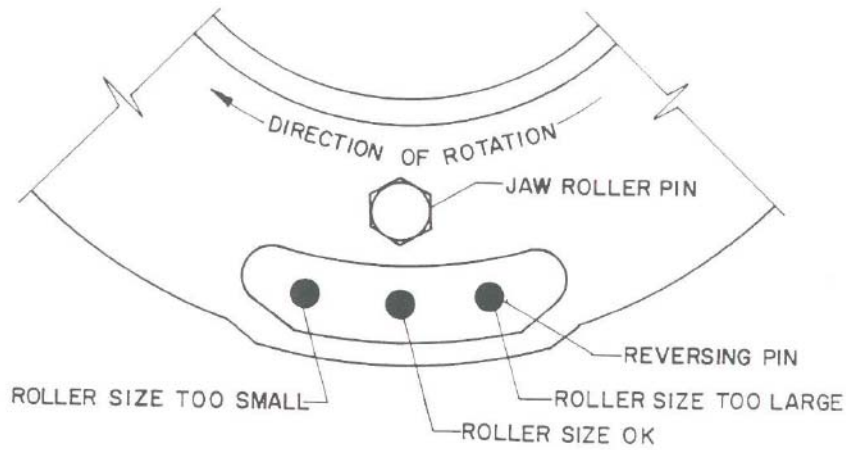
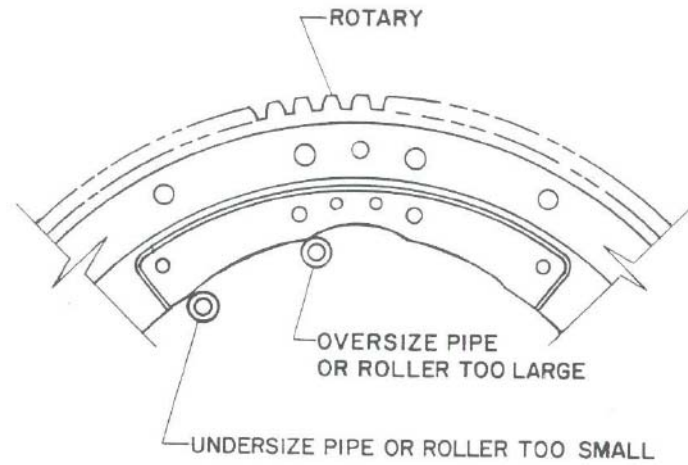
Figure 7-7: Installation of 2 1/8 through 3 1/2-inch jaw

Figure 7-8: Parts for 2 1/8 through 3 1/2-Inch Jaws

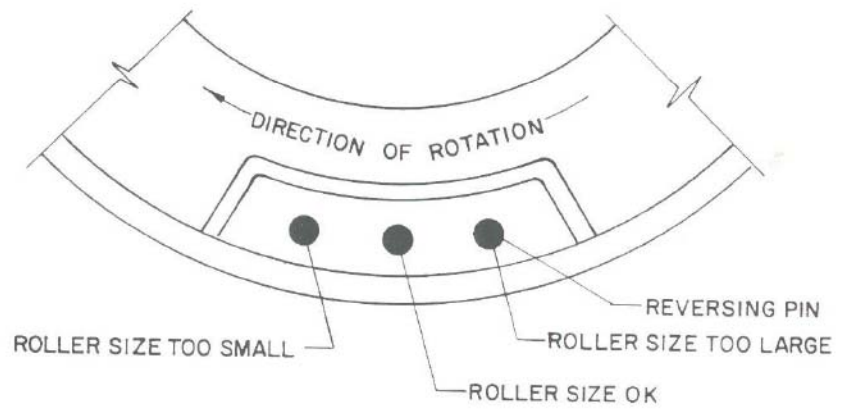
Pipe Size (inches)	Part No.	Description	Req'd No. per Jaw Set	Req'd No. per Master Jaw
2 1/8 to 3/8	101216-001	Auxiliary cam set	X	
	100051-001	Reversing pin	3	
	100178-001	Magnet	3	
2 1/8	100085-001	2 1/8" jaw set	X	
	103732-001	2 1/8" master jaw assembly	3	X
	100104-001	Jaw roller 1 1/2 DIA.		1
	100283-001	Jaw roller shaft		1
	100398-001	Contour die		2
2 3/8	100086-001	2 3/8" jaw set	X	
	103733-001	2 3/8" master jaw assembly	3	X
	100104-001	Jaw roller 1 1/2 DIA.		1
	100283-001	Jaw roller shaft		1
	100397-001	Contour die		2
3/8	100087-001	3 1/8" jaw set	X	
	103734-001	3 1/8" master jaw assembly	3	X
	100104-001	Jaw roller 1 1/2 DIA.		1
	100283-001	Jaw roller shaft		1
	100396-001	Contour die		2



Figure 7-9: Example of roller movement with undersized or oversized pipe or rollers



2<sup>3</sup>/<sub>8</sub>-THROUGH 13<sup>3</sup>/<sub>8</sub>-INCH JAWS



16-INCH JAWS

Figure 7-10: Reversing pin indication of undersized or oversized rollers

Table 7-11: Standard and Non-Standard Jaw Roller Sizes

Tubing/Casing Size (inches)	Applicable Jaw Size (inches)	Standard Jaw Roller Size (inches)	Useable Non-standard Jaw Roller Sizes (inches)*															
			1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	2	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>				
2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	X	X	X	X	X	X	X	X	X	X	X	X				
2 <sup>7</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	X	X	X	X	X	X	X	X	X	X						
3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	X	X	X	X	X	X	X	X	X							
4	4	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X							
4 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X							
5	5	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X							
5 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X							
6 <sup>5</sup> / <sub>8</sub>	6 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	7	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7 <sup>5</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7 <sup>3</sup> / <sub>4</sub>	7 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8 <sup>5</sup> / <sub>8</sub>	8 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8 <sup>3</sup> / <sub>4</sub>	8 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9 <sup>5</sup> / <sub>8</sub>	9 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9 <sup>3</sup> / <sub>4</sub>	9 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10 <sup>3</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11 <sup>3</sup> / <sub>4</sub>	11 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	X	X	X	X	X	X	X	X	X	X	X	X				
13 <sup>3</sup> / <sub>8</sub>	13 <sup>3</sup> / <sub>8</sub>	1	X	X														
13 <sup>1</sup> / <sub>2</sub>	13 <sup>3</sup> / <sub>8</sub>	1	X	X														
13 <sup>5</sup> / <sub>8</sub>	13 <sup>3</sup> / <sub>8</sub>	1	X	X														
16	16	1	X															

\*Cam roller sizes blocked out are not acceptable for use with jaw size noted. Use other sizes as applicable.

Table 7-12: Jaw Cam Rollers Available

Part No.	Jaw Roller Size
100103-001	1
103398-001	1 <sup>1</sup> / <sub>16</sub>
103399-001	1 <sup>1</sup> / <sub>8</sub>
100242-001	1 <sup>1</sup> / <sub>4</sub>
100243-001	1 <sup>3</sup> / <sub>8</sub>
100104-001	1 <sup>1</sup> / <sub>2</sub>
100105-001	1 <sup>5</sup> / <sub>8</sub>
100106-001	1 <sup>3</sup> / <sub>4</sub>
100107-001	1 <sup>7</sup> / <sub>8</sub>
100108-001	2
103344-001	2 <sup>1</sup> / <sub>16</sub>
103345-001	2 <sup>1</sup> / <sub>8</sub>
103803-001	2 <sup>3</sup> / <sub>8</sub>
103802-001	2 <sup>1</sup> / <sub>4</sub>

# Tong Assembly, Disassembly and Parts

## Section 8

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The Model 16 tong is designed for assembly/disassembly using normally available mechanics' tools. No special tools are required. As with any piece of equipment, the mechanic must familiarize himself with the equipment and nomenclature to avoid improper assembly and damage to the tong. Do not disassemble the tong or subassembly further than necessary to accomplish the required maintenance.

**WARNING: Do not attempt to perform any adjustment, repair or disassembly with the tong connected to a power source.**

The Model 16 tong has been separated into several major subassemblies as listed below.

Rotary assembly	Figures 8-1, 8-2, 8-3 and 8-4
Case assembly	Figures 8-5, 8-6, 8-7 and 8-8
Door assemblies	Figures 8-5, 8-6, 8-7 and 8-8
Gear box assembly	Figures 8-9 and 8-10
Motor assembly	Figures 8-11 and 8-12
Manifold assembly	Figures 8-13, 8-14, 8-15 and 8-16

## Disassembly

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The following item can be removed without disassembly of the case:

Rotary assembly	
Piping manifold	
Motor	
Gear box assembly	
Door assemblies	
Door hinge bearings	See Figures 8-6 and 8-8
Guide rollers	See Figures 8-6 and 8-8
Main drive pinion shaft cup and bearing	See Figures 8-6 and 8-8

## Rotary Assembly

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This procedure applies to both the 13 3/8 inch rotary assemblies.

**WARNING: Jaws must be removed prior to rotary disassembly.**

### Rotary Removal

Remove the three rotary retainer bolts from the underside of the case and doors. Place the tong on a flat surface, where it cannot tilt forward when doors are opened and the rotary is slid forward.

**WARNING: Do not allow doors to open as rotary may slide out if case is tilted while being positioned.**

Open doors fully. Fasten rotary plunger assembly (112414-001) in the down position and slide rotary forward until rear section is clear of case body. Attach sling, take up slack and slowly slide the rotary forward and out of case. Maintain support on front of rotary to prevent tilting (see Figure 8-1). Place rotary on blocks to allow access to underside.

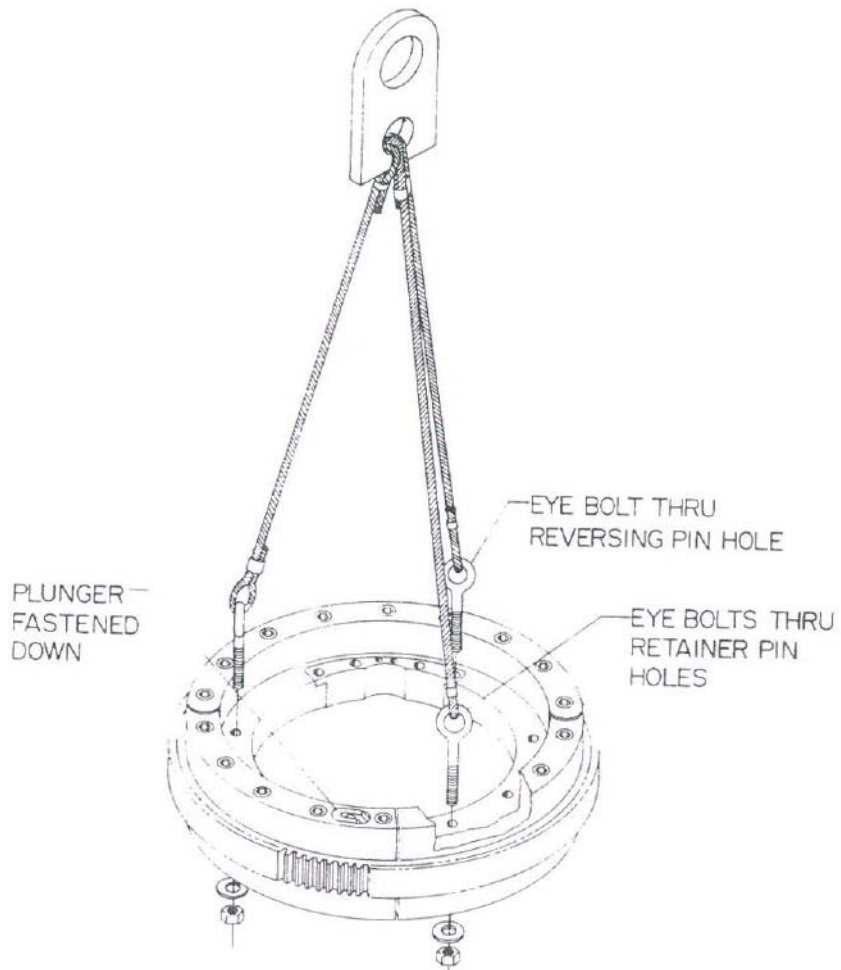


Figure 8-1: Preferred method of lifting rotary

**WARNING: Do not disassemble further unless necessary. The rotary is fabricated from three segments consisting of top strap, gear and bottom strap. All three pieces and segments are matched serialized sets. Interchange of segments can result in damage to tong components.**

Plunger assembly (112414-001) is removable by removing retaining bolt (112426-001) and lockwasher (190100-095).

Replace the assembly (112414-001) or roller (100046-001) and pin (190105-549) as required.

The cam inserts (112374-001) can be removed by removing the retainer bolts (190103-881) from the bottom.

Bushings (111786-001, 111785-001 and 100043-001) can be removed by pressing out with a drift pin.

**WARNING: In some models (111786-001) has a set screw in the rotary end.**

When replacing bushing, apply loctite stud lock to outer surface and press in place.

**WARNING: No further disassembly or repair is recommended.**

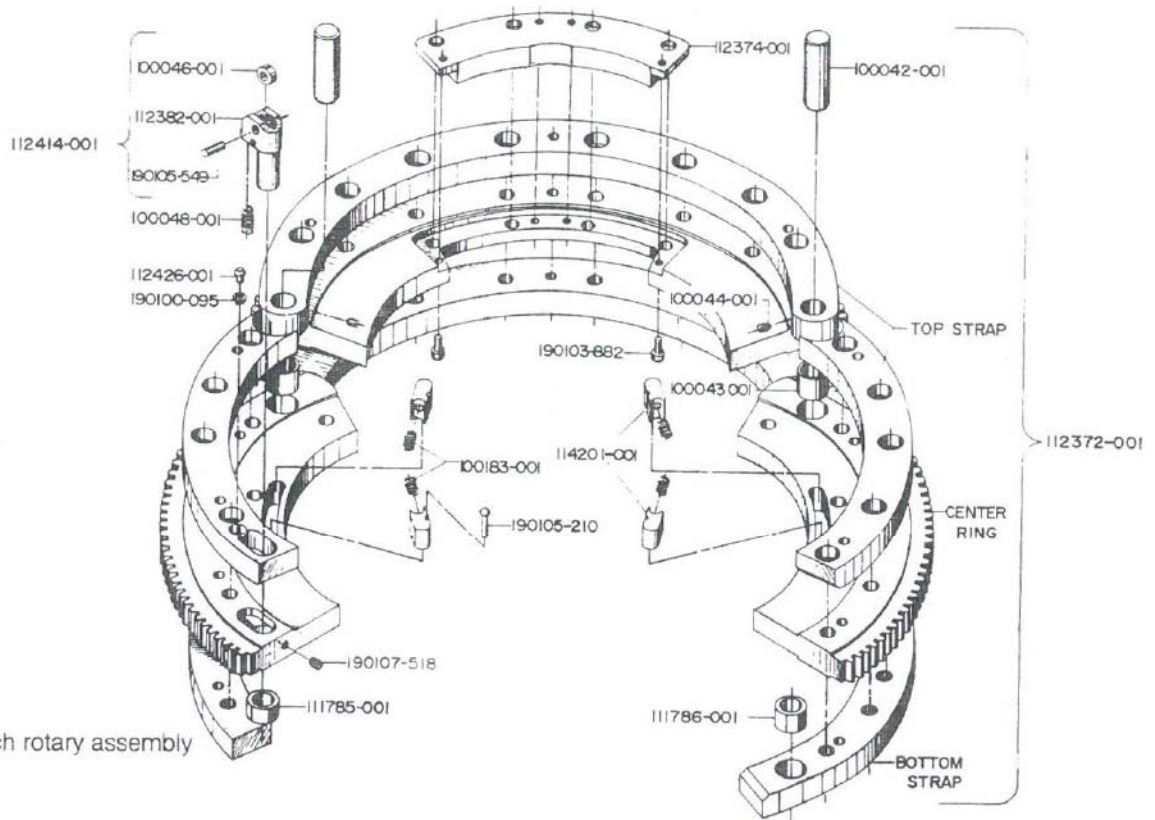


Figure 8-2: 13 3/8-inch rotary assembly

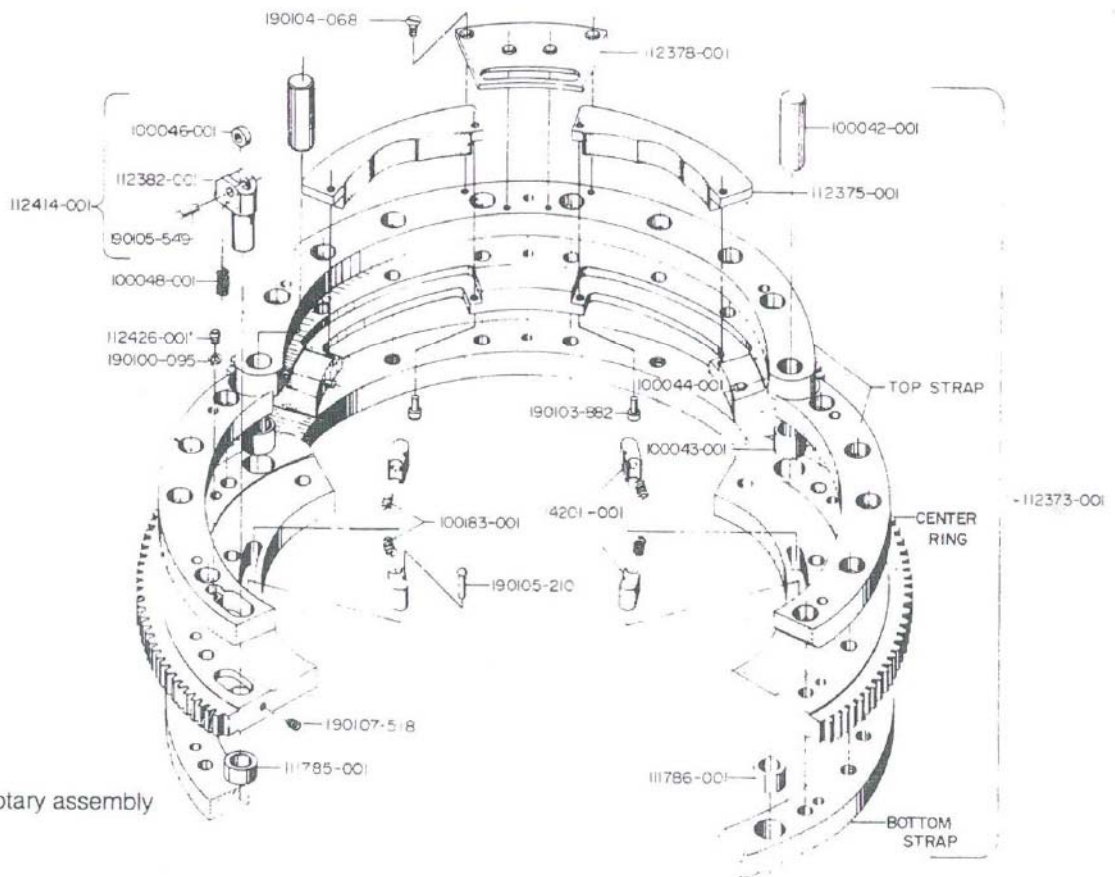


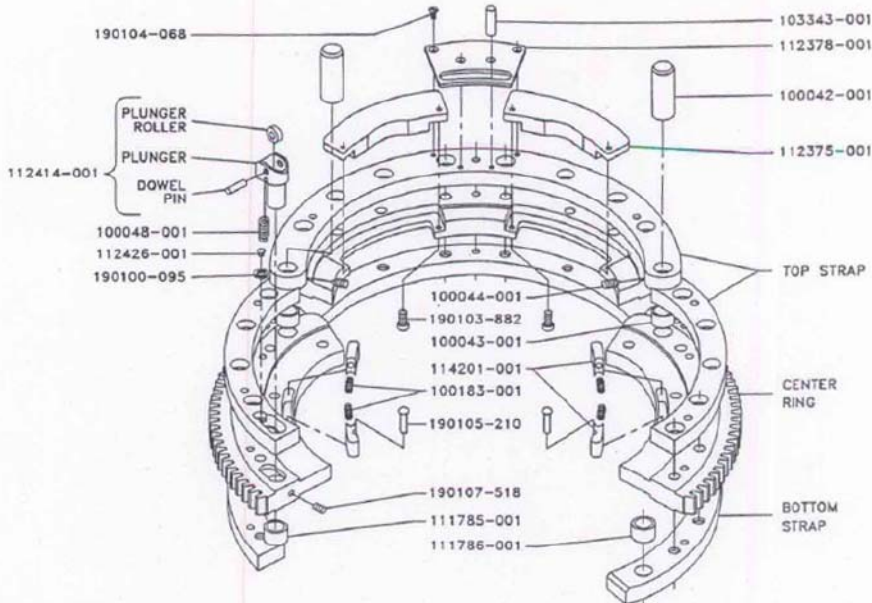
Figure 8-3: 16-inch rotary assembly



Figure 8-4: Parts for 16 Tong Rotary Assembly  
(Use with Figure 8-2 and 8-3.)

Part No.	Description	Quantity	Quantity
112372-001	Rotary assembly, 13 <sup>3</sup> / <sub>8</sub> -inch	X	-
112373-001	Rotary assembly, 16-inch	-	X
100042-001	Pin, rotary hinge	2	2
100043-001	Bushing, rotary hinge	2	2
100044-001	Set screw	2	2
100046-001	Roller plunger	1	1
100048-001	Spring, plunger	1	1
100183-001	Spring, rotary block	4	4
101161-001	Pin, taper	7	7
111785-001	Bushing, rotary plunger	1	1
111786-001	Bushing, rotary plunger	1	1
112374-001	Cam insert, 13 <sup>3</sup> / <sub>8</sub> -inch rotary	1	-
112375-001	Cam insert, 16-inch rotary	-	2
112378-001	Reversing pin plate	-	1
112382-001	Plunger	1	1
112414-001	Plunger assembly	1	1
112426-001	Capscrew, button hd.	1	1
114201-001	Block, spring	4	4
190100-095	Washer lock	1	1
190103-882	Capscrew, socket hd.	2	4
190103-942	Capscrew, socket hd.	17	17
190104-068	Capscrew, flat hd.	-	4
190105-210	Rivet, flat hd.	4	4
190105-549	Pin, dowel	1	1
190107-518	Setscrew	1	1

\*Part of 112414-001 Assembly



Part Number	Description	Qty
100007-001	Bearing, cluster gear	2
100016-001	Cone, bearing - guide roller	24
100017-001	Cup, bearing	24
100018-001	Roller, guide	12
100022-001	Bearing	4
100029-001	Gasket, guide roller shaft	12
100033-001	Bearing, roller	5
100052-001	Screw, rotary retainer	3
100177-001	Handle, tong	2
100246-001	Gear, jam - rotary drive pinion	2
100247-001	Plate, cover - jam counter	1
103294-001	Cup, main drive pinion bearing	1
111946-001	Cover, top case	1**
111947-001	Cover, bottom case	1**
111950-001	Side, case (right)	1**
111950-002	Side, case (left)	1**
111952-001	Side, curved case	2**
111954-001	Spacer, hinge	4**
111975-001	Shackle, 3/4"	1
112133-001	Side plate, lug door	1*
112135-001	Cover bottom, latch door	1*
112136-001	Side plate, latch door	1*
112137-001	Lug	1*
112174-001	Gear cluster	1
112358-001	Spacer, guide roller	12
112359-001	Spacer, guide roller	12
112919-001	Ear	3*
112919-002	Ear, lug door, top	1*
113030-001	Spring, latch	2
113034-001	Guard, door	2*
113035-001	Stop, lug door	1*
113750-001	Plate assembly, magnetic drag	1
113778-001	Cover, top, lug door	1*
113779-001	Cover, top, latch door	1*
113780-001	Pocket rotary plunger, latch door	1*
113780-002	Pocket rotary plunger, lug door	1*
114018-001	Latch	1
114022-001	Shim, ear	4*
114029-001	Hinge, door	4**
114038-001	Retainer door guard	2*
114041-001	Body assembly	1
114046-001	Latch door assembly	1
114047-001	Lug door assembly	1
114053-001	Bracket, torque gauge assembly	1

- \* Part of 114046-001 and 114047-001 assemblies.
- \*\* Part of 114041-001 assembly.



Part Number	Description	Qty
114068-001	Bracket, bail (left)	1
114068-002	Bracket, bail (right)	1
114081-001	Bail	1
114082-001	Leg	3**
114089-001	Cover, bottom, lug door	1*
114093-001	Washer, thrust	2
114164-001	Shaft, cluster gear	1
114165-001	Shaft, rotary drive pinion	2
114166-001	Shaft, guide roller	12
114167-001	Pin, latch	1
114230-001	Handle, door	2*
114489-001	Washer, thrust	3
115554-001	Bushing, door hinge	4
116867-001	Back, case body	1**
117385-001	Bolt, flat hd 5/8"-11 UNC X 3 LG	4
119003-032	Washer, thrust	1
119003-056	Washer, thrust	2
190100-027	Washer, flat 3/4" diameter	13
190100-075	Washer 3/4"	2
190100-151	Washer, lock 1/4"	10*
190100-153	Washer, lock 3/8"	70**
190100-155	Washer, lock 1/2" diameter	130*
190100-267	Washer, lock 1/2"	3*
190101-297	Nut, lock 5/8"-11 UNC	4
190101-298	Nut, lock 3/4"-10 UNC	15
190101-300	Nut, lock, heavy, hex	7
190102-151	Capscrew, hex hd 1"-8 UNC X 4 1/2" LG	1
190102-443	Capscrew, hex hd 1/4"-20 UNC X 5/8" LG	13*
190102-472	Capscrew hex hd 3/8"-16 UNC X 3/4" LG	2
190102-473	Capscrew, hex hd 3/8"-16 UNC X 7/8" LG	38*
190102-474	Capscrew, hex hd 3/8"-16 UNC X 1" LG	24
190102-502	Capscrew, hex hd. 1/2"-13 UNC X 1 LG	2
190102-503	Capscrew, hex hd 1/2"-13 UNC X 1 1/4" LG	28*
190102-504	Capscrew, hex hd 1/2"-13 UNC X 1 1/2" LG	74*
190102-505	Capscrew, hex hd 1/2"-13 UNC X 1 3/4" LG	1*
190102-506	Capscrew, 1/2"-13 UNC X 2.0 LG	28*
190102-557	Capscrew, 3/4"-10 UNC X 2.75 LG	2
190103-883	Capscrew, 3/8"-16 UNC X 3/4" LG	3
190103-884	Capscrew, hex socket 3/8"-16 UNC X 7/8" LG	4
190104-151	Capscrew, hex socket, flat hd, 5/8"-11 UNC X 1 1/2" LG	6**

\* Part of 114046-001 and 114047-001 assemblies.

\*\* Part of 114041-001 assembly.

Table 8-5 (continued)  
Tong Case Body/Door Assemblies

Figure 8-6: Tong case body/door assembly

Part Number	Description	Qty
190105-619	Dowel, pin 1/2" X 1" LG	4*
190105-621	Dowel, pin 1/2" X 1 1/2" LG	26*
190105-622	Dowel, pin 1/2" X 1 3/4" LG	8**
190105-623	Pin, dowel	4*
190107-301	Fitting, grease	1
190107-321	Fitting grease 45°	1
190107-322	Fitting, grease - straight 1/4"-28 UNF	13
190107-329	Fitting, grease 90°	3
190109-059	Ring, retainer	4
190109-159	Ring, retaining	2
190109-323	Ring, retaining	2

- \* Part of 114046-001 and 114047-001 assemblies.
- \*\* Part of 114041-001 assembly.

Table 8-5 (continued)  
Tong Case Body/Door Assemblies

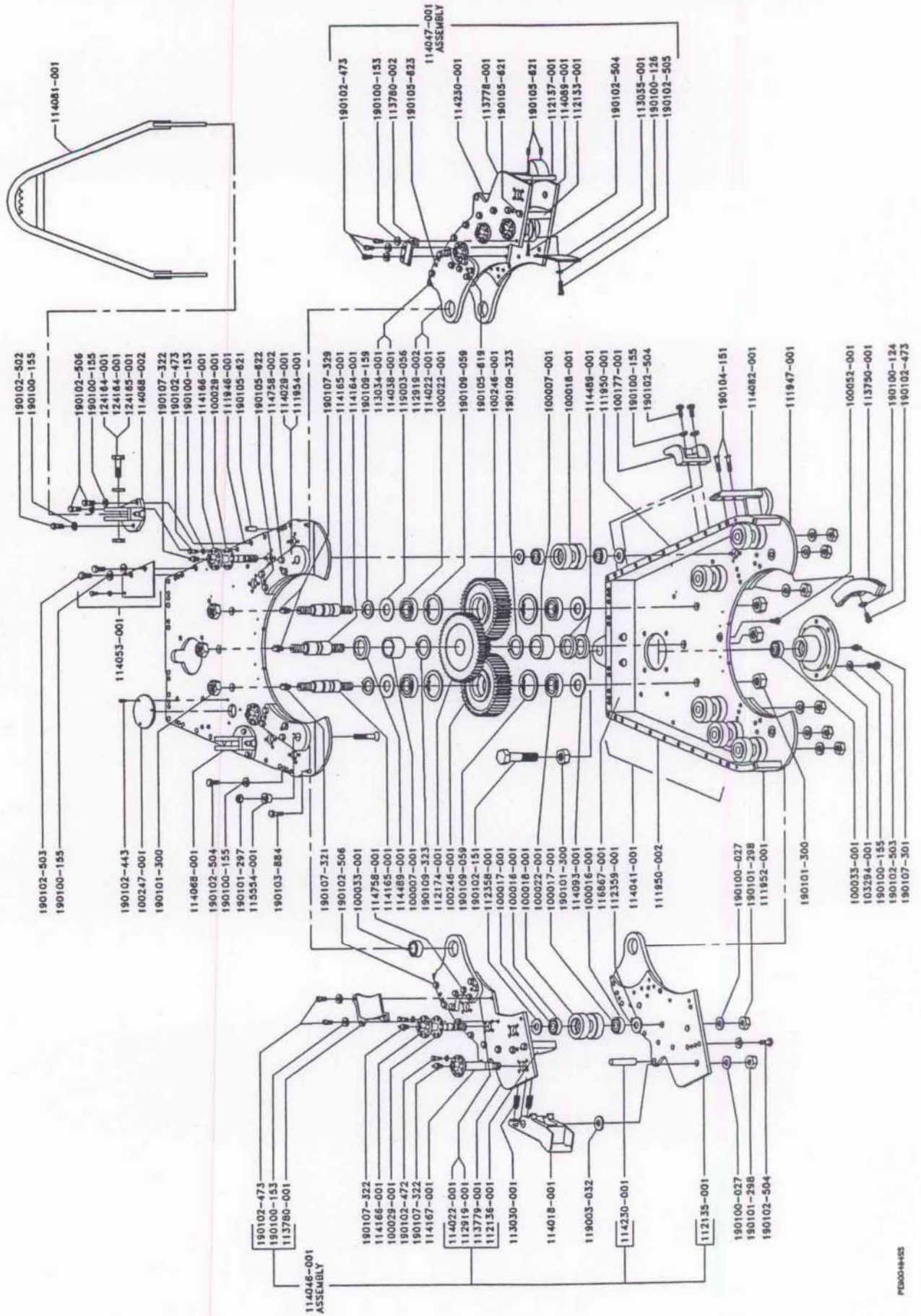


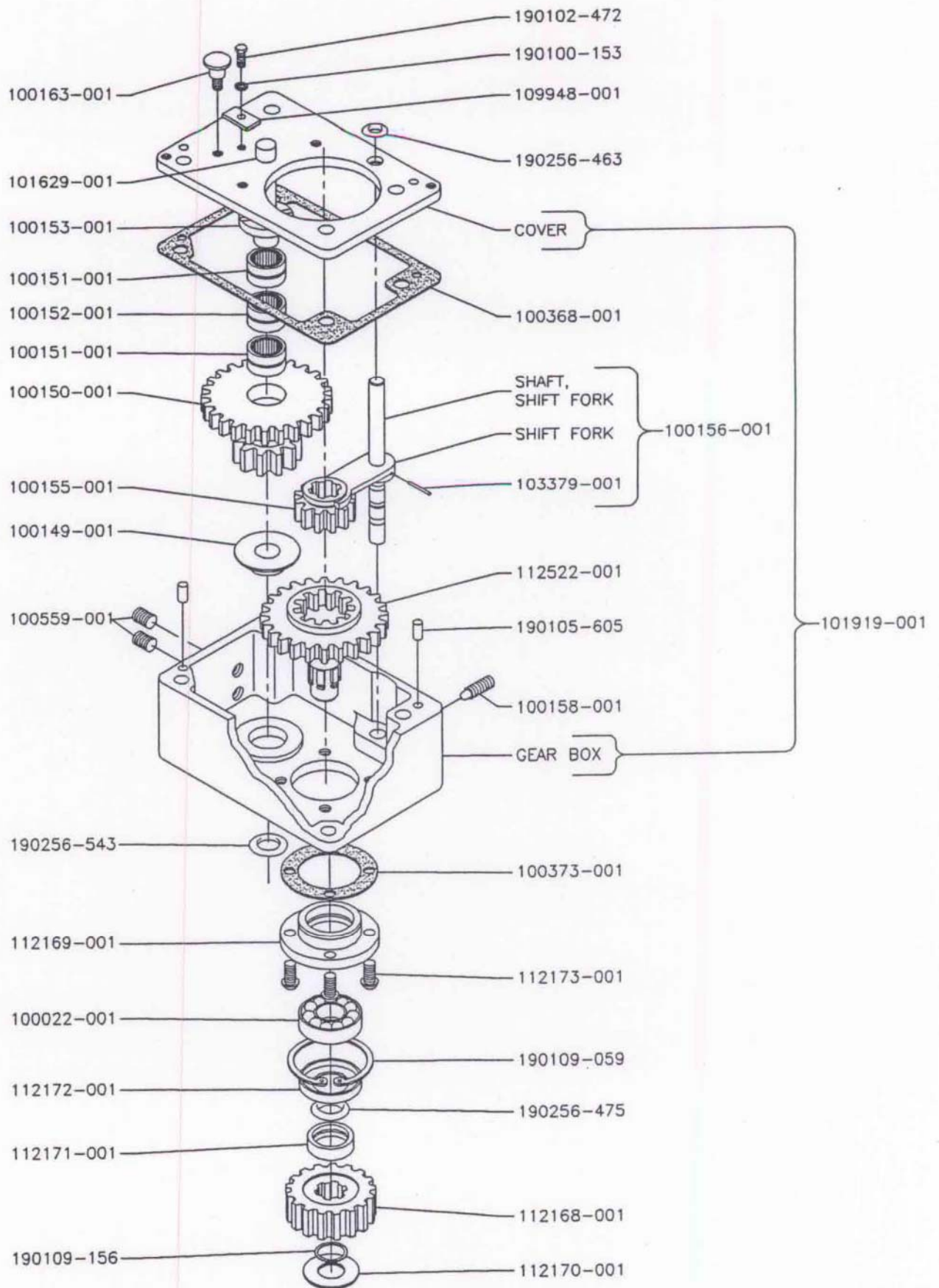
Figure 8-6  
Tong Case Body/Door Assembly

FD00044MS



Part Number	Description	Qty
100022-001	Bearing - pinion shaft - upper	1
100149-001	Bearing - cluster gear - thrust	1
100150-001	Gear, HI-LO cluster	1
100151-001	Bearing, HI-LO cluster gear	2
100152-001	Bearing, HI-LO cluster gear - narrow	1
100153-001	Washer, thrust - cluster gear - upper	1
100155-001	Gear, clutch	1
100156-001	Shift fork assembly	1
100158-001	Pin - locator assembly	1
100163-001	Breather - gear box	1
100368-001	Gasket - gear box cover	1
100373-001	Gasket - ext. ring to gear box	1
100559-001	Plug - magnetic	2
101629-001	Shaft, HI-LO cluster gear	1
101919-001	Gear box and cover assembly	1
103379-001	Pin	Ref
109948-001	Lock - cluster gear shaft	1
112168-001	Gear, pinion	1
112169-001	Retainer, extension, bearing	1
112170-001	Washer, thrust	1
112171-001	Spacer, bearing to gear	1
112172-001	Seal, pinion shaft	1
112173-001	Bolt, button, hd. socket	4
112522-001	Gear & pinion shaft assembly	1
190100-153	Lock washer 3/8"	1
190102-472	Capscrew, hx hd 3/8"-16 x .75 Lg	1
190105-605	Pin	2
190109-059	Snap ring - pinion shaft bearing	1
190109-156	Snap ring - pinion gear	1
190256-463	O-Ring - shifting fork	1
190256-475	O-Ring	1
190256-543	O-Ring	1

**Table 8-9**  
**Gear Box Assembly**  
**(Use with Figure 8-10)**



**Figure 8-10**  
**Gear Box Assembly (100394-002)**

Part Number	Description	Qty	Qty
114080-004	Motor Assembly, one stage	X	-
114080-005	Motor, two stage	-	X
112886-001	Bracket, shift handle	1	1
112887-001	Motor	-	1
100135-001	Stud, 1/2"-13 UNC x 6 LG	2	2
100371-001	Gasket	1	1
100372-001	Gasket, gear box	1	1
101931-001	Handle, shift	1	1
103361-001	Stud, 1/2"-13 UNC x 7 1/4" LG	2	2
111780-001	Motor, one stage	1	-
112885-001	Block, shift fork	1	1
190100-155	Washer, lock	4	4
190101-005	Nut hex	4	4
190102-504	Capscrew, hex hd	2	2
190105-038	Clevis pin, 1/8" x 3/4"	2	2
190105-500	Clevis pin, 3/8" x 1.0	2	2
190105-732	Clevis pin, 3/8" x 1.0	1	1

Table 8-11  
Motor Assembly  
(Use with Figure 8-12)

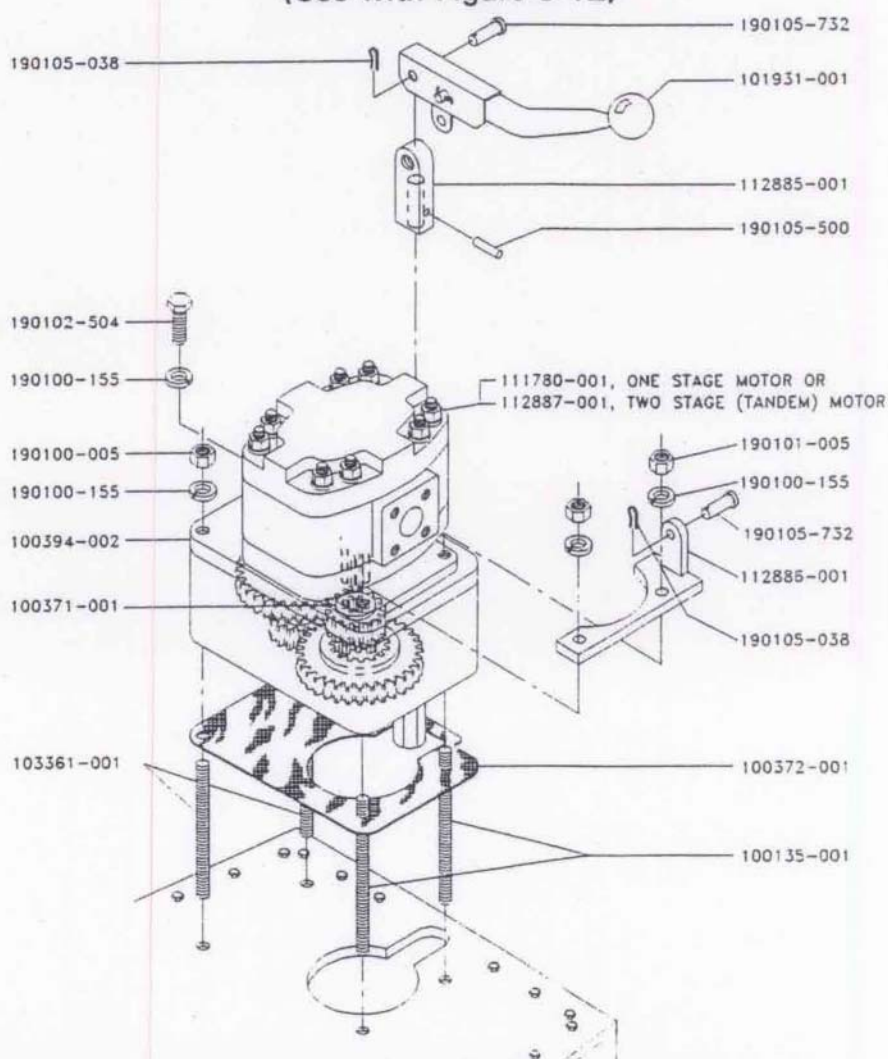


Figure 8-12  
Motor Installation



Part Number	Description	Qty
100175-001	Valve, speed control	1
100573-001	Nut, tru-seal - 1" NPT	12
101932-001	Handle, throttle assembly	1
112525-001	Bracket, mount-valve	2
112907-001	Assembly, hose - 1" ID X 13 1/8" OAL	2
112908-001	Adaptor, 45° - 1" NPT	1
112911-001	Adaptor, swivel	2
112912-001	Ell, 90° Swivel - 1" NPT	2
113939-001	Assembly, hose 1/4" ID X 14" OAL	2
113942-001	Valve, 4-way, 1/4" NPT	1
114071-001	Bracket, mounting manifold	1
114077-001	Assembly, hose 1/4" ID X 18" OAL	2
114085-001	Tee, 1" NPT	2
114504-001	Nipple, 1" NPT X 3" OAL - CHAMFER 30°, ASTM A-53	1
114680-001	Bracket, 4-way valve	1
119000-011	Rod, all thrd, 1/2"-13 UNC X 3 1/2" OAL, CARBON STL.	4
124155-001	Nipple, 1" x 9.5" OAL SCH 80 ASTM A-53	1
190050-417*	Nipple 1" NPT X Close - SCH 80, ASTM A-53	1
190050-420	Nipple 1" NPT X 3 OAL - SCH 80, ASTM A-53	1
190050-422	Nipple, 1" NPT X 4 OAL - SCH 80, ASTM A-53	2
190050-428	Nipple, 1" X 8", SCH 80, ASTM A-53	1
190050-430	Nipple, 1" NPT X 10" OAL-SCH 80, ASTM A-53	1
190050-583	U-bolts w/nuts, 5/16"-18 UNC	2
190051-326	Ell, 90° X 1" NPT - 3000 PSI ASTM A-105	4
190051-342	Ell, 90° Street 1/4" NPT	1
190051-453	Bushing, 1" NPT X 1/4" NPT - 3000 PSI, ASTM A-105	2
190051-455	Bushing, 1 1/4" NPT X 1" NPT - 3000 PSI, ASTM A-105	1
190100-152	Washer, split lock 5/16"	4
190101-005	Nut, hex - 1/2"-13 UNC-2A	14
190102-458	Capscrew, hex hd. 5/16"-18 UNC X 7/8"	4
190102-514	Capscrew, hex hd. 1/2"-13 UNC X 4 1/2" LG	2
190302-306	Coupling, hose - 1" NPT	1
190302-307	Coupling, hose - 1 1/4" NPT	1
190302-554	Plug, dust - 1"	1
190302-555	Plug, dust - 1-1/4"	1
190302-604	Adaptor, 90°-1/4" NPT	5
190302-748*	Joint, swivel - CHICKSAN 1" NPT	2
190302-902	Adaptor, straight 1/4" NPT	2
190302-952	Adaptor 45°, 1/4" NPT	1

\* Optional Accessory

**Table 8-15**  
**Manifold Assembly**

(This part list applies to tongs with tandem motors. Use with Figure 8-16)



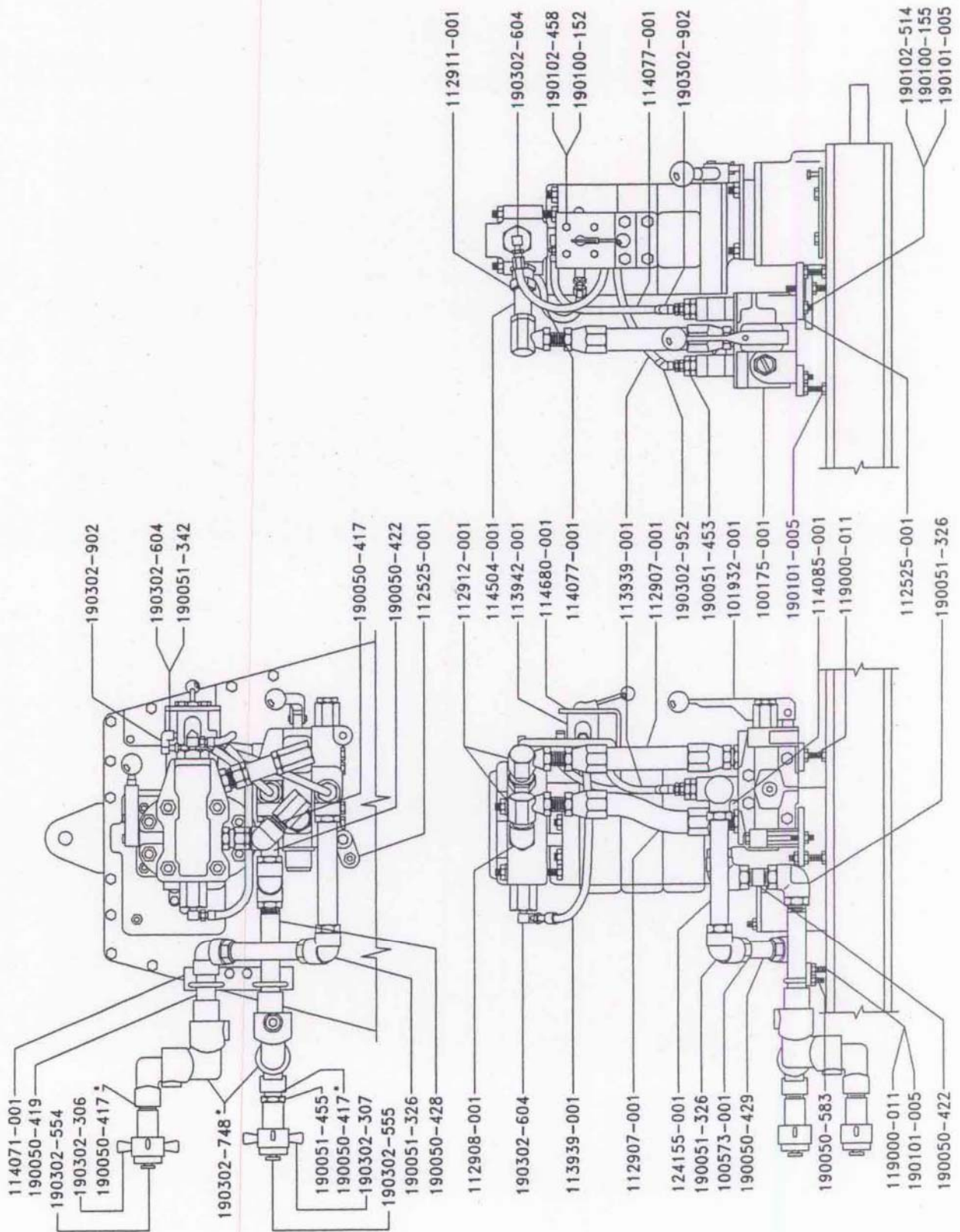


Figure 8-16  
Manifold Assembly (tandem motor)

Part Number	Description	Qty
100181-001	Spring, hanger	1
101932-001	Handle , throttle	1
103643-001	Cylinder, hydraulic	1
103644-001	Valve flow control	1
103646-001	Coupling, quick disconnect, female half	4
103647-001	Coupling, quick disconnect, male half	4
103649-001	Dust plug	1
103650-001	Dust cap	1
103664-001	Valve, work section control	1
103692-001	Hose assy, high pressure with fittings x 30.0 LG	1
103693-001	Hose assy	1
111964-001	Capscrew, 1/2"-13 UNC x 7.0 LG hex hd grade 8	4
111975-002	Shackle, .62 with .75 diameter screw pin	1
111975-006	Shackle, .75 with .88 diameter screw pin	1
124099-001	Valve, control and hydraulic lift	1
190050-383	Nipple, 1/2" NPT x Close	5
190051-279	Reducer, 3/4" x 1/2" NPT	2
190051-344	Elbow, St 90° 1/2" NPT, 3000 PSI	4

Table 8-21  
Lift Assembly  
(Use with Figure 8-22)

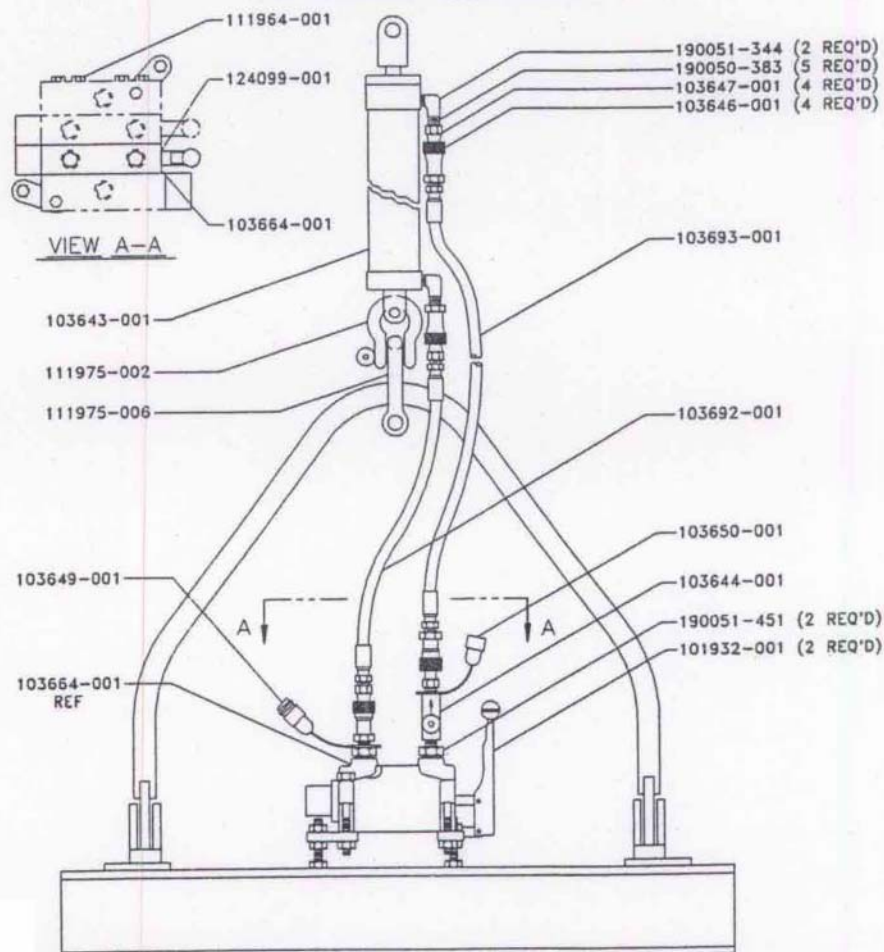
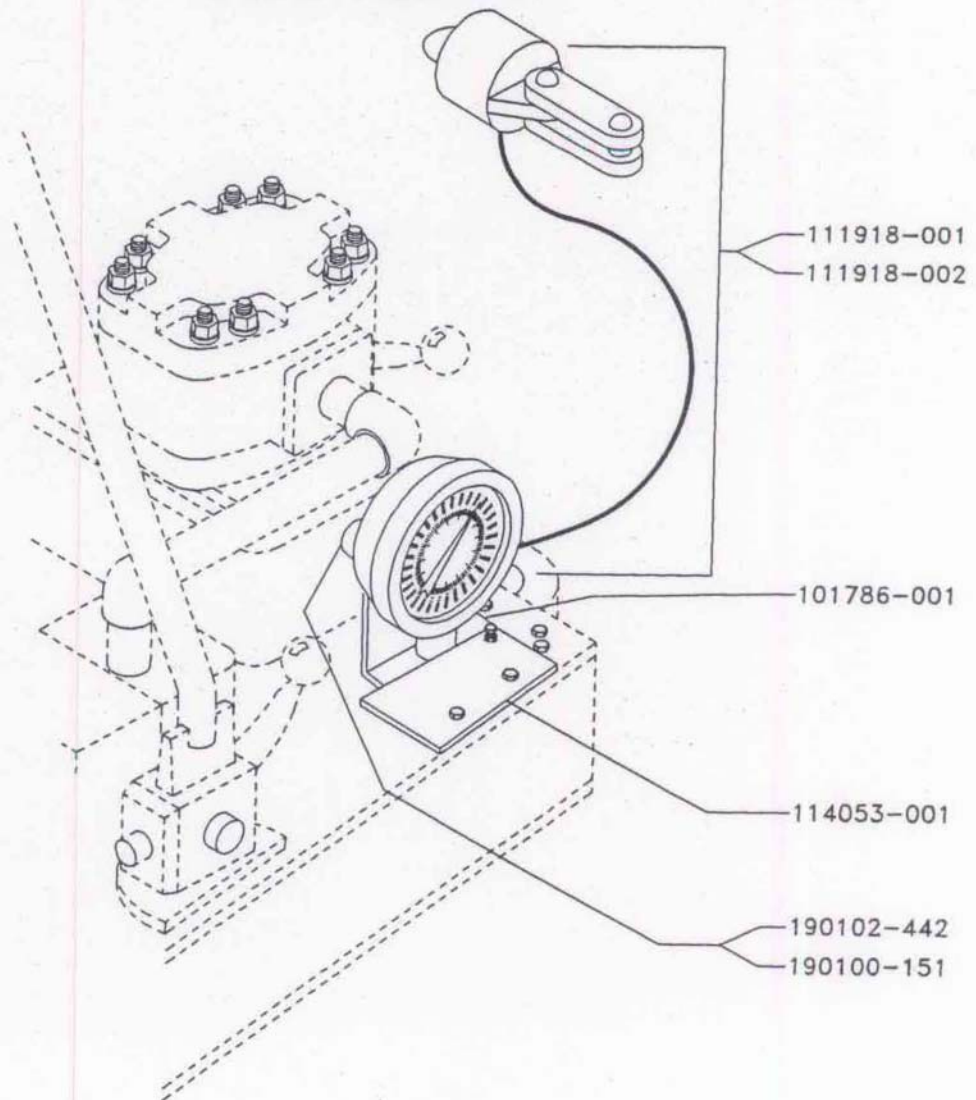


Figure 8-22  
Lift Assembly



Part Number	Description	Qty
101786-001	Torque gauge fastener plate	1
111918-001	Torque gauge - 30,000 ft. lbs	1
111918-002	Torque gauge - 20,000 ft. lbs.	1
114053-001	Bolt, torque gauge assy	1
190102-442	Capscrew, hex hd 1/4"-20 UNC x .50 LG	3
190106-151	Lockwasher, hel spring, 1/4"	3

**Table 8-23**  
**Torque Gauge**  
**(Use with Figure 8-24)**



**Figure 8-24**  
**Torque Gauge**