



**HYDRAULIC POWER TONGS**  
**KT 20,000 CASING TONG & BACK-UP**

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KT20,000  
November 17, 1998

Rev. C



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## REVISION TRACKING

<u>Revision</u>	<u>Date</u>	<u>Page #</u>	<u>Description</u>
0	September 10, 1998		
A	October 1, 1998	all	-Complete Revision
B	October 20, 1998	all iv II-1 II-4 II-7-8 II-10 II-12 II-13 II-19 II-22-23 II-24, II-26 II-47 – 50 Section III	-new pg. No. system -inclusion of Revision Tracking - Modified Appendices List -20" door part # -Cam Followers and holders modified -Tong (Outer Assembly) Part # changed -Remote Backing Pin not size specific - Changed part # on index 7 and 13 -Revised Pressure Chart -Revised Jaw Chart -Warning on 7" Jaw Identification drawing - Modified parts and added part # 's - Addition of V40 Control Valve Components
C	November 17,1998	I-1 I-9 I-10-11 I-14 I-16-18 II-12 II-12-18 II-18 II-22	- added SI (metric) equivalents - two more warning were added - added more cross-references to clarify - expanded on gauge workings - corrected, clarified and eliminated redundancy - removed side designation (left, right) on bearing pivot arm (both sides similar) - modified part indexes - added bottom clutch bushing and shifting yoke (#174 & #176) - added <i>Standard Jaw Configuration</i> Illustration
	March 03,1999	I-9A	-addendum to page 9
	July 12, 2000	II-22	-added note

## **INTRODUCTION**

This FARR tong and back-up system is sturdy and powerful. It will give you years of outstanding performance. Simple maintenance and care will extend its life and insure a continuing level of excellent performance and reliability.

This manual will assist you in giving your tong and back-up the care a fine machine deserves. **Please read the manual and observe maintenance instructions.**

Replacement parts are readily available from FARR Canada Ltd. in Edmonton Alberta. However, most of the parts that are subject to wear or damage are standard items likely to be found in supply stores or parts depots. Many parts are transferable between FARR tongs.

Should you need replacement parts, or should you experience any difficulty not covered in this manual, please contact:

FARR Canada Ltd.  
14755-121A Avenue  
Edmonton, Alberta  
Canada T5L 2T2

Phone #: (403) 453-3277  
Fax #: (403) 455-2432

**Note: Effective January 25, 1999, the area code for Edmonton is changing from (403) to (780).**



**This symbol will be used throughout this manual. When it appears, particular attention should be given as to what is being stated for safe, reliable operation.**

## SECTION I – OPERATION & MAINTENANCE SPECIFICATIONS – Tong & Back-Up

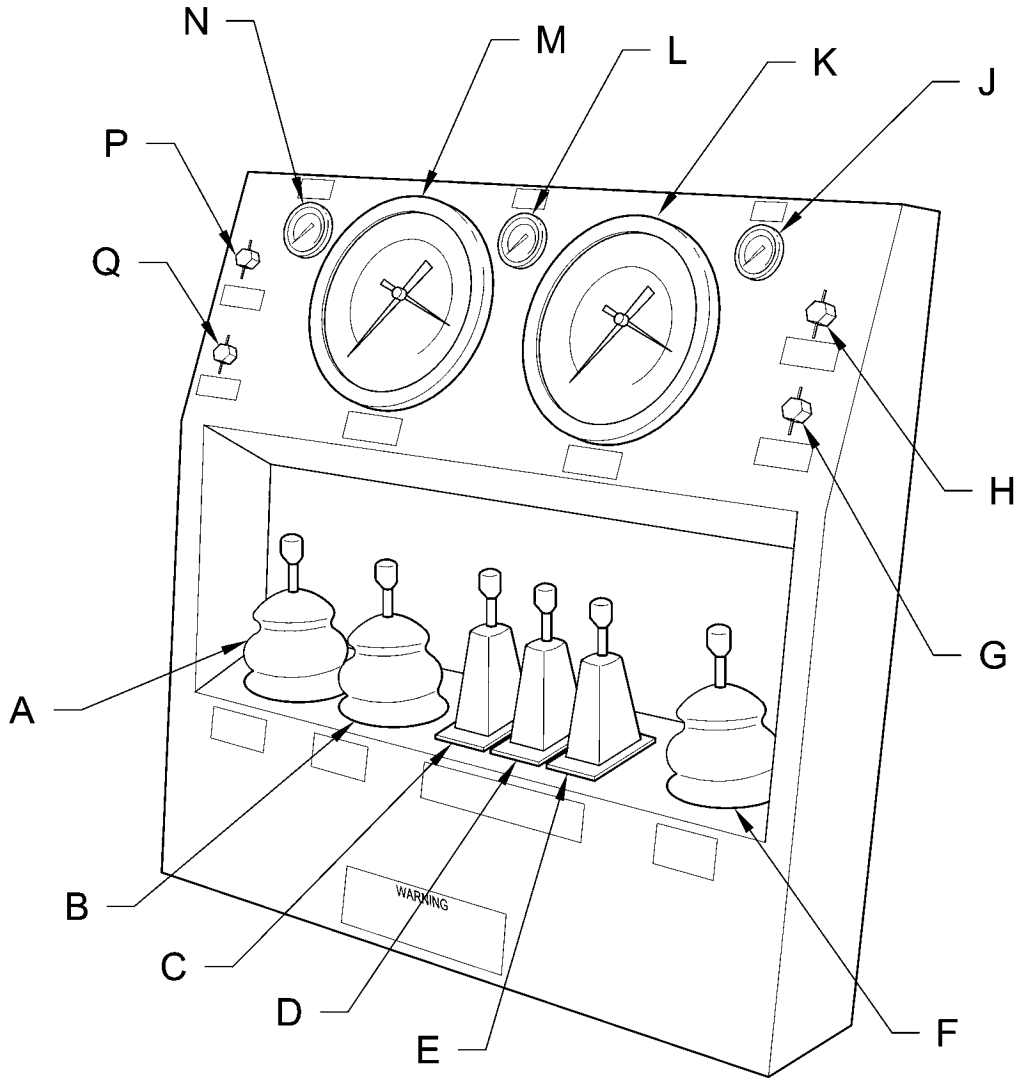
Torque Range: High Gear	7,500 ft-lbs. / 10,440 Nm
Low Gear	50,000 ft-lbs. / 68,750 Nm
Maximum RPM at 60 GPM	High: 40 RPM Low: 6 RPM
§ Maximum Flow	60 GPM / 227.12 LPM
Maximum Relief Pressure	2500 PSI / 17,236.9 KPa
Length	74 in. / 188 cm
Overall Width	60 in. / 152 cm
Height	63 in. / 160 cm.
Space Required on Pipe	10 in. / 25.4 cm
Maximum Elevator Diameter	Unlimited (tong comes off pipe)
Torque Arm Length	
Centre Line of Pipe to Centre Line of Anchor Handle	52 in. / 132 cm
Weight (excluding jaws)	9,200 lbs. 4,173 Kg.
Jaws Available	See Appendix C

§ **GPM refers to U.S. gallons per minute.**

## **OPERATION**

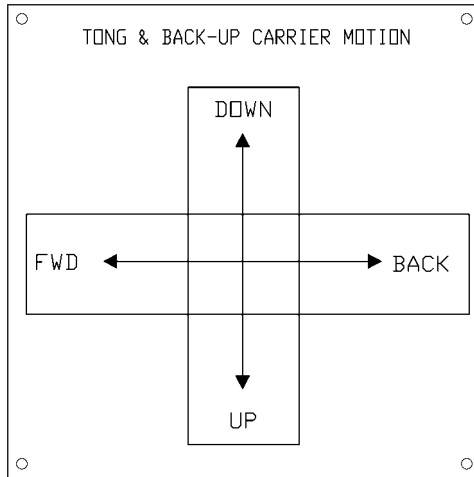
The operation of a FARR Hydraulic Power Tong and Back-Up requires the operator to know how to use the controls in a safe and effective manner. This section will show where to find the Power Tong and Back-Up controls and how to use them.

### **TONG & BACK-UP CONTROLS**



The remote control console cabinet contains all the controls for the operation of the tong, back-up and suspension.

**A. Tong and Back-Up Carrier Motion**

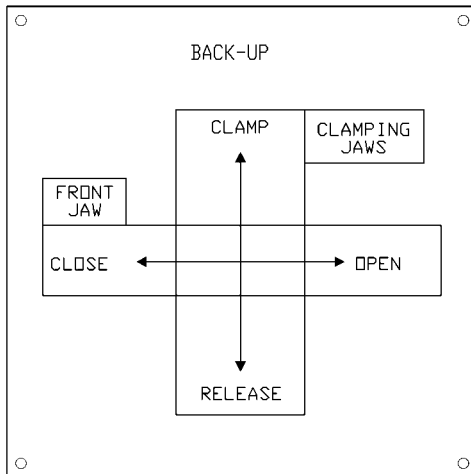


Pull the joystick UP to raise the tong and back-up; push DOWN to lower. To move the assembly forwards (from rear to tong mouth), push FWD, BACK for reverse.

**WARNING** Ensure no personnel are in the way of the moving tong.

**Note:** On the *Left-hand* controller, FWD and BACK designations on the face-plate are reversed to correspond with the changed perspective.

**B. Back-Up Control**



There are two jaws on the back-up. To open the front gate, pull the joystick to the right, to close, to the left.

**WARNING** Rear master jaw must be fully retracted before opening the front gate. Failure to do this may cause serious internal damage.

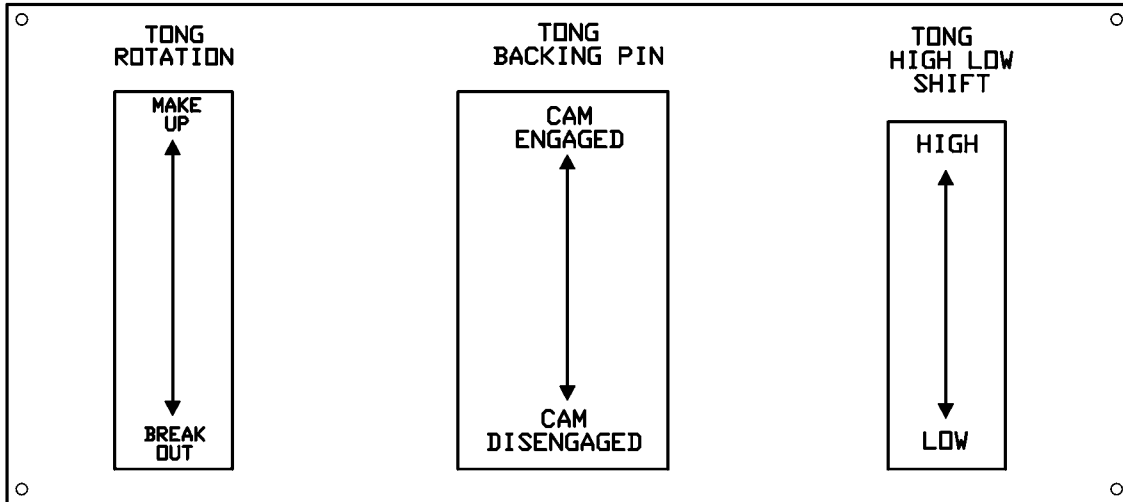
To clamp the pipe, push up to engage the clamping jaws; to release, pull down.

**WARNING** The front gate must be closed before moving rear clamping jaws to clamp pipe.



### C. Tong Rotation

The tong turns in two directions. To *MAKE UP*, push the joystick up; to *BREAK OUT*, pull down. The farther the joystick is from center the faster the tong will rotate in the appropriate direction.



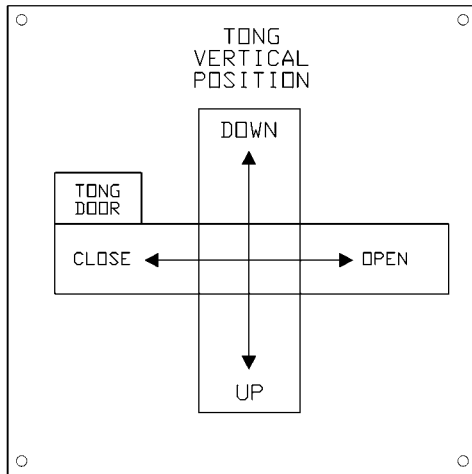
### D. Tong Backing Pin

In order for the jaws to engage in the appropriate *make* or *break* direction, the backing pin must be in the appropriate position. This is accomplished by engaging the backing pin cam just prior to turning the tong. To engage the cam to change backing pin position, push up; to disengage pull down. **WARNING** This must be achieved in low gear. It is recommended that the cam be disengaged after pin position has changed.

### E. Tong High / Low Shift

The tong has two drive gears, high and low. Pushing the joystick up to high will up-shift the tong to high gear, pulling down to low will downshift the tong to low gear. **WARNING** Any changes in rotation, etc. should be effected in LOW gear prior to shifting to HIGH gear.

**F. Tong Vertical Position / Tong Door Control**



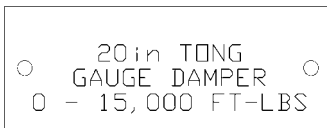
The tong assembly moves up from the back-up by pulling *UP* on the joystick, down towards the back-up by pushing the joystick *DOWN*. The tong door opens by moving the joystick to the right, left to close.

**WARNING** Do not operate the door when personnel are near the door.

The swinging door is a safety hazard and care should be taken to avoid hitting/ pinching anyone or anything with it.

**WARNING** The tong will not turn if the door is not fully closed.

**G. 20-in. Tong Gauge Damper (0-15,000 ft-lbs)**



Tighten the knob to restrict gauge needle movement, loosen to increase needle sensitivity.

**H. 20-in. Tong Gauge Damper (0-60,000 ft-lbs)**



Tighten the knob to restrict gauge needle movement, loosen to increase needle sensitivity.

**J. Pilot Pressure Gauge**



Displays the working pressure of the joystick controllers.

**WARNING** Pressure must not exceed 400 psi or damage will occur.

**K. 20-in. Tong Torque Gauge**



Displays the torque produced by the 20" tong on the pipe.

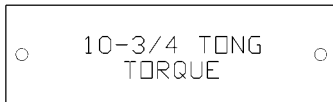
**L. Back-Up Clamp Pressure Gauge**



Displays the working pressure for the back-up clamp.

**WARNING** See clamping pressure chart (Appendix B) for appropriate pressure for a particular pipe size and weight.

**M. 10-3/4 in. Tong Torque Gauge**



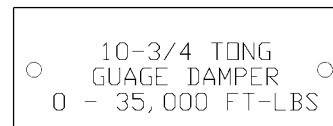
Displays the torque produced by the 10-3/4" tong on the pipe.

**N. Hydraulic System Pressure Gauge**



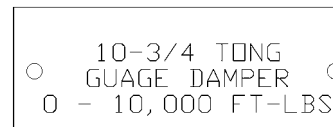
Displays the hydraulic pressure of the tong assembly.

**P. 10-3/4 in. Tong Gauge Damper (0-35,000 ft-lbs)**



Tighten the knob to restrict gauge needle movement, loosen to increase needle sensitivity.

**Q. 10-3/4 in. Tong Gauge Damper (0-10,000 ft-lbs)**



Tighten the knob to restrict gauge needle movement, loosen to increase needle sensitivity.

## START-UP CHECKLIST

✓ **TONG CLEAR**

Is the tong clear of anything that may get in its way? Are any personnel in the way of any moving parts?

✓ **HOSE CONNECTIONS**

Prior to starting the hydraulic system, an inspection should be made to ensure proper lube oil levels in the engine, and hydraulic oil in the hydraulic reservoir. Open the by-pass valve on the hydraulic system. Check all pressure and return line hose connections to ensure they are securely installed.

✓ **TEST TONG**

With the tong in low gear, rotate the tong slowly forward and then in reverse. Open and shut the tong door, and engage and disengage the sliding jaw for the back-up.

✓ **INSTALL JAWS**

**WARNING**

The hydraulic system must be OFF prior to jaw installation.

With the tong and back-up ready to run, install the correct jaws and dies in both the tong and back-up. Now, start-up the hydraulic system. The tong is now ready to run pipe.

✓ **TONG FLOAT TEST**

With tong in low or high gear and tong lift cylinders at the halfway point, rotate the tong in the brake direction. The tong should not move up (away from back-up) without an upward force being applied. If it does, or doesn't move up with an applied force, the float manifold needs to be readjusted (see Float Manifold Installation and Set-up Procedure).

With tong in low or high gear and the tong lift cylinders extended, rotate the tong in the make direction. The tong should float down very slowly. If this does not happen, the float manifold needs to be readjusted (see Float Manifold Installation and Set-up Procedure).

## PERIODIC CHECKLIST

✓ **SHIFTING SHAFT**

The shifting yoke is secured to the shifting shaft by one lock nut on the bottom of the yoke. Ensure that this lock nut is on securely.

✓ **TORQUE GAUGE ASSEMBLY**

Periodic calibration of the torque gauge is recommended to ensure accurate torque readings. When having the torque gauge serviced and calibrated, it is important to note that the arm length on the FARR 20 KT with compression load cell assembly is 53 inches.

✓ **BACKING PIN**

It is recommended that after each job, the backing pin be visually inspected for wear or cracks. If stress cracks or excessive wear exists, the pins should be replaced. The cam travel surface should also be cleaned and greased between jobs.

# **WARNINGS!**

## **Backing Pin Operation:**

- **WARNING** ***The Cage Plate and Rotary Gear opening must be aligned when installing or shifting the Backing Pin!*** Without proper alignment the Pin may fail to shift and or the soft rollers may be damaged. When properly installed (i.e.: the pin installed while the cage plates and rotary gear openings are aligned) the malfunction can not occur during normal shifting of the pin using the ramp, it may occur if the pin is shifted manually without the proper alignment.
  
- When using the Ramp to shift the Backing Pin the Rotary Gear and Cage Plate are aligned and moving together as the pin is moving up the ramp. As the engaged pin is freed from the slot the second pin is now in its slot. At this point you will see the Rotary Gear moving, the Cage Plate will have stopped moving until the second pin has traveled to the end of its slot.  
**WARNING** ***The operator must leave the ramp in position until the cage plate moves a 1/8 of a turn.*** This ensures the second pin has completely engaged into the slot.
  
- **WARNING** ***The Backing Pin must never be shifted while in high gear. Use low gear only!***
  
- **WARNING** When necessary, the adjustment of the spring plunger should be checked to ensure proper engagement of backing pins. With pivot arm in neutral position, turn spring plunger clockwise until it makes contact with the pivot arm. Then turn the spring plunger  $\frac{3}{4}$  turn clockwise and tighten locknut. Finally, check to ensure free movement of backing pins by hand.
  
- **WARNING** Always ensure the backing pin assembly is clear of the backing pin cam engagement area before engaging the cam.
  
- **WARNING** Always ensure the cage plate and rotary gear are aligned when installing or manually changing the direction of the backing pin to ensure the pin goes into its correct slot.

**WARNING**

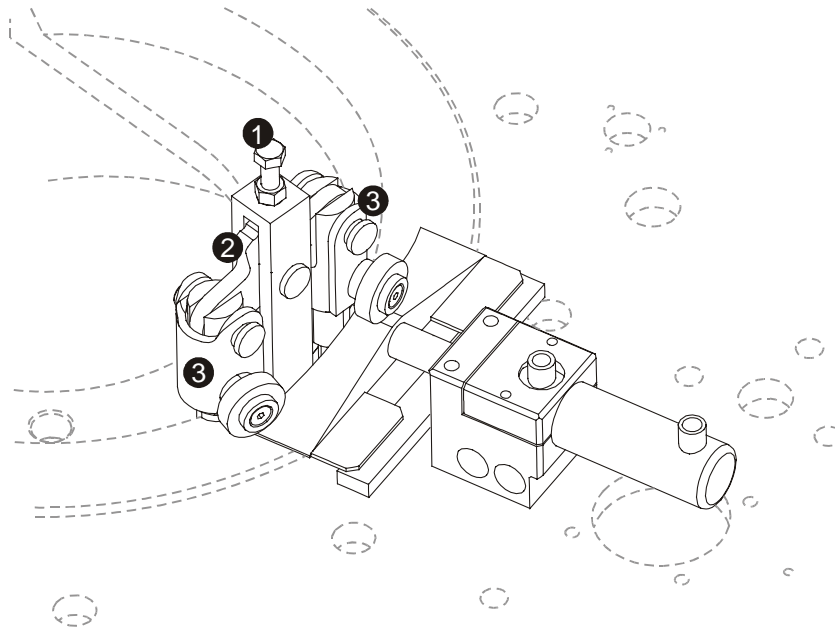
When using the remote backing-pin changing mechanism the following 2 conditions must be adhered to.

1. The ramp cylinder must be fully extended before attempting to change the backing pin direction.
2. The brake bands must not be over-tightened.

**Failure to do these things may result in damage to the assembly.**

If the brake bands are overly tightened they can be checked with the following procedure:

1. Back off the spring plunger **1** on the rocker arm assembly such that it does not impede the pivot motion of the pivot arm **2**.
2. Engage one of the backing pins **3** in either make up or break out mode.
3. Rotate the tong in the opposite direction of intended operation until the rotary gear is flush (aligned) with the cage plates.
4. Stop the rotation, taking care as not to reverse the rotation of the rotary gear.
5. Manually attempt to push the backing pin rocking arm assembly into the alternate position.
6. If the backing pin will not go into the alternate position without undo force the brake bands are too tight & must be loosened, *refer to page I-25*.
7. Repeat the procedure again until the backing pin can be manually maneuvered into the alternate position with reasonable force.
8. After successful completion of inserting the backing pin, the spring plunger must now be set to accommodate the new position. Slowly thread the spring plunger down until the pin at the end of the spring plunger contacts the bottom of the indentation of the pivot arm. Test this position and make adjustments as required.



## “MAKE-UP” CASING

For proper make-up of a casing joint, the following procedure should be used:

1. **POSITION TONG ASSEMBLY OVER CASING.** The back-up unit should be centered over the casing with the tong and back-up doors open. Close the tong and back-up using the tong door control (Joystick F), and the back-up control to close the front jaws (Joystick B).
2. **ENGAGE CASING WITH BACK-UP.** With the proper jaws installed (see Jaw and Die Installation/Removal), engage the clamping jaw of the back-up using the back-up clamp control (Joystick B) on the operator control panel.

**Note: Adjust clamping pressure by adjusting the relief valve on the side of the back-up. See Clamping Pressure Chart (Appendix B) for appropriate pressure for pipe size and weight.**

3. **ENGAGE CASING WITH TONG.** With the casing in place, and the tong door closed, ensure backing pin is set for make or break of pipe (Joystick D). To make-up casing, raise tong to the top of the float by pulling down on Tong Vertical Position (Joystick A). Select tong rotation speed high/low range (Joystick E). Engage tong via the tong rotation control (Joystick C).
4. **RELEASE THE THROTTLE.** Now that the connection has been made, stop applying torque by centering the Tong Rotation Joystick (Joystick C).
5. **DOWNSHIFT TONG SPEED.** Set the tong rotational speed to low, and push the tong rotation joystick up to “make-up”. Continue to make-up casing to desired torque.
6. **DISENGAGE JAWS.** Rotate the tong until the jaws have disengaged and the opening of the rotary gear aligns with the door opening. Disengage the back-up clamping jaw from pipe using Joystick B.

**WARNING** Move the rear jaw all the way to the back of the back-up before opening the door.

7. **OPEN DOORS.** The tong can now be cleared from the pipe by opening both doors using the back-up control to open the front jaws (Joystick B), and the tong door control to open the tong door (Joystick F).



## “BREAK-OUT” OF CASING

For proper break-out of a casing joint, the following procedure should be used:

1. **POSITION TONG ASSEMBLY OVER CASING.** The back-up unit should be centered over the casing. Ensure the tong and back-up doors are open. Close the tong and back-up using the tong door control (Joystick F), and the back-up control (Joystick B) to close the front jaws.
2. **ENGAGE CASING WITH BACK-UP.** With the front jaw of the back-up closed, engage the rear jaw using the back-up control joystick (Joystick B). Pull the joystick down to engage the rear jaws.

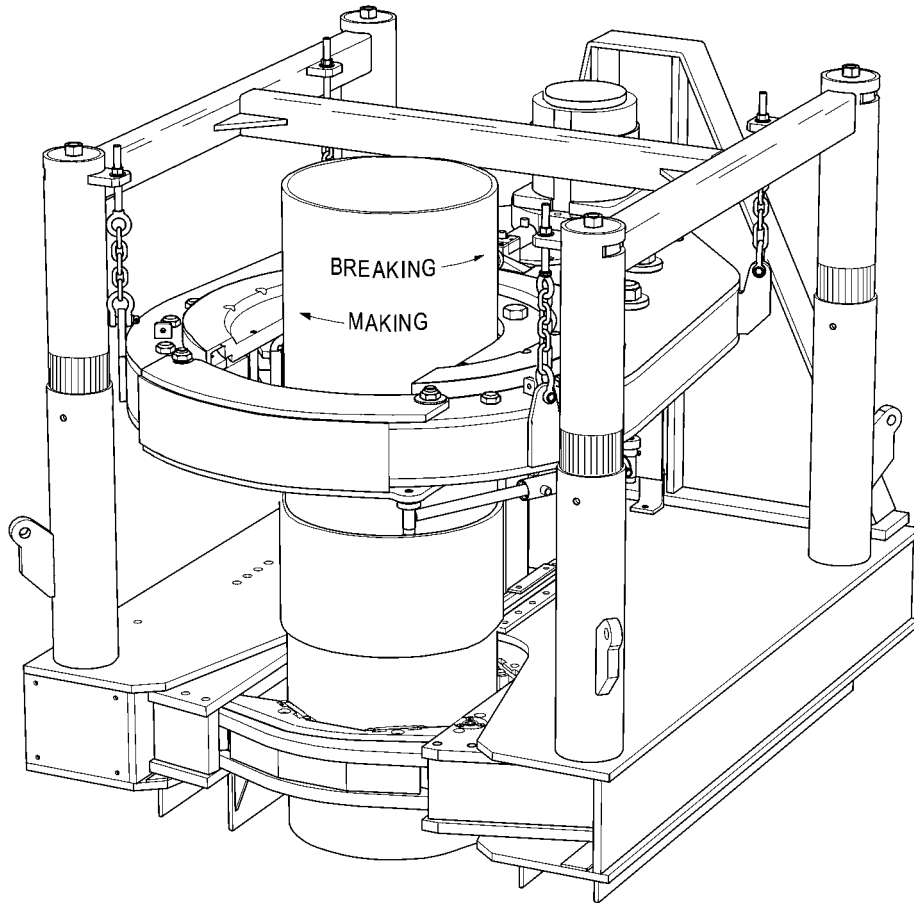
**WARNING** Ensure that the proper pressure is set on the rear jaw by adjusting the relief valve on the side of the back-up.

3. **ENGAGE CASING WITH TONG.** Lower tong to back-up (Joystick A) before engaging pipe. With the casing in place, and the tong door closed, push the tong backing pin joystick (Joystick D) up so that the cams can engage the jaws. Ensure that the tong is in low gear (Joystick E); pull the tong rotation joystick (Joystick C) down to the “break-out” position. This will rotate the casing, causing the threads to begin to break-out.

**Note: To break-out pipe, lower tong to back-up before engaging pipe.**

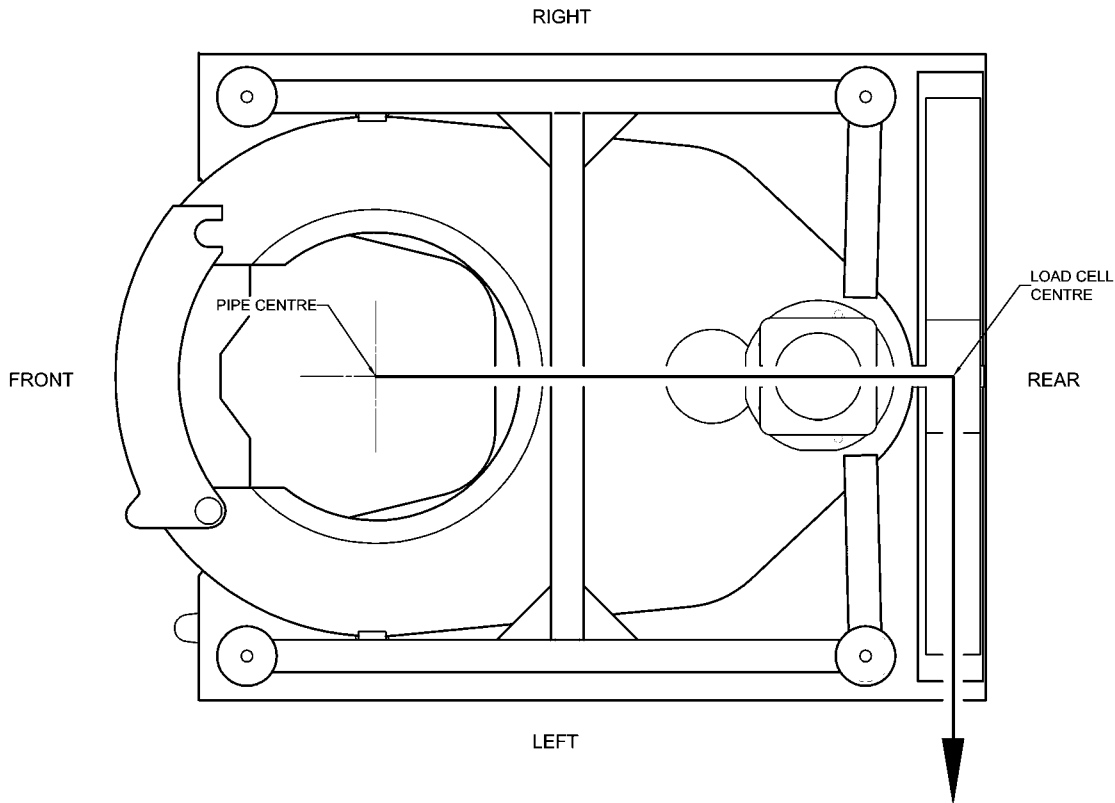
4. **RELEASE THE THROTTLE.** Now that the connection has been broken, stop applying torque by centering the tong rotation joystick (Joystick C).
5. **TONG SPEED.** Set the tong rotational speed to high (Joystick E), and push the tong rotation joystick (Joystick C) up to “break-out”. Continue to rotate the casing until free.
6. **DISENGAGE JAWS.** Rotate the tong until the jaws have disengaged and the rotary gear aligns with the door opening.
7. **OPEN DOORS.** The tong can now be cleared from the pipe by opening both doors using the back-up control (Joystick B) to open the front jaws, and the tong door control (Joystick F) to open the tong door.

**WARNING** Ensure that the rear jaw of the back-up is fully retracted before opening the door.

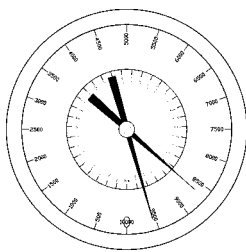


**CONCEPTUAL ILLUSTRATION OF *MAKE* AND *BREAK* DIRECTIONS**

## TORQUE MEASUREMENT



The tong is suspended, enabling it to rotate around pipe center whenever engaged. There is a compression load cell located at the rear of the tong that is used to measure the applied torque of the tong.



The compression cell is connected to the display gauge on the control cabinet for the operator to view. There are two torque measurement gauges (*K* and *M* on *Tong Controls*), one for the 10-3/4 in. tong (shown) and one for the 20-in. tong. Each gauge has been calibrated for the correct load arm length, giving the torque to read in foot-pounds.

The correct position of the load cell for “make-up” is with the load plate facing the right side of the tong. To “break-out” (disconnect) casing, the tong will turn in the opposite direction and the load cell must be repositioned if you require the “break-out” torque. Simply unscrew the load cell and turn it around so that it faces in the opposite direction to measure torque in the opposite direction.

See the maintenance section of the manual for instructions to re-load the torque gauge system with hydraulic fluid.

## GAUGES – INSTALLATION AND MAINTENANCE

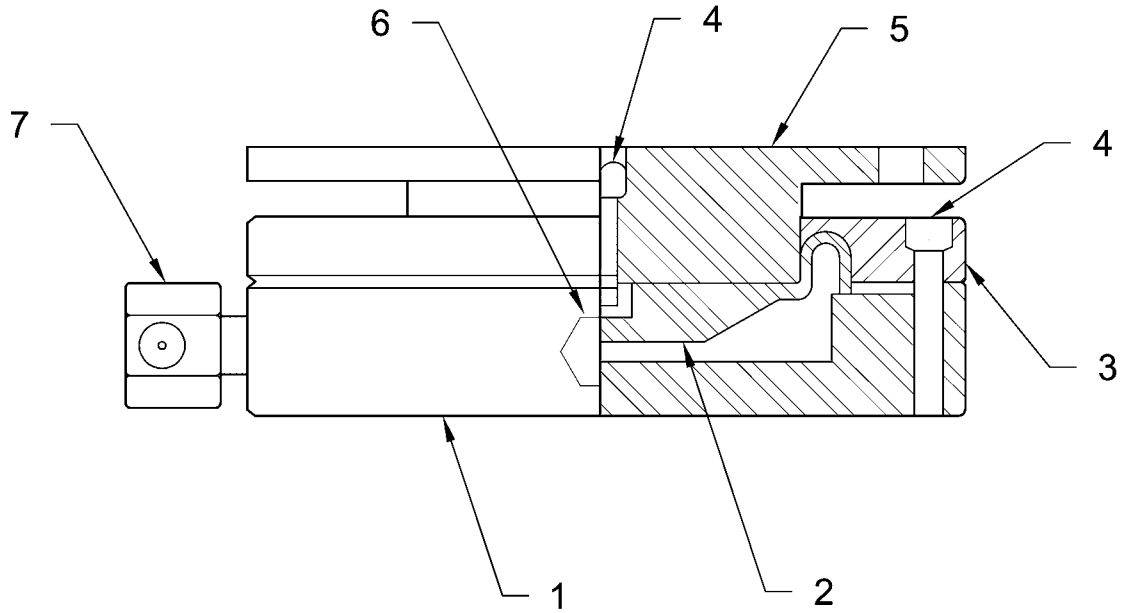
### PROCEDURES FOR 8 ½” DEEP DISH DUAL POINTER GAUGES

1. Each system consist of (1) 8½’ dual pointer gauge, (2) dampers (1) compression load cell (1) High pressure hose (1) set disconnects (1) gauge minder.
2. The gauges are equipped with two damper blocks for each gauge. The damper can be used to control oscillations. Turn the stem clockwise to increase dampening action. If the stem threads become disengaged, push in and turn to the right. Dampen only enough to stop violent fluctuation. Over dampening will cause the indicator pointer to lag. It is recommended to shut off the low-pressure damper if it is not in use, as this will prolong the life of the gauge.
3. Once the gauges have been installed it is necessary to **bleed** all the air out of the system. To do this, ensure that the load cell does not have any pressure on it. Raise the load cell so that it is the highest point. Loosen brass plug (item # 6, Load Cell drawing, following page) from the load cell. Place primer pump on check valve at the side of the panel. At this point the load cell must be attached to the panel. Fill the primer pump instrument fluid (if instrument fluid is not available Esso bayol 35 can be used as a substitute) pump approximately 2 liters of instrument fluid through the lines. After all the air has been purged from the system, tighten the brass plug on the load cell and pump up until needle on the gauge barely moves. Remove the primer pump. If the gauge does not zero release fluid from the load cell until it does. The system has now been purged and is ready for use. It may be necessary in hot weather to release excess fluid if the indicator shows pressure when not under compression.

**WARNING** Air in the lines causes incorrect torque readings.

**NOTE:** Each gauge comes with a *gauge minder*. The gauges are designed such that the outer scale is used until it reaches its maximum reading. Increasing pressure from this point will be read off the inner scale. To prevent damage from occurring to the gauge, the gauge minder does not allow the outer needle to exceed its maximum scale (continue rotating). **WARNING** The gauge minder is set at the factory and should **NEVER** be adjusted in the field!

**LOAD CELL – PART # 10-0063**



<b>INDEX #</b>	<b>PART #</b>	<b>QTY.</b>	<b>DESCRIPTION</b>
1	02-0354	1	CASING DIAPHRAGM
2	02-0387	1	DIAPHRAGM
3	08-0357	1	CLAMP RING
4	02-0203	13	SCREW, 5/16-18 x 1 ALLOY SOCKET HEAD
5	08-0356	1	LOAD PLATE
6	02-0202	1	BRASS PLUG, ¼ NPT
7	08-0023	1	STREET ELBOW

## LOAD CELL INSTRUCTION MANUAL

### INTRODUCTION AND DESCRIPTION

- The load cell system consists of three basic components: the indicator, the hydraulic hose assembly, and the hydraulic load cell.
- The load cell system consists of the following components and attached hardware:
  - Indicator
  - Sensater load cell
  - Hydraulic hose
  - Disconnects
- The indicator provides a dial faceplate calibrated in pounds, tons, or kilograms, as specified. The indicator has a damper to smooth pointer sensitivity and to adjust the pointer's response to the operator's preference. The indicator has a dial adjust to zero out tank weight.
- The ¼" diameter hose is of double wire braid construction and rubber covered. The connection is ¼" NPT male.
- Disconnects are provided offering in-line separation of the indicator from the hose and load cell.
- Tubing may be used if long runs from the cell to the indicator are required.

### SYSTEM INSTALLATION

The load plates of the cell may be tilted a maximum of 2° from their parallel position to facilitate installation without causing a measurement error. Misalignment (lateral displacement) of the load plates is tolerable; however, if misalignment exceeds 0.06 inches, it will produce a slight error in indication and increased wear to the diaphragm will result.

The load cell in the tong is encased in the Load Cell Holder (see Outer Frame & Suspension Assembly, page II-6). The Load Cell Holder is subsequently attached to a paddle connecting the tong to the outer frame.

When installing hydraulic hoses, choose a route such that the hose will not be crushed, cut, or otherwise damaged. Tie hose to structures where permitted.

**WARNING** Allow sufficient slack in the hose to avoid pulling the hose taut. Excess tension could cause fitting or connector failure.

Connect disconnects in accordance with the following procedures:

- Carefully align male and female coupling.
- Push two halves together firmly.
- Thread nut onto male half of coupling and tighten

**NOTE: O-ring may be damaged if not inserted straight. If so, see *System Repair*.**

After system installation, check to insure that it is operating properly.

- Check load cell for proper gap (see table).
- Check the damper. It should be closed off and backed off two turns. If pointers are too sensitive, turn clockwise. If pointers are too slow, turn damper counter-clockwise.

## SYSTEM OPERATION

The load indicating system is automatic, but an adjustment of the load cell system is necessary prior to initial use.

- The damping adjustment is designed to adjust the pointer sensitivity to the operator's preference. However, the adjustment can affect indicator response if too much damping is applied. The following procedure is recommended to achieve desired sensitivity:
  - Fully engage all dampers, by pushing stem in to insure thread engagement, and turn stems clockwise to close.
  - Open all dampers by turning stems counter-clockwise two complete revolutions.
  - If pointer is too sensitive, turn all damper stems clockwise  $\frac{1}{2}$  revolution.
  - If pointer is too sluggish, turn all damper stems counter-clockwise  $\frac{1}{2}$  revolution.
  - Recheck sensitivity and repeat above until desired sensitivity is reached.

## SYSTEM ACCURACY

System accuracy is such that the indicated load should not differ from the actual load by more than 0.2% of full scale.

## SYSTEM REPAIR

System repair is limited to removing a faulty component and replacing it with one in serviceable condition. This section covers repairs that may be readily performed in the field and does not

include detailed disassembly/assembly procedures of the indicator and load cell. Field repairs consist of charging or bleeding the hydraulic system, removing and replacing the indicator, load cell and hydraulic hose.

## COMPONENT REPAIR

### **Disconnect O-Ring Repair**

If the o-ring in the female half of the disconnect becomes damaged, it must be replaced to preserve the integrity of the system.

- Remove damaged o-ring from the female half.
- Clean the o-ring groove.
- Lubricate and install new o-ring.
- Disconnect is ready to be returned to service.

### **Load Cell Gap**

The load cell gap is the distance measured between the load plate and the load cell retaining ring (see Typical Load Cell Illustration). **The nominal gap is 7/16” for the 16.10 in<sup>2</sup> diaphragm.**

The nominal gap may vary up to  $\pm 1/8$  inch to achieve accuracy.

### **Hydraulic Fluid Addition**

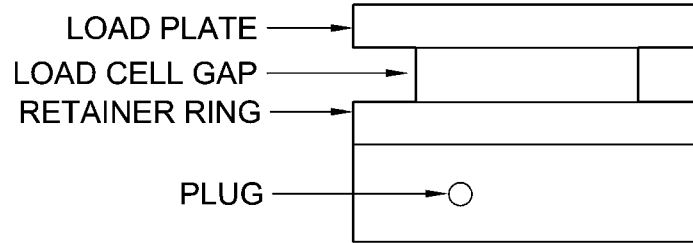
The system must be kept charged with fluid at all times to achieve proper system accuracy. A quick check for adequate fluid in the system is the gap between the load cell load plate and the retainer ring. If this measurement is off or there are other reasons to believe the system requires recharging, see # 3, page 1–14, for the correct bleed / recharge procedure.



EFFECTIVE AREA (IN <sup>2</sup>)

NOMINAL GAP

16.10 ..... 7/16

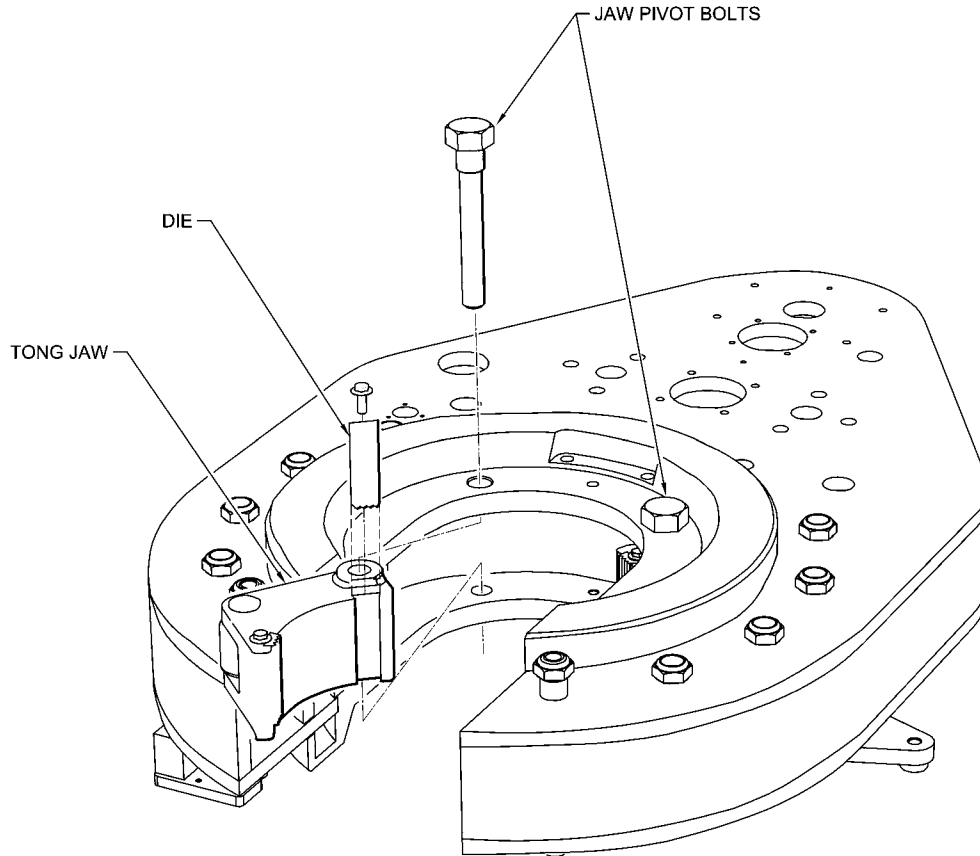


### TYPICAL LOAD CELL

## JAW AND DIE INSTALLATION / REMOVAL

Ensure that the jaw and insert sizes in use are correct for the task. If not, they must be changed.

**WARNING** Always ensure that the hydraulics are turned OFF before performing any jaw removal or installation.



### Tong Jaw Installation

1. Remove the two jaw pivot bolts from the cage plate.
2. Place jaw, one at a time, between the upper and lower cage plates with the flanged part of the jaw roller pin facing upwards. **WARNING** Ensure jaws are installed in tong with the word TOP facing upwards.
3. Align the holes in the jaws with the matching holes in the cage plate.
4. Grease and insert jaw pivot bolt and tighten.

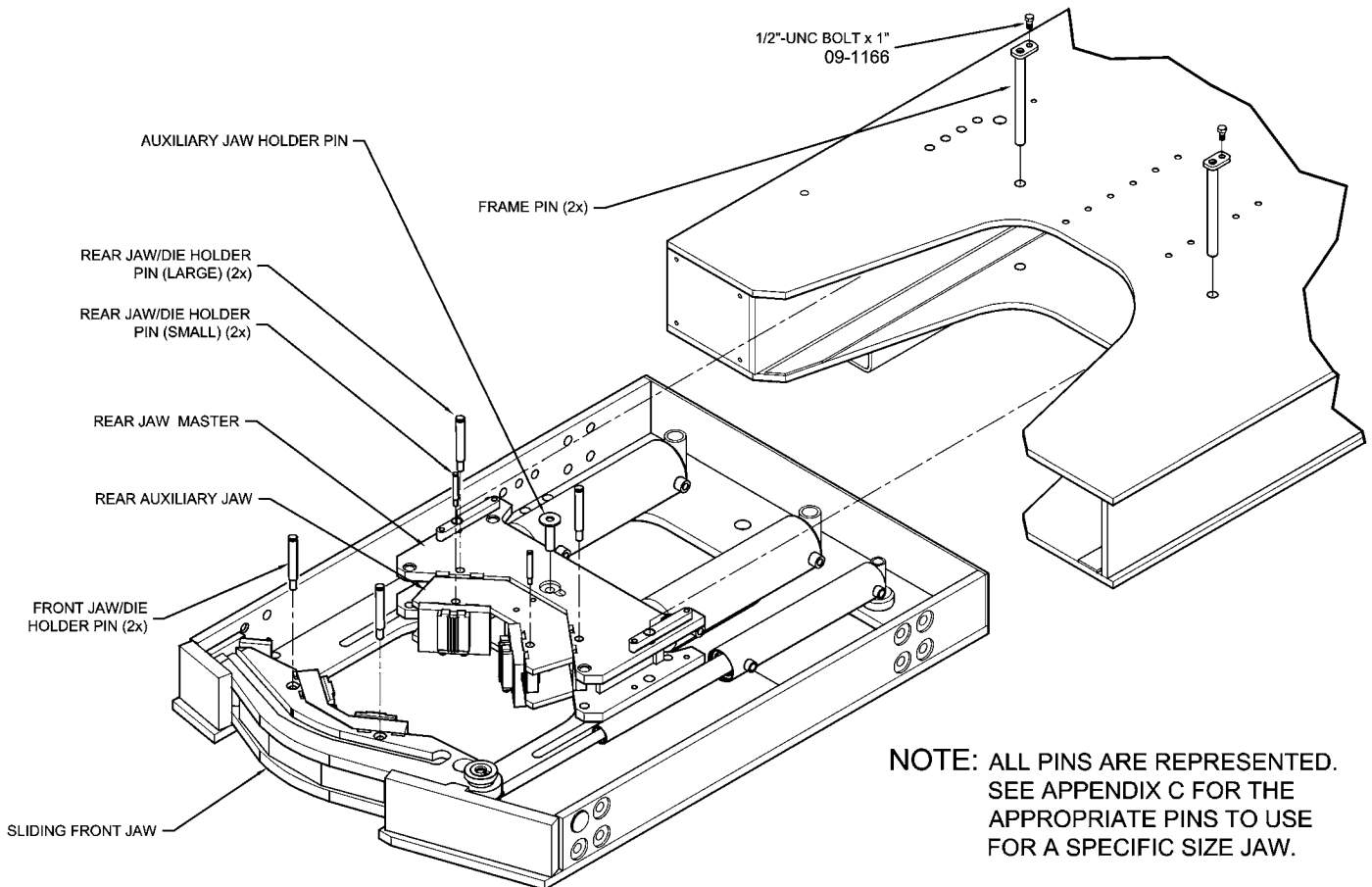
*Note: Jaw removal is identical to installation in reverse.*

See Appendix C for appropriate jaw configurations. For casing sizes of 7-5/8" or smaller, see Appendix C for auxiliary cage plate installation.

### Back-Up Jaw Removal

1. Ensure the jaw size is correct for the task at hand (see Appendix C).
2. **WARNING** Ensure the hydraulics are turned OFF before any operation be performed on the jaws.
3. For ease of installation, have the sliding front jaw in the closed position and the rear master jaw extended 8" from its *full stop* position.
4. Now its is safe to remove pins and subsequently jaws. See Appendix C to verify which pins and jaws are appropriate for the size casing you are running.

*Note: Jaw installation is identical to installation in reverse.*



## **MAINTENANCE**

It is suggested that a regular maintenance program be established, to assure dependable operation of the FARR Hydraulic Tong and Back-Up. The following recommendations concerning cleaning, lubrication, and adjustments will enhance the performance and life expectancy of the tong and back-up and assure safety to operating personnel.

### **CLEANING**

The tong and back-up should be thoroughly cleaned with a good petroleum base cleaning agent, after each job, prior to storage. It is recommended that periodically the motor and valve assembly be removed, along with the top tong plate, so that guides, rollers and gears can be properly cleaned.

### **LUBRICATION**

A good grade of multi-purpose bearing lubricant which is compatible with expected ambient temperatures is recommended along with the following lubrication procedures, at the completion of each job prior to storage.

#### **1. CAGE PLATE CAM FOLLOWER BEARINGS**

Grease should be applied to these bearings through the grease fittings at the end of the cam follower shafts, located at the top and bottom face of the tong.

#### **2. ROLLER CAP BEARINGS**

Grease should be applied to these bearings through the grease fittings in the end of the guide roller shafts, located at the top and bottom face of the tong.

#### **3. ROTARY IDLER BEARINGS**

Grease should be applied to these bearings through the grease fittings in the end of the rotary idler gear shaft located at the top face of the tong.

#### **4. PINION IDLER BEARING**

Grease should be applied to this bearing through the grease fittings in the end of the half shaft located at the bottom face of the tong.

**5. PINION BEARINGS**

Grease should be applied to these bearings through the grease fittings in the pinion bearing retainer plate, located at the top and bottom face of the tong.

**6. CLUTCH SHAFT BEARINGS**

Grease should be applied to these bearings through the grease fittings in the bearing retainer plate located at the bottom face of the tong.

**7. SHIFTING SHAFT AND BUSHINGS**

Grease should be applied to the shifting shaft, shifting shaft bushings and nipples. The shifter assembly should be greased via the access door.

**8. DOOR HYDRAULIC CYLINDER**

Grease should be applied via the nipple on the pivot points.

**9. BACK-UP**

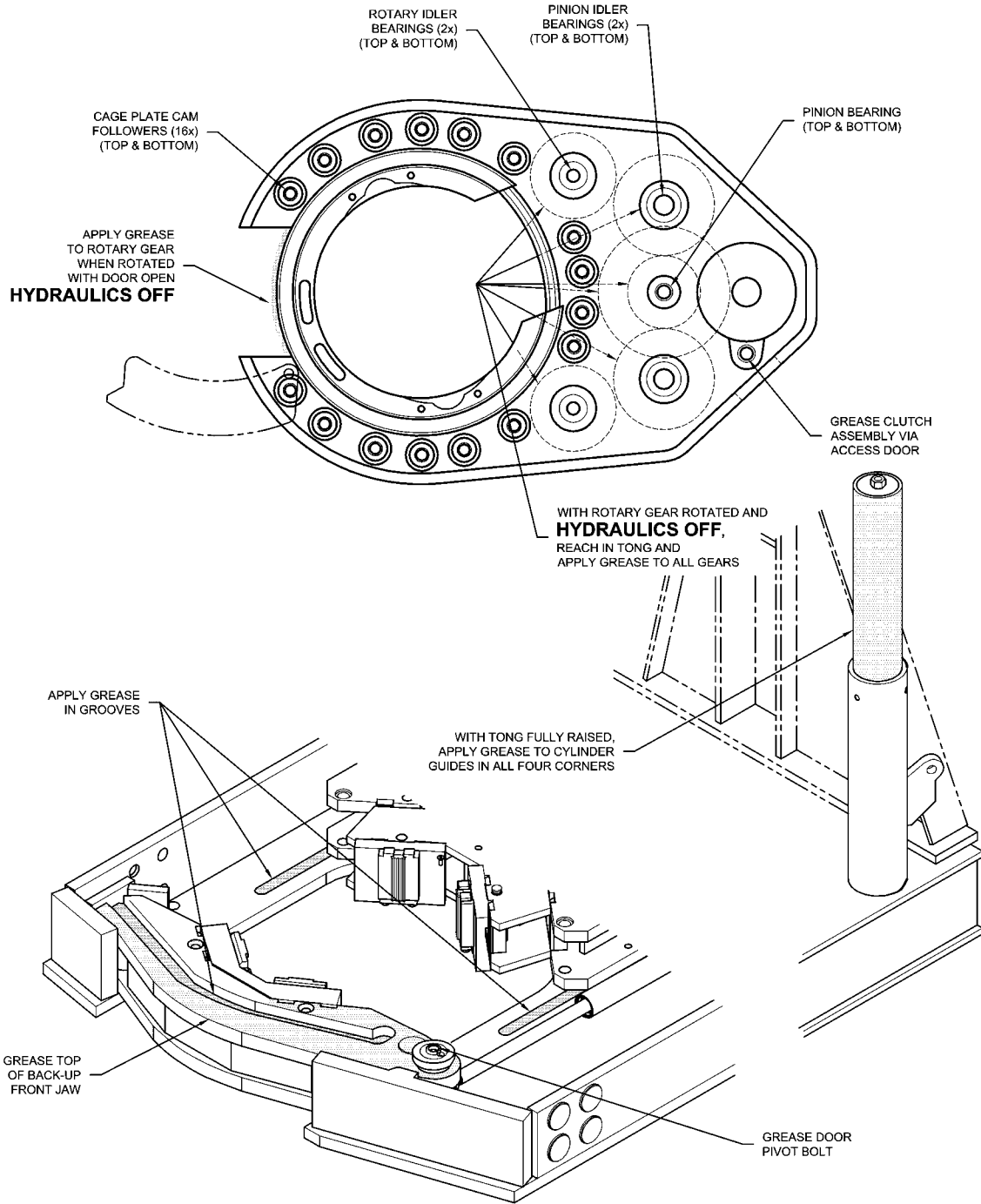
With the front gate closed and the rear jaw fully retracted, liberally coat all sliding surfaces with grease. Grease front gate pivot post and bronze bearings through grease nipples.

Recommended lubrication at the **completion of each job or once per month** (which ever comes first) should be as follows:

1. Rotary Roller Bearings	3 shots grease
2. Rotary Idler Bearings	4 shots grease
3. Pinion Idler Bearings	4 shots grease
4. Pinion Bearings (Upper & Lower)	2 shots grease
5. Clutch Shaft Bearings	1 shot grease
6. Shifting Shaft	as required
7. Door Cylinder Pivot Points	1 shot grease each

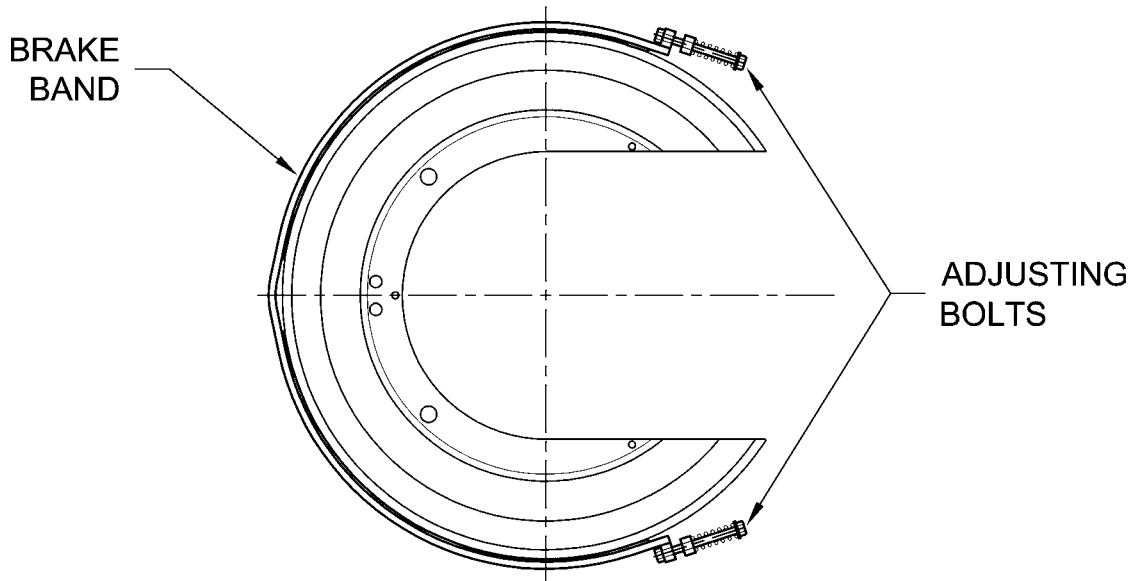
It is also recommended that prior to jaw installation a liberal coating of grease should be applied to the cam surface of the rotary drive gear. Also, the inspection plate should be periodically removed, and a liberal coating of grease applied to the clutch, drive gears and shifting shaft.

# LUBRICATION POINTS AND ZONES



## BRAKE BAND ADJUSTMENT

As the tong is used, it becomes necessary at times to adjust the brake bands to provide a smoother and more efficient jaw cam action. If the cage plate turns with the rotary gear before the jaws have cammed and locked on to the pipe, the jaws will not cam properly and, therefore, will not bite on to the tubing or casing. By tightening the brake band against the cage plates, enough frictional resistance occurs to allow jaws to cam properly and grip the casing. To adjust the brake band, simply turn the adjustment bolt clockwise to tighten and counterclockwise to loosen.



## OVERHAUL PROCEDURES

Should the need arise to overhaul any portion of the tong and back-up, certain disassembly procedures must be followed. Access to the gear train in the tong is possible by removal of the top plate of the tong.

**NOTE: ALL MAINTENANCE AND OVERHAUL SHOULD BE ACCOMPLISHED FROM THE TOP. THEREFORE, THE BOTTOM PLATE OF THE TONG SHOULD NEVER BE REMOVED FROM THE GEAR CASE HOUSING.**

***For disassembly, reverse the assembly sequence.***

The FARR Hydraulic Power Tong has been designed such that assembly is simple and can be accomplished without the use of special tools. The following sequence is presented as a guide only in maintenance and overhaul procedures as *initial* assembly occurs before leaving the plant.

### ASSEMBLY SEQUENCE - TONG

1. Position the tong body (gear case) on a suitable stationary support such that the bottom plate is accessible.
2. Install bottom pinion bearing and bearing cap.
3. Install bottom clutch bearing and bearing cap.
4. Install rotary gear. Limit grooves must face up.
5. Install roller assemblies and roller shafts.
6. Install clutch assembly, leaving high gear off.  
**Note: A spacer is required on the top of the high clutch gear.**
7. Install pinion gear with low gear on the bottom of the tong body.
8. Install pinion idler gear assembly, complete with spacers.  
**Note: Ensure that gear is installed as per drawing.**
9. Install rotary idler gear assembly, complete with spacers.  
**Note: Ensure that gear is installed as per drawing.**
10. Install high pinion gear.
11. Install high clutch gear with spacer on top.
12. Lubricate tong thoroughly before installing top plate. Bolt top plate securely in place. Bolt idler gears and rotary roller shafts.
13. Grease drive assembly and install motor mount. Bolt securely.



14. Install motor. Bolt securely. Ensure that the motor case drain is connected to the tank.
15. Clean and grease rotary gear grooves. Install cage plates.
16. Install brake bands.
17. Install backing pin.
18. Position door in place and insert pins.
19. Install hydraulic door opening cylinder.
20. Install deceleration valve and adjust with door closed.

#### **ASSEMBLY SEQUENCE - INNER BACK-UP FRAME**

1. Install slider pucks in gate and rear master jaw.
2. With top plate off, install gate and rear master jaw. Ensure that the bronze bearings are installed in the gate.
3. Install telescoping cylinder to gate. Position rear of cylinder to pinning hole, **but do not pin in place at this time.** Install hydraulic lines.
4. Install the two 5" cylinders to the rear master jaw with 2-1/2" shoulder bolts. Position rear of cylinders to pinning holes, **but do not pin in place at this time.** Install hydraulic lines ensuring that the lines are not crossed.
5. Install top plate and bolt in place.
6. Now, install all three rear cylinder pins from steps 3 and 4.
7. Install slider pucks on the outside of inner frame.
8. Grease slider pucks and slide inner frame into outer frame. Pin the units together.

#### **ASSEMBLY SEQUENCE - SUSPENSION**

1. Position tong on top of the back-up and support in place.
2. Install leveling cylinders in sockets provided on back-up, with guide/retaining sleeve.
3. Assemble the cradle assembly with shackles for tong.
4. Lower the cradle assembly on to the cylinders/inner guides group.
5. Attach shackles to tong and remove supports.
6. Check the tong level. If necessary, adjust I-bolts and chains on carrier.

## **PROBLEM DIAGNOSIS**

Proper maintenance of any hydraulic system should keep hydraulic problems to a minimum. Typically, proper selection of hydraulic oil, and proper maintenance of both equipment and oil can prevent trouble encountered with hydraulic equipment. Locating trouble in a hydraulic system is a job for a well-trained technician. He must be familiar with the equipment design, assembly and operation. He should be knowledgeable enough about hydraulic circuits and components to localize trouble areas and then pinpoint the particular problem.

The following notes on problem diagnosis are general in nature and are presented to serve as a guide to help analyze your hydraulic problems. Please refer any specific problems to our Engineering department for their evaluation.

**Note: System has a high-pressure filter.**

### **TONG WILL NOT DEVELOP SUFFICIENT TORQUE**

#### POTENTIAL REASONS

- Relief valve on unit or valve on tong not working
  - Set too low.
  - Valve stuck.
  - Valve leaking.
- Viscosity of oil too high.
- Viscosity of oil too low.
- Oil by-passed to reservoir.

#### POTENTIAL SOLUTIONS

- ◆ Increase setting. To check, block the oil line beyond the relief valve and determine pressure with a gauge.
- ◆ Check for contamination of oil or broken valve spring.
- ◆ Check valve seat for scouring. Check oil seals. Check for particles stuck under the valve stem.
- ◆ Pump may not prime if oil is too heavy. Change to appropriate grade.
- ◆ System may overheat. Change to appropriate grade.
- ◆ Check relief valve for proper operation. Check directional valve; neutral position should return oil directly to the reservoir.

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>▪ Tong motor worn or damaged causing slippage.</li> <li>▪ Excessive drag on tong due to damaged bearings or gears.</li> <li>▪ Restriction in line between power unit and tong.</li> </ul> | <ul style="list-style-type: none"> <li>◆ Repair or replace worn or damaged parts.</li> <li>◆ Repair or replace worn or damaged parts.</li> <li>◆ This condition may be detected when pump pressure is not reaching the tong or when excessive back-pressure is created in the return line. Ensure proper engagement of self-seal coupling.</li> </ul> |
| <ul style="list-style-type: none"> <li>▪ Defective torque gauge or load cell.</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Replace defective components. Ensure the damper screw has been adjusted. Ensure the gauge has been calibrated to proper torque arm length.</li> </ul>  |
| <ul style="list-style-type: none"> <li>▪ Door safety switch not set properly.</li> </ul>   | <ul style="list-style-type: none"> <li>◆ Readjust valve with door closed. Valve plunger should be fully in valve body.</li> </ul>   |

**FAILURE OF JAWS TO GRIP PIPE TONG**

POTENTIAL REASONS

- Dull dies.
- Brake band insufficiently adjusted, not allowing jaws to cam properly.
- Jaw roller broken or worn.
- Pipe out of jaw range.
- Insufficient clamping pressure.

POTENTIAL SOLUTIONS

- ◆ Replace dies.
- ◆ Adjust brake bands to give proper resistance to cage plates.
- ◆ Replace roller.
- ◆ Change jaws to correct size.
- ◆ See Table, Appendix B.

**FAILURE OR DIFFICULTY OF TONG TO SHIFT GEARS****POTENTIAL REASONS**

- Shifter shaft appears to be frozen or hard to move.
- Shifter shaft bent.

**POTENTIAL SOLUTIONS**

- ◆ Check hydraulic lines.
- ◆ Replace.

**GENERAL COMMENTS**

The following factors contribute significantly to inefficient hydraulic operation:

- Failure to change the oil often enough, or employ proper filtration.
- Failure to select the proper grade of hydraulic oil.
- Defective packing or seals in components of the hydraulic system.
- Inadequate understanding of hydraulic system components, or operation of the accompanying equipment.

## **SECTION II - APPENDICES**

### **Appendix A – Reference Drawings with Parts List**

- 20" Tong & Back-Up Assembly .....	II-3
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- Bolt Torque Chart .....	II-20

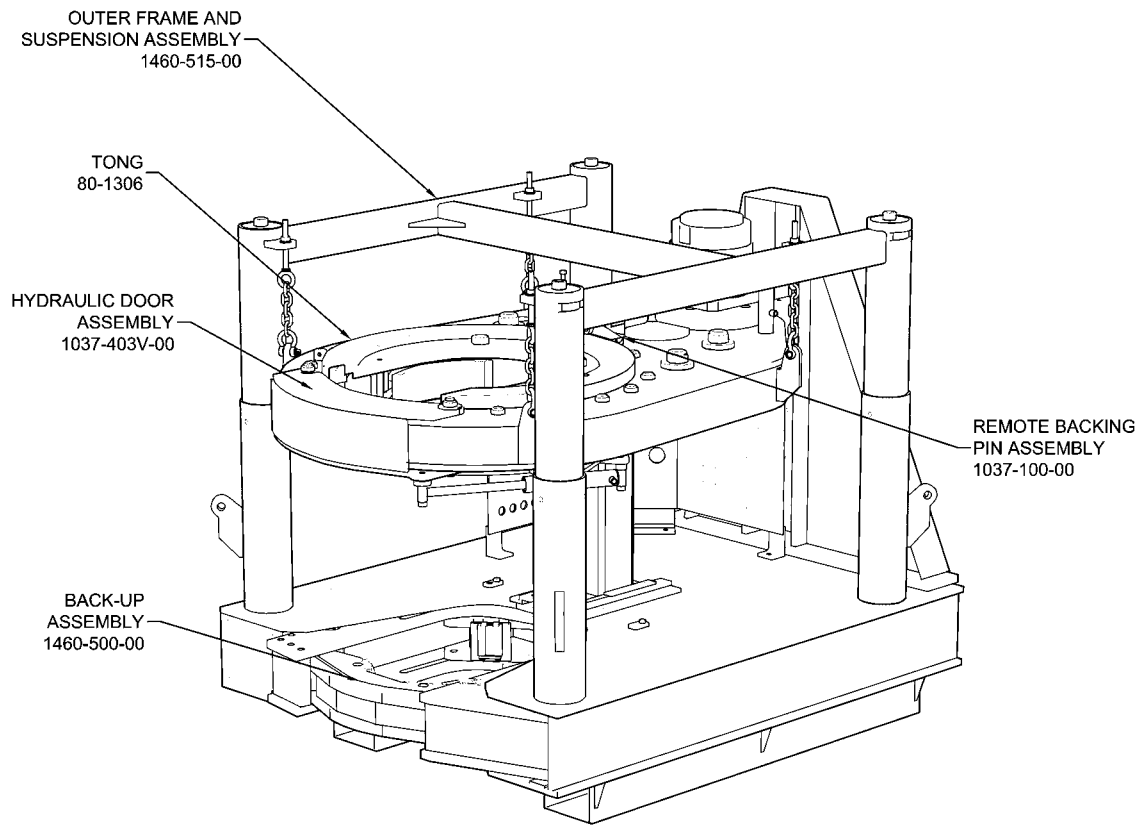
### **Appendix C – Tong & Back-Up Configurations**

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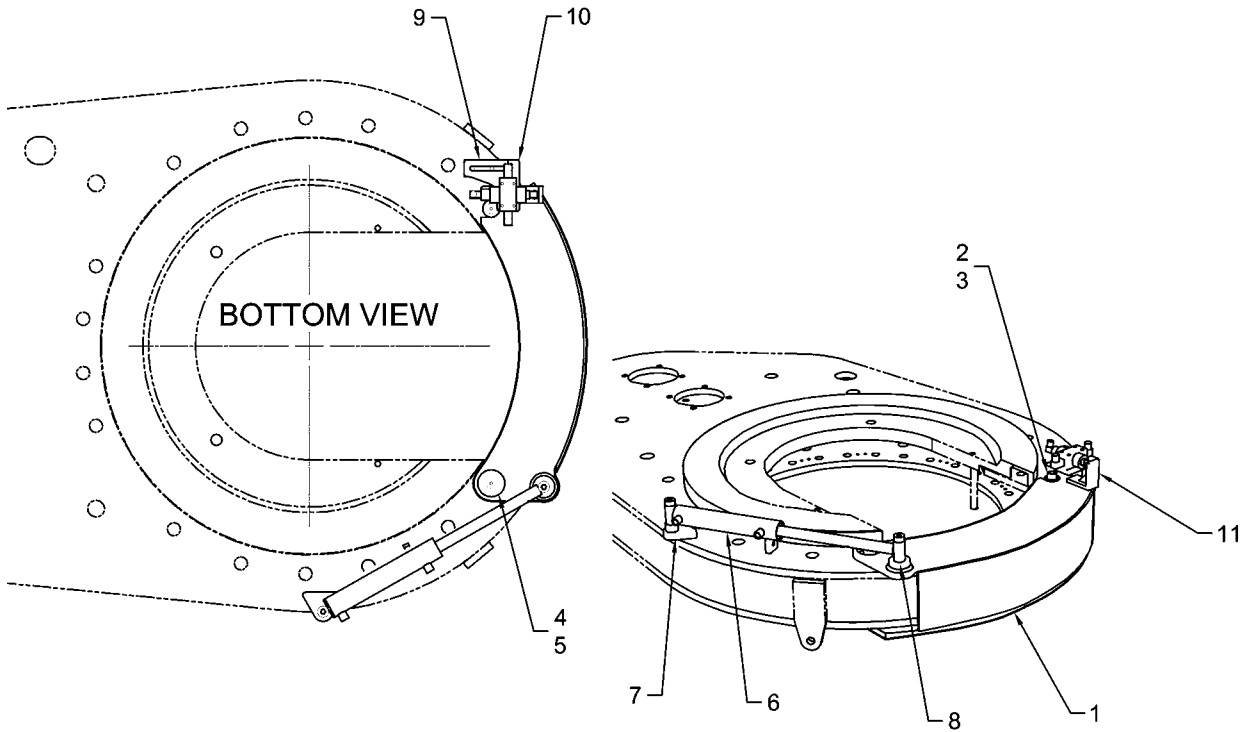
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**APPENDIX A – REFERENCE DRAWINGS WITH  
PARTS LIST**



## 20" TONG & BACK-UP ASSEMBLY



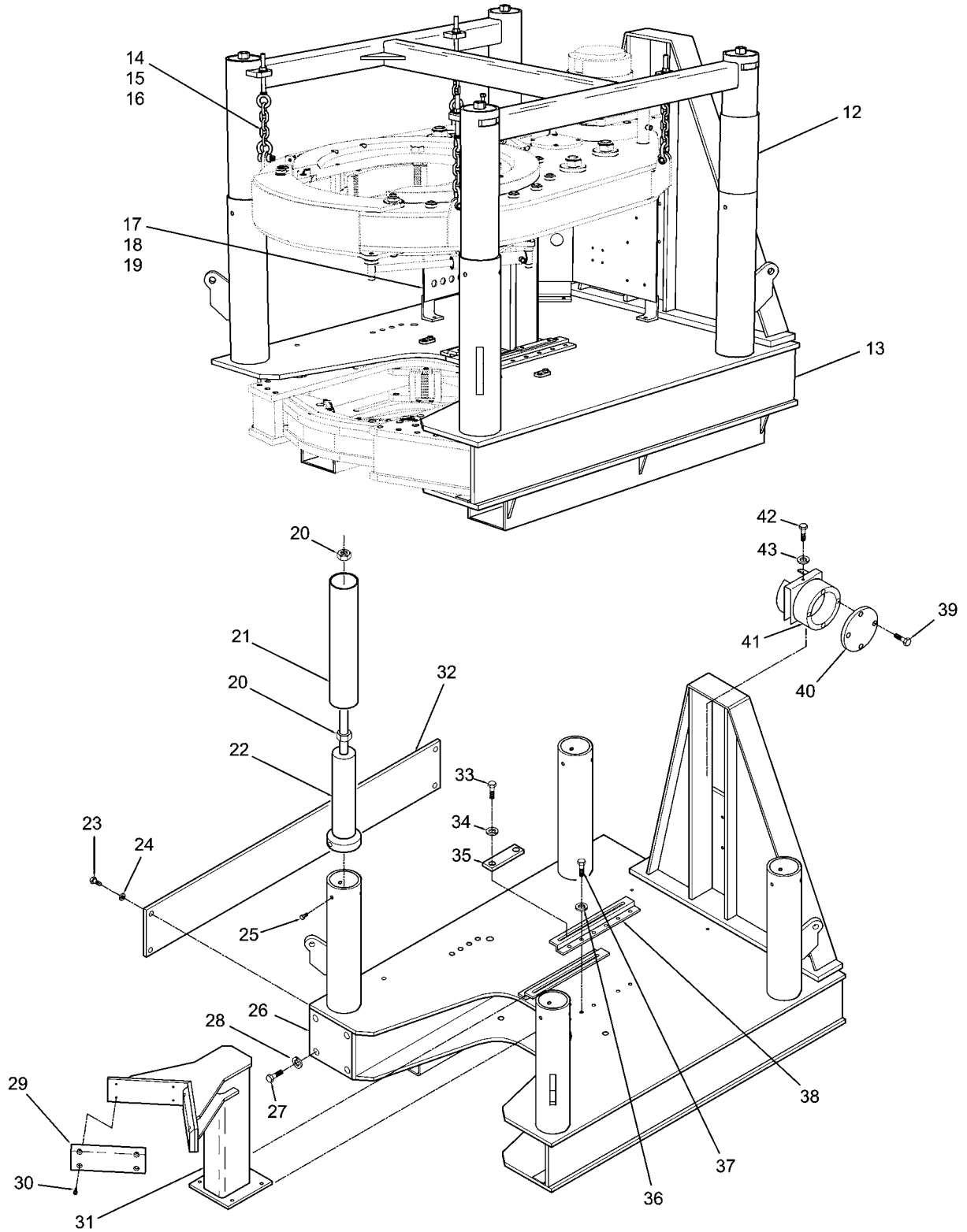
**20 INCH DOOR ASSEMBLY**  
**(Part # 1037-403V-00)**

<b>INDEX #</b>	<b>PART #</b>	<b>QTY.</b>	<b>DESCRIPTION</b>
1	1037-403V-08	1	20 IN. DOOR
2	1037-133	2	DOOR ROLLER PIN
3	1037-11-203	2	LATCH SPACER
4	02-0096	2	BEARING
5	01-0345	4	SPACER WASHER
6	1037-403-21	1	CYLINDER
7	1037-11-201	1	DOOR CYLINDER MOUNT
8	09-0085	2	3/4" x 2" SHOULDER BOLT
9	1037-403-27	1	ADJUSTER MOUNT BASE
10	1037-403-26	1	ADJUSTER PLATE
11	1037-403-28	1	DOOR PLUNGER TAB



<b>INDEX #</b>	<b>PART #</b>	<b>QTY.</b>	<b>DESCRIPTION</b>
12	1460-515-00	1	SUSPENSION ASSEMBLY
13	1460-27-00	1	OUTER FRAME ASSEMBLY
14	1460-515-40	4	HANGER- CHAIN ASSEMBLY
15	09-5814	8	5/8"-UNC NUT
16	02-0389	4	1/2" SHACKLE
17	1458-506-19-00	1	HYDRAULICS MOUNTING PANEL
18	09-1164	4	1/2"-UNC x 3/4" BOLT
19	09-5110	4	1/2" LOCKWASER
20	09-5826	8	1"-UNC NUT
21	1429-511-1	4	SLEEVE
*22	1461-515-00	4	SUSPENSION CYLINDER
23	09-1046	4	3/8"-UNC x 1" BOLT
24	09-5106	4	3/8" LOCKWASHER
25	1410-515-31	12	MODIFIED BOLT
26	1460-27-5	2	COVER PLATE
27	09-5106	8	3/8" LOCKWASHER
28	09-1046	8	3/8"-UNC x 1" BOLT
29	1458-508-07	2	WEAR PADS
30	09-4003	8	1/4"-UNC x 1/2" FHCS
31	1460-508-00	1	STABBING GUIDE ASSEMBLY
32	1448-18	1	SIDE PLATE
33	09-1164	4	1/2"-UNC x 3/4" BOLT
34	09-5110	4	1/2" LOCKWASER
35	1458-508-09	2	SIDE CLAMP PLATE
36	1458-508-08	2	SIDE CHANNEL
37	09-1230	12	5/8"-UNC x 1-1/2" BOLT
38	09-5114	12	5/8" LOCKWASHER
39	09-4162	8	1/2"-UNC x 1/2" FHCS
40	1458-15-06	2	TORQUE LOAD CELL SLIDER
41	1460-15-7	1	LOAD CELL HOLDER
42	09-1164	1	1/2"-UNC x 3/4" BOLT
43	09-5110	1	1/2" LOCKWASER

\* See Hydraulics Supplement for detailed breakdown.

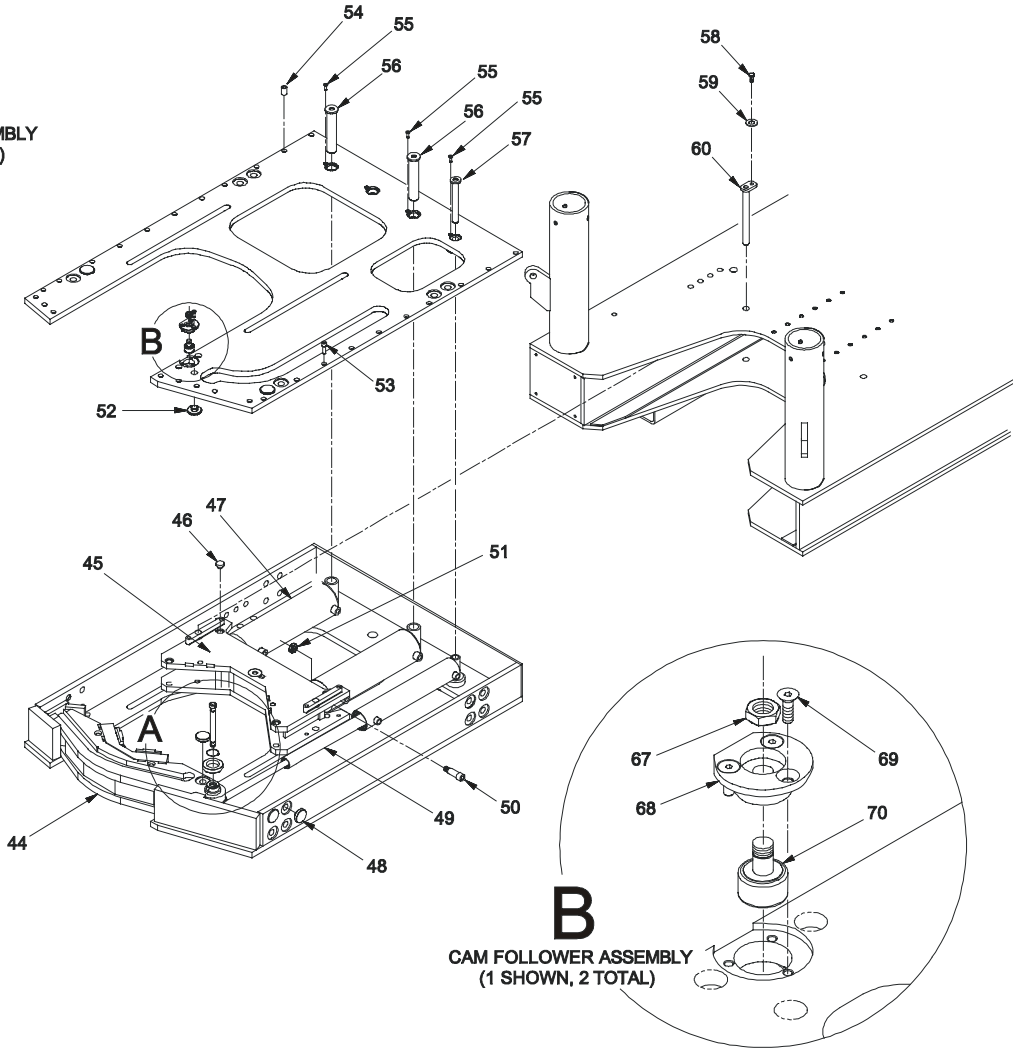
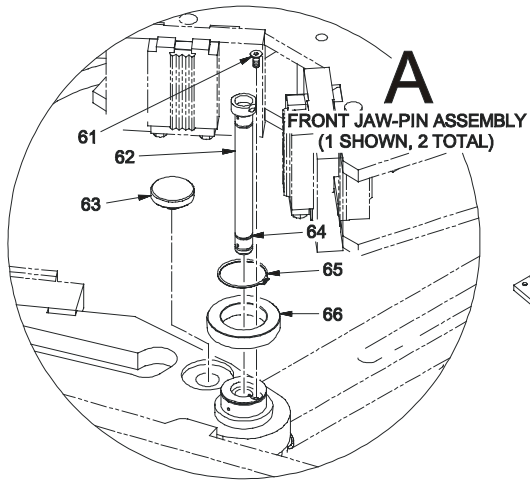


## OUTER FRAME & SUSPENSION ASSEMBLY (1460-515-00)

<b>INDEX #</b>	<b>PART #</b>	<b>QTY.</b>	<b>DESCRIPTION</b>
44	1460-502-00	1	SLIDING FRONT JAW
45	1460B-17	1	REAR MASTER JAW
46	1458-500-02	8	BRASS WEAR PAD
*47	‡	2	BACK-UP PUSH CYLINDER
48	1448-14-1	34	NYLATRON PUCK
*49	1458-507-00	1	BACK-UP TELE-CYLINDER
50	09-0091	2	½" x 2" SHOULDER BOLT
51	09-5606	2	3/8"-UNC NYLON LOCKNUT
52	1448-14-4	6	NYLATRON PUCK
53	09-2166	29	½"-UNC x 1" SHCS
54	02-0388	3	DOWEL PINS
55	09-4024	3	5/16"-UNC x ¾" FHCS
56	1448-32	2	PUSH CYLINDER PIN
57	1448-31	1	TELE-CYLINDER PIN
58	09-1164	2	½"-UNC x ¾" BOLT
59	09-5110	2	½" LOCKWASHER
60	1448-33	2	OUTER FRAME PIN
61	09-4003	1	¼"-UNF x 1" FHCS
62	1448-29	1	FRONT JAW CYLINDER PIN
63	1448-14-3	2	NYLATRON PUCK
64	08-0401	4	#016 O-RING
65	02-0201	2	SNAP RING
66	1460-00-5	2	BRASS BEARING
67	09-5522	2	7/8"-UNF NYLOCK JAMNUT
68	1460-20-1H	2	CAM FOLLOWER HOLDER
69	09-4024	6	5/16"-UNC x ¾" FHCS
70	1448-37H	2	CAM ROLLER

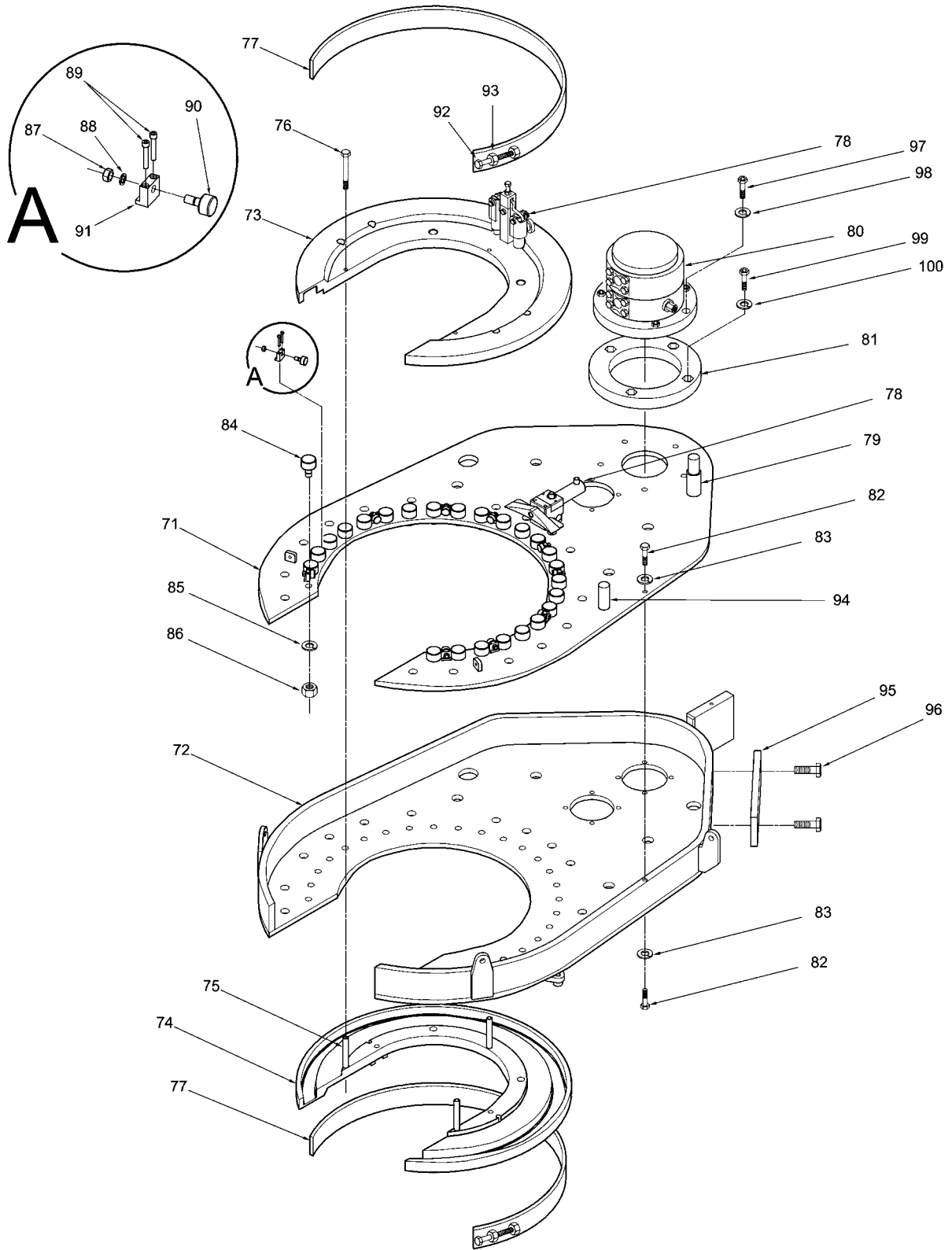
\* See Hydraulics Supplement for detailed breakdown.

‡ A design modification was implemented on this cylinder. See Hydraulics Supplement for appropriate part #, dependent upon serial #.

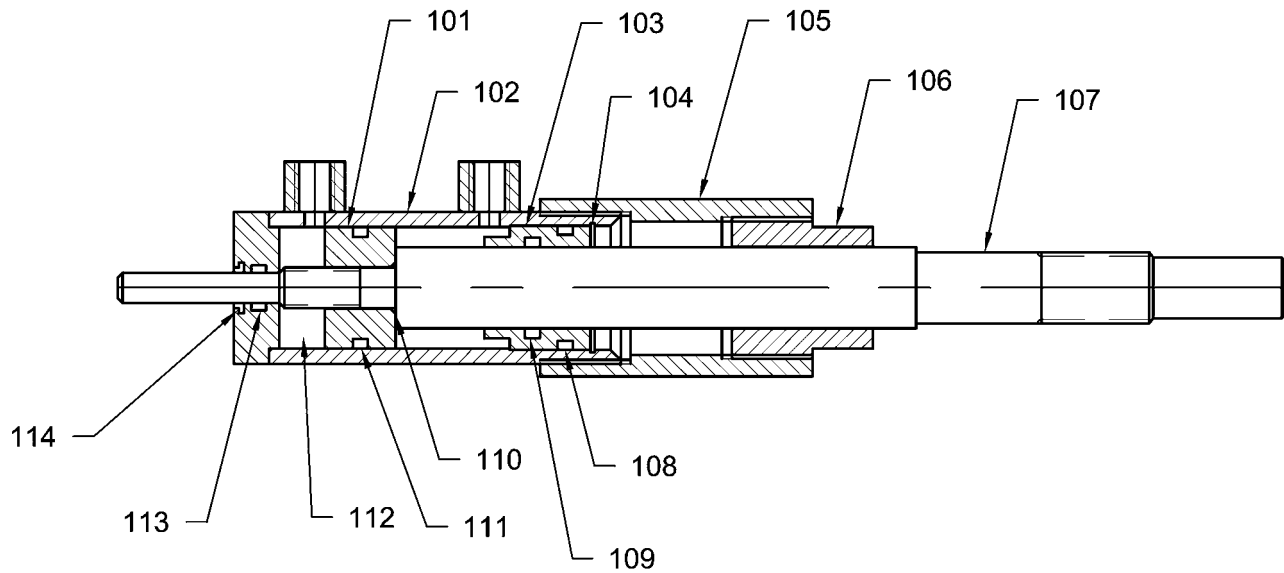


<b>INDEX #</b>	<b>PART #</b>	<b>QTY.</b>	<b>DESCRIPTION</b>
71	01-0276	1	GEAR CASE, TOP PLATE
72	01-0277	1	GEAR CASE, BOTTOM PLATE ASS'Y
73	1037-50-RBP	1	TOP CAGE PLATE
74	01-0253	1	BOTTOM CAGE PLATE
75	01-0254	3	CAGE PLATE SPACER
76	09-1198	3	½"-UNC x 8" HHCS
77	01-0259	2	BRAKE BAND
*78	1037-100-00	1	REMOTE BACKING PIN ASS'Y
*79	1037-71-00	1	CLUTCH SHAFT SHIFTER ASS'Y
80	87-0150	1	RINEER MOTOR
81	01-0286A	1	MOTOR MOUNT
82	09-1048	80	3/8"-UNC x 1-1/4" GRADE 5 BOLT
83	09-5106	80	3/8" LOCKWASHER
84	02-0107	50	RADIAL LOAD CAM FOLLOWER
85	09-5122	50	7/8" LOCKWASHER
86	09-5522	50	7/8"-UNF JAMNUT
87	09-5508	10	7/16"-UNF JAMNUT
88	09-5108	10	7/16" LOCKWASHER
89	09-2509	20	¼"-UNF x 1-1/4" SHCS
90	02-0108	10	THRUST LOAD CAM FOLLOWER
91	01-0258	10	CAM FOLLOWER BRACKET
92	09-1552	4	3/8"-UNF x 1-3/4" HHCS
93	09-5714	4	3/8"-UNF NYLON LOCKNUT
94	09-0021	6	3/8" x 1-½" DOWELL PIN
95	01-0274	1	CLUTCH INSPECTION DOOR
96	09-0036	2	¼"-UNC x 1-1/4" SHCSZ
97	09-2236	6	5/8"-UNC x 2-1/2" SHCS
98	09-0093	6	5/8" HIGH-COLLAR LOCKWASHER
99	09-2288	4	¾"-UNC x 1-1/2" SHCS
100	09-0094	4	3/4" HIGH-COLLAR LOCKWASHER

\* These assemblies are further detailed in the section.

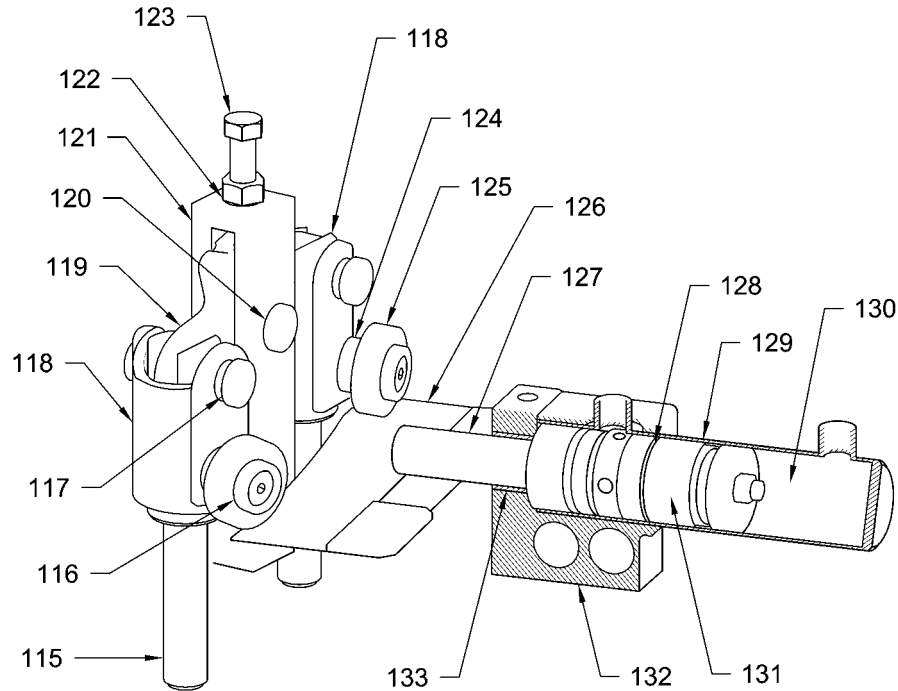


TONG (OUTER ASSEMBLY)



### CLUTCH SHAFT SHIFTER ASSEMBLY – (Part # 1037-71-00)

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
101	1116-71-06	1	PISTON
102	1116-71-02	1	BODY CYLINDER
103	1116-71-05	1	GLAND
104	02-9017	1	SNAP RING
105	1116-71-03	1	COUPLING CYLINDER
106	1037-71-04	1	GUIDE TOP
107	1037-71-01	1	CYLINDER ROD UNIT
108	02-0304	1	O-RING
109	02-0302	1	ROD T-SEAL
110	02-0305	1	O-RING
111	02-0301	1	PISTON T-SEAL
112	09-5810	1	1/2"-UNC HEX NUT (NOT SHOWN)
	09-5110	1	1/2" LOCKWASHER (NOT SHOWN)
113	02-0306	1	ROD T-SEAL
114	02-0303	1	WIPER

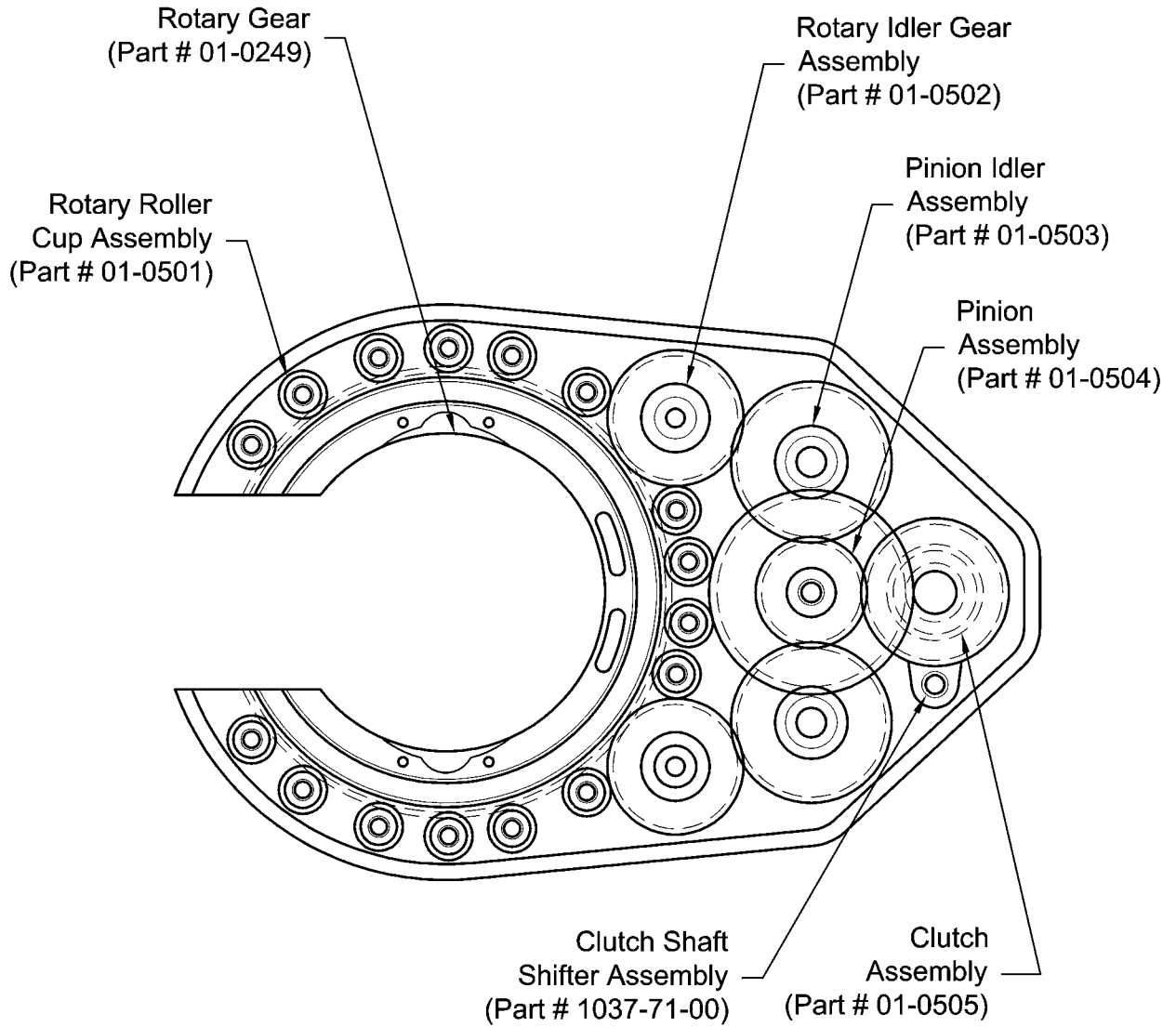


## REMOTE BACKING PIN ASSEMBLY – (1037-100-00)

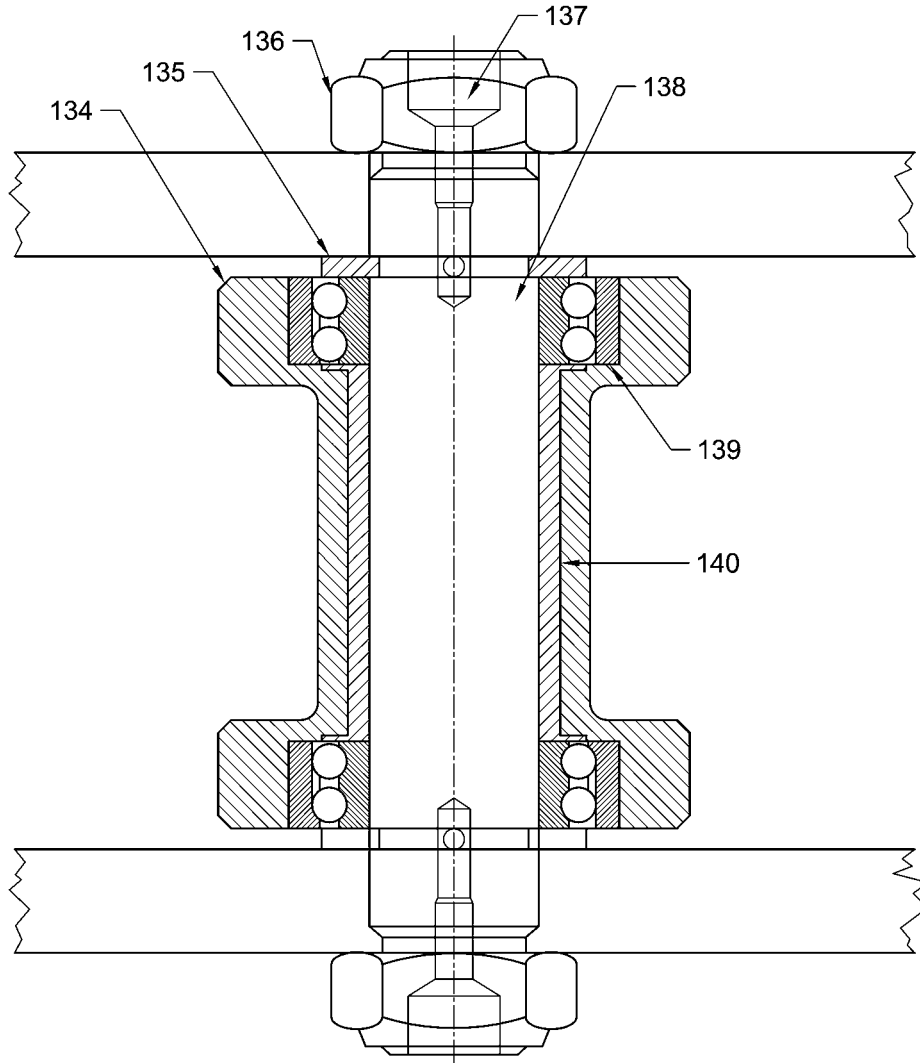
INDEX #	PART #	QTY.	DESCRIPTION
115	1037-100-1	2	BACKING PIN
116	1438-100-13	2	RETAINING WASHER
117	1438-100-7	2	PIN LONG
118	1404-100-4	2	BEARING PIVOT ARM
119	1438-100-3	1	PIVOT ARM
120	1438-100-8	1	PIN SHORT
121	1037-100-2	1	PIVOT POST
122	1438-100-13	1	NUT
123	1037-100-20	1	SPRING PLUNGER
124	1438-100-12	2	BEARING MOUNT STUB
125	1404-100-14	2	SOFT ROLLER
126	1037-100-6	1	RAMP
127	1116-100-15R	1	CYLINDER ROD
128	07-0480	1	70D #208 O-RING
129	1116-100-15B	1	CYLINDER BARREL
130	1116-100-15	1	CYLINDER
131	1116-100-19	1	CYLINDER SPACER
132	1116-100-17	1	MOUNT & ROD GUIDE
133	1116-100-17B	1	ROD GUIDE BUSHING

**NOTE:** The cylinder comes complete with a seal kit. This kit may be replaced separately by ordering #1116-100-15-SK.



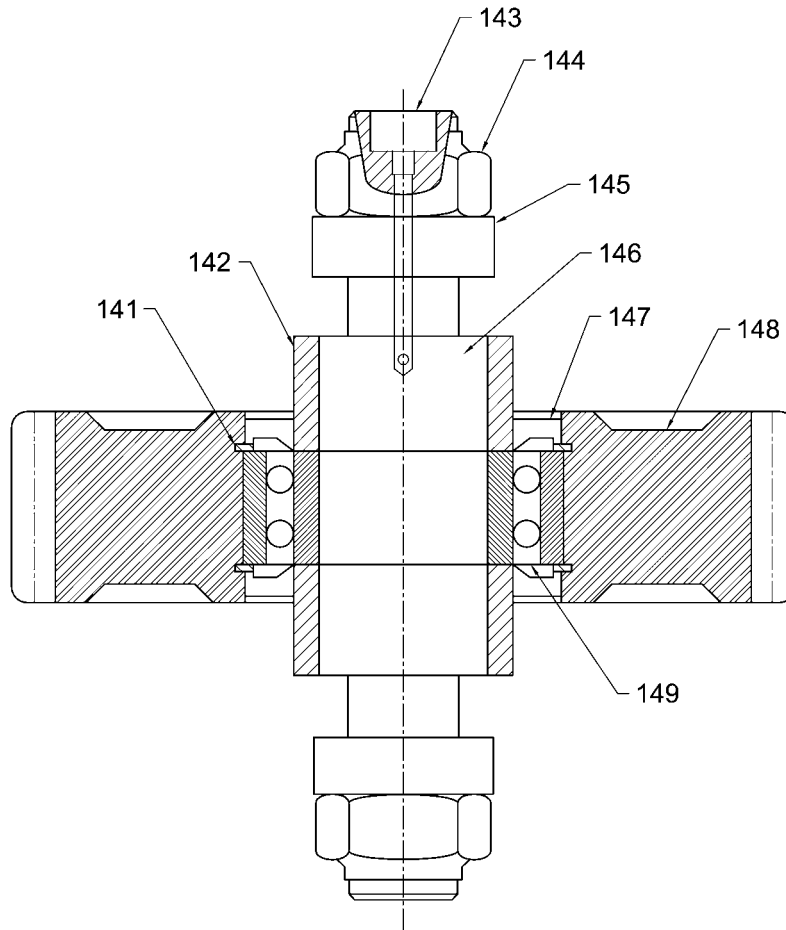


## GEAR CONFIGURATION



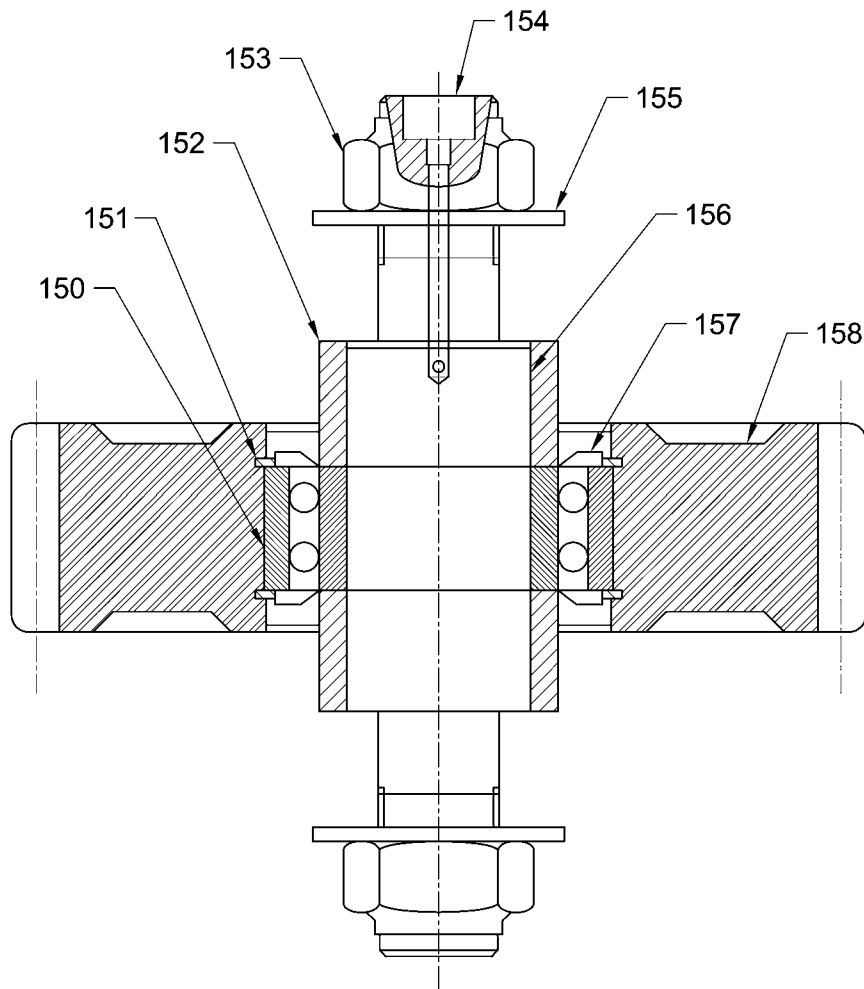
**ROTARY ROLLER CUP ASSEMBLY (16x) – (Part # 01-0501)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
134	01-0096	1	ROLLER CUP
135	01-0095	2	ROLLER CUP BEARING SPACER
136	09-5726	2	1"-UNF NYLON LOCKNUT
137	02-0097	2	1/4"-UNF GREASE FITTING
138	01-0098	1	ROLLER SHAFT
139	02-0094	2	ROLLER CUP BEARING
140	01-0097	1	ROLLER CUP SPACER



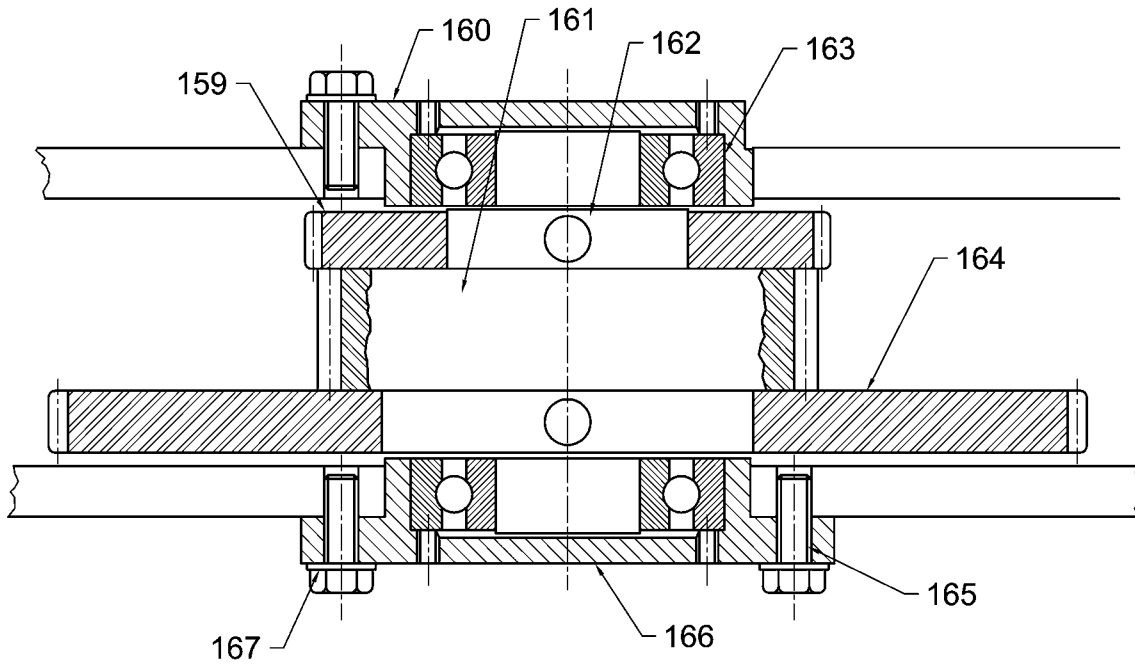
### ROTARY IDLER GEAR ASSEMBLY (2x) – (Part # 01-0502)

INDEX #	PART #	QTY.	DESCRIPTION
141	02-0009	2	ROTARY IDLER GEAR RETAINER
142	01-0093	2	ROTARY IDLER BEARING SPACER
143	02-0005	1	1/8"-NPT GREASE FITTING
144	09-5740	2	1-1/2"-UNF NYLON LOCKNUT
145	01-0246	2	ROTARY IDLER PAD
146	01-0094	1	ROTARY IDLER SHAFT
147	02-0010	2	ROTARY IDLER BEARING SEAL
148	01-0248	1	ROTARY IDLER GEAR
149	02-0011	1	ROTARY IDLER BEARING



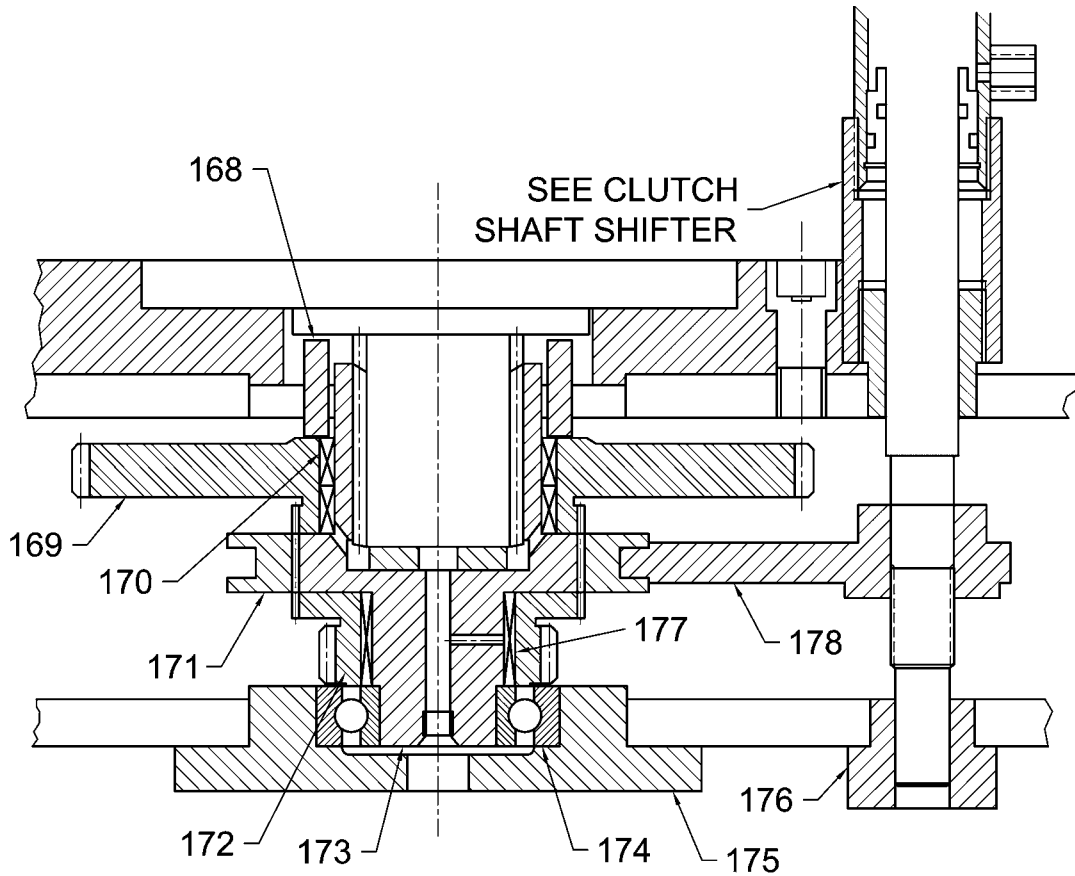
### PINION IDLER ASSEMBLY (2x) – (Part # 01-0503)

INDEX #	PART #	QTY.	DESCRIPTION
150	02-0011	1	PINION IDLER BEARING
151	02-0009	2	PINION IDLER GEAR RETAINER
152	01-0093	2	PINION IDLER BEARING SPACER
153	09-5740	2	1-1/2"-UNF NYLON LOCKNUT
154	02-0005	1	1/8"-NPT GREASE FITTING
155	01-0246	2	PINION IDLER PAD
156	01-0094	1	PINION IDLER SHAFT
157	02-0010	2	PINION IDLER BEARING SEAL
158	01-0247	1	PINION IDLER GEAR



**PINION ASSEMBLY – (Part # 01-0504)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
159	01-0241	1	HIGH PINION GEAR
160	01-0240	1	TOP PINION BEARING CAP
161	01-0243	1	PINION GEAR
162	01-0242	4	PINION KEY
163	02-0106	2	PINION BEARING
164	01-0244	1	PINION LOW GEAR
165	09-1232	8	5/8"-UNC x 1-3/4" H.H.C.S.
166	01-0245	1	BOTTOM PINION BEARING CAP
167	09-5114	8	5/8" LOCKWASHER



**CLUTCH ASSEMBLY – (Part # 01-0505)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
168	1037-42	1	TOP CLUTCH SHAFT SPACER
169	01-0235	1	HIGH CLUTCH GEAR
170	02-0103	2	HIGH CLUTCH GEAR BEARING
171	01-0236	1	SHIFTING COLLAR
172	01-0238	1	LOW CLUTCH GEAR
173	01-0237	1	SPLINED CLUTCH SHAFT
174	02-0105	1	CLUTCH SHAFT BEARING
175	01-0239	1	CLUTCH SHAFT BEARING CAP
176	01-0272	1	BOTTOM CLUTCH BUSHING
177	02-0104	1	LOW CLUTCH GEAR BEARING
178	01-0262	1	SHIFTING YOKE

## **APPENDIX B – CHARTS**

### **20” BACK-UP CLAMPING PRESURE CHART**

<b>PIPE SIIZE &amp; WEIGHT</b>	<b>MAX. RECOMMENDED TORQUE (FT-LBS)</b>	<b>RECOMMENDED PRESSURE (PSI)</b>	
7 @ 17	1530	800	Use 'Wraparound' Dies
7 @ 26	7410	1500	Use 'Wraparound' Dies
# 7 @ 38	13590	1500	Use 'Wraparound' Dies
‡ 7-5/8 @ 24	2650	1500	Use 'Wraparound' Dies
7-5/8 @ 29.7	7190	1500	Use 'Wraparound' Dies
# 7-5/8 @ 39	13330	1500	Use 'Wraparound' Dies
‡ 8-5/8 @ 28	2910	1500	
8-5/8 @ 36	6580	1500	
# 8-5/8 @ 49	16690	1500	
9-5/8 @ 32	3180	1500	
9-5/8 @ 40	7010	1500	
# 9-5/8 @ 54	17780	1500	
‡ 10-3/4 @ 33	2560	1200	
10-3/4 @ 51	9450	1500	
# 10-3/4 @ 66	18400	1500	
‡ 13-3/8 @ 48	4030	1500	
13-3/8 @ 61	7910	1500	
13-3/8 @ 72	15050	1500	
16 @ 65	5490	1500	
16 @ 75	9400	1500	
16 @ 84	10800	1500	
18-5/8 @ 88	9930	1500	
20 @ 94	7260	1500	
20 @ 106	13910	1500	
20 @ 133	18160	1500	

**Pressure chart notes:**

- # May require more than 1500 psi to break-out. The optimum pressure for breaking out these sizes is 2000 psi.
- ‡ The clamping pressure must not exceed 1500 psi. There is the potential for permanent deformation if the pressure exceeds the 1500 psi limit.

## **RECOMMENDED TORQUE VALUES**

For SAE Grade 2, Grade 5 and Grade 8 Cap Screws & Bolts

Torques listed are suggested values on parts residual oil of manufacture. These values do not apply to plated or otherwise lubricated part

BOLT SIZE	S.A.E. GRADE 2		S.A.E. GRADE 5		S.A.E. GRADE 8	
	LOAD* (lbs)	TORQUE (ft-lbs)	LOAD* (lbs)	TORQUE (ft-lbs)	LOAD* (lbs)	TORQUE (ft-lbs)
1/4-20	1320	5	2020	8	2860	12
1/4-28	1500	6	2320	10	3280	14
5/16-18	2160	11	3340	17	4720	24
5/16-24	2400	13	3700	19	5220	27
3/8-16	3200	20	4940	30	7000	45
3/8-24	3620	22	5600	35	7900	50
7/16-14	4380	30	6800	50	9550	70
7/16-20	4900	35	7550	55	10,700	78
1/2-13	5840	50	9050	75	12,750	105
1/2-20	6600	55	10,700	90	14,400	120
9/16-12	7100	65	11,600	110	16,400	155
9/16-18	7900	75	12,950	120	18,250	170
5/8-11	8800	90	14,400	150	20,350	210
5/8-18	10,000	105	16,950	180	23,000	240
3/4-10	13,000	160	21,300	270	30,100	375
3/4-16	14,550	180	23,800	300	33,600	420
7/8-9	9700	145	27,000	395	41,600	610
7/8-14	10,700	155	29,800	435	45,800	675
1"-8	12,700	210	35,500	590	54,500	910
1"-12	13,900	230	38,800	650	59,700	1000
1"-14	14,300	240	39,700	655	61,000	1015

**NOTE:** These recommended torque values are approximate only. The torque-tension relationship is affected by lubrication, surface finish, thread fit, plating, lock washers, etc. \*

FOR PLATED FINISH, TORQUE MUST BE REDUCED.

USE ONLY 75% OF ABOVE VALUES.

\* Clamp Load (lbs) equals 75% of Bolt Proof Load.

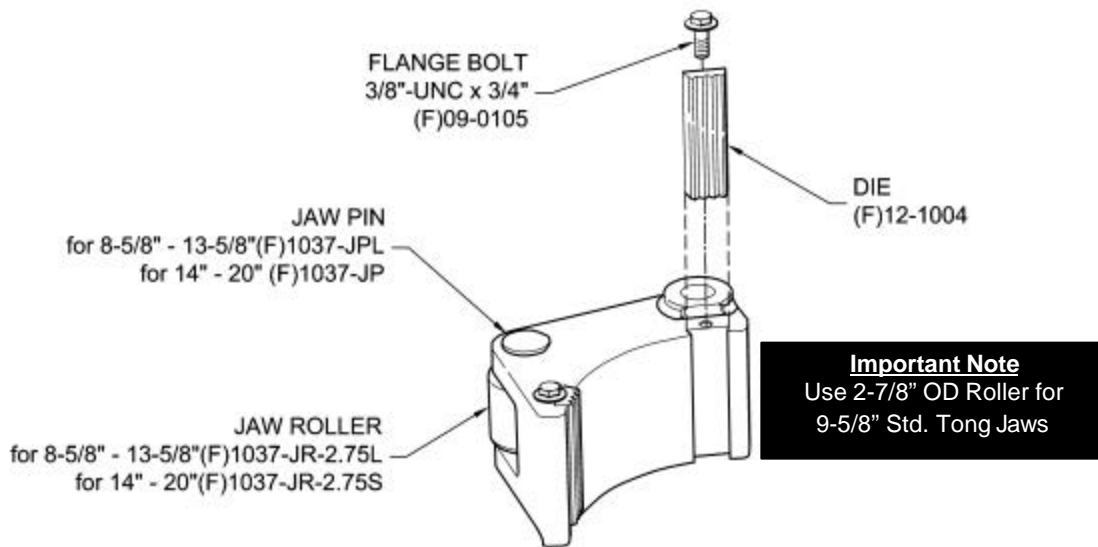


## **APPENDIX C - TONG & BACK-UP CONFIGURATIONS**

# JAW CONFIGURATION CHART

## 20" TONG JAWS

	FARR PART #	VARCO PART #
*7" – 7-5/8" SLIDING HEAD W/A JAW	1037-46-SH/J758	122722-22
†7" WRAPAROUND DIES (2 PER SET)	12-2016	131250-9
†7-5/8" WRAPAROUND DIES (2 PER SET)	12-2017	131250-10
8-5/8" STD. TONG JAWS	1037-JDK-540	122722-21
9-5/8" STD. TONG JAWS	1037-JDK-545	122722-13
9-7/8" STD. TONG JAWS	1037-JDK-547	122722-23
10-3/4" STD. TONG JAWS	1037-JDK-550	122722-14
11-3/4" STD. TONG JAWS	1037-JDK-555	122722-15
13-3/8" STD. TONG JAWS	1037-JDK-558	122722-16
13-5/8" STD. TONG JAWS	1037-JDK-560	122722-17
16" STD. TONG JAWS	1037-JDK-565	122722-18
18-5/8" STD. TONG JAWS	1037-JDK-570	122722-19
20" STD. TONG JAWS	1037-JDK-575	122722-20



### STANDARD JAW CONFIGURATION (8-5/8" – 20")

\* Use with Auxiliary Cage Plate Assembly (F)1037-46-00 which includes: 3/4"-UNC x 2-1/4" shoulder bolts (8x), bottom fastening key (F)1037-46-01A-4 (2pc), 3/4"-UNC x 2" HHCS (8x), and 1-1/4" x 2-1/4" HHCS (2x).

† Requires 7" – 7-5/8" sliding head w/a jaw (F)1463-MJK-3.5 (V) 122722-1 to be utilized.

## 20" BACK-UP JAWS

	FARR PART #	VARCO PART #
7" – 11-3/4" AUXILIARY JAW MOUNT SET	1460-503B-00	131245-2
*7" – 7-5/8" JAW ADAPTER SET FOR W/A DIES	1460-500W-A	131247-2
‡7" W/A DIES (2 PER SET)	12-2016	131250-9
‡7-5/8" W/A DIES (2 PER SET)	12-2017	131250-10
*8-5/8" STD. DIE BACK-UP JAW KIT	1460-BUJDK-8.62	131151-17
*9-5/8" STD. DIE BACK-UP JAW KIT	1460-BUJDK-9.62	131151-18
*9-7/8" STD. DIE BACK-UP JAW KIT	1460-BUJDK-9.87	131151-26
*10-3/4" STD. DIE BACK-UP JAW KIT	1460-BUJDK-10.7	131151-19
*11-3/4" STD. DIE BACK-UP JAW KIT	1460-BUJDK-11.7	131151-20
13-3/8" BACK-UP JAW DIE KIT	1460-BUJDK-13.3	131151-21
13-5/8" BACK-UP JAW DIE KIT	1460-BUJDK-13.6	131151-22
16" BACK-UP JAW DIE KIT	1460-BUJDK-16.0	131151-23
18-5/8" BACK-UP JAW DIE KIT	1460-BUJDK-18.6	131151-24
20" BACK-UP JAW DIE KIT	1460-BUJDK-20.0	131151-25
21" BACK-UP JAW DIE KIT	1460-BUJDK-21.0	

## ACCESSORIES (20" TONGS)

REAR JAW/DIE HOLDER PIN	1460-00-8	131361
FRONT JAW/DIE HOLDER PIN	1460-502-10	131362
TONG DIE	12-1004	131363-2
BACK-UP DIE	12-1004S	131363-1
BUSHINGS FOR 3-1/2" SLIDING HEAD JAW	1463-M-BU3.5	
BUSHINGS FOR 5-1/2" & 7-5/8" SLIDING HEAD JAW	1463-M-BU5.5	

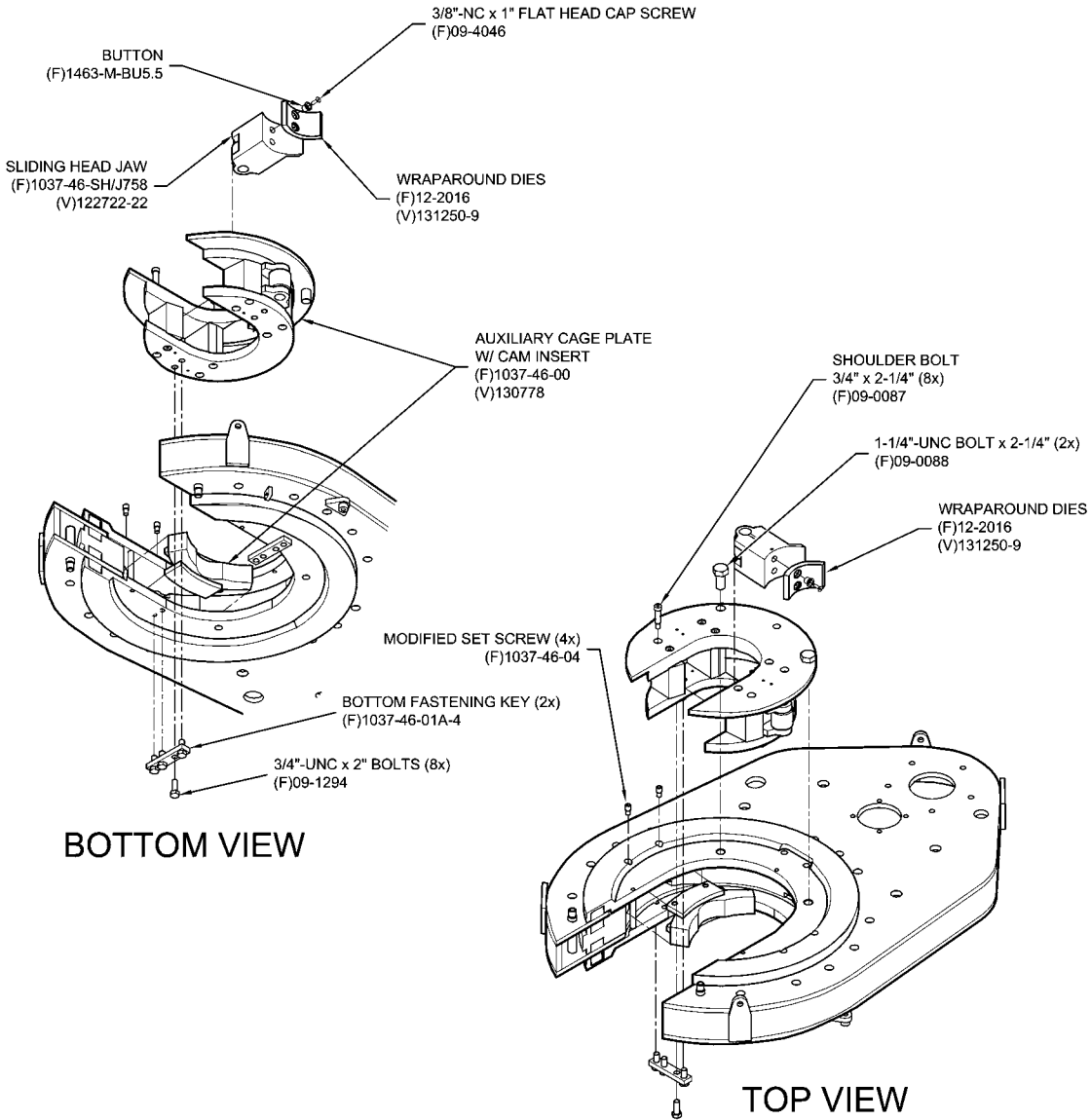
\* Requires 7" – 11-3/4" auxiliary jaw mount set, (F)1460-503B-00, (V)131245-2, to be utilized.

‡ Requires jaw set for 7" – 7-5/8" w/a dies, (F)1410-500W-A, (V)131247-2, to be utilized.

Note: W/A is an abbreviation for wraparound.

**20" - JAW IDENTIFICATION AND INSTALLATION  
FOR 7" CASING  
WITH AUXILIARY CAGE PLATE INSTALLATION**

(20)7



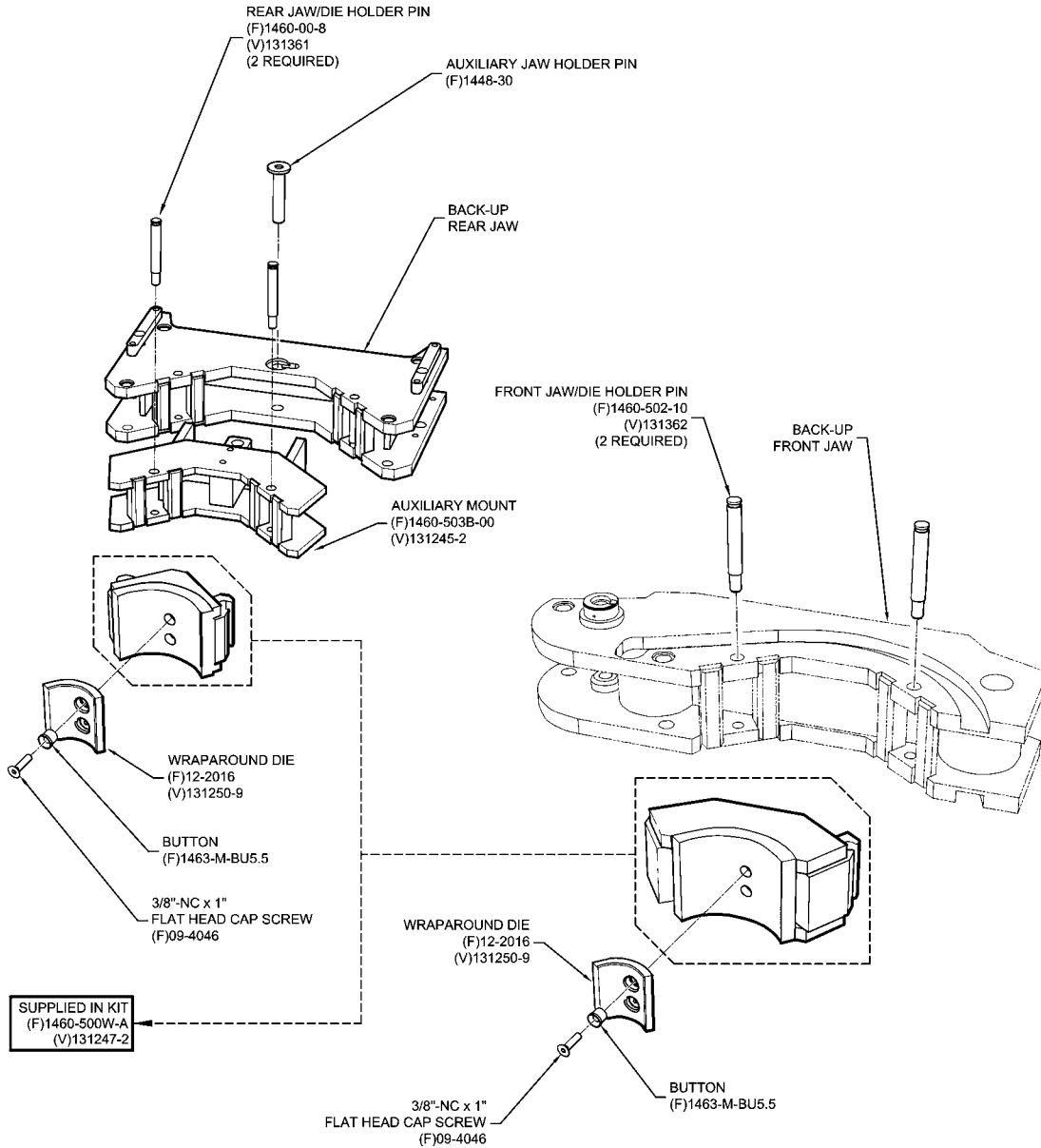
(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #

**WARNING**

When installing the Auxiliary Cam Insert bolts, ensure the holes in the rotary gear have been cleaned thoroughly and ensure the attaching bolts are FLUSH with the support plate of the Auxiliary Cam Insert.

## 20" BACK-UP JAW IDENTIFICATION FOR 7" CASING

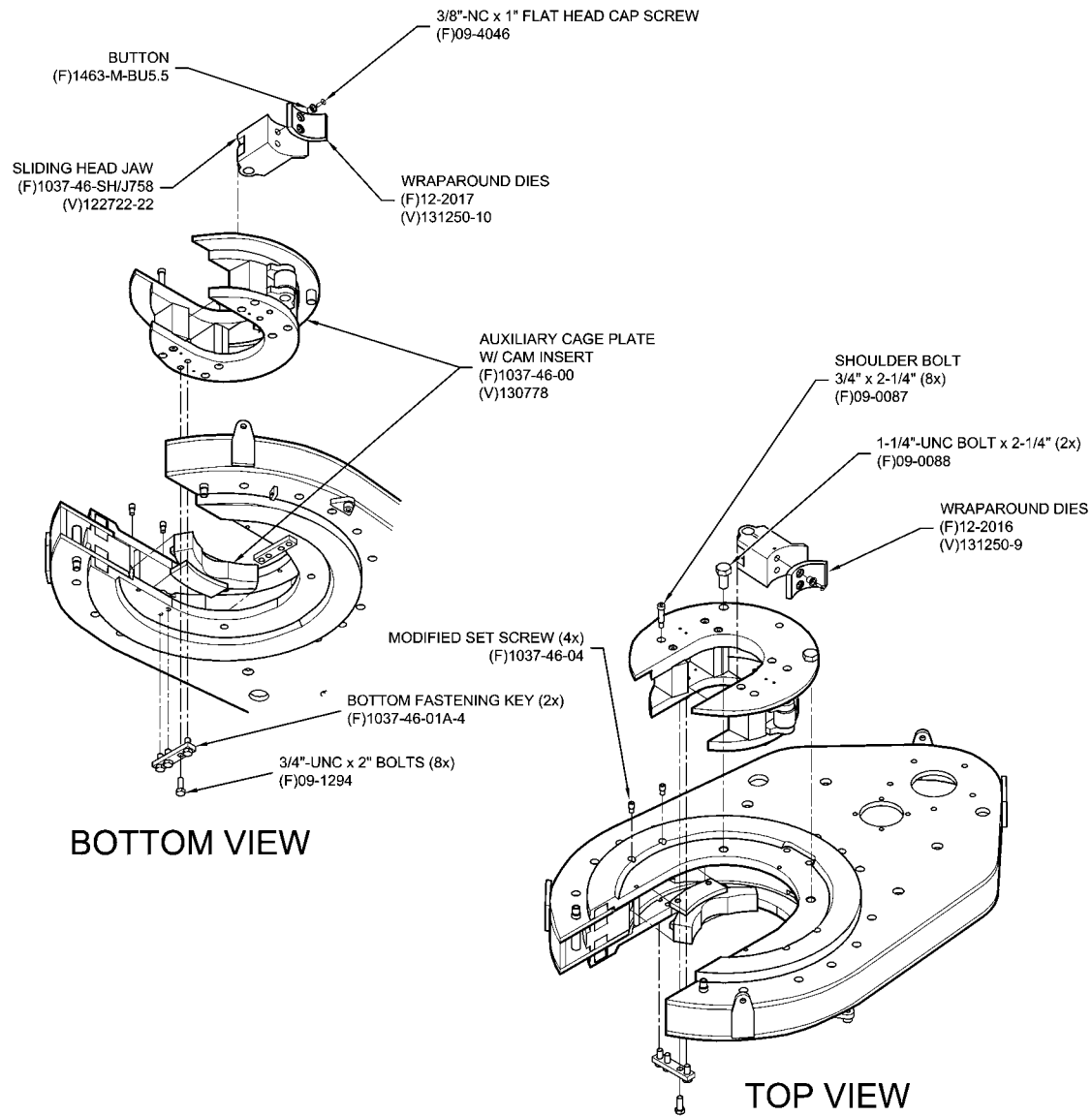
(20)7-BU



(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #

**20" - JAW IDENTIFICATION AND INSTALLATION  
FOR 7-5/8" CASING  
WITH AUXILIARY CAGE PLATE INSTALLATION**

(20)7-5/8



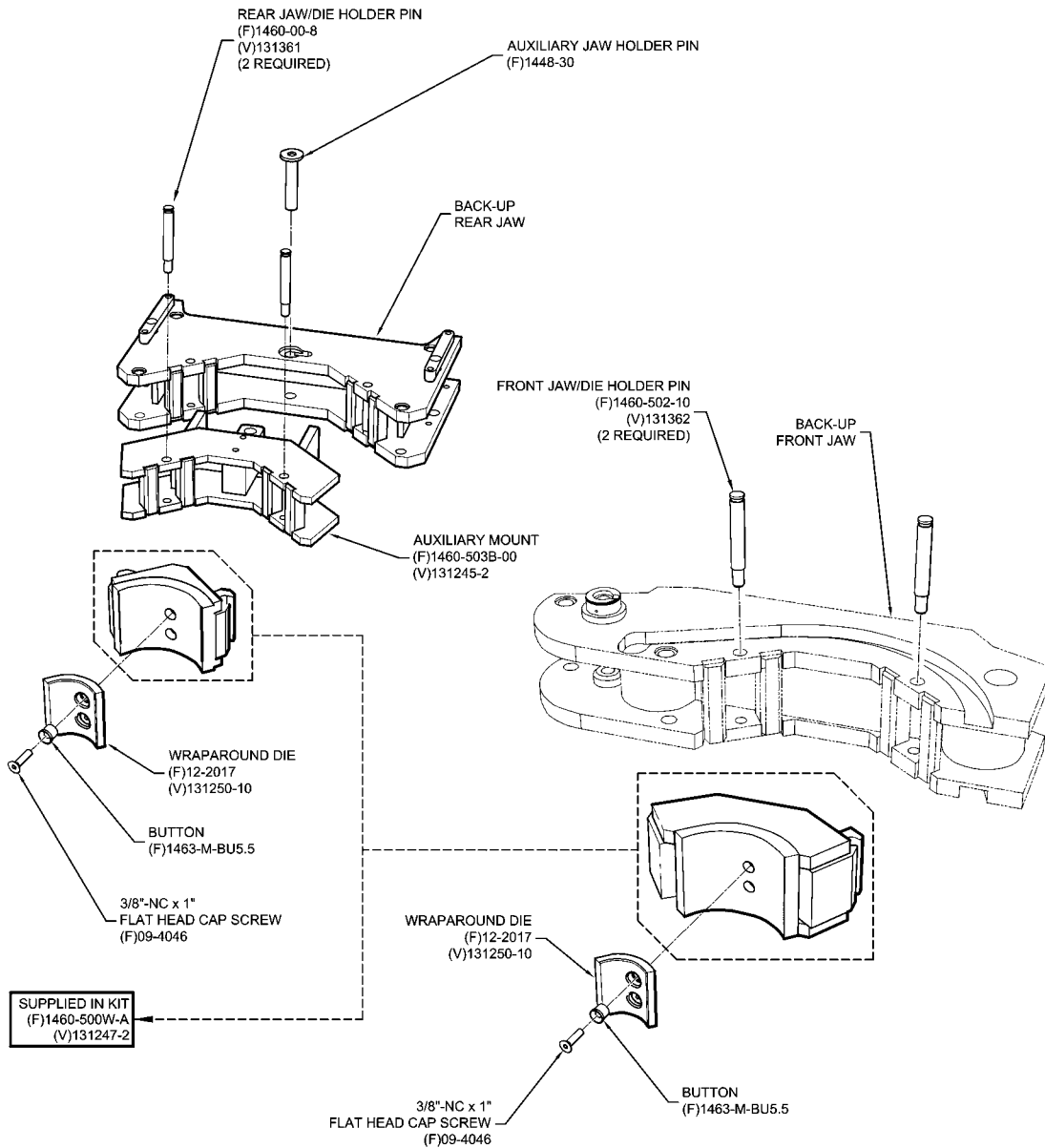
(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #

**WARNING**

When installing the Auxiliary Cam Insert bolts, ensure the holes in the rotary gear have been cleaned thoroughly and ensure the attaching bolts are FLUSH with the support plate of the Auxiliary Cam Insert.

# 20" BACK-UP JAW IDENTIFICATION FOR 7-5/8" CASING

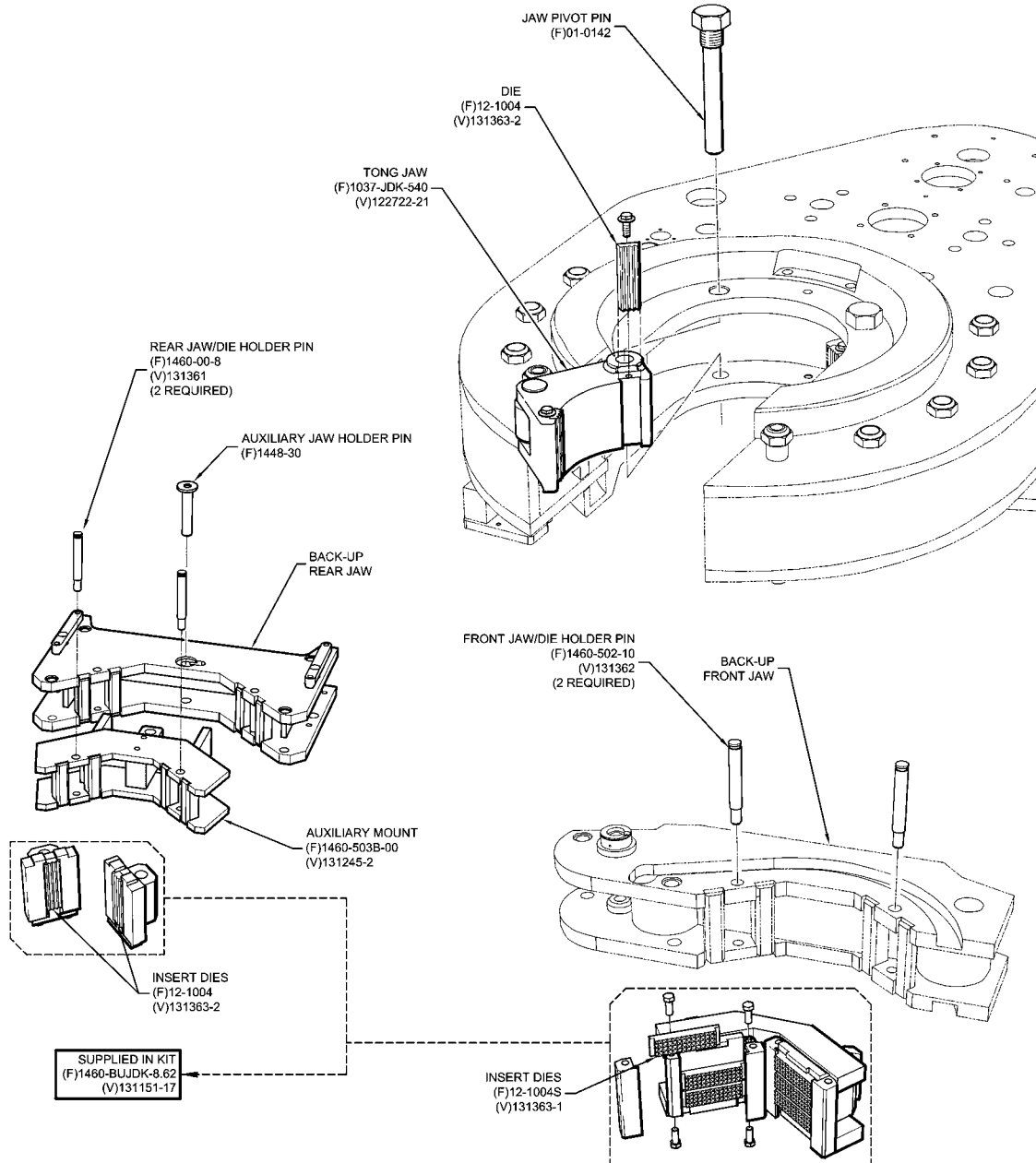
(20)7-5/8-BU



(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #

## 20" TONG & BACK-UP JAW IDENTIFICATION FOR 8-5/8" CASING

(20) 8-5/8

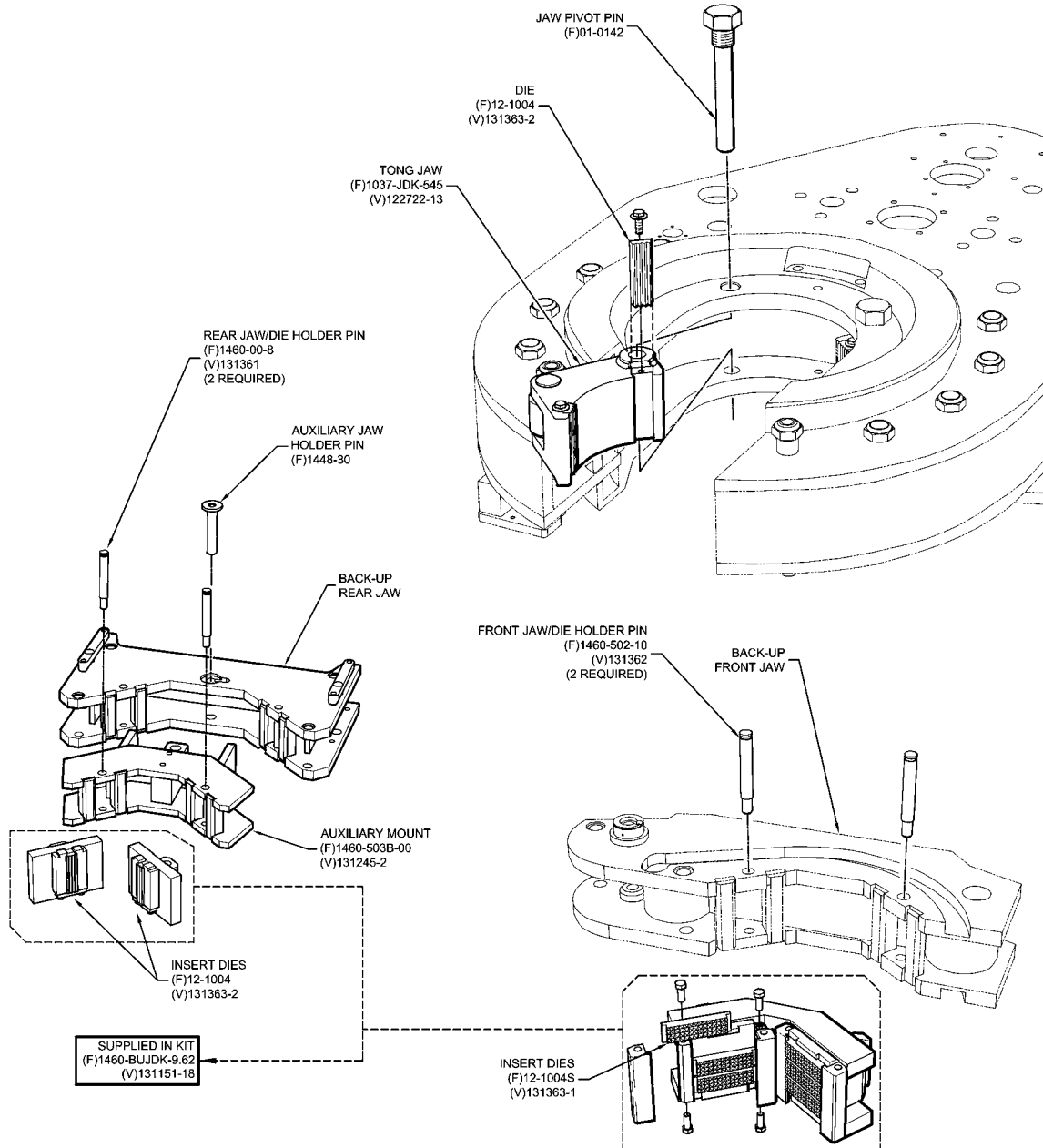


(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #



# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 9-5/8" CASING

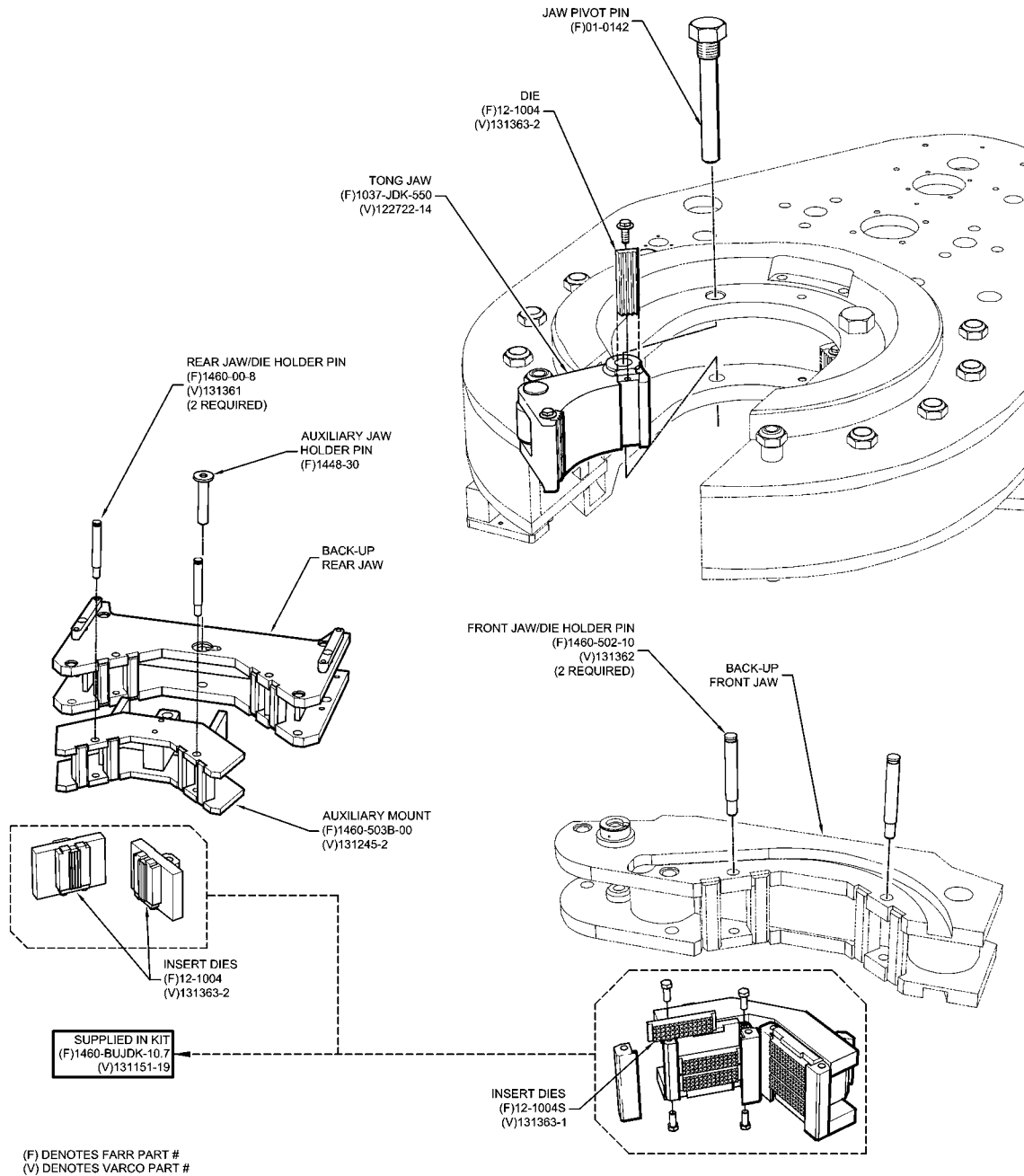
(20) 9-5/8



(F) DENOTES FARR PART #  
(V) DENOTES VARCO PART #

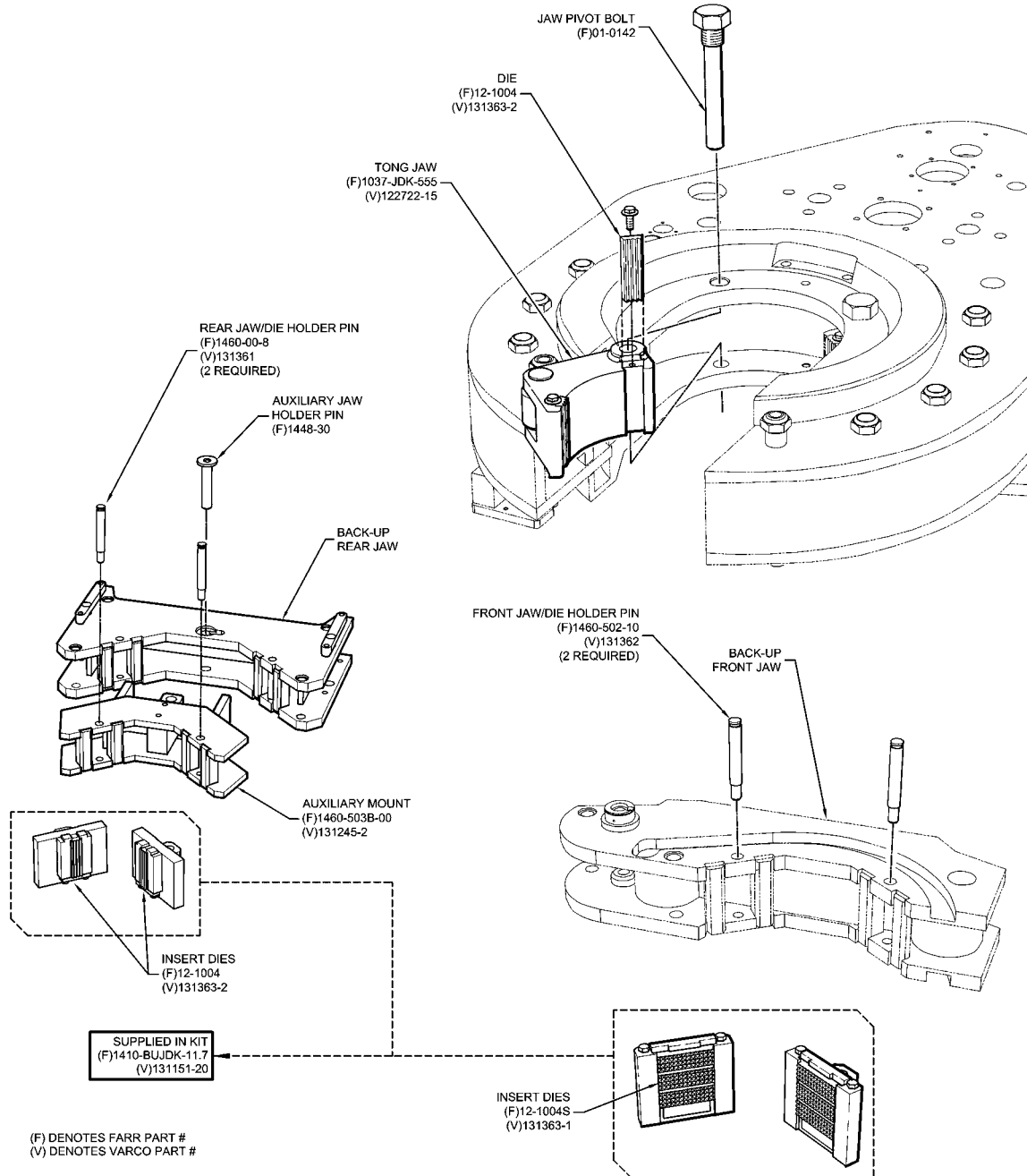
## 20" TONG & BACK-UP JAW IDENTIFICATION FOR 10-3/4" CASING

(20) 10-3/4



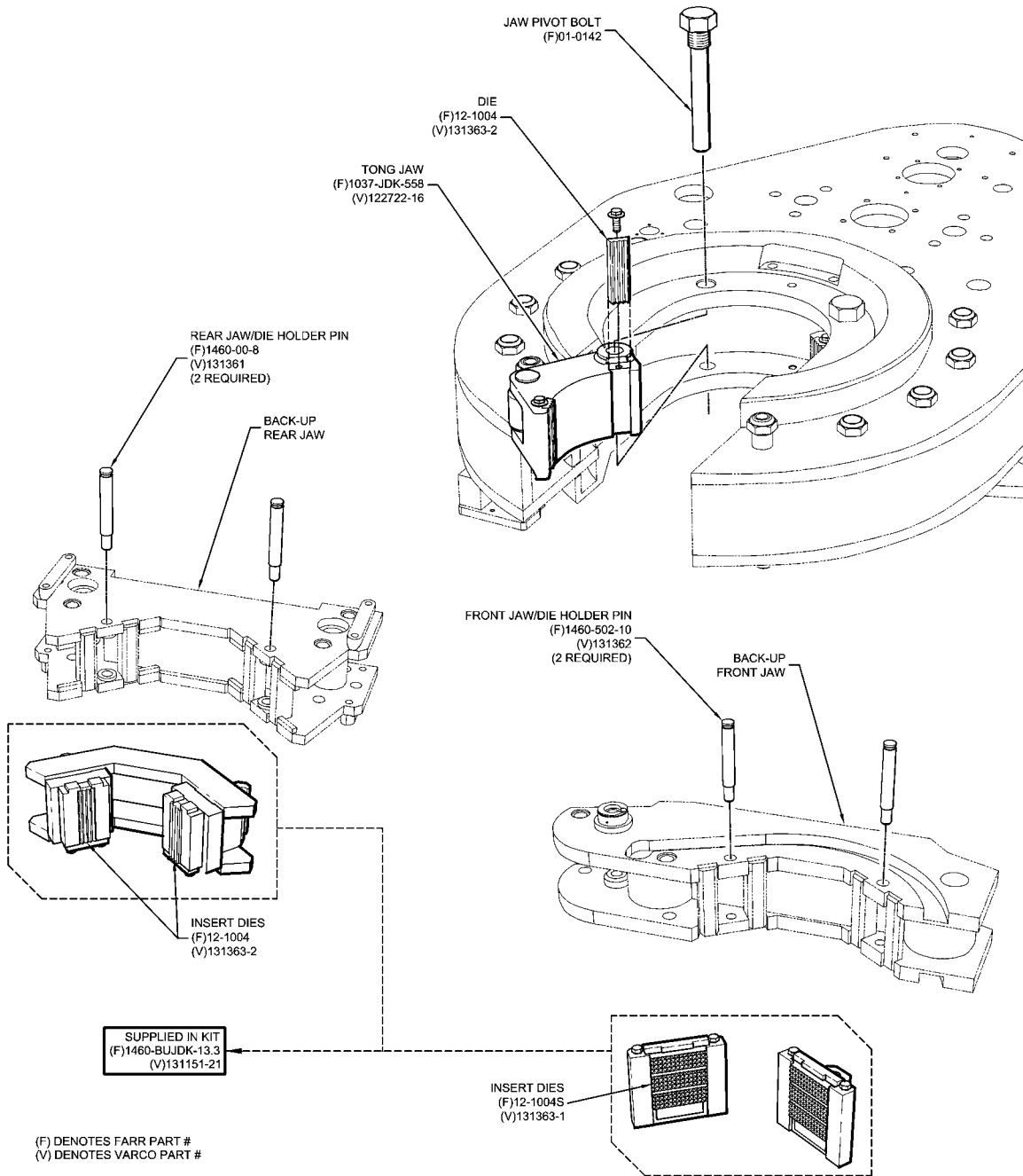
## 20" TONG & BACK-UP JAW IDENTIFICATION FOR 11-3/4" CASING

(20) 11-3/4



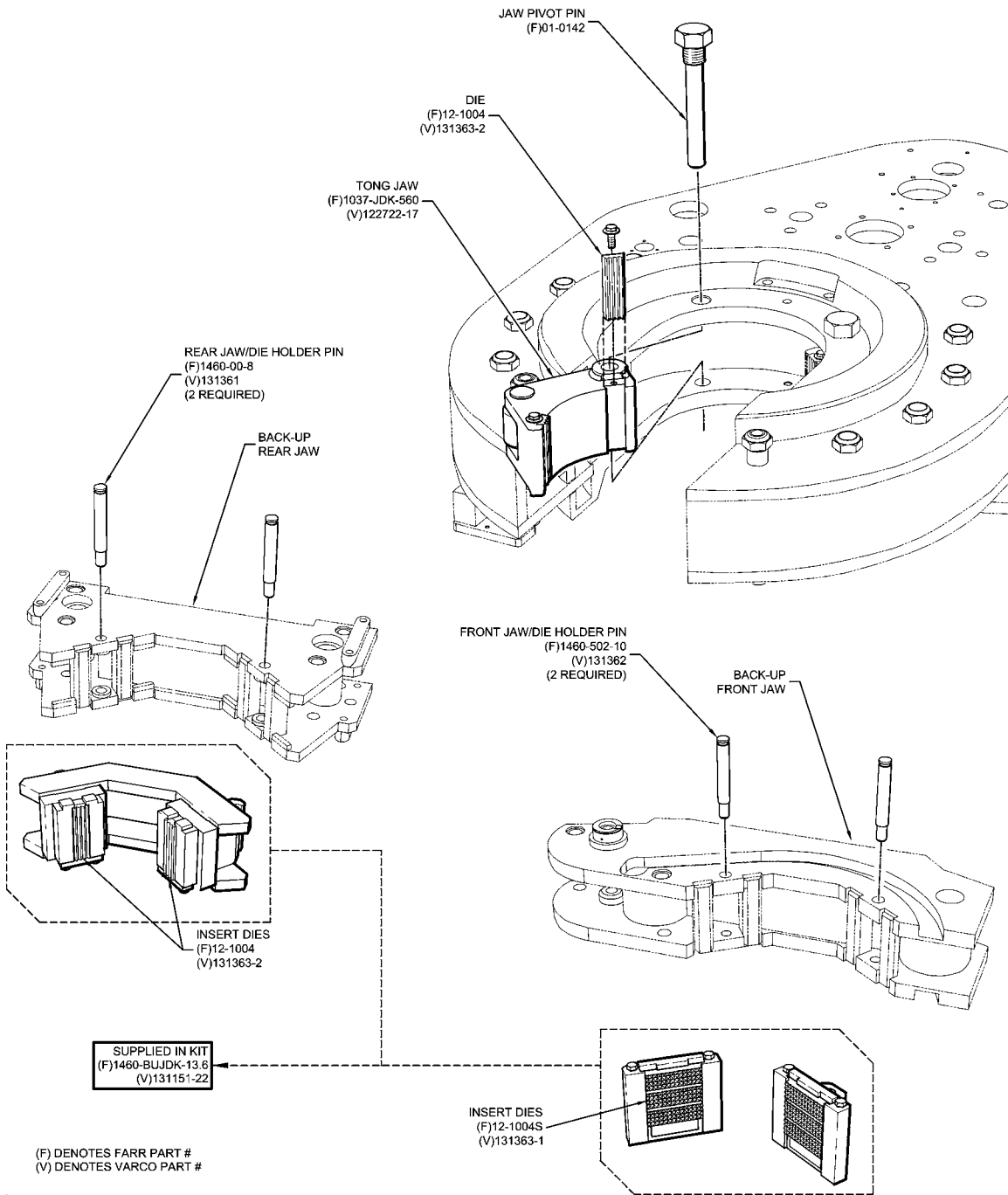
# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 13-3/8" CASING

(20) 13-3/8



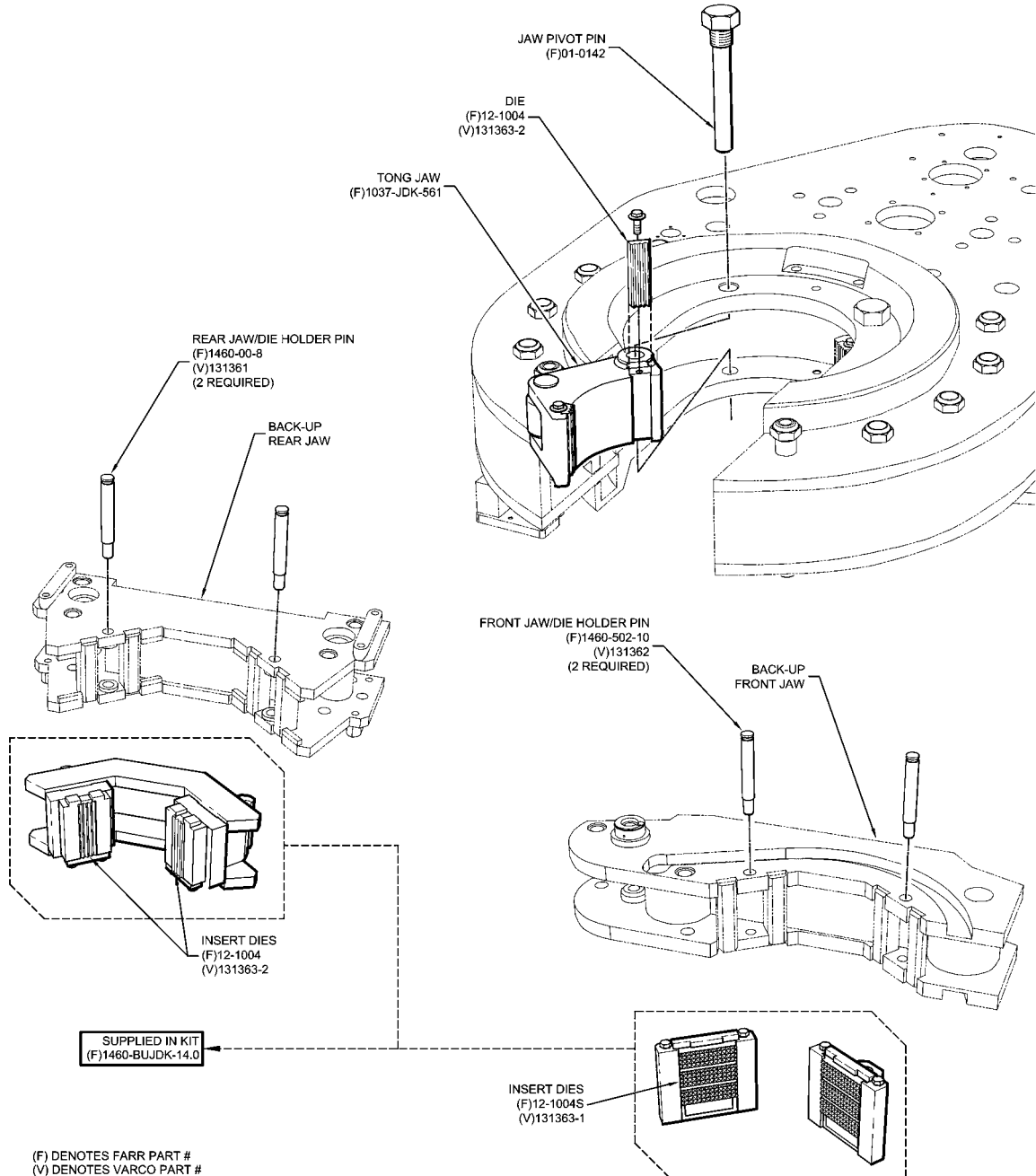
# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 13-5/8" CASING

(20) 13-5/8



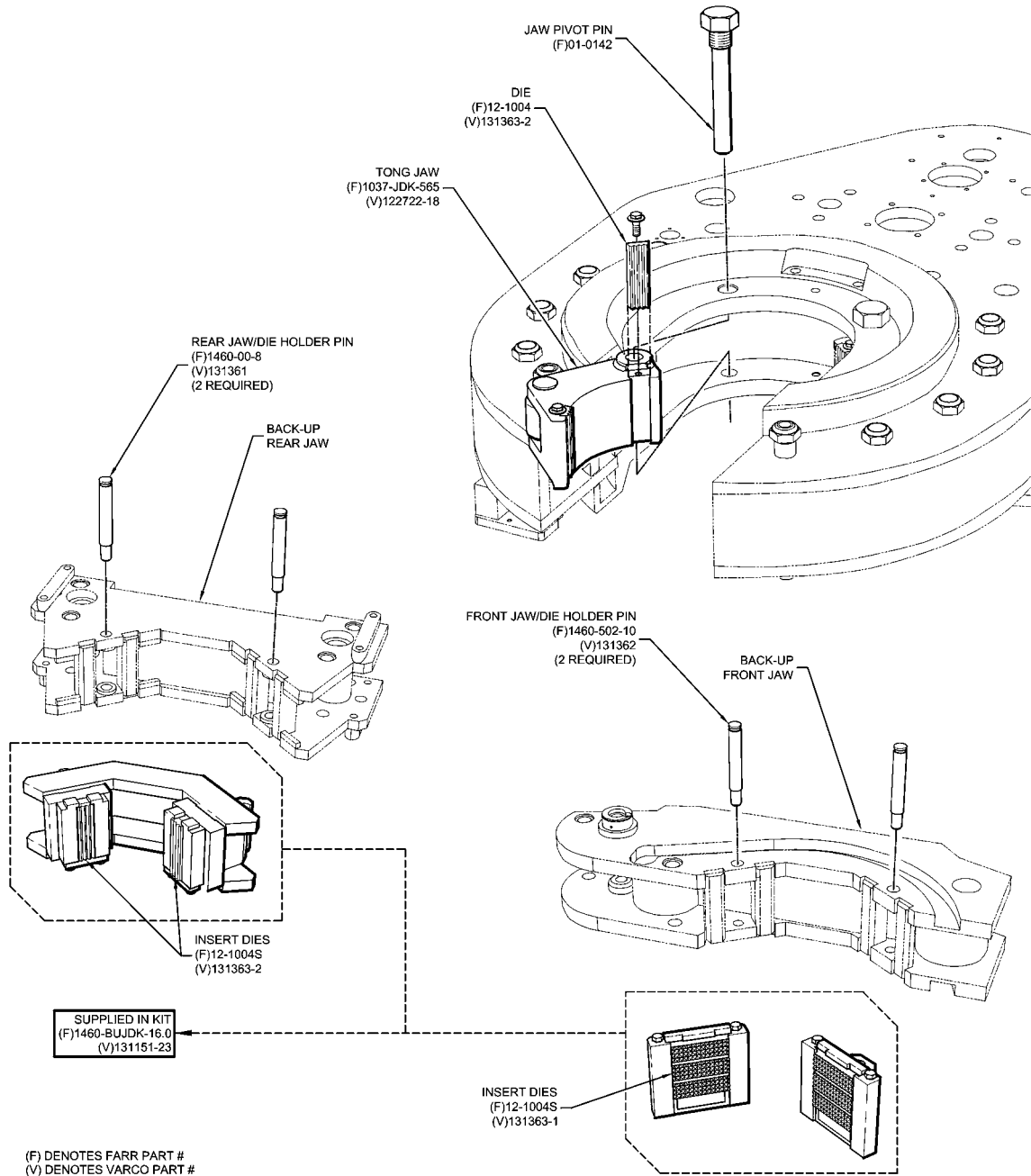
# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 14" CASING

(20) 14



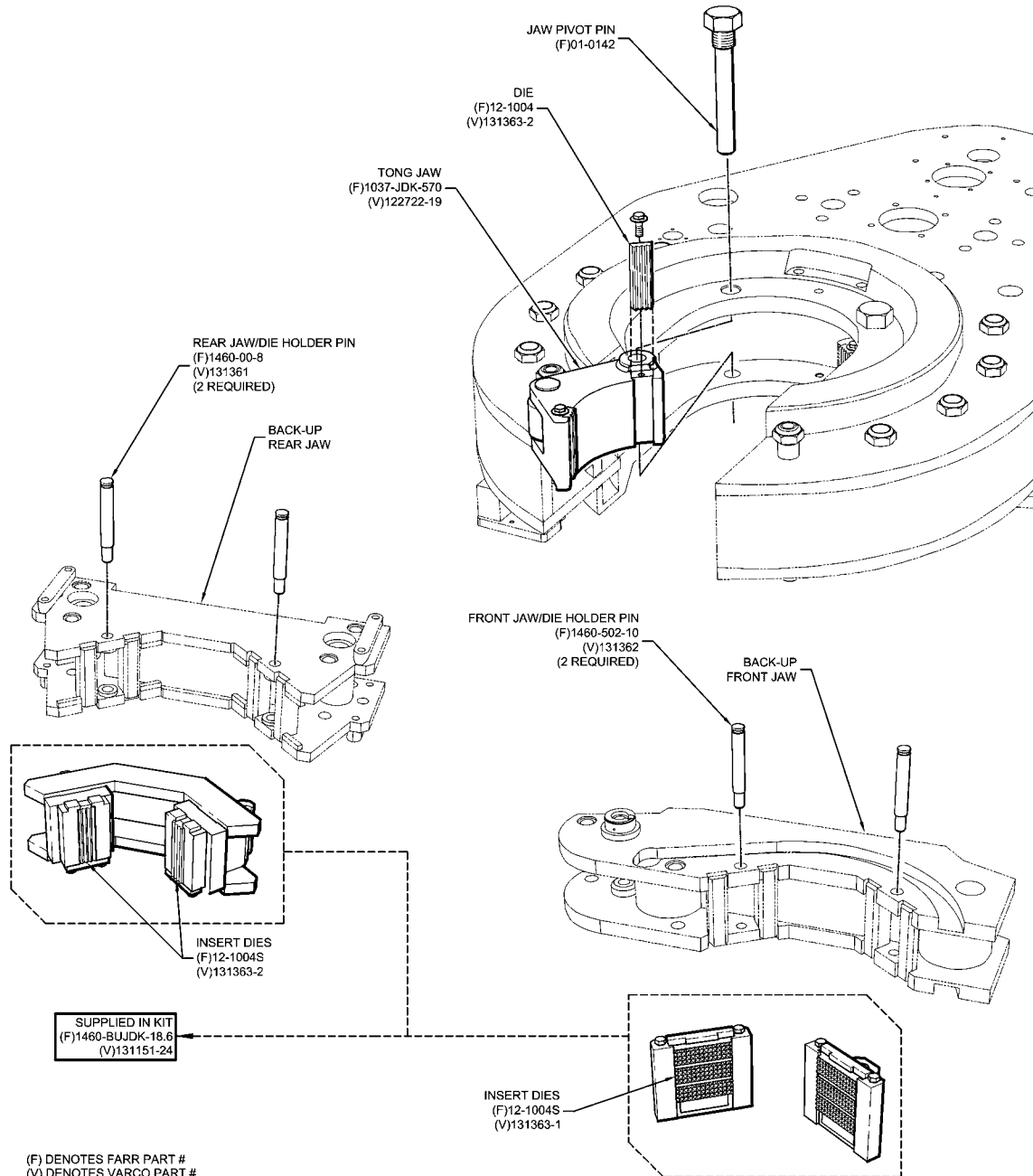
### 20" TONG & BACK-UP JAW IDENTIFICATION FOR 16" CASING

(20) 16



# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 18-5/8" CASING

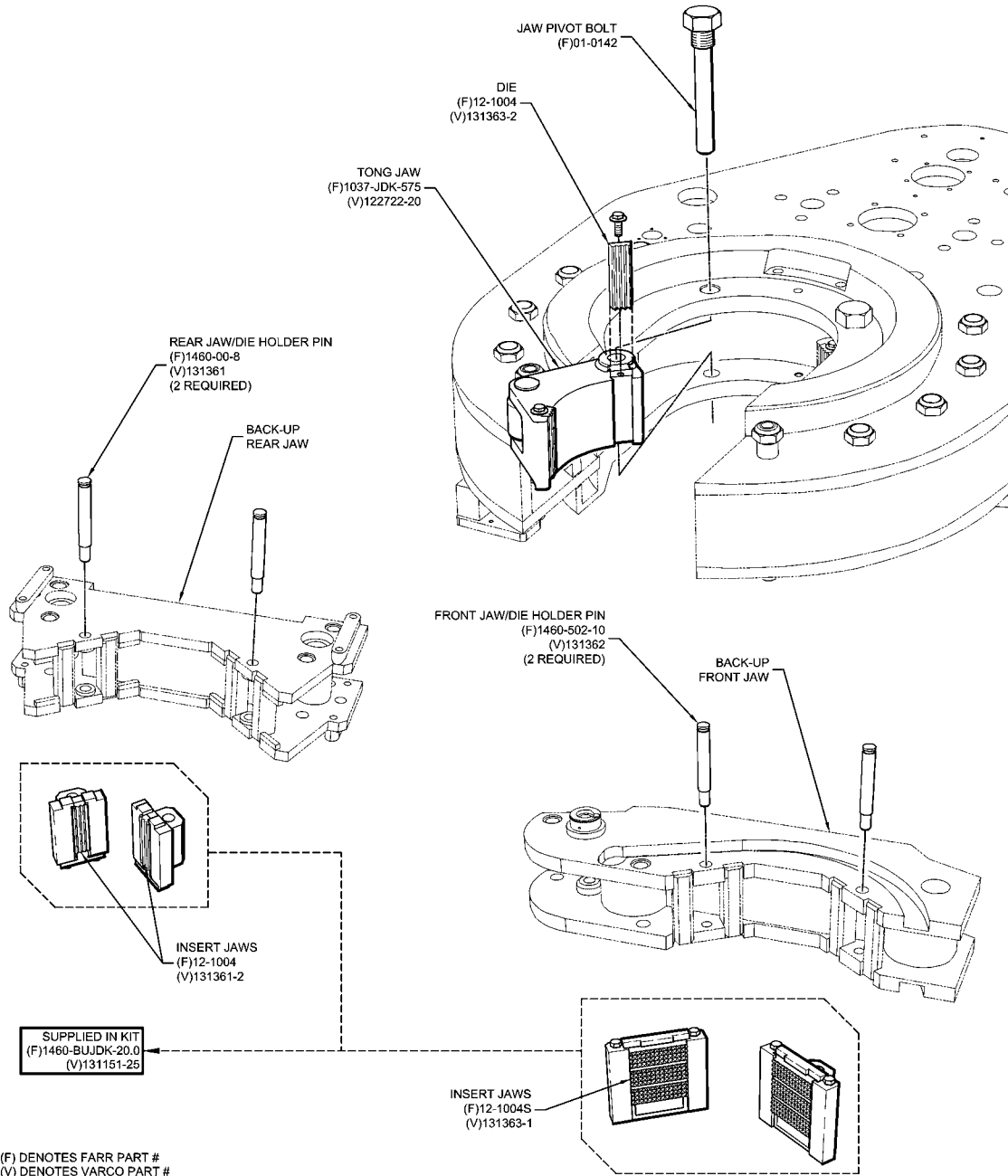
(20) 18-5/8



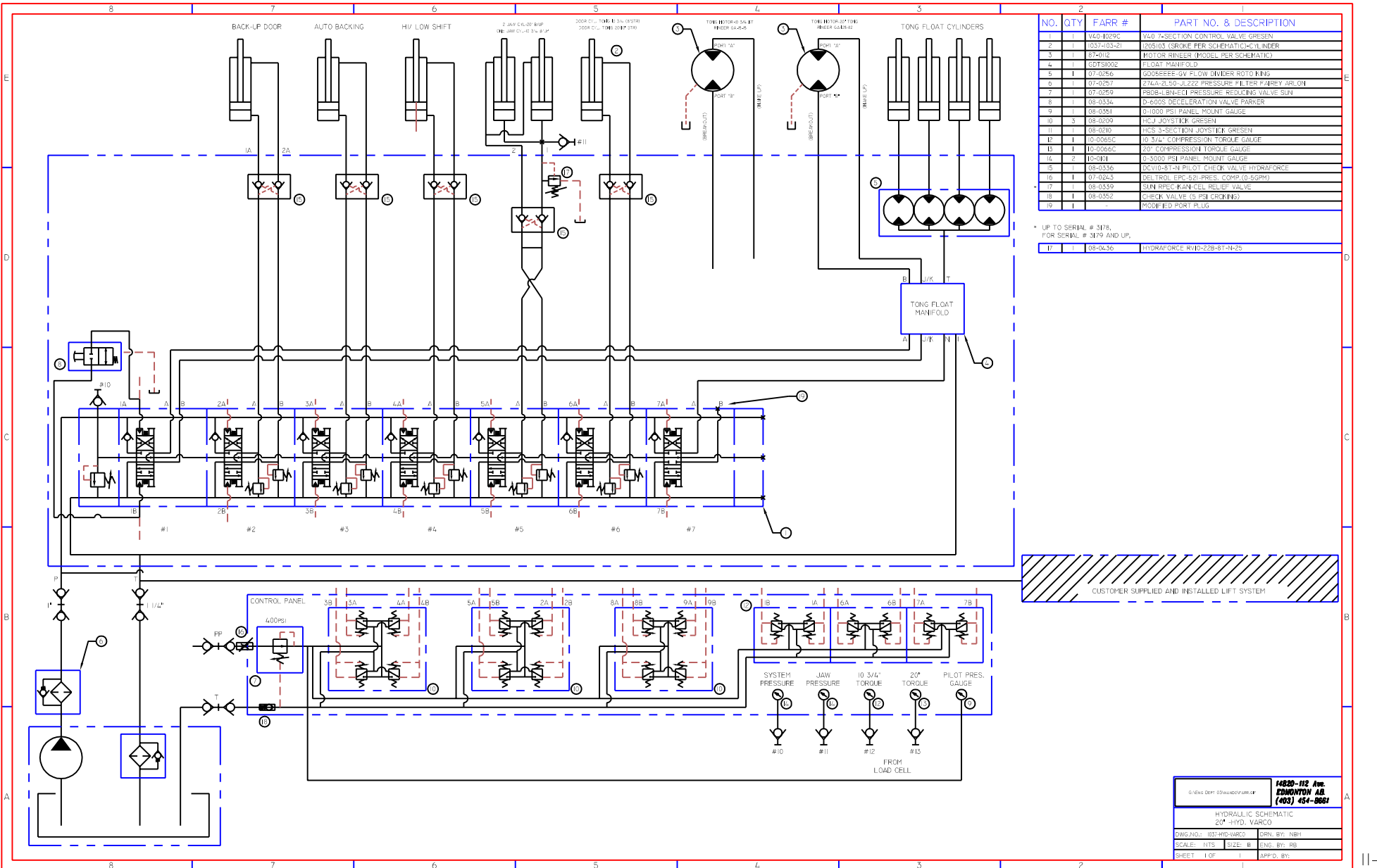


# 20" TONG & BACK-UP JAW IDENTIFICATION FOR 20" CASING

(20) 20



## **APPENDIX D – HYDRAULICS SUPPLEMENT**



NO.	QTY	FARR #	PART NO. & DESCRIPTION
1	1	140-1029C	140 7-SECTION CONTROL VALVE GREEN
2	1	1037-103-21	1205103 (SROKE PER SCHEMATIC)-C-LINER
3	1	87-012	MOTOR RINGER (MODEL PER SCHEMATIC)
4	1	CDTS1002	FLOAT MANIFOLD
5	1	07-0256	GD555555-GV FLOW DIVIDER ROTO KING
6	1	07-0267	Z744-2L50-3Z22 PRESSURE FILTER FAIRBAY ARLON
7	1	07-0259	FS0811-BIN-CI PRESSURE REDUCING VALVE SUN
8	1	08-0334	D-800S DECELERATION VALVE PARKER
9	1	08-0351	0-1000 PSI PANEL MOUNT GAUGE
10	3	08-0209	HCU JOYSTICK GREEN
11	1	08-0210	HCS 3-SECTION JOYSTICK GREEN
12	1	10-0650C	0 3/4" COMPRESSION TORQUE GAUGE
13	1	10-0306C	20" COMPRESSION TORQUE GAUGE
14	2	10-0111	0-3000 PSI PANEL MOUNT GAUGE
15	1	08-0336	DCV10-BT-N PILOT CHECK VALVE HYDRAFORCE
16	1	07-0243	DELTRON EPC-521-PRES. COMP.(0.5GPM)
17	1	08-0339	SUN RPEC-KAN-CEL RELIEF VALVE
18	1	08-0352	CHECK VALVE (5 PSI CRACKING)
19	1		MODIFIED PORT PLUG

\* UP TO SERIAL # 3175,  
FOR SERIAL # 3179 AND UP.

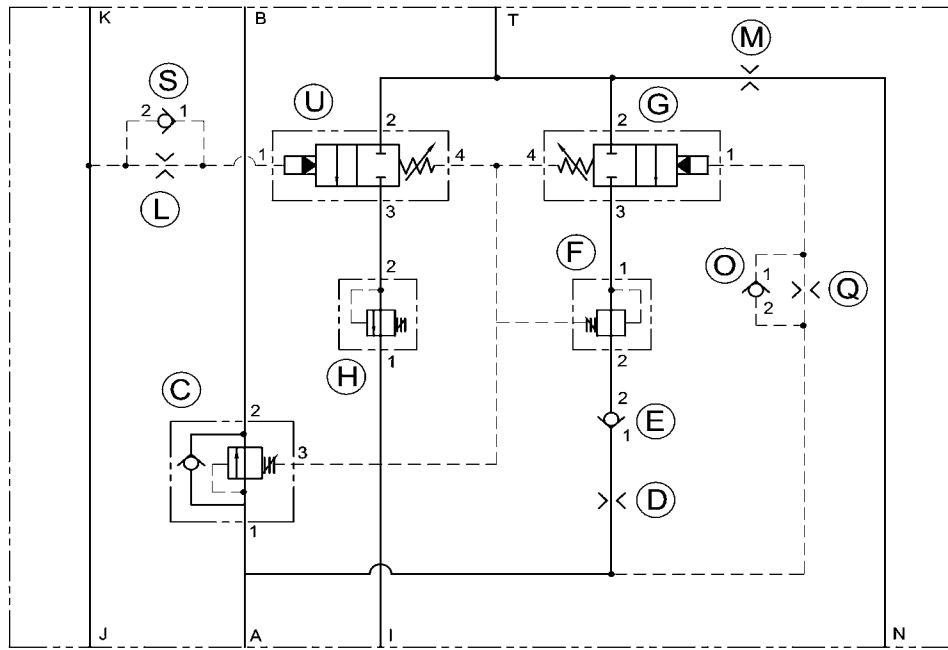
17	1	08-0436	HYDRAFORCE RVD1-22B-BT-NH-25
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CUSTOMER SUPPLIED AND INSTALLED LIFT SYSTEM

14220-112 Ave.  
 EDMONTON AB  
 (403) 454-8861

HYDRAFORCE  
 20" HYD. VARCO

DWG. NO.: 037-HYD-VARD-0 DRN. BY: N8H  
 SCALE: 1:1.5 SIZE: B ENG. BY: RS  
 SHEET 1 OF 1 APPD. BY:

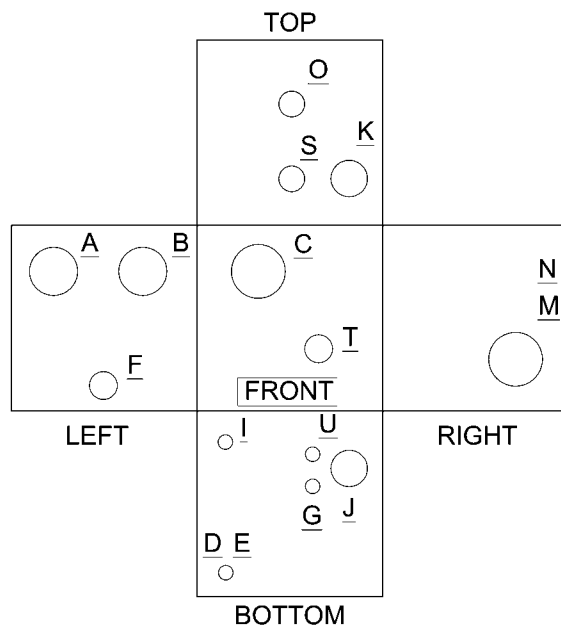
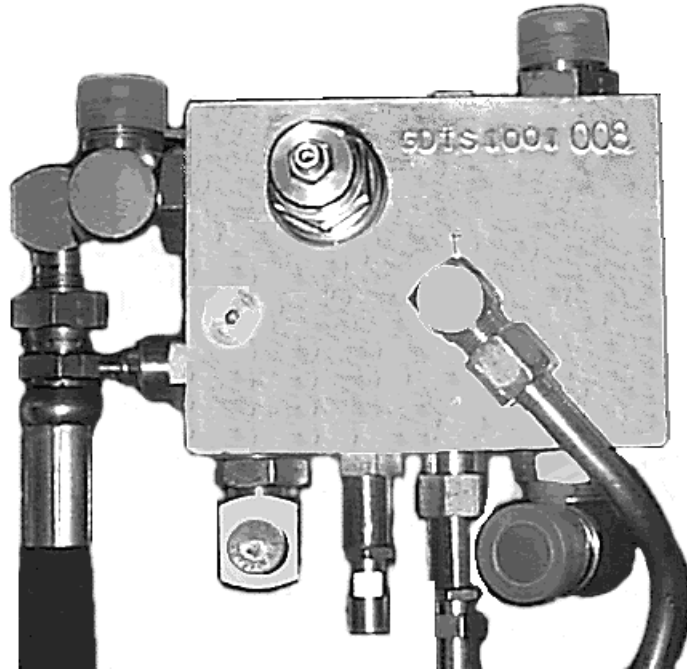


FLOAT MANIFOLD SCHEMATIC

INDEX	QYT.	DESCRIPTION	PART #
C	1	SEQUENCE VALVE	08-0059
D	1	REMOVABLE ORIFACE - 0.250 Ø (1/4" NPT PLUG)	08-0439
E	1	CHECK VALVE	08-0434
F	1	PRESSURE REDUCING VALVE	08-0188
G	1	SEQUENCE VALVE	08-0435
H	1	RELIEF VALVE	08-0436
L	1	REMOVABLE ORIFACE - 0.050 Ø (1/4" NPT PLUG)	08-0440
M	1	REMOVABLE ORIFACE - 0.156 Ø (1/4" NPT PLUG)	08-0441
O	1	CHECK VALVE	08-0434
Q	1	REMOVABLE ORIFACE - 0.050 Ø (1/4" NPT PLUG)	08-0440
S	1	CHECK VALVE	08-0434
U	1	SEQUENCE VALVE	08-0435

PORT I. D.	DESCRIPTION	SIZE
A, B, J, K	POWER TONG	#16 O.R.B.
T	THREAD SAVER	#8 O.R.B.
I	TANK	#12 O.R.B.
N	LIFT / LOWER	#8 O.R.B.

**FLOAT MANIFOLD INSTALLATION AND SETUP PROCEDURE**



**THREAD SAVER MANIFOLD - PART # GDS1002**

**HYDRAULIC REQUIREMENTS**

MAXIMUM FLOW	40 GPM
MINIMUM PRESSURE	1250 PSI
MAXIMUM PRESSURE	3000 PSI

**LABELING LEGEND**

- A) *TONG MOTOR BREAK IN* PORT (#16 ORB)
- B) *TONG MOTOR BREAK OUT* PORT (#16 ORB)
- C) PRESSURE CONTROL
- F) *BREAK PRESSURE* CONTROL
- G) *BREAK SELECTOR*
- H) *MAKE PRESSURE* CONTROL
- I) DRAIN PORT (#12 ORB)
- J) *TONG MOTOR MAKE* PORT (#16 ORB)
- K) *TONG MOTOR MAKE* PORT (#16 ORB)
- N) MANUAL *LIFT/LOWER* PORT (#8 ORB)
- T) *THREAD SAVER* PORT (#8 ORB)
- U) *MAKE SELECTOR*

## **INSTALLATION**

Mount *Thread Saver* manifold via (3) 3/8" NC X 3/4" deep threaded holes, allowing access to plug and orifice **P** and **Q**.

Plumb from *Power Tong Motor's* directional valve work ports to *Thread Saver* ports as follows:

Pressurized work port on *Make* to **J** or **K**.

Pressurized work port on *Break* to **A**.

Plumb from *Thread Saver* to *Power Tong Motor* as follows:

Port **J** or **K** to port for *Make*.

Port **B** to Port for *Break*.

Plumb from the manual *Lift/Lower* directional-valve work port to **N** port on *Thread Saver*

Single line only required because of single acting cylinders

Plumb from **I** port on *Thread Saver* to hydraulic reservoir.

**Note: It is strongly recommended that this line be run unrestricted and not combined with any other return or drain lines.**

Plumb from **I** port on *Thread Saver* to inlet of the 4-way flow-divider for lift cylinders (see air bleed instructions).

## **BLEEDING THE AIR FROM THE "THREAD SAVER" MANIFOLD**

Before connecting **I** Port of *Thread Saver* to the lift cylinder circuit, connect **I** port to a drain line, return line, or into the reservoir in order to properly bleed the thread saver manifold.

**Caution: Do not fully shift directional control valves during air bleed procedure unless indicated.**

- 1) Engage the manual *Lift* Function and hold for approximately 1 minute; then release. The hose routed to **N** port of the thread saver should pressure up slightly.

**Note: It is important that the manual *Lower* function not be engaged until later in the set up procedure.**

- 2) Ensuring Tong Motor is in low speed (high torque), engage *Make* function and hold for approximately 2 minutes then release.
- 3) Shift Tong Motor to high speed (low torque) and repeat step 2.
- 4) Repeat steps 2 & 3 for *Break* function (the hose routed to **A** port on *Thread Saver* should pressure up).
- 5) Repeat steps 1, 2, & 4 but this time fully shift or engage functions.
- 6) Connect the **I** port of the thread saver to the lift cylinder circuit.
- 7) Bleed the lift cylinder circuit as indicated below. **It is important at this point that the manual Lower function not be engaged until the cylinders have been bled and rod glands tightened.**
- 8) With hydraulic lines attached to *Thread Saver* and flow-divider, crack open the 4 air bleeder screws on top of the cylinder's glands.
- 9) Engage lift function. **Make sure not to fully engage.** As oil starts to come out of the 4 hydraulic lines, tighten fittings.
- 10) Oil should then start to fill the 4 lift cylinders. As only oil starts to come out of air bleeders with no air present, tighten the bleeders.
- 11) At this point you should be ready to run. If tong seems to be *spongy* on the float, repeat cylinder bleed procedure until all air is out of cylinders.



## THREAD SAVER SET UP PROCEDURE

For best results and maximum efficiency from the *Thread Saver* the following procedures should be followed:

- Hydraulic power pack running at normal operating speed and temperature.
- Tongs in place, fully assembled, and air bled from system.
- No pipe in tongs.

1) Engage the manual *Lower* function until tongs reach bottom. Engage the manual *Lift* function until tongs reach top. (Always, slow the lift/lower speed near the top and bottom). Repeat this step several times to ensure tongs lift and lower smoothly and evenly.

2) Unlock adjustment screw on pressure controls E and C.

With the tong at mid height, set in *Break* mode and screw adjustment C counter-clockwise until the tong **just** stops lifting or creeps up. Release the *Break* function.

Turn Adjustment C 1/2 turn clockwise and lock adjustment.

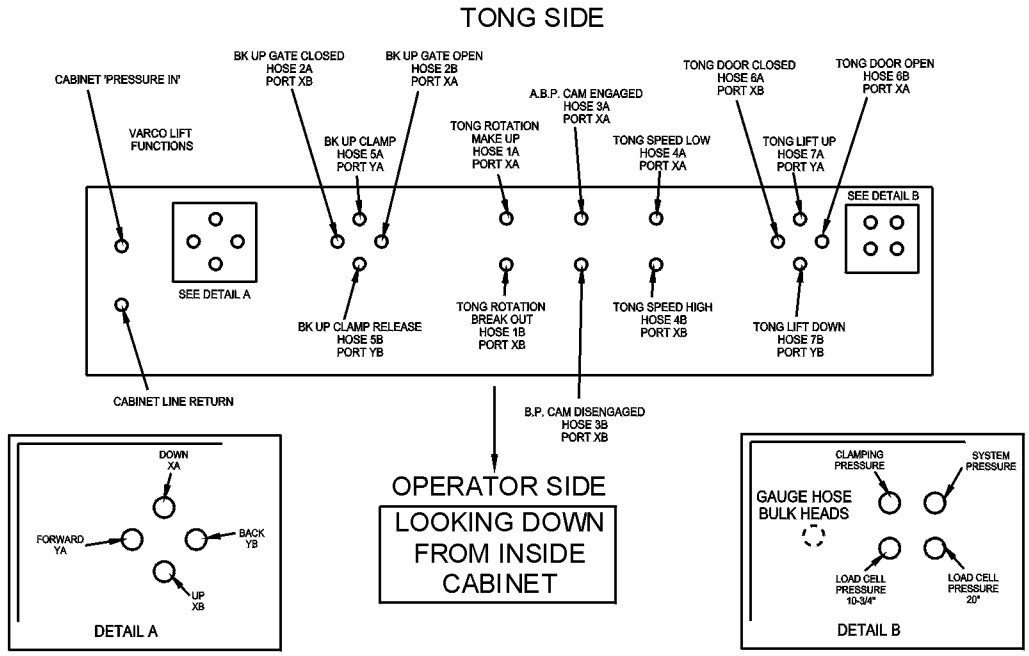
Again, with tong at mid height, engage *Break* function and screw adjustment E counter-clockwise until tong **just** stops lifting. Release the *Break* function and lock the adjustment.

3) Unlock adjustment screw on pressure control H.

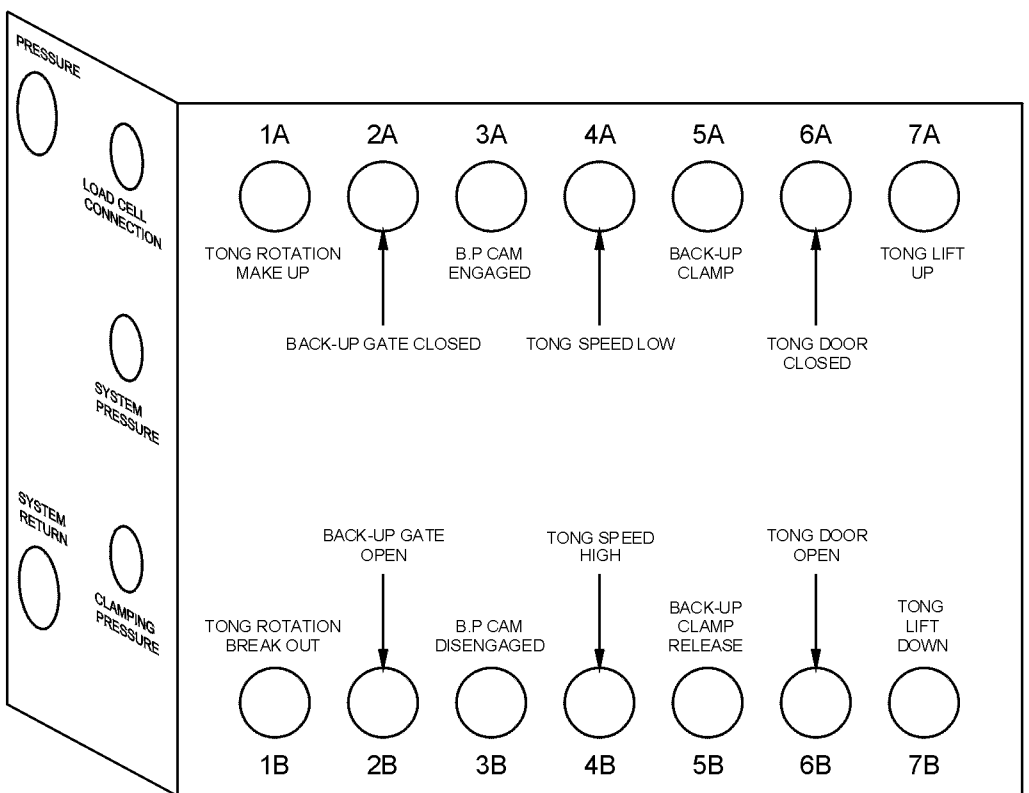
With the tong at mid height, engage the *Make* function and screw adjustment H counter-clockwise until tong **just** starts to creep down. Release the *Make* function and lock the adjustment.

4) Try the *Make* and *Break* functions with the tong at different levels. With either function engaged at any level, tong should stay in place or **creep** very slowly.

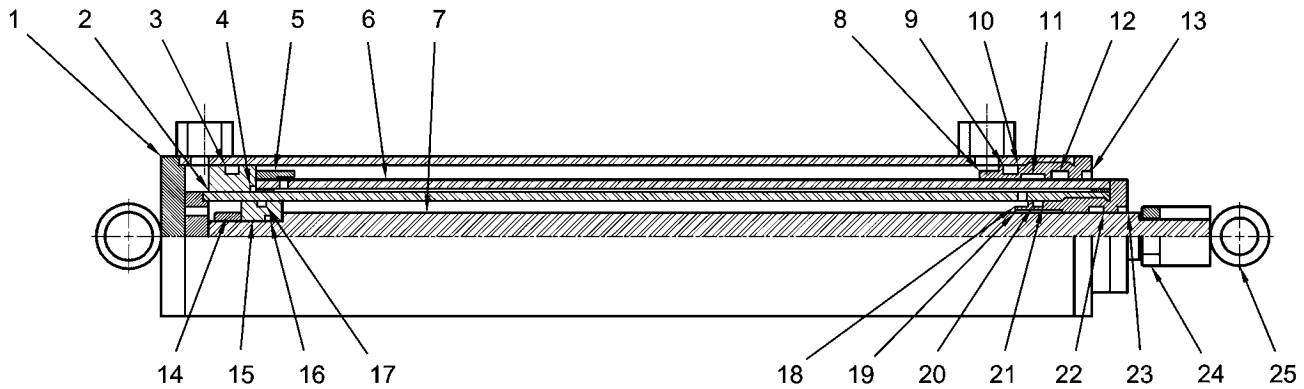
# HOSE AND PORT DESIGNATIONS



## CONTROL PANEL - BOTTOM PLATE



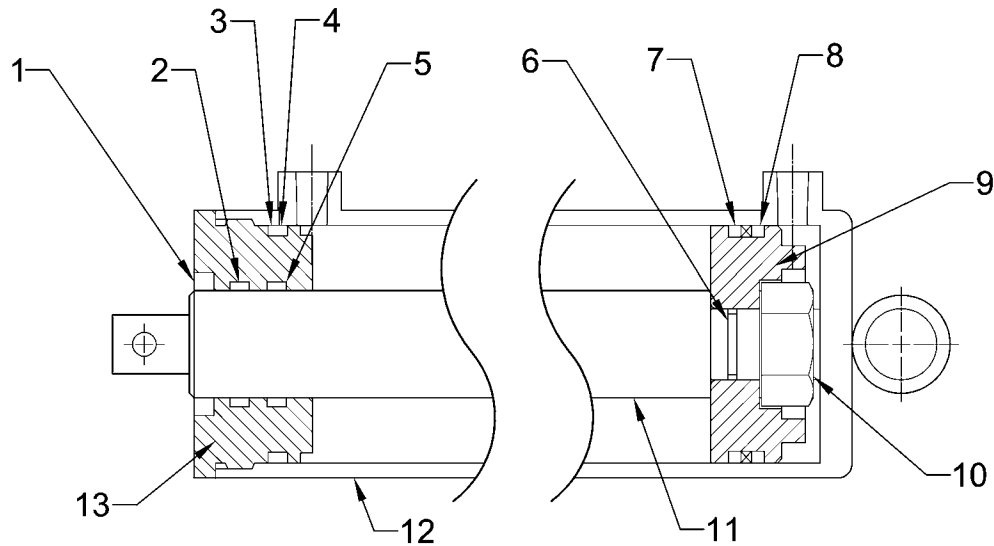
## 10-3/4" HYDRAULIC CONNECTION PANEL



**BACK-UP TELE-CYLINDER – (# 1458-507-00)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
1	02-0453	1	BARREL S.A.
2	02-0452	1	PISTON #1
3	08-0505	1	#334 PSP-AT
4	02-0364	1	#224 BUNA N 70 O-RING
5	02-0451	1	STOP TUBE
6	02-0450	1	SHAFT S.A. #1
7	02-0449	1	SHAFT #2
8	02-0448	1	GLAND #1
9	08-0504	1	URETHANE B.U.
10	08-0503	1	#334 BUNA N 70 O-RING
11	08-0502	1	WEAR RING (H.S. NYLON)
12	08-0501	1	POLYPAK B
13	08-0500	1	SNAP-IN WIPER
14	09-0113	1	3/4"-16 UNF GR. 8 LOCKNUT
15	02-0457	1	PISTON #2
16	02-0344	1	#116 BUNA N 70 O-RING
17	08-0509	1	#218 PSP-A
18	02-0456	1	GLAND #2
19	02-0455	1	BUSHING
20	02-0304	1	#218 BUNA 70 O-RING
21	08-0508	1	URETHANE B.U.
22	08-0507	1	POLYPAK B
23	08-0506	1	SNAP-IN WIPER
24	09-0114	1	3/4"-16 UNF GR. 8 JAMNUT
25	02-0454	1	ROD END

**Note: The seal kit for the cylinder is # 1458-507-00-NSK.**



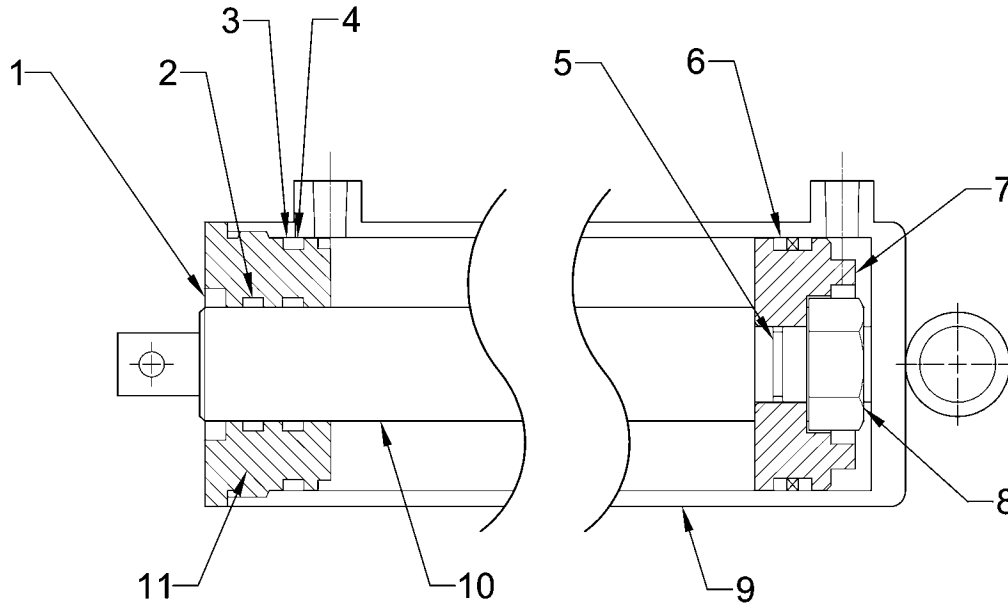
**NEW DESIGN**

(SERIAL # 3173 AND UP)

**BACK-UP PUSH CYLINDER – (1460-34)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
1	08-0476	1	WIPER – 2-250 x 2.625 x 0.188 CASED
2	08-0477	1	SHAFT SEAL – 2.250 x 2.625 x 0.313 POLY-PAK B
3	08-0478	1	GLAND SEAL - #425 BUNA-N-DURO 70 O-RING
4	08-0479	1	GLAND BACKUP - #425 URETHANE BACK-UP RING
5	08-0480	1	WEAR RING – 2.250 x 2.500 x 0.500 H.S. NYLON
6	08-0841	1	PISTON SEAL – O-RING - #222 BUNA-N-DURO 70 O-RING
7	08-0482	2	POLY-PACK – 4.25" ID x 5.00" OD x 0.375" x 0.375"
8	08-0483	1	WEAR RING – 5.000 x 4.750 x 0.500 H.S. NYLON
9	1460-34-03	1	PISTON
10	09-5640	1	1-1/2"-UNC NYLOCK NUT
11	1460-34-01	1	ROD
12	1460-34-00	1	BARREL
13	1460-34-02	1	END GLAND

**NOTE: The seal kit for this cylinder is # 1460-34-SK.**



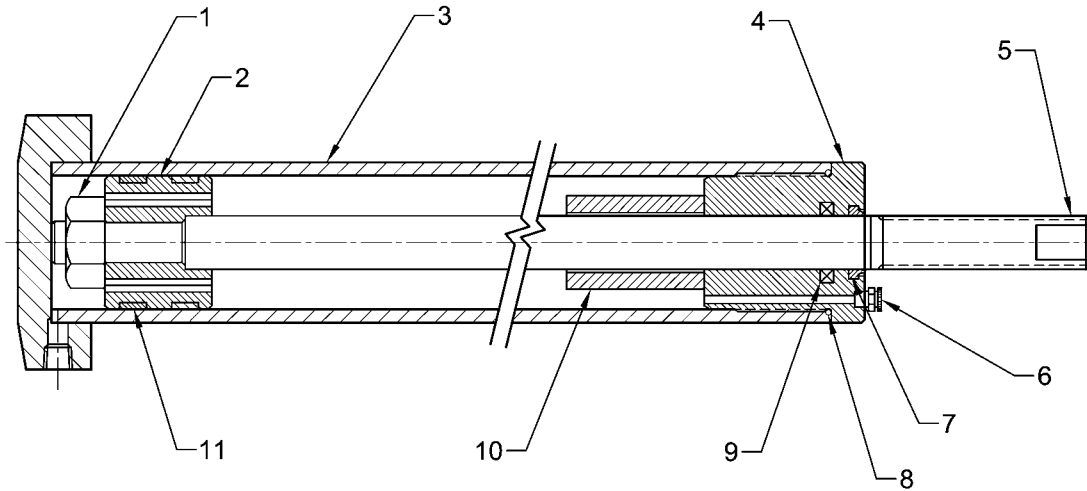
**PREVIOUS DESIGN**

(SERIAL # 3157 - 3170)

**BACK-UP PUSH CYLINDER – (1448-34)**

<u>INDEX #</u>	<u>PART #</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
1	08-0484	1	WIPER - J-2250-3/8
2	08-0485	1	SHAFT SEAL – 1870-2250-375 TYPE 'B' POLY
3	08-0478	1	GLAND SEAL - #425 O-RING
4	08-0478	1	GLAND BACKUP - #425 O-RING
5	02-0304	1	PISTON SEAL - #218 O-RING
6	08-0486	1	PISTON SEAL – 2500-4500-563 TYPE 'B' w/ P.I.P. RING
7	1448-34-03	1	PISTON
8	09-5640	1	1-1/2"-UNC NYLOCK NUT
9	1458-507-10	1	BARREL
10	1448-34-01	1	ROD STAINLESS STEEL
11	1448-34-02	1	END GLAND

**NOTE: The seal kit for this cylinder is # 1448-34-SK.**



**SUSPENSION CYLINDER – (1461-515-00A)**

<b>INDEX #</b>	<b>QTY.</b>	<b>PART #</b>	<b>DESCRIPTION</b>
1	1	09-5718	3/4"-UNF NYLON LOCKNUT
2	1	1461-515-02	PISTON
3	1	1461-515-03	BODY
4	1	1461-515-04	GLAND
5	1	1429-515-05	ROD
6	1	08-0417	WEATHERHEAD BREATHER
7	1	1429-515-06	WIPER SHU-1000
8	1	02-0380	O-RING #2-038
9	1	02-0385	POLYPAC – #1250-1000-250
10	1	1460-00-09A	SPACER
11	2	1429-515-07	WEAR RING

**NOTE: The seal kit for this cylinder is 1461-515-00A-SK.**