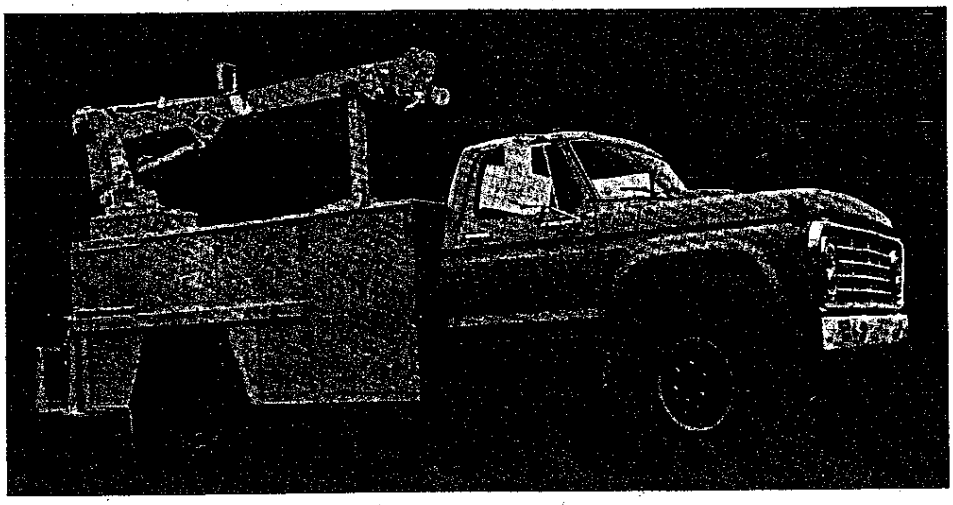
IMT 315
CRANE



IOWA MOLD TOOLING CO., INC.

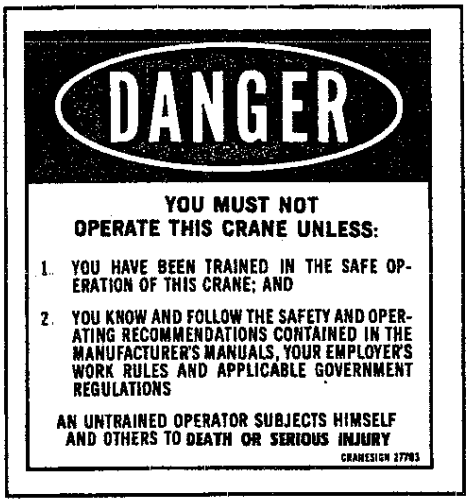
INSTRUCTIONS PARTS LISTS

ACCIDENT PREVENTION SIGNS FOR TELESCOPING AND ARTICULATING CRANES

Help promote essential safety practices for operator and crew

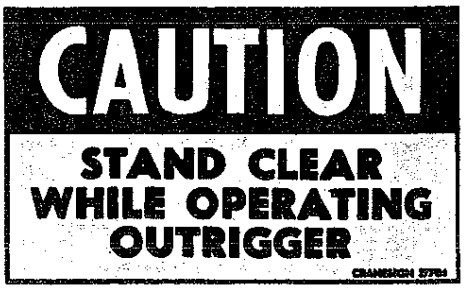
Available from members of the Manufacturers of Telescoping and Articulating Cranes Council

Cranesign No. 27701 lists operating practices which contribute to the proper operation of cranes. One is recommended for each control station to be applied in line-of-sight visibility of crane operator. Approx. size: 4-1/8 in. x 5-1/2 in.

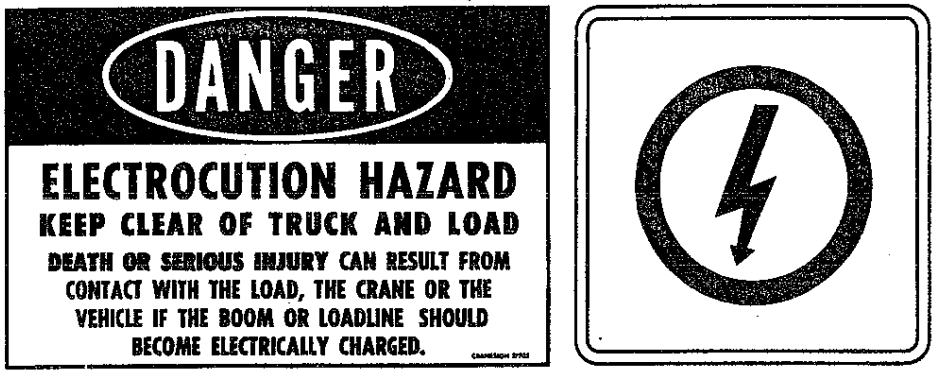


Cranesign No. 27703 warns that a crane should be operated only by trained experienced personnel having complete knowledge of information in equipment's manuals and all applicable work rules. One is recommended for each control station to be applied in line-of-sight visibility of crane operator. Approx size: 4-5/8 in x 4-3/4 in.

Cranesign No. 27702 emphasizes danger of electrocution present when operating a crane near charged electrical conductors. One is recommended for each control station to be applied in line-of-sight visibility of crane operator. Approx. size: 4-1/2 in. x 6-1/4 in.



Cranesign No. 27704 cautions personnel in vicinity of crane to stay away from the outriggers while they are being operated. One is recommended for each outrigger and applied on outrigger where readily visible by anyone nearby. Approx. size: 2-1/2 in. x 4 in.



Cranesign No. 27705 displays the international symbol for electricity and warns of danger from an electrically charged vehicle, crane or load. Four are recommended (one for each side and one for each end of vehicle) to be applied in locations which are readily visible to ground personnel. Approx. size: 5-1/4 in. x 13-1/4 in.

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MFRS. OF TELESCOPING AND ARTICULATING CRANES COUNCIL

A Council of the Farm and Industrial Equipment Institute
410 North Michigan Avenue Chicago, Illinois 60611 Telephone: 312/321-1470

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LIST OF TABLES

This manual is provided to acquaint you with the operation of your IMT truck mounted, articulating, hydraulic crane and supply you with the information necessary for proper equipment maintenance.

Three means are used throughout this manual to gain the attention of operating and service personnel. They are NOTES, CAUTIONS, and WARNINGS and are defined as follows:

NOTES

A NOTE is used to either convey additional information or to provide further emphasis for a previous point.

CAUTIONS

A CAUTION is used when there is the strong possibility of damage to the equipment or premature equipment failure.

WARNINGS

A WARNING is used when there is the potential for personal injury or a fatality.

Treat this equipment with respect and service it regularly. These two things can add up to a safer working environment and a longer equipment life.

SECTION 1. SYSTEM DESCRIPTION

1-1. INTRODUCTION

This section provides a description of the crane and the assemblies making up the crane.

1-2. CRANE DESCRIPTION

The unit is capable of lifting up to 1,900 lbs. (862 kg) at 15 feet from the centerline of rotation. It consists of the major assemblies listed in Table A-1. The page numbers in Table A-1 refer to the page of the parts list and drawing.

1-2-1. BASE ASSEMBLY

The base assembly provides 370° (6.45 Rad.) of rotation from stop to stop. It is driven by a hydraulic motor through a ring and pinion spur gear. The base provides a platform for mounting the crane.

1-2-2. MAST ASSEMBLY

The mast assembly is bolted to the turntable gear-bearing which is bolted to the base assembly. It incorporates a winch with a lifting capacity of 3,750 lbs. for a single-part line. For over 3,750 lbs, a two-part line must be used.

1-2-3. MAIN BOOM

The main boom provides the capability to raise and lower the tip of the crane from +72° (+1.26 rad.) to -15° (-.26 rad.). This is accomplished through the use of a double-acting hydraulic cylinder.

1-2-4. EXTENSION BOOM

The extension boom provides an additional 72" (182.9 cm) of reach. It is deployed by a double-acting hydraulic cylinder.

1-2-5. ROPE AND HOOK KIT

The rope and hook kit consists of 75 feet (22.8 m) of 3/8" (0.95 cm) FW IWRC 6 x 25 rope, snatch block for two-part line and anchor hook.

1-2-6. HYDRAULIC ASSEMBLY

The hydraulic assembly includes all hoses and fittings necessary to plumb the crane as well as the remote control electrical assembly.

1-2-7. OUTRIGGERS (OPTIONAL)

The outriggers are fastened to the frame of the carrier vehicle and provide greater stability.

1-2-8. THROTTLE CONTROL (OPTIONAL)

The throttle control allows the operator to accelerate the engine to the proper operating speed and lock the throttle at that setting.

TABLE A-1. STANDARD AND OPTIONAL ASSEMBLIES

Part Number	Description	Page No.
	STANDARD EQUIPMENT	
40702481	Base Assembly	6-3
41702483	Mast Assembly	6-4
41702485	Main Boom Assembly	6-8
41702487	Extension Boom Assembly	6-10
90702491	Rope and Hook Kit	6-16
90702489	Hydraulic Assembly	6-17
90702490	Installation Kit	6-15
	OPTIONAL EQUIPMENT	
31702792	Left Hand Outrigger Assembly	6-11
31702656	Right Hand Outrigger Assembly	6-11
90702746	18-foot Throttle Control	6-14
90702747	30-foot Throttle Control	6-14

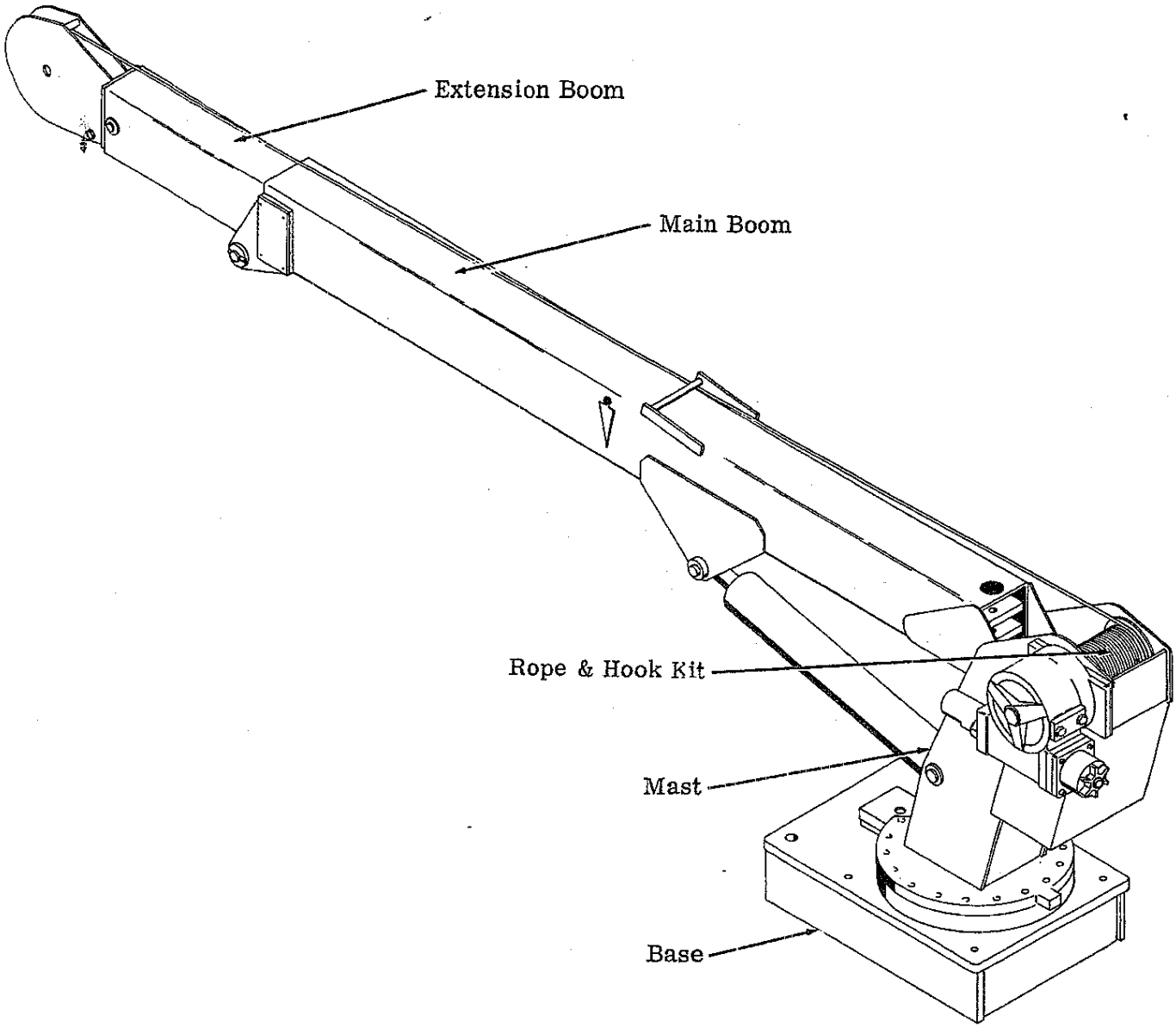

Figure A-1. 315 Crane Group

SECTION 2. INSTALLATION

2-1. INTRODUCTION

This section deals with the installation of the crane, and the hydraulic components such as the pump, PTO, filter, etc To install the components, the truck must meet the specifications listed in Table B-1.

2-2. PTO INSTALLATION

Power take-off (PTO) manufacturers provide specific installation instructions on their products. These instructions should be followed when installing a PTO. Furthermore, some trucks will require modification of the transmission cross member in order to provide clearance for the driveline, and the exhaust pipe may need modification. Check with the PTO manufacturer's representative for specific installation instructions regarding your particular make, model and year of truck. The following instructions are a guide in the installation

1. If the vehicle is new, drain the transmission oil into a clean container for re-use. If the vehicle is used, dispose of the transmission oil.

2. Temporarily install the PTO with the proper gaskets and only two studs. Snug the PTO down and check backlash for maximum allowance of 1/32" to 1/16". If the backlash is excessive, remove the gaskets and check backlash again until it is correct. The number of gaskets used will depend upon your particular installtion.

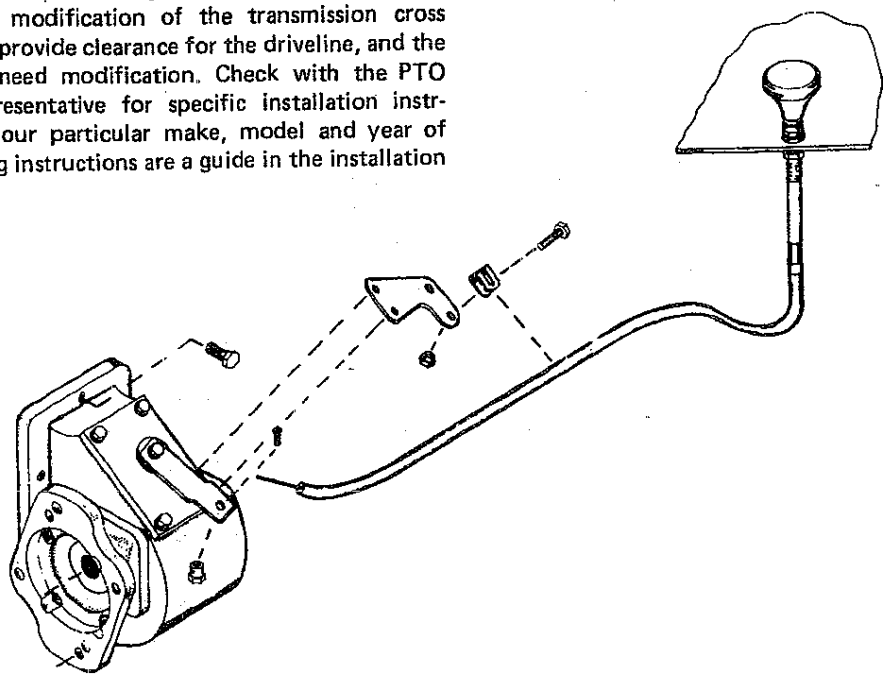

Figure B-1. PTO Installation

TABLE B-1. MINIMUM CHASSIS SPECIFICATIONS

Wheelbase	154"	391 cm
Cab to Axle	84"	213 cm
Frame Section Modulus	9.45 cu. in.	154.9 cu. cm
RBM	340,200 in. lbs	3920.8 kg-m
Front Axle	5,000 lbs.	2268 kg.
Rear Axle	13,000 lbs.	5896.8 kg.

addition to these specifications, heavy duty electrical and cooling systems and dual rear wheels are required. It is recommended that the vehicle be equipped with an electric engine tachometer, auxiliary brake lock and power steering.

3. Remove the PTO and apply Permatex® to the gaskets. If the holes for the studs are tapped through the transmission housing, apply Permatex to the studs and tighten them down. Make certain that the studs do not interfere with the transmission gears.

CAUTION

Avoid contact of Permatex with automatic transmission fluid.

4. Install the PTO and gaskets. Torque the nuts to 30-35 ft. lbs. (4.14 - 4.84 kg-m) for a 6-bolt PTO, 45-50 ft. lbs. (6.22-6.91 kg-m) for 8-bolt PTO's. Recheck the backlash.

5. Install the shifter cable to suit conditions. Always allow a slight overshift on lever or knob to ensure the PTO is fully engaged.

CAUTION

Avoid sharp bends in the shifter cable. All bends should have a minimum 6" radius. Tighter bends will cause difficult operation of the shifter cable.

6. Replace the transmission oil. If the PTO is located below the transmission oil level, an additional quanity of oil will be required.

7. Start the engine, engage the PTO and allow it to run for 5-10 minutes. Check for leaks, unusual noise and proper operation.

8. Re-torque the mounting bolts.

2-2-1. PUMP INSTALLATION

Install the pump according to the following instructions:

1. Check pump rotation and bolt the pump to the PTO. Torque the mounting bolts (refer to the Torque Data Chart in the Appendix).

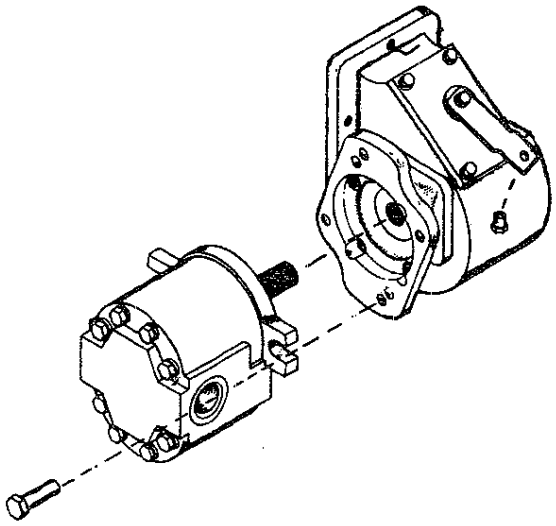

Figure B-2. Pump Installation

® Registered trademark of Permatex Co., Kansas City, Kansas.

2. Install the adapters in the pump inlet and outlet. Use a thread sealer and adequately tighten the fittings to prevent leaks.

2-2-2. DRIVELINE APPLICATION

The pump can be driven with a drive line as an optional method to the one given in Paragraph 2-2-2. The following instructions are a guide in this application.

1. Loosely bolt the pump mounting bracket to the adjustable bracket.

2. Bolt the adjustable bracket to the frame at a point that will not exceed 48" (122 cm) from the PTO and will not cause a joint angle greater than 8° (.14 rad.).

3. Check pump rotation and install pump, pump end yoke and PTO end yoke.

4. Size, cut and weld the driveline to the necessary length. Ensure driveline balance. Allow 1" (2.54 cm) extra for PTO end yoke.

5. Install driveline, lock set screws and lubricate U-joints.

6. Ensure all mounting bolts are tight.

2-2-3. HYDRAULIC INSTALLATION

To install the hydraulic components, proceed as follows:

NOTE

All fittings should be treated with a good sealant material and adequately tightened to prevent leaks.

1. Install the hydraulic oil reservoir. The reservoir is supplied with a channel which bolts to the reservoir. Position the channel against the side of the chassis frame and clamp it in place. It should be positioned to allow easy access to the fill cap and drain plug. Drill four (4) 7/16" diameter holes through the channel and frame. Use existing holes and bolts wherever possible. Use 3/8-16 X 1-1/4" long bolts, nuts and lock washers (customer supplied) to bolt the channel to the chassis frame. Bolt the reservoir to the channel.

2. Install the suction line filter below the top of the frame and within 48" of the pump. Locate it in such a way as to make it easily accessible for servicing.

3. Install the hoses and fittings between the reservoir and filter and the filter and pump. Cut the hoses to suit (refer to the hydraulic schematic for fittings).

2-3. CRANE INSTALLATION

2-3-1. MOUNTING REQUIREMENTS

In addition to meeting the Minimum Chassis Specifications (Table B-1), there must be sufficient room for mounting the crane and the platform must be strong enough to support the crane and the maximum rated load.

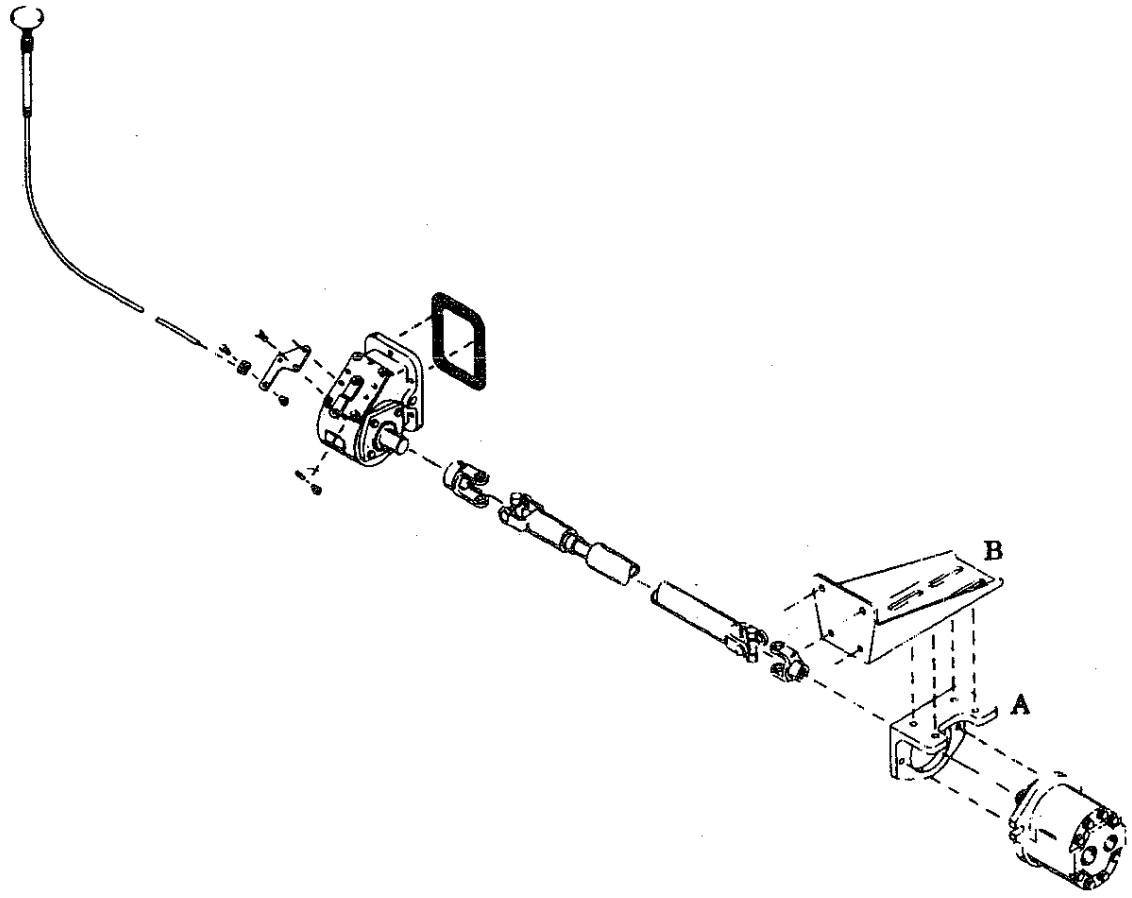

Figure B-3. Driveline Application

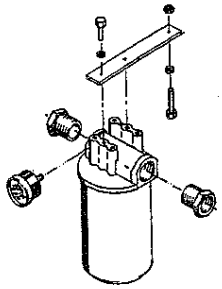

Figure B-4. Filter Installation

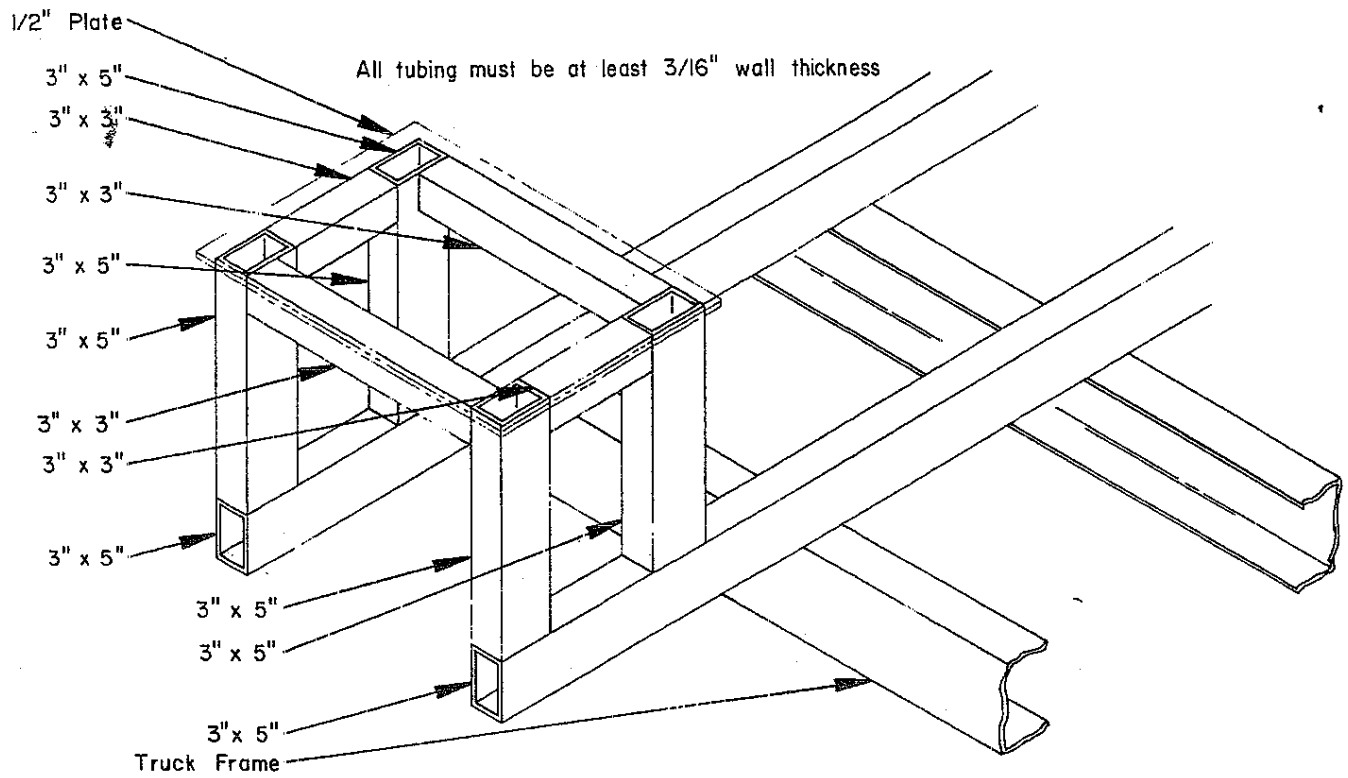

Figure B-5. Body Reinforcement

The crane base requires an area of at least 20" x 28". It should be reinforced as shown in Figure B-5

2-3-2. MOUNTING CRANE

1. Locate and drill the four mounting holes and the center hole for the hoses and remote control cable. Make certain that the holes are located to properly orient the front of the crane base toward the front of the truck (refer to Figure B-6).

2. Use a lifting device capable of lifting the weight of the crane - 1,400 lbs. (635 kgs). Attach the lifting device to the lift brackets of the crane (located on both sides of the main boom approximately 18" from the mast hinge). Lift the crane, move the chassis under the crane and lower the crane into the desired position.

3. Install mounting bolts (tie rods), lock washers and nuts to secure the crane base to the truck body. Tighten the mounting bolts. Refer to Figure B-7 for proper placement.

4. Install the pressure hose between the pump and the crane control valve inlet (refer to the Hydraulic Schematic in the PARTS section).

5. Install the return hose between the reservoir and the crane control valve outlet (refer to the Hydraulic Schematic in the PARTS section.)

6. Fill the reservoir with hydraulic oil (refer to Table D-2 for hydraulic oil specifications).

7. Check the unit for leaks.

8. Connect the 12 VDC cable from the battery to the terminal strip (refer to the Electrical Wiring Diagram in the REPAIR section).

9. Install the emergency stop relay (refer to the Wiring Diagram).

2-4. EMERGENCY STOP RELAY INSTALLATION

1. Install the emergency stop relay and relay housing under the hood of the carrier vehicle. Make certain that the location selected will provide a good ground. If not, run a ground wire from one of the mounting bolts to one of the ground straps in the engine compartment.

2. Install the 3-wire cable between the terminal strip on the crane and the engine compartment (refer to the Electrical Wiring Diagram, Figure E-7). Table B-2 lists the wire colors and connections for both ends.

3. Install 18-gauge wires between the emergency stop relay and ignition coil (fuel solenoid on diesel) and between the relay and ignition switch.

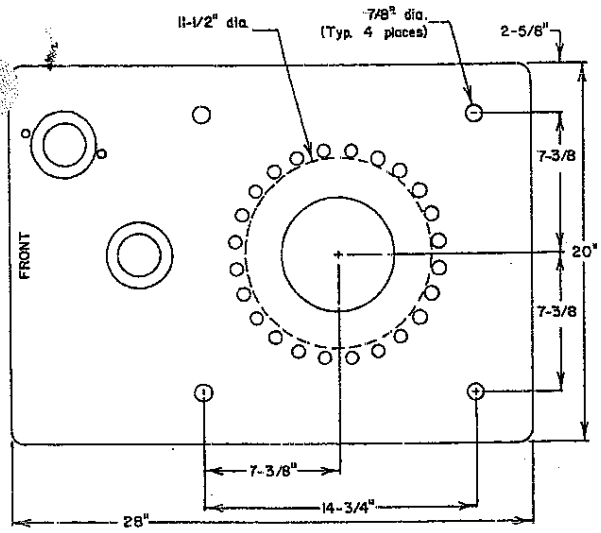

Figure B-6. Mounting Hole Layout

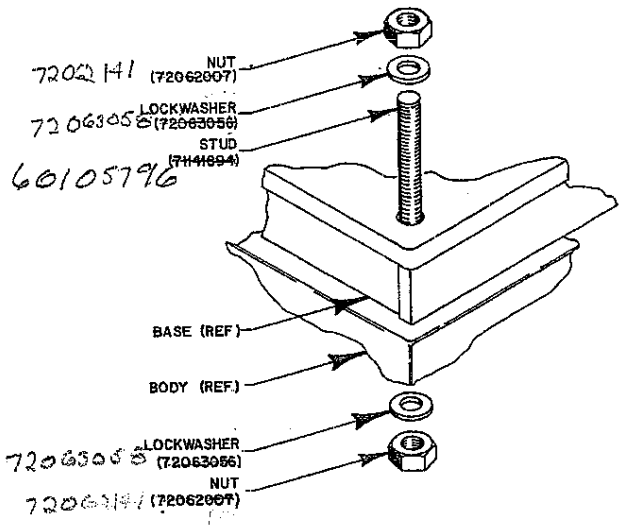

Figure B-7. Mounting Bolt Installation

TABLE B-2. WIRING COLOR CODES

COLOR	TERMINAL CONNECTION	VEHICLE CONNECTION
Black	Pin 1	Battery (+)
White	Pin 2	Ground
Green	Pin 3 or 4	Emergency stop Relay

2-5. TESTING

1. Start the engine, engage the PTO and charge the system with oil.
2. Check the oil reservoir and refill as necessary.
3. Conduct the Inspection and Test procedure in Section 8.
4. Record the necessary data in this service manual.

SECTION 3. OPERATION

3-1. INTRODUCTION

This section deals with control functions, safety factors and proper operating practices.

3-2. CONTROLS

3-2-1. VEHICLE CONTROLS

Auxiliary Brake — Must be engaged whenever the crane is in operation.

Throttle Control — Used to accelerate engine to the proper operating RPM. Clockwise to increase throttle setting and counterclockwise or push to decrease throttle setting.

PTO Shift — Pull to engage the PTO and push to disengage. Transmission must be in neutral when attempting to engage PTO.

3-2-2. CRANE CONTROLS

The crane controls are basically a hand-held remote control unit consisting of four (4) crane functions, a MASTER switch and an ENGINE STOP switch (Figure C-1). The functions and operating directions are as follows:

MASTER — Turns the remote control unit on and off.

MAIN — Push to lower the main boom and pull to raise.

SEC. — Not used on the IMT 315 crane.

ROT. — Push to rotate the crane counterclockwise and pull to rotate clockwise.

EXT. — Push to retract the extension boom and pull to extend.

WINCH — Push to lower the hook and pull to raise.

ENGINE STOP — Depress and hold to kill the vehicle's engine.

3-3. SAFETY FACTORS

Three important factors in the safe operation of the unit are a competent operator, mechanical soundness of the unit and absolute assurance that the unit is not loaded to exceed its maximum specified capacities. The safety precautions contained in this section should be read carefully and observed at all times during unit operation

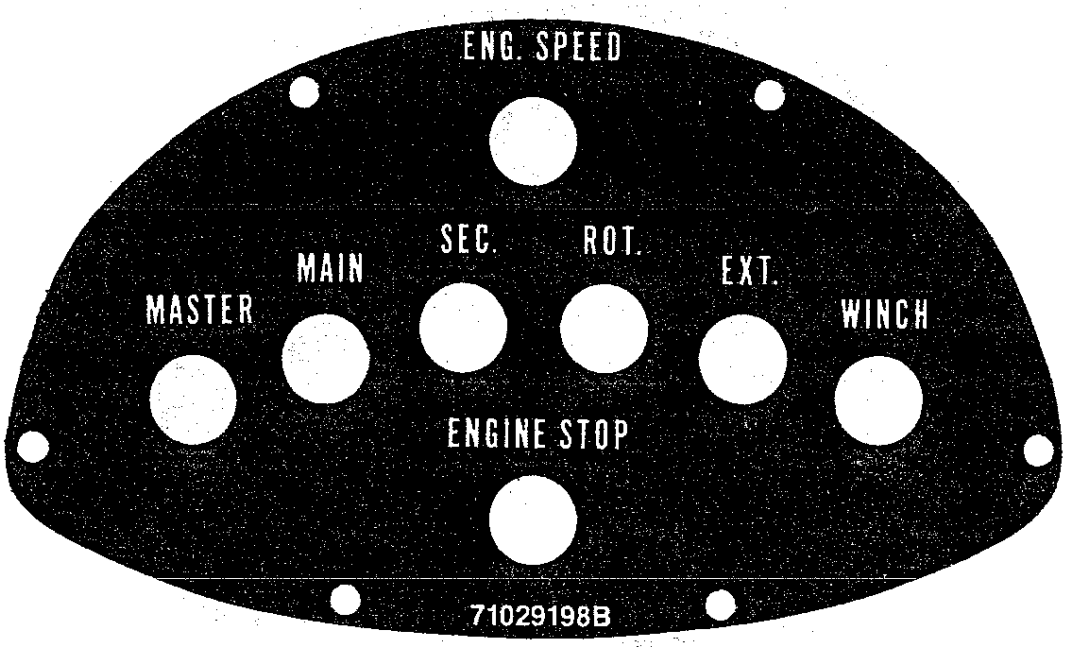

Figure C-1. Control Placard

3-3-1. EQUIPMENT INSPECTION

Before operating the unit, always perform the safety checks outlined below These procedures are vital to the detection of equipment malfunctions and damage which may be potential safety hazards.

STRUCTURAL SOUNDNESS — Inspect the unit for damaged members and loose nuts, bolts, etc.

HYDRAULIC OIL SUPPLY — Check oil level in hydraulic reservoir with all cylinders fully retracted and fill if required.

LEAKAGE — Examine all visible hydraulic hoses for frays and blisters. Look for signs of lubricating or hydraulic oil leakage

CONTROLS — Make a short test for proper operation.

REPAIRS — Before putting the unit into service, correct all observed defects and malfunctions.

This equipment check should be performed before every task and as a periodic preventive maintenance check.

CAUTION

This equipment inspection does not satisfy the requirements of Table D-3, Inspection Check List or Paragraph 4-4, Periodic Inspection.

3-3-2. WORK STATION POSITIONING

he best location for the working unit is on firm, level and dry pavement or ground close to the job. Overhead obstructions on the work side of the unit should be avoided as much as possible

Wheel chocks should be used when parked on sloping terrain. If parking on a curbed roadway, turn the front wheels toward the curb when parked with the front of the truck downgrade and away from curb with the rear of the truck downgrade. At the work site, the vehicle should be parked with the grade. When cross-grade parking is necessary, restricted operation will be required to compensate for increased tipping risk.

3-3-3. LOAD LIMITS

The crane is designed to give satisfactory service if operated within maximum allowable load specifications stated on the unit's capacity placard. The placard should be studied before lifting operations are carried out. Overloading may result in potentially serious safety hazards and shortened service life of the unit – exceeding the stated load limit for a given radius can cause tipping or structural failure.

The winch is capable of lifting more than the rated load. However, attempting to lift more than the safe rated load with the winch will cause an overload situation. All lifting operations should be performed by raising the main boom. If it cannot be lifted with the main boom, an overload condition exists. In addition, with the extension boom retracted and carrying the full rated load for that particular radius, an overload condition will exist if the boom is extended. The same conditions will apply if the boom is in an elevated position with full rated load and then lowered. Either situation results in an increase of operating radius and calls for a reduction of the load

Warranty of this unit will be void on any part of the unit subjected to misuse due to overloading, abuse or lack of maintenance. No warranty - verbal, written or implied - other than the official published IMT new machinery and equipment warranty will be valid with this unit.

3-3-4. POWER LINE PROXIMITY

Except where the electrical distribution and transmission lines have been de-energized and visibly grounded at point of work, or where insulating barriers not a part of or an attachment to the crane have been erected to prevent physical contact with lines, cranes shall be operated proximate to, under, over, by or near power lines only in accordance with the following:

1. For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.

2. For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or use twice the length of the insulator, but never less than 10 feet.

3. In transit with no load and boom lowered, the clearance shall be a minimum of four feet.

4. It is recommended that a person be designated to observe the clearance and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.

In addition to the above mentioned safety measures, the operator must take into account sag, sway and deflection factors in allowing for proper clearances.

3-4. BEGINNING OPERATION

Listed below are important points to remember while operating this unit:

1. ALWAYS depress the clutch pedal before engaging or disengaging the PTO

2. NEVER swing a load so it passes over people.

3 ALWAYS stabilize the unit before attempting a lifting operation.

4 NEVER rotate the crane too fast with a load.

5. ALWAYS cycle the controls a few times to purge the air trapped in the cylinders and hoses before attempting a lifting operation.

6. NEVER operate the crane too close to power lines.

7. ALWAYS have a clear view of the work area.

8. NEVER exceed the rated lifting capacity.

9. ALWAYS repair any defects before placing the unit in service.

10. NEVER leave the operator's station with a load suspended in the air.

11. ALWAYS disengage the PTO before moving the unit.

12. NEVER use the winch to drag a load into position before lifting.

13. ALWAYS keep the tip of the extension boom as close to the load as possible.

14. NEVER side load the boom by dragging a load from the side.

15. ALWAYS extend the cable before extending the boom.

3-4-1. ENGINE SPEED REGULATION

The delivery rate of the hydraulic pump dictates the operating speed of the crane. In order for the unit to function at speeds stated in the specifications, the pump must operate at optimum speed.

To determine the engine RPM required for optimum pump speed, the optimum pump speed is divided by engine to PTO ratio (PTO ratio is generally specified as a percentage of engine speed). When the engine to PTO ratio is not known, this information may be obtained from a local IMT dealer or distributor or Iowa Mold Tooling Co., Inc. direct.

To determine an unknown ratio, it will be necessary to know the PTO and transmission model numbers, as well as the make, model and year of the truck. When the ratio is obtained, compute the proper engine speed as shown in Table C-1.

Efficient operation of the unit is dependent upon proper pump speed. When operation is too slow, always check the pump speed when diagnosing the cause. An electric engine tachometer with accurate calibration may be used to check the engine speed.

3-4-2. LOAD LIFTING

Capacity placards are located either on the valve bank cover or on the cabinet door below the crane. The structural capacities and permissible radii of operation stated on the placard should be carefully studied and strictly adhered to during equipment operation. All indicated placard loads include weight added by optional equipment and consideration must be given to this weight in load assessment.

NOTE

Capacity placards are intentionally located near the operator to assure ready reference in determining when a load can or cannot be handled.

TABLE C-1. ENGINE SPEED REGULATION

PUMP MODEL	RECOMMENDED PTO%	ENGINE SPEED
Borg-Warner® S2059	75 - 100	$\frac{\text{Optimum Speed (1100 RPM)}}{75\%}$ = 1470 RPM
Borg-Warner S20512	60 - 75	$\frac{\text{Optimum Speed (900 RPM)}}{60\%}$ = 1500 RPM
Borg-Warner S20515	45 - 60	$\frac{\text{Optimum Speed (700 RPM)}}{45\%}$ = 1550 RPM

Any pump can be used that will supply 6 GPM (22.7 1/min.) at 2350 PSI. Greater flow will result in valve seizure.

The formula used to determine the proper engine speed is as follows:

$$\frac{\text{Optimum Pump Speed (RPM)}}{\text{Engine to PTO Ratio (\%)}} = \text{Required Engine Speed (RPM)}$$

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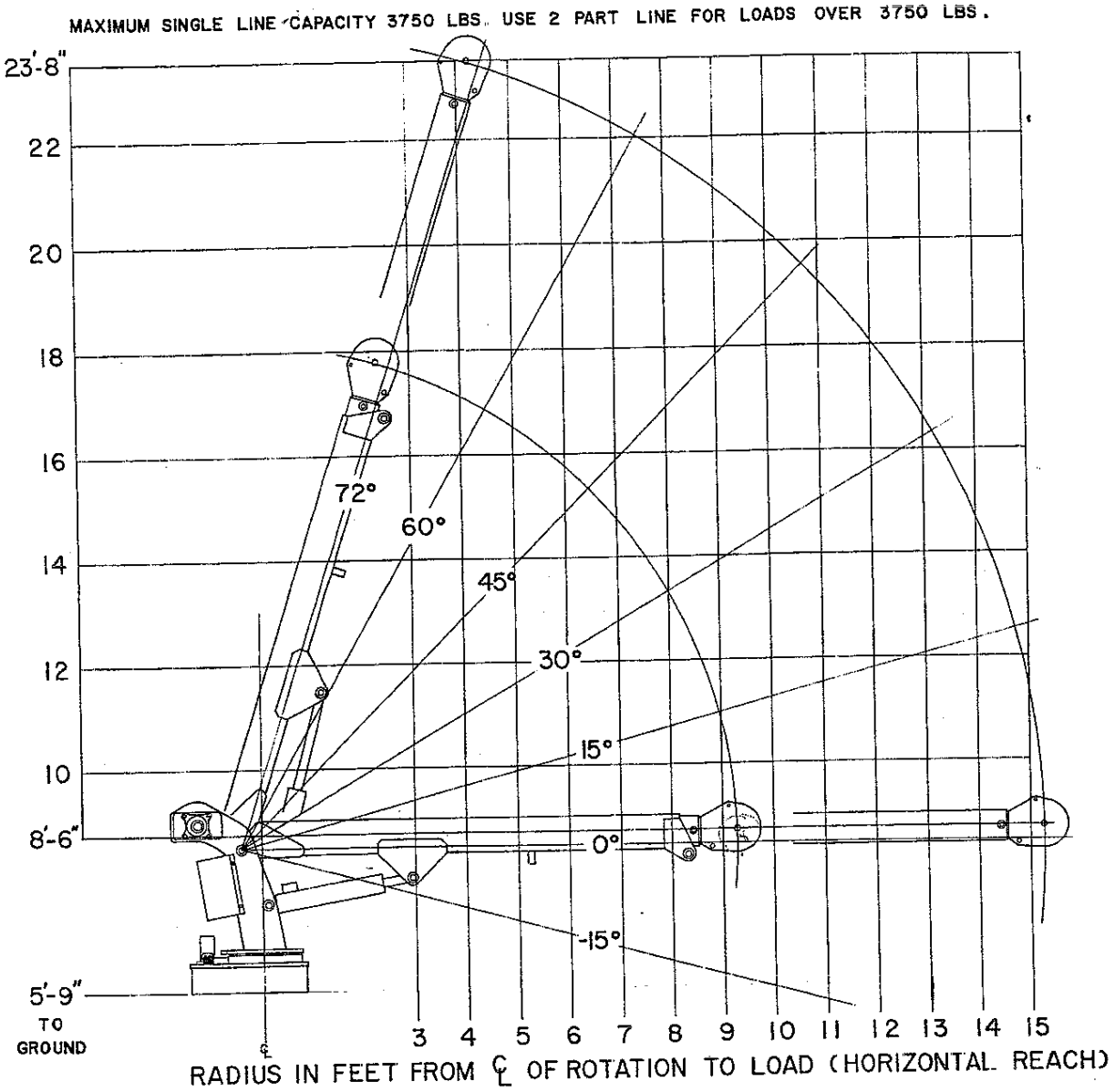


EXTENSION BOOM RETRACTED	LOAD RADIUS	FEET	3	4	6	8	9
		METERS	0.91	1.22	1.83	2.44	2.74
	LOAD	LBS	7500	6000	4600	3700	3300
		KGS	3402	2722	2087	1678	1497

EXTENSION BOOM OUT	LOAD RADIUS	FEET	5	7	10	13	14	15
		METERS	1.52	2.13	3 05	3.96	4.27	4.57
	LOAD	LBS	4400	3400	2800	2300	2100	1900
		KGS	1996	1542	1270	1043	953	862

WEIGHTS OF LOAD HANDLING DEVICES ARE PART OF THE LOAD LIFTED AND MUST BE DEDUCTED FROM MAIN BOOM CAPACITIES.

CAPACITIES ARE BASED ON 85 % OF TIPPING WHEN ALL OUTRIGGERS ARE EXTENDED WITH POSITIVE CONTACT ON FIRM LEVEL SURFACE AND WHEN THE PROPER AMOUNT OF COUNTERWEIGHT IS INSTALLED AND APPROVED BY THE FACTORY. UNIT SHALL BE MOUNTED IN ACCORDANCE WITH FACTORY INSTRUCTIONS ON A VEHICLE TYPE APPROVED BY THE FACTORY.

Figure C-2. Load Capacity Chart

Load limit information given on the capacity chart is formulated on 85% of tipping.

It is implicit in all load ratings that the following conditions have been met:

1. Unit has been correctly installed on a factory-approved truck.
2. A satisfactory stability test has been performed (refer to Section 8).
3. The intended operation is to be carried out on level solid footing with proper outrigger placement.

It should be understood that each stated capacity is directly related to the radius of a given operation. The radius is measured from center of rotation to load line on the horizontal plane.

3-4-3. STABILITY RATINGS

Capacity ratings project unit stability to no more thatn 85% of tipping provided:

1. The vehicle on which the unit is mounted complies with factory specifications.
2. Factory installation instructions are followed when the unit is mounted on a vehicle.
3. Counter-weight sufficient to supplement vehicle weight has been installed and meets factory requirements.
4. Tire inflation pressures meet requirements stipulated in the TIRE INFLATION TABLE in the APPENDIX.
5. The outriggers are in use, making proper contact with firm, level footing.

The load capacity chart ratings depend upon compliance with the curb weights coupled with truck size. Adherence to minimum chassis specifications and/or requirements is necessary to maintain safe stabilization.

WARNING

The mimimum curb weights shown do not ensure the unit will be stable. Actual stability ratings will be obtained from the initial start-up and testing procedures.

Stability ratings for the IMT 315 crane mounted on a conventional chassis with a 154" (391 cm) wheelbase and a 84" (213 cm) cab-to-axle dimension are shown below. These specifications will provide complete 370° rotation stability based upon 85% tipping factor without capacity chart restrictions. Required axle weights are listed in Table C-2.

TABLE C-2. AXLE WEIGHTS

Front	4000 lbs.
Rear	11,500 lbs.
Total	15,500 lbs.

3-4-4. TASK PERFORMANCE

To operate the crane:

1. Position the crane as close to the job as possible on a firm, dry and level surface. Avoid overhead obstructions.
2. Set the auxiliary brake and start the vehicle engine.
3. Depress the clutch pedal, shift the transmission into neutral and engage the PTO.
4. Operate the throttle control to achieve the proper engine speed (refer to Paragraph 3-4-1).
5. Extend and lower outriggers until firm ground contact is made. On soft ground, use bearing pads to retard sinking.
6. Remove the remote control box from the cabinet and move the MASTER switch to the ON position.
7. Any of the functions may be operated to manipulate the crane to pick up the load.

CAUTION

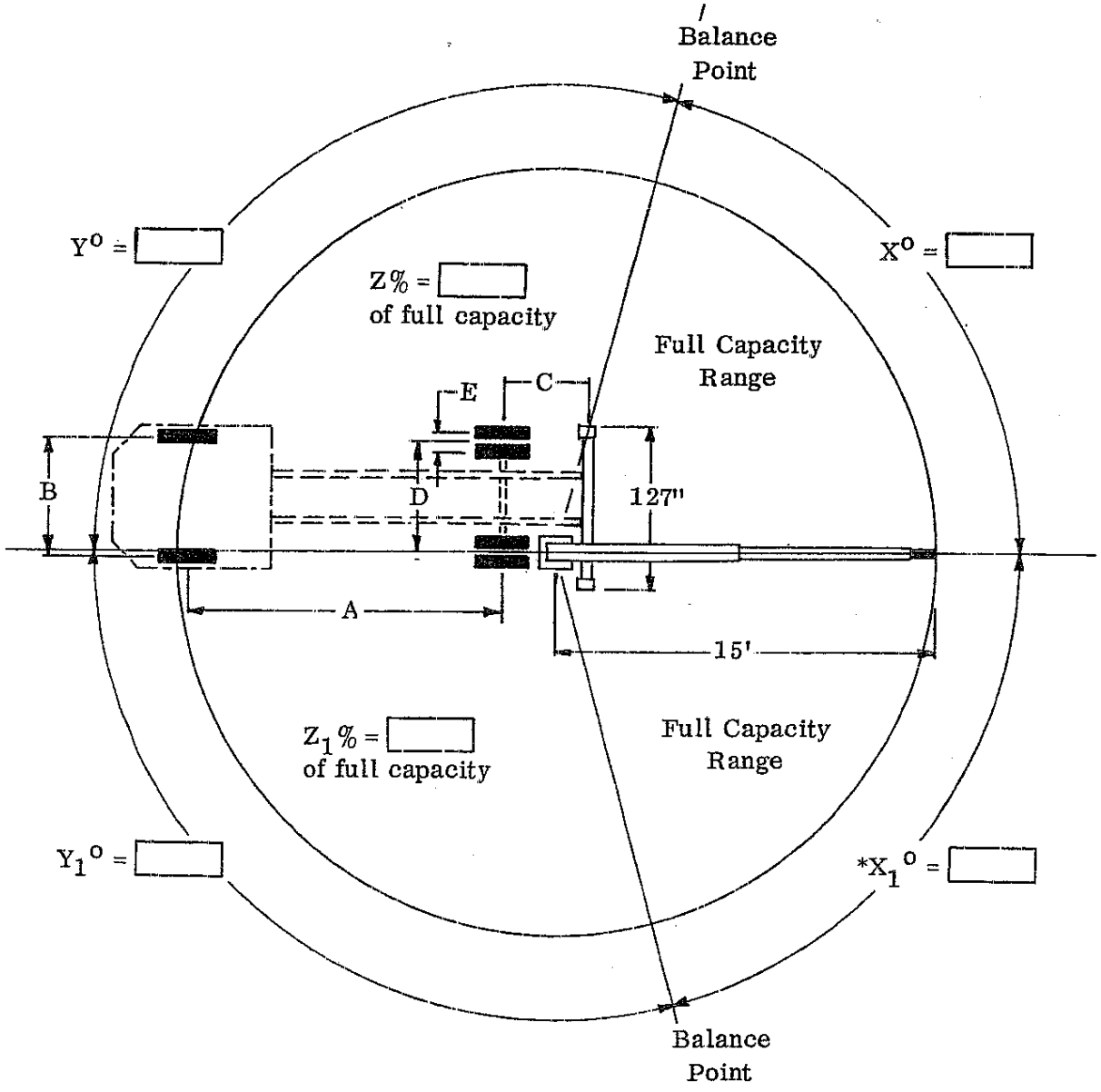
Never use the winch to drag a load into position before lifting. This may place an excessive side load on the crane or stress the cable beyond the safe limits. Damage to the equipment may result.

WARNING

Always keep the tip of the extension boom as close to the load as is practical. This will help keep the load from swinging out of control when using the ROTATION function. To dampen excessive swing of the load, rotate the crane in the direction of the swing. Failure to comply with these instructions may result in an injury or damage to equipment.

3-4-5. OPERATION SHUTDOWN

1. Retract the cable and extension boom
2. Rotate the crane until the boom is centered over the saddle.
3. Lower the boom until the crane rests in the saddle.
4. Move the MASTER switch to the "OFF" position. Stow the remote control unit.
5. Raise and store the outriggers.
6. Disengage the throttle control.
7. Depress the clutch pedal and disengage the PTO.
8. Release the auxiliary brake.



Refer to Figure H-1 for the values of X^{o}, $X_1{}^{o}$, Y^{o}, $Y_1{}^{o}$, Z% and Z_1%. Enter those values on this stability chart.

Figure C-3. Stability Chart

SECTION 4. PREVENTIVE MAINTENANCE

4-1. INTRODUCTION

Proper maintenance on a regular schedule is essential to keep your unit operating at peak efficiency. This section outlines required maintenance information and service intervals. Personnel responsible for care of the unit should familiarize themselves with the service interval and type of maintenance operation to be performed.

4-2. LUBRICATION

Maintaining the proper lubrication schedule will vary with climatic conditions and the amount of use the unit receives. The lubrication schedule (Table D-1) is intended to serve for a normal work load and moderate weather variance. Periods of heavy use would shorten service intervals.

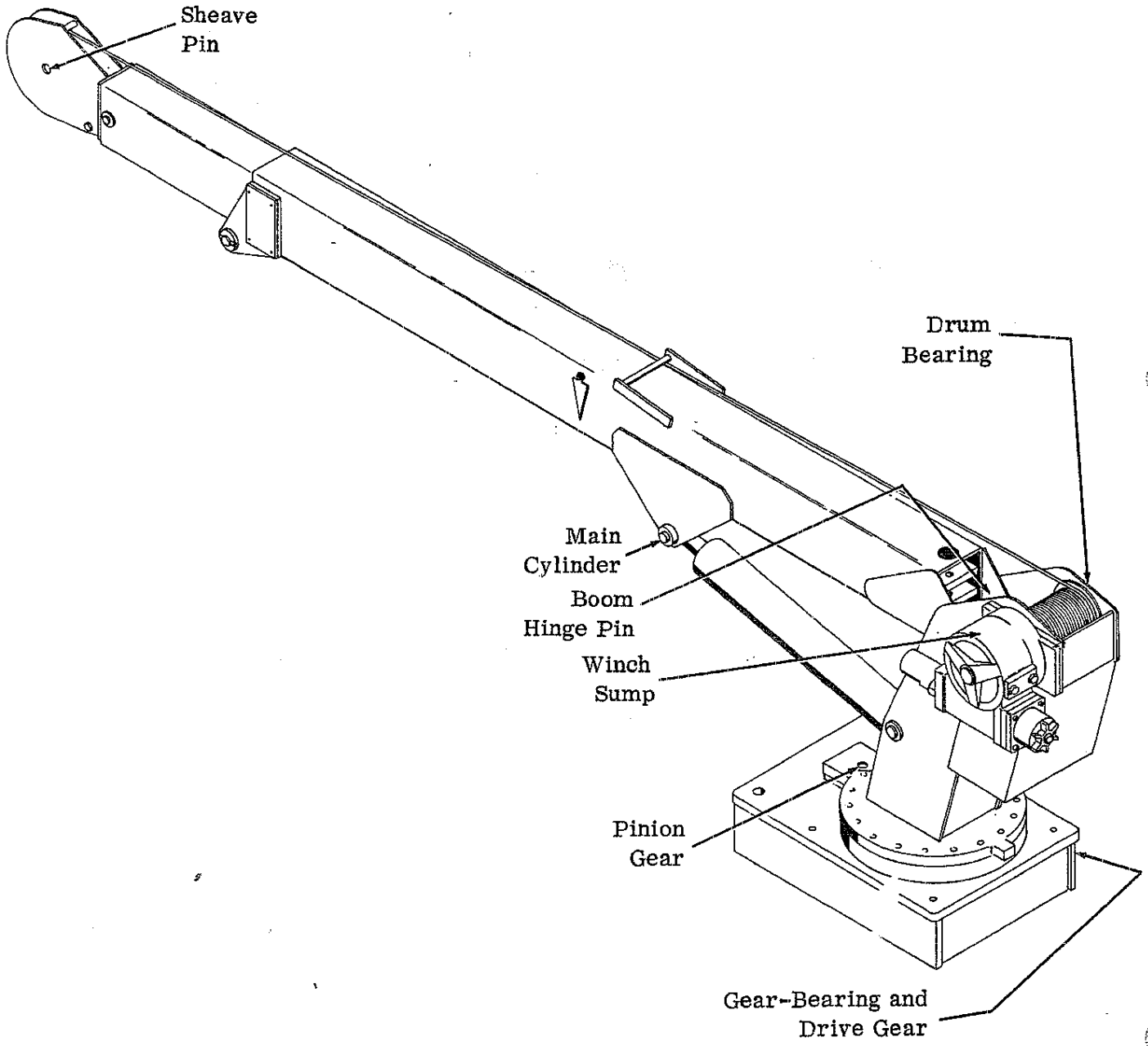


Figure D-1. Lubrication Points

TABLE D-1. LUBRICATION SCHEDULE

APPLICATION POINT	LUBRICATION PRODUCT	APPLICATION MEANS	INTERVAL
ıion and Drive Gears	Shell Alvania 2EP or Shell Retinax "A" or equivalent	Hand Grease Gun or Pneumatic Pressure Gun	Monthly
Gear-Bearing			
Main Cylinder			
Winch, Bearing & Sheave Pin			
Power Take-Off or Transmission	EP 90 Gear Oil	Fill to check plug	Monthly
Winch Sump			

4-3. HYDRAULIC SYSTEM

4-3-1. HYDRAULIC FLUID SPECIFICATIONS

Minimum viscosity specificatons for hydraulic oil to be used in the crane are given in Table D-2. Any major oil company can supply products which meets these requirements.

Oils selected by user for this class of equipment, in addition to meeting viscosity requirements, should have the following additives:

1. Antifoam Inhibitors
ntioxidant Inhibitors
3. Rust Resistant Additives
4. Antiwear Additives

4-3-2. HYDRAULIC OIL DETERIORATION

Contamination of the hydraulic oil by solvents, water, dust or other abrasives will result in a premature breakdown of the oil's antifoam, lubrication, anti-rust and viscosity properties Prolonged exposure to water or high operating temperatures (above 180°F) will cause an increase in the oxidation rate, producing varnish-forming materials and sludge in the oil.

Periodically a sample of the hydraulic oil in the system should be drawn off and its condition checked for breakdown. To check oil quality:

1. Place oil sample in a clean glass.
2. Smell oil to detect a burnt or rancid odor.
3. Examine the oil for a cloudy or dark color.
4. Allow the sample to stand for several minutes and inspect it for water which will settle to the bottom. Water can result from a leak in the system or condensation due to temperature extremes.

When any of these conditions is observed, the system should be purged and filled with new oil.

4-3-3. HYDRAULIC SYSTEM PURGING

The oil should be changed in the reservoir and complete system after 800 hours of operation (or every six months, whichever occurs first) and after pump or other major hydraulic component failure

TABLE D-2. HYDRAULIC OIL SPECIFICATIONS

Ambient Temperature Range, °F	0 - 90	Below 32	32 - 90	Above 90
Minimum Pour Point, °F	- 30	- 25	+10	+10
Max. Viscosity, SSU @ 0°F	4000	4000	- - -	- - -
Min. Viscosity, SSU @100°F	140 - 195	100 - 130	150 - 200	200 - 315
Min. Viscosity, SSU @ 210°F	48	41	43	47
Min Viscosity Index	139	90	90	90

Arctic conditions present special requirements which are not within the scope of this table and must be given special consideration and individual analysis. Consult your oil supplier for the proper fluid for working under these severe conditions In addition, electric raulic oil reservoir heaters are available to improve operation at extremely low temperatures.

Purging the system requires a new oil supply sufficient to completely fill the reservoir, lines, cylinders, etc., and an extra quanity, for loss during this procedure. To minimize oil loss during this process, operate the truck engine at a low RPM.

During purging, new oil is supplied to the pump suction line through the reservoir fill cap and old oil is drained from the valve bank return.

Two operators are required during the purging operation: one to operate the crane controls and the other to regulate pump output (engine speed).

CAUTION

DO NOT allow reservoir oil level to drop below 1/3 capacity during this procedure.

1. Locate the unit in an area which provides solid, level footing and space to accomodate the full operating range of the crane.
2. Stabilize the unit with the outriggers. Move the crane to either side of the truck, retract the main cylinder and fully extend the extension cylinder.
3. Disengage the PTO, drain the hydraulic reservoir, remove the suction line filter cartridge (Paragraph 4-3-5) and drain all hoses. Disconnect the pressure hose from the pump, drain and reassemble.

NOTE

The methdod of waste oil disposal is left to the discretion of service personnel.

4. Disconnect the return hose at the valve bank. Make certain that the end of the hose remains up near the valve bank. Connect 3/4" ID x 96" long hose at the return port on the valve bank and direct the discharge into a waste container. Plug the reservoir drain and refill the reservoir with new oil.

NOTE

Be thoroughly familiar with the following steps and prepared to perform them in an uninterruped sequence or stop the engine at the end of each step. If this is not done, excessive oil waste will occur.

5. Start the truck engine and engage the PTO. Rotate the crane 90° of travel horizontally, retract the extension boom and raise the main boom. Lower the hook about 4 feet.
6. All components of the system are now purged. Re-install the return hose on the valve bank return port.
7. Check the reservoir oil level and add oil to the "FULL" mark.

4-3-4. PURGING AIR FROM THE SYSTEM

Air that is trapped in the cylinder will cause an erratic, "bumpy" motion. To expel the air, hold the affected control open after the function has "bottomed-out". Move the function in the opposite direction and again hold the control open. Attempt to operate the crane in the normal manner to determine if the air has been purged.

4-3-5. FILTER REPLACEMENT

The unit's hydraulic system is filtered on the suction side only. The suction filter utilizes a replaceable 30-micron filter element (Figure D-2). To avoid residue accumulation in the reservoir and to protect hydraulic components -- valves, pump, cylinders, etc., — this filter must be serviced on a regular basis.

The element must be replaced after the first 50 hours of new-unit operation and appoximately every 200 hours thereafter. In addition to this servicing schedule, the suction line filter is equipped with a danger vacuum gauge. This gauge should be checked daily while the unit is operating. If it reads 8 inches of mercury pull, the filter cartridge must be replaced. When the element requires changing:

1. Kill the engine.
2. Shut the gate valve and remove the filter element.
3. Replace with a new element, ensuring proper rubber seal seating and tighten as much as possible with both hands.
4. Open the gate valve, start the engine, engage the PTO and check for leaks.

CAUTION

Failure to open the shut-off gate valve may result in pump failure.

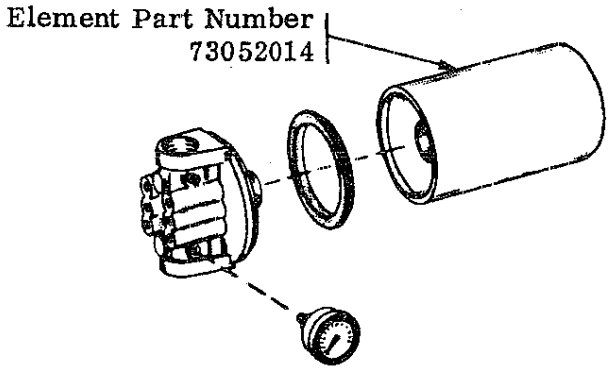


Figure D-2. Suction Line Filter

4-4. PERIODIC INSPECTION

The following inspection list is designed to assist you in keeping the vehicle and crane unit in safe operating condition. Items which apply to the unit should be checked before unit operation and the carrying vehicle should be inspected before moving the equipment.

TABLE D-3. INSPECTION CHECK LIST

VEHICLE CHECK LIST				
ITEM	DESCRIPTION	FREQUENCY		
		Daily	Weekly	Monthly
Battery	Inspect for correct fluid level. In hot dry weather, increase inspection frequency.			
Engine Oil	Check for proper level. Make sure oil level on dip stick is above "ADD" mark.			
Brakes (Service and Parking)	Operate both systems to assure positive, efficient functioning			
Radiator	Inspect coolant level. Check the anti-freeze protection in cold weather			
Safety Equipment Warning Signals and Lights	Inspect all devices and lights for proper operation			
Suspension	Check for broken or weak springs			
Tires and Wheels	Inspect tires for bruises, cuts and proper inflation. Check for loose wheel stud nuts, bent wheels and mud lumps or stones between dual wheels			
UNIT CHECK LIST				
Walk-Around Inspection	Visually inspect unit on all sides for hydraulic leaks, loose parts and obvious damage to external structural members.			
Cylinders	Check securing pins on cylinders and main boom for proper installation. Check for proper installation of pins securing outriggers.			
Hydraulic Hoses	Inspect hose surfaces and metal end coupling junctions for oil leakage. Check outer hose coverings for blistering, excessive wear or flattening			
Hydraulic Reservoir	With all cylinders retracted, check fluid level in reservoir.			
Mounting Bolts	Inspect and check torque. Refer to the Torque Data Chart in the Appendix.			
Rotation System	Check for excessive bask lash (play) in horizontal rotaion stops. Normal variation at the mast location is not to exceed 1/8 -3/16" inch.			
Oil Leaks	Inspect all valves and cylinders for signs of leakage.			
Power Take-Off	Check for transmission lubrication. Check security of mounting bolts, leakage and correct alignment.			
Structural Damage	Inspect all structural members for broken welds and fatique cracks. Check booms for structural defects such as bends, weld cracks or dents.			
Holding Valve	Conduct a holding test with loaded boom to assure proper operation of holding valve.			

4-4-1. REGULAR INSPECTION

Every three months or more often when equipment is subjected to heavy use, the following inspections should be performed in addition to the preceding routine Inspection Check List.

4-4-1-1. Main and Extension Booms

1. Check structural defects evidenced in weld cracks, dents or bends.
2. Check slide pads for wear.
3. Check main and extension boom cylinder pins for proper installation. Check main cylinder pivot pin bushings for excessive wear.

4-4-1-2. Mainframe

1. Check control valve bank and all other fittings for oil leaks and tightness.
2. Check all roll pins and lock rings on main pin assemblies for proper installation.
3. Check torque on all unit mounting bolts (refer to the Torque Data Chart in the APPENDIX)
4. Check for loose bolts, fatique cracks or corroded structural members.

4-4-1-3. Mast and Rotation System

1. Check mast housing for cracks.
2. Check security of winch mounting bolts.
3. Check for leaks around winch housing.
4. Check for proper rotation function by making several stop - start operations. Maximum allowable free-play at mast front should be 1/8 - 3/16".
5. Check for proper gear mesh in turntable gear-bearing. Check motor and gear mounting bolts for tightness.

4-4-1-4. Hydraulic System

1. Cylinders
   - A. Check rods for damage such as scarring, nicks, dents and rust on out-of-service units.
   - B. Check for leaks at weld joints and rod seals. Check for drift indicating leakage around piston.
   - C. Check cylinder barrel for dents.
2. Hydraulic Pump
   - A. Check for leaks at shaft seal.
   - B. Check for drop in operating speed.
   - C. Check hydraulic oil for excessive heating.
   - D. Check bolts and fasteners for tightness and not unusual vibration or noise.
3. Hydraulic Control Valves
   - A. Check spools for sticking and failure to return to neutral.
   - B. Inspect for leaks at joints and spools.
   - C. Inspect valve housing for cracks.
   - D. Make sure relief valve reaches correct pressure setting.

4-4-1-5. Underdrive and Pump

1. Inspect for proper transmission gear to PTO engagement.
2. When supplied, inspect driveline U-joints for securing cap tightness and adequate lubrication
3. Check mounting bolts on pump and PTO for tightness.

4-5. WIRE ROPE INSPECTION*

4-5-1. INSPECTOR

A representative of the user of the material hoist shall be appointed and this representative shall keep written reports of the rope condition on file at the work site. The representative shall have the authority to order wire rope replacements and keep unsafe wire rope from being used.

4-5-2. PERIODS OF INSPECTION

Inspection periods shall be set up for each material-hoist wire rope. The frequency of inspection shall be determined by consideration of environment, degree of hazard to materials, frequency of operation, and the frequency with which the rope is subjected to its capacity limits. Inspection shall be made not less often than once each 30 days.

4-5-3. METHODS OF INSPECTION

The working length of the wire rope shall be unwound from the hoist drum. Thorough inspection shall be made of the rope sections that pass over sheaves, drums or contact saddles, or which make opposing turns. The rope close to end attachments shall be carefully inspected.

4-5-4. INSPECTION OF USED WIRE ROPE

A used wire rope shall be thoroughly inspected prior to installation.

4-5-5. INSPECTION OF WIRE ROPE ON IDLE EQUIPMENT

The wire rope on equipment that has been idle or shut down for a period of one month or more shall be completely inspected prior to operation.

4-5-6. SURFACES CONTACTED BY WIRE ROPE

Sheaves, guards, guides, drums flanges and other surfaces contacted by wire rope during operation should be examined at the time of inspection. Any condition harmful to the rope in use at the time should be corrected.

4-5-7. WIRE ROPE REMOVAL AND REPLACEMENT

Wire rope with one or more of the following defects shall be removed or replaced immediately:

1 Severe corrosion shall be cause for replacement. Any development of corrosion should be noted and watched closely

2. Broken wires
   A. One or more valley breaks shall be cause for replacement (a valley break is a wire break occurring in the valley between two adjacent strands).

   B. Six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay, shall be cause for replacement (A rope lay is the length along the rope in which one strand makes a complete revolution around the rope).

3. End attachments - development of broken wires in the vicinity of attachments shall be cause for replacement. If this condition is localized in an operating rope and the section in question can be eliminated by making a new attachment, this can be done rather than replacing the entire rope.

4. Abrasion - abrasion, scrubbing, flattening, or peening causing loss of more than one third of the original diameter of the outside wires shall be cause for replacement.

5. Kinking - severe kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure shall be cause for replacement.

6. Heat - evidence of any heat damage resulting from a torch, or any caused by contact with electrical wires shall be cause for replacement.

7. Reduction of rope diameter - reduction from nominal diameter of more than 3/64 inch for diameters up to and including 3/4 inch; 1/16 inch for diameters 7/8 to 1 - 1/8 inches; and 3/32 inch for diameters 1 - 1/4 to 1 - 1/2 inches shall be causes for replacement. Marked reduction in diameter indicates deterioration of the core.

4-6. WIRE ROPE MAINTENANCE*

Rope should be maintained in a well lubricated condition. It is important that lubricant applied as part of a maintenance program shall be compatible with the original lubricant and to this end the rope manufacturer should be consulted. Those sections of rope which are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

When an operating rope shows greater wear at well defined areas than on the remainder of the rope, rope life can be extended in cases where a reduced rope length is adequate, by cutting off a section at one end, and thus shifting the wear to different areas on the rope.

*USAS A10.5-1969

*USAS B30.5-1968

SECTION 5. REPAIR

5-1. INTRODUCTION

This section includes disassembly, repair and assembly instructions for many of the components on the crane.

5-2. HYDRAULIC SYSTEM

Certain procedures involving the hydraulic system require special consideration for proper functioning and service life of the unit. These steps are to be taken whenever a hydraulic component is disconnected.

1. ALWAYS relieve internal hydraulic pressure before proceeding with a repair.

2. NEVER allow foreign matter - dirt, water, metal particles, etc - to enter the hydraulic system through the open connection. Seal the connection as completely as possible. If dirt does get in, a filter change is required after approximately 50 hours of operation.

3. ALWAYS cycle all of the controls after completing a repair. This will eliminate air that is trapped in the cylinders, hoses, spool valves, etc. and avoid erratic bumpy motion during actual working conditions.

4. ALWAYS check for hydraulic leaks after a repair. A high pressure leak is hazardous and must be repaired before putting the unit to work.

5-2-1. CYLINDERS

The cylinders are the same type; therefore, the same disassembly and repair instructions apply to both. Check the PARTS section for specific parts and repair kits. The following list of tools will be a definite asset in the disassembly and repair of all IMT cylinders;

1. Spanner wrench - IMT part number 3Y140510. Fits all IMT cylinders.

2. Needle-nose pliers - for removal and replacement of seals.

3. Awl - for removal and replacement of seals.

4. Plastic hammer - used with the spanner wrench for head and piston installation.

5-2-1-1. Main Cylinder Removal

These removal instructions pertain to the main cylinder only. For removal and installation instructions for the extension cylinder, refer to paragraph 5-2-1-2.

1. Support the crane with the boom horizontal and fully extended.

2. Kill the engine.

3. Relieve the internal hydraulic pressure (cycle the controls a few times).

4. Disconnect the hydraulic hoses from the cylinder.

WARNING

Get help when removing the cylinder. Avoid dropping the cylinder and causing an injury or damaging the cylinder.

5. Remove the rod-end pin.

   A. Remove the retaining ring and bushing.

   B. Hold the cylinder in position and drive out the end pin.

6. Remove the base-end pin in the same manner as the rod-end pin.

7. Carefully lower the cylinder.

To install the cylinder:

1. Position the base-end pin boss in line with the pin boss on the mast. Install the pin, retaining ring and machinery bushing.

2. Raise the rod end into position and install the rod-end pin.

3. Connect the hydraulic hoses to the cylinder ports. Use a good thread sealer and adequately tighten fittings to prevent leaks.

4. Start the vehicle engine, engage the PTO and raise and lower the main boom through about five complete cycles to purge air from the cylinder and hoses. Operation should be smooth without erratic, bumpy behavior.

5. Kill the engine and check for leaks.

6. With all cylinders retracted, check the oil level in the reservoir.

5-2-1-2. Extension Cylinder Removal and Installation

To remove the extension cylinder:

1. Start the engine, engage the PTO and extend the extension boom to full stroke. Kill the engine.

2. Remove the nut, washer, bolt and roller restricting the cable to the groove in the pulley. Lift the cable up and out of the way.

3. Remove the retaining ring and machinery bushing and drive out the rod-end cylinder pin.

4. Start the engine, engage the PTO and retract the extension cylinder. Kill the engine.

5. Remove the retainer plates and Delrin pads located on both sides of the main boom. The pads are near the tip of the boom. Remove the trunnion from the main boom.

6. Support the extension boom with an overhead crane or other suitable lifting device. Slowly work the boom out of the main boom. Set it aside.

WARNING

Secure the boom to the lifting device to prevent it from slipping.

7. Disconnect and cap the hoses to the cylinder. Plug the cylinder ports.

8. Pull the hair pin out of the pin securing the base-end of the cylinder to the main boom. Pry the pin out of the pin boss.

9. Slide the cylinder out of the main boom.

To install the cylinder:

1. Slide the rod end of the cylinder into the extension boom. Line up the pin boss.

2. Drive the pin through the rod-end pin boss and install the machinery bushing and retaining ring.

3. Lift the extension boom and slide it into the main boom.

4. Line up the pin boss and install the pin. Insert the hair pin.

5. Connect the hydraulic hoses to the cylinder ports. Use a thread sealer and adequately tighten fittings to prevent leaks.

6. Install the Delrin pads and retainer plates on both sides of the main boom. Install the trunnion.

7 Start the engine, engage the PTO and cycle the extension boom at least five times in both directions to purge air from the cylinder. Operation should be smooth without erratic, bumpy movement. Check for hydraulic leaks

8. With all cylinders fully retracted, check the oil level in the reservoir.

9. Thread the cable around the pulley groove and install the roller, bolt, nut and washer.

5-2-1-3. Cylinder Disassembly

CAUTION

If solvent is used to clean the internal cylinder components, all traces of solvent must be removed. Any residual may damage the seals.

WARNING

Do not use compressed air to assist in withdrawing the piston/rod assembly. The use of compressed air may result in propelling the piston/rod assembly out of the cylinder and may cause serious injury or death.

NOTE

If the cylinder is being repaired due to a worn seal, we strongly recommend replacing all components found in a repair kit. The small additional expense may save you expensive equipment down-time in the future. Refer to the appropriate drawing in the PARTS section.

1. Thoroughly wash the exterior of the cylinder case.

NOTE

After the case has been washed, proceed with disassembly in a clean environment – one that is free of dust and dirt.

2. Remove the six allen head screws securing the holding valve (extension cylinder only). Remove the holding valve.

3. Place the cylinder on a flat surface near a vise. Slip a pin through the pin boss and clamp the pin in a vise (Figure E-1)

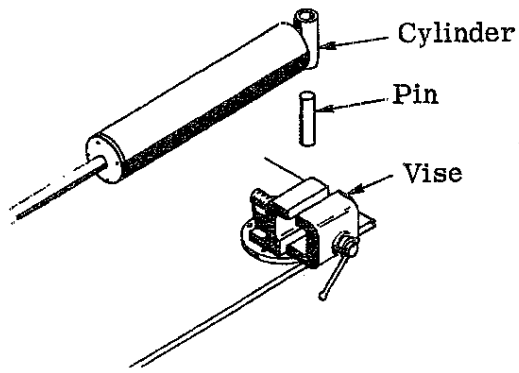


Figure E-1. Securing Cylinder

CAUTION

Do not clamp the cylinder in a vise. It may damage the cylinder.

4. Unscrew the head (Figure E-2) in a counterclockwise direction with the spanner wrench. Withdraw the head from the case.

5. Secure the rod pin boss in the same manner as the base pin boss (Figure E-1)

6. Unscrew the piston from the rod in the same manner as the head.

CAUTION

Do not clamp the machined surface of the rod in a vise. Damage to the rod will result.

7. Remove the wafer-lock and the stop tubes from the rod. the wafer-lock was crushed to secure it and will have to be broken to remove it.

CAUTION

Make certain that the rod isn't damaged during removal of the wafer-lock.

8. Slide the head off the rod.

9. Inspect the cylinder interior and the rod for dents, nicks, scratches, etc. and replace if necessary.

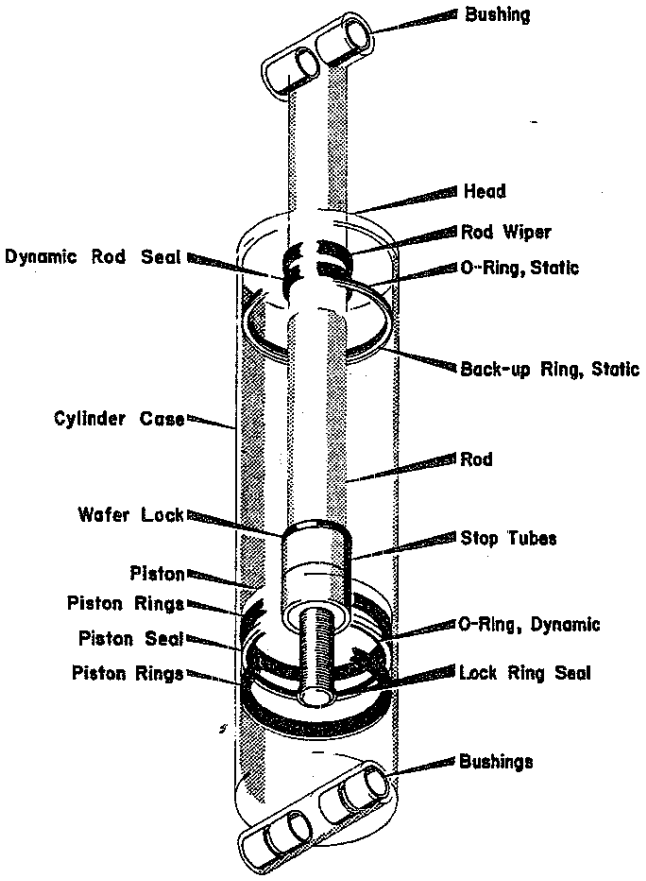


Figure E-2. Cylinder Layout

CAUTION

Failure to replace a damaged rod or cylinder case may result in leaks and poor performance. Further equipment down-time will occur to remedy this problem.

NOTE

Further work should be done in a warm environment (70°F or warmer). This makes the seals more pliable and easier to work with.

10. Work a slack section into the head seal static o-ring and pick it up out of the groove (Figure E-3). Lift the static back-up out of its groove with the needle-nose pliers.

11. Pinch the lip of the rod wiper with the needle nose pliers and pull it out of the head.

12. Position the head with the top of the head up and puncture the dynamic rod seal with the awl. Pry it out of the groove and push it on through the head.

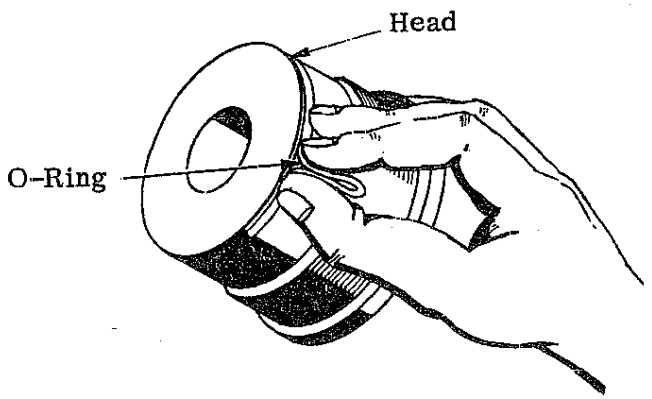


Figure E-3. O-Ring Removal

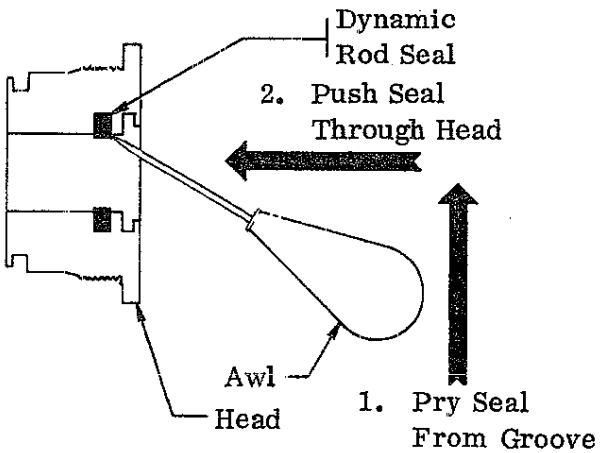


Figure E-4. Dynamic Rod Seal Removal

13. Spread the piston rings, slip them over the land and off the end of the piston nearest to the ring.

14. Carefully lift the dynamic piston seal out of the groove with a thin blade such as a putty knife blade. Take care not to nick the edges of the groove. Twist and break the seal.

CAUTION

Damaging the edges of the groove is likely to cause premature seal failure.

15. Prick the companion o-ring with a pin or needle and lift it out of the groove. Roll it off the end of the piston.

16. Pry the lock ring from its seat in the bottom of the piston.

17. Clean the piston, head, rod and cylinder. Dress any nicks and gouges that may have occurred during disassembly.

5-2-1-4. Cylinder Assembly

CAUTION

Use all of the components in the seal kit. It may save you expensive down-time in the future.

1. Install the companion o-ring. Make certain it is free of twists.

2. Slide the piston seal carefully into position.

CAUTION

Work the piston seal carefully into position from the top of the piston using the assembly groove. Do not attempt it from the bottom of the piston - you may stretch it and render it useless.

3. Slide the piston rings over the land and allow them to snap into the grooves.

4. Carefully press the lock ring into position.

5. Install the static back-up and the o-ring. Make certain there are no twists

6. Position the head with the rod wiper pocket up. Grasp the dynamic rod seal with the needle-nose pliers (Figure E-5).

CAUTION

Do not apply too much pressure to the rod seal or you may cut it with the needle-nose pliers.

7. Insert the dynamic rod seal into the head and allow it to snap into position. Use your fingers to help it if necessary.

8. Install the rod wiper.

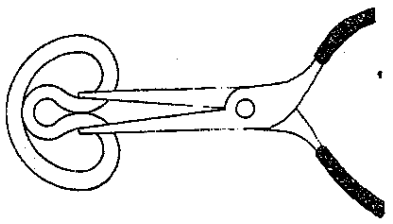


Figure E-5. Rod Seal Installation

9. Generously lubricate the inside diameter of the head with a non-fibrous bearing grease such as Lubriplate®.

10. Carefully slide the head onto the rod. Make certain that the rod wiper does not catch on the rod when it is first started. Slide the head all of the way onto the rod and up to the pin boss.

11. Slide the wafer-lock and stop tube(s) onto the rod.

12. Lubricate the entire threaded area of the rod and the inside diameter of the piston with a non-fibrous bearing grease.

13. Secure the rod as shown in Figure E-1 and screw the piston onto the rod by hand. You should be able to get the piston almost all of the way onto the rod before using the spanner wrench.

CAUTION

Check to make certain that the lock ring stays in position. It must remain in position or leaks will occur.

14. Torque the piston onto the rod at 250 ft. lbs. of torque. Impact the wrench three times with a heavy plastic mallet while maintaining the torque (Figure E-6).

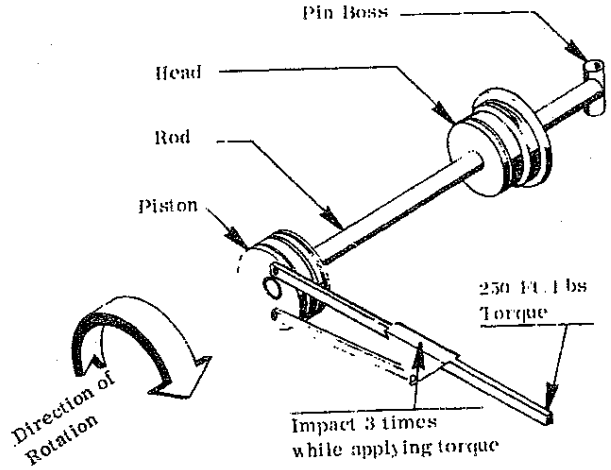


Figure E-6. Piston/Rod Assembly

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15 Generously lubricate the outside diameter of both the head and piston with nonfibrous bearing grease. Also lubricate the threads and beveled area of the top of the cylinder case.

16. With a side-to-side or up-and-down motion, work the piston into the cylinder and past the threads and beveled area of the top of the cylinder case.

17 Slide the piston into the cylinder With a rotating motion, work the o-ring and the back-up ring past the threads and hand tighten the cylinder head

18. Secure the cylinder (Figure E-1) and torque the head in the same manner as the piston (Step 14 and Figure E-6).

19 Install the holding valves and their o-rings. Make certain that the o-rings are in good condition and properly positioned.

5-2-2. WINCH REPAIR

There are two different manufacturers of winches used on the IMT 315 crane - Gear Products® and Koenig®. The winches are interchangeable. Determine which winch is on your particular crane before attempting to order parts or disassemble winch. Cranes using the Koenig winch may be identified by a letter suffix "K" in the serial number of the Serial Number Placard. To remove either type of winch:

1. Disconnect and cap the hydraulic hoses.

2. Remove the four (4) bolts securing the winch base to the side of the mast.

3. Slide the winch and shaft out while supporting the drum.

4. If the winch is dirty, wash it thoroughly before beginning disassembly

CAUTION

Plug the motor ports before washing the exterior of the winch. Do not introduce water into the interior of the motor. Failure to comply with these instructions may result in rust inside the motor.

5-2-2-1. Koenig Winch Disassembly and Repair

These instructions apply only to those winches manufactured by Koenig Iron Works.

To disassemble the winch:

1. Remove the drain plug in the bottom of the gear housing and drain the gear oil.

2. Remove the four (4) bolts securing the gear housing cover to the gear housing. Remove the cover and gasket.

3. Remove the gear with spider attached. Remove the bushings, gasket and shaft.

4. Remove the motor and motor adapter.

5. Remove the bolt in the center of the brake cover.

6. Remove the brake cover by unscrewing all of the socket head screws except for one. Then, using hand pressure to hold the cover in place, remove the tenth screw. Carefully lift off the cover.

7. Remove the brake button, thick and thin thrust washers, pressure plate, plate and disc group and cover gasket.

8. Remove the first set of retaining rings from the shaft. Slide the washer off the shaft.

9. Carefully slide the clutch off the shaft.

NOTE

There are three (3) pins and springs inside the clutch that will fall out once the clutch clears the end of the shaft.

10. Remove the second washer and retaining ring.

11. Remove the six (6) socket head screws securing the brake housing to the gear housing. Remove the brake housing.

NOTE

Do not remove the worm unless the worm is damaged and requires replacing.

12. Position the gear housing in a press and press the end of the worm until one of the bearing cups is free. Remove the cup, bearing and spacer. Invert the gear housing and press the other bearing cup out of the housing. Remove the worm.

13. Thoroughly wash all parts with clean solvent and blow dry with compressed air.

14. Before beginning assembly, check bearing surfaces for nicks, gouges and out-of-round condition. Replace if necessary. Check the teeth of the worm and worm gear for burrs.

NOTE

When replacing bearings, always replace bearing cups at the same time.

To assemble the Koenig winch:

1. Press the bearing cup into the housing on the brake end of the gear housing.

2. Invert the housing and insert the worm, bearing and spacer. Press the other bearing cup into position.

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®Koenig is a registered trademark of Koenig Iron Works, Inc., Houston, TX

3. Position both keys in the drive shaft and slide the shaft through the worm.

4. Position the gasket and install the brake housing. Torque the screws in a criss-cross pattern (refer to Torque Data Chart in the APPENDIX).

5. Install the retaining ring and washer on the shaft. Slide the clutch onto the shaft and insert the roller springs and pins in the clutch. Install the second washer and retaining ring.

6. Thoroughly lubricate the brake disc and plate group with clean gear oil. Both sides of each disc and plate must be oiled.

7. Slide the disc and plate group into the brake housing. The discs will have to be rotated to line up with the clutch and the plates must be aligned with the housing.

8. Slip the pressure plate over the shaft and install a thick thrust washer, a thin thrust washer and the brake button.

9. Position the cover gasket on the brake housing and align the cover. Install the center bolt in the brake cover.

10. Install all ten (10) socket head screws in the brake cover. Torque in a criss-cross pattern (refer to the Torque Data Chart in the APPENDIX).

11. Invert the assembly. Position the adapter gasket, spacer and adapter on the gear housing. Install the bolts and torque in a criss-cross pattern.

12. Install the motor coupler on the drive shaft. Position the motor flange gasket and install the motor.

13. Secure the hub to the worm gear. Insert the keys in the drum shaft and slide the shaft through the hub.

14. Slide the bushings over the shaft to the hub. Lower the assembly into the gear housing until it meshes with the worm. Adjust the shaft to the proper position and tighten both set screws. The end of the shaft should be even with the end of the bushing.

15. Position the cover gasket on the gear housing and bolt the cover in place.

16. Install the drain plug.

17. Install the winch on the crane.

18. Remove the check plug from the side of the gear housing and the fill plug from the cover. Fill the gear housing with oil until it is level with the check plug port.

NOTE

Due to the high viscosity of the gear oil, it may come out of the check plug before it fills the brake housing. Make certain that both the gear and brake housing are properly filled.

19. Install the check and fill plugs.

20 Grease the winch bushing and the shaft bearing on the other side of the mast.

21. Connect the hoses to the motor. Use a thread sealer and adequately tighten the fittings to prevent leaks.

22. Start the engine and engage the PTO. Lower and raise the cable a number of times to purge the air in the hydraulic system. Kill the engine.

23. Check for hydraulic leaks

24. With the cylinders fully retracted, check the reservoir fluid level.

25. Recheck the level of gear oil in the winch.

5-2-2-2. Gear Products Winch Disassembly and Repair

To disassemble the winch:

1. Drain the gear oil.

2. Remove the four socket head screws and remove the brake housing. The spring assembly, pressure plate and one (1) disc will come off with the brake housing.

3. Slide the rotor assembly off the shaft. To disassemble the rotor assembly:

NOTE

The rotor assembly is difficult to assemble and should not be disassembled unless it is necessary.

A. Remove both snap rings and retaining rings.

B. Slowly slide the driver out of the race. The rollers are spring loaded and will fly in all directions unless precautions are taken. Hold the rotor inside a box or pail when sliding the driver out of the race.

4. Remove the bearing container. The friction disc is glued to the bearing container and should not be removed except for replacement purposes.

5. Remove four (4) 3/8" x 3/8" x 2 - 1/2" keys from the drum shaft. Use a vise grip and a screwdriver as a lever if necessary. Clamp the vise grip on the key and pry against the vise grip.

6. Slide the spacer off the shaft.

7. Remove the four (4) hex head and six (6) ferry screws from the cover. Slide the cover off the shaft.

NOTE

The gaskets between the cover and housing may be stuck together and prevent the cover from being easily removed. Wrap the shaft in a rag to protect your hands and give it a sharp tug. The cover should break free.

8. Remove the thrust ring from the shaft

9. Remove the bearing retainer and gasket.

10. Press the worm bearing cup out of the housing. Apply pressure on the splined end of the worm shaft. Stop pressing when the race is pressed out of the housing.

11. Pull the worm partially out of the housing. Do not pull it far enough that the bearing interferes with the worm gear. Slide the worm to one side and remove the shaft and worm gear.

12. Press the worm shaft from the other end to remove the other bearing cup.

13. Drive the expansion plug out of the housing from the inside with a hammer and drive pin.

14. Press the bushings out of the cover and housing.

NOTE

Removal of the bushings is not required if they are not to be replaced.

15. Pull the worm gear off the shaft with a gear puller.

NOTE

Do not remove the worm gear unless it is being replaced.

16. Pull the bearings off the worm shaft with a gear puller.

NOTE

Do not remove the bearings unless replacement is necessary. If the bearings are replaced, also replace the bearing cups.

17. Thoroughly wash all metal parts in a cleaning solvent such as trichloroethane and dry with a low pressure air hose.

To assemble the winch:

1. Make certain the parts are thoroughly dry. Any trace of solvent may damage the rubber seals.

2. Replace all seals and gaskets. Replace any part suspected of being damaged.

3. Dress any nicks and scratches that may have occurred during disassembly. Use a wire brush or #400 emery paper.

4. Press the new busings into the housing and cover.

5. Press the new bearings onto the worm shaft.

6 Slide the worm into the housing. Make certain that the splined end is on the motor side.

7. Install two (2) keys on the drum shaft and press the worm gear onto the shaft.

8. With the housing lying flat, position the thrust ring over the bushing. Slide the shaft through the thrust ring and into the bushing. The worm will have to be moved to one side to provide adequate clearance for the worm gear. Align the teeth of the worm gear with the worm.

9. Start both bearing cups into position with a plastic hammer.

10. Position the bearing retainer and gasket on the housing. Install the four (4) bolts through the bearing retainer and tighten them to press the bearing cup into position. Tighten each bolt about two (2) turns and then tighten another bolt. Continue until the bearing retainer is properly tightened.

11. Position the bearing container and gasket on the housing. If the friction disc was removed, glue another disc on the housing. Use a good quality high-temperature glue.

12. Assemble the rotor assembly:

    A. Position the race on a flat surface.

    B. Install a screw-type ring compressor loosely around the driver. Install the springs, plungers and rollers in the driver. The plunger must be inserted in the hole of the driver before the ring compressor is tightened. If the compressor is tightened before the plunger is in the hole, the angle is too great to insert the plunger. Tighten the ring compressor.

    C. Position the assembled driver over the race and push the driver into the race. Work slowly and keep the rollers in position with respect to the driver.

13. Install the #15 Woodruff key in the worm shaft.

14. Slide the driver over the shaft and Woodruff key.

15. Tighten the worm brake adjustment nut on the spring assembly. This relieves spring tension against the pressure plate.

16. Install the spring assembly in the brake housing. Make certain that the o-ring and seal are properly positioned on the nut.

17. Slide the pressure plate into the brake housing. The "ears" on the pressure plate fit in the detent inside the brake housing. The ends of the spring assembly fit in the recessed area of the pressure plate. Insert the friction disc into the housing.

18. Position the brake housing gasket on the bearing container and slide the brake housing with spring assembly, pressure plate and friction disc over the shaft and into position.

Install the socket head bolts through the brake housing and tighten each one alternately to press the bearing cup into position. Tighten the bolts.

20. Slide the second thrust ring over the drum shaft and install the cover with new gaskets and o-ring. Install six (6) ferry screws to draw the cover up tight against the housing. Install and tighten the four (4) hex head screws through the cover side brackets.

21. Slide the spacer over the shaft.

22. Install the four (4) keys in the shaft. Start the end of the key closest to the cover and then rap the other end sharply with a plastic mallet.

23. Install the winch on the crane. Install the winch motor.

24. Connect the hydraulic hoses to the motor. Use a thread sealer and adequately tighten fittings to prevent leaks.

25. Grease the drum shaft bearing.

26. Remove the check plug and the fill plug from the winch housing. Fill the housing with gear oil until it comes out of the check plug hole. Allow all of the oil to run down into the sump of the housing before installing the check plug.

27. Start the engine, engage the PTO and operate the winch in and out several times to purge air from the system.

28. Lift the full rated load –1,900 lbs. (862 kg) at 15 feet (4.57 m). Run the winch in and out several times. Make certain that the brake is functioning properly. If not, it may be adjusted by turning the brake adjusting nut counterclockwise to increase braking and clockwise to decrease.

5-2-3. CONTROL VALVE BANK

5-2-3-1. Electrical Testing

If a control valve section fails to operate:

1. Check for power at the remote control unit (operate an alternate funtion). If power is available, proceed with Step 2. If not:

   A. Check for a blown fuse in the carrier vehicle's fuse holder.

   B. Check for loose wires or broken conections in the terminal strip and control handle (refer to Figure E-7, Wiring Diagram)

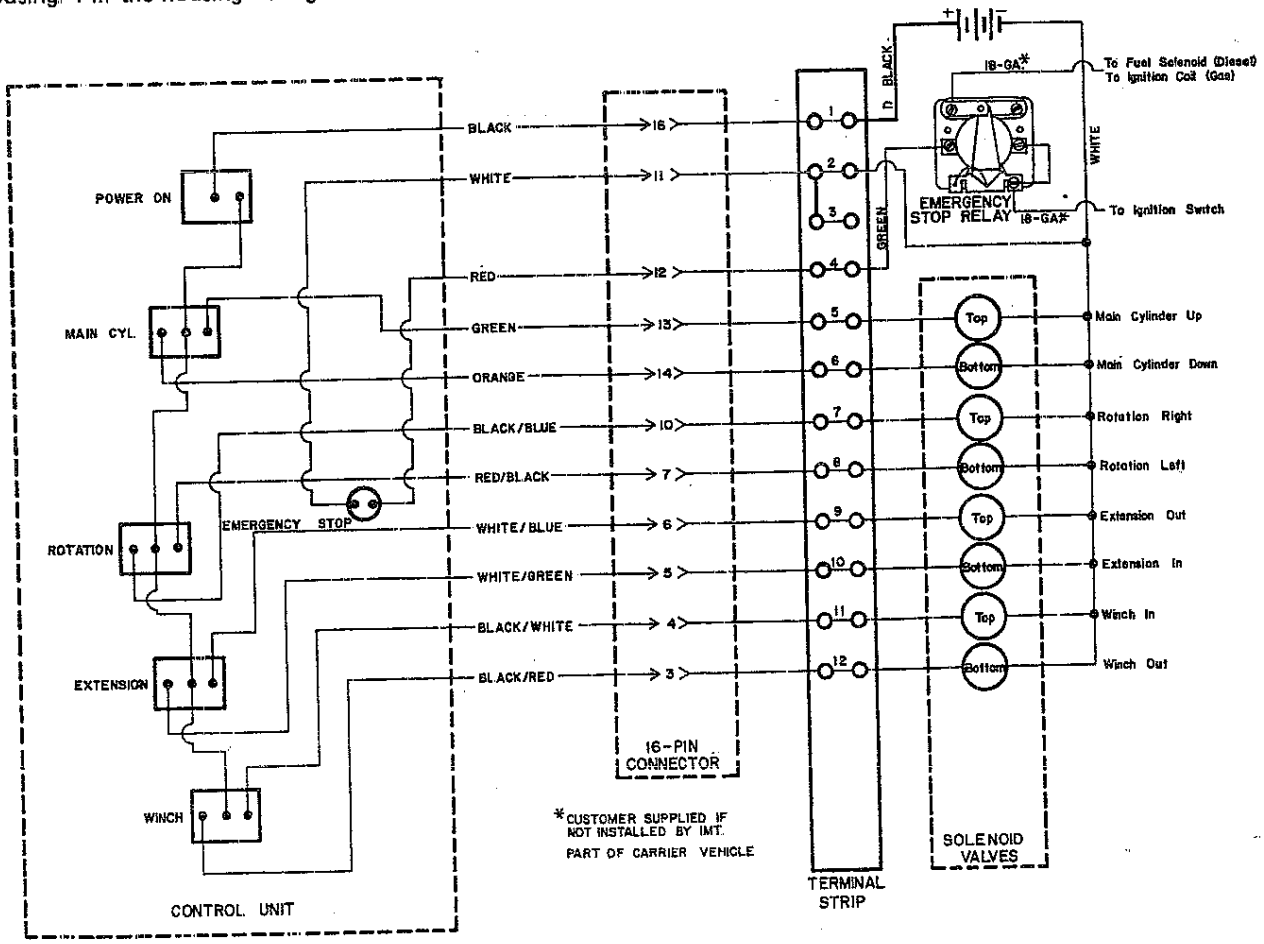


Figure E-7. Electrical Wiring Diagram

C. Check for 12 VDC at the main power terminal in the terminal strip. If there is power at the terminal strip, check for power at the remote control handle (hot side of MASTER switch). If power is available, proceed to Step D. If not, a wire is broken.

D. If power is available, turn on the MASTER switch and check the hot side of the function switch. If power is present, proceed to Step 2. If power is not present, replace the MASTER switch.

2. Determine which wires at the terminal strip correspond to the affected function. Disconnect those wires from the terminal strip and wire up an alternate function to the same terminals. If the alternate function operates, repair or replace the control valve section.

3. If the alternate function will not operate, the problem is in the switch or wiring. With the switch activated, check for power on the function side of the switch. If power is not present, replace the switch. If it is present, replace the cable.

5-2-3-2. Valve Repair

To remove the valve section:

1. Remove the valve bank cover.

2. Disconnect the hoses from the affected section of the valve bank.

3. Disconnect the affected function from the terminal strip.

4. Remove the screws securing the terminal strip to the valve section (only if the affected function has the terminal strip attached).

5. Loosen the nuts and bolts securing the valve bank to the mast.

6. Remove the nuts from one end of the studs. Work from the end with the affected function. Slide the studs far enough out of the valve bank to permit removal of the affected function. Slide the section out of the valve bank and loosely install the studs in the valve bank.

Before beginning disassembly, prepare an oil bath of clean SAE 10 oil to receive the parts as described in the following procedures. Refer to the parts drawing in the PARTS section and disassemble the valve as follows:

1. Remove the tube nut and slide the solenoid coil off the tube.

CAUTION

Use the proper tool to avoid damaging the tube. Do not use a monkey wrench or visegrip pliers.

2. Use a 1-1/4" spanner wrench to loosen the tube.

NOTE

Spring and spring retainer may fall from valve body when the tube is removed.

3. Remove the tube by hand.

4. Remove the spring and spring retainer from the valve body. Place spring and retainer in oil bath.

5. Slide the pin, plug and plunger out the open end of the tube. Place pin, plug and plunger in the oil bath.

6. Using a small screwdriver or punch, gently push the button into the tube until it is free and falls out. Remove and discard o-ring and place the button in the oil bath.

7. Remove the o-ring from the tube and place the tube in the oil bath. Discard the o-ring.

8. Repeat steps 1 through 7 to remove the second tube.

CAUTION

Handle spool with extreme care. Damage to surface of spool will prevent it from functioning properly.

9. Carefully slide the spool from the valve body.

CAUTION

Valve body and spool are a matched pair. If either one is damaged, both must be replaced.

10. Inspect all parts for damage. Replace all o-rings and any part suspected of being damaged. Place replacement parts in oil bath.

To assemble the valve:

CAUTION

Before proceeding, check that both valve body and spool are thoroughly dry. Any residual cleaning agent may damage the o-rings.

1. Wash all parts with a cleaning solvent such as trichloroethane and dry with a low pressure air hose.

CAUTION

Handle spool with extreme care. Contamination or damage to the surface of the spool will prevent it from functioning properly.

2. Dip the spool and valve body in clean SAE 10 oil and slide spool carefully into the valve body. If the spool does not slide freely into the valve body, inspect for burrs. Remove burrs with a stiff wire brush or #400 emery paper and repeat Steps 1 and 2.

3. Place all disassembled parts in oil bath.

4. Place a new O-ring into slot on tube.

5. Place a new O-ring into groove on button. Drop button into the tube and, using a screwdriver, push it into place.

6. Insert plunger, plug and pin in tube.

7. Place spring retainer and spring over the spool end in the body.

8. Reinstall the tube assembly and hand tighten.

9. Repeat steps 3 through 9 for the second tube assembly.

10. Using a 1 - 1/4" spanner wrench, tighten the tube.

11. Install the solenoid coils and tube nut.

To install the repaired valve section:

1. Slide the studs far enough out of the valve bank to permit insertion of the repaired section.

2. Install new O-rings on both sides of the section.

3. Carefully slide the section back into the valve bank. Do not dislodge the o-rings.

4. Slide the studs through the valve bank and install the nuts and washers. Torque to 125 in. lbs.

5. Tighten the valve bank mounting bolts and nuts evenly.

6. Connect the wires to the terminal strip.

7. Connect the hoses to the valve ports. Use a thread sealer and adequately tighten fittings to prevent leaks.

8. Connect the wires to the terminal strip.

9. Install the valve bank cover.

5-2-3-3. Relief Valve Adjustment

Normally the relief valve (Figure E-8) will not require adjustment. However, if it was disassembled for cleaning or otherwise tampered with, or if the spring is just getting weaker, it must be adjusted. The correct relief setting is 2300 - 2350 PSI. To adjust the relief valve:

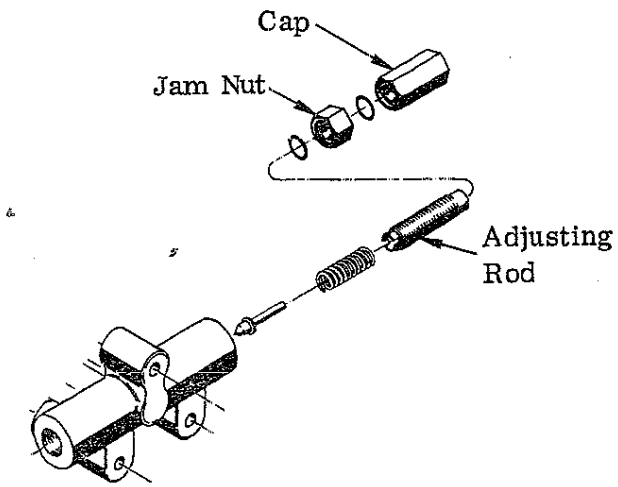


Figure E-8. Relief Valve Adjustment

1. Remove the cap and loosen the jam nut.

2. Turn the adjusting rod clockwise to increase pressure and counterclockwise to decrease pressure.

3. Start the engine, engage the PTO and move any control function to full open. After the cylinder is fully extended (or retracted), check the pressure on the pressure gauge. Keep the control valve open while checking the pressure. Adjust the pressure according to the instructions in Step 2.

4. When the valve has been adjusted to 2300 - 2350 PSI, tighten the jam nut and install the cap. Re-check the pressure setting.

NOTE

If relieving pressure cannot be brought up to 2350 PSI, it indicates pump slippage.

5-2-4. HOLDING VALVES

There are two types of holding valves used on the IMT 315 crane: a counter-balance holding valve is used on the main cylinder and a locking holding valve is used on the extension cylinder. An unsafe condition exists if either valve is inoperative. The holding capability should be checked weekly and anytime there is a suspected malfunction. To conduct a holding test:

1. Lift the full rated load to approximately 30° above the horizontal position. Kill the engine.

2. Cycle all hydraulic control valves and check to see if any of the cylinders "creep". If not, the valve is serviceable. If the cylinder "creeps", refer to Paragraph 5-2-4-1 or 5-2-4-2.

5-2-4-1. Counter-Balance Holding Valve

The counter-balance holding valve (Figure E-9) can be checked for holding capabilities by following the procedure outlined in Paragraph 5-2-4. It serves as a holding valve in the event of a hydraulic component failure and also functions as a metering valve which allows a feathered motion when lowered while under load. This is not a repairable component. If defective, it must be replaced.

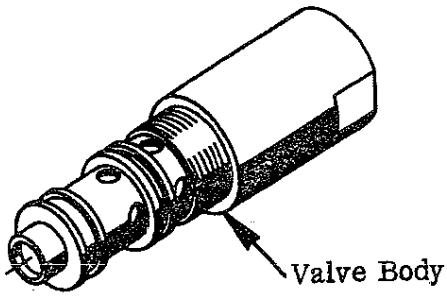


Figure E-9. Counter Balance Holding Valve

5-2-4-2. Locking Holding Valve

The extension cylinder is equipped with a locking holding valve (Figure E-10). Its purpose is to prevent injury or damage from the crane descending too quickly in the event of a hydraulic hose or other downstream component failure.

The valve is non-adjustable and failure is unlikely. However, if a malfunction is supected it may be checked by performing a holding test. If the cylinder "creeps":

1. Place the crane in a fully supported position by completely retracting the cylinder and positioning the main boom so that it is parallel with the ground.

2. Remove the cylinder (paragraph 5-2-1-2).

NOTE

Be prepared for reasonable oil drainage from the extension cylinder.

3. Remove the six (6) allen head screws from the holding valve.

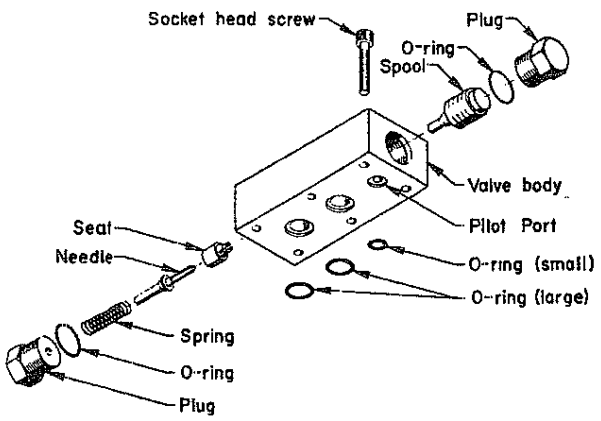


Figure E-10. Locking Holding Valve

4. Lift the holding valve away from the cylinder. Be careful not to introduce dirt in the cylinder.

5. Check the smallest port for a dirt plug and clean it out if necessary (pilot port).

6. Carefully test actuate the valve needle with a small screwdriver through the center port. If the needle is free, reinstall the valve. If not, proceed with step 7 or replace the valve.

NOTE

If the valve appears to be functioning properly, hydraulic fluid is probably bypassing the piston rings, allowing the piston to creep. This indicates the need for new piston rings (refer to paragraph 5-2-1-3 for piston disassembly.

7. The valve may be disassembled and cleaned in the following manner:

   A. Unscrew the plugs from both ends of the valve body and remove the spring, needle, seat and spool. The o-rings will come out with the plugs.

   B. Immerse all of the parts except for the o-rings in a container of clean solvent.

CAUTION

Solvents may be corrosive to o-rings and damage them.

   C. Thoroughly clean the components and then rinse them in clean solvent. Blow the parts dry with compressed air.

   D. Reassemble the valve and repeat step 6.

NOTE

Take care that the o-ring seals are placed properly and are dirt free. Also be sure that the small pilot port is properly located over the small o-ring seal.

8. Position the locking holding valve on the cylinder port block and evenly tighten the allen head mounting bolts.

9. Activate the system and check for leaks.

5-3. BEARINGS.

This paragraph deals with the removal and installation of bushings and the gear-bearing.

5-3-1. BOOM HINGE PIN BUSHINGS

To remove the main boom hinge pin bushing:

1. Position the crane with the main boom horizontal to the ground. Kill the engine.

2. Disconnect and cap the hydraulic hoses to the extension cylinder.

3. Remove the roller spacer from the extension boom and lift the cable out of the groove. Remove the stud from the cable guide on the main boom and set the cable and sheave off to one side.

4. Support the main and extension boom with a sling. Take the slack out of the sling until the boom is fully supported.

5. Support the rod end of the main cylinder and remove the rod-end pin retaining ring and machinery bushing. Drive out the pin and carefully lower the rod end of the cylinder.

6. Remove the hinge pin retaining ring and machinery bushing. Drive out the hinge pin.

7. Lift the main boom away from the mast. Press the bushing out of the sleeve and install the new bushings.

To install the boom:

1. Lift the boom into position on the mast. Line up the holes and drive in the pin. Install the machinery bushing and retaining ring.

2. Raise the rod end of the main cylinder until it lines up with the hole on the main boom. Raise or lower the main boom as necessary to line up the hole. Install the pin, machinery bushing and retaining ring. Move the sling out of the way.

3. Grease the hinge bushings and cylinder bushings.

4. Route the cable along the top of the boom and through the groove in the sheave. Install the cable guide on the main boom and the roller spacer on the tip of the extension boom.

5. Connect the hoses to the extension cylinder.

6. Start the vehicle engine, engage the PTO and cycle the extension cylinder in and out several times. This will purge the air trapped in the cylinder.

5-3-2. CYLINDER PIN BUSHINGS

To remove the cylinder pin bushings:

1. Remove the main cylinder (Paragraph 5-2-1-1).

2. Position the cylinder on a flat surace and press the old bushings out of the pin boss. Press the new bushings into place.

3. Inspect the pin for nicks, scratches, gouges or an out-of-round condition. Where possible, dress the scratches with fine emery paper. If the damage is too severe, replace the pin.

4. Install the cylinder in the crane (Paragraph 5-2-1-1)

5. Grease the pin bushings.

5-3-3. PINION GEAR AND DIVE GEAR BUSHINGS

To remove the pinion gear bushing:

1. Rotate the crane until the notch on the mast base plate is positioned over the pinion gear.

2. Remove the pinion gear cover.

3. Locate and remove the retaining ring on the bottom of the pinion gear.

4. Lift the pinion gear up and out of the intermediate gear. Slide the intermediate gear out of the way.

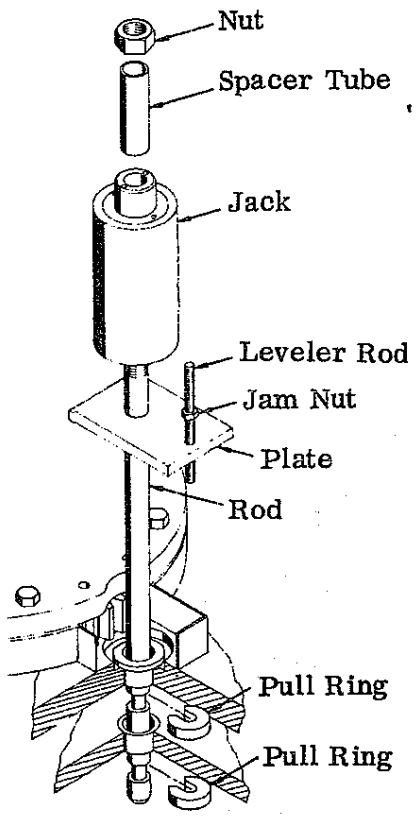


Figure E-11. Pinion Gear Bushing Removal

5. Install the bearing removal tool as shown in Figure E-11.

6. Apply power to pull the bushings up and out of the base.

NOTE

Power may be supplied by a simple hand pump or by an air-over-hydraulic intensifier pump

To install the pinion gear bushings:

1. Assemble the tool as shown in Figure E-12. The flat side of the ring bushing set and the top bushing fits against the gear bearing. A spacer is installed and then the hydraulic jack.

2. Apply power to press the bushings into place.

3. Install the pinion gear and intermediate gear. Install the retaining ring on the bottom of the pinion gear.

4. Install the pinion gear covers on the mast and base.

To remove the drive gear:

1. Disconnect the hydraulic hoses and remove the rotation motor.

2. Remove the grease plate on the bottom of the drive gear.

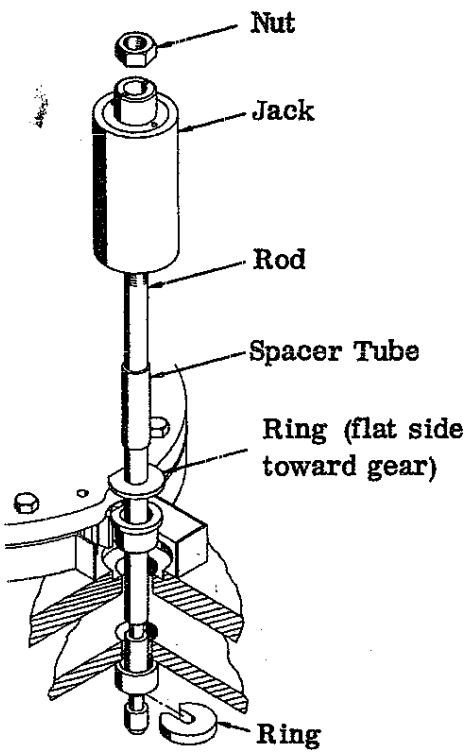


Figure E-12. Pinion Gear Bushing Installation

3. Install the tool as shown in Figure E-13. Apply power to pull the bushings and gear upward.

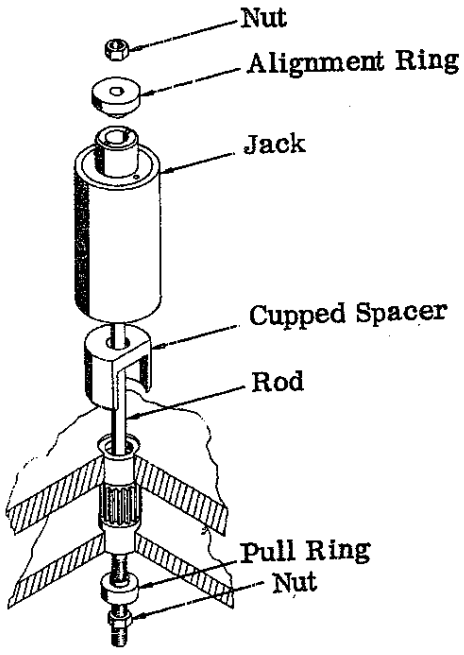


Figure E-13. Drive Gear Bushing Removal

4. Reassemble the tool as shown in Figure E-13. Press the gear and bushings into place.

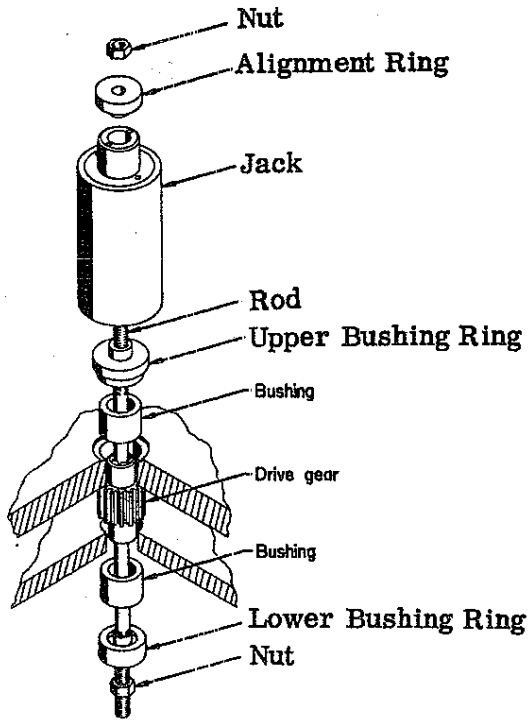


Figure E-14. Drive Gear Bushing Installation

5. Install the grease plate and rotation motor. Lubricate the drive gear.

6. Connect the hydraulic hoses to the motor.

7. Start the engine, engage the PTO and test actuate the rotation motor. Check for leaks.

8. Rotate the crane at least five times in both directions to purge the air trapped in the rotation motor and hoses.

5-3-4. TURNTABLE GEAR-BEARING

To remove the turntable gear-bearing:

1. Position the main boom parallel with the ground. Kill the vehicle engine.

2. Disconnect the pressure and return hoses from the valve bank. Push the hoses through the base and out of the way.

3. Disconnect the rotation hoses from the valve bank.

4. Support the crane with an overhead crane, forklift or other lifting device. Take up the slack in lifting device.

5. With crane fully supported, remove all eighteen mast mounting bolts. Lift off the crane and set it to one side. Feed the remote control cable through the base while lifting the crane.

6. Remove the mounting bolts and lift the base off the mounting platform. Turn the base upside down and block up the gear-bearing.

7. Cut the safety wires and remove the twenty-four bolts securing the gear-bearing to the base.

To install the gear-bearing:

1. Position the gear-bearing on the base. Install the twenty-four bolts and torque in a criss-cross pattern to 180 ft. lbs. (24.89 kg-m).

2. Safety wire all bolts in pairs. The safety wires should be installed in such a way that it pulls the bolt in the direction employed for tightening (refer to Figure E-15).

3. Position the base on the platform and install the mounting bolts. Evenly tighten all four mounting bolts.

4. Lift the crane into position on the base. Install and torque all eighteen mast mounting bolts in a criss-cross pattern to 180 ft. lbs. (24.89 kg-m).

5. Grease the gear-bearing. Also coat the entire outside diameter of the gear with a thick layer of grease.

6. Connect the pressure and return hoses to the valve bank. Use a thread sealer and adequately tighten all fittings to prevent leaks.

7. Connect the rotation motor hoses to the valve bank. Use a thread sealer and adequately tighten all fittings to prevent leaks.

8. Start the vehicle engine, engage PTO and test actuate all functions. Each function should be operated until the motion is smooth -- air is purged from the system.

9 Check for hydraulic leaks and repair if necessary.

10 With all cylinders retracted, check the reservoir oil level and add to "FULL" mark.

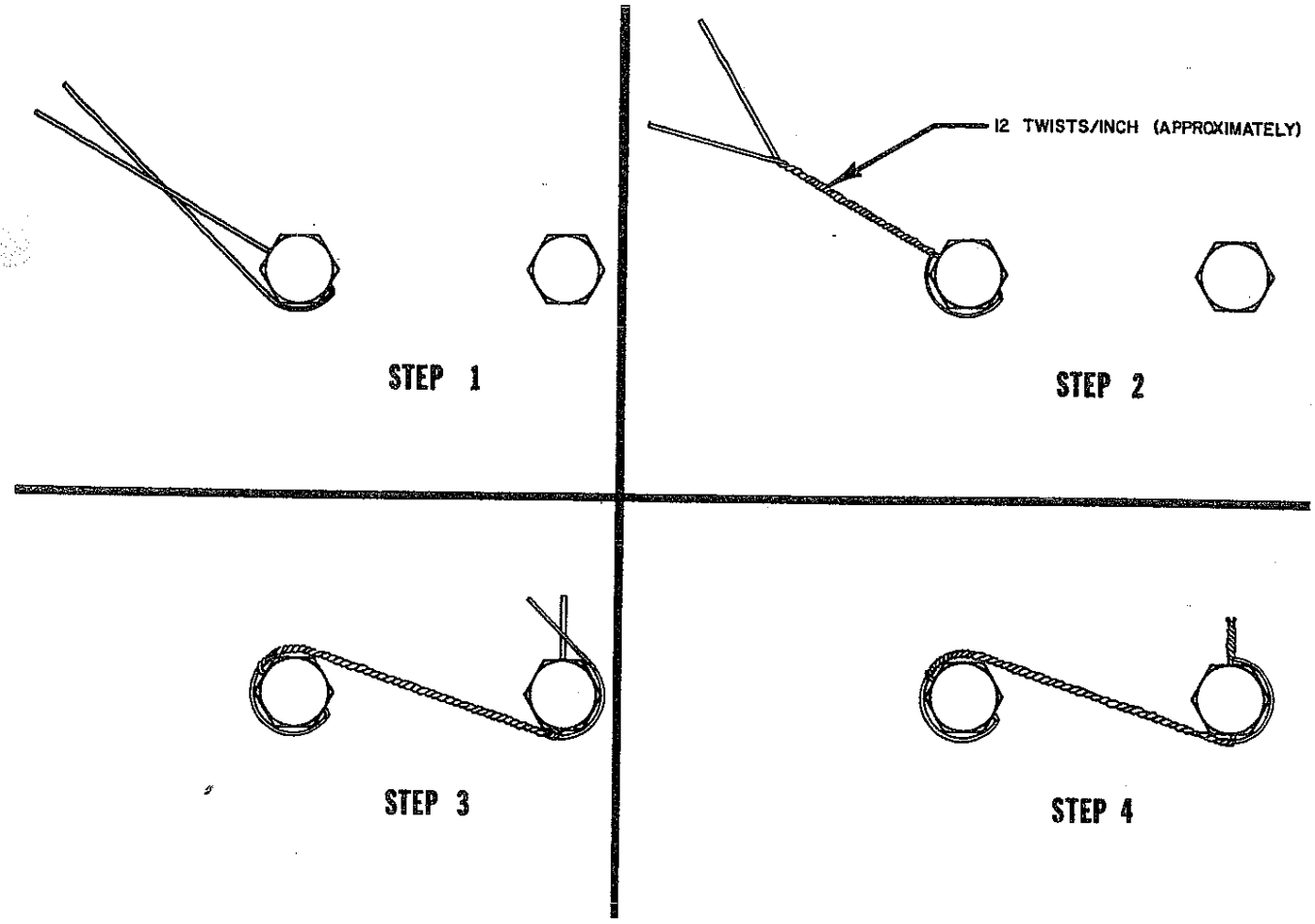


Figure E-15. Safety Wire Installation

5-4. TROUBLESHOOTING

Table E-1 is intended for quick reference in diagnosing on-the-job malfunctions. Care has been taken to list the possible causes in the most likely order of occurence.

TABLE E-1. TROUBLESHOOTING CHART

MALFUNCTION	POSSIBLE DEFECT
Controls fail to respond	1. Electrical malfunction (Paragraph 5-2-3-1) 2. Hydraulic oil supply is low – fill (Table D-3) 3. Hydraulic pump is faulty – repair or replace 4. Hydraulic pressure line is ruptured – replace 5. Relief valve is set incorrectly (Paragraph 5-2-3-2)
Operation slow down	1. Hydraulic oil supply is low – re-fill (Table D-3) 2. Hydraulic pump is operating at reduced speed (Paragraph 3-4-1) 3. Relief valve is set too low (Paragraph 5-2-3-2) 4. Pump or cylinder is worn – repair or replace (Paragraph 5-2-1-3) 5. Pump is slipping due to excessive oil temperatures – change oil (Paragraph 4-3-2). 6. Filter element is dirty – replace (Paragraph 5-2-3) 7. Valve spool is inoperative – repair (Paragraph 5-2-3) 8. Obstruction in boom holding valve – clean or replace (Paragraph 5-2-4)
Boom drifts when loaded and controls neutralized	1. Hydraulic oil bypassing piston seal – repair (Paragraph 5-2-1-3) 2. Holding valves defective or contaminated – clean or replace (Paragraph 5-2-4)
Unusual noise in operation	1. Cavitation is occuring due to low hydraulic oil supply – fill (Table D-3) 2. Loading is excessive (Figure C-2) 3. Restriction or collapse of suction line – clear or replace. 4. Relief valve is set too low (Paragraph 5-2-3-2) 5. Relief valve is damaged – replace (Paragraph 5-2-3-2) 6. Valve obstructed due to particle accumulation – clean (Paragraph 5-2-3-1)

6-1. INTRODUCTION

This section contains the parts list for the assemblies of the crane. Whenever an assembly is taken apart and re-assembled, refer to the appropriate drawing in this section for placement of the parts.

6-2. CRANE IDENTIFICATION

Every unit has an identification placard (Figure F-1) attached to the mast. When ordering parts, communicating warranty information or referring to the unit in correspondence, always include the assigned serial number and model number. All inquiries should be addressed to Iowa Mold Tooling Co., Inc.; 500 Highway 18 West; Garner, Iowa 50438 or telephone (515) 923-3711.

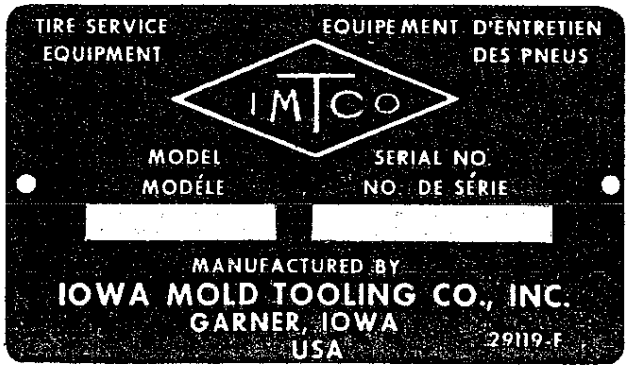


Figure F-1. Serial Number Placard

6-3. CYLINDER IDENTIFICATION

The crane has a cylinder identification placard (Figure F-2) attached to the mast. To ensure proper replacement parts are received, it is necessary to specify a complete number/letter sequence for any part request. Part numbers may be cross checked by comparing the stamped identification of the cylinder base porting blocks against the information stamped on the placard.

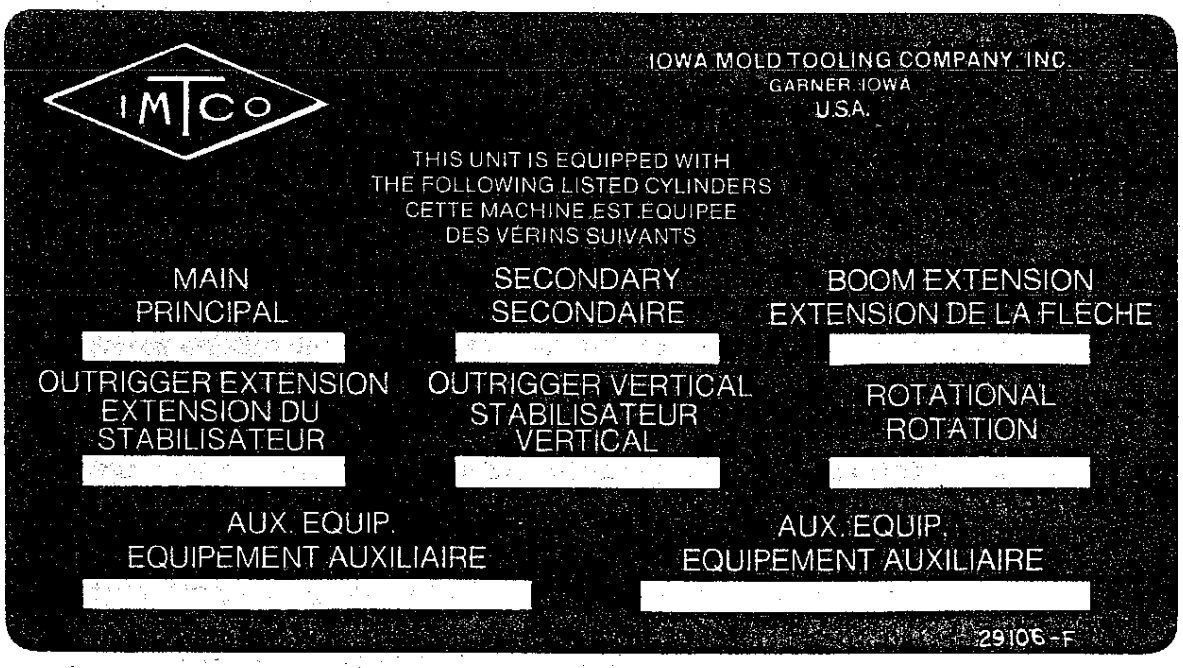


Figure F-2. Cylinder Identification Placard

6-4. ORDERING INFORMATION

When placing orders for parts or requesting assistance, refer to the information below:

TO BE COMPLETED BY DEALER

Carrier vehicle information:

Make: _____ Model: _____ VIN: _____

Transmission Model: _____ Serial No : _____

PTO Ratio (%): _____ Make: _____

Crane and Pump Information:

Serial No.: _____ Model: _____

Pump Make: _____ Model: _____ Serial No.: _____

Accessories and Options: _____

Item No.	Part No.	Description	Qty	Item No.	Part No.	Description	Qty
1.	60010118	CLAMP, hose	1	16.	71056012	GEAR, intermediate	1
2.	60010235	COVER, guard	1	17.	71056062	GEAR, turntable	1
3.	60010844	PLATE, drive gear cover	1	18.	72060092	BOLT; 1/2-13 x 1-1/4"	2
4.	60102942	SPACER, intermediate gear	1	19.	72060997	BOLT; 5/8-11 x 2" lg.	24
5.	60020081	BUSHING	1	20.	72060794	BOLT; 1/2-13 x 1-1/4"	2
6.	60020100	BUSHING	1	21.	72060833	BOLT; 5/16-18 x 3/4" self tap	2
7.	60020114	BUSHING	1	22.	72062002	NUT; 3/8-16 hex	1
8.	60020115	BUSHING	1	23.	72063035	BUSHING, machy.; 1-1/4" x 10 ga.	1
9.	73051030	MOTOR, hydraulic	1	24.	72063051	LOCK WASHER; 3/8"	1
10.	72053240	PLUG, pipe; 1/8" npt	1	25.	72063053	LOCK WASHER; 1/2"	4
11.	72053508	ZERK; 1/8" npt	3	26.	72066084	RING, retaining; 1-1/4"	1
12.	72053638	ADAPTER, swivel; 1/8" npt (m x f)	2	27.	72066427	SPRING WASHER; 5/8"	24
13.	72531130	ELBOW, street, 90°; 1/8" npt	1	28.	52702842	BASE, right hand	1
14.	71056010	GEAR, pinion	1	29.	73731169	EXTENSION, grease; 7-1/4" lg.	1
15.	71056011	GEAR, drive	1	30.	73731170	EXTENSION, grease; 16-1/4" lg.	1

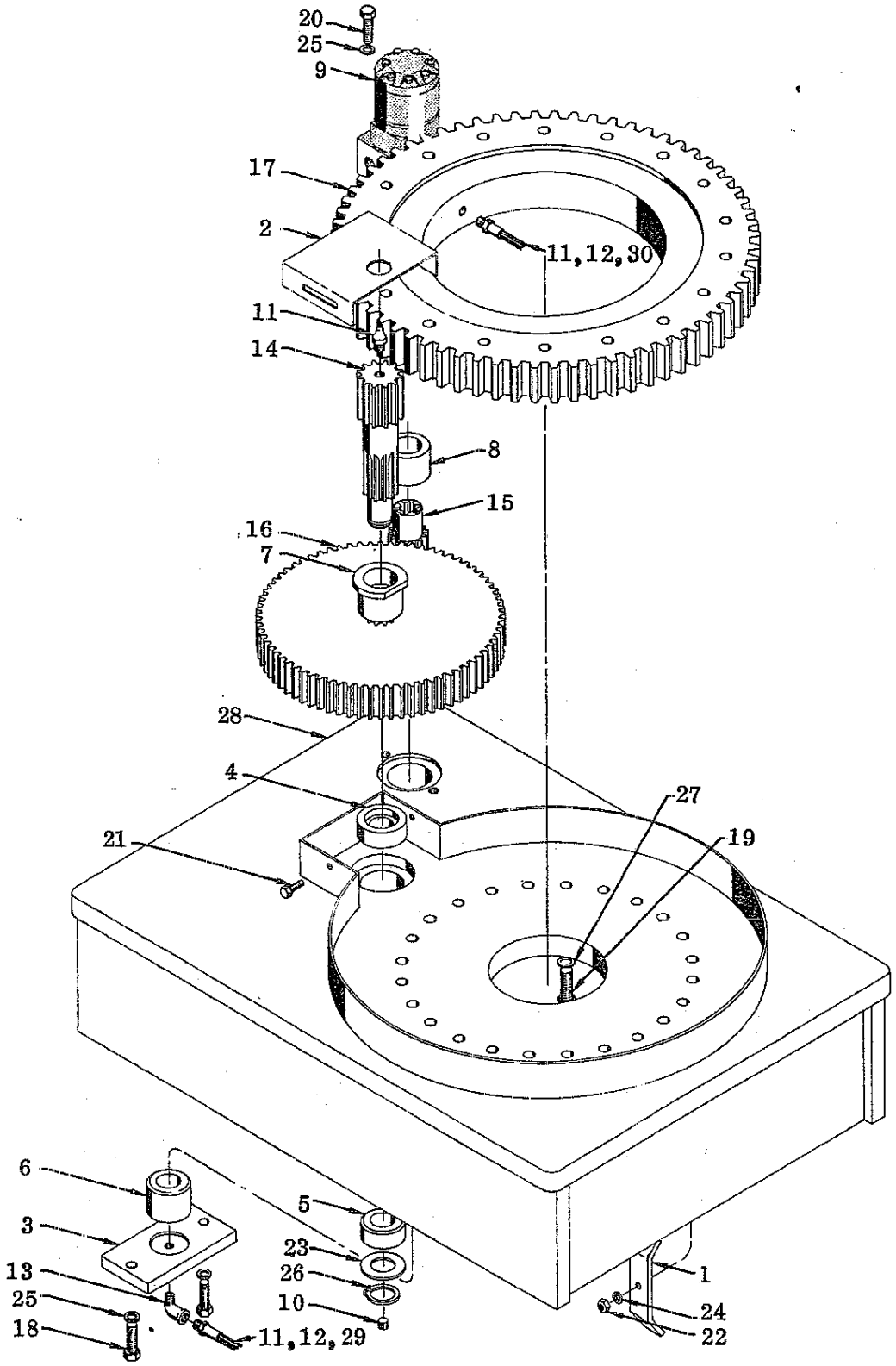


Figure F-3. Base (Part Number 31702481)

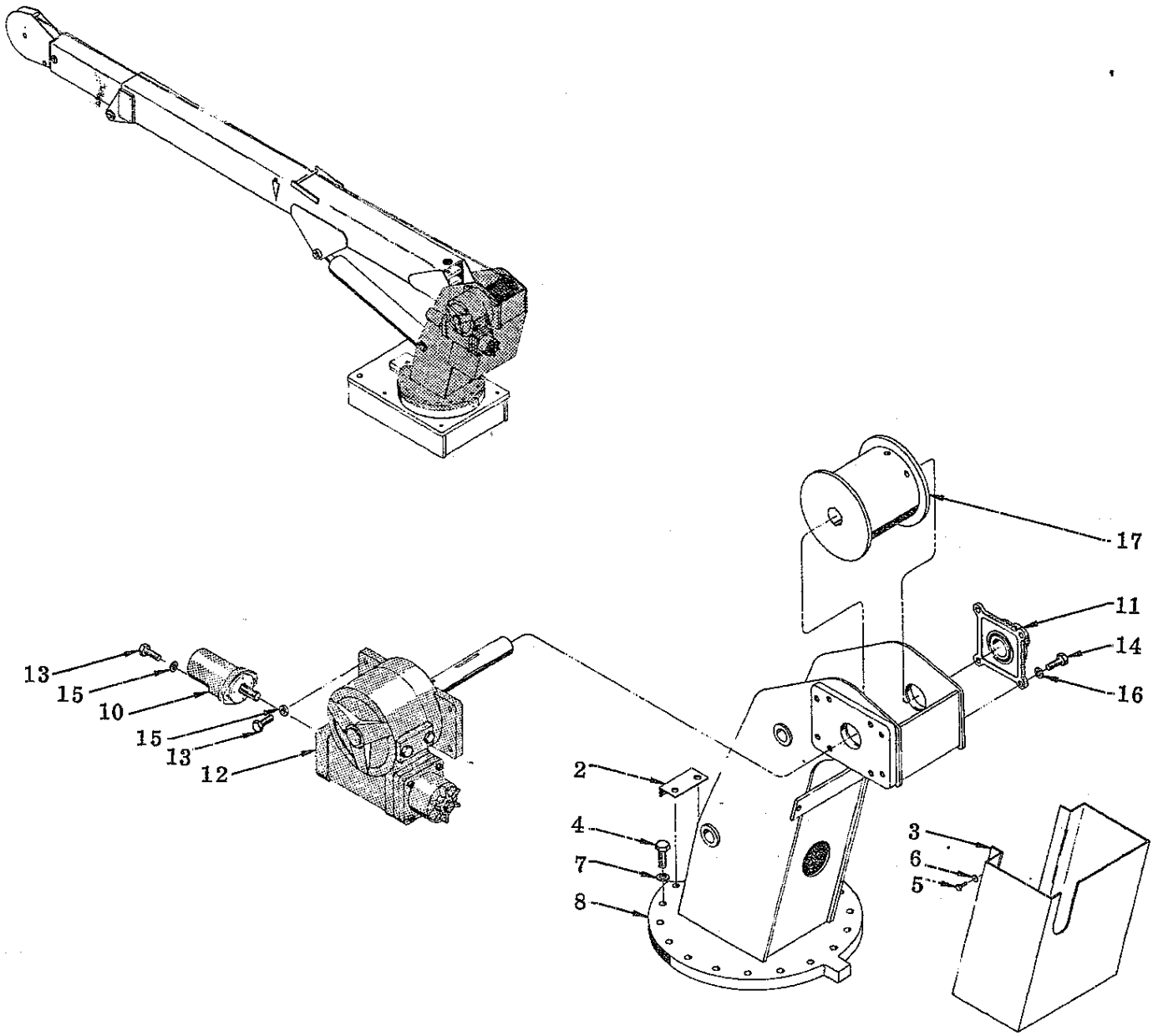


Figure F-4. Mast (Part Number 41702483)

Item No.	Part No.	Description	Qty
1.	41702483	MAST Assy. (includes items 2 thru 9)	1
2.	60104540	COVER, pinion	2
3.	60105214	COVER, valve bank	1
4.	72060151	BOLT; 5/8-11 x 2" lg. gr. 8	18
5.	72060833	BOLT; 5/16-18 x 3/4" self-tap	4
6.	72063050	WASHER, lock; 5/16"	4
7.	72066427	WASHER, lock; 5/8"	18
8.	52702484	MAST	1
9.	51702596	WINCH Assy. (includes items 10 thru 17)	1
10.	73051201	MOTOR	1
11.	70055117	BEARING, flange	1
12.	71057028	WINCH	1
13.	72060093	BOLT; 1/2-13 x 1-1/2" lg.	6
14.	72060148	BOLT; 5/8-11 x 1-1/4" lg.	4
15.	72063053	WASHER, lock; 1/2"	6
16.	72063055	WASHER, lock; 5/8"	4
17.	52702499	DRUM, winch	1

The following placards are a part of the mast assembly but are not shown on the drawing

18.	71029106	PLACARD, cylinder ID	1
19.	71029115	PLACARD, serial number	1

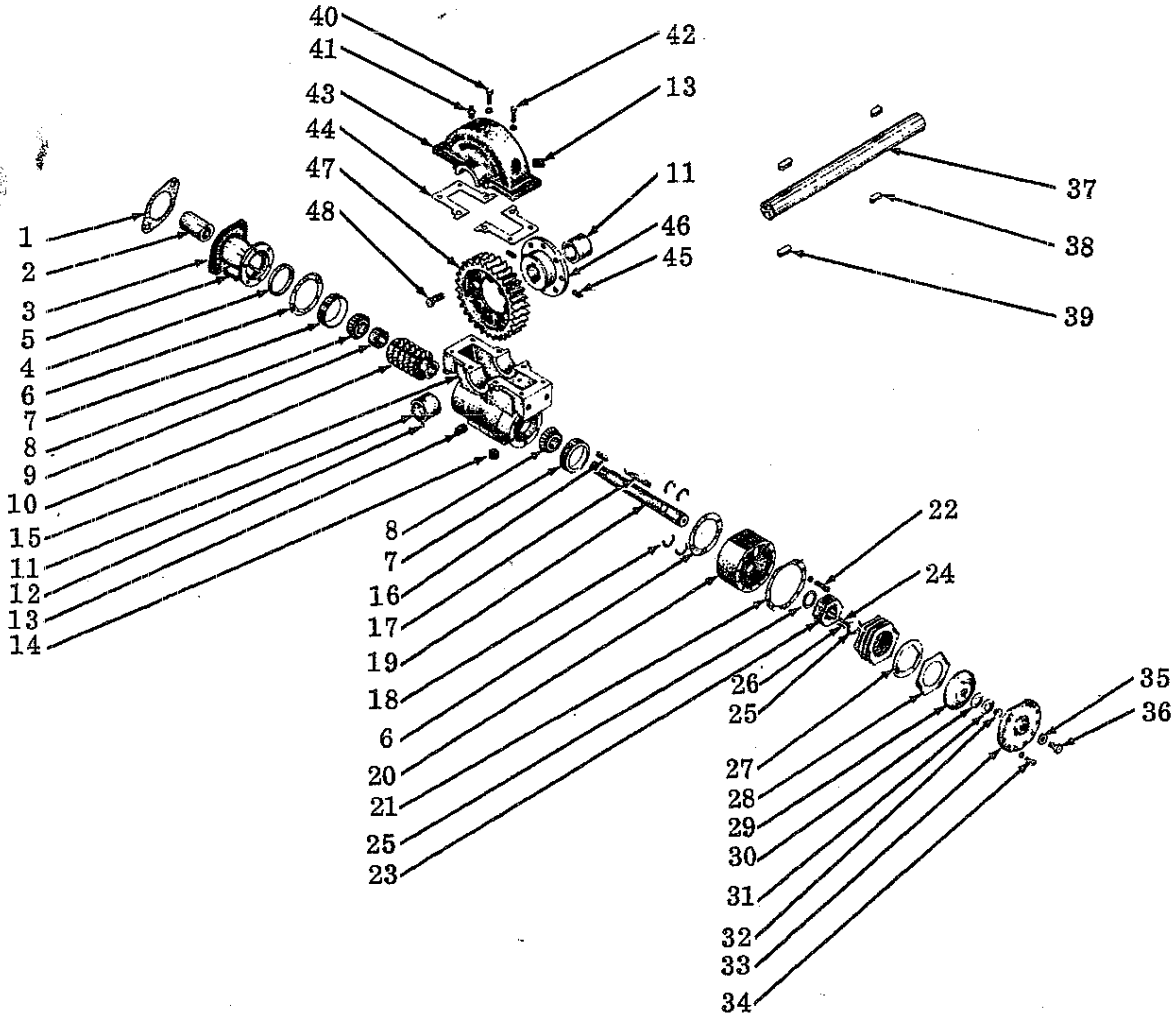


Figure F-5. Koenig Winch (Part Number 71057028)

Item No.	Part No.	Description	Qty	Item No.	Part No.	Description	Qty
1.	76391588	GASKET, motor flange	1	25.	70142187	WASHER	2
2.	70142176	COUPLING, motor	1	26.	70142188	SPRING, roller	3
3.	70142177	ADAPTER, motor	1	27.	70142189	DISC, brake	4
4.	70142178	SPACER	1	28.	70142190	PLATE, brake	6
5.	72060026	BOLT, hex hd.; 5/16-18 x 1-1/4"	6	29.	70142191	PLATE, pressure	1
6.	76391589	GASKET	4	30.	70142193	WASHER, thrust, thick	1
7.	70055037	CUP, bearing	2	31.	70142192	WASHER, thrust; thin	1
8.	70055127	CONE, bearing	2	32.	70142194	BUTTON, brake	1
9.	70142179	SPACER, bearing	1	33.	70142195	COVER, brake housing	1
10.	70056256	GEAR, worm	1	34.	72060705	SCREW, soc. hd.; 1/4-20 x 3/4"	10
11.	70024248	BUSHING, shaft	2	35.	72062039	NUI; 1/2-20	1
12.	70142180	PIN, bushing retainer	2	36.	72060357	BOLI, hex hd.; 1/2-20 x 1-1/2" lg.	1
13.	72053244	PLUG, grease; 1/8" npt sq. hd.	2	37.	70142196	SHAFT, drum	1
14.	72053240	PLUG, grease; 1/8" npt hollow hex	1	38.	70142197	KEY, drum shaft	4
15.	70142201	HOUSING, gear	1	39.	70142198	KEY, drum shaft	2
16.	70142181	KEY, drive shaft	1	40.	72060062	BOLI, hex hd.; 7/16-14 x 1" lg.	3
17.	70142182	KEY, drive shaft	1	41.	72053508	ZERK; 1/8" npt	2
18.	72661079	RING, retaining	2	42.	72060046	BOLI, hex hd.; 3/8-16 x 1" lg.	4
19.	70142183	SHAFT, worm gear	1	43.	70142199	COVER, gear housing	1
20.	70142184	HOUSING, brake	1	44.	76391591	GASKET	2
21.	76391590	GASKET, brake cover	1	45.	72060583	SCREW, set; 3/8-16 x 1"	2
22.	72060705	SCREW, soc. hd.; 1/4-20 x 3/4" lg.	6	46.	70142200	HUB, worm gear	1
23.	70142185	CLUTCH, brake	1	47.	70142199	GEAR	1
24.	70142186	PIN, roller	3	48.	72060356	SCREW; 1/2-20 x 1-1/4"	1

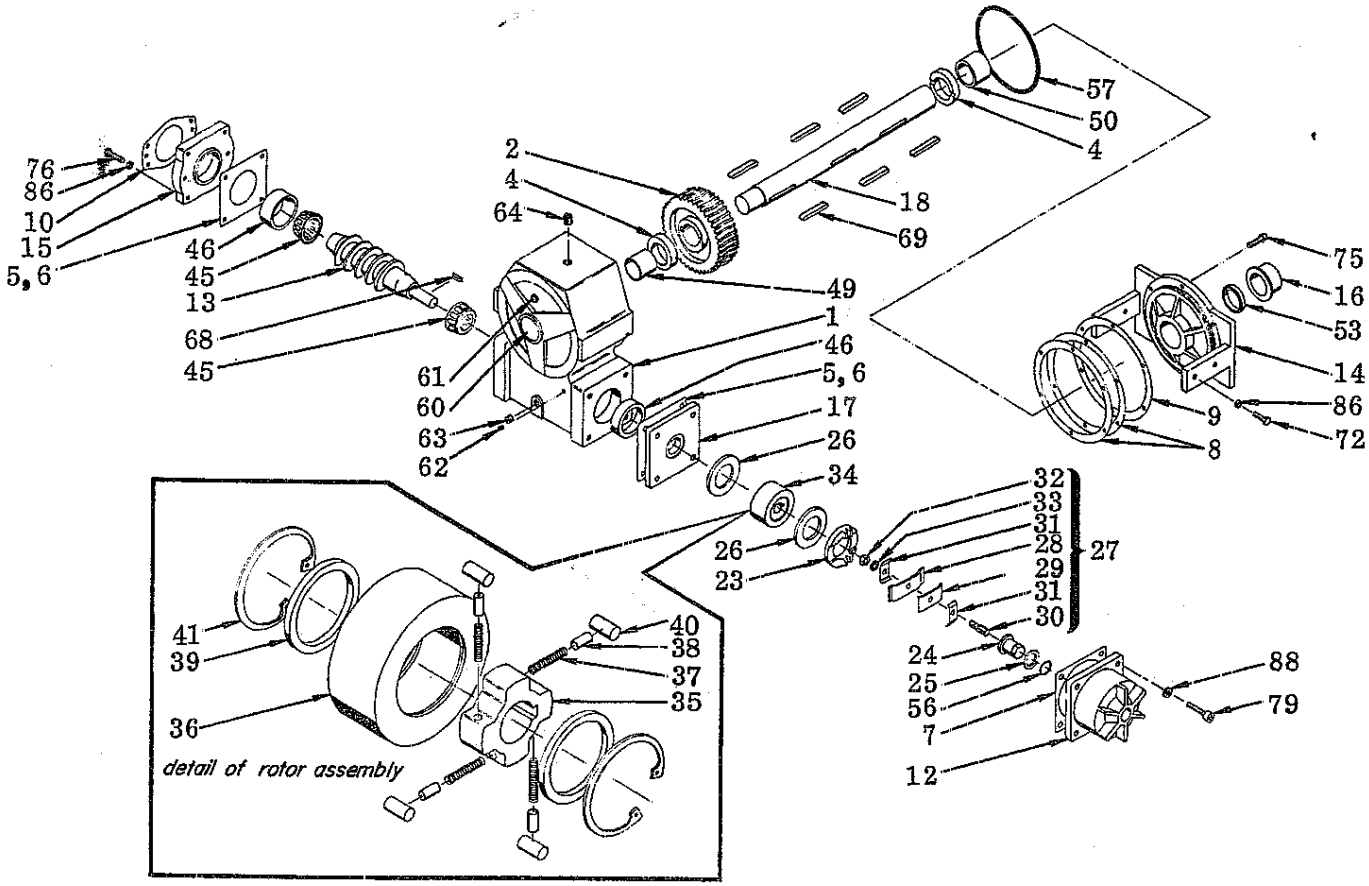
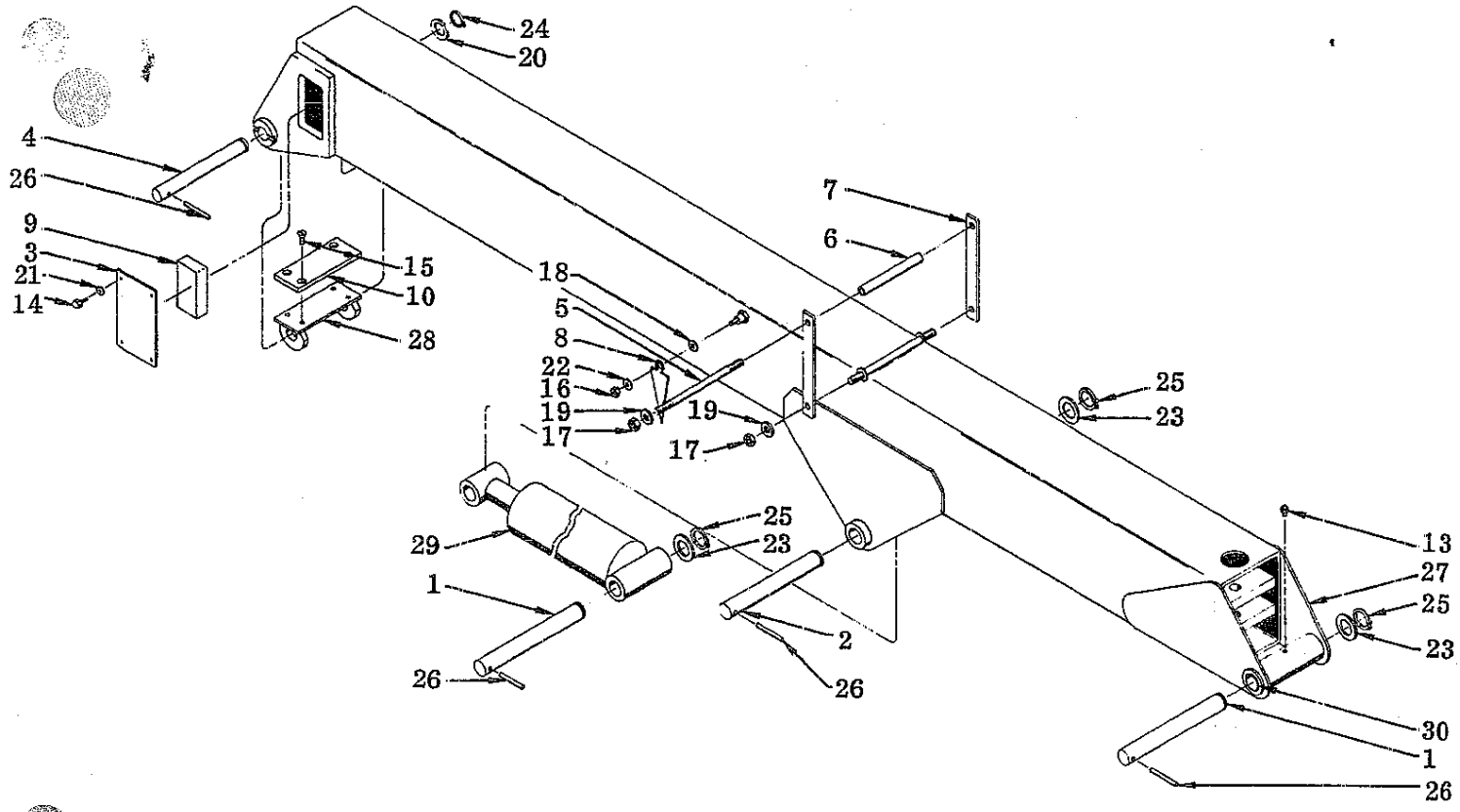


Figure F-6. Gear Products Winch (Part Number 71057028)

Item No.	Part No.	Description	Qty
1.	70142224	HOUSING	1
2.	70056257	GEAR, worm	1
4.	71014644	RING, thrust	2
5.	76039191	GASKET; 1/64" thk.	As Required
6.	76039192	GASKET; 1/32" thk.	As Required
7.	76391592	GASKET; 1/32" thk.	1
8.	76039189	GASKET, cover; 1/64" thk.	2
9.	76039190	GASKET, cover; 1/32" thk.	1
10.	76039295	GASKET, motor	1
12.	70142225	HOUSING, safety brake	1
13.	70056258	WORM, right hand	1
14.	70142226	COVER	1
15.	70142227	RETAINER, bearing	1
16.	70142228	SPACER	1
17.	70142229	CONTAINER, bearing	1
18.	70142230	SHAFT, cable drum	1
23.	71014833	PLATE, pressure	1
24.	71014836	NUT, worm brake adjustment	1
25.	76039293	GASKET	1
26.	76039296	DISC, friction	2
27.	71014835	SPRING assembly (includes items 28 thru 33)	1
28.	70142231	SPRING, main leaf	1
29.	70142232	SPRING, secondary leaf	1
30.	70142233	STUD	1
31.	70142234	CLIP	1
32.	72062039	NUT; 1/2-20 hex	1
33.	72063112	LOCK WASHER; internal tooth; 1/2"	1
34.	71014837	ROTOR assembly (includes items 35 thru 41)	1
35.	70142235	DRIVER	1
36.	70142236	RACE	1
37.	70142237	SPRING	4
38.	70142238	PLUNGER	4
39.	70142239	RING	2
40.	70142240	ROLLER	4
41.	72066796	RING, internal retaining; 2-3/16"	2
45.	70055017	BEARING, cone	2
46.	70055020	BEARING, cup	2
49.	70024233	BUSHING	1
50.	70024234	BUSHING	1
53.	70142241	SEAL	1
56.	7Q072022	O-RING	1
57.	7Q072266	O-RING	1
60.	71014648	PLUG, expansion	1
61.	70142242	VENT	1
62.	72053391	PLUG, pipe; 1/8" npt	1
63.	72053393	PLUG, pipe; 3/8" npt	2
64.	72053394	PLUG, pipe; 1/2 npt	1
68.	72066283	KEY, Woodruff; #15	1
69.	71014645	KEY; 3/8 x 3/8 x 2-1/2" lg.	6
72.	72060062	BOLT, hex hd.; 7/16-14 x 1" lg.	4
75.	72601133	BOLT, Ferry cap; 7/16-14 x 1"	6
76.	72601134	BOLT, Ferry cap; 7/16-14 x 1-1/2"	4
79.	72060075	BOLT; 7/16-14 x 1-1/2" shcs	4
86.	72063052	LOCK WASHER; 7/16"	8
88.	72063113	LOCK WASHER, shakeproof; 7/16"	4

AR = As required



Item No.	Part No.	Description	Qty	Item No.	Part No.	Description	Qty
1.	60102376	PIN	2	15.	72060972	SCREW, flat hd.; 3/8-16 x 3/4" lg.	4
2.	60102388	PIN	1	16.	72062103	NUT, nylon locking; 3/8-16	2
3.	60103463	PLATE, retainer	2	17.	72062080	NUT, nylon locking; 1/2-13	4
4.	60105495	PIN, trunnion	1	18.	72063005	WASHER; 1/2"	6
5.	60105538	STUD, cable guide	1	19.	72063005	WASHER; 1/2"	4
6.	60105539	ROLLER, cable guide	1	20.	72063035	BUSHING, machy; 1-1/4" x 10 ga.	1
7.	60105540	BAR, side, cable guide	2	21.	72063049	WASHER, lock; 1/4"	8
8.	60105544	PLATE, angle indicator	2	22.	72063003	WASHER; 3/8"	2
9.	60030015	PAD, Delrin	2	23.	72063037	BUSHING, machy.; 1-1/2" x 10 ga.	3
10.	60030043	BAR, rub, trunnion	1	24.	72066129	RING, retaining; 1-1/4"	1
11.	71391522	PLACARD, angle indicator, right hand (not shown)	1	25	72066132	RING, retaining; 1-1/2"	3
12.	71391523	PLACARD, angle indicator, left hand (not shown)	1	26.	72661157	PIN, groove; 1/2" x 2-1/2" lg.	4
13.	72053508	ZERK; 1/8" npt	1	27.	52702486	BOOM, main	1
14.	72060002	BOLT; 1/4-20 x 3/4" lg.	8	28.	52702785	TRUNNION	1
				29.	3B253315	CYLINDER, main	1
				30.	7BF81215	BUSHING	4

Figure F-7. Main Boom (Part Number 41702485)

DIMENSIONS	
Bore	4"
Stroke	19-1/2"
Rod Diameter	2"
Pin Diameter	1-1/2"
C-C Closed	31"

NOTE

Whenever the cylinder is disassembled, we strongly recommend replacing all of the components in the seal kit. This may save expensive down-time in the immediate future.

Item No.	Part No.	Description	Qty
1.	7BF81015	BUSHING	4
2.	73054242	VALVE, counter balance	1
3.	4B253315	CASE, cylinder	1
4.	7T61N143	*SEAL, lock ring	1
5.	7T65I040	*RING, piston	2
6.	6I040143	PISTON	1
7.	7Q072153	*O-RING	1
8.	7T66P040	*SEAL, piston, dynamic	1
9.	6C075020	TUBE, stop	1
10.	6A025020	*WAFER LOCK	1
11.	7Q072342	*O-RING	1
12.	7Q10P342	*RING, back-up	1
13.	6H040020	HEAD	1
14.	7R546020	*SEAL, rod	1
15.	7R14P020	*WIPER, rod	1
16.	4G253315	ROD	1
17.	72053508	ZERK; 1/8" npt	2
18.	7BF81215	BUSHING	2

*Part of seal kit (Part Number 9C161623)

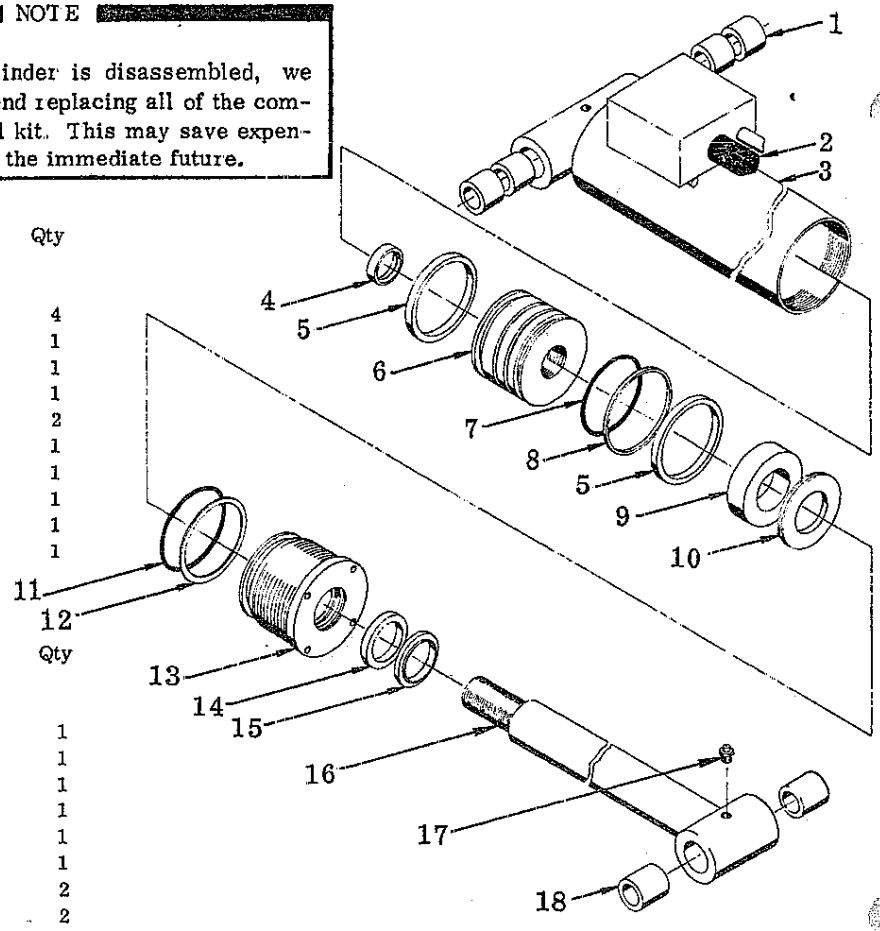
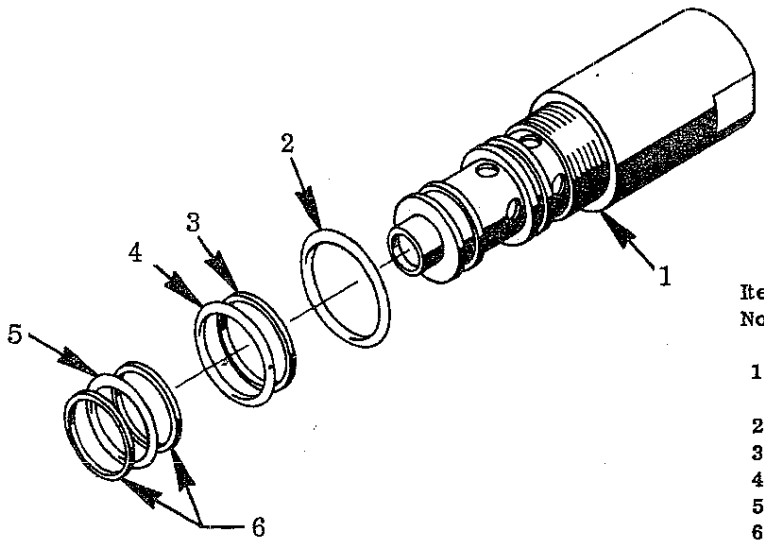
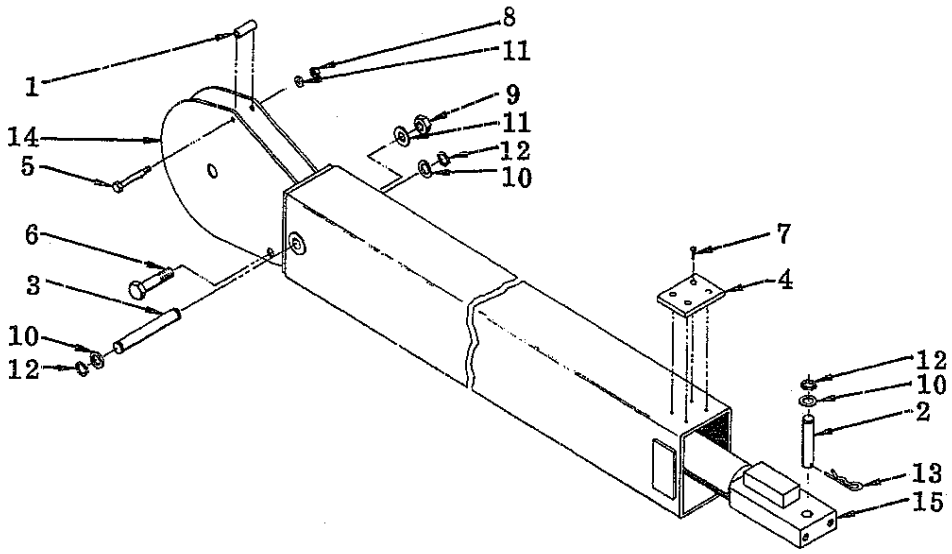


Figure F-8. Main Cylinder (Part Number 3B253315)



Item No.	Part No.	Description	Qty
1.	---	BODY, valve (not a replacement part)	1
2.	7Q072215	O-RING	1
3.	7Q10P021	RING, back-up	1
4.	7Q072021	O-RING	1
5.	7Q072020	O-RING	1
6.	7Q10P020	RING, back-up	1

Figure F-9. Counter Balance Holding Valve (Part Number 73054242)

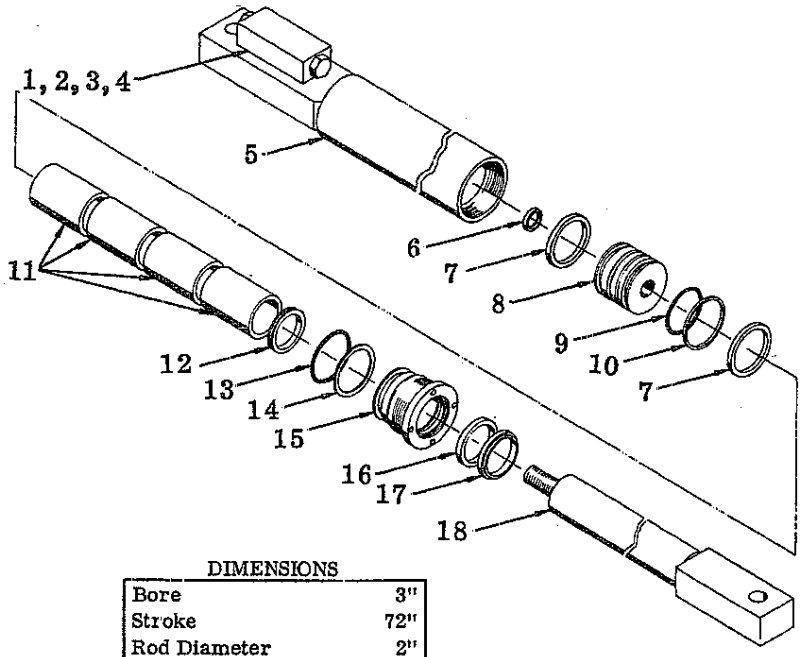


Item No.	Part No.	Description	Qty	Item No.	Part No.	Description	Qty
1.	60101842	SPACER, roller	1	9.	72062007	NUT; 3/4-10	1
2.	60101905	PIN	1	10.	72063034	BUSHING, machy.; 1" x 10 ga.	3
3.	60102099	PIN	1	11.	72063056	WASHER, lock; 3/4"	1
4.	60030016	PAD, slide	1	12.	72066080	RING, retaining; 1"	3
5.	72060054	BOLT; 3/8-16 x 3" lg.	1	13.	72066145	PIN, hair; 3/16"	1
6.	72060187	BOLT; 3/4-10 x 3" lg.	1	14.	52702488	BOOM, extension	1
7.	72060836	BOLT; 1/4-20 x 3/4" lg. flat hd.	4	15.	3B250315	CYLINDER, extension	1
8.	72062103	NUT; 3/8-16 self locking	1				

Figure F-10. Extension Boom (Part Number 41702487)

Item No.	Part No.	Description	Qty
1.	73054004	VALVE, safety locking	1
2.	72060708	SCREW, soc. hd.; 1/4-20 x 1-1/4"	6
3.	7Q072113	O-RING; large	2
4.	7Q072012	O-RING; small	1
5.	4B250315	CASE, cylinder	1
6.	7T61N106	*SEAL, lock ring	1
7.	7T65I030	*RING, piston	2
8.	6I030106	PISTON	1
9.	7Q082145	*O-RING	1
10.	7T66P030	*SEAL, piston	1
11.	6C300020	TUBE, stop	4
12.	6A025020	*WAFER LOCK	1
13.	7Q072334	*O-RING	1
14.	7Q10P334	*RING, back-up	1
15.	6H030020	HEAD	1
16.	7R546020	*SEAL, rod	1
17.	7R14P020	*WIPER, rod	1
18.	4G250315	ROD	1

*Part of seal kit (Part Number 9C121617)

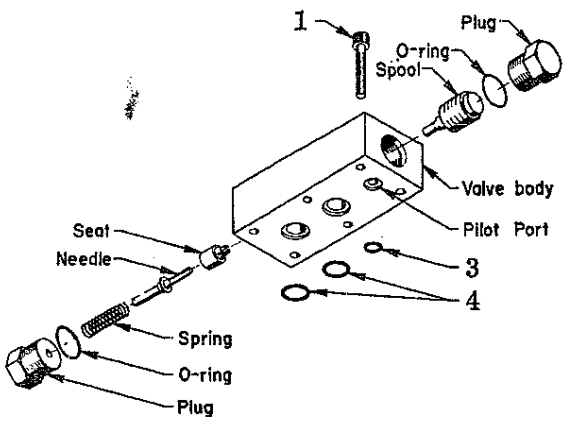


DIMENSIONS	
Bore	3"
Stroke	72"
Rod Diameter	2"
Pin Diameter	1"
C-C Closed	100-1/2"

NOTE

Whenever the cylinder is disassembled, we strongly recommend replacing all of the components in the seal kit. This may save expensive down-time in the immediate future.

Figure F-11. Extension Cylinder (Part Number 3B250315)

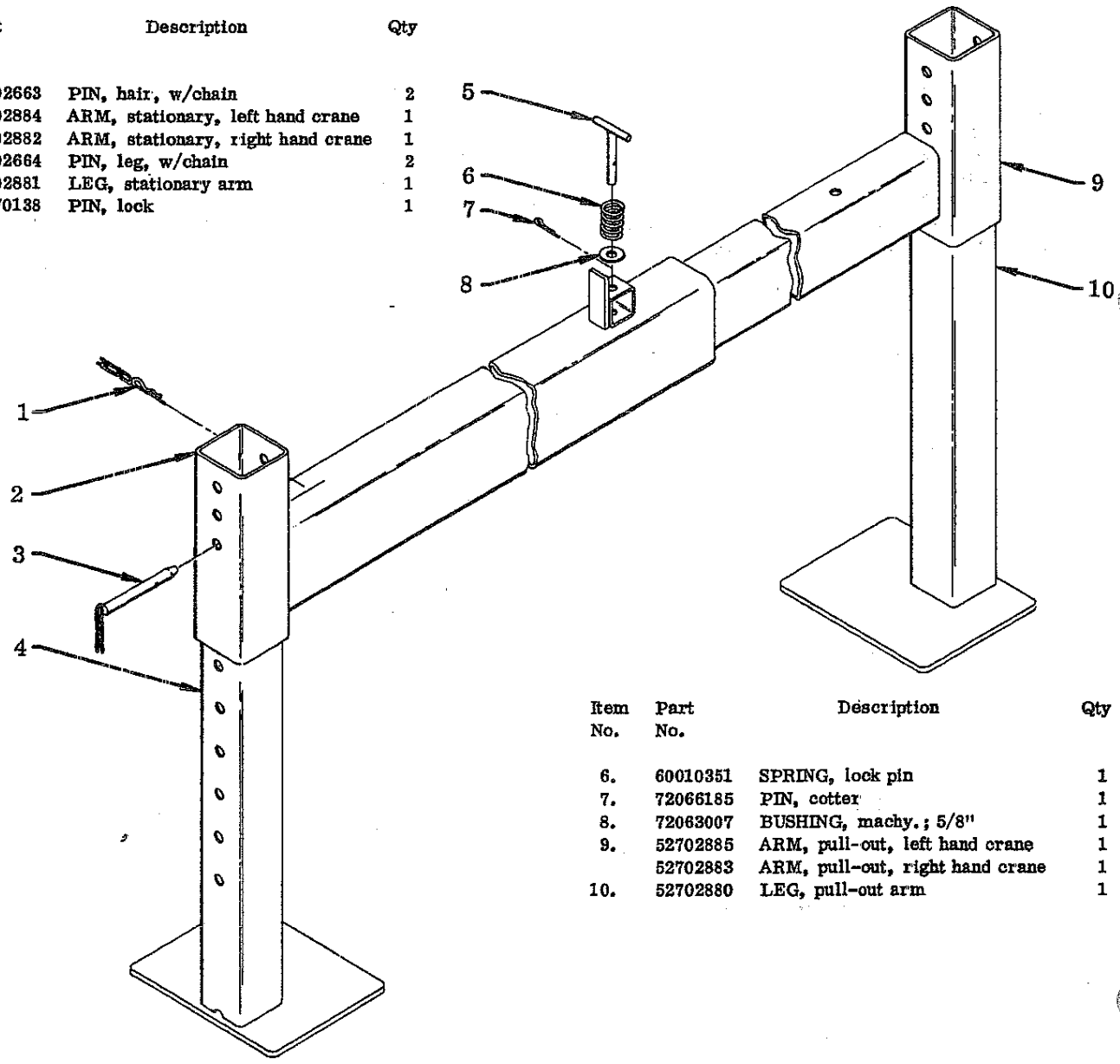


Item No.	Part No.	Description	Qty
1.	72060709	SCREW, soc. hd.; 1/4-20 x 1-1/4"	6
2.	73054004	VALVE, safety locking	1
3.	7Q072012	O-RING; small	1
4.	7Q072113	O-RING; large	2

Parts without item numbers are considered non-replaceable. Order item number 2.

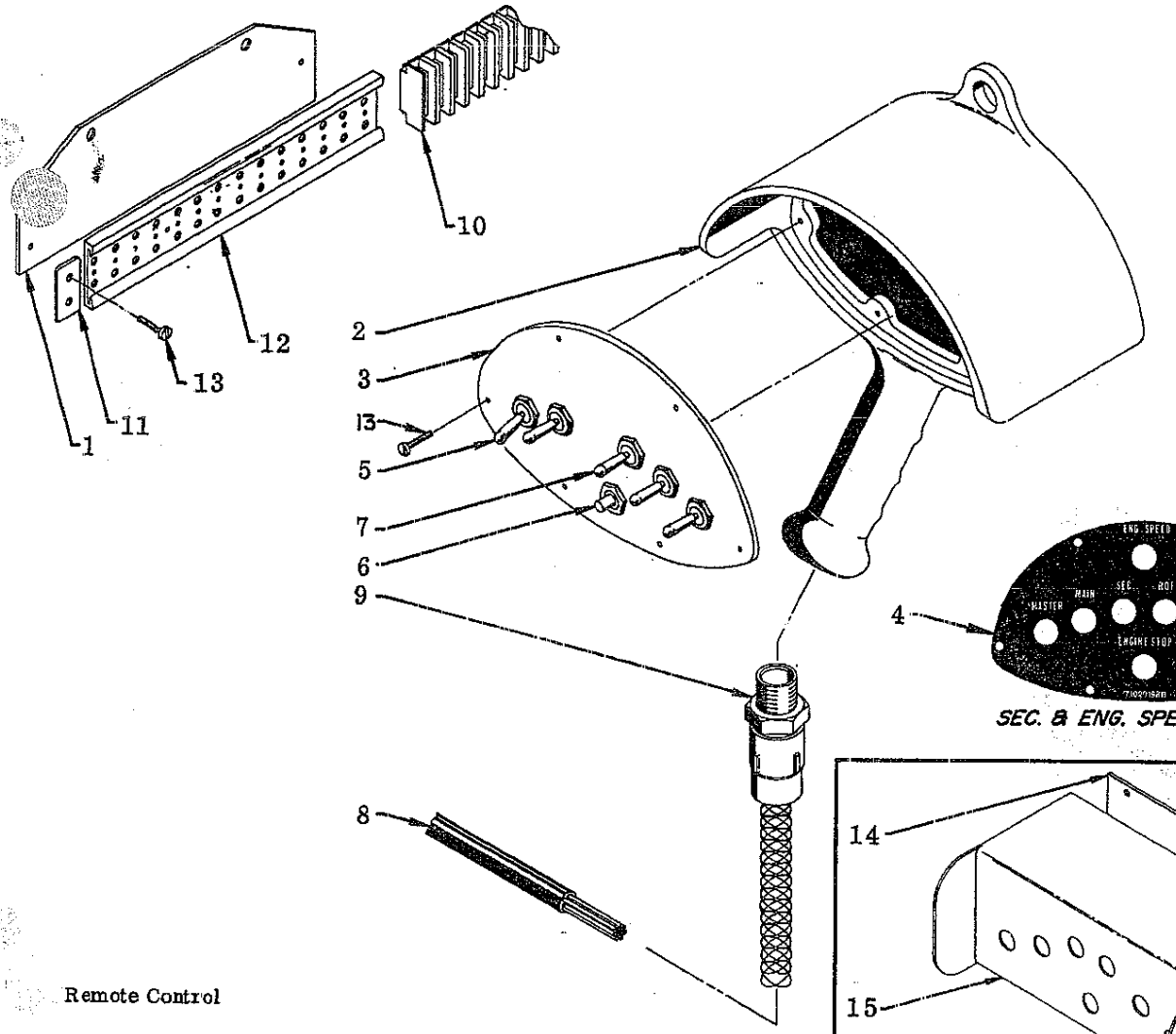
Figure F-12. Locking Holding Valve (Part Number 73054004)

Item No.	Part No.	Description	Qty
1.	52702663	PIN, hair, w/chain	2
2.	52702884	ARM, stationary, left hand crane	1
	52702882	ARM, stationary, right hand crane	1
3.	52702664	PIN, leg, w/chain	2
4.	52702881	LEG, stationary arm	1
5.	52070138	PIN, lock	1

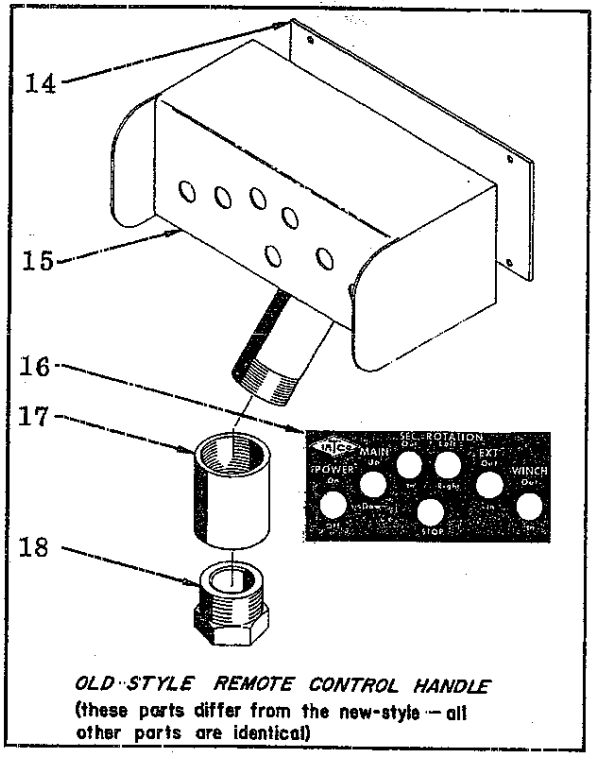


Item No.	Part No.	Description	Qty
6.	60010351	SPRING, lock pin	1
7.	72066185	PIN, cotter	1
8.	72063007	BUSHING, machy.; 5/8"	1
9.	52702885	ARM, pull-out, left hand crane	1
	52702883	ARM, pull-out, right hand crane	1
10.	52702880	LEG, pull-out arm	1

Figure F-13. Optional Outriggers (Part Number 31702656 - right hand and 31702792 - left hand)



SEC. B ENG. SPEED-not used

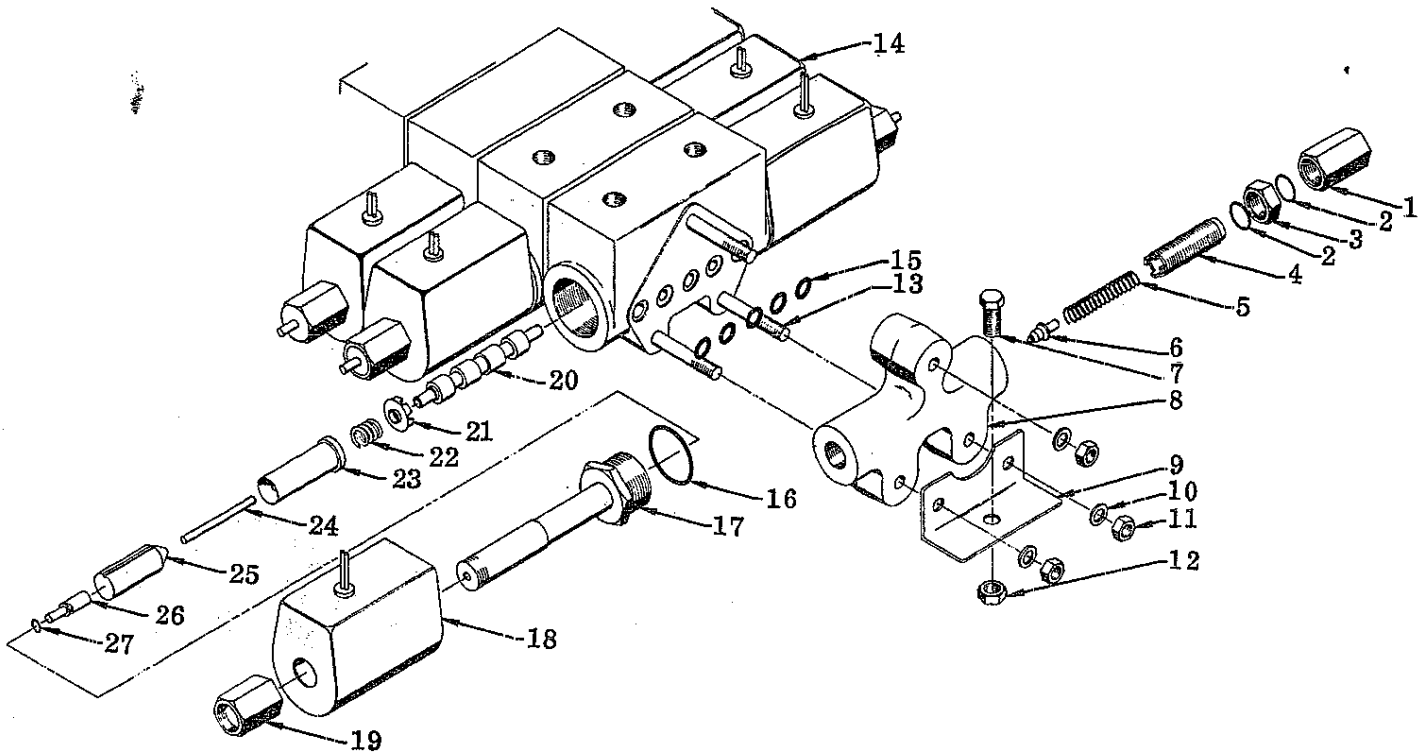


OLD STYLE REMOTE CONTROL HANDLE
(these parts differ from the new-style — all other parts are identical)

Remote Control

Item No.	Part No.	Description	Qty
1.	60105226	BAR, terminal strip mounting	1
X 2.	60025137	HANDLE, control	1
3.	60025138	PLATE, switch mounting	1
4.	71029198	PLACARD, control	1
5.	77041004	SWITCH, toggle (MASTER)	1
6.	77041005	SWITCH, pushbutton (ENG. STOP)	1
7.	77041006	SWITCH, toggle (MAIN, ROT., EXT., WINCH)	4
8.	60044101	CABLE, 16-wire; 25 ft. lg.	1
9.	77044096	GRIP, cord; 1/2"	1
10.	77044110	STRIP, terminal	1
11.	77044111	STOP, terminal strip	2
12.	60044185	TRACK, terminal strip	1
13.	72061003	SCREW; #6 x 1/2" lg. self tap	8
14.	60101416	COVER, control handle (old style)	1
15.	52070674	HANDLE, control (old style)	1
16.	71039170	PLACARD, control (old style)	1
17.	72063306	COUPLING; 1" npt	1
18.	72531836	BUSHING, red.; 1" npt(m) x 1/2" npt (f) (old style)	1

Figure F-14. Remote Control (Part Number 51702597)

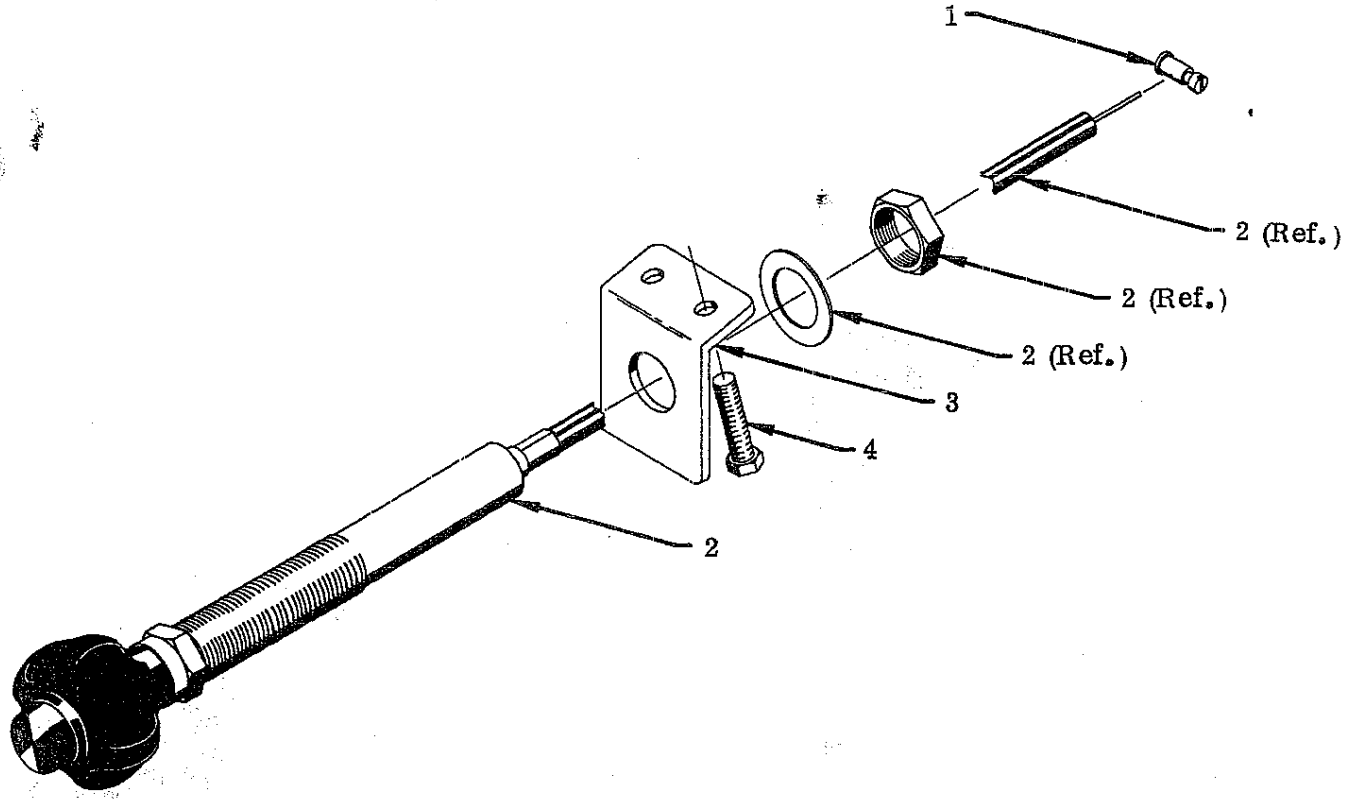


Item No.	Part No.	Description	Qty	Item No.	Part No.	Description	Qty
1.	*	CAP, relief valve adjust	1	15.	7Q072012	O-RING	**5
2.	*	O-RING	2	16.	7Q072113	O-RING	**2
3.	*	NUT, jam	1	17.	73014958	TUBE	**2
4.	*	ROD, adjustment	1	18.	77040028	COIL, 12 VDC	**2
5.	*	SPRING	1	19.	73014950	NUT	**2
6.	*	NEEDLE	1	20.	51014951	SPOOL & BODY (matched set)	**1
7.	72060046	BOLT; 3/8-16 x 1" lg.	2	21.	73014952	RETAINER, spring	**2
8.	73014948	INLET (with relief valve)	1	22.	73014953	SPRING	**2
9.	73014959	BRACKET	2	23.	73014955	PLUG	**2
10.	72063002	WASHER; 5/16"	6	24.	73014954	PIN	**2
11.	72062001	NUT; 5/16-18	6	25.	73014956	PLUNGER	**2
12.	72062002	NUT; 3/8-16	2	26.	73014957	BUTTON	**2
13.	73014960	STUD	3	27.	7Q072008	O-RING	**2
14.	73054077	VALVE SECTION; 12 VDC	4				

*Not available separately - order item 8.

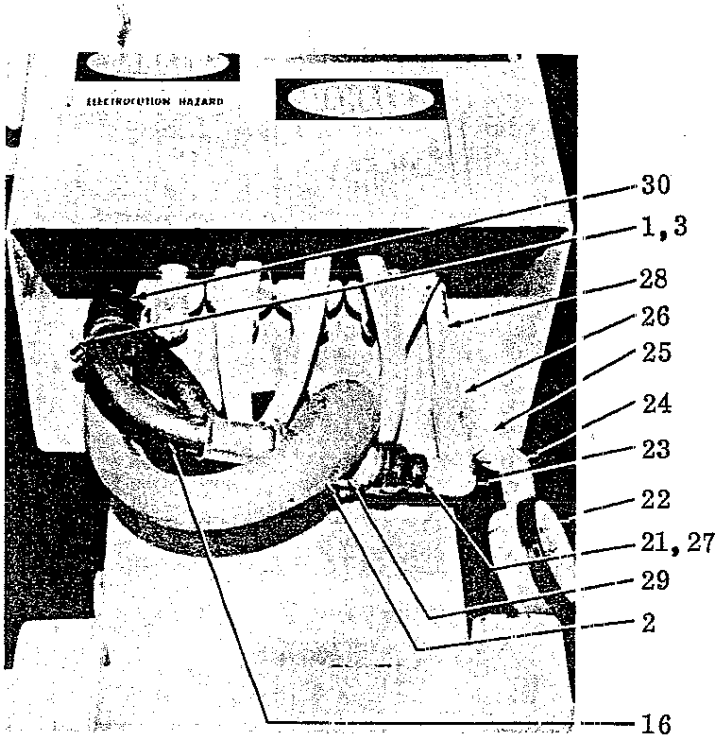
**Quantity per valve section

Figure F-15. Control Valve (Part Number 73054077)

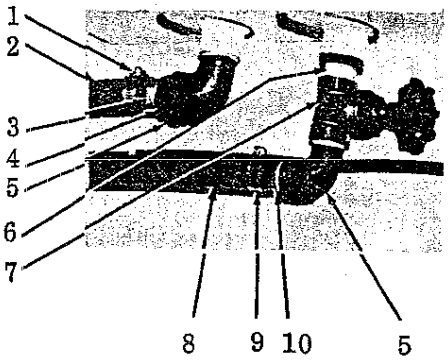


Item No.	Part No.	Description	Qty
1.	72066377	LOCK, cable	1
2.	70058067	CABLE, throttle control w/knob; 18'	1
	70058068	CABLE, throttle control w/knob; 30'	1
3.	60105400	BRACKET	1
4.	72060962	BOLT; 5/16-18 x 1" lg. self-tapping	2

Figure F-16. Throttle Control (Part Number 90702746 - 18 foot and 90702747 - 30 foot)

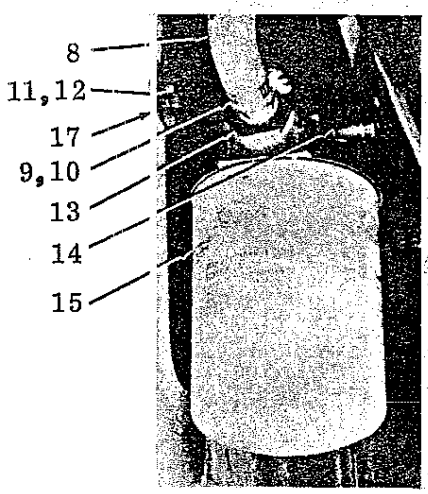


Valve Bank Connections

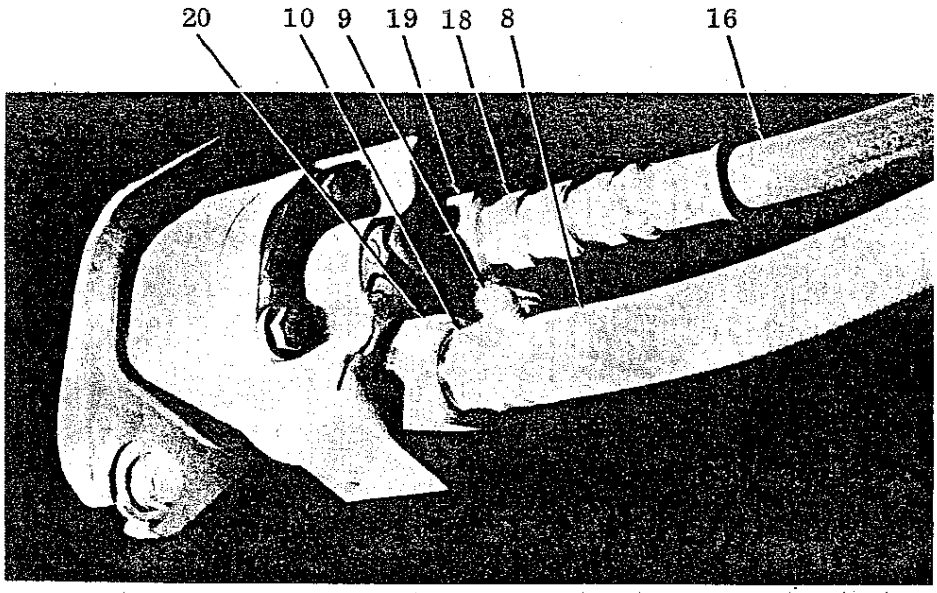


Reservoir Connections

Parts List on Page 6-16

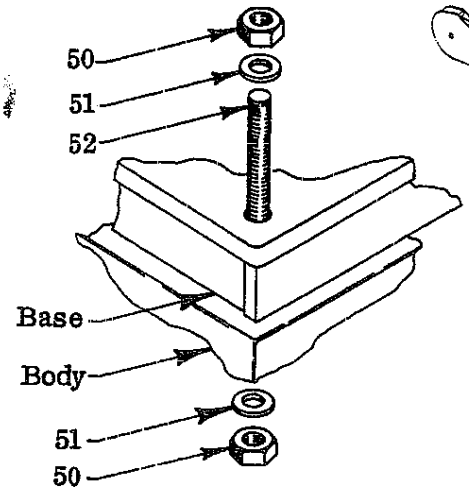


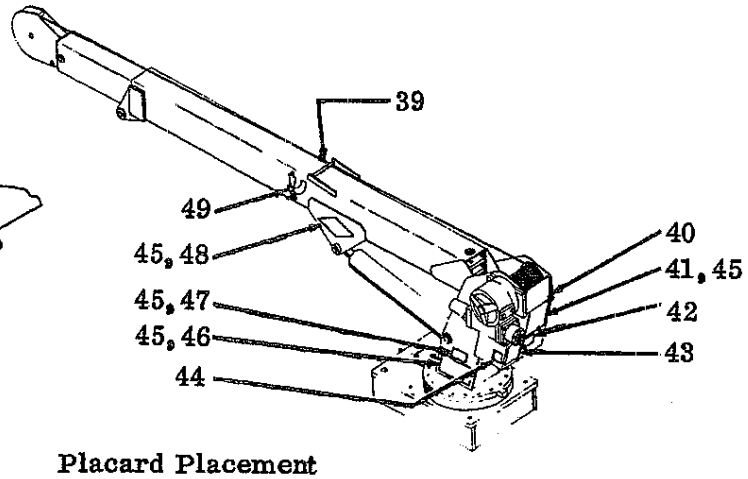
Filter Installation



Pump Connections

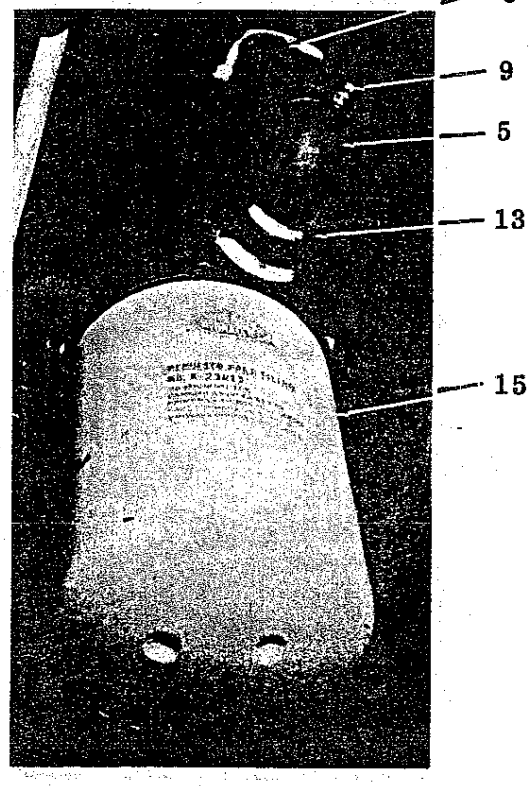
Figure F-17. Installation Kit (Part Number 90702490)





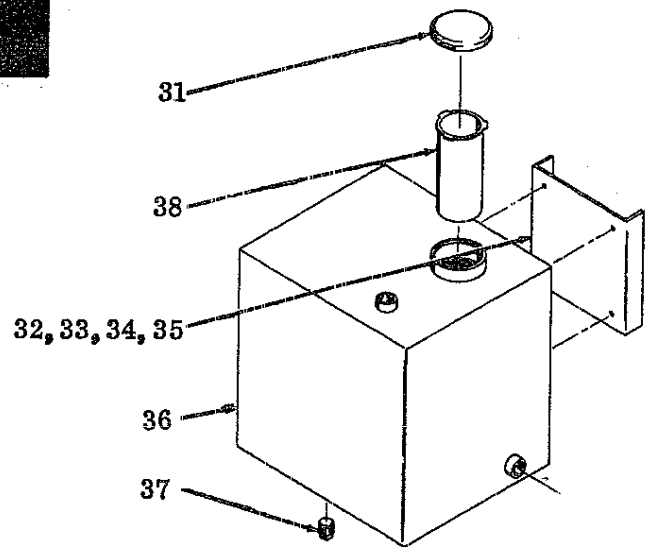
Placard Placement

Opposite Side View of Filter



Filter Installation

Parts List on Page 6-16



Reservoir Installation

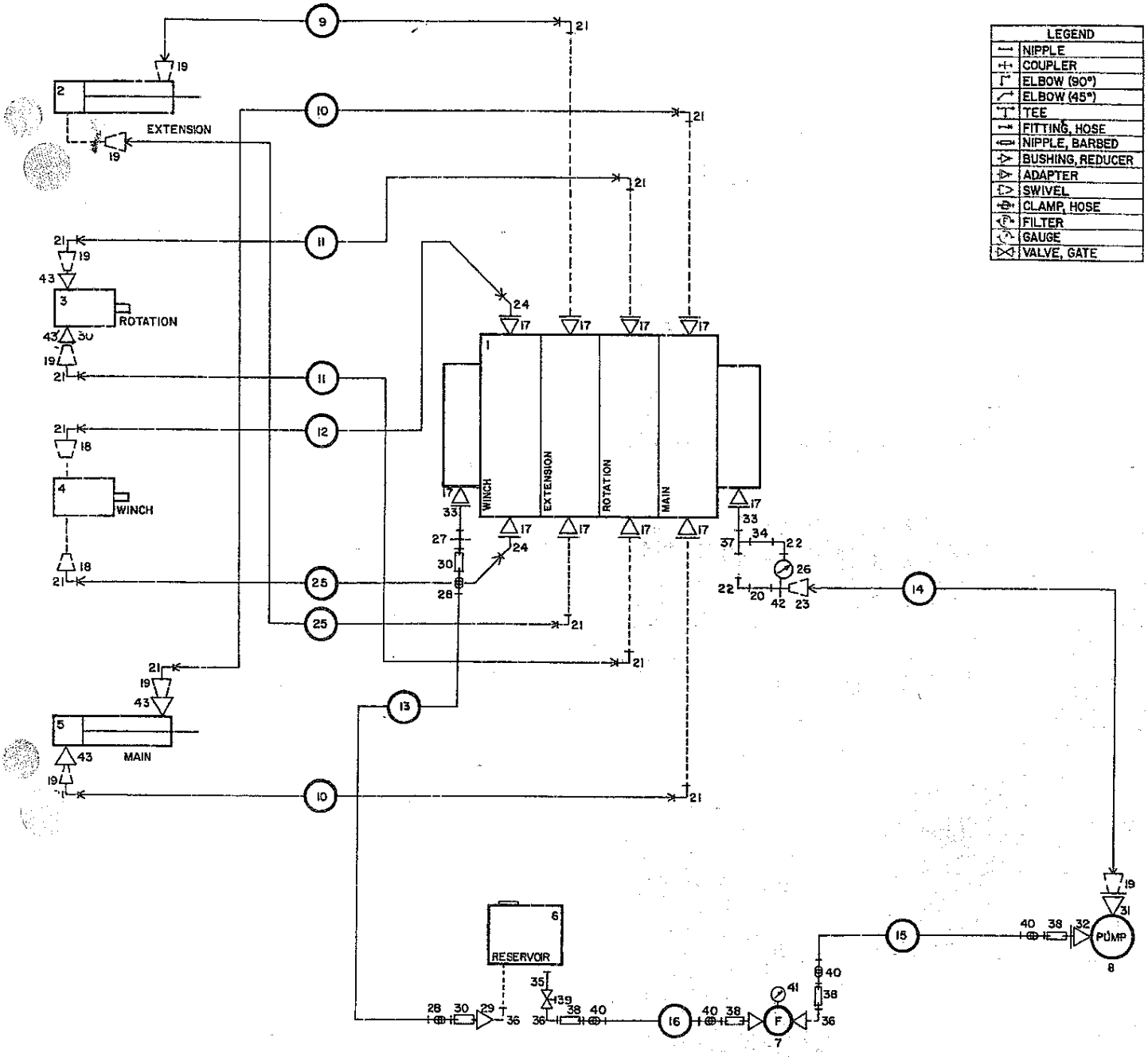
Figure F-17. Installation Kit (Part Number 90702490) Sheet 2

Item No.	Part No.	Description	Qty
1.	72066003	CLAMP, hose	2
2.	89039146	HOSE; 1/2" return	As Required
3.	72053457	NIPPLE, barbed; 1/2"	2
4.	72053375	BUSHING, reducer; 3/4" npt(m) x 1/2" npt(f)	1
5.	72053285	ELBOW, street, 90°; 3/4" npt	3
6.	72053141	NIPPLE, close; 3/4" npt	1
7.	73054129	VALVE, gate; 3/4"	1
8.	89039107	HOSE; 3/4"	As Required
9.	72066000	CLAMP, hose	4
10.	72053458	NIPPLE, barbed; 3/4"	4
11.	72060004	BOLT; 1/4-20 x 1"	2
12.	72062000	NUT; 1/4-20	2
13.	72053180	BUSHING, reducer; 1-1/4" npt(m)	
14.	73058031	GAUGE, vacuum	1
15.	73052012	FILTER, suction	1
16.	51703077	HOSE; 1/4" x 276"	1
17.	60103870	BRACKET, suction filter	1
18.	72053640	SWIVEL; 1/4" npt	1
19.	72053XXX	ADAPTER, pump	1
20.	72053XXX	ADAPTER, pump	1
21.	72053013	NIPPLE, close; 1/4" npt	1
22.	73054003	GAUGE; 5 - 5000 PSI	1
23.	72531131	ELBOW, street, 90°; 1/4" npt	1
24.	72531099	ELBOW, 90°; 1/4" npt	1
25.	72053517	NIPPLE; 1/4"	1
26.	72053362	TEE; 1/4" npt	1
27.	72053432	COUPLING, reducer; 3/8" npt x 1/4" npt	1
28.	72053012	NIPPLE, pipe; 1/4" x 6" lg.	1
29.	72053641	SWIVEL, reducer; 3/8" npt(m) x 1/4" npt	1
30.	72053434	COUPLING, reducer; 1/2" x 1/4" npt	1
31.	73014671	CAP, fill	1
32.	60103693	BRACKET, reservoir	1
33.	72060046	BOLTS; 3/8-16 x 1" lg.	4
34.	72062002	NUT; 3/8-16	4
35.	72063051	LOCK WASHER; 3/8"	4
36.	52070760	RESERVOIR	1
37.	72053425	PLUG; 3/4" npt	2
38.	73141276	SCREEN, fill	1
39.	71391522	PLACARD, angle indicator, RH	1
40.	70391390	PLACARD, operating precaution	1
41.	71029194	PLACARD, capacity	2
42.	70391392	PLACARD, operator caution	1
43.	70391391	PLACARD, electrocution	1
44.	71039134	PLACARD, oil level	1
45.	72066340	RIVET, pop; 1/8"	14
46.	71029106	PLACARD, cylinder ID	1
47.	71029119	PLACARD, serial number	1
48.	70029251	PLACARD, IMT diamond	2
49.	71391523	PLACARD, angle indicator, LH	1
50.	72062007	NUT; 3/4-10	8
51.	72063056	LOCK WASHER; 3/4"	8
52.	71141894	STUD; 3/4-10 x 16" lg.	4

Parts Drawing on Pages 6-14 & 6-15

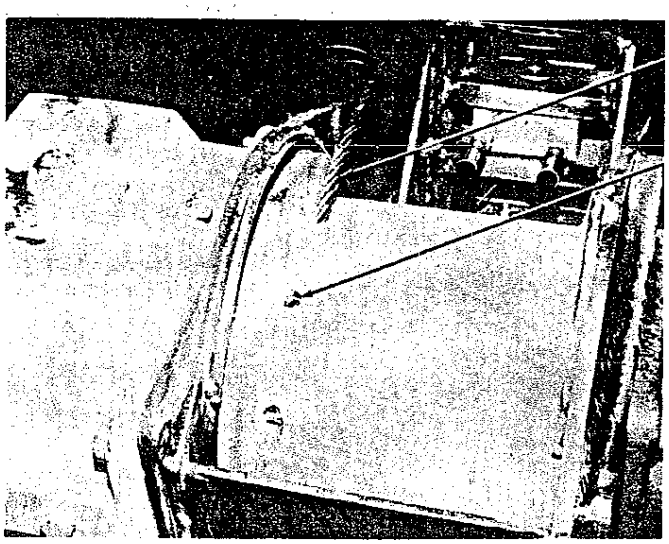
Parts Drawing on Page 6-17

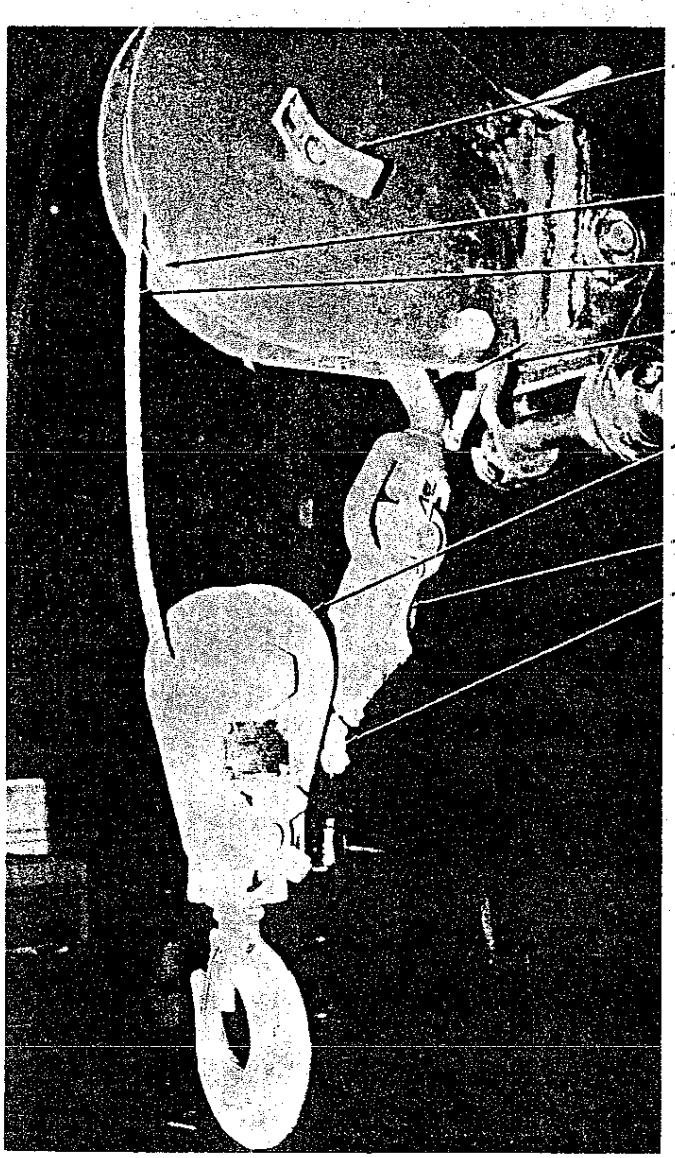
Item No.	Part No.	Description	Qty
1.	73073772	VALVE BANK; 12 VDC	1
2.	3B250315	CYLINDER, extension	1
3.	73051030	MOTOR, rotation	1
4.	73051201	MOTOR, winch	1
5.	3B253315	CYLINDER, main	1
6.	52070760	RESERVOIR, hydraulic oil	1
7.	73052012	FILTER	1
8.	73051XXX	PUMP	1
9.	51702868	HOSE; 1/4" x 17" lg.	1
10.	51703076	HOSE; 1/4" x 20" lg.	2
11.	51703084	HOSE; 1/4" x 60" lg.	2
12.	51703085	HOSE; 1/4" x 13" lg.	1
13.	60035XXX	HOSE; 1/2" ID	As Required
14.	51703077	HOSE; 1/2" ID	As Required
15.	60035XXX	HOSE; 3/4" ID	As Required
16.	60035XXX	HOSE; 3/4" ID	As Required
17.	72053787	SWIVEL, adapter; 1/4" npt(f) x 9/16-18 str. thd.	12
18.	72053742	ADAPTER; 1/4" npt x 7/8-14	2
19.	72053640	SWIVEL; 1/4"	8
20.	72053013	NIPPLE, close; 1/4" npt	1
21.	72531131	ELBOW, street, 90°; 1/4" npt	12
22.	72531099	ELBOW, 90°; 1/4" npt	2
23.	72053641	SWIVEL, reducing; 3/8" npt(m) x 1/4" npt(f)	1
24.	72053553	ELBOW, street, 45°; 1/4" npt	2
25.	51703083	HOSE; 1/4" x 15" lg.	2
26.	73054003	GAUGE, pressure; 0-5000 PSI	1
27.	72053434	COUPLING, reducer; 1/2" npt x 1/4" npt	1
28.	72066003	CLAMP, hose	2
29.	72531823	BUSHING, reducer; 3/4" npt(m) x 1/2" npt(f)	1
30.	72053457	NIPPLE, barbed; 1/2"	2
31.	72053XXX	ADAPTER	1
32.	72053XXX	ADAPTER	1
33.	72053012	NIPPLE, pipe; 1/4" npt x 6" lg.	2
34.	72053517	NIPPLE, hex; 1/4" npt	1
35.	72053141	NIPPLE, close; 3/4" npt	1
36.	72053556	ELBOW, street, 90°; 3/4" npt	3
37.	72053610	TEE; 1/4" npt	1
38.	72531548	NIPPLE, barbed; 3/4"	4
39.	73054129	VALVE, gate; 3/4"	1
40.	72066000	CLAMP, hose; 3/4"	4
41.	73058031	GAUGE, vacuum	1
42.	72053432	COUPLING, reducer; 3/8" npt x 1/4" npt	1
43.	72053743	BUSHING, reducer; 1/2" npt(m) x 1/4" npt(f)	4



Parts List on Page 6-16

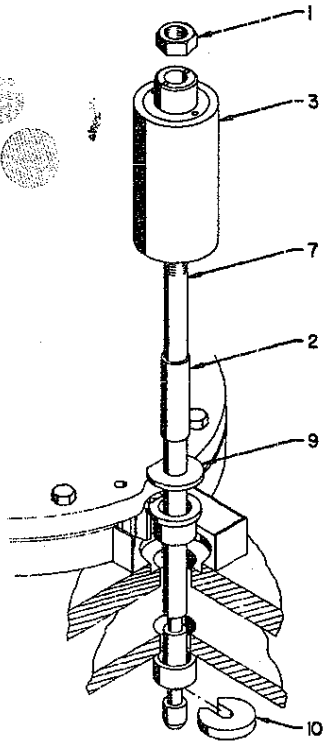
Figure F-18. Hydraulic Schematic



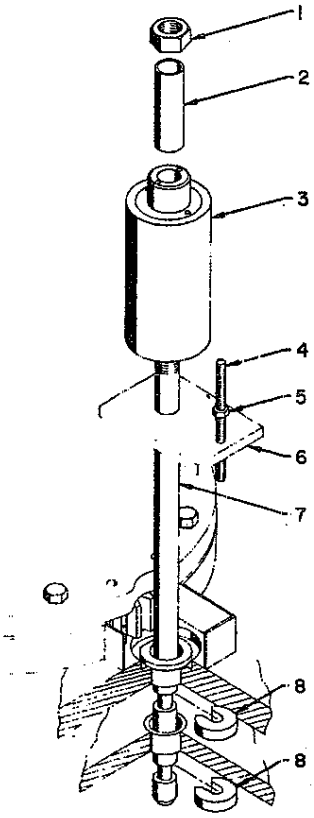


Item No.	Part No.	Description	Qty
1.	60105186	ROPE; 3/8"	75 ft.
2.	72060596	SCREW, set; 1/2-13 x 3/4"	1
3.	52070705	PIN, sheave	1
4.	72053506	ZERK; 3/16" press fit	1
5.	72066145	PIN, hair; 3/16"	1
6.	72063035	BUSHING, machy; 1-1/4" x 10 ga.	2
7.	60101504	SHEAVE; 10" (includes item 8)	1
8.	70055024	BEARING, roller	1
9.	70055025	RACE, innder bearing	1
10.	71073920	HOOK; 3-ton	1
11.	70731114	SNATCH BLOCK	1
12.	70058015	SOCKET, wedge; 3/8"	1
13.	70058033	CLIP, cable; 3/8"	1

Figure F-19. Rope and Hook Kit (Part Number 90702491)



installation



removal

Parts list for pinion gear bushing removal and installation.

Item No.	Part No.	Description	Qty
1.	72062011	NUT; 1-1/4 - 7	1
2.	60105358	SPACER	1
3.	73073134	JACK, hydraulic	1
4.	60105497	ROD; 1/2-13 x 6" lg.	1
5.	72062004	NUT; 1/2-13	1
6.	60105496	PLATE	1
7.	60102775	ROD	1
8.	60102779	RING, slotted	2
9.	60102778	RING, installation	1
10.	60102780	RING, slotted	1

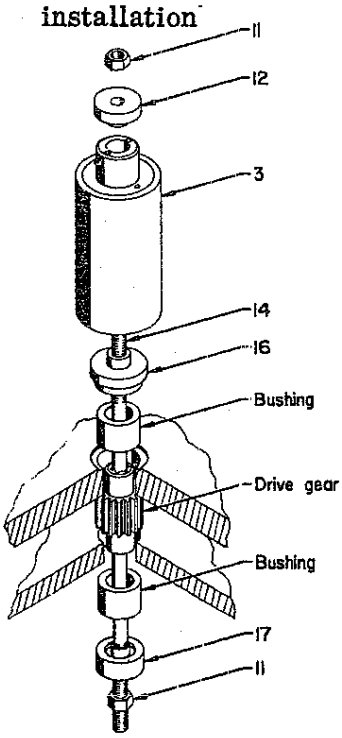
Pinion Gear

Drive Gear

Parts list for drive gear bushing removal and installation.

Item No.	Part No.	Description	Qty
3.	73073134	JACK	1
11.	72062007	NUT; 3/4-10	2
12.	60102782	RING, alignment	1
13.	60102776	SPACER, cupped	1
14.	60102777	ROD	1
15.	60102781	RING, pull	1
16.	60102783	RING, upper bushing	1
17.	60102784	RING, lower bushing	1

installation



removal

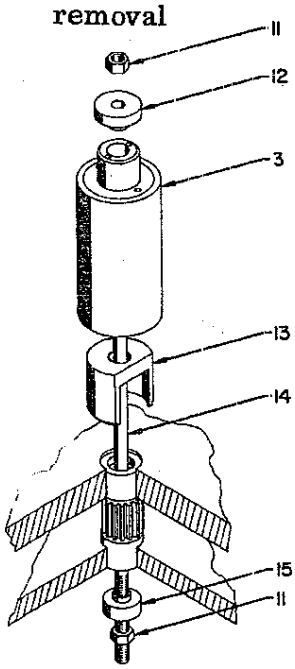


Figure F-20. Bushing Removal Tool (Part Number 92091200)

SECTION 7. SPECIFICATIONS

7-1. GENERAL

REACH (Maximum from Centerline of Rot.)	(4.57 m)	15' - 0"
EXTENSION	(182.9 cm)	72"
LIFTING HEIGHT (Based on 69" (175 cm) ground to base height	(7.21 m)	23' - 8"
WEIGHT OF CRANE	(635 kg)	1400 lbs.
OUTRIGGER SPAN (Required Option) Crane side from centerline of truck	(201 cm)	79"
Opposite side from centerline of truck	(122 cm)	48"
OPTIMUM PUMP CAPACITY	(22.7 liters)	6 US Gal
MOUNTING SPACE	(50.8 cm X 71.1 cm)	20 x 28
STORAGE HEIGHT (Based on 69" (175 cm) ground to base height)	(282.6 cm)	111¼"
DESIGN FACTORS		
Materials		3/1
Pins & Hydraulics		4/1

7-2. PERFORMANCE CHARACTERISTICS

ROTATION (370°) (6.45 Rad.)	30 Sec.
MAIN TOPPING CYLINDER (-15° to +72°) (-.26 Rad to 1.26 Rad)	11 Sec.
EXTENSION (72") (182.9 cm)	24 Sec.

7-3. LIFTING CAPACITY (Extension Boom Retracted)*

(0.91 m) 3'	(3402 kg)	7500 lbs.
(1.22 m) 4'	(2722 kg)	6000 lbs.
(1.83 m) 6'	(2087 kg)	4600 lbs
(2.44 m) 8'	(1678 kg)	3700 lbs.
(2.74 m) 9'	(1497 kg)	3300 lbs.

7-4. LIFTING CAPACITY (Extension Boom Out)

(1.52 m) 5'	(1996 kg)	4400 lbs.
(2.13 m) 7'	(1542 kg)	3400 lbs.
(3.96 m) 13'	(953 kg)	2100 lbs
(4.57 m) 15'	(862 kg)	1900 lbs.
(3.05 m) 10'	(2800 kg)	2300 lbs.

7-5. HYDRAULIC SYSTEM

Open centered, full pressure system that requires 6 GPM (22.7 liters/min.) optimum oil flow @2350 PSI (165.2 kg/cm^2). Four spool electric remote stack type control valve with a 25' (6.4m) contol cable. System includes seperate oil reservoir, suction line filter, control valve, and return line filter

POWER SOURCE

Intregral mounted hydraulic pump and PTO; Other standard power sources may be utilized.

7-6. ROTATION

Turntable bearing powered by a high torque hydraulic motor through a ring and pinion type spur gear train.

7-7. CYLINDERS

MAIN TOPPING	4"	(10.2 cm)	19½"	(49.5 cm)
EXTENSION	3"	(7.6 cm)	72"	(182.9 cm)

* For loads over 3750 lbs. use two-part line.

7-8. WINCH

Lifting capacity 4000 lbs. (1814 kg) on a one part line; 75' (22.8 m) of 3/8" (0.95 cm) IWRC 6 x 25 rope; Snatch block for 2 part line and anchor hook.

MINIMUM CHASIS SPECIFICATIONS

Body Style	Conventional	
WHEEL BASE	154"	391 cm
CAB TO AXLE	84"	213 cm
FRAME SECTION MODULUS	9.45 in^3	154.9 cu. cm
R B M	340,200 in. lbs.	3920 kg-m
FRONT AXLE	5000 lbs.	2268 kg
REAR AXLE	13,000 lbs.	5897 kg
TRANSMISSION	4 Speed	

In addition to these specifications, heavy duty electrical and cooling systems and dual rear wheels are required. It is recommended that the vehicle be equipped with an electric engine tachometer, auxiliary brake lock and power steering.

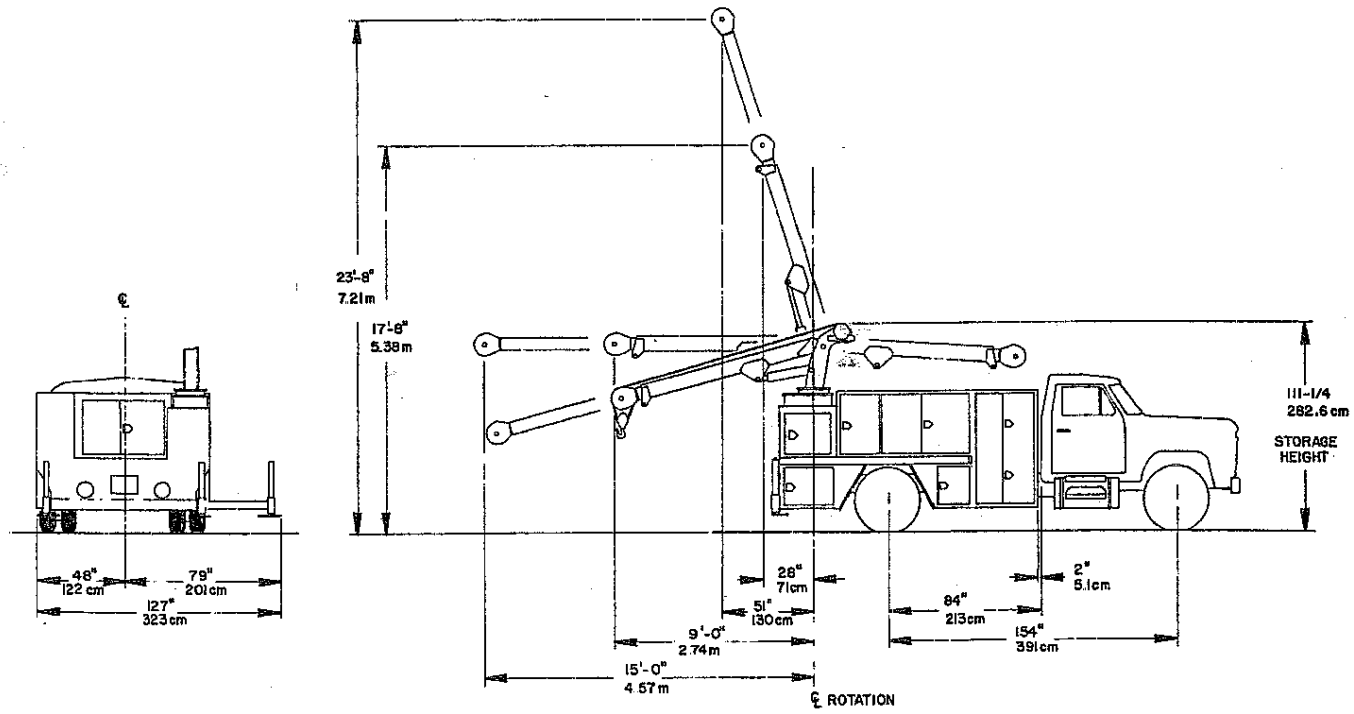


Figure G-1. Geometric Configuration

SECTION 8. INSPECTION & TEST PROCEDURE

Completed at Factory

Date:_____ Work Order No:_____

Tested By(signature):_____

Completed at Factory

CRANE INFORMATION

Model: IMT 315 Crane Serial No.:_____

Cylinder Serial Numbers

Main:_____ Extension:_____

Completed by Installer

CHASSIS INFORMATION

Make:_____ Model:_____ VIN:_____

Wheelbase:_____in. Cab/axle:_____in. Transmission:_____

GAWR-front:_____lb. GAWR-rear:_____lb. GVWR:_____lb.

PTO model:_____ PTO %:_____

Pump model:_____ GPM:_____ Optimum speed:_____

Engine speed: optimum pump speed/PTO %=_____

Tire size:_____ Ply:_____ Pressure:_____PSI

Power source (if other than PTO drive):_____

Accessories:_____

_____

TABLE H-1. PRE-OPERATION INSPECTION (on IMT test vehicle)

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Inspect and lube all points (refer to chart in service manual)			
Check all hydraulic lines for: 1. sharp corners and kinks 2. abrasions & chafing 3. tightness of fittings 4. leaks			
Check all pins for proper installation (refer to service manual)			
Check all crane bolts for proper installation & tightness (refer to Torque Data Chart on back cover)			
Visually inspect all welds for cracks, holes, etc.			
Inspect all crane members for proper installation, alignment & workmanship			

Completed at Factory

TABLE H-2. OPERATING TEST (on IMT test vehicle)

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Engage power take-off			
Position & lower outriggers			

Completed at Factory

TABLE H-2. OPERATING TEST (on IMT test vehicle) Continued

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Slowly operate unit through all motions. Check hoses, cylinders & all structural members for proper operation.			
Place crane under full rated load at proper distance from centerline of rotation. Raise load to +30°. * 1. Shut off engine 2. Actuate each valve bank function to assure operation of holding valves			
Restart engine & extend & retract extension cylinder under full rated load. * 1. Repeat five times with main boom in various positions 2. Note crane operation & system pressure variation during each cycle.			Pressure Range Min. _____ Max. _____ 1. _____ _____ 2. _____ _____ 3. _____ _____ 4. _____ _____ 5. _____ _____
Raise & lower secondary boom under full rated load. * 1. Repeat five times with main boom in various positions 2. Note crane operation & system pressure variation during each cycle.			Pressure Range Min. _____ Max. _____ 1. _____ _____ 2. _____ _____ 3. _____ _____ 4. _____ _____ 5. _____ _____

*Note: Maintain test vehicle stability at all times.

Completed at Factory

TABLE H-2. OPERATING TEST (on IMT test vehicle) Continued

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
With secondary cylinder at full stroke, raise & lower main boom under full rated load. * 1. Repeat five times under different rated loads 2. Note crane operation & variation in system pressure during each cycle.			Pressure Range Min. _____ Max. _____ 1. _____ _____ 2. _____ _____ 3. _____ _____ 4. _____ _____ 5. _____ _____
Remove load from crane, reposition outriggers to provide 5° slope from horizontal. 1. Position crane at maximum horizontal reach 2. Put maximum load on crane, with load close to ground. * 3. Rotate crane through full cycle. * 4. Repeat rotation cycle five times, note operation of crane and system pressure variation during each cycle			Pressure Range Min. _____ Max. _____ 1. _____ _____ 2. _____ _____ 3. _____ _____ 4. _____ _____ 5. _____ _____
Recheck all welds for stress cracks.			

Completed at Factory

FURTHER COMMENTS — RECOMMENDED CORRECTIVE ACTION

1. _____ _____

2. _____ _____

3. _____ _____

*Note: Maintain test vehicle stability at all times.

Completed at Factory

TABLE H-2. OPERATING TEST (on IMT test vehicle) Continued

FURTHER COMMENTS	RECOMMENDED CORRECTIVE ACTION
4.	
5.	
6.	
7.	

Total time spent on OPERATING TEST: _____ hrs.

Completed by Installer

TABLE H-3. PRE-OPERATION INSPECTION (truck mounted)

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
PTO shifting cable for efficient operation			
Engine speed control for proper operation			
PTO mounting bolts for tightness (refer to Torque Data Chart on back cover)			
Level of transmission grease			
Underdrive hoses for breaks, leaks, etc.			
Routing of underdrive hoses for kinks, sharp bends, muffler or tail pipe contact			
Proper pump installation (refer to service manual)			

TABLE H-3. PRE-OPERATION INSPECTION (truck mounted) Continued

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Proper crane installation (refer to service manual)			
All bolts for proper tightness (refer to Torque Data Chart on back cover)			
Perform checks outlined in Table 1			
Fill oil reservoir (all cylinders retracted)			
Placard placement (refer to service manual)			
Suction line gate valve at reservoir open			

Completed by Installer

TABLE H-4. OPERATING TEST (truck mounted)

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Start vehicle engine			
Proper operation and installation of tachometer			
Engage PTO			
Set engine RPM for optimum pump speed			
Position & lower outriggers			
Slowly operate unit through all motions. Check hoses, cylinders & all structural members for operation			

Completed by Installer

TABLE H-4. OPERATING TEST (truck mounted) Continued

Completed by Installer

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Bypass all functions (hold handle open), check each function for relief pressure			
1. Rotation			_____ PSI
2. Main			_____ PSI
3. Extension			_____ PSI
4. Winch			_____ PSI
Cross check each function relief setting with proper relief valve specifications			
Check operation of pump by timing the extend side of each function - under no load (± 2 Sec.)			Expected Time / Observed Time
1. Rotation			32 Sec. _____ Sec.
2. Main			11 Sec. _____ Sec.
3. Extension			24 Sec. _____ Sec.
4. Winch			_____ Sec. _____ Sec.

TABLE H-4. OPERATING TEST (truck mounted) Continued

INSTRUCTIONS	PASS	FAIL	OBSERVATIONS AND CORRECTIONS
Operate each function under full rated load. Note speed and operation of each function			
With crane booms at 30° above horizontal, kill the engine, operate each function checking for drift			

FURTHER COMMENTS	RECOMMENDED CORRECTIVE ACTION
1.	
2.	
3.	
4.	
5.	
6.	
7.	

Completed by Installer

STABILITY TEST

INSTRUCTIONS

1. Refer to Figure H-1.

2. Fill out items A through L.

3. The testing area must be a flat, hard surface (ideally concrete, but asphalt or hard packed gravel is acceptable). Only authorized testing personnel will be in or near the test area.

4. Position and lower outriggers until the weight of the crane has been removed from the truck springs.

5. Extend the crane to full horizontal position, centered over the rear of the truck.

6. Place full rated load on crane at the maximum horizontal distance (L = _____ ft.). Keep the load close to the ground to avoid excessive tipping.

7. Slowly start rotating the load counterclockwise. Through every 5° increment, check whether all vehicle tires remain in contact with the testing surface.

Completed by Installer

Completed by Installer

8. If at any point through the rotation cycle, any one of the vehicle tires starts to break contact with the test surface, the rotation should be stopped and the position of the crane noted as X^o (balance point). X^o = _____^{o}.

9. If the balance point has been reached during the rotation cycle, the crane position (X^o) should be noted on the appropriate figure. This is the area where the crane maintains stability under full capacity. Determine Y. $Y = 180^o - X^o$ = _____^{o}.

10. After the balance point has been reached, the extension boom should be retracted until all tires are again in full contact with the test surface.

11. Continue rotating the boom after stability has been regained. Again, watch all vehicle tires for a point of instability. If a point of instability re-occurs (one of the vehicle tires breaks contact with test surface), retract the extension boom until stability is regained.

12. Repeat this cycle through a full 180^o of arc.

13. At the end of the 180^o arc, physically measure the existing horizontal distance from the centerline of rotation to centerline of the load. Note distance (K). K = _____ft.

14. To determine the per cent of full capacity in the derated zone, divide the remaining horizontal distance (K) by the original maximum horizontal distance (L). Multiply this figure by 100.

$\frac{K}{L} \times 100$ = _____%

15. The derated per cent of full capacity (Z) obtained in Step 14 should be entered on the appropriate figure.

16. Repeat the stability test by rotating the crane clockwise through 180^o arc to find $X_1{}^o$ _____^{o}, $Y_1{}^o$_____^{o} and Z_1%_____%.

17. The figures obtained indicate the stability range of that particular crane and truck.

18. Rotate the crane at least five times utilizing the completed figure to ensure that the rating is accurate.

19. Before shipout, the truck with the crane in the stored position must be weighed.

Front Axle:_____lb.

Rear Axle:_____lb.

Total:_____lb.

20. Make certain that all information has been recorded on Figure H-1. ate figure.

21. Record the total length of time to test the crane (total crane test and inspection time should approximate 4 hours - 1979 SAE). _____hrs.

BOOM IN STORED POSITION (no payload)
ACTUAL WEIGHTS

Front Axle: _____ lb.

Rear Axle: _____ lb.

Total: _____ lb.

LEGEND
$Z\%$ or $Z_1\% = 100 \times \frac{K}{L}$
$Y^o = 180^o - X^o$
$Y_1{}^o = 180^o - X_1{}^o$

This stability chart conforms to SAE standards

DIMENSIONAL DATA

A: _____ in.

B: _____ in.

C: _____ in.

D: _____ in.

E: _____ in.

F: _____ in.

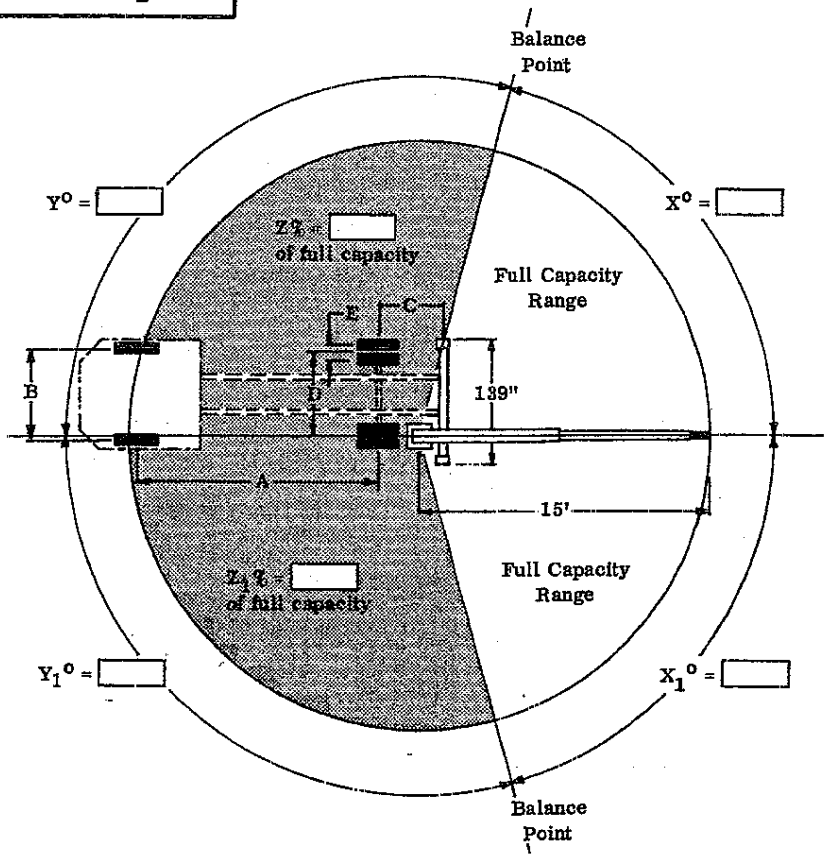
_____ in.

L: _____ ft.

X^o: _____ o

Y^o: _____ o

Z%: _____ %



Completed by Installer

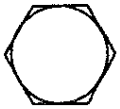
[ ] = Derated Load Capacity ($Z\%$ or $Z_1\%$)

Reach (per capacity chart)	Full Rated Load	x	$\frac{Z\%}{100}$	$\frac{Z_1\%}{100}$	= Derated Load for $Z\%$	Derated Load for $Z_1\%$
		x			=	
		x			=	
		x			=	
		x			=	
		x			=	

Figure H-1. Corrected Stability Chart

SECTION 9. APPENDIX

TABLE I-1. TORQUE DATA CHART

GRADE BOLT	SAE GRADE 1 or 2	SAE GRADE 5	SAE GRADE 6	SAE GRADE 8
MARKING				
DEFINITION	INDETERMINATE QUALITY	MINIMUM COMMERCIAL QUALITY	MEDIUM COMMERCIAL QUALITY	BEST COMMERCIAL QUALITY
MATERIAL	LOW CARBON STEEL	MEDIUM CARBON STEEL TEMPERED	MEDIUM CARBON STEEL Q & T	MEDIUM CARBON ALLOY STEEL Q & T
MINIMUM TENSILE STRENGTH	64,000 PSI 44,998,400 kg/sq. m.	105,000 PSI 73,825,500 kg/sq. m.	133,000 PSI 93,512,300 kg/sq. m.	150,000 PSI 105,465,000 kg/sq. m.

BOLT SIZE		RECOMMENDED TORQUE VALUES							
Fraction	mm	Ft. Lbs.	kg-m	Ft. Lbs.	kg-m	Ft. Lbs.	kg-m	Ft. Lbs.	kg-m
1/4	6.35	5	.69	7	.96	10	1.38	10.5	1.45
5/16	7.92	9	1.24	14	1.93	19	2.62	22	3.04
3/8	9.52	15	2.07	25	3.45	34	4.7	37	5.11
7/16	11.09	24	3.31	60	8.29	55	7.6	60	8.29
1/2	12.7	37	5.11	60	8.29	85	11.75	92	12.72
9/16	14.27	53	7.32	88	12.17	120	16.59	132	18.25
5/8	15.87	74	10.23	120	16.59	167	23.0	180	24.89
3/4	19.05	120	16.59	200	27.66	280	38.72	296	40.93
7/8	22.22	190	26.27	302	41.76	440	60.85	473	65.41
1	25.4	282	39.0	466	64.45	660	91.27	714	98.74

In using the torque data in the chart above, the following rules should be observed:

1. Manufacturers' particular specifications should be consulted when provided.

2. When multiple tapered tooth (shakeproof) washers are employed, the torque should be increased by 20%.

3. All torque measurement values are given in foot pounds. To convert measurement to inch pounds, multiply by 12.

4. The information in the chart is pertinent to lightly lubricated coarse and fine thread fasteners.

Definite tire inflation pressures are established for each tire size depending upon the load imposed on the tires. For greater stability, riding comfort and prolonged tire life, tires should be inflated for the loads carried. The "Load and Inflation Table" shown below, indicates the proper inflation pressures.

TABLE I-2. TIRE LOAD AND INFLATION PRESSURES

SINGLE TIRES FOR TRUCKS IN HIGHWAY SERVICE

Tire Size	Load Range	TIRE LOAD LIMITS AT VARIOUS INFLATION PRESSURES										
		50	55	60	65	70	75	80	85	90	95	
7.00-20	D	2100	2260	2390	2530	2670	2790					
7.00-20	E	2100	2260	2390	2530	2670	2920	3030	3150			
7.50-20	D	2360	2530	2680	2840	2990	3140					
7.50-20	E	2360	2530	2680	2840	2990	3140	3270	3410	3530		
8.25-20	E	2800	3010	3190	3370	3560	3730	3890	4050			
8.25-20	F	2800	3010	3190	3370	3560	3730	3890	4050	4210	4350	4500
9.00-20	E		3560	3770	4000	4210	4410	4610				
9.00-20	F		3560	3770	4000	4210	4410	4610	4790	4970	5150	
10.00-20	F			4290	4530	4770	4990	5220	5430			
10.00-20	G			4290	4530	4770	4990	5220	5430	5640	5840	6040
11.00-20	F			4670	4940	5200	5450	5690	5920			
11.00-20	G			4670	4940	5200	5450	5690	5920	6140	6370	6590
11.00-22	F			4960	5240	5520	5790	6040	6290			
11.00-22	G			4960	5240	5520	5790	6040	6290	6530	6770	7000

DUAL TIRES FOR TRUCKS IN HIGHWAY SERVICE

Tire Size	Load Range	TIRE LOAD LIMITS AT VARIOUS INFLATION PRESSURES										
		40	45	50	55	60	65	70	75	80	85	90
7.00-20	D	1840	1980	2100	2220	2340	2450					
7.00-20	E	1840	1980	2100	2220	2340	2450	2560	2660	2760		
7.50-20	D	2070	2220	2350	2490	2620	2750					
7.50-20	E	2070	2220	2350	2490	2620	2750	2870	2990	3100		
8.25-20	E	2460	2640	2800	2960	3120	3270	3410	3550			
8.25-20	F	2460	2640	2800	2960	3120	3270	3410	3550	3690	3820	3950
9.00-20	E		3120	3310	3510	3690	3870	4040				
9.00-20	F		3120	3310	3510	3690	3870	4040	4200	4360	5420	
10.00-20	F			3760	3970	4180	4380	4580	4760			
10.00-20	G			3760	3970	4180	4380	4580	4760	4950	5120	5300
11.00-20	F			4100	4330	4560	4780	4990	5190			
11.00-20	G			4100	4330	4560	4780	4990	5190	5390	5590	5780
11.00-22	F			4350	4600	4840	5080	5300	5520			
11.00-22	G			4350	4600	4840	5080	5300	5520	5730	5940	6140

Tire and Rim Association Standard Tire Loads at Various Inflation Pressures. Load range letters and corresponding ply rating (D=8 ply, E=10 ply, F=12 ply and G=14 ply).

LIMITED WARRANTY

Products manufactured by Iowa Mold Tooling Co., Inc. are warranted to be free from defects in material and workmanship, under proper use, application and maintenance in accordance with IMT's written recommendations, instructions and specifications, for a period of ninety (90) days from the date of shipment to the end user. IMT's obligation under this warranty is limited to, and the sole remedy for any such defect shall be the repair or replacement (at IMT's option) of unaltered parts returned to IMT, freight prepaid, and proven to have such defect, provided such defect occurs within the 90-day warranty period and is reported within fourteen (14) days of its occurrence.

This is the only authorized IMT warranty and is in lieu of all other express or implied warranties or representations, including any implied warranties of merchantability or fitness or of any other obligations on the part of IMT. Warranty claims must be submitted and shall be processed in accordance with IMT's established warranty claim procedure. In no event will IMT be liable for business interruptions, loss of sales and/or profits, personal injury, costs of delay or for any other special, indirect, incidental or consequential losses, costs or damages.

One manual is provided with each piece of new equipment and additional manuals may be obtained at a nominal price.

IOWA MOLD TOOLING CO., INC.

500 Highway 18 West•Garner, Iowa 50438

Phone: (515) 923-3711

PART NUMBER 99900420

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