

BASIC HYDRAULICS FUNDAMENTAL LAWS OF HYDRAULICS

1. A fluid always seeks its common level.
2. For practical purposes a liquid cannot be compressed.
3. Pascal's Law:

Pressure applied to an enclosed or confined liquid is transmitted uniformly throughout the liquid and in all directions. A unit of pressure applied anywhere in a liquid system transmits the same unit of pressure to all areas of the system.

4. A liquid can be used to multiply force. For example: a pressure in a liquid system of one pound per square inch exerts a force of four pounds on any four-square-inch surface of the system.
5. The natural character of liquids may change under pressure or with changes of temperature.
6. A force (measured in pounds) exerted on an area (measured in square inches) creates a pressure (measured in pounds per square inch). Pressure equals force divided by area $P = \frac{F}{A}$
or force equals pressure times area $F = PA$. Area equals force divided by pressure or $A = \frac{F}{P}$

BASIC HYDRAULICS GENERAL FACTS

1. A pump puts out flow, not pressure. Pressure is the result of resistance to flow.
2. Vacuum is complete emptiness. More commonly, vacuum (partial) is reduction, below atmospheric pressure.
3. Pressure by gravity helps atmosphere when reservoir is above the pump, and hinders it when reservoir is below the pump. It can usually be neglected on pressure side of pump.
4. A liquid always seeks its common level.
5. Hydraulics is a means of power transmission.
6. Oil is a commonly used medium because it serves as a lubricant and is practically non-compressible. (It will, however, compress approximately 1/2 of 1% per 1000 PSI.)
7. There must be a pressure drop (pressure difference) across an orifice or restriction to cause flow through it. Conversely, if there is no flow there will be no pressure drop.
8. Oil takes the course of least resistance.
9. A pressure gauge indicates the work load at any given moment. Gauge readings do not include atmospheric pressure unless marked PSIA.
10. A liquid is pushed, not drawn, into a pump. (Atmospheric pressure equals 14.7 PSI or 30" mercury at sea level.)
11. A pump does not pump pressure; its purpose is to create a flow. (Pumps used to transmit power are usually positive displacement type.)
12. A liquid can be used to multiply force. For example, a pressure in a liquid system of one pound per square inch exerts a force of four pounds on any four-square-inch surface of the system.

13. Steel and copper tubing size indicates the outside diameter. To find the actual inside diameter, subtract two times the wall thickness from the tube size quoted.

BASIC HYDRAULICS CALCULATIONS

1. To find the circumference of a circle, multiply the diameter by 3.1416.
2. To find the area of a circle, square the diameter and multiply by 0.7854.
3. To find the effective force of a cylinder, multiply the area (sq. inches) by pressure (in P.S.I.).
4. Speed of a cylinder is dependent upon its size (piston area) and the rate of oil flow into it.
5. To find the capacity of a cylinder in gallons, multiply the area (sq. inches) of the cylinder bore by the length (in inches) and divide this product by 231. The quotient is the number of gallons capacity of the cylinder.

BASIC HYDRAULICS WEIGHTS & MEASURES

1. A gallon (U.S. Std.) of water or oil contains 231 cu. inches. Water weighs 8.345 lbs. per gallon.
2. A gallon (British Imperial) of water contains 277.418 cu. inches and weighs 10.022 lbs. (avoirdupois) at maximum density.
3. To find British Imperial gallons, multiply U.S. gallons by 0.833.
4. To find U.S. gallons, multiply British Imperial gallons by 1.201.

BASIC FORMULAS

1. Force (Pounds) = $\frac{\text{Cylinder Area} \times \text{Line Pressure}}{(\text{Sq. Inch}) \quad (\text{PSI})}$
2. Displacement (Cu. Inches/min.) = $\frac{\text{Cylinder Area} \times \text{Stroke}}{(\text{Sq. inches}) \quad (\text{Inches})}$
3. Time (Seconds) = $\frac{\text{Cylinder Displacement (cu. inches)}}{\text{Pump Delivery (GPM)} \times .2597}$
4. Horsepower (Hydraulic) = $\frac{\text{GPM} \times \text{Pressure}}{1714 \text{ (100\% efficiency)}}$
5. Oil Velocity (Ft./Sec.) = $\frac{\text{Pump Delivery (GPM)} \times .3208}{(\text{Pip Size (Sq. Inches)})}$
6. Piston Velocity (In./Sec.) = $\frac{\text{Stroke (inches)}}{\text{Time (Seconds)}}$

$$7. \text{ Pump Delivery (Cu. inches/min.)} = \frac{\text{Cylinder Area} \times \text{Piston Velocity (Sq. inches)} \times \text{Stroke (Inches/min.)}}{\text{Stroke (Inches/min.)}}$$

$$8. \text{ Pump Delivery (GPM)} = \frac{\text{Cylinder Area} \times \text{Stroke} \times \text{Time (stroke/min.)}}{231}$$

$$9. \text{ Torque} = \frac{63025 \times \text{H.P.}}{\text{R.P.M.}}$$

$$10. \text{ H.P.} = \frac{\text{T} \times \text{R.P.M.}}{63025}$$

USEFUL CONSTANTS

1 H.P. = 550 Ft. Lb. per sec.

1 H.P. = 33,000 Ft. Lb. per min.

1 H.P. = 42.44 BTU/Min.

1 U.S. Gallon = 231 Cu. In.

1 U.S. Gallon = 0.13368 Cu. Ft.

1 Atmosphere = 14.7 Lb./Sq. In.

1 Atmosphere = 29.92 Inches of (Hg.) Mercury

1 Atmosphere = 33.96 Ft. of Water

1 Inch of Mercury (HG.) = 0.491 Lbs. Per Squ.
in. = 13.6 Inches of water

1 PSI = 2.0416 In. of Mercury at 62°F.

1 GPM = 3.85 Cu. In./Sec.

BTU = British Thermal Unit = Heat required raise temperature of 1 Lb. of Water 1° F.

1 BTU = 778.57 Ft. Lb.

1 Ft. Head of Oil = .4 P.S.I.

1 Micron = .00003937

100 Mes = .0059" = 149 Micron

CLARK

Service gram

May 17, 1971

MICHIGAN SG-387
Group Ref. No. 1100
1200
1300

SUBJECT: Hydraulic System Split Flange Half Attaching Bolts
All Models MICHIGAN Tractor Shovels, Dozers & Scrapers

Investigation has indicated that when the attaching bolts, used for retaining the split flange halves, are tightened to excessive torque values it is possible to cause damage to the flange halves and components to which they attach.

Accordingly the following standards have been set up as maximum torque values to which the retaining bolts are to be tightened.

<u>BOLT DIA.</u>	<u>SPLIT FLANGE SIZE</u>	<u>TORQUE VALUES</u> <u>DRY, PLATED THREADS</u>
3/8"	3/4" & 1"	20 to 25 ft. lbs.
7/16"	1-1/4"	35 to 45 ft. lbs.
1/2"	1-1/2"	45 to 55 ft. lbs.
1/2"	2"	55 to 65 ft. lbs.

CLARK

Service gram

September 10, 1971

MICHIGAN SG-397
Group Ref. No. 1100
1200
1300

SUBJECT: Changing of Filter Elements after First 50 Hours
of Operation - Applicable to All Models of
MICHIGAN Tractor Shovels & Dozers

During the initial hours of operation of a new machine, the working components of the hydraulic systems employed tend to seat themselves in place due to normal break-in action. This break-in action tends to produce minute wear particles which are introduced into the oil flow of the hydraulic systems. These wear particles are in turn trapped by the oil filter assemblies built into the systems.

In the interest of obtaining optimum service life of hydraulic system components, it is strongly recommended that replaceable filter elements employed in all filter assemblies in the main, steering and converter/transmission hydraulic systems be replaced after the first 50 hours of operation. This will alleviate the possibility of unfiltered oil being by-passed through the various hydraulic systems due to early "plugging" of filter elements.

On models equipped with main hydraulic reservoir suction filters and converter cooler line strainers, remove, clean and reinstall them at this time.

Subsequent servicing of filters and strainers may then be performed at normal intervals as specified in applicable operators manual.

DW

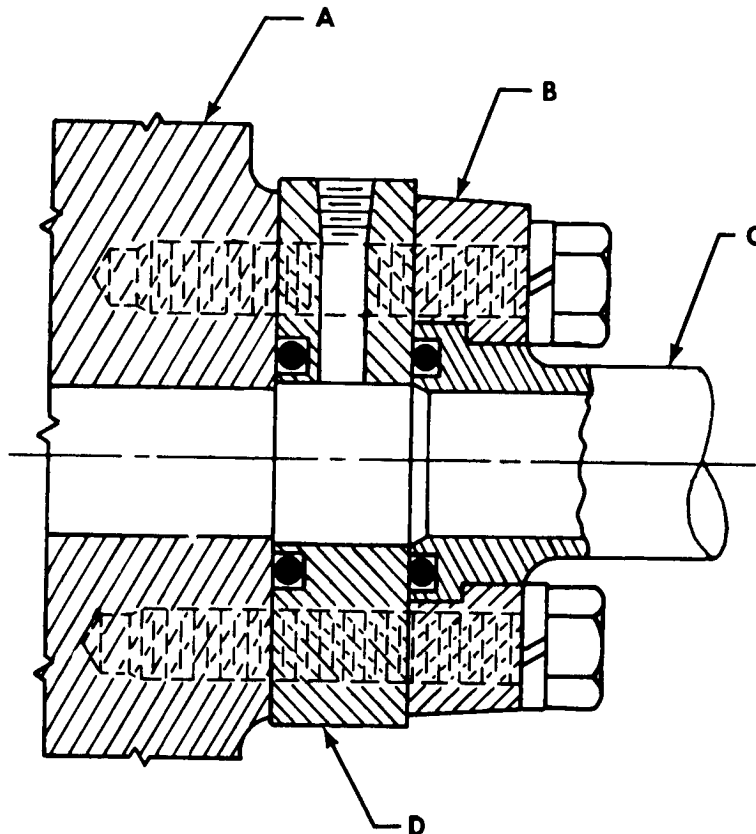
May 10, 1972

MICHIGAN SG-432
Group Ref. No. 2100

SUBJECT: Hydraulic Pressure Check Block Specifications

Many requests have been received from the field for specifications to cover hydraulic pressure check blocks for use in connection with the various size split flange fittings used throughout the hydraulic systems. A typical usage of such pressure check blocks would be for use in checking the internal pressures of a pair of hydraulic cylinders for comparison, one against the other, to determine the amount of leakage past the cylinder packings and seals.

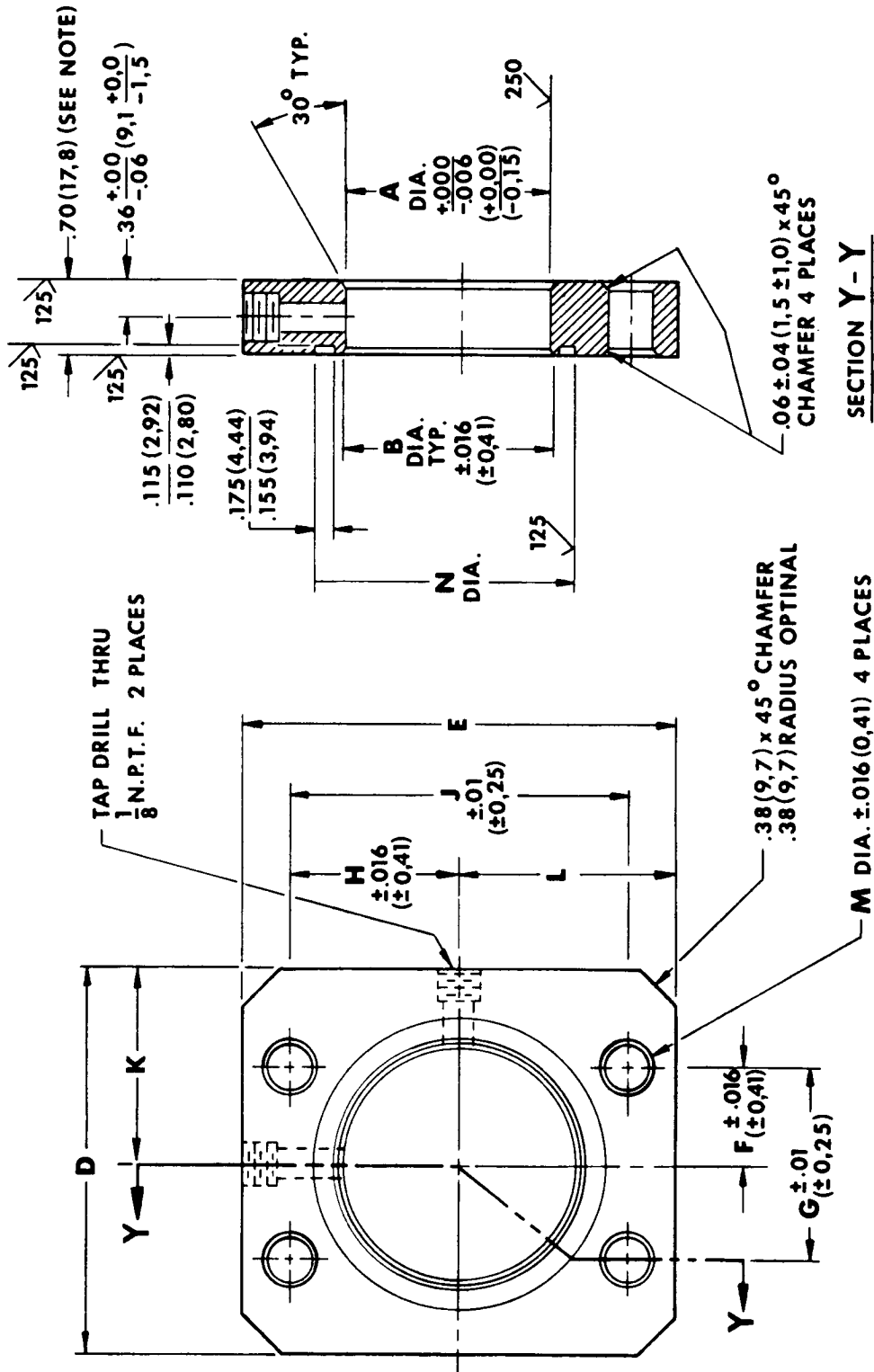
In response to such requests, charted herein are specifications of pressure check blocks for use with split flange connection sizes 3/4" thru 2-1/2". When using pressure check block with split flange connections, it will be necessary to use 1/16" longer connecting bolts to compensate for thickness of check block.



TYPICAL INSTALLATION OF
PRESSURE CHECK BLOCK

A - Typical Split Flange Port
B - Split Flange

C - Hose
D - Pressure Check Block



NOTE: MAKE FROM $\frac{3}{4}$ " (19.05) SAE 1018 CDS (COLD DRAWN STEEL)
 CDS NORMALLY MEETS 125 MICRO INCH FINISH
 FINISH ONLY IF REQUIRED

TS-11530 B

SPLIT FLANGE SIZE	3/4	1	1-1/4	1-1/2	2	2-1/2
A DIA.	.75 (19,0)	1.00 (25,4)	1.25 (31,8)	1.50 (38,1)	2.00 (50,8)	2.50 (63,5)
B DIA.	.81 (20,6)	1.06 (26,9)	1.31 (33,3)	1.56 (39,6)	2.06 (52,3)	2.56 (65,0)
D	2.00 (50,8)	2.00 (50,8)	2.50 (63,5)	3.00 (76,2)	3.50 (88,9)	4.00 (101,6)
E	2.56 (65,0)	2.76 (70,1)	3.12 (79,2)	3.68 (93,5)	4.00 (101,6)	4.50 (114,3)
F	.44 (11,2)	.52 (13,2)	.59 (15,0)	.70 (17,8)	.84 (21,3)	1.00 (25,4)
G	.875 (22,22)	1.031 (26,19)	1.188 (30,18)	1.406 (35,71)	1.688 (42,88)	2.00 (50,8)
H	.94 (23,9)	1.03 (26,2)	1.16 (29,5)	1.38 (35,1)	1.53 (38,9)	1.75 (44,4)
J	1.875 (47,62)	2.062 (52,37)	2.312 (58,72)	2.75 (69,8)	3.062 (77,77)	3.50 (88,9)
K	1.00 (25,4)	1.00 (25,4)	1.26 (32,0)	1.50 (38,1)	1.76 (44,7)	2.00 (50,8)
L	1.28 (32,5)	1.38 (35,1)	1.56 (39,6)	1.84 (46,7)	2.00 (50,8)	2.00 (50,8)
M DIA.	.41 (10,4)	.41 (10,4)	.47 (11,9)	.53 (13,5)	.53 (13,5)	.53 (13,5)
N DIA.	1.255(31,87) 1.250(31,75)	1.565(39,75) 1.560(39,63)	1.755(44,57) 1.750(44,45)	2.125(53,97) 2.115(53,73)	2.50(63,50) 2.49(63,25)	3.005(76,32) 2.995(76,08)

CLARK

Service gram

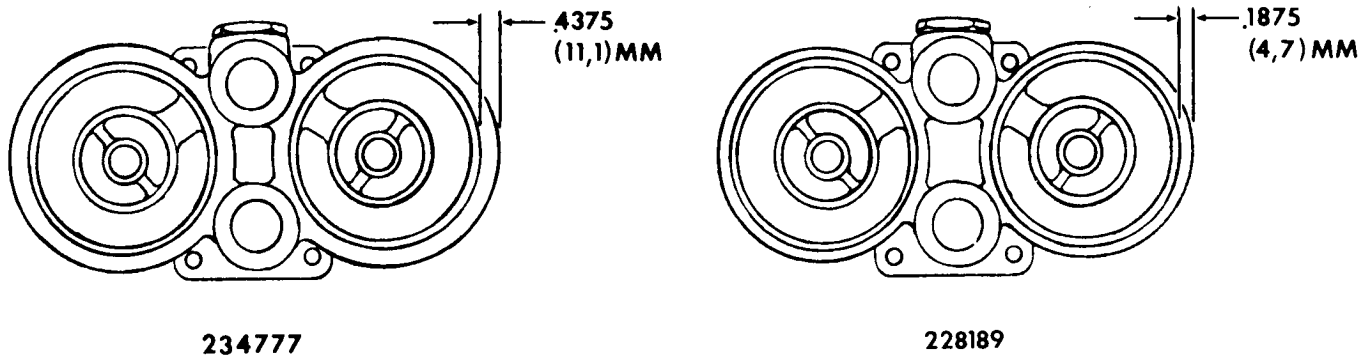
28 January 1976

MICHIGAN SG-577
Group Ref. No. 1300

SUBJECT: Transmission and Torque Converter Filter Assembly
Models 175-III, 275-III, 275-III A, 475-III A, 475B,
280-III, 280-III A, 380-III & 380-III A

The 234777 Filter Assembly has superseded the 228189 Filter Assembly in transmission and torque converter hydraulic systems on subject model machines. Both filter assemblies are dual, full flow type filters using two (2) 215502 Elements and two (2) 25K-80500 O-Rings for regularly scheduled preventative maintenance requirements.

The 234777 Filter Assembly has a heavier wall base casting and may be identified from the 228189 Filter Assembly by comparing thickness of base casting where the filter casings contact the base casting as illustrated in Figure 1 below.



TS-14522

Figure 1

November 1982

CLARK

SERVICE GRAM

*(This bulletin replaces SG-885, dated August 1981.
REASON: Information Revision)

SUBJECT: Front and Rear Main Hydraulic Piping
Revision (Heavy Duty Maeward Fittings)
Model 175B Wheel Loader with S/N:
Cummins: 438C101 thru 999
GM: 427C101 thru 999

MICHIGAN SG - 885A
Group Ref. No. 1100

Improved main hydraulic system piping can be installed on machines with serial numbers listed above.

This includes the supply and return piping for the main valve and the supply piping for the bucket and boom cylinders.

The new piping is more durable for greater reliability.

*** NOTE:** *Individual pipes can be replaced. It is not necessary to replace all pipes to take advantage of this improvement.*

To make this change, order the parts from the parts list below and follow the installation instructions.


*** NOTE:** *Always lubricate o-rings with grease before installing.*

PARTS LIST FOR ONE MACHINE:

1 - 2524738	Tube	1 - 2524765	Tube
12- 19J24	Flange Half	8 - 19J32	Flange Half
6 - 58K225	O-ring	4 - 58K228	O-ring
40- 17C824	Bolt	1 - 19K5	Tee
1 - 36K5	Cap	1 - 1631632	Elbow
1 - 1306142	Coupling	1 - 6000689	Cap
1 - 2536855	Tube	4 - 18C1232	Bolt
4 - 27E12	Washer	1 - 2521677	Tube
1 - 2521675	Tube	24 - 19J16	Flange Half
12- 58K219	O-ring	48 - 17C620	Bolt
6 - 19J20	Flange Half	4 - 58K222	O-ring
16- 17C724	Bolt	2 - 1542421	Block
2 - 18C832	Bolt	2 - 27E8	Washer
1 - 2524594	Tube	1 - 2524595	Tube
2 - 1529375	Hose	1 - 2521674	Tube
1 - 2521676	Tube		

(11A1)

INSTALLATION:

1. Put the machine on a level surface.
2. Put the machine in the 'SERVICE' position: Bucket on the ground, parking brake applied, engine stopped, ignition key removed, red warning flag on steering wheel, steering frame lock connected, wheels blocked.
3.  Let the machine become cool. Loosen the hydraulic reservoir cap **slowly** to reduce pressure in the reservoir. Remove the fluid from the reservoir.
4. See Figure 1 and remove the bolts and flanges that connect the hoses (Items 8 and 53) to the front main valve supply and return tubes. Remove the hoses from the tubes. Discard the existing flanges, o-rings and bolts.
5. See Figure 1 and remove the nuts, washers, clamps and u-bolts (Items 30, 36, 37, 38 and 42) that hold the front tube assemblies keep these parts for reuse. Remove the front tube assemblies o-rings, nipple, coupling and cap (Items 29,31,39,40,41). Discard these parts.
6. See Figure 2 and install new front main valve supply and return tubes and all component parts as shown. Install the existing u-bolts, clamps, washers and bolts (Items 30,36,37,38, and 42, Figure 1) onto the tubes assemblies. Install the existing hoses (Items 8 and 53, Figure 1) to the tubes using 2 - new o-rings, 4 - new flanges and 8 - new bolts as shown on the chart on Figure 2.
7. See Figure 1 and remove the bolts, flanges hoses and o-rings (Items 1,28 and 53) from the rear main valve supply and return tubes. Discard the o-rings, bolts and flanges.
8. See Figure 1 and remove the bolts, lockwashers and washers that hold the tube assembly to the frame. Remove the tube assembly (Item 54). Discard these parts.
9. See Figure 3 for the necessary pivot plate rework and tube assembly installation information. Install the existing hoses (Items 1, 2, 8 and 53, Figure 1) using 4 - new o-rings, 8 - new and 16 - new bolts as shown on the chart on Figure 3.
10. See Figure 1 and remove the bolts, flanges, hoses and o-rings (Items 12, 13 and 28) from the left hand bucket cylinder tubes. Remove the flanges, bolts and o-rings from where the right hand bucket cylinder tubes (Items 9 and 52) connect to the left hand tubes. Discard the o-rings, bolts and flanges. Remove the mounting bolts, washers, nuts and bracket (Item 15, 16, 18, 19 and 20). Discard these parts. Remove the tubes (Items 10 and 11). Discard the tubes.
11. See Figure 4 and weld 1 - new 1542421 block to the frame as shown. Install the new tubes and component parts as shown. Install the existing hoses (Items 12, 13 and 28, Figure 1) using 3 - new o-rings, 6 - new flanges, and 12 - new bolts as shown on the chart on Figure 4.
12. Remove the bolts, flanges, hoses and o-rings from the right hand bucket cylinder tubes. Discard the o-rings, bolts and flanges. Remove the tube mounting bolts, washers and nuts. Remove the mounting brackets (Items 49 and 50, Figure 1). Remove the tubes (Items 9 and 52, Figure 1). Discard the mounting brackets and tubes.
13. See Figure 5 and weld 1 - new 1542421 block to the frame as shown. Install the new tubes and component parts as shown. Connect the new right hand tubes to the new left hand tubes and the existing hoses to the right hand tubes using 5 - new o-rings, 10 - new flanges, and 20 - new bolts as shown on the chart on Figure 5.
14. See Figure 1 and remove the bolts, flanges, hoses and o-rings from the boom cylinder tubes (Items 17, 25, 27 and 34). Remove bolts, flanges and hoses (Items 27 and 34) from the main valve. Discard these two hoses and all of the bolts, flanges and o-rings. Remove the existing mounting bolts, washers and nuts (Items 21 thru 24, 44 thru 47) from the boom tubes. Remove the boom cylinder tubes (Items 43 and 48). Discard the tubes. Keep the mounting bolts, washers and nuts for reuse.

15. See Figure 6 and install 2 - new hoses, 2 - new tubes and all other component parts as shown.
NOTE: *Use the existing mounting hardware from the present tubes to install the new tubes.* Connect the hoses and tubes using 8 - new o-rings, 16 - new flanges, and 32 - new bolts as shown on the chart on Figure 6.

NOTE: *The pivot plate must be reworked (See step 9) before the tubes can be installed.*

16. Make sure that all connections are tight. Refill the main hydraulic reservoir with the correct type and quantity of fluid.
17. Start the engine. Check all systems for proper operation and for any leaks.
18. Stop the engine. Check the fluid level in the main hydraulic reservoir. Add fluid if necessary.
19. Remove the warning flag from steering wheel. Disconnect steering frame lock. Remove blocks from wheels.

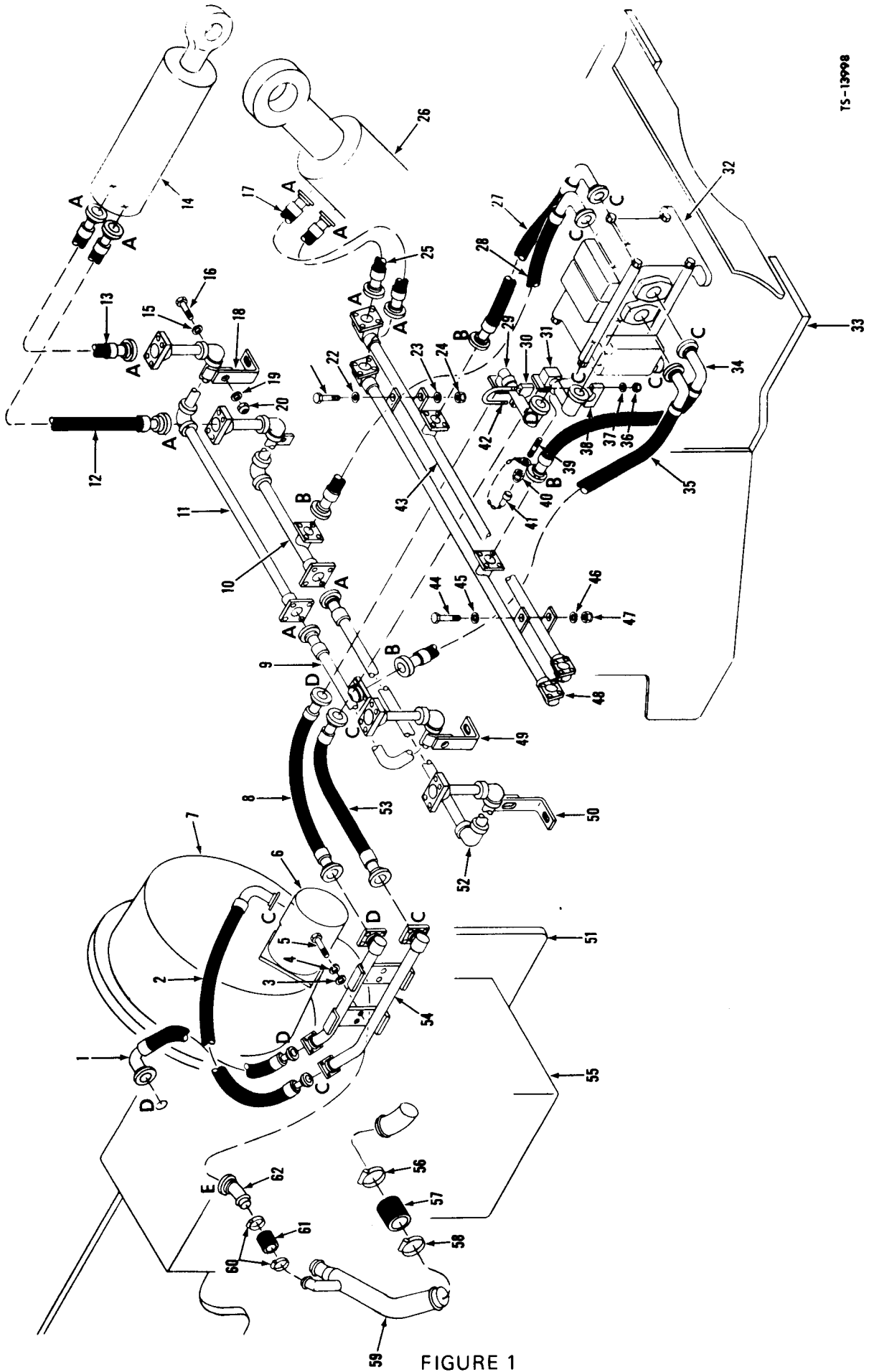


FIGURE 1

CODE	SIZE	FLANGE	REQD.	O-RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
C	1.50	19J24	2	58K225	1	17C824	4	46-58LB-FT(62.79N.m)
D	2.00	19J32	2	58K228	1	17C824	4	54-67LB-FT(73.90N.m)

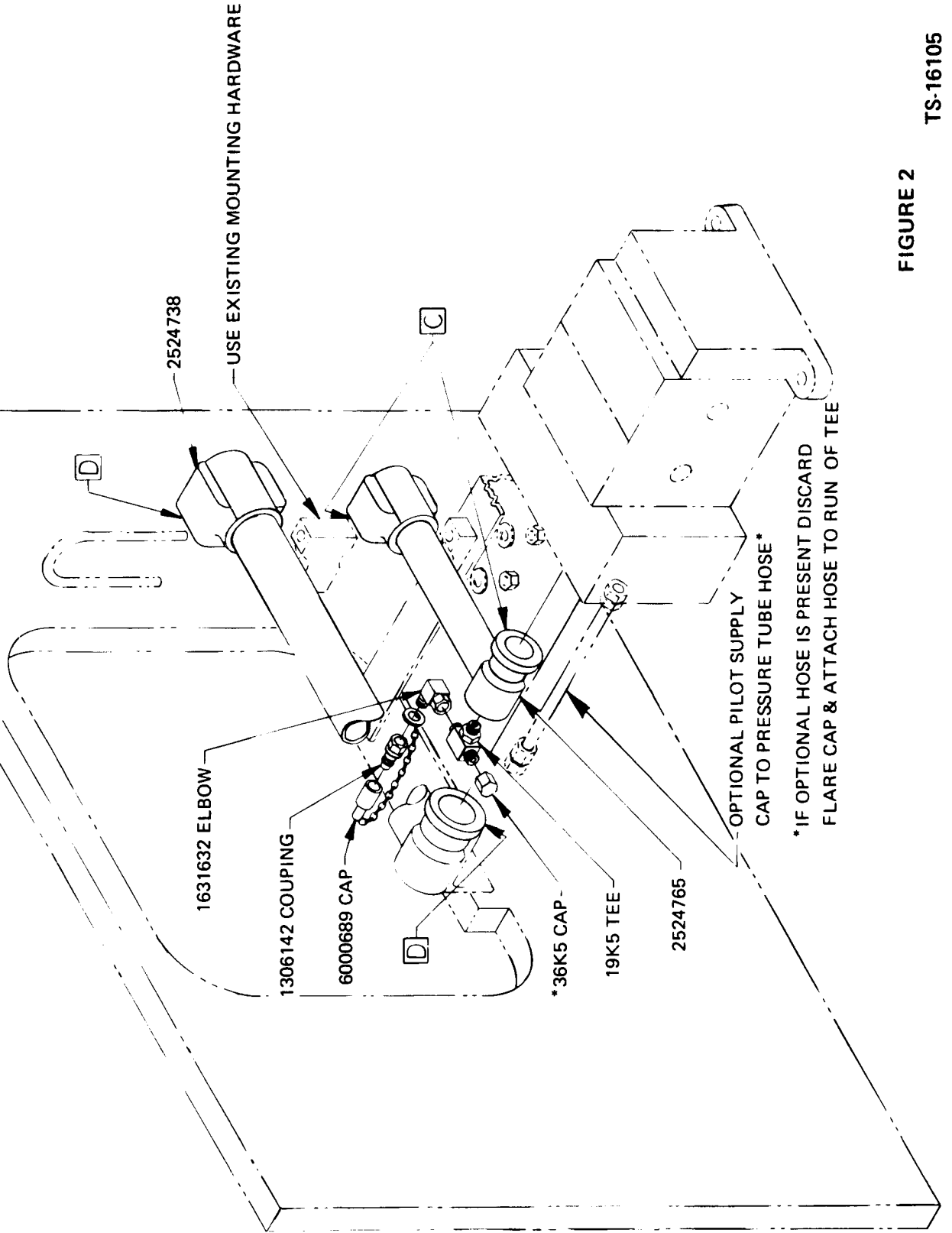
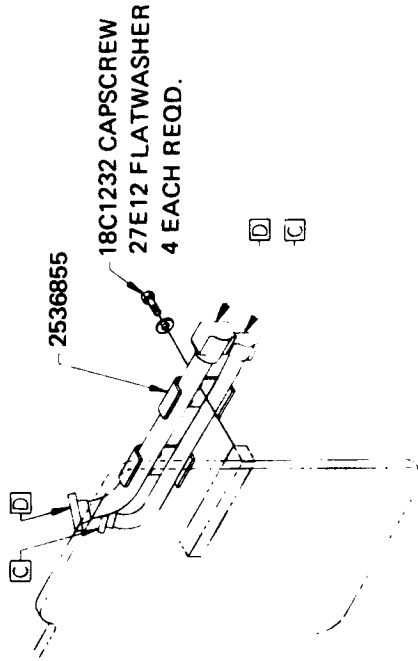
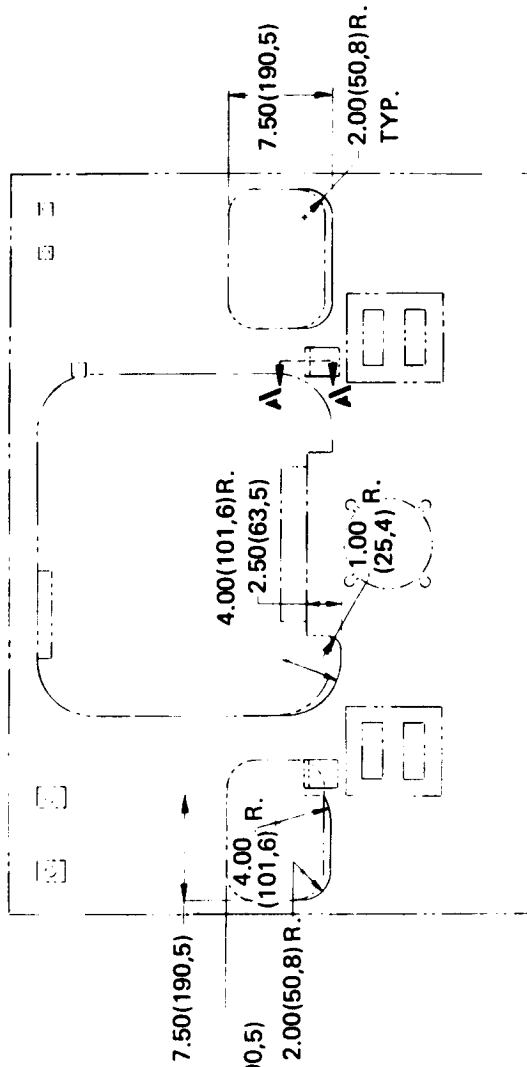


FIGURE 2

TS-16105

CODE	SIZE	FLANGE	REQD.	O-RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
C	1.50	19J24	2	58K225	1	17C824	4	46-58LB-FT(62.79N:m)
D	2.00	19J32	2	58K228	1	17C824	4	54-67LB-FT(73.90N:m)



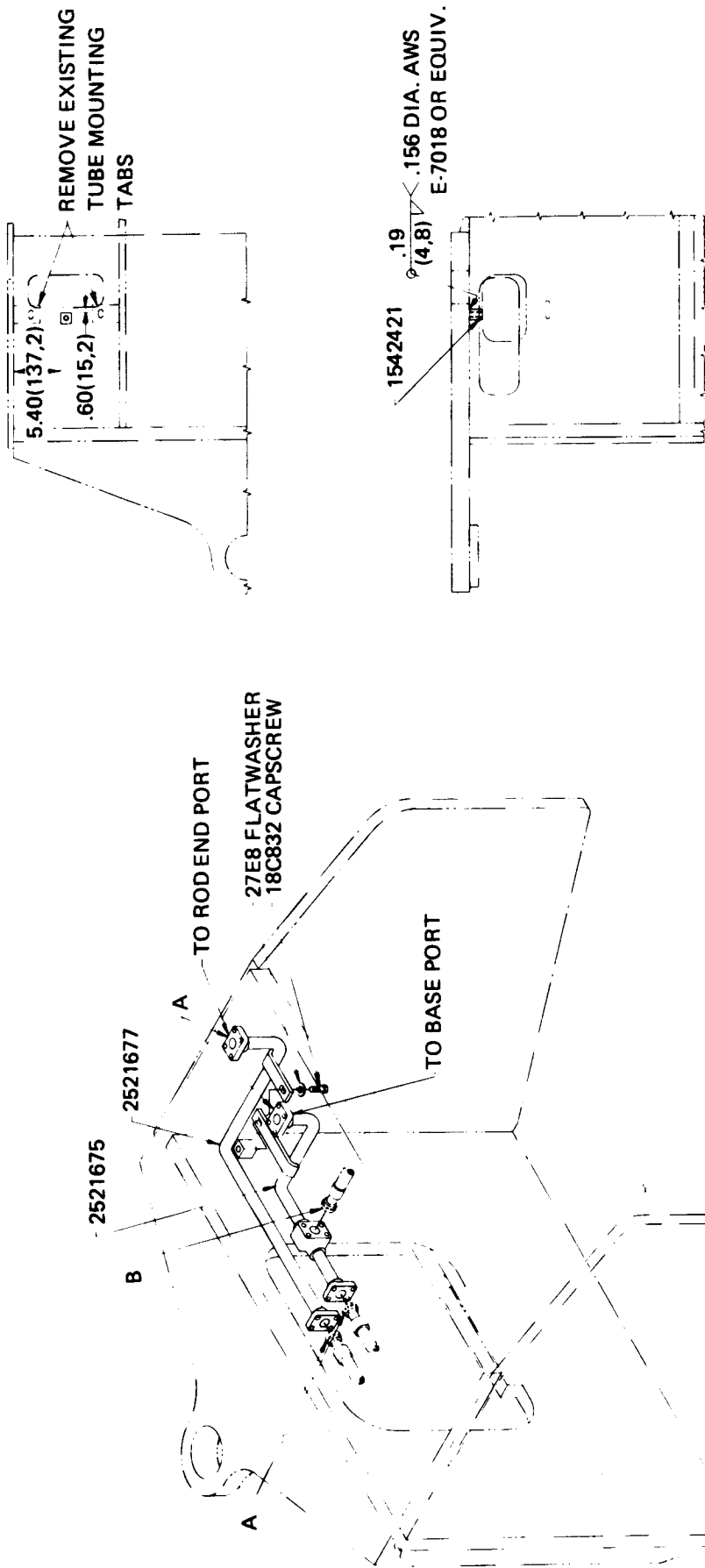
PIVOT PLATE REWORK

IF BUCKET SUPPLY TUBES
ARE MOUNTED AS SHOWN
ABOVE LEFT REMOUNT
THEM AS ABOVE RIGHT

VIEW A-A

FIGURE 3

TS-16106



CODE	SIZE	FLANGE	REQD.	O-RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
A	1.00	19J16	2	58K219	1	17C620	4	27-35LB-FT (37-48N.m)
B	1.25	19J20	2	58K222	1	17C724	4	35-46LB-FT (48-62N.m)

PROCEDURE

REMOVE ALL OLD WELD USING CARBON ARC (AIR-ARC), GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXY-ACETYLENE TORCHES SHOULD NOT BE USED.

IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.

CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.

DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.

LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.

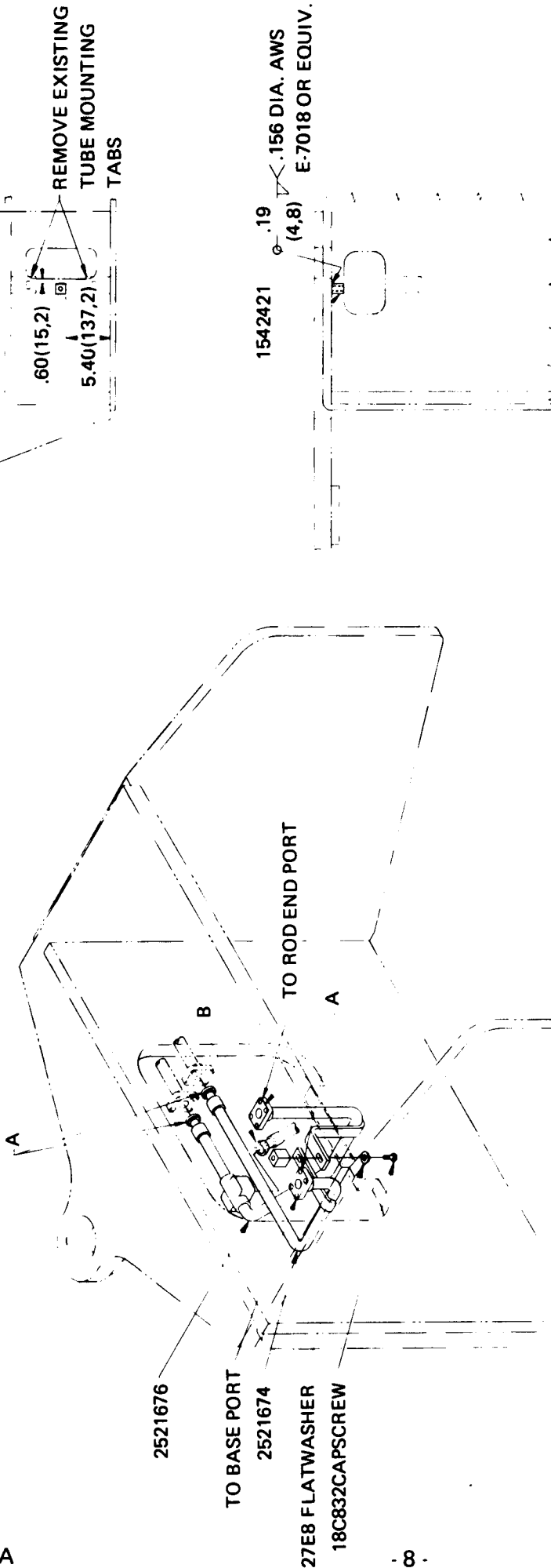
NOTE

WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELD BEING MADE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE). QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE).

WARNING

FAULTY WELDING OR IMPROPER INSTALLATION COULD CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

FIGURE 4



PROCEDURE

REMOVE ALL OLD WELD USING CARBON ARC (AIR ARC), GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXY ACETYLENE TORCHES SHOULD NOT BE USED.

IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.

CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.

DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.

LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.

NOTE

WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELD BEING MADE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE). QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE).

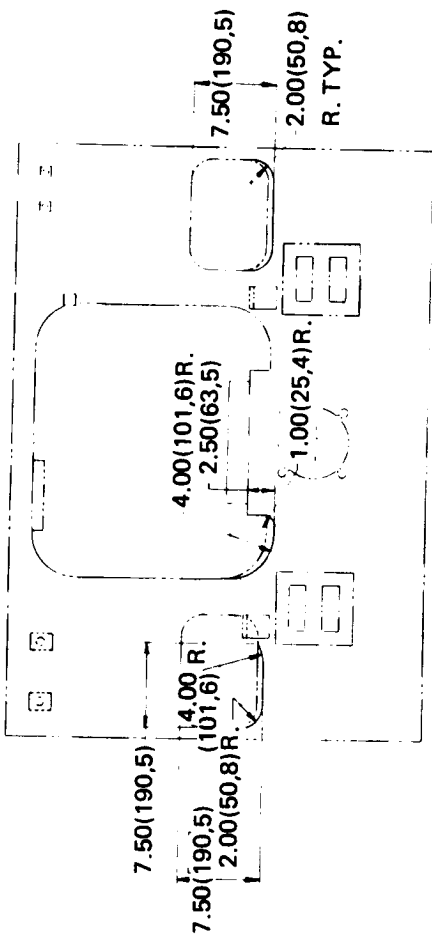
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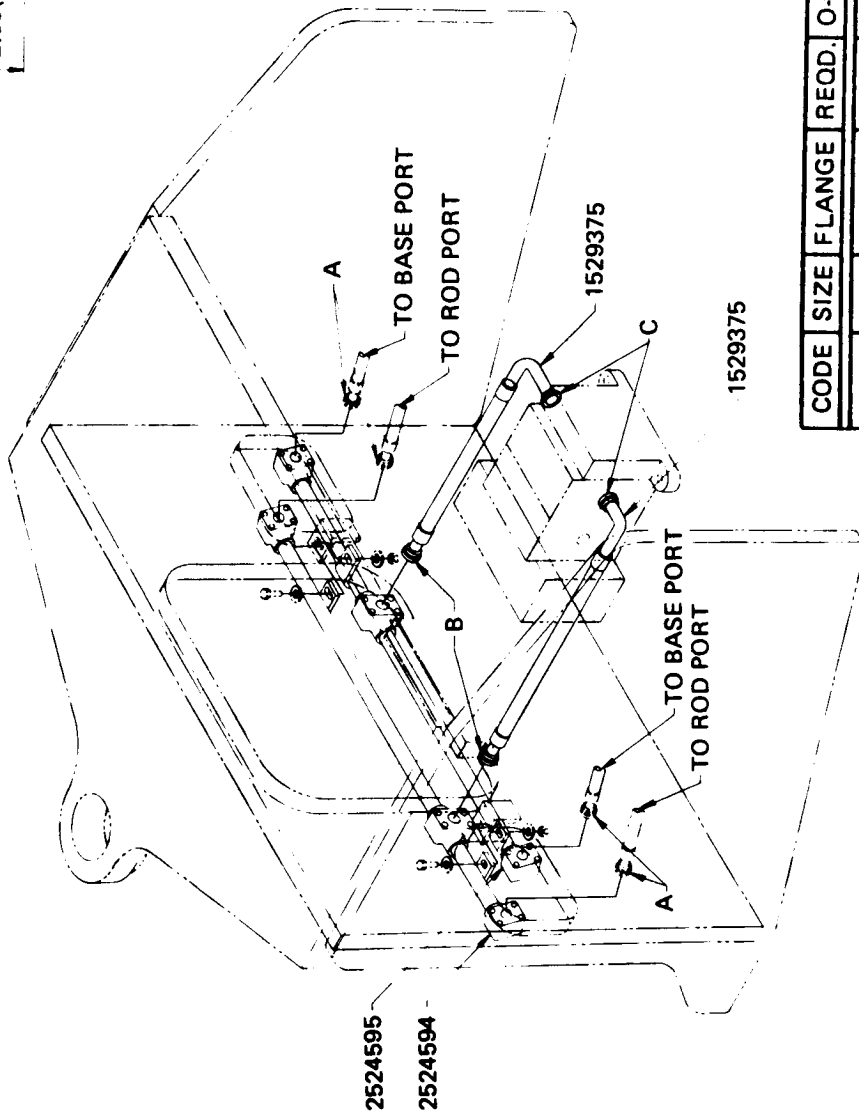
CODE	SIZE	FLANGE	REQD.	O-RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
A	1.00	19J16	2	58K219	1	17C620	4	27-35LB-FT (37-48N:m)
B	1.25	19J20	2	58K222	1	17C724	4	35-46LB-FT (48-62N:m)

FIGURE 5

TS-16108



PIVOT PLATE MUST BE REWORKED AS SHOWN ABOVE BEFORE NEW TUBE ASSEMBLIES ARE INSTALLED
USE EXISTING HARDWARE TO ATTACH NEW TUBES



CODE	SIZE	FLANGE	REQD.	O-RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
A	1.00	19J16	2	58K219	1	17C620	4	27-35LB-FT(37-48N·m)
B	1.25	19J20	2	58K222	1	17C724	4	35-46LB-FT(48-62N·m)
C	1.50	19J24	2	58K225	1	17C824	4	46-58LB-FT(62-79N·m)

FIGURE 6

September 1981

MICHIGAN SG - 895
Group Ref. No. 1100
1200
1300

**SUBJECT: Hydraulic System Hose Maintenance
All Models of Wheel Loaders and Dozers**

Proper hydraulic system hose maintenance, inspection and installation is very important for safe and efficient machine operation.

Follow the instructions as shown below for the correct hydraulic hose maintenance procedure.

HYDRAULIC HOSE MAINTENANCE



WARNING - Improper selection, installation or maintenance may result in premature failures, bodily injury, or property damage.

Hose (also includes hose assemblies) has a finite life and there are a number of factors which will reduce its life.

INSPECTION:

Inspect all hose daily. Any of the following conditions will require replacement of the hose:

- (1) Leaks at fitting or in hose (leaking fluid is a fire hazard)
- (2) Damaged, cut, or abraded cover (any reinforcement exposed)
- (3) Kinked, crushed, flattened, or twisted hose.
- (4) Hard, stiff, heat cracked, or charred hose.
- (5) Blistered, soft, degraded, or loose cover.
- (6) Cracked, damaged, or badly corroded fittings.
- (7) Fittings slippage on hose.

The following items must be tightened, repaired, or replaced as required:

- (1) Leaking port conditions.
- (2) Clamps, guards, shields.
- (3) Remove excessive dirt build up.
- (4) System fluid level, fluid type, and any air entrapment.

Every 2000 hours or yearly, clean hoses completely and inspect and replace as listed above.

INSTALLATION:

Use only CLARK - approved parts as listed in the applicable parts manual. Use of 'will-fit' or non approved parts may cause premature failures, bodily injury, or property damage.

Use proper hose, install so that relative motion of machine components produces bending rather than twisting. Replace all clamps and other restraints used on previous installation. Install port connection so that no twist or torque is put into the hose. Correct or eliminate all tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces.

After completing the installation, all air entrapment must be eliminated and the system pressurized to the maximum pressure and checked for proper function and freedom from leaks.



WARNING - Avoid potential hazardous areas while testing.

REPLACEMENT:

Specific replacement intervals must be considered based on previous service life or when failures could result in downtime, damage, or injury risk.

CLARK

Service gram

August 1982

MICHIGAN SG - 937
Group Ref. No. 1100

SUBJECT: Hydraulic Reservoir By-pass Revision
Wheel Loader Models 75C, 125C, 175B, 175C and 275B with S/N:
494A, 495A, 496A, 497A, 438D, 427D, 490A, 491A & 482B

An improved hydraulic reservoir filter by-pass assembly for Wheel Loaders with serial numbers listed above, can now be installed using the parts listed below and following the installation instructions.

This new filter by-pass assembly moves the by-pass function of the existing filter from the bottom of the filter assembly to the top.

This will also give move stability to the mounting assembly and give an improved by-pass location which will not let collected contaminants flow back into the system.

This filter assembly, the use of the correct fluid (Ref. SG-856A) ,and the correct filter change intervals (Ref. SG-903) will protect the system.

For Machines with S/N:
427D, 438D and 482B
Parts List

Omit the following parts:

4 - 64D6	Nut
4 - 63D10	Nut
2 - 2550328	Retainer Plate
2 - 2550326	Retainer
2 - 2550325	Rod Assy.
2 - 25K60624	O-ring
2 - 25K40808	O-ring

2 - 86D6	Nut
2 - 2525186	Retainer
2 - 2525197	Rod
2 - 2525184	Plate
4 - 64D8	Nut
2 - 25K60624	O-ring
2 - 25K40808	O-ring

For Machines with S/N:
494A and 495A
Parts List

Omit the following parts:

2 - 64D6	Nut
2 - 64D10	Nut
1 - 2550328	Retainer Plate
1 - 2550326	Retainer
1 - 2550352	Rod Assy.
1 - 25K60624	O-ring
1 - 25K40808	O-ring

1 - 86D6	Nut
1 - 2525186	Retainer
1 - 2534488	Rod
1 - 2525184	Plate
2 - 64D8	Nut
1 - 25K60624	O-ring
1 - 25K40808	O-ring


For Machines with S/N:
490A, 491A, 496A, 497A
Parts List

Omit the following parts:

2 - 64D6	Nut
2 - 63D10	Nut
1 - 2550328	Retainer Plate
1 - 2550326	Retainer
1 - 2550325	Rod Assy.
1 - 25K40808	O-ring
1 - 25K60624	O-ring

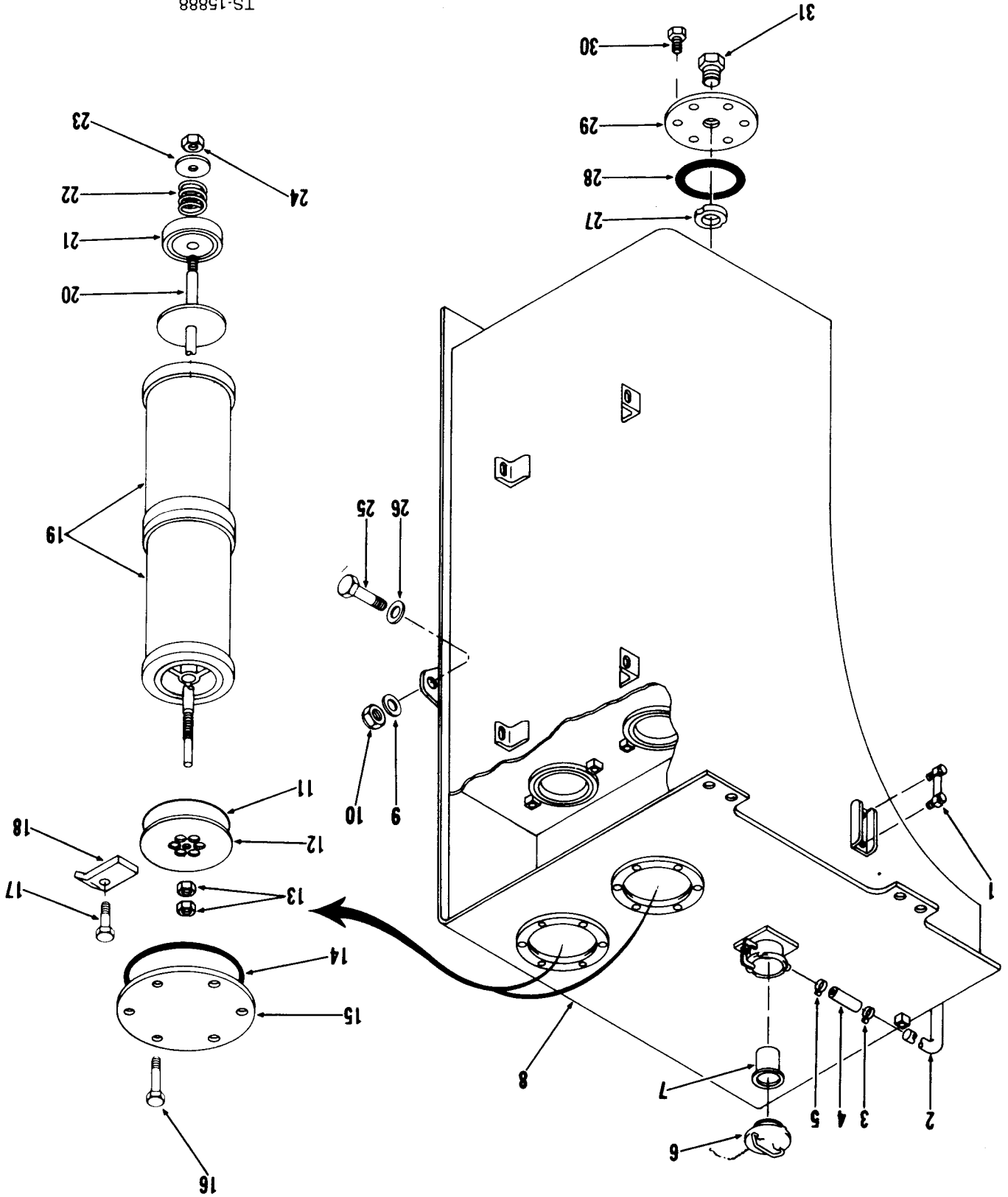
1 - 86D6	Nut
1 - 2525186	Retainer
1 - 2525197	Rod
1 - 2525184	Plate
2 - 64D8	Nut
1 - 25K60624	O-ring
1 - 25K40808	O-ring

INSTALLATION:

1. Put the machine on a level surface.
2. Put the machine in the 'SERVICE' position: Bucket on the ground, parking brake applied, engine stopped, ignition key removed, red warning flag on steering wheel, safety link connected, wheels blocked.
3.  Let the machine become cool. Remove the hydraulic reservoir cap **slowly** or push the manual override on the pressure relief valve, until the pressure is out of the reservoir.
4. Remove the cap from the hydraulic reservoir filter assembly(s).
5. Remove the filter assembly(s) from the reservoir. See Figure 1 - 5 and discard the parts listed. Keep all the other parts for reuse.
6. See Figure 6 and put the filter assembly together, using the new parts as shown.
7. See Figure 7 for the correct tightening of the nuts.
8. Install the filter assembly into the reservoir. Install the cap on the reservoir.
9. Remove the warning flag from steering wheel. Disconnect safety link. Remove blocks from wheels.

For machines with S/N:
427D and 438D
Discard Items 11, 12, 13, 20, 21 and 24

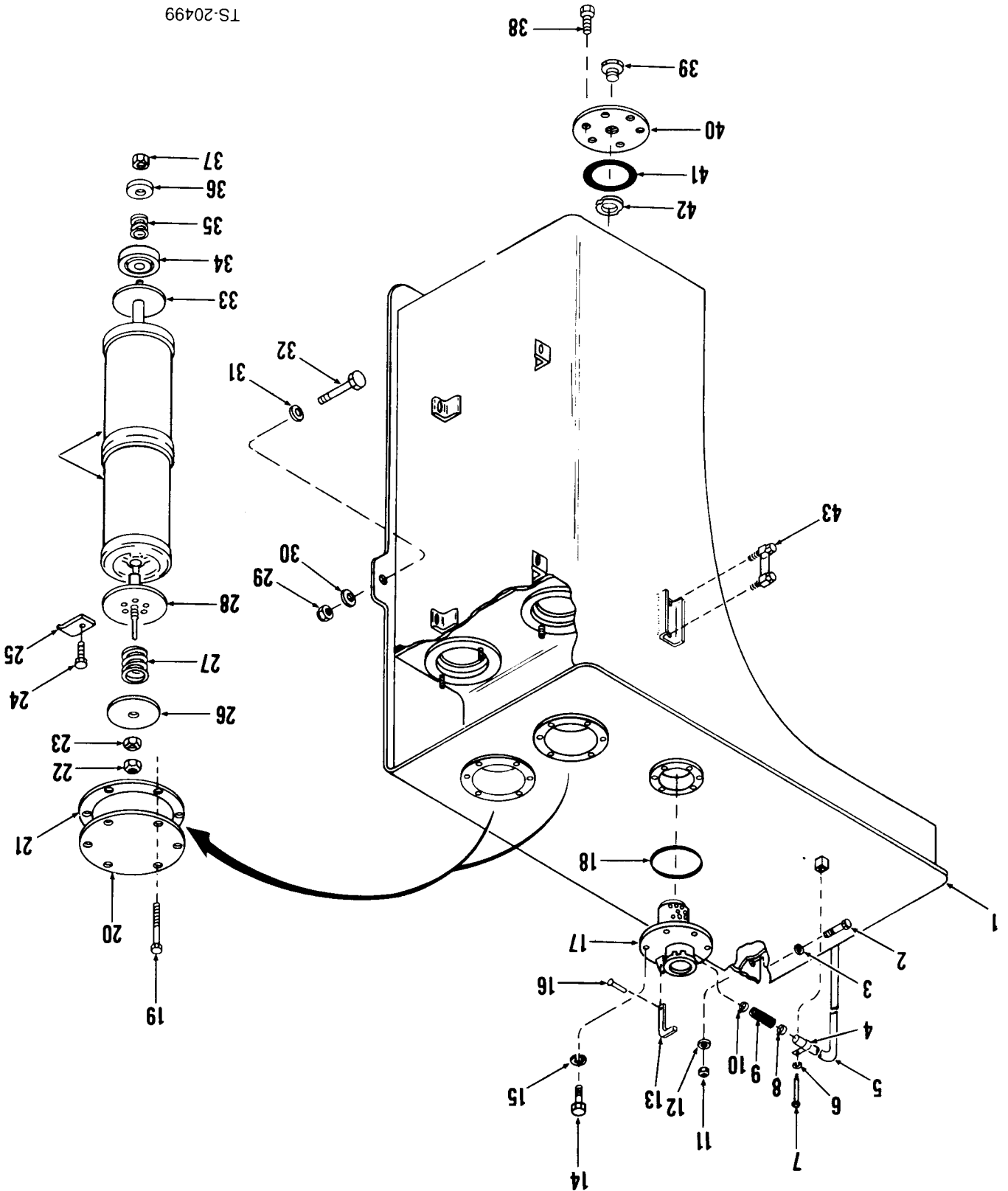
TS-15888



Discard Items 21, 22, 23, 28, 33, 34 and 37

For machines with S/N:
482B

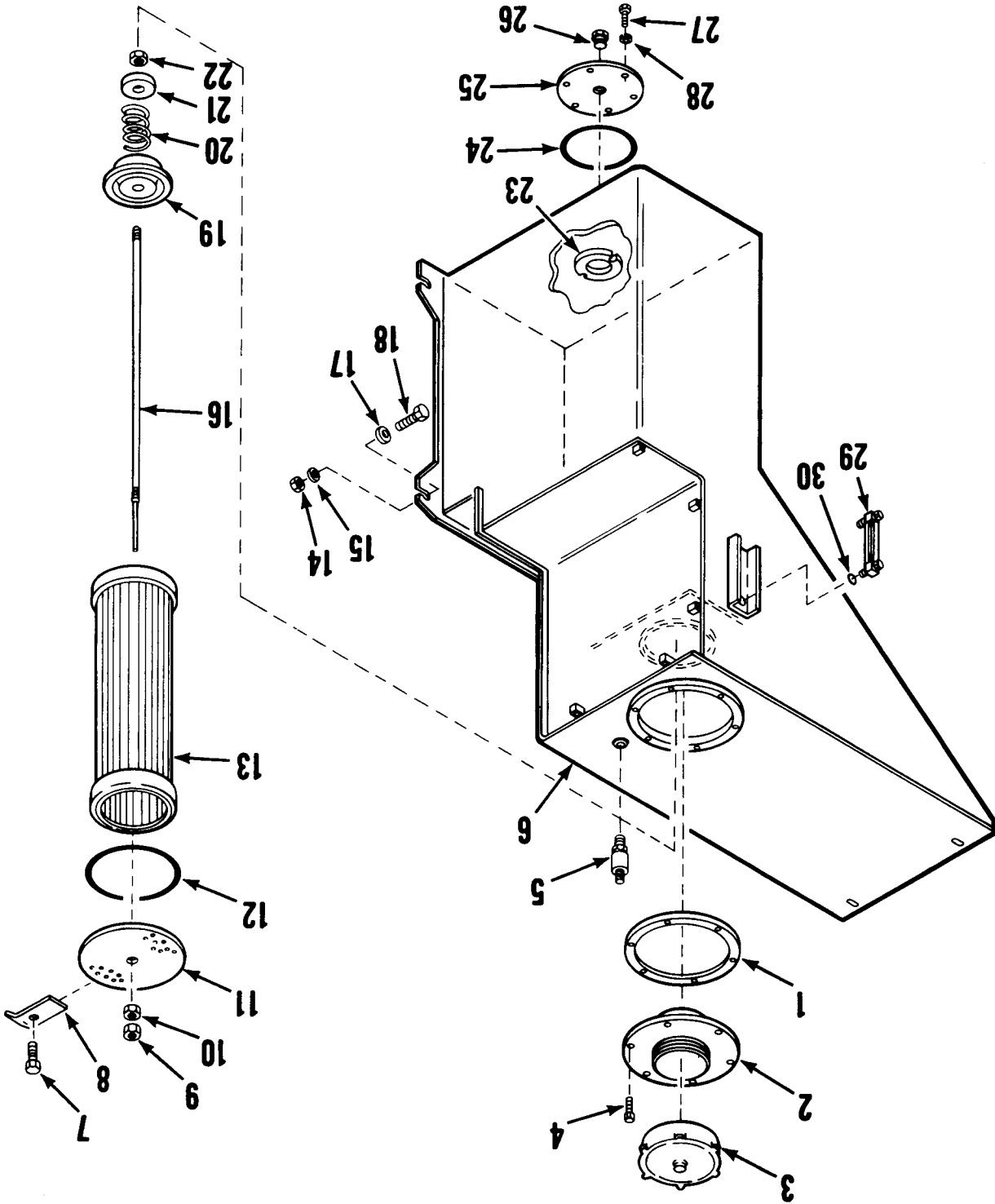
TS-20499



For machines with S/N:
494A and 495A

Discard items 1, 9, 10, 11, 12, 16, 19 and 22

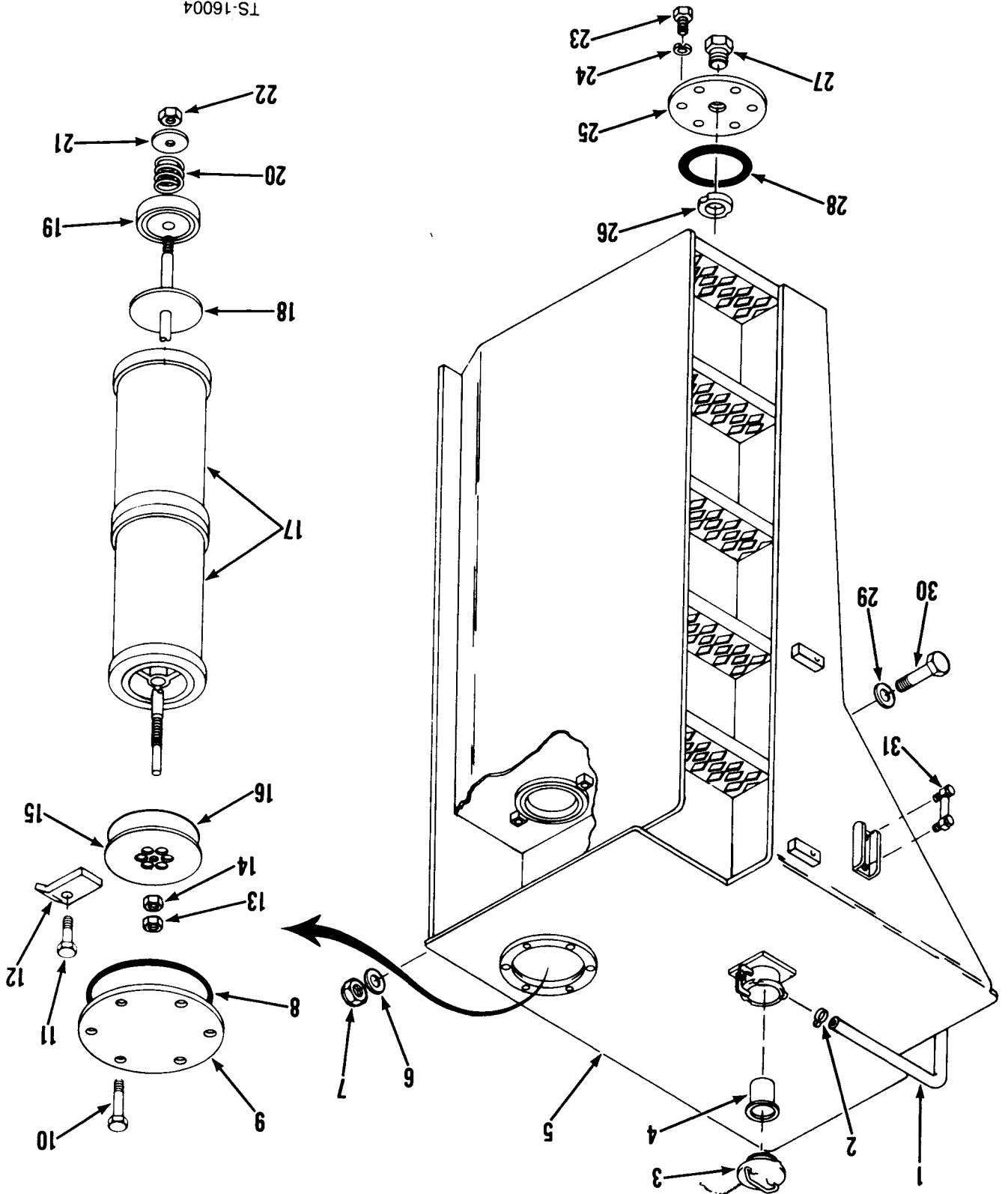
TS-20715



Discard items 8, 13, 14, 15, 16, 18, 19 and 22

For machines with S/N:
490A and 491A

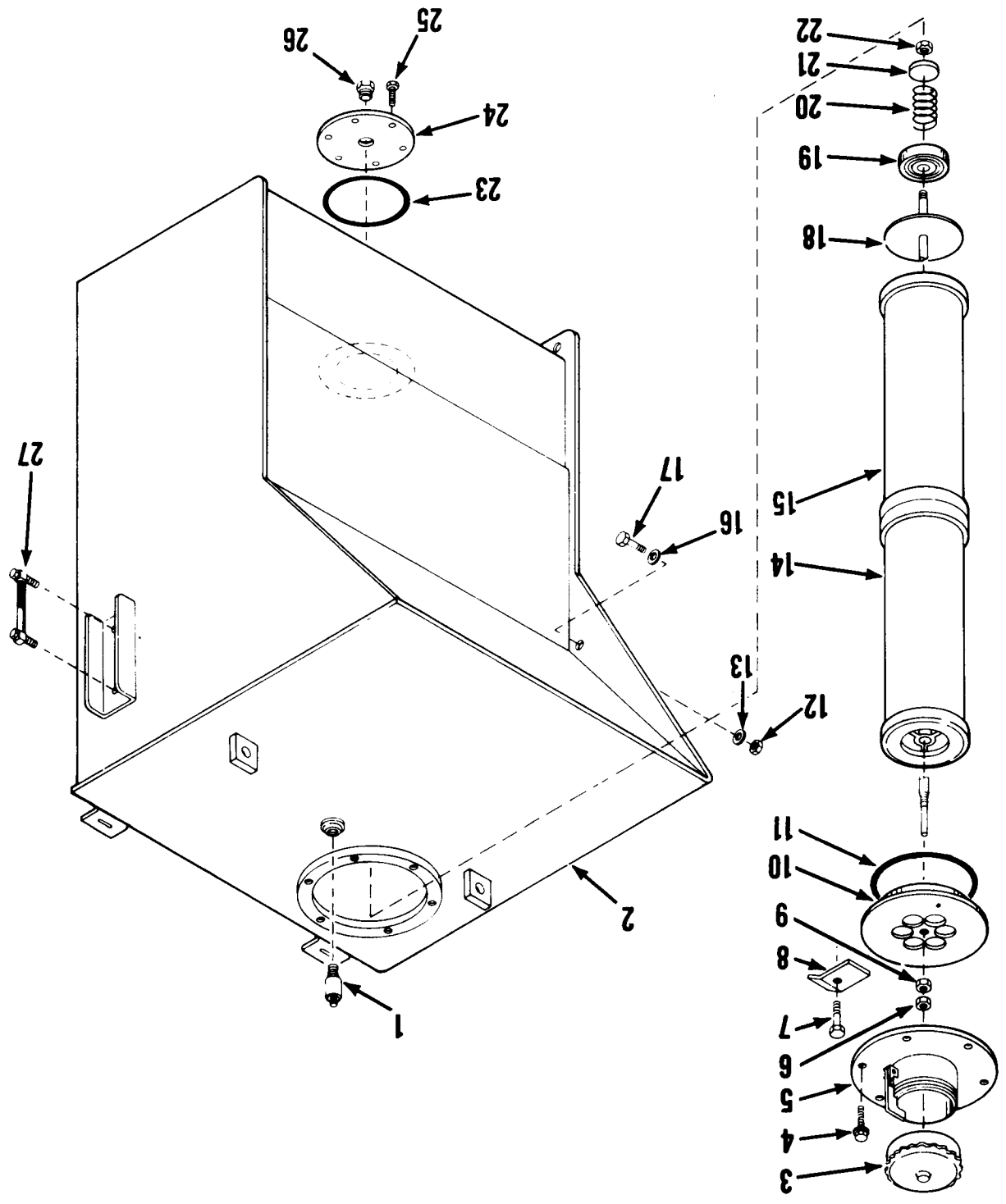
TS-16004



Discard items 6, 9, 10, 11, 18, 19 and 22

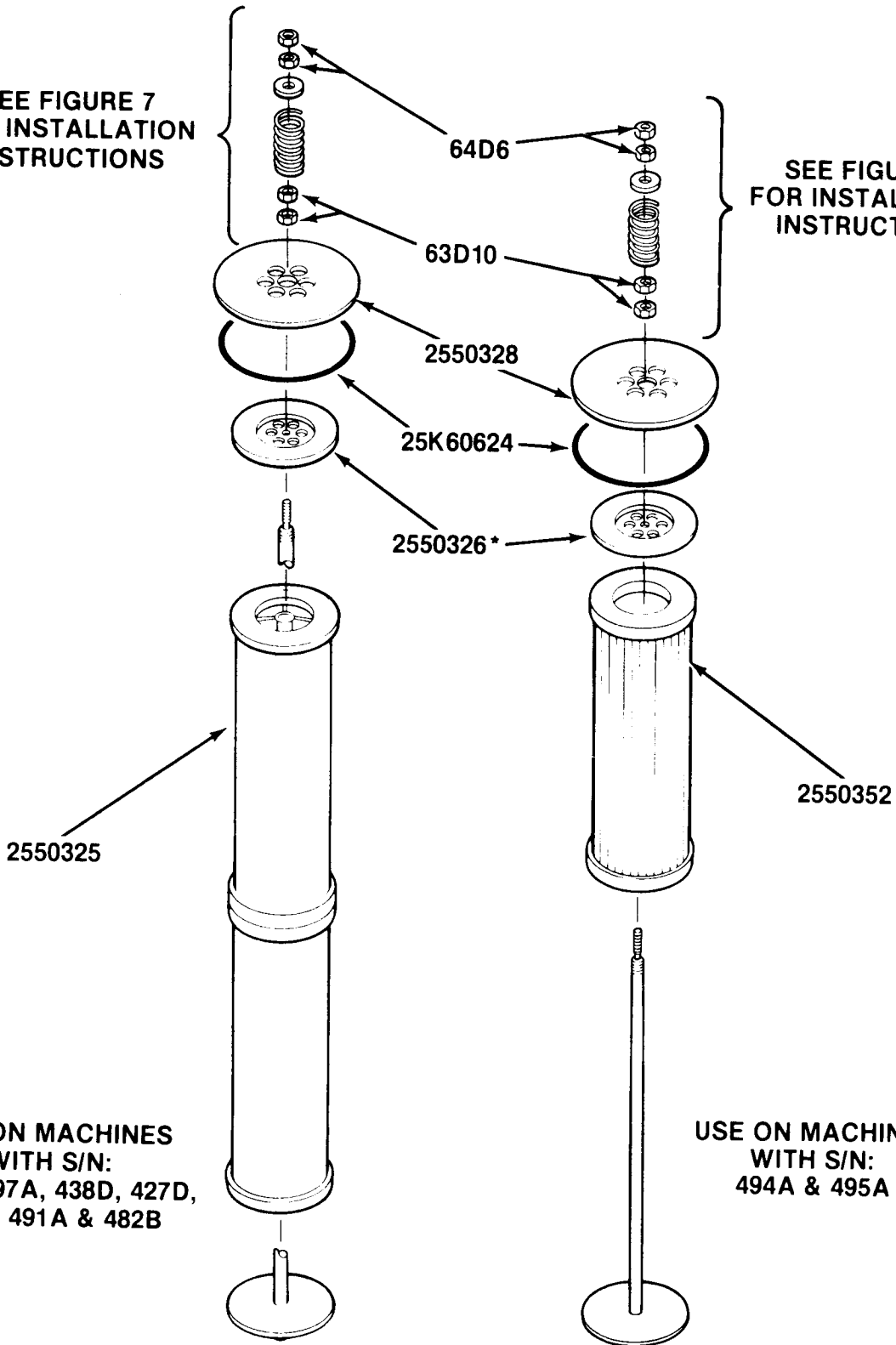
For machines with S/N:
496A and 497A

TS-20644



SEE FIGURE 7
FOR INSTALLATION
INSTRUCTIONS

SEE FIGURE 7
FOR INSTALLATION
INSTRUCTIONS

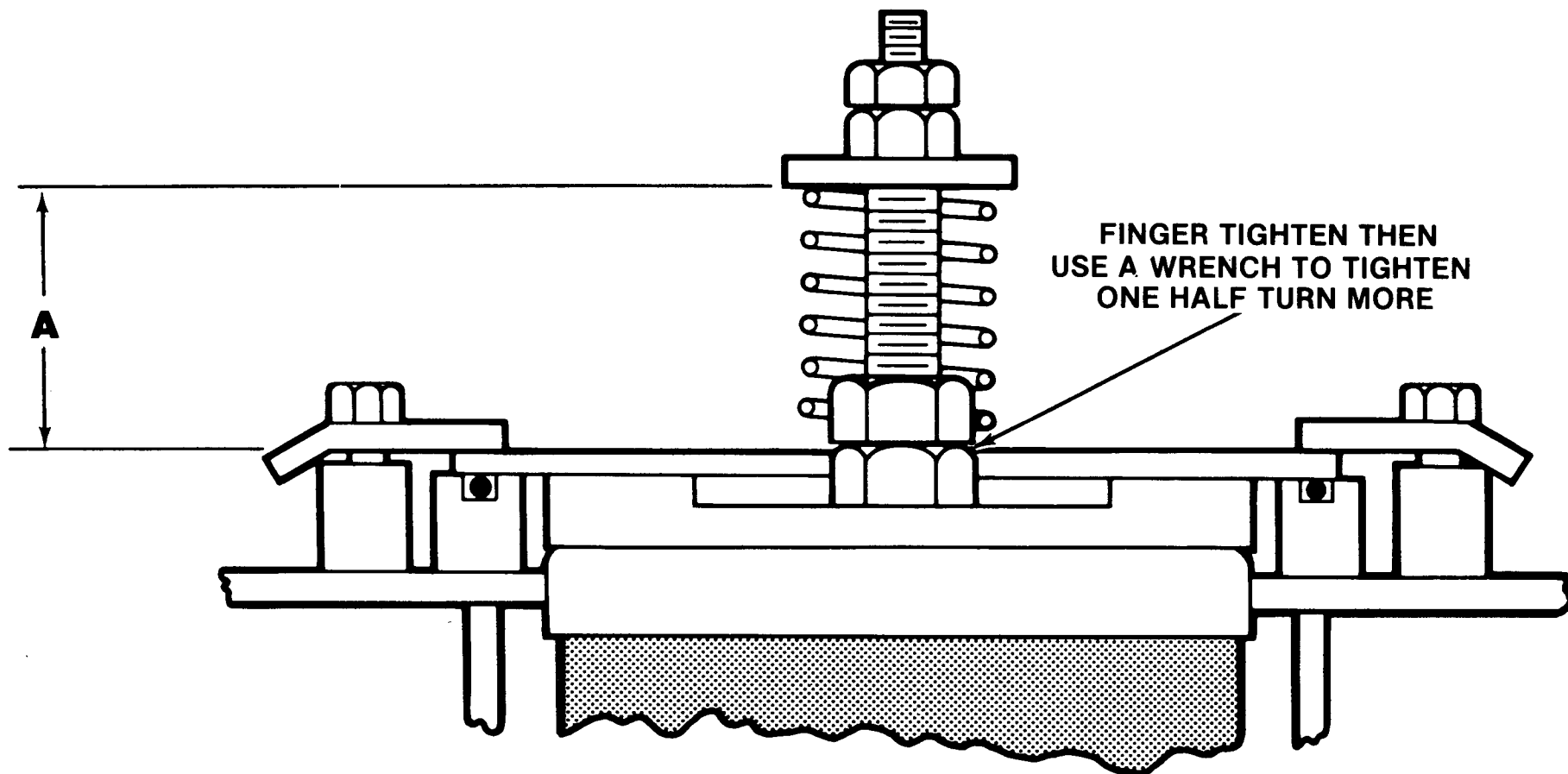


USE ON MACHINES
WITH S/N:
496A, 497A, 438D, 427D,
490A, 491A & 482B

USE ON MACHINES
WITH S/N:
494A & 495A

*BE SURE TO INSTALL WITH THE COUNTERBORE FACING THE TOP.

TS-21558



FINGER TIGHTEN THEN
USE A WRENCH TO TIGHTEN
ONE HALF TURN MORE

Figure 7
-9-
(12B23)

MACHINES WITH S/N	"A" in. (mm)
494A & 495A	2.20(55,9)
427D, 438D, 482D, 490A, 491A, 496A, 497A	2.16(54,9)

