ALAMO INDUSTRIAL

Axtreme™

BOOM ARM MOWER

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SERVICE MANUAL

An Operator's Manual was shipped with the equipment in the Manual Canister. This Operator's Manual is an integral part of the safe operation of this machine and must be maintained with the unit at all times. READ, UNDERSTAND, and FOLLOW the Safety and Operation Instructions contained in this manual before operating the equipment. If the Operator's Manual is not with the equipment, contact your dealer or Alamo Industrial (830-379-1480) to obtain a Free copy before operating the equipment.

ATTENCIÓN!

Si No Lee Ingles, Pida Ayuda a Alguien Que Si Lo Lea Para Que le Traduzca las Medidas de Seguridad.

LEA EL INSTRUCTIVO

ALAMO INDUSTRIAL
1502 E. Walnut
Seguin, Texas 78155
830-379-1480

MEMBER OF THE ALAMO GROUP
ALWAYS ON THE CUTTING EDGE.

TO THE OWNER/OPERATOR/DEALER

All implements with moving parts are potentially hazardous. There is no substitute for a cautious, safe-minded operator who recognizes the potential hazards and follows reasonable safety practices. The manufacturer has designed this implement to be used with all its safety equipment properly attached to minimize the chance of accidents.

BEFORE YOU START!! Read the safety messages on the implement and shown in your manual. Observe the rules of safety and common sense!

WARRANTY INFORMATION:

Read and understand the complete Warranty Statement found in this Manual. Fill out the Warranty Registration Form in full and return it to within 30 Days. Make certain the Serial Number of the Machine is recorded on the Warranty Card and on the Warranty Form that you retain.

INTRODUCTION

ABOUT THIS MANUAL:

The intent of this publications to provide the competent technician with the information necessary to perform the CORRECT repairs to the Alamo Industrial Product. This will, in turn provide for complete customer satisfaction

It is hoped that the information contained in this and other Manuals will provide enough detail to eliminate the need for contact of the Alamo Industrial Technical Service Dept. However, it should be understood that many instances may arrive wherein correspondence with the Manufacturer is necessary.

CONTACTING MANUFACTURER: (Please help us Help You! Before You Call!)

Alamo Industrial Service Staff Members are dedicated to helping you solve yours or your customer's service problem as quickly and efficiently as possible. Unfortunately, we receive entirely to many calls with only a minimum amount of information. In some cases, the correspondent has never gone out to look at the equipment and merely calls inquiring of the problems described to him by the operator or customer.

PART NUMBERS: Part numbers listed in this manual are subject to change without notice as designs are made to adapter to the tractor or for a design improvement. Before ordering parts ALWAYS Measure old part to make certain that is the one you will need. This manual is designed to be used along with the Parts and Operators Manual. Most calls received by Alamo Industrial Service can be classified into approx. 6 general categories.

1. Hydraulic or Mechanical Trouble Shooting.
2. Request for Technical Information or Specifications.
3. Mounting or Fitting Problem.
4. Special Service Problem.
5. Equipment Application Problems.
6. Tractor Problem Inquiries.

HOW YOU CAN HELP:

1. Make sure the call is necessary! Most of the calls received may not be necessary if the Dealer Service Technician would do the following.

2. Check the Service Information at your Dealership provided by Alamo Industrial, This would include, Service Bulletins, Information Bulletins, Parts Manuals, Operators Manuals or Service Manuals, many of these are available via the Alamo Industrial Internet site (Alamo - Industrial. Com). Attempt to diagnose or repair problem before calling.

3. If a call to Alamo Industrial is needed, Certain Information should be available and ready for the Alamo Industrial Service Staff. Such information as, Machine Model, Serial Number, Your Dealer Name, Your Account Number and Any other information that will be useful. This information is vital for the development of a prompt and correct solution to the problem. This will also help to develop a database of problems and related solutions, which will expedite a solution to future problems of a similar nature.

4. The technician may be asked to provide detailed information about the problem including the results of any required trouble shooting techniques. If the information is not available, The technician may be asked to get the information and call back. Most recommendations for repairs will be based on the procedures listed in the Service Manual / Trouble Shooting Guide.

CONTACT ALAMO INDUSTRIAL:

Alamo Industrial, 1502 E. Walnut St. Seguin TX. 78155,
Technical Service Dept. PH: 830-379-1480

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NOTES

Section 1

Axtreme Boom

Model Specifications

SPECIFICATIONS - AXTREME BOOM

READ THIS BEFORE BEGINNING ASSEMBLY:

The Axtreme Boom has electronic components:. The electronic components can be damaged if care is not taken when performing repairs, testing and/or during assembly.

DO NOT

1. ***DO NOT*** short any wires across or allow them to be shorted out.
2. ***DO NOT*** attempt to jump across any wires or supply them with alternate power source.
3. ***DO NOT*** install higher rated fuses than are recommended by manufacturer.
4. ***DO NOT*** do any welding on unit unless the computer modules are unplugged first, this is to prevent a power surge going into modules (THIS IS VERY IMPORTANT). This could also apply to the tractor components. Check Tractors repair guide for specific instruction about tractor model and type.
5. ***DO NOT*** attempt to repair or adjust a component that is not intended to be repaired, example sealed components as there are no serviceable components inside.
6. ***DO NOT*** let anyone attempt any testing or repairs unless they are an experienced and qualified technician. Technicians must have proper tools, gauges, meters etc. to perform proper diagnosis and/or repairs.
7. ***DO NOT*** perform any assembly or repairs with dirty tools or in dirty work area. When working on hydraulic components keeping system clean and free of contamination is important.
8. ***DO NOT*** start or engage system if the oil level is not at the proper level or condition. Never start or run unit low or out of oil.
9. ***DO NOT*** install / add any oil unless you know it is the correct type and the container is clean. Make certain the oil is not contaminated with dirt or any liquid.

1. Pump Specifications:

Body Construction	Cast Iron
Control Valve Type	Direct Acting, Pilot Operated
Control Valve Relief	3000 PSI
Driveshaft Type	1" X 15 Spline
Driveshaft Torque Rating	371 ft. lbs.
Pressure Rating (Maximum)	3000 PSI
Pump Type	Gear
Pump Gear Width	2 inch
Pump Efficency Flow Rate (Approx)	85 % of G.P.M. is Acceptable
Speed Rating (Maximum)	2400 RPM
Nominal Displacement (Per Revolution)	5.1 Cu. In.
Output @ 1800 RPM.(Operating RPM)	37.5 G.P.M.
Output @ 2400 RPM.(Maximum RPM)	51 G.P.M.
Horsepower Rating (Maximum Conditions)	90 HP
Rotation Direction (Viewed from Top of Deck	Clockwise
Motor Start / Stop Time	6 Seconds (Approx)
Tank Capacity Required	17.5Gallons
Oil Type	See Oil Chart
Oil Temperature (While Operating)	70 Deg, (F) Above Ambient

SPECIFICATIONS - AXTREME BOOM

2. Fifty Inch (50") Cutting Head Specifications:

Blade / Motor Rotation (Looking down from Top of Deck)	Clockwise
Blade Tip Speed	18,850 FPM / 210 MPH
Blade carrier Type	Pan or 3 Leaf bar Option
Blade Pan Blade Qty	2 Blade or 3 Blade Option
Blade Bar Blade Qty	2 Blades
Blade Cutting Width (Overall)	50 inches.
Deck Construction	Formed and Welded Steel
Deck Material	10 Gauge
Deck Weight	725 lbs.
Spindle	4.5" by 9" Heat Treated Alloy
Spindle Bearing	Tapered Roller Bearings
Spindle Lubrication	Grease (Pumped In)
Motor Type	Gear
Motor Gear Width	2-1/2"
Motor Speed (Maximum)	2400 RPM
Motor Pressure (Maximum)	3000 PSI
Motor Rated Pressure	3000 PSI
Motor Rated Flow	38 GPM
Motor Displacement	6.375 Cu. Inches

3. Sixty Inch (60") Rotary Mower Head:

Blade / Motor Rotation (Looking down from Top of Deck)	Clockwise
Blade Tip Speed	18,000 FPM / 205 MPH
Blade Carrier Type	2 Leaf bar Option
Blade Bar Blade Qty	2 Blades
Blade Cutting Width (Overall)	60 inches.
Deck Construction	Formed and Welded Steel
Deck Material	10 Gauge
Deck Weight	818 lbs.
Spindle	4.5" by 9" Heat Treated Alloy
Spindle Bearing	Tapered Roller Bearings
Spindle Lubrication	Grease (Pumped In)
Motor Type	Gear
Motor Gear Width	2.25"
Motor Speed (Maximum)	2500 RPM
Motor Pressure (Maximum)	3250 PSI
Motor Rated Pressure	3000 PSI
Motor Rated Flow	38 GPM
Motor Displacement	8.1 Cu. Inches

4. Rotary Head Torque Specification:

Motor to Spindle Housing	100 ft. lbs.
SPindle to Deck	425 ft. lbs.
Spindle Bearing Pre-Load	25 in. lbs. Rolling Torque
Blade Bar Leaf Bars. (1-1/4" Bolts)	2000 ft. lbs.
Blade Bolts	400 ft. lbs.
Blade Bar to Spindle	400 ft. lbs.

SPECIFICATIONS - AXTREME BOOM

5. Control Valve: 5 Spool used with Rotary Heads w/ Door

Valve Type	Open Center 5 Spool
Valve Control (Manual Standard)	Remote Cable Control
Valve Control (Electonic Joystick Optional)	Joystick Electronic Control
Pressure (Maximum)	3500 PSI
Flow (Maximum)	20 GPM
Main Relief	Direct Acting: 3000 PSI: Adjustable
FilterType	Return Side
Filter Size	10 Micron
Bushings	Greasable Steel

6. Valve Ports: (See Figure 1 & 2)

"A" Port..... Valve Ports designated as "A" Ports connect to the Rod End of the Swing and Lift Cyl, to the Barrel End of the Dipper Cyl, to the Barrel End of Tilt Cyl and to Barrel End of the Door Cyl.

"B" Port..... Valve Ports designated as "B" Ports connect to the Barrel End of Swing and Lift Cyl, to the Rod End of the Dipper Cyl, to the Rod End of the Tilt Cyl and to the Rod End of the Door Cyl.

Mechanical Remote Cable Controled Valve (Standard)

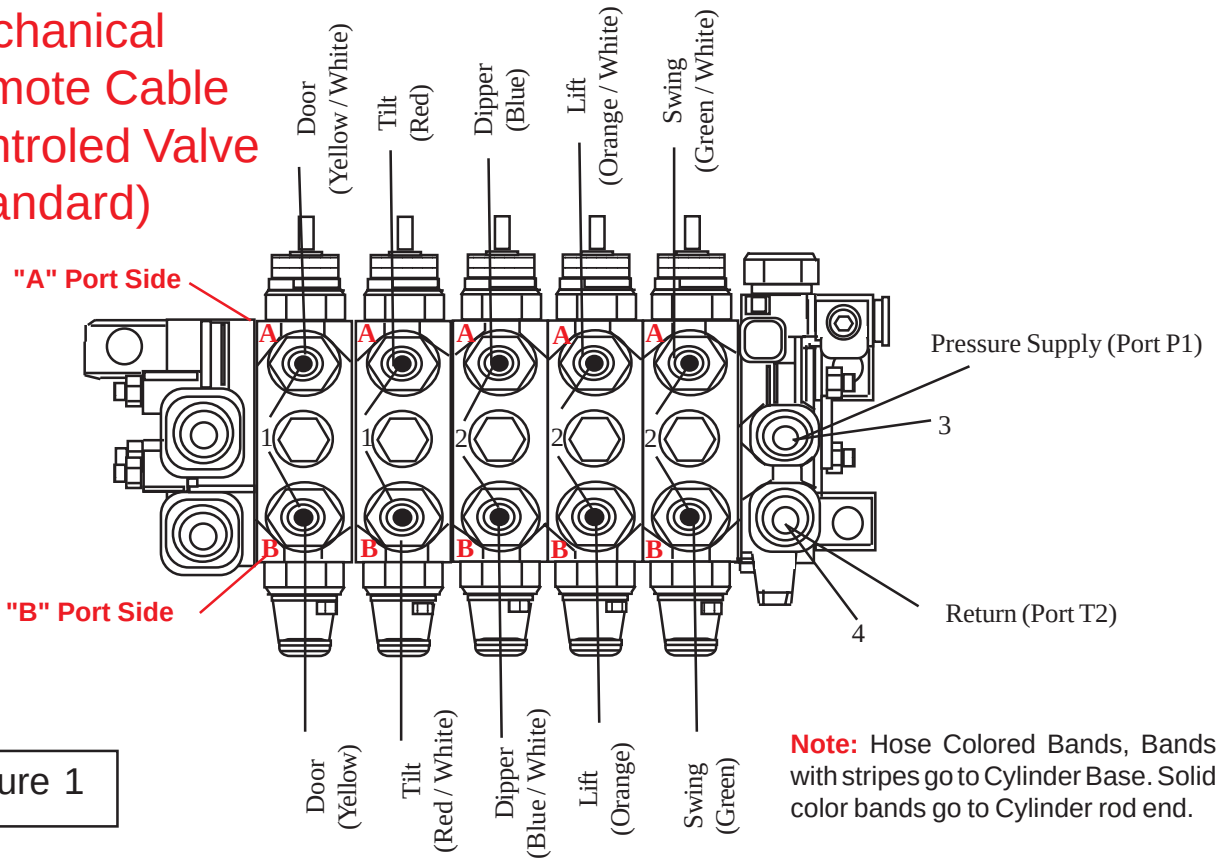


Figure 1

Note: Hose Colored Bands, Bands with stripes go to Cylinder Base. Solid color bands go to Cylinder rod end.

Joystick Electronic Controled Valve (Optional)

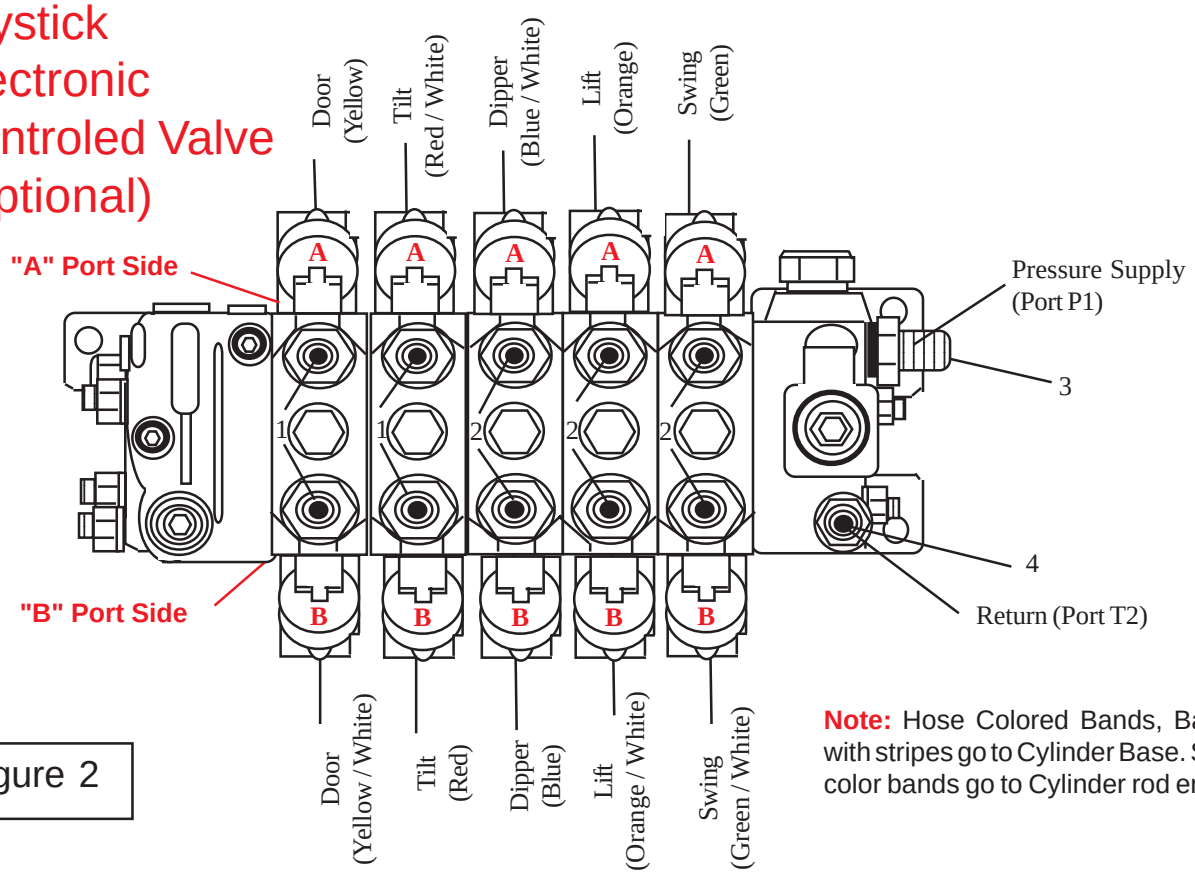


Figure 2

Note: Hose Colored Bands, Bands with stripes go to Cylinder Base. Solid color bands go to Cylinder rod end.

7. Valve Sections Function:

Mechanical Control Vale (See Figure 1)

Spool	Cylinder	Function "B"	Function "A"	Pressure "A"	Pressure "B"
1	Swing	Back	Forward	2750 PSI	2750 PSI
2	Lift	Up	Down	2750 PSI	1160PSI
3	Dipper	Out	In	2750 PSI	1160PSI
4	Tilt	Up	Down 2750 PSI	Main Relief	Main Relief
5	Door	In-Open	Out-Closed	Main Relief	Main Relief

Electronic Control Vale (See Figure 2)

Spool	Cylinder	Function "B"	Function "A"	Pressure "A"	Pressure "B"
1	Swing	Back	Forward	2750 PSI	2750 PSI
2	Lift	Up	Down	1160 PSI	2750 PSI
3	Dipper	Out	In	1160 PSI	2750 PSI
4	Tilt	Up	Down	2750 PSI	Main Relief
5	Door	In-Open	Out-Closed	2750 PSI	2750 PSI

BOOM HYD HOSE CONNECTIONS

8. Hyd Hose Codes at Control Valve & Head Swivel Divertor Valve Option

Hydraulic Hose Band Mark Color Codes: Hose's and/or fittings are marked with a Color Coded Plastic Band around it. Some Bands are a solid Color and some are Colored with a Stripe. The purpose of the colored bands are to provide a quick reference for hose and port connection. A metal band is also attached to the hose, on that band is an Alamo Industrial Part Number for reference if needing a replacement hose. **Always Check Hose Size, Color Code & Part No. when ordering parts.**

Boom Cylinder Circuit Hoses: Mechanical Cable Controlled Valve (Std)

Color Tie	(Code)	Hose Size	Port	Diverter	Hyd. Function
Green	G	SAE # 6	A	---	Swing, Back (Rod End)
Green / White	G/W	SAE # 6	B	---	Swing, Forward (Base End)
Orange	OR	SAE # 6	A	---	Lift, Down (Rod End)
Orange / White	OR/W	SAE # 6	B	---	Lift, Up (Base End)
Blue	B	SAE # 6	A	---	Dipper, In (Rod End)
Blue / White	B/W	SAE # 6	B	---	Dipper, Out (Base End)
Red	R	SAE # 6	B	---	Head Tilt, Up (Rod End)
Red / White	R/W	SAE # 6	A	---	Head Tilt, Down (Base End)
Yellow	Y	SAE# 4	B	---	*Door, Open, (Rod End) (* See Option)
Yellow/White	Y/W	SAE# 4	A	---	*Door, Closed, (Base End (* See Option

*** Connections w/ Swivel Head / Diverter Valve Option (Connects to Door Valve section)**

Green	G	SAE # 4	A	P2	Control Valve tor Diverter valve
Green / White	G/W	SAE # 4	B	P1	Control Valve to Diverter Valve
Green	G	SAE # 4	---	C4	Swivel, CW (Rod End)
Green / White	G/W	SAE # 4	---	C1	Swivel, CCW (Base End)
Yellow	Y	SAE # 4	---	C3	Door, Open (Rod End)
Yellow / White	Y/W	SAE # 4	--	C2	Door, Closed (Base End)
Orange	OR	SAE#12	T	---	Valve Return To Tank
Red	R	SAE#12	P	--	Pressure to Valve.

Boom Cylinder Circuit Hoses: Electrical Joystick Controlled Valve (Option)

Color Tie	(Code)	Hose Size	Port	Diverter	Hyd. Function
Green	G	SAE # 6	A	---	Swing, Back (Rod End)
Green / White	G/W	SAE # 6	B	---	Swing, Forward (Base End)
Orange	OR	SAE # 6	A	---	Lift, Down (Rod End)
Orange / White	OR/W	SAE # 6	B	---	Lift, Up (Base End)
Blue	B	SAE # 6	B	---	Dipper, In (Rod End)
Blue / White	B/W	SAE # 6	A	---	Dipper, Out (Base End)
Red	R	SAE # 6	B	---	Head Tilt, Up (Rod End)
Red / White	R/W	SAE # 6	A	---	Head Tilt, Down (Base End)
Yellow	Y	SAE# 4	A	---	*Door, Open, (Rod End) (* See Option)
Yellow/White	Y/W	SAE# 4	B	---	*Door, Closed, (Base End (* See Option

*** Connections w/ Swivel Head / Diverter Valve Option (Connects to Door Valve section)**

Green	G	SAE # 4	A	P1	Control Valve to Diverter Valve
Green / White	G/W	SAE # 4	B	P2	Control Valve to Diverter Valve
Green	G	SAE # 4	---	C4	Swivel, CW (Rod End)
Green / White	G/W	SAE # 4	---	C1	Swivel, CCW (Base End)
Yellow	Y	SAE # 4	---	C3	Door, Open (Rod End)
Yellow / White	Y/W	SAE # 4	--	C2	Door, Closed (Base End)
Orange	OR	SAE#12	T	---	Valve Return To Tank
Red	R	SAE#12	P	--	Pressure to Valve.

9. Hose End Fitting Torque Specification:

Hose End Type: 37 Degree Angle End Steel Hose End Fittings*

Dash Size	Nominal Cyl. Size (in.)	Torque in. lbs.	Torque ft .lbs.
-4	1/4"	140	12
-6	3/8"	230	19
-8	1/2"	450	38
-10	5/8"	650	54
-12	3/4"	900	75
-16	1"	1200	100
-20	1-1/4"	1600	133
-24	1-1/2"	2000	167
-32	2"	2800	233

* Straight Threads do not always seal better when higher torgues are used. Too much torque causes distortion and may lead to leakage. DO NOT over torque fittings and DO NOT allow any contaminants to enter system through fittings when installing them.

10. TORQUE VALUES - BOLTS:

Maximum Torque per Bolt Size and Grade, Ft lbs & (Nm)

IMPORTANT! Listed below IS BOLT TORQUE and NOT APPLICATION TORQUE, Component Application Torque will vary dependimg on what is bolted down and the type material (Metal) that is being bolted together. Thread condition and lubrication will vary Torque settings.

Inche Sizes

Bolt Dia. inch	2 (B) Plain Head	5 (D) 3 Dashes	8 (F) 6 Dashes
1/4	Not Used	10 (14)	14 (19)
5/16	Not Used	20 (27)	30 (41)
3/8	Not Used	35 (47)	50 (68)
7/16	35 (47)	55 (75)	80 (108)
1/2	55 (75)	85 (115)	120 (163)
9/16	75 (102)	130 (176)	175 (230)
5/8	105 (142)	170 (230)	240 (325)
3/4	185 (251)	300 (407)	425 (576)
7/8	160 (217)	445 (603)	685 (929)
1	250 (339)	670 (908)	1030 (1396)
1-1/8	330 (447)	910 (1234)	1460 (1979)
1-1/4	480 (651)	1250 (1695)	2060 (2793)

ALWAYS CHECK MARKINGS ON TOP OF BOLT HEAD OR OTHER BOLT DESCRIP-TIONS

Metric Sizes

Bolt Dia. mm	4.8	8.8	10.8
6	5	7	12
8	11	20	25
10	20	40	58
12	37	70	105
14	60	100	140
16	92	155	200
18	118	216	280
20	160	270	355
22	215	330	430
24	285	500	700
27	450	875	1000
30	600	1200	1700
33	800	1600	2300
36	900	2100	3000

SPECIFICATIONS - AXTREME BOOM

Recommended Start-up procedure for New or Rebuilt Pump:

Before Installing a New or Rebuilt Pump

A. Connect your Flow Meter in Line to test Pressure as unit is started; this is in case the Relief Valve is malfunctioning or has been tampered with. If this is not done you could damage the replacement Pump because you would not Know it till Pump failed from excessive pressure.

B. Before connecting any lines to Pump, fill all Ports with clean Oil to provide initial Lubrication. This is especially important is Pump is located at a higher level than Oil Reservoir.

C. Check Oil level in reservoir, fill to full level if needed, Reservoir must have more Oil than the Pump GPM capacity.

D. After connecting the Lines and mounting the replacement Pump, make sure that Oil is not warmer than Pump temperature. If Oil is warmer than pump run Pump at short intervals till Pump and Oil temperature is equalized. Hot Oil must not be fed into cold Pump.

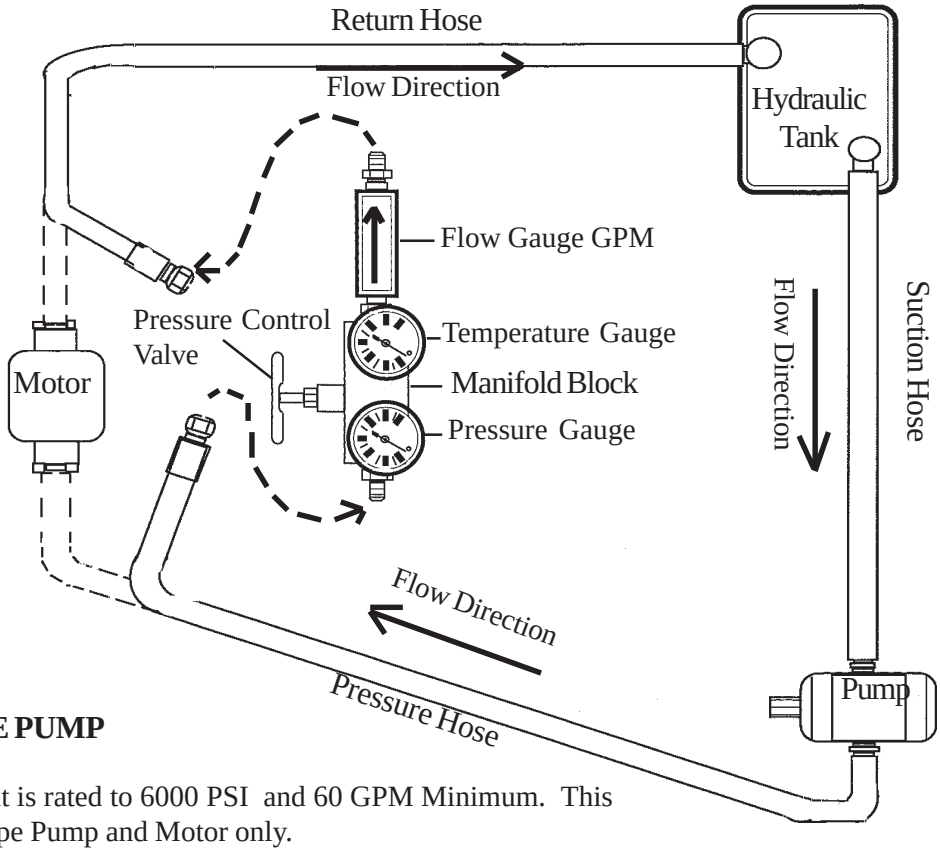
E. Operate the Pump for at least two minutes at no load and at low RPM (400 RPM min and 1400 RPM max.). Watch Flow Meter Pressure (or Pressure Gauge). During this break-in period, the unit should run free and not develop an excessive amount of heat. Heat should not exceed 100 deg F. above ambient Temperature. If the unit operates properly, speed and pressure can then be increased to normal operating settings. Increase Pressure in 500 Lbs. PSI increments from start, this should take 4 to 5 minutes to max. PSI allowing 1 minute between increases to check Oil Pressure and Temperature.

F. If normal Pressure and Heat readings are seen then the New or Rebuilt Pump installation should be done, remove Flow Meter (Pressure Gauge) from line, reconnect Line and check all connections.

Test Equpment Needed:

1. Flow Meter, The Flow meter should have components to measure:
   - A. Guage to Measure the Oil Temperature.
   - B. Gauge to Measure Oil Pressure PSI (Load and No Load).
   - C. Gauge to Measure Oil Flow in G.P.M.
   - D. A Valve to load system to check operating Pressure (PSI).
   - E. Assortment of Connections to connect to Hydraulic System.
2. Electrical Volt Meter with variable settings and Ohm Meter.
3. Electrical DC Volt Test Light.
4. Wrenches, Torque Wrench, Socket Wrenches, Open and Boxed End Wrenches.

TESTING GEAR PUMP W/ FLOW METER



FLOW TESTING THE PUMP

1. Use a Flow Meter that is rated to 6000 PSI and 60 GPM Minimum. This applies to the Gear type Pump and Motor only.
2. The area around the hoses, motor and flow meter must be clean of all debris and dirt. NO contamination can be allowed to enter the system. Make certain there is nothing in flow meter from previous use that will contaminate the system.
3. Disconnect Pressure and return hoses from Motor. Connect hoses to the flow meter as shown above.
4. Completely open the pressure control valve on flow meter.
5. Record all Reading during this test. Start system, run at 1800 Engine RPM (Pump Speed) until the Oil Temperature reaches at least 110° F. before starting test. Check flow (GPM) at 0 psi. or no load. Slowly close pressure control valve until pressure gauge reaches 500 psi. Record your readings, Pressure, Temperature and Flow (GPM). Continue this at 500 psi increments until a maximum of 2000 psi.
6. If Flow Rate @ 2000 psi. is greater than 85% of beginning flow rate at no load, pump is serviceable and functioning within specifications.

CAUTION ! Stop tractor engine if hydraulic fluid temperature reaches 220°F

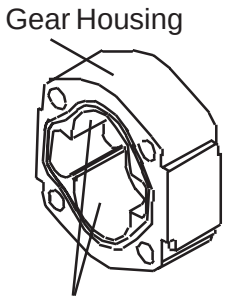
Recored Test Results

PSI	GPM	Temp ° F.	PSI	GPM	Temp ° F.
0	_____	_____	500	_____	_____
1000	_____	_____	1500	_____	_____
2000	_____	_____			

Wear Tolerance for Pump & Motor:

This is suggested Wear Tolerance to Keep Assemblies operating as efficient as possible, Not Complete failure rate.

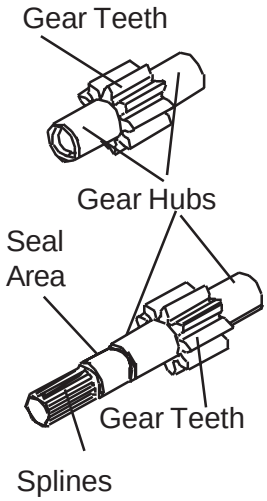
Gear Housing: Gear type Pump and Motor



Wear in excess of .007" cut-out necessitates replacement of the Gear Housing. Place a straight edge across the Bore in the cut out area. If you can slip a .007" feeler gage under the straight edge in the cutout area. Replace the Gear Housing.

Pressure pushes the Gears against the Housing on the Low-Pressure side. As the Hubs and Bushings wear, the cutout becomes more pronounced. Excessive cutout wear in short period of time indicates excessive pressure or Oil contamination. If the relief Valve Settings are within prescribed limits check for shock pressures or tampering. Withdraw Oil Samples and check it and tank for dirt. Where cut-out is moderate, 0.007" or less, gear housing is in good enough condition and may be reused, understand if you are at 0.007" you are at the upper limits and will not be at peak performance. A pump should always produce at least 85% efficiency (Example: if your Pump is rated at 37 GPM it should produce at least 32 GPM).

Gears:



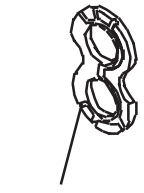
Any scoring on Gear Hubs necessitates Replacement. Scoring, Grooving or Burring of Outside diameter of Teeth requires replacement. Nicking, Grooving or Fretting of Teeth surfaces also necessitates replacement.

Drive Shaft: (with Built on Gear)

If Gear Teeth and Gear Hubs are OK, Inspect Splines on input end (OD) of Shaft and the Splines (ID) Output) Coupler End (Tandem Pump) for condition and Wear.

Inspect Wear or damage to Seal Wear Area. If damage at Seal are check for contamination. Note: Some Pumps and/or Motors may have Keyway or Splines. Either will have to be inspected for condition. If Damage in any of these area the Shaft / Gear will have to be replaced.

Thrust Plate:

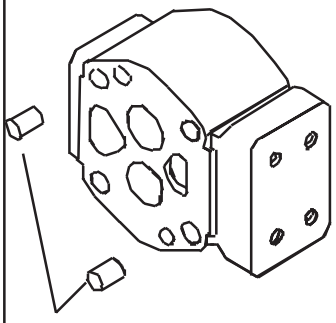


The Thrust Plate Seals the Gear Section at the sides of the Gears. Wear will allow internal slippage, which is Oil bypassing within the pump. The Pump and Motor Thrust Plates are different even though they may look very similar. They are built different. They will not interchange.

A Maximum of 0.002" wear is allowable. Replace Thrust Plates if they are scored, eroded or pitted. Wear can be checked usually by comparing thickness at outer edges with thickness at Gear contact area.

1. Check center of Thrust Plates where the Gears mesh. Erosion here indicates Oil contamination.
2. Pitted Thrust Plates indicate cavitation or Oil aeration.
3. Discolored Thrust Plates indicate overheating, probably insufficient Oil.

Wear Tolerance: Continued from Previous Page



Dowel Pins

Dowel Pins:

There are Dowel Pins and Dowel Pin Holes in each Pump or Motor Section; these are to align the components.

if either the Dowel Pin or the Hole is damaged, the Dowel or the Machined Casting and in some cases both must be replaced.

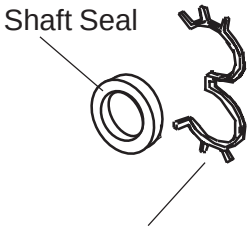
If more than reasonable force is required to seat dowels, the cause may be poorly deburred or dirty parts; cocking of Dowel Pins in the Hole; or improper Pin to Hole Fit. Dowel Pins are a snug fit and must remain that way; the four Retaining Studs will not keep components aligned without the Dowel Pins. Without the Dowel Pins or with improper fit of Dowel Pins, damage of components will occur from an alignment problem.

Bushing
(Bearing)

Bushing (Bearings):

These are the Bushings that keep the Gears aligned and in the proper operating position. If these wear it will cause damage to most of the other components; Thrust Plates, Gear Housing and Gears. A number of conditions can cause these to wear, so always check the fit on Gear Hubs for a good firm fit. Check the Fit of Bushings into Housings, it should have a heavy press fit.

If Gears are replaced the Bushings must also be replaced. Never use new Gears and old Bushings.



Seals and Gaskets:

There are Shaft Seals, Thrust Plate Channel Seals and Gasket Seals (O-Rings). All these Seals should always be replaced when Pump or Motor is reassembled.

The Shaft Seals are about the same on Pumps and Motors.

The Thrust Plate Channel Seals are different shapes from pump to motor (Pump Seal Shown to Left). But the function is the same, the Thrust Plate will have a groove machined into it, the Channel Seal will have a flat side and an angled side, the angle side must fit into this groove.

The gasket Seal is the Seal, which fits into the Groove, machined into the Gear Housing, it is usually square shaped and has the same curved shape as the groove in Housing. Must make sure groove is clean and Seal (O-Ring) is seated in groove during assembly.

Plug

Plugs: (Pumps Only)

Plugs should not have been remove unless the Pump Rotation was being reversed. If they were removed they were staked in, pieces of Metal could come off when they are removed. DO NOT remove the Plugs just to examine them, this only applies if you had to remove them.

Examine the Plug in the Shaft Mount Flange Housing End and the one in the Port End Cover. Make sure Plugs are tight and seated properly. Make sure there are no metal slivers from Plugs that could get into system.

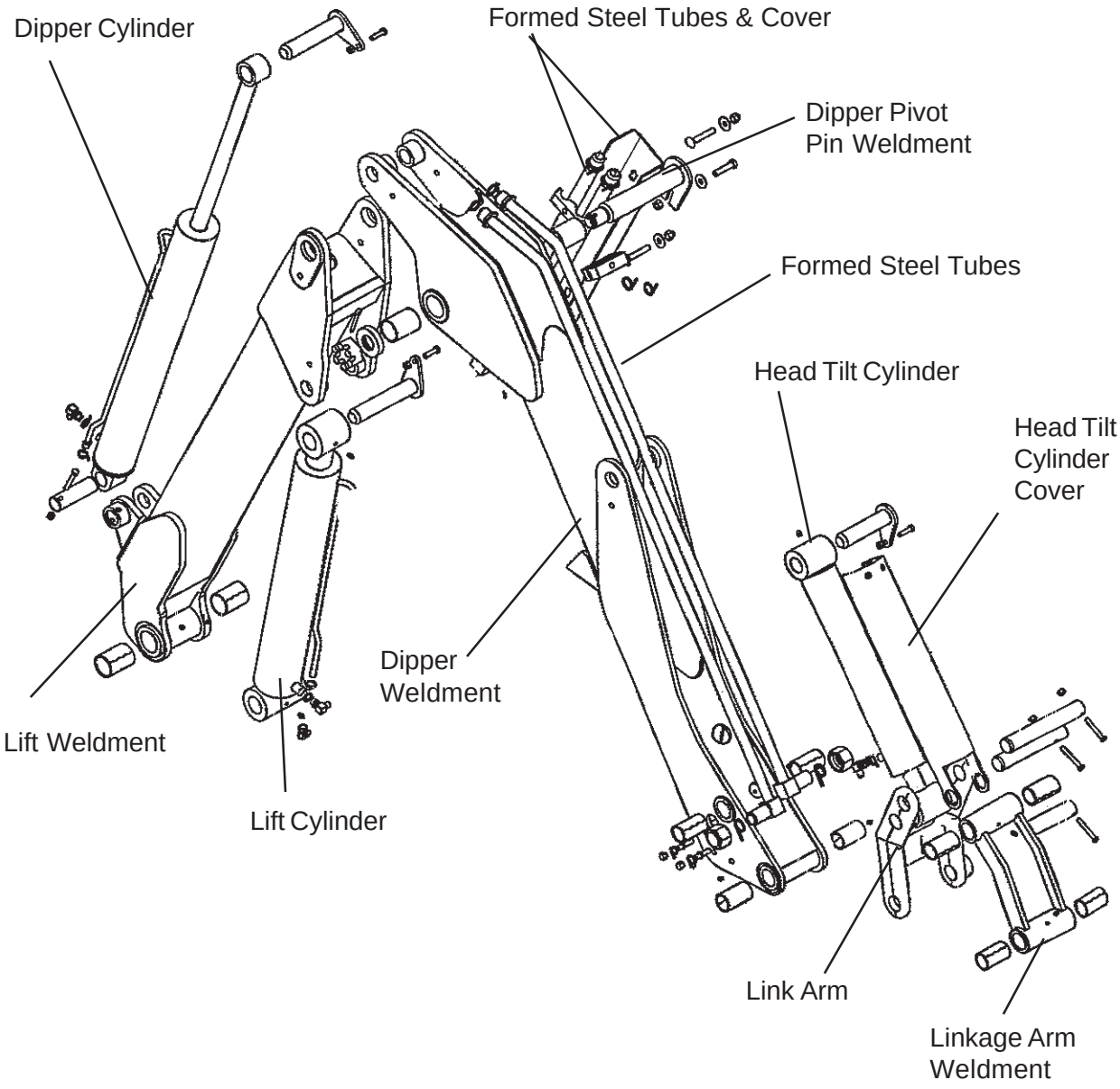
NOTES

Section 2

Axtreme Boom

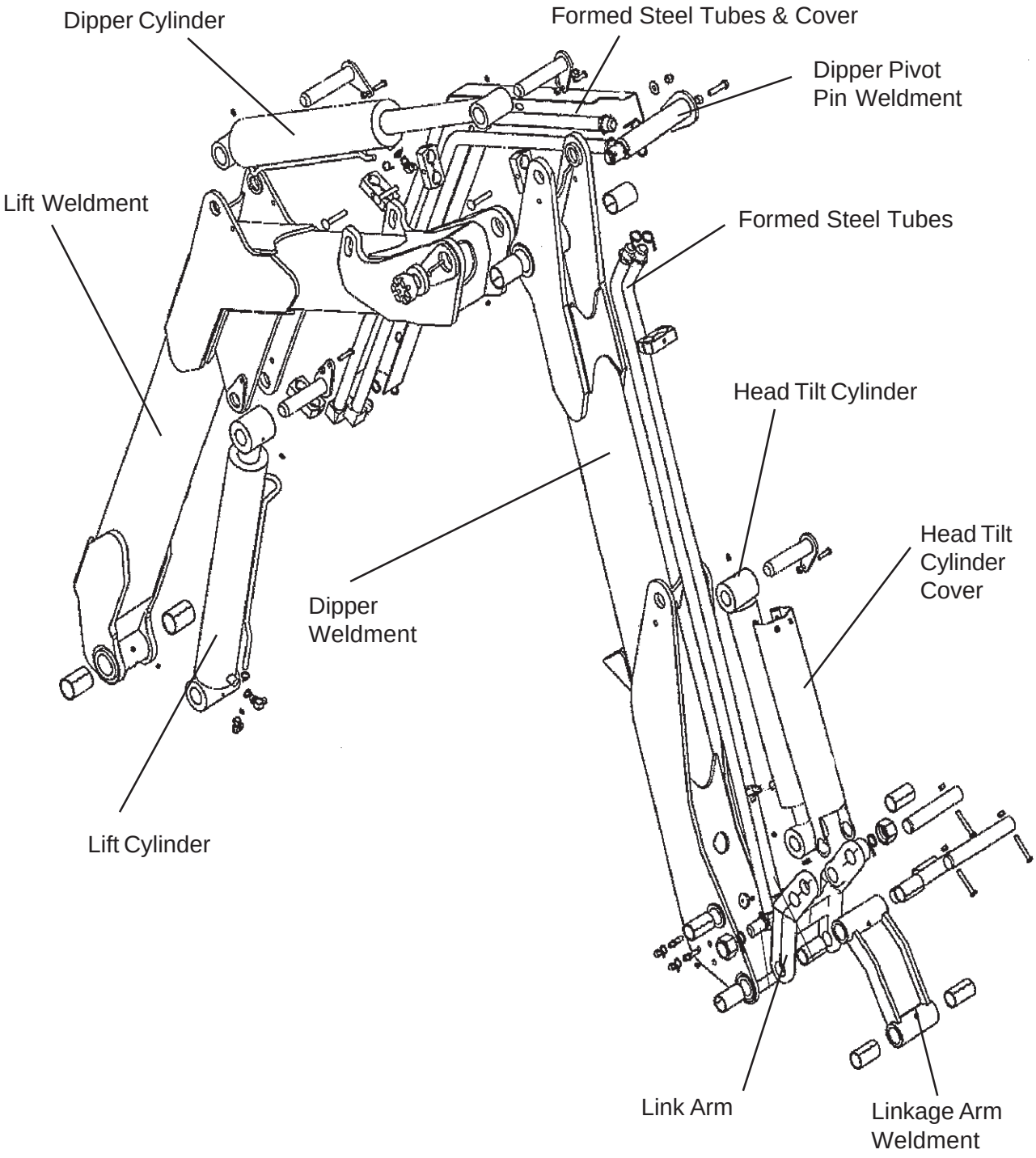
Boom Arm Components

BOOM ARM COMPONENTS - 18 FT.



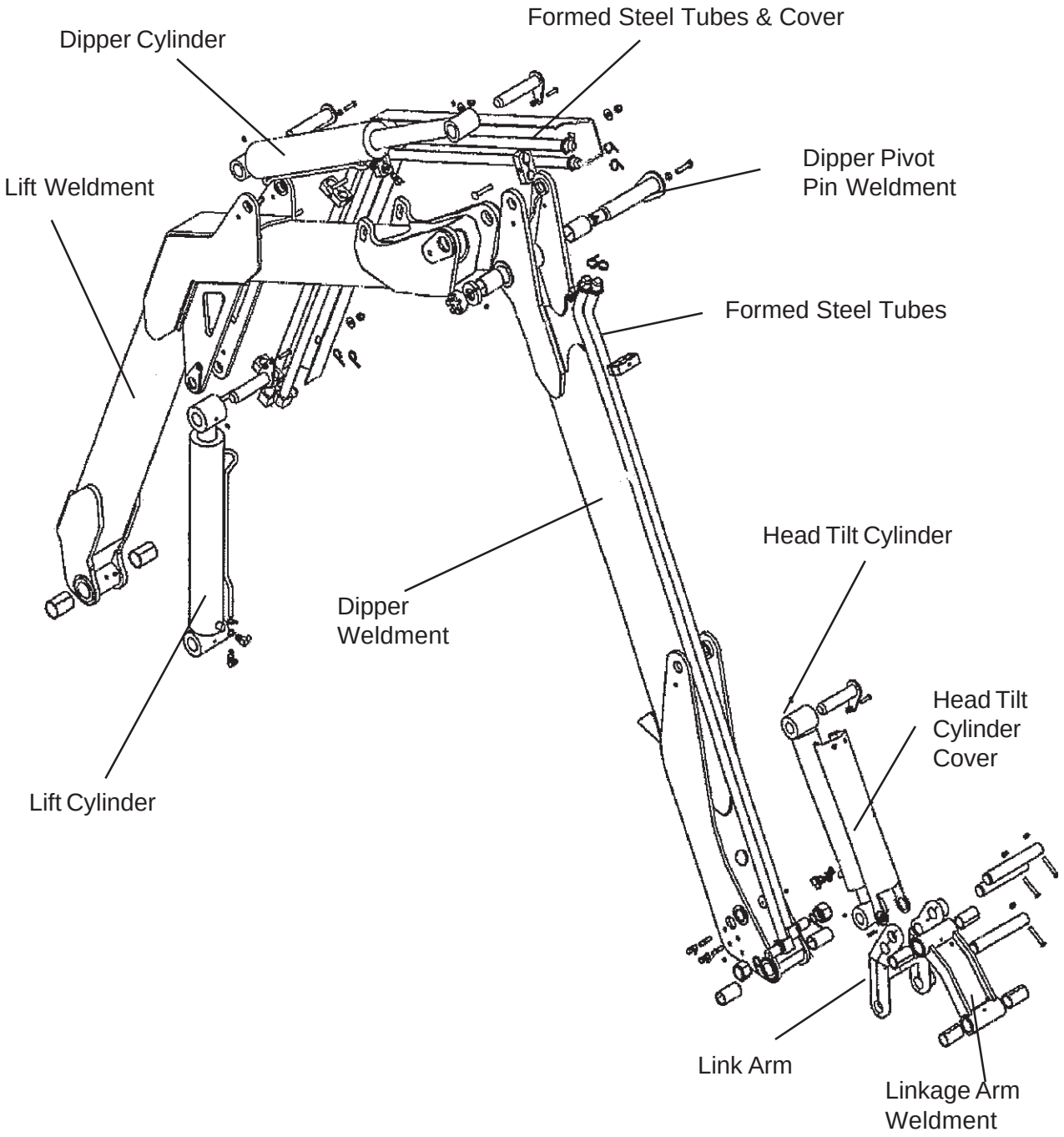
Boom is shown disassembled for clarity of illustration. When boom is received it will be assembled with hoses and fittings from the factory and some components for the boom will be in the packing crates. The purpose of this section is to indicate the terminology of the component.

BOOM ARM COMPONENTS - 22 FT.



Boom is shown disassembled for clarity of illustration. When boom is received it will be assembled with hoses and fittings from the factory and some components for the boom will be in the packing crates. The purpose of this section is to indicate the terminology of the component.

BOOM ARM COMPONENTS - 25 FT.



Boom is shown disassembled for clarity of illustration. When boom is received it will be assembled with hoses and fittings from the factory and some components for the boom will be in the packing crates. The purpose of this section is to indicate the terminology of the component.

Section 3

Axtreme Boom

Hydraulic System Operation

Hyd Schematic - Mechanical Operated (Std)

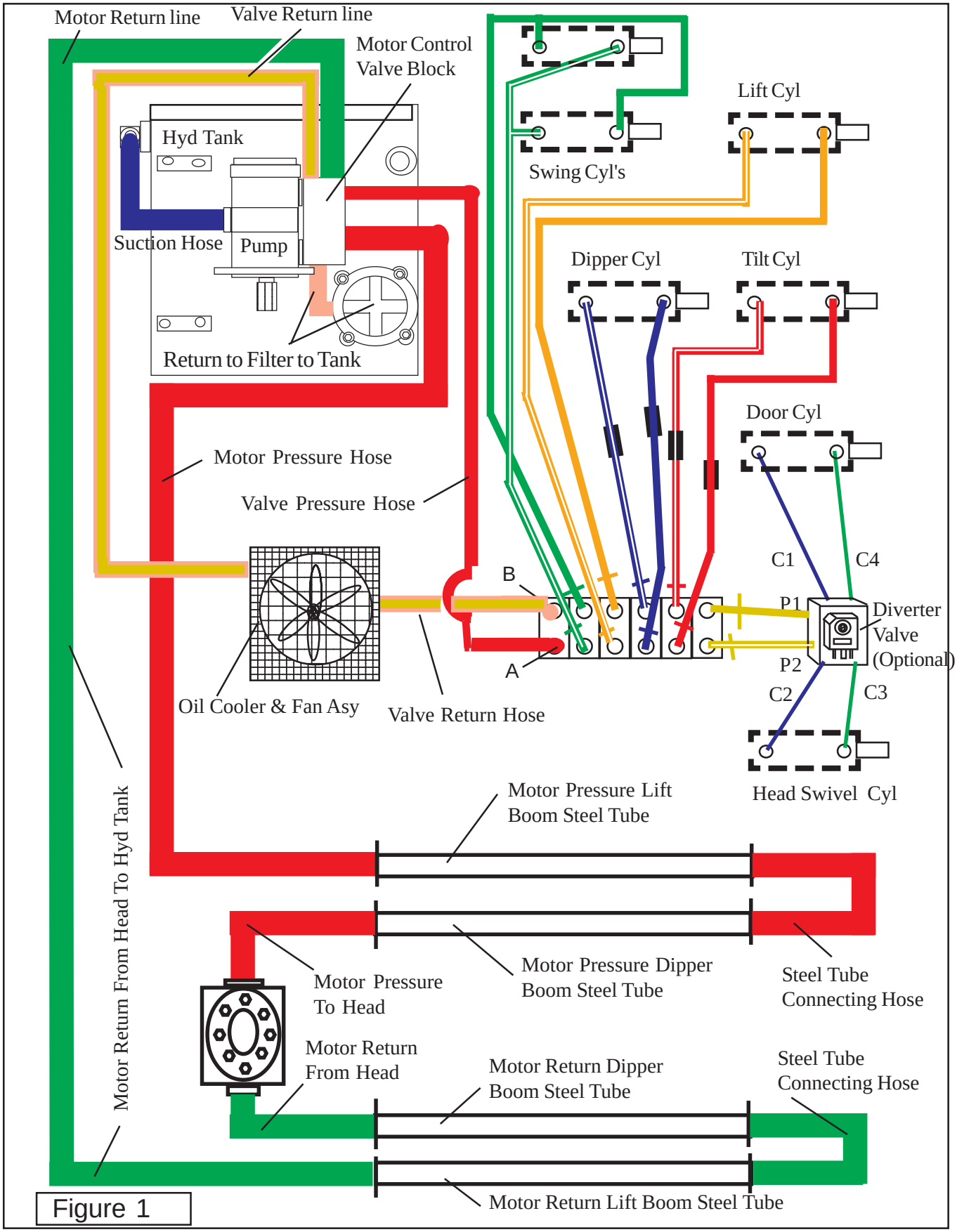


Figure 1

Hyd Schematic - Electrically Controlled (Opt)

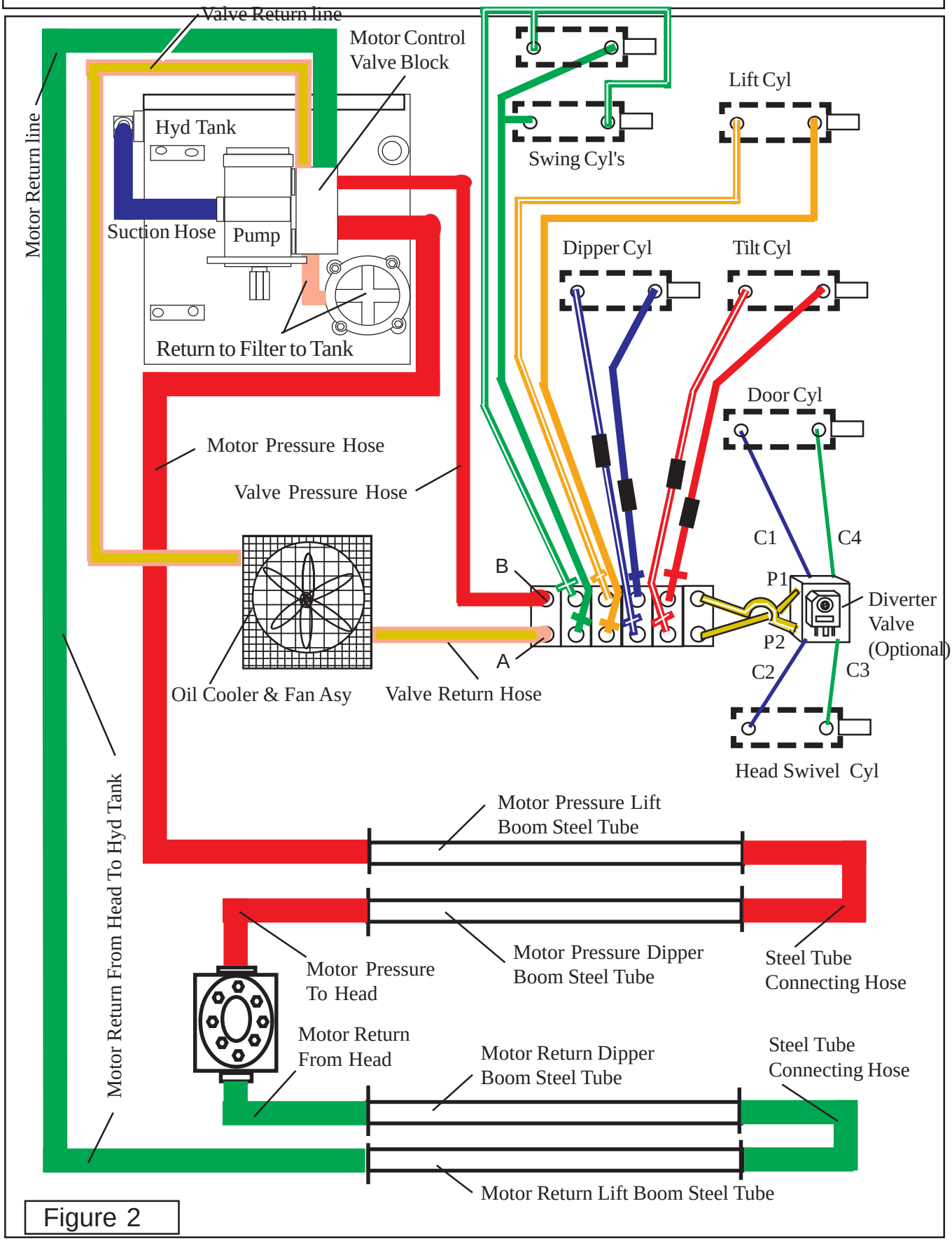


Figure 2

Hydraulic Power to Motor:

The rotation of the cutting blades is accomplished through the use of hydraulic power. Power to drive the pump is typically taken from the tractor engine pulley, or if this is not possible, it is taken from the tractor PTO turning at 540 RPM and stepped up to 2160 RPM with the use of a 4:1 speed increaser.

Note: Use of a rear mounted PTO driven Pump requires the Pump to be set up to operate in the reverse rotation.

Hydraulic Oil to the pump is supplied from the Hydraulic Tank through a 100-micron suction Filter throughhose (Suction) . Oil from the pump flows through hose (Pressure) to the motor control Valve Port (P). If the electrical solenoid valve is activated, the oil flows through M1 port to the Motor via the pressure line and is returned through hose to port M2 on the Motor Control Valve. The oil exits the Valve through port (T) return line to the Tankthrough the 10 micron Filter and into the Tank.

If the Solenoid Valve is not activated, oil flows through the Motor Control Valve, out port (T) through line and back to Tank via the 10 micron Filter. See the Motor Control Valve Section for detailed explanation of the valve operation. A non-adjustable Pressure Relief Valve located on the Motor Control Valve Block and set at 2500 PSI protects the Motor circuit.

Note: In System Schematic (Figure 1 & 2) the Cylinder Control Valve System is also Shown, This will be discussed in the Cylinder Control valve Section later in this Manual. Cylinder Control System is shown here in schematic to make it as complete as possible.

Gear Motor and Tandem Gear Pump Operation:

The Axtreme Boom Hydraulic System is powered by the Tractor and produces the desired hydraulic function through the use of an external spur gear - fixed displacement pump (Figure 3 and 4). For every complete revolution of the pump's input shaft, the pump displaces a fixed amount of oil. This pump output flow is proportional to the engine speed.

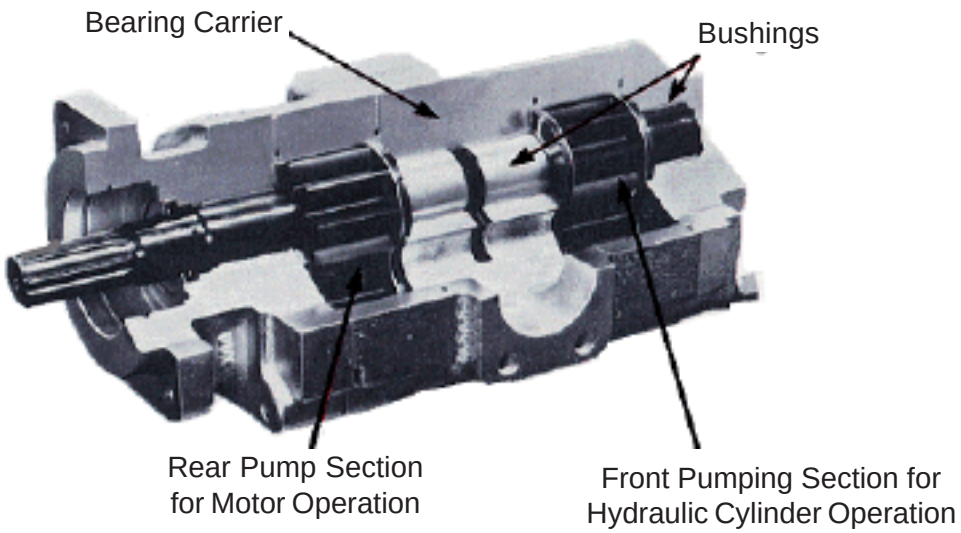


Figure 3

Tandem Pumps:

The Tandem pumps utilized on Axtreme Booms provide hydraulic oil flow for both, the boom movement / control functions as well as for the operation of the cutter motor circuit. The cutting circuit section is the larger section located closest to the mounting flange, while the boom movement section is the smaller section and is located behind the cutting circuit section (Figure 4).

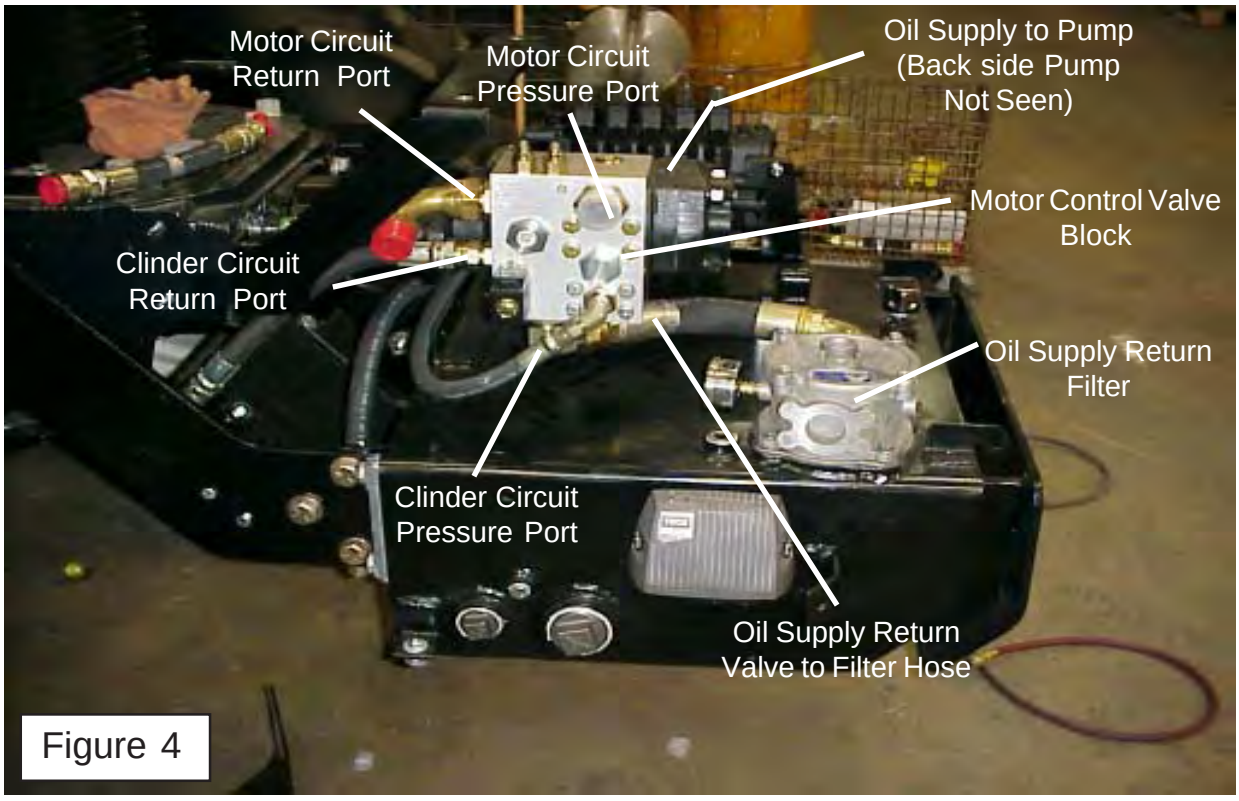


Figure 4

Viewing the cross section of one of the gear Sections in Pump (Figure 5) can illustrate the Flow of the Oil through the section along with the physical results.

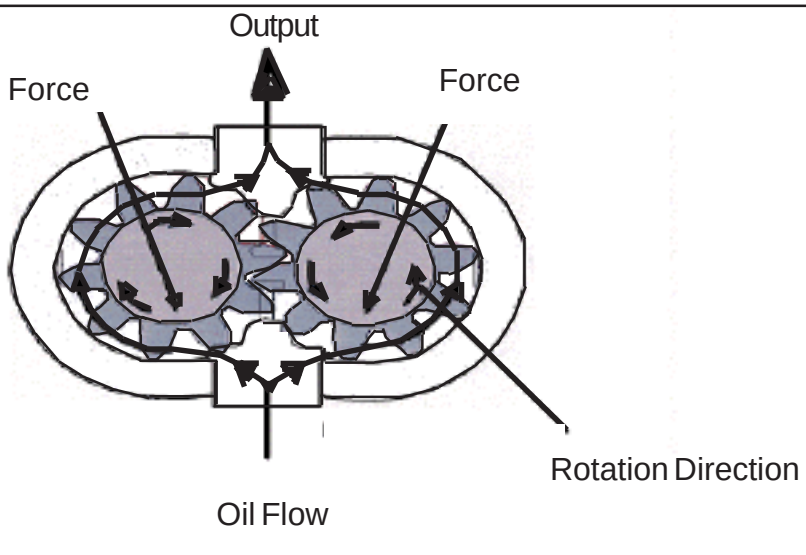


Figure 5

Tandem Pumps: (Continued)

The counter rotating gears create a vacuum drawing oil into the inlet (See Figure 5). Oil is trapped in the recess between each gear tooth and carried around the outside of the gear. Oil does not pass through the center. At the point where the gear teeth mesh on the outlet side, the oil is forced from the recess and exits the pump. Each one of the recesses is referred to as a pumping chamber.

Forces downstream from the pump such as line restrictions or motor loading will allow pressure to build on the outlet side of the pump. This pressure forces the gears to deflect into the housing on the low-pressure (inlet) side. The contact of the gears to the housing walls prevents the high-pressure output oil from leaking to the input side. Excessive pressure will cause excessive wear to the housing and allow leak back of the pressurized oil and poor performance of the hydraulic system.

The hydraulic pumps and motors used on the A-Boom utilize a Pressure Balanced Thrust Plate Design (Figure 6). This design allows the oil pressure to hydraulically balance the thrust plates and squeezes them against the gear faces. This provides a seal between the gear face and the thrust plate surface preventing the high-pressure oil from leaking back to the low-pressure (inlet) side. Mechanical seals on the thrust plate prevent oil from leaking between the plate and the adjoining casting. The seals depicted in the illustration are known as Pocket seals, a channel type seal (Figure 7) may be used on other units with the same results.

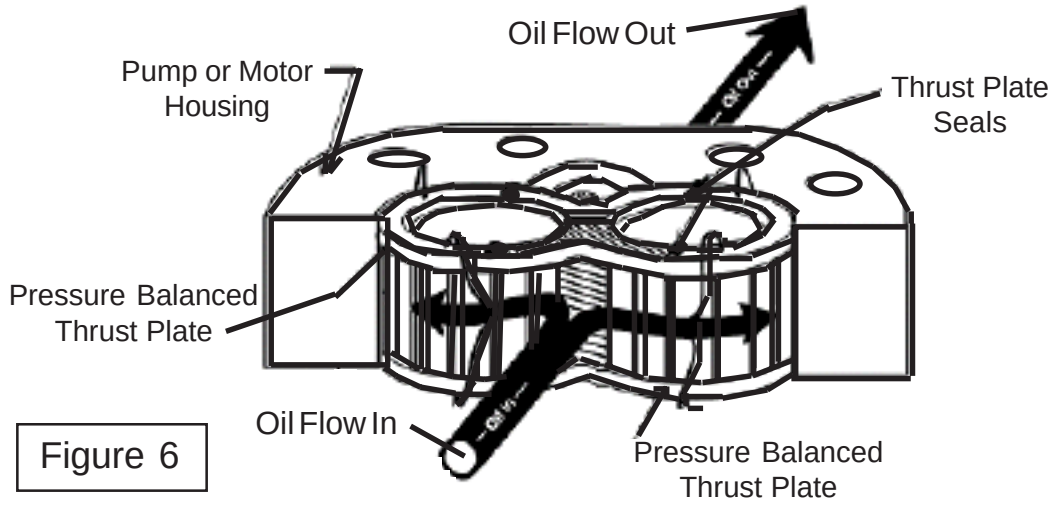


Figure 6

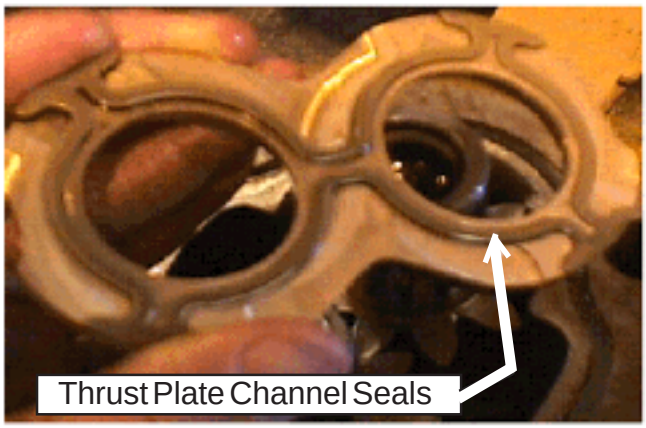


Figure 7

Tandem Pumps: (Continued)

The operation of the hydraulic motor is essentially the same as the operation of the pump with the exception that the outlet oil from the pump provides oil under pressure to counter rotate the gears of the motor, and provide for the rotation of the shaft. The oil output from the motor flows directly back to the tank and is pressurized only to the extent of the restriction in the return line.

Common Complaints:

For the most part, gear pumps and motors fail as a result of, CONTAMINATION, CAVITATION (OR LACK OF LUBE), OR OVER PRESSURIZATION.

Contamination damage results from the introduction of foreign material into the hydraulic system. The foreign material may be in the form of nuts and bolts or as fine as small grains of sand or dirt which are undetectable to the human eye.

Damage due to contaminants usually takes the form of machined grooves in the thrust plates or damage to the gears.

All Alamo Industrial hydraulic machines are protected from some forms of contamination by a suction screen filter and a return filter. Regular maintenance of these filters is vital to the survival of the system.

Protect the system from potential contamination during repairs by plugging all ports which are opened during disassembly. Rebuild the components in a dust free environment.

CAVITATION is the development and explosion of air bubbles in the hydraulic system at the pump or motor. Cavitation damage is identified as isolated pitting in the thrust plates and results in drastic loss of performance. This type of damage is usually the result of the loss of oil in the tank, or air leaks in the suction line to the pump.

It is also possible to cavitate the motor during shut down by completely stopping the tractor motor and front pump while the motor is still turning due to the momentum of the blade bar. The tractor should remain at the rated RPM until the blades come to a stop.

Over pressurization is the result of excessive restriction in the return line, or excessive load on the system. All Alamo Industrial hydraulic systems are protected from damage due to over pressurization with the use of pressure relief valves.

Over-pressurization usually results in excessive backpressure wear to the pump housing and causes extreme loss of performance. Extreme cases can cause torsional shear of the pump or motor shaft or cracking of the pump or motor housing.

In addition to these modes of failure, loss of mower performance may be attributed to the failure of the front pump drive assembly. This is identified as severe wear to the pump input shaft and the shaft coupler splines. This type of damage is almost always attributed to momentary or permanent misalignment of the front pump drive assembly.

Motor Circuit Control Valve Operation:

The control of the cutting operation of the mower head is obtained through the operation of a motor control valve. This valve is controlled by the operator through a switch located near the operator's position.

In most cases the control valve is located below the swing cylinder mount and attached to the main frame of the boom (Figure 8).

Motor Control Valve Block

The Motor Control Valve Block is used to control the on - off function of the mower head. The control block diverts the hydraulic pressure through a bypass by using an electric solenoid. The Brake relief is set at 1875 psi and is located on top of the control block, this as a brake to stop the motor from turning when mower is shut down. The control block for this model is bolted to the pump on the right hand side of the pump (See Figure 8).

The motor control block has the main relief on it, this relief is set to 3000 psi (Max 3000 psi) and should not be exceeded. If a problem in the system this pressure should be tested used an appropriate flow meter. DO NOT do any adjusting or modifications to the control block without the proper testing.

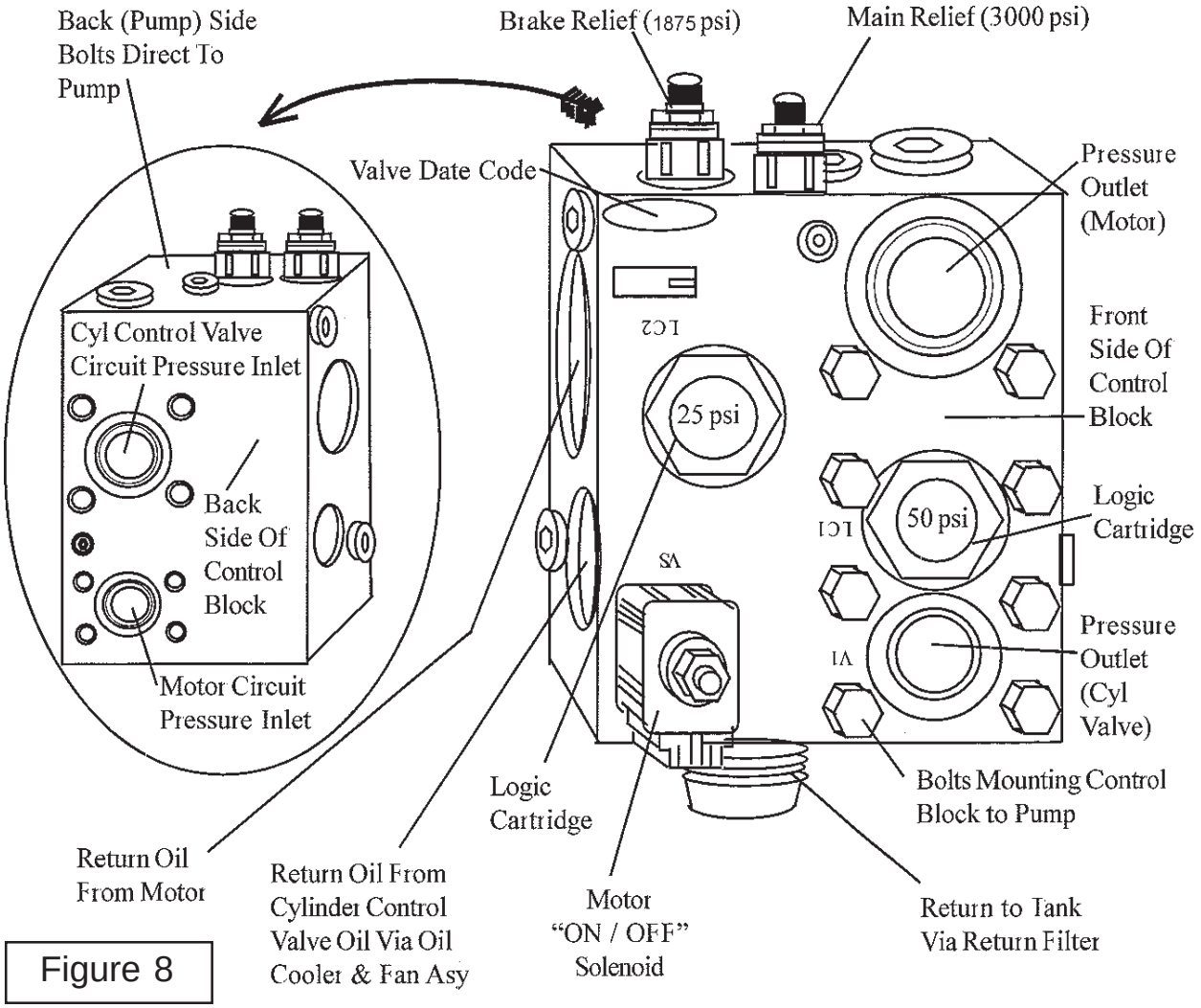


Figure 8

Cylinder Diverter Valve Block

The Cylinder Diverter Valve Block is used to control the hydraulic head swivel option if used. The control block diverts the hydraulic pressure through a bypass by using an electric solenoid so the pressure can be used to operate two functions (one at a time) as needed. This block is bolted to the mainframe and is connected to the door cylinder and the optional head swivel option cylinder.

Through a toggle switch operation it can be decided which cylinder will function when on the cable control valve system and through button trigger combination on the joystick (electronic valve control) option. If the head swivel option is not used this diverter valve will not be used. (See Figure 9)

Used with Swivel Head Option Only

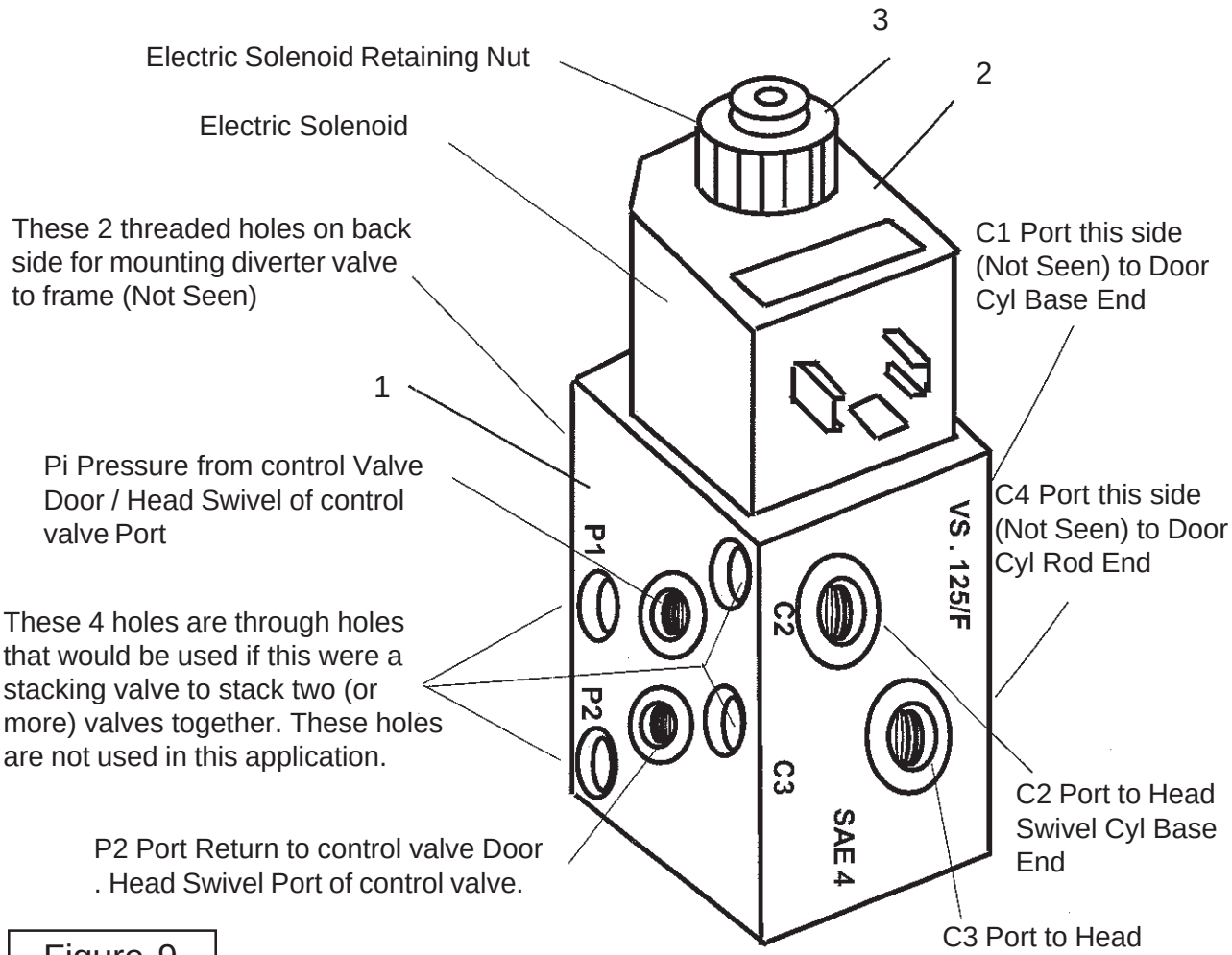


Figure 9

NOTES

Section 4

Axtreme Boom

Pump Driveline Assembly

Pump - Driveline - Hose Removal

Pump - Driveline - Hose Removal:

1. This Section covers the Pump and Driveline Components. Some precautions must be followed during the dis-assembly and/or Repair Process before unit is ever re-started for the first time.

A. Tractor must be disabled to prevent accidental engine start and prevent damge to components.

B. All Fittings, Hose, Cylinders, Tank must be kept plugged at all times, No part of the Hydraulic System can be left open at any time

C. All Tools, Work Area, Components and Workers Hands must remain Clean when working on any part of the Hydraulic System.

D. All components should be rechecked for tightness at least twice, Hose routing also double checked.

CAUTION: Shown in Figure 1 is a basic pump driveline configuration, BUT NOT the only configuration. Components will vary with the type tractor that the Axtreme Boom is mounted on. See the Assembly Manual and Parts manual that is for the unit mounted to your tractor.

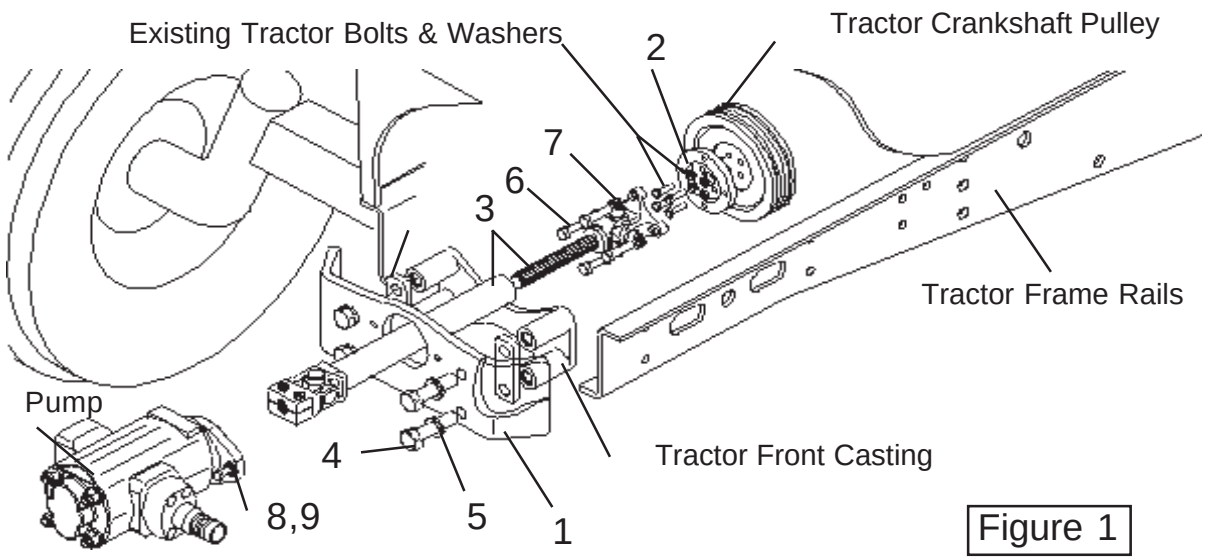


Figure 1

Item	Part No.	Qty	Description
1	----------	ar	Front Pump Plate (Standard) Shown
	----------	ar	Front Pump Plate (Optional w/ Pump Guard)
2	----------	1	Pulley Adapter
3	----------	1	Driveline Assembly
4	----------	4	Bolt, 20 mm 2.5P X 60 mm GR 10.9
5	----------	4	Lockwasher, 20 mm
6	----------	4	Bolt, 7/16" NC X 1-1/4" GR 8
7	----------	4	Lockwasher, 7/16"
8	----------	2	Bolt, 1/2" NC X 1-1/2" GR8
9	----------	2	Lockwasher, 1/2"

2. Pump Disconnect for Driveline Removal Only The pump is a tandem pump with a 1" x 15 spline shaft. The pump will bolt to the Pump mount plate which is built for the specific tractor that the unit is mounted on. The pump is retained by two bolts and lockwashers. In most cases the pump can be unbolted from the pump mount plate without removing any of the hoses. BUT caution must be taken not to allow the pump weight to hang on the hoses. Use a hoist or other means to support pump and keep weight off of hoses.

Pump - Driveline - Hose Removal

3. Disconnect Pump Hoses for Pump Removal If the pump hoses need to be removed so the pump can be removed, the hoses should be disconnected before unbolting pump from pump mount plate. **SEE STEPS BELOW!**

THESE ARE STEPS THAT MUST BE FOLLOWED WHEN REMOVING PUMP & HOSES.

A. Clean Tractor, Pump and all Hoses The tractor must be cleaned at the pump, hoses and hydraulic tank before beginning any repairs or service. Never disconnect any hose if tractor is running.

B. Secure Tractor where it is in a clean area for working on Hydraulic system. Make certain tractor is parked safely, parking brake set (See Tractors manufactuers Parking recommendations). Tractor secure to where it cannot be started by someone other than the repair technician. Make certain the Axtreme boom is in the Boom Rest securely or setting flat on the ground. Make certain that all hydraulic pressure is relieved from the system, Cylinders and hoses. Relieve pressure by operating the hydraulic controls with the tractor engine "OFF" (If joystick controls the electrical current must be "ON" for joystick to operate controls).

C. Position drain pan (sufficient size pans) to catch any leakage during hose removal but **do not** remove any hoses yet.

D. Remove the hose rings (if used that hold the hose against the tractor), the hose rings are used to hold the hoses against the tractor and are held to the tractor with a bolt. The pressure hoses (right side of tractor) will have hose rings bolted on tractor. The suction hose will not use hose ring as it is above the tank under the pump.

E. The Suction Hose should be loosened at the hydraulic Tank first. This will break the seal and prevent the suction hose from pulling oil out of the tank when disconnected at the pump. The suction hose will not have to be removed from the tank only loosen where it can get air. If the suction hose is removed from the tank cap the hose and the tank fitting to keep them clean. Make certain that step C.has been done before removing suction hose at the pump. When the suction hose is removed at the pump raise the hose end above the tank level as quickly as possible to stop oil from running out the hose. Cap the hose to keep it clean, cap the opening of the pump also.

F. The Pressure Hoses run down the right side of the tractor & connect to the control valve block on the right side of the pump. The small hose is the pressure to cylinder control valve, the larger hose is the pressure hose for the mower motor circuit (See Figure 13). When removing these hoses cap them when they are removed and cap the pump fittings also. Remove of pump control block is not required unless pump is being repaired.

G. Tractor Operation. **DO NOT ALLOW** tractor to be started with pump hoses disconnected as it will damage the pump and other components.

4. Pump Removal The pump is heavy, it is recommended that the pump be supported by a hoist when removing it from the tractor. (See Figure 2)

A. All steps in part 3 above have been taken.

B. Secure Pump with an overhead hoist or block up on a cart/table moved in under the pump to support pump during the unbolting of the pump from tractor pump mount plate.

C. Remove Pump Mounting Bolts. Remove the two pump mounting bolts. The pump will need to be slid outward away from mount plate.

D. The driveline half with the clamp yoke will slide out with the pump. Slide the pump back far enough the clamp yoke clamp bolts can be removed (there are two bolts). With the two clamp yoke bolts removed the clamp yoke should slide off of pump shaft. **DO NOT** use excessive force to get clamp yoke off of shaft, use caution not to damage any other components when removing clamp yoke. The pump can be removed from the tractor with the driveline half connected to it if wanted and moved to bench for removal.

(Continued Next Page)

Pump - Driveline - Hose Removal

(Continued Next Page)

E. Engine Driveline Half Asy Removal The inner half of the driveline is not required to be removed if just working on the pump, it can be left on the engine. The inner half of driveline bolts to the engine crankshaft pulley with a 4 bolt flange. The tractor may have side covers on the engine that may have to be removed to gain access to the crankshaft pulley. The inner half of the driveline will not pull out from the front of the tractor bolster, it will have to be pulled back out from engine side opening. **CAUTION: DO NOT ALLOW** the tractor engine to be started if engine half of driveline is still connected and inside engine compartment.

F. Pump Replacement or Repair If the pump replacement is required see the Pump installation section. If pump repairs are required see the pump repair section for detailed procedures.

G. Driveline Replacement or Repairs. This model uses a driveline that has an inner splined shaft with a 4 bolt flange yoke on it and a outer splined tube that has a splined clamp yoke on it. The universal joints are a conventional type and are change using the conventional universal joint procedure. The normal tools will be required to disassemble and reassemble the universal joint . When the driveline halves are installed together they MUST BE in time, this means the universal joints must be aligned with each other (Same), if universal joints are not time driveline will not run as smooth and could cause damage.

H. Crankshaft Pulley Adapter. The crankshaft pulley adapter will not require removal as there are no repairable components other than mounting bolts or replacing pulley adapter.

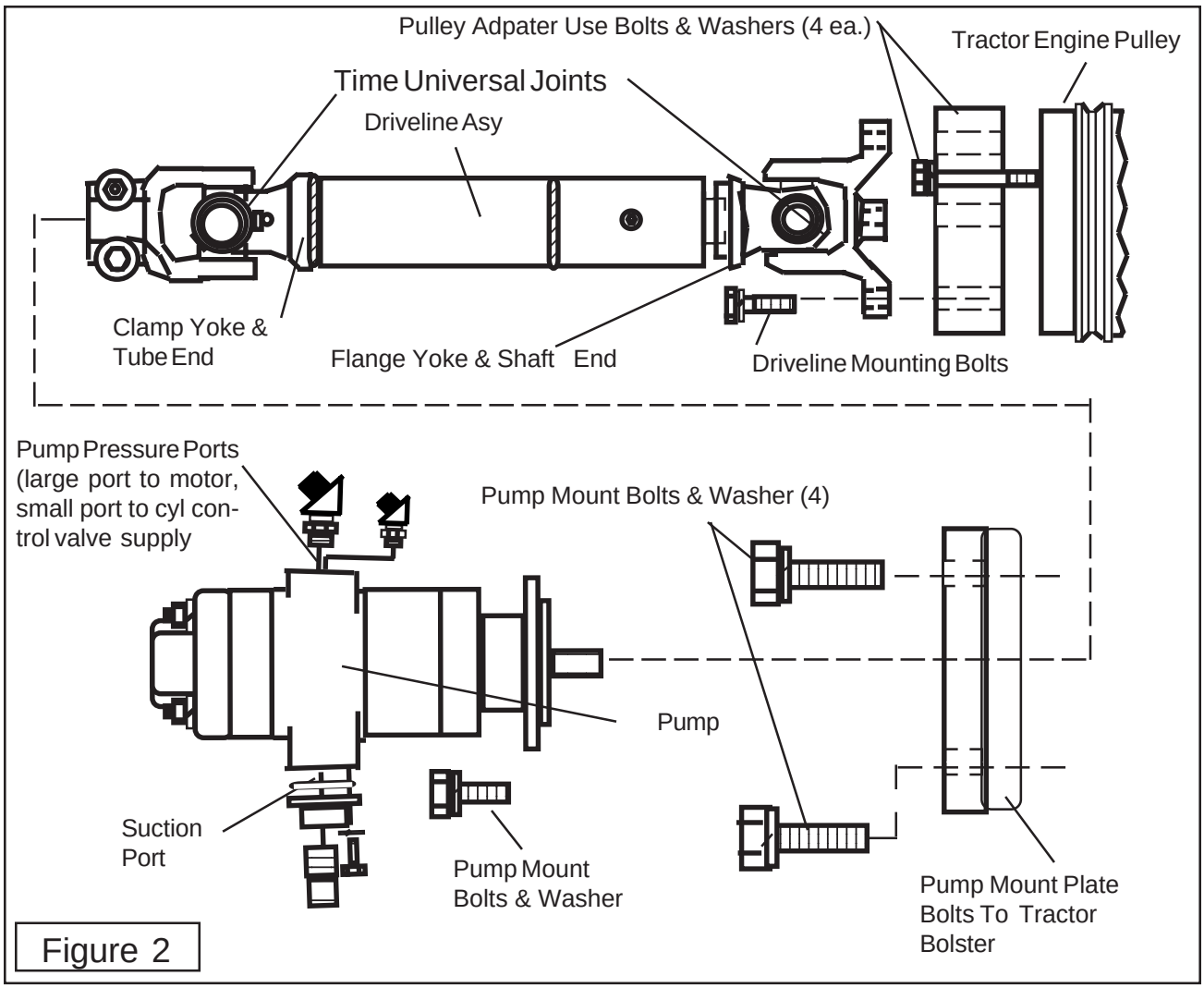


Figure 2

Pump - Driveline - Hose Installation

Pump - Driveline - Hose Re-Installation:

1. Install Pulley Adapter. If the pulley adapter was removed, The Pulley adapter is a round plate with 4 threaded holes and four non-threaded holes in it. The Non-treaded holes are used to mount the Adapter to the Pulley using 4 bolts & Lockwasher. Do not use longer bolts to mount Pulley Adapter to Pulley than is supplied with mounting kit. If the pulley adapter was not removed it is recommended that the pulley adapter mounting bolts be checked to make certain they are tight. (See Figure 2)

4. Driveshaft Assembly. The drive shaft is a two piece Assembly, an inner and outer shaft assembly **(See Figure 2 & 3).** The Shaft End has a four bolt flange yokes on it that connect to the Crankshaft Pulley Adapter. The Tube end has a splined clamp yoke on it that connects to the Pump. This Drive Shaft connects to the Pulley Adapter. Note that the Universals of the Driveshaft are in time. When installed in tractor they should be in time as shown, both Yokes the same direction (See Figure 2 & 3).

5. Install Shaft End of Driveline / Engine end. Install the Shaft 1/2 Assembly w/ Flanged Yoke into the Engine compartment of Tractor, install it from the LH front Side down and under radiator. **(See Figure 4)**. This needs to be installed this way because the Flange Yoke will not go through the Crankshaft access hole in the front of the Tractor. Bolt the Flange Yoke to the Pulley Adapter using the four 7/16" X 1-1/4" Bolts (Part # 02976344), use the four Lock Washers (Part # 00022200), put Locktite on the threads of the Bolts and install them into Pulley Adapter. To Tighten these four Bolts, use a long extension and go through the front Crankshaft Pulley access hole in front of Tractor. Do Not use bolts longer than 1-1/4" long, longer bolts will damage Crankshaft Pulley.

6. Driveline timeing means the universal joints are both the same position when driveline half is slid together. If they are not timed, it will decrease the life of the universal joint and in some cases could cause a vibration. **(See Figure 2 & 3), Driveline timing is critical to smooth operation.**

7. Install Tube End of Driveline / Pump End. Slide the Tube half of driveshaft through Pump Mount Plate and Tractor Crankshaft Access Hole **(See Figure 8).** You will have to align the Universals when doing this (time the Driveshaft). Slide the two together where the Universal are in time **(See Figure 2, 3 & 5)** this will help the driveshaft to operate smoothly.

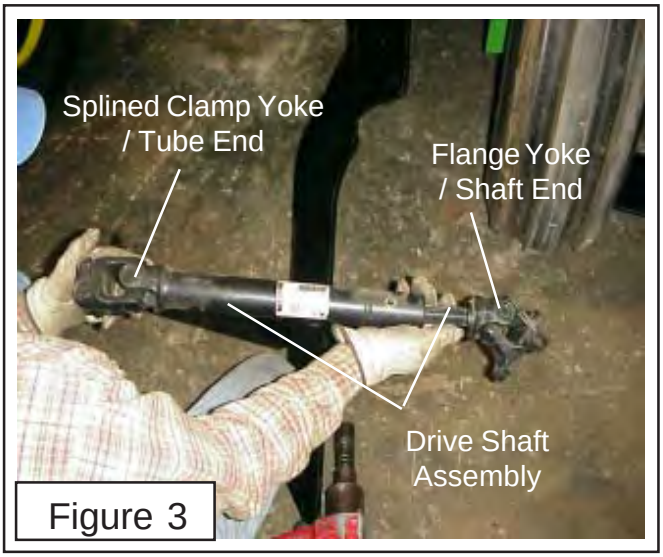


Figure 3

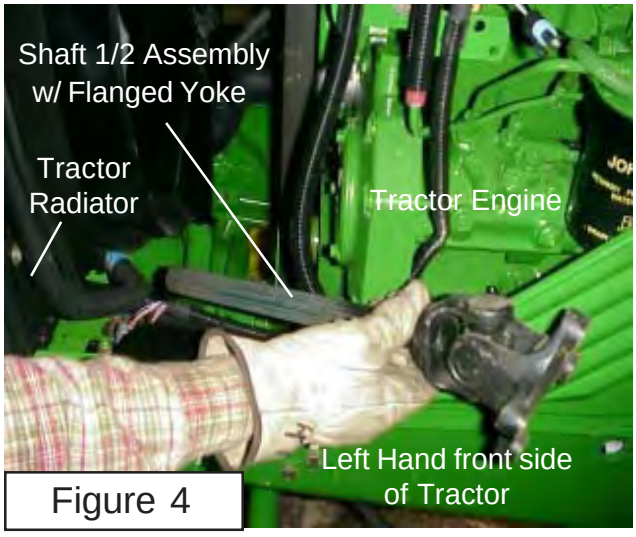


Figure 4

Pump - Driveline - Hose Installation

8. Loosen Splined Clamp Yoke. Insert a bar through the Yoke to hold Driveshaft up and to help loosen the Bolts in the clamp Yoke **(See Figure 6)**. This can be loosened with a hand Wrench or a Socket whichever is easier (See Figure 6)**.** Sometimes it is easier to test fit the Tube End of Driveshaft to the Pump while the Pump is on the bench, But this make timing the driveline yokes more difficult.

9. Install Pump into Splined Clamp Yoke. Coat the Pump Splined Shaft with Anti-Sieze Compound. Slide the Pump Splined Shaft into the Spline Clamp Yoke **(See Figure 8).** Leave the Bar stuck in through the Yoke as shown, this helps to stabilize the Yoke as you slide Pump Shaft into the Yoke. Once Pump is slid into the Splined Yoke, keep the Pump supported; DO NOT let the Pump hang on the Yoke unsupported.

10. Pump / Driveshaft Yoke Gap Adjustment. After sliding Pump Shaft into Splined Clamp Yoke, the Pump and Yoke must be slid apart far enough to allow for a 1/16" to 1/8" Gap between them. The Yoke edge cannot touch the Pump Housing; it will damage the Housing and the Yoke if it does. This is a very critical adjustment **(See Figure 9).**

11. Tighten Clamp Yoke. After Gap between Yoke and Pump has been adjusted tighten the Bolts & Nuts on the Clamp Yoke **(See Figure 9 & 10).** Check Pump to Yoke Gap once more. Keep Pump Supported do not let it hang on Yoke.

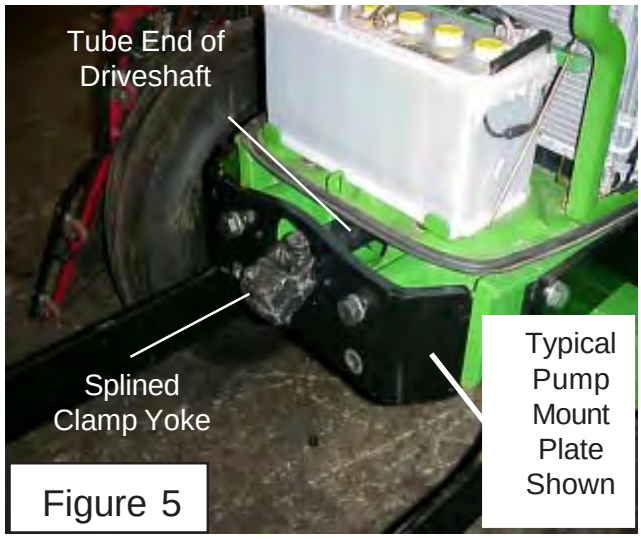


Figure 5

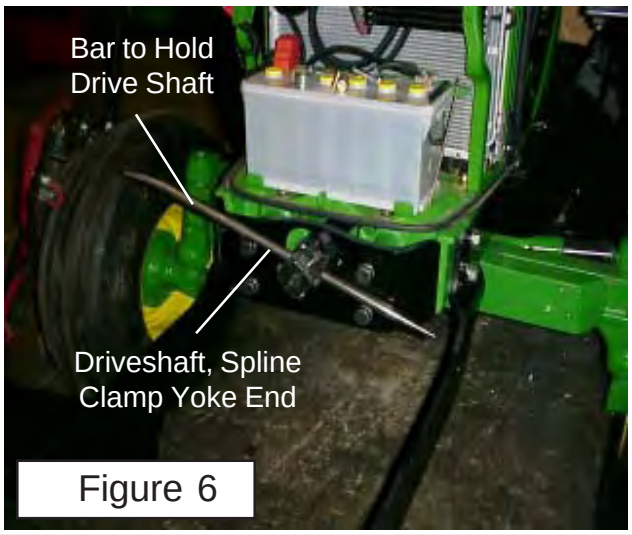


Figure 6

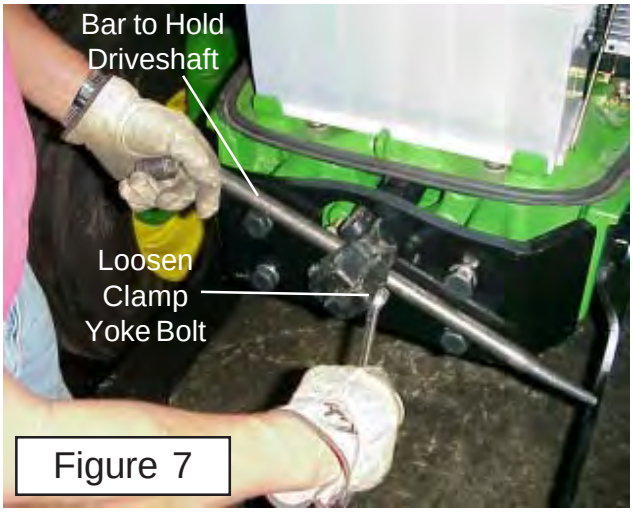


Figure 7

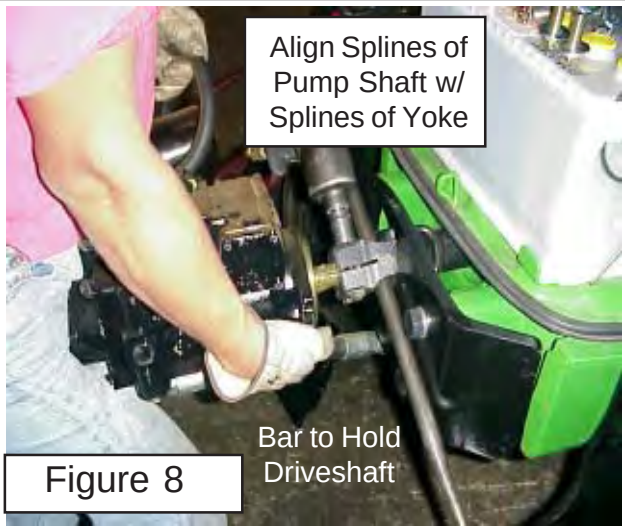


Figure 8

Pump - Driveline - Hose Installation

12. Mount Pump to Pump Plate. Remove the Bar that is slid through the Driveshaft Yoke and push the Pump inward **(See Figure 11).** This will make the two piece Driveshaft slide together allowing the Pump to be pushed towards the tractor. Do this untill the Pump is against the Pump Plate **(See Figure 12).**

13. Install Pump Mounting Bolts. While holding in on the Pump **(See Figure 12)** start the two Pump Retaining Bolts. Make sure both Bolts are started well before you stop supporting pump. The Bolts should be snugged untill pump sits level before you stop supporting it **(See Figure 12).** Let go of the Pump, it may slide back some and leave a slight gap between Pump and Mounting Plate **(See Figure 16).**

14. Tightening Pump Mounting Bolts. There is a shoulder on Pump Flange that must line up through hole in Pump Mounting Plate **(See Figure 14),** if the Pump is slid back as in figure 11 try to push it inward untill it is against Pump Mount Plate as shown **(See Figure 12).** Slowly and alternating from Left to the Right side, tighten the Pump mounting bolts untill they are tight. DO NOT FORCE Pump through Pump Mount Plate, if it will not freely slide in check for a problem of some kind. Excess force could damage Pump Housing. (See Figure 12). Do Not remove any Plastic caps from Pump inlet or outlet at this time, keep all openings plugged and sealed to keep them clean.

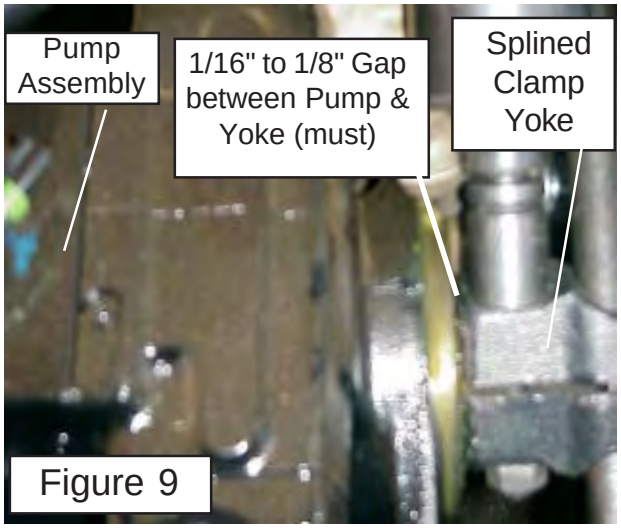


Figure 9

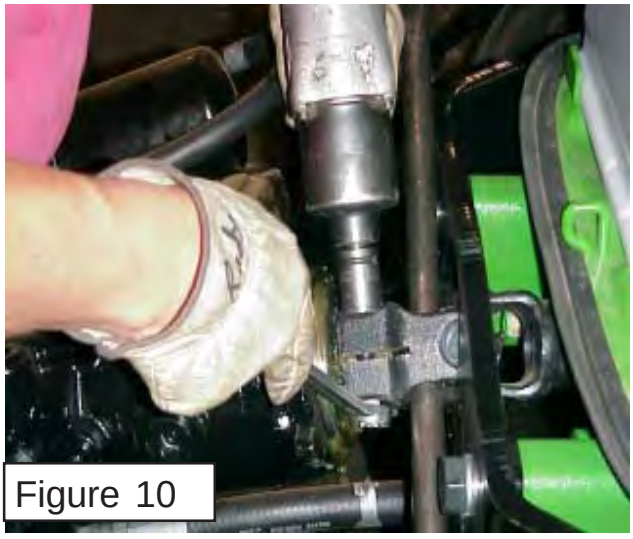


Figure 10

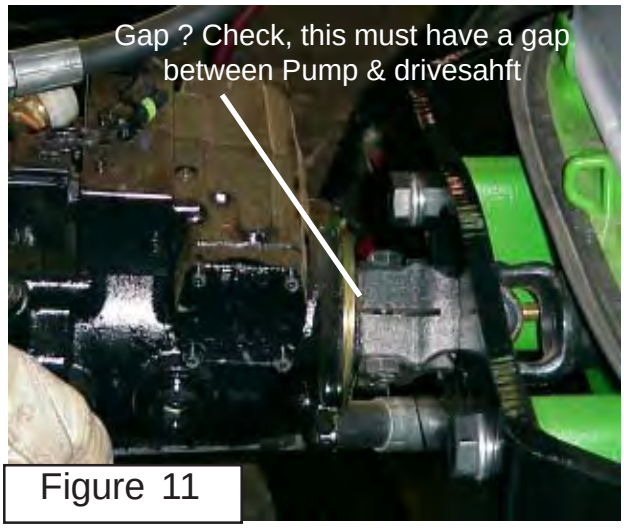


Figure 11

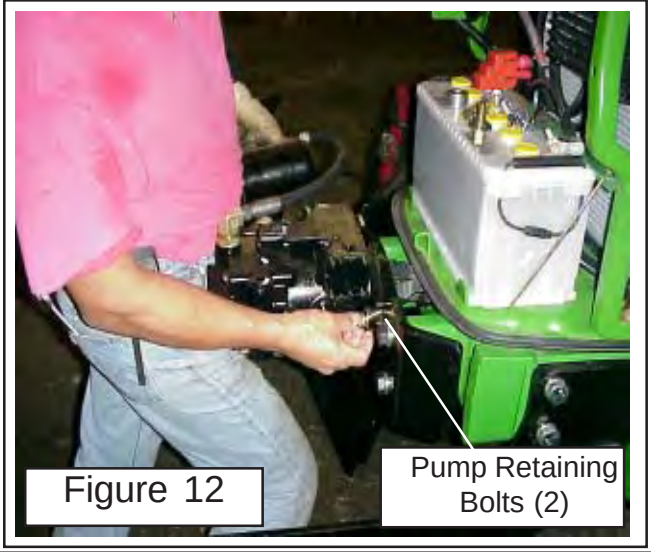


Figure 12

Pump - Driveline - Hose Installation

Hose Re-Installation:

1. Reconnect Pump Hoses for Pump After Removal If the pump hoses were removed so the pump could be removed, the hoses should be reconnected after bolting pump to front pump mount plate. **SEE STEPS BELOW!**

THESE ARE STEPS THAT MUST BE FOLLOWED WHEN REINSTALLING PUMP HOSES.

A. Clean all Hoses and Pump Fitting The tractor must be clean at the pump, hoses and hydraulic tank before beginning any repairs or service. **Never start tractor before pump has been completely installed with hoses connect and system full of oil.**

B. Position drain pan (sufficient size pans) to catch any leakage during hose re-connection.

C. The Pressure Hoses run down the right side of the tractor and connect to the control valve block which is bolted to the pump on the right hand side (See Figure 13, 14 & 15). The small hose is the pressure to cylinder control valve, the larger hose is the pressure hose for the mower motor circuit. These hoses should be reconnected first. Reinstall them the same way they came off (See Figure 13). Re-Bolt the hose rings to the right side of tractor.

D. The Suction Hose At Tank: The suction hose is connected to the pump first. Make certain that suction hose is fastened tightly at the Tank (See Figure 14).

E. The Suction Hose At Hydraulic Pump Fill the hose with clean new hydraulic oil (recommended type only). This is so when pump is started it will not start up dry. Re-Install suction hose to hydraulic pump and tight en hose fitting (See Figure 14).

F. Tractor Operation. **DO NOT ALLOW** tractor to be started as it could damage the pump and other components if the assembly is not complete, completely inspect all repair made to make certain they have been completed. Check oil level in hydraulic tank and fill as required. (See Start up Procedures on next pages).

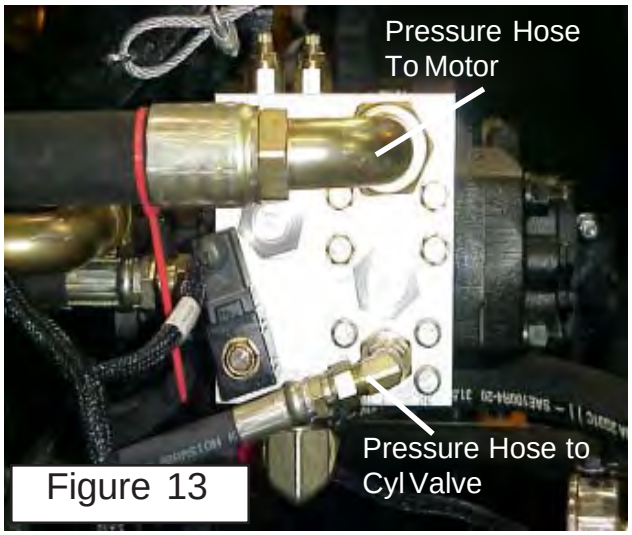


Figure 13

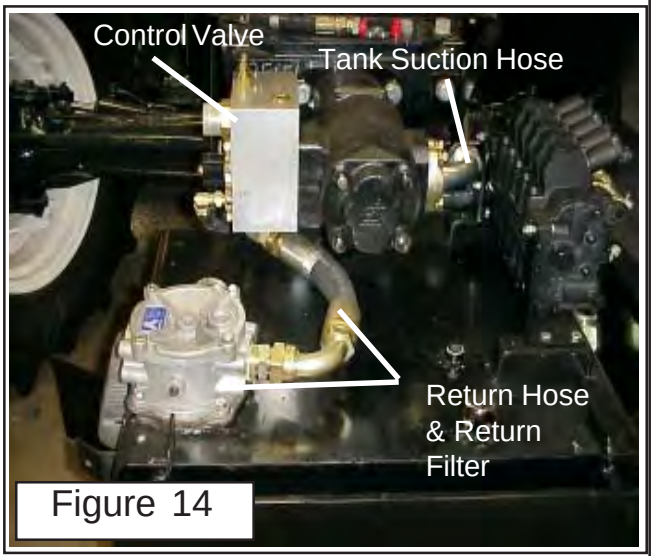


Figure 14

Motor Control Valve Block

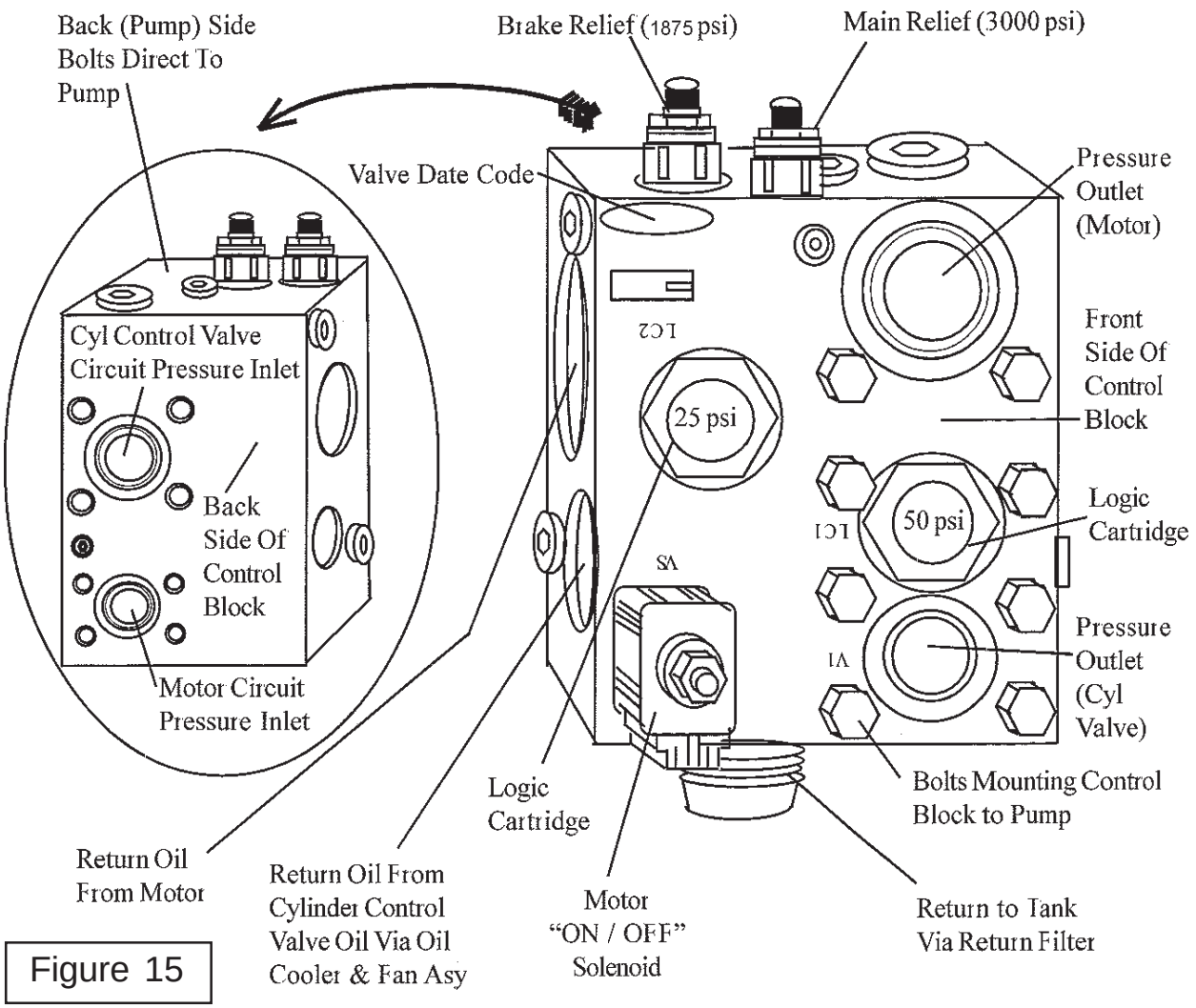


Figure 15

1. Pump Control valve Block Shown above is the pump control valve block, this bolts to the right hand side of the pump (See Figure 13) and the pressure hoses are connected to this valve block.

Pump - Driveline - Hose Installation

Return Oil Cooler with Fan

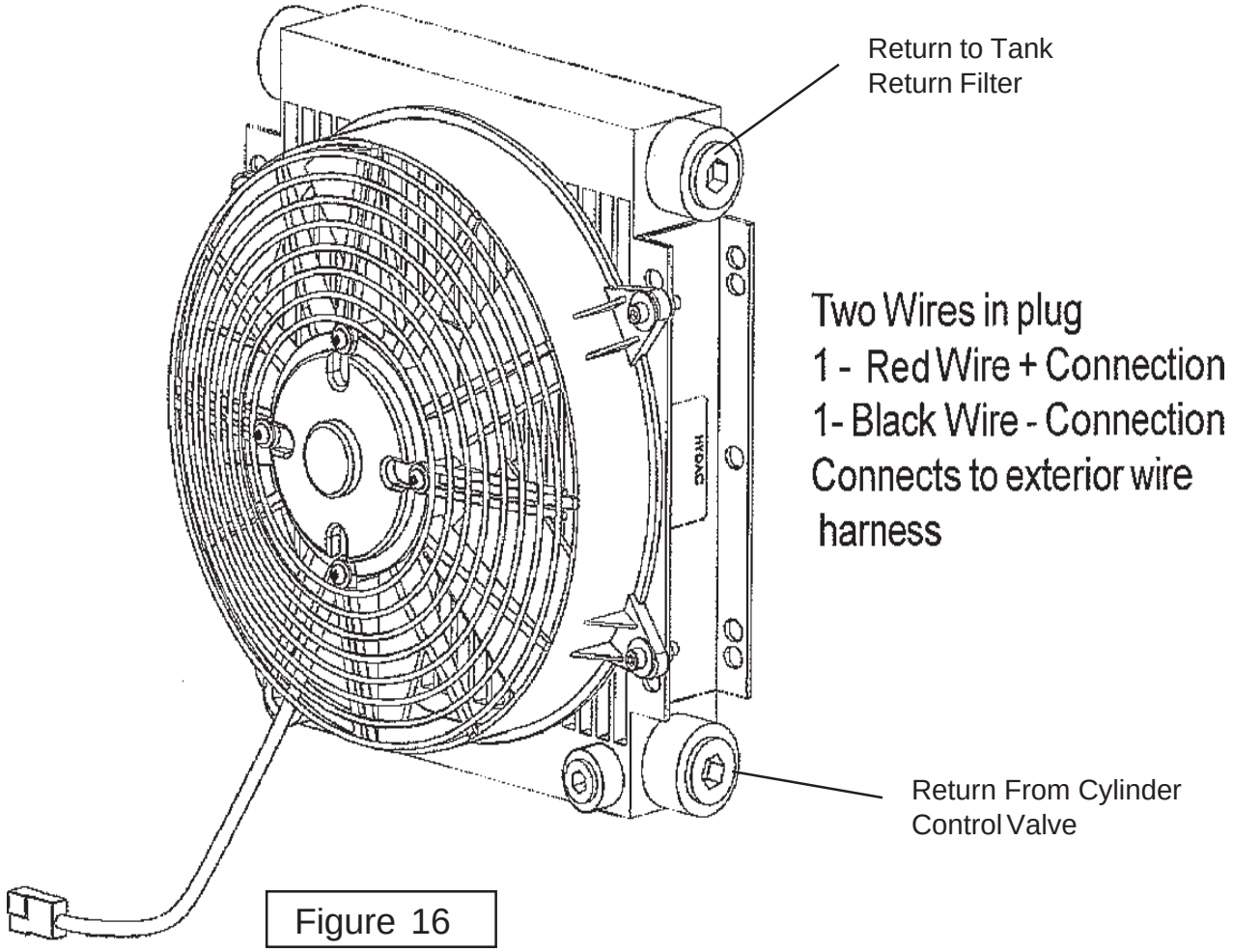


Figure 16

Start-Up Procedure

Start-up Instructions:

1. Read all safety instructions. Decals on the Axtreme-Boom warn you of particular and multiple Hazards.Many decals are attached close to part of the Axtreme-Boom where there is a possible hazard. Read and make sure you understand the safety messages before you operate the Axtreme-Boom. Keep all decals clean and readable. Replace lost or damaged decals.

2. Before operating, read all the safety and operating instructions in the Operator's Manuals for both the tractor and mower.

3. When the hydraulic tank has been filled, The Pump Suction Hose filled with Hydraulic Oil and the mower unit (Head) properly assembled, the unit should be started up. NOTE: Make sure that no materials, tools, or jacks have been left under the mower head. Make sure the front and rear of the mower are properly guarded to prevent any foreign objects from being thrown by the mower. All other workers should be kept a safe distance from the unit before the mower is started.

4. Start the tractor and idle at a slow engine speed until oil is being pumped. Check for any leaks, this is easiest with an assistant watching for leaks. Do not run if Oil is leaking.

5. Bleed the air out of all hydraulic cylinders one at a time by extending them to their full length. DO NOT SWING THE BOOM till last and you have gone to the Rest Stop and Support Section for instructions.

6. Engage the Cutter Control Valve at low engine rpm and run the mower slowly for a short period until all air is removed from the hoses. Keep all persons WELL CLEAR of mower since Blades can THROW OBJECTS with great velocity for a considerable distance! KEEP CLEAR!

7. Run the mower at a low tractor engine speed until the mower Hydraulic System gets the Air out off it. Operate at an engine speed that keeps the filter restriction gauge reading in the "Green Zone". With the hydraulic warm, bring the tractor speed up to normal operating speed.If the filter gauge reads in the red zone, stop the unit, release all hydraulic oil pressure, and Check the filter element in the tank mounted filter or any Hose that may be kinked. Restart the tractor and mower unit and again check the filter gauge (oil must still be hot).

8. If the filter gauge reads in the red when first started and does not drop as oil warms, then something is wrong, contaminants have been introduced into the hydraulic system or some thing connected wrong. You may need to repeat previous steps again until the gauge reads in the green.

9. Check the fluid level in the Hydraulic Tank and add oil if required. As the air has been forced out of the Cylinders and Hoses, it goes into the Hydraulic Tank and reduces the oil level. The Hydraulic Oil must be at least at the level of the Sight Gauge on the side of the Tank.

10. Basic trouble shooting guide for first start up.

- **A.** Electrical solenoid valve does not work - check wiring, possible faulty switch, possible faulty solenoid.
- **B.** Pump is making noise - check for obstruction in suction hose and tank suction assembly, check alignment of pump driveshaft.
- **C.** Cylinders will not raise - hoses from cylinder incorrectly connected to valve bank, pump not suppling oil.
- **D.** Cylinder rises slowly - hoses from cylinder incorrectly connected to valve bank, work port reliefs on valve bank set too low - replace as required.
- **E.** Filter reads in red - viscosity of oil too high - wait until oil heats up before checking filter gauge. If gauge reads in red even after unit is hot, then the filter must be replaced.

NOTES

Section 5

Axtreme Boom

Pump Testing
&
Pump Repair

Hyd Schematic - Mechanical Operated (Std)

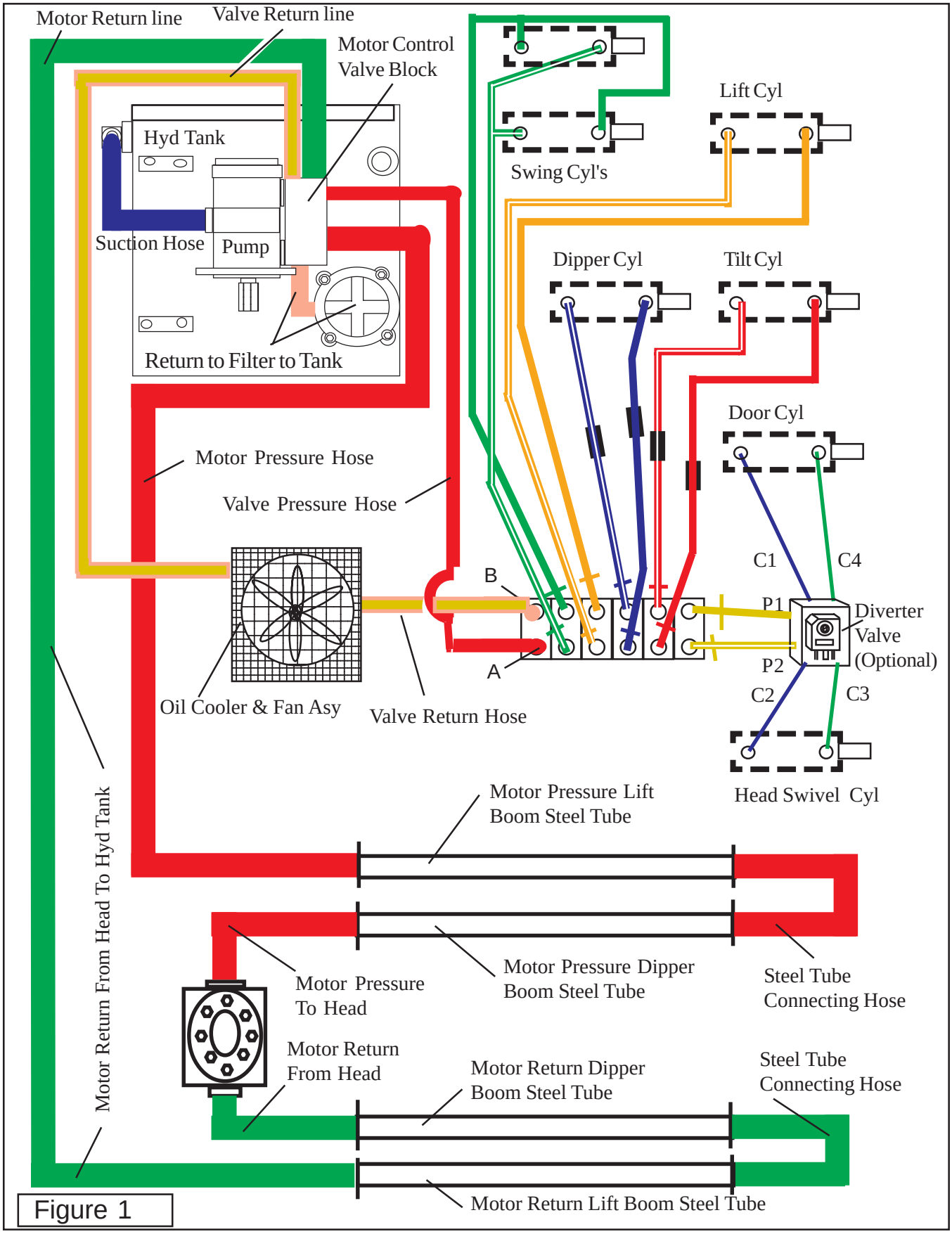


Figure 1

Hyd Schematic - Electrically Controlled (Opt)

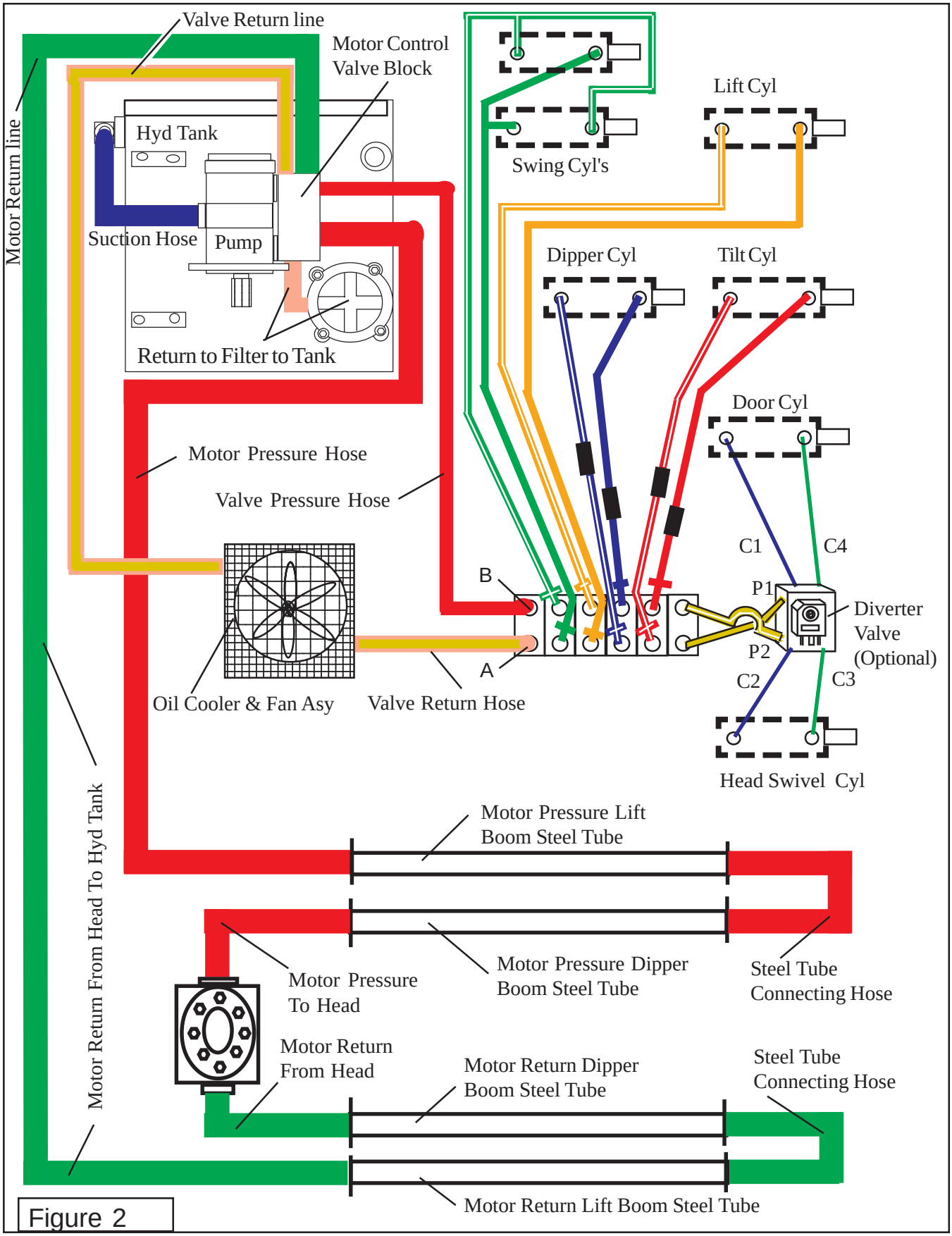


Figure 2

Pump Testing

GEAR PUMP TESTING: Tandem Front Engine Mounted or Rear PTO Mounted

NOTE: The Axtreme Boom uses a Gear Type Tandem Pump, Front mounted and rear mounted Pumps do not rotate in same direction, Front to rear Pumps cannot be swapped unless pump is dis-assemble and parts changed, See Pump repair section for information to reverse Rotation of the Pump.

IMPORTANT NOTE:

1. Safety is most important beginning of Test. You MUST be totally in control of Tractor and You're surrounding area before beginning any test, there must not be other people in area when Tractor is started and mower is being tested, If you have an assistant always know where your Assistant is before you do anything. Only you should be able to start Tractor, Keep the Key with you, do not leave it in Tractor.
2. Repairing a failed Component is not always repairing the Cause of a failure, When making repairs always check all associated components because one component can be the cause of another component failure.

INFORMATION COLLECTION: Any information on Unit from operator will be helpful.

1. What is Model Unit, Size, Type Head, Type Tractor it is mounted on etc?
2. What is not working correctly? In as much detail as possible.
3. Has this malfunction existed for some time, just start suddenly, continuos malfunction or off and on, when does malfunctions occur.
4. Did this malfunction result from an earlier malfunction? What if any repairs, adjustment, modifications or any changes to any components have been made to unit recently. (Repairs - Maintenance - Accidents - Operator Change)
5. Have all the obvious items been checked, Oil Levels (Tractor & Unit Reservoirs), Electrical Supply (Dead Battery, Loose connections, etc.)
6. Does the malfunction affect all circuits, one, two or more?
7. Does malfunction affect both sides of the same function or just one (Example Lift & Lower, in or out, etc)
8. Does malfunction happen when Cold, Hot, only Cold or only Hot, more when Cold than Hot, more when Hot than Cold etc.
9. What Conditions? What is Unit doing when malfunction occurs, running at low RPM, High RPM, heavy Cutting, light Cutting, Level Ground, Slope Angle etc.
10. Any information that helps determine what is causing Malfunction or point the location of the malfunction.

VISUAL TEST:

1. Do Not Start Tractor till visual inspections are done. Chec Fluid Levels (Fluid Levels should be checked with oil warm, with all components filled with Oil from operation), Remove any bolt on/Slip Cover that prevent visual inspection of general condition of components. Look for any Broken Components, Missing Components, Loose Components, Oil Leaks, Damaged Components. Look for anything that is obvious to cause a problem.
2. Replace any missing / broken components, tighten any loose components, repair any Oil Leaks before beginning any further test.

OPERATIONAL TEST:

1. Visual Test should have been done already, If not go back one page and perform visual test now. Pump and/ or Valve covers should be removed. There are two different types of Optional Pump Systems offered, determine which you have.
   - A. One type is a Tandem Pump (Double Pump) where the first section (larger Section) supplies the Heads Motor Hydraulics Pressure and the Second Section (Smaller Section) Supplies the Control Valve Hydraulics Pressure.
   - B. Second type is a Single Pump which only supplies the Head Motor Hydraulic Only, The Control Valve Hydraulic Pressure is supplied using Tractors internal Hydraulic System when Single Pump is used.

Pump Testing

OPERATIONAL TEST:

2. With Tractor Engine running operate each Circuit, Paying close attention to everything the unit does or does not do.
3. The Engine speed should drop slightly (the Sound Change) when the Valve spool moves and the Pump comes under a load, If the Engine sound does not change when the Circuit is activated, it is an indication that there is no load being placed on Pump.
4. Observe each movement of the Cable controls throughout its complete range of movement. Check the Cylinder speeds; Look for "Jerky" operation, the Cylinder should respond smoothly to the movement of the control valve controls. Look for time delay between movement of Controls and movement of Cylinders. This could indicate an uneven Pressure Flow.
5. After checking each function, attempt to duplicate the malfunction described by Operator, Using the information gathered in the Operator Interview. If you are not able to get machine to malfunction; see if operator can get the machine to malfunction.
6. When the Malfunction occurs, take note of all conditions that exist during the time of the malfunction, Some things to take note of are,
   - A. Engine Speed or Sound.
   - B. Position of Articulating Members.
   - C. Operating Temperature
   - D. Length of time Unit has been running
   - E. Position of Control Levers before and during malfunction.
   - F. Position and Condition of Tractor
   - G. Any other condition you might notice.
7. Duplicate the conditions that existed when the malfunction occurred to determine if the malfunction would occur every time that the same conditions exist. Try different combinations of conditions to determine which conditions actually affect the malfunction and which ones just happened to be there when the malfunction occurred.

Pressure & Flow Supply Test: Front or Rear Mounted Pump

This test will use the Hydraulic Schematic on previous page for reference points. If you have a Tandem (Double) Pump System this test will work for the Front or Rear Tandem Pump. If you have a Single Pump System it will also Work.

1. Perform all the Obvious Test First. Check all oil levels. Check Hose's and Connections to make sure they are not in a bind restricting Oil flow. If repairs have been made that everything was connected correctly. If PTO mounted rear pump make sure PTO is engaging. Make sure Speed Changer is transferring RPM to Pump. If Front mount Engine Pump make sure front drive shaft and its components are installed and installed correctly. If every thing checks OK go on to next step.
3. Use extreme caution if using a Flow Meter, Use Caution when installing a Flow Meter if the System has been run and Oil is hot. Never remove a Hydraulic Line while System is running or while System still has residual Pressure in it. Never connect a Flow Meter in system backwards. Pressure should flow through Gauges and then Restrictor valve.
4. Install Flow Meter in System in Line # 1 (See Pump System Schematic for Line location). This will require all Flow to move through Flow Meter. The purpose of this test is to make sure Pump is producing sufficient Flow and Pressure. Make Sure that Restrictor Valve of Flow Meter is in the Full Open Position and that all line connections are tight. See Fitting Chart in Specification Section for proper Torque for Fittings. Do not over tighten fittings.
5. Safety first, make sure area is clear of danger to other Persons and property before starting any test. Start Tractor, you should have a pressure of 200-PSI (approx.) on Flow Meter Gauge, this is caused by line size, which creates restriction. At 1800 RPM you should have 37 GPM and still 200 PSI through Pressure supply line. It is not unusual for a Spike Pressure to be seen in Flow Meter Gauge if head is started then drop back. If this tests OK go on too next Step.

Pump Testing

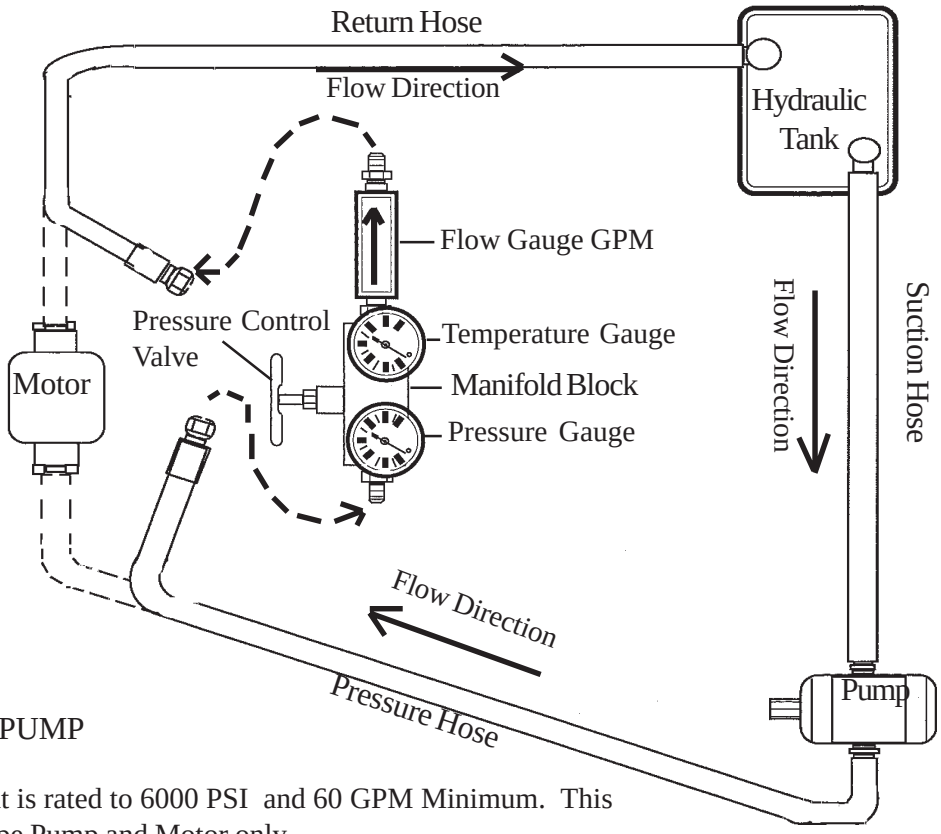
Pressure & Flow Supply Test: (Continued From Previous Page)

6. Slowly turn Restrictor Valve of Flow Meter down to create Load on Pump. Close Valve slowly watching Pressure Gauge as you go, increasing Pressure in 500-PSI increments. DO NOT exceed 2000 PSI when doing this test, There is no Relief Valve in the System as Flow Meter By passes it. If you exceed 2000 PSI with Flow Meter Test you will damage System. The 38 GPM will drop when under pressure but should not drop below 32 GPM (this is 85% efficiency rating). If GPM drops below 32 GPM there is something wrong with Pump. If test of Pressure and Flow are OK, Leave Flow Meter Connected and go to next step.
7. With Tractor Engine running, Turn Mower on. With Mower running and not cutting anything (No Load or resistance to Blades other than Air). With Tractor RPM at 1800 you should get a reading of 400 to 600 PSI and 37 GPM, If flow were tested while Cutting this Pressure would increase as bladE resistance increased, To test while Cutting would not be necessary. When you first turn Cutter Switch on it is not unusual for the Pressure in flow meter to spike as Cutter first starts and then drop back on pressure. The Spike is due to the resistance encountered to get the Blade Carrier turning. If these test are OK remove Flow Meter from Line # 1 and reconnect lines, tighten lines to specifications.(See Pump System Schematic for line location)
8. Install the Flow Meter in line # 2 (See Pump System Schematic for Line location). Connect Flow Meter in line between Cutting Head Motor and Motor Control Valve on the Pressure Side. Check all connections and tightened to specifications. Safety first, make sure area is clear of danger to other Persons and property before starting any test. Start Tractor, you should not get a reading till you turn the Cutter Control Switch on. With Blades on Head running but not cutting anything (No Load or resistance to Blades other than Air) and Tractor RPM at 1800 you should get a reading of 400 PSI to 600 PSI and 37 GPM. It is not unusual to see a Spike Pressure in Flow Meter Gauge when Motor is first started then drop back. Some times when a load is put on the Hydraulic System during test the Load will cause the Tracror RPM to pull down, 1800 RPM Engine speed must be maintained during test, so watch Tractor Rpm and increase it if required to maintain needed PRM. If This Checks OK leave Flow Meter connected and go on to next Step. If this is not OK check the Logic Valve and relief Valve, They are located in the Cutter Control Valve Assembly. There are Seal Kits available for the Logic Valve and Relief Valve, see Part Manual for Part numbers.
9. With the Flow Meter Connected to Line # 2 (See Pump System Schematic for Line Location) and Motor Control Valve engaged with Motor running, you should be showing 400 PSI to 600 PSI Pressure and 37 GPM Flow. Let the System run till the Oil Temperature reaches a least 100 deg. F. Slowly close Restrictor Valve in Flow Meter watching Flow Meter Gauges till Pressure reaches 1000 PSI, here you may see a slight drop in GPM but this is OK. Record the Pressure, Temperature and GPM reading. Continue this in 500 PSI increments till you reach approx. 2500 PSI (2400 to 2600 PSI is OK) and your Flow should be at least 32 GPM (85 % Efficiency rate), At approx. 2500 PSI the Cutter Valves Relief Valve should open and pressure will not increase past Relief Valve Setting. If the Pressure exceeds 2600 PSI stop and back off retsrictor Valve on Flow Meter, replace Cutter Control Valves Relief Valve and and run test again. NEVER EXCEED Pressure Relief Pressure Setting in System when running test. If all checks out the Motor is most likely the problem, see the Motor Repair Section.

10. Remove Flow Meter from System and reconnect the original lines back up. Check to make sure all connections are connected to right place (See Pump System Schematic Drawing for line location). Check to make sure all lines a tightened to correct Torque (See Specification Section for Fitting Torque Specs).

11. Check Pressure Gauge at the return on tank, This gauge measure the pressure (return is Low Pressure) as it is being returned through the system to the return filter, This gauge is marked in Green and Red Zones. Green is acceptable return pressure, Red means return pressure is too high. If to high it can be cause by a dirty Filter or a restriction in return line in tank, But in most cases it is the Filter and it should be changed.

TESTING GEAR PUMP W/ FLOW METER



FLOW TESTING THE PUMP

1. Use a Flow Meter that is rated to 6000 PSI and 60 GPM Minimum. This applies to the Gear type Pump and Motor only.
2. The area around the hoses, motor and flow meter must be clean of all debris and dirt. NO contamination can be allowed to enter the system. Make certain there is nothing in flow meter from previous use that will contaminate the system.
3. Disconnect Pressure and return hoses from Motor. Connect hoses to the flow meter as shown above.
4. Completely open the pressure control valve on flow meter.
5. Record all Reading during this test. Start system, run at 1800 Engine RPM (Pump Speed) until the Oil Temperature reaches at least 110° F. before starting test. Check flow (GPM) at 0 psi. or no load. Slowly close pressure control valve until pressure gauge reaches 500 psi. Record your readings, Pressure, Temperature and Flow (GPM). Continue this at 500 psi increments until a maximum of 2000 psi.
6. If Flow Rate @ 2000 psi. is greater than 85% of beginning flow rate at no load, pump is serviceable and functioning within specifications.

CAUTION ! Stop tractor engine if hydraulic fluid temperature reaches 220°F

Recored Test Results

PSI	GPM	Temp ° F.	PSI	GPM	Temp ° F.
0	_____	_____	500	_____	_____
1000	_____	_____	1500	_____	_____
2000	_____	_____			

FRONT MOUNT PUMP / REAR MOUNT PUMP

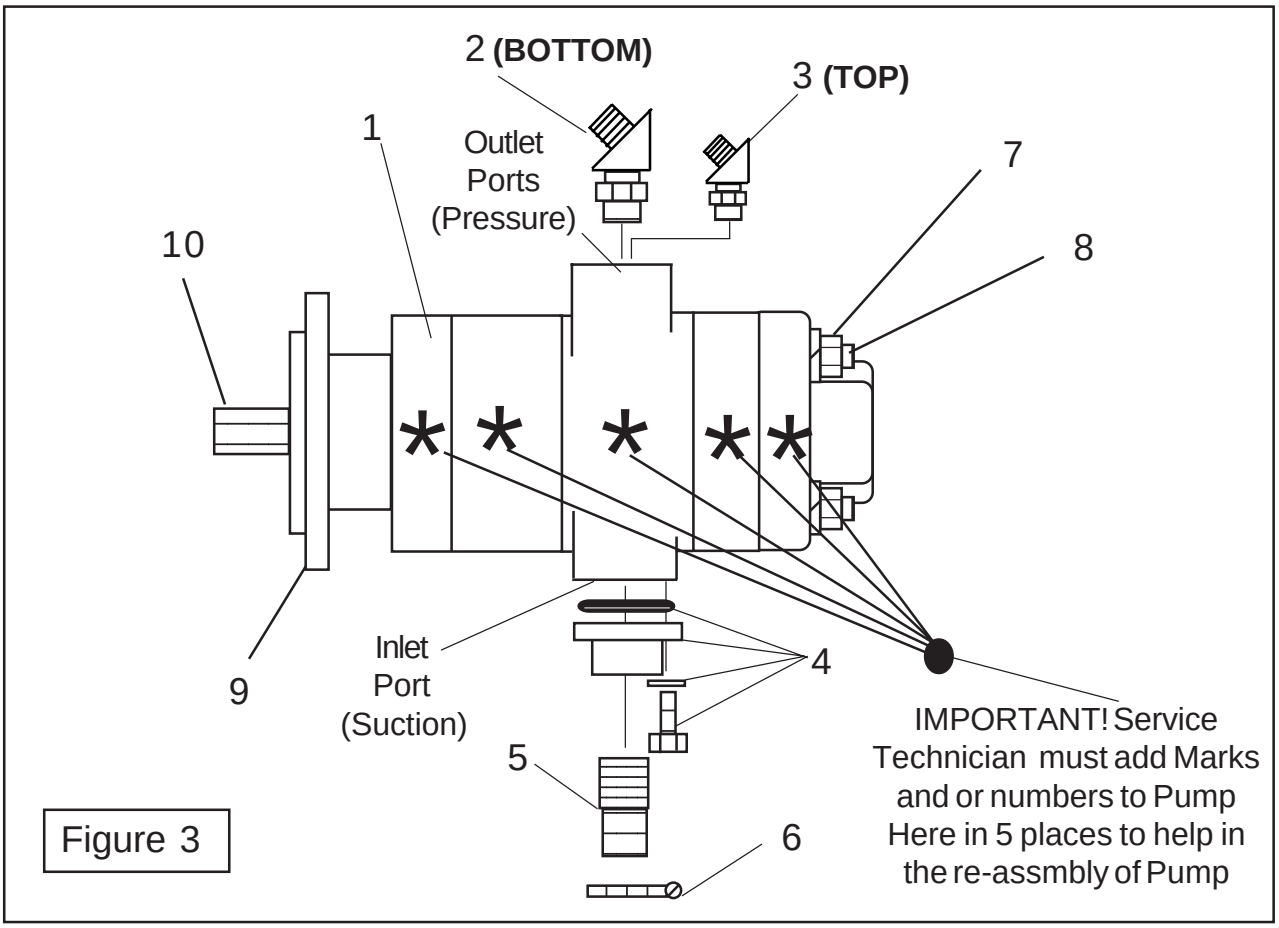


Figure 3

ITEM	QTY	DESCRIPTION
1	1	Hydraulic Pump Assembly
2	1	45 Deg. Elbow
3	1	45 Deg. Elbow
4	1	Flange Kit
5	1	Hose Bib
6	1	Hose Clamp
7	4	Retaining Nut
8	4	Stud
9	1	Pump Mounting Flange (Part of Pump Assembly)
10	1	Pump Input Shaft (Gear & Shaft)

Tandem Pump Shown in Figure 3 with standard rotation shown above, If Pump Rotation is reversed when re-assembled the only Mark you would see from this side is on item 9, Pump Mounting Flange and inlet and Outlet side would be the Opposite of shown and the Pump would be re-assembled to where the Marks would be on the other side.

Pump Repair

READ THIS FIRST **Dis-Assembly and Re-Assembly of Pump:**

(Standard Rotation is front Engine Mounted, Reverse Rotation is Rear PTO Mounted and cannot be swapped unless the Rotation is changed by re-installing parts differently)

1. Close Attention must be paid to the way the Pump is assembled. If the Rotation of the is going to be reversed, The Pump must be dis-assembled to change the direction of Shaft rotation. This would be done if you were converting a front engine mounted pump to a rear PTO (w/ speed Changer) driven pump. If the same rotation of Pump is to be the same as it was when disassembled then it must be assembled the same as it came apart. This only applies to the Gear Type Pumps as used on the A-Boom.

2. The Gear Housings have a specific way they must be installed to match the rotation of Pump, This is very important, as Pump will not operate if assembled wrong. The Gears are matched and must installed the same as they came out, This should not be to difficult as Gears are different Width on the Tandem Pump. The Single Pump is basically the same as the Tandem Pump except it has only one set of Gears and one Gear Housing. Most of the directions in this section reference to the Tandem Pump but can be applied to the single pump.

3. Before any dis-assembly of any component of Pump is dis-assembled, The entire area around Pump, Work Area, Tools and including service mans hands must be completely free of any dirt or any debris that could contaminate Pump and lines. THERE CAN BE NO DIRT ALLOWED TO ENTER HYDRAULIC SYSTEM. When parts are being removed do not leave open lines of components that are removed.

4. When Cleaning Pump Components, Do Not used cloth unless it is totally Lint Free. It is best to use Clean Solvent and Blow-dry components with clean filtered compressed air. DO NOT SPIN components with Compressed Air, it is dangerous and will damage parts. After Cleaning if parts are not to be assembled right away they should be coated with light coat of Hydraulic Oil and stored where they can not collect dust.

5. Caution: During dis-assembly, use extreme caution when prying apart castings. The marring of machined surfaces could cause leakage. Excessive use of force can result in mis-alignment and serious damage to parts. Gears are closely matched and must be kept together as a set, when removed from the Pump. Handle them with care to avoid damage to the Journals, Faces and Teeth.

6. During re-assembly, care must be taken when installing all the parts. If one part, Gear Housing, Bearing Carrier Housing, Thrust Plates, Channel Seals, Gasket Seals, Threaded Passage Plugs or any other part is installed in the wrong place or wrong direction, This would cause pump not to work and/or be severely damaged. Read all directions as listed in the assembly steps, If there is some thing in question as to which way a part should be installed, check it out. Installing a small part wrong can cause major damage.

7. After Assembling Pump and reinstalling it on Tractor, MAKE SURE PUMP IS FULL OF OIL (Pre-Lubed). Never start Engine with New or Re-Built Pump unless it is prelube. On models where Oil Level (Tank) is higher than Pump Gravity will prelube Pump when Tank is filled. This means that Oil level in Tank must be higher than the Suction Line, If any part of the Suction Line is higher than the Oil Level in tank Pre-Lube Pump in addition to coating all components with oil during assembly.

Pump Repair

DIS-ASSEMBLY INSTRUCTIONS:

1. Remove the Shaft Key from the drive shaft. Clean the Shaft and inspect for burrs. If Burrs exist, lightly stone away to prevent the Lip Seal from being damaged during dis-assembly.

2. Place the Pump assembly in a vice with the drive shaft pointing downward (Figure 4). Clamp the Pump on the sides of the mounting Flange only, Do Not clamp on the round pilot diameter of Shaft (Figure 3 item 10) as it would damage shaft which would cause seal surface to be damaged.

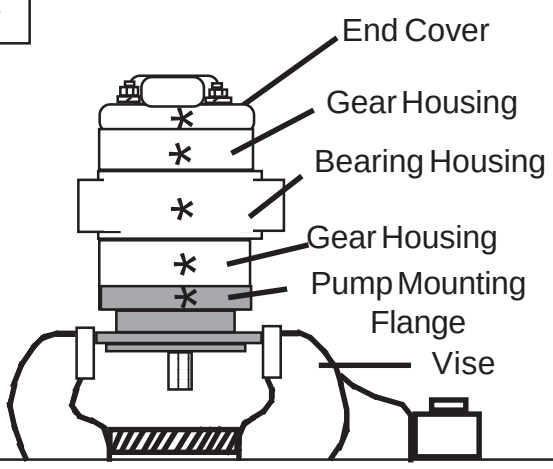
3. * Match - Mark and/or number each casting piece in the Pump assembly (See Figure 3 & 4). This will help ensure proper location and direction of assembly of each component during re-assembly. This is important because casting must be installed in same direction and order as they came apart.

4. Use a Socket Wrench to remove 4 Hex Nuts at the top of the Pump (See Figure 5). Some times when removing these, Stud will unscrew and come out instead of the Nut coming off of the stud, if this happens make sure that at least two of the studs stay in at all times, All 4 can stay in it will be OK, (the studs do not have to be removed). Remove the 4 lock washers from the Studs.

5. Removing the Port End Cover, make sure a least 2 Studs are still in the assembly with all the retaining nuts removed. If End cover will not pull up over Studs, Place the point of a wedge (large Screw driver or Chisel) on the parting line between the Port End cover and the Gear Housing. Lightly tap until a slight separation between the castings is detected. Caution must be used when prying Port End Cover off as not to damage the machined surfaces of components. There are Dowel Pins used between the Port End Cover and Gear Housing, these Dowel Pins may stay in either casting which will be important to know when time to re-assemble but do not remove Dowel Pins at this time. Looking at the Machined side of Port End Cover you will see 2 threaded passageways, 1 that has a plug and 1 that will not have a plug. Mark the passage without the Plug so that you will know which one it is later when re-assembling. DO NOT REMOVE THIS THREADED PLUG, even if you are reversing rotation on the Pump from front mounted to a rear mounted.

6. The 1 st. Thrust Plate (See Figure 6) will be on top of Gear Housing between it and the Port End Plate. The Thrust plate has two different sides, Remove the Trust plate by hand, Do Not pry on Thrust Plate. The Channel Seal (facing up) can be left in Thrust Plate Groove, If the unit has a lot of hours operation it will be best to replace these Channel Seals.
   .

Figure 4



DIS-ASSEMBLY INSTRUCTIONS: (Continued)

7. Match-Mark the Outer Gear Set. before removing them, they must be reinstalled with the Teeth meshed the same way they came out. Wipe (with Lint free cloth) the Oil from Gear Set. Mark the Gear Set with Machinist Ink or Quick Dry Marker. Carefully remove the Gears from the Gear Housing. You should be able to do this by hand. Avoid tapping the gear teeth together or against other hard surfaces. Lift the Gear housing up and off. Be careful if prying Gear Housing. If Gear Housing is stuck, break it free with a wedge as was done in step 5 above. Carefully remove the 2 nd. Thrust Plate off by hand, The Channel Seals will be on the bottom side of thrust plate and may or may not come off with Thrust Plate. (See Figure 6) Note: When looking at Thrust Plate and the Channel Seals, The Smooth side of the Thrust Plate goes against Gears and Channel Seal are on opposite side from Gears. if they are not this way they were installed wrong and will have been destroyed by the gears. .

8. There are Gasket Seals in grooves for the gear Housing (See Figure 8), check to see if these Seals stayed in grooves or fell out, It is not important to remove these Seals unless they have a lot of field time or they are damaged. Replaces Seals if damaged. There are Dowel Pins that will have remained in Gear Housing or Bearing Carrier Housing. Do not remove the Dowel Pins at this time. Note that the Inlet (Suction) Core has a larger opening than Outlet (Pressure) Core. This must be this way, the larger opening must always be on the Suction side of Bearing Carrier Housing.

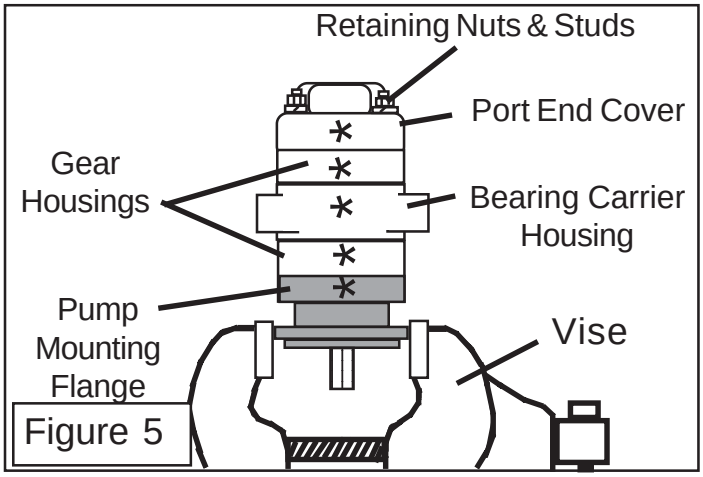


Figure 5

9. Lift the Bearing Carrier Housing up and Off. If prying on it be careful with machined surfaces. The Dowel Pins will stay in this Housing or stay in the next Gear Housing. Do Not remove Dowel Pins at this time.

10. Remove the 3 rd. Thrust Plate that will be with the Channel Seal facing up away from Gears in next Gear Housing. (See Figure 15 which is a motor Channel Seal, A Pump Channel Seal is only one sided See Figure 14 & 15) The Thrust Plate should lift off by hand, Do Not Pry on Thrust Plate. Inspect Channel Seal.

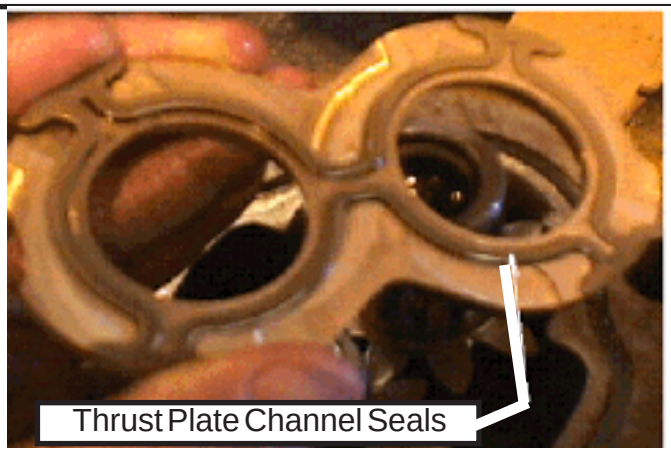


Figure 6

DIS-ASSEMBLY INSTRUCTIONS: (Continued)

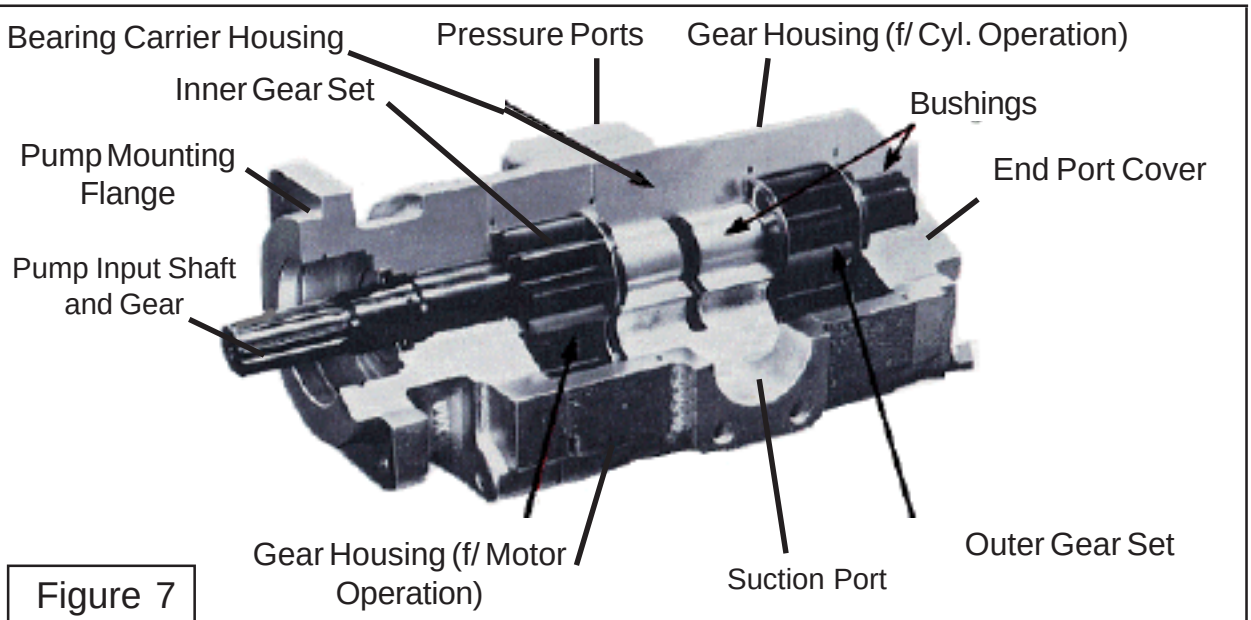


Figure 7

11. Match-Mark the Inner Gear Set. before removing them, they must stay together and not get mixed with the Outer Gear Set. Wipe (with Lint free cloth) the Oil from Gear Set. Mark the Gear Set with Machinist Ink or Quick Dry Marker. Inspect the Input Shaft that protrudes out through the front of the Pump, make sure there are no damage to Shaft that will damage Seals or flange Housing as gears are removed. (See Pump Breakdown For detailed View). Carefully remove the Gears from the Gear Housing. You should be able to do this by hand. Avoid tapping the gear teeth together or against other hard surfaces.

12. Lift the Gear Housing up and off. Be careful if prying Gear Housing. If Gear Housing is stuck, break it free with a wedge as was done in step 5 earlier. The Gear Housing has Dowel Pins between Gear Housing and Pump Mounting Flange Housing, The Dowel Pins will stay in one or the other housing, do not remove Dowel pins from housing at this time. Carefully remove the 4 th. Thrust Plate off by hand, Some times these thrust Plates will come out with the Gears or can be removed up through Gear Bore in Gear Housing. The Channel Seals will be on the bottom side of Thrust Plate and may or may not come off with Thrust Plate. (See Figure 6) Note: When looking at Thrust Plate and the Channel Seals, The Smooth side of the Thrust Plate goes against Gears and Channel Seal are on opposite side from Gears. If they are not this way they were installed wrong and will have been destroyed by the gears.

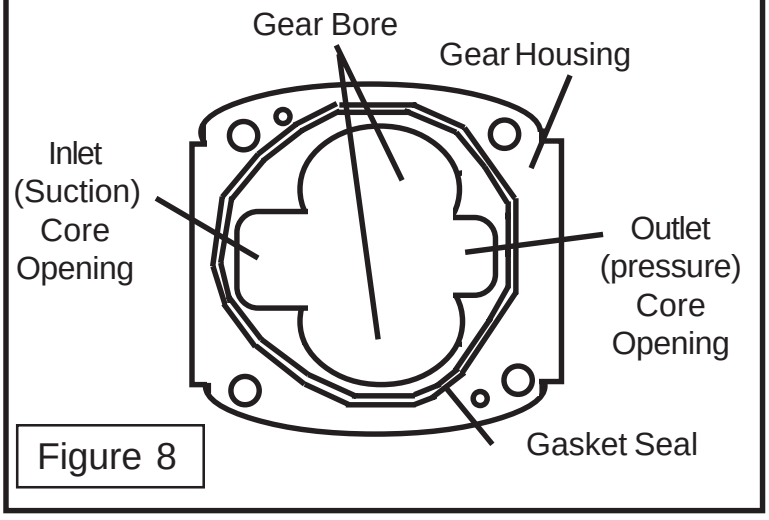


Figure 8

DIS-ASSEMBLY INSTRUCTIONS: (Continued)

13. Important! Look at the top of the Pump Mounting Flange you will see two threaded passage ways, one will have a plug in it, the other one will not (See Figure 18). Mark these hole so that you will know which had threaded plug and which did not. DO NOT REMOVE THE PLUG from housing unless you are reversing the Rotation of the Pump from front mounted to a rear mounted. If you are reversing rotation of Pump remove the threaded Plug from the Pump Mounting Flange. Clean the area around the hole where the plug came out, make sure that there are no metal shavings or splinters that came off of threaded plug or hole left on Pump Mounting Flange Housing. Carefully remove any burrs on Housing where Plug came out.

14. Inspect and Clean the Pump Mounting Flange, Inspect and replace the Shaft Lip Seal in housing if needed. If Seal has any damage, nicks or wear is visible it should be replaced. There is a Bearing (Bushing) inside Pump Mounting Flange behind Shaft Lip Seal, Inspect the Bearing condition, There is also a Bearing (Bushing) where Idler Gear runs in this Mounting Flange. If Bering is worn it should not be used.

15. Coat all the parts with a light coat of hydraulic Oil, If parts are going to be around awhile before being re-assembled they should be covered to prevent dust from collecting on them. Never Assemble a Pump if any of the Parts have rust or dirt on them, Pump will be damaged plus you could damage other components of your Unit. The Cleanliness is the most important operation of any hydraulic component repair. The cleanliness during service work is your responsibility

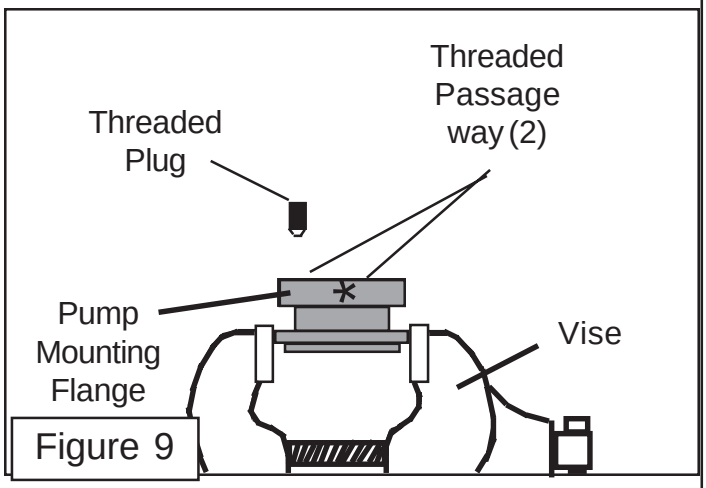


Figure 9

Pump Repair

ASSEMBLY INSTRUCTIONS:

1. Important! This Step will only apply if you are reversing rotation of Pump to mount it on a Speed increaser on rear of tractor, If NOT Reversing Rotation go on to next Step and do not swap holes with this plug. Apply Loctite to the threads of the Plug that you have removed in Step 13 of dis-assembly. Screw the Plug tightly into the marked (Hole that had no plug) hole or opposite the one that the plug came in, of Pump Mounting Flange. Stake the Plug with a prick punch at both ends of the screwdriver slot and around the edges. Peen the edge of the hole 1/32" to 1/16" with a 1-1/2" diameter steel ball. After this step the pump must be assembled as started for rotation as this Plug will only work in the correct hole as comparison to the way the rest of components are assembled.

2. Pump Mounting Flange should be checked to make sure it is clean, make sure the Shaft Lip Seal has been replaced or is in good condition. Lightly coat the ID of the Lip Seal with new clean Hydraulic Oil. Pump Mounting Flange should have at least 2 of the 4 studs (all 4 will be OK) screwed into it to hold everything in place as being assembled, For Illustration and clarity purposes the Studs are not shown in drawings.

3. Now is the time to look at the marks that you put on the castings prior to dis-assembling the Pump (See Figure 5). Get the Inner Gear Housing, as it supplies the Motor which needs more volume of Oil it will be the thicker of the two Gear Housings, Inspect the machined surfaces, check Gasket Seals and Seal grooves, If pump is be assembled with the same Rotation slide the Gear Housing with the Gasket Seal in its groove the same way it came off (Your Marks will line up on same side), If you are reversing rotation the Mark on gear housing will be 180 degree turned from the way it came off (See Figure 5). If reversing rotation you may also have to reposition Dowel Pins at this time from housing to housing to get them to be compatible with correct holes. Once everything is lined up, tap Gear Housing with a soft hammer to seat it down over dowel pins.

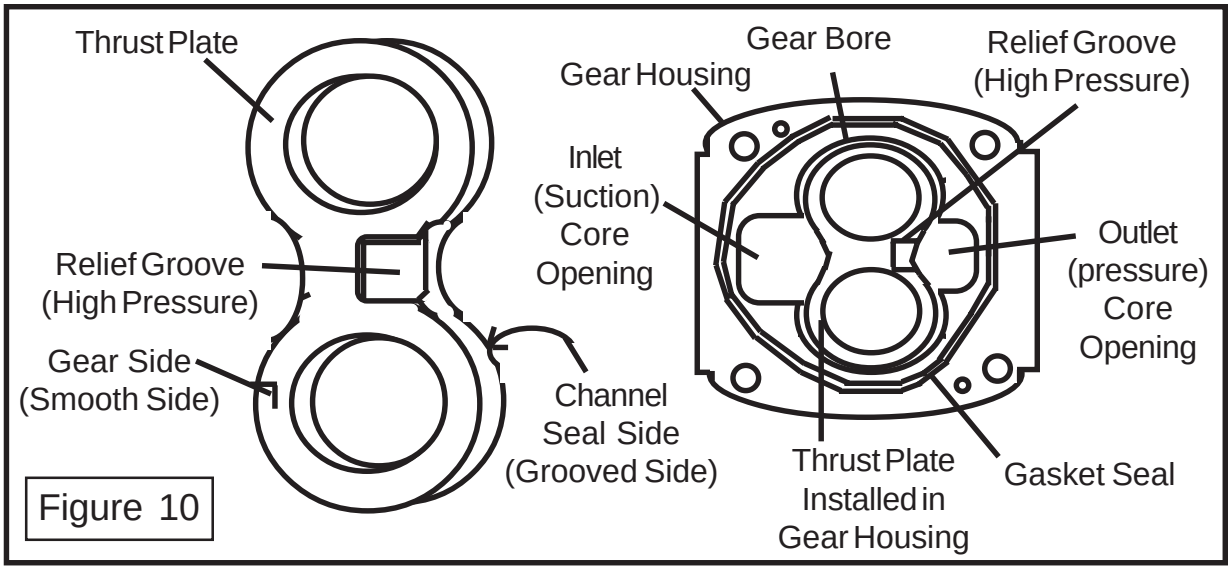


Figure 10

ASSEMBLY INSTRUCTIONS: (Continued)

4. Install 1 st. of 4 Thrust Plates, Install the Channel Seal into the Groove on Thrust Plate, The Channel Seal has a Flat side and a V shaped side, The V shape goes into groove of Thrust Plate, the Flat side of Seal faces away from Thrust Plate. Gently slip the Thrust Plate with the Channel Seal installed into the Gear Bore of Gear Housing, The Thrust plate must be installed with the Channel Seal Down and the smooth side of the Thrust plate up toward gear, Channel Seal down toward Pump Mount Flange. The Thrust plate also has a notch (lowered Slot) in the smooth side of it. This Notch must always point toward the Outlet (Pressure) side of Gear Housing (See Figure 10). Notice the Openings (core) for Inlet (Suction) Side and Outlet (Pressure) side, The Inlet (Suction) side is always a larger opening (See Figure 10) and must always be installed this way. (See Figure 15 for Channel Seal Description)

5. Coat the Drive Gear input Shaft with light coat of clean Hydraulic Oil; Slide the Shaft down into the Gear Housing, Guiding it through the Thrust Plate, Do not touch Thrust plate with Shaft Splines, Guide Splines through Thrust Plate. Insert Gear Shaft till it protrudes through Shaft Bushing, Shaft Lip Seal and the bottom of Pump Mounting Flange using a gentle Push and twisting motion (See Figure 18), Use caution not to wobble Shaft or push on shaft and damage the Thrust Plate. Coat Idler gear with light coat of Clean Hydraulic Oil and drop it into Gear Housing using caution as it goes through the Thrust Plate. Squirt Clean Hydraulic Oil into cavity around and all over Gears.

6. Mark the position of one of the <u>Tooth points of the Gear on the Out side of the Gear Housing.</u> This Mark will be needed later and used as a reference point during installation of the second Gear Set on a Tandem Pump.

7. Slip the Thrust Plate with Channel Seals installed down over the gear Shafts. Thrust Plate must be installed with the Flat Side toward Gears and the Channel Seal Up. Also the Relief Groove of Flat side of Thrust Plate must be toward Outlet (Pressure) Side core Opening (See Figure 13 & 14), The correct installation of Thrust Plate is important. Recheck and make sure Channel Seal is installed with the flat side up. Make sure that Gasket Seal is installed in Groove of Gear Housing.

8. Installing of the Bearing Carrier Housing Must be done correctly. Check Bearings (Bushings) in Housing for condition, Check that Gasket Seal is still in place on the installed Gear Housing. Coat Housing Bearings (Bushings) with Hydraulic Oil. Find the Mark you put on Bearing Carrier Housing when it was dis-assembled (See Figure 16). Line the mark on the Bearing Carrier Housing with the Mark on the previously installed Gear Housing. (If rotation is not being changed then all the marks (3 installed Parts)) you made will be lined

(Continued Next Page)

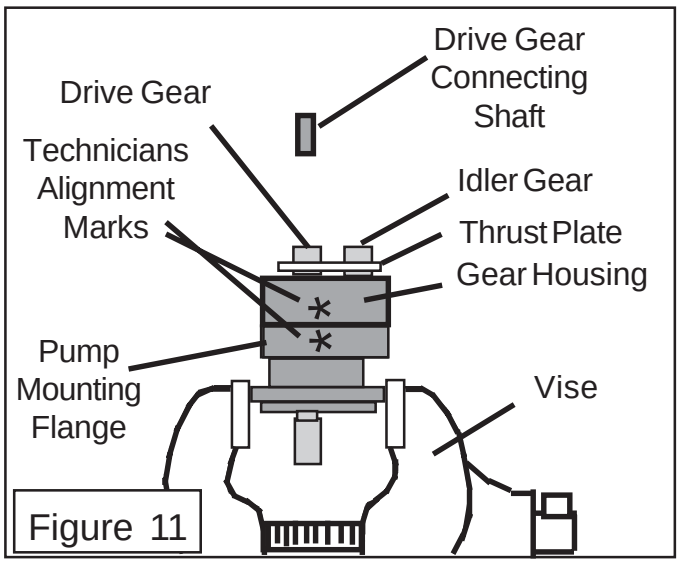


Figure 11

ASSEMBLY INSTRUCTIONS: (Continued)

8. (Continued From Previous Page) up on same side, If you are changing Rotation the Pump Mounting Flange mark will be on one side and the other two pieces installed will have their marks on the other side. With the Mark lined up with the mark on the Gear Housing and the Dowel Pins checked (or changed) to align properly, carefully lower the Bearing Carrier Housing down till it is seated against Gear Housing. If needed lightly tap Housing with soft hammer to seat down over Dowel pins. (Check the Bearing Carrier Housing), The size of the Inlet Core and Outlet Core openings a different size and must be installed correctly to Match Gear Housing Core openings. If this is not correct you will have immediate Pump failure.

9. Installing the Second Gear Housing, This applies to the Tandem Pump. The Second (outer Gear Housing is thinner than the first, this is because it supplies the Hydraulic Cylinder Operation and the Volume demand is not as much as the Pump Supply. Inspect the condition of the Gear Housing. Locate the Mark that you put on it during dis-assembly (See Figure 13), If the pump is being assembled with the same rotation as when it was dis-assembled the Mark will be in its original location (all the marks aligned on the same side). If the pump rotation is beiing change it will be aligned with the other two housings opposite the Mark on the Pump Mount Flange. Install the Gasket Seals into the grooves on the Gear Housing, Check the Dowel Pins in both housings and move them if needed. Lower Housing down till it rest against the the Bearing Carrier Housing. Tap Gear Housing with a soft Hammer if needed to seat over Dowel Pins.

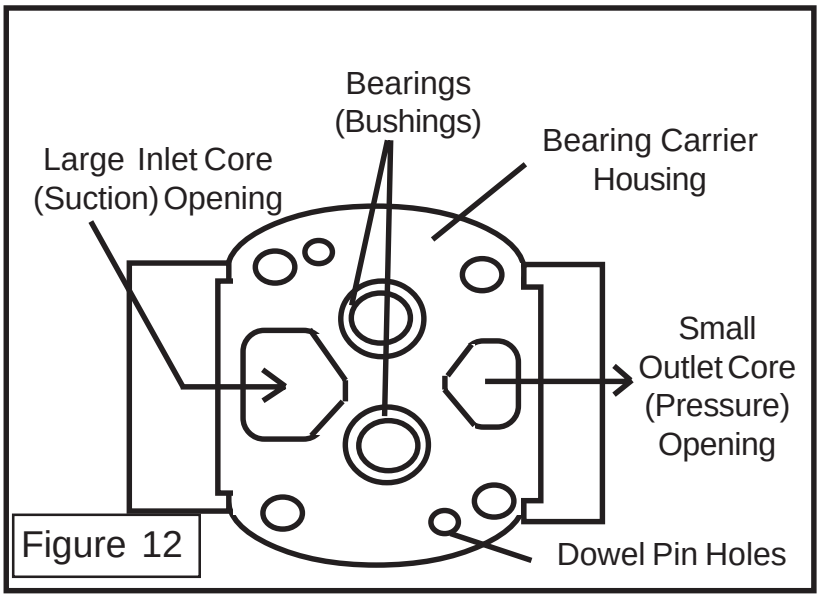


Figure 12

10. Before continuing check the Inlet and Outlet Core Opening to make sure the Large opening is on the same side as the other Large Inlet Core Opening. Check to make sure that Gasket Seal is still in its groove on Gear Housing. (See Figure 13)

11. Install the 3rd Thrust Plate; make sure that Channel Seal (See Figure 13) is installed into Thrust Plate. When installing Thrust Plate into there are 3 things that must be correct. 1. Make sure Channel Seal is installed with Flat side of Seal out away from groove in Thrust Plate. 2. Install Thrust Plate into Gear Housing with the Channel Seal Down and Facing the Bearing Carrier Housing. 3 rd. Make sure that The Relief Groove in Thrust Plate is pointed toward the Small Outlet Core (Pressure) Opening side (See Figure 13).

12. Install Drive Gear Connecting Shaft (See Figure 11) in to end of Drive Gear that is installed already. The Connector Shaft is a short stub piece of splined Shaft.

ASSEMBLY INSTRUCTIONS: (Continued)

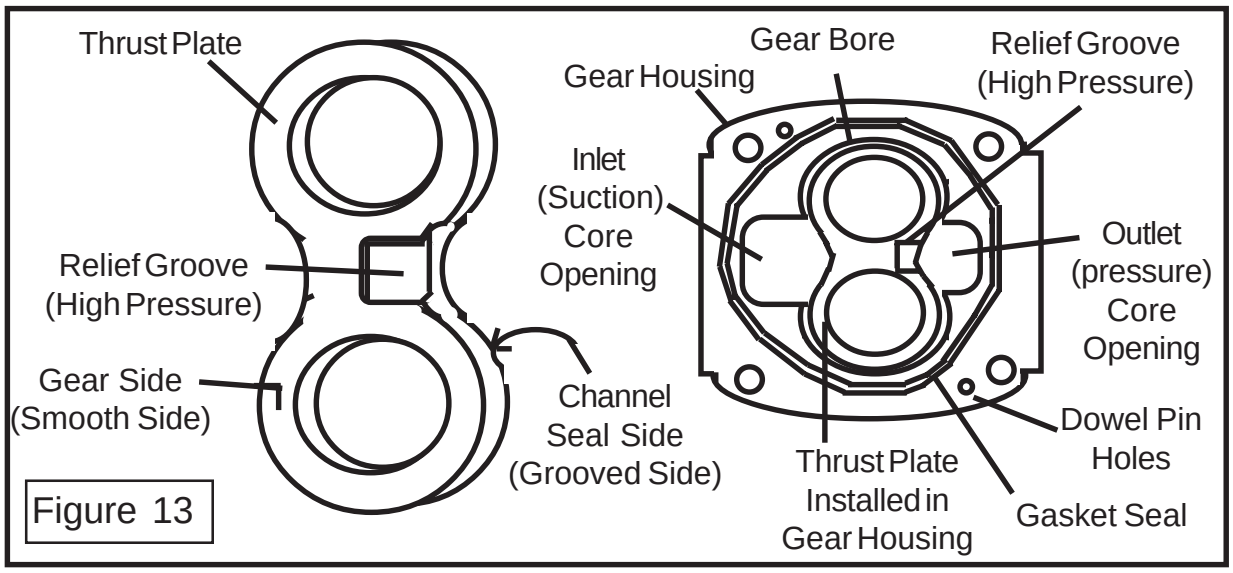


Figure 13

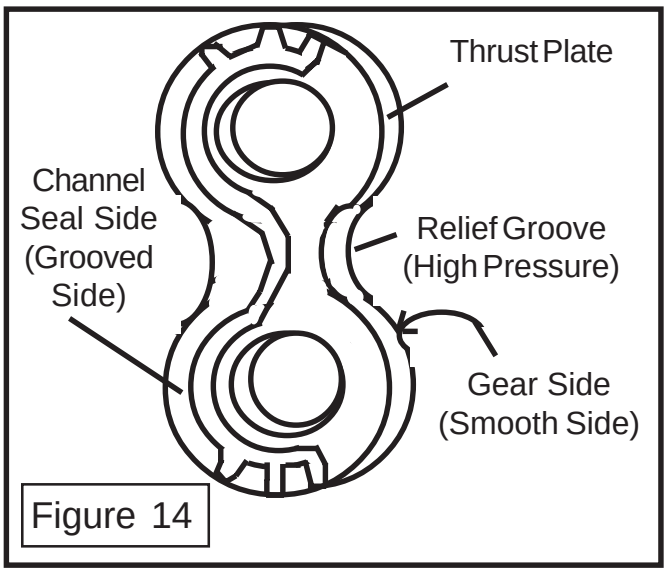


Figure 14

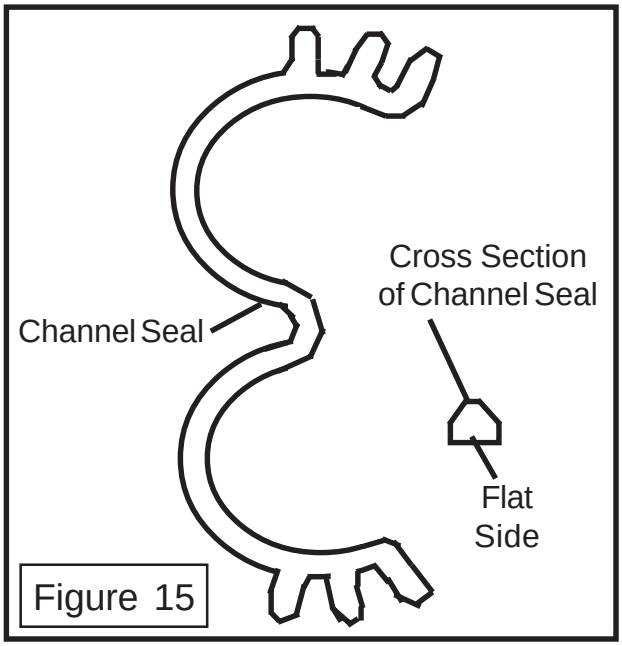


Figure 15

13. Slide the Second Driven Gear (this is the gear that will not have Splines in Shaft) through the Gear Housing being careful of Thrust Plate. Align this gear with the Mark you made earlier as described in step six. Align this Gear to where that mark is between two tooth points. This will put the two Gear Sets out of Phase and maximize performance. Phase the Drive Gear into the Housing lining up the marks on the gears from dis-assembly. You will have to rotate Gears to get them to slide together at the Gear Connecting Shaft, But try to keep the Gears a half Tooth out of Phase. Squirt clean Hydraulic Oil over Gears. (Gears installed out of Phase; this will keep the pump operating with smooth constant flow).

ASSEMBLY INSTRUCTIONS: (Continued)

14. Slip the Thrust Plate, with Channel Seal over the Journal and into the Gear Housing. Make Sure the Relief Groove (See Figure 13) is down toward Gear Side and pointing toward the Outlet Core Opening (See Figure 92). Make sure the Channel Seal is installed into Thrust Plate facing up. Make sure the Channel Seal has the Smooth side up and the angled side into groove of Thrust Plate (See Figure 14 & 15).

15. All the Studs should be installed at this time if they are not already installed. Make sure that the Gasket Seal is installed into the groove on the Gear Housing (See Figure 13)

16. Install the Port End Cover, The Port End Cover should have your alignment Mark from disassembly. If you are not Reversing Rotation of Pump, put Port End Cover back on the same way it came off, This means that all of your Marks will line up on the same side and the Threaded Plug will be in the same Hole (See Threaded Hole in Figure 16) that it was in originally. If you are Reversing Rotation the Port End Cover will be installed turned 180 degrees and your mark will be on opposite side. The Plug in the Threaded Hole WILL NOT have to be moved to the other Hole from where it was because as cover is turned 180 degrees Plug is being moved. DO NOT MOVE PLUG and if you do move Plug DO NOT ROTATE COVER. Note. You may have to move Dowel pins to line them up.

17. Lightly tap the Port End Cover in the center to seat down over Dowel pins till it rest against Gear Housing.

18. Install the Flat Washers and Nuts on Studs, Tighten these till Nuts and Washers touch End Cover and are snug. Rotate Input shaft of Pump to make sure it is not binding. Now torque these Nuts using an alternating pattern (1 - 4 - 2 - 3 See Figure 17) diagonally in increments 1st to 100 ft. lbs, 2 nd 150 ft. lbs and 3 rd to 200 ft. lbs. Re-check to make sure pump turns with out binding between Torque sequence. and after last tightening. Always check Driveshaft components before reinstalling Pump.

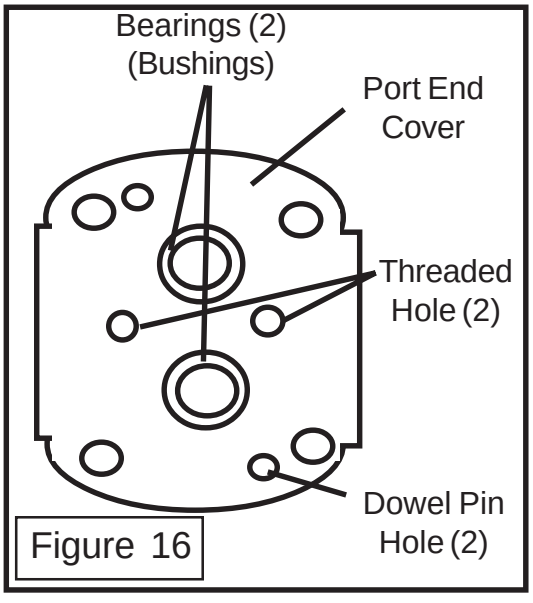


Figure 16

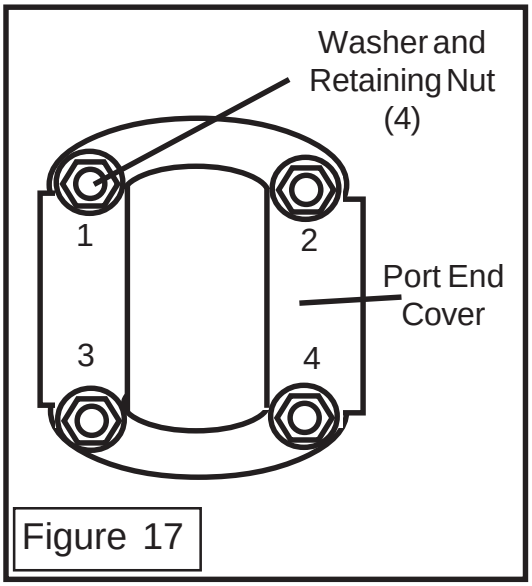


Figure 17

Pump Repair - Summary

IMPORTANT FACTS TO WATCH OUT FOR: SUMMARY

1. **Always clean Pump,** Tools and work are before perform any repairs on Hydraulic System.

2. **Mark Each Section of Pump** to where you will know how it came apart and in a way that you will know which side id Left or Right, Top or Bottom, This is important for re-assembly. you can mark these as you want but it is best to do it with Punch Marks, Number or Letter Stamps. Marks should be permanent and not wipe off. See figures in this Section for Parts Location and design.

3. **The Gears** must be marked before being dis-assembled as they must be put back the same as removed, This can be done with machinist Ink or a permanent marker. The Gears on a Tandem Pump has two sets of Gears, The Gears are installed 1/2 tooth out of Phase with each other.

4. **Gear Housing** must be installed with the Inlet and Outlet Core Openings on the correct side, On Tandem Pump the core opening on all sections must be on the same side, all large one side and all small on other side.

5. **Bearing Carrier Housing** must be installed with the Inlet and Outlet Core opening on the correct side, they must match the Gear Housings Core Openings.

6. **Thrust Plates** must always be installed with the smooth side against gears and the Relief Groove toward the Outlet (Pressure) Core Opening.

7. **Channel Seals** must always be installed on the opposite side of the thrust plates away from Gears (Channel Seals Never go on Gear side of Thrust Plate). The Channel Seals are Flat on one side and peaked on other side, the peaked side always goes against Thrust Plate in the groove on Thrust Plate. The Flat Side goes away from Thrust Plate.

8. **Gasket Seals,** these are the Gaskets (Rings) that fit into the Grooves on each side of Gear Housings, these must be fit squarely into these grooves to prevent leaking.

9. **Pump Mounting Flange,** This has two threaded holes in it on the machined side. One hole has a Plug ant the other Hole will not. If Reversing Rotation of Pump is done this plug must be moved to the opposite Hole. If NOT Reversing Pump Rotation DO NOT remove or change this Plug.

10. **Port End Cover,** The Port End Cover has two threaded holes, one with a plug and one without a plug. This plug WILL NOT need to be removed or changed. The End Cover must be put on in the correct direction to match pump rotation. Always pay attention to how pump was dis-assembled to see which way you need to put cover back on. Put Cover on same for same Rotation or turn 180 degrees if Reversing Rotation.

Pump Repair - Part Location

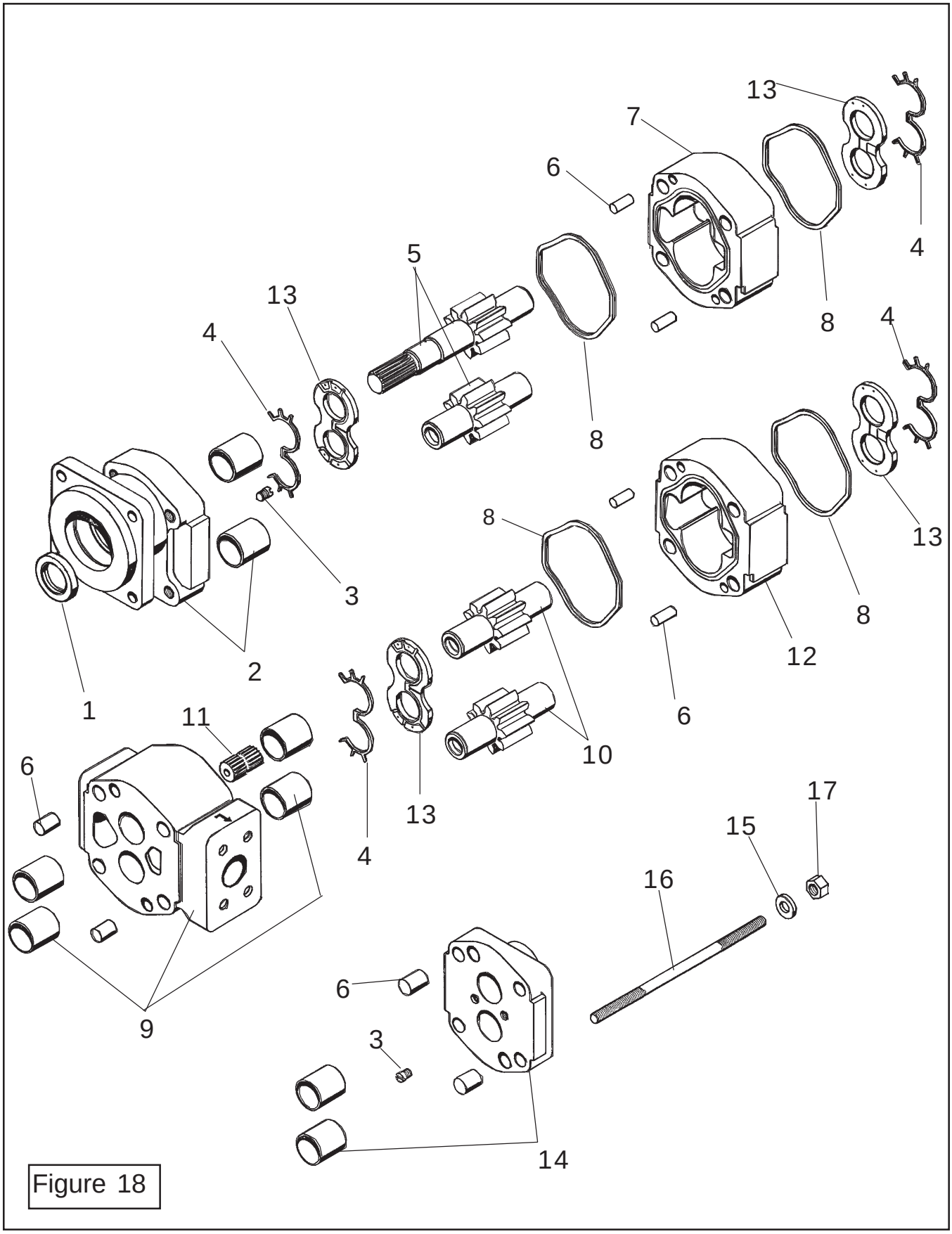


Figure 18

TANDEM PUMP
(AXTREME-BOOM)

ITEM	QTY	DESCRIPTION
	--	**Pump Assembly, Tandem**
1*	1	Seal
2	1	Mounting Flange w/Bushings
3	2	Plug
4*	4	Channel Seal
5	1	Gear Set
6	8	Dowel Pin
7	1	Gear Housing
8*	4	Gasket Seal, Square
9	1	Bearing Carrier Housing w/Bushings
10	1	Gear Set
11	1	Connector Shaft
12	1	Gear Housing
13**	4	Thrust Plate
14	1	Port End Cover w/Bushing
15	4	Washer
16	4	Studs
17	4	Nuts

** included in major rebuild seal kit (includes Minor Seal Kit)

* included in Minor Rebuild Seal Kit

NOTES

Section 6

Axtreme Boom

Mechanical Valve (Std) With Remote Cable Repairs

This Control valve is the Standard 5 Spool that is remote cable controlled, with the 5 Th. Spool operating the Door or the Swivel Head Mount Option through a diverter valve. The Standard Pump System is used to supply the cylinder valve control circuit.

"ON - OFF" Switch Installation

Wire Harness: (Standard Mechanical Valve)

1. Starter Safety Switch Schematic, Mechanical Cable Operated Valve Type, NOT correct for Optional Joystick (Electronic) Controls.

2. Figure 1 illustrates a common wire harness connection for Boom mowers with mechanical cable controls, If the Joystick Optional controls are used the Wiring will be different than shown.

3. Individual installations may vary and are dependent on the electrical and safety system designs of the tractor to which the mower is mounted.

4. Consult the specific mounting instructions to determine the correct wire routing for each specific unit.

Common Problems:

1. The tractor won't start: The mower on/off switch, if left in the "on" position will not allow the tractor to restart. Be sure to push the switch into the "off" position and account for all the tractor safety interlocks to enable the tractor to start. Failure of the tractor starter safety lock system is normally attributed to a failure of the mower on/off switch. Check continuity at the switch. Check for loose connections.

2. Cutter motor won't start: Normal causes of this type of malfunction include failure of the push/pull switch, failure of the solenoid coil, loose connections, loss of ground, or a blown fuse. If the mower won't start, check continuity of the system with a test light to find an electrical problem. Problems may also exist in the cutter valve and other systems.

3. The problem may not be in the electrical system, but because there are so many connections that could be malfunctioning it is the best place to start checking. If the electrical connections are OK, go on to the Tractor connections and/or the Tractor components to check for the malfunction. Some times the service technician thinks the best way to eliminate the Mower electrical connection problem is to bypass them; this should never be done, eliminating the starter safety system is dangerous and hard on the Hydraulic System, The Hydraulic System will be trying to start at a low RPM which is not good.

Wire Harness - Cable Controled Valve

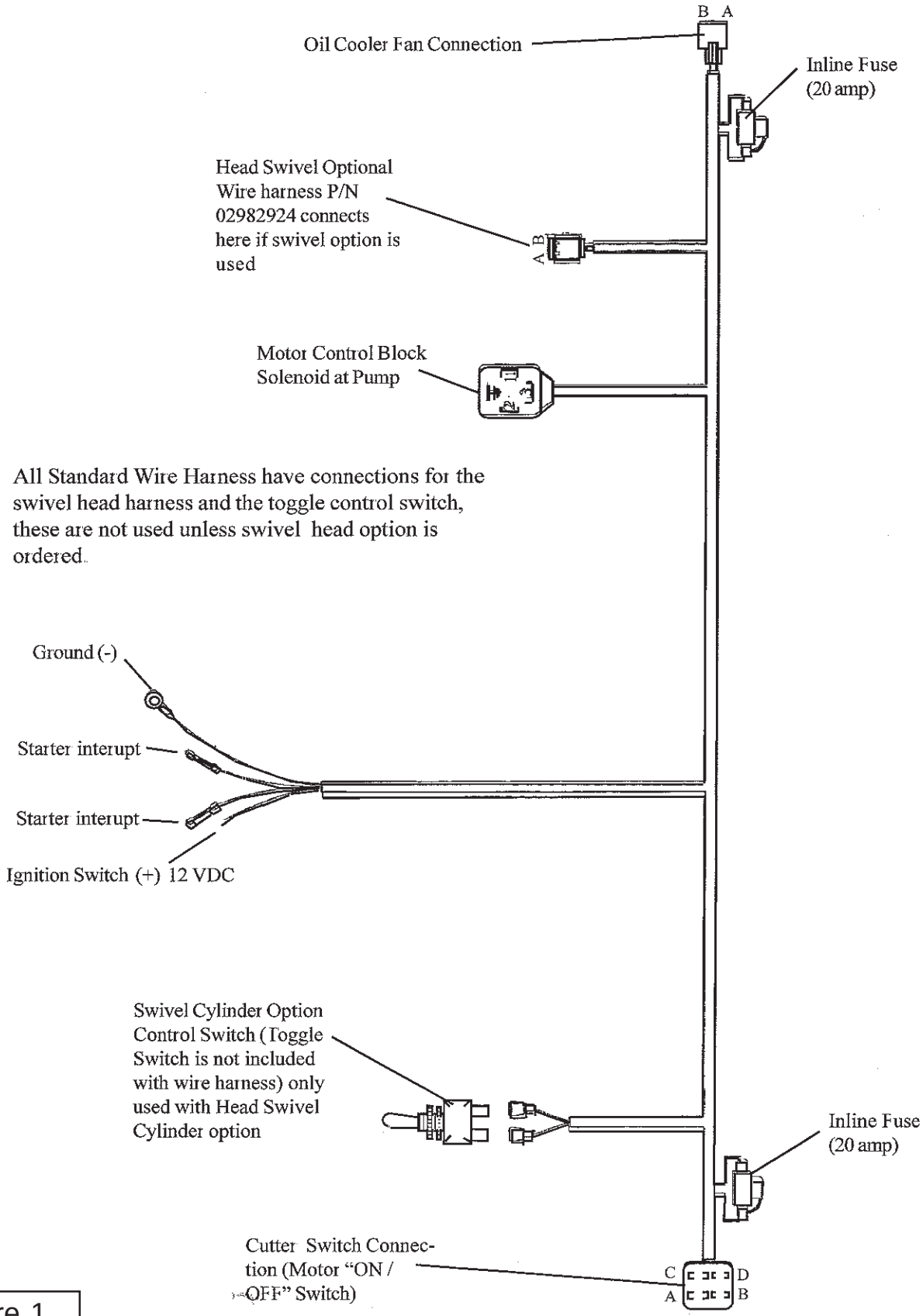


Figure 1

Valve Remote Cable Controls

Mechanical Remote Cable Controled Valve (Standard)

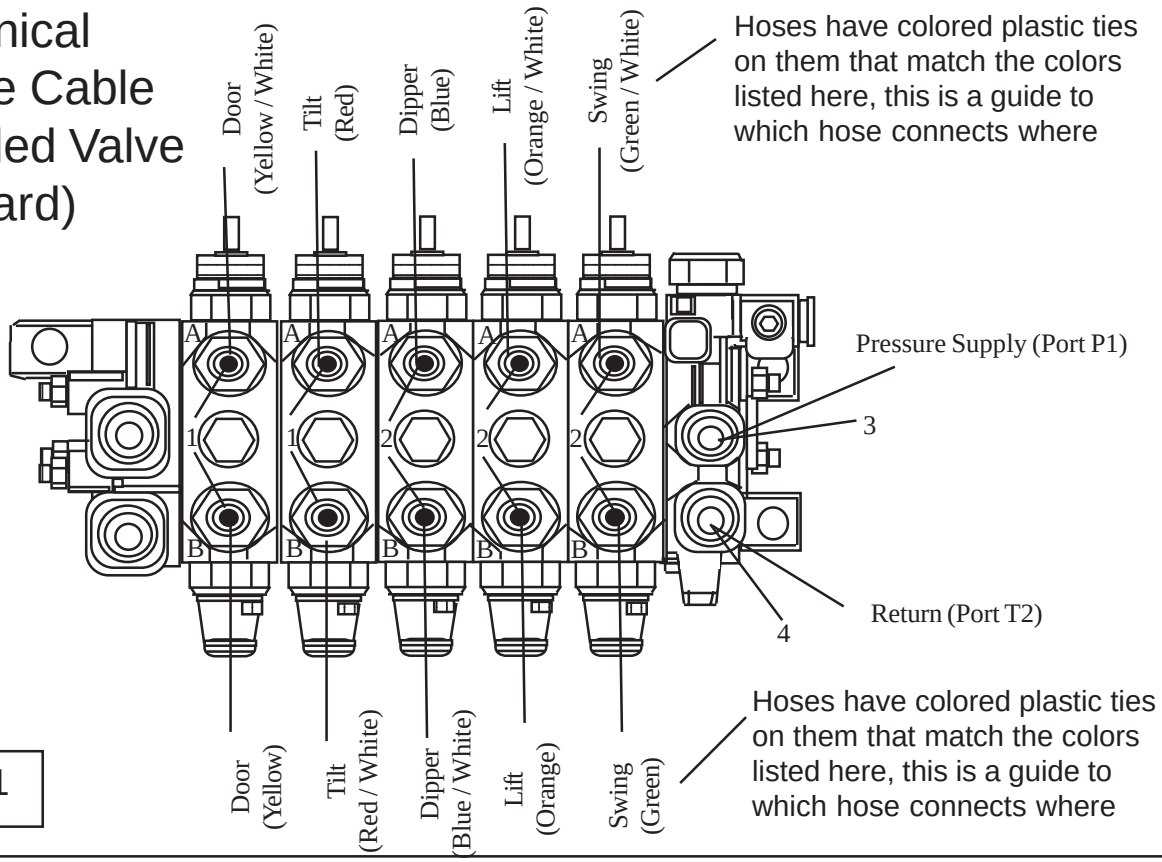


Figure 1

Cylinder Control Valve Cables To Valve Spools:

The Remote Control Cables Connection to the valve and the Control Handle assembly. See Figure 2 for listing of items (1 thru 8) listed in assembly steps.

1 Remove the phillps head screws that are in the valve body next to the spool end (8). There are bolts in kit that will be used to replace these screws when needed (See Figure 2).

2. Slide the Bolt flange (8)

3. Thread .750-16 NF jam nut entire length of threaded hub and onto the cable (7).

4. Place flange on sleeve and thread flange / sleeve assembly entire length of threaded hub and onto cable (2 & 6).

5. Thread .250-28 NF jam nut onto cable threaded rod until it bottoms (3).

6. Place connector onto threaded rod and against jam nut. Align connector so it will mate with spool terminal and secure jam nut against connector (4).

7. Slide the connector onto spool and align the holes. Insert pin through connector and spool holes (5). The control cables will need to inserted through the floor of the tractor cab and the Control Levers will need to be assembled to the cables before continuing with the next assembly steps.

8. With cable attached to the valve and control levers, turn the flange / sleeve assembly onto the threaded hub until it is flush with the valve face. When turning the flange / sleeve assembly make certain that the control levers remains in the neutral position.

9. Tighten the .750-16 NF jam nut against the sleeve to lock in position (6).

10. Bring flange into position and bolt assembly to valve housing. Tighten screws sufficiently to flatten lockwashers / secure flange (8). Caution, overtightening flange bolts will distort flange.

Valve Remote Cable Controls

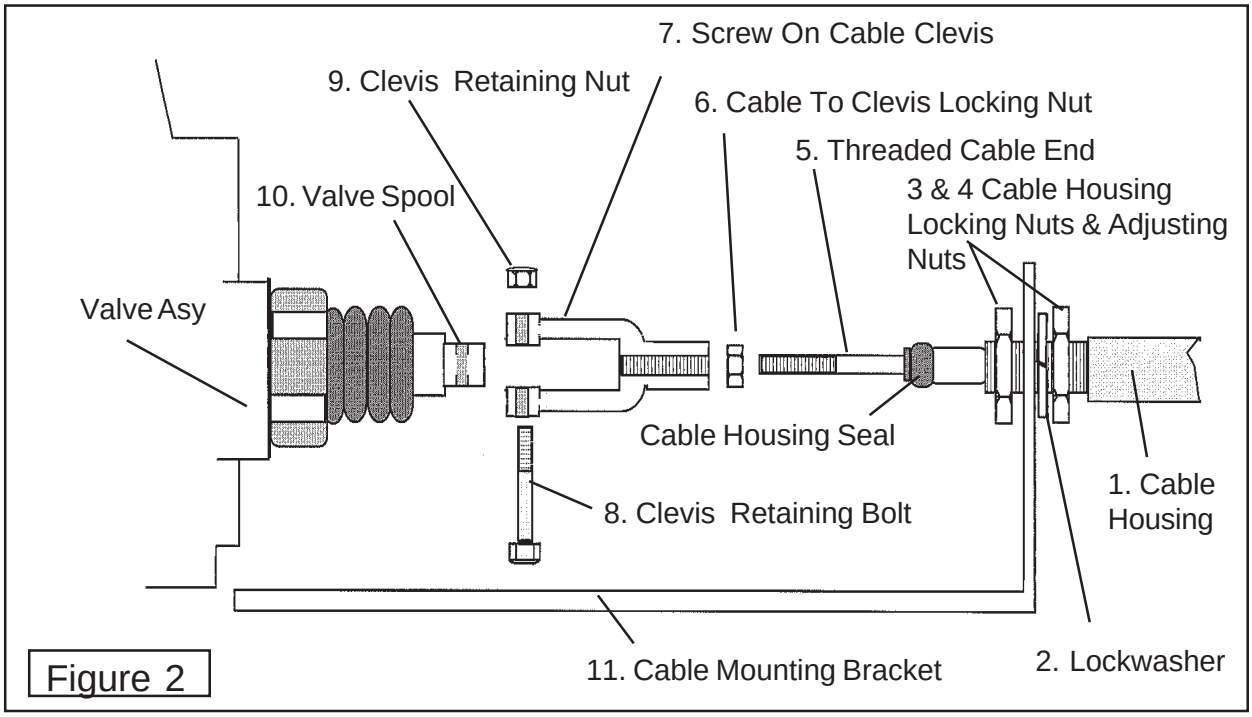


Figure 2

REMOTE CABLE OPERATION AND INSTALLATION:

1. Remote operation of the boom movement control valve can be achieved with the use of cables and remote actuator handles. The remote operation system is standard equipment on cab tractor and ROPS tractors as well (See Figure 2). Cable lengths will vary based on the length required to reach from the valve to the Operator's location with out binding or kinking. This cable length is determined by which model tractor the boom is mounted on. See the tractor mounting instruction for the type tractor being used. The Cable lengths are limited to 48,60,72 and 102 inches.

2. To install the cables to the valve, each valve section will require a cable installation kit (5 kits for a 5-spool valve). Each individual valve connection kit can be ordered separately. The set of five will be shipped with a mount kit when using remote cable controls.

3. Install Valve Cable Mounting Bracket, The valve cable mounting bracket will have 5 holes to mount 5 cables (See Figure 2). The cable will be shipped with the components on them or in a separate package.

4. Install cable to valve cable mounting bracket. Locate the cable & housing assembly, one end the cable housing is threaded (See Item 1). Install inner locking / adjusting nut (See Item 3) on to the cable housing, screw it on until it is about 3/4" the way on. Slide the lockwasher (See Item 2) on to the cable housing until it is seated against the inner locking nut. Install the other locking / adjusting nut (See Item 4) on the cable housing and screw it on until the nut is touching the valve mounting plate, but do not tighten the nuts at this time. Repeat this procedure with the other four cables.

5. Install Locking nut to Cable. Install the locking nut to the threaded end of the cable (See Item 5 & 6). Screw the locking nut onto the threads of the cable to about 3/4 of the way.

Valve Remote Cable Controls

6. Cable Clevis Installation. Screw the cable clevis (item 7) onto the threaded cable (item 5) until the threads are fully engaged into the clevis. If the locking nut (item 6) needs to be run further onto cable, this is OK.

7. Connect Cable Clevis to Valve Spool. The cable clevis (item 7) is retained to the valve spool (item 10) with a bolt & locknut (item 8 & 9). The valve spool will have a hole in it and two flat side for the clevis to slide onto. Slide the clevis onto valve spool until the holes in clevis align with the hole in the valve spool. Install the clevis retaining bolt & locknut , but do not tighten them at this time. Continue this with the other four cables.

8. Mark Cables For Identification. The cable Will be run up through the floor of the tractor (See Figure 4 as an Example, actual routing may vary). It is recommended that the ends of the cables be marked before this is done to track which cable is which control function. Cable need to be marked as shown from left to right (See Figure 5).

9. Remote Cable Control Handle. The remote control cable handle is a stackable type where they can be bolted together. All five of the handles used are the same (See Figure 6). Remove the Cable Housing Retaining screw & Nut (See Figure 6). Set the screw and nut aside for now, it will be reinstalled later.

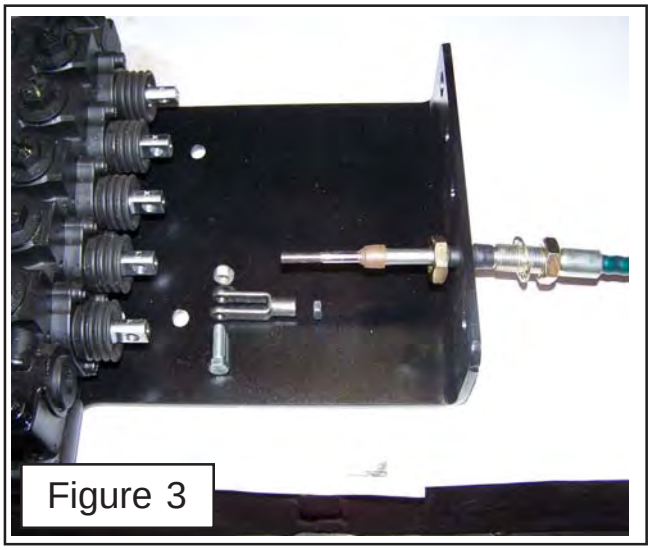


Figure 3

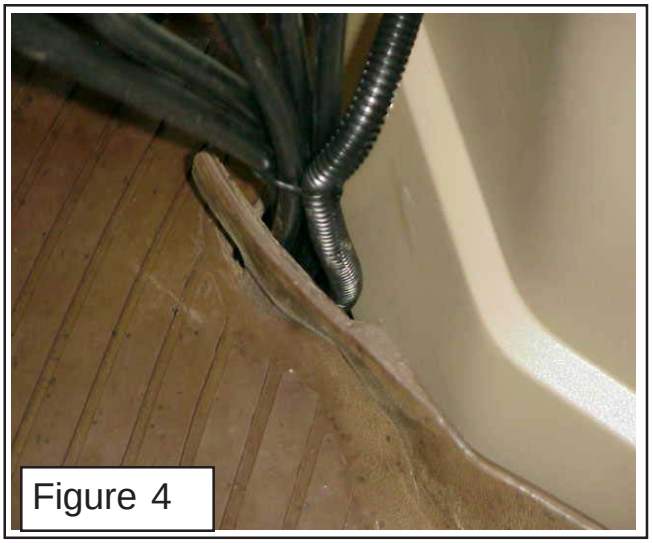


Figure 4

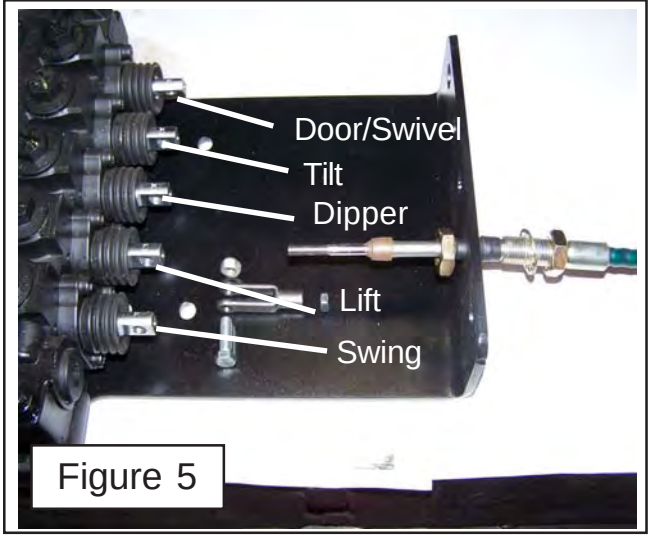


Figure 5

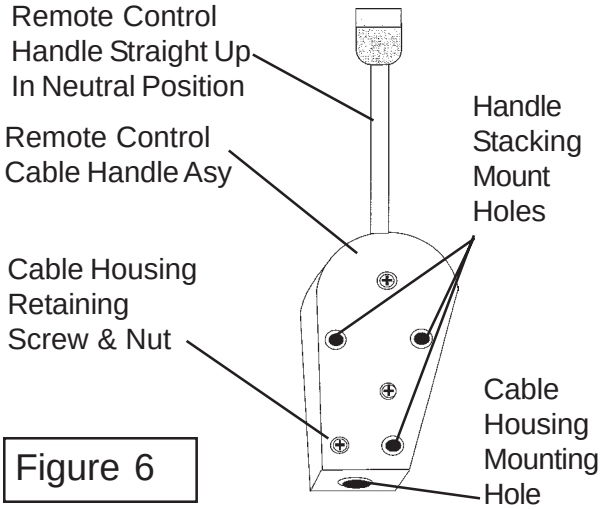


Figure 6

Valve Remote Cable Controls

10. Connect Cable to Control Handle. Install the cable locking nut onto the threaded cable (See Figure 7), screw the nut on leaving enough threads to fully screw the control handle to the cable. Push the handle of the control assembly all the way to one side and the threaded shaft of the handle will be visible at the bottom (See Figure 8). After the handle is screwed onto the cable, tighten the cable locking nut against the handle control. Push the control handle to the straight position (See Figure 9), while pushing the cable into the handle asy. When the cable is inserted into the handle assembly until the groove in the cable housing is aligned with the retaining screw hole of handle housing assembly insert the retaining screw and nut (See Figure 9)

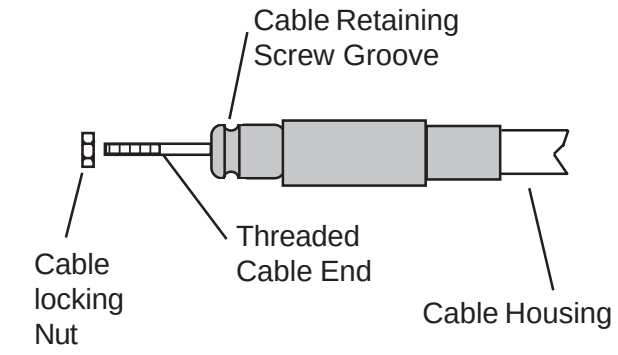


Figure 7

11. Stack Control Handles. Each cable control handle will attach to the cable in the same way. The control handles will be stacked together in the proper order (See Figure 5 & 10). These control handles will be stacked with the mounting brackets and electrical switch brackets between them. Where the brackets are located in the group can vary. Shown in figure 10 is the recommended placement of these brackets. The bracket that mounts the control handles is slotted to allow for the adjustment of the angle of the control handle assemblies.

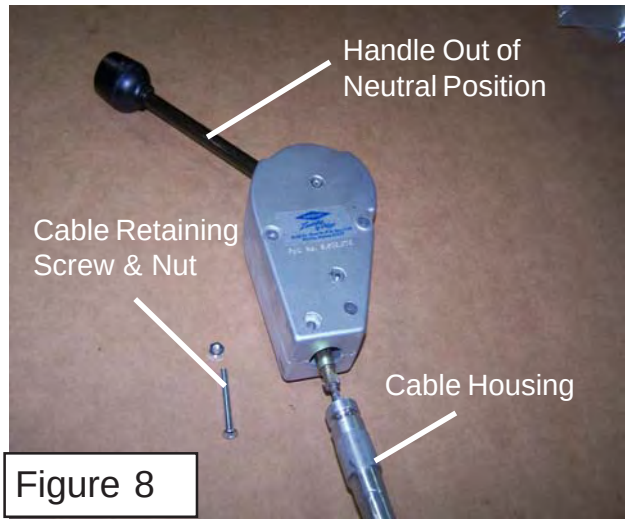


Figure 8

12. The "ON" / "OFF" Switch is bolted to the Control Handles. This is a good place but can be mounted somewhere else is desired. If Mounted somewhere else keep in mind it must be accessible quickly by the operator in case of emergency needs. (See Figure 10)

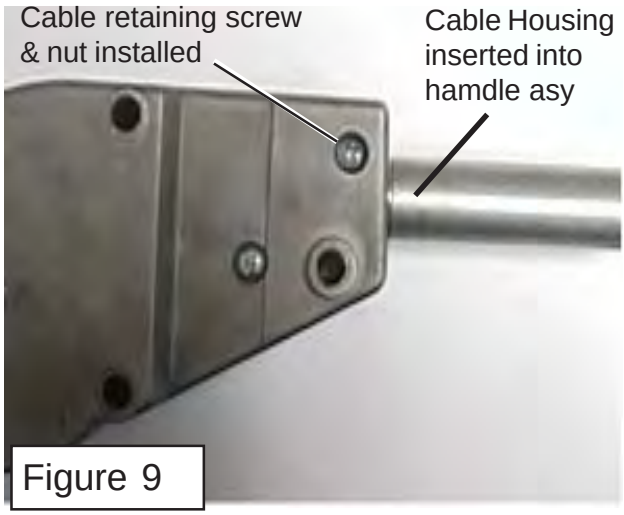


Figure 9

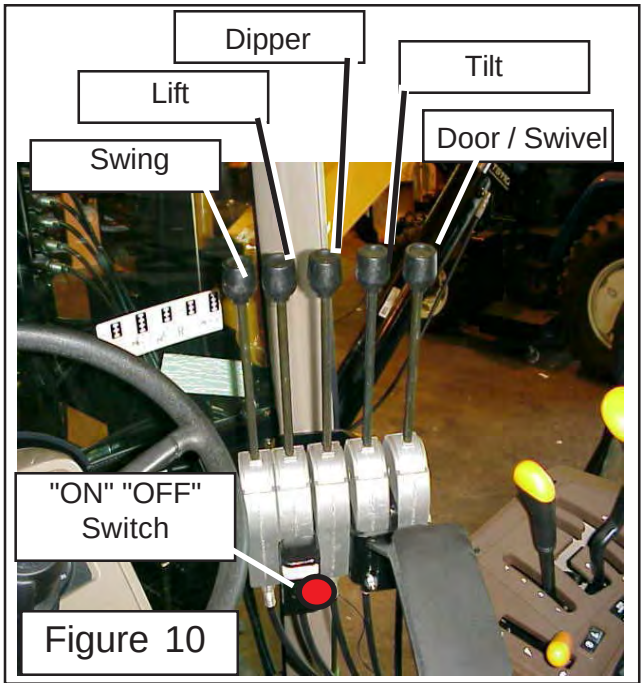


Figure 10

Valve Remote Cable Controls

13. The Arm Rest is bolted to the Control Handles. This has some options as to where it is bolted and can be bent to adjust to individual preference. **(See Figure 11).**

14. Control Handle Stand is bolted to the floor of the Cab under the Floor Mat on the right hand side oir to the cab support post with a fabricated bracket.. There is a rubber plug in floor under floor mat here. Remove and/or cut the rubber plug to run the cables and wire harness through it. The opening around cables through rubber plug can be sealed using silicone sealer. Floor mat will lay back down around cables and leave a small area of floor mat opening. **(See Figure 11)**

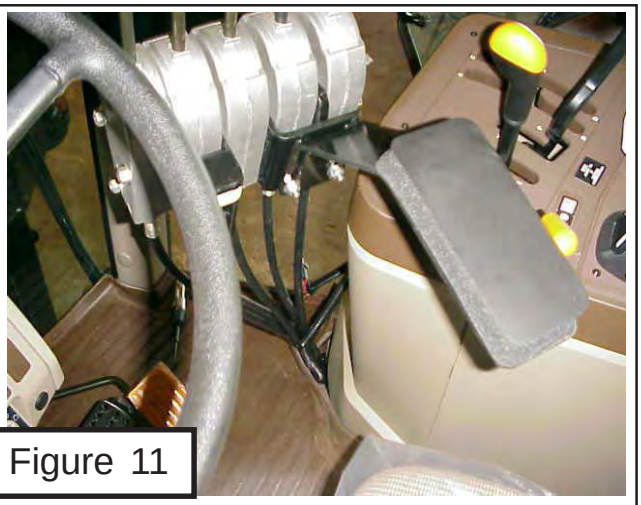


Figure 11

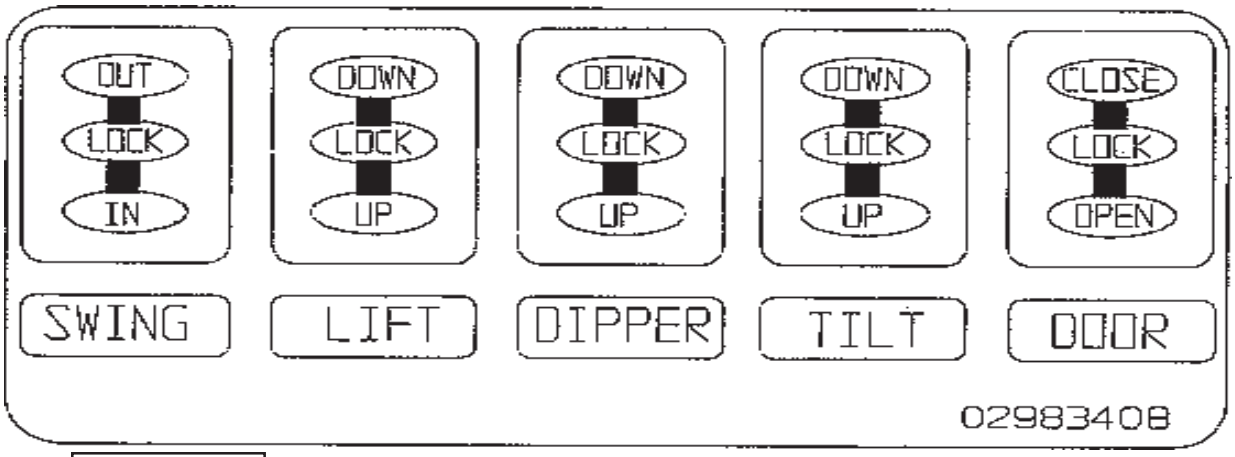


Figure 12

15. Cable Handle Control Instructional Decal. There will be a decal showing the operation of the spools of the valve that will show you how the handles shoud be placed.

13. Control Handle Adjusted to neutral position. Adjust the cable control handle to the neutral position. Using the two locking nuts on the cable housing to adjust the handle to the neutral position. Loosen one nut and tighten the other the cable can be moved back and forth in the valve mounting bracket. This must be done before operating the mover.

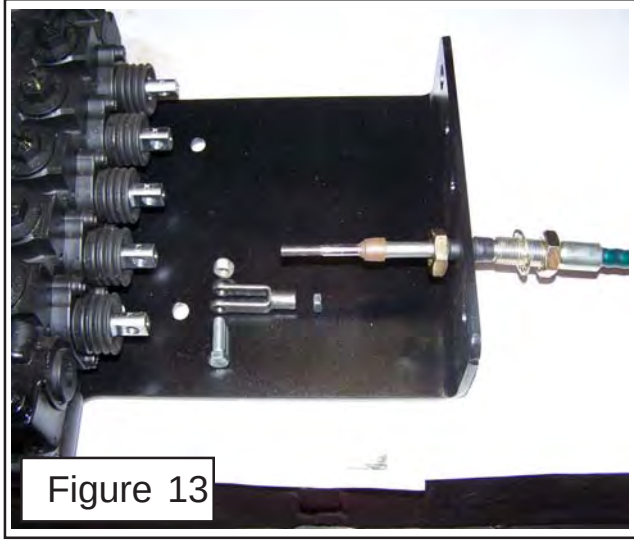


Figure 13

"ON - OFF" Switch Installation

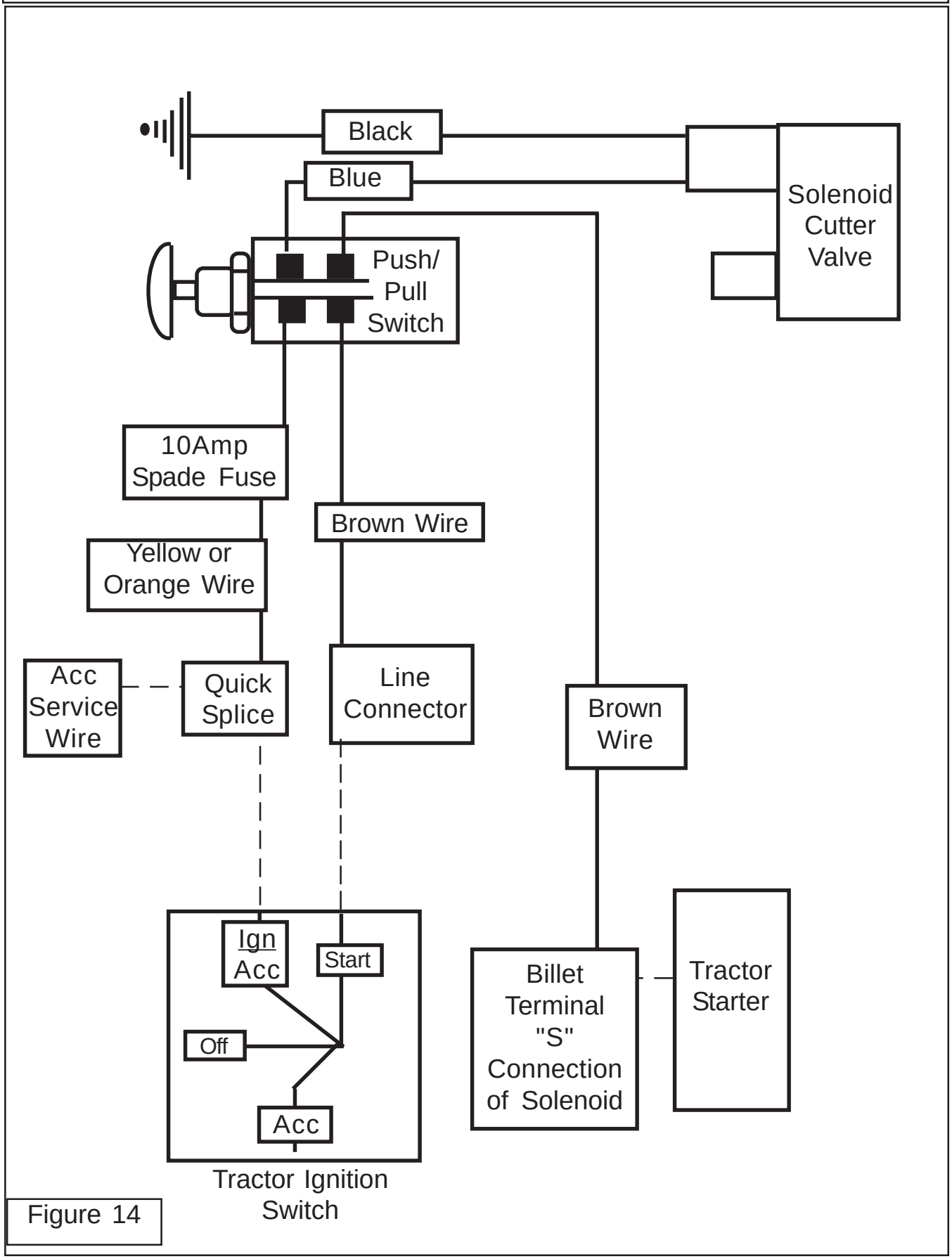


Figure 14

"ON - OFF" Switch Installation

Wiring Tractor with Remote Cable Cylinder Control Valve:

1. Connecting Harness Wires. There are 4 wires that must be connected inside Tractor. 1. Red Wire (power supply), 1 Black Wire (Ground) and 2 Brown Wires (Neutral Safety Switch). These will have to be spliced into Tractor circuits. (See Figure 15).

2. Ground Wire. The Black wire at the harness (See Figure 15) can be connected inside the cab floor, or it can be run down through the floor and connected to the frame below the cab. If grounding to the Cab floor connect ground now.

3 Reinstall Dash Panel. Reinstall the dash panel after the wires have been connected to the tractors wiring system (See Figure 16 & 17) . The dash panel is attached with screw on fasteners. Note: All wires for the trator connection with wire harnes should all be under floor mat of tractor and not visible. this is a typical installation and will vaey from type tractor to tractor model.

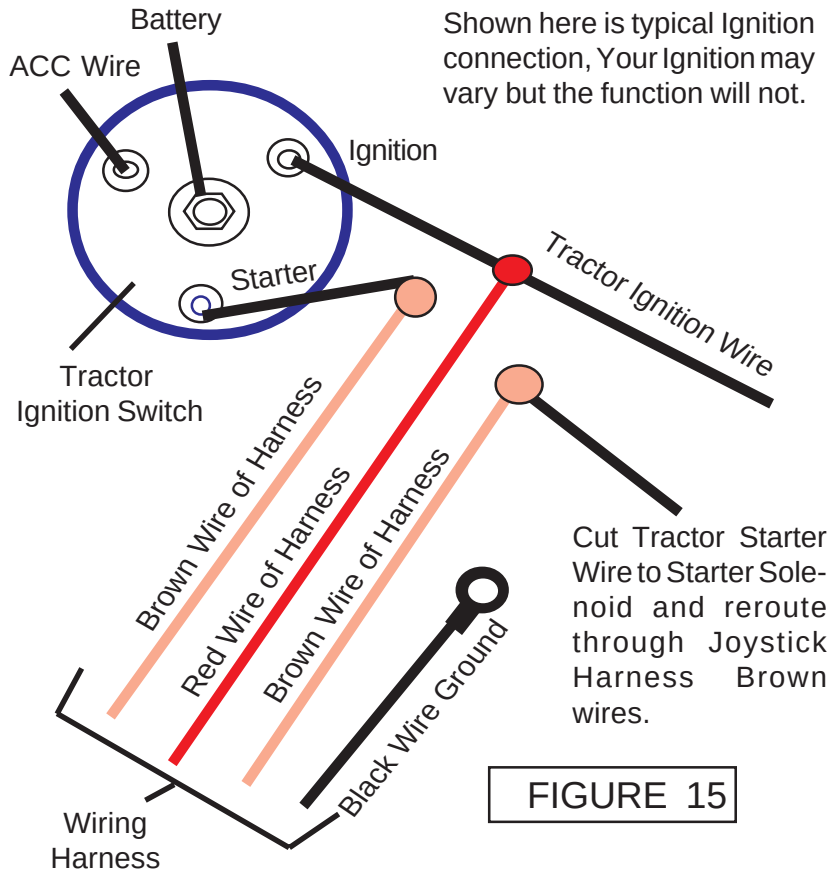


FIGURE 15

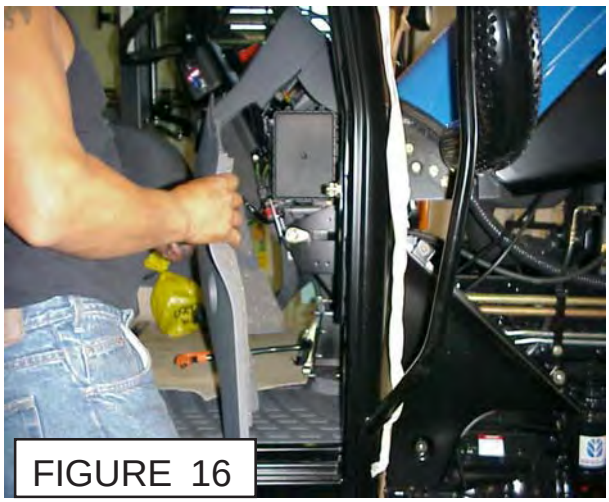


FIGURE 16

FIGURE 17

Hyd Schematic - Mechanical Operated (Std)

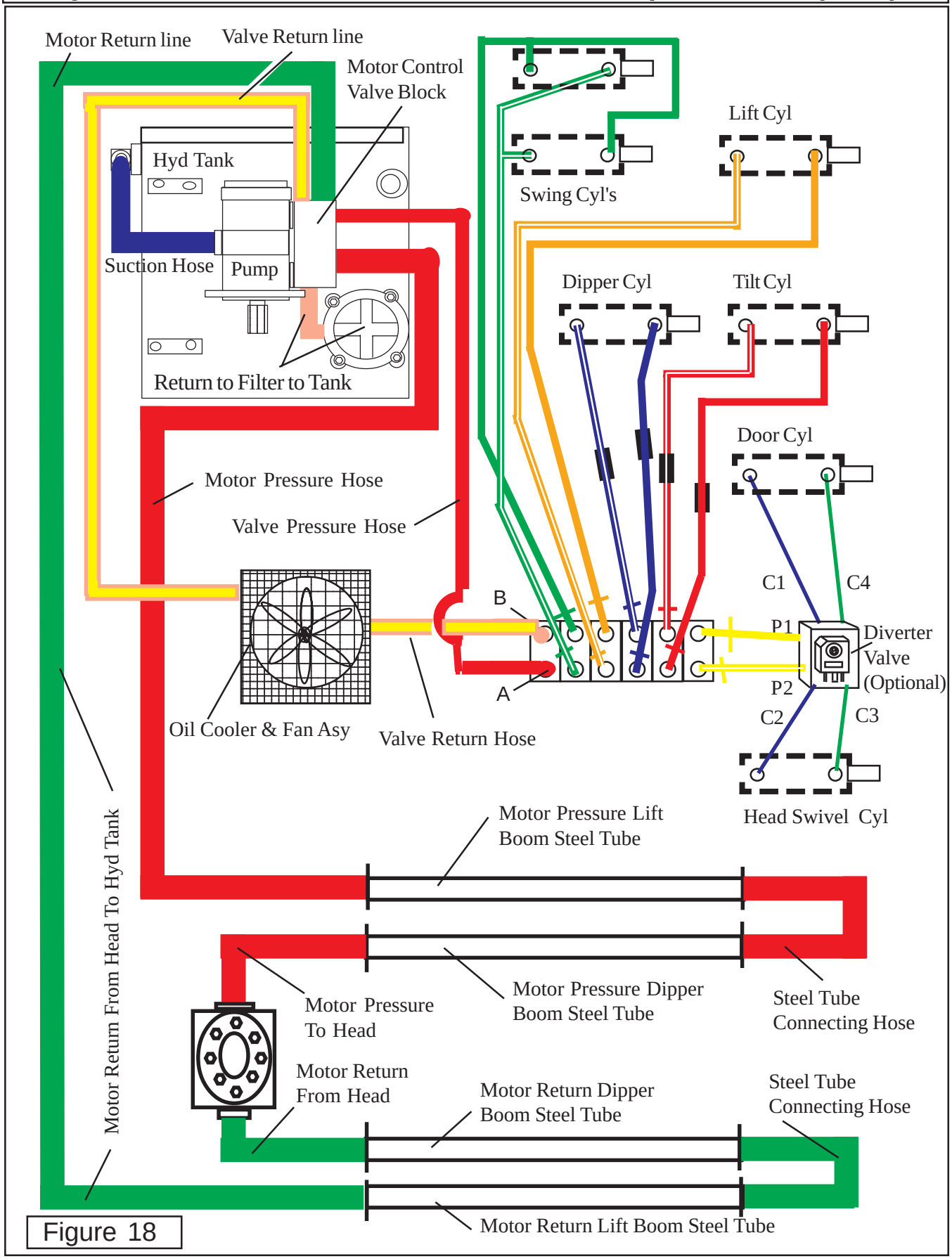
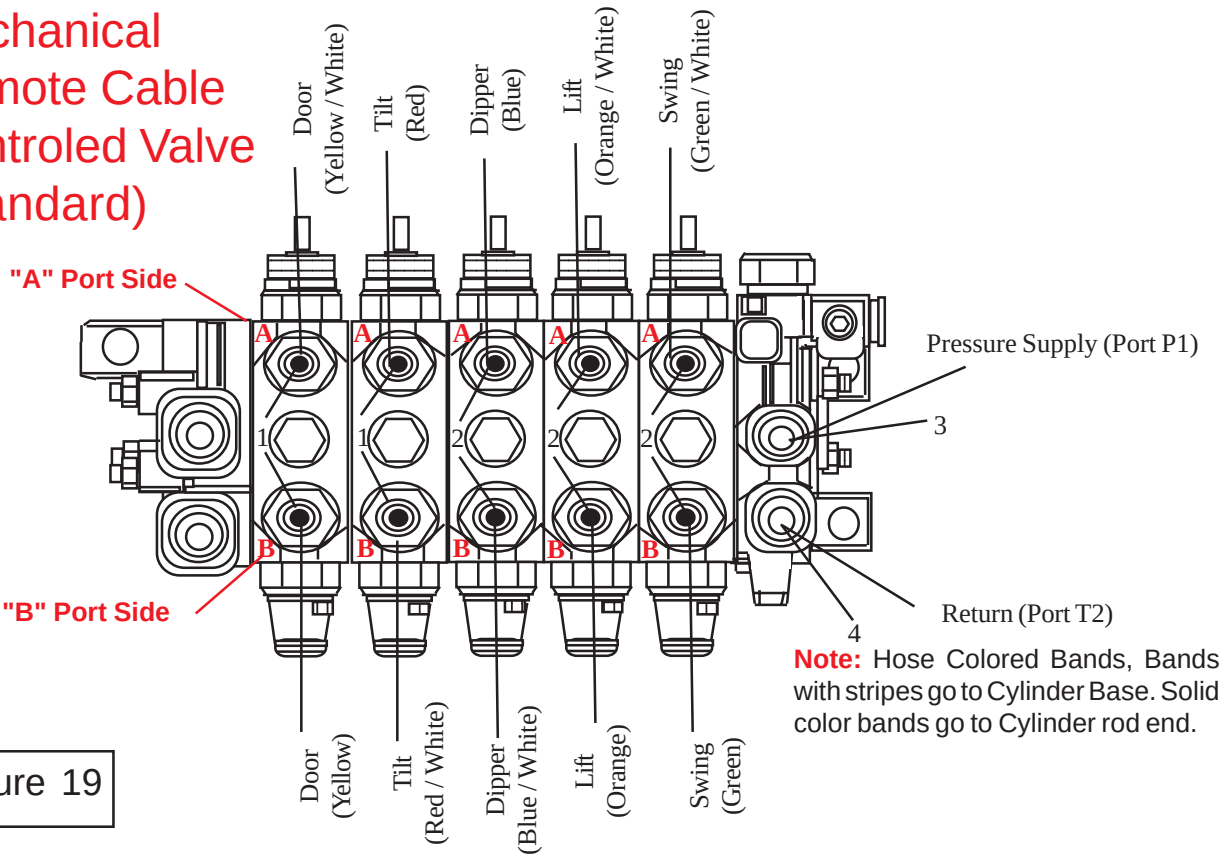


Figure 18

Hyd Schematic - Mechanical Operated (Std)

Mechanical Remote Cable Controled Valve (Standard)



Note: Hose Colored Bands, Bands with stripes go to Cylinder Base. Solid color bands go to Cylinder rod end.

Figure 19

Hyd Hose Codes at Control Valve & Head Swivel Divertor Valve Option

Hose Bands Mark Color Codes: Hose fittings are marked with Color Coded Plastic Band. Some Bands are solid Color, some are Colored with Stripe. Purpose of colored bands is provide quick reference for hose and port connection. Metal band is also attached to hose, that band has Alamo Industrial Part Number for reference.

Boom Cylinder Circuit Hoses: Mechanical Cable Controlled Valve (Std)

Color Tie	(Code)	Hose Size	Port	Diverter	Hyd. Function
Green	G	SAE # 6	A	---	Swing, Back (Rod End)
Green / White	G/W	SAE # 6	B	---	Swing, Forward (Base End)
Orange	OR	SAE # 6	A	---	Lift, Down (Rod End)
Orange / White	OR/W	SAE # 6	B	---	Lift, Up (Base End)
Blue	B	SAE # 6	A	---	Dipper, In (Rod End)
Blue / White	B/W	SAE # 6	B	---	Dipper, Out (Base End)
Red	R	SAE # 6	B	---	Head Tilt, Up (Rod End)
Red / White	R/W	SAE # 6	A	---	Head Tilt, Down (Base End)
Yellow	Y	SAE# 4	B	---	*Door, Open, (Rod End) (* See Option)
Yellow/White	Y/W	SAE# 4	A	---	*Door, Closed, (Base End (* See Option

* Connections w/ Swivel Head / Diverter Valve Option (Connects to Door Valve section)

Green	G	SAE # 4	A	P2	Control Valve tor Diverter valve
Green / White	G/W	SAE # 4	B	P1	Control Valve to Diverter Valve
Green	G	SAE # 4	---	C4	Swivel, CW (Rod End)
Green / White	G/W	SAE # 4	---	C1	Swivel, CCW (Base End)
Yellow	Y	SAE # 4	---	C3	Door, Open (Rod End)
Yellow / White	Y/W	SAE # 4	–	C2	Door, Closed (Base End)
Orange	OR	SAE#12	T	---	Valve Return To Tank
Red	R	SAE#12	P	–	Pressure to Valve.

Section 7

Axtreme Boom

Optional
Electric / Hydraulic
Joystick Cylinder Control
Valve Installation

Joystick Mounting

Joystick Optional :

The joystick is an option and allows the mower & boom to be operated with electronic control. The joystick will be mounted in different ways depending on the type tractor you have. Some models bolt to a stand on the floor that is sent with the mower. Another style is an arm rest mount that is designed to allow the joystick to be mounted to the tractor seat or a stand that bolts to the floor. Check which you have before ordering parts, check the assembly list for your mount kit.

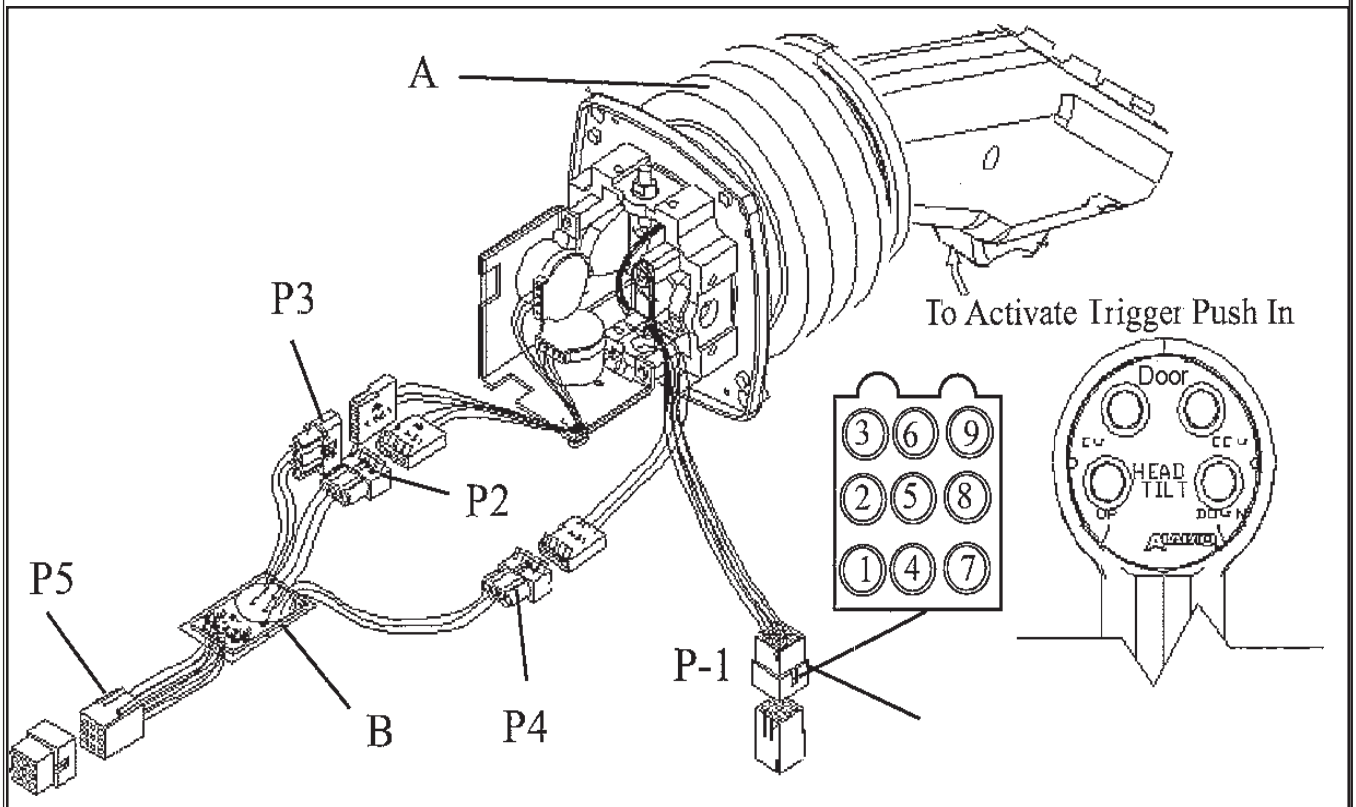


FIGURE 1

Swivel Head Option Wiring Harness
(Used Only with Swivel Head Mount Asy.

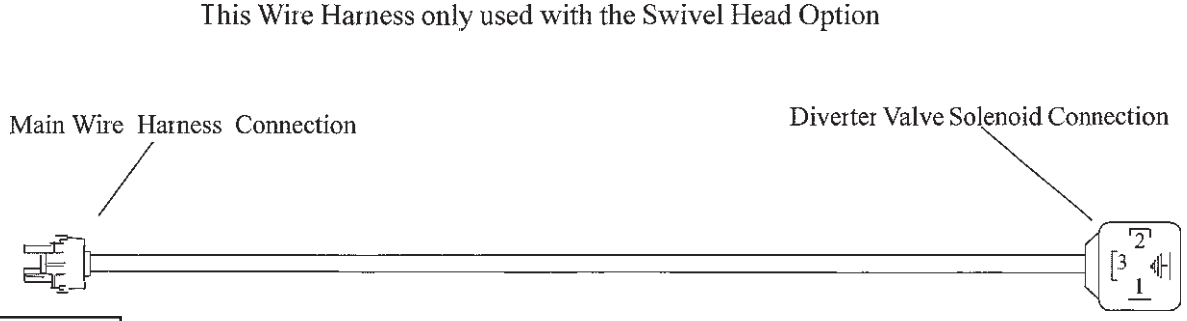


FIGURE 2

Joystick Mounting

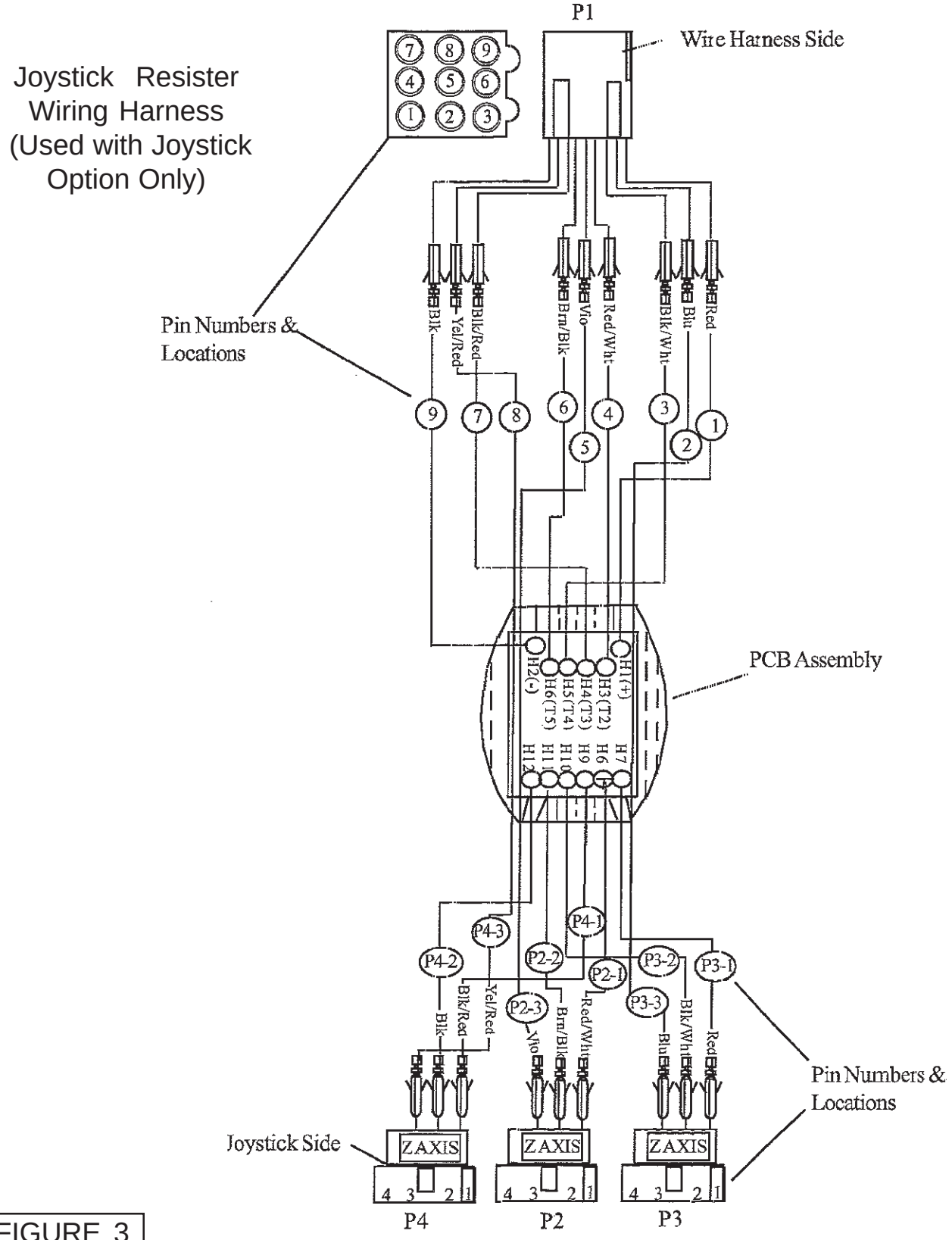


FIGURE 3

Joystick Mounting

Wiring Harness used with Joystick Valve Controls Only
(Note: Wires are marked with function identification)

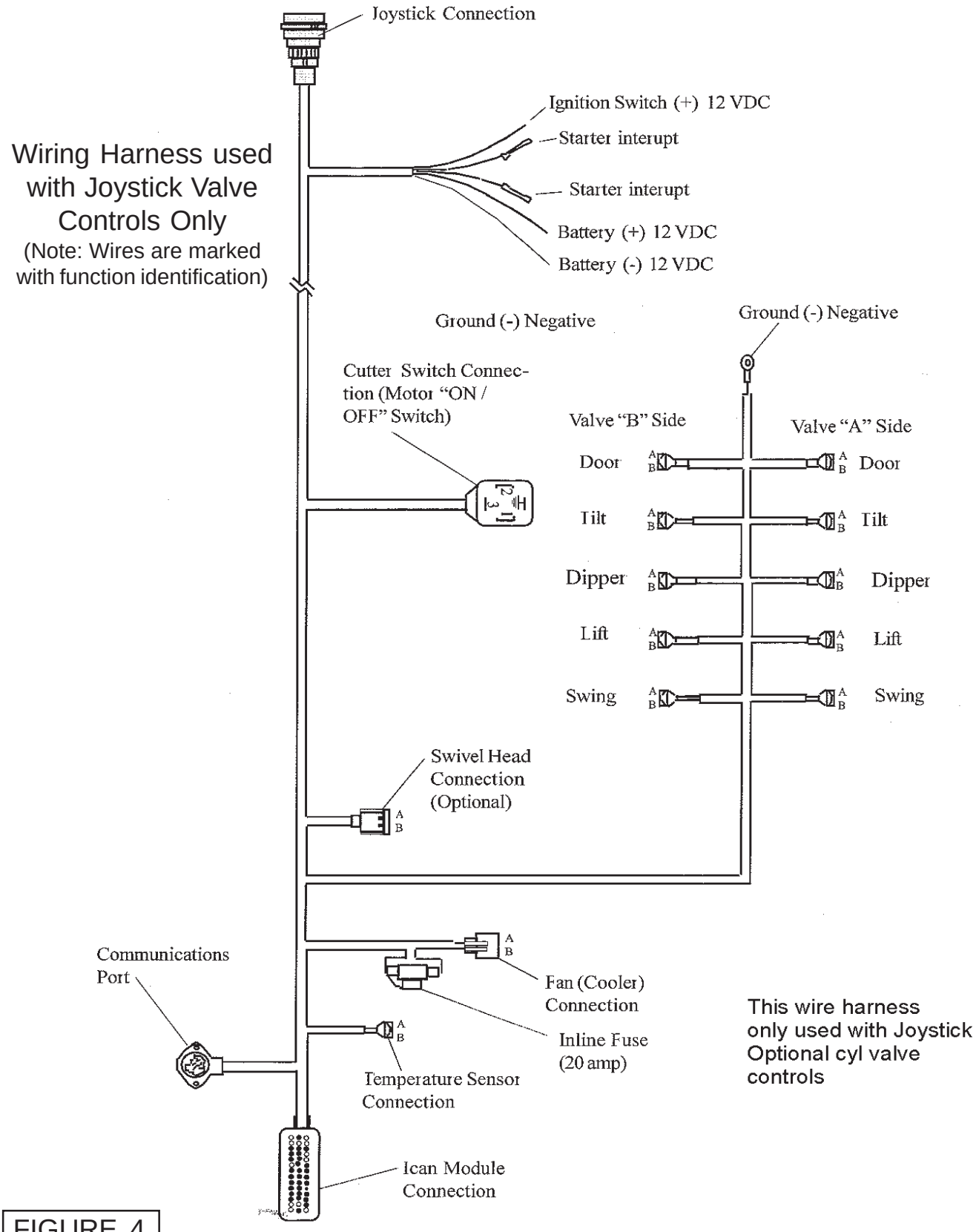


FIGURE 4

Joystick Mounting

Joystick Installation :

1. Cab Floor Access Hole. Raise the floor mat on the RH side of the cap and inspect the floor for an access hole to the under side of cab. A 2" diameter hole is needed to run the cables or the wire harness through. If there is no hole one will need to be cut with a hole saw. Check the under side of the cab floor to make certain you do not hit a brace or any other object under the floor (See Figure 5) . DO NOT cut the floor mat it will not be required. Run the wire harness up through the floor from the bottom and to the left of the floor mat (See Figure 6) .

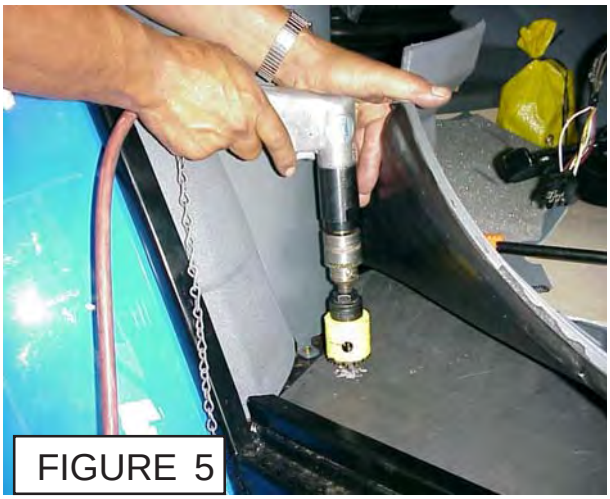
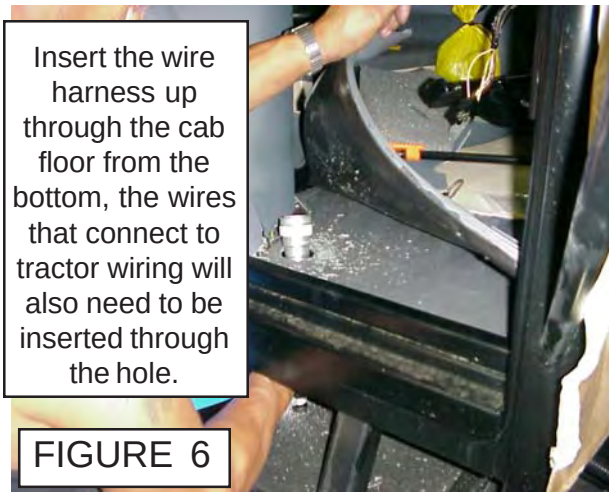


FIGURE 5

2. Remove Tractor Dash Panel . Remove the plastic panel on the RH side of the dash from the floor up (See Figure 7). This will give access to the tractor ignition switch plug for connecting the wire harness to the tractor starter wires (See Wire Schematic). See the New Holland Manual for the location of the wires to the switch on the tractor.

3. Locate the Seat Panel Bolts. The Joystick mounting bracket will bolt the lower seat panel (See Figure 8, 9 & 10). If the controls on the RH Fender interfere with the joystick (See Figure 11). Loosen the black knob on top of the shift selector. This knob allows the shift lever to be moved Left or Right. This will help it clear the Joystick when it is mounted, once the desired location of the shifter is reached tighten the black knob back down to secure the tractor shifter lever in position you want it. (See Figure 11). NOTE: Shift Lever is a tracotr Function, any reference to the operation of it or the nomenclature should be referenced to the New Holland Manual or authorized dealer.



Insert the wire harness up through the cab floor from the bottom, the wires that connect to tractor wiring will also need to be inserted through the hole.

FIGURE 6

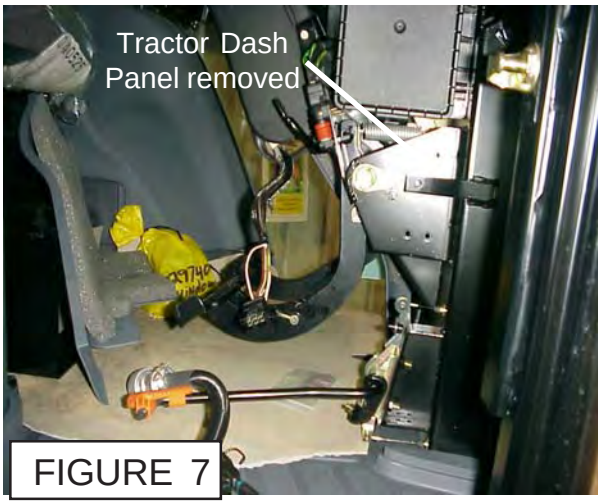
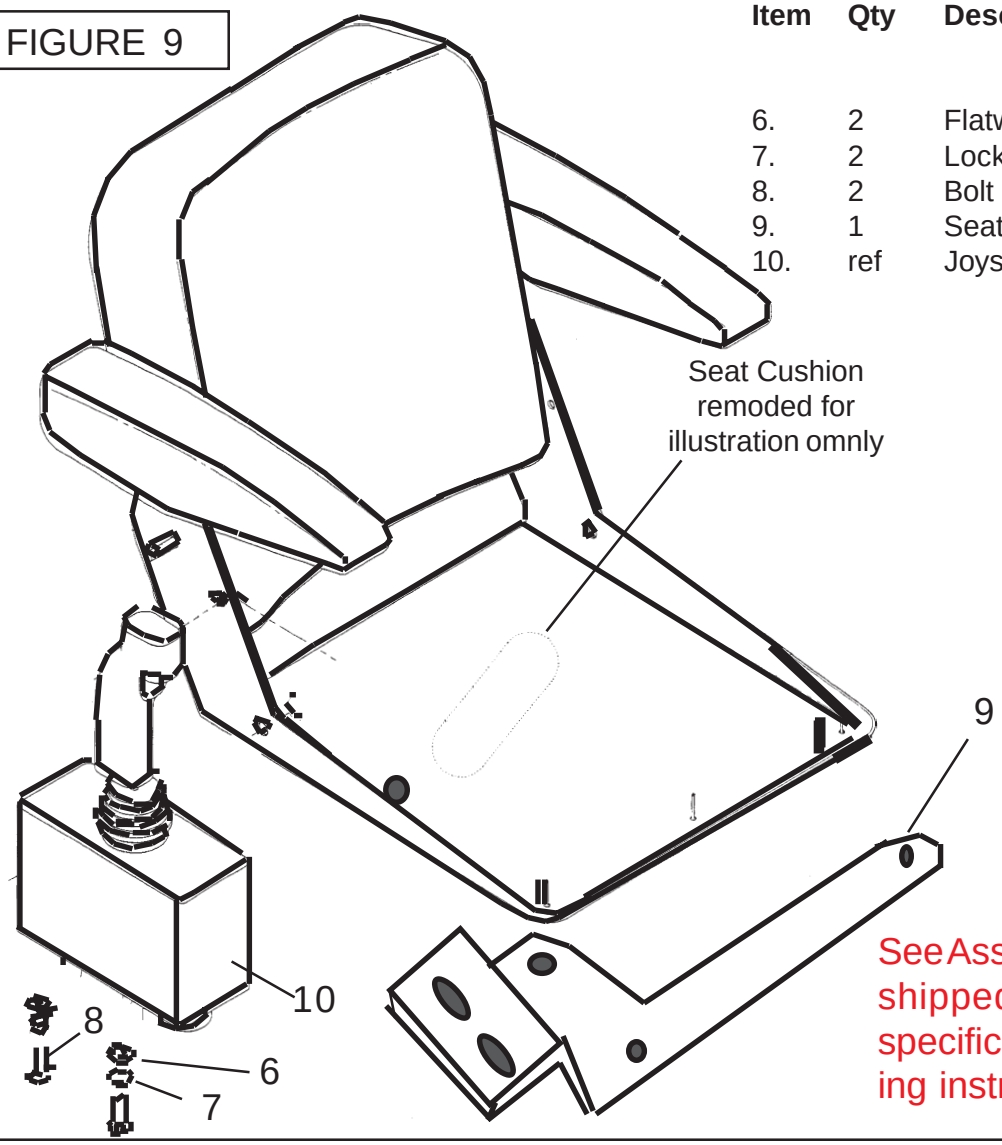


FIGURE 7

FIGURE 8

Joystick Mounting

FIGURE 9



Item	Qty	Description
6.	2	Flatwasher
7.	2	Lockwasher
8.	2	Bolt
9.	1	Seat Mounting bracket
10.	ref	Joystick

See Assembly drawings shipped with unit for specific joystick mounting instructions

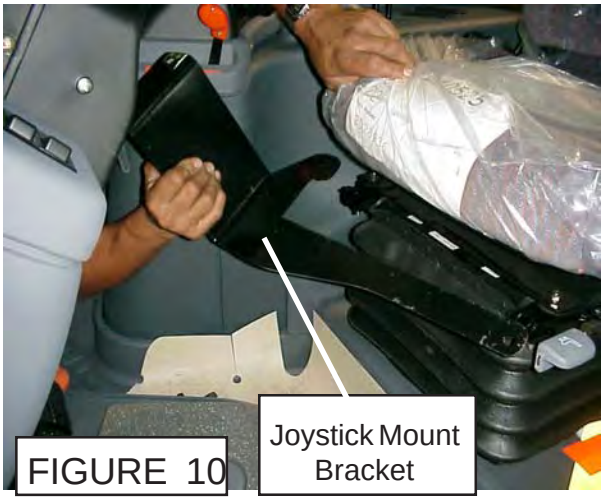


FIGURE 10

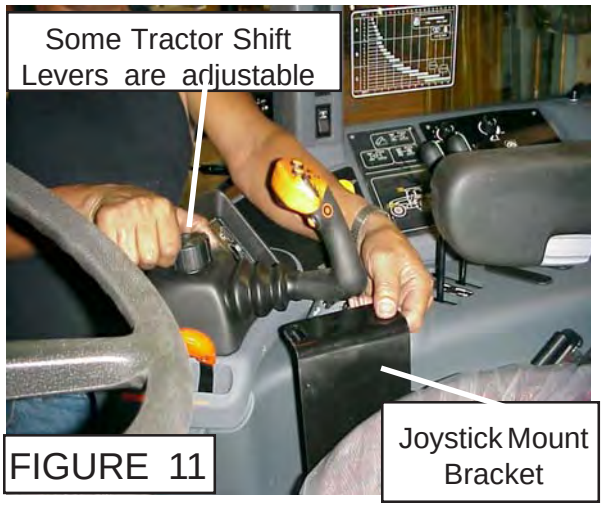


FIGURE 11

Joystick Mounting

4. Install Joystick Console Controler. Set the Joystick Controller down on top of the mounting bracket and insert the two mounting bolts (with flat washer and lockwashers) form the bottom side of the console. DO NOT used excessive long bolts to mount the joystick. The joystick will have some adjustemnt through the mounting bolts as to where it will sit on bracket. Thighten the two mounting bolts for the joystick from the bottom (See Figure 12 & 13)

5. Attach Wire Harness to the Joystick. DO NOT CUT floor mat it is not required. The wire harness will fit between the floor mat and the RH side panel (See Figure 14) The Wire harness connects to the joysick through a plug at the bottom of the joystick console. This plug will only fit on one way, there are three notches (of different width) that must be aligned befor the plug will fit. (See Wire Shematic and Figure 15).

6. Connect the wire harness to Tractor Connections. See the wire schematic fot the wire connections to the tractor wiring. Make certain that the battery cables are disconnected before attempting to connect any wires. (See Figure 16)

FIGURE 12

FIGURE 13

FIGURE 14

FIGURE 15

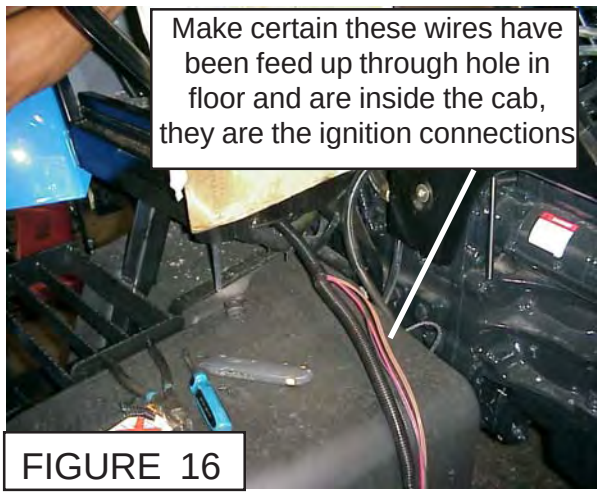


FIGURE 16

Joystick Mounting

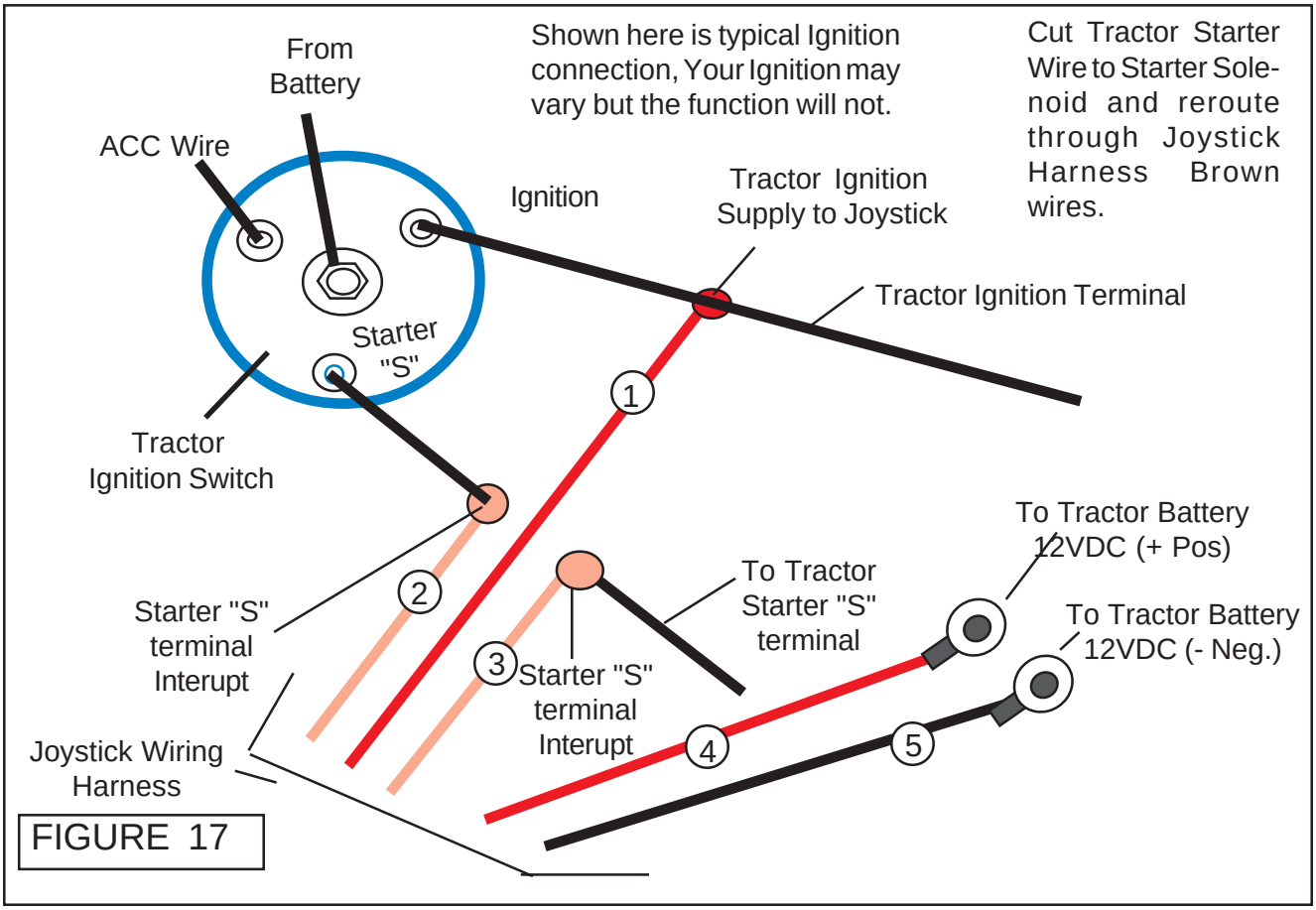


FIGURE 17

7. Connecting Harness Wires. There are 5 wires that must be connected to Tractor wiring, these wires will be marked with the description of what they are from the factory.

1. Power supply to joystick, this wire will be connected to the tractors ignition switch wire, as close to the ignition switch as possible. It is recommended to be not more that 3" away from ignition switch.
2. This is the tractor starter interrupt switch. It connects to the wire to the tractors starter solenoid marked "S", this prevents the tractor from being started when the mower is in the on position.
3. This is the return for the tractor starter interrupt switch. It is connect back into the other end of the cut starter solenoid wire.
4. Battery 12 VDC + connection which connects direct to the battery terminal. This wire will power a relay that will operate the electric cooling fan for the hydraulic oil.
5. Ground wire, This connect direct to the negative Battery terminal of the battery. It will serve as a ground for the system.

8. Reinstall Dash Panel. Reinstall any dash panels after the wires have been connected to the tractors wiring system if they were removed . Dash panels will vary with the type and model tractor used, the type fasteners will vary. Consult tractors manufacturer service repair and/or parts manual for removing any fasteners fro the tractor components. Note: All wires for the tractor connection with wire harness should all be under floor mat of tractor and not visible with the exception of the harness running up to the bottom of the joystick this will prevent damage to the wiring. (See Figure 18 & 19)

Joystick Mounting

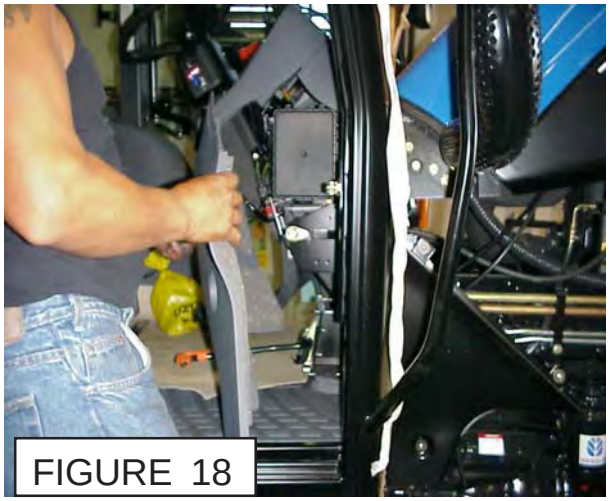


FIGURE 18

FIGURE 19

Installing Wire Harness To Valve:

1. Wire Harness From Cab to Front. The wire harness runs out the bottom of the Cab on the right hand side. Run harness along under RH cab of Tractor to the control valve (See Figure 21). Note the wire harness runs bottom of cab and near the exhaust from the Tractor to the Stack Valve to the front of the tractor. Make certain to tie the Harness or Hoses to the Tractor for protection.

2. Gaskets on Valve Terminals. There are 5 wire terminals on Valve,

3. Wire Harness Terminal Identification. The Wire Harness Terminal Plugs are marked in writing on the plug. Swing, Lift, Dipper, Tilt and Door terminal plugs (5 Total). The Valve terminals are in this same order starting at the input cap end and going toward the blank end.

4. Wire Harness Terminal Installation. You will need to feed wire harness under the fitting of hoses to valve. (See Figure 20 & 21) lay the Plugs out in the Order they are to be installed starting at the far end terminal.

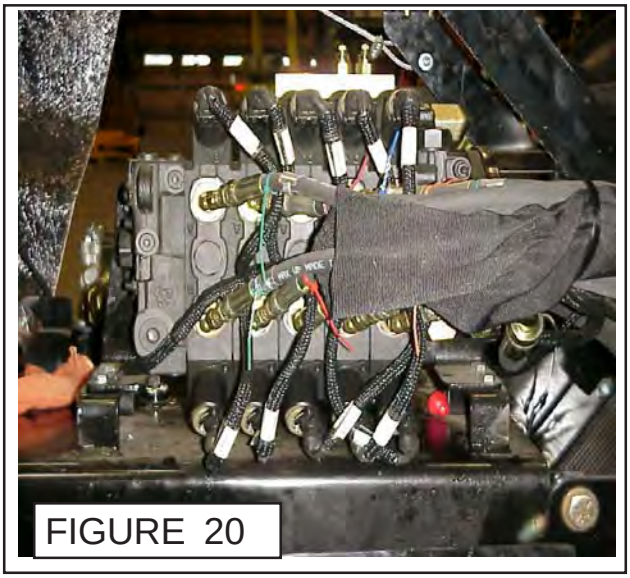


FIGURE 20

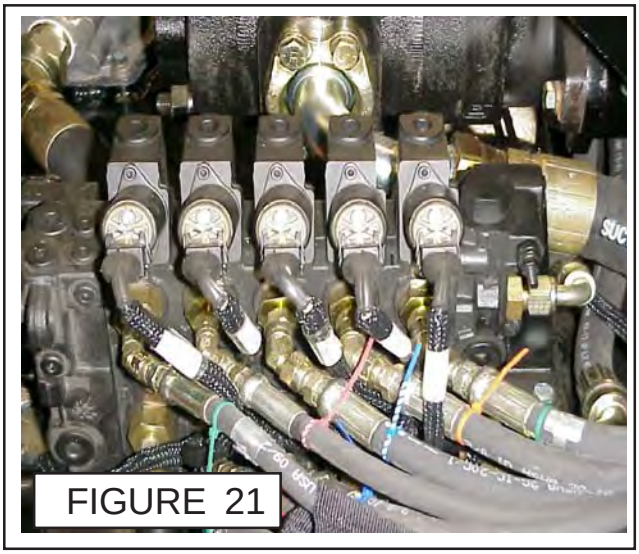


FIGURE 21

Installing Wire Harness To Valve: (Continued)

5. Terminal Connections. The Valve is mounted on the left hand side of the hydraulic tank.

	PLUG	FUNCTION
1	1 st Plug	Swing Terminal
2	2 nd Plug	Lift Terminal
3	3 rd Plug	Dipper Terminal
4	4 th Plug	Tilt Terminal
5	5 th Plug	Door Terminal

Always check to make certain that the plugs are securly mounted t mthe valve.

6. Wire Harness Completed. Pull the Wire harness back toward Cab to remove any excess slack, only enough to remove slack not to make Wire Harness tight. Tie wire harness or hoses to Tractor Frame Rails to prevent them from rubbing or getting caught on something. The Wiring Schematic is shown in this book as a reference only, the wire harness will come to you assembled and ready to mount. The only wires that will have to be altered are the wires inside that connect to the existing Tractor Wires. These inside wires are intentionally left long so they can be cut as needed. None of the wires with the factory plugs will have to be cut.

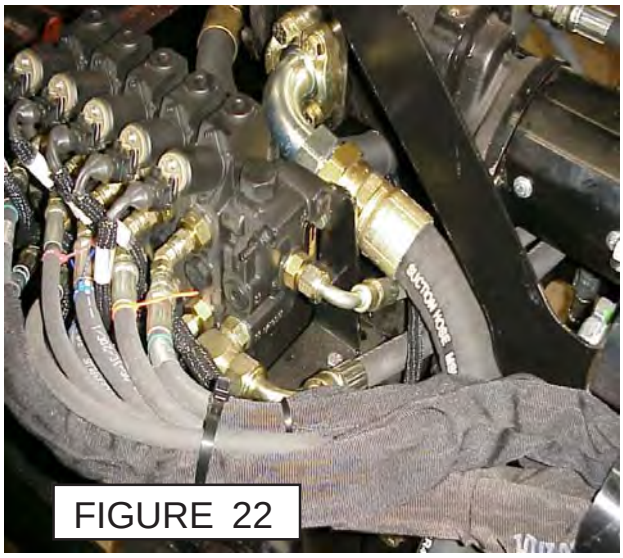


FIGURE 22

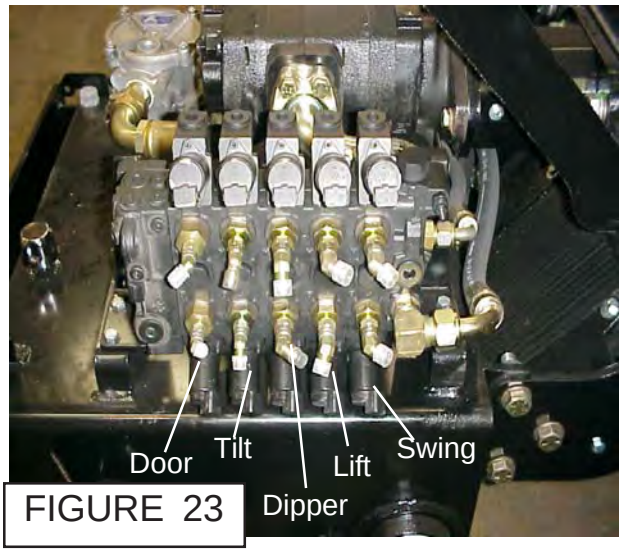


FIGURE 23

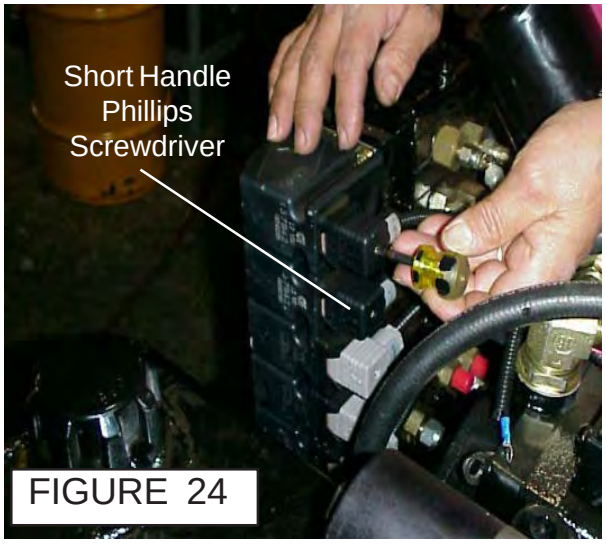


FIGURE 24

Hyd Schematic - Electrically Controlled (Opt)

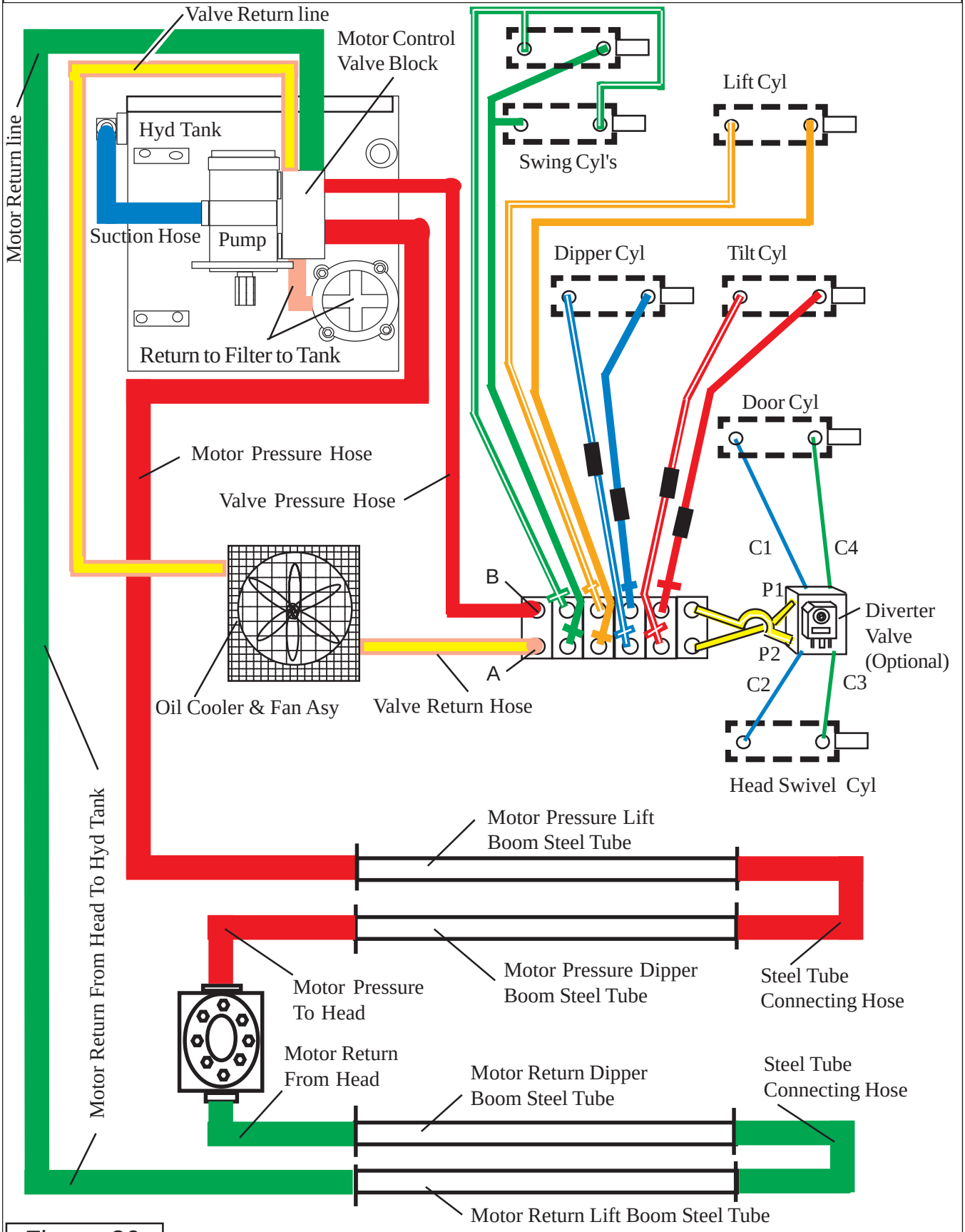


Figure 26

Hyd Schematic - Electrically Controlled (Opt)

Joystick Electronic Controled Valve (Optional)

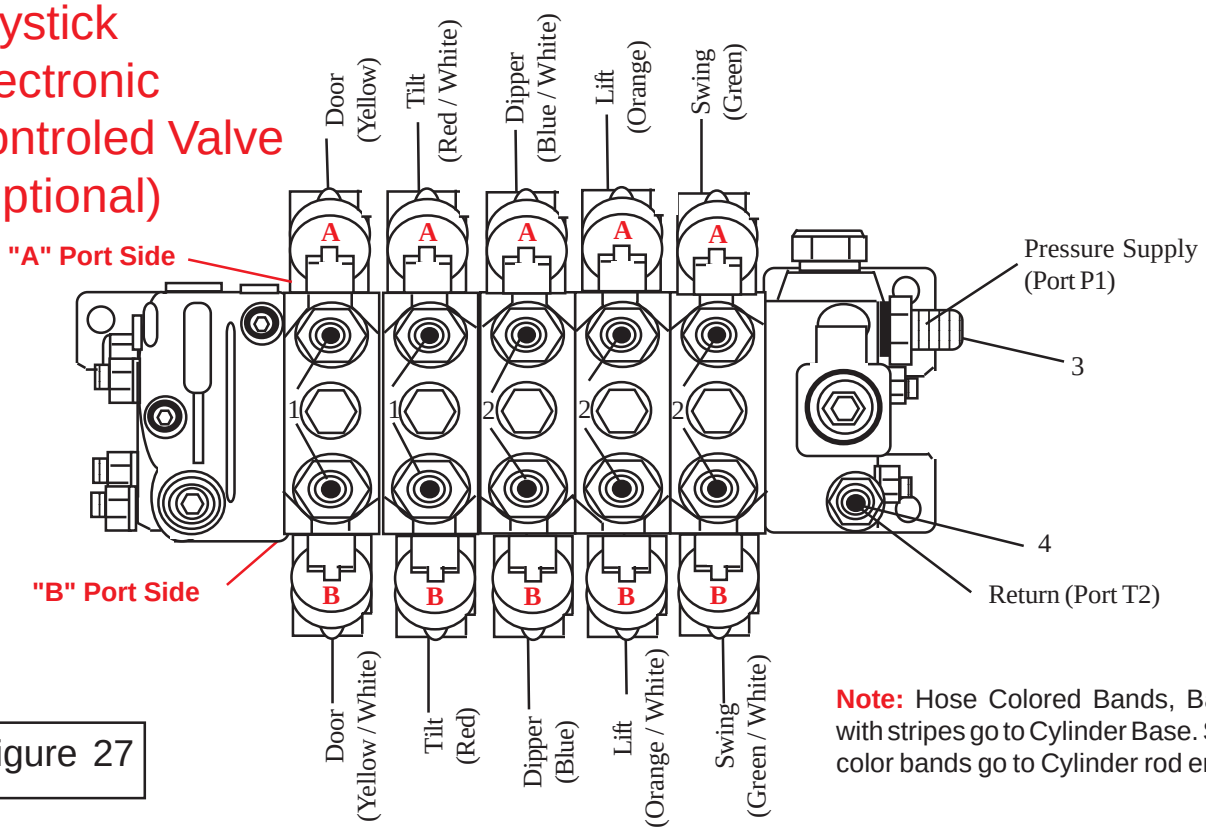


Figure 27

Note: Hose Colored Bands, Bands with stripes go to Cylinder Base. Solid color bands go to Cylinder rod end.

Hyd Hose Codes at Control Valve & Head Swivel Divertor Valve Option

Hose Bands Mark Color Codes: Hose fittings are marked with Color Coded Plastic Band. Some Bands are solid Color, some are Colored with Stripe. Purpose of colored bands is provide quick reference for hose and port connection. Metal band is also attached to hose, that band has Alamo Industrial Part Number for reference.

Boom Cylinder Circuit Hoses: Electrical Joystick Controlled Valve (Option)

Color Tie	(Code)	Hose Size	Port	Diverter	Hyd. Function
Green	G	SAE # 6	A	---	Swing, Back (Rod End)
Green / White	G/W	SAE # 6	B	---	Swing, Forward (Base End)
Orange	OR	SAE # 6	A	---	Lift, Down (Rod End)
Orange / White	OR/W	SAE # 6	B	---	Lift, Up (Base End)
Blue	B	SAE # 6	B	---	Dipper, In (Rod End)
Blue / White	B/W	SAE # 6	A	---	Dipper, Out (Base End)
Red	R	SAE # 6	B	---	Head Tilt, Up (Rod End)
Red / White	R/W	SAE # 6	A	---	Head Tilt, Down (Base End)
Yellow	Y	SAE# 4	A	---	*Door, Open, (Rod End) (* See Option)
Yellow/White	Y/W	SAE# 4	B	---	*Door, Closed, (Base End (* See Option

* Connections w/ Swivel Head / Diverter Valve Option (Connects to Door Valve section)

Green	G	SAE # 4	A	P1	Control Valve to Diverter Valve
Green / White	G/W	SAE # 4	B	P2	Control Valve to Diverter Valve
Green	G	SAE # 4	---	C4	Swivel, CW (Rod End)
Green / White	G/W	SAE # 4	---	C1	Swivel, CCW (Base End)
Yellow	Y	SAE # 4	---	C3	Door, Open (Rod End)
Yellow / White	Y/W	SAE # 4	–	C2	Door, Closed (Base End)
Orange	OR	SAE#12	T	---	Valve Return To Tank
Red	R	SAE#12	P	–	Pressure to Valve.

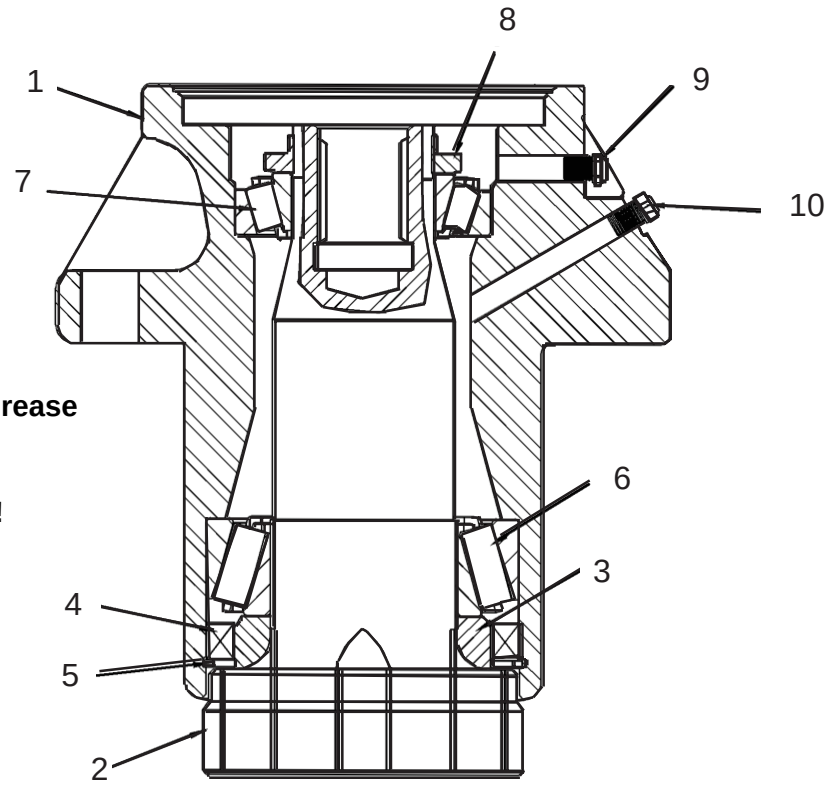
Section 8

Axtreme Boom

Spindle Asy Repair

(Rotary Head)

Spindle Housing Assembly Procedure (Rotary Head)



Fill with NLGI 000 Grease
Alamo Group P/N
00765444
DO NOT OVERFILL!

Figure 1

Item	Qty	Description
1	1	Housing
2	1	Spindle
3	1	Bearing Ring
4	1	Lower Seal Seal
5	1	Snap Ring
6	1	Lower Bearing, Cup and Cone
7	1	Upper Bearing, Cup and Cone
8	1	Stake Nut
9	1	Plug, Pressure Relief Fitting
10	1	Grease Fitting Plug
11	**--**	**Gear Oil, 1 Quart (NLGI 000)**

SPINDLE HOUSING:

In order to properly perform repairs to the spindle housing assembly, it must first be removed from the mower deck. (See Figure 2)

1. Remove the Blade Bar or Pan Assembly (See Blade Carrier at the end of Spindle Section)
2. Remove the hydraulic motor. Hoses can be left connected to Motor and lifted off with Motor
3. Remove the Spindle Assembly from the Mower Deck, Unbolt and remove Spindle Retaining Bolts

Be certain to clamp or securely support the Spindle Housing and sub-assemblies to prevent injuries to hands and feet due to inadvertent dropping or falling. Always wear safety glasses and gloves to prevent eye and hand injury when chiseling or hammering on metal components. Hardened metal will chip un-expectedly. An assembled spindle housing is quite heavy. Use a hoist or lift to handle them safely. Always use proper lifting techniques when lifting heavy objects.

Figure 2

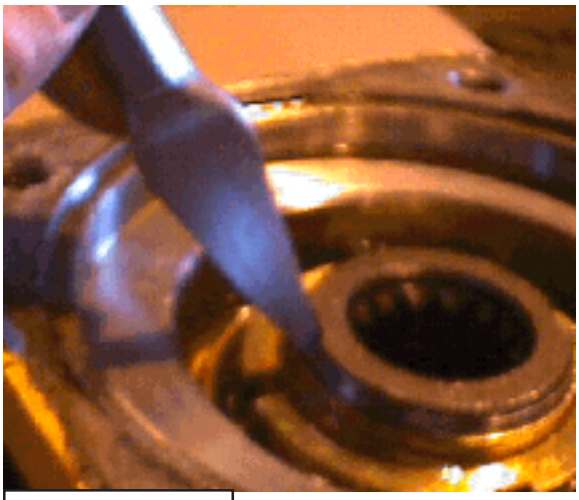


Figure 3

SPINDLE HOUSING DIS-ASSEMBLY:

Drain the oil from the Spindle Assembly. Inspect the housing for cracks or other damage, which would deem it unusable. (See Figure 2)

Place a 3/16” angled chisel, parallel with and into one of the staking slots in the threaded section of the shaft. Using a hammer, drive the chisel downward until the bent part of the staking flange on the adjusting nut is bent outward and is free of the slot and threads of the shaft. This procedure is done in two places on the shaft. A new nut will be required for reassemble. (See Figure 3)

If the Spindle is equipped with a locking washer, use a chisel to bend the locking tang until it is free from the slot in the nut.

SPINDLE HOUSING DIS-ASSEMBLY: (Continued)

Use a four pronged socket or a suitable punch and hammer to remove the shaft nut. (See Figure 4)

Insert the original blade bar or pan bolts into the threaded spindle shaft. Turn the bolts until they contact the bearing ring. Rotate each bolt in a clockwise pattern 1/4 turn at a time for 2&1/2 revolutions. (See Figure 5)

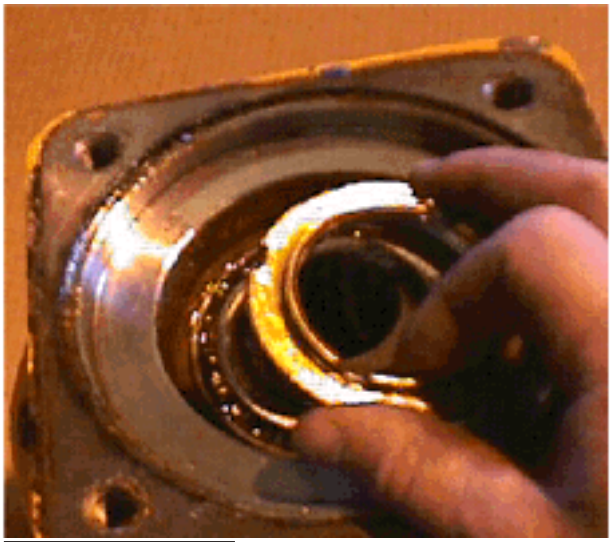


Figure 4

Figure 5

Remove the original bolts and replace them with 4 shanked bolts (PN 02964353). In a clockwise pattern, rotate each bolt 1/4 turn at a time until the spindle shaft is free from the housing. (See Figure 6)

In some cases it may be necessary to use a drift punch and hammer to fully dislodge the shaft. Care should be taken to avoid damage to the shaft or housing. (See Figure 7).

Figure 6

Figure 7

SPINDLE HOUSING DIS-ASSEMBLY: (Continued)

Place the housing in a suitable vise with the motor flange facing down as shown. (See Figure 8). Use a flat blade screwdriver to remove the seal retaining ring. (See Figure 9).

Figure 8

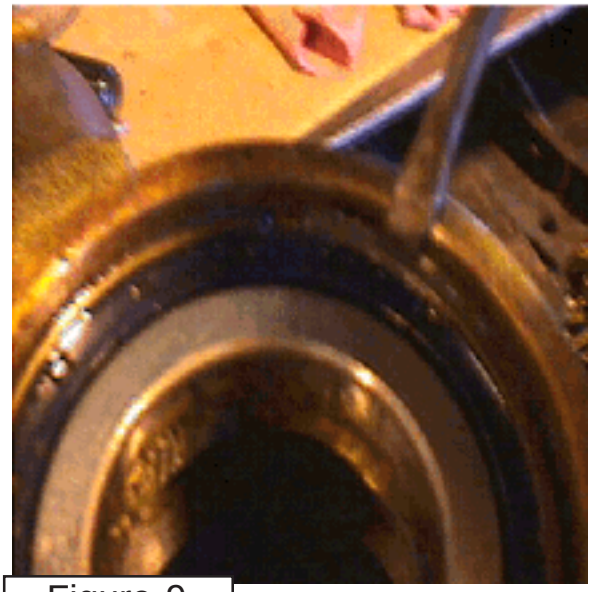


Figure 9

Pry out the lower seal. **BE CAREFUL NOT TO DAMAGE THE SPINDLE HOUSING.** A new seal is required for rebuild of the spindle. (See Figure 10).

Remove the bearing and check it for damage or excessive wear. (See Figure 11)

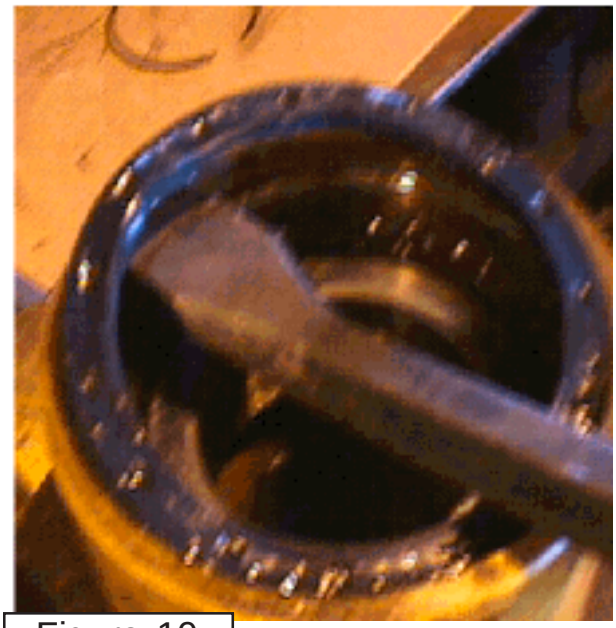


Figure 10

Figure 11

SPINDLE HOUSING DIS-ASSEMBLY: (Continued)

Use a suitable drift punch to remove the bearing races. **BE CAREFUL NOT TO DAMAGE THE SPINDLE HOUSING. (See Figure 12),** Remove and inspect the vent and filler plugs and passageways. Be sure the vent is free from clogs due to debris or paint. Always install the vent plug above the filler plug. (See Figure 13).

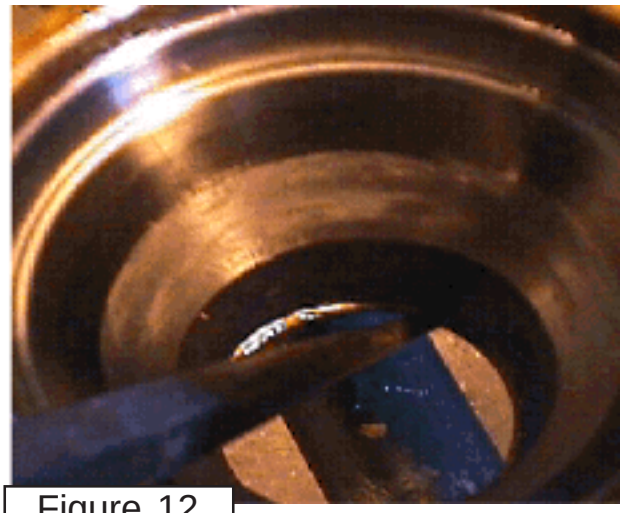


Figure 12

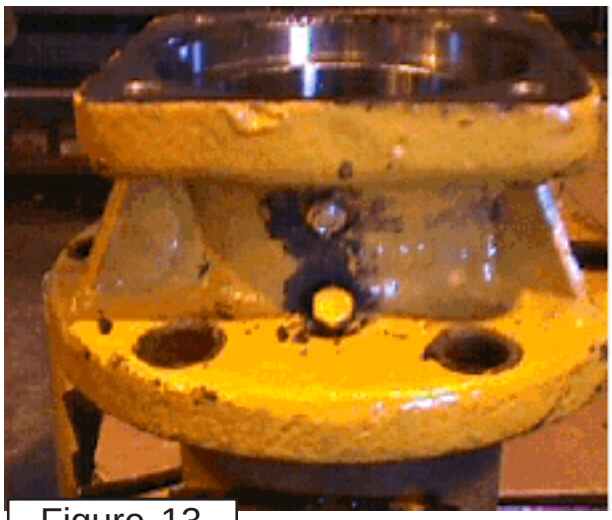


Figure 13

SPINDLE HOUSING INSPECTION:

Inspect the bearings and bearing cups for nicks, pitting, discoloration and wear. If any exist, replace the bearing and bearing cup. Inspect the housing for cracks, wear at the bearing cup bores, or impact damage. Replace if necessary. Inspect the spindle shaft for pulled bolt threads, cracks, adjusting nut thread damage, or machined surface damage. Replace if required.

SPINDLE HOUSING ASSEMBLY:

Figure 14

Figure 15

SPINDLE HOUSING ASSEMBLY: (Continued)

If installing new bearings, be sure to install new bearing cups (races). When installing the bearing cups, make sure that they are properly seated into the housing. **DO NOT DRIVE AGAINST THE BEARING SURFACE.** All parts should be thouroughly cleaned. The bearing nut, the lower seal and the motor flange seal cannot be reused. Therefore, replacements should be ordered. (See Figure 14).

Figure 16

Figure 17

Place a thin coat of silicone on the inside (tapered side) of the bearing ring. (See Figure 15). Place the bearing ring on the spindle shaft. The tapered surface should face downward to fit the contour of the spindle shaft. (See Figure 16). Use a piece of 2-3/4" 16 gauge tubing, 8" long to drive the bearing ring down on to the spindle until the bearing ring bottoms out against the spindle. (See Figure 17).Remove any excess silicone from the spindle shaft and bearing ring. (See Figure 18). Turn the housing upside down so that the bearing seal and retaining ring may be installed. Lubricate the seal prior to installation. (See Figure 19).

Figure 18

Figure 19

SPINDLE HOUSING ASSEMBLY: (Continued)

Install the lower Bearing race and Bearing. Install the seal to approximately 1/4" from the edge of the Spindle Housing. Place the Retaining Ring in the housing on top of the seal. (See Figure 20). Using a suitable driver, EVENLY press the seal and retaining ring into the housing until the retaining ring snaps into place in the ring groove. Be sure the retaining ring is in the groove all the way around and the seal is against the retaining ring. (See Figure 21)

Figure 20

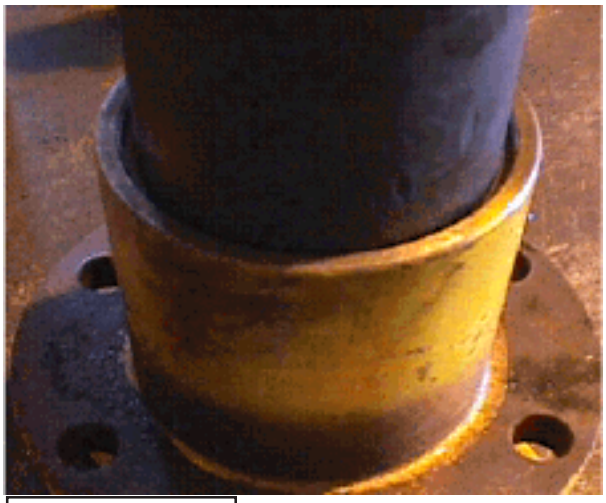


Figure 21

Place the spindle shaft with the bearing ring installed into the spindle housing. Turn the assembly over so that the housing is sitting upright and the spindle shaft is supporting the housing. (See Figure 22). Use the 2-3/4" tube to drive the lower bearing down onto the bearing ring. BE SURE THAT THE BEARING IS FULLY SEATED ONTO THE SPINDLE. **If the bearing ring is not seated, or if the bearing is not properly seated against the bearing ring, the assembly will lose bearing preload and rapidly fail.** (See Figure 23)

Figure 22

Figure 23

SPINDLE HOUSING ASSEMBLY: (Continued)

Fill the spindle housing with NLGI000 grease Alamo PN 00765444. The proper oil level is indicated when the spindle is laying on its side and level (fill plug facing to the side). The oil level should be flush with the bottom of the oil fill hole when in this position. (See Figure 24). Install the upper bearing and race along with the bearing nut. Tighten the new Lock Nut with a 4 prong socket and hand ratchet until tight. Back the nut off until 12 to 15 INCH POUNDS of rolling resistance is achieved (See Figure 25)

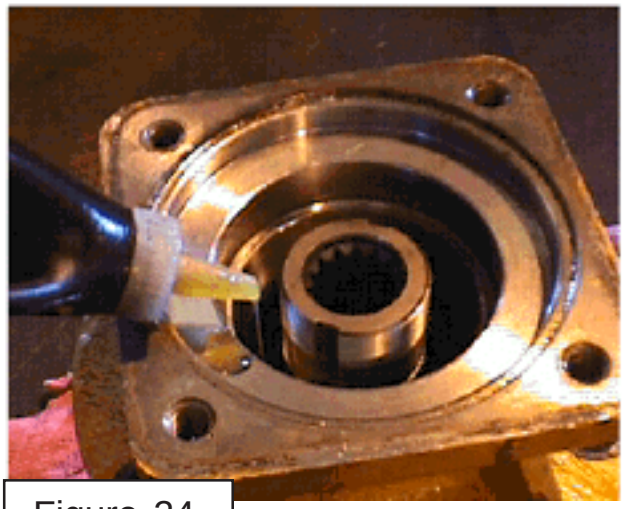


Figure 24

Figure 25

Use a punch to stake the bearing nut in place. Be sure to stake the nut at both slot locations. (See Figure 26). Install the new motor flange gasket. Apply a thin film of silicone to both sides of the gasket to ensure a good seal. (See Figure 27)

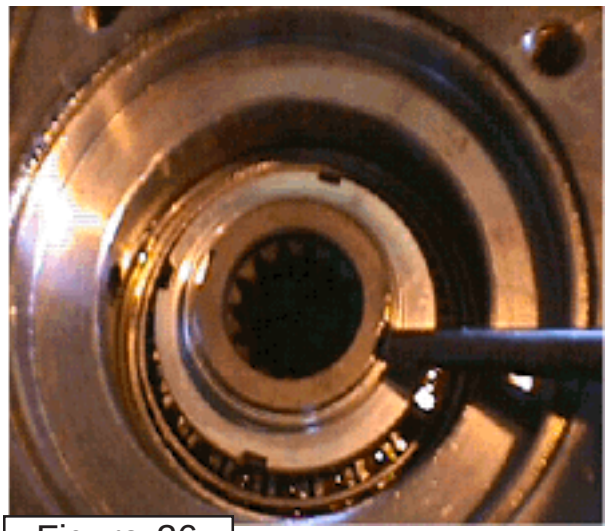


Figure 26

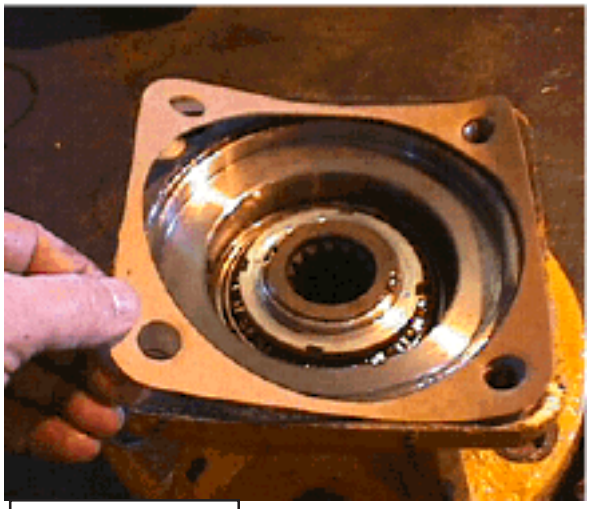


Figure 27

SPINDLE HOUSING ASSEMBLY:
(Continued)

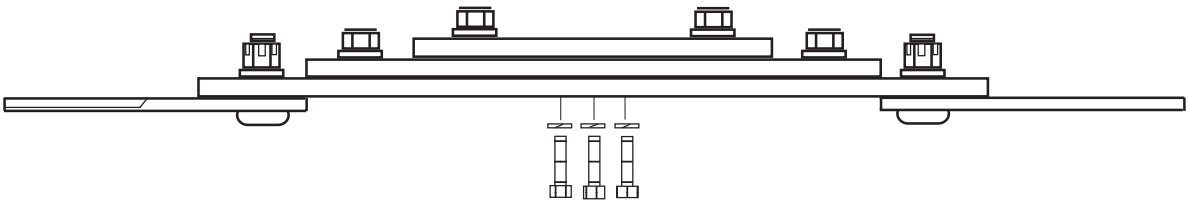
Install the spindle so that the vent and fill plugs face towards the front or rear of the mower.
Install the blade bar and pan and torque the bolts to **400ftlbs. Use a suitable locking compound on the bolts. (See Figure 28)**

Figure 28

BLADE CARRIERS:

Shown in Figure 29 and 30 are the Blade Carriers that could be used, These Carriers were used on Rotary Heads, This is Not intended to be a source of replacement parts. These are intended to be a general reference as to design and type Carriers, Options of type of Heads and Carriers on the Head makes determination as to type used.

Rotary Head 3 Leaf Bar Carrier



Rotary Head Pan Carrier

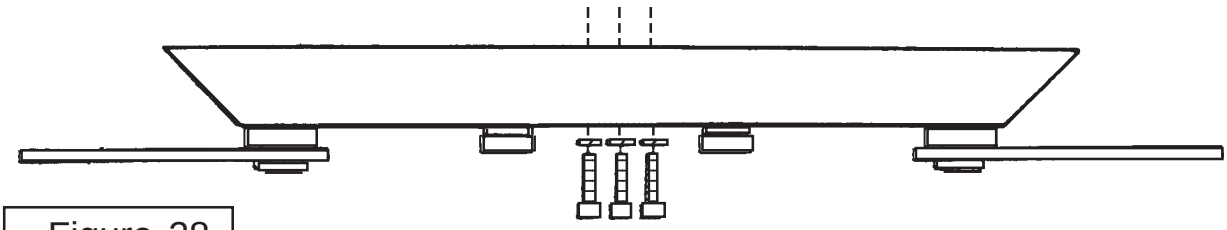


Figure 28

Rotary Head w/ 3 Leaf Bar Carrier Shown

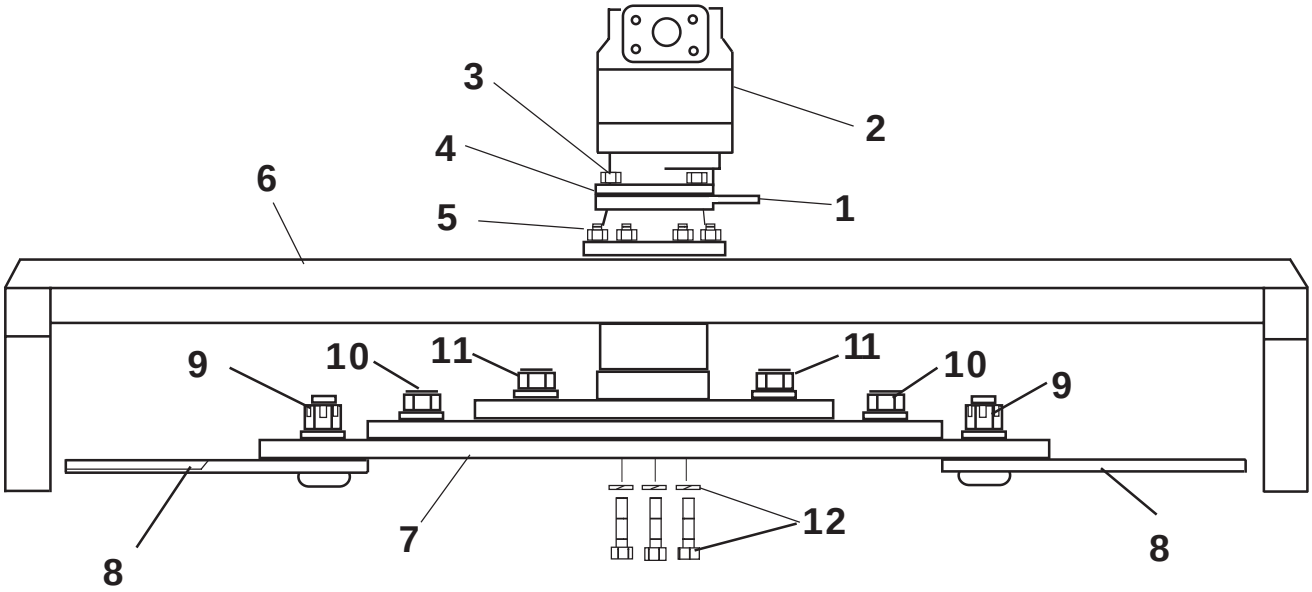


Figure 28

Item	Qty	Description
1	1	Spindle Housing Assembly
2	1	Motor Assembly
3	4	Motor To Spindle Retaining Bolts
4	1	Motor Spindle Gasket
5	6	Spindle to Deck Retaining Bolts
6	1	Deck (Mainframe)
7	1	Blade Bar Carrier Assembly w/ Blades
8	2	Blades
9	2	Blade Bolts, Bolt, Nut and Roll Pin (Torque to 400 ft. lbs.)
10	2	Blade Leaf Assembly Bolts, Short (Torque to 600 ft. lbs.)
11	2	Blade Leaf Assembly Bolts, Long (Torque to 600 ft. lbs.)
12	4	Blade Bar Carrier Retaining Bolts and Washers (Torque to 400 ft. lbs.)

NOTE: BOLTS OF DIFFERENT LENGTHS ARE AVAILABLE FOR THE INSTALLATION OF THE BLADE BAR/PAN ASSEMBLIES. THE REQUIRED LENGTH IS DEPENDENT ON THE OPTIONS USED.BE SURE TO INSTALL THE PROPER LENGTH BOLTS TO ATTACH THE BLADE ASSEMBLY IN ORDER TO AVOID RAPID FAILURE OF THE SPINDLE OR BLADE ASSEMBLY. (See Figure 30)

Roll Pins Must Be Installed in Blade Bolt To Prevent Nut From Becoming Loose Blades Should Always Be Replaced In Pairs. Blades Of Different Weights Can Cause Serious Imbalance And Cause Vibration. When Replacing Blades, Blade Bolts, Bushings, Nuts And Washer Should Be Replaced With New Ones.

NOTES

Section 9

Frame Boom Mount & Turret / Bearing Repair

Under Mount Frame Asy:

1. Before beginning any repairs on this section make certain the boom is extended outward to full extend and laying on the floor. Before removing the Boom Pivot Pin support the boom with an overhead hoist so as when Pie is removed boom can be lifted out of the way. NEVER REMOVE ANY PINS OR BOLTS unless boom is supported at pivot end and head end is resting on the floor. **It is IMPORTANT that once this repair is started that the tractor NOT be started until the repair is finished, injury and/or damage could occur if tractor was started with any components disconnected.**

2. The under mount frame asy is made up of the Turret, Center Section Frame Weldment, Boom Mount, Swing Cylinders, Swing Cylinder Trunnion Mount, Turret Cylinder Link and Counter Weight.

3. The Turret Asy will be shipped assembled to the Boom mount with the hoses and cylinders plus attaching hardware assembled to it. The Turret has been manufactured in two versions, the weldment version and the cast steel version. The Welded assembly version (older 11-06 & earlier) is identifiable by the obvious welds around the gussets and base of weldment. The cast steel version (newer 12-06 & after) is identifiable by the lack of any welds and the face (outward side) will have holes cast into it, also the turret cylinder link is a cast part of the turret and not a bolt on component as shown on the old style.

4. The Swing Cylinders have replaceable mounting bushing which can be replaced by removing the bottom cover and trunnion mount weldment. The Cylinders can be dropped down enough to replace the bushing. The replace the Trunnion Mount weldment. Also by removing the cylinders the Turret Cylinder link can be removed.

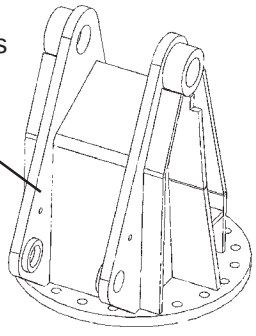
5. The Turret assembly has a large bearing assembly bolted to it and then bolted to the Boom Mount. This Bearing CANNOT be removed (or replaced) unless the Boom is disconnected from it first. When disconnecting boom make certain the boom is supported as not to fall (See Step 1). The Bolts retaining the turret to the bearing and the bolts connecting bearing to the Boom Mount MUST be torqued to the required specification, This is very critical. See the Bolt Torque Chart in the beginning of this manual.

6. DO NOT remove any mount pins and/or bolts unless the components are supported properly to prevent them from falling

7. The Turret Bearing Assembly has 3 grease fittings, each 120° apart. All three of these grease fittings must be greased because of the diameter of the bearing this to ensure an even distribution of grease though out the diameter of the bearing assembly.

8. If the hoses for the swing cylinders are disconnected or replaced make certain that they are reconnected correctly as shown in this section (Swing Cylinder Hose Routing). If the hoses are not connected correctly the swing will not function correctly.

Old style turret, welded asy. Identify by the welds visible and the bolt on turret cylinder link



New style turret, cast steel asy. No welding, turrethas holes cast in the front of the turret and the turret cylinder link is a cast part of the turret.

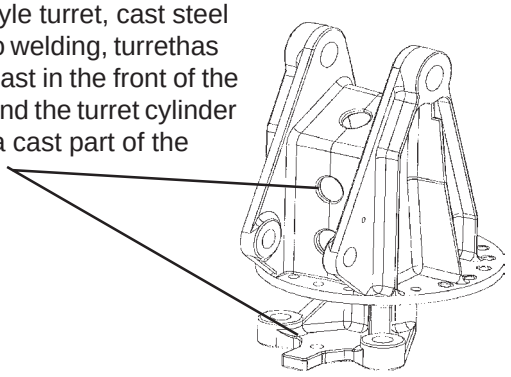
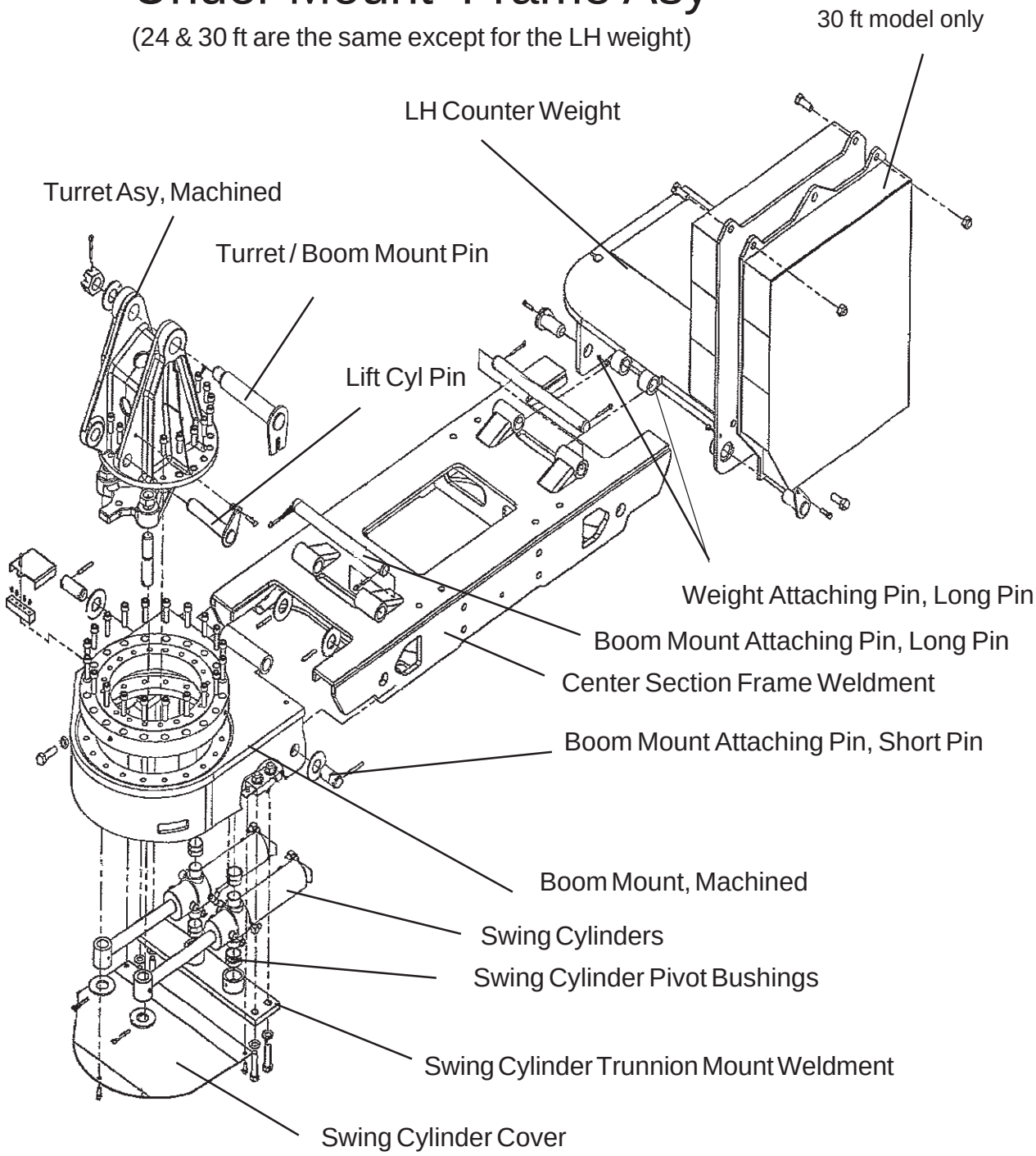


Figure 1

Under Mount Frame Asy

(24 & 30 ft are the same except for the LH weight)



Under Mount Turret & Bearing Asy Repair: Dis-Assembly

1. Before beginning any repairs on this section make certain the boom is extended outward to full extend and laying on the floor. Before removing the Boom Pivot Pin support the boom with an overhead hoist so as when Pin is removed boom can be lifted out of the way. NEVER REMOVE ANY PINS OR BOLTS unless boom is supported at pivot end and head end is resting on the floor. Note the welded turret is shown here, the cast turret will have the turret cylinder link cast as part of the turret not bolt on as shown on the welded assembly.

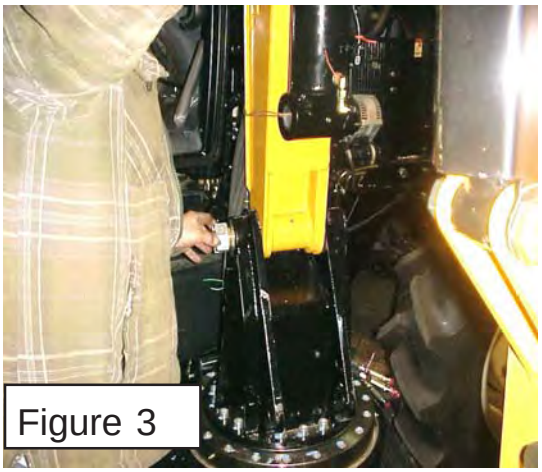


Figure 3

2. The Boom to Turret Pivot pin will need to be removed. Extend the boom outward with the head resting on the ground and boom extended. Connect a hoist to the boom lifting points for support. Remove the boom cylinder from the turret (rod end of cylinder). Loosen the nut on the boom pivot lift pin. Remove the boom pin, it may require you to lift or lower the boom some to remove pressure on pin. With pin remove swing boom to the rear far enough that it is not above the turret. It will not require the hydraulic lines to be disconnected. Using capable support stands under boom to support it while performing repairs, do not work under boom with only the hoist supporting it. (See Figure 3)

3. The Boom Turret mount weldment can be removed from the tractor by removing the mounting pins or it can be left connect to the under frame, it will be the repair technicians decision. If under mount is removed the swing cylinder hoses will required disconnecting and plugging. Here it is shown with the assembly removed and sitting on the bench (See Figure 4). The bottom cover will need to be removed, this will allow access to the cylinder rods where the connect to the turret. Remove the cotter pins and washers from the cylinder rod connections (See Figure 5 & 6). With the cotter pins and washers removed the cylinder rods should not fall from the pins, they will hang on the pins until later when turret is lifted up.

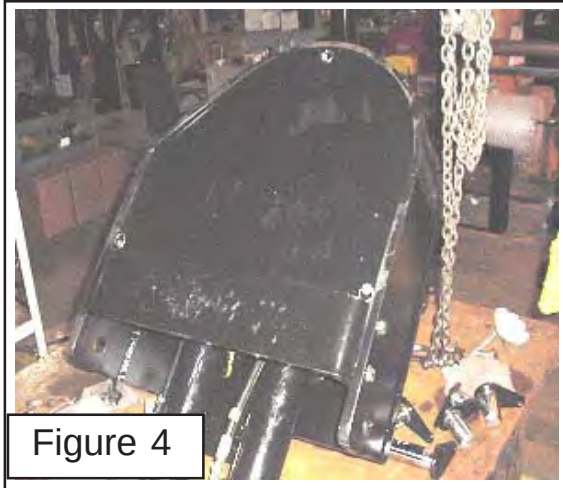


Figure 4

4. Turn turret back over on bench (See Figure 3). There are two rows of Allen head bolts around base of turret, NEVER REMOVE ANY BOLTS from turret unless boom has been disconnected and supported away from turret. Hydraulic Swing cylinders must be disconnected from cylinder turret link.

5. Before removing turret mounting bolts, connect over head hoist to the boom pin of turret. Take slack out of the hoist, it is only to prevent turret from falling over when all the bolts are removed (See Figure 7). Snug the nut on the boom mounting pin when connecting over head hoist to it.

Turret mounting bolts can be removed from the under mount weldment with air impact wrench if wanted (See Figure 8). Make certain to only remove the bolt connecting the turret to the bearing at this time.

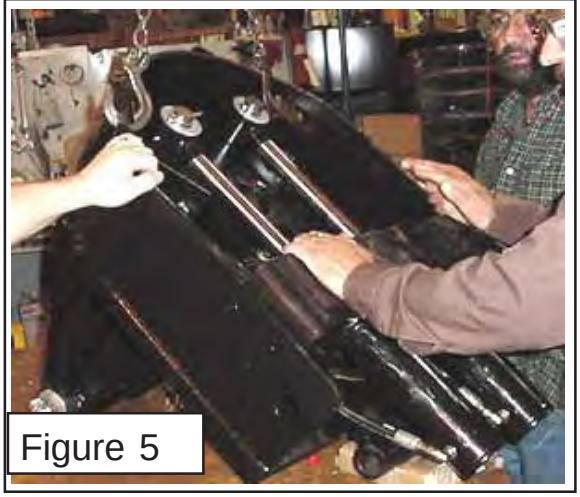


Figure 5

6. With turret mount bolts removed (See Figure 8) use the over head hoist to slowly lift the turret assembly upward (See Figure 9). Watch to make certain the cylinder rods fall off the cylinder link on bottom of turret. The turret will need to be guided up and out of the turret bearing, this is to get the cylinder link worked through the hole as turret is lifted (See Figure 9).

7. There are two types of turrets that have been used, weldment (old style) and castings (new style). The weldments have a bolt on cylinder turret link. The cast steel turret has the cylinder turret link built to the turret casting as part of the casting. If the turret weldment and cylinder turret Link weldment are used (old style) it will not be required to remove the bolt on cylinder turret link. To remove the cylinder turret link weldment would not be required unless it is needed for repair or replacement. If replacing the turret only the cast steel turret will be available which will replace the old weldment without modification. If the old style cylinder turret link (See Figure 10) requires replacing, it will be replace by a kit that will have bolt in pins instead of the weld in pins. The kit will include the required parts and instruction sheet. The new cylinder turret link will have bolt in pins (See Figure 11) and not the weld in pins that the old style had (See Figure 10).

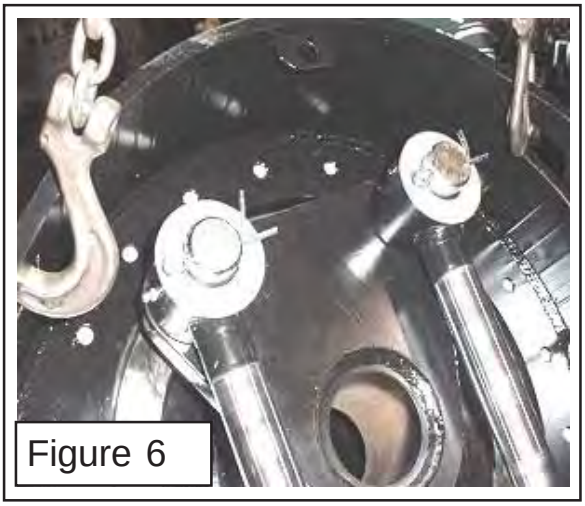


Figure 6

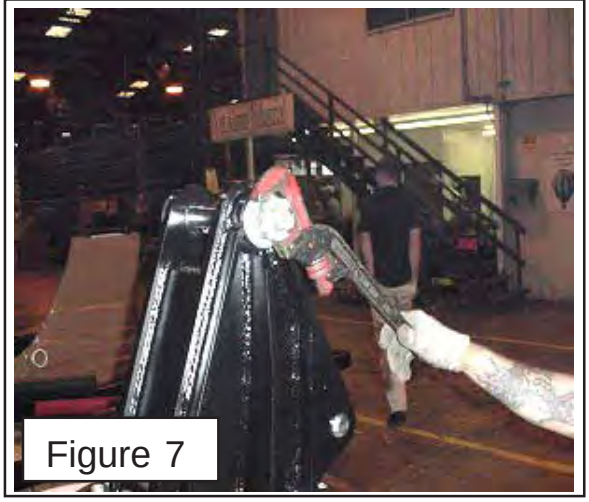


Figure 7

Figure 8

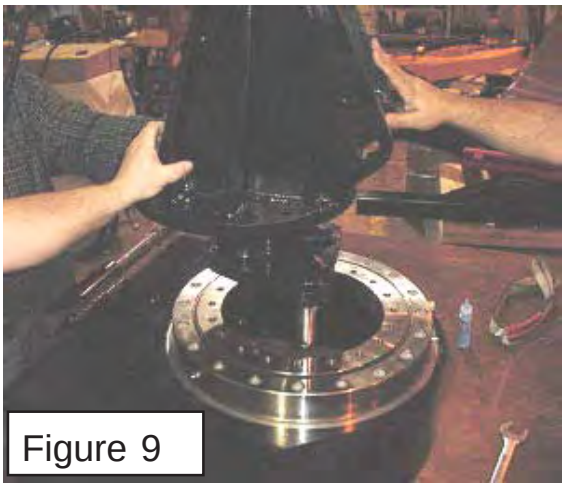


Figure 9

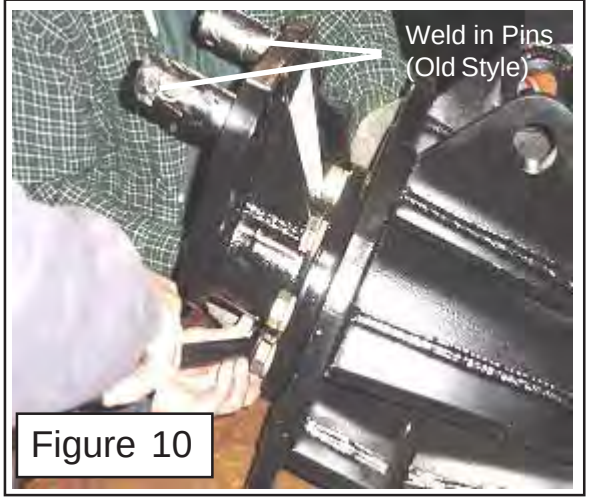


Figure 10

UNDER MOUNT TURRET & BEARING DIS-ASSEMBLY

8. The outer set of Allen Head Bolt around the outer diameter of the bearing assembly will require removing. This can be done with an air impact wrench if wanted (See Figure 12). Make a note of the grease fittings, there are three of them 120° apart. When installing new bearing these grease fittings need tobe in the same place (See Figure 13 & 14). Completley remove all the bolts connecting turret bearing assemblt to under frame (See Figure 13 & 14)

9. MARK LOCATION OF GREASE FITTINGS as to where they are pointing on the under mout weldemnt (See Figure 13 & 14). Lift the turret bearing upward off the under mount. This bearing is heavy use caution when lifting. Set the Bearing assembly aside for now.

10. Inspect Machied surface of boom mount. This area must be clean of debre, rust, scratches, nick and ding. The bearing mounting surfsce must be flat so bearing when installed will sit squarely on boom mount (See Figure 15). If reinstalling the originl bearing inspec the bottom bearing surface to make certai it is clear of dirt and debree. Bearing must sit square on boom mount weldment (See Figure 13, 14 & 15).

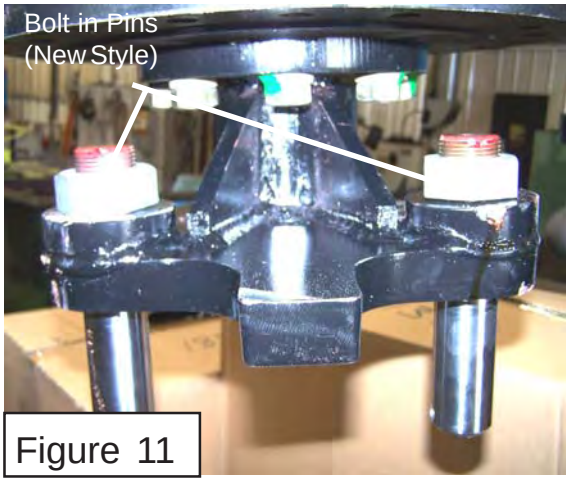


Figure 11


Figure 12

Figure 13

Figure 14

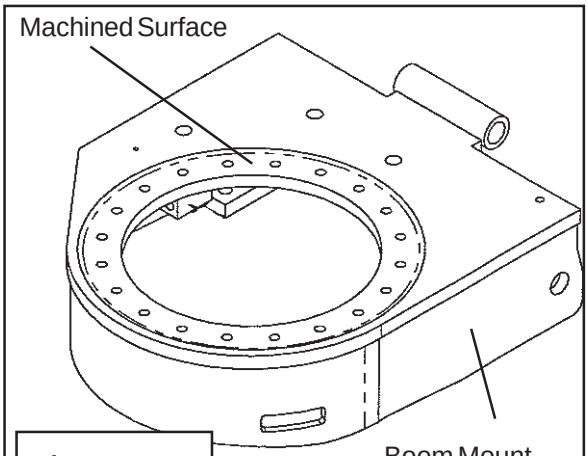


Figure 15

Under Mount Turret & Bearing Asy Repair: Re-Assembly

1. Recheck the machined surface of the boom mount (See Figure 15) ,Check the under side of bearing to make certain there is nothing stuck to it that would prevent it from sitting flat and square onto boom mount. Carefully lower the bearing assembly squarely down onto the boom mount. **Align the grease fittings as shown (See Figure 16)** making certain the bolt holes of the bearing assembly and the boom mount holes are aligned. **The grease fittings must be aligned with 1 straight out to side as shown (See Figure 16) and the other 2 at 120° apart from first one. (Three total 120° apart).**

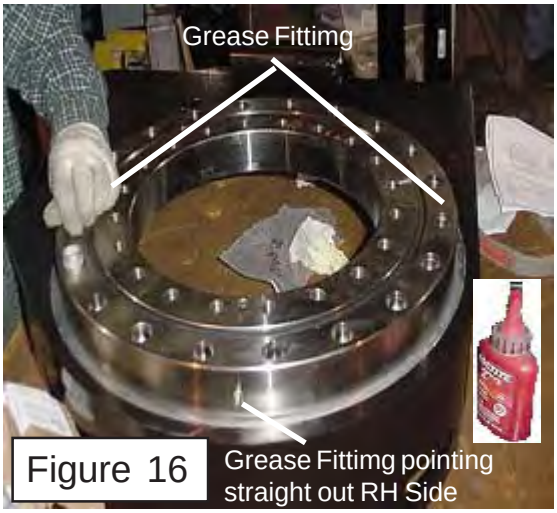


Figure 16

2. The Bearing assembly **mounting bolts must be coated with locktite compound when installed** (See Figure 16), after installing the first bolt recheck to make certain the grease fitting are aligned. Install all the bearing mounting bolts. **These bolts can be snugged down only with an impact wrench, but not tightened with one (See Figure 17).** Tighten the bolts using a torque wrench, tighten them in an alternating cross circular pattern. **These bolts torque to 225 ft. lbs. (See Figure 18).**


Figure 17

3. **CRITICAL BEARING ALIGNMENT STEP.** The alignment of the inner bearing ring is very critical before mounting the turret. If this inner bearing ring is not aligned properly failure of the bearing could occur because of misalignment.

Looking on the inner dia. of the inner bearing ring find the screw in plug, there is only one plug here. The correct alignment of this plug will be to the rear (rear of tractor when mounted) or to the front (front of tractor). Set the inner ring with plug in correct location, mark the bearing inner ring and outer ring with marker alignment marks that can be used as a reference. These alignment marks MUST stay aligned until after turret is installed (See Figure 19)

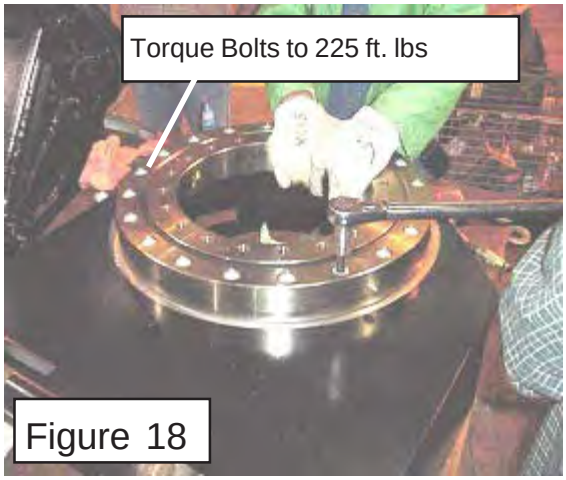


Figure 18

Figure 19

4. **NOTE:** This step will only apply to the older models which had the turret weldment with the bolt on turret cylinder link. The late models used a cast turret and the turret cylinder link is cast to the turret as a one piece component.

Using a wrench as shown start and snug the bolts that mount the turret cylinder link to the turret (See Figure 20). These bolts must be torqued in a cross circular pattern in progressive increments (See Figure 21) to a torque of 400 ft. lbs. This will require that the turret be held (See Figure 21). If torque wrench that will reach 400 ft. lbs. a torque multiplier adapter is available (See Figure 22). To compute the procedure to achieve 400 ft lbs. When using a adapter like this see the tool manufactures instructions for computing torque.

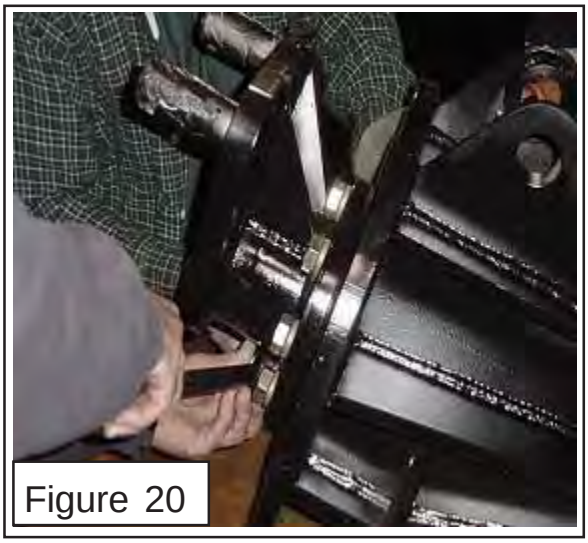


Figure 20

5. Check the inner bearing ring to make certain that the alignment is still correct**, this is critical (See Step 3 Figure 19).** Check the under side of the turret where it mounts to the boom mount, make certain there is no debris or anything that will prevent the turret from sitting flat on the inner bearing ring. Using an overhead hoist, lift the turret up above boom mount. The turret MUST be positioned so the Cylinder mount for the boom lift cylinder is facing outward 90° from tractor (See Figure 23). Slowly lower the turret into the bearing inner ring, MAKE CERTAIN the bearing inner ring stays in alignment as set in step 3.

When lowering the turret it will be required to align the turret swing cylinder rod ends so they will slide over the pins of the turret cylinder link. This can be done this way or the cylinders can be drop and reinstalled later. The decision which needs to be made now. Do not force the turret down if it is not aligned with the swing cylinders, this would damage cylinders and/or turret cylinder link. As the turret is being lower align the turret mounting hole with the holes in the bearings inner ring.


Figure 21

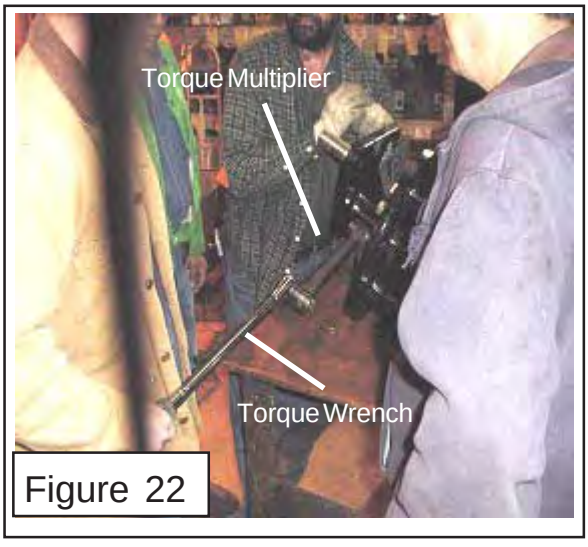


Figure 22

Figure 23

UNDER MOUNT TURRET & BEARING RE-ASSEMBLY

6. Apply Locktite to the threads of the allen head bolts. Install the allen head bolts that mount turret to bearing inner ring (See Figure 24). The Bolts can be snugged with an impact wrench only, do not tighten them with impact wrench. Inspect to make certain that the alignment of inner bearing ring to outer bearing ring is still in alignment, make certain the turret is mounted correctly with the alignment marks you made to bearing.

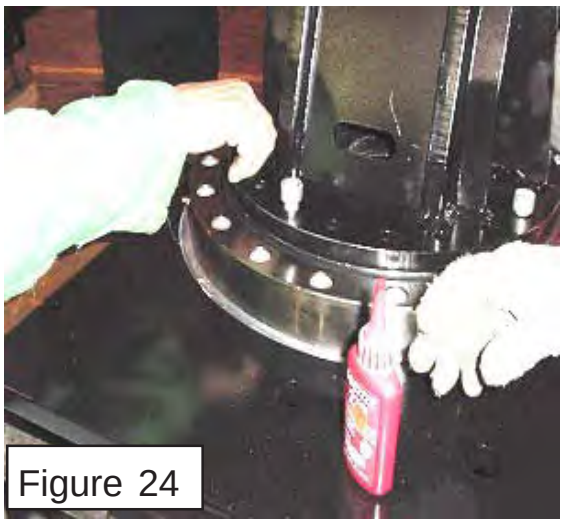


Figure 24

7. Torque the allen head bolts that mount turret to bearing assembly. Tighten in a cross pattern alternating and tighten in increments to a final torque of 225 ft. lbs. (See Figure 26).

8. Check to make certain the swing cylinder rod ends are on the turret cylinder link pins. If they are not it may require the swint cylinder trunnion mount to be dropped so the cylinder can be slid over pins. Install the washers and cotter pins. Re-install cylinder trunnion mount if it was removed (See Figure 27). Reinstall any swing cylinders if removed. Insert hose through the holes in the boom mount. Reinstall the bottom boom mount cover plate (See Figure 28).

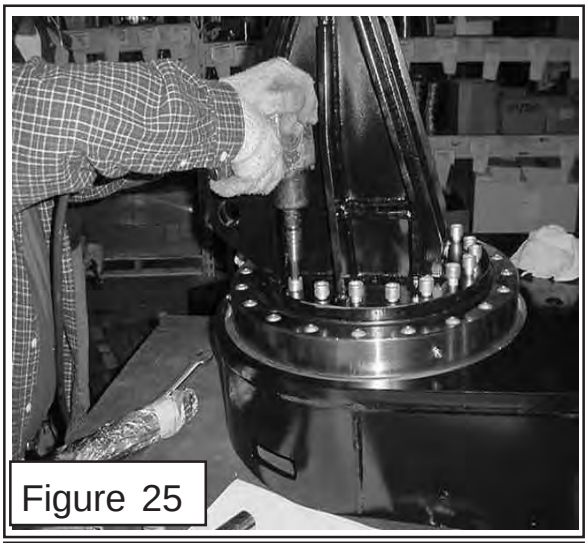


Figure 25

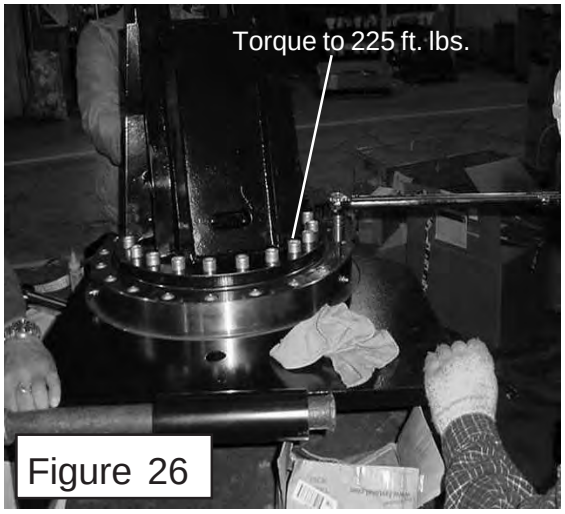


Figure 26

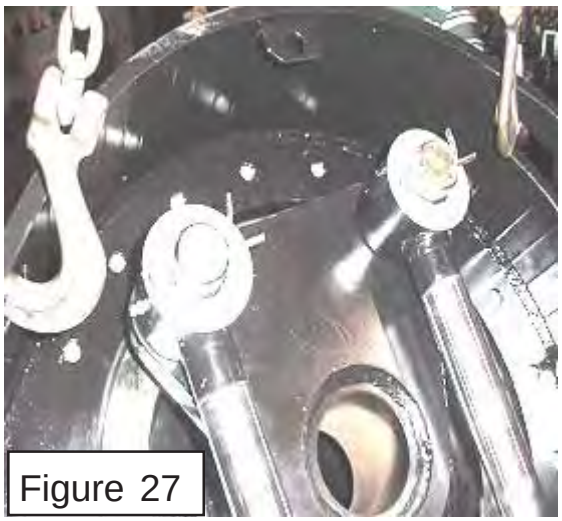


Figure 27


Figure 28

9. Reinstall boom mount and turret assembly back on tractor if it was removed. This is done by lowerinf the assembly onto tractor mounting frame and installing the upper pin and the two lower pins. Revconnect the swing cylinder hoses to the hoses that come up through the boom mount (See Figure 29).

10. Lower the boom down onto the the turret, align the boom hole with the turret hole ans insert the boom pivot pin (See Figure 30). Install and tighten the boom pivot pin retaining nut (See Figure 31).

11. Reconnect the lift cylinder to the turret (See Figure 30)

12. Reinstall the boom hoses if they were disconnected, make certain all hoses are connect to the correct fittings. See parts and/or assembly manuals for hydraulic schematics (See Figure 32 for motor hose connections to boom).

13. Always inspect all fitting, hoses, pins, boltsand all safety divices for equipment and tractor. DO NOT start tractor until all safety divice are installed and functioning properly. DO NOT start tractor untill the oil level for the mower and tractor has been checked and filler to proper levels with the proper oil type. See the recommended oil chart for the mower on the next page (See Figure 33)

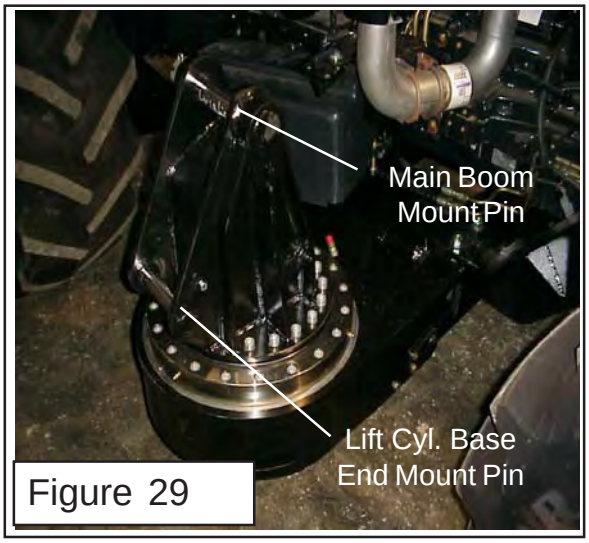


Figure 29

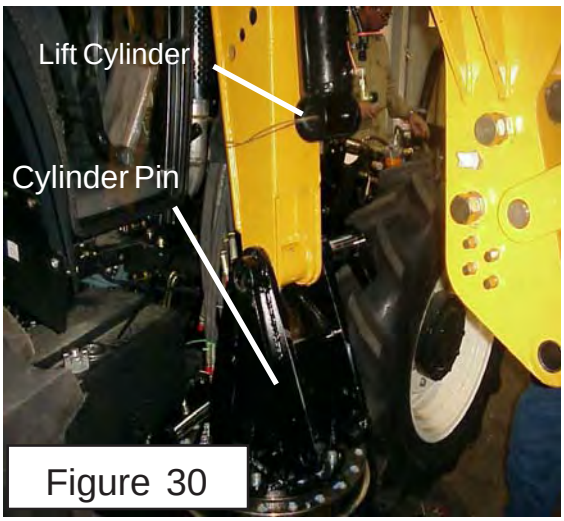


Figure 30

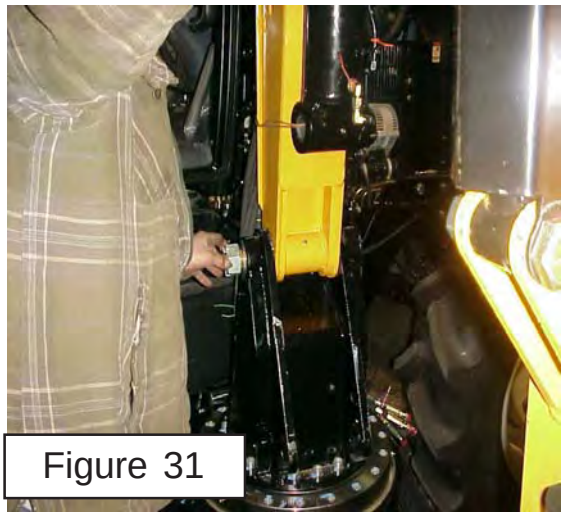


Figure 31

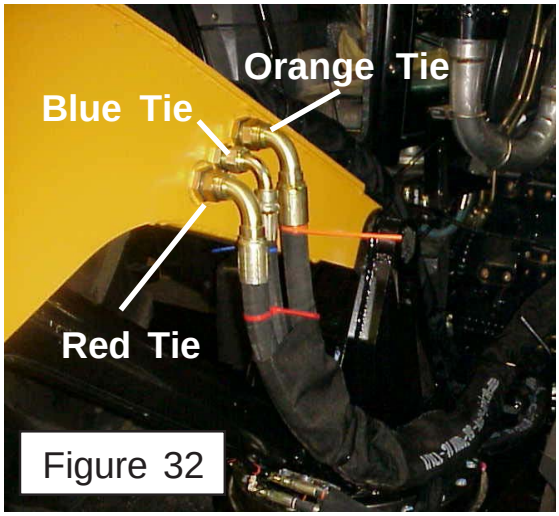


Figure 32

Section 10

Axtreme Boom

Possible Failure Cause and Solution Section

NOTE;

This Section is written to give a POSSIBLE CAUSE of a problem and the POSSIBLE SOLUTION of a problem, it is also to aid in finding problems and to correct problems. There may be more than one cause to a problem as there may be more than one solution. Inspection and testing by you at the Unit site can diagnose these problems, This section cannot be used as absolute diagnose of a problem as well as not to give the absolute solution. It can only suggest where to check and what to repair.

General:

Cracks in mowing Decks or Booms can be generally attributed to Severe Usage and/or Vibration caused by an imbalance in the rotating parts. It should be remembered that vibrations occur as a result of operation when cutting Heavy Material or hitting stationary object that cause a component to bend, break or lose pieces etc. In some cases it may be the result of a design or application, this is something that will have to be determined through investigation of circumstance.

Simply welding up a Crack will not usually yield a satisfactory repair; simply welding may cause another weak spot during welding process. The condition that caused crack may still be present. It is usually advisable to grind down the weld and add a plate over the weld to span the site of the original crack.

Adding a reinforcing piece (or Extra Brace) may not be as good as it sounds a number of reasons this is not advisable. Because you could be making an area that needs to flex some to relieve stress is being eliminated; the added weight may change the balance of unit or component.

A good suggestion for future reference is to take photos of cracks (Failures) before the repairs are made; this will aid you in future failures to see what happened in the past ones. This is a good idea because the failed area may not always cause the failure, it may be caused by something else and it is sometimes hard to explain what the failure looked like before it was repaired.

Always repaint any area that has been re-welded to prevent rust as well as cosmetic appearances.

POSSIBLE FAILURE / CAUSE & SOLUTION

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POSSIBLE FAILURE / CAUSE & SOLUTION

Boom Breaks Back Too Easily: Boom is designed to break back if tomuch resistance is meet for safety reason.

CAUSE: **Work Port Relief for Swing Cylinder Malfunction?**
SOLUTION: Test for Pressure required to Break Back the Boom. If Pressure is lower or higer than Specified, Adjust or Replace Work Port Relief Valve.

CAUSE: **Cutting Head Positioned Too Close To The Ground?**
SOLUTION: This is an Operational Problem, The Operator will be required to adjust the way the unit is being run and raise the Head Up.

CAUSE: **Operator Running Into Too Heavy Material or Traveling Too Fast?**
SOLUTION: This is an Operational Problem, The Operator will be required to adjust the way the unit is being run and Adjust Operating procedures to eliminate this.

CAUSE: **Inadequate Bracing?**
SOLUTION: This is a difficult subject, It is recommended that you consult with the factory before making modifications of this type, Adding additional pieces may change many components functions, the weight that would be added changes the balance weight ratio. The Hydraulics ability to lift and even lower could be affected. Adding weight is not recommended.

Boom Drops When Two Functions Actuated:

CAUSE: **Low Oil Level in Tractor Hydraulic System?**
SOLUTION: Fill and Bleed all Cylinders (Run All Cylinders through thier Cycle), Then fill Tractor Hydraulic Oil to Proper Level, Run Cylinders through thier Cycle again and recheck Hydraulic Sump Oil Level again. If the Cylinders are not Filled then Oil Level brought to Specs the Oil Level could be low during operation causing damage to Tractor Hydraulic System.

CAUSE: **Too Rapid Drop Of Boom?** (Too Rapid Drop in Cylinder)
SOLUTION: Restrictors damaged or removed, Check restrictors if they have them, Make sure correct size Hoses are installed to cylinders. Repair or Replace as needed.

CAUSE: **Defective or Damaged Joy Stick Controller?** (w/ Electronic Control Option)
SOLUTION: There are very few replaceable Parts in Joy Stick Controller, See the Repair Section for Testing and repairing the Joystick. DO NOT Replace Joystick till all Test have been performed to pin down the problem area. There are a number of tests to locate problem area that can be used, these are listed through out sections of the repair Manual as well as some listed in the Operators Manual.

Cylinder Boom Positioning:

Cyl. Continue to move after Joy Stick released.

Boom Moves on its Own (Electronic Joystick). Joystick does Not return to Neutral.

CAUSE: **Defective or Damaged Joy Stick Controller?** (w/ Electronic Control Option)

SOLUTION: There are very few replaceable Parts in Joy Stick Controller, See the Repair Section for Testing and repairing the Joystick. DO NOT Replace Joystick till all Test have been performed to pin down the problem area. There are a number of test to locate problem area that can be used, these are listed through out sections of the repair Manual as well as some listed in the Operators Manual.

CAUSE: **Oil Contaminated?** (w/ Electronic Control Option)

SOLUTION: If the Filters are Not Maintained properly on the Tractor Hydraulic System, Fine contaminates can get into the Solenoid valves, this prevents them from seating Properly. This can result in Boom Circuits moving without input from the Joystick Controller. When Filters get full, It causes the Bypass valve on the Filter to Open and allow unfiltered Oil to go throughout the System. Once this is allowed to happen even though the Filters are later changed, it is no guarantee that the malfunction will not re-occur because the contamination could be any where in the system waiting to break free and travel on through the system. Later Models (Machete) had an add on filter added which has a lower Micron Rating than Tractor Filter, This was added to keep Contamination from Tractor System from going through the Boom System, Both Tractor and add on Boom Filter will have to be changed an a regular maintance schedule, See Operators manual.

Control Valve Spool or Spools Sticking:

CAUSE: **Control Valve Bolted to Mounting Plate Incorrectly?**

SOLUTION: Loosen bolts and re-tighten 1 turn at a time using a criss-cross pattern. The Valve Body can be placed in a bind if the mounting bolts are tightened un-evenly. This can cause the Spool to stick in the bore or cause the Valve to leak internaly.

CAUSE: **Contamination in Valve Spool?**

SOLUTION: Find Contamination source and correct it, Clean Valve, Change Filters, Replace Oil (if required to remove contamination), Re-Assemble and Test.

CAUSE: **Faulty Valve Spool or Section?**

SOLUTION: Replace Valve Section, If the valve Section is defective, The Malfunction will most likely occur immediately after being placed in service. If the Unit has been operating for sometime, the problem is most likely to be a failure not a defective part there fore more checking maybe needed to determine why the Valve Spool failed.

Cylinder Excessive Drift:

NOTE: All Cylinder Hydraulic Systems have some amount of drift or leakage in the system. All parts have tolerances and all parts Must have clearance in order to function. Clearance necessary to allow the part to function also results in some internal leakage. Cylinder Drift can also be refered to as "Leak Down" or "Settling", In most cases, the cause of Cylinder Drift will be found in the Cylinder, Valve (s) or Lines. Components have a different leakage rate. Reducing the amount of drift also has its drawbacks. "Tight" components are very sensitive to contamination, Seizure due to high operating temperatures, Seizure due to contamination. Valves have a tight clearance, restrictors have small openings. Leaking External Lines cause Cylinder Drift but this is the easiest problem to correct as it is the easiest type to find. There fore most causes listed below will deal with Internal Leakage. See "Cylinder Drift Rate Chart" in Specification Section of Product Repair Manual to determine if drift rate is excessive. See Cylinders Leak Section for Cylinder leak Problems.

CAUSE: **Cylinder Pistons Seals Bypassing?** Dual Function Cylinders have 2 lines and have pressure both ends, Single Function Cylinders have 1 line and pressure on one end and Vent Plug on other, Piston bypass in Single Action Cylinders it will not require this test, If they leak the Oil will leak out of Vent Plug.

SOLUTION: Raise load and support it safely. Drain Pressure off Line after Load is supported and before removing any lines. Drain Pressure can be done with Tractor "Off" and open valve to lower Load. Remove and solidly plug lines to the Cylinder. Remove Load Support (Hoist will be reqiured), Document the time it takes for the load to drift down. (See Cylinder Drift Chart) If the Piston Seal is cause of excessive Drift down this will tell you. Reseal or Repair Cylinders as required. Note Piston Seal bypass can be caused by damaged Seals, oversized or worn Cylinder Bores. Some Cylinders don't function through out the intire length of their stroke, So the oversize wear could only be in part of the bore, When checking Bore size it is recommended to check entire length of Bore if the length of stroke is not known.

CAUSE: **Work Port Relief Valves Not Seating Properly?**

SOLUTION: Test Cylinders for Bypassing as above. If OK, Leakage must be occurring in the Control Valve Spool or Work Port Reliefs (if Equipped). Suspend the Load with the Cylinders and place Valve Lever in "Hold" (Neutral / Centered) position. Use a "Stethoscope" Tool (or equivelant), Listen to the Valve Body next to the Work Port that is suspect. The Oil will be making a shrill whistling sound as it leaks past the Work Port Poppet. If Leakage is evident, Lower the Load and inspect to Work Port Relief Valve, replace if needed.

Cylinder Excessive Drift: (Continued)

CAUSE: **Leakage Past Control Valve Spool?**
SOLUTION: If excessive Cylinder Drift is confirmed and the Cylinder and Work Port Relief Valves have been eliminated, The possibility is the Control Valve Spool itself. If clearance between the Control valve Spool and Body are causing the drift, the Only Solution is to replace the Valve Section. Keep in mind that the cause for excess clearance must be found and corrected. Frequently the cause is pre-mature wear from abrasive material (Contamination) in the Oil. If this is not corrected failure will re-occur.

CAUSE: **Abrasive Contamination In Oil?**
SOLUTION: Abrasive Contaminants (Dirt, Iron Particles, Clutch Disc Material etc.) in the Oil Sump / System is a major contributor to all of the above internal leakage problems. It is especially likely if the Positioning Hydraulics are using Oil from the Tractor Hydraulic System. If the Tractor Hydraulic System is not properly maintained, Materials from Gears, Clutch Disc and Etc. can enter the Control Valve and Cylinders causing excessive Pre-mature Wear. If Abrasive material Wear is found the complete system Should be flushed and cleaned. On Some Later Models an additional Filter System has been added as additional Filtering of Tractor Hydraulic Oil. But even this add on Filter, if not maintained, will run through the Filter Bypass and contaminate System. KEEP FILTERS CLEAN and/or Replace on a good Maintenance Schedule.

CAUSE: **Electrical Short Circuit?** (w/ Electronic Control Option)
SOLUTION: Electrical short causing controls to emit electrical current even though controller is in neutral position. Check all wire connections and try to determine where electrical short is, Repair or replace as needed. Usually this type of problem will allow drift to be rapid unless Short is through Joystick controller, There should be no electrical current when Valve and Joystick are in centered (neutral) position

Cylinder Leaks At Fittings:

CAUSE: **Loose or Wrong Fittings?**
SOLUTION: Make sure correct Fittings are installed and are torque to correct specification. Boss Fittings may have damaged O-Ring, Check and repair as required.

CAUSE: **Port Cracked at Fitting?**
SOLUTION: Repair or Replace Cylinder and/or Fitting. This type failure is more common on Cylinders with Pipe Fittings than the ones with O-Ring Boss Fittings. The reason is because the Pipe Thread is tapered and can be over tightened and the tapered thread acts as a wedge. Don't over tighten any fittings, Don't use Teflon tape at all, if using a Semi Liquid Pipe Thread Sealer Don't put excessive amount on fitting and Never put sealer into ID of Port, It will get into system and contaminate it.

CAUSE: **Deformed or Damaged Fitting?** (JIC)
SOLUTION: Replace damaged Fittings and/or Hose, Over tightening of JIC Fittings can deform the Flares on the Fitting and create leaks. See Torque Specification for proper Torque Values.

Cylinder Leaks Around Rod:

CAUSE: **Faulty Seals On Cylinder Gland?**
SOLUTION: Dis-Assemble and Re-Seal Gland. Seals can be damaged by foreign objects, or worn by abrasive material such as Dirt getting into Seal and/or Rod. Seals can also be damaged during Assembly and this type of damage will almost always show up shortly after being put in service.

CAUSE: **Damage To Cylinder Rod?**
SOLUTION: Determine the cause of the Damage, Dent, Scratch, Rust and/or something stuck to Rod. The Damage and cause should always be identified and corrected before any repairs are made, Repairing the failure and leaving the cause will result in more failure. In Some cases a Cylinder Rod can be cleaned up with CROCUS CLOTH (a very fine abrasive material), DO NOT USE anything more abrasive than crocus cloth. A major problem for cylinders is storage when unit is not being used for a while, The Rods are a chrome alloy but if subjected to moisture long enough they will rust, This is not a problem when being operated as they are be cleaned with every in and out stroke. If Unit is going to be stored for an extended time you can coat Rods (Exposed Part) with Oil or Grease to protect them, But If you do this it must be cleaned off before running to remove the Dust that will have collected on rod from Oil and grease.

CAUSE: **Cylinder Rod Bent?**
SOLUTION: Determine and correct cause of bent Rod, Replace Rod and Re-Seal Cylinder.

Cylinder Moves On Its Own: (Under Power)

CAUSE: **Control Valve Spool Stuck?**
SOLUTION: Locate stuck Spool, repair or replace Spool, Determine why Spool is stuck, Debris, Foreign Objects, Contamination, Broken Spool Components and etc. If just the Spool is replaced and the reason it failed is not corrected, it will fail again.

CAUSE: **Return Spring Broken in Control Valve?**
SOLUTION: Repair or Replace Spring, Determine why it broke.

CAUSE: **Binding of Control Cables or Linkage?** (Remote Cable Control Models)
SOLUTION: Determine cause of Cable Binding or Sticking, repair or replace as required. Sometimes it may be the Linkage sticking or binding and not the Cable, It may be required to disconnect Cables from Linkage to determine which is sticking, If it is the Linkage repair as needed. Cables may stick because of internal abrasion inside calve Housing, Some times this damage is not visible.

Cylinder Moves On Its Own: Under power (Continued)

CAUSE: **Controller Not Returning to Center?** (w/ Electronic Control Option) (Electronic Joystick Control Models)

SOLUTION: Test Joy Stick Controller as shown in Repair Manual, Repair or Replace as needed. Note: Do Not replace Joystick till Test have been performed to eleminate other possible failures, Other Malfunctions can appear like Joystick Failures.

CAUSE: **2 Way Radio RF Interference?** (w/ Electronic Control Option)

SOLUTION: Radio Frequency interference is a common problem with all electronic controllers in all equipment and vehicles. Normally keying the microphone of the radio will result in some unwanted or unexpected operation. In the case of a boom mower on of the boom functions may slowly begin to move.
The resolution of this problem requires that power to the controller be disconnected when operating the radio. To accomplish this, simply switch off the power switch on the controller box prior to using the radio.
This may affect Tractors that are equipped with two way radios and when using radio to send, When Radio Receives there should be no interference.

Cylinder Moves Wrong Way:

(Opposite of direction it should per Control Movement)

CAUSE: **Hoses Routed incorrectly?** (On New or Repaired Units)

SOLUTION: Route hoses per Hose Diagram in Parts Manual.

CAUSE: **Incorrect Valve Operation Plate?** (On New or Repaired Units)

SOLUTION: Replace with correct Plate.

CAUSE: **Wire Harness improperly connected?** (w/ Electronic Control Option) (On New or Repaired Units with Joystick)

SOLUTION: Change connectors to other solenoid valve on Same Circuit and test. Applies to Old Apitech valve Models (Ten Connector Wiring harness 5 on each side of Valve,)

CAUSE: **Confusion On Direction Travel of Joystick or Switch Application ?** (w/ Electronic Control Option)

SOLUTION: The Function of Joystick is specific to type or combinations of movement that is made to perform that function, If the system was not connected correctly when first assembled the the movements may not match what is expected. See Operators Manual, Parts Manual or Repair Manuaul for what action or combination of actions should operate what function.

Cylinder Moves Intermittent: (All Functions)

CAUSE: **Obvious Causes Check First?** (Check These First)
SOLUTION: Perform all Operational checks, Tank Oil Level , Pump Operation, Control Valve Circuit (Electrical Supply & Hyd Supply), All Circuits affected or only some Circuits. If All Circuits will not work the Problem is most likely up-stream of the control Valve or an electrical Problem (Models with Joystick Controller). The Following Causes are based on Only some circuits being affected, Not all Circuits.

CAUSE: **Load Sense Signal Not Reaching The Tractor Pump Control?** (w/ Electronic Control Option)
SOLUTION: Remove, Inspect and clean Signal Lines from Control Valve to Priority Valve. Check all orfices to make sure they are clear. Note: it is not unusual for the debris to drain out of system with the Oil when the pressure is released or the lines are removed. Everything can appear clear then be pushed back in when pressure is applied or it may never return, this can be a difficult malfunction to find as well as correct. This means even though it was checked once it does not mean the problem is not there.

CAUSE: **Low Oil Level In Tractor ?**
SOLUTION: Fill to Proper Level with recommended Oil. See Specification Chart for recommended Oil type.

CAUSE: **No Voltage to Joystick Controller?** (w/ Electronic Control Option)
SOLUTION: Check for Voltage to Controller. repair or replace as required, Wiring, Fuses, Switches, etc.

CAUSE: **Faulty Joystick Controller ?** (w/ Electronic Control Option)
SOLUTION: Check for Voltage output from Controller. With power to Controller and Joystick function actuated, Check for Voltage at Harness end of Solenoid Valve Connector for that function that is actuated. If there is no Output Voltage from Controller, check Controller End of Harness, If still no Voltage Repair or Replace Controller as needed. If Voltage at Controller then check Harness and Repair or Replace as needed. (see pages 56 and 57 trouble Shooting / Testing)

CAUSE: **Faulty Tractor Hydraulic System ?** (w/ Single Pumpl Option)
SOLUTION: Perform Hydraulic ? Electrical isolation Test. If Tractor System is at Fault, Trouble Shoot and Repair Tractor per Tractor Manufactures Guidelines.

CAUSE: **No or Low Pilot Pressure?** (w/ Electronic Control Option)
SOLUTION: Check Pilot Pressure. Test, Adjust or Replace Pilot Pressure Valve as required

Cylinder Moves Spongy or Jerky:

CAUSE: **Air in Oil?**

SOLUTION: Run the System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil will have a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine "Off" you can find a leak by pressurizing the Tank, This will not take but a few pounds of pressure (3 to 5 PSI or less). Look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have had severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Air in the Cylinders?**

SOLUTION: Remove Air from Cylinders by Bleeding the System. Operate Cylinders and Hold at maximum stroke for several seconds. Repeat several times to purge Air from Cylinder. Repeat for other Cylinders till condition no longer exist.

CAUSE: **Wrong Type of Oil?**

SOLUTION: Fill to Proper Level with recommended Oil. See Specification Chart for recommended Oil type. If changing Oil in Old type Unit always use most recent recommended Oil Type but do not mix types of Oil.

CAUSE: **Cold Oil?**

SOLUTION: Run Unit at low Speed until Oil warms up. If Oil is to cold and flows slowly it can cause Cavitation, this will damage Pump. DO NOT Operate if Oil is so thick that you have this problem, wait till it warms up or move unit To a Building where Oil can warm up before operating.

CAUSE: **Faulty Pump Drive?**

SOLUTION: Inspect Pump Drive Components for wear and damage, or other reason pump May not run smoothly. If Pump is not smooth then Pressure will not be steady causing surges in pressure.

CAUSE: **Work Port Relief Set Too Low for Application?**

SOLUTION: Install proper work Port Relief. If the Pressure needed to operate the function Can exceed the setting of the valve in certain positions, it will cause the Oil to bypass, causing jerky movement of the function.

Cylinder Moves, Some Functions Work, But Not All:

CAUSE: **Faulty Joystick Controller?** (w/ Electronic Control Option)

SOLUTION: Check Output voltage at the harness end connector for the affected Function, (Switch ON, Engine OFF, Joystick Function Actuated). If No Voltage is present, Check Harness, If Harness is OK, Repair or Replace Controller as needed. (See Page 56 and 57)

Cylinder Moves, Some Functions Work, But Not All:

(Continued)

CAUSE: **Obvious Causes Check First?** (Check These First)

SOLUTION: You may have enough Oil to operate one function but not all because Some Cylinders will require more volume than others will. Perform all Operational checks, Tank Oil Level, Pump Operation, Control Valves Circuit (Electrical Supply and Hydraulic Oil Supply), All Circuits affected or only some Circuits. If All Circuits will not work the Problem is most likely up-stream of the control Valve or an electrical Problem? (Models with Joystick Controller). The Following Causes are based on Only some circuits being affected, Not all Circuits.

CAUSE: **Control Valve Bolted to Mount Plate Incorrectly?**

SOLUTION: Loosen Bolts and retighten 1 turn at a time using a criss cross pattern. The Valve Body can be placed in a bind if the mounting bolts are tightened incorrectly. This can cause the Spool to stick in the Bore or results in Internal Valve Leakage.

CAUSE: **Contamination in the Valve Spool?**

SOLUTION: Clean Valve, Check complete System for contamination, Flush and Clean as required. Reassemble and Test.

CAUSE: **Faulty Valve Spool or Section?**

SOLUTION: Determine what caused Valve Spool to be Faulty, is it a failure or a defect, A Defect usually shows up soon, Failure can be any time. If Defect Repair or Replace as needed, If Failure determine cause of Failure, Repair Failure cause and Repair or replace Spool Section.

CAUSE: **Faulty Control Module?** (w/ Electronic Control Option)
(electric over hydraulic new style (5 wire) valve only.

SOLUTION: Valve control modules may develop one of two modes of failure:

1. Water damage: In this case condensation will develop in the circuit board cavity of the controller and result in a short. With this mode, the controller will stop working in one or both directions and will very seldom regain function.

2. Thermal Fatigue: This failure will be identified as a module which performs adequately when cold but will stop working in one or both directions as the unit warms up. This is caused by fatigue of the wire strip located inside the module. Identify the signal wire from the joystick attached to the faulty segment of the valve (swing, lift, dipper, etc). Use a phillips screw driver to remove the wire. Remove the wire attached to the module next to the faulty segment and swap the two wires. If the problem moves to the new location, the problem is in the Joystick or harness. If the problem continues in the affected valve segment, replace the module.

Cylinder Won't Move At All: (No Power)

CAUSE: **Obvious Causes Check First?** (Check These First)
SOLUTION: Perform all Operational checks, Tank Oil Level, Pump Operation, Control Valve Circuit (Electrical Supply & Hydraulic Supply), All Circuits affected or only some Circuits. If All Circuits will not work the Problem is most likely up-stream of the control Valve or an electrical Problem (Models with Joystick Controller). The Following Causes are based on only some circuits being affected, Not all circuits.

CAUSE: **Incorrect Hose Routing?** (Unit has never worked or been repaired)
SOLUTION: Check Hose Routing with Parts Manual and Assembly Guide to make sure Hoses are routed correctly. Move and reconnect Hoses as required.

CAUSE: **Work Port Relief Installed Improperly?** (Unit has never worked or been repaired)
SOLUTION: Determine correct positioning of Work Port Relief's. If relief's are incorrectly installed, Install correctly and Test.

CAUSE: **Work Port Relief Malfunction?**
SOLUTION: Determine if one or both sides are affected. Make sure Work Port Relief's are in proper position, Swap Hoses with another circuit or swap Work Port relief's with another circuit to determine where problem lies. Repair or replace faulty Parts as required.

CAUSE: **Control valve or Remote Control Malfunction?**
SOLUTION: Observe actuation of Valve Spool in relation to Control Lever. Repair any faults.

CAUSE: **Restrictions in System?**
SOLUTION: Look for Kinked, Plugged, Pinched Hoses or Lines. Observe as Cutting Head is moved throughout its range of movement. Do not forget the possibility of foreign objects being lodged in Restrictors, Hoses, Tubes, Fittings and/or Lines

CAUSE: **Piston has come off of Rod?**
SOLUTION: This can be difficult to diagnose, if the Piston comes completely off of Rod it can be pushed to bottom of Barrel below Port, Then Oil just circulates around through Piston with little or no resistance, This makes it appear there is no Pressure or valve is not working. The best way to check would be with a Flowmeter in Cylinder Line. Check, Repair or Replace as required.

CAUSE: **Vent Plug Block or Not Installed?** (Power One Way Cylinders)
SOLUTION: This applies to Cylinders that only Stroke in or Out under pressure, The return Stroke under gravity. Remove Plug, Clean or Replace as needed. If No Vent Plug is there determine if one is needed and install as required. (See Parts / Operators Manual for Vent Plug requirements).

Cylinder Won't Move Under Load: (Moves Slowly)

CAUSE: **Obvious Causes Check First?** (Check These First)
SOLUTION: Perform all Operational checks, Tank Oil Level, Pump Operation, Control Valve Circuit (Electrical Supply & Hydraulic Supply), All Circuits affected or only some Circuits. If All Circuits will not work the Problem is most likely up-stream of the control Valve or an electrical Problem (Models with Joystick Controller). The Following Causes are based on only some circuits being affected, Not all Circuits.

CAUSE: **Incorrect Hose Routing?** (Unit has never worked or been repaired)
SOLUTION: Check Hose Routing with Parts Manual and Assembly Guide to make sure Hoses Are routed correctly. Move and reconnect Hoses as required.

CAUSE: **Work Port Relief Installed Improperly?** (Unit has never worked or has been repaired or worked on)
SOLUTION: Determine correct positioning of Work Port Relief's. If reliefs are incorrectly installed, Install correctly and Test.

CAUSE: **Work Port Relief Malfunction?**
SOLUTION: Determine if one or both sides are affected. Make sure Work Port Relief's are in proper position, Swap Hoses with another circuit or swap Work Port relief's with another circuit to determine where problem lies. Repair or replace faulty Parts as required.

CAUSE: **Control valve or Remote Control Malfunction?**
SOLUTION: Observe actuation of Valve Spool in relation to Control Lever. Repair any faults.

CAUSE: **Restrictions in System?**
SOLUTION: Check Hoses and Lines for Kinks / Obstructions. Hoses have an inner lining that can turn loose and block a hose. If Assembly or Repair work has been performed, recheck all connections for correct location. Some may not be visible without some dis-assembly. Unplanned restrictions cause increased backpressure, loss of usable power, excess Heating of Oil and failure of Shaft Seals.
Restrictions can sometimes be found by measuring the temperature of the Oil (or fittings) at various points in circuit as heat will usually be higher at the restriction. The restriction should be located at or upstream of the increased temperature point.
Restrictions are sometimes caused by foreign objects that get into the system, This can happen during servicing, maintenance or repairs. It is not uncommon to find bolts, nuts, plastic plugs, paper or rags stuck into system when it was being repaired or assembled then forgotten about.
Restrictions sometimes can be a piece off of a failed component up stream or a Component such as a Hose built wrong.

Cylinder Won't Move Under Load: (Continued)

CAUSE: **Piston has come off of Rod?**
SOLUTION: This can be difficult to find, If the Piston comes completely off of Rod it can be pushed to bottom of Barrel below Port, Then Oil just circulates through Cylinder with little or no resistance, This makes it appear there is no Pressure or valve isn't working. The best way to check would be with a Flowmeter in Cylinder Line. Check, Repair or Replace as required.

CAUSE: **Restrictor Valve Installed in Wrong Line, Backwards or Plugged?**
SOLUTION: Determine the correct location of installation for Restrictor and make sure it is in correct location. Inspect for being Plugged, Clean or Replace as needed.

CAUSE: **Excessive Internal Leakage in Pump / Motor?**
SOLUTION: Perform Flow and Pressure Test. If results aren't within Specifications, determine the cause of the internal leakage, correct the cause. Replace worn or damaged parts. It is good to replace the Filter any time the Pump and/or Motor are repaired or replaced. Pump and/or Motor wear usually occurs over a long period and are gradual loses of power and excess heating of Oil. This may go un-noticed until it is severe making the operator think it just started, this can make this type of failure hard to determine. Pre-Mature Pump and/or Motor Failure wear occurs quickly, The problem for these failures must be found and repaired or the failure will be repetitive. The Most common cause of Pre-Mature Failure is Cavitation, Oil Contamination, Oil Aeration and/or Defects in Pump and/or Motor. MACHETE SPECIFIC, When performing the Flow Test on the Machete, The flow going to Motor and either the return from the Motor or the Case drain must be determined. These figures will indicate internal leakage in the Motor.

CAUSE: **Air in Oil?**
SOLUTION: Run the System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil will have a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine "Off" you can find a leak by pressurizing the Tank; This will not take but a few pounds of pressure (3 to 5 PSI or Less) look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have had severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Engine RPM Too Slow?**
SOLUTION: Run Tractor Engine at required Speed to achieve GPM through Pump, See Specification Section in Repair Manual.

CAUSE: **Vent Plug Block or Not Installed?** (Power One Way Cylinders)
SOLUTION: This applies to Cylinders that only Stroke in or Out under pressure, The return Stroke under gravity. Remove Plug, Clean or Replace as needed. If No Vent Plug is there determine if one is needed and install as required. (See Parts / Operators Manual for Vent Plug requirements).

Cylinder Rod Bent:

CAUSE: **Excessive Load Applied to Cylinder?**
SOLUTION: This is an Operational Problem or Operational Accident. The Mode of failure would be that an excessive load was applied while the Control Valve Spool was in “Hold” and there was no Work Port Relief in circuit (or it was malfunctioning). Corrective action is to counsel the operator to avoid conditions that resulted in bending. repair or replace Cylinder and any other damaged component. A good example would be using Tractor Wheel Power to put pressure against boom and Valve closed so Cylinder can not give (Exceeding Break-A-Way).

CAUSE: **Misalignment of Cylinder Lugs?**
SOLUTION: make sure something has not been bent, Frame, Lugs and etc. Align Cylinder Lugs (may require cutting and Welding) or replace faulty Parts as needed. Mis-Alignment of Lugs place a side load on Rods that can cause them to bend. Usually this alignment is noticeable.

CAUSE: **Work Port Relief Malfunction?**
SOLUTION: Check relief Pressure of Valves that are in the affected circuit. Adjust or replace them as needed to bring them to specification (See Repair Manual). Do not operate with Relief Setting incorrect, this will cause damage. Also check to make sure that Port Relief’s are installed correctly and in the proper places.

CAUSE: **Interference with Another Part of Component?**
SOLUTION: Repair or Replace the damaged cylinder. Slowly actuate the Implement throughout its full range of motion, utilizing all possible Cylinders. Observe for interference with any other Part. Correct cause of interference as needed.

Cylinder Rod Came Out of Cylinder:

CAUSE: **Piston Nut Backed Off of Rod?**
SOLUTION: Replace damaged Parts and Assemble. Make sure Piston Nut is Correct and Properly Torqued. This problem is usually caused by improper assembly (Nut Not Torqued) but can also be caused by a faulty Nut and/or Rod threads, This failure would show Rod Threads that are damaged most likely. Some times Threads will show damage from Piston working on Rod because it has been operated while Nut was loose.

CAUSE: **Wrong Nut On Rod?**
SOLUTION: Replace with correct Piston Nut, Check Piston Nut that it is not too Thin, Wrong Threads or Insufficient Thread engagement on Rod.

Cylinder Rod Came Out of Cylinder: (Continued)

CAUSE: **Relief Valve Setting Too High?**

SOLUTION: After Replacing the damaged Parts, test the Settings of the Relief Valve, Test this by slowly pressurizing the Cylinder to determine the Relief Pressure, a Pressure Gauge installed inline for testing will show this Relief Pressure. If Pressure exceeds what Relief Should be stop. Repair or replace Relief Valve and retest. IF RELIEF IS TO HIGH DO NOT CONTINUE WITH PRESSURE UNTILL RELIEF IS REPAIRED OR DAMAGE WILL RESULT. Note: Usually Rods that have Nuts pulled off due to Pressure to high will have Threads pulled off of Rod.

Deck Cracks:

CAUSE: **Severe Usage?**

SOLUTION: Prepare and Repair, Weld, Grind Down, Add Scab Plate and Re-Paint Repaired Area.

CAUSE: **Vibration?**

SOLUTION: Locate and correct cause of Vibration problem. Prepare and Repair, Weld, Grind Down, Add Scab Plate and Re-Paint Repair Area.

CAUSE: **Poor or Missing Welds, Missing Bracing?**

SOLUTION: Prepare and Repair, Weld, Grind Down, Add Scab Plate and Re-Paint Repaired Area. As this will usually be found rather quickly from delivery date it should be covered under warranty, always take photos of this before any repairs as they may be requested by factory.

CAUSE: **Inadequate Bracing?**

SOLUTION: This is a difficult subject, It is recommended that you consult with the factory before making modifications of this type, Adding additional pieces may change many components functions, the weight added could affect balance weight ratio and the Hydraulic Functions ability to lift.

Deck Worn on Underside:

CAUSE: **Mowing Over Sand or Other Abrasive Material?** Under side of deck has Sand Blasted appearance. This Sand Blasted appearance will also be visible on Blades and Carrier, most severe on Fan Blades (Up-Lift Blades).

SOLUTION:
1. Run Mower with as low a Tractor RPM as Possible (Decreased PTO Speed) and still get a satisfactory Mowing job done. Use Flat non Up Lift Blades is available. Try to do the mowing at a time when the ground is still damp (earlier in day).
2. Check to make sure mower is operating at correct RPM (540 or 1000 as required by mower components). If a 540 RPM mower was connected to a 1000 RPM Tractor the Blade Tip Speed would be way to high and this would create severe amount of Sand and Dust under deck.

Deck Worn on Underside: (Continued)

CAUSE: **Deck being Worn and Ripped away by Heavy Debris?**
SOLUTION: Make sure material being cut is not to heavy, large or thick for unit being used, This type wear will be accompanied by dents and large scratches. The best solution for this is to make sure that Unit is suited for job. Make sure job is not over tasking Unit.

CAUSE: **Deck Worn from Continuous Use?**
SOLUTION: The Deck will wear over time, If Deck had severe wear by sand or other debris at one time causing excess (premature) wear, then this will make it wear that much faster and the only solution would be to replace Deck.

Hydraulic System Noise: (Squeal)

CAUSE: **Restrictions in System?** A Squeal may be normal in some Valves when the lowering function is actuated as Oil is going over restrictors.
SOLUTION: Check Hoses and Lines for Kinks / Obstructions. Hoses have an inner lining that can turn loose and block a hose. If Assembly or Repair work has been performed, recheck all connections for correct location. Some may not be visible without some disassembly. Unplanned restrictions cause increased backpressure, loss of usable power and excess heating of Oil. Restrictions can sometimes be found by measuring the temperature of the Oil (or fittings) at various points in circuit as heat will usually be higher at the restriction. The restriction should be located at or upstream of the increased temperature point. Foreign objects that get into the system sometimes cause restrictions, This can happen during servicing, maintenance or repairs. It is not uncommon to find bolts, nuts, plastic plugs, paper or rags stuck into system when it was being repaired or assembled then forgotten about. Restrictions sometimes can be a piece off of a failed component up stream or a Component such as a Hose built wrong

CAUSE: **Relief Valve Malfunction?**
SOLUTION: Perform Flow Pressure Test. If Flow is correct and Pressure is Low, remove Relief Valve and inspect for damaged Seals, Contamination or other abnormalities. Re-Seal, Adjust or replace the Valve as needed. Leakage through the Valve (from Low Pressure setting) or leakage around the Valve from damaged Seals will cause heating of the Oil and Low Power complaints. NOTE: There may be situations when Pump Flow is insufficient to reach Relief Pressure. Therefore it is important to test for proper Flow before condemning the Relief Valve.

Hydraulic System Noise: (Continued)

CAUSE: **Cavitation?** Cavitation is caused by inadequate amount of fluid reaching the Pump, Cavitation will damage Pump, so do not run with a Cavitation problem any more than necessary to check system. If Suction side is pulling Air in the Oil will usually cause Oil to Foam after running some.

SOLUTION: Cavitation is usually caused by a restriction of some sort in the suction lines, but can also be caused by an un-vented tank which creates a vacuum when the pump has a demand for Oil. Other problems such as plugged Suction Screens or very thick Oil can cause cavitation. The cause must be found and corrected before a new Pump is installed as cavitation will damage a Pump. Repair or Replace components a required.

CAUSE: **Wrong Oil?** (Oil to Thick or Viscous)

SOLUTION: Make sure correct Oil is used, Recommended Hydraulic Oil only should be used. Do not mix grades and types of Oil, if wrong oil has been used it must be completely remove before adding different types Oil. See Specification Chart for recommended Oil type

Hydraulic System Overheating:

Note:

1. Overheating of the Hydraulic System can have many individual causes. Before going too far into trouble shooting an overheating complaint it would be well to understand exactly the difference between HOT and TO HOT.

2. Heat is produced anytime a Hydraulic System is working. Heat is generated when the Oil moves from an area of High Pressure to an area of Low Pressure. These “Pressure drops” occur when work is performed by the System and normally occurs in Pumps, Motors, Hoses and Valves. They are expected and allowed for in the design of the System.

3. Alamo Industrial’s Systems are designed to operate at approximately 100 Degrees F. above ambient temperature (Ambient Temperature measured close to Tank) with the proper Oil Level in tank and System. Small variances can be expected due to normal wear in the System and other environmental conditions. A System is not considered to be overheating unless it significantly exceeds 100 degree F. over ambient temperature. This is not to be measured by touching, use a temperature measuring device to measure temperature to avoid being burnt.

4. When Discussing the Problem with a Customer, it is important to determine the condition under which the Symptoms occur. For example, Ask if the Symptom has existed for the life of the machine, has been gradually getting worse, or if it has occurred suddenly. A sudden occurrence might indicate that foreign material entered the system when work was being performed. Gradual worsening would indicate internal leakage (Wear or Breakage). Symptoms that occur with specific operators would indicate a possible operational problem. Symptoms that have been present for some time could be any of the above problems.

Hydraulic System Overheating: (Continued)

CAUSE: **Restrictions?** Just as indicated, an unintentional obstruction to normal Oil Flow through the circuit.

SOLUTION: Check for an unwanted increase in pressure, The obstruction would be down stream from the Pressure increase, so you would want to check pressure going back toward pressure inlet. As Oil passes through the obstruction it causes Heat increase, a check of temperatures will generally be near restriction, a heat sensing gun works well for this. Some Examples of Restrictions are:

- Kinked, Mashed or Internally Broken Hoses.
- Obstruction by foreign materials in lines.
- Plugged Filter or Wrong Filters installed
- Open (Stuck) By Pass Valve
- Wrong Size Hoses or fittings installed.
- Repair work done and parts assembled wrong.

The number of possibilities is numerous, Do not forget when checking especially for kinks in hoses it may be required to run the cylinders through their complete range of movement to check them. Know what repair work or modifications were performed.

CAUSE: **Wrong Type Valve being Used For Tractor?** (Tractor Hydraulics Only)

SOLUTION: Determine type of Control Valve for Tractor, Is tractor a Fixed Displacement (Open Center) System or a Load Sense (Closed Center) System. Make Sure the Valve that is installed is the correct one for the Type Tractor Hydraulics be used. If the Wrong System is Used it will cause a Heating problem.

CAUSE: **Spool Valve Stuck In Open or Partially Open Position?**

SOLUTION: Repair or Replace Valve components as needed.

CAUSE: **Relief Valve Set to Low?** (Load Sense / Closed Center Only)

SOLUTION: Relief Valve for Mower Positioning Control Valve must be set higher than Tractor Relief Valve, Otherwise the Oil will bypass continuously and overheat rapidly.

CAUSE: **Leakage?**

SOLUTION: This type Leakage is Internal, an External Leak will not cause Heating unless it causes enough Oil loss to effect the Oils cooling. Another type leakage would be Air entering the system on the suction side, This may not leak externally when system is engaged because it would be a suction. Some internal leakage is always present because of tolerance in the components, Valve, Pump, Motor and other components. But usually this is compensated for in the design of the system and components. Internal leakage will normally increase with wear and age on the system components. Heating from normal internal leakage is usually not severe or noticeable until it reaches advanced stages. It usually occurs gradually and is accompanied by a gradual loss of power. Test System for leakage by running Pressure and flow Test, Rebuild or Replace as required.

Hydraulic System Overheating: (Continued)

CAUSE: **Excessive Pump or Motor Wear?** These will be accompanied by a Power Loss when Mower Head is Cutting. Rapid Pump and/or Motor wear can be from damage caused by Cavitation (restricted Oil Supply), Contamination, Aeration, or defects in the Pump and Motor. Air Leaks (Air being sucked into system) causes Air Bubbles to be entrained into the Oil. These Air Bubbles will reduce the lubricating ability of the Oil causing adhesive wear to the Pump and Motor and a rapid increase in internal leakage, Air entrained Oil will have a foamy look after the system has run for a while.

SOLUTION: Test System for excessive Pump and Motor Wear or Cavitaion by running Pressure and flow Test, Repair or Replace as required.

CAUSE: **Engine RPM Too High?**

SOLUTION: Run Tractor Engine at required Speed to achieve GPM through Pump, See Specification Section in Repair Manual.

CAUSE: **Malfunctioning Valves?** (Main Relief, Priority Valves and Logic Valves)

SOLUTION: Test the above Valves, they are on the High Pressure Side of the system, these act on a pressure differential and are spring loaded. The Typical failure is a Leaking Seal between the Valve Cartridge and the Valve Block. An improper Low setting of Relief Valve to Low a Pressure can cause rapid Heating as the Oil passes from the High Pressure to the Low-Pressure area. The same is true for the other Spring Type Valves such as the Priority Valve (Governors).

CAUSE: **Operational Problems?** (Cutting Excessively Heavy Material, Traveling to Fast for Conditions, Improper Cutting Height)

SOLUTION: Make sure Cutting Height is not so low Blades are hitting Ground. Make sure that Travel Speed while cutting does not exceed cutting capacity of Model Design. Make sure something too heavy for this model is not being cut. Make Sure the Tractor Engine is running at the correct RPM to run Hydraulics at the correct Speed. All of these can cause Over Heating by forcing the system pressure over relief (causing Relief Valves to Open and heating the Oil as it passes across the Valve). If the system pressure is going over relief too frequently or for too long at a time, The Oil capacity will not be sufficient to maintain the desired operating temperature. Travel Speed is always dependent on the material being cut.

Motor Flange Breaking:

CAUSE: **Insufficient Support on Upper End of Motor?**

SOLUTION: 1. Make sure that the Motor Plate is installed on top of Motor and that it is installed correctly, These Plates must be installed with clearance dimensions and Torque settings, See the Spindle repair instruction in the Operators / Product Service Manual.
2. Some Units built prior to 1996 did not have this Motor Plate on it, There was a kit made to add to these early units. Kit P/N 02970754 can be used to add Motor Plate to Units made prior to 1996.

CAUSE: **Motor to Spindle retaining Bolts not Tight?**

SOLUTION: Check and Tighten Motor to Spindle Mounting Bolts.

Motor Inoperative: (Won't Run)

CAUSE: **Low Oil Level or No Oil?**
SOLUTION: Check and Correct Oil Level, If oil level was extremely Low or Empty, Pump Damage most likely has occurred, This will also have to be checked. Repair any cause of Oil loss before continuing.

CAUSE: **No Oil Flow to Motor?** Front Pump Inoperative, No Pump Pressure reaching Motor.
SOLUTION: Oil Level is correct but no Oil Flow to Motor. Check Pump connection to Tractor, Shafts, Couplers and Adapters, make sure they are not stripped or broken. Check to make sure Pump is "ON" if equipped with Pump "Shut Off". Check to make sure Motor is "ON" when equipped with "Shut Off". Check for any malfunctions in Drive System and Shut Off Components.

CAUSE: **No Voltage to Solenoid Valve?** (If Equipped)
SOLUTION: Check Fuse (if used), replace if required and try again. With Tractor Ignition Switch "ON", and Mower Switch "ON" Test for voltage at the Solenoid Valve. A quick test is to turn switches on (With Tractor Engine "Off") and see if a small metal object such as a paper clip or washer will stick to the end of the Valve when the mower is turned "ON". If it does not, The Coil is not magnetizing the Valve. Test for Voltage at the Wire using a test Light or Voltmeter. If no Voltage is present, trace the circuit back through the wiring, the Mower Switch, The Fuse and the Tractor Wiring to locate the faulty part. If Current is available to the Solenoid but Solenoid won't turn on motor replace Solenoid.

CAUSE: **Spindle Locked Up?**
SOLUTION: The Spindle can be locked up causing Motor not to Start, This can usually be felt or seen in the System trying to run but having to bypass. Sometimes the Spindle is not seized but only tight, this can prevent motor from starting right away from a dead Stop or slowly start, The tightness is not enough to prevent motor from running once it is started, See the Spindle Section for more information.

Motor Over Heating: (Motor Over Heating is considered when the Operating temperature exceeds 100 degrees F. over ambient Temperature).

CAUSE: **Oil Level Too Low?**
SOLUTION: Make sure it is filled to proper level with recommended Oil. Determine reason for low Oil Level (leaks, etc.) and correct problem, Run Mower and check temperature, it should not exceed 100 degree F. above ambient Temperature.

CAUSE: **Incorrect Oil Used?**
SOLUTION: Use recommended Hydraulic Oil, DO NOT mix Oils that are not compatible, in some cases it may be required to drain and replace all the oil. See Specification Chart for recommended Oil Type. When repairing unit it is recommended that Oil be update to recommended Oil.

Motor Over Heating: (Continued)

CAUSE: **Air in Oil?**

SOLUTION: Run the System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil will have a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine Off you can find a leak by pressurizing the Tank, This will not take but a few pounds of pressure (10 PSI or Less) look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have had severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Engine RPM Too High?**

SOLUTION: Run Tractor Engine at required Speed to achieve GPM through Pump, See Specification Section in Repair Manual.

CAUSE: **Excessive Ground Speed for Mowing Conditions?** (Operational Problem)

SOLUTION: This will usually also have a Heating Problem if continuing to mow. Observe (or Ask Operator) mowing conditions, Material being Cut etc. Correct Ground Speed is always relative to Material and conditions of mowing. One indication of Excessive Ground Speed is considerable wear on tips of blades but this is not exclusive of Excessive Ground Speed as the Wear can be caused by other factors. So Blade Wear alone is not definite Travel Speed problem. The Cut is Choppy and uneven, the material is coming from under deck in Lumps instead of being distributed across width of Deck. These conditions can force the Oil to go over relief because of excessive Load on Motor. A Change of Ground Speed and/or material being cut by unit will cure this problem.

CAUSE: **Excessive Ground Contact with Blades?** (Operational Problem)

SOLUTION: Inspect Blades, Blade Carrier and Blade Bolts for wear, Excessive wear could indicate frequent contact with the ground, Check cutting Height of Blades above Skid Shoes, Check for proper Blades and Skid Shoe condition, Repair or Replace as required.

CAUSE: **Incorrect Oil Installed?**

SOLUTION: Incorrect Oil installed may produce internal wear, which will overheat the motor. Use only the recommended Oil for the model being used. See Specification Chart for correct Oil type. Do not mix Oil Types as the may not be compatible, if types of Oil are being changed over, completely change the Oil, Drain and flush the system before installing the new Oil.

Motor Over Heating: (Continued)

CAUSE: **Excessive Internal Leakage in Pump / Motor?**

SOLUTION: Perform Flow and Pressure Test. If results are not within Specifications, determine the cause of the internal leakage, correct the cause. Replace worn or damaged parts. It is good to replace the Filter any time the Pump and/or Motor are repaired or replaced. Pump and/or Motor wear usually occurs over a long period and are gradual loss of power and excess heating of Oil. This may go un-noticed until it is severe, making the operator think it just started, this can make this type of failure hard to determine. Pre-Mature Pump and/or Motor Failure wear occurs quickly, The problem for these failures must be found and repaired or the failure will be repetitive. The Most common cause of Pre-Mature Failure is Cavitation, Oil Contamination, Oil Aeration and/or Defects in Pump and/or Motor. MACHETE SPECIFIC, When performing the Flow Test on the Machete, The flow going to the Motor and either the return from the Motor or the Case drain must be determined. These figures will indicate internal leakage in the Motor.

CAUSE: **Relief Valve Malfunction?**

SOLUTION: Perform Flow Pressure Test. If Flow is correct and Pressure is Low, remove Relief Valve and inspect for damaged Seals, Contamination or other abnormalities. Re-Seal, Adjust or replace the Valve as needed. Leakage through the Valve (from Low Pressure setting) or leakage around the Valve from damaged Seals will cause heating of the Oil and Low Power complaints.
NOTE: There may be situations when Pump Flow is insufficient to reach Relief Pressure. Therefore it is important the proper Flow be present before condemning the Relief Valve.

CAUSE: **Restrictions in System?**

SOLUTION: Check Hoses / Lines for Kinks/Obstructions. Hoses have inner linings that can turn loose to block it. If assembly or Repair work has been performed, recheck all connections for correct location. Some may not be visible without some disassembly. Unplanned restrictions cause increased backpressure, loss of usable power and excess Heating of Oil. Restrictions can sometimes be found by measuring the temp of the Oil (or fittings) at various points in circuit for higher heat. The restriction should be located at or upstream of the increased temp. point. Foreign objects sometimes cause restrictions in the system,
This can happen during servicing, maintenance or repairs. It is not uncommon to find bolts, nuts, plastic plugs, paper or rags stuck into system when it was used as being repaired or assembled then forgotten about. Restrictions sometimes can be a piece off of a failed component up stream, a Component such as a Hose built wrong.

Motor Shaft Seal Leaking:

CAUSE: **Excessive Back Pressure on return side of Motor?** (Constant or Intermittent)
SOLUTION: Check for restrictions on the return side of Motor (See Overheating in General). Check all return Plumbing for kinked hoses or hoses that can Kink in various positions of the Cutting Head or Boom. Look for plugged Lines or a Plugged Filter. Check also for other Valves or add-on components downstream of the motor that can stop or restrict the Flow of Oil. Do not just replace the Seal without curing the problem, if you do it will likely happen again.

CAUSE: **Incorrect Oil Used?**
SOLUTION: Use recommended Hydraulic Oil, DO NOT mix Oils that are not compatible, in some cases it may be required to drain and replace all the oil. See Specification Chart for recommended Oil Type. When repairing unit it is recommended that Oil is updated to recommended Oil.

CAUSE: **Shaft Seal Worn?**
SOLUTION: This is usually visible damage. Replace Seal if Shaft is NOT also worn, If Shaft is worn (Groove or scratches in Shaft) it is advisable to replace the Motor. Seal and Shaft wear are normally caused by abrasive material (dirt) getting around the Seal, Damage can also occur from damaged Spindle Assembly. What ever the cause it must be corrected before new Motor is installed.

CAUSE: **Shaft Seal Coming Out of Bore?**
SOLUTION: Check Seal retainer if equipped to make sure that retainer is of proper size and installed properly. Install New Seal and proper retainer, But always try to find the cause of Seal blowing out to correct the problem.

CAUSE: **Faulty Motor?**
SOLUTION: Motors can leak at the Shaft Seal due to internal wear, Damaged Internal Seals or Improper Assembly. Repair or Replace as required.

Motor Runs Too Slow: (Or Slows Down under Load)

Note: The Motor on the Cutting Head running too slow can be a result of many causes and not all caused by the Motor itself. It needs to be determined whether the Symptom occurs by itself or if it is accompanied by other symptoms such as overheating, unusual noise, etc. The question should be asked whether the symptom occurs when the mower is freewheeling or only when the Mower is cutting under a load (light or heavy grass). If the Motor only slows when under a load see Motor Stop Section. If Mower Loads and not under a Load see the following Section Motor runs to Slow.

Motor Runs Too Slow: (Continued)

CAUSE: **Engine RPM Too Slow?**
SOLUTION: Run Tractor Engine at required Speed to achieve GPM through Pump, See Specification Section in Repair Manual.

CAUSE: **Pump Drive Damaged?**
SOLUTION: Inspect Pump Drive components for wear or damage, If Pump is not being driven properly, repair or replaced parts as required.

CAUSE: **Faulty Logic Valve in Motor Control Circuit?** (If Equipped)
SOLUTION: Remove and inspect Logic Cartridge for damaged seals or contamination, Repair, Reseal or Replace as needed. If the Seals on the Logic Valve repeatedly fail, it will likely be required to replace the Valve Block due to damage or erosion in the Valve Bore.

CAUSE: **Air in Oil?**
SOLUTION: Run the System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil will have a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine Off you can find a leak by pressurizing the Tank, This will not take but a few pounds of pressure (10 PSI or less) look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have had severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Restrictions in System?**
SOLUTION: Check Hoses / Lines for Kinks/Obstructions. Hoses have inner linings that can turn loose to block it. If Assembly or Repair work has been performed, recheck all connections for correct location. Some may not be visible without some dis-assembly. Unplanned restrictions cause increased backpressure, loss of usable power and excess Heating of Oil. Restrictions can sometimes be found by measuring the temperature of the Oil (or fittings) at various points in circuit for higher heat. The restriction should be located at or upstream of the increased temperature point. Foreign objects sometimes cause restrictions in the system, This can happen during servicing, maintenance or repairs. It is not uncommon to find bolts, nuts, plastic plugs, paper or rags stuck into system when it was used as being repaired or assembled then forgotten about. Restrictions sometimes can be a piece off of a failed component up stream, Component such as a Hose built wrong.

CAUSE: **Damaged O-Ring on Solenoid Valve?** (If Equipped)
SOLUTION: Remove Valve and inspect Seals, replace if damaged.

Motor Runs Too Slow: Continued

CAUSE: **Excessive Internal Leakage in Pump / Motor?**

SOLUTION: Perform Flow and Pressure Test. If results are not within Specifications, determine the cause of the internal leakage, correct the cause. Replace worn or damaged parts. It is good to replace the Filter any time the Pump and/or Motor are repaired or replaced. Pump and/or Motor wear usually occurs over a long period and are gradual loss of power and excess heating of Oil. This may go unnoticed till it is severe making the operator think it just started, this can make this type of failure hard to determine. Pre-Mature Pump and/or Motor Failure wear occurs quickly, The problem for these failures must be found and repair or the failure will be repetitive. The Most common cause of Pre-Mature Failure is Cavitation, Oil Contamination, Oil Aeration and/or Defects in Pump and/or Motor.

NOTES:

Motor Stops: (Mower Quits Under Load)

CAUSE: **Incorrect Oil Used?**
SOLUTION: Use recommended Hydraulic Oil, DO NOT mix Oils that are not compatible, in some cases it may be required to drain and replace all the oil. See Specification Chart for recommended Oil Type. When repairing unit it is recommended that Oil is updated to recommended Oil.

CAUSE: **Air In Oil?**
SOLUTION: Run the System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil will have a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine Off you can find a leak by pressurizing the Tank, This will not take but a few pounds of pressure (10 PSI or Less) look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have had severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Engine RPM Too Slow?**
SOLUTION: Run Tractor Engine at required Speed to achieve GPM through Pump, See Specification Section in Repair Manual.

CAUSE: **Excessive Ground Speed For Mowing Conditions?** (Operational Problem)
SOLUTION: This will usually also have a Heating Problem if continuing to mow. Observe (or Ask Operator) mowing conditions, Material being Cut etc. Correct Ground Speed is always relative to Material and conditions of mowing. One indication of Excessive Ground Speed is considerable wear on tips of blades but this is not exclusive of Excessive Ground Speed as the Wear can be caused by other factors. So Blade Wear alone is not definite Travel Speed problem. The Cut is Choppy and uneven, the material is coming from under deck in Lumps instead of distributed across width of Deck. These conditions can force the Oil to go over relief because of excessive Load on Motor. A Change of Ground Speed and/or application will cure this problem.

CAUSE: **Excessive Internal Leakage in Pump / Motor?**
SOLUTION: Perform Flow / Pressure Test. If results are not within Specifications, determine cause of the internal leakage, correct the cause. Replace worn / damaged parts. It is good to replace the Filter anytime the Pump and/or Motor are repaired or replaced. Pump and/or Motor wear usually occurs over a long period and are gradual loss of power and excess heating of Oil. This may go unnoticed till it is severe making the operator think it just started, this can make this type of failure hard to determine. Pre-Mature Pump and/or Motor Failure wear occurs quickly, The problem for these failures must be found and repaired or the failure will be repetitive. The Most common cause of Pre-Mature Failure is Cavitation, Oil Contamination, Oil Aeration and/or Defects in Pump and/or Motor.

Motor Stops: (Mower Quits) Continued

CAUSE: **Low Relief Valve Setting?**
SOLUTION: Best Tested with Pressure / Flowmeter, Some Relief Valve can be Repaired, Some Only Replaced, See Assembly set up instruction on Relief Valves, See Specification Section on Relief valve Settings. DON'T exceed recommended Relief Settings. Before condemning Relief Valve do a Flow and Pressure Test, The Pump under some conditions can't build enough pressure to make the relief open and this would appear Relief Valve is stuck, A Flowmeter will show when Pressure Relief opens.

CAUSE: **Restrictions in System?**
SOLUTION: Check Hoses / lines for Kinks / Obstructions. May not be visible without disassembly. Unplanned restrictions cause increased back pressure, loss of usable power and excessive heating of Oil (Usually at the restriction). Restrictions can sometimes be found by checking different locations for the temperature, The restriction will generally be upstream of heated spot. There are a number of things that can cause this heating problem, Most common Problem, Contamination, Kinked or Damaged Hose,

Pump Seizure: (Pump Locking Up)

CAUSE: **Lack of Oil?** (Lubrication)
SOLUTION: This is normally caused by failure to Pre-Lube the Pump before starting or cavitation (Air or Lack of Oil) during operation. A Lack of Pre-Lube failure will occur soon after start up if Pre-Lube is not done when unit is assembled. Obstruction or damage to Intake (Suction) Side of Pump or Lines can cause this problem. The solution would be to determine what is damaged and why was Oil Low, Repair or Replace as required

CAUSE: **Improper Assembly?**
SOLUTION: Damage can be caused by over torquing the Pump components, incorrect alignment or location of components. Improper Torquing or Assembly will normally show up very soon after start up. The solution would be to determine what is damaged and why, Repair or Replace as required

CAUSE: **Faulty - Defective Pump?**
SOLUTION: Sometimes Oil passages are not open inside the Pump during Manufacturing. These problems will show up as early Bearing failures or Pump not working when installed and very seldom occur after being run for awhile unless there is debris or other contamination blocking something. The solution would be to determine damage, why, and Repair or Replace as required

CAUSE: **Foreign Material?** (Contamination)
SOLUTION: Objects left in Tank or fall in during service. This can include, Dirt, Pieces of Hose, Plugs, Rags or any other object can be left or get into system. Keep everything clean and account for every thing used when serviced. The solution is to determine what is damaged and why, Repair/ Replace as required.

Pump Wear: (Rapid Excessive Wear)

CAUSE: **Contamination In System?**

SOLUTION: Locate and correct source of contaminants, This could include the complete system, Pump, Motor, Valves, Hoses, Tank, Oil, Filter System or any other component including your source of replacement Oil Supply. The Contaminants must be found and completly removed and stopped. The Solution is to repair or replace worn parts, Completly Flush and Clean all Hydraulic Components, Install New Clean Recommended Oil.

CAUSE: **Cavitation?**

SOLUTION: Cavitation is caused by inadequate amount of Fluid (Hydraulic Oil) reaching Pump, Usually a restriction of some sort in the suction lines but can also be caused by an unvented Tank. This will cause a vacuum when the Pump starts demanding Oil, The Pump cannot pull Oil out of this vacuum. Other Problems such as plugged Suction Screens or very Thick Oil can cuase cavitation. This must be found and corrected before repairing old Pump ot installing new one.

CAUSE: **Air In The Oil?**

SOLUTION: Run System for a few minutes. Check for Air in the Oil in the Tank. Air entrained Oil has a foamy appearance. If Air is present, find the Air Leak and correct it. Air Leak can be in the Suction Line and Oil may not leak out because there may only be Oil in that location when the Pump is sucking it in. With the Tractor Engine Off you can find a leak by pressurizing the Tank, This will not take but a few pounds of pressure (10 PSI or Less) look for leakage in the Suction Lines, Because the Oil Pick-Up is lower than the Oil Level this will force Oil out the leak. Leaks in Hoses and at Fittings can draw Air into System as Oil Flows Past. Systems that have severe or prolonged Air Entry Problems may have Experienced Pump Damage.

CAUSE: **Pump Not Pre-Lubed before Starting?**

SOLUTION: Repair or Replace Pump, Fill Pump with Oil during Assembly and or before Starting, This can be done by pouring Oil into the Suction Hose and letting it run into Pump as you are connecting Suction Hose, The Pump should have been Assembled using lubricant as it was assembled. The Machete and Brahma this is not required as the Pump is lower than the tank. This will make the suction line full of Oil to Pump

CAUSE: **Incorrect Oil Used?**

SOLUTION: Use recommended Hydraulic Oil, DO NOT mix Oils that are not compatible, in some cases it may be required to drain and replace all the oil. See Specification Chart for recommended Oil Type. When repairing unit it is recommended that Oil is updated to recommended Oil.

CAUSE: **Water In Oil?**

SOLUTION: Moisture in Oil adversely affects the lubricating ability of the Oil. The Source of the Moisture entry must be found and corrected, The System cleaned and flushed, All damaged components replaced. DO NOT operate system with moisture in it because the moisture will turn to Steam when heated, Steam will pit and damage components of Pump, Valves and Motors. As well as the Lubricating ability of the Oil will be diminished.

Spindle Leaking at Motor:

CAUSE: **Filling Spindle with Hydraulic Oil?** Motor Seal Leaks.
SOLUTION: Determine and correct cause of Motor Shaft Seal Leaking, Re-Seal Motor, Clean Repack or rebuild Spindle as required. Note: Be sure to determine what caused Seal to Blow out and repair that problem before considering the repair to be done. If you just put in New Motor Seal you have not cured the cause of the Problem. See Motor Seal Leaking for possible cause of Seal problems.

CAUSE: **Motor Loose or Bolts Missing?**
SOLUTION: Tighten Motor to Spindle retaining bolts, If they will not tighten? check and repair threads. Notice this problem will let Spindle Oil Leak but will not let Hydraulic Oil from Motor Leak.

CAUSE: **Gasket Torn or Damaged?**
SOLUTION: Remove Motor, Check surface of Spindle Housing and surface of Motor, Clean Surfaces of both, Check for Burrs or deep Scratches. Burrs can be removed by carefully filing surface, If you file surface caution must be taken to keep filings out of Spindle. If Scratches they can be filled with a sealer. Make Sure Sealer is Oil compatible?

CAUSE: **Pressure in Spindle Housing? Excess Backpressure.**
SOLUTION: Make sure Relief Plug installed or Relief Plug is not clogged, Check Spindle Oil level so it is not overfull, Notice this will be Spindle Oil leaking out not Hydraulic Oil.

Spindle Leaking around Bottom Seal:

CAUSE: **Seal Damaged?** Could be damaged by foreign material.
SOLUTION: It will be required to replace Seal and refill Spindle with Lubricant. Before replacing Seal always check to make sure Shaft Bearings have not lost Pre-load (Shaft will be loose in Housing) as this will make Seal Leak and will damage Seal. If Shaft is Loose see next cause / Solution. Always Check condition of Shaft surface at Seal Area that it is not damaged, Always coat ID of Seal with light coat of grease before installing.

CAUSE: **Bearings Loose?**
SOLUTION: If Bearings are Loose the Bearing Pre-Load is lost and Bearings are most likely damaged, Remove Motor, Dis-assemble Spindle, clean and Inspect, Rebuild and Fill with Lubricant. (See Spindle Repair / Product Service manual).

Spindle Leaking at Relief Plug:

CAUSE: **Relief Fitting Installed in Wrong Hole?**

SOLUTION: 1. First Determine what is leaking, Spindle Oil or Hydraulic Oil, If it is Spindle Oil continue, If it is Hydraulic Oil See Motor Seal Leaking.
2. Sometimes the Fill Plug (Grease Fitting on Spindles that are filled with Grease) and the Relief Fitting are installed in the wrong Holes. The relief Fitting should be in the Upper Hole (Hole closest to the Motor) if there are 2 holes. Note: There were changes made to Spindle in 1996 to add another Hole near the top of the Housing (above Oil Level) for the Relief Fitting to be installed, a Plug was installed into the lower hole where the relief/fill plug was installed as the early spindle only had the one hole. Spindle should always be installed with Pressure and Fill Plugs pointing away from Tractor.

CAUSE: **Spindle Overfilled?**

SOLUTION: Continue running (Only continue to Run if sure Leak is because Spindle is Over Filled) and clean up the mess until the leakage stops or remove some of the lubricant with possibly a suction gun,

Spindle Over Heating:

Spindle will operate up to 200 F. which is considered within tolerance range and is not considered over heating, DON'T Check for over heating with the touch of your Hand, The Temperature is to high and will burn you.

CAUSE: **Low Oil Level in Spindle?**

SOLUTION: Find causes of Low Oil Level and correct it. If Spindle was run Low Lubricant it is likely to be Bearing Damage from lack of Lubricant. The Spindle should be dis-assembled, Inspected and reassembled replacing any damaged parts. Always use New Seals.

CAUSE: **Excessive Bearing Pre-load?** (Bearings to Tight)

SOLUTION: Bearing need to be removed and inspected for damage from running too tight. Rebuild Spindle replacing Parts as required, Always replace with new Seal. Set Bearing Pre-Load and Lock Adjusting and Locking Nut down as instructed in Spindle repair section to correct Specifications, always double check to make sure Nuts are Locked in place.

CAUSE: **Bolts Holding Blade Bar to Spindle replaced and New Bolts to Long?**

SOLUTION: Check that Blade Bar Retaining Bolts are not to Long to cause them to bottom out and jam through Spindle damaging Shaft. Always make sure same Length Bolts are installed that came Out. If to long of Bolts have been installed in Spindle, it will have to be rebuilt.

Spindle Shaft Loose or Falls Out:

Note: When Spindles are properly assembled and lubricated, The Shaft should not loosen up in service. Shaft loosening up is an indication of a serious internal problem. Merely tightening up the adjusting Nut will not correct the cause of the problem.

CAUSE: **Bearing Adjusting Nut Backed Off?** (Not Properly Locked)
SOLUTION: Dis-Assemble Spindle and inspect Parts for damage, All components have a possibility of being damaged if ran with Bearings Loose. Install required replacement parts and re-assemble. See Spindle repair section for assembly and settings.

CAUSE: **Bearing Cups or Bearing Cones Not Seated Properly?**
SOLUTION: 1. IF MOWER HAS NOT BEEN RUN since Spindle was assembled, Find out why Bearings are not seated and correct problem, readjust Bearing Pre-load and make sure Bearings are seated properly, Fill with Lubricant and Test.
2. IF MOWER HAS BEEN RUN since Spindle was assembled. Dis-Assemble Spindle and inspect Parts for damage, All components have a possibility of being damaged if ran with Bearings Loose. Install required replacement parts and re-assemble. See Spindle repair section for assembly instructions and settings.

CAUSE: **Shaft Falls Out of Spindle Housing?** (Lost Bearing Pre-Load))
SOLUTION: Remove Motor from Spindle Housing and Remove Spindle from Deck. Clean and inspect all Parts, try to determine what part failed and why. Replace Parts as required and re-assemble spindle assembly. Note: Pay close attention to the threads on top of the Shaft where Bearing Adjusting Nuts screw on if using old shaft, make sure that Shaft and Nut Threads are in good shape and compatible. DO NOT use old parts if the fit of them is not correct.

Spindle Locks Up: (Seizes and will not turn)

CAUSE: **Low Oil Level in Spindle?** (Causing it to Over Heat)
SOLUTION: This will damage almost all parts in Spindle Assembly, the only way to find out is to completely dis-assemble the spindle. Repair and / or Replace as required.

CAUSE: **Excessive Bearing Pre-load?** (Bearings to Tight)
SOLUTION: Bearing needs to be removed and inspected for damage from running too tight. Rebuild Spindle replacing Parts as required, Always replace with new Seal. Set Bearing Pre-Load and Lock Adjusting and Locking Nut down as instructed in Spindle repair section to correct Specifications, always double check to make sure Nuts are locked in place.

CAUSE: **Bolts Holding Blade Bar to Spindle replaced and New Bolts to Long?**
SOLUTION: Check that Blade Bar Retaining Bolts are not too long to cause them to bottom out and jam through Spindle damaging Shaft. Always make sure same Length Bolts are installed that came out. If to long of Bolts have been installed in Spindle, it will have to be rebuilt.

CAUSE: **Seal Protector Damaged?** (Component Bent), The Seal Protector, there has been two types, Old Type was a Cup type that slid up on to bottom of Shaft. This type usually would not stop the Spindle from spinning while running if it got bent, but it could prevent the spindle from starting. The New Type is a Steel Wing that is welded to Blade Bar, it is thicker than old type but it can get bent.
SOLUTION: Check Seal protector type and if damaged repair or replace as required Seal protector can be straighten if damage will allow, as long as it does not hit Housing and protect Seal it will be OK.

Starter on Tractor Will Not Crank:

Note: Most of the problems that will cause the Tractor not to fail to crank will be found in the Tractor, However there are some causes that involve the Mower. Only those problems that are caused by the Mower are covered here, and only mower models that have electrical systems that are tied in with Tractor Electrical system could affect Tractor Starting Circuit.

CAUSE: **Mower "ON" / "OFF" Switch Engaged?**
SOLUTION: Move Mower Switch to the "Off" Position and retry Tractor Starter System. Tractor is not supposed to start when Mower Switch is on, This is a safety feature and is not to be bypassed. When Mower Switch is "Off" the System is internally bypassed to allow the Tractor to Start. Therefore if Switch is "Off" and Starter circuit is not complete through switch, Check Wiring and Switch. Repair or Replace as needed.

Starter on Tractor Will Not Crank: (Continued)

CAUSE: **Mower "ON" / "OFF" Switch or Wiring Malfunction?**

SOLUTION: CAUTION, MAKE SURE TRACTOR IS IN NUETRAL WITH PARKING BRAKE SET! MAKE SURE ENGINE IS DISABLED TO SO THAT IT WILL NOT SUDDENLY START SHOULD IT START CRANKING, ALSO MAKE SURE EVERYONE AROUND YOU KNOWS THAT THE TRACTOR ENGINE MAY SUDDENLY START CRANKING! THIS BECAUSE WHEN DEALING WITH A SHORT OR LOOSE CONNECTION YOU MAY MOVE IT AND MAKE IT START TO OPERATE!

Check for Voltage at Starter Solenoid when Starter Switch is engaged. If Voltage is not present make Sure Mower Switch is "Off" and recheck for Voltage at Starter Solenoid. If still no Voltage check through circuit till voltage is found (checking must be done with Starter Switch engaged). The faulty component is most likely immediately down stream of the point of voltage. Repair or Replace as needed and retest system. DO NOT BYPASS MOWER SWITCH SAFETY FEATURE!

Tractor Battery Dead or Low:

Note: Most of the problems that will cause the Tractor Battery to fail drain power will be found in the Tractor, However there is a cause that involves the Mower. Only the problem that could be caused by the Mower is covered here, and only mower models that have electrical systems that are tied in with Tractor Electrical system could affect Tractor Battery Circuit.

CAUSE: **"ON" / "OFF" Switch or Joystick Wired Incorrectly?**

SOLUTION: Power Wire from Tractor to Mower control system must be wired through the Tractor Ignition (Key) Switch to where it only has current when Tractor (Key) Ignition Switch is "ON". If the Mower Power Source is connected where it has Power (Constant Power) when Tractor Ignition (Key) Switch is "OFF" it will put a constant Drain on Battery. This is the only one problem that should be able to affect Tractor Battery from Mower Electrical System. Check where Wiring is connected, Correct as required, See Operators, Parts or Repair Manuals for Wiring Schematics.

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