

# DAKOTA™ Transplanter (65 & 90) Service Manual



# FOREWORD

This manual contains service, maintenance, and troubleshooting information for the Model 65 and Model 90 Dakota Tree Transplanters. The manual is designed to aid quality service personnel in service-oriented applications. A complete troubleshooting section is also included in this manual.

The manual is divided into sections. Each section of the manual covers a specific component or system. A troubleshooting section is also included in this manual.

The service technician should become familiar with the operation and construction of each component or system of the Tree Transplanter by carefully studying this manual. This manual will assist the service technician in becoming more aware of and efficient with service procedures. Such efficiency not only builds customer confidence, but also saves time and labor.

The procedures in this manual cover the disassembly, inspection, and assembly of the major Tree Transplanter components. When servicing the Transplanter, the technician should use discretion as to how much disassembly is needed to correct any given condition.

At the time of publication, all information, photographs, and illustrations were technically correct. Because Dakota Peat and Equipment constantly refines and improves its products, no retroactive obligation is incurred.

All materials and specifications are subject to change without notice.

Keep this manual accessible in the shop area for quick reference.

## SERVICE & OPERATING PRECAUTIONS

### WARNING

Many components of the Tree Transplanter are extremely heavy. Be sure to properly support and use lifting devices with adequate lifting capacities.

### WARNING

Before operating, locate all overhead and buried lines. Call your locator service.

### WARNING

Do not operate the Tree Transplanter below or within 15 feet (5m) of any overhead power lines. If necessary to work within this clearance, notify the power company to de-energize and/or move the power lines.

### WARNING

Whenever operating the Transplanter, do not allow anyone too close [within 10 feet (9m)] of the Transplanter.

### WARNING

Operating the Tree Transplanter in a manner or purpose for which it is not designed for may result in personal injury and damage to the Tree Transplanter.

### WARNING

Operation of the Tree Transplanter by someone other than a trained operator may result in personal injury or damage to the Tree Transplanter. Read and understand the entire Operator's Manual prior to operating the Tree Transplanter.

### WARNING

Whenever the truck PTO is engaged with the engine running, hydraulic fluid at extreme pressure and high temperature will be present.

### WARNING

Wear heavy gloves and eye protection whenever searching for suspected hydraulic leaks. Use a piece of wood or cardboard as a backstop instead of a hand to isolate and identify a leak. A high pressure concentrated stream of hydraulic fluid can pierce the skin. If such happens, seek immediate medical attention as infection and toxic reaction could develop.

### WARNING

Turn the engine OFF and remove the ignition switch key; then relieve hydraulic pressure before servicing the Tree Transplanter.

### WARNING

Stay clear of all pinch points and moving parts. Do not wear loose fitting clothing when operating the Tree Transplanter.

### WARNING

Do not attempt to move trees with a trunk diameter larger than specified in the Operator's Manual.

### WARNING

Do not transport trees or plugs with the Tree Transplanter in the vertical position. Only transport in the stowed position.

### CAUTION

Be sure to disengage the power take off before operating the truck engine at speeds above 1500 rpm. Damage to the hydraulic system or pump may result from excessively high rpm.

### CAUTION

When in the stow position, do not fully raise the spades. Damage to the frame supports will result.

# SPECIFICATIONS

## Dimensions

|                              | Model 65 | Model 90 |
|------------------------------|----------|----------|
| Dry Weight                   | 14000 lb | 16192 lb |
| Working Width, Gate Closed   | 101 in.  |          |
| Working Width, Gate Open     | 150 in.  |          |
| Clearance Between Open Gate  | 30 in.   |          |
| Height* (transport position) | 99 in.   | 111 in.  |
| Height* (upright position)   | 163 in.  | 175 in.  |
| Width (overall)              | 102 in.  | 101 in.  |
| Pivot to spade centerpoint   | 65 in.   | 65 in.   |
| Hole (width)                 | 65 in.   | 90 in.   |
| Hole (depth)                 | 36 in.   | 60 in.   |

\* not including truck frame height

## Capacities

|                                |               |               |
|--------------------------------|---------------|---------------|
| Water Tank (approximate)       | 400 U.S. gal. | 420 U.S. gal. |
| Hydraulic Oil Reservoir        | 50 U.S. gal.  | 50 U.S. gal.  |
| Root Ball                      | 1.17 cu. yd   | 2.7 cu. yd    |
| Root Ball Weight (approximate) | 3000 lb       | 6925 lb       |

## Hydraulic System

|                              |                  |                  |
|------------------------------|------------------|------------------|
| Operating pressure           | 3500 psi         | 3500 psi         |
| Flow rate (Transplanter)     | 20 gpm           | 20 gpm           |
| Flow Rate (water pump drive) | 10 gpm           | 10 gpm           |
| Hydraulic Filter             | Dakota p/n 13611 | Dakota p/n 13611 |

## Recommended Lubricants

|                 |                    |                    |
|-----------------|--------------------|--------------------|
| Hydraulic Fluid | HDZ-46             | HDZ-46             |
| Grease          | EP-2 Lithium-based | EP-2 Lithium-based |

## Transmitter

|                   |                        |                        |
|-------------------|------------------------|------------------------|
| Weight            | 6.7 Ounces             | 20 Ounces              |
| Dimensions        | 4.8x2.2x1.4 in.        | 4x12x1 in.             |
| Batteries (2)     | AA Alkaline            | AA Alkaline            |
| Operating Range   | 300 ft                 | 300 ft* 1000 ft**      |
| Antenna           | Internal Circuit Board | Internal Circuit Board |
| Modes             | 2                      | 3                      |
| Function Switches | 11                     | 9                      |

\* obstructed view

\*\* unobstructed view

# GENERAL INFORMATION

## LABELING AND TERMINOLOGY

The Transplanter and its manuals use the following terms and symbols to bring attention to the presence of hazards of various risk levels and important information concerning the use and maintenance of the Transplanter.

**WARNING:** Indicates presence of a hazard which can cause severe personal injury, death, or substantial property damage if ignored.

**CAUTION:** Indicates presence of a hazard which will or can cause minor personal injury or property damage if ignored.

**NOTE:** Indicates supplementary information worthy of particular attention relating to installation, operation, or maintenance of the Transplanter but is not related to a hazardous condition.

Be sure to follow all instructions and related precautions as they are meant for your safety and protection.

Right and left-hand sides are determined by sitting in the driver's seat of the truck.

The model and serial numbers are found on the left hand support. Have these numbers readily available when contacting the factory for parts or service information.



## AUTHORIZED MAINTENANCE

Perform only the maintenance described in this manual that you are qualified to perform. If repair assistance is desired, contact the factory for their professional advice.

## POWER OFF MAINTENANCE AND ADJUSTMENTS

All maintenance and adjustments to the Transplanter must be made with the transplanter in a secure position and the truck's parking brakes set, engine off, and key removed. Failure to do so could result in injury or even death.

## MAINTAIN SAFE OPERATING CONDITIONS

Before releasing the Transplanter back to the customer, visually inspect the Transplanter for any abnormalities. Look for loose or broken hardware; bent or damaged components; broken or fatigued welds; leaking, worn or damaged hydraulic hoses and fittings.

## RELIEVE HYDRAULIC PRESSURE

Before performing any work on the hydraulic system, all pressure in the system must be relieved. Place the Transplanter either in the transport position or firmly support the area being serviced. Make sure all parts of the Transplanter actuated by hydraulic pressure are supported or otherwise restrained to prevent movement prior to relieving hydraulic pressure.

Disengage the power take off; then turn off the transmitter and stop the truck engine. Using the special 1/2 in. wrench found in the manual canister, rotate the hex shaft of the appropriate valve to both ON positions. Residual hydraulic pressure may still be present, so care must be taken. Failure to do so could result in damage, injury, or even death.

## KEEP TRANSPLANTER CLEAN

Keep the Transplanter free of excessive grass, leaves, and accumulations of dirt and sand. Materials such as this can compromise seals, bearings, and other components.

## REPLACEMENT PARTS

To ensure optimum performance and safety, always purchase genuine **DAKOTA** replacement parts and accessories. NEVER USE "WILL-FIT" REPLACEMENT PARTS AND ACCESSORIES MADE BY OTHER MANUFACTURERS. Using unapproved replacement parts and accessories voids the warranty of the **DAKOTA** Transplanter.

If ever in need of a new remote, please provide **DAKOTA** the serial number of either the existing remote or receiver to ensure proper programming.

## SHIELDS AND SAFETY DEVICES

Keep all shields, guards, and safety devices in place. If a shield, guard, or safety device is damaged, replace or repair it prior to operating the Transplanter. If a safety or warning decal is illegible, order and install a new one.

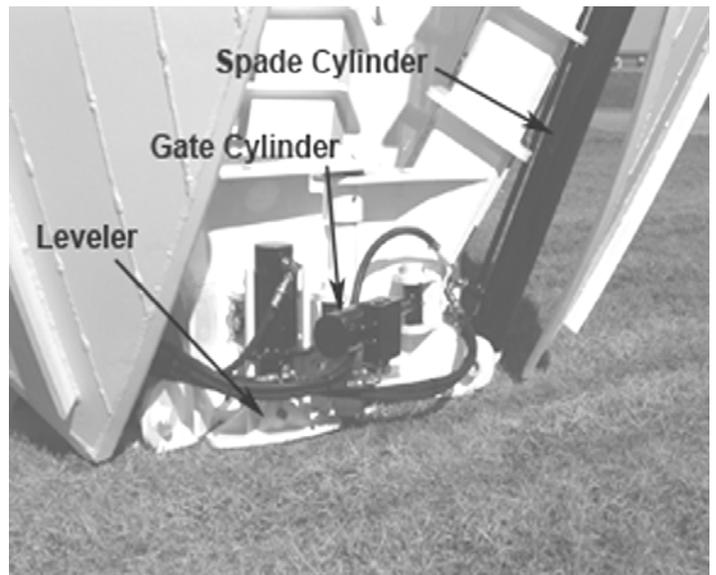
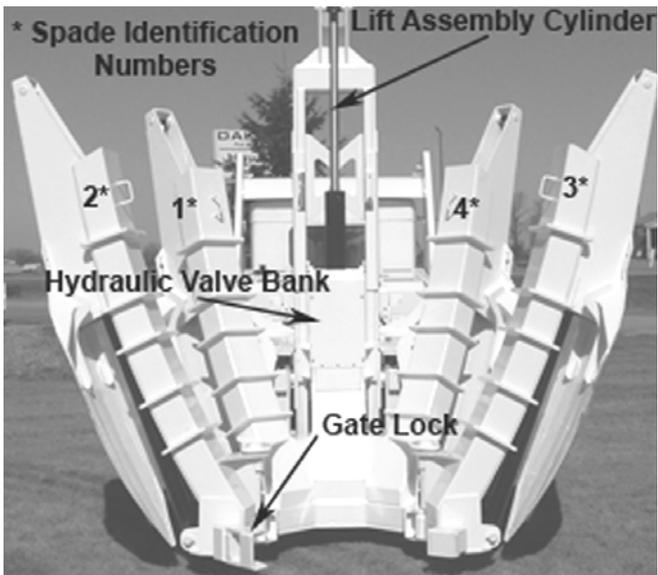
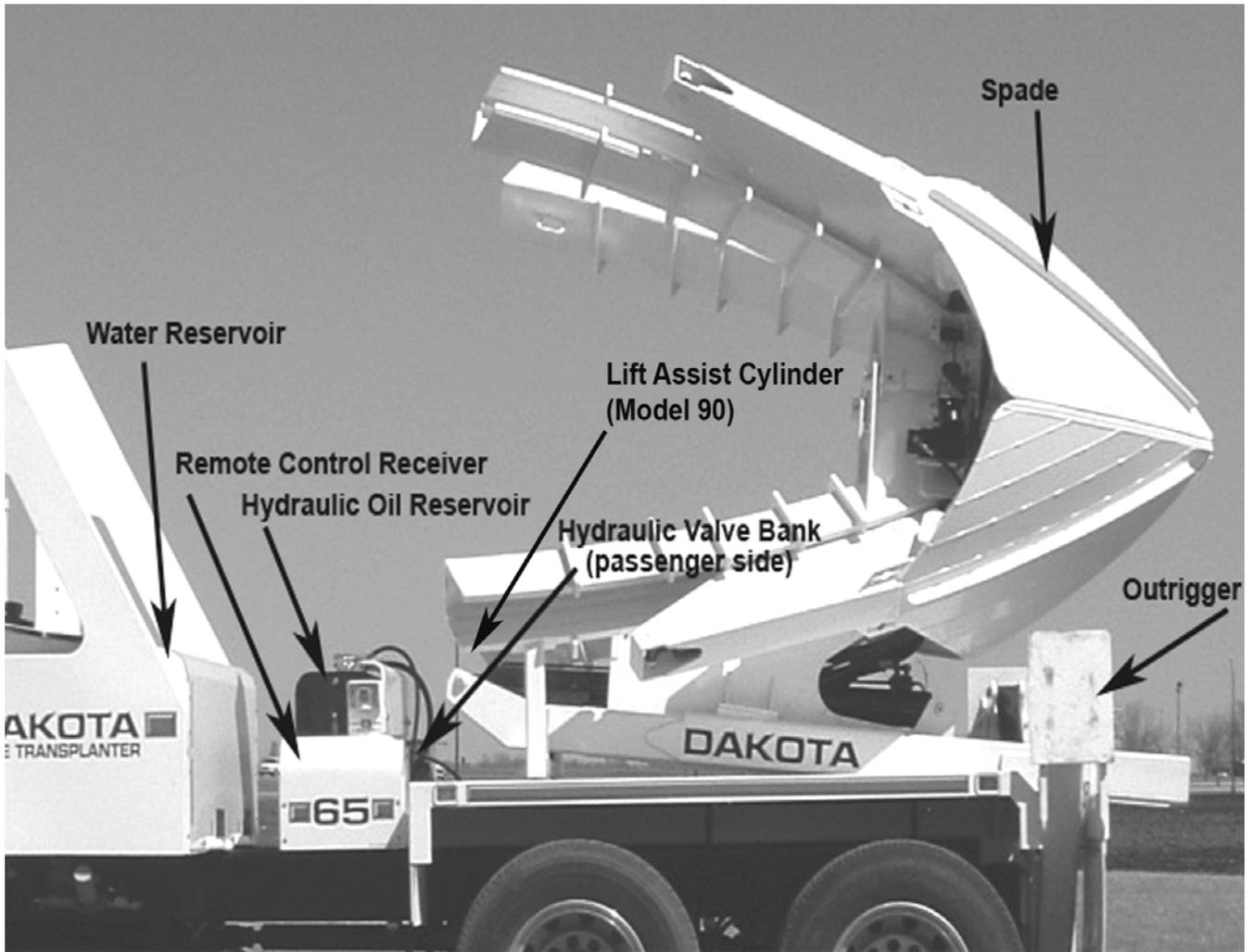
## LOOSE FASTENERS AND FITTINGS

Although the Transplanter has been designed so that components will not come loose during normal operation of the Transplanter, always check the Transplanter for loose fasteners, fittings, connectors, and other components. Tighten, repair, or replace as necessary. This includes electrical and hydraulic system components, also.

## MODIFICATIONS TO TRANSPLANTER

Do not modify the Transplanter in any way. Modifying the Transplanter will void the warranty.

# COMPONENT LOCATIONS



# OPERATION

## TRANSMITTER (MODEL 65) GENERAL INFORMATION

The hand-held remote control transmitter controls all of the hydraulic and water functions of the Transplanter. The transmitter is powered by 2 AA batteries giving approximately 200 hours of continuous service on fresh batteries. Alkaline batteries are recommended. Do not use rechargeable batteries. If the remote detects that the batteries need to be replaced, an **L** will flash in the display on the lower left-hand corner of the remote. The remote has an operating range of 300 ft.

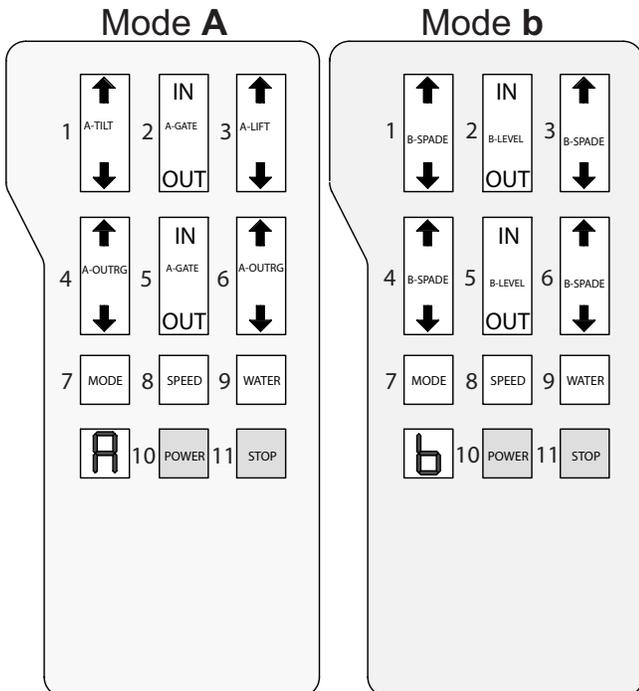
The remote operates in two modes and the remote switches are labeled to indicate their function in each of the two modes. The mode is displayed in the lower left corner of the remote. Every time the remote is first activated, it will be in mode A. Mode **A** will operate the mast tilt and lift, the outriggers, and the gates. Mode **b** will operate the spades, the levelers, and the water pump. It should be noted that the water pump will only work in Mode **b**.

## SWITCH FUNCTION REVIEW

Two groups of switches are located on the transmitter. The first group of switches involves the six, three-position rocker (ON/OFF/ON) switches that are located in the top two rows of the transmitter. These six switches control individual Transplanter functions depending upon the transmitter mode. The second group, located in the bottom two rows of the transmitter, contains 5 (ON/OFF) switches. These switches are the MODE, SPEED, WATER, POWER, and STOP.

The following explains the function of each switch. Refer the Fig. 2 for the specific location of each switch.

Fig. 2



### Switch 1

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 1 controls the tilt in Mode **A** and the left front spade in Mode **b**.

### Switch 2

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 2 controls the left gate in Mode **A** (Setup); and controls the left leveler in Mode **b** (Dig).

### Switch 3

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 3 controls the lift in Mode **A** and the right front spade in Mode **b**.

### Switch 4

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 4 controls the left outrigger in Mode **A** (Setup); and controls the left rear spade in Mode **b** (Dig).

### Switch 5

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 5 controls the right gate in Mode **A** (Setup); and controls the right leveler in Mode **b** (Dig).

### Switch 6

Enabled in Mode **A** (Setup) and Mode **b** (Dig), Switch 6 controls the right outrigger in Mode **A** (Setup); and controls the right rear spade in Mode **b** (Dig).

### Switch 7 (MODE)

Activating Switch 7 places the transmitter into either Mode **A** (Setup) or Mode **b** (Dig). The display on the lower left-hand corner of the remote will identify the current mode.

### Switch 8 (SPEED)

Enabled in Mode **A** (Setup), Switch 8 controls the cylinder speed of the tilt and lift between slow and fast. To increase or decrease the speed of the tilt or lift, press Switch 8 **while** the lift or tilt switch is activated. The speed of the cylinder will remain the same (either slow or fast) until changed by the operator. If the transmitter mode is changed, cylinder speed will return to slow speed. Pressing down on Switch 8 while holding down the POWER switch will toggle engine rpm between high and low engine idle.

**NOTE: It is permissible to operate the transplanter with the engine running at low idle.**

### Switch 9 (WATER)

Enabled only in Mode **b** (Dig), Switch 9 opens and closes the water valve allowing water to flow down the face of each spade for lubrication and to soften the ground. A switch on the left-hand side of the transplanter allows the operator to divert water to either the wash down hose or the spades.

### Switch 10 (POWER)

Enabled at all times, the POWER switch turns the transmitter power ON and OFF. The POWER switch must be held on for a period of 3 seconds in order to activate the remote.

### Switch 11 (STOP)

Enabled at all times, pressing the STOP switch overrides all commands and immediately stops all Transplanter functions. The STOP switch also drops the engine rpm back to idle.

**NOTE: If radio interference causes problems with the operation of the transplanter, the remote can switch radio channels to allow the transplanter to continue operating safely. To change channels press and hold the POWER switch and simultaneously press the MODE switch. The new channel will be displayed on the lower left corner of the remote.**

## WARNING

**If a second remote transmitter has been ordered, NEVER have batteries installed in both transmitters at the same time. Severe personal injury and property damage may occur from inadvertent transmission.**

# TRANSMITTER (MODEL 90)

## GENERAL INFORMATION

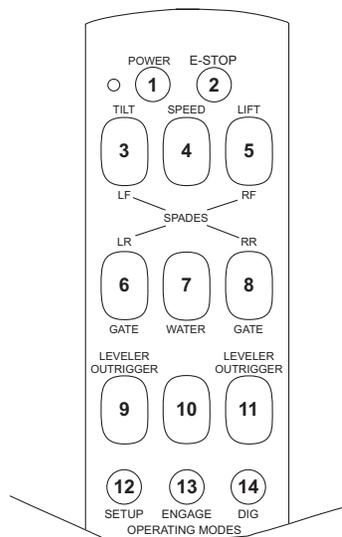
The hand-held remote control transmitter controls all of the hydraulic and water functions of the Transplanter. The transmitter is powered by 2 AA batteries giving approximately 200 hours of continuous service on fresh batteries. Alkaline batteries are recommended. The transmitter contains LED status indicators for power, active transmission, low-battery, and failure (or control pressed on start-up). It has operating ranges of 1000 ft (unobstructed) and 300 ft (obstructed). The decal on the face of the remote is color-coded to identify the enabled switches for each of the three modes. To prevent the batteries from running down, the transmitter has a time-out function built into its programming. The transmitter will shut off if none of the switches are pressed for a period of 60 minutes.

## SWITCH FUNCTION REVIEW

Three groups of switches are located on the transmitter. The first group, located across the top of the transmitter, contains 2 (ON/OFF) switches. These switches are the POWER and E-STOP. The second group of switches involves the nine, three-position rocker (ON/OFF/ON) switches that are located in the center of the transmitter. These nine switches control individual Transplanter functions depending upon the transmitter mode. The third group of switches, contains 3 (ON/OFF) switches. These switches determine the transmitter mode (which rocker switches will be enabled and their particular function).

The following explains the function of each switch. Refer the Fig. 2 for the specific location of each switch.

Fig. 2



### Switch 1 (POWER)

Enabled at all times, the POWER switch turns the transmitter power ON and OFF. Switch 1 enables E-STOP and Switch 12.

### Switch 2 (E-STOP)

Enabled at all times, pressing the E-STOP switch overrides all commands and immediately stops all Transplanter functions. E-STOP also drops the engine rpm back to idle.

### Switch 3

Enabled in Mode 2 (Engage) and Mode 3 (Dig), Switch 3 controls the tilt in Mode 2 and the left front spade in Mode 3.

### Switch 4

Enabled in Mode 2 (Engage), Switch 4 controls the cylinder speed of the tilt and lift between slow and fast. To increase or decrease the speed of the tilt or lift, press Switch 4 **while** the lift or tilt switch is activated. The speed of the cylinder will remain the same (either slow or fast) until changed by the operator. If the transmitter mode is changed, cylinder speed will return to slow speed. Pressing down on Switch 4 without activating any other switch, drops the engine rpm to idle.

**NOTE: To bring engine idle back to operating speed, press the mode switch that you were in.**

### Switch 5

Enabled in Mode 2 (Engage) and Mode 3 (Dig), Switch 5 controls the lift in Mode 2 and the right front spade in Mode 3.

### Switch 6

Enabled in Mode 2 (Engage) and Mode 3 (Dig), Switch 6 controls the left gate in Mode 2 (Engage); and controls the left rear spade in Mode 3 (Dig).

### Switch 7

Enabled only in Mode 3 (Dig), Switch 7 opens and closes the water valve allowing water to flow down the face of each spade for lubrication and to soften the ground.

### Switch 8

Enabled in Mode 2 (Engage) and Mode 3 (Dig), Switch 8 controls the right gate in Mode 2 (Engage); and controls the right rear spade in Mode 3 (Dig).

### Switch 9

Enabled in all three Modes, Switch 9 controls the left outrigger in Mode 1 (Setup); and controls the left leveler in Mode 2 (Engage) Mode 3 (Dig).

### Switch 10

Not enabled in any Mode.

### Switch 11

Enabled in all three Modes, Switch 11 controls the right outrigger in Mode 1 (Setup); and controls the right leveler in Mode 2 (Engage) Mode 3 (Dig).

### Switch 12

Activating Switch 12 places the transmitter into Mode 1 (Setup). It enables switches 9, 11, and 13 to operate. This Mode allows the operator to operate the outriggers. It also allows the operator to activate Mode 2 (Switch 13).

### Switch 13

Activating Switch 13 places the transmitter into Mode 2 (Engage). It enables switches 3, 4, 5, 6, 8, 9, 11, 12, and 14 to operate. This Mode allows the operator to operate the tilt, lift, levelers, and gate. In this Mode, the operator can also adjust the speed of the tilt and lift. It also allows the operator to activate Mode 1 (Switch 12) and Mode 3 (Switch 14).

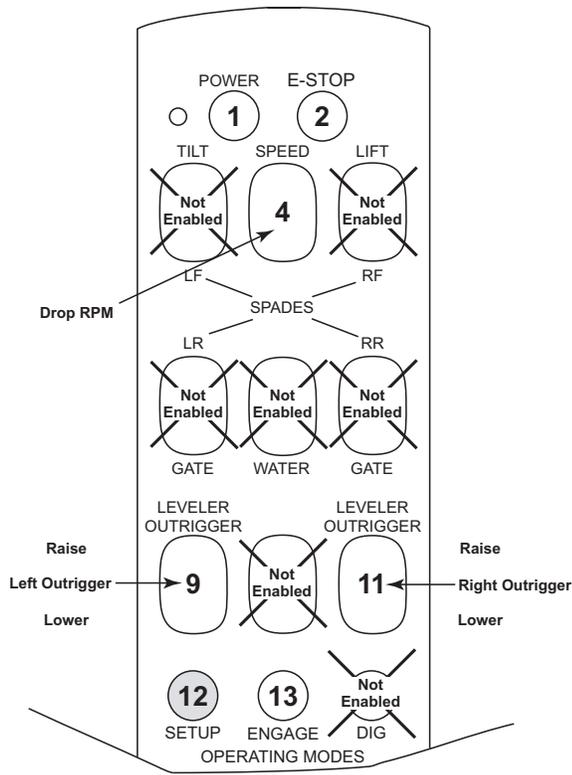
### Switch 14

Activating Switch 14 places the transmitter into Mode 3 (Dig). It enables switches 3, 5, 6, 7, 8, 9, 11, and 13 to operate. This Mode allows the operator to operate the levelers and spades and to turn the water on and off during the digging process. It also allows the operator to activate Mode 2 (Switch 13). It is not possible to go to Mode 1 from Mode 3.

# MODE SUMMARIES (MODEL 90)

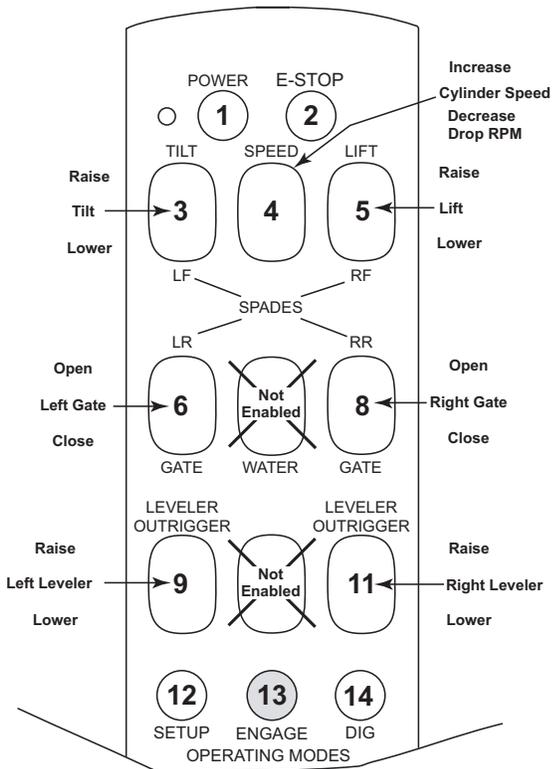
## Mode 1 SETUP

Fig. 3



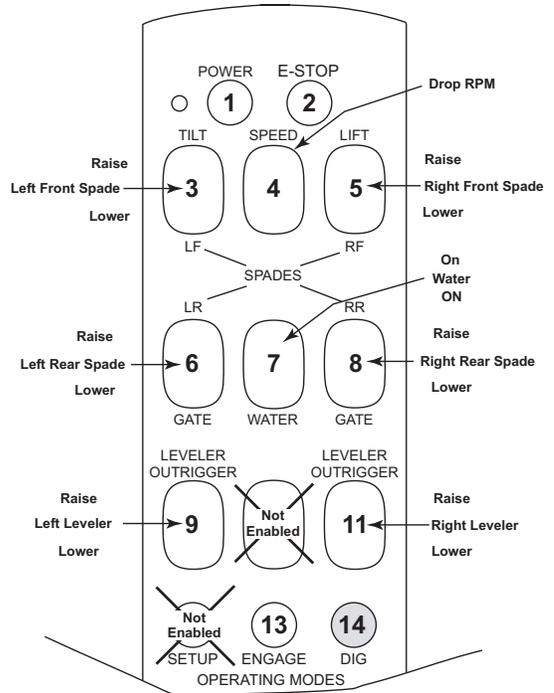
## Mode 2 ENGAGE

Fig. 4



## Mode 3 DIG

Fig. 5



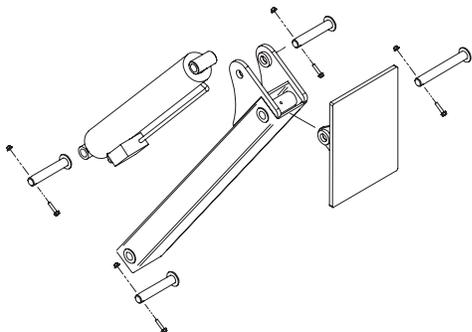
# SERVICING TRUCK BED COMPONENTS

## OUTRIGGER

### WARNING

**Before working on or removing any part of the transplanter, ensure all components are mechanically held in position or at rest.**

Each outrigger pad should be free to pivot around the end of the outrigger arm and pin. Check to see if there is any debris around the outrigger pad and the end of the outrigger arm that may interfere with the pivoting. There is also a grease fitting on each of the bushings of each outrigger arm. Also inspect for any damage or deformity to the outrigger pad, outrigger arm, cylinder, and pins.



### OUTRIGGER PAD REMOVAL AND INSTALLATION

1. Remove the nut and bolt securing the pin; then while supporting the outrigger pad remove the pin and remove the outrigger pad. Account for the bushings.
2. Inspect the pin, bolt, and bushings for damage and wear. Replace as necessary.
3. Making sure the bushings are properly positioned in the outrigger arm and pad, place the outrigger pad into position; then insert the pin through the outrigger pad and the outrigger arm. Install the bolt and nut.
4. Grease the grease fitting until a small amount is visible.

### OUTRIGGER ARM REMOVAL AND INSTALLATION

**NOTE: Secure the outrigger cylinder to prevent the cylinder from falling when the cylinder rod pin is removed.**

1. Remove bolt and nut securing each of the two outrigger arm pins.
2. Remove the pin securing the cylinder rod to the outrigger arm and carefully lower the outrigger arm to the ground.
3. Remove the outrigger pin securing the outrigger arm to the truck bed; then remove the outrigger arm. Account for the bushings.
4. Inspect the pin, bolt, and bushings for damage and wear. Replace as necessary.
5. Making sure the bushings are properly positioned in the outrigger arm and truck bed, place the outrigger arm into position; then insert the pin through the truck bed and the outrigger arm. Install the bolt and nut.
6. Making sure the bushings are properly positioned in the outrigger arm, lift the outrigger arm until its mounting bracket hole aligns with the cylinder rod; then insert the pin through the outrigger arm and cylinder rod. Install the bolt and nut.
7. Grease the grease fittings until a small amount is visible.

## OUTRIGGER CYLINDER REMOVAL AND INSTALLATION

1. Secure outrigger arm in a position which will allow removal of the cylinder.
2. Remove bolt and nut securing each of the two cylinder pins.
3. Mark the hoses to reference their position on the cylinder; then remove the hoses from the cylinder.

**NOTE: Be sure to note and mark hose position on cylinder for proper installation on new cylinder.**

4. Remove the pin securing the cylinder to the outrigger arm; then remove the pin securing the cylinder to the truck bed. Account for the bushings.
5. Inspect the pins, bolts, and bushings for damage and wear. Replace as necessary.
6. Place the new (or serviced) cylinder into position and secure to the truck bed (making sure the bushings are properly positioned) with the pin. Install the bolt and nut.
7. Making sure the bushings are properly positioned in the outrigger arm, lift the outrigger arm until its mounting bracket hole aligns with the cylinder rod; then insert the pin through the outrigger arm and cylinder rod. Install the bolt and nut.
8. Using the reference marks made in Step 3, install the hoses on the cylinder. Tighten securely.
9. Grease the grease fittings until a small amount is visible.

## MAST

### MAST REMOVAL

**NOTE: Prior to removing the mast, the mast lift assembly must first be removed (see Mast Lift Assembly Removal and Installation section for the proper procedure).**

1. From the 3-section hydraulic valve located on the truck bed, remove and then cap the pressure, return, and pilot pressure lines.

**NOTE: With the lines capped, the hydraulic system can still be operated.**

2. Lower the outriggers to the ground; then while supporting each cylinder, remove the base pin from each outrigger cylinder to allow access to the mast pin covers.
3. To prevent any damage to the outrigger cylinder rods, either retract the outrigger cylinders or remove the cylinders from the machine.

**NOTE: If the outrigger cylinders are removed, cap the hydraulic lines. This will allow the hydraulic system to still be operational.**

4. Remove the mast pin covers to access the main mast pin. Remove bolt and nut securing the mast pin.
5. Tilt the mast upward; then fully support the front of the mast. Remove bolt and nut securing each of the two cylinder pins; then remove the rod end pin from each tilt cylinder.

### WARNING

**Do not perform maintenance of any kind below the mast unless it is properly secured and stabilized.**

6. Carefully lay the tilt cylinders down on the frame of the truck. Retract the tilt cylinders to protect the tilt cylinder rods while working on the mast.

- Using another shaft which is smaller in diameter than the mast tilt pin, drive out the mast tilt pin.

**NOTE: A worn pin may be difficult to remove.**

- Remove the mast from the truck bed.

### MAST INSTALLATION

- Place the mast into position on the truck bed; then install the mast tilt pin. Install the bolt and nut securing the pin.
- Lift the front of the mast upward; then fully support the front of the mast.

### WARNING

**Do not perform maintenance of any kind below the mast unless it is properly secured and stabilized.**

- Lift the tilt cylinders upward and extend until the rod ends align with the mounting holes in the mast. Install the cylinder pins and secure with the bolts and nuts.
- Install and secure the mast pin covers.
- Place each outrigger cylinder into position on the truck bed (extending to the necessary length); then install the cylinder base pin and secure with the bolt and nut.

**NOTE: If the cylinders were removed, install them at this time.**

- Connect the pressure, return, and pilot pressure lines to the 3-section hydraulic valve.

### MAST LIFT ASSEMBLY

The mast lift assembly may need to be removed in order to service the plastic wear strips that go against the lift track of the main mast. It also may be removed to lighten the load when removing the mast or truck bed. For stability and because of the weight of the mast lift assembly, it is recommended to remove the spades and spade cylinders before removing the mast lift assembly.

### MAST LIFT ASSEMBLY REMOVAL

- Remove the four spades (See the Spade Removal section).
- Remove the spade cylinders (see Spade Cylinder Removal section). Be sure to cap the hose ends.

### CAUTION

**The ends of the hoses must be capped if the cylinders are to be taken out of the machine.**

**NOTE: The cylinders may also be restrained within the towers if the equipment used to lift the assembly can handle the extra weight.**

- Raise the mast lift assembly half way up the mast and tilt the mast all the way down to the stowed position.
- Close the ball valves on the hydraulic reservoir.

### CAUTION

**Failure to close the ball valves will allow all hydraulic oil to drain out of the system because the reservoir is higher than the truck bed frame.**

- To ensure proper assembly, mark the supply and return hydraulic hoses to the mast lift assembly; then remove the hoses.

### CAUTION

**The hoses must be properly marked and assembled correctly. If the hoses are reversed, the hydraulic valve will be damaged.**

- Remove bolt and nut securing the mast lift assembly cylinder rod end pin; then remove the pin.

### CAUTION

**Since the mast lift assembly has been freed from the cylinder, the mast lift assembly is unrestrained and may slide on its own.**

- While supporting the lift assembly, manually move the mast lift assembly down the mast as far as it takes to complete the service.

### CAUTION

**The mast lift assembly must be properly restrained and supported during this process.**

**NOTE: With the lift assembly removed from the mast, inspect for wear on the plastic wear slides and the end caps of the lift assembly. Replace any worn or broken plastic wear items.**

### MAST LIFT ASSEMBLY INSTALLATION

- Reinsert the mast lift assembly into the mast making sure the wear strips are fully inside the mast. Do not apply any lubrication to the wear strips.

### CAUTION

**Applying any lubrication to the wear strips will only cause premature wear.**

- Observing the identifying marks made during removal, install the hoses to the ports from which they were removed.

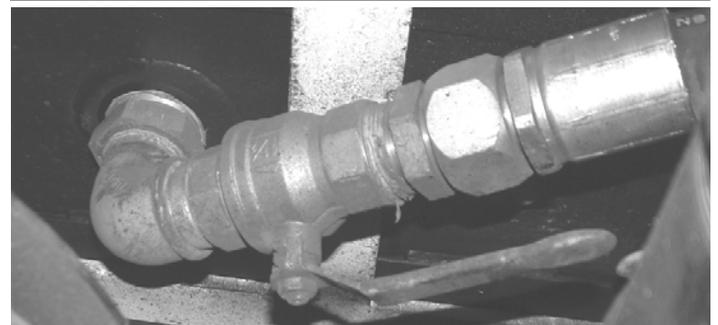
### CAUTION

**Make sure the hydraulic hoses are connected in the same configuration as they were removed. If the hoses are reversed, the hydraulic valve will be damaged and the warranty voided.**

- Open both ball valves on the hydraulic oil reservoir.

### CAUTION

**Failure to reopen the valves on the reservoir will damage the hydraulic pump when the PTO is turned on and run without oil.**



- Extend the mast lift assembly cylinder and secure the cylinder rod end to mast with the pin. Secure the pin with the bolt and nut.
- Retract the mast lift assembly cylinder halfway up the mast.

6. Lift the transplanter to the dig position and install the spade cylinders and spades.

**NOTE: The spade cylinders and spades should be installed in the reversed order that they were removed in but in the same configuration as when removed.**

## **CAB GUARD**

The cab guard is where the water pump system is located for all transplanter models. The water system is composed of the following:

- Hydraulic driven water pump
- Water filter
- Water tank drain or facet valve
- Spade Water Solenoid

The hydraulic driven water pump is attached to the water tank by a flexible hose. The pump is controlled by its own hydraulic system, which is the rear section of the main hydraulic pump. The water pump is controlled or operated by a valve which is mounted directly to the pump. There is a T-fitting connected to the outlet of the water pump.

On one side of the T-fitting is a gate valve and on the other side there is another solenoid that controls the water to the nozzles on the lift assembly.

Three styles of Cab Guards, Standard Top, Long Top, and Flip Top. The only difference between the standard top and the long top is the length above the cab. The width of all cab guards is the same.

The flip top has the same top as the standard cab guard in length, but the top hinges on the side supports. The flip top is position by both a mechanical and a hydraulic system. The mechanical system is a pin and the hydraulic system are the hydraulic cylinders that lift the top up and down for servicing.

### **FLIP TOP LIFTING PROCEDURE**

1. Remove safety pins.
2. Raise the flip top by pumping the hand hydraulic pump.  
Raise the top high enough for adequate clearance for servicing.

### **FLIP TOP LOWERING PROCEDURE**

1. Open the relief valve on the hydraulic pump to lower the flip top.
2. Install the safety pins in their proper places and secure with the pin keepers.

## **WATER TANK**

- Tank
- Fill Cap
- Sight Gauge

The water tank is used for holding water which is used for blade lubrication, tree watering, and truck cleanup. The filler cap is connected to the tank by a tethered chain. There is a sight gauge on the side of the tank. The tank, hose, and fittings are all replaceable if needed.

# SERVICING DIGGING COMPONENTS

## CHECK VALVE

### CHECK VALVE CARTRIDGE REMOVAL AND INSTALLATION

If the check valve cartridges get dirty the check valve not operate properly. If cleaning of the check valve cartridge does not resolve the operational problem of the check valve, the check valve must be either cleaned or replaced.

1. Ensure all components are mechanically held in position or at rest; then relieve hydraulic pressure (see Relieving Hydraulic Pressure).

#### WARNING

**Do not perform any maintenance on the hydraulic system without first stabilizing (or restraining) all components and relieving hydraulic pressure.**

2. Remove the cartridge.
3. Inspect the cartridge for visible contaminants. Carefully remove any obvious particles.
4. Flush the cartridge in clean mineral spirits and dry with compressed air.
5. Inspect the seals for damage or wear. Replace seals as necessary.
6. Dip the cartridge in clean hydraulic fluid; then install the cartridge. Tighten securely.

### CHECK VALVE BLOCK REMOVAL AND INSTALLATION

1. Position the machine for easy access to the check valve.
2. Ensure all components are mechanically held in position or at rest; then relieve hydraulic pressure (see Relieving Hydraulic Pressure).

#### WARNING

**Do not perform any maintenance on the hydraulic system without first stabilizing (or restraining) all components and relieving hydraulic pressure.**

3. To ensure proper assembly, mark the hoses leading to the check valve block; then remove the hoses.
4. Remove check valve block from lift assembly.
5. Place a cleaned or new check valve block into position on the lift assembly; then secure.
6. Observing the identifying marks made during removal, install the hoses to the ports from which they were removed.

## GATE ASSEMBLY

The right gate has the locking tab on the end of the main tube base. The right gate is also the gate that is opened last and closed first when either digging or planting a tree. The left gate has the locking plate on the end of the main tube base. The left gate is also the gate that is opened first and closed last when either digging or planting a tree.

Before working on or removing any part of the tree spade, ensure all components are mechanically held in position or at rest; then relieve hydraulic pressure (see Relieving Hydraulic Pressure).

#### WARNING

**Do not perform any maintenance on the hydraulic system without first stabilizing (or restraining) all components and relieving hydraulic pressure.**

## RIGHT OR LEFT GATE INSTALLATION AND REMOVAL

1. Remove the spades and spade cylinders.
2. Remove the gate cylinders.
3. Either support (restrain) or remove the appropriate (right or left depending upon which side is being serviced) leveler pad; then remove the hydraulic hoses from the appropriate leveler cylinder. Remove the leveler cylinder.

**NOTE: The leveler pads will have to be supported or removed as the cylinder will extend on its own when the hoses are removed as there are no counter balance valves or check valves on these cylinders.**

4. Remove the pin keeper for the gate pin.
5. While supporting the gate, remove the gate pin.
6. Place the new gate into position and secure with the gate pin.
7. Secure the gate pin with the pin keeper.
8. Place the leveler cylinder into position; then secure with the pins and pin keepers.
9. Making sure the hoses are properly routed, connect the hoses to the leveler cylinder. Tighten securely.
10. Install and secure the gate cylinders and spades.

**NOTE: After servicing the gate when the hydraulic system has been disconnected for service, always use caution when first operating the gate. Operate all hydraulic functions on the gate for ten (10) cycles, to purge the air in the lines.**

## SPADE

Before working on or removing any part of the tree spade, ensure all components are mechanically held in position or at rest; then relieve hydraulic pressure (see Relieving Hydraulic Pressure).

#### WARNING

**Do not perform any maintenance on the hydraulic system without first stabilizing (or restraining) all components and relieving hydraulic pressure.**

### SPADE REMOVAL

1. Park the machine on a level surface with sufficient room for a forklift, hoist, or crane to lift and remove the spades from the tree transplanter.
  2. Raise all spades of the transplanter and rest the lift assembly firmly on the level surface.
  3. While supporting the bottom of the spade, remove the rod pin securing the spade cylinder to the spade.
  4. With the rod pin removed, fully retract that cylinder only. The cylinder will roll back against the spade as it retracts. Using a safety strap or safety chain, hold the cylinder away from the spade; then lift the spade from the tower.
  5. Place the spade on the ground for servicing.
- NOTE: The rollers and wear blocks may fall out of the spade as it gets positioned for service.**
6. If the spade cylinder needs to be serviced, remove the spade cylinder at this time.
  7. Perform the desired service of the spade blade at this time.

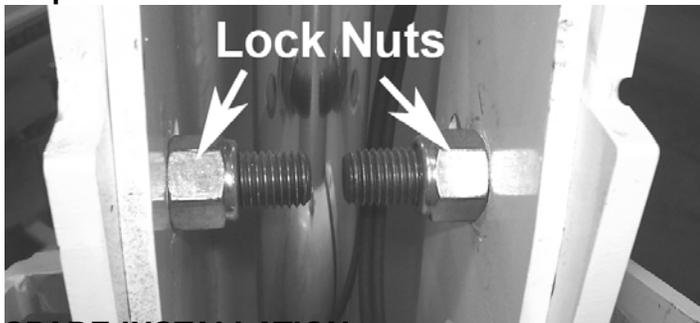
Several items should be closely inspected whenever a spade is removed for servicing. The spade guide bushings will wear from a lack of grease and excessively hard ground while digging. Check to make sure the bushings are not elongated or egg shaped. Replace if there are visual signs of damage and wear.

The spindles for the plastic guide block and steel guide roller will wear from the pressures of digging. The spindles may also wear from the lack of rotation caused by a lack of lubrication. Replace the spindle if there is excess clearance. Clean the bushing and spindle to allow the spindle to rotate freely.

Check the plastic guide blocks for compression failure. Replace the guide blocks if there are visible signs of compression damage. There may be also be clearance issues in the tower when the guide blocks wear under normal use. Replace the guide blocks when excessive movement is evident and the spade can't be adjusted any more.

The teeth on the adjuster plates may wear from being too loose or from digging in excessively hard condition. Inspect the teeth of the plates for wear or damage. Replace if worn to the point of not holding the spade in position. Tighten the lock nuts to a torque of 270 ft-lb. The adjuster plates may have to be loosened to adjust the spade blades after the spades are reinstalled into the tower.

**NOTE: The adjuster plate bolt must be properly torqued to 270 ft-lb.**



### SPADE INSTALLATION

Prior to installing the spade, check the grease lines and verify that the grease is being delivered to the proper locations on the spade. Put a light coating of grease on the spindle shank of the spade guides and spade guide spindles before insertion. Place the spade in the same tower or configuration as it was in before the spade was removed. If more than one spade was removed, there is a code on the spade to determine the proper position on the lift assembly.

**NOTE: Lightly grease the spindles before and after the spade has been installed in the tower.**

### SPADE POSITIONING CODE

The spade is marked with either one weld dot or two weld dots between the two guides. The dots are on the side closest to the mast or truck. The spades on the left side of truck have the welded dots on the right side of the spade and the spades on the right side of the truck have the welded dots on the left side of the spade.

**Spade One has one weld dot on the right side between the spade guides.**

**Spade Two has two weld dots on the right side between the spade guides.**

**Spade Three has one weld dot on the left side between the spade guides.**

### **Spade Four has two weld dots on the left side between the spade guides.**

1. Place the spindles in the spade.
2. Place a plastic guide block onto each spindle.

**NOTE: When installing the plastic guide block on a spindle, there is a specific orientation that the plastic guide block must be in. There is a machined dot on the inside surface which must be positioned so that the edge of the block that the dot is located closest is positioned against the outside tower guide bar.**

3. Carefully lower the spade into the tower. As the spade is inserted, the orientation (machined dot positioned to the outside of machine) of the plastic guide blocks must be maintained. Also, watch for interference with the spade cylinder as the spade is lowered into position.
4. Adjust the length of the spade cylinder until the cylinder rod end aligns with the mounting hole in the spade; then connect the rod end of the cylinder to the spade with the pin.
5. Lightly grease the spade cylinder spindles.
6. Cycle all hydraulic functions to purge air out of the lines and valves.

**NOTE: After finishing the maintenance on the spade, the angle of the spade may need to be adjusted for a better fit.**

### ADJUSTING SPADE

For consistent digging and minimal machine stress, the spades must be properly adjusted. Differing soil types and conditions will affect the amount and frequency of adjustments. Always be aware of how the Transplanter functions normally and what a good root ball looks like. Digs which consistently fall out of spec are usually a good indication that adjustments need to be made or worn parts replaced.

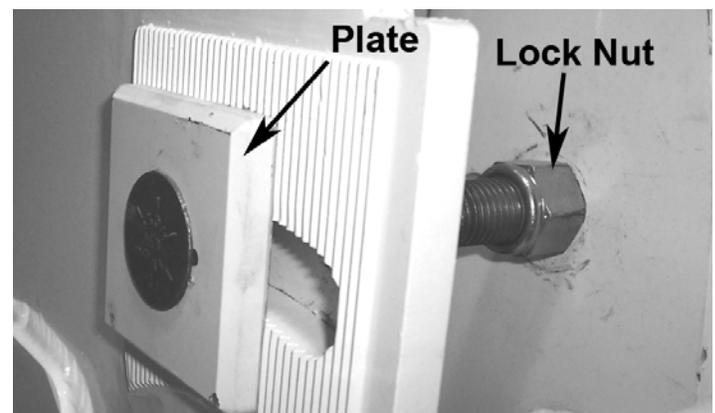
To adjust a spade, use the following procedure.

1. Set the Transplanter in a vertical position and lower the lift assembly to the ground; then fully raise the spades.
2. Turn off the transmitter and the truck engine. Remove the ignition key.

### WARNING

**Do not attempt any service on the Transplanter with the key in the ignition of the truck. The engine must be turned off and the key removed prior to servicing.**

3. On each side of the spade that is to be adjusted, loosen the lock nut securing each adjuster bracket.



4. Either push in or pull out on the tip of the spade while listening for “clicks” coming from the adjuster plates. Each click relates to one groove on the adjuster plates and is equal to approximately 1/4 in. in spade tip movement.
5. When the spade is properly positioned, tighten both adjuster bracket lock nuts securely (270 ft-lb).

# HYDRAULICS

## HYDRAULIC SYSTEM

The Transplanter hydraulic system should be filled with premium grade HDZ-46 hydraulic fluid. The oil should be good for at least two years unless one of the following problems occur:

1. If the reservoir is **contaminated with excessive water or dirt**. Hydraulic fluid can hold more than 20% water in solution. Usually at these high levels, the fluid will appear milky. A quick test for water at lower concentrations may be performed outside with a hot (>300°P) sheet of steel. With the sheet heated, drop a small amount of hydraulic fluid in the center of the sheet. If it sputters, there is a significant amount of water in the fluid and the fluid should be replaced.
2. If the oil has been **overheated** [above 190° P (87°C)]. The oil will have a foul odor. Do not use oil that has been overheated. The lubricating properties have been destroyed and acids and varnish have been created by oxidation.
3. If a **pump or one of the valves has had a catastrophic failure** resulting in metal fragments and particles entering the fluid. These particles may cause the replacement components to fail before the filter cleans up the system. The filter in a hydraulic system does not filter out 100% of all particles as the fluid passes through it.

After any of the above have occurred, the entire system should be drained, cleaned, and filled with new fluid. A new filter should always be installed after any maintenance to the hydraulic system.

Whenever service to a hydraulic line, cylinder, or valve is performed where air may enter the system, be sure to cycle the hydraulic controls to remove any air that has entered the system. Air in the hydraulic system may cause the Transplanter to act erratically. This purging of air should be done in a controlled setting prior to any on site work.

### WARNING

**The Transplanter may not react smoothly until all air is purged from the system.**

## HYDRAULIC PRESSURE

The hydraulic pressure of the tree transplanter is designed to operate at 3500 PSI. The system has a relief valve located in the three section hydraulic valve (by the right fender).

In order to test system pressure, remove the inspection plug and install a gauge on the valve. To prevent damage to the gauge, make sure the gauge can read at least 5000 PSI.

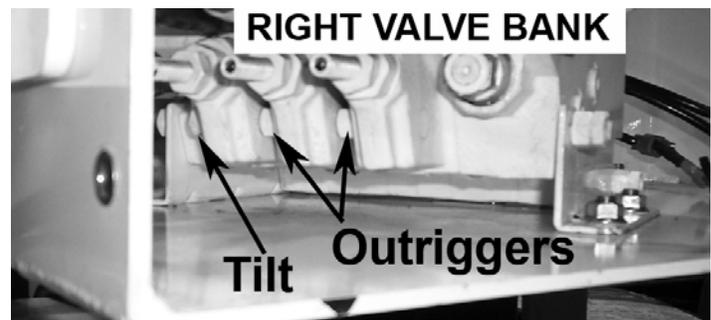
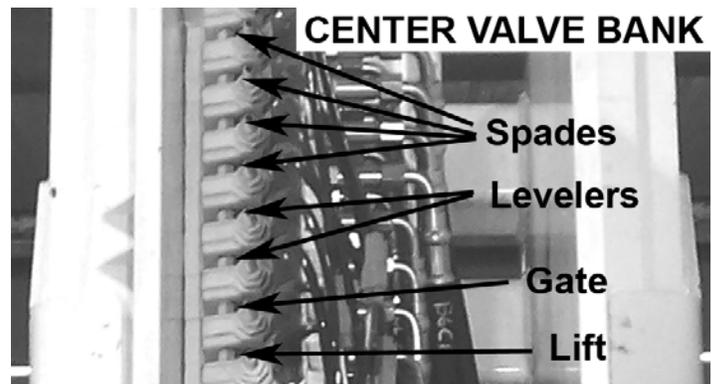
### WARNING

**HYDRAULIC PRESSURE IS SET AT 3500 PSI. Use extreme caution when servicing machine. Whenever servicing any hydraulic components or components restrained by hydraulics, it will be necessary to relieve system pressure. Do not perform any maintenance on the hydraulic system without first stabilizing (or restraining) all components and relieving hydraulic pressure.**

## RELIEVING PRESSURE FROM A SPECIFIC FUNCTION

The remote and electric solenoids will not relieve any pressure on the system as it needs a pilot pressure to make the spools move. In order to relieve the pressure on a certain function on the machine, use a ½” wrench on the valve section that is to be worked on. Place the wrench on the hex head shaft and move the shaft in both directions to relieve the pressure. Again use caution for the moving parts. There is a hex head shaft on each individual section of the two stacked valve sections on the machine (the 3-section fender valve and the 9-section lift assembly valve).

**NOTE: Each valve bank has a cover that must be removed for servicing. Be sure to install and secure the cover after completing the service procedures.**



When appropriate, placing the lift assembly on the ground is also recommended for safety.

## HYDRAULIC COMPONENTS

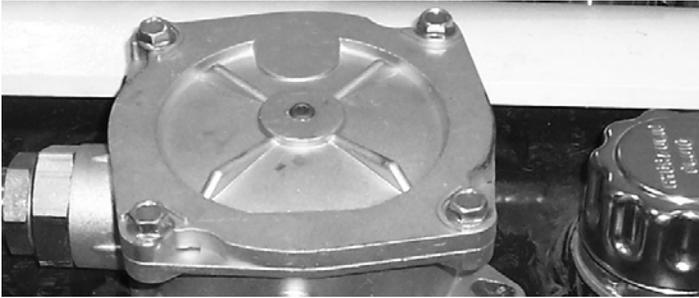
The following are the major components of the hydraulic system:

- Hydraulic Filter
- Hydraulic Reservoir
- Power Take Off
- Hydraulic Pump
- Hydraulic Valve (3-section)
- Hydraulic Valve (9-section)
- Pilot Operated Check Valve
- Counterbalance Valves

## HYDRAULIC FILTER

The hydraulic filter should be changed every six (6) months. To change the filter, use the following procedure:

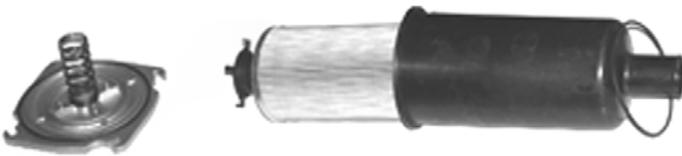
1. Loosen the four cap screws securing the filter cover on the top of the hydraulic reservoir.



2. While pressing downward, rotate the cover clockwise and remove the cover and spring; then remove the filter. Remove the bypass valve from the top of the old filter.

**NOTE: The cover is under spring pressure.**

3. Place the bypass valve into one end of the new filter; then with the bypass valve positioned on the top, place the new filter into position. Place the spring and cover into position. Make sure the O-ring is properly positioned in the groove of the housing.



4. While pressing downward on the cover, rotate the cover counterclockwise until it is in the proper position beneath the four cap screws; then tighten the cap screws securely.

## HYDRAULIC RESERVOIR

The Hydraulic system has one reservoir that supplies the entire tree transplanter. The oil capacity of the system is not the 55 U.S. gallons that the tank holds. Do not fill tank full as the tank must have room for oil expansion as the oil warms up with use. The proper level of oil in the tank, with all cylinders in the transport or retracted position, has been determined to be when oil is just visible at the bottom of the filler screen. The hydraulic oil used in the tree transplanter is specified as HDZ-46 or equivalent.

## POWER TAKE OFF (PTO)

The power take off (PTO) has been individually selected for each truck for optimum performance of the transplanter hydraulic system. **DO NOT OPERATE THE PTO ABOVE THE SET OPERATING SPEED.** Operating the machine above the set point may cause severe damage to the hydraulic pump. This may void the hydraulic pump warranty. The PTO can be engaged by two methods, air operated or manual. Inspect the PTO for proper engagement; use only qualified personnel to repair any PTO related problems.

## HYDRAULIC PUMP

The hydraulic pump has been designed exclusively for the tree transplanter. Periodically the pump should be checked for oil external oil leakage as this will adversely affect the function of the machine and possibly damage the hydraulic pump.

The hydraulic system has two ball valves for each section of the hydraulic pump. The valves must be in the fully OPEN position to supply the necessary oil to the system and prevent damage to the pump from cavitation. The ball valves are to be closed only for service. After completing the necessary service, remember to completely open the ball valves. There will be major hydraulic pump damage if a ball valve is in the OFF position and the PTO is turned on.

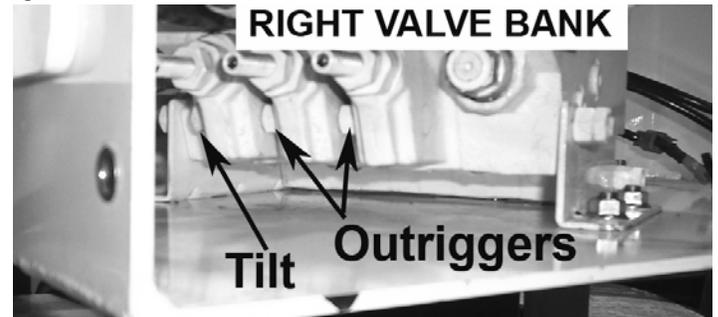
## HYDRAULIC SOLENOID TYPES

There are two types of solenoids found on each valve section. One type is for the on/off sections; the other type of solenoid is the proportional solenoid. The function of the proportional solenoid is to act as a throttle on the section, making the section act like it has variable speed. The solenoids only differ in color when physically looked at (GREEN for on/off type and BLACK for the proportional type).

## HYDRAULIC VALVE SECTION FUNCTIONS

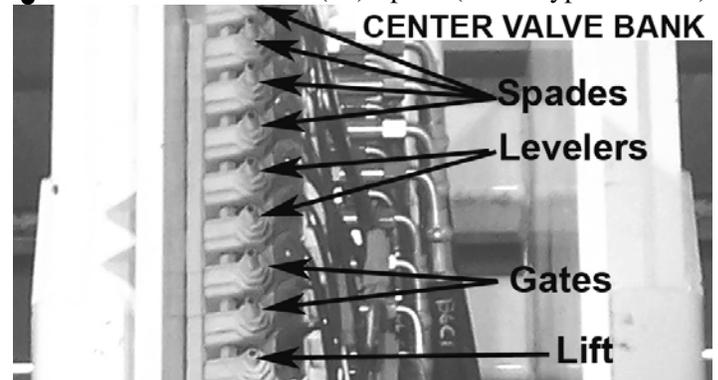
**Three Section Valve Functions (orientated from the inlet to return end):**

- Section 1 – Left-Hand Outrigger (on/off type solenoid)
- Section 2 – Right-Hand Outrigger (on/off type solenoid)
- Section 3 – Tilt (proportional type solenoid)



**Nine Section Valve Functions (orientated from the inlet and return end upward):**

- Section 1 – Mast Lift Assembly (proportional type solenoid)
- Section 2 – Left Gate (on/off type solenoid)
- Section 3 – Right Gate (on/off type solenoid)
- Section 4 – Left Leveler (on/off type solenoid)
- Section 5 – Right Leveler (on/off type solenoid)
- Section 6 – Left Front (#1) Spade (on/off type solenoid)
- Section 7 – Right Rear (#3) Spade (on/off type solenoid)
- Section 8 – Right Front (#4) Spade (on/off type solenoid)
- Section 9 – Left Rear (#2) Spade (on/off type solenoid)



## CYLINDERS

**NOTE: All cylinders are designed to use O-ring fittings.**

## CYLINDER REMOVAL AND INSTALLATION:

### Leveler Cylinder

1. Position the lift assembly in the dig position with the spades in the UP position. Position the assembly about 3 feet above the ground for this service.
2. Mechanically secure the four spade cylinders in the UP position.

#### WARNING

**The spade cylinders must be properly restrained during the servicing of the leveler cylinder(s).**

3. Extend the appropriate leveler cylinder.
4. Remove the pin keeper; then remove the pin securing the leveler pad to the cylinder. Remove the leveler pad.
5. Remove the hoses to the cylinder and remove the cylinder base pin; then remove the cylinder.
6. Closely inspect the pins and pin keepers; replace worn or damaged components.
7. Place the new (or serviced) cylinder into position and secure the base of the cylinder with the pin. Install the pin keeper.
8. Install the hoses on the cylinder. Tighten securely.
9. Place the leveler pad into position and secure to the cylinder with the pin. Install the pin keeper.
10. Grease the grease fittings until a small amount is visible.

### Outrigger Cylinder

1. Secure outrigger arm in a position which will allow removal of the cylinder.
2. Remove bolt and nut securing each of the two cylinder pins.
3. Mark the hoses to reference their position on the cylinder; then remove the hoses from the cylinder.

**NOTE: Be sure to note and mark hose position on cylinder for proper installation on new cylinder.**

4. Remove the pin securing the cylinder to the outrigger arm; then remove the pin securing the cylinder to the truck bed. Account for the bushings.
5. Inspect the pins, bolts, and bushings for damage and wear. Replace as necessary.
6. Place the new (or serviced) cylinder into position and secure to the truck bed (making sure the bushings are properly positioned) and secure with the pin. Install the bolt and nut.
7. Making sure the bushings are properly positioned in the outrigger arm, lift the outrigger arm until its mounting bracket hole aligns with the cylinder rod; then insert the pin through the outrigger arm and cylinder rod. Install the bolt and nut.
8. Using the reference marks made in Step 3, install the hoses on the cylinder. Tighten securely.
9. Grease the grease fittings until a small amount is visible.

### Lift Assembly Cylinder

1. Remove the number 1 and 4 spades from the lift assembly (see Spade Removal section).
2. Position the mast in the transport position.
3. Mechanically secure the lift assembly to prevent the lift assembly from moving.

#### WARNING

**The lift assembly must be properly restrained during the servicing of the lift assembly cylinder.**

4. Mark the hoses to reference their position on the cylinder; then remove the hoses from the cylinder.

**NOTE: Be sure to note and mark hose position on cylinder for proper installation on new cylinder.**

5. Remove the pin keepers; then remove the cylinder rod pin and base pin.
6. Carefully remove the cylinder by sliding it out the rear of truck bed.
7. Closely inspect the pins and pin keepers; replace worn or damaged components.
8. Slide the new (or serviced) cylinder into position and secure the cylinder with the pins. Install the pin keepers.
9. Using the reference marks made in Step 4, install the hoses on the cylinder. Tighten securely.
10. Grease the grease fittings until a small amount is visible.
11. Install the spades.

### Mast Tilt Cylinders

1. Place the lift assembly on firm, level ground.
2. Secure the transplanter to prevent movement while working on the tilt cylinders.

#### WARNING

**The lift assembly must be properly restrained during the servicing of the mast lift cylinder.**

3. While supporting the cylinders, remove the pin keepers and rod pins from the mast. If possible, retract and let the cylinders rest on the truck bed frame.
4. Mark the hoses to reference their position on the cylinders; then remove the hoses from the cylinders.

**NOTE: Be sure to note and mark hose position on cylinders for proper installation on new cylinders.**

5. Remove the base end cylinder pin keepers; then remove the pins.
6. Remove the cylinders.
7. Closely inspect the pins and pin keepers; replace worn or damaged components.
8. Place the new (or serviced) cylinders into position and secure the cylinders with the pins. Install the pin keepers.
9. Using the reference marks made in Step 4, install the hoses on the cylinder. Tighten securely.
10. Grease the grease fittings until a small amount is visible.

### List Assist Cylinder (Model 90)

1. Place the lift assembly on firm, level ground.
2. Secure the transplanter to prevent movement while working on the tilt cylinders.

## WARNING

**The lift assembly must be properly restrained during the servicing of the mast lift cylinder.**

3. Remove the hydraulic hose from the cylinder.
4. Remove the pin keeper; then while supporting the cylinder, remove the base pin.
5. Remove cylinder and service as needed.
6. Closely inspect the pin and pin keeper; replace worn or damaged components.
8. Place the new (or serviced) cylinder into position and secure the cylinder with the pin. Install the pin keeper.
9. Install the hose on the cylinder. Tighten securely.

### Spade Cylinder

1. Place the lift assembly on firm, level ground.
2. Secure the transplanter to prevent movement while working on the spade cylinder.

## WARNING

**The lift assembly must be properly restrained during the servicing of the spade cylinder.**

3. Remove the spade (see Spade Removal section); then move the spade out of the way while removing the spade cylinder.
4. Mark the hoses to reference their position on the cylinder; then remove the hoses from the cylinder.

**NOTE: Be sure to note and mark hose position on cylinder for proper installation on the new cylinder.**

5. With the spade cylinder supported remove the hydraulic hoses.
6. Remove the cylinder base pin keepers and the cylinder base pin; then carefully the cylinder from the transplanter.
7. Closely inspect the pins and pin keepers; replace worn or damaged components.
8. Place the new (or serviced) cylinder into position and secure the cylinder base with the pin. Install the pin keeper.
9. Using the reference marks made in Step 4, install the hoses on the cylinder. Tighten securely.
10. Install the spade (see Spade Installation section).
11. Grease the grease fittings until a small amount is visible.

### Gate Cylinder

1. Raise all spade cylinders and position the lift assembly in the digging position. Mechanically secure the spades from moving, while working on a gate cylinder.

**Note: The lift assembly can be raised up for easier of removal the gate cylinders.**

2. Mark the hoses to reference their position on the cylinder; then remove the hoses from the cylinder.

**NOTE: Be sure to note and mark hose position on cylinder for proper installation on the new cylinder.**

3. Remove the rod end pin keeper and pin. Be care as the leveler leg is now free to move.

## CAUTION

**Work carefully around machine when the leveler leg is free to move on its own.**

4. While supporting the cylinder, remove the base end pin keeper and pin (p/n 13112) from the gate; then remove the cylinder from the gate.
5. Closely inspect the pins and pin keepers; replace worn or damaged components.

6. Slide the new (or serviced) cylinder into position and secure the cylinder with the pins. Install the pin keepers.
7. Using the reference marks made in Step 2, install the hoses on the cylinder. Tighten securely.
8. Grease the grease fittings until a small amount is visible.

## COUNTERBALANCE VALVES

For operator protection, counterbalance valves are installed on certain cylinders to prevent further movement if the transplanter should rupture a hose. The counterbalance valves operate in both directions (extend and retract) of the cylinder. The following cylinders have double acting counterbalance valves:

- Outrigger
- Mast Lift Assembly
- Mast Tilt

The most common cause of failure of a counterbalance valve cartridge is seal failure or contamination in the hydraulic fluid, which can then lodge in the working parts of the cartridge and interfere with its operation. The major symptom of a failed counterbalance valve is 'creeping' in the cylinder. To clean a counterbalance valve, use the following procedure.

1. Before removing a counterbalance valve, ensure the machines and related loads (i.e. Top Drive) are mechanically held in position or at rest. Also make sure that the valve is not under pressure at the time of removal.

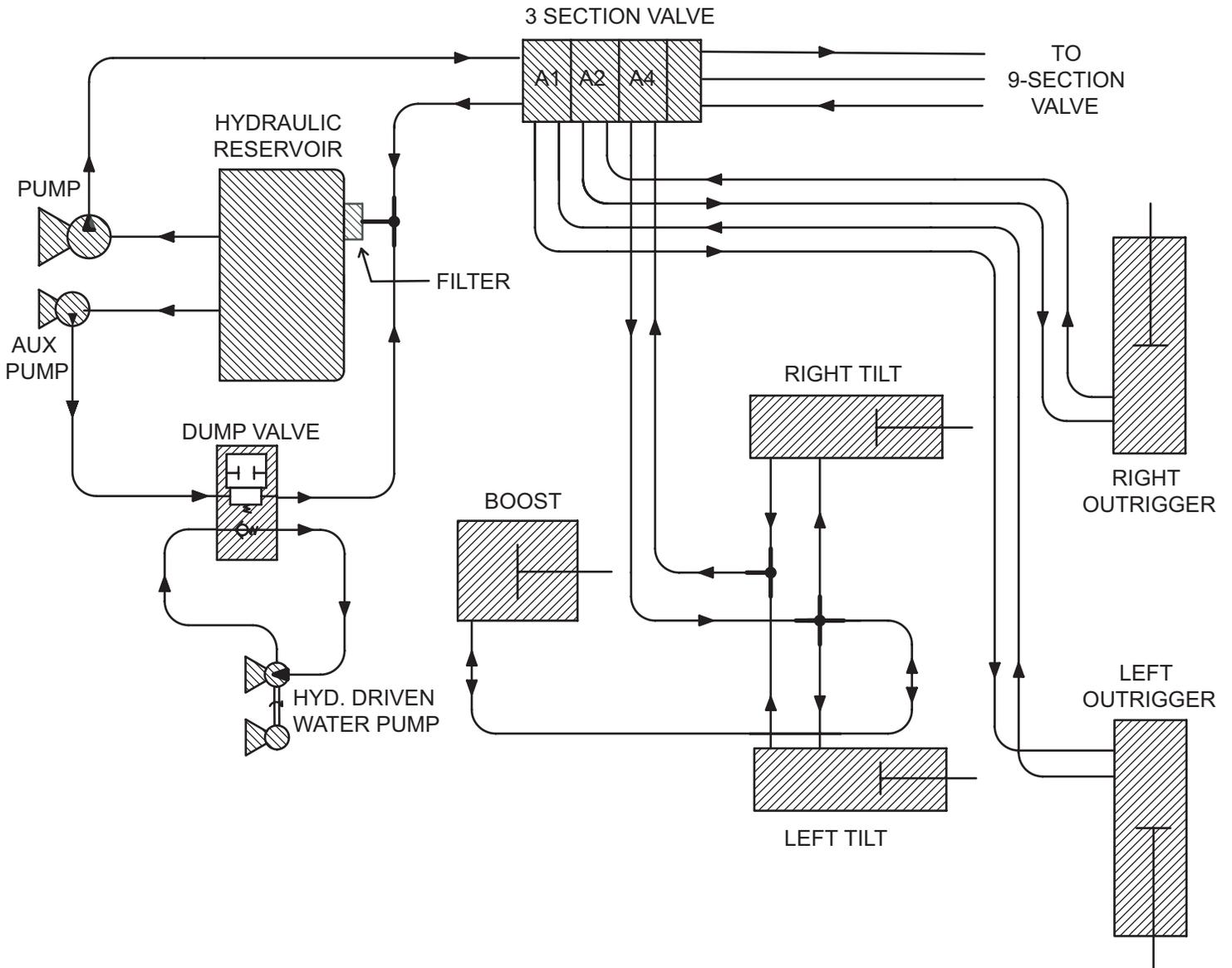
## WARNING

**The component being worked on must be properly restrained during the servicing of the counterbalance valve.**

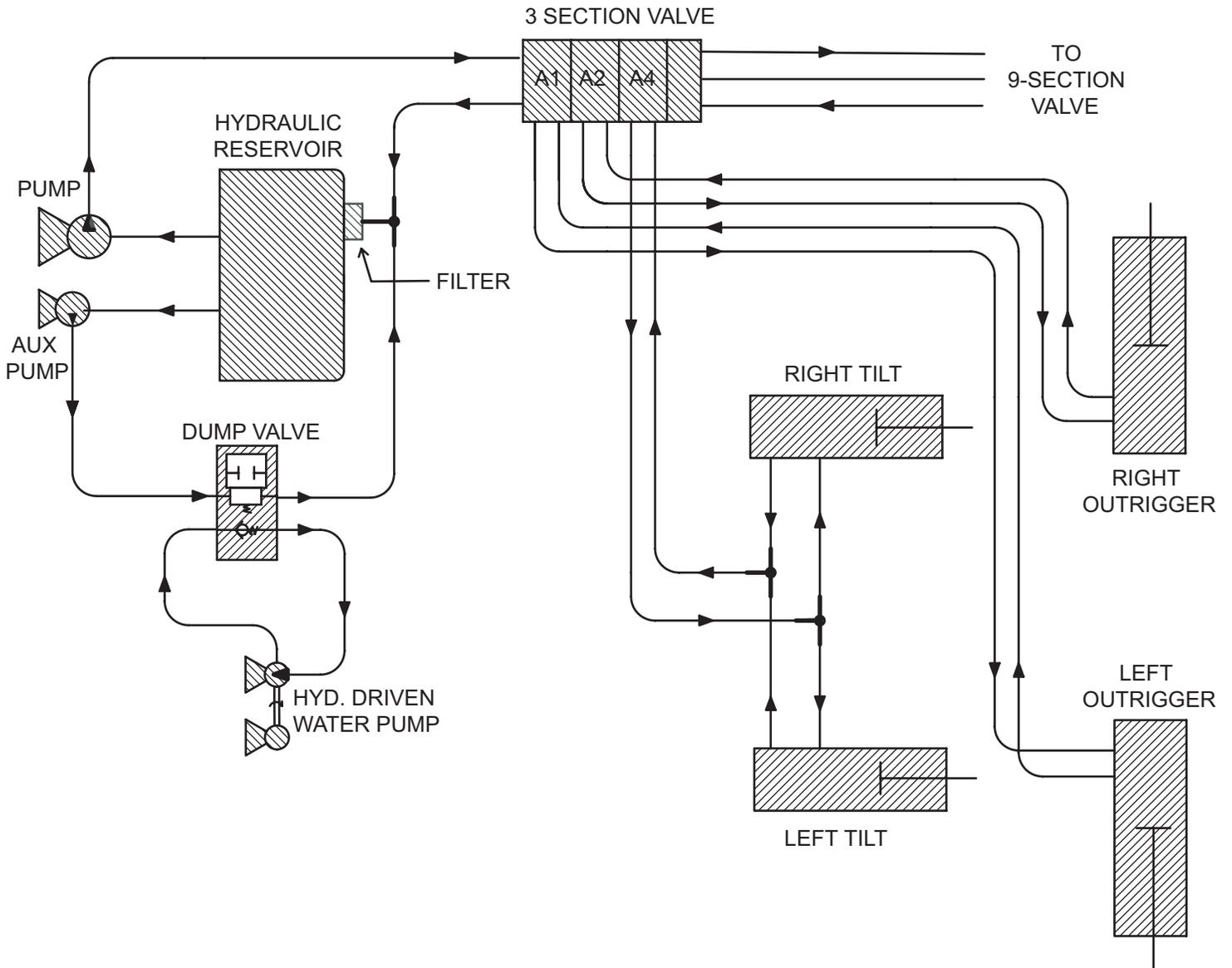
2. Remove the cartridge from its cavity.
3. Inspect the cartridge for visible contaminants. If any contaminants are found, carefully remove them.
4. Flush the cartridge in clean mineral spirits and blow dry with compressed air.
5. Inspect the seals. Replace any seals that are worn or damaged.
6. Dip the cartridge in clean hydraulic fluid and install the cartridge. Tighten to \_\_\_\_\_ft-lb.
7. If cleaning the counterbalance valve does not eliminate the operational problem, replace the cartridge.

**NOTE: Because of the complexity of counterbalance valves, servicing counterbalance valves should only be performed by a qualified technician with the proper tools and knowledge. The major symptom of a failed counterbalance valve is 'creeping' in the cylinder.**

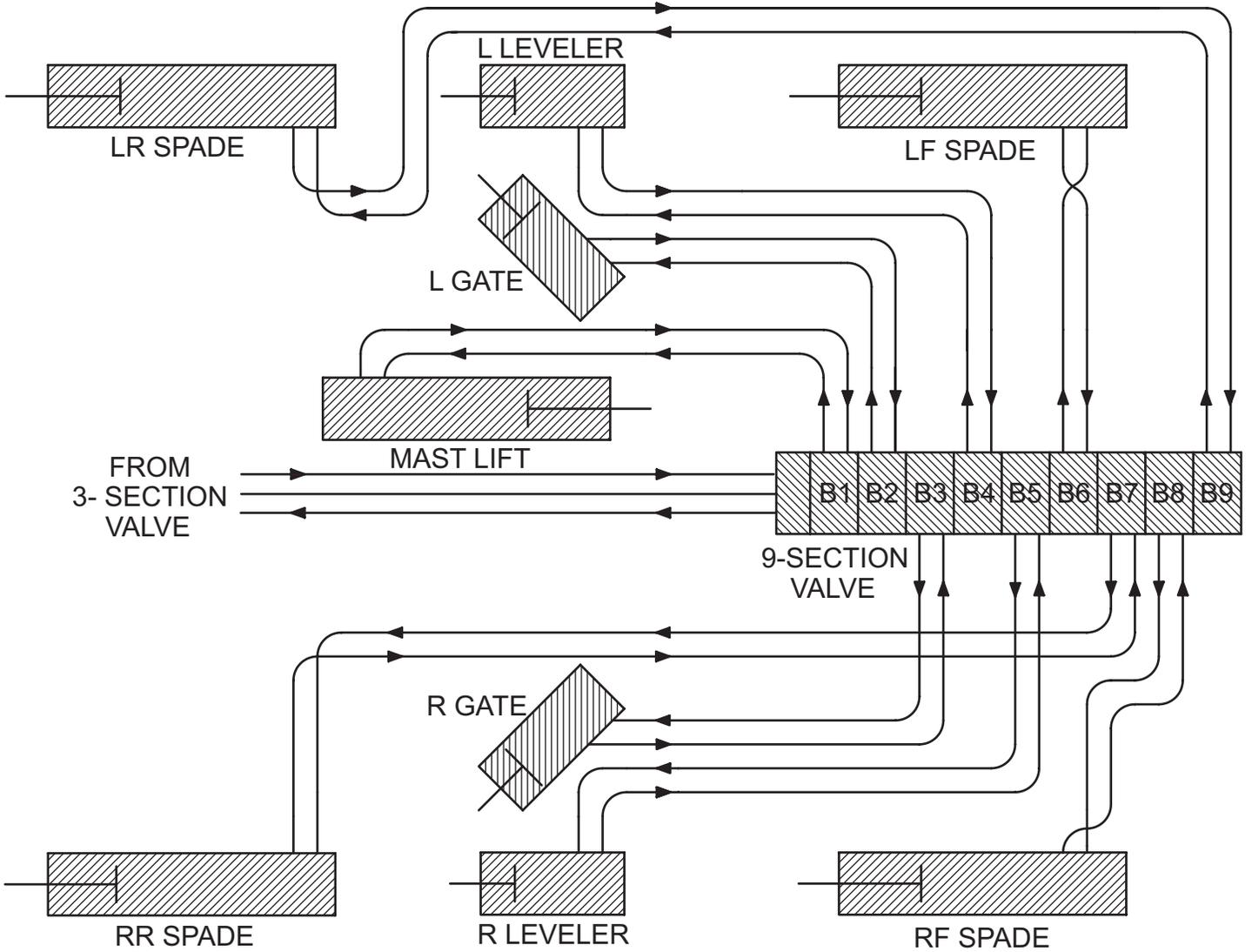
# MODEL 90 3-SECTION VALVE HYDRAULIC SCHEMATIC



# MODEL 65 3-SECTION VALVE HYDRAULIC SCHEMATIC



# 9-SECTION VALVE HYDRAULIC SCHEMATIC



# TROUBLESHOOTING

## INTRODUCTION

This troubleshooting section is designed to help identify possible conditions adversely affecting the operation of the Tree Transplanter. Troubleshooting is a process of step by step elimination and isolation. Careful and logical thought processes are an important part of the troubleshooting procedure. Generally speaking, the first step in troubleshooting the transplanter is to determine whether the problem is transmitter, electric, or hydraulic. Whenever performing any maintenance and troubleshooting on the Tree Transplanter, be sure to observe all safety and hazard information listed both in this manual and in the Operator's Manual.

## TRANSMITTER TROUBLESHOOTING

The transmitter has an LED status indicator to aid in troubleshooting. Due to the rough treatment it may be subjected to, most communication problems are likely to occur in the transmitter. The transmitter should be thoroughly diagnosed before proceeding to the receiver.

### WARNING

**When testing the transmitter, the receiver may become active resulting in system operation. Always assume the system is working and will respond when testing the transmitter.**

| LED Indication  | Possible Cause   |
|---|--|
| LED is off  | Transmitter is off.  |
| LED flashes at low rate   | Transmitter is operating in a normal mode.   |
| LED flashes at high rate  | Command Switch is pressed.   |
| LED flashes on-off at a slow rate<br>(1/2 second on and 1/2 second off) | Batteries getting low. Batteries should be changed at the next convenient opportunity.   |
| LED remains on continuously   | Either a switch was activated at the time the transmitter was turned on or a general failure occurred that requires factory service. Ensure no other switches are pressed while attempting to turn the transmitter on. |
| LED will not light when ON/OFF<br>button is pushed                      | Replace batteries. If this does not correct the problem, the transmitter must be repaired.   |

## RECEIVER TROUBLESHOOTING

The receiver uses three basic LEDs for diagnostics (PWR, Signal, and Safety).

| LED Indicators      | Receiver Action  |
|---------------------|--|
| PWR illuminated.    | Receiver operating voltage is present.                       |
| SIGNAL flashes.     | Signal is being received that matches the decoder's address. |
| SAFETY illuminated. | One or more command outputs are energized.                   |

Use the following when troubleshooting the receiver.

|   |   |
|---|---|
| PWR is not illuminated                            | Check that the power source to the receiver is active.<br>Check the fuse for the receiver power input.                                    |
| With transmitter ON, SIGNAL<br>is not illuminated | Check Transmitter batteries<br>Troubleshoot Transmitter   |
| Only some functions operate                       | Check/replace fuses in fuse blocks<br>Check output voltage of respective electrical circuits.<br>Check condition of transmitter switches. |
| Intermittent operation                            | Check all connections and antenna for damage.   |
| Operating range is short                          | Check antenna connections.  |

## TRANSMITTER TROUBLESHOOTING

The controllers have green and red LED status indicators to aid in troubleshooting. Due to the rough treatment it may be subjected to, most communication problems are likely to occur in the transmitter. The transmitter should be thoroughly diagnosed before proceeding to the receiver. Be sure the transmitter has a set of new batteries prior to any troubleshooting procedure.

### WARNING

**When testing the transmitter, the receiver may become active resulting in system operation. Always assume the system is working and will respond when testing the transmitter.**

Check the LED indicators on the controllers. If neither the red or green indicators are illuminated, there is no power to the controllers. Check all fuses; replace as necessary.

A steady green LED on Controller A indicates the controllers are able and ready to receive information from the transmitter.

A flashing green LED on Controller A indicates that the controllers and transmitter are communicating.

**NOTE: In order to have the flashing green LED, the transmitter must be turned on.**

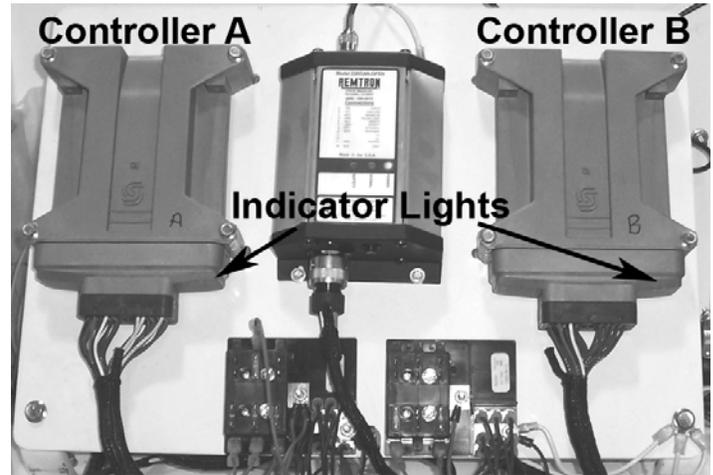
A red LED on Controller A indicates a general system breakdown. No power to one of the Controllers, a problem with the antenna, or communication problems with the transmitter are the major reasons for a red LED illumination.

**NOTE: The red LED on Controller B will only illuminate if Controller A is not functioning properly.**

## CONTROLLER TROUBLESHOOTING

Each controller has a self-diagnostic function built into its memory for troubleshooting system failures. If the Transplanter will not respond to signals sent by the transmitter and the transmitter has proven to be working properly and the incoming power to the receiver has been verified, check for controller output faults by observing the red indicator light on each controller upon start-up.

If an output fault has been detected, a series of flashes will be given. Count the series and compare it to the following codes. The series of flashes will be repeated three times. A short pause will be present between the first and second number. These codes indicate the particular circuit where either an open or short exists.



### Controller A (front)

- 4-1 Engine High Idle
- 4-2 Water Valve
- 4-3 Left Outrigger Extend
- 4-4 Left Outrigger Retract
- 4-5 Right Outrigger Extend
- 4-6 Right Outrigger Retract
- 4-9 Tilt Up
- 5-1 Tilt Down
- 5-2 Lift Up
- 5-3 Lift Down
- 5-4 Left Gate Open
- 5-5 Left Gate Close
- 5-6 Right Gate Open
- 5-7 Right Gate Close

### Controller B (rear)

- 4-1 Left Leveler Up
- 4-2 Left Leveler Down
- 4-3 Right Leveler Up
- 4-4 Right Leveler Down
- 4-5 Left-Front Spade Up
- 4-6 Left-Front Spade Down
- 4-7 Right-Rear Spade Up
- 4-8 Right-Rear Spade Down
- 4-9 Right-Front Spade Up
- 5-1 Right-Front Spade Down
- 5-2 Left-Rear Spade Up
- 5-3 Left-Rear Spade Down
- 5-4 Left-Front Water Valve
- 5-5 Right-Rear Water Valve
- 5-6 Right-Front Water Valve
- 5-7 Left-Rear Water Valve

### **NO HYDRAULIC FUNCTION**

- Check PTO to make sure it is engaged
- Check batteries in remote control transmitter
- Check for codes on controllers
- Check wiring harnesses for damage
- Check to be sure all connectors are plugged in properly
- Check engine idle
  - Lost communication to the truck's engine computer
  - Check connector to the engine ECM on truck
  - Check engine idle set point on ECM.
  - Mechanical throttle solenoid components lost reference
- Check for broken or loose hydraulic hoses.
- Hydraulic pump damaged/leaking

### **LOSS OF HYDRAULIC SPEED**

- Check hydraulic oil level in hydraulic reservoir.
- Replace hydraulic oil filter
- Check engine RPM Set Speed

### **NO WATER FLOW**

- Check PTO to make sure it is engaged
- Water switch damaged/defective
- Check batteries in remote control transmitter
- Water tank empty; valve closed
- Loss of Hydraulic Fluid

### **CYLINDER MOVES ON ITS OWN**

- Check hydraulic hoses for any fluid leakage
- Check fittings at the cylinder ports for leakage
- Check cylinder tube for leakage
- Counterbalance block or cartridge dirty
- Counterbalance block or cartridge seals damaged/leaking
- Counterbalance block operating improperly
- Internal cylinder seals damaged/leaking

### **ONE CYLINDER DOESN'T MOVE**

- Component obstructed
- Check hydraulic hoses for fluid leakage
- Check fittings at the cylinder ports for leakage
- Check cylinder tube for leakage
- Counterbalance seals damaged/leaking
- Internal cylinder seals damaged/leaking
- Hydraulic valve jam nut loose/missing
- Hydraulic valve stroke incorrect
- Hydraulic valve damaged/defective
- Check solenoid connectors for proper connection
- Check electrical system on machine
- Check electrical connection to truck
- Check fuses on fuse panel
- Check fault codes on controllers

### **NO PTO ENGAGEMENT (air engagement)**

- Check truck system air pressure.
- Check PTO air controls
- Check for broken/damaged air lines
- Check for any loose air lines on air controls
- Check air lines at the PTO
- Check for any loose/damaged air line fittings
- Service PTO

### **NO PTO ENGAGEMENT (manual engagement)**

- Check PTO cable for binding or interference
- Check PTO cable for travel or stroke
- Service PTO

### **ELECTRICAL CONTROLS (do not operate)**

- Won't turn on (no power)
  - Check main fuse and wire connection
  - Check for 12V on truck
  - Check truck fuse block for 12V
  - Ensure E-stop switches are in ON position
  - Check for damaged harness from truck

- Won't turn on (power present)
  - Check controller fuses
  - Check ground connections and continuity

### **SOME ITEMS TURN ON AND OTHERS WON'T**

- Check fuses
- Check for 12V at fuse blocks
- Check harness plug to component for 12V and ground
- Replace non-working component

### **SEVERAL FUNCTIONS NOT WORKING**

- Functions are on the same controller
  - Check for proper operation of controller
  - Check for blink codes on controller
  - Check power and ground to controller
  - Check continuity on valve sections
  - Check pulsar operation of valve
  - Replace controller

- Functions are on both controllers
  - Check power and ground to controllers
  - Check for blink codes on controllers
  - Check receiver operation
  - Check continuity on valve sections
  - Check pulsar operation of valves
- Functions are all proportional (lift and tilt)
  - Check power and ground to controllers
  - Check for blink codes on controllers
  - Test diodes and diode harness
  - Test system with a plus-1 diagnostic tool

## **ELECTRICAL CONTROLS (one function not working)**

Section won't work in either direction

- Check fuse and wire connection
- Check power and ground to controller
- Check for blink codes on controller
- Check continuity on pulsar cartridge
- Manually operate valve (ensure valve operates)
- Use a different remote

Section won't work in one direction

- Check fuse and wire connection
- Check power and ground to controller
- Check for blink codes on controller
- Check continuity on pulsar cartridge
- Apply 12 V to pulsar cartridge
- Check wiring harness
- Swap cartridge with functioning one

Proportion section not working

- Check power and ground to controller
- Check for blink codes on controller
- Check continuity on pulsar cartridge
- Apply 12 V to pulsar cartridge
- Test diodes and diode harness
- Test system with a plus-1 diagnostic tool

## **ERRATIC OR RUNAWAY OPERATION**

Sympathetic operation

- Disconnect pulsar cartridge of sympathetic function
- Check for short in wiring harness

Runaway function

- Disconnect pulsar cartridge of runaway function
- Check for blink codes on controller
- Swap cartridge with functioning one

Sporadic operation

- Check power and ground to controller
- Check for blink codes on controller
- Check pulsar cartridge resistance
- Check pulsar cartridge wiring harness
- Swap cartridge with functioning one