**DIVERSIFIED METAL FABRICATORS, INC.** 

# Installation and Parts & Service Manual ROTO 180



July 2021

SERIAL NUMBER

NOTE: Please refer to the serial numbers when ordering parts or inquiring about warranty items.

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# Message from DMF

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# SECTION 1.0 GENERAL INFORMATION

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# 1.1 GENERAL DESCRIPTION

The DMF ROTO 180 system is a rotating dump body that allows the operator to deposit its payload anywhere within a 180° arc. Between the dump body and the truck chassis is the hydraulically actuated subframe. This two-piece subframe is joined through a bearing allowing the dump body to rotate about the truck frame. Within the structure are hydraulic cylinders used to lift and rotate the dump body. The ROTO 180 system offers two different dump body sizes, a 12' long 10-12 cubic yard and a 14' long 12-14 cubic yard dump body. Two control options are offered with this system, see the following sections for a description on both.

#### 1.1.1 HydraForce Manifold ROTO 180 System Controls

The HydraForce ROTO 180 System is operated by a manifold mounted within the subframe. Toggle switches mounted in the cab, activate 12 VDC solenoid valves to operate the lift, rotation and tailgate functions of the dump body.

#### 1.1.2 PVG Valve ROTO 180 System Controls

The PVG Valve ROTO 180 System uses a PVG valve block, mounted to the exterior of the subframe, to control the hydraulic system. Proportional valves smooth out the movement of the lift and swing functions. The system is controlled using a keypad and joystick mounted within the cab of the truck. All major electronics and hydraulics are mounted outside of the subframe for easy access and serviceability. An optional wireless remote is available for operation outside the cab.

## 1.2 SPECIFICATIONS

#### 1.2.1 Standard Dump Body

- 12' subframe weight 2,180 lbs.
- Standard 12' dump body 6,100 lbs.
- 14' subframe weight 2,690 lbs.
- Standard 14' dump body 6,290 lbs.
- 12' dump body is 144" long and 40" high walls with optional side board pockets. See Section 5 for other body options.
- 14' dump body is 168" long and 46" high walls with optional side board pockets. See Section 5 for other body options.
- Apron 30" long and full width of body, ¼" thk steel, fixed side plates and hinged to dump body
- Inside width 85"
- Tailgate height varies
- Floor thickness 1/4"
- Side walls 10 gauge 50,000 PSI yield steel
- Side braces 10 gauge steel
- Tailgate high tensile steel with formed top rail and boxed reinforcements
- Cross members 3" x 2" x 11 gauge rectangular tubing
- Longitudinal members 6" x 2" x ¼" rectangular tubing

#### 1.2.2 Hydraulic Requirements

**Power Source -** PTO/pump combination **System Requirements -** 21 GPM at 2,000 PSI **Reservoir Capacity -** 25 gal minimum

#### 1.2.3 Rotating Subframe & Hoist

Maximum Lifting Capacity - 60,000 lbs. Hoist Speed - 50 Secs. to 40° Unloaded Floor Height Above Frame Rail - 19" for 14' Body, 18.5" for 12' Body Dump Angle - 40° max Hoist Cylinder - Telescoping (3 Stage Single Acting) Hoist Cylinder Bore/Stroke - 6-5-4 x 111" Turning Speed - 1/2 RPM Swing Actuator - Hydraulic Cylinders Thrust Bearing - 43" Diameter Max. Moment Load - 120,000 ft.-lbs. Hydraulic Valves - Manifold/PVG Valve Block

#### 1.2.4 Safety Features

The ROTO 180 system has built in safety features to keep personnel safe and equipment functioning properly. The tailgate is set to automatically release at 22° to prevent sudden load shifts that could derail the truck. This function may be overridden by the operator at any time however at their own risk. The dump body is restricted to a 40° lift angle to prevent overextending the hoist cylinder, damaging the rear of the truck or damaging the rear Railgear. A swing alarm sounds whenever the dump body is rotated. A safety strut is provided for use when servicing the system.

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The HydraForce manifold is located within the ROTO 180 system subframe. The manifold is controlled from a set of toggle switches mounted to the dashboard of the truck, see Figure 2.1. If equipped, a vibrator toggle switch may be included on this mount and a tarp control switch mounted to the dashboard.



Figure 2.1 - HydraForce Manifold Dashboard Mounted Controls

#### 2.1.1 Enable System

- 1. Engage the PTO as outlined in the PTO's Operations Manual.
- 2. If the truck is equipped with a hydraulic selector valve, shift it for operation of the ROTO 180 system.
- 3. PULL out or toggle the "SYSTEM ENABLE" switch, to enable the system. The red light will come on to indicate that the system is operational.

#### 2.1.2 Disable System

- 1. PUSH in or toggle the switch, to disable the system. The red light will turn off to indicate the end of the task.
- 2. Disengage the PTO as outlined in the PTO's Operations Manual.

#### 2.1.3 Raising Body – HydraForce Manifold

#### **A**WARNING

Operation of the ROTO 180 system with the body rotated away from the center position requires the use of either manual or hydraulic Raildogs to stabilize the truck. For operation of Raildogs, refer to the separate Raildogs Manual.

#### **A**WARNING

The tailgate is set to open automatically at 22° of body lift to avoid sudden load shifts which could derail the vehicle. This feature can be bypassed using the "OVERRIDE" switch. The use of this switch is only intended for maintenance and repair activities and not for everyday use.

- 1. Check the position of the tarp and open it completely.
- 2. Hold the hoist switch in the "HOIST RAISE" position. The body will pause at 22° while the tailgate opens and stop moving completely at 40°. Releasing the switch at any time will stop the body from raising.
- 3. The tailgate may be operated, at any time, by moving the "TAILGATE" switch to "RELEASE" and holding until fully opened. The automatic tailgate release may be overridden by holding the "OVERRIDE" button, while raising the body.
- 4. If equipped, the vibrator may be operated at any time while dumping. To prevent overloading follow the operating guidelines provided by the manufacturer.

#### 2.1.4 Lowering Body – HydraForce Manifold

- 1. Switch hoist to "HOIST LOWER". The switch will stay in this position and a red LED will illuminate. To stop the dump body from lowering, toggle the switch to its neutral position.
- 2. Lower the dump body fully and center it with respect to the truck chassis to engage the center lock pin, as shown in Figures 2.1.4.A and 2.1.4.B.



Figure 2.1.4.A - Center Lock Pin Engaged



Figure 2.1.4.B - Engaging the Center Lock Pin

- 3. After the body has lowered, switch "HOIST" to its neutral position. The red LED will turn off.
- 4. Latch the tailgate by switching "TAILGATE" to the "LATCH" position until fully engaged.

#### 2.1.5 Swinging Body – HydraForce Manifold

#### **A**WARNING

The dump body may only be used to swing while on rail and with Raildogs deployed. There is an increased risk of tipping when the dump body is raised. This is especially true when the truck is on super elevated track or the body is rotated away from center.

- 1. Before swinging the dump body, ensure the dump body has been lifted enough for the center lock pin to clear.
- 2. Activate the "SWING" switch to rotate the <u>REAR</u> of the dump body in the intended direction. An alarm will sound while the body is being rotated. Releasing the switch at any time will stop the dump body from moving.
- 3. After dumping, lower and center the dump body. Check for center lock pin engagement and latch the tailgate.

# 2.2 OPERATIONS – PVG VALVES IN CAB

The PVG Valves and the electrical interface box are mounted on the exterior of the ROTO 180 subframe for easy access and serviceability. The primary method of operation is from the joystick within the truck cab. In cases of troubleshooting or electrical failure the PVG Valves can be manually operated from outside the cab. Manual operation however overrides many of the system's safety functions and should be used only as a last resort.

#### 2.2.1 PVG Valves – In Cab Controls

The in-cab controls consist of a joystick and keypad mounted to an adjustable base. The base is secured to the floor of the truck and can be positioned for ease of operation, see Figure 2.2.1.A. Figure 2.2.1.B shows a top view of the keypad and its available options.

A wiring harness runs from the electrical control box, mounted to the front of the subframe, into the truck cab to interface with the joystick and keypad.

#### Joystick Mount Height Adjustment:

- 1. Loosen the locking handle until there is movement between the upper assembly and lower weldment. Reference Figure 2.2.1.A for joystick assembly nomenclature.
- 2. Hold the upper assembly in place before removing the wire lock pin.
- 3. Ensure there is adequate slack in the wiring harness within the tubes before adjusting the upper assembly.
- 4. Align the upper assembly through hole with the desired lower weldment through hole and insert the wire lock pin, **being careful not to pinch the wiring harness**.
- 5. Tighten the locking handle until there is no play between the upper assembly and lower weldment.



Figure 2.2.1.A - PVG Joystick Assembly



Figure 2.2.1.B - Keypad Top View

#### 2.2.2 Enable System – Within Truck Cab

- 1. Engage the PTO as outlined in the PTO's Operations Manual. The ROTO 180 system can only be enabled while the PTO is engaged.
- 2. If the truck is equipped with a hydraulic selector valve, shift it to activate the ROTO 180 system.
- 3. Press the "ROTO ENABLE" button found on the keypad. All 3 LEDs will illuminate on this button when enabled, see Figure 2.2.2. If the left LED blinks when this button is pressed, the PTO has not been engaged. If the right LED flashes during this step, reference Section 3.4 for troubleshooting the fault code(s).



Figure 2.2.2 - Keypad Top View & LED Locations

#### 2.2.3 Disable System

#### NOTICE

Turning off the system from the keypad is the recommended method to shutdown the ROTO 180 system, however if the PTO is disengaged at any time, the system will also shutdown.

- 1. Lower and center the dump body following the operating instructions in Sections 2.2.6 & 2.2.7. Ensure the tailgate has also been latched closed, using the keypad.
- 2. Press the "ROTO ENABLE" button. The center and right LEDs will turn off. The left LED will remain on until the PTO has been disengaged.
- 3. Disengage the PTO as outlined in the PTO's Operations Manual.

#### 2.2.4 Operator Presence Switch

Joysticks assembled after 2016 are equipped with an operator presence switch located on the grip. This switch, must be held by the operator to perform all functions of the joystick. The operator presence switch has been added as a safety feature but is only activated when ordered as an option by the customer.

#### 2.2.5 Raising Body – In Cab Operation

#### **A**WARNING

Operation of the ROTO 180 system with the body turned away from the center position requires the use of either manual or hydraulic Raildogs to stabilize the truck. For operation of the Raildogs, refer to the separate Raildogs Manual.

#### **A**WARNING

The tailgate is set to open automatically at 22° of body lift to avoid sudden load shifts which could derail the vehicle. This feature can be bypassed using the "OVERRIDE" button on the joystick. The use of this button is only intended for maintenance and repair activities and not for everyday use.

1. Check the position of the tarp and open it completely using the keypad.

2. Pull the joystick back towards the rear of the truck to raise the body. Returning the joystick to its neutral position at an time will stop the body from rising. See Figure 2.2.5 for joystick operation.



Figure 2.2.5 - Joystick Operation

- 3. The dump body will pause at 22° while the tailgate opens and stop moving completely at a max height of 40°. When the body reaches max height an alarm will sound, the body will stop moving and then lower slightly.
- 4. The tailgate may be operated at any time by pressing and holding the "RELEASE TAILGATE" button on the keypad until fully opened. The automatic tailgate release may be overridden by holding the "AUTO GATE OVERRIDE" button on the joystick, while raising the body.
- 5. If equipped, the vibrator may be operated from the joystick at any time while dumping. Follow the vibrator manufacturer's operating instructions to prevent overloading.

#### 2.2.6 Lowering Body – In Cab Operation

- 1. With the joystick in its neutral position, push it forward towards the front of the truck to lower the body. To stop the dump body from lowering, bring the joystick back to its neutral position.
- 2. Lower the dump body fully and center it with respect to the truck chassis to engage the center lock pin, as shown in Figures 2.1.4.A and 2.1.4.B.
- 3. Latch the tailgate by pressing and holding the "LATCH TAILGATE" button on the keypad until fully engaged.

#### **NOTICE** The left LED on "RELEASE TAILGATE" will illuminate when the tailgate is unlatched.

#### 2.2.7 Swinging Body – In Cab Operation

#### **A**WARNING

The dump body may only be used to swing while on rail and with the Raildogs deployed. There is an increased risk of tipping when the dump body is raised. This is especially true when the truck is on super elevated track or the body is rotated away from center.

- 1. Before swinging the dump body, ensure the center lock pin has cleared the body lock.
- 2. Move the joystick to rotate the <u>REAR</u> of the body in the intended direction. See Figure 2.2.5. An alarm will sound while the body is being rotated. Releasing the joystick at any time will stop the dump body from moving.
- 3. Release the joystick when the dump body is rotated to the desired location. The more the joystick is displaced from its neutral position the faster the body will swing.
- 4. After dumping, lower and center the dump body. Check the center lock pin engagement and latch the tailgate.

# 2.3 OPERATIONS – PVG VALVES WIRELESS REMOTE

The ROTO 180 system can be operated from outside the truck through the use of the optional wireless remote. The remote can perform all the operations available in the cab with the exception of enabling the ROTO 180 system and operating the tarp, see Figure 2.3. The proportional ability of the remote has been built into the logic of the controller. Each movement will ramp up to full speed when the button is held down.



Figure 2.3 - Wireless Remote

#### 2.3.1 Enable System - Wireless Operation

- 1. Follow the steps in Section 2.2.2 to enable the system.
- 2. Press the "REMOTE ENABLE" button on the keypad. The left and center LEDs will become illuminated. At this time the system will not react to any inputs from the joystick or keypad.
- 3. Press the green "ON" button on the wireless remote. The "REMOTE ENABLE" right LED will illuminate when the remote is linked to the system. If this LED does not turn on, see Section 3.4 for troubleshooting.

#### 2.3.2 Disable System – Wireless Operation

#### From the Remote:

- 1. Press the red "OFF" button on the wireless remote. All lights on the remote will turn off at this time. This operation will turn off the "REMOTE ENABLE" button on the keypad.
- 2. Verify that the "REMOTE ENABLE" button has been turned off. The system can now be controlled from the joystick.
- 3. Continue to Section 2.2.3 to fully disable the system.

#### From the Keypad:

- 1. The wireless remote can be deactivated by pressing the "REMOTE ENABLE" button on the keypad. All LEDs on this button will turn off when pressed.
- 2. Press the red "OFF" button on the wireless remote. The system can now be controlled from the joystick.
- 3. Continue to Section 2.2.3 to fully disable the system.

#### 2.3.3 Raising Body – Wireless Operation

#### **A**WARNING

Operation of the ROTO 180 system with the body turned away from the center position requires the use of either manual or hydraulic Raildogs to stabilize the truck. For operation of Raildogs, refer to the separate Raildogs Manual.

#### **A**WARNING

The tailgate is set to open automatically at 22° of body lift to avoid sudden load shifts that could derail the vehicle. This feature can be bypassed using the "OVERRIDE GATE" button on the remote. The use of this button is only intended for maintenance and repair activities and not for everyday use.

- 1. Check the position of the tarp and open it completely using the keypad.
- 2. Press and hold the "BODY RAISE" button on the wireless remote. Releasing the button at any time will stop the body from raising. The dump body will pause at 22° while the tailgate opens and stop moving completely at a max height of 40°. When the body reaches the max height an alarm will sound, the body will stop moving and then lower slightly. This indicates that the max height has been reached.
- 3. The tailgate may be operated at any time by pressing and holding the "GATE OPEN" button on the remote until fully opened. The automatic tailgate release may be overridden by holding the "OVERRIDE GATE" button, while raising the body.
- 6. If equipped, the vibrator may be operated from the remote at any time while dumping. Follow the vibrator operating guidelines as described in the user manual to prevent overloading.

#### 2.3.4 Lowering Body – Wireless Operation

- 1. To lower the dump body using the wireless remote press and hold the "LOWER BODY" button. To stop the dump body from lowering, release the "LOWER BODY" button.
- 2. Lower the dump body fully and center it with respect to the truck chassis to engage the center lock pin, as shown in Figures 2.1.4.A and 2.1.4.B.
- 3. Latch the tailgate by holding the "LATCH GATE" button until fully engaged.

#### 2.3.5 Swinging Body – Wireless Operation

#### **A**WARNING

The dump body may only be used to swing while on rail and with Raildogs deployed. There is an increased risk of tipping when the dump body is raised. This is especially true when the truck is on super elevated track or the body is rotated away from center.

- 1. Before swinging the dump body, ensure the center lock pin has cleared the body lock.
- Press and hold the desired swing direction on the remote to rotate the back of the dump body in the intended direction. An alarm will sound while the body is being rotated. Releasing the button at any time will stop the body from swinging.
- 3. Release the button when the dump body is rotated to the desired location.
- 4. After dumping, lower and center the dump body. Check the center lock pin engagement and verify the tailgate has also been latched.

## 2.4 OPERATIONS – MANUAL PVG VALVES OPERATION

The levers on the PVG Valves can be used to manually operate the ROTO 180 system from outside the truck. These levers operate the hoist, the rotation of the dump body and the tailgate, see Figure 2.4.



Figure 2.4 - PVG Valves

## **ACAUTION**

Manual operation of the PVG Valves bypasses many of the safety features associated with this system thus should be only used as a backup operation method.

#### NOTICE

The following subsections assume the operator has completed all steps found in Section 2.2.2 to enable the ROTO 180 system.

#### 2.4.1 Raising Body – Manual Operation

#### **A**WARNING

Operation of the ROTO 180 system with the body turned away from the center position requires the use of either manual or hydraulic Raildogs to stabilize the truck. For operation of Raildogs, refer to the separate Raildogs Manual.

#### **A**WARNING

If the PVG Valves are being operated manually, because of a power failure, the max height function will <u>not</u> limit the height of the body. This could result in major damage to the truck or the overextension of the hoist cylinder if extended past 40°. The electrical problem should be addressed immediately when the truck is in a safe location and off the rail.

#### **A**WARNING

Operating the PVG Valves manually overrides the auto release tailgate, swing alarm and the remote operation. This method of operation should <u>only</u> be used as a backup means to operate the system.

- 1. Check the position of the tarp and open it completely from the keypad.
- 2. The PVG Valves are located behind the cab of the truck. Move the PVG Valve lever in the direction of "RAISE BODY" to raise the body. Releasing the lever from this position at any time will stop the body from moving. See Figure 2.4.1.
- 3. When the body reaches 40° an alarm will sound to indicate the max height has been reached. The lever will also push in the opposite direction. Release the lever at this time to avoid damage to the vehicle.

#### **ACAUTION**

The max height alarm and lever push back are dependent on the roto electrical system being enabled and functioning properly. If there is an electrical system problem these warnings may not function properly to indicate the max height has been reached. If proper precautions are not taken damage to the truck or lift cylinder may result.

4. The tailgate may be operated at any time by moving the specified lever in the "OPEN GATE" indicated direction until fully opened. See Figure 2.4.1.



Figure 2.4.1 - Manual Operation of PVG Valves

#### 2.4.2 Lowering Body – Manual Operation

#### **A**WARNING

Operating the PVG Valves manually overrides the auto release tailgate, swing alarm and the remote operation. This method of operation should only be used as a backup means to operate the system.

- 1. To lower the dump body, locate the PVG Valves on the exterior of the truck. Move the specified lever in the "LOWER BODY" direction as indicated on the valve block. To stop the dump body from lowering, bring the lever back to its neutral position.
- 2. Lower the dump body fully and center it with respect to the truck chassis to engage the center lock pin, as shown in Figures 2.1.4.A and 2.1.4.B.
- 3. Latch the tailgate by moving the lever in the "LATCH GATE" direction as indicated until fully engaged.

#### NOTICE

The left LED on the "OPEN GATE" button on the keypad will illuminate when the tailgate is unlatched.

#### 2.4.3 Swinging Body – Manual Operation

#### **A**WARNING

Operating the PVG Valves manually overrides the auto release tailgate, swing alarm and the remote operation. This method of operation should only be used as a backup means to operate the system.

#### **A**WARNING

The dump body may only be used to swing while on rail and with Raildogs deployed. There is an increased risk of tipping when the dump body is raised. This is especially true when the truck is on super elevated track or the body is rotated away from center.

- 1. Before swinging the dump body, ensure the center lock pin has cleared the body lock.
- 2. The PVG Valves are located on the exterior of truck. Move the lever on PVG Valves labeled in the direction of "SWING RIGHT" or "SWING LEFT" to rotate the <u>REAR</u> of the body in the intended direction. Releasing the lever from this position at any time will stop the body from swinging. See Figure 2.4.1.
- 3. Release the lever when the dump body is rotated to the desired location. The more the lever is displaced from its neutral position the faster the body will swing.
- 4. After dumping, lower and center the dump body. Check the center lock pin engagement and verify the tailgate has also been latched.

## 2.5 OPERATIONS – POST DUMP TRAVEL

The following checklist must be performed prior to driving the truck:

- 1. Fully lower and center the dump body about the truck frame following the instructions listed previously in this section. The center lock pin must be fully engaged as shown in Figure 2.1.4-A.
- 2. Release and store the Raildogs following the instructions outlined in the Raildogs Manual.
- 3. Latch the tailgate shut.
- 4. Disable the ROTO 180 system following the instructions listed earlier in this section.
- 5. Disengage the PTO following the manufacturer's instructions.
- 6. If the dump body is equipped with a foldable dump apron it must be secured in the stowed position prior to driving the truck on the highway. This must be done to abide by highway safety regulations.

# SECTION 3.0 ROUTINE MAINTENANCE & TROUBLESHOOTING

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# **3.1 INSPECTION AND MAINTENANCE**

#### 3.1.1 Daily

- Visually inspect for hydraulic fluid leaks.
- Check and make sure that all threaded fasteners are secured.
- Check and make sure all tie straps securing hoses from moving parts and exhaust systems are in place. Replace if cracked or worn.

#### 3.1.1 Weekly

- Perform daily maintenance.
- Grease all ROTO fittings according to the locations in Section 3.2.
- Check level of hydraulic oil and all other fluids.

#### 3.1.2 Bi-Annually

- Perform daily and weekly maintenance.
- Clean the strainer/filter in the hydraulic power unit tank.

#### 3.1.3 Annually

- Perform daily, weekly and bi-annual maintenance.
- Service hydraulic system following the manufacturer's specifications.
- Replace the oil filter element.
- DMF recommends inspecting the ROTO 180 swing bearing annually for wear.

The bearing manufacturer recommends replacement when the bearing play exceeds 0.065". A dial indicator w/ an articulating arm and a magnetic base is recommended for taking these measurements. A low profile pancake jack rated for at least 5 tons will also be needed. The following procedure should be used for taking bearing play measurements at the locations indicated.

## **ACAUTION**

The dump body tailgate will open automatically at 22° and dump any remaining payload unless the "override" button is held. It is recommended to completely empty the dump body before preforming this procedure.

- 1. Figure 3.1.3.A shows the four locations requiring bearing play measurements.
- All measurements are taken w/ respect to the centerline of the upper subframe. This
  reference is also to be used when the body is rotated to the side for Measurements 3
  and 4.
- 3. Park the truck on a flat surface with the parking brake applied and appropriate surrounding clearance to fully operate the ROTO 180 system. Ensure the dump body is empty and enable the system following the procedures in Section 2.
- 4. Lower the body fully and locate the center bolt at the front of the bearing securing it to the upper subframe. This location is "Measurement 1" in Figure 3.1.3.A.
- 5. A dial indicator should be used to measure the bearing play as shown in, Figure 3.1.3.B. Attach the base of the dial indicator to the lower subframe and position the indicator to take a vertical measurement with respect to the upper subframe. Make sure the indicator is zeroed out before taking the measurement.

- 6. Place the lifting jack in the location shown. The jack should rest on the lower subframe and apply a force to the upper subframe or bearing flange close to the dial indicator for an accurate measurement. Write down the value.
- 7. Unload the jack and zero out the indicator then repeat the process for a second measurement.
- 8. Remove the dial indicator and locate the center bolt at the rear of the bearing connected to the upper subframe. This is the location for "Measurement 2" in Figure 3.1.3.A. This "center bolt" will be used as a reference on the remaining two measurement locations.
- 9. Follow steps 4 through 6 to setup and to take measurements in this location.
- 10. Remove the dial indicator and jack then rotate subframe clockwise to approximately 45 degrees as shown. Take a measurement for "Measurement 3" about the rear "center bolt".
- 11. Finally rotate the body counterclockwise to the opposite side approximately 45 degrees off of center. Follow steps 4 through 6 for measurements at this location, "Measurement 4".
- 12. Compare the measurements at all locations to the manufacture's recommendations. If there are any outliers repeat the measurements for verification. A bearing that exceeds these recommendations should be replaced <u>immediately</u> to prevent failure. Contact DMF for additional assistance.



Figure 3.1.3.A - Roto 180 Bearing Play Measurement Locations



Figure 3.1.3.B - Roto 180 Swing Bearing Measurement

# **3.2 LUBRICATION SPECIFICATION**

- Grease Fittings:
  - Factory Standard Citgo Syndurance Premium Synthetic 460 #2
  - Warm Climates Mystik JT-6 Hi-Temp Multi-Purpose Grease #2 or equivalent
- Hydraulic Oil: ASTM D6158 HM (Unax RX-46 Hydraulic Oil, Shell Tellus EE 46 or equivalent) or Dexron III ATF
- Oil Filter Element: Gresen FSP212-1EBNH or equivalent
- Subframe Filter: Schroeder 3000 PSI Pressure Filter NF301NZ10SD-5



# **3.3 TROUBLESHOOTING – HYDRAFORCE MANIFOLD**

#### NOTICE

Thoroughly clean the entire manifold and its surroundings before removing any hoses or components to avoid introducing any foreign debris into the manifold.

#### **A**WARNING

Always set the support strut before working beneath the dump body. The strut prevents the dump body from lowering unexpectedly.

#### **3.3.1 General Procedures for Common Issues**

Many of the common problems with this system can be addressed by following the steps below. If these steps do not solve or identify the issue at hand, continue on to the following sections.

- 1. If equipped with a hydraulic diverter valve, ensure it has been switched to operate the ROTO 180 system.
- 2. Ensure the PTO has been engaged properly following the PTO's Operations Manual.
- 3. Verify the ROTO 180 system has been enabled and the red LED is illuminated.
- 4. Ensure the body is raised above the center lock pin before attempting to rotate.
- 5. Ensure hydraulic fluid levels are adequate to operate all cylinders. If the hoist cylinder has been raised, the fluid level in the tank will appear low.
- 6. Check for any signs of hydraulic leaks and tighten fittings as necessary.
- 7. Check for clearance between the upper and lower subframes. They should never contact unless the dump body has been overloaded or the subframe has been bent. If in contact the ROTO 180 will have difficulty swinging.

#### 3.3.2 Movement Troubleshooting

#### The dump body will not rise

- A. Refer to Section 3.3.1 to address some of the common issues with the HydraForce Manifold.
  - 1. Check to see if the tailgate functions properly and listen for hydraulic loading on the hoses.
    - If there is no response there is an issue with the hydraulics or the pump. Refer to the hydraulics troubleshooting, Section 3.3.3.
    - Continue on if the other functions work properly.
  - 2. Check the needle valve that manually overrides the lowering operation. <u>This</u> issue does not affect systems built after July 2020 because the needle valve's function has been changed to lift the dump body.
    - If the valve is not completely closed and the jam nut fully seated hydraulic fluid will bypass the hoist cylinder and be routed to the tank.
  - 3. Disconnect the main hoist cylinder from the dump body to raise it high enough and set the support strut. Remove the subframe cover plate to access the manifold. <u>In systems built after July 2020 the needle valve mentioned in the</u> <u>above step can be used to lift the dump body to gain access to the subframe, it is</u> <u>no longer necessary to disconnect the hoist cylinder to raise the body.</u>
  - 4. Find the solenoid valve for raising the dump body. The electrical connector will illuminate when power is being supplied to the valve.
    - If this connector is not illuminated refer to Section 3.3.4 for electrical troubleshooting.
    - If the connector is illuminated ensure it is fully seated. Check that the valve has been properly grounded. If this does not solve the problem

there is an issue with the solenoid valve, coil or an obstruction in the manifold. Contact DMF for additional assistance.

#### The dump body will not lower

- A. Refer to Section 3.3.1 to address some of the common issues with the HydraForce Manifold.
- B. After depressing the 'HOIST LOWER' switch the red indicator should illuminate.
- C. Verify the return hose from the manifold has a dedicated line back to the tank.
  - 1. The hose should not pass through any type of return filter or connect to any other hoses.
    - The resulting back pressure will significantly decrease the rate at which the dump body lowers.
- D. Check that power is being supplied to the manifold solenoid valve.
  - 1. Support the dump body using the support strut and remove the subframe cover to access the manifold.
  - 2. The connector supplying power to the valve will be illuminated if it has been wired correctly.
    - If the connector is not illuminated there is an issue with the electrical. Follow the steps in Section 3.3.4 for electrical troubleshooting.
    - If the connector is illuminated ensure it is fully seated. Check that the valve has been properly grounded. If this does not solve the issue there is an issue with the valve, solenoid or the manifold is obstructed. Contact DMF for additional assistance.

#### Dump body has trouble swinging or with tailgate operations

- A. Address common issues, see Section 3.3.1.
- B. Check the operation of other functions.
  - 1. Raise and attempt to swing the dump body.
  - 2. Listen for the swing alarm and look for hydraulic loading in the hoses.
    - If none of the other functions operate and there is no hydraulic loading, the issue is with the hydraulic system. See Section 3.3.3 for hydraulic troubleshooting.
    - If the other functions operate correctly the issue is related to the single operation and not the whole system. Continue on for troubleshooting.
    - If the swing alarm does not sound, there is an electrical problem. Reference Section 3.3.4 for electrical troubleshooting.
    - If the swing alarm sounds and there is hydraulic loading but no movement use the test ports to measure pressure in the swing circuit. If there is pressure when tested check that the upper subframe is not touching the lower subframe.
    - If there is no issue between the upper and lower subframe the issue is related to one of the swing cylinders. Replace as needed.
    - If no pressure is detected when testing the swing circuit the issue is with the manifold. Continue on with the troubleshooting.
- C. Check all electrical connection to the HydraForce manifold.
  - 1. Raise the dump body and secure the support strut.
  - 2. Remove the subframe cover to expose the manifold.
  - 3. When power is supplied to a valve, that connector will illuminate.
    - If the connector is not illuminated see Section 3.3.4 for electrical troubleshooting.
      - If the connector illuminates there is power being supplied to the solenoids. Continue on to the next step.
- D. Determine if the valve coils are bad by manually operating the valves.
  - 1. On the end of the valve coils, for the swing and tailgate operations, are manual overrides.

#### **A**WARNING

The swing valve override is operated from within the subframe and will cause the subframe to swing. The operator should use extreme caution to avoid personal injury.

- With the PTO running use a small screwdriver to press the override located at center of each spool on the far end. <u>On ROTO 180 systems built after July 2020</u> <u>a key ring has been attached to the valve. Pushing or pulling this ring will override the coil operation for testing.</u>
  - If the body swings or the tailgate opens in both directions there is no obstruction within the manifold and the solenoid valve assembly should be replaced. Test this by removing the problematic coil and replacing it with a working one. The solenoids valves are the same for the swing and tailgate operations.
  - If the body does not swing or the tailgate does not open there is an issue with either the valve, an obstruction within the flow control or an internal issue with the manifold. Continue on to the next section.
- E. Replace problematic solenoid valve with a working solenoid valve.
  - 1. Replace the problematic solenoid valve with the working valve from the other manifold function and test its operation.
    - If it operates correctly the solenoid valve on the problematic function needs replacing.
    - If the operation does not work there is an obstruction within the manifold or the flow control. Contact DMF for additional assistance.

#### Tailgate is not automatically opening or dump body height is not limited

- A. Address common issues, see Section 3.3.1.
- B. Verify tailgate cylinder is operating properly.
  - 1. With the dump body lowered and empty, operate the tailgate in both directions. Note the direction of the cylinder during both movements.
    - If the cylinder does not move or moves in the opposite direction there is a hydraulics issue, reference hydraulic troubleshooting Section 3.3.3.
- C. Tailgate is not closing properly.
  - 1. Verify latch is properly being closed. Ensure tailgate has closed properly and is restrained by the tailgate latch.
  - 2. The dump body must be lowered fully before latching the tailgate.
- D. Tailgate and height sensors are no longer working.
  - 1. Locate tailgate and height proximity sensors and enable the system.
  - 2. All three sensors will remain illuminated when in range of a ferrous metal object and turn off when not in range. Verify that all are working properly. When the dump body is first raised, the two height sensors on the passenger's side will be illuminated. When the tailgate has been released the tailgate sensor will become illuminated. The sensor is located on the driver's side rear of the dump body.
  - 3. Raise the dump body. When the body reaches 22° <u>the upper height sensors</u> should turn off and the tailgate should release.
  - 4. The <u>lower sensor</u> should turn off at the set max height, approximately 40°. **Do not overextend the hoist cylinder.** 
    - If any of the sensors do not turn off, check to make sure they are positioned correctly.
    - If the sensors do not turn on when tested check the wire connection following Section 3.3.4.
    - If the sensors turn off as expected but the tailgate does not open automatically or the body doesn't stop when reaching max height there is

an issue with one of the sensor relays found behind the toggle switches or a wiring issue. Replace and repair as needed.

#### Dump body not moving in intended direction

A. If the dump body swings opposite of the intended direction, there is an issue with either the wiring or the hydraulics. Reference the hydraulic troubleshooting in Section 3.3.3.

#### NOTICE

The dump body's <u>REAR</u> should swing in the direction indicated by the control switch.

#### Dump body swings too fast

- A. If the body swings too fast, flow controls are located in the upper subframe on the back side of the manifold. On systems built after July 2020 the flow controllers are located at the top of the manifold labeled "FC1" & "FC2".
- B. Turning the adjuster clockwise will restrict fluid flow and slow down the swing speed.

#### **A**WARNING

The ROTO will not swing until the body is raised to clear the center lock pin. Make sure to set the support strut before doing any work within the subframe.

#### 3.3.3 Hydraulic Troubleshooting

- A. Address common issues, see Section 3.3.1.
- B. Verify the issue is hydraulic related.
  - 1. Operate the problematic function and listen for hydraulic loading.
  - 2. Operate one of the other functions and listen for hydraulic loading.
    - If there is no hydraulic loading with either of the operations there is an electrical issue or an issue with the pump. Verify the issue with the pump by attempting to operate the Railgear or hydraulic Raildogs if equipped. Refer to the owner's manual of the pump if the hydraulic functions do not work.
    - If hydraulic loading occurs there is no issue with the hydraulic pump. The issue is related to hydraulic system. Continue on for troubleshooting.
- C. Check for hydraulic leaks.
  - 1. Check the hydraulic tank fluid level for adequate fluid. If the dump body has been raised, take this into account when checking the level.
  - 2. Check around the truck for any signs of system leaks.
    - If found, replace or tighten hoses and fittings as necessary.
  - 3. Engage PTO as outlined in the PTO's Operations Manual. Check again for leaks and damaged hoses.
    - If found, replace or tighten hoses as necessary.
    - If the leak check does not fix the problem continue on.
- D. Determine if the trouble is related to the system as a whole.
  - 1. Operate one of the other functions or the Railgear to help locate the hydraulic issue.
    - If the other operation functions normally there may be an issue with the hydraulic plumbing. See Section 6 for hydraulic schematic. If after checking and the plumbing is correct, there is an issue with either the electrical or manifold. See Section 3.3.4 for electrical troubleshooting.
    - If the alternate operation does not function check the filter and replace as needed. If this does not solve the problem the manifold should be replaced. Contact DMF for assistance.

#### 3.3.4 Electrical System Troubleshooting

- A. Determine if the issue is localized or involves the whole electrical system.
  - 1. Operate multiple functions to see if the system responds.
  - 2. Test the swing function and listen for the swing alarm.
    - If the body moves and the swing alarm sounds, the problem is local to that function and does not involve the whole system. Continue on for troubleshooting.
      - If nothing happens the issue is related to the overall electrical system. Check to make sure the system is grounded properly, all fuses are working properly, there is an adequate power source and none of the circuit breakers have been tripped.
- B. Check power supply to manifold.
  - 1. Raise the dump body and set the support strut.
  - 2. Remove the subframe cover to expose the manifold.
  - 3. Ensure all electrical connectors to the manifold are illuminated when power is being supplied to each function.
    - If all connectors illuminate make sure the connector(s), for the problematic function, are fully seated.
    - If any of the connections do not illuminate lit continue on for troubleshooting.
- C. Test for voltage signal.
  - 1. Locate the terminal strip on the front driver's side of the subframe and remove the protective cover. Visually check for damage to the terminal strip and wires. Repair as necessary.
  - 2. Test for voltage when operating the problematic function. Reference the electrical schematic in Section 7.
  - 3. Test the voltage of another operation. Refer to the electrical schematic.
    - If voltage is detected, check the wire connections leading out of the terminal strip. Perform the same operation on the terminal strip located within the subframe next to the manifold. If this does not solve the problem check that all solenoids have been grounded properly.
    - If voltage is not seen check the wire connections coming into the terminal strip. If this does not solve the issue continue on.
- D. Power to switch panel.
  - 1. Verify the "ROTO ENABLE" LED is illuminated on the switch panel within the cab.
    - If it is not, reference the electrical schematic to troubleshoot the "ROTO ENABLE" switch and to confirm there is power to the ignition source.
  - 2. Check that there is voltage coming into the switch controlling the problematic operation. Check that the voltage changes pins as the switch is toggled.
    - If voltage is not detected at the pins when the switch is used the switch should be replaced.
    - If the switch is not the issue contact DMF for additional support.

# 3.4 TROUBLESHOOTING – PVG VALVES

#### 3.4.1 General Procedures for Common Issues

Many of the common problems with this system can be addressed by following the below steps. If these steps do not solve or identify the issue continue on to the following sections.

- 1. Ensure that all 3 LEDs are illuminated on the keypad "ROTO ENABLE" button. If not see Section 3.4.2 for troubleshooting.
- When the system is not being operated using the wireless remote, verify that none of the LEDs are illuminated on the keypad "REMOTE ENABLE" button. When illuminated, the system will ignore inputs from the joystick and operations from the other keypad buttons.
- 3. Ensure that the right LED on "ROTO ENABLE" is not blinking. If it is, a fault has been detected in the system, see Section 3.4.3 for troubleshooting.
- 4. If equipped with a hydraulic diverter valve, ensure it has been switched to operate the ROTO 180 system.
- 5. Ensure hydraulic fluid levels are adequate to operate all cylinders. If the hoist cylinder has been raised, the fluid level in the tank will appear low.
- 6. Check for any signs of hydraulic leaks and tighten fittings as necessary.
- 7. Test the PVG Valves manually following Section 2.4. Adhere to all warnings in this section. If the dump body operates as intended, the problem is electrical and not hydraulics related.

#### 3.4.2 PVG Valves – Keypad LED Definitions

The keypad, in addition to controlling system functions, also provides the operator with feedback on the operation being performed. Each button on the keypad has 3 LEDs as shown in Figure 3.4.2. If a fault occurs within the system, a fault code will be displayed on the right LED of "ROTO ENABLE", see Section 3.4.3. The meanings of these LEDs are shown below:



Figure 3.4.2 - Keypad LED Identification

#### 1. ROTO ENABLE

LED Location	<u>Solid</u>	<u>Blinking</u>	<u>Off</u>
Left	PTO engaged	PTO not engaged see PTO's Operations Manual	PTO not engaged
Center	ROTO enabled Button pressed	-	-
Right	ROTO enabled	Fault code - see Section 3.4.3	ROTO not enabled

#### 2. WIND TARP

LED Location	<u>Solid</u>	Blinking
Left	Button pressed	-
Center	Button pressed	-
Right	Button pressed	Fault – see fault codes

#### 3. LATCH TAILGATE

LED Location	<u>Solid</u>	Blinking
Left	Button pressed	ROTO not enabled
Center	Button pressed	-
Right	Button pressed	Fault – see fault codes

#### 4. <u>REMOTE ENABLE</u>

LED Location	<u>Solid</u>	<u>Blinking</u>
Left	Remote enabled	ROTO not enabled
Center	Remote enabled Button pressed	-
Right	Remote enabled	-

#### 5. UNWIND TARP

LED Location	<u>Solid</u>	<u>Blinking</u>
Left	Button pressed	-
Center	Button pressed	-
Right	Button pressed	Fault – see fault codes

#### 6. <u>RELEASE TAILGATE</u>

LED Location	<u>Solid</u>	<u>Blinking</u>
Left	Button pressed or Tailgate is unlatched while PTO is operational	ROTO not enabled
Center	Button pressed	-
Right	Button pressed	Fault – see fault codes

#### 3.4.3 Keypad Fault Codes

The PVG Valves are operated by a PlusOne Controller located in the electrical box attached to the front of the subframe. The controller provides the operator with fault codes that are displayed on the keypad. If the ROTO 180 system is not responding to certain commands the operator should first look for any fault codes displayed on the right LED of "ROTO ENABLE" keypad button.

The first digit of the code will blink, followed by a pause and then the last digit of the code. For example, if the LED blinks twice, pauses and then blinks three more times, view fault code 23. When multiple faults occur, they will be displayed consecutively. Depending on the severity of the fault, some functions may not be available until the issue is addressed. A light on the PlusOne Controller also displays the fault codes if the keypad is not working properly.
Blinking Code	Reason for Fault	Corrective Action	
21	Swing Right	Check wiring. Follow Section 3.4.9 for troubleshooting.	
22	Swing Left	Check wiring. Follow Section 3.4.9 for troubleshooting.	
23	Body Raise	Check wiring. Follow Section 3.4.9 for troubleshooting.	
24	Body Lower	Check wiring. Follow Section 3.4.9 for troubleshooting.	
25	Tailgate Release	Check wiring. Follow Section 3.4.9 for troubleshooting.	
26	Tailgate Latch	Check wiring. Follow Section 3.4.9 for troubleshooting.	
27	Tarp Unwind	Check wiring.	
28	Tarp Wind	Check wiring.	
29	Vibrator	Check wiring.	
31	ROTO Enable	Check wiring.	
32	Keypad Offline	Check power, ground and CAN wiring. Typically an issue	
		w/ wiring between electrical box and keypad not the	
		keypad itself.	
33	Remote Offline	Check power, ground and CAN wiring. Check receiver	
		and remote batteries. Ensure remote has been synced to	
		receiver.	
34	Joystick Offline	Check power, ground and CAN wiring. Typically an issue	
		w/ the wiring between the electrical box and the joystick	
		and not the joystick itself.	

When the issue has been addressed, power off the "ROTO ENABLE" button, wait a few seconds and power on again to clear the fault. If this does not clear the fault, cycle the truck ignition. If both operations do not clear the fault code, the issue has not been resolved.

#### 3.4.4 Joystick Troubleshooting

#### Joystick is not functioning

- A. Address common errors see, Section 3.4.1.
- B. Check for hydraulic failures.
  - 1. Test the system manually using the PVG Valves. Make sure to first lift the body above the center lock pin before any testing. Caution the auto tailgate will not function when the dump body is raised manually nor will the max height if there is an electrical failure.
  - 2. Swing the body from side to side. Caution, the swing alarm will not function when the dump body is being rotated manually.
    - If the system responds correctly the issue is electrically related.
    - If the system does not respond there is a hydraulic issue, reference the hydraulic troubleshooting Section 3.4.8.
- C. Verify the joystick is not functioning properly.
  - 1. Raise the dump body beyond the center lock pin by manually operating the PVG Valves.
  - 2. Test the functions of the joystick by attempting to raise the body.
  - 3. Attempt to swing the body in both directions.
  - 4. Press the vibrator button, if equipped, to verify it does not function.
    - This will verify the signal is not being received from the joystick and that there is an electrical issue, see Section 3.4.9 for troubleshooting.

#### 3.4.5 Movement Troubleshooting

#### Dump body is not swinging smoothly

- A. Address common errors, see Section 3.4.1.
- B. Make sure the dump body has not been overloaded or the upper subframe (mounted to the dump body) is not touching the lower subframe (mounted to the truck) in any place other than at the bearing.

- If there is contact, the dump body will have difficulty swinging.
- C. Verify all pivot points have been greased on the subframe, see Section 3.2.
- D. Check for hydraulic system failures.
  - 1. Test the system manually using the PVG Valves to duplicate the operation not functioning properly.
    - If the system responds correctly the issue is electrically related, see Section 3.4.9.
    - If the system does not respond, there is a hydraulic issue. Reference the hydraulic troubleshooting in Section 3.4.8.

### Dump body is not moving in intended direction

- A. Address common errors, see Section 3.4.1.
- B. The swing direction indicates the intended swing direction of the <u>rear</u> of the dump body.
- C. Check for hydraulic failures.
  - 1. Test the system manually using the PVG Valves to duplicate the movement not working properly, see Section 2.4.
    - If the system responds correctly, the issue is electrically related, see Section 3.4.9.
    - If the system does not respond correctly there is a hydraulic issue. Reference the hydraulic troubleshooting Section 3.4.8.

#### 3.4.6 Tailgate Troubleshooting

#### Tailgate is not opening automatically or body is not lifting above 22 degrees

- A. Address common errors, see Section 3.4.1.
- B. Verify tailgate cylinder is operating properly.
  - 1. With the dump body lowered and empty, operate the tailgate manually using the PVG Valve in both directions. Note the direction of the cylinder during both movements.
    - If the cylinder does not move or moves in the opposite direction there is a hydraulics issue, reference hydraulic troubleshooting Section 3.4.8.
  - 2. Operate the tailgate from the keypad in both directions looking for cylinder movement.
    - If the cylinder moves in the opposite direction intended, or does not move at all, there is an electrical issue. Reference the electrical troubleshooting Section 3.4.9. Check the keypad for system faults, see Section 3.4.3.
- C. Tailgate is not closing properly.
  - 1. Verify latch is properly being closed. Ensure tailgate has closed properly and is restrained by the tailgate latch.
  - 2. The dump body must be lowered fully before latching the tailgate.
- D. PVG Valves are being operated manually.
  - 1. The auto tailgate release will not function when the PVG Valves are operated manually.
  - 2. It is not recommended to operate the system in this way due to safety issues. Manual operation is only recommended for system troubleshooting or as a last resort because of a system failure.
- E. Tailgate and height sensors are no longer working.
  - 1. Locate tailgate and height proximity sensors at the rear of the dump body and enable the system following the steps in Section 2.2.1.
  - 2. All three sensors will remain illuminated when in range of a ferrous metal object and turn off when not. Verify that all are working properly. When the dump body is lowered, the two height sensors will be illuminated. When the tailgate has been released the tailgate sensor will illuminate.
    - If the sensors do not respond when tested, see the electrical troubleshooting in Section 3.4.9. Reference drawing 20754 in Section 7.

This will prevent the dump body from rising beyond 22° w/out holding the "OVERRIDE" button on the joystick.

- F. Tailgate or 22° sensor has moved from the original position.
  - 1. Lift the dump body using the joystick or remote, see Section 2.2 or 2.3. When the body reaches 22° the upper height sensors should turnoff and the tailgate should release, illuminating the tailgate sensor on the driver's side.
  - 2. If these sensors both work when tested but do not turn on or off when intended they should be repositioned. If this does not completely fix the issue continue on to Section 3.4.9 for electrical troubleshooting.

# 3.4.7 Wireless Remote Troubleshooting

- A. Address common errors, see Section 3.4.1.
- B. Communication between wireless remote and transmitter.
  - 1. Follow all steps in Section 2.3.1 to enable the wireless remote.
  - 2. Check the "REMOTE ENABLE" on the keypad and verify all three LEDs are illuminated.
    - The right LED indicated the remote has been enabled and the receiver is communicating with the remote
  - 3. Check the wireless remote and make sure the "TX" and "RX" indication lights are flashing.
    - Another indication the remote and receiver are communicating
- C. Cycling power on the Wireless Remote.
  - 1. When the remote is in communication with the system and the remote is turned off by pressing the red "OFF" button, the "REMOTE ENABLE" button on the keypad will also turn off.
  - 2. This button must be pressed again on the keypad and the remote turned back on to continue working wirelessly.
- D. Wireless Remote will not connect to system.
  - 1. Follow all steps in Section 2.3.1 to enable the wireless remote.
  - 2. Check the "REMOTE ENABLE" on the keypad and verify all three LEDs are illuminated.
  - 3. If the right LED is off the receiver is not communicating with the remote. Press the Green "ON" button on the remote. When communication is established the "TX" and "RX" LEDs will start flashing on the remote.
    - If nothing happens when the "ON" button is pressed replace the batteries in the remote and check again.
  - 4. The operator should be close to the cab of the truck when first establishing communication with the wireless remote. Once communication is fully established, the operator can then relocate to a safe location to operate the system.
  - 5. Follow the wiring harness from the electrical interface box to the cab to find the wireless receiver.
    - If the LEDs on the receiver are illuminated, see the Cervis Operation Manual to verify everything is function properly.
    - If there are no LEDs illuminated on the receiver make sure the connector is fully attached. If this does not work follow Section 3.4.9 for troubleshooting the electrical system.

# 3.4.8 Hydraulic System Troubleshooting

- A. Address common errors, see Section 3.4.1.
- B. Verify an issue with the hydraulics.
  - 1. Ensure the PTO has been properly engaged as outlined in the PTO Operations Manual provided with the truck.

- 2. Test the manual operation of the PVG Valves following Section 2.4. **The dump body must be raised to clear the center lock pin before it is rotated.** 
  - If the PVG Valves do not work, continue on to troubleshoot for system leaks.
  - If the PVG Valves operate in the opposite direction, there is an issue with the plumbing. The hydraulic schematics in Section 6 should be referenced to identify the issue.
  - If the PVG Valves operate correctly, there is no issue with the hydraulic system. Continue on to Section 3.4.9 for electrical system troubleshooting.
- C. Check for Hydraulic Leaks.
  - 1. Check the hydraulic tank fluid level for adequate fluid. If the dump body has been raised, take this into account when checking the level.
  - 2. Check around the truck for any signs of system leaks.
    - If found, replace or tighten hoses as necessary.
  - 3. Engage PTO as outlined in the PTO Operations Manual and check again for leaks.
    - If found, replace or tighten hoses as necessary after disengaging the PTO. Test the PVG Valves again to see if the hydraulics issue persists. If the valves are still not working, continue on.
  - 4. Test other hydraulic functions such as the Raildogs. **Do not test by operating the Railgear if on rail.** 
    - If the pump is working, check the inline filter and replace as needed.
    - If nothing is operational, there may be an issue with the PTO, reference the owner's manual.
    - If the Raildogs or Railgear function properly, continue on.
- D. PVG Valves diagnosis.
  - 1. Engage the PTO as outlined in the PTO's Operations Manual provided.
  - 2. Test the functions of all the PVG Valves.
    - If none of the sections respond to input, there is an issue with the PVG Valves and it should be replaced. Contact DMF for additional assistance.
    - If some of the sections do not work, these sections should be replaced. Contact DMF for additional assistance.

# 3.4.9 Electrical System Troubleshooting

- A. Verify the issue is not hydraulic related by following Section 3.4.8.
- B. Ensure power is delivered to PlusOne Controller.
  - 1. With the truck ignition turned on, open the electrical interface box mounted behind the cab of the truck.
  - 2. Locate the PlusOne Controller and ensure there is a green LED illuminated on it.
    - If illuminated, this indicates power is being delivered to the controller.
      - If not illuminated, there is an issue with the battery, a blown fuse, the ignition relay or the wiring.
- C. Check for loose wiring.
  - 1. Reference the Electrical Schematic from Section 7.
  - 2. Make sure the connector on the PlusOne Controller is fully seated.
  - 3. Make sure the power and ground wires are fully seated in the connector.
- D. Check signal input voltage.
  - 1. With power to the PlusOne Controller, find the terminal number associated with the operation functioning incorrectly.
  - 2. Test the voltage across this terminal block while repeating the operation.
    - If there is no voltage across the terminal block, check the wire connection between the controller and terminal strip. If wiring is correct, try testing another operation using the same procedure. If this yields no voltage as

well, the PlusOne may need replacing. Contact DMF for additional assistance.

- If there is a voltage across the terminal strip, a signal is being sent from the PlusOne Controller. Continue on to the next step.
- 3. Follow the wire from the terminal strip to its next connection whether it be the subframe terminal strip or a connector to the PVG Valves.
- 4. If the wires being tested lead into the subframe check for signal voltage at the terminal strip within the subframe.
  - If signal is supplied one of the components upstream of the terminal strip has an issue.
  - If signal is not supplied to the terminal strip there is an issue with the wiring
- 5. If the wires being tested lead to one of the PVG Valves disconnect the connector on the PVG Valve and test for voltage while operating the function from the joystick/keypad or wireless remote.
- 6. Test the other connector on the same valve.
  - If there is voltage across both connectors the valve coil should be changed.
  - If there is no voltage across either of the connectors there may be a continuity or grounding issue between the electrical box and the connector.

# NOTICE

The connector attached to the PlusOne Controller cannot be removed without registering an error in the system. All functions should be tested directly from the terminal strip when possible.

# SECTION 4.0 ROTO 180 INSTALLATION

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# NOTICE

Read <u>all</u> the instructions and check that all required kit parts are included before beginning the installation. The proper installation of this equipment is solely the responsibility of the authorized installer. When in doubt, contact DMF for assistance.

# 4.1.1 Safety Statements

# **A**WARNING

Always use a dump body support strut before going underneath the dump body.

# **ACAUTION**

Use personal protective equipment and clothing when performing any work on the ROTO 180 system.

#### 4.1.2 Tools Required for Installation

- Welder (Arc or Mig)
- Hoist or Overhead Crane
- Frame Drill (with 5/8" Drill Bit)
- Angle Finder

- General Mechanic Tools
- Cutting Torch
- Hand Grinder
- Surge Protector (protects ECM from damage during welding)

# 4.1.3 On Hand Additional Material

Item	Qty.
Hydraulic Hose (Appropriate Size & Rating for System)	As Required
Swivel Hose Ends (Appropriate Size & Rating for System)	As Required
Hydraulic Oil – Unax RX-46 (or Equivalent)	As Required
Grease – Citgo Syndurance Premium Synthetic 460 #2	As Required
Bolts – 5/8"-11 Gr. 8 (for Subframe Attachment)	12
Nylock Nuts – 5/8"-11 Gr 8 (for Subframe Attachment)	12

# 4.1.4 Welding Information

- Dual Shield Wire spec. AWS E71T-1
- Low Hydrogen spec. AWS E-7018

Low Hydrogen Electrodes (AWS E-7018)

Manufacturer Equivalent Welding Rod		
Manufacturer	Welding Rod	
Air Products	AP-7018, 7018IP	
Airco	7018C, 7018-A1	
Arcos	Ductilend 70	
Air Products	170-LA, SW-47,616	
Chemtron	170-LA, SW-47,616	
Hobart	718, 718-SR	
Marquette	7018	
МсКау Со	7018	
Reid-Avery	7018	
Uniblaze	7018	
Westinghouse	Wiz-18	
Lincoln	Jetweld LH-70	

#### 4.1.5 Work Area

The installation area should meet the minimum following requirements to facilitate a safe, accurate and timely installation.

- Floor The floor should be level to provide a good surface for the installation and alignment of the subframe.
- Lighting The work area should be adequately lighted.
- Space There should be enough space to maneuver the subframe and truck body components into position and to safely work around other equipment.

#### 4.1.6 Preliminary Truck Preparation

The truck should be outfitted with a hydraulic system that includes a minimum 25 gallon tank, suction filter, pump, PTO, relief valve and a power beyond/ diverter valve for the Railgear (if equipped). The pump should be capable of 21 GPM at 2000 PSI to operate the Roto 180 System. Engage the PTO as outlined in the PTO's Operations Manual.

#### NOTICE

Frame modifications, other than that required for mounting the ROTO 180 system, must adhere to the truck manufacturer's recommended standard practice.

#### 4.1.7 Purchased Fastener Torque Specifications

See drawing on the following page for torque specifications.

TITLE: Purchased Fastener Torque Specifications

PURPOSE: To establish production methods for the installation of commonly purchased threaded fasteners.

COMMON USAGE: Most areas of multiple part assembly and retention.

PARTS GENERALLY ENCOMPASSED BY THIS PROCEDURE: Most common sizes of SAE J429 Grade 5 and 8 and of ASTM A574 socket head cap screws. PROCEDURE:

A) Identify the fastener as either fine or coarse thread, select the appropriate chart below.

B) Identify the fastener size (diameter and threads per inch), select the appropriate row in the chart selected.

C) Identify grade of the bolt.

D) Read across the size row and down the grade column. The intersection of row and column gives torque.

## FINE THREAD BOLTS

SIZE (DIA-TPI)	SAE J429 GRADE 5 (3 MARKS) PLATED (FTLB)	SAE J429 GRADE 8 (6 MARKS) PLATED (FTLB)	ASTM A574 SOCKET HEAD CAP SCREW (FTLB)
1/4-28	6	8	12
5/16-24	12	15	24
3/8-24	21	27	43
7/16-20	33	43	68
1/2-20	51	66	105
9/16-18	72	96	-
5/8-18	100	135	202
3/4-16	180	223	354
7/8-14	260	350	564
1-12	390	530	860
1 1/8-12	540	750	-
1 1/4-12	745	1050	1697
1 3/8-12	-	-	2288
1 1/2-12	1320	1850	3001

COARSE THREAD BOLTS (MATCHING HEX NUTS			
SIZE (DIA-TPI)	SAE J429 GRADE 5 (3 MARKS) PLATED (FTLB)	SAE J429 GRADE 8 (6 MARKS) PLATED (FTLB)	ASTM A574 SOCKET HEAD CAP SCREW (FTLB)
1/4-20	5	7	10
5/16-18	19	14	22
3/8-16	19	24	38
7/16-14	30	38	61
1/2-13	45	59	93
9/16-12	66	84	-
5/8-11	90	120	179
3/4-10	160	200	317
7/8-9	240	320	511
1-8	360	480	767
1 1/8-7	480	670	1087
1 1/4-7	670	930	1533
1 3/8-6	-	-	2010
1 1/2-6	1170	1650	2668

#### COMMENTS:

A) Torque valves specified are for bolts with residual oils or no special lubricants applied. if special lubricants of high stress capacity (such as Never-Seez, graphite and oil, molybdenum disulphite, colloidal copper or white lead) are applied, multiply the torque values in charts by 0.90. The use of Loctite does not affect the torque values in charts.

B) All values are in Foot-Pounds (FTLB). Multiply by 12 for Inch-Pounds.

- C) Flat washers of equal strength must be used.
- D) Bolt manufacturer's specs should be used when available.
- E) Values shown are for Nylock nuts or Grade C prevailing torque nuts.
- F) Never re-use a highly stressed, torque fastener: IT MAY FAIL!

	07/15/15	UPDATED /	UPDATED ALL TORQUE VALUES, REMOVED PLAIN TORQUE SPECS				DJJ	
$\mathbb{A}$	12/29/99	ADDED RE	ADDED RECOMMENDED TORQUE CHART			LOR		
REV	DATE			DESCRIPTIO	1		BY	APP
TOLERANI (UNLE COMMON FRAC, M FRAC, C .X .XX	CES: <u>SSPECIFIED)</u> <u>SENSE PREVAILS</u> ACH: ± 1/32" THER: ± 1/16" ± .063 ± .030 ± .030			TITLE: PRODUCTION PROCEDURE 006 FASTENER TORQUE SPECIFICATION DIVERSIFIED METAL FABRICATORS, INC. (404) {			l 175–15	12
DRILL SI ANGULAF	ZES: ± .005 c: ± 1	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:
THREADS BREA	NISH: 125 MICRO 3: 2A AND 2B K SHARP EDGES	TSH		06/02/94	ATLANTA	PP006		в

The ROTO 180 system must have the minimum cab to axle length as specified in the table below. The dump body subframe is installed on the chassis with the center of the swing bearing located forward of the tandem centerline. The shift forward allows for better weight transfer to the front axle. See Figure 4.2.A for the subframe positioning.

Dump Body	Minimum Cab to	Swing Bearing
Length	Axle Distance (in)	Centerline Offset (in)
12′	87	3
14′	111	15



Figure 4.2.A - Subframe Mounting Location

1. The lower subframe, located beneath the swing bearing, is bolted to the vehicle frame with four mounting angles and four shear plates. The mounting angles are found on both sides of the swing bearing. Figure 4.2.B shows the location for these components.



Figure 4.2.B - Subframe Component Location

2. Set the ROTO package on the chassis at the pre-determined location and match drill through the mounting angles and chassis frame. Secure the subframe to the truck chassis with 5/8" Grade 8 bolts.

# NOTICE

The slotted leg of the mounting angle bolts to the exposed leg of the mating subframe angle. The slots accommodate different chassis frame widths.

- 3. Use c-clamps to hold the front of the lower subframe firmly against the truck frame. Position a shear plate at the front end of the subframe as shown in the above figure. Tack the plate in place to the subframe. Match drill through the shear plate and truck frame. Bolt the shear plate to the truck frame and fully weld to the subframe. Do the same on the opposite side of the truck.
- 4. Similarly, locate the other two shear plates near the rear end of the subframe and attach as described above. Figure 4.2.B shows the relative position for these shear plates, however the positon will vary from truck to truck.

# NOTICE

If the subframe extends over the Railgear mounting bracket, move the rear two shear plates to  $\frac{1}{2}$ " forward of the Railgear mounting bracket. Do not weld the shear plates to the Railgear bracket.

Refer to the drawing located at the end of this subsection for the overall clearance requirements of the ROTO 180 system during installation.



# 4.3 HYDRAULIC SYSTEM CONNECTION – HYDRAFORCE MANIFOLD

### 4.3.1 Hydraulics Install

As stated earlier, the PTO and hydraulic system requirements are as follows:

- Power source PTO/pump combination
- System requirements 21 GPM at 2,000 PSI
- Reservoir capacity 25 gallons minimum
- 1. On the lower subframe forward of the swing bearing, there are two #12 JIC bulkhead fittings and one #12 JIC hydraulic fitting in the center. See Figure 4.3.1.
- 2. Connect the two bulkhead fittings to the tank. The bulkhead fitting on the driver's side must be a dedicated return to the tank. This fitting comes from the T2 port on the manifold. See the hydraulic schematics on the next page.
- 3. The center #12 JIC fitting is connected to the pressure line from the rear Railgear valve power beyond port. This line must pass through a pressure filter prior to connecting to the subframe. Refer to the hydraulic schematic on the next page.



Figure 4.3.1 - Subframe Hydraulic Connections



# 4.4 ELECTRICAL INSTALLATION - HYDRAFORCE MANIFOLD

- 1. In the kit provided is a switch panel wired with a 16-14 cable, approximately 18 ft. long. Find a suitable hole in the truck firewall (on driver's side) to feed the cable through from the inside of the cab, see Figure 4.4. See electrical schematic on the next page.
- 2. Mount the control panel in a convenient location for the operator. Commonly the panel is located on top of the dashboard at the lower left corner of the windshield. Make certain that the 16-14 cable will not interfere with any pedals or controls.
- 3. Connect the green wire from the "ROTO ENABLE" switch to a 15A fused ignition source.
- 4. Connect the indicator lamp ground (black wire) to a good location under the dash.
- 5. Connect the truck body clearance light wire (black) to either the truck clearance light switch or the parking light tap on the headlight switch.

Recommended Fuse Sizes		
In-Cab Pendant	15 Amps	
Vibrator	60 Amps	
Tarp	50 Amps	



Figure 4.4 - ROTO 180 Controls Cable

- 6. Pull the 16-14 cable down the driver's side of the frame to the driver's front corner of the subframe. Use tie straps to secure the cable and hoses.
- Bolted to the front of the lower subframe is a bracket and cover plate containing a terminal strip. Remove the cover and insert the cable through the opening before connecting to the terminal strip. Connect the 16-14 cable at the terminal strip using the wire color codes.



# 4.5 INITIAL OPERATION – HYDRAFORCE MANIFOLD

- 1. Check the hydraulic fluid level in the tank before operating the system.
- 2. Enable the system following the steps found in Section 2.1.1.
- 3. On the control panel, hold the hoist switch in the raise position. Raise the body a few inches to clear the center lock pin.
- 4. Use the "SWING" switch and rotate the body a few times in both directions to purge the air out of the swing cylinders. For the overall operation of the ROTO 180 system see Section 2.

# 4.6 HYDRAULIC SYSTEM CONNECTION – PVG VALVES

#### 4.6.1 Hydraulics Install

- 1. The PVG Valves are shipped attached to the front of the subframe. The shipping mount securing the valves to the subframe is for shipping purposes <u>ONLY</u>. The valves must be removed from this mount and relocated on the truck frame. Choose a location that safely positions the operator away from the swinging dump body. Do not disconnect or run any new hydraulic hoses until the PVG Valves have been relocated.
- 2. Route all hoses following the hydraulic schematic located at the end of this subsection. Reference Figure 4.6.1.A below for PVG Valve port locations.
- 3. Connect the "P" port on PVG Valves to the "power beyond" of the rear Railgear, first passing through a pressure filter. Use <sup>3</sup>/<sub>4</sub>" sized hoses with swivel fittings.
- 4. Connect the "T" port on the same section back to the tank using a <sup>3</sup>/<sub>4</sub>" sized hose with swivel fittings.
- 5. Connect the "T" port of the hoist section back to the tank using a <sup>3</sup>/<sub>4</sub>" sized hose with swivel fittings. This hose is a dedicated return and must not tee to any other hoses or be routed through a return filter.
- 6. Connect the "TO" port of the PVG Valves back to the tank using a ¼" sized hose with swivel fittings. This hose is a dedicated return and must not tee to any other hoses or be routed through a return filter.



Figure 4.6.1.A - 3 Section PVG Valves - Port Locations

7. Connect a ¼" sized hose from the tank return port on the lower subframe to the tank. See Figure 4.6.1.B for the subframe port location.



Figure 4.6.1.B - Subframe Hydraulic & Electrical Connections



# 4.7 ELECTRICAL INSTALLATION – PVG VALVES

- 1. The joystick and keypad have been provided attached to an adjustable base mount. Use the provided hardware to secure this base mount to the floor of the cab. Choose a location that does not interfere with the truck operation and is easily accessible for the operator. The best spot is typically between the driver and passenger seats.
- 2. Route the provided wiring harness into the cab through the bottom of the joystick. The harness is labeled "Cable 7" on the electrical schematic found at the end of this subsection. The mount allows for the harness to be routed through the floor or run through the back of the mount. See Figure 4.7 for clarification.
- 3. Open the joystick box and route the connectors up through the tubes. Connect the connector to the joystick.
- 4. Route the keypad connector through the wall of the joystick box to the keypad. Close the joystick box and secure the cover.



Figure 4.7 - Joystick/Keypad Mount Wiring

- 5. Attach the wiring harness to the wireless receiver, if equipped. Mount the receiver, with the connector facing down, on the outside of the truck in a location that is both protected and accessible.
- 6. Wire the 16-6 "Cable 6", to the truck's electrical system as detailed in the electrical schematic. Connect the other end of the cable to the matching connecter found on the outside of the electrical box.

- 7. Route the wiring harness, "Cable 7", back to the electrical box on the front of the subframe. Connect the cable to the connector on the outside of the electrical box.
- 8. Within the battery box, mount a 150A circuit breaker within 18" of the positive battery terminal.
- Route the 16-3 "Cable 1" from the electrical box to the negative terminal of the battery and 150A circuit breaker. DO NOT connect the circuit breaker to the battery's positive terminal. As a safety precaution, trip the 150A circuit breaker.
- 10. Within the lower subframe are two 4 AWG cables passing through cord grips, one labeled "positive" and one labeled "negative". Route the "positive" wire to the 150A circuit breaker. Route the "negative" wire to the negative terminal on the battery following the electrical schematic. Pass both cables through the D rings welded to the long rails of the lower subframe.
- 11. Connect a 4 AWG wire from the 150A circuit breaker to the positive terminal of the battery. Reset the circuit breaker after the ROTO 180 installation is complete and ready for testing.
- 12. Secure all cables and wires using tie straps.



# 4.8 INITIAL OPERATION – PVG VALVES

- 1. Check the hydraulic fluid level in the tank before operating the system.
- 2. Enable the ROTO 180 system following the steps found in Section 2.2.2.
- 3. Pull the joystick back towards the rear of the truck to raise the dump body a few inches and clear the center lock pin.
- 4. Move the joystick to the left and right a few times in both directions to rotate the body and purge the air out of the swing cylinders. For the overall operation of the PVG Valves see Section 2.2.



Figure 4.8 - Joystick Movement

# **A**WARNING

The dump body may only be used to swing while on rail and with Raildogs deployed.

# SECTION 5.0 ROTO 180 OPTIONS

5.1	ROTO 180 TOOLBOX AND FUEL TANK OPTIONS - MROTO100	5-2
5.2	ROTO 180 HYDRAULIC TANK OPTIONS - MROTO101	5-3
5.3	ROTO 180 DUMP BODY OPTIONS - MROTO102	5-4
5.4	ROTO 180 DUMP BODY OPTIONS CONTINUED - MROTO103	5-5
5.5	ROTO 180 DUMP BODY LADDER OPTIONS - MROTO104	5-6
5.6	ROTO 180 OPTIONAL VIBRATOR - 870993	5-7
5.7	ROTO 180 TRAILER HITCH OPTIONS - MROTO107	5-8
5.8	ROTO 180 FENDER ASSEMBLY - 20396	5-9
5.9	ROTO 180 RUBBER STEP ASSEMBLY LEFT HAND SIDE - 20331	5-10
5.10	ROTO 180 RUBBER STEP ASSEMBLY RIGHT HAND SIDE - 20332	5-11

















08/05/15

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AND 28

MROTO107

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	ITEM PART NO. QTY DESCRIPTION
	1 20337 1 WELDMENT, STEP TREAD LH, RUBBER & GRIPSTRUT STEP
	2 20334 2 RUBBER STRAP DETAIL, "Z" SHAPED, SOUTHEAST RUBBER
	3 20333 2 ANGLE BRACKET DETAIL, RUBBER & GRIPSTRUT STEP
	4 20339 8 SPACER BUSHING - RUBBER & GRIPSTRUT STEP
$\frown$	5 20341 4 DOUBLER PLATE, RUBBER & GRIPSTRUT STEP
	6 102408 8 HHCS 3/8-16 UNC x 1-1/2" LONG, GRADE 8 (NOT SHOWN)
	<b>7</b> 605077 8 NYLOCK NUT, 378-16 UNC (NOT SHOWN)
	8 100135 4 HHCS 5/16-18 UNC X 3/4" LONG (NOI SHOWN)
	9 20342 4 INYLOCK NUT, 5/16-18 UNC (NOT SHOWN)
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	$\langle \mathbf{A} \rangle$
	(6)(7)
	A 2/28/14 605029 WAS 500693
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	TRAC, MACH: 11/32
	FRAC, OTHER. ± 1/16* X ± .063
	XX ±.030 XX DIVERSIFIED METAL FABRICATORS,INC. (404)875-1512
	ANGULAR: 1° JUD ANGULAR: 1° I JUF FINISH: 125 MCRO
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3	ITEMPART NO.OTYDESCRIPTION1203381WELDMENT, STEP TREAD RH, RUBBER & GRIPSTRUT STEP2203342RUBBER STRAP DETAIL, "Z" SHAPED, SOUTHEAST RUBBER3203332ANGLE BRACKET DETAIL, RUBBER & GRIPSTRUT STEP4203398SPACER BUSHING - RUBBER & GRIPSTRUT STEP5203414DOUBLER PLATE, RUBBER & GRIPSTRUT STEP61024088HHCS 3/8-16 UNC x 1-1/2" LONG, GRADE 8 (NOT SHOWN)76050778NYLOCK NUT, 3/8-16 UNC (NOT SHOWN)81001354HHCS 5/16-18 UNC x 3/4" LONG (NOT SHOWN)9203424NYLOCK NUT, 5/16-18 UNC (NOT SHOWN)
	Image: Constraint of the state of

# SECTION 6.0 ROTO 180 Hydraulics

6.1	ROTO 180 HYDRAFORCE MAN GEN 2, HYD SCHEM – 190176-2
6.2	12' ROTO 180 SUBFRAME, HYDRAFORCE MAN GEN 2, HYD SCHEM - 189916-3
6.3	14' ROTO 180 SUBFRAME, HYDRAFORCE MAN GEN 2, HYD SCHEM - 189896-4
6.4	ROTO 180 HYDRAFORCE MAN GEN 2, HYD SCHEM (HF138555-19) - 189906-5
6.5	ROTO 180 5 SECTION PVG VALVES, HYD SCHEM – 310306-6
6.6	ROTO 180 3 SECTION PVG VALVES, HYD SCHEM - 31029
6.7	12' ROTO 180 SUBFRAME, PVG VALVES, HYD SCHEM - 189556-8
6.8	14' ROTO 180 SUBFRAME, PVG VALVES, HYD SCHEM – 310086-9
6.9	ROTO 180 HYD SWING CYLINDER, RH – 240316
6.10	ROTO 180 HYD SWING CYLINDER, LH – 2403156-11
6.11	ROTO 180 HYD TAILGATE CYLINDER – 182806-12
6.12	CYLINDER ASSEMBLY PRODUCTION PROCEDURE – PP008
6.13	JIC FITTING INSTALLATION PROCEDURE – PP005
6.14	O-RING FITTING INSTALLATION PROCEDURE - PP0036-15
6.15	PIPE FITTING INSTALLATION PROCEDURE – PP004




BY APP

REV:

#



#



ITEM	PART #	QTY	DESCRIPTION
1	605517	1	FITTING, #12 MJIC X #12 MALE SAE O-RING, STRAIGHT (6400-12-12)
2	605773	1	FITTING, #12 MJIC X #12 MALE SAE O-RING, 90 DEG (6801-L-12-12)
3	18952	2	FITTING, #04 MJIC X #6 MALE SAE O-RING, 90 DEG (6801-04-06)
4	605774	2	FITTING, #04 MJIC X #6 MALE SAE O-RING, 90 DEG, LONG (6801-L-04-06)
5	18958	1	FITTING, #12 MJIC X #12 MALE SAE O-RING, 90 DEG, EXTRA LONG (6801-LL-12-12)
6	10466	1	FITTING, #12 MJIC X #12 MAL SAE O-RING, 45 DEG (6802-12-12)
7	10464	2	DIAGNOSTIC NIPPLE (PARKER PD341)
CL1	18992	2	HOIST SOLENOID VALVE COIL, 12VDC, DEUTSCHE (4303712)
CL2	18993	4	SWING & TAILGATE SOLENOID VALVE COIL, 12VDC, DEUTSCHE (4303612)
CR1	18929	1	CROSS PORT RELIEF VALVE, 2750 PSI (CR08-38H-0-N-30/27.5)
CV1	19916	1	CHECK VALVE (CV12-20-0-N-05)
CV2	19915	1	CHECK VALVE (CV04-20-0-N-05)
CVD1	19920	2	CVD08 CHECK VALVE DISC 5190900
DC1	241013	1	LOCKING VALVE (DC08-40-0-N-85)
DC2	241013	1	LOCKING VALVE (DC08-40-0-N-85)
DS1	18994	1	SOLENOID VALVE, HOIST RAISE, NO COIL (SV12–20–0–N–00)
DS2	18995	1	SOLENOID VALVE, HOIST LOWER, NO COIL (SV16-20-0-N-00)
EPFR1	19929	1	FLOW REGULATOR, PRESSURE COMPENSATED (EPFR52-S35T-0-N-160)
FC1	19928	1	FLOW CONTROL (FC10-20A-0-N)
FC2	19928	1	FLOW CONTROL (FC10-20A-0-N)
NV1	19930	1	NEEDLE VALVE, 1/4 HEX (NV08–20A–0–N)
ORF1	19931	1	ORIFICE PLUG 6101080
ORF2	19912	1	ORIFICE PLUG 6101062
SV3	18996	1	SOLENOID VALVE, SWING & TAILGATE, NO COIL (SV08-58DM-0-N-00)
SV4	18996	1	SOLENOID VALVE, SWING & TAILGATE, NO COIL (SV08-58DM-0-N-00)

NOTES:

- STATIC BENCH TEST AT 2500 PSI
- CROSS PORT RELIEF TO BE PRESET AT 2750 PSI
- INTERNAL PORT CONTAMINATION NOT TO EXCEED 5 MICRONS
- ALL EXTERNAL PORTS TO BE SEALED FOR SHIPMENT
- IDENTIFY MANIFOLDS W/ STAMPED SERIAL NUMBER & PART NUMBER HF138555-19 REV 3

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$\mathbb{A}$	10/28/20	19931 WAS	19913				DJJ	-	
REV	DATE			DESCRIPTIO	DESCRIPTION				
TOLERAN (UNLE COMMON FRAC, N FRAC, O .X .X	ICES: ESS SPECIFIED) N SENSE PREVAILS AACH: ± 1/32° OTHER: ± 1/16° ± .063 ± .030	ROTO	-180	TITLE: HYDRAF( GEN 2 (I	DRCE ROTO	MANIFOLI 19)	D,	12	
.XXX OF DRILL S ANGULA	R .XXXX ± .005 IZES: ± .005 R: ± 1*	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:	
SURF FI THREADS BREA	'INISH: 125 MICRO S: 2A AND 2B WK SHARP EDGES	DJJ		06/29/20		18990	)	А	





QTY		DESCRIPTION		
RFF	HYDRAULIC TAN	K. 25 GALLON RECOMMENDED		
	FILTER: GRESEN	(520  GREEBA RECOMPLETED		
		GRESEN 1/2" NRT \/ II -50-A-2500 (RR	FOU	
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	HTD. VALVE W/			
RFF	HYD, VALVE W/	FITTINGS, PUWER BEYUND		
1	PRESSURE FILT	ER KII (10 MICRUN)		
1	3 SEC. PVG32	₩/ FTGS -HDIST, GATE, SWING (CVA-108	351)	
1	ROTO PROP, SUF	PPORT FRAME ASSY		
1	TAILGATE CYLIN	IDER KIT - ROTARY DUMP		
1	ROTO HOIST C	YLINDER HARDWARE KIT		
1	HOSE; #12 X 48	,"		
2	HUSE: #04 X 48	2#		
	HDSE: #04 X 46			
	HUSE, HUY A 40			
REF		LINDER (FEE 6-3-108)		
SEE	DRAWING 30037	FOR ELECTRICAL DETAIL		
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4 I - 42I		PUSH - PORT A		
JJI -	PORT B	PULL - PORT B		
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		DESCRIPTION	BY	APP
		TITLE:		
		HYDRAULIC SCH., RUIU SHIP-D	UΙ	
RC	10-180	W/ PVG32 3 SECTION		
		DIVERSIFIED METAL FABRICATORS INC. (404)	875	-1512
			- <del>.</del>	REVI
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ITEM	PART NO.	QTY	DESCRIPTION
1	31005	1	CROSS PORT RELIEF & MFLD W/FITTINGS(CR08-38H-0-N-30/27.5)
2	240315	1	CYLINDER; SWING, DRIVER SIDE
3	240316	1	CYLINDER; SWING, PASSENGER SIDE
4	605131	4	#04 MJIC X #04 FJIC X 45 DEG (6502-04-04)
5	605325	9	#04 MJIC X #04 MJIC BULKHEAD
6	605463	2	#12 MJIC x #12 MJIC BULKHEAD
7		1	HOSE; #12 X 32"
8		1	HOSE; #04 X 28"
9		2	HOSE; #04 X 33"
10		1	HOSE; #04 X 32"
11		1	HOSE; #04 X 49"
12	71000	2	HOSE; #04 X 96"
13	31026	2	HOSE; #04 X 47"
14		1	HOSE; #12 X 81"
15		1	HOSE; #12 X 48"
16		2	HOSE; #04 X 65"
17		2	HOSE; #04 X 24"
18		3	HOSE; #04 X 90"
19		1	HOSE; #04 X 51"

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REV	DATE			DESCRIPTION	١		BY	APP
TOLERANI (UNLE COMMON FRAC, M FRAC, M FRAC, C .X .XX	CES: <u>SSPECIFIED)</u> <u>SENSE PREVAILS</u> ACH: ± 1/32" UTHER: ± 1/16" ± .063 ± .030 ± .030	ROTO	-180	12'SUB DIVERSIFIED M	FRAME HY OTO W/ I	D SCHEN PVG32 V 5, INC. (404) 8	ATI ALV	C, E
DRILL SI	ZES: ± .005	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:
SURF FI THREADS BREA	NISH: 125 MICRO 24 AND 28 K SHARP EDGES	DJJ		08/24/15		18955		#

NOTES: 1. SEE DRAWING 30013 FOR ELECTRICAL DETAIL

2. BULKHEAD VIEWS LOOKING FROM FRONT OF FRAME AFT



	ITEM	PART NO.	QTY	DESCRIPTION
	1	31005	1	CROSS PORT RELIEF & MFLD W/FITTINGS(CR08-38H-0-N-30/27.5)
	2	240315	1	CYLINDER; SWING, DRIVER SIDE
	3	240316	1	CYLINDER; SWING, PASSENGER SIDE
	4	605131	4	#04 MJIC X #04 FJIC X 45 DEG (6502-04-04)
	5	605325	9	#04 MJIC X #04 MJIC BULKHEAD
	6	605463	2	#12 MJIC x #12 MJIC BULKHEAD
	7		1	HOSE; #12 X 44"
	8		1	HOSE; #04 X 28"
	9		1	HOSE; #04 X 33"
	10		2	HOSE; #04 X 43"
	11		2	HOSE; #04 X 62"
	12	74000	2	HOSE; #04 X 96"
	13	31009	2	HOSE; #04 X 59"
	14		1	HOSE; #12 X 81"
A	15		1	HOSE; #12 X 60"
	16		2	HOSE; #04 X 65"
	17		2	HOSE; #04 X 24"
[	18		3	HOSE; #04 X 86"

Ð								
$\blacksquare$	08/17/15	60" WAS 58	3"				DJJ	
REV	DATE		DESCRIPTION					APP
TOLERANI (UNLE COMMON FRAC, M FRAC, M FRAC, C .X .XX	CES: SS SPECIFIED) SENSE PREVAILS ACH: ± 1/32 DTHER: ± 1/16" ± .063 ± .030 .XXXX ± .005	ROTO	-180	14'SUB Diversified m	FRAME HY OTO W/ I	D SCHEN PVG32 V 5, INC. (404) 8	ALV	C, E
DRILL SI ANGULAF SURF FI	ZES: ± .005 t: ± 1* NISH: 125 MICRO	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:
THREADS	E 2A AND 2B	BJF		04/20/15	ATIANTA	31008		А

2. BULKHEAD VIEWS LOOKING FROM FRONT OF FRAME AFT



	ITEM	PART NO.	QTY	DESCRIPTION
	1	31005	1	CROSS PORT RELIEF & MFLD W/FITTINGS(CR08-38H-0-N-30/27.5)
	2	240315	1	CYLINDER; SWING, DRIVER SIDE
	3	240316	1	CYLINDER; SWING, PASSENGER SIDE
	4	605131	4	#04 MJIC X #04 FJIC X 45 DEG (6502-04-04)
	5	605325	9	#04 MJIC X #04 MJIC BULKHEAD
	6	605463	2	#12 MJIC x #12 MJIC BULKHEAD
	7		1	HOSE; #12 X 44"
	8		1	HOSE; #04 X 28"
	9		1	HOSE; #04 X 33"
	10		2	HOSE; #04 X 43"
	11		2	HOSE; #04 X 62"
	12	74000	2	HOSE; #04 X 96"
	13	31009	2	HOSE; #04 X 59"
	14		1	HOSE; #12 X 81"
A	15		1	HOSE; #12 X 60"
	16		2	HOSE; #04 X 65"
	17		2	HOSE; #04 X 24"
[	18		3	HOSE; #04 X 86"

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$\blacksquare$	08/17/15	60" WAS 58	3"				DJJ	
REV	DATE		DESCRIPTION					APP
TOLERANI (UNLE COMMON FRAC, M FRAC, M FRAC, C .X .XX	CES: SS SPECIFIED) SENSE PREVAILS ACH: ± 1/32 DTHER: ± 1/16* ± .063 ± .030 .XXXX ± .005	ROTO	-180	14'SUB Diversified m	FRAME HY OTO W/ I	D SCHEN PVG32 V 5, INC. (404) 8	ALV	C, E
DRILL SI ANGULAF SURF FI	ZES: ± .005 t: ± 1* NISH: 125 MICRO	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:
THREADS	E 2A AND 2B	BJF		04/20/15	ATIANTA	31008		А

2. BULKHEAD VIEWS LOOKING FROM FRONT OF FRAME AFT





#### TITLE: Cylinder Assembly

PURPOSE: To Establish Production Methods For The Assembly Of Cylinders

#### COMMON USAGE: All Models

PARTS GENERALLY ENCOMPASSED BY THIS PROCEDURE: D.M.F. Manufactured Hydraulic Cylinders With "PolyPack" Piston Seals

#### ASSEMBLY PROCEDURE:

PISTON: A) Inspect for sharp edges. Deburr as neccessary.

B) Clean and blow off with shop air.
C) Use Blue Assemblee Goo (19260) to aid in assembly.
D) Install two (2) seals with each lip (o'ring insert side) facing the closer piston face.

- GLAND: A) Inspect OD and bore for sharp edges. Deburr as neccessary.
  B) Clean and blow off with shop air.
  C) Use Blue Assemblee Goo (19260) to aid in assembly.
  D) Install wiper ring in bore with lip facing outboard.
  E) Install seal in bore with lip (o'ring insert side) facing inboard.
  F) Inspect for seal damage. Any shaved seal material requires replacement.
  G) Install backing ring in O'ring groove on OD with concave surface facing inboard.
  H) Install O'ring on inboard side of groove in Step G.
  I) Inspect O'ring for damage.

#### ROD ASSEMBLY:

- A) Clean and inspect shaft surface for scratches and dings. B) Install grease fitting in rod end per PP001. C) Use Blue Assemblee Goo (19260) to aid in assembly. D) Install gland assembly onto rod with the outboard side facing the rod end. E) Install rod O'ring onto threaded end of rod. F) Inspect O'ring for damage. G) Install piston assembly onto rod with the O'ring counterbore facing O'ring in Step E. Be certain that O'ring seats in counterbore. H) Install self locking rod nut on rod. Tighten to 200 to 300 foot-pounds torque (Torque will vary based on rod & nut size).

#### CYLINDER ASSEMBLY:

- A) Inspect cylinder ports for minimum three (3) threads and no burrs. Deburr as neccessary.
  B) Clean tube ID threads and bore and blow out with shop air.
  C) Inspect threads for debris.
  D) Support cylinder barrel assembly with gland end facing up.
  E) Maintain rod assembly in vertical position, align piston with tube bore, engage piston in tube bore, strike rod end with hammer until piston is below first cylinder port.
  F) Slide gland down on rod, engage gland threads into barrel by hand.
  G) Screw gland into barrel with spanner wrench until gland face contacts barrel tube-end.
  H) Install two (2) hydraulic fittings into cylinder ports per PP003.

#### PRESSURE TESTING:

- A) Connect hydraulic power unit to cylinder.
   B) Operate cylinder through complete cycle to purge air and fill with clean hydraulic oil.
   C) Operate cylinder to full extension and retraction and maintain at 3300 PSI for 15 seconds at each extent. While maintaining pressure at each extent, visually inspect ports, rod seal, gland OD seal, and cylinder bottom areas for leakage.
   D) Disconnect hydraulic power unit and install caps on port fittings.

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COMMENTS: Specific assembly instructions on prints are performed with preference over this procedure.

FOR CYLINDERS GREATER THAN Ø4.5", DO NOT ALLOW CYLINDER TO BOTTOM DURING TESTING, BLOCK ROD AGAINST GLAND WITH PIN AND 1" BLOCKS.

⚠	11/7/14	REMOVED S	TEP E				JDI	
$\triangle$	5/25/12	USE 19260	USE 19260 INSTEAD OF HYDRAULIC OIL					
A	7/16/11	REMOVED C	REMOVED CYLINDER PART #'S					
$\square$	9/27/07	ADDED CYL	NDER TESTI	NG WARNING			WAK	
REV	DATE		DESCRIPTION					APP
TOLERAN (UNLE COMMON FRAC, M FRAC, C	CES: SS SPECIFIED) SENSE PREVAILS ACH: ± 1/32" DTHER: ± 1/16" ± 063			TITLE:	PRODUCTIO	N PROCEDUR	RE 00	В
	XX B XX 4 .030 XX B XX 4 .030			DIVERSIFIED M	ETAL FABRICATORS	, INC. (404) 8	875-15	12
DRILL SI	ZES: + .015	DRAWN BY:	APPD BY:	DATE:		DRAWING NUM	BER:	REV:
SURF FI	SURF FINISH: 125 MICRO THREADS: 12A AND 2B MEM HAR CEES (S. 602 K. 67 MS)			6/24/94	-¶ <b>i</b> ≯	PP008	5	D

ITEM	PART NO.	QTY	DESCRIPTION	
1				
2				

TITLE: SAE (JIC) 37 Degree Fitting Installation.

PURPOSE: To Establish Production Methods For The Installation Of SAE (JIC) Medium Pressure Hydraulic Fittings.

COMMON USAGE: Hydraulic Systems Operating With Petroleum-Based Fluids At Pressures Below 4000 PSI Or Minimum Component Rating.

PARTS GENERALLY ENCOMPASSED BY THIS PROCEDURE: Purchased Fittings With SAE (JIC) 37 Degree Flared Ends.

PROCEDURE: A) Inspect fitting components to ensure that mating parts are free of burrs, nicks, scratches or any foreign material.

- B) Align tube flare against nose of fitting body and screw on the nut, finger tight, clamping the tube flare between the fitting nose and the nut.
- C) Tighten the nut the indicated Flats From Finger Tight (F.F.F.T.) listed in the chart below. Use a second wrench to hold the hose in proper alignment while tightening to avoid twisting the lay line. One flat on a hex is equal to 1/6th of a full turn. Tolerance on tightening is plus or minus 1/4 flat (1/24th of full turn).

Size	Thread Size	Tube Connection F.F.F.T.	Swivel Nut or Hose Connection F.F.F.T.
-4	7/16-20	2	2
-6	9/16-18	1.5	1.25
-8	3/4-16	1.5	1
-12	1 1/16-12	1.25	1
-16	1 5/16-12	1	1
-20	1 5/8-12	1	1
-24	1 7/8-12	1	1

# SAE (JIC) 37° Flare Fittings

A									
$\square$									
REV	DATE		DESCRIPTION						
TOLERANC (UNLES COMMON FRAC, M FRAC, O	OLERANCES: CUNLESS SPECIFIED) COMMON SENSE PREVAILS RAC, MACH: 1/32 RAC, OTHER: 1/32			TITLE: PRODUCTION PROCEDURE 005 JIC FITTING INSTALLATION					
XX XXX OR	± .030			DIVERSIFIED N	IETAL FABRICATORS	i, INC. (404) 875–	1512		
DRILL SU	ZES: ± .005	DRAWN BY:	APPD BY:	DATE:		DRAWING NUMBER:	REV:		
SURF FIN THREADS BREAN	NISH: 125 MICRO 24 AND 28 K SHARP EDGES	TSH		06/02/94	ব্যা≯	PP005	#		

ITEM	PART NO.	QTY	DESCRIPTION
1			
2			

TITLE: SAE O-Ring Fitting Installation

PURPOSE: To Establish Production Methods For The Installation Of O-Ring Medium And High Pressure Hydraulic Fittings.

COMMON USAGE: Hydraulic Systems Operating With Petroleum-Based Fluids At Pressures Below 4000 PSI Or Minimum Component Rating.

PARTS GENERALLY ENCOMPASSED BY THIS PROCEDURE: Purchased Fittings With O-Ring Seals And SAE Straight Threads.

## PROCEDURE:

- A) Inspect to ensure that both mating parts are free of burrs, nicks, scratches or any foreign particles.
- B) Lubricate O-Ring with light coat of system fluid or compatible oil.
- C) For adjustable fittings, back off lock nut as far as possible. Make sure back up washer is not loose and is pushed up to nut.
- D) Screw fitting into port until finger tight. Back up washer (adjustable) or hex face (non-adj.) should contact port face. Light wrenching may be necessary.
- E) To align an adjustable fitting, unscrew by desired amount but not more than one full turn. Use wrench to hold in position. Screw nut down to port face until finger tight.
- F) Tighten lock nut (adjustable) or fitting (non-adj.) the indicated Flats From Finger Tight (F.F.F.T.) in either the Adjustable chart or the Non-Adjustable chart below. One Flat on a hex is equal to 1/6th of a full turn. Tolerance on tightening is plus or minus 1/4 flat (1/24th of full turn).
- G) Inspect to ensure that O-Ring is not pinched and back up washer/hex seats flat on face of port.

ADJUSTABLE FITTINGS

SAE Port Thread Size	F.F.F.T.
5/16-24	1.0
7/16-20	1.5
9/16-18	1.5
3/4-16	1.5
7/8–14	1.5
1 1/16-12	1.5
1 3/16-12	1.5
1 5/16-12	1.5
1 5/8-12	2.0
1 7/8–12	2.0
	SAE Port         Thread Size         5/16-24         7/16-20         9/16-18         3/4-16         7/8-14         1         1         1/16-12         1         3/16-12         1         5/16-12         1         5/16-12         1         5/16-12         1         5/16-12         1         5/8-12         1         7/8-12

## NON-ADJUSTABLE FITTINGS

Fitting Size	SAE Port Thread Size	F.F.F.T.
2	5/16-24	1.0
4	7/16-20	1.0
6	9/16-18	1.5
8	3/4-16	1.5
10	7/8-14	1.5
12	1 1/16-12	1.5
14	1 3/16-12	1.5
16	1 5/16-12	1.5
20	1 5/8–12	1.5
24	1 7/8–12	1.5

<u>A</u>							
$ \mathbb{A} $							
REV DATE		DESCRIPTION					
TOLERANCES:           (UNLESS SPECIFIED)           COMMON SENSE PREVAILS           FRAC, MACH:         ± 1/32"           FRAC, OTHER:         ± 1/16"           .X         ± .063           .XX         ± .035           XX         ± .035			TITLE: PRODUCTION PROCEDURE 003 O-RING FITTING INSTALLATION DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512				12
DRILL SIZES: ± .005 ANGULAR: ± 1 SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES	DRAWN BY: TSH	APPD BY:	DATE: 06/02/94		DRAWING NUM PP003	BER:	REV: #

	ITEM
	1
2	2

TITLE: National Pipe Thread (NPT) Fitting Installation.

PURPOSE: To Establish Production Methods For The Installation Of NPT Medium Pressure Hydraulic Fittings.

COMMON USAGE: Hydraulic Systems Operating With Petroleum-Based Fluids At Pressures Below 3000 PSI Or Minimum Component Rating.

PARTS GENERALLY ENCOMPASSED BY THIS PROCEDURE: Purchased Fittings With Tapered Pipe Threads.

PROCEDURE: A) Inspect port components to ensure that male and female threads are free of nicks, burrs, dirt etc.

- B) Apply sealant/lubricant to male pipe threads. Use only Permatex #14D "Thread Sealant With Teflon" paste (or Engineering approved equal). The first few threads must be left uncovered to avoid system contamination.
- C) Screw fitting into female pipe port to the finger tight position.
- D) Wrench tighten the fitting to the appropriate Turns From Finger Tight (T.F.F.T.) shown in chart below. Make sure that tube end of shaped fitting is aligned to receive in coming tube or hose assembly.

Fitting Size	Pipe Thread Size, NPT	T.F.F.T.
2	1/8-27	2.0-2.5
4	1/8-27	2.0-2.5
6	1/4-18	1.5-2.0
8	3/8-18	2.0-2.5
10	1/2-14	2.0-2.5
12	3/4-14	1.5-2.0
14	3/4-14	1.5-2.0
16	1-11 1/2	1.5-2.0
20	1 1/4-11 1/2	1.5-2.0
24	1 1/2-11 1/2	1.5-2.0

## STEEL PIPE THREAD FITTINGS

COMMENTS: Teflon Tape May Be Used In Certain Situations With Engineering Approval. A Pipe Fitting Is Limited To One Or Two Re-Uses.

A								
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REV	DATE		DESCRIPTION					APP
TOLERANCES:         (UNLESS SPECIFIED)           COMMON SENSE PREVALS         FRAC, MACH:         ± 1/32           FRAC, OTHER:         ± 1/16"         ±           XX         ± .063				TITLE: PROD PIPE DIVERSIFIED M	UCTION PROCED FITTING INSTALL	OURE 004 ATION	75-15	512
DRILL S ANGULAI SURF FI THREADS BREA	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	DRAWN BY: TSH	APPD BY:	DATE: 06/02/94		DRAWING NUM PP004	BER:	REV: #

# SECTION 7.0 ROTO 180 ELECTRICAL

7.1	ROTO 180, ELECTRICAL SCHEM, HYDRAFORCE MANIFOLD GEN 2, 3 PROXIMITY SWITCHES - 20855
7.2	ROTO 180, ELECTRICAL SCHEM, PVG, TARP, VIBRATOR & WIRELESS - 300377-3
7.3	ROTO 180, ELECTRICAL SCHEM, PVG, TARP & VIBRATOR - 300407-4
7.4	ROTO 180 PROXIMITY SWITCH KIT – 207547-5







	TITLE:	PROXIMITY	WITCH	KIT FOR GA	TE/LIFT				
	DRAWING #:	20754	54 BY: JDI DATE: 5/7/		/12	REV:	А		
ROTO-180		DIVERSIFIED METAL FABRICATORS, INC. (404) 875-15					512		
REV:	DATE: DESCRIPTION:				BY:				
А	11/23/2015	ADDED BLUE LOCTITE 243			BJF				
-	-	-			-				

## **Proximity Switch Kit for Roto 180**

## **Kit Contents**

PART #			DESCRIPTION	QTY.
20754			PROXIMITY SWITCH KIT FOR GATE/LIFT	EA.
	20256		PROXIMITY SWITCH (18MM)	3
	20751		PROXIMITY BRACKET – FOR 22/40 DEG PROX. SWITCHES	1
	20752		PROXIMITY DETECTION PLATE FOR 22/40 PROX SWITCHES	1
	20753		PROXIMITY BRACKET FOR GATE LATCH POSITION DETECTION	1
	238112		FLAT WASHER, 1", GR5	1

## Installation

- 1. Park the truck on a level surface.
- 2. See drawing 18318 for tailgate cylinder installation and adjustment.
- 3. Weld the proximity detection plate (20752) on to the inside of the passenger side long sill of the dump body. Refer to Figure 1 for proper location of detection plate.



## Figure 1 – Proximity Detection Plate Location

4. Weld the proximity bracket for the 22/40 degree proximity switches (20751) onto the sub frame. Refer to Figure 2 for proper location of proximity bracket.



#### Figure 2 – Bracket Location for 22/40 Degree Proximity Switches

- 5. Place the proximity switches (20256) into the proximity bracket (20751) so that there is an approximately 1/8" gap between the switch and the detection plate (20752). Hand tighten the jam nuts to lock each switch into its initial position. Final adjustment of proximity switches will be addressed in later steps.
- 6. Take the flat washer and cut it in half to be used as a stop washer on the tailgate latch rod.
- 7. Weld one half of the washer, to the tailgate rod, on the inside of the tailgate rod support bracket on both sides of the body. This is to keep the rod from moving from side to side and causing interference between the tailgate proximity switch and the tailgate cam. Refer to Figure 3 and Figure 4 for proper washer orientation and location.
- 8. Weld the bracket for the tailgate proximity switch (20753) to the underside of the bed. Refer to Figure 5 for the proper bracket location.
- 9. Place the tailgate proximity switch into the tailgate proximity bracket so there is an approximately 1/8" gap between the face of the switch and the tailgate cam. Hand tighten the jam nuts to lock the switch into its initial position. Check to make sure the proximity switch is located over the tailgate cam when the tailgate is un-latched.







- 10. Paint over the welds and the brackets to protect them from corrosion.
- 11. Check that the gate latch proximity switch is on (sensor LED on) when the gate is un-latched.
- 12. Using a protractor, raise the bed to 22 degrees above horizontal and set the top proximity switch just off the edge of the detection plate (sensor LED off). Continue to raise the bed until the desired fully raised point is reached (typically 40 degrees) and set the lower proximity switch just off the detection plate (sensor LED off). Check that the proximity switches are over the detection plate when the body is in stowed position.
- 13. Check that all sensors have an approximately 1/8" gap between the face of the sensor and the detection plate. Tighten the proximity switch jam nuts with blue Loctite 243.
- 14. Test the system by raising the bed from the stowed position. Check that the gate opens at 22 degrees and that the bed will not raise beyond 40 degrees.

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# SECTION 8.0 ROTO 180 LEGACY HYDRAULIC & ELECTRICAL DRAWINGS

8.1 R	ROTO 180, HYDRAFORCE MANIFOLD, FIRST GENERATION8	3-2
8.1.1	ROTO 180, HYD SCHEM, HYDRAFORCE MANIFOLD, SHIPOUT – 18941 8-	3
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# 8.1 ROTO 180, HYDRAFORCE MANIFOLD, FIRST GENERATION











# 8.2 ROTO 180 PARKER MANIFOLD







▲ 6/30/10 W WAS Y & B	WAS G FOR PARKER MANIFOLDS	BJF	]						
<u>A</u>  4/23/10  ADDED CLARIF	ICATION ON IN-CAB WIRING	BJF							
🛕 7/30/09 ADDED SECONI	LIMIT SWITCH	BJF	(UNLESS SPECIFIED)			TITLE			
A 10/23/97 MADE SWITCHE	S COMMON	KLC TSH	FRAC, MACH: ± 1/32"			STANDA	RD ROTO,EL	_ECTRIC SCH	EM.
▲ 5/19/97 ADDED P/N's	18630 & 18640	KLC TSH	X ± .063	-					
A 7/08/96 ITEM #8 WAS	SPDT (6FA64-73)	WET	.XXX DR .XXXX ± .005			DIVERSIFIED	METAL FABRICAT	ORS, INC. (404) 87	5-1512
7/01/96 ADDED LEGENI	PLATES	TSH	DRILL SIZES: ± .005 ANGULAR: ± 1*	DRAWN BY:	APPD BY:	DATE:		DRAWING NUMBER:	REV⊧
REV DATE	DESCRIPTION	BY APP	THREADS: 2A AND 2B	TSH		1/12/94		18900	G
			BREAK SHARP EDGES						

ΓY	DESCRIPTION	
l 1	INSIDE TERMINAL BLOCK - AB 1	L492-F1
1	MOUNTING CHANNEL	
10	SUBFRAME TERMINAL BLOCK - A-	-B 1492-F1
1	LED - 3LF4LR / 14V / BEZ	
	SWITCH -HDIST SPDT (6FC58-78)	
L	SWITCH -TAILGATE SPDT (6FC54-78)	
1	SWITCH -SWING DPDT (6GM5S-78)	
1	SWITCH - DVERRIDE SPDT (6GL5E-78)	)
2	D'RIDE LIMIT (AB 802T W-1)	(AB 802T-A)
1	SWING ALARM - TARGET TECH 4:	L-720 (POLLAK)
1	SWITCH -ROTO ENABLE: PUSH PU	JLL (PP 6020)
1	16-6 SD CABLE × 11′	
1	16-10 SD CABLE × 14′	
1	16-10 SD CABLE × 18'- 6"	
5	DIN CONN'R CANFIELD 5300-1090000	3093
1	SWITCHPLATE LEGEND	
1	RDTD ENABLE LEGEND: COVER 11	
1	SWITCHBOX IN CAB	
1	SWITCHBOX ASSY.	
1	MISC, ROTO SUBFRAME ASSY,	
	(15)	
		(6) TYP
		IAILGAIL
		HDIST
		SWING

	TITLE: LIMIT SWITCH KIT FOR GATE/LIFT							
	DRAWING #	t: 20769	BY:	JDI	DATE:	5/7/12	REV:	А
ROTO-180	DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512							
REV:	DATE:	DESCRIPTION:					BY:	
Α	4/1/2016	18664 WAS 18651				BJF		
-	-	-					-	

# Limit Switch Kit for Roto 180

## **Kit Contents**

PART #			PART # DESCRIPTION	
20769			LIMIT SWITCH KIT FOR GATE/LIFT	EA.
	18279		ROTO TAILGATE TRIP CAM	1
	18650		ROTO LIMIT SWITCH ASSEMBLY W/ SHORT ARM	1
		18651	ROTO LIMIT SWITCH (A-B 802T-A)	1
		18652	ROTO LIMIT SWITCH SHORT ARM (A-B 802T-W1)	1
	18664		ROTO LIMIT SWITCH ASSEMBLY W/ LONG ARM	1
		18651	ROTO LIMIT SWITCH (A-B 802T-A)	1
		18663	ROTO LIMIT SWITCH LONG ARM (A-B 802T-W2)	1
	18653		ROTO LIMIT SWITCH MOUNT PLATE	1
	605027		ROUND HEAD MACHINE SCREW, 10-24 X 2-1/2	4
	605028		HEX NUT, 10-24	4
	605029		ESNA LOCK NUT, 10-24	4
	605030		ROUND HEAD MACHINE SCREW, 10-32 X 1/2	4

### Installation

- 1. Park the truck on a level surface.
- 2. See drawing 18318 for tailgate cylinder installation and adjustment.
- 3. Position the limit switch mount plate (18653) on the subframe and the tailgate trip cam (18279) on the tailgate latch rod and weld in place. Refer to Figures 1 through 3 for location details. Note the length of the subframe. The position of the limit switch mount plate (18653) is different for 12 and 14 foot subframes. Refer to Figure 3 and Figure 4.



Figure 1 – 12 and 14 Foot Limit Switch Mount Plate/Cam Location

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Figure 2 – 12 Foot Side View Limit Switch Mount Plate/Cam Location



Figure 3 – 14 Foot Side View Limit Switch Mount Plate/Cam Location

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- 4. Mount the limit switches to the limit switch mount plate (18653). The limit switch (18650) with the adjustable arm goes on the inside of the mount plate closest to the tailgate trip cam (18279).
- 5. Fully release the tailgate. Raise the bed to 22 degrees, using a protractor to indicate the angle between the bed and horizontal. Set the limit switch (18650) with the adjustable arm such that the roller at the end of the arm is in contact with the tailgate trip cam (18279) and at an angle that triggers the limit switch (18650). Refer to Figure 4.

CAUTION: CHECK THE ADJUSTABLE ARM POSITION PRIOR TO RAISING BED AS IT CAN BE BROKEN IF IMPROPERLY POSITIONED.



Figure 4 – Setting Limit Switch

- 6. Continue raising the bed until the desired fully raised position is reached (typically 40 degrees). Check to make sure the other limit switch (fully raised switch) is activated by the tailgate latch rod with the bed in the fully raised position. If it is not, loosen the bolt on the arm and rotate the arm until it is in a position that will be activated by the tailgate latch rod.
- 7. Test the system to insure that it is performing properly by raising the bed from stowed position and checking that at the 22 degree position the adjustable limit switch is triggered and at the fully raised position (40 degrees) the bed stops rising.
## 8.3 CUSTOMER SPECIFIC INSTALLATIONS

IT	ΈM	PART NO.	QTY	DESCRIPTION	ITEM	PART NO.	QTY	DESCRIPTION
	21	18952	1	#04 MJIC X #06 O'RING X 90 DEGREE	1	19923	1	HOC BY-PASS BLOCK
	22	605133	2	#12 MJIC X #20 O'RING X 90 DEGREE	2	20259	1	HOC PUMP, MAX 24.5 GPM @ 2500 PSI
	23	605134	1	#12 MJIC X #20 O'RING X 90 DEGREE	3	20070	1	PUMP & VALVE MOUNTING BRACKET (NOT SHOWN)
	24	605135	1	#12 MJIC X #12 MPT STRAIGHT	4	19924	1	HOC FLOW CONTROL BLOCK, 25 GPM
	25	18956	1	#12 MJIC X #12 MPT X 90 DEGREE	5	19925	1	HOC UNLOADER ASSEMBLY
	26	20080	1	DRIVESHAFT FOR FRONT MOUNTED PUMP (NOT SHOWN)	6	20191	1	HOC ROADING VALVE
	27	19008	1	HOSE; #12 X 33"	7	20805	1	HOC ROADING VALVE MOUNTING BLOCK
	28	Ī	1	HOSE; #12 X 22"	8	20278	1	DIN CONNECTOR W/LED
	29		1	HOSE; #12 X 21"	9	20082	1	CHECK VALVE, PARKER C1200S, 65 PSI
	30		1	HOSE; #04 X 28"	10	605126	1	SPLIT FLANGE KIT, 2"
	31		1	HOSE; #04 X 19"	11	605127	1	#20 MJIC TUBE TO 2" O'RING FLANGE X 90 DEGREE
	32		1	HOSE; #04 X 16"	12	18962	2	#12 MJIC X #12 O'RING X 90 DEGREE
					13	605128	1	#12 MJIC TUBE TO $1-1/4$ " O'RING FLANGE X 90 DEGREE
					14	605129	1	SPLIT FLANGE KIT, 1–1/4"
					15	605130	1	#04 MJIC X #08 O'RING X 45 DEGREE
					16	605131	2	#04 MJIC X #04 FJIC X 45 DEGREE
					17	810308	1	#04 MJIC X #04 MPT X #04 MJIC
					18	605132	1	#04 FJIC TO #08 MPT ADAPTER
					19	10428	2	#04 MPT X #04 MJIC X 90 DEGREE
					20	20253	1	#12 MUIC X #20 O'RING X 90 DEGREE WITH #06 EPT PORT



A							
▲ -	-					-	
REV DATE		DESCRIPTION					
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC, MACH: $\pm 1/32^{\circ}$ FRAC, OTHER: $\pm 1/16^{\circ}$ .X $\pm .063$ .XX $\pm .030$ VYY OP VYY $\pm .055$	ROTO	-180	TITLE: HOC MAXX DIVERSIFIED M	ATIC			
DRILL SIZES: ± .005	DRAWN BY:	APPD BY:	DATE:		DRAWING NUME	BER:	REV:
SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES	JDI		10/9/12		20279		#





B 4GA TO TARP GROUND IN SUBFRAME



_					-				
-	-								
DESCRIPTION									
RDTD-	-180	VITLE: 2020 N/S SPEC ROTO-180 SHIP-OUT WITH DIAMOND LOGIC & PLUS+1							
		DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512							
DRAWN BY:	APPD BY:	DATE:		DRAWING N	UMBER:	REV⊧			
DJJ		10/31/19		2085	2	#			







SEE DRAWING 30040 FDR INTERFACE BDX AND SUBFRAME ELECTRICAL DETAILS

-	-							
-	-							
	BY	APP						
RDTD-	-180	2015 N/S SPEC RDTD-180 WITH DIAMOND LOGIC & PLUS+1						
		DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512						
DRAWN BY:	APPD BY:	DATE:		DRAWING NUN	1BER:	REV⊨		
BJF		11/24/15	ATANTA	20828		#		



		RE	FER TE	18901 I	- OR	HYDRA	AULIC DETA	۱L
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	RD	ТП	- 180	RDTD-18    W/ JDY	BO EL STIC	_ECTRIC K & 3	CAL SCHEMAT PROX SW,	IC
	DDAY #1	<b>D</b> 14		DIVERSIFIED	METAL	. FABRICAT	DRS, INC. (404) 87	5-1512
		BAi	APPD BY:	DATE: 7/8/14		ME>	20826	
	JLG					~~~		#

## **DMF LIMITED WARRANTY POLICY**

**Diversified Metal Fabricators (DMF)** products are designed to provide the utmost service and reliability. Competent workmen, guided by stringent quality standards, manufacture the products from high-grade material. **DMF** warrants products of its manufacture to be free of defects in material and workmanship, under normal use and service, for a period of **ONE CALENDAR YEAR**. **DMF's** obligation under this warranty is limited to repairing or replacing at its factory, or other location designated by us, any part or parts there-of which shall, within 30 DAYS of the date of failure or notice of defect, be returned, and which upon examination shall appear to **DMF's** satisfaction to have been defective. Such repair or replacement does not include the cost of installing the new part or any other expenses incident thereto; however, the outbound direct ground freight on the part will be prepaid to locations within the continental United States and Canada. **DMF** shall not be liable for other loss, damage, or expense directly or indirectly arising from the use of its products.

Ordinary wear and tear, abuse, misuse, neglect, or alteration is not covered by this warranty. **DMF** assumes no liability for expenses or repairs made outside its factory except by written consent. Warranty is null and void if instructions and operating procedures specifically referring to warranty coverage are not followed.

Equipment or parts not manufactured by this company, but which are furnished in connection with **DMF** products are covered directly and solely by the warranty of the manufacturer supplying them.

This warranty is in lieu of other warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose and any liability for special or consequential damages.

All warranty claims must reference a serial number. Returns must reference a RA number.

