

DIVERSIFIED METAL FABRICATORS, INC.



Installation and Parts & Service Manual ROTO 180



November 2015

SERIAL NUMBER _____

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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 load anywhere within a 180° arc. Between the dump body and the truck chassis lays the hydraulically actuated subframe. This two-piece structure contains a ball bearing that lets the dump body to rotate about the truck frame. Within the subframe are the hydraulic cylinders used to lift and rotate the dump body. The standard ROTO 180 has a 12' long, 10-12 cubic yard dump body; however there are also options for 10' long, 5-7 cubic yard and 14' long, 12-14 cubic yard models. There are two different control options for the ROTO 180 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, active 12 VDC solenoid valves to control the operation of the manifold. The manifold controls 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 are used to smooth out the movement of the lift cylinder and the rotation of the dump body. The system is controlled from a keypad and joystick within the cab of the truck. It can also be controlled externally through an optional wireless remote. All signals from these devices are routed through a PlusOne control module. All major electronics and hydraulics are mounted outside of the subframe for easy access and serviceability.

1.2 SPECIFICATIONS

1.2.1 Standard Dump Body

- 12' subframe weight: 2180 lbs.
- Standard 12' dump body: 6100 lbs.
- 14' subframe weight: 2690 lbs.
- Standard 14' dump body: 6290 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 – ¼"
- 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 Sub-frame & 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°

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: Diameter -- 43"
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 shifts in load that could tip over 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 and damaging the rear of the truck and rear Railgear. A swing alarm sounds whenever the dump body is rotated. A safety strut is provided for use when servicing the dump body.

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2.1 OPERATIONS – HYDRAFORCE MANIFOLD

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.

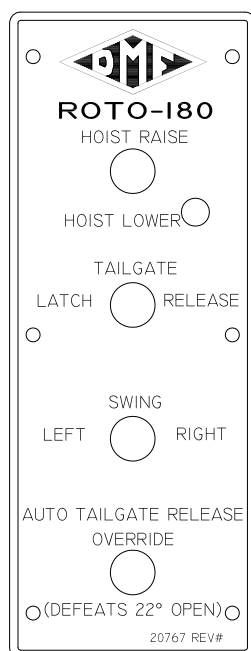


Figure 2.1 - HydraForce Manifold Dashboard Mounted Controls

2.1.1 Enable System

1. Engage the PTO as outlined in the PTO Operations Manual provided with the truck.
2. If the truck is equipped with a hydraulic selector valve, shift it to activate 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 Operations Manual provided with the truck.

2.1.3 Raising Body – HydraForce Manifold

NOTE

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 "Raildog" manual.

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" 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 if not already done so.
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.

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.

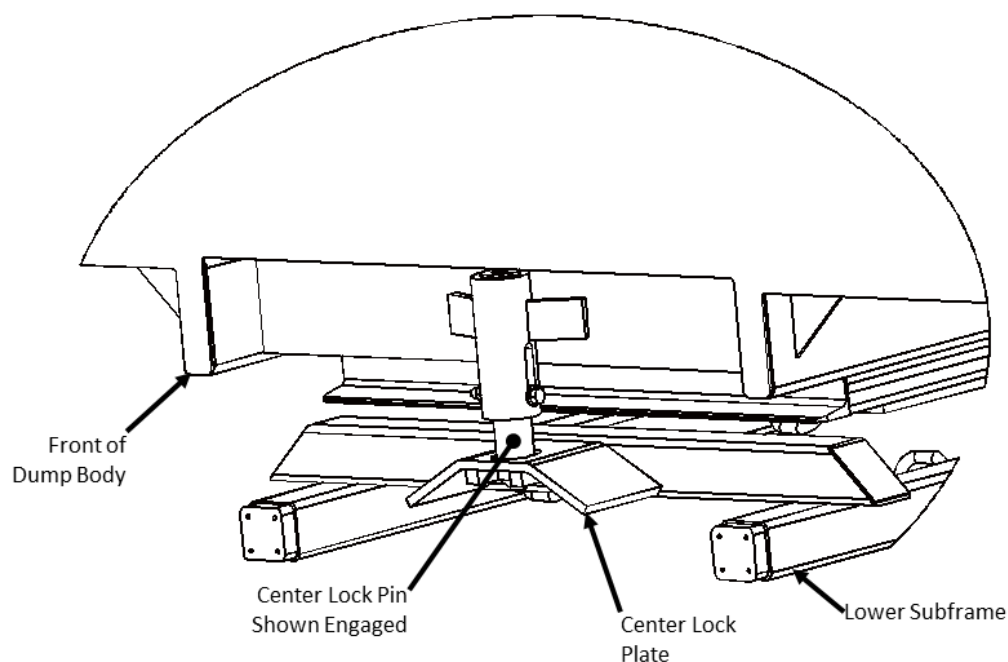


Figure 2.1.4.A - Center Lock Pin Engaged

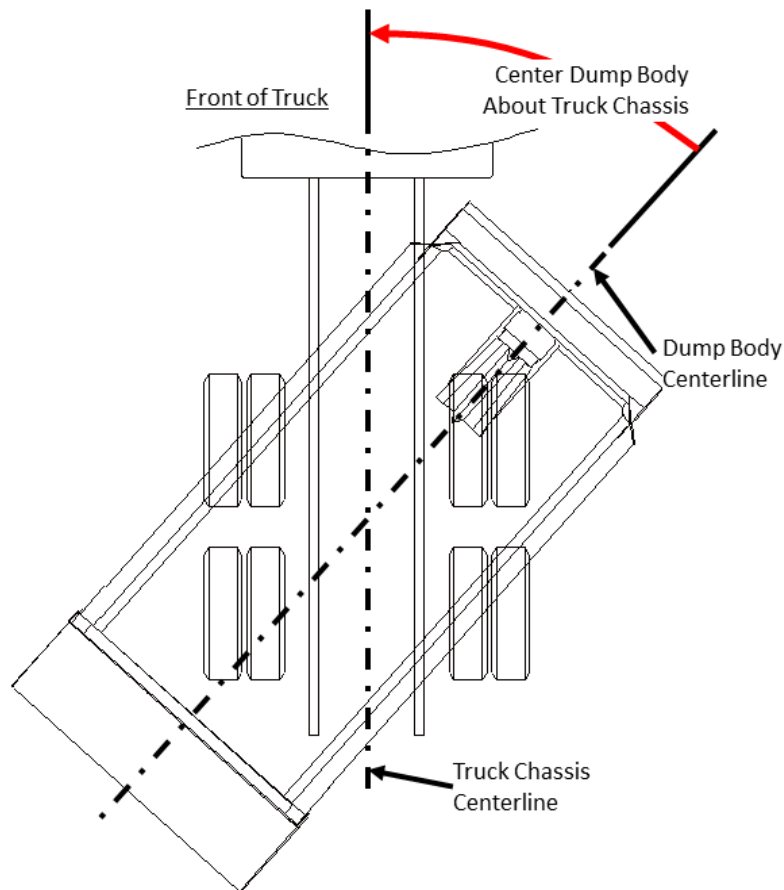


Figure 2.1.4.B - Engaging the Center Lock Pin

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

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. Activate the "SWING" switch to rotate the back 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 the center lock pin engagement and verify the tailgate has also been latched.

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 cab of the truck. A wireless remote option is available for operation outside the truck. The PVG Valves can also be operated from outside. This method, however, is suggested only for system troubleshooting and in cases of an electrical failure. Manual operation overrides many of the system's safety functions.

2.2.1 PVG Valves – In Cab Controls

The in cab controls consist of a joystick mount, a joystick and a keypad. The joystick mount is secured to the floor of the truck cab. The joystick and keypad are attached to the joystick mount, see Figure 2.2.1.A. The keypad may be relocated to the dashboard when space is available. 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 up through the joystick mount to the joystick and keypad. To adjust the operating height of the joystick, use the following steps:

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 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 any of the wiring within the tubes.**
5. Tighten the locking handle until there is no play between the upper assembly and lower weldment.

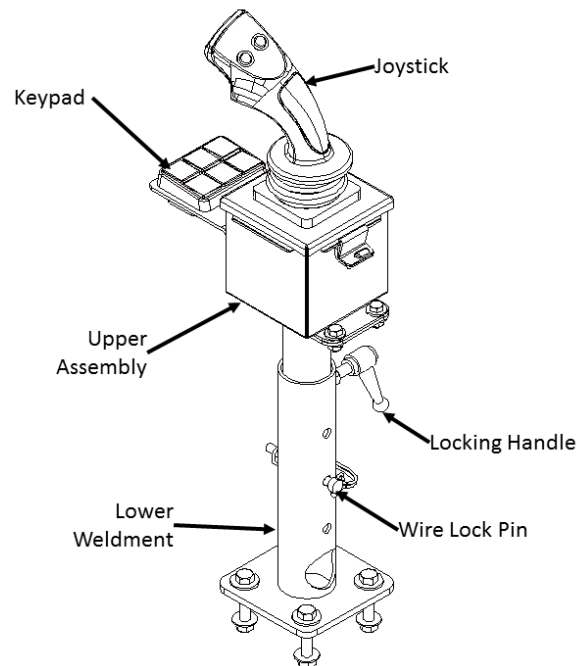


Figure 2.2.1.A - PVG Joystick Assembly

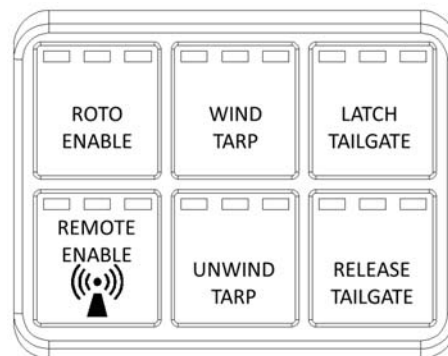


Figure 2.2.1.B - Keypad Top View

2.2.2 Enable System – Within Truck Cab

1. Engage the PTO as outlined in the PTO Operations Manual provided with the. 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 the ROTO 180 system is 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).

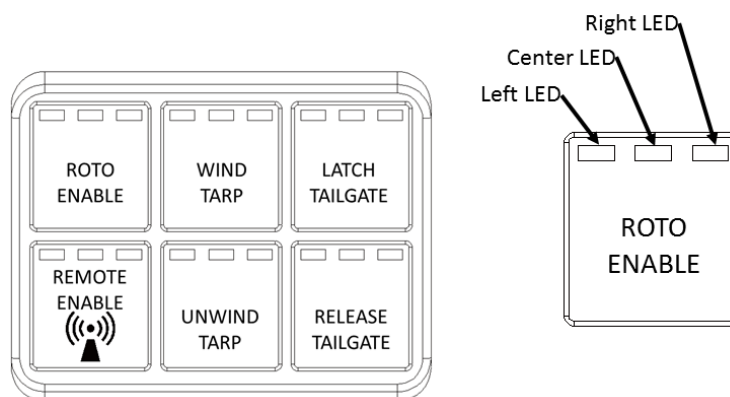


Figure 2.2.2 - Keypad Top View & LED Locations

2.2.3 Disable System

NOTE

Turning off the system from the keypad is the recommended method to shut down the ROTO 180 system; however if the PTO is disengaged at any time, the system will shut off as well.

1. Lower and center the dump body following the operating instructions that follow. Make sure the tailgate has also been latched.
2. Press the "ROTO ENABLE" button and 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 Operations Manual provided with the truck.

2.2.4 Raising Body – In Cab Operation

NOTE

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 "Raildog" manual.

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" 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 if not already done so.
2. Pull the joystick back towards the rear of the truck to raise the body. Releasing the joystick from this position at any time will stop the body from raising. See Figure 2.2.4 for joystick operation.

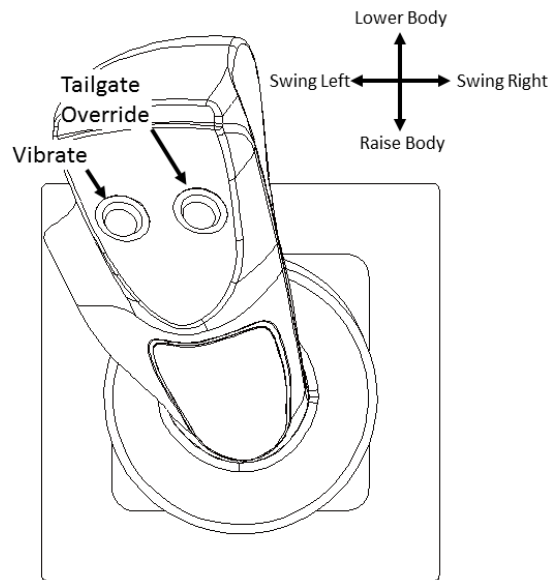


Figure 2.2.4 - Joystick Operation

3. The dump body will pause at 22° while the tailgate opens and stop moving completely at 40°. When the body reaches 40° an alarm will sound, the body will stop moving and then lower slightly. This indicates that the max height has been reached.
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.

2.2.5 Lowering Body – In Cab Operation

1. With the joystick in its neutral position, push it 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.

NOTE

The left LED on “RELEASE TAILGATE” will illuminate when the tailgate is unlatched.

2.2.6 Swinging Body – In Cab Operation

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. Move the joystick to rotate the back of the body in the intended direction. See Figure 2.2.4. 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 verify the tailgate has also been latched.

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.

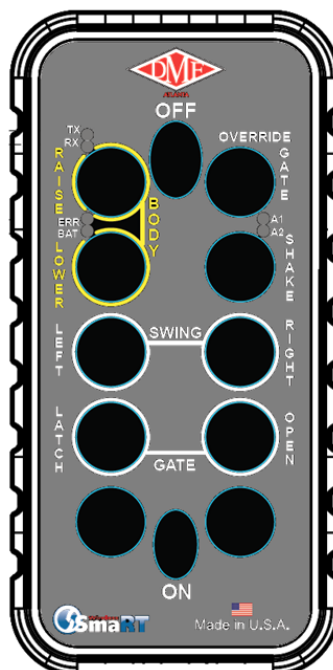


Figure 2.3 - Wireless Remote

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**NOTE**

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 "Raildog" manual.

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 if not already done so.
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 40°. When the body reaches 40° 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.
4. If equipped, the vibrator may be operated from the remote at any time while dumping.

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

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. 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 – PVG VALVES MANUAL 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.

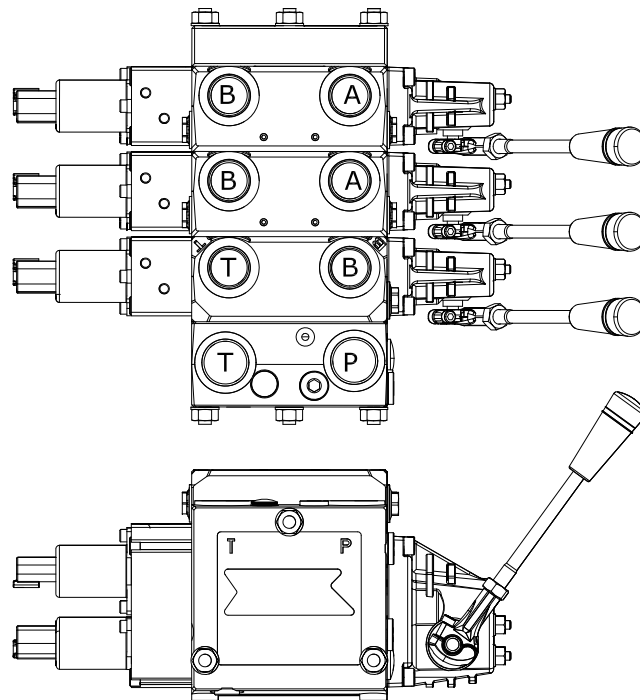


Figure 2.4 - PVG Valves

WARNING

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.

NOTE

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

NOTE

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 "Raildog" manual.

WARNING

If the PVG Valves are being operated manually because of a power failure, the max height function will not 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.

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. Check the position of the tarp and open it completely if not already done so.
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.
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.

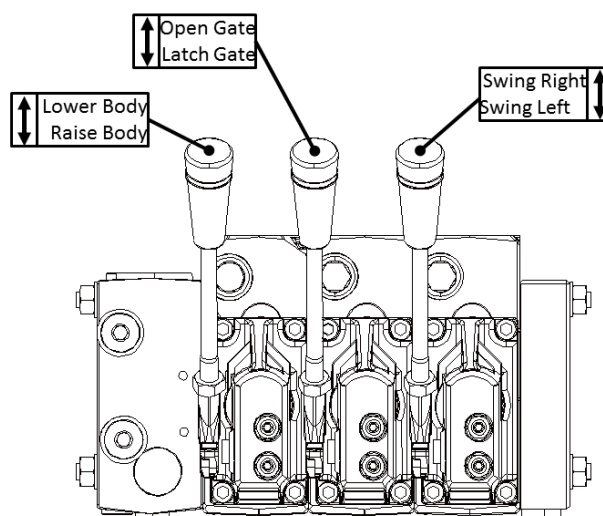


Figure 2.4.1 - Manual Operation of PVG Valves

2.4.2 Lowering Body – Manual Operation

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.

NOTE

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**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.

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 back 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.

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

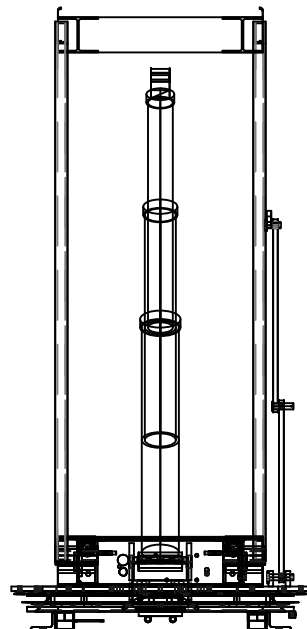
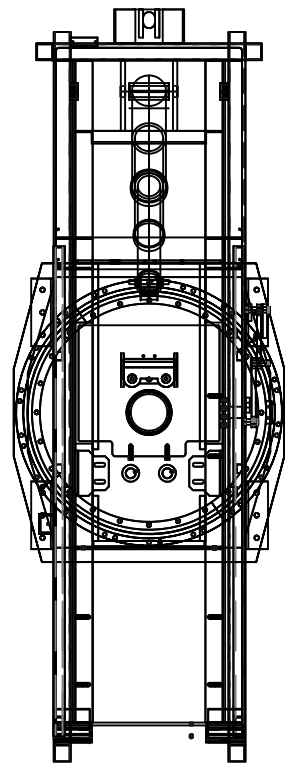
- Perform daily and weekly maintenance.
- Clean the strainer/filter in the hydraulic power unit tank.

3.1.3 Annually

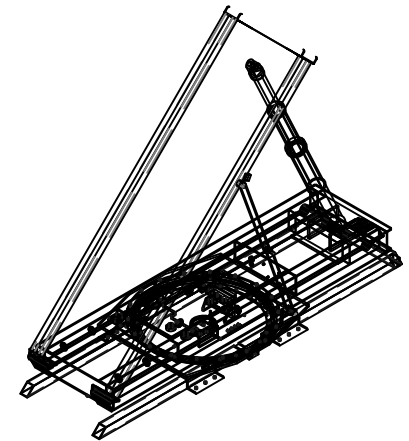
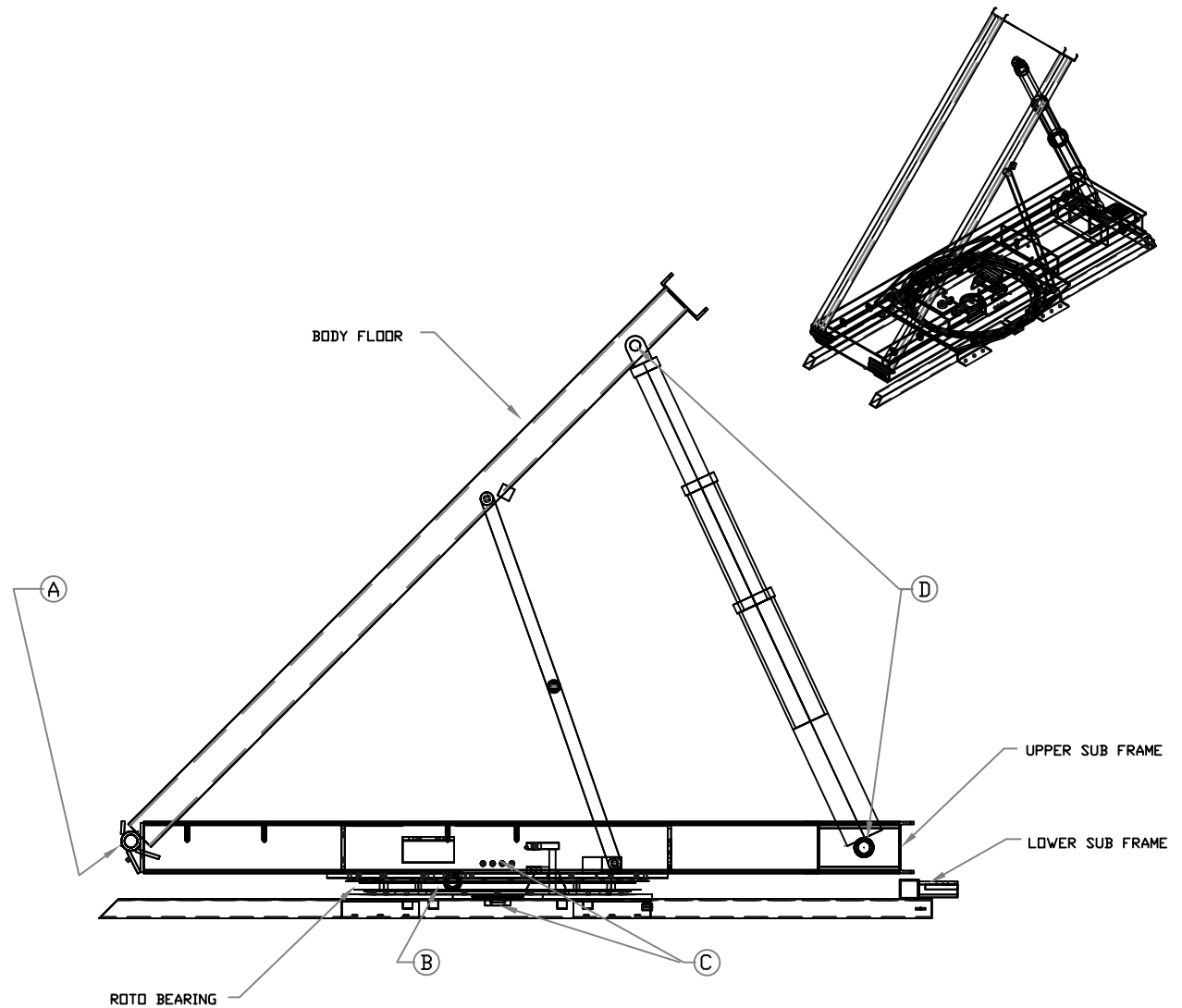
- Perform daily, weekly and bi-annual maintenance.
- Service hydraulics system following the user's manual, which includes replacing oil filter element.

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



ITEM	PART NO.	PLCS.	DESCRIPTION
1	A	2	REAR FRAME PIVOT TUBES
2	B	2or	BEARING (2) FITTINGS @ 180°
	B	4	BEARING (4) FITTINGS @ 90°
3	C	6	UPPER & LOWER FRAME
4	D	2	HOIST CYLINDER (1) ON EACH END



<div> <div> <div></div> <div></div> </div> </div>					
REV	DATE	DESCRIPTION			BY APP
<div> <div> <div>TOLERANCES:</div> <div>(UNLESS SPECIFIED)</div> <div>CURVED SURF: PER VAILS</div> <div>FRACTION: ± 1/32"</div> <div>FRACTION: ± 1/16"</div> <div>XXX: ± .063</div> <div>XXX OR .XXXX: ± .030</div> <div>XXX OR .XXXX: ± .005</div> <div>DRILL SIZES: ± .015</div> <div>ANGULAR: ± 1°</div> <div>SURF FINISH: 125 MICRO</div> <div>THREADS: 2A AND 2B</div> <div>(SEEK SHARP EDGES (0.000 X 45° MAX))</div> </div> </div>		<div> <div> <div>TITLE:</div> <div>GREASE FITTING LOCATIONS (FOR ROTD DUMP)</div> </div> </div>		<div> <div> <div>DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512</div> </div> </div>	
<div> <div> <div>DRAWN BY:</div> <div>KLC</div> </div> </div>		<div> <div> <div>APPD BY:</div> <div></div> </div> </div>		<div> <div>DATE:</div> <div>02/13/98</div> </div>	<div> <div>DRAWING NUMBER:</div> <div>R18512</div> </div>
				<div> <div>REV:</div> <div>#</div> </div>	

3.3 TROUBLESHOOTING – HYDRAFORCE MANIFOLD

NOTE

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

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 Operations Manual provided with the truck.
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 raise

- 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 pumps. 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.
 - 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.
 4. Find the solenoid valve for raising the dump body. It should be illuminated when power is being sent to the manifold.
 - 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 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 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 the issue is related to one of the swing cylinder. Replace as needed. If no pressure is detected 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.

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.

2. With the PTO running use a small screwdriver to press the override located at center of each spool on the far end.
 - 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. The solenoid valves are the same for the swing and tailgate operations.
 2. 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. 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 become illuminated.
 3. Release the tailgate and make sure the sensor turns on.
 4. Raise the dump body. When the body reaches 22° one of the height sensors should turn off and the tailgate should release.
 5. The other sensor should turn off at 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 broken wire. Replace 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.

NOTE

The dump body's rear end 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.
- B. Turning the adjuster knob clockwise will restrict fluid flow and slow down the swing speed.

NOTE

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 Operations Manual provided with the truck. 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 and 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.

3.3.4 Electrical System Troubleshooting

- A. Determine if 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 sound, 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 are illuminated make sure the connector(s), for the problematic function, are fully seated. Tighten the screw on each connector if necessary.
 - If any of the connections are not 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 there is a voltage seen 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 at hand 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.
2. 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:

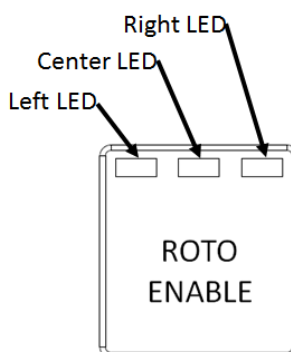


Figure 3.4.2 - Keypad LED Identification

1. ROTO ENABLE

LED Location	Solid	Blinking	Off
Left	PTO engaged	PTO not engaged see PTO Operations Manual in truck	PTO not engaged
Center	ROTO enabled Button pressed	-	-
Right	ROTO enabled	Fault code - see Section 3.4.3	ROTO not enabled

2. WIND TARP

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

3. LATCH TAILGATE

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

4. REMOTE ENABLE

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

5. UNWIND TARP

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

6. RELEASE TAILGATE

<u>LED Location</u>	<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 which is 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 Plus One 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. Replace keypad.
33	Remote Offline	Check power, ground and CAN wiring. Replace receiver.
34	Joystick Offline	Check power, ground and CAN wiring. Replace joystick.

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.
- D. Test the system using the wireless remote, if equipped.
 1. Enable the wireless remote following Section 2.3.1 and attempt to rotate and lift the body.
 - If the wireless remote functions properly there is an issue with the joystick or the joystick wiring. Reference Section 3.4.9 for troubleshooting.
 - If the wireless remote does not function there is a problem with the electrical system. See Section 3.4.9 for troubleshooting.

3.4.5 Movement Troubleshooting

Dump body is not moving or 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.
 - If the system does not respond, there is a hydraulic issue. Reference the hydraulic troubleshooting in Section 3.4.8.
- E. Check for electrical system failures.
 - 1. Enable the wireless remote, if equipped, following Section 2.4.1.
 - 2. Duplicate the operation not responding using the wireless remote.
 - If the remote works, there is a problem with the joystick or the joystick wiring, reference the electrical troubleshooting in Section 3.4.9.
 - If the system does work, there is an overall electrical system issue. Refer to Section 3.4.9.

Dump body is not moving in intended direction

- A. Address common errors, see Section 3.4.1.
- B. The swing direction indicates the tailgate position 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.
 - If the system does not respond correctly there is a hydraulic issue. Reference the hydraulic troubleshooting Section 3.4.8.
- D. Check for electrical system failures.
 - 1. If equipped, enable the wireless remote following Section 2.3.1.
 - 2. Duplicate the movement that is not working properly.
 - If the remote works properly, there is an issue with the joystick, reference Section 3.4.9.
 - If the remote does not work properly, there is an overall issue with the electrical system. See Section 3.4.9.

3.4.6 Tailgate Troubleshooting

Tailgate is not opening

- E. Address common errors, see Section 3.4.1.
- F. Verify tailgate cylinder is operating properly.
 - 1. With the dump body lowered and empty, operate the tailgate manually using the PVG Valves 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.
- G. 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.

- H. 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.
- I. Tailgate and height sensors are no longer working.
 - 1. Locate tailgate and height proximity sensors 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 become illuminated.
 - If the sensors do not respond when tested, see the electrical troubleshooting in Section 3.4.9. Reference drawing 20754 in Section 7.
- J. Tailgate and height sensors have 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° one of the height sensors should turnoff and the tailgate should release.
 - 2. The other sensor should turn off at approximately 40°. If this does not happen for either of the sensors they may have moved during operation and require repositioning.
 - 3. If these sensors are being repositioned, ensure the body does not contact any part of the truck when raised. **Do not overextend the hoist cylinder.**

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 function properly, continue on.
- D. PVG Valves diagnosis.
 1. Engage the PTO as outlined in the PTO Operations Manual provided with the truck.
 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.
 - If some of the sections do not work, these sections should be replaced.

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 Plus One 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 controller may need replacing.
 - 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 is an issue with the PlusOne controller.
 - If voltage is present in only one of the connectors check for wire connectivity.

NOTE

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.

SECTION 4.0 ROTO 180 INSTALLATION

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4.1 PRE-INSTALLATION

NOTE

Read all 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

- Always use a dump body support strut before going underneath the dump body.
- 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	
<u>Manufacturer</u>	<u>Welding Rod</u>
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
McKay Co	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 (Power Take-Off), relief valve and a power beyond/ diverter valve for the Railgear (if equipped). The pump should be capable of 21 GPM at 2000 PSI. Engage the PTO as outlined in the PTO Operations Manual provided with the truck.

NOTE

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 values 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 disulphide, 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 ALL TORQUE VALUES, REMOVED PLAIN TORQUE SPECS		DJJ	
	12/29/99	ADDED RECOMMENDED TORQUE CHART		LOR	
REV	DATE	DESCRIPTION			BY APP
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRACTIONAL: ± 1/32" FRACTIONAL, OTHER: ± 1/16" X: ± .063 .XX: ± .030 .XXX OR .XXXX: ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES		DRAWN BY: TSH APPD BY:		TITLE: PRODUCTION PROCEDURE 006 FASTENER TORQUE SPECIFICATION DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512	
		DATE: 06/02/94		DRAWING NUMBER: PP006	REV: B

4.2 SUBFRAME MOUNTING PROCEDURE

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 center of the tandem. The shift forward allows for better weight transfer to the front axle. See Figure 4.2.A for the subframe positioning. These values have been listed in the table below:

<u>Dump Body Length</u>	<u>Minimum Cab to Axle Distance (in)</u>	<u>Swing Bearing Centerline Offset (in)</u>
12'	87	3
14'	111	15

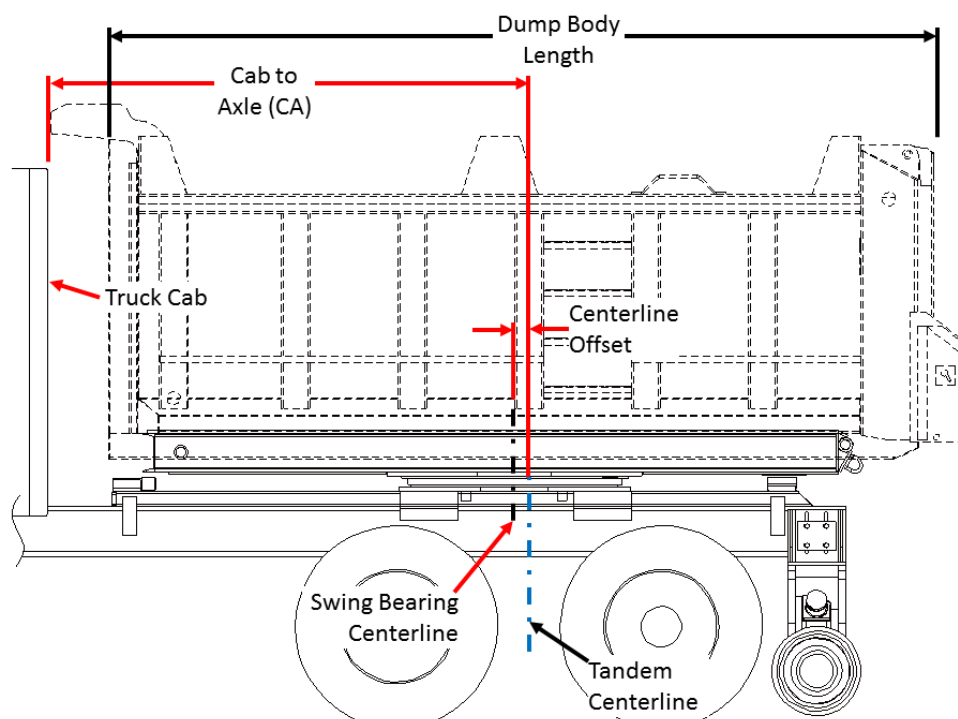


Figure 4.2.A - Subframe Mounting Location

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.

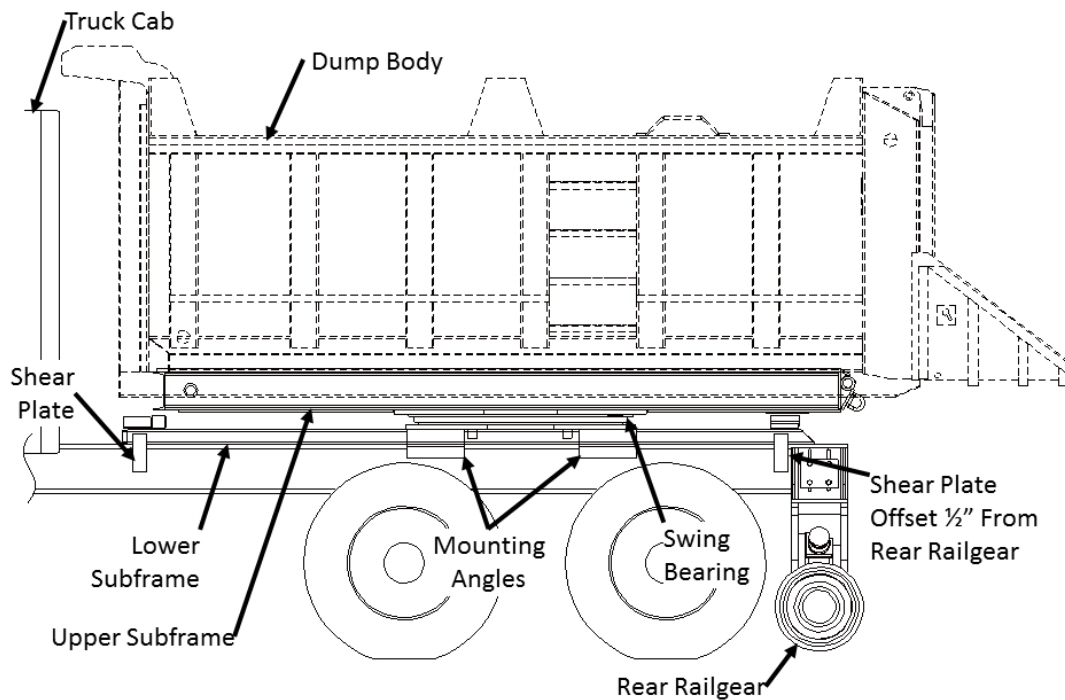


Figure 4.2.B - Subframe Component Location

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.

NOTE

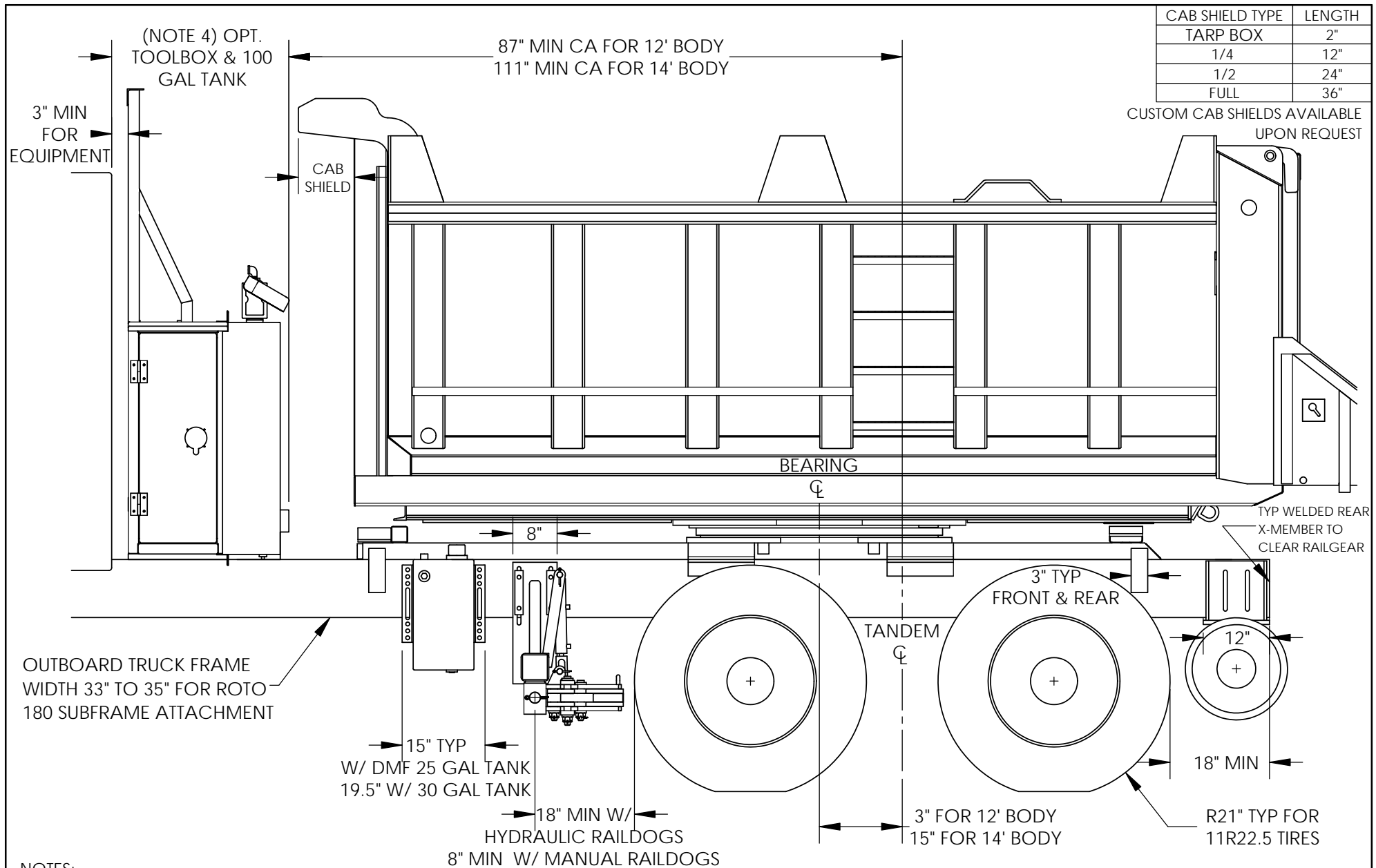
The slotted leg of the mounting angle bolts to the exposed leg of the mating subframe angle. The slot accommodates different chassis frame widths.

3. Locate two of the shear plates at the extreme front end of the subframe. Use c-clamps to hold the lower subframe firmly against the truck frame and match drill through the truck frame. Bolt the clips to the truck frame as with the angles. Then, weld the shear plates to the ROTO subframe.
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 position will vary from truck to truck.

NOTE


If the subframe extends over the Railgear mounting bracket, move the rear two shear plates to 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.



NOTES:

1. SEND CHASSIS SPECS TO DMF FOR REVIEW BEFORE PLACING PO FOR CHASSIS OR ROTO 180.
2. DIMENSIONS SHOWN ARE TO "EFFECTIVE CA" WHICH ACCOUNTS FOR CHASSIS COMPONENT INTRUSION ON "CLEAN CA" SUCH AS EXHAUST, CAB SUSPENSION, ETC.
3. SEE ROTO 180, RAILDOG, & RAILGEAR MANUALS FOR HYDRAULIC REQUIREMENTS & OTHER DETAILS.
4. 32" AS SHOWN, 41.5" FOR TOOLBOX & 2 TANKS. ADJUST AS NEEDED FOR SPARE TIRE, BEHIND CAB CRANE, OR OTHER EQUIPMENT.

REV	DATE	DESCRIPTION			BY	APP
TOLERANCES: (UNLESS SPECIFIED)		ROTO 180				
FRAC. MACH: ± 1/32"		TITLE: ROTO CHASSIS CLEARANCE REQUIREMENTS				
FRAC. OTHER: ± 1/16"						
X ± .063		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512				
.XX ± .030						
.XXX ± .005		DRAWN BY: B J F APPD BY: - DATE: 7/27/15				
DRILL SIZES: ± .015						
ANGULAR: ± 1"						
SURF FINISH: 125 MICRO						
THREADS: 2A AND 2B		DRAWING NUMBER: MROTO106 REV: #				
[PLEASE SHIP TO LOCAL CUSTOMER OR HQS.]						

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.

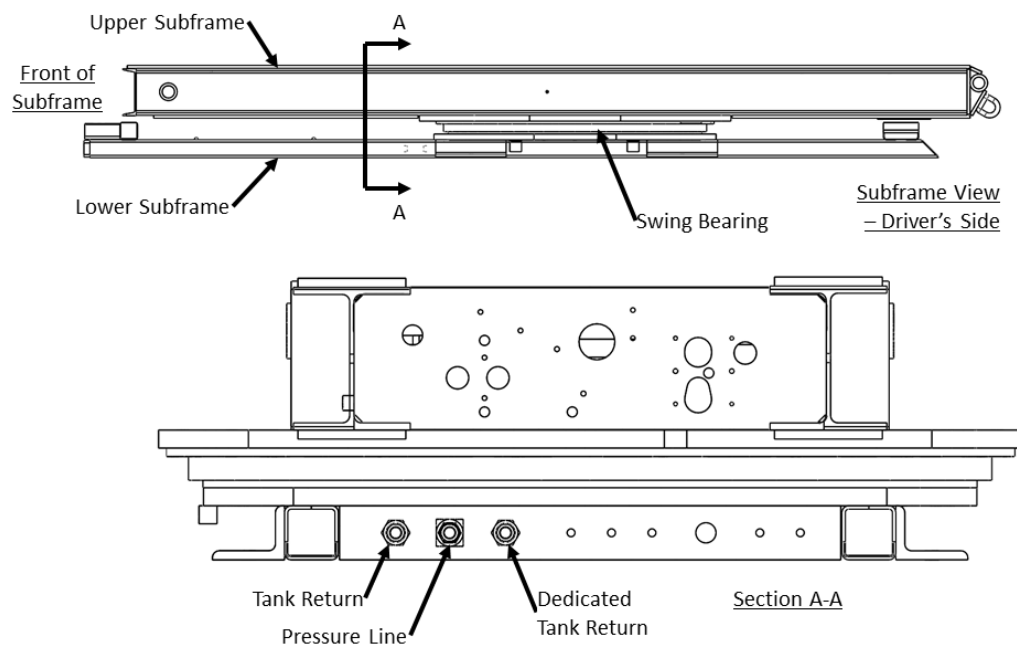
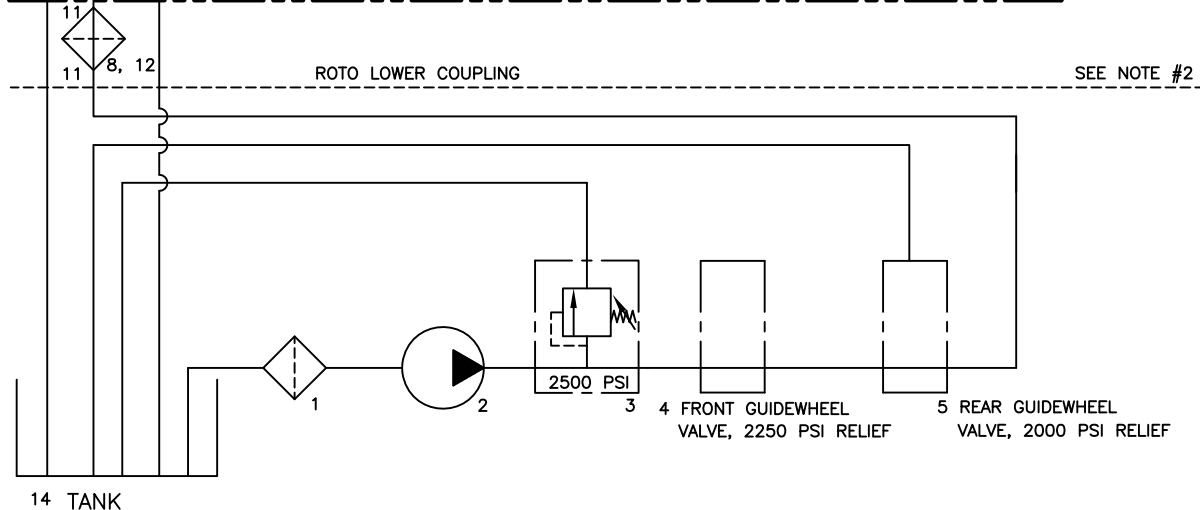
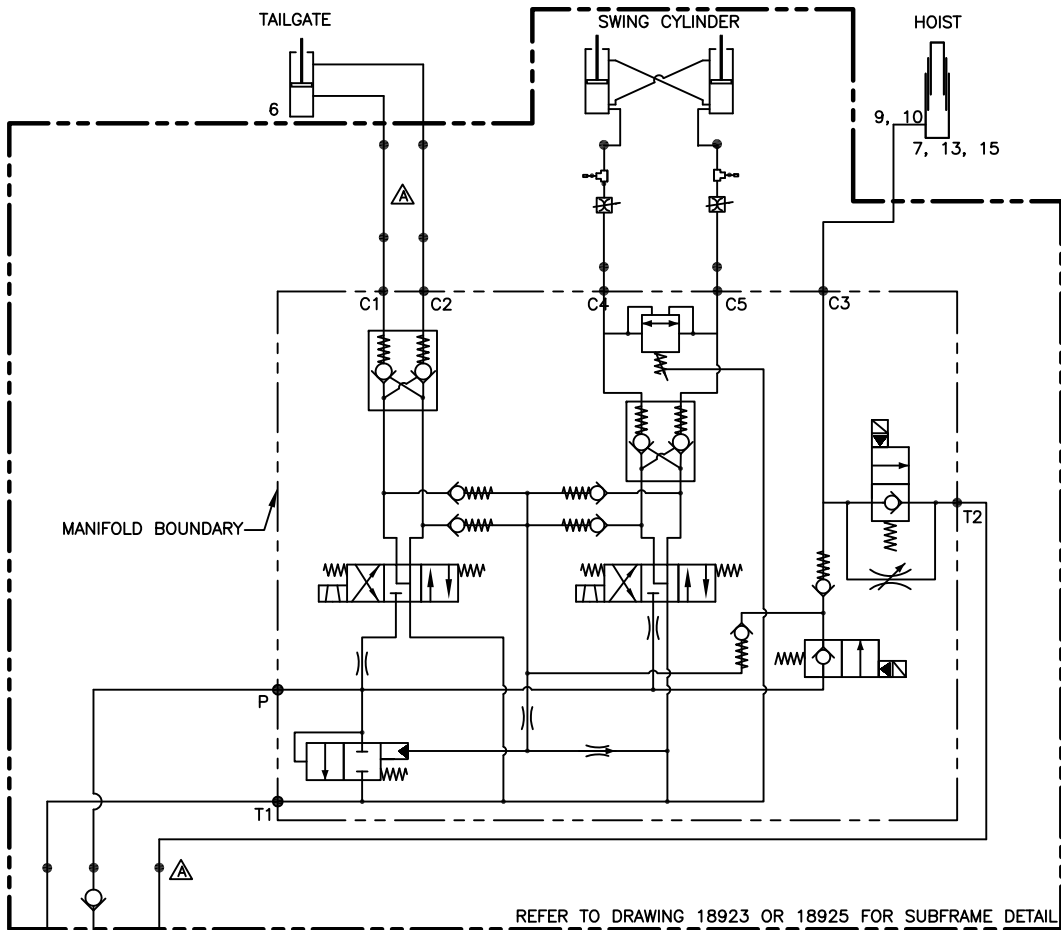


Figure 4.3.1 - Subframe Hydraulic Connections



ITEM	PART NO.	QTY	DESCRIPTION
1	605138	1 REF	FILTER; GRESEN FSP212-1EBNN (OR EQUAL)
2		1 REF	PUMP; RECOMMENDED 25 GPM @ 2500 PSI
3	18737	1 REF	RELIEF VALVE; GRESEN 1/2" NPT, WJL-50-A-2500 (OR EQUAL)
4	810202	1 REF	VALVE TANDEM CENTER: ENERGY CVA-200-1/2
5	810209	1 REF	VALVE TANDEM CENTER: GRESEN SPYTE-4-4-HP W/ PWR BEYOND
6	18318	1	TAILGATE CYLINDER KIT
7	18957	1	HYVA HOIST CYLINDER FOR DUMP BODY (FEE 6-3-108)
8	18902	1	HIGH-PRESSURE FILTER (10 MICRON)
9	605143	1	#12 MJIC X #12 MPT X 45 DEGREE
10	605142	1	REDUCER BUSHING, #16 MPT X #12 FPT
11	605144	2	#12 MJIC X #12 O'RING X 90 DEGREE, EXTRA LONG
12	20810	1	HIGH-PRESSURE FILTER BRACKET
13	18698	2	SPACER FOR LOWER ROTO HOIST PIN
14	18797	1 REF	HYDRAULIC TANK, 25 GALLON RECOMMENDED
15	605145	2	COTTER PIN, 1/4" X 3"
16			
17			
18			
19			
20			
21			
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23			
24			
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34			
35			

NOTES: 1) ITEMS WITH A QTY. CONTAINING "REF." ARE NOT IN THE BOM FOR 18941 AND ARE LISTED ONLY TO AID IN SYSTEM TROUBLESHOOTING. THEY ARE SUPPLIED EITHER WITH THE RAILGEAR OR BY THE INSTALLER
2) EVERYTHING ABOVE DOTTED LINE IS INCLUDED WITH A ROTO-180 SHIP-OUT KIT.

REFER TO DWG 20756 FOR ELECTRICAL DETAIL

<div>⚠</div>	08/13/15	18957 WAS 18945, ADDED 605145, SUBFRAME UPDATED, 18797 WAS 18780		DJJ		
REV	DATE	DESCRIPTION			BY	APP
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: ± 1/32 FRAC. OTHER: ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES		TITLE: STANDARD ROTO W/ HYDRAFORCE MANIFOLD, HYD SCHEM. DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512				
ROTO-180		DRAWN BY:	APPD BY:	DATE:	DRAWING NUMBER:	REV:
JDI				9/28/12	18941	A
		<div><div></div><div>DME</div><div>ATLANTA</div></div>				

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

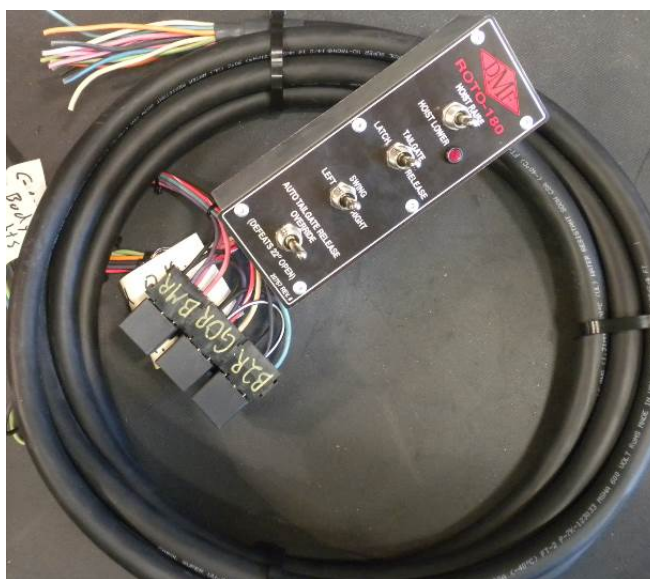
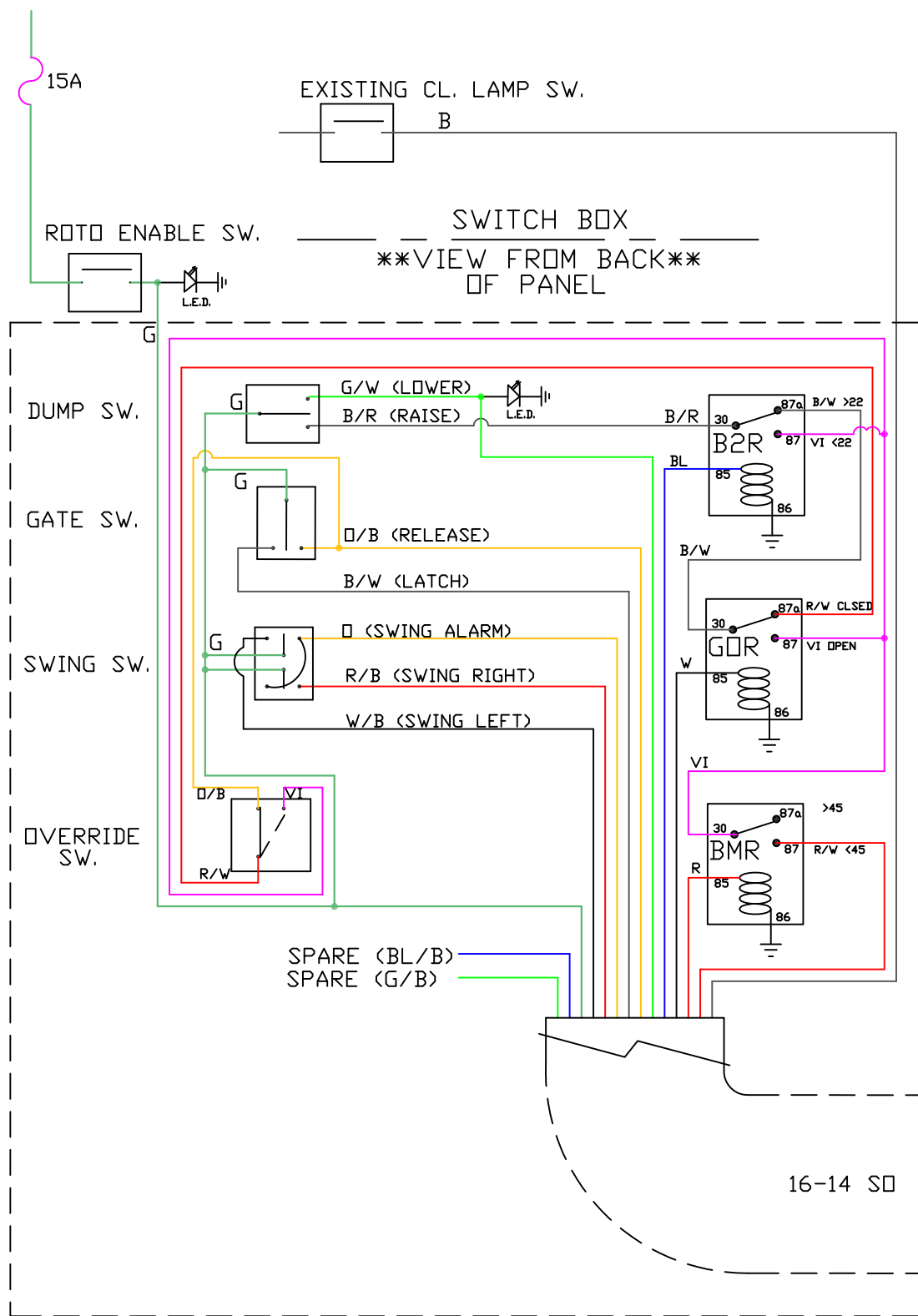


Figure 4.4 - ROTO 180 Controls Cable

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.
7. Bolted or welded 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.

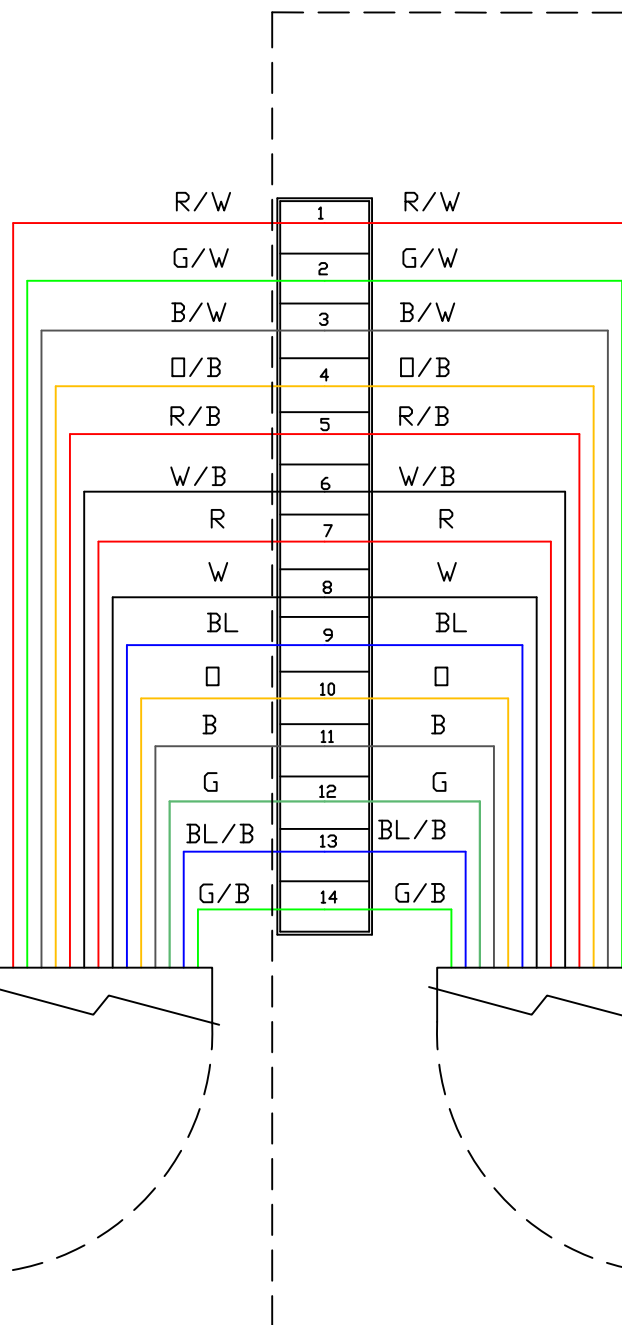
12 V DC FROM IGNITION SOURCE



REFERENCE DWG. 20755

ROTO - TERMINAL WIRING

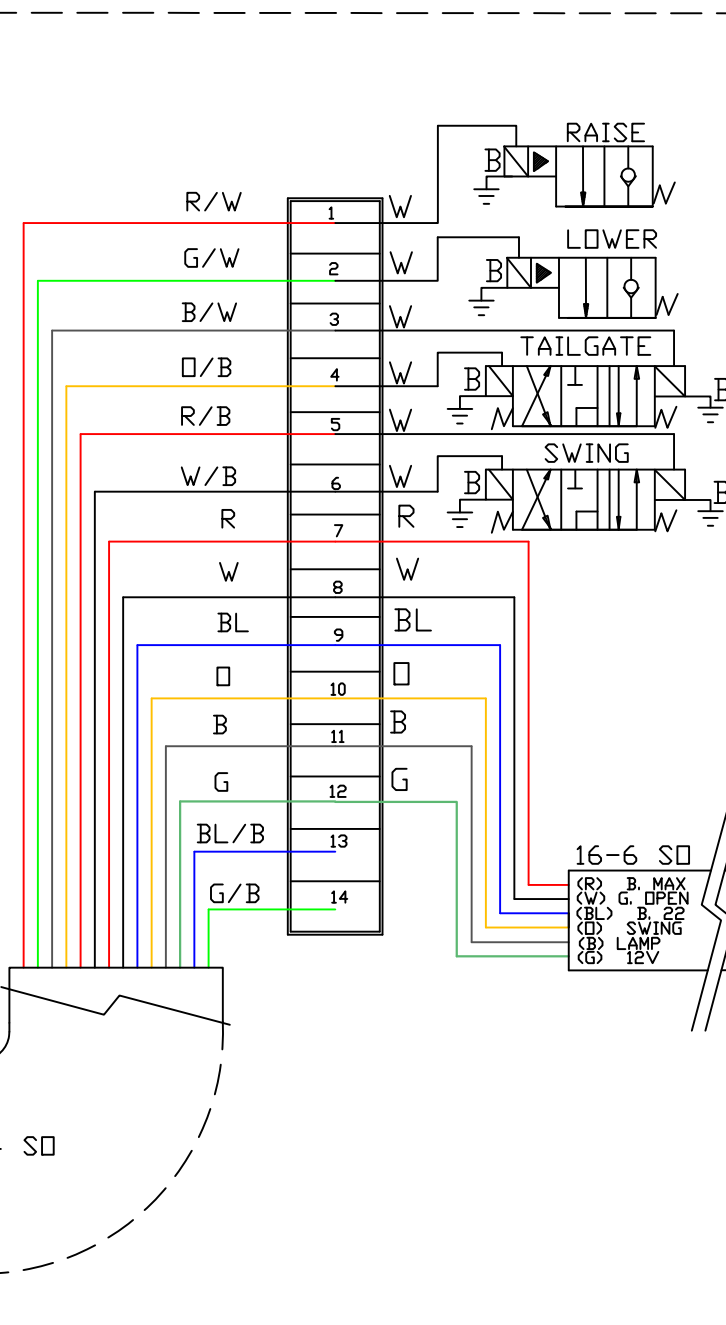
VIEW FROM D.S.



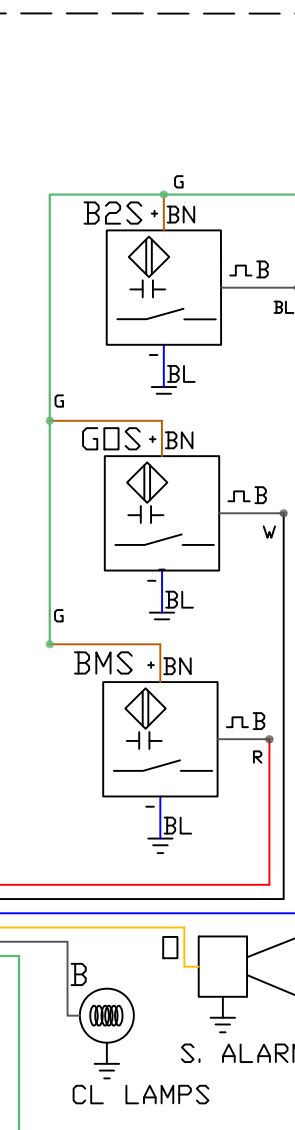
REFERENCE DWG. 20757

ROTO SUB-FRAME WIRING

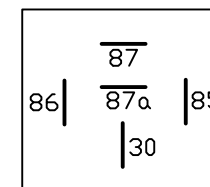
VIEW FROM D.S.



REAR CROSS MEMBER WIRING



RELAY PIN CONFIG.
BOTTOM VIEW



HELLA 87401 OR EQV.

SENSORS:
BELOW 22 SENSOR = B2S
GATE OPEN SENSOR = GOS
BELOW MAX SENSOR = BMS

RELAYS:
BELOW 22 RELAY = B2R
GATE OPEN RELAY = GOR
BELOW MAX RELAY = BMR

REFER TO 18901 FOR HYDRAULIC DETAIL

ROTO - 180

TITLE:
ROTO-180 ELECTRICAL SCHEMATIC
W/ 3 PROX SW.

DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512

DRAWN BY:

APPD BY:

DATE:

DRAWING NUMBER:

REV:

ARJ

1/23/12

20756

#

REV	DATE	DESCRIPTION	BY	APP
△	-	-	-	-
△	-	-	-	-
△	-	-	-	-

4.5 INITIAL OPERATION – HYDRAFORCE MANIFOLD

1. Enable the system following the steps found in Section 2.1.1.
2. On the control panel, hold the hoist switch in the raise position. Raise the body a few inches to clear the center lock pin.
3. Active the “SWING” switch and rotate the body a few times in both direction 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 subframe. If there is insufficient space on the truck frame, they can be removed from the mounting plate and relocated. 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 $\frac{3}{4}$ " sized hoses with swivel fittings.
4. Connect the "T" port on the same section back to the tank using a $\frac{3}{4}$ " sized hose with swivel fittings.
5. Connect the "T" port of the hoist section back to the tank using a $\frac{3}{4}$ " 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 $\frac{1}{4}$ " 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.

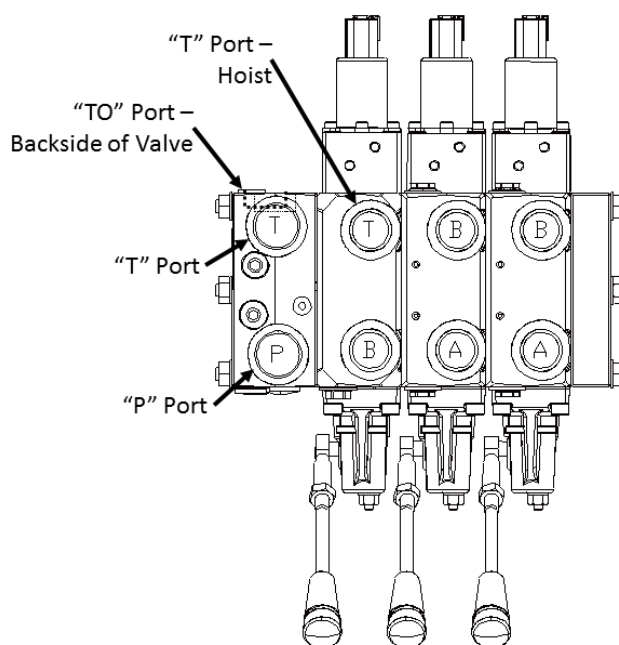


Figure 4.6.1.A - 3 Section PVG Valves - Port Locations

7. Connect a $\frac{1}{4}$ " sized hose with swivel fitting from the tank return port located on the lower subframe to the tank. See Figure 4.6.1.B for the subframe port location.

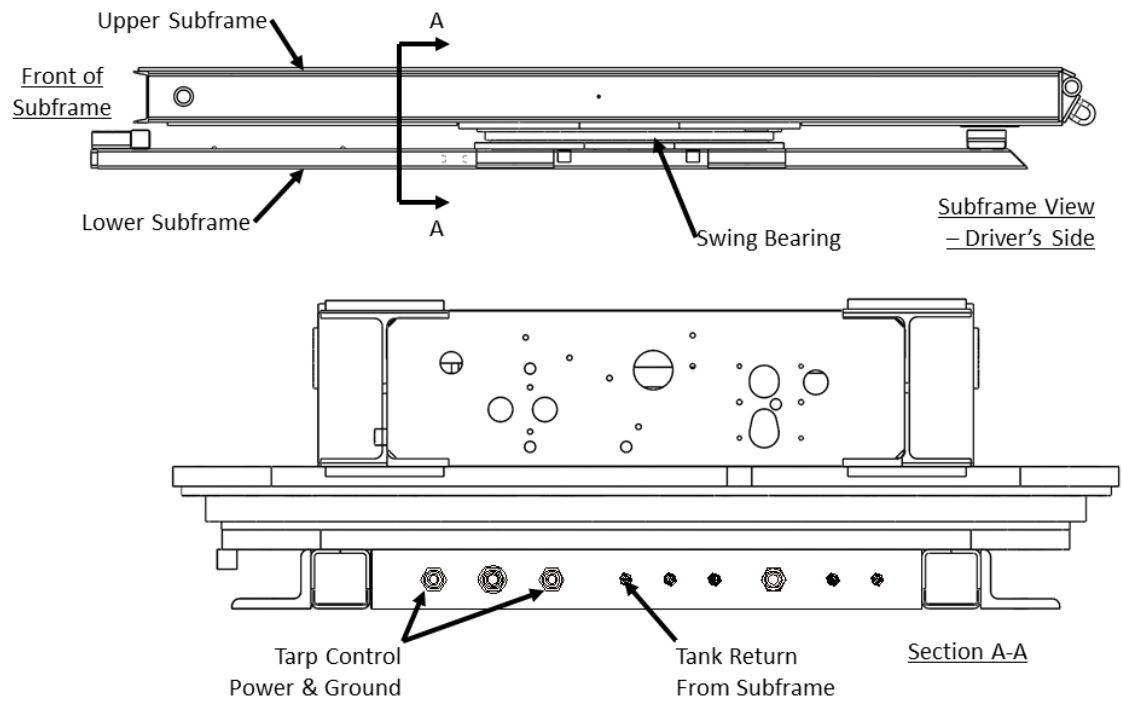
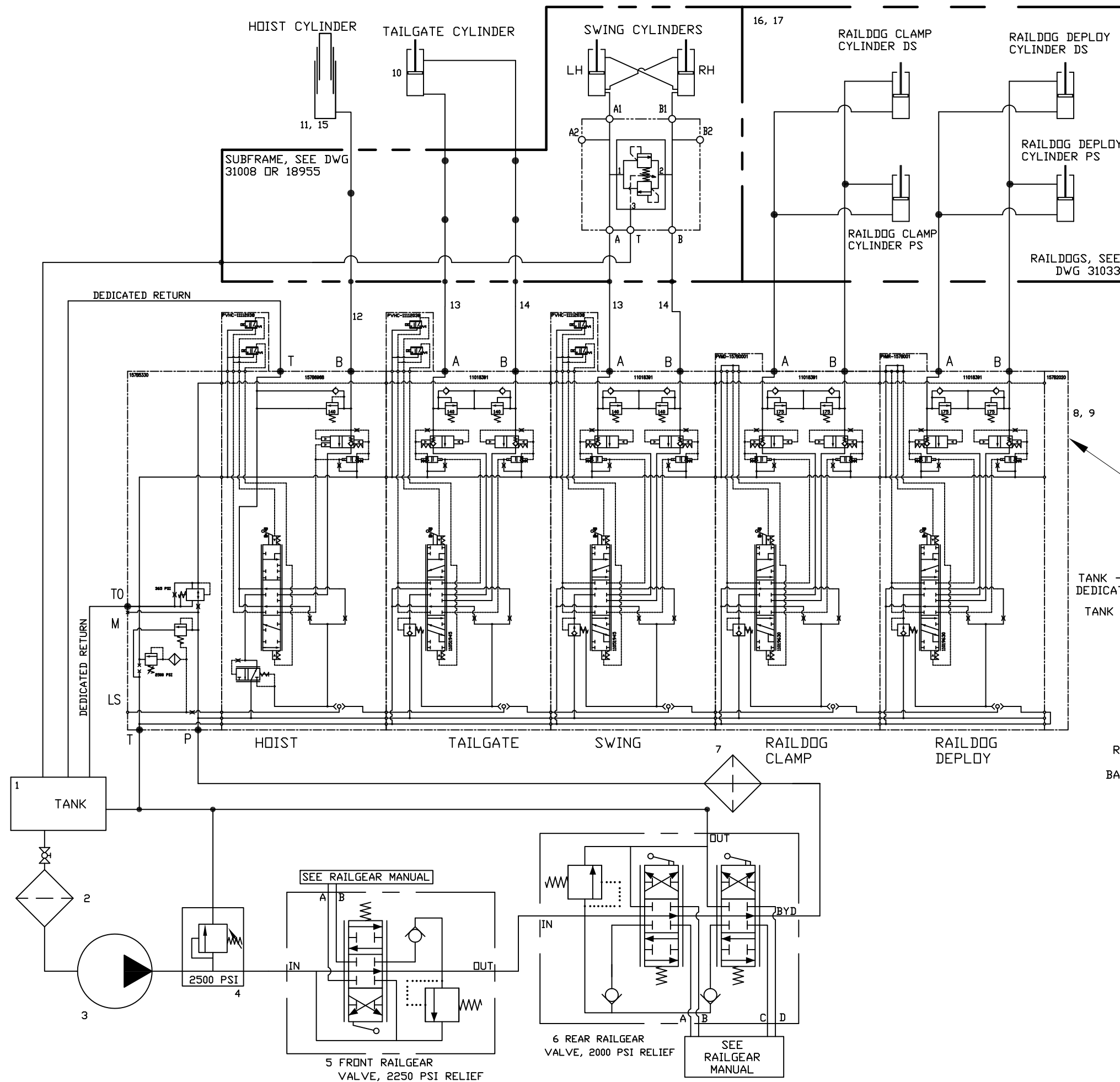
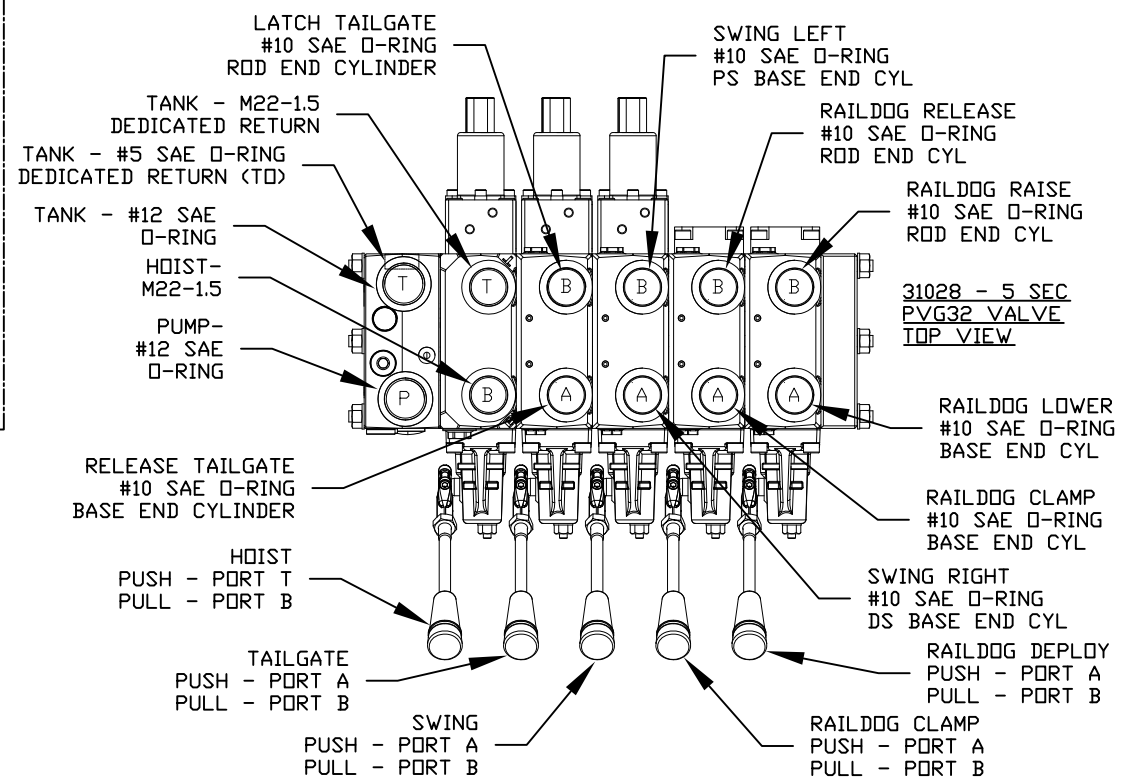
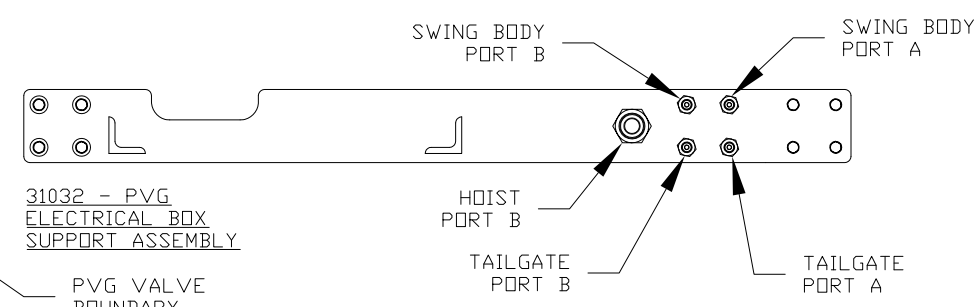


Figure 4.6.1.B - Subframe Hydraulic & Electrical Connections



ITEM	PART NO.	QTY	DESCRIPTION
1	18797	REF	HYDRAULIC TANK, 25 GALLON RECOMMENDED
2	605138	REF	FILTER; GRESNEN FSP212-1EBNH (OR EQUAL)
3	-	REF	PUMP; RECOMMENDED 25 GPM @ 2,500 PSI
4	18737	REF	RELIEF VALVE; GRESNEN 1/2" NPT, WJL-50-A-2500 (OR EQUAL)
5	810202	REF	HYD. VALVE W/ FITTINGS
6	810209	REF	HYD. VALVE W/ FITTINGS, POWER BEYOND
7	18924	1	PRESSURE FILTER KIT (10 MICRON)
8	31028	1	5 SECTION PVG32 W/ FTGS - HOIST, GATE, SWING, RAILDOGS (CVA-11285)
9	31032	1	ROTO PVG ELECTRICAL BOX SUPPORT ASSEMBLY
10	18318	1	TAILGATE CYLINDER KIT - ROTARY DUMP
11	18953	1	ROTO HOIST CYLINDER HARDWARE KIT
12		1	HOSE; #12 X 48"
13	31021	2	HOSE; #04 X 48"
14		2	HOSE; #04 X 46"
15	18957	REF	HYVA HOIST CYLINDER (FEE 6-3-108)
16	31033	1	RAILDOGS, HYDRAULIC SCHEMATIC, 5 SECTION PVG VALVES
17	300603	1	HYD. RAILDOGS - NO HOSES

SEE DRAWING 30037 FOR ELECTRICAL DETAIL



REV	DATE	DESCRIPTION	BY	APP
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4.7 ELECTRICAL INSTALLATION – PVG VALVES

WARNING

To reduce the risk of electrocution, make sure the truck has been turned off and the key is no longer in the ignition.

1. In the kit provided is a joystick and keypad installed on a mount. Use the provided mounting hardware to secure this 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.

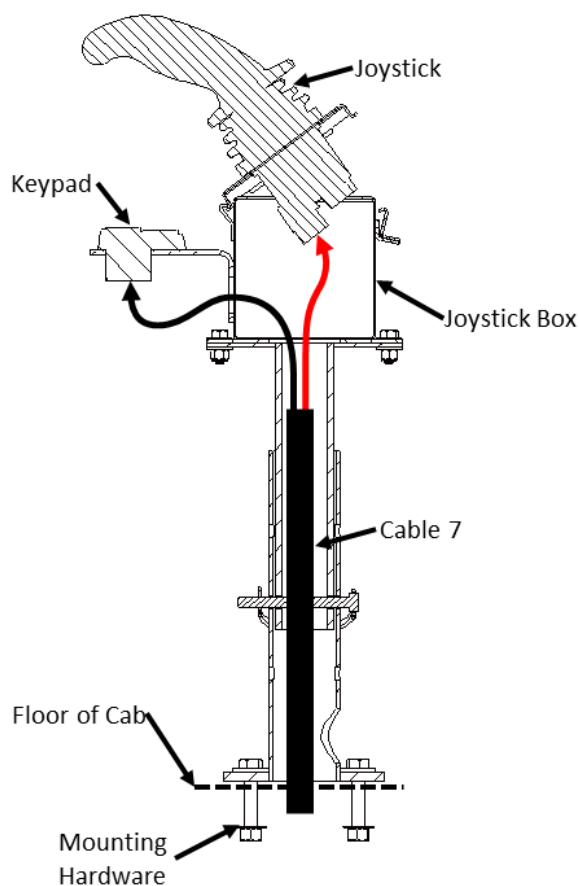
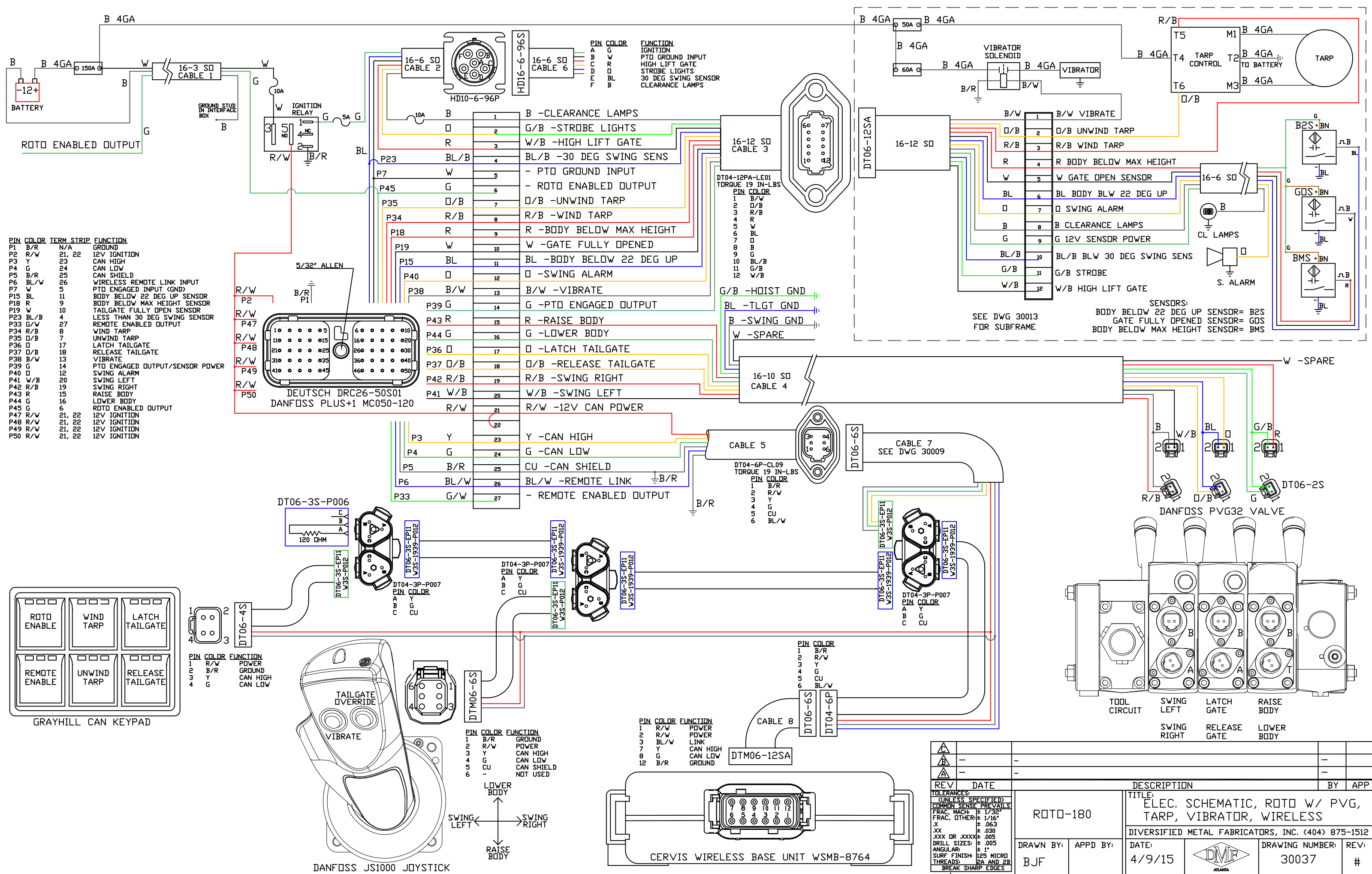


Figure 4.7 - Joystick/Keypad Mount Wiring

NOTE

The keypad may be mounted to the dashboard. Remove the angle bracket from the joystick mount to use as a cutout template. Route the keypad connector up through the firewall instead of the joystick mount.

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 connector found on the outside of the electrical box.
7. Route the wiring harness, "Cable 7", back to the electrical box on 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.
9. 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 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.



PIN	COLOR	TERM	STRIP	FUNCTION
P1	B/R	N/A		GROUND
P2	R/W	21, 22		12V IGNITION
P3	Y	23		CAN HIGH
P4	G	24		CAN LOW
P5	B/R	25		CAN SHIELD
P6	BL/W	26		WIRELESS REMOTE LINK INPUT
P7	W	5		PTO ENGAGED INPUT (GND)
P15	BL	11		BODY BELOW 22 DEG UP SENSOR
P18	R	9		BODY BELOW MAX HEIGHT SENSOR
P19	W	10		TAILGATE FULLY OPEN SENSOR
P23	BL/B	4		LESS THAN 30 DEG SWING SENSOR
P33	G/W	27		REMOTE ENABLED OUTPUT
P34	R/B	8		WIND TARP
P35	D/B	7		UNWIND TARP
P36	D	17		LATCH TAILGATE
P37	D/B	18		RELEASE TAILGATE
P38	B/W	13		VIBRATE
P39	G	14		PTO ENGAGED OUTPUT/SENSOR POWER
P40	D	12		SWING ALARM
P41	W/B	20		SWING LEFT
P42	R/B	19		SWING RIGHT
P43	R	15		RAISE BODY
P44	G	16		LOWER BODY
P45	G	6		ROTO ENABLED OUTPUT
P47	R/W	21, 22		12V IGNITION
P48	R/W	21, 22		12V IGNITION
P49	R/W	21, 22		12V IGNITION
P50	R/W	21, 22		12V IGNITION

PIN	COLOR	TERM	STRIP	FUNCTION
P3	Y	23		Y -CAN HIGH
P4	G	24		G -CAN LOW
P5	B/R	25		CU -CAN SHIELD
P6	BL/W	26		BL/W -REMOTE LINK
P33	G/W	27		- REMOTE ENABLED OUTPUT

PIN	COLOR	FUNCTION
1	R/W	POWER
2	BL/W	POWER
3	Y	LINK
4	Y	CAN HIGH
5	G	CAN LOW
6	B/R	GROUND

REV	DATE	DESCRIPTION	BY	APP
1	4/9/15	ELEC. SCHEMATIC, ROTO W/ PVG, TARP, VIBRATOR, WIRELESS	BJF	
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512				
DRAWN BY: BJF		APPD BY:	DATE: 4/9/15	DRAWING NUMBER: 30037
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS		REV: #		
FRAC. MACH: ± 1/32"				
FRAC. OTHER: ± 1/16"				
X: ± .063				
XX: ± .030				
XXX OR .XXXX: ± .005				
DRILL SIZES: ± .005				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 1/8 AND 3/8				
BREAK SHARP EDGES				

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.

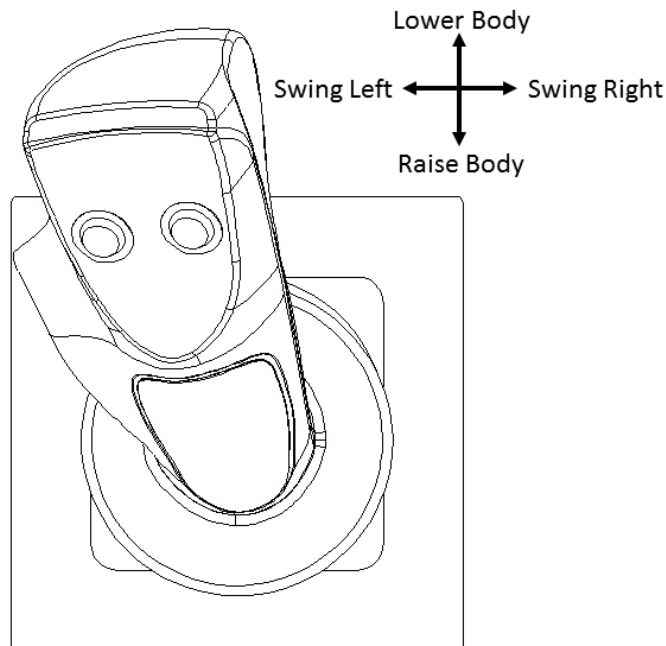


Figure 4.8 - Joystick Movement

WARNING

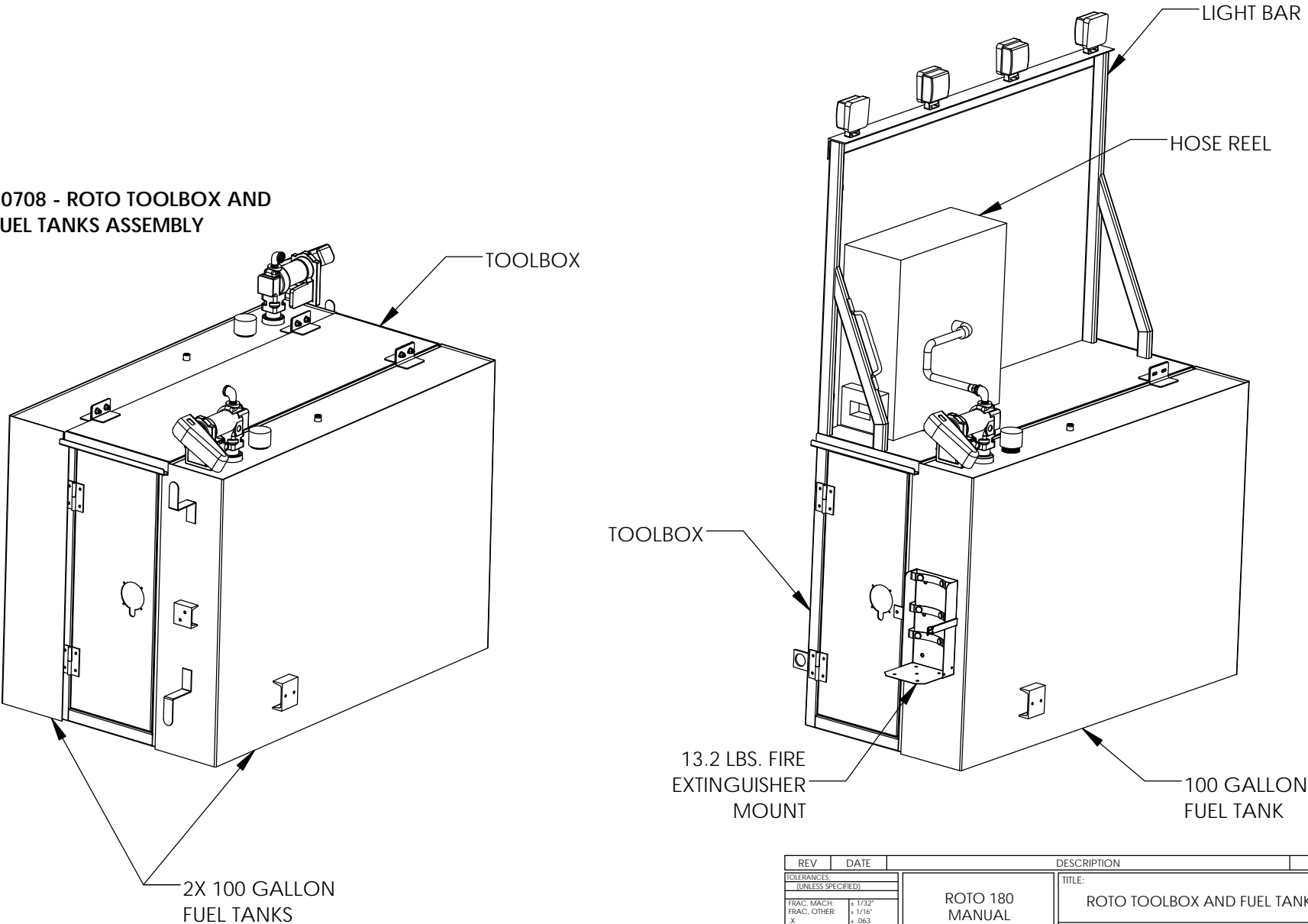
The dump body may only be used to swing while on rail and with Raildogs deployed.

SECTION 5.0 ROTO 180 OPTIONS

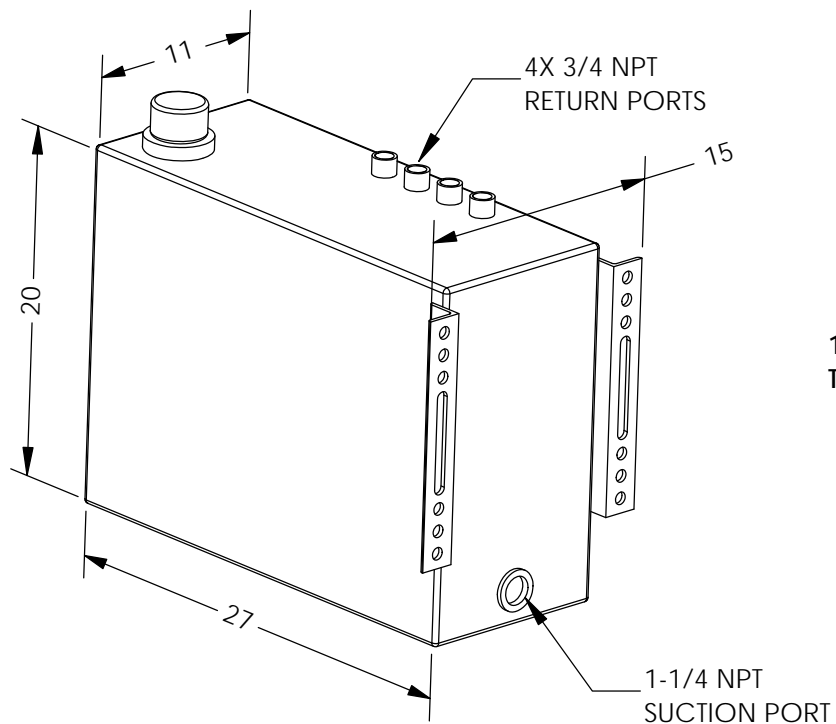
5.1	ROTO 180 TOOLBOX AND FUEL TANK OPTIONS - MROTO100	5-2
5.2	ROTO 180 HYDRAULIC TANK OPTIONS - MROTO101	5-3
5.3	ROTO 180 DUMP BODY OPTIONS - MROTO102	5-4
5.4	ROTO 180 DUMP BODY OPTIONS CONTINUED - MROTO103	5-5
5.5	ROTO 180 DUMP BODY LADDER OPTIONS - MROTO104	5-6
5.6	ROTO 180 DUMP BODY SPARE TIRE CARRIER ASSEMBLY - 20290.....	5-7
5.7	ROTO 180 OPTIONAL VIBRATOR - 870993	5-8
5.8	ROTO 180 TRAILER HITCH OPTIONS - MROTO107	5-9
5.9	ROTO 180 FENDER ASSEMBLY - 20396	5-10
5.10	ROTO 180 RUBBER STEP ASSEMBLY LEFT HAND SIDE - 20331	5-11
5.11	ROTO 180 RUBBER STEP ASSEMBLY RIGHT HAND SIDE - 20332	5-12

20703 - ROTO TOOLBOX, FUEL
TANK AND LIGHT BAR ASSEMBLY

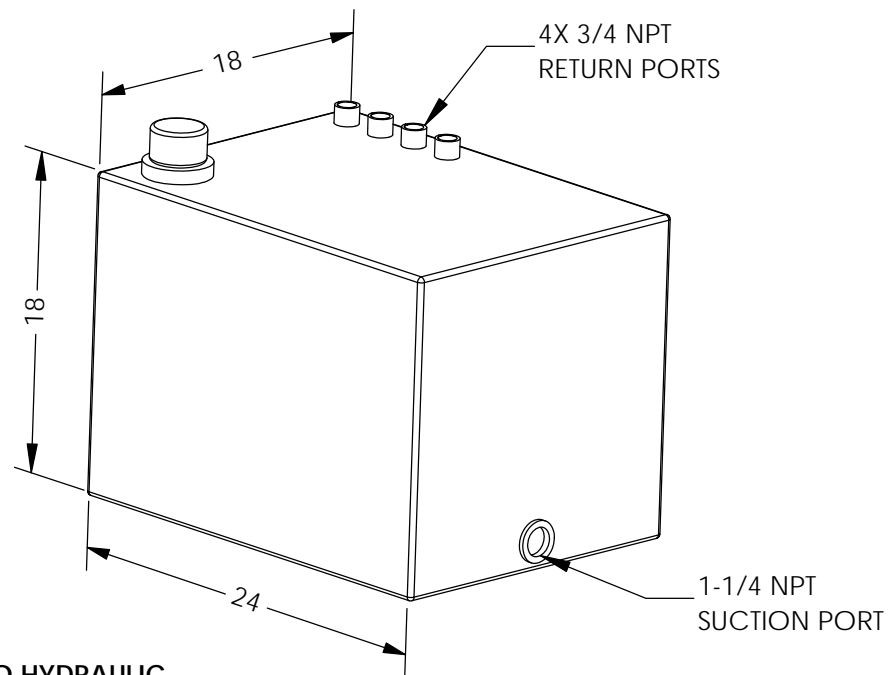
20708 - ROTO TOOLBOX AND
FUEL TANKS ASSEMBLY



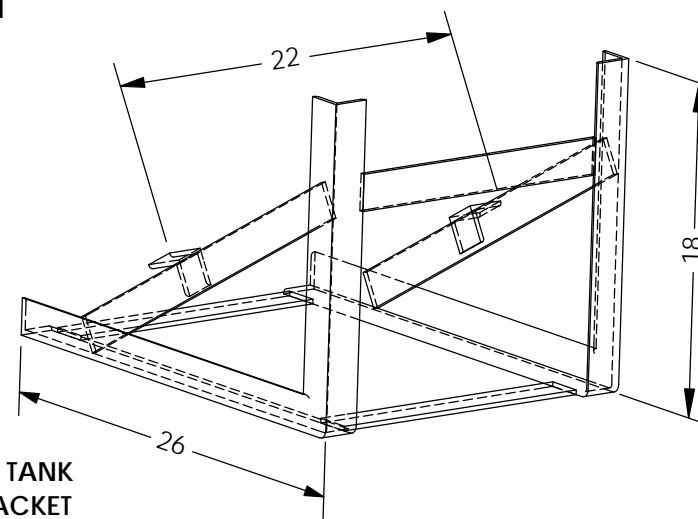
REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED)				
FRAC. MACH:		± 1/32"	ROTO 180 MANUAL	
FRAC. OTHER:		± 1/16"		
.X		± .063	DRAWN BY: DJJ	
.XX		± .030		
.XXX		± .005	APPD BY: -	
DRILL SIZES:		± .015		
ANGULAR:		± 1°	DATE: 07/08/15	
SURF FINISH:		125 MICRO		
THREADS:		2A AND 2B	DRAWING NUMBER: MROTO100	
			REV: #	
			DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512	
			DMF	




**18797 - ROTO HYDRAULIC
TANK, 25 GALLON**

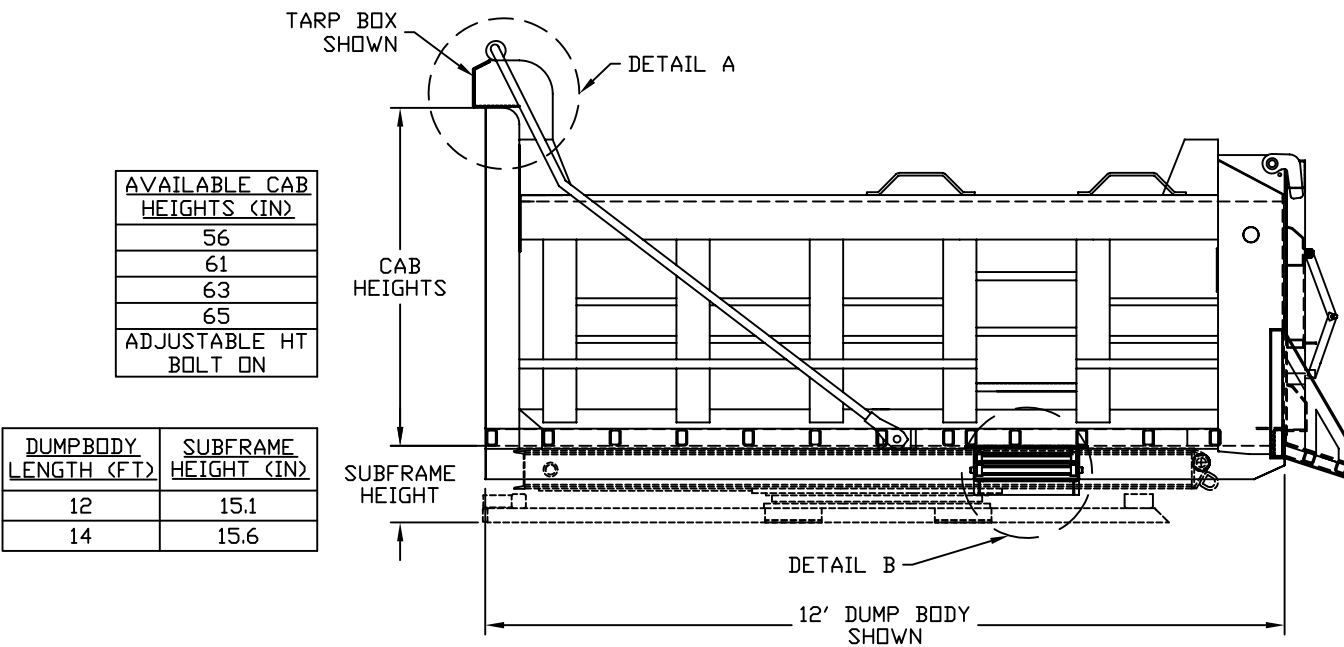


**18780 - ROTO HYDRAULIC
TANK, 30 GALLON**



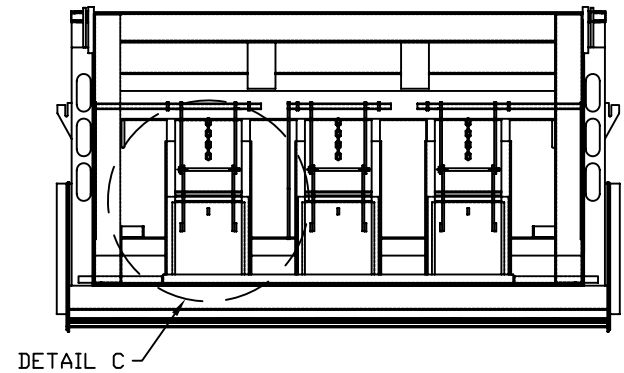
**18785 - 30 GAL TANK
MOUNTING BRACKET**

REV	DATE	DESCRIPTION	BY	APP
<div> <div> TOLERANCES: (UNLESS SPECIFIED) FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" .X ± .063 .XX ± .030 .XXX ± .005 DRILL SIZES: ± .015 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B </div> <div> <div>ROTO 180 MANUAL</div> <div> DRAWN BY: DJJ APPD BY: - </div> </div> </div> <div> <div>TITLE: ROTO HYDRAULIC TANK OPTIONS</div> <div>DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512</div> <div> DATE: 07/08/15  DRAWING NUMBER: MROTO101 REV: # </div> </div>				



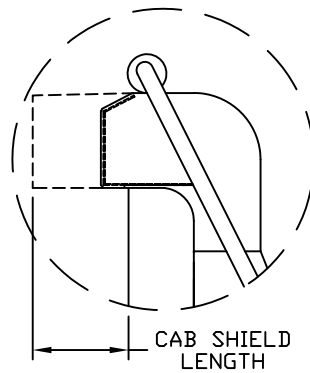
AVAILABLE CAB HEIGHTS (IN)
56
61
63
65
ADJUSTABLE HT BOLT ON

DUMPBODY LENGTH (FT)	SUBFRAME HEIGHT (IN)
12	15.1
14	15.6

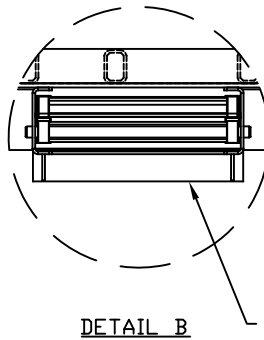


CAB SHIELD TYPE	LENGTH (IN)
TARP BOX	2
1/4	12
1/2	24
FULL	36
EXTENDED	42

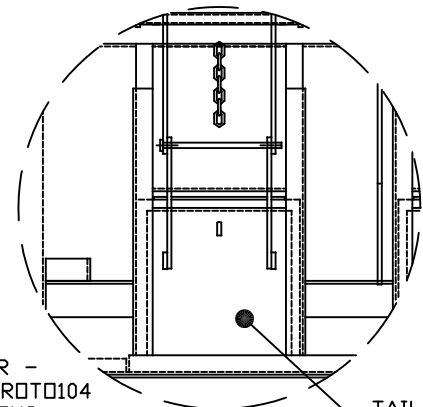
ALL OPTIONS SHOWN ARE AVAILABLE IN BOTH 12' AND 14' DUMP BODIES



DETAIL A



FOLDING LADDER - SEE DRAWING MROT0104 FOR MORE OPTIONS



DETAIL C

△					
△	-	-	-	-	-
△	-	-	-	-	-
REV	DATE	DESCRIPTION	BY	APP	
TOLERANCES:					
UNLESS SPECIFIED, COMMON SENSE PREVAILS					
FRAC. MACH ± 1/32"					
FRAC. OTHER ± 1/16"					
X ± .063					
XX ± .030					
.XXX OR .XXXX ± .005					
DRILL SIZES ± .005					
ANGULAR ± 1°					
SURF FINISH ± 125 MICRO					
THREADS: RA AND 2B					
BREAK SHARP EDGES					
ROTO 180 MANUAL		TITLE: ROTO DUMP BODY OPTIONS			
DRAWN BY: DJJ		APPD BY:		DATE: 07/09/15	
				DRAWING NUMBER: MROT0102	
				REV: #	

Technical drawing of a rectangular box with a lid. The drawing includes a top view, a front view, and a side view. The top view shows a rectangle with a smaller rectangle inside, representing the lid. The front view shows the box with a lid, and the side view shows the box with a lid. The drawing includes dimensions and a small detail of the lid's hinge mechanism.





DETAIL A

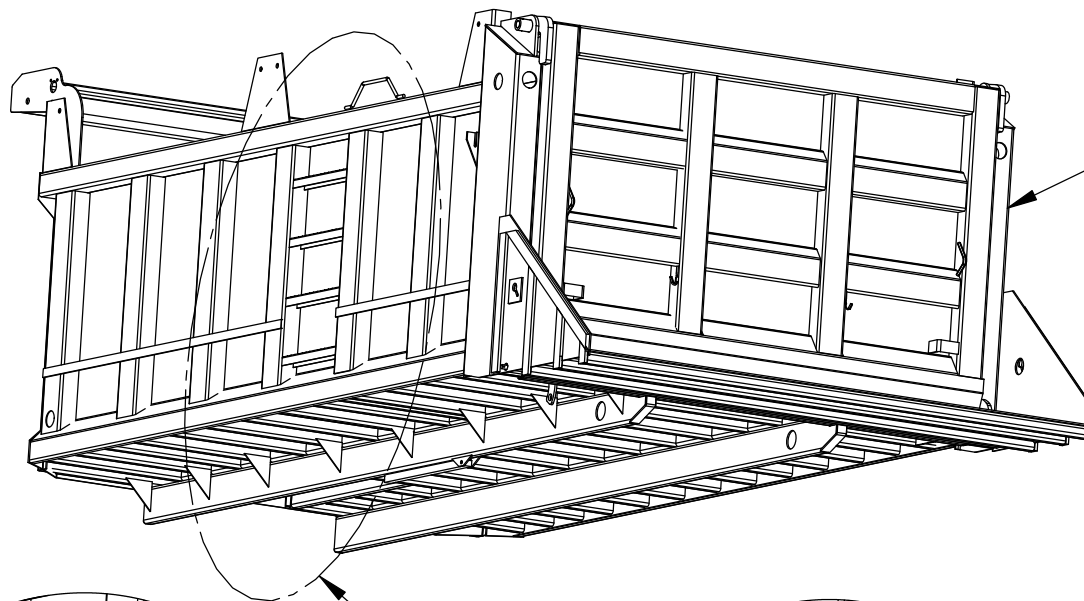
ELLIPTICAL
- DUMP BODY
SHOWN

MOUNTAIN TARP -
- ALUMINUM FRAME
WITH VINYL TARP

FOLDING
APRON

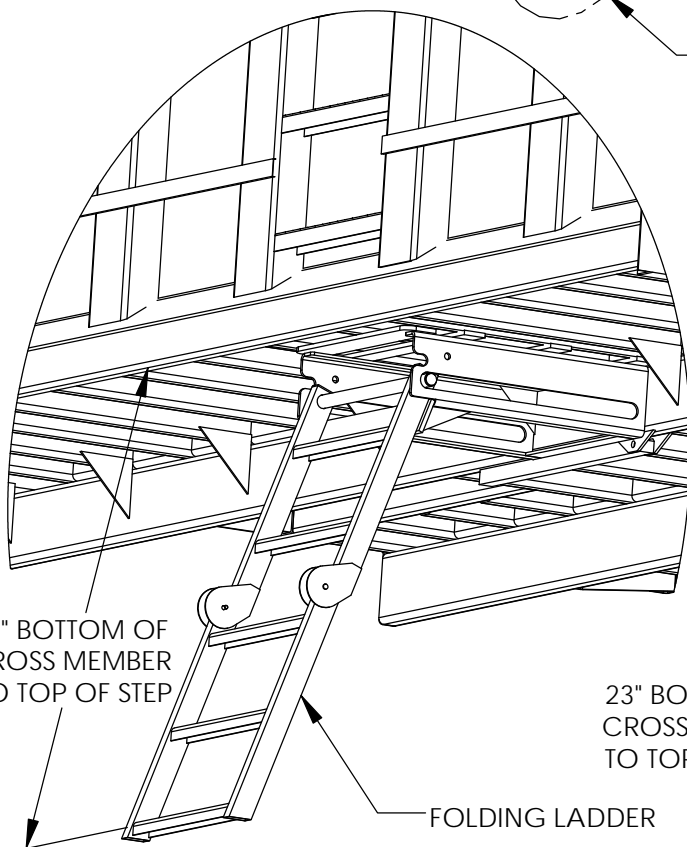
FIXED APRON

					
	-	-		-	
	-	-		-	
REV	DATE			DESCRIPTION	BY APP
TOLERANCES: (UNLESS SPECIFIED) DIMENSION SURF FINISHES FRAC. MACH. \pm 1/32 FRAC. OTHER: \pm 1/16 .X \pm .063 .XX \pm .030 .XXX OR .XXXX \pm .005 DRILL SIZES: \pm .005 ANGULAR: \pm 1° SURF FINISH: .125 MICRO THREADS: BA AND 2B BREAK SHARP EDGES			TITLE: <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> ROTO 180 MANUAL </div> <div style="text-align: center;"> ROTO DUMP BODY OPTIONS </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"> <div> DRAWN BY: DJJ APPD BY: </div> <div> DATE: 07/09/15 </div> <div style="text-align: center;">  </div> <div> DRAWING NUMBER: MR0T0103 REV: # </div> </div>		



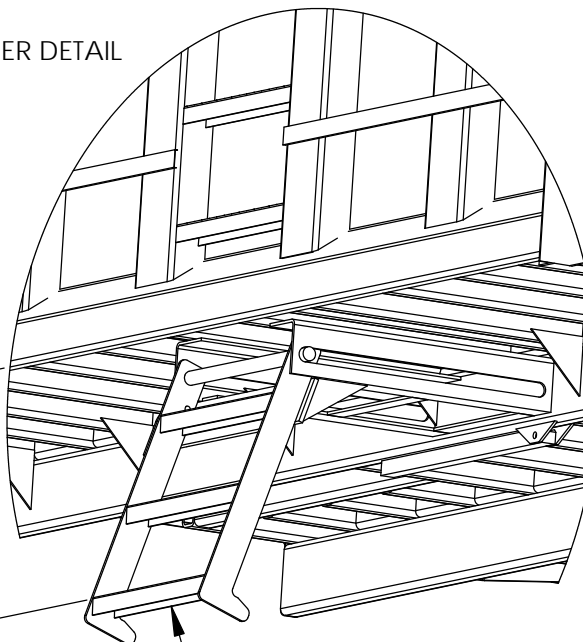
STANDARD DUMP BODY
SHOWN WITH OPTIONAL
LADDER CONFIGURATIONS

LADDER DETAIL



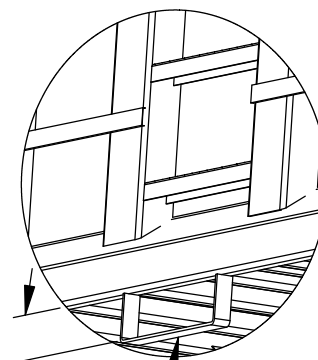
42" BOTTOM OF
CROSS MEMBER
TO TOP OF STEP

FOLDING LADDER




23" BOTTOM OF
CROSS MEMBER
TO TOP OF STEP

SLIDE-OUT
LADDER

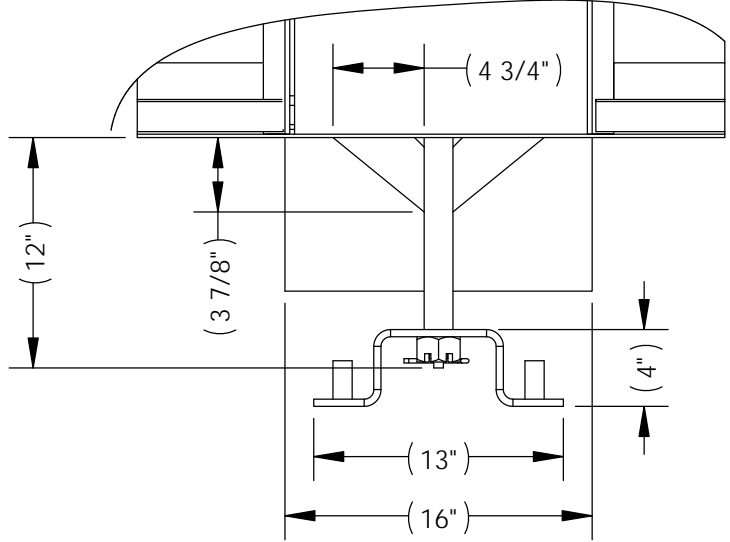


8" BOTTOM OF
CROSS MEMBER
TO TOP OF STEP

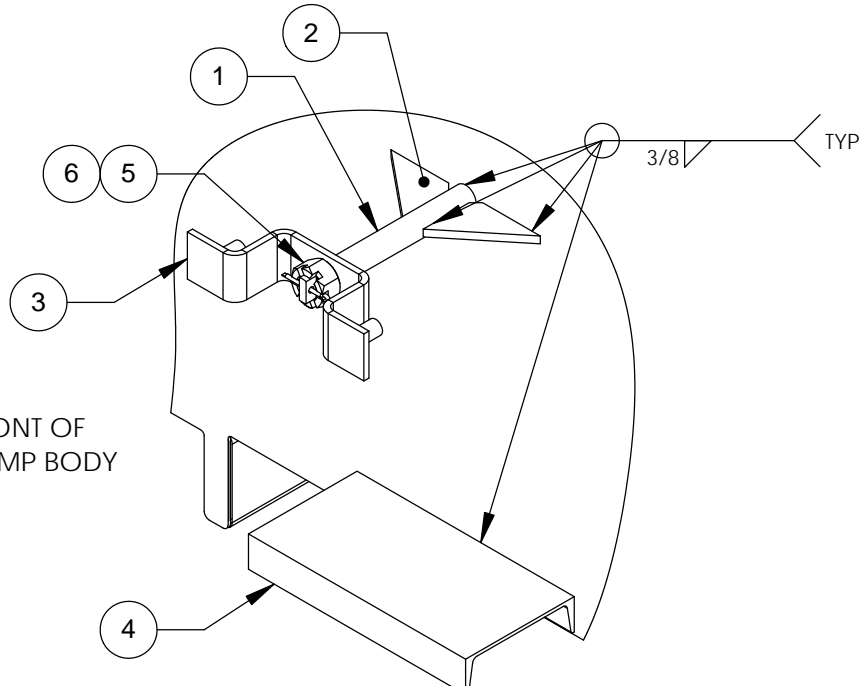
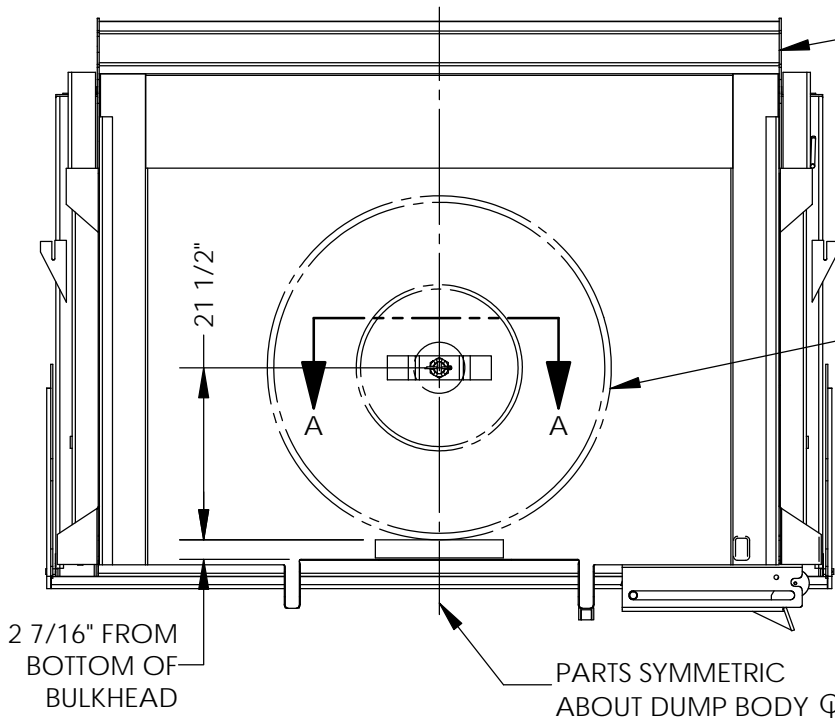
STIRRUP STEP

REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED)				
FRAC. MACH.	± 1/32"	ROTO 180 MANUAL		
FRAC. OTHER	± 1/16"			
.XX	± .063	TITLE: ROTO 180 DUMP BODY LADDER OPTIONS		
.XX	± .030			
.XXX	± .005	DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512		
DRILL SIZES:	± .015			
ANGULAR:	± 1"	DATE:	07/20/15	REV:
SURF FINISH:	125 MICRO			
THREADS:	2A AND 2B			
DRAWN BY: DJJ		APPD BY: -		DRAWING NUMBER: MROTO104
				#

ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
1	20292	1	SPARE TIRE MOUNTING ROD DETAIL
2	818121	2	GUSSET 3-7/8" X 4-3/4" X 1/2"
3	20294	1	SPARE TIRE RETAINER ASSEMBLY
4	20291	1	ROTO FNT 8" CHANNEL X MEMBER
5	818134	1	RW-1630 FRONT HEX NUT, SLOTTED (SLHN: 1-1/2"-6)
6	605145	1	COTTER PIN, 1/4" X 3"



SECTION A-A

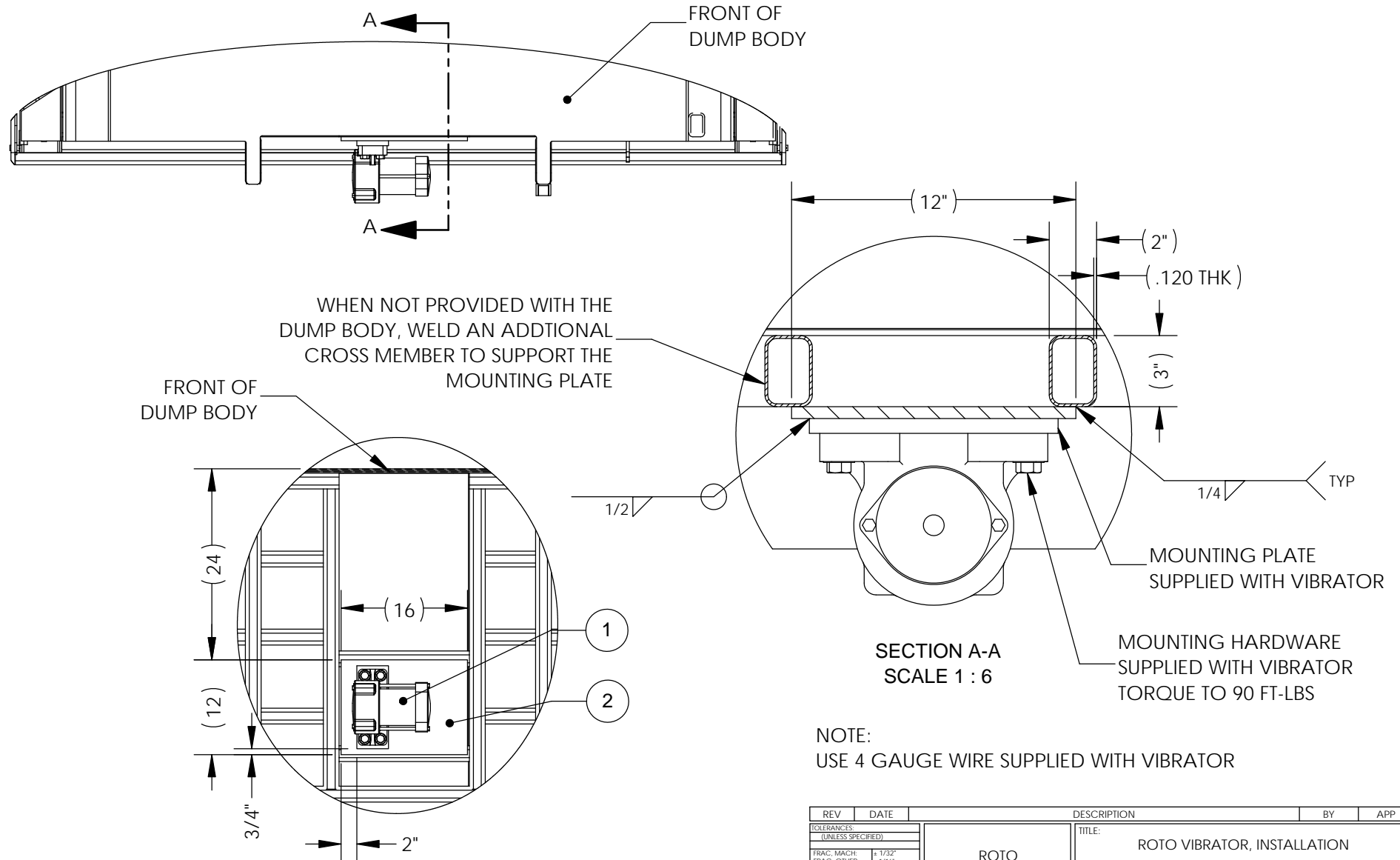


FRONT OF
DUMP BODY

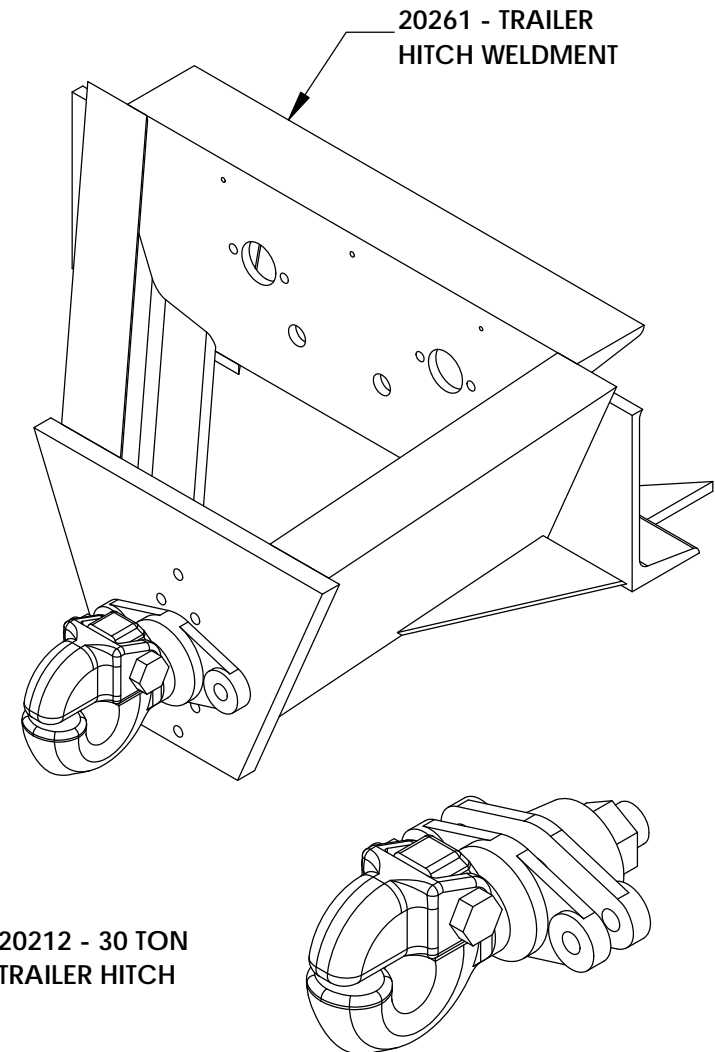
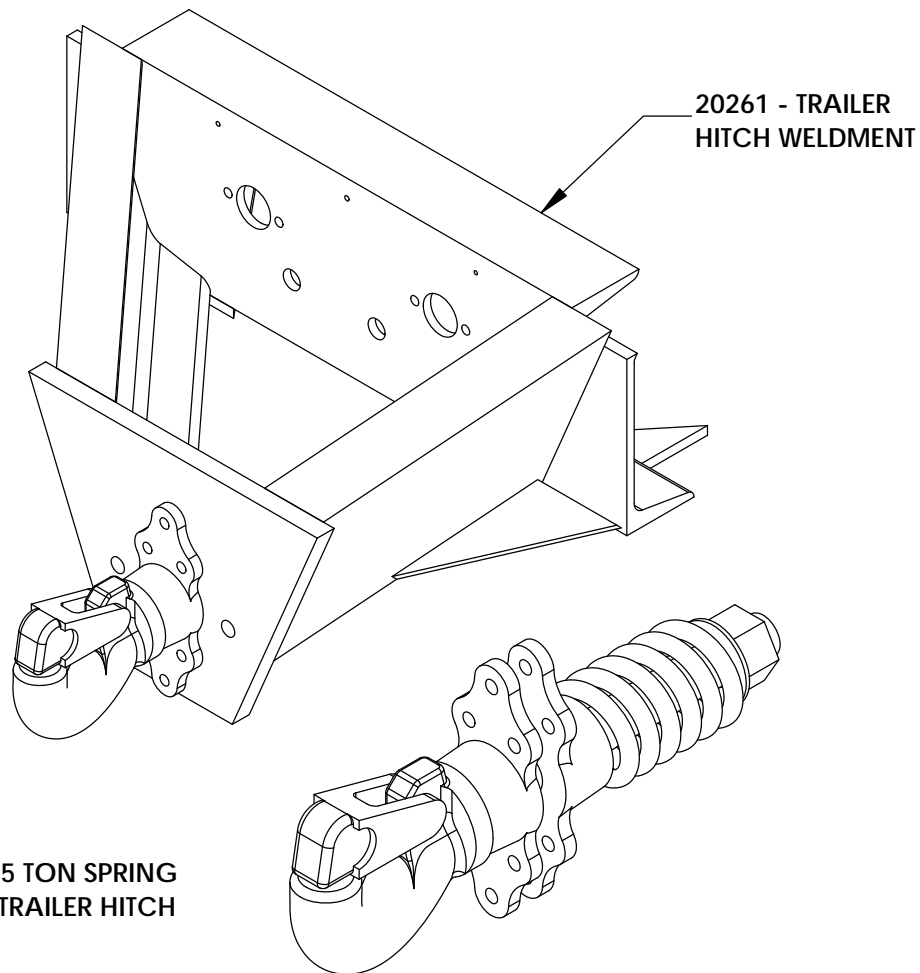
SPARE TIRE
LOCATION

A	07/24/15	MIGRATED TO SOLIDWORKS, REMOVED 20293, ADDED 818134 & 605145				DJJ	
REV	DATE	DESCRIPTION				BY	APP
TOLERANCES (UNLESS SPECIFIED)		ROTO		TITLE: ROTO SPARE TIRE MOUNT, FRONT OF BODY			
FRAC. MACH:				± 1/32"			
FRAC. OTHER:				± 1/16"			
.X				± .063			
.XX				± .030			
.XXX		± .005					
DRILL SIZES:		± .015					
ANGULAR:		± 1"					
SURF FINISH:		125 MICRO					
THREADS:		2A AND 2B					
DRAWING NUMBER: 20290		DRAWN BY: TSH		APPD BY: -		DATE: 12/13/90	
TITLE: ROTO SPARE TIRE MOUNT, FRONT OF BODY		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512		DRAWING NUMBER: 20290		REV: A	

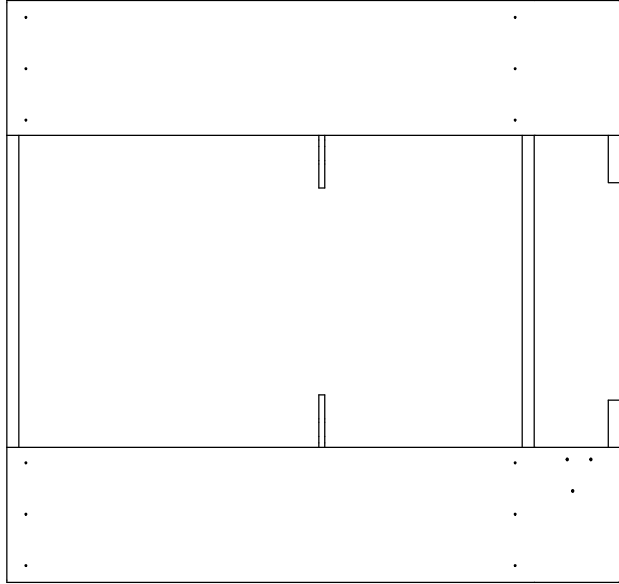
ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
1	20185	1	ROTO VIBRATOR, COUGAR DC-3200, POST '95
2	20179	1	COUGAR VIBRATOR MOUNTING PLATE
3	605090	1	CIRCUIT BREAKER, 60A, MANUAL RESET, SURFACE MOUNT (NOT SHOWN)



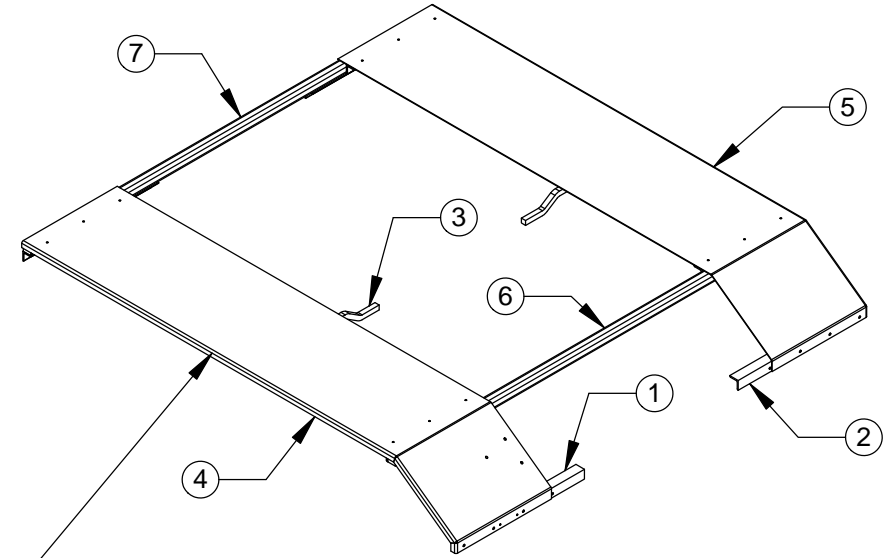
REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED)				
FRAC. MACH: ± 1/32"				
FRAC. OTHER: ± 1/16"				
.X ± .063				
.XX ± .030				
.XXX ± .005				
DRILL SIZES: ± .015				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
DRAWN BY: DJJ		APPD BY: -		TITLE: ROTO VIBRATOR, INSTALLATION
DATE: 08/12/15		DRAWING NUMBER: 870993		REV: #



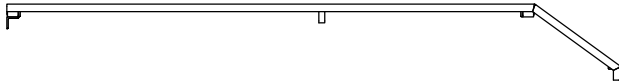
REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED)		TITLE: ROTO TRAILER HITCH OPTIONS		
FRAC. MACH: ± 1/32"		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512		
FRAC. OTHER: ± 1/16"		DATE: 08/05/15		
.X ± .063		DRAWING NUMBER: MROTO107		
.XX ± .030		REV: #		
.XXX ± .005				
DRILL SIZES: ± .015				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
DRAWN BY: DJJ				
APPD BY: -				



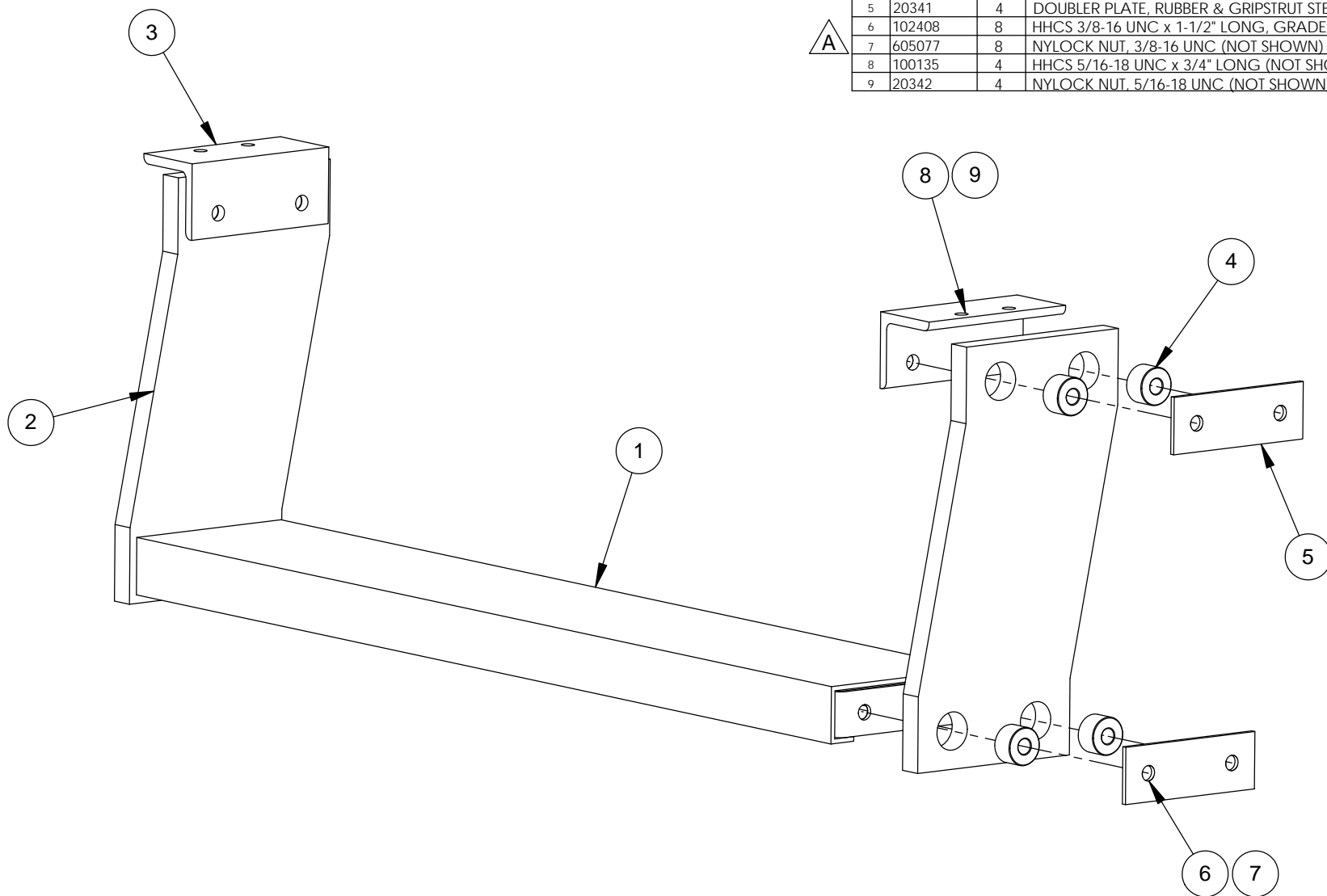
ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
1	20153	1	ANGLE, MUD FLAP MOUNT (LEFT)
2	20154	1	ANGLE, MUD FLAP MOUNT (RIGHT)
3	20155	2	FENDER BRACE, CENTER
4	20392	1	FENDER, BOLT-ON, ROTO, DS
5	20393	1	FENDER, BOLT-ON, ROTO, PS
6	20395	1	BOLT-ON FENDER CROSS TUBE, REAR
7	20397	1	BOLT-ON FENDER CROSS TUBE, FRONT
8	11257	18	LOCKNUT, 1/4-20 (NOT SHOWN)
9	605235	12	ROUND HEAD SQUARE NECK BOLT, 1/4-20 X 3/4" (NOT SHOWN)
10	605236	6	ROUND HEAD SQUARE NECK BOLT, 1/4-20 X 1-1/2" (NOT SHOWN)



DRILL $\varnothing 9/32$ HOLES IN FENDERS
FOR FENDER BRACE (ITEM 3) ONCE
FENDER BRACE IS POSITIONED ON FRAME



REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED)				
FRAC. MACH: $\pm 1/32"$				
FRAC. OTHER: $\pm 1/16"$				
.X $\pm .063$				
.XX $\pm .030$				
.XXX $\pm .005$				
DRILL SIZES: $\pm .015$				
ANGULAR: $\pm 1"$				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
DRAWN BY: JDI		APPD BY: -		TITLE: BOLT-ON FENDER ASSEMBLY
DATE: 3/20/13		DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512		DRAWING NUMBER: 20396
		DATE: 3/20/13		REV: #

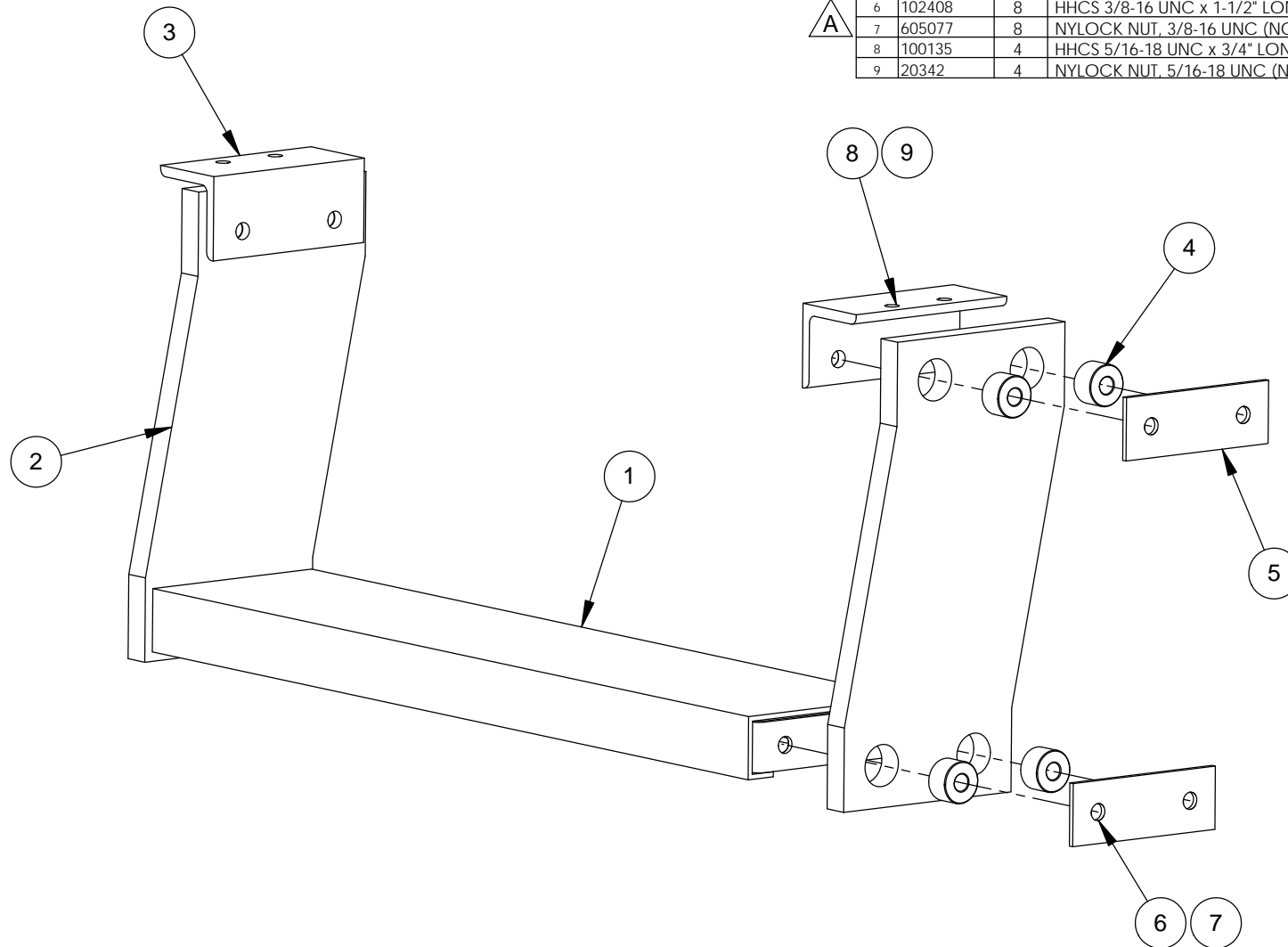


ITEM	PART NO.	QTY	DESCRIPTION
1	20337	1	WELDMENT, STEP TREAD LH, RUBBER & GRIPSTRUT STEP
2	20334	2	RUBBER STRAP DETAIL, "Z" SHAPED, SOUTHEAST RUBBER
3	20333	2	ANGLE BRACKET DETAIL, RUBBER & GRIPSTRUT STEP
4	20339	8	SPACER BUSHING - RUBBER & GRIPSTRUT STEP
5	20341	4	DOUBLER PLATE, RUBBER & GRIPSTRUT STEP
6	102408	8	HHCS 3/8-16 UNC x 1-1/2" LONG, GRADE 8 (NOT SHOWN)
7	605077	8	NYLOCK NUT, 3/8-16 UNC (NOT SHOWN)
8	100135	4	HHCS 5/16-18 UNC x 3/4" LONG (NOT SHOWN)
9	20342	4	NYLOCK NUT, 5/16-18 UNC (NOT SHOWN)

REV	DATE	DESCRIPTION	BY	APP
1	2/28/14	605029 WAS 500693	JDI	
TOLERANCES: (UNLESS SPECIFIED)				
FRAC. MACH: ± 1/32"				
FRAC. OTHER: ± 1/16"				
.XX ± .063				
.XXX ± .030				
.XXX ± .005				
DRILL SIZES: ± .015				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
DRAWN BY: BJJ		APPD BY:		DATE: 4/19/11
				DRAWING NUMBER: 20331
				REV: A



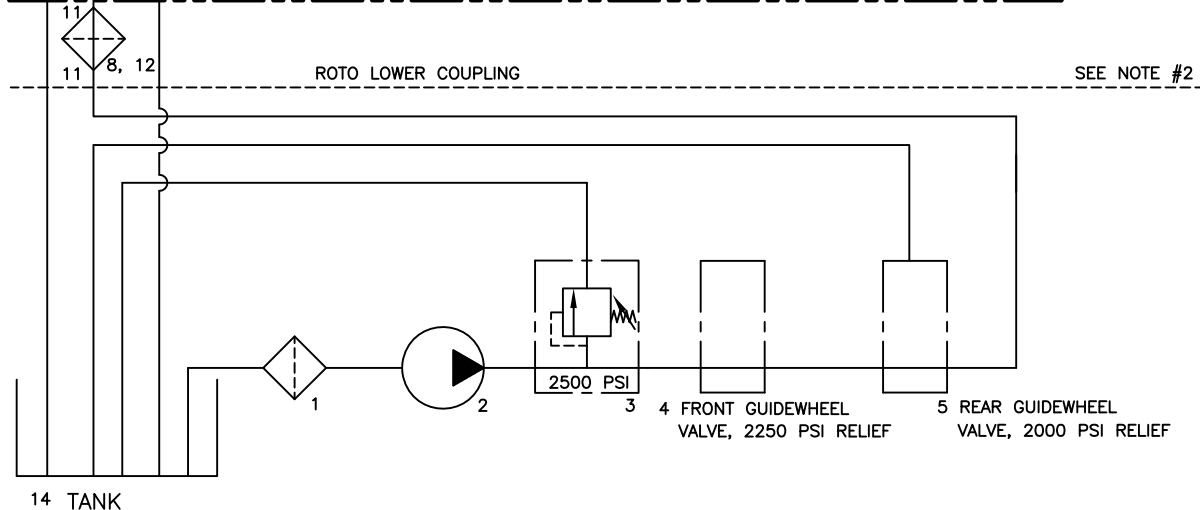
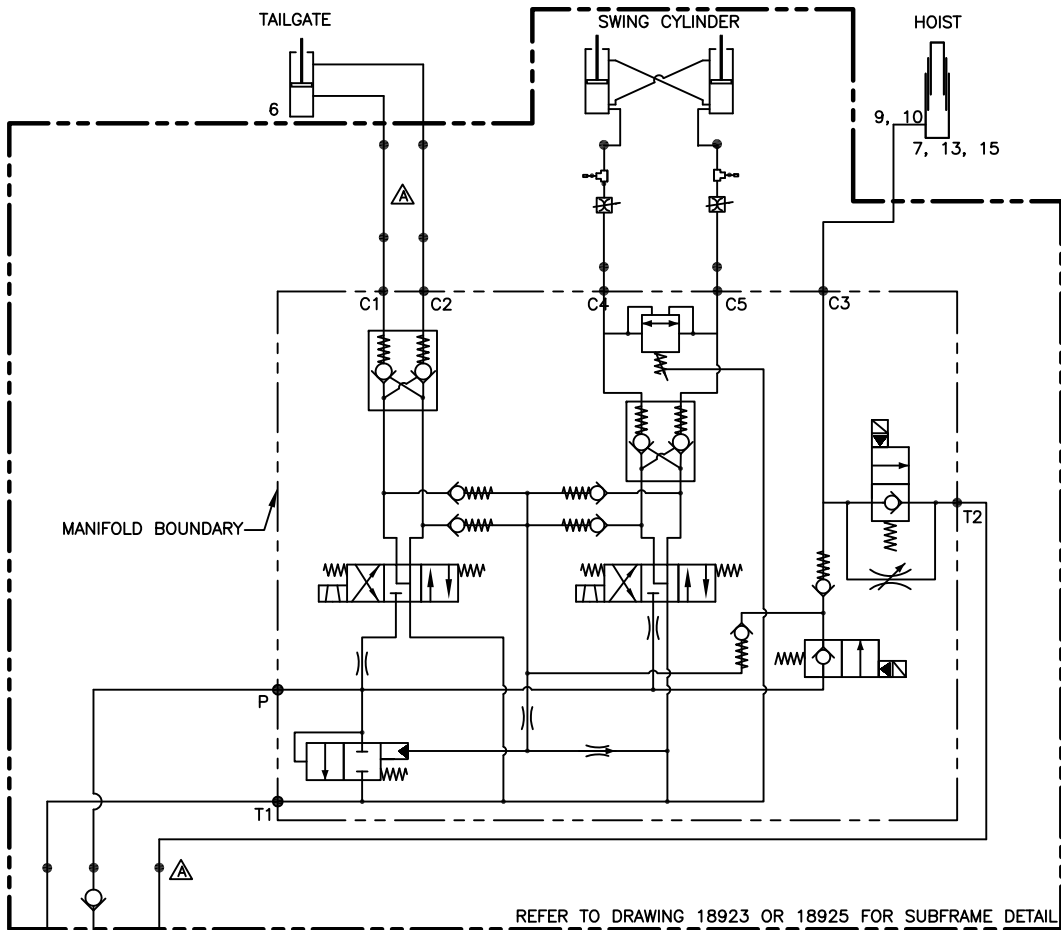
ITEM	PART NO.	QTY	DESCRIPTION
1	20338	1	WELDMENT, STEP TREAD RH, RUBBER & GRIPSTRUT STEP
2	20334	2	RUBBER STRAP DETAIL, "Z" SHAPED, SOUTHEAST RUBBER
3	20333	2	ANGLE BRACKET DETAIL, RUBBER & GRIPSTRUT STEP
4	20339	8	SPACER BUSHING - RUBBER & GRIPSTRUT STEP
5	20341	4	DOUBLER PLATE, RUBBER & GRIPSTRUT STEP
6	102408	8	HHCS 3/8-16 UNC x 1-1/2" LONG, GRADE 8 (NOT SHOWN)
7	605077	8	NYLOCK NUT, 3/8-16 UNC (NOT SHOWN)
8	100135	4	HHCS 5/16-18 UNC x 3/4" LONG (NOT SHOWN)
9	20342	4	NYLOCK NUT, 5/16-18 UNC (NOT SHOWN)



REV	DATE	DESCRIPTION	BY	APP
	2/28/14	605029 WAS 500693	JDI	
TOLERANCES: (UNLESS SPECIFIED)		TITLE: RUBBER STEP ASSEMBLY RH, W/ GRIPSTRUT TREAD		
FRAC. MACH: ± 1/32"		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512		
FRAC. OTHER: ± 1/16"		DATE: 4/19/11		
.XX ± .063		DRAWING NUMBER: 20332		
.XX ± .030		REV: A		
.XXX ± .005				
DRILL SIZES: ± .015				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
DRAWN BY: BJF		APPD BY:		

SECTION 6.0 ROTO 180 HYDRAULICS

6.1	ROTO 180 HYDRAFORCE MANIFOLD, HYDRAULIC SCHEMATIC - 18941.....	6-2
6.2	12' ROTO 180 SUBFRAME, HYDRAFORCE MANIFOLD, HYDRAULIC SCHEMATIC – 18925.....	6-3
6.3	14' ROTO 180 SUBFRAME HYDRAFORCE MANIFOLD, HYDRAULIC SCHEMATIC - 18923.....	6-4
6.4	ROTO 180 HYDRAFORCE VALVE MANIFOLD, HYDRAULIC SCHEMATIC (HF44367-07) - 18926.....	6-5
6.5	ROTO 180 PARKER MANIFOLD, HYDRAULIC SCHEMATIC - 18901	6-6
6.6	ROTO 180 PARKER VALVE MANIFOLD, HYDRAULIC SCHEMATIC (PAR-4269) - 18905.....	6-7
6.7	ROTO 180 5 SECTION PVG VALVES, HYDRAULIC SCHEMATIC – 31030	6-8
6.8	ROTO 180 3 SECTION PVG VALVES, HYDRAULIC SCHEMATIC - 31029.....	6-9
6.9	12' ROTO 180 SUBFRAME, PVG VALVES, HYDRAULIC SCHEMATIC - 18955.....	6-10
6.10	14' ROTO 180 SUBFRAME, PVG VALVES, HYDRAULIC SCHEMATIC - 31008.....	6-11
6.11	2015 N/S SPEC ROTO 180 PVG VALVES, HYDRAULIC SCHEMATIC - 20436.....	6-12
6.12	HOC HYDRAULIC SCHEMATIC – 20279	6-13
6.13	ROTO 180 HYDRAULIC SWING CYLINDER, RH – 240316	6-14
6.14	ROTO 180 HYDRAULIC SWING CYLINDER, LH – 240315	6-15
6.15	ROTO 180 HYDRAULIC TAILGATE CYLINDER – 18280	6-16
6.16	CYLINDER ASSEMBLY PRODUCTION PROCEDURE – PP008.....	6-17
6.17	JIC FITTING INSTALLATION PROCEDURE – PP005.....	6-18
6.18	O-RING FITTING INSTALLATION PROCEDURE - PP003	6-19
6.19	PIPE FITTING INSTALLATION PROCEDURE – PP004	6-20

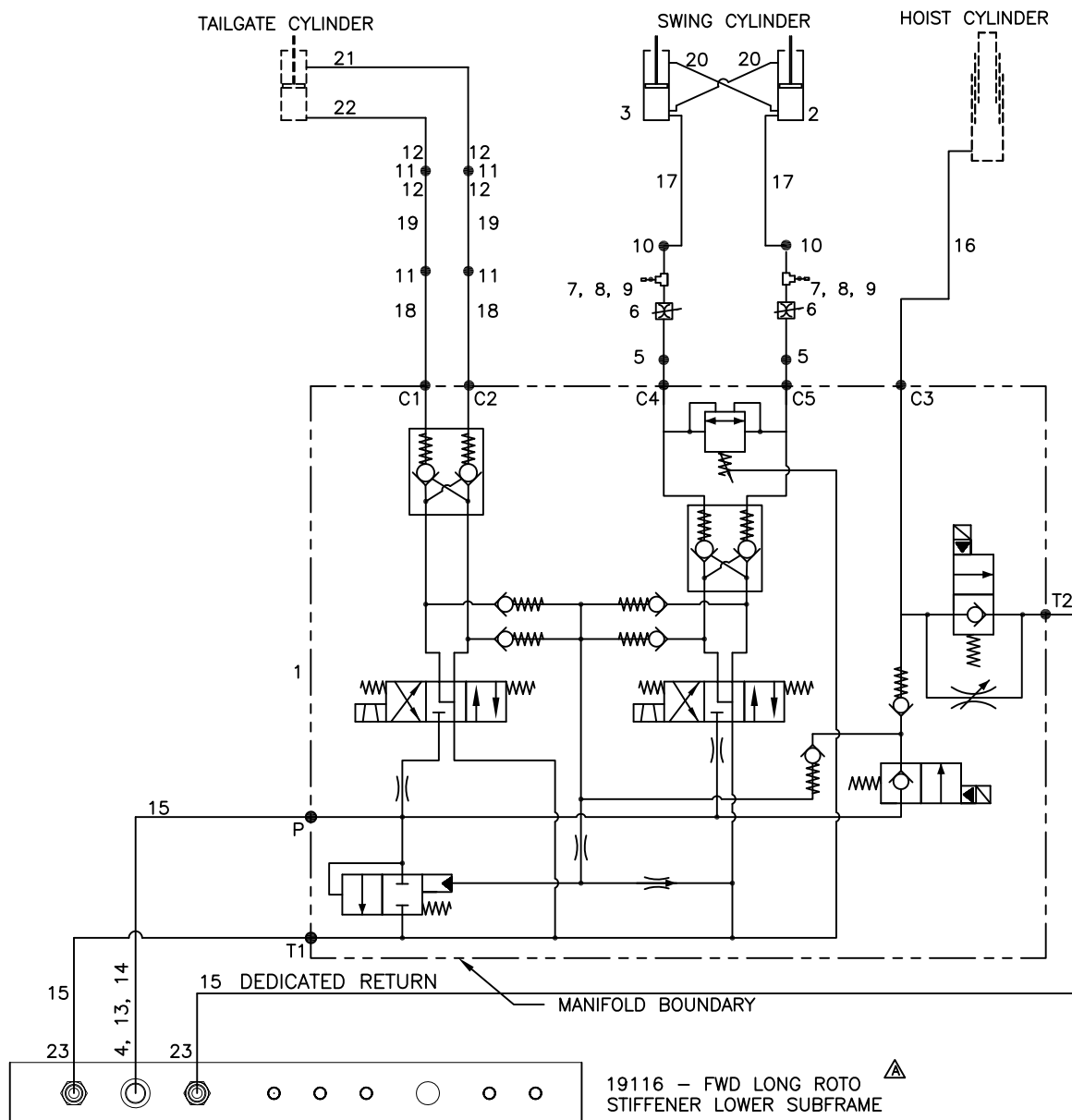


ITEM	PART NO.	QTY	DESCRIPTION
1	605138	1 REF	FILTER; GRESEN FSP212-1EBNN (OR EQUAL)
2		1 REF	PUMP; RECOMMENDED 25 GPM @ 2500 PSI
3	18737	1 REF	RELIEF VALVE; GRESEN 1/2" NPT, WJL-50-A-2500 (OR EQUAL)
4	810202	1 REF	VALVE TANDEM CENTER: ENERGY CVA-200-1/2
5	810209	1 REF	VALVE TANDEM CENTER: GRESEN SPYTE-4-4-HP W/ PWR BEYOND
6	18318	1	TAILGATE CYLINDER KIT
7	18957	1	HYVA HOIST CYLINDER FOR DUMP BODY (FEE 6-3-108)
8	18902	1	HIGH-PRESSURE FILTER (10 MICRON)
9	605143	1	#12 MJIC X #12 MPT X 45 DEGREE
10	605142	1	REDUCER BUSHING, #16 MPT X #12 FPT
11	605144	2	#12 MJIC X #12 O'RING X 90 DEGREE, EXTRA LONG
12	20810	1	HIGH-PRESSURE FILTER BRACKET
13	18698	2	SPACER FOR LOWER ROTO HOIST PIN
14	18797	1 REF	HYDRAULIC TANK, 25 GALLON RECOMMENDED
15	605145	2	COTTER PIN, 1/4" X 3"
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35			

NOTES: 1) ITEMS WITH A QTY. CONTAINING "REF." ARE NOT IN THE BOM FOR 18941 AND ARE LISTED ONLY TO AID IN SYSTEM TROUBLESHOOTING. THEY ARE SUPPLIED EITHER WITH THE RAILGEAR OR BY THE INSTALLER
2) EVERYTHING ABOVE DOTTED LINE IS INCLUDED WITH A ROTO-180 SHIP-OUT KIT.

REFER TO DWG 20756 FOR ELECTRICAL DETAIL



<div><div><div>⚠</div></div><div>08/13/15</div></div>	18957 WAS 18945, ADDED 605145, SUBFRAME UPDATED, 18797 WAS 18780		DJJ		
REV	DATE	DESCRIPTION		BY	APP
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: ± 1/32 FRAC. OTHER: ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES		<div><div>ROTO-180</div><div>DRAWN BY: JDI</div><div>APPD BY:</div></div> <div><div>TITLE: STANDARD ROTO W/ HYDRAFORCE MANIFOLD, HYD SCHEM.</div><div>DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512</div><div>DATE: 9/28/12</div><div><div><div><div></div><div>DME</div><div>ATLANTA</div></div></div><div>DRAWING NUMBER: 18941</div><div>REV: A</div></div></div>			

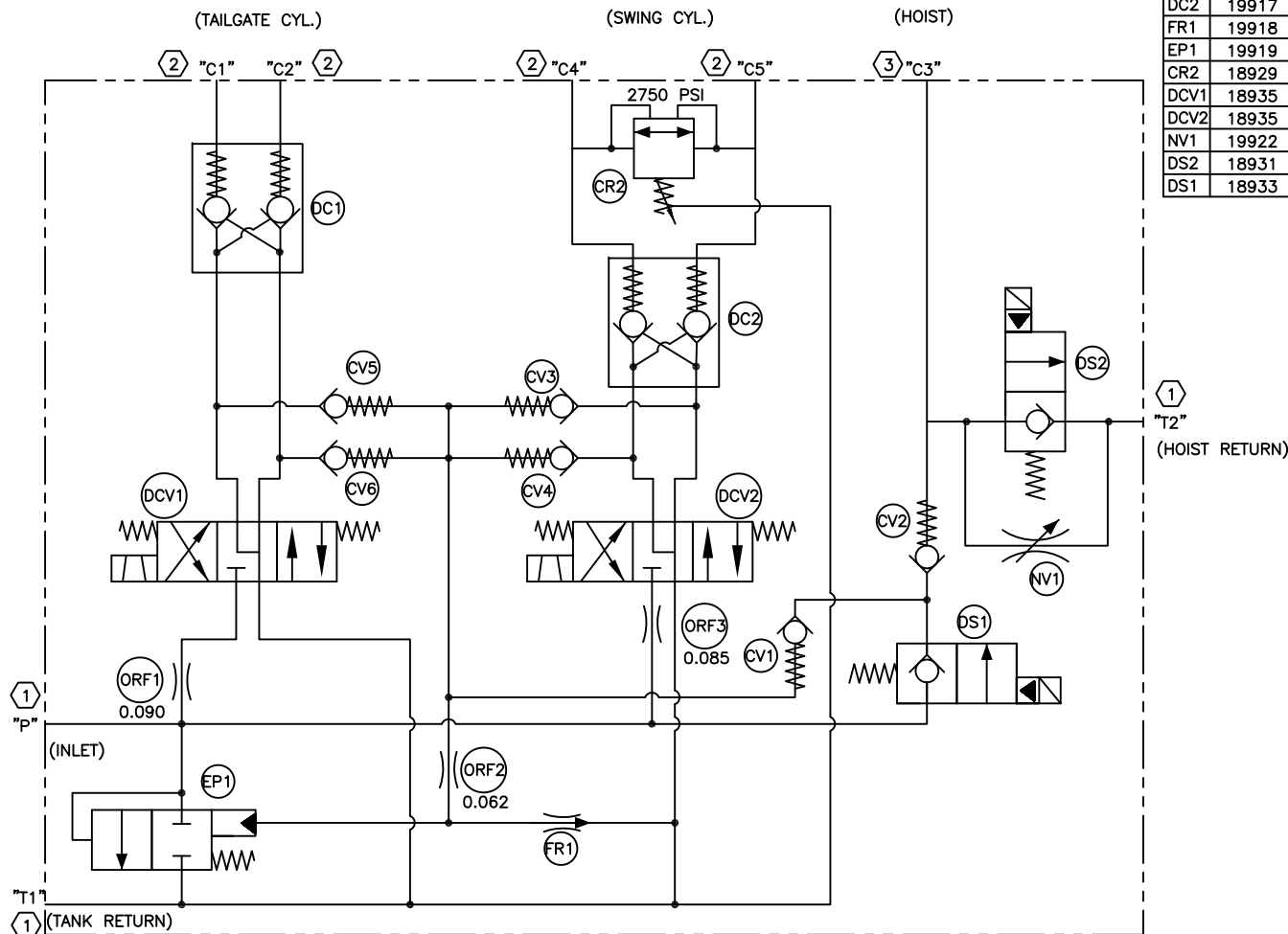


ITEM	PART NO.	QTY	DESCRIPTION
1	18926	1	MANIFOLD ASSY.; HYDRAFORCE (HF44367-07 REV 6)
2	240315	1	CYLINDER; SWING, DRIVER SIDE
3	240316	1	CYLINDER; SWING, PASSENGER SIDE
4	18764	1	CHECK VALVE; PARKER C1200S
5	605141	2	STRAIGHT SWIVEL: 1/4 FJIC TO 1/4 MPT, 6505-4-4
6	18943	2	FLOW CONTROL VALVE; PARKER F-400-S-4
7	605140	2	STREET TEE: 1/4 MPT, 1/4 FPT, 1/4 FPT, 5602-4-4-4
8	10433	2	REDUCER BUSHING: 1/4 MPT TO 1/8 FPT
9	10438	2	TEST NIPPLE, PD323
10	10428	2	FITTING, 2501-4-4
11	605325	4	#04 MJIC X #04 MJIC BULKHEAD (2700-LN-04-04)
12	605131	4	#04 MJIC X #04 FJIC X 45 DEG FITTING (6502-04-04)
13	810314	2	STRAIGHT 3/4 MPT, 3/4 MJIC, 2404-12-12
14	605024	1	STRAIGHT 3/4 MPT, 3/4 MPT, 5404-12-12
15		3	HOSE; #12 X 69"
16		1	HOSE; #12 X 44"
17		2	HOSE; #04 X 58"
18		2	HOSE; #04 X 48"
19	18998	2	HOSE; #04 X 43"
20		2	HOSE; #04 X 24"
21		1	HOSE; #04 X 35"
22		1	HOSE; #04 X 25"
23	605463	2	#12 MJIC X #12 MJIC BULKHEAD
24			
25			
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32			
33			
34			
35			

NOTES:

- REFER TO DWG 20757 FOR ELECTRICAL DETAIL
- BULKHEAD VIEW LOOKING FROM FRONT OF SUBFRAME AFT.

	08/15/15	REMOVED 819536, 10406 & 40" HOSE, ADDED 605325, 605131 & 605463, 810314 QTY 2 WAS QTY 6, HOSE #04 X 43" QTY 2 WAS #04 X 42" QTY 1, ADDED STIFFENER		DJJ			
REV	DATE	DESCRIPTION			BY	APP	
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" .X ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES		ROTO-180		TITLE: 14' STAND. ROTO SUBFRAME, W/ HYDRAFORCE MANIFOLD, HYD. SCHEM DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
DRAWN BY: JDI		APPD BY:		DATE: 9/28/12		DRAWING NUMBER: 18923	REV: A

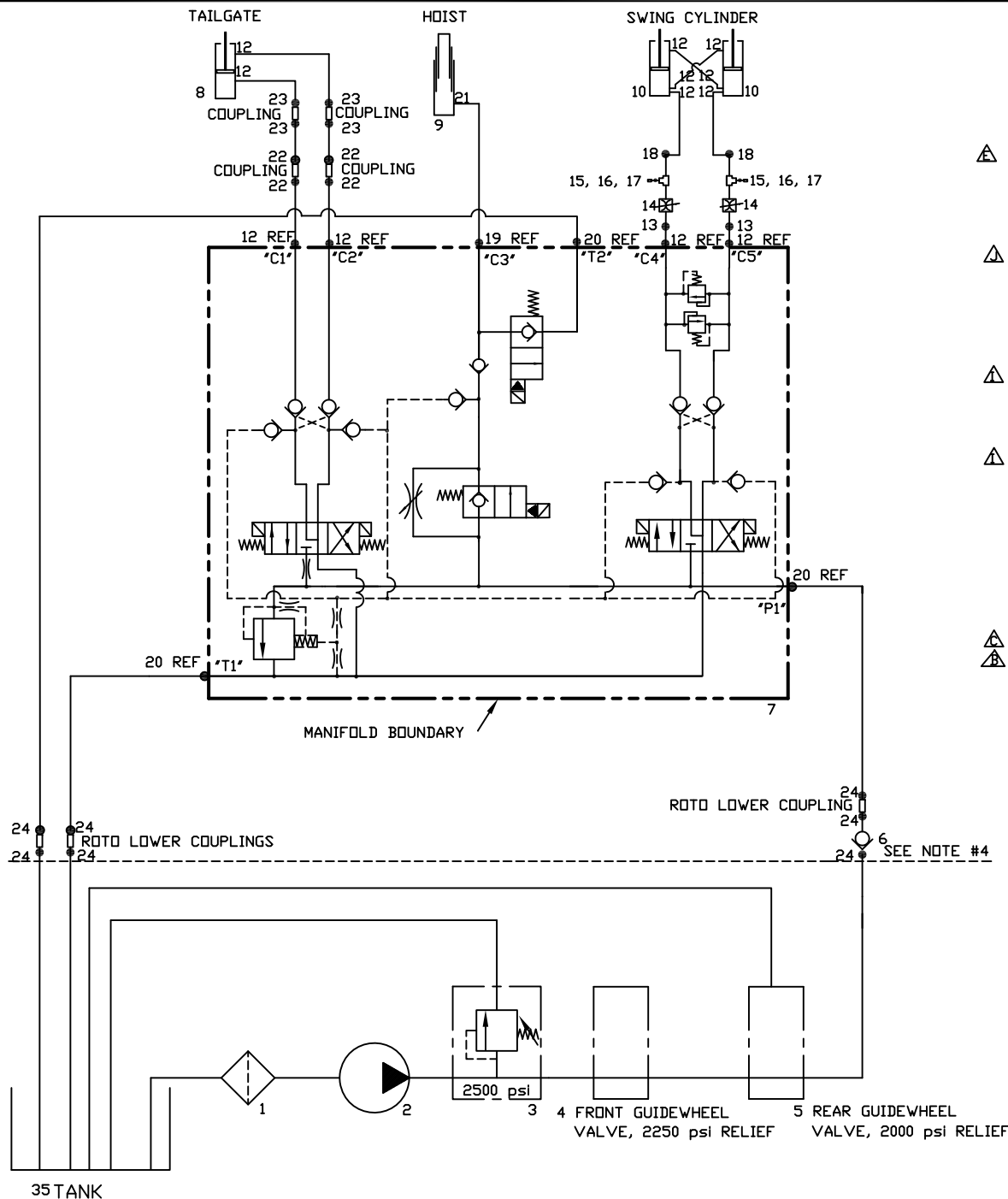


ITEM	PART NO.	QTY	DESCRIPTION
1	18958	3	6801-LL-NWO-12-12 O'RING FITTING
2	18952	4	6801-04-06 O'RING FITTING
3	810314	1	2404-12-12 (#12 JIC X 3/4" MPT STR)
ORF1	19914	1	ORIFICE PLUG 6101090
ORF2	19912	1	ORIFICE PLUG 6101062
ORF3	19913	1	ORIFICE PLUG 6101085
CV1	19915	1	CHECK VALVE, CV04-20-0-N-05
CV2	19916	1	CHECK VALVE, CV12-20-0-N-05
CV3	19915	1	CHECK VALVE, CV04-20-0-N-05
CV4	19915	1	CHECK VALVE, CV04-20-0-N-05
CV5	19915	1	CHECK VALVE, CV04-20-0-N-05
CV6	19915	1	CHECK VALVE, CV04-20-0-N-05
DC1	19917	1	PILOT OPERATED CHECK VALVE, DC10-40-0-N-05
DC2	19917	1	PILOT OPERATED CHECK VALVE, DC10-40-0-N-05
FR1	19918	1	FLOW REGULATOR, PRESSURE COMPENSATED, FR08-20F-0-N-/0.10
EP1	19919	1	PILOTED, SPOOL TYPE, DIRECTIONAL ELEMENT, EP12-S35-0-N-100
CR2	18929	1	CROSS PORT RELIEF VALVE, CR08-38H-0-N-30/27.5
DCV1	18935	1	SOLENOID DIRECTIONAL VALVE, DHI-713-X-12VDC
DCV2	18935	1	SOLENOID DIRECTIONAL VALVE, DHI-713-X-12VDC
NV1	19922	1	NEEDLE VALVE, 1/4" HEX ALLEN HEAD, NV10-20A-0-N
DS2	18931	1	SOLENOID VALVE, SV16-20-0-N-00
DS1	18933	1	SOLENOID VALVE, SV12-20-0-N-00

NOTES:

1. STATIC BENCH TEST @ 2500 PSI
CROSS PORT RELIEFS ARE TO BE PRE-SET AT 2750 PSI
2. INTERNAL PORT CONTAMINATION NOT TO EXCEED 5 MICRONS.
3. ALL EXTERNAL PORTS TO BE SEALED FOR SHIPMENT
4. IDENTIFY MANIFOLDS WITH STAMPED SERIAL NUMBER
AND PART NUMBER HF44367-07 REV 6

REV	DATE	DESCRIPTION	BY	APP
1				
<div> <div> TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRACTIONAL: ± 1/32" DECIMAL: ± 1/16" .X ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES </div> <div> ROTO-180 DRAWN BY: JDI APPD BY: </div> <div> TITLE: VALVE MANIFOLD ASSEMBLY HYDRAFORCE; HF44367-07 DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512 DATE: 9/24/12 DRAWING NUMBER: 18926 REV: # </div> </div>				



ITEM	PART NO.	QTY	DESCRIPTION
1		1 REF.	FILTER, GRESEN FSP212-1EBNN (OR EQUAL)
2		1 REF.	PUMP, MAX 25 GPM @ 2500 PSI
3		1 REF.	RELIEF VALVE, VICKERS CT-06 F 50 (OR EQUAL)
4		1 REF.	VALVE TANDEM CENTER, ENERGY CVA-200-1/2
5		1 REF.	VALVE TANDEM CENTER, GRESEN SPYTE-4-4-HP
6	18764	1	CHECK VALVE, PARKER C1200S (5 PSI)
7	18905	1	MANIFOLD ASSY, PARKER #PAR-4269 (REV 1)
8	18943	1	CYLINDER, TAILGATE - DMF #18280
9		1	CYLINDER, DUMP HOIST - PROVIDED BY DUMP BODY VENDOR
10		2	CYLINDER, SWING-DMF #240315 (DR. SIDE) 204316 (PASS. SIDE)
11			
12	10457	2/10 REF.	6801-NWD-4-4 (NB, SWING CYL. FITTINGS NOT INCLD. IN QTY.)
13	6505-4-4	2	STRAIGHT SWIVEL, 1/4 FJIC TO 1/4 MPT, 6505-4-4
14	18943	2	FLOW CONTROL VALVE, PARKER F-400-S-4
15	5602-4-4-4	2	STREET TEE, 1/4 MPT, 1/4 FPT, 1/4 FPT, 5602-4-4-4
16	5404-4-2	2	REDUCER BUSHING, 1/4 MPT TO 1/8 FPT
17	10438	2	TEST NIPPLE, PD323
18	10428	2	FITTING, 2501-4-4 RV10 #2
19	18960	1 REF.	STRAIGHT NIPPLE, 3/4 M ORING TO 3/4 M JIC 6400-D-12-12
20	18958	3 REF.	LONG ELBOW, 3/4 M ORING TO 3/4 MJIC 6801-LL-NWD-12-12
21	18956	1	ELBOW, 3/4 MPT, 3/4 MJIC, 2501-12-12
22	819536	4	FITTING, 2404-04-04 -- JIC TO MPT
23	10406	4	45 ELBOW, 1/4 MJIC TO 1/4 MPT, 2503-4-4
24	810314	6	STRAIGHT 3/4 MPT, 3/4 MJIC, 2404-12-12
25			
26			
27			
28		1	HOSE, 301-12 x 70'
29		1	HOSE, 301-12 x 48'
30		2	HOSE, 301-12 x 70'
31		4	HOSE, 421-4 x 28'
32		2	HOSE, 421-4 x 49'
33			ROTO 180 ASSY, DUMP BODY ROTATING FRAME (NOT SHOWN)
34			DUMP BODY (NOT SHOWN)
35	18780		TANK, 35 GALLON-(18780)

NOTES: 1) ITEM NUMBERS WERE CHANGED WITH REV G. OF THIS DRAWING.
2) ITEMS WITH A QTY. CONTAINING 'REF.' ARE NOT IN THE BOM FOR 18901 AND ARE LISTED ONLY TO AID IN SYSTEM TROUBLESHOOTING. THEY ARE SUPPLIED EITHER WITH THE RAILGEAR OR BY THE INSTALLER.
3) HOSES NOT ITEMIZED ON THIS DRAWING. FOR DETAILED HOSE LISTING SEE DWG. 18999.
4) EVERYTHING ABOVE DOTTED LINE IS INCLUDED WITH A ROTO-180 SHIP-OUT KIT.
5) ALL FITTINGS ON THE BOUNDARY OF THE MANIFOLD ARE SHIPPED AS PART OF THE MANIFOLD AND ARE NOT INCLUDED IN THE 18901 BOM. THESE PARTS ARE MARKED 'REF' ON THE DRAWING AND IN THE 'QTY' COLUMN.
6) ITEMS LABELED 'COUPLING' IN THIS DRAWING ARE PART OF THE ROTO FRAME AND NOT IN THE 18901 BOM.

△	12/15/14	10457 WAS 10456	JDI	
△	3/7/12	ITEM #18 WAS 10408, ITEM #22 WAS 2404-04-04	JTM	
△	3/31/11	ADDED PORT LABELS FOR MANIFOLD	NEH	
△	11/15/02	REMOVED CTL VALVES, ITEMS #12, 13 & 14-NEVER USED	SEW	
△	10/5/01	ADD CONTROL VALVES, ITEMS #12, 13 & 14	WT	
△	8/3/99	ITEM #7, VENDOR PART NO. WAS MCD-4269, REV 6	WT	
△	1/13/99	DELETED ITEM 4; ADDED ITEMS 6, 7, 8, 11	LDR	
F △	9/11/97	DELETED #7; ADDED #'s 9, 10, 31	KLC	TSH
△	11/22/95	WAS 50' LONG	TSH	
△	8/07/95	ADDED DEDICATED TANK LINE FOR LOWERING	TSH	
REV	DATE	DESCRIPTION	BY	APP

TOLERANCES:
UNLESS SPECIFIED
COMMON SIZES PREVAIL
FRAC. MACH. ± 1/32"
FRAC. OTHER ± 1/16"
X ± .063
XX ± .030
XXX OR .XXXX ± .005
DRILL SIZES ± .005
ANGULAR ± 1°
SURF FINISH .125 MICRO
THREADS .25 AND .375
BREAK SHARP EDGES

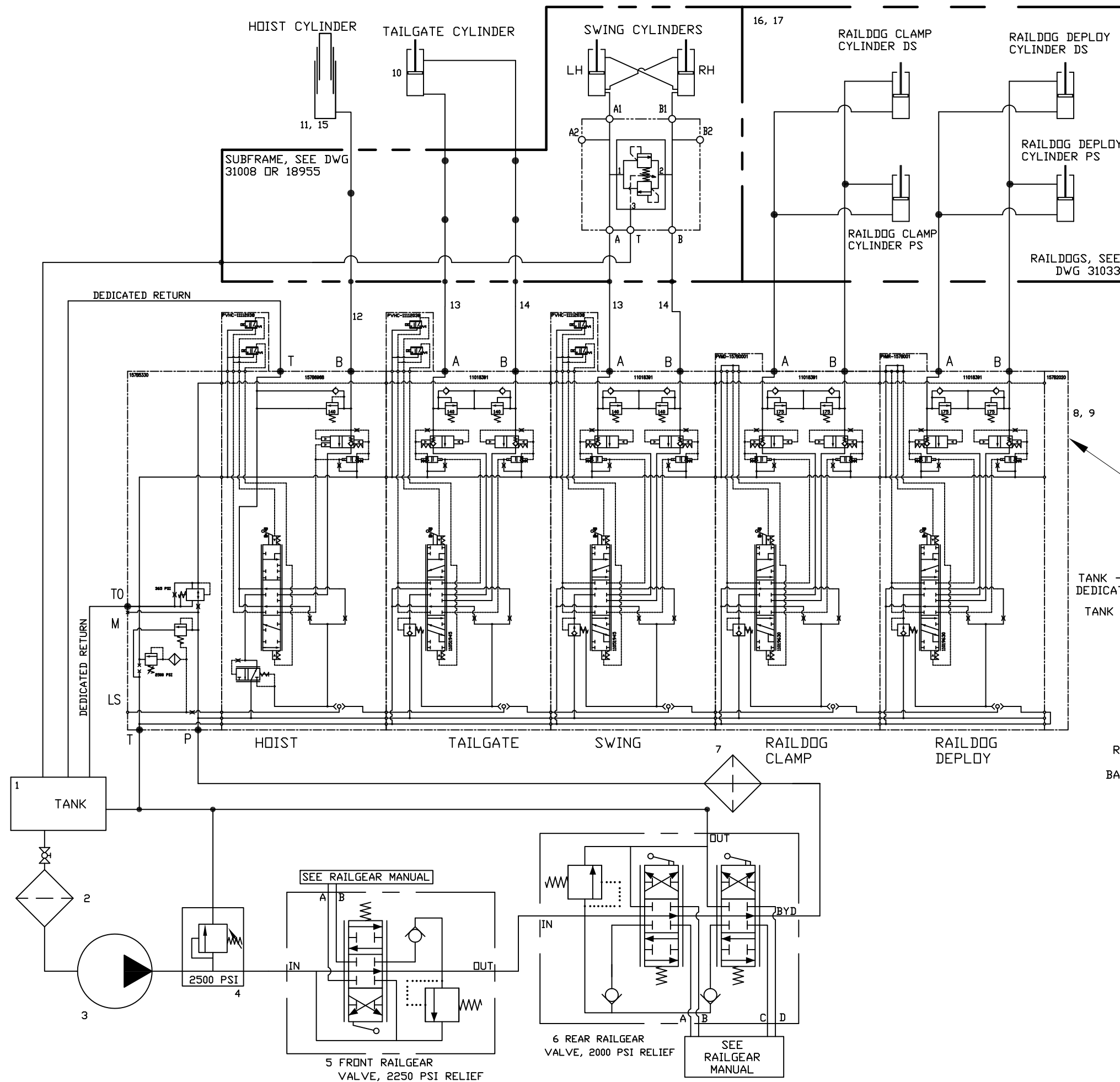
ROTO-180

DRAWN BY: TSH
APPD BY:

TITLE:
STANDARD ROTO, HYD SCHEM.
PARKER MANIFOLD VALVE ASSEMBLY
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512

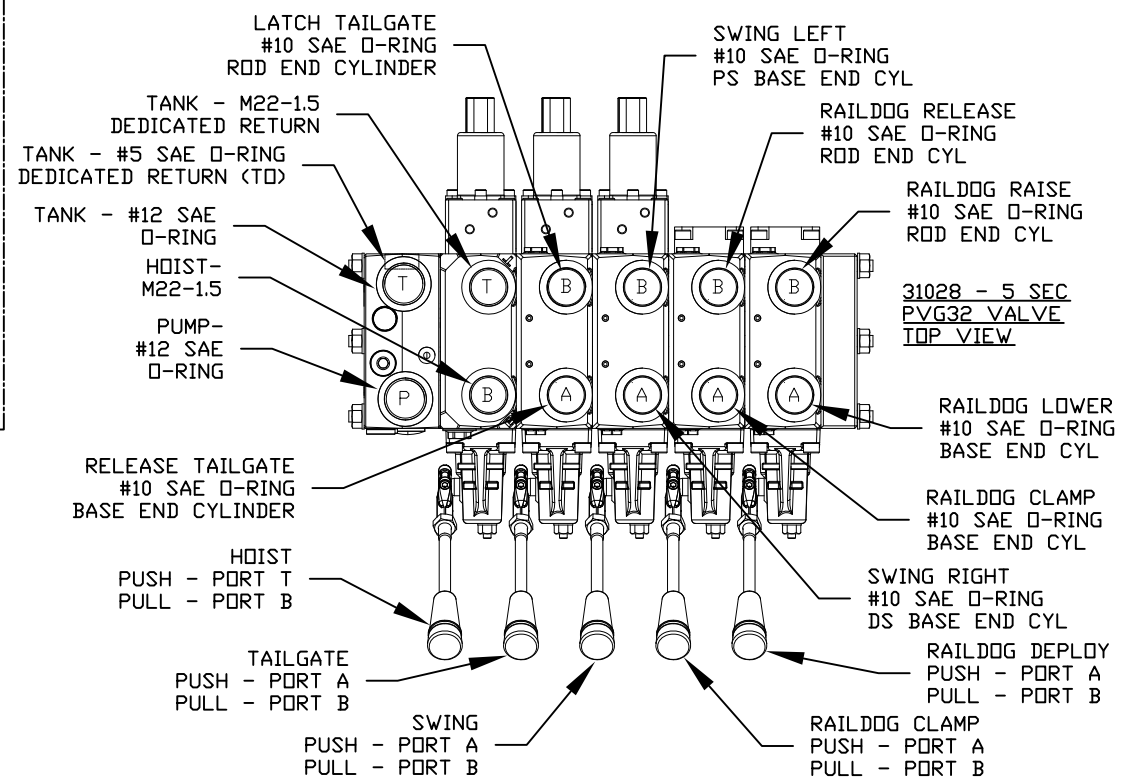
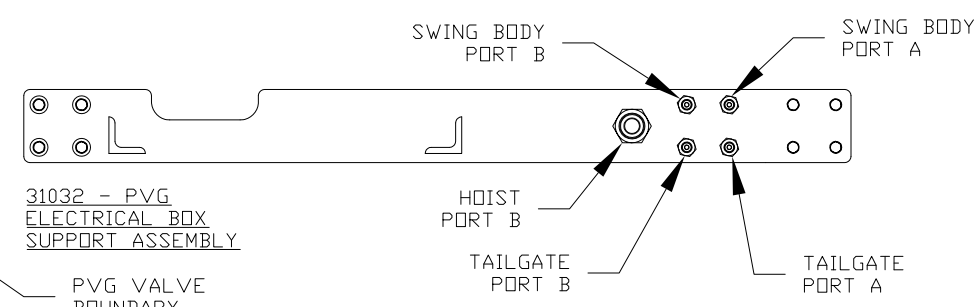
DATE: 1/12/94
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REFER TO DWG 18900 FOR ELECTRICAL DETAIL

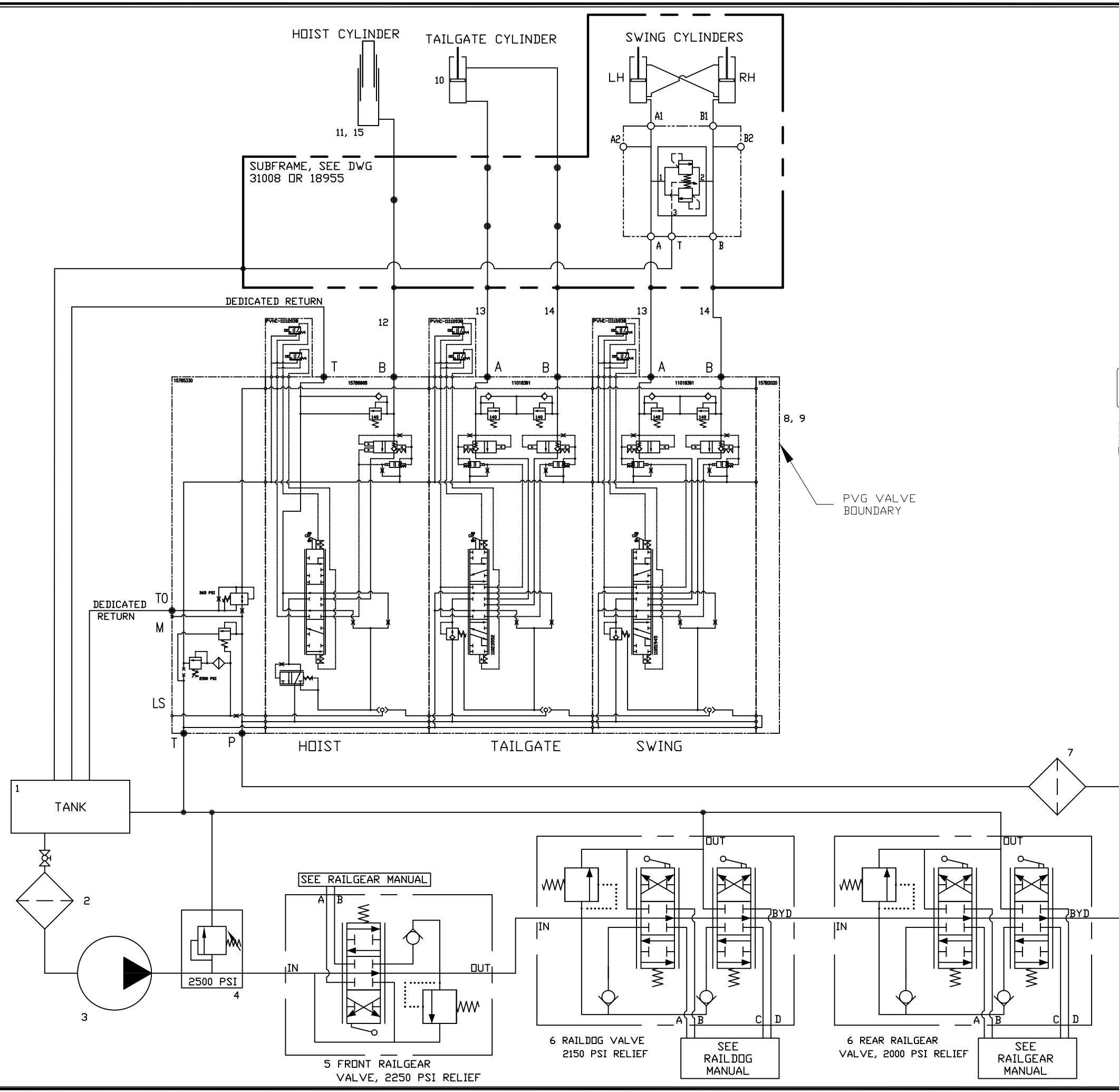


ITEM	PART NO.	QTY	DESCRIPTION
1	18797	REF	HYDRAULIC TANK, 25 GALLON RECOMMENDED
2	605138	REF	FILTER; GRESNEN FSP212-1EBNH (OR EQUAL)
3	-	REF	PUMP; RECOMMENDED 25 GPM @ 2,500 PSI
4	18737	REF	RELIEF VALVE; GRESNEN 1/2" NPT, WJL-50-A-2500 (OR EQUAL)
5	810202	REF	HYD. VALVE W/ FITTINGS
6	810209	REF	HYD. VALVE W/ FITTINGS, POWER BEYOND
7	18924	1	PRESSURE FILTER KIT (10 MICRON)
8	31028	1	5 SECTION PVG32 W/ FTGS - HOIST, GATE, SWING, RAILDOGS (CVA-11285)
9	31032	1	ROTO PVG ELECTRICAL BOX SUPPORT ASSEMBLY
10	18318	1	TAILGATE CYLINDER KIT - ROTARY DUMP
11	18953	1	ROTO HOIST CYLINDER HARDWARE KIT
12		1	HOSE; #12 X 48"
13	31021	2	HOSE; #04 X 48"
14		2	HOSE; #04 X 46"
15	18957	REF	HYVA HOIST CYLINDER (FEE 6-3-108)
16	31033	1	RAILDOGS, HYDRAULIC SCHEMATIC, 5 SECTION PVG VALVES
17	300603	1	HYD. RAILDOGS - NO HOSES

SEE DRAWING 30037 FOR ELECTRICAL DETAIL

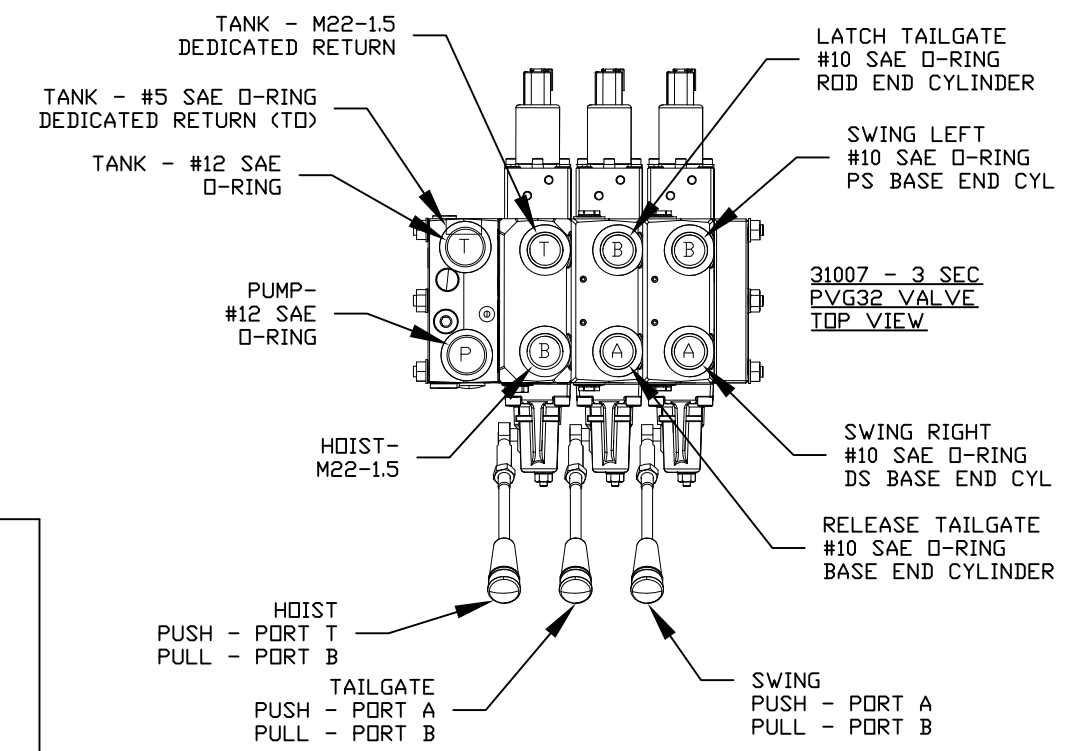
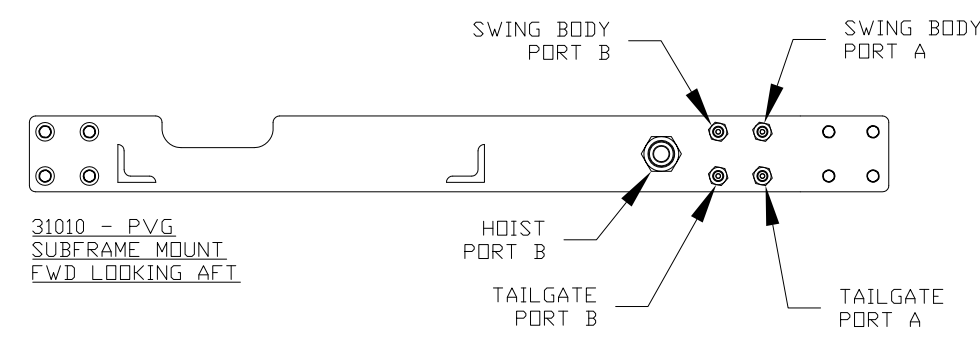


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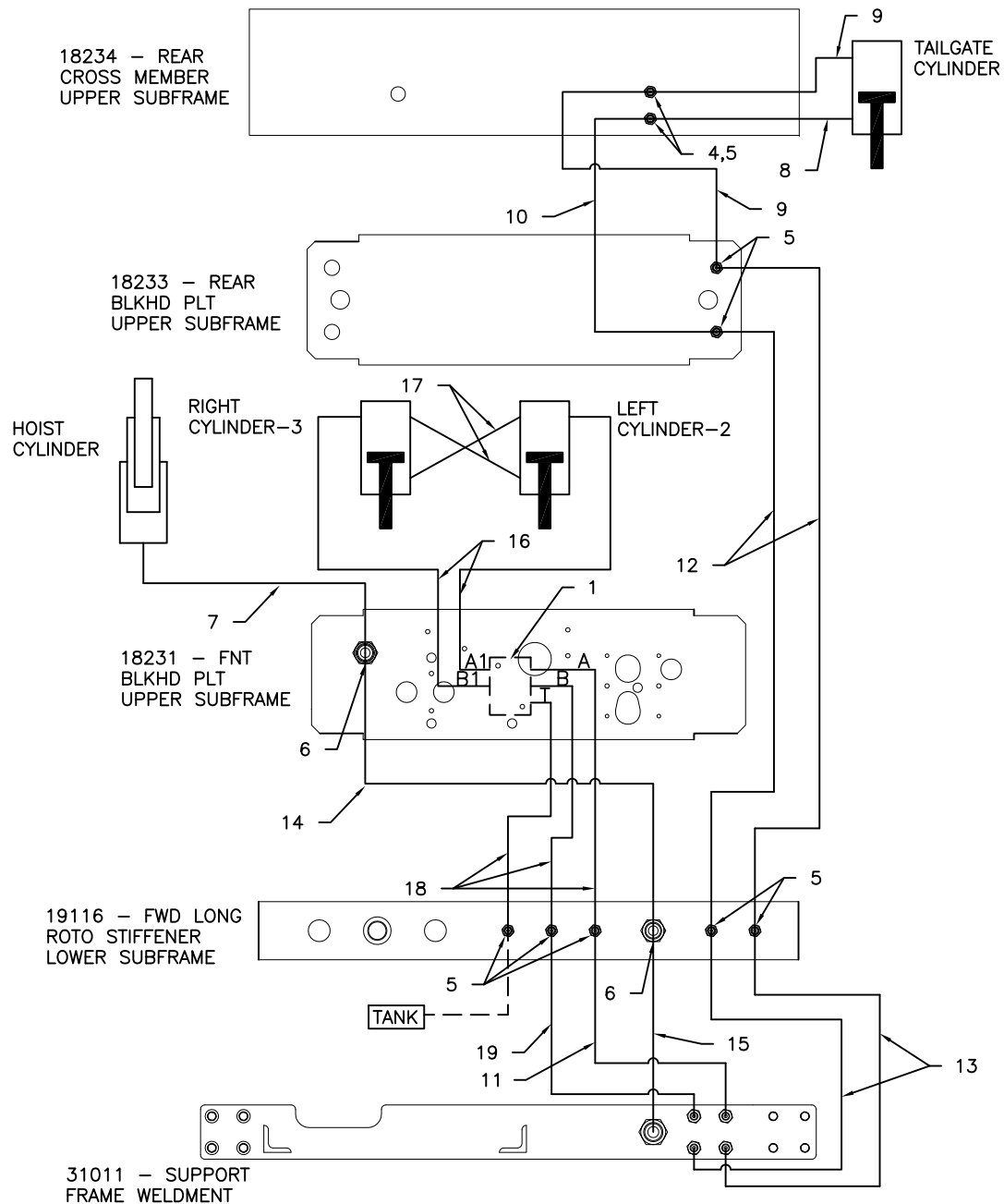


ITEM	PART NO.	QTY	DESCRIPTION
1	18797	REF	HYDRAULIC TANK, 25 GALLON RECOMMENDED
2	605138	REF	FILTER; GRESN FSP212-1EBNH (OR EQUAL)
3	-	REF	PUMP; RECOMMENDED 25 GPM @ 2,500 PSI
4	18737	REF	RELIEF VALVE; GRESN 1/2" NPT, WJL-50-A-2500 (OR EQUAL)
5	810202	REF	HYD. VALVE W/ FITTINGS
6	810209	REF	HYD. VALVE W/ FITTINGS, POWER BEYOND
7	18924	1	PRESSURE FILTER KIT (10 MICRON)
8	31007	1	3 SEC. PVG32 W/ FTGS -HOIST, GATE, SWING (CVA-10851)
9	31010	1	ROTO PROP, SUPPORT FRAME ASSY
10	18318	1	TAILGATE CYLINDER KIT - ROTARY DUMP
11	18953	1	ROTO HOIST CYLINDER HARDWARE KIT
12	31021	1	HOSE; #12 X 48"
13		2	HOSE; #04 X 48"
14		2	HOSE; #04 X 46"
15	18957	REF	HYVA HOIST CYLINDER (FEE 6-3-108)

SEE DRAWING 30037 FOR ELECTRICAL DETAIL



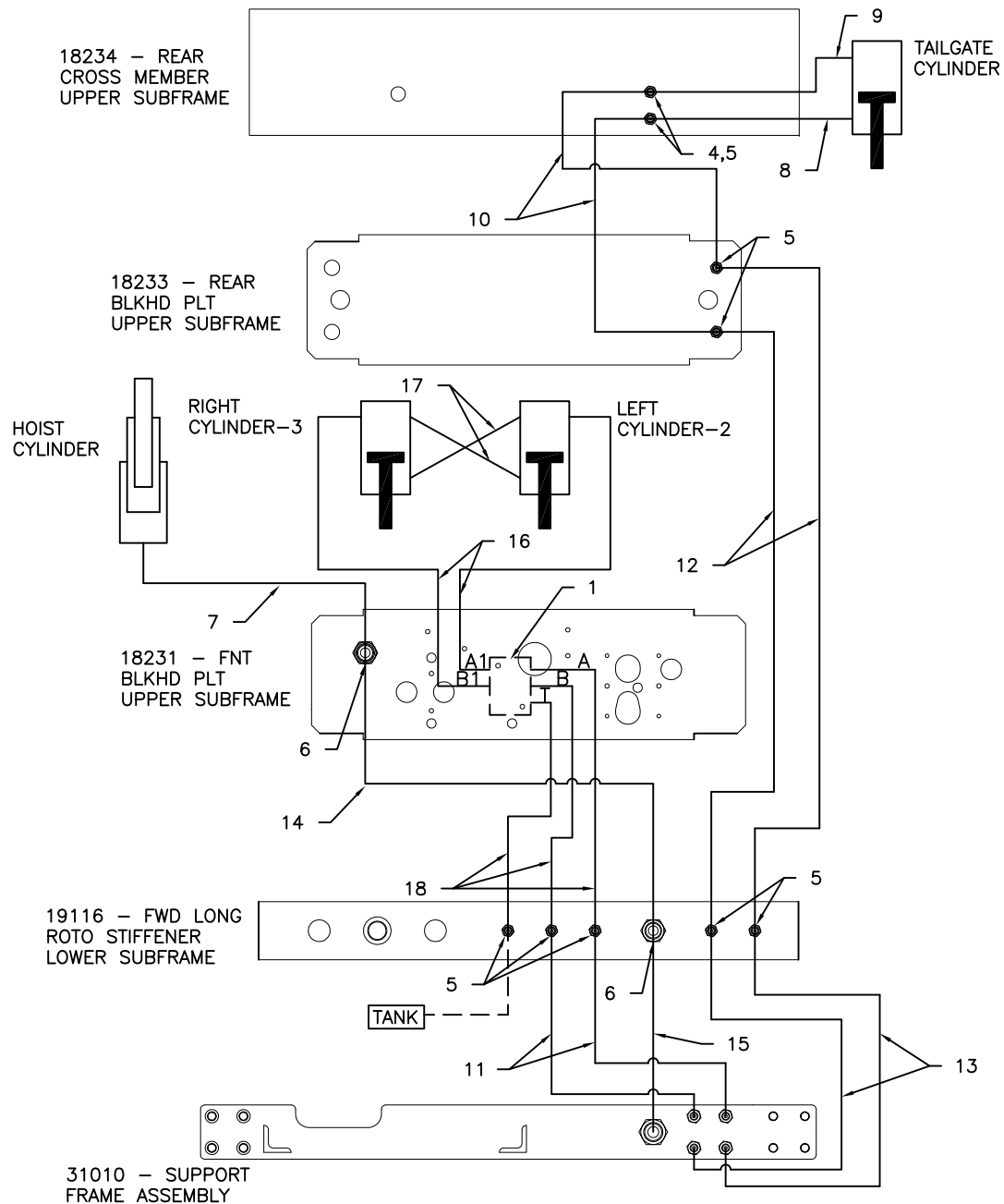
REV	DATE	DESCRIPTION	BY	APP
A	-	-	-	-
B	-	-	-	-
C	-	-	-	-
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS				
FRAC. MACH. ± 1/32"				
FRAC. OTHER ± 1/16"				
X ± .063				
XX ± .030				
XXX OR .XXX ± .005				
DRILL SIZES ± .005				
ANGULAR ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 1A AND 2B				
BREAK SHARP EDGES				
TITLE: ROTO-180		HYDRAULIC SCH., ROTO SHIP-OUT W/ PVG32 3 SECTION		
DRAWN BY: DJJ		APPD BY:		DATE: 08/07/15
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512		DRAWING NUMBER: 31029		REV: #



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	31026	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		2	HOSE; #04 X 96"
13		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"

- NOTES:
1. SEE DRAWING 30013 FOR ELECTRICAL DETAIL
 2. BULKHEAD VIEWS LOOKING FROM FRONT OF FRAME AFT

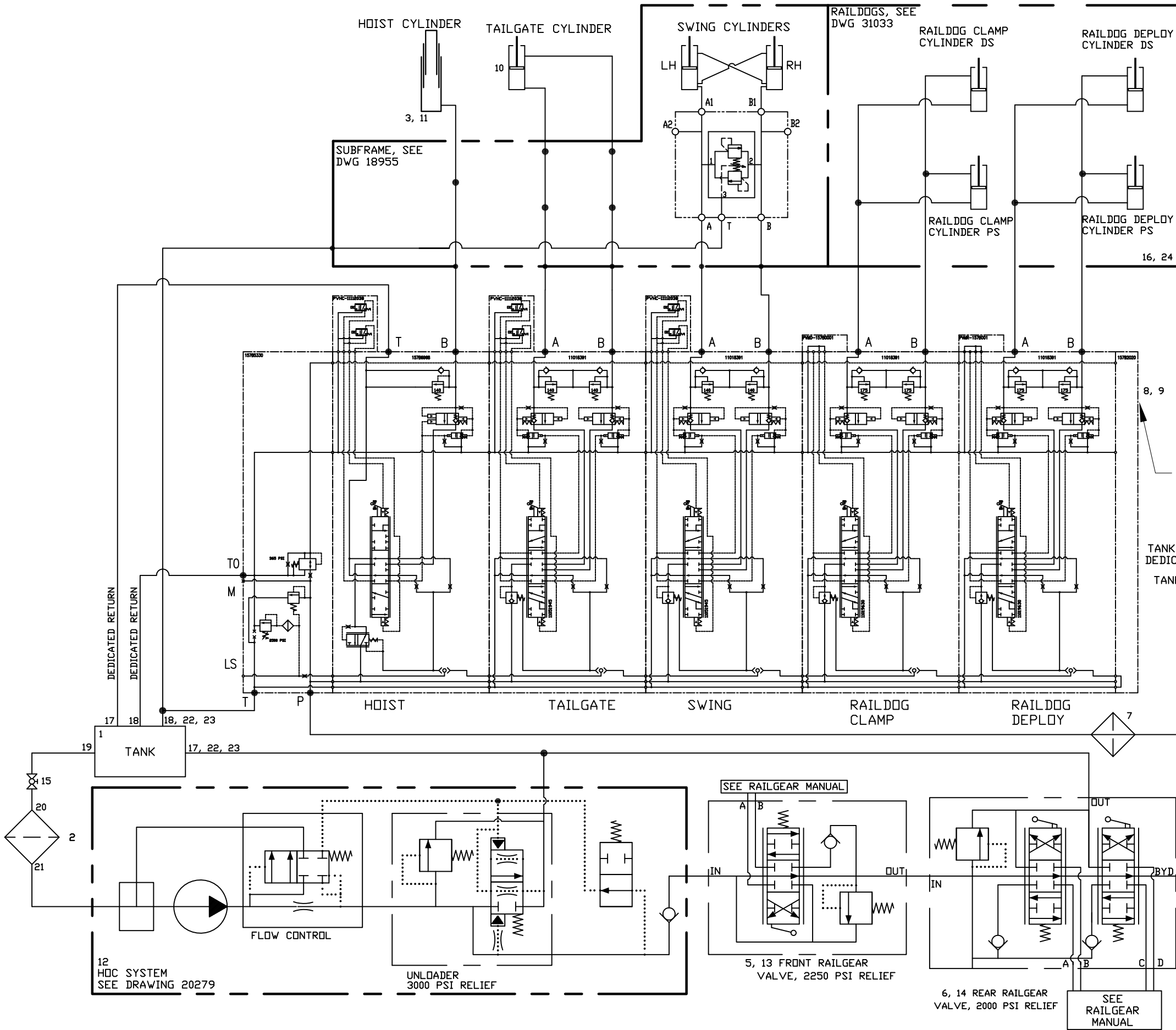
REV		DATE	DESCRIPTION		BY	APP
1			ROTO-180			
2			12'SUBFRAME HYD SCHEMATIC, ROTO W/ PVG32 VALVE			
3			DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
DRAWN BY:		APPD BY:	DATE:	DRAWING NUMBER:		REV:
DJJ			08/24/15	18955		#



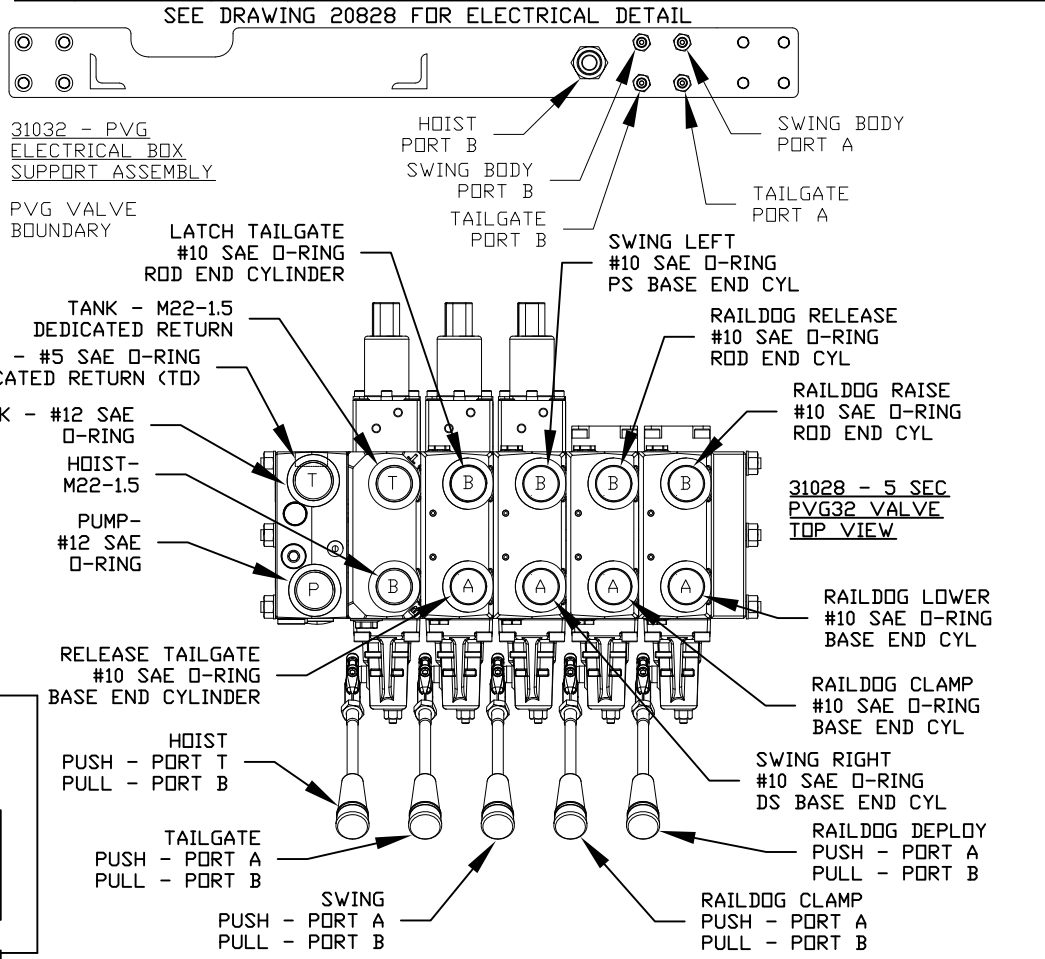
ITEM	PART NO.	QTY	DESCRIPTION
1	31005	1	CROSS PORT RELIEF & MFLD W/FITTINGS(CR08-38H-0-N-30/27.5)
2	240315	1	CYLINDER; SWING, DRIVER SIDE
3	240316	1	CYLINDER; SWING, PASSENGER SIDE
4	605131	4	#04 MJIC X #04 FJIC X 45 DEG (6502-04-04)
5	605325	9	#04 MJIC X #04 MJIC BULKHEAD
6	605463	2	#12 MJIC x #12 MJIC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

- NOTES:
1. SEE DRAWING 30013 FOR ELECTRICAL DETAIL
 2. BULKHEAD VIEWS LOOKING FROM FRONT OF FRAME AFT

<div> <div> <div></div> <div></div> </div> <div>08/17/15</div> </div>		60" WAS 58"		DJJ	
REV	DATE	DESCRIPTION			BY APP
<div> <div> <div>TOLERANCES:</div> <div>(UNLESS SPECIFIED)</div> <div>COMMON SENSE PREVAILS</div> <div>FRAC. MACH: ± 1/32"</div> <div>FRAC. OTHER: ± 1/16"</div> <div>.X ± .063</div> <div>.XX ± .030</div> <div>.XXX OR .XXXX ± .005</div> <div>DRILL SIZES: ± .005</div> <div>ANGULAR: ± 1°</div> <div>SURF FINISH: 125 MICRO</div> <div>THREADS: 2A AND 2B</div> <div>BREAK SHARP EDGES</div> </div> </div>		<div>ROTO-180</div>		<div> <div>TITLE:</div> <div>14'SUBFRAME HYD SCHEMATIC, ROTO W/ PVG32 VALVE</div> <div>DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512</div> </div>	
<div> <div>DRAWN BY:</div> <div>BJF</div> </div>		<div> <div>APPD BY:</div> <div></div> </div>		<div>DATE:</div> <div>04/20/15</div>	<div>DRAWING NUMBER:</div> <div>31008</div>
		<div> <div></div> <div>ATLANTA</div> </div>		<div>REV:</div> <div>A</div>	



ITEM	PART NO.	QTY	DESCRIPTION
1	18797	1	HYDRAULIC TANK, 25 GALLON RECOMMENDED
2	605138	1	FILTER; GRESN FSP212-1EBNH (OR EQUAL)
3	18957	REF	HYVA HOIST CYLINDER (FEE 6-3-108)
4	19007	1	HYDRAULIC HOSE KIT FOR N/S 12 FT ROTO
5	810202	1	HYD. VALVE W/ FITTINGS
6	810209	1	HYD. VALVE W/ FITTINGS, POWER BEYOND
7	18924	1	PRESSURE FILTER KIT (10 MICRON)
8	31028	1	5 SECTION PVG32 W/ FTGS - HOIST, GATE, SWING, RAILDOGS (CVA-11285)
9	31032	1	ROTO PVG ELECTRICAL BOX SUPPORT ASSEMBLY
10	18318	1	TAILGATE CYLINDER KIT - ROTARY DUMP
11	18953	1	ROTO HOIST CYLINDER HARDWARE KIT
12	20279	1	HOC SYSTEM
13	20802	1	ROTO ENERGY VALVE MOUNTING PLT
14	20804	1	N/S ROTO REAR HYD HOSE GUIDE BRKT
15	605123	1	BALL VALVE, 1-1/4"
16	300603	1	HYDRAULIC RAILDOGS, N/S NO HOSES
17	18956	2	#12 MJIC X #12 MPT, 90 DEG FITTING (2501-12-12)
18	810301	2	#12 MPT X #04 JIC, 90 DEG FITTING (2501-04-12)
19	605122	1	#20 MPT X #20 MPT STRAIGHT FITTING (5404-20-20)
20	605124	1	#20 MPT X #20 MPT, 90 DEG FITTING (2501-20-20)
21	605125	1	#20 JIC X #20 MPT, 45 DEG FITTING (2503-20-20)
22	605136	2	#12 MPT X #12 FPT X #12 FPT TEE FITTING (5602-12-12-12)
23	810314	2	#12 JIC X 3/4 MPT FITTING (2404-12-12)
24	31033	1	RAILDOGS, HYDRAULIC SCHEMATIC, 5 SECTION PVG VALVES



REV	DATE	DESCRIPTION	BY	APP
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TOLERANCES:
(UNLESS SPECIFIED)
COMMON SENSE PREVAILS
FRAC, MACH: ± 1/32"
FRAC, OTHER: ± 1/16"
XX: ± .063
XXX: ± .030
XXX OR .XXXX: ± .005
DRILL SIZES: ± .005
ANGULAR: ± 1°
SURF FINISH: 125 MICRO
THREADS: 2A AND 2B
BREAK SHARP EDGES

ROTO-180

DRAWN BY: DJJ
APPD BY:

TITLE:
2015 N/S HYDRAULIC SCH., ROTO W/
PVG32 - 5 SECTION VALVES
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512

DATE: 10/21/15

DRAWING NUMBER: 20436

REV: #

The diagram illustrates a hydraulic circuit for a tank unloader. The components and their functions are as follows:

- FROM TANK:** The inlet line to the pump, labeled 10, 11.
- Pump (2, 3, 26):** A circular symbol with a shaded triangle indicating the direction of flow.
- Flow Control Valve (4):** A valve with two arrows pointing up, indicating flow direction. It is labeled 4 FLOW CONTROL.
- Unloader Valve (5):** A valve with a 3000 PSI relief, labeled 5 UNLOADER 3000 PSI RELIEF.
- Tank Return:** The line returning fluid to the tank, labeled 16, 17, 18, 23, 31.
- System Components (6, 7, 8):** A section of the circuit containing a valve and a spring, labeled 6, 7, 8.
- To System Components:** The line leading to the system components, labeled 24, 25, 28.

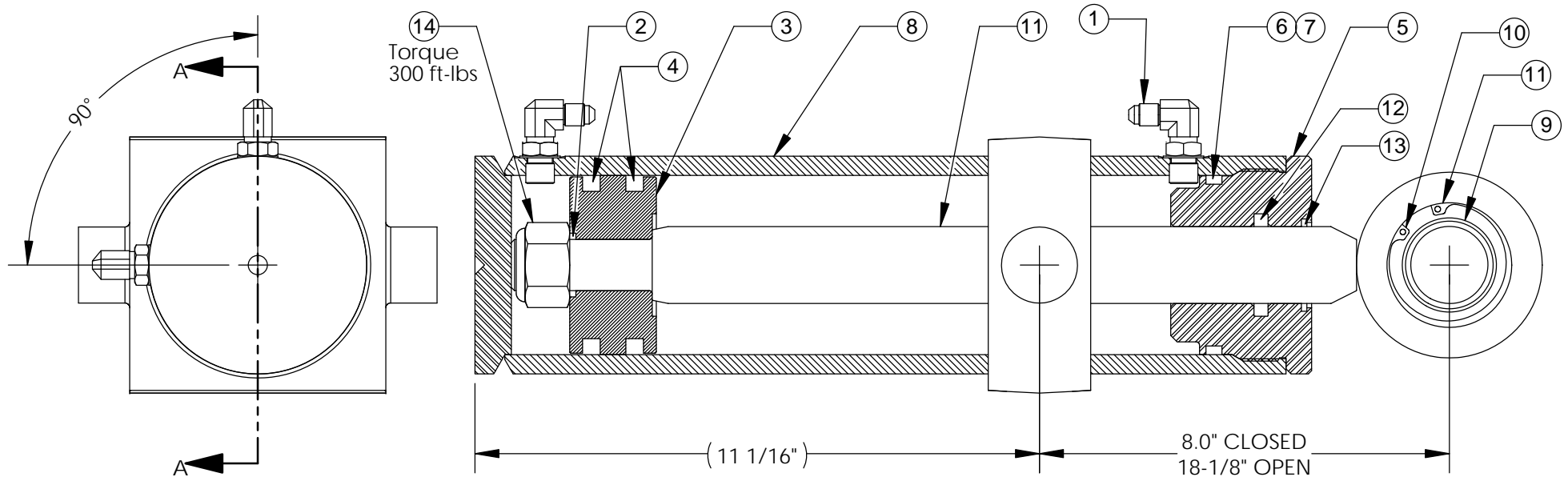
The flow path is as follows: FROM TANK (10, 11) → Pump (2, 3, 26) → Flow Control Valve (4) → Unloader Valve (5) → Tank Return (16, 17, 18, 23, 31) → System Components (6, 7, 8) → To System Components (24, 25, 28).

DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES	DRAWN BY: JDI	APPD BY:	DATE: 10/9/12		DRAWING NUMBER: 20279	REV: #
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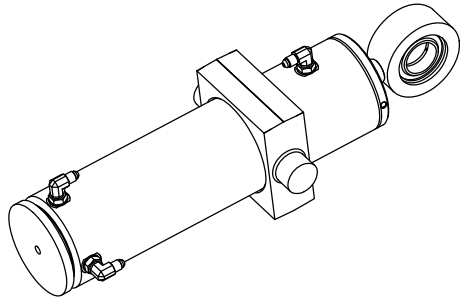
B	ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
	1	18952	3	04 JIC X 06 O'RING 90 FITTING
	2	240107	1	HYD. CYL. O-RING, 1"
	3	240201	1	HYD. CYL. PISTON (3-1/2")
	4	240204	2	HYD. CYL. PISTON SEAL, 3-1/2"
	5	240207	1	3-1/2" HYDRAULIC CYLINDER GLAND
	6	240208	1	HYD. CYL. O-RING, 3-1/2"
	7	240209	1	HYD. CYL. BACK UP O-RING, 3-1/2"
	8	240310	1	3-1/2" ROTO CYLINDER TUBE ASSEMBLY (PASSENGER'S SIDE)
	9	240323	1	HYDRAULIC CYL. ROD END, SPHERICAL ROLLER BEARING (15SF24)
	10	240324	1	SNAP RING, 2-7/16"
	11	240325	1	HYD. CYL. ROD ASSEMBLY, ROTO
	12	241105	1	1-1/2" DIA ROD SEAL
	13	241106	1	1-1/2" DIA ROD WIPER
	14	605119	1	NYLON LOCK NUT, 1"-14

SECTION A-A



NOTE:
DMF P/N 240335 - ROTO SEAL KIT
(SEAL KIT INCLUDES ITEM #'S 2, 4, 6, 7, 12, 13)

B	9/27/2012	18952 WAS 10456		JDI	
A	9/19/2012	REDRAWN IN SOLIDWORKS		JDI	
REV	DATE	DESCRIPTION		BY	APP
TOLERANCES: (UNLESS SPECIFIED)		TITLE:			
FRAC. MACH. ± 1/32"		ROTO-180			
FRAC. OTHER: ± 1/16"					
X ± .063		HYD. CYL. ASSY., ROTO SWING, RH (W/ 1-1/2" ROD)			
XX ± .030					
XXX ± .005		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512			
DRIILL SIZES: ± .015					
ANGULAR: ± 1°		DRAWN BY: APPD BY:			
SURF FINISH: 125 MICRO					
THREADS: Z&A AND 2B		DATE: 10/25/01			
WEAR SHARP EDGES (LESS 4 VEE ROUNDS)					
WET		-		DRAWING NUMBER: 240316	
				REV: B	

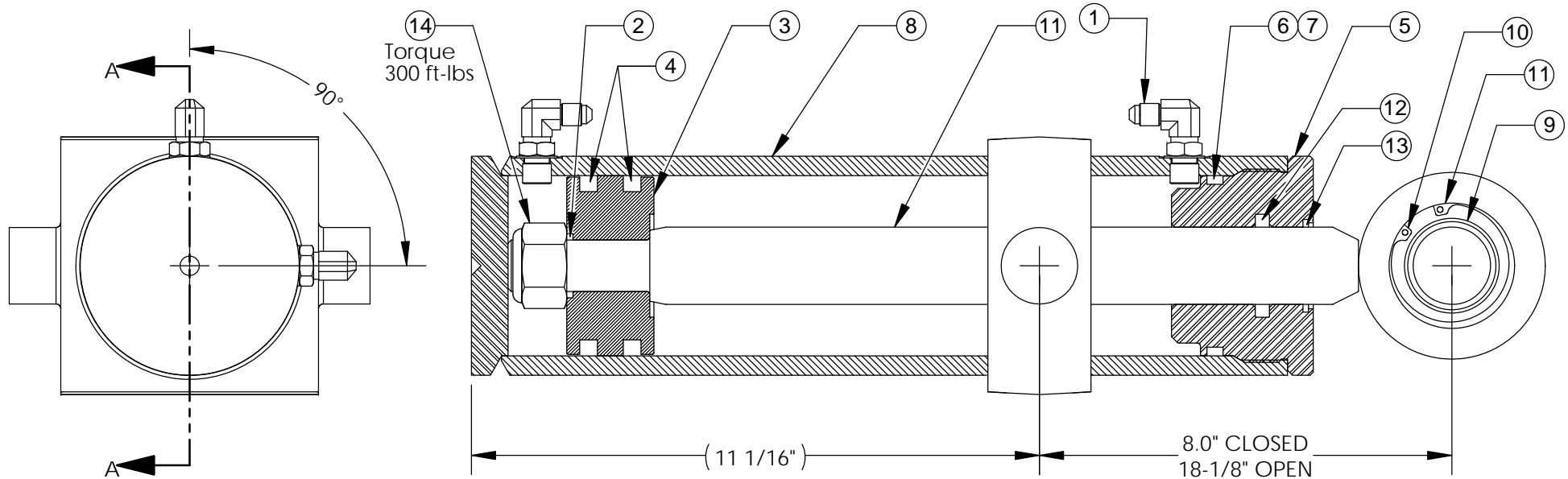


SEE PP008 FOR CYLINDER
ASS'Y & TEST PROCEDURE


B

ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
1	18952	3	04 JIC X 06 O-RING 90 FITTING
2	240107	1	HYD. CYL. O-RING, 1"
3	240201	1	HYD. CYL. PISTON (3-1/2")
4	240204	2	HYD. CYL. PISTON SEAL, 3-1/2"
5	240207	1	3-1/2" HYDRAULIC CYLINDER GLAND
6	240208	1	HYD. CYL. O-RING, 3-1/2"
7	240209	1	HYD. CYL. BACK UP O-RING, 3-1/2"
8	240311	1	3-1/2" ROTO CYLINDER TUBE ASSEMBLY (DRIVER'S SIDE)
9	240323	1	HYDRAULIC CYL. ROD END, SPHERICAL ROLLER BEARING (15SF24)
10	240324	1	SNAP RING, 2-7/16"
11	240325	1	HYD. CYL. ROD ASSEMBLY, ROTO
12	241105	1	1-1/2" DIA ROD SEAL
13	241106	1	1-1/2" DIA ROD WIPER
14	605119	1	NYLON LOCK NUT, 1"-14

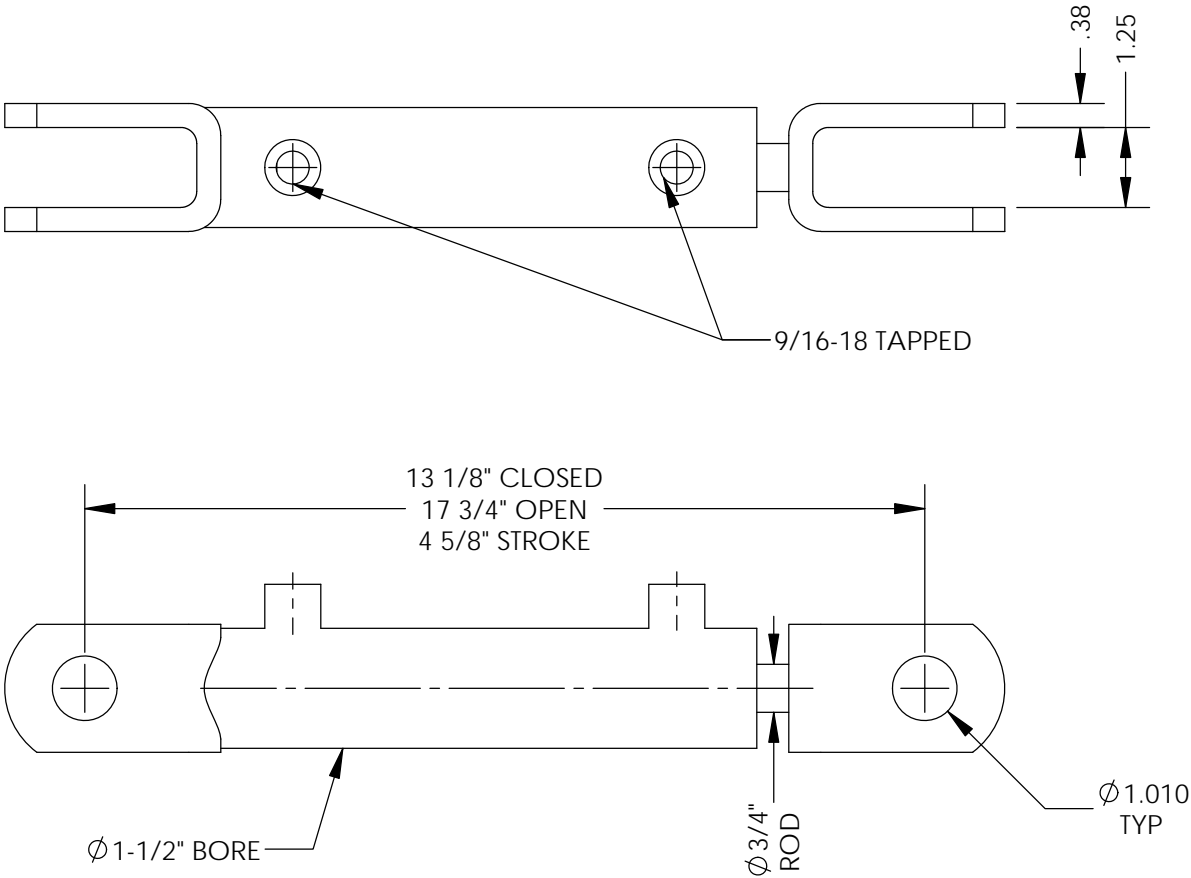
SECTION A-A




NOTE:
DMF P/N 240335 - ROTO SEAL KIT
(SEAL KIT INCLUDES ITEM #'S 2, 4, 6, 7, 12, 13)

B	9/27/2012	18952 WAS 10456		JDI	
A	9/19/2012	REDRAWN IN SOLIDWORKS		JDI	
REV	DATE	DESCRIPTION		BY	APP
TOLERANCES: (UNLESS SPECIFIED)		TITLE: HYD. CYL. ASSY., ROTO SWING, LH (W/ 1-1/2" ROD)			
ROTO-180					
FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" X ± .063 XX ± .030 XXX ± .005 DRILL SIZES: ± .015 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512			
DRAWN BY:	APPD BY:	DATE:		DRAWING NUMBER:	REV:
WET	-	10/25/01		240315	B
WEAR SHARP EDGES (LESS 1-40T DRAWS)					

ITEM NO.	PART NUMBER	QTY.	DESCRIPTION
1	-	EA	CYLINDER, GHC 251507PP-4.625



A	10/4/2012	REDRAWN IN SOLIDWORKS				JDI	
REV	DATE	DESCRIPTION				BY	APP
TOLERANCES: (UNLESS SPECIFIED)		TITLE: ROTO TAILGATE CYLINDER					
FRAC. MACH: ± 1/32"		DIVERSIFIED METAL FABRICATORS, INC. (404)875-1512					
FRAC. OTHER: ± 1/16"							
X ± .063		DRAWN BY: MSM					
.XX ± .030							
.XXX ± .005		APPD BY: -					
DRILL SIZES: ± .015							
ANGULAR: ± 1°		DATE: 11/15/94					
SURF FINISH: 125 MICRO							
THREADS: 2A AND 2B							
[RECALL HARDY LOGOS (LSDS & RAL) 2001]							
		DRAWING NUMBER: 18280					
		REV: A					

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 necessary.
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 necessary.
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 necessary.
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.



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 STEP E	JDI	
	5/25/12	USE 19260 INSTEAD OF HYDRAULIC OIL	JDI	
	7/16/11	REMOVED CYLINDER PART #'S	NEH	
	9/27/07	ADDED CYLINDER TESTING WARNING	WAK	
REV	DATE	DESCRIPTION	BY	APP
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" .X ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: + .015 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B <small>BREAK SHARP EDGES (R.000 X .001 MAX.)</small>		TITLE: PRODUCTION PROCEDURE 008 CYLINDER ASSEMBLY DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512		
DRAWN BY:		APPD BY:	DATE:	DRAWING NUMBER:
WAK			6/24/94	PP008
				REV: 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).

SAE (JIC) 37° Flare Fittings

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

					
					
REV	DATE	DESCRIPTION			BY APP
<small> TOLERANCES: (UNLESS SPECIFIED) COMMON SIZES PREVAIL FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" .X ± .063 .XX ± .030 .XXX OR .XXXX ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES </small>		<small> TITLE: PRODUCTION PROCEDURE 005 JIC FITTING INSTALLATION DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512 </small>		<small> DATE: 06/02/94 </small>	
<small> DRAWN BY: TSH </small>		<small> APPD BY: </small>			<small> DRAWING NUMBER: PP005 </small>
				<small> REV: # </small>	

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

Fitting Size	SAE Port Thread Size	F.F.F.T.
2	5/16-24	1.0
4	7/16-20	1.5
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	2.0
24	1 7/8-12	2.0

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

 					
REV	DATE	DESCRIPTION			BY APP
<small> TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: $\pm 1/32$ FRAC. OTHER: $\pm 1/16$.X $\pm .063$.XX $\pm .030$.XXX OR .XXX: $\pm .005$ DRILL SIZES: $\pm .005$ ANGULAR: $\pm 1^\circ$ SURF FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES </small>		<small> TITLE: PRODUCTION PROCEDURE 003 O-RING FITTING INSTALLATION DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512 </small>		<small> DRAWN BY: TSH APPD BY: DATE: 06/02/94 DRAWING NUMBER: PP003 REV: # </small>	

ITEM	PART NO.	QTY	DESCRIPTION
1			
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.

STEEL PIPE THREAD FITTINGS

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

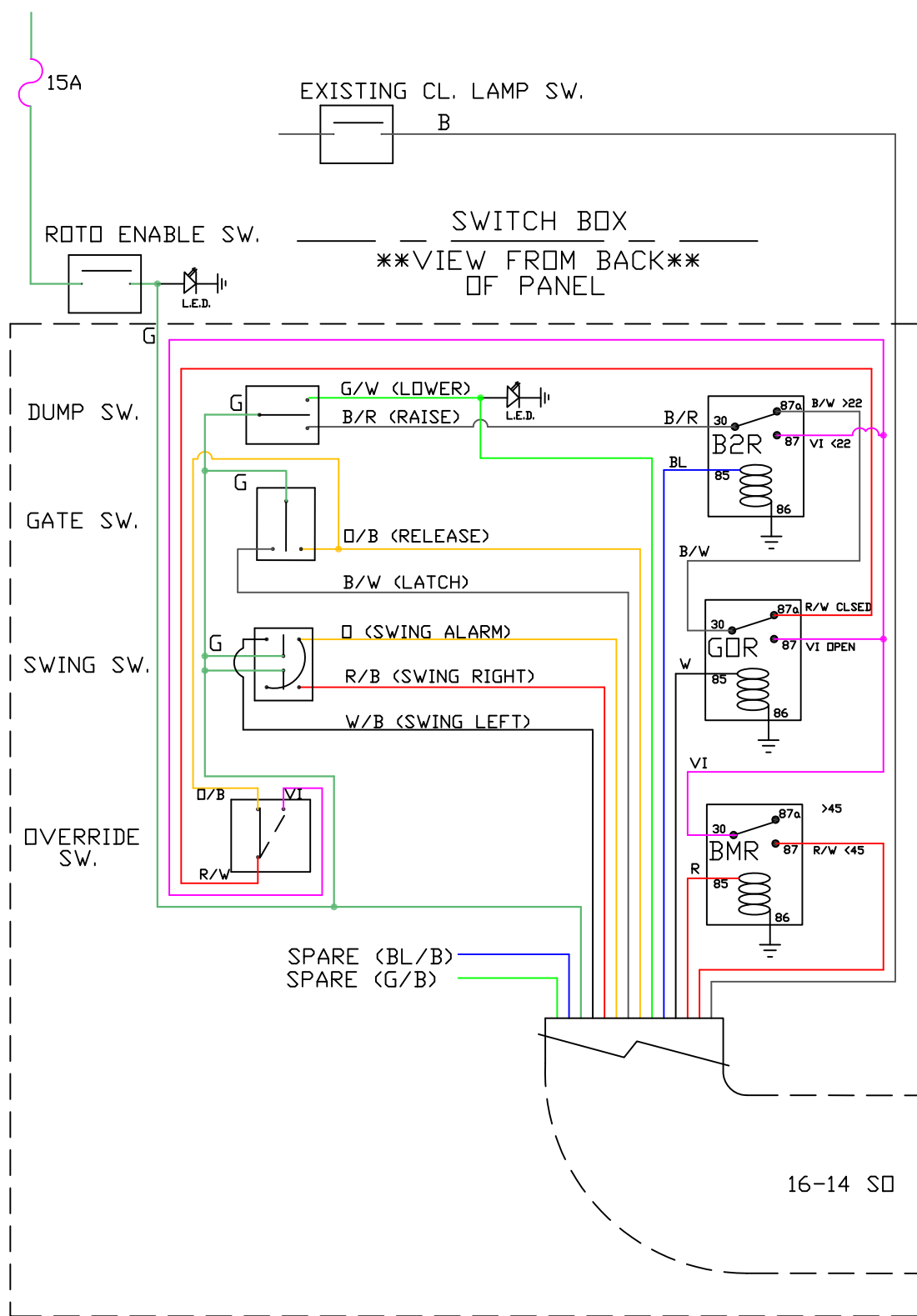
COMMENTS: Teflon Tape May Be Used In Certain Situations With Engineering Approval. A Pipe Fitting Is Limited To One Or Two Re-Uses.

					
REV	DATE	DESCRIPTION			BY APP
<small> TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS FRAC. MACH: ± 1/32" FRAC. OTHER: ± 1/16" .X ± .063 .XX ± .030 .XXX OR .000 ± .005 DRILL SIZES: ± .005 ANGULAR: ± 1° SURF. FINISH: 125 MICRO THREADS: 2A AND 2B BREAK SHARP EDGES </small>				TITLE: PRODUCTION PROCEDURE 004 PIPE FITTING INSTALLATION DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512	
DRAWN BY: TSH		APPD BY:		DATE: 06/02/94	
				DRAWING NUMBER: PP004	REV: #

SECTION 7.0 ROTO 180 ELECTRICAL

7.1	ROTO 180 HYDRAFORCE MANIFOLD, ELECTRICAL SCHEMATIC, 3 PROXIMITY SWITCHES - 20756.....	7-2
7.2	ROTO 180 IN-CAB CONTROL, 3 PROXIMITY SWITCHES - 20755.....	7-3
7.3	ROTO 180 HYDRAFORCE MANIFOLD SUBFRAME, ELECTRICAL SCHEMATIC, 3 PROXIMITY SWITCHES - 20757	7-4
7.4	ROTO 180 PARKER MANIFOLD, ELECTRICAL SCHEMATIC - 18900	7-5
7.5	ROTO 180 PVG VALVES, ELECTRICAL SCHEMATIC, TARP, VIBRATOR & WIRELESS - 30037	7-6
7.6	ROTO 180 PVG VALVES SUBFRAME, ELECTRICAL SCHEMATIC, TARP & VIBRATOR - 30013	7-7
7.7	ROTO 180 PVG VALVES, N/S '15 ELECTRICAL SCHEMATIC, DIAMOND LOGIC & PLUS1 - 20828	7-8
7.8	ROTO 180 PVG VALVES, ELECTRICAL SCHEMATIC, TARP & VIBRATOR - 30040	7-9
7.9	ROTO 180 JOYSTICK FOR HYDRAFORCE MANIFOLD - 20826	7-10
7.10	ROTO 180 PROXIMITY SWITCH KIT – 20754.....	7-11
7.11	ROTO 180 LIMIT SWITCH KIT - 20769	7-12

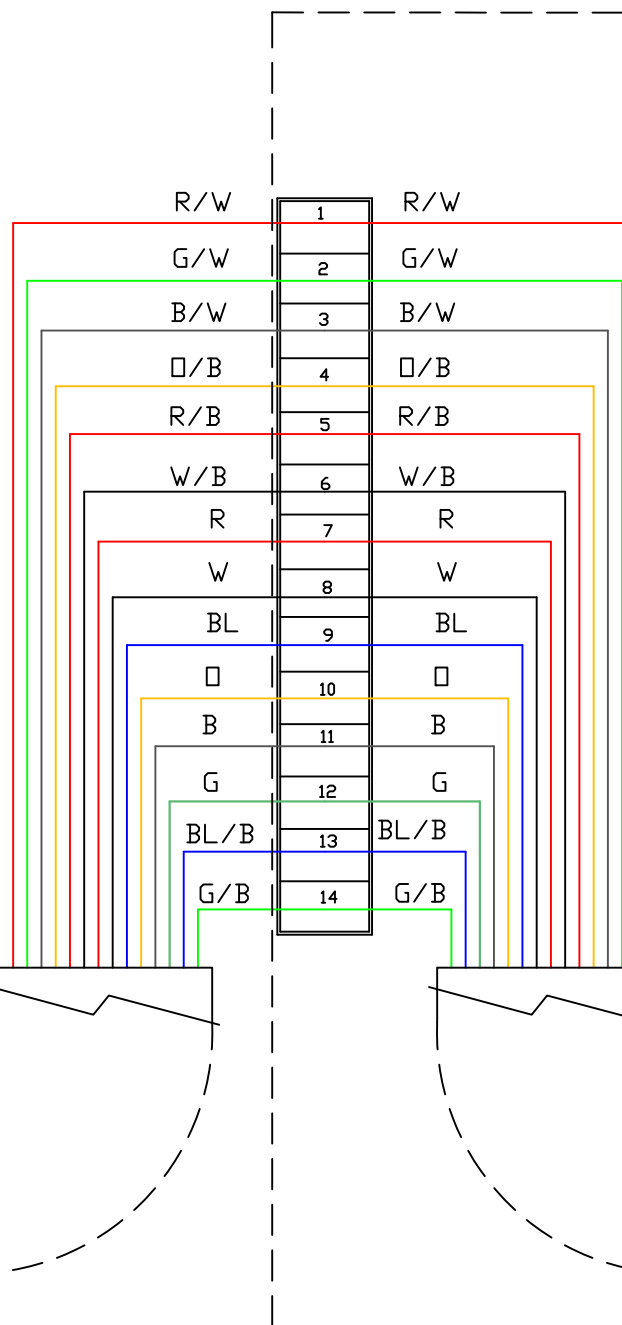
12 V DC FROM IGNITION SOURCE



REFERENCE DWG. 20755

ROTO - TERMINAL WIRING

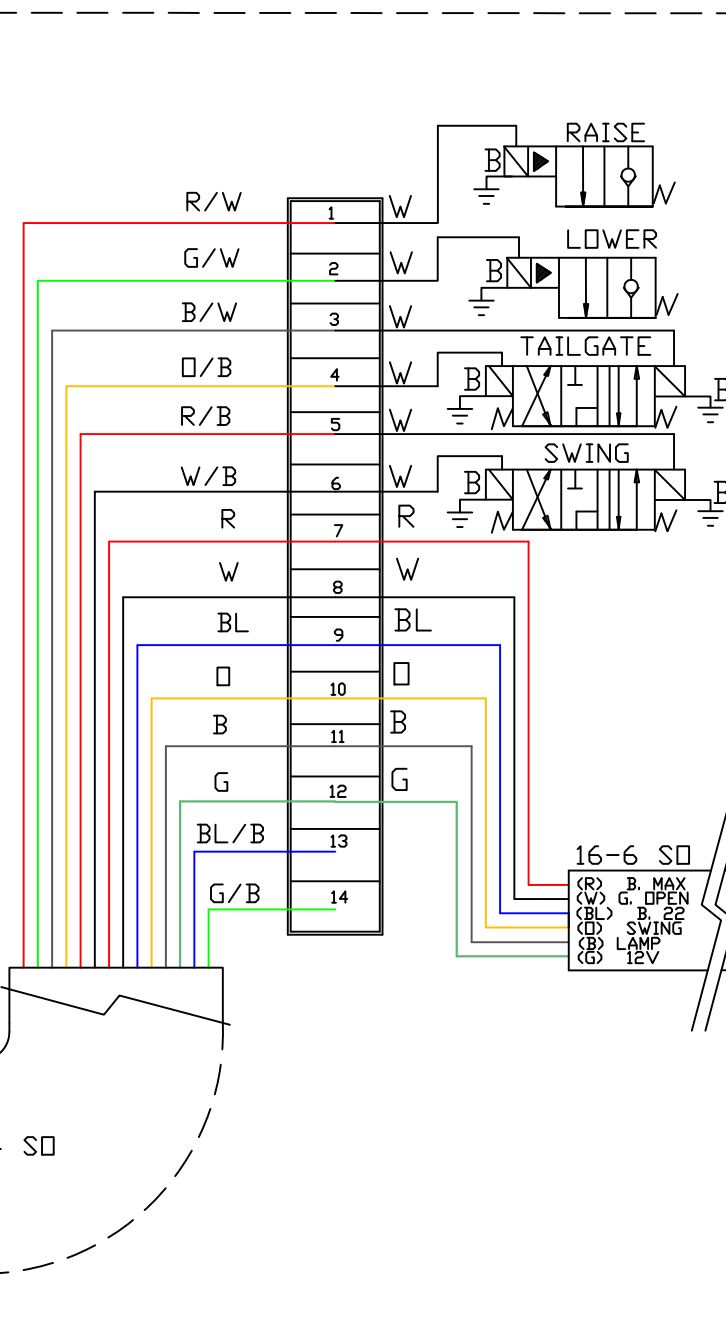
VIEW FROM D.S.



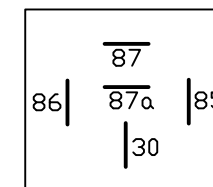
REFERENCE DWG. 20757

ROTO SUB-FRAME WIRING

VIEW FROM D.S.



RELAY PIN CONFIG.
BOTTOM VIEW



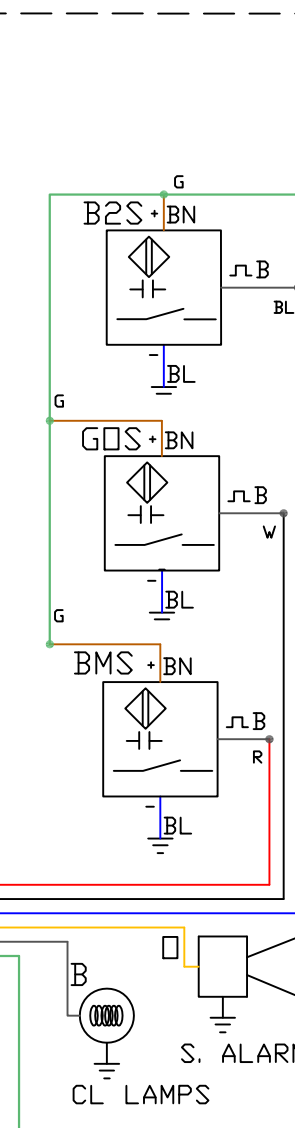
HELLA 87401 OR EQV.

SENSORS:
BELOW 22 SENSOR = B2S
GATE OPEN SENSOR = GOS
BELOW MAX SENSOR = BMS

RELAYS:
BELOW 22 RELAY = B2R
GATE OPEN RELAY = GOR
BELOW MAX RELAY = BMR

REFER TO 18901 FOR HYDRAULIC DETAIL

REAR CROSS MEMBER WIRING



ROTO - 180

TITLE:
ROTO-180 ELECTRICAL SCHEMATIC
W/ 3 PROX SW.

DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512

DRAWN BY:

APPD BY:

DATE:

DRAWING NUMBER:

REV:

ARJ

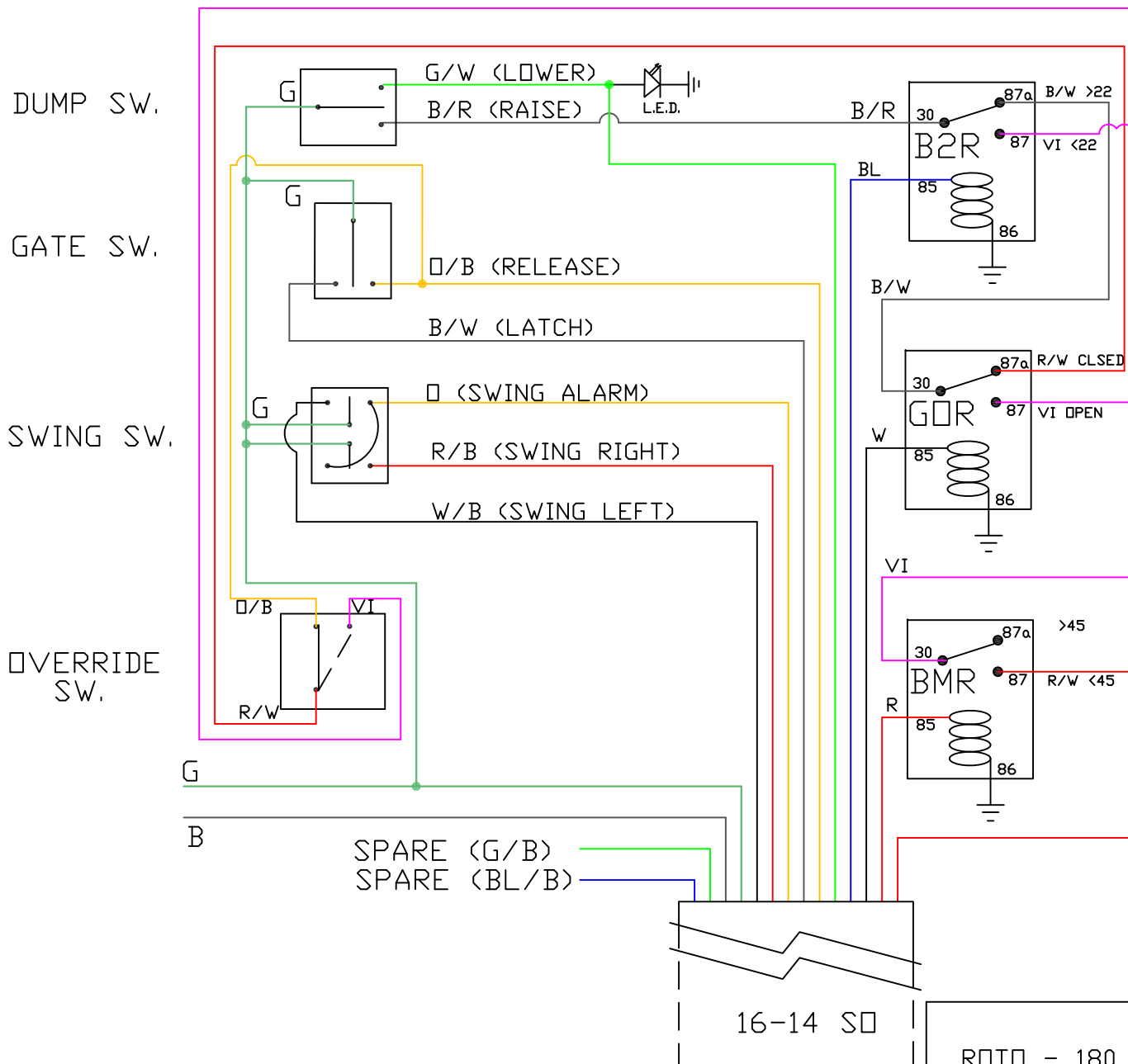
1/23/12

20756

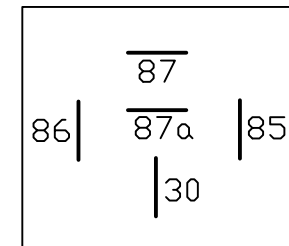
#

REV	DATE	DESCRIPTION	BY	APP
1				
2				
3				

****VIEW FROM BACK****
OF PANEL



RELAY PIN CONFIG.
BOTTOM VIEW



HELLA 87401 OR EQV.

RELAYS:

BELOW 22 RELAY = B2R
GATE OPEN RELAY = GOR
BELOW MAX RELAY = BMR

NOTE:
TEST COMPLETED
COMPONENTS USING
20779

△	-	-	-	-
△	-	-	-	-
△	-	-	-	-
REV	DATE	DESCRIPTION	BY	APP

ROTO - 180	
DRAWN BY:	APPD BY:
BJF	

TITLE: ROTO-180 IN-CAB CONTROL WITH PIGTAIL FOR 3 PROX SW. CONFIG			
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
DATE:		DRAWING NUMBER:	REV:
5/8/12		20755	#

REFER TO 18901 FOR HYDRAULIC DETAIL

ROTO - TERMINAL WIRING

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**VIEW FROM D.S.**
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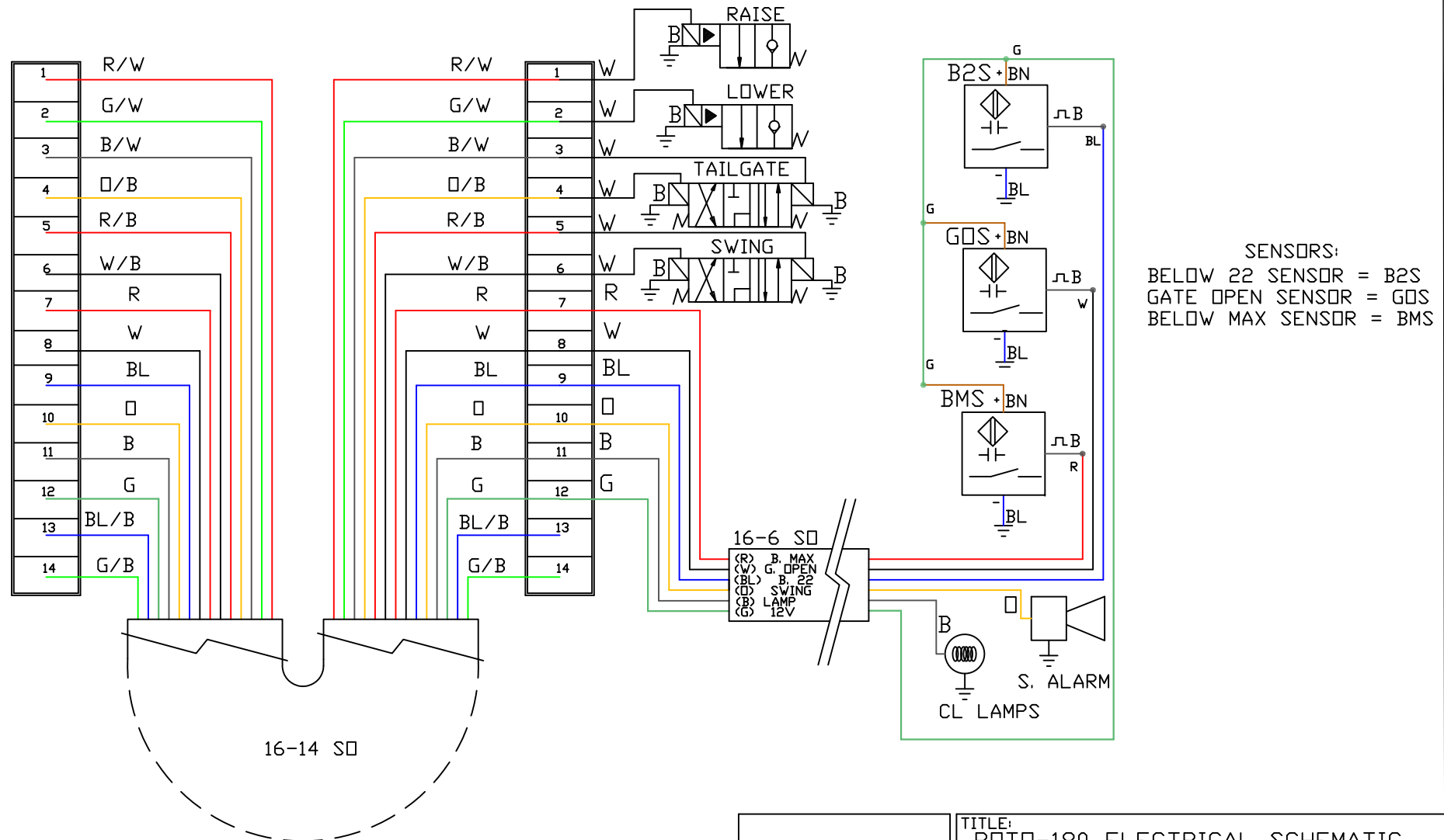
ROTO SUB-FRAME WIRING




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**VIEW FROM D.S.**

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REAR CROSS MEMBER WIRING




	-	-	-	
	-	-	-	
	-	-	-	
REV	DATE	DESCRIPTION		BY APP

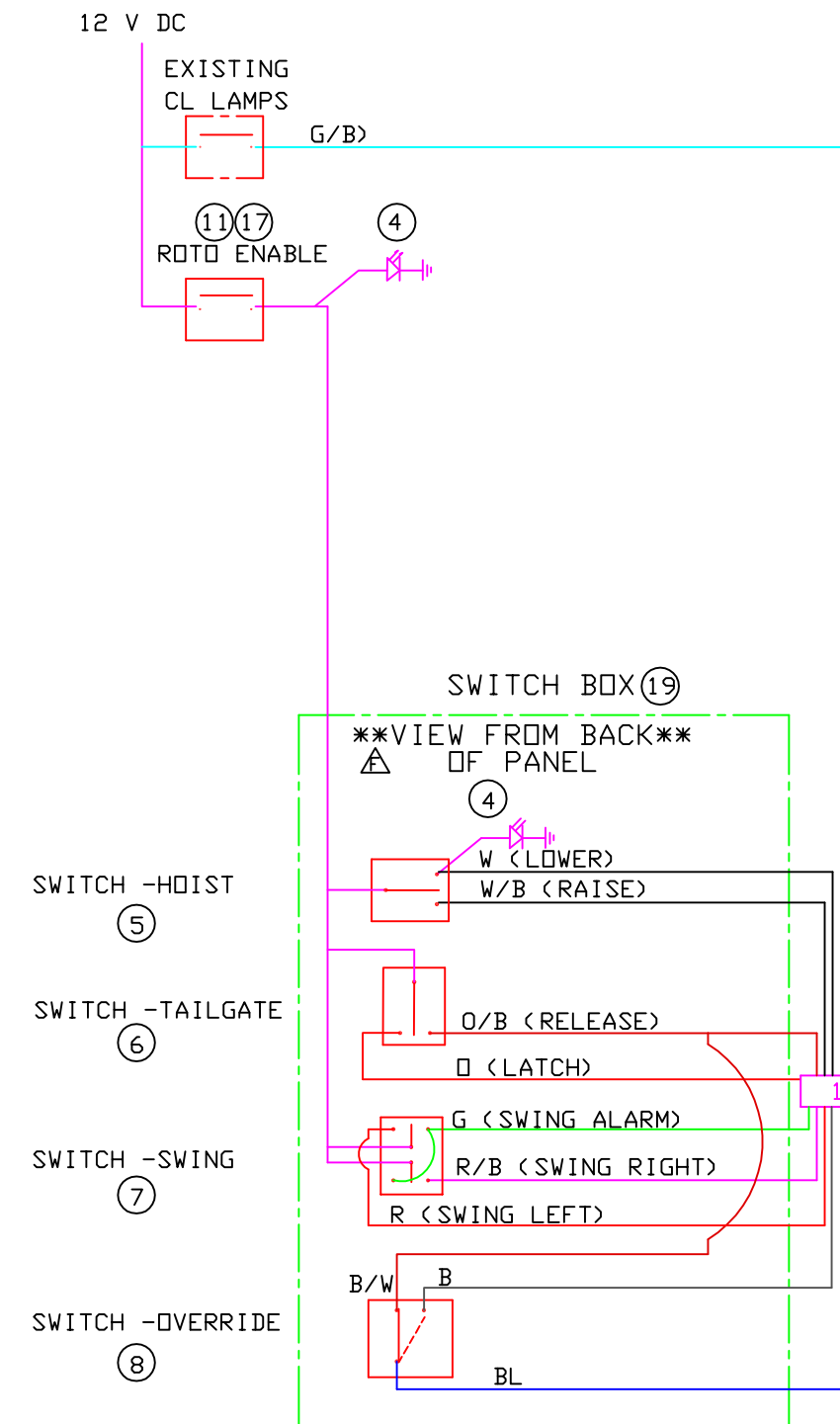
ROTD - 180

DRAWN BY:	APPD BY:
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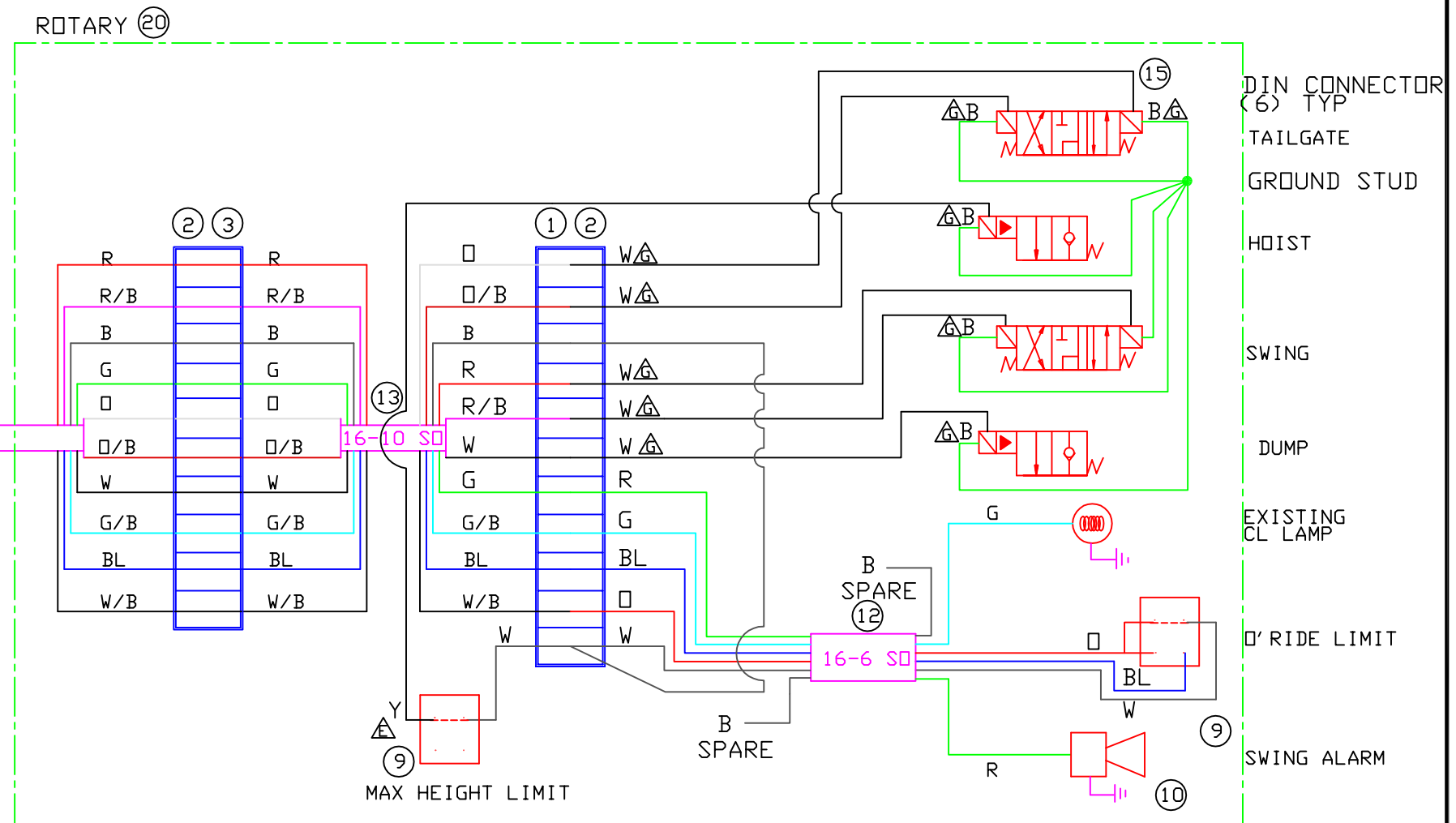
BJF

APPD BY:

TITLE: ROTO-180 ELECTRICAL SCHEMATIC SUBFRAME W/ 3 PROX SW.			
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
DATE: 5/8/12		DRAWING NUMBER: 20757	REV: #



REFER TO 18901 FOR HYDRAULIC DETAIL

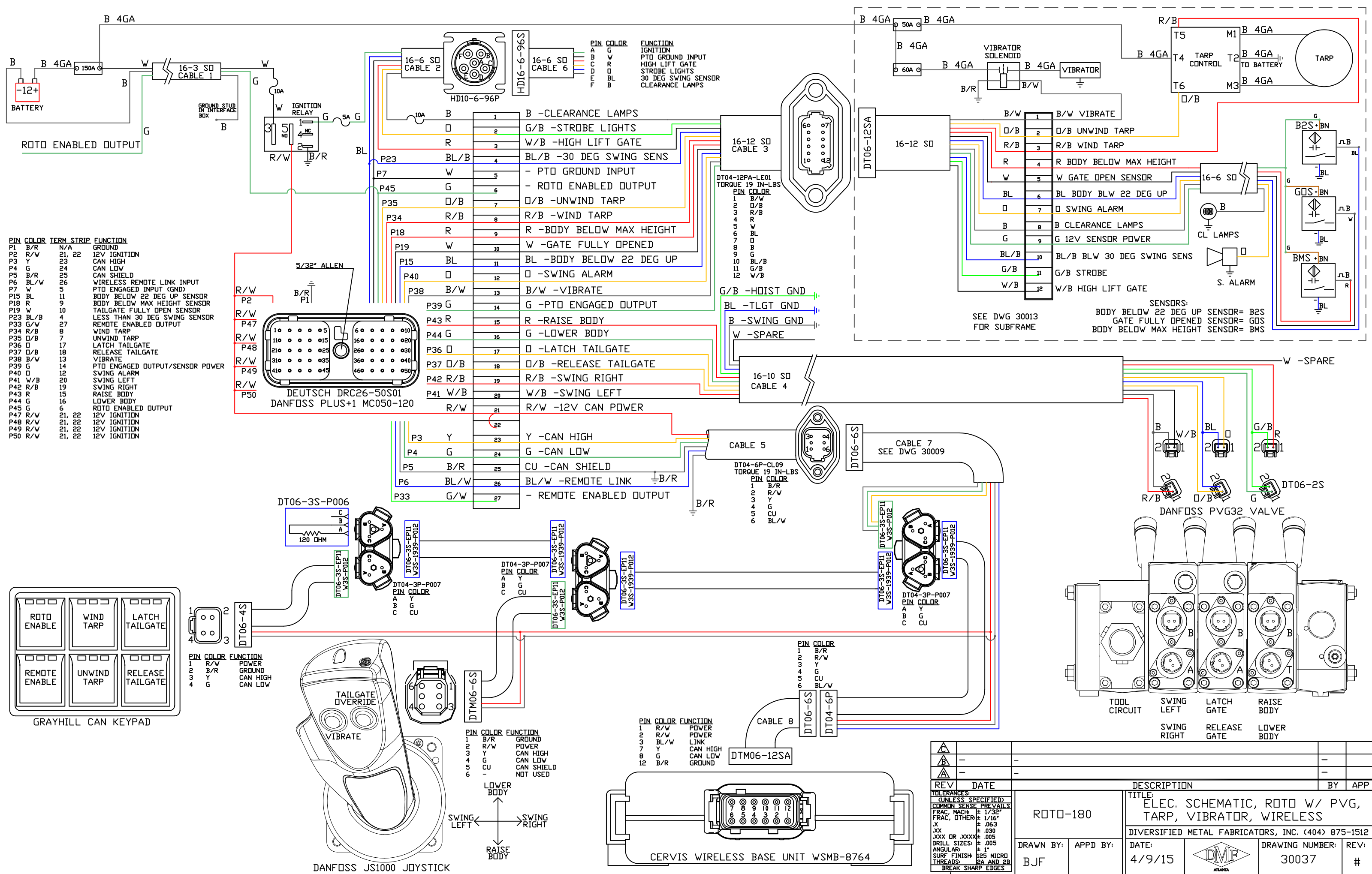


ITEM	PART NO.	QTY	DESCRIPTION
1	REF. 18640	11	INSIDE TERMINAL BLOCK - AB 1492-F1
2	REF. 18640	1	MOUNTING CHANNEL
3	REF. 18640	10	SUBFRAME TERMINAL BLOCK - A-B 1492-F1
4	REF. 20115	1	LED - 3LF4LR / 14V / BEZ
5	REF. 18630	1	SWITCH -HOIST SPDT (6FC58-78)
6	REF. 18630	1	SWITCH -TAILGATE SPDT (6FC54-78)
7	REF. 18630	1	SWITCH -SWING DPDT (6GM5S-78)
8	REF. 18630	1	SWITCH -OVERRIDE SPDT (6GL5E-78)
9	REF. 18650	2	O' RIDE LIMIT (AB 802T W-1) (AB 802T-A)
10		1	SWING ALARM - TARGET TECH 41-720 (POLLAK)
11	REF. 20115	1	SWITCH -ROTO ENABLE: PUSH PULL (PP 6020)
12	REF. 18640	1	16-6 SO CABLE x 11'
13	REF. 18640	1	16-10 SO CABLE x 14'
14	REF. 18630	1	16-10 SO CABLE x 18' - 6"
15		6	DIN CONN'R CANFIELD 5300-1090000 3093
16	REF. 18630	1	SWITCHPLATE LEGEND
17		1	ROTO ENABLE LEGEND: COVER 11
18	REF. 18630	1	SWITCHBOX IN CAB
19	18630	1	SWITCHBOX ASSY.
20	18640	1	MISC. ROTO SUBFRAME ASSY.

6/30/10	W WAS Y & B WAS G FOR PARKER MANIFOLDS	BJF	
4/23/10	ADDED CLARIFICATION ON IN-CAB WIRING	BJF	
7/30/09	ADDED SECOND LIMIT SWITCH	BJF	
10/23/97	MADE SWITCHES COMMON	KLC	TSH
5/19/97	ADDED P/N's 18630 & 18640	KLC	TSH
7/08/96	ITEM #8 WAS SPDT (6FA64-73)	WET	
7/01/96	ADDED LEGEND PLATES	TSH	
REV	DATE	DESCRIPTION	BY APP

TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS
FRAC, MACH: ± 1/32"
FRAC, OTHER: ± 1/16"
.X ± .063
.XX ± .030
.XXX OR .XXXX ± .005
DRILL SIZES: ± .005
ANGULAR: ± 1°
SURF FINISH: 125 MICRO
THREADS: 2A AND 2B
BREAK SHARP EDGES

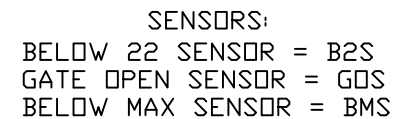
DRAWN BY: TSH		APPD BY:		TITLE: STANDARD ROTO, ELECTRIC SCHEM.	
DATE: 1/12/94		DRAWING NUMBER: 18900		REV: G	






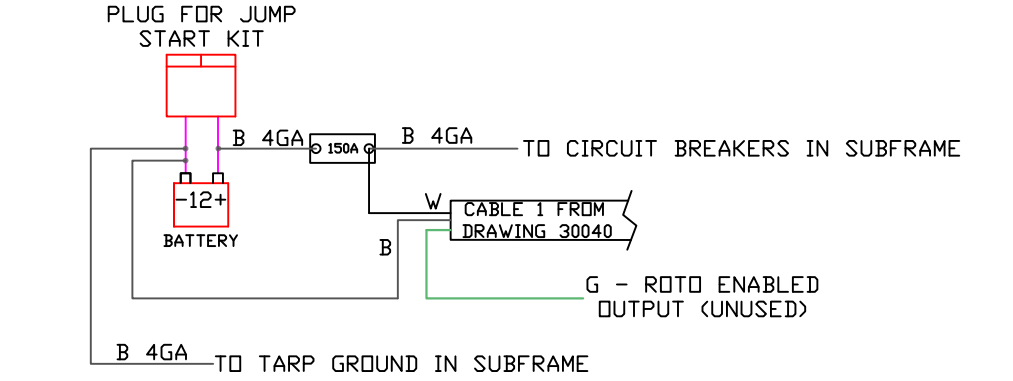
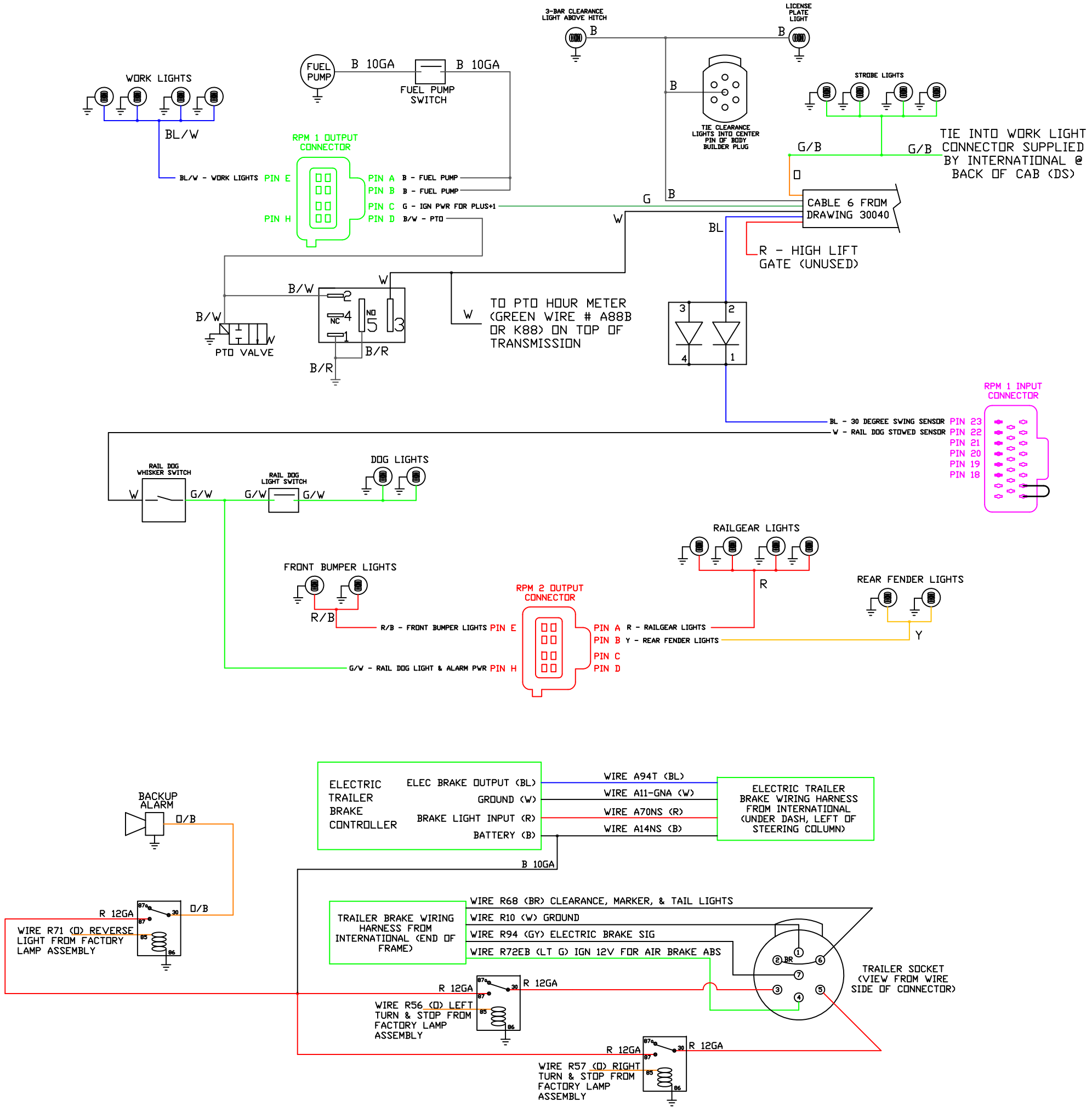
PIN	COLOR	TERM	STRIP	FUNCTION
P1	B/R	N/A		GROUND
P2	R/W	21, 22		12V IGNITION
P3	Y	23		CAN HIGH
P4	G	24		CAN LOW
P5	B/R	25		CAN SHIELD
P6	BL/W	26		WIRELESS REMOTE LINK INPUT
P7	W	5		PTO ENGAGED INPUT (GND)
P15	BL	11		BODY BELOW 22 DEG UP SENSOR
P18	R	9		BODY BELOW MAX HEIGHT SENSOR
P19	W	10		TAILGATE FULLY OPEN SENSOR
P23	BL/B	4		LESS THAN 30 DEG SWING SENSOR
P33	G/W	27		REMOTE ENABLED OUTPUT
P34	R/B	8		WIND TARP
P35	D/B	7		UNWIND TARP
P36	D	17		LATCH TAILGATE
P37	D/B	18		RELEASE TAILGATE
P38	B/W	13		VIBRATE
P39	G	14		PTO ENGAGED OUTPUT/SENSOR POWER
P40	D	12		SWING ALARM
P41	W/B	20		SWING LEFT
P42	R/B	19		SWING RIGHT
P43	R	15		RAISE BODY
P44	G	16		LOWER BODY
P45	G	6		ROTO ENABLED OUTPUT
P47	R/W	21, 22		12V IGNITION
P48	R/W	21, 22		12V IGNITION
P49	R/W	21, 22		12V IGNITION
P50	R/W	21, 22		12V IGNITION

PIN	COLOR	FUNCTION
1	B	-CLEARANCE LAMPS
2	G/B	-STROBE LIGHTS
3	W/B	-HIGH LIFT GATE
4	BL/B	-30 DEG SWING SENS
5	W	- PTO GROUND INPUT
6	G	- ROTO ENABLED OUTPUT
7	D/B	-UNWIND TARP
8	R/B	-WIND TARP
9	R	-BODY BELOW MAX HEIGHT
10	W	-GATE FULLY OPENED
11	BL	-BODY BELOW 22 DEG UP
12	D	-SWING ALARM
13	B/W	-VIBRATE
14	G	-PTO ENGAGED OUTPUT
15	R	-RAISE BODY
16	G	-LOWER BODY
17	D	-LATCH TAILGATE
18	D/B	-RELEASE TAILGATE
19	R/B	-SWING RIGHT
20	W/B	-SWING LEFT
21	R/W	-12V CAN POWER
22		
23	Y	-CAN HIGH
24	G	-CAN LOW
25	B/R	CU -CAN SHIELD
26	BL/W	-REMOTE LINK
27	G/W	- REMOTE ENABLED OUTPUT

REV	DATE	DESCRIPTION	BY	APP
1	4/9/15	ELEC. SCHEMATIC, ROTO W/ PVG, TARP, VIBRATOR, WIRELESS	BJF	
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS				
FRAC. MACH: ± 1/32"				
FRAC. OTHER: ± 1/16"				
X: ± .063				
XX: ± .030				
XXX OR .XXXX: ± .005				
DRILL SIZES: ± .005				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
BREAK SHARP EDGES				

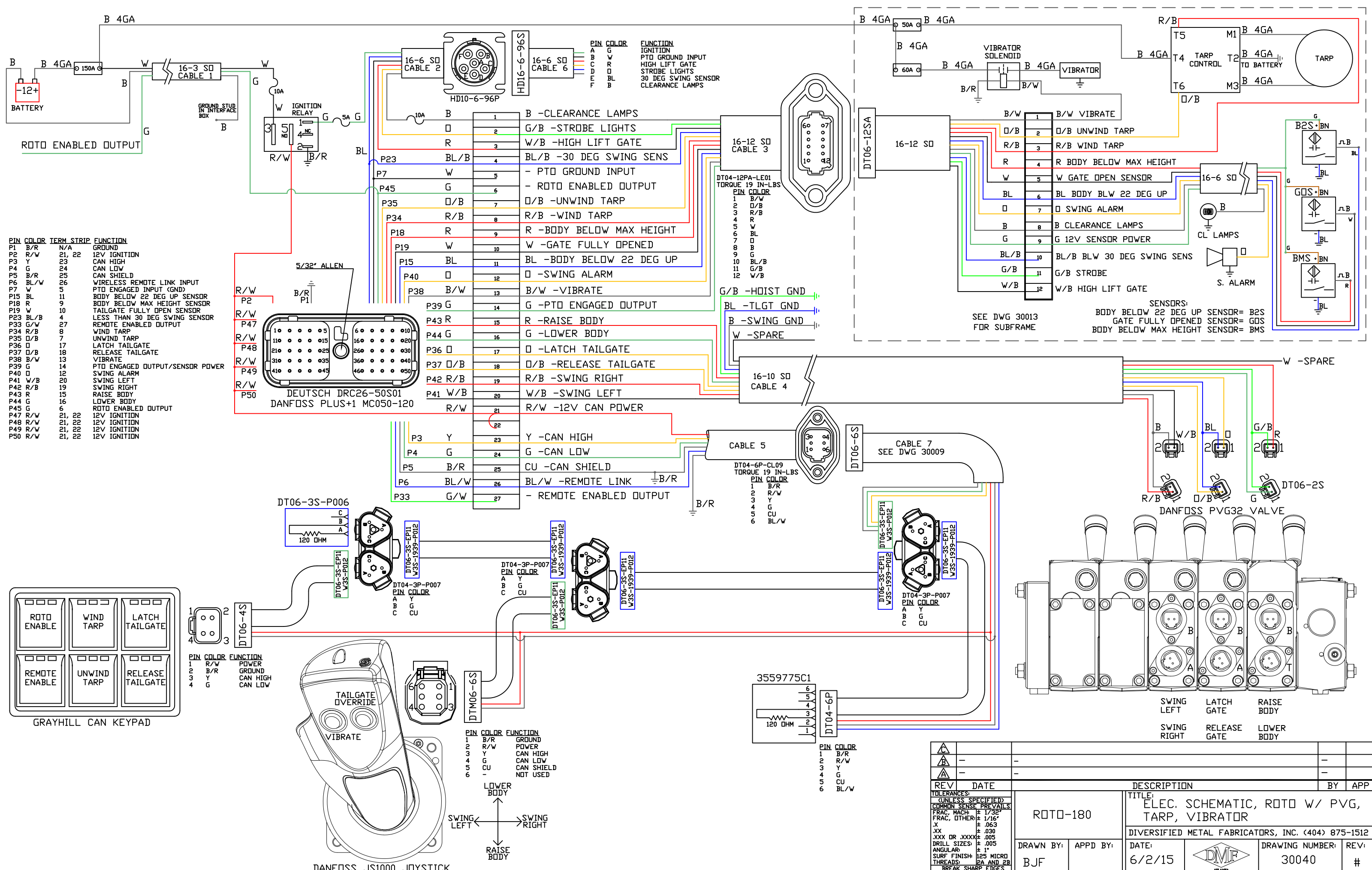


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	-	-	-	
	-	-	-	
REV	DATE	DESCRIPTION	BY	APP



SEE DRAWING 30040 FOR
INTERFACE BOX AND SUBFRAME
ELECTRICAL DETAILS

<div>△</div>					
<div>△</div>	-	-		-	
<div>△</div>	-	-		-	
REV	DATE	DESCRIPTION			BY APP
TOLERANCES:		ROTO-180		TITLE:	
(UNLESS SPECIFIED)				2015 N/S SPEC ROTO-180	
COMMON SENSE PREVAILS				WITH DIAMOND LOGIC & PLUS+1	
FRAC. MACH. ± 1/32"				DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512	
FRAC. OTHER: ± 1/16"				DRAWN BY: APPD BY:	
X ± .063				DATE:	
.XX ± .030				<div><div>DMF</div><div>ATLANTA</div></div>	
.XXX OR .XXXX ± .005				DRAWING NUMBER:	
DRILL SIZES: ± .005				20828	
ANGULAR: ± 1°				REV:	
SURF FINISH: 125 MICRO		BJF		#	
THREADS: 1/2 AND 28		10/30/15			
BREAK SHARP EDGES					



PIN	COLOR	TERM	STRIP	FUNCTION
P1	B/R	N/A		GROUND
P2	R/W	21, 22		12V IGNITION
P3	Y	23		CAN HIGH
P4	G	24		CAN LOW
P5	B/R	25		CAN SHIELD
P6	BL/W	26		WIRELESS REMOTE LINK INPUT
P7	W	5		PTO ENGAGED INPUT (GND)
P15	BL	11		BODY BELOW 22 DEG UP SENSOR
P18	R	9		BODY BELOW MAX HEIGHT SENSOR
P19	W	10		TAILGATE FULLY OPEN SENSOR
P23	BL/B	4		LESS THAN 30 DEG SWING SENSOR
P33	G/W	27		REMOTE ENABLED OUTPUT
P34	R/B	8		WIND TARP
P35	O/B	7		UNWIND TARP
P36	O	17		LATCH TAILGATE
P37	O/B	18		RELEASE TAILGATE
P38	B/W	13		VIBRATE
P39	G	14		PTO ENGAGED OUTPUT/SENSOR POWER
P40	O	12		SWING ALARM
P41	W/B	20		SWING LEFT
P42	R/B	19		SWING RIGHT
P43	R	15		RAISE BODY
P44	G	16		LOWER BODY
P45	G	6		ROTO ENABLED OUTPUT
P47	R/W	21, 22		12V IGNITION
P48	R/W	21, 22		12V IGNITION
P49	R/W	21, 22		12V IGNITION
P50	R/W	21, 22		12V IGNITION

PIN	COLOR	FUNCTION
A	G	IGNITION
B	W	PTO GROUND INPUT
C	R	HIGH LIFT GATE
D	O	STROBE LIGHTS
E	BL	30 DEG SWING SENSOR
F	B	CLEARANCE LAMPS

PIN	COLOR	FUNCTION
1	B	-CLEARANCE LAMPS
2	G/B	-STROBE LIGHTS
3	W/B	-HIGH LIFT GATE
4	BL/B	-30 DEG SWING SENS
5	W	- PTO GROUND INPUT
6	G	- ROTO ENABLED OUTPUT
7	O/B	-UNWIND TARP
8	R/B	-WIND TARP
9	R	-BODY BELOW MAX HEIGHT
10	W	-GATE FULLY OPENED
11	BL	-BODY BELOW 22 DEG UP
12	O	-SWING ALARM
13	B/W	-VIBRATE
14	G	-PTO ENGAGED OUTPUT
15	R	-RAISE BODY
16	G	-LOWER BODY
17	O	-LATCH TAILGATE
18	O/B	-RELEASE TAILGATE
19	R/B	-SWING RIGHT
20	W/B	-SWING LEFT
21	R/W	-12V CAN POWER
22		
23	Y	-CAN HIGH
24	G	-CAN LOW
25	B/R	CU -CAN SHIELD
26	BL/W	-REMOTE LINK
27	G/W	- REMOTE ENABLED OUTPUT

REV	DATE	DESCRIPTION	BY	APP
A				
B				
C				
TOLERANCES: (UNLESS SPECIFIED) COMMON SENSE PREVAILS				
FRAC. MACH: ± 1/32"				
FRAC. OTHER: ± 1/16"				
.XX ± .063				
.XXX OR .XXXX ± .030				
DRILL SIZES: ± .005				
ANGULAR: ± 1°				
SURF FINISH: 125 MICRO				
THREADS: 2A AND 2B				
BREAK SHARP EDGES				
ROTO-180		TITLE: ELEC. SCHEMATIC, ROTO W/ PVG, TARP, VIBRATOR		
DRAWN BY: B.J.F.		APPD BY:		DATE: 6/2/15
		DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512		DRAWING NUMBER: 30040
		REV: #		

SENSORS:
BELOW 22 SENSOR = B2S
GATE OPEN SENSOR = GOS
BELOW MAX SENSOR = BMS

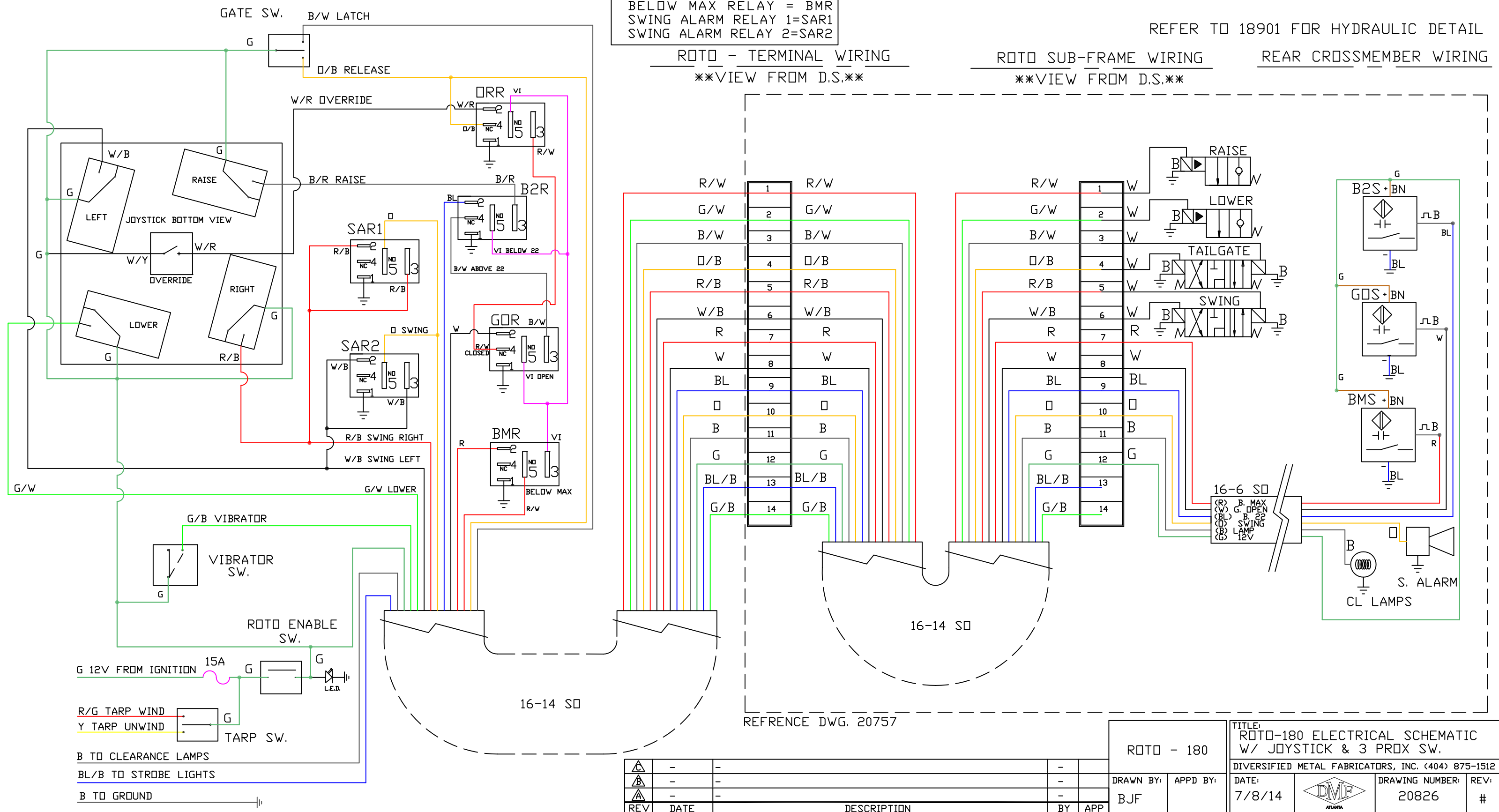
RELAYS:
OVERRIDE RELAY = ORR
BELOW 22 RELAY = B2R
GATE OPEN RELAY = GOR
BELOW MAX RELAY = BMR
SWING ALARM RELAY 1=SAR1
SWING ALARM RELAY 2=SAR2

REFER TO 18901 FOR HYDRAULIC DETAIL

ROTO - TERMINAL WIRING
VIEW FROM D.S.

ROTO SUB-FRAME WIRING
VIEW FROM D.S.

REAR CROSSMEMBER WIRING




REFERENCE DWG. 20757

ROTO - 180

TITLE: ROTO-180 ELECTRICAL SCHEMATIC W/ JOYSTICK & 3 PROX SW.			
DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
DRAWN BY: BJF	APPD BY:	DATE: 7/8/14	DRAWING NUMBER: 20826
REV:	DATE	DESCRIPTION	BY APP

R/G TARP WIND
Y TARP UNWIND
TARP SW.

B TO CLEARANCE LAMPS
BL/B TO STROBE LIGHTS
B TO GROUND

	TITLE: PROXIMITY SWITCH KIT FOR GATE/LIFT			
	DRAWING #:	20754	BY: JDI	DATE: 5/7/12 REV: #
ROTO-180	DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
REV:	DATE:	DESCRIPTION:		BY:
-	-	-		-
-	-	-		-

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.

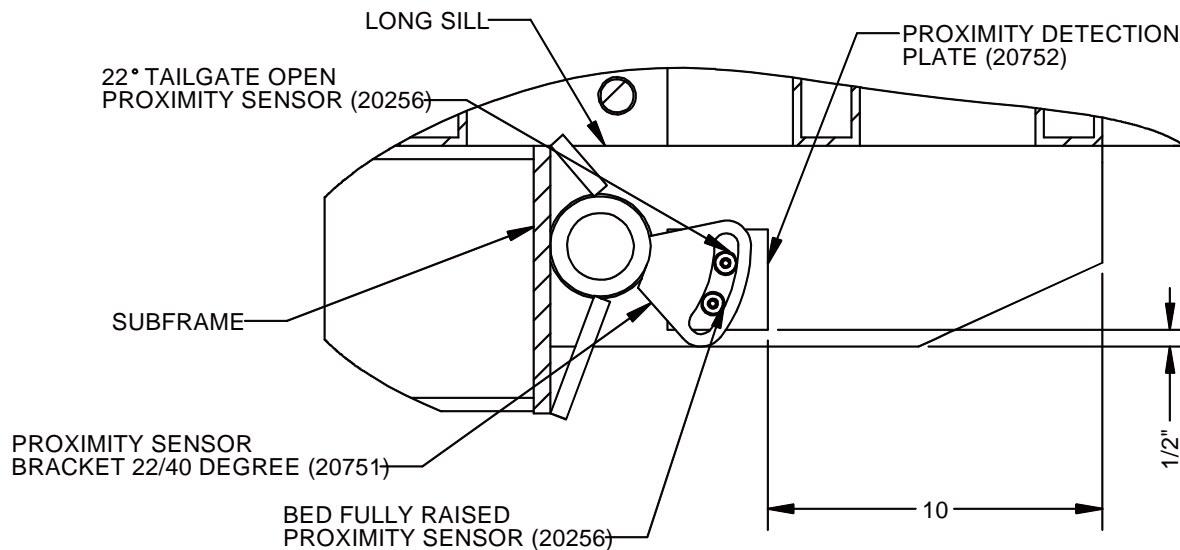


Figure 1 – Proximity Detection Plate Location

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.

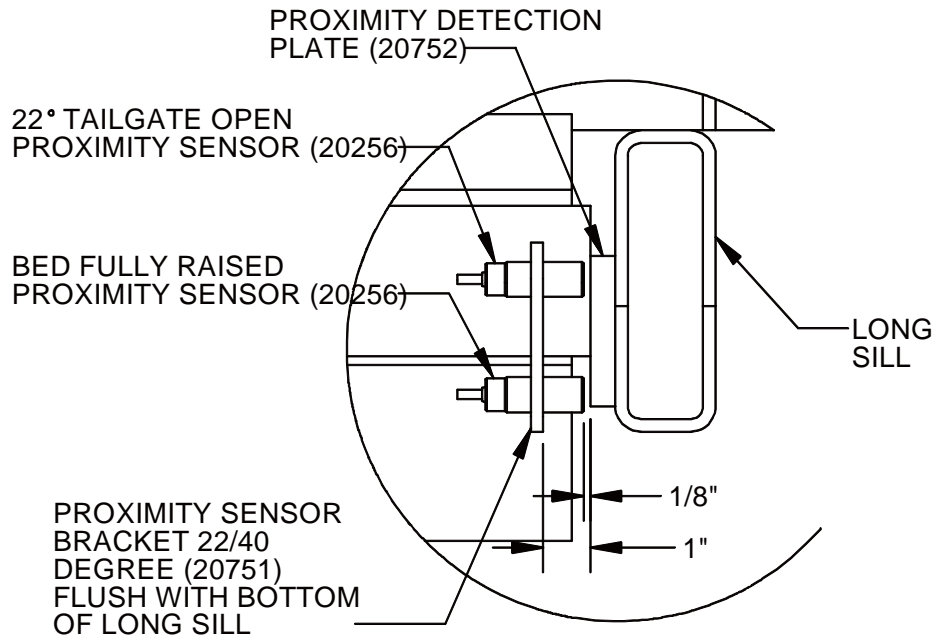


Figure 2 – Bracket Location for 22/40 Degree Proximity Switches

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.

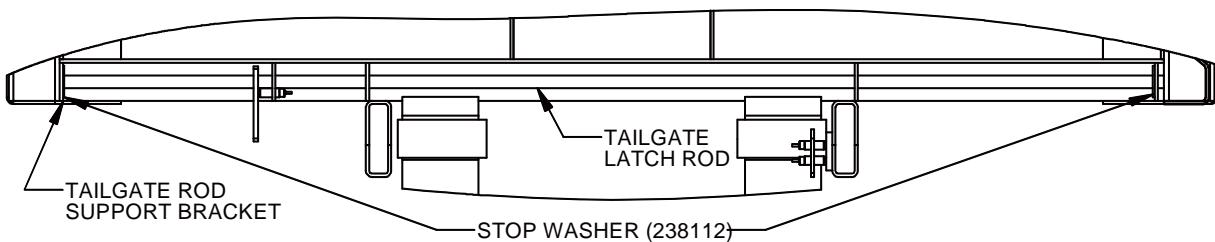


Figure 3 – Stop Washer Location

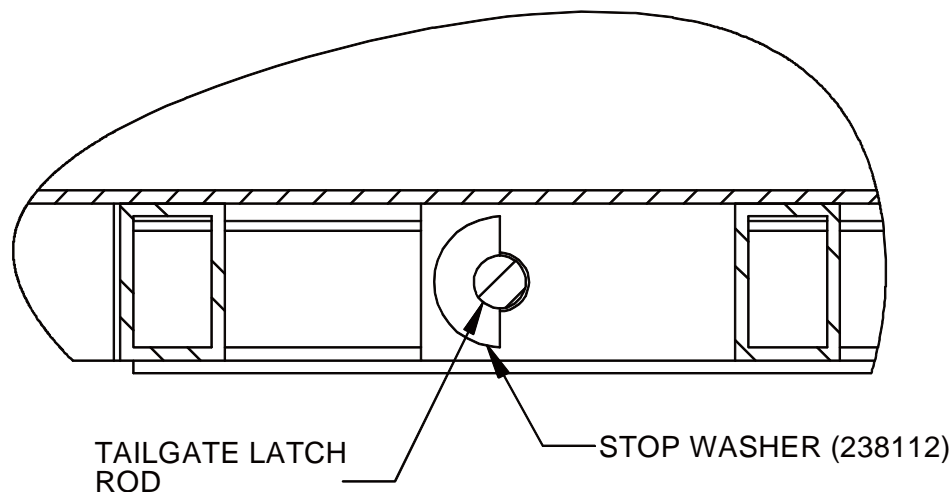


Figure 4 – Stop Washer Orientation

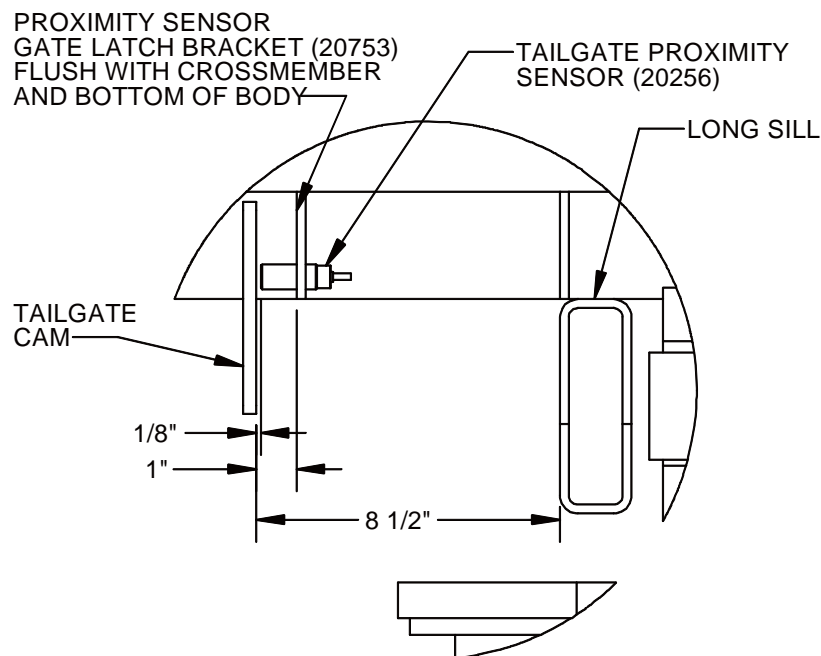



Figure 5 – Bracket Location for Gate Latch Position Detection

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.
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.

	TITLE: LIMIT SWITCH KIT FOR GATE/LIFT			
	DRAWING #:	20769	BY: JDI	DATE: 5/7/12
ROTO-180	DIVERSIFIED METAL FABRICATORS, INC. (404) 875-1512			
REV:	DATE:	DESCRIPTION:		BY:
-	-	-		-
-	-	-		-

Limit Switch Kit for Roto 180

Kit Contents

PART #				DESCRIPTION	QTY.
20769				LIMIT SWITCH KIT FOR GATE/LIFT	EA.
	18279			ROTO TAILGATE TRIP CAM	1
	18650			ROTO LIMIT SWITCH ASSEMBLY W/ ARM	1
		18651		ROTO LIMIT SWITCH (A-B 802T-A)	1
		18652		ROTO LIMIT SWITCH ARM (A-B 802T-W1)	1
	18651			ROTO LIMIT SWITCH (A-B 802T-A)	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.

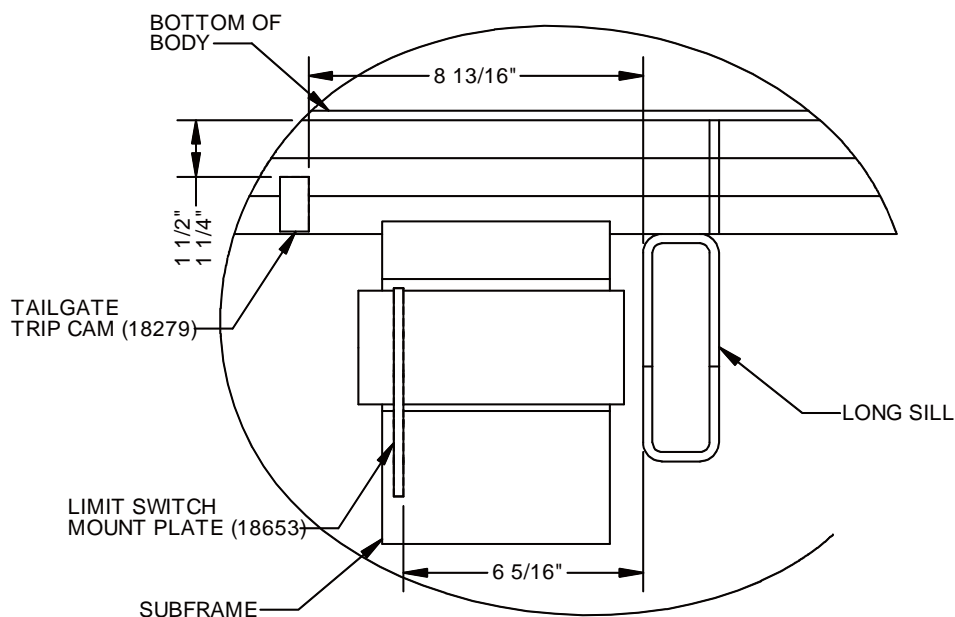


Figure 1 – 12 and 14 Foot Limit Switch Mount Plate/Cam Location

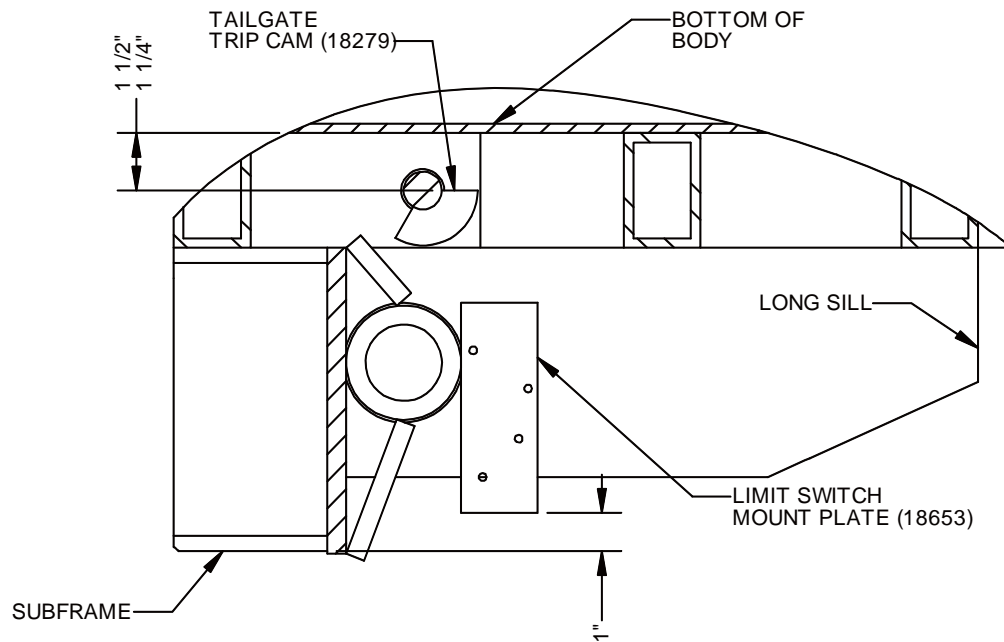


Figure 2 – 12 Foot Side View Limit Switch Mount Plate/Cam Location

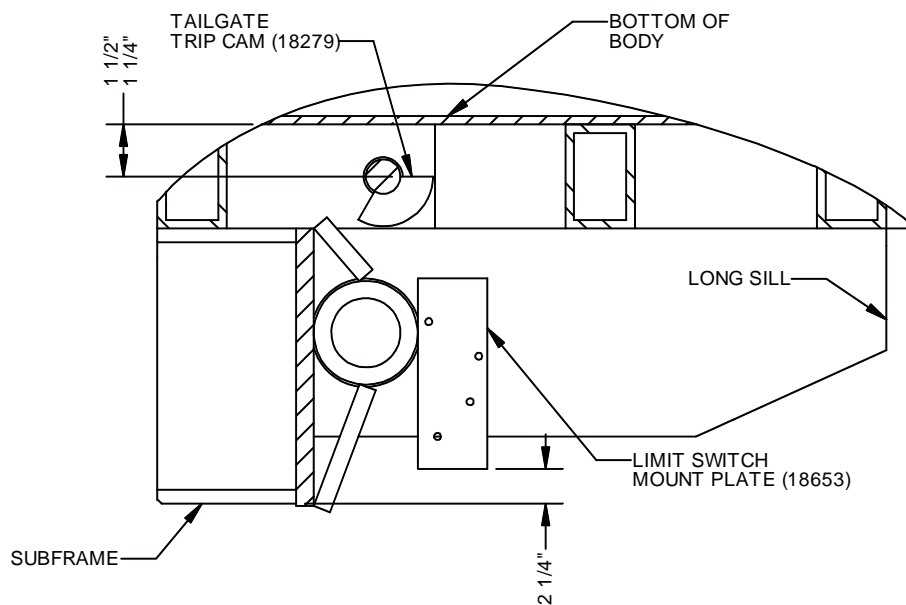


Figure 3 – 14 Foot Side View Limit Switch Mount Plate/Cam Location

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.

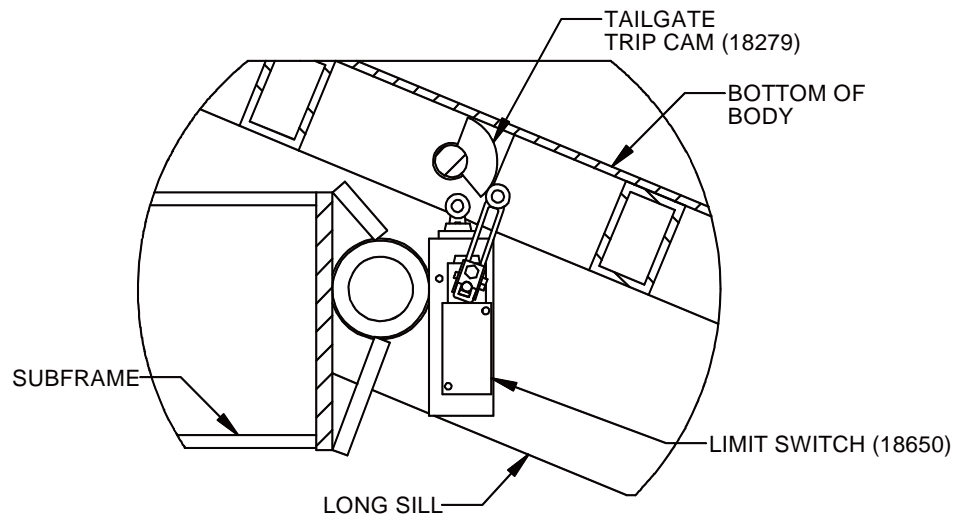


Figure 4 – Setting Limit Switch

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.

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.

