



TL-3
OWNER/OPERATOR
MANUAL

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Note: There are multiple drawings included for some of the components listed below. You will need to identify which drawing matches the components on your loader. Please call our Parts Department at 800-930-5623, Ext. 229, should you need assistance. Please have your loader Serial Number available when calling our Parts Department. See “How to Find the Serial Number” in this section of the manual.



How to Find the Serial Number

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Petersen Industries, Inc.
TL Owner's Manual



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OWNER/OPERATOR TRAINING VIDEOS

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Part 1: A Word to Owner, Operator, and Service Personnel About Safety

WARNING

FAILURE TO READ THIS BOOKLET IS A MISUSE OF THE EQUIPMENT. ANYONE WHO WILL OPERATE, SERVICE OR WORK AROUND THIS LOADER MUST FIRST READ THIS BOOKLET. DEATH OR SERIOUS INJURY MAY RESULT FROM IMPROPER USE OR MAINTENANCE OF THIS LOADER.

Introduction

Anyone who will operate, service or work around the loader should first read this manual. It is important that all workers understand the safety, operational, service, and repair requirements of the loader. Death or serious injury can result from improper use or maintenance of the loader.

As an owner or employer, it is your responsibility to know the specific requirements, governmental regulations, precautions, and work hazards that exist. You should make these known to all personnel working with the equipment or in the area. It is your responsibility to instruct the operator in the safe operation of the equipment and to provide the operator with properly maintained equipment.

It is the operator's responsibility to operate the loader with skill, good judgment and caution. Following recognized safety procedures helps to avoid accidents.

Do not allow untrained personnel, even on a temporary basis, to operate this equipment. Operators must be trained by an experienced trash loader operator who is familiar with all aspects of operation, safety, and maintenance of this equipment. Keep children, visitors and untrained personnel away from the equipment.

Modifications to any part of this loader can create a safety hazard and therefore shall not be made without the manufacturer's written approval. Use only factory approved parts to repair or maintain this equipment. If this equipment is rebuilt or remounted, mounting procedures and retesting is required in accordance with factory instructions.

WARNING

DO NOT OPERATE THE LOADER UNDER ANY CIRCUMSTANCE IF THERE IS REASON TO BELIEVE THE UNIT IS BROKEN OR MALFUNCTIONING. DO NOT ATTEMPT TO PLACE THE BOOM OF A BROKEN OR MALFUNCTIONING UNIT IN THE BODY OF THE LOADER UNIT WITHOUT ASSISTANCE FROM ANOTHER CRANE OR LIFTING DEVICE. ANY ATTEMPT TO USE OR MOVE THE BROKEN OR MALFUNCTIONING UNIT COULD RESULT IN SERIOUS BODILY INJURY OR DEATH.

The lighting and reflective devices on the unit is in compliance with FMVSS 108, however it is the responsibility of the end user to verify that the lighting specifically complies with any additional local requirements for the area that the truck is to be operated within.

The mud flaps installed on the unit are positioned based on the method of locating the mud flap a distance behind the rear tire in order for the bottom of the mud flap to be mounted low enough to be below the line formed from a 22.5 degree tangent angle out the rear tire. It is however the responsibility of the end user to verify that the mud flaps comply with requirements for the area that the truck is to be operated within.

Part 2: Daily Inspections - Before Leaving the Storage Facility

One of the most important factors in the prevention of accidents is a positive attitude towards safety. The habit of anticipating possible problems normally prevents many accidents from occurring.

Each morning, prior to leaving the storage facility or lot, the following inspections should be made:

1. Check oil level and battery.
2. Check the brakes and backup alarm. The backup alarm must always be sounding prior to backing up. If your unit is equipped with any additional alarms or warning lights, check these items also for proper operation.
3. Check rearview mirrors and adjust if necessary.
4. Check tires for proper inflation, cuts, and loose wheel nuts.
5. Check head and taillights, strobes, and flashers for proper operation.
6. Check the hydraulic system for any unusual conditions such as pools of hydraulic fluid or lubricating oil under the chassis, any outrigger which may have crept down, or any signs of damage or improper maintenance. The hydraulic hoses should be free from cuts and abrasions and there should be no evidence of binding or leakage.
7. Ensure that outriggers are fully retracted and the bucket is open and resting on the floor of the body. If the body contains debris, the bucket should be closed and at rest on the load. Ensure that most of the bucket and boom tip are below top of body.

Consult the truck manufacturer's manual for vehicle checks recommended by them.

Any insufficiencies found during this inspection must be corrected prior to use of the equipment.



Part 3: Safety Devices

We will now discuss some of the components designed into the loader system to ensure that safe loader control is maintained. There are hydraulic system flow devices designed into the loader system to control the flow of hydraulic fluid. Loader control and speed are essential to the safe operation of, and longevity of the loader.

To maintain safe loader control you must ensure that proper engine speed is observed, all oil flow restrictors are in place and have not been modified, and all valves are operating properly. You must not remove, or tamper with the manufacturer's recommended settings of oil flow devices.

Excessive operating speed causes erratic operation of the loader. Excessive operating speed decreases operator control and increases the stresses on the loader's supporting structures, which could cause unexpected component failure. The result of unexpected component failure could be damage to the equipment and/or serious bodily injury or death.



FLOW RESTRICTORS

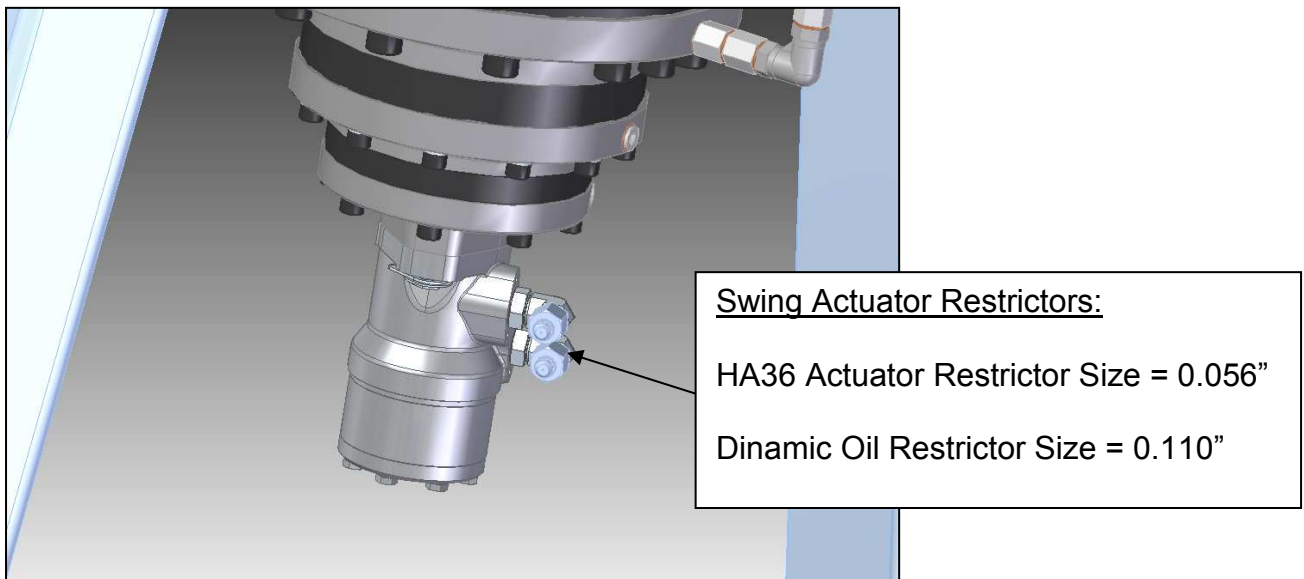
Swing Actuator Restrictors: - The swing actuator flow restrictors control the swing speed of the loader boom. These restrictors are located on the swing drive motor, one on each port. These restrictors are factory preset and must not be removed or drilled out.

Hydraulic Actuator, Restrictor Size = 0.056”

Gearbox Rotator, Restrictor Size = 0.110”

Some signs of restrictor removal or modification are:

1. Excessive boom swing speed. Full travel time should be 20 seconds, ± 3 seconds, from head stop to head stop.
2. Broken or bent head (swing) stops. Catastrophic actuator damage will result if head stops are damaged or missing.
3. Excessive swing speed causes excessive wear on the main boom/tip boom connecting bolt.



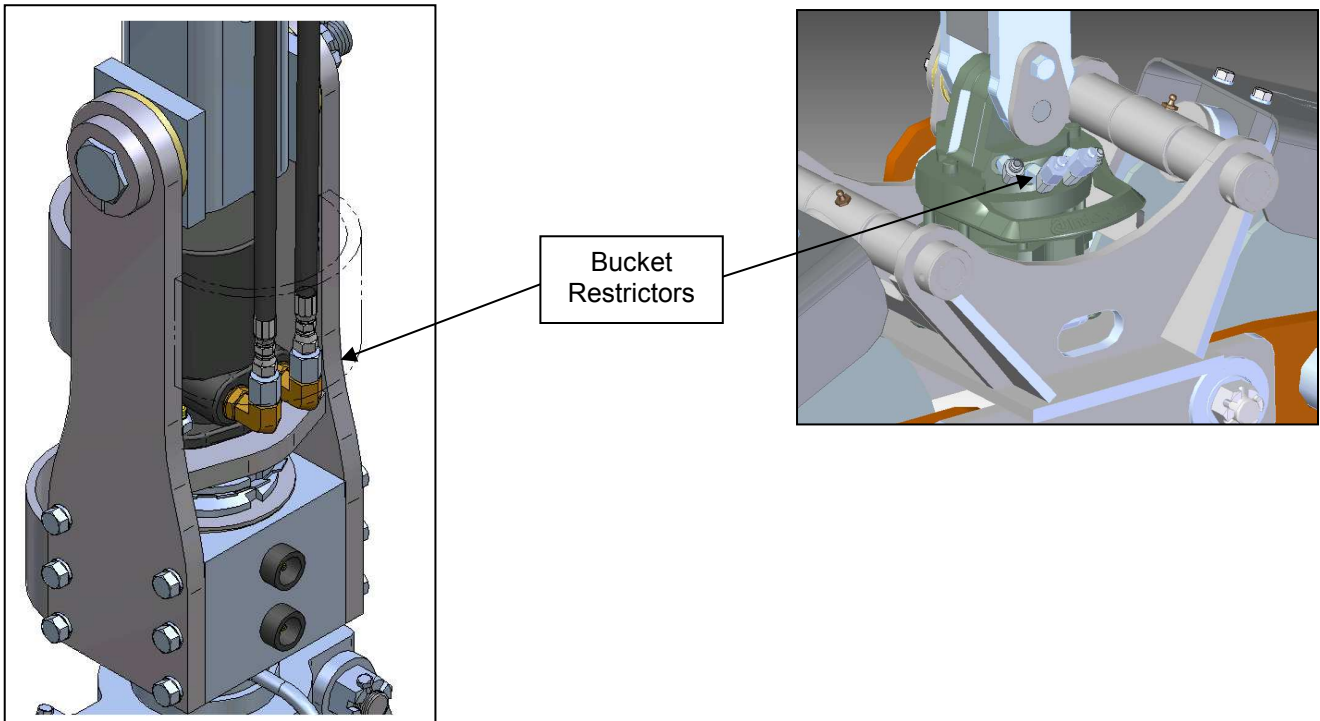
Bucket Motor Restrictors: The bucket motor restrictors control the speed of the bucket rotation. These restrictors are located on the motor ports. These restrictors are factory preset and must not be removed or drilled out.

Single Cylinder Restrictor Size: 0.046”

Big Bite Bucket Restrictor Size: 0.046”

Some signs of restrictor removal or modification are:

1. Excessive bucket rotation speed. Bucket rotation must not exceed 15 RPM.
2. Broken bucket rotator motor mounting bolts.
3. Broken bucket motor shaft and/or housing.



LOAD CONTROL VALVES

The load control valves are either a part of or plumbed directly onto load holding cylinders. These valves are found on the main boom lift cylinder, tip cylinder, tip extension, and the outrigger cylinders.


Main Boom Lift, Tip, and Tip Extension Cylinders:

Counter-balance Valves: - The counter-balance valve is a cartridge type valve, mounted directly into a housing that is welded to the lift, tip, and tip extension cylinders. These valves hold the load until hydraulic pressure is applied to it causing the valve to open. This ensures the load is held in case of hose rupture, or other hydraulic system failure.

Notice to Operators: If load control valve(s) malfunction, do not attempt to adjust valves, and/or continue to use the loader. Return to the maintenance facility for repair.

Counter-balance valve adjustment is not normally needed after initial installation. However, if adjustment is needed, first release load from valve and rest bucket on ground or floor of body. Turn valve screw far enough out so that valve will hold load when control valve is opened and truck PTO is off. The PTO should be off when adjusting the screw, back on to lift the boom, and off again to test load holding capability of the valve.

If the cartridge valve is replaced, you must first release the load from the valve. This means the boom must be at rest in the floor of the body or on the ground, prior to removing the cartridge valve.

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|  WARNING |
| FAILURE TO FOLLOW THE PRECEDING INSTRUCTIONS REGARDING COUNTER-BALANCE VALVE ADJUSTMENT AND/OR REPLACEMENT, COULD RESULT IN THE BOOM FALLING ONCE THE CARTRIDGE VALVE IS REMOVED, WHICH COULD RESULT IN DAMAGE TO THE EQUIPMENT OR SERIOUS PERSONAL INJURY OR DEATH. |

If the operator experiences hydraulic failure while on route, first try to get the hydraulic system working again. If you cannot get the hydraulic system working, we recommend that you call for the assistance of an auxiliary service vehicle that can provide a power source for the loader hydraulic system. The connections from the auxiliary power source should be made at the appropriate loader valve bank. Hydraulic pressure from the power source should go to the “in” at the loader valve bank, and return to the power source should come from the “out” at the loader valve bank. Using the auxiliary power source to run the hydraulics, replace all loader components to the travel position, and then return the loader to the shop for repair.

Outrigger Cylinders:

Pilot Operated Check Valve: - The outrigger cylinders use pilot operated check valves which are part of the cylinders. In the event of hose failure, these valves hold the load until hydraulic pressure is applied, causing the valve to open.

These valves are factory preset and are not serviceable.

If you need to remove this valve, make sure the load is released from the cylinder prior to removing the valve.

LOCK COLLAR

The lock collar is an integral part of the trash loader that holds the head and spindle assembly in the pedestal. The lock collar must be in place and the lock collar bolts properly torqued prior to use of the trash loader. The lock collar must be tight against the bottom of the spindle bearing housing with a maximum gap of one-quarter inch (1/4").

Under normal operating conditions, there is very little load applied to the lock collar. However, the following improper operating practices could put excess stress on the lock collar and therefore must be avoided.

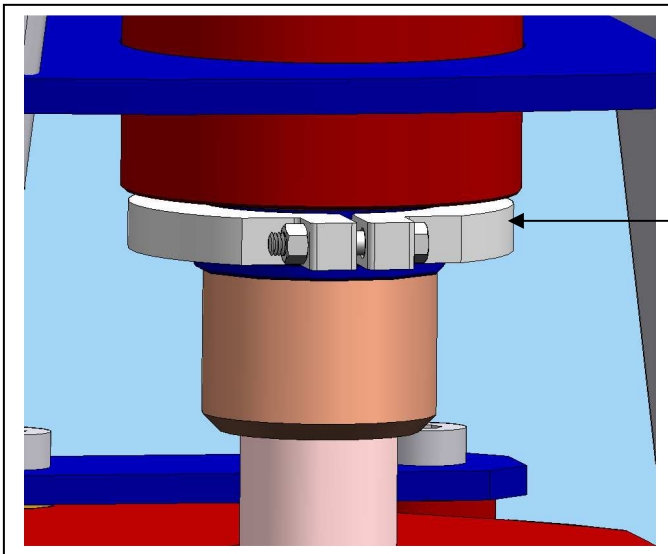
- Excessively packing the load with the boom. Evidence of this may be the bulkhead of the body may be bowed outward.
- Forcing the dump body down with the boom. Evidence of this may be the bulkhead of the body is dented down.
- Improper positioning of the boom prior to raising the dump body. Evidence of this may be the underside of the main boom will be dented and scarred.

Improper lock collar installation and/or the improper operating practices listed above, could result in the head assembly being pulled up out of the pedestal assembly. The



separation of these two loader components will result in equipment damage, and could result in serious personal injury or death.

Maintenance and shop personnel must continuously check for the above listed signs of abuse, and must report their observations to the person responsible for the operation practices of the trash loader operators. Corrective measures must be taken to stop abusive loading practices.



Lock Collar

(See Item No. 9 on the Head and Pedestal Assembly drawing found in the “Dia. & Drawings” Section of this manual).

BACK-UP ALARM

All truck mounted loaders have back-up alarms that must sound any time the gear shift selector is in reverse “R”. The back-up alarm is on the daily checklist of items to be checked prior to leaving the storage facility. If the back-up alarm is not working, it must be repaired prior to putting the vehicle in service.

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|  WARNING |
| ALARM MUST SOUND WHEN BACKING UP. DO NOT BACK UP WITHOUT HAVING SOMEONE CLEAR BEHIND THIS VEHICLE. |

It is the operator’s responsibility to make sure that the area behind the loader is clear before backing up.

“BOOM-UP” ALARM

A warning system that alerts the loader operator when the boom is not stowed properly for travel. A sensor is installed on the boom, and an audible alarm and red light in the

truck cab. When the operator enters the truck cab after using the loader, the warning light and audible alarm will alert him if the boom travel height exceeds 13 feet.



The boom up alarm may have a round dial attached to the light that can be turned to adjust the volume of the audible alarm.

The boom up sensor will turn on a light once the sensor passes the head side plate.



Some trucks have a customizable red light and alarm already in the dash that can be used as a boom up alarm. If the truck is equipped with such a light and alarm, the boom up sensor will be wired into this light and alarm to function as a boom up alarm.

This system should be viewed as a tool to help operators measure the height of their boom, but more importantly, to warn the loader operators that their boom is above safe height for travel. It is not intended to replace an operator's good judgment on safe travel height of their boom.

Operators should always be aware that some routes may have streets, roads, alleys, etc., that do not comply with the legal height requirement of 13'6", and should conduct their operations accordingly.

The PI factory boom sensors are set to 13'-0" so if you have a low height object you need to travel under you will need to set the sensor to the desired boom height. It therefore, may be necessary for the boom up sensor to be adjusted to a lower setting than the factory setting.

To adjust the boom sensor:

1. Park the truck on a smooth and level paved surface.
2. Set the outriggers out and down to stabilize the truck (Do not lift the truck). Swing the boom over to the side of the truck with the boom fully extended. Lift the main boom to desired height (typically the highest point is at the tip boom stop).

3. Loosen the sensor and slide it up or down as necessary so that the in dash alarm starts to go off at this boom height.
4. Tighten the sensor and put a visible mark at the center of the bracket so that a visual inspection can confirm that the sensor position has not changed. Note: This sensor must be within 1/8" of the head side plate to function properly.



When adjusting or checking boom sensor, use a set gage or measure to desired height (measure to from the ground to the upper most point of the tip boom stop).



Once sensor is set to required setting, mark with paint marker.

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| <h1> WARNING</h1> <p>BEFORE MOVING TRUCK, BOOM MUST BE STOWED TO LOWEST POSSIBLE HEIGHT; MAX. BOOM HEIGHT NOT TO EXCEED 13'6".</p> |
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This boom-up warning system became a standard feature of our loader in April, 2002. If you have an older model Lightning Loader® that does not have this boom-up warning system, you can contact our Parts Department and order a retro-fit kit to install this system.

SAFETY SYMBOLS

Your loader has required safety decals (see following pages) that alert those operating, working around, or performing maintenance on the loader of certain safety hazards. The safety decals are used to show the consequence of human interaction with a hazard in terms of:

1. The degree of severity.
(minor injury, severe injury, death)

2. The probability of severity.
(WILL result in, COULD result in)

The following definitions for identifying hazard levels are provided with their respective signal words.

DANGER

DANGER Immediate hazards which WILL result in severe personal injury or death.

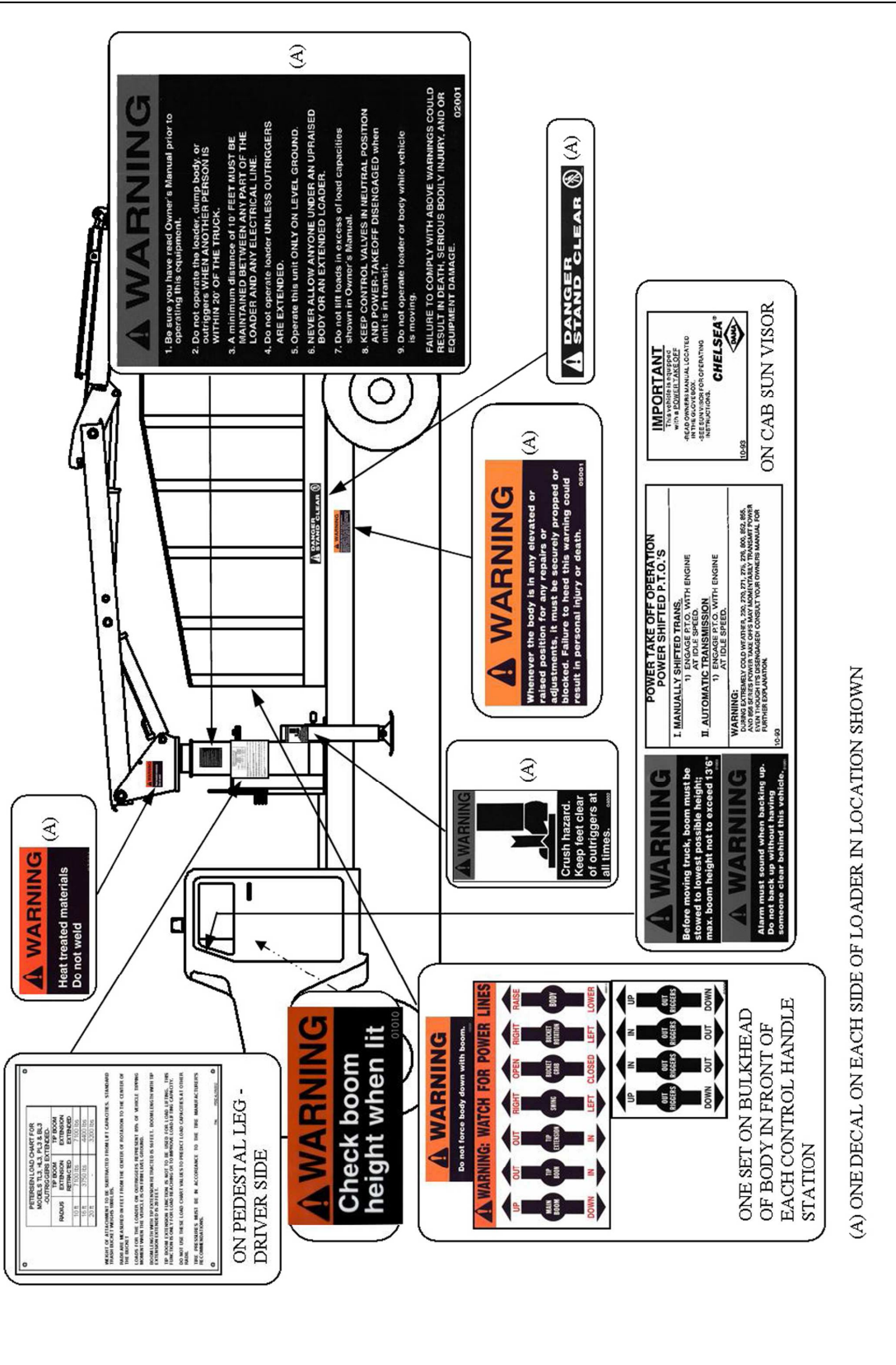
WARNING

WARNING Hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION

CAUTION Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

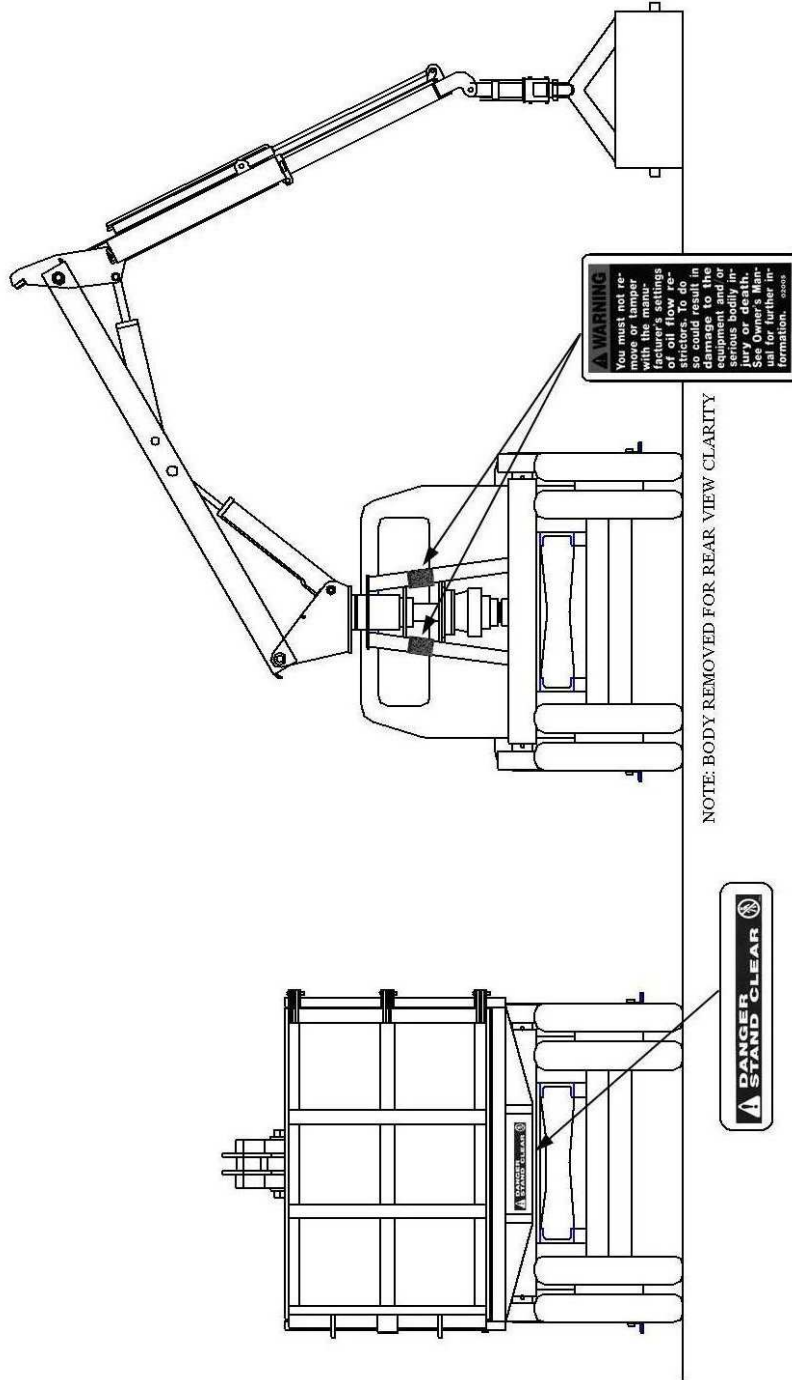
MODEL TL-3 TRASH LOADER - REQUIRED SAFETY DECALS



(A) ONE DECAL ON EACH SIDE OF LOADER IN LOCATION SHOWN



MODEL TL-3 TRASH LOADER - REQUIRED SAFETY DECALS



Part 4: Controls

THROTTLE CONTROL

Throttle controls are installed for loaders mounted on a truck chassis. For loaders mounted on trucks with mechanical engines, either a manual throttle or a Muncie Hydrothrottle is installed. For loaders mounted on trucks with electronically controlled engines, a manual switch is used to advance the engine speed. The engine speed is advanced to the preset RPM, thus increasing the volume of oil available for loader functions. The hydraulic system is designed for maximum oil flow of 18 gallons per minute. This engine speed is based on the ratios of the transmission and the pto gear and is noted below.

Exceeding preset RPM will cause excess oil flow, which may cause unsafe operating speeds, excessive oil temperature, undue wear and tear on the loader and chassis.

Some signs of throttle control mal-adjustment or tampering are:

1. Leaking hydraulic seals caused by excess heat.
2. Prematurely worn loader components caused by excess operating speed.
3. Sticks, bricks, rocks, etc. found in the truck cab may indicate the loader operator has purposely intended to exceed preset engine RPM by jamming the truck accelerator.

PTO OVER-SPEED CONTROL

The over-speed control is a device that disconnects the PTO or diverts the flow of oil back to tank rather than to the loader valves.

The purpose of this control device is to prevent excess oil flow to the hydraulic system, which could happen if the throttle control device is altered or over-ridden.

This over speed is set at 350 rpm higher than the preset rpm.

Power Take-Off Manual Transmission:

Manual Shift Control – The PTO is engaged when the knob on the dash or floor is pulled out and disengaged when the knob is pushed in. The truck gear shift lever must be in neutral and the clutch depressed whenever the knob is moved.

Air Shift Control – The PTO is engaged when the switch is moved to apply air to PTO, the “On” position. The PTO is disengaged when the switch is



in the “Off” position. The truck gear shift lever must be in neutral and the clutch depressed when the switch is moved.

Power Take-Off Automatic Transmission:

Electrical Shift Control – The recommended procedure is to bring the vehicle to a full stop, place the truck gear shift lever in the neutral position, set the parking brake, and then engage the PTO. At the completion of loading operations, disengage the PTO, apply the service brakes, disengage the parking brake, and then select the appropriate transmission gear.

PARK BRAKE

The truck brake must be set before leaving the cab for any reason.

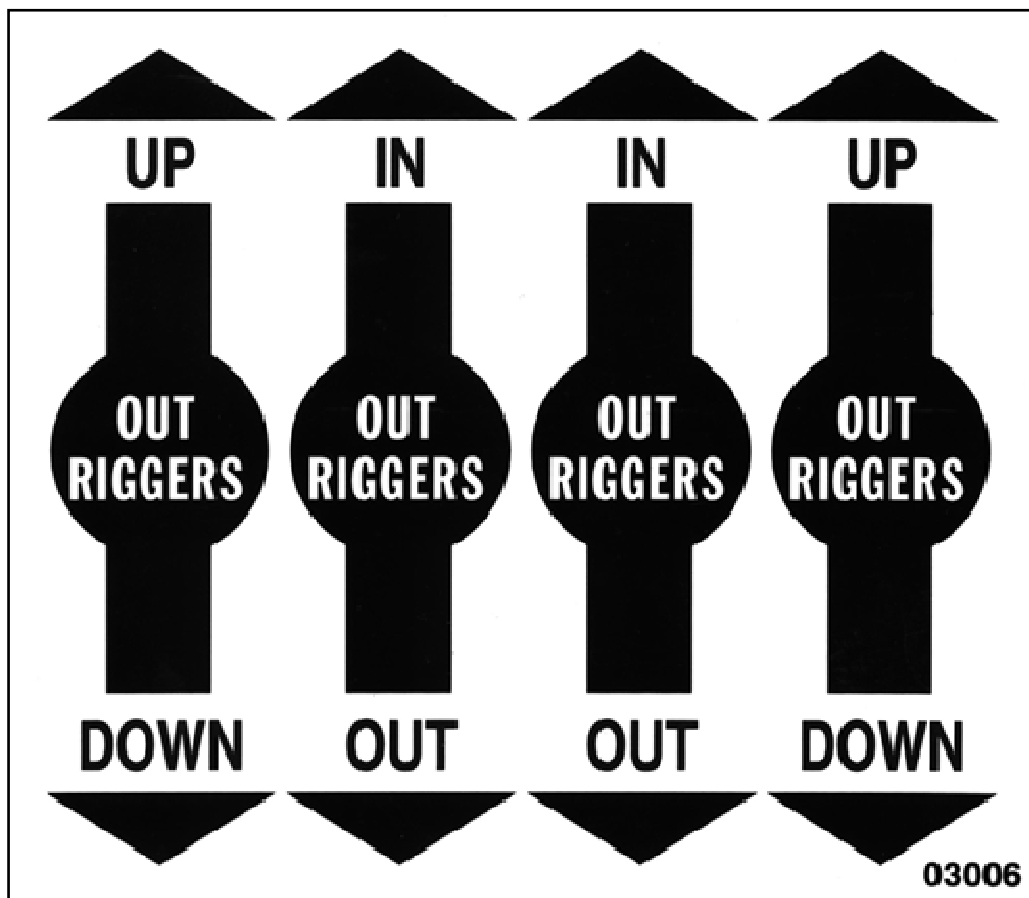


STANDARD LOADER CONTROLS

The loader control placards indicate the direction to actuate the control handles for various unit functions. The loader placard gives visual instructions for boom elevation, boom swing, tip boom elevation, tip boom extension, bucket grab, bucket rotation, and body dump. The outrigger placard gives visual instructions for horizontal outrigger in/out, and vertical outrigger up/down.

Outriggers:

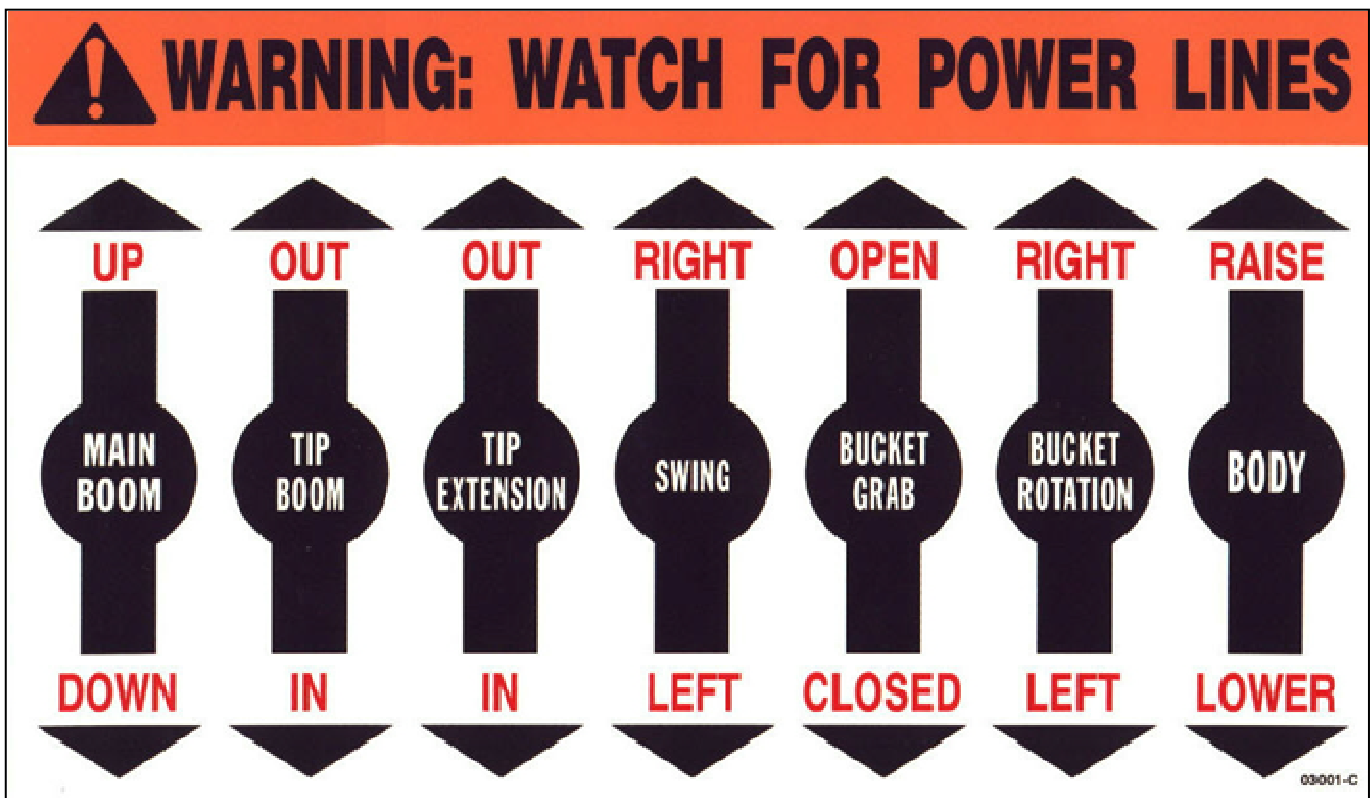
The Model TL3 Loader has outrigger handles mounted below the other control handles. There is a set of four (4) handles on each side of the work platform on loaders with dual walk thru controls, and they are configured the same on each side of the platform. In the four (4) handle configuration, the two (2) handles on the right operate the right outrigger, and the two (2) handles on the left operate the left outrigger. The following decal shows the control handle configuration, and the arrows indicate the direction to push or pull the handle for each function.



Loader and Dump Body:

The standard Model TL3 has seven (7) control handles that activate the loading and dumping operations of the loader. The following decal shows the control handle configuration, and the arrows indicate the direction to push or pull the handle for each function.

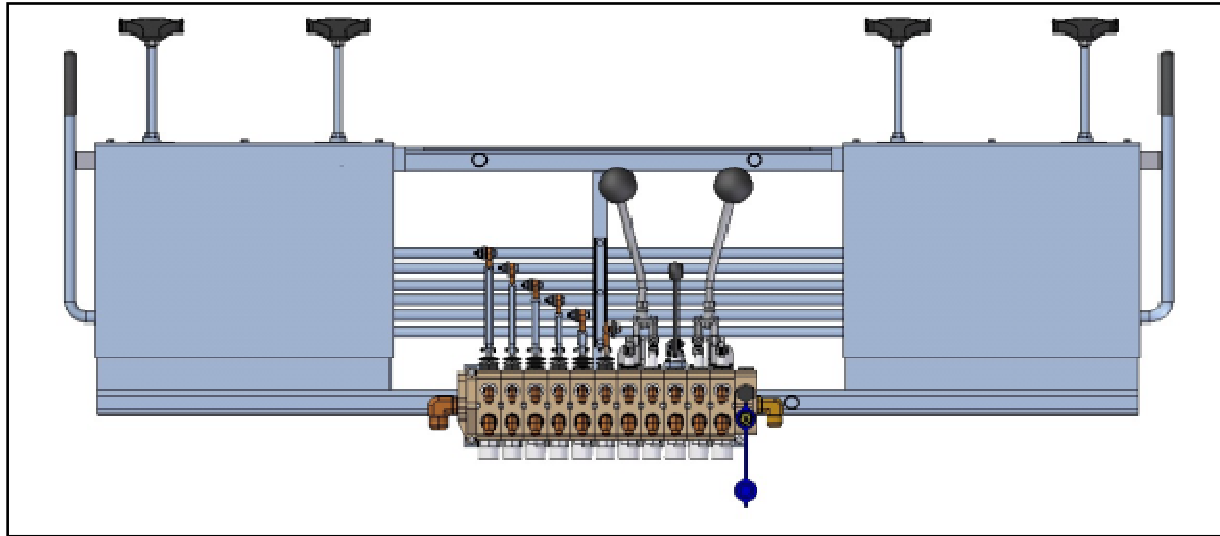
The control handle configuration is the same at both operator stations on loaders with dual walk thru controls. Always operate the loader on the side closest to the debris being loaded. Do not store any collectibles on the operator's platform, as they can create a tripping hazard or become lodged in the controls.



During all operations, the controls should be feathered when beginning or terminating a movement to prevent sudden starting or stopping which imposes undue shock loads on the equipment. Feather the controls by moving the valve handle smoothly from the neutral position to start motion. After a slow, smooth start, move the valve handle control to extreme for full speed. Just before stopping movement, move valve handle control smoothly back to the neutral position.

QUADSTICK LOADER CONTROLS

There are two (2) joystick handles on each side of the operator's platform. The operating functions of the two sides are identical, so the operator uses the same movements on either side to control the boom elevation, boom swing, tip boom extension, bucket grab, and bucket rotation.



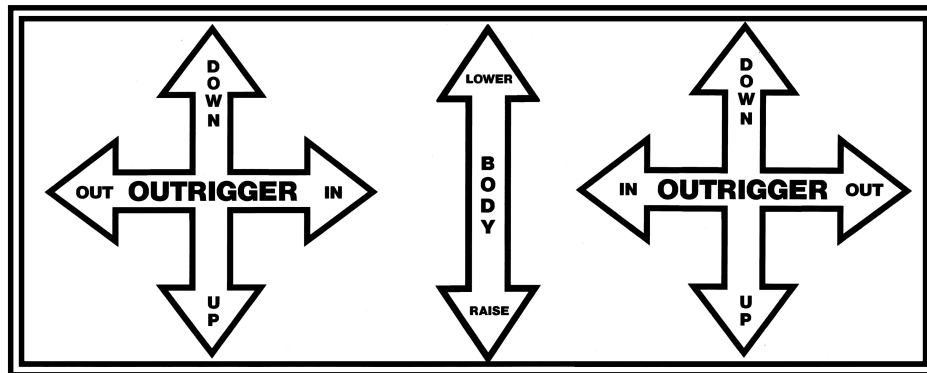
At the center of the work platform are three (3) control handles. The two handles with the round knobs are the outrigger control handles. The round knob on the left controls the left outrigger, and the round knob on the right controls the right outrigger. The handle between the outrigger control handles is the body dump handle.

The optimum, safe method of operating the controls is by feathering. **Do not jerk the control levers to full speed, or from one extreme to another.** Feather the controls by moving the joystick smoothly from the neutral position to start motion. After a slow, smooth start, move the joystick control to extreme for full speed. Just before stopping movement, move the joystick control smoothly back to the neutral position.

On units equipped with dual controls, always operate the loader on the side closest to the debris being loaded. Do not store any collectibles on the operator's platform, as they can create a tripping hazard or become lodged in the controls.

QUADSTICK LOADER CONTROLS

Outriggers and Dump Body



Left Outrigger

Dump Body

Right Outrigger

Left Outrigger Handle:

Move the handle to the left to extend the left horizontal outrigger.
Move the handle to the right to retract the left horizontal outrigger.
Push the handle forward to lower the left vertical outrigger foot.
Pull the handle back to raise the left vertical outrigger foot.

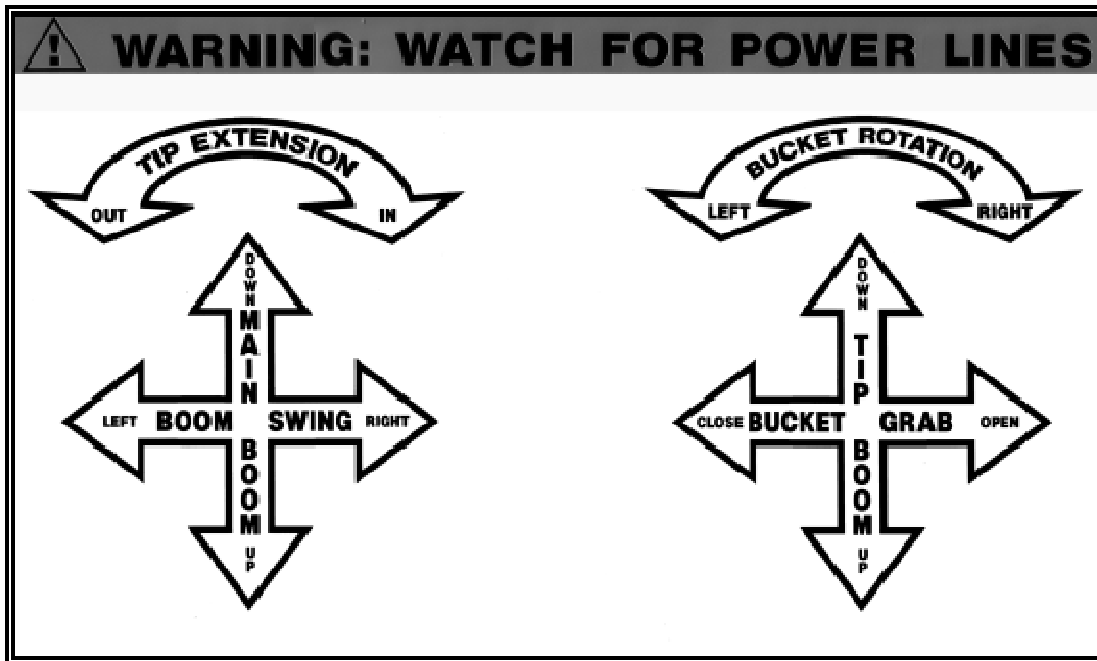
Right Outrigger Handle:

Move the handle to the right to extend the right horizontal outrigger.
Move the handle to the left to retract the right horizontal outrigger.
Push the handle forward to lower the right vertical outrigger foot.
Pull the handle back to raise the right vertical outrigger foot.

Body Dump:

Pull the handle back to raise the dump body.
Push the handle forward to lower the dump body.

QUADSTICK LOADER CONTROLS



Left Joystick:

Boom Swing: Move handle right to make boom swing right.
Move handle left to make boom swing left.

Main Boom: Pull handle back to raise boom.
Push handle forward to lower boom.

Tip Ext.: Twist handle counter-clockwise to extend tip extension out.
Twist handle clockwise to retract tip extension in.

Right Joystick:

Tip Boom: Pull the handle back to raise tip boom.
Push handle forward to lower tip boom.

Bucket Grab: Move handle right to open bucket.
Move handle left to close bucket.

Bucket Rot.: Twist handle clockwise to rotate bucket right (clockwise).
Twist handle counter-clockwise to rotate bucket left (counter-clockwise).

HYDRAULIC PILOT LOADER CONTROLS

There are two (2) joystick handles on each side of the operator's platform. The operating functions of the two sides are identical, so the operator uses the same movements on either side to control the boom elevation, boom swing, tip boom extension, bucket grab, and bucket rotation.

At the center of the work platform are three (5) control handles. These handles are for the outriggers and the body dump.

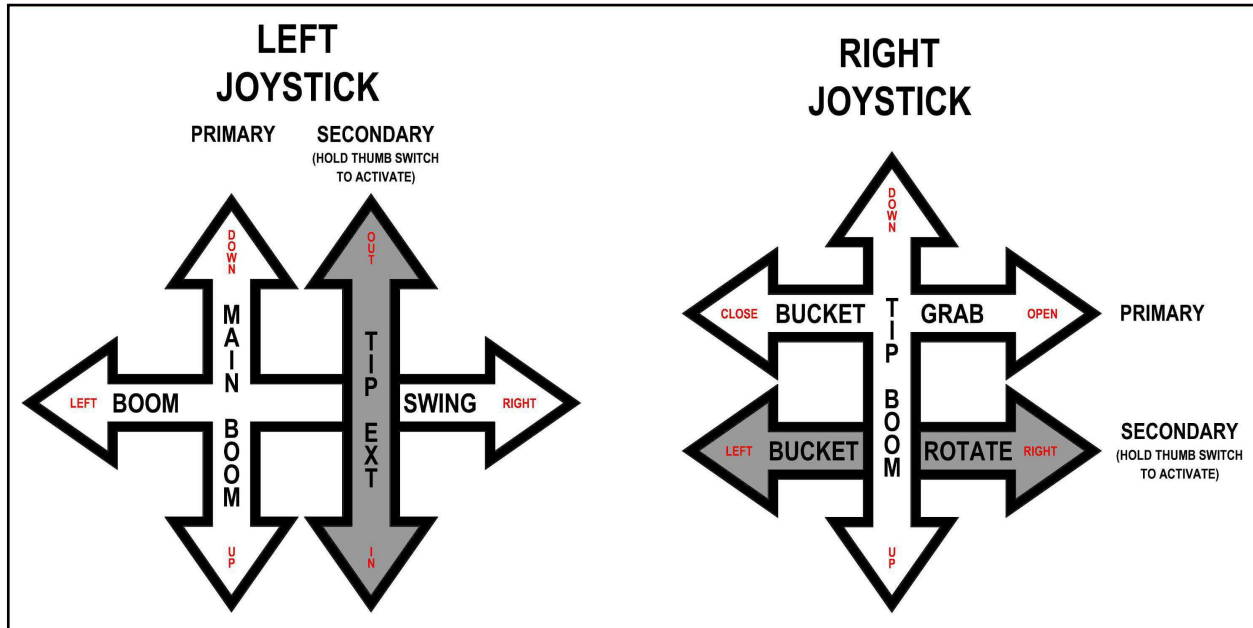
At the center of the work platform is a 3 position toggle switch. This switch is used to activate the left control station, the right control station or turn both control stations off.

The optimum, safe method of operating the controls is by feathering. **Do not jerk the control levers to full speed, or from one extreme to another.** Feather the controls by moving the joystick smoothly from the neutral position to start motion. After a slow, smooth start, move the joystick control to extreme for full speed. Just before stopping movement, move the joystick control smoothly back to the neutral position.

Always operate the loader on the side closest to the debris being loaded. Do not store any collectibles on the operator's platform, as they can create a tripping hazard or become lodged in the controls.



HYDRAULIC PILOT LOADER CONTROLS



Left Joystick:

Boom Swing: Move handle right to make boom swing right.
Move handle left to make boom swing left.

Main Boom: Pull handle back to raise boom.
Push handle forward to lower boom.

Tip Ext.: While holding the thumb switch push handle forward to extend tip or pull handle back to retract tip.

Right Joystick:

Tip Boom: Pull the handle back to raise tip boom.
Push handle forward to lower tip boom.

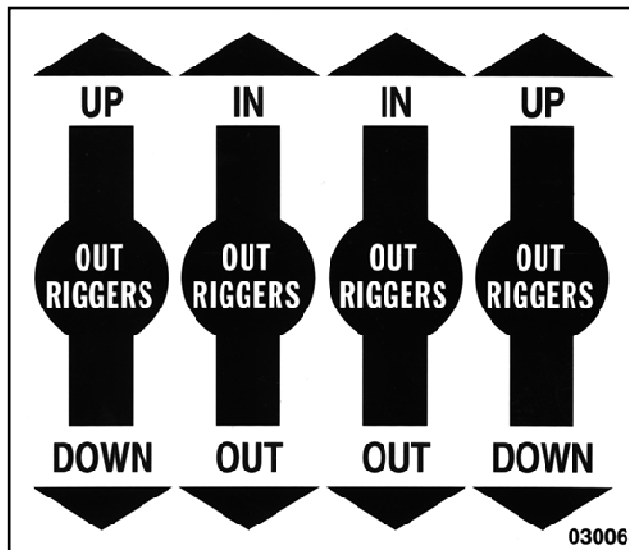
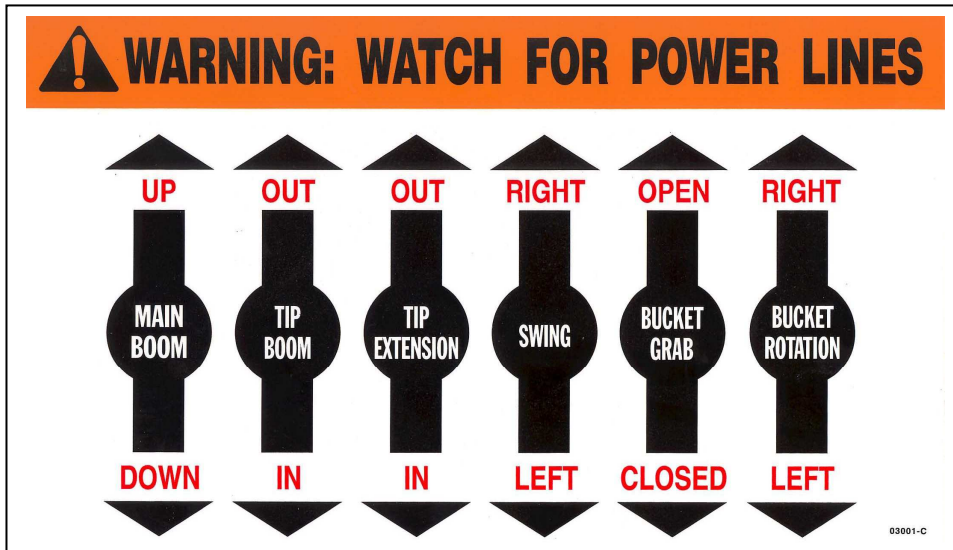
Bucket Grab: Move handle right to open bucket.
Move handle left to close bucket.

Bucket Rot.: While holding the thumb switch move handle right to rotate bucket right (clockwise) or move handle left to rotate bucket left (counter-clockwise).

TOP MOUNT WITH STANDARD LEVER CONTROLS

The following decal shows the control handle configuration for the Model TL3 Loader, and the arrows indicate the direction to push or pull the handle for each function.

The loader control placards indicate the direction to actuate the control handles for various unit functions. The loader placard gives visual instructions for boom elevation, boom swing, tip boom elevation, tip boom extension, bucket grab, bucket rotation, and body dump. The outrigger placard gives visual instructions for horizontal outrigger in/out, and vertical outrigger up/down. The outrigger controls are located to the left and right of the loader controls.



Part 5: Training

All members of the crew must become thoroughly familiar with the operation of controls, the correct operating procedures, maximum lifting capacities, and safety precautions before operating the loader. Operator training is essential. Always be prepared for an emergency. The following pages contain numerous safety precautions, information, and operating instructions that must be observed while performing work operations.

The health, safety and well-being of each member of the crew is of primary importance. Consequently, each member has an obligation to himself, and to his fellow workers, to make sure safe operating procedures are followed. All operating regulations recommended by the manufacturer, the employer and by municipal, state and federal agencies must be observed. The operating procedures set up in this manual are Petersen's recommendations and do not necessarily cover employer and governmental regulations. Each operator must know and observe those regulations.

Become familiar with all equipment checks. You should make daily equipment inspections and be able to spot any abnormality or malfunctions before beginning an assigned task, while working or after completing the task. There is a high degree of reliability built into your equipment, but there is always a possibility of mechanical failure or power failure due to incomplete service or abnormal wear. An operator should never take another's word. He should always thoroughly check the equipment himself.

Each crew member must receive thorough instructions on the care and maintenance of this machine, thus enabling him to identify and anticipate any problems that may occur. Knowing how the equipment operates will help you recognize when it is not operating properly and if repairs or adjustments are required.



Part 6: Setting Up at the Job Site

An important prerequisite to proper setting up at the job site is to thoroughly plan the lift before positioning the vehicle.

Always seek the best possible work site when parking the vehicle. An ideal parking location at a job site is firm, level dry ground or pavement, located in close proximity to the work station. Avoid uneven, rocky or muddy terrain, or steep grades. Location should be selected such that outriggers can be fully extended and the outrigger pad comes down on a firm, level surface. In the event that it is necessary to use the loader on an inclined surface, extreme care should be used. Loader slewing torque, stability, lifting capacity and other loader control functions may be affected adversely. Particular caution must be exercised with the swing function since a “downhill” inclined surface will increase the slewing speed and lengthen the time it takes to stop the motion. Your vehicle should be positioned in an area free from overhead obstructions and to allow performance of the entire task without repositioning, if possible. The operator must be familiar with the swing arc of the loader. You should position your vehicle so that the load is well within this arc. The swing arc is controlled by positive stops. Damaged or missing head and pedestal stops poses an unsafe condition by allowing the boom to swing too far resulting in damage to the swing actuator, which could also result in loss of boom swing control. Once the vehicle is in position for loading, please follow these precautions and procedures for loading:

Precautions and Procedures for Loading:

- Before leaving the cab, engage all safety lights, place the transmission in neutral, and set the parking brake.
- Always be aware of traffic conditions. Extreme caution should be taken when operating extendible outriggers where there is traffic. The operator should consider the possible safety hazard and take necessary precautions, such as using safety cones to mark the outriggers. The operator should also consider using safety cones to mark the vehicle, if the loading position interferes with traffic flow, or other conditions make the vehicle not easily visible.
- Before commencing work, make sure the debris you are going to load does not conceal any fixed objects, such as fire hydrants, guy wires, etc.
- The vehicle should be positioned so that it is impossible for any portion of the equipment to come within the minimum required safe distance to any energized power line. Maintain a clearance of at least 10 feet between any part of the loader and any electrical line. Remember, power lines deflect in winds and additional clearances must be allowed. Death or serious injury may result from contact or arcing due to inadequate clearance to anyone working on or around the loader. All



overhead wires should be considered energized until the electrical utility authorities verify that they are not and the wires are visibly grounded.

- Do not operate the loader during electrical storms, when high wind conditions exist, or in poorly lighted conditions.
- Your loading area must be clear of people. Do not operate the loader, outriggers, or dump body if another person is within twenty feet of the equipment.
- Do not allow any person under a raised body or extended loader.
- If your model loader uses a ladder for access to the loader station, use provided handholds and steps. Face the steps when getting on and off. Never use controls as handholds. Do not mount the machine if handholds or steps are broken or missing. Repair them first.

Failure to heed these instructions can result in serious personal injury or death.



Part 7: Loading Procedures

Engage the power-take-off. For cold weather operation, allow the loader hydraulic system to reach operating temperature before commencing work.

Before conducting any boom operations, extend all outriggers to level the loader side to side. When extending outriggers out and down, ensure that the vehicle is stabilized. To develop rated load capacity, the outriggers should be fully extended horizontally. Provide blocks, if necessary, to level the unit on sloping ground or bearing pads if the outriggers tend to sink into soft terrain. Some concrete surfaces are relatively thin and cannot withstand outrigger loading. Concrete can break thru and cause instability.

Remember this safety information regarding the outriggers:

- Keep feet clear of outriggers at all times to avoid serious crushing injury.
- Failure to use the outriggers when loading may create an unstable condition, including the loader overturning that could result in serious personal injury or death.

Do you know the load capacity of the loader? Refer to the "Load Capacity Chart" in this manual for information regarding load capacities. The "Load Capacity Chart" is also riveted to the pedestal of the loader. Do not attempt to lift more than the capacities shown on the load chart for your model loader at the correct radius.

For loaders with manual throttle controls, set the throttle control to desired RPM, depending on loading conditions. Remember, DO NOT exceed the preset throttle control setting.

To make the lift:

1. If your loader is equipped with a boom swing lock, make sure you disengage the lock before conducting any boom operations. Raise boom from inside of dump body and swing to trash pile. Use tip extension, if needed, and rotate bucket so that it is aligned with the pile.
2. Open the bucket, lower around trash, and close the bucket so that you have a firm grip on the trash. Raise the boom slightly and activate the bucket grab once again to make sure you have a firm grip on the trash.
3. Lift and swing the load over the dump body. In order to minimize the height and stress on the boom, it is recommended that the tip extension be retracted prior to swinging the load. It is recommended to load the front of the body first.



When loading the dump body, please follow these precautions:

- **Do not** use the bucket to crowd the load to the front of the dump body as you can damage the bucket and other loader components.
- **Do not** overload the dump body. You must have room to stow the bucket within the body sides for travel.
- **Do not** allow limbs or other debris to protrude from the dump body.
- **Do not** excessively pack the load. Excess packing could result in dump body floor damage and loader damage.
- **Do not** allow the bucket to swing beyond parallel to the tip boom. If the bucket flips up beyond parallel it can cause damage to loader components.

Continue the loading procedure until all trash is loaded. If it is necessary for the operator to manually rake any remaining trash into a smaller pile, the boom must be stowed in the dump body or on the ground, and the PTO disengaged when the operator leaves the control station.

Please follow these additional loading precautions at all times:

- Do not leave a load suspended when the operator is away from the control station.
- Only operate the loader from the operator's station. Do not attempt to operate the loader from any position other than the operator's station.
- Never climb on operator controls or other loader components.
- Do not sit or stand at operator control station when truck is in motion. The control station is to be manned only when the vehicle has been parked and the procedures we previously discussed have been followed for setting up to load.
- Do not attempt to lift loads exceeding manufacturer's recommended safe working capacity.
- Do not impose lateral loads on the boom.
- Do not use stability to determine safe working load.



To cover the load:

When using a Petersen manufactured and installed load cover, please follow these procedures:

1. Knuckle the bucket to the front of the dump body.
2. Hook the tarp chain to the hook on the bucket.
3. Extend the boom to cover the debris, and rest the bucket on the load.

To stow the boom and bucket:

There are two proper ways to stow the bucket in the dump body. In each case the bucket sides should be parallel to sides of the dump body. The operator can either stow the bucket in the opened position on the body floor, or roll the closed bucket over on top of the load. In both cases it is necessary for the operator to leave room in the dump body to stow the boom and bucket. Always ensure that at least half of the bucket and tip of the boom are below the top of the body sides before travel.

Bucket Roll Method:

The rear of the dump body must be at least half full in order to use the bucket roll method for stowing the boom and bucket.

1. Use the control handles on the curb side.
2. Close the bucket and rotate until bucket sides are parallel to body sides.
3. Move the bucket to the curb side rear inside corner of the dump body.
4. Rest the bucket on the load.
5. Simultaneously boom down and swing the boom to the street side until the boom tip and at least half of the bucket are below top of body sides. Ensure that no part of the loader or load is over legal height of 13 ft.-6 in.

Please see illustrations on the following page for examples of correct and incorrect ways to stow the bucket for travel.

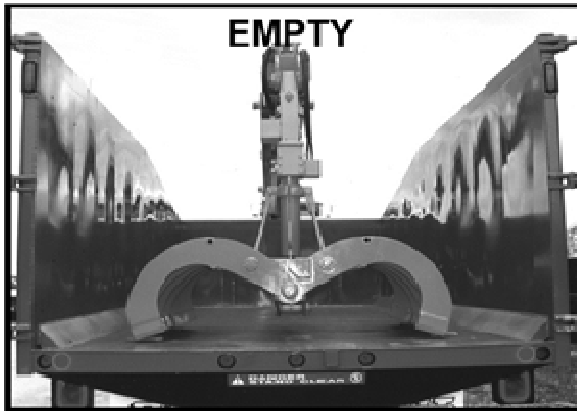
WARNING! - Failure to stow the boom and bucket as instructed could allow the boom to slew (swing) and the bucket to fall outside of the body. Loss of boom control with the bucket outside of the dump body could result in damage to objects in the vicinity of the grapple truck, and/or serious injury or death to people in the vicinity of the grapple truck.



Once the bucket has been properly stowed for travel, retract all outriggers, disengage the PTO, and pickup any safety cones or markers that were used. Release the parking brake, and you're ready to travel to the dump site.



CORRECT METHODS OF STOWING THE BOOM & BUCKET



- BUCKET OPEN AND AT REST ON DUMP BODY FLOOR.

NOTE: FOR ILLUSTRATION PURPOSES REAR DUMP BODY DOORS ARE SHOWN OPEN. REAR DUMP BODY DOORS MUST BE CLOSED AND LOCKED EXCEPT WHEN DUMPING THE LOAD



- BUCKET ROLLED OVER WITH JAWS TO RIGHT REAR OF DUMP BODY
- BOOM AT SAFE TRAVEL HEIGHT & BOOM TIP BELOW TOP OF BODY SIDES
- MORE THAN 1/2 OF BUCKET MUST BE BELOW TOP OF BODY SIDES
- LOAD COVER DEPLOYED

INCORRECT METHODS OF STOWING THE BOOM & BUCKET



- BUCKET NOT CONFINED INSIDE OF DUMP BODY
- DEBRIS HANGING OUTSIDE OF DUMP BODY
- BOOM OVER LEGAL HEIGHT OF 13 FT. 6 IN.



- BOOM OVER LEGAL HEIGHT OF 13 FT. 6 IN.
- BUCKET NOT CONFINED INSIDE OF DUMP BODY
- DEBRIS HANGING OUTSIDE OF DUMP BODY

Part 8: Dumping the Load

As you prepare to dump the load, it is important that you choose a level, firm area. Each of the following steps must be followed precisely and in sequence. The procedure must not be done in a hurried manner.

1. Set the parking brake.
2. Open the rear dump body doors and latch them back. Use caution when opening doors, as items placed against doors could fall suddenly when doors are opened and cause injury.
3. Engage the power-take-off.
4. Extend the outrigger on both sides and lower to within six to eight inches of the ground. This allows for emergency stabilization, and movement of the truck.
5. If your loader is equipped with a boom swing lock, make sure you disengage the lock before conducting any boom operations.
6. If your load is covered with a tarp, as discussed in "Covering the Load", retract the tarp.
7. Raise the main boom to the maximum elevation and keep it centered over the dump body during the entire dumping procedure.
8. Place the tip boom in a position so that it will not contact the bulkhead of the dump body when the dump body is raised. Do not swing the boom to either side during the dumping procedure, as the outriggers are not fully lowered.
9. Activate the body dump handle. Slowly raise the body to empty the load. Make sure you avoid contact between the main boom and tip boom, and the dump body.
10. If the emptied pile prevents complete dumping of body contents, disengage the PTO. SLOWLY move the truck forward to complete dumping of the body. Remember, the outriggers are partially down and the boom is raised. Extreme caution should be used during this procedure.

This is not a procedure to force debris out of the dump body. If there is debris stuck in the dump body, lower the dump body and dislodge the debris with the loader.

11. When you have finished dumping the load, lower the dump body. Stow the boom and bucket in the dump body with bucket open and resting on body floor.
12. Raise and retract the outriggers, and disengage the power-take-off.



13. Close and lock body rear doors.

Safety Precautions Regarding Dumping Procedure:

- Do not use the loader boom to force the dump body down when lowering the dump body.
- Do not dump the load until the rear body doors are latched open. The doors and body hinges can be damaged if doors are allowed to swing freely during the dumping procedure.
- Do not travel with rear body doors open. They must be closed and locked for travel.



Part 1: Safety Procedures and Precautions for Service and Repair

A regular schedule of maintenance is essential to keep your unit at peak operating efficiency. Operators or service personnel responsible for the care of the unit must be completely familiar with the type and frequency of inspections, maintenance, and lubrication operations to be performed.

Always keep the loader free from sand and other foreign particles to ensure trouble-free operation and to avoid excessive wear. Air entering the oil tank carries with it small quantities of impurities and moisture. The hydraulic oil should be drained at least once a year to rid the system of any contamination and condensation.

The hydraulic circuit diagram is included in the “Dia. & Drawings” section of this manual for service or maintenance information.

Make sure you observe the following procedures and precautions when performing maintenance and/or repairs on your equipment.

Safety Procedures and Precautions for Service and Repair

- Do not perform any work on the loader unless you are qualified and authorized to do so.
- Loader is placed where it will cause the least interference with other equipment or operations in the area.
- All controls at the off position and all operating features in neutral position.
- Do not attempt to clean, oil or service a loader when the power-take-off is engaged.
- Deactivate means for starting. Use lockout-tagout procedure. See lock-out/tag-out procedures on following page.
- Bucket and boom at rest on ground or floor of dump body.
- Do not disconnect hydraulic connections under pressure. Hot hydraulic fluid can cause serious injury. Stay clear of hydraulic leaks as high pressure and hot hydraulic fluid can cause serious injury.
- Always use dump body prop(s) before servicing or repairing body or hoist. Never leave the body raised or partly raised while vehicle is unattended or



while performing maintenance or service under the body, unless the body is braced to prevent accidental lowering.

Lock-out/Tag-out Procedure (LOTO)

1. With the vehicle parked on level firm ground, set the parking brake and chock the wheels.
2. Place operating equipment at lowest potential energy level or position so as not to be subject to possible free fall, and/or install additional blocking device(s) to prevent this potential for any raised or elevated equipment such as bodies, tail or side gates, booms, bucket or other attachments.
3. If work on the bucket is required, place the bucket outside the body by first setting the outriggers, second, positioning the bucket over the side of the truck and finally, lowering the boom until the bucket is on the ground.
4. If it is necessary to raise the body during LOTO, the body prop must be in place to secure the body from falling.
5. Disengage the PTO and shut down the truck engine.
6. Remove the key from the ignition.
7. Using a non-reusable fastener, secure a LOTO tag to the steering wheel indicating the vehicle is out of service.
8. Relieve stored energy from the hydraulic components by moving each control handle back and forth several times. Cylinders equipped with either pilot operated check or counterbalance valves will not function unless under hydraulic power.

Modification to any part of the loader can create a safety hazard and therefore shall not be made without the manufacturer's written approval. It is important that you use factory replacement parts to ensure that size and capacity are as the original parts.

It is important that hydraulic components be rated at proper flow and pressure. If your loader is rebuilt or remounted, mounting procedures and retesting is required in accordance with factory instructions.

Disconnecting, removing, or disabling any part or component which controls the speed of the loader is a misuse of the loader.



The following lists inspections and maintenance which are to be conducted on your unit to help assure it is operating properly and safely. These inspections are in addition to any inspections previously listed, such as daily inspections. Check all items at the frequency listed and make necessary repairs prior to operating.

The following are minimum service requirements. Hard use or dirty operating conditions dictate more frequent inspection and maintenance.

After service adjustment, and repairs, the loader shall not be returned to service until all guards have been reinstalled, trapped air removed from the hydraulic system if required, safety devices reactivated, and maintenance equipment removed.



Part 2: Preventative Maintenance Items:

| AFTER FIRST 40 HOURS OF OPERATION (BREAK IN SERVICE) | |
|--|---|
| Re-torque boom swing actuator bolts. | To 500 ft. lbs (HA36) To 160 ft. lbs (Planetary Gearbox) |
| Replace return filter. | |
| Change oil in planetary gearbox (If applicable) | Drain existing oil from swing gearbox and replace with 7 quarts of 80W Gearlube |

| EVERY 40 HOURS OR WEEKLY | |
|---|--|
| Grease all fittings. | See Grease and Maintenance Diagram in the "Dia. & Drawings" section of this manual. Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced. Grease = EP2 (Extreme Pressure) |
| Check hydraulic hoses for cuts or abrasions, or any evidence of binding or leakage. | Replace any damaged hoses. |
| Check all hydraulic fittings to make sure they are in place and do not show signs of leakage. | Replace any missing, damaged or modified fittings. |
| Tighten bucket brake pads. | If brake pads show excessive wear, replace. Tighten gimbal rotator bolt and tip boom gimbal bolt, if needed. |
| Check oil level. | All oil levels are to be checked with the loader parked on a level surface in transport position, and while the oil is cold, unless otherwise specified. Oil level should be two to three (2 to 3) inches from top of tank. Planetary Gearbox Oil should be visible on site glass. Hydraulic Oil = AW32 Gear Oil = 80W Gearlube |



| EVERY 40 HOURS OR WEEKLY | |
|--|--|
| Check engine overspeed control for proper setting. | Check by revving the engine to 350 RPM above the preset rpm on the remote throttle switch, at which point the PTO light should turn off if the engine overspeed is properly set. Reset if necessary. |
| Check the engine throttle control for proper setting. | Refer to the throttle control section of this manual for preset setting |
| Check lock collar for excess clearance. | Lock collar must be tight against bottom of spindle bearing housing with maximum gap of one-quarter inch (1/4"). |
| Check back-up and boom-up alarms to make sure they are working properly. | Repair or replace if needed. |

| EVERY 80 HOURS OR EVERY 2 WEEKS <i>(These requirements are in addition to the 40 hour service requirements)</i> | |
|---|---|
| Re-torque boom swing actuator bolts. | To 500 ft. lbs (HA36) To 160 ft. lbs (Planetary Gearbox) |
| Re-torque bucket rotator bolts. | To 110 ft. lbs. - dry threads |

| EVERY 160 HOURS OR MONTHLY <i>(These requirements are in addition to the 80 hour service requirements)</i> | |
|--|--|
| Examine all loader pivot points (head and pedestal, main boom, tip boom, bucket and body) for visible play. | If visible play is observed at pivot points, bushings and/or pins must be replaced as needed. |
| Chassis - Check truck frame for cracks, loose or missing bolts, rivets, damaged springs or loose shackles. | See truck manufacturer's service manual for service and repair instructions. |
| Structural - Visually inspect complete loader for damage, especially cracks in weldments. | It is necessary for your loader to clean of oil and grease for these inspections to be made. The Petersen rotating head assembly has special high strength steel components that are welded together. After welding, the entire assembly receives post-weld heat treatment. Do not weld on the rotating head assembly. Welding on the rotating head could reduce its load bearing capacity and fatigue life. |



| EVERY 160 HOURS OR MONTHLY <i>(These requirements are in addition to the 80 hour service requirements)</i> | |
|--|-----------------------------------|
| Fasteners - Check all pins, sheaves, retainers, bolts and nuts. | Replace damaged or missing parts. |
| Retighten main boom and tip boom connecting bolts. | Replace if needed. |
| Check PTO and pump drive train. | Check for loose or missing bolts. |

| EVERY 160 HOURS OR MONTHLY <i>(These requirements are in addition to the 80 hour service requirements)</i> | |
|--|--|
| Re-torque loader tie-down bolts. | To 400 ft. lbs. - dry threads |
| Decals - Check for presence and legibility. | Check decal listing in "Part 3: Safety Devices – Safety Symbols" of this manual for required operational and safety decals. Replace missing or illegible decals. |

| EVERY 600 HOURS OR 6 MONTHS <i>(These requirements are in addition to the 160 hour service requirements.)</i> | |
|---|--|
| Replace return line filter, replace breather. Note that breather may be integral with the oil tank cap. | |

| EVERY 3000 HOURS OR 12 MONTHS <i>(These requirements are in addition to the 600 hour service requirements.)</i> | |
|---|---|
| Change oil in planetary gearbox (if applicable) | Drain existing oil from swing gearbox and replace with 7 quarts of 80W Gearlube |
| Change hydraulic oil | |
| Gear Pump shaft splines on pump to PTO coupling (for non-wet spline pto's only) | Remove pump and grease gear pump shaft splines with anti fretting, high pressure, high temperature grease |



How to Find the Serial Number

The serial number for your unit can be found in two places. The number is stamped on the side of the base plate of the head assembly, and is also stamped on the base plate of the pedestal assembly. You will be asked to provide the serial number any time you order parts from our Parts Department.

The serial number listed below is a fictitious number for illustration purposes.

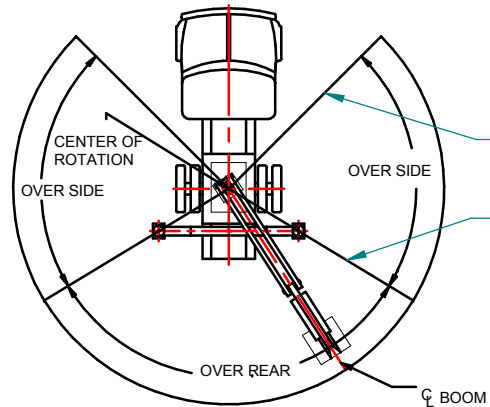
TL3-0199-344

The serial number provides us with three types of information, as shown in the above example.

- “TL3” indicates the model of your loader.
- “0199” indicates the date it was manufactured. This example indicates that the loader was manufactured in January, 1999.
- “0344” is a unit number that is specific to your loader only.

If your head and/or pedestal assembly is or has been changed to a current production model, this number will have an “R” added, which would become “0344R”. When a major component such as the head or pedestal assembly receives a replacement, the date of manufacture also gets updated. For example, if the unit listed above were to get a new head assembly in May of 2004, the serial number stamped on the new head assembly would be TL3-0504-0344R.

| REV. | DESCRIPTION | DATE | BY |
|------|---|----------|----|
| 1 | ADD TO TL3 CHART LOADS WITH TIP EXT RETRACTED, CHANGE BUCKET WEIGHT 1000 LB | 02/23/01 | - |
| 2 | ADD TO RL3 AND SL3 LOADS WITH TIP EXT RETRACTED | 02/27/01 | - |
| 3 | ADD NOTES TO MEET ASME B30.22 | 02/07/02 | - |
| 4 | ADD DL3 AND UPDATE RL3 TABLE | 08/29/06 | - |



| MODEL TL 2 | | |
|------------|-----------------|------------------|
| RADIUS | No 1 OUTRIGGERS | No. 3 OUTRIGGERS |
| 10 ft | 5320 lb * | 7100 lb |
| 16 ft | 2650 lb * | 3750 lb |

| MODELS TL 3, PL 3, HL 3 & BL 3 & DL3 OUTRIGGERS EXTENDED | | |
|---|-------------------------|------------------------|
| RADIUS | TIP EXTENSION RETRACTED | TIP EXTENSION EXTENDED |
| 10 ft | 7100 lb | 7100 lb |
| 16 ft | 3750 lb | 4400 lb |
| 20 ft | - | 3200 lb |

| MODEL RL 2 WITH OUTRIGGERS EXTENDED | | |
|-------------------------------------|-----------|-----------|
| RADIUS | OVER SIDE | OVER REAR |
| 10 ft | 5500 lb * | 7100 lb |
| 16 ft | 3100 lb * | 3750 lb |

| MODEL RL 3 WITH OUTRIGGERS EXTENDED | | | |
|-------------------------------------|-----------|-------------------------|------------------------|
| RADIUS | OVER SIDE | OVER REAR | |
| | | TIP EXTENSION RETRACTED | TIP EXTENSION EXTENDED |
| 10 ft | 5500 lb * | 7100 lb | 7100 lb |
| 16 ft | 3100 lb * | 3750 lb | 4400 lb |
| 20 ft | 1800 lb * | - | 3200 lb |

| RADIUS | MODEL SL 2 | MODEL SL 3 | |
|--------|------------|-------------------------|------------------------|
| | | TIP EXTENSION RETRACTED | TIP EXTENSION EXTENDED |
| 10 ft | 7100 lb | 7100 lb | 7100 lb |
| 16 ft | 3750 lb | 3750 lb | 4400 lb |
| 20 ft | - | - | 3200 lb |

NOTE: THESE LINES DETERMINE THE LIMITING POSITION OF ANY LOAD FOR OPERATION WITHIN WORKING AREAS INDICATED

LOAD DIAGRAM FOR MODELS RL 2 & RL 3

Weight of attachment to be subtracted from lift capacities. Standard Trash bucket weighs 1000 lbs.

Radii are measured in feet from the center of rotation to the center of the bucket

Loads marked with (*) are limited by the stability of the loader.

Loads for the loader on outriggers represent 85% of vehicle tipping moment when the vehicle is on firm level ground.

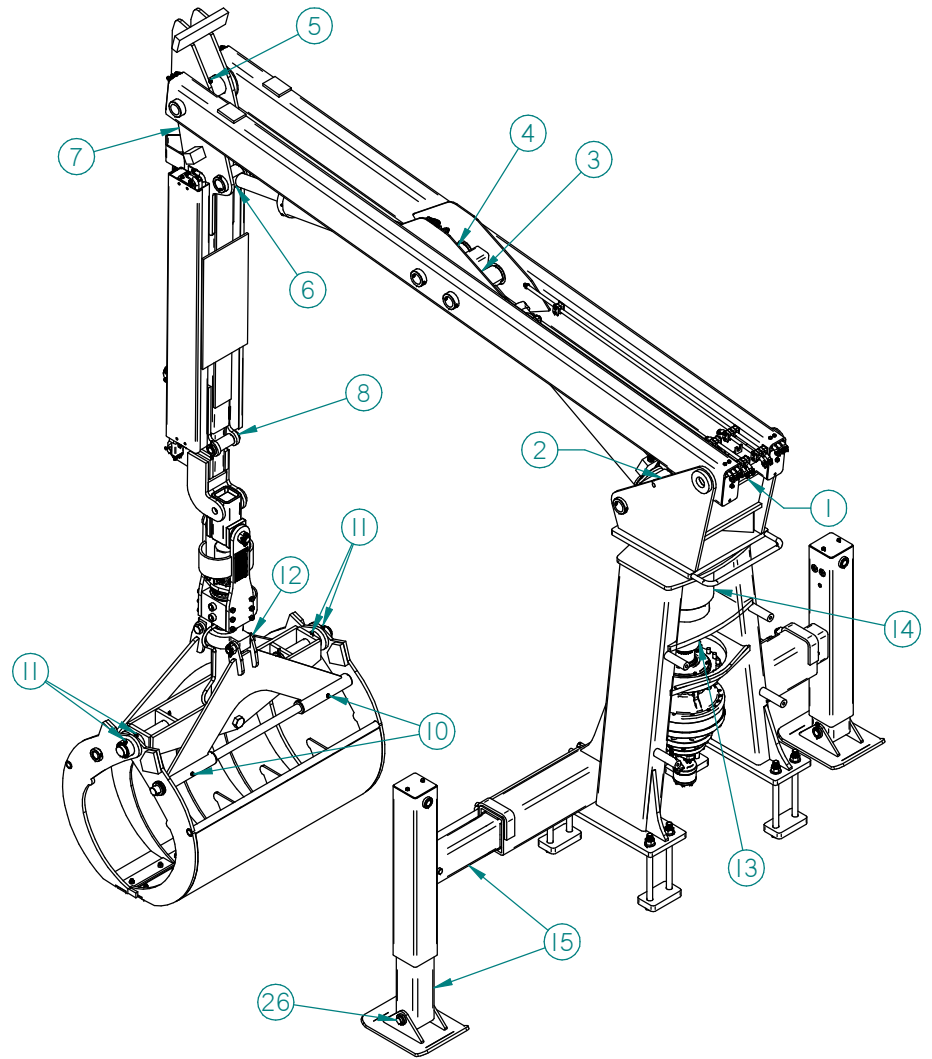
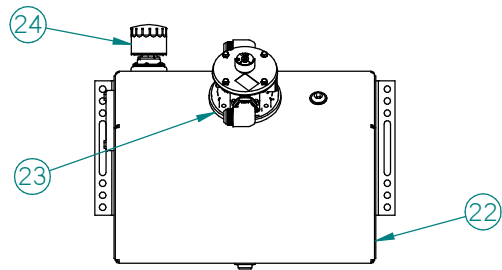
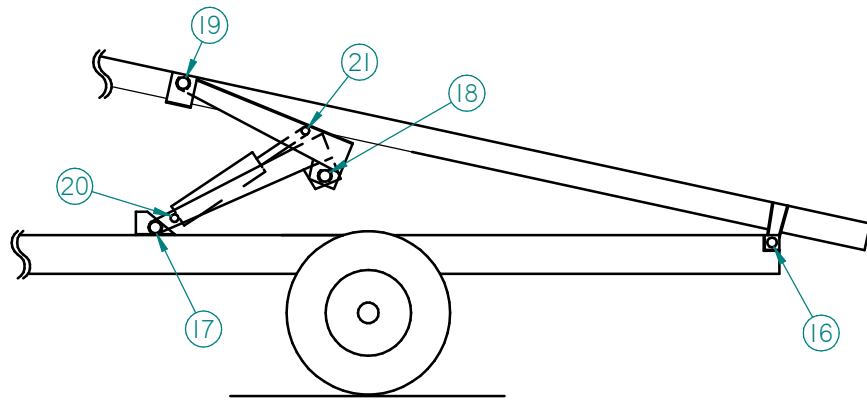
Boom length with tip extension retracted is 16 feet. Boom length with tip extension extended is 20 feet.

Tip Boom Extension function is not to be used for load lifting. This function is only for load reaching or to improve load-lifting capacity.

Do not use these load chart values to predict load capacities at other radii.

Tire pressures must be in accordance to the tire manufacturer's recommendations.

| TOLERANCES | |  | PETERSEN INDUSTRIES INC. | |
|----------------------------|----------|---|--------------------------|--|
| 1 DEC. | ± 0.100 | | 4000 S.R. 60 WEST | |
| 2 DEC. | ± 0.050 | LAKE WALES, FL. 33859-8234 | | |
| 3 DEC. | ± 0.010 | TEL: (863) 676-1493 FAX: (863) 676-6844 | | |
| ANGLE: | ± 1.000° | TITLE: LOAD CHART FOR TRASH LOADERS | | |
| FRACTION: | ± 1/32" | PART NUMBER: 01 00 00 003 4 | | |
| DIM. UNITS: | INCHES | SCALE: NA | | |
| SURFACE FINISH: | 125/32 | DRAWN BY: EJB | | |
| UNLESS OTHERWISE SPECIFIED | | APPROVED BY: | | |
| | | DATE: 08/31/99 | | |
| | | SHEET: 1 OF 1 | | |




PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|--------------------------------------|--------------|------------------------|----------------------|
| TITLE: TL3 MAINTENANCE POINTS | | | |
| PART NUMBER: 01 00 00 008 2 | | | SCALE: NA |
| DRAWN BY: BRB | APPROVED BY: | DATE: 8/24/2016 | SHEET: 1 OF 4 |

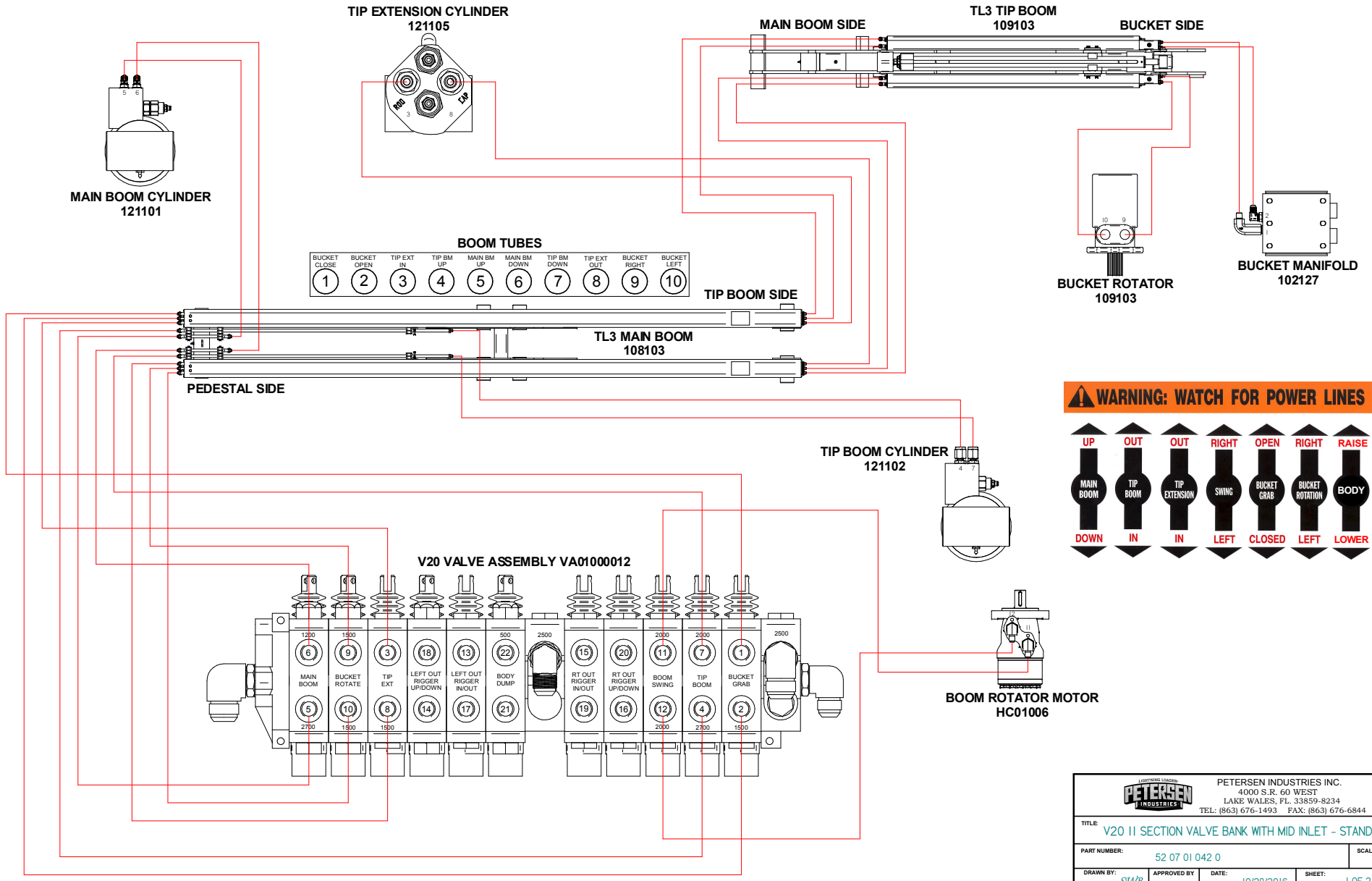
TL3 LUBRICATION POINTS TABLE

| Point Number | Maintenance Description | Number of Points | Lubricant | Application Method | Frequency |
|--------------|--------------------------------|------------------|----------------|--------------------|-------------------------|
| 1 | Main Lift Pivot | 1 | Grease | Pressure | 40 Hours |
| 2 | Main Lift Cylinder Base End | 1 | Grease | Pressure | 40 Hours |
| 3 | Main Lift Cylinder Rod End | 1 | Grease | Pressure | 40 Hours |
| 4 | Tip Cylinder Base End | 1 | Grease | Pressure | 40 Hours |
| 5 | Tip Boom to Main Pivot | 1 | Grease | Pressure | 40 Hours |
| 6 | Tip Cylinder Rod End | 1 | Grease | Pressure | 40 Hours |
| 7 | Tip Extension Tube | 1 | Grease | Pressure | 40 Hours |
| 8 | Tip Extension Roller | 1 | Grease | Pressure | 40 Hours |
| 9 | Rotator Housing Manifold | 2 | Grease | Pressure | 40 Hrs / 20 Hrs Service |
| 10 | Bucket A Frame Spools | 4 | Grease | Pressure | 40 Hrs / 20 Hrs Service |
| 11 | Bucket Main Pivot | 4 | Grease | Pressure | 40 Hrs / 20 Hrs Service |
| 12 | Bucket A Frame Connect Pivot | 2 | Grease | Pressure | 40 Hrs / 20 Hrs Service |
| 13 | Spindle Bottom Bearing Housing | 1 | Grease | Pressure | 40 Hours |
| 14 | Spindle Top Bearing Housing | 1 | Grease | Pressure | 40 Hours |
| 15 | Outrigger Inner Tubes | 4 | Grease | Brush | 80 Hours |
| 16 | Rear Body Hinge | 2 | Grease | Pressure | 40 Hours |
| 17 | Hoist Lower Pivot | 2 | Grease | Pressure | 40 Hours |
| 18 | Hoist Scissors Pivot | 3 | Grease | Pressure | 40 Hours |
| 19 | Hoist Upper Pivot | 2 | Grease | Pressure | 40 Hours |
| 20 | Hoist Cylinder Lower Pivot | 2 | Grease | Pressure | 40 Hours |
| 21 | Hoist Cylinder Upper Pivot | 2 | Grease | Pressure | 40 Hours |
| 22 | Hydraulic Tank | 1 | ISO 32 Hyd Oil | Fill to Max Level | 40 Hours |
| 23 | Hydraulic Filter | 1 | OT03008 | Replace | 1000 Hours |
| 24 | Hydraulic Tank Breather | 1 | OT05007 | Replace | 1000 Hours |
| 25 | Gearbox (if applicable) | 1 | 80w Gearlube | Replace | 3000 Hours |
| 26 | Outrigger Foot | 2 | Grease | Pressure | 40 Hours |

| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TL3 MAINTENANCE POINTS | | | |
| PART NUMBER: 01 00 00 008 2 | | | SCALE: NA |
| DRAWN BY: BRB | APPROVED BY: | DATE: 8/24/2016 | SHEET: 2 OF 4 |

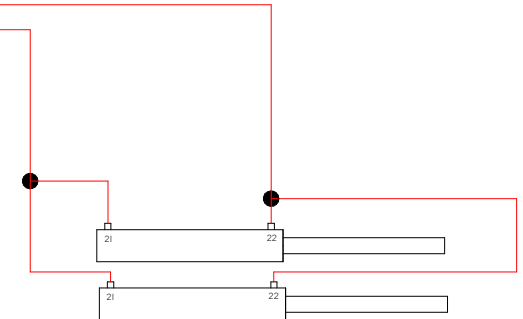
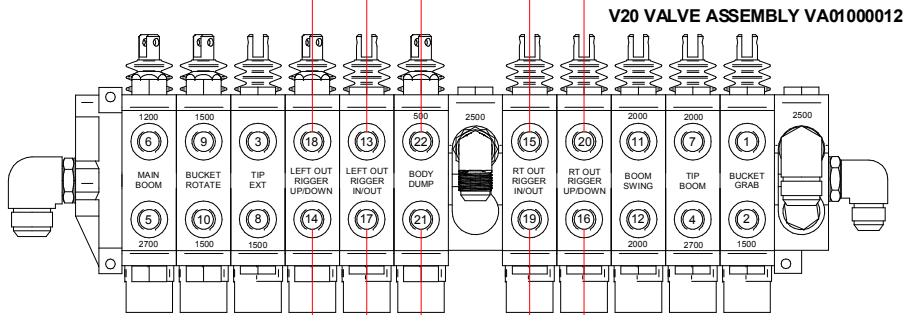
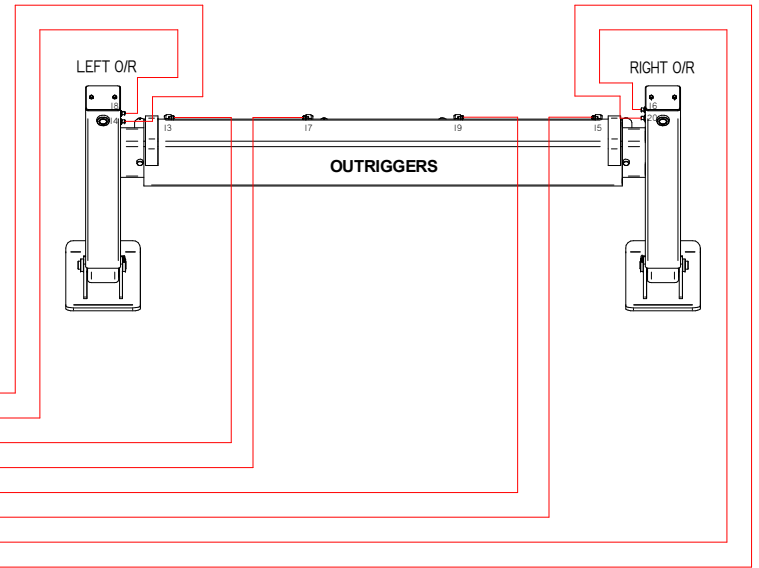
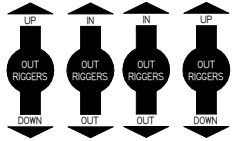
| Labeled Wire and Color List | | | |
|--------------------------------|-----------------------------|------------|-------------|
| Wire Label | Part Number Printed on Wire | Wire Gauge | Wire Color |
| TCM 143 | EL03005LGR-143 | 16 | Light Green |
| TCM 145 | EL03005BL-145 | 16 | Blue |
| TCM 130 | EL03005YE-130 | 16 | Yellow |
| ENGINE KILL | EL03005GY-K | 16 | Gray |
| THROTTLE | EL03005TN-THR | 16 | Tan |
| HORN | EL03005WH-H | 16 | White |
| STROBE | | 16 | Orange |
| WORK LIGHT | EL03005OR-WL | 16 | Orange |
| STREET SIDE WORK LIGHT | EL03005OR-SWL | 16 | Orange |
| CURB SIDE WORK LIGHT | EL03005OR-CWL | 16 | Orange |
| 12 VOLT IGN | EL03009RD-12v | 14 | Red |
| PTO LIGHT/FEEDBACK | EL03005LBU-PTO | 16 | Light Blue |
| Ground | EL03005BLA-GR | 16 | Black |
| Use for Atlas Solenoids | | | |
| O/R Left Up | EL03005YE-LU | 16 | Yellow |
| O/R Left Down | EL03005GR-LD | 16 | Green |
| O/R Left In | EL03005BLA-LI | 16 | Black |
| O/R Left Out | EL03005BLU-LO | 16 | Blue |
| O/R Right Up | EL03005PI-RU | 16 | Pink |
| O/R Right Down | EL03005VI-RD | 16 | Violet |
| O/R Right In | EL03005BR-RI | 16 | Brown |
| O/R Right Out | EL03005OR-RO | 16 | Orange |
| Body Dump | EL03005LBU-BD | 16 | Light Blue |
| Use For Rear Steer | | | |
| O/R Right Up | EL03005PI-RU | 16 | Pink |
| O/R Right Down | EL03005VI-RD | 16 | Violet |
| O/R Right In | EL03005BR-RI | 16 | Brown |
| O/R Right Out | EL03005OR-RO | 16 | Orange |
| Body Dump | EL03005LBU-BD | 16 | Light Blue |
| REMOTE START/STOP | EL03005BR-SS | 16 | Brown |
| RS2 Throttle Voltage | EL03005RD-TH | 16 | Red |
| RS2 Throttle Ground | EL03005BLA-TH | 16 | Black |
| RS2 Throttle Signal | EL03005WH-TH | 16 | White |

WORK PORTS DIAGRAM



| | | | |
|---|--------------|--|----------------------|
| | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 II SECTION VALVE BANK WITH MID INLET - STANDARD | | | |
| PART NUMBER: 52 07 01 042 0 | | SCALE: NA | |
| DRAWN BY: STW | APPROVED BY: | DATE: 10/28/2016 | SHEET: 1 OF 2 |

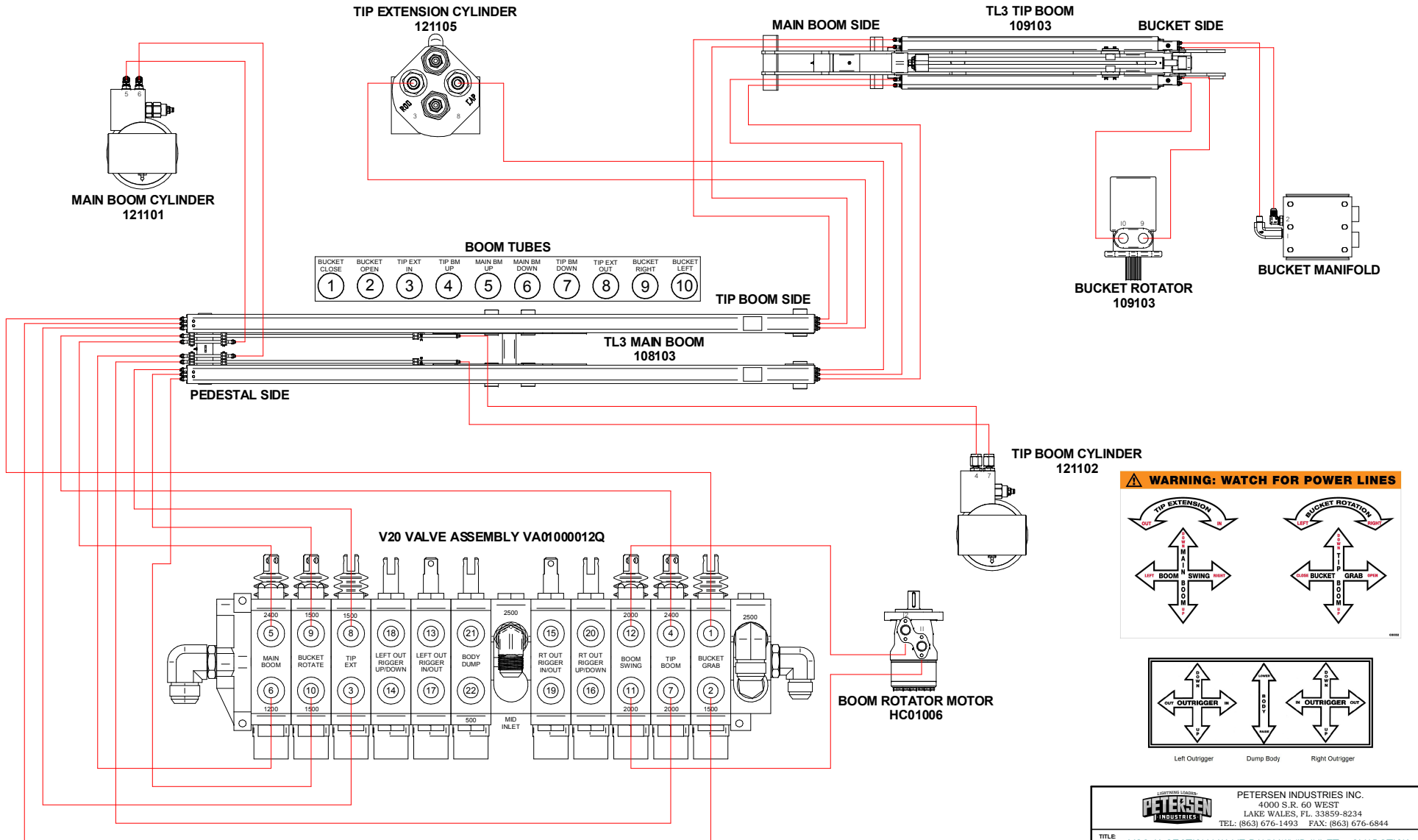
**WORK PORTS DIAGRAM
(CONTINUED)**



BODY HOIST CYLINDERS
NOTE: ON 22' BODIES AND LARGER HOIST IS POWER UP & GRAVITY DOWN. UP PORT RELIEF IS THEN SET TO 3100 PSI AND MAIN RELIEF IS SET TO 3000 PSI. DEPENDING ON CONTROL OPTION BODY HOIST VALVE MAYBE SEPERATE VALVE BANK.

| | | | |
|---|--------------|--|----------------------|
| | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 II SECTION VALVE BANK WITH MID INLET - STANDARD | | | |
| PART NUMBER: 52 07 01 042 0 | | | SCALE: NA |
| DRAWN BY: <i>STW/B</i> | APPROVED BY: | DATE: 10/28/2016 | SHEET: 2 OF 2 |

WORK PORTS DIAGRAM



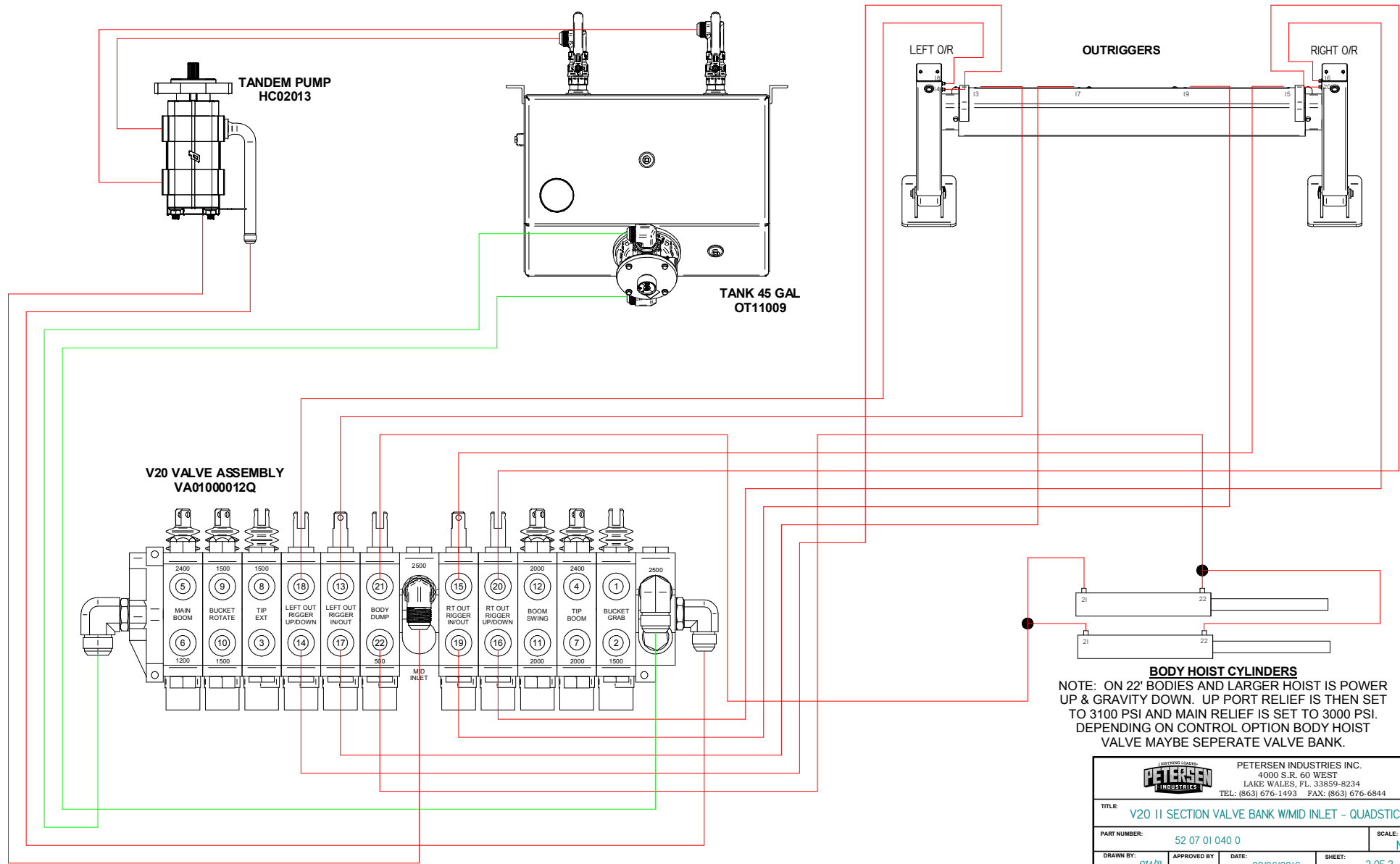
PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844


TITLE: V20 11 SECTION VALVE BANK W/MID INLET - QUADSTICK

PART NUMBER: 52 07 01 040 0 **SCALE:** 1:4

DRAWN BY: STW **APPROVED BY:** **DATE:** 09/06/2016 **SHEET:** 1 OF 2

**WORK PORTS DIAGRAM
(CONTINUED)**



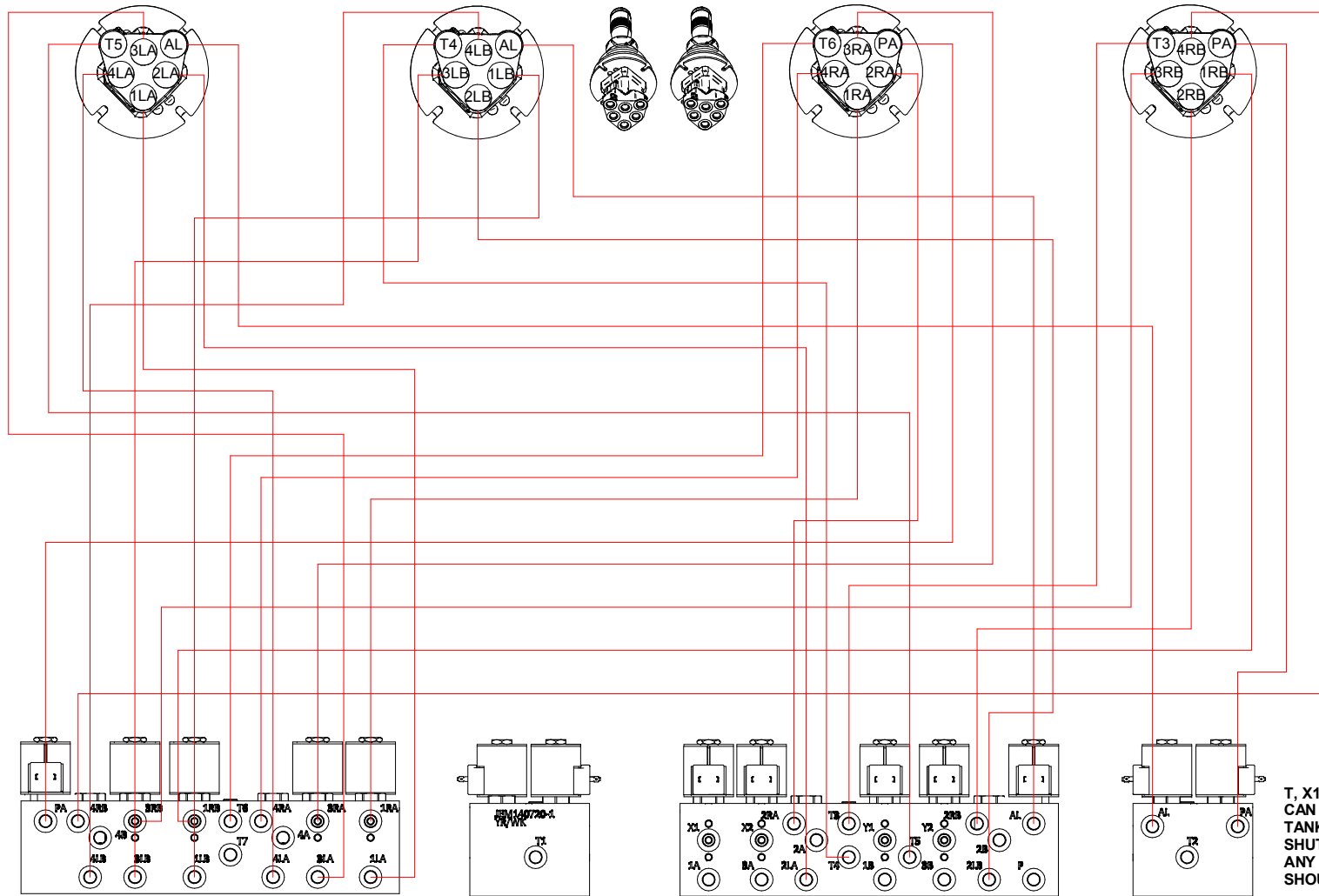
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|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 11 SECTION VALVE BANK W/MID INLET - QUADSTICK | | | |
| PART NUMBER: 52 07 01 040 0 | | | SCALE: NA |
| DRAWN BY: STW/B | APPROVED BY: | DATE: 09/06/2016 | SHEET: 2 OF 2 |

**PILOT CONTROL
DIAGRAM**

PRESSURE
SUCTION

**LEFT JOYSTICKS
VA02000004**

**RIGHT JOYSTICKS
VA02000004**



**SHUTTLE MANIFOLD
VA13001**

T, X1, X2, Y1, Y2
CAN BE USED AS
TANK PORTS ON
SHUTTLE MANIFOLD.
ANY UNUSED PORTS
SHOULD BE PLUGGED.



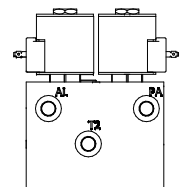
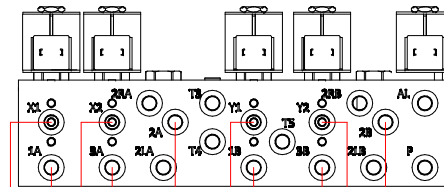
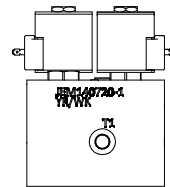
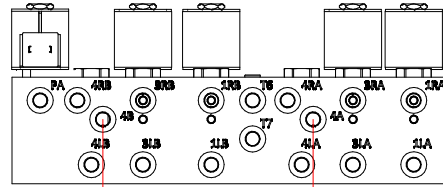
PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|--|--------------|-------------------------|----------------------|
| TITLE: V20 DUAL WALK THRU PILOT HYD CNTRL PLUMBING/WIRING | | | |
| PART NUMBER: 52 07 14 006 1 | | | SCALE: NA |
| DRAWN BY: SWB | APPROVED BY: | DATE: 10/27/2016 | SHEET: 1 OF 5 |

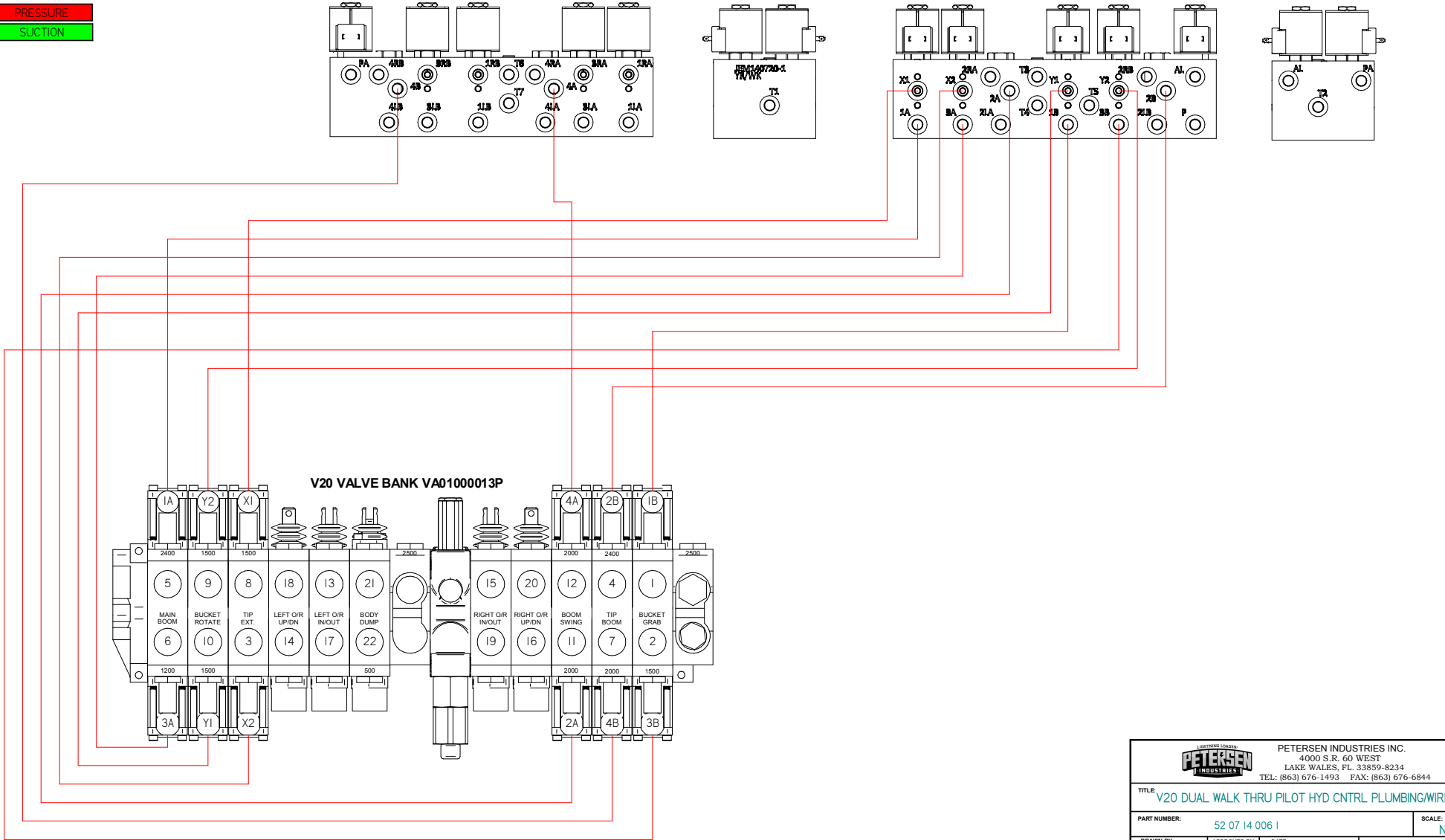
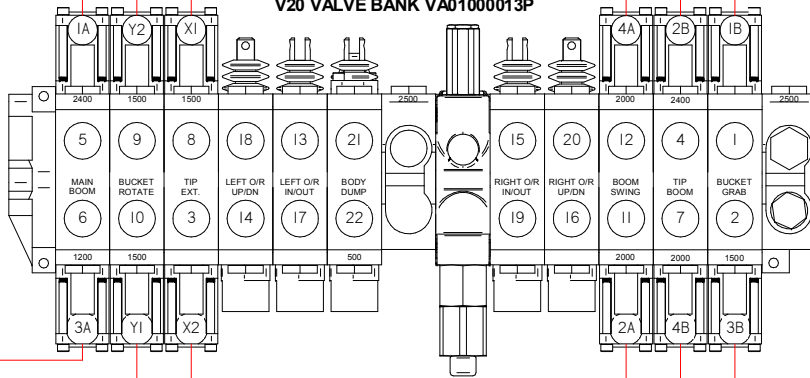
**PILOT CONTROL
DIAGRAM**

PRESSURE
SUCTION

**SHUTTLE MANIFOLD
VA13001**

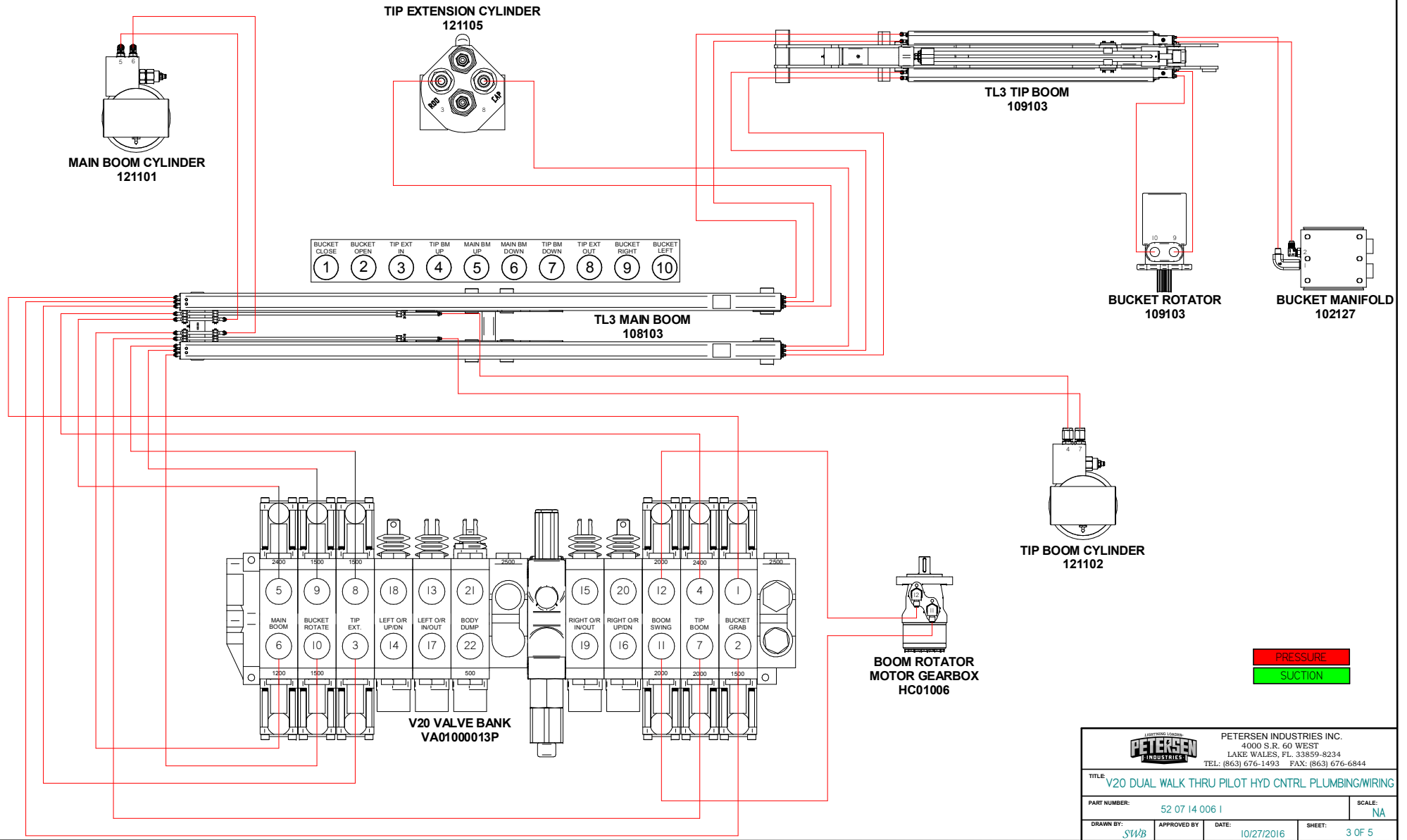



V20 VALVE BANK VA01000013P



| | | | |
|--|--------------|--|----------------------|
| | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 DUAL WALK THRU PILOT HYD CNTRL PLUMBING/WIRING | | | |
| PART NUMBER: 52 07 14 006 1 | | | SCALE: NA |
| DRAWN BY: <i>SWB</i> | APPROVED BY: | DATE: 10/27/2016 | SHEET: 2 OF 5 |

WORK PORTS DIAGRAM

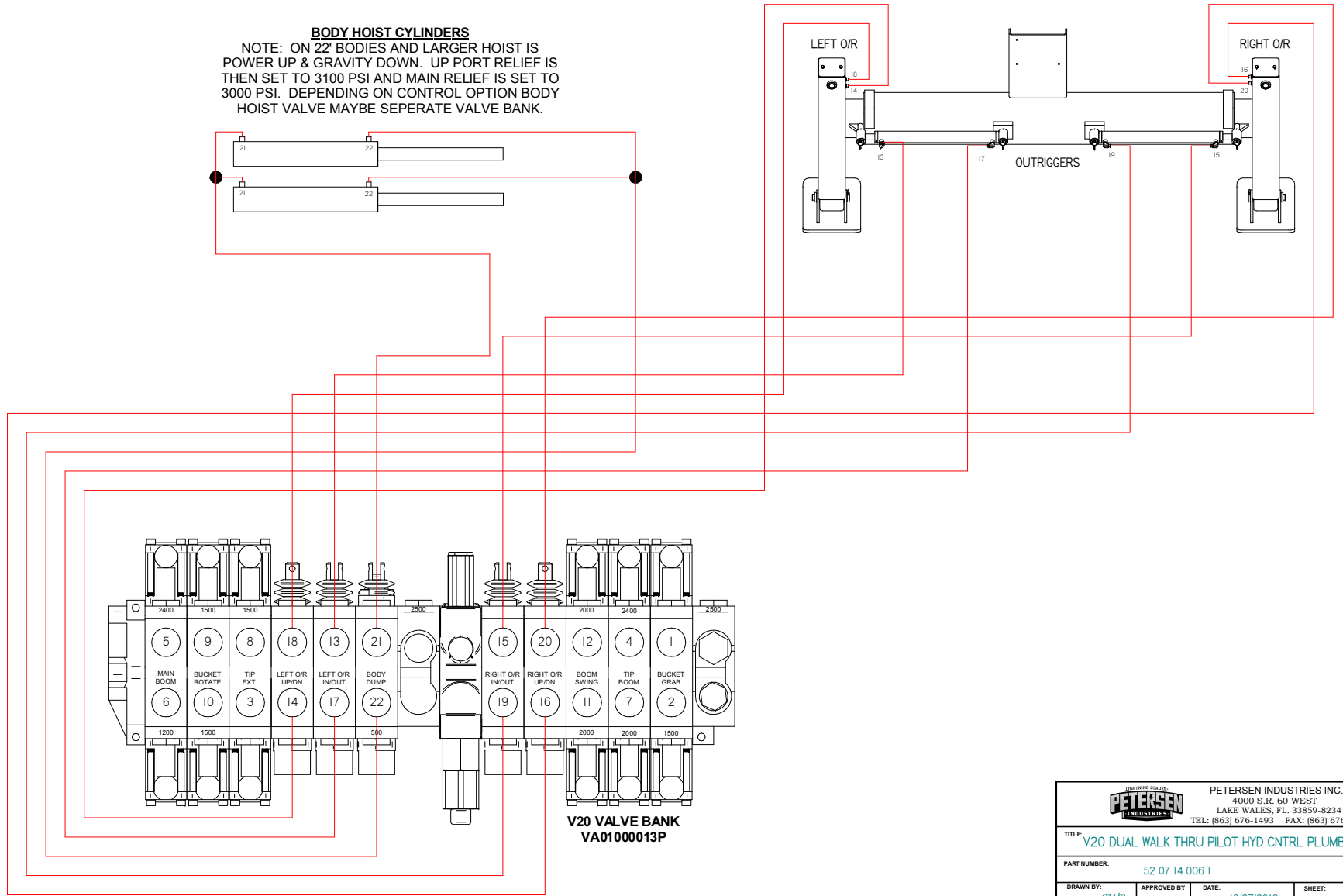


| | | | |
|---|--------------|--|---------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 DUAL WALK THRU PILOT HYD CNTRL PLUMBING/WIRING | | | |
| PART NUMBER: 52 07 14 006 1 | | | SCALE: NA |
| DRAWN BY: SWB | APPROVED BY: | DATE: 10/27/2016 | SHEET: 3 OF 5 |

WORK PORTS DIAGRAM

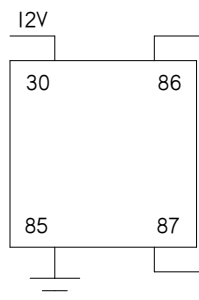
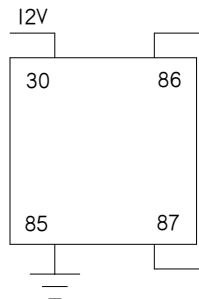
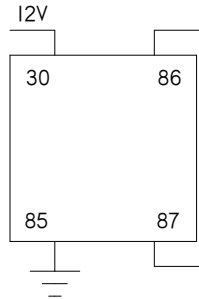
- PRESSURE
- SUCTION
- LOAD SENSE
- CONTROLS

BODY HOIST CYLINDERS
 NOTE: ON 22' BODIES AND LARGER HOIST IS POWER UP & GRAVITY DOWN. UP PORT RELIEF IS THEN SET TO 3100 PSI AND MAIN RELIEF IS SET TO 3000 PSI. DEPENDING ON CONTROL OPTION BODY HOIST VALVE MAYBE SEPERATE VALVE BANK.



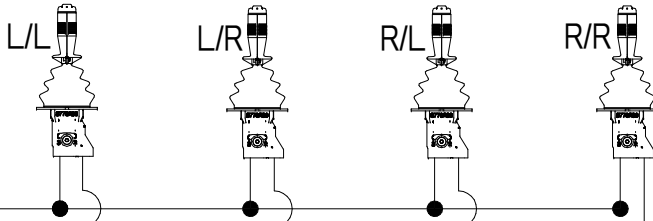
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|--|--------------|--|----------------------|
| <small>LIGHTING SYMBOL</small> PETERSEN INDUSTRIES | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 DUAL WALK THRU PILOT HYD CNTRL PLUMBING/WIRING | | | |
| PART NUMBER: 52 07 14 006 1 | | | SCALE: NA |
| DRAWN BY: SWB | APPROVED BY: | DATE: 10/27/2016 | SHEET: 4 OF 5 |

ELECTRICAL DIAGRAM



PTO OUTPUT RED

LEFT SIDE JOYSTICKS

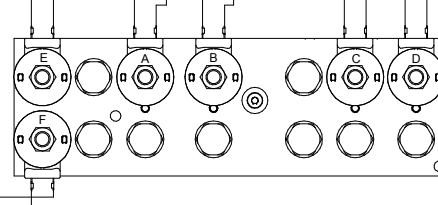
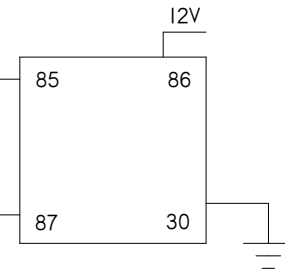
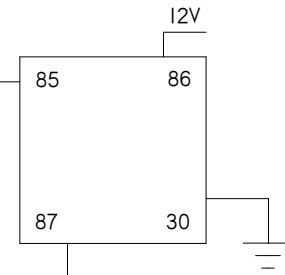


RIGHT SIDE JOYSTICKS

TO SOLENOID E TRIGGERS LEFT JOYSTICKS

TO SOLENOID F TRIGGERS RIGHT JOYSTICKS

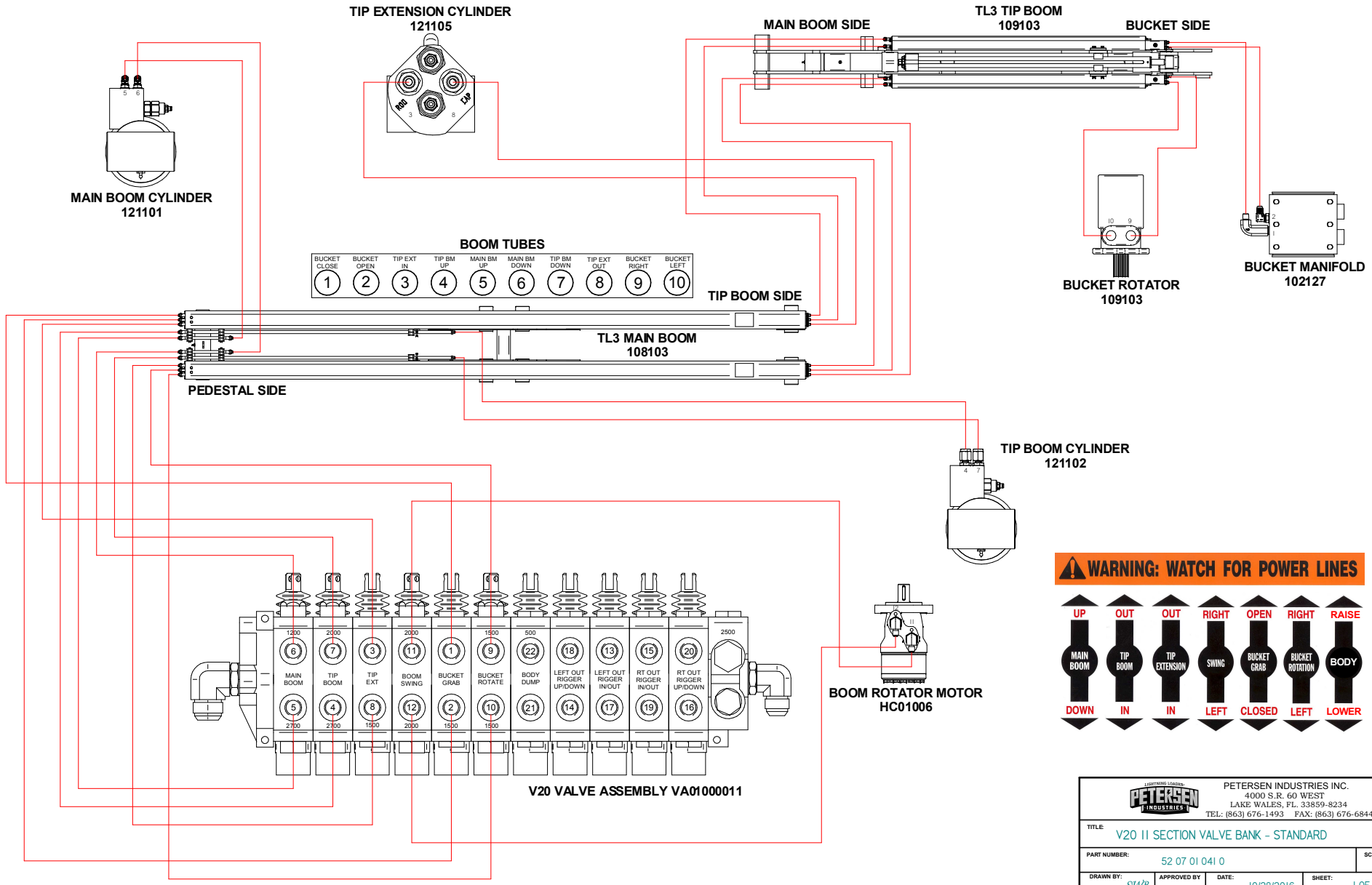
LEFT / OFF / RIGHT



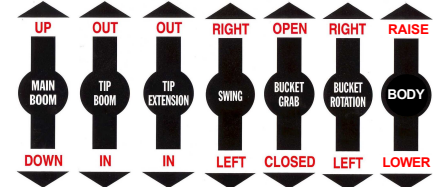
PILOT CONTROL MANIFOLD

| | | | |
|--|--------------|--|---------------|
| | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 DUAL WALK THRU PILOT HYD CNTRL PLUMBING/WIRING | | | |
| PART NUMBER: 52 07 14 006 1 | | | SCALE: NA |
| DRAWN BY: <i>SWB</i> | APPROVED BY: | DATE: 10/27/2016 | SHEET: 5 OF 5 |

WORK PORTS DIAGRAM

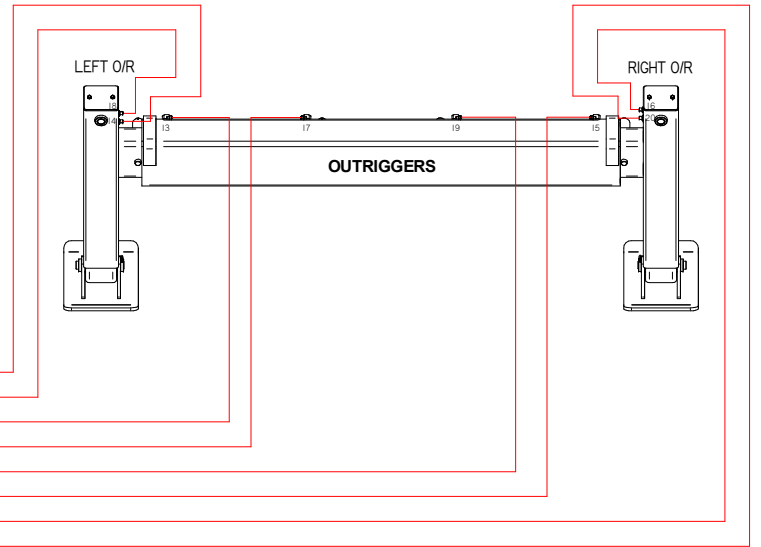
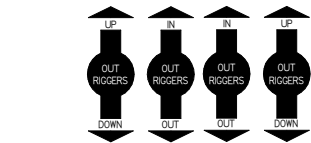


WARNING: WATCH FOR POWER LINES

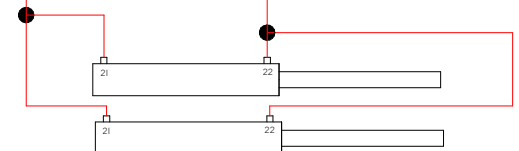
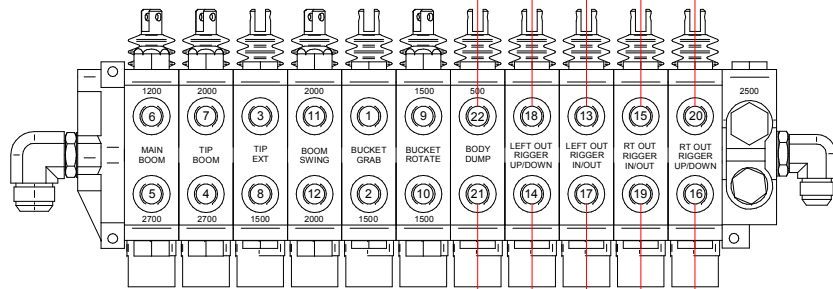


| | | | |
|--|--------------|--|----------------------|
| PETERSEN INDUSTRIES | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 II SECTION VALVE BANK - STANDARD | | | |
| PART NUMBER: 52 07 01 041 0 | | | SCALE: NA |
| DRAWN BY: STW/B | APPROVED BY: | DATE: 10/28/2016 | SHEET: 1 OF 2 |

**WORK PORTS DIAGRAM
(CONTINUED)**




V20 VALVE ASSEMBLY VA01000011

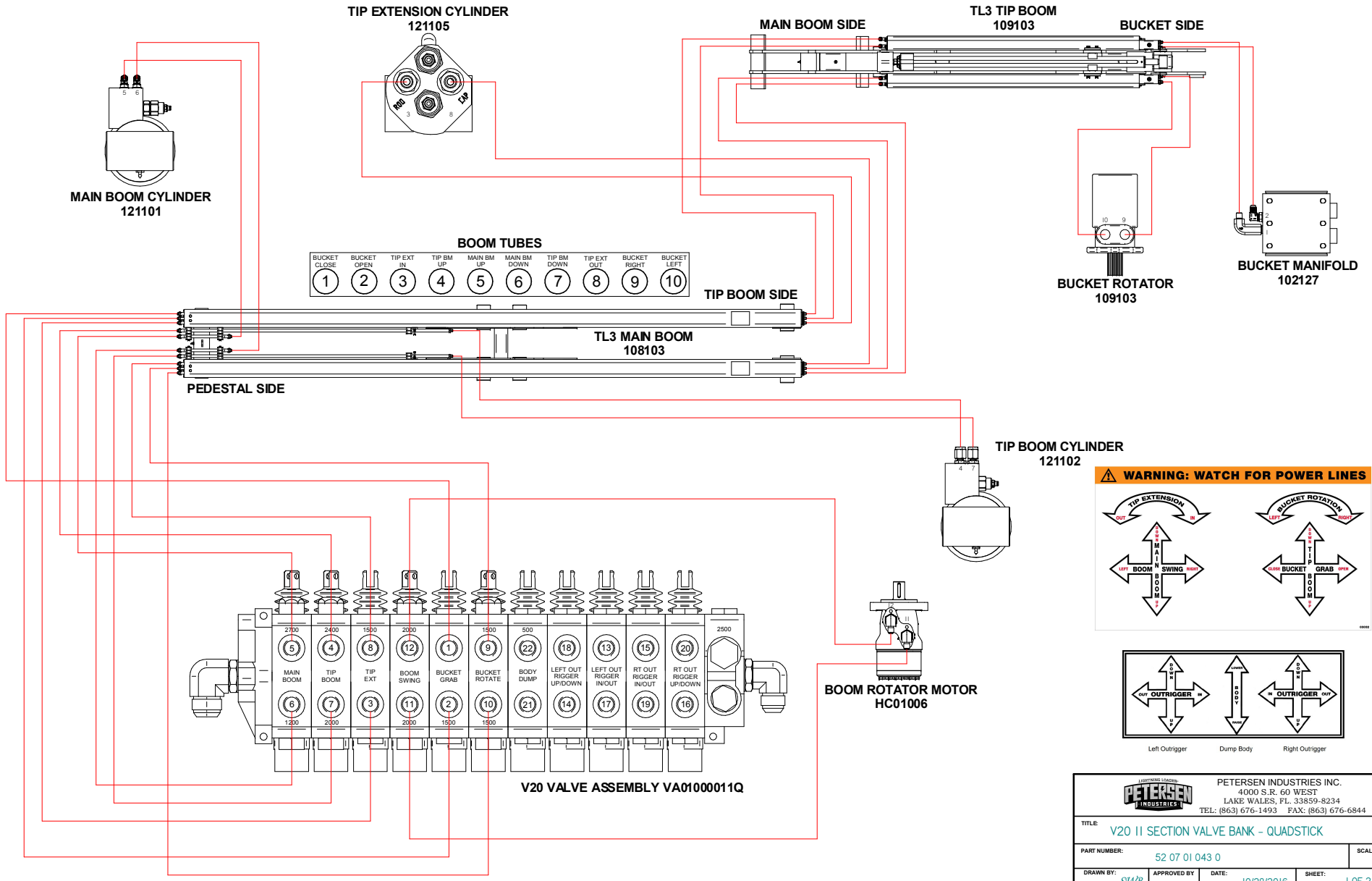


BODY HOIST CYLINDERS

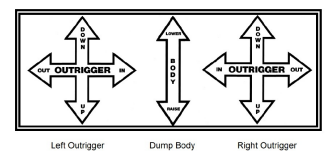
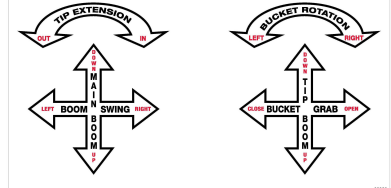
NOTE: ON 22' BODIES AND LARGER HOIST IS POWER UP & GRAVITY DOWN. UP PORT RELIEF IS THEN SET TO 3100 PSI AND MAIN RELIEF IS SET TO 3000 PSI. DEPENDING ON CONTROL OPTION BODY HOIST VALVE MAYBE SEPERATE VALVE BANK.

| | | | |
|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 II SECTION VALVE BANK - STANDARD | | | |
| PART NUMBER: 52 07 01 041 0 | | | SCALE: NA |
| DRAWN BY: <i>STW/B</i> | APPROVED BY: | DATE: 10/28/2016 | SHEET: 2 OF 2 |

WORK PORTS DIAGRAM



WARNING: WATCH FOR POWER LINES



PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
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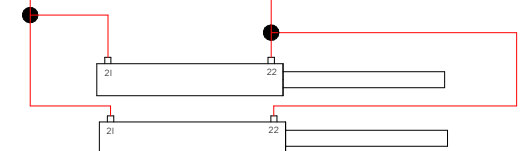
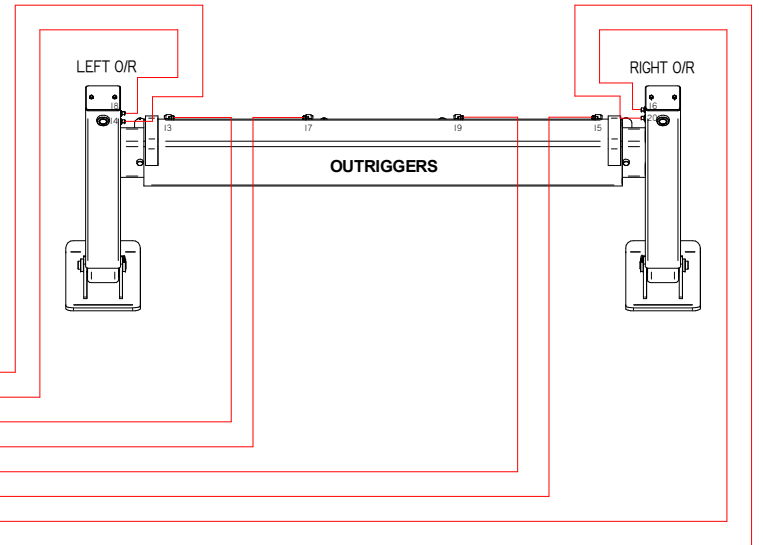
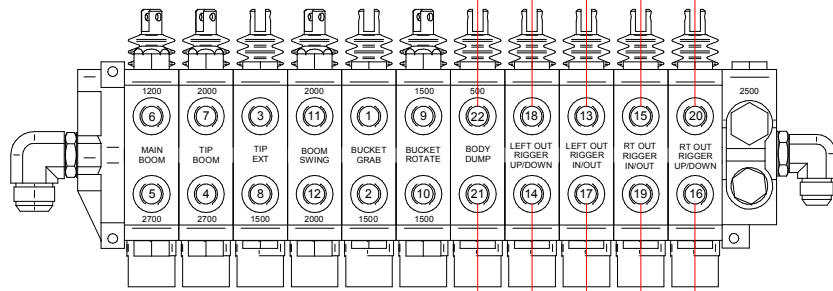
TITLE: V20 II SECTION VALVE BANK - QUADSTICK

PART NUMBER: 52 07 01 043 0 **SCALE:** NA


DRAWN BY: STW/B **APPROVED BY:** **DATE:** 10/28/2016 **SHEET:** 1 OF 2

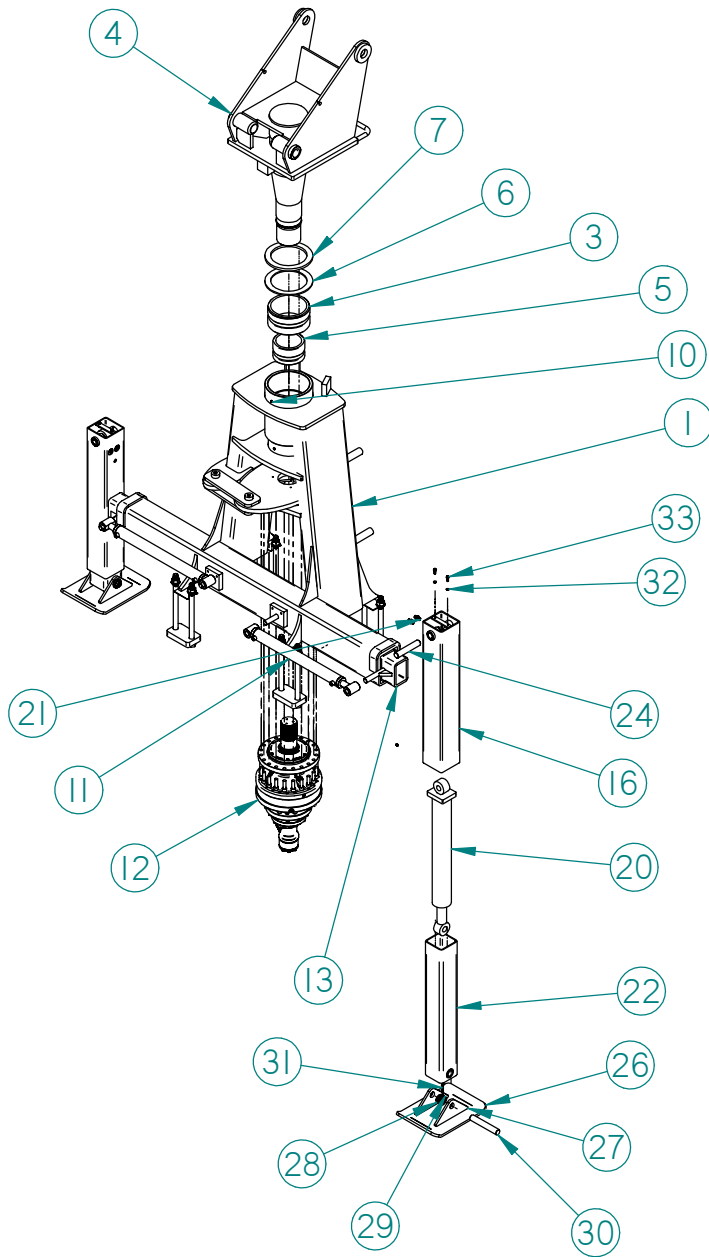
**WORK PORTS DIAGRAM
(CONTINUED)**

V20 VALVE ASSEMBLY VA01000011Q




BODY HOIST CYLINDERS
 NOTE: ON 22' BODIES AND LARGER HOIST IS POWER UP & GRAVITY DOWN. UP PORT RELIEF IS THEN SET TO 3100 PSI AND MAIN RELIEF IS SET TO 3000 PSI. DEPENDING ON CONTROL OPTION BODY HOIST VALVE MAYBE SEPERATE VALVE BANK.



| | | | |
|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: V20 II SECTION VALVE BANK - QUADSTICK | | | |
| PART NUMBER: 52 07 01 043 0 | | | SCALE: NA |
| DRAWN BY: <i>STW/B</i> | APPROVED BY: | DATE: 10/28/2016 | SHEET: 2 OF 2 |

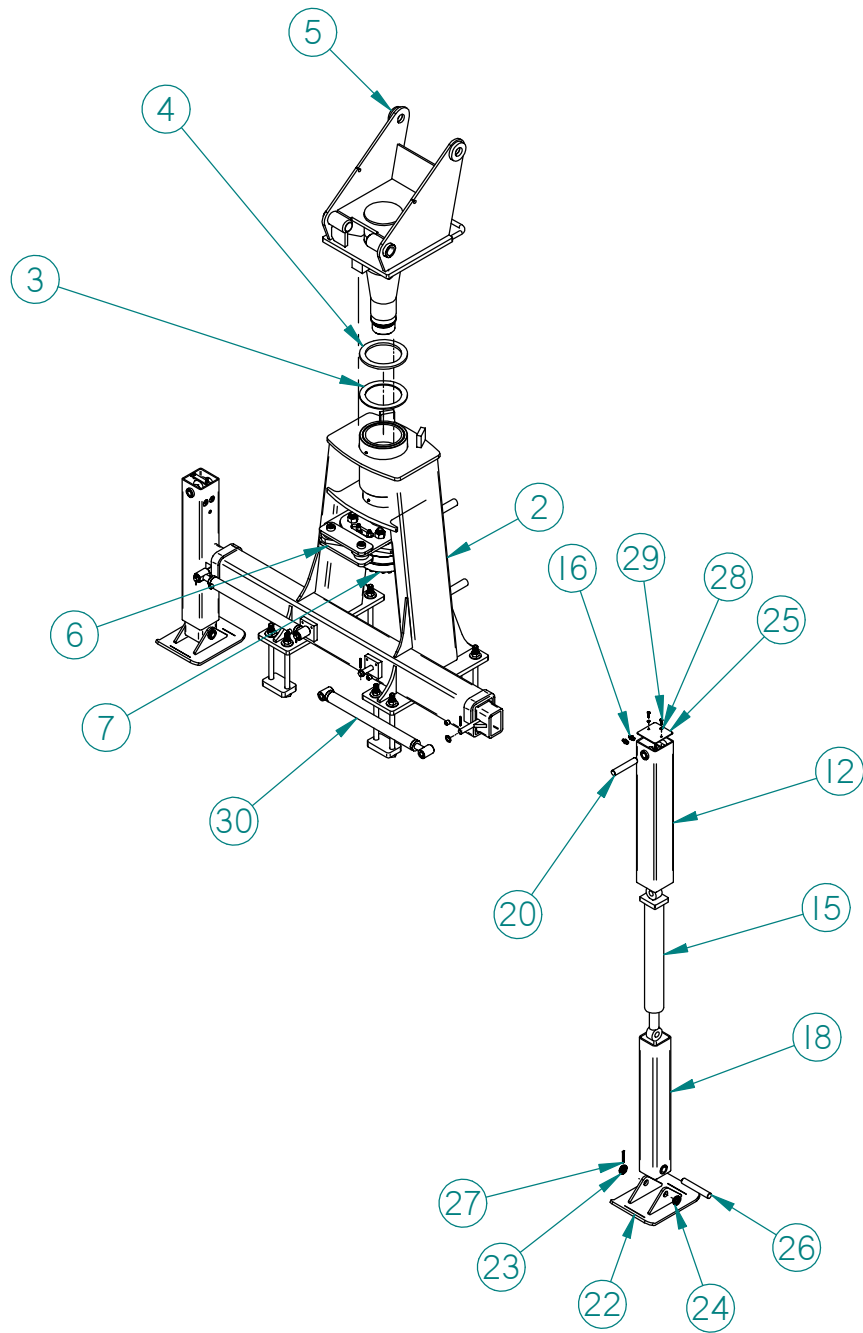


NOTE: FOR HA36 12 INCH
EXTENDED PEDESTAL
SEE PART NUMBER 106116

| | | | |
|---|--------------|---|------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TL GEARBOX HEAD PEDESTAL AND O_R ASSEMBLY | | | |
| PART NUMBER: 02 02 13 001 6 / NA | | | SCALE: 1:40 |
| DRAWN BY: <i>SWB</i> | APPROVED BY: | DATE: 1/13/2016 | SHEET: 1 OF 2 |

| Item # | Part Name | Order by this # | Quantity | Item # | Part Name | Order by this # | Quantity |
|--------|---|-----------------|----------|--------|--|-----------------|----------|
| 1 | PEDESTAL, TL GEARBOX WELDMENT | I06104 | 1 | 21 | HYDRAULIC, FITTING #6-6 MALE CONNECTOR | HF060606 | 4 |
| 2 | GEARBOX TORQUE ARM ASSEMBLY - IN-LINE | I14101 | 1 | 22 | OUTRIGGER, #3 VERTICAL LEG INNER TUBE | I13112 | 2 |
| 3 | PEDESTAL BEARING HOUSING UPPER BUSHING | BU509002 | 1 | 23 | SPOOL, OUTRIGGER LEG CYLINDER LOWER | I15108 | 4 |
| 4 | HEAD WELDMENT FOR GEARBOX | I07105 | 1 | 24 | PIN, VERTICAL CYLINDER, BASE END | PI18106F1 | 2 |
| 5 | PEDESTAL BEARING HOUSING LOWER BUSHING | BU507005 | 1 | 25 | ROLL PIN, .3125 X 2 | FA040532 | 2 |
| 6 | TRASH HEAD-PEDESTAL SPACER | I06210 | 1 | 26 | OUTRIGGER, FOOT PLATE | I13109 | 2 |
| 7 | TRASH HEAD PEDESTAL NYLATRON SPACER | BU510002 | 1 | 27 | OUTRIGGER FOOT MOUNTING EAR | I13108 | 4 |
| 8 | TRASH HEAD LOCK - COLLAR | I17103 | 2 | 28 | COLLAR - 42 | I16102 | 2 |
| 9 | BOLT HEX 1/2-13 X 3.00 USS G5 | BL308048U513 | 2 | 29 | COLLAR # 42 WITH HOLE | I16103 | 2 |
| 10 | HYDRAULIC, .125 STRAIGHT GREASE FITTING | HF2002S | 4 | 30 | PIN, VERTICAL CYL, ROD END | PI18122F | 2 |
| 11 | OUTRIGGER IN/OUT CYLINDER | CY05001 | 2 | 31 | COTTER PIN, 5/16 X 3 | FA020548 | 2 |
| 12 | HYDRAULIC, DINAMIC GEARBOX/MOTOR ASSEMBLY | HC01005-110 | 1 | 32 | WASHER LOCK 5/16 SPLIT | WAS055 | 4 |
| 13 | OUTRIGGER, #3A INNER HORIZONTAL TUBE | I13115 | 2 | 33 | HEX BOLT 5/16-18 X 1 USS G5 | BL305016U518 | 4 |
| 14 | OUTRIGGER PIN, 10" LONG | PI16160F | 2 | 35 | OUTRIGGER VERTICAL LEG COVER PLATE | I13107 | 2 |
| 15 | OUTRIGGER, #3A HORIZONTAL TUBE PIN GUSSET | I13116 | 2 | | | | |
| 16 | OUTRIGGER, #3A VERTICAL LEG OUTER TUBE | I13111 | 2 | | | | |
| 17 | SPOOL, OUTRIGGER LEG CYLINDER UPPER W/HOLE | I15107 | 2 | | | | |
| 18 | SPOOL, OUTRIGGER LEG CYLINDER UPPER | I15106 | 2 | | | | |
| 19 | OUTRIGGER COVER PLATE BRACKET | I13110 | 2 | | | | |
| 20 | CYLINDER, OUTRIGGER, VERTICAL LEG EXTENSION | CY05003 | 2 | | | | |

| | | | |
|---|---------------------|---|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TL GEARBOX HEAD PEDESTAL AND O_R ASSEMBLY | | | |
| PART NUMBER: 02 02 13 001 6 / NA | | | SCALE: |
| DRAWN BY:  | APPROVED BY: | DATE: 1/13/2016 | SHEET: 2 OF 2 |




NOTE: FOR HA36 12 INCH
EXTENDED PEDESTAL
SEE PART NUMBER 106116



PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

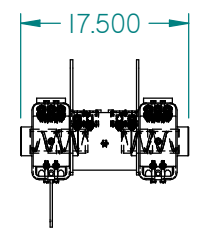
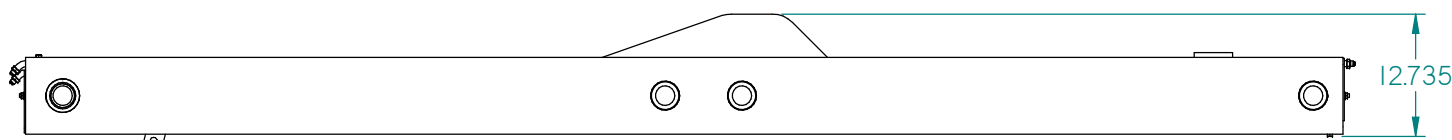
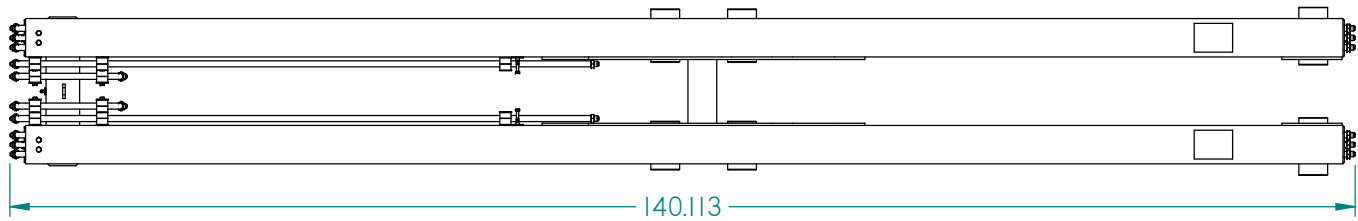
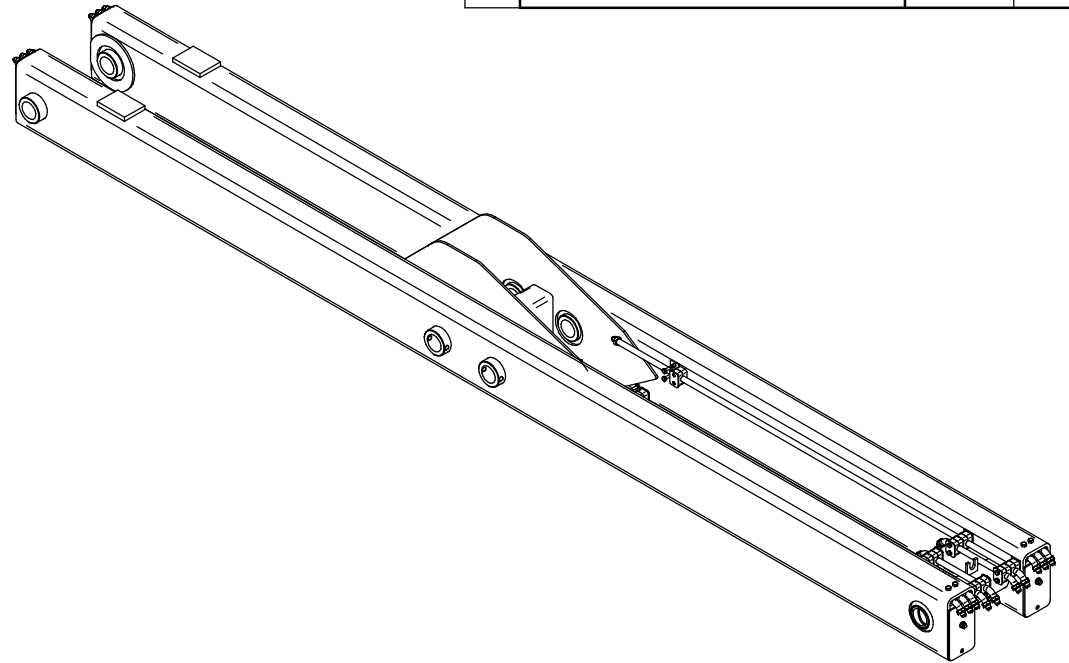
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|---------------------------------------|--------------|-----------|--------|
| TITLE: | | | |
| HA36, HEAD, PEDESTAL AND O/R ASSEMBLY | | | |
| PART NUMBER: | | | SCALE: |
| 02 02 10 001 8 | | | |
| DRAWN BY: | APPROVED BY: | DATE: | SHEET: |
| SWB | | 1/18/2016 | 1 OF 2 |


| Item # | Part Name | Order by this # | Quantity |
|--------|---|-----------------|----------|
| 1 | PEDESTAL TL HA36 ASSEMBLY | 106110 | 1 |
| 2 | PEDESTAL, TL HA-36 WELDMENT | 106103 | 1 |
| 3 | TRASH HEAD-PEDESTAL SPACER | 106210 | 1 |
| 4 | TRASH HEAD PEDESTAL NYLATRON SPACER | BU510002 | 1 |
| 5 | HEAD WELDMENT FOR HA36 | 107104 | 1 |
| 6 | HA-36 TORQUE ARM ASSEMBLY | 114103 | 1 |
| 7 | HYDRAULIC, ACTUATOR HA36 | HC01001 | 1 |
| 8* | NUT HEX 1-1/4 - 7 UNC CENTERLOCK | NUC20U | 4 |
| 9* | FITTING, RESTRICTOR 06M JIC 06F JIC | HF906063056FM | 2 |
| 10 | RL & RS MODEL 3 OUTRIGGER VERTICAL LEG ASSEMBLY | 113103 | 1 |
| 11 | OUTRIGGER LEG OUTER TUBE | 113104 | 1 |
| 12 | OUTRIGGER, #3A VERTICAL LEG OUTER TUBE | 113111 | 1 |
| 13* | SPOOL, OUTRIGGER LEG CYLINDER UPPER WHOLE | 115107 | 1 |
| 14* | SPOOL, OUTRIGGER LEG CYLINDER UPPER | 115106 | 1 |
| 15 | CYLINDER, OUTRIGGER, VERTICAL LEG EXTENSION | CY05003 | 1 |
| 16 | HYDRAULIC, FITTING #6-6 MALE CONNECTOR | HF060606 | 2 |
| 17 | OUTRIGGER, LEG INNER TUB | 113105 | 1 |
| 18 | OUTRIGGER, #3 VERTICAL LEG INNER TUBE | 113112 | 1 |
| 19* | SPOOL, OUTRIGGER LEG CYLINDER LOWER | 115108 | 2 |
| 20 | PIN, VERTICAL CYLINDER, BASE END | PI18106F1 | 1 |
| 21 | OUTRIGGER FOOT ASSEMBLY | 113106 | 1 |
| 22 | OUTRIGGER, FOOT PLATE | 113109 | 1 |
| 23 | COLLAR # 42 WITH HOLE | 116103 | 1 |
| 24 | COLLAR - 42 | 116102 | 1 |
| 25 | OUTRIGGER VERTICAL LEG COVER PLATE | 113107 | 1 |
| 26 | PIN - OUTRIGGER LEG CYLINDER LOWER | PI18122F | 1 |
| 27 | COTTER PIN, 5/16 X 3 | FA020548 | 1 |
| 28 | WASHER LOCK 5/16 SPLIT | WAS055 | 2 |
| 29 | HEX BOLT 5/16-18 X 1 USS G5 | BL305016U518 | 2 |
| 30 | OUTRIGGER IN/OUT CYLINDER | CY05001 | 1 |

| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: HA36, HEAD, PEDESTAL AND O/R ASSEMBLY | | | |
| PART NUMBER: 02 02 10 001 8 | | | SCALE: |
| DRAWN BY: SWB | APPROVED BY: | DATE: 1/18/2016 | SHEET: 2 OF 2 |

010 ASSEMBLY

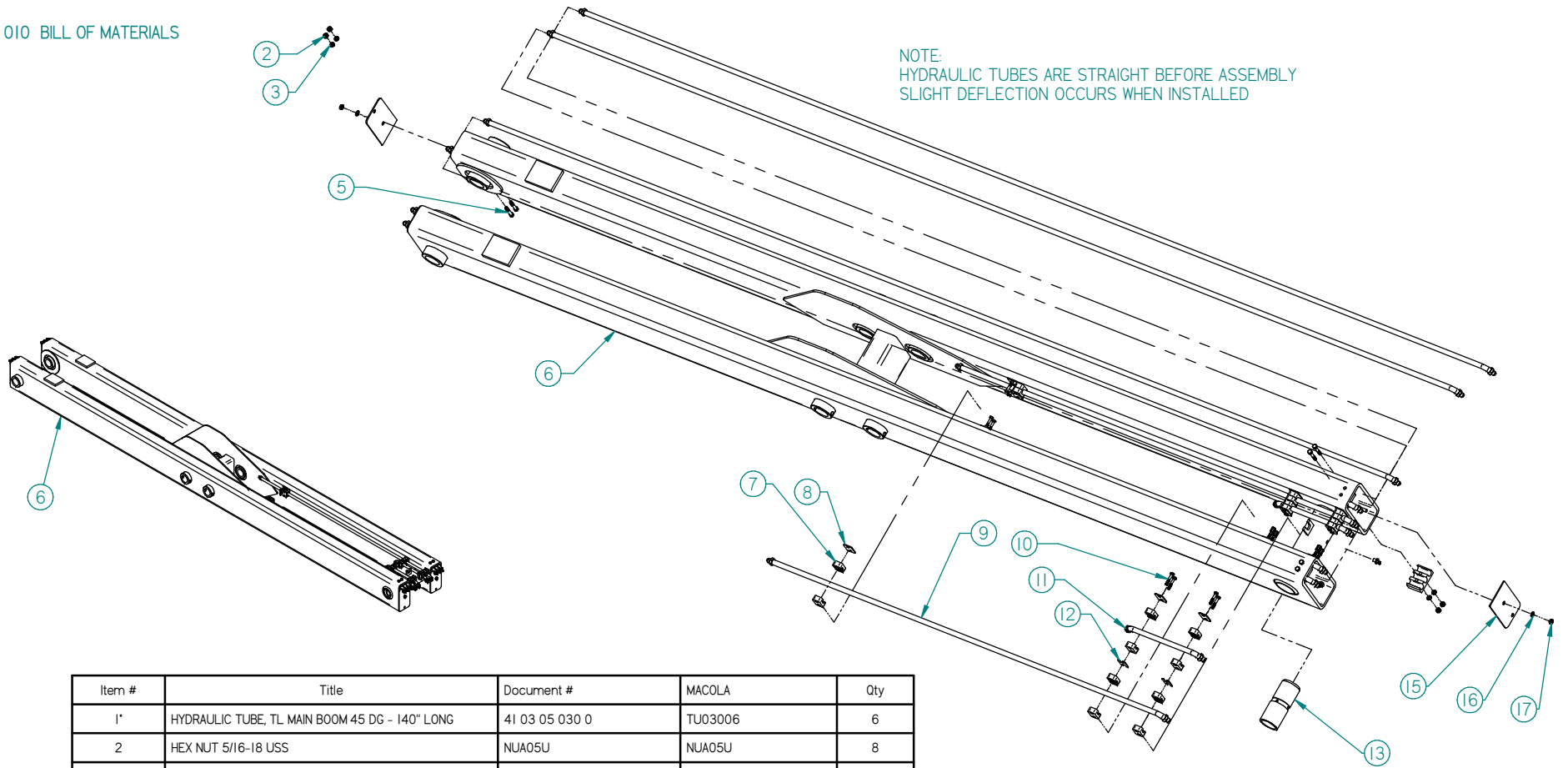
| REV. | DESCRIPTION | DATE | BY |
|------|-------------|------|----|
| - | - | - | - |




| TOLERANCES | |  | PETERSEN INDUSTRIES INC. | |
|----------------------------|---------|---|--------------------------|---------------|
| 1 DEC. | ± 0.100 | | 4000 S.R. 60 WEST | |
| 2 DEC. | ± 0.050 | LAKE WALES, FL. 33859-8234 | | |
| 3 DEC. | ± 0.010 | TEL: (863) 676-1493 FAX: (863) 676-6844 | | |
| ANGLE: | ± 1.000 | TITLE: MAIN BOOM TL3 ASSEMBLY | | |
| FRACTION: | ± 1/32" | PART NUMBER: 12 03 04 001 0 / 108103 | | SCALE: 1:20 |
| DIM. UNITS: | INCHES | DRAWN BY: OJ | | APPROVED BY: |
| SURFACE FINISH: | 125/32 | DATE: 08/04/2006 | | SHEET: 1 OF 2 |
| UNLESS OTHERWISE SPECIFIED | | | | |

010 BILL OF MATERIALS

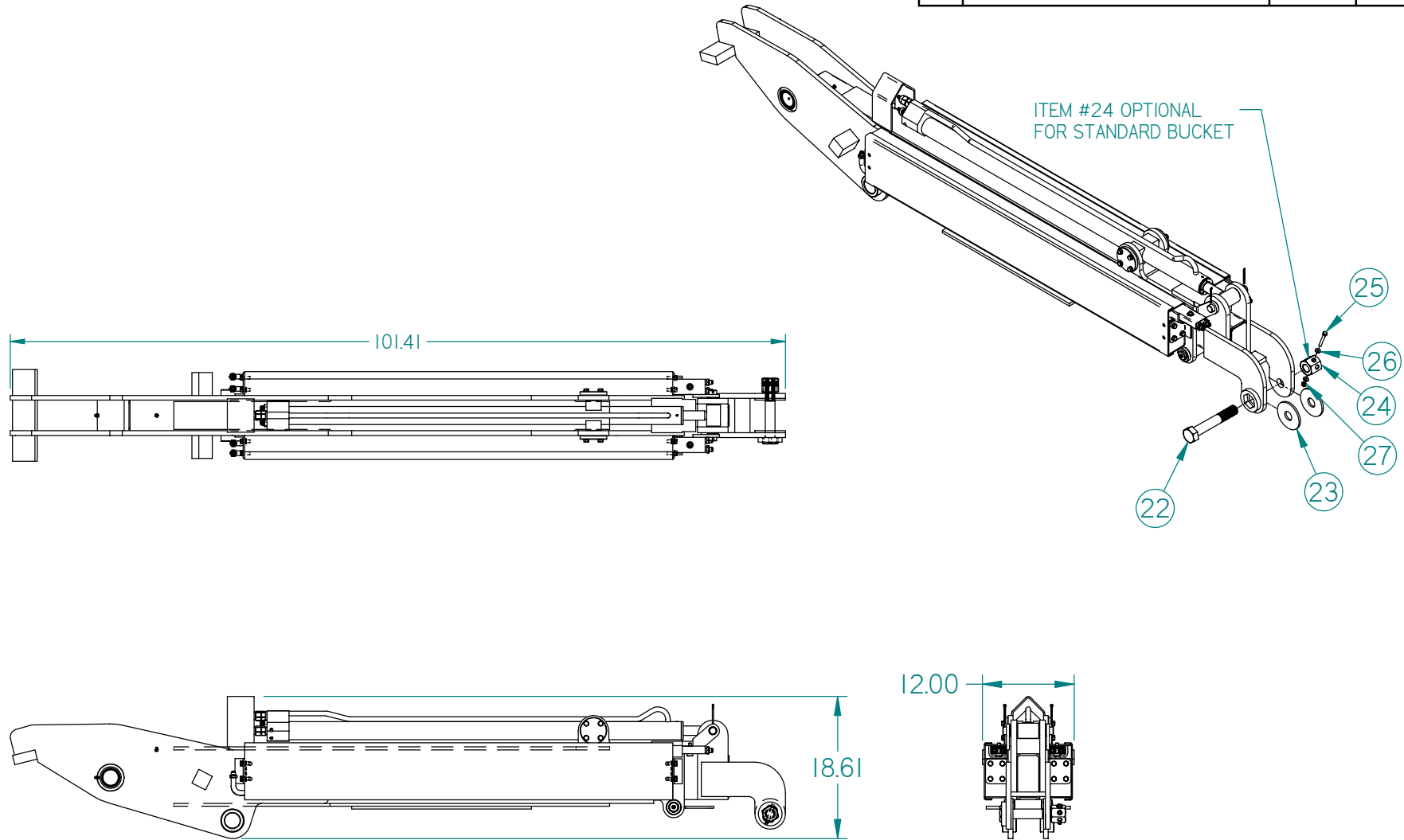
NOTE:
HYDRAULIC TUBES ARE STRAIGHT BEFORE ASSEMBLY
SLIGHT DEFLECTION OCCURS WHEN INSTALLED




| Item # | Title | Document # | MACOLA | Qty |
|--------|--|----------------|--------------|-----|
| 1' | HYDRAULIC TUBE, TL MAIN BOOM 45 DG - 140" LONG | 41 03 05 030 0 | TU03006 | 6 |
| 2 | HEX NUT 5/16-18 USS | NUA05U | NUA05U | 8 |
| 3 | WASHER LOCK 5/16 SPLIT | WAS055 | WAS055 | 8 |
| 4' | 3 HOLE CLAMP NYLATRON | 40 00 00 066 0 | CLT3N | 4 |
| 5 | HEX BOLT 5/16-18 X 2 UNC G5 | BL305032U518 | BL305032U518 | 8 |
| 6 | TL MAIN BOOM WELDMENT | 21 03 05 002 2 | I08152 | 1 |
| 7 | CLAMP, PLASTIC (I-HOLE) (I SET) | CLP210 | CLP210 | 10 |
| 8 | CLAMP, TOP PLATE ONLY (I-HOLE) | CL5G215 | CL5G215 | 6 |
| 9 | HYDRAULIC TUBE, TL MAIN BOOM 45 DG - 62" LONG | 41 03 05 029 0 | TU02002 | 2 |
| 10 | BOLT HEX 1/4-20 X 1-1/2 UNC G5 | BL304024U520 | BL304024U520 | 8 |
| 11 | HYDRAULIC TUBE, TL MAIN BOOM 45 DG - 12" LONG | 41 03 05 020 0 | TU03002 | 2 |
| 12 | CLAMP SAFETY PLATE | CL5G211 | CL5G211 | 4 |
| 13 | BUSHING, 2-1/2" X 2" X 6" NYLATRON | 41 03 05 028 2 | BU503004 | 2 |
| 14' | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 1 |
| 15 | TL MAIN BOOM END CAP | 41 03 05 007 2 | I08225 | 4 |
| 16 | WASHER LOCK 3/8 SPLIT | WAS065 | WAS065 | 4 |
| 17 | HEX NUT 3/8 -16 USS | NUA06U | NUA06U | 4 |

| | | | |
|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: MAIN BOOM TL3 ASSEMBLY | | | |
| PART NUMBER: 12 03 04 001 0 / I08103 | | SCALE: 1:20 | |
| DRAWN BY: <i>Oj</i> | APPROVED BY: | DATE: 08/04/2006 | SHEET: 2 OF 2 |

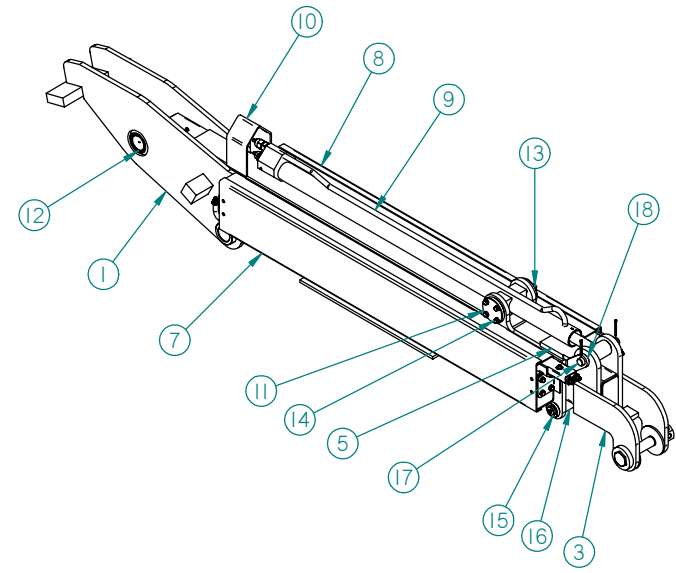
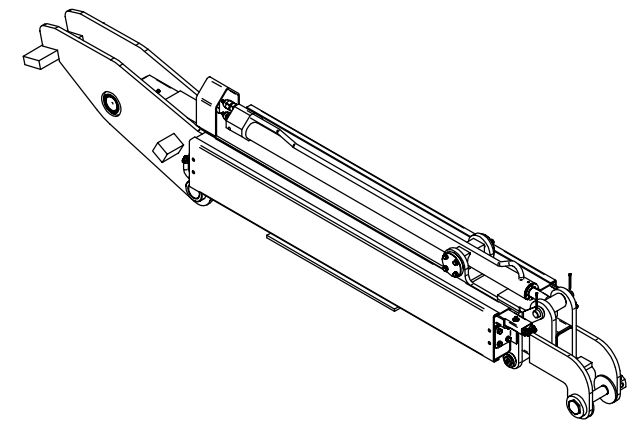
| REV. | DESCRIPTION | DATE | BY |
|------|-------------|------|----|
| - | - | - | - |




| TOLERANCES | |  | PETERSEN INDUSTRIES INC. | |
|----------------------------|----------|---|--------------------------|------------------|
| 1 DEC. | ± 0.100 | | 4000 S.R. 60 WEST | |
| 2 DEC. | ± 0.050 | LAKE WALES, FL. 33859-8234 | | |
| 3 DEC. | ± 0.010 | TEL: (863) 676-1493 FAX: (863) 676-6844 | | |
| ANGLE: | ± 1.000° | TITLE: TL3 TIP BOOM ASSEMBLY | | |
| FRACTION: | ± 1/32" | PART NUMBER: 12 04 04 002 1 / 109103 | | SCALE: 1:20 |
| DIM. UNITS: | INCHES | DRAWN BY: BRB | | |
| SURFACE FINISH: | 125/32 | APPROVED BY: | | DATE: 10/26/2016 |
| UNLESS OTHERWISE SPECIFIED | | SHEET: 1 OF 2 | | |

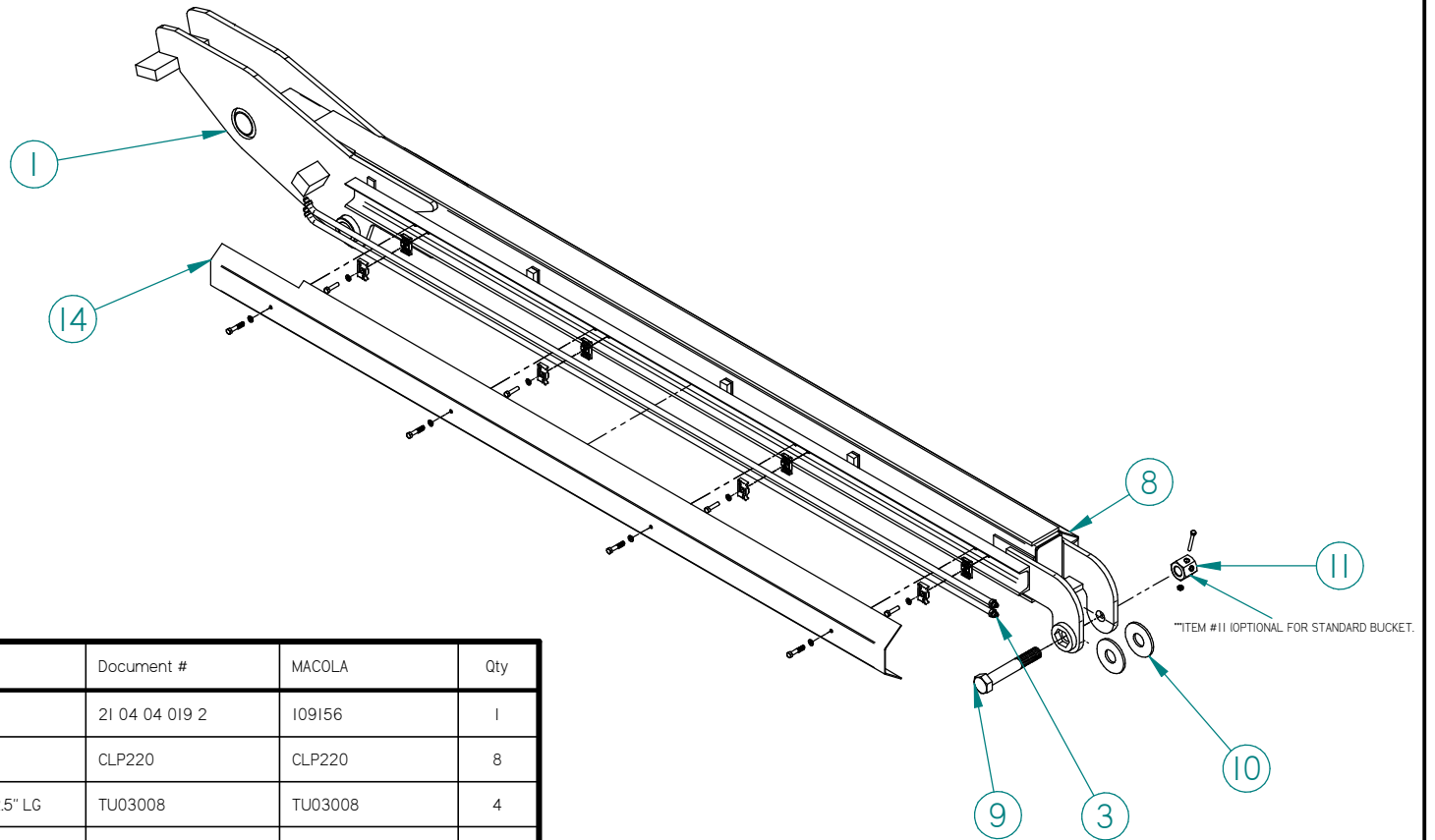
010 BILL OF MATERIALS

| Item # | Title | Document # | MACOLA | QTY |
|--------|---|----------------|--------------|-----|
| 1 | TL3 TIP BOOM OUTER WELDMNT | 21 04 04 011 1 | I09152 | 1 |
| 2' | TL3 TIP BOOM SIDE WEAR PAD 2-7/8 X 5 | 41 04 04 041 0 | BU303003 | 2 |
| 3 | TL3 TIP EXTENSION INNER TUBE WELDMNT | 21 04 04 010 3 | I09153 | 1 |
| 4' | TIP EXTENSION SQUARE WEAR PUCK | 41 04 04 028 1 | I09210 | 10 |
| 5 | TIP EXTENSION WEAR PLT RTNR / RTRCT STOP PLT ASSEMBLY | 21 04 04 009 0 | I09154 | 1 |
| 6' | TL3 TIP BOOM TOP WEAR PAD 2-7/8 X 4 | 41 04 04 040 0 | BU303002 | 1 |
| 7 | HOSE RECOIL BOX ASSEMBLY - RIGHT | 21 04 04 012 1 | I23122 | 1 |
| 8 | HOSE RECOIL BOX ASSEMBLY - LEFT | 21 04 04 013 1 | I23121 | 1 |
| 9 | TIP EXTENSION CYLINDER SHAFT ASSEMBLY | 22 14 01 010 2 | I21105 | 1 |
| 10 | TIP BOOM TIP EXTENSION GUARD | 41 04 04 027 1 | I09238 | 1 |
| 11 | TRUNION TIP EXTENSION CYLINDER MOUNT | 41 04 04 004 1 | I09205 | 2 |
| 12 | BUSHING, 2 1/2 X 2 X 2 NYLATRON | 41 11 09 022 5 | BU502008 | 2 |
| 13 | WASHER LOCK 3/8 SPLIT | WAS065 | WAS065 | 8 |
| 14 | HEX BOLT 3/8-16 X 1.00 USS G5 | BL306016U516 | BL306016U516 | 8 |
| 15 | PIN, CONNECT | 41 04 04 018 0 | PII8105F | 1 |
| 16 | TIP BOOM, SUPPORT ROLLER WITH BUSHINGS | 31 04 04 008 0 | I09235 | 1 |
| 17 | PIN, CONNECT | 41 04 04 012 0 | PII6112F | 1 |
| 18 | WASHER, BUSHING 1.00 X 1.50 | WAB1624 | WAB1624 | 2 |
| 19' | PIN, COTTER .187 X 2 | FA020332 | FA020332 | 2 |
| 20" | COTTER PIN 5/16 X 3 | FA020548 | FA020548 | 1 |
| 21" | HYDRAULIC, .125 STRAIGHT GREASE FITTING | HF2002S | HF2002S | 3 |
| 22 | HEX BOLT 1-1/4-7 X 7-3/4 GR8 | BL120124U87 | BL120124U87 | 1 |
| 23 | BUCKET BRAKE WASHER 4 X 1-5/16 X 1/4 | WAF642004 | WAF642004 | 2 |
| 24 | BUCKET BOLT NUT | 40 00 00 053 1 | I02454 | 1 |
| 25 | HEX BOLT 5/16-18 X 2.50 USS G5 | BL305040U518 | BL305040U518 | 1 |
| 26 | WASHER FLAT 5/16 USS | WAF05U5 | WAF05U5 | 2 |
| 27 | HEX NUT 5/16-24 SAE STOVERLOCK | NUS05S | NUS05S | 1 |




| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TL3 TIP BOOM ASSEMBLY | | | |
| PART NUMBER: 12 04 04 002 1 / I09103 | | | SCALE: 1:24 |
| DRAWN BY: BRB | APPROVED BY: | DATE: 10/26/2016 | SHEET: 2 OF 2 |

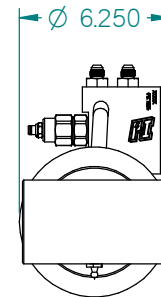
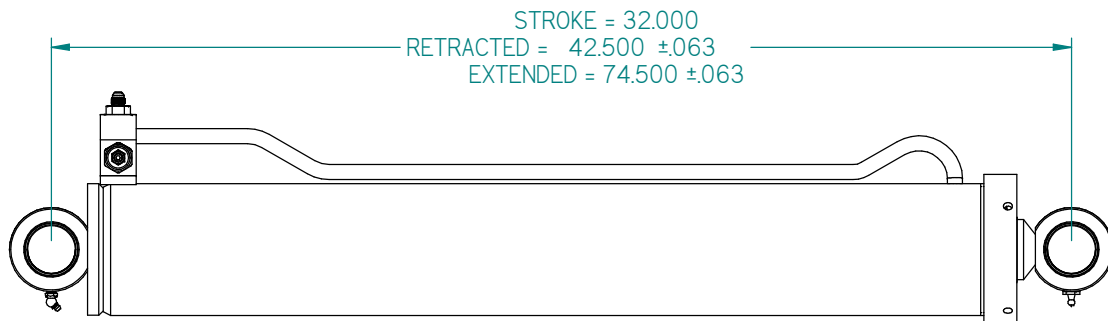
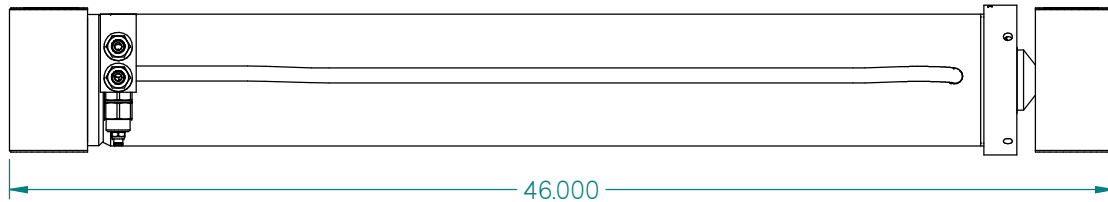
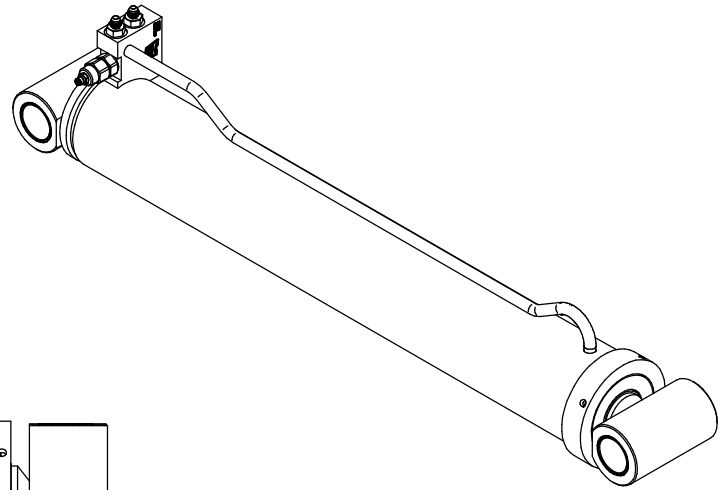
010 ASSEMBLY



| Item # | Title | Document # | MACOLA | Qty |
|--------|---|----------------|--------------|-----|
| 1 | TIP BOOM, FIXED LENGTH, WELDMENT | 21 04 04 019 2 | I09156 | 1 |
| 2' | CLAMP, PLASTIC ONLY (2-HOLE) (I SET) | CLP220 | CLP220 | 8 |
| 3 | HYDRAULIC TUBE, FIXED MAIN BOOM 45 DG - 102.5" LG | TU03008 | TU03008 | 4 |
| 5' | WASHER LOCK 3/8 SPLIT | WAS065 | WAS065 | 16 |
| 6' | HEX BOLT 3/8-16 X 1.50 USS G5 | BL306024U516 | BL306024U516 | 8 |
| 8 | TL EXTENDED TIP BOOM SIDE COVER | 41 04 04 058 0 | I09253 | 1 |
| 9 | HEX BOLT 1-1/4-7 X 7-3/4 GR8 | BL120124U87 | BL120124U87 | 1 |
| 10 | WASHER BRAKE, 4 X 1 5/16 X 1/4 | WAF642004 | WAF642004 | 2 |
| 11 | BUCKET BOLT NUT | 40 00 00 053 1 | I02454 | 1 |
| 12' | HEX BOLT 5/16-18 X 2.50 USS G5 | BL305040U518 | BL305040U518 | 1 |
| 13' | HEX NUT 5/16-24 SAE STOVERLOCK | NUS055 | NUS055 | 1 |
| 14 | TL, 16 FOOT TIP BOOM SIDE COVER | 41 04 04 074 0 | I09253 | 1 |
| 15' | WASHER FLAT 5/16 USS | WAF05U5 | WAF05U5 | 2 |
| 16' | HEX BOLT 3/8-16 X 2 UNC G5 | 40 00 00 052 0 | BL306032U516 | 8 |

| | | | |
|---|--------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TIP BOOM FIXED LENGTH | | | |
| PART NUMBER: 12 04 04 004 2 / I09149 | | | SCALE: 1:20 |
| DRAWN BY: <i>SWB</i> | APPROVED BY: | DATE: 02/01/2016 | SHEET: 1 OF 1 |

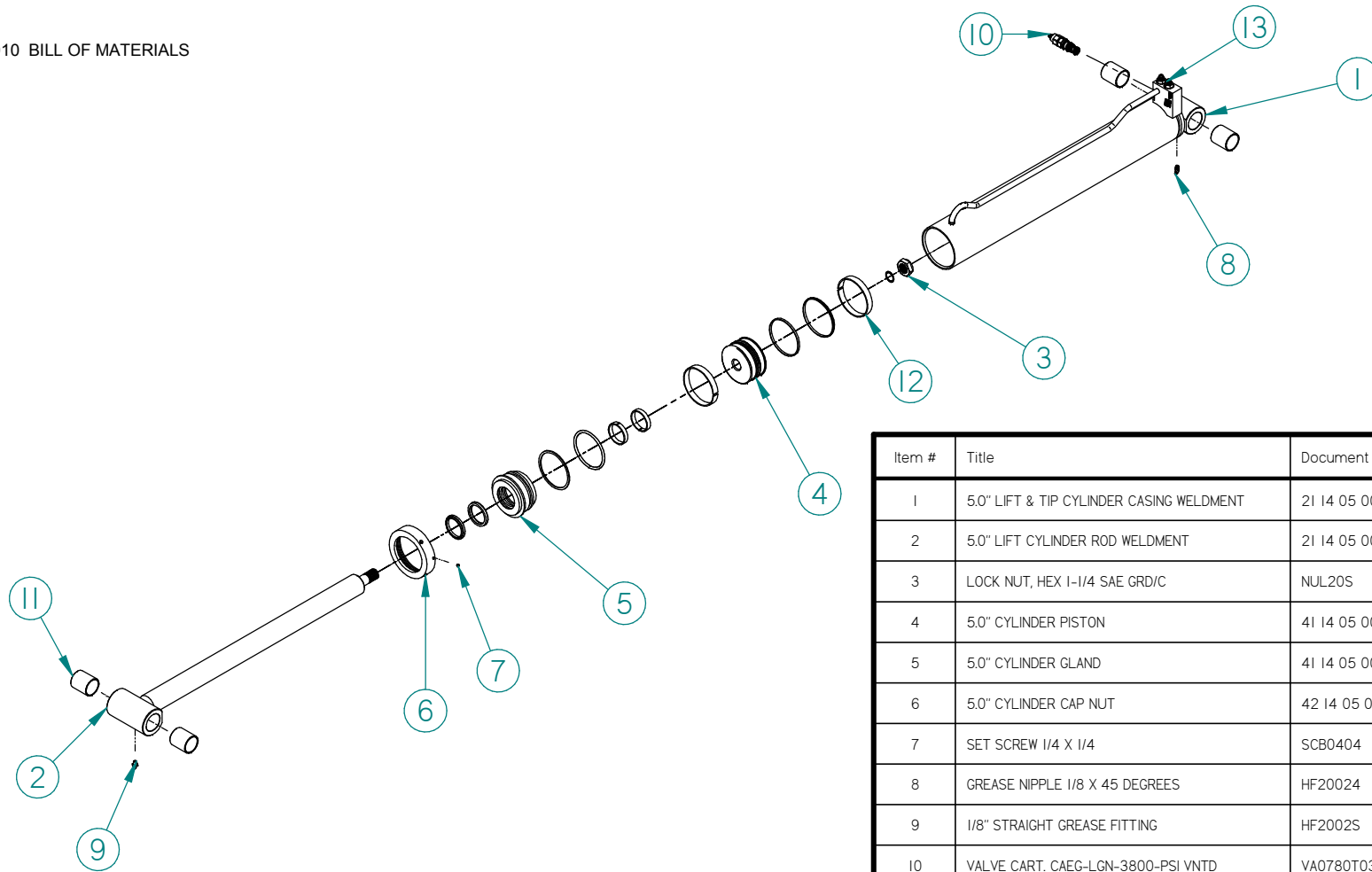
010 ASSEMBLY
 020 COUNTER BALANCE VALVE SET TO 3100 PSI
 030 5" BORE X 32" STROKE X 2.5" ROD



PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|--------------------------------------|--------------|------------------|---------------|
| TITLE: 5.0" LIFT CYLINDER | | | |
| PART NUMBER: 21 14 05 003 0 / 121101 | | | SCALE: 1:8 |
| DRAWN BY: <i>Olena J.</i> | APPROVED BY: | DATE: 11/23/2005 | SHEET: 1 OF 3 |

010 BILL OF MATERIALS



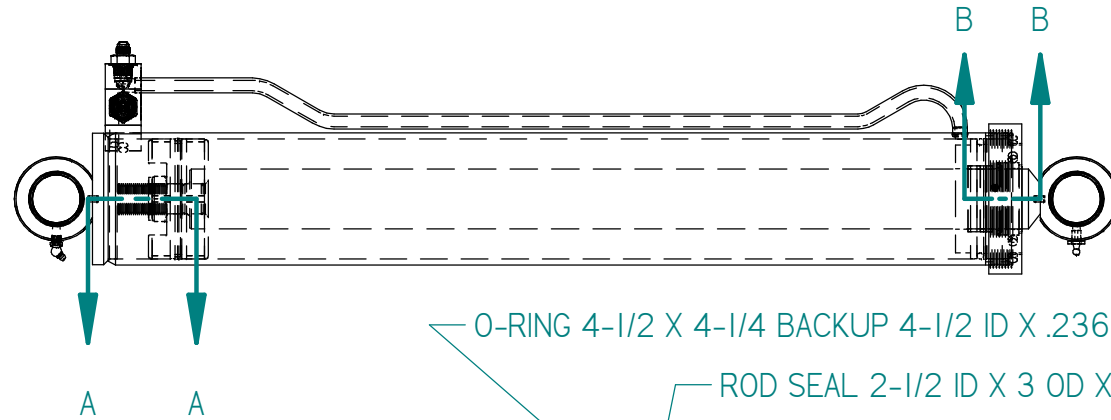
| Item # | Title | Document # | MACOLA | Qty |
|--------|---|----------------|-------------|-----|
| 1 | 5.0" LIFT & TIP CYLINDER CASING WELDMNT | 21 14 05 001 0 | I21126 | 1 |
| 2 | 5.0" LIFT CYLINDER ROD WELDMNT | 21 14 05 002 0 | I21174 | 1 |
| 3 | LOCK NUT, HEX 1-1/4 SAE GRD/C | NUL20S | NUL20S | 1 |
| 4 | 5.0" CYLINDER PISTON | 41 14 05 009 7 | I21157 | 1 |
| 5 | 5.0" CYLINDER GLAND | 41 14 05 008 2 | I21158 | 1 |
| 6 | 5.0" CYLINDER CAP NUT | 42 14 05 001 0 | I21156 | 1 |
| 7 | SET SCREW 1/4 X 1/4 | SCB0404 | SCB0404 | 1 |
| 8 | GREASE NIPPLE 1/8 X 45 DEGREES | HF20024 | HF20024 | 1 |
| 9 | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 1 |
| 10 | VALVE CART. CAEG-LGN-3800-PSI VNTD | VA0780T03 | VA0780T03 | 1 |
| 11 | BUSHING 2 X 2-1/4 X 2-1/2 | I21166 | I21166 | 4 |
| 12 | SEAL KIT 2-1/2 X 5 TH10329A | 52 14 05 001 0 | HPKTH10329A | 1 |
| 13 | HYDRAULIC, #6 JIC X #8 M OR | HF10608JM | HF10608JM | 2 |



PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|------------------------|--------------|-------------------------|------------------|
| TITLE: | | 5.0" LIFT CYLINDER | |
| PART NUMBER: | | 21 14 05 003 0 / I21101 | SCALE: 1:20 |
| DRAWN BY: Olvera J. | APPROVED BY: | DATE: 11/23/2005 | SHEET: 2 OF 3 |

010 MAXIMUM OPERATING PRESSURE = 2500 PSI
 020 TEST PRESSURE = 3200 PSI
 030 CYLINDER BURST SAFETY FACTOR = 4:1
 040 COUNTER BALANCE VALVE SET TO 3100 PSI



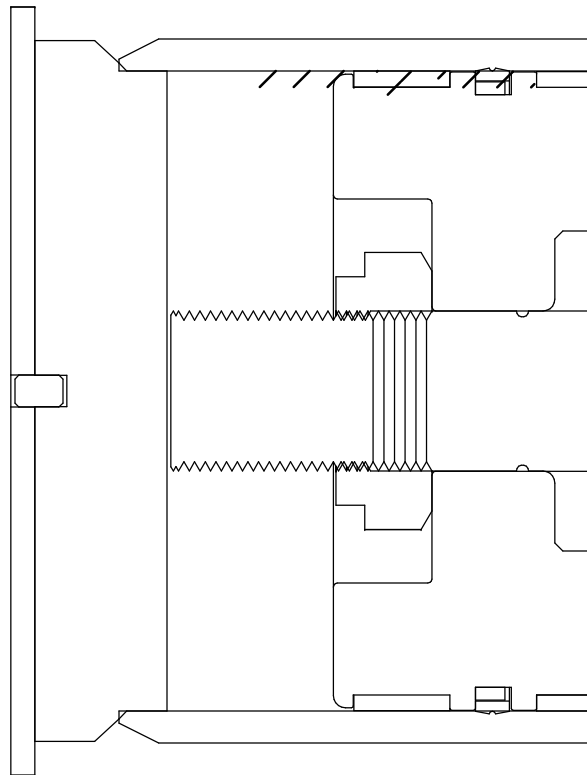
O-RING 4-1/2 X 4-1/4 BACKUP 4-1/2 ID X .236 CS X .117 HT

ROD SEAL 2-1/2 ID X 3 OD X 1/4


ROD WIPER 2-1/2 ID X 3 OD X 0.395

WEAR BAND 2-3/4 OD X 1/2 W X 1/8 CS

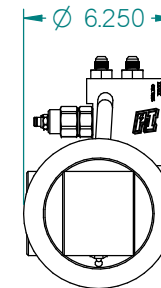
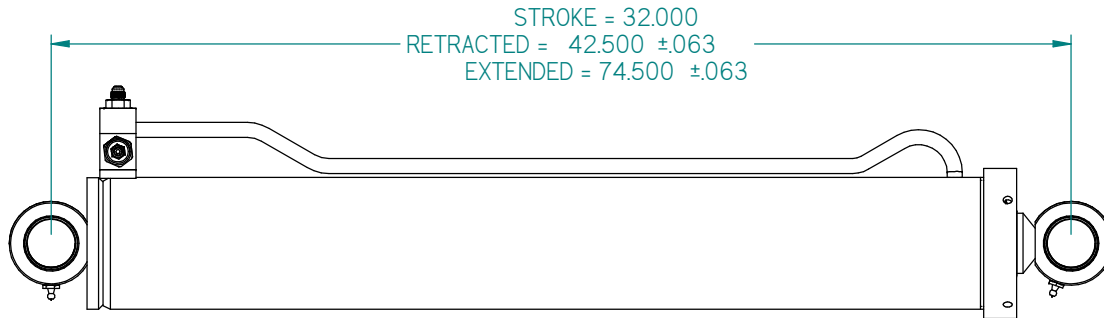
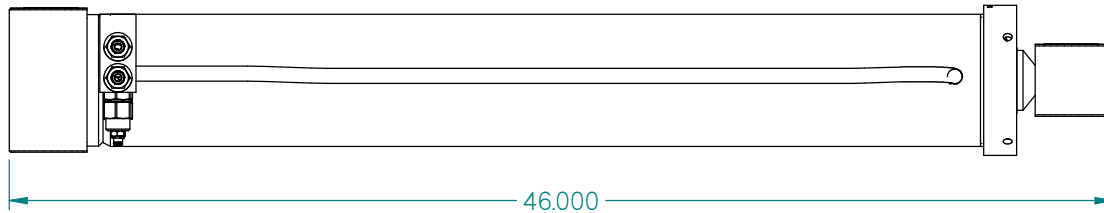
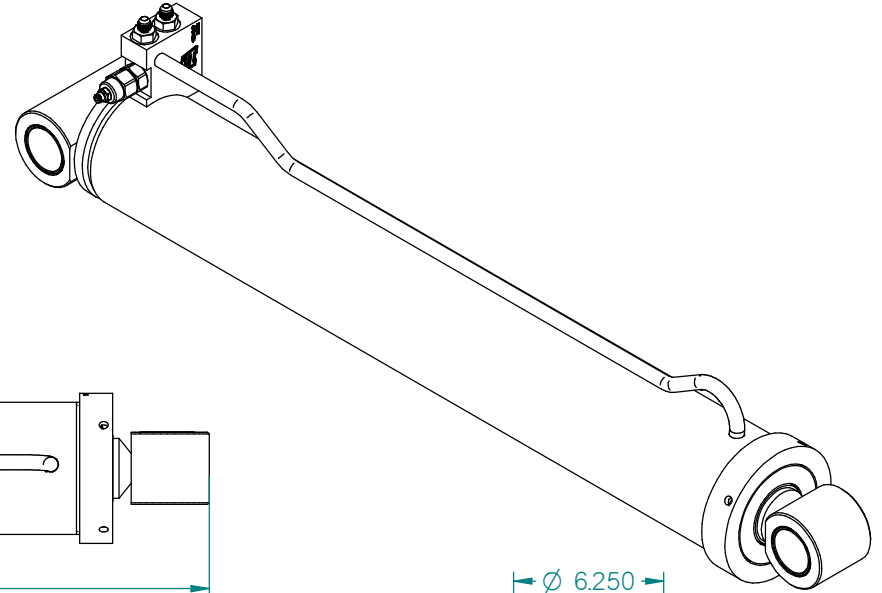
SECTION B-B



SECTION A-A

| | | | |
|---|--------------|--|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| | | TITLE: 5.0" LIFT CYLINDER | |
| PART NUMBER: 21 14 05 003 0 / 121101 | | SCALE: NA | |
| DRAWN BY: <i>Olvera J.</i> | APPROVED BY: | DATE: 11/23/2005 | SHEET: 3 OF 3 |

010 ASSEMBLY
 020 COUNTER BALANCE VALVE SET TO 3100 PSI
 030 5" BORE X 32" STROKE X 2.5" ROD

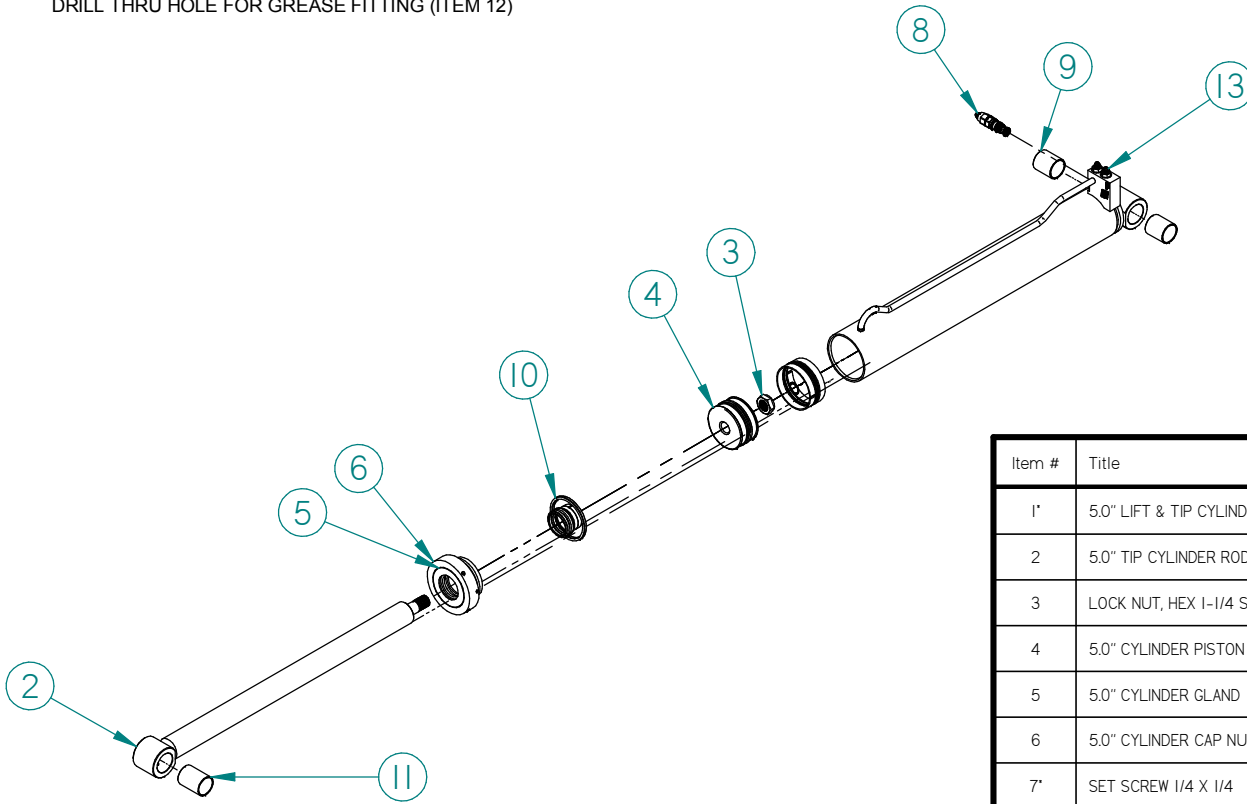


PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|-------------------------|--------------|-------------------|--------|
| TITLE: | | 5.0" TIP CYLINDER | |
| PART NUMBER: | | | SCALE: |
| 21 14 05 005 0 / 121102 | | | 1:8 |
| DRAWN BY: | APPROVED BY: | DATE: | SHEET: |
| Olvera J. | | 11/23/2005 | 1 OF 3 |

010 BILL OF MATERIALS

020 INSTALL BUSHING (ITEM 11) INTO ROD SPOOL. THEN
DRILL THRU HOLE FOR GREASE FITTING (ITEM 12)



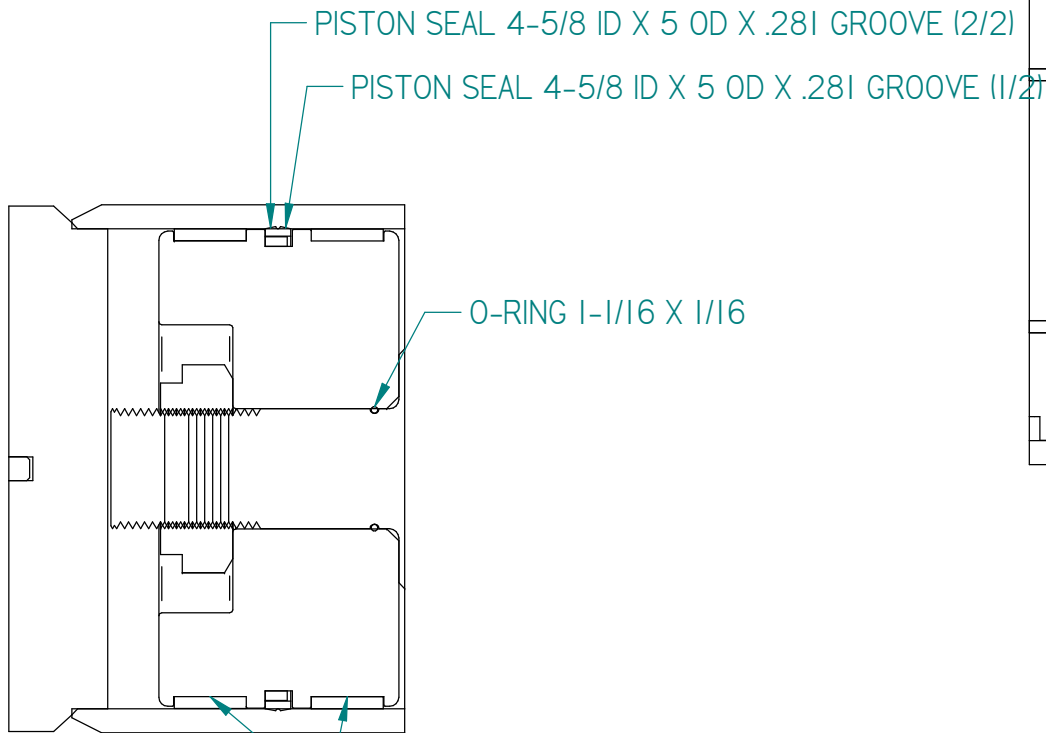
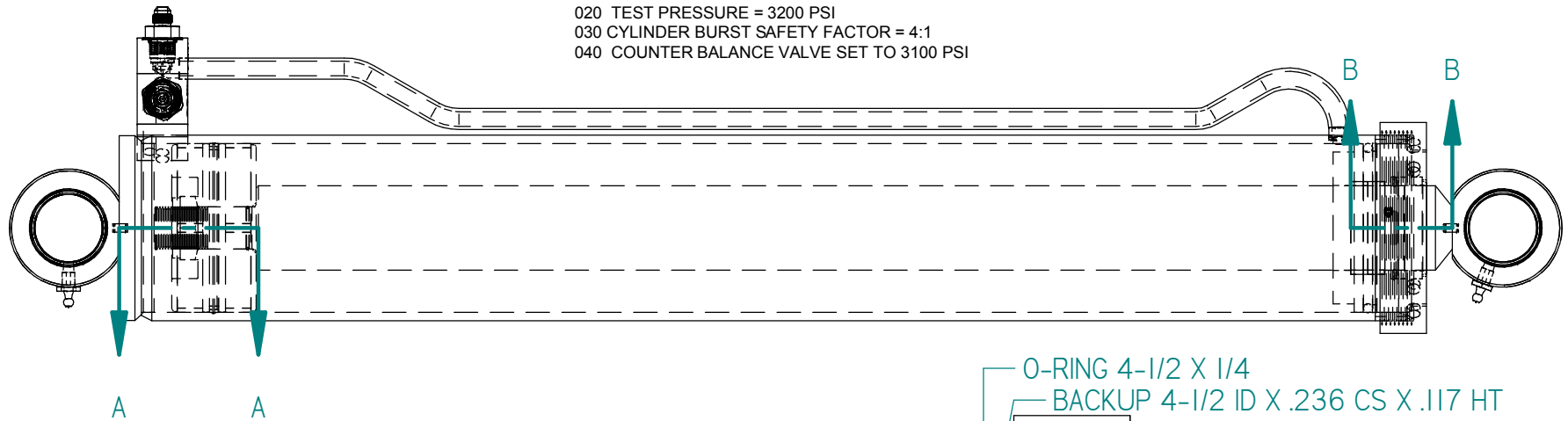
| Item # | Title | Document # | MACOLA | Qty |
|--------|--|----------------|-------------|-----|
| 1' | 5.0" LIFT & TIP CYLINDER CASING WELDMENT | 21 14 05 001 0 | I21126 | 1 |
| 2 | 5.0" TIP CYLINDER ROD WELDMENT | 21 14 05 004 0 | I21175 | 1 |
| 3 | LOCK NUT, HEX 1-1/4 SAE GRD/C | NUL20S | NUL20S | 1 |
| 4 | 5.0" CYLINDER PISTON | 41 14 05 009 7 | I21157 | 1 |
| 5 | 5.0" CYLINDER GLAND | 41 14 05 008 2 | I21158 | 1 |
| 6 | 5.0" CYLINDER CAP NUT | 42 14 05 001 0 | I21156 | 1 |
| 7' | SET SCREW 1/4 X 1/4 | SCB0404 | SCB0404 | 1 |
| 8 | VALVE CART. CAEG-LGN-3100-PSI | VA0780T03 | VA0780T02 | 1 |
| 9 | BUSHING 2 X 2-1/4 X 2-1/2 | I21166 | I21166 | 2 |
| 10 | SEAL KIT 2-1/2 X 5 TH10329A | 52 14 05 001 0 | HPKTH10329A | 1 |
| 11 | BUSHING 2 X 2-1/4 X 3 | I21167 | I21167 | 1 |
| 12' | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 2 |
| 13 | HYDRAULIC, #6 JIC X #8 M OR | HF10608JM | HF10608JM | 2 |



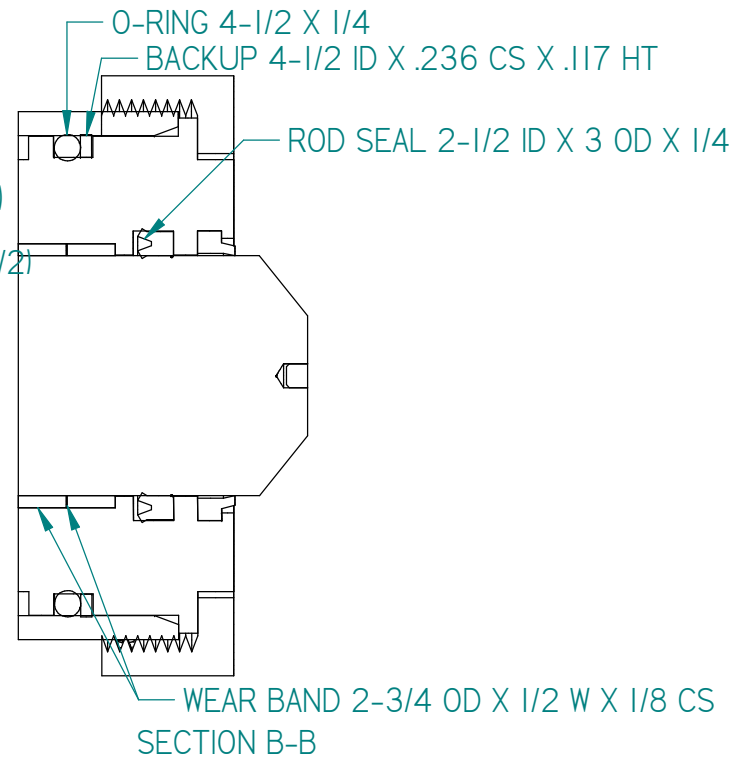
PETERESEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844


| | | | |
|------------------------|--------------|-------------------------|------------------|
| TITLE: | | 5.0" TIP CYLINDER | |
| PART NUMBER: | | 21 14 05 005 0 / I21102 | SCALE: 1:20 |
| DRAWN BY: Olvera J. | APPROVED BY: | DATE: 11/23/2005 | SHEET: 2 OF 3 |

010 MAXIMUM OPERATING PRESSURE = 2500 PSI
 020 TEST PRESSURE = 3200 PSI
 030 CYLINDER BURST SAFETY FACTOR = 4:1
 040 COUNTER BALANCE VALVE SET TO 3100 PSI



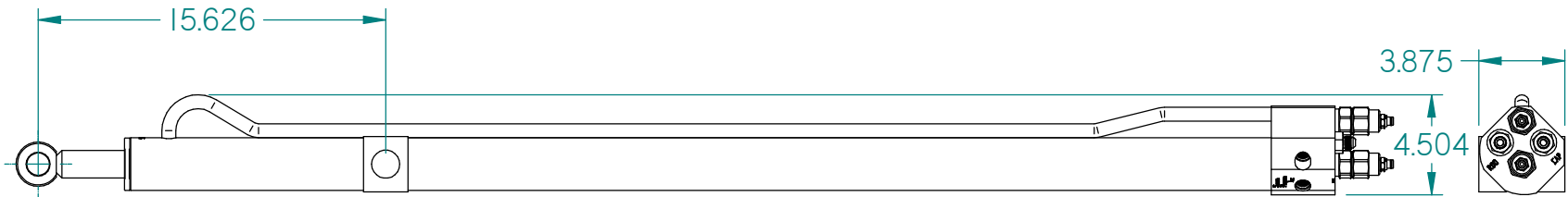
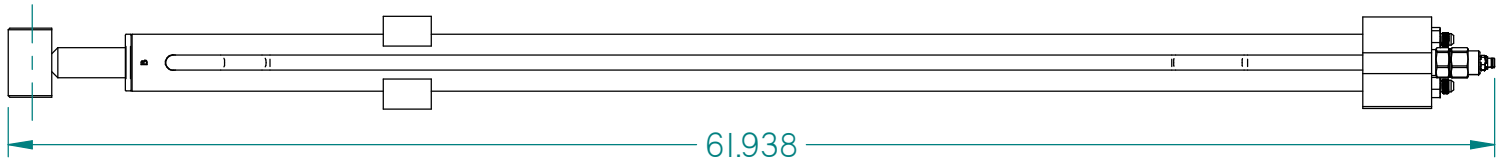
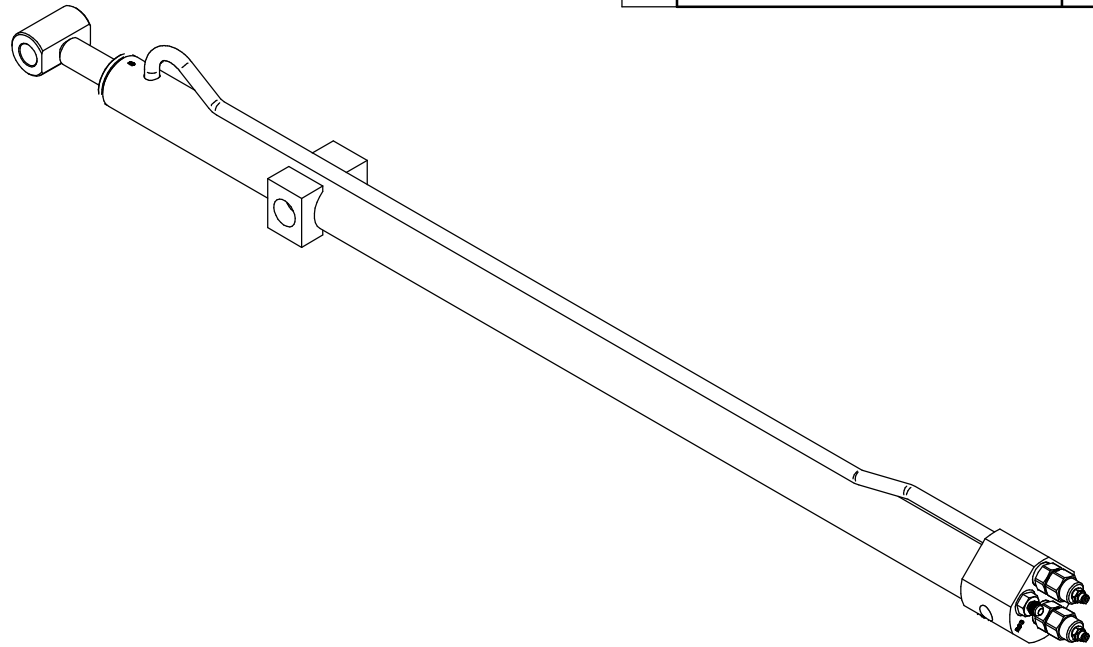
SECTION A-A WEAR BANDS 5 OD X 3/4 W X 1/8 CS




| | | | |
|---|--------------|--|---------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: 5.0" TIP CYLINDER | | | |
| PART NUMBER: 21 14 05 005 0 / 121102 | | | SCALE: NA |
| DRAWN BY: <i>Olvera J.</i> | APPROVED BY: | DATE: 11/23/2005 | SHEET: 3 OF 3 |

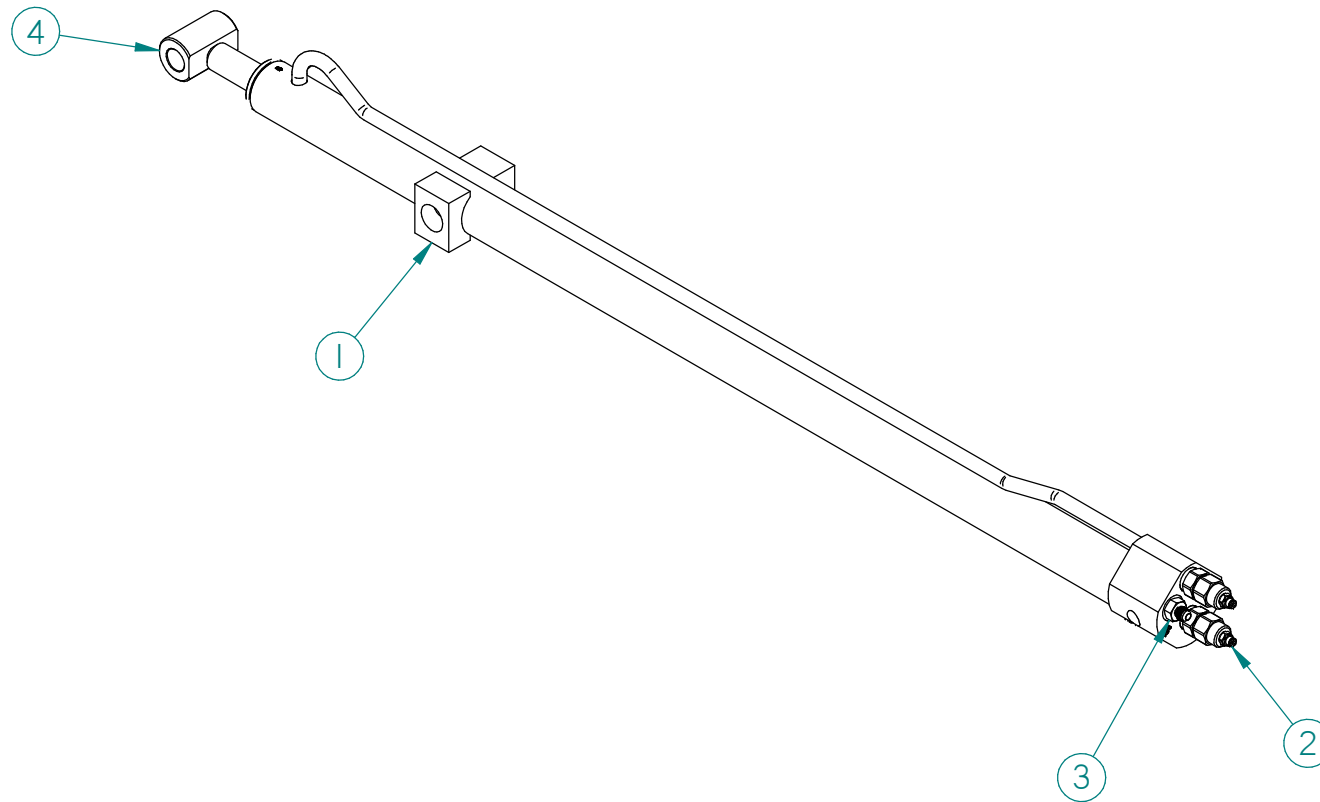
010 ASSEMBLY

| REV. | DESCRIPTION | DATE | BY |
|------|------------------------|----------|----|
| I | CHANGE CASING WELDMENT | 06/05/06 | Oj |




| TOLERANCES | |  | PETERSEN INDUSTRIES INC. | |
|----------------------------|----------|---|--------------------------|---------------|
| 1 DEC. | ± 0.100 | | 4000 S.R. 60 WEST | |
| 2 DEC. | ± 0.050 | LAKE WALES, FL. 33859-8234 | | |
| 3 DEC. | ± 0.010 | TEL: (863) 676-1493 FAX: (863) 676-6844 | | |
| ANGLE: | ± 1.000° | TITLE: 2.0" TIP EXTENSION CYLINDER | | |
| FRACTION: | ± 1/32" | PART NUMBER: 22 14 01 010 I / 121105 | | SCALE: 1:8 |
| DIM. UNITS: | INCHES | DRAWN BY: LW | | APPROVED BY: |
| SURFACE FINISH: | 125/32 | DATE: 12/16/2004 | | SHEET: 1 OF 3 |
| UNLESS OTHERWISE SPECIFIED | | | | |

010 BILL OF MATERIALS
 020 ASSEMBLE AS SHOWN



| Item # | Title | Document # | MACOLA | Qty |
|--------|--|----------------|-----------|-----|
| 1 | CYLINDER 2.0", TIP EXTENSION CASING WELDMENT | 22 14 01 002 3 | I21127 | 1 |
| 2 | VALVE CART. CAEG-LGN-3800-PSI VNTD | VA0780T03 | VA0780T03 | 2 |
| 3 | HYDRAULIC, #6 JIC X #8 M OR | HF10608JM | HF10608JM | 2 |
| 4 | 2.0" TIP EXTENSION CYLINDER ROD ASSEMBLY | 22 14 01 008 1 | I21177 | 1 |

| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: 2.0" TIP EXTENSION CYLINDER | | | |
| PART NUMBER: 22 14 01 010 1 / I21105 | | | SCALE: 1:8 |
| DRAWN BY: <i>LW</i> | APPROVED BY: | DATE: 12/16/2004 | SHEET: 2 OF 3 |

010 PARTS LIST

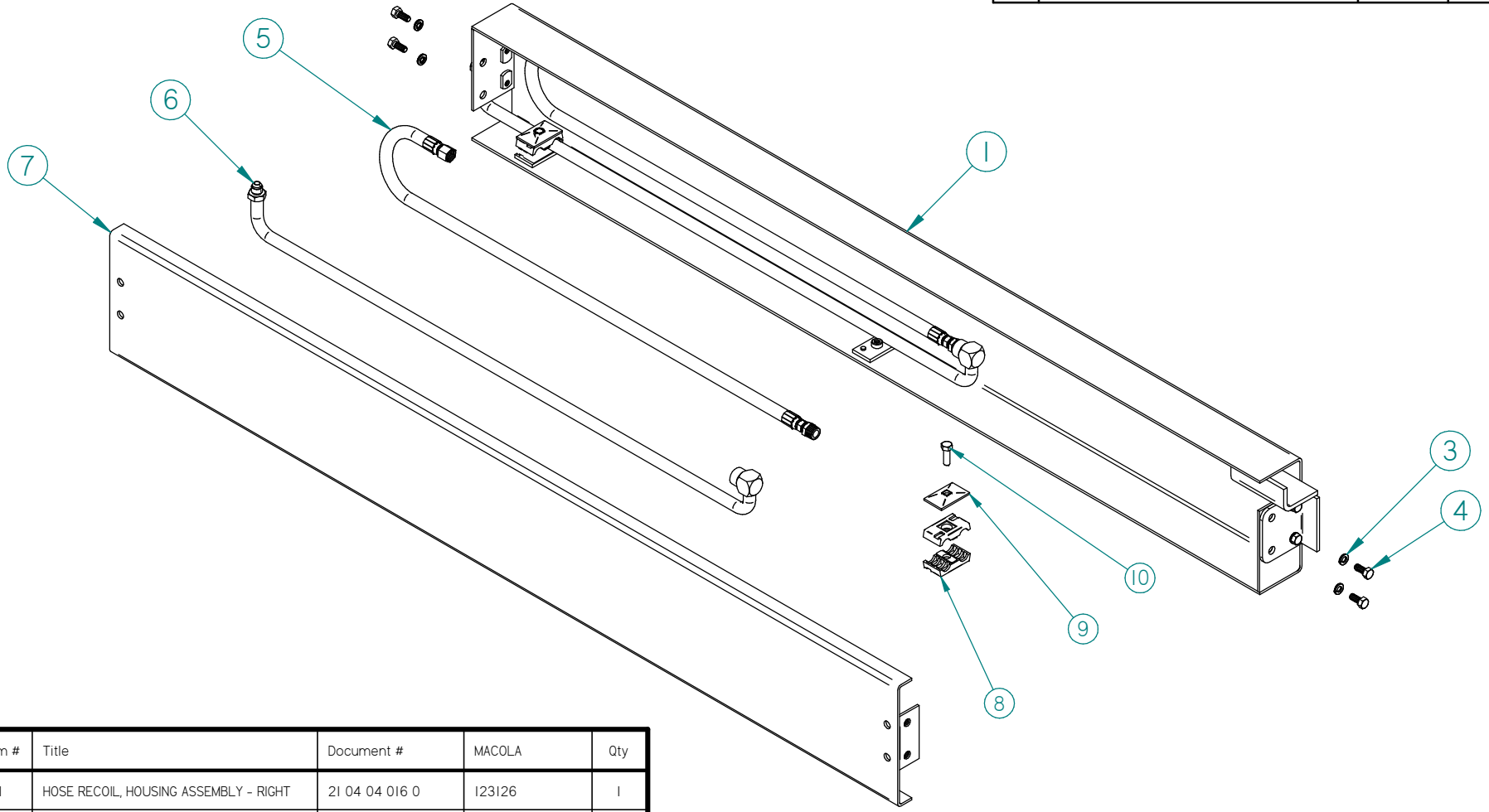
| Item # | Title | Document # | MACOLA | Qty |
|--------|--|----------------|-----------|-----|
| 1* | DUAL COUNTER BALANCE VALVE, TIP EXTENSION CYLINDER | 42 14 01 009 1 | CP071005 | 1 |
| 2* | 2.0" TIP EXTENSION CYLINDER CASING | 42 14 01 002 4 | I21176 | 1 |
| 3* | CYLINDER, TRUNION MOUNT BLOCK | 42 14 01 008 1 | CP071003 | 2 |
| 4* | HYDRAULIC TUBE, TIP EXTENSION CYLINDER | 41 04 04 036 1 | TU04006 | 1 |
| 5* | HYDRAULIC, #6 JIC X #8 M OR | HF10608JM | HF10608JM | 2 |
| 6* | VALVE CART. CAEG-LGN-3800-PSI VNTD | VA0780T03 | VA0780T03 | 2 |
| 7* | 2.0" TIP EXTENSION CYLINDER SHAFT | 42 14 01 005 2 | | 1 |
| 8* | TIP EXTENSION CYLINDER ROD END SPOOL | 42 14 01 006 1 | I15155 | 1 |
| 9* | NUT HEX 3/4 STOVERLOCK SAE | NUS12S | NUS12S | 1 |
| 10* | 5/8 X 1/16 O-RING | HPKTHI2570 | | 1 |
| 11* | 2.0" TIP EXTENSION CYLINDER GLAND NUT | 42 14 01 003 4 | I21163 | 1 |
| 12* | 1 1/2 OD X 1/2 W X 1/8 CS WEAR BAND | HPKTHI2570 | | 2 |
| 13* | 1 1/4 ID X 1 5/8 OD X 3/16 WIPER | HPKTHI2570 | | 1 |
| 14* | 1 1/2 ID X 2 OD X 0.050 BACK UP RING | HPKTHI2570 | | 1 |
| 15* | 1 3/4 X 1/8 O-RING | HPKTHI2570 | | 1 |
| 16* | 1 1/4 ID X 1 5/8 OD X 5/16 ROD | HPKTHI2570 | | 1 |
| 17* | 2.0" CYLINDER PISTON | 42 14 01 004 2 | I21160 | 1 |
| 18* | 1 1/2 ID X 2 OD X 3/8 PISTON | HPKTHI2570 | | 2 |



PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
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 TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|---|--------------|-------------------------|----------------------|
| TITLE: 2.0" TIP EXTENSION CYLINDER | | | |
| PART NUMBER: 22 14 01 010 1 / I21105 | | | SCALE: NA |
| DRAWN BY: LW | APPROVED BY: | DATE: 12/16/2004 | SHEET: 3 OF 3 |

| REV. | DESCRIPTION | DATE | BY |
|------|---|------------|----|
| 1 | CHANGED RECOIL SLIDE TO TUBING FROM CHANNEL | 07/30/2008 | RB |



| Item # | Title | Document # | MACOLA | Qty |
|--------|---------------------------------------|----------------|--------------|-----|
| 1 | HOSE RECOIL, HOUSING ASSEMBLY - RIGHT | 21 04 04 016 0 | I23126 | 1 |
| 2 | TIP BOOM, HOSE RECOIL SLIDE ASSY RH | 21 04 04 014 1 | I23124 | 1 |
| 3 | WASHER LOCK 5/16 SPLIT | WAS055 | WAS055 | 4 |
| 4 | HEX BOLT 5/16-18 X 3/4 USS G5 | BL305012U518 | BL305012U518 | 4 |
| 5 | HOSE CUT 36" #6-S RECOIL BOX | HSI0576FS | HSI0576FS | 2 |
| 6 | TUBE, TL3 HOSE RECOIL BOX - CURVED | 41 04 04 043 0 | TU04004 | 2 |
| 7 | HOSE RECOIL, COVER ASSEMBLY | 21 04 04 018 0 | I23127 | 1 |
| 8 | CLAMP, PLASTIC ONLY (2-HOLE) (I SET) | CLP220 | CLP220 | 2 |
| 9 | CLAMP, TOP PLATE ONLY (2-HOLE) | CL5G225 | CL5G225 | 2 |
| 10 | BOLT, HEX HD, 5/16 - 18 UNC 1.250 LG | BL305012U518 | BL305012U518 | 2 |

TOLERANCES

1 DEC. ± 0.100
 2 DEC. ± 0.050
 3 DEC. ± 0.010
 ANGLE: ± 1.000°
 FRACTION: ± 1/32"
 DIM. UNITS: INCHES
 SURFACE FINISH: 125/32

UNLESS OTHERWISE SPECIFIED

DEC = DECIMAL PLACES (S)

PETERSEN INDUSTRIES LIGHTNING LOGO

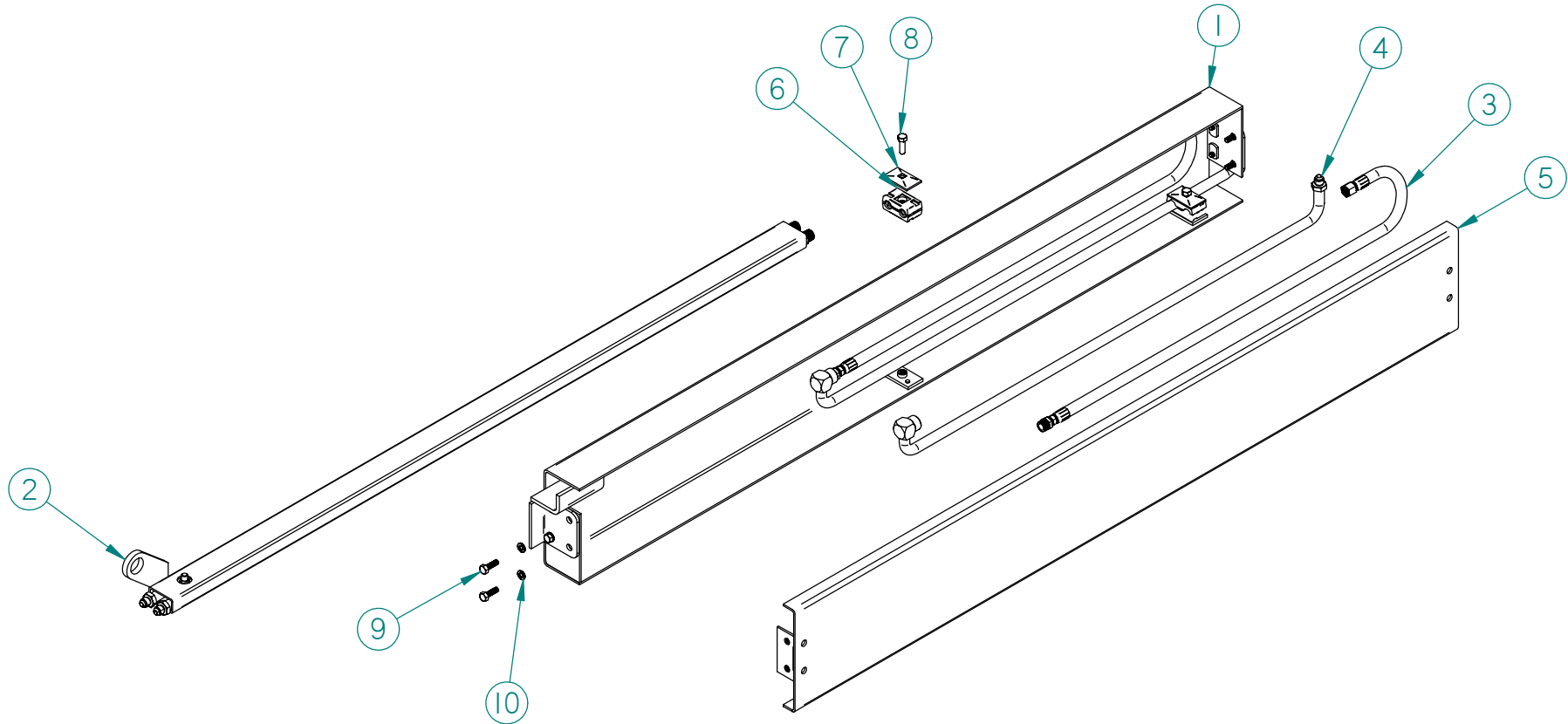
PETERSEN INDUSTRIES INC.
 4000 S.R. 60 WEST
 LAKE WALES, FL. 33859-8234
 TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: HOSE RECOIL BOX ASSEMBLY - RIGHT

PART NUMBER: 21 04 04 012 1 / I23122 SCALE: 1:8

DRAWN BY: RB APPROVED BY: DATE: 07/30/2008 SHEET: 1 OF 1

| REV. | DESCRIPTION | DATE | BY |
|------|---|------------|----|
| 1 | CHANGED RECOIL SLIDE TO TUBING FROM CHANNEL | 07/30/2008 | RB |




| Item # | Title | Document # | MACOLA | Qty |
|--------|--------------------------------------|----------------|--------------|-----|
| 1 | HOSE RECOIL, HOUSING ASSEMBLY - LEFT | 21 04 04 017 0 | I23125 | 1 |
| 2 | TIP BOOM, HOSE RECOIL SLIDE ASSY LH | 21 04 04 015 1 | I23123 | 1 |
| 3 | HOSE CUT 36" #6-S RECOIL BOX | HSI0576FS | HSI0576FS | 2 |
| 4 | TUBE, TL3 HOSE RECOIL BOX - CURVED | 4I 04 04 043 0 | TU04004 | 2 |
| 5 | HOSE RECOIL, COVER ASSEMBLY | 21 04 04 018 0 | I23127 | 1 |
| 6 | CLAMP, PLASTIC ONLY (2-HOLE) (I SET) | CLP220 | CLP220 | 2 |
| 7 | CLAMP, TOP PLATE ONLY (2-HOLE) | CL5G225 | CL5G225 | 2 |
| 8 | BOLT, HEX HD, 5/16 - 18 UNC 1.250 LG | BL305012U518 | BL305012U518 | 2 |
| 9 | HEX BOLT 5/16-18 X I USS G5 | BL305016U518 | BL305016U518 | 4 |
| 10 | WASHER LOCK 5/16 SPLIT | WAS055 | WAS055 | 4 |

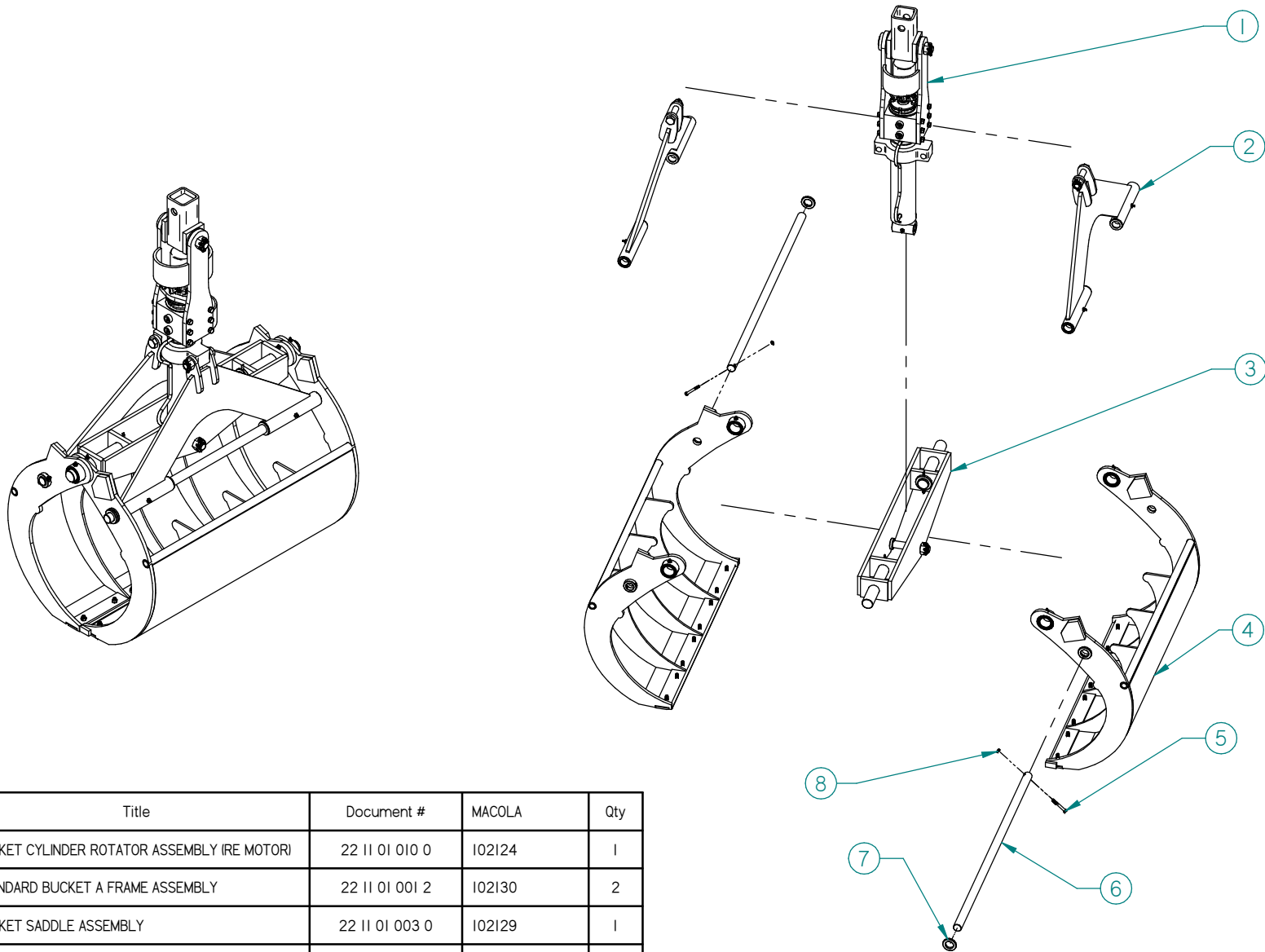
TOLERANCES

1 DEC. ± 0.100
 2 DEC. ± 0.050
 3 DEC. ± 0.010
 ANGLE: ± 1.000°
 FRACTION: ± 1/32"
 DIM. UNITS: INCHES
 SURFACE FINISH: 125/32


UNLESS OTHERWISE SPECIFIED

| | | | | |
|--------------------------------------|---|------------------|--|--|
| DEC. = DECIMAL PLACES |  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| | TITLE: HOSE RECOIL BOX ASSEMBLY - LEFT | | | |
| PART NUMBER: 21 04 04 013 1 / I23121 | | | SCALE: 1:10 | |
| DRAWN BY: RB | APPROVED BY: | DATE: 07/30/2008 | SHEET: 1 OF 1 | |

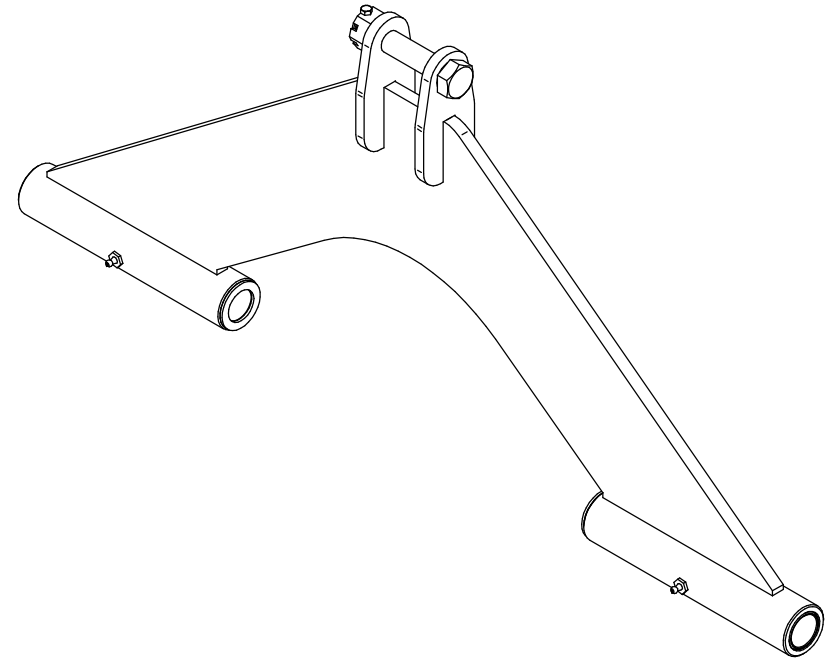
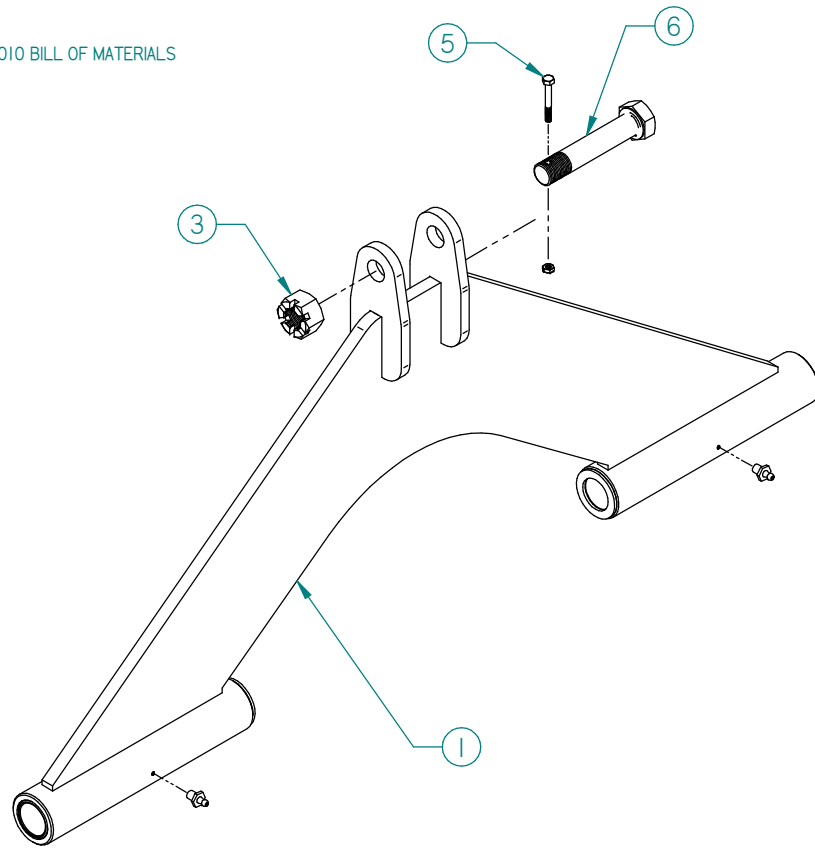
010 BILL OF MATERIALS




| Item # | Title | Document # | MACOLA | Qty |
|--------|---|----------------|--------------|-----|
| 1 | BUCKET CYLINDER ROTATOR ASSEMBLY (RE MOTOR) | 22 11 01 010 0 | 102124 | 1 |
| 2 | STANDARD BUCKET A FRAME ASSEMBLY | 22 11 01 001 2 | 102130 | 2 |
| 3 | BUCKET SADDLE ASSEMBLY | 22 11 01 003 0 | 102129 | 1 |
| 4 | TRASH BUCKET JAW ASSEMBLY | 22 11 01 002 5 | 102132 | 2 |
| 5 | BOLT HEX 3/8-16 UNC X 3 G8 | BL108048U816 | BL108048U816 | 2 |
| 6 | STD BUCKET A FRAME SHAFT | 42 11 01 011 1 | 102173 | 2 |
| 7 | STD BUCKET A FRAME COLLAR | 41 11 09 019 1 | 116106 | 2 |
| 8 | NUT HEX 3/8 -16 UNC STOVERLOCK | NUS06U | NUS06U | 2 |

| | | | |
|---|--------------|--|--------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: STANDARD TRASH BUCKET ASSEMBLY | | | |
| PART NUMBER: | | SCALE: | |
| 22 11 01 001 1 / 102101 | | 1:28 | |
| DRAWN BY: | APPROVED BY: | DATE: | SHEET: |
| <i>EB</i> | | 12/20/2000 | 2 OF 3 |

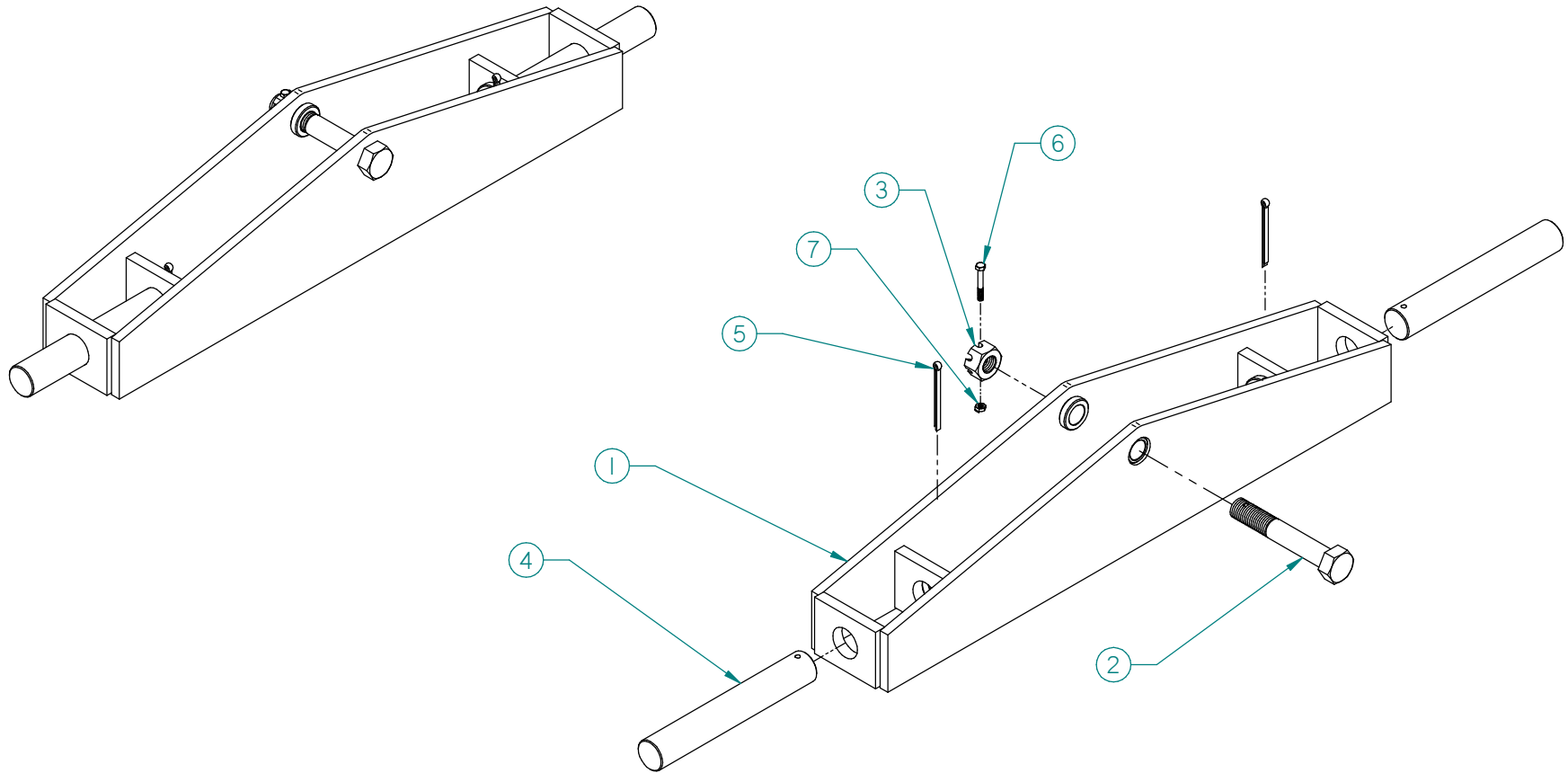
010 BILL OF MATERIALS




| Item # | Title | Document # | Macola | Qty |
|--------|----------------------------------|-----------------|-----------------|-----|
| 1 | STANDARD BUCKET A FRAME WELDMENT | 22 11 01 009 0 | 102172 | 1 |
| 2 | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 2 |
| 3 | NUT SLOTTED 1-14 SAE GR5 | NUB16S5 | NUB16S5 | 1 |
| 4 | HEX NUT 1/4-20 STOVERLOCK USS | NUS04U | NUS04U | 1 |
| 5 | BOLT HEX 1/4-20 X 2 USS G5 | BL304032U520 | BL304032U520 | 1 |
| 6 | BOLT HEX 1-14 X 5 1/4 SAE HOLE | BL116084S8HI400 | BL116084S8HI400 | 1 |

| | | | |
|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: STANDARD BUCKET A FRAME ASSEMBLY | | | |
| PART NUMBER: 22 11 01 001 2 / 102130 | | | SCALE: 1:8 |
| DRAWN BY: EB | APPROVED BY: | DATE: 02/23/1999 | SHEET: 2 OF 2 |

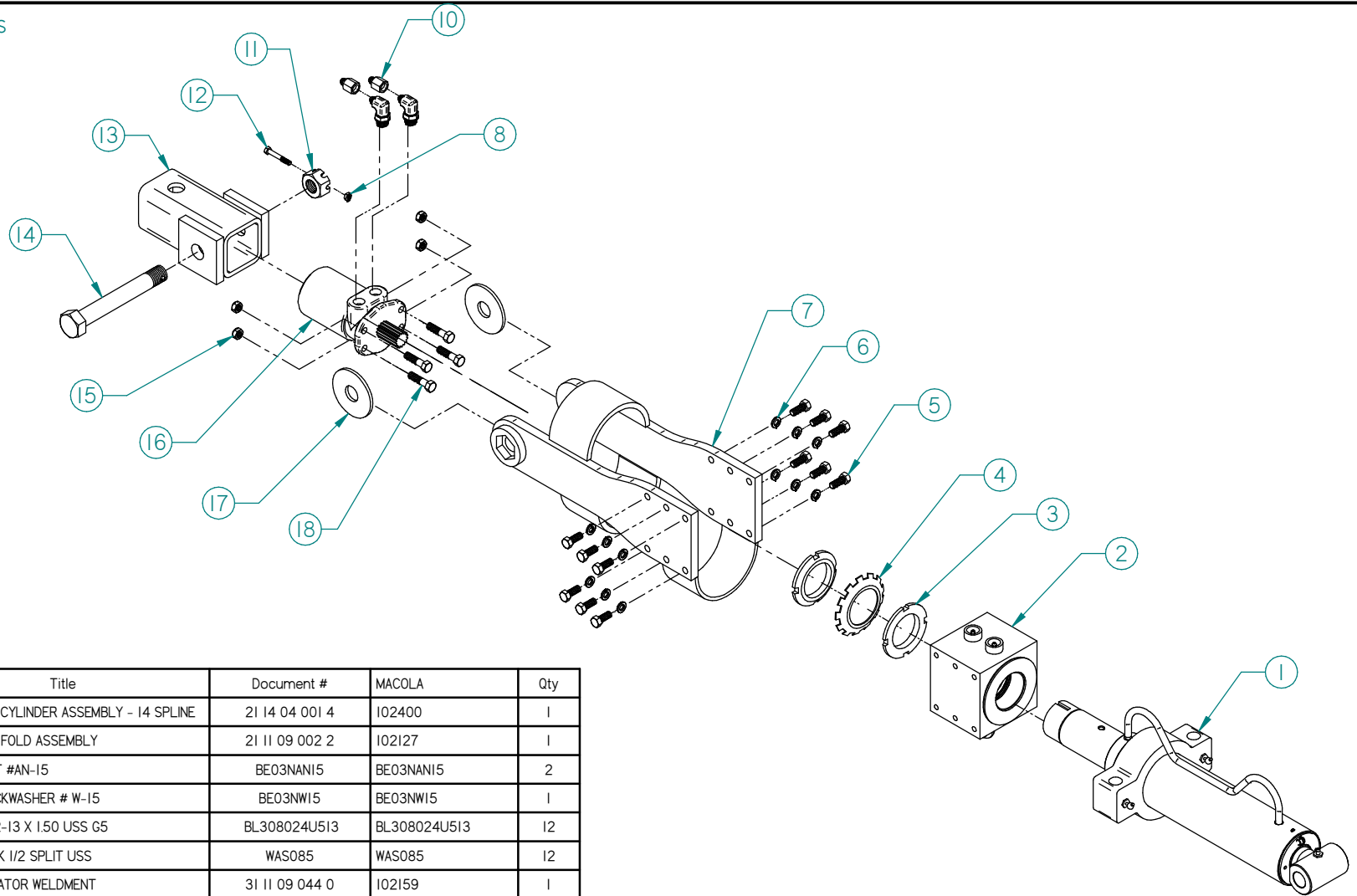
010 BILL OF MATERIALS




| Item # | Title | Document # | MACOLA | Qty |
|--------|---------------------------------|----------------|--------------|-----|
| 1 | BUCKET SADDLE WELDMENT | 22 11 01 004 1 | I02178 | 1 |
| 2 | HEX BOLT 1-1/4-7 X 7-3/4 GR8 | BL120124U87 | BL120124U87 | 1 |
| 3 | SLOTTED NUT 1-1/4 UNC GR5 | NUB20U | NUB20U | 1 |
| 4 | BUCKET SADDLE PIVOT PIN | 41 11 09 005 0 | PI30204F | 2 |
| 5 | COTTER PIN 5/16 X 4 | FA020564 | FA020564 | 2 |
| 6 | HEX BOLT 5/16-18 X 2-1/4 USS G5 | BL305036U518 | BL305036U518 | 1 |
| 7 | HEX NUT 5/16-24 SAE STOVERLOCK | NUS05S | NUS05S | 1 |

| | | | |
|---|--------------|---|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: BUCKET SADDLE ASSEMBLY | | | |
| PART NUMBER: 22 11 01 003 0 / I02129 | | | SCALE: 1:10 |
| DRAWN BY: EB | APPROVED BY: | DATE: 11/13/2000 | SHEET: 2 OF 2 |

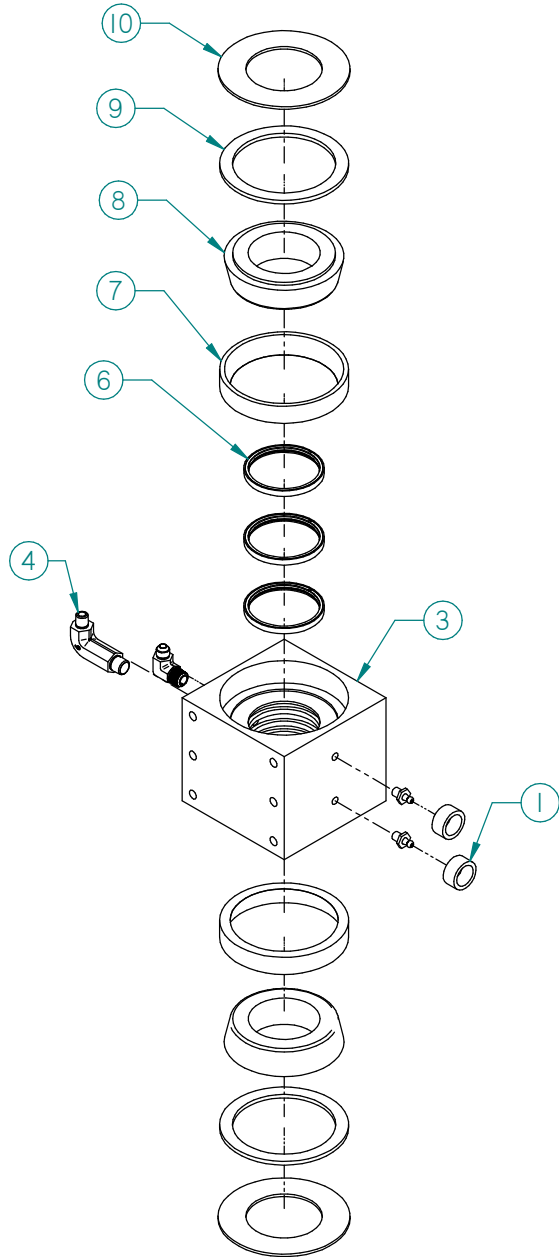
010 BILL OF MATERIALS




| Item # | Title | Document # | MACOLA | Qty |
|--------|---|----------------|---------------|-----|
| 1 | 4.0" BUCKET CYLINDER ASSEMBLY - 14 SPLINE | 21 14 04 001 4 | 102400 | 1 |
| 2 | BUCKET MANIFOLD ASSEMBLY | 21 11 09 002 2 | 102127 | 1 |
| 3 | BEARING, NUT #AN-15 | BE03NAN15 | BE03NAN15 | 2 |
| 4 | BEARING, LOCKWASHER # W-15 | BE03NWI15 | BE03NWI15 | 1 |
| 5 | BOLT HEX 1/2-13 X 1.50 USS G5 | BL308024U513 | BL308024U513 | 12 |
| 6 | WASHER LOCK 1/2 SPLIT USS | WAS085 | WAS085 | 12 |
| 7 | BUCKET ROTATOR WELDMENT | 31 11 09 044 0 | 102159 | 1 |
| 8 | HEX NUT 5/16-24 SAE STOVERLOCK | NUS05S | NUS05S | 1 |
| 9* | HYDRAULIC, #6 JIC X #10 M OR 90 | HF10610JM9 | HF10610JM9 | 2 |
| 10 | FITTING, RESTRICTOR 06M JIC 06F JIC | HF906063046FM | HF906063046FM | 2 |
| 11 | SLOTTED NUT 1-1/4 UNC GR5 | NUB20U | NUB20U | 1 |
| 12 | HEX BOLT 5/16-18 X 2-1/4 USS G5 | BL305036U518 | BL305036U518 | 1 |
| 13 | GIMBAL WELDMENT 4 X 5-1/2 | 31 11 09 042 1 | 102119 | 1 |
| 14 | BOLT - ROTATOR GIMBAL, TRASH | 41 11 09 040 0 | 102158 | 1 |
| 15 | HEX NUT 1/2-13 STOVERLOCK | NUS08U | NUS08U | 4 |
| 16 | HYD MOTOR RE-32-08-05-0 (14 SPLINE) | HC03004 | HC03004 | 1 |
| 17 | BUCKET BRAKE WASHER 4 X 1-5/16 X 1/4 | WAF642004 | WAF642004 | 2 |
| 18 | BOLT HEX 1/2-13 X 2 UNC GR8 | BL108032U813 | BL108032U813 | 4 |

| | | | |
|---|--------------|--|------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: BUCKET CYLINDER ROTATOR ASSEMBLY (RE MOTOR) | | | |
| PART NUMBER: | | 22 11 01 010 0 / 102124 | SCALE: 1:12 |
| DRAWN BY: OJ | APPROVED BY: | DATE: 11/09/2005 | SHEET: 2 OF 2 |

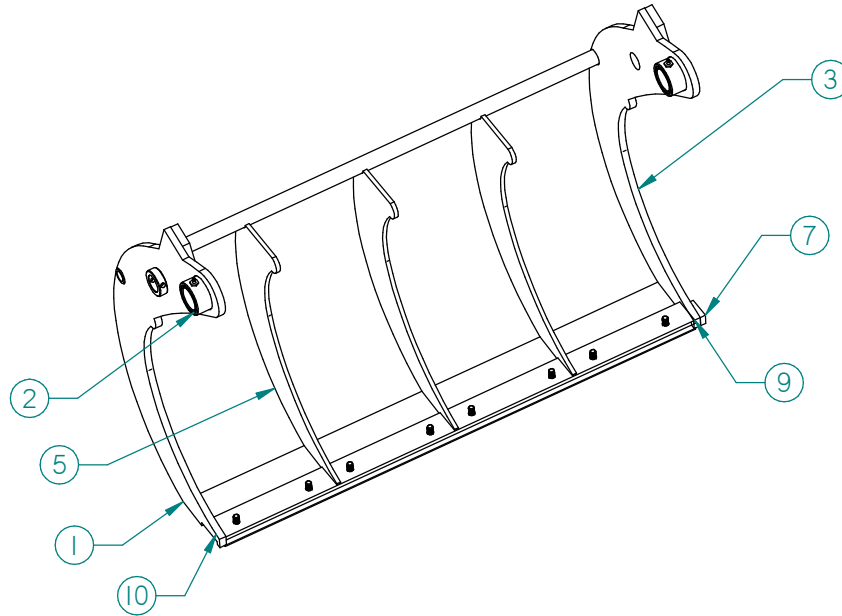
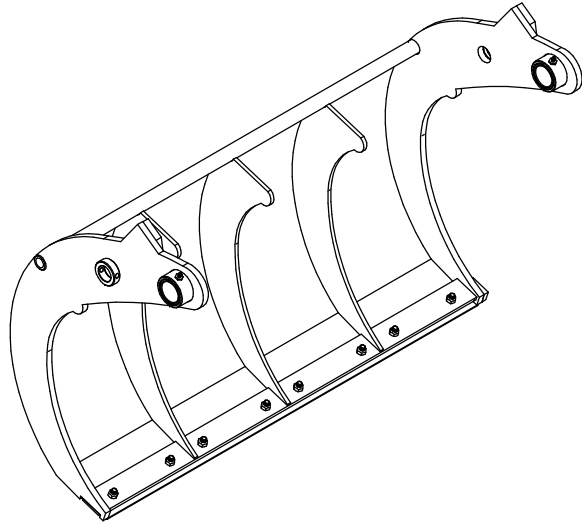
010 BILL OF MATERIALS




| Item # | Title | Document # | MACOLA | Qty |
|--------|--|----------------|-------------|-----|
| 1 | BUCKET MANIFOLD GREASE FITTING COVER | 41 11 09 025 0 | I02151 | 2 |
| 2 | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 2 |
| 3 | BUCKET MANIFOLD HOUSING | 41 11 09 024 2 | I02443 | 1 |
| 4 | ELBOW 90 06M-JIC 06M-JIC LONG | HF806069ML | HF806069ML | 1 |
| 5 | HYDRAULIC, #6-6 90 DEG ELBOW | HF806069M | HF806069M | 1 |
| 6 | SEAL KIT TR-035 | HPKTR035 | HPKTR035S09 | 3 |
| 7 | BEARING RACE #493 | BE03N493 | BE03N493 | 2 |
| 8 | TIMKEN ROLLER BEARING #495-A | BE03N495A | BE03N495A | 2 |
| 9 | BEARING GREASE RETAINER FOR CONTINUOUS ROTATOR | 41 11 09 013 2 | WAL866902 | 2 |
| 10 | CONTINUOUS ROTATOR THRUST WASHER | 41 11 09 015 1 | WAF885002 | 2 |

| | | | |
|---|--------------|--|----------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: BUCKET MANIFOLD ASSEMBLY | | | |
| PART NUMBER: 21 11 09 002 2 / I02127 | | | SCALE: 1:8 |
| DRAWN BY: <i>EB</i> | APPROVED BY: | DATE: 12/14/2000 | SHEET: 3 OF 3 |

010 BILL OF MATERIALS
020 ASSEMBLE AS SHOWN

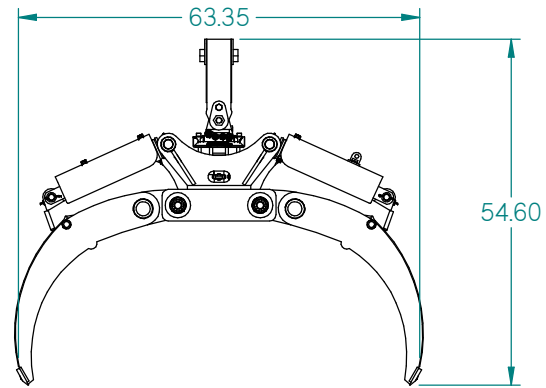
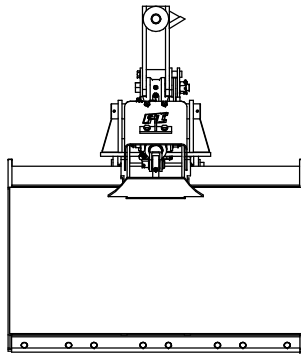
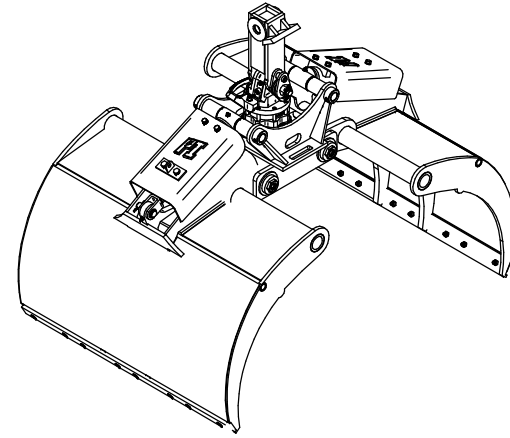
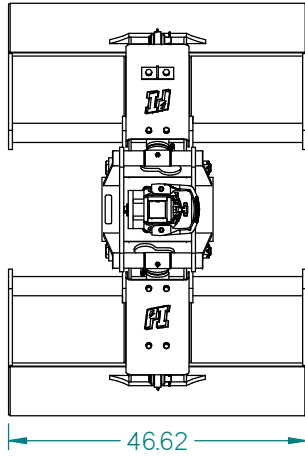


| Item # | Title | Document # | MACOLA | Qty |
|--------|---|----------------|----------|-----|
| 1 | BUCKET, TL JAW RIGHT SIDE WELDMENT | 22 11 01 007 1 | 102435 | 1 |
| 2 | BUSHING, 2 1/2 X 2 X 2 NYLATRON | 41 11 09 022 4 | BU502008 | 2 |
| 3 | BUCKET, TL JAW LEFT SIDE WELDMENT | 22 11 01 008 1 | 102442 | 1 |
| 4* | BUCKET, TL JAW RIB TUBE | 42 11 01 019 1 | 102169 | 1 |
| 5 | STD BUCKET JAWS RIB | 41 11 09 021 2 | 102165 | 3 |
| 6* | BUCKET, TL JAW SKIN 3/16" | 42 11 01 015 4 | 102166 | 1 |
| 7 | BUCKET, ALLIGNMENT BLOCK | 42 11 01 040 0 | 102199 | 1 |
| 8* | 1/8" STRAIGHT GREASE FITTING | HF2002S | HF2002S | 2 |
| 9 | BUCKET, TL JAW BOLT-ON BAR 3/8 X 2-1/2 X 46 | 42 11 01 042 1 | 102161 | 1 |
| 10 | BUCKET, TL JAW BLADE | 42 11 01 041 0 | 102171 | 1 |
| 11* | HEX NUT 1/2-13 STOVERLOCK | NUS08U | NUS08U | 8 |

| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: TRASH BUCKET JAW ASSEMBLY | | | |
| PART NUMBER: 22 11 01 002 5 / 102132 | | | SCALE: 1:16 |
| DRAWN BY: EB | APPROVED BY: | DATE: 08/28/2000 | SHEET: 2 OF 3 |

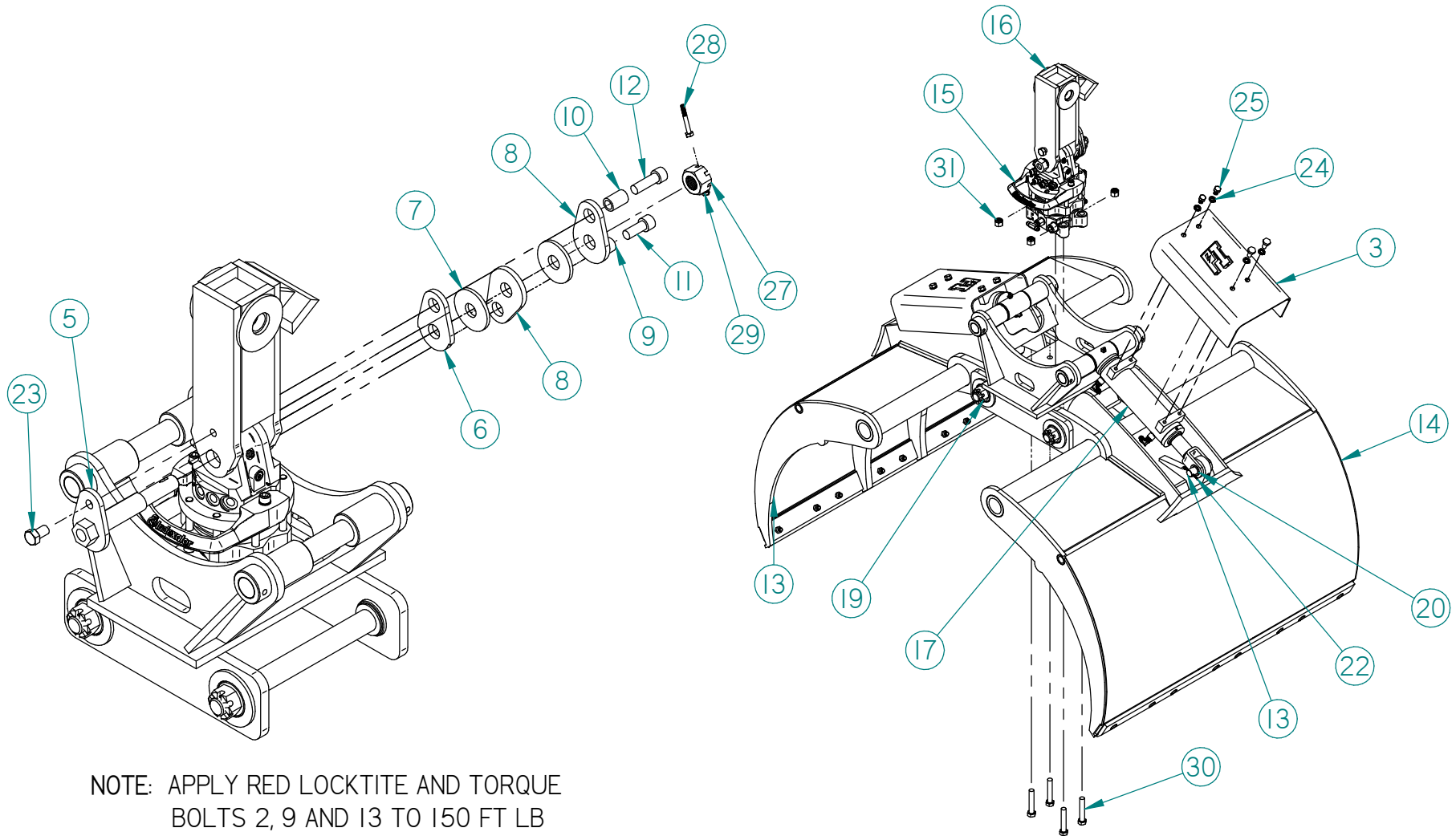
010 ASSEMBLY

| REV. | DESCRIPTION | DATE | BY |
|------|--------------------------------|------------|-----|
| 1 | REVISED GIMBAL MOUNTING PIN | 09/30/2016 | SWB |
| 2 | REVISED BUCKET SADDLE WELDMENT | 10/04/2016 | SWB |




NOTE: DUAL CYLINDER BUCKET WEIGHS 1040 LBS


| TOLERANCES | | PETERSEN INDUSTRIES INC. | |
|----------------------------|----------|---|--|
| 1 DEC. | ± 0.100 | 4000 S.R. 60 WEST | |
| 2 DEC. | ± 0.050 | LAKE WALES, FL. 33859-8234 | |
| 3 DEC. | ± 0.010 | TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| ANGLE: | ± 1.000° | TITLE: DUAL CYLINDER BUCKET ASSEMBLY | |
| FRACTION: | ± 1/32" | PART NUMBER: 11 11 11 001 2 / 102103 | |
| DIM. UNITS: | INCHES | SCALE: 1:30 | |
| SURFACE FINISH: | 125 / 32 | DRAWN BY: SWB | |
| UNLESS OTHERWISE SPECIFIED | | APPROVED BY: | |
| | | DATE: 03/03/2016 | |
| | | SHEET: 1 OF 3 | |



NOTE: APPLY RED LOCKTITE AND TORQUE BOLTS 2, 9 AND 13 TO 150 FT LB

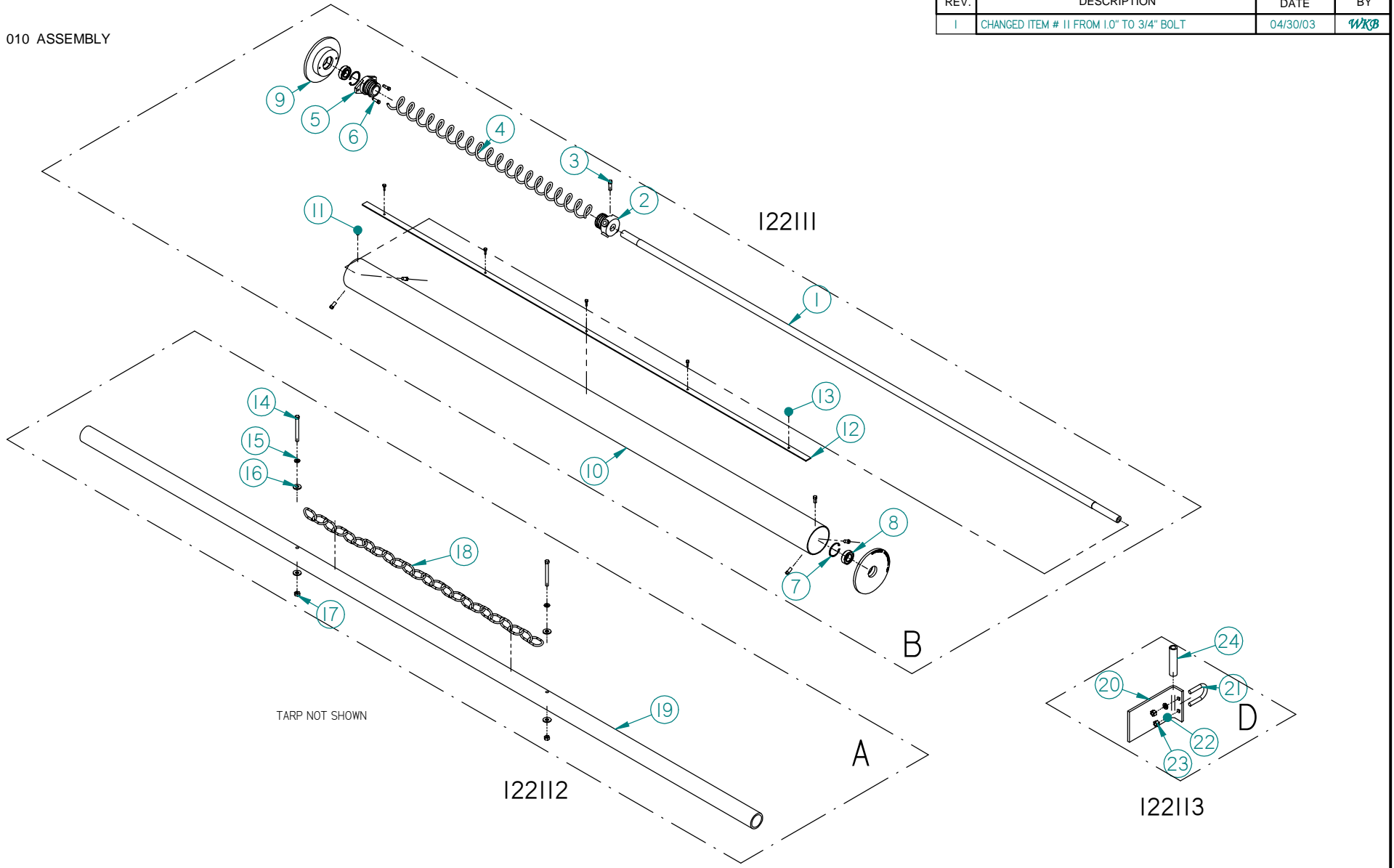
| | | | |
|---|--------------|--|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: DUAL CYLINDER BUCKET ASSEMBLY | | | |
| PART NUMBER: 11 11 11 001 2 / 102103 | | | SCALE: 1:20 |
| DRAWN BY: <i>SWB</i> | APPROVED BY: | DATE: 03/03/2016 | SHEET: 2 OF 3 |

| Item # | Title | Document # | MACOLA | Quantity | Item # | Title | Document # | MACOLA | Quantity |
|--------|--|----------------|--------------|----------|--------|---|----------------|--------------|----------|
| 1' | DCB, BUCKET SADDLE WELDMENT | 32 II II 004 I | I02543 | 1 | 26' | BOLT, STRUCTURAL, HEAVY HEX, .50 - 13 UNC X 1.00 LG | BL408016U5 | BL408016U5 | 2 |
| 2' | DUAL CYLINDER BUCKET, CYLINDER PIN | 42 II II 020 0 | I02526 | 2 | 27 | NUT SLOTTED 1-12 SAE GR5 | NUBI6S5 | NUBI6S5 | 1 |
| 3 | BUCKET, DCB CYLINDER COVER | 41 II 09 056 I | I02204 | 2 | 28 | BOLT HEX 1/4-20 X 2 USS G5 | BL304032U520 | BL304032U520 | 1 |
| 4' | WASHER BRAKE, 4 X 1 5/16 X 1/4 | WAF642004 | WAF642004 | 2 | 29 | HEX NUT 1/4-20 STOVERLOCK USS | NUS04U | NUS04U | 1 |
| 5 | GIMBAL MOUNTING PIN ASSEMBLY | 31 II II 008 2 | I02208 | 1 | 30 | HEX BOLT .625-11 X 3.50 USS G5 | BL310056U511 | BL310056U511 | 4 |
| 6 | DCB, GIMBAL BRAKE PLATE W/ CUTOUT | 42 II II 021 0 | I02527 | 1 | 31 | NUT, HEX .625 USS | NUS10U | NUS10U | 4 |
| 7 | BUCKET BRAKE WASHER 3 X 1.063 X .25 | WAF632004 | WAF632004 | 2 | 32' | DCB, TARP HOOK BRACKET WELDMENT | 32 II II 006 0 | I02550 | 1 |
| 8 | GIMBAL BRAKE PLATE | 42 II II 022 0 | I02528 | 2 | | | | | |
| 9 | METRIC BOLT SHOULDER | 41 II II 012 0 | I02504 | 1 | | | | | |
| 10 | STANDARD BOLT SHOULDER | 41 II II 011 I | I02503 | 1 | | | | | |
| 11 | SCREW, CAP M16 X 2.0 X 40 | SCAM1640 | SCAM1640 | 1 | | | | | |
| 12 | GEARBOX MOUNTING BOLT | SCAI032C | SCAI032C | 1 | | | | | |
| 13 | SAE CLEVIS PIN 1 X 3 | FA011648 | FA011648 | 2 | | | | | |
| 14 | DUAL CYLINDER BUCKET, JAW ASSEMBLY | 22 II II 001 0 | I02541 | 2 | | | | | |
| 15 | DUAL CYLINDER BUCKET, ROTATOR ASSEMBLY | 32 II II 005 0 | I02547 | 1 | | | | | |
| 16 | BUCKET GIMBAL WELDMENT 4" X 5" X 11" | 31 II 09 046 I | I02200 | 1 | | | | | |
| 17 | CYLINDER ASSEMBLY | 11 14 02 001 I | I21195 | 2 | | | | | |
| 18' | PIN, GRAPPLE ARM | 31 II II 007 0 | I02207 | 2 | | | | | |
| 19 | SLOTTED NUT 1-1/4 UNC GR5 | NUB20U | NUB20U | 2 | | | | | |
| 20 | WASHER, BUSHING 1.00 X 1.50 | WAB1624 | WAB1624 | 8 | | | | | |
| 21' | WASHER BUSHING, 1 1/2 X 2 1/4 | WAB2436 | WAB2436 | 4 | | | | | |
| 22 | COTTER PIN 3/16 X 2 | FA020332 | FA020332 | 2 | | | | | |
| 23 | HEX BOLT .625-11 X 1.00 USS G5 | BL310016U511 | BL310016U511 | 1 | | | | | |
| 24 | WASHER LOCK 1/2 SPLIT USS | WAS085 | WAS085 | 8 | | | | | |
| 25 | BOLT, HEX 1/2-13 X 3/4 USS G5 | BL308012U513 | BL308012U513 | 6 | | | | | |


| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: DUAL CYLINDER BUCKET ASSEMBLY | | | |
| PART NUMBER: II II II 001 2 / I02103 | | | SCALE: NA |
| DRAWN BY: SWB | APPROVED BY: | DATE: 03/03/2016 | SHEET: 3 OF 3 |

010 ASSEMBLY

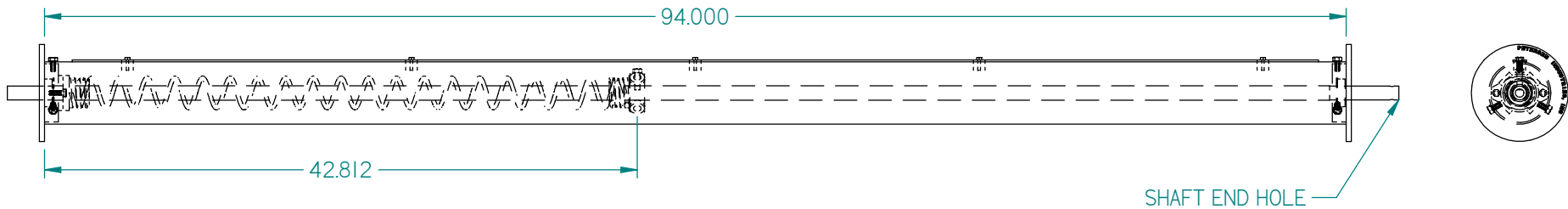
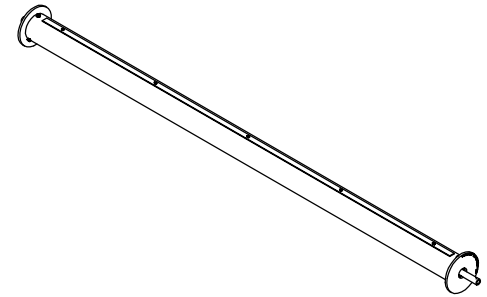
| REV. | DESCRIPTION | DATE | BY |
|------|--|----------|-----|
| I | CHANGED ITEM # 11 FROM 1.0" TO 3/4" BOLT | 04/30/03 | WKB |




| TOLERANCES | |
|----------------------------|----------|
| 1 DEC. | ± 0.100 |
| 2 DEC. | ± 0.050 |
| 3 DEC. | ± 0.010 |
| ANGLE: | ± 1.000° |
| FRACTION: | ± 1/32" |
| DIM. UNITS: | INCHES |
| SURFACE FINISH: | 125/32 |
| UNLESS OTHERWISE SPECIFIED | |

| | | | | |
|--------------------------------------|---|------------------|--|--|
| DEC. = DECIMAL PLACES |  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| | TITLE: LOAD COVER ROLLER ASSEMBLY | | | |
| PART NUMBER: 22 09 01 001 1 / 122101 | | | SCALE: 1:18 | |
| DRAWN BY: EB | APPROVED BY: | DATE: 10/29/2001 | SHEET: 1 OF 3 | |

- 010 ASSEMBLE END PLATE, BEARING AND RETAINING RING WITH SPRING CONE.
- 020 ATTACH SPRING AND SHAFT CONE TO CONE ASSEMBLED END PLATE.
- 030 SLIDE SHAFT THROUGH SUB ASSEMBLY. SPRING MUST BE ON OPPOSITE SIDE OF SHAFT END HOLE. PULL SHAFT CONE AND SECURE IT TO THE SHAFT WITH BOLT.
- 040 INSERT SUB ASSEMBLY INTO TUBING. ATTACH TUBING TO END PLATE SUB ASSEMBLY WITH BOLTS
- 050 ASSEMBLE END PLATE, BEARING AND RETAINING RING.
- 060 INSERT END PLATE SUB ASSEMBLY AT ASSEMBLY OPEN END AND ATTACH IT WITH BOLTS.
- 070 INSTALL COVER AND SECURE IT TO TUBING WITH STRAP AND SCREWS



| | | | |
|---|---------------------|---|-------------------------|
|  | | PETERSEN INDUSTRIES INC. 4000 S.R. 60 WEST LAKE WALES, FL. 33859-8234 TEL: (863) 676-1493 FAX: (863) 676-6844 | |
| TITLE: LOAD COVER ROLLER ASSEMBLY | | | |
| PART NUMBER: 22 09 01 001 1 / 122101 | | | SCALE: 1:12 |
| DRAWN BY: <i>EB</i> | APPROVED BY: | DATE: 10/29/2001 | SHEET: 2 OF 3 |

| Item # | Title | Document # | MACOLA | Qty |
|--------|--------------------------------------|----------------|--------------|------|
| 1 | LOAD COVER SHAFT | 42 09 01 011 2 | I22I21 | 1 |
| 2 | LOAD COVER SPRING CONE, SHAFT SIDE | 42 09 01 016 0 | I22I22 | 1 |
| 3 | HEX BOLT 3/8-16 X 1.25 USS G5 | BL306020U516 | BL306020U516 | 1 |
| 4 | LOAD COVER SPRING | 42 09 01 017 0 | SP01001 | 1 |
| 5 | LOAD COVER SPRING CONE, PLATE SIDE | 42 09 01 015 0 | I22I23 | 1 |
| 6 | HEX BOLT 5/16-18 X 1 USS G5 | BL305016U518 | BL305016U518 | 2 |
| 7 | 2.1875" RETAINER RING, 1/16" THICK | FA093200 | FA093200 | 2 |
| 8 | BEARING 1.0" ID, 2.0" OD, .56" THICK | BE04NI64IDC | BE04NI64IDC | 2 |
| 9 | LOAD COVER END PLATE | 42 09 01 010 2 | CA3002 | 2 |
| 10 | LOAD COVER TUBING | 42 09 01 013 2 | I22I26 | 1 |
| 11 | HEX BOLT 3/8-16 X .750 USS G5 | BL306012U516 | BL306012U516 | 6 |
| 12 | LOAD COVER STRAP | 42 09 01 012 0 | I22I27 | 1 |
| 13 | # 14 SCREW, 3/4" LONG | BL306020U516 | BL306020U516 | 5 |
| 14 | BOLT, 5/16"-18 X 3" | BL305048U518 | BL305048U518 | 2 |
| 15 | LOCK WASHER, 5/16" | WAS055 | WAS055 | 2 |
| 16 | FLAT WASHER, 5/16" | WAF05U5 | WAF05U5 | 4 |
| 17 | NUT, 5/16"-18 | NUA05U | NUA05U | 2 |
| 18 | CHAIN, 1/4" PC X 48" | CHP04B00 | CHP04B00 | 4 FT |
| 19 | PIPE, 102" PVC | 42 09 01 008 0 | I22I29 | 1 |
| 20 | MOUNTING EAR | 42 09 01 055 1 | I22I28 | 1 |
| 21 | BOLT, 1-1/4" X 2-1/4" U | BLU20036U5 | BLU20036U5 | 1 |
| 22 | LOCK WASHER, 3/8" | WAS065 | WAS065 | 2 |
| 23 | NUTS (COMES WITH U-BOLTS) | NA | NA | 2 |
| 24 | MOUNTING EAR PIPE | 42 09 01 018 0 | I22I30 | 1 |



PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

| | | | |
|--|--------------|------------------|---------------|
| TITLE: LOAD COVER ROLLER ASSEMBLY | | | |
| PART NUMBER: 22 09 01 001 1 / I22I01 | | | SCALE: NA |
| DRAWN BY: EB | APPROVED BY: | DATE: 10/29/2001 | SHEET: 3 OF 3 |

PETERSEN INDUSTRIES, INC. TRASH LOADER PARTS

| Dia. | | Order By |
|-----------------------------|---|---------------|
| No. | Part Name | This Part No. |
| MISCELLANEOUS PARTS: | | |
| | Seal Kit - HA36 Hydraulic Actuator | HPKAS395 |
| | Seal Kit - SS40 Hydraulic Actuator | HPK430308SI |
| | Pump, Standard Spline | HC02002 |
| * | 3-Way Valve, 3/4" Port | VA0312160R |
| * | 4-Way Valve, 3/4" Port | VA0412160R |
| * | Seal Kit, 5" Lift Cylinder | HPKTH10329B |
| * | Seal Kit, 5" Tip Cylinder | HPKTH10329B |
| | Seal Kit, 3" Vertical Outrigger Cylinder, Round | HPK12044X |
| | Seal Kit, 3" Vertical Outrigger Cylinder, Square | HPKTH16195 |
| | Seal Kit, 2" Horizontal Outrigger Cylinder | HPKTH10154 |
| | Seal Kit, 4" Bucket Cylinder | HPKTH10140 |
| | Suction Filter Assembly | OT01002 |
| | Suction Filter Element | OT02003 |
| | Return Filter Assembly | OT03004 |
| | Return Filter Element | OT03005 |
| | Seal Kit, 2" Tip Extension Cylinder | HPKTH12570 |
| | * NOTE: Item numbers with an asterisk (*) may have part numbers and prices different than what is shown on this price list. Please consult with the Petersen Parts Department to help correctly identify these parts for your loader. You may reach our Parts Department at 800/930-5623, ext. 229. | |

NOTIFICATION OF TRANSFER OF OWNERSHIP

TO: Petersen Industries, Inc.
4000 SR 60 West
Lake Wales, FL 33859
Telephone: 800/930-5623, Ext. 256

FROM: _____

This is to advise you that our organization is no longer the owner of the Petersen loader listed below. We have listed the name and address of the subsequent owner. Would you please change your records accordingly.

Petersen Loader Serial Number: _____

VIN: _____

Name and Address of New Owner:

Phone: _____

Contact: _____

BY: _____
(Name)

Date: _____

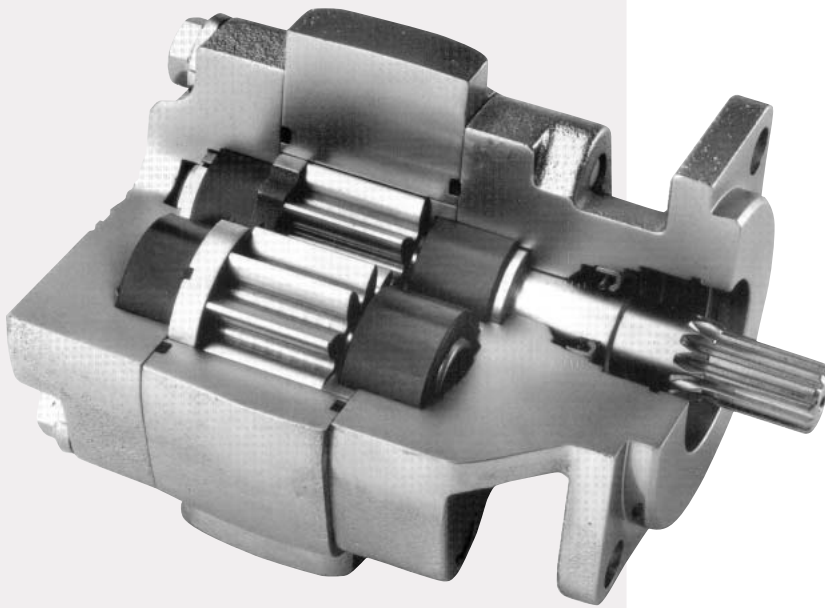


Service Manual HY09-SM020/US

Service Manual PGP020™

Effective: July 1, 2006
Supersedes: All Others

PGP020 Series



The Parker Hannifin Gear Pump Division Assures:

- Consistent quality
- Technical innovation
- Premier customer service

Worldwide Sales and Service

Parker operates sales and service centers in major industrial areas worldwide. Call 1-800-C-PARKER for more information, or for a synopsis of the Gear Pump Division, contact a Parker representative.

The Gear Pump Division's ability to engineer specialty products for unique applications has kept us at the forefront of technology, and ensured our position as the industry leader. Our success has come from providing a quality product with excellent sales and service support.

We manufacture hydraulic components for a wide range of industries including:

- Construction
- Refuse/dump truck
- Material handling
- Forestry
- Agriculture
- Industrial



WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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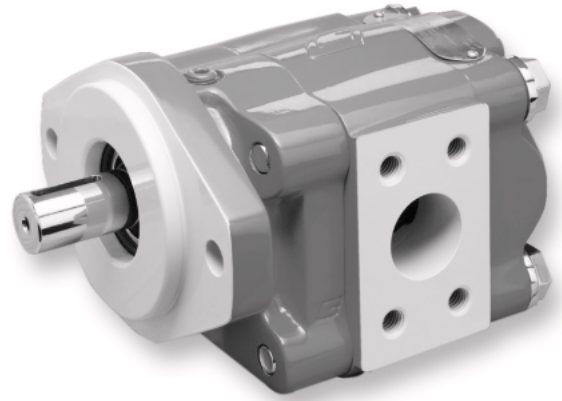


Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

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Pump Service Instructions

General Instructions

These service instructions will:

- familiarize you with the PGP020 series roller bearing pump, its component parts and their relative position;
- show the proper methods for disassembly and assembly;
- advise appropriate care and use of this hydraulic pump.

Following these instructions can prolong the life of your pump, and help achieve optimal performance.

We recommend you read this entire set of instructions before attempting any repair.

To ensure damage did not occur during shipment, check all replacement parts closely before installation.

Cleanliness

Dirt is the enemy of any hydraulic system, so keeping equipment clean is a crucial maintenance requirement.

MAKE SURE YOU DISASSEMBLE AND ASSEMBLE YOUR HYDRAULIC EQUIPMENT IN A CLEAN AREA.

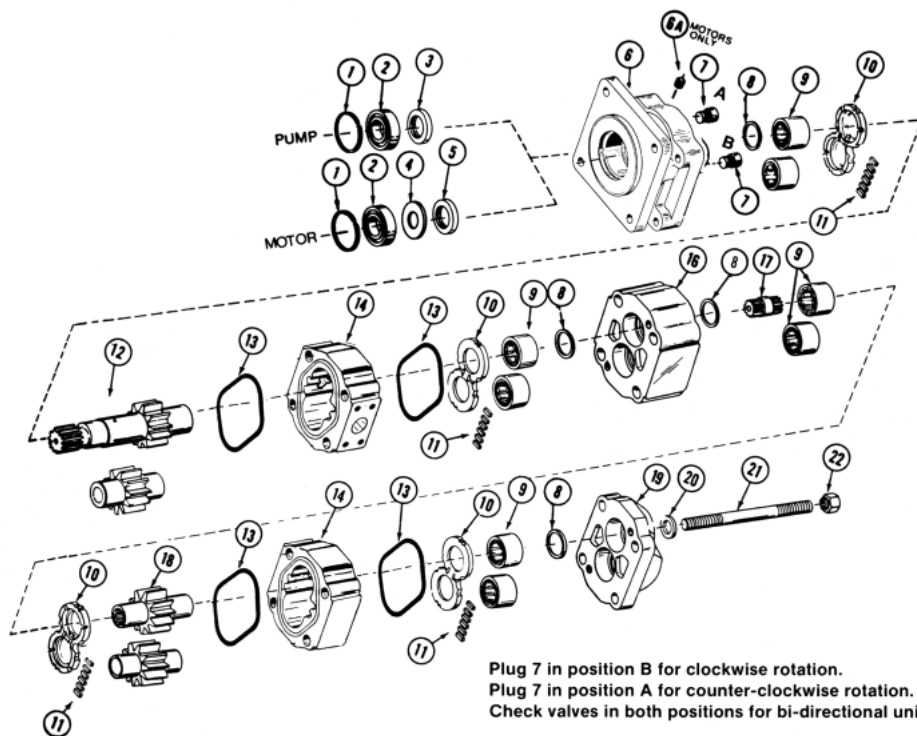
TO PREVENT PERSONAL INJURY, SAFETY GLASSES AND STEEL TOE SHOES SHOULD BE WORN.

Cautions

- 1) Parker replacement parts are made to original equipment standards. For assured quality of material and workmanship and for compatibility in assembly, **USE ONLY GENUINE Parker REPLACEMENT PARTS.**
- 2) If it becomes necessary to pry apart castings, use extreme caution not to mar or damage the machined surfaces. Excessive force while prying can result in misalignment and seriously damage parts.
- 3) If component assembly is difficult, do not force items and never employ an iron hammer. For a complete list of recommended tools, see Page 11.
- 4) Gears are closely matched, therefore, they must be kept together as a set when removed from the unit. Handle with care to avoid damage to the journals, faces and teeth.
- 5) Never hammer roller bearings into bores. Use only an arbor press or other suitable tool.
- 6) It is important to airblast all parts and wipe them with a clean, lint-free cloth before assembly.

Exploded View and Parts List

| Item No. | Description | Required | Ten Digit No. (TDN) |
|----------|---|----------|----------------------|
| 1 | Snap Ring | 1 | 391-2686-063 |
| 2 | Outboard Bearing | 1 | 391-0381-040 |
| | Outboard Spacer | 1 | 391-3383-069 |
| 3 | Lip Seal (pump) | 1 | 391-2883-058 |
| 4 | Seal Retainer (motor) | 1 | 391-3381-040 |
| 5 | Lip Seal (motor) | 1 | 391-2883-119 |
| 6 | Shaft End Cover | 1 | 308-50XX-XXX |
| 6A | Drain Plug (motor) | 1 | 391-2282-XXX |
| 7 | Check Assemblies for Motors & Bi-Rotational Pumps | 2 | 391-3681-001 |
| | Plugs (pumps only) | 1 | 391-2286-004 |
| 8 | Ring Seals (per gear section) | 2 | 391-2585-006 |
| 9 | Roller Bearings (per gear section) | 4 | 391-0381-906 |
| 10 | Thrust plates (motor) (per gear section) | 2 | 391-2185-913 |
| | Thrust plates (pump) (per gear section) | 2 | 391-2185-913 |
| 11 | Pocket Seals (per gear section) | 1 strip | 391-2882-022 (Viton) |
| | | | 391-2882-051 (Buna) |
| 12 | Drive Shaft Gear Set | 1 Set | 312-29XX-XXX |
| 13 | Gasket Seals (per gear section) | 2 | 391-2884-019 |
| 14 | Gear Housing | 1 | 308-8XXX-XXX |
| 16 | Bearing Carrier | - | 308-7XXX-XXX |
| 17 | Connecting Shaft | - | 312-1133-001 |
| 18 | Gear Set | set | 312-28XX-XXX |
| 19 | Port End Cover | 1 | 308-3XXX-XXX |
| 20 | Washers | 4 | 391-3782-146 |
| 21 | Cap Screws (single units) | 4 | 391-1401-XXX |
| | Studs (multiple units) | 4 | 391-1425-XXX |
| 22 | Nuts (multiple units) | 4 | 391-1451-115 |



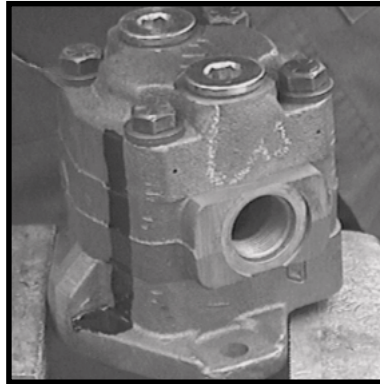
PGP020™ Disassembly Instructions

STEP 1



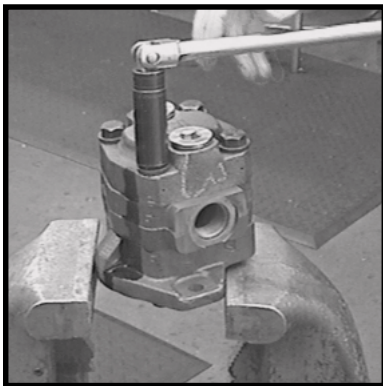
Place the pump in a vise with the drive shaft pointing down. Clamp unit on the sides of the mounting flange. Do not clamp on the pilot diameter as it may damage the sealing surface.

STEP 2



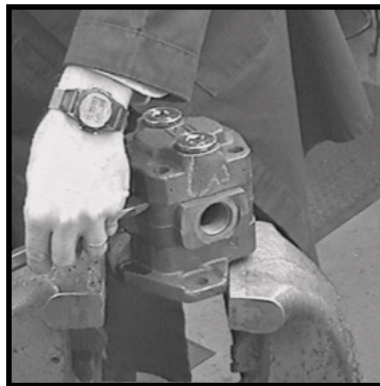
Mark each casting in the assembly with machinist ink or a prick punch to orient the castings, so that the unit can be reassembled later in the proper position.

STEP 3



Loosen and remove the four, cap screws and washers with a 13/16" socket and wrench.

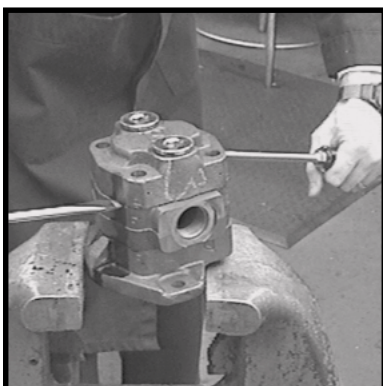
STEP 4.1



Remove the port end cover subassembly using steps 4.1 - 4.3:

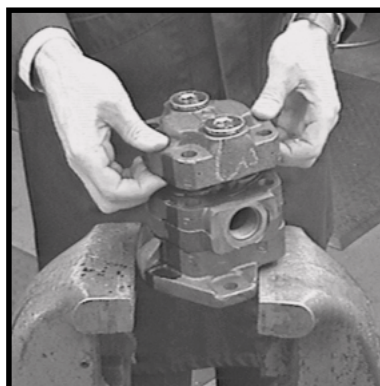
4.1 Place the point of a large, screwdriver or a chisel on the parting line between the port end cover casting and the gear housing casting. Gently tap until a slight separation between the castings is detected.

STEP 4.2



4.2 Place two, large, flat-bladed screwdrivers into the separation notches and pry up the port end cover until loose. **BE CAREFUL** not to nick, mar or scratch the machined casting faces.

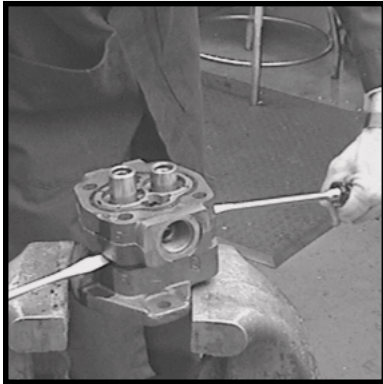
STEP 4.3



4.3 Lift off the port end cover subassembly.

PGP020™ Disassembly Instructions

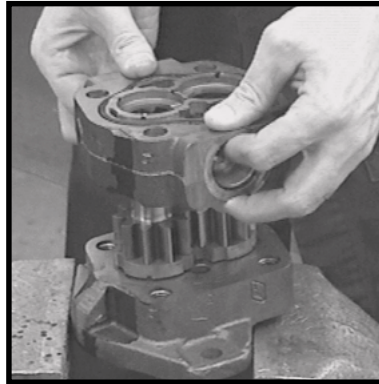
STEP 5.1



Remove the gear housing subassembly using steps 5.1 - 5.3:

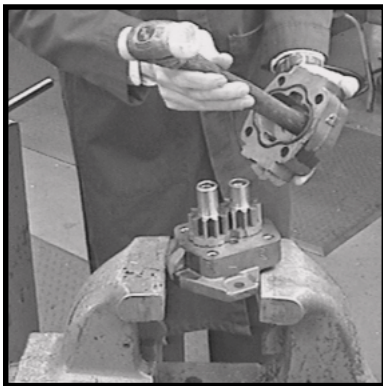
5.1 Place the two, large, flat-bladed screwdrivers into the separation notches and pry up the gear housing until loose. BE CAREFUL not to nick, mar or scratch the machined casting faces.

STEP 5.2



5.2 Lift off the gear housing subassembly.

STEP 5.3



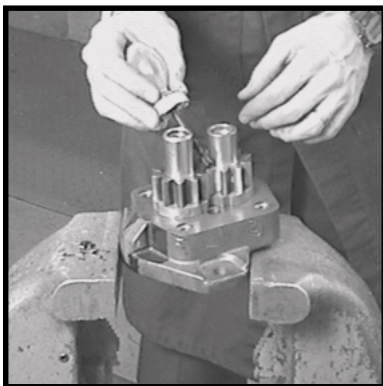
5.3 Remove the thrust plate from the housing. It may be necessary to gently tap the thrust plate with the handle of a hammer or screwdriver. Be careful not to bend or score the thrust plate. Remove and discard the six, small, rubber pocket seals from the thrust plate.

STEP 6



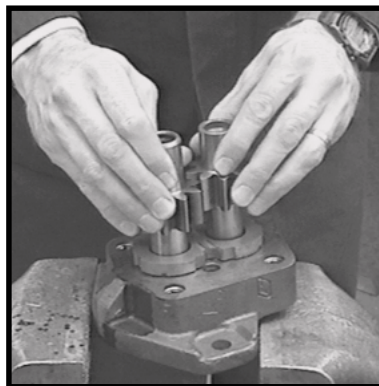
Remove and discard the rubber section seals from the top and bottom gear housing faces.

STEP 7



Wipe the gear face surface dry with a clean, lint-free cloth. Mark the teeth of the drive and driven gears (the gear set) at their mesh point with machinist ink or quick-dry marker. This is to index the gear set for proper orientation during reassembly.

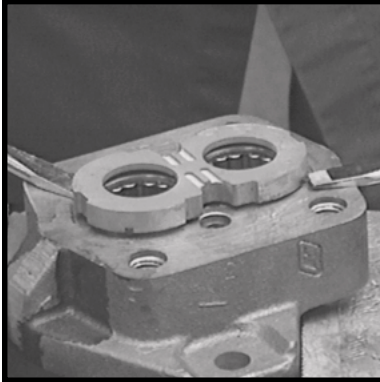
STEP 8



Remove the idler gear and the gear shaft. Keep them together as they are a matched set. Handle with care to avoid damage to the journals, faces and teeth.

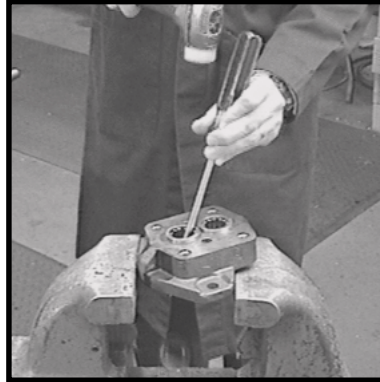
PGP020™ Disassembly Instructions

STEP 9



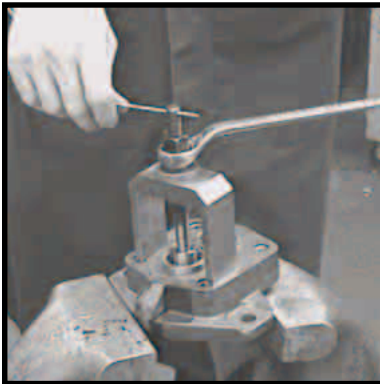
Gently lift off the thrust plate. Be careful not to bend or score the plate and mating surface of the casting. Remove and discard the six, rubber pocket seals from the back of the thrust plate.

STEP 10



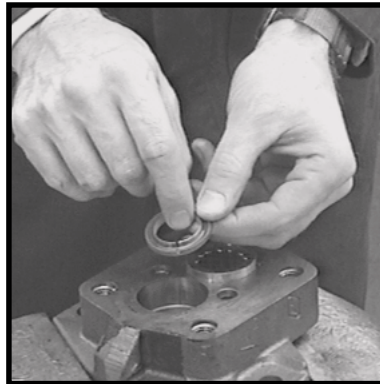
Remove lip seal. Place a lip seal removal tool (see Tool List P11) or a screwdriver tip against the inside of the lip seal and tap the screwdriver handle with a hammer. Be careful not to damage the roller bearing or the ring seal with screwdriver tip. Note: If bearings are to be removed from the casting, then step can be performed after Step 12.

STEP 11



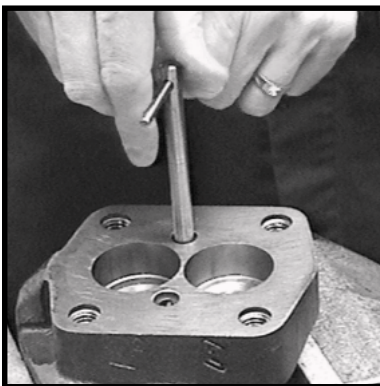
Use a bearing puller to remove the roller bearings. Note: This step is optional depending on the condition of the bearings.

STEP 12



Remove the bronze ring seal from the gear shaft bearing bore in the shaft end cover and the port end cover castings.

STEP 13



Remove the checks from the shaft end cover casting with the check tool (see Tool List on Page 11).

CAUTION: Failure to follow the recommended assembly instructions can result in poor performance or failure of the product. Product should be thoroughly tested to ensure proper operation before the unit is put back into service.

PGP020™ Assembly Instructions

STEP 1



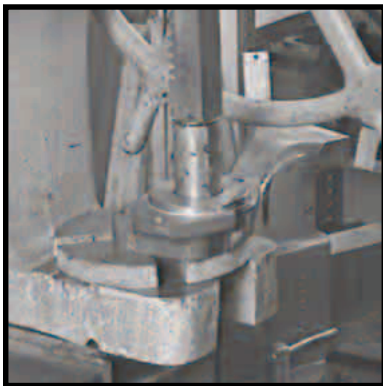
Stone all machined casting surfaces with a medium-grit carborundum stone. If the bearings were removed, deburr the bearing bore using a deburring tool. Rinse all parts in a solvent fluid. Air blast all parts and wipe them with a clean, lint-free cloth before starting the assembly.

STEP 2



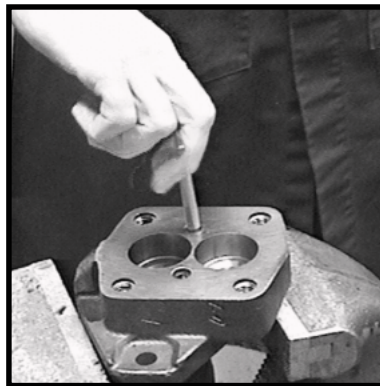
Coat the outside diameter of the lip seal with Permatex Aviation Form-A-Gasket No.3 Non-Hardening Sealant or equivalent. Be careful not to get Permatex on the inner lip of the seal as it will cause a lip seal leak.

STEP 3



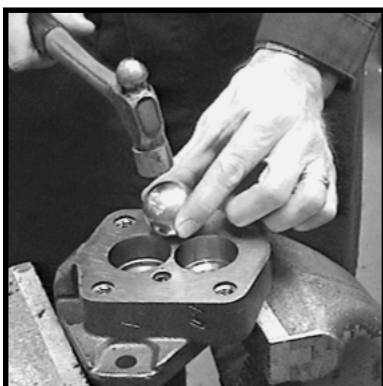
Place the shaft end cover on an arbor press with the pilot facing up. Place lip seal with the shoulder of the seal up, at the top of the seal bore. Press the lip seal into the shaft end cover with a lip seal installation bar (see Tool List on Page 11). The seal should be pressed in so it is flush with the recessed face in the shaft end cover casting.

STEP 4



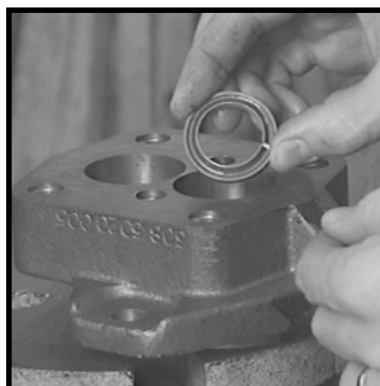
Apply Loctite® No.262 to the threaded check holes in the shaft end casting. Install the checks in the shaft end cover using the check tool (see Tool List on Page 11). The checks must bottom out in the casting.

STEP 5



Peen over the check holes in the shaft end cover with a 1½" steel ball and a hammer. This will insure the checks do not back out of the check holes during operation.

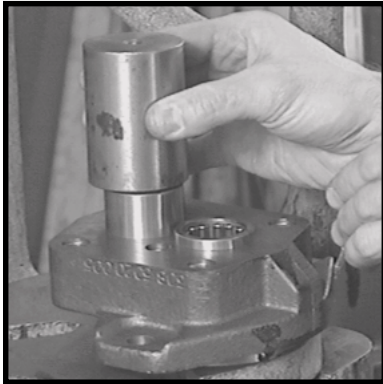
STEP 6



If the ring seals were removed from the shaft end cover or the port end cover, they should be replaced at this time. Place the ring seals in the bottom of the drive gear bearing bores. Be sure that the flat side of the ring seal is against the mating surface in the casting. Ring seals are placed behind the drive gear bearings only.

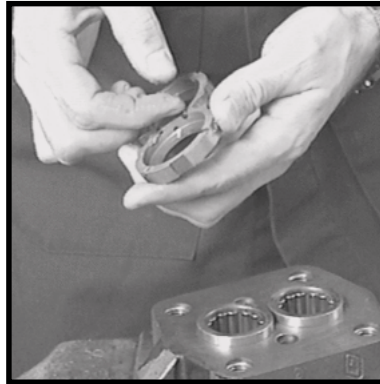
PGP020™ Assembly Instructions

STEP 7



Install the bearings in the shaft end cover and the port end cover. Use an arbor press to press the bearings into the bottom of the bearing bores. Check to make sure the ring seals move freely under the drive gear bearings.

STEP 8



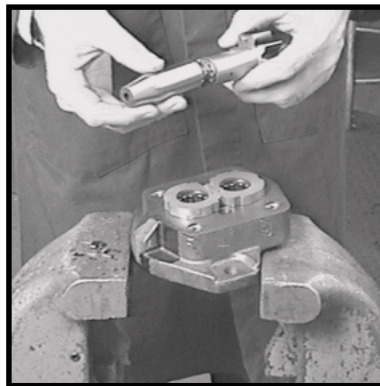
Grip the shaft end cover in a vise with the mounting face down. Cut two, pocket seals $7/32$ " long from the pocket seal strip. Grease the seals well and insert them into the center slots on the reverse side of the thrust plate.

STEP 9



With the pocket seals facing down, place thrust plate over the bearings. Tap the thrust plate with a soft-faced hammer around the edge until the thrust plate is about $1/32$ " from the casting surface. Do not tap the center of the plate. Cut four pocket seals $1/4$ " long from the seal strip. Push a pocket seal into each of the remaining slots in the thrust plate until it touches the bearing wall. Use a razor blade to trim the exposed portion of the pocket seals. The pocket seals should be flush with the outside diameter of the plate.

STEP 10



Insert the external drive end of the gear shaft into the shaft installation sleeve (see Tool List on Page 11). Lightly grease the gear shaft and sleeve.

STEP 11



Insert the gear shaft with the shaft installation sleeve into the shaft end cover using a twisting motion. Be careful not to damage the lip seal. Push down carefully until the gear rests against the thrust plate face. Remove the shaft installation sleeve. Insert the idler gear into its bearing bore, matching the orientation marks on the teeth of the gear set as previously marked (see Step 7 on Page 5).

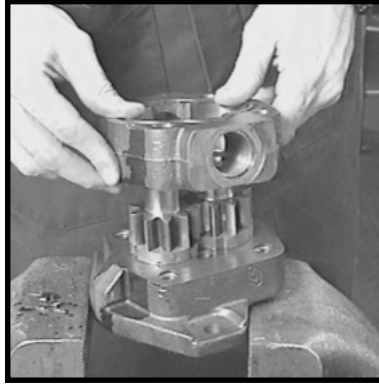
PGP020™ Assembly Instructions

STEP 12



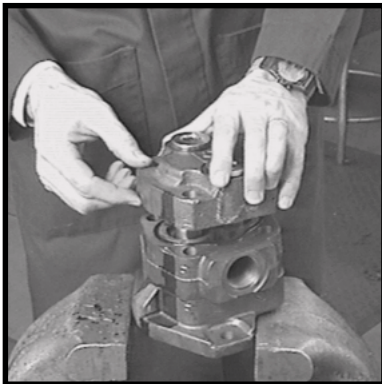
Apply a light coating of grease to the new section seals and place them into the machined grooves on both sides of the gear housing. Check the section seals for proper fit.

STEP 13



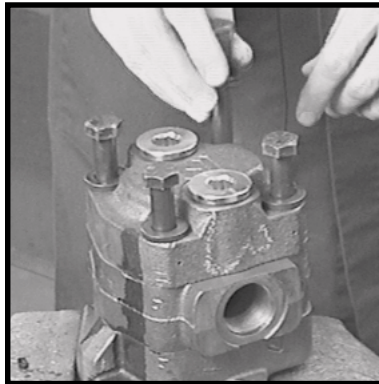
Locate the orientation mark on the gear housing and line it up with the mark on the shaft end cover. Slide the gear housing over gear set. Make sure the gear housing rests tightly against shaft end cover. Be careful not to pinch the section seal. Squirt clean, hydraulic oil over the gear shaft and the idler gear to provide initial lubrication when the pump is started.

STEP 14



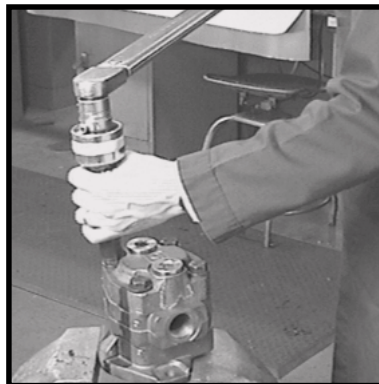
Insert the pocket seals into the thrust plate and install onto the port end cover following the previous instructions in steps 8 & 9. Then place port end cover over the gear journals. The orientation mark on port end cover must line up with the mark on the gear housing. Also, be sure bearing bore holding the ring seal goes over the drive gear journal. Apply pressure to the casting with your hand or tap lightly with a soft-faced hammer until the port end cover rests tightly against the gear housing.

STEP 15



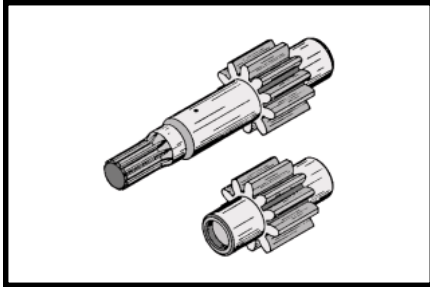
Thread the four, cap screws with the shaft end cover and tighten them in a cross-corner pattern. Rotate the gear shaft of the pump with a 6" wrench to make certain there is no binding in the pump.

STEP 16



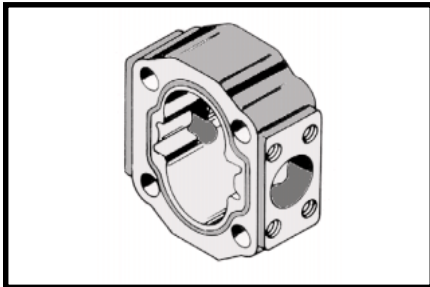
After the cap screws are tightened, make certain there is no internal binding of the gear set by rotating the gear shaft, then tighten the cap screws in a cross-corner pattern to a final torque of 2400 in. lbs. (200 ft. lbs.).

Part Replacement Guide



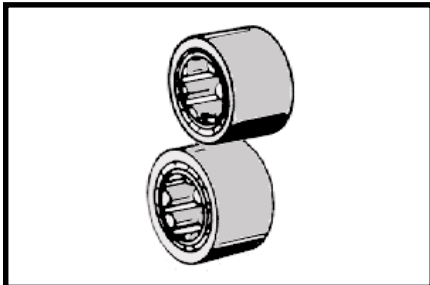
If the gear set contains any of the following defects, it should be replaced:

- Wear on the hubs or in the seal areas detectable by touch or in excess of .002".
- Score marks, grooves or burrs on the outside diameter of the teeth.
- Nicks, grooves or fretting of the teeth surfaces.
- Wear or damage to the drive spline, key or keyway.



Wear in excess of .005" cut-out necessitates replacement of the gear housing. Place a straight-edge across the bore. If you can slip a .005" feeler gage in the cut-out area, replace the gear housing.

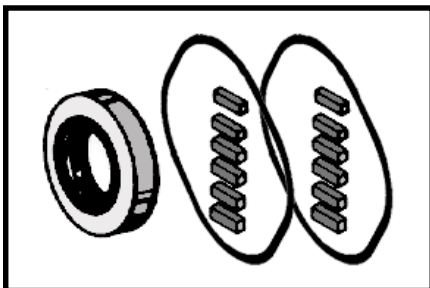
Where the cut-out is moderate, .005" or less, the gear housing is still in good condition. If the housing has equal size ports or no ports, the housing may be rotated 180°, exchanging ports, and reused.



If the gears are replaced, then the bearings must be replaced also. Bearings should fit into the bores with a light press fit.



Any scratches, grooves, erosion or pitting on the thrust plate face, which is the area that comes in contact with the gear faces, requires the replacement of the thrust plates.

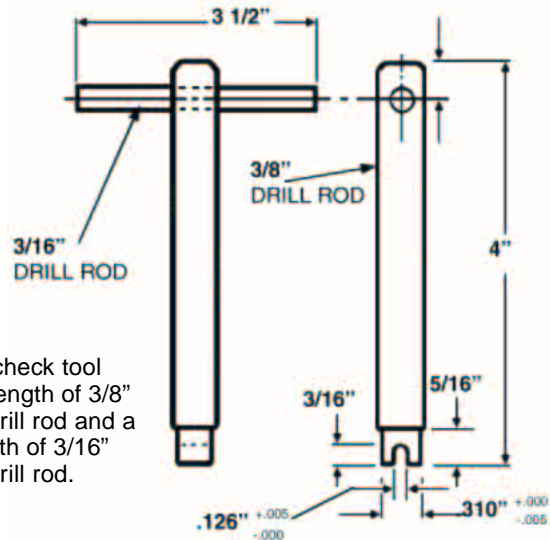


Replace all rubber and polymer seals whenever reassembling the pump. This includes lip seal, pocket seal strips and section seals.

Tool List

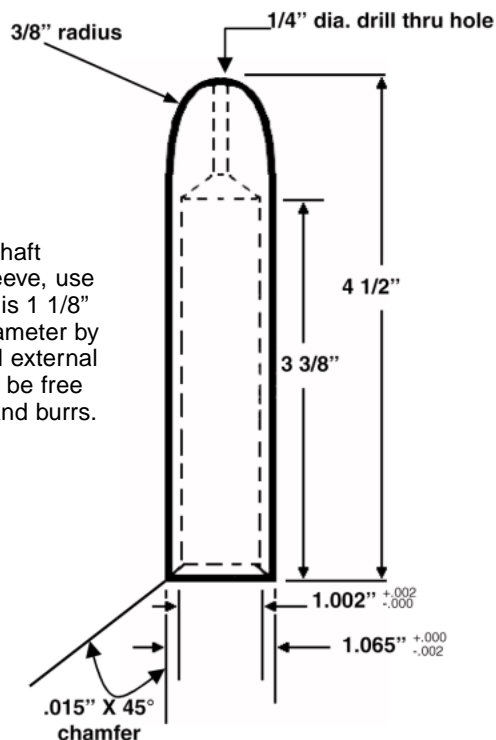
- Arbor press
- Permanent marker or an awl
- Bearing puller
(Owatonna Tool Co. MD-956 or equivalent)
- Clean, lint-free cloths
- Deburring tool (a file with the cutting teeth ground off)
- Machinist hammer
- Soft-faced hammer
- Permatex Aviation Form-A-Gasket No.3 Non-hardening Sealant or equivalent
- Medium-grit carborundum stone
- Hydraulic oil and grease
- Prick punch or machinists ink
- Sharp, razor blade
- Scale (1/32" or 1/64" graduations)
- Feeler gauges
- Small, flat-head screwdriver
- Large, flat-headed screwdrivers
- Torque wrench
- 13/16" socket
- 1½" steel ball
- Loctite® No.262
- Vise with a 6" minimum open spread
- Lip seal installation bar (1 3/4" X 2")
- Shaft installation sleeve (steel)
- Lip seal removal tool
- Check tool
- 6" wrench

Check Tool



Make the check tool from a 4" length of 3/8" diameter drill rod and a 3 1/2" length of 3/16" diameter drill rod.

Shaft Installation Sleeve (Steel)



To make the shaft installation sleeve, use bar stock that is 1 1/8" or 1 1/4" in diameter by 4 5/8" long. All external surfaces must be free of scratches and burrs.

Lip Seal Removal Tool

A seal removal tool can be made easily from an old screwdriver. Heat the tip and bend as shown. Grind off the tip to fit the notch behind the lip seal.



Lubrication and Oil Recommendations

All parts, with the exception of the outboard bearing, are lubricated by the hydraulic oil in the circuit. Particular attention must be paid to keep the oil in the system clean. Whenever there is a pump or motor failure and there is reason to suspect that metal particles may be in the system, the oil must be drained, the entire system flushed clean and any filter screens thoroughly cleaned or replaced. New oil should be supplied for the entire system. Oil suitable and recommended for use in circuits involving Commercial Hydraulics' pumps and motors should meet the following specifications:

- Viscosity:**
- 50 SSU minimum @ operating temperature
7500 SSU maximum @ starting temperature
 - 150 to 225 SSU @ 100° F (37.8° C) (generally)
44 to 48 SSU @ 210° F (98.9° C) (generally)

| Approximate SSU at . . . | | |
|--------------------------|-----------------|------------------|
| Oil Grade | 100 F (37.8° C) | 210° F (98.9° C) |
| SAE 10 | 150 | 43 |
| SAE 20 | 330 | 51 |

Viscosity Index: 90 minimum

Aniline Point: 175 minimum

Recommended Additives: Foam Depressant
Rust and Oxidation Inhibitors

- Other Desirable Characteristics:**
- Stability of physical and chemical characteristics.
 - High demulsibility (low emulsibility) for separation of water, air and contaminants.
 - Resistant to the formation of gums, sludges, acids, tars and varnishes.
 - High lubricity and film strength.

General Recommendations:

A good-quality, hydraulic oil conforming to the characteristics listed above is essential to the satisfactory performance and long life of any hydraulic system.

Oil should be changed on a regular schedule in accordance with the equipment manufacturer's recommendations, and the system should be periodically flushed.

Oil temperature in reservoir must not exceed 200° F (93.3° C) with a maximum temperature of 180° F (82.2° C) recommended. Higher temperatures will result in rapid oil deterioration.

Reservoir capacity should equal in gallons the pump output in gpm or the total gpm of all pumps where there is more than one in the system.

Normal Temperatures: 0° F (-18° C) to 100° F (37.8° C) Ambient
100° F (37.8° C) to 180° F (82.2° C) System
Be sure your oil is suitable for the temperatures you expect to encounter.

Cold Weather Operation:

Oils for use in cold weather should have a viscosity that does not exceed 7500 SSU at the minimum start-up temperature. A pour point of at least 20° F below start-up temperature is recommended. Start-up procedures should allow for a gradual warm-up until the oil reaches a reasonably fluid state.

Lubrication and Oil Recommendations

The Use of Other Oils:

- Diesel Fuel or Kerosene (Coal Oil): These are sometimes used as dilutants for cold weather operations but are not recommended as they are not sufficiently refined products.
- Fire-Resistant Fluids: Of the several different types, only the inverted emulsion types may be used without switching to a special seal, packing, gasket, hose, etc., compositions. Their use may substantially reduce pump life. Experience indicates that the use of fire-resistant fluids can be disastrous unless certain precautions are followed. **DO NOT USE ANY FIRE RESISTANT FLUIDS OR NON-PETROLEUM OILS WITHOUT CONSULTING OUR PRODUCT SUPPORT DEPARTMENT.**
- These suggestions are intended as a guide only. **OBTAIN YOUR FINAL OIL RECOMMENDATIONS FROM YOUR OIL SUPPLIER.**

Recommended Start-up Procedure for New or Rebuilt Pump or Motor

Before installing a new or a rebuilt pump or motor, back out the main relief valve until the spring tension on the adjusting screw is relaxed. This will avoid the possibility of immediate damage to the replacement unit in the event that the relief valve setting had been increased beyond the recommended operating pressure prior to removing the old unit.

Before connecting any lines to the pump or to the motor, fill all ports with clean oil to provide initial lubrication. This is particularly important when the unit is located above the oil reservoir.

After connecting the lines and mounting the replacement unit, operate the pump or the motor for at least two minutes at zero pressure at the lowest possible rpm. During this break-in period, the unit should run free and not develop an excessive amount of heat. If the unit operates properly, the speed and the pressure can then be increased to the normal operating settings.

Reset the main relief valve to its proper setting while the pump is running at the maximum operating engine (motor) speed for the vehicle.

ALWAYS USE AN ACCURATE GAGE WHEN ADJUSTING THE RELIEF VALVE PRESSURE SETTING.

Test Procedure Recommended

Be sure there is an adequate supply of oil for the pump; at least one gallon of oil for each gpm of pump capacity.

If one section of a tandem pump is being tested, make sure all other sections which are not being tested, are adequately supplied with oil. If any of the other sections run dry or if plugs are left in ports, serious and permanent damage will result.

The oil should be a good-quality, hydraulic oil rated at 150 SSU at 100° F with the oil temperature held at 120° F plus or minus 5° F. (Test procedures are described in detail in SAE handbooks; see Hydraulic Power Pump Test Procedure SAE J745c.)

The inlet line must be an adequate size with no more than 5" mercury vacuum adjacent to the pump inlet. As a rule, the inlet line must provide an inlet flow velocity that is not in excess of 8 feet per second.

Hot oil drawn into a cold pump could cause it to seize. Switching the pump on and off in short bursts could help prevent seizure.

Operate the pump at least two minutes at zero pressure and at moderate speed (not over 1500 rpm).

If pump becomes hot to touch, it is binding and could seize. This rarely occurs, but if it does, the pump will

have to be disassembled and be rebuilt, taking extra care to remove burrs and to assure freedom from binding.

Gradually increase the pressure on a pump until the desired test pressure has been reached. This should take about five minutes.

Delivery should run close to the rated, catalog performance figures which are averaged from the testing of several pumps. A 5% lower reading may be used as a rated minimum, if new or relatively new parts have been used. When rebuilding the pump, reuse only those parts which appear to be in satisfactory condition. A 10% or 15% lower reading is permitted for the rebuilt pump, depending upon the performance expected from the equipment. Your individual experience is the best guide.

Many repairmen measure the output at the normal operating speed, at zero pressure, then at 1000 psi (or the operating pressure of the equipment), and allow a volume decrease approximating the listing below. The table listing shows the drop off in flow that can be expected at various operating pressures for a pump rebuilt with used parts.

PGP020 pumps are generally tested to 2000 psi.

| GPM Delivery at 1800rpm | GPM Drop Off At... | | | |
|-------------------------|--------------------|------------------|------------------|------------------|
| | 1000 psi/70 bar | 1500 psi/105 bar | 2000 psi/140 bar | 2500 psi/175 bar |
| 100 psi | 2 to 3 | 2 1/2 - 3 1/2 | 3 to 4 | 3 1/2 - 4 1/2 |
| 5 - 14 | 2 1/2 to 3 1/2 | 3 - 4 | 3 1/2 to 5 | 4 - 5 1/2 |
| 15 - 25 | 3 to 4 | 4 - 5 | 4 to 6 | 4 1/2 - 6 1/2 |

At test speeds other than 1800 rpm, gpm delivery will vary almost proportionately, but the same (drop-off) figures should be used.

Be sure to run the pump in the direction for which it was designed and built. Driving the pump in the wrong direction will build up pressure behind the lip seal, causing damage to the pump and necessitating its replacement.

Since it is rarely feasible to test motors on dynamometers, the practical procedure is to test them as pumps, running complete testing procedures in each direction.

After completing the testing procedures, the pump is ready for installation and immediate duty operation on equipment. It must be reinforced that to prevent seizure, hot oil must not be drawn into a cold pump.

Instructions for Change of Rotation

The PGP020 series pump can be assembled for clockwise (CW), counterclockwise (CCW), or bi-rotational operation. The direction of rotation is determined by looking at the pump with the drive shaft facing you and the idler gear down. If the pump has unequal porting and the larger port is on the left side, then the pump is set up for CW operation. If the larger port is on the right side of the pump, then it is set up for CCW operation. Bi-rotational pumps that can be run in either direction, will have equal size ports.

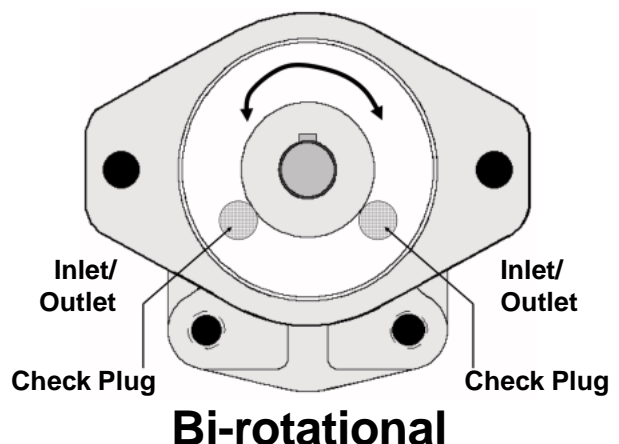
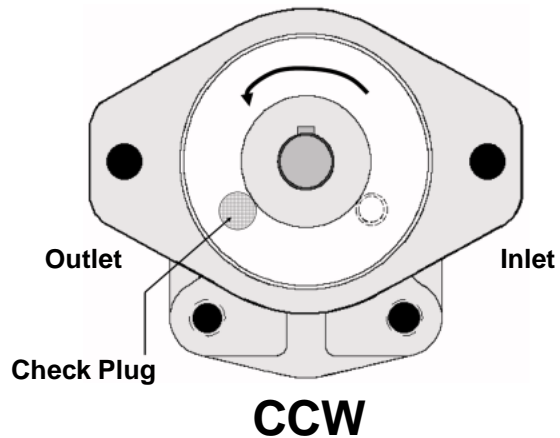
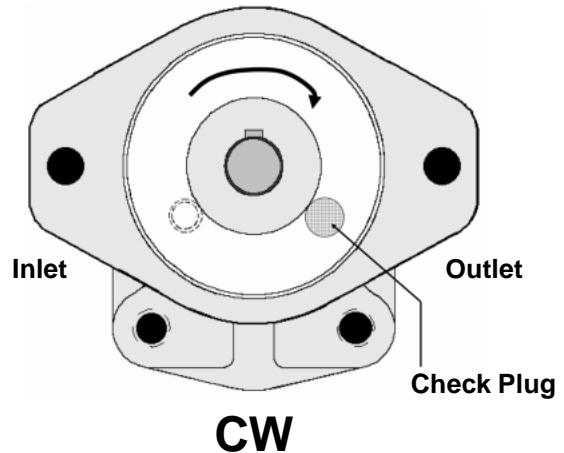
DISASSEMBLY

- 1) If the unit has a keyed shaft, remove the key.
- 2) Clamp the unit in a vise on the outside diameter of the mounting flange with the drive shaft down.
- 3) Remove the cap screws on single units or hex nuts and studs on multiple units.
- 4) Remove the port (rear) end cover.
- 5) Remove the gear housing and the gear set. Keep the gears together because they are a matched set.

For multiple units: Remove the bearing carrier and the next gear housing and gear set until all that remains is the shaft end cover.

Note: Care should be taken to avoid losing the small, rubber pocket seals fitted in the thrust plate pocket seal grooves.

- 6) Lift the thrust plate off of the shaft end cover. Do not lose the pocket seals.
- 7) Remove the check plug in the shaft end cover with a screwdriver and then install it in the opposite drain hole. Screw in tightly and stake the check plug with a punch at both edges of the screwdriver slot. For a single-rotation pump, the check plug is always located on the high pressure (outlet) side of the pump. If the shaft end cover has two check plugs, the pump is already set-up for double rotation.



ASSEMBLY

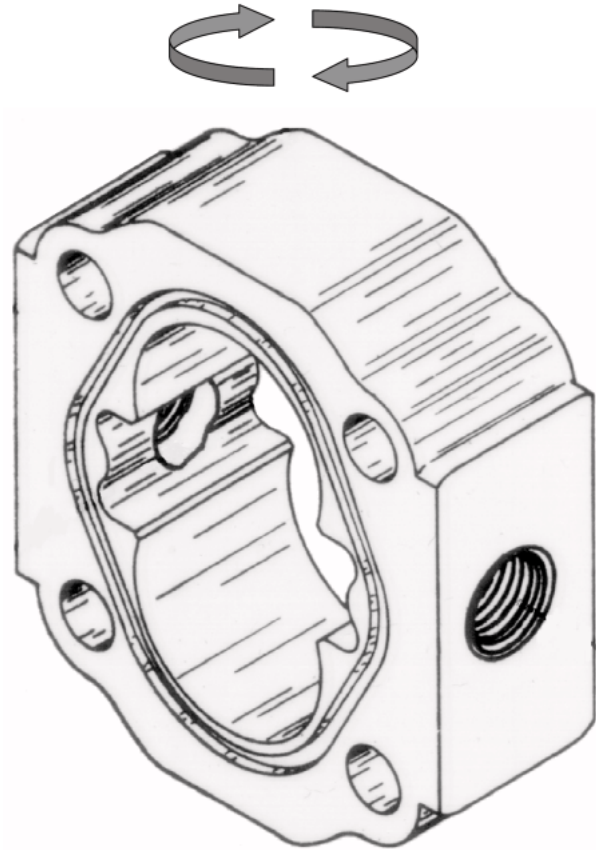
- 1) Before assembling the unit, stone off the machined surfaces. This will remove any nicks or burrs that may have resulted from the disassembly.
- 2) Air blast all parts and wipe them with a clean, lint-free cloth before starting the assembly.

Note: PGP020 series thrust plates are designed for bi-rotational operation and do not have to be rotated.

- 3) Place one thrust plate with pocket seals over the shaft end cover bearings. Be sure the pocket seals are properly fitted in the thrust plate pocket seal grooves.
- 4) Insert the gear shaft with the shaft installation sleeve into the shaft end cover with a twisting motion. Insert the idler gear.
- 5) Rotate the gear housing 180° and carefully slide over the gear set. Make sure both section seals stay in the seal grooves during assembly. Keep the drive gear and idler gear in the same gear bore as previously marked.
- 6) For multiple units: Place the thrust plates with pocket seals over the bearings on both sides of the bearing carrier. Be sure the pocket seals are properly fitted in the thrust plate pocket seal grooves.
- 7) Rotate the bearing carrier 180° and install over the gear set and gear housing.

Note: If the bearing carrier has an L-shaped porting configuration, it cannot be used. A new bearing carrier will have to be machined with the proper configuration.

- 8) Insert the gears into the bearing carrier.
- 9) Rotate the gear housing 180° and carefully slide over the gear set. Make sure both section seals stay in the seal grooves during assembly.
- 10) Place the port end cover with the thrust plate over the gear set. If the port end cover is ported, it must be inverted.
- 11) Insert the cap screws or the studs into the unit and torque in a cross-corner pattern to 2400 in. lbs (200 ft. lbs).



Gear Housing

Offer of Sale

The items described in this document are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the item sold hereunder shall be free from defects in material or workmanship for a period of 547 days from the date of shipment to Buyer, or 3,000 hours of use, whichever expires first. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYERS DESIGNS OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL OR SEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEM SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.



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Parker Hannifin Corporation

About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving more than 350,000 customers worldwide.

Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In the UK, a similar service is available by calling 0500-103-203.

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is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.



The Climate & Industrial Controls Group

designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.



The Fluid Connectors Group

designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.



The Seal Group designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.



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designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.



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The Automation Group

is a leading supplier of pneumatic and electro-mechanical components and systems to automation customers worldwide.



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is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.



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Service Manual
HY09-SM020/US
2.5M, 07/06, T&M



Chelsea® Power Take-Off

280 Series Service Manual

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



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CHELSEA[®]

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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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SECTION 1

NOTES

- 1 Visually inspect parts before assembly for flaws.
- 2 The item numbers identifying parts are the same item numbers used on the engineering drawings.
- 3 Ensure tools and fixtures are current and have the required inspection and calibration labels and/or tags.
- 4 The terms **OUTPUT** and **DRIVE** are used interchangeably.
- 5 Lubricate most bearings before assembly. Use MELCOMOL "Y", EP-2 or equal.
- 6 When assembling bearings, always place the bearings rounded end into the part.
- 7 Use Parker O-Lube or equal to lubricate O-Rings and seals before assembly.
- 8 When assembling O-Rings, do not roll it into their grooves. Use a O-Ring tool for assembly. O-Rings are not to be twisted or damaged.
- 9 Always reference the current Chelsea Parts List for part numbers and assemblies. 280 Series is HY25-2280-M1/US



Suggested Tools

| | | | |
|-----------------|-----------------|----------------------|------------------|
| Safety Glasses | Oil Seal Slide | Shop Press | 3/16" Hex Wrench |
| Oil Seal Driver | Pliers | 5/32" Hex Bit Driver | Hammer/Mallet |
| 1/2" Socket | 1/2" Hex Wrench | | |

Suggested Service Kits

| Part Number | Description |
|-------------|---|
| 329071-62X | Gasket & Seal Kit (All Outputs Except BA) |
| 329071-63X | Bearing Kit "AC", "XD", "XV", "RF", "RK", "RS", "RY", "RZ" (All Outputs Except "BA", "UN") |
| 329071-64X | Bearing Kit ("BA", "UN" Outputs) |
| 329678X | Gear & Clutch Plates Kit (All) |
| 7170-86X | Mounting Kit ("FJ" Gear Pitch) |
| 7170-117X | Mounting Kit ("KV" Gear Pitch) |

See [Page 35-36](#) for Kits Bill of Materials

Model Number Designation

**Service Manual
280 Series**

280 G B F J P - B 5 X D

Basic Model
280

Mounting Option

G = Standard Mount, Metric Studs

Gear Ratio

| | |
|--------------|-----------|
| [3 & 5 Arr.] | [8 Arr.] |
| B = 22/50 | B = 22/53 |
| C = 25/47 | C = 25/50 |
| D = 28/44 | D = 28/47 |
| G = 31/41 | G = 31/44 |
| K = 33/39 | M = 35/40 |
| M = 35/37 | P = 37/38 |
| P = 37/35 | S = 39/36 |
| S = 39/33 | T = 42/33 |
| T = 41/31 | |

Input Option

FJ = Allison
KV = Caterpillar

Lube Option

P = Pressure Lube Only
R = Valve Cap Rotated 120°
S = Valve Cap Rotated 240°
W = Wet Spline
V = Valve Cap Rotated 120° with Wet Spline
Y = Valve Cap Rotated 240° with Wet Spline

Output Option

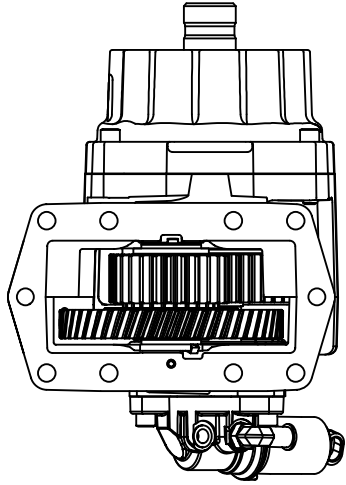
AB = DIN 120 Flange
AC = DIN 100 Flange
BA = 1410 Flange with Shaft Brake
BD = 1.250" Keyed with Shaft Brake
RF = Class "B" 2 & 4-Bolt Rotatable Pump Mount, 15T
RK = Class "B" 2 & 4-Bolt Rotatable Pump Mount, 13T
RS = Class "C" 2 & 4-Bolt Rotatable Pump Mount, 14T
RY = DIN 5462 Pump Mount, 8T
RZ = Class "B" 2 & 4-Bolt Pump Flange, Class "C" Shaft
UN = UNI 8953 3-Bolt Pump Flange, 6T
XD = 1.250" Round Shaft Keyed
XV = 1-1/2" - 10T Spline Shaft with 1410 Flange

Assembly Arrangement

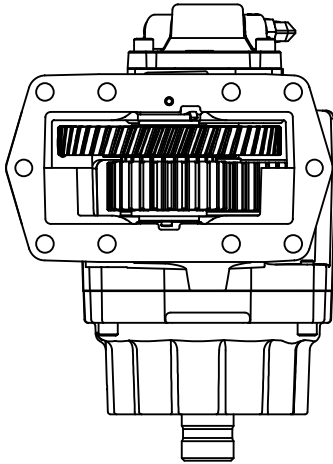
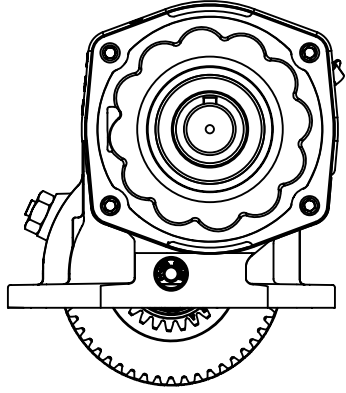
3 - Gear Forward, Shaft Rear, Bulge Up Left Side,
Bulge Down Right Side
5 - Gear Forward, Shaft Rear, Bulge Up Right Side,
Bulge Down Left Side
8 - Gear Forward, Shaft Rear

Shift Option

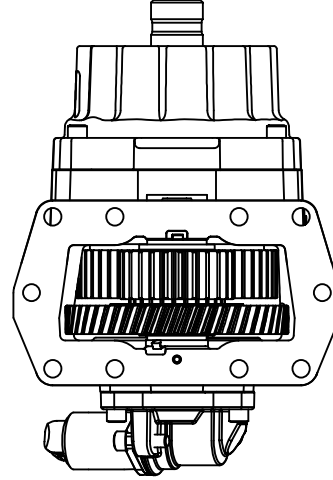
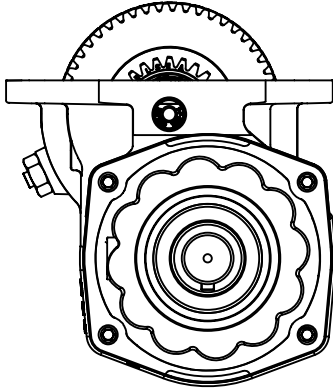
B = 12V Hydraulic Valve
D = 24V Hydraulic Valve
G = 12V Remote Valve w/o E.O.C.
H = 24V Remote Valve w/o E.O.C.
K = 12V Hydraulic Valve w/E.O.C.
L = 24V Hydraulic Valve w/E.O.C.
M = 12V w/o Installation Kit
N = 24V w/o Installation Kit
S = P.T.O. (Air/Elec/Hyd) & Dump Pump (Air)
Combo Valve - with P.T.O. Kick Out & Neutral Spring Return
T = P.T.O. (Air/Elec/Hyd) & Dump Pump (Air)
Combo Valve - Less P.T.O. Kick Out & Neutral Spring Return



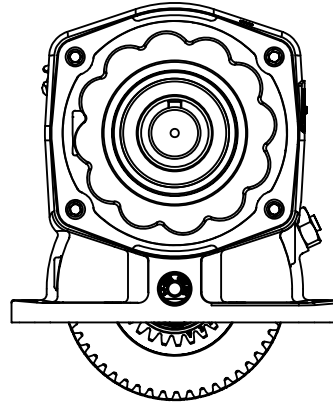
Assembly 3



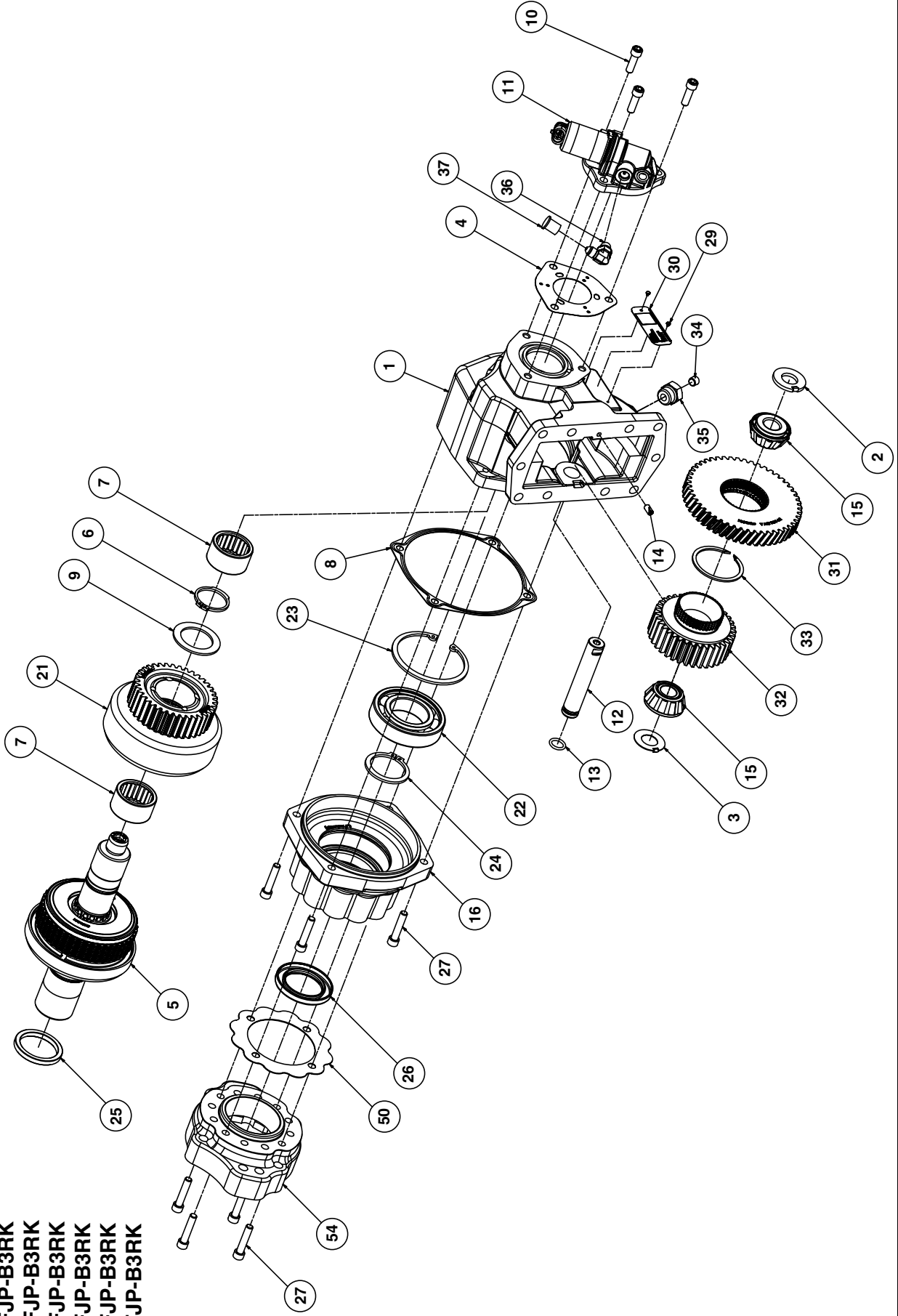
Assembly 5



Assembly 8



- 280GBFJP-B3RK
- 280GCFJP-B3RK
- 280GDFJP-B3RK
- 280GGFJP-B3RK
- 280GKFJP-B3RK
- 280GPFJP-B3RK
- 280GSFJP-B3RK
- 280GTFJP-B3RK



**Service Manual
280 Series**

Bill of Materials

280GMFJP-B3RK

| Item | Part Number | Description | Qty. |
|------|-------------|---|------|
| 1 | 1-P-703 | Housing..... | 1 |
| 2 | 14-P-73-1 | Spacer .762" x 1.500" x .150" Thickness As Required | 1 or |
| | 14-P-73-2 | Spacer .762" x 1.500" x .153" | 1 or |
| | 14-P-73-3 | Spacer .762" x 1.500" x .156" | 1 |
| 3 | 31-P-102 | Washer Thrust .754" x .440" x .030" | 1 |
| 4 | 22-P-112 | Gasket..... | 1 |
| 5 | 329724-4X | Drive Shaft & Clutch Assembly "RK" | 1 |
| 6 | 379746 | Lockring | 1 |
| 7 | 560972 | Bearing Needle Roller Assembly 1.500" x 1.875" x 1.000" | 2 |
| 8 | 22-P-101 | Gasket..... | 1 |
| 9 | 31-P-70 | Washer Thrust 1.507" x 2.167" x .094" | 1 |
| 10 | 378447-6 | Capscrew SH .312" - 18 x 1.000" | 3 |
| 11 | 329463-12X | 12V Valve Cap Assembly | 1 |
| 12 | 9-P-106 | Idle Shaft .75" | 1 |
| 13 | 28-P-191 | O-Ring .549" x .103" | 1 |
| 14 | 378452-7 | Set Screw SH .250" - 20 x .500" | 1 |
| 15 | 550439 | Tapered Bearing Cone .750" x .8598" | 2 |
| 16 | 21-P-767 | Bearing Cap | 1 |
| 21 | 2-P-933 (1) | Output Gear 37T | 1 |
| 22 | 550311 | Ball Bearing 1.77" x 3.346" x .748" | 1 |
| 23 | 378263 | Lockring | 1 |
| 24 | 379555 | Lockring | 1 |

(1) See Page 23 for other Gear Options

| Item | Part Number | Description | Qty. |
|------|--------------|--|------|
| 25 | 4-P-187 | Spacer 1.776" x 2.200" x .239" | 1 |
| 26 | 28-P-267 | Oil Seal 2.627" x 1.750" x .312" | 1 |
| 27 | 378447-8 | Capscrew SH .312" - 18 x 1.500" | 4 |
| 29 | 378422 | Drive Screw..... | 2 |
| 30 | 68-P-51 | Name Plate | 1 |
| 31 | 5-P-1491 (1) | Input Gear 50T ("FJ" Gear Pitch) | 1 |
| 32 | 5-P-1482 (1) | Gear Ratio 35T | 1 |
| 33 | 379522 | Lockring | 1 |
| 34 | 379231 | Pipe Plug .125" - 27 | 1 |
| 35 | 379242 | Adapter Straight .125" - 27 x .750" - 16 | 1 |
| 36 | 379486 | Fitting 90° | 1 |
| 37 | 379564-2 | Cap Thread .438" | 1 |
| 50 | 35-P-101 | Gasket Bearing Cap Wet Spline | 1 |
| 54 | 21-P-731 | Pump Flange | 1 |

Service Kits

| Part Number | Description |
|-------------|---|
| 329071-62X | Gasket & Seal Kit (All Outputs Except "BA") |
| 329071-63X | Bearing Kit "AC", "XD", "XV", "RF", "RK", "RS", "RY" and "RZ" (All Outputs Except "BA" and "UN") |
| 329678X | Gear & Clutch Plates Kit (All) |

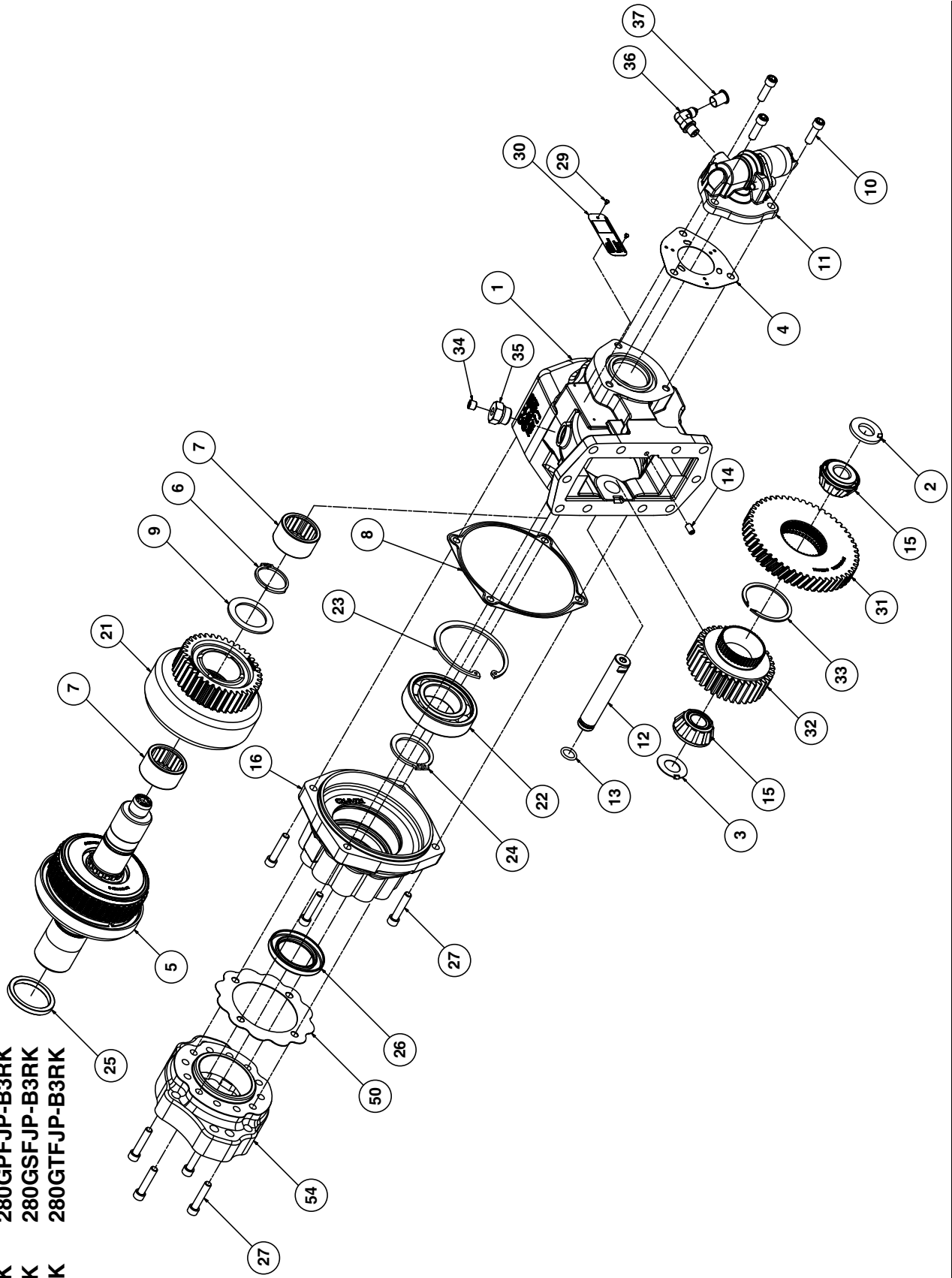
See Page 35-36 for Kits Bill of Materials

Service Manual
280 Series

Bulletin HY25-6280-M1/US

Exploded View – 280GMFJP-B5RK

- 280GBFJP-B3RK
- 280GCFJP-B3RK
- 280GDFJP-B3RK
- 280GGFJP-B3RK
- 280GKFJP-B3RK
- 280GPFJP-B3RK
- 280GSFJP-B3RK
- 280GTFJP-B3RK



Service Manual 280 Series

Bill of Materials

280GMFJP-B5RK

| Item | Part Number | Description | Qty. |
|------|-------------|--|------|
| 1 | 1-P-705 | Housing..... | 1 |
| 2 | 14-P-73-1 | Spacer .762" x 1.500" x .150" Thickness As Required | 1 or |
| | 14-P-73-2 | Spacer .762" x 1.500" x .153" | 1 or |
| | 14-P-73-3 | Spacer .762" x 1.500" x .156" | 1 |
| 3 | 31-P-102 | Washer Thrust .754" x .440" x .030" | 1 |
| 4 | 22-P-112 | Gasket..... | 1 |
| 5 | 329724-4X | Drive Shaft & Clutch Assembly "RK" | 1 |
| 6 | 379746 | Lockring | 1 |
| 7 | 560972 | Bearing Needle Roller Assembly 1.500" x 1.875" x 1.000"..... | 2 |
| 8 | 22-P-101 | Gasket..... | 1 |
| 9 | 31-P-70 | Washer Thrust 1.507" x 2.167" x .094" | 1 |
| 10 | 378447-6 | Capscrew SH .312" - 18 x 1.000" | 3 |
| 11 | 329463-12X | 12V Valve Cap Assembly..... | 1 |
| 12 | 9-P-106 | Shaft Idler .75" | 1 |
| 13 | 28-P-191 | O-Ring .549" x .103" | 1 |
| 14 | 378452-7 | Set Screw SH .250" - 20 x .500" | 1 |
| 15 | 550439 | Tapered Bearing Cone .750" x .8598" | 2 |
| 16 | 21-P-767 | Bearing Cap..... | 1 |
| 21 | 2-P-933 (1) | Output Gear 37T | 1 |
| 22 | 550311 | Bearing Ball 1.77" x 3.346" x .748" | 1 |
| 23 | 378263 | Lockring | 1 |
| 24 | 379555 | Lockring | 1 |

(1) See Page 23 for other Gear Options

| Item | Part Number | Description | Qty. |
|------|--------------|--|------|
| 25 | 4-P-187 | Spacer 1.776" x 2.200" x .239" | 1 |
| 26 | 28-P-267 | Oil Seal 2.627" x 1.750" x .312" | 1 |
| 27 | 378447-8 | Capscrew SH .312" - 18 x 1.500" | 4 |
| 29 | 378422 | Drive Screw..... | 2 |
| 30 | 68-P-51 | Name Plate | 1 |
| 31 | 5-P-1491 (1) | Gear Input 50T ("FJ" Gear Pitch) | 1 |
| 32 | 5-P-1482 (1) | Gear Ratio 35T | 1 |
| 33 | 379522 | Lockring | 1 |
| 34 | 379231 | Plug Pipe .125" - 27 | 1 |
| 35 | 379242 | Adapter Straight .125" - 27 x .750" - 16 | 1 |
| 36 | 379486 | Fitting 90° | 1 |
| 37 | 379564-2 | Cap Thread .438" | 1 |
| 50 | 35-P-101 | Gasket Bearing Cap Wet Spline | 1 |
| 54 | 21-P-731 | Pump Flange | 1 |

Service Kits

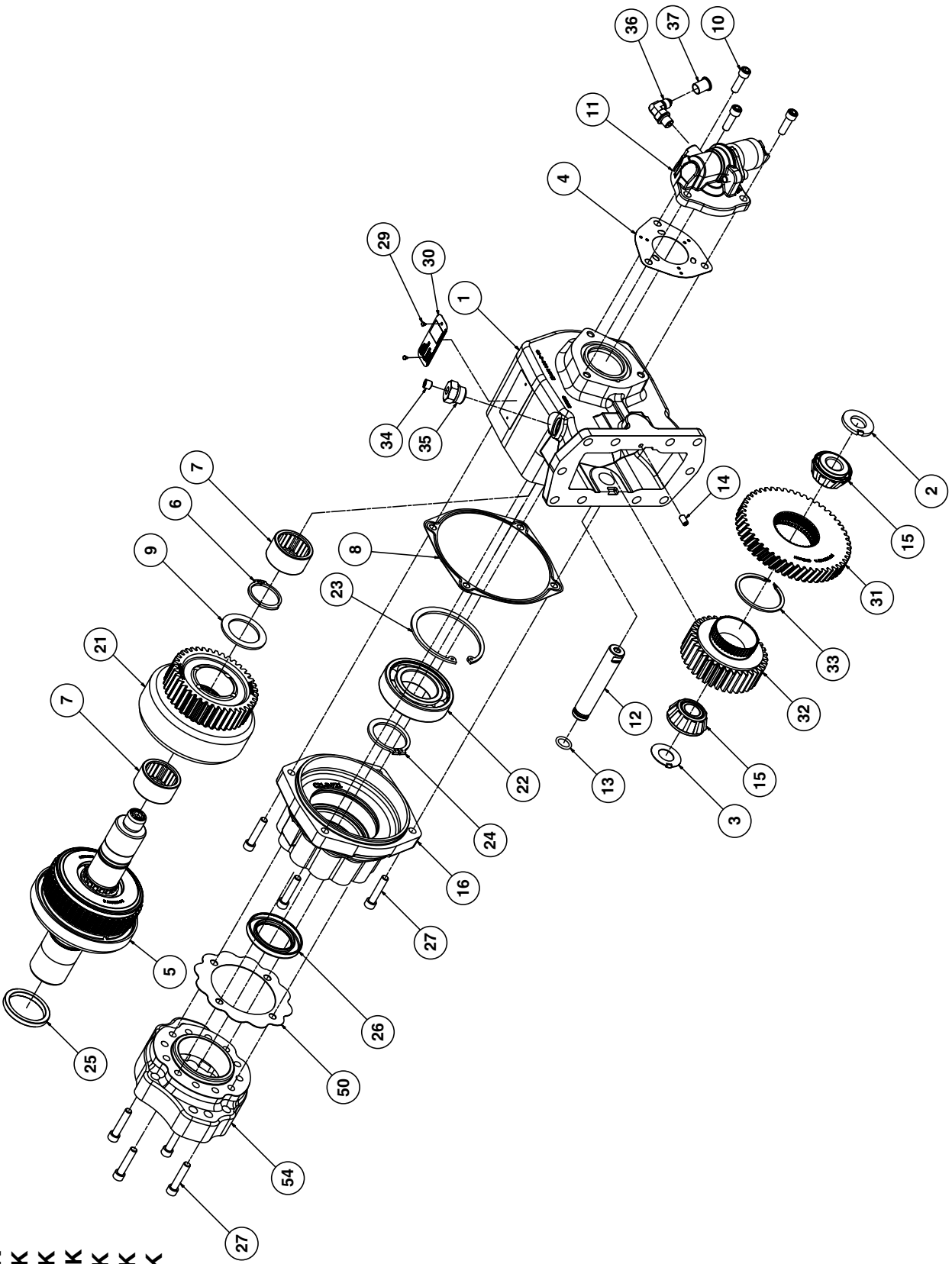
| Part Number | Description |
|-------------|---|
| 329071-62X | Gasket & Seal Kit (All Outputs Except "BA") |
| 329071-63X | Bearing Kit "AC", "XD", "XV", "RF", "RK", "RS", "RY" and "RZ" (All Outputs Except "BA" and "UN") |
| 329678X | Gear & Clutch Plates Kit (All) |

See Page 35-36 for Kits Bill of Materials

Service Manual
280 Series

Bulletin HY25-6280-M1/US
Exploded View – 280GMFJP-B8RK

- 280GBFJP-B3RK
- 280GCFJP-B3RK
- 280GDFJP-B3RK
- 280GGFJP-B3RK
- 280GPFJP-B3RK
- 280GSFJP-B3RK
- 280GTFJP-B3RK



**Service Manual
280 Series**

Bill of Materials

280GMFJP-B8RK

| Item | Part Number | Description | Qty. |
|------|-------------|--|------|
| 1 | 1-P-708 | Housing..... | 1 |
| 2 | 14-P-73-1 | Spacer .762" x 1.500" x .150" Thickness As Required | 1 or |
| | 14-P-73-2 | Spacer .762" x 1.500" x .153" | 1 or |
| | 14-P-73-3 | Spacer .762" x 1.500" x .156" | 1 |
| 3 | 31-P-102 | Washer Thrust .754" x .440 x .030" | 1 |
| 4 | 22-P-112 | Gasket..... | 1 |
| 5 | 329724-4X | Drive Shaft & Clutch Assembly "RK" | 1 |
| 6 | 379746 | Lockring | 1 |
| 7 | 560972 | Bearing Needle Roller Assembly 1.500" x 1.875" x 1.000"..... | 2 |
| 8 | 22-P-101 | Gasket..... | 1 |
| 9 | 31-P-70 | Washer Thrust 1.507" x 2.167" x .094" | 1 |
| 10 | 378447-6 | Capscrew SH .312" - 18 x 1.000" | 3 |
| 11 | 329463-12X | 12V Valve Cap Assembly..... | 1 |
| 12 | 9-P-106 | Idle Shaft .75" | 1 |
| 13 | 28-P-191 | O-Ring .549" x .103" | 1 |
| 14 | 378452-7 | Set Screw SH .250" - 20 x .500" | 1 |
| 15 | 550439 | Tapered Bearing Cone .750" x .8598" | 2 |
| 16 | 21-P-767 | Bearing Cap..... | 1 |
| 21 | 2-P-930 (1) | Output Gear 40T..... | 1 |
| 22 | 550311 | Ball Bearing 1.77" x 3.346" x .748" | 1 |
| 23 | 378263 | Lockring | 1 |
| 24 | 379555 | Lockring | 1 |

(1) See Page 23 for other Gear Options

| Item | Part Number | Description | Qty. |
|------|--------------|--|------|
| 25 | 4-P-187 | Spacer 1.776" x 2.200" x .239" | 1 |
| 26 | 28-P-267 | Oil Seal 2.627" x 1.750" x .312" | 1 |
| 27 | 378447-8 | Capscrew SH .312" - 18 x 1.500" | 4 |
| 29 | 378422 | Drive Screw..... | 2 |
| 30 | 68-P-51 | Name Plate..... | 1 |
| 31 | 5-P-1491 (1) | Input Gear 50T ("FJ" Gear Pitch) | 1 |
| 32 | 5-P-1482 (1) | Gear Ratio 35T | 1 |
| 33 | 379522 | Lockring | 1 |
| 34 | 379231 | Pipe Plug .125" - 27 | 1 |
| 35 | 379242 | Adapter Straight .125" - 27 x .750" - 16 | 1 |
| 36 | 379486 | Fitting 90° | 1 |
| 37 | 379564-2 | Cap Thread .438" | 1 |
| 50 | 35-P-101 | Gasket Bearing Cap Wet Spline | 1 |
| 54 | 21-P-731 | Pump Flange | 1 |

Service Kits

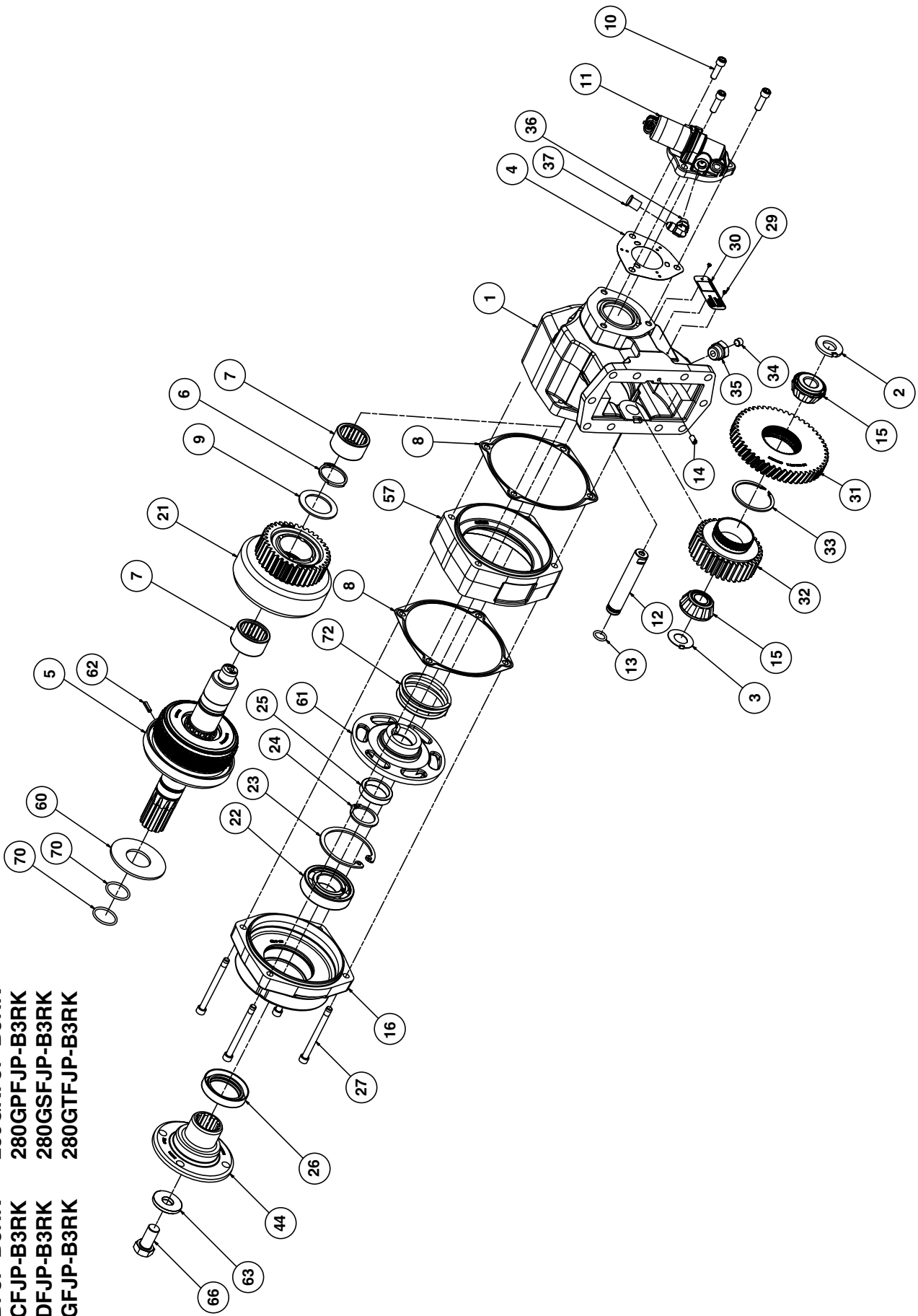
| Part Number | Description |
|-------------|---|
| 329071-62X | Gasket & Seal Kit (All Outputs Except "BA") |
| 329071-63X | Bearing Kit "AC", "XD", "XV", "RF", "RK", "RS", "RY" and "RZ" (All Outputs Except "BA" and "UN") |
| 329678X | Gear & Clutch Plates Kit (All) |

See Page 35-36 for Kits Bill of Materials

Service Manual
280 Series

Bulletin HY25-6280-M1/US
Exploded View – 280GMFJP-B3BA

- 280GBFJP-B3RK 280GKFJP-B3RK
- 280GCFJP-B3RK 280GPFJP-B3RK
- 280GDFJP-B3RK 280GSFJP-B3RK
- 280GGFJP-B3RK 280GTFJP-B3RK



**Service Manual
280 Series**

Bill of Materials

280GMFJP-B3BA

| Item | Part Number | Description | Qty. |
|------|-------------|--|------|
| 1 | 1-P-703 | Housing..... | 1 |
| 2 | 14-P-73 | Spacer .762" x 1.500" x .156"..... | 1 |
| 3 | 31-P-102 | Washer Thrust .754" x .440" x .030"..... | 1 |
| 4 | 22-P-112 | Gasket..... | 1 |
| 5 | 329723X | Drive Shaft & Clutch Assembly..... | 1 |
| 6 | 379746 | Lockring..... | 1 |
| 7 | 560972 | Bearing Needle Roller Assembly 1.500" x 1.875" x 1.000"..... | 2 |
| 8 | 22-P-101 | Gasket..... | 2 |
| 9 | 31-P-70 | Washer Thrust 1.507" x 2.167" x .094"..... | 1 |
| 10 | 378447-6 | Capscrew SH .312" - 18 x 1.000"..... | 3 |
| 11 | 329463-12X | 12V Valve Cap Assembly..... | 1 |
| 12 | 9-P-106 | Idle Shaft .75"..... | 1 |
| 13 | 28-P-191 | O-Ring .549" x .103"..... | 1 |
| 14 | 378452-7 | Set Screw SH .250" - 20 x .500"..... | 1 |
| 15 | 550439 | Bearing Tapered Cone .750" x .8598"..... | 2 |
| 16 | 21-P-773 | Bearing Cap..... | 1 |
| 21 | 2-P-933 (1) | Output Gear 37T..... | 1 |
| 22 | 550010 | Ball Bearing 1.378" x 2.8346" x .6693"..... | 1 |
| 23 | 378895 | Lockring..... | 1 |
| 24 | 378576 | Lockring..... | 1 |
| 25 | 4-P-186 | Spacer 1.385" x 1.750" x .365"..... | 1 |
| 26 | 28-P-212 | Oil Seal 2.506" x 1.750" x .315"..... | 1 |

(1) See Page 23 for other Gear Options

| Item | Part Number | Description | Qty. |
|------|--------------|---|------|
| 27 | 378447-16 | Capscrew SH .312" - 18 x 3.500"..... | 4 |
| 29 | 378422 | Drive Screw..... | 2 |
| 30 | 68-P-51 | Name Plate..... | 1 |
| 31 | 5-P-1491 (1) | Input Gear 50T ("FJ" Gear Pitch)..... | 1 |
| 32 | 5-P-1482 (1) | Gear Ratio 35T..... | 1 |
| 33 | 379522 | Lockring..... | 1 |
| 34 | 379231 | Pipe Plug .125" - 27..... | 1 |
| 35 | 379242 | Adapter Straight .125" - 27 x .750" - 16..... | 1 |
| 36 | 379486 | Fitting 90°..... | 1 |
| 37 | 379564-2 | Cap Thread .438"..... | 1 |
| 44 | 380081 | Companion Flange 1410..... | 1 |
| 57 | 23-P-68 | Spacer Drag Brake Bearing Cap..... | 1 |
| 60 | 31-P-113 | Washer Thrust 1.385" x 3.125" x .125"..... | 1 |
| 61 | 329410X | Brake Assembly..... | 1 |
| 62 | 379977 | Spring Pin..... | 1 |
| 63 | 4-P-130 | Washer..... | 1 |
| 66 | 378435-7 | Hex. Head Capscrew .625" - 11 x 1.250"..... | 1 |
| 70 | 28-P-244 | O-Ring 1.174" x .103"..... | 2 |
| 72 | 37-P-60 | Spring 2.531" x 2.13" x .172"..... | 1 |

Service Kits

| Part Number | Description |
|-------------|-------------------------------------|
| 329071-64X | Bearing Kit ("BA" and "UN" Outputs) |
| 329678X | Gear & Clutch Plates Kit (All) |

See Page 35-36 for Kits Bill of Materials

SECTION 2

Disassembly

Before disassembling any Chelsea P.T.O. inspect it for clues to the failure. Do this now so you don't lose valuable evidence during disassembly.

Check the case for wear or damage. Gears should spin freely, with no side-to-side movement. The output shaft should turn with no radial movement.

Disassembly

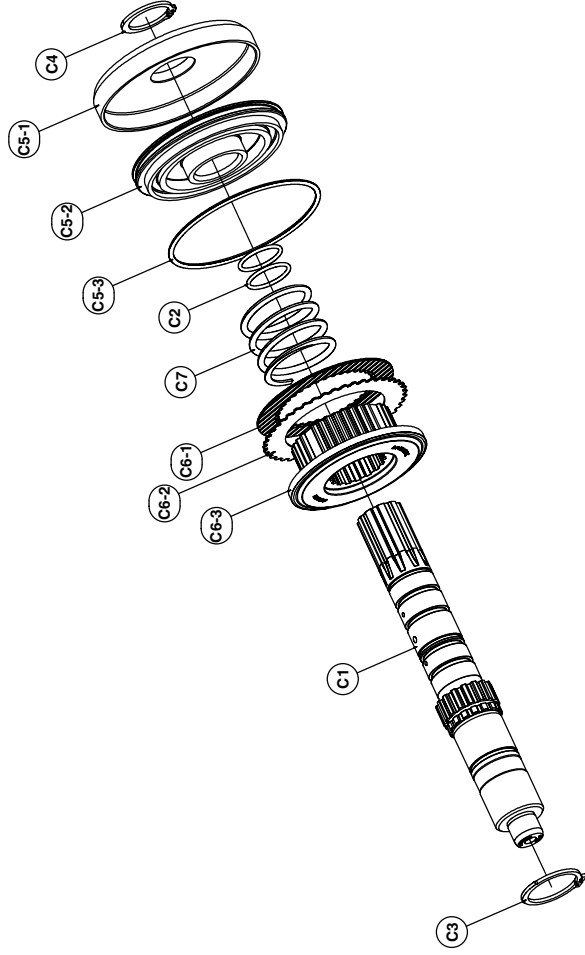
1. Output Bearing and Clutch Pack
 - 1.1. Remove the four Pump Flange Cap Capscrews (27). Lift the Pump Flange (54) from the Open End Bearing Cap (16).
 - 1.2. Remove the four Capscrews (27) from the Open End Bearing Cap (16), lift the Bearing Cap (16), Gasket (8) and Shaft/Clutch Assembly (5) from the Housing (1).
 - 1.3. **NOTE:** At this point Items (25), (5), (7), (21), (9) and (6) will come out of the unit.
 - 1.4. Place the Assembly in a Soft-Jawed Vise. Support the Shaft above the Bearing surface.

- 1.5. Use a Screwdriver or a Seal Remover to pry the Oil Seal (26) from the Bearing Cap (16). **Important:** This Seal will be damaged during removal. Replace it with a new one.
- 1.6. Remove the Retaining Ring (24) from the Output Shaft.
- 1.7. Support the Assembly directly underneath the Bearing Cap (16). Using an Arbor Press, press the Output Shaft through the Bearing Cap (16).
- 1.8. Remove the Retaining Ring (23) and Bearing (22) from the Bearing Cap (16). If the Bearing sticks, tap it with a Soft Mallet and a Driver.

Disassembly

Disassembly

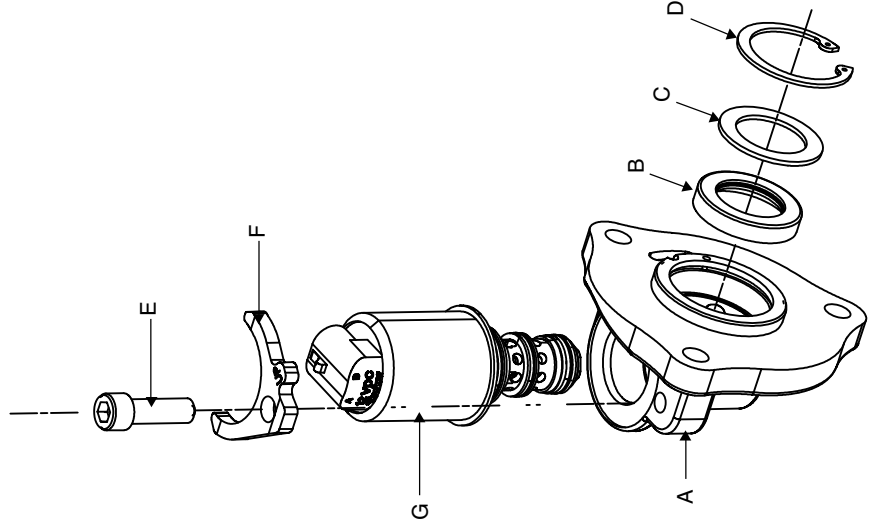
2. Clutch Pack and Output Shaft
 - 2.1. Remove the Spacer (25) from the Shaft (C1).
 - 2.2. Remove the Retaining Ring (6), Thrust Washer (9) and Output Gear (21). Inspect the Washer (9) for heat damage. Replace if necessary.
 - 2.3. Next, compress the Clutch Assembly (5).
 - 2.4. Remove the Retaining Ring (C4)
 - 2.5. Slide the Clutch Back-Up Cylinder (C5-1) and Piston (C5-2) off the Shaft (C1). Remove the O-Ring (C5-3) from the Piston (C5-2). Inspect the Piston for galling or scratches.
 - 2.6. Remove the Return Spring (C7). Check it for cracks or breaks. Also remove the two Shaft O-Rings (C2) that seal off the Piston (C5-2) and Clutch Back-Up Cylinder (C5-1).
 - 2.7. Remove and inspect the Clutch Plates (C6-2) and Friction Discs (C6-1). If debris is present but the Chelsea P.T.O. Gears (C6-3) aren't damaged, it indicates possible transmission problems. If the components are burnt, the problem may be low lubricant levels, misapplication, or P.T.O. engagement at too high an R.P.M.
 - 2.8. Remove the Clutch Gear (C6-3) off the Shaft (C1). Check it for wear or damage. Replace if necessary. Retaining Ring (C3) can stay on the Shaft (C1) if they aren't damaged.
 - 2.9. Remove and inspect Shaft (C1) especially the Bearing surfaces for nicks, scratches, or other damage. The best way to discover these problems is to run your fingernail across the Shaft (C1) surface. If you feel a scratch, replace the Shaft (C1). Also make sure the Pressure Port is clear. Do this by blowing air through the hole.
 - 2.10. Reference main drawing. Using an appropriate driver, press the Internal Needle Bearing (7) from the Output Gear (21). Press against the flat surface of the Bearing (7).
 - 2.11. Inspect the Output Gear (21) for cracks, pitting, missing teeth or other damage. Replace if necessary.



| Item | Part Number | Description | Qty. |
|------|-------------|--------------------------------------|------|
| C1 | 3-P-1072 | Output Shaft 10T Straight (329723X) | 1 or |
| C1-1 | 3-P-1141 | Output Shaft 1.25" Keyed (329723-1X) | 1 |
| C2 | 28-P-244 | O-Ring 1.174" x .103" | 2 |
| C3 | 380069 | Lockring | 1 |
| C4 | 378576 | Lockring | 1 |
| C5 | 329179-1X | Assy Piston & Back-Up Cylinder | 1 |
| C5-1 | 379323-1 | Cylinder Clutch Back-Up | 1 |
| C5-2 | 380057-1 | Piston Clutch Hydraulic | 1 |
| C5-3 | 28-P-178 | O-Ring 4.484" x .138" | 1 |
| C6 | 329678X | Gear & Plates Kit | 1 |
| C6-1 | 379485 | Disc Friction | 11 |
| C6-2 | 380065 | Clutch Plate | 10 |
| C6-3 | 2-P-858 | Output Gear 36T | 1 |
| C7 | 37-P-39 | Spring 2.552" x 1.985" | 1 |

Disassembly

3. Valve & Cap Assembly
 - 3.1. Remove the three Socket Head Capscrews (10), Valve Assembly (11), and Valve Cap Gasket (4) from the Chelsea P.T.O.
 - 3.2. Carefully remove the Retaining Ring (D) and Washer (C). Visually inspect the Oil Seal (B) now. If you see signs of wear or leakage, remove the Seal (B).
Important: Do not nick the Seal Bore. This could result in leakage or further damage to the P.T.O.
 - 3.3. Remove the Solenoid Valve (G) Socket Capscrew (E). Use a Screwdriver in the Shaft Seal Opening to carefully pry the Solenoid Valve (G) loose from the Housing (A). Be careful not to damage the Seal.
 - 3.4. Remove the Solenoid Valve (G) from the cap. Check the O-Rings for damage. If they are damaged, replace the O-Rings.



| Item | Part Number | Description | Qty. |
|------|-------------|--|------|
| 11 | 329442-12X | Valve & Cap Assembly (12V) ("KV" Pitch Only) | 1 or |
| | 329442-24X | Valve & Cap Assembly (24V) ("KV" Pitch Only) | 1 |
| | 329463-12X | Valve & Cap Assembly (12V) ("FJ" Pitch Only) | 1 or |
| | 329463-24X | Valve & Cap Assembly (24V) ("FJ" Pitch Only) | 1 |
| A | 34-P-143 | Valve Cap | 1 |
| B | 28-P-119 | Oil Seal (Hi Pressure) | 1 |
| C | 378811 | Washer | 1 |
| D | 378849 | Retaining Ring | 1 |
| E | 378447-6 | Sockethead Capscrew .312" - 18 x 1.00" | 1 |
| F | 379995 | Clamp ("KV") Included with 379993 Valve | 1 or |
| | 380012 | Clamp ("FJ") used with 380011 Valve | 1 |
| | 380124 | Clamp ("FJ") used with 380123 Valve | 1 |
| G | 379993-12 | Hydraulic Valve (12V) ("KV") (White Connector) | 1 or |
| | 379993-24 | Hydraulic Valve (24V) ("KV") (Black Connector) | 1 |
| | 380011-12 | Hydraulic Valve (12V) ("FJ") (White Side Connector) | 1 |
| | 380011-24 | Hydraulic Valve (24V) ("FJ") (Black Side Connector) | 1 or |
| | 380123-12 | Hydraulic Valve (12V) ("FJ") (White Connector Top) (New Style) | 1 or |
| | 380123-24 | Hydraulic Valve (24V) ("FJ") (Black Connector Top) (New Style) | 1 |

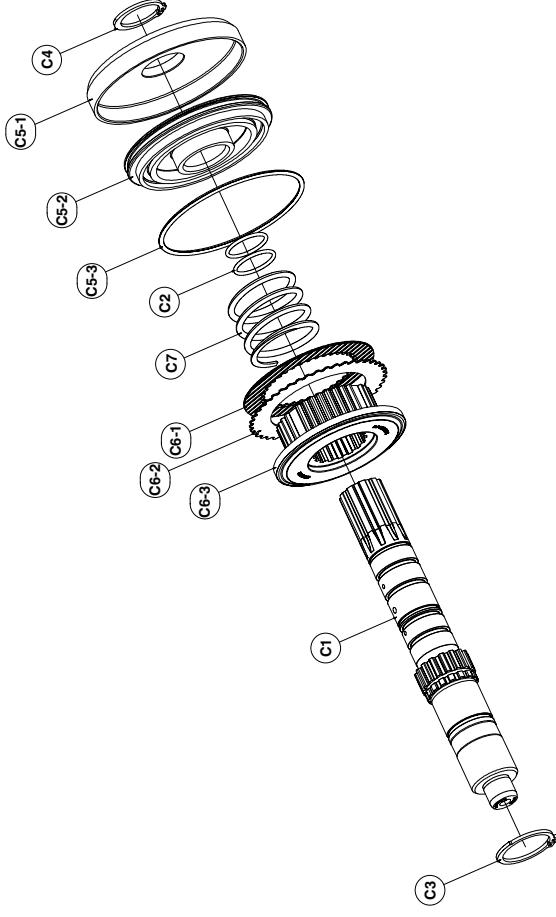
Disassembly

4. Input Gear Sub-Assembly
 - 4.1. Next, remove Set Screw (14) from Main Housing (1).
 - 4.2. Pull the Idler Shaft (12) from the Housing (1) by using a long threaded 3/8" - 16 Bolt. Replace Shaft (12) if it is nicked or scratched. Inspect the Shaft O-Ring (13) for nicks or cuts, replace if necessary.
 - 4.3. Remove the Input Gear section (31), (32) & (33), one Spacer (2) and one Thrust Washer (3). Remove the two Tapped Bearing Cones (15) from the Gear. Inspect Gear Races and Teeth for cracks, nicks, heat signs or other damage. Replace if necessary.
 - 4.4. Press the remaining Needle Bearing (7) from the Housing (1). **Important:** This Bearing (7) will be damaged during removal. Replace it with a new one.
 - 4.5. Inspect the Housing (1) for deep grooves, gouges, and cracks. Make sure sealing surfaces are smooth
 - 4.6. Chelsea strongly recommends that you replace all used Retaining Rings, O-Rings, Seals, Bearings and Gaskets with new ones during P.T.O. service. Also replace any worn or damaged components you found during disassembly.
 - 4.7. Clean all reusable components.

Assembly

1. Assembly
 - 1.1. Output Shaft and Clutch Pack Assembly - Standard
 - 1.1.1. If the Spacer (25) and Retaining Ring (C4) were removed from the Shaft earlier, replace them with new ones now.
 - 1.1.2. Lubricate the Output Shaft (C1). Secure it in a Vise, making certain not to scratch it.
 - 1.1.3. Install the Clutch Gear (C6-3).
 - 1.1.4. Lubricate the metal Clutch Plates (C6-1). Then starting with a Friction Disc (C6-1) (which has teeth on the inner diameter), alternately stack all the Friction Discs (C6-1) and Clutch Plates (C6-2) (which have teeth on the outer diameter) on the Shaft.
 - 1.1.5. Install the two O-Rings (C2) on the Shaft.
 - 1.1.6. Install the Return Spring (C7).
 - 1.1.7. Lubricate a new Block Vee Ring (C5-3) and position it on the Piston (C5-2). The open face of the Ring should face toward the Clutch Back-Up Cylinder (C5-1).
 - 1.1.8. Install the Piston (C5-2), centering it over the Spring. Install the Clutch Back-Up Cylinder (C5-1).
 - 1.1.9. Compress the Piston and Clutch Assembly down past the Retaining Ring groove. Install a new Retaining Ring (C4).
 - 1.1.10. **NOTE:** If servicing a unit with a Shaft Brake ("BD" output) refer to "Shaft Brake Assembly" if standard Shaft Output go to 1.1.11
 - 1.1.10.1. Shaft Brake Assembly
 - 1.1.10.2. Slide Washer (60) onto output side of Shaft.
 - 1.1.10.3. Slide the two O-Rings (70) onto Shaft and into the grooves in shaft. Take care not to nick O-Rings.
 - 1.1.10.4. Slide Spring (72) onto output side of Shaft.
 - 1.1.10.5. Install Brake Assembly (61) onto Shaft making sure the slot slides over the Pin (62) on the Shaft.
 - 1.1.10.6. Install Spacer (25)
 - 1.1.10.7. Install Snap Ring (24) on shaft to hold Brake Assembly on Shaft.
 - 1.1.10.8. Go to 1.1.12
 - 1.1.11. Install the Spacer (25)
 - 1.1.12. Lubricate a new Ball Bearing (22) and install it into the Bearing Cap (16). Use a soft Mallet and a proper Driver to do this.
 - 1.1.13. Secure the Bearing with a new Retaining Ring (23).
 - 1.1.14. Position the Bearing Cap over the Output Shaft. Support the Shaft Assembly in a press, being careful not to damage it. Using an appropriate Driver, press on the inner Bearing Race until resistance is felt.
 - 1.1.15. Secure the Assembly with a new Retaining Ring (24)

- 1.1.16. Lubricate a new Bearing Cap Oil Seal (26). Then using an appropriate Shaft Seal Slide, Driver and a soft Mallet or Press, install it into the Bearing Cap (16).



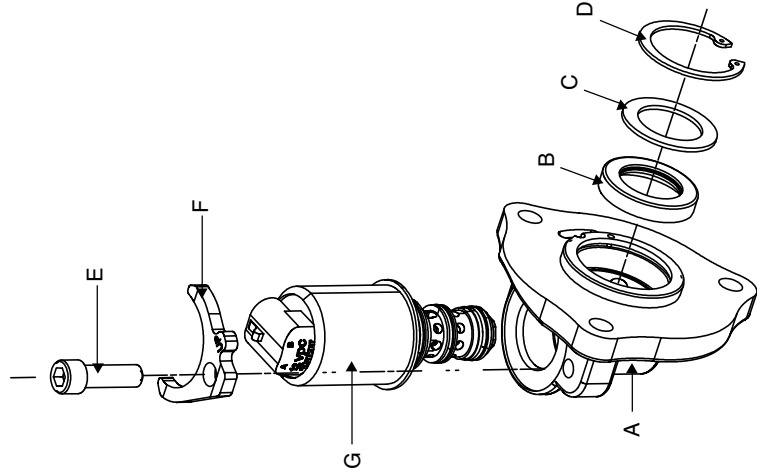
| Item | Part Number | Description | Qty. |
|------|-------------|--------------------------------------|------|
| C1 | 3-P-1072 | Output Shaft 10T Straight (329723X) | 1 or |
| C1-1 | 3-P-1141 | Output Shaft 1.25" Keyed (329723-1X) | 1 |
| C2 | 28-P-244 | O-Ring 1.174" x .103" | 2 |
| C3 | 380069 | Lockring | 1 |
| C4 | 378576 | Lockring | 1 |
| C5 | 329179-1X | Assy Piston & Back-Up Cylinder | 1 |
| C5-1 | 379323-1 | Cylinder Clutch Back-Up | 1 |
| C5-2 | 380057-1 | Piston Clutch Hydraulic | 1 |
| C5-3 | 28-P-178 | O-Ring 4.484" x .138" | 1 |
| C6 | 329678X | Gear & Plates Kit | 1 |
| C6-1 | 379485 | Disc Friction | 11 |
| C6-2 | 380065 | Clutch Plate | 10 |
| C6-3 | 2-P-858 | Output Gear 36T | 1 |
| C7 | 37-P-39 | Spring 2.552" x 1.985" | 1 |

Assembly

- 1.3. P.T.O. Housing
- 1.3.1. Lubricate a new Needle Bearing (7) and install it into the Chelsea P.T.O. Housing (1). Using a proper Driver will help ensure that the Bearing is seated properly. Press on the flat side of the Bearing. The rounded side of the Bearing should face away from the Housing (1).
- 1.4. Output and Flange Assembly Installation
- 1.4.1. Place a new Gasket (8) on the P.T.O. Housing (1) mating face.
 - 1.4.2. **Caution:** Do not use sealing compounds. It could affect the correct operation of the transmission. Install the Clutch Pack/ Bearing Cap Assembly into the Chelsea P.T.O. Housing (1)
 - 1.4.3. **NOTE:** See "BA" Flange Output for Shaft Brake Installation
 - 1.4.4. Secure the Bearing Cap (16) with Socket Head Capscrews (27). Tighten them, and torque to 16-20 Lbs. ft. (22 – 27 N.m.).
 - 1.4.5. **"XD" Output Option**
 - 1.4.5.1. Use a soft Mallet to install a new Woodruff Key (63) into the Output Shaft.
 - 1.4.6. **"VX" Output Option**
 - 1.4.6.1. Place a new Gasket (8) on the P.T.O. Housing (1) mating face.
 - 1.4.6.2. **Caution:** Do not use sealing compounds. It could affect the correct operation of the transmission. Install the Clutch Pack/ Bearing Cap Assembly into the Chelsea P.T.O. Housing (1)
 - 1.4.6.3. Secure the Bearing Cap (16) with Socket Head Capscrews (27). Tighten them, and torque to 16-20 Lbs. ft. (22 – 27 N.m.).
 - 1.4.6.4. Install Output Shaft Companion Flange (44) onto Output Shaft
 - 1.4.6.5. Install Washer (63) and Hex Head Capscrew (66) into Threaded Bore on Output Shaft and torque to 75-85 Lbs. ft. [102 – 115 N.m.].
- 1.4.7. **"BA" Output Option**
- 1.4.7.1. Place a new Gasket (8) on the P.T.O. Housing (1) mating face.
 - 1.4.7.2. **Caution:** Do not use sealing compounds. It could affect the correct operation of the transmission. Install the Clutch Pack/ Bearing Cap Assembly into the Chelsea P.T.O. Housing (1)
 - 1.4.7.3. Install Shaft Brake Housing (1) Spacer (57) with another Gasket (8)
 - 1.4.7.4. Secure the Bearing Cap (16) with Socket Head Capscrews (27). Tighten and torque to 16-20 Lbs. ft. (22 – 27 N.m.).
 - 1.4.7.5. Install Output Shaft Companion Flange (44) onto Output Shaft
 - 1.4.7.6. Install Washer (63) and Hex Head Capscrew (66) into Threaded Bore on Output Shaft and torque to 75-85 Lbs.ft. [102 – 115 N.m.].
- 1.4.8. **Pump Flange Options**
- 1.4.8.1. Install Rotatable Flange (54) and Gasket (50) after installing P.T.O. on transmission or on bench. Torque the four Socket Head Capscrews (27) to 16-20 Lbs. ft. [22 – 27 N.m.].
- 1.5. Input Gear Assembly
- 1.5.1. Install new, lubricated Bearing Cones (15) into the Input Gear (31), (32) and (33). The tapers should go toward the center of the Gear.
 - 1.5.2. Next, place Tabbed Washer (12) next to the tall side of the Gear. This Washer shims the unit.
 - 1.5.3. Place the Thrust Washer (3) on the ratio side of the Gear. Place the components into the Housing (1).
 - 1.5.4. Align the Gear Assembly with the Idler Shaft (12) hole.
 - 1.5.5. Place a new, lubricated O-Ring (13) on the Idler Shaft (12). Push it into the Housing (1) from the side opposite of the Roll Pin until it is just below the Housing (1) surface. Use the special alignment tool to make the job easier. The Shaft can only be installed from one direction because of the Roll Pin in the Housing (1).
 - 1.5.6. **NOTE:** Once the Input Gear Assembly is installed, spin the Gear to seat the Tapered Bearing Cones. There should be no side-to-side Gear movement. If side-to-side movement exists, re-shim the Gear with the appropriate thickness of shims.

Assembly

- 1.6. Valve Cap Assembly
 - 1.6.1. If the Valve Assembly Oil Seal (B) was worn or damaged, replace it now. Lubricate a new Seal. Install it carefully with the proper Driver. **Important:** Avoid nicking the Housing (1). This could cause leakage or other PTO damage.
 - 1.6.2. Next install the Washer (C) and Retaining Ring (D).
 - 1.6.3. Lubricate and attach the Solenoid Valve (G) to the Cap (A).
 - 1.6.4. Next install the Clamp (F) and Socket Head Capscrew (E). Secure the Solenoid to the Valve Cap (A) with Socket Head Capscrew (E). Torque it to 96 – 120 in-lbs (11 – 14 Nm).
 - 1.6.5. Place a new Valve Cap Gasket (4) on the Valve Assembly. Make sure the holes are aligned. **Caution:** Do not use sealing compounds. It could affect the correct operation of the transmission.
 - 1.6.6. Attach the Valve Assembly to the PTO Housing (1). Tighten the three Capscrews (10) and torque them to 192 – 240 in-lbs (22 – 27 Nm).
2. Final Check
 - 2.1. While holding the Input Gear, turn the Output Shaft. If everything is assembled correctly, the Shaft will turn freely. Next, roll the Gears. They should roll freely. No side-to-side wobble should occur if the unit is assembled correctly.
 - 2.2. The unit is ready to be installed back on the transmission



| Item | Part Number | Description | Qty. |
|------|-------------|--|------|
| 11 | 329442-12X | Valve & Cap Assembly (12V) ("KV" Pitch Only) | 1 or |
| | 329442-24X | Valve & Cap Assembly (24V) ("KV" Pitch Only) | 1 |
| | 329463-12X | Valve & Cap Assembly (12V) ("FJ" Pitch Only) | 1 or |
| | 329463-24X | Valve & Cap Assembly (24V) ("FJ" Pitch Only) | 1 |
| A | 34-P-143 | Valve Cap | 1 |
| B | 28-P-119 | Oil Seal (Hi Pressure) | 1 |
| C | 378811 | Washer | 1 |
| D | 378849 | Retaining Ring | 1 |
| E | 378447-6 | Sockethead Capscrew .312" - 18 x 1.00" | 1 |
| F | 379995 | Clamp ("KV") Included with 379993 Valve | 1 or |
| | 380012 | Clamp ("FJ") used with 380011 Valve | 1 |
| | 380124 | Clamp ("FJ") used with 380123 Valve | 1 |
| G | 379993-12 | Hydraulic Valve (12V) ("KV") (White Connector) | 1 or |
| | 379993-24 | Hydraulic Valve (24V) ("KV") (Black Connector) | 1 |
| | 380011-12 | Hydraulic Valve (12V) ("FJ") (White Side Connector) | 1 |
| | 380011-24 | Hydraulic Valve (24V) ("FJ") (Black Side Connector) | 1 or |
| | 380123-12 | Hydraulic Valve (12V) ("FJ") (White Connector Top) (New Style) | 1 or |
| | 380123-24 | Hydraulic Valve (24V) ("FJ") (Black Connector Top) (New Style) | 1 |

SECTION 3

| Location | Torque (English) | Torque (Metric) |
|---|--------------------|-----------------|
| Idle Pin Screw Set | 20 - 30 In. Lbs. | 2 - 3 N.m. |
| Bearing Cap Open | 24 - 28 Lbs. ft. | 33 - 38 N.m. |
| Rotatable Flanges | | |
| "RK", "RF", "RY" and "RS" (378447-8) (Qty. 4) | 16 - 20 Lbs. ft. | 22 - 27 N.m. |
| Valve Cap Assembly | 24 - 28 Lbs. ft. | 33 - 38 N.m. |
| Hydraulic Valve Clamp | 96 - 120 In. Lbs. | 11 - 13 N.m. |
| Shaft Nut "BA" and "XV" (378435-7) | 75 - 85 Lbs. ft. | 102 - 115 N.m. |
| Straight Thread Connector 90° (379486) | 120 - 156 In. Lbs. | 14 - 18 N.m. |
| Speed Sensor Port | | |
| With E.O.C. (379243) | 25 - 30 Lbs. ft. | 34 - 41 N.m. |
| Without E.O.C. | | |
| O-Ring Boss Plug (379242) | 25 - 30 Lbs. ft. | 34 - 41 N.m. |
| Pipe Plug (379231) | 8 - 12 Lbs. ft. | 11 - 16 N.m. |

Gear Charts

“3” and “5” Assembly Gear Chart

| Gear Designator | Input Gear (31) | No. Teeth Input | Ratio Gear (32) | No. Teeth Ratio | Output Gear (21) | No. Teeth Output |
|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| 280*BFJ | 5-P-1491 | 50 | 5-P-1478 | 22 | 2-P-926 | 50 |
| 280*CFJ | 5-P-1491 | 50 | 5-P-1495 | 25 | 2-P-927 | 47 |
| 280*DFJ | 5-P-1491 | 50 | 5-P-1479 | 28 | 2-P-928 | 44 |
| 280*GFJ | 5-P-1491 | 50 | 5-P-1480 | 31 | 2-P-929 | 41 |
| 280*KFJ | 5-P-1491 | 50 | 5-P-1481 | 33 | 2-P-931 | 39 |
| 280*MFJ | 5-P-1491 | 50 | 5-P-1482 | 35 | 2-P-933 | 37 |
| 280*PFJ | 5-P-1491 | 50 | 5-P-1483 | 37 | 2-P-935 | 35 |
| 280*SFJ | 5-P-1491 | 50 | 5-P-1484 | 39 | 2-P-936 | 33 |
| 280*TFJ | 5-P-1491 | 50 | 5-P-1497 | 41 | 2-P-937 | 31 |
| 280*BKV | 5-P-1493 | 45 | 5-P-1478 | 24 | 2-P-926 | 50 |
| 280*CKV | 5-P-1493 | 45 | 5-P-1495 | 22 | 2-P-927 | 47 |
| 280*DKV | 5-P-1493 | 45 | 5-P-1479 | 28 | 2-P-928 | 44 |
| 280*GKV | 5-P-1493 | 45 | 5-P-1480 | 31 | 2-P-929 | 41 |
| 280*KKV | 5-P-1493 | 45 | 5-P-1481 | 33 | 2-P-931 | 39 |
| 280*MKV | 5-P-1493 | 45 | 5-P-1482 | 35 | 2-P-933 | 37 |
| 280*PKV | 5-P-1493 | 45 | 5-P-1483 | 37 | 2-P-935 | 35 |
| 280*SKV | 5-P-1493 | 45 | 5-P-1484 | 39 | 2-P-936 | 33 |
| 280*TKV | 5-P-1493 | 45 | 5-P-1497 | 41 | 2-P-937 | 31 |

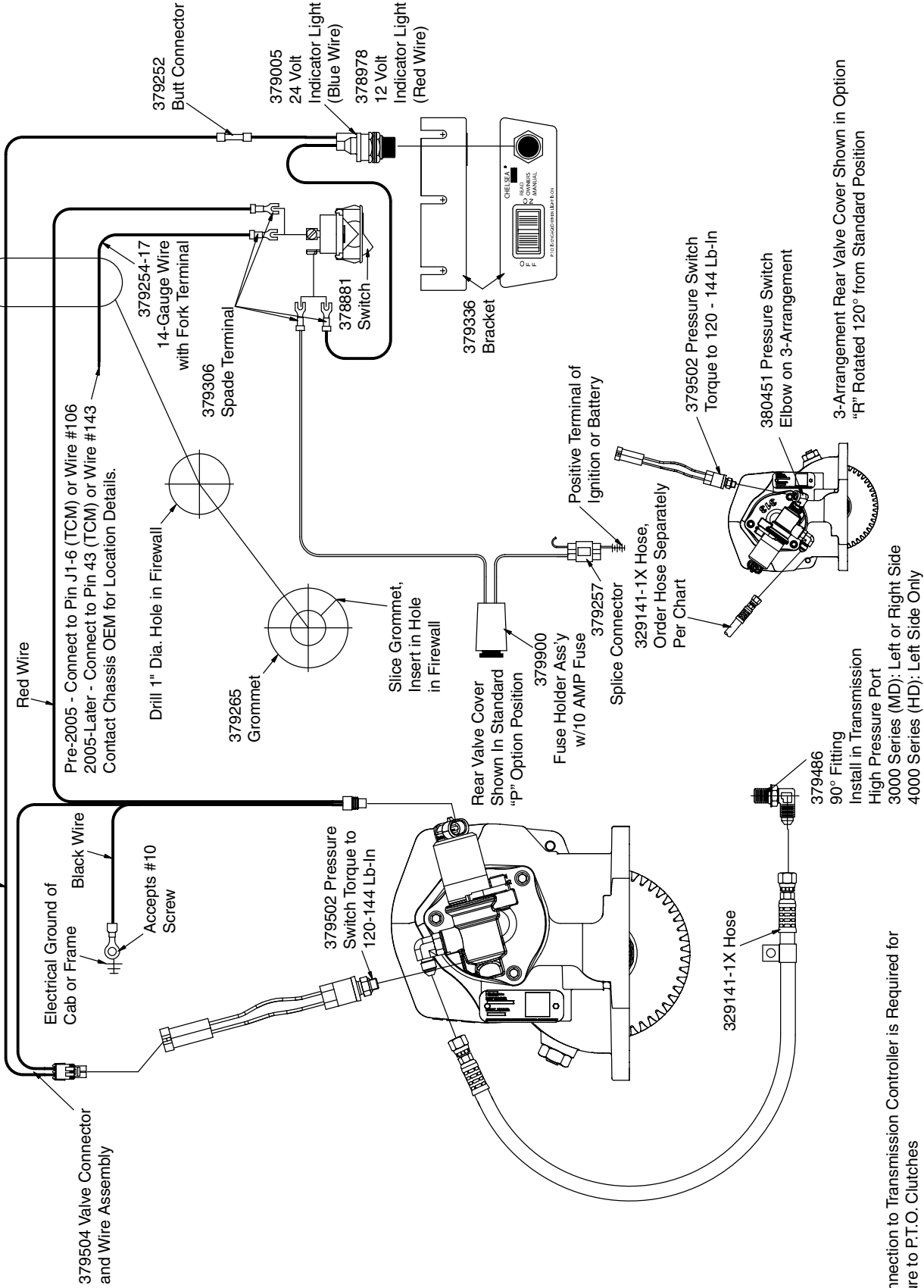
“8” Assembly Gear Chart

| Gear Designator | Input Gear (31) | No. Teeth Input | Ratio Gear (32) | No. Teeth Ratio | Output Gear (21) | No. Teeth Output |
|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| 280*BFJ | 5-P-1491 | 50 | 5-P-1478 | 22 | 2-P-925 | 53 |
| 280*CFJ | 5-P-1491 | 50 | 5-P-1495 | 25 | 2-P-926 | 50 |
| 280*DFJ | 5-P-1491 | 50 | 5-P-1479 | 28 | 2-P-927 | 47 |
| 280*GFJ | 5-P-1491 | 50 | 5-P-1480 | 31 | 2-P-928 | 44 |
| 280*MFJ | 5-P-1491 | 50 | 5-P-1482 | 35 | 2-P-930 | 40 |
| 280*PFJ | 5-P-1491 | 50 | 5-P-1483 | 37 | 2-P-932 | 38 |
| 280*SFJ | 5-P-1491 | 50 | 5-P-1484 | 39 | 2-P-934 | 36 |
| 280*TFJ | 5-P-1491 | 50 | 5-P-1485 | 42 | 2-P-936 | 33 |
| 280*BKV | 5-P-1493 | 45 | 5-P-1478 | 22 | 2-P-925 | 53 |
| 280*CKV | 5-P-1493 | 45 | 5-P-1495 | 25 | 2-P-926 | 50 |
| 280*DKV | 5-P-1493 | 45 | 5-P-1479 | 28 | 2-P-927 | 47 |
| 280*GKV | 5-P-1493 | 45 | 5-P-1480 | 31 | 2-P-928 | 44 |
| 280*MKV | 5-P-1493 | 45 | 5-P-1482 | 35 | 2-P-930 | 40 |
| 280*PKV | 5-P-1493 | 45 | 5-P-1483 | 37 | 2-P-932 | 38 |
| 280*SKV | 5-P-1493 | 45 | 5-P-1484 | 39 | 2-P-934 | 36 |
| 280*TKV | 5-P-1493 | 45 | 5-P-1485 | 42 | 2-P-936 | 33 |

SECTION 4

Shift Installation Kit 280 Series without Electronic Overspeed Control (SK-347 Rev G)

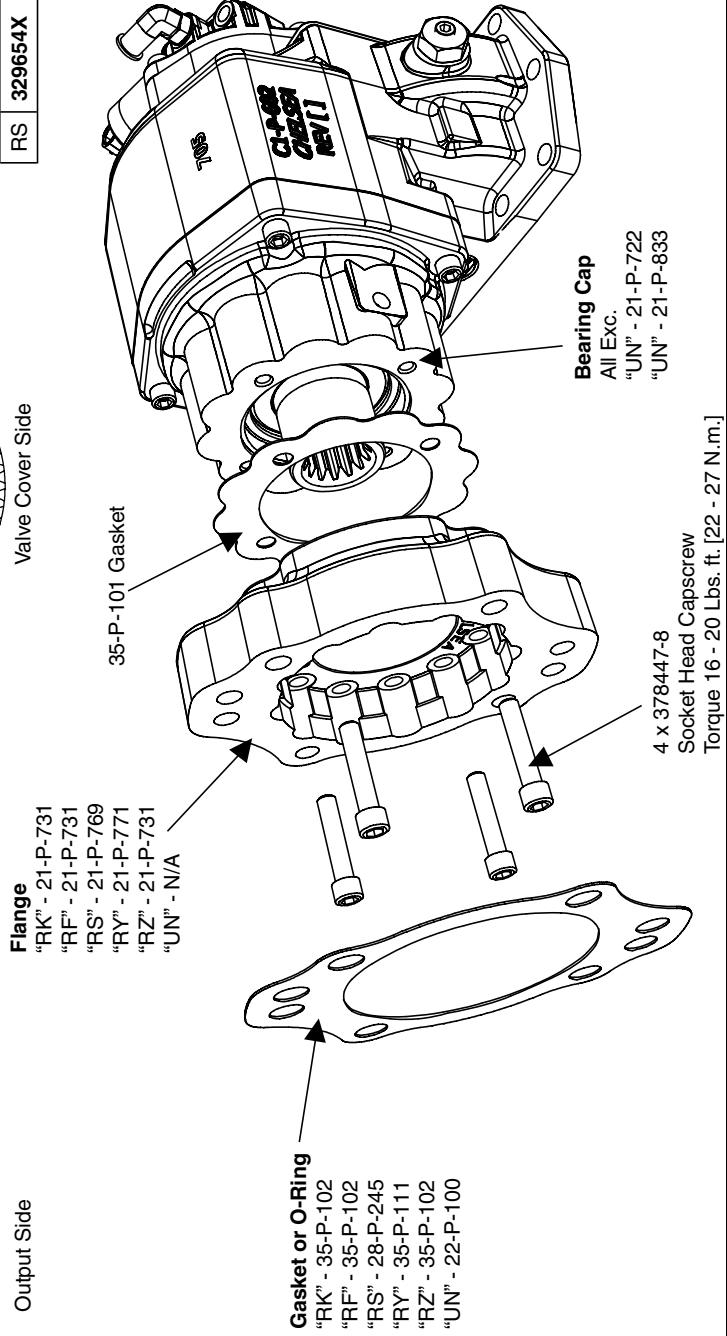
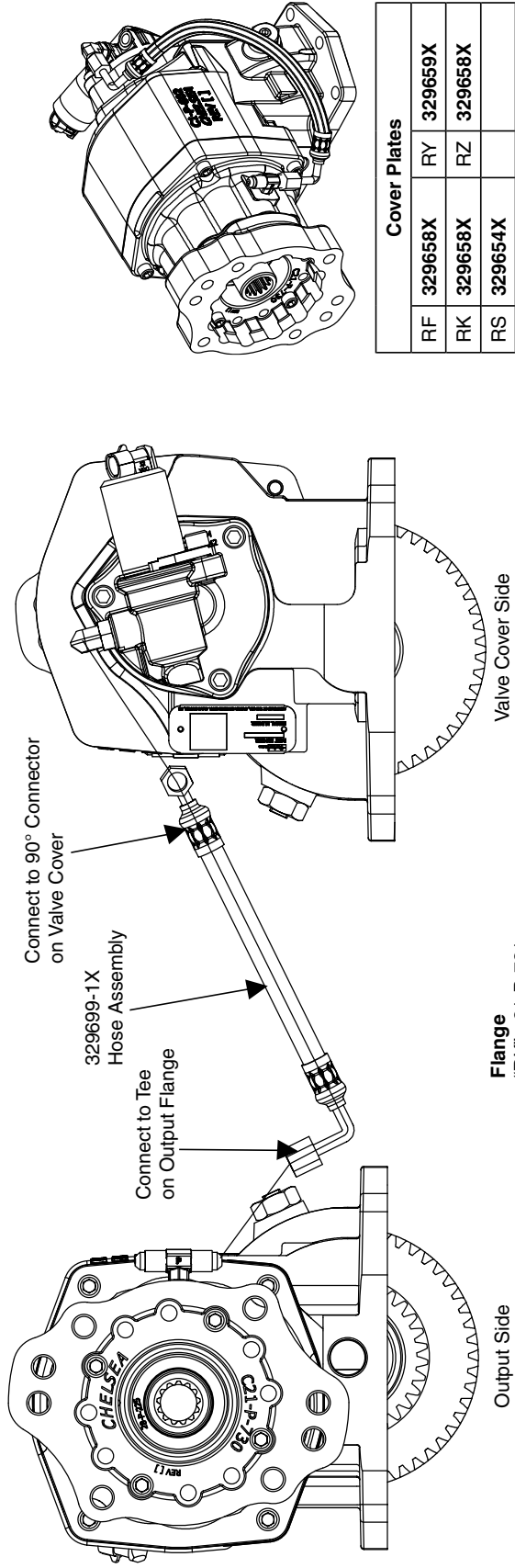
Reference Kit 329024-12X for 12 Volt Installation.
Reference Kit 329024-24X for 24 Volt Installation.



NOTE: Connection to Transmission Controller is Required for Full Pressure to P.T.O. Clutches

Installation Sketches

Installation "RF", "RK", "RS", "RY", "RZ" & "UN" Wet Spline 280 Series (SK-508)



SECTION 5

Installation Instructions**Mounting the P.T.O. on the Transmission for Allison**

When installing a P.T.O., always wear protective clothing and safety glasses.

1. Begin by draining the oil from the transmission. Use caution, since the oil may be hot (**Fig. 1**).

NOTE: Installation shown is for Left Side (Street Side) of transmission.

2. Remove the P.T.O. aperture plate with a 15mm socket (**Fig. 2**).

3. Remove the gasket and clean the aperture surface (**Fig. 3**).

NOTE: Do not reuse the gasket that comes with the transmission.

4. Using a screwdriver, install the guide pins until they bottom out (**Fig. 4**).

NOTE: Do not use sealing compounds because they are generally incompatible with automatic transmission fluid.

5. Install the special gasket over the guide pins. The ribbed surface should face outward, toward the installer (**Fig. 5**).

NOTE: To ensure proper backlash and sealing of P.T.O. to transmission only use gasket furnished with the P.T.O.

6. Position the P.T.O. and secure it with the top capscrew (**Fig. 6**).

7. Install the remaining capscrews. Torque all to 40 - 50 Lbs. ft. (54 - 68 N.m. or 5.5 - 6.9 Kg.m) (**Fig. 7**).

NOTE: Always use a crossing pattern with tightening capscrews.

8. If installing a wet spline output, attach hose to tee fitting on output flange. If non wet spline option attach hose to fitting at P.T.O. valve (**Fig. 8**).



Fig. 1



Fig. 5



Fig. 2



Fig. 6



Fig. 3



Fig. 7



Fig. 4



Fig. 8

Installation Instructions

9. Remove the Transmission High Pressure port plug and securely install the 90° elbow fitting supplied with the P.T.O. (**Fig. 9**).
10. Wet spline Option - Connect the pressure hose between the tee fitting on the output bearing cap and high pressure port on the transmission. Non-Wet spline Option - Attach hose between P.T.O. valve fitting and High Pressure Port on the transmission (**Fig. 10**).
11. After determining the position of the rotatable flange /pump, install the flange with the gasket and cap screws supplied with the P.T.O. (**Fig. 11**).

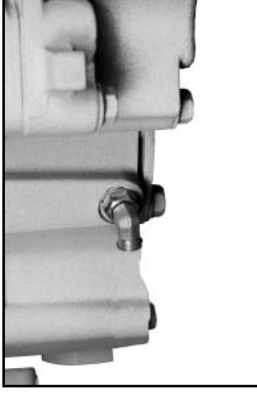


Fig. 9



Fig. 13



Fig. 10



Fig. 14

Installing Rotatable Flanges

The rotatable flange is shipped loose with the P.T.O. units for ease of installation. After determining the flange position, attach the flange to the P.T.O. bearing cap using the capscrews provided in the bag kit. After installing the capscrews make sure to torque the screws to 16 - 20 Lbs. ft. [22-27 N.m.]. Consideration should be taken on the size and weight of the pump being installed.

CAUTION: If not installing direct mount pump at this time install gasket, cover plate and bolts to wet spline output option to prevent transmission fluid from leaking out of P.T.O. flange if truck engine is turned "ON" (**Fig. 12**).

NOTE: Also see [page 22](#) for rotatable flange/wet spline information.

12. Complete the assembly by installing the electrical connection to the valve assembly (**Fig. 13**) and the pressure switch (**Fig. 14**).
13. Reference SK-Drawings in this book for complete installation information.



Fig. 11



Fig. 12

NOTE: After installation is complete refill transmission with oil as per manufacture recommendation. Run PTO for approximately 5-10 minutes. Check for any unusual noise or vibration also check for leaks and/or loose fittings or fasteners. Disengage P.T.O. and shut vehicle engine off.

SECTION 6



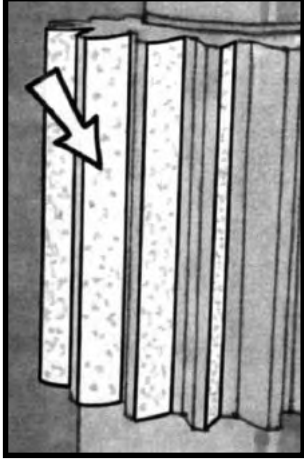
Improper Installation and Operator Abuse are the Leading Causes of P.T.O. Failure

The Chelsea P.T.O. is designed and built to meet the rugged demands of the Mobile Equipment Industry. With proper use and maintenance, the Chelsea P.T.O. will provide a long service life, both on-highway and off. Yet, if a problem does arise, it is important to diagnose its causes and correct it at once.

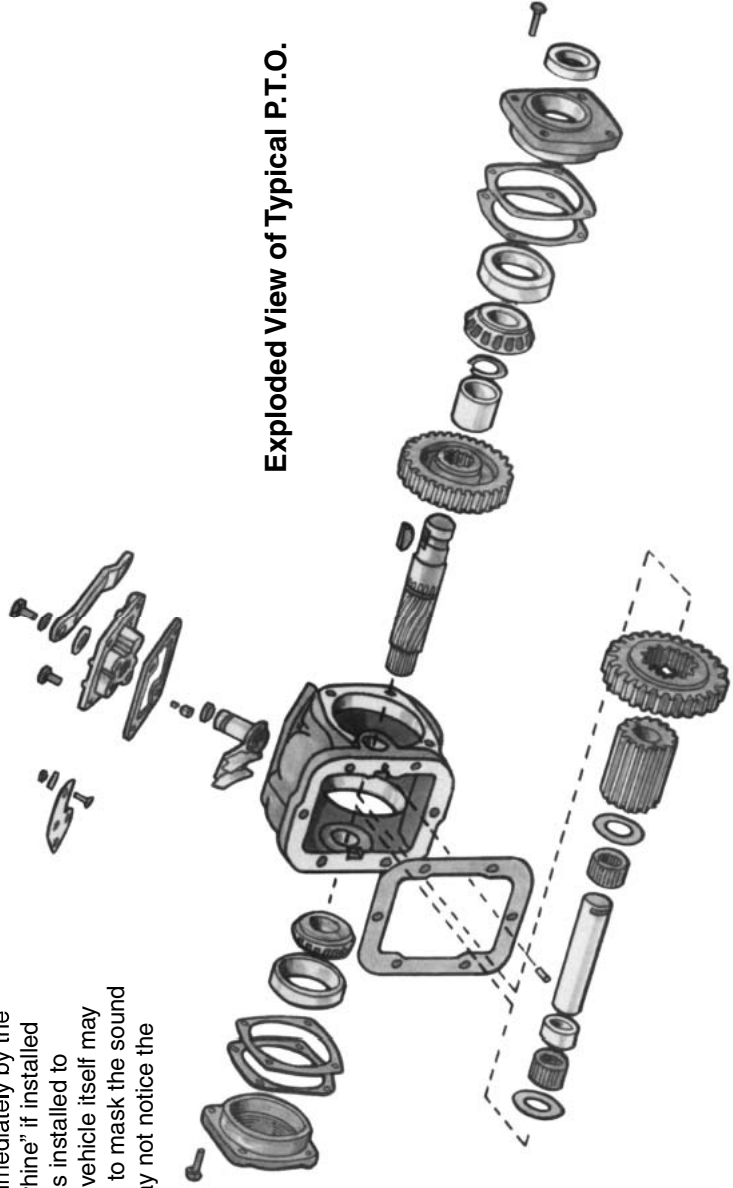
The first place to look when troubleshooting a P.T.O. failure is in the application itself. Repeated or premature failure may be a sign of an incorrect application. This can be discovered by using the Chelsea HY25-3001/US General Information Catalog or HY25-3000/US Applications Catalog. Check to see if the proper P.T.O. was specified for the transmission, then find out if the torque handling capabilities of the P.T.O. are satisfactory for the job being done. A P.T.O. works best when it is properly specified for the transmission and job requirement.

If a problem is allowed to continue, then damage to the P.T.O. will result. A unit that has been mounted to loosely could result in broken gear teeth. A unit that is mounted too tightly could result in premature wear to the gear teeth. Also, when a P.T.O. is installed without enough filler blocks, spacers, or gaskets between it and the transmission, a deep wear pattern will occur on the gear teeth. These patterns will lead to fatigue and early tooth failure. To help prevent this from occurring, always test the P.T.O. for noise just after it is installed.

Whatever the reason for a P.T.O. failure, there will be confusion over who, or what, is at fault. More than likely the product will be blamed. Although the P.T.O. cannot defend itself, its failed parts will tell a story.



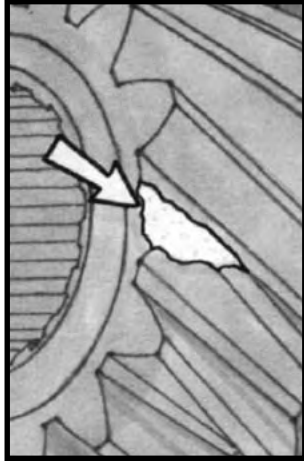
The first parts to inspect should be the gears. Check the surface of the gear teeth for signs of pitting . . . pitting is a normal wear pattern in most cases. However, contaminants in the oil or an installation that is too tight will cause severe pitting.



Exploded View of Typical P.T.O.

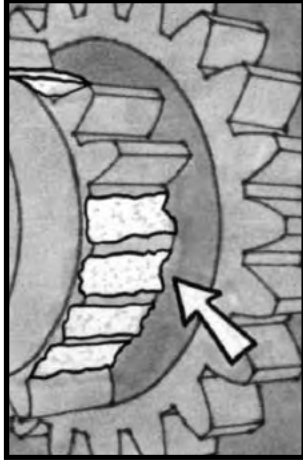
Troubleshooting

Once pitting of the gear surfaces has begun, there is nothing that can stop it. Severe pitting will eventually lead to gear tooth failure, therefore the damaged gear should be replaced when a P.T.O. is repaired or rebuilt.

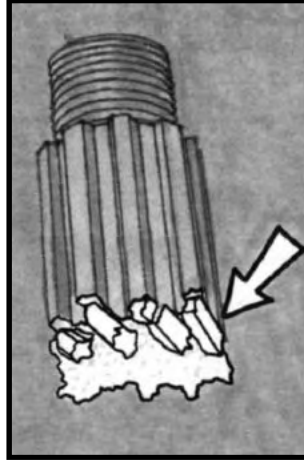


Sometimes a gear will chip a tooth because of mishandling or improper shifting. Even though a P.T.O. may continue to run with a chipped tooth, the damaged gear should be replaced immediately. It will damage the other teeth it comes in contact with during operation, not to mention the possible damage which could result from the loose chip. If the problem is allowed to continue, then failure to other parts in the P.T.O. or transmission could result.

Another possible problem during vehicle operation is "shock load." This occurs when the torque demands on a P.T.O. are suddenly greater than it was designed to take. "Shock load" could be caused by torque overloads, improper shifting, equipment failure, or excessive loads over a short period of time. If this happens, the P.T.O. is likely to fail immediately. The vehicle operator may not even be aware of the reason for the P.T.O. failure.



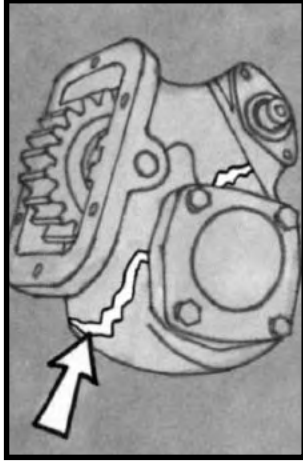
Worn gears can easily be affected by "shock load." If the worn gears are not replaced, they can eventually lead to broken gear teeth. This is the most severe form of P.T.O. failure. Worn or damaged gears are likely to break because of their reduced load carrying capacity. To prevent the possibility of broken gear teeth, always inspect auxiliary equipment for possible freeze-up. Also, recheck P.T.O. application, operating conditions and P.T.O. installation.



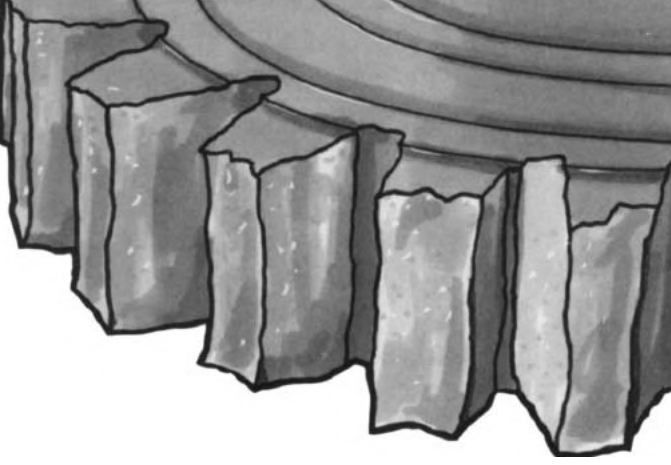
P.T.O. shafts are also vulnerable to operating abuse. If the shaft break is irregular, this usually indicates a torsional overload. Bending fatigue failure usually shows up as a smooth, flat break. To correct a P.T.O. shaft problem replace the failed shaft and check the speed and operating angle of the universal joint. Also, make sure the P.T.O. driveshaft is properly phased, (yokes in-line with each other). If a driveline is improperly installed it will cause vibration, which may lead to P.T.O. driveshaft or driven equipment problems.



When inspecting a P.T.O. output shaft, always inspect the keyway. Sometimes a P.T.O. will fail because of a displaced keyway on the shaft caused by a loose fitting yoke or equipment freeze-up. Proper maintenance on auxiliary equipment and replacing a worn yoke and/or P.T.O. driven shaft will prevent this problem.

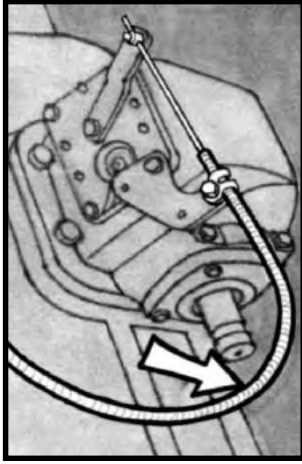


One of the most serious problems a P.T.O. can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure. Improper installation, poorly torqued bolts, or an unsupported direct mount pump can cause such a problem. A P.T.O. case can also be damaged by foreign objects meshing between the gear teeth, severe shock load, or even hitting an obstacle in the road.



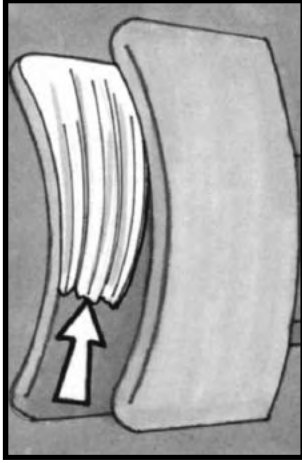
Prevention is the best cure for P.T.O. case damage. Therefore, always torque the P.T.O. flange bolts in sequence and the proper specifications. Also, be sure to check the weight of the direct mount pump and, if it is over forty pounds, make a support bracket for it.

Deep Mesh Pattern Caused by Improper Backlash Adjustment

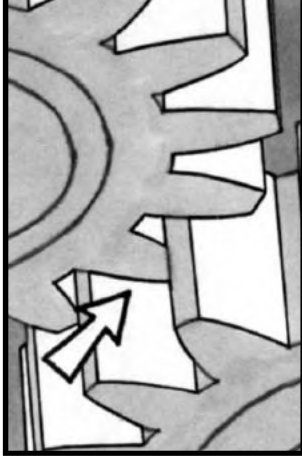


Shifting problems are sometimes a complaint an operator will have about his P.T.O. A P.T.O. that is hard to shift may be caused by a tight bend in the shifter cable, poor leverage, a gear that is installed backwards, or too tight of an installation. Many of these problems can be solved by inspecting the P.T.O. installation and making the proper adjustments regarding cable length, gear position, or shift lever.

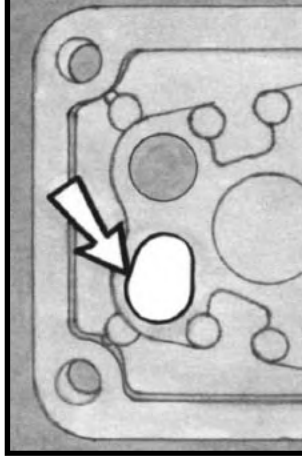
Remember, a lever-operated shift linkage should not be connected to a wire shift cover. The mechanical advantage of the lever is often too great for the wire shift cover and could severely damage it. Also inversely, don't use a cable with a lever shift cover. The cable isn't capable of transmitting the force necessary to shift a lever mechanism.



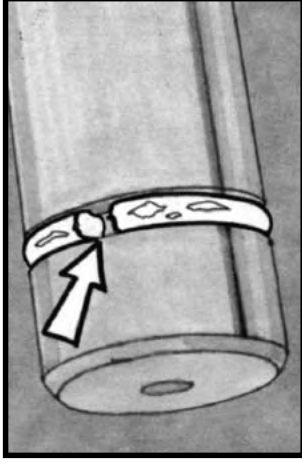
Most shifting complaints are caused by improper shifting procedure or incorrect linkage installation. Both of these situations will cause premature wear on the shift pad or fork and the shift rod or rail. To prevent this premature wear, avoid overshifting or undershifting the P.T.O. Overshifting causes the shifter fork to press against a P.T.O. gear during operation. This results in unnecessary friction and wear.



Undershifting allows incomplete gear tooth contact with the driver gear. This means only part of the tooth width is transmitting the torque and R.P.M. during P.T.O. operation. This situation can lead to gear failure or it could cause the P.T.O. to jump out of gear. These two problems can be overcome by checking linkage adjustments and proper operator training.



Shifting problems can also be caused by a worn or elongated shifter poppet hole. This causes the P.T.O. to jump out of gear and the parts in the shifter assembly to break or become loose. If this happens, replace those parts that are worn.



Seals and O-Rings may cause special problems in P.T.O. operations. Improper installation or heat build-up can cause O-Rings and seals to fail prematurely. Once seals or O-Rings fail, they should be replaced. The proper procedure for installing these parts is to lubricate them first so they will easily slide on the shaft.

SECTION 7

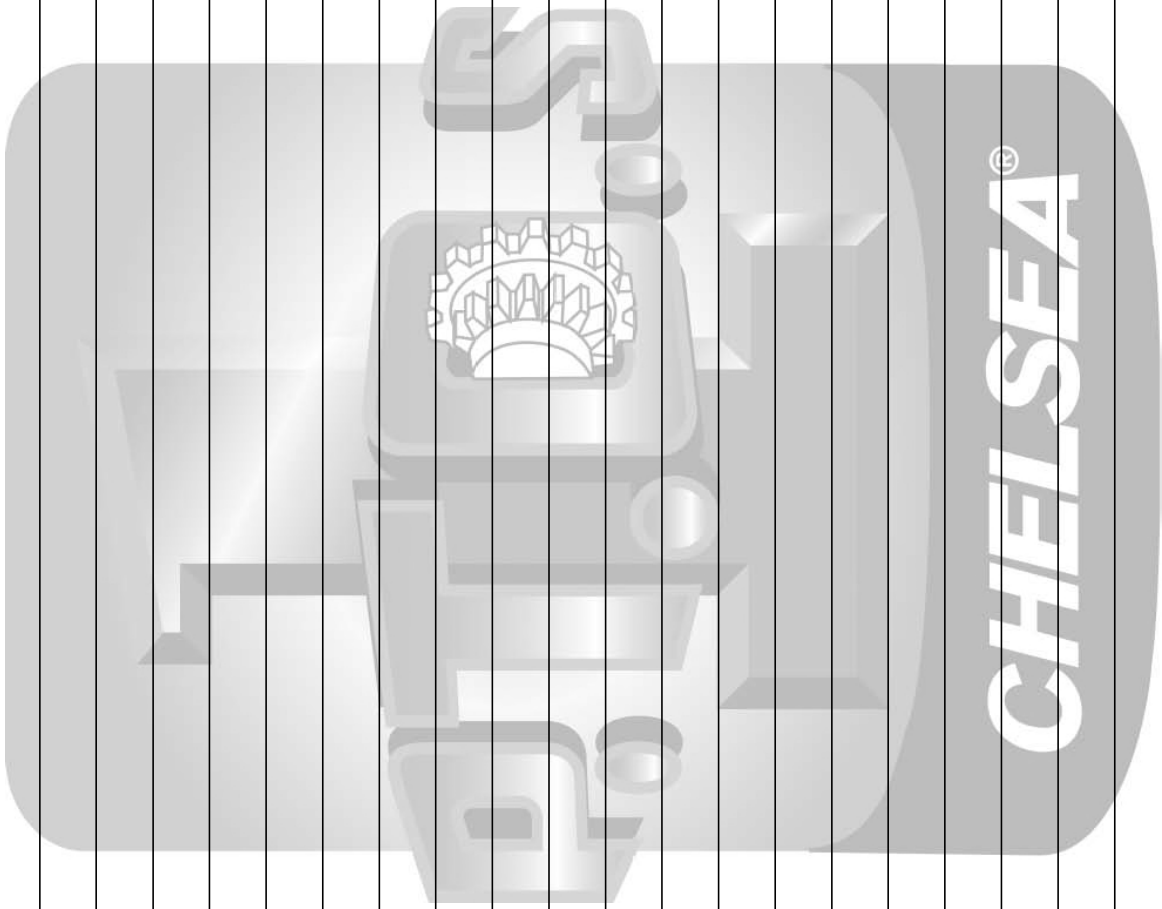
| | | | |
|-------------------|--|---|--|
| 329071-62X | Gasket & Seal Kit (All Outputs Except "BA",) | | |
| 2-P-112 | Gasket..... | 1 | |
| 22-P-101 | Gasket..... | 1 | |
| 28-P-191 | O-Ring .549" x .103" | 1 | |
| 28-P-119 | Oil Seal 1.379" x .875" x .250" | 1 | |
| 28-P-211 | Oil Seal 3.001" x 2.00" x .375" | 1 | |
| 28-P-267 | Oil Seal 2.627" x 1.750" x .312" | 1 | |
| 28-P-285 | O-Ring 1.597" x .103" | 2 | |
| 28-P-178 | O-Ring 4.484" x .138" | 1 | |
| 35-P-101 | Bearing Cap Gasket Wet Spline..... | 1 | |
| 329071-63X | Bearing Kit "AC", "XD", "XV", "RF", "RK", "RS", "RY", "RZ" (All Outputs Except "BA" and "UN") | | |
| 379746 | Lockring..... | 1 | |
| 378263 | Lockring..... | 1 | |
| 379555 | Lockring..... | 1 | |
| 560972 | Needle Roller Bearing Assy 1.500" x 1.875" x 1.000" | 1 | |
| 550311 | Ball Bearing 1.77" x 3.346" x .748" | 1 | |
| 550439 | Tapered Cone Bearing .750" x .8598" | 2 | |
| 561056 | Plain Bearing 1.500" x 1.656" x 1.00" | 1 | |
| 31-P-102 | Thrust Washer .754" x .440" x .030" | 1 | |
| 14-P-73-1 | Spacer .762" x 1.500" x .150" | 1 | |
| 14-P-73-2 | Spacer .762" x 1.500" x .153" | 1 | |
| 14-P-73-3 | Spacer .762" x 1.500" x .156" | 1 | |
| 329071-64X | Bearing Kit ("BA", "UN" Outputs) | | |
| 379746 | Lockring..... | 1 | |
| 378263 | Lockring..... | 1 | |
| 379555 | Lockring..... | 1 | |
| 378895 | Lockring..... | 1 | |
| 378576 | Lockring..... | 1 | |
| 550010 | Ball Bearing 1.378" x 2.8346" x .6693" | 1 | |
| 560972 | Needle Roller Bearing Assy 1.500" x 1.875" x 1.000" | 1 | |
| 550439 | Tapered Cone Bearing .750" x .8598" | 2 | |
| 561056 | Plain Bearing 1.500" x 1.656" x 1.00" | 1 | |
| 31-P-102 | Thrust Washer .754" x .440" x .030" | 1 | |
| 14-P-73-1 | Spacer .762" x 1.500" x .150" | 1 | |
| 14-P-73-2 | Spacer .762" x 1.500" x .153" | 1 | |
| 14-P-73-3 | Spacer .762" x 1.500" x .156" | 1 | |
| 329175-12X | Conversion Kit E.O.C. 12V ("FJ" Pitch) | | |
| 28-P-171 | O-Ring..... | 1 | |
| 329650X | Electronic Overspeed Controller..... | 1 | |
| 329076X | Hydraulic Shift..... | 1 | |
| 379243 | Speed Sensor..... | 1 | |
| 329175-24X | Conversion Kit E.O.C. 24V ("FJ" Pitch) | | |
| 28-P-171 | O-Ring..... | 1 | |
| 329650X | Electronic Overspeed Controller..... | 1 | |
| 329076X | Hydraulic Shift..... | 1 | |
| 379243 | Speed Sensor..... | 1 | |
| 329354-12X | Conversion Kit 12 Volt Remote Valve (All) | | |
| 22-P-112 | Gasket..... | 1 | |
| 500457-6 | Mounting Screw..... | 2 | |
| 500357-7 | Lockwasher..... | 2 | |
| 379686-1 | Solenoid Valve..... | 1 | |
| 379449 | Screen Adapter..... | 1 | |
| 379258 | Bracket..... | 1 | |
| 379564-2 | Cap Thread..... | 2 | |
| 329231X | Valve Connector..... | 1 | |
| 329230X | Connector..... | 1 | |
| 328075X | Hose Assembly..... | 1 | |
| 379700 | Tee Female..... | 1 | |
| 380010 | Union Female..... | 1 | |
| 379486 | 90° Elbow..... | 1 | |
| 329403X | Assembly Seal..... | 1 | |
| 379711 | Female Bracket..... | 1 | |
| 379131-1 | Adapter..... | 1 | |
| SK-432 | Installation..... | 1 | |
| 329057-4X | Hose Assembly..... | 2 | |

Continued on Next Page

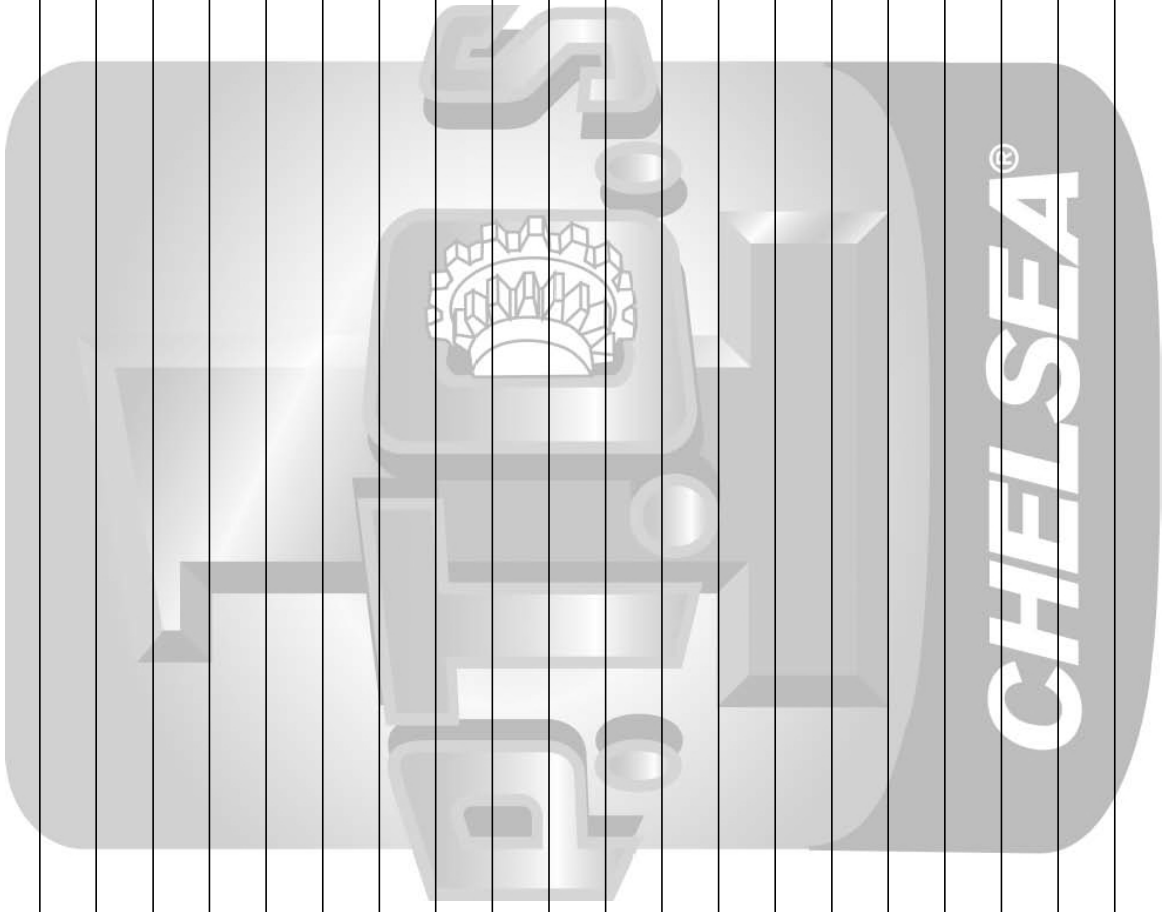
Kits Bill of Materials

| | | | | |
|-------------------|---|----|--|--|
| 329354-24X | Conversion Kit 24 Volt Remote Valve (All) | | | |
| 500457-6 | Mounting Screw | 2 | | |
| 500357-7 | Lockwasher | 2 | | |
| 379686-2 | Solenoid Valve | 1 | | |
| 379449 | Screen Adapter | 1 | | |
| 379258 | Bracket | 1 | | |
| 379564-2 | Cap Thread | 2 | | |
| 329231X | Valve Connector | 1 | | |
| 329230X | Connector | 1 | | |
| 328075X | Hose Assembly | 1 | | |
| 22-P-112 | Gasket | 1 | | |
| 379700 | Tee Female | 1 | | |
| 380010 | Union Female | 1 | | |
| 379486 | 90° Elbow | 1 | | |
| 329403X | Assembly Seal | 1 | | |
| 379711 | Female Bracket | 1 | | |
| 379131-1 | Adapter | 1 | | |
| SK-432 | Installation | 1 | | |
| 329057-4X | Hose Assembly | 2 | | |
| 329448-12X | Conversion Kit E.O.C. 12V ("KV" Pitch) | | | |
| 28-P-171 | O-Ring | 1 | | |
| 329650X | Electronic Overspeed Controller | 1 | | |
| 329444X | E.O.C. Wire Installation Kit | 1 | | |
| 379243 | Speed Sensor | 1 | | |
| 329448-24X | Conversion Kit E.O.C. 24V ("KV" Pitch) | | | |
| 28-P-171 | O-Ring | 1 | | |
| 329650X | Electronic Overspeed Controller | 1 | | |
| 329444X | E.O.C. Wire Installation Kit | 1 | | |
| 379243 | Speed Sensor | 1 | | |
| 329678X | Gear & Clutch Plates Kit (All) | | | |
| 2-P-858 | Output Gear 36T | 1 | | |
| 379485 | Friction Disc | 11 | | |
| 380065 | Clutch Plate | 10 | | |
| 7170-86X | Mounting Kit ("FJ" Gear Pitch) | | | |
| 379451 | Screw Pilot | 2 | | |
| 379453-10 | Capscrew M10 - 1.5" x 1.378" | 8 | | |
| 379486 | 90° Elbow | 1 | | |
| SK-355 | Installation | 1 | | |
| 7170-117X | Mounting Kit ("KV" Gear Pitch) | | | |
| 379451 | Screw Pilot | 2 | | |
| 379453-10 | Capscrew M10 - 1.5" x 1.378" | 8 | | |
| 379812 | Male Connector | 1 | | |

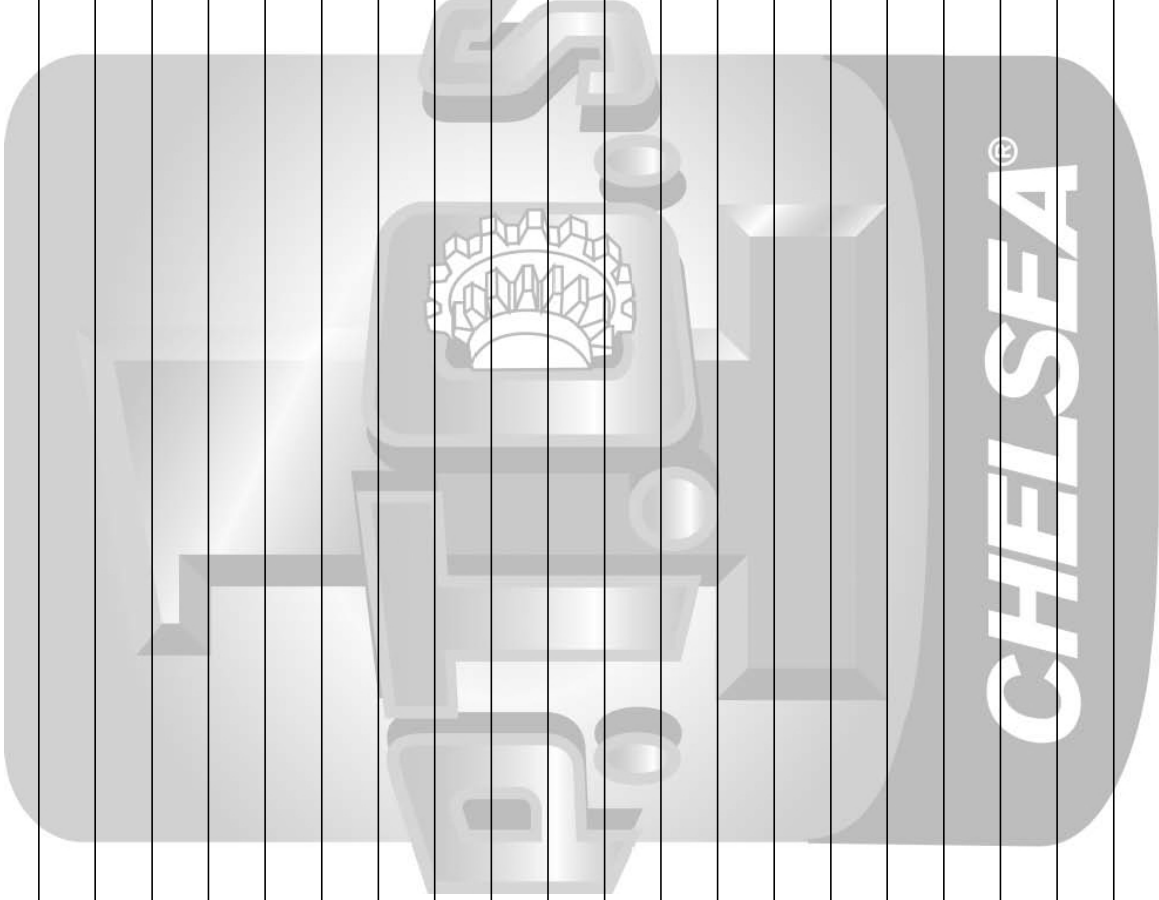
Notes



Notes



Notes



Parker Hannifin Corporation – Chelsea Division Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors, ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

- 1. Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at www.parker.com/sale/terms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.
- 2. Price Adjustments; Payments.** Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.
- 3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferral of shipment at Buyers' request, beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.
- 4. Warranty.** Seller warrants that all products sold, other than the 590 Series, conform to the applicable Parker Chelsea standard specification for the lesser period of 2 years (24 Months) from date of service or 2-1/2 years (30 Months) from date of build (as marked on the product name plate). Seller warrants that the 590 Series will conform to the applicable Seller standard specification for the lesser period of 2 years (24 Months) from date of service or 2000 hours of usage. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**
- 5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.
- 6. LIMITATION OF LIABILITY, UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT; OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT. EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY, IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

10. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. Force Majeure. Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. Termination. Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act. Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

07/14

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GEARBOX DESCRIPTION
GEARBOX CODE

RE 1523 TS SP.8/16 Z26 60.5 MR
91V2HS300600

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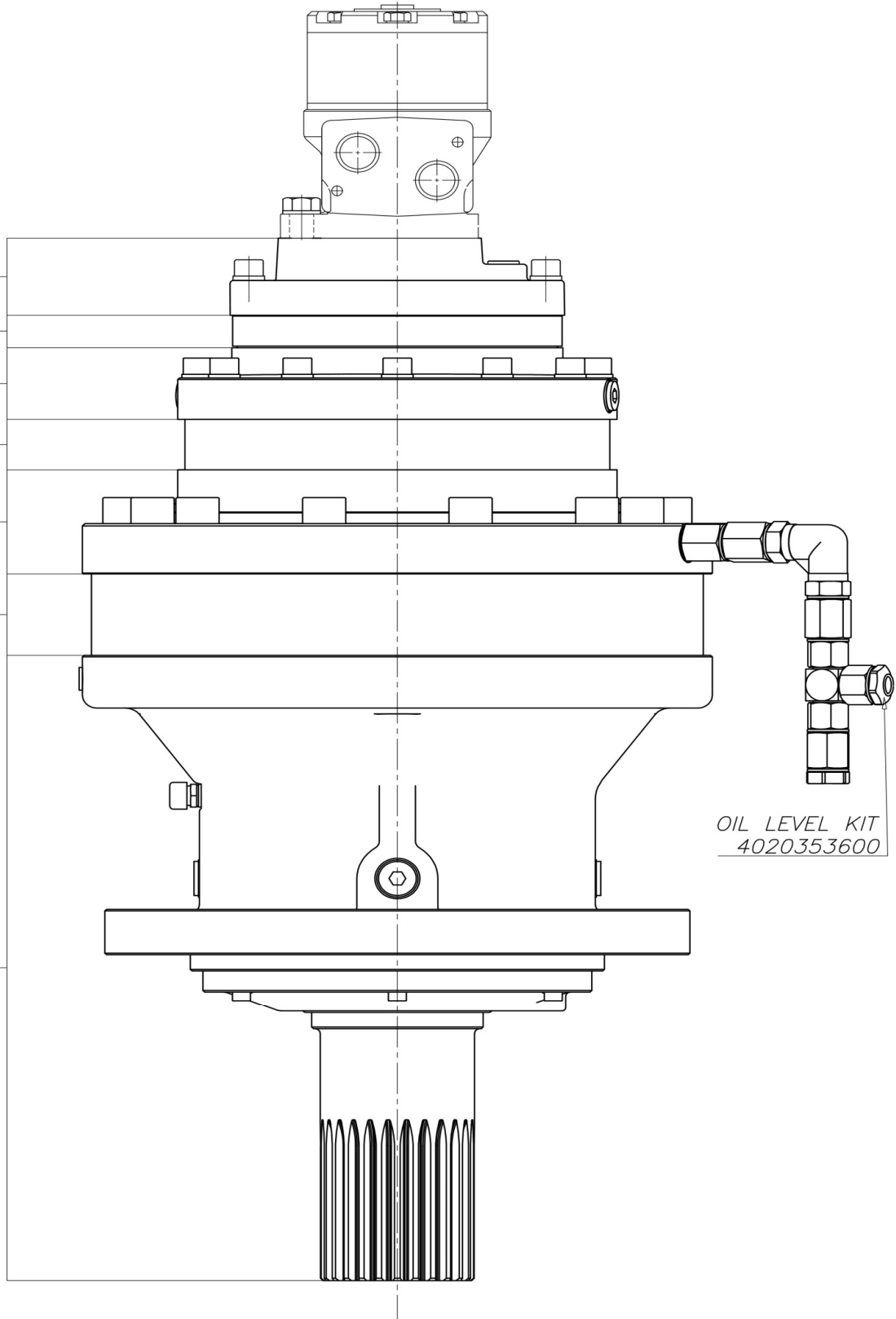
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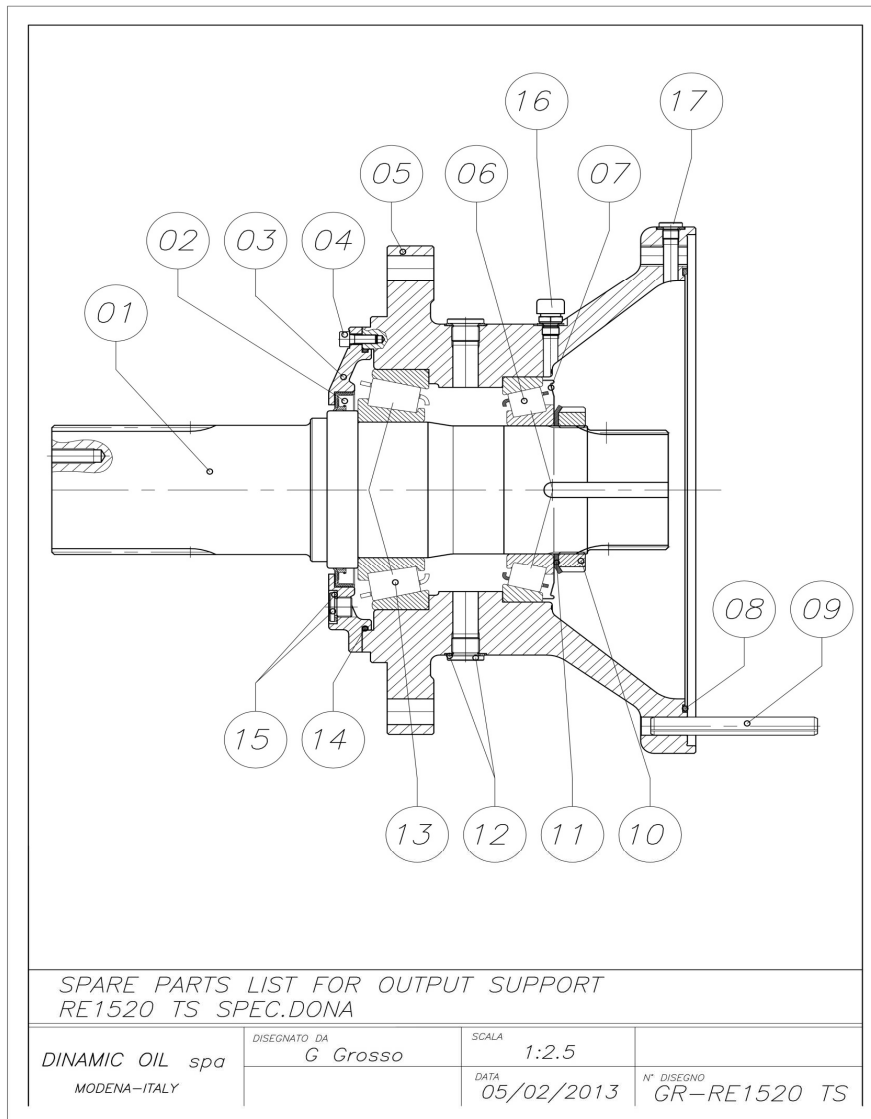
PAGE 5

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PAGE 2



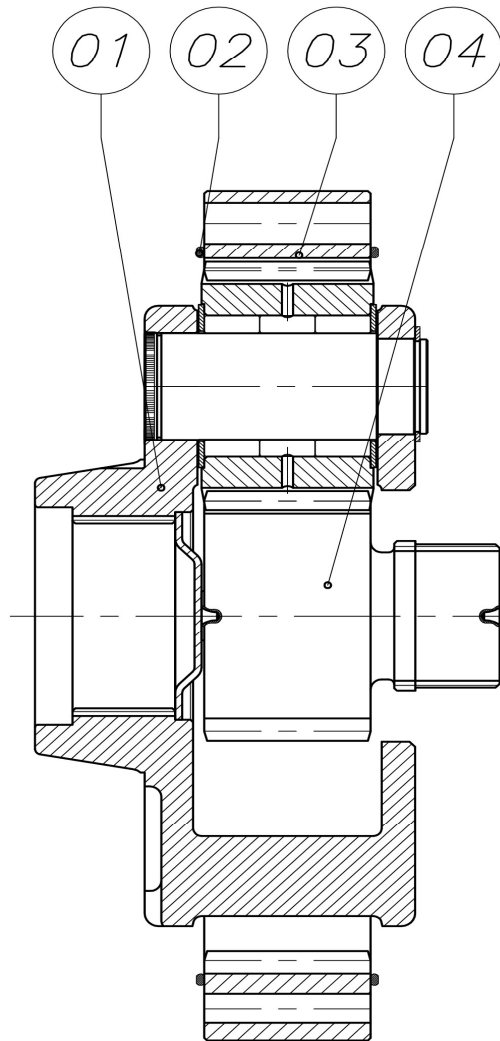


| | |
|--|--------------------|
| SPARE PARTS LIST FOR OUTPUT SUPPORT RE1520 TS SPEC.DONA | GRU-1520 TS |
|--|--------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|---|-------------------------|-------|------------------------|
| 1 | ALBERO SCANALATO SPEC. 8/16 DP Z26 RE1520 | SHAFT | 1 | 02261309 |
| 2 | ANELLO DI TENUTA 105x130x12 | RING SEAL | 1 | 415003300 |
| 3 | COPERCHIETTO PORTATEN.RE1020/1520 | COVER | 1 | 02251012 |
| 4 | VITE TCEI M6x16 12,9 | SCREW | 6 | 410409400 |
| 5 | CORPO T RE 1520 SPEC.FORI RADDOPPIA | OUTPUT SUPPORT | 1 | 022010139 |
| 6 | CUSCINETTO CR 30217 TIPO A | BEARING | 1 | 401021200 |
| 7 | ANELLO NILOS 32217 AV | NILOS | 1 | 415052600 |
| 10 | GHIERA M85x2 | LOCKNUT | 1 | 430000900 |
| 11 | ROSETTA DI SIC. MBS17 X RE1020/1520 | TAB WASHER | 1 | 423205300 |
| 12 | TAPPO TCEI 3/8"GAS RONDELLA RAME 3/8"GAS | PLUG WASHER | 4 | 419000700 423000600 |
| 13 | CUSCINETTO CR 32218 TIPO A | BEARING | 1 | 401018100 |
| 14 | GUARNIZIONE O-RING 2-167 | O-RING SEAL | 1 | 406013100 |
| 15 | RONDELLA RAME 1/4"RICOTTO TAPPO TCEI 1/4"GAS DIN 908 | WASHER PLUG | 1 | 423000300 419000600 |
| 16 | TAPPO SFIATO 1/8"GAS CON VALVOLA RONDELLA RAME 1/8"GAS | BREATHER PLUG WASHER | 1 | 419021900 423001700 |
| 17 | TAPPO TCEI 1/8"GAS RONDELLA RAME 1/8"GAS | PLUG WASHER | 1 | 419020900 423001700 |

SUB ASSEMBLY CODE: 99371400

| | | | | |
|---|--------------------------------|--------------|---|-----------|
| 8 | OR 2-277 | O RING SEAL | 1 | 406023400 |
| 9 | SPINA ELASTICA Ø12X100 UNI6873 | ELASTIC PINS | 3 | 434010700 |



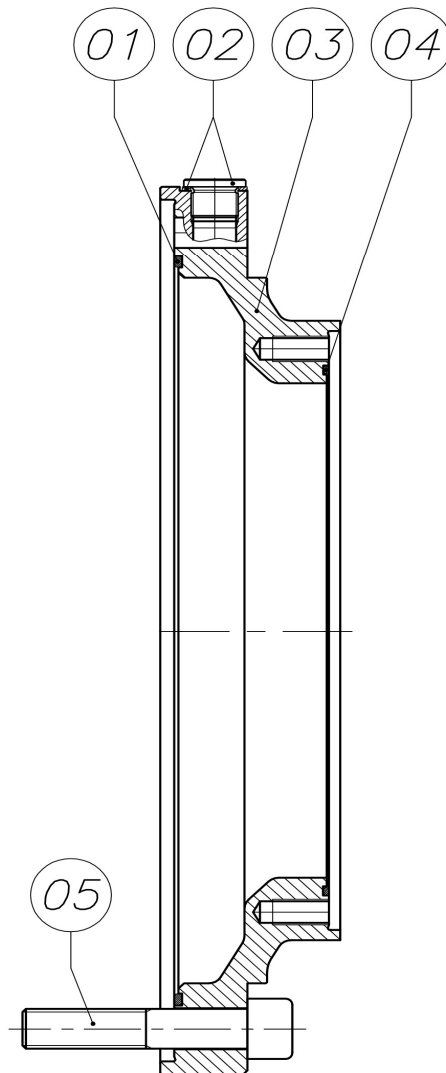
SPARE PARTS LIST FOR GEAR SET
RE1520 M

| | | | |
|---------------------------------|--------------------------|--------------------|----------------------------|
| DINAMIC OIL spa MODENA-ITALY | DISEGNATO DA G Grosso | SCALA 1:2 | |
| | | DATA 17/11/2012 | N° DISEGNO GRI-RE1520 M |

| | |
|--|---------------------|
| SPARE PARTS LIST FOR GEAR SET RE1520 M R=4.09 | GRI-RE1520 M |
|--|---------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|-----------------------------------|-------------|-------|-----------|
| 1 | RAGG.INGRANAGGERIA RE1520 R1:4.09 | GEAR SET | 1 | 99130400 |
| 2 | OR 2-277 | O RING SEAL | 2 | 406023400 |
| 3 | CORONA RE1520/2000 | RING GEAR | 1 | 02231027 |
| 4 | SOLARE R=1:4.09 RE 1520 | SUN GEAR | 1 | 02611116 |

SUB ASSEMBLY CODE: K0500H1A01

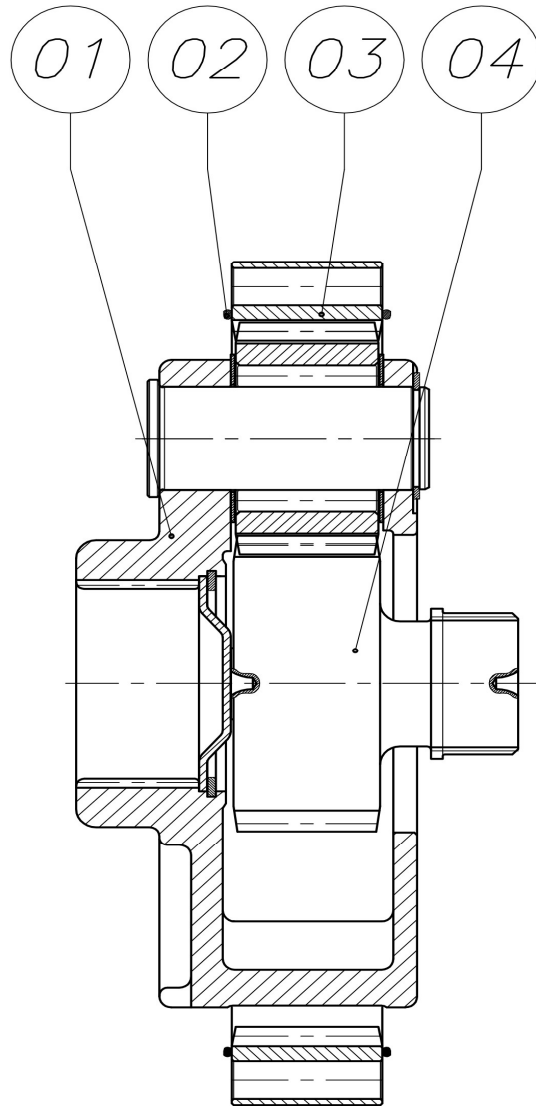


SPARE PARTS LIST FOR INTERMEDIATE FLANGE RE1520

| | | | |
|---------------------------------|--------------------------|--------------------|----------------------------|
| DINAMIC OIL spa MODENA-ITALY | DISEGNATO DA G Grosso | SCALA 1:2 | |
| | | DATA 07/12/2012 | N° DISEGNO GR-FL RE1520 |

SPARE PARTS LIST FOR INTERMEDIATE FLANGE RE1520 x SUPPORT "T" GR-FL RE1520

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|-------------------------------------|---------------------|-------|-----------|
| 1 | GUARNIZIONE OR 2-277 | OR-RING SEAL | 1 | 406023400 |
| 2 | TAPPO TCEI DIN 908 R 3/8"GAS | PLUG | 2 | 419000700 |
| | RONDELLA 3/8" RAME RICOTTO UNI 6953 | WASHER | 2 | 423000600 |
| 3 | FLANG.INTERM.RE1520 PER RE510 | INTERMEDIATE FLANGE | 1 | 02731044 |
| 4 | GUARNIZIONE OR 2-171 | OR-RING SEAL | 1 | 406015000 |
| 5 | VITE TCEI M16X110 12.9 UNI5931 | SCREW | 16 | 410408400 |



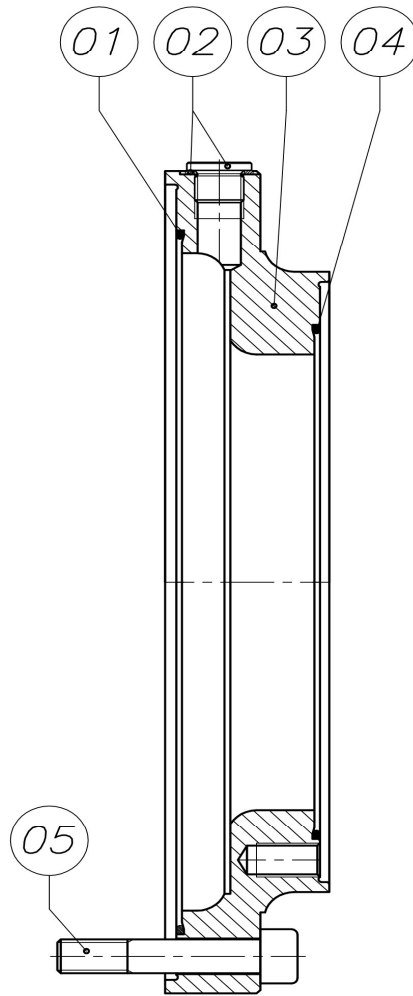
SPARE PARTS LIST FOR GEAR SET
RE510 N

| | | | |
|---------------------------------|--------------------------|--------------------|---------------------------|
| DINAMIC OIL spa MODENA-ITALY | DISEGNATO DA G Grosso | SCALA 1:1 | |
| | | DATA 17/11/2012 | N° DISEGNO GRI-RE510 N |

| | |
|---|--------------------|
| SPARE PARTS LIST FOR GEAR SET RE510 N R=4.25 | GRI-RE510 N |
|---|--------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|--------------------------------|-------------|-------|------------|
| 1 | RAGG.INGRANAGGERIA RE 510 4,25 | GEAR SET | 1 | 99121600 |
| 2 | GUARNIZIONE OR 2-171 | O RING SEAL | 2 | 406015000 |
| 3 | CORONA RE500 | RING GEAR | 1 | 2030030600 |
| 4 | SOLARE 2ST R 4,25 RE 510 | SUN GEAR | 1 | 2030031900 |

SUB ASSEMBLY CODE: K0500E1B01



SPARE PARTS LIST FOR INTERMEDIATE FLANGE RE510

DINAMIC OIL spa
MODENA-ITALY

DISEGNATO DA
M Springhetti

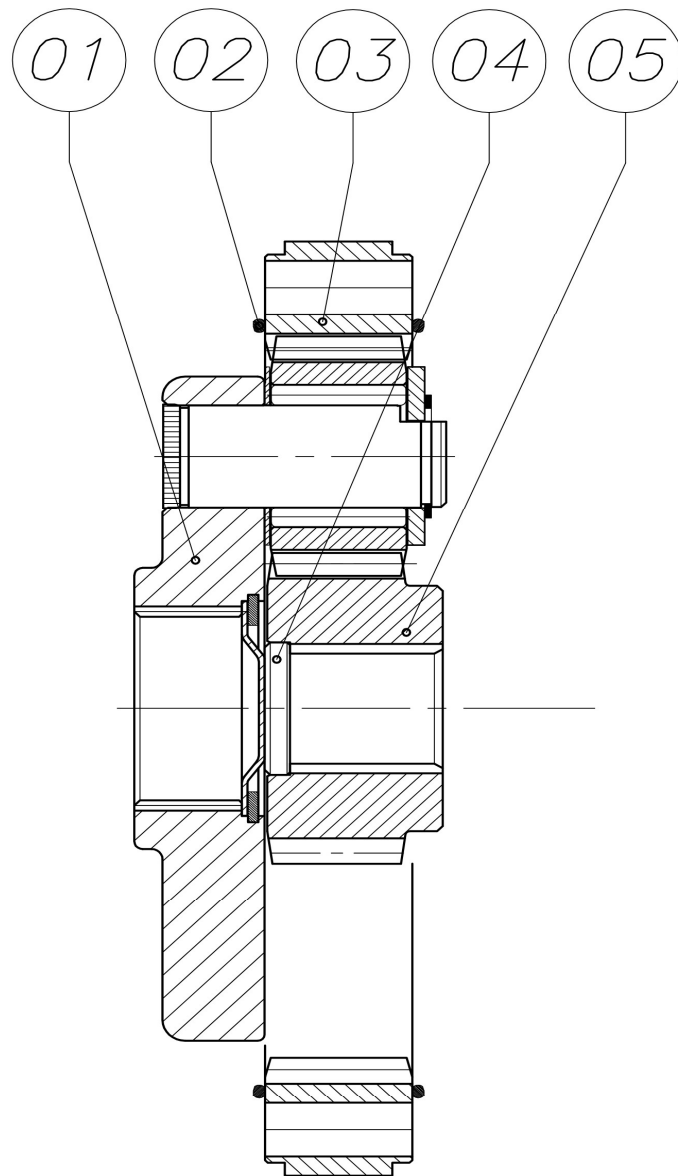
SCALA
1:1.5

DATA
01/06/2011

N° DISEGNO
GR-FL RE510

| | |
|--|--------------------|
| SPARE PARTS LIST FOR INTERMEDIATE FLANGE RE510 x RE1520 | GR-FL RE510 |
|--|--------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|----------------------------------|---------------------|-------|------------|
| 1 | GUARNIZIONE OR 2-171 | OR-RING SEAL | 1 | 406015000 |
| 2 | TAPPO TCEI 1/4" GAS DIN 90 | PLUG | 1 | 419000600 |
| | RONDELLA RAME 1/4" RAME RICOTTO | WASHER | 1 | 423000300 |
| 3 | FLANGIA INTERMEDIA RE300-500 | INTERMEDIATE FLANGE | 1 | 2030022400 |
| 4 | GUARNIZIONE OR 147X2,62 N70-N003 | OR-RING SEAL | 1 | 406018200 |
| 5 | VITE TCEI M10X80 12.9 UNI 5931 | SCREW | 12 | 410407800 |

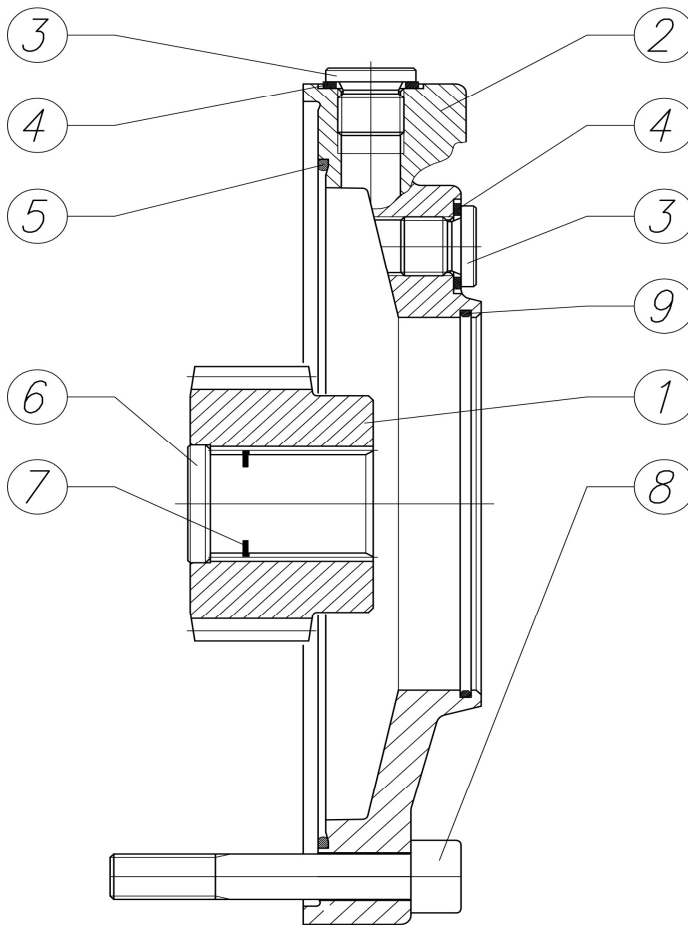


SPARE PARTS LIST FOR GEAR SET
RE210 N 1'6B

| | | | |
|---------------------------------|--------------------------|--------------------|-------------------------|
| DINAMIC OIL spa MODENA-ITALY | DISEGNATO DA G Grosso | SCALA 1:1 | |
| | | DATA 01/06/2011 | N° DISEGNO GRI-210 N |

| | |
|---|------------------|
| SPARE PARTS LIST FOR GEAR SET RE 210 N 1"6B i=3.48 | GRI-210 N |
|---|------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|----------------------------------|-------------|-------|-----------|
| 1 | RAGG.INGRANAGGERIA RE 210 N 3,48 | GEAR SET | 1 | 99103600 |
| 2 | OR 147X2,62 N70-N003 | O-RING SEAL | 2 | 406018200 |
| 3 | CORONA RE210/240 1 ST | RING GEAR | 1 | 02231009 |
| 4 | PASTIGLIA MR 110-210 R.3,48-4,26 | PAD | 1 | 02741011 |
| 5 | SOLARE R.3.48 MOT.ORB.1"6B | SUN GEAR | 1 | 026110274 |



DENOMINAZIONE COMPLESSIVO

SPARE PARTS LIST FOR MR INPUT SPEC. 1"6B

| | | | | | |
|-----------------------------|-------------------|---------------------|---|--------------------------|-------------------|
| DINAMIC OIL MODENA-ITALY | spa | DISEGNATO ZOBOLI | DATA 04/02/10 | | |
| REV: 00-data: 19/07/01 | | CONTROLLATO | <table border="1"> <tr> <td>N°DISEGNO GRE-MR 1"6B</td> <td>INDICE MOD. 00</td> </tr> </table> | N°DISEGNO GRE-MR 1"6B | INDICE MOD. 00 |
| N°DISEGNO GRE-MR 1"6B | INDICE MOD. 00 | | | | |

CI RISERVAMO A TERMINI DI LEGGE LA PROPRIETA DI QUESTO DISEGNO CON DIVIETO DI RIPRODURLO O DI RENDERLO COMUNQUE NOTO A TERZI SENZA LA NOSTRA AUTORIZZAZIONE

| | |
|--------------------------------------|--------------------|
| SPARE PARTS LIST FOR MR INPUT | GRE-MR 1"6B |
|--------------------------------------|--------------------|

| POS. | DESCRIZIONE | ITEM | Q.TA' | CODICE |
|------|-------------------------------------|--------------------|-------|-----------|
| 2 | FLANGIA MR 110-240 | INPUT MOTOR FLANGE | 1 | 200080100 |
| 3 | TAPPO TCEI 1/4"GAS DIN 908 | PLUG | 2 | 419000600 |
| 4 | RONDELLA RAME 1/4"RICOTTO 13X19X1.5 | WASHER | 2 | 423000300 |

SUB ASSEMBLY CODE: K0700AV01

| | | | | |
|---|----------------------------|----------------|-----|-----------|
| 1 | SOLARE R.3.48 MOT.ORB.1"6B | SUN GEAR | 1 | 026110274 |
| 5 | GUARNIZIONE OR 147x2,62 | O-RING SEAL | 1 | 406018200 |
| 6 | PASTIGLIA MR 110-210 | PAD | 1 | 02741011 |
| 7 | SEGER FORO Ø22 | INT. SNAP RING | *** | ***** |
| 8 | VITE TCEI M10X60 12.9 | SCREW | 8 | 410410300 |
| 9 | OR 2-042 | O-RING SEAL | 8 | 406002300 |