DL-3
OWNER/OPERATOR MANUAL

TABLE OF CONTENTS

OPERATION:

MAINTENANCE:

DIAGRAMS AND DRAWINGS:

Parts List – Miscellaneous Parts

Notification of Transfer of Ownership

WARRANTY:

VENDOR INSERTS:

Hydraulics Pump Service Manual

Dinamic Oil Gearbox and Motor

PTO Information

White RE Series Motors Service Procedures (Bucket Motor) – Go to following website:
http://www.whitehydraulics.com/pdf/service/RE_service.pdf

Parker Model V20 Sectional Body Directional Control Valve – Go to following website:
http://www.parker.com/hydraulicvalve/serv/Bul%20HY14-2705-M3cvr.pdf

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.

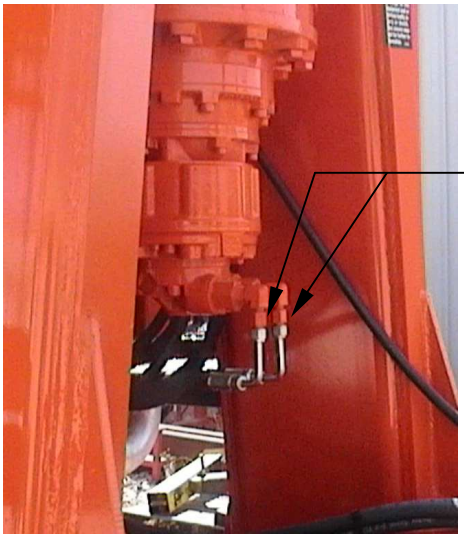
Model SAI Rotary Actuator, Restrictor Size = .096

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.



Swing Actuator Restrictors:

HA36 Actuator Restrictor Size = .056

SS40 Actuator Restrictor Size = .056

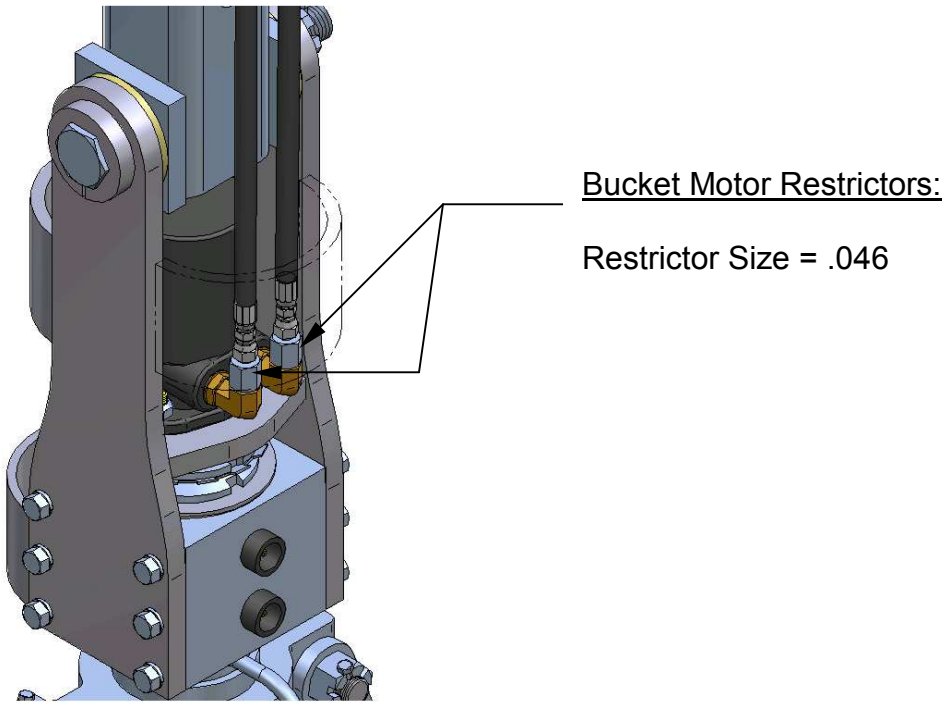
SAI Actuator Restrictor Size = .096

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.

Restrictor Size: .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.

⚠ 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.

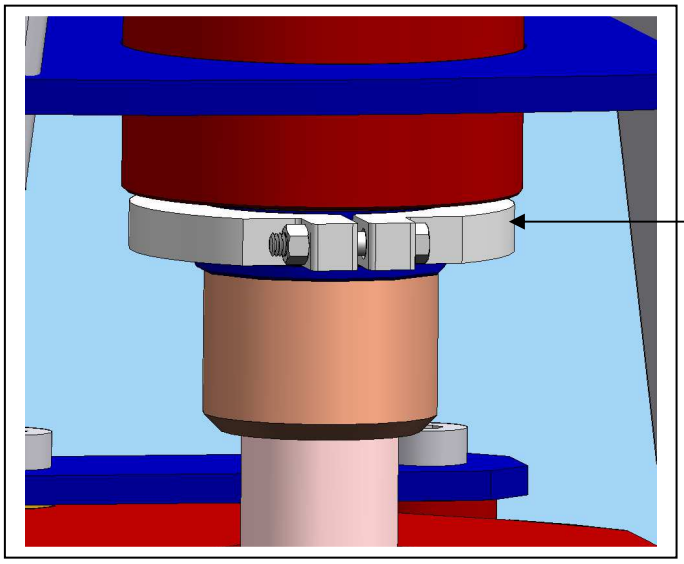
- Excessively packing the load with the boom. Evidence of this may be the bulkhead of the body may be bowed outward.

- 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

(Also shown on Diagram No. 1300 in “Dia. & Drawings” Section of this manual (see Item No. 9).

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.

⚠ WARNING

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

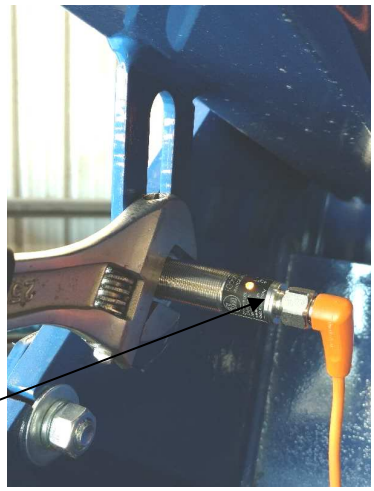
It is the operator’s responsibility to make sure that the area behind the loader is clear before backing up.

“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.

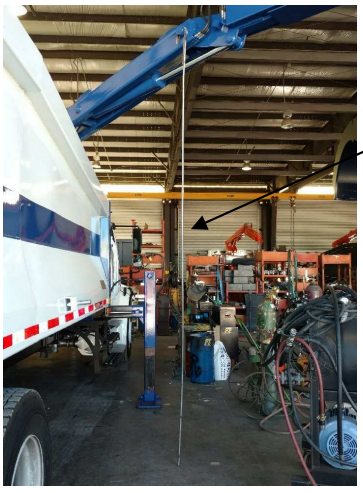
To adjust the boom sensor:

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.

⚠ WARNING

BEFORE MOVING TRUCK, BOOM MUST BE STOWED TO LOWEST POSSIBLE HEIGHT; MAX. BOOM HEIGHT NOT TO EXCEED 13'6".

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.

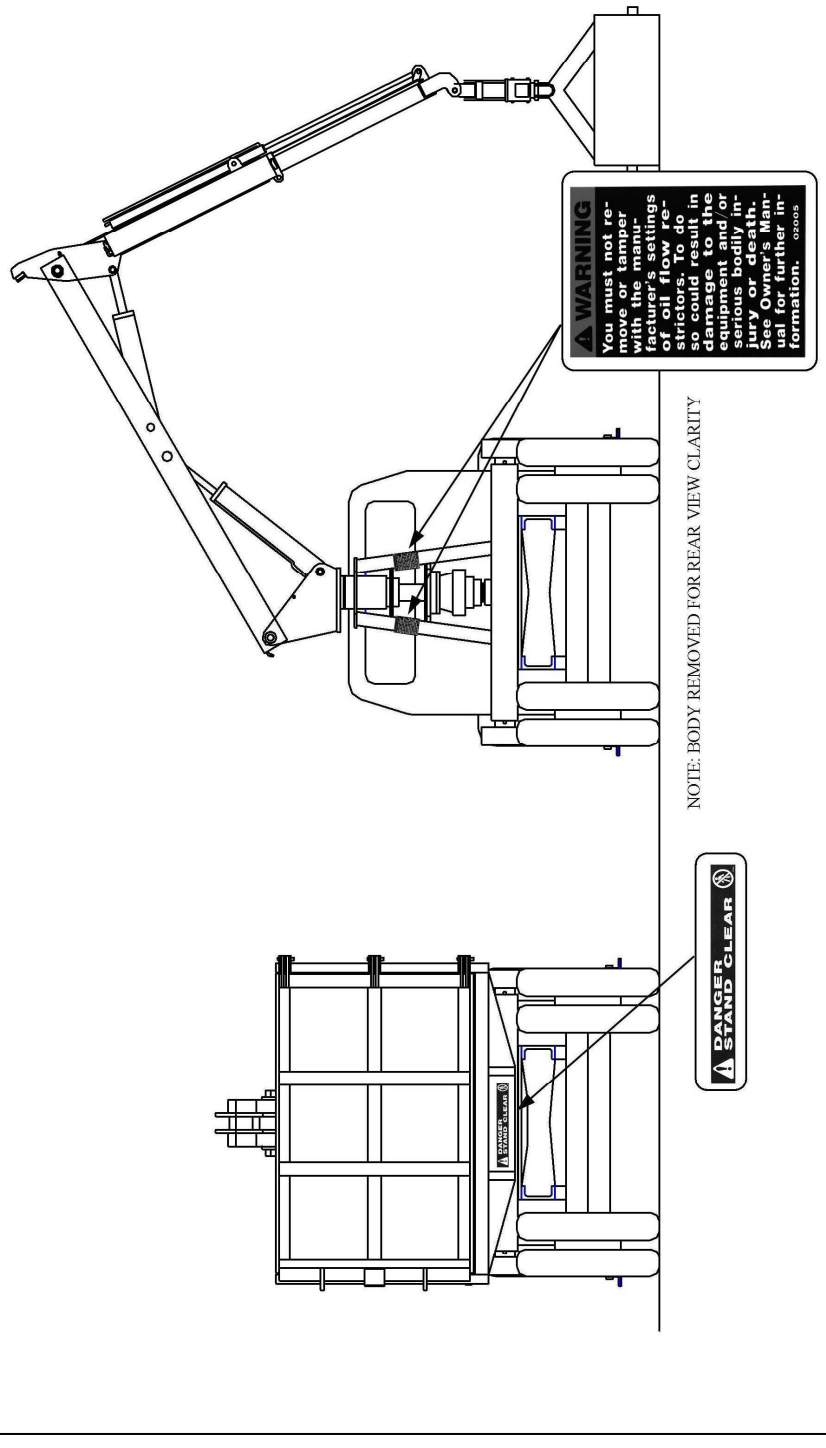
⚠ WARNING

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

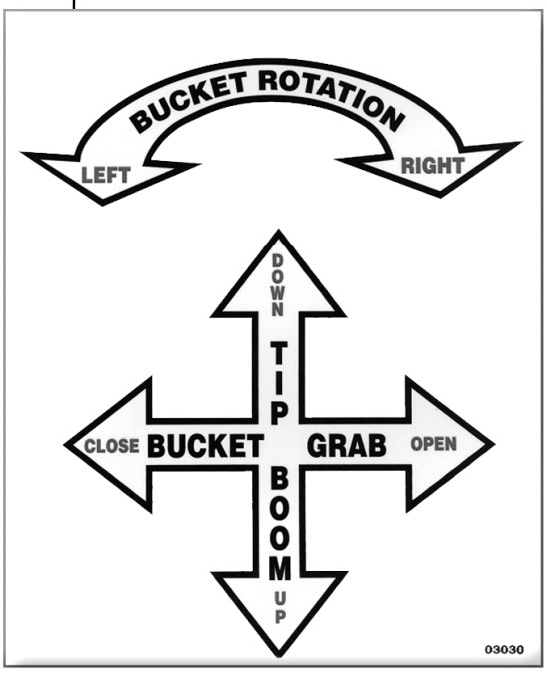
⚠ CAUTION

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

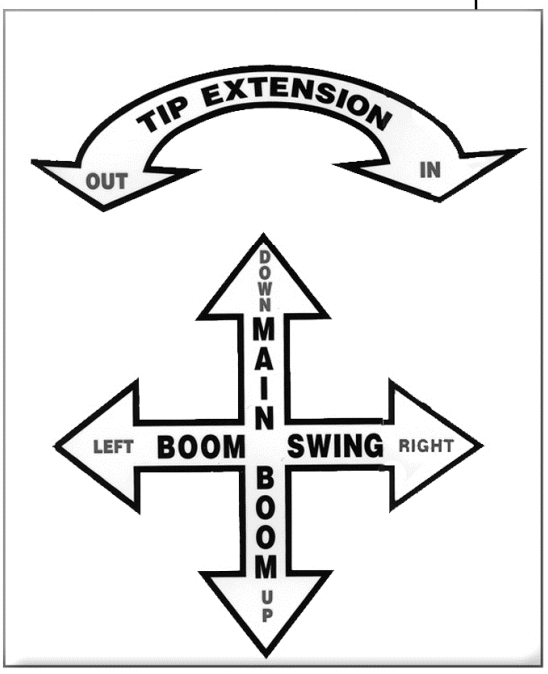
MODEL DL-3 TRASH LOADER - REQUIRED SAFETY DECALS



LOADER CONTROL DECALS

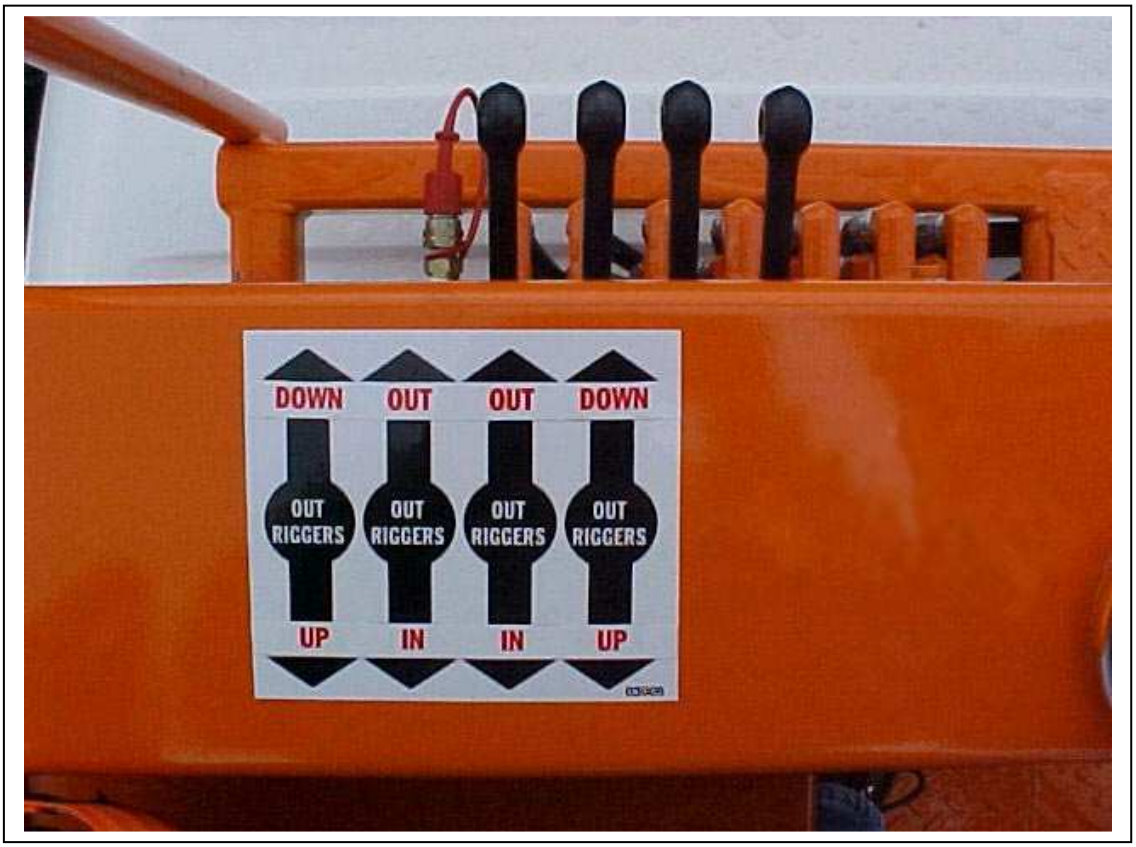


RIGHT JOYSTICK CONTROL DECAL



LEFT JOYSTICK CONTROL DECAL

Outrigger Control Decals



Part 4: Controls

THROTTLE CONTROL

Throttle controls are installed for loaders mounted on a truck chassis. For loaders mounted on trucks with electronically controlled engines, a manual switch is used to advance the engine speed. This switch is a push pull type, and is located to the right of the operator's seat.

Throttle Control Switch

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.

Preset RPM = Never to exceed 1400

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.

PRESET RPM = NOT TO EXCEED 1600

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

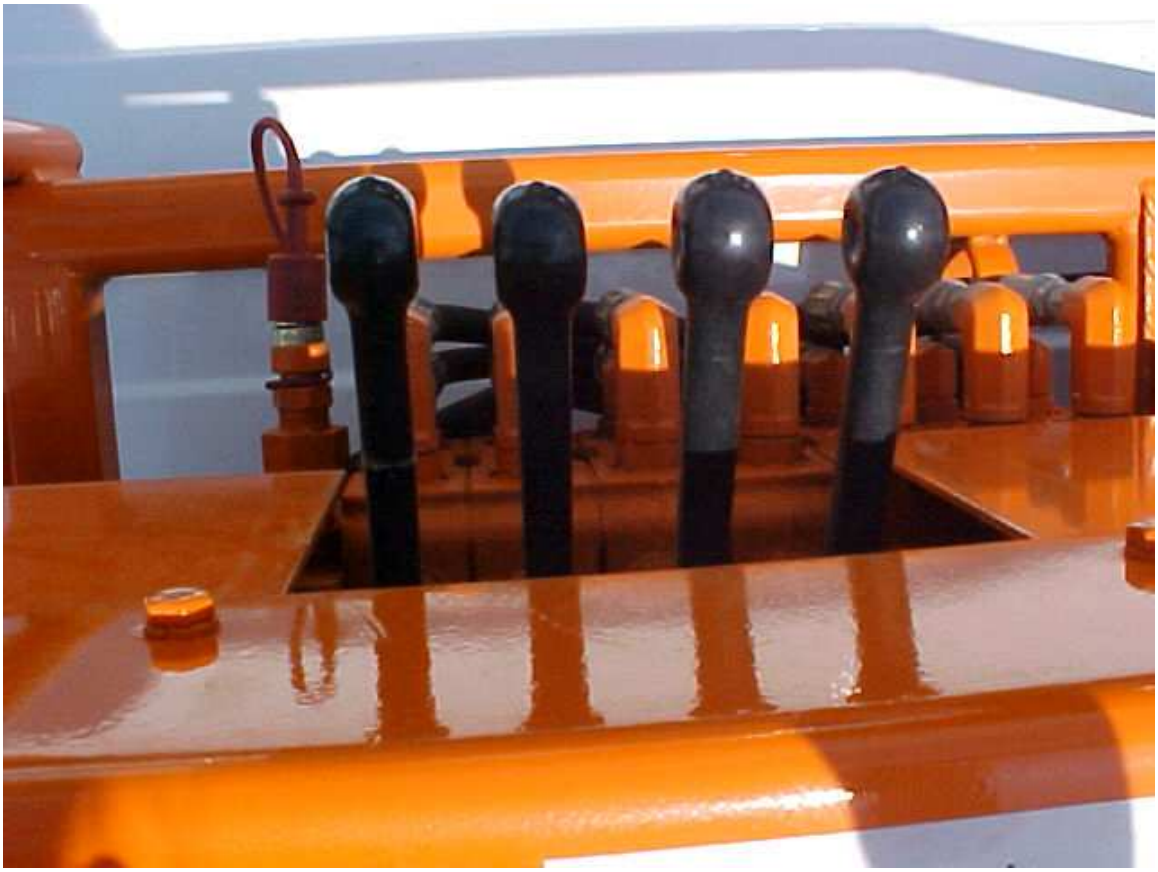
The truck brake must be set before leaving the cab for any reason.

LOADER CONTROLS

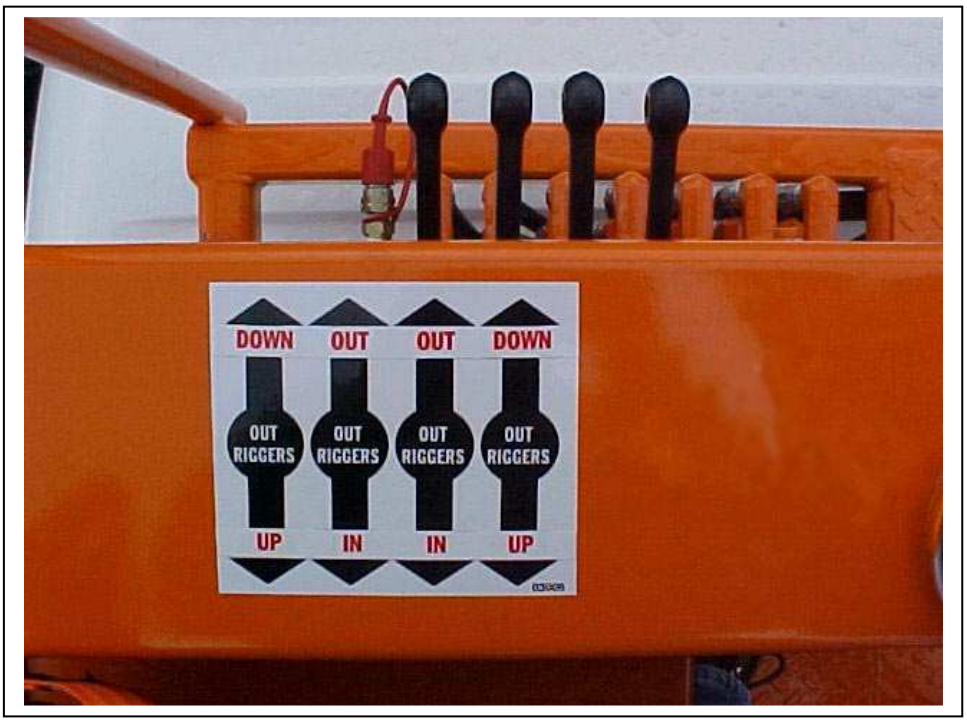
The loader control placards indicate the direction to actuate the control handles for various unit functions. The loader placard gives visual instructions for boom elevation, boom swing, tip boom elevation, tip boom extension, bucket grab, bucket rotation, and body dump. The outrigger placard gives visual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

Outriggers:

The Model DL3 Loader has four (4) outrigger control handles mounted to the lower left side of the operator's seat.



The following decal, located to the operator's left when seated at the control station, shows the control handle configuration, and the arrows indicate the direction to push or pull the handle for each function.



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 left inside handle controls the left horizontal outrigger out/in.
- The right inside handle controls the right horizontal outrigger out/in.
- The left outside handle controls the left vertical outrigger down/up.
- The right outside handle controls the right vertical outrigger down/up.

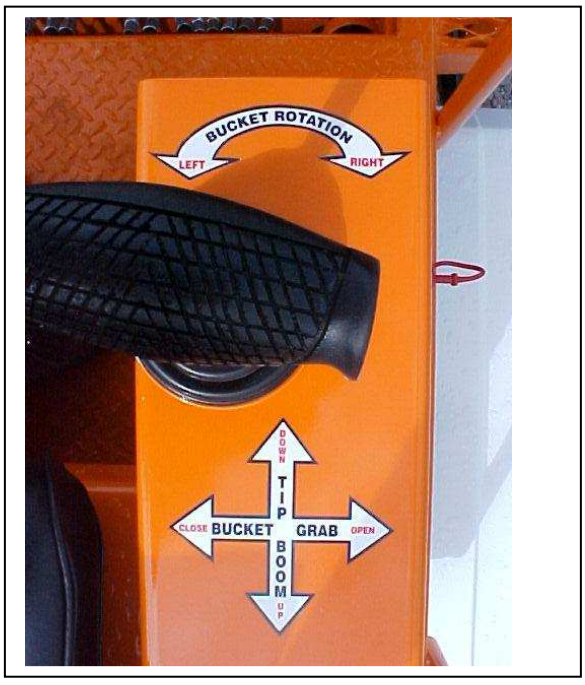
Loader :

The standard Model DL3 has two (2) six function control handles that activate the loading operations of the loader, one on each side of the operator's seat.

Decals showing the control handle functions are located above and below each of the joysticks, and the arrows indicate the direction to push, pull or twist the joystick for each function.

Left Joystick

Right Joystick



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 joystick handle smoothly from the neutral position to start motion. After a slow, smooth start, move the joystick to extreme for full speed. Just before stopping movement, move joystick control smoothly back to the neutral position.

Dump Body:

The body dump control lever is located inside the chassis cab. Push the handle forward to lower the body, and pull the handle back to raise the body.

WARNING: It is difficult to see the area behind the truck cab when raising and lowering the body. It is the operator's responsibility to make sure that the area is clear when raising and lowering the body.

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 that 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:

<u>Precautions and Procedures for Loading:</u>

- Before leaving the cab, engage all safety lights, place the transmission in neutral, and set the truck 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 or outriggers if another person is within twenty feet of the equipment.

- Do not allow any person under a raised body or extended loader.

- Use provided handholds and steps to access to the loader station. 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

Ensure parking brake is set, 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. 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 through 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.

<u>To make the lift:</u>

1. 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 trash.
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. If necessary to minimize the height during loading, 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 loader damage.

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.

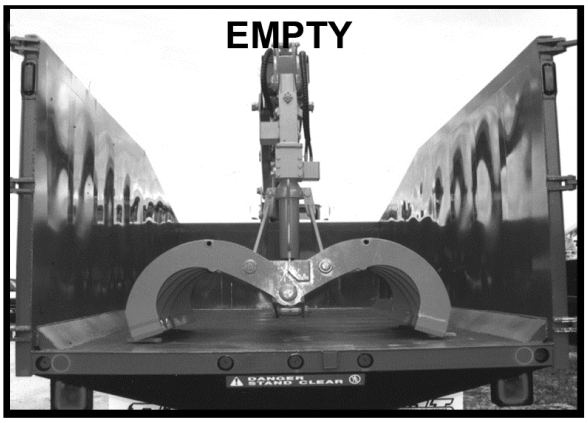
WARNING! - Failure to stow the boom and bucket as instructed could allow the boom to slew (swing) and the bucket to fall outside of the body. Loss of boom control with the bucket outside of the dump body could result in damage to objects in the vicinity of the grapple truck, and/or serious injury or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

Traveling with a load:

For improved braking, increased stability and better load distribution, tag axle should be deployed as per manufacturer’s instructions when the truck is in a loaded condition.

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 imperative that you choose a level, firm area. The DL Model has a long, tall body that can cause a high center of gravity during dumping operations. Due to irregularities in dump sites and varying load conditions, it may be necessary to remove part of load with the grapple prior to dumping. Each of the following steps must be followed precisely and in sequence. Use extreme caution as dumping must not be done in a hurried manner.

1. Set the parking brake, and ensure tag axle is fully deployed.

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 load is covered with a tarp, as discussed in "Covering the Load", retract the tarp.

6. Raise the main boom to the maximum elevation and keep it centered over the dump body during the entire dumping procedure.

7. Raise the tip boom to the maximum elevation. Do not swing the boom to either side during the dumping procedure, as the outriggers are not fully lowered.

8. 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.

9. 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, after fully extending the outriggers.

Body Access Ladder: The dump body has an access ladder. Do not enter the dump body for any purpose when the truck engine is running. There should be no power source to the controls whenever a person is entering, exiting, or inside the dump body. Shut down truck engine prior to entering dump body.

Operators: Use extreme care when entering and exiting a loaded dump body. Loose debris may shift and cause injury.

Maintenance personnel: If circumstances dictate that service personnel need to enter the dump body, use caution as the dump body floor may be slippery, and cause a slipping hazard. Petersen recommends that all service be performed with loader components positioned outside of dump body.

10. 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.

11. Raise and retract the outriggers, disengage the power-take-off.

12. Close and lock body rear doors.

13. Raise tag axle for travel while unloaded.

<u>Safety Precautions Regarding Dumping Procedure:</u>

- 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.
- Do not allow any person within 35 feet of the loader during the dumping procedure.
- Do not dump on uneven or soft terrain, as this will cause an unstable tipping hazard.

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: Service:

EVERY 40 HOURS	
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
Check engine overspeed control for proper setting.	Check by reving the engine to exceed 1600 RPM, 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.	1400 RPM maximum.

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 *(These requirements are in addition to the 40 hour service requirements.)*	
Re-torque boom swing actuator bolts.	To 500 ft. lbs (HA36) To 250 ft. lbs. (Planetary Gearbox)
Re-torque bucket rotator bolts.	To 110 ft. lbs. - dry threads

EVERY 160 HOURS *(These requirements are in addition to the 80 hour service requirements.)*	
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.
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.

	Replace seals if needed.
Re-torque loader tie-down bolts.	To 400 ft. lbs. - dry threads
Clean hydraulic oil filter on suction line, and replace return line filter cartridge.	
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 3000 HOURS *(These requirements are in addition to the 160 hour service requirements.)*	
Change oil in planetary gearbox	Drain existing oil from swing gearbox and replace with 1.75 quarts of 80W Gearlube

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.

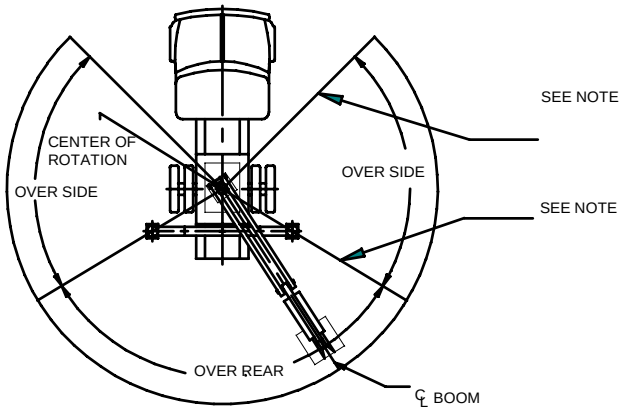
MODEL TL 2		
RADIUS	No. 1 OUTRIGGERS	No. 3 OUTRIGGERS
10 ft	5320 lb *	7100 lb
16 ft	2650 lb *	3750 lb

MODELS TL 3, PL 3, HL 3, BL 3 & DL 3 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.

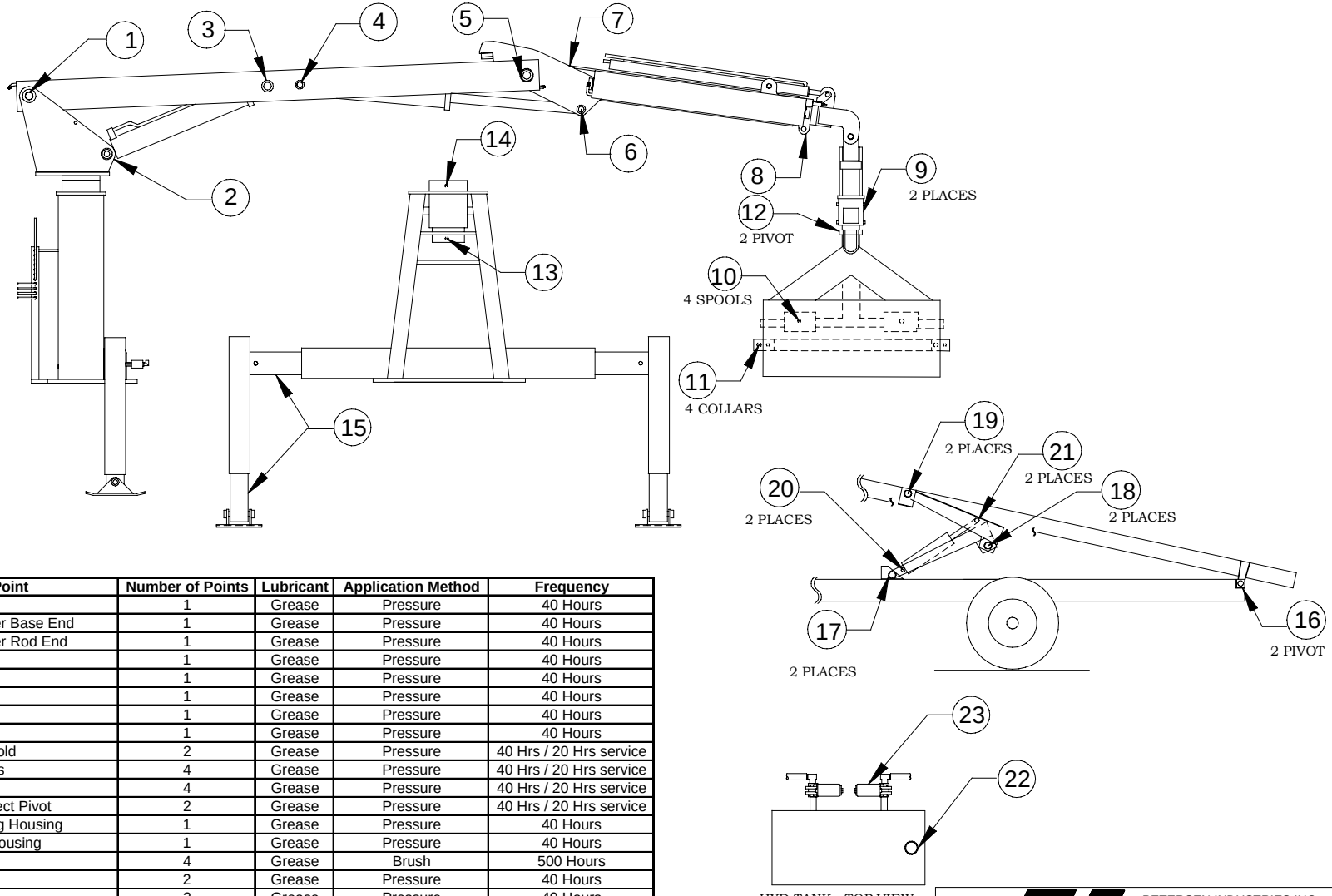
Tip Boom Extension function is not to be used for load lifting. This function is only for load reaching or to improve load-lifting capacity.

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.

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

TITLE:		
LOAD CHART FOR TRASH LOADERS		
CAD NO.: 01 00 00 003 4	PART NO.:	SCALE: N/A
DRAWN BY: EJB	APPROVED:	DATE: 8/31/99
SHEET: 1 OF 1		



Point Number	Grease Point	Number of Points	Lubricant	Application Method	Frequency
1	Main Boom Pivot	1	Grease	Pressure	40 Hours
2	Main Boom Lift Cylinder Base End	1	Grease	Pressure	40 Hours
3	Main Boom Lift Cylinder Rod End	1	Grease	Pressure	40 Hours
4	Tip Cylinder Base End	1	Grease	Pressure	40 Hours
5	Tip Boom Main Pivot	1	Grease	Pressure	40 Hours
6	Tip Cylinder Rod End	1	Grease	Pressure	40 Hours
7	Tip Extension	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	500 Hours
16	Body, Chassis Pivot	2	Grease	Pressure	40 Hours
17	Hoist Lower Pivot	2	Grease	Pressure	40 Hours
18	Hoist Scissors Pivot	2	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	Oil	Fill to Max. Level	40 Hours
23	Hydraulic Filters	2	-	Replace	1000 Hours

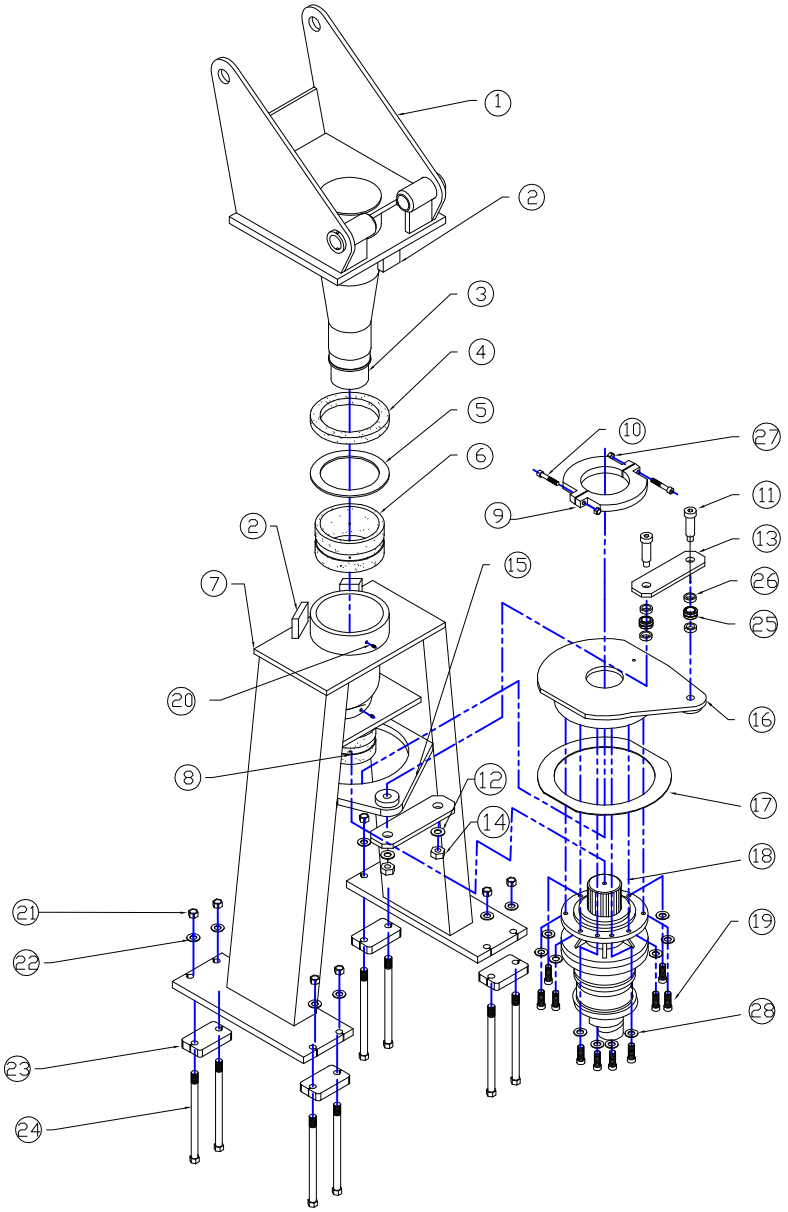
PETERSEN INDUSTRIES INC.
20165 HWY. 27
LAKE WALES, FL. 33853-2426
(863) 676 1493 FX (863) 676 6844

TITLE: LOADER LUBRICATION POINTS

CAD NO.:	PART NO.:	SCALE
01 00 00 001 4	N/A	N/A

DRAWN BY:	APPROVED:	DATE:	SHEET:
E.B.		8/06/99	1 OF 1

ZONE	REV.	DESCRIPTION	DATE	APPR.
N/A	1	ADD TWO WASHERS No 12 / CHANGE BOLT No 23	2/99	
N/A	2	UP DATE SPINDLE LOCK	6/24/99	
N/A	3	ADD TIE DOWN BLOCKS WITH BOLTS. ADD TWIN TORQUE ARM	5/08/01	
N/A	4	ADD SPACERS AND SPHERIAL BEARINGS FOR TWIN TORQUE ARM ASSEMBLY	7/24/01	
N/A	5	ADD ITEMS No. 27 LOCK COLLAR NUT & 28 LOCK WASHER FOR SAI BOLTS	8/06/01	



PETERSEN INDUSTRIES INC.
446 US HWY. 27 N.
LAKE WALES,FL.33853
(863) 676 1493 FX (863) 676 6844

TITLE: HEAD AND PEDESTAL

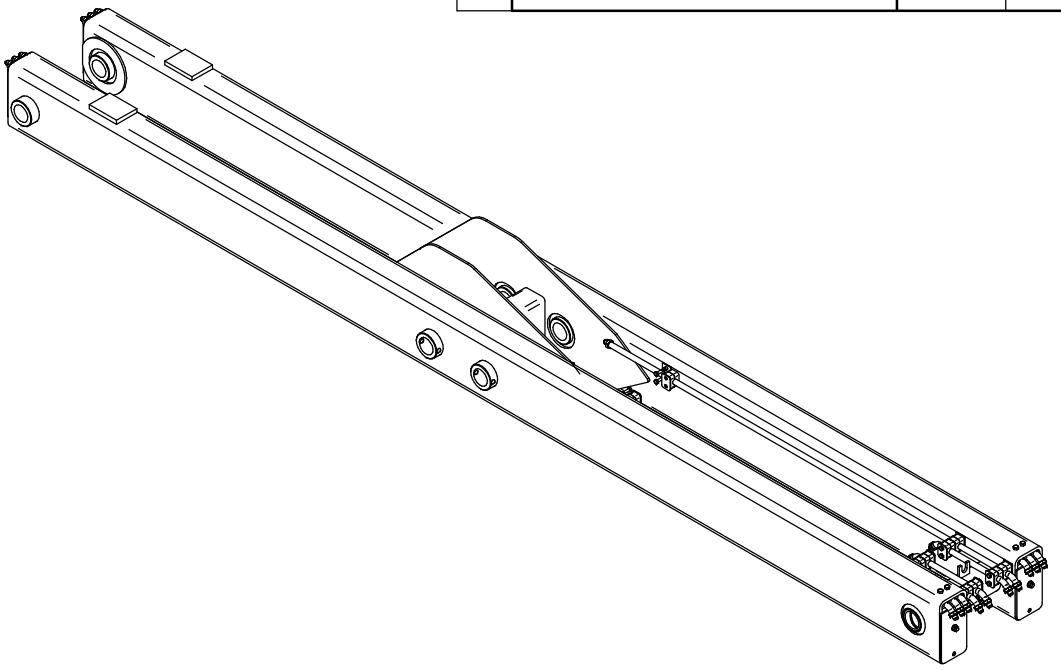
CAD NO:	DIAGRAM No.	SCALE
02 02 13 001 5	1300	N/A

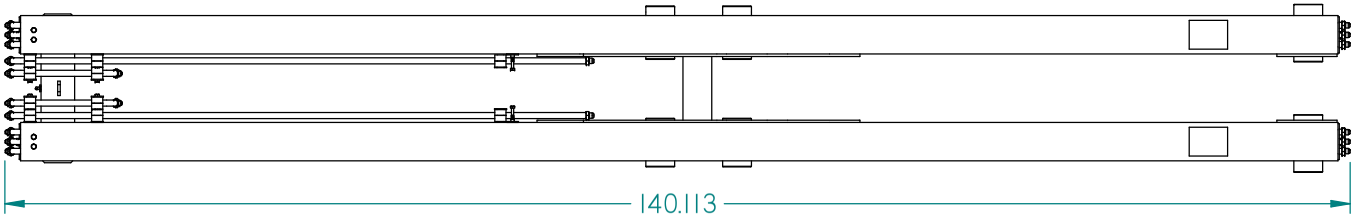
DRAWN BY:	APPROVED:	DATE:	SHEET:
E.B.		3/3/99	1 OF 1

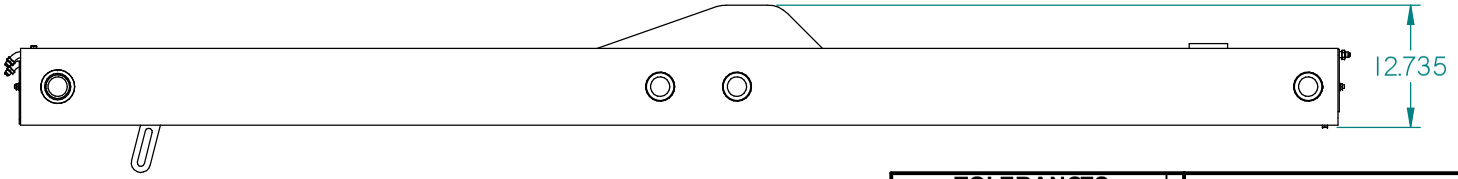
Dia. No.		Part Name	Order By This Part No.
HEAD AND PEDESTAL ASSEMBLY WITH DINAMIC OIL ROTARY ACUTATOR (DIAGRAM NO. 1300)			
1		Head and Spindle Assembly	107105
2		Head and Pedestal Stop	107173
3		Spline, Spindle	HC99005
4	*	Nylatron Bushing-Thrust Bearing	BU510002
5		Thrust Spacer	106210
6		Nylatron Bushing-Upper Spindle	BU509002
7		Pedestal Assembly	106104
8		Nylatron Bushing, Lower Spindle	BU507005
9		Lock Collar, (one side)	117103
10		Bolt, Lock Collar	BL308048U513
11	*	Bolt, Torque Link	BL120056U8
12	*	Flat Washer, Torque Link	WAF14S8
13	*	Torque Arm Link	114401
14	*	Locknut, 7/8"	NUC14U
15	*	Support Plate, Torque Arm Assy.	114302
16	*	Rotary Actuator Mt. Plate, Torque Arm Assy.	114202
17		Wear Pad	BU317002
18	*	Dinamic Oil Rotary Actuator	HC01005
19	*	Bolt, Rotary Actuator	SCA1032C
20		Grease Fitting, 1/8" Straight	HF2002S
21		Nut, 1" Nylon Lock	NUN16U
22		Washer, 1" Flat, Gr. 8	WAF16S8
23		Tie Down Block for Single Frame Truck	125202
		Tie Down Block for Double Frame Truck	125203
24		Bolt, Tie Down for Single Frame Truck	BL116224U88
		Bolt, Tie Down for Double Frame Truck	BL116240U88
25	*	Bearing, Torque Link	BE04N12SF20
26	*	Spacer, Torque Link	114454
27		Lock Collar Nut, Stoverlock 1/2"	NUS08U
28		Lockwasher, Rotary Actuator Bolt	WAS108
	*	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.	

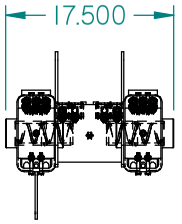
REV.	DESCRIPTION	DATE	BY
-	-	-	-

010 ASSEMBLY









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 PLACE(S)

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

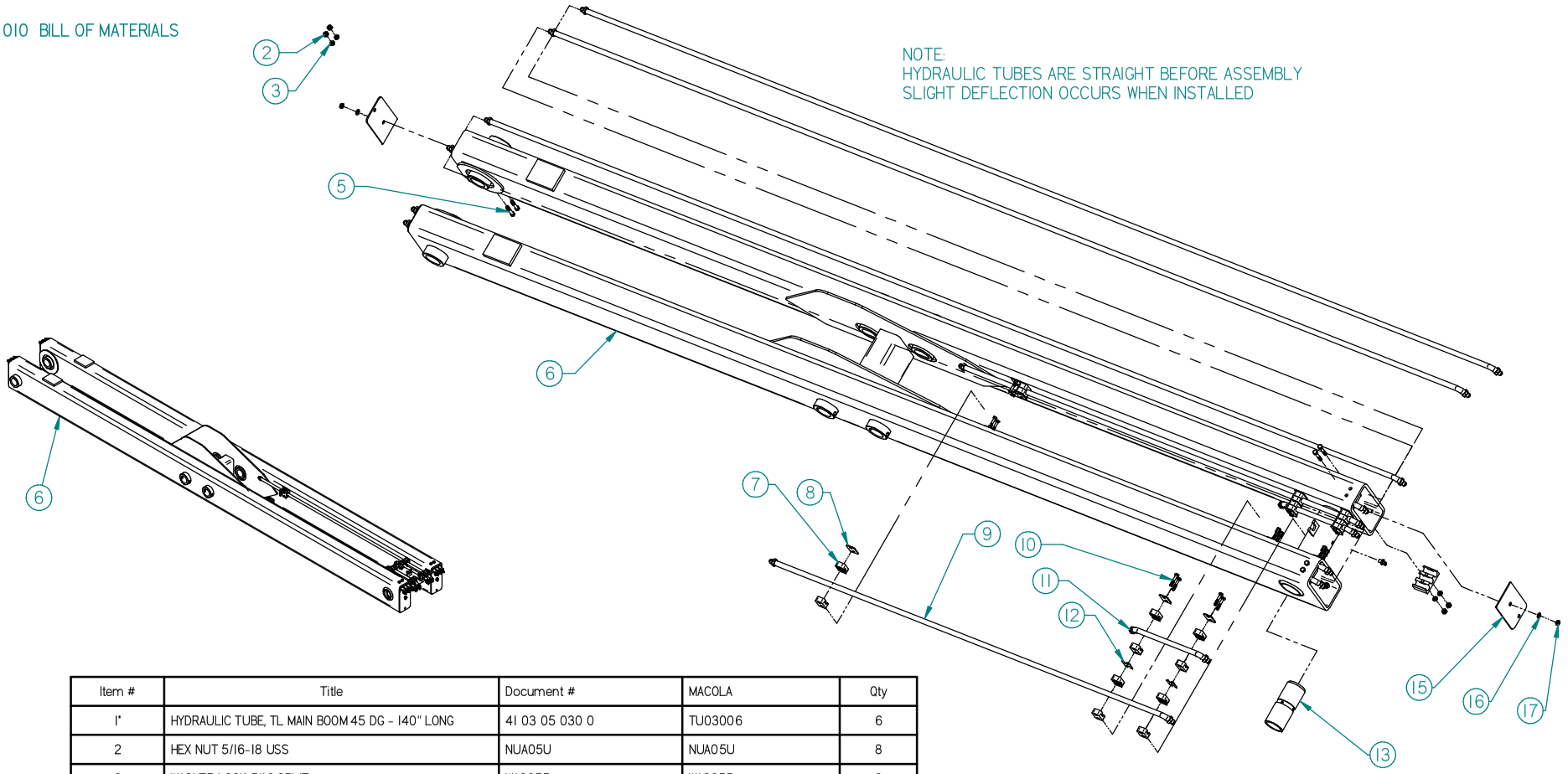
TITLE: MAIN BOOM TL3 ASSEMBLY

PART NUMBER:	SCALE:
12 03 04 001 0 / 108103	1:20

DRAWN BY:	APPROVED BY:	DATE:	SHEET:
OJ		08/04/2006	1 OF 2

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	108152	1
7	CLAMP, PLASTIC (1-HOLE) (1 SET)	CLP210	CLP210	10
8	CLAMP, TOP PLATE ONLY (1-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 BOOM45 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	108225	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 / 108103

SCALE: 1:20

DRAWN BY: OJ

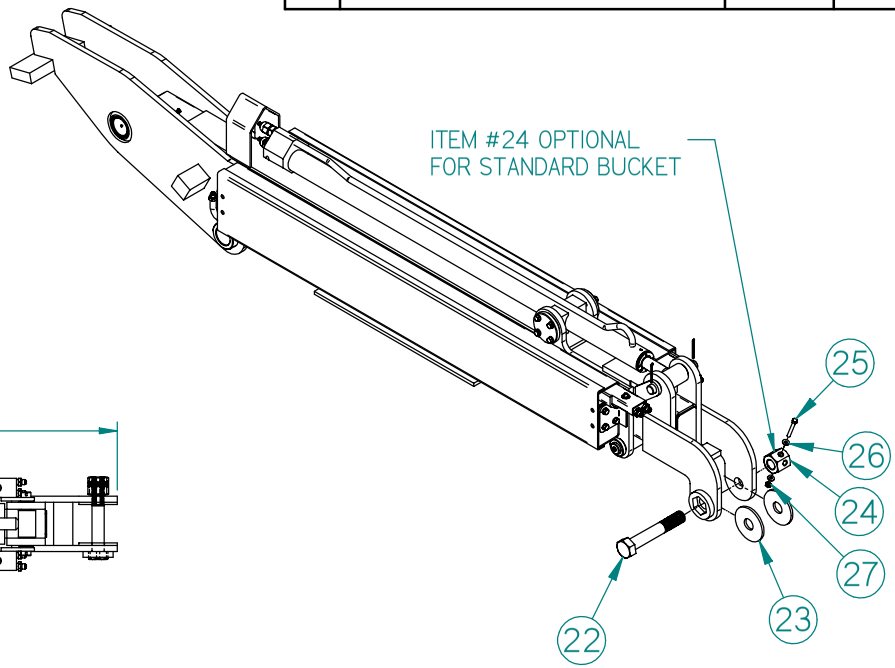
APPROVED BY:

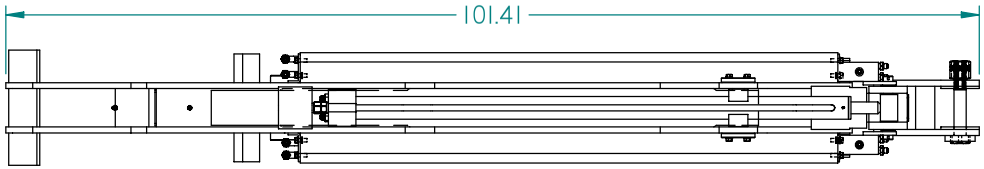
DATE: 08/04/2006

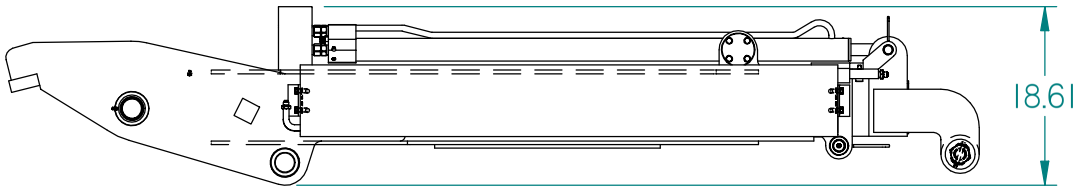
SHEET: 2 OF 2

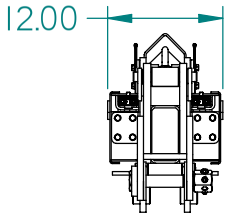
010 ASSEMBLY

REV.	DESCRIPTION	DATE	BY
-	-	-	-









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 PLACE(S)

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 / 109103

SCALE: 1:20

DRAWN BY: BRB

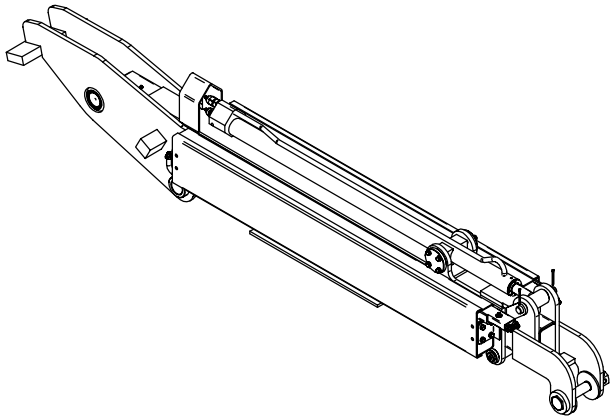
APPROVED BY:

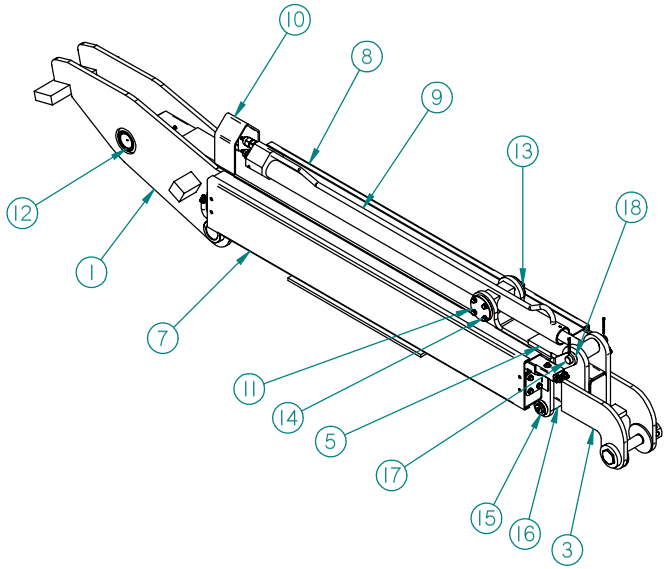
DATE: 10/26/2016

SHEET: 1 OF 2

010 BILL OF MATERIALS

Item #	Title	Document #	MACOLA	QTY
1	TL3 TIP BOOM OUTER WELDMENT	21 04 04 011 1	109152	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 WELDMENT	21 04 04 010 3	109153	1
4*	TIP EXTENSION SQUARE WEAR PUCK	41 04 04 028 1	109210	10
5	TIP EXTENSION WEAR PLT RTNR / RTRCT STOP PLT ASSEMBLY	21 04 04 009 0	109154	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	123122	1
8	HOSE RECOIL BOX ASSEMBLY - LEFT	21 04 04 013 1	123121	1
9	TIP EXTENSION CYLINDER SHAFT ASSEMBLY	22 14 01 010 2	121105	1
10	TIP BOOM TIP EXTENSION GUARD	41 04 04 027 1	109238	1
11	TRUNION TIP EXTENSION CYLINDER MOUNT	41 04 04 004 1	109205	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	PI18105F	1
16	TIP BOOM, SUPPORT ROLLER WITH BUSHINGS	31 04 04 008 0	109235	1
17	PIN, CONNECT	41 04 04 012 0	PI16112F	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	102454	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



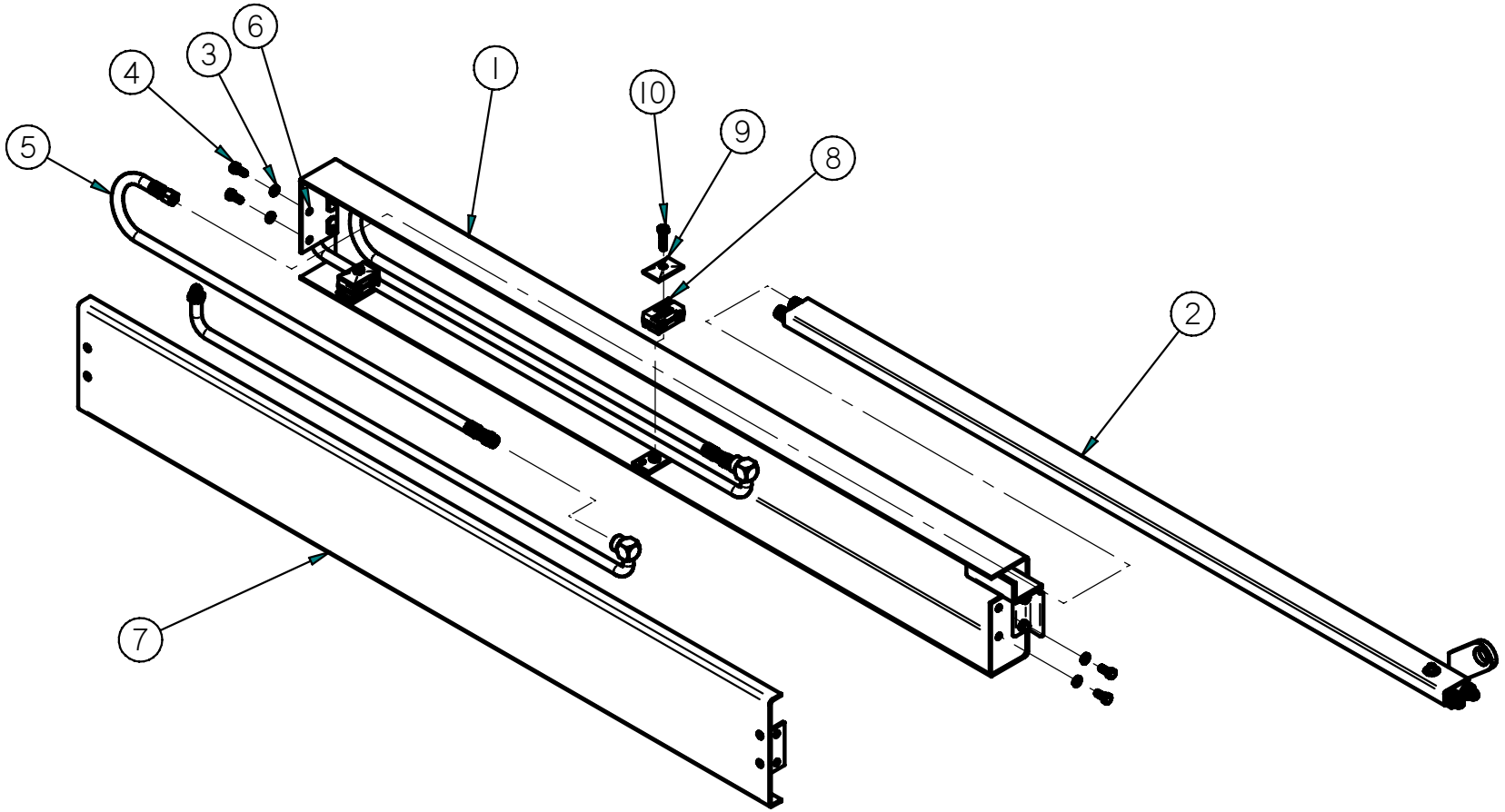


PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: TL3 TIP BOOM ASSEMBLY

PART NUMBER:	SCALE:
12 04 04 002 1 / 109103	1:24

DRAWN BY:	APPROVED BY:	DATE:	SHEET:
BRB		10/26/2016	2 OF 2



Item Number	Title	Part Number	Quantity
1	HOSE RECOIL, HOUSING ASSEMBLY - RIGHT	123126	1
2	TIP BOOM, HOSE RECOIL SLIDE ASSY RH	123124	1
3	WASHER LOCK 5/16 SPLIT	WAS055	4
4	HEX BOLT 5/16-18 X 3/4 USS G5	BL305012U518	4
5	HOSE CUT 36" #6-S RECOIL BOX	HS10576FS	2
6	TUBE, TL3 HOSE RECOIL BOX - CURVED	TU04004	2
7	HOSE RECOIL, COVER ASSEMBLY	123127	1
8	CLAMP, PLASTIC ONLY (2-HOLE) (1 SET)	CLP220	2
9	CLAMP, TOP PLATE ONLY (2-HOLE)	CL5G225	2
10	HEX BOLT 5/16-18 X 1-1/4 UNC G5	BL305020U518	2

PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8201
TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: HOSE RECOIL BOX ASSEMBLY - RIGHT

PART NUMBER: 21 04 04 012 1 / 123122

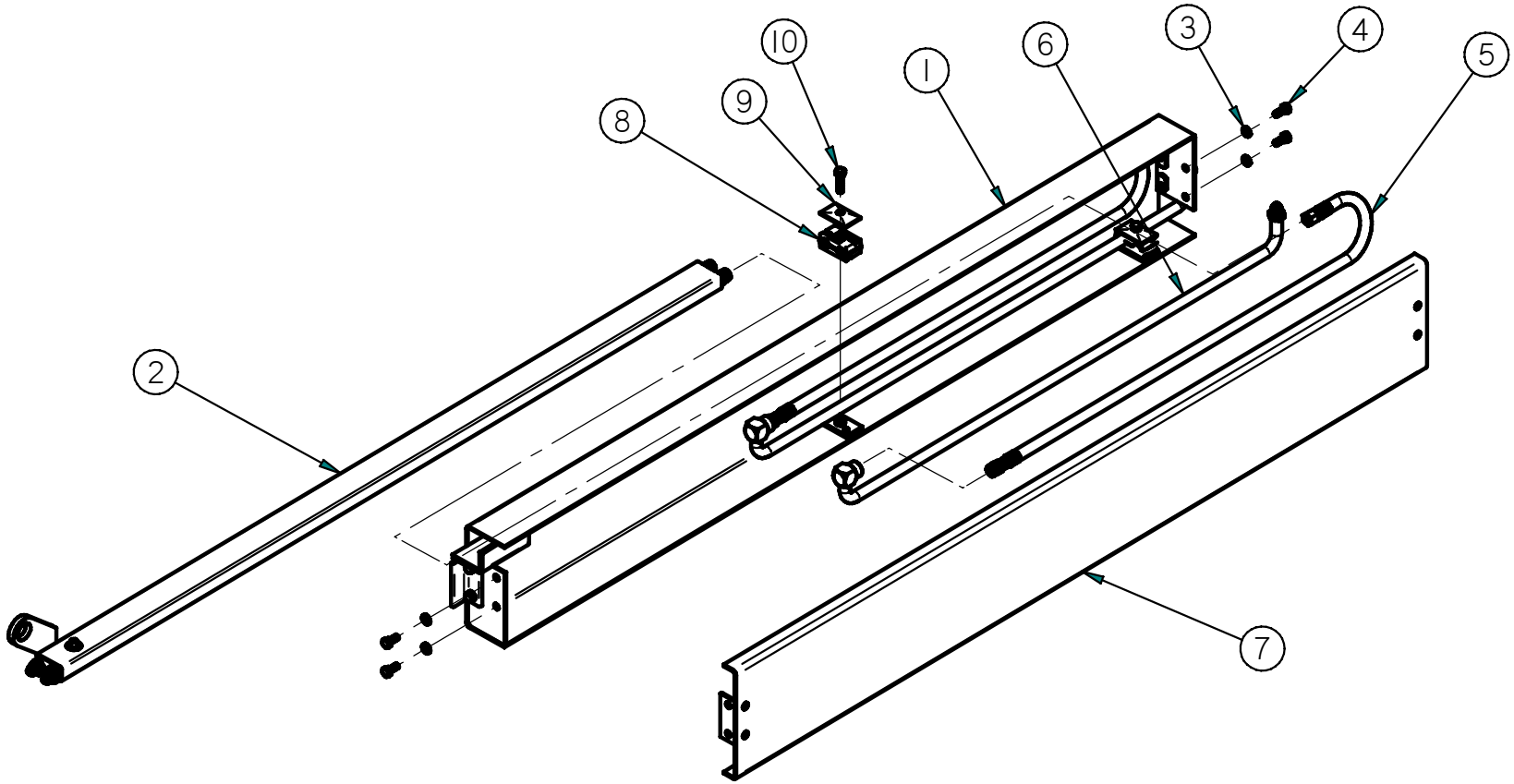
SCALE: NA

DRAWN BY: RB

APPROVED BY:

DATE: 08/05/08

SHEET: 1 OF 1



Item Number	Title	Part Number	Quantity
1	HOSE RECOIL, HOUSING ASSEMBLY - LEFT	123125	1
2	TIP BOOM, HOSE RECOIL SLIDE ASSY LH	123123	1
3	WASHER LOCK 5/16 SPLIT	WAS055	4
4	HEX BOLT 5/16-18 X 3/4 USS G5	BL305012U518	4
5	HOSE CUT 36" #6-S RECOIL BOX	HS10576FS	2
6	TUBE, TL3 HOSE RECOIL BOX - CURVED	TU04004	2
7	HOSE RECOIL, COVER ASSEMBLY	123127	1
8	CLAMP, PLASTIC ONLY (2-HOLE) (1 SET)	CLP220	2
9	CLAMP, TOP PLATE ONLY (2-HOLE)	CL5G225	2
10	HEX BOLT 5/16-18 X 1-1/4 UNC G5	BL305020U518	2

PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8201
TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: HOSE RECOIL BOX ASSEMBLY - LEFT

PART NUMBER: 21 04 04 013 1 / 123121

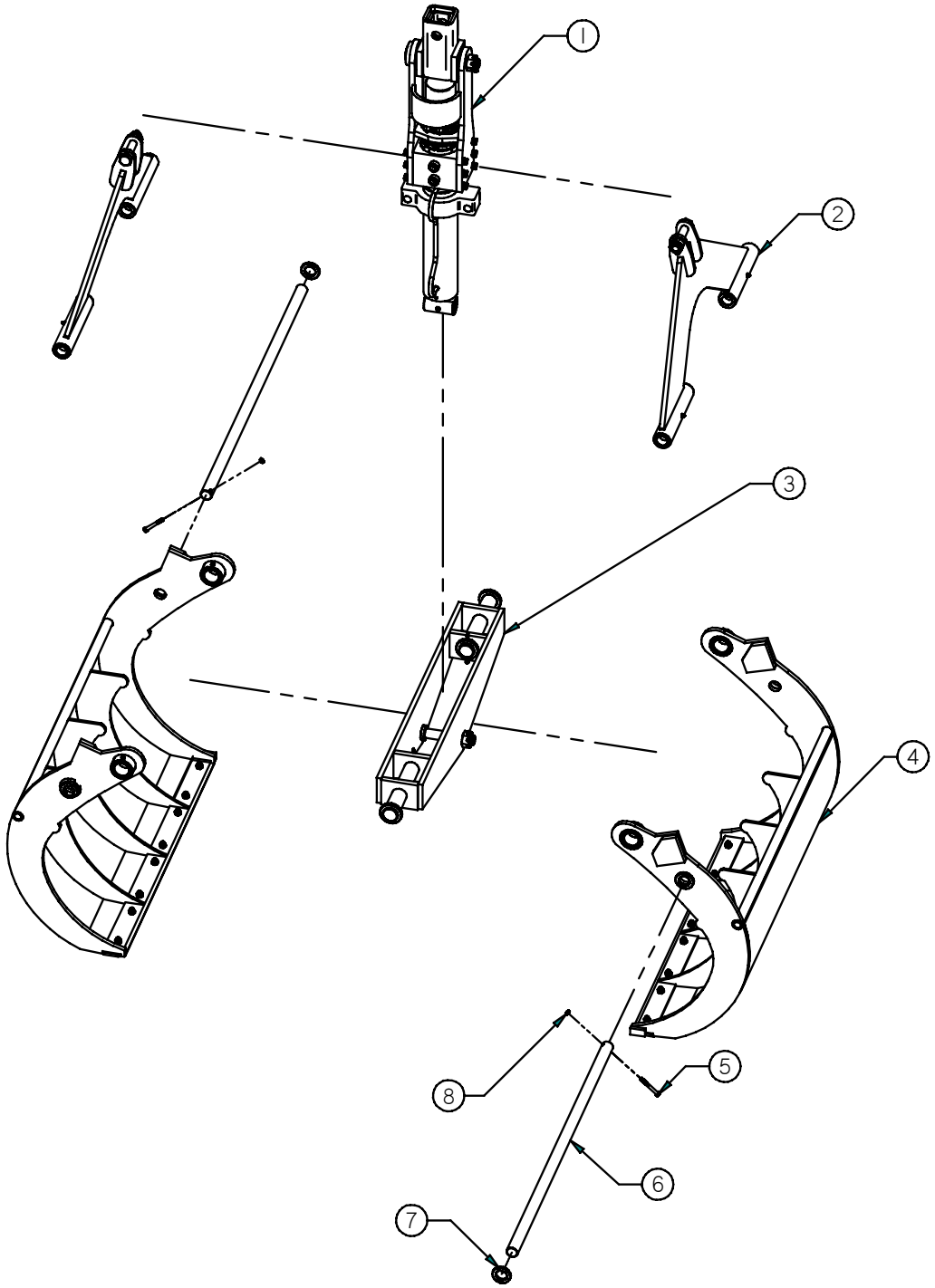
SCALE: NA

DRAWN BY: RB

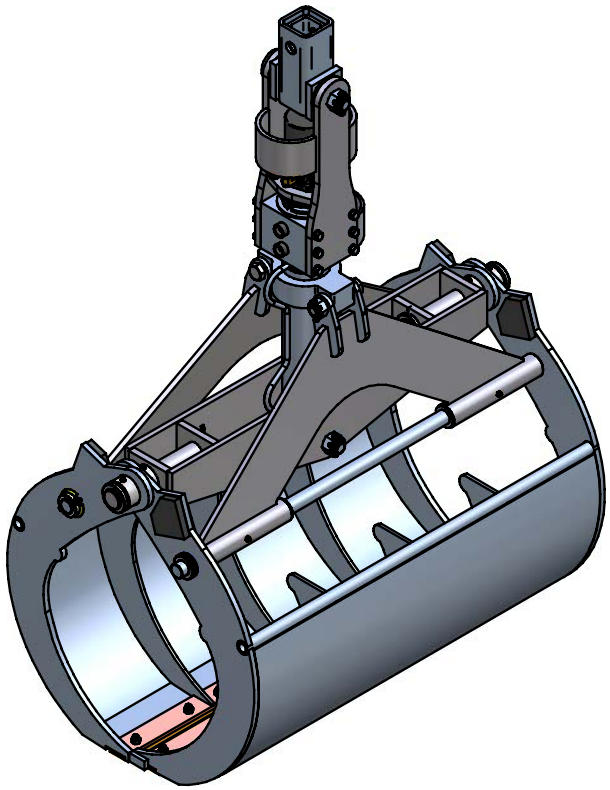
APPROVED BY:

DATE: 08/05/08

SHEET: 1 OF 1



Item Number	Title	Part Number	Quantity
1	BUCKET CYLINDER ROTATOR ASSEMBLY (RE MOTOR)	102124	1
2	STANDARD BUCKET A FRAME ASSEMBLY	102130	2
3	BUCKET SADDLE ASSEMBLY	102129	1
4	TRASH BUCKET JAW ASSEMBLY	102132	2
5	BOLT HEX 3/8-16 UNC X 3 G8	BL108048U816	2
6	STD BUCKET A FRAME SHAFT	102173	2
7	COLLAR SPACER 1 1/2 X 2 1/2 X 1/2_3/8	116106	2
8	NUT HEX 3/8 -16 UNC STOVERLOCK	NUS06U	2

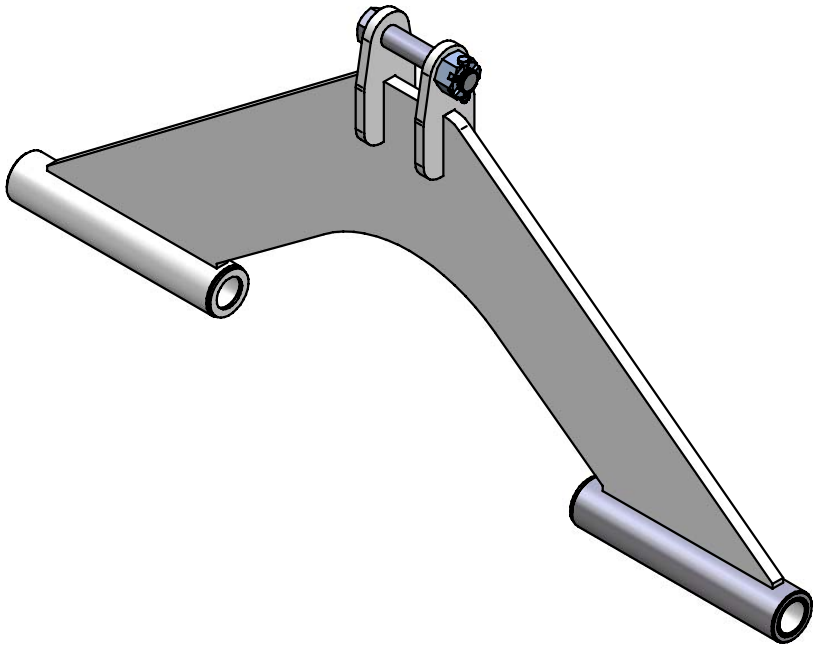


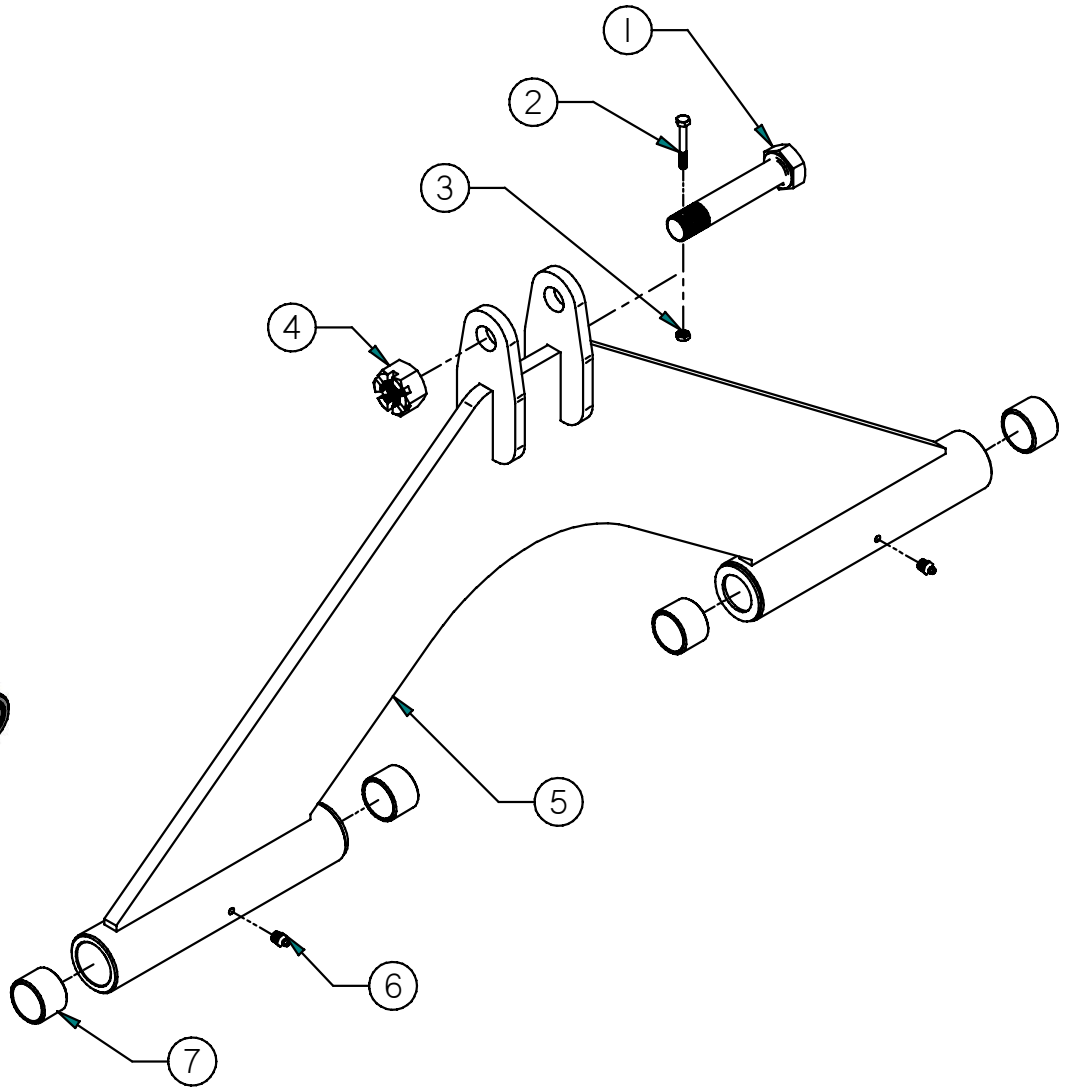
PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: STANDARD TRASH BUCKET ASSEMBLY

PART NUMBER:	SCALE:
11 11 01 001 1 / 102101	N/A

DRAWN BY:	APPROVED BY:	DATE:	SHEET:
E. B.		12/20/2000	1 OF 1





Item Number	Title	Part Number	Quantity
1	BOLT HEX 1-14 X 5 1/4 SAE HOLE	BL116084S8H1400	1
2	BOLT HEX 1/4-20 X 2 USS G5	BL304032U520	1
3	NUT STOVERLOCK 1/4 USS	NUS04U	1
4	NUT SLOTTED 1-14 SAE GR5	NUB16S5	1
5	STANDARD BUCKET A FRAME WELDMENT	102172	1
6	GREASE NIPPLE 1/8" STRAIGHT	HF2002S	2
7	A FRAME BUCKET SPOOL BUSHING	BU402012	4

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

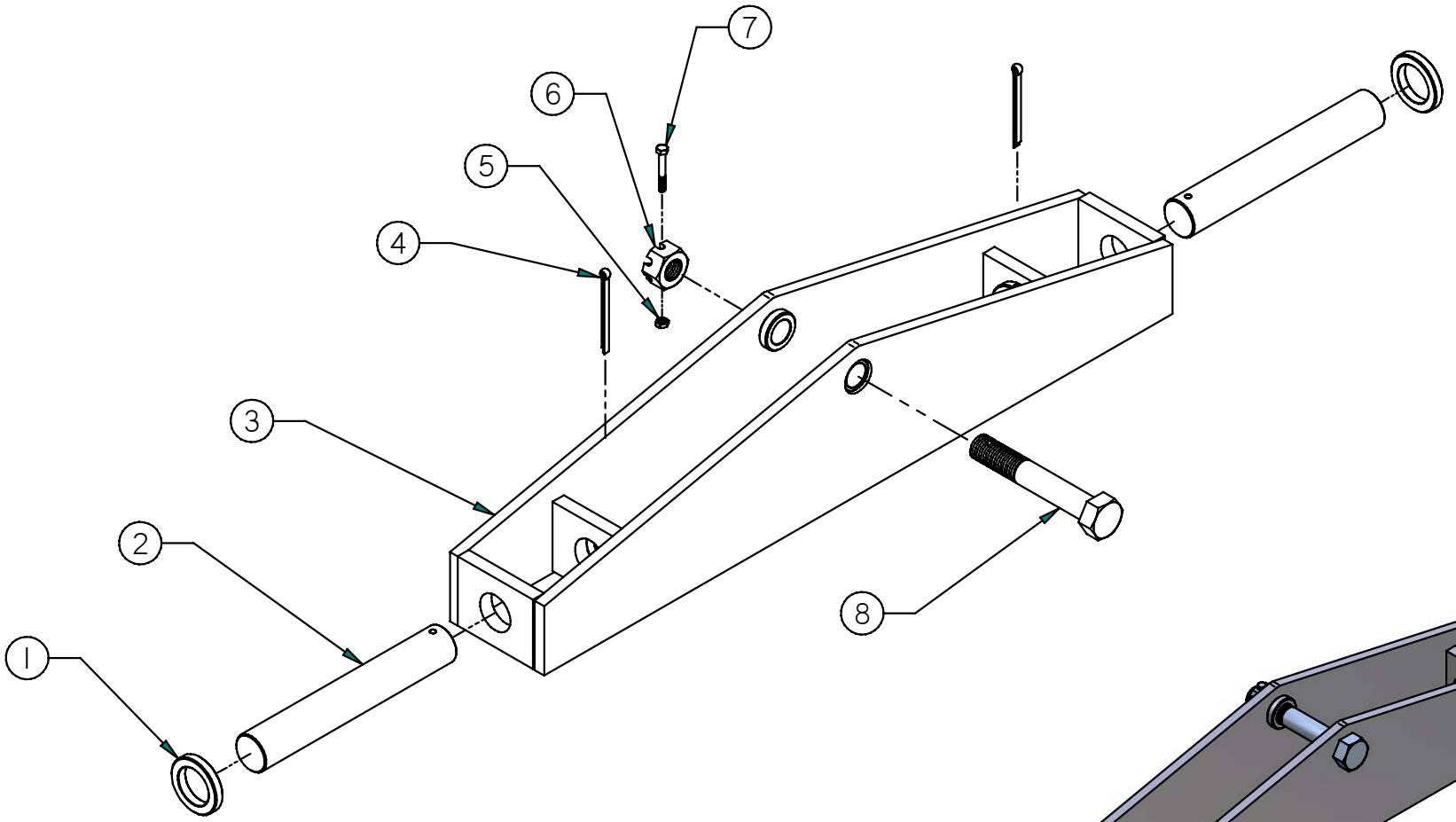
SCALE: N/A

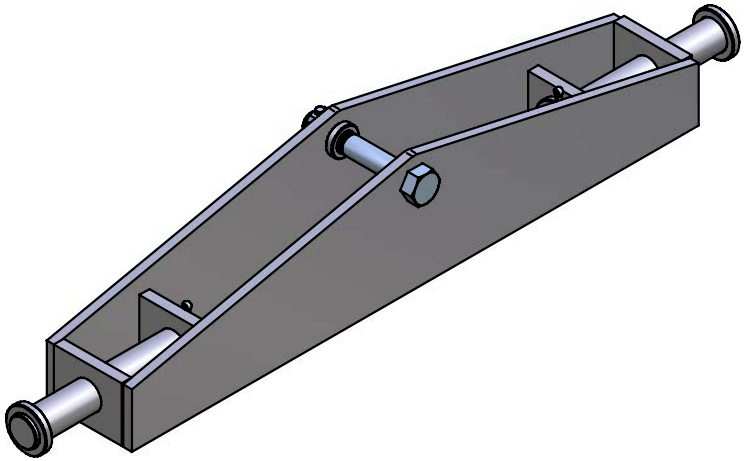
DRAWN BY: E.B.

APPROVED BY:

DATE: 2/23/99

SHEET: 1 OF 1





Item Number	Title	Part Number	Quantity
1	BUCKET SADDLE PIVOT COLLAR	116107	2
2	BUCKET SADDLE PIVOT PIN	PI30204FC	2
3	BUCKET SADDLE WELDMENT	102178	1
4	COTTER PIN 5/16 X 4	FA020564	2
5	HEX NUT 5/16-18 USS STOVERLOCK	NUS05U	1
6	SLOTTED NUT 1-1/4 UNC GR5	NUB20U	1
7	HEX BOLT 5/16-18 X 2-1/4 UNC GR5	BL305036U518	1
8	HEX BOLT 1-1/4-7 X 7-3/4 GR8	BLI20124U87	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 / 102129

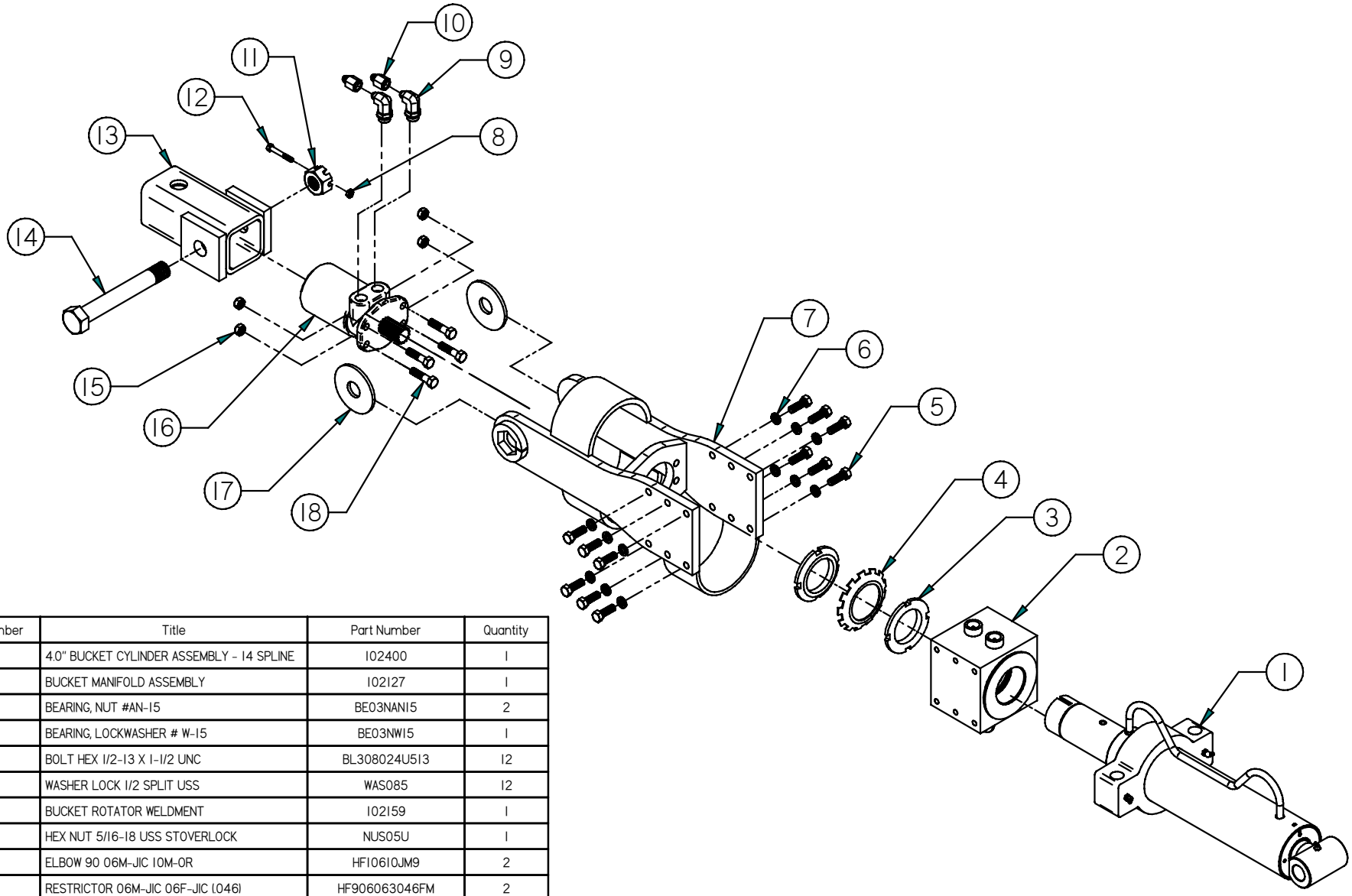
SCALE: N/A

DRAWN BY: E.B.

APPROVED BY:

DATE: 11/13/2000

SHEET: 1 OF 1

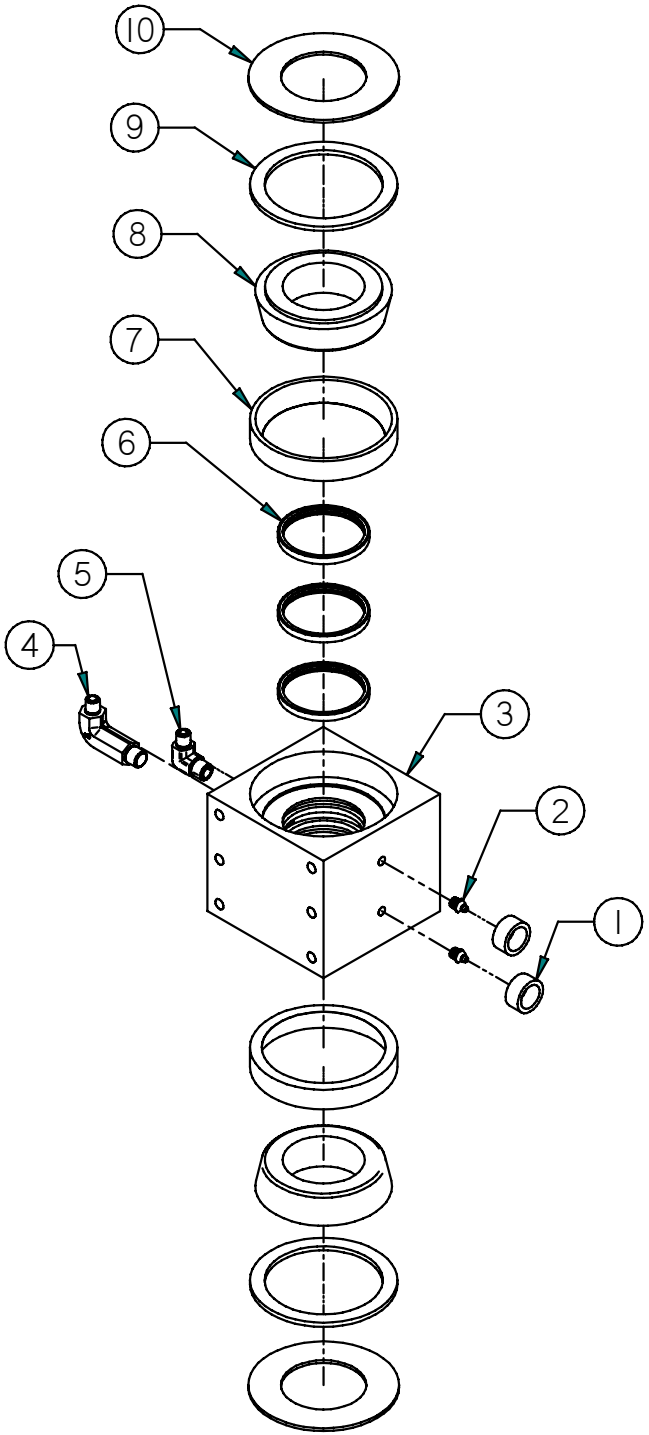


Item Number	Title	Part Number	Quantity
1	4.0" BUCKET CYLINDER ASSEMBLY - 14 SPLINE	102400	1
2	BUCKET MANIFOLD ASSEMBLY	102127	1
3	BEARING, NUT #AN-15	BE03NAN15	2
4	BEARING, LOCKWASHER # W-15	BE03NW15	1
5	BOLT HEX 1/2-13 X 1-1/2 UNC	BL308024U513	12
6	WASHER LOCK 1/2 SPLIT USS	WAS085	12
7	BUCKET ROTATOR WELDMENT	102159	1
8	HEX NUT 5/16-18 USS STOVERLOCK	NUS05U	1
9	ELBOW 90 06M-JIC 10M-OR	HF10610JM9	2
10	RESTRICTOR 06M-JIC 06F-JIC (046)	HF906063046FM	2
11	SLOTTED NUT 1-1/4 UNC GR5	NUB20U	1
12	HEX BOLT 5/16-18 X 2-1/4 UNC GR5	BL305036U518	1
13	GIMBAL WELDMENT 4 X 5-1/2	102119	1
14	BOLT - ROTATOR GIMBAL, TRASH	102158	1
15	HEX NUT 1/2-13 STOVERLOCK	NUS08U	4
16	HYD MOTOR RE-32-08-05-0 (14 SPLINE)	HC03004	1
17	BUCKET BRAKE WASHER 4 X 1-5/16 X 1/4	WAF642004	2
18	BOLT HEX 1/2-13 X 2 UNC GR8	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:			SCALE:
22 11 01 010 0 / 102124			N/A
DRAWN BY:	APPROVED BY:	DATE:	SHEET:
Olvera, J.		11/9/2005	1 OF 1



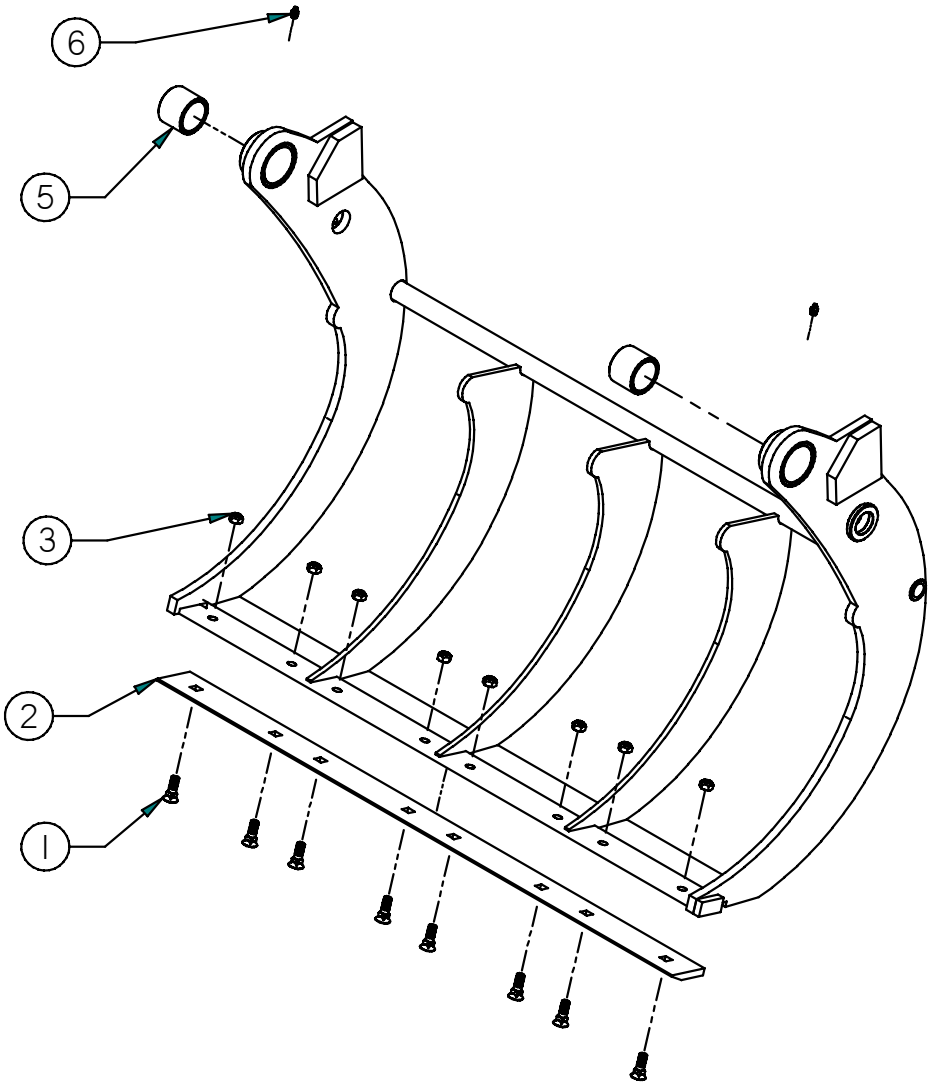
Item Number	Title	Part Number	Quantity
1	BUCKET MANIFOLD GREASE FITTING COVER	102151	2
2	GREASE NIPPLE 1/8" STRAIGHT	HF2002S	2
3	BUCKET MANIFOLD HOUSING	102443	1
4	ELBOW 90 06M-JIC 06M-JIC LONG	HF806069ML	1
5	ELBOW 90 06M-JIC 06M-JIC	HF806069M	1
6	SEAL KIT TR-035	HPKTR035	3
7	BEARING RACE #493	BE03N493	2
8	TIMKEN ROLLER BEARING #495-A	BE03N495A	2
9	ROTATOR FELT WASHER	WAL866902	2
10	CONTINUOUS ROTATOR THRUST WASHER	WAF885002	2

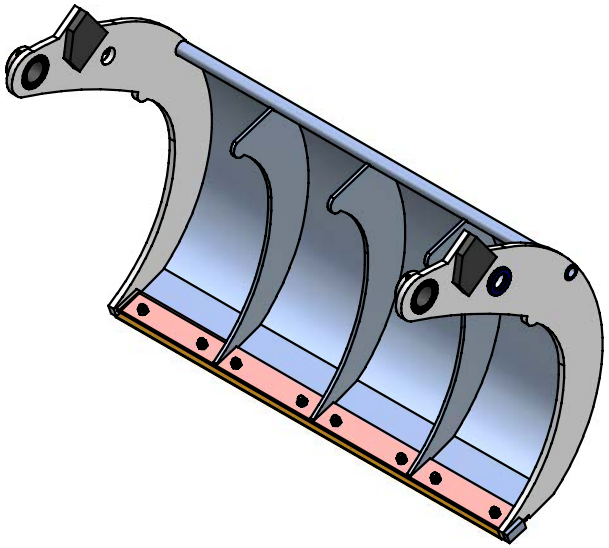
PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES, FL. 33859-8234
TEL: (863) 676-1493 FAX: (863) 676-6844

TITLE: BUCKET MANIFOLD ASSEMBLY

PART NUMBER:	SCALE:
21 11 09 002 2 / 102127	N/A

DRAWN BY:	APPROVED BY:	DATE:	SHEET:
E. B.		12/14/2000	1 OF 1

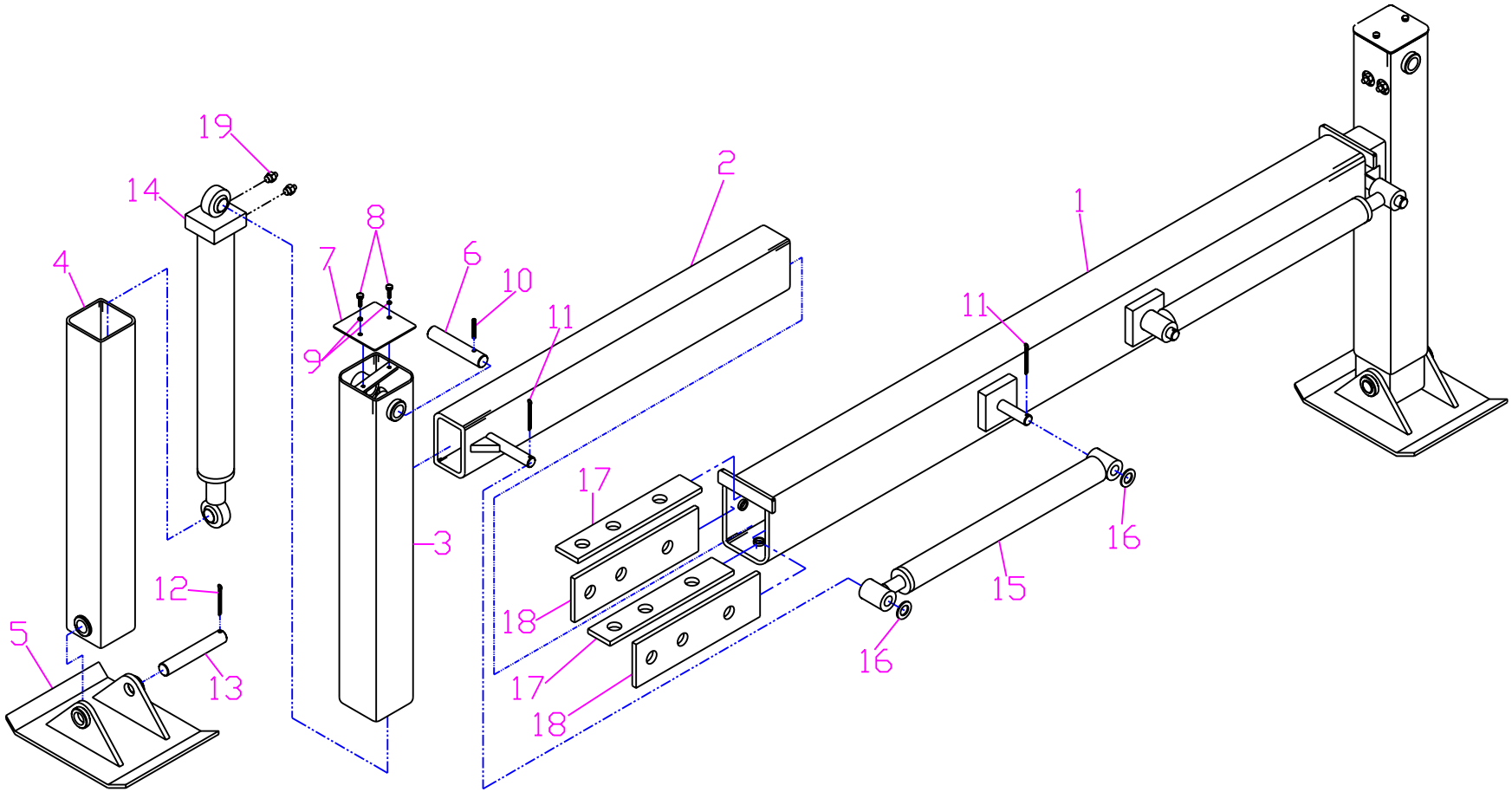




Item Number	Title	Part Number	Quantity
1	FLAT HEAD PLOW BOLT 1/2-13 X 1-1/2 #3 G5	BL6080243513	8
2	BUCKET, TL JAW BLADE	102171	1
3	HEX NUT 1/2-13 STOVERLOCK	NUS08U	8
5	BUSHING, 2 1/2 X 2 X 2 NYLATRON	BU502008	2
6	GREASE NIPPLE 1/8" STRAIGHT	HF2002S	2

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: N/A
DRAWN BY: E.B.	APPROVED BY:	DATE: 8/28/00	SHEET: 1 OF 1



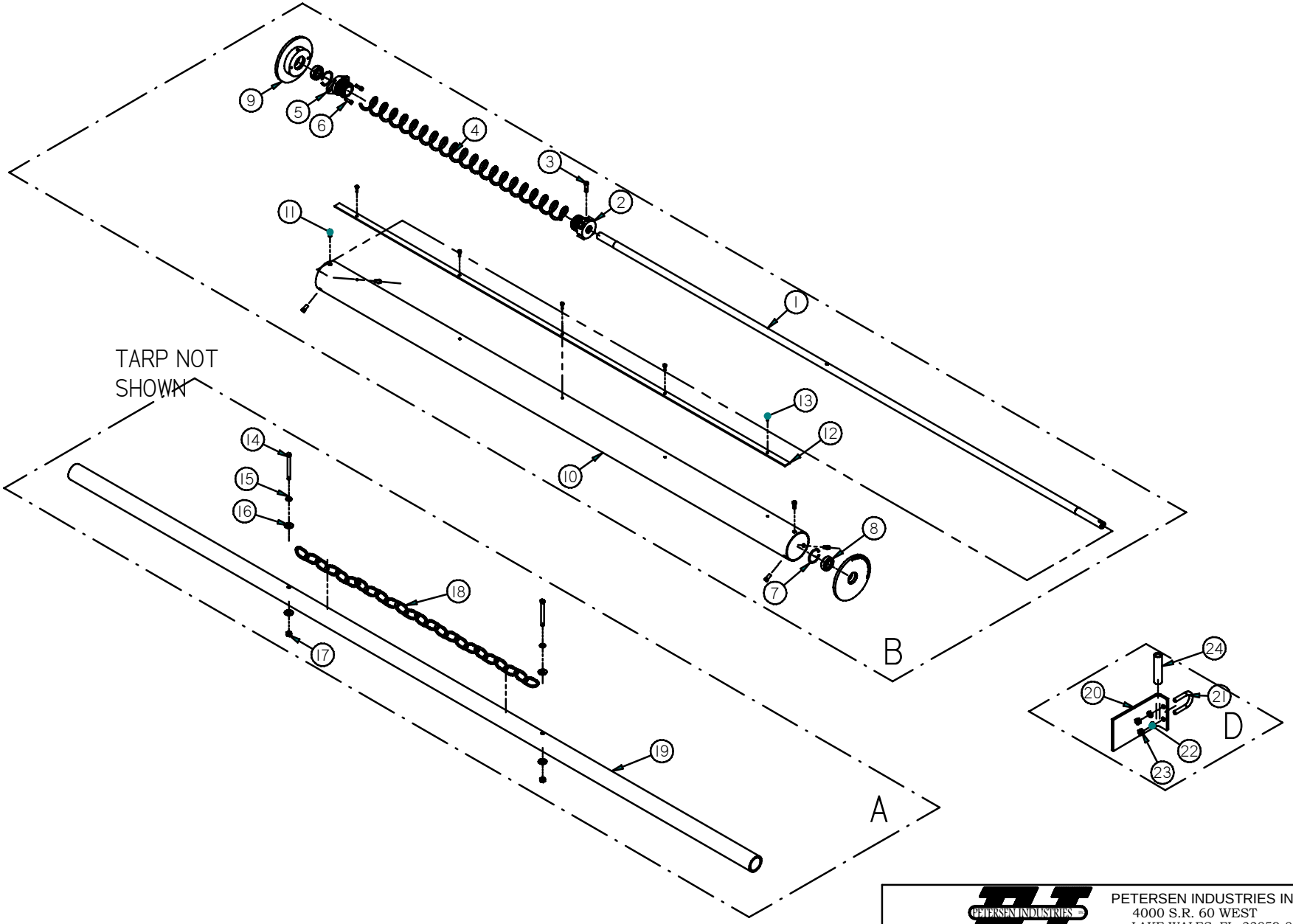
PETERSEN INDUSTRIES INC.
4000 S.R. 60 WEST
LAKE WALES,FL.33859-8201
(863) 676 1493 FX (863) 676 6844

TITLE: MODEL # 3 OUTRIGGER ASSEMBLY

CAD NO:	PART NO:	SCALE
02 06 04 001 1		1:20

DRAWN BY:	APPROVED:	DATE:	SHEET:
E.J.B.		5/18/99	1 OF 1

Dia. No.		Part Name	Order By This Part No.
MODEL3A OUTRIGGER ASSEMBLY: (DRAWING #02 06 04 001 0)			
1		Outer Horizontal Leg Weldment	Not Sold Separately
2		Inner Horizontal Leg Weldment	113114
3		Outer Vertical Leg Weldment	113104
4		Inner Vertical Leg Weldment	113105
5		Foot Weldment	113106
6		Pin, Vertical Cylinder - Base End	PI18106F1
7		Cover Plate, Vertical Leg	113107
8		Bolt, Cover Plate	BL305016U518
9		Washer, Cover Plate Bolt	WAS055
10		Roll Pin, 5/16" x 2"	FA040532
11		Cotter Pin, 3/16" x 2"	FA020332
12		Cotter Pin, 5/16" x 3"	FA020548
13		Pin, Vertical Cylinder - Rod End	PI18122F
14		Cylinder, Vertical Leg Extension	CY05003
15		Cylinder, Horizontal Leg Extension	CY05001
16		Washer	WAB1624
17		Wear Plate	113602
18		Wear Plate	113603
19		Hydraulic Fitting, 1/8 90 Degree	HF20029
		Vertical Leg Assembly (One Side Only)	113103



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

TITLE: 2001 LOAD COVER ASSEMBLY

CAD NO.:	PART NO.:	SCALE
01 00 00 019 0	122101	N/A

DRAWN BY:	APPROVED:	DATE:	SHEET:
E.B.		3/18/02	1 OF 1

Dia. No.		Part Name	Order By This Part No.
2001 LOAD COVER ASSEMBLY #0100000190			122101
	*	**B - Roller Assembly**	122111
1		Shaft	122121
2		Spring Cone, Shaft Side	122122
3		Bolt, 3/8" x 1 1/4"	BL306020U516
4		Spring	SP02004
5		Spring Cone, End Plate Side	122123
6		Bolt, 5/16" x 1"	BL305016U518
7		Retainer Ring, 2" Snap Ring	FA093200
8		Bearing	BE04N1641DC
9		End Plate	122124
10		Tubing	122126
11		Bolt, 3/8" x 3/4"	BL306012U516
12		Strap	122127
13		Screw, #14 x 3/4 Hex Head	SCMAD0612
	*	**A - Pull Bar Assembly**	122112
14		Bolt, 5/16"-18 x 3"	BL305048U518
15		Lock Washer, 5/16"	WAS055
16		Flat Washer, 5/16"	WAF05U5
17		Nut, 5/16"-18	NUA05U
18		Chain, 1/4" PC x 48" (Order Qty = 4)	CHP04B00
19		Pipe, 102" PVC	122129
	*	**D - Bracket Assembly (Each)**	122113
20		Mounting Ear Bracket with Pipe	122128
21		Bolt, 1 1/4" x 2 1/4" U	BLU20036U5
22		Lockwasher, 3/8"	WAS065
23		Nuts (Comes with U-Bolts)	N/A
24		Mounting Ear Pipe	122130
		Tarp, 7'6" x 18'	AC1701
		Canvas Roller Hook	CHH07000
		1/4" Quick Link	CHQ04000
	*	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.	

Dia. No.		Part Name	Order By 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: _____

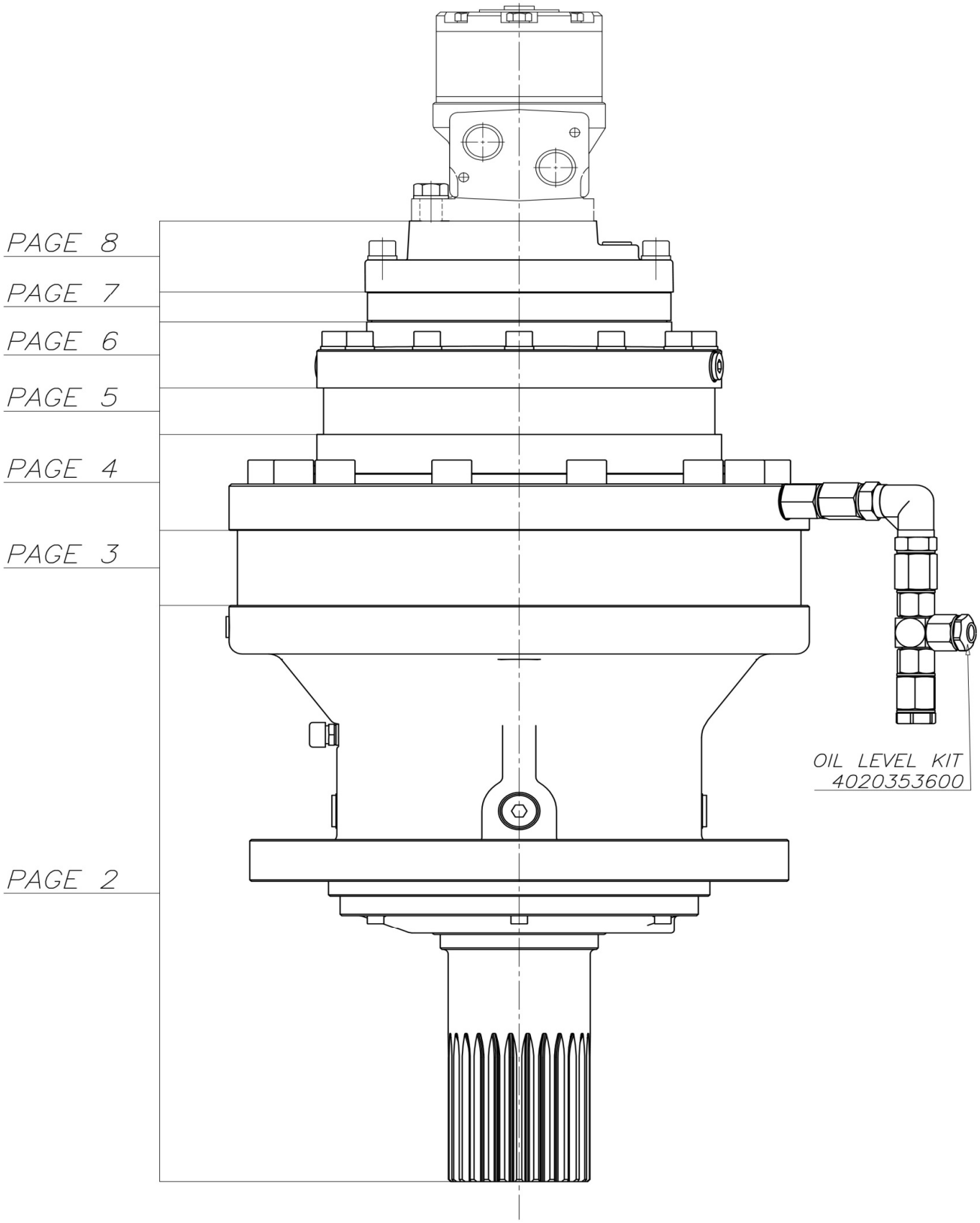
BY: _____
(Name)

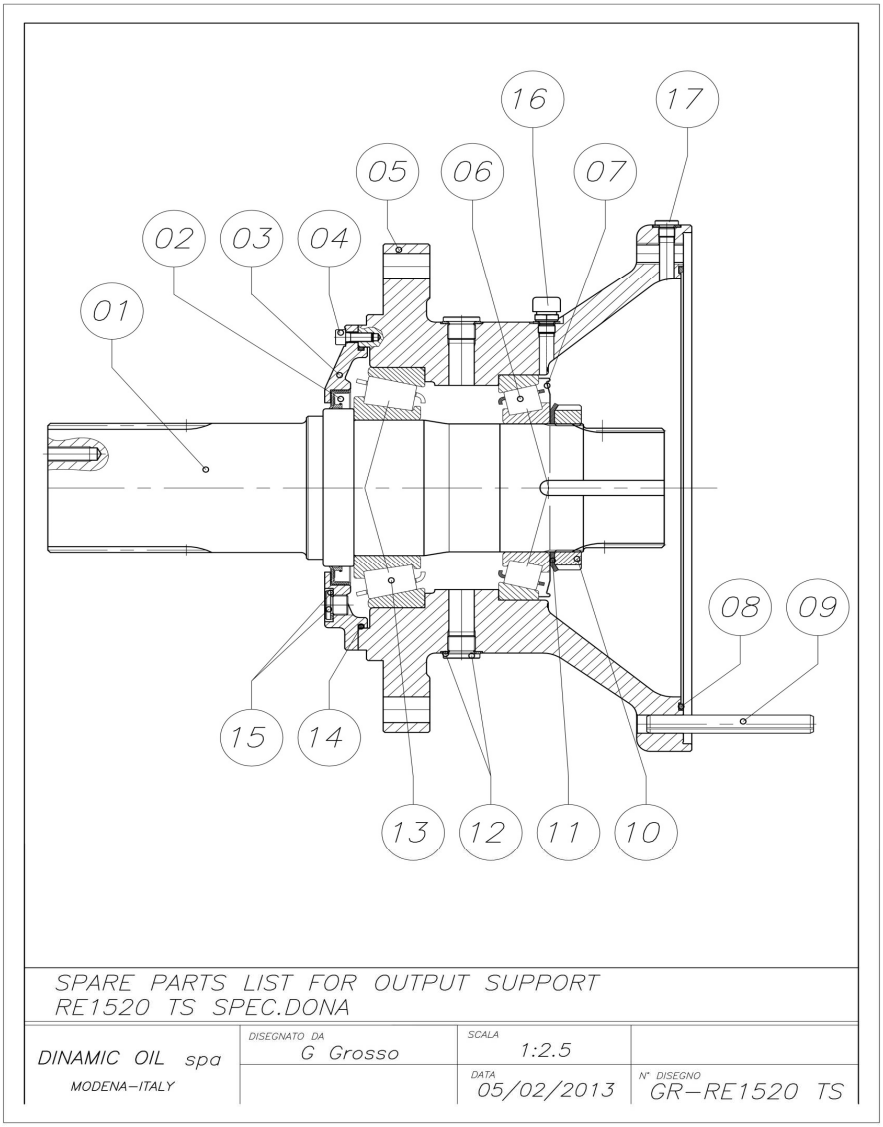
Date: _____

LISTA RICAMBI N°**2712-02**	N°PAGINE **08**
DATA DI COMPILAZIONE **04/02/2013**	
FIRMA : **Grosso.G**	N° RICHIESTA:**CI_0116**

GEARBOX DESCRIPTION **RE 1523 TS SP.8/16 Z26 60.5 MR**

GEARBOX CODE **91V2HS300600**



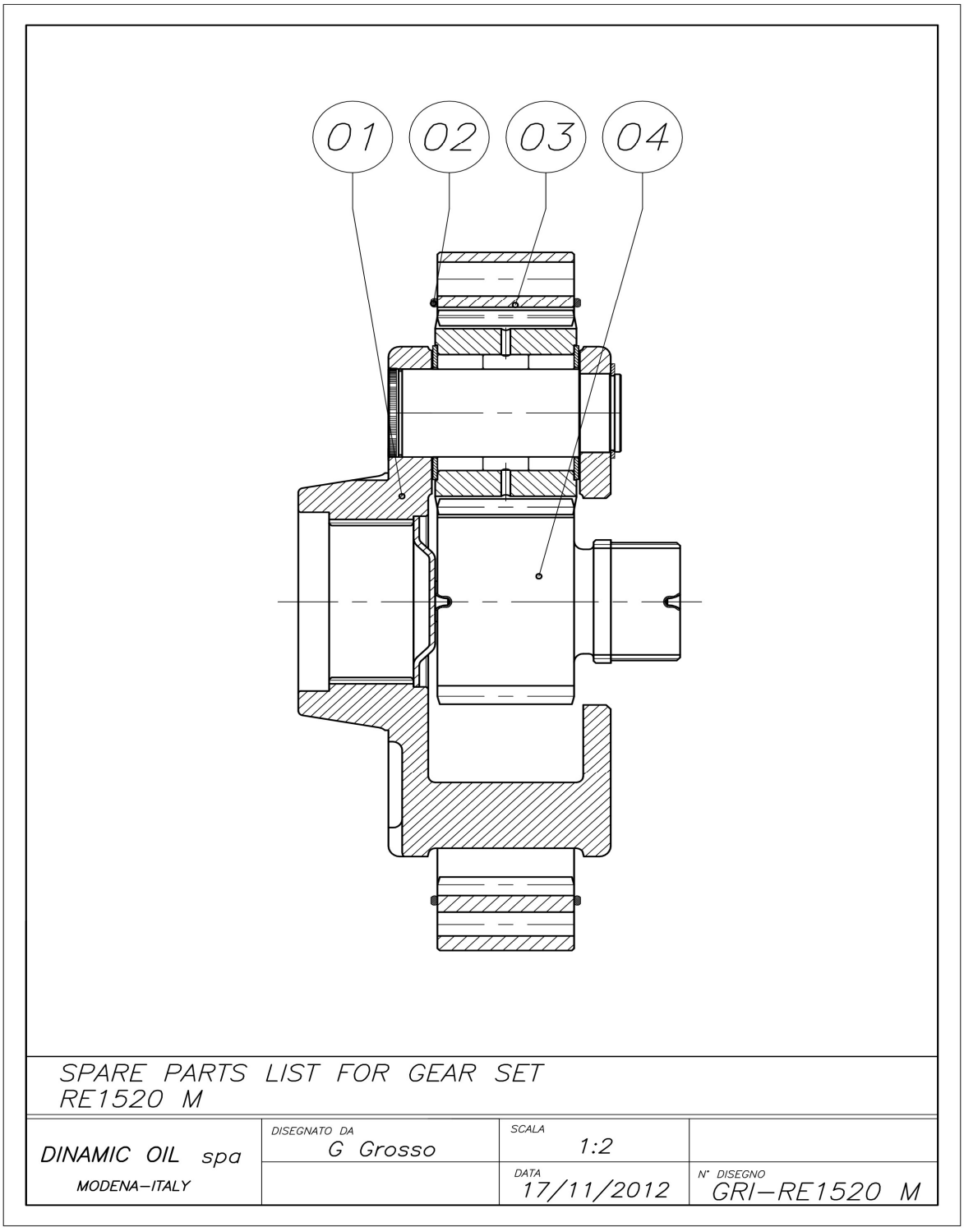


SPARE PARTS LIST FOR OUTPUT SUPPORT RE1520 TS SPEC.DONA	**GRU-1520 TS**

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	PLUG	4	419000700
	RONDELLA RAME 3/8"GAS	WASHER	4	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	WASHER	1	423000300
	TAPPO TCEI 1/4"GAS DIN 908	PLUG	1	419000600
16	TAPPO SFIATO 1/8"GAS CON VALVOLA	BREATHER PLUG	1	419021900
	RONDELLA RAME 1/8"GAS	WASHER	1	423001700
17	TAPPO TCEI 1/8"GAS	PLUG	1	419020900
	RONDELLA RAME 1/8"GAS	WASHER	1	423001700

SUB ASSEMBLY CODE: 99371400

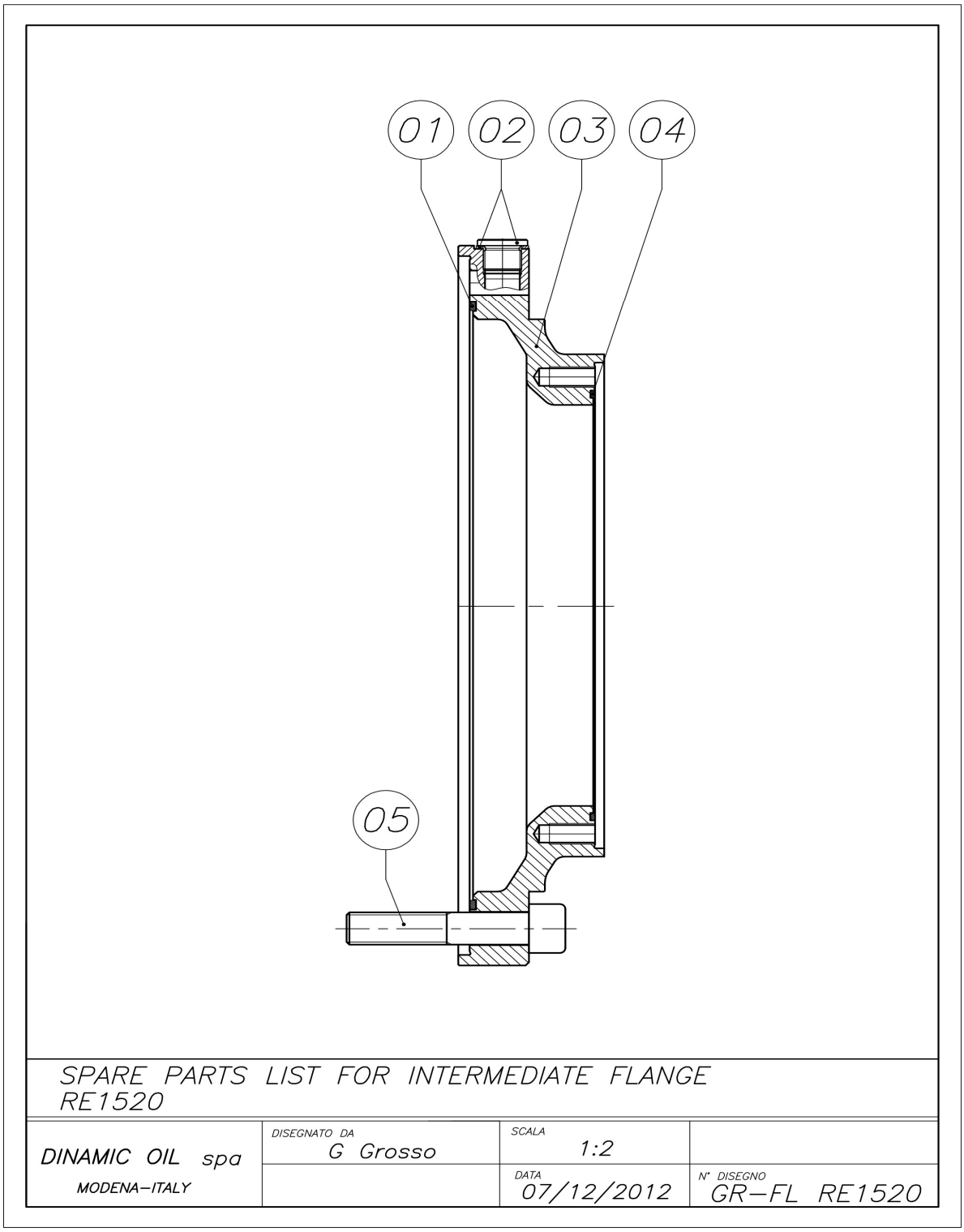
8	OR 2-277	O RING SEAL	1	406023400
9	SPINA ELASTICA Ø12X100 UNI6873	ELASTIC PINS	3	434010700



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

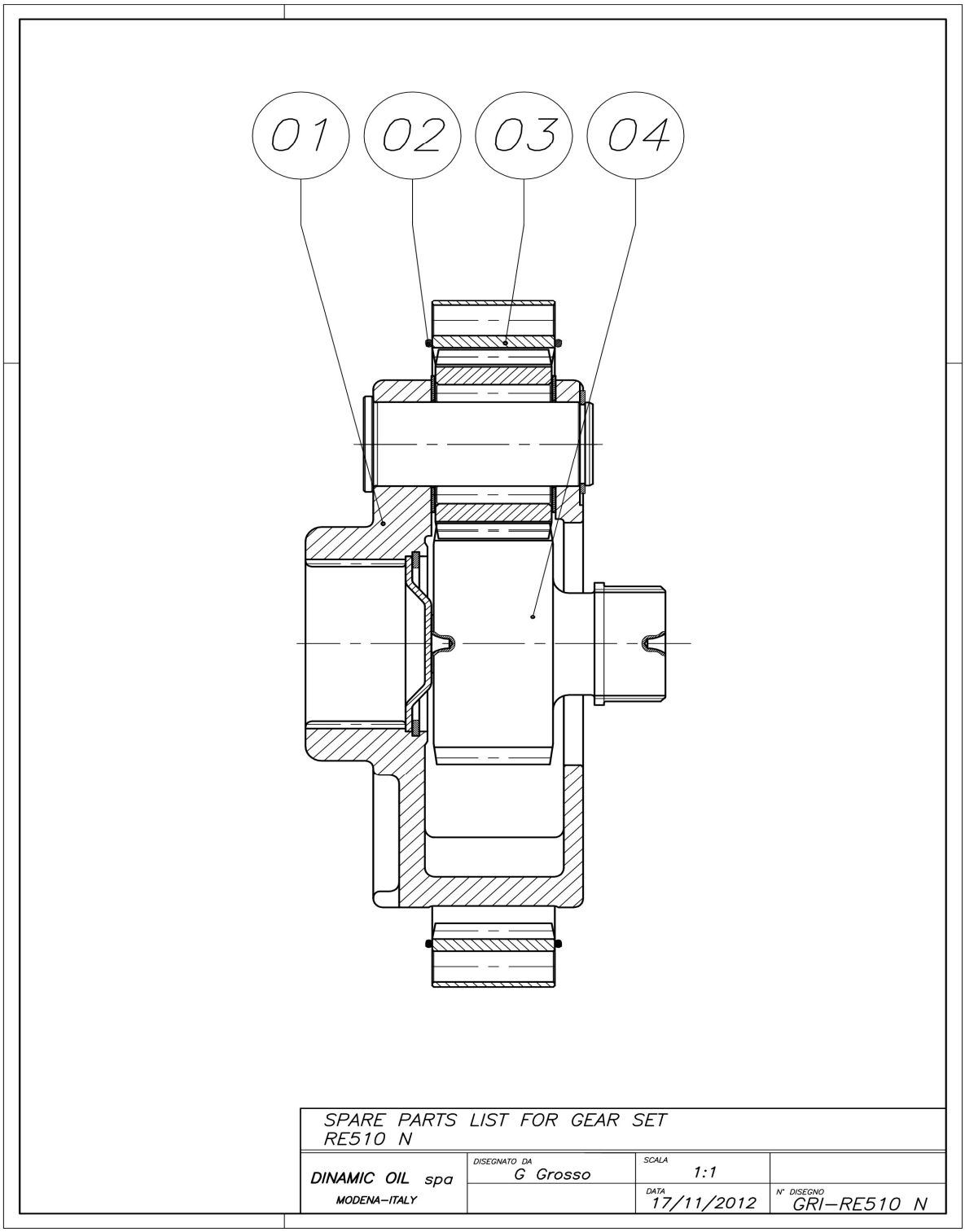
POS.	DESCRIZIONE	ITEM	Q.TA'	CODICE
1	RAGG.INGRANAGGERIA RE1520 R1:4.09	GEAR SET	1	99130400
2	OR 2-277	O RING SEAL	2	406023400
3	CORONA RE1520/2000	RING GEAR	1	02231027
4	SOLARE R=1:4.09 RE 1520	SUN GEAR	1	02611116

SUB ASSEMBLY CODE: K0500H1A01



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

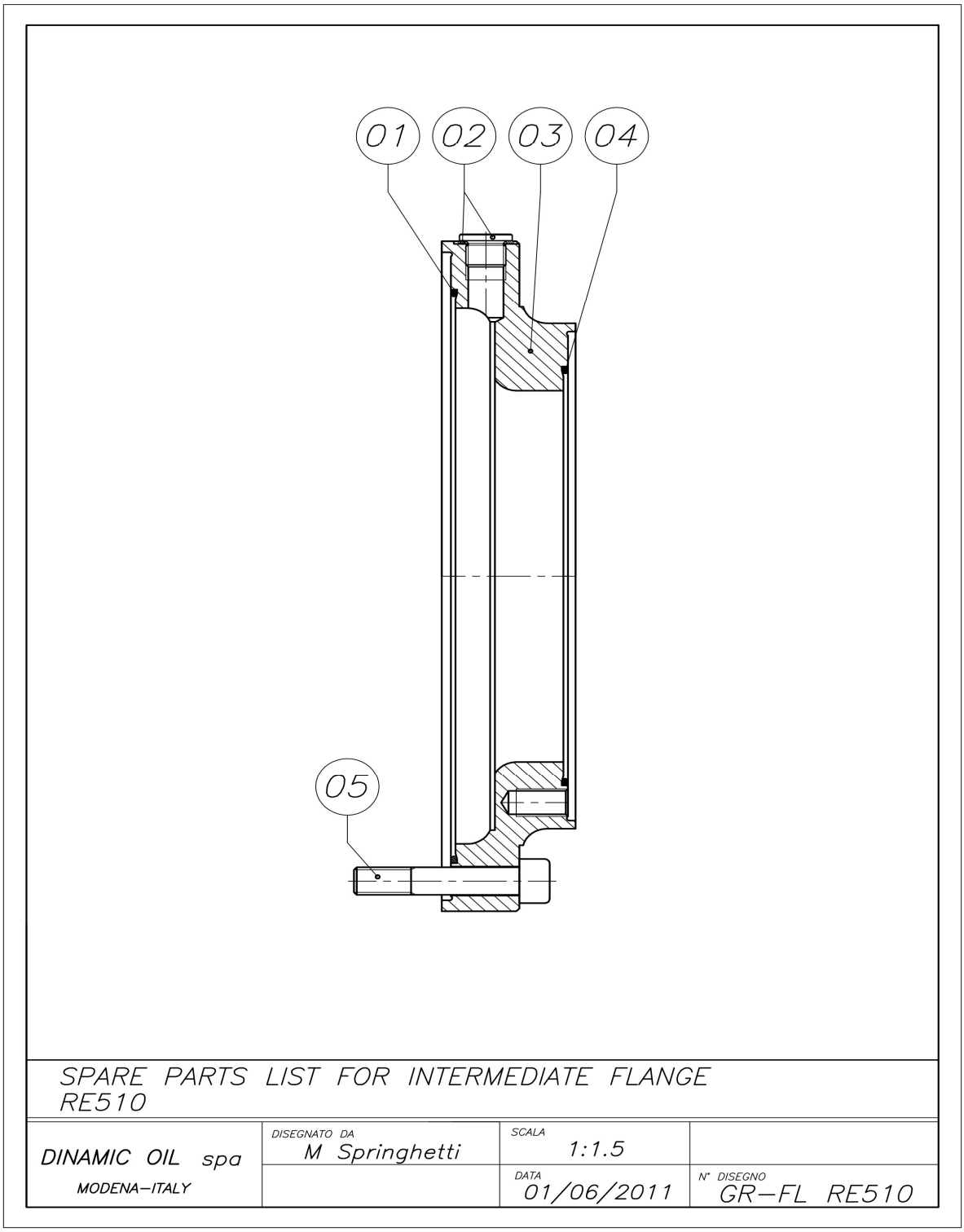
POS.	DESCRIZIONE	ITEM	Q.TA'	CODICE
1	GUARNIZIONE OR 2-277	OR-RING SEAL	1	406023400
2	TAPPO TCEI DIN 908 R 3/8"GAS	PLUG	2	419000700
	RONDELLA 3/8" RAME RICOTTO UNI 6953	WASHER	2	423000600
3	FLANG.INTERM.RE1520 PER RE510	INTERMEDIATE FLANGE	1	02731044
4	GUARNIZIONE OR 2-171	OR-RING SEAL	1	406015000
5	VITE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



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

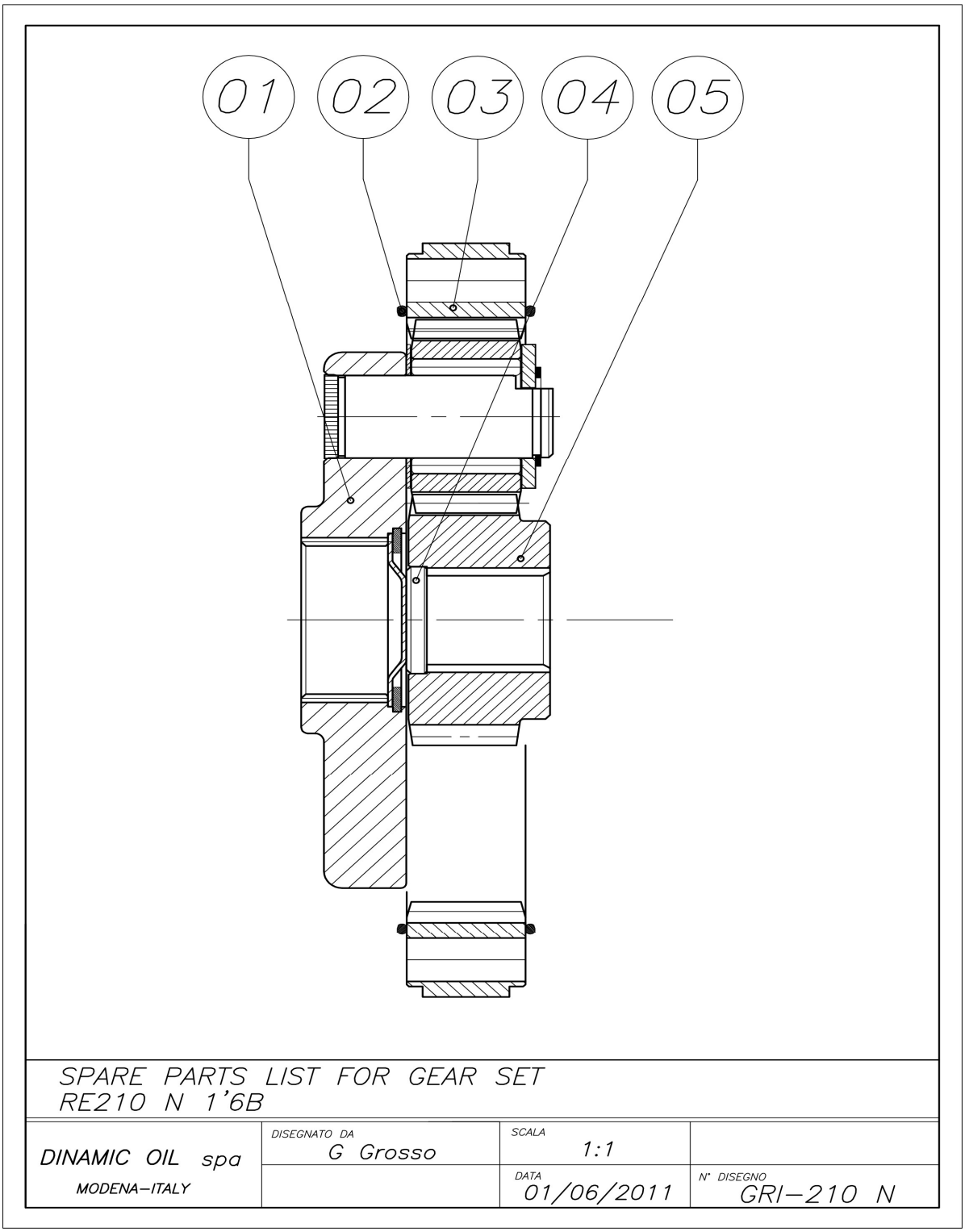
POS.	DESCRIZIONE	ITEM	Q.TA'	CODICE
1	RAGG.INGRANAGGERIA RE 510 4,25	GEAR SET	1	99121600
2	GUARNIZIONE OR 2-171	O RING SEAL	2	406015000
3	CORONA RE500	RING GEAR	1	2030030600
4	SOLARE 2ST R 4,25 RE 510	SUN GEAR	1	2030031900

SUB ASSEMBLY CODE: K0500E1B01



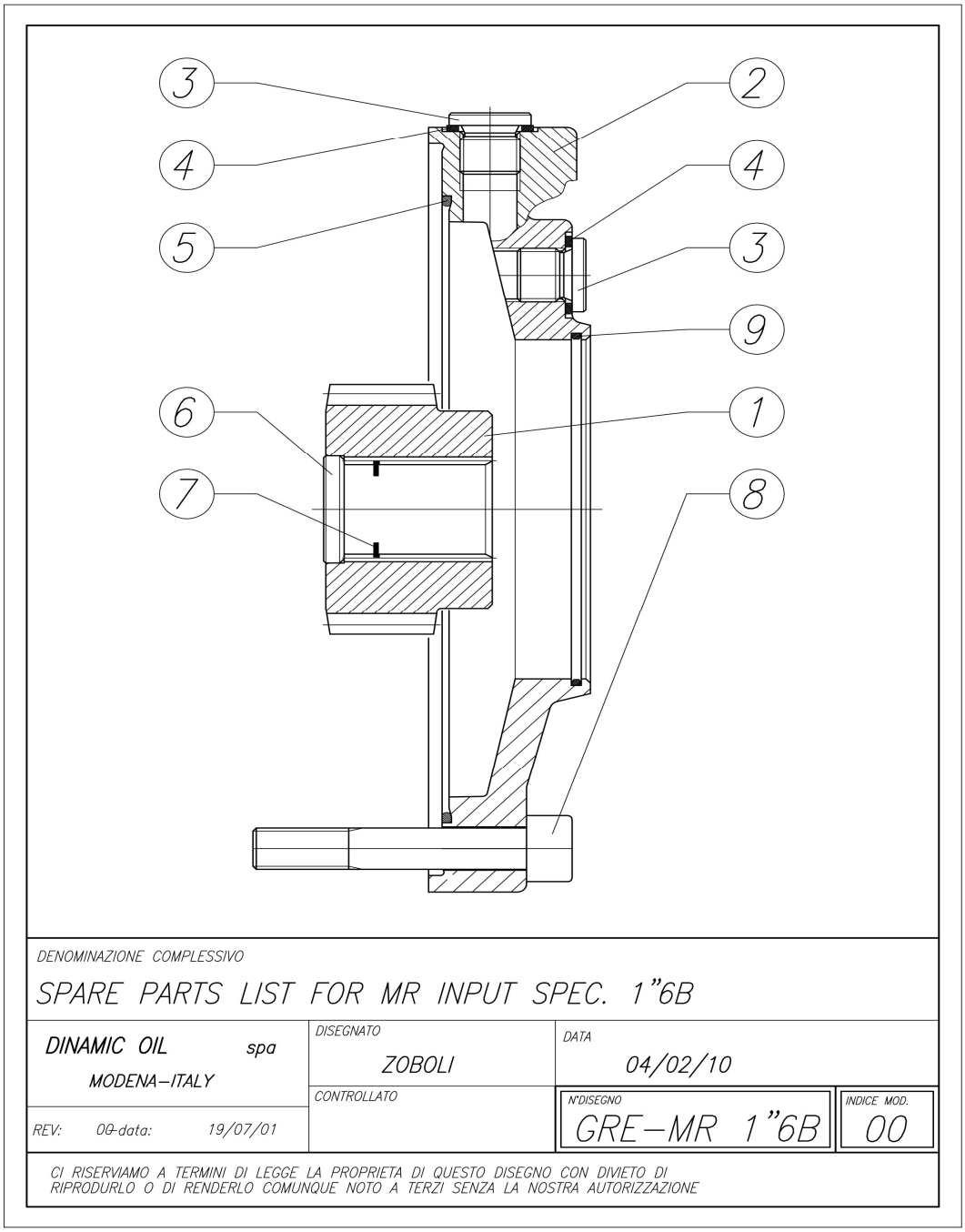
SPARE PARTS LIST FOR INTERMEDIATE FLANGE RE510 x RE1520	GR-FL RE510

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 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



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	2000080100
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	SEEGER FORO Ø22	INT. SNAP RING	***	*********
8	VITE TCEI M10X60 12.9	SCREW	8	410410300
9	OR 2-042	O-RING SEAL	8	406002300

7 LUBRICATION

All DINAMIC OIL S.p.A. gearboxes are supplied without lubricating oil.
The user is required to ensure the units are filled with the correct lubricants before putting the machine to use.

7.1 TYPE OF LUBRICATION

Gearboxes are oil bath lubricated. Before putting the gearbox to use, fill it with oil, looking through the level cap to see if it is at the correct level. This operation requires special attention, and the level must be checked again after a few minutes of operation.

7.2 SELECTING AN OIL

Any mechanical transmission oil with EP additives in viscosity classes ISO VG220 to ISO VG320 under ISO 3448 can be used. In special cases oils with different viscosities may be used. In this case, contact the DINAMIC OIL S.p.A. technical assistance service. The oil viscosity must be chosen to suit the room temperature and the gearbox's real operating temperature. If the gearboxes must operate at very high ambient temperatures or with very large temperature excursions, synthetic oil is recommended. In gearboxes with vertical fitting and continuous operation, oil may suddenly overheat. In these cases it is necessary to provide an external tank (which DINAMIC OIL S.p.A. can supply) to allow the oil to expand as it heats up.

If the delivered gearbox is already filled with oil, the lock cap used for delivery needs to be replaced with the vent cap supplied.

Lubricants are potentially harmful/toxic substances to health: always refer to the manufacturer's safety data sheets.

Do not release used oil into the environment. Collect it and send it to authorised bodies for disposal in accordance with legislative provisions in force.

Recommended viscosity

ISO VG 3448	OPERATING TEMPERATURE [C°] / AMBIENT TEMPERATURE [C°]												
	-20°	-10°	0	10°	20°	30°	40°	50°	60°	70°	80°	90	100°
220													
320													

Lubricants for general use:

Manufacturer	Mineral oil	Synthetic oil	
		Polyalphaolefins (PAO)	Polyglycols (PG)
AGIP	Blasia	Blasia SX	Blasia S
ARAL	Degol BG		Degol GS
BP	Energol GR-XP	Enersyn EPX	Enersyn HTX
CASTROL	Alpha SP	Alphasyn EP	Alphasyn PG
CHEVRON	Ultra Gear	Tegra Synthetic	HiPerSYN
DEA	Falcon CLP		
ELF	Reductelf	Elf Syntherma	Elf Syntherma
ESSO	Spartan EP	Spartan S EP	Glycolube
FINA	Giran		
IP	Mellana		Telesia Oil
KLÜBER	Kluberoil GEM 1	Klubersynt EG4	Klubersynt GH6
MOBIL	Mobilgear XMP	Mobilgear SHC	Glygoile
OPTIMOL	Ultra		
Q8	Goya	El Greco	El Greco
SHELL	Omala S2 G	Omala S4 GX	Omala S4 WE
TOTAL	Carter EP	Carter SH	Carter SY

Lubricants for the food industry:

Manufacturer	Gear oil
AGIP	Rocol Foodlube Hi-Torque
ESSO	Gear Oil FM
KLÜBER	Klüberoil 4 HU1 N
MOBIL	DTE FM
SHELL	Cassida Fluid GL

7.3 BRAKE LUBRICATION

Negative hydraulic brakes with multiple discs and a lubrication chamber are already lubricated.

7.4 OIL FILLING AND LEVEL CHECKING

Every gearbox is equipped with level, vent, filling and draining caps for oil in a configuration that varies depending on the structural form (see point 3).

7.4.1. Horizontal fitting

For horizontal fitting, the lubricating oil level is located on the middle section of the gearbox.

7.4.2 Vertical fitting

For vertical fitting (both linear and at right angle), the lubricating oil level is located on the “top” section of the gearbox, to ensure the upper bearing is lubricated.

7.5 FILLING PROCEDURE

When being filled, the gearbox must be in the exact position that it will be in when operating.

Ensure the power supply is disconnected when filling.

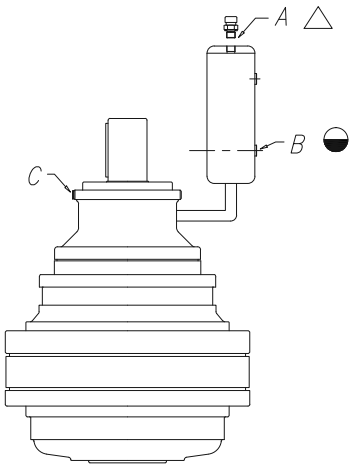
- Unscrew and remove the loading and level caps (see point 3.5).
- Feed the oil through the loading hole until it flows out of the level hole.
- Refit the caps using the appropriate tightening torques (see Annex 2).

7.5.1 Filling procedure with expansion chamber

In vertical fitting and cases where the gearbox needs to be completely filled, use of an expansion chamber is recommended.
This accessory ensures that all the gearbox’s components are lubricated, as well as serving as a reservoir for the oil, which increases in volume as the temperature rises.

- Unscrew cap “C”, located on the upper part of the gearbox, to prevent an air bubble from forming at the upper rotary seal.
- Unscrew loading cap “A” and start filling. When the oil flows out of the hole in cap “C”, close it using the appropriate tightening torques (see Annex 2) and fill up to level “B”.

- Refit cap “A” using the appropriate tightening torques (see Annex 2).



7.6 AMOUNT OF OIL

Indicative oil amounts are given in Annex 1 of this manual. These values are only indicative, and the level cap on the middle section of the gearbox itself must therefore be referred to.

8 SUPPORT AND SERVICING

Servicing must be performed by expert, authorised personnel adhering to the work and environmental safety standards in force.

Servicing on the gearbox must be performed with the power supply disconnected and the gearbox taken “out of service” to prevent it from being switched on accidentally. The oil temperature must be at a safe level so as not to burn the operators.

The instructions given in this paragraph must be followed, ensuring the gearbox is operational and that required levels of safety are met:

- Only use original spare parts. (Refer to the Spare Parts List for the gearbox in question).
- Use lubricants that are recommended by the manufacturer.
- After any servicing work, always replace the seal washers and any lubricating oil.
- Carry out the routine servicing work as set out by the manufacturer.
- Use additional lighting if carrying out servicing work in dimly lit areas, to ensure that it is performed safely.
- Take relevant precautions if carrying out servicing work in enclosed spaces, to ensure that it is performed safely.

DINAMIC OIL S.p.A. will not be held liable for damage caused to persons, animals or objects if non-original spare parts are used.

8.1 ROUTINE SERVICING

Scheduled routine servicing work is carried out on DINAMIC OIL S.p.A. gearboxes by the operator:

Proper servicing improves performance, longevity and safety.

After the first 150 hours of operation:

- Check there are no metal residues of abnormal size in the magnetic caps on the gearboxes.
- Clean the surfaces of the gearbox body and the air ventilation pathways to ensure correct

heat dispersal.
- Change the lubricating oil (see point 8.3).
- Check the screws are all tight, and tighten them where required.

After every 500 hours of operation:

- Check the oil levels with the relevant caps.
- Check for any leaks in the seals.
- Check the screws are all tight, and tighten them where required.

After every 2000 hours of operation or at least every 12 months:

- Clean the surfaces of the gearbox body and the air ventilation pathways to ensure correct heat dispersal.
- Check the screws are all tight, and tighten them where required.

It is worth checking for the vibration, noise and temperature of the gearbox while it is in operation.
When repaired, the right amount of oil must be restored.

8.2 SUPPLEMENTARY SERVICING

If agreed with the customer, DINAMIC OIL S.p.A. can supply suitable servicing procedures on a case by case basis.

DINAMIC OIL S.p.A. prohibits the gearbox from being opened for any operations which are not defined as “routine” servicing.

DINAMIC OIL S.p.A. will accept no liability for harm to objects or persons caused by operations carried out which do not fall within routine servicing and have not been agreed with the customer.

If in need of assistance, contact the DINAMIC OIL S.p.A. technical sales office.

8.3 OIL REPLACEMENT

Replace the lubricating oil according to the schedule set out in the following table, or at least every 2 years.

Average operating duration according to oil type:

Operating temperture	Oil type		
	Mineral oil	Synthetic oil	
		Polyalphaolefins (PAO)	Polyglycols (PG)
70° C	7000 hours	15000 hours	16000 hours
80° C	5000 hours	10000 hours	12000 hours
90° C	3000 hours	7500 hours	9000 hours

To make it easier to empty the gearbox, it is recommended that oil be changed when the gearbox is warm. Internal parts must be washed with a suitable liquid before filling with new oil. Oils with different viscosity or different brands of oil should not be mixed. In particular, synthetic and mineral oils must never be mixed together.
Once the machine is in operation, periodically check lubricant level and top up if necessary.

Do not release used oil into the environment. Collect it and send it to authorised bodies for disposal in accordance with legislative provisions in force.

Empty the oil when the gearbox is warm, but at a temperature not exceeding 40-45 °C to prevent the risk of burns.

8.3.1 Oil replacement procedure

- Place a receptacle of sufficient size underneath the draining cap.
- Unscrew the gearbox's loading and draining caps and allow the oil to completely drain.
- Wash internal parts with a suitable liquid.
- Refill the gearbox with oil (see point 7.5).

8.4 GREASE REPLACEMENT

The bearings of some gearboxes are lubricated with grease (performed in the factory). Replace the lubricating grease according to the schedule set out in the following table:

Average operating duration according to grease type:

Grease type	
Mineral	Synthetic
5000 hours	10000 hours

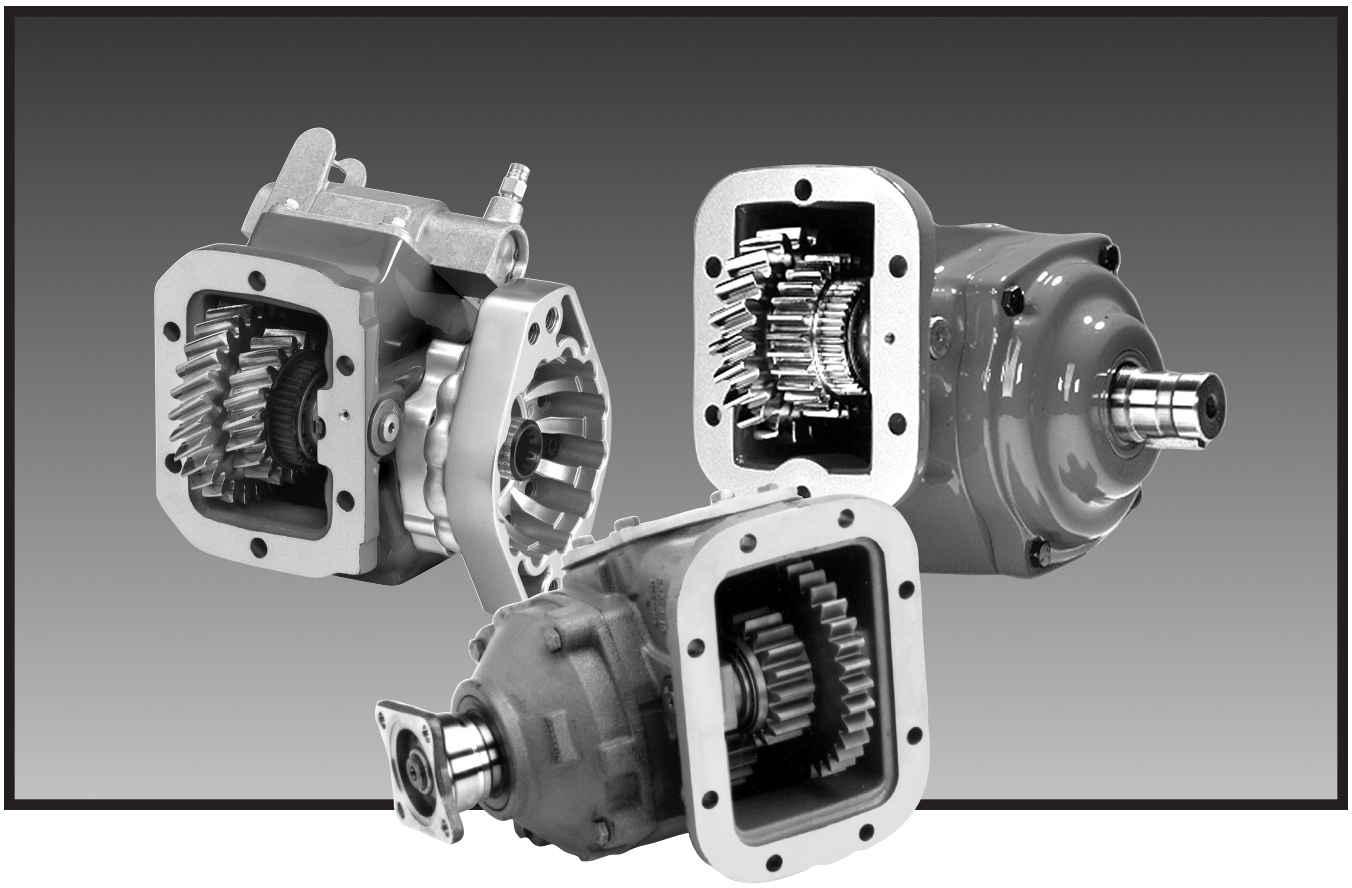
DINAMIC OIL S.p.A. recommends replacement at every oil change.
For the type and quantity, refer to the gearbox data sheet.

CHELSEA®

Bulletin HY25-1380-M1/US

Owner's Manual
Power Take-Offs

Effective: April 2008
Supersedes: HY25-1380-M1/US March 2008



267 Series
269 Series
277 Series
278 Series
859 Series
867 Series

Parker

⚠ 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.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

Patent Information

The Chelsea® Power Take-Off or its components shipped with this owner's manual may be manufactured under one or more of the following U.S. patents:
4610175 5228355 4597301 5645363 6151975 6142274 6260682 7159701 B2
Other patents pending.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Continued on Next Page

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Safety Information

These instructions are for your safety and the safety of the end user. Read them carefully until you understand them.

General Safety Information

To prevent injury to yourself and/or damage to the equipment:

- Read carefully all owner's manuals, service manuals, and/or other instructions.
- Always follow proper procedures, and use proper tools and safety equipment.
- Be sure to receive proper training.
- Never work alone while under a vehicle or while repairing or maintaining equipment.
- Always use proper components in applications for which they are approved.
- Be sure to assemble components properly.
- Never use wornout or damaged components.
- Always block any raised or moving device that may injure a person working on or under a vehicle.
- Never operate the controls of the Power Take-Off or other driven equipment from any position that could result in getting caught in the moving machinery.

Proper Matching of P.T.O.

WARNING: A Power Take-Off must be properly matched to the vehicle transmission and to the auxiliary equipment being powered. An improperly matched Power Take-Off could cause severe damage to the vehicle transmission, the auxiliary driveshaft, and/or to the auxiliary equipment being powered. **Damaged components or equipment could malfunction causing serious personal injury to the vehicle operator or to others nearby.**

To avoid personal injury and/or equipment damage:

- Always refer to Chelsea catalogs, literature, and owner's manuals. Follow Chelsea recommendations when selecting, installing, repairing, or operating a Power Take-Off.
- Never attempt to use a Power Take-Off not specifically recommended by Chelsea for the vehicle transmission.
- Always match the Power Take-Off's specified output capabilities to the requirements of the equipment to be powered.
- Never use a Power Take-Off whose range of speed could exceed the maximum.

Cold Weather Operation of Powershift P.T.O.

WARNING: During extreme cold weather operation [32°F (0°C) and lower], a disengaged Powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag will quickly decrease.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment resulting in serious personal injury, death, or equipment damage.

To avoid personal injury or equipment damage:

- Driven equipment must have separate controls.
- The driven equipment must be left in the disengaged position when not in operation.
- Do not operate the driven equipment until the vehicle is allowed to warm up.

This symbol warns of possible personal injury.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Safety Information (Continued)

Rotating Auxiliary Driveshafts

WARNING: 

- Rotating auxiliary driveshafts are dangerous. You can snag clothes, skin, hair, hands, etc. This can cause serious injury or death.
- Do not go under the vehicle when the engine is running.
- Do not work on or near an exposed shaft when the engine is running.
- Shut off the engine before working on the Power Take-Off or driven equipment.
- Exposed rotating driveshafts must be guarded.

Guarding Auxiliary Driveshafts

WARNING: We strongly recommend that a Power Take-Off and a directly mounted pump be used to eliminate the auxiliary driveshaft whenever possible. If an auxiliary driveshaft is used and remains exposed after installation, it is the responsibility of the vehicle designer and P.T.O. installer to install a guard.

Using Set Screws

WARNING: Auxiliary driveshafts may be installed with either recessed or protruding set screws. If you choose a square head set screw, you should be aware that it will protrude above the hub of the yoke and may be a point where clothes, skin, hair, hands, etc. could be snagged. A socket head set screw, which may not protrude above the hub of the yoke, does not permit the same amount of torquing as does a square head set screw. Also, a square head set screw, if used with a lock wire, will prevent loosening of the screw caused by vibration. Regardless of the choice made with respect to a set screw, an exposed rotating auxiliary driveshaft must be guarded.

Important: Safety Information and Owner's Manual

Chelsea Power Take-Offs are packaged with safety information decals, instructions, and an owner's manual. These items are located in the envelope with the P.T.O. mounting gaskets. Also, safety information and installation instructions are packaged with some individual parts and kits. **Be sure to read the owner's manual before installing or operating the P.T.O.** Always install the safety information decals according to the instructions provided. Place the owner's manual in the vehicle glove compartment.

WARNING: Operating the P.T.O. with the Vehicle in Motion

Some Power Take-Offs may be operated when the vehicle is in motion. To do so, the P.T.O. must have been properly selected to operate at highway speeds and correctly matched to the vehicle transmission and the requirements of the driven equipment.

If in doubt about the P.T.O. specifications and capabilities, avoid operating the P.T.O. when the vehicle is in motion. Improper application and/or operation can cause serious personal injury or premature failure of the vehicle, the driven equipment, and/or the P.T.O.

Always remember to disengage the P.T.O. when the driven equipment is not in operation.

Pump Installation Precautions

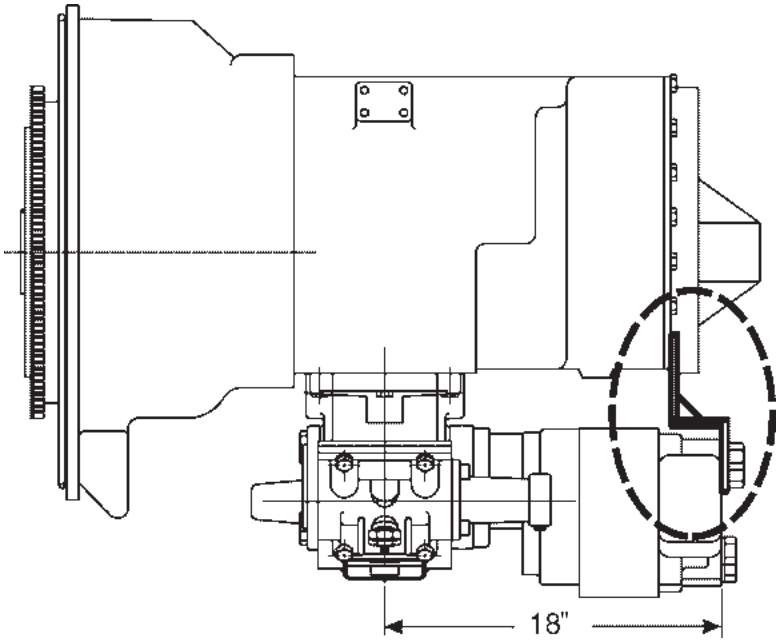
Use a bracket to support the pump to the transmission if:

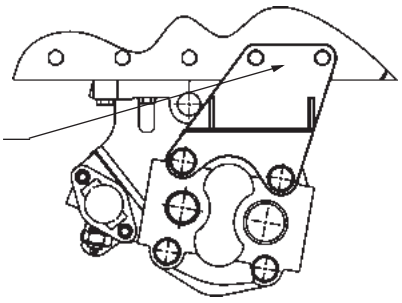
- The pump weighs **40 pounds [18.4 kg]** or more.
- The combined length of the P.T.O. and pump is **18 inches [45.72 cm]** or more from the P.T.O. centerline to the end of the pump.

This symbol warns of possible personal injury.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Direct Mount Pump Support Recommendations





NOTE: For Proper Bracketing Attach at 2 or More Transmission Bolt Locations and 2 or More Pump Locations. Contact Transmission Manufacture for Proper Bracket Mounting Locations.

Use caution to ensure that bracket does not pre-load pump/P.T.O. mounting

Chelsea strongly recommends the use of pump supports (Support Brackets) in all applications. P.T.O. warranty will be void if a pump bracket is not used when:

1) The combined weight of pump, fittings and hose exceed **40 pounds [18.14 kg]**.
2) The combined length of the P.T.O. and pump is **18 inches [45.72 cm]** or more from the P.T.O. centerline to the end of the pump.

ALSO: Remember to pack the female pilot of the P.T.O. pump shaft with grease before installing the pump on the P.T.O. (reference Chelsea grease pack 379688)

This symbol warns of possible personal injury.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

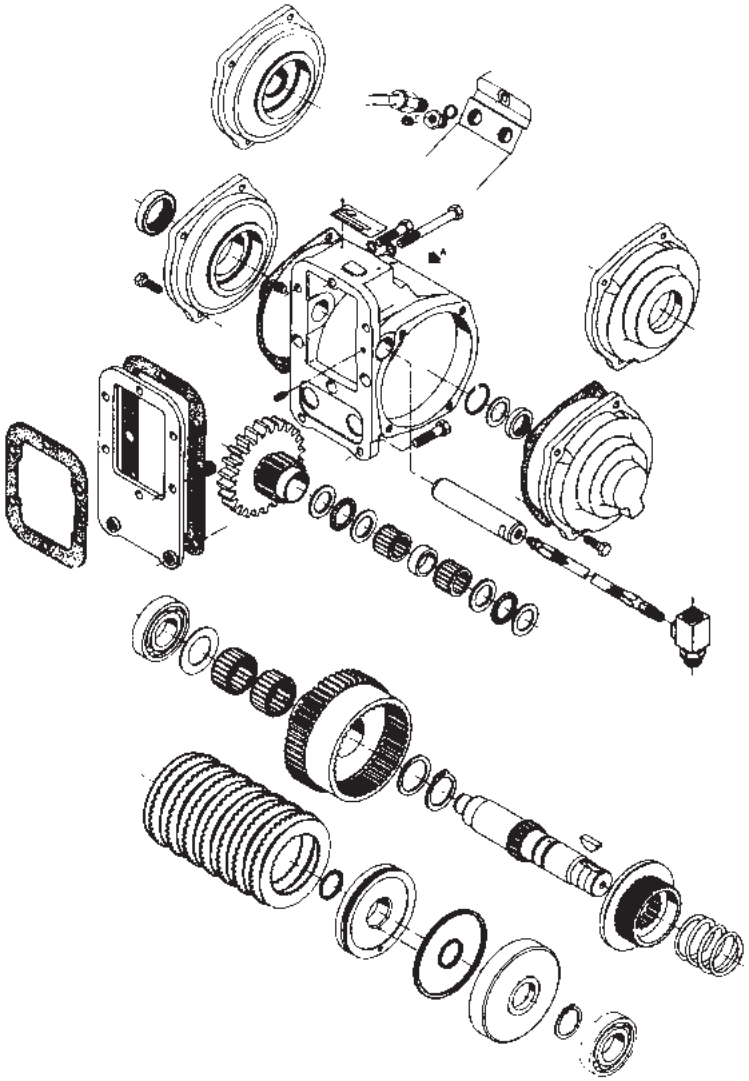
Foreword

Since our major objective is to show you how to get additional and more profitable miles from truck, tractor and trailer components, we want to provide you with information on the installation of Chelsea Power Take-Offs.

We all realize that an inadequate transmission will overwork any Power Take-Off in a very short period of time. In addition, a mismatched transmission/P.T.O. combination can result in unsatisfactory performance of the equipment right from the start.

Before you order new trucks, be sure you're getting the right transmission/P.T.O. combination. It is of vital importance for efficient performance to have adequate power. To help you select the proper type, size and design of P.T.O. it is advisable to discuss your specific requirements with Chelsea P.T.O. specialists. They know their products and have easy access to manufacturers of equipment, transmissions and Power Take-Offs. They can inform you about everything you need to know about power, at the right time, before you specify components.

Exploded View of a Typical Powershift P.T.O.



Chelsea P.T.O. Safety Label Instructions

1. The two black and orange on white 5" x 7" pressure sensitive vinyl labels, part number 379274; must be placed on the vehicle frame rails (one (1) on each side), in a position that would be **HIGHLY** visible to anyone that would go under the truck near the P.T.O. rotating shaft. If the vehicle is to be painted after these labels are installed, cover them with two (2) blank masking covers. Remove the masking covers after painting.

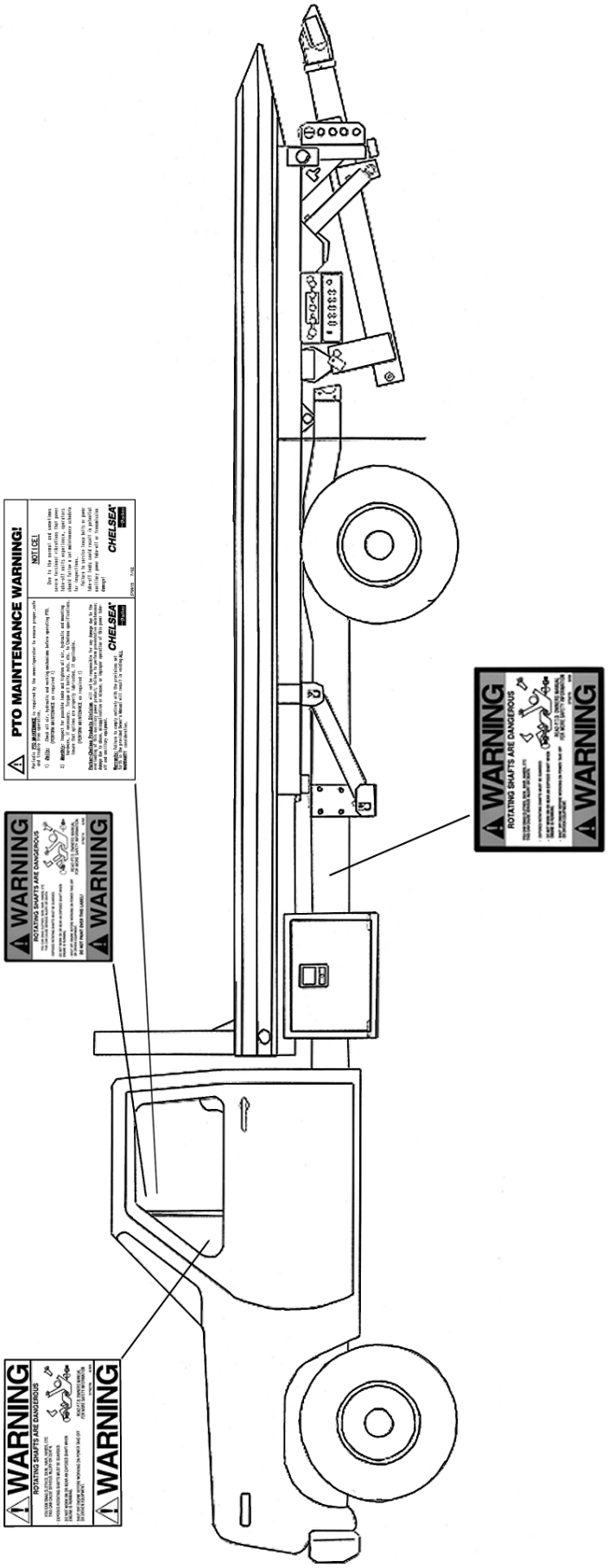
2. Place the one (1) black and orange on white 3.5" x 5" pressure sensitive vinyl label, part number 379275, on the visor nearest the operator of the vehicle, this must be placed near the P.T.O. visor label.

3. Place the one (1) red and white with black lettering 3.5" x 7.5" pressure sensitive vinyl label, part number 379915, on the opposite side of the visor from the above label # 379275.

4. Place the one (1) white and black heavy duty card, part number 379276, in the vehicle glove box. Again in a position highly visible to the operator, for example: try to place this card on top of whatever may be in the glove box.

If you require labels, please order part number 328946X at no charge from your local Chelsea Warehouse or send request direct to:

Parker Hannifin Corporation
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, MS 38654
Customer Service: (662) 895-1011



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Function of Auxiliary Power Shafts

An auxiliary power shaft transmits torque from the power source to the driven accessory. The shaft must be capable of transmitting the maximum torque and R.P.M. required of the accessory, plus any shock loads that develop.

An auxiliary power shaft operates through constantly relative angles between the power source and the driven accessory, therefore, the length of the auxiliary power shaft must be capable of changing while transmitting torque. This length change, commonly called "slip movement", is caused by movement of the power train due to torque reactions and chassis deflections.

Joint operating angles are very important in an auxiliary power joint application. In many cases, the longevity of a joint is dependent on the operating angles. (See chart below)

This information is limited to 1000 through 1310 series applications. For applications requiring a series larger than 1310, contact your local Chelsea distributor**.**

Determining Shaft Type

1) Solid or tubular?
   a) In applications requiring more than 1000 R.P.M. or where the application necessitates a highly balanced auxiliary power shaft, a tubular shaft should be used.
   b) Spicer's solid shafting auxiliary power joints are designed for 1000 or less R.P.M. intermittent service such as:
      Driving small hydraulic pumps
      Driving winches
      Driving low speed product pumps
2) Joint Series should be determined using the chart on the following page.

Spicer® Universal Joint Operating Angles			
Prop. Shaft R.P.M.	**Max. Normal Operating Angle**	**Prop. Shaft R.P.M.**	**Max. Normal Operating Angle**
3000	5° 50'	1500	11° 30'
2500	7° 00'	1000	11° 30'
2000	8° 40'	500	11° 30'

Above based on angular acceleration of 100 RAD/SEC^2

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Spicer® Universal Joint Engineering Data

Joint Series	1000	1100	1280	1310
Torque Rating				
Automotive (Gas or Diesel Engine) Lbs. ft.				
Continuous	50	54	95	130
Tubing				
Diameter	1.750	1.250	2.500	3.00
Wall Thickness	.065	.095	.083	.083
W = Welded S = Seamless	W	S	W	W
Flange Diameter (Swing Diameter)				
Rectangular Type	3.500	3.500	3.875	3.875
Bolt Holes - Flange Yoke				
Circle	2.750	2.750	3.125	3.125
Diameter	.312	.312	.375	.375
Number	4	4	4	4
Male Pilot Dia.	2.250	2.250	2.375	2.375
Distance Across Lugs				
Snap Ring	2.188	2.656	3.469	3.469
Construction				
Bearing Diameter	.938	.938	1.062	1.062

Maximum Operating Speed * By Tube Size, Solid Shaft Size, and Length
***(For speed below 500 R.P.M. or over 2500 R.P.M., contact your Chelsea Distributor)**

Tubing Dia. & Wall Thickness Joint & Shaft (W=Welded S=Seamless)	Max. Installed Length in Inches for Given R.P.M. Centerline to Centerline of Joints for a Two Joint Assembly or Centerline of Joint to Centerline of Center Bearing for a Joint & Shaft R.P.M. - Revolutions per Minute				
	500	**1000**	**1500**	**2000**	**2500**
1.750" X .065" W	117"	82"	67"	58"	52"
1.250" X .095" S	91"	64"	52"	45"	40"
2.500" X .083" W	122"	87"	70"	62"	55"
3.000" X .083" W	-	-	-	85"	76"
Solid Shaft Diameter					
.750"	60"	42"	35"	30"	27"
.812"	62"	44"	36"	31"	28"
.875"	65"	46"	37"	32"	29"
1.000"	69"	49"	40"	35"	31"
1.250"	77"	55"	45"	39"	35"

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission

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**).

Fig. 1

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

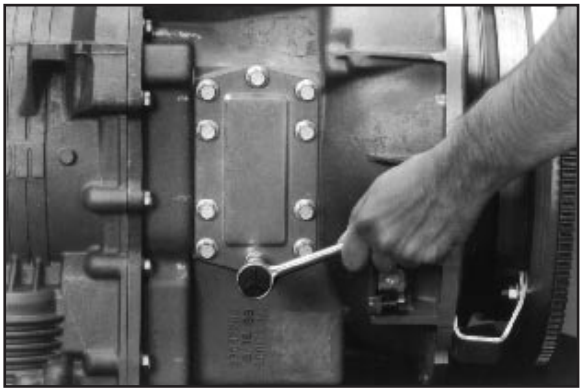


Fig. 2

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

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

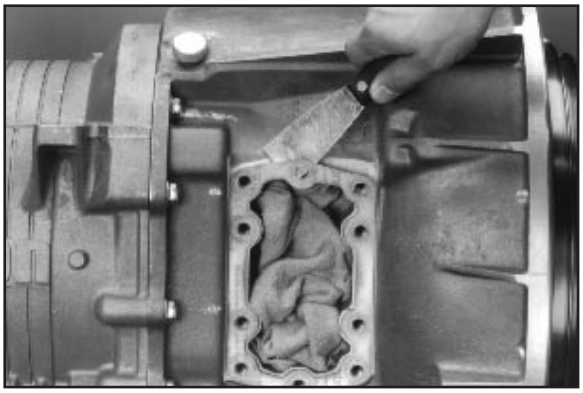


Fig. 3

4. Using a screwdriver, install the guide pins until they bottom out (**Fig. 4**) (Refer to Page 34 for 269 & 278 Series).

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

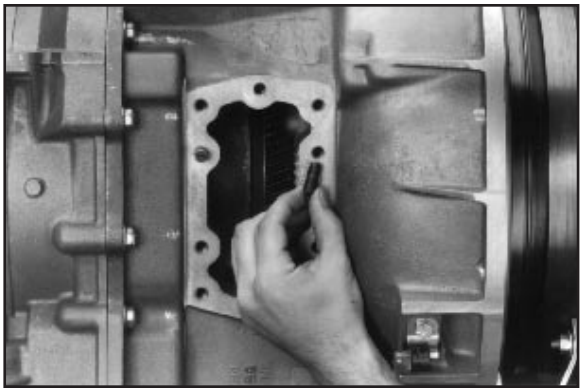


Fig. 4

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission (Continued)

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

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

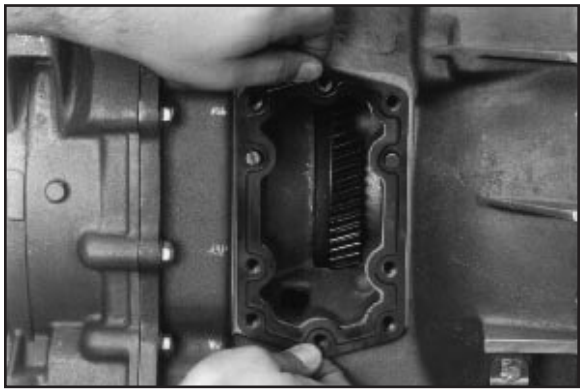


Fig. 5

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

NOTE: Refer to page 34 for proper capscrew installation for the 269 & 278 Series

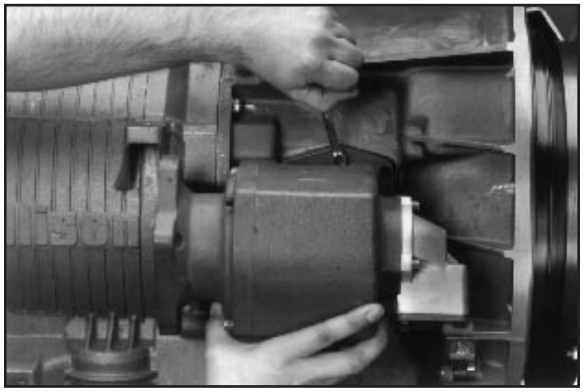


Fig. 6

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**).

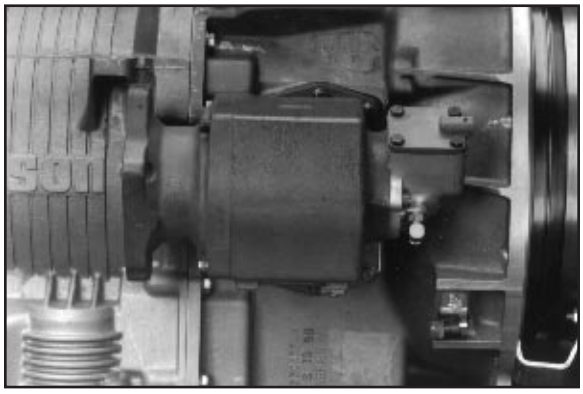


Fig. 7

8. Rotate the valve cap to one of two positions to provide maximum clearance (**Fig. 8**).

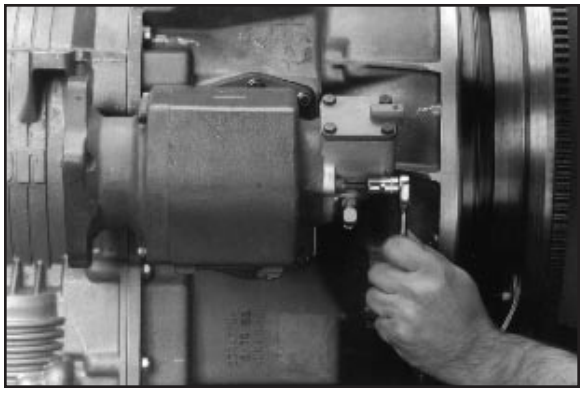


Fig. 8

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission (Continued)

9. After selecting the best position for the application, torque the valve cap bolts to 16 - 20 Lbs. ft. (22 - 27 N.m. or 2.2 - 2.8 kg) (**Fig. 9**).

NOTE: If using a rotatable flange see page 34 for bolt torque specifications.

Fig. 9

10. Securely attach the high pressure line to the valve (**Fig. 10**).

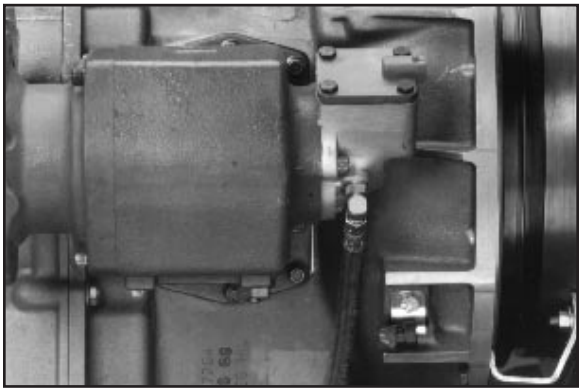


Fig. 10

11. Use the special fitting to securely attach the high pressure line to the transmission. This fitting is included with the P.T.O. (**Fig. 11**). See the chart on page 12 for the correct hose specifications. With the hose and P.T.O. securely connected, refill the transmission to the manufacturer's suggested specifications.

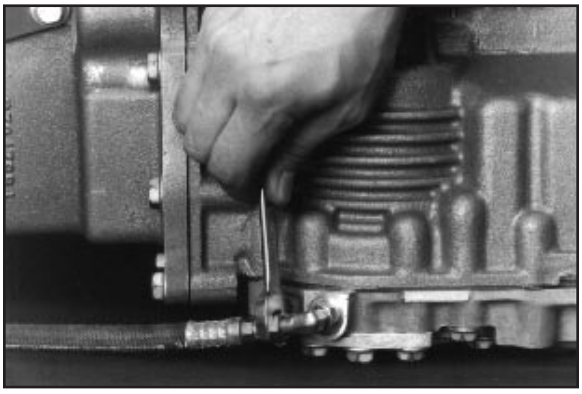


Fig. 11 (Left side)

12. Complete the assembly by installing the electrical connection (**Fig. 12**).

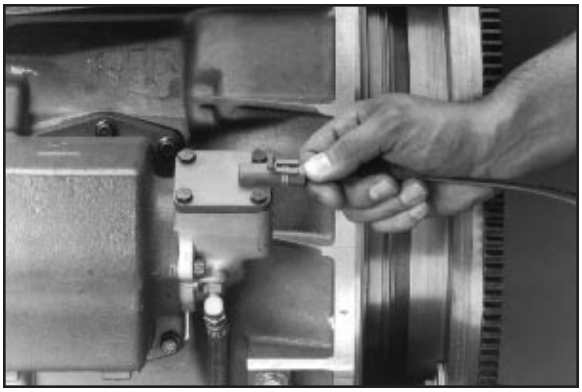
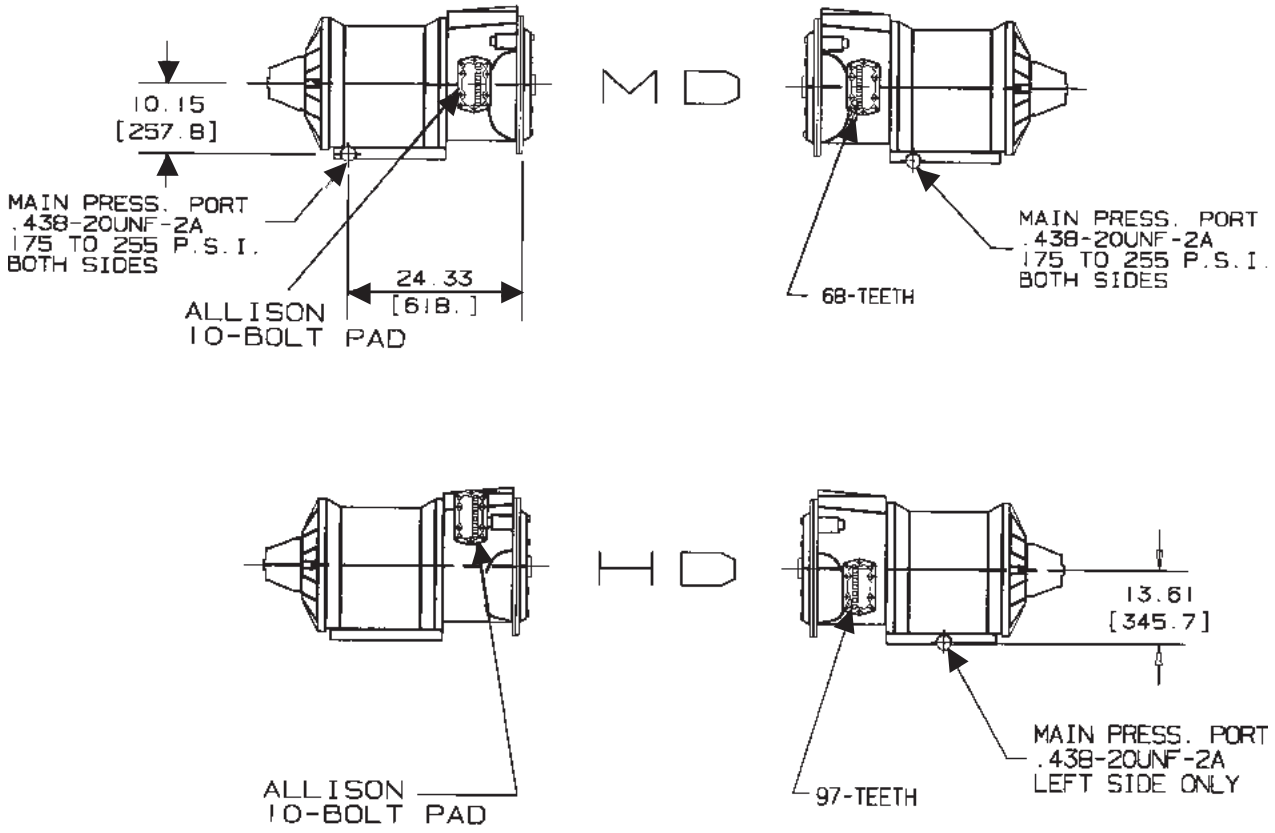


Fig. 12

Pressure Port and Aperture Opening Identification

1. These drawings represent left and right views of the MD and HD pressure ports on the transmission.



Hose Specifications by Transmission

TRANS.	LOCATION	267 Series	277 Series	278 Series	859 Series
MD	L.H. Side (Left Press. Port)	329130-1X	329130-5X	329130-5X	329130-5X
MD	R.H. Side (Right Press. Port)	329130-4X	329075-1X	329075-1X	329075-1X
HD	Top Right (Left Press. Port)	329130-6X	329075-2X	329075-2X	329075-2X
HD	L.H. Side (Left Press. Port)	329130-1X	329130-4X	329075-4X	329130-4X
HD[1,2]	L.H. Side (Left Press. Port)	—	329130-5X	329130-5X	329130-5X
HD[1,2]	Top Right (Right Press. Port)	—	329130-4X	329075-4X	329130-4X
MD[1,2]	L.H. Side (Left Press. Port)	—	329130-5X	329130-5X	329130-5X
MD[1,2]	R.H. Side (Right Press. Port)	—	329075-1X	329075-1X	329075-1X

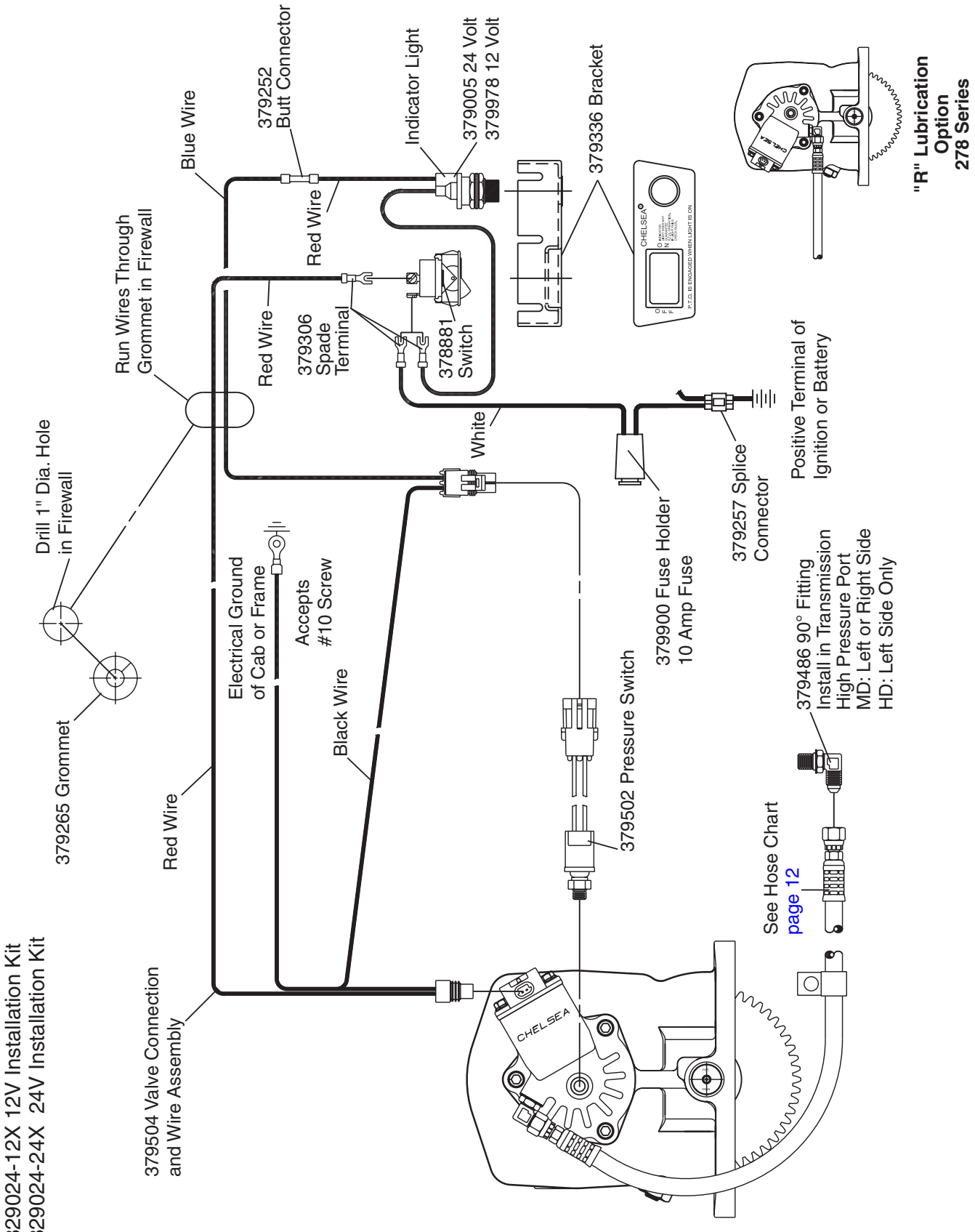
An HD with 2 P.T.O.'s requires a 379556 "T" fitting and a 379703 swivel nut 90 degree elbow to attach 2 hoses to the single port on the left side.

1 Lubrication Option "R", shifter Options "G" and "H" for 277 and 859 Series

2 Lubrication Option "R" for 278 Series

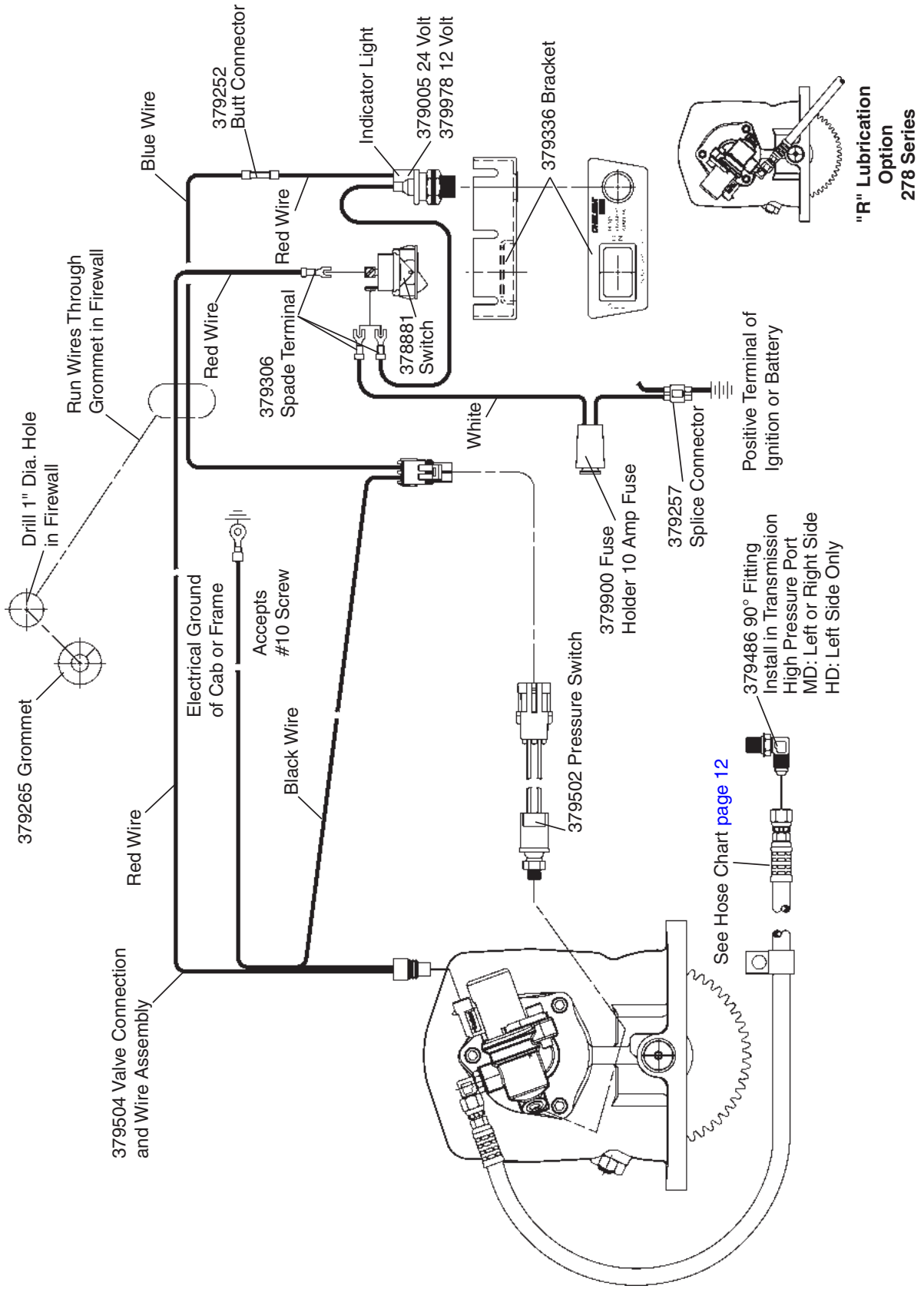
Parker Chelsea
Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Shift Installation Kit 277, 278 & 859 Series without Electronic Overspeed Control (SK-347 Rev C) (Old Style)



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

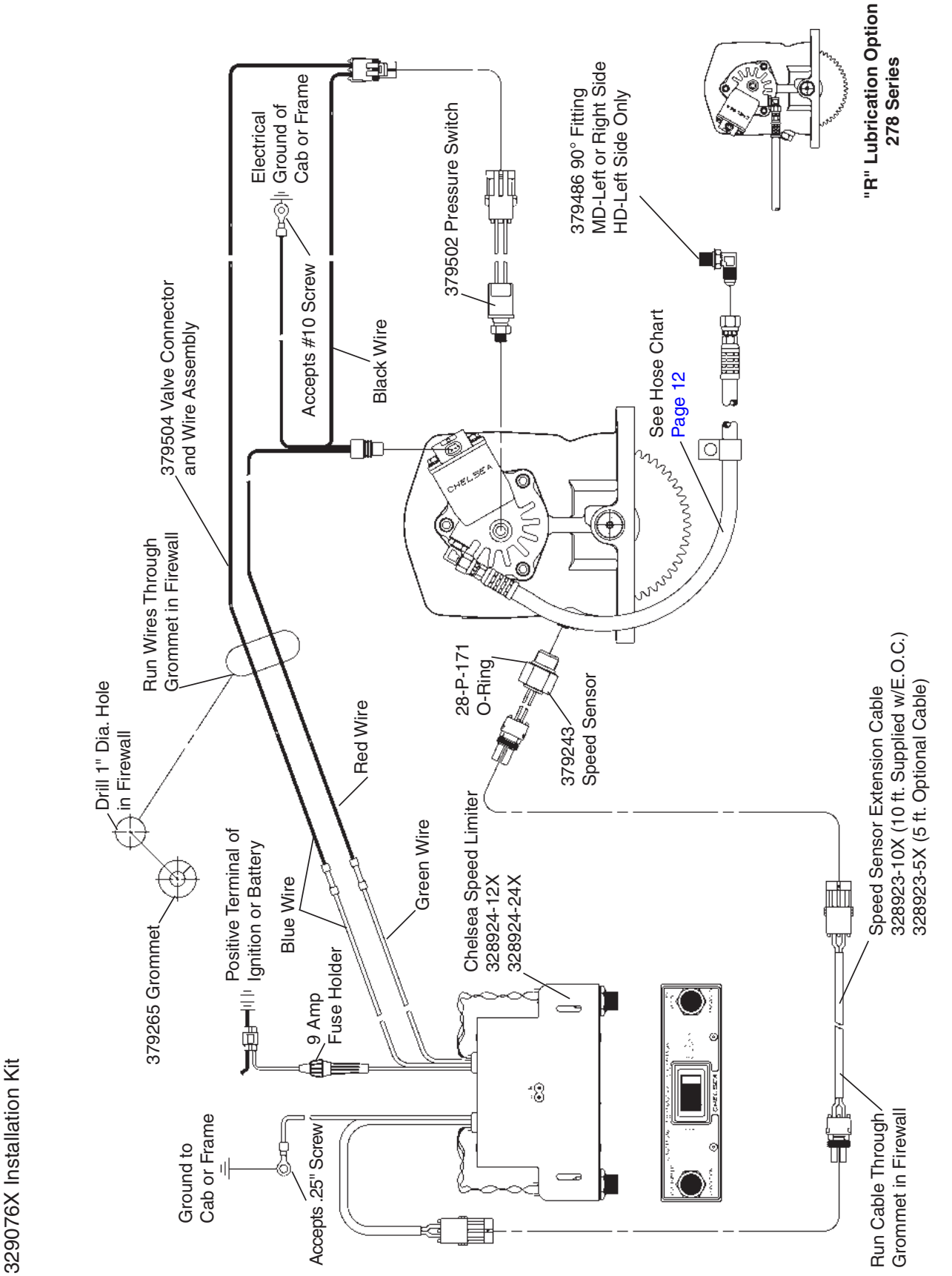
Shift Installation Kit 277, 278 & 859 Series without Electronic Overspeed Control (SK-347 Rev D) (New Style)



329024-12X 12V Installation Kit
329024-24X 24V Installation Kit

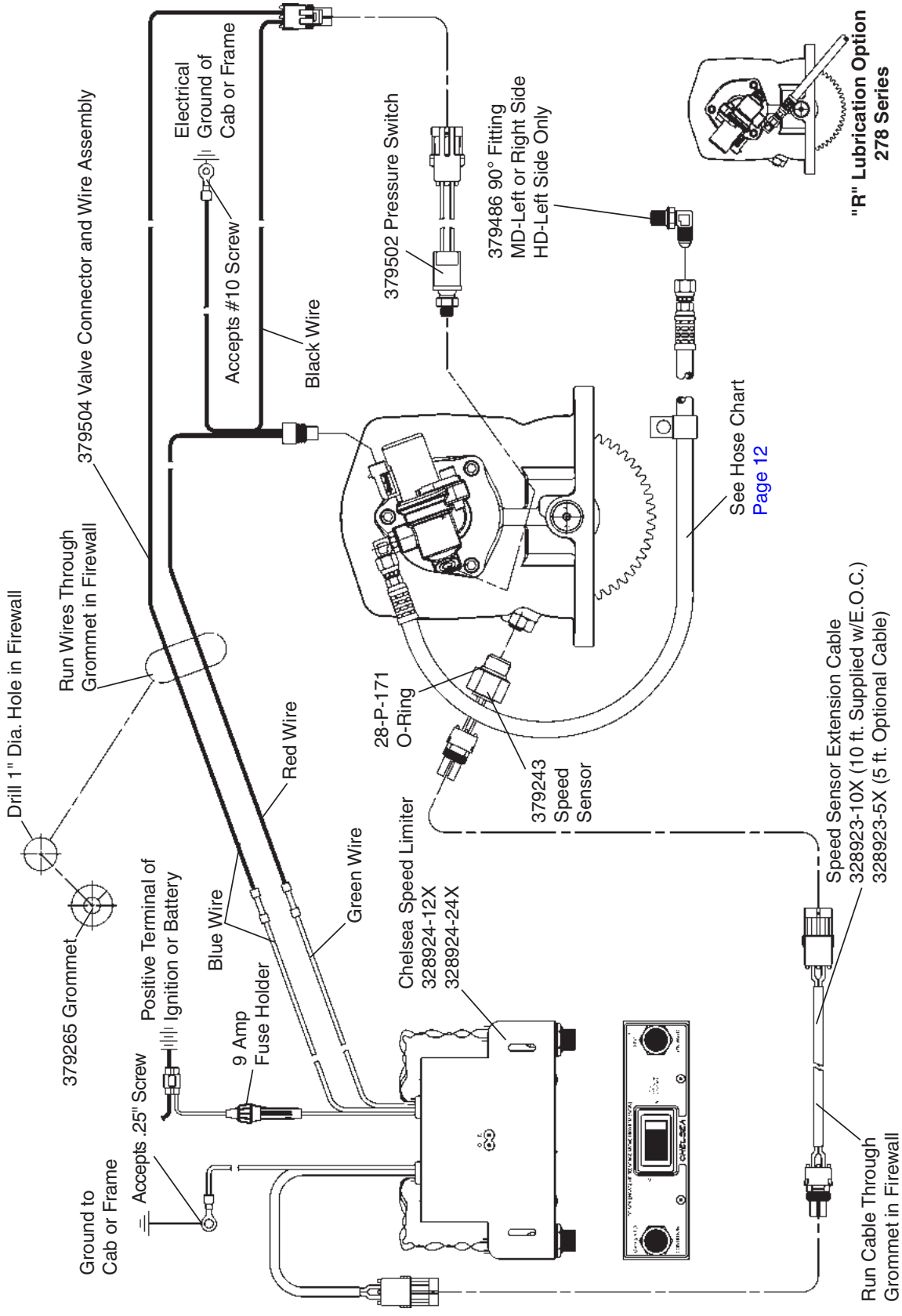
Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Shift Installation Kit 277, 278 & 859 Series with Electronic Overspeed Control (SK-348 Rev B) (Old Style)



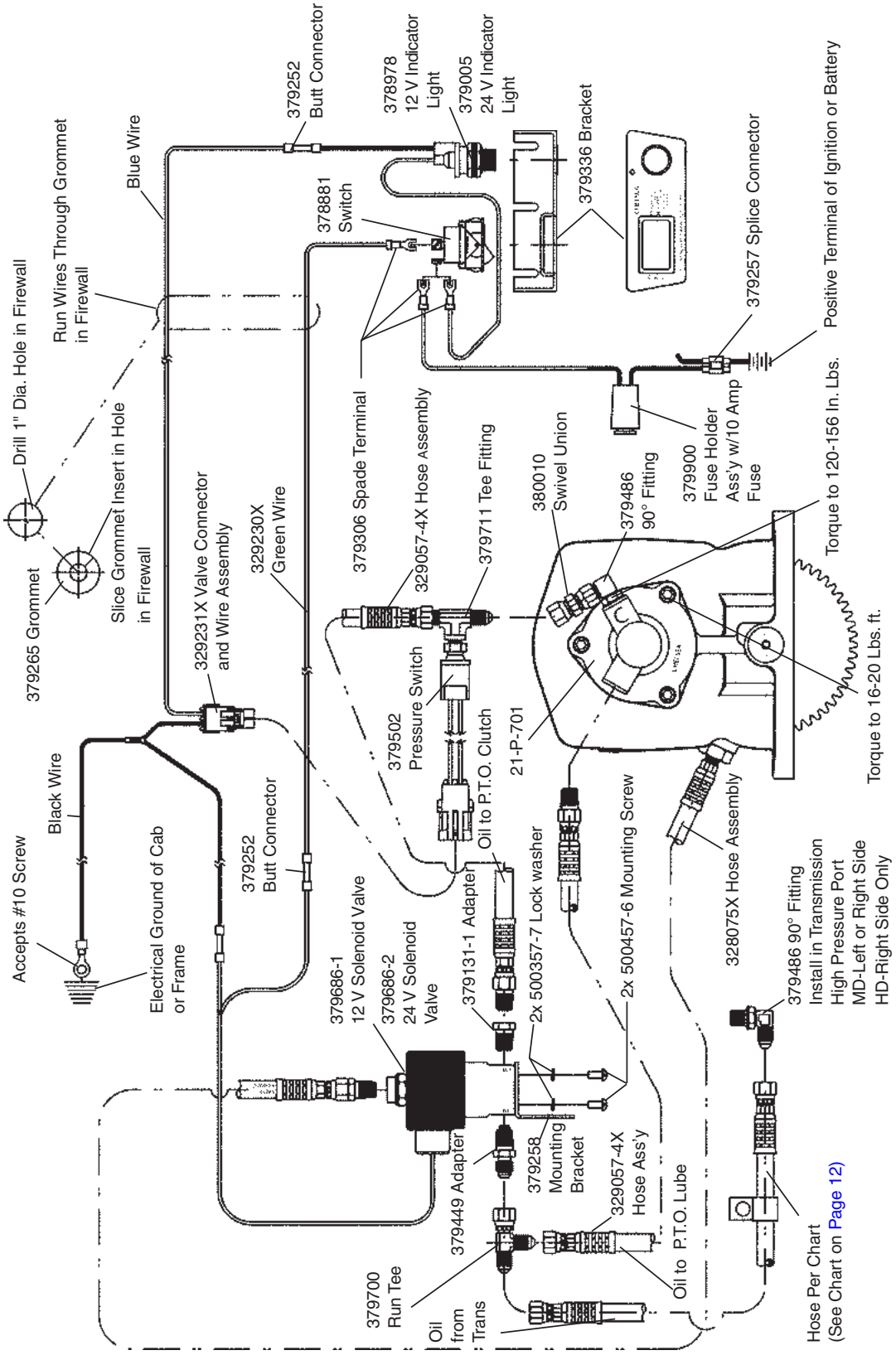
Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Shift Installation Kit 277, 278 & 859 Series with Electronic Overspeed Control (SK-348 Rev C) (New Style)



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Shift Installation Kit 277, 278, & 859 Series with Remote Mount Solenoid (SK-432 Rev B)

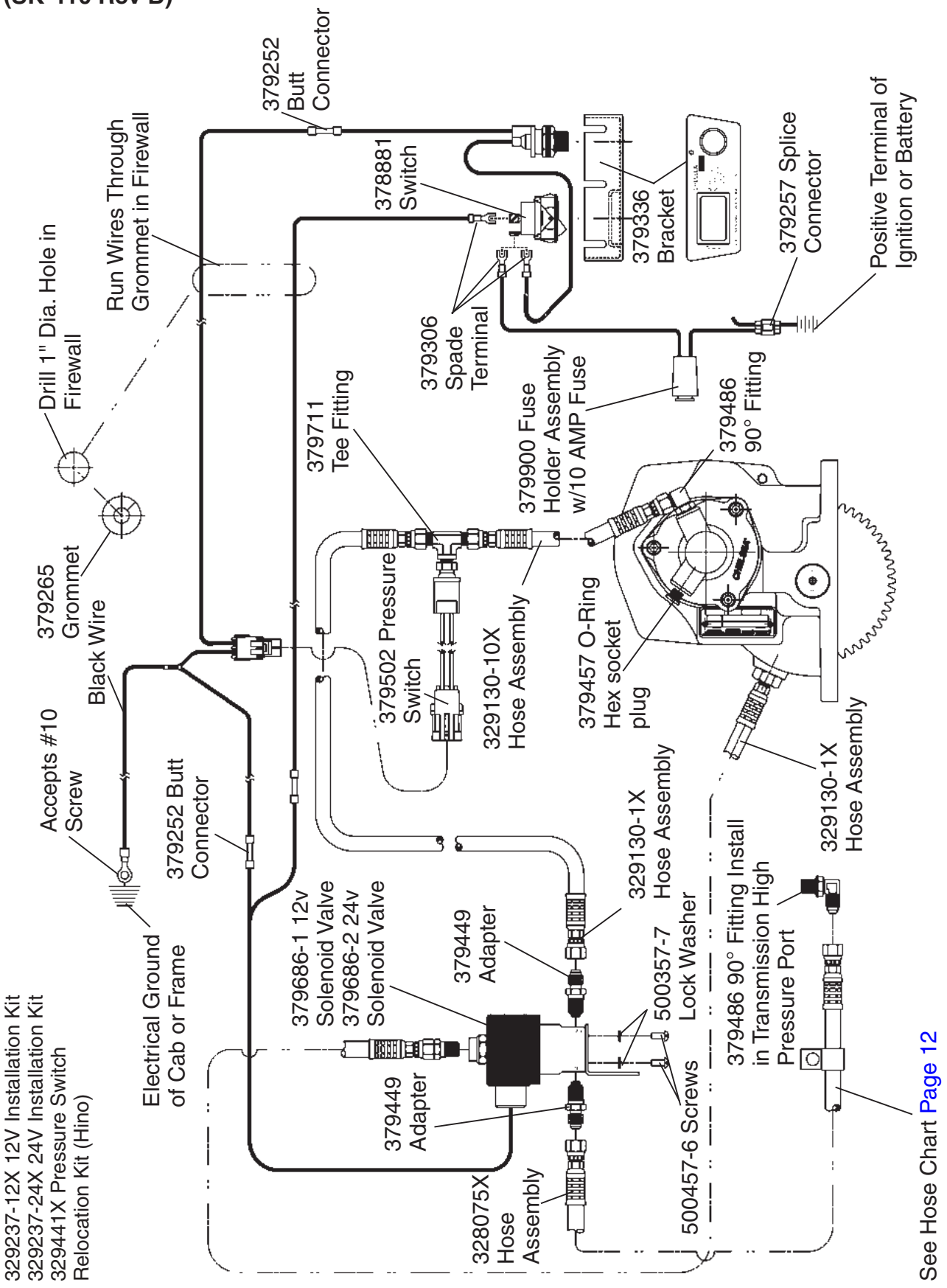


329237-12X 12V Installation Kit
329237-24X 24V Installation Kit

NOTE: This option is not available with nor can it be used on E.O.C. applications.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Shift Installation Kit 277 Series with Remote Mount Solenoid for Hino Model 338 (SK-410 Rev B)



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

GMT C Series Trucks

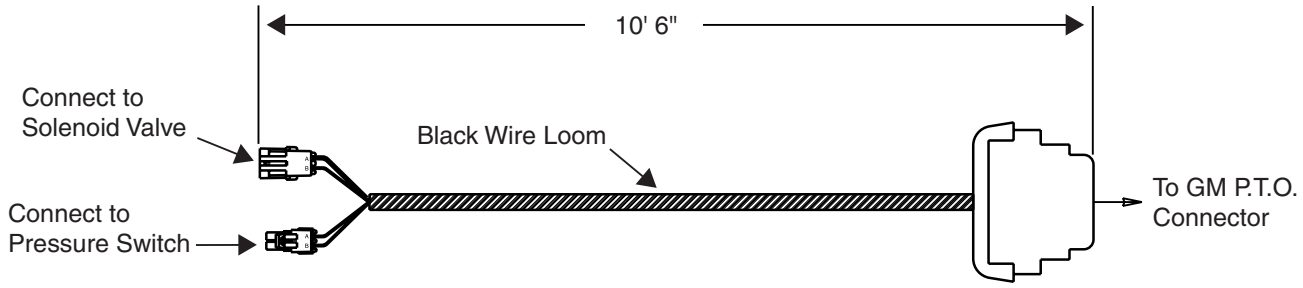
For model year 2003 GM C Series 4500, 5500, 6500, 7500 and 8500 trucks may be equipped with the Allison World (MD) transmission. In these vehicles GM Truck has integrated a P.T.O. connector, located in the right hand engine compartment area. A Power Take-Off switch has also been incorporated into the GM dash panel to control P.T.O. operation. With the P.T.O. option ordered on the truck, the P.T.O. connector and in-dash switch simplify the interface for the body builder.

In order for the customer to utilize the full capability of the P.T.O./transmission, Chelsea has design a wiring harness that must be used between the GM P.T.O. connector and the Chelsea Power Take-Off. These are for P.T.O. Non E.O.C. applications only.

On the Allison World (MD) transmission the P.T.O. drive gear is engine driven. The wiring harness is not "required" for the Power Take-Offs listed on the chart, but must be used if the GM supplied in-dash P.T.O. switch is to be utilized.

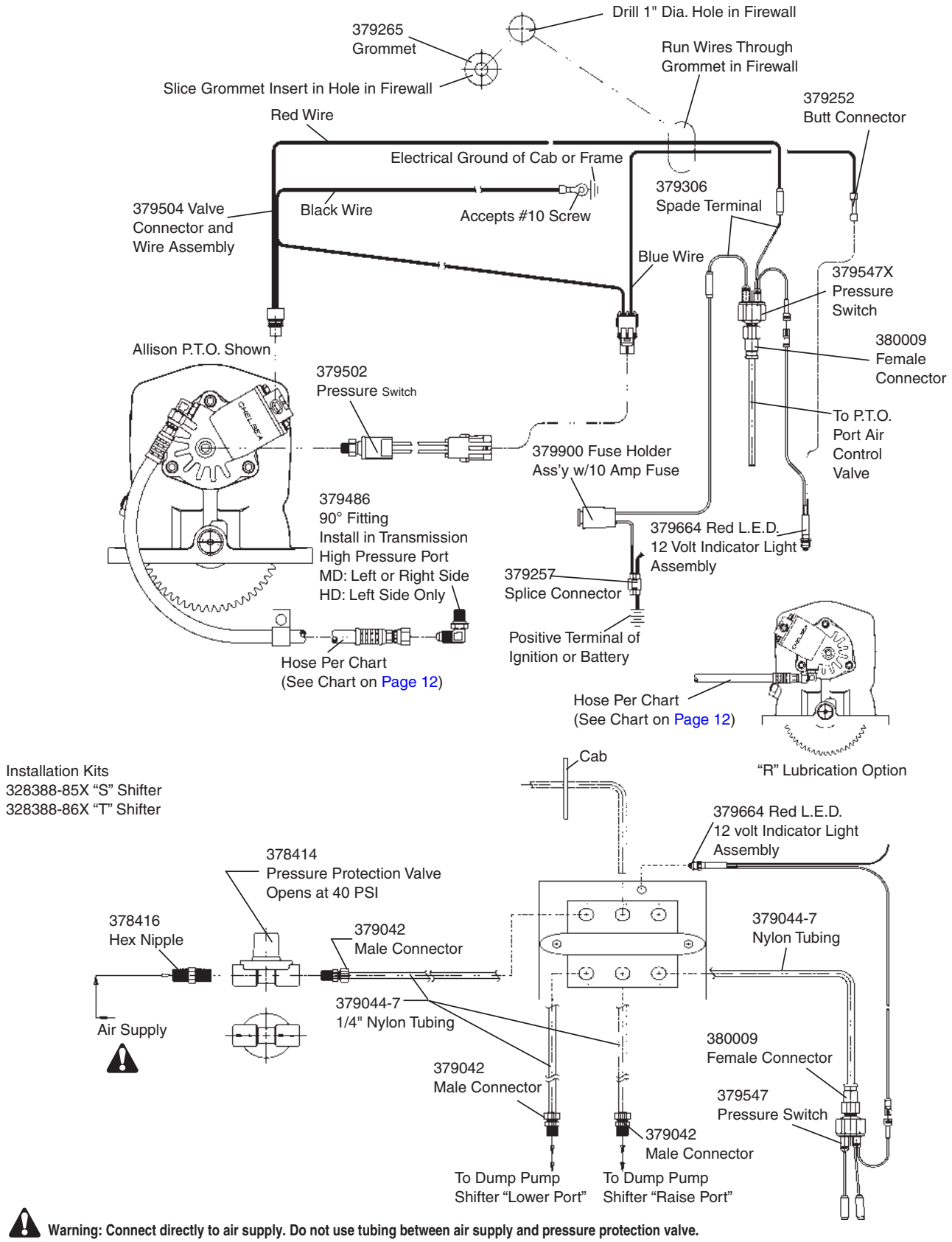
See wiring harness part number 379926 for the 277, 278 and 859 Series Power Take-Offs.

2003 GM "C" Series Wiring Harness for 277, 278 and 859 Series
Part Number 379926



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

P.T.O. Combo Valve Installation Sketch, 277/278 Series (SK-427 Rev B) (Old Style)

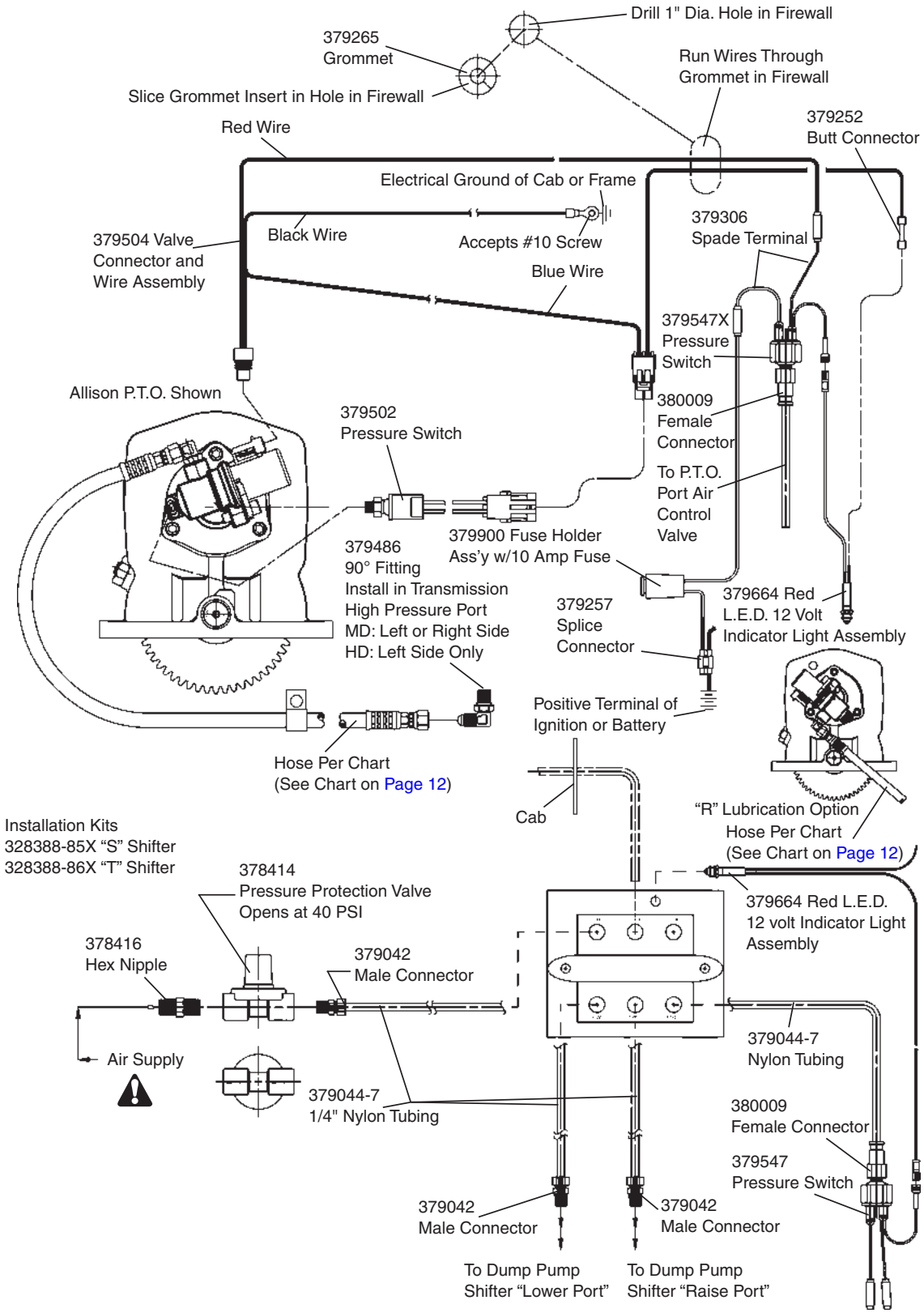


Warning: Connect directly to air supply. Do not use tubing between air supply and pressure protection valve.

Caution: When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

P.T.O. Combo Valve Installation Sketch, 277/278 Series (SK-427 Rev C) (New Style)



Warning: Connect directly to air supply. Do not use tubing between air supply and pressure protection valve.

Caution: When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission

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

1. Remove the P.T.O. aperture plate with a 16mm socket (**Fig. 1**).

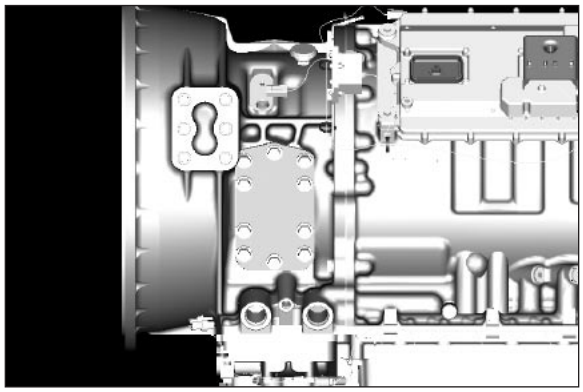


Fig. 1

2. Remove the gasket and clean the aperture surface (**Fig. 2**).

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

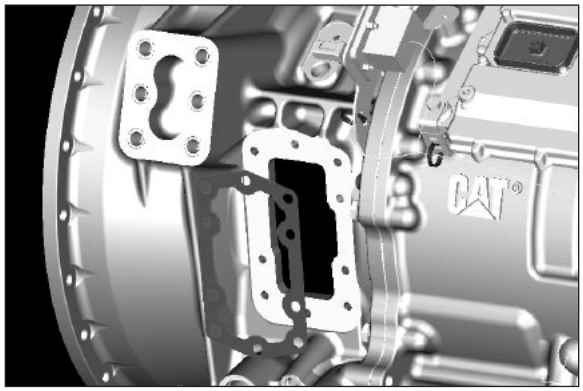


Fig. 2

3. Using a screwdriver, install the guide pins until they bottom out (**Fig. 3**) (see page 34).

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

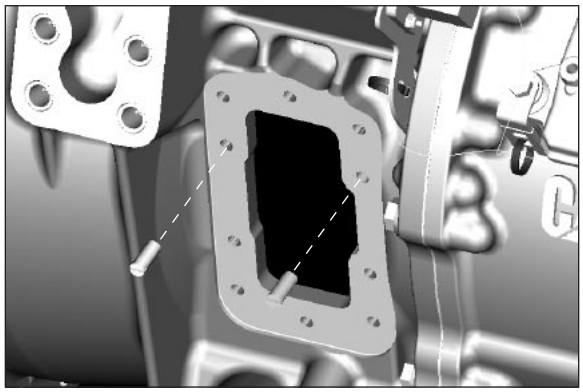


Fig. 3

4. Install the special gasket over the guide pins. The ribbed surface should face outward, toward the installer (**Fig. 4**).

NOTE: To insure proper backlash and sealing of the P.T.O. to the transmission, only use Gasket furnished with the P.T.O.

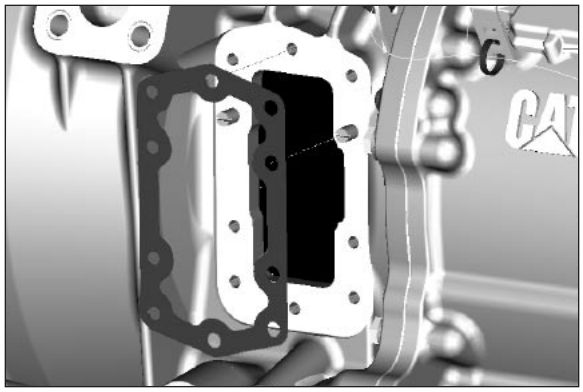


Fig. 4

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission (Continued)

5. Position the P.T.O. and secure it with the top capscrew provided. (**Fig. 5**)

NOTE: Refer to page 34 for proper capscrew installation for the 269 & 278 Series

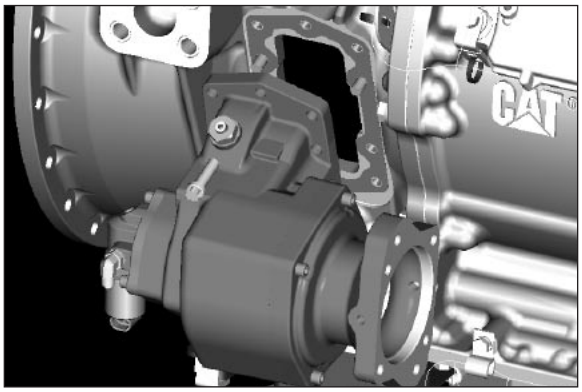


Fig. 5

6. Install the remaining capscrews. Torque them to 37-44 Lbs. ft. [50-60 N.m.] (**Fig. 6**).

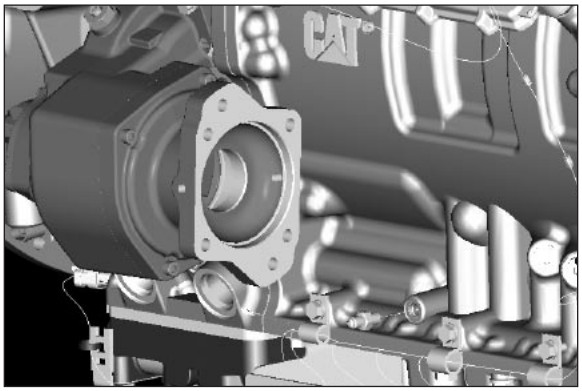


Fig. 6

NOTE: There are two (2) high pressure ports available. Use the port located on the driver's side of the transmission unless there is an interference issue with a pump or driven object (**Fig. 7**).

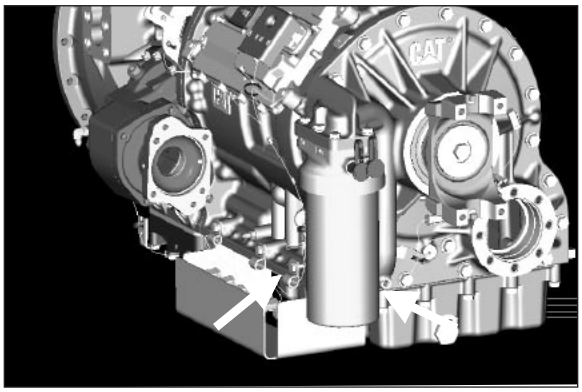


Fig. 7

7. Using the special fitting (379812) to securely attach the high pressure line to the transmission. This fitting is included with the P.T.O. Tighten to 8 - 10 Lbs. ft. [11.0 - 13.5 N.m.] (**Fig. 8**).

   See the hose chart on page 28 for the correct hose specifications. Tighten hose end fitting 2 flats from finger tight

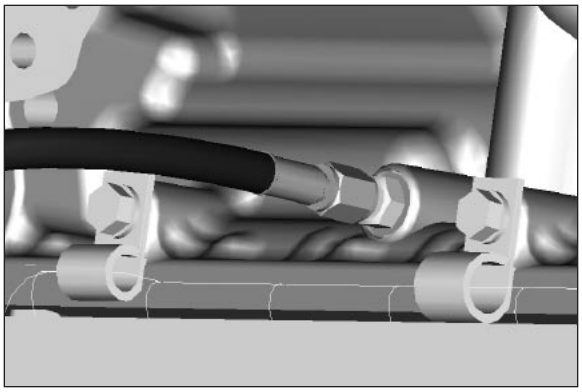


Fig. 8

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Mounting the P.T.O. on the Transmission (Continued)

8. Securely attach the high pressure line to the valve. Tighten hose end fitting 2 flats from finger tight (**Fig. 9**).

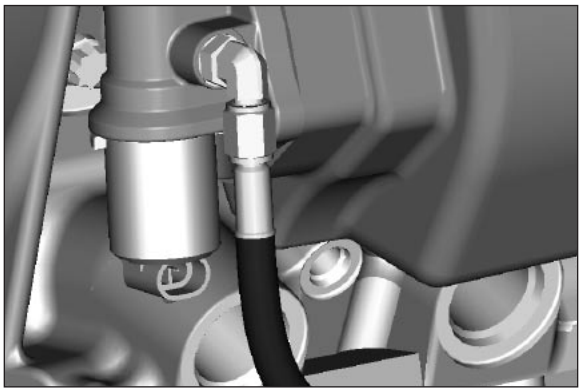


Fig. 9

9. Complete the assembly by installing the electrical connection (**Fig. 10**).

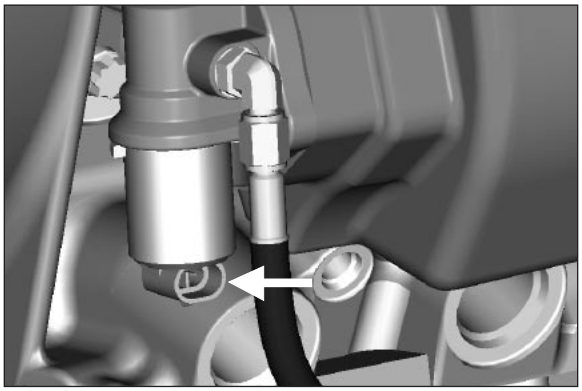
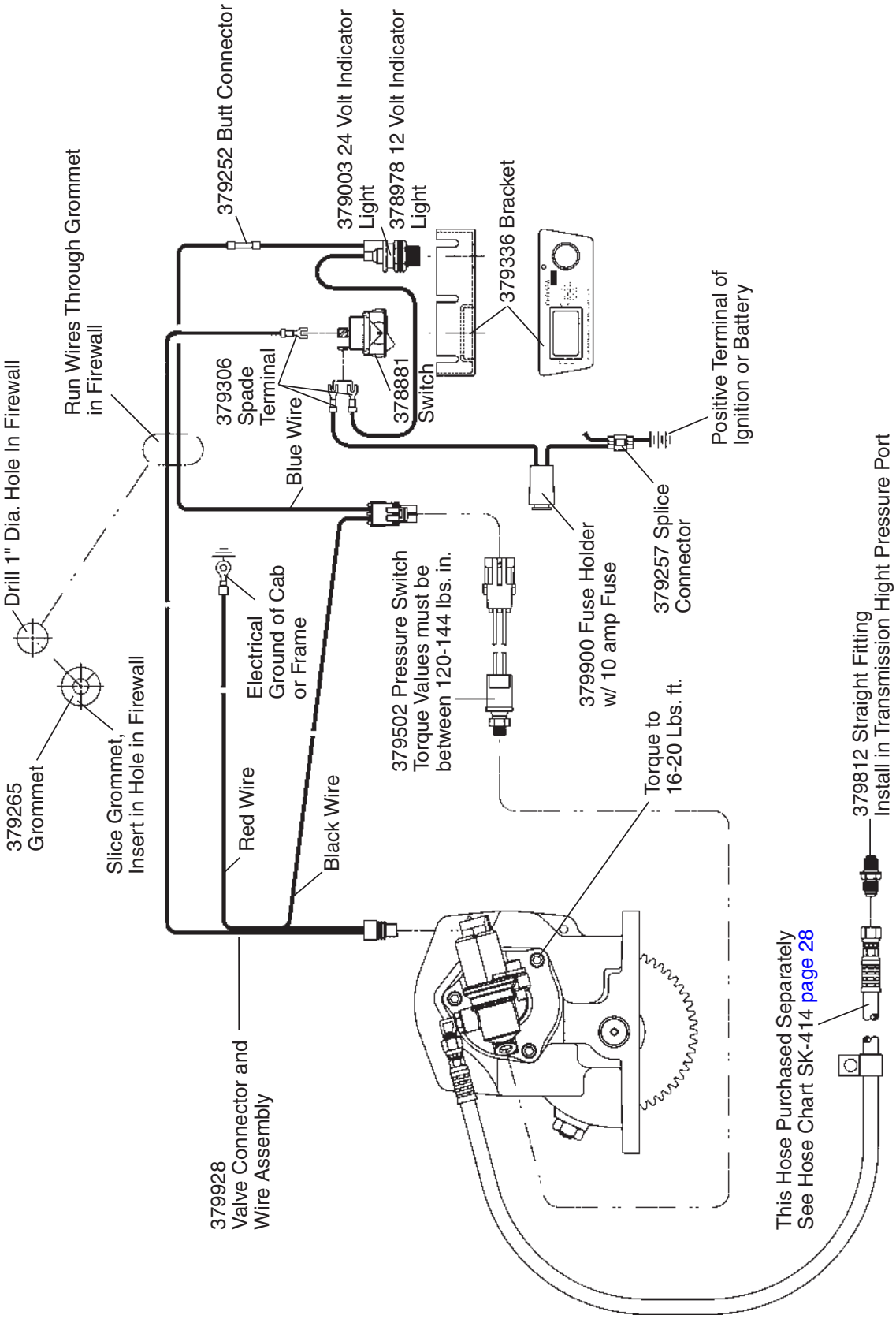


Fig. 10

NOTE: See page 25-27 for electrical connection drawings.

NOTE: If using a rotatable flange, see page 34 for bolt torque.

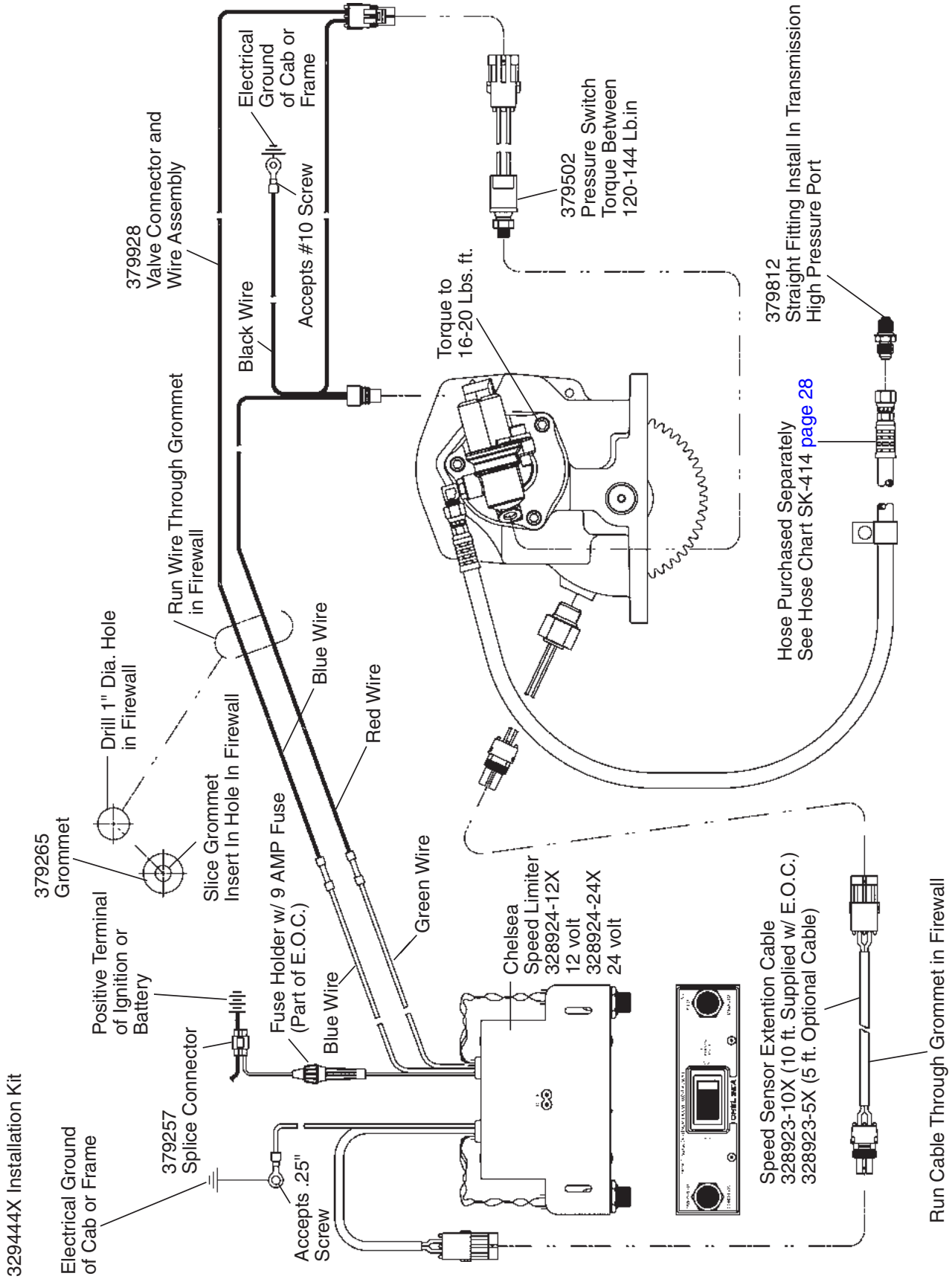
Shift Installation Kit 277, 278 and 859 Series Without Electronic Overspeed Control (SK-411 Rev A)



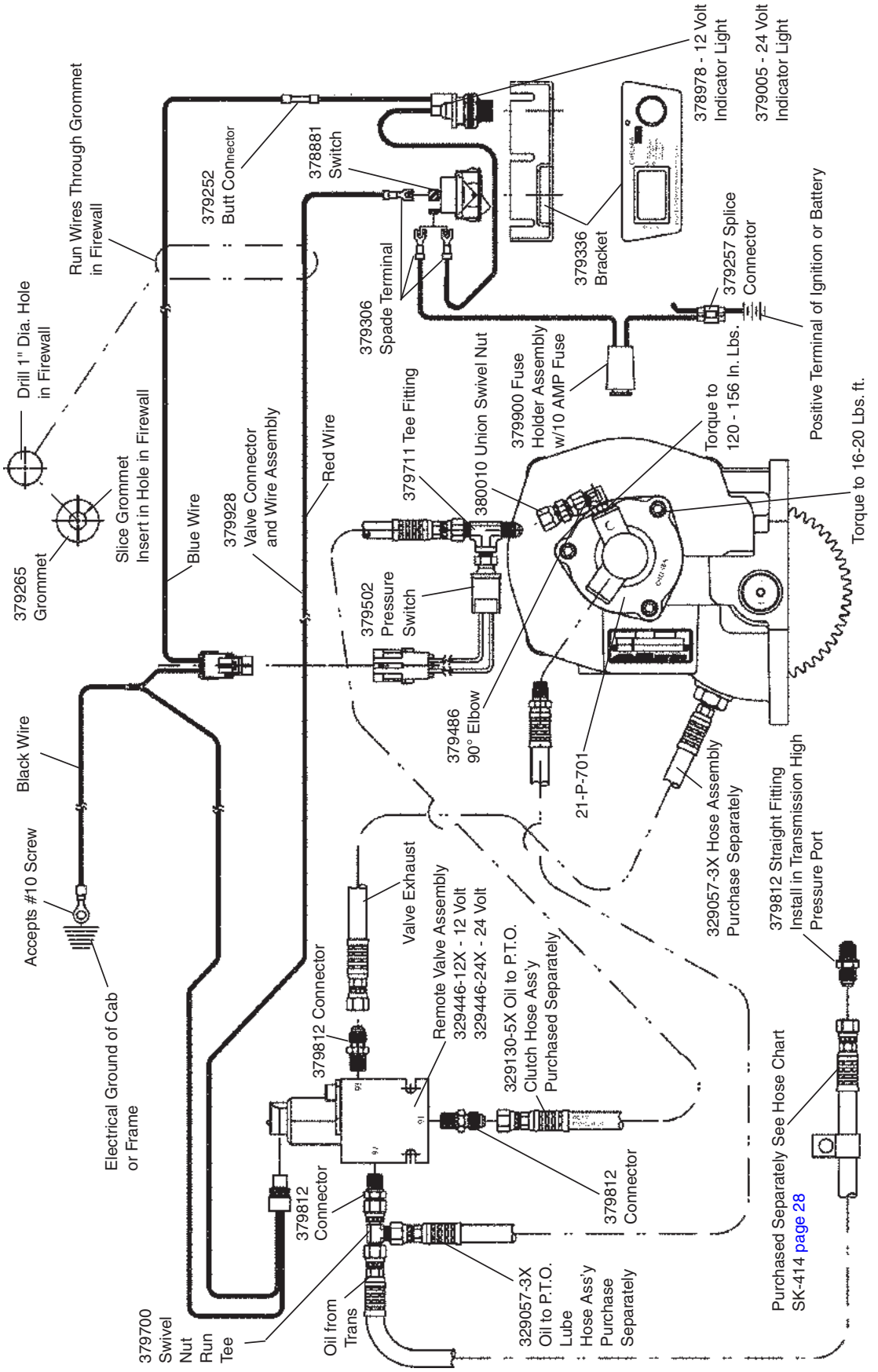
329443-12X - For 12V Installation Kit
329443-24X - For 24V Installation Kit

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Electronic Overspeed Control Installation Sketch for 277, 278 and 859 Series (SK-412 Rev A)



Remote Mount Installation Sketch for 277, 278 and 859 (SK-413 Rev C)

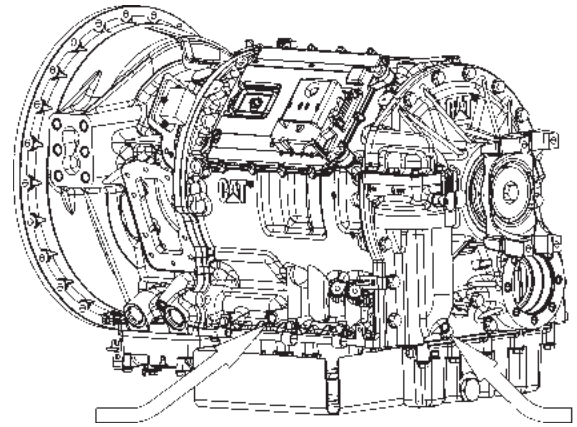


NOTE: This option is not available with, nor can it be used on E.O.C. applications.

329445-12X 12V Installation Kit
329445-24X 24V Installation Kit

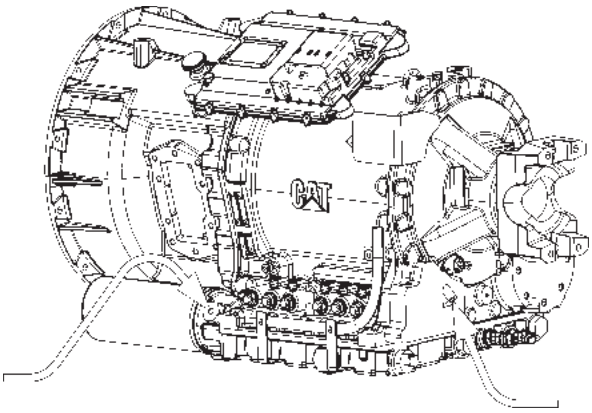
Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Pressure Port Locations & Hose Chart (SK-414 Rev B)



Left Side Port Rear Port

CX31
(Filter Removed for Clarity)



Left Side Port Rear Port

CX28

Both High Pressure Connections are -4 O-Ring Boss

HOSE CHART							
Trans.	**P.T.O.**	**P.T.O. Location**	**High Oil Pressure Location**	**P.T.O. Valve Location**	**P.T.O. Fitting**	**Trans. Fitting**	**Trans.-P.T.O. Valve Hose #**
CX31 CX28	277, 278 859	Driver (LHS)	LHS	Attached	379486	379812	329075-1X
		Driver (LHS)	Rear				329075-5X
		Pass. (RHS)	LHS				329075-2X
		Pass. (RHS)	Rear			379486	329075-5X
		Driver (LHS)	LHS	Remote	379486	379812	329130-6X
		Driver (LHS)	Rear				329130-6X
		Pass. (RHS)	LHS				329130-6X
		Pass. (RHS)	Rear				329130-6X
	267	Driver (LHS)	LHS	N/A	379486	379812	329130-3X
		Driver (LHS)	Rear			379486	329075-5X
		Pass. (RHS)	LHS			379812	329075-2X
		Pass. (RHS)	Rear			379812	329075-5X
	867	Driver (LHS)	LHS	N/A	379486	379812	329130-3X
		Driver (LHS)	Rear				329075-5X
		Pass. (RHS)	LHS				329075-2X
		Pass. (RHS)	Rear			379486	329075-5X

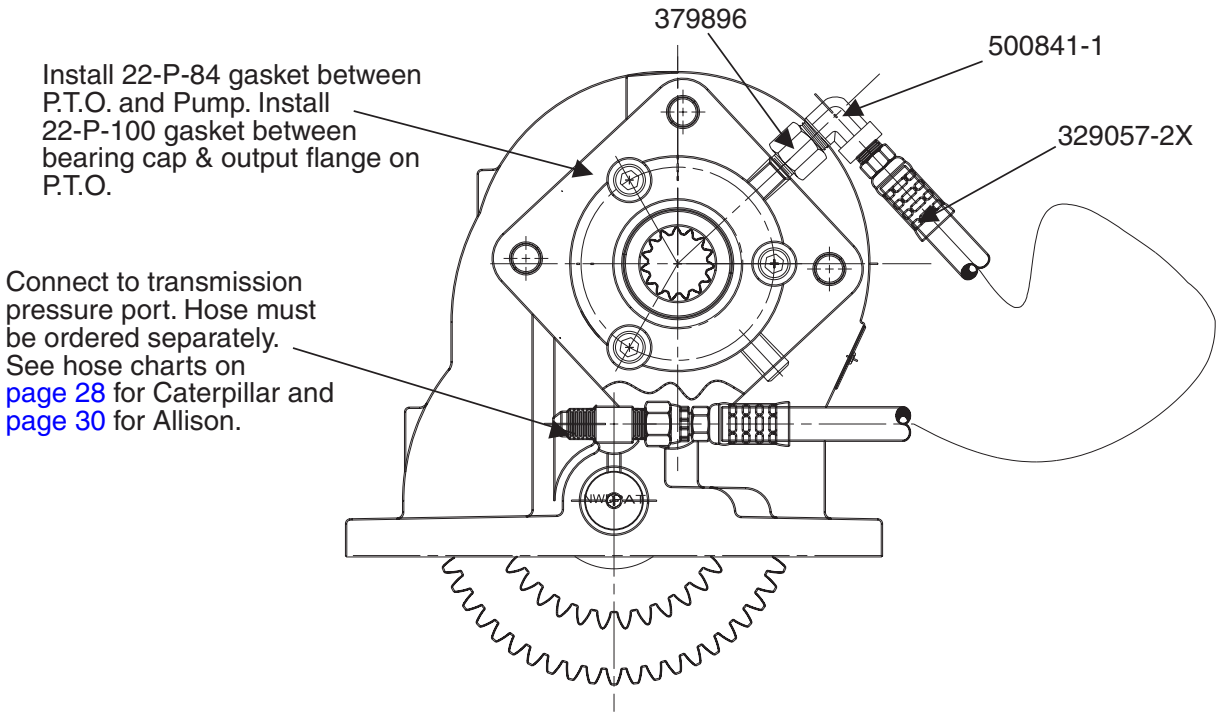
LHS = Left Side of Transmission, 8 o'clock position
RHS = Right Side of Transmission, 1 o'clock position

NOTES:

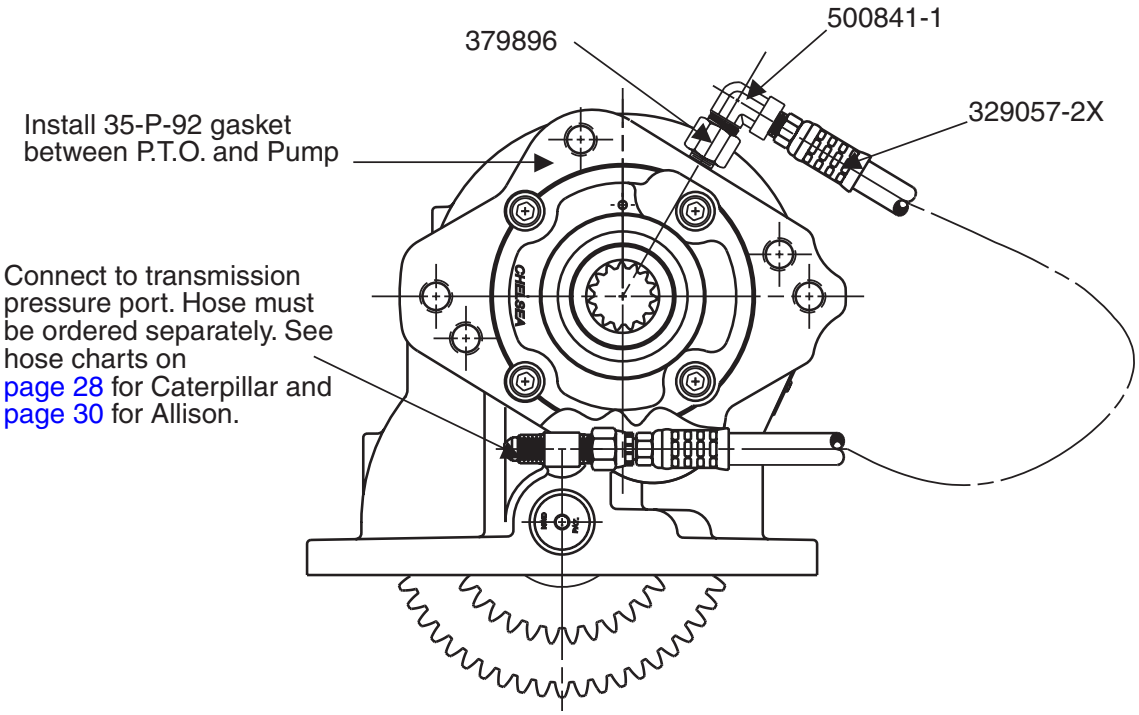
1. P.T.O. Fitting 379486 and Transmission Fitting 379812 included with the P.T.O. Unit. If Using 379486 in Transmission it Must be Purchased Separately
2. Hoses to be Purchased Separately
3. 379486 Elbow Will Not Install on Left Hand (Driver) Side Oil Port Due to Transmission Interference
4. If 379486 is Listed as Transmission Fitting for Rear Location, Route Hose Along Right Hand (passenger) Side of Transmission and Under Transmission Output Yoke

CAUTION: Wet Spline Options Must be used with a Pump that has a Contiguous Sealing surface to Ensure a proper seal between Pump and P.T.O.

Installation "RY" Wet 267 Series (SK-351 Rev C)



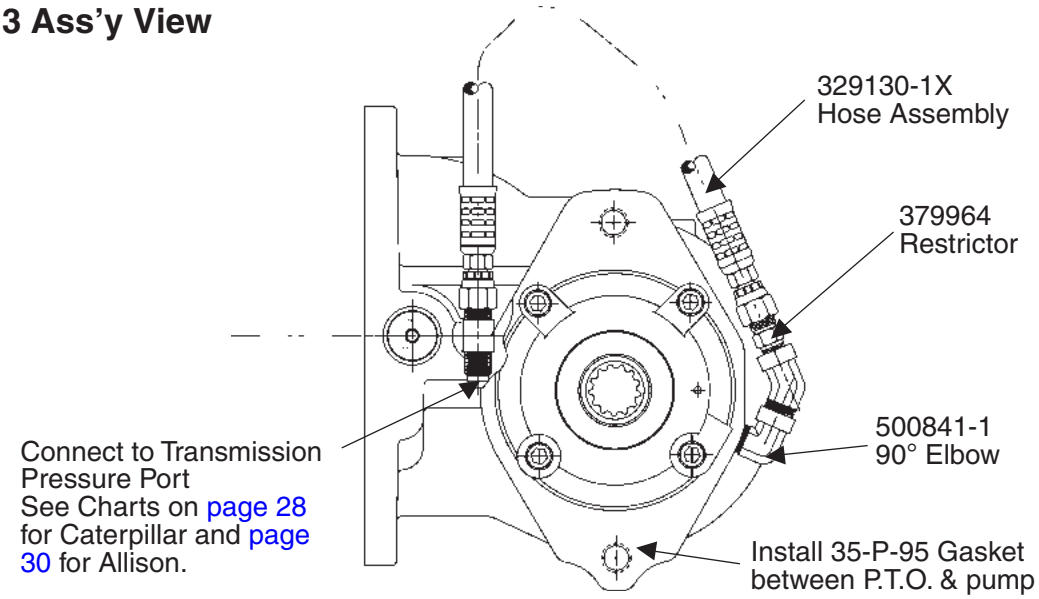
Installation "AF" Wet Spline 267 Series (SK-350 Rev C)



Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

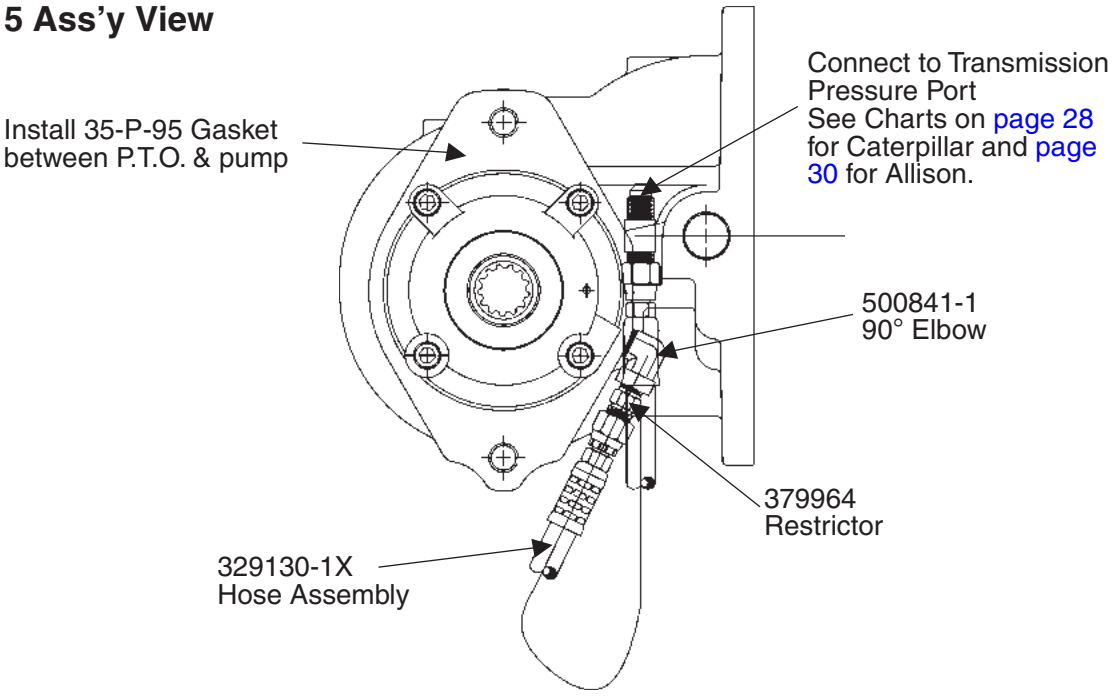
Installation "AK" Wet Spline 267 Series (SK-378 Rev A)

3 Ass'y View



Kit #329406X for Wet Spline
Installation Components

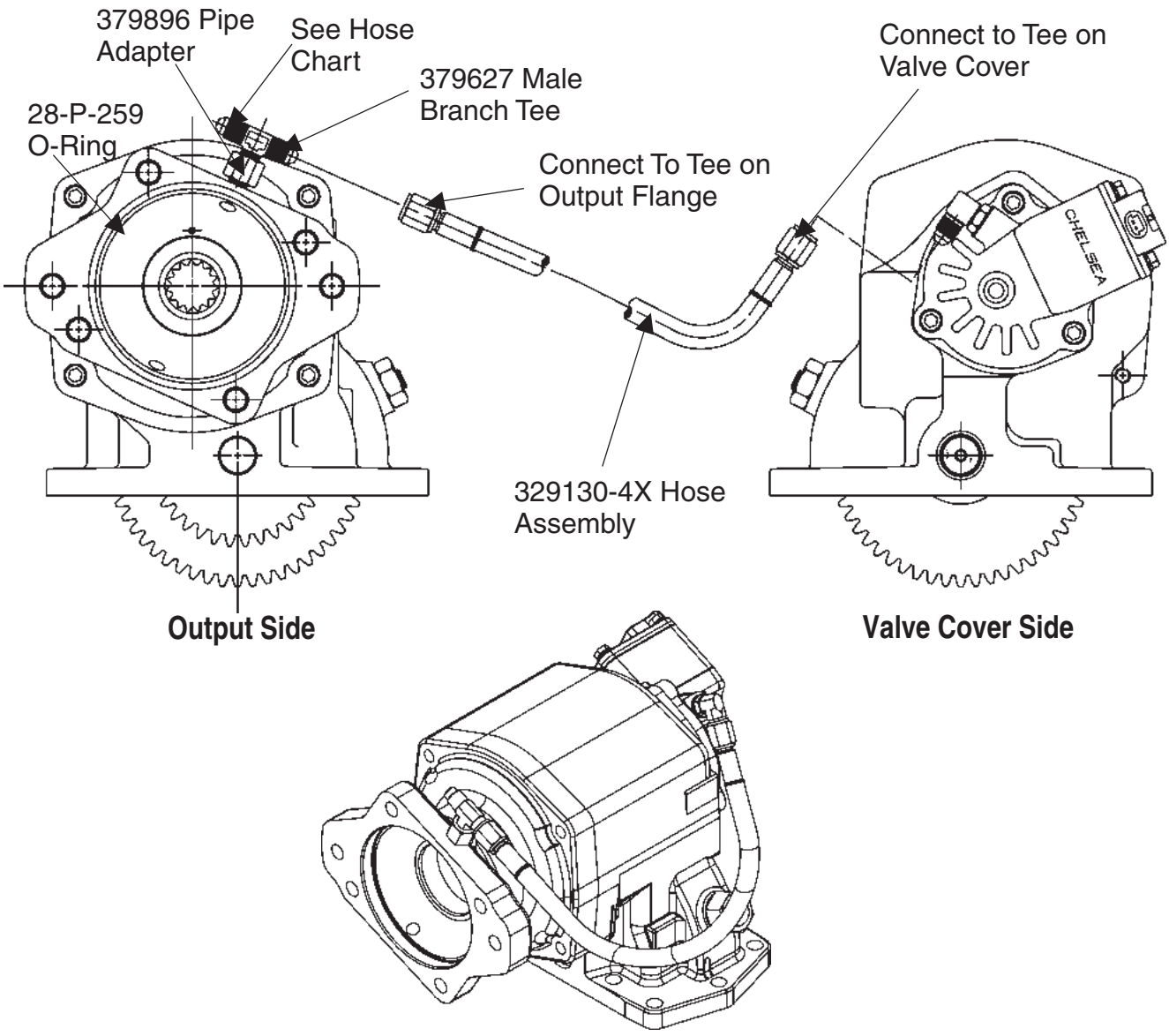
5 Ass'y View



Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-5X
MD	Right	329130-4X
HD	Left	329130-5X
HD	Top Right	329130-8X

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

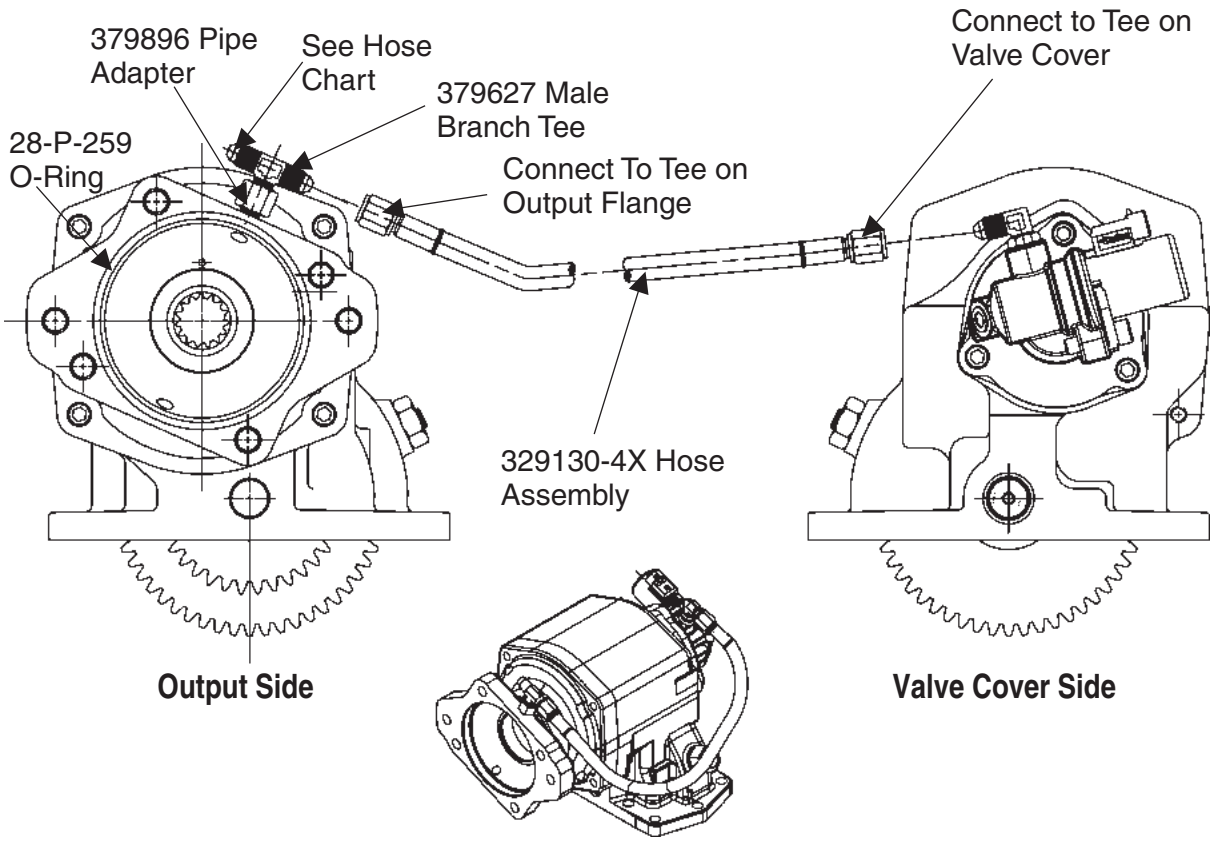
Installation "AF" Wet Spline 277 & 278 Series (SK-383 Rev B) (Old Style)



Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-1X
MD	Right	329075-1X
HD	Left	329130-1X
HD	Right	329075-2X

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

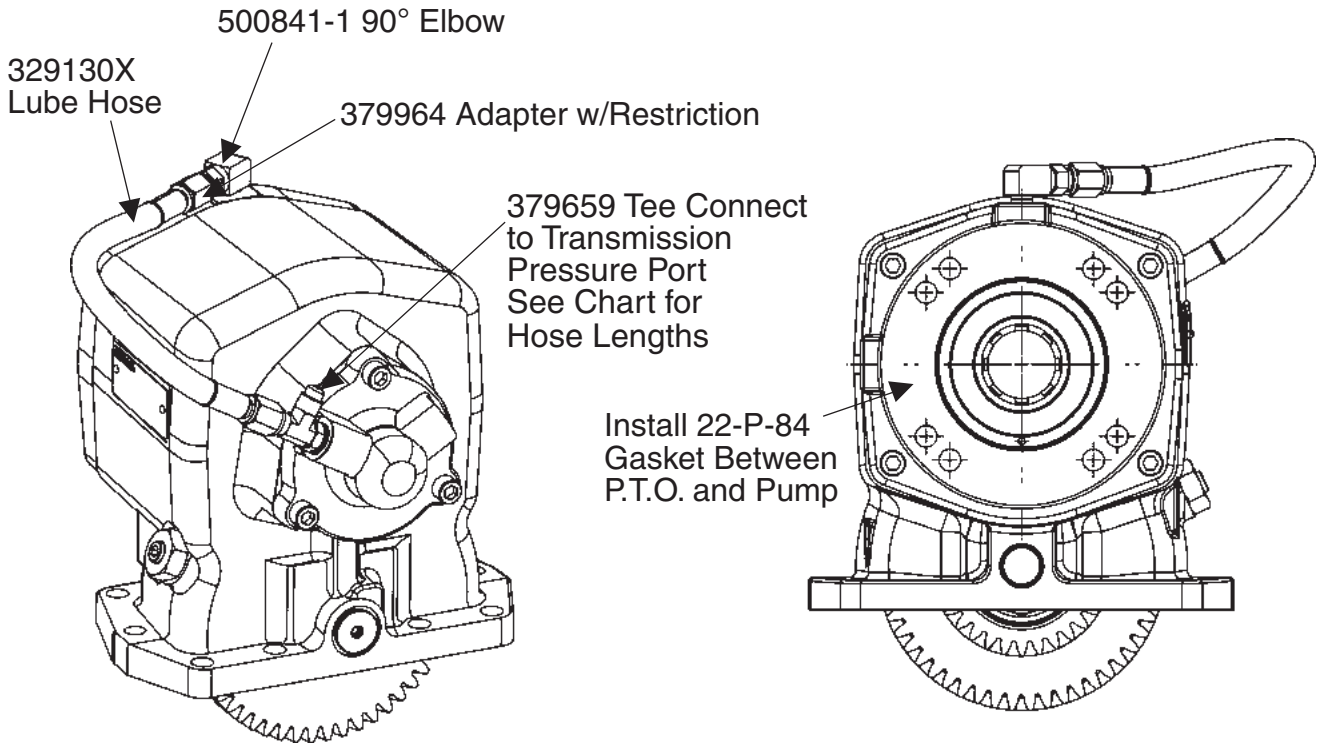
Installation "AF" Wet Spline 277 & 278 Series (SK-383 Rev C) (New Style)

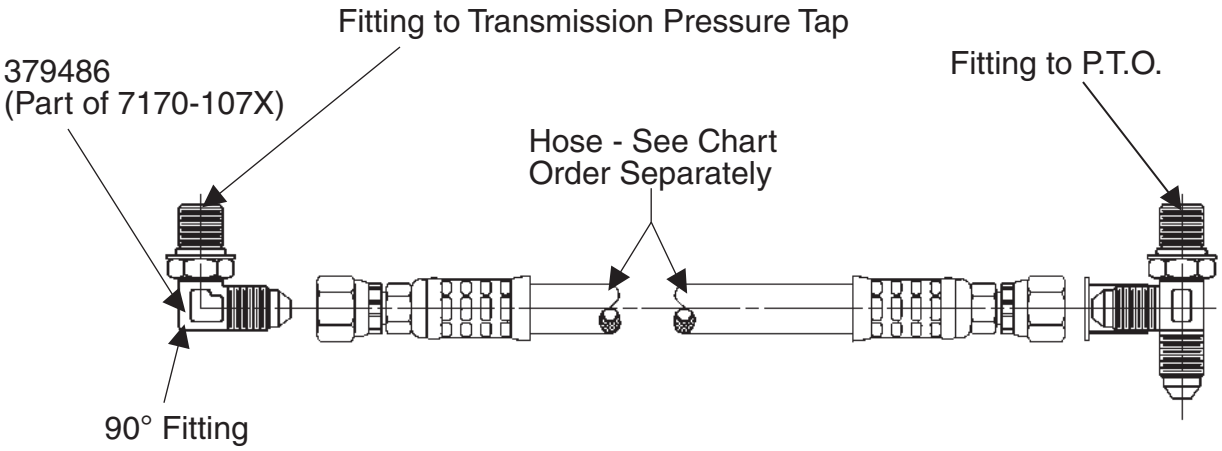


Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-1X
MD	Right	329075-1X
HD	Left	329130-1X
HD	Right	329075-2X

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Installation "XY" Wet Spline 269 Series (SK-416 Rev B)

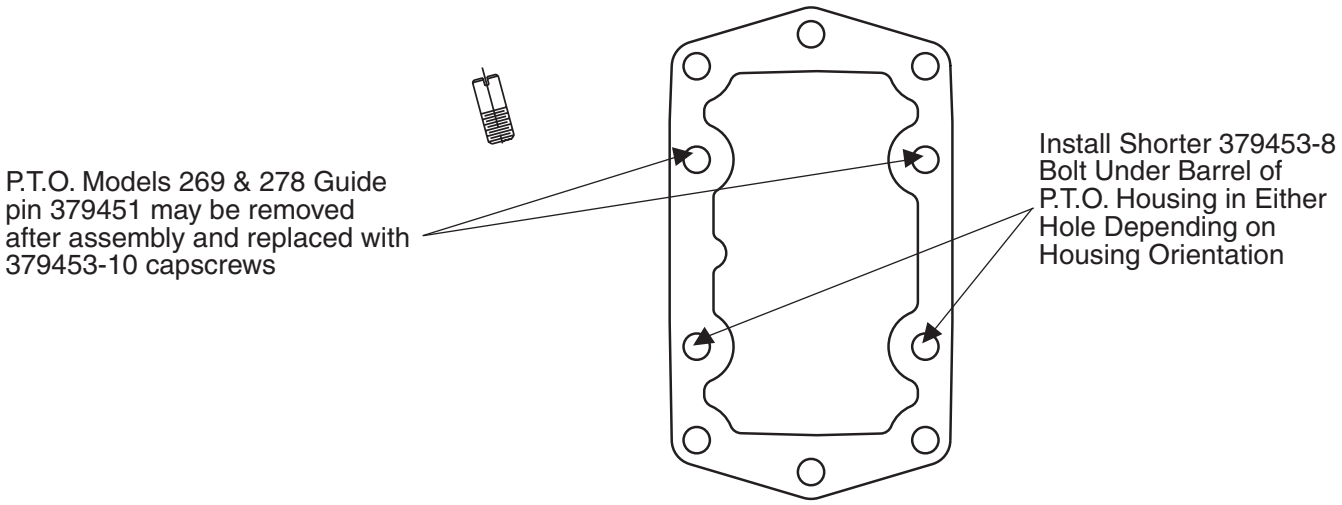




Pressure Hose Chart (Transmission to P.T.O.)		
Trans	**Location**	**Hose**
MD	Left	329130-5X
MD	Right	329075-1X
HD	Left	329075-4X
HD	Top Right	329075-2X

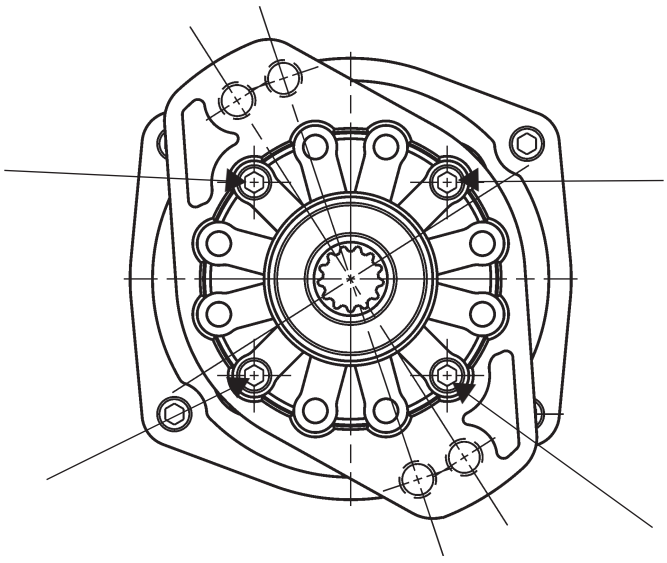
Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

269 & 278 Series Installation Mounting Kit Instructions (SK-355 Rev A)



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. Bag kit number 328170-207X (6-bolt family) will contain (3) capscrews (378447-6) and 328170-208X (277 Series) will contain (4) capscrews for attaching the flange to the P.T.O. bearing cap.
After installing the capscrews make sure to torque the screws to 16-20 Lbs. ft.
Consideration should be taken on the size and weight of the pump being installed. (see pages 3 and 4)



RA Flange Shown

NOTE: Reinstalling or tightening of a rotatable flange after it has become loose is not recommended. If a P.T.O. has run for a length of time after the flange has become loose, the flange and / or bearing cap may not be to manufacturing tolerance.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

P.T.O. Shifting Procedure & Precautions

CAUTION: This vehicle is equipped with a Power Take-Off. Shut engine off before working on the Power Take-Off or getting below the vehicle. Consult the operating instructions before using the P.T.O. (See sun visor.)

POWER TAKE-OFF OPERATION — VEHICLE STATIONARY

Automatic Transmission with Powershift P.T.O.s

Engage the P.T.O. with the engine at idle speed.

NOTE: Powershift P.T.O.s: The engine must be at idle or below 1000 R.P.M. when the P.T.O. is engaged. See the transmission manufacturer's instructions for special procedures.

IMPORTANT:

Failure to follow the proper shifting or operating sequences will result in premature P.T.O. failure with possible damage to other equipment.

Warning: Cold Weather Operation of Powershift P.T.O.s

During extreme cold weather operation [32° F (0° C) and lower], a disengaged Powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag quickly decreases.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment, resulting in serious personal injury, death, or equipment damage.

To avoid personal injury or equipment damage:

- Driven equipment must have separate controls.
- Driven equipment must be left in the disengaged position when not in operation.
- Driven equipment must not be operated until the vehicle is allowed to warm up.

This symbol warns of possible personal injury.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Notes

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Notes

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Power Take-Off Maintenance

Due to the normal and sometime severe torsional vibrations that Power Take-Off units experience, operators should follow a set maintenance schedule for inspections. Failure to service loose bolts or Power Take-Off leaks could result in potential auxiliary Power Take-Off or transmission damage.

Periodic P.T.O. MAINTENANCE is required by the owner/operator to ensure proper, safe and trouble free operation.

Daily: Check all air, hydraulic and working mechanisms before operating P.T.O. Perform maintenance as required.

Monthly: Inspect for possible leaks and tighten all air, hydraulic and mounting hardware, if necessary. Torque all bolts, nuts, etc. to Chelsea specifications. Insure that splines are properly lubricated, if applicable. Perform maintenance as required.

With regards to the direct mounted pump splines, the P.T.O. requires the application of a specially formulated anti-fretting, high pressure, high temperature grease. The addition of the grease has been proven to reduce the effects of the torsional vibrations, which result in fretting corrosion on the P.T.O. internal splines as well as the pump external splines. Fretting corrosion appears as a "rusting and wearing" of the pump shaft splines. Severe duty applications, which require long P.T.O. running times and high torque may require more frequent regreasing. Applications such as Utility Trucks that run continuously and are lightly loaded also require frequent regreasing due to the sheer hours of running time. It is important to note that service intervals will vary for each and every application and is the responsibility of the end user of the product. Chelsea also recommends that you consult your pump owners manuals and technical services for their maintenance guidelines. Fretting corrosion is caused by many factors and without proper maintenance; the anti-fretting grease can only reduce its effects on components.

Chelsea offers the grease to our customers in two packages. The first is a 5/8 fluid ounce tube (379688), which is included with every applicable P.T.O., and the second is a 14-ounce grease cartridge (379831). Chelsea also offers greaseable shafts for most all output designators.

Warranty: Failure to comply entirely with the provisions set forth in the appropriate Owner's Manual will result in voiding of ALL Warranty consideration.

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors 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 such items, 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. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. 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 items sold hereunder shall be free from defects in material or workmanship for a period of:

(A) All Power Take-Off units one (1) year from date of installation.

(B) Except 267, 277, 278, 242, 244, 246, 250, 251 and 859 series two (2) years from date of installation. **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 BUYER'S 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, CONSEQUENTIAL 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 ITEMS 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 there/to. 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.

1/06-P

Parker Chelsea

Parker Hannifin Corporation
Chelsea Products Division
Olive Branch, MS 38654 USA

Parker Hannifin Corporation
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, Mississippi 38654 USA
Tel: (662) 895-1011
Fax: (662) 895-1019
www.parker.com/chelsea

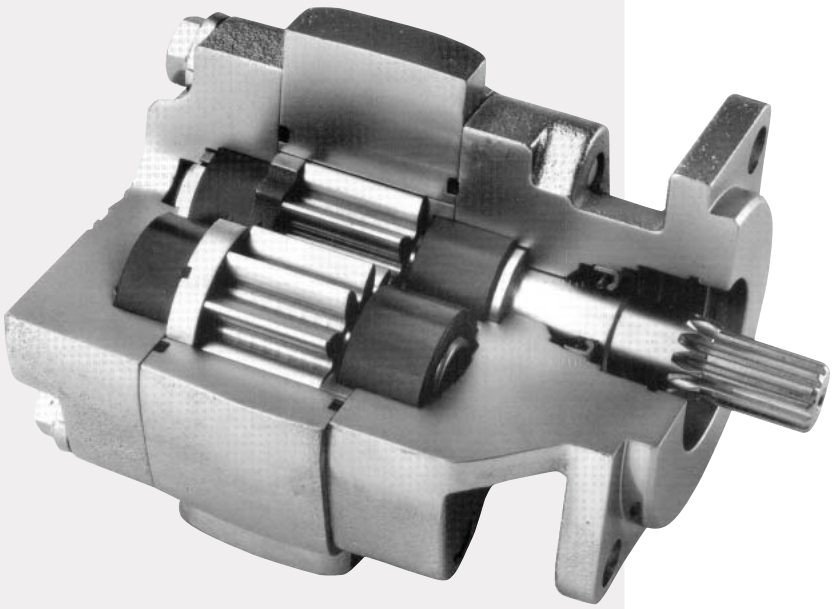
FP 06/08 12M

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.

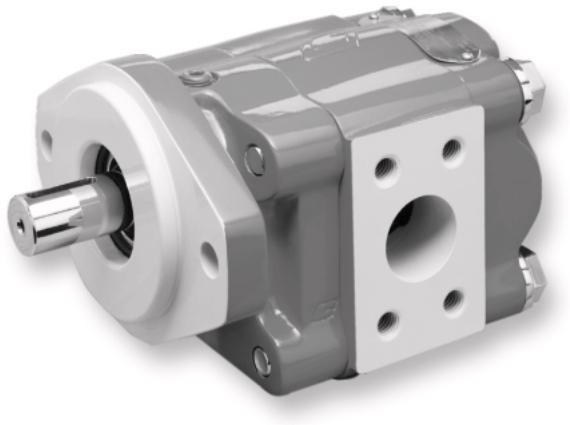
The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

Index



Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

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.

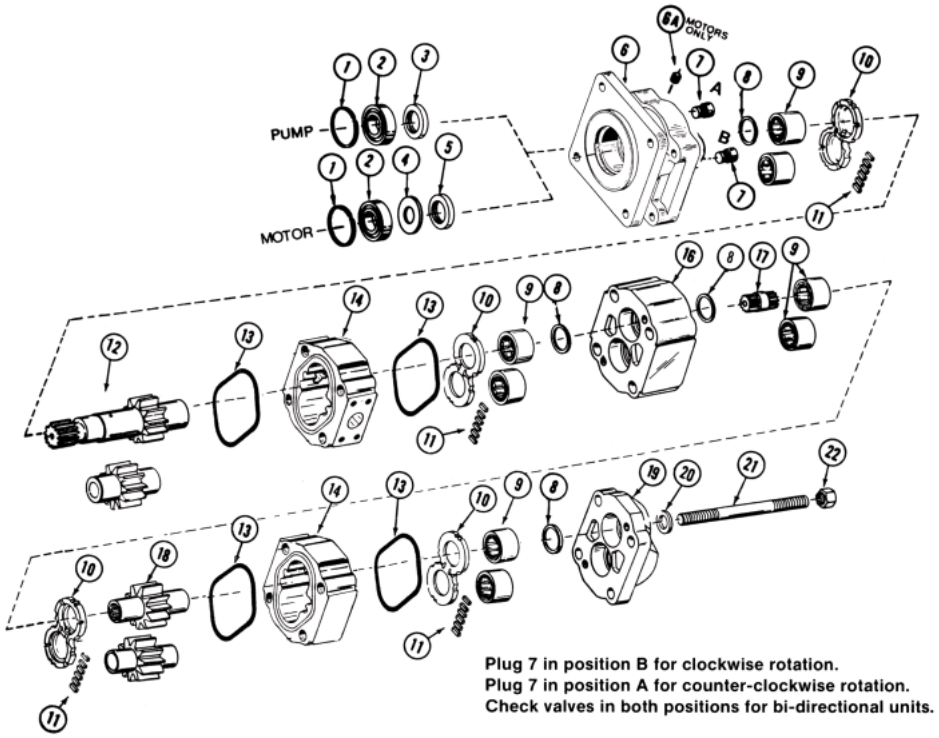
4) Gears are closely matched, therefore, they must be kept together as a set when removed from the unit. Handle with care to avoid damage to the journals, faces and teeth.

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



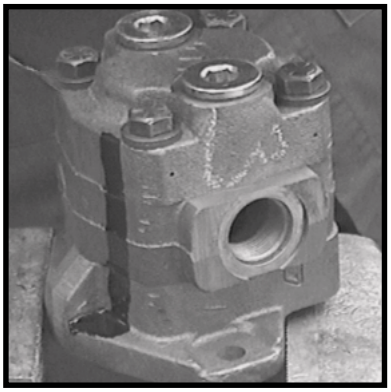
Plug 7 in position B for clockwise rotation.
Plug 7 in position A for counter-clockwise rotation.
Check valves in both positions for bi-directional units.

PGP020™ Disassembly Instructions

STEP 1

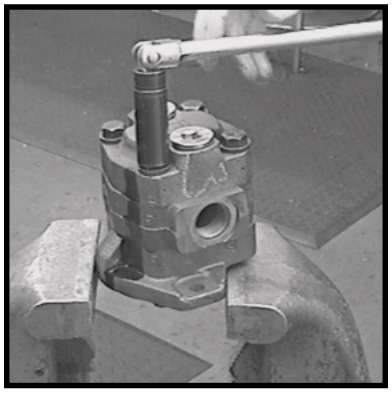
Place the pump in a vise with the drive shaft pointing down. Clamp unit on the sides of the mounting flange. Do not clamp on the pilot diameter as it may damage the sealing surface.

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



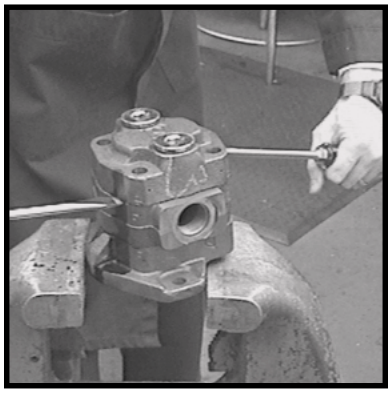
Loosen and remove the four, cap screws and washers with a 13/16” socket and wrench.

STEP 4.1

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

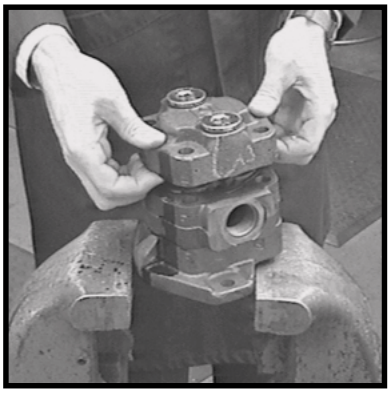
4.1 Place the point of a large, screwdriver or a chisel on the parting line between the port end cover casting and the gear housing casting. Gently tap until a slight separation between the castings is detected.

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

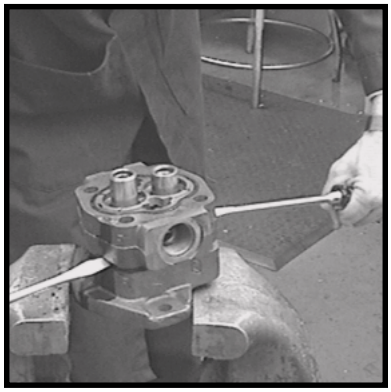


4.3 Lift off the port end cover subassembly.

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

PGP020™ Disassembly Instructions

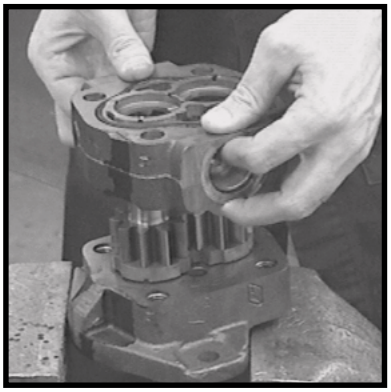
STEP 5.1



Remove the gear housing subassembly using steps 5.1 - 5.3:

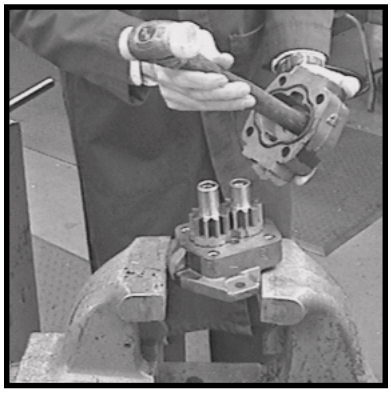
5.1 Place the two, large, flat-bladed screwdrivers into the separation notches and pry up the gear housing until loose. BE CAREFUL not to nick, mar or scratch the machined casting faces.

STEP 5.2



5.2 Lift off the gear housing subassembly.

STEP 5.3

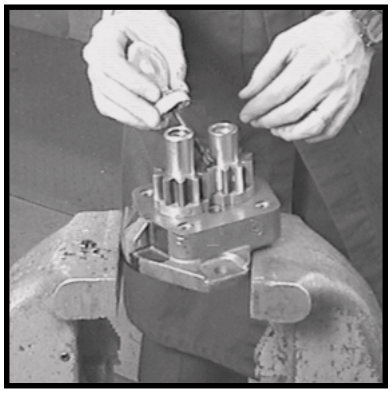


5.3 Remove the thrust plate from the housing. It may be necessary to gently tap the thrust plate with the handle of a hammer or screwdriver. Be careful not to bend or score the thrust plate. Remove and discard the six, small, rubber pocket seals from the thrust plate.

STEP 6

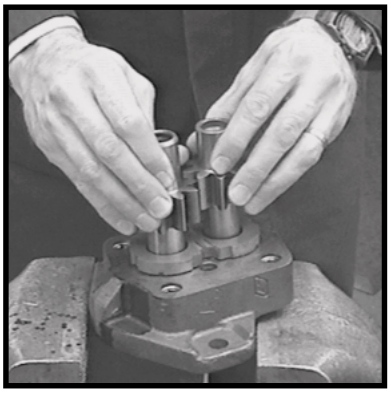
Remove and discard the rubber section seals from the top and bottom gear housing faces.

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.

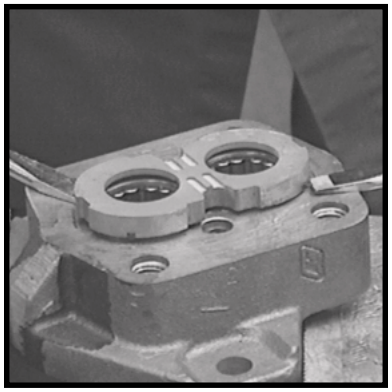
STEP 8



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.

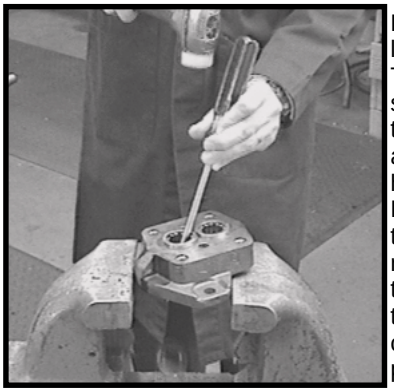
PGP020™ Disassembly Instructions

STEP 9



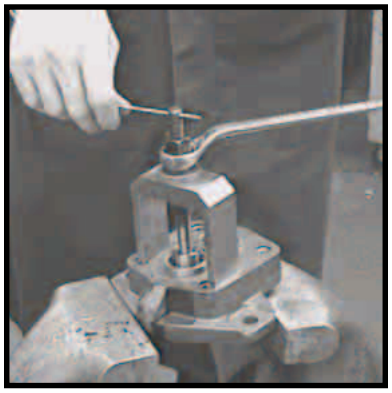
Gently lift off the thrust plate. Be careful not to bend or score the plate and mating surface of the casting. Remove and discard the six, rubber pocket seals from the back of the thrust plate.

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

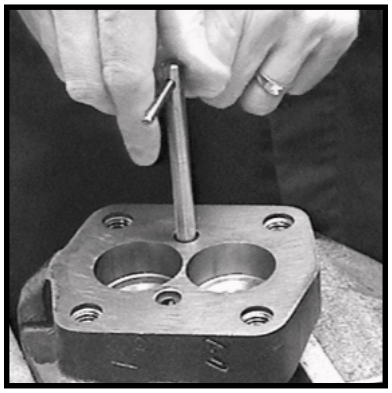


Use a bearing puller to remove the roller bearings. Note: This step is optional depending on the condition of the bearings.

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



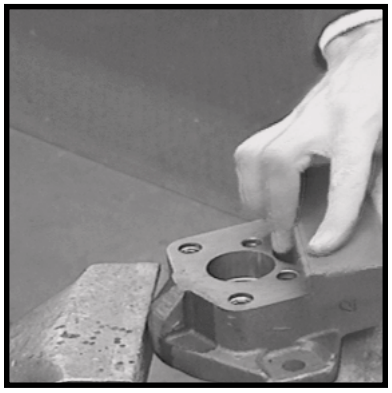
Remove the checks from the shaft end cover casting with the check tool (see Tool List on Page 11).

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.

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

PGP020™ Assembly Instructions

STEP 1

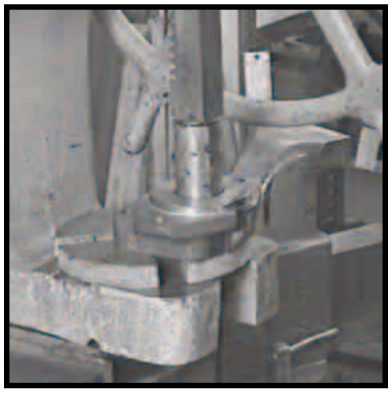


Stone all machined casting surfaces with a medium-grit carborundum stone. If the bearings were removed, deburr the bearing bore using a deburring tool. Rinse all parts in a solvent fluid. Air blast all parts and wipe them with a clean, lint-free cloth before starting the assembly.

STEP 2

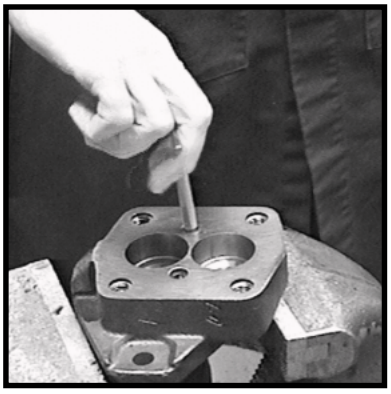
Coat the outside diameter of the lip seal with Permatex Aviation Form-A-Gasket No.3 Non-Hardening Sealant or equivalent. Be careful not to get Permatex on the inner lip of the seal as it will cause a lip seal leak.

STEP 3



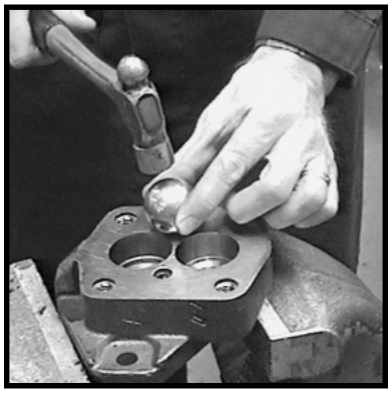
Place the shaft end cover on an arbor press with the pilot facing up. Place lip seal with the shoulder of the seal up, at the top of the seal bore. Press the lip seal into the shaft end cover with a lip seal installation bar (see Tool List on Page 11). The seal should be pressed in so it is flush with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

STEP 4



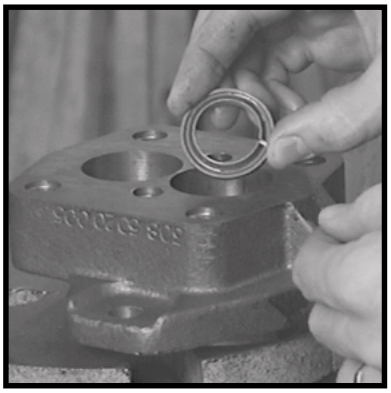
Apply Loctite® No.262 to the threaded check holes in the shaft end casting. Install the checks in the shaft end cover using the check tool (see Tool List on Page 11). The checks must bottom out in the casting.

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

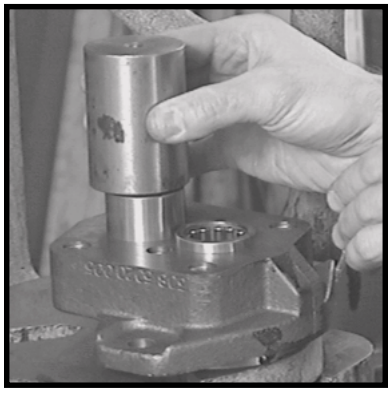


If the ring seals were removed from the shaft end cover or the port end cover, they should be replaced at this time. Place the ring seals in the bottom of the drive gear bearing bores. Be sure that the flat side of the ring seal is against the mating surface in the casting. Ring seals are placed behind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

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

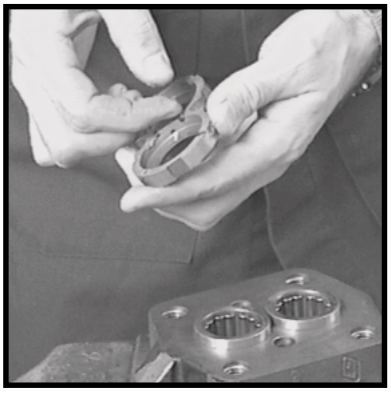
PGP020™ Assembly Instructions

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

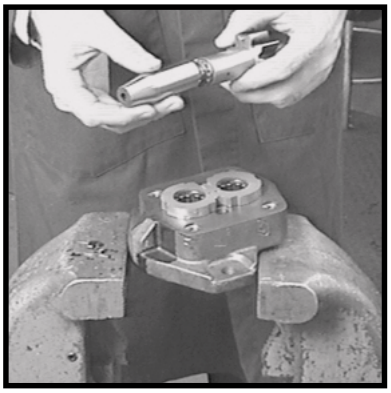


Grip the shaft end cover in a vise with the mounting face down. Cut two, pocket seals 7/32” long from the pocket seal strip. Grease the seals well and insert them into the center slots on the reverse side of the thrust plate.

STEP 9

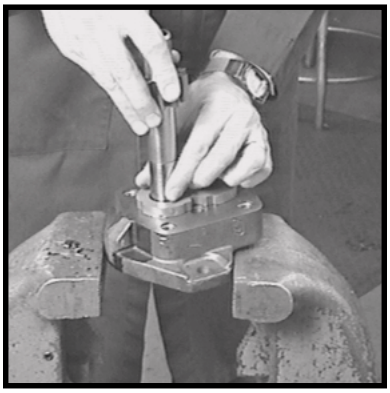
With the pocket seals facing down, place thrust plate over the bearings. Tap the thrust plate with a soft-faced hammer around the edge until the thrust plate is about 1/32” from the casting surface. Do not tap the center of the plate. Cut four pocket seals 1/4” long from the seal strip. Push a pocket 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).

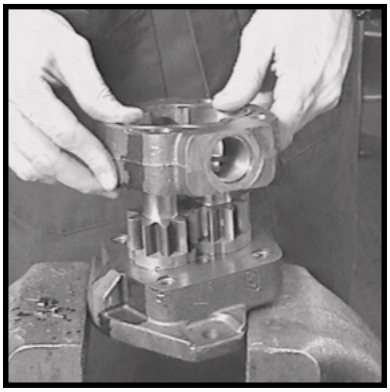
Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

PGP020™ Assembly Instructions

STEP 12

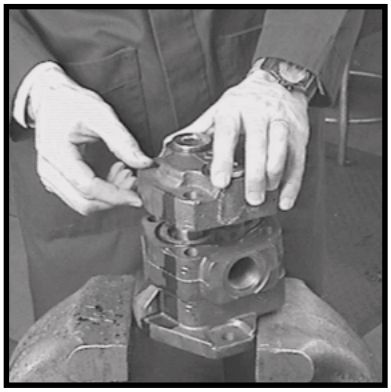
Apply a light coating of grease to the new section seals and place them into the machined grooves on both sides of the gear housing. Check the section seals for proper fit.

STEP 13



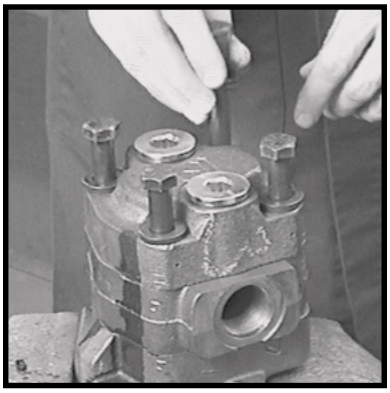
Locate the orientation mark on the gear housing and line it up with the mark on the shaft end cover. Slide the gear housing over gear set. Make sure the gear housing rests tightly against shaft end cover. Be careful not to pinch the section seal. Squirt clean, hydraulic oil over the gear shaft and the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

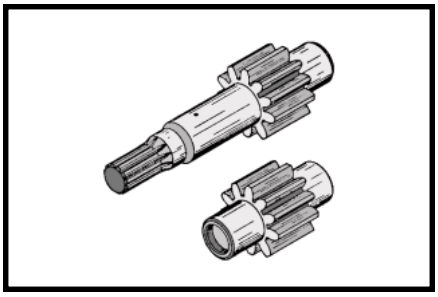


Thread the four, cap screws with the washers into the shaft end cover and tighten them in a cross-corner pattern. Rotate the gear shaft of the pump with a 6” wrench to make certain there is no binding in the pump.

STEP 16

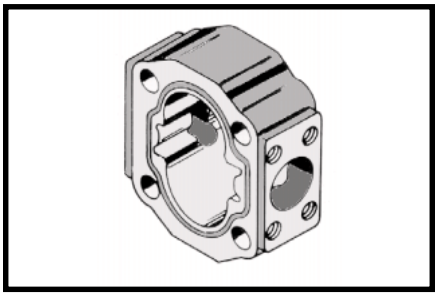
After the cap screws are tightened, make certain there is no internal binding of the gear set by rotating the gear shaft, then tighten the cap screws in a cross-corner pattern to a final torque of 2400 in. lbs. (200 ft. lbs.).

Part Replacement Guide



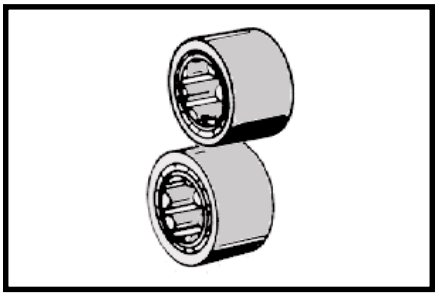
If the gear set contains any of the following defects, it should be replaced:

- 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.

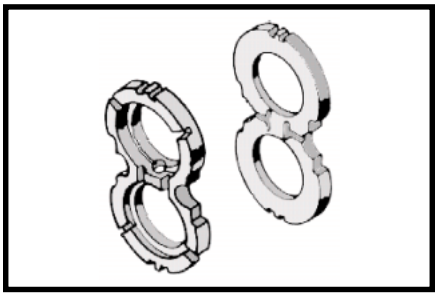


Wear in excess of .005” cut-out necessitates replacement of the gear housing. Place a straight-edge across the bore. If you can slip a .005” feeler gage in the cut-out area, replace the gear housing.

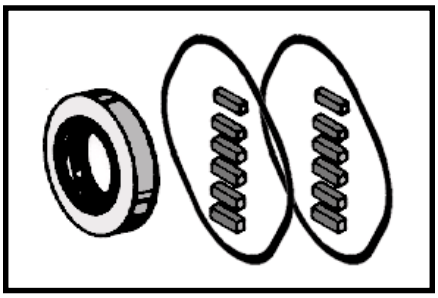
Where the cut-out is moderate, .005” or less, the gear housing is still in good condition. If the housing has equal size ports or no ports, the housing may be rotated 180°, exchanging ports, and reused.



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.



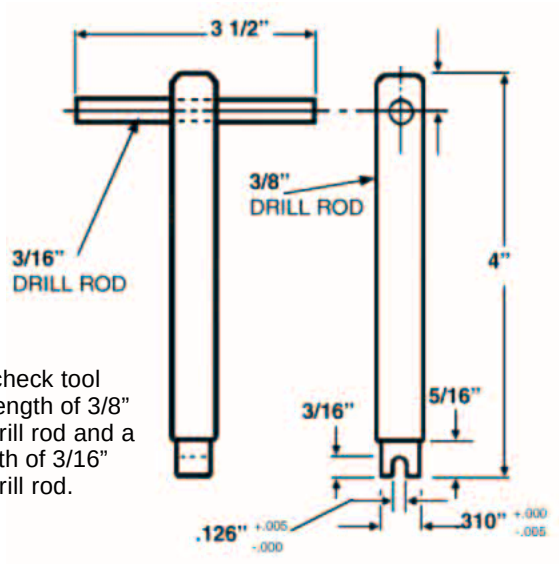
Replace all rubber and polymer seals whenever reassembling the pump. This includes lip seal, pocket seal strips and section seals.

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

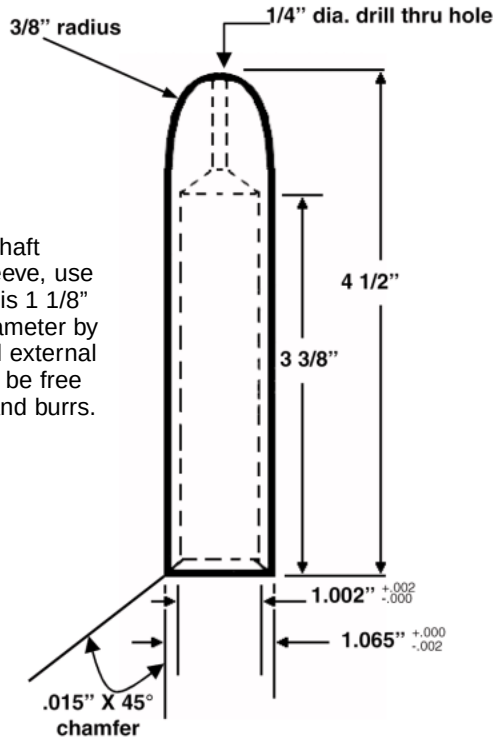
Check Tool

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.



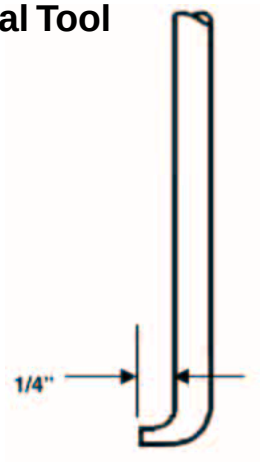
Shaft Installation Sleeve (Steel)

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.



Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

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 @ 100º F (37.8º C) (generally)
  44 to 48 SSU @ 210º F (98.9º 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 200º F (93.3º C) with a maximum temperature of 180º F (82.2º 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: 0º F (-18º C) to 100º F (37.8º C) Ambient
100º F (37.8º C) to 180º F (82.2º 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 20º 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 100º F with the oil temperature held at 120º F plus or minus 5º 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...**			
100 psi	**1000 psi/70 bar**	**1500 psi/105 bar**	**2000 psi/140 bar**	**2500 psi/175 bar**
5 - 14	2 to 3	21/2 - 31/2	3 to 4	31/2 - 41/2
15 - 25	21/2 to 31/2	3 - 4	31/2 to 5	4 - 51/2
26 - 50	3 to 4	4 - 5	4 to 6	41/2 - 61/2

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.

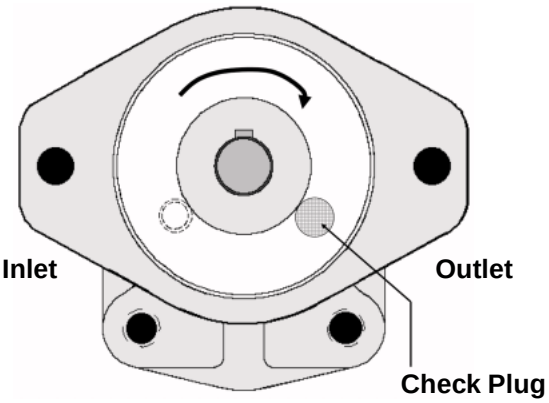
5) Remove the gear housing and the gear set. Keep the gears together because they are a matched set.

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

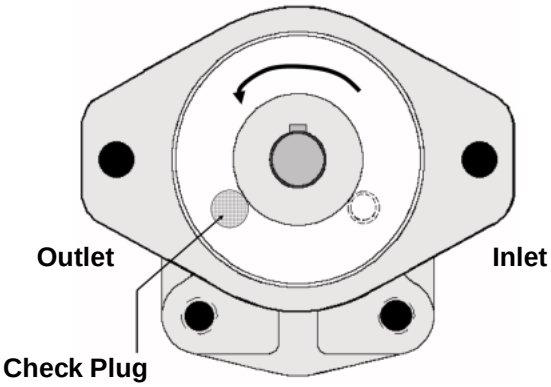
Note: Care should be taken to avoid losing the small, rubber pocket seals fitted in the thrust plate pocket seal grooves.

6) Lift the thrust plate off of the shaft end cover. Do not lose the pocket seals.

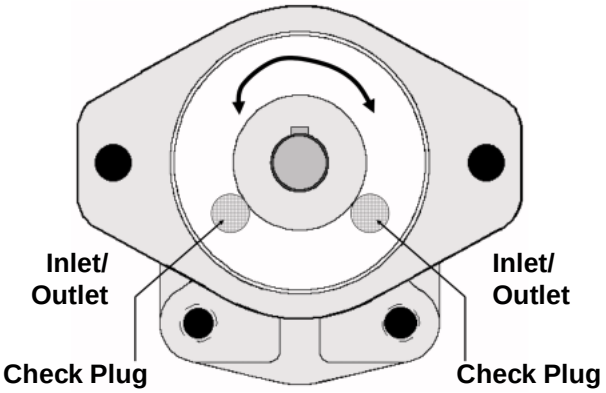
7) Remove the check plug in the shaft end cover with a screwdriver and then install it in the opposite drain hole. Screw in tightly and stake the check plug with a punch at both edges of the screwdriver slot. For a single-rotation pump, the check plug is always located on the high pressure (outlet) side of the pump. If the shaft end cover has two check plugs, the pump is already set-up for double rotation.



CW



CCW



Bi-rotational

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

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.

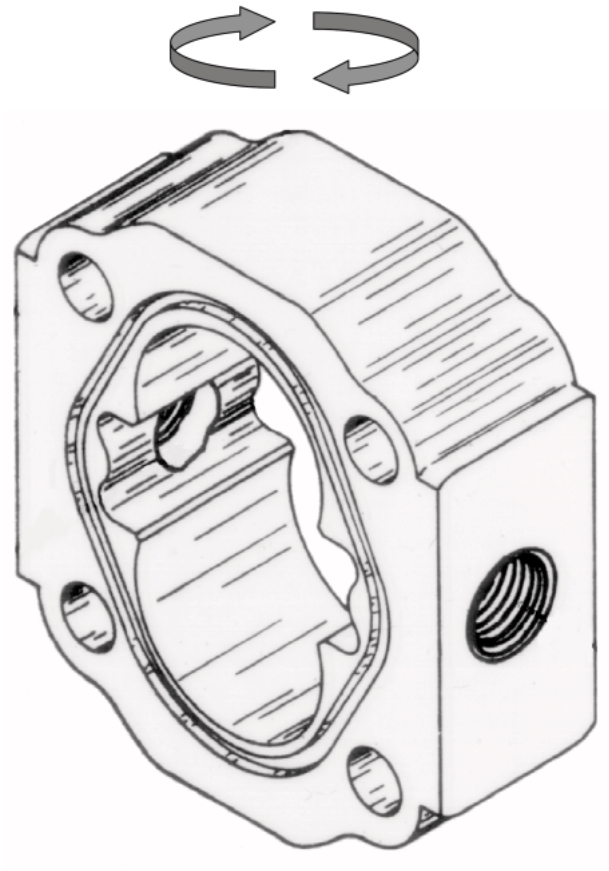
Note: If the bearing carrier has an L-shaped porting configuration, it cannot be used. A new bearing carrier will have to be machined with the proper configuration.

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

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

Notes

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

Notes

Parker Hannifin Corporation
Gear Pump Division
Youngstown, Ohio USA

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 time 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.

Parker Hannifin Corporation
6035 Parkland Blvd.
Cleveland, Ohio 44124-4141
Telephone: (216) 896-3000
Fax: (216) 896-4000
Web site: www.parker.com

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.

The Aerospace Group 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.

The Hydraulics Group designs, produces and markets a full spectrum of hydraulic compnents and systems to builders and users of industrial and mobile machinery and equipment.

The Filtration Group designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

The Automation Group is a leading supplier of pneu-matic and electro-mechanical components and systems to automation customers worldwide.

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

Parker Hannifin Corporation
Gear Pump Division
1775 Logan Avenue
Youngstown, OH 44501 USA
Tel: (330) 746-8011
Fax: (330) 746-1148
http://www.parker.com/gearpump

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