SURF RAKE®

INSTRUCTION & PARTS MANUAL

MODEL 400

MACHINE SERIAL NUMBER

CATALOG 400S47800318

IMPORTANT SAFETY INFORMATION FOR SURF RAKE® OWNERS, OPERATOR EMPLOYERS AND OPERATORS

1. Do not allow individuals to operate the Surf Rake® without first receiving personalized training and ensuring that they have read this manual.

2. Before each operation of the Surf Rake®, make a careful visual inspection of the machine. Do not operate if you observe damaged or missing parts, missing guards, excessive wear or unusual noise or vibration during startup.

3. Never allow a bystander to approach the operating Surf Rake®, whether or not it is moving forward. Stop the Surf Rake®, unless that individual is qualified and is present for the specific purpose of assisting in the operation, maintenance or repair of the Surf Rake®.

4. Never allow a bystander to approach the operating Surf Rake® and stand under or near the hopper while it is being raised or lowered.

5. Do not attempt to clear large obstacles from the path of the Surf Rake® by pushing them with the tractor or the Surf Rake®. Stop the Surf Rake®, turn it off and manually remove obstacles. Seek assistance if you cannot do so alone.

6. Never attempt to clear a jam by placing hands or any part of the body into or near the machinery which has not been completely shut down. A jammed conveyor component can immediately jump into motion and cause serious injury to hands or other body parts in immediate contact with the components if the system is under hydraulic pressure.

7. Stand clear of the Surf Rake® when it is being set down on its foot stands or jack stand, to prevent injury.

8. Follow OSHA regulations regarding hydraulic fluid, fire safety, guarding and if applicable, lock-out/tag-out procedures.

9. Before conducting any repair or maintenance on the Surf Rake®, ensure that the hydraulic pump is OFF, not just in neutral, and examine the machine carefully to assure that:
   (a) No hydraulic hoses remain pressurized.
   (b) No parts of the machine are suspended without being mechanically blocked or supported.
   (c) All sources of power have been locked in the OFF position and tagged.

10. Never allow one person to operate the controls of the Surf Rake® while another has any part of their body in or near a pinch point or machinery element from which a guard has been removed.

11. Stand clear of hydraulic hoses and fittings while the Surf Rake® is in operation. A sudden fitting or hose failure can inflict serious injury.

12. Do not operate the Surf Rake® on a steep incline, extremely irregular surface or unstable surface. The tractor and/or the Surf Rake® can capsize and cause serious injury or death to the operator or nearby persons.

13. Never modify any part of the Surf Rake® without prior approval, in writing, from the manufacturer.

14. Never replace any components of the Surf Rake® with one which is not manufactured by H. Barber & Sons, Inc., or listed in this manual as a proper replacement part.

TABLE OF CONTENTS
SURF RAKE® MODEL 400

When Ordering Parts, state the:

1. Model and serial number of your Surf Rake®.
2. Part number, description and page number.
3. Shipping and billing address.
4. Method by which shipment is to be made.
5. Full name of consignee.
6. Catalog number of this parts book (found on bottom left corner of every page).

BARBER SURF RAKE® MODEL 400

SECTION 1 - SURF RAKE® COMPONENTS

This instruction manual describes the different systems and components that make up the Surf Rake®. This manual includes a maintenance, lubrication and parts ordering section. It is important that anyone operating the Surf Rake® should read and understand this manual prior to operating the machine. All safety procedures must be observed. Step-by-step instructions are also included to facilitate installation. The following section describes the different systems and features of the Surf Rake®.

MECHANICAL COMPONENTS

CONVEYOR The conveyor belt rakes the material off of the beach, separates the debris from the sand, elevates the debris up the conveyor and deposits the debris into the hopper. The speed of the conveyor is adjustable. Proper belt tension is essential for long life of the conveyor belt chains and the conveyor belt drive components which include rollers, sprockets and bearings. If the conveyor is loose, it will cause the Surf Rake® to pick up less material and will hasten the wear of the Surf Rake's® drive and conveyor components.

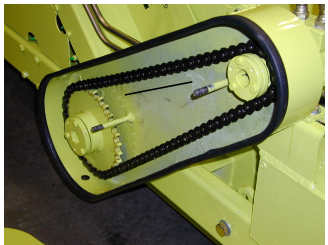
MOLDBOARD The moldboard is located behind the reservoir and in front of the conveyor. It allows debris in the path of the Surf Rake® to pass under it and into the adjacent area between the moldboard and conveyor belt, where the conveyor separates the sand and lifts the debris using the back/hidden side of the moldboard. The proper height adjustment of the moldboard is important for picking up the maximum amount of debris per pass.

DRIVE MECHANISM The conveyor belt is supported by sets of sprockets and rollers on each side of the frame. The bottom front shaft is the driving shaft or main shaft. The pair of sprockets on the main shaft and the pair on the top shaft keep the conveyor belt tracking straight by guiding the chains located on each side of the conveyor belt. For the conveyor belt to track correctly, the tension must be the same on each side of the conveyor belt. The top shaft moves upward to achieve correct tracking tension. Take up bolts located under the top shaft on each side of the frame are tightened to raise the top shaft. It is very important to evenly adjust both sides of the conveyor belt to the same tension by tightening these take up bolts. There are two rubber roller assemblies that support the weight of the conveyor and the debris that is being lifted up to the hopper.
There are two idler sprocket assemblies that also support the weight of the conveyor and the debris that is being lifted up to the hopper. There are four 8" diameter idler roller assemblies that create a smooth path of support for the conveyor to rotate on.

SIDE GUARDS/STONE GUARDS The side guards and stone guard flaps are located on each side of the conveyor belt. Together they guide debris up to the top of the conveyor belt and into the bucket. They keep debris away from the conveyor belt chain and drive sprockets. The side guards are fastened to the side frame with three bolts. The stone guard flaps are fastened to the side guards with bolts which are loosened to adjust the flaps down toward the belt as the flaps wear.

TOP SHIELD The top shield acts as a guide that prevents light weight objects from being blown out of the side of the moving Surf Rake®. The top shield is also a safety device that prevents incidental contact with the moving conveyor belt assembly. It is fastened to the side guard with four bolts and is taken off to adjust the stone guard flaps.

CHAIN CASE The conveyor belt is driven by the hydraulic motor which transfers power



to the drive chain and the drive sprockets located inside the chain case.
Drive chain should be adjusted so that there is approximately 1/4"(6.35mm) slack but no more than 1"(25.4mm) slack midpoint between the sprockets. Adjustment is made by loosening the two bolts that fasten the motor mount to the front tank motor bracket and tightening the adjusting bolt, which will move the motor and attached front sprocket assembly forward. When adequate adjustment can no longer be achieved in this manner, a half-link should be removed from the chain. Note: Chain tension should **CHAIN TENSION** (6.35 mm) and 1" maximum (25.4 mm).

BUCKET The bucket catches the debris the conveyor belt picks up. When full, the bucket is tripped, pivoting on the lift arm and bucket bearings. There is a bucket stop on the right side, which stops the bucket from rotating at its dumping position and prevents the bucket from spinning and over turning. When the bucket is in its correct nesting position, the blocks should be to the bottom of the guides and slightly off the frame.

HUB ASSEMBLY, WHEEL AND TIRE The two hub assemblies are attached to the frame by the spindle. The hub rides on two races and bearings that can be adjusted as they wear with the adjusting castle nut and pin. There is a refillable grease reservoir on each hub that maintains pressure to the bearings.
Torque the lugs on the wheel and tire assemblies to 90 ft/lbs. The tires are inflated to 18 PSI. It is important that both tires be the same pressure.

FINISHER (OPTION) The grooming finisher is attached to the rear of the Surf Rake® to smooth the clean sand and eliminate tire marks left by the tractor and beach cleaner. Always raise the finisher before backing up the machine.

HYDRAULIC COMPONENTS (CONVEYOR)

The conveyor hydraulic system is separate from the bucket or finisher hydraulic systems. It is a closed system made of the following components:
A reservoir of hydraulic fluid on the front of the Surf Rake®
A hydraulic pump, attached to and powered by the tractor PTO, which circulates the hydraulic fluid
The flow control, which regulates the flow of the hydraulic fluid through the motor
The conveyor belt motor that turns the chain case drive chain and sprockets and turns the conveyor
The hydraulic fluid is then filtered and returns back to the Surf Rake® reservoir

HYDRAULIC RESERVOIR The reservoir tank is located across the front of the frame. It supplies hydraulic fluid to the hydraulic pump and conveyor belt drive motor. It has a magnetic drain on the bottom for changing the hydraulic fluid. There is a sight gage for inspecting hydraulic fluid level on the side of the tank.
BREATHER CAP The breather cap on top of the reservoir is pressurized to keep out contaminants and keep fumes from entering the atmosphere. It has a 10 micron rating and has a 5 PSI relief valve setting.

HYDRAULIC PUMP The hydraulic pump should be placed over the PTO spline shaft at the rear of the tractor. Slide the pump as far forward as possible. The pump bracket can be mounted directly to the top link of the three point hitch. Adjust arms to keep the pump upright and as close as possible to the tractor. If this bracket cannot be attached, use the bracket with mounting chain. To secure the pump, secure the chain to a rigid surface of the tractor, preferably to the pin of the upper three-point hitch arm bracket, so that the torque arm of the pump is positioned up. The PTO spline will turn clockwise and the resulting torque will tend to turn the pump clockwise also. Minimize the length of the safety chain. There is a removable link that attaches the hook to the chain. This link may be repositioned along the chain to minimize the chain length and maintain the upright orientation of the pump. It may be necessary to reduce the chain length to achieve proper orientation of the pump. It may also be necessary to reposition the pump arm to fit up with the tractor. Be careful not to crimp or twist the hoses. If the 1"(2.54cm)

suction hose is twisted, the hose clamp on the pump end of the hose can be loosened, the hose turned to the desired position, and the clamp re-tightened.

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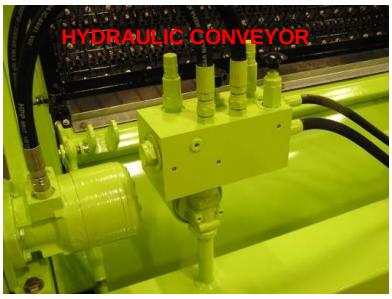
HYDRAULIC FILTER The hydraulic fluid is filtered and returned to the reservoir tank through the canister filter.

HYDRAULIC CONVEYOR BELT MOTOR The hydraulic motor drives the conveyor belt and is located next to the chain case. The intake hose comes from the flow control and the outlet hose returns to the reservoir. The motor does not run in reverse. There is a take up bolt and lock down nut at the base of the motor that moves the motor to adjust and tighten the chain case drive chain when the chain wears.



THE CONTROL VALVE includes an adjustable control for conveyor speed, a reversing valve and overflow protection and

The conveyor is activated when the tractor PTO is engaged. The conveyor speed adjustment is set for optimal cleaning. The conveyor speed can be slowed down by loosening the lock nut and turning the speed control handle clockwise.

The automatic finisher is activated or deactivated when the PTO is engaged or disengaged. The finisher is not affected when adjusting the conveyor speed. The finisher can be kept in the up position by closing the in line shut off valve which is located above the hydraulic tank at the front, center of the machine. The shut off valve is shipped in the open position for normal finisher operation.

The internal overflow valve protects the conveyor, sprockets and rollers from objects that have become wedged. In the event that the conveyor is stopped because of an obstruction, the reversing valve handle can be lifted and held to reverse the conveyor direction and disentangle these objects. Release the valve to resume normal operation.

HYDRAULIC COMPONENTS (BUCKET AND FINISHER)

The tractor's remote valve hydraulic system is used to control both the bucket hydraulics and the finisher hydraulics.
Each tractor remote valve spool has a pair (2) of quick disconnects that are next to each other, positioned vertically one on top of the other, and independently operated from adjacent spools.
If a finisher option is added to the Surf Rake®, an additional spool or remote spool is needed for the finisher raising and lowering operation (OPTIONAL).

AUTOMATIC FINISHER (OPTION) The automatic finisher is integrated into the conveyor belt hydraulics. When the PTO on the tractor is engaged, the conveyor belt is activated and the finisher is lowered. A spring mechanism is used to raise the finisher when the PTO is disengaged.

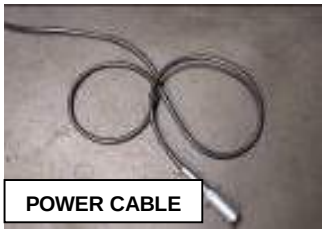
FINISHER CYLINDER (OPTION) The finisher's single acting cylinder is operated hydraulically through a hose connected to one of the tractor's quick disconnecting remote valves. The finisher cylinder lowers the finisher onto the beach to create a smooth pathway behind the Surf Rake®. The finisher cylinder raises the finisher for transporting to and from either a debris dump site or dumpster and for transporting the Surf Rake® to a storage site.

HYDRAULIC MOLDBOARD (OPTION) The hydraulic moldboard is moved up and down by two double acting cylinders. This option requires a set of remote valves on the tractor. The two hoses connect to one rear remote valve.

ELECTRONIC COMPONENTS (OPTIONS)

Electrical diagrams for all component options are located at the end of this manual.

POWER CABLE The towing tractor supplies the Surf Rake® and all its electronic components with power through a seven conductor cable. The cable runs from the tractor to the junction box on the Surf Rake®. Wiring diagrams are located at the back of this manual – refer to the table of contents. **See Picture.**



LIGHTING (OPTION) The lighting circuit is comprised of left and right molded light assemblies, an electrical harness that connects to the towing vehicle's lighting system. The Electrical Plug is a 7-pin configuration. Wiring diagrams are at Section 6-14.

BARBER SURF RAKE® MODEL 400

SECTION 2 - ATTACHING TO TOWING VEHICLE

This instruction manual describes the different systems and components that make up the Surf Rake®. This manual includes a maintenance, lubrication and parts ordering section. It is important that anyone operating the Surf Rake® should read and understand this manual prior to operating. All safety procedures must be observed. Step-by-step instructions are also included to facilitate installation. The following section describes the different systems and features of the Surf Rake®.

ATTACH

DRAWBAR Install the supplied draw bar onto the tractor's lower 3-point hitch arms, securing it on each end with the supplied hitch bar snap pins. **See Figure 2.**

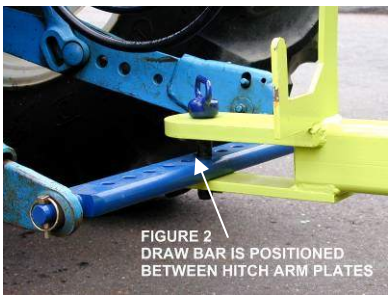


FIGURE 2
DRAW BAR IS POSITIONED
BETWEEN HITCH ARM PLATES

FRONT HITCH To attach, back the tractor up to the Surf Rake® and centrally locate the draw bar between the upper and lower plates of the hitch. Drop hitch pin through and insert cotter pin into bottom of hitch pin.

DRAFT CONTROL Set the draft control on the tractor so the bottom edge of the moldboard may be lowered at least 4 inches (10.16 cm) below ground level. The three-point hitch lift arms on the tractor may need to be adjusted so that you have the necessary range of movement. It is recommended that sway bars be used on the arms of the three-point hitch.

HYDRAULIC PUMP The hydraulic pump should be placed over the PTO spline at the rear of the tractor. Slide the pump as far forward on the PTO spline shaft as possible. The pump bracket is attached to the pump. Attach the bracket to the top pin of the three point hitch assembly. Keep the pump as close to the tractor as possible. If the arm cannot be attached, use the attaching chain. The pump chain is located in the spare parts box. Secure the chain to a rigid surface of the tractor, preferably to the pin of the upper three-point hitch arm bracket, so that the torque arm of the pump is positioned up. The PTO spline will turn clockwise and the resulting torque will tend to turn the pump clockwise also. ***MINIMIZE THE LENGTH OF THE SAFETY CHAIN.*** There is a removable link that attaches the hook to the chain. This link may be repositioned along the chain to minimize the chain length and maintain the upright orientation of the pump. It may be necessary to reduce the chain length to achieve proper orientation of the pump. Be careful not to crimp or twist the hoses. If the 1"(2.54cm) suction hose is twisted, the clamp on the pump end of the hose can be loosened, the hose turned to the desired position, and the clamp re-tightened. **See Figure 4.**

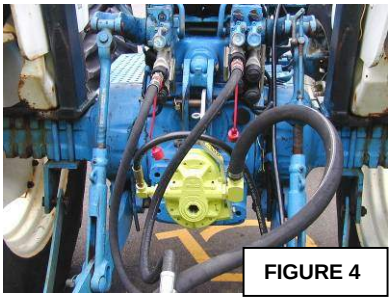


FIGURE 4

HYDRAULICS FOR CONVEYOR The conveyor belt is driven by the hydraulic motor which transfers power to the drive chain and the drive sprockets located inside the chain case. Drive chain should be adjusted so that there is approximately 1/4"(6.35mm) slack but no more than 1"(25.4mm) slack midpoint between the sprockets. Adjustment is made by loosening the two bolts that fasten the motor mount to the front tank motor bracket and tightening the adjusting bolt, which will move the motor and attached front sprocket assembly forward. When adequate adjustment can no longer be achieved in this manner, a half-link should be removed from the chain.

HYDRAULICS FOR BUCKET RAISE Remove the protective cover (545HD-13) from the bucket hose. Attach the hose, which is equipped with quick disconnect coupler into your tractor's quick disconnect outlet.

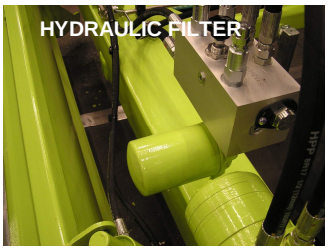
JACK POSITIONING Lift the machine up with the three-point hitch, remove the jack stand pin and turn the jack stand back, not forward, into its neutral position (or remove jack stand if desired). Replace jack stand pin. Fold the jack stand arm up to keep it away from the working area as shown in Figure 6. The Surf Rake® is now ready for operation. **See Figure 6.**


FIGURE 6

TRACTOR ENGINE While in operation, the tractor engine should be kept at an RPM that will result in a **540-RPM PTO** speed. This should be displayed on the tractor's tachometer. The speed of the tractor and the PTO speed will later be adjusted to suit individual beach.

CONTROL VALVE The control valve is located between the pump and conveyor belt motor. It raises or lowers the speed of the conveyor belt motor by regulating the flow of hydraulic fluid circulated by the pump. The adjustable control knob is on the top, rear of the valve. Turning the knob counter clockwise opens the valve inside and the conveyor belt increases in speed. Turning the knob clockwise lowers the belt speed. There is a built-in, preset, pressure relief valve that protects the conveyor belt assembly from objects that may become wedged during cleaning. If an oversized or wedged object stops the rotation of the conveyor belt, the valve will open, relieving pressure from the conveyor motor and bypass the hydraulic fluid back to the reservoir. There is also a reversing knob on the top, front of the valve. To reverse the conveyor, pull up on the knob while the PTO is engaged. The automatic finisher is also operated from the control valve. When the PTO is engaged, the finisher will lower to operating position and raise when the PTO is disengaged.


CONTROL VALVE


HYDRAULIC FILTER

BARBER SURF RAKE® MODEL 400

SECTION 3 – OPERATING THE SURF RAKE®

OPERATION

Do not allow individuals to operate the Surf Rake® without first receiving personalized training and ensuring that they have read this manual.

Before each operation of the Surf Rake®, make a careful visual inspection of the machine. Do not operate if you observe damaged or missing parts, missing guards, excessive wear or unusual noise or vibration during startup.

Stand clear of hydraulic hoses and fittings while the Surf Rake® is in operation. A sudden fitting or hose failure can inflict serious injury.

To prevent the tractor and/or Surf Rake® from capsizing and causing serious injury or death, do not operate the Surf Rake® on a steep incline or unstable surface.

Do not allow a bystander to approach the Surf Rake® unless that individual is qualified and is present to assist in the operation or repair of the machine. Never allow one person to operate the controls of the Surf Rake® while another has any part of their body in or near a pinch point.

Under no circumstances should a bystander stand under or near the hopper while it is being dumped.

To prevent injury, do not attempt to clear large obstacles by pushing them with the tractor or Surf Rake®.

Never attempt to clear a jam by placing hands or any part of the body into or near the machinery that has not been completely shut down. A jammed conveyor component can immediately jump into motion and cause serious injury to hands or other body parts in immediate contact with the components if the system is under hydraulic pressure.

START UP Turn the handle of the flow control of the Surf Rake® down to full speed. Pull the Surf Rake® into position on the beach area to be cleaned. Put the tractor in gear. Engage the PTO and adjust the engine to a **540-RPM PTO** setting. With the tractor moving and the belt turning, lower the Surf Rake® into the sand. The Surf Rake® can be towed along the beach at speeds from one to fifteen miles per hour (1.6km/hr to 24 km/hr). Speed is dependent on the contour of the beach and the volume of debris to be removed. On a very uneven beach or on a beach that is heavily littered, travel-cleaning speeds of three to four miles per hour should be maintained. On a level beach that is lightly littered, higher speeds can be attained. The operator must be alert for large objects or obstructions on the beach.


FIGURE 8
MATERIAL CARRIED
IN FRONT OF MOLDBOARD

If a significant obstruction is encountered, the Surf Rake® must be raised clear of the obstruction. If it is not possible to safely raise the Surf Rake® clear of the obstruction, stop the machine, turn it off, and manually remove the obstacle.
Seek assistance if you cannot do so alone.

UNDER NO CIRCUMSTANCES SHOULD THE SURF RAKE® REMOVE MORE THAN A NEGLIGIBLE AMOUNT OF SAND.

If it is picking up too much sand, refer to the operating hints section of this manual. The machine should be raised and lowered while cleaning to follow the general contour of the beach. To achieve a consistently clean beach, some material should be carried in front of the moldboard deflector unit. This allows the tines to penetrate evenly for the full width of the machine, thus leveling the beach while utilizing the Surf Rake® to its maximum potential.

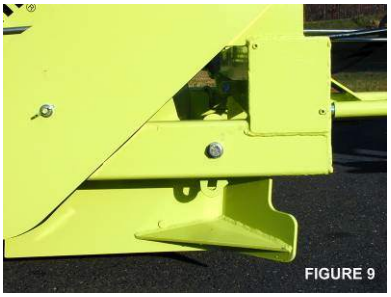


FIGURE 9

MOLDBOARD ADJUSTMENT Proper adjustment of the moldboard is critical to achieving the maximum potential from your Surf Rake®. The distance from the bottom of the Surf Rake® frame to the bottom edge of the moldboard is set at the factory at 7 1/4"(18.42cm). This adjustment can be varied to change the cleaning depth and accommodate particular beach conditions. The moldboard is adjusted by two turnbuckles as shown in Figure 10 (one side). Caution must be taken so that both sides of the moldboard are adjusted evenly and it should be noted that even a 1/4"(.635cm) adjustment makes a significant difference in the performance of the machine. ***Do Not Raise The Moldboard Too High.*** This will result in the Surf Rake® unnecessarily removing sand and will greatly accelerate tine and conveyor wear. If there are any questions regarding this adjustment, please call the factory for a more in-depth explanation.


FIGURE 10

OPERATING HINTS

The following general rules should be followed to attain maximum efficiency from your Surf Rake®.

If your Surf Rake® is picking up too much sand:	If your Surf Rake® is not removing enough debris:
1. Lower moldboard	1. Raise moldboard
2. Reduce conveyor belt speed	2. Increase conveyor belt speed
3. Increase tractor speed	3. Decrease your tractor speed

As beach conditions vary, the adjustments listed below should also be varied. Some general conditions and the proper settings for the condition are also listed below:

WET SAND	DRY SAND
Moldboard - lower	Moldboard - raise
Belt Speed RPM's - decrease	Belt Speed RPM's - increase
Tractor speed - not critical	Tractor speed - not critical

FIRM BEACH	SOFT BEACH
Moldboard - lower	Moldboard - raise
Belt Speed RPM's - decrease	Belt Speed RPM's - increase
Tractor speed - not critical	Tractor speed - not critical

BIG MATERIAL	SMALL MATERIAL
Moldboard - not critical	Moldboard - raise
Belt Speed RPM's - decrease	Belt Speed RPM's - increase
Tractor speed - slow	Tractor speed - not critical

CLAY OR SOIL IN SAND	PURE SAND
Moldboard - lower	Moldboard - raise
Belt Speed RPM's - decrease	Belt Speed RPM's - increase
Tractor speed - not critical	Tractor speed - not critical

HEAVY SEAWEED	BOTTLES
Moldboard - raise	Moldboard - not critical
Belt Speed RPM's - decrease	Belt Speed RPM's - decrease
Tractor speed - slower	Tractor speed - not critical

Once the proper settings have been found, ***a negligible amount of sand should be removed with the unwanted debris.*** After this setting has been attained, no further adjustment of the moldboard should be required. The daily variations can be satisfactorily dealt with by adjusting the conveyor RPM or tractor speed.

These rules are to be used as a general guideline. Each beach is unique and requires its own group of settings. With experience, the best settings can be found quickly allowing the Surf Rake® to be used to its maximum potential.

BARBER SURF RAKE® MODEL 400

SECTION 4 – MAINTENANCE

To prevent injury, before conducting any repair or maintenance on the Surf Rake®, ensure that the hydraulic pump is OFF, not just in neutral, and examine the machine carefully to assure that:

No hydraulic hoses remain pressurized

No parts of the machine are suspended without being mechanically blocked or supported.

All sources of power have been locked in the "off" position and tagged.

Follow OSHA regulations regarding hydraulic fluid, fire safety, guarding and, if applicable, lock-out/tag-out procedures.

Always ensure that the parking brake on the tractor is set before working on the Surf Rake® to prevent injury.

Never modify any part of the Surf Rake® without prior approval, in writing, from H. Barber & Sons, Inc. Do not replace any component of the Surf Rake® with one that is not manufactured by Barber or listed in this manual as a proper replacement part.

LUBRICATION

GREASE FITTINGS Lubricate all grease fittings every 40 hours of operation. **(See Maintenance and Lubrication Chart - Section 5)**

CHAINCASE ROLLER CHAIN Roller Chain should be oiled after every 100 hours of use.

TURNBUCKLES The Turnbuckles should be cleaned and re-greased at the end of the season. In severe rusting areas this should be done more frequently.

PINS Cylinder and moldboard pins should be spot lubricated with oil every 4 weeks.

CYLINDERS Cylinder tops should be wiped clean and spot lubricated with penetrating oil every 100 hours and at the end of the season.

CONVEYOR CHAIN It is recommended that the Conveyor Chain be run dry. A dry graphite lubricant may also be used. Occasionally, especially after a period of disuse, light penetrating oil may be applied.
Prior to winter storage, heavier oil may be applied to avoid rusting.

BARBER SURF RAKE® MAINTENANCE ADJUSTMENTS

DAILY ADJUSTMENT CHECK There are three basic component checks for proper adjustment to ensure that your Surf Rake® is operating to the efficiency for which it was designed. The three adjustments work together and should be checked each time the machine is used.

1. **TIRE PRESSURE** It is important for the proper operation of the Surf Rake® to have the two rear tires inflated to the same pressure.

   TO ADJUST TIRE PRESSURE: Inflate tires to 18 PSI.
   When the tires are not inflated the same, the tire with the lower pressure will in turn lower that side of the Surf Rake® and cause the tines on that side to be lower. The result is the conveyor belt will clean unevenly, possibly picking up sand on the lower side or not cleaning deep enough on the higher side.

2. **CONVEYOR BELT TENSION** It is important for the proper operation of the Surf Rake® to have both sides of the conveyor belt with the same tension.

   TO ADJUST THE CONVEYOR BELT: Open the side guard doors on both sides of the Surf Rake®. Pull the conveyor belt back and forth midway between the upper 8" idler roller wheel and lower 8" idler roller wheel to check for amount of play. If there is more than 1 ½" of play, tighten the adjusting bolt. This will raise the upper shaft and tighten the conveyor assembly. Repeat this procedure on the other side of the conveyor assembly. Take some time and go back and forth to each side of the machine, checking that both sides are the same tension. Once both sides are the same tension, retighten the jam nuts on the take up bolts and refasten the doors/guards.

   When the conveyor belt assembly is loose on one side, the belt will naturally sag on that side and cause the tines to drag on that side. The result is premature wear to the tines, an uneven cleaning and possibly picking up sand.

3. **MOLDBOARD HEIGHT** It is important for the proper operation of the Surf Rake® to have both sides of the moldboard adjusted identically to the same height. The moldboard is initially set evenly. For most applications, this factory setting works well. If the factory setting is changed, be advised that a small amount of adjustment has dramatic results. Do not move more than ¼" at a time without testing the new setting in the sand for a period of time. Use the guides at the sides of the moldboard to align both sides identically.

   TO ADJUST: Loosen the turnbuckle locking arms on the sides to be moved. Use the guides at each side of the moldboard to level the moldboard to the desired height. Be sure that the guides are set at the same mark or location on each side. Retighten the turnbuckle locking arm/s.
   The moldboard levels the beach so the tines can penetrate and clean the sand to a constant depth. If the moldboard is too high on one side, the tines will be forced too deep into the sand. This will result in sand being removed along with the debris. **At no time should the Barber Surf Rake® pick up sand.**

CONVEYOR BELT DRIVE COMPONENTS – INSPECTION AND ADJUSTMENT

MAIN SHAFT

MAIN SHAFT SPROCKETS Make a visual inspection of the sprockets for wear. If the sprocket tooth is worn down half of its original width, it should be replaced. There is no adjustment to be made on the sprockets.

MAIN SHAFT BEARINGS Try and lift the main shaft either with a pry bar or by hand. If there is play or movement, an adjustment can be made to tighten the bearing.

TO ADJUST THE MAIN SHAFT BEARINGS: Unscrew machine screw on side of main shaft bearing and

remove retaining ring stop. Turn retaining ring clockwise until there is little or no play. Reinsert the stop and screw. Do not over-tighten. The drive chain and drive sprocket must be removed to adjust the bearing on the chain case side. If adjusting does not remove the play from the bearing, it must be replaced.

TO REMOVE THE MAIN SHAFT BEARINGS:
Remove the top shield, side guards, and conveyor belt assemblies.
Remove the chain case cover.
Loosen the motor jam nut and take up bolt.
Loosen the motor mount bolts and slide back the motor to loosen the drive chain.
Remove drive chain.
Remove large drive sprocket.
Loosen the setscrews on the cast iron conveyor belt sprocket that is farthest away from the chain case - the left side.
Clean the paint off of the inner/left side of the main shaft and move the left side cast iron conveyor belt sprocket toward the center of the main shaft.
Remove the left/outer-retaining ring, which holds the cartridge bearing in its sleeve.
Pull the main shaft away from the chain case so that the left bearing slides out of its sleeve and can be taken off of the shaft.
Remove the right inner retaining ring and push the cartridge bearing out of its sleeve.
If the cartridge bearing is locked into place, a bearing puller can be purchased to help remove the bearing.

TOP SHAFT

TOP SHAFT SPROCKETS Make a visual inspection of the sprockets for wear. If the sprocket tooth is worn down half of its original thickness, it should be replaced. There is no adjustment to be made on the sprockets.

TOP SHAFT BEARINGS The top shaft bearings are take-up bearings. Clean off any debris or excess grease and visually inspect for wear or damage. Use a pry bar to check for wear pushing on the bar to inspect for movement. If there is no movement, clean and grease. If the bearing or sprockets are visibly damaged or have movement, they must be replaced.

TO REMOVE THE TOP SHAFT: Remove the top shield. Loosen up the four 1/2" wing nuts (518AA) that secure the top shield to the side shields. Remove the top shield assembly by lifting it off the side shields.

REMOVE SIDE SHIELDS Remove the three 5/16” bolts that hold the side shields onto the frame.

REMOVE DRIVE CHAIN Remove the two ½” wing nuts that secure the chain case cover to the chain case. Remove the chain case cover. Position the connecting link midway between the large and small drive sprockets. Remove the connecting link and the drive chain.

REMOVE CONVEYOR BELT There is an overlap at the ends of the conveyor belt rubber belting. The overlap is under one of the rows of springs. The belt must be disconnected at this overlapped row. To find the overlap, look inside the belt while turning it. The channel on the inside of the belt will partially hide the ends of the rubber belting, but the end of the belting will be visible. When it is found, the overlapped row should be positioned one row up from the rear bottom sprockets.

The top shaft is a sliding/take up shaft. It is used for tensioning and loosening the conveyor belt. By loosening the take up bolts, the top shaft will lower and the conveyor belt will loosen. Loosen the take up bolts until the conveyor belt stops lowering (1 1/8” socket with one 12” and one 6” extension). Loosen both sides completely.
The conveyor belt must be clamped to prevent it from rolling off/down when all fasteners and chains from the overlapped row are removed. Clamp each side using a c-clamp type vice grip or similar clamps. Remove the row of tines that covers the overlap by removing the 3/8” bolts/nuts that secure the channels-backing strips-retaining bars (9/16” socket with 6” extension & 9/16” box wrench).
Remove the cotter pin and connecting pin from the chains. If the chains are worn out and being replaced, they can be torched apart.

There are 20 rows on the belt. Count 10 rows or half way from where the belt is split. A lifting chain should be hooked at or near this midpoint location on each side of the conveyor belt. This will allow the lowest height necessary to lift the conveyor belt off of the machine.

When the lifting chain is fastened / hooked to the conveyor belt chain and enough tension is on the lifting chain to prevent the conveyor belt from moving, remove the clamps that prevent the conveyor belt from rolling off/down.

Lift the conveyor belt up/off of the top shaft of the machine.

Unbolt the top shaft take up assembly from each side of the machine. Loosen set screws from the bearings and remove bearings from the top shaft.

Put the new bearings on the top shaft. Do not tighten the bearings onto the shaft yet. Do not grease the bearings yet. Replace the top shaft assembly onto the frame. Tighten the four bolts/nuts to secure the top shaft.

Grease the bearings until grease is visible at the seals. Wipe off any excess grease. Any excess grease will immediately have sand adhering to it creating a situation where abrasion will occur.

Replace the belt using the belt removal sequence in reverse.

8" IDLER ROLLERS INSPECTION AND ADJUSTMENT

There are four 8" poly rollers that support and guide the conveyor belt on the 400. Two of the 8" poly rollers support and guide the conveyor belt over the front of the bucket. The other two 8" poly rollers turn the belt at the bottom of the machine, directing the belt toward the front main shaft and providing a plane of four rows of tines that clean the sand. The internal components are the same for all rollers. Look for any wear on the outside diameter/working surface of the roller. To check for wear, loosen the conveyor belt by backing off the adjusting bolts located on each side under the top shaft take-up bearings. Take the weight off of the roller you are inspecting. Check for any wobbling or play. If there is play, the bearings are worn but can be adjusted.

TO ADJUST THE IDLER ROLLERS: Shims are used to compensate for wear. Remove the bearing from the machine. Remove the external retaining ring and cover from the roller. Clean the grease away from the pin and retaining ring. Remove the retaining ring off of the pin. Add shim(s) as necessary, replace retaining ring and recheck for play. Repeat until the roller is tight on the pin. The rollers ride on tapered roller bearings. The bearings will wear out prematurely if not adjusted for wear.

CHAIN CASE SPROCKETS AND CHAIN The drive chain sprockets and chain will wear with use and need to be adjusted periodically. Remove chain case cover and check chain tightness. There should be ½" play in the chain, midway between the sprockets. Check the condition of the teeth of the sprockets. If they are worn down to half their original thickness, they should be replaced. The chain should be replaced if the sprockets are replaced.

TO ADJUST THE CHAIN CASE DRIVE CHAIN: Loosen the take-up bolt and nut away from the motor base plate. Slightly loosen the two motor mount bolts to allow the motor to slide. Tighten the take-up bolt until there is ½" play in the drive chain. Re-tighten the motor mount bolts and the take-up nut. Re-check the chain for correct tension. Only use dry film lubricant on the chain. Do not use grease or oil that will attract sand and shorten the life of the components.

SKID SHOES – SOLID BELT There are two skid shoes located underneath the conveyor belt on each side and on the inside of the side frame. There are wear blocks on each end of the conveyor belt channels that ride on the skid shoes. The skid shoes prevent the belt from sagging while elevating the picked up debris on its way up to the hopper. The skid shoes are made of an abrasion resistant material and must be replaced

when they wear down to a thickness of 1/8". Inspections should be made every month to monitor the wear.

TO REMOVE THE SKID SHOES: Open the side door/guard. Tighten the conveyor belt fully to take the weight off of the skid shoes. Do this on each side of the machine. Loosen and remove the two ½" bolts that hold each skid shoe to the side frame arms. Note the way that the angles/brackets of the skid shoes are situated in relation to the side frame arms. Pry the skid shoes out toward the center of the machine. Replace with new skid shoes and fasteners. The skid shoes should sit down flush on the side frame arms that they fasten to. A clamp may be needed to hold the skid shoes down when refastening to ensure that they are flat on the arms. Slightly loosen the conveyor belt until there is one-inch play midway between the large 8" rollers.

HYDRAULIC COMPONENTS

CYLINDERS There are two single acting cylinders that trip the bucket. Hydraulic pressure from the towing vehicle raises the cylinders and the weight of the bucket and gravity lowers them. Check for hydraulic leaks. There are seal kits to repair leaking cylinders. A WD-40 type penetrate can be used to prevent the seals from drying out when the machine sits for the off-season. It can also lubricate the rods when first operating a machine after it has sat for a period of time.

TO REPLACE THE CYLINDER SEALS: Power wash or clean the cylinder before removing it from the machine. Remove hose from the cylinder. Place the base of the cylinder in a vice and position the cylinder horizontally. Use a bar through the piston rod hole to pull out the piston and piston rod assembly.

CYLINDER DISASSEMBLY Unscrew the top with a spanner wrench. Remove the rod/piston assembly. Never try to slide the gland over the end of the piston rod. To clean gland, remove nut on bottom of piston rod and disassemble from that side.

Before removing seals, wipers and o-rings, take note of their orientation in the piston and gland. When replacing felt wipers, make sure they have been saturated in oil. Coat all surfaces in oil before reassembly.

WHEELS SPINDLES AND AXLES To check for play in the spindle/hubs, elevate the wheels off of the ground and check for play or looseness on the spindles. It is easier to determine if adjustment is necessary when the tire/wheel is off the hub. If there is excessive play, the bearing and races should be inspected for damage.

TO ADJUST WHEEL HUBS: Remove the buddy hub/grease reservoir from the end of the hub. Clean away the grease. Remove the cotter pin. Tighten the castle nut assembly until the play is gone. Reinsert the cotter pin and grease reservoir. There is a blue collar on the grease reservoir that extends out when grease is added. Add grease to the reservoir until the blue collar extends out. Check for tightness of the wheel cone nuts. They should be tightened to 95 ft/lbs. Tires should be inflated to 18 PSI.

TINE REPLACEMENT Replace tines as they break. Your machine can clean effectively with 20 or 30 tines missing; however, it is advisable to replace them soon after they break. When a tine is broken, the work it would normally do picking up material is transferred to the adjacent tines. This will overwork them and, in turn, shorten their life. Never operate your machine with more than 50 broken tines. Tines will shorten as they are used and should be replaced when they wear to within ½" of the bends.

The most convenient location for removing and replacing tines on the conveyor belts is on the top of the machine with the top shield removed.

Position the belt. Rotate the conveyor belt slowly and stop it when the row on which you are going to replace the tines is conveniently located.

REMOVAL AND REPLACEMENT OF 504FH TINES (SIFTING BELT)

TOOLS RECOMMENDED: Safety support is REQUIRED! Power tool or ratchet, 6” socket extension and 1/2” socket (6 point), large flat blade screwdriver, 1/2” combination wrench, drive torque wrench.

The tines are secured on the retaining bar by a spacer washer and a locknut. Loosen off the retaining washer and nut and remove the old tine. Reapply a small amount of nickel based antiseize to the threaded stud before reassembling. Start the washer and nut back onto the threaded stud, leaving enough room to allow the tine to be positioned underneath.

Tines should be parallel to each other and to the conveyor. Be sure the tines are positioned next to the retaining bolt and well secured under the retaining washer and nut. Tighten the retaining nut 18 to 20 PSI.

REMOVAL AND REPLACEMENT OF 504F-1 TINES (SOLID BELT)

TOOLS RECOMMENDED: Safety support is REQUIRED! Impact gun or ratchet, 6” socket extension and 9/16” socket (6 point), large flat blade screwdriver, 9/16” combination wrench, drive torque wrench.

The tines are secured under the retaining bars (516A/516B) and kept in position by a series of divots on the retaining bars. Loosen conveyor bolts (SIX REVOLUTIONS MAXIMUM). Bolts on both sides of any tine must be loosened in order to remove and replace the tine. The center bolts are secured by wing nuts that will fall to the inside of the belt if the bolts are loosened more than 6 turns. Marking the side of the 9/16" socket with a bright colored line will allow you to count the revolutions while loosening a bolt. If a tine is to be replaced next to the belt chain, the end bolts that secure the chain to the retaining bar must be loosened from the side location of the machine.

Once the bolts are loosened, place the screwdriver between the retaining bar and the backing strip and next to the tine that you are removing. Pry the retaining bar away from the belt and remove the tine. Place the new tine under the retaining bar and resting on the backing strip, make sure that it is positioned correctly around the divot. Torque center bolts to 22 ft.-lbs. (30 Meter-Newtons). If a torque wrench is not available, tighten the bolts so that the retaining bars are tight against the spacer washers on which they sit. If the retaining bars bend when tightening, back off until the retaining bar is straight. Torque end bolts to 40 ft.-lbs. (54 Meter-Newtons).

Barber SURF RAKE® Model 400

Maintenance & Lubrication Schedule

Every 8 Hours or Every Day:

- Wash Machine After Use

Every 40 Hours or Every Week: Lubricate the following:

Chart Ref. #	Barber Part #	Description (Quantity)
1	549AS08	8” Roller Assemblies (4)
2	403T	Main Shaft Bearings (2)
3	503VV	Upper Shaft Bearings (2)
4	527GF-4	Wheel Bearings (2)
5	545NN	Cylinder Pins (2)
	508RA	Caster Arm Sleeve Bearings (2) (Optional Equipment)
	530	Finisher Assembly Pins (6) (Optional Equipment)

Every 40 Hours or Every Week Inspect and/or Adjust:

Chart Ref. #	Barber Part #	Description (Quantity)
6	504FH	Replace Broken Tines / Clear Obstructions on tines
7	404AS04	Inspect Conveyor Belt Tension (Both Sides)
8	540G	Adjust Conveyor Belt Tension If Needed (Both Sides)
9	527KC	Tire Pressure 18 PSI (2)

Every 200 Hours or Every 2 Months:

Chart Ref. #	Barber Part #	Description (Quantity)
10	522JT1	Spot Lubricate Moldboard Turnbuckle Pins (4)
11	545MM	Clean Breather / Filter on Hydraulic Tank
12	545C	Change Hydraulic Filter
13	503MMC	Inspect and Adjust, if necessary, Main Shaft Drive Chain
14	645HYOIL	Check Hydraulic Tank Fluid Level
20	442F	Push flap down so it touches chain

Every 500 Hours or Once a Year:

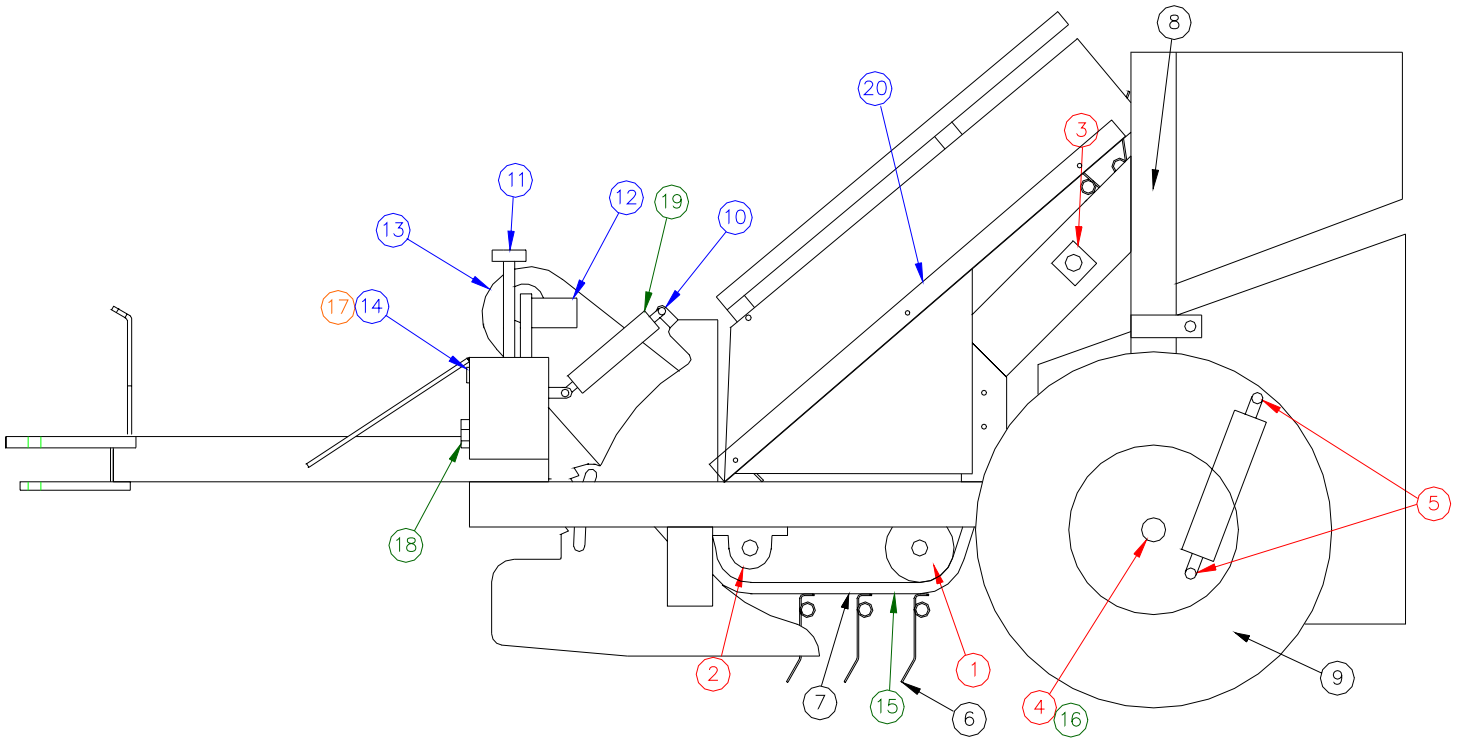
Chart Ref. #	Barber Part #	Description (Quantity)
15	504G	Check / Torque End Bolts on Conveyor to 40psi (40)
16	527GF-4	Adjust / Repack / Replace (if needed) Wheel Bearings
18	645HM	Clean Hydraulic Tank Strainer
19	522JT	Clean and Grease Moldboard Turnbuckle Assembly (2)

Every 1000 Hours or Once Every 3 Years:

Chart Ref. #	Barber Part #	Description (Quantity)
17	645HYOIL	Change Hydraulic Fluid 10 Gal (ISO-32 Grade or Equivalent)

MAINTENANCE AND LUBRICATION CHART

GREASE EVERY 40 HOURS OR EVERY WEEK - BOTH SIDES
INSPECT AND ADJUST EVERY 40 HOURS OR EVERY WEEK
INSPECT AND MAINTAIN EVERY 200 HOURS OR BIMONTHLY
INSPECT AND MAINTAIN EVERY 500 HRS OR EVERY YEAR
INSPECT AND MAINTAIN EVERY 1000 HRS OR EVERY THREE YEARS



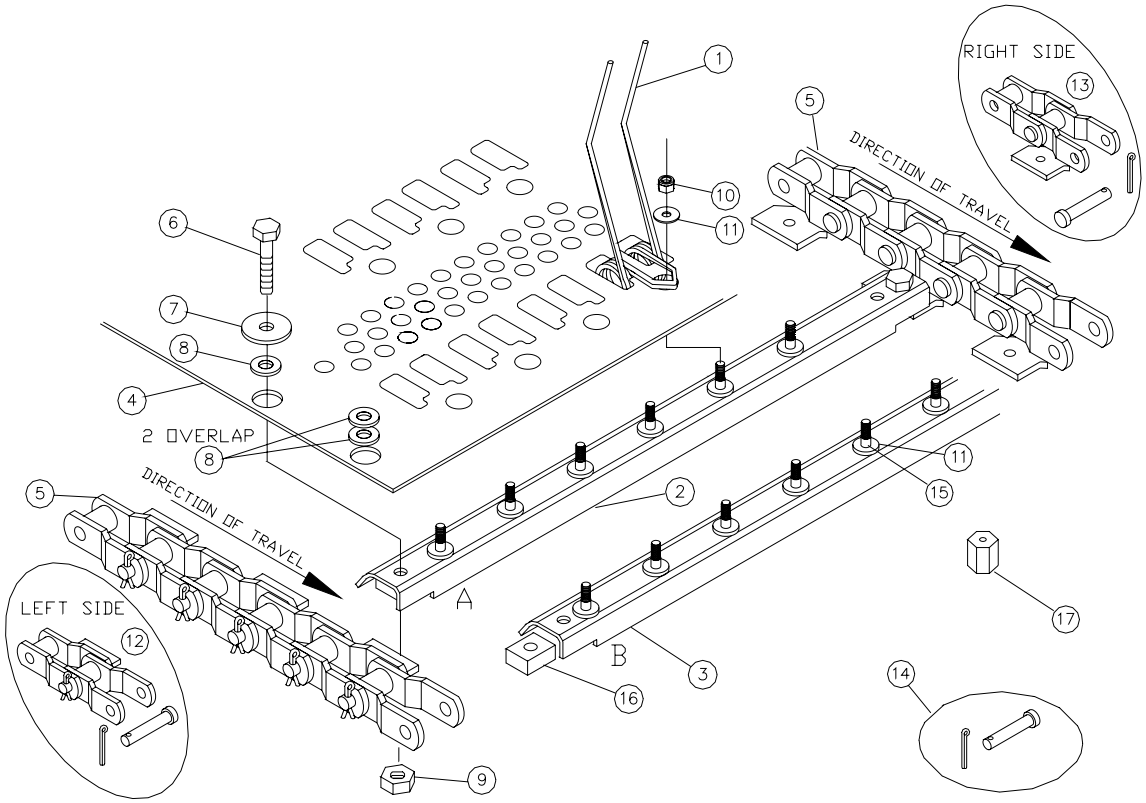
BARBER SURF RAKE®
MODEL 400

SECTION 6 – PARTS CATALOG AND ORDERING

When Ordering Parts, please have the following information available:

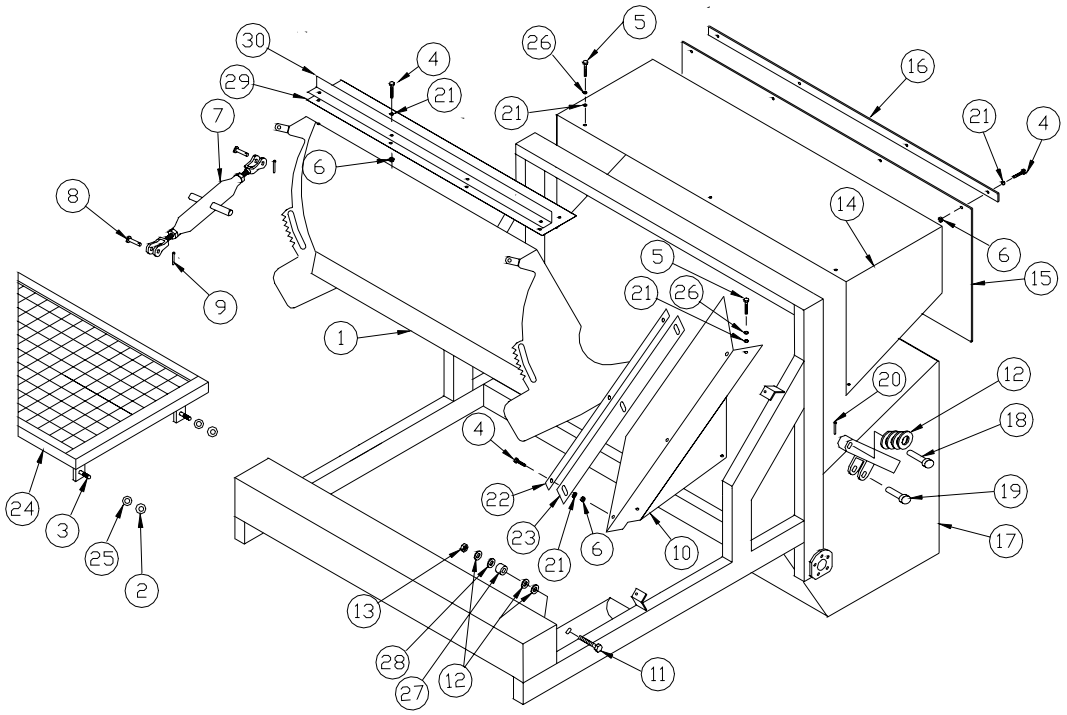
1. Model and serial number of your SURF RAKE
2. Part number, description and page number
3. Shipping and billing address
4. Method by which shipment is to be made
5. Full name of consignee
6. Catalog number of this parts book (found on bottom left corner of every page)

CONVEYOR



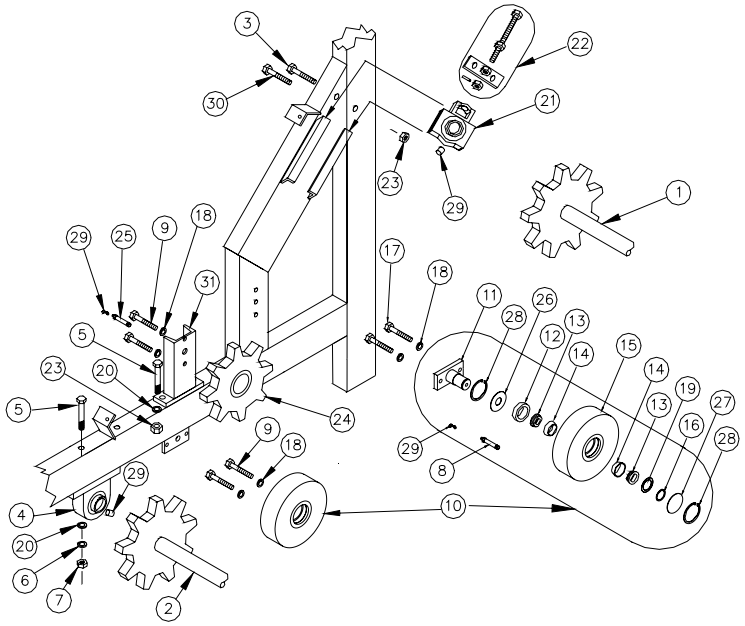
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	504FH	320	TINE
2	410HA	10	CHANNEL A WITH STUDS AND WASHERS
3	410HB	10	CHANNEL B WITH STUDS AND WASHERS
4	404BE02	1	BELT
5	404DK	1	OFFSET CHAIN, COMPLETE (BOTH SIDES)
6	504G	40	CAPSCREW
7	560W06S	40	WASHER
8	560W06H	42	SPACER, SILVER
9	504H	40	LOCKNUT
10	560N05LS	320	LOCKNUT
11	560W05S	640	WASHER
12	504DKSL		OFFSET CHAIN SEGMENT, LEFT SIDE
13	504DKSR		OFFSET CHAIN SEGMENT, RIGHT SIDE
14	404DB		CHAIN PIN AND COTTER
15	560B05095S	320	STUD
16	510HC	40	SPACER
17	504CM02		CHANNEL STUD REPLACEMENT TOOL
18	404AS02		CONVEYOR ASSEMBLY COMPLETE (NOT SHOWN)

MOLDBOARD AND SHIELDS



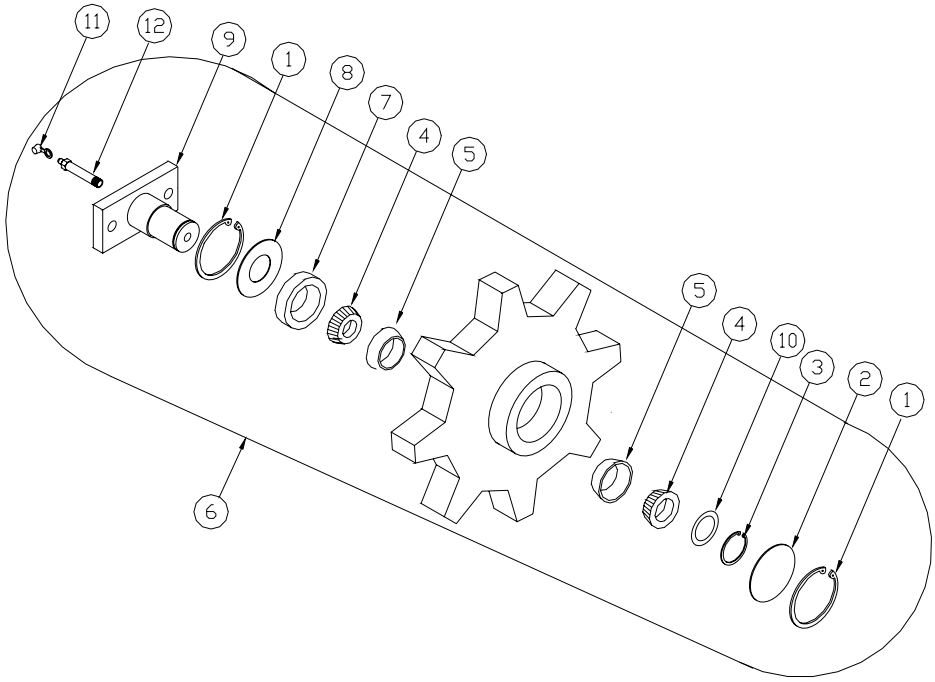
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0719
1	422AS01	1	MOLDBOARD
2	560N08L	4	LOCK NUT
3	560B08100	4	CAPSCREW
4	524X	14	CAPSCREW
5	560B05075	11	CAPSCREW
6	560N05L	14	LOCK NUT
7	522JT	2	TURNBUCKLE
8	522JT1	4	PIN
9	522JT2	4	COTTER PIN
10	442A/B	2	SIDE SHIELD (B SHOWN)
11	409D	2	CAPSCREW
12	502N	16	FLAT WASHER
13	509FA	2	LOCKING NUT
14	424F	1	BACK SHIELD
15	424E	1	BACK FLAP
16	424G	1	BACK FLAP HOLD DOWN
17	A425	1	BUCKET
18	545NN	4	PIN
19	530CM06	2	PIN
20	502P	6	COTTER PIN
21	524S	25	FLAT WASHER, STAINLESS
22	442E	2	SIDE GUARD FLAP HOLD DOWN
23	442F	2	SIDE GUARD FLAP
24	442G	1	TOP CONVEYOR SHIELD
25	603GG	4	FLAT WASHER
26	524Y	11	LOCK WASHER
27	422TB02	2	SPACER
28	509C	2	WASHER
29	422F	1	MOLDBOARD FLAP
30	422G	1	MOLDBOARD FLAP HOLD DOWN BAR

DRIVE MECHANISM



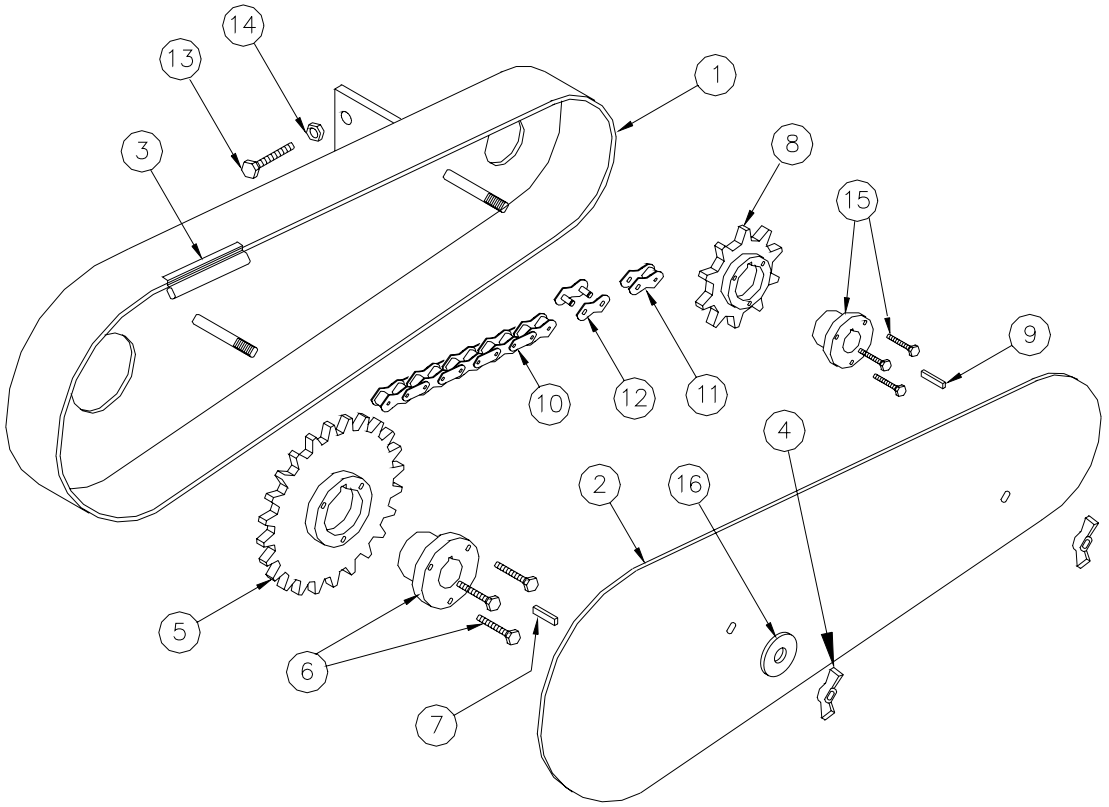
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0118
1	435AS01	1	SPROCKET AND SHAFT ASSEMBLY
2	436AS01	1	SPROCKET AND SHAFT ASSEMBLY
3	540D	2	CAPSCREW
4	403T	4	BEARING
5	408BB	8	CAPSCREW
6	524G	8	LOCK WASHER
7	523R	8	HEX NUT
8	503ZE01	2	GREASE FITTING
9	560B06100	4	CAPSCREW
10	549AS08	4	IDLER ROLLER ASSEMBLY
11	549AS01	4	PIN AND BASE ASSEMBLY
12	549CM01	4	SEAL
13	527GF-2	8	ROLLER BEARING
14	527GF-9	8	RACE
15	549CM08	4	IDLER ROLLER
16	549CM03	4	SNAP RING – SMALL EXTERNAL
17	560B06125	4	CAPSCREW
18	509H	8	LOCK WASHER
19	549CM05	8	SHIM
20	603GG	12	WASHER
21	503VV	2	BEARING
22	A440G	2	TAKE UP BOLT
23	560N08L	8	LOCK NUT
24	549AS04	2	SPROCKET ROLLER ASSEMBLY
25	503ZE01	4	GREASE FITTING
26	549FM02	4	COVER PLATE WITH HOLE
27	549FM01	4	COVER PLATE
28	549CM02	8	SNAP RING – LARGE INTERNAL
29	503CAP	8	GREASE COVER
30	560B08100	2	CAPSCREW
31	449AS01	2	SPROCKET MOUNTING BRACKET

SPROCKET ROLLER ASSEMBLY



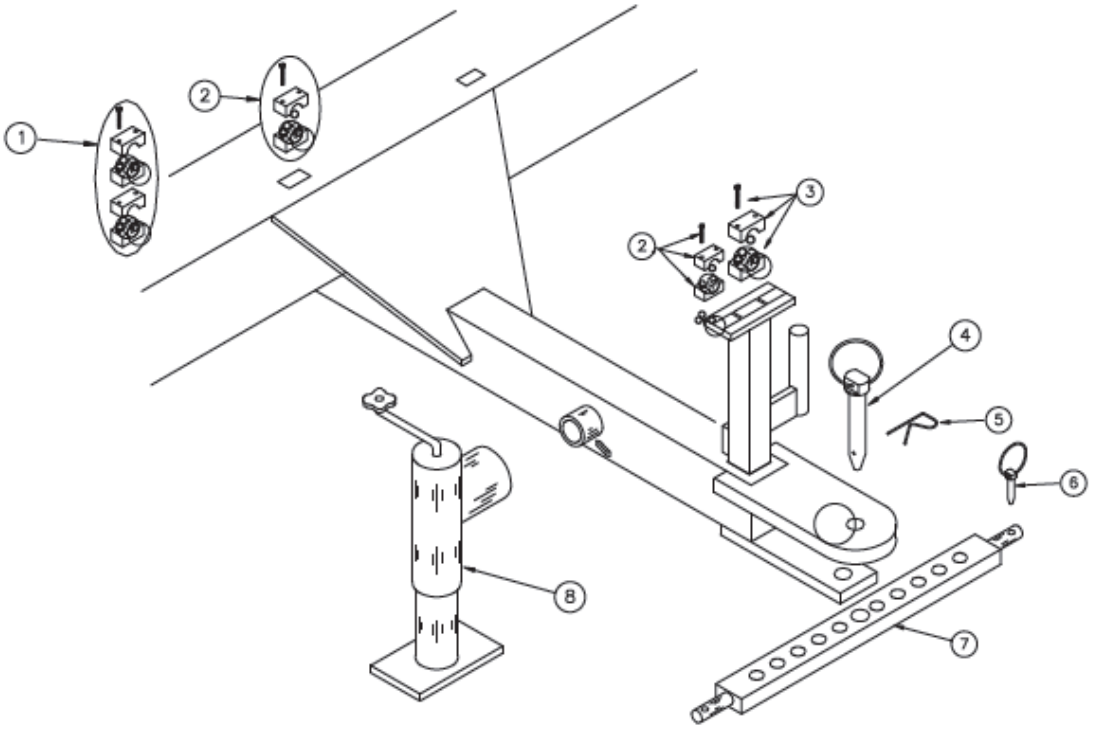
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0118
1	549CM02	2	SNAP RING, LARGE INTERNAL
2	549FM01	1	FRONT COVER PLAET
3	549CM03	1	SNAP RING, SMALL EXTERNAL
4	527GF-2	2	ROLLER BEARING
5	527GF-9	2	RACE
6	549AS04	1	SPROCKET ROLLER ASSEMBLY, COMPLETE
7	549CM01	1	SEAL
8	549FM02	1	REAR COVER PLATE
9	549AS01	1	PIN AND BASE ASSEMBLY
10	549CM05	2	SHIM
11	503CAP	1	GREASE COVER
12	503ZE01	1	GREASE FITTING

CHAIN CASE



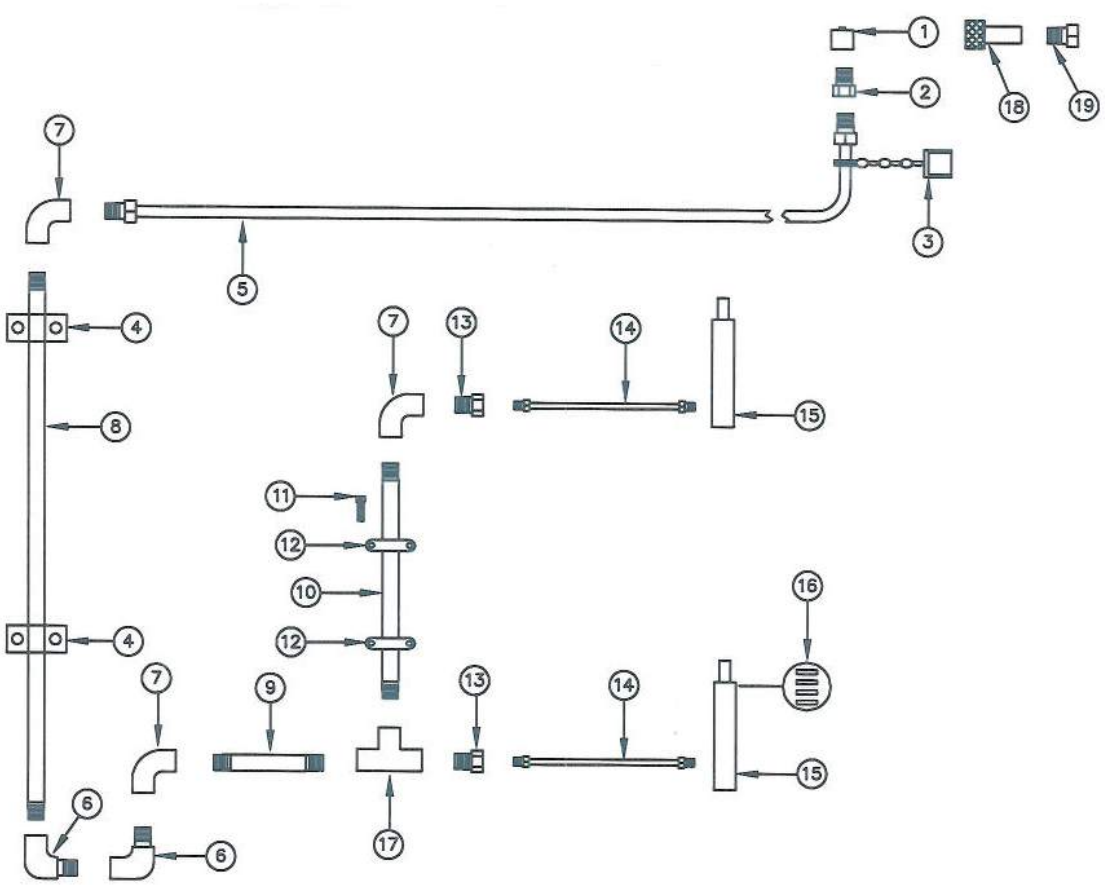
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	A518	1	CHAIN CASE ASSEMBLY
2	518C	1	COVER PLATE
3	518D	1	GASKET
4	518AA	2	WING NUT
5	603E	1	SPROCKET
6	403FF	1	BUSHING
7	503X	1	KEY
8	503W12	1	SPROCKET
9	503WHK	1	KEY
10	503MMC	1	CHAIN
11	503NN-1	1	HALF LINK
12	503NN-2	1	CONNECTING LINK
13	518K	1	CAPSCREW
14	523R	1	HEX NUT
15	503WB	1	BUSHING
16	603GG	2	FLAT WASHER

HITCH



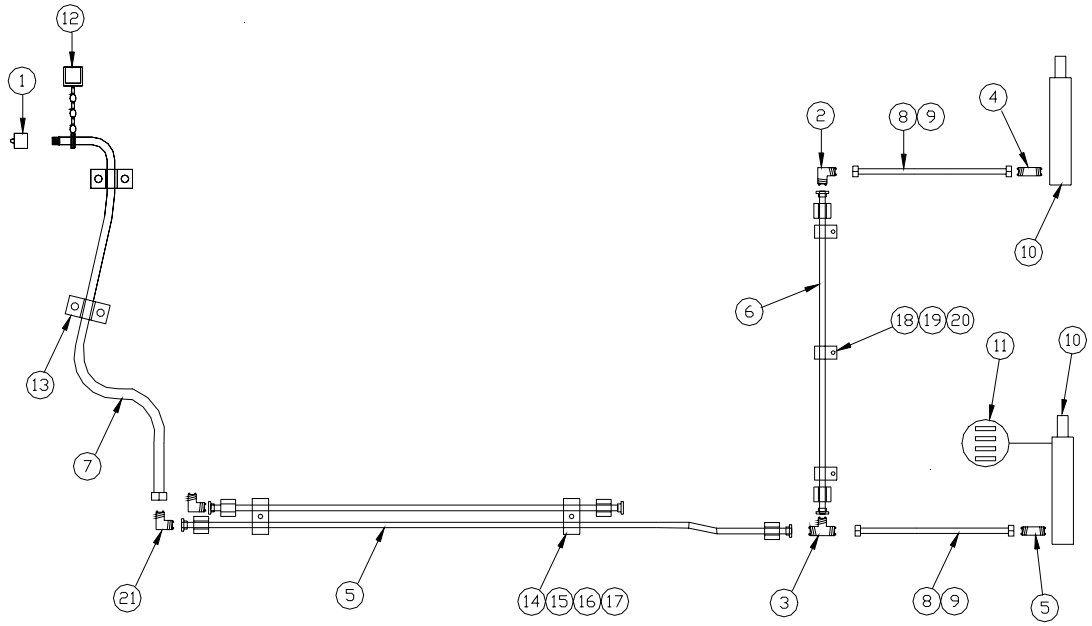
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	540C1001	2	HOSE CLAMP, DOUBLE
2	608HX	4	HOSE CLAMP ½”
3	645HBB	1	HOSE CLAMP 1”
4	A552-1	1	HITCH PIN WITH COTTER
5	552D	1	HITCH PIN COTTER
6	552C	2	DRAW BAR SNAP PIN
7	552CAT-1 (OR 2)	1	DRAW BAR WITH SNAP PINS IS EITHER CATEGORY 1 OR 2 DEPENDING ON TRACTOR
8	553AS02	1	JACK STAND

HYDRAULIC LIFT



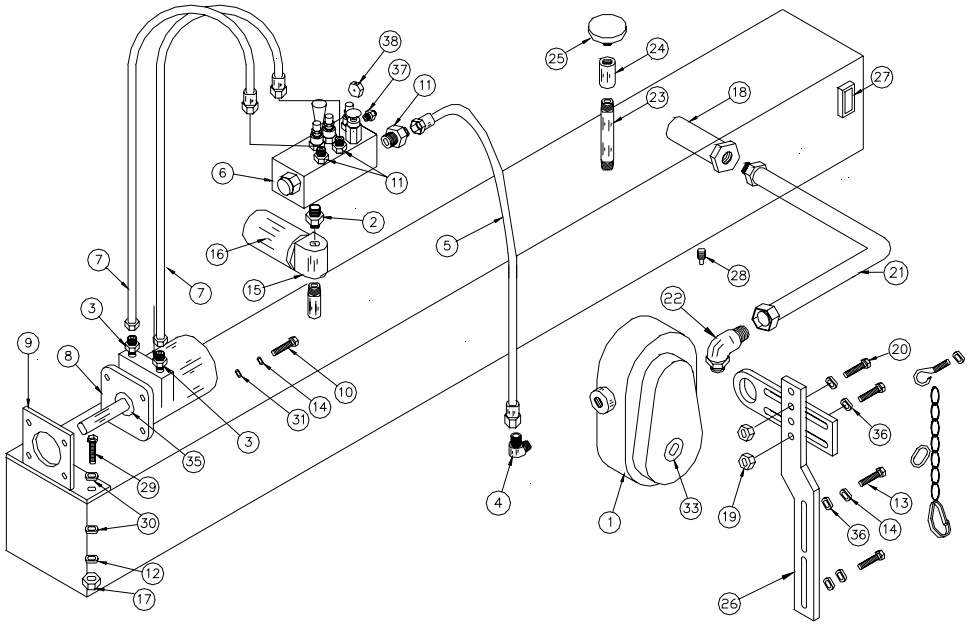
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	545HD-12	1	QUICK DISCONNECT (MALE)
2	540A0807	1	PRESSURE REDUCER
3	545HD-13	1	QUICK DISCONNECT COVER
4	608HX	2	HOSE CLAMP
5	645HY	1	HOSE
6	545R	2	STREET ELBOW
7	545CC	3	ELBOW
8	445DD	1	PIPE
9	445DD-1	1	PIPE
10	445FF	1	PIPE
11	520K	4	CAPSCREW
12	645C	2	PIPE CLAMP
13	545P	2	REDUCER BUSHING
14	445S	2	HOSE
15	445J	2	RAM
16	445JS	1	RAM SEAL AND PACKING
17	545EE	1	TEE
18	545HDB	1	QUICK DISCONNECT (FEMALE) – OPTIONAL
19	545HDC	1	REDUCER BUSHING - OPTIONAL

HYDRAULICS



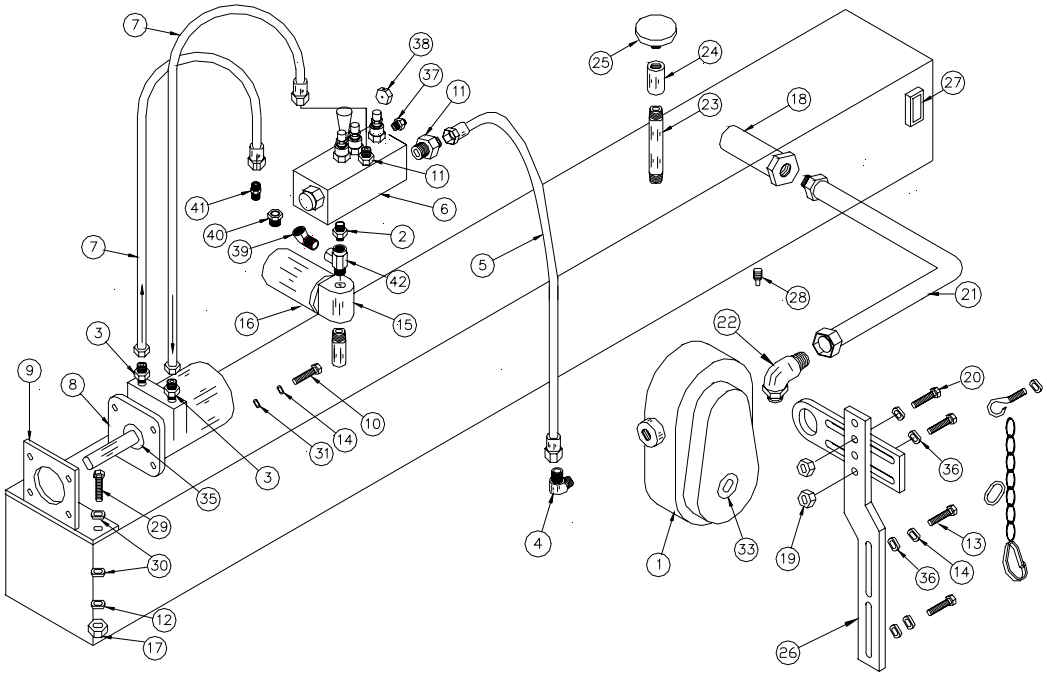
ITEM	PART NUMBER	QTY	DESCRIPTION 0520
1	540A0809	1	QUICK DISCONNECT (MALE)
2	540E0602	1	ELBOW
3	540T0602	1	UNION TEE
4	540A0403	2	ADAPTER
5	540B0618	1	TUBE ASSEMBLY
6	540B0619	1	TUBE ASSEMBLY
7	540H06120	1	HOSE
8	540H04012	1	HOSE
9	540HP001	2	HOSE PROTECTOR
10	445J	2	RAM
11	445JS	1	RAM SEAL AND PACKING
12	545HD-13	1	QUICK DISCONNECT COVER
13	540C1001B	2	HOSE CLAMP
14	540C1017	2	COVER PLATE
15	540C1018	2	BLACK PLASTIC BODY
16	560B04150	2	CAPSCREW
17	520P	1	LOCKWASHER
18	540C0401	1	LOOP CLAMP
19	560N04L	1	LOCK NUT
20	560B04100S	3	CAPSCREW
21	540E0602R	1	ELBOW/RESTRICTOR

HYDRAULIC DRIVE WITH MANIFOLD



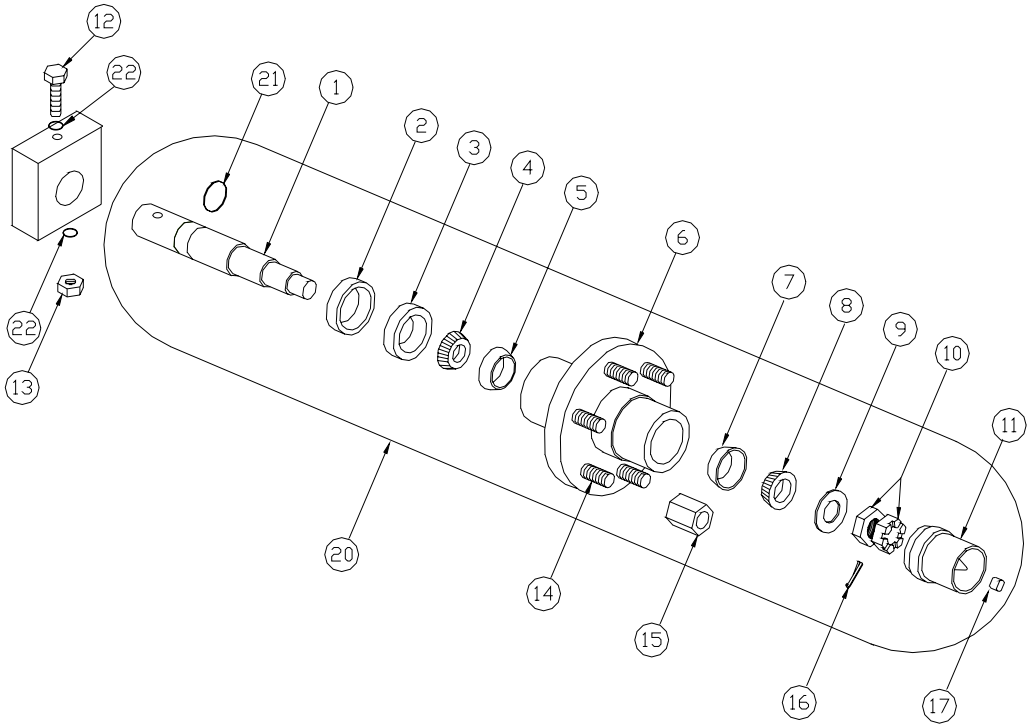
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0318
1	645HA	1	PUMP
2	540A1205	1	ADAPTER
3	540A1003	2	ADAPTER
4	540E1202	1	ELBOW
5	540H08105	1	HOSE
6	540V015	1	CONTROL MANIFOLD, REVERSING AND FLOW
7	540H08024	2	HOSE
8	645HF	1	MOTOR
9	645HF-1	1	MOUNTING BRACKET
10	504J	4	CAPSCREW
11	540A0801	3	ADAPTER
12	503Q	2	LOCK WASHER
13	560B06100	2	CAPSCREW
14	509H	4	LOCK WASHER
15	545B	1	FILTER BASE
16	545C	1	FILTER ELEMENT
17	503S	2	HEX NUT
18	645HMA	1	FILTER – SUCTION SAE
19	560N06L	2	LOCKNUT
20	560B06125	2	CAPSCREW
21	540H16077	1	SAE SUCTION HOSE ASSEMBLY
22	540E1604	1	ELBOW
23	645HS	1	NIPPLE
24	545T	1	COUPLER
25	545MM	1	BREATHER
26	645HEG	1	PUMP BRACKET AND CHAIN
27	645HUA	1	GAUGE – OIL LEVEL
28	645HV	1	PIPE PLUG – MAGNETIC
29	560B09175	2	CAPSCREW
30	503R	4	FLAT WASHER
31	514G	4	FLAT WASHER
32	645HAAA	1	PUMP SEAL KIT, COMPLETE (NOT SHOWN)
33	645HAAB	1	PUMP SPLINE SEAL
34	645HFA	1	MOTOR SEAL KIT, COMPLETE (NOT SHOWN)
35	645HFB	1	MOTOR DRIVESHAFT DIRT SEAL
36	560W06S	4	FLAT WASHER
37	540A0602	1	ADAPTER
38	540R4500236	1	ORIFICE PLATE

HYDRAULIC DRIVE WITH MANIFOLD



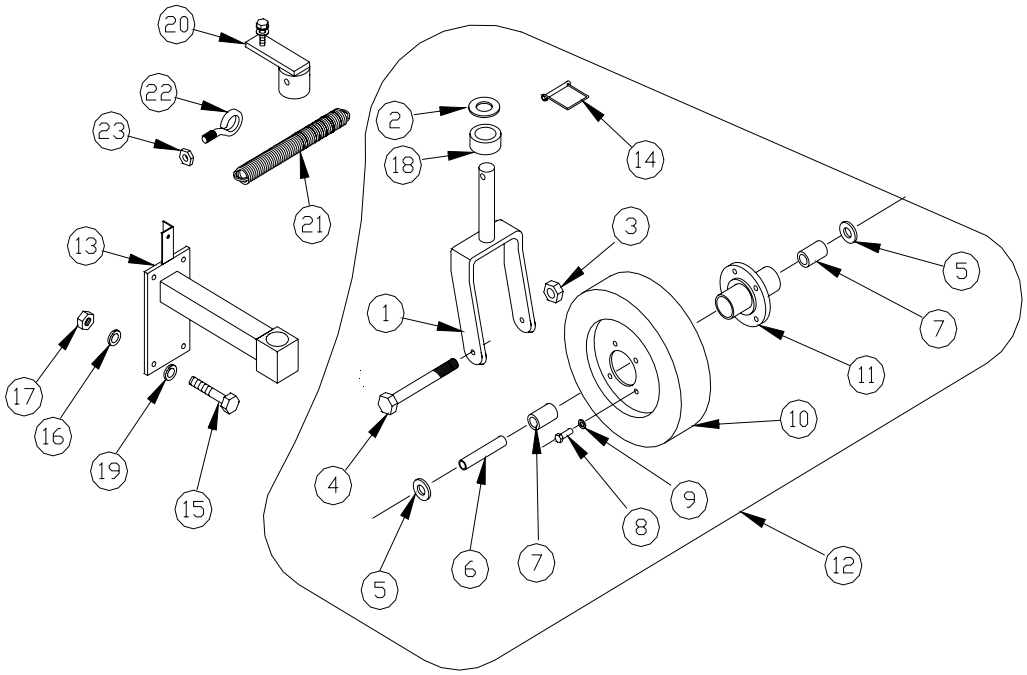
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 1118
1	645HA	1	PUMP
2	540A1205	1	ADAPTER
3	540A1003	2	ADAPTER
4	540E1202	1	ELBOW
5	540H08105	1	HOSE
6	540V015	1	MANIFOLD
7	540H08024	2	HOSE
8	645HF	1	MOTOR
9	645HF-1	1	MOUNTING BRACKET
10	504J	4	CAPSCREW
11	540A0801	3	ADAPTER
12	503Q	2	LOCK WASHER
13	560B06100	2	CAPSCREW
14	509H	4	LOCK WASHER
15	545B	1	FILTER BASE
16	545C	1	FILTER ELEMENT
17	503S	2	HEX NUT
18	645HMA	1	FILTER – SUCTION SAE
19	560N06L	2	LOCKNUT
20	560B06125	2	CAPSCREW
21	540H16077	1	SAE SUCTION HOSE ASSEMBLY
22	540E1604	1	ELBOW
23	645HS	1	NIPPLE
24	545T	1	COUPLER
25	545MM	1	BREATHER
26	645HEG	1	PUMP BRACKET AND CHAIN
27	645HUA	1	GAUGE – OIL LEVEL
28	645HV	1	PIPE PLUG – MAGNETIC
29	560B09175	2	CAPSCREW
30	503R	4	FLAT WASHER
31	514G	4	FLAT WASHER
32	645HAAA	1	PUMP SEAL KIT, COMPLETE (NOT SHOWN)
33	645HAAB	1	PUMP SPLINE SEAL
34	645HFA	1	MOTOR SEAL KIT, COMPLETE (NOT SHOWN)
35	645HFB	1	MOTOR DRIVESHAFT DIRT SEAL
36	560W06S	4	FLAT WASHER
37	540A0602	1	ADAPTER
38	540R4500236	1	ORIFICE PLATE
39	540E1203	1	ELBOW
40	645HC	1	ADAPTER
41	540A0810	1	ADAPTER
42	540T1201	1	STREET TEE

HUB, WHEEL, TIRE



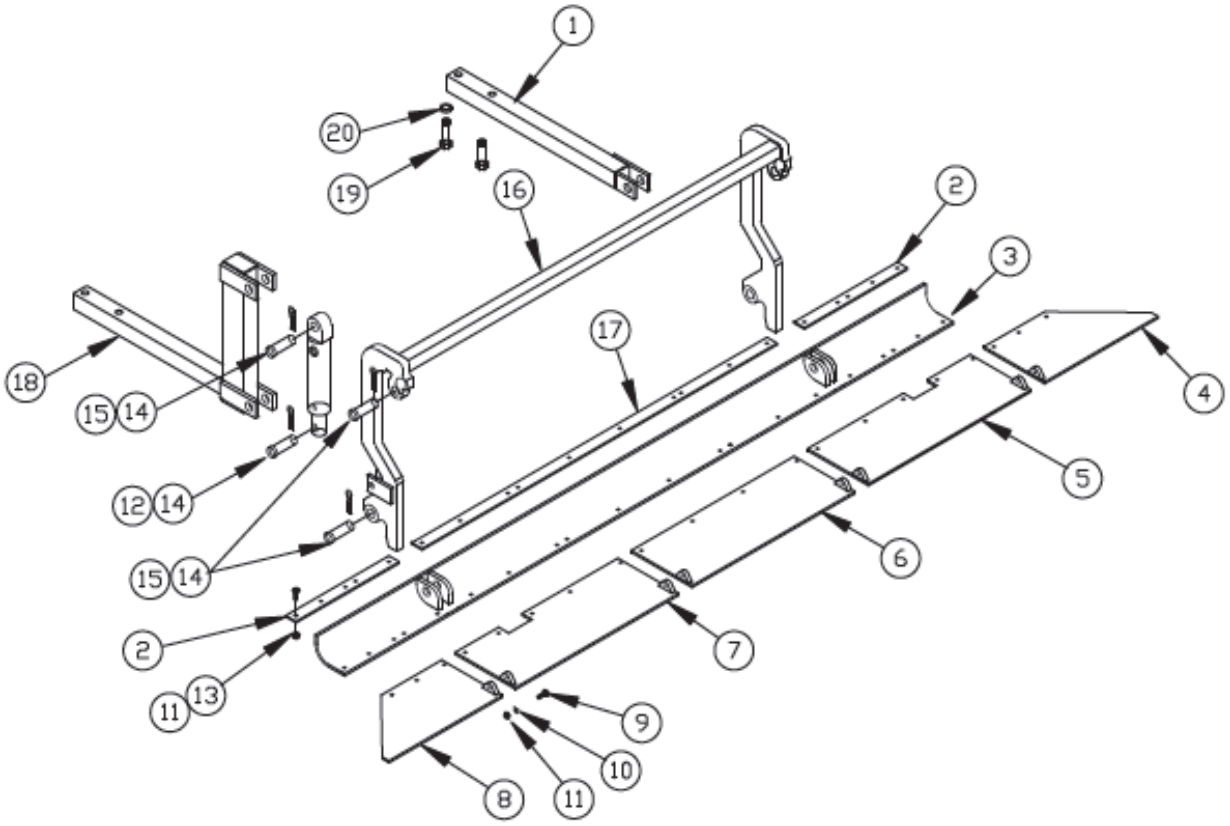
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0616
1	527GF-10A	2	SPINDLE WITHOUT FLANGE
2	527GF-11	2	RACE, STAINLESS SLEEVE
3	527GF-6A	2	GREASE SEAL 3.38” OD
4	527GF-1	2	HUB BEARING, LARGE
5	527GF-8	2	RACE, LARGE
6	527GF	2	HUB WITH RACES
7	527GF-9	2	RACE, SMALL
8	527GF-2	2	HUB BEARING, SMALL
9	527GF-5	2	WASHER
10	527GF-3	2	CASTLE NUT AND RETAINER
11	527GF-4A	2	BUDDY HUB
12	560B08475	2	CAPSCREW
13	560N08L	2	LOCKNUT
14	527GF-7PA	12	HUB STUD .563” SPLINE 0
15	527GF-7B	12	LUG NUT, ALUMINUM WHEEL
16	522JT2	2	COTTER PIN
17	503CAP	2	GREASE CAP
18	527HC	2	WHEEL (NOT SHOWN)
19	527KC	2	TIRE (NOT SHOWN)
20	A527GFB	2	HUB, SPINDLE END UNIT ASSEMBLY WITHOUT FLANGE
21	527GF-18	1	O RING, LARGE
22	527GF-19	2	O RING, SMALL

OPTIONAL CASTER ASSEMBLY



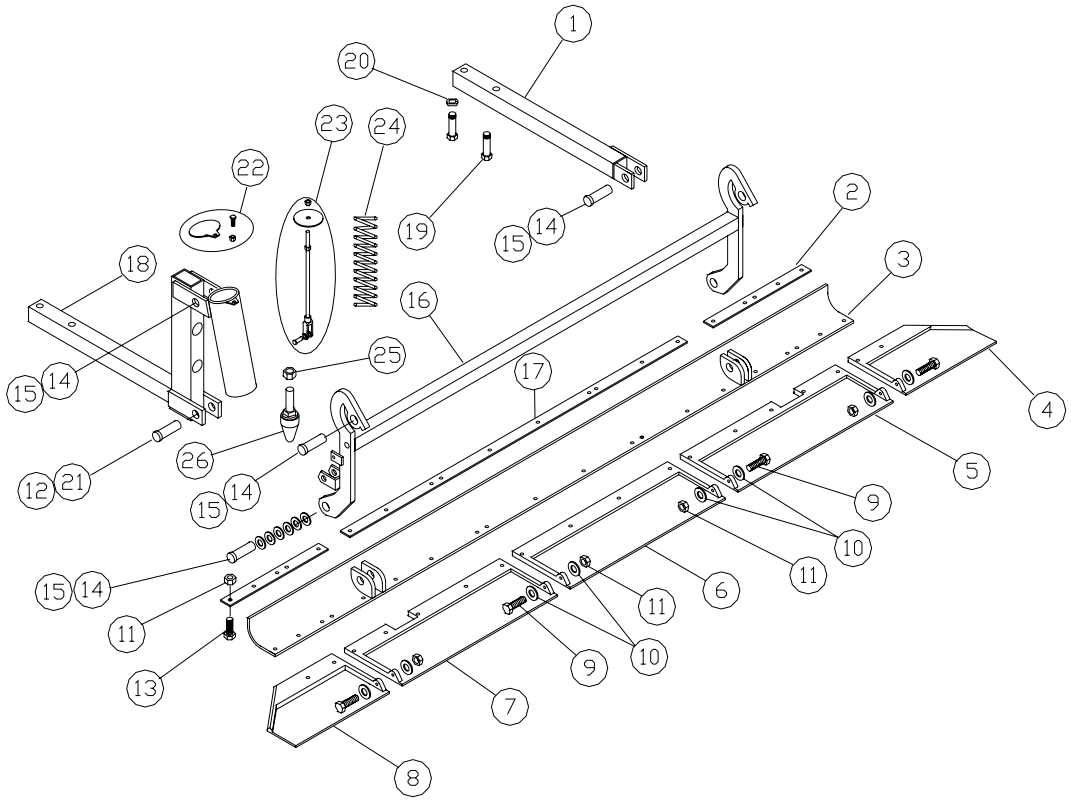
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	251A	2	FORK ASSEMBLY
2	251B	12	WASHER
3	509FA	2	LOCKING NUT
4	251C	2	BOLT
5	251D	4	WASHER
6	251E	2	SPACER TUBE
7	251F	4	ROLLER BEARING
8	560B08100	8	BOLT
9	524G	8	LOCK WASHER
10	251G	2	WHEEL FLANGE AND TIRE ASSEMBLY
11	251H	2	HUB ASSEMBLY
12	251ASY	2	CASTER ASSEMBLY COMPLETE
13	251JASY	2	CASTER HOLDER
14	251N	2	SNAP PIN
15	524D	8	CAPSCREW
16	524G	8	LOCK WASHER
17	523R	8	HEX NUT
18	251TB05	4	SPACER
19	603GG	8	FLAT WASHER
20	251AS01	2	RETAINER CAP ASSEMBLY
21	251TCM07	2	SPRING
22	560B05100E	2	EYEBOLT
23	560N05L	4	NUT

OPTIONAL FINISHER



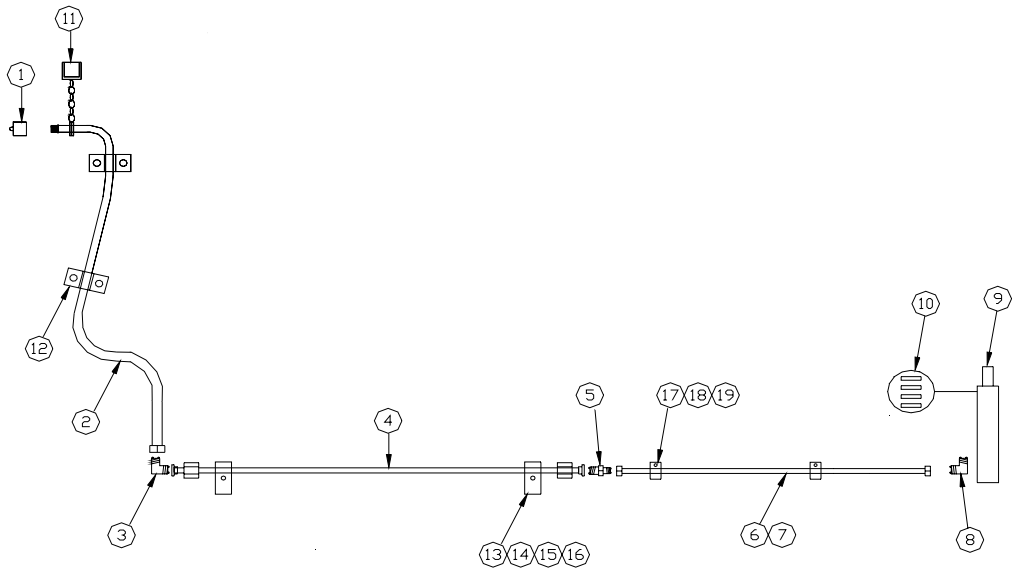
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	430AS13	1	EXTENSION ARM (RIGHT)
2	530FB01	2	HOLD DOWN BAR
3	530AS06	1	FINISHING PLATE
4	530CM02	1	FINISHER (RIGHT OUTSIDE)
5	530CM05	1	FINISHER (RIGHT INSIDE)
6	530CM03	1	FINISHER (CENTER)
7	530CM04	1	FINISHER (LEFT INSIDE)
8	530CM01	1	FINISHER (LEFT OUTSIDE)
9	560B05150	4	BOLT
10	524S	4	WASHER
11	560N05L	24	NUT
12	530CM07	1	PIN
13	560B05125	20	BOLT
14	502P	5	COTTER PIN
15	530CM06	5	PIN
16	430AS02	1	ARM ASSEMBLY
17	530FB02	1	HOLD DOWN BAR, MIDDLE
18	430AS14	1	EXTENSION ARM, LEFT
19	560B12300	4	BOLT
20	560LW12	4	LOCK WASHER

OPTIONAL AUTO FINISHER



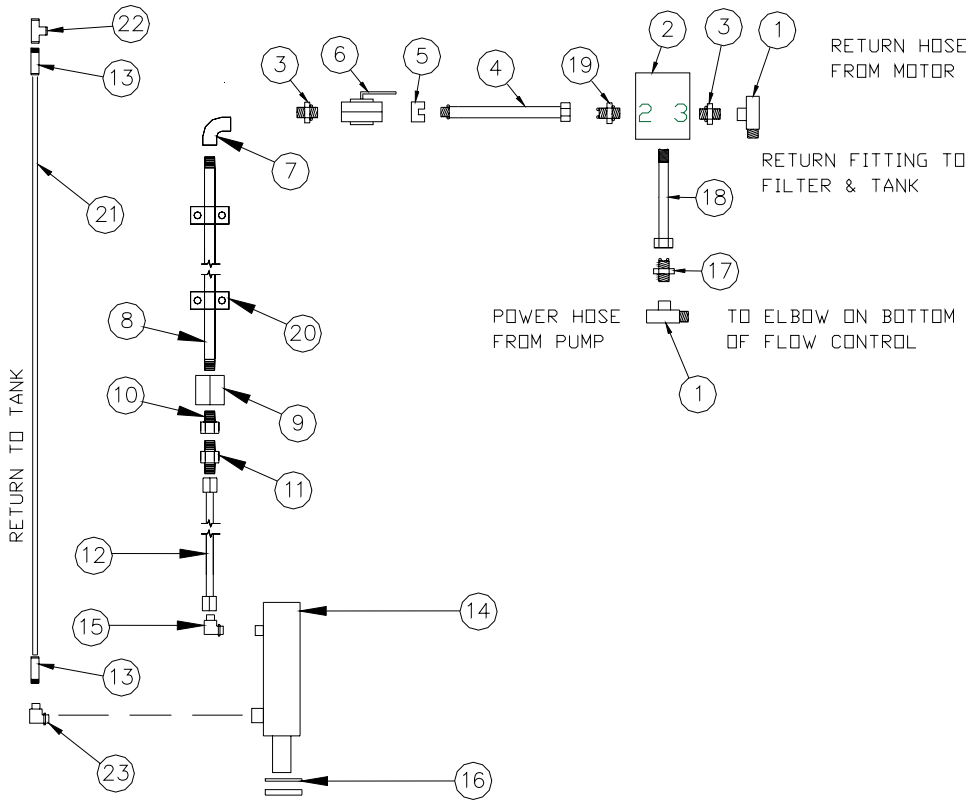
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	430AS13	1	EXTENSION ARM (RIGHT)
2	530FB01	2	HOLD DOWN BAR
3	530AS06	1	FINISHING PLATE
4	530CM02	1	FINISHER (RIGHT OUTSIDE)
5	530CM05	1	FINISHER (RIGHT INSIDE)
6	530CM03	1	FINISHER (CENTER)
7	530CM04	1	FINISHER (LEFT INSIDE)
8	530CM01	1	FINISHER (LEFT OUTSIDE)
9	560B05150	4	BOLT
10	524S	4	WASHER
11	560N05L	22	NUT
12	530CM07	1	PIN
13	560B05150	18	BOLT
14	560C02150	3	COTTER PIN
15	530CM06	5	PIN
16	530AS17	1	ARM ASSEMBLY
17	530FB02	1	HOLD DOWN BAR, MIDDLE
18	430AS41	1	EXTENSION ARM (LEFT)
19	560B12300	4	BOLT
20	560LW12	4	LOCK WASHER
21	522JT2	1	COTTER PIN
22	530AS44	1	CAP ASSEMBLY
23	530AS43	1	SPRING TENSIONER ASSEMBLY
24	530CS01	1	SPRING
25	509F	1	NUT
26	530AS46	1	RUBBER STOP
27	430AS21	1	AUTO FINISHER ASSEMBLY AND AUTO FINISHER HYDRAULICS ASSEMBLY

OPTIONAL FINISHER HYDRAULICS



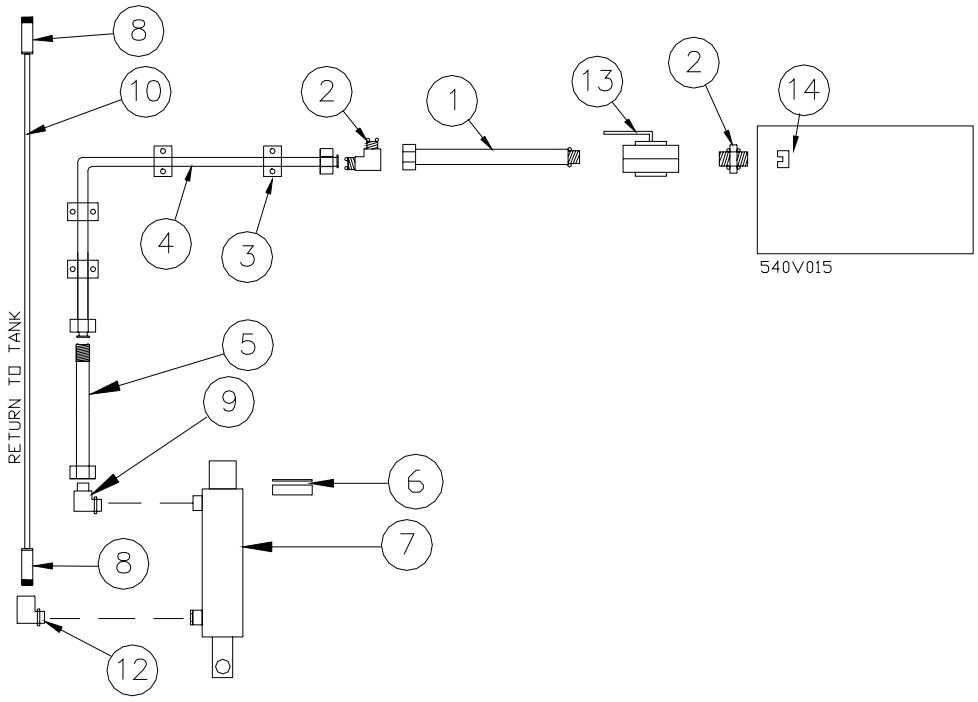
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	540A0809	1	QUICK DISCONNECT (MALE)
2	540H06120	1	HOSE
3	540E0602R	1	ELBOW/RESTRICTOR
4	540B0617	1	TUBE ASSEMBLY
5	540A0618	1	ADAPTER
6	540H04061	1	HOSE
7	540HP001	2	HOSE PROTECTOR
8	540E0603	1	ELBOW
9	445J	2	RAM
10	445JS	1	RAM SEAL AND PACKING
11	545HD-13	1	QUICK DISCONNECT COVER
12	540C1001B	2	HOSE CLAMP
13	540C1017	2	COVER PLATE
14	540C1018	2	BLACK PLASTIC BODY
15	560B04175	2	CAPSCREW
16	520P	1	LOCKWASHER
17	540C0401	1	LOOP CLAMP
18	560N04L	1	LOCKNUT
19	560B04100S	3	CAPSCREW

OPTIONAL AUTO FINISHER HYDRAULICS



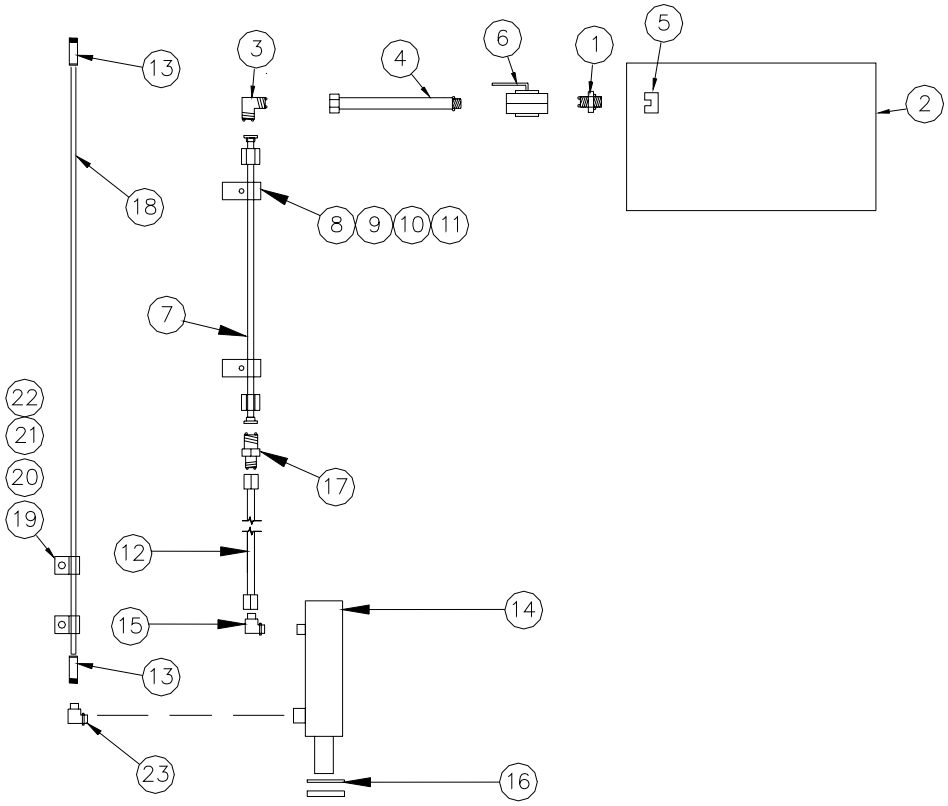
ITEM	PART NUMBER	QTY	DESCRIPTION 400S 0111
1	540T0804	2	STREET TEE
2	540V007	1	SEQUENCE VALVE
3	540A0611	1	ADAPTER
4	540H06052	1	HOSE
5	540R4500236	1	ORIFICE PLATE
6	540V004	1	SHUT OFF VALVE
7	545CC	1	ELBOW
8	540P08023	1	PIPE
9	540A0805	1	COUPLER
10	545P	1	REDUCER BEARING
11	540A0403	1	ADAPTER
12	540H04061	1	HOSE
13	540A0404	2	ADAPTER
14	545JJH	1	CYLINDER
15	540E0603	1	ELBOW
16	545JJHP	1	REPLACEMENT SEAL KIT PER CYLINDER
17	540A0610	1	ADAPTER
18	540H06013	1	HOSE
19	540A0602	1	ADAPTER
20	608HX	4	HOSE CLAMP
21	540TB04000	108	TUBE 108”
22	540T0401	1	UNION TEE, TUBE
23	540E0401	1	ELBOW
24	430AS21	1	AUTO FINISHER ASSEMBLY AND AUTO FINISHER HYDRAULIC ASSEMBLY

OPTIONAL AUTO FINISHER HYDRAULICS



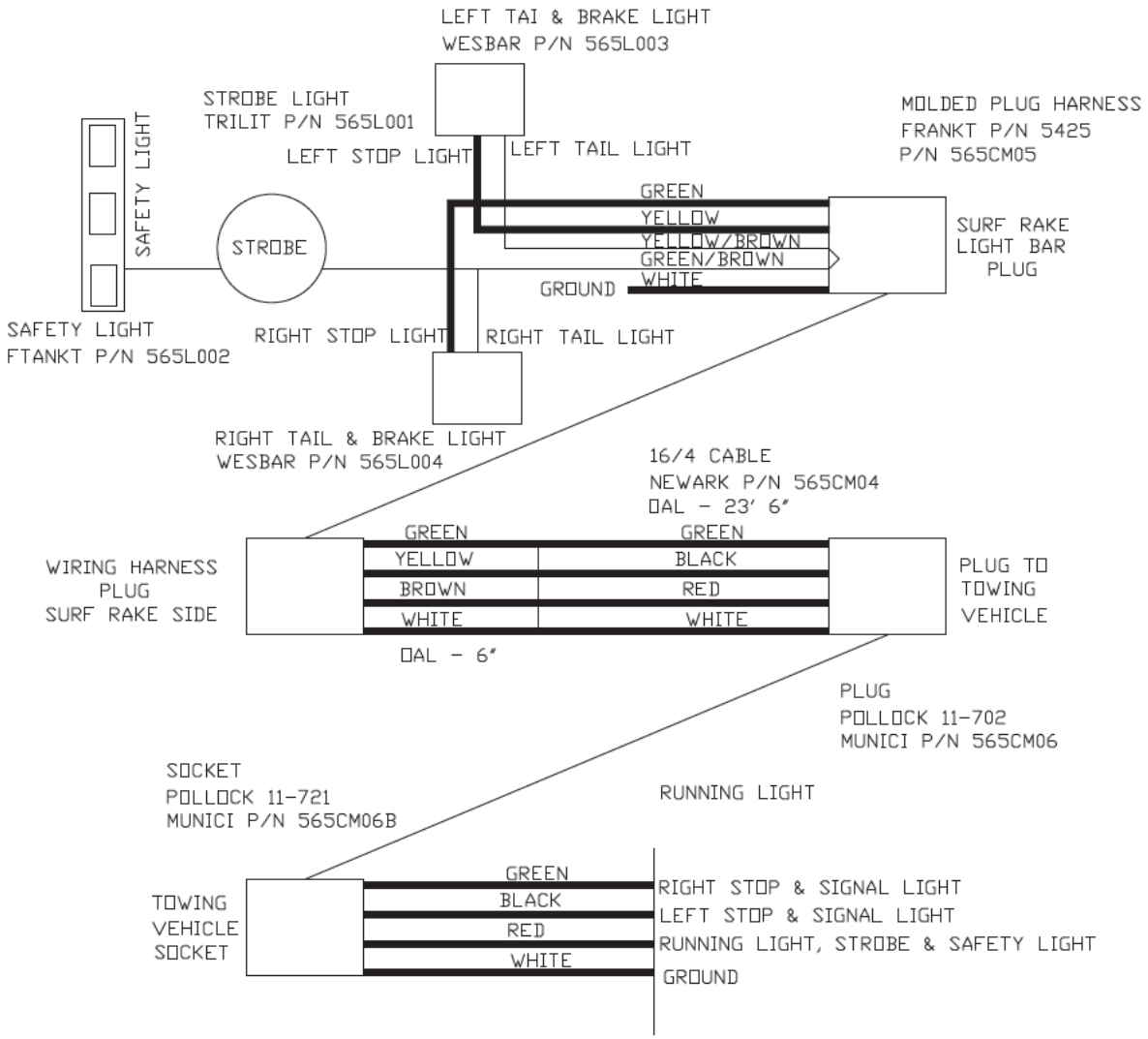
ITEM	PART NUMBER	QTY	DESCRIPTION
1	540H06052	1	HOSE
2	540E0602	1	ELBOW 90°
3	540C1001A	14	HOSE CLAMP
4	540B0602	1	TUBE, LEFT
5	540H06130	1	HOSE
6	545JJHP1	1	REPLACEMENT SEAL KIT
7	545JJH	1	CYLINDER
8	540A0404	1	ADAPTER
9	540E0601	2	ELBOW 90°
10	540TB04000	105	TUBE
11	540T0401	1	UNION TEE, TUBE
12	540E0401	1	ELBOW 90°
13	540V004	1	SHUT OFF VALVE
14	540R4500236	1	ORIFICE PLATE

OPTIONAL AUTO FINISHER HYDRAULICS

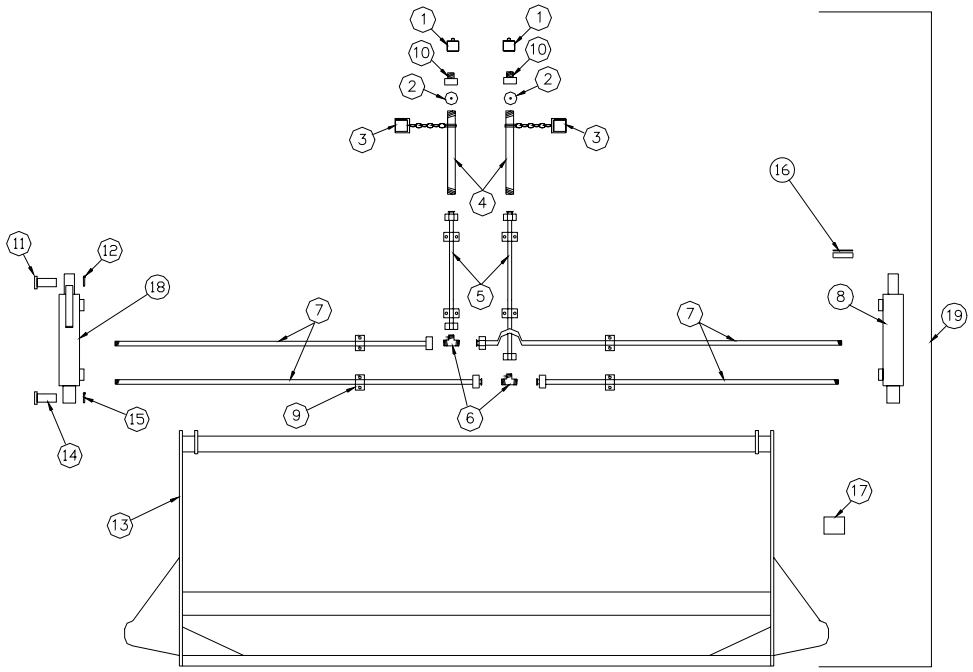


ITEM	PART NUMBER	QTY	DESCRIPTION
1	540A0601	1	ADAPTER
2	540V015	1	MANIFOLD
3	540E0602	1	ELBOW/RESTRICTOR
4	540H06052	1	HOSE
5	540R4500236	1	ORIFICE PLATE
6	540V004	1	SHUT OFF VALVE
7	540B0617	1	TUBE ASSEMBLY
8	540C1017	2	COVER PLATE
9	540C1018	2	BLACK PLASTIC BODY
10	560B04175	2	CAPSCREW
11	520P	1	LOCKWASHER
12	540H04061	1	HOSE
13	540A0404	2	ADAPTER
14	545JJH	1	CYLINDER
15	540E0603	1	ELBOW
16	545JJHP	1	REPLACEMENT SEAL KIT PER CYLINDER
17	540A0618	1	ADAPTER
18	540TB04000	108	TUBE – 108”
19	565CM16	1	LOOP CLAMP
20	520K	1	CAPSCREW
21	520P	1	LOCK WASHER
22	560W04	1	FLAT WASHER
23	540E0401	1	ELBOW

OPTIONAL 400 LIGHT BAR



OPTIONAL HYDRAULIC MOLDBOARD



ITEM	PART NUMBER	QTY	DESCRIPTION
1	540A0809	1	QUICK DISCONNECT, MALE
2	540R08032	2	ORIFICE PLUG
3	545HD-13	2	QUICK DISCONNECT COVER
4	540H06050	2	HOSE
5	540B0601	2	TUBE
6	540T0602	2	TEE
7	540H06025	4	HOSE
8	545JJH	2	CYLINDER
9	540C1001	8	HOSE CLAMP
10	540R0806	2	ADAPTER
11	530CM07	2	PIN
12	522JT2	2	COTTER PIN
13	422AS04	1	MOLDBOARD
14	530CM06	2	PIN
15	560C02150	2	COTTER PIN
16	545JJHP	1	REPLACEMENT SEAL KIT PER CYLINDER
17	422TB02	2	MOLDBOARD SPACER
18	545JJHG	1	CYLINDER WITH DEPTH GAGE
19	422AS03	1	HYDRAULIC MOLDBOARD ASSEMBLY, COMPLETE