



## ATTENTION:

Depending on what replacement parts you are ordering, we will need the following information:

### GRINDER COMPONENTS

Serial Number  
Model Number of Grinder

### ENGINE COMPONENTS

Brand  
Engine Serial Number  
Engine Spec. Number

### CLUTCH COMPONENTS

Brand  
Serial Number  
Assembly of Clutch

## STUMP GRINDER MODELS HB19/HB19SP/HB20SP OPERATING & PARTS MANUAL

Model No: \_\_\_\_\_

Serial No: \_\_\_\_\_

DEALER:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State: \_\_\_\_\_

Phone No: \_\_\_\_\_

Delivery Date: \_\_\_\_\_

Engine Make: \_\_\_\_\_

Serial No: \_\_\_\_\_

Clutch Make: \_\_\_\_\_

Model: \_\_\_\_\_ S/N \_\_\_\_\_



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MANUFACTURED BY  
**BANDIT INDUSTRIES, INC.**

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PHONE: (989) 561-2270 OR 561-2272

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**NOTE- ANY PART, PORTION, DESIGN, NUMBER, SPECIFICATION, AND/OR DIMENSION IN THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE BY THE MANUFACTURER.**

# INTRODUCTION

The purpose of this manual is to provide the user with specifications and procedures for the operation, maintenance and repair of this BANDIT product. As with any piece of equipment, safety should always be a constant thought while the machine is being operated, serviced or stored. In order to highlight this consideration, the material which addresses safety is preceded by the following signal words:

Signal Word	Likelihood of Occurrence	Degree of Potential Injury or Damage
 <b>DANGER</b>	Will occur if warning is ignored	Severe
 <b>WARNING</b>	Can occur if warning is ignored	Severe
 <b>CAUTION</b>	Will or can occur if warning is ignored	Minor to Severe
<b>NOTICE</b>	Important, but not hazard related	Minor

The equipment is designed and manufactured in accordance with the latest product industry standards. This alone does not prevent injury. It is the operator's responsibility to use good judgement and follow the warnings and instructions as indicated in this manual, on the machine and follow all safety standards per ANSI and OSHA instructions.

### **WARNING**

Improper use of the product can result in severe personal injury. Personnel using the equipment must be qualified, trained and familiar with the operating procedures as defined in this manual, prior to operating the product.

### **WARNING**

It is the responsibility of the owner or employer to insure that the operator is trained and practices safe operation while using and servicing the machine. It is also the owner's responsibility to provide and follow a regularly scheduled preventative maintenance and repair program on the product, using only factory approved replacement parts. Any unapproved repairs or modifications may not only damage the machine and its performance, but could result in severe personal injury. Unapproved repairs or modifications will void warranty and eliminate manufacturer of any liability claims. Consult the equipment manufacturer!!!

Each machine is shipped with a manual, a customer's check sheet on the product, and any available parts & service manuals on component parts not produced by this manufacturer. Additional copies of these manuals and check sheets can be purchased from the manufacturer, or through the dealer. Engine parts, service and maintenance manuals **MUST** be purchased through the engine manufacturer or their dealer.

**NOTE** - The producer of this Bandit product reserves the right to make any modifications or revisions to the design or specifications of its machine without advance notice. The producer also reserves the right to change machine and part prices as needed without advance notice.

# Bandit

# BANDIT INDUSTRIES, INC.

## EXPLANATION OF LIMITED WARRANTY

The manufacturer will not reimburse the customer or dealer labor costs incurred for installing “bolt-on” or “slip-on” items, such as hydraulic pumps and motors, control valves, flow dividers, belts, sheaves, etc. The manufacturer will provide replacement parts to the customer for defective parts during the warranty period. **Defective parts must be returned to Bandit Industries, Inc.** It will be the customer’s responsibility to install the replacement parts unless arrangements are made with the selling dealer.

The manufacturer will not reimburse travel costs to servicing dealer unless prior approval has been obtained from the manufacturer. It is the customer’s responsibility to deliver the machine to dealer’s service facility, unless other arrangements have been agreed to between selling dealer and customer.

The manufacturer may elect, at its discretion, to reimburse reasonable labor costs to customer or dealer for major defect repairs. Diagnostic labor and overtime labor will not be covered under warranty. Prior approval must be obtained from Bandit Industries, Inc.

There are several forms that must be completely filled out and returned to us in reference to our portion of warranty. Read and understand the Bandit Limited Warranty responsibilities. Some components on your machine are covered by their respective manufacturers and cannot be handled through Bandit Industries as stated in Warranty Section of this manual.

Use this manual to help you resolve what and where your problem is, in most cases you can fix it easily. If you still have problems, work through the dealer you purchased the machine through, or contact Bandit Industries direct if needed.

Make sure the following forms are used, for us as well as you, to keep track of service and pending warranty request. It is our company policy that all parts shipped out will be invoiced until the possible warranty parts are returned with a Warranty Claim Form completed for consideration.

Make sure the Warranty Validation Form is completed and sent in to us as soon as you receive the Bandit. This will activate our warranty responsibilities.

**If Warranty Validation Form is not on file, all Warranty consideration is null and void.**

NOTE: Prior to delivery to final owner and during storage, this machine must be serviced and lubricated to avoid damage that will not be covered under warranty, see “Lubrication & Coolant” page.

Also, damage or premature failure of equipment components because of incorrect or incomplete service and maintenance by the equipment owner will not be covered under warranty.

All controls, safety devices, guards, and shields must be correctly operational and securely in place at all times during equipment operation.

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**Bandit**

### BANDIT INDUSTRIES INC. LIMITED WARRANTY (989) 561-2270

Bandit Industries Inc., also referred to as “Manufacturer” warrants this new product to be free of defects in workmanship and material for a period of 1 year.

This warranty takes effect upon delivery to the original retail purchaser. The manufacturer at it's option will replace or repair at a point designated by the manufacturer, any parts which appear to have been defective in material or workmanship. The manufacturer is not responsible for labor, consequential damages, traveling or down time expenses.

This warranty and any possible liability of Bandit Industries Inc., is expressly in lieu of any other warranties, expressed or implied, including but not limited to, any implied warranty or merchantability of fitness for a particular purpose and of any noncontractual liabilities including product liabilities based upon negligence or strict liability. Bandit Industries Inc., will not be liable for consequential damages resulting from breach of warranty.

All parties involved agree that the Owner's Sole and Exclusive Remedy against the Manufacturer, whether in contract or arising out of this warranty, instructions, representations, or defects shall only be for the replacement or repair of defective parts as provided herein. In no event or circumstances shall the Manufacturer's liability exceed the purchase price of the machine. The buyer also agrees that no other remedy (including but not limited to consequential or incidental loss) shall be available to him or her.

It is absolutely necessary to return the Warranty Validation Form, completely and accurately filled out, and notify Bandit Industries Inc., in writing within ten (10) days from the date of purchase to validate this warranty. If Warranty Validation Form is not on file, all Warranty Consideration is NULL AND VOID.

This warranty will not apply if the Bandit product is not operated with replacement parts or equipment not manufactured or recommended by Bandit Industries, Inc.

This warranty will not apply if the Bandit product is not operated in a manner recommended by the manufacturer. The following examples would void the warranty:

1. The completed Warranty Validation Form is not on file.
2. The Bandit product has been abused, or not serviced properly.
3. Repairs or attempted repairs made without prior written authorization.
4. Repairs made due to normal wear are not warrantable.
5. The Bandit product was involved in, or damaged by an accident.
6. The Bandit product was damaged from any type of foreign material.

The owner is responsible for all scheduled maintenance as explained in the Operators Manuals. Negligence of proper maintenance or any other negligence, accident or fire; nor with failure to adjust, tighten, or replace wear items included but not limited to items such as teeth, teeth holders, belts, lubrication fluids, bearings, filters, hydraulic components, loose nuts or bolts, etc. may void warranty.

All components and parts being returned to Bandit Industries for warranty consideration must be complete and assembled when delivered. Hydraulic components and parts must be returned assembled with all fluid ports capped or plugged and free of foreign contamination, or warranty will not be considered.

## INTRODUCTION & WARRANTY

### BANDIT INDUSTRIES, INC. LIMITED WARRANTY (989) 561-2270

NOTE: This warranty applies only to new and unused equipment or parts thereof manufactured by Bandit Industries Inc. and is void if the machine is operated with replacement parts or equipment not manufactured or recommended by Bandit Industries Inc.

All other components are warranted by their respective manufacturers (i.e. engines, axles, hydraulic pumps and motors, clutches, tires, batteries, etc.) Any machines used for lease or rental purposes warranty is limited to 90 days from the first day of initial service.

#### CONTINENTAL U.S. INFORMATION PHONE NUMBERS FOR ACCESSORIES (NOT COVERED UNDER PRODUCT WARRANTY PROGRAM)

Briggs & Stratton Engines	1-414-259-5333	PGL Auto Clutch	1-800-551-2938
Caterpillar Engines (Thru 275Hp)	1-800-551-2938	PT Tech Clutch	1-330-414-3172
Caterpillar Engines (300Hp & Up)	1-866-228-2111	Rockford Clutch	1-800-383-9204
Continental Engines	1-800-726-8870	Twin Disc Clutch	1-440-951-5111
Cummins Engines	1-248-573-1592	Electronic Solutions	1-866-736-6839
Deutz, Lombardini Engines	1-800-445-5273	E.S.I.	1-815-985-0383
Ford, Hatz Engines	1-800-726-8870	L.O.R. MFG.	1-866-644-8622
GM, Perkins Engines	1-800-551-2938	Miratron Inc.	1-866-285-0132
Honda Engines	1-734-453-6258	Omnex Radios	1-419-294-4985
John Deere Engines	1-888-803-9175	Dexter Axles	1-574-295-7888
Kohler Engines	1-800-854-9273	Tires	1-989-463-4088
Kubota Engines	1-800-832-7670	Caterpillar Tracks	1-309-636-1100
Robin Engines	1-248-399-0002	Chermack Tracks	1-715-458-2655
Wisconsin Engines	1-800-726-8870	Petro-Canada Hydrex XV	1-888-284-4572
Interstate Batteries	1-800-331-2000		

(Phone numbers for outside the continental U.S. can be supplied from your phone directory or local Bandit dealer.)

In order to process any warranty claims, it is the owner's responsibility to report the claims promptly to the Manufacturer, or our authorized dealer from whom the equipment was purchased.

It is necessary to include the following information on any and all requests for warranty:

- 1) Warranty Claim Form, obtained from Bandit Industries or it's dealers, completely and accurately filled out.
- 2) Dealer from whom purchased.
- 3) Date of delivery.
- 4) Serial number of unit.
- 5) Model number of unit.
- 6) Engine make and serial number.
- 7) Length of time in use (hours on machine).
- 8) Date of Failure.
- 9) Nature of Failure.

Bandit Industries Inc., reserves the right to alter, improve, revise or modify any parts or products with the altered, improved, revised or modified parts or products. They also may change design, specifications, or part prices without advance notice.

Bandit Industries Inc., is NOT responsible for updating or upgrading completed machines with design changes that are made after it's production.

Bandit Industries Inc., expects the Customer/Owner to bring their machine to the Dealer/Manufacturer for Warranty Repairs. The Manufacturer DOES NOT pay Dealers or Customers for bringing their machine in for repair. Nor does the Manufacturer furnish loaner machines while the unit is being repaired.

# Bandit

# TYPICAL GRINDER SERIAL NUMBER AND/OR WORK ORDER NUMBER LOCATIONS



- 1. Work Order Number
- 2. Serial Number For HB19 & HB19SP
- 3. Serial Number For HB20SP

**NOTE:** The engine information is located on the engine block. The clutch information is located on the clutch plate.

# SAFETY PROCEDURES

## **⚠ DANGER**

The words ⚠ Danger, ⚠ Warning, ⚠ Caution, and Notice are used on the safety decals and throughout this manual, to make you aware of the safety procedures. These procedures are very important, read and obey them.

### **YOUR SAFETY IS VERY IMPORTANT TO US!**

This machine is equipped with safety decals, guards and designs for your protection.

Don't ever take the machine for granted, always be cautious and careful when operating your equipment.

Read and follow all the instructions in your manual thoroughly. Your safety is dependent on your knowledge of how to operate and maintain this machine. You may obtain additional copies of this manual from your Bandit Dealer.

Before operating machine, you must have all potential operators; read and understand manuals and decals, watch the video and follow the recommendations.

Regardless of how hard a manufacturer tries to produce a safe machine, accidents still happen. Normally accidents are caused by people making mistakes. They do not read the manual, they ignore warning decals or do not use lockouts provided for their safety. This normally happens after the person has become accustomed to the machinery. In the initial start up and operation of the machinery, they are cautious, they are very careful because they do not understand the machine.

This equipment is intended for use by personnel who are experienced with similar equipment. Always operate safely. It is also recommended that someone else is present while operating or servicing in case an accident should occur. Never operate any machine while under the influence of drugs or alcohol.

Keep children, bystanders and animals clear of working area. Never operate equipment that is in need of repair or adjustment.

## **⚠ DANGER**

Before starting the machine, take a minute to check a few things. The grinder should be in an area restricted from people passing by. This area around the grinder must be free of all objects that can obstruct movement when working with the grinder. The machine should be checked for loose tools or foreign objects, especially in the grinding area. All tools not in use should be secured in a tool box.

## **⚠ WARNING**

Operators **must** at all times be located within easy reach of all feed control and shut-off devices when the unit is running. They must be attentive and prepared to activate the devices.

## **⚠ DANGER**

Torn or loose clothing is more likely to get caught in moving machinery parts. Keep such items as long hair, shirt sleeves, and shirt tails properly contained. Avoid wearing necklaces, rings, watches, and especially neckties while operating this machinery. Make sure the machine is in excellent condition, and all the guards are in place, tight and secure.

Wear all personal protection equipment and follow all safety standards per ANSI and OSHA instructions. Examples of equipment: hard hat, face shield, safety glasses, gloves, ear protection, etc. Always keep a fully charged fire extinguisher with the machine while operating and servicing the machine.





# SAFETY PROCEDURES

**⚠ DANGER**

**NEVER** sit, stand, lay, climb or ride anywhere on this machine while it is running, operating, or in transit. You will be injured.

**⚠ WARNING**

It is very important after you have operated a new machine for approximately an hour to shut down the machine and recheck all hydraulic fittings. Retighten as needed.

**DO NOT GO NEAR HYDRAULIC LEAKS!** High pressure oil easily punctures skin causing serious injury, gangrene, or death. **DO NOT** use fingers or skin to check for leaks. Lower load or relieve hydraulic pressure before loosening fittings. Use a piece of cardboard to find leaks. Never use your bare hands.

In cold weather situations let your hydraulic system idle for approximately 15 minutes to allow the system to warm up to operating temperature.

**⚠ WARNING**

It is very important after you have operated a new machine for approximately an hour to shut down the machine and recheck all nuts and bolts. It is normal for nuts and bolts to loosen once on a new piece of machinery. If you tighten them now, there is a good possibility they won't loosen again. Certain nuts and bolts must be checked periodically such as cutter teeth bolts, etc. for torque and fit.

Most of the nuts used on the Bandit Grinder are self locking. After a nut or bolt has been removed five times, it should be replaced to insure proper tightness. This is especially critical on the cutter tooth bolts!

After the engine is started, let the grinder disc turn at the lowest RPM's possible. Listen for any type of noise that is foreign. Any steel on steel noise is foreign. If you hear a noise, stop the engine, find the problem and fix it.

**CALIFORNIA**  
**Proposition 65 Warning**  
 Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

**⚠ DANGER**

Do not go near or in-line with the debris field of the stump grinder while in operation. While grinding stumps, the chips and portions of the stump fly from the cutterhead and can cause severe injury.

**⚠ DANGER**

**DO NOT** operate this machine indoors! Exhaust fumes can be fatal. Never refuel while the machine is running. Never refuel in the shop or building. Always refuel in a well ventilated area, away from sparks or open flames, **DO NOT SMOKE**. Extinguish all smoking materials. Wipe up all spilled fuel before restarting the engine. Do not fill above 1/2" (12.7 mm) from top of tank.

To obtain the most from your machine, for the least amount of cost, it is a good practice to set up and follow a scheduled preventative maintenance program. It will eliminate many possible problems and down time.

**⚠ WARNING**

Never use jumper cables during freezing temperatures. Haul the machine inside and allow the battery time to warm up. If the machine must be started outside, inspect the battery acid for ice formation. Explosion will occur with a frozen battery. Never use jumper cables in a confined or unventilated area. Battery acid fumes are explosive. Never expose an open flame or spark near the battery.

**⚠ DANGER**

Before attempting any type of maintenance disengage clutch, turn off engine, wait for the cutter wheel to come to a complete stop, install the cutter wheel lock pin, disconnect battery, and make sure the ignition key is in your possession.

**ALWAYS** install the lock pin into the cutter lock tube before working on the grinder.

Simply slide the lock pin into the cutter wheel lock tube. This is to insure that the cutter wheel cannot be started while you are working on the grinder. If for some reason the cutter wheel would start to turn, it would simply hit the lock pin.

**⚠ WARNING**

**DO NOT** operate this machine unless all hydraulic control devices operate properly. They must function, shift and position smoothly and accurately at all times. Faulty controls can cause personal injury!

**Bandit**

# SAFETY PROCEDURES

**⚠ DANGER**

Never grind any materials that might contain wires, stones, nails, or other metal objects which may damage the teeth and become dangerous projectiles. Remove all rocks and stones from stump grinding area.

**⚠ DANGER**

Your machine may or may not be equipped with a clutch. Depending on the options ordered, some machines are direct drive.

Do not work on the machine if the engine is running with the clutch disengaged. A clutch can self engage if the switch is faulty or the rotor and armature are stuck together.

The operator must take care in the engagement and disengagement of the clutch, engine RPM's should always be at idle. When the engine has sufficiently warmed up, switch the clutch to the on position, you may have to switch the clutch off and on a few times to start the cutterwheel turning. After engagement and the cutterwheel is turning at proper ratio with engine RPM, raise the engine RPM to full throttle. Engaging and disengaging the clutch at high engine RPM will quickly and excessively wear out the clutch.

**NOTICE**

Do not attempt to start the engine or engage the engine PTO (power-take-off) system on this machine if the cutter wheel is jammed or frozen in place. If you do, you will damage or ruin the drive belts and/or the PTO which will not be covered under warranty and will cost you down time and money.

**⚠ DANGER**

Do Not start to grind a stump unless you are completely sure there are not any power lines, water lines, sewer lines, phone lines, etc. in the area above or below ground level where you are grinding.

**⚠ DANGER**

Never go near cutter wheel or teeth while engine is running or cutter wheel is coasting to a stop.

**⚠ DANGER**

- Use **EXTREME CAUTION** when traveling over non-level surface! Not designed to be used on non-level surface.
- This machine can tip over or tip backwards on non-level surface. You will cause engine damage, machine damage and possible personal injury!
- Use caution when transporting to avoid a roll over because of narrow wheel base!



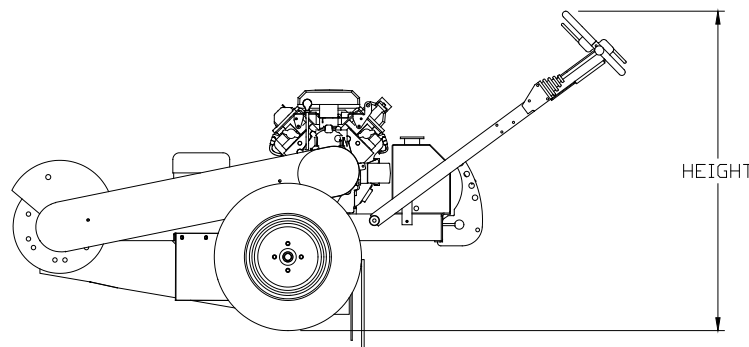
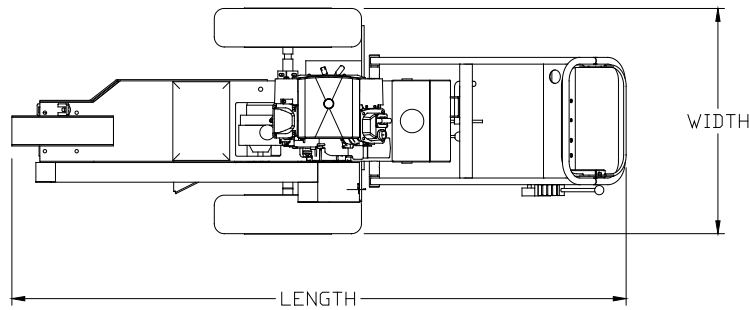
**⚠ WARNING**



**WEAR EYE & PERSONAL PROTECTION EQUIPMENT**

Wear all personal protection equipment and follow all safety standards per ANSI and OSHA instructions.

# EQUIPMENT SPECIFICATIONS



## Approximate Dimensions & Weights

(Dimensions & weights will vary depending on optional equipment)

Approx. Weight:	Model HB19:	400 to 500 Lbs. (181 to 227 kg)
	Model HB19SP:	550 to 650 Lbs. (249 to 295 kg)
	Model HB20SP:	650 to 750 Lbs. (295 to 340 kg)

(Approximate weights depending on engine and equipment options.)

Overall Dimension:	Model HB19:	Height: 58" (1.5 m)	Length: 98" (2.5 m)	Width: 29" (0.7 m)
	Model HB19SP:	Height: 58" (1.5 m)	Length: 98" (2.5 m)	Width: 34" (0.9 m)
	Model HB20SP:	Height: 54" (1.4 m)	Length: 83" (2.1 m)	Width: 27" (0.7 m)

Cutter Wheel: Top of: 24" (.6 m)      Center of: 14 1/2" (.4 m)      Cutting Depth Below Ground: 22" (.6 m)

Cutterhead Swing: Model HB20SP: Arc: 28" (0.7 m)

Number of Teeth on Cutter Wheel: 12

Cutter Wheel Diameter with Teeth: 19" (.5 m)

Fuel Tank Capacity:	<u>Model HB19 &amp; HB19SP</u> 4 Gallons (15.1 Liters) 1.7 Gallons (6.4 Liters) with Honda engine.	<u>Model HB20SP</u> 5 Gallons (18.9 Liters)
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Hydraulic Tank Capacity: N/A      1.5 Gallons (5.7 Liters)

(Approximate dimension depending on equipment options.)

**Bandit**

# DECALS



# DECAL LOCATIONS - MODEL HB19

Decal locations may vary, these are general locations.



**DECAL LOCATIONS - MODEL HB19**

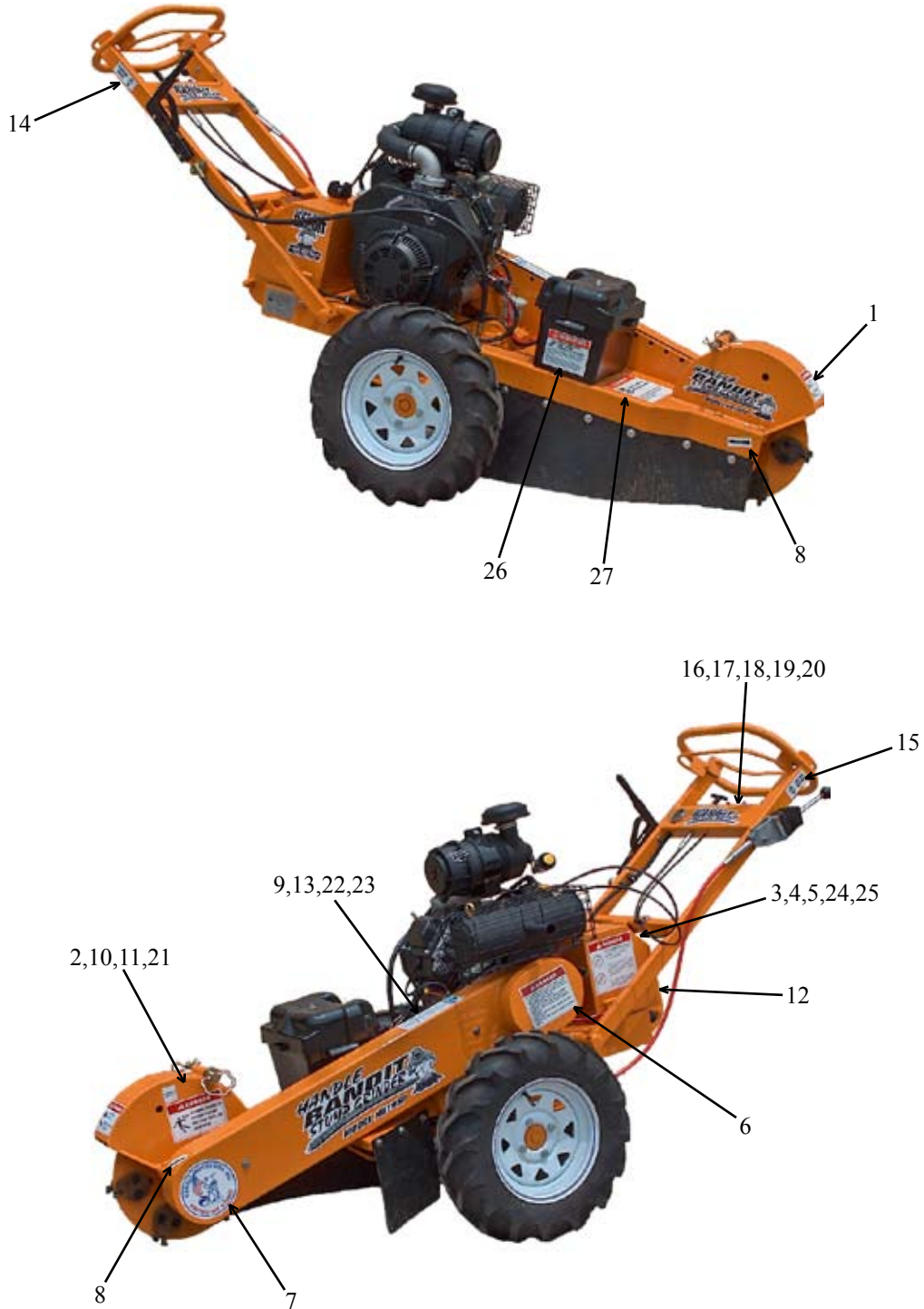
Modifications and/or additions of decals to this list will happen.  
 Consult grinder dealer or manufacturer for most current decal package.

<b>LOCATION</b>	<b>NUMBER</b>	<b>DESCRIPTION</b>
1.	SPD-02	Moving Parts Keep Hands...
2.	SPD-20	Flying Objects Stand Clear...
3.	SPD-30	Do Not Sit, Stand, Lay, Climb or...
4.	SPD-35	Extreme Caution...Non-Level Surface...
5.	SPD-36	...Debris Field...
6.	SPD-39	Do Not Operate...Without Guard In Place...
7.	ID-42	Bandit Industries Inc...USA
8.	INST-12	Grease Daily
9.	INST-44	Proposition 65
10.	INST-73	Cutter Head Lock Hole
11.	INST-74	Cutter Head Lock Pin
12.	INST-101	Canada Engine Decal
13.	INST-107	Parking Brake Release / Lock
14.	INST-116	Engine Will Not Start...Bail Handle Down...
15.	INST-117	Ignition Off / Run / Start
16.	INST-118	Pull To Increase RPM'S / Turn Clockwise To Lock
17.	INST-119	Clutch Engage On / Off
18.	INST-120	Pull To Choke
19.	INST-122	...Bail Handle Down...Beware Cutterhead Is Direct Drive...
20.	SPN-06	Decal Maintenance..
21.	N-24	Service Under Beltshield...
22.	N-33	Engine Oil Lubrication...
23.	SPW-02	Diesel Fuel Only...
24.	SPW-03	Gasoline Fuel Only...
25.	SPW-04	Frozen Battery Will Explode...
26.	SPW-08	Wear Eye & Personal Protection...
27.		Bandit Model HB19 Vinyl Decals

Note: Some decals are for optional equipment. Decal Locations may vary, these are general locations. If any decals become damaged , replace immediately.

# DECAL LOCATIONS - MODEL HB19SP

Decal locations may vary, these are general locations.



## DECAL LOCATIONS - MODEL HB19SP

Modifications and/or additions of decals to this list will happen.  
Consult grinder dealer or manufacturer for most current decal package.

LOCATION	NUMBER	DESCRIPTION
1.	SPD-02	Moving Parts Keep Hands...
2.	SPD-20	Flying Objects Stand Clear...
3.	SPD-30	Do Not Sit, Stand, Lay, Climb or...
4.	SPD-35	Extreme Caution...Non-Level Surface...
5.	SPD-36	...Debris Field...
6.	SPD-39	Do Not Operate...Without Guard In Place...
7.	ID-42	Bandit Industries Inc...USA
8.	INST-12	Grease Daily
9.	INST-44	Proposition 65
10.	INST-73	Cutter Head Lock Hole
11.	INST-74	Cutter Head Lock Pin
12.	INST-99	Hydraulic Transmission Bypass...
13.	INST-101	Canada Engine Decal
14.	INST-107	Parking Brake Release / Lock
15.	INST-108	Drive Train Engagement Forward / Reverse
16.	INST-116	Engine Will Not Start...Bail Handle Down...
17.	INST-117	Ignition Off / Run / Start
18.	INST-118	Pull To Increase RPM'S / Turn Clockwise To Lock
19.	INST-119	Clutch Engage On / Off
20.	INST-120	Pull To Choke
21.	SPN-06	Decal Maintenance..
22.	N-24	Service Under Beltshield...
23.	N-33	Engine Oil Lubrication...
24.	SPW-02	Diesel Fuel Only...
25.	SPW-03	Gasoline Fuel Only...
26.	SPW-04	Frozen Battery Will Explode...
27.	SPW-08	Wear Eye & Personal Protection...
28.		Bandit Model HB19SP Vinyl Decals

Note: Some decals are for optional equipment. Decal Locations may vary, these are general locations. If any decals become damaged, replace immediately.



# DECAL LOCATIONS - MODEL HB20SP

Decal locations may vary, these are general locations.



## DECAL LOCATIONS - MODEL HB20SP

Modifications and/or additions of decals to this list will happen.  
Consult grinder dealer or manufacturer for most current decal package.

LOCATION	NUMBER	DESCRIPTION
1.	SPD-02	Moving Parts Keep Hands...
2.	SPD-20	Flying Objects Stand Clear...
3.	SPD-28	Do Not Insert Fingers...
4.	SPD-30	Do Not Sit, Stand, Lay, Climb or...
5.	SPD-35	Extreme Caution...Non-Level Surface...
6.	SPD-36	...Debris Field...
7.	SPD-39	Do Not Operate...Without Guard In Place...
8.	ID-42	Bandit Industries Inc...USA
9.	INST-12	Grease Daily
10.	INST-16	Grease Weekly Arrow
11.	INST-44	Proposition 65
12.	INST-53	Hydraulic Oil...Hydrex XV...
13.	INST-73	Cutter Head Lock Hole
14.	INST-74	Cutter Head Lock Pin
15.	INST-101	Canada Engine Decal
16.	INST-108	Drive Train Engagement Forward / Reverse
17.	INST-117	Ignition Off / Run / Start
18.	INST-118	Pull To Increase RPM'S / Turn Clockwise To Lock
19.	INST-119	Clutch Engage On / Off
20.	INST-120	Pull To Choke
21.	INST-131	Patent Application Pending
22.	INST-133	Engine Will Not Start...Bail Handle Down...
23.	INST-134	Swing Lever Release / Lock
24.	N-02	Maintain Lubrication...
25.	SPN-06	Decal Maintenance..
26.	N-24	Service Required Under Beltshield...
27.	N-33	Engine Oil Lubrication...
28.	SPW-01	Do Not Go Near Oil Leaks...
29.	SPW-02	Diesel Fuel Only...
30.	SPW-03	Gasoline Fuel Only...
31.	SPW-04	Frozen Battery Will Explode...
32.	SPW-08	Wear Eye & Personal Protection...
33.		Bandit Model HB20SP Vinyl Decals

Note: Some decals are for optional equipment. Decal Locations may vary, these are general locations. If any decals become damaged , replace immediately.

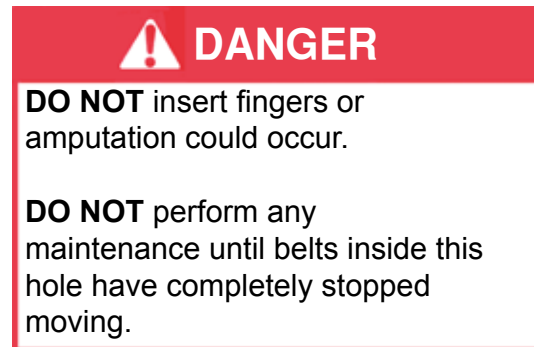
# DECALS

Decals located on your Bandit equipment contain useful information to assist you in operating your equipment safely. Some of the decals on your machine and their location are shown in this section.

It is very important that all decals remain in place and in good condition on your machine. Please follow the care and instructions given below:

- 1) You should use soap and water to keep your decals clean. Never use mineral spirits or any other abrasive cleaners.
- 2) Replace immediately any missing or damaged decals. The location the decal is going to be applied to must be clean and dry, and at least 40° F (5°C) before applying decal.
- 3) When the need arises to replace a machine component with a decal attached, be sure and replace the decal.
- 4) Replacement decals are available, and can be purchased from the manufacturer or your Bandit Dealer.
- 5) Combination English / Spanish decals are typically standard. Other foreign language decals are available and may be purchased. Mail translated decals required to Bandit Industries, Inc.

## EXAMPLES:



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# CONTROL OPERATING PROCEDURES

**Parking Brake - (HB19 & HB19SP):**

The parking brake will keep the machine from moving forward or backwards, but still allow the machine to pivot. Push the brake lever forward (away from the operator) to release the brake. Pull the brake lever back (towards the operator) to activate the brake.

**Drive Train Control - (HB19SP & HB20SP):**

Push the knob on the control lever in and push the lever forward (away from the operator) to move the machine forward. Push the knob on the control lever in and pull the lever back (towards the operator) to move the machine in reverse.

**Clutch Engagement (if equipped):**

The clutch engagement switch will activate the cutter wheel. Reduce the engine to an idle before turning the clutch on or off.

**Choke:**

Pull the choke to help a cold engine start.

**Throttle:**

Pull to increase the engine rpm's and turn the handle clockwise to lock.

**Bail Handle:**

The bail handle must be held down for the engine to start and to run. If the bail handle is released, the machine will shut down.

**Transmission Bypass - (HB19SP Only):**

Pull out knob for normal operating position. This position is for grinding and moving machine under power. Push in knob for hydraulic drive bypass. With the knob pushed in the hydraulic drive bypass valve permits manual movement of machine.

**Swing Lever - (HB20SP Only):**

Pull out knob for the release position. This position allows the cutter wheel to pivot while grinding. Push the knob in for the lock position. With the knob pushed in, the drive frame assembly is locked to the frame so the machine can be moved.

**Handle Bar Adjustment:**

The handle bar can be adjusted at different heights for the most comfortable operating position.

### CONTROLS

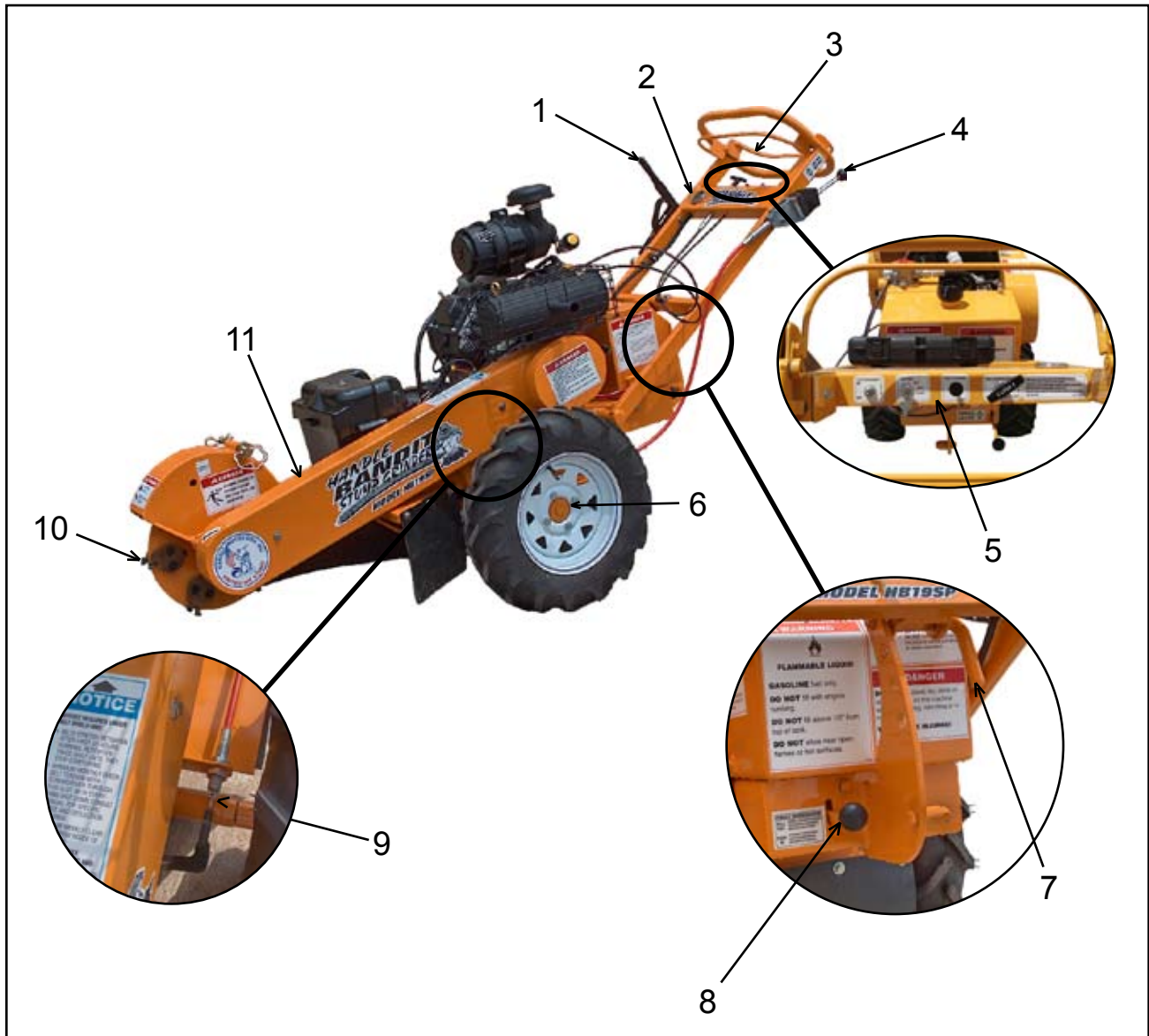
#### Models HB19 & HB19SP Basic Location of Controls and Adjustments

**LOCATION SHOWN**

- 1. Parking Brake
- 2. Hour Meter
- 3. Bail Handle
- 4. Drive Train Control (HB19SP Only)
- 5. Engine Controls
- 6. Wheel Nuts / Wheel Studs
- 7. Handle Adjustment
- 8. Transmission Bypass (HB19SP Only)
- 9. Drive Cable Adjustment (HB19SP Only)
- 10. Grinder Teeth
- 11. Grinder Belts

**NOT SHOWN**

Transmission (HB19SP Only)



**CONTROLS**

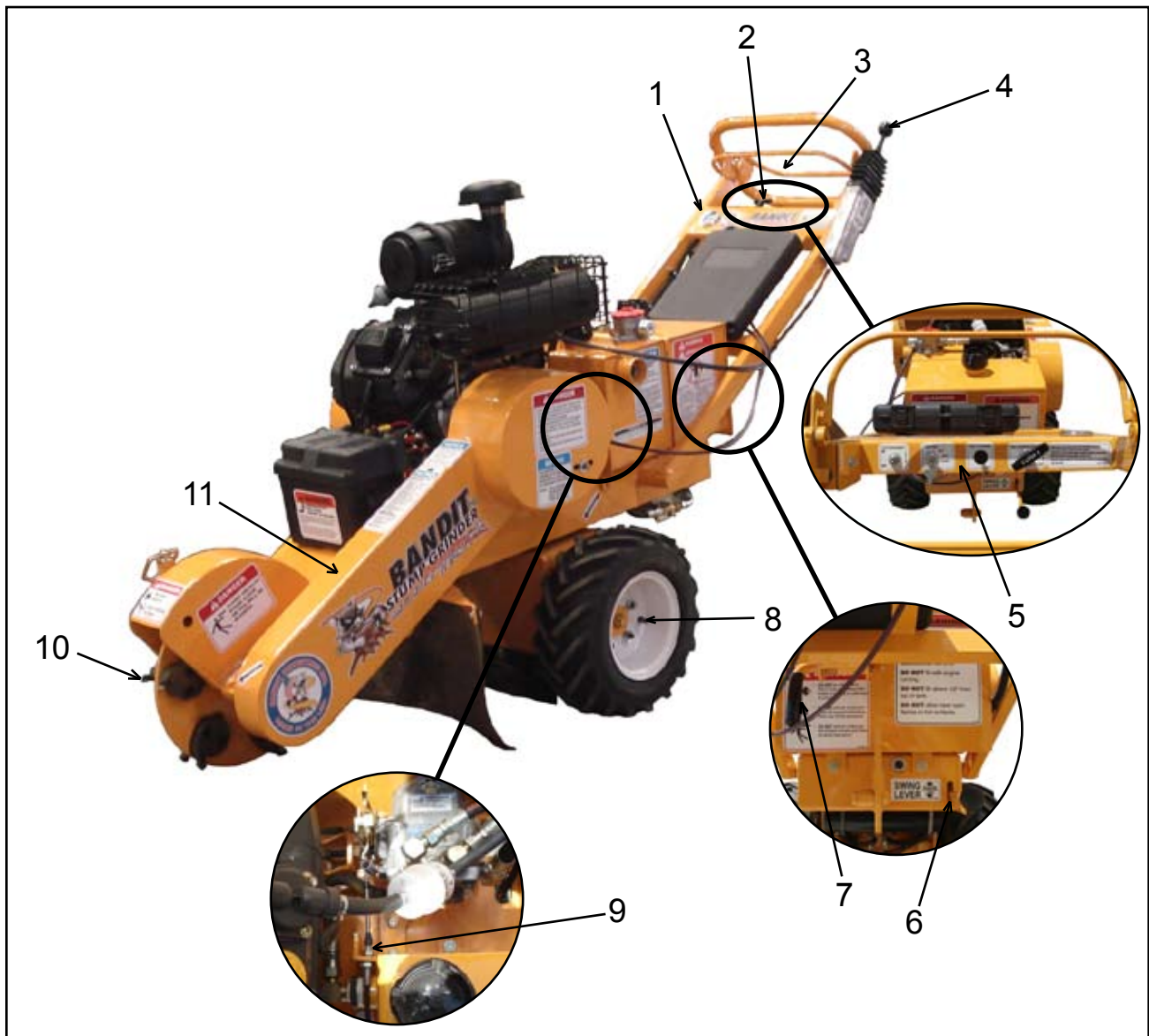
**Model HB20SP Basic Location of Controls and Adjustments**

**LOCATION SHOWN**

- 1. Hour Meter
- 2. Engine Controls
- 3. Bail Handle
- 4. Drive Train Control
- 5. Engine Controls
- 6. Swivel Frame Lock
- 7. Handle Adjustment
- 8. Lug Nuts / Drive Wheel Motor Nuts
- 9. Drive Cable Adjustment
- 10. Grinder Teeth
- 11. Grinder Belts

**NOT SHOWN**

Pump Belt



**CONSULT THE ENGINE MANUFACTURER’S MANUAL FOR SPECIFIC CONTROLS, OPERATION, & MAINTENANCE FOR TYPICAL ENGINES**

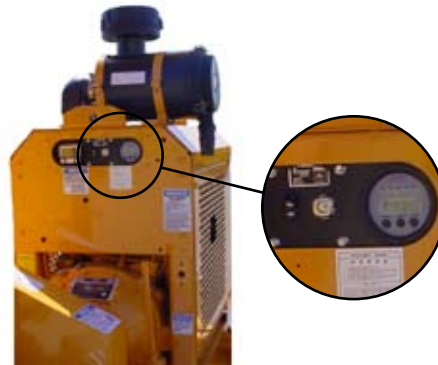
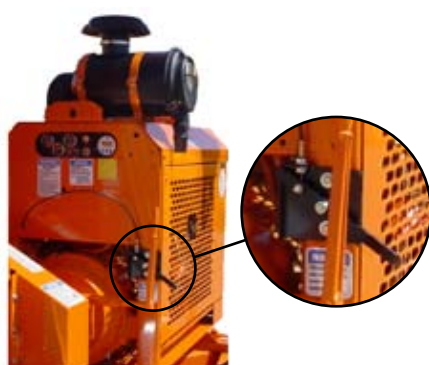
- 1) **Ignition Switch:**  
Turn the ignition switch key clockwise one stop (on position) to turn the electrical system on. The key should remain in the on position while the engine is running. Turn the key fully clockwise (start position) this will start the engine. To shut off the engine, return the key to the off position.
- 2) **On/Off Switch - Push Button Start:**  
Some gasoline engines may have a Toggle Switch or an On/Off Switch combined with a push button to start the engine. First turn the On/Off Switch or Toggle Switch to the on position, then depress and hold the Push Button Start until the engine starts, then release the button. To shut off the engine, return the On/Off Switch or Toggle Switch to the off position.
- 3) **Ignition Switch With Preheat:**  
The typical diesel engine may have a preheat system to assist in starting the engine during cold weather. To activate the preheat system, continue to hold the ignition key in the preheat position for 15 to 20 seconds, then attempt to start the engine. If the engine fails to start within 15 seconds, return the key to the preheat position, hold 10 seconds, and try starting again.
- 4) **Choke Adjustment (if equipped):**  
Some gasoline engines may have a choke adjustment, pull the choke lever out to choke the engine. Push the choke lever in for normal engine operations.
- 5) **Throttle Adjustment (if equipped):**  
Some engines may have a knob or a handle for the throttle adjustment. Typically you would pull the knob out, or turn the handle to increase the engine R.P.M.'s. To decrease you would push in the knob or turn the handle the opposite way.
- 6) **“Bandit” Lever Lock Cable Throttle System (if equipped):**  
The Bandit throttle system has (2) positions, HIGH and LOW. Engine R.P.M. is controlled by moving the lever from one position to the other.
- 8) **Push Button Or Electric Throttle System (if equipped):**  
Some engines may have a push button or electric throttle adjustment. Engine R.P.M. is controlled by pushing a button or switch to raise or lower the R.P.M.
- 9) **Alternator Warning Light:**  
This light will glow when the alternator is not charging, or when the ignition switch is turned on and the engine is not running.
- 10) **Oil Pressure Warning Light:**  
This light will glow when the oil pressure is to low, or when the ignition switch is turned on and the engine is not running.
- 11) **Engine Temperature Warning Light:**  
This light will glow when the engine, or engine coolant, is above normal operating temperature. If this occurs allow the engine temperature to cool down. If the engine is overheating because of a loss of coolant, or a broken fan belt, shut the engine off immediately.

**NOTICE**

Most engines have an automatic low oil pressure shutdown device, but some engines do not for example the **Lombardini 9LD**. Expensive damage to the engine may occur if the engine oil level and condition is not checked daily. Follow all maintenance procedures specified by the engine manufacturer’s manual. Check the fuel level daily, running out and repriming is time consuming. Do not over fill the fuel tank, there must be expansion space in the top of the tank. Inspect hoses, fittings, lines, tanks, etc. for any oil, fuel, engine coolant, etc. leaks daily. Repair or replace any damaged or leaking components.

TYPICAL DIESEL ENGINES

TYPICAL GASOLINE ENGINE



BANDIT THROTTLE SYSTEM

PUSH BUTTON OR ELECTRIC THROTTLE SYSTEM

**Bandit**

# MACHINE OPERATION

- Check all fluids before starting the machine.
- Make sure to go through the daily start-up and maintenance procedures before operating the machine.
- Clutch must be disengaged before starting if equipped.
- Hold bail handle down to start engine. Engine will shut down when the bail handle is released.
- Start engine at idle speed and allow for sufficient time for oil to circulate before proceeding.
- Test all controls for proper operation.
- Avoid transversing slopes.

## DANGER

**DO NOT OPERATE AROUND WATER, GAS, POWER OR PHONE LINES. IF IN DOUBT, CHECK BEFORE GRINDING.**

## DANGER

**WEAR ALL PERSONAL PROTECTIVE EQUIPMENT PER ANSI, OSHA AND MANUALS.**

## DANGER

**KEEP CLEAR OF CUTTING WHEEL, MOVING MACHINE PARTS AND GRINDER DEBRIS FIELD**

Position machine at stump with cutter wheel slightly above the front of the stump.

Engage parking brake if equipped.

Start engine at idle on Model HB19. Reduce engine RPM to idle on Model HB19SP or HB20SP.

Engage cutterhead, if equipped with a clutch. If not equipped with a clutch, the cutter wheel should already be spinning.

Release the swing lever on Model HB20SP.

Increase engine RPM to full.

Test controls for proper operation, speed, and unobstructed movement.

Lower spinning cutter wheel to stump and make a few light passes at stump to get a feel for the cutting action.

Gradually increase cutting action and work away at stump by swinging cutter wheel left-to-right-to-left through stump in a sideways motion. Smooth, effortless cutting lengthens machine life, minimizes down time and is more profitable in the long run.

Continue cutting stump by adjusting cutting wheel progressively lower until stump is cut well below ground level.

Swing cutter wheel clear of stump, disengage parking brake, and reposition machine closer for next series of passes and continue cutting.

Engage parking brake, if equipped.

Continue in this manner until stump has been removed.

If you cut deeper than ground level, it may be necessary to reposition the handle bar.

Raise cutter wheel clear of stump, disengage parking brake if equipped, lock the swing lever if equipped, position the machine away from work area, and engage parking brake if equipped.

Reduce engine speed to idle and disengage cutter wheel. **DO NOT TURN OFF MOTOR.** Engine should be allowed to cool slowly at idle for 3-5 minutes to avoid damage.

**DO NOT ENGAGE OR DISENGAGE CUTTER WHEEL AT A HIGH ENGINE SPEED.** Damage to belts and machine will occur.

Turn off engine.

Allow cutter wheel to come to a complete stop before inspecting.

If necessary to clear the chips from work area before the rest of the stump can be cut out, be sure to reduce engine speed to idle, disengage cutter wheel, raise cutter wheel clear of stump, allow cutter wheel to come to a complete stop, disengage parking brake if equipped, lock the swing lever if equipped, position the machine away from work area, engage parking brake if equipped, turn off engine, remove the engine key, and keep in your possession.



# MOVING A MACHINE WITHOUT POWER

## NOTICE

FOR MODEL HB19SP:

If the hydraulic valve bypass is pushed in (see Figure 1), the machine is ready to be moved under manual power. Pull the hydraulic valve bypass out to move the machine with power.

FOR MODEL HB20SP:

Use this procedure only when the machine will not start or run, to help prevent damage to the hydraulic system. With the key in the "off" position and in your possession, turn the free wheel knob on the bottom of the hydraulic pump (see Figure 2) counter-clockwise one full turn. Adjust the counter balance valves all the way in. Now, the machine is ready to be moved. After moving the machine, turn the free wheel knob clockwise one turn and readjust the counter balance valves out 3 turns from the bottom setting.

Figure 1 (Model HB19SP)



Figure 2 (Model HB20SP)

Hydraulic Pump



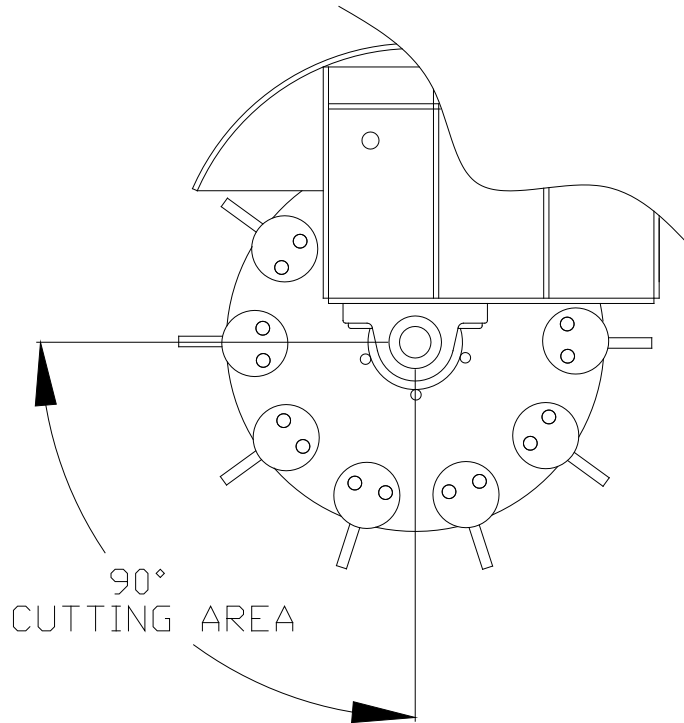
Counter Balance



# CUTTING AREA

**⚠ DANGER**

For optimum performance, the stump should be cut with the portion of the cutter wheel shown below. **NEVER UNDERCUT THE STUMP.** Undercutting the stump may cause severe kickback, vibration and component damage. **NEVER CUT THE STUMP FROM THE TOP.** The cutter wheel will throw debris up and toward the operator, instead of down and under the machine.



## MAINTENANCE SECTION

The Bandit is a very simple machine to maintain. If you will follow a regular scheduled preventative maintenance program you should have years of trouble free operation.

### **⚠ DANGER**

Before attempting any type of maintenance disengage clutch, turn off engine, wait for the cutterwheel to come to a complete stop, install the cutterwheel lock pin, place cutterwheel on the ground, disconnect battery, and make sure the ignition key is in your possession.

### **⚠ DANGER**

Do not let anyone operate or maintain this machine until they have thoroughly read this manual, reviewed the equipment decals and watched the equipment video. You can purchase additional Bandit manuals, decals and videos for a nominal fee.

### **NOTICE**

Consult your engine manual for proper break-in procedures. Various engines require somewhat different procedures, but basically the engines need to operate at lower R.P.M.'s and loads for a specific time.

### **NOTICE**

Failure to properly break-in your engine will result in poor bearing and piston ring surfaces.

### **NOTICE**

The Bandit has only been run for a short time to test proper hydraulic pressures, possible leaks, etc. The fuel tank will be empty. Fuel is provided through a small auxiliary tank for testing. This immensely helps maintain safety in our manufacturing facility and while shipping.

### **NOTICE**

Expensive damage to the Bandit will occur if proper preparation is not taken before welding on the machine. Be sure to disconnect both battery cables before welding. Follow the specific Engine MFG. instructions for proper welding and grounding procedures, before attempting to weld on the machine.

## DAILY START UP & MAINTENANCE

### **1) Check the safety decals and engine gauges:**

Replace any missing or damaged decals and/or engine gauges.

### **2) Check all safety equipment:**

Check for proper operation. Repair or replace as needed. Insure the bail handle shuts the machine off when released and the engine will not start without pressing the bail handle.

### **3) Check entire machine for loose bolts, nuts, parts, or components:**

Check entire machine for any loose parts or components. Check for loose nuts or bolts. Torque, tighten, or replace any of the loose components. See page 32 for specific bolt torques.

### **4) Check all guards:**

Check to make sure all guards are in place and installed correctly. Make sure they are secure.

### **5) Check the cutter wheel and pockets for wear:**

Check for elongated bolt holes, secure welds, torqued bolts, excessive wear and impact cracks. If a problem is found contact the grinder manufacturer or an authorized Bandit dealer.

### **6) Check condition of cutter teeth and hardware:**

Grind or replace your cutter teeth to keep them sharp. Check the condition of your teeth hardware. Replace if necessary.

# Bandit

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**DAILY START UP & MAINTENANCE cont.****7) Check cutter teeth bolts:**

All cutter teeth bolts must be factory approved. Bolts must be replaced after a maximum of 4-5 rotations/changes to insure safe clamping ability.

Torque to 150 ft.-lbs. (203 Nm) AT ALL TIMES.

**8) Grease grinder bearings daily:**

Use an EP-2 Lithium type grease only for all bearings. Purge grinder bearings with grease. You can not over grease these bearings. These bearings are designed with a relief system that will not allow over greasing. In other words, you can not hurt the bearing seals by pumping in too much grease. Most of the failures related to bearings are diagnosed as "contaminations". Contamination is caused by improper lubrication. Wipe off excess grease.

**Excessive grease will attract dirt.**

**9) Clean debris from beltshield(s):**

Inspect beltshield and hydraulic pump beltshield (if equipped) for debris and clean out any chips.

**10) Check / adjust the grinder belt tension and alignment:**

The belts will need to be tightened several times in the first few days of operation. A loose belt will slip and glaze over. Once they slip you must replace them. See pages 44 - 45 for procedures. Check the grinder belt sheaves with a straight edge to ensure they are in line.

**11) Check / adjust the hydraulic pump belt tension and alignment (Models HB19SP & HB20SP):**

The hydraulic pump belt will need to be tightened several times in the first few days of operation. A loose belt will slip and glaze over. Once they slip you must replace them. See pages 44 - 45 for procedures. Check the hydraulic pump belt sheaves with a straight edge to ensure they are in line.

**12) Check hydrostatic pump fluid level (Model HB19SP Only):**

Check the hydrostatic pump fluid level and add fluid as necessary. Keep at the "Oil Level Cold" mark, do not over fill. Manufacturer recommendations for hydrostatic pump fluid is SAE 20W-20 or equivalent.

**13) Check hydraulic oil level (Model HB20SP Only):**

The hydraulic oil reservoir tank level should always remain at 7/8 full. Remember to check DAILY to avoid excessive heat build up.

**14) Check for any fluid leaks:**

Inspect for any oil, fuel, or hydraulic oil. Check all hoses, fittings, lines, and tanks. DO NOT use fingers or skin to check for hydraulic leaks. Repair or replace any damaged or leaking components.

**15) Check the fuel level:**

Check the fuel level, running out and repriming is time consuming.

**16) Check engine oil:**

Follow the engine manufacturer manual recommendations for fluid levels. You MUST follow specific ENGINE MFG. manual recommendations for lubrication, correct engine speed, ETC.

**17) Check cooling fins, fan, and debris screen:**

Thoroughly clean cooling fins on engine at least once a day and twice in excessive conditions. Make sure debris is not packed between fins. Clean cooling fan, shroud on air cooled engines, and the debris screen (if so equipped). Improper service, maintenance, or neglect will cause overheating problems and engine failure.

**18) Check air cleaner or precleaner:**

Clean or replace element following engine manual recommendations.

**19) Check control cables:**

Corrosion can occur if the outer covering of control cable is damaged. Replace the control cable if it is damaged, kinked, frayed, etc, or does not operate smoothly.

**20) Check parking brake (if equipped):**

The machine should not move forward or backward when the parking brake is engaged, but the machine will still pivot. To tighten the brakes turn the top of the parking brake lever clockwise.

**21) Check tires:**

Check tires for wear, weather checking, and damage. Replace if damaged.

**22) Check around machine:**

Check around the entire machine for tools, cans, saws, etc. All tools not in use should be stored in a tool box.

**23) Review all safety procedures on decals, from manual, and from video.****24) Make sure all safety equipment is being worn:**

Make sure you are wearing all of your safety equipment: hard hat, face shield, gloves, eye protection, ear protection, etc. per ANSI and OSHA standards.

**25) Remember to check EVERYTHING on the checklist.**

---

## WEEKLY MAINTENANCE

**1) Grease upper frame pivot bushings (Model HB20SP Only):**

Grease upper frame pivot bushings with 1 to 2 shots of EP-2 Lithium type grease. Wipe off excessive grease. **Excessive grease will attract dirt.**

**2) Check set screws in bearings:**

Check set screws in cutter wheel bearings for tightness.

**3) Check and retighten tank mount bolts:**

Check the mount bolts for the fuel tank and hydraulic tank (if equipped) and retighten.

**4) Check wheel nuts or studs:**

For Model HB19, keep wheel nuts tight, insure the cotter pin is installed, retorque, replace if needed. For Model HB19SP, keep wheel studs tight, retorque, replace if needed. For Model HB20SP, keep drive wheel motor nuts tight, insure the cotter pin is installed, keep lug nuts tight, retorque, replace if needed.

**5) Check alternator and fan belts on engine (as applicable):**

Adjust and maintain per the engine manufacturer's manual.

## MONTHLY MAINTENANCE

**1) Check grinder bearings and grinder sheave:**

Check, retighten all bearing bolts and belt sheave bushings to correct torques.

**2) Check bearing and bearing lock collars:**

Check, retighten all bearing lock collars to correct torques.

**3) Grease or anti-seize handle bar pivot pins:**

Grease handle bar pivot pins with EP-2 Lithium grease or anti-seize. Wipe off excess grease. **Excessive grease will attract dirt.**

**4) Grease or anti-seize swivel frame lock (Model HB20SP Only):**

Grease end of swivel frame lock assembly with EP-2 Lithium grease or anti-seize. Wipe off excess grease. **Excessive grease will attract dirt.**

**5) Check wheel bearings (Model HB19 Only):**

Check and grease wheel bearings with an EP-2 Lithium grease. Wipe off excess grease. **Excessive grease will attract dirt.**

**6) Lubricate control cables:**

Lubricate inner control cables and cable ends with a cable lube or SAE 10W30 oil. Replace control cables if they do not operate smoothly.

**7) Tire air pressure:**

Fill each tire to rated capacity on tire.

**8) Adjust drive cable (Model HB19SP Only, Pre 7/06):**

Block the machine up so that the wheels do not touch the ground. With the transmission in neutral the wheels should not turn. There are two jam nuts for adjustments and a clevis at the end of the drive cable for fine tuning.

## 3 MONTH MAINTENANCE

**1) Hydraulic oil filter (Model HB20SP Only):**

Must be replaced after FIRST 10 HOURS OF OPERATION, USE A 10 MICRON FILTER. After first change replace oil filter every 3 months or 400 hours.

## YEARLY MAINTENANCE

**1) Hydrostatic transmission (Model HB19SP Only):**

Change hydrostatic transmission oil yearly or every 500 hours. Manufacturer recommendations for hydrostatic transmission fluid is SAE 80W90 or equivalent.

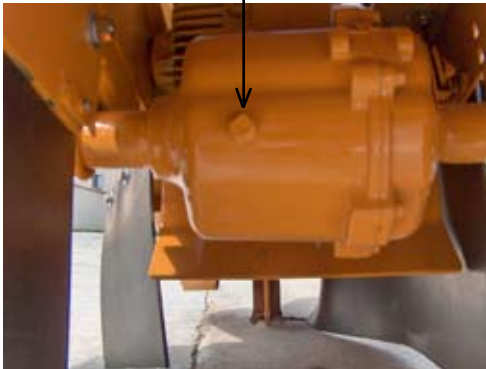
**3) Hydraulic suction screen (Model HB20SP Only):**

Change hydraulic suction screen yearly or every 2000 hours.

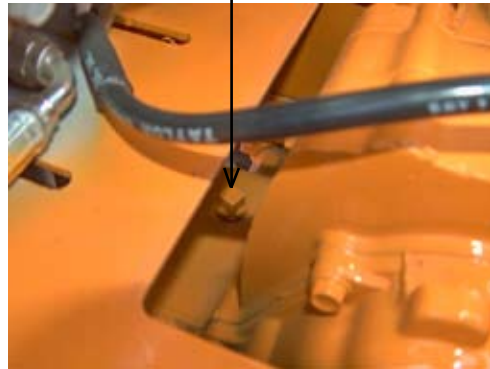
**2) Hydraulic oil (Model HB20SP Only):**

Change hydraulic oil and flush the hydraulic reservoir tank.

Model HB19SP  
Hydrostatic Transmission Drain



Model HB19SP  
Hydrostatic Transmission Fill



# DAILY START UP & MAINTENANCE CHECK LIST

Each day before starting your machine these checks must be made:

	O.K.	Repaired
1) Check the safety decals and engine gauges, replace if damaged.	<input type="checkbox"/>	<input type="checkbox"/>
2) Check, maintain, and service all safety equipment for proper operation.	<input type="checkbox"/>	<input type="checkbox"/>
3) Check entire machine for loose nuts, bolts, and components.	<input type="checkbox"/>	<input type="checkbox"/>
4) Make sure all guards are tight and securely in place.	<input type="checkbox"/>	<input type="checkbox"/>
5) Check the condition of the cutter wheel and teeth pockets.	<input type="checkbox"/>	<input type="checkbox"/>
6) Check the condition of the cutter teeth and hardware.	<input type="checkbox"/>	<input type="checkbox"/>
7) Properly torque cutter teeth bolts.	<input type="checkbox"/>	<input type="checkbox"/>
8) Grease all grinder related bearings daily. Wipe off excess grease.	<input type="checkbox"/>	<input type="checkbox"/>
9) Clean debris from beltshield(s).	<input type="checkbox"/>	<input type="checkbox"/>
10) Check and/or adjust grinder belt tension and alignment.	<input type="checkbox"/>	<input type="checkbox"/>
11) Check and/or adjust pump belt tension and alignment (Models HB19SP & HB20SP).	<input type="checkbox"/>	<input type="checkbox"/>
12) Check and add as necessary hydrostatic pump fluid level (Model HB19SP Only).	<input type="checkbox"/>	<input type="checkbox"/>
13) Check and always maintain hydraulic oil level at 7/8 full (Model HB20SP Only).	<input type="checkbox"/>	<input type="checkbox"/>
14) Check all hoses, fittings, lines, and tanks for damage and fluid leaks.	<input type="checkbox"/>	<input type="checkbox"/>
15) Check fuel level. (Running out and repriming is time consuming).	<input type="checkbox"/>	<input type="checkbox"/>
16) Check engine oil and correct engine speed. Follow ENGINE MANUFACTURERS manual specs. Engine Must Be Level To Check Fluids.	<input type="checkbox"/>	<input type="checkbox"/>
17) Check cooling fins on engine, cooling fan, shroud, and debris screen. Clean as necessary.	<input type="checkbox"/>	<input type="checkbox"/>
18) Check air cleaner and precleaner. Clean as necessary.	<input type="checkbox"/>	<input type="checkbox"/>
19) Check control cables, replace if damaged.	<input type="checkbox"/>	<input type="checkbox"/>
20) Check parking brake, if equipped. Adjust as necessary.	<input type="checkbox"/>	<input type="checkbox"/>
21) Check condition of the tires.	<input type="checkbox"/>	<input type="checkbox"/>
22) Check around the entire machine for any foreign objects, tools, cans, saws, etc.	<input type="checkbox"/>	<input type="checkbox"/>
23) Review all safety procedures on decals, from manual, and from video.	<input type="checkbox"/>	<input type="checkbox"/>
24) Wear all applicable safety equipment: hard hat, gloves, eye protection, ear protection, etc.	<input type="checkbox"/>	<input type="checkbox"/>
25) Remember to check EVERYTHING on the checklist.	<input type="checkbox"/>	<input type="checkbox"/>

## WEEKLY CHECK LIST

- |  | O.K.                     | Repaired                 |
|--|--------------------------|--------------------------|
| 1) Grease upper frame pivot bushings (Model HB20SP Only).        | <input type="checkbox"/> | <input type="checkbox"/> |
| 2) Check set screws in cutter wheel bearings for tightness.      | <input type="checkbox"/> | <input type="checkbox"/> |
| 3) Check and retighten fuel tank and hydraulic tank mount bolts. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4) Check and retighten wheel nuts or studs.                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 5) Check alternator and fan belts on engine.                     | <input type="checkbox"/> | <input type="checkbox"/> |

## MONTHLY CHECK LIST

- |   | O.K.                     | Repaired                 |
|---|--------------------------|--------------------------|
| 1) Check grinder bearings and grinder sheaves.                        | <input type="checkbox"/> | <input type="checkbox"/> |
| 2) Check bearing lock collars.  | <input type="checkbox"/> | <input type="checkbox"/> |
| 3) Grease or anti-seize handle bar pivot pins.                        | <input type="checkbox"/> | <input type="checkbox"/> |
| 4) Grease or anti-seize end of frame swivel lock (Model HB20SP Only). | <input type="checkbox"/> | <input type="checkbox"/> |
| 5) Check and grease wheel bearings (Model HB19 Only).                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 6) Lubricate inner control cables and cable ends.                     | <input type="checkbox"/> | <input type="checkbox"/> |
| 7) Check and fill tires to rated pressures.                           | <input type="checkbox"/> | <input type="checkbox"/> |
| 8) Adjust drive cable as needed (Model HB19SP Only, Pre 7/06).        | <input type="checkbox"/> | <input type="checkbox"/> |

## 3 MONTH CHECK LIST

- |   | O.K.                     | Repaired                 |
|---|--------------------------|--------------------------|
| 1) Replace hydraulic oil filter after first 10 hours then quarterly or every 400 hours (Model HB20SP Only). | <input type="checkbox"/> | <input type="checkbox"/> |

## YEARLY CHECK LIST

- |   | O.K.                     | Repaired                 |
|---|--------------------------|--------------------------|
| 1) Change hydrostatic transmission oil (Model HB19SP Only).                               | <input type="checkbox"/> | <input type="checkbox"/> |
| 2) Change hydraulic oil and flush the hydraulic tank (Model HB20SP Only).                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 3) Replace the hydraulic suction screen annually or every 2000 hours (Model HB20SP Only). | <input type="checkbox"/> | <input type="checkbox"/> |



# MAINTENANCE SECTION

## BOLT TORQUE CHART

(THESE TORQUES ARE BASED ON DRY, CLEAN THREADS)

DESCRIPTION	BOLT SIZE	TORQUE (FT.-LBS.)	TORQUE (Nm)
Grinder Bearing Bolts	1/2" - 13 NC	75	102
Grinder Bearing Set Screw	5/16" - 24 NF	12	16
Cutter Wheel Shaft Bolts	7/16" - 20 NF	58	79
Engine Hold Downs	3/8" - 16 NC	33	45
Electric Clutch	5/8" - 18 NF	160	217
Cutter Wheel Bushing - "P1"	5/16" - 18 NC	16	22
Cutter Wheel / Engine Bushing - "SDS"	1/4" - 20 NC	9	12
Engine / Pump Bushing - "2517"	1/2" - 13 NC	36	48
Pump Bushing - "1108"	1/4" - 20 NC	5	6
Cutter Wheel Teeth Bolts	5/8" - 18 NF	150	203
Wheel Stud (Model HB19SP & HB20SP)	1/2" - 20 NF	90	122
Wheel Nut (Model HB19)	1" - 8 NC	250	339
Hydraulic Motor Wheel Nut (Model HB20SP)		250	339

Before tightening bolts be sure you have the correct size bolt for the correct amount of torque.  
Use only factory approved bolts and hardware.

## PAINT CARE

To help keep up the appearance of your Bandit Equipment and reduce the possibility of surface rust follow these steps:

- 1) The machine should be washed on a regular basis with a non-abrasive mild detergent and then rinsed thoroughly. Do not pressure wash sensitive areas like: decals, gauges, electronic devices, etc.
- 2) If a stone chip, paint scratch, or paint crack occurs - it should be repaired immediately. Simply sand the edges of the damaged paint area, mask off the surrounding area and apply primer and paint to the dry, clean, and warm surface. This will help keep the damaged area from spreading or getting worse.
- 3) If you are unable to sand and mask the area, there are containers of primer and paint available. A small brush can be used to touch up the area.
- 4) Also, primer and most colors of paint are available in aerosol spray cans to simply spray over the effected area after it is cleaned, dry, and warmed. This method is not as reliable as the process in step #2.

It is also reported that some equipment owners polish their machine at least yearly.

# GREASE CHART - MODEL HB19



#	DESCRIPTION	CHECK			PROCEDURE
		DAY	MONTH	YEAR	
1	Cutter Wheel Bearings	X			Purge bearing daily - wipe off excess
2	Handle Bar Pivot Pins		X		Grease or anti-seize - wipe off excess
3	Wheel Bearings		X		Grease - wipe off excess
4	Control Cables		X		Lubricate the inner cables and ends

# GREASE CHART - MODEL HB19SP



#	DESCRIPTION	CHECK			PROCEDURE
		DAY	MONTH	YEAR	
1	Cutter Wheel Bearings	X			Purge bearing daily - wipe off excess
2	Handle Bar Pivot Pins		X		Grease or anti-seize - wipe off excess
3	Control Cables		X		Lubricate the inner cables and ends

# GREASE CHART - MODEL HB20SP



#	DESCRIPTION	DAY	CHECK		PROCEDURE
			MONTH	YEAR	
1	Cutter Wheel Bearings	X			Purge bearing daily - wipe off excess
2	Upper Frame Pivot Bushing		X		1 to 2 shots of grease - wipe off excess
3	Handle Bar Pivot Pins		X		Grease or anti-seize - wipe off excess
4	Swivel Frame Lock		X		Grease or anti-seize - wipe off excess
5	Control Cables		X		Lubricate the inner cables and ends

# TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Engine will not start. (See Engine MFG. manual for further information.)	<ol style="list-style-type: none"> <li>1. Loose ground cable.</li> <li>2. Loose hot cable.</li> <li>3. Dead battery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean and tighten.</li> <li>2. Clean and tighten.</li> <li>3. Recharge or replace.</li> </ol>
Belt squeal.	<ol style="list-style-type: none"> <li>1. Belt tension too loose.</li> <li>2. Belt out of alignment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten or replace.</li> <li>2. Align pulleys.</li> </ol>
Belt jumping off.	<ol style="list-style-type: none"> <li>1. Engaging or disengaging belt at high engine RPM.</li> <li>2. Belt tension too loose.</li> <li>3. Belt out of alignment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Only engage or disengage belts at low engine speed or need replacement.</li> <li>2. Tighten or replace.</li> <li>3. Make sure sheaves aligned properly.</li> </ol>
Cutter wheel vibration.	<ol style="list-style-type: none"> <li>1. Tooth missing.</li> <li>2. Pocket out of balance.</li> <li>3. Improper tooth arrangement.</li> <li>4. Bad cutter shaft bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace missing teeth.</li> <li>2. Always replace pockets in pairs across from each other.</li> <li>3. Install correctly with like pairs of teeth directly across from each other.</li> <li>4. Replace bearing.</li> </ol>
Cutter wheel throwing teeth.	<ol style="list-style-type: none"> <li>1. Bad pocket.</li> <li>2. Dirt in pocket.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace pocket.</li> <li>2. Clean pocket and replace missing teeth.</li> </ol>
Cutter wheel breaking teeth.	<ol style="list-style-type: none"> <li>1. Operator hitting rocks.</li> </ol>	<ol style="list-style-type: none"> <li>1. Avoid rocks, stone, etc.</li> </ol>
Cutter wheel stops turning.	<ol style="list-style-type: none"> <li>1. Belt not engaged.</li> <li>2. Belt loose.</li> <li>3. Engine belt broke.</li> <li>4. Clutch broke.</li> <li>5. Sheared key in shaft.</li> <li>6. Broke cutter wheel shaft.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust belt assembly.</li> <li>2. Tighten.</li> <li>3. Replace.</li> <li>4. Replace.</li> <li>5. Replace.</li> <li>6. Replace.</li> </ol>
Roar in machine when cutter wheel is engaged.	<ol style="list-style-type: none"> <li>1. Belt guards rubbing on cutter wheel shaft.</li> <li>2. Cutter wheel bearings going bad.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reposition guards off of shafts.</li> <li>2. Replace bearings.</li> </ol>
Bearing will not take grease.	<ol style="list-style-type: none"> <li>1. Grease fitting clogged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> </ol>

# HYDRAULIC SECTION

**⚠ WARNING**

**DO NOT GO NEAR HYDRAULIC LEAKS!**

High pressure oil easily punctures skin causing serious injury, gangrene, or death. If injured, seek emergency medical help. Immediate surgery is required to remove oil. DO NOT use fingers or skin to check for leaks. Lower load or relieve hydraulic pressure before loosening fittings.

DO NOT operate this machine unless all hydraulic control devices operate properly. They must function, shift and position smoothly and accurately at all times. Faulty controls can cause personal injury!

## Hydraulic Fluid Requirements

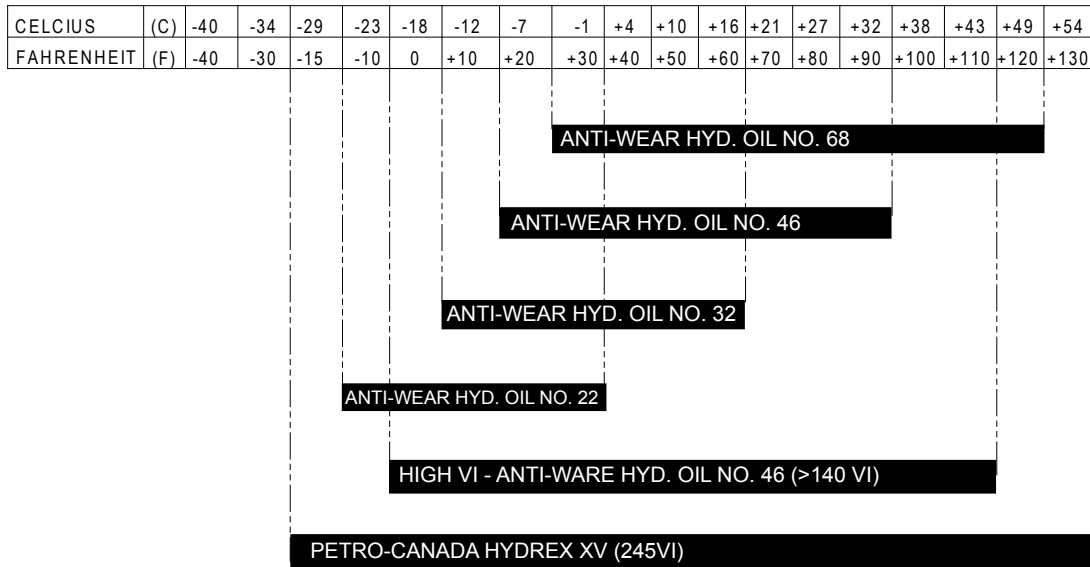
This machine is equipped with “Petro-Canada Hydrex XV” hydraulic fluid. It is recommended to replace with the same. “Petro-Canada Hydrex XV” is an all season hydraulic fluid. This is a premium performance, long life anti-wear, hydraulic fluid, designed for all season use in heavy duty hydraulic systems. “Petro-Canada Hydrex XV” allows year round use under wide extremes of temperature. It allows the hydraulic system to start at temperatures as low as -40°C/-40°F, under no load conditions and it improves lubrication of hydraulic components at high operating temperatures. It will also help protect against hydraulic failures during the wide temperature swings of spring and fall. To find the closest “Petro-Canada Hydrex XV” dealer call 1-888-284-4572.

Multi Viscosity motor oils are not recommended to mix with “Petro-Canada Hydrex XV” hydraulic oil. AW oils may mix with “Petro-Canada Hydrex XV” hydraulic oil. The following are specifications and authorizations of compatible oils. Only a high quality anti-wear (AW) hydraulic oil containing foam, corrosion, rust and oxidations inhibitors should be used. This viscosity grade depends on the oil temperature in service, based on the climate and operating conditions.

	Hydrex XV	ISO 22, AW	ISO 32, AW	ISO 46, AW	ISO 68, AW	ISO 100, AW
Viscosity Index	>235	>95	>95	>95	>95	>95
Flash Point	>240°C /464°F	>200°C /395°F	>210°C /410°F	>220°C /430°F	>220°C /430°F	>240°C /464°F
Oxidations Stability (ASTM D0943)	>9,000 Hours	>3,000 Hours	>3,000 Hours	>3,000 Hours	>3,000 Hours	>3,000 Hours
Cold Start-up, No Load, Max	-40°C/-40°F	-34°C/-29°F	-26°C/-14°F	-19°C/-3°F	-9°C/16°F	-4°C/24°F

# HYDRAULIC SECTION

Alternate hydraulic oils are available, but they do not equal the performance or longevity of the “Hydrex XV” oil. Consult the following information supplied by the oil distributor.



**Note:** The above chart is a suggested guide for viscosity of hydraulic fluids at start up ambient temperature. The load, demand, and cleanliness of the equipment will affect actual oil temperatures which can increase dramatically above ambient air temperatures during operation. The actual viscosity needed is based on oil temperature during operation and not air temperature. Compare your fluid specifications with the specifications below to verify compliance.

When choosing a hydraulic fluid - these maximum and minimum specifications must be met:

Minimum Viscosity during operation = 12 cSt  
 Maximum No-Load Viscosity at start-up = 2000 cSt

Hydraulic fluids vary in their resistance to oxidation at elevated temperatures, their ability to protect against metal-to-metal contact under increasing temperature, and their ability to separate water from the fluid. Viscosity is temperature dependant. Fluids with high viscosity-index (VI) will thin out slower at higher temperature and thicken slower at colder temperatures allowing a wider operating range. Choose a fluid that has test results in these areas for best results.

Based on the varying temperatures of the area where Bandit equipment is used, and the high demand and loads placed on this equipment, Bandit has filled each hydraulic system with Petro-Canada’s Hydrex XV All Season Hydraulic Fluid for maximum protection and performance.

Contact Petro Canada at (888) 284-4572 to find a dealer near you.

**Note:** Some equipment and components such as fluid engagement clutch’s (PTO’s) have their own lubrication requirements. Consult their manufactures manual for that information.

# HYDRAULIC SECTION

## THE BANDIT HYDRAULIC SYSTEM

The Bandit is equipped with a very efficient, simple hydraulic system. Each component is capable of withstanding a specified PSI (bar) and still operate for a very long time.

If the simple rules mentioned below are followed, the hydraulic components will last for years:

- After you have operated a new machine for approximately an hour shut down the machine and recheck all hydraulic fittings for tightness and leaks.
- Avoid hydraulic pump cavitation. Low oil levels or cold start-ups will cause the hydraulic pump to cavitate. Cavitation will ruin the pump and possibly the entire hydraulic system. Cavitation only has to happen once. This will start the pump on its way to ruin. Allow hydraulic system to turn slowly for several minutes in cold weather in order for hydraulic system to warm up. Cavitation is not covered under warranty.

- Keep hydraulic oil clean. Dirty oil will cause excessive wear and loss of hydraulic power.
- Replace the hydraulic oil filter(s) after first 10 hours and with each 400 hours of operation or 3 months.
- Replace hydraulic oil & suction screen(s) at least once yearly. This is also a very good time to flush and clean the tank. Replace hydraulic oil immediately if it is contaminated or looks “milky”.
- If the Bandit’s hydraulic system is kept clean and the hydraulic pressures are not increased beyond the specified PSI (bar), the maximum use and life should be received from the Bandit grinder hydraulic system.
- Some component manufacturers require different specific hydraulic lubrication, such as gear boxes, undercarriage drives, etc. Refer to their manuals and maintenance section of this manual.

## HYDRAULIC COMPONENTS

### 1) HYDRAULIC PUMP:

The hydraulic pump is belt driven off the engine.

### 2) HYDRAULIC TANK:

This tank must be kept clean and filled minimum 7/8 full. Clean tank yearly.

### 3) SUCTION STRAINER:

The strainer stops contaminants from reaching the hydraulic pump. The suction strainer should be replaced every 2000 hours or yearly.

### 4) FILTER:

The filter element is mounted inside of the tank and must be replaced per maintenance schedule.

### 5) HYDRAULIC MOTORS:

The hydraulic motors power the drive wheels.

### 6) TIMING CYLINDER:

The timing cylinder helps the drive motors start and stop smoothly.

### 7) COUNTER BALANCE:

The counter balance keeps the machine from drifting when not in drive motion.





# TROUBLE SHOOTING

**BEFORE ATTEMPTING ANY TYPE OF MAINTENANCE DISENGAGE CLUTCH, TURN OFF ENGINE, WAIT FOR THE CUTTER WHEEL TO COME TO A COMPLETE STOP, INSTALL THE CUTTER WHEEL LOCK PIN, DISCONNECT BATTERY, AND MAKE SURE THE IGNITION KEY IS IN YOUR POSSESSION.**

PROBLEM	POSSIBLE CAUSE	SOLUTION
<b>Hydraulic oil very hot, causing system to operate slowly</b>	<ol style="list-style-type: none"> <li>1. Dull teeth.</li> <li>2. Low oil level.</li> <li>3. Worn pump, poor oil quality.</li> <li>4. Damaged hose.</li> <li>5. Oil suction screen or filter plugged.</li> <li>6. Binding.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace teeth.</li> <li>2. Fill 7/8 full minimum.</li> <li>3. Replace.</li> <li>4. Replace.</li> <li>5. Clean or replace.</li> <li>6. Repair.</li> </ol>
<b>Hydraulic system loss of power.</b>	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Poor oil quality.</li> <li>3. Bad pump.</li> <li>4. Bad motor.</li> <li>5. One of the two reliefs stuck open on pump.</li> <li>6. Hydraulic Unlock knob is open on pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill 7/8 full minimum.</li> <li>2. Replace.</li> <li>3. Replace.</li> <li>4. Replace or repair.</li> <li>5. Clean or replace.</li> <li>6. Close (turn clockwise).</li> </ol>
<b>Drive motors slow or loss of power.</b>	<ol style="list-style-type: none"> <li>1. Drive cable out of adjustment.</li> <li>2. Low oil level.</li> <li>3. Poor oil quality.</li> <li>4. Bad pump.</li> <li>5. Bad motor.</li> <li>6. One of the two reliefs stuck open on pump.</li> <li>7. Hydraulic Unlock knob is open on pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or replace.</li> <li>2. Fill 7/8 full minimum.</li> <li>3. Replace.</li> <li>4. Replace.</li> <li>5. Replace or repair.</li> <li>6. Clean or replace.</li> <li>7. Close (turn clockwise).</li> </ol>
<b>Drive motors are jumpy and erratic.</b>	<ol style="list-style-type: none"> <li>1. Bad timing cylinder. To check, unhook the hydraulic hoses and hook air up to one end of the cylinder. If, air comes out the other port, the cylinder is bad.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace or repair.</li> </ol>

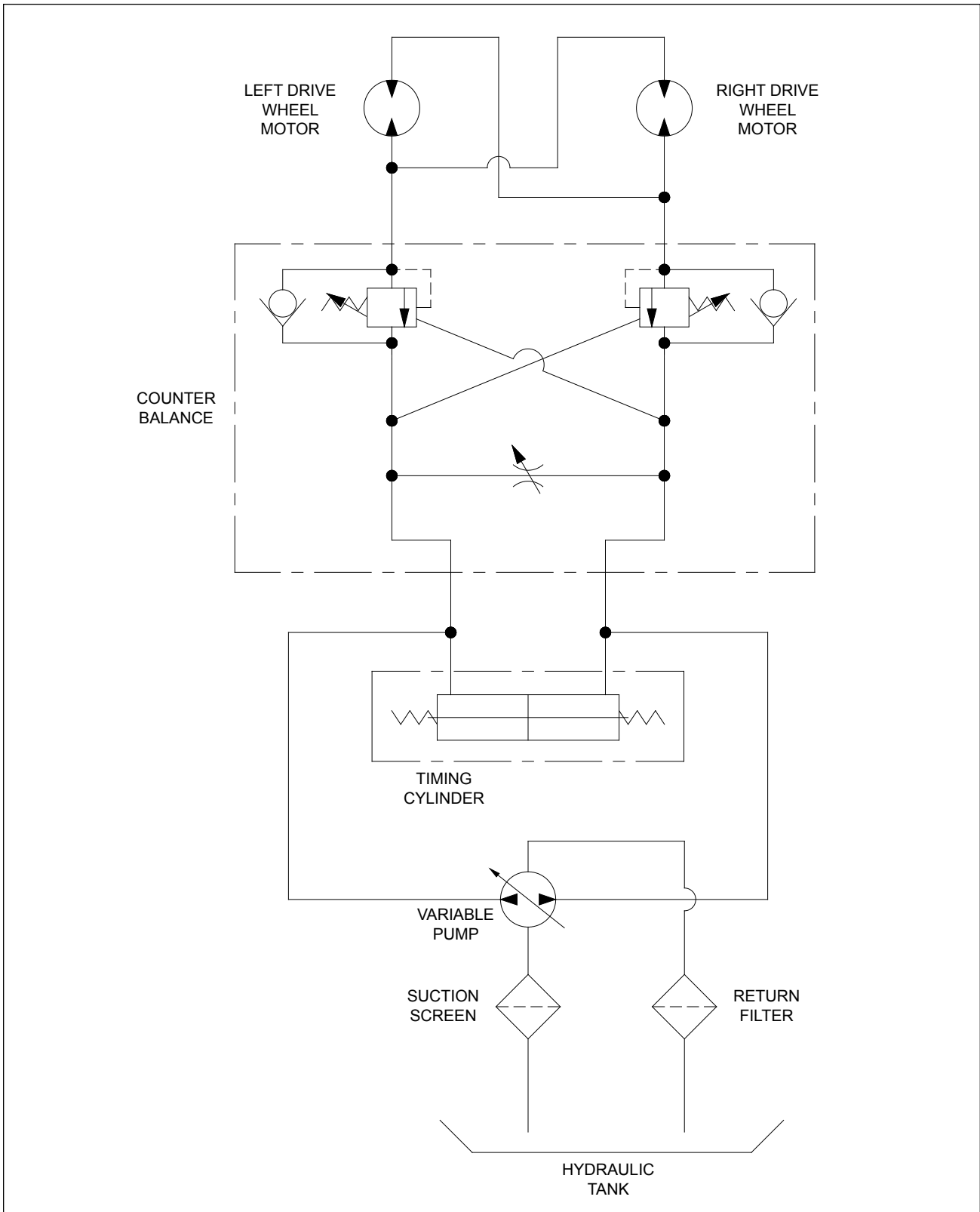
## CORRECTING HYDRAULIC PROBLEMS

COMPONENT	PROCEDURE
<b>Checking for defective pump</b>	<ol style="list-style-type: none"> <li>1. Do not attempt to check your hydraulic pump without first consulting your local dealer or Bandit Industries.</li> </ol>
<b>Checking for defective motor</b>	<ol style="list-style-type: none"> <li>1. If everything checks out as correct, it may be time to check the hydraulic motor.</li> <li>2. Do not attempt to check your hydraulic motor without first consulting your local dealer or Bandit Industries.</li> </ol>

**NOTE:** When returning hydraulic components for warranty make sure to box up all warranted parts to avoid additional damage while shipping. **Do not disassemble any hydraulic components which are to be warranted.** Anything which has been disassembled or tampered with will not be warranted. Items being returned must be clean. All hydraulic components must have all hosing ports plugged. Failure to plug ports will allow debris to enter components which will void warranty.

# MODEL HB20SP HYDRAULIC SCHEMATIC

SPECIFIC SCHEMATIC FUNCTION MAY VARY  
DEPENDING ON OPTIONS OR COMPONENT MANUFACTURER.



# CUTTER WHEEL SECTION (START 8/07)

**DO NOT OPERATE MACHINE WITHOUT A FULL SET OF TEETH. OPERATING MACHINE WITHOUT A FULL SET OF TEETH CAN CAUSE EXCESSIVE VIBRATION AND PREMATURE BEARING FAILURE.**

Use only original equipment manufacturer's teeth. The use of any other aftermarket teeth may cause damage or premature failure to the drive train.

There are eight (8) teeth to a complete set on the model HB19, HB19SP, or HB20SP built during and after 8/07. Four (4) straight teeth, two (2) left 45° teeth, and two (2) right 45° teeth.

**Do Not operate machine with extremely worn or broken teeth.**

A locking pin is provided to hold the cutter wheel in position during tooth removal and reinstallation. Locking pin will only lock on outer teeth. **NEVER USE HAND ON CUTTER WHEEL TO HOLD IN PLACE WHILE CHANGING TEETH. BE SURE TO REMOVE LOCKING PIN BEFORE OPERATING THE MACHINE.**

# TOOTH ARRANGEMENT (START 8/07)

Inspect pockets, teeth and bolts for damage and replace as required.

When replacing pockets, always replace new pockets across from each other in order to prevent vibration.

Replacement teeth must be carbide tipped and of like design as provided with the machine.

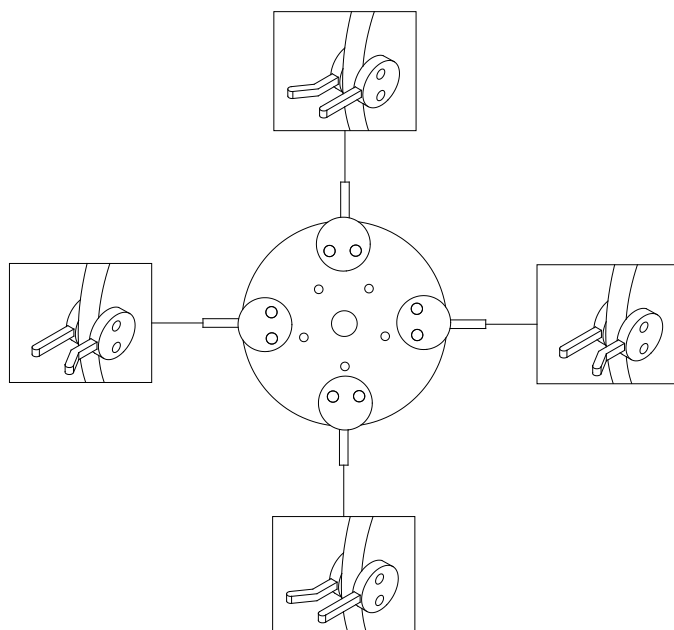
Use anti-seize on threads to prevent bolts from "freezing up" in cutter wheel pockets.

When replacing complete set of teeth, be sure to duplicate original factory tooth arrangement. Typically a 1/2" allen key socket is required to change or torque the teeth. Torque bolts to 150 ft.-lbs. (203 Nm).

Straight teeth are mounted in **TWO OPPOSING POCKETS**, on each side.

A straight tooth must have a 45° tooth accompanying it in the same pocket set. The opposite pocket sets should have this same combination of straight and 45° teeth, except with positions reversed. Mounting these teeth opposite each other on the cutting wheel cancels damaging vibration.

The tooth arrangement is a left tooth with a straight tooth, a straight tooth with a right tooth, a left tooth with a straight tooth, and a straight tooth with a right tooth.



Straight Tooth:	900-9903-75
Left Tooth 45°:	900-9903-76
Right Tooth 45°:	900-9903-77
Counter Bored Pocket:	900-9903-78
Threaded Pocket:	900-9903-79
Bolt:	900-9903-94
Tooth Kit:	900-9906-67

# CUTTER WHEEL SECTION (PRE 8/07)

**DO NOT OPERATE MACHINE WITHOUT A FULL SET OF TEETH. OPERATING MACHINE WITHOUT A FULL SET OF TEETH CAN CAUSE EXCESSIVE VIBRATION AND PREMATURE BEARING FAILURE.**

Use only original equipment manufacturer's teeth. The use of any other aftermarket teeth may cause damage or premature failure to the drive train.

There are twelve (12) teeth to a complete set on the model HB19, HB19SP, or HB20SP built before 8/07. Two (2) straight teeth, five (5) left 45° teeth, and five (5) right 45° teeth.

**Do Not operate machine with extremely worn or broken teeth.**

A locking pin is provided to hold the cutter wheel in position during tooth removal and reinstallation. Locking pin will only lock on outer teeth. **NEVER USE HAND ON CUTTER WHEEL TO HOLD IN PLACE WHILE CHANGING TEETH. BE SURE TO REMOVE LOCKING PIN BEFORE OPERATING THE MACHINE.**

## TOOTH ARRANGEMENT (PRE 8/07)

Inspect pockets, teeth and bolts for damage and replace as required.

When replacing pockets, always replace new pockets across from each other in order to prevent vibration.

Replacement teeth must be carbide tipped and of like design as provided with the machine.

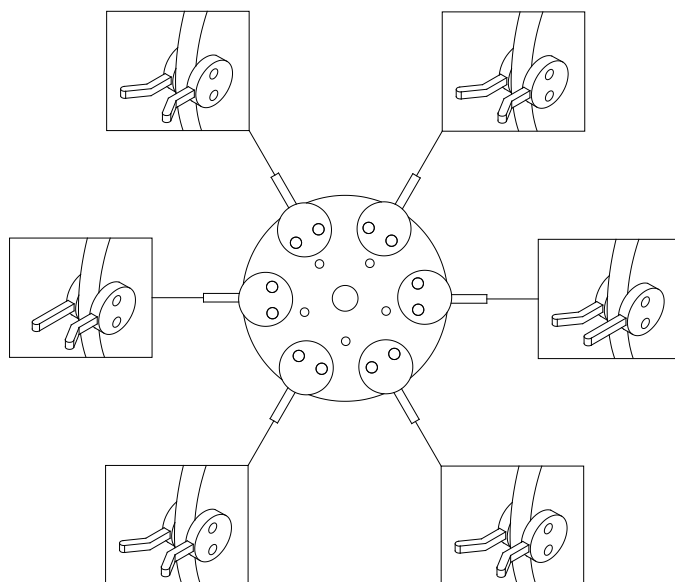
Use anti-seize on threads to prevent bolts from "freezing up" in cutter wheel pockets.

When replacing complete set of teeth, be sure to duplicate original factory tooth arrangement. Typically a 1/2" allen key socket is required to change or torque the teeth. Torque bolts to 150 ft.-lbs. (203 Nm).

Straight teeth are mounted in **TWO OPPOSING POCKETS.**

A straight tooth must have a 45° tooth accompanying it in the same pocket set. The opposite pocket sets should have this same combination of straight and 45° teeth, except with positions reversed. Mounting these teeth opposite each other on the cutting wheel cancels damaging vibration.

Four Remaining Pockets require 45° teeth mounted away from the cutter wheel.



Straight Tooth:	900-9903-75
Left Tooth 45°:	900-9903-76
Right Tooth 45°:	900-9903-77
Counter Bored Pocket:	900-9903-78
Threaded Pocket:	900-9903-79
Bolt:	900-9903-94
Tooth Kit:	900-9904-39

# BELT TENSION

## GENERAL RULES FOR TENSIONING

1. Check tensioning during the first 2-48 hours of run-in operation.
2. Over tensioning or under tensioning shortens belt and bearing life.
3. Keep belts free from foreign materials that may cause the belt to slip.
4. Make V-drive inspection on a periodical basis. Never use belt dressing as this will damage the belt and cause early failure.
5. Belts should never be forced over the sheave. Allow enough room for belts to slip on during removal and replacement.
6. Always make sure sheaves are aligned properly.

## TENSIONING PROCEDURE

### Main Drive Belts:

Follow all pre-maintenance shut down procedures. Locate the center of the belt span between the sheaves. Push or pull on the belt until the belt has deflected 5/32" (4.0 mm). Record the push or pull force. The force should be 10 lbs/belt (4.5 kg/belt). Adjust the belt tension if the force falls outside of this range. If belts are not properly adjusted belts will slip, glaze over and be ruined. This is **NOT** covered by warranty.

- 1) Remove beltshield.
- 2) To adjust the belt tension, loosen the engine mounting bolts.
- 3) Turn the engine puller bolt clockwise to tighten the belts and counter-clockwise to loosen the belts.
- 4) Tighten and torque the engine mount bolts.
- 5) Recheck the belt tension and alignment, if readjustment is needed go back to step 2.
- 6) Adjust pump drive belt, if equipped. See below for procedure.
- 7) Reinstall beltshield.

**NOTE:** lbs./belt (kg/belt) is per 1 belt. If equipped with 2 groove poly band belt, lbs./belt (kg/belt) must be multiplied by 2. If equipped with two 3 groove poly band belts, lbs./belt (kg/belt) must be multiplied by 3 for each poly band belt.

**NOTE:** It is a good practice to rotate the belts during tensioning. Then recheck deflections. The belts may need to be tightened again.

### Hydrostatic Pump Drive Belt (Model HB19SP only):

- 1) After the main drive belts have been properly adjusted.
- 2) Loosen the bolt on the idler pulley and slide forward or backward until the belt is tight.
- 3) Slide the idler pulley forward or backward until the belt is tight
- 4) Once the belt is tight, tighten the idler pulley bolt.
- 5) Reinstall beltshield.

### Hydraulic Pump Drive Belt (Model HB20SP only):

- 1) After the main drive belts have been properly adjusted.
- 2) Remove hydraulic pump beltshield
- 3) Locate the center of the belt span between the sheaves.
- 4) Push or pull on the belt until the belt has deflected 5/32" (4.0 mm).
- 5) Record the push or pull force.
- 6) The force should be 10 lbs/belt (4.5 kg/belt).
- 7) To adjust the belt tension, loosen the pump adjuster bolt jam nuts and
- 8) Turn the pump adjuster bolt clockwise to tighten the belt and counter-clockwise to loosen the belt.
- 9) Once the belt is adjusted to the proper tension, tighten the jam nuts on the pump adjuster bolt.
- 10) Reinstall beltshields.

Do not over tighten the hydraulic pump belt. For best results use a good belt tension tester. Most all pump failures result from too much side load on the pump shaft. Too much belt tension is very easy to detect inside a failed pump. Pumps with this condition will not be covered under warranty.

## DO NOT IGNORE THIS MAINTENANCE RULE!

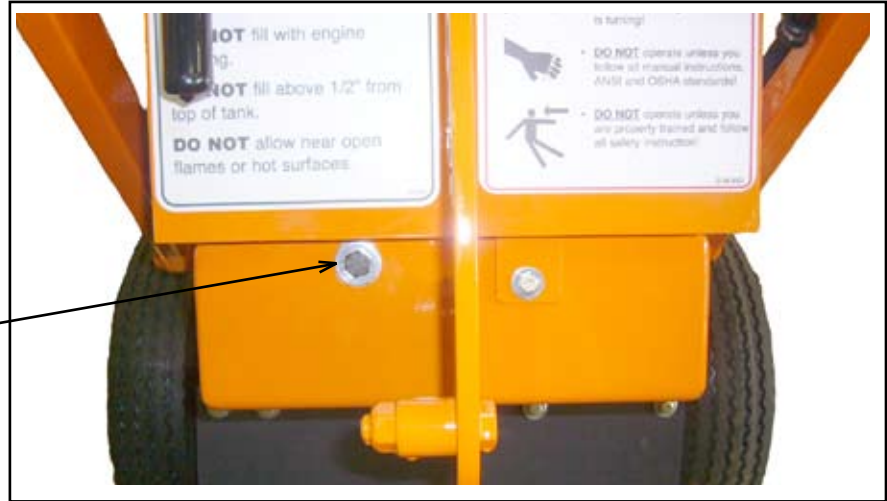
New belts stretch very soon and must be adjusted several times in the first few hours of operation. Adjust after one hour of operation, then every four hours until the belts quit stretching.

Failure to do this will cause the belts to burn and fly off. **THIS FAILURE IS NOT COVERED BY WARRANTY!**

# Bandit

# BELT TENSION

Engine Puller Bolt  
For Models HB19  
& HB19SP



Engine Puller Bolt  
For Model HB20SP



Worn or misaligned belts and sheaves in the power train causes belt slippage, thus power loss. Keep the power train working for you, not against you, by checking for needed adjustment or replacement.

WORN SHEAVE	GOOD BELT	WORN BELT

Main Drive belts maximum of 5/32" deflection with 10 lbs. of force.  
 Pump Drive belts maximum of 5/32" deflection with 10 lbs. of force.

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## LUBRICATION & COOLANT

### 1) Engine:

Follow original equipment manufacturers requirements for both changing oils and filters, refer to engine manual specifications.

### 2) Engine Coolant:

Refer to engine manufacturers manual specifications.

### 3) Wheel Bearings (Model HB19 Only):

Check and grease wheel bearings with an EP-2 Lithium grease. Wipe off excess grease. **Excessive grease will attract dirt.**

### 4) Hydrostatic Transmission (Model HB19SP Only):

Change hydrostatic transmission oil yearly or every 500 hours. Manufacturer recommendations for hydrostatic transmission fluid is SAE 80W90 or equivalent.

### 5) Hydrostatic Pump (Model HB19SP Only):

Check the hydrostatic pump fluid level daily and add fluid as necessary. Keep at the "Oil Level Cold" mark, do not over fill. Manufacturer recommendations for hydrostatic pump fluid is SAE 20W-20 or equivalent.

### 6) Hydraulic Reservoir Tank (Model HB20SP Only):

Completely change hydraulic oil, suction screen(s), and flush the tank annually. Change hydraulic oil filter AFTER FIRST 10 HOURS OF OPERATION. Then change hydraulic oil filter(s) every 400 hours or 3 months thereafter. Maintain hydraulic oil level 7/8 full. See hydraulic oil requirements below. Check hydraulic oil level in tank daily.

### 7) Hydraulic Fluid Requirements (Model HB20SP Only):

See pages 37 - 38 for hydraulic fluid requirements.

### 8) Grinder Bearings:

Use an EP-2 Lithium type grease only for all bearings. Purge grinder bearings with grease you can not over grease these bearings. These bearings are designed with a relief system that will not allow over greasing. In other words, you can not hurt the bearing seals by pumping in to much grease. Wipe off excess grease. **Excessive grease will attract dirt.**

Most of the failures related to bearings are diagnosed as "Contamination". Contamination is caused by improper lubrication.

**Especially important is proper lubrication when the grinder is setting idle. The bearings must be fully purged when shut down. Then the bearings must be again fully purged each thirty (30) days and the machine allowed to run for approximately 10 minutes. Then fully purged again before the machine is put back into operation. Failure to do this will ruin the bearings. Bearings corrode when the machine is setting idle.**

The second largest cause of bearing failure is operating them at high speeds when the grease is cold. This causes the bearing race to turn on the shaft. Naturally this ruins the bearing as well as the shaft. Allow the bearings to turn at slower speeds for at least five minutes. Also check the bearing lock collar set screws for tightness each 30 days. Loose set screws allow the race to turn on the shaft. Failed bearings diagnosed as contamination or cold starts at high speed are not covered by warranty of the bearing manufacturer.

### 9) Upper Frame Pivot Bushings (Model HB20SP Only):

Grease upper frame pivot bushings weekly. Use one (1) or two (2) shots of EP-2 Lithium type grease. Wipe off excess grease. **Excessive grease will attract dirt.**

### 10) Handle Bar Pins:

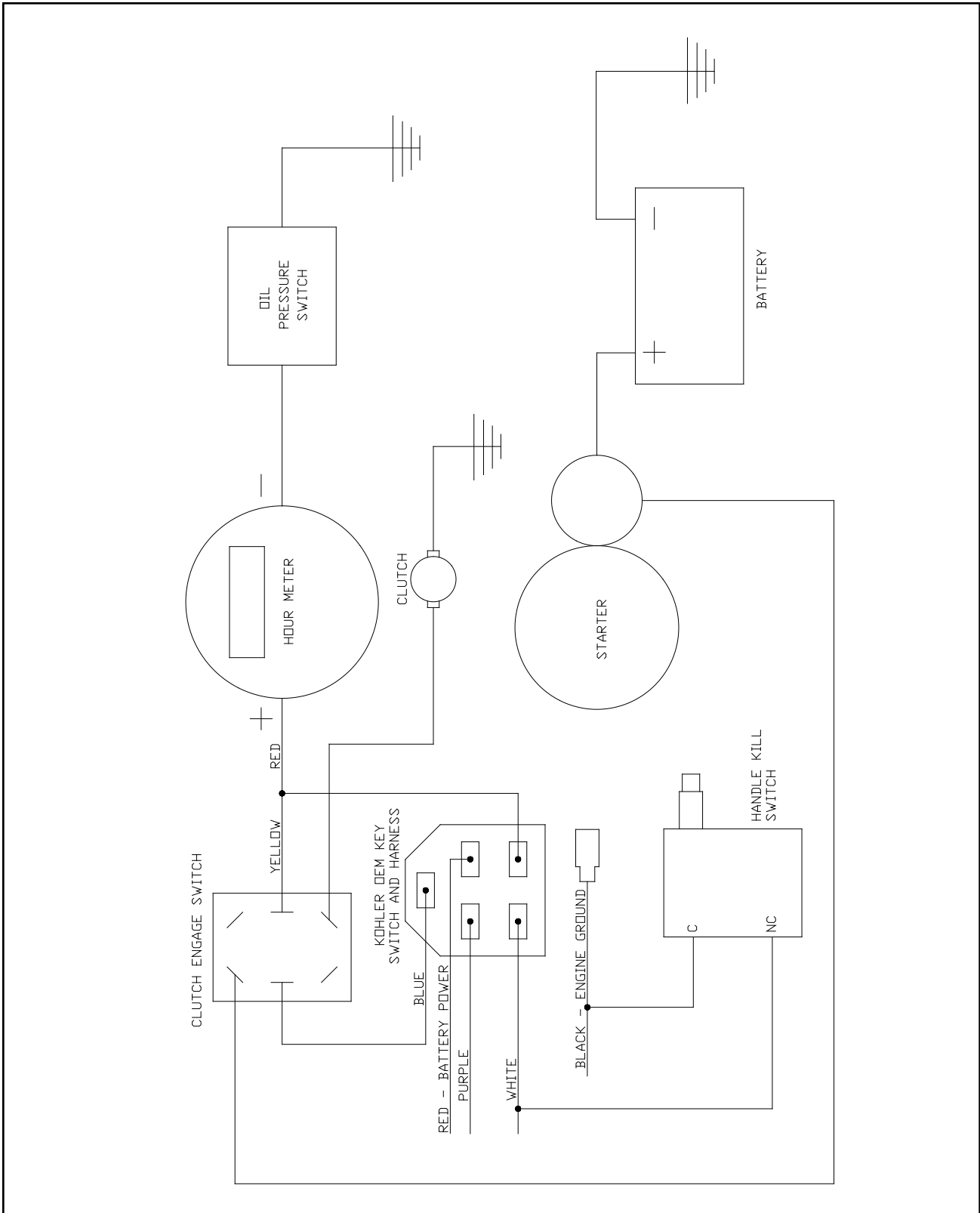
Grease handle bar pivot pins with a EP-2 Lithium grease or an anti-seize monthly. Wipe off excess grease. **Excessive grease will attract dirt.**

### 11) Control Cables:

Lubricate the inner cables and cable ends monthly with a cable lube or SAE 10W30 oil.

# KOHLER ENGINE

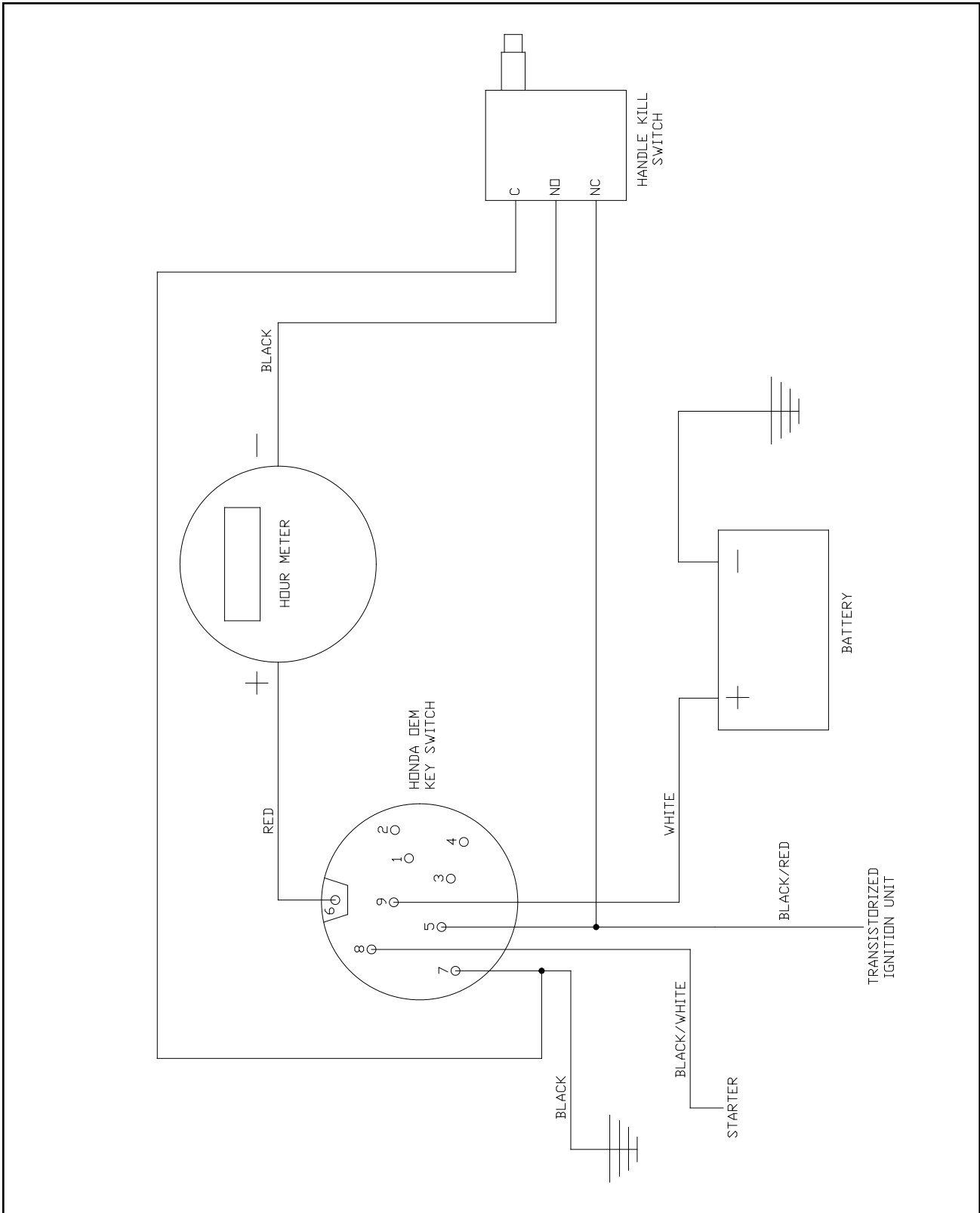
SPECIFIC SCHEMATIC FUNCTION MAY VARY  
DEPENDING ON OPTIONS OR COMPONENT MANUFACTURE.





# HONDA ENGINE

SPECIFIC SCHEMATIC FUNCTION MAY VARY  
DEPENDING ON OPTIONS OR COMPONENT MANUFACTURE.



# REPLACEMENT PARTS SECTION

Depending on what replacement parts you are ordering  
the following information will be needed:

**GRINDER COMPONENTS**

Serial Number  
Model Number of Grinder

**ENGINE COMPONENTS**

Brand  
Engine Serial Number  
Engine Spec. Number

**CLUTCH COMPONENTS**

Brand  
Serial Number  
Assembly Number of Clutch

**NOTE**

When ordering any replacement parts you should have the serial number (S/N) of the machine to ensure that you receive the correct replacement part. See page 6 for typical serial number & work order number locations.

**NOTE**

All nuts, bolts, washers, and many other components can be ordered by physical description.

**NOTE**

Some of the components shown in this section are for optional equipment and may not apply to every machine.

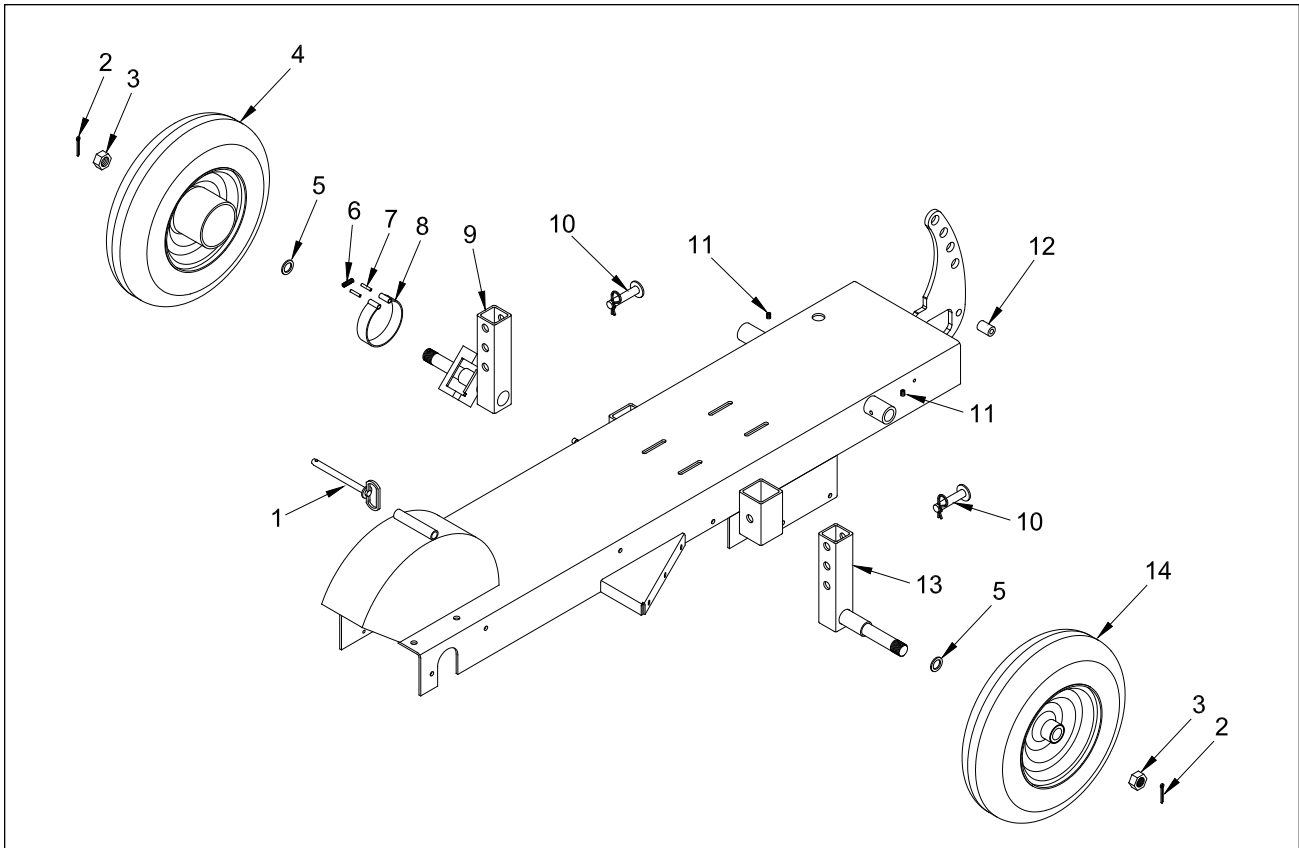
Bandit Industries Inc. reserves the right to make changes in models, size, design, installations and applications on any part without notification.



LOCATION	PART NUMBER	DESCRIPTION
1.	900-4906-73	1/2"-13NC x 1 3/4" Hex Head Bolt
2.	900-4909-18	1/2" Mill Carb Washer
3.	900-1911-08	Cutter Wheel Bearing
4.	900-4901-76	1/2"-13NC Lock Nut
5.	900-4908-87	7/16"-20NF Lock Nut
6.	200-300062	Cutter Wheel Shaft
7 a.	200-300183	Cutter Wheel - 8 Tooth (Start 8/07)
b.	200-300011	Cutter Wheel - 12 Tooth (Pre 8/07)
8.	900-4912-62	7/16"-20NF x 1 1/2" Hex Head Bolt
9 a.	900-1911-96	Cutter Wheel Sheave
b.	900-1911-15	Cutter Wheel Sheave With Electric Clutch
10 a.	900-1911-97	Cutter Wheel Bushing
b.	900-1911-14	Cutter Wheel Bushing With Electric Clutch
11.	900-9903-94	Tooth Bolt
12.	900-9903-78	Counter Bored Pocket
13.	900-9903-79	Threaded Pocket
14.	900-9903-75	Straight Tooth
15.	900-9903-76	Left Tooth 45°
16.	900-9903-77	Right Tooth 45°
17 a.	900-9906-67	Tooth Kit (8) - Full Set of Teeth, Bolts, and Pockets (Start 8/07) (Not Shown)
b.	900-9904-39	Tooth Kit (12) - Full Set of Teeth, Bolts, and Pockets (Pre 8/07) (Not Shown)
18.	900-9904-57	1/2" Allen Key Socket For 1/2" Drive (Not Shown)

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

# MODEL HB19



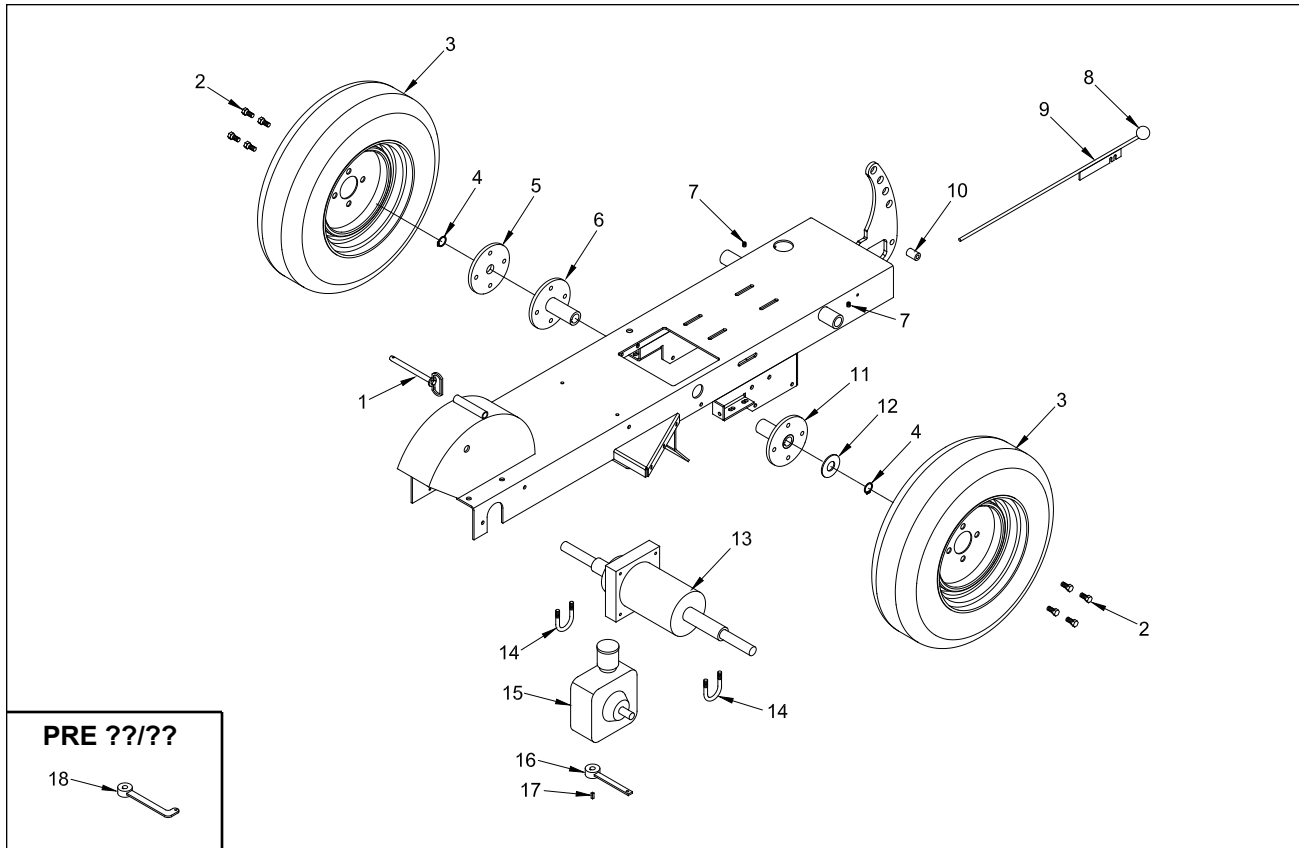
LOCATION	MODEL HB19 PART NUMBER	DESCRIPTION
1.	900-4907-44	Cutter Head Lock Pin
2.	900-4911-72	Cotter Key
3.	900-4909-08	1"-8NC Castle Nut
4 a.	901-100014	4.80" x 8" Turf Tire and Solid White Rim With Brake Drum Hub Assembly
b.	900-5907-58	4.80" x 8" Turf Tire Only
c.	200-2000-09	4" x 8" Solid White Rim Only With Brake Drum Hub
5.	900-4904-46	1" Mill Carb Washer
6.	900-4914-02	Brake Band Spring
7.	900-5907-96	Brake Band Pin
8.	900-5907-95	4" Brake Band
9.	201-200003	Right Side Axle Shaft Assembly With Brake Bracket
10.	201-200007	Axle Assembly Pin
11.	900-4910-66	Set Screw - Handle Bar Pin
12.	200-300083	Handle Bar Stop
13.	201-200002	Left Side Axle Shaft Assembly
14 a.	900-5905-06	4.80" x 8" Turf Tire and Solid White Rim Assembly
b.	900-5907-58	4.80" x 8" Turf Tire Only
c.	900-5907-60	4" x 8" Solid White Rim Only With 1" Integral Hub

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

NOTE: Parts may not be exactly as shown.

**Bandit**

# MODEL HB19SP



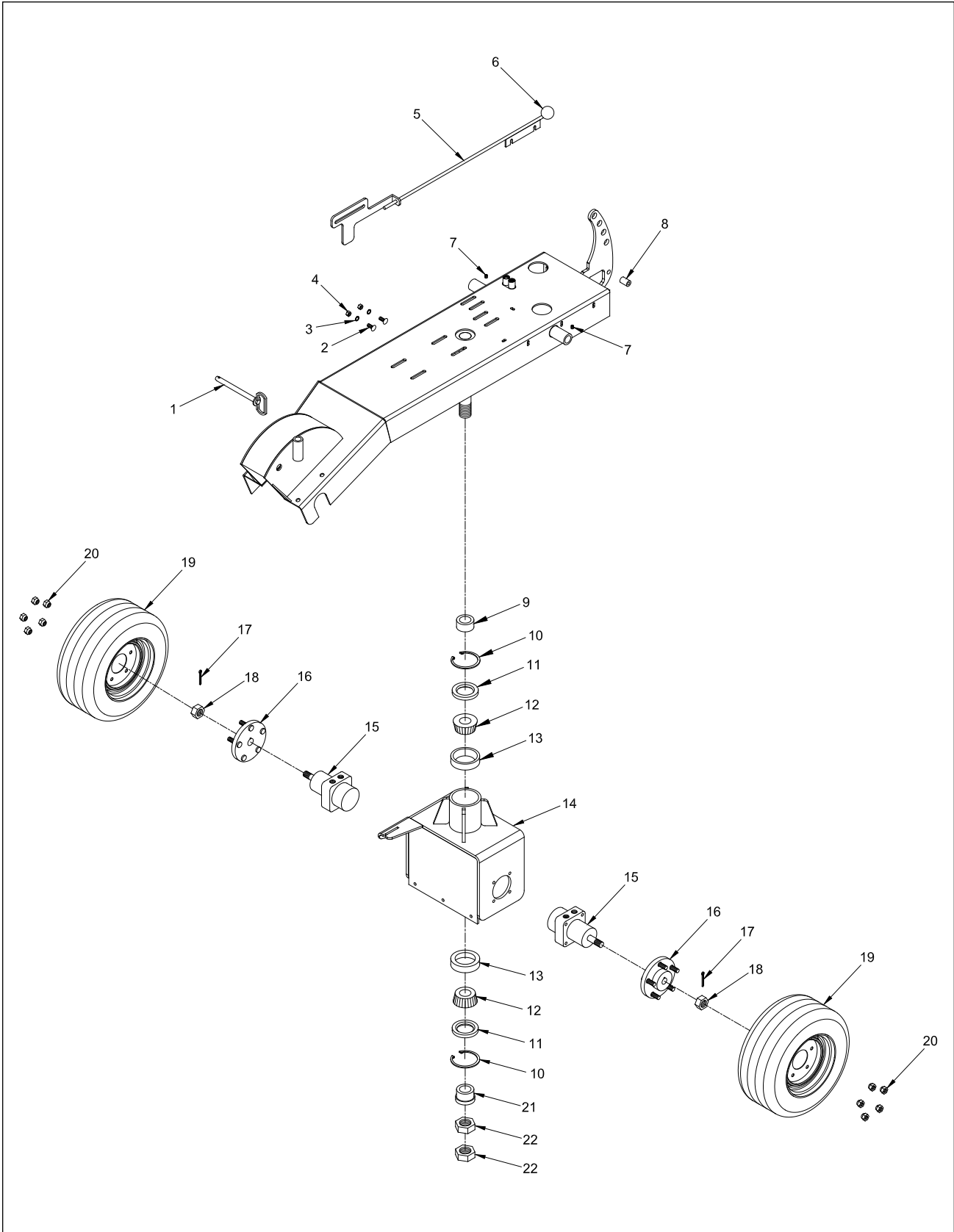
LOCATION	MODEL HB19SP PART NUMBER	DESCRIPTION
1.	900-4907-44	Cutter Head Lock Pin
2.	900-4912-68	1/2"-20NF Wheel Stud
3 a.	900-5906-01	6-12 Traction Tire and White Spoke, 4 Bolt Rim Assembly
b.	900-5907-57	6-12 Traction Tire Only
c.	900-5907-59	12" x 4" White Spoke, 4 Bolt Rim Only
4.	900-4908-84	1" External Snap Ring
5.	200-300066	Axle Hub Spacer
6.	200-2000-39	Hub Assembly - 4" Long
7.	900-4910-66	Set Screw - Handle Bar Pin
8.	900-4912-42	Ball Knob
9.	200-200007	Hydrostatic Over-Ride Rod Assembly
10.	200-300083	Handle Bar Stop
11.	200-200009	Hub Assembly - 3 1/2" Long
12.	900-4908-83	1" Flat Washer
13.	900-3928-51	Hydrostatic Transmission
14.	900-6910-37	3/8"-16NC x 1 1/2" U-Bolt
15.	900-3928-50	Hydrostatic Pump
16.	200-200013	Hydrostatic Engagement Arm Assembly (Start 10/06)
17.	900-4908-76	Key - Hydrostatic Engagement Arm
18.	200-2000-40	Hydrostatic Engagement Arm Assembly (Pre 10/06)

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

NOTE: Parts may not be exactly as shown.

**Bandit**

# MODEL HB20SP



NOTE: Parts may not be exactly as shown.

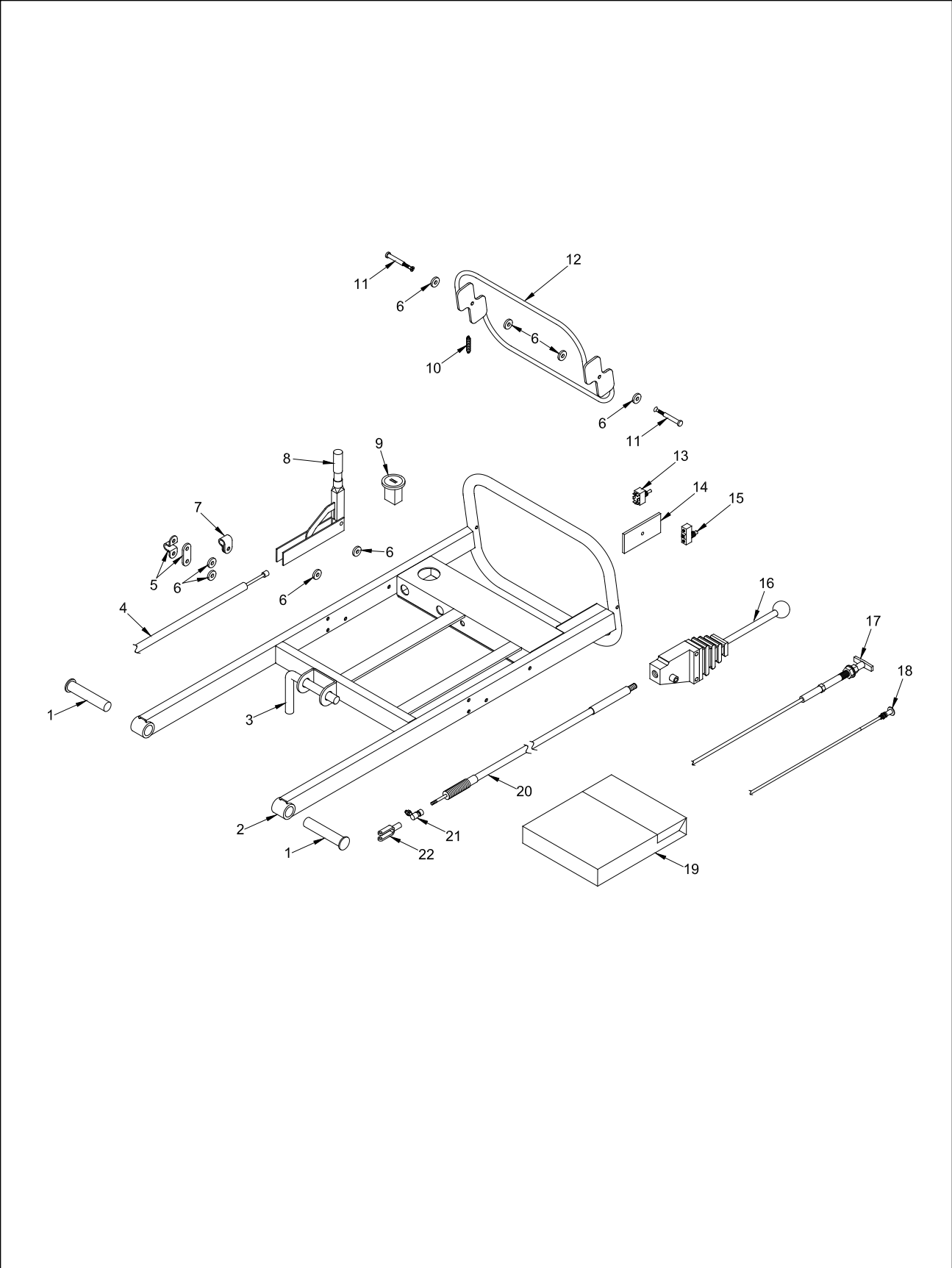
**Bandit**

# MODEL HB20SP

LOCATION	MODEL HB20SP PART NUMBER	DESCRIPTION
1.	900-4907-44	Cutter Head Lock Pin
2.	900-4906-11	3/8"-16NC x 1" Carriage Bolt
3.	900-4906-62	3/8" Lock Washer
4.	900-4906-60	3/8"-16NC Lock Nut
5.	200-200038	Swivel Frame Lock Assembly
6.	900-4912-42	Ball Knob
7.	900-4910-66	Set Screw - Handle Bar Pin
8.	200-300083	Handle Bar Stop
9.	200-3001-90	Spacer - Pivot Pin
10.	900-1910-08	External Snap Ring
11.	900-1910-04	Oil Seal For Drive Frame
12.	900-1910-06	Tapered Roller Bearing For Drive Frame
13.	900-1910-05	Inner Race For Drive Frame
14.	200-200035	Drive Frame Assembly
15 a.	900-3938-25	Hydraulic Drive Wheel Motor
b.	900-4914-01	Woodruff Key Only
16 a.	200-2000-43	Hydraulic Motor Wheel Hub
b.	900-5905-97	1/2"-20NF Wheel Stud Only
17.	900-4911-81	Cotter Key
18.	900-4913-97	3/4"-10NC Castle Nut
19 a.	900-5908-51	16" - 6.5" x 8 Super Lug Tire and White Solid, 5 Bolt Rim Assembly
b.	900-5908-49	16" - 6.5" x 8 Super Lug Tire Only
c.	900-5908-50	8" x 5.375" White Solid, 5 Bolt Rim Only
20.	900-4914-00	1/2"-20NF Cone Lug Nut
21.	200-300111	Bearing Tension Sleeve
22.	900-4908-36	1 1/2"-6NC Jam Nut

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**





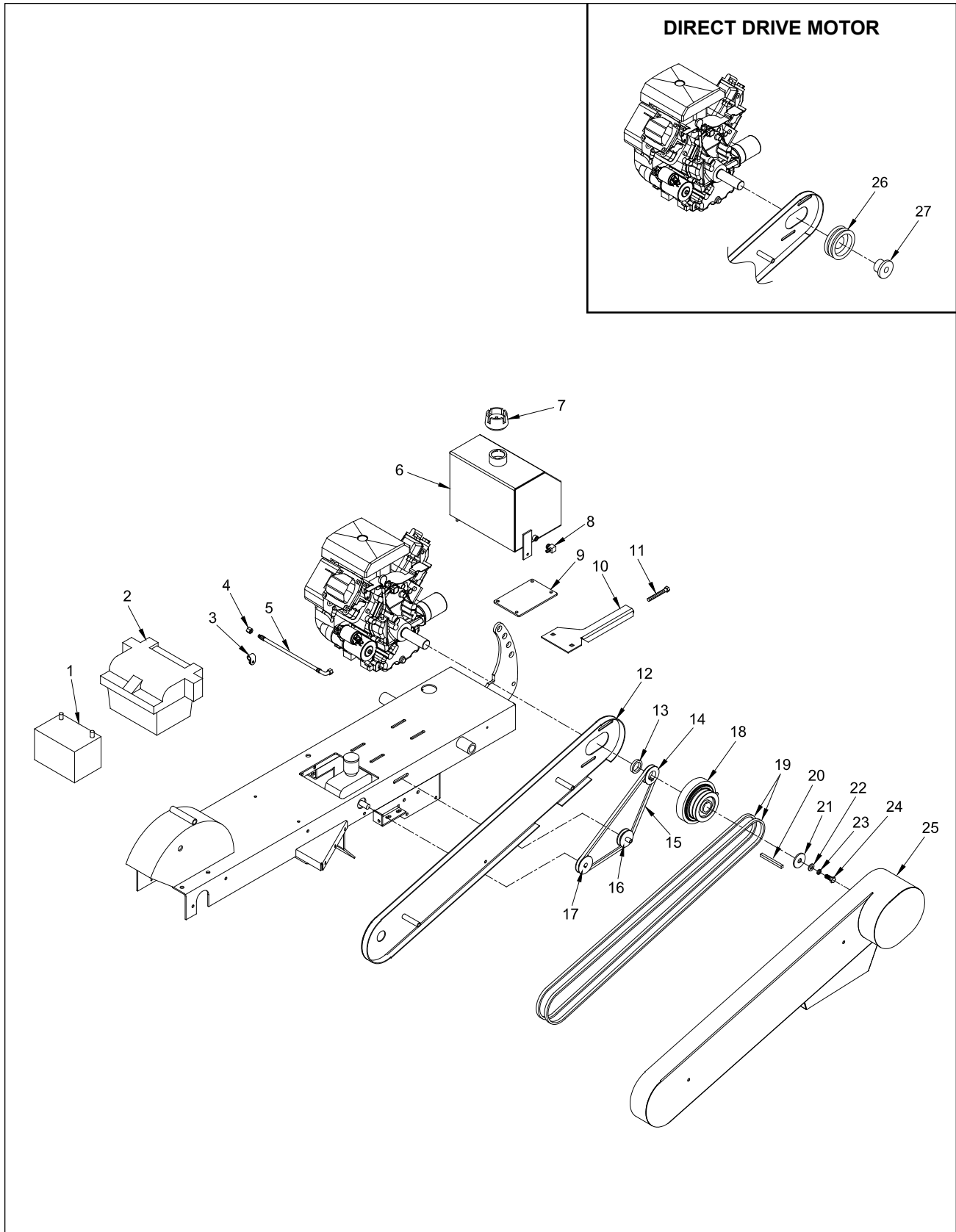
NOTE: Parts may not be exactly as shown.

**Bandit**

LOCATION	PART NUMBER	DESCRIPTION
1.	200-200004	Handle Pivot Pin
2.	200-200005	Handle Bar Assembly
3 a.	900-4904-90	Spring Lock For Handle Bar (Not Shown)
b.	900-7900-96	Rubber Cap For Spring Lock
4 a.	900-4909-47	Brake Cable - Model HB19
b.	900-4912-63	Brake Cable - Model HB19SP
5.	900-4912-64	Cable Clamp - Model HB19SP
6.	900-4912-65	Spacer
7.	900-4912-66	Cable Clamp - Model HB19
8.	900-4912-67	Brake Lever Assembly
9.	900-2903-76	Hour Meter
10.	900-4913-79	Spring For Bail Handle
11.	900-3933-97	3/8" Diameter x 2 1/16" Binding Barrel & Screw
12.	200-200011	Bail Handle
13.	900-2706-99	Clutch Toggle Switch
14.	200-300081	Bail Handle Switch Cover
15.	900-2911-66	Bail Handle Switch
16 a.	900-3934-86	Hydraulic Drive Engagement Lever - (Start 10/06)
b.	900-2912-30	Hydraulic Drive Engagement Lever - (Pre 10/06)
17.	900-4912-46	"T" Handle Throttle Cable
18.	900-6908-84	Choke Cable Assembly
19.	900-9902-07	Manual Holder
20 a.	900-3934-87	Hydraulic Drive Cable Assembly (Includes Item 21) - (Start 10/06)
b.	900-3902-32	Hydraulic Drive Cable - (Pre 10/06)
21.	900-4913-98	Hydraulic Drive Ball Socket - (Start 10/06)
22.	900-4912-69	Hydraulic Drive Clevis End - (Pre 10/06)

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

# MODELS HB19/HB19SP



NOTE: Parts may not be exactly as shown.

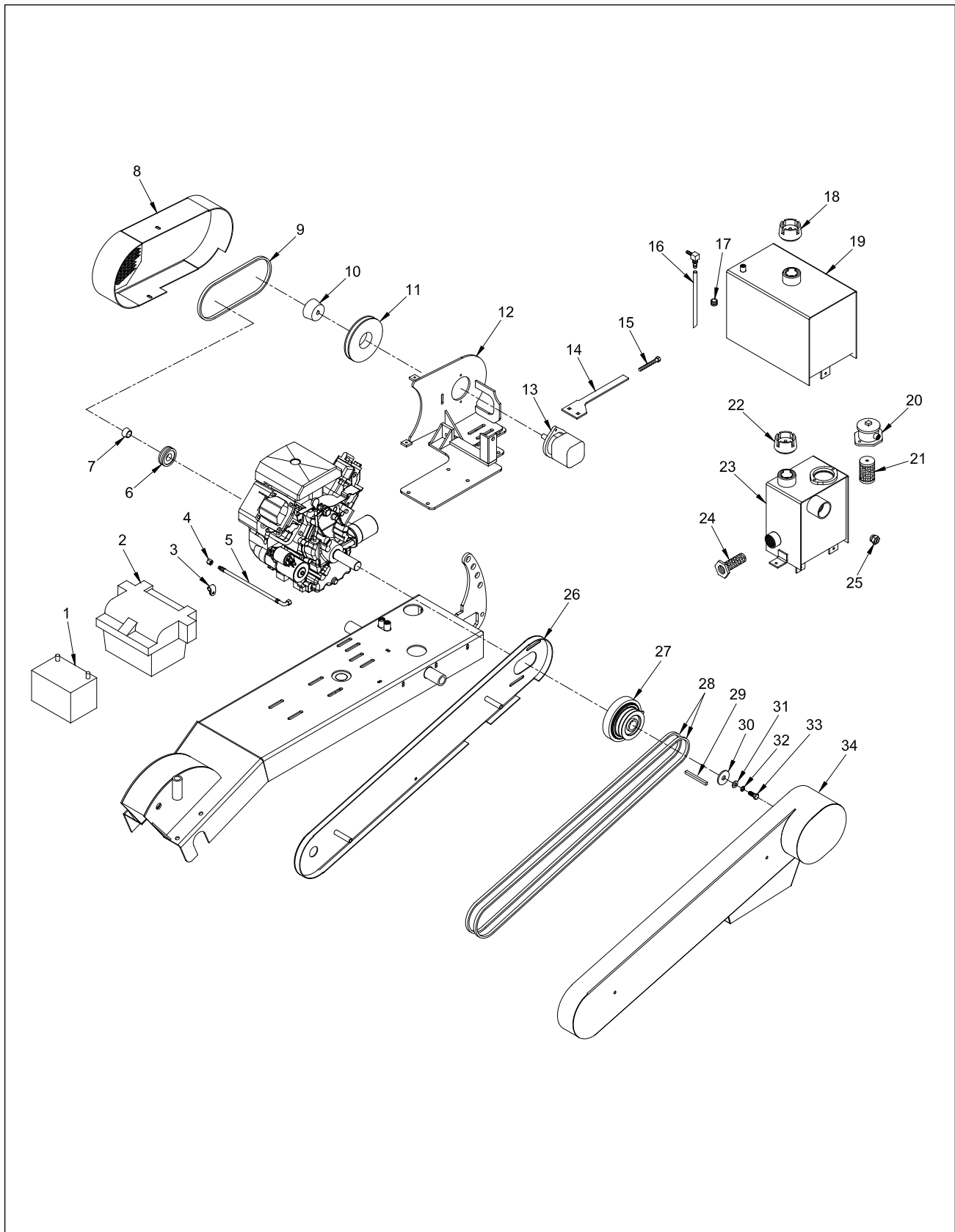
**Bandit**

## MODELS HB19/HB19SP

LOCATION	PART NUMBER	DESCRIPTION
1.	900-6911-34	425 CCA Battery
2 a.	900-7901-35	Plastic Battery Box - Black (Start 2/07)
b.	900-7900-01	Plastic Battery Box - Black (Pre 2/07)
3.	900-3927-12	Wire Clip
4.	900-3932-96	1/4" NPT Cap - Oil Drain Hose
5.	200-000001	Engine Oil Drain Hose
6.	200-200008	4 Gallon Steel Fuel Tank
7.	900-3908-77	Suction Elbow
8 a.	900-3934-56	Locking Fill Cap - Green (Start 8/07)
b.	900-3917-71	Fill Cap Only No Dipstick (Pre 8/07)
9.	201-300029	Engine Mount Skid Plate
10 a.	201-200001	Engine Tensioner Assembly - Model HB19
b.	200-200010	Engine Tensioner Assembly - Model HB19SP
11.	900-4908-80	3/8"-16NC x 4" Engine Puller Bolt
12 a.	200-200004	Beltshield Back Assembly - Model HB19
b.	201-200000	Beltshield Back Assembly - Model HB19SP
13.	200-300065	Engine Shaft Spacer - Model HB19SP
14.	900-1911-11	Hydrostatic Engine Sheave - Model HB19SP
15.	900-1911-09	Hydrostatic Pump Belt - Model HB19SP
16.	900-1911-13	Hydrostatic Idler Sheave - Model HB19SP
17.	900-1911-12	Hydrostatic Pump Sheave - Model HB19SP
18 a.	900-6910-87	12 Volt Electric Clutch - If Equipped (Start 9/06)
b.	900-6908-81	12 Volt Electric Clutch - If Equipped (Pre 9/06)
19 a.	900-1911-10	Cutter Wheel Belt - Kohler 20 Hp
b.	900-1911-35	Cutter Wheel Belt - Honda 13 Hp And Kohler 13 Hp
20.	200-300061	Key For Electric Clutch
21.	200-300063	Clutch Clamp Washer
22.	900-4909-18	1/2" Mill Carb Washer For Electric Clutch
23.	900-4902-11	1/2" Lock Washer For Electric Clutch
24.	900-4908-86	7/16"-20NF x 1 3/4" Clutch / PTO Bolt
25 a.	201-200000	Beltshield Cover Assembly - Model HB19
b.	200-200005	Beltshield Cover Assembly - Model HB19SP
26.	900-1903-91	Engine Sheave - Direct Drive Motor
27.	900-1905-54	Engine Sheave Bushing - Direct Drive Motor

**NOTE: Nuts, bolts, washers, and all other components  
can be ordered by physical description.**

# MODEL HB20SP



NOTE: Parts may not be exactly as shown.

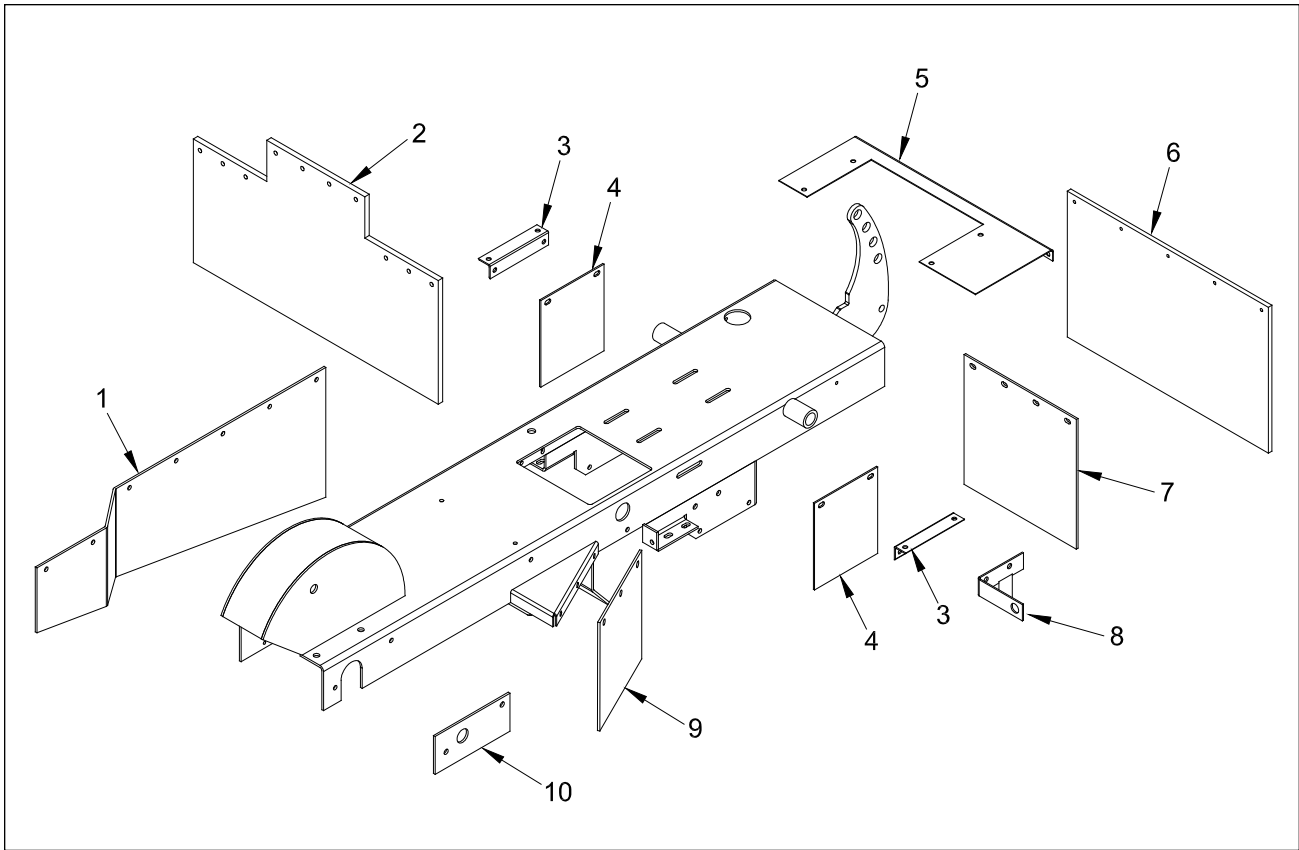
**Bandit**

## MODEL HB20SP

LOCATION	PART NUMBER	DESCRIPTION
1.	900-6911-34	425 CCA Battery
2.	900-7901-35	Plastic Battery Liner Box - Black
3.	900-3927-12	Wire Clip
4.	900-3932-96	1/4" NPT Cap - Oil Drain Hose
5.	200-000001	Engine Oil Drain Hose
6.	900-1914-26	Engine / Pump Sheave
7.	900-1914-27	Engine / Pump Bushing
8.	200-200037	Beltshield Assembly For Hydraulic Drive
9.	900-1914-30	Pump Belt
10.	900-1914-29	Pump Bushing
11.	900-1914-28	Pump Sheave
12.	200-200027	Hydraulic Pump Mount
13.	900-3938-24	Hydraulic Pump
14.	200-200010	Engine Tensioner Assembly
15.	900-4908-80	3/8"-16NC x 4" Engine Puller Bolt
16 a.	900-3908-78	Suction Elbow
b.	900-3909-03	Drop Pipe
17.	900-3922-60	Magnetic Drain Plug
18 a.	900-3934-56	Fuel Locking Fill Cap - Green (Start 8/07)
b.	900-3917-71	Fill Cap Only No Dipstick (Pre 8/07)
19.	200-200032	5 Gallon Steel Fuel Tank
20.	900-3938-23	Return Filter Assembly For Hydraulic Tank (Includes Filter Element)
21.	900-3938-96	Filter Element For Hydraulic Tank
22 a.	900-3934-55	Hydraulic Locking Fill Cap - Black (Start 8/07)
b.	900-3917-71	Fill Cap Only No Dipstick (Pre 8/07)
23.	200-200031	1 1/2 Gallon Steel Hydraulic Tank
24.	900-3900-07	Suction Screen For Hydraulic Tank
25.	900-3900-44	Glass Sight Gauge For Hydraulic Tank
26.	200-200028	Beltshield Back Assembly
27.	900-6908-81	12 Volt Electric Clutch
28.	900-1914-31	Cutter Wheel Belt - Kohler 20 Hp
29.	200-300061	Key For Electric Clutch
30.	200-300063	Clutch Clamp Washer
31.	900-4909-18	1/2" Mill Carb Washer For Electric Clutch
32.	900-4902-11	1/2" Lock Washer For Electric Clutch
33.	900-4908-86	7/16"-20NF x 1 3/4" Clutch / PTO Bolt
34.	200-200037	Beltshield Cover Assembly

**NOTE: Nuts, bolts, washers, and all other components  
can be ordered by physical description.**

**MODELS HB19/HB19SP**



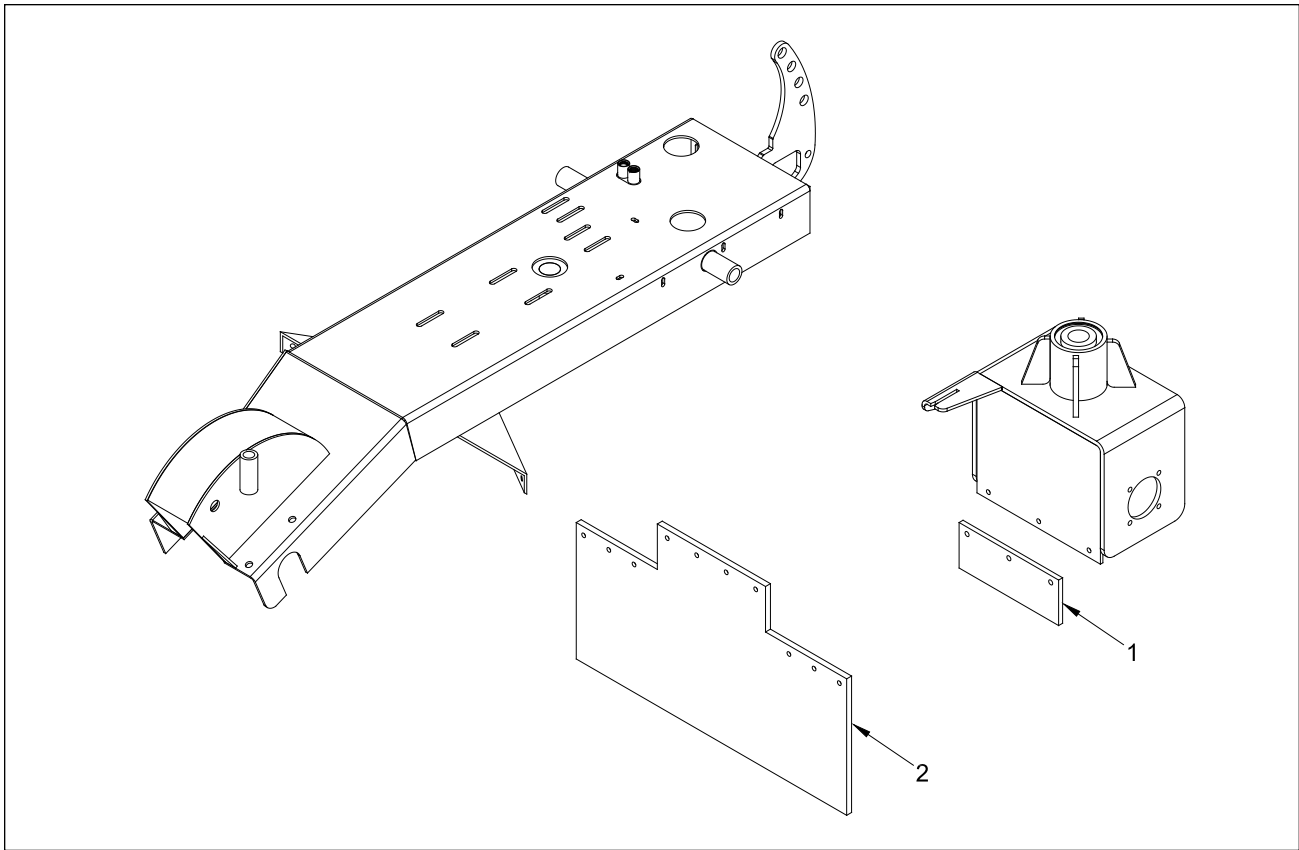
LOCATION	PART NUMBER	DESCRIPTION
1.	200-300052	Right Side Rubber Skirt (Pre 8/07)
2.	200-3001-92	Main Chip Guard (Start 8/07)
3.	200-300026	Skirt Mount Bracket
4.	200-300016	Rear Side Rubber Skirt (Pre 8/07)
5 a.	201-300027	Outside Rear Skirt Mount - Model HB19
b.	200-300015	Outside Rear Skirt Mount - Model HB19SP
6 a.	201-300023	Outside Rear Rubber Skirt - Model HB19
b.	200-300018	Outside Rear Rubber Skirt - Model HB19SP
7.	200-300017	Inside Rear Rubber Skirt (Pre 8/07)
8.	200-200003	Hydrostatic Cable Bracket (HB19SP Only)
9.	200-300050	Left Side Front Rubber Skirt (Pre 8/07)
10.	200-300053	Beltshield Seal

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

NOTE: Parts may not be exactly as shown.

**Bandit**

**MODEL HB20SP**



LOCATION	PART NUMBER	DESCRIPTION
1.	200-3001-93	Drive Frame Chip Guard
2.	200-3001-92	Main Chip Guard

**NOTE: Nuts, bolts, washers, and all other components can be ordered by physical description.**

NOTE: Parts may not be exactly as shown.

**Bandit**



# MODEL HB20SP



Drive Wheel Motor: 900-3928-25  
Castle Nut Only: 900-4913-97  
Woodruff Key Only: 900-4914-01



Hydraulic Pump: 900-3938-24



Rodless Timing Cylinder: 900-3938-83  
(Start 2/07)



Timing Cylinder (Pre 2/07): N/A

NOTE: Parts may not be exactly as shown.

**Bandit**

# MODEL HB20SP



Counter Balance: 900-3918-65  
Relief Only: 900-3929-09



Return Filter Assembly: 900-3938-23  
(Includes Filter Element)



Filter Element Only: 900-3938-96

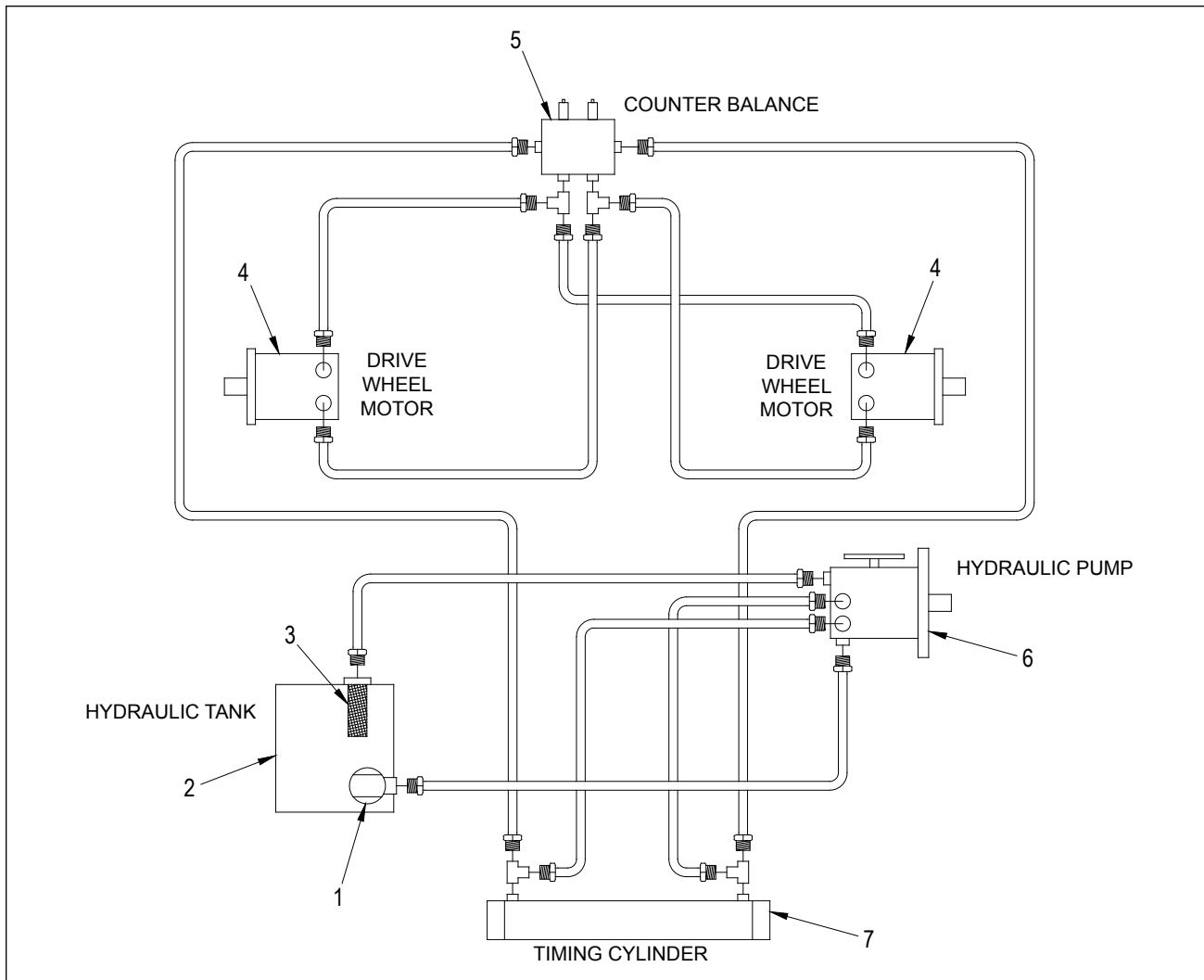


Suction Screen: 900-3900-07

NOTE: Parts may not be exactly as shown.

**Bandit**

# MODEL HB20SP



LOCATION	PART NUMBER	DESCRIPTION
1 a.	900-3938-23	Return Filter Assembly (Includes Filter Element)
b.	900-3938-96	Filter Element Only
2.	200-200031	1 1/2 Gallon Steel Hydraulic Tank
3.	900-3900-07	Suction Screen
4 a.	900-3928-25	Drive Wheel Motor
b.	900-4913-97	3/4" - 10NC Castle Nut Only
c.	900-4914-01	Woodruff Key Only
5 a.	900-3918-65	Counter Balance
b.	900-3929-09	Relief Only
6.	900-3938-24	Hydraulic Pump
7 a.	900-3938-83	Rodless Timing Cylinder (Start 2/07)
b.	N/A	Timing Cylinder (Pre 2/07)

**NOTE: Make sure to order components according to fitting type, fittings may vary on all components.**

**\*\* Hydraulic components, fittings, hoses will very depending on optional equipment. Order by physical description.**

NOTE: Parts may not be exactly as shown.

**Bandit**



# MODEL HB19SP ONLY

NO. 7-403

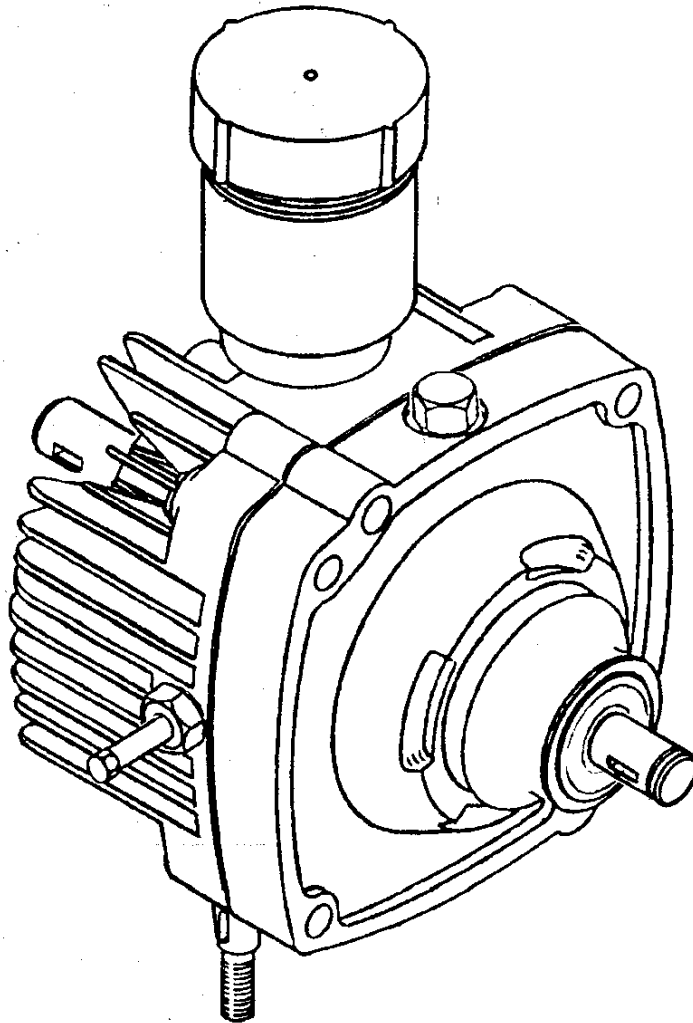
**Eaton  
Hydraulics  
Division**

## Repair Information

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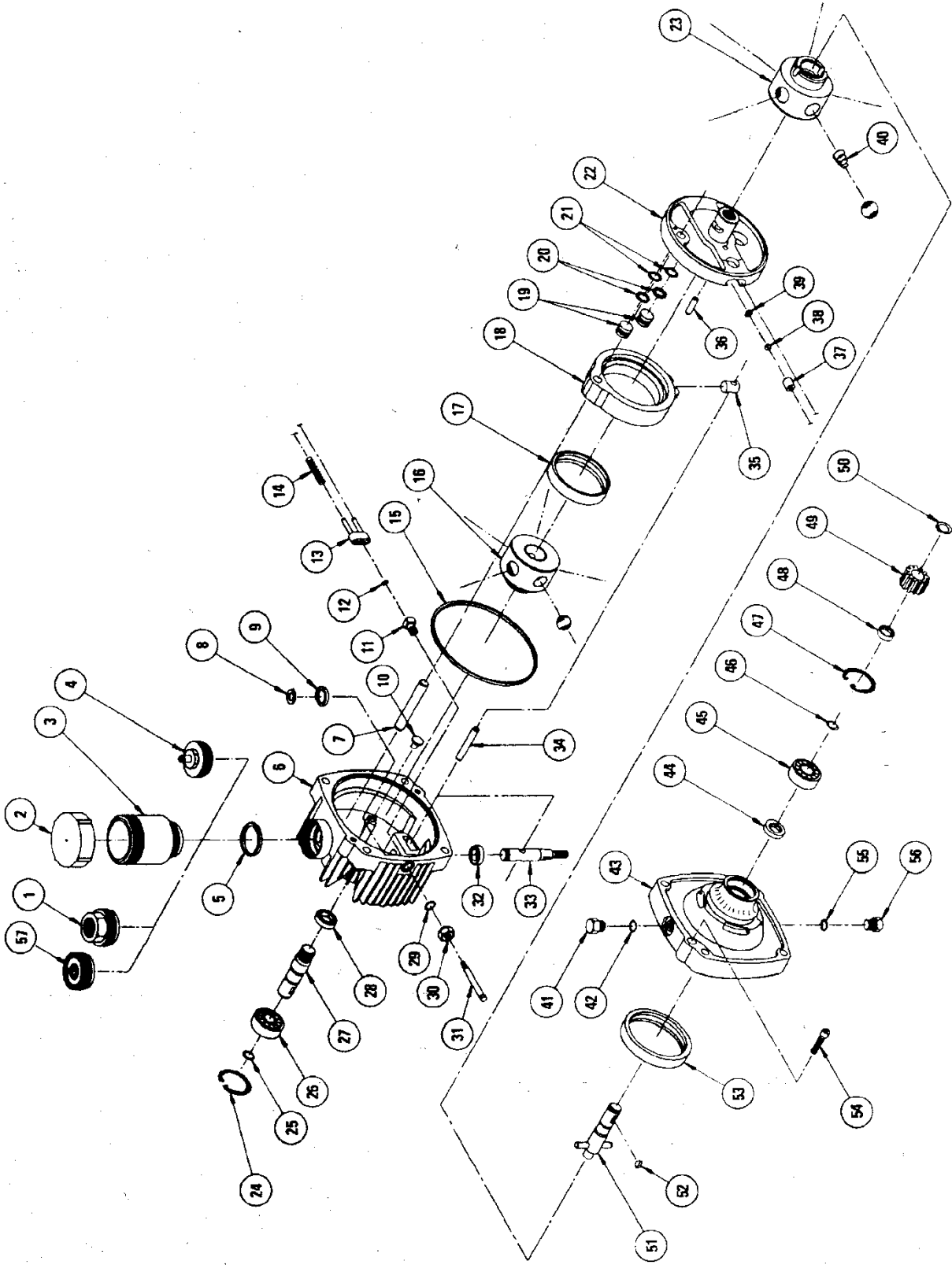
**Eaton Hydrostatic Transmissions – Model 6 / 7**

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**EATON**

2



## General Parts List Model 6 and 7

Item No.	Description	Item No.	Description
1	Reservoir Adapter	30	Nut and Gasket Subassembly
2	Reservoir Cover Subassembly	31	Dump Valve Shaft
3	Reservoir Body	32	Seal
4	Reservoir Adapter	33	Control Shaft Kit
5	Seal Ring	34	Dowel
6	Cover Service Kit	35	Cam Ring Insert
7	Dowel Pin	36	Pin
8	Retaining Ring	37	Check Valve Body
9	Washer	38	Ball
10	Button (Model 7 only)	39	Retaining Ring
11	Guide Fitting Subassembly	40	Spring
12	O-Ring	41	Plug Subassembly
13	Dump Valve Bracket	42	O-Ring
14	Spring	43	Body
15	Seal Ring	44	Seal
16	Pump Rotor and Ball Assembly	45	Bearing
17	Pump Race	46	Snap Ring
18	Cam Ring Assembly (includes No. 17)	47	Retaining Ring
19	Piston (Model 7 only)	48	Spacer
20	Back-Up Ring (Model 7 only)	49	Gear
21	O-Ring (Model 7 only)	50	Retaining Ring
22	Pintle Subassembly	51	Output Shaft Subassembly
23	Motor Rotor and Ball Assembly	52	Key
24	Retaining Ring	53	Motor Race
25	Snap Ring	54	Cap Screw
26	Bearing	55	O-Ring
27	Input Shaft	56	Plug Subassembly
28	Seal	57	Plug
29	O-Ring		

This list is for identification of parts only. To insure the correct replacement parts for your transmission, it will be necessary to order parts by part number. Consult your supplier for a parts list for your specific model number.

## Contents

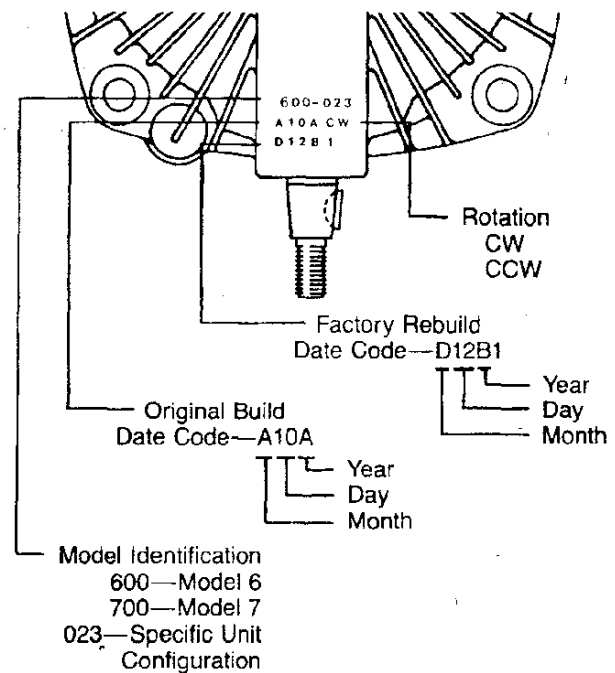
<b>Product Identification and Ordering Information</b>	4
<b>Exploded View</b>	2
<b>Part Description</b>	3
<b>Disassembly—Reassembly Procedures</b>	
<b>Body Assembly—Disassembly</b>	9
<b>Reassembly</b>	11
<b>Body/Cover—Disassembly</b>	5
<b>Reassembly</b>	11
<b>Cam Ring—Disassembly/Inspection</b>	6
<b>Installation</b>	11
<b>Check Valves—Removal</b>	7
<b>Installation</b>	8
<b>Cover Assembly—Disassembly/Inspection</b>	5
<b>Reassembly</b>	9
<b>Dampening Pistons—Removal</b>	8
<b>Installation</b>	8
<b>Motor Rotor Assembly—Removal</b>	8
<b>Installation</b>	12
<b>Pintle Assembly—Removal</b>	7
<b>Disassembly/Inspection</b>	7
<b>Installation</b>	11
<b>Pump Rotor Assembly—Removal</b>	7
<b>Installation</b>	11
<b>Reservoir/Adapter—Disassembly</b>	5
<b>Reassembly</b>	13
<b>Rotor Assemblies—Disassembly/Inspection</b>	8
<b>Start/up Procedures</b>	13
<b>Trouble Shooting</b>	14
<b>Fluid Recommendations</b>	16

## Product Identification and Ordering Information

Refer to specific listing covering your Eaton transmission. Parts listings are available from the Hydraulics Division, Minneapolis Plant.

When ordering parts, please include the following:

- Model Number
- Date Code
- Part Number
- Part Name
- Quantity of Parts



## Special tools to aid in Disassembly/Reassembly

2" x 6" x 10" wooden block with 3/4" dia. hole in the center.

2 large, wide rubber bands.

3/16-18 tap.

Light petroleum jelly (such as Vaseline).

Steel bar stock or piece of wood—2" dia. x 2 1/2" long.



## Disassembly/Reassembly

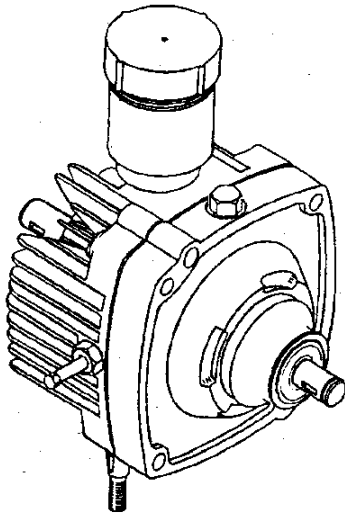


Fig. 1

Clean the transmission exterior thoroughly before repairs are begun. Use a cleaning solution that will not affect paint, gaskets, rubber seals, and plastic.

**Important:** When compressed air is used in cleaning, do not expose lip seals or bearing surfaces to high pressure.

Drain fluid from transmission.

**Note:** A 2" x 6" x 10" wooden block with a 3/4 inch hole in the center is recommended for a suitable bench fixture.

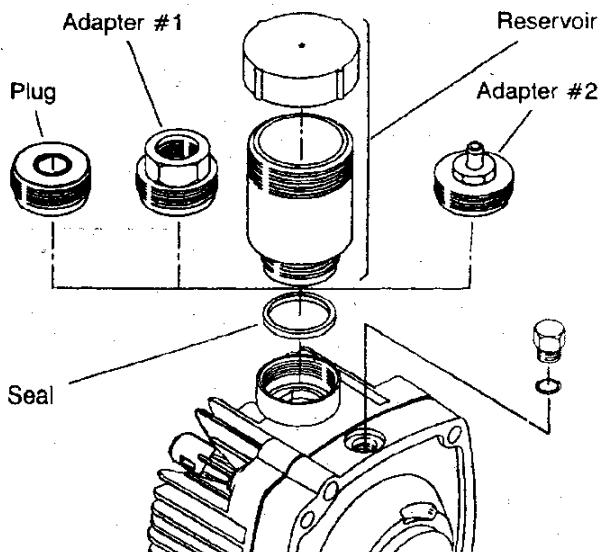


Fig. 2

## Reservoir/Adapter—Disassembly

Eaton light duty transmissions are equipped with one of two adapters or a reservoir as shown in Fig. 2.

1 Remove the adapter or reservoir by rotating *clockwise*.

**Important:** The adapters and reservoir have left hand threads. To remove turn *clockwise*.

To remove adapter #1 use a six point 1 1/2" hex wrench or socket.

To remove adapter #2 use a six point 1" hex wrench or socket.

To remove the reservoir use a small filter or web wrench.

2 Remove the seal ring from the cover and discard.

**Note:** We recommend that all seals be replaced with new ones whenever the transmission is disassembled and reassembled.

## Body/Cover—Disassembly

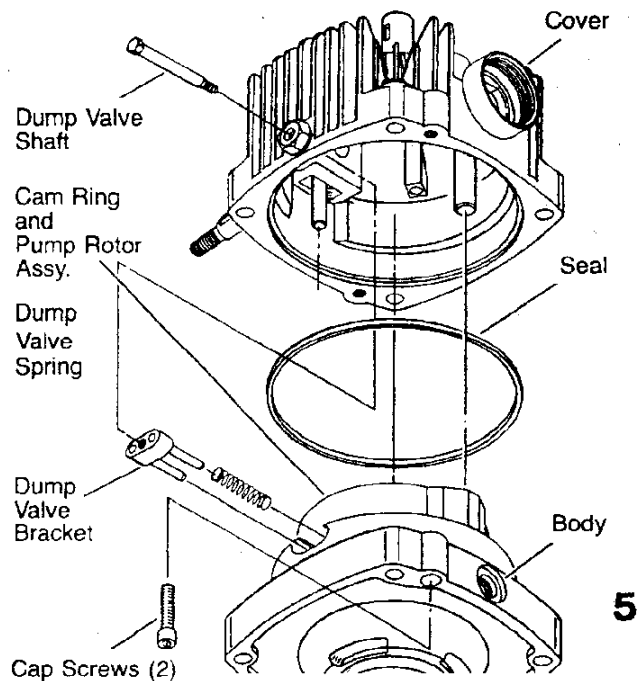


Fig. 3

**Important:** Before disassembling the transmission, scribe a line across the cover and body to ensure correct reassembly. Incorrect assembly will change output shaft rotation.

3 Use 3/4 inch allen wrench to remove the (2) 5/16 cap screws. Where applicable, remove the dump valve shaft.

4 Lift the cover to separate from the body.

**Important: Do not allow the cam ring, pintle, or pump rotor assembly to lift with the cover. The pump ball piston assembly must remain intact as the ball pistons are matched to the pump rotor bores.**

If the cover does not separate easily from the body because of fluid seal, tap the body and or cover with plastic hammer to break the seal.

5 Remove the dump valve bracket, and springs, when used.

6 Remove the seal ring and discard.

### Cover—Disassembly

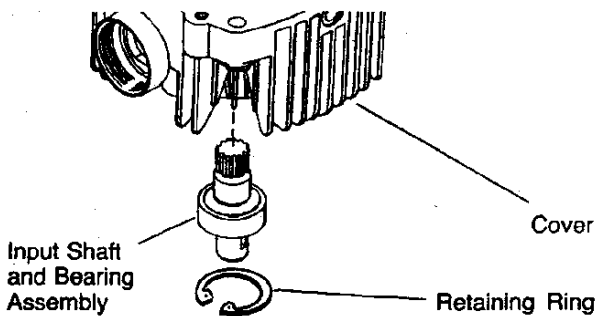


Fig. 4

7 Remove input shaft retaining ring. Press or drive the input shaft and bearing assembly from the cover.

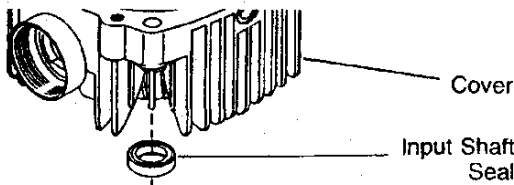


Fig. 5

6 8 Press or drive the input shaft seal from the cover.

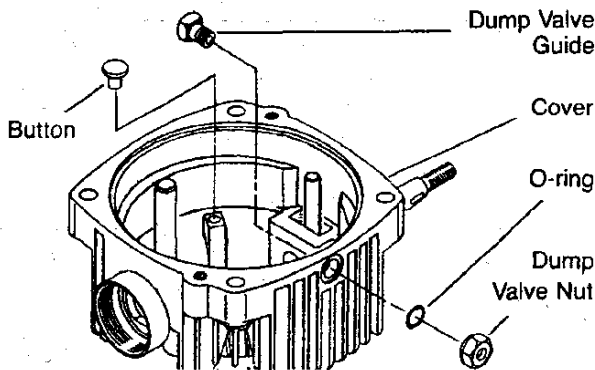


Fig. 6

9 Remove the button from the cover (model 7 only).

Where applicable, remove the dump valve guide, nut, and o-ring. Discard the o-ring.

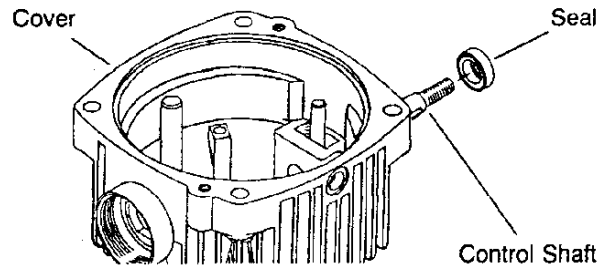


Fig. 7

10 Use a sharp, narrow tool to pierce the top metal part of the oil seal and remove seal from the cover.

**Important: Do not scratch the control shaft or distort the seal counter bore when removing seal.**

### Cam Ring—Disassembly/Inspection

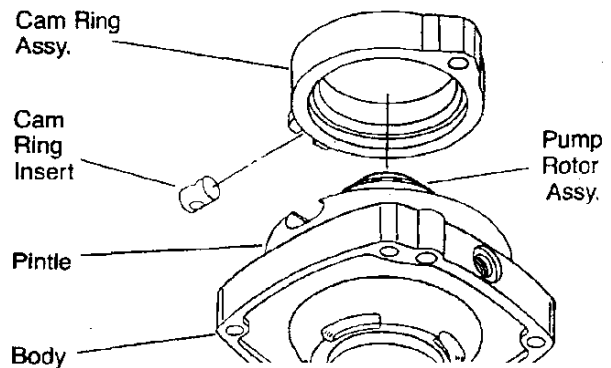


Fig. 8

11 Remove the cam ring assembly from the pintle. Remove the cam ring insert.

**Important: Use special care when removing the cam ring from the pump rotor assembly. The ball pistons must remain in place as they are matched to the rotor bores. Use a wide rubber band to hold the ball pistons in place.**

12 Inspect area where the ball pistons contact the pump race. This area must be smooth and completely free of irregularities. If it is not, replace the pump race.

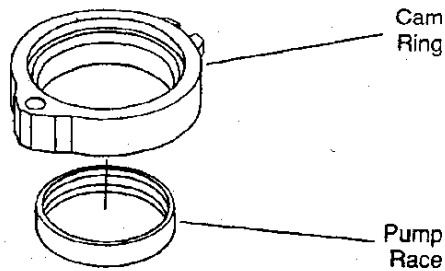


Fig. 9

**Note:** The pump race is press fit in the cam ring and will require a press to remove it. The cam ring and pump race are available as an assembly.

**Note:** If irregularities are noted in the pump race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

### Pump Rotor—Removal

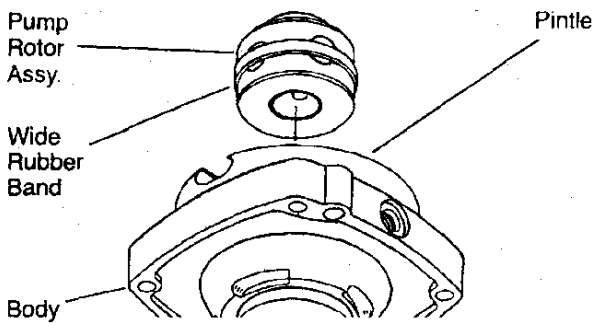


Fig. 10

13 Hold the pintle assembly in position against the body and remove the pump rotor assembly intact.

### Pintle Assy.—Removal

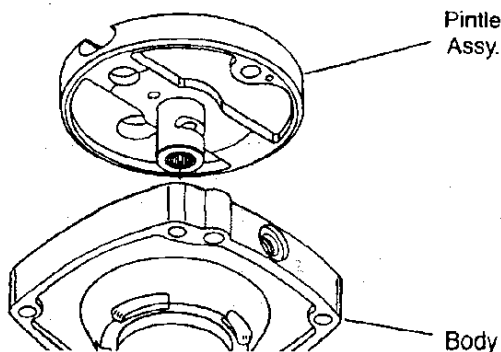


Fig. 11

14 Hold the motor rotor assembly in the bottom position and tap lightly on the body. Lift the pintle assembly out of the body.

### Pintle Assembly—Disassembly/Inspection

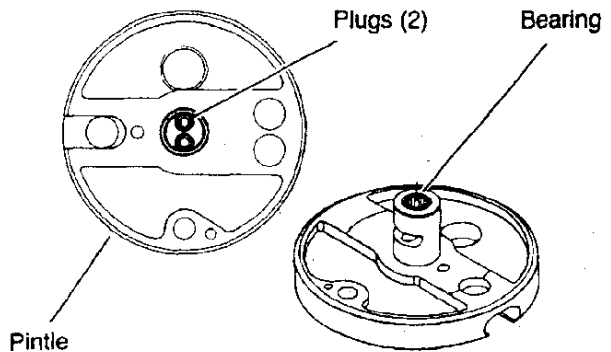


Fig. 12

15 We do not recommend complete disassembly of the pintle assembly for cleaning. Normal flushing should be all that is required. However, if complete disassembly is required, use the following procedures:

**Note:** Do not remove the two large plugs located on pintle journal.

16 Inspect the pintle journals, particularly in the porting area for any irregularities such as scoring or grooves cut between ports.

If any irregularities are noted: Replace the pintle assembly.

### Check Valve—Removal

**Note:** Removal of check valves is not necessary if check valve balls move freely and seat properly.

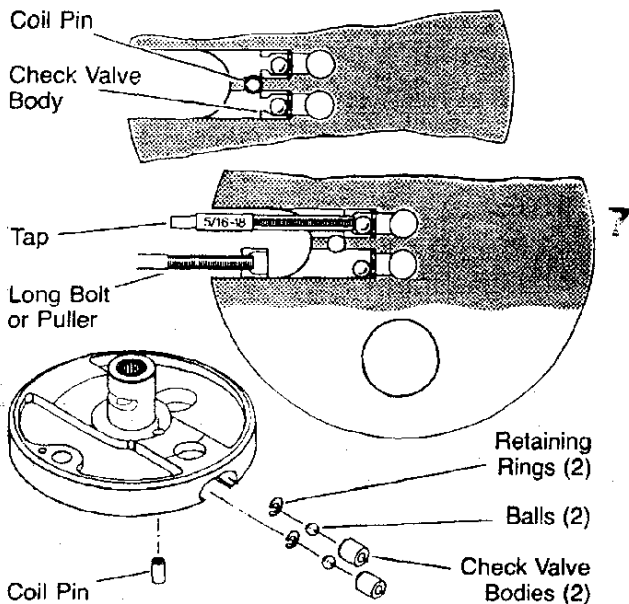


Fig. 13

17 Press or drive out the coil pin that retains the two check valve bodies. Use a four blade  $\frac{5}{16}$ -18 tap to tap holes in check valve bodies. Insert a long bolt or a threaded puller, pull the check valve bodies from the pintle housing and discard them.

18 Remove check balls and retaining ring.

19 Inspect check valve balls and retaining rings. Replace any defective parts.

### Check Valve—Installation

20 Install retaining rings and check valve balls in bores of pintle. Press new check valve bodies in bores. Press far enough for coil pin clearance.

**Important: To prevent dislodging of retaining rings do not drive check valve bodies into bores.**

21 Press coil pin into pintle until flush with or slightly below surface.

### Dampening Piston—Removal (Model 7 Only)

**Note:** Remove only if surface is scored.

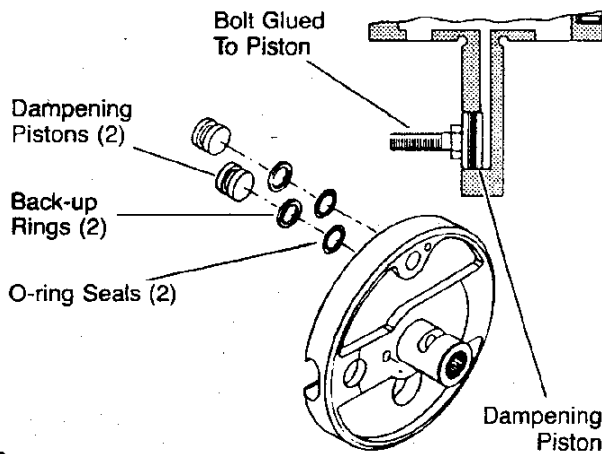


Fig. 14

22 To remove pistons, firmly tap the outside edge of pintle on a work surface. Remove back-up ring and o-ring from pistons.

**Important: When dislodging dampening pistons, do not hit pintle journals or the pintle housing will be ruined.**

**Note:** If tapping of pintle does not dislodge the pistons, use adhesive to cement a bolt or similar object to the pistons and pull them from the bore.

### Dampening Piston—Installation

23 Install new back-up rings nearest to the smooth piston face and o-rings in groove on a new piston.

24 Lubricate outer surface of the pistons. Press pistons (smooth face up) in bores in pintle to the bottom position.

### Motor Rotor—Removal

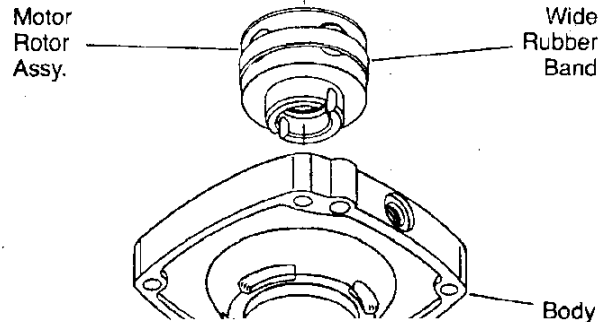


Fig. 15

25 Remove the motor assembly intact from the body.

**Important: Use special care when removing the motor rotor from the body. The ball pistons MUST remain in place as they are matched to the motor bores. Use a wide rubber band to hold the ball pistons in place.**

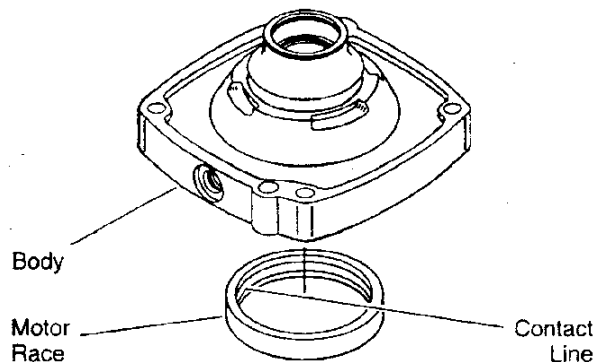


Fig. 16

26 Inspect the contact line of the motor ball pistons on the motor race located in body. This contact area must be smooth and completely free of any irregularities. If any irregularities are noted, replace the motor race.

**Note:** If irregularities are noted in the motor race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

### Rotor Assemblies—Disassembly Inspection

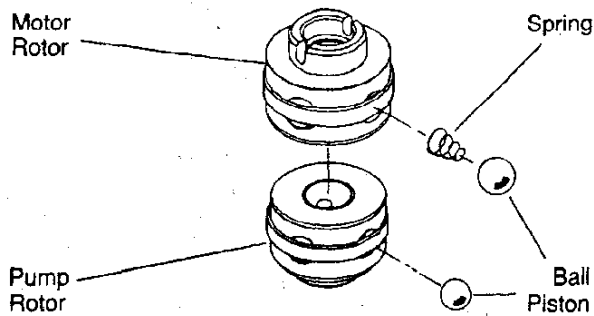


Fig. 17

**27** Inspect the rotor assemblies. Remove the piston balls from the rotor, one at a time, by working clockwise from the letter stamped in the face of the rotor and placing in a prepared container.

**Note:** Each ball must be replaced in the same bore from which it was removed. Use a suitable container for piston ball storage such as an egg carton or ice cube tray.

**28** Inspect for broken or collapsed springs in the motor rotor assembly.

**Note:** When broken or collapsed springs are found with no other irregularities, the springs may be replaced individually without replacing the complete motor rotor assembly.

**29** Inspect the piston balls. They must be smooth and completely free of any irregularities.

**30** Inspect the rotor bores, rotor bushing and pintle journals for irregularities or excessive clearance. The ball piston to rotor bore clearance is select fit electronically to .0002 to .0006 of an inch. When irregularities or excessive clearance are noted, replace the complete rotor assembly.

Install ball pistons in their matching bores. Hold them in place with a rubber band.

### Body—Disassembly

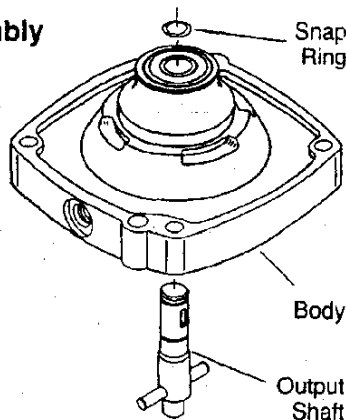


Fig. 18

**31** Remove the snap ring that retains the output shaft and tap or press the shaft from the body.

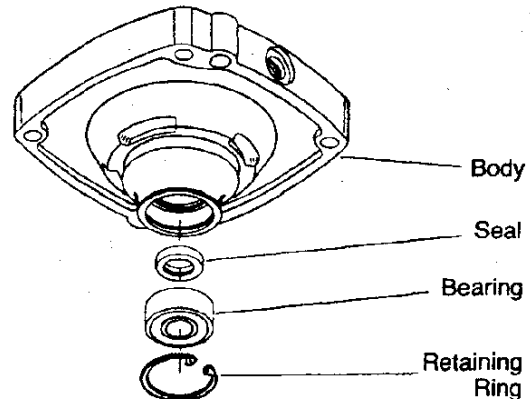


Fig. 19

**32** Remove the large retaining ring that retains the output bearing to body. Drive or press the output bearing and seal from the motor body.

### Cover—Reassembly

**33** Inspect cover assembly, especially around the control shaft area. Replace the cover assembly if it is broken, cracked or if side clearance between control shaft and cover exceeds .006".

**34** In most cases, it will not be necessary to remove the control shaft from the cover. If the dowel is loose or broken in the control shaft, remove the shaft using the following procedures.

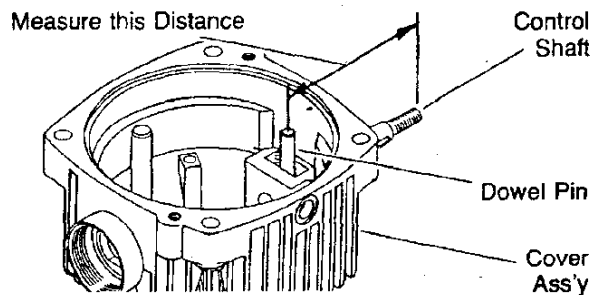


Fig. 20

**35** Measure the distance between center of dowel pin and the end of the shaft as shown in Figure 20.

**36** Turn cover over. Use this dimension to locate dowel pin in cover face. Drill  $\frac{1}{32}$ " diameter hole at center point of dowel pin. Drill hole exactly in line with center of shaft.

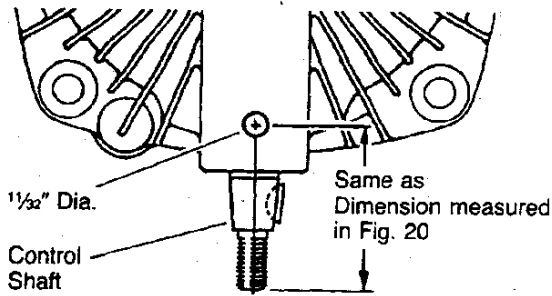


Fig. 21

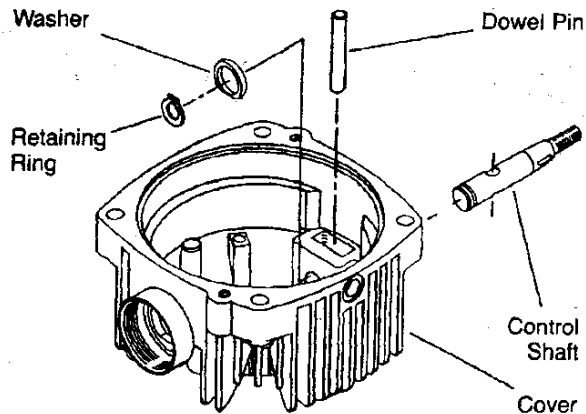


Fig. 22

**37** Press loose or broken dowel pin out. Remove retaining ring and washer from end of control shaft. Remove control shaft outward from the cover.

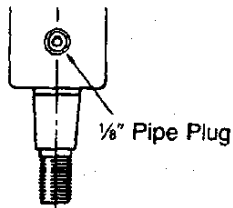


Fig. 23

**38** Tap hole drilled with 1/8" pipe tap. Install 1/8" flush type pipe plug.

**39** Lubricate a new control shaft and install in cover. Replace washer and retaining ring on end of control shaft. Press new dowel pin through shaft leaving 1 1/8 inch of dowel extending from shaft.

**Important:** When pressing the new dowel pin into the control shaft, the Woodruff key in control shaft must be to the left looking at the threaded end of shaft.

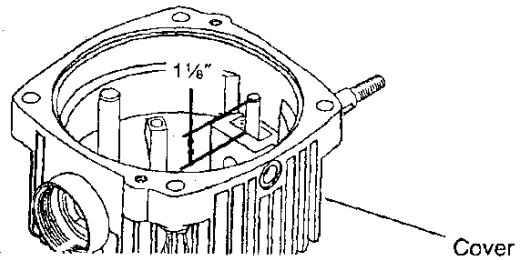


Fig. 24

**40** Lubricate I.D. of new oil seal with clean lubricant. Then press or tap seal in bore until completely seated.

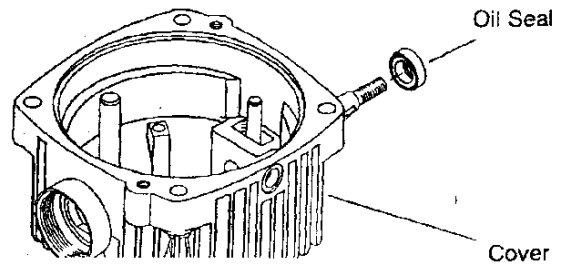


Fig. 25

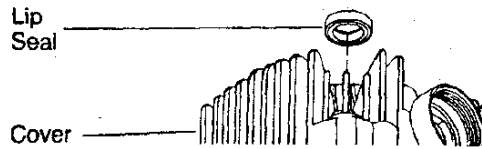


Fig. 26

**41** Lubricate inner surface of the lip seal with a clean lubricant. Press or tap seal into the bottom position in cover counter bore.

**Important:** Be careful not to damage the inner portion of the oil seal. Excessive pressing or driving of the oil seal will damage the rubber portion of the seal.

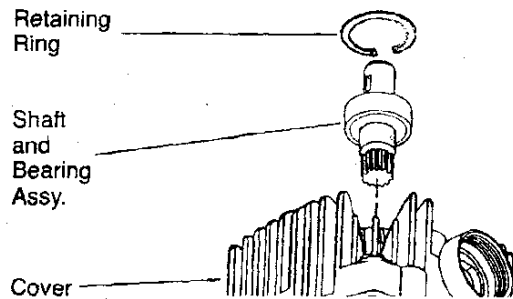


Fig. 27

42 Install the input shaft assembly into bottom position in the counter bore in cover. Install the retaining ring in the groove located in front cover.

### Cam Ring—Installation

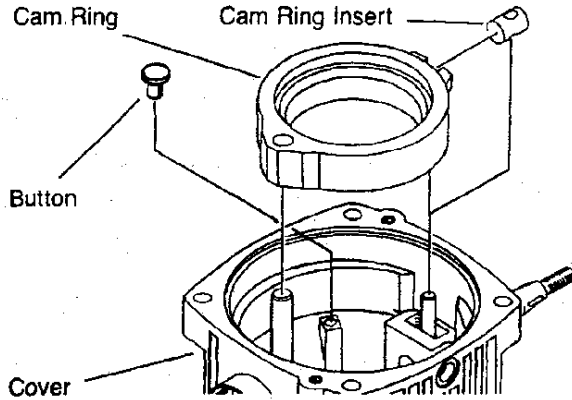


Fig. 28

43 Install the button in the hole located in the cover. (In Model 7 only)

44 Install the cam ring insert with the hole away from the cam ring as shown in Figure 28.

45 Align the cam ring with the control shaft pin and the cam ring pivot pin.

Install the cam ring with the flush side of the bearing race facing the cover. Press in firmly until the cam ring has bottomed in the cover assembly.

**Important: Cam ring must move freely from stop to stop. If binding occurs at either stop rotate the cam ring insert 180°. Check the cam ring movement again.**

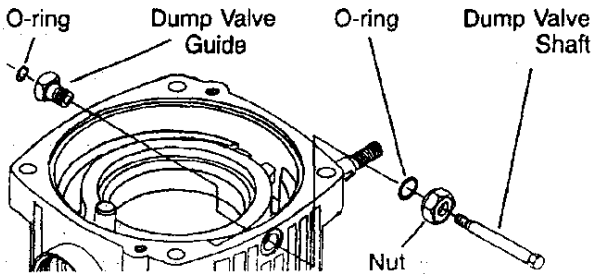


Fig. 29

46 Where applicable, lubricate O-Ring and install in groove located in dump valve guide. Install guide through cover and install O-Ring and nut. Lubricate dump valve, valve shaft and install in guide assembly.

**Note:** Check dump valve shaft for freedom of movement.

### Pump Rotor-Installation

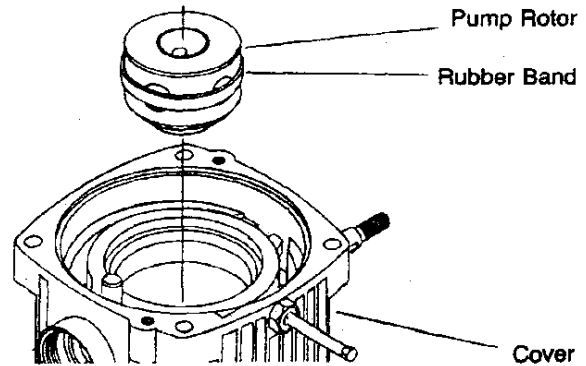


Fig. 30

47 Align the internal spline in the pump rotor assembly with the external spline on the input shaft and install the pump rotor in the cover.

Remove the rubber band retaining the ball pistons (if used).

### Pintle—Installation

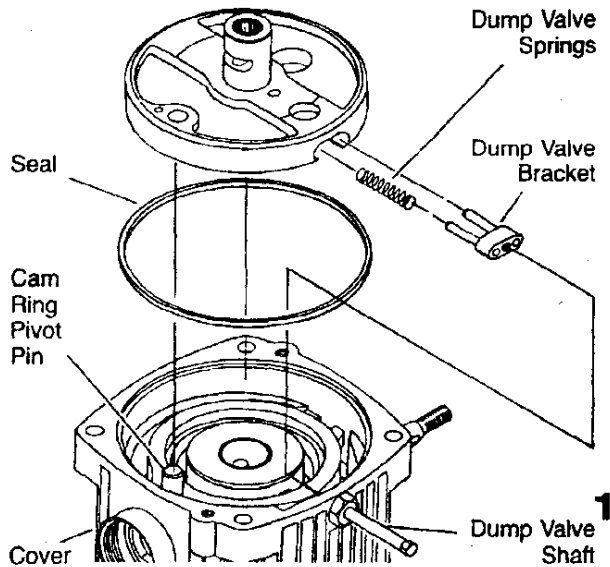


Fig. 31

48 Install the two springs and dump valve bracket into pintle assembly.

Use a small screwdriver to compress and hold dump valve bracket into pintle to clear previously installed dump valve guide located in cover.

49 Align pintle assembly with the cam ring pivot pin and guide pintle assembly into pump rotor. Push to bottom position in cover.

**Note:** Do not force pintle through the pump rotor assembly as it is a slip fit. The pump rotor assembly must turn freely on the pintle by hand. If not recheck pintle installation.

**50** Push dump valve shaft in and thread into dump valve bracket. **Torque to 2-3 Foot Pounds.**

**51** Lightly grease new cover sealing ring and install in the groove in the cover.

### Body—Reassembly

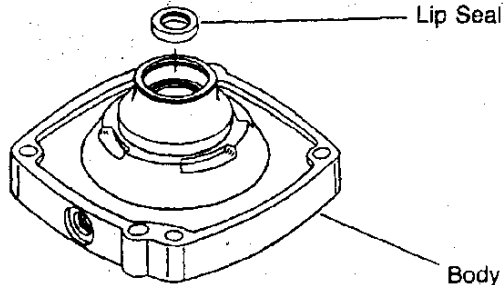


Fig. 32

**52** Lubricate inner surface of new lip seal and install with the rubber lip of the seal toward the counter bore in body.

**Important:** Do not over press or drive the seal, this may damage the rubber sealing portion of the seal or distort counter bore.

**53** Install output shaft into body, protecting the shaft seal lip from keyway and snap ring grooves.

Support the output shaft from underneath body so that the cross pin in output shaft is tight against body.

Use a solid block (steel or hardwood) 2 inches in diameter by at least 1½ inches long to support the output shaft.

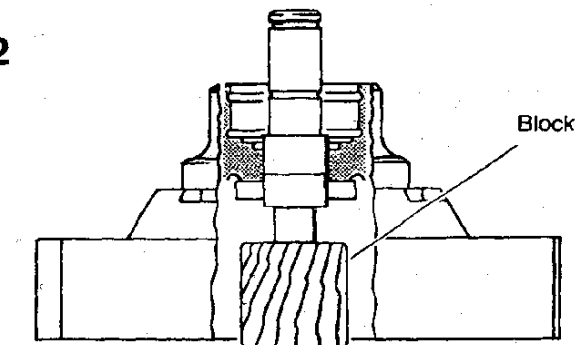


Fig. 33

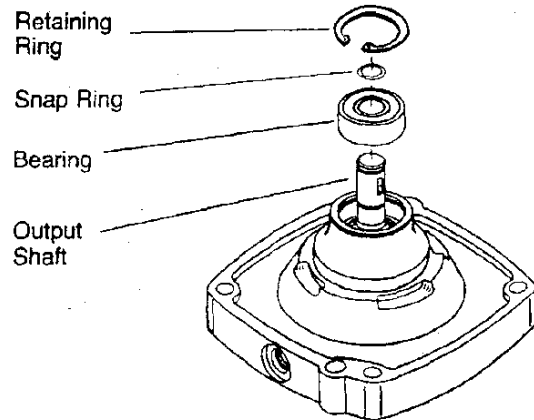


Fig. 34

**54** Install output shaft bearing by positioning bearing over output shaft and pressing on outer race of ball bearing to the bottom position in body.

**55** Install small snap ring on output shaft against inner bearing race.

**56** Install the large retaining ring used to retain ball bearing in body.

**Note:** The output shaft must rotate freely by hand. If it doesn't, recheck bearing installation.

### Motor Rotor—Installation

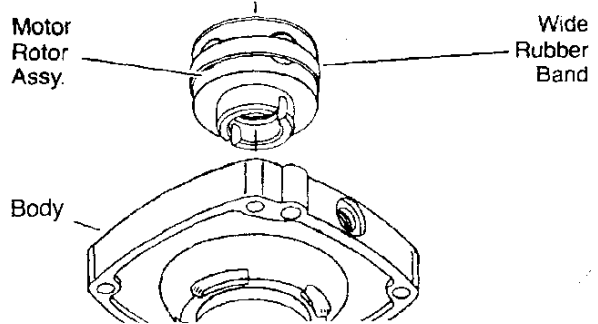


Fig. 35

**57** Align the slot in the motor rotor assembly with the cross pin on the output shaft and install the motor rotor in body.

**58** Remove the rubber band retaining the ball pistons in their respective bores (if used).



### Cover/Body—Reassembly

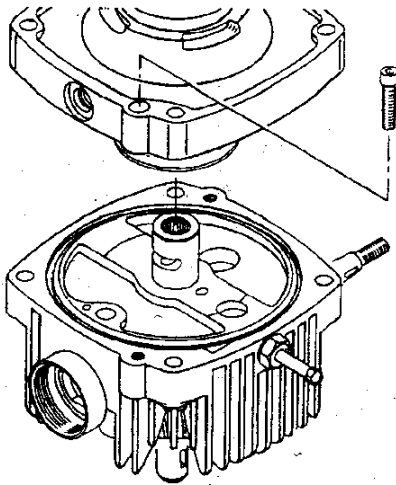


Fig. 36

**Important:** Be sure to realign previous scribed line for correct output rotation. If body assembly is installed 180° as previous assembled output rotation will be reversed.

59 Hold the motor rotor assembly in position and install body on pintle.

**Note:** Do not force motor rotor assembly on pintle as it is a slip fit and must turn freely by hand.

60 Install the (2)  $\frac{3}{16}$  x  $1\frac{1}{4}$  socket head cap screws and torque to 15 foot pounds.

### Reservoir/Adapter—Reassembly

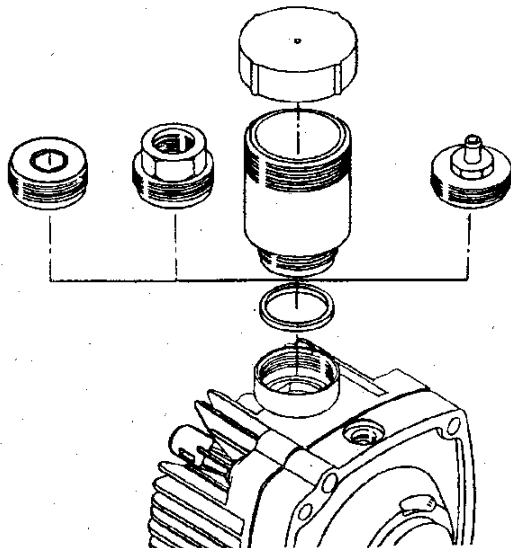


Fig. 37

61 Lightly grease sealing ring and install into recess in cover.

62 Install the adapter or reservoir in cover by rotating *counterclockwise*.

**Torque to Approximately 8–12 ft. lbs.**

**Important:** The adapters and reservoir are threaded left hand. To install, turn *counterclockwise*.

### Start-up Procedure

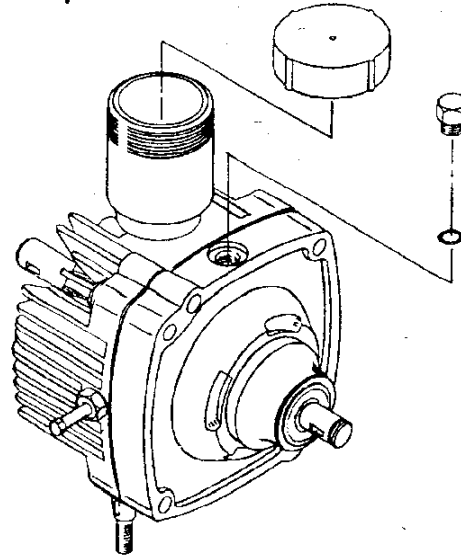


Fig. 38

63 Remove the  $\frac{3}{8}$  hex head plug to vent the transmission. See Page 16 for fluid recommendations.

#### Attached Reservoir

Fill the transmission with the proper fluid through reservoir until fluid overflows from opening in body.

Rotate both the input and output shafts to purge any trapped air from transmission. Refill reservoir until fluid reappears and install hex head plug, **Torque to 2-5 Foot Pounds.**

Fill reservoir to oil level cold mark.

#### Separate Reservoir

Fill the transmission with the proper fluid through customer supplied separate reservoir until fluid overflows from opening in body.

Rotate both the input and output shafts to purge any trapped air from transmission. Refill reservoir until fluid reappears and install hex head plug. **Torque to 2-5 Foot Pounds.**

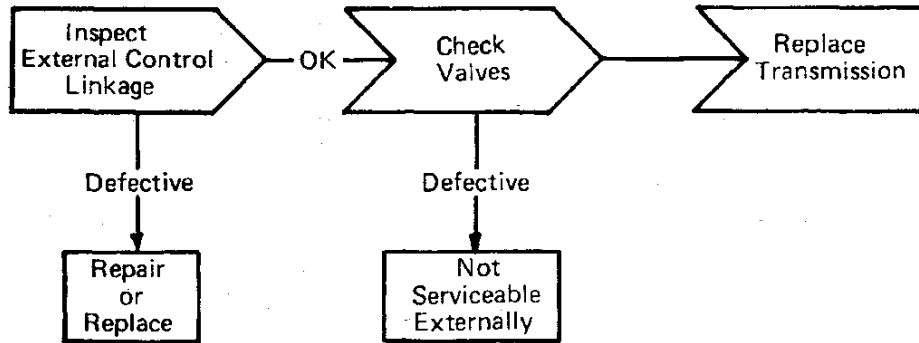
Fill reservoir to proper fluid level shown.

### Trouble Shooting Instructions

This fault-logic troubleshooting section is designed as a diagnostic aid in locating transmission problems by the user.

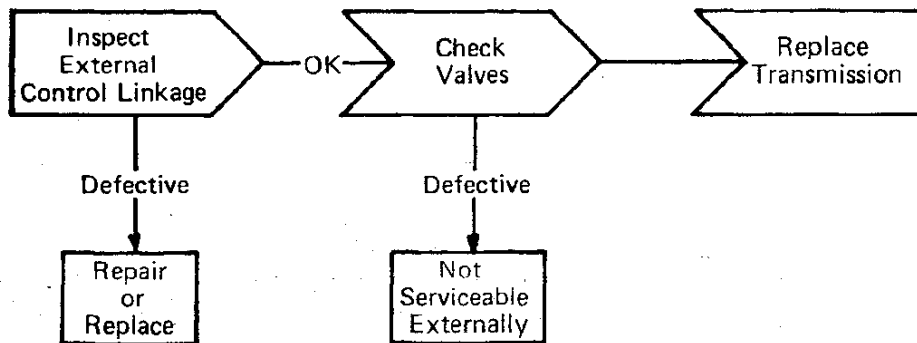
Match the transmission problem with the problem statements and follow the action steps shown in the diagrams. This will give the user expedient aids in correcting the problem and eliminating unnecessary machine down time.

## System Jerky When Starting

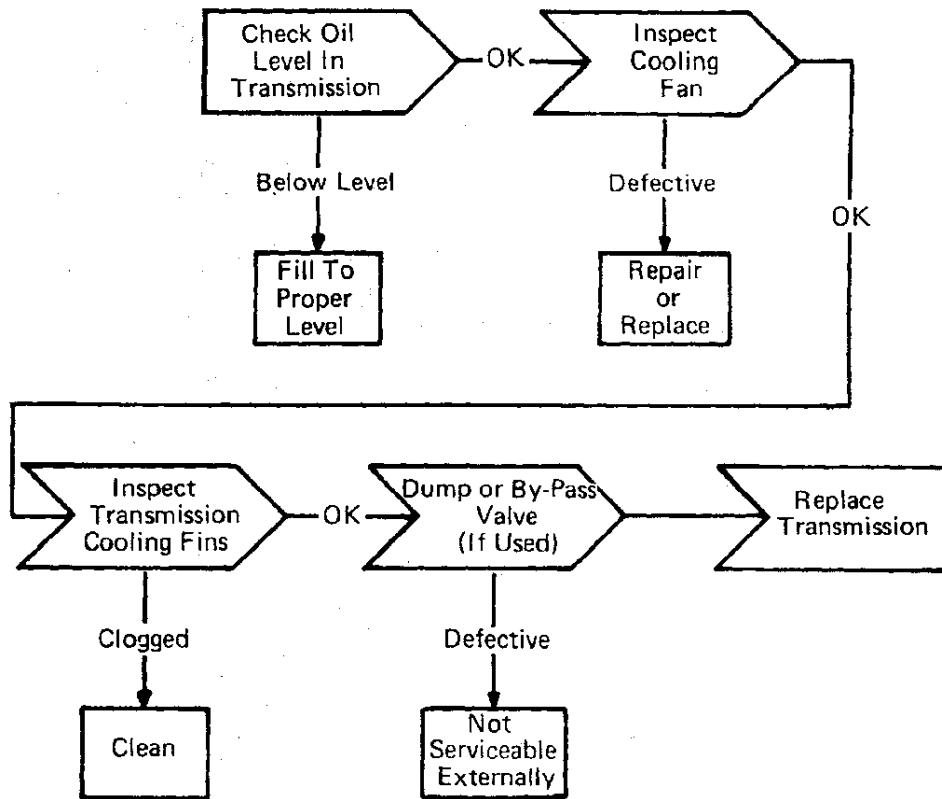


## System Operates in One Direction Only

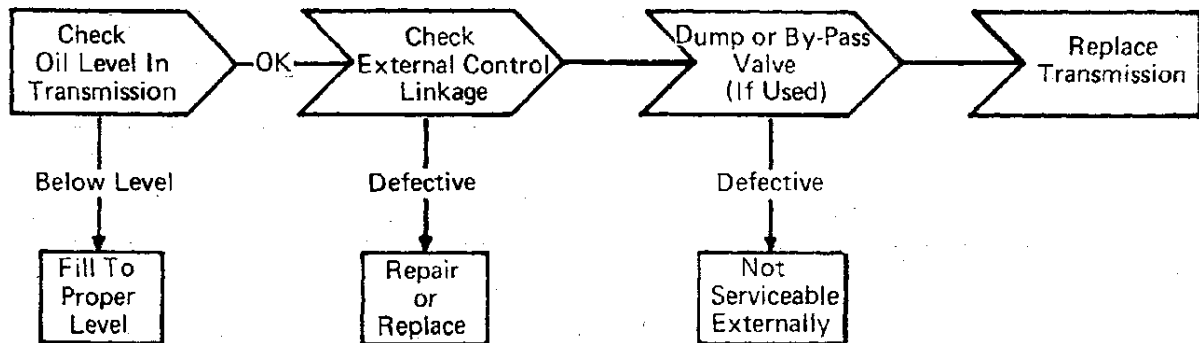
14



## System Operating Hot



## Loss of Power or System Will Not Operate in Either Direction



### Hydrostatic Fluid Recommendations

A reputable supplier can help you make the best selection of hydraulic fluid for use in Eaton hydrostatic products.

For satisfactory operation, the following recommendations apply:

1. The filter system used in the hydraulic circuit should be capable of cleaning and maintaining the hydraulic fluid to meet ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5  $\mu\text{m}$  and a maximum of 80 particles per milliliter greater than 15  $\mu\text{m}$ .
2. At normal operating temperatures, optimum viscosity ranges are from 80-180 SUS (16-39 cSt). Viscosity should never fall below 60 SUS (10 cSt) and, at the lowest expected start-up temperature, should not exceed 10,000 SUS (2158 cSt).
3. The fluid should be chemically stable, incorporating rust and oxidation inhibitors.

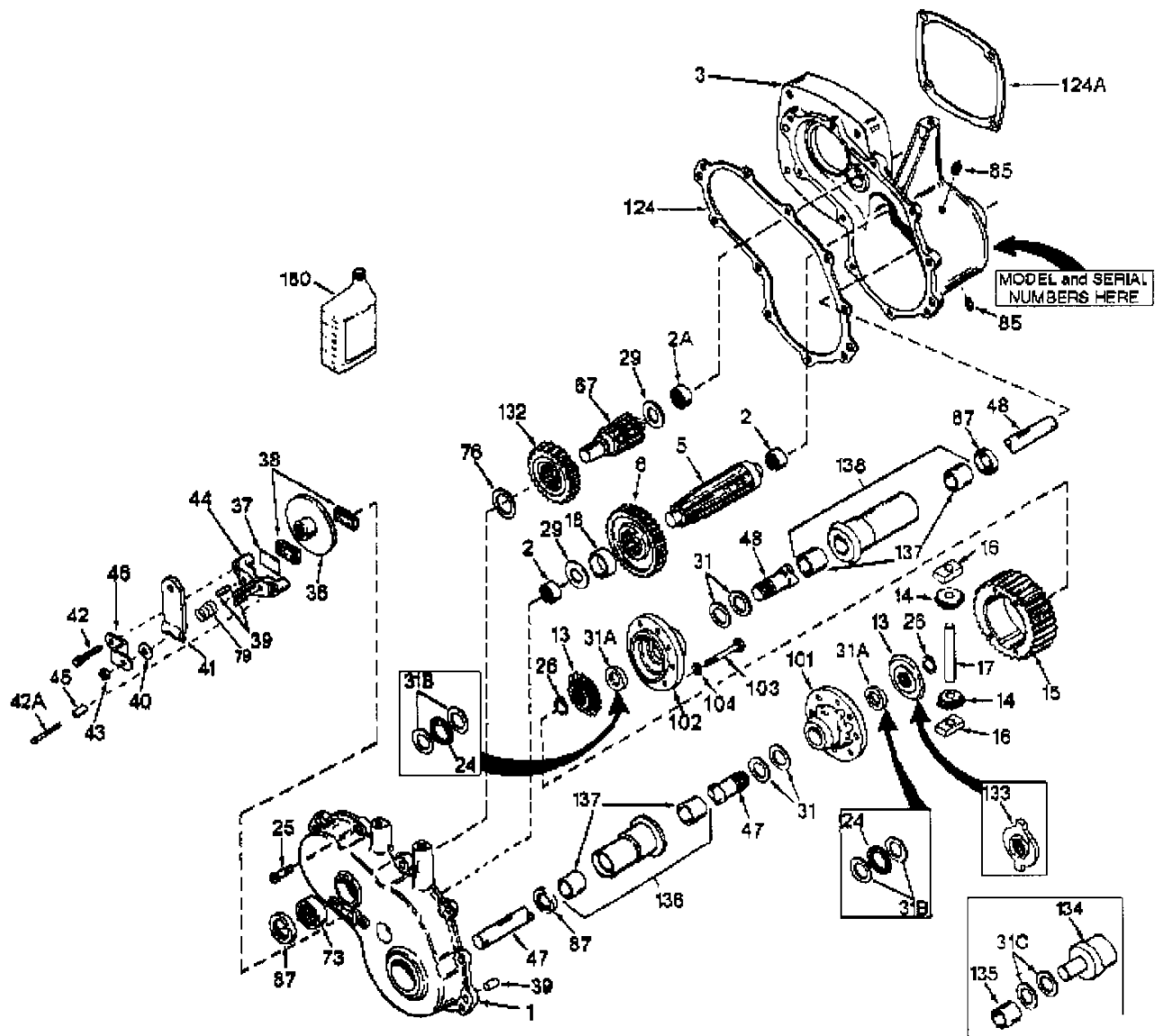
Specific types of fluid meeting these requirements are:

- Premium hydraulic oil\*
- Engine crankcase oil—SAE 10w, SAE 20w-20, SAE 30
- Automatic transmission oil
- Hydraulic transmission oil
- Synthetic fire resistant fluid—
  - Quintolubric 822-220, -300 or -450  
Quaker Chemical Co.  
Conshohocken, PA 19428
  - Cosmolubric HF-122, -130, -144 or -1530  
E.F. Houghton & Co.  
Valley Forge, PA
  - Milisafe Code 1274 (280 Series) 280-150, -300 or -500  
Future Trend Industries  
Cottage Grove, MN 55016

**Note:** If the natural color of the fluid has become black or milky, it is possible that an overheating or water contaminant problem exists.
















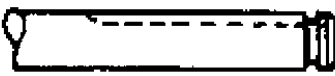




For accurate level readings, take readings when the fluid is cold.

\*Supplied in Model 6 and 7 Transmissions, Model 750 and 770 Transaxles, and 780 Transaxles without charge pumps that are shipped from the Spencer factory. The viscosity of this factory fluid is equivalent to SAE 20w-20. The preferred fluids for all light duty transmissions, pumps, transaxles and motor axles are those having a viscosity equivalent to SAE 20w-20, SAE 30 or SAE 40.



Ref #	Part Number	Qty	Description
1	772085	1	Cover Assembly (Incl. 2 & 73)
2	780013	2	Needle Bearing
2A	780088	1	Needle Bearing
3	770072	1	Case Assembly (Incl. 2 & 2A)
5	778041	1	Output Pinion
6	778036	1	Output Gear
13	778198	2	Bevel Gear (16 teeth-steel)
14	778197	2	Bevel Pinion (10 teeth-steel)
15	778033A	1	Ring Gear
16	786027	2	Drive Block
17	786019	1	Drive Pin
18	786017	1	Spacer
25	792046	1	Screw, 1/4-20 x 1"
26	792018	2	Snap Ring
29	780001	2	Washer
31A	780107	2	Washer
31	780042	4	Thrust Washer
36	790027	1	Brake Disk
37	790007	1	Brake Pad Plate
38	799021	2	Brake Pad (pkg of 2)
39	786026	4	Dowel Pin
40	792076A	1	Flat Washer
41	790008A	1	Brake Lever
42	792073A	2	Screw, 1/4-20 x 1-1/4"
43	792075	1	Locknut, 5/16-24
44	790025	1	Brake Pad Holder
46	786086	1	Brake Lever Bracket
47	774629	1	Axle (13-7/64" long)
48	774450	1	Axle (14-23/32" long)
67	776207	1	Brake Shaft
73	780089	1	Needle Bearing
76	780090	1	Washer
85	792010	2	Pipe Plug
87	788008	3	Oil Seal
101	774028A	1	Differential Carrier
102	774029A	1	Differential Carrier
103	792020	4	Screw, 1/4-20 x 2-1/4"
104	792006	4	Lockwasher, 1/4"
124	788044A	1	Case-to-Cover Gasket
132	778037	1	Idler Gear (30 teeth)
136	782041A	1	L.H. Housing & Bushing (Incl. 137)
137	780054	4	Bushing
138	782042A	1	R.H. Housing & Bushing (Incl. 137)
180	730229A	1	Gear Oil SAE 80W90

1300-1019B Peerless #1  
Page 2 of 4  
Screw, 1/4-20 x 1"

<p>47</p> 		<p>48</p> 
<p>47A</p> 		<p>48A</p> 
<p>47B</p> 		<p>48B</p> 
<p>47C</p> 		<p>48C</p> 
<p>47D</p> 		<p>48D</p> 
<p>47E</p> 		<p>48E</p> 
<p>47F</p> 		<p>48F</p> 
<p>47G</p> 		<p>48G</p> 
<p>47H</p> 		<p>48H</p> 
<p>47I</p> 		<p>48I</p> 

# General Purpose Clutches



## FEATURES

### SOLID FORGED ROTOR

A one piece solid forged rotor means no chance of internal parts separation. Our rotors also have an even wall thickness around the coil which gives optimum flux distribution, maximizing torque.

### DIFFERENT COIL VOLTAGES AVAILABLE

Although 12 volt is the most common, 24 volts can also be made available. Depending upon the quantity, other specialty voltages can be made.

### HIGH TEMPERATURE, LONGER LIFE GREASE

All models include our special long life grease which has shown a significant improvement in life over other standard high temp greases.

### E-COATING

Where possible, all parts in the clutch are e-coated to give maximum corrosion protection.

### HIGH TEMPERATURE EPOXY COIL

To help prevent failure from both vibration and outside contaminants, all coils are sealed in the coil shell with a high temperature epoxy coating.





































### FORGED MACHINED PULLEY

All models in this section use a heavy duty machined pulley or flange. A stronger pulley resists damage due to abusive environments.

### REDUCED BURNISHING TIME

Ogura is using a coating on the clutch faces that significantly reduces burnishing time. This is standard on all units.



Ogura P/N	Static Torque (ft-lbs)	Bore (inch)	Volts/Watts	Output Pulley (P) Hub (H) Other (O)	Ref. Pitch Dia. (inch)	# Grooves	Wgt (lbs)	PIC	PDF	DXF
505894	110	*Taper	12/50	H	2.75	UnivMt	11.00			
515609	110	1	12/47	H	3.63	UnivMt	10.00			
509812	110	1	12/50	P	4.13	2/A	10.00			
522756	110	1	12/47	P	6.91	1/B	14.00			
515294	110	25mm	12/47	P	4.07	2/3V	12.00			
516849	250	1	12/50	P	4.65	2/A	16.00			
526126	250	1	12/50	P	4.65	2/A	16.00			
519225	250	1.125	12/50	H	3.90	UnivMt	16.00			
521325	250	1.125	12/50	P	4.65	2/A	16.00			
522879	250	1.125	12/50	P	5.00	2/A	17.00			
525569	250	1.25	12/50	H	3.90	UnivMt	16.00			
509044	250	1.4375	12/50	P	4.65	2/A	16.00			



**Step 1**

Slide the clutch onto the shaft, (for a two-piece clutch, slide both pieces on one at a time). Please make sure that the key is in the proper location. Do not force the clutch onto the shaft because, if the key is off slightly, damage could occur to the key or to the bore of the clutch. The shaft should extend into the clutch enough to support each component. A standard rule of thumb is the penetration should be at least equal to the diameter of the shaft. The clutch should be slid onto the shaft until the bearing inner race on the clutch contacts a step, washer or other drive pulley. In all cases, the mounting surfaces of these components need to be parallel to each other within .003". If these surfaces are not parallel, the clutch could become cocked on the shaft. (This would show up as a wobbling pulley.) The contact of these components, to the bearing inner race, can extend beyond the inner race because the seal is recessed. (If you are using a washer, make sure it is not cupped; otherwise, this cupping could dig into the bearing seal.) Please be sure to check the chamfer on the ground drive pulley, washer or clutch so they do not interfere with the radius on the step in the engine crankshaft. On some of our clutches, the bearing is kept on the inner sleeve via a snap ring, (pulley side). With this design, the rotor would then contact the appropriate step on the shaft. (See example below.)

**Step 2**

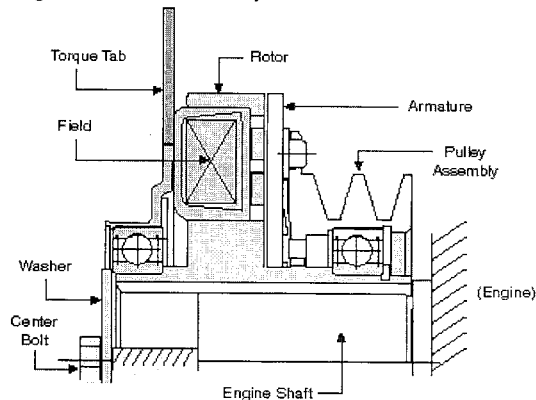
A center bolt and washer, (customer supplied) is then placed into the end of the tapped shaft and then tightened down. The washer should be .250" in thickness. Bolt tightening torque will vary depending upon the bolt used in the application. This can be anywhere from 20 -50 ft. lbs. of tightening torque, depending upon the bolt. If vibration is heavy an adhesive may be required to prevent the bolt from becoming loose. The washer should contact the inner race of the bearing. It can extend beyond the inner race as long as it does not contact the outer race.

**Step 3**

At this point, the torque tab should be held in the appropriate position. Please make sure that there is freedom of movement both axially and radially of the torque tab of about 1/16". Double check the installation after it is tightened down, you should be able to push against the back of the field and move it slightly from side to side. Under no circumstances should the torque tab be tightened down firmly. This will cause failure of the field bearings.

**Step 4**

In order to get maximum torque out of the clutch, burnishing should be performed. Burnishing is a procedure where the clutch is cycled anywhere from 30 - 50 times at half the normal operating speed of the clutch. The cycle rate can be anywhere from 2 - 6 cycles per minute depending upon your inertia. (Please consult with your local representative to determine your maximum cycle rate.) Proper burnishing allows the wear surfaces to mate together to produce maximum torque. However improper burnishing can damage the surfaces. Please take care to allow enough time in between cycles so that the surfaces are not damaged.



Mobile Clutch/Brakes

## Troubleshooting

### Clutch Will Not Disengage

Potential Problem	Possible Reason	Solution
Voltage not releasing.	Faulty switch.	Replace switch.
Rotor and armature locked together.	The clutch has been severely galled and has locked up. (Galling is the condition whereby a piece of metal is trapped between the armature and the rotor and melts due to high pressure and heat, spot welding the surfaces together.)	If rotor and armature cannot be separated, replace the clutch. If they do separate, follow burnishing procedure.
Pulley bearing locked.	Bearing lost grease due to seal problem, temperature or water contamination. (Example)	Replace clutch.

## Troubleshooting Clutch Will Not Engage

Potential Problem	Possible Reason	Solution
No voltage going to the clutch.	Wiring connector not seated properly.	Pull apart and re-seat connector.
	No voltage or low voltage coming from the battery.	Check with voltmeter, battery should be 8-16 volts. (Assuming 12 volt battery.)
	Defective charging system.	Fix charging system.
	Lead wire cut or broken internally. <b>(Example)</b>	Fix or replace lead wire. If destroyed, replace clutch.
	Fuse blown.	Replace fuse.
If voltage is going to the clutch, but the clutch will still not engage.	Defective switch operating clutch.	Replace the switch.
	Coil open or shorted.	Check coil with ohmmeter. A range close to 3 to 4 ohms should be present at an ambient coil temperature of 70 \uffffF. Replace coil. <b>(Example)</b>
	Check coil voltage to make sure it is compatible with the voltage coming in. (If voltage is too high, this could cause the coil to burn out.)	Change battery or coil to meet your requirement.
Clutch engages, but load will not engage.	Burnt out coil caused by frictional contact (rotor strike). If so, coil will be discolored, can be cracked, burnt or epoxy can be melted. <b>(Example 1, Example 2)</b>	Replace coil.
	Rivets or springs broken. <b>(Example)</b>	Replace clutch.
	Key missing.	Put in key.
	Armature could be warped because of heat due to slippage. This means it will pull in, but will slip when a load is supplied. Clutch should show signs of heat. <b>(Example)</b>	Replace clutch and determine why it slipped.

## Troubleshooting Clutch Slips

Potential Problem	Possible Reason	Solution
Low voltage going into the clutch.	Defective battery.	Check with voltmeter, battery should be 8-16 volts. (Assuming 12 volt battery.)
	Lead wire cut which could be intermittently grounding out the lead wire causing the clutch to turn on and off or not to give full voltage. <b>(Example)</b>	Fix or replace lead wire.
Erratic engagement.	If lead wire is kinked or pinched and the break is internal, the clutch operation may show up as being erratic engagement. <b>(Example)</b>	Fix or replace lead wire.
Clutch is contaminated.	Oil or other lubricant has been sprayed on the clutch surface. Sometimes this shows up after the clutch is disassembled. Physical evidence is either burnt oil or a greasy metallic surface showing oil still present. <b>(Example)</b>	Clean off surfaces with solvent and reburnish. Replace the clutch if damage is severe enough.
Clutch overloaded.	Output torque required is greater than what the clutch can handle. If input torque going into clutch is greater than the output torque required, the clutch will slip. If it slips too long, the clutch surfaces will be galled	Size clutch correctly for the application. Replace clutch.
Output stalled.	If output is stalled, clutch could slip to the point where it will burn up and destroy either bearings or the field.	Replace clutch.
If voltage is going to the clutch, but the clutch will still not engage.	Coil open or shorted.	Check coil with ohmmeter. A range close to 3 to 4 ohms should be present at an ambient coil temperature of 70 \uffffF. Replace coil.
Clutch not burnished.	If full torque is required immediately and clutch is not burnished, it will slip and could become galled.	Try to reburnish clutch. If slipping is to severe, clutch will have to be replaced.

## Troubleshooting

### Noisy Clutch

Potential Problem	Possible Reason	Solution
If clutch is able to move on the shaft.	Check center bolt and washer to make sure it is tight. If it is tight, make sure that the shaft is not too long. Clutch shaft should end before the end of the clutch to allow some deflection in the center bolt and washer to keep clutch on tightly. <b>(Example)</b>	Retighten center bolt or change spacer or shaft length.
Noise from pulley bearing.	Check if bearing feels rough. Check belt load to make sure pulley and bearings are not over loaded.  High temperature can be caused by either operating environment or due to slippage. If slippage, clutch should be discolored. Refer to slippage section for potential reasons.	Reduce belt load.  Reduce the heat or eliminate slippage.
Pinging or scraping noise noticed when clutch is disengaged	Air gap too close. <b>(Example)</b>	Increase air gap.
Noise from field bearing.	Surface is heavily galled.  Check to see if the clutch is discolored to see if it shows signs of slippage.  Check for damage to both the outer race and inner race of the bearing. Make sure key is not too tight forcing pressure on the inner race . In the outer race area, check for marks or damage that could have caused the clearances to close up. <b>(Example 1, Example 2, Example 3)</b>	Re-burnish the clutch.  Refer to slippage section.  Replace clutch.
	Check temperature of shaft where clutch is mounted to verify that it is under 300\uffffF.	Reduce reason for the high temperature overloading on the engine.
	Check torque tab or backing plate to make sure that there is freedom of movement of 1/16 of an inch axially and radially. Check to see if any marks are evident that would indicate axial forces applied. <b>(Example)</b>	Loosen torque tab to make sure it has freedom of movement both axially and radially.