

BUFFALO TURBINE

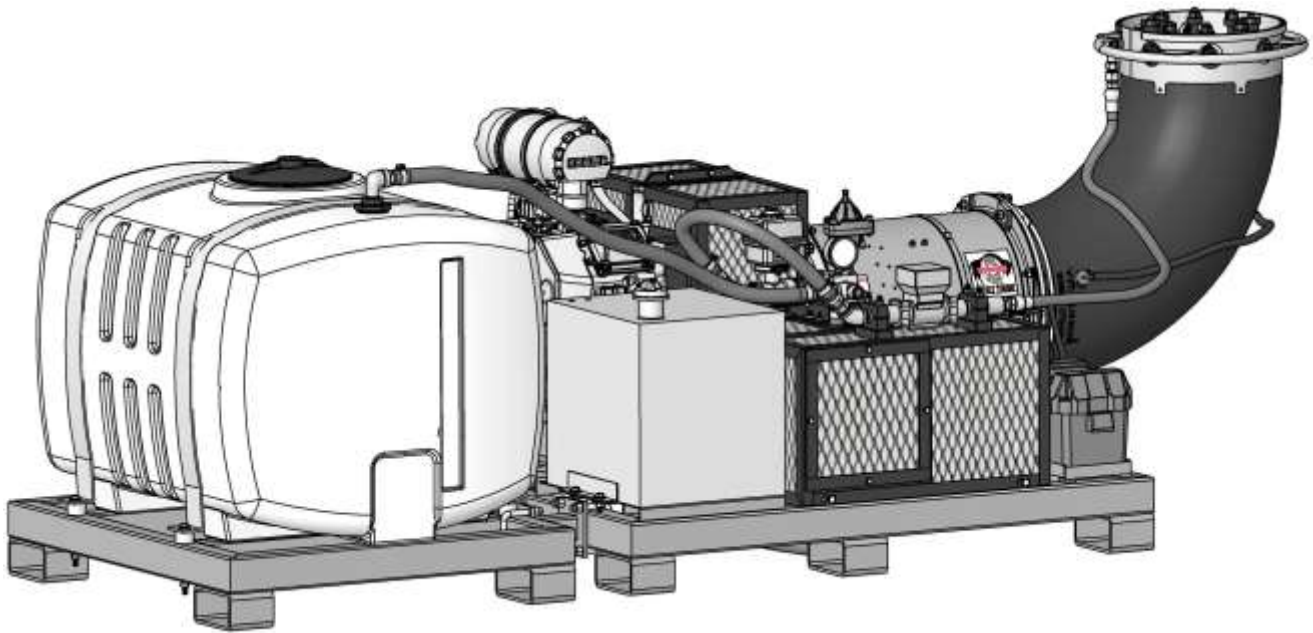
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BUFFALO TURBINE'S BT-CS4 SPRAYER ORIGINAL INSTRUCTIONS AND PARTS MANUAL

12/19 -BT MAN

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1.0 INTRODUCTION

Congratulations on your choice of a Buffalo Turbine Sprayer and/or Granular machine. This equipment has been designed and manufactured to meet the needs of the Insect Control Industry.

Safe, efficient and trouble-free operation of your Buffalo Turbine Unit requires that you and anyone else, who will be operating or maintaining the Blower, read and understand all of the safety, operation, maintenance and troubleshooting information contained within this Operator's manual.

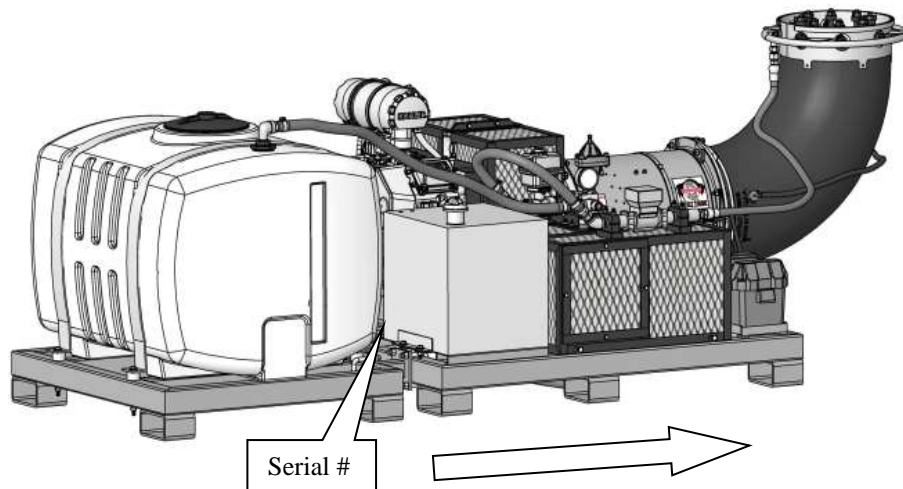
This Manual covers the BT-CS4 Models.

Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Buffalo Turbine dealer or distributor if you need assistance, information, or additional copies of the manuals.

SERIAL NUMBER LOCATION

Always give your dealer the serial number of your Monsoon when ordering parts or requesting service or other information.

The serial number plate(s) is located where indicated in the pictures below. Please document the number in the space provided for easy reference.



OPERATOR ORIENTATION – The directions left, right, front and rear, as mentioned throughout the manual, are as seen from the driver's seat and facing in the direction of travel.

MODEL BT-CS4 RIGHT FRONT TOP SURFACE OF FRAME

Serial Number: _____

2.0 SAFETY

YOU are responsible for the **SAFE** operation and maintenance of your Buffalo Turbine Sprayer and /or Granular unit. **YOU** must ensure that you and anyone else, who is going to operate, maintain or work around the Buffalo Turbine Sprayer and/or Granular unit be familiar with the operating and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practice while operating the Monsoon.

Remember **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this machine is familiar with the procedures recommended and follows safety precautions. Remember most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

- Sprayer/granular unit owners must give operating instructions to operators or employees before allowing them to operate the unit, and at least annually thereafter.
- The most important safety device on this equipment is a **SAFE** operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow these. All accidents can be avoided.
- A person who has not read and understood all operating instructions is not qualified to operate the machine. An untrained operator exposes themselves and bystanders to possible serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety which could affect the life of the equipment.
- Think **SAFETY!** Work **SAFELY!**

This Safety Alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**

The Safety Alert symbol identifies important safety messages on the Buffalo Turbine Sprayer and/or Granular unit and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

Why is **SAFETY** important to you?



**3 Big Reasons: Accidents Disable and Kill
Accidents Cost
Accidents Can Be Avoided**

SIGNAL WORDS: Note the use of the signal words **DANGER**, **WARNING** and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guidelines

1. **DANGER** –injury or death if the proper precautions are not taken.
2. **WARNING** -- A specific hazard or unsafe practice that **COULD** result in severe personal injury or death if proper precautions are not taken.
3. **CAUTION** – Unsafe practices that **COULD** result in personal injury if proper practices are not taken, or as a reminder of good safety.

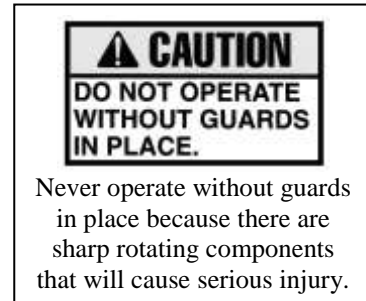
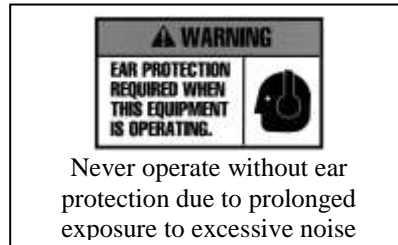
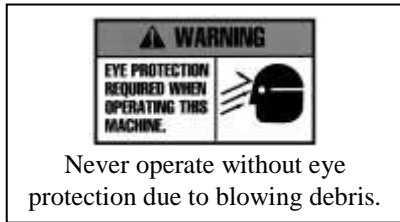
The Safety Alert symbol identifies important safety messages on the Buffalo Turbine Sprayer and/or Granular unit and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

2.1 SAFETY DECALS

The types of decals on the blower unit are shown below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area that requires your **SAFETY AWARENESS.* THINK SAFETY! WORK SAFELY!**

!ATTENTION!

1. **KEEP HANDS, FEET AND CLOTHING AWAY FROM POWER DRIVEN PARTS.**
2. **STOP ENGINE AND REMOVE KEY BEFORE LEAVING OPERATOR'S POSITION.**
3. **MACHINE MUST COME TO A COMPLETE STOP BEFORE ANY MAINTENANCE, TO INCLUDE ADJUSTING, LUBRICATING OR CLEANING, IS PERFORMED.**
4. **KEEP PEOPLE AND PETS AT SAFE DISTANCE FROM MACHINE.**
5. **KEEP ALL GUARDS AND SHIELDS IN PLACE.**



REMEMBER – If safety decals have been damaged, removed, become illegible or parts replaced without decals, new decals must be applied. New decals are available from your authorized dealer.

2.2 GENERAL SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, maintaining, and adjusting.
2. Provide a first-aid kit for use in case of an accident. Store in a highly visible place.
3. Provide a fire extinguisher for use in case of an accident. Store in a highly visible place.
4. Wear appropriate protective gear. This list includes but is not limited to:
 - A hard hat
 - Protective shoes with slip resistant soles
 - Protective glasses or goggles
 - Heavy gloves
 - Wet weather gear
 - Hearing protection
5. Do not operate without guards or shields properly installed.
6. Do not allow riders.
7. **Wear appropriate ear protection for prolonged exposure to excessive noise.**
8. **(All Models) Set Blower on the ground, stop engine, chock wheels, remove ignition key and wait for all moving parts to stop before dismounting to service or adjust.**
9. Clear the area of people, especially small children, before starting the unit.
10. Review all safety related items annually with all personnel who will be operating or maintaining the Blower.
11. Keep hands, feet, hair and clothing away from moving parts. Operate equipment only while seated in the operator's seat.

2.3 OPERATING SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, servicing or adjusting.
2. Before servicing or repairing, **Set sprayer and/or granular unit on the ground, stop engine, chock wheels, remove key, and wait for all moving parts to stop.**

2.4 MAINTENANCE SAFETY

1. Read and follow ALL general, operating, maintenance and safety information in this manual.
2. Support the machine with blocks or safety stands when changing tires or working beneath it.
3. Set sprayer and/or granular unit on the ground, stop engine, chock wheels, remove ignition key and wait for all moving parts to stop before operating, servicing or adjusting.
4. Make sure all guards are in place and properly secured when operating or maintaining the Blower.

*** NEVER HAVE NOZZLE POINTING AT/NEAR ANYONE DURING STARTUP***

2.5 TRANSPORT SAFETY

1. Use a DOT Approved trailer for Highway Use and for speeds exceeding 15 MPH (24KPH). Make sure you are in compliant with all local DOT regulations regarding transporting Buffalo Turbine equipment on public roads and highways.
2. The sprayer and/or granular unit can easily be transported and operated in the bed of a standard pick-up truck or utility vehicle. Be sure to block, anchor and secure the unit before operating or transporting. **Do not use the top of the Turbine housing to strap or tie down blower unit.**

2.6 STORAGE SAFETY

1. Store the sprayer and/or granular unit on a firm, level surface.
2. Store away from areas of human activity. Do not permit children to play on or around the stored machine.
3. Make sure the unit is sitting, or blocked up firm and solid and will not tip or sink into a soft area.
4. Cover with a weatherproof tarpaulin and tie down securely.
5. Make sure nozzle is covered during storage.

2.7 SIGN-OFF FORM

- Buffalo Turbine recommends that anyone who will be operating and/or maintaining the Buffalo Turbine sprayer and/or granular unit must read and clearly understand ALL Safety, Operating and Maintenance information presented in this manual.
- Do not operate or allow anyone else to operate this equipment until such information has been reviewed. Annually review this information before the season start-up.
- Make these periodic reviews of SAFETY and OPERATION a standard practice for all of your equipment. We feel that an untrained operator is unqualified to operate this machine.

A sign-off sheet is provided for your record keeping to show that all personnel who will be working with the equipment have read and understand the information in the Operator's Manual and have been instructed in the operation of the equipment.

SIGN-OFF FORM

DATE	EMPLOYEES SIGNATURE	EMPLOYERS SIGNATURE

Buffalo Turbine Sprayer and/or Granular Unit

3.0 WARRANTY

Buffalo Turbine warrants the Sprayer and/or Granular unit to be free from defects in material and workmanship, under normal use and service. Obligation under this warranty shall extend for a period of 1 year (12 months) and shall be limited to, at the option of Buffalo Turbine, replacement of any parts found, upon inspection by Buffalo Turbine, to be defective.

Buffalo Turbine reserves the right to incorporate improvements in material and design of its products without notice and is not obligated to make the same improvements to equipment previously manufactured.

WARRANTY CLAIMS- Buffalo Turbine Must be Notified Prior to Performing any Warranty Repairs:

The purchaser claiming under this warranty shall submit a warranty claim in the prescribed form to Buffalo Turbine or an Authorized Dealer for inspection by an authorized company representative.

Factory ordered Buffalo Turbine parts must be used when filing a warranty claim.

LIMITATIONS OF LIABILITY

This warranty is expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on our part of any kind or character, including liabilities for alleged representations or negligence. We neither assume nor authorize any other person to assume on our behalf, any liability in connection with the subsequent sale of the **Sprayer and/or Granular unit**.

This warranty shall not apply to any Sprayer and/or Granular unit, which has been altered outside the factory in any way so as, in the judgment of Buffalo Turbine, to affect its operation or reliability, or which has been subject to misuse, neglect, or accident.

This warranty does not cover parts and accessories, which are under separate guarantee from the manufacturers and service can be, obtained from their service facilities. No warranty is extended to regular service items such as lubricants, belts, paint and the like. **(See Page 8)**

Original Instruction Manual

The Purchaser acknowledges having receiving training in the safe operation of the Sprayer and/or Granular unit and further acknowledges that Buffalo Turbine does not assume any liability resulting from the operation of the Sprayer and/or Granular unit in any manner other than described in the Operator's Manual supplied at the time of purchase.

WARRANTY VOID IF NOT REGISTERED (see Page 7 for warranty registration form)

If there are any questions regarding any of our products call Buffalo Turbine at 716 592 2700.

DO NOT SPLIT THE TURBINE HOUSING FOR ANY REASON.

DO NOT ATTEMPT TO SERVICE OR DISASSEMBLE THE TURBINE.

DO NOT USE THE TOP OF THE TURBINE HOUSING TO STRAP OR TIE DOWN BLOWER UNITS.

Unauthorized service work on the Sprayer and/or Granular unit will null and void all warranties.

3.1 Warranty Registration Form

BUFFALO TURBINE

WARRANTY REGISTRATION FORM & INSPECTION REPORT

Any units not registered with Buffalo Turbine are not eligible for warranty claims

WARRANTY REGISTRATION

This form must be filled out by the dealer and signed by both the dealer and the customer at the time of delivery

Customer's Name _____ Dealer's Name _____

Address _____ Address _____

City, State, Zip, Country _____ City, State, Zip, Country _____

Email Address (important) _____ Email Address _____

Telephone Number _____

Blower Model _____

Circle one:

Serial Number _____

Commercial Use

Delivery Date _____

Private Use

DEALER INSPECTION REPORT

SAFETY CHECKS

_____ Tire Pressure Check -- Model KB

_____ All Decals Installed

_____ Wheel Bolts

_____ Review Operating and Safety Instructions

_____ Belt Tension

_____ Lubricate Machine

_____ Guards in Place

_____ Fasteners Tight

_____ Trailer assembly bolts properly installed and tightened

ALL 3 POINT HITCH MODELS: PTO SHAFTS MUST TELESCOPE IN EVERY POSITION

I have thoroughly instructed the buyer on the above described equipment which reviews the included Operator's Manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____

Dealer's Rep. Signature _____

The above equipment and Operator's Manual has been received by me and I have been thoroughly instructed as to the care, adjustments, safe operation and applicable warranty policy.

Date _____

Owner's Signature _____

PLEASE FAX A COPY TO BUFFALO TURBINE AT 716 592 2460 Or
Email - service@buffaloturbine.com

3.2 Parts Warranty Information

	Manufacturer's Warranty	Who to Contact
The turbine assembly, blower wheel, frame, engine mounting rails, rotation motor mounting bracket, tongue, axle assembly, hub assembly, All belt driven components and other components manufactured by Buffalo Turbine*.	1 Year Parts and Labor	Buffalo Turbine (716) 592-2700 Or Local Authorized Buffalo Turbine Representative
Rotation Motor	1 Year Parts	Buffalo Turbine (716) 592-2700
Yellow/black Box Wireless transmitter, Receiver, Wiring harness.	1 Year Parts	Buffalo Turbine (716) 592-2700
Battery	1 Year Parts Reimbursement with Faxed receipt from new battery and Defective Battery Serial #. Up to \$30.00	El-Don Battery (716)-896-0404 Fax: (716)-896-0406
Gas Tanks	1 Year Parts	Buffalo Turbine (716) 592-2700
Battery Box	1 Year Parts	Buffalo Turbine (716) 592-2700
Tires and Wheels	1 Year Parts	Buffalo Turbine (716) 592-2700
Kohler Engines	3 Year Engine Warranty See Engine owner's Manual	Kohler Dealer http://kohlerplus.com go to: Dealer Locator
Sandevil Units		Buffalo Turbine (716) 592-2700
EQUIPMENT REGISTRATION, TO INCLUDE THE SERIAL NUMBER OF THE UNIT, WILL BE REQUIRED FOR ALL WARRANTY REPAIRS. PRE-APPROVAL BY A FACTORY PERSON (FROM BUFFALO TURBINE) PRIOR TO COMMENCING WITH A WARRANTY REPAIR, WILL BE REQUIRED BY THE END USER AND AT THE DEALER / DISTRIBUTOR LEVEL.		
REPAIR PARTS MUST BE ORDERED THROUGH AN AUTHORIZED BUFFALO TURBINE DEALER. WARRANTY REPAIR PARTS ARE SHIPPED FREE OF CHARGE VIA UPS GROUND* *If expedited shipping is required the shipping method can be altered with the expedited charges being paid by the end user*		
PLEASE CONTACT BUFFALO TURBINE'S SERVICE DEPARTMENT AT 716 592 2700 FOR ANY SERVICE QUESTION YOU MAY HAVE REGARDING THE BUFFALO TURBINE BLOWERS.		

4.0 OPERATIONS

4.1 TO THE NEW OPERATOR OR OWNER

Buffalo Turbine Sprayer and/or Granular unit are designed to spray a fine mist of water particles and/or granular giving a thorough and wide-ranged coverage. Being adjustable allows a desired degree of agitation to the foliage, with enough velocity to completely carry through the tops of trees as well as through row after row of heavy thick leaf cover in row crops.

Many of the features incorporated into the machine are the result of suggestions made by customers like you. Read the manual carefully to learn to operate the machine safely and how to set it to provide maximum efficiency. The manual will take you step-by-step through your working day. By following the operating instructions in conjunction with a good maintenance program, your Blower will provide many years of trouble-free service.

Potential Mechanical Hazards while operating your machine:

Never operate the monsoon around others to prevent the possibility of being run over by equipment.

Never ride on your monsoon to prevent the possibility of being thrown off the machine or hurt severely.

Potential Crushing Hazards while operating your machine:

Between Trailer Tongue and mounting hitch on towing vehicle



WARNING:

This Product can expose you to chemicals including carbon monoxide and benzene, which are known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

4.2 BREAK-IN

Although there are no operational restrictions on the Blower when it is used for the first time, it is recommended that the following mechanical items be checked:

A. Operating for first ½ hour

1. Re-torque all wheel bolts, axle nuts and trailer mounting bolts and nuts.
2. Re-torque all other fasteners and hardware.
3. Check set screw (nozzle pulley) to ensure it tightened.

B. Operating for first 5 hours

1. Re-torque all hardware and fasteners.
2. Check set screw (nozzle pulley) to ensure it tightened.
3. Go to the normal servicing and maintenance schedule as defined in the Maintenance Section of the manual.

4.3 PRE-OPERATION CHECKS

Efficient and safe operation of the Buffalo Turbine Sprayer and/or Granular unit requires that each operator reads and understands the operating procedures and all related safety precautions outlined in this section. A pre-operation checklist is provided for the operator. It is important for both personal safety and maintaining the good mechanical condition of the machine that this checklist is followed.

BATTERY MUST BE CONNECTED BEFORE OPERATION (DISCONNECTION FOR SHIPPING).

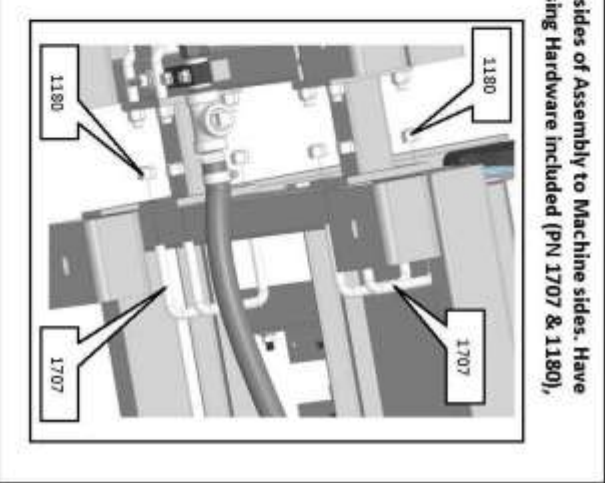
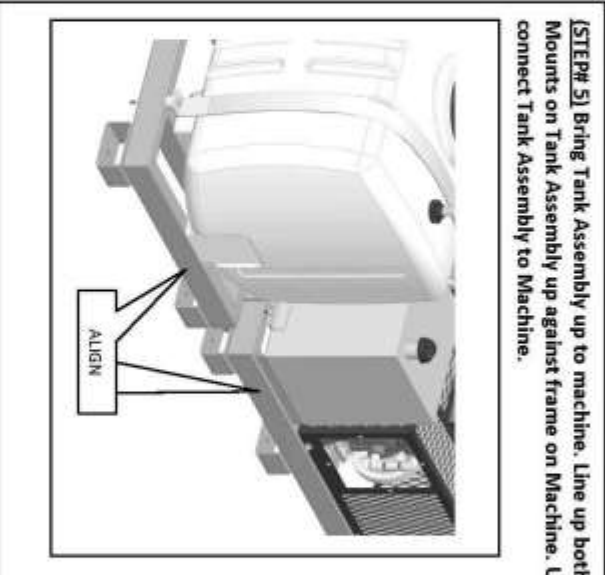
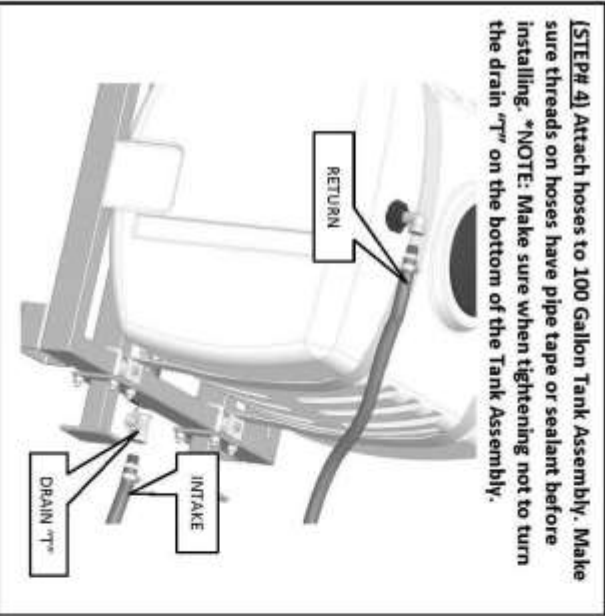
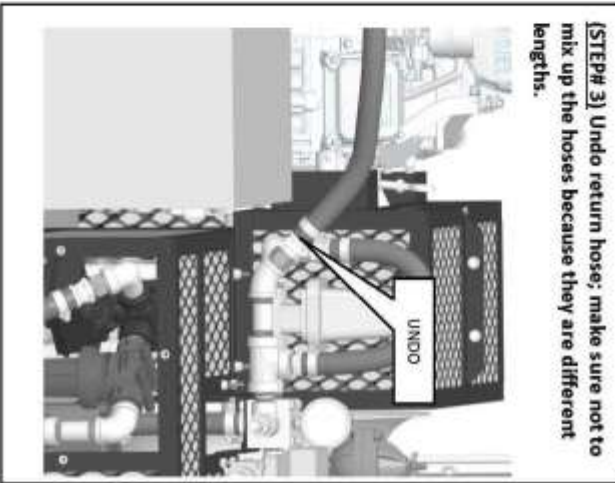
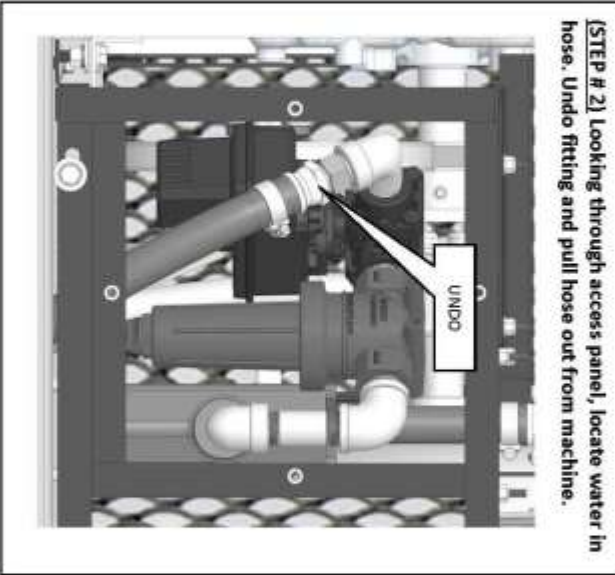
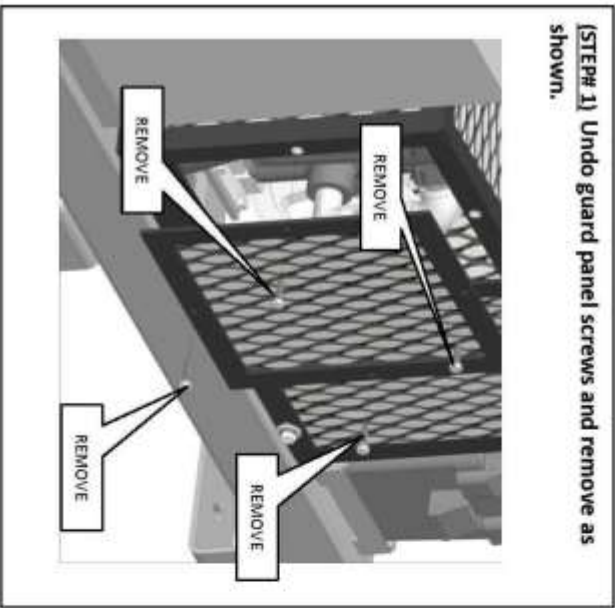
Before Operating the Monsoon and each time thereafter, the following areas should be checked off.

1. For fuel, oil, and operating information of the Kohler Engine, refer to the Manufacturers specs included with this manual.
2. The Model CS4 machines are designed to be skid mounted. For highway use or speeds above 15mph (24kph) an optional DOT approved trailer must be used.
3. Make sure all guards and shields are in place, secured and functioning as designed.
4. Check that all clamp bands are secure.
5. Check the belts and pulleys for proper tension and alignment.

CAUTION ! DO NOT ALLOW LEAVES OR DEBRIS TO ACCUMULATE ON OR NEAR THE ENGINE OR EXHAUST SYSTEM OF THE MODEL KB BLOWER, TRACTOR ENGINE OR ANY INTERNAL COMBUSTION ENGINE.

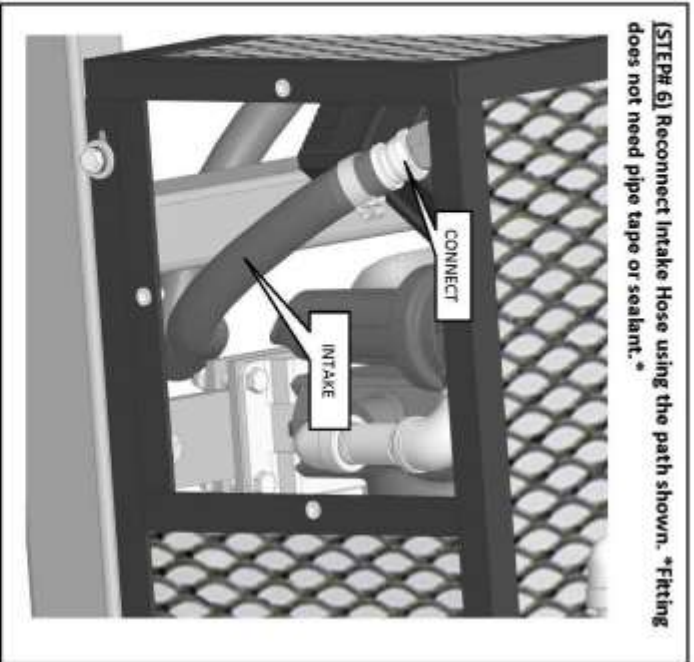
4.4 MODEL BT-CS4 Assembly Instructions

100 GALLON TANK INSTALLATION INSTRUCTIONS

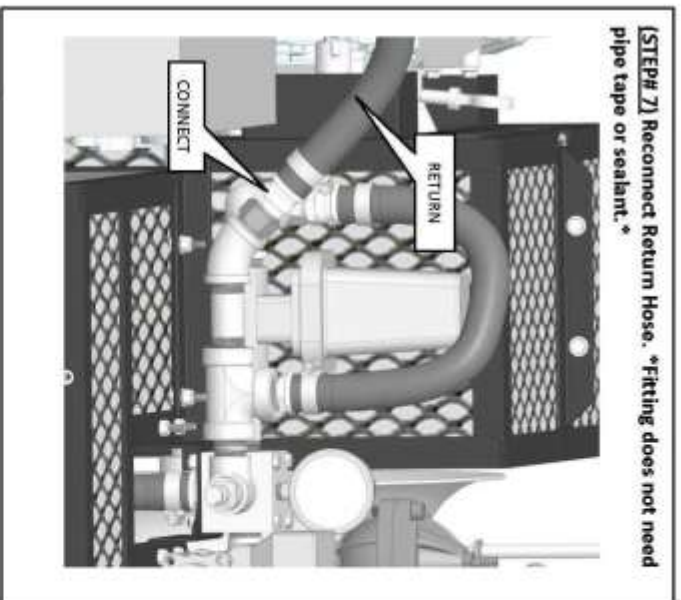


100 GALLON TANK INSTALLATION INSTRUCTIONS

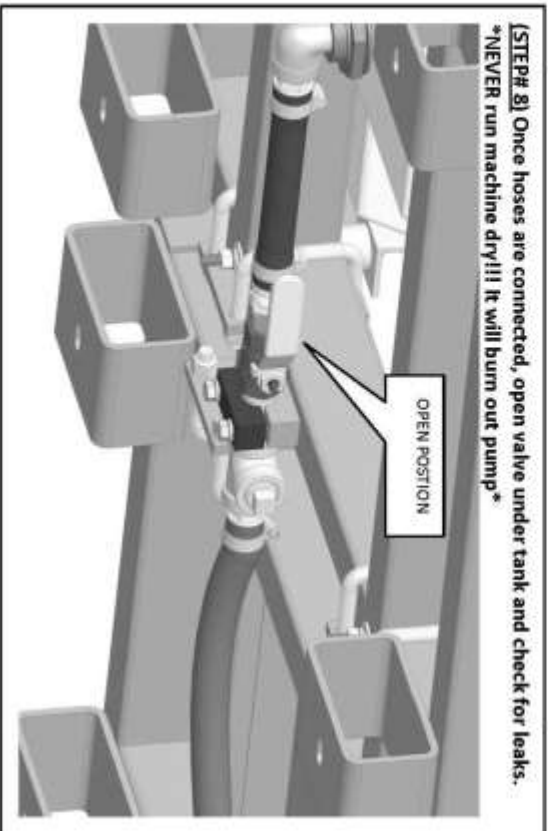
(STEP# 6) Reconnect Intake Hose using the path shown. *Fitting does not need pipe tape or sealant.*



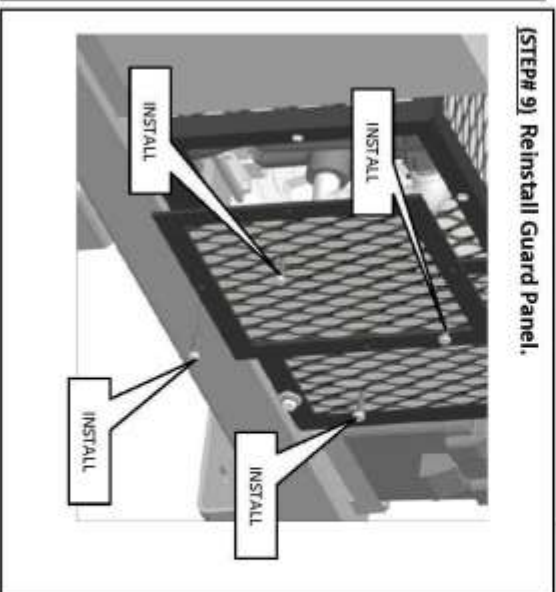
(STEP# 7) Reconnect Return Hose. *Fitting does not need pipe tape or sealant.*



(STEP# 8) Once hoses are connected, open valve under tank and check for leaks. *NEVER run machine dry!!! It will burn out pump.*



(STEP# 9) Reinstall Guard Panel.



4.5 FIELD OPERATION

1. Do not direct monsoon towards people, pets, autos, windows, etc.
2. **Starting Sprayer and/or Granular unit:** Always start engine at a lower engine speed with nozzle pointed down or away.
3. The air stream direction is changed (in either direction) by pressing the nozzle buttons on the transmitter. The nozzle will stop turning by releasing the transmitter button. ALWAYS CHECK THE GROUND CLEARANCE WHEN OPERATING THE NOZZLE IN THE DOWN VERTICAL POSITION.
4. **Stopping Sprayer and/or Granular unit:** Shut engine off above ½ throttle by turning key switch to off position to avoid engine backfire.
5. Allow the blower fan speed to come to a complete stop before disconnecting from tow vehicle.

4.6 Operating RPM (All Models)

The manufacturer's engine section normally recommends the unit be run at a RPM that will insure efficient operation. The Sprayer and/or Granular unit can operate at a slower RPM. Increase engine RPM as needed. Always try to blow with the wind.

4.7 Storage

At the end of each day and before storing the Sprayer and/or Granular unit, prepare the machine by following this procedure:

1. Select a storage area that is dry, level and free of debris.
2. Thoroughly wash the machine with a water hose to remove all debris and residue. DO NOT PRESSURE WASH
3. Run the machine at low RPM to dry the Blower Components.
4. Touch up all paint chips and scratches to prevent rusting.
5. Inspect for worn or failed components. Order the replacement parts and repair the monsoon unit when time allows. This will eliminate unnecessary down time at the start of next season.
6. Store in an enclosed building. If space is not available, cover with a waterproof tarpaulin and tie it down securely.
7. Store the machine away from areas of human activity.
8. Do not allow children to play around the stored unit.

5.0 TROUBLE SHOOTING

The Buffalo Turbine Sprayer and/or Granular unit uses a high volume and velocity of air to move material from one place to another. The system is simple and reliable requiring minimal maintenance. If you encounter a problem that is difficult to solve, even after reading through this trouble shooting section, please call your local dealer or distributor. **Before calling, please have this Operator's Manual and the serial number from your Blower ready.** In the following section, we have listed causes and solutions to the problems that you may have encountered.

TURN OFF ENGINE, REMOVE KEY, AND DISCONNECT BATTERY BEFORE SERVICING BLOWER UNITS.

INSTALL GUARDS BEFORE OPERATING

PROBLEM	CAUSE	SOLUTION
No air flow	Buildup of debris inside turbine Broken coupling (KB Series) Blower fan not turning	Remove nozzle and clean debris from inside turbine Replace coupling
Reduced or no air flow	Blower fan turns	Air intake or exhaust restricted Shut off engine Blower or tractor – remove restrictions Debris cannot be allowed to build up between the blower fan and stationary vanes
Machine vibrates or Unusual sounds	Bearing or coupling failure Out-of-balance	Replace bearings or coupling Have your dealer check blower for damaged blades. Wash and clean blower fan blades
No Liquid Spray	Toggle switch not turned on Holding tank plugged or empty Loose or broken belt Pulleys slipping Defective or worn pump Dirty strainer or nozzle screens	Turn switch on from control panel Check hoses and fill tank Adjust or replace belts Tighten set screws on pulleys Rebuild or replace pump Clean or replace strainer/nozzle screens
Granular Bin troubles	Clutch not engaged Granulars packing solid Loose or broken belts Pulleys slipping Inconsistent application	Turn switch on from control panel Check agitators Adjust or replace belts Tighten set screws on pulleys Check and clean control gates
Belts or Pulleys overheat	Belts slipping	Adjust belt tension
Engine will not start	Dead battery Battery cables dirty or disconnected	Charge or replace battery Clean and connect terminals

6.0 Machine Specifications

Model CS4 Series

Length(without trailer): 114" with nozzle assembly & 100 gallon tank attached
Length (with DOT Trailer) 166" with nozzle assembly & 100 gallon tank attached

Width(without trailer): 38"
Width(with DOT Trailer): 80"

Height(Without trailer): 38 1/2" (with Granular bin 53")
Height(With DOT Trailer): 54" (with Granular bin 73")

Weight (without trailer): TBD
Weight (with DOT Trailer): TBD
Weight(with granular bin & 100 Gallon tank): Approx. 820 lbs.
Weight(with granular bin and DOT trailer): TBD

Electrical System: 12 Volt battery / 300 CCA

Fuel Capacity: 12 gallon Unleaded Fuel only

Input Power: ECH749 Kohler Engine (EFI does not have a choke)

Input RPM: Up to 3900 RPM (more fuel economy when ran below 3600 RPM)

Outlet Size: Approximately 12"

7.0 MAINTENANCE SECTION

7.1 Maintenance Safety

1. Set Blower on a level surface, stop engine, set park brake, remove ignition key and wait for all moving parts to stop before dismounting to service, adjust or repair.
2. Reinstall and secure all guards removed for servicing before starting to use machine again. *We recommend wearing gloves when removing or installing the guard to avoid getting cut*
3. Securely support machine with blocks or safety stands when changing tires or working beneath it.

7.2 Fluids

Change oil per Manufacturer's specification (see Engine owner's manual section).

A Teflon spray type lubricant on the nozzle base and slides provides for freer rotation.

Use only a hand-held grease gun for all greasing (USE NLGI2 grease only)

7.3 SERVICE CHECKLIST

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

TURN OFF ENGINE, REMOVE KEY & DISCONNECT BATTERY BEFORE SERVICING BLOWER UNIT

CODE: LUBRICATE-(L) / CHECK-(*) / CHANGE-(C) / REPLACE-(B) / CLEAN-(CL)

SCHEDULED MAINTENANCE HOURS _____

SERVICED BY _____

MAINTENANCE

8 hrs or daily

(*) Remove all debris that has settled between the blower wheel fan and the stationary vanes.

Helps maintain peak performance.

(*) Check engine oil and fill to proper level – Do not overfill

(*) Check air filter and precleaner

(CL) Clean debris from air intake and other cooling areas on the engine

(*) Check tire pressure (Max. 50 PSI)

(*) Check Clamp Band Bolt for tightness

40 hours or weekly

(*) Check condition of coupling (center section # 1256) connecting bolts and nuts during each oil change or when experiencing vibration or unusual noises. (See page 15)

(*) Inspect battery terminals for any corrosion, broken wires, or loose connections.

(*) Remove Battery and clean debris from inside of battery box

(L) Nozzle base slides (Teflon or silicone spray)

(*) Check set screw (nozzle pulley) to ensure it is tightened

(*) Wash and Clean any dirt or grime build up that has accumulated on blower wheel fan blades. Helps to minimize vibration balance and maintain peak performance.

100hrs or monthly

(L) Pump (Hypro 5210) grease fitting on cam bearing. With a flat tool, apply a generous dab of grease to the outer diameter surface of the cam bearing at the top and bottom, where the bearing contacts connecting rod.

(L) Granular Bin

200hrs or annually

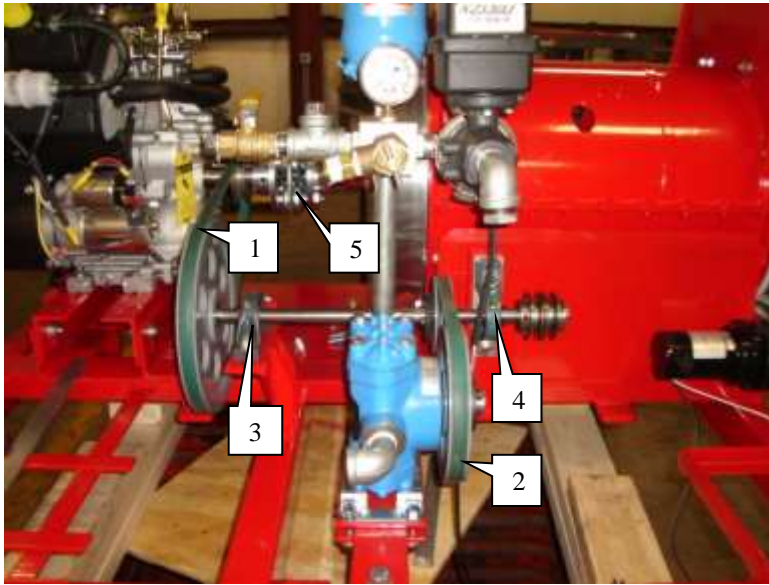
(CL) Machine

DO NOT OPERATE SPRAYER AND/OR GRANULAR UNIT WITHOUT GUARDS SECURELY ATTACHED

7.4 Belt Tension

Efficient machine operation requires that the belts always be properly tensioned.

V -belts 6930 and 6945 are used to drive the Hypro pump (shown below).



To adjust belt #1 (6945), loosen bolts on bearing #3 then move bearing in the direction of the arrow. Tighten bolts securely and check for proper tension.

To adjust belt #2 (6930), loosen pump mounting bolts at the base of the pump and move in the direction of the arrow. Tighten bolts securely and check for proper tension.

Always check the pulleys and jack shaft alignment after any adjustments are made. Replace belts that are broken, worn or stretched.

7.5 Changing the Belts

After using the Model CS4 for a long period of time, the belts will stretch and wear. To change belts, follow this procedure:

1. Turn off engine and remove key for **SAFETY**. Remove the guards around belt and pulleys.
2. Refer to the picture section 7.4 for changing the belts. To replace belt #1 (6945), loosen bearing #3 then slide the bearing toward the output shaft of the engine. The center section of the coupling (#5) will have to be removed in order to remove the old belt and install a new one. Page 28 has a detailed picture of the coupling. The center section of the coupling must be disassembled and assembled with extreme care. Damage to the coupling can result in premature bearing failure in the turbine and engine. A new bolt kit for the coupling is recommended before reassembling the coupling. **ALWAYS USE TOPLOC NUTS.** Remove the bolts from the coupling (2 ea. side of flange). Loosen setscrews on one flange only. A thread lock material is used on the threads at assembly. Heat may be needed to break that bond. Clean all dirt and rust that has accumulated on the shaft (behind the flange) then slowly wedge the center section off of the flange. Note: The flanges are counter bored to match the flange bushings. Once the center section is removed, belt #1 can be removed and a new belt can be installed. **DO NOT TENSION THE BELT UNTIL THE CENTER SECTION OF THE COUPLING IS INSTALLED.** Bolt the center section per the picture on page 28. **DO NOT TIGHTEN THE SET SCREWS AT THIS TIME.** Note position of bolts and locking nuts. Once the coupling is installed and securely tightened, check to see if the key is in position on the shaft and in the keyway of the flange. Coat the setscrews with Loc Tite (red) and securely tighten. Re check all the setscrews and coupling bolts before proceeding.
3. To replace belt #2 (6930), loosen mounting bolts (#5) under the Hypro pump and slide toward the Turbine. Remove old belt then install the new belt. Adjust the belt tension by sliding the pump assembly away from the Turbine Assembly. See section 4.2.1. in the previous section for more information. Check the pulley alignment and recheck both belts and the tightness of all bolts and set screws. **ASSEMBLE ALL GUARDS BEFORE OPERATING UNIT!**
4. To replace (4L870) Granular Bin belts (optional Granular models only) remove granular bin cover. Remove two 3/8" bolts on jackshaft right side bearing. Slide old belts off. Replace with new belts and reinstall two 3/8" bolts in pillow block, apply pressure straight down on jackshaft to give proper belt tension and tighten pillow block bolts. Reinstall guards.
5. **Install all guards before operating blower unit!**

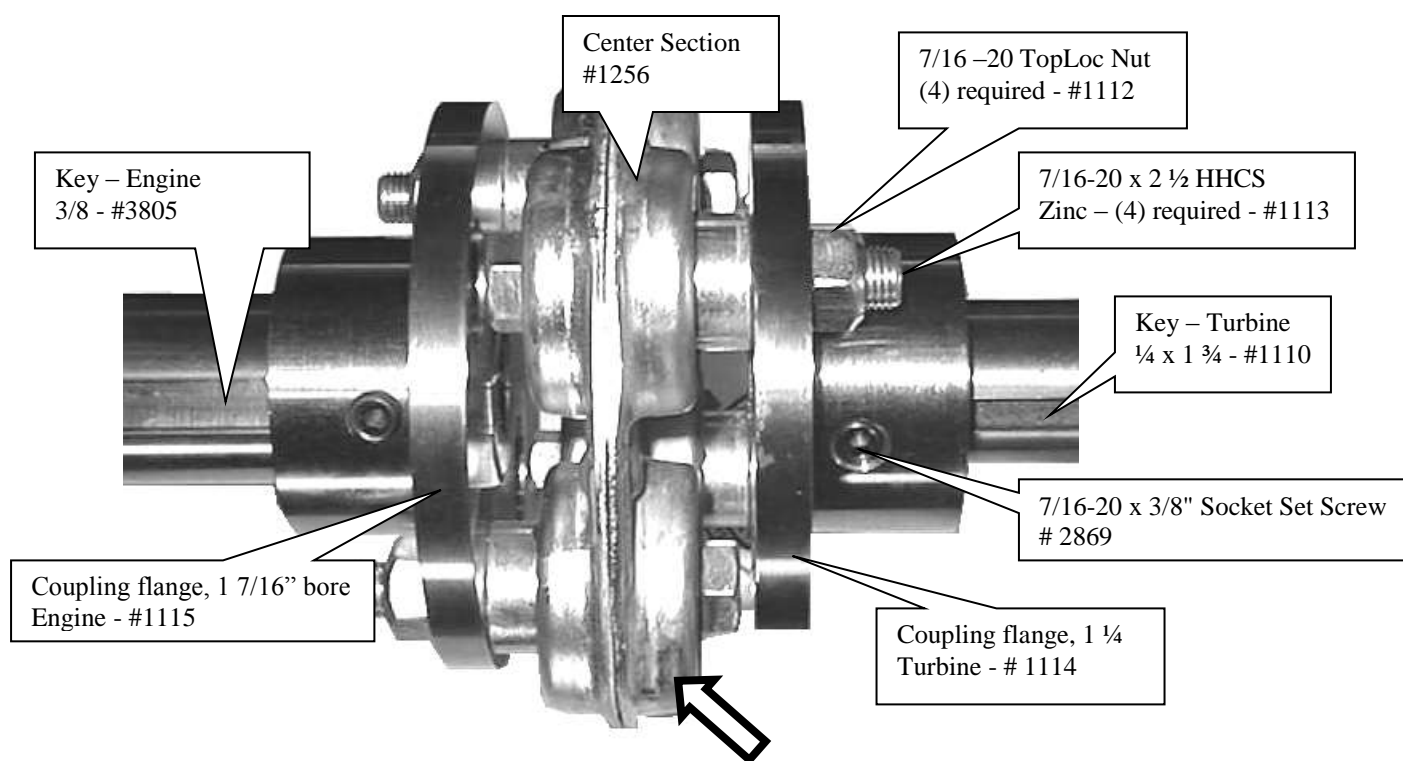
INSTALLATION INSTRUCTIONS & PARTS FOR THE MOREFLEX COUPLING

COUPLING COMPLETE, KOHLER ENGINE

PN 1110(1pc), 3805 (1pc), 1112(4pc), 1113(4pc), 1114(1pc), 1115(1pc), 1256(1pc), 2869(4pc)

ALIGNMENT OF TURBINE SHAFT WITH SHAFT OF ENGINE IS CRITICAL

1. Install keys in both shafts.
2. Slide coupling flanges on both shafts (engine and turbine shafts)
3. Place Morflex coupling CENTER SECTION between coupling flanges and secure with 4 bolts and TOPLOC nuts. The bolt heads are positioned against the coupling in alternating directions. Tighten all 4 bolts. DO NOT TIGHTEN SET SCREWS AT THIS TIME.
4. Check key for proper position under the set screw hole on both shafts.
5. Place several drops of Loctite 271 into these two holes only. Set screws and tapped screw holes must be free of dirt and oil for Loctite to work properly.
6. Install the set screws over the keys and tighten firmly.
7. Using a drill point, dimple each shaft through the other 2 set screw holes. Clean drill chips, oil and dirt before applying Loctite.
8. Place several drops of Loctite 271 in these 2 holes.
9. Install and tighten set screws in these 2 holes.
10. Check and retighten the 4 bolts that hold the coupling center section in place.
11. Visually inspect the unit and replace the guard. DO NOT OPERATE WITHOUT THE GUARDS IN PLACE.

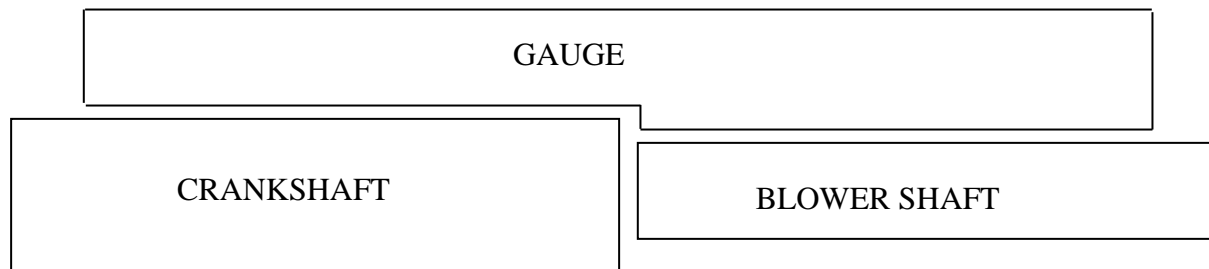


Part # 1256 (center section) is a **“WEAR”** item that should be visually checked each time the engine oil is changed. This coupling is equipped with special lock nuts. Occasionally check that all 4 nuts are securely fastened. **LOOK FOR CRACKS IN THE RUBBER COMPOSITION THAT SURROUNDS THE 4 BUSHINGS. Replace the center section when the rubber composition begins to show ANY signs of cracking OR an increase in vibration OR unusual sounds. When in doubt, call our Service Department.**

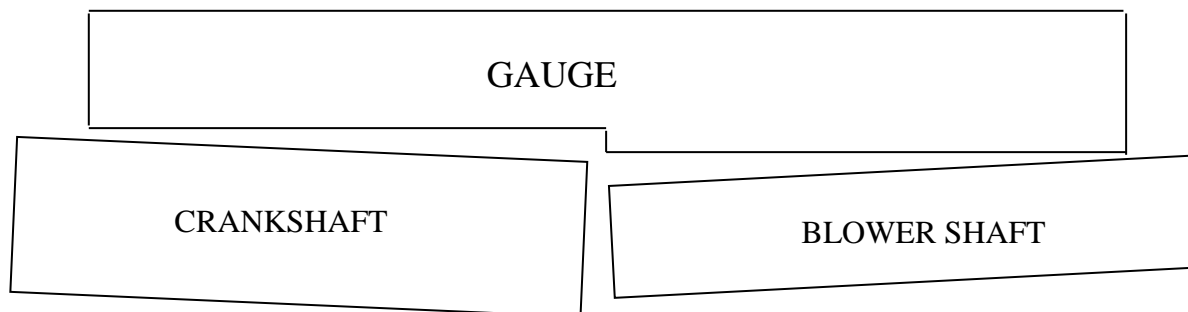
MOUNTING BLOWER ASSEMBLY ONTO FRAME **AND ALIGNMENT RECOMMENDATIONS**

1. Install blower assembly onto frame and tighten all of the bolts.
2. Remove all burrs and oil from the shafts and keyways (engine and blower shafts).
3. Using the supplied gauge, align the shafts parallel to each other (very important).
4. Check in four places around the shafts at 90° to each other.
5. When properly aligned, gauge should have little to no gap between itself and the shafts at any point along the gauge.
6. To adjust, move the engine. The 2 mounting brackets have tapped holes in each corner to help support and adjust the position of the engine. The 4 roll pins may need to be repositioned after alignment is completed and bolts are tightened.
7. Tighten all engine bolts and recheck alignment. Drill and install 4 roll pins in new position.

ACCEPTABLE



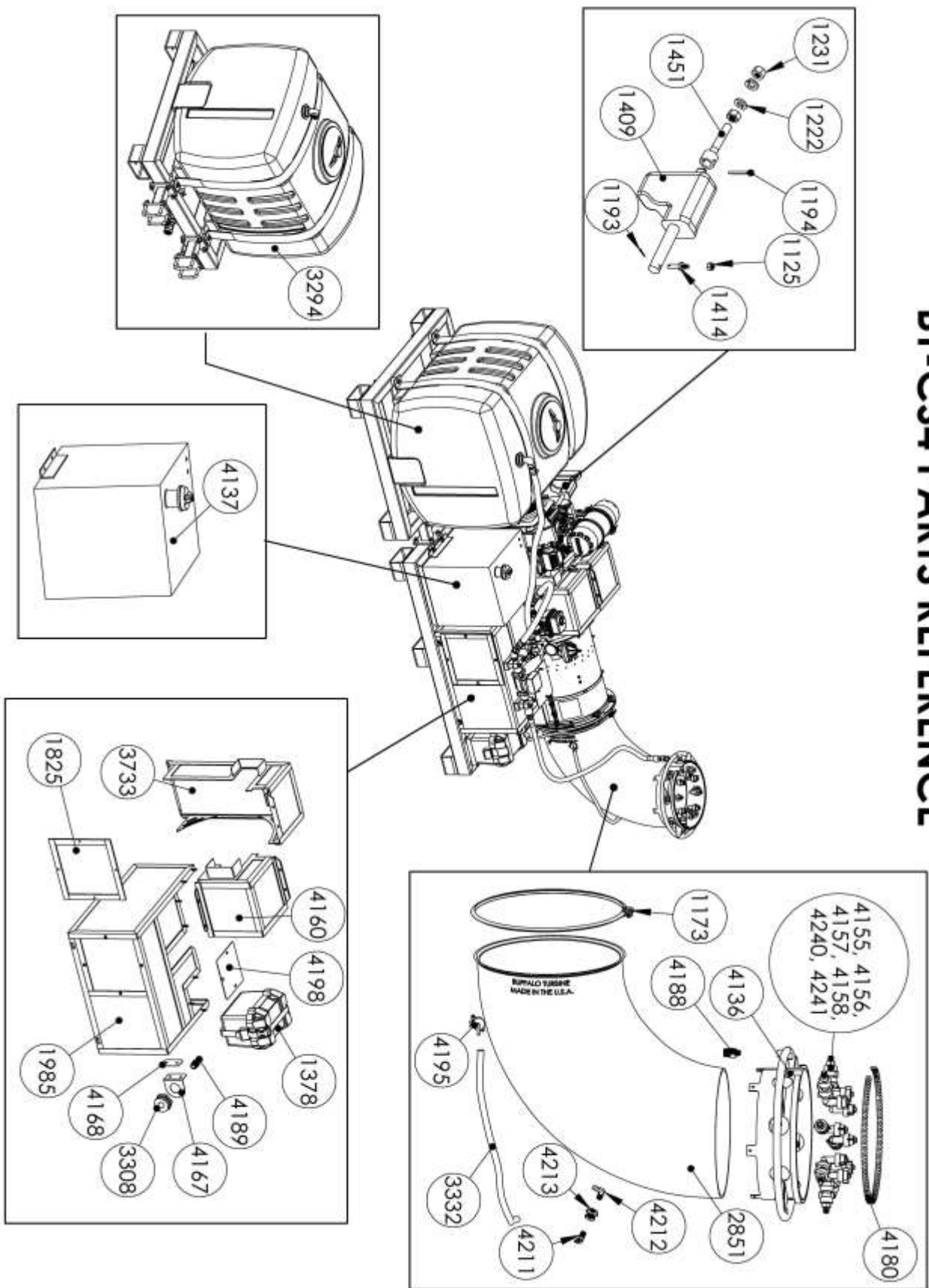
NOT ACCEPTABLE



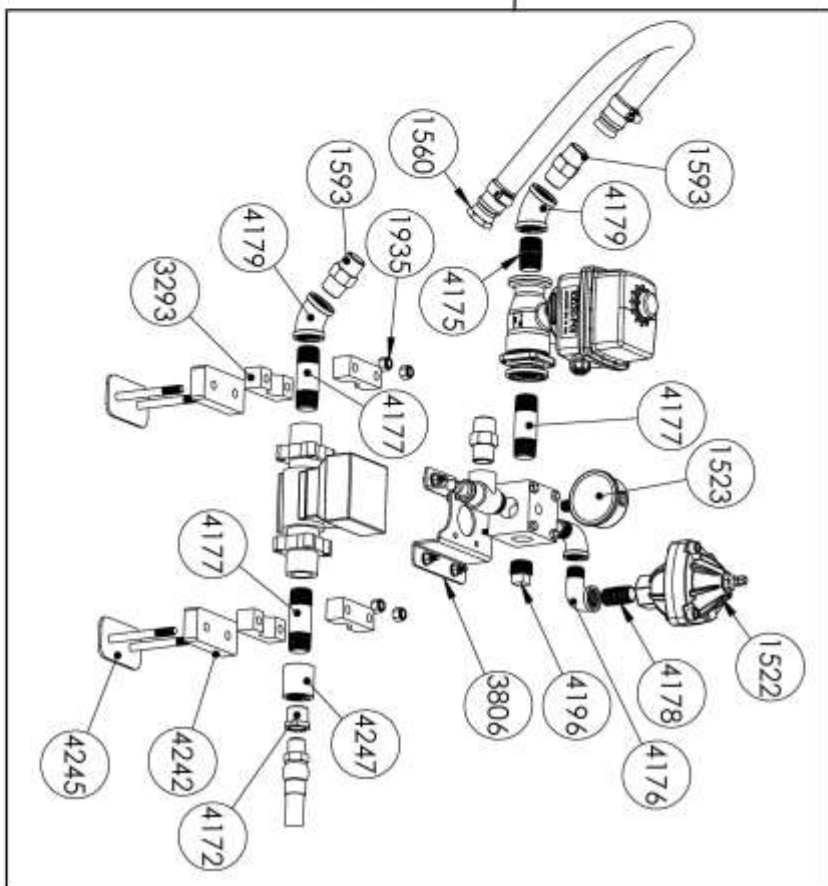
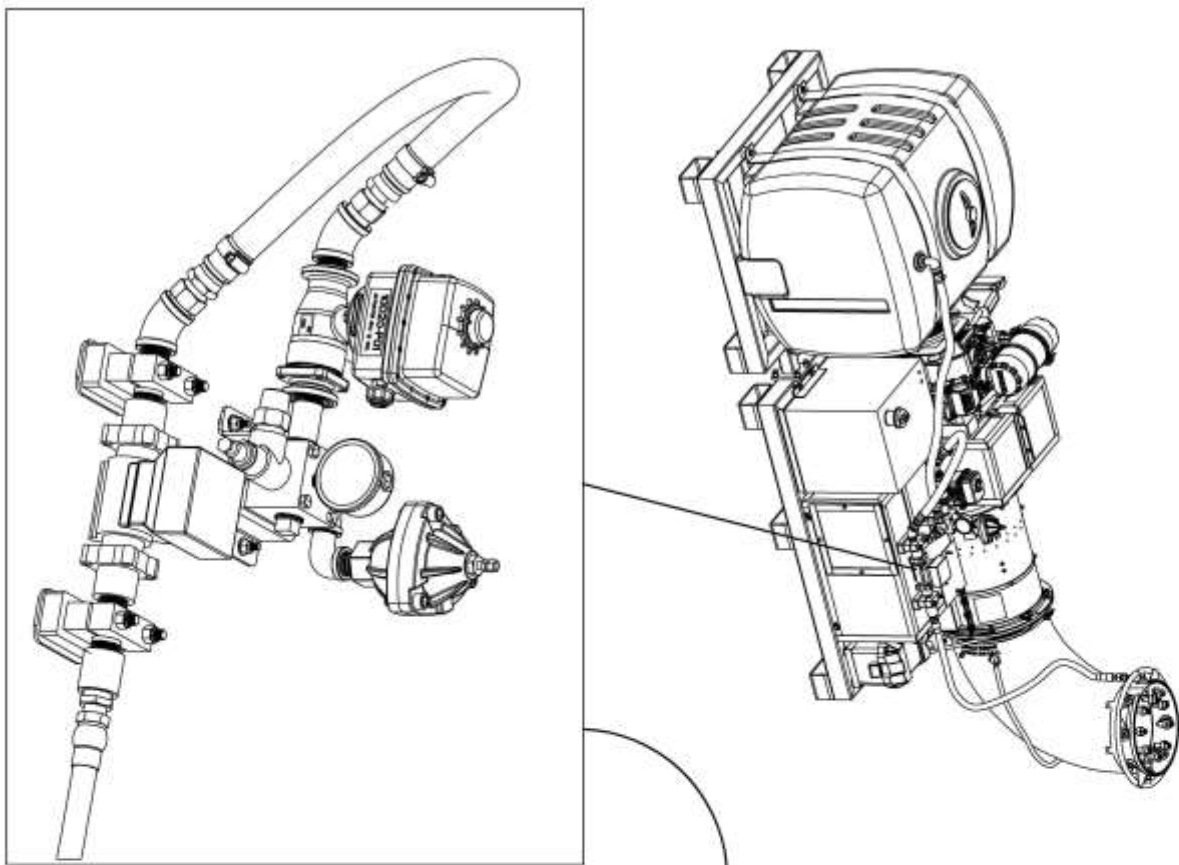
SECURELY ATTACH GUARDS BEFORE OPERATING BLOWER UNITS

BILL OF MATERIALS FOR BT-CS4			
REF PAGE #	PN	DESCRIPTION	QTY
	1100	3/8-24 X 1-1/4 HHCS ZINC GR 5	16
	1101	3/8-24 X 1-1/2 HHCS ZINC GRADE 5	7
	1102	3/8-24 X 1-3/4 HHCS ZINC GRADE 5	8
	1103	3/8-24 X 2 FACED HEAD SCREW ZINC GRADE 5	2
	1104	3/8-24 X 2 HHCS ZINC GRADE 5	9
	1105	3/8-24 HEX NUT ZINC PLATED GRADE 5	33
	1107	3/8 LOCK WASHER ZINC PLATED	42
	1108	3/8 FLAT WASHER ZINC PLATED	46
	1109	3/16 X 1/2 ROLL PIN	4
	1110	KEY, 1/4 X 1-1/2	2
	1112	7/16-20 TOPLOC NUT GRADE 5 ZINC	4
	1113	7/16-20 X 2-1/2 HHCS ZINC GRADE 5	4
	1114	COUPLING FLANGE 1-1/4 BORE	1
	1115	COUPLING FLANGE 1-7/16 BORE	1
24	1119	14-221-D1 BELLMOUTH	1
	1123	M8 X 1.25 X 1/4 HHCS	1
21	1125	1/4-20 NYLOC NUT ZINC	16
	1130	5/16-18 X 3/8 SET SCREW	1
	1131	3/8-16 X 3/8 SET SCREW	1
	1132	300 CCA BATTERIES FOR KB'S UIL-4	1
24	1138	PLASTIC SLIDES	3
	1139	3/8 NOTCHED WASHER	10
24	1142	AX54 V-BELT	1
24	1144	ROTATION MOTOR BRACKET	1
24	1145	SHEAVE AK32 X 1/2	1
	1146	10-32 X 5/8 SHCS	4
	1156	SERIAL TAG	1
	1158	1/4" GAS LINE	56
	1166	COV 1/2 X 1/4 WIRE CLAMP	5
	1168	HC-4M SS HOSE CLAMP	5
	1169	1/4-20 X 1HHCS ZINC	10
	1170	1/4-20 HEX NUT	2
21	1173	CLAMP BAND W/ BOLT & NUT	1
	1187	8 X 10 BT DECAL	1
21	1193	1/16 X 1/2 COTTER PIN	1
21	1194	3/16 X 1-1/2 COTTER PIN	1
	1218	BOLT, 1/2 PUSHOVER	1
21	1222	1/2 LOCK WASHER ZINC	4
	1223	1 X 1/2 X 3/16 THICK WASHER	2
	1226	1/2 FLAT WASHER	3
21	1231	1/2-13 HEX NUT	2
	1237	1/4-20 HEX NUT	2
24	1239	FRAME, CSII SPRAYER	1
23	1247	1/4 PILLOW BLOCK BEARING	2
	1256	MOREFLEX CENTER SECTION	1
	1258	1/4-20 X 1/4 HHCS	4
	1259	1/4 LOCKWASHER	6
24	1308	PUMP MOUNT PLATE FOR CSII	1
24	1315	PUMP MOUNT PUSHOVER PLATE	1
24	1359	ENGINE RAIL	2
21	1378	PLASTIC BATTERY BOX AND COVER	1
21	1409	LINEAR ACTUATOR - 4" STROKE	1
21	1414	REMOTE THROTTLE PIN	1
	1415	1/4"FLAT WASHER	17
21	1451	ACTUATOR MOUNT, PIN	1
23	1487	MANIFOLD BLOCK, ALUMINUM	1
	1499	NUT PLATE, 3/8	4
24	1510	PUMP MOUNT BAR FOR CSII	1
23	1520	HYPRO PUMP 5210C	1
23	1521	1/4" PRESSURE RELIEF VALVE	1
22,23	1522	HYPRO SURGE TANK	1
22,23	1523	0-300 PSI PRESSURE GUAGE	1
	1540	5/16 LOCK WASHER, ZINC	1
23	1555	SHEAVE, BK 100H	1
	1558	807-31 1/2" FEMALE COUPLAMATIC HOSE END	1
	1559	3/4" MALE PUSH ON FITTING	3
22	1560	3/4" FEMALE PUSH ON SWIVEL FITTING	5
23	1562	SHEAVE, BK40 H	1
23	1563	H 3/4 " BUSHING	2
23	1586	PULLEY, 3-3/8 X .850 WIDE	1
23	1589	6945 GATES V-BELT	1
22	1593	3/4" BRASS HEX NIPPLE	5
	1596	3/16 SQUARE X 1-3/8 KEY	2
	1597	ALUMINUM SPACER 3/8 X 1-1/2 X 5.1	1
	1599	1/4-20 X 1-3/4 HHCS ZINC GR 5	2
23	1648	H X 1" BUSHING	1
	1669	1/4-20 X .055 HEAD INSERT	2
	1720	1/2" GOODYEAR ORTAC HOSE	60
	1727	PUMP PUSHOVER BOLT FOR CSII	1
	1732	1/4" GOODYEAR ORTAC HOSE	111
21	1825	PUMP GUARD ACCESS PANEL	1
22	1935	3/8-24 NYLOC NUT ZINC PLATED	6

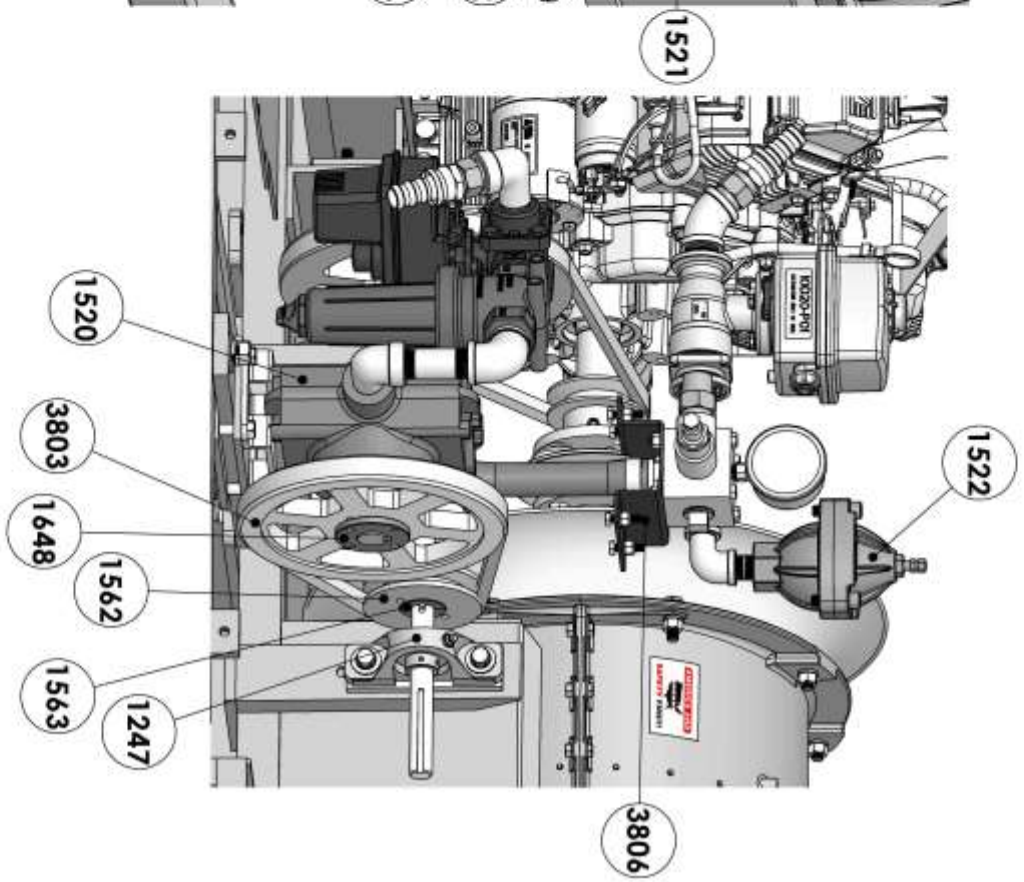
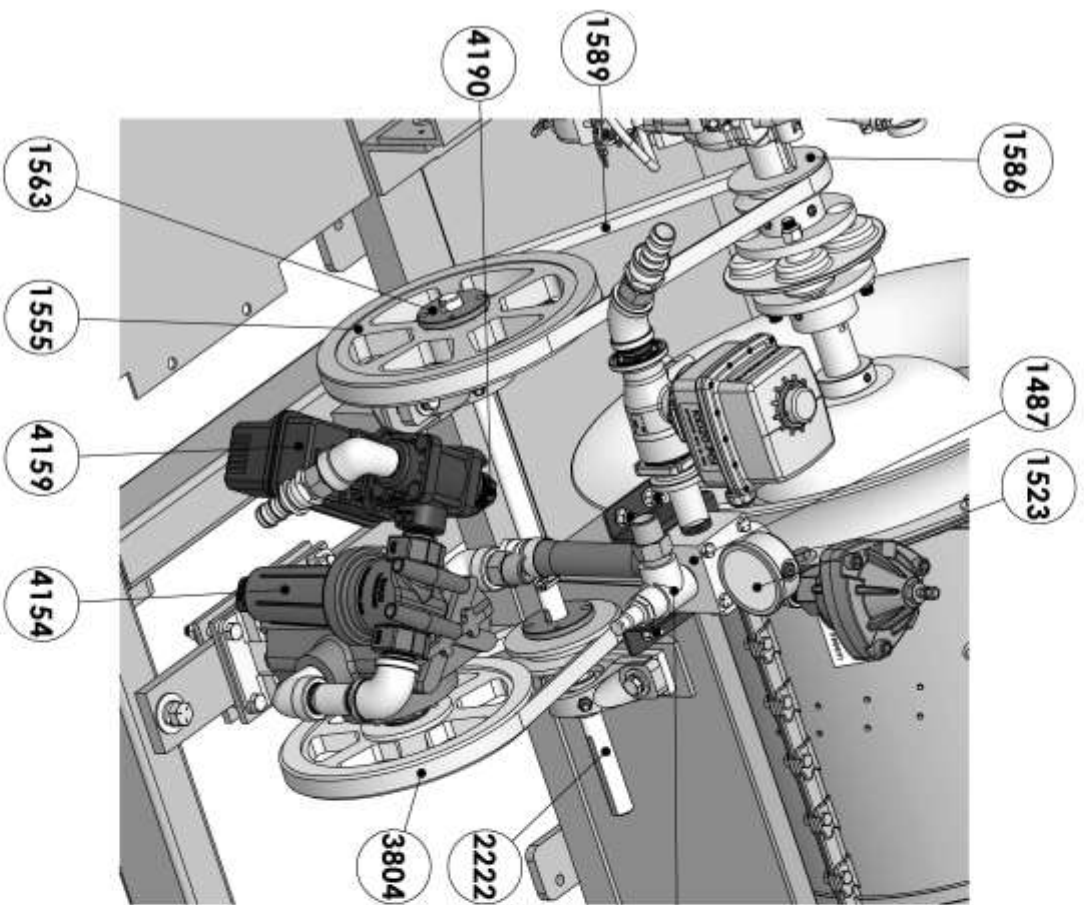
BT-CS4 PARTS REFERENCE



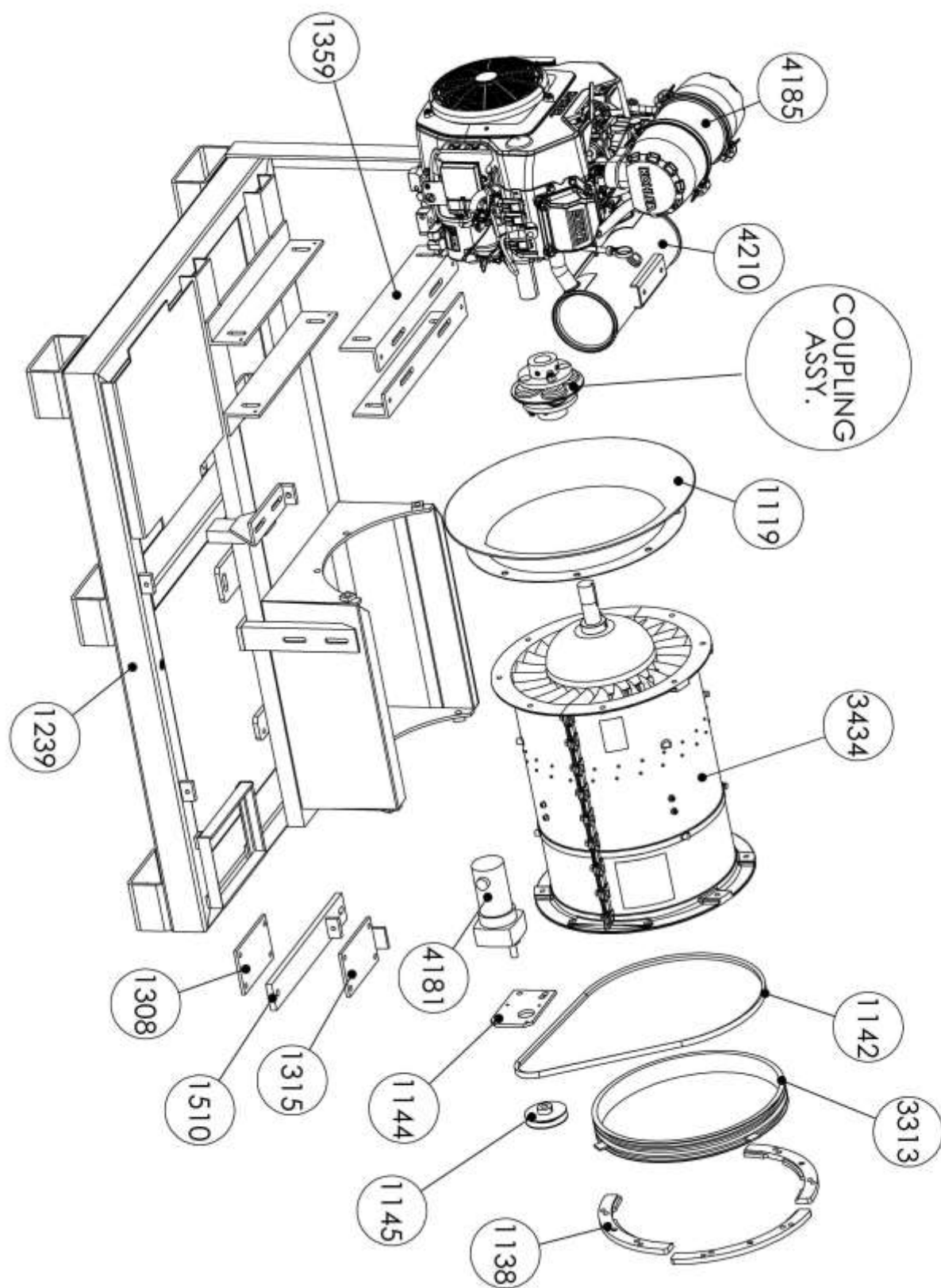
BT-CS4 PARTS REFERENCE



BT-CS4 PARTS REFERENCE



BT-CS4 PARTS REFERENCE



Installation, Operation, Repair and Parts Manual

Description



SERIES 5200C

Cast Iron Big Twin Piston Pump

Max. Flow Rate: 8 gpm (5206) @ 800 rpm
	10 gpm (5210)
Max. Pressure: 400 psi
Max. Speed: 800 rpm (5206)
	600 rpm (5210)
Ports: 3/4" NPT inlet
	3/4" NPT outlet
Shaft: 1" solid
	1-3/8" hollow shaft

The Hypro Series 5200 Big Twin® piston pump is suitable for applications in high pressure washers for industrial and agricultural cleaning needs. It is also useful as a sprayer pump to apply a wide range of chemicals.

The Series 5200 is constructed of cast iron body and cylinder heads, unitized stainless steel valve assemblies and double row ball bearing supported crankshaft. Three cup materials are available to meet specific pumping needs. They are:

Leather—for pumping aromatic solvents and other chemicals damaging to rubber.

Fabric—for pumping most insecticides, herbicides and fertilizers.

Buna-N Rubber—for pumping soap and detergent solutions and some fertilizers.

Two crankshaft options are available—1" solid shaft for belt and pulley or flexible coupling drive, or 1-3/8" hollow shaft for direct mounting onto a 6-spline 540 rpm PTO shaft.



Safety Information

- Warning:** Do not pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in explosive atmospheres. The pump should be used only with liquids compatible with the pump component materials. Failure to follow this warning can result in personal injury and/or property damage and will void the product warranty.
- Be sure all exposed moving parts such as shafts, couplers and adapters are properly shielded or guarded and that all coupling devices are securely attached before applying power.
- Pumps mounted directly on to PTO shaft or other power shaft must be prevented from rotating with the power shaft by use of a torque arm. Pump must float freely on the power shaft and must not be tied rigidly to equipment on which it is mounted.
- Do Not Exceed** recommended speed, pressure and temperature for pump and equipment being used.
- Before Servicing**, disconnect all power, make sure all pressure in the system is relieved, drain all liquids from the system and flush.
- Secure the discharge lines before starting the pump. An unsecured line may whip, causing personal injury and/or property damage.
- Check hose for weak or worn condition before each use. Make certain that all connections are tight and secure.
- Periodically inspect the pump and the system components. Perform routine maintenance as required (see Maintenance section).
- Protect pump from freezing conditions by draining liquid and pumping rust inhibiting antifreeze solution through the system, coating the pump interior.
- Use only pipe, hose and fittings rated for the maximum psi rating of the pump.
- Do not use these pumps for pumping water or other liquids for human or animal consumption.

Drive Source Installation

This manual will cover the installation of the basic drive configurations available for the Hypro Big Twin Piston pumps. Consult the manufacturer of your motor or engine

for additional information. Read all instructions and general safety information before attempting to install or operate the pump.

Belt/Pulley Drive Installation

Mounting Belts and Pulleys

Mount pulleys as close to pump and motor engine shaft bearings as possible. Check alignment with a straight edge as shown in Fig. 1. Make sure that belt has proper tension. (Too much tension will cause bearing wear; too little will cause slippage.) See Fig. 2. Check with belt and pulley sources for specific recommendation.

To figure proper diameter of pump pulley, multiply the motor/engine rpm by the diameter of the motor/engine pulley and divide that figure by desired pump speed.

$$\frac{\text{Pump Pulley Size}}{\text{Motor RPM} \times \text{Motor Pulley Size}} = \text{Desired Pump Speed}$$

Refer to the pump performance chart on Page 5 to determine the desired speed to obtain the desired maximum flow.

NOTE: Shaft rotation can be either clockwise or counter clockwise.

Four points of contact indicate alignment.

NOTE: Pump may be mounted in other orientations with respect to the motor or engine.

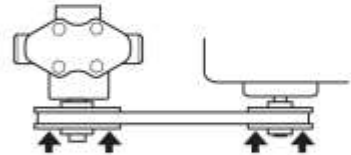


Figure 1

Push the belt midway between the pulleys, check the deflection (d) and adjust:

$$d = 0.016 \times L$$

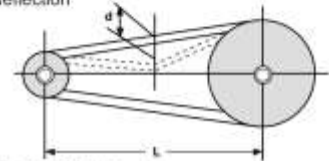


Figure 2

⚠ Caution:
For safety, always install a shield over rotating shafts and belts.

Direct Drive - Flexible Coupling Installation

First, slide coupling ends onto motor/engine and pump shafts as far as possible (Fig 3). Mount motor/engine and pump onto base, shimming pump or power unit so that shafts are aligned. Leave enough space between ends of shafts to allow coupling disc to be inserted. When alignment is made, slide coupling ends over coupling disc. Leave clearance between coupling ends and center disc. Tighten screws in both coupling ends. For electric motor drive, use couplings rated at least twice the horsepower required to operate pump. For gas engine drive, select couplings rated at three times the required pump horsepower.

⚠ Caution:
For safety, always install a shield over rotating shafts and couplings.

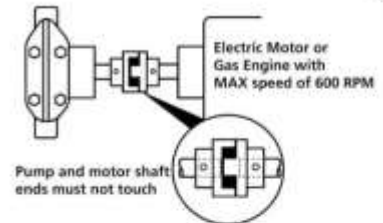


Figure 3

Direct Drive - Hollow Shaft Installation

Hollow shaft models may be mounted directly onto power shaft — motor or engine shaft, truck or tractor PTO shaft. **Important:** When direct mounting a hollow shaft pump, **Do Not** rigidly mount the pump base. The pump must be allowed to “float”. Secure a torque arm with a chain or flexible fastener to the frame or base, directly below and in-line with the pump. This prevents the pump from rotating with the shaft. Always check to see if the pump will turn by hand to ensure that the pump rotates freely. **Do Not** apply power to a pump where the shaft doesn't rotate freely.

⚠ Caution:
For safety, always install a shield over rotating shafts and couplings.

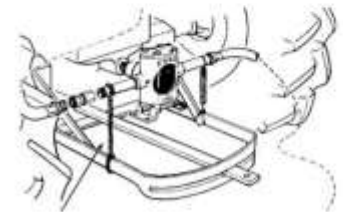
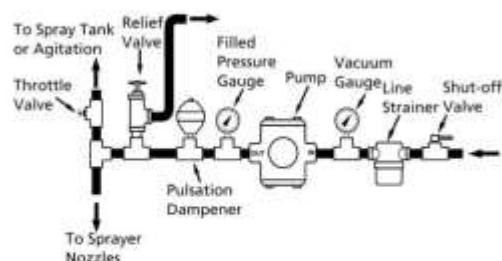


Figure 4

System Installation

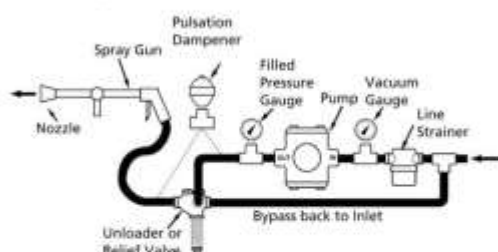
Series 5200 Pump Hookup to Boom for Chemical Spraying



Note: A pulsation dampener such as our Model No. 3375-0017 or 3375-0015 must be installed on the outlet side for optimum performance and maximum life. For the proper operation of some unloader valves, it may be necessary to install a pulsation dampener downstream from the unloader valve; however, for optimum system dampening, it may be installed upstream from the unloader valve provided that the unloader valve will still function properly.

Figure 5

Series 5200 Pump Hookup for Pressure Washing



Piston Pump Installation

Accessories should be installed with solid piping and be mounted as close to the pump as possible. Hose must be used right after accessories. **Note:** If remaining installation is solid piping, a two to four foot length of hose must be installed between accessories and solid piping.

Hose

Selection of the right size and type of hose is vital to good performance. Be sure to hook up to proper ports on pump (note markings "IN" and "OUT" on pump castings).

Suction Hose

Always use genuine suction hose of at least the same inside diameter as pump ports. Hose should have some elasticity, but not overly soft so that it collapses. Use 3/4" (ID) hose or larger for a Series 5200 pump. If suction hose is over 6 feet long on Series 5200 use next larger size hose. Keep suction hose as short as possible and restrictions such as elbows, check valves, etc. at a minimum.

Discharge Hose

High pressure pumps require the use of special high pressure discharge hose (2 rayon braid or equivalent). Use a hose rated at least 50% greater than the highest operating pressure required of pump. Example: If required pump pressure is 200 psi, use discharge hose rated at minimum of 300 psi working pressure.

Unloader or Relief Valve

The unloader or relief valve has a very important safety function in your piston pump hook-up. The valve protects the pump by unloading or bypassing the pump's flow when gun is shut off or discharge is otherwise blocked.

Strainers

Use a suction line strainer with an open screen area of at least 3 to 5 times the suction port area. For example, an area of approximately 2-1/3 to 4 square inches for a 1" suction port. Be sure the screen is suitable for the liquid being pumped. Keep filter clean. A clogged strainer will cause cavitation, which usually leads to a poor performance, wear and failure of pump parts.

Vacuum Gauge (Optional)

Pump should not be subjected to high suction line vacuums. To check on this, install a vacuum gauge at pump inlet. Generally, it should not read over 5 inches of mercury.

Suction Line Shut-Off

This suction line accessory allows the pump to be removed for service without draining the tank. Be sure valve is open before starting pump.

Pulsation Dampener

A Series 3375-0015 pulsation dampener is recommended for all models. This device absorbs the shock and smooths out the pump discharge pulsations, providing smoother operation. A charge of 50% of operating pressure is normally optimum.

Pressure Gauge/Dampener

Use gauge capable of reading double the pump working pressure. Use a filled gauge or a gauge dampener to protect the gauge needle against pressure surges to provide easier reading and longer life.

Spray Gun

Use a Model No. 3381-0010 spray gun or a 3381-0013 Turbo 400 spray gun with the correct nozzle. For 5206 models, use a 3385-3000 nozzle and for the 5210 models use a 3385-4000 to obtain a maximum pressure of 400 psi.

Operation

Priming

If liquid is below level of pump, some means should be provided in installation to prime pump - such as a riser pipe. If there is a suction lift, use a foot valve or check valve to hold prime. In general, keep suction lift to minimum and avoid unnecessary bends in suction line. Before starting pump, make sure air bleeder valve or spray gun is open - or unloader/relief valve is adjusted to its lowest pressure. After starting pump, open and close gun several times if necessary to aid priming the pump. If pump does not prime within a few seconds, stop motor and inspect installation for suction line leaks or obstructions. Make sure that strainer is not clogged. Be sure that suction line is not obstructed, kinked or blocked.

If pump is to operate hours at a time, check frequently for:

1. Adequate liquid supply. Pump must not run dry for more than 30 seconds.
2. Temperature rise. Overheating is harmful to bearings and piston cups.

Care of Pump

Your pump will last longer and give best performance when properly taken care of. Proper pump care depends a lot on the liquid being pumped and when the pump will be used again.

Generally, after each use, flush pump with a neutralizing solution for the liquid just pumped. Follow with a clear water rinse. This is especially important for corrosive chemicals. Then flush out pump with a 50% solution of automotive radiator anti-freeze (ethylene glycol-type such as Prestone, Zerex, etc.) containing a rust inhibitor.

While this flushing is not absolutely necessary for short periods of idleness (as over night) it is good practice to clean the pump after each use to prevent deposits from forming and damaging the pump. The antifreeze not only coats the interior of the pump with an inhibitor, but acts as a lubricant as well, keeping the valves from sticking and protecting against any remaining moisture freezing in cold weather.

For infrequent use and before long periods of storage, drain pump thoroughly. Open any drain plugs, remove suction hose from liquid and run pump "dry" from 0 to 30 seconds (not longer). Flush with a 50% solution of anti-freeze and water. Then, plug both ports to keep out air until pump is used again.

Lubrication

Use a small push-type grease gun to lubricate Hypro Series 5200 Piston Pumps. **Do not use airpowered or hand lever operated grease guns** as they develop too much pressure and may cause damage to the sealed cam bearing. Lubricate a minimum every 100 hours or when bearing appears to need grease. Use Moly-Lithium No. 2 wheel bearing grease.

Exception: In applications where FDA approval is required, use one of these greases: Chevron FM#2, Mobile FM#2 Keystone (Penwalt Corp.) Nevastane SP Medium.

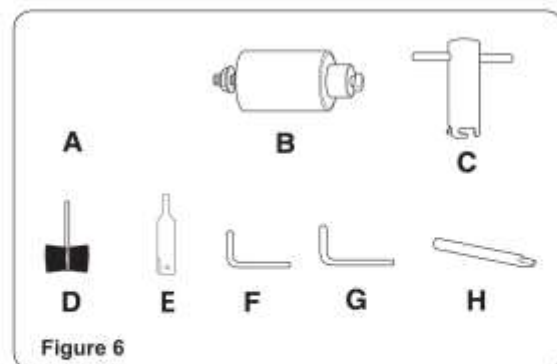
Do not under-grease or premature bearing failure may result.

Do not grease excessively. Remove (do not **WASH** out) any excess grease from pump cavity to prevent grease buildup.

Repair Instructions

Recommended Repair Tools For Hypro Big Twin Piston Pumps

Ref.	Description	Part No.
A	Internal External Pliers (not shown)	3010-0084
B	Valve Seat Extractor	3010-0130
C	Valve Cage Extractor	3010-0052
D	Wire Brush	3010-0066
E	Wire Brush Holder	3010-0067
F	Allen Wrench	3020-0009
G	Allen Wrench	3020-0008
H	Sleeve Extractor	3010-0064
	Tool Box (not shown)	3010-0168



Model 5206C Performance

	25 PSI			100 PSI			200 PSI			300 PSI			400 PSI		
RPM	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM
400	3.9	.26	3.9	.40	4.0	.66	3.9	.89	3.9	1.1					
500	4.9	.29	5.0	.46	5.0	.75	5.0	1.1	4.9	1.4					
540	5.4	.31	5.4	.50	5.4	.81	5.3	1.2	5.3	1.5					
600	6.0	.34	6.0	.56	6.0	.90	5.9	1.3	5.9	1.6					
700	7.0	.40	7.0	.65	6.9	1.1	6.9	1.5	6.9	1.9					
800	8.0	.46	7.9	.74	7.8	1.2	7.7	1.7	7.7	2.2					

Model 5210C Performance

	25 PSI			100 PSI			200 PSI			300 PSI			400 PSI		
RPM	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM
400	7.3	.39	7.3	.69	7.2	1.2	7.2	1.7	7.2	2.1					
500	8.9	.57	8.9	.87	8.8	1.5	8.8	2.0	8.7	2.6					
540	9.4	.66	9.4	.94	9.3	1.6	9.3	2.2	9.2	2.7					
600	10.0	.73	9.9	1.10	9.9	1.7	9.8	2.3	9.8	3.0					

Disassembly

1. Remove nameplate and both cylinder heads with a 9/16" combination wrench or socket.
2. Remove both piston cap screws with 1/4" allen wrench.
3. Remove piston cup spreader seal ring with O-ring piston guide and support ring.
4. Place the body into a vise as shown in Fig. 7. With care, drive out the cylinder sleeves using the sleeve extractor tool and a hammer.
5. Remove connecting rod.

Figure 7



Figure 8

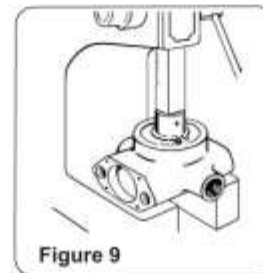


6. Remove the four valves, using the valve seat extractor to pry out the seat (See Fig. 8). Use a valve cage extractor tool to remove each spring retainer. Lift out the other parts, using penetrating oil as necessary to loosen parts.
7. Place the pump body onto an arbor press with the shaft end of the pump up. Press the crankshaft and bearing out of the pump body (See Fig. 9). The main bearing will come out with the crankshaft.
8. Sand the body ends and cylinder heads (mating surfaces) lightly to remove all foreign material. Use a belt sander, flat sanding block or flat file.
9. With wire brush mounted in an electric drill, clean all valve cavities, sleeve cavities and ports. Wash pump body out with solvent and let dry.

Inspection of Pump Parts

Before reassembling the pump, thoroughly inspect all parts, with special consideration given to following points:

- a. Inspect the pump body for erosion at all O-ring seal points and in valve and sleeve holes. Check main bearing housing for proper bearing fit. Check for cracks at the ports.
- b. Check for excessive wear in the cylinder heads. This can result from erosion and/or valve seat hammer.
- c. Check crankshaft assembly for general wear. Rotate main and cam bearing to check for roughness due to moisture or lack of grease damage. If bearings do not turn smoothly or appear to be damaged, they should be replaced. See section on **replacing bearings** in this manual.
- d. Carefully inspect cylinder sleeves. Polish sleeves not more than .008" — using No. 120 grit emery cloth. For final finish use a fine No. 320 grit emery cloth. If at this point all grooves have not been removed, replace the parts. **Note:** If there is some pitting only at the top of the sleeves, they can still be used. Grooves are more likely to be the problem here instead of pitting.



- e. Inspect the piston guides for chips, cracks and score marks. Compare guides with new one. If there is noticeable amount of clearance between the guide and sleeve wall, the guide should be replaced.

- f. Check for erosion on the underside of piston cup screw head. **Note:** The condition of the screws is very important - if there is erosion or grooves, leakage will occur.

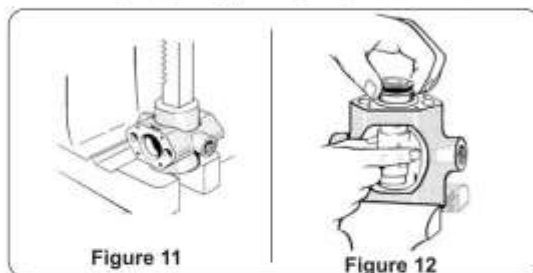


Figure 10

- g. Next check the connecting rod for wear. If there are visible signs of wear or damage to the hard coating, the connecting rod should be replaced. If there is more than .005" of wear, the connecting rod should be replaced. A worn connecting rod results in low volume, low pressure and a hammering sound. If not replaced, this situation will damage the cam bearing as well.
- h. The valve seat, poppet, spring and guide in valve sets should be carefully inspected for cracks, pitting, etc. and replaced as necessary. Note in particular the seat and matching poppet; replace both - as a set - if one new part will not mate with other old part.
- i. When repairing the Series 5200 pump it is usually a good idea to replace the piston cups. Piston repair kits are available with either leather, fabric (rubber-impregnated) or pure rubber (Buna-N) cups.
- j. Inspect complete crankshaft assembly for general wear. If the pump has had as much as 500 hours of use, it is suggested to replace the assembly. If broken cam bearing is found - the reason is usually that the pump has been operating over the 400 psi maximum. Another possible cause is that the pump has not been equipped with the proper surge tank or pulsation dampener to smooth out the pressure surges inherent in a large displacement 2-cylinder pump.
- k. Check all fittings - make certain that all sizes are correct for port size of the pump. Thoroughly inspect and clean before reinstalling.
- l. At this point all parts should have been inspected and cleaned. All parts should now be oiled (particularly the o-rings) and placed on a clean work bench for reassembly.

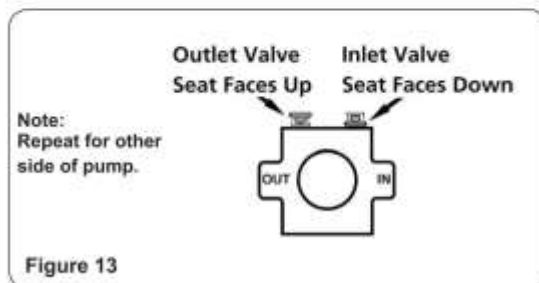
Reassembly

1. Using bearing seat tool, press the crankshaft assembly into the pump body (see Fig. 11).



2. Insert connecting rod over the cam bearing.
3. Insert both cylinder sleeves with oiled o-rings in cylinder bores.
4. Place pump in vise with ports horizontal (See Fig. 12). Rotate crankshaft to raise connecting rod to its highest position. Place support ring over top of connecting rod.
5. Insert piston guide.

6. Place seal ring on top of guide.
7. Place cup backing plate with o-ring in place over seal ring.
8. Insert piston cup.
9. Insert cup spreader with new o-ring in place. Press into hollow of the piston cup.
10. Place a new copper washer gasket in the countersunk screw hole of cup spreader.
11. Tighten piston cap screw securely with 1/4" allen wrench.
12. Insert inlet and outlet valves with o-ring seals (See Fig. 13). These are identical, but in reverse positions.



Note the pump ports which are the "IN" and "OUT" sides.

13. Install cylinder head with a new o-ring seal and tighten head bolts securely with a 9/16" wrench or socket.
14. Repeat steps 5 through 13 for assembling the other half of the pump.

Note: Follow proper lubrication procedures as listed in the Operating the Pump section of this manual.

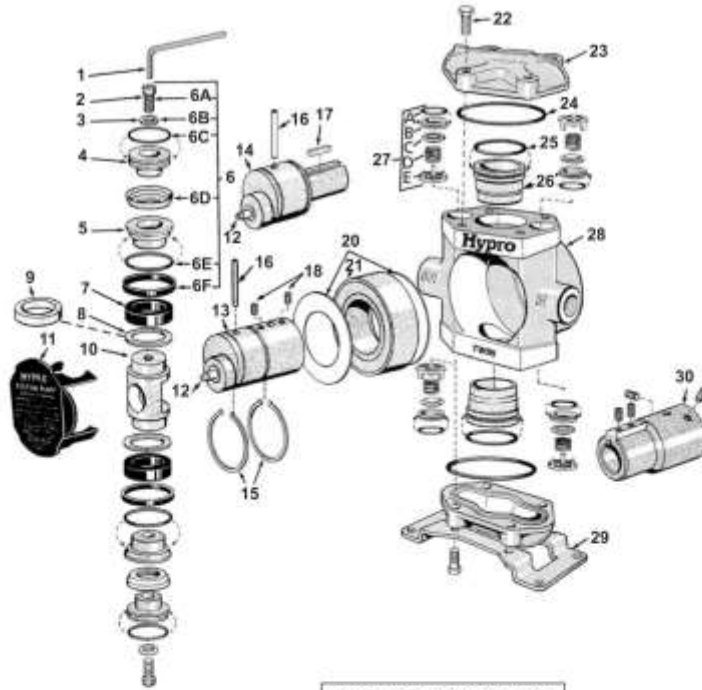
15. Replace the nameplate. The pump can now be tested - pumping clear water.

Main Bearing Replacement

1. Remove set screws, bolts or keys from the shaft and smooth off any burrs or rough spots.
2. Remove retainer rings from shaft with external pliers. For convenience, you can remove just the one closest to the drive end of the shaft.
3. Support bearing in arbor press and press shaft out as shown in Fig. 14.
4. New bearing is pressed on in reverse manner. Front retainer ring (closest to cam bearing) should be in place to provide a stop for the bearing.
5. After bearing has been pressed into place, install the other retainer ring in shaft groove with the external pliers as before.



Figure 14



NOTE: When ordering parts, give quantity, part number, description, and complete model number. Reference numbers are used **ONLY** to identify parts in the drawing and are **NOT** to be used as order numbers.

Ref. No.	Qty. Req'd.	Part No.	Description
1	1	3020-0008	Allen Wrench (Optional)
2	2	2220-0013	Piston Cap Screw
3	2	2270-0012	Washer
4	2	1830-0039	Piston Cup Spreader
5	2	1410-0054	Cup Backing Plate
6	1	3430-0037	Piston Stack Parts Kit with Leather Cups (Standard)
6	1	3430-0039	Piston Stack Parts Kit with Fabric Cups (Model 5200-F)
6	1	3430-0189	Piston Stack Parts Kit with Buna-N Cups (Model 5200-R)
7	2	1440-0005	Piston Guide
8	2	1410-0018	Support Ring For 5210 Models Only
9	2	1410-0020	Support Ring For 5206 Models Only
10	1	0503-5200	Connecting Rod
11	1	0602-5200	Safety Cover
12	1	2405-0006	Grease Fitting Assembly
13	1	See Listing	Crankshaft (Hollow Shaft Models)
14	1	See Listing	Crankshaft (Solid Shaft Models)
15	2	1810-0001	Retainer Ring
16	1	1600-0013	Crankpin Retainer

Piston Stack Parts Kits

Leather Cup Kit No. 3430-0037 (STD)

Consists of two each of the following parts: No. 2220-0013 Piston Cap Screw (Ref. 6A), No. 2270-0012 Washer (Ref. 6B), No. 1720-0030 O-Ring (Ref. 6C), No. 2150-0001 Leather Cup (Ref. 6D), No. 1720-0065 O-Ring (Ref. 6E) and No. 1440-0012 Seal Ring (Ref. 6F).

Fabric Cup Kit No. 3430-0039

Same as Leather Cup Kit except with two No. 2150-0012 Fabric Cups.

Rubber Cup Kit No. 3430-0189

Same as Leather Cup Kit except with two No. 2150-0042 Rubber Cups.

Crankshaft Assemblies

Sub-Assemblies

Include Grease Fitting (Ref. 12), Crankshaft with cam bearing (Ref. 13 or 14) and Crankpin Retainer (Ref. 16).

Complete Assemblies

Include Sub-Assembly components plus Retaining Rings (Ref. 15), slinger rings (Ref. 20) and Bearing (Ref. 21).

Complete Sub-Assembly PART NO.	Pump Assembly PART NO.	Model Number
with 1-3/8" Hollow PTO Shaft (Ref. 13)		
5503-5206	5501-5206	5206C-H
5503-5210	5501-5210	5210C-H
with 1" Solid Shaft (Ref. 14)		
5003-5206	5001-5206	5206C
5003-5210	5001-5210	5210C

Ref. No.	Qty. Req'd.	Part No.	Description
17	1	1610-0005	Key (Solid Shaft Models)
18	2	2230-0003	Set Screw
20	2	1410-0006	Slinger Ring
21	1	2005-0002	Main Bearing
22	8	2210-0062	Cylinder Head Bolt
23	2	0203-5200CB	Cylinder Head
24	2	1720-0028	O-Ring - for cylinder head
25	2	1720-0019	O-Ring - for cylinder sleeve
26	2	3550-0007	Cylinder Sleeve
27	4	3400-0038	Valve Assembly—Consists of: O-ring (Ref. A), Valve Seat (Ref. B), Valve Poppet (Ref. C), Valve Spring (Ref. D) and Valve Spring Retainer (Ref. E)
28	1	0100-5200C	Body
29	1	1510-0024	Base
30	1	1320-0061	Adapter-Adapts 1" solid shaft to 1- 3/8" 6-spline PTO hollow shaft (Includes set screws.)



Hazardous Substance Alert

1. Always drain and flush pump before servicing or disassembling for any reason (see instructions).
2. Always drain and flush pumps prior to returning unit for repair.
3. Never store pumps containing hazardous chemicals.
4. Before returning pump for service/repair, drain out all liquids and flush unit with neutralizing liquid. Then, drain the pump. Attach tag or include written notice certifying that this has been done. Please note that it is illegal to ship or transport any hazardous chemicals without United States Environmental Protection Agency Licensing.

Troubleshooting

Symptom	Probable Cause(s)	Corrective Action(s)
Low Discharge	Pump not primed	See Priming section of this manual.
	Clogged suction strainer	Clear strainer screen.
	Suction hose collapsed	Replace suction hose with stronger wall hose.
	Excessive vacuum on inlet	Reduce inlet restrictions by eliminating items such as elbows, valves or too small of inlet hose.
	Pump running at wrong speed	Check speed of pump and adjust accordingly.
Low Pressure	Valves worn or hung-up	Inspect valves and replace if necessary.
	Unloader or Relief Valve set improperly	Readjust unloader or relief valve.
	Nozzle worn or damaged	Check nozzle and replace.
	Valves worn or hung-up	Inspect valves and replace if necessary.
	Insufficient power from gas engine or electric motor	Check performance chart to find proper HP needed for flow and pressure desired.
Liquid leaking from center of pump	Seals worn	Replace with new seal kit.

Limited Warranty on Hypro/SHURflo Agricultural Pumps & Accessories

Hypro/SHURflo (hereafter, "Hypro") agricultural products are warranted to be free of defects in material and workmanship under normal use for the time periods listed below, with proof of purchase.

- Pumps: one (1) year from the date of manufacture, or one (1) year of use. This limited warranty will not exceed two (2) years, in any event.
- Accessories: ninety (90) days of use.

This limited warranty will not apply to products that were improperly installed, misapplied, damaged, altered, or incompatible with fluids or components not manufactured by Hypro. All warranty considerations are governed by Hypro's written return policy.

Hypro's obligation under this limited warranty policy is limited to the repair or replacement of the product. All returns will be tested per Hypro's factory criteria. Products found not defective (under the terms of this limited warranty) are subject to charges paid by the returnee for the testing and packaging of "tested good" non-warranty returns.

No credit or labor allowances will be given for products returned as defective. Warranty replacement will be shipped on a freight allowed basis. Hypro reserves the right to choose the method of transportation.

This limited warranty is in lieu of all other warranties, expressed or implied, and no other person is authorized to give any other warranty or assume obligation or liability on Hypro's behalf. Hypro shall not be liable for any labor, damage or other expense, nor shall Hypro be liable for any indirect, incidental or consequential damages of any kind incurred by the reason of the use or sale of any defective product. This limited warranty covers agricultural products distributed within the United States of America. Other world market areas should consult with the actual distributor for any deviation from this document.

Return Procedures

All products must be flushed of any chemical (ref. OSHA section 1910.1200 (d) (e) (f) (g) (h)) and hazardous chemicals must be labeled/tagged before being shipped* to Hypro for service or warranty consideration. Hypro reserves the right to request a Material Safety Data Sheet from the returnee for any pump/product it deems necessary. Hypro reserves the right to "dispose as scrap" products returned which contain unknown fluids. Hypro reserves the right to charge the returnee for any and all costs incurred for chemical testing, and proper disposal of components containing unknown fluids. Hypro requests this in order to protect the environment and personnel from the hazards of handling unknown fluids.

Be prepared to give Hypro full details of the problem, including the model number, date of purchase, and from whom you purchased your product. Hypro may request additional information, and may require a sketch to illustrate the problem.

Contact Hypro Service Department at 800-468-3428 to receive a Return Merchandise Authorization number (RMA#). Returns are to be shipped with the RMA number clearly marked on the outside of the package. Hypro shall not be liable for freight damage incurred during shipping. Please package all returns carefully. All products returned for warranty work should be sent **shipping charges prepaid to:**

HYPRO
Attention: Service Department
375 Fifth Avenue NW
New Brighton, MN 55112

For technical or application assistance, call the Hypro Technical/Application number: 800-445-8360, or send an email to: technical@hypropumps.com. To obtain service or warranty assistance, call the Hypro Service and Warranty number: 800-468-3428, or send a fax to the Hypro Service and Warranty FAX: 651-766-6618.

*Carriers, including U.S.P.S., airlines, UPS, ground freight, etc., require specific identification of any hazardous material being shipped. Failure to do so may result in a substantial fine and/or prison term. Check with your shipping company for specific instructions.

Printed in the USA
2011 Hypro



Pentair

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OPTIONS TOW BEHIND

NOZZLES



Aerospace Polymer Nozzle - Part# 2851
Standard Clamp Band - Part# 1173



Flexible Nozzle Assembly - Part# 3345
Various lengths available.
Ideal for rough terrain.

Gyratory Atomizing Nozzle - Part# 2547
(Safety guard removed for clarity)



ALUMINUM NOZZLES

Optional aluminum nozzles **will not** connect to the standard Aerospace Polymer Nozzle (Part# 2851).
Requires: Two 45° elbow segments (Part# 1171) and two additional clamp bands (Part# 1173).

- 12" Nozzle Extension - Part# 1468
- 15" Nozzle Extension - Part# 1842
- 20" Nozzle Extension - Part# 1845

10" Round Nozzle - Part# 1417
12" Round Nozzle - Part# 1172
Improves air velocity with lower horsepower and hydraulic blower units



12" Rectangular Nozzle - Part# 1469
19" Rectangular Nozzle - Part# 1425
5.5"x15" opening - extra length/more concentrated air flow. Uses - heavy wet debris, plugs, top dressing. No ground clearance in the vertical down position.



Fishtail Nozzle - Part# 1743
5"x30" (wide angle) opening. Distributes a large volume of air at a lower velocity over a wide area. Easily converts blower into a "Greens Fan". Adaptable to all models. Not as effective at moving debris.



D.O.T. TRAILER

Part# 1613-D f or 8000, KB4, EFI
Part# 3410 for Mega



2" BALL RECEIVER HITCH

Part# 2981



FORK POCKET

Part# 3894
Great for moving blowers around jobsites and bed mount / skid mount applications.



LINE DRIVER ATTACHMENT

Part# 2419



CORDED CONTROL

Part# 2788 for KB4 Model
Part# 2787 for Mega, Diesel Models



ROTATION BEARING KIT

Part# 3838
Increases rotation speed and reduces load on rotation motor.



EXHAUST GUARD KIT

Part# 2988
Available for Model: KB



BUFFALO TURBINE PRODUCTS

CYCLONE 8000

The Cyclone 8000 Debris Blower is strategically priced to fit most budgets. This little powerhouse is already proving its worthiness in saving Time and Labor.



MEGA

The word "MEGA" is defined as Impressive, Extreme and Mammoth. The NEW Buffalo Turbine MEGA lives up to its name!



CYCLONE PTO

The Cyclone PTO incorporates an "Advanced" direct drive gearbox which significantly reduces routine maintenance. At 238lbs, it's the lightest, meanest turbine style PTO blower available!



CYCLONE SQUARED

The Cyclone Squared with its "Twin Turbines", and wireless controlled dual independent nozzles, in most cases can handle twice the work in half the time. This versatile powerhouse is already a favorite on Golf courses, Racetracks, and the Paving Industry.



CYCLONE KB4

The Cyclone KB4 with its "More Powerful" CH740 Kohler Engine and a "State of the Art" Wireless Remote System is the most powerful KB unit to date.



HYDRAULIC

The Hydraulic debris blower features our built in "flow and pressure" control system and easily attaches to most skid steers. This handy attachment comes complete with mounting plate and hoses.

