



HYDRAULIC FOLDING TRAILED BOOMSPRAY

Operation Manual



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INTRODUCTION

Congratulations on the purchase of your new Hayes Spraying Trailed Boomspray.

Hayes Spraying originally commenced operations in the early 1970's as a contract spraying & consulting business. By the late 1980's, demand for the tough and well designed spray equipment allowed Hayes Spraying to manufacture agricultural machinery full time.

Over the last 30 years, Hayes Spraying has built a name synonymous with reliable, robust and good value for money equipment. The products have proved themselves in the agricultural industry for many years & remain highly sought after due to their durability, performance & ability to be customised.

Today, Hayes Spraying has a state of the art workshop facility and a strong team of manufacturing and assembly specialists. The extent of knowledge and experience within the company ensures that your equipment is specifically designed to suit your requirements. Constant research and development ensure our product range meets the changing demands of farmers and conditions today and into the future.

Our boomsprays are used extensively throughout the QLD, NSW & VIC broadacre cropping areas. Our products have been exported to seven countries; mainly Africa, where they have stood up well to the rugged conditions.

The experienced sales and support team at Hayes Spraying offer outstanding after sales service; you can be guaranteed of superior assistance for years to come.

Our website is constantly improving and is an ideal tool for the operator to gain further information & assistance now and into the future. Keep up to date with Hayes Spraying at **www.hayesspraying.com.au**. Be sure to look into our wider range of agricultural equipment including three point linkage boomsprays, vehicle mounted boomsprays, shielded sprayers, tractor mounted tanks and the N-Buggy.

Thank you again for choosing Hayes Spraying. We hope that you are very pleased with the performance of your trailed boomspray and we welcome any feedback that you have about our product.

Kind regards,

Maurie & Jenny Hayes
Directors

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Postal: PO Box 515, GOONDIWINDI QLD 4390
Street: 1 Troy Drive, GOONDIWINDI QLD 4390

WARRANTY POLICY

Hayes Spraying Pty Ltd, warrants to the original purchaser, that each new Hayes Spraying Pty Ltd boomspray, part or accessory will be free from defect in material or workmanship for twelve (12) months after the date of delivery.

During the warranty period, the Dealer or Hayes Spraying Pty Ltd shall repair or replace, at Hayes Spraying option, without charge for parts and labour any part of the Hayes Spraying Pty Ltd product, which fails because of defects in parts or workmanship.

Pumps, engines, controller's tyres and hoses are all warranted directly by the original manufacturer, pending that manufacturer's warranty approval.

This warranty does not cover damage resulting from misuse, neglect, alterations or normal wear and tear or outside of recommended operation procedures.

In no event shall the authorised dealer or Hayes Spraying Pty Ltd be liable for downtime expenses, loss of chemical, loss of machine use or other incidental damages.

Incorrect operating speeds will void warranty and compromise the life of your boomspray.

Exclusions

At the discretion of Hayes Spraying Pty Ltd, the defective part must be returned to Hayes Spraying Pty Ltd at the owners cost.

Time for wash down, transportation costs or insurance costs for sprayers are not warranted. Travel and communication are not covered by warranty.



WARRANTY REGISTRATION

NOTE: your details will not be passed on to a third party.
Please fill out warranty registration details and return to Hayes Spraying.

SERIAL NUMBER: _____

Owners Name /s	
Trading Name	
Postal Address	
State	
Postcode	
Landline	
Mobile	
Fax	
Email	
District where boomspray is used?	
Would you like to receive newsletters or product information?	

Hayes Spraying

Phone: 07 4671 3092

Fax: 07 4671 3155

Email: office@hayesspraying.com.au

Website: www.hayesspraying.com.au

Postal: PO Box 515, GOONDIWINDI QLD 4390

Street: 1 Troy Drive, GOONDIWINDI QLD 4390

**PLEASE ENSURE YOU ABIDE BY MAINTENANCE
REQUIREMENTS LISTED IN MAINTENANCE
SECTION.**

SPECIFICATIONS

APPROXIMATE DIMENSIONS

NOTE: Due to the nature of our booms being custom built, slight variations will occur in the dimensions used here as an example. Transport heights can vary depending on drawbar position in transit.

Tandem Axle Front Mounted Trailer						
Boom	Wheel Track	Height	Length Inc. booms	Length Hitch to Jet rail	Width at widest point	Notes
24m	2m	3750mm	8400mm	8100mm	3250mm	
36m	2m, 2.3m & 3m	3750mm	11400mm	8400mm	3450mm	
48m	2.3 & 3m	3500mm	15000mm	9800mm	4000mm	
Floating Hitch Option (add)						
6000L Tank		0mm				
7000L & 8000L Tank		500mm				
7000L & 8000L Tank 48m		0mm				

Weedit Tandem Axle Front Mounted Trailer						
Boom	Wheel Track	Height	Length Inc. booms	Length Hitch to Jet rail	Width at widest point	Notes
36m	2m & 3m	3750mm	12700mm	11500mm	3480mm	

CUSTOMISED BOOMSPRAY DETAILS

SERIAL NUMBER

BOOM MOUNT

Front Mount Tandem Axle ☐

BOOM SIZE

18m ☐

24m ☐

27m ☐

30m ☐

36m ☐

48m ☐

Other ☐

TANK

3000L ☐

4500L ☐

6000L ☐

7000L ☐

8000L ☐

WHEEL CENTRES

2m ☐

2.3m ☐

3m ☐

WHEEL SIZE

Tandem Axle 14.9 x 28 ☐

Tandem Axle 16.9 x 30 ☐

Tandem Axle 18.4 x 34 ☐

Other ☐

FLOATING HITCH

☐

CHEMICAL HOPPER

☐

BOOM SECTIONS

3 ☐

5 ☐

Other ☐

FENCELINE NOZZLES

Manual ☐

Electric ☐

SECOND SPRAY LINE

☐

TRIPLEX BODIES

☐

ON / OFF VALVES

Teejet B344BEC24-C 1" ☐

Teejet 430 Flowback ☐

Teejet 430 Two way ☐

Other ☐

REGULATING VALVE

Teejet B344BRL 24s 03 ☐

Teejet B344BRL 24s 06 ☐

Teejet B346BRL 25s 03 ☐

Teejet B246BRL 25s 06 ☐

Other ☐

FLOW METER

Teejet 801 1" ☐

Teejet 801 1.25" ☐

Other ☐

PUMP

1.5" Cast 9303C-HM4C ☐

1.5" S/S 9303S-HM4C ☐

2" Cast 9306C-HM5C ☐

2" S/S 9306S-HM5C ☐

2" S/S with self-fill plumbing ☐

Other ☐

BOOM PLUG

23 pin deutsch ☐

HYDRAULIC PLUG

14 pin deutsch ☐

14 pin + 14 pin reverse deutsch ☐

ADDITIONAL PRODUCT INFORMATION

Paint

Hayes Spraying products are painted with a chemical resistant two-pack paint. For touch ups, the closest colour is Watty! Killrust Ocean Blue.

Filter System

Trailed boomsprays are plumbed with a three-point filtration system.

Tank Basket



Inline Pressure Filters



Nozzle Strainer



Boom

Hayes Spraying boom design is standard with the following features:

- Individual hydraulic boom tilt
- Shock dampened breakaway end sections
- Self-levelling
- Hydraulic accumulators
- Twin Chain Suspension

Suspension

Fully independent coil spring suspension allows for a no maintenance smooth ride.

Chassis

Fully welded RHS steel construction.

IMPORTANT INFORMATION TO UNDERSTAND BEFORE USE

OPERATOR RESPONSIBILITIES *Include but are not limited to:*

Operator

- Read and understand the operator's manual before using the equipment. All other operators of the sprayer must also read and understand the operator manual.
- Local laws may require the operator to be licenced.
- Do not be under the influence of drugs or alcohol whilst operating boom equipment
- Read & follow the chemical label
- Do not eat, drink or smoke while working with spray equipment
- If poisoned, seek medical advice immediately and identify the chemicals being used.
- Be aware of power line locations
- Be aware of weather conditions

Protective Clothing

- Wear protective clothing
- Wash and change clothing after spraying
- Keep protective clothing in good condition and replace as required

SAFE CHEMICAL USE

The hazard

All agricultural chemicals and pesticides are biologically active. They can be dangerous to all living organisms including humans, fish, birds, bees and domestic animals and plants.

Method of pesticide entry

- Oral – by drinking and splashing into the mouth or by smoking or eating with contaminated hands. Cleaning nozzles by blowing through them with your mouth.
- Inhalation - by nose or mouth of spray drift and mist
- Dermal – absorption through the skin particularly with raw chemical or through cuts and abrasions or while perspiring.

Decontamination

- Change out of protective clothing after spraying and wash separately
- Wash thoroughly before eating or drinking
- Keep fresh water tank on sprayer full with clean water
- Replace respirator filters regularly
- Clean sprayer regularly & fix leaks
- Ensure cab filters are adequate for the job
- Always use the recommended type of protection clothing and equipment

Operating the Boomspray Safely

- Take notice of the safety warning labels on boomspray & replace when necessary
- Lower the boom fully or put locking pins in place if the boom needs to be raised
- Do not go under any equipment unless properly secured
- Keep the freshwater tank full with clean water only.
- Disconnect the power before servicing or welding
- Never repair or service equipment whilst operating
- Do not enter the spray tank
- Rinse, wash and depressurise equipment after use and before servicing or storage
- Inspect boomspray for faults, leaks and cracks to avoid contamination
- Ensure the boomspray locking pins and support jack are in the correct position
- Ensure bystanders are a safe distance away from sprayer when operating
- Be aware of the width of the machine especially when turning or moving around obstacles
- Boom tips move much faster while turning and may cause injury to equipment or bystanders
- Spray at speeds suitable to the ground conditions. Warranty will be void if operated at speeds exceeding those stated in this manual.
- Avoid sudden turns, stops and constant direction changes at high speeds.
- Do not ride on the boomspray.

SAFETY DECALS

Take notice of the safety warning labels on the boomspray and replace when damaged. Replacement decals are readily available through spare parts.



SLIDING HEIGHT ADJUSTMENT TOWER

Locking Pins

Locking pins exist for the sliding height adjustment tower & the self-levelling system.

Transporting & Maintenance Position

There are **two** locking pins for the tower / height adjustment located on the sides

1. Lift the tower all the way up.
2. Remove the locking pin from the vertical locking pin holder.
3. Insert the locking pin horizontally into the height adjustment tower.
4. Lower the tower down to rest on the locking pins.



Spraying Position

To get the tower into the spraying position from the transport/ maintenance position:

1. Raise the tower off the locking pins.
2. Remove the locking pin from the horizontal locked position.
3. Insert the pin into the vertical locking pin holder.
4. Lower the tower to the desired height.
5. Never operate with the tower fully up or fully down. We require a minimum of 25mm travel for the accumulators to function properly.

NOTE: *Damage may occur if you attempt to lower your tower before removing locking pins*

SELF-LEVELLING ROCKING BAR

Transporting & Maintenance Position

To lock the self-level function into place:

1. Unscrew the D Shackle pin and twist the locking pin handle to release from the D Shackle.
2. Make sure the spring-loaded locking pin is aligned with the bush.



NOTE: Above photos display transport & maintenance position

Spraying Position

To unlock the self-level function for spraying:

1. Pull the spring-loaded locking pin out from the bush.
2. Twist the locking pin handle so that it locks in the D shackle.
3. Insert the D Shackle pin.



NOTE: Above photo displays spraying position.

BOOMSPRAY OPERATION

CONNECTING TO THE TRACTOR

Check the Tractor Hydraulic Oil Level

The tractor needs to have an adequate level of hydraulic oil available for the boomsprays hydraulic functions to operate properly.

Identify the Tractor Free Flow Return Port

The Hypro pump requires the return line to be plugged into the Free Flow Return or Dump Port of your tractor hydraulic system. You will need to identify this port and make sure all operators are aware of this requirement.

Hooking Up

All bystanders should be well away whilst the tractor is reversing onto the trailer drawbar.

- Reverse the tractor onto the trailer drawbar.
- The support jack may have to be adjusted to suit the tractor hitch height.
- Lock the tractor drawbar pin into place.
- Attach the safety chain to the tractor.
- Wind up the support jack and remove from front supporting position lug.
- Attach the support jack to the spraying position lug on the top rail of the drawbar and lock in with the pin.



Support Jack

The trailer support jack has two lug positions:

Supporting Position

Located on the left side of the drawbar side.

Spraying Position

Located on the top of the left side of the drawbar

HYDRAULIC HOSES

The hydraulic hoses are fitted with crimp on JIC fittings.

Hypro Pump Hydraulic Lines

The Hypro pump hydraulic lines are easily identified, as they are 1/2" hoses. There are two hydraulic lines for the Hypro.

1. Pressure Line – marked with spiral guard & can be fitted to any remote.
2. Return Line – is not marked and **MUST** be fitted to the dump port / free flow return.

Hydraulic Folding Boomspray Functions

These hydraulic lines are 3/8" in size. The hydraulic lines can be connected to any pair of remote couplings on the tractor.

As Shown Below From Top to Bottom:

1. Pressure Line for Hypro – 1/2" hose & can fit to any remote.
2. Return Line for Hypro – 1/2" hose & must be fitted to free flow return port.
3. Hydraulic Boomspray Functions Line – 3/8" hose & can fit to any remote.
4. Hydraulic Boomspray Functions Line – 3/8" hose & can fit to any remote.



CONNECTING DEUTSCH PLUGS

There are three deutsch plugs.

1. 23 pin with pins
2. 14 pin with pins
3. 14 pin with sockets (reverse).



HYPRO HYDRAULIC DRIVE PUMP

Hypro pumps cannot be run dry or the seal will be damaged. Shut pump down immediately when tank is empty or when pressure drops below 1 bar.

1. Connect the Hypro return line to the free flow return.

It is critical it is not connected to a normal remote. You can identify the return line on the Hypro pump as it has TANK written above it.



2. Connect the Hypro pressure line to the tractor remote.

The pressure line is the ½" hose with spiral guard on it. You can identify the pressure line on the Hypro pump as it has PRESS written above it.



3. Ensure the filters are clean – clean daily at least.

4. Set the main bypass / agitation ball valve at the pump.

This should never be fully open or fully closed whilst spraying. For glyphosate, it should be approx ¼ turn open. The thickness of the chemical you are using will determine how far the valve should be open. Some products require more agitation; however, Glyphosate will foam with excessive agitation.



5. Ensure bypass screw is screwed the entire way in.

This ensures the pump has full flow of oil when used with closed centre hydraulics.

6. Set the hydraulics to slow / low flow eg 25%

7. Turn on all boom sections.

Turn spray controller on and set to manual to open regulator valve fully and turn all boom sections on.

8. Adjust hydraulic flow.

Engage the Hypro hydraulics and increase hydraulic flow until the maximum spray pressure is achieved.

Do not exceed 5 bar pressure when nozzles are on

Do not exceed 6 bar pressure when nozzles are off

9. Set Low Pressure Alarm (if installed)

Close the regulator valve until 12 – 15psi is displayed on gauge. Adjust the pressure switch (located below & behind gauge) with screwdriver until alarm beeps at 1 bar / 12-15psi. Make sure master switch and boom section switches are on & check alarm by cycling pressure up and down.

The alarm serves to notify operator that the tank level is low and pump is starting to suck air.

HYDRAULIC FOLDING BOOMS



BOOM MUST BE STATIONARY WHEN BEING FOLDED/ UNFOLDED

Folding Out

STOP MOVING!

1. First move the TILT RAISE switch for the side you are unfolding upwards to raise the booms off the carrier frame – make sure the bottom of the boom clears the top of the frame.
2. Then move the INNER FOLD switch for the side you are unfolding downwards until the section is unfolded.
3. Then do the same for the other side.
4. Do the same for the OUTER FOLD on both sides.
5. Unlock the self-levelling locking pin.
6. Tilt booms down to a level position.

Folding In

STOP MOVING!

1. Tilt booms up to approximately 25-degree angle.
2. Lock the self-levelling locking pin into the locked position.
3. Move the OUTER FOLD switch upwards until the section is folded in for each side.
4. Move the INNER FOLD switch upwards making sure the bottom of the boom clears the cradle using the TILT RAISE switch until the section is folded in.
5. Use the TILT RAISE switch to lower the boom onto the cradle and into the travelling position.

NOTE:

If the booms have been tilted all the way up, you may find that the booms will not drop immediately. To enable the booms to drop, hold the TILT switch on for 5 seconds or until booms drop.

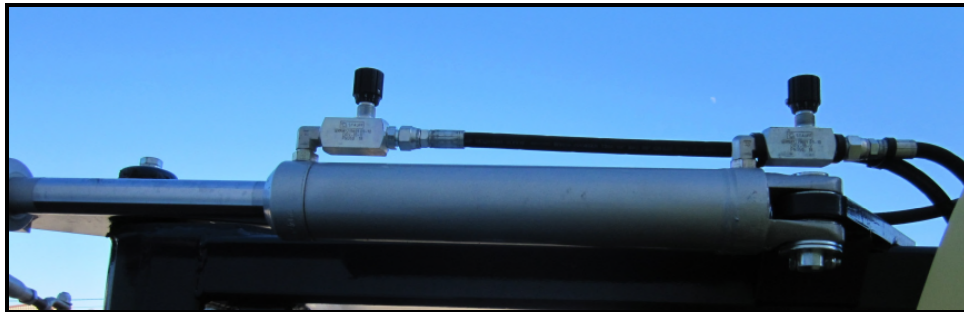
Folding Opening & Closing Speed Adjustment

Hydraulic flow should be regulated so a constant fold or unfold is performed without the need for “pulsing” the controls, because the oil flow is too quick.

Adjust the flow of oil at the tractor first to fine tune opening and closing speeds. Tractors with an oil flow rate of 100L/min should be set at approx. 30%.

Needle valves are placed on each port of the cylinder to allow slow and constant folding and unfolding. The needle valves have been factory set, to open and close at a safe speed. If a fold function is operating too quickly, the flow can be adjusted by the needle valves located at each hydraulic cylinder.

The speed is controlled by the oil leaving the cylinder, not the oil entering.



OPERATIONAL CAPACITIES

Wing Tilt

Your booms are set at the correct operating position. Booms should sit low when ram is fully extended – not level. DO NOT adjust turnbuckle so boom sits level, as you will bend your boom.



When spraying, ensure at least 40mm hydraulic cylinder travel is available for wing tilt rams. Do not operate wing tilt rams bottomed out or fully extended.

Do not adjust the wing tilt turnbuckles. Booms must be allowed to drop below the level working height for operation to allow accumulators to properly dampen the boom ride.

The adjusting screw on the accumulator mount block is used to control the speed of the tilt hydraulic cylinder when lowering only.

Adjustment can be made with a 5/32 hex key.

To Slow Down – screw clockwise

To Speed Up – screw anticlockwise



Minimum Boom Operating Height from Ground

BOOM WIDTH	MIN HEIGHT
24m – 32m boom	800mm
36 – 48m boom	1000mm

In undulating or rough terrain conditions, minimum operating height may vary accordingly.

Never operate at fully raised or fully lowered boom heights, ensure at least 40mm of your hydraulic cylinder travel is available to allow the hydraulic accumulators to work.

Maximum Operating Speed – Use as a guide only

Incorrect operating speed will void warranty and compromise the life of your boomspray.

BOOM WIDTH	GOOD CONDITIONS	ROUGH CONDITIONS
24m	18 k/hr	16 k/hr
36m	17 k/hr	15 k/hr
48m	15 k/hr	13 k/hr

Operating speeds may need to be further reduced by 20 – 40% when crossing contour banks, washouts, extremely rough conditions and when turning at the headland.

When using auto steer systems the boom should be aligned with the run prior to engaging the auto steer.

36 to 48m booms require skilled operators experienced with wide implements.

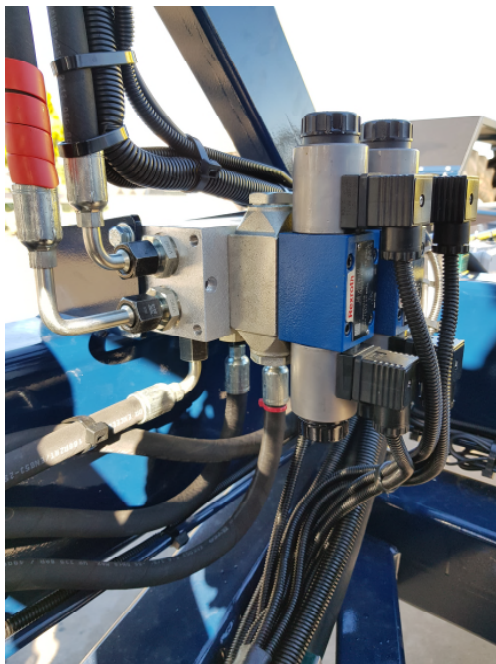
Floating Hitch (Optional)

The floating hitch drawbar is fitted with hydraulic accumulators, which significantly improve the terrain ride whilst providing a smoother connection between the trailer and tractor. It is recommended for large tanks and when working in contoured terrain.

1. Adjust to the height where the trailer is level.
2. When spraying, the hitch will adjust according to weight distribution such as booms extended and the remaining tank volume.

Default Factory Adjustment Setting

1. Have the tractor hydraulic oil at operating temperature.
2. Engage the hydraulic remote that activates all the fold, tilt and height adjustment functions.
3. Fully raise and lower the floating hitch three times minimum.
4. Fully raise the floating hitch
5. Loosen the lock nut on the adjusting screw on the counter balance valve, located on the two station hydraulic block.
6. Using a 5/32 hex key, loosen adjusting screw until the floating hitch starts to lower.
7. Tighten adjusting screw one full turn.
8. Lock up the lock nut.
9. It is normal for a small amount of oil to leak out the adjusting screw while performing this adjustment.
10. For 48M machines, you may need to turn the hex key a further $\frac{1}{4}$ to $\frac{1}{2}$ turn if you find any downward creep in the floating hitch.
11. If at any time in operation you find the floating hitch creeps up, turn the hex screw anti clockwise up to $\frac{1}{4}$ turn.
12. If at any time in operation you find the floating hitch creeps down, turn the hex screw clockwise up to $\frac{1}{4}$ turn.



HYDRAULIC LEVELLING SYSTEM (Optional)

The boom height levelling system has been specially designed to provide improved ground following particularly in contoured terrain.

The system is engaged via a dual electric/hydraulic control panel mounted in the cabin (LED illuminate when engaged).

In operation, the levelling system senses via boom mounted jockey wheels when a load is apparent and according takes weight off the boom tilt hydraulic cylinders hence making the boom become weightless (approx 40Kg). Jockey wheel pressure is recommended at 20 psi.

When engaged, the system will automatically lower to the preset height avoiding the need to make constant adjustments.

Note: When turning disengage leveller & tilt boom so the jockey wheels do not make contact with the ground. This prevents a sideways screwing effect of the wheel and any consequent boom stress.

ADJUSTMENT

The pressure adjusting screw will require some minimal adjustment. If the boom tends to lay back on the chains when operating or falls too quickly to the ground when the control panel is engaged, the boom will be too heavy on the ground.



To adjust the boom height levelling system:

1. Have the tractor hydraulic oil at operating temperature.
2. Have the levelling control panel switches turned on
3. Loosen the lock nut on the block
4. Using the 5/32 hex key, turn clockwise until the boom lifts slightly off the ground
5. Turn anticlockwise until the boom slowly lowers to the ground
6. Lock up the lock nuts
7. Test the weight of the boom by manually lifting. You should feel approximately 40kg of weight to lift.

The boom will fall quicker when spray rig is moving. Do not worry if it only falls very slowly when stationary.

WARNING: Major damage will be incurred if:

- Using jockey wheels without the leveller being engaged.
- You allow the wheel to run too heavily on the ground (see adjustment above).
- You do not slow down as required when crossing contours & on rough terrain.

The automatic levelling system will only work properly with tractors that have a genuine pressure and flow compensated closed centre, variable flow systems with flow rates in excess of 100L/min.

Eg, JD6000, 7000 & 8000 series & Case Magnum range.

PLUMBING FUNCTIONS

The following plumbing components that are on your trailer will depend on the plumbing options you have chosen.

Main Fill Camlock & Ball Valve

The point at which you connect your loading hose to the boomspray.
Turn the ball valve ON when loading hose is connected.
Turn the ball valve OFF when loading hose is disconnected.

Bypass / Agitation Tap

This tap should only ever be adjusted when you are setting up your Hypro or if you are changing to a chemical with differing viscosity. This tap should never be fully open or closed. Increased agitation is required for powdered and thick chemicals; reduced agitation is required for chemicals that will froth.

Tank Fill

This line allows liquid to enter from the fill camlock into the tank.
Turn ON when filling tank.
Turn OFF when tank is full & ready to spray.

Tank Suction

This line allows liquid to enter from the tank into the Hypro pump.
Turn OFF when filling tank.
Turn ON when ready to spray.
Turn OFF when flushing lines using clean water from Rinse Tank.
Turn ON when filling with a separate load pump.

Spray Pressure

This line allows liquid from the manifold into the delivery line to the booms.
Turn OFF when cleaning filters.
Turn ON when ready to spray.

Induction Probe

The induction probe allows you to load chemical from a standalone chemical hopper.
Turn ON to load chemical from bin. Turn OFF to spray.



Hand wash

The hand wash tap is connected to the 20L Clean Water Container. This container is isolated from all other plumbing to stop contamination.

Wash-down

The wash-down function allows you to use the trailer plumbing for washing down the trailer or for firefighting.

Turn OFF when spraying.

Turn ON to wash-down.

Turn ON tank suction

Tank Wash Nozzle

This is the nozzle in the main tank, which rinses the main tank with clean water from clean water loaded at the fill point or Rinse Tank if fitted (see Rinse Tank Plumbing).

To Rinse Main Tank with Clean Water from External Loading Pump

Connect loading hose to main fill point.

Turn OFF Tank Suction

Turn ON Tank Wash Nozzle

To Flush Boom Lines with Clean Water from Main Fill Point Using External Loading Pump

Connect loading hose to main fill point.

Turn OFF Tank Agitation.

Turn OFF Tank Suction.

Open regulating valve.

Turn on the (on/off) section valves.

Rinse Tank Plumbing (Optional)

Rinse Tank Fill

This allows water from the fill point into the Rinse Tank.

It is important that you always put clean water into your rinse tank. It is advisable to rinse the lines through with clean water before opening the rinse tank fill tap and fill this tank before loading chemical.

Turn ON to fill Rinse Tank.

Turn Off when ready to spray.

Rinse Tank Suction

This delivers clean water from rinse tank to the delivery line of the boomspray to rinse out the boom and the main tank.

Turn OFF when spraying.



To Flush Boom Lines with Clean Water from Rinse Tank.

Turn OFF Tank Suction.
Turn OFF Tank Agitation.
Turn ON Rinse Tank Suction.
Turn ON Pressure Spray.
Open regulating valve.
Turn on (on/off) section valves.

To Rinse Main Tank with Clean Water from Rinse Tank

Turn OFF Tank Suction.
Turn ON Rinse Tank Suction.
Turn ON Tank Wash Nozzle.

Chemical Hopper Self Fill Plumbing (Optional)

NOTE: Do not spray with chemical loaded in your chemical hopper.

Hopper Fill

Fills the chemical hopper with water to rinse the bin. You must have the lid closed.
Turn OFF to spray.

Hopper Suction

Loads the chemical into the main tank from the hopper once loaded.
Turn OFF to spray.

Jet Agitation

Agitates the chemical in the hopper. You must have the lid closed.
Turn OFF to spray.

Drum Rinse

Directs water into the drum rinse nozzles to allow you to rinse 20L drums.
Turn OFF to spray.

Loading Chemical from Hopper into Main Tank

Start loading the main tank with water as above.

Make sure rinse tank is filled prior to loading chemical into main tank. Ensure Rinse Tank Fill tap is OFF.

Fill hopper with chemical as desired.

Once full, turn ON jet agitation to agitate brew.

Turn ON Hopper Suction until hopper is empty.

Turn OFF Hopper Suction.

Repeat as required. When changing from one chemical to another, it is a good idea to rinse the hopper between in case of a reaction-causing chemical to go hard.

To rinse drums, turn ON Drum Rinse as required. Place drum over nozzle and push down to rinse.

To rinse hopper, turn ON Hopper Fill & rinse components.

Once rinsed; turn ON Hopper Suction.

Turn OFF when empty.

Always finish filling the main tank with clean water to flush the pump.

DECONTAMINATION

You may need to decontaminate your boomspray when

- Changing from one chemical to another
 - Changing from one crop type to another
-
- Flush all spray lines, agitation lines, delivery hoses, tanks, jugs, rinse bins and chemical hopper with clean water. Make sure you utilise the tank rinse nozzle for your main tank – see above.
 - When soaking boomspray with rinsing solution, leave all ball valves turned half on to expose inner cavity to rinse.
 - Flush again with recommended cleaner. Talk to your agronomist about the best cleaning agent & penetration time.
 - Flush out cleaning agent with clean water.

MAINTENANCE

FILTERS

The filters are a critical part of your boomspray operation.

Tank Basket



Inline Pressure Filters



Nozzle Strainer



1. Check the tank basket for debris
2. Unscrew (clockwise) the bottom filter bowl of the inline pressure filters and remove. Use a toothbrush to clean the filter under running water. Reseat the filter into the filter bowl and screw back onto filter body. Take care not to cross thread the o-ring while reassembling or over tighten as it may crack.
3. If nozzle strainers are located in the nozzle bodies. Remove from nozzle body and clean with a toothbrush to remove build up.

Flush the booms with water.
Isolate main tank by closing tank suction if you still have chemical left in spray tank before flushing booms.

Every Day

Drain any remaining spray mix from tank.
Fill tank with at least 200L water and open regulator valve fully.
Spray water through nozzles to flush.
Clean the outside of the boomspray.

End of Spraying Session

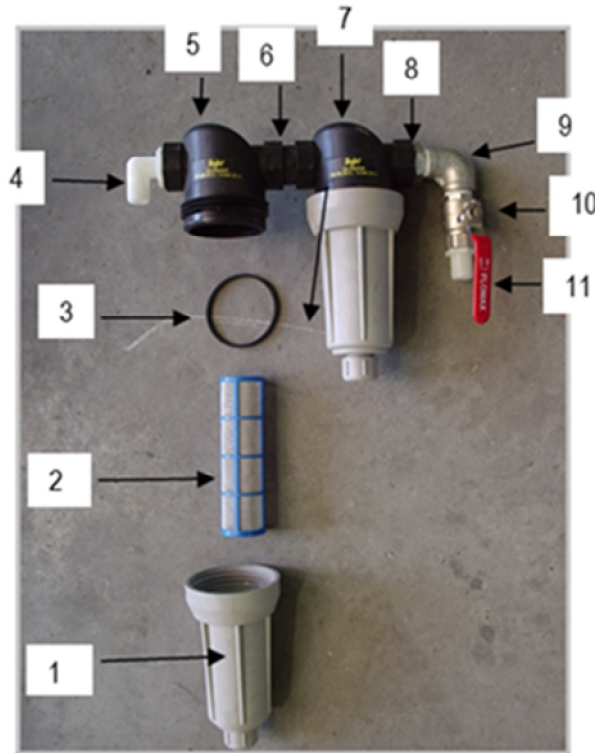
Flush as described previously.
Drain all water from system.
Drain water from pump.
Fill pump with a mix of 50% water and antifreeze.
Take particular care not to have any air in the pump.

Long Term Storage

NOTE: See decontamination in Boomspray Operation Section

FILTRATION SYSTEM

The filtration system is made up of 2 inline strainer filters that are plumbed into the delivery line. The strainers come in various colours depicting the size screens. These screens should be cleaned regularly for optimum performance. If the filters are dirty it can affect the water rates and spray line pressures. We normally use 2 x blue 80 mesh screens for most applications.



1. SS-CP48654-PP Strainer Bowl Grey 126 Series 1-1/4 BSP
2. SS-CP15941-4 Strainer Screen 124NY 80 Mesh (now yellow)
3. SS-CP48656-EPDM Gasket for 126 Filter 1-1/4 & 1-1/2
4. Nf-el1140 Nylon Elbow 1-1/4 BPSM x1 HB
5. SS-CPB63065-1-1 Strainer Head PP 126 Series 1-1/4 BSP
6. BP-SHN32 Poly Nipple BSP 1-1/4
7. SS-AAB126-5-80 Line Strainer 1-1/4 Complete
8. SF-SS2415 Bush Reducing S/Steel 1-1/4x1
9. SF-SS2511 Elbow S/Steel MF 1 BSP
10. BV-25MF Ball Valve Brass MF 1 BSP
11. NF-A1010 Nylon Fitting 1 Male x 1 HB



1. BJ-MLSTI150-80 Banjo Strainer 2 Flange T Body w/80MESH

2. BJ-FC200 Clamp 20 Series Banjo 2

3. BJ-150G Gasket 200 Series Banjo 2

GREASING

The following grease points need greasing as per below.

First Fold Point 2 grease points on each swivel on each boom arm.

10 hrs



Second Fold Point 4 grease points on each boom arm

10 hrs



Swing arm & Self Level Pivot Point Left Boom - 2 grease points – one for Swing arm and one for the Self Level Pivot Point.

10 hrs

Right Boom – 1 grease point for the Swing arm



Tow Hitch One grease point for the swivel ball in tow hitch

10 hrs



Supporting Jack One grease point for the supporting jack

100 hrs



OTHER MAINTENANCE

Drawbar Bolts	Check drawbar bolts & tighten	First 50 hrs then every 200 hrs
Wheel Nuts	Check wheel nuts & tighten. 297 ft. Lbs (404N.m)	First 50 hrs then every 200 hrs
Wheel Bearings	Check wheel bearings.	First 50 hrs then every 200 hrs
	Repack annually with grease or as required	If floatation tyres are fitted first 50 hrs then every 100 hrs. Repack annually or as required

PAINTWORK

To protect the paintwork and presentation of your new boomspray it will require regular washing at the end of every spraying session.

When using hydrocarbon-based products (e.g. Ester, Treflan, and Avadex) a strict external method is required using clean water.

Do not allow dust to build up and turn to chemical impregnated mud. Any neat chemical spills onto paintwork will require immediate wash-down.

TYRE PRESSURE

Tyre pressure guide is written on your tyre sidewall. Do not exceed maximum pressure stated on tyre.

As a guideline only, we have listed approximate pressures to use, but remember NEVER exceed maximum pressure stated on tyre.

14.9 x 28	18 psi to 35 psi
16.9 x 30	18 psi to 35 psi
18.4 x 34	18 psi
600/65 x 30.5	29 psi to 47 psi
650/65 x 30.5	28 psi

TROUBLESHOOTING UNDERSTAND YOUR AUTOMATIC CONTROLLER

The controller controls the application rate based upon the target application rate set before spraying such as 40L / Ha. The controller receives information from the flow meter and the speed sensor and tells the Regulating Valve to open or shut.

Nozzle Size:	Set in Controller
Boom Width:	Set in Controller
Speed Sensor:	Measures speed & sends information to Controller
Flow Meter:	Measures L/Min & sends information to Controller
Regulating Valve:	Controlled by controller calculating variable information such as speed & flow.
	L/Ha is too high – Reg Valve Closes
	L/Ha is too low – Reg Valve Opens

The controller will also monitor when spraying speed is too fast or slow for the controller to regulate the target rate given the nozzle and desired application rate.

You must use suitable nozzles for the application rate. Check the nozzle capacity information.

UNDERSTAND THE HYDRAULICS

The hydraulic spool system on your boomspray has been fitted to suit your tractor depending on whether you have an open or closed centre system. The majority of systems use the closed system.

The electric solenoid spool valves are Rexroth brand with a J (closed) or G (open) CETOP3.



Closed Centre Solenoid Spool Valve



Open Centre Solenoid Spool Valve



Located between the hydraulic block and the solenoid valve there is a pilot operated check valve to prevent cylinder creep.

The hydraulic hoses are either 3/8" or 1/2" fitted with JIC fittings.

It is crucial that you identify the hydraulic hoses that control your Hypro pump. These are 1/2" hoses.

COMMON ISSUES

Most problems can be found quickly by checking the following:

What does the monitor display?

Speed

Hectares

L/min

Can you spray in manual mode (+ & - buttons increase & decrease pressure)?

Can you manually adjust the pressure & flow?

Are the fuses good?

Check your controller settings are correct.

Check the filters are clean & briefly start pump to check flow.

ISSUE	ITEMS TO CHECK
No Pressure	Check your filters Check the Reg Valve has power Check Reg Valve is opening & closing by either listening or watching. Apply a separate 12v DC power source to Reg Valve wires. This will isolate the valve from the controller & cables. Disconnect Reg Valve power for 30 secs as it has a reset fuse built in. Check Reg Valve is working in the correct direction, if not reverse the polarity of red & black wires eg red to black. If you remove the reg valve motor from shaft, make sure the paint pen marks on the shaft are aligned when in the off position.
No Speed	Check speed sensor connectors & cable for cuts or breaks. Check speed sensor is plugged in. Check you are getting a pulse in the signal wire. Check pins in the deutsch plug are not pushed out. For wheel sensors: Check magnets are in place Check the LED light in the end of the sensor when the magnet passes. Check the sensor is the correct distance from the magnets 10—20mm
No Hectares	See above as for speed Check width setting in controller
No L/Min	Check pump is pumping liquid Check flow meter connectors and cable for cuts etc Check flow meter is not stuck or restricted Flush flow meter with clean water, it should spin freely when blown through. Check pins in deutsch plug are not pushed out. Teejet 801 Flow Meters: Turn on spray controller; a green LED light should appear on the flow sensor to indicate power. An orange LED should also appear to indicate when flow is going out nozzles. Check reg valve is working in the correct direction.

ISSUE	ITEMS TO CHECK
Tank Output Different To What Has Been Sprayed Out	If controller is saying too high—increase flow meter calibration by that % If controller is saying too low—decrease flow meter calibration by that % Default calibration for the Teejet 801 is 82—start with this number and adjust as above.
Cant Adjust Flow Manually	Check Reg Valve has power Check Reg Valve is opening & closing by either listening or watching. Apply separate 12v DC power source to reg valve wires. This will isolate from controller & cables. Disconnect reg valve power for 30 secs as it has a reset fuse built in. Reverse the polarity of red & black wires on reg valve eg red to black. If you removed the reg valve motor from the shaft, make sure the paint marks are aligned when in the off position. Check pins in deutsch plug are not pushed out.
Spraying Stops While In Auto Mode	Check flow meter is not stuck or stalled. The flow meter might be stalled due to reg valve shutting. Check reg valve console settings are set to inline or throttling, not bypass.
Application Rate Oscillates	Check all controller values are correct. Check Reg Valve motor is correctly aligned with the paint pen mark on the shaft of the reg valve (when aligned the motor should be in the off position). Decrease the reg valve speed in the controller.
Application Rate Oscillates with only 1 section of boom on or when connected to a planter or shielded sprayer.	Teejet 801 flow meters wont regulate below 9.5L/min. All low flow applications need to be done in manual mode.
Flow Drops Off Whilst Spraying	Check for blocked filters or delivery hose. Check reg valve is opening & closing by watching or listening.
Tank 3/4 Empty & Cant Maintain Pressure	Check the agitation tap is not too far open causing frothing in the tank making the pump suck air & water.
Hypro Pump Runs For A Few Seconds Then Stops	Tractor hydraulics are on a timer, adjust to a continuous setting. Case—set timer to 0. JD—set time to C.

ISSUE	ITEMS TO CHECK
Not Regulating in Auto Mode	Ensure controller is in Auto Mode. Check speed sensor Check regulating valve If you are using 1 or 2 sections and going slow, some flow meters will not operate below 9.5L/min. You might have to operate in manual mode.
Console wont turn on, it just clicks	Dead short in electrical cables Disconnect sensor cables to isolate short.
Other Electrical Faults	Check 15 amp fuse at battery Ball valves have an internal resettable fuse, disconnect all three wires for 30 sec Check wiring harness for cuts or breaks. Check pins in deutsch plugs Make sure settings in controller are correct Make sure ISO plug is pushed in all the way and locked in
Hydraulic Functions	Ensure hydraulics are connected to the correct port. Ensure Hypro is connected to a free flow return. Wiring plugs on solenoid valves (Hirschmann plug) can be swapped from one to another to determine if fault is hydraulic or electrical. Check if power is getting to Hirschmann plug with a multimeter. Check for a quiet click when solenoid is activated. If solenoid is faulty, it can be swapped with another. Hydraulic function can be activated manually by pushing a small screwdriver into the poppet on either end of spool valve in the middle of the cap. This will manually open or close the solenoid valve.

WIRING DIAGRAMS

HYDRAULICS

14 pin Deutsch Plug for Tilt & Folds

Tractor Plug: HD 34-18-14 SN

Boom Plug: HD 36-18-14 PN

PIN	FUNCTION	WIRE COLOUR
A	Left Tilt Up	Purple
B	Left Tilt Down	Dark Brown
C	Right Tilt Up	White / Red
D	Right Tilt Down	White / Blue
E	Left Inner Fold Out	Grey
F	Left Inner Fold In	Orange
G	Right Inner Fold Out	Blue
H	Right Inner Fold In	Red
J	Left Inner Fold Out	Green
K	Left Outer Fold In	Yellow
L	Right Outer Fold Out	White / Brown
M	Right Outer Fold In	White
N	Blank (12v switch wire for 6 pole switches if fitted)	Blank (White)
P	Earth	Black

14 pin Deutsch Plug for Height Adjust Tower, Floating Hitch & Levelling

Tractor Plug: HD 34-18-14 PN

Boom Plug: HD 36-18-14 SN

PIN	FUNCTION	WIRE COLOUR
A	Tower Height Up	White / Green
B	Tower Height Down	White / Yellow
C	Floating Hitch Up	Yellow / Green
D	Floating Hitch Down	Yellow / Black
E	Levelling Right On	White
F	Earth	Black
G	Levelling Left On	Yellow
H	Earth	Black
J	Back Jet rail Up	Pink
K	Back Jet rail Down	Blue
L	Blank	
M	Blank	
N	Blank	
P	Earth	Earth

ELECTRICAL

Boom 23 Pin Deutsch Plug

Boom Plug: HD 36-24-23 PN
Pins: D0460-215-16141

PIN	FUNCTION	WIRE COLOUR
A	Boom Section 1	3mm White
B	Boom Section 2	3mm Brown
C	Boom Section 3	3mm Green
D	Boom Section 4	3mm Yellow
E	Boom Section 5	3mm Grey
F	Boom Sections Earth -	4mm Green
G	Regulator Valve	3mm Brown
H	Regulator Valve	3mm White
J	Boom Sections Power +	4mm Red
K	Flow Meter	3mm White / Red
L	Flow Meter Power +	3mm Brown
M	Flow Meter Earth -	3mm Green
N	Speed Sensor	3mm White / Green
O	Speed Sensor Power +	3mm Brown
P	Speed Sensor Earth -	3mm Green
Q	Pressure Sensor	3mm Black
R	Pressure Sensor	3mm White
S	Blank	
T	Boom Section 9	3mm Purple
U	Boom Section 10	3mm Orange
V	Boom Section 6	3mm Pink
W	Boom Section 7	3mm Blue
X	Boom Section 8	3mm Yellow / Red

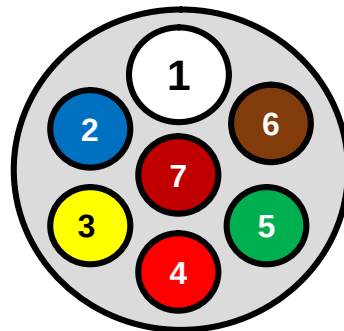
NOTE:

- Boom Section Wires In Group of 12
- Regulator Valve Wires In Group of 2
- Flow Meter Wires In Group of 3
- Speed Sensor Wires in Group of 3
- Pressure Sensor Wires in Group of 2

John Deere / Case / New Holland 7 Pin Large Round Plug Light Layout

Boom Plug: EC-82193

PIN	FUNCTION	WIRE COLOUR
1	Earth Return	5mm White
2	Work Lights	3mm Blue
3	Left-hand Turn	3mm Yellow
4	Breaks Lights	3mm Red
5	Right-hand Turn	3mm Green
6	Tail Lights	3mm Brown
7	AUX Power	5mm Red



For European tractors/plugs, check tractor manual or dealer.

CONTROLLER HARNESSES

TEEJET 844E 23 pin Deutsch Plug

Tractor Plug: HD 34-24-23 SN

Socket: D0462-209-16141

PIN	FUNCTION	WIRE COLOUR
A	Boom Section 1	3mm White
B	Boom Section 2	3mm Brown
C	Boom Section 3	3mm Green
D	Boom Section 4	3mm Yellow
E	Boom Section 5	3mm Grey
F	Boom Sections Earth -	4mm Green
G	Regulator Valve	3mm Brown
H	Regulator Valve	3mm White
J	Boom Sections Power +	4mm Red
K	Flow Meter	3mm White / Red
L	Flow Meter Power +	3mm Brown
M	Flow Meter Earth -	3mm Green
N	Speed Sensor	3mm White / Green
O	Speed Sensor Power +	3mm Brown
P	Speed Sensor Earth -	3mm Green
Q	Pressure Sensor	3mm Black
R	Pressure Sensor	3mm White
S	Blank	
T	Boom Section 9	3mm Purple
U	Boom Section 10	3mm Orange
V	Boom Section 6	3mm Pink
W	Boom Section 7	3mm Blue
X	Boom Section 8	3mm Yellow / Red

NOTE:

- Boom Section Wires In Group of 12
- Regulator Valve Wires In Group of 2
- Flow Meter Wires In Group of 3
- Speed Sensor Wires in Group of 3
- Pressure Sensor Wires in Group of 2

TRIMBLE Ez Guide 500, CFX & FMX AMP Plug

Main Connector: AMP 206037-1

PIN	FUNCTION	WIRE COLOUR
1	GND	4mm Green
2	Boom 2	3mm Brown
3	Inc. / Dec Reg Valve Open	3mm Brown
4	Inc. / Dec Reg Valve Close	3mm White
5	Boom 3	3mm Green
6	Boom 1	3mm White
7	Boom 4	3mm Yellow
8	Boom 5	3mm Grey
9	Boom 6	3mm Pink
10	Blank	
11	Flow Earth -	3mm Green
12	Flow Power +	3mm Brown
13	Flow Signal	3mm White / Red
14	Blank	
15	Boom 7	3mm Blue
16	Positive +	4mm Red

Secondary Connector: AMP 206044-1

PIN	FUNCTION	WIRE COLOUR
1	Boom 8	3mm Red / Yellow
2	Boom 9	3mm Purple
3	Boom 10	3mm Orange
4	Blank	
5	Blank	
6	Blank	
7	Blank	
8	Blank	
9	Blank	
10	Blank	
11	Blank	
12	Blank	
13	Blank	
14	Blank	

GREENSTAR

37 PIN AMP CONNECTOR – 2009 onwards

PIN	FUNCTION	WIRE COLOUR
1	Valve Ground	4mm Green
4	Boom Section 1	3mm White
5	Boom Section 2	3mm Brown
6	Boom Section 3	3mm Green
7	Boom Section 4	3mm Yellow
8	Boom Section 5	3mm Grey
9	Boom Section 6	3mm Pink
10	Boom Section 7	3mm Blue
11	Boom Section 8	3mm Yellow Red
12	Left Fence Line	3mm Purple
13	Right Fence Line	3mm Orange
15	Regulator Valve	3mm White
16	Regulator Valve	3mm Brown
21	Flowmeter Shield	3mm Green
28	Flowmeter #1 Signal	3mm White Red
36	Valve Power	4mm Red
37	Flowmeter +	3mm Brown

Greenstar use boom sections 9 + 10 for fenceline nozzles

31 PIN DEUTSCH PLUG– Older Type HDP26-24-31

PIN	FUNCTION	WIRE COLOUR
1	Boom Section 1	3mm White
2	Boom Section 2	3mm Brown
3	Boom Section 3	3mm Green
4	Boom Section 4	3mm Yellow
5	Boom Section 5	3mm Grey
6	Boom Section 6	3mm Pink
7	Boom Section 7	3mm Blue
8	Boom Section 8	3mm Yellow Red
9	Left Fence Line	3mm Purple
10	Right Fence Line	3mm Orange
15	Regulator Valve	3mm Brown
16	Regulator Valve	3mm White
23	Flowmeter Earth	3mm Green
24	Flowmeter Power + 5v dc	3mm Brown
25	Flowmeter Signal	3mm White Red
27	Boom Section Earth	4mm Green
28	Boom Section Power + 12v dc	4mm Red

ELECTRICAL COMPONENTS

BALL VALVES



Banjo MEXV on/off electric valve

Part No. BJ-MEVX100

Circulation: 2021 onwards



TEEJET 344 Series 2-Way Electric Ball Valve

Part No. SS-B344BEC-24-C

Circulation: 2005 onwards



TEEJET 430 Series 2-Way Electric Ball Valve

Part No. SS-430EC-2-D (Single Unit)

Part No. SS-435EC-2-D (5 Manifold)

Part No. SS-437EC-2-D (7 Manifold)

Circulation: 2010 onwards



TEEJET 430 Series Flow Back Electric Ball Valve

Part No. SS-435EC-3FB-D (5 Manifold)

Part No. SS-437EC-3FB-D (7 Manifold)

Circulation: 2010 onwards

REGULATING VALVE



TEEJET 344 Series Electric Regulating Valve

Part No. SS-B344BRL-24S-03CGS

Circulation: 2005 onwards

When ordering make sure, you specify if you need 1" or 1.25"

OTHER BOOMSPRAY COMPONENTS



TEEJET Wheel Speed Sensor

Part No. SS-38412 (Sensor Only)

Part No. SS-38416 (Single Magnet)



TEEJET Flowmeter 801

Part No. SS-57-10100

When ordering make sure, you specify if you need 1" or 1.25"

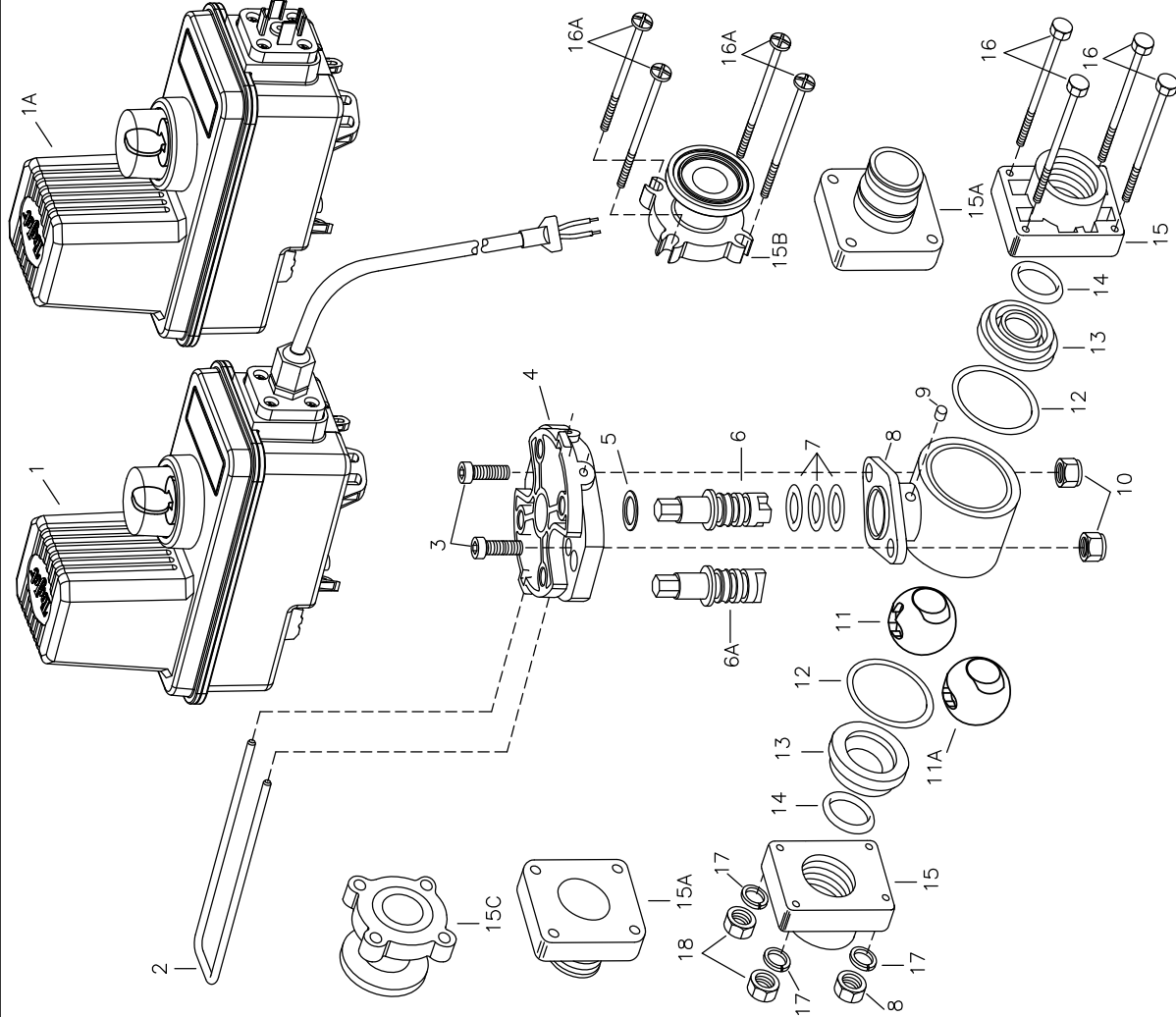
TEEJET NOZZLE CAPACITY GUIDE

	BAR	1 Nozzle L/Min	L/ ha on 50cm Spacing										
			4 km/h	5 km/hr	6 km/hr	7 km/hr	8 km/hr	10 km/hr	12 km/hr	16 km/hr	18 km/hr	20 km/hr	25 km/hr
Green 015	1.5	0.42	126	101	84.0	72.0	63.0	50.4	42.0	31.5	28.0	25.2	20.2
	2.0	0.48	144	115	96.0	82.3	72.0	57.6	48.0	36.0	32.0	28.8	23.0
	2.5	0.54	162	130	108	92.6	81.0	64.8	54.0	40.5	36.0	32.4	25.9
	3.0	0.59	177	142	118	101	88.5	70.8	59.0	44.3	39.3	35.4	28.3
	4.0	0.68	204	163	136	117	102	81.6	68.0	51.0	45.3	40.8	32.6
	5.0	0.76	228	182	152	130	114	91.2	76.0	57.0	50.7	45.6	36.5
Yellow 02	1.5	0.56	168	134	112	96.0	84.0	67.2	56.0	42.0	37.3	33.6	26.9
	2.0	0.65	195	156	130	111	97.5	78.0	65.0	48.8	43.3	39.0	31.2
	2.5	0.72	216	173	144	123	108	86.4	72.0	54.0	48.0	43.2	34.6
	3.0	0.79	237	190	158	135	119	94.8	79.0	59.3	52.7	47.4	37.9
	4.0	0.91	273	218	182	156	137	109	91.0	68.3	60.7	54.6	43.7
	5.0	1.02	306	245	204	175	153	122	102	76.5	68.0	61.2	49.0
Purple 025	1.5	0.70	210	168	140	120	105	84.0	70.0	52.5	46.7	42.0	33.6
	2.0	0.81	243	194	162	139	122	97.2	81.0	60.8	54.0	48.6	38.9
	2.5	0.90	270	216	180	154	135	108	90.0	67.5	60.0	54.0	43.2
	3.0	0.99	297	238	198	170	149	119	99.0	74.3	66.0	59.4	47.5
	4.0	1.14	342	274	228	195	171	137	114	85.5	76.0	68.4	54.7
	5.0	1.28	384	307	256	219	192	154	128	96.0	85.3	76.8	61.4
Blue 03	1.5	0.83	249	199	166	142	125	99.6	83.0	62.3	55.3	49.8	39.8
	2.0	0.96	288	230	192	165	144	115	96.0	72.0	64.0	57.6	46.1
	2.5	1.08	324	259	216	185	162	130	108	81.0	72.0	64.8	51.8
	3.0	1.18	354	283	236	202	177	142	118	88.5	78.7	70.8	56.6
	4.0	1.36	408	326	272	233	204	163	136	102	90.7	81.6	65.3
	5.0	1.52	456	365	304	261	228	182	152	114	101	91.2	73.0
Red 04	1.5	1.12	336	269	224	192	168	134	112	84.0	74.7	67.2	53.8
	2.0	1.29	387	310	258	221	194	155	129	96.8	86.0	77.4	61.9
	2.5	1.44	432	346	288	247	216	173	144	108	96.0	86.4	69.1
	3.0	1.58	474	379	316	271	237	190	158	119	105	119	105
	4.0	1.82	546	437	364	312	273	218	182	137	121	109	87.4
	5.0	2.04	612	490	408	350	306	245	204	153	136	122	97.9

NOZZLE WEAR CALCULATOR

Check nozzles regularly or replace on an annual basis.

Nozzle Capacity	Pressure at the nozzle (bar)	Flow at the nozzle (L/Min)	Replace Nozzles if L/Min is more than
015	3.0	0.59	0.64
02	3.0	0.79	0.86
025	3.0	0.99	1.08
03	3.0	1.18	1.29
04	3.0	1.58	1.73



ITEM	PART NO.	DESCRIPTION
1	50516-01C---■	REGULATING MOTOR, 1-RPM, (18-SEC), 2-WIRE JACKETED CABLE
	50516-03C---■	REGULATING MOTOR, 3-RPM, (6-SEC), 2-WIRE JACKETED CABLE
	50516-06C---■	REGULATING MOTOR, 6-RPM, (3-SEC), 2-WIRE JACKETED CABLE
1A	50516-01D	REGULATING MOTOR, 1-RPM, (18-SEC), DIN CONNECTION
	50516-03D	REGULATING MOTOR, 3-RPM, (6-SEC), DIN CONNECTION
	50516-06D	REGULATING MOTOR, 6-RPM, (3-SEC), DIN CONNECTION
2	CP50517-SSPV	RETAINING CLIP, 304 STAINLESS STEEL
3	CP26197-7/8-SS	SOCKET HEAD CAP SCREW, STAINLESS STEEL (2 REQ'D)
4	CP50514-PP	MOTOR ADAPTER, POLYPROPYLENE (BLACK)
5	CP20125-TEF	THRUST WASHER, TEFLON
6	CP56613-SS	STEM, 303 STAINLESS STEEL (FOR POLYPROPYLENE BALL)
6A	CP56615-SS	STEM, 303 STAINLESS STEEL (FOR STAINLESS STEEL BALL)
7	CP7717-M12X2.5-VI	O-RING, VITON (3 REQ'D)
8	CP20101-NYB	BODY, NYLON (BLACK) (2-WAY)
9	CP20126-FELT	DUST PLUG, FELT
10	CP38435-1/4-SSNY	ELASTIC LOCKNUT, STAINLESS STEEL (2 REQ'D)
11	CP22259-2-PP	RL BALL, POLYPROPYLENE (WHITE) (BRL VALVE)
11A	CP38441-1-SS	RL BALL, 303 STAINLESS STEEL (BRL VALVE)
12	CP20564-VI	GASKET, VITON (2 REQ'D)
13	CP20103-TEF	SEAL, TEFLON (2 REQ'D)
14	CP7717-2/213-VI	O-RING, NYLON (2 REQ'D)
	CP20104-3/4-NYB	END CAP, NYLON (BLACK) (3/4" NPT THREAD) (2 REQ'D)
15	CPB20104-3/4-NYB	END CAP, NYLON (BLACK) (3/4" BSPT THREAD) (2 REQ'D)
	CP20104-1-NYB	END CAP, NYLON (BLACK) (1" NPT THREAD) (2 REQ'D)
	CPB20104-1-NYB	END CAP, NYLON (BLACK) (1" BSPT THREAD) (2 REQ'D)
15A	CP45514-NYB	END CAP, NYLON (BLACK) (QUICK CONNECT) (2 REQ'D)
15B	CP45253-NYB	END CAP, NYLON (BLACK) (FLANGE) (1 REQ'D)
15C	CP48265-NYB	END CAP, NYLON (BLACK) (FLANGE) (1 REQ'D)
16	CP20129-SS	BOLT, 1/4"-20 X 3" HEX, STAINLESS STEEL (4 REQ'D) (THD & QC)
16A	CP45252-2-3/4-SSPV	SCREW, PAN HEAD, STAINLESS STEEL (4 REQ'D) (FLANGE VERSION)
17	CP20128-SS	LOCK WASHER, 1/4", STAINLESS STEEL (4 REQ'D) (THD & QC)
18	CP8535-SS	NUT, 1/4"-20 HEX, STAINLESS STEEL (4 REQ'D) (THD & QC)
AB344AE-KIT, SPARE PARTS KIT (INCLUDES ALL ITEMS MARKED WITH *)		

NOTE: (B) IN PART NUMBER INDICATES B.S.P.T INLET AND OUTLET CONNECTIONS
 ■ NOTE: FOR JACKETED CABLE MOTORS SPECIFY CABLE LENGTH IN PART NUMBER--
 03 (0.3-METER), 05 (0.5-METER), 15 (1.5-METER) OR 60 (6.0-METER).

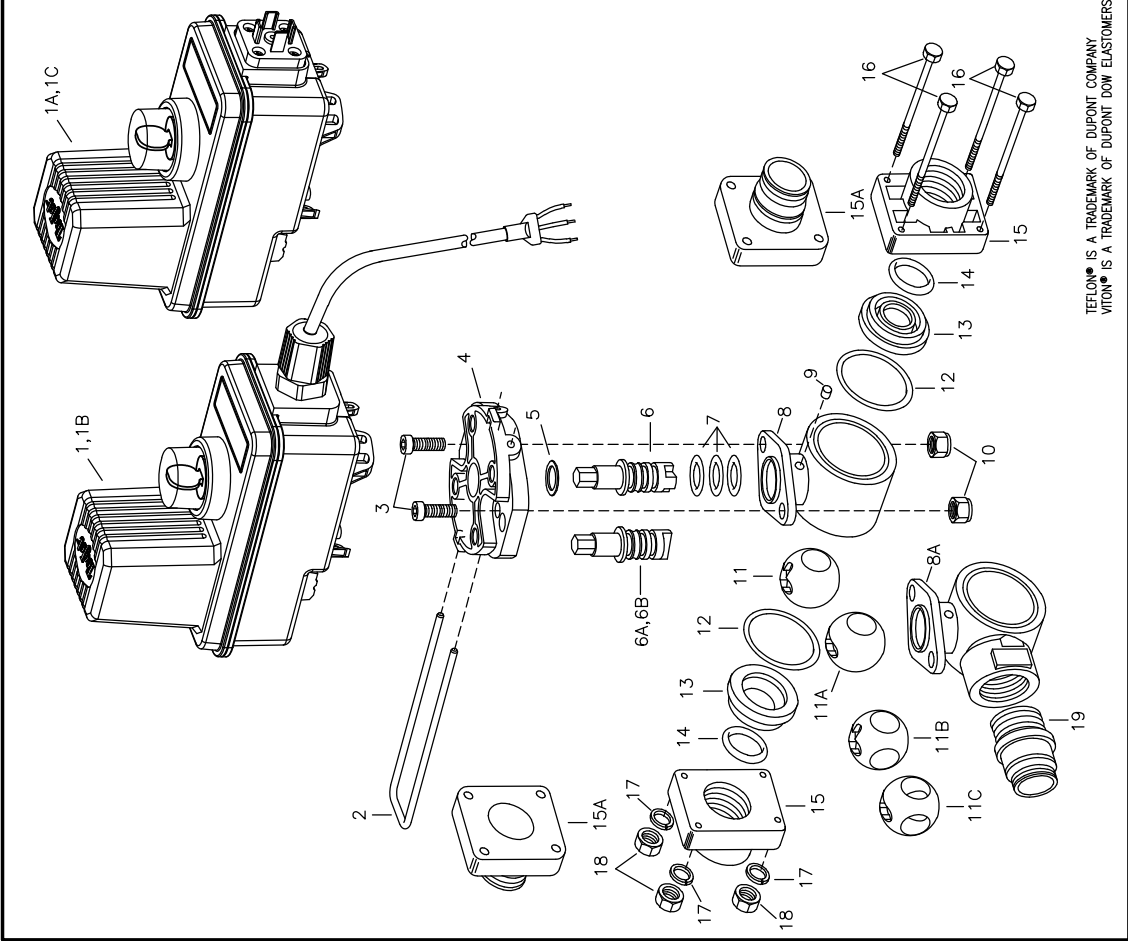
DESCRIPTION:
 344BRL
 DIRECTVALVE®
 LINEAR REGULATING
 ELECTRIC BALL VALVE



Spraying Systems Co.®
 Spray Nozzles and Accessories
 P.O. Box 7900 - Wheaton, IL 60187-7901

Rev. No. 2
 Ref. 11/10/2009

PARTS LIST
 PL344BRL
 SHEET OF



TEFLON® IS A TRADEMARK OF DUPONT COMPANY
VITON® IS A TRADEMARK OF DUPONT DOW ELASTOMERS

ITEM	PART NO.	DESCRIPTION
1	50515-22CP03 ■	BEC MOTOR, 22-RPM (0.7-SEC), 0.3-METER CABLE, POSITIVELY SWITCHED
	50515-22CP05 ■	BEC MOTOR, 22-RPM (0.7-SEC), 0.5-METER CABLE, POSITIVELY SWITCHED
	50515-22CP15 ■	BEC MOTOR, 22-RPM (0.7-SEC), 1.5-METER CABLE, POSITIVELY SWITCHED
	50515-22CP60 ■	BEC MOTOR, 22-RPM (0.7-SEC), 6.0-METER CABLE, POSITIVELY SWITCHED
1A	50515-22DF ■	BEC MOTOR, 22-RPM (0.7-SEC), DIN CONNECTION, POSITIVELY SWITCHED
	50533-22C03	BE MOTOR, 22-RPM (0.7-SEC), 0.3-METER CABLE
1B	50533-22C05	BE MOTOR, 22-RPM (0.7-SEC), 0.5-METER CABLE
	50533-22C15	BE MOTOR, 22-RPM (0.7-SEC), 1.5-METER CABLE
	50533-22C60	BE MOTOR, 22-RPM (0.7-SEC), 6.0-METER CABLE
1C	50533-22D	BE MOTOR, 22-RPM (0.7-SEC), DIN CONNECTION
2	CP50517-SSPV	RETAINING CLIP, 304 STAINLESS STEEL
3	CP26197-7/8-SS	SOCKET HEAD CAP SCREW, STAINLESS STEEL (2 REQ'D)
4	CP50514-PP	MOTOR ADAPTER, POLYPROPYLENE (BLACK)
5	CP20125-TEF	THRUST WASHER, TEFLON
6	CP56613-SS	STEM, 303 STAINLESS STEEL (FOR POLYPROPYLENE BALL)
6A	CP56615-SS	STEM, 303 STAINLESS STEEL (FOR 2-WAY STAINLESS STEEL BALL)
6B	CP56725-SS	STEM, 303 STAINLESS STEEL (FOR 3-WAY STAINLESS STEEL BALL)
7	CP7717-M12X2.5-VI	O-RING, VITON (3 REQ'D)
8	CP20101-NYB	BODY, NYLON (BLACK) (2-WAY)
	CP20102-3/4-NYB	BODY, NYLON (BLACK) (3-WAY, 3/4" NPT THREAD)
8A	CP820102-3/4-NYB	BODY, NYLON (BLACK) (3-WAY, 3/4" BSPT THREAD)
	CP20102-1-NYB	BODY, NYLON (BLACK) (3-WAY, 1" NPT THREAD & QUICK CONNECT)
	CP820102-1-NYB	BODY, NYLON (BLACK) (3-WAY, 1" BSPT THREAD)
9	CP20126-FELT	DUST PLUG, FELT
10	CP38435-1/4-SSNY	ELASTIC LOCKNUT, STAINLESS STEEL (2 REQ'D)
11	CP20106-1-PP	BALL, POLYPROPYLENE (WHITE) (2-WAY)
11A	CP19926-SS	BALL, STAINLESS STEEL (2-WAY)
11B	CP20109-1-PP	BALL, POLYPROPYLENE (WHITE) (3-WAY)
11C	CP45510-1-SS	BALL, STAINLESS STEEL (3-WAY)
12	CP20564-VI	GASKET, VITON (2 REQ'D)
13	CP20103-TEF	SEAL, TEFLON (2 REQ'D)
14	CP7717-2-213-VI	O-RING, VITON (2 REQ'D)
	CP20104-3/4-NYB	END CAP, NYLON (BLACK) (3/4" NPT THREAD) (2 REQ'D)
15	CP820104-3/4-NYB	END CAP, NYLON (BLACK) (3/4" BSPT THREAD) (2 REQ'D)
	CP20104-1-NYB	END CAP, NYLON (BLACK) (1" NPT THREAD) (2 REQ'D)
	CP820104-1-NYB	END CAP, NYLON (BLACK) (1" BSPT THREAD) (2 REQ'D)
15A	CP45514-NYB	END CAP, NYLON (BLACK) (QUICK CONNECT) (2 REQ'D)
16	CP20129-SS	BOLT, 1/4"-20 X 3" HEX, STAINLESS STEEL (4 REQ'D)
17	CP20128-SS	LOCK WASHER, 1/4" HEX, STAINLESS STEEL (4 REQ'D)
18	CP8535-SS	NUT, 1/4"-20 HEX, STAINLESS STEEL (4 REQ'D)
19	CP45526-NYB	THREADED QUICK CONNECT ADAPTER, NYLON (BLACK) (3-WAY ONLY)
20	56601-_-_-_-	VALVE BODY SUB-ASSY, SPECIFY OUTLET SIZE & BALL MATERIAL, INCLUDES ITEMS 3-19
	AB344AE-KIT	SPARE PARTS KIT (INCLUDES ALL ITEMS MARKED WITH *)

NOTE: (B) IN PART NUMBER INDICATES B.S.P.T INLET AND OUTLET CONNECTIONS
INLET FOR NEGATIVE, SWITCHED MOTORS SPECIFY "N" RATHER THAN "P" IN MOTOR PART NUMBER
EXAMPLE: 50515-22C05N

DESCRIPTION:

344BE AND 344BEC
DIRECTVALVE®
ELECTRIC SHUT-OFF
BALL VALVE



Spraying Systems Co.
Spray Nozzles and Accessories
P.O. Box 7900 - Wheaton, IL 60189-7900

Rev. No. 3
Ref.
PARTS LIST
PL344BEC
SHEET OF

MANIFOLD FLANGE CONNECTIONS

1" MEVX SERIES

FEATURES

- 12-volt DC operated
- 24-volt available
- Open/closed indicator
- ON/OFF has ¾ second response
- Regulating has 4 second response
- Open / Close verification available
- IP68 waterproof
- -20 to 150F (-29 to 65C) operating
- -67 to 221F (-55 to 105C) storage
- Actuator rated to 500,000 cycles
- Valve rated to 50,000 cycles leak-free
- 100G's shock rating

MATERIALS

- 316 stainless steel ball & stem
- Poly ball available
- Stainless steel hardware
- Fiberglass reinforced polypropylene
- PTFE seats
- FKM stem seals

ON/OFF

- Red = +12V DC
- Black = Ground
- White = +12VDC (Open)
0VDC (Close)

4 WIRE REGULATING

- Red = +12V DC (Open)
- White = Ground (Open)
- Black = +12V DC (Close)
- Green = Ground (Close)



1" MEVX ON/OFF ELECTRIC VALVES

PART NO	DESCRIPTION	MAX PSI	PIPE SIZE	OPENING THRU BALL	QTY
MEVX100	1" FULL PORT ELECTRIC VALVE	300	1"	1"	1

1" MEVX REGULATING ELECTRIC VALVES

PART NO	DESCRIPTION	MAX PSI	PIPE SIZE	OPENING THRU BALL	QTY
MEVXR100	1" FULL PORT ELECTRIC VALVE	300	1"	1"	1

Note: 1" MANIFOLD BANK VALVE ASSEMBLIES AVAILABLE

MANIFOLD FLANGE CONNECTIONS



2" MEVX ON/OFF ELECTRIC VALVES

PART NO	DESCRIPTION	MAX PSI	PIPE SIZE	OPENING THRU BALL	QTY
MEVXR200	2" STANDARD PORT ELECTRIC VALVE	300	2"	1½"	1
MEVXR220	2" FULL PORT ELECTRIC VALVE	250	2"	2"	1

2" MEVX REGULATING ELECTRIC VALVES

PART NO	DESCRIPTION	MAX PSI	PIPE SIZE	OPENING THRU BALL	QTY
MEVXR200	2" STANDARD PORT ELECTRIC VALVE	300	2"	1½"	1
MEVXR220	2" FULL PORT ELECTRIC VALVE	250	2"	2"	1

Note: 2" MANIFOLD BANK VALVE ASSEMBLIES AVAILABLE

2" MEVX SERIES

FEATURES

- 12-volt DC operated
- 24-volt available
- Open/closed indicator
- ON/OFF has 1½ second response
- Regulating has 4 second response
- Open / Close verification available
- IP68 waterproof
- -20 to 150F (-29 to 65C) operating
- -67 to 221F (-55 to 105C) storage
- Actuator rated to 500,000 cycles
- Valve rated to 50,000 cycles leak-free
- 100G's shock rating

MATERIALS

- 316 stainless steel ball & stem
- Poly ball available
- Stainless steel hardware
- Fiberglass reinforced polypropylene
- PTFE seats
- FKM stem seals

ON/OFF

- Red = +12V DC
- Black = Ground
- White = +12VDC (Open)
0VDC (Close)

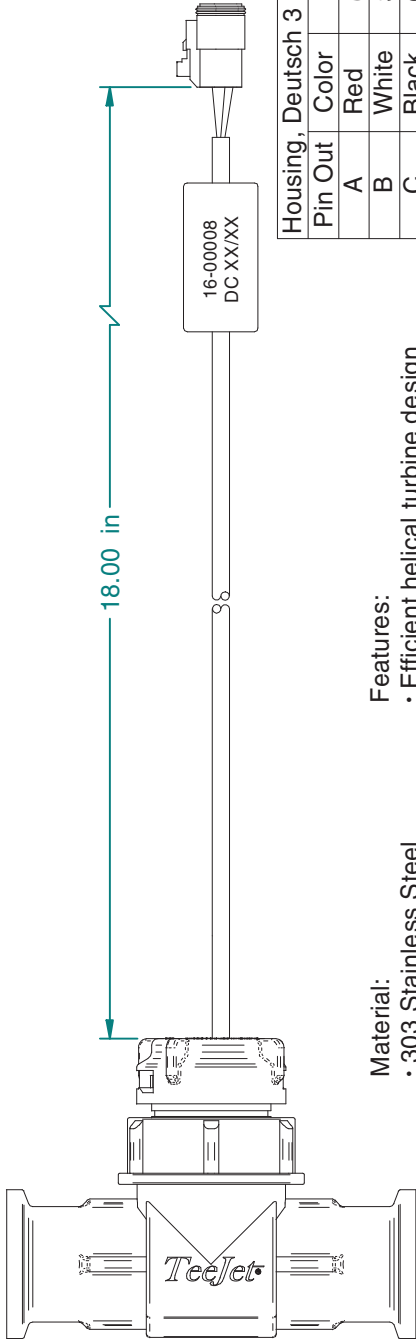
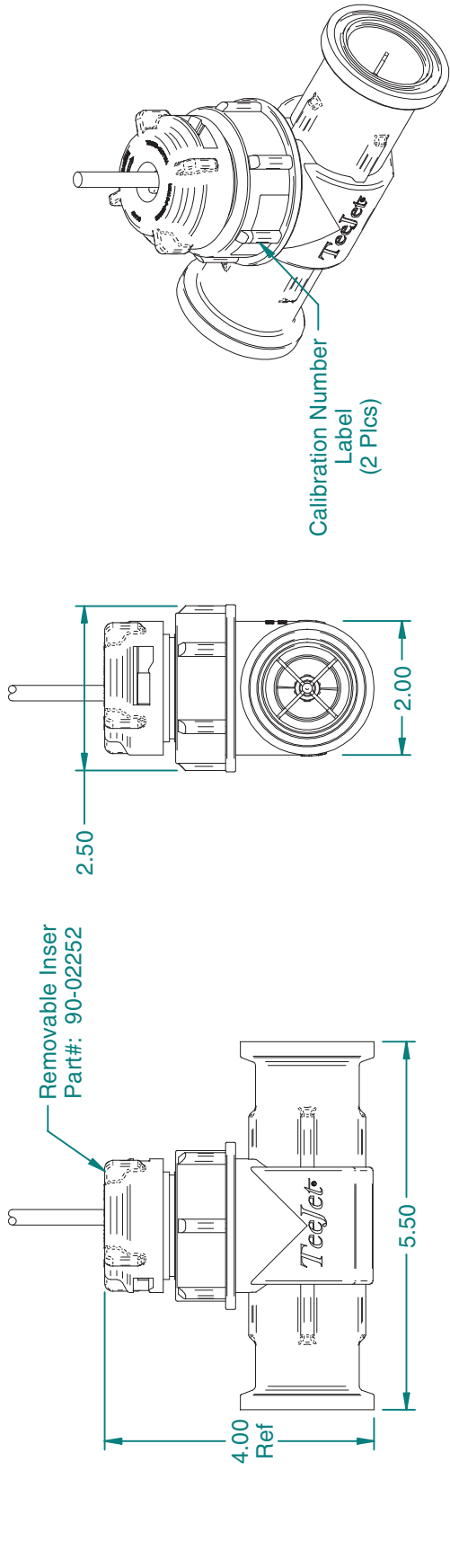
4 WIRE REGULATING

- Red = +12V DC (Open)
- White = Ground (Open)
- Black = +12V DC (Close)
- Green = Ground (Close)



<i>TeeJet</i>	801 FM Assemblies	Mid-Tech	801 FM Assemblies	Hose Connection Option
90-50231	801 w/ 3/4" HB	90-02175	801 w/ 3/4" HB	P/N
90-50230	801 w/ 1" HB	90-02176	801 w/ 1" HB	Description
90-50232	801 w/1_1/4" HB	90-02177	801 w/1_1/4" HB	57-10112* 3/4" Hose Barb
90-50233	801 w/1_1/4" NPT (F)	90-02178	801 w/1_1/4" NPT (F)	57-10113* 1" Hose Barb
		Above assemblies include flow meter interface cable 45-05315		57-10114* 1_1/4" Hose Barb
				57-10115* 1_1/4" NPT (F)
				(*) 2 Required per 57-10100 flow meter

Note: Also requires 2 flange clamp (50 series) assemblies 90-50229



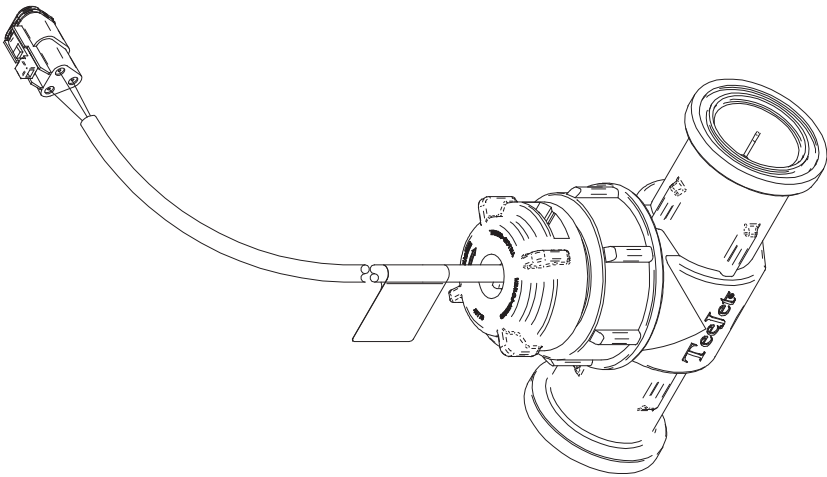
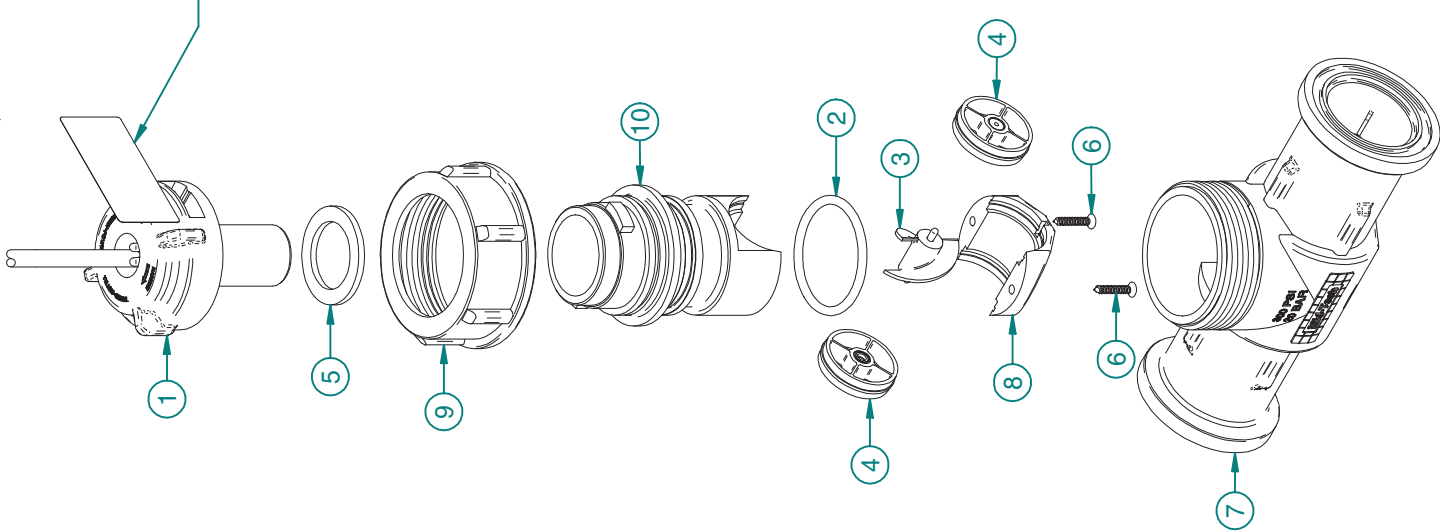
- Material:
 - 303 Stainless Steel
 - 410 Stainless Steel
 - Nylon
 - Polypropylene
 - Ruby
 - Sapphire
- Features:
 - Efficient helical turbine design
 - Easy access to turbine assembly for cleaning and maintenance
 - Flange mount design for flexible installation options
 - 2.5-60 GPM (10-225 LPM)

- Notes:
- Approximate calibration #82 pulses/lit - 310 pulses/gal.
 - Vertical mounting position recommended
 - 12 inches (30cm) of uninterrupted flow required before the flow meter and 6 inches (15cm) of uninterrupted flow required after flow meter.
 - 45-05315 Flow meter interface cable required for Mid-Tech controls.

MATERIAL:		See Notes	
FINISH:		See Notes	
PROJECTION:		SCALE: UNITS: INCH: $\frac{X}{2.1}$ METRIC: $\frac{X}{2.1}$	TITLE: Flowmeter, 801
UNLESS OTHERWISE SPECIFIED TOLERANCE:		0-1" $\pm .1$ 1" $\pm .125$ 1.5" $\pm .15$ 2" $\pm .2$ 3" $\pm .25$ 4" $\pm .3$ 6" $\pm .375$ 8" $\pm .5$ 10" $\pm .625$ 12" $\pm .75$ 15" ± 1.0 18" ± 1.25 24" ± 1.5 30" ± 1.75 36" ± 2.0 48" ± 2.5 60" ± 3.0 72" ± 3.5 84" ± 4.0 96" ± 4.5 108" ± 5.0 120" ± 5.5	DRAWN BY: <i>Byron Miller</i>
REV. DATE		NO. NO.	CHECKED BY: <i>Ang Nabea</i>
R1 6/15/05 UpDated			APPROVED BY: <i>Ang Nabea</i>
R0 8/14/02 010117			SHEET No: <i>50231</i>
			DWG No: <i>10f2</i>
			C-57-10100

Midwest Technologies IL, LLC. Claims proprietary right in the material disclosed hereon. This document is not to be used in any way detrimental to the interest of Midwest Technologies IL, LLC.

Item	Description	Part Number	QTY	U.M.
1	Sensor, PCB Assembly	16-00008	1	EA
2	O-Ring, 35mmx3mm	57-00065	1	EA
3	Turbine Assembly 801 FM	57-10108	1	EA
4	Guide Vane Bearing	57-10109	2	EA
5	Washer, Seat, 801	57-10111	1	EA
6	Screw, #6-5/8" LG Flat Head	60-04031	2	EA
7	Body, 801 Flowmeter	64-50044	1	EA
8	Endcap, 801 Flowmeter	64-50045	1	EA
9	Retaining, Nut 801 FM	64-50046	1	EA
10	Insert, Body 801 FM	64-50047	1	EA



		MATERIAL: N/A		Midwest Technologies, LLC	
		FINISH: N/A		TITLE: Flowmeter, 801	
		PROJECTION: 		DRAWN BY: <i>Byron Miller</i>	
		SCALE: UNITS:  INCH: 2.1 METRIC: X		CHECKED BY: <i>Ang Newberry</i>	
		UNLESS OTHERWISE SPECIFIED TOLERANCE:		APPROVED BY: <i>Scott Lander</i>	
		0.1" +/- .1"		SHEET No: <i>20f2</i>	
		1.5" +/- .25"		DWG No: <i>C-57-10100</i>	
		3.0" +/- .5"		REV. DATE	
R1	6/15/05	UpDated			
R0	8/14/02	010117			
REV.	DATE	NOC. No			

Midwest Technologies IL, LLC. Claims proprietary right in the material disclosed hereon. This document is not to be used in any way detrimental to the interest of Midwest Technologies IL, LLC.



Series 9300 Hydraulically-Driven Centrifugal Pumps

Form L-1526
1/10

Installation, Operation, Repair and Parts Manual

Description

Hypro centrifugal pumps are designed for agricultural and industrial spraying and transfer of a variety of fluids: water, insecticides, herbicides, wettable powders, emulsives, liquid fertilizers, etc. Polypropylene centrifugal pumps may also be used to pump acid fertilizer, calcium chloride and other highly corrosive liquids such as sulfuric and phosphoric acids.

Hypro Series 9300 hydraulic motor-driven centrifugal pumps provide smooth performance. They can be conveniently mounted on the tractor or sprayer, becoming part of the vehicle's hydraulic system and freeing the PTO for other uses. The Hypro "close-coupled" design reduces the mounting space required, eliminating long shafts and couplers between the pump and motor.



SERIES 9302C & 9302S
Cast Iron & Stainless Steel
Centrifugal Pumps

Max. Flow Rate:100 gpm
Max. Pressure:120 psi
Ports:1-1/4" NPT Inlet
.....1" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9303C & 9303S
Cast Iron & Stainless Steel
Centrifugal Pumps

Max. Flow Rate:147 gpm
Max. Pressure:145 psi
Ports:1-1/2" NPT Inlet
.....1-1/4" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9303P
Polypropylene
Centrifugal Pumps

Max. Flow Rate:113 gpm
Max. Pressure:125 psi
Ports:1-1/2" NPT Inlet
.....1-1/4" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9303C-SP
Cast Iron Centrifugal Pumps

Max. Flow Rate:122 gpm
Max. Pressure:140 psi
Ports:1-1/2" NPT Inlet
.....1-1/4" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9304C
Cast Iron Centrifugal Pumps

Max. Flow Rate:190 gpm
Max. Pressure:130 psi
Ports:2" NPT Inlet
.....1-1/2" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9305C-HM3C
Cast Iron Centrifugal Pumps

Max. Flow Rate:190 gpm
Max. Pressure:180 psi
Ports:2" NPT Inlet
.....1-1/2" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



**SERIES 9305C-
HM3C-SP, -BSP**
Cast Iron Centrifugal Pumps

Max. Flow Rate:178 gpm
Max. Pressure:154 psi
Ports:2" NPT or BSP Inlet
.....2" NPT or BSP Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank



SERIES 9306C & 9306S
Cast Iron & Stainless Steel
Centrifugal Pumps

Max. Flow Rate:214 gpm
Max. Pressure:150 psi
Ports:2" NPT Inlet
.....1-1/2" NPT Outlet
Hydraulic Ports:1/2" NPT Inlet
.....1/2" NPT Tank

General Safety Information

NOTE

Notes are used to notify of installation, operation, or maintenance information that is important but not safety related.

CAUTION

Caution is used to indicate the presence of a hazard, which will or may cause minor injury or property damage if the notice is ignored.

WARNING

Warning denotes that a potential hazard exists and indicates procedures that must be followed exactly to either eliminate or reduce the hazard, and to avoid serious personal injury, or prevent future safety problems with the product.

DANGER

Danger is used to indicate the presence of a hazard that will result in severe personal injury, death, or property damage if the notice is ignored.

DANGER

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 notice may result in severe personal injury and/or property damage and will void the product warranty.

CAUTION

1. Do not pump at pressures higher than the maximum recommended pressure.
2. Maximum liquid temperature is 140° F for Series 9300 centrifugal pumps.
3. Disconnect power before servicing.
4. Release all pressure within the system before servicing any component.
5. Drain all liquids from the system before servicing any component. Flush with water.
6. Secure the outlet lines before starting the pump. An unsecured line may whip, causing personal injury and/or property damage.
7. Check hose for weak or worn condition before each use. Make certain that all connections are tightly secured.
8. Periodically inspect the pump and the system components. Perform routine maintenance as required (See Repair Instructions).
9. Use only pipe, hose and fittings rated for the maximum psi rating of the pump.
10. Do not use these pumps for pumping water or other liquids for human or animal consumption.

Hazardous Substance Alert

CAUTION

1. Always drain and flush pump before servicing or disassembling for any reason.
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. It is illegal to ship or transport any hazardous chemicals without United States Environmental Protection Agency Licensing.

DANGER

Never use your hand to check the condition of hydraulic lines or hoses. If hydraulic fluid penetrates the skin, get medical help immediately. Failure to get proper medical help may result in loss of limb or life. The safest way to check hydraulic lines or hoses is by holding a piece of cardboard next to the hydraulic line or hose.

WARNING

The sound pressure level of the pump is 80dBA. Observe all safety precautions when operating the pump within close proximity for extended periods of time by wearing hearing protectors. Extended exposure to elevated sound levels will result in permanent loss of hearing acuteness, tinnitus, tiredness, stress, and other effects such as loss of balance and awareness.

General Information—Hydraulic Systems

Hydraulic Pumps

Hydraulic pumps come in two basic types:

- **Constant displacement** - which will continue to put out its rated flow regardless of pressure, until the relief valve bypasses the flow.
- **Variable displacement** - which will produce only the flow needed by the implement until the total pump output is reached. If less than the full pump output is required, an automatic stroke control mechanism decreases the pump output to maintain a constant pressure and flow. The output varies according to demand.

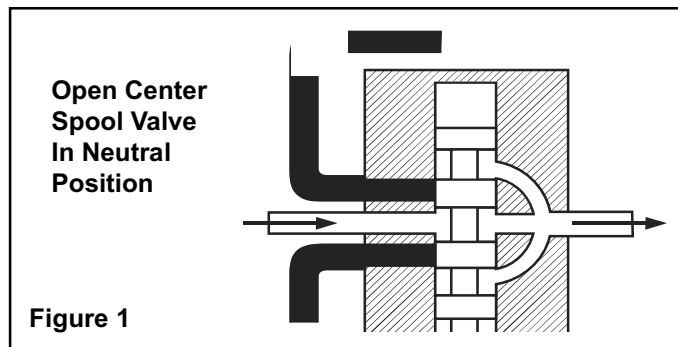


Figure 1

Spool Valves

There are two basic types of spool valves used in conjunction with these pumps — Open and Closed Center. In the Open Center Valve (See Figure 1), the flow goes straight through the valve when in the neutral position. This type is used for constant displacement pumps where the flow should never be shut off.

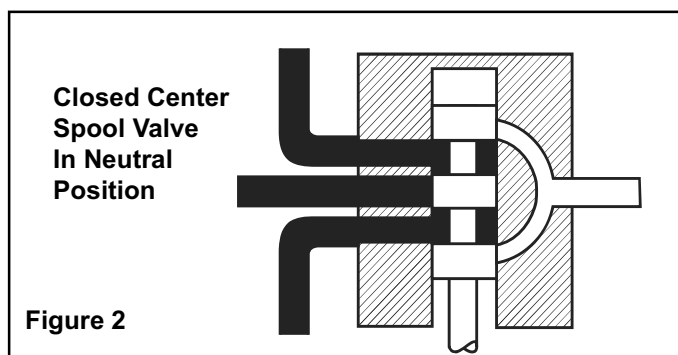


Figure 2

The Closed Center Valve (See Figure 2) is used with variable displacement pumps. The flow is completely shut off in the neutral position, causing the pump stroke to adjust to zero flow. The flow stops, but the pump maintains a static pressure up to the valve.

Hydraulic Motors

Figure 3 shows an internal gear motor (Gerotor) where pressure causes the cavities between the gears to expand on one side, developing torque. The Gerotor type of hydraulic motor is used on Hypro pumps for its superior performance characteristics, including cooler running and higher rpm capabilities.

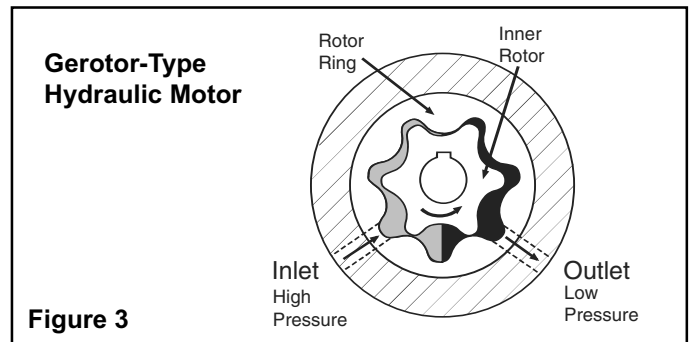


Figure 3

Three Systems

Fitting these components together and installing a motor, we have one of the three types of systems: Open Center, Closed Center (pressure compensated) and Closed Center Load Sensing (flow and pressure compensated).

Open Center Systems

In an Open Center System, the hydraulic pump puts out a constant flow. If the pump puts out more oil than the motor can use, a portion of the oil must be bypassed around the motor. When the oil is bypassed around a loop and does no work, the energy put into it by the pump turns into heat. Therefore, the amount of oil bypassed should be kept to a minimum. Use the largest motor possible.

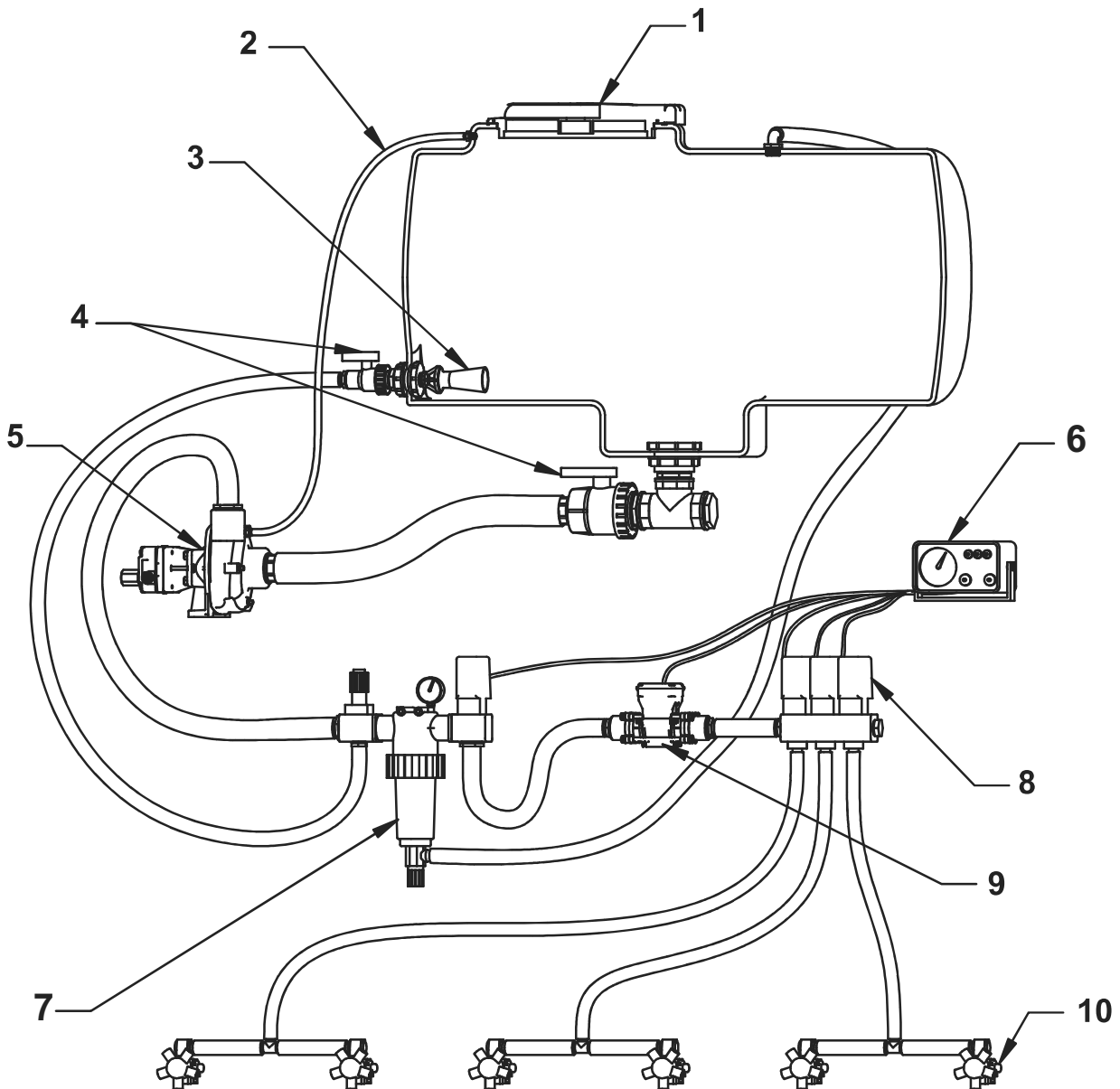
Closed Center (Pressure-Compensated) Systems

The Closed Center Pressure-Compensated system has a variable displacement pump which will deliver flow at the necessary rate to maintain a specified pressure. It is desirable to equip implements with a motor of a low flow range that will cause the pump to operate between 1800 and 2100 psi [124 and 145 BAR]. A motor that requires a large volume to obtain the correct implement speed usually causes the hydraulic pump in a closed center system to operate at a lower pressure than desirable. This low pressure results in unnecessary flow and the generation of heat that lowers the lubricating quality of the oil and may damage transmission parts. Use the smallest motor possible.

Closed Center Load Sensing Systems (Flow and Pressure-Compensating)

The Closed Center Flow-Compensated System is a variation of the pressure-compensated system, designed primarily for more efficient operation and the generation of less heat. It works on the principle of maintaining a constant pressure drop from the pump to the work port of the selector valve. Any variation in demand at the motor will cause a change in flow. The system senses this change in flow due to the change in pressure drop across the valve and causes the pump to compensate by varying the pump flow. No restrictor is used in the pressure line and no oil is bypassed.

Plumbing Installation



Centrifugal Plumbing Hook-up

REF. NO.	DESCRIPTION
1	Tank Lid
2	Vent Line #3430-0456
3	Jet Agitator
4	Shut-off Ball Valves
5	Centrifugal Pump
6	Spray Control Console
7	Centrifugal Pump Control
8	Manifold Boom Valve
9	Electromagnetic Flowmeter
10	Compact Jet Turret Nozzle Body

Installation Instructions

All Models — Open Center Systems

Models include Tank Port Adapter with built-in Check Valve Assembly and Pressure Port Adapter.

HM2C and HM4C Models Only — Closed Center and Small Open Center Systems.

Models include Tank Port Adapter with built-in Check Valve Assembly and Pressure Port Adapter with three different size metering orifices for HM4C models. The orifices are not required for use with closed center systems with flow control, such as John Deere closed center systems. Also, do not use for small open center systems with a maximum flow of 8 gpm [30.28 lpm] for HM2C model; 10 gpm [37.85 lpm] for HM4C model. If necessary, the pressure port adapter may be used without a metering orifice installed in any closed center system. For best results, the pressure differential across the motor should be less than 2500 psi (170 bar).

Preliminary to Mounting

Consult the owners manual to determine the type and capacity of the hydraulic system. Make sure the hydraulic system is recommended to operate with a continuous load. Refer to the Pump Selection Guide to confirm you have the proper pump for your hydraulic system.

Check to see that the pump impeller can be turned by hand. (Turn the shaft clockwise using a deep socket wrench on the impeller nut.) If it cannot be turned, open the pump casing to look for obstructions. Clean out any corrosion build up where the casing fits over the eye of the impeller.

Pump Inlet Line

To achieve full capacity from the pump, the inlet line should be at least the same size as the inlet port on the pump. Reducing this line size will restrict the capabilities of the pump. The line must also be free of air leaks. Check all fittings and connections in the suction line for tightness. The introduction of air may affect the priming and pumping capabilities of the pump. Use good quality suction hose that will not be collapsed by suction.

For non self-priming models, the centrifugal pump should be mounted below the liquid level and as near to the liquid source as possible to allow for the shortest suction line practical. To achieve optimal performance, the suction line should slope down into the pump. Avoid rises and humps that could trap air in the line to the pump. The suction line and pump should be filled with liquid prior to starting the pump, and all discharge lines should be open.

Pump Outlet Line

The recommended orientation for the outlet port is pointing straight up. This allows liquid to stay in the pump while it is priming. The outlet line should be the same size as the pressure port on the pump to give the optimal flow. The line should have as few restrictions and elbows as possible to optimize the pump performance and reduce pressure drop from the pump to the spray tips.

Priming the Pump

NOTE

The pump must not be run dry.

Before starting the pump, the inlet line and pump must be filled with liquid and all discharge lines must be open. On self-priming models, only the pump chamber needs to be filled with liquid. The pump must not be run unless it is completely filled with liquid because there is a danger of damaging the mechanical seal, which depends on the liquid for its lubrication.

Non-self-priming models should be mounted below the level of the liquid. The suction line should slope down to the pump and be free of dips and bends. If this cannot be done, a foot valve should be installed in the end of the inlet line so that the line can be completely filled with liquid before starting the pump.

For best priming results, the top vent plug should be removed from the pump casing. A vent line (1/4" [6.35 mm] tubing is sufficient) should be installed running back to the top of the tank. This line prevents air lock and allows the pump to prime itself by bleeding off trapped air. The small stream of liquid that returns to the tank during operation is negligible. The discharge from this line should be positioned in the tank above the high liquid level. Self-priming models can be primed by removing the top vent plug and filling the priming chamber. The priming chamber will fill to the level of the inlet port. After use, the priming chamber should be flushed and drained to avoid chemical corrosion and damage from freezing. Drain by removing the lower drain plug.

Controlling the Pump Flow

The best way to control the flow is by incorporating two control valves in a pipe tee immediately after the strainer in the discharge line. This permits controlling agitation flow independently of nozzle flow.

In any centrifugal pump, it is the large volume of liquid which puts load on the drive. Use only the flow needed to develop the pressure required at the boom and to maintain adequate agitation. Hydraulic motor-driven centrifugal pumps are easily adjusted to the exact flow required, as explained in the Operating Instructions of this manual.

Centrifugal Pump Control

Hypro now offers many different components for spraying systems. The Hypro centrifugal pump control incorporates the electric flow control valve, a self-cleaning line strainer, a visual pressure gauge and a manual agitation control valve.

Flow Control Valve

A high-flow electric proportional valve allows for maximum flow control to the boom valves. It provides smooth, rapid control that can be controlled from either an electronic rate controller or switch box.

Strainers

The recommended placement of the strainer for a centrifugal pump is in the pump outlet line. This will eliminate any possible restriction that the strainer could

Plumbing Installation

create if it were installed in the inlet line. Ensure that the proper strainer size and screen mesh are used to limit the pressure drop and achieve the best filtration. Line strainers can also be installed in the tank fill line to filter liquid as it is loaded into the tank as well as in the boom lines to further filter the solution prior to the spray tips. Tank baskets can also be used to filter material added through the tank lid.

Agitation

The centrifugal pump control contains a manual agitation control valve that can be adjusted to provide the right amount of flow to the jet agitators in the tank to ensure proper mixing within the tank.

Flowmeter

To eliminate the mechanical problems of a turbine flowmeter, we recommend that an electromagnetic flowmeter be used. These flowmeters have no moving parts to wear out and will provide a more consistent and accurate flow reading. They can be input into just about any electronic rate controller or switch box.

Boom Section Valves

For rapid response and reliability, we recommend electric plunger valves be used for boom control. The valves should be sized accordingly to minimize the pressure drop and maximize the flow rate. The boom tubing or hose should be sized accordingly to ensure that a pressure drop in the lines does not occur, causing inconsistent pressures at the nozzles.

Nozzle Bodies

Nozzle bodies with shut-off check valves are recommended to eliminate dripping from the spray tips when the boom valves are shut down.

Hooking Up the Hydraulic Motor to the Tractor Hydraulic System

Hypro Series 9300HMC hydraulic motor-driven pumps can be mounted on either the tractor or sprayer. When hooking up, make sure that no dirt or liquid gets into the hydraulic motor. **Keep all hydraulic connections clean.** Be sure to connect the hydraulic motor into the system correctly by

putting the pressure line to the Pressure Port Adapter and return line to the Tank Port Adapter. The adapters on the hydraulic motor are sized to accommodate 1/2" NPT fittings on the pressure port and 3/4" NPT on the tank port. For maximum performance, the hydraulic lines should also be at least 1/2" [12.7 mm] in size for the pressure line and 3/4" [19.05 mm] for the tank line.

The tank (**OUT**) port adapter with a built-in check valve assembly will guard against reverse operation — allowing you to reverse oil flow to operate other equipment. **This adapter must not be removed.** On HM2C and HM4C model pumps, the pressure (**IN**) port adapter is a two-piece assembly consisting of an open (unrestricted) adapter with three orifices packed loose with the pump. (See the Operations Section.)

When using the HM2C or HM4C unit on any flow-compensated (load sensing) closed center system, or any small open center system with a maximum flow of 8 gpm [30.28 lpm] for HM2C or 10 gpm [37.85 lpm] for HM4C, the metering orifice should be removed from the pressure port adapter. When using these units on flow-compensated systems, connect to the motor priority circuit if your tractor has one.

Standard spool valves, which are found on all tractor hydraulic systems, may cause potentially damaging high peak pressures in the hydraulic system when closed because of abrupt shut-off of oil flow in both the supply and return lines. When shutting off the pump, move the selector to the **FLOAT** position to allow the centrifugal pump to come to a stop gradually.

**For further information
regarding Hypro products,
contact your local dealer or
Hypro directly at
www.hypropumps.com or by
calling 1-800-424-9776.**

Operation

Open Center Systems— All Models Adjusting Centrifugal Pump Output

[NOTE]

HM1C, HM3C & HM5C motors have bypass screw fully closed from the factory. HM2C & HM4C motors have bypass screw set at 1-1/2 turns from fully closed from the factory.

1. Open the bypass adjustment screw 2-1/2 turns from fully closed. Turn the bypass screw in to achieve the flow for the desired gpm and psi.
2. Start the tractor. Leave the directional valve in the neutral position and allow hydraulic oil to circulate for approximately 10 to 15 minutes or until adequately warmed.

3. Prime the centrifugal pump with all valves open (See the Installation Instructions and System Configuration Diagram).
4. Close the agitation line valve and keep the control valve and the boom shut-off valve open. Note the spray pressure.
5. Open the agitation line valve until you have desired circulation in the tank. Recheck the spray pressure. If it is too low, close down the agitation line valve until the desired spray pressure is reached. If the spray pressure is too high, throttle the centrifugal pump by closing down the control valve.

Closed Center (Pressure-Compensated) — HM2C and HM4C Models Only

On a pressure-compensated system, the amount of oil that is allowed to flow through the hydraulic motor is regulated by a metering orifice in the pressure port adapter. Three different sizes of orifices are supplied with the HM2C and HM4C model pumps to allow flexibility in the flow required for individual sprayer needs.

The smaller the orifice, the less hydraulic oil goes through the motor, so the pump will run slower and the flow of liquid pumped and the spray pressure will also be less. As the hydraulic oil flow is increased (by installing a larger orifice), the amount of liquid being pumped and the spray pressure is also increased.

Installing and Removing Metering Orifice

1. Shut off the hydraulic system.
2. Disconnect the line to the pressure port of the hydraulic motor.
3. Remove the adapter from the motor using a 1-1/16" wrench. Make sure the o-ring is on the metering orifice before installing into port adapter.
4. The orifice is removed or installed in the port adapter by tapping either in or out of the adapter.
 - A. To remove — tap the orifice out from the small end of the adapter.
 - B. To install — tap the orifice in from the large end of the adapter. The orifice is seated when a snap sound is heard.

Adjusting Centrifugal Pump Output

1. Open the bypass adjusting screw in the hydraulic motor three (3) turns.
2. Start the tractor and allow the hydraulic oil to circulate for approximately 10 to 15 minutes or until adequately warmed.
3. Close and lock down the bypass adjusting screw in the hydraulic motor.
4. Prime the centrifugal pump with all valves open (See Installation Instructions and System Configuration Diagram).
5. Close the agitation line valve and the control valve; open the boom shut-off valve.
6. With the pump running, open the control valve until the pressure gauge indicates the desired spraying pressure.
7. Open the agitation line valve until sufficient agitation is observed. Then, if spray pressure drops, readjust the control valve to restore to the desired pressure.
8. If a sufficient boom pressure cannot be attained, install the #2 size orifice and repeat Steps 5 through 7.
9. If a sufficient boom pressure still cannot be attained with the #2 size orifice, install the #3 size orifice and repeat Steps 5 through 7.
10. If a sufficient boom pressure still cannot be attained with the #3 size orifice, remove the orifice and repeat Steps 5 through 7.

Closed Center (Load Sensing) — All Models

Many tractors are being introduced with load sensing systems (also referred to as flow and pressure-compensated systems) which simplify system setup and eliminate many of the problems associated with using the wrong size pump motors on a given hydraulic system. Usually, any of Hypro's 9300HMC models may be used on this type of system, provided the hydraulic system produces sufficient oil flow for the hydraulic motor being used (Refer to the Pump Selection Guide).

This system maintains a constant flow of hydraulic oil for a given pressure drop. The flow is adjustable with a flow control valve installed in the hydraulic system (such as the Tortoise/Hare control on John Deere tractors). Because this system has adjustable flow, there is no need to bypass hydraulic oil as in an open center system, or to restrict the flow with orifices as in a closed center pressure-compensated system.

Adjusting Centrifugal Pump Output

1. Make sure the orifice from the pressure port adapter of the hydraulic motor has been removed (HM2C and HM4C models only).
2. Close and lock down the bypass adjusting screw in the hydraulic motor.
3. Set the tractor hydraulic flow control valve for minimum hydraulic oil flow to the remote outlet (Tortoise position).
4. Start the tractor and allow the hydraulic oil to circulate for approximately 10 to 15 minutes or until adequately warmed.
5. Prime the centrifugal pump with all valves open (See the Installation Instructions and System Configuration Diagram).
6. Close the agitation line valve and open the control valve and the boom shut-off valve.
7. Slowly adjust the tractor hydraulic flow control valve until the desired boom pressure is attained.
8. Open the agitation line valve until sufficient agitation is observed. If spray pressure drops, readjust the tractor hydraulic flow control valve to restore it to the desired pressure.

Flush Pump After Use

One of the most common causes for faulty pump performance is gumming or corrosion inside the pump. Flush the pump and entire system with a solution that will chemically neutralize the liquid pumped. Mix this solution according to the manufacturer's directions. This will dissolve most residue remaining in the pump, leaving the inside of the pump clean for the next use.

To Prevent Corrosion

After cleaning the pump as directed above, flush it with a permanent-type automobile antifreeze (Prestone®, Zerex®, etc.) containing a rust inhibitor. Use a 50% solution, half antifreeze and half water. A protective coating will remain on the inner pump surfaces. Save the excess antifreeze for the next application. Plug the ports to keep out air during storage. For short periods of idleness, noncorrosive liquids may be left in the pump, but air must be kept out. Plug the ports or the seal port connections.

Repair Instructions

Hypor Repair Tools:

Tool Box No. 3010-0168 • 1/4" Allen Wrench No. 3020-0008
Support Bars (2) No. 3010-0064 • Port Brush No. 3010-0066
1/16" Allen Wrench No. 3020-0009 • Brush Holder No. 3010-0067 •
Large Retaining Ring Pliers No. 3010-0084 • Small Retaining Ring
Pliers No. 3010-0167

Shop Tools Needed

Bench Vice • Arbor Press • Air or Hand Drill • Small Knife
Metal Pipe - 1" dia. x 4" high (Bearing Seating Tool)
PVC Pipe - 3/4" dia. x 4" - 6" high (Seal Seating Tool)
12" Crescent Wrench • Two Flat Screwdrivers (approx. 10" long)
1/2", 9/16", 5/8" and 7/8" sockets • Hammer or Rubber Mallet
Small Screwdriver (recommended) • Large File (optional)
1/2" and 9/16" Box End Wrench • Lubricating Spray (WD-40 or LPS)
Small amount Hydraulic Oil • Cleaning Solvent Tank (recommended)

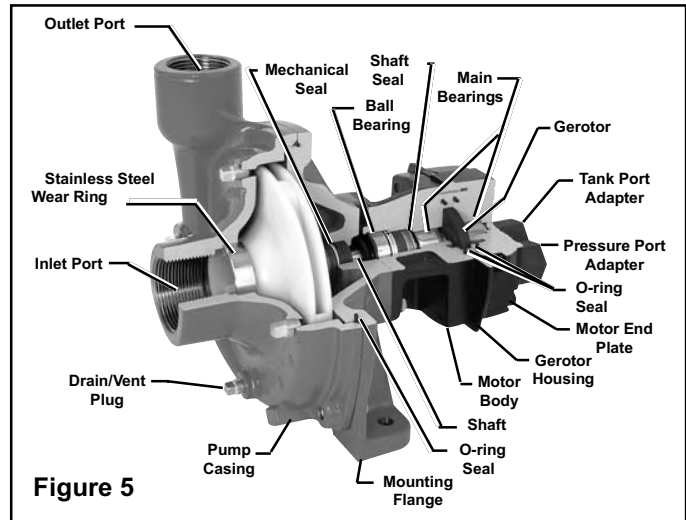


Figure 5

Pump Housing Disassembly

[NOTE]

Instructions in *italics* describe procedures for the Series 9300P Polypropylene Centrifugal Pumps, when different than the cast iron pumps.

- Using a 9/16" box end wrench, remove the four Hex Head Bolts holding the Pump Casing to the Mounting Flange. (If necessary, tap Pump Casing Outlet Port with rubber mallet or hammer to separate.) *[Using a 1/2" wrench, remove the six bolts from the front. For the two bottom bolts securing the base, you will need to hold the two nuts with another 1/2" wrench. Also remove the 5/16" screw from the rear, near the outlet port.]*
- To remove the Impeller Nut, insert a large screwdriver or file (at least 10" [254 mm] long) into Impeller Vanes to prevent Impeller from turning when loosening nut. Use a 5/8" socket wrench to remove the Impeller Nut by turning it counterclockwise (See Figure 6). *[Use 7/8" deep socket wrench to remove Plastic Seal Nut, then 9/16" deep socket to remove Metal Jam Nut and Washer.]*

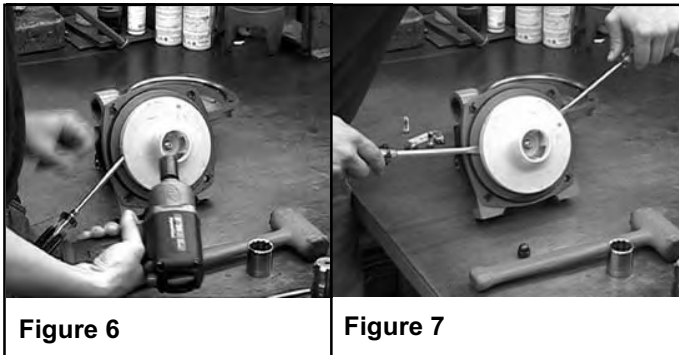


Figure 6

Figure 7

- Once nut *[and washer]* is removed, place a screwdriver on each side behind the Impeller and pry away from the Mounting Flange (See Figure 7). Remove Woodruff Key from the Shaft. Remove O-ring from the Mounting Flange.

Pump Seal Removal

- Lightly lubricate the Shaft for easier removal of the Seal. Using two screwdrivers positioned opposite each other, pry the rotary portion of the Seal from the Shaft (See Figure 8).

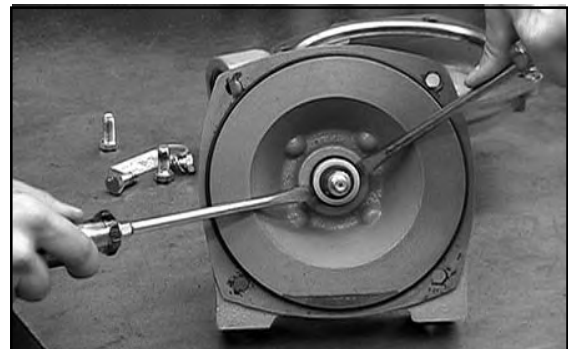


Figure 8

[NOTE]

In the case of a severe pump seal leak, inspect the Shaft/Bearing Assembly in the hydraulic motor for possible contamination.

- Using a 1/2" box end wrench, remove the four bolts holding the Motor to the Mounting Flange. Remove Motor. *[Remove the Plastic Back Cover flange. Knock the Seal out from back with a hammer and screwdriver. Use a 1/2" socket wrench and 1/2" box end wrench to remove the Mounting Flange from the Hydraulic Motor.]*

- Using a screwdriver and hammer, tap out the stationary portion of the Mechanical Seal from the motor side of the Mounting Flange. (If the motor is not removed, the seal can be pried out with a small screwdriver.)

[NOTE]

The seal will be damaged by removal in this manner. A new seal must be used when pump is reassembled.

Clean-Up Of Pump Housing

- Using a circular bottle-type wire brush with air or hand drill, clean the Outlet Port, Inlet Port and the sealing areas of the o-ring on the Pump Casing and Mounting Flange. Using the port brush, clean the seal cavity in the Mounting Flange. *[The last step should not be performed on the 9300P.]*
- After wire brush cleaning, it is recommended that the Pump Casing and Mounting Flange be further cleaned in a solvent tank to remove rust and corrosion particles.

Seal Replacement/Pump Housing Reassembly**[NOTE]**

If the hydraulic motor requires repair, proceed to **Disassembly and Repair of the Hydraulic Motor** in the next column.

- Lubricate the seal cavity in the Mounting Flange with WD-40®, LPS or equivalent. Do not lubricate the shaft.
- Install the stationary portion of the Mechanical Seal by sliding over the Shaft with the ceramic side out.

[NOTE]

Make sure both the seal cavity and seal are clean and lubricated.

- To seat the seal in the seal cavity, use a piece of 3/4" PVC pipe 4" to 6" [101.6 to 152.4 mm] in length. Lubricate sealing surface on seal after it is seated. Do not lubricate the shaft.
- To install the rotary portion of the mechanical seal, place it over the shaft with the carbon side facing in, and press against the stationary portion (See Figure 9).
- Install rubber gasket 1700-0100 over shaft against rotary portion of seal.

**Figure 9****[NOTE]**

On Models 9305C-HM3C-SP, 9505C-HM3C-BS and 9305C-HM3C, install the washer on the shaft prior to installing the impeller nut.

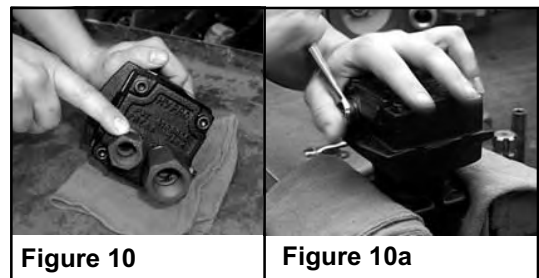
[CAUTION]

The threads of the Plastic Seal Nut are fine and can be easily cross threaded. To prevent cross threading, turn the Plastic Seal Nut counterclockwise until area of thread engagement is detected; then turn the Plastic Seal Nut clockwise until it is secure. Do not over tighten the Plastic Seal Nut.

- Insert a Woodruff Key into the Shaft key slot; then place the Impeller on the Shaft and align it with the Key and press against the Mechanical Seal Assembly. Apply a blue thread locking compound to the Impeller Nut, and using a 5/8" socket wrench and using a screwdriver to hold the Impeller, install the Impeller Nut. *[On polypropylene models, insert the Woodruff Key into the Shaft key slot. Place the Impeller on the Shaft and align it with the Key; then press against the Mechanical Seal Assembly. Place the Metal Seal Washer on the Shaft. Apply a drop of blue thread locking compound on the Impeller Nut and secure the Impeller to the Shaft as described previously.]*
- Install the o-ring on the mounting flange. Replace the o-ring if worn or damaged.
- Place the pump casing on the mounting flange, insert and tighten the bolts.

Disassembly and Repair of the Hydraulic Motor**[NOTE]**

The work area and motor should be as clean as possible to prevent contamination of parts.

**Figure 10****Figure 10a**

- Remove the Mounting Flange from the motor body and place Hydraulic Motor in vise.
- Remove Tank Port Adapter and Pressure Port Adapter with large crescent wrench or 1-1/16" and 1-3/8" box end wrench (See Figure 10).
- Using a 9/16" box end wrench, loosen the nut on the Bypass Adjusting Screw (See Figure 10a).
- Using a small screwdriver, remove the Bypass Adjusting Screw from the Motor. (This will remove the Screw, Nut, Washer and Thread-Seal Gasket.)
- Using a 1/4" Allen wrench, remove the Socket Head Cap Screws from the Motor End Plate (See Figure 10).
- If Motor End Plate will not lift off easily, use a small screwdriver to carefully pry apart the boss portion of the End Plate and Gerotor Housing until free (See Figure 11). If Gerotor Housing will not lift off easily, carefully pry

apart the boss area between the Gerotor Housing and the Motor Body. (It may be necessary to alternate sides when prying apart Motor sections.)



Figure 11

7. Remove both parts of the Gerotor.
8. On HM3C models, remove the Woodruff Key from the Shaft. On HM1C, HM2C and HM4C models, remove the Roll Pin from the Shaft.
9. Remove the o-ring from the Motor End Plate and Body with a flat instrument such as a knife blade.
10. Inspect Motor End Plate, Body and Gerotor Housing for wear and/or gouging. If gouging has occurred in both the Motor End Plate and Body, the motor is not repairable. If gouging has occurred in the Motor End Plate, Body or Gerotor Housing, the part that is worn must be replaced. If Gerotor Housing is damaged, Gerotor parts must also be replaced.

To Remove the Shaft Assembly from the Motor Body

1. Remove the Slinger Ring from the Motor Shaft.

⚠ WARNING

Special attention should be exercised when working with retaining rings. Always wear safety goggles when working with spring or tension loaded fasteners or devices.

2. Using the large retaining ring pliers, remove the Retaining Ring next to the Ball Bearing in the Motor Body.

NOTE

If bearing is binding against the retaining ring so that it cannot easily be removed, place the motor body (threaded portion of the shaft up) on arbor press. Using a piece of un-threaded metal pipe (1" dia. x 4" high [254. mm x 101.6 mm high]), slide over the shaft and gently press down with the arbor press just enough to relieve the pressure on the retaining ring.



Figure 12

3. Place body in position on arbor press. Threaded portion of the Shaft should be inside the fixture. Press out shaft assembly with arbor press (See Figure 12).

Hydraulic Motor Shaft Disassembly and Repair

1. Remove Large Retaining Ring from Shaft with a screwdriver. Remove Thrust Bearing Assembly from Shaft (includes the Thrust Bearing and two Thrust Bearing Races) and the Seal Spacer.
2. Remove the Small Retaining Ring next to the Shaft Ball Bearing.
3. To remove the Bearing from the shaft, place the shaft (threaded end up) in the arbor press fixture. Place the two support bars provided in the repair kit opposite each other and between the seal on the shaft and the arbor press fixture. Using an arbor press, press the shaft through the Bearing, Seal Spacer and Seal (See Figure 13).
4. Inspect the sealing area of the shaft for wear. Inspect other Shaft Assembly Components for wear and replace if necessary.



Figure 13

5. While motor is completely disassembled, clean all parts in a solvent bath.

Build Shaft Sub-Assembly

1. To assemble the seal cartridge, remove the old seal from the cartridge by pressing it out. The cartridge is reused by assembling the new seal into cartridge, ensuring the new seal is pressed in with the lip seal on the opposite side as shown in Fig.1.

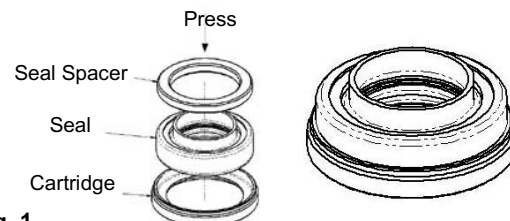


Fig. 1

Important: To prevent damage to the seal lip extending out, use seal spacer as shown to guard lip during assembly.

2. Install the large retaining ring onto large diameter end of shaft.
3. From the small, threaded end of the shaft, install the following parts in this order: thrust bearing race, thrust bearing, 2nd thrust bearing race.

Note: The thrust bearing and races should not be reused if they are showing any signs of wear.

4. Install new type seal spacer (looks like a thick washer, approx .130 inch thick).
5. Before installing the new seal, its lip must be expanded to fit on the shaft. With the seal lip facing out, slide the seal over the threaded end of the shaft and gently push the seal onto the raised area of the shaft. Do not push the seal past the large retaining ring groove on the shaft.

6. Once the seal has been expanded, remove the seal from the shaft.
7. Install seal cartridge assembly: With seal lip facing the large end of the shaft, slide the seal cartridge assembly over the threaded end of the shaft and gently push into the raised area of the shaft. Align the seal lip to enter the center diameter of the seal spacer and push until seal body touches seal spacer.

Important: If the seal lip is longer than the seal spacer's width, please stop the assembly and review parts being used.

8. Assemble two o-rings on the outside body of the new seal cartridge assembly as shown in Fig 2. Install o-rings one at a time and do not roll over each other.

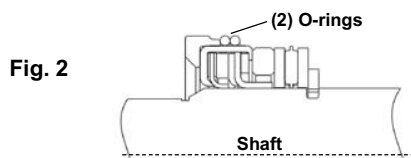


Fig. 2

9. Finished shaft sub-assembly should look like this:



10. Do not press, but place the shaft sub-assembly into the motor body with threaded end of shaft up. Lubricate the two o-rings with hydraulic or mineral oil before assembling.



Figure 14

Install Shaft Sub-Assembly Into Motor Body

Important: Make sure the surface edge of the arbor press fixture is smooth and clean. An unthreaded piece of pipe (1" x 4" high) is needed to support the outer race of the seal cartridge sub-assembly and outer race of the ball bearing during assembly. Place this pipe over the shaft threaded end for assembly of the following steps.

1. Place the body on a support fixture in the arbor press. Using an unthreaded piece of pipe (1" dia. x 4" high), press the shaft subassembly down into the body until it bottoms out. This is a light press fit and should be done slow and easy.

2. Install the new ball bearing onto the threaded end of the shaft. Press down using the 1" x 4" pipe until the retaining ring can be installed in its groove in the bearing core of the motor body. Install the retaining ring.



Figure 15

3. Turn the motor body assembly over (threaded shaft end down) on the arbor press. Press the shaft down into its "final position" until the small retaining ring can be installed in the shaft next to the ball bearing.
4. Install small retaining ring on shaft.
5. Check shaft rotation at this point. It should rotate smoothly with only slight resistance from the seal lip pressure on the shaft. If you feel any gritty or sticking movement, return assembly to the arbor press and lightly press on the threaded end of the shaft to relieve press fit compression on the thrust bearing. **Note:** Don't over do this press. The objective is to move the small outer retaining ring installed in the previous step back to "touching only" the ball bearing inner race.

Important: If gritty or sticky movement persists, it's likely due to re-used parts or the body needle bearing is in need of replacement.

Reassembly of Remaining Hydraulic Motor Parts

1. Place Motor Body in a vise with large end of shaft facing up.
2. Install the o-ring in the body.
3. Install the Roll Pin on the shaft. Place the Inner Gear of the Gerotor onto the shaft making sure Gerotor slot lines up with the key in the shaft.

The Roll Pin can slide up behind the inner gear of the gerotor when the gear is installed. Make sure the key is visible in the slot after the gear is in place.

4. Install the outer portion of the Gerotor, making sure the Gerotor is centered within the o-ring groove on the body.
5. Install the Gerotor Housing, making sure the pins in the Gerotor Housing line up with their respective holes in the body.

6. Lightly lubricate the area between the Inner and Outer Gerotor, the Outer Gerotor, and Gerotor Housing with hydraulic oil or mineral oil.

Special attention should be exercised when working with retaining rings. Always wear safety goggles when working with spring or tension-loaded fasteners or devices.

7. Install o-ring on the motor end plate.
8. Place end plate on gerotor housing, making sure holes in end plate line up with pins in the gerotor housing.
9. Install four Socket Head Cap Screws in Motor End Plate, and using a 1/4" Allen wrench, tighten Cap Screws alternately and evenly in a crisscross pattern to approximately 15 foot pounds [20 Nm] of torque.
10. Install the Thread Seal Gasket on the Bypass Adjusting Screw. Put the Gasket on from the slotted end and turn until four threads on the screw are showing. Install the Washer and the Nut. Install Bypass Adjusting Screw in the motor end plate.
 - A. For closed center hydraulic systems, turn the Bypass Adjusting Screw in until it bottoms out in the End Plate. Tighten nut down with 9/16" box end wrench.

- B. For open center hydraulic systems, turn the Bypass Adjusting Screw in until it bottoms out in the End Plate; then turn back out 1½ full turns. Holding the Bypass Adjusting Screw with a screwdriver, tighten Nut. (Motor will then have to be readjusted to tractor system.)

11. Replace o-ring on both port adapters.
12. Install Pressure Port Adapter and Tank Port Adapter back onto the motor. (For ease of installation, tighten the Pressure Port Adapter first, then the Tank Port Adapter.)
13. Remove Hydraulic Motor from the vise. Turn shaft by hand to check for binding.
14. Install Slinger Ring over Motor Shaft.
15. Install Motor into Pump Mounting Flange. Insert four Hex Head Bolts; then alternately and evenly tighten them. *[For polypropylene models, secure the Hydraulic Motor to the Mounting Flange with four Hex Head Cap Screws and Nuts. The nuts should be visible when the assembly is complete.]*

Troubleshooting

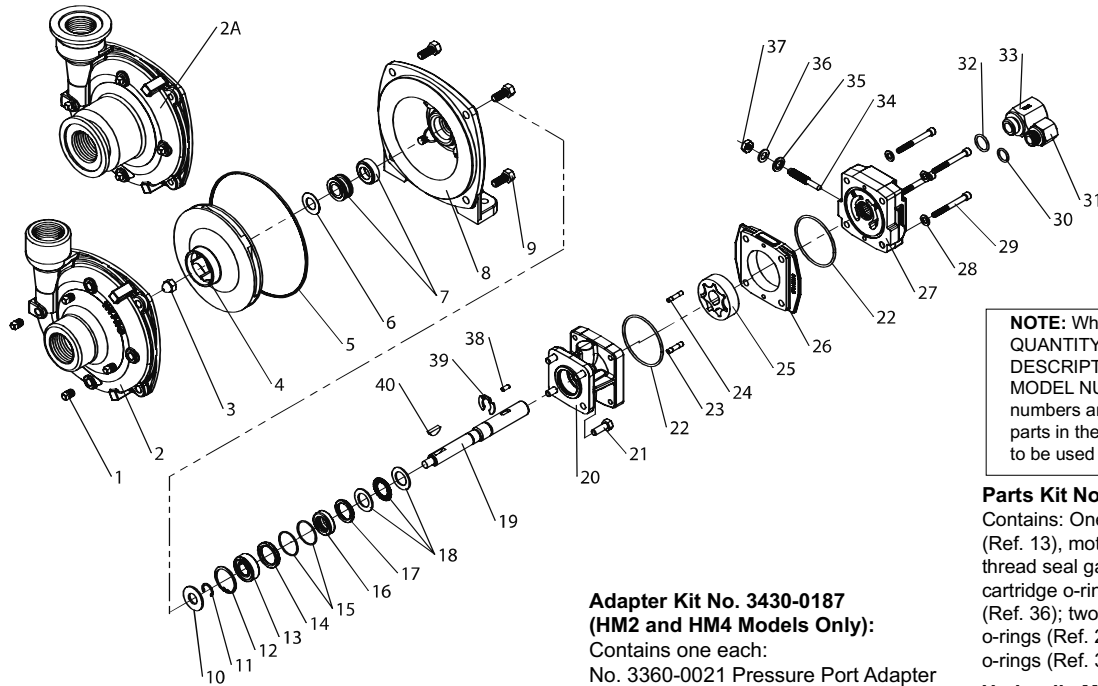
If the proper Hydraulic Pump Unit has been selected according to Hypro recommendations, and the unit has been correctly plumbed into the hydraulic system, operation should be quite satisfactory. If spraying performance is unsatisfactory

or hydraulic system heat is excessive etc., check the following troubleshooting guide for possible problems and solutions.

Troubleshooting Guide

Symptom	Probable Cause(s)	Corrective Action(s)
Low discharge	Pump not primed.	— Remove top most vent plug from face of pump and run pump to expel trapped air (see Installation Instructions).
	Air leaks in inlet line.	— Check and reseal inlet fittings.
	Blocked or clogged line strainer.	— Inspect strainer and clear any debris from screen.
	Impeller plugged.	— Inspect and clear obstruction.
	Undersize inlet line or collapsed hose.	— Suction line should be the same diameter as inlet port of pump or larger.
	Improperly sized hydraulic motor.	— Refer to Pump Selection Guide to determine proper size hydraulic motor for your hydraulic system.
	Bypass Adjustment Screw not set properly.	— Adjust bypass screw on side of hydraulic motor in until the desired output is attained.
Hydraulic system overheating	Eye of impeller rubbing on volute.	— Remove volute (front cover) and inspect the impeller. If wear detected, sand the impeller eye O.D. with emery cloth.
	Improper hydraulic motor size.	— Refer to Pump Selection Guide to determine proper size for your hydraulic system.
	Bypass Adjustment Screw set to bypass too much oil.	— Close adjustment screw on side of hydraulic motor to lessen the amount of oil being bypassed.
	Improper metering orifice installed in pressure port.	— Install proper size orifice. Refer to Installation section for proper sizing.
	Insufficient hydraulic hose size.	— Check hydraulic hose size. Hose should be at least 1/2" [12.7 mm] on the pressure port and 3/4" [19.05mm] on the tank port.

All 9303C and 9303S Series Pumps

**Repair Parts Kit No. 3430-0332**

Contains: One o-ring (Ref. 5), one rubber gasket (Ref. 6), and one mechanical seal (Ref. 7).

Silicon Seal Kit No. 3430-0589

Contains one each: 1720-0083 o-ring (Ref. 5) and one mechanical seal (silicon carbide) (Ref.7).

Adapter Kit No. 3430-0187 (HM2 and HM4 Models Only):

Contains one each:

No. 3360-0021 Pressure Port Adapter
No. 3373-0020 (Size #1)
No. 3373-0021 (Size #2)
No. 3373-0022 (Size #3).
No. 1720-0108 Adapter O-ring and
No. 1720-0105 Orifice O-ring (Qty 3).

Parts Kit No. 3430-0748

Contains: One each ball bearing (Ref. 13), motor shaft seal (Ref. 16), thread seal gasket (Ref. 35), two cartridge o-rings (Ref. 15) and washer (Ref. 36); two each motor housing o-rings (Ref. 22), and port adapter o-rings (Ref. 30 & 32).

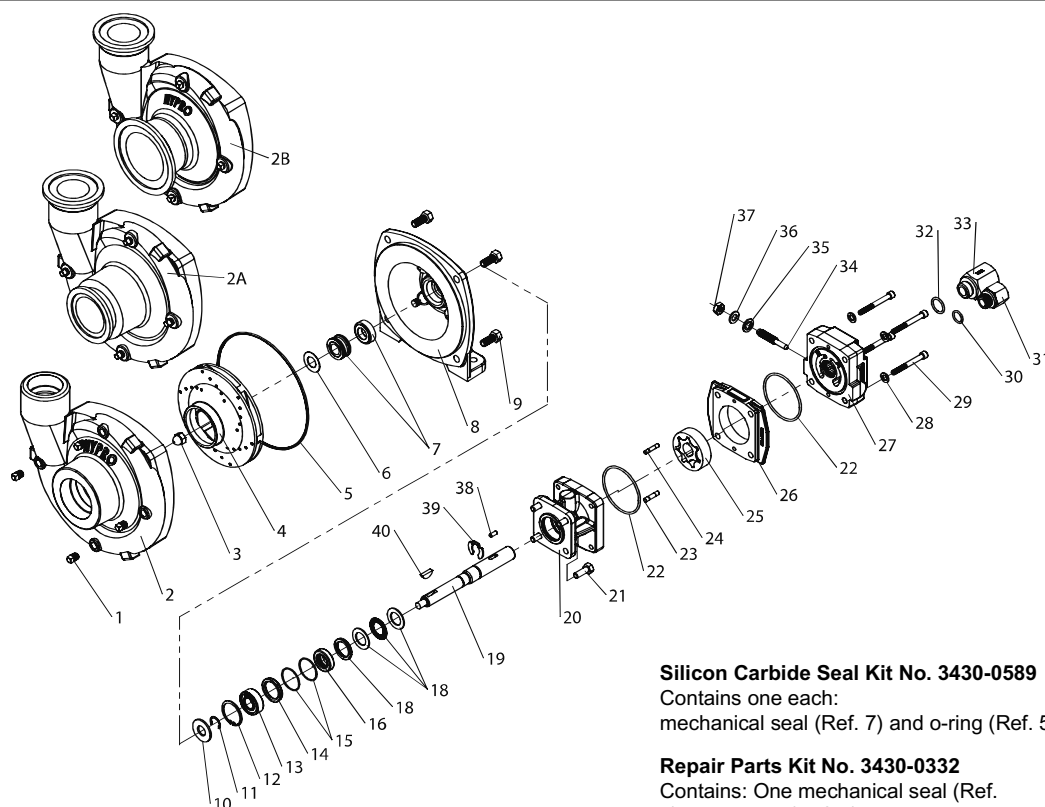
Hydraulic Motor Part Nos.

2500-0081C (HM1C Models)
2500-0082C (HM2C Models)
2500-0083C (HM3C Models)
2500-0084C (HM4C Models)
2500-0085C (HM5C Models)

Ref. No.	Qty. Req'd.	Part No.	Description
1	4	2406-0007	Drain/Vent Plug (9303C)
1	4	2406-0016	Drain/Vent Plug (9303S)
2	1	0150-9000C	Pump Casing (Model 9303C)
2	1	0150-9000S	Pump Casing (Model 9303S)
2A	1	0153-9000C	Pump Casing (Universal Flange Model C-U)
3	1	2253-0002	Impeller Nut (9303C)
3	1	2253-0006	Impeller Nut (9303S)
4	1	0401-9100P	Impeller (Nylon Std. 9303C)
4	1	0402-9100P	Impeller (Polypropylene Optional) (Std 9303S)
5	1	1720-0083	O-ring
6	1	1700-0100	Gasket
7	1	2120-0009	Mechanical Seal (Viton/Ceramic) (Std 9303C)
7	1	3430-0589	Mechanical Seal (Silicon Carbide) (Std 9303S)
8	1	0750-9300C	Mounting Flange (9303C)
8	1	0756-9300S	Mounting Flange (9303S)
9	4	2210-0020	Hex Head Cap Screw (9303C)
9	4	2210-0125	Hex Head Cap Screw (9303S)
10	1	1410-0056	Slinger Ring
11	1	1810-0014	Snap Ring
12	1	1820-0013	Retaining Ring
13	1	2000-0010	Ball Bearing
14	1	1410-0131	Cartridge, Front
15	2	1720-0268	O-ring
16	1	2104-0010	Lip Seal
17	1	1410-0130	Seal Spacer
18	1	2029-0014	Thrust Bearing Assembly
19	1	0531-2500	Shaft (HM2C/HM4C)
19	1	0533-2500	Shaft (HM1C/HM5C)
19	1	0536-2500	Shaft (HM3C)
20	1	0150-2500C	Motor Body (includes needle bearing)
21	4	2210-0005	Hex Head Cap Screw
22	2	1720-0110	O-ring
23	1	1600-0045	Dowel Pin (HM2C / HM4C)
23	1	1600-0044	Dowel Pin (HM1C/HM5C)
23	1	1600-0052	Dowel Pin (HM3C)

Ref. No.	Qty. Req'd.	Part No.	Description
24	1	1600-0042	Dowel Pin (HM2C / HM4C)
24	1	1600-0037	Dowel Pin (HM1C/HM5C)
24	1	1600-0068	Dowel Pin (HM3C)
25	1	3900-0022	Gerotor (HM1C)
25	1	3900-0023	Gerotor (HM2C)
25	1	3900-0024	Gerotor (HM3C)
25	1	3900-0025	Gerotor (HM4C)
25	1	3900-0048	Gerotor (HM5C)
26	1	0701-2500C1	Gerotor Housing (HM2C Models) 1/4" wide
26	1	0700-2500C1	Gerotor Housing (HM1C Models) 1/2" wide
26	1	0703-2500C1	Gerotor Housing (HM4C Models) 5/16" wide
26	1	0702-2500C1	Gerotor Housing (HM3C Models) 1" wide
26	1	0704-2500C1	Gerotor Housing (HM5C Models) 5/8" wide
27	1	0254-2500C2	Motor End Plate (includes needle bearing)
28	4	2270-0039	Washer
29	4	2220-0045	Cap Screw (HM2C / HM4C Models)
29	4	2220-0021	Cap Screw (HM1C Models)
29	4	2220-0044	Cap Screw (HM3C Models)
29	4	2220-0032	Cap Screw (HM5C Models)
30	1	1720-0108	O-ring
31	1	3360-0021A	Pressure Port Adapter (includes o-ring)
32	1	1720-0262	O-ring
33	1	3320-0051A	Tank Port Adapter (includes o-ring)
34	1	3220-0029	Bypass Adjusting Screw
35	1	1700-0047	Gasket
36	1	2270-0027	Washer
37	1	2250-0038	Lock Nut
38	1	1610-0032	Roll Pin (HM2C / HM4C)
38	1	1610-0031	Roll Pin (HM1C / HM5C)
38	1	1610-0055	Roll Pin (HM3C)
39	1	1810-0026	Snap Ring
40	1	1610-0012	Woodruff Key (9303C)
40	1	04432	Woodruff Key (9303S)

All 9306C Series



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.

Parts Kit No. 3430-0748

Contains: One each ball bearing (Ref. 13), motor shaft seal (Ref. 16), thread seal gasket (Ref. 35), two cartridge o-rings (Ref. 15) and washer (Ref. 36); two each motor housing o-rings (Ref. 22), and port adapter o-rings (Ref. 30 & 32).

Silicon Carbide Seal Kit No. 3430-0589

Contains one each: mechanical seal (Ref. 7) and o-ring (Ref. 5).

Repair Parts Kit No. 3430-0332

Contains: One mechanical seal (Ref. 7), one o-ring (Ref. 5) and one rubber gasket (Ref. 6).

Hydraulic Motor Part Nos.

2500-0081C (HM1C Models)
2500-0083C (HM3C Models)
2500-0085C (HM5C Models)

Ref. No.	Qty. Req'd.	Part No.	Description
1	4	2406-0007	Drain/Vent Plug (9306C)
1	4	2406-0016	Drain/Vent Plug (9306S)
2	1	0154-9200C1	Pump Casing (9306C)
2	1	0154-9200S1	Pump Casing (9306S)
2A	1	0157-9200C	Pump Casing (Universal Flange 220x200)
2B	1	0158-9200C	Pump Casing (Universal Flange 300x220 Cast)
2B	1	0158-9200S	Pump Casing (Universal Flange 300x220 S.S.)
3	1	2253-0002	Impeller Nut (9306C)
3	1	2253-0006	Impeller Nut (9306S)
4	1	0401-9200P2	Impeller (Nylon Std. 9306C)
4	1	0405-9100P2	Impeller (Polypropylene Optional) (Std. 9306S)
4	1	0407-9306P	Impeller (GTX Optional)
5	1	1720-0083	O-ring
6	1	1700-0100	Gasket
7	1	2120-0009	Mechanical Seal (Viton/Ceramic) (Std. 9306C)
7	1	3430-0589	Mechanical Seal (Silicon Carbide) (Std. 9306S)
8	1	0750-9300C2	Mounting Flange (9306C)
8	1	0756-9300S	Mounting Flange (9306S)
9	4	2210-0020	Hex Head Cap Screw (9306C)
9	4	2210-0125	Hex Head Cap Screw (9306S)
10	1	1410-0056	Slinger Ring
11	1	1810-0014	Snap Ring
12	1	1820-0013	Retaining Ring
13	1	2000-0010	Ball Bearing
14	1	1410-0131	Cartridge, Front
15	2	1720-0268	O-ring
16	1	2104-0010	Lip Seal
17	1	1410-0130	Seal Spacer
18	1	2029-0014	Thrust Bearing Assembly
19	1	0531-2500	Shaft (HM2C/HM4C)
19	1	0533-2500	Shaft (HM1C/HM5C)
19	1	0536-2500	Shaft (HM3C)
20	1	0150-2500C	Motor Body (includes needle bearing)
21	4	2210-0005	Hex Head Cap Screw
22	2	1720-0110	O-ring

Ref. No.	Qty. Req'd.	Part No.	Description
23	1	1600-0045	Dowel Pin (HM2C / HM4C)
23	1	1600-0044	Dowel Pin (HM1C/HM5C)
23	1	1600-0052	Dowel Pin (HM3C)
24	1	1600-0042	Dowel Pin (HM2C / HM4C)
24	1	1600-0037	Dowel Pin (HM1C/HM5C)
24	1	1600-0068	Dowel Pin (HM3C)
25	1	3900-0022	Gerotor (HM1C)
25	1	3900-0023	Gerotor (HM2C)
25	1	3900-0024	Gerotor (HM3C)
25	1	3900-0025	Gerotor (HM4C)
25	1	3900-0048	Gerotor (HM5C)
26	1	0701-2500C1	Gerotor Housing (HM2C Models) 1/4" wide
26	1	0700-2500C1	Gerotor Housing (HM1C Models) 1/2" wide
26	1	0703-2500C1	Gerotor Housing (HM4C Models) 5/16" wide
26	1	0702-2500C1	Gerotor Housing (HM3C Models) 1" wide
26	1	0704-2500C1	Gerotor Housing (HM5C Models) 5/8" wide
27	1	0254-2500C2	Motor End Plate (includes needle bearing)
28	4	2270-0039	Washer
29	4	2220-0045	Cap Screw (HM2C / HM4C Models)
29	4	2220-0021	Cap Screw (HM1C Models)
29	4	2220-0044	Cap Screw (HM3C Models)
29	4	2220-0032	Cap Screw (HM5C Models)
30	1	1720-0108	O-ring
31	1	3360-0021A	Pressure Port Adapter (includes o-ring)
32	1	1720-0262	O-ring
33	1	3320-0051A	Tank Port Adapter (includes o-ring)
34	1	3220-0029	Bypass Adjusting Screw
35	1	1700-0047	Gasket
36	1	2270-0027	Washer
37	1	2250-0038	Lock Nut
38	1	1610-0032	Roll Pin (HM2C / HM4C)
38	1	1610-0031	Roll Pin (HM1C / HM5C)
38	1	1610-0055	Roll Pin (HM3C)
39	1	1810-0026	Snap Ring
40	1	1610-0012	Woodruff Key (9306C)
40	1	04432	Woodruff Key (9306S)

HM Series Hydraulic Motor Updates 2019-

All standard "HM" series hydraulic centrifugal pumps are being updated with the premium features originally implemented on ForceField pumps. This will be a rolling change that will occur effective 2019 but will take some time to roll out across the range of available pumps. These features are outlined below.

- Premium hydraulic motor seal is not backwards compatible with current hydraulic motor assemblies due to machining differences within the hydraulic motor body.
- Motors which have been updated to the premium hydraulic seal can be easily identified by the updated gerotor housing shown below.
- Current **3430-0748** hydraulic seal repair kits cannot be installed in the new "2540-" series premium motor assemblies.
- New **3430-0881** premium hydraulic seal repair kits cannot be installed in existing "2500-" series motor assemblies.
- Powdered metal gerotor housings are dimensionally equivalent to the cast iron parts they are replacing.
- New "2540-" series service motors should be used to replace existing "2500-" series service motors in the field.
- The "2540-" series motors are drop-in replacements for the existing "2500-" series motors. See page two for cross reference matrix of 2500/2540 service motors.
- The "2500-" series service motors will eventually be discontinued.

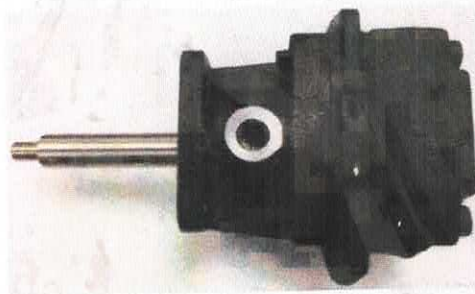
Current Hydraulic Seal



Current (Old) Hyd. Motor (2500-)

Uses hydraulic repair kit 3430-0748

(Cast Iron Gerotor Housing)



Gerotor housing protrudes

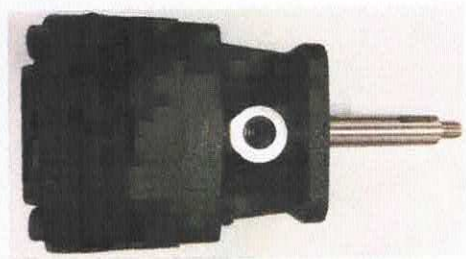
New Premium Hydraulic Seal



New Motor (2540-)

Uses hyd. repair kit 3430-0881

Powdered Metal Gerotor Hous-



Gerotor housing is flush with motor

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