HAYES SPRAYING P/L

MANUAL TRAILED SPRAYER

OPERATION MANUAL

JULY 2005

1. CONTENTS

WARRANTY POLICY

HAYES SPRAYING P/L , WARRANTS TO THE ORIGINAL PURCHASOR, THAT EACH NEW HAYES SPRAYING P/L SPRAYER, 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 P/L, SHALL REPAIR OR REPLACE , AT HAYES SPRAYING P/L DISCRETION, WITHOUT CHARGE FOR PARTS AND LABOUR, ANY PART OF THE HAYES SPRAYING P/L PRODUCT WHICH FAILS BECAUSE OF DEFECTS IN PARTS OR WORKMANSHIP.
PUMPS, ENGINES, CONTROLLERS AND HOSES, ARE ALL WARRANTED DIRECTLY BY THE ORIGINAL MANUFACTURER, PENDING THAT MANUFACTURERS WARRANTY APPROVAL.

THIS WARRANTY DOES NOT COVER DAMAGE RESULTING FROM MISUSE, NEGLECT, ALTERATIONS, OR NORMAL WEAR AND TEAR.

IN NO EVENT SHALL THE AUTHORISED DEALER OR HAYES SPRAYING P/L BE LIABLE FOR DOWNTIME EXPENSES, LOSS OF CHEMICAL, LOSS OF MACHINE USE OR OTHER INCIDENTAL DAMAGES.

EXCLUSIONS

AT THE DISCRETION OF HAYES SPRAYING P/L, THE DEFECTIVE PART MUST BE RETURNED TO HAYES SPRAYING P/L, AT THE OWNERS COST.
TIME FOR WASHDOWN, TRANSPORTATION COSTS, OR INSURANCE COSTS FOR SPRAYERS ARE NOT WARRANTED.
TRAVEL AND COMMUNICATION ARE NOT COVERED BY WARRANTY.

2. Product information

Shipping information

Height 2.6m
Width folded 2.47 m approx
Length folded 6.4 approx
Weight empty 1940 kg approx. Different models will vary
Wheeltrack width 2m

Serial number

Located on the inside of the drawbar.

Specifications

Tanks
2000l, 3000, polyethylene tanks with hinged lid and filling strainer
20l freshwater tank with screw top lid and tap for hand washing.

Pump
Hydraulic driven Hypro, centrifugal pump, 114 lpm- series 9303c, model 9303c-hm3c or 9303c-hm4c
Twin impellor Davey firefighter with Honda engine.

Filtration
3 point filtration
* 18 mesh tank basket
* 2 pressure filters, 80 mesh
* nozzles filters , 50 mesh.

Booms.
Boom options include 18m t0 27m manual fold.
Booms finished in chemical resistant two pack paint.
Booms are fitted with non drip bodies and quick release nozzle caps.
Booms have individual hydraulic tip lift, shock dampened breakaway end sections, self leveling, and hydraulic accumulators for boom suspension.

Chassis.
Fully welded box steel construction, painted with chemical resistant two pack paint.

Suspension.
Bogie axle with 11 x 16 wheels.
Trailing arm independent coil suspension.

Foam marker.
Seris/jenell single or double compressor foam marker with boom mounted foam generator with 90 l stainless steel tank.

Controller.
Standard boom comes with tee- jet 744e- 3 manual control. Options include tee – jet 844e or 854e, fully automatic rate controllers.

3. Safety instructions

Operators responsibilities

- Read and understand the operators manual before using the equipment. All other operators of the sprayer must also read and understand the operator manual.
- Read and follow the chemical labels
- Local laws may require operators to be licensed
- Pressure test the sprayer with water before use
- Wear protective clothing
- Rinse , wash and depressurize equipment after use and before servicing or storage
- Never repair or service the equipment while it is operating.
- Disconnect power before servicing and or welding
- Do not eat drink or smoke while spraying or working with spraying equipment.
- Wash and change clothes after spraying
- Wash tools if they have been contaminated
- If poisoned seek medical advice immediately. Identify the chemicals being used
- Keep children away from spray equipment at all times
- Do not enter the spray tank
- Do not go under any equipment unless properly secured
- Be aware of power lines at all times
- Operators must not be under the influence of drugs or alcohol while operating spraying equipment.

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

Safe boomspray operation

- Always read your sprayer manual before operating.
- Make sure all other operators have read the sprayers manuals and are suitably trained in the use of the equipment and chemicals being used.
- Always wear protective clothing.
- Inspect sprayer for faults, leaks, and cracks to avoid contamination.
- Personnel only associated with the spraying operation who are suitably trained, should be in the immediate area of operation.
- Bystanders must be a safe distance away from the sprayer while operating and in the upwind direction.
- Contamination is the responsibility of the operator.
- While spraying be aware of the width of the machine. Particularly while turning or moving around obstacles.
- Boom tips move much faster while turning and may cause injury to equipment or bystanders if careless.
- Before operation check that booms are unfolded and locked into position correctly.
- Check that trailer support jack is folded up and pinned for spraying.
- Spray at speeds suitable to the ground conditions for safe operation and extended sprayer life.
- Avoid sudden turns or constant direction changes at high speed.
- Do not ride on the boomspray.

4. Boomspray operation

Programming the controller

See the tee – jet controller manual and quick guide included.

Setting up the hypro hydraulic drive pump

For the best care and long life of your hydraulic motor and hypro pump follow the instructions below.

The hydraulic return line from the motor must be connected to a free flow return line, not the breakaway coupling.

- Ensure filters are clean.
- Set the main agitation valve and / or bypass valve to the desired level. Eg ¼ turn open for glyphosate.
- Set hydraulics to low flow.
- Turn on spray controller, and fully open the regulator valve . To do this turn the controller to the manual position and hold the + / - , in the + position for 7 seconds with the boom sections on.
- turn the pump on and increase the oil flow until the desired spray pressure is achieved.
- If a low pressure alarm is fitted.
- With the pump on and boom sections open, close the spray regulator valve by pressing the - key on the controller for 7 seconds or so until the spray pressure is 1 bar (12 -15 psi) .
- Adjust the pressure switch which is located below and behind the pressure gauge with a small screwdriver until the alarm beeps at 1 bar pressure.
- Cycle the pressure up and down to check that the alarm cuts in .
- The pressure alarm notifies the operator that the tank level is low and that the pump is beginning to suck air.

Hypro pumps can not be run dry or the seal will be damaged.

Davey twin impellor pumps

The Davey pump has been fitted with a chemical resistant Viton seal.
Run the engine at ½ to 2/3 throttle for longer engine life and good spray pressure.

Hooking up

- Have bystanders stand well away while backing the tractor on to the drawbar.
- The boomspray support jack may have to be adjusted before the drawbar pin connects the sprayer.
- Lock the drawbar pin into place, so that it cannot jump out.
- Connect hydraulic hoses for the sprayer.
- If connecting hydraulic hoses for the pump be sure to put the return line into the dump port of the tractor (may vary from tractor to tractor).
- Connect electrical leads for the controller and foam marker.
- Wind up the support jack, remove, and turn the jack 90 degrees before repinning.

Folding out booms

- Raise the tip lift slightly on each boom to take the weight of the boom off the rests

* From the rear of the sprayer remove the lynch pins and push the boom towards the front of the tractor.

* Lock stay bars in place, with the lynch pin

*Remove the lynch pin located at the top of the boom approx. 1m from the centre section and swing the boom arm forward until it is in line with the first boom section and locks into place

*Unclip breakaway and swing around to the front automatically
* use tip lift to level booms ready for spraying. When booms are level there should be 40 – 50mm travel left in the hydraulic ram .

- Pull out self leveling pin and lock out of the way.

Folding up

- Put self level pin in the locked position
- Level booms
- Fold breakaway tip and clip into place.

Release lock and swing next section around to locking position

* Release the stay bar and replace it in its bracket, and swing the boom to the rear of the sprayer. Tip lift may have to be adjusted for the boom to fit into the locking position

* lower the tips to place the weight on the boom supports. The chains will slacken slightly

Unhooking the trailer

- Chock trailer wheels
- Reposition jack and wind up to take the weight off the drawbar.
- Disconnect hydraulic hoses and deutch plugs.
- Remove drawbar pin and move tractor forward, taking care not to catch the drawbar on the sprayer or hoses.

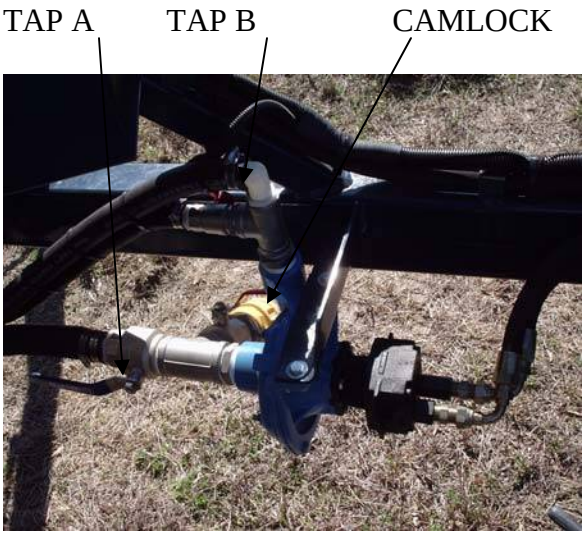
Going spraying

Setting boom height
Minimum boom height is set at 950 mm which will be adequate for the majority of spraying.
To change the boom height, slide boom up and lock into position with the locking collar, or adjust with hydraulics.

Filling the tank.
filling the sprayer tank with chemical and water will depend on what system you have. Options include;

- Fill through sprayer
- Fill through chemical hopper or vat

Fill through sprayer tank
Hook 1 ½ camlock hose to fill point at the front of the sprayer and turn on tap A and B.



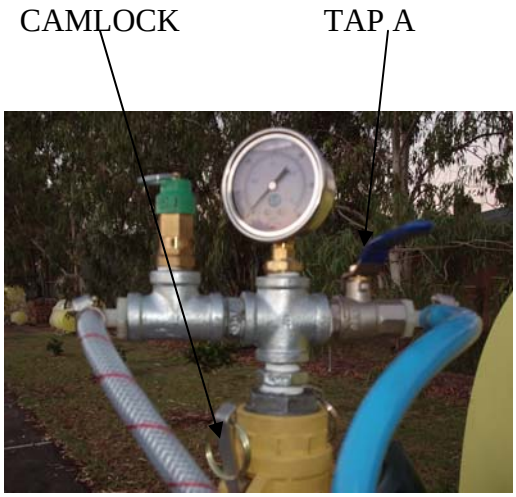
When the sprayer is full and ready to spray, remember to pump some chemical through the boom while stationary to spray out the clean water left in the lines after the last flush. About 30l is required or until the chemical is visible at the last spray tips on the boom.
Important: take particular note where you do this when using residual chemicals, so that the ground does not become sterilized.

Filling using a chemical hopper and load pump

Refer to the chemical hopper operation, chapter 8.

Filling the foam marker

- Foam marker has 90l capacity
- Release pressure in the foam tank by turning tap a
- Remove the top camlock and fill with foam concentrate depending on weather conditions, concentrate is mixed at 1: 60 or in harsher conditions 1: 40
- Replace top camlock with tap a still open
- Hook 1 ½ camlock to fill point B and turn on the tap.
- Fill foam tank using the side sight gauge
- Excess foam will overflow through tap A
- After filling disconnect camlock and close tap A

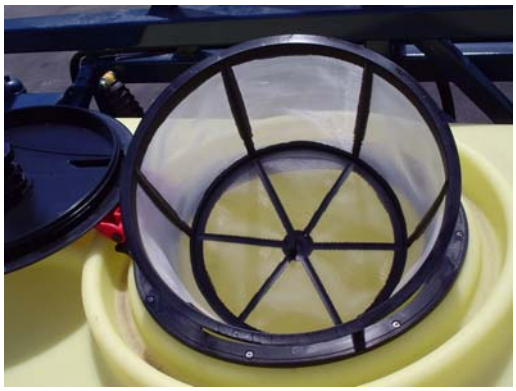


Refer to the Seris/Jenell foam marker insert for parts and foam marker operation

Filter maintenance

Filter maintenance is a critical part of your sprayers operation.
The number and type of filters may vary from sprayer to sprayer. They will include;

Tank filter basket located in the top of the tank
18 mesh



Pressure filters located between the pump and spray lines
80 mesh

In line boom filters located in the nozzle bodies
50 mesh

Foam marker filter located under the foam tank on the pressure side
50 mesh

Filters require regular cleaning.

Regularity will depend on the quality of water being used and type of chemical being used

As a guide

- Pressure filters should be cleaned once a day
- Nozzle filters should be cleaned once a week
- Foam marker filters should be cleaned once a week. Note that this can change to once a day in cold weather

The cleaning process

- Completely stop all sprayer functions
- Release all pressure from the spray lines
- Unscrew (anticlockwise) bottom filter bowl and remove
- Use a toothbrush to clean filter under running water
- Reseat filter into filter bowl and screw back onto filter body
- Take care not to damage or cross thread the o ring while re- assembling

5. General maintenance

Servicing

There are 5 grease nipples that require grease every 50 hrs

stay bar spring x 1 each side

First fold x 1 each side

Self level x1

Other maintenance

*check bolts top and bottom on the height adjust slide after the first 50 hrs, and at the beginning of every season.

* The load pump is fitted with a donaldson air filter with pre – cleaner. These should be inspected every 50 hours, and cleaned accordingly, depending on conditions.

* Check the drawbar bolts after the first 50 hours, and at the beginning of every season.
* for the Honda motor maintenance refer to the Honda manual.
* check wheel nuts after the first 50 hrs, and at the beginning of every season.
* check wheel bearings at the beginning of every season, and repack with grease as required.

At the end of spraying

- Always flush the booms with water at the end of every day. Note when spraying liquid fertilizers, check for phosphoric acid content. If left in the pump, it can corrode the pump body and galvanized fittings in as little time as a week. Roundup can corrode a pump body in less than two years.

Daily

- Connect fill hose
- Close tank suction hose and agitation / bypass
- Pump water through spray lines
- Spray lines can be cleaned with chemical mix still in the tank

End of spraying session

- Drain any remaining spray mixture from the tank at the appropriate place
- Fill spray tank with 200l of water
- Open agitation line fully
- Set the controller to manual
- Spray 100l of water out of the boom with the end taps open

- Note that if the water flow is low the regulator valve
  May be closed. Open the valve manually by holding the + key down for 7 seconds.
- Close boom taps and spray 100l of water out of the nozzles.

Long term storage

- Flush as described previously
- Drain all water from the system
- Drain water from the pump.
- Fill pump with a 50 % mix of water and anti freeze. Take particular care not to have any air in the pump. Note that in frost prone areas- frost can freeze water in the pump and crack the housing
- Clean the outside of the sprayer with appropriate tank cleaner

6. Trouble shooting

Controller

Understanding the sprayer controller and its functions can help greatly when diagnosing problems.

The controller controls the rate based on the target application set before spraying. Ie. L/ha. And receiving input information from the speed sensor and the flowmeter sensor (or pressure sensor, if fitted)

For example the target application rate may be 50 l/ha using 11002 nozzles (110 degree size 2 nozzles) the controller calculates the target rate by receiving speed inputs and l/ min inputs. If the calculation is done and the rate per ha. Is too high, the controller closes the pressure regulating valve to restrict the flow to the nozzles and therefore lowers the application rate. If the calculation is done and the rate is too low the controller will open the pressure regulating valve.

The controller will also let you know when the spraying speed is too low or too high for the controller to regulate using the desired nozzle and application rate.

Most problems can be found quickly by asking the following questions.

Does the monitor record

- Speed
- Hectares
- L/minute
- Does the sprayer spray in manual
- Can you manually adjust the pressure and flow
- Are all the fuses good

If you have no speed

- Check speed sensor cable for cuts, breaks etc
- Check that the sensor is plugged in correctly
- Check that the magnets are in place
- Check that the sensor is the correct distance away from the magnets. 10 – 20mm

If you have no hectares

- See above for speed sensor
- Check that the width is correctly set in the controller

If you have no l/min

- Check that the pump is pumping liquid
- Check the flowmeter cable for cuts, breaks etc.
- Check that the flowmeter is not stuck or restricted

If you cannot adjust the flow manually

- Check that power is getting to the pressure regulating valve
- Check that the pressure regulating valve is cycling by either listening to it open and close, or watching it open or close.

The console switches itself off in 20 seconds and “clicks”

- There is a short in the electrical leads
- disconnect the sensor cables one by one to isolate the short.

Also refer to the tee jet controller manual.

Foam marker

The foam marker is manufactured by Seris/Jen-ell Agrispray.
For other start up, tuning, and trouble shooting refer to the Seris/Jen-ell manual.

If the foam is too runny

- Needle valve open too far
- Relief valve stuck open
- Air jet blocked
- Compressor reed valves bent or broken
- Air cleaner blocked
- Weak or old foam mix
- Poor air volume
- Air leak on hose or fittings
- Screen in foam generator blocked

If foam is too light or airy

- Needle valve closed to far
- Filter on the foam tank blocked
- Liquid supply blocked or leaking

Fuse blows continually or after 30 seconds of use

- Low voltage
- Brushes worn in compressor
- Seized bearings in compressor
- Electrical short
- Bad electrical connection
- Bad relay

Compressor wont run

- Fuse blown
- Relay faulty
- Seized bearings in the compressor
- brushes worn
- Bad electrical connection

Foam slows or stops

- Blocked air jet
- Blocked liquid filter
- Electrical fault to solenoid
- Low power to solenoid. Check for 12.4 volts
- Compressor stopped or running intermittently

Spray pump

Hypro pump
The pump and hydraulic motor are manufactured by hypro.

Important: when connecting the hydraulic hoses to the tractor the return line must be connected to a free flow return **– not** the breakaway coupling.

For start up, tuning, and trouble shooting refer to the "setting up the hypro pump " section, and the hypro manual.

Davey twin impellor
The pump is manufactured by Davey, powered by a Honda motor.
Maintenance and parts schedules are included in this manual.

When running the honda for spraying, set the throttle at ½ to 2/3 revs. For optimal performance and engine life.

7. Spraying technique

Mixing chemical
When mixing chemicals, always check and follow the label and agronomists recommendations.
If unsure, mix a small amount of concentrate in a jug to observe any reaction between the chemical mix.
For example, when mixing glysophate and 24d concentrates together, a chemical reaction can occur causing the chemicals to go hard.
When mixing chemical fill the tank half full with water before adding chemical.
Add the chemical separately, rinsing the measuring jug each time before adding the next chemical.
If using a vat, follow the same procedure, rinsing the vat each time before adding the next chemical.

Decontamination
When changing from one chemical group to another, or from spraying one type of crop to another it may be necessary to decontaminate the tank, boom, and lines.
For example, when changing from spraying fallow ground to spraying over a crop, or from spraying a narrow leaf crop to a broad leaf crop.

- Flush all spray lines, agitation lines, delivery hoses, tank, jugs, and vat with clean water.
- Flush again with the recommended cleaner. Different chemicals require different cleaning agents to neutralize the active chemical. Check the chemical label or agronomist to use the correct cleaning agent, and time for penetration.
- Flush out the cleaning agent with clean water.
- Be sure to carry out all rinsing and cleaning, on jugs vats, delivery pumps and hoses

Calibration
For manual controlled sprayers, follow the calibration set out in the tee-jet products buyers guide attached, on page 34.
For automatic controllers, refer to the tee-jet 844e controller manual.

Also in the tee-jet buyers guide,

- **Nozzle selection guide, page 56**

For choosing which **type of nozzle** best suits your application.

- **Nozzle description, page 58**

Overview of the range of nozzles, including brief description, availability of size, spray angle, and material made from.

- **Nozzle pressure chart, page 59**

For determining which **size of nozzle** suits your application.

- **Nozzle droplet size chart, page 60**

Demonstrates droplet size of particular nozzles at given pressures.

8. Rinse bin operation

When using the rinse bin and probe, always wear protective clothing, gloves, waterproof boots, and face shield.
Do not operate the rinse bin or probe while eating or smoking, or in an area without adequate ventilation.
Check the chemical label for any other safety directions.

The delivery pump and rinse bin are plumbed to perform a number of operations.
The rinse bin has two pressure outlets.

- The drum rinse: activated by putting the drum over the nozzle and pushing down on the spring loaded rinser. Once pressure is released, the rinser will return to the off position.
- The bin rinse: activated by the ball valve on the outside of the rinse bin. Remember to have the lid closed to agitate powders or rinse the bin.
- Note that there is a tap also located on the pump. This allows you to change between drum rinsing and agitation while continuing to pump water into the sprayer.

The suction side also performs two operations.

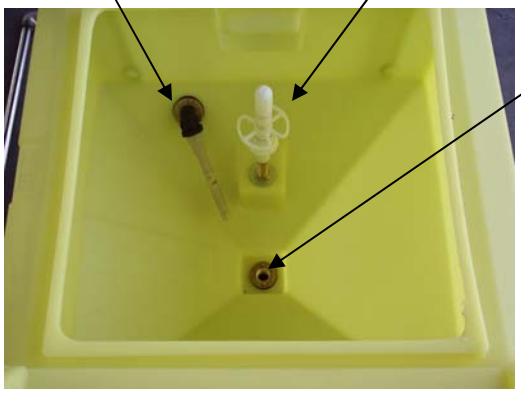
- The outlet on the rinse bin has a tap that lets the pump suck chemical from the rinse bin, and delivers it to the sprayer.
- The suction probe can also be attached to the suction line of the pump, to draw chemical straight from larger containers.
- Note that there is also a tap on the pump that allows the changing of functions while still delivering water to the sprayer.
- If the transfer of chemical through the probe, or from the rinse bin is slow, the main suction tap on the pump can be closed partially or fully, to speed up chemical transfer

When filling the spray tank, always finish filling the last 200L with straight water, to ensure that the pump has been flushed. This will ensure a longer life of the pump, seals and o rings.

When changing chemicals, always remember to decontaminate the rinse bin, pump, jugs, and delivery hoses, with the recommended cleaner.

Rinse bin operation

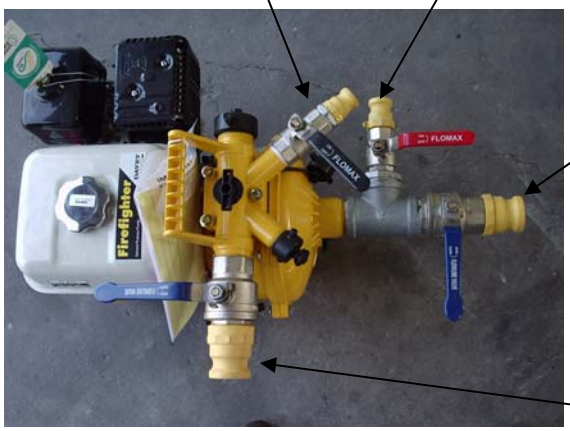
Bin rinse drum rinse outlet to pump suction



Outlet to pump With tap drum rinse bin rinse with tap probe holder

Delivery pump layout

Pressure to drum Rinse or flush suction from vat suction from water source



water to boom

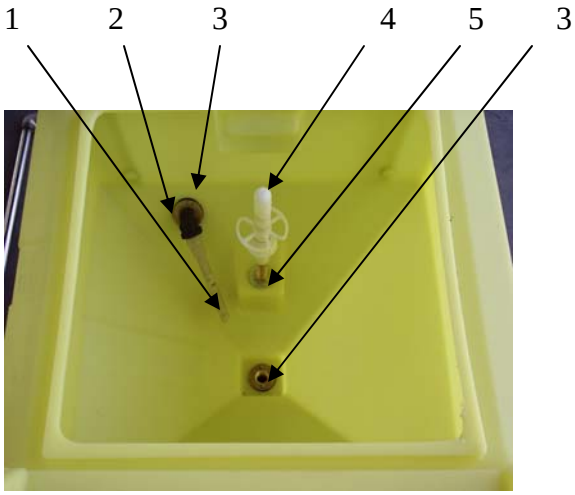
Rinse bin plumbing example

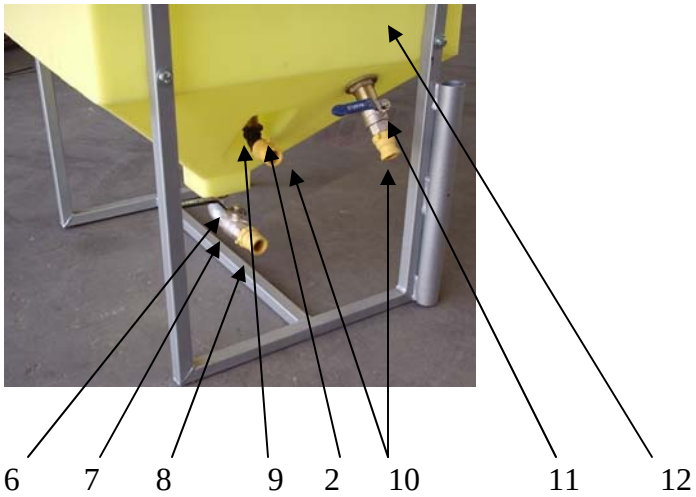
Pump pressure to drum rinse

Pump suction from bin rinse

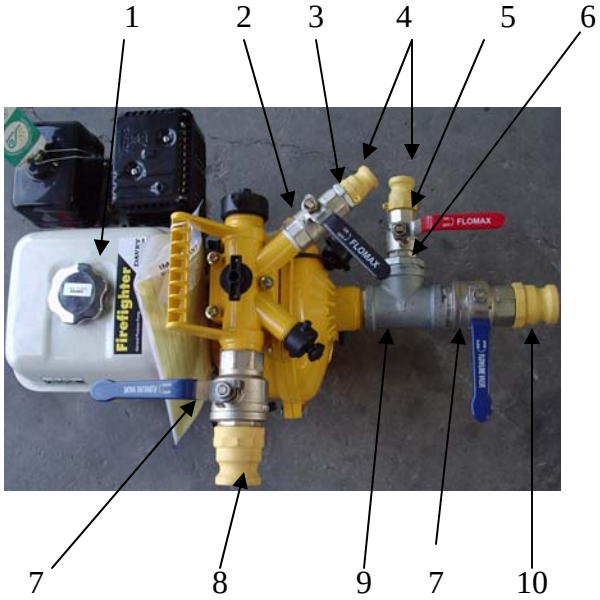
Pump suction connected to suction probe

Rinse bin parts





Delivery pump



Delivery pump parts

1	DP – 5155H	DAVEY FIRE FIGHTER SINGLE IMPELLOR
2	BV – 25FF	1 BAL VALVE F/F NICKEL
3	GF – LB2520	1 X ¾ REDUCING BUSH GAL
4	NY – 25F	1 MALE CAMLOCK MALE BSP
5	BV – 25MF	1 BALL VALVE M/M NICKEL
6	GF – LB4025	1 ½ X 1 REDUCING BUSH GAL
7	BV – 25MF	1 BALL VALVE M/F NICKEL
8	NY – 40A	1 ½ MALE CAMLOCK FEMALE BSP
9	GF – LT40	1 ½ GAL TEE
10	NY – 40F	1 ½ MALE CAMLOCK MALE BSP

Rinse bin parts

1	HP – 33710019	HYPRO JET AGITATOR
2	BP – SMFE20	¾ ELBOW M/F BLACK POLY
3	TF – SFOMF25	1 X ¾ BRASS THRUOGH TANK FITTING
4	RB – 06	DRUM RINSE VALVE
5	BR – ATO806	½ X 6 THREADED BRASS PIPE
6	GF – LEMF20	¾ ELBOW M/F GAL
7	BV – 25MF	1 BAL VALVE NICKEL
8	NY – 25F	1 MALE CAMLOCK MALE BSP
9	BP – ½ X ¾	REDUCING BUSH BLACK POLY
10	NY – 20F	¾ MALE CAMOCK/ MALE BSP
11	BV – 20F	¾ BALL VALVE M/F NICKEL
12	RB – 09	120L RINSE BIN NO FRAME

Hose kit and probe

RB – 03	6M X 1 INCH SUCTION FEMALE CAMOCKS
RB – 04	9M X ¾ PRESSURE HOSE FEMALE CAMLOCKS
RB – 05	SUCTION PROBE S/STEEL

9. Parts assembly drawings

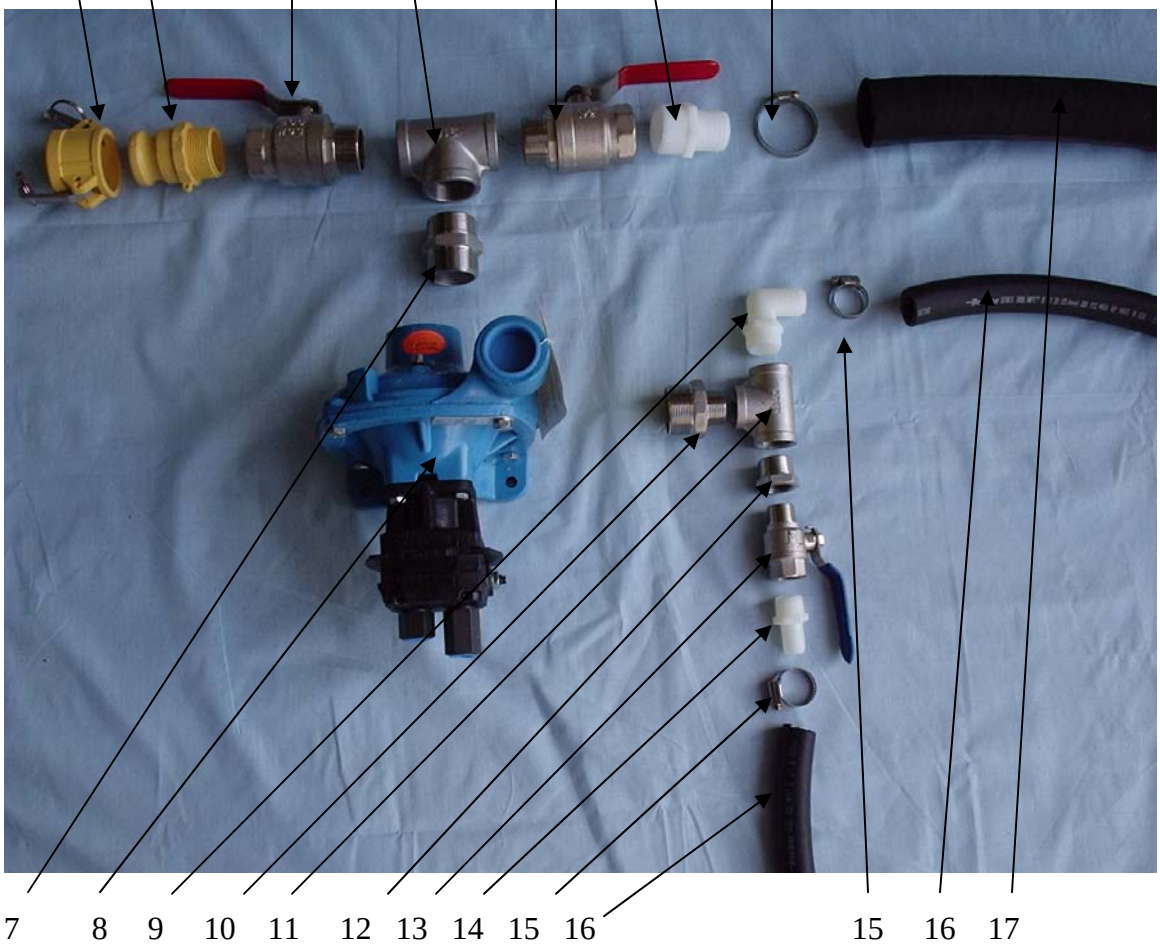
Electrical

24 pin deutsch plug to suit tee-jet 844e controller with regulator, flowmeter, speed sensor and foam

Pin no.	Wire colour	description
A	white	switch 1
B	brown	switch 2
C	green	switch 3
D	yellow	switch 4
E	grey	switch 5
F	green 4mm	negative for valves
G	brown	regulator valve
H	white	regulator valve
J	red 4mm	positive for valves
K	white/red	flow signal
L	brown	flow power
M	green	flow earth
N	white/green	wheel signal
O	brown	wheel power
P	green	wheel earth
Q	black	pressure power
R	white	pressure signal
S	white	foam right
T	green	foam compressor 1
U	yellow	foam left
V	red	foam power
W	brown	foam compressor 2
X	yellow	Honda pump - off

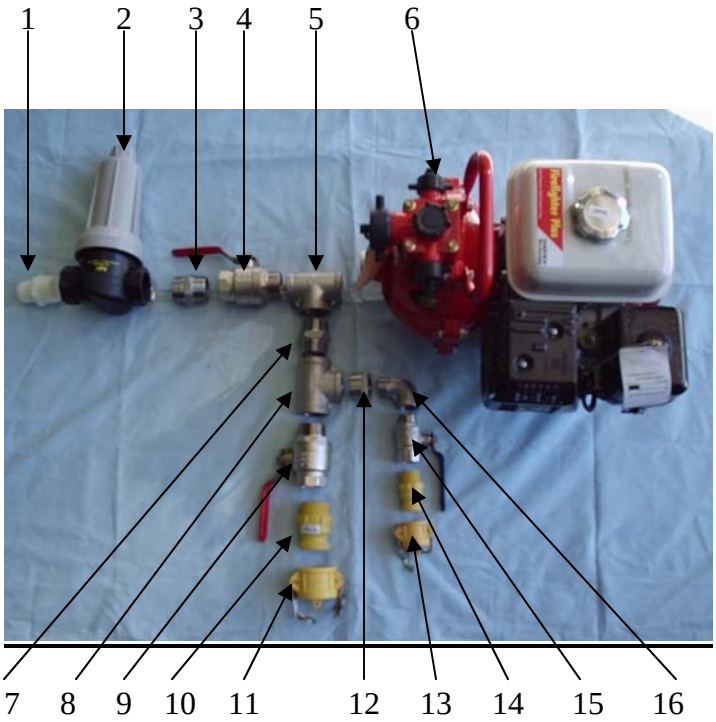
Deutch plug

Boomspray mounted pump and fill point



1	NY – 40DC	1 ½” camlock cap
2	NY – 40F	1 ½” male camlock male bsp
3	BV – 38MF	1 ½” ball valve m/f nickel plated
4	SF – SS3508	1 ½” tee s/steel
5	NF – A112	1 ½” x 1 ½” hose barb nylon
6	HC – BZ62028	1 ½” clamp
7	SF – SS2708	1 ½” nipple s/steel
8	HP – 9303C-HM4	hypro pump and hydraulic motor
9	NF – EL1034	1”m x ¾” elbow nylon
10	SF – SS7311	1 ¼” x 1” reducing nipple s/steel
11	SF – SS3506	1” tee s/steel
12	SF – SS2412	1” x ¾” reducing bush s/steel
13	BV – 20FF	¾” ball valve f/f nickel plated
14	NF – A3434	¾” m x ¾” nylon hose barb
15	HC – BZ62012	¾” clamp
16	HO – MPT20BL	¾” pressure hose
17	HO – 72161502	1 ½” suction / pressure hose

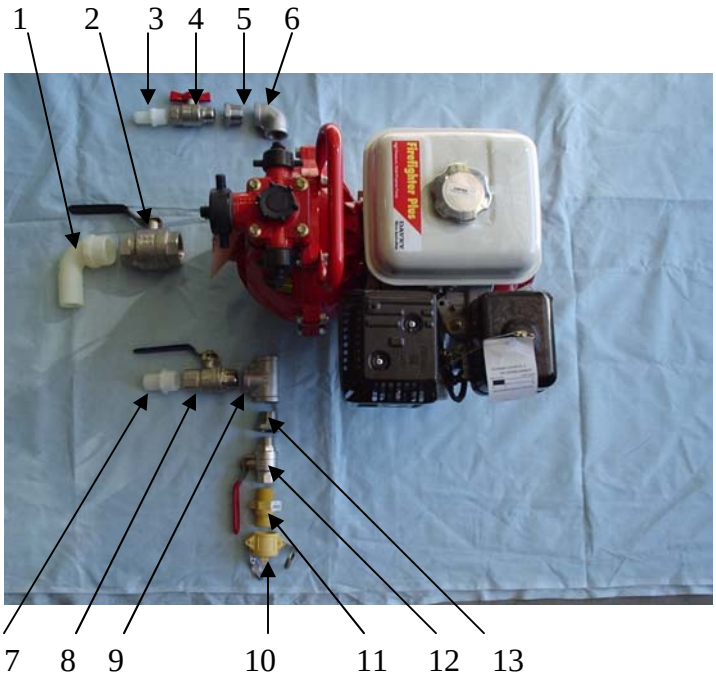
Davey firefighter spray pump parts.



Suction side

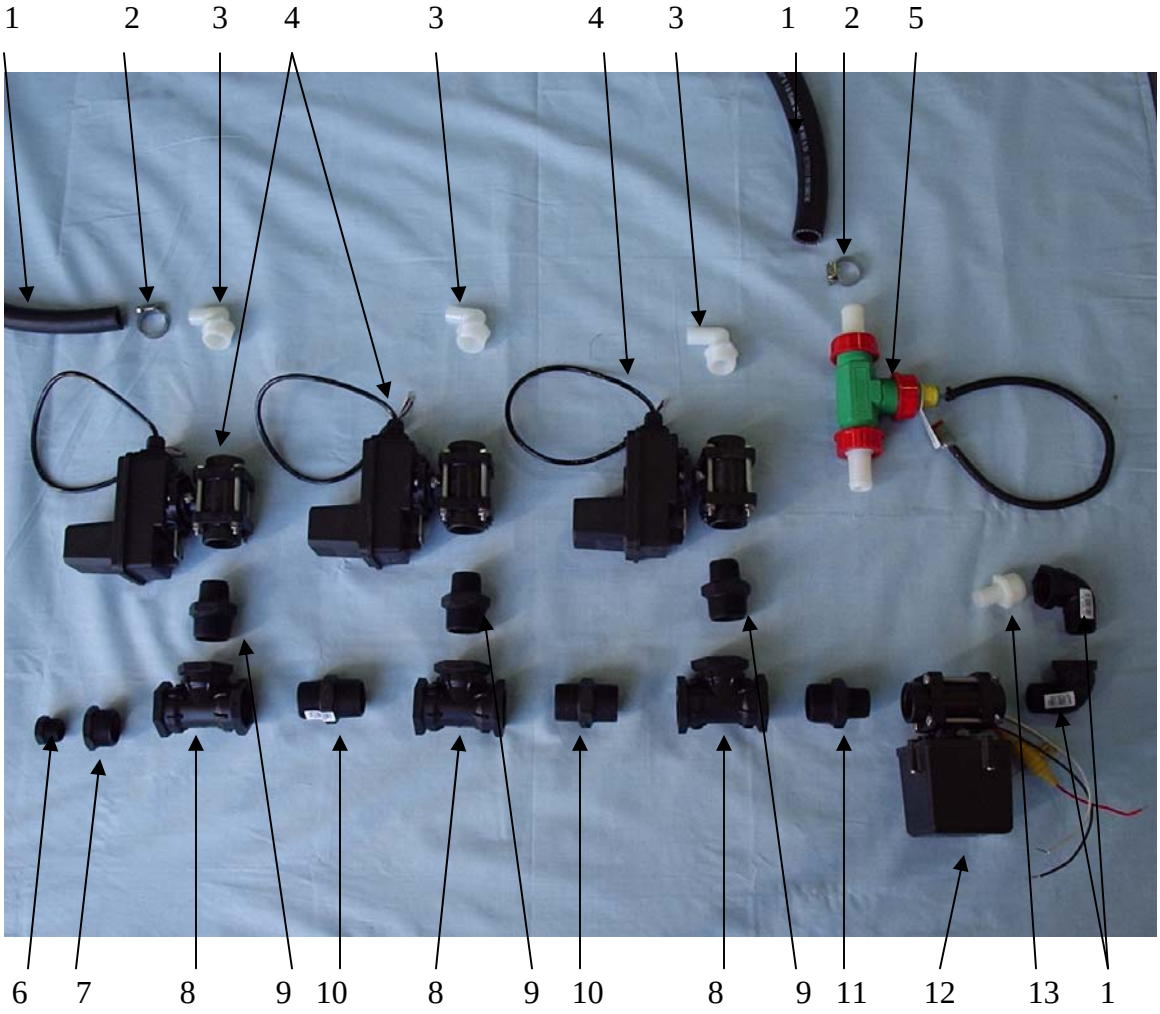
1	NF – A112	1 ½ nylon hose tail
2	SS – AAB14-1 ½	1 ½ spraying systems filter
3	SF – SS2708	1 ½ s/steel nipple
4	BV - 38MF	1 ½ ball valve m/f
5	SF - SS3508	1 ½ s/steel tee
6	DP – 93216-0	twin impellor davey firefighter
7	SF – SS2708	1 ½ s/steel nipple
8	SF – SS3508	1 ½ s/steel tee
9	BV – 38MF	1 ½ ball valve
10	NY – 40F	1 ½ male camlock male thread
11	NY – 40DC	1 ½ camlock cap
12	SF – SS2418	1 ½ x 1 s/steel red bush
13	NY – 25DC	1 camlock cap
14	NY – 25F	1 male camlock male thread
15	BV – 25MF	1 ball valve m/f
16	SF – SS2511	1 s/steel m/f elbow

Pressure side



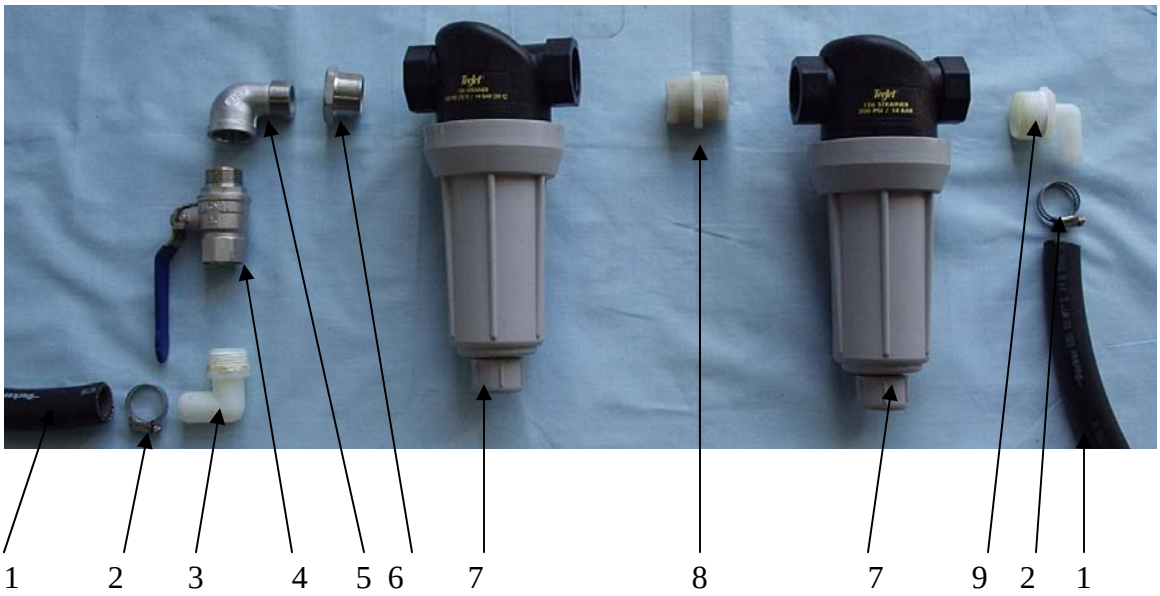
1	NF – EL112	1 ½ nylon hosetail elbow
2	BV – 12FF	1 ½ ball valve f/f
3	NF – A3434	¾ nylon hose tail
4	BV – 20MF	¾ ball valve m/f
5	SF – SS2412	1 x ¾ red. Bush
6	SF – SS3405	1 s/steel elbow f/f
7	NF – A1010	1 nylon hose tail
8	BV – 20MF	1 ball valve m/f
9	SF- SS3506	1 s/steel tee
10	NY – 20DC	¾ camlock cap
11	NY – 20F	¾ male camlock male thread
12	BV - 20MF	¾ ball valve m/f
13	SF – SS2412	1 x ¾ s/steel red. bush

Electric ball valve assembly with boom mounted flowmeter



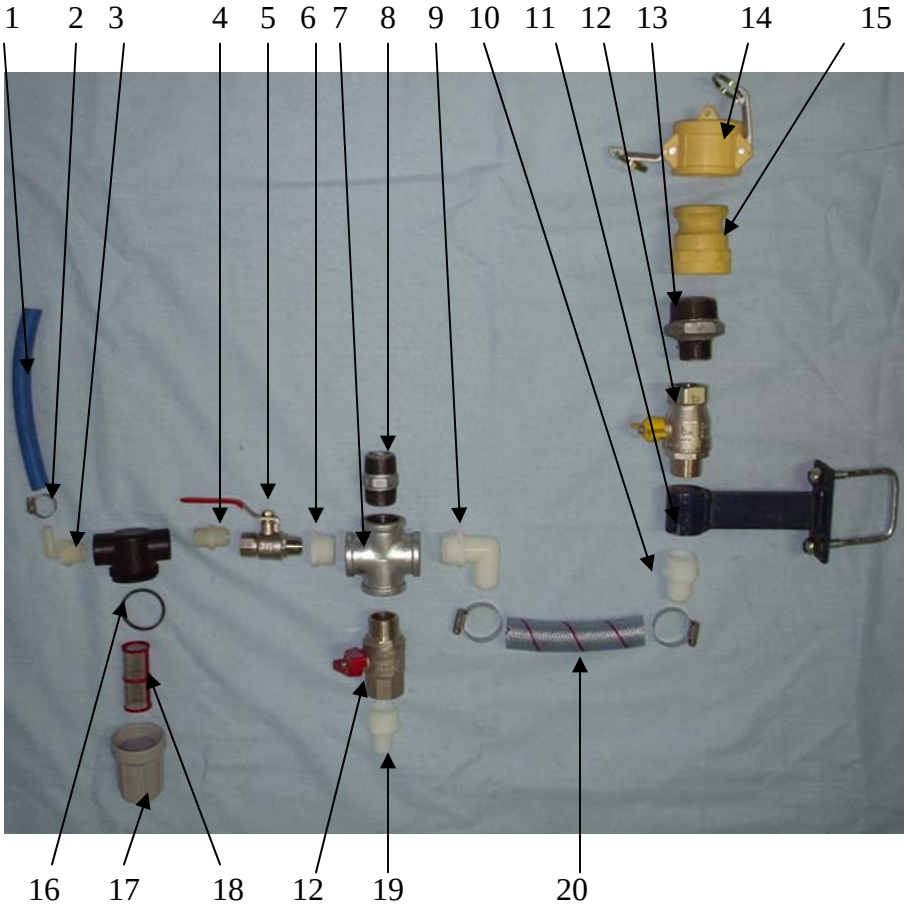
1	HO – MPT20BL	¾” pressure hose black
2	HC – BZ62012	¾” clamp
3	NF – EL11434	1 ¼” x ¾” hose barb elbow nylon
4	SS – B344BEC-24-C	s/systems elec. ball valve
5	SS – 38410-1-CER	1” flowmeter for 24m + booms
	SS – 38410-3/4-BB	¾” flowmeter for booms below 24m
6	BP – SRB2015	¾” x ½” reducing bush black poly
7	BP – SRB3220	1 ¼” x ¾” reducing bush black poly
8	BP – ST32	1 ¼” tee black poly
9	BP – SRHN3225	1 ¼” x 1” reducing nipple black poly
10	BP – SHN32	1 ¼” nipple black poly
11	BP – SRHN3225	1” x 1 ¼” reducing nipple black poly
12	SS – B38440-344AE	s/systems regulation valve
13	NF – A1034	1” male x ¾” nylon
14	BP – SMFE25	1” x 1” m/f elbow black poly

Pressure filter assembly



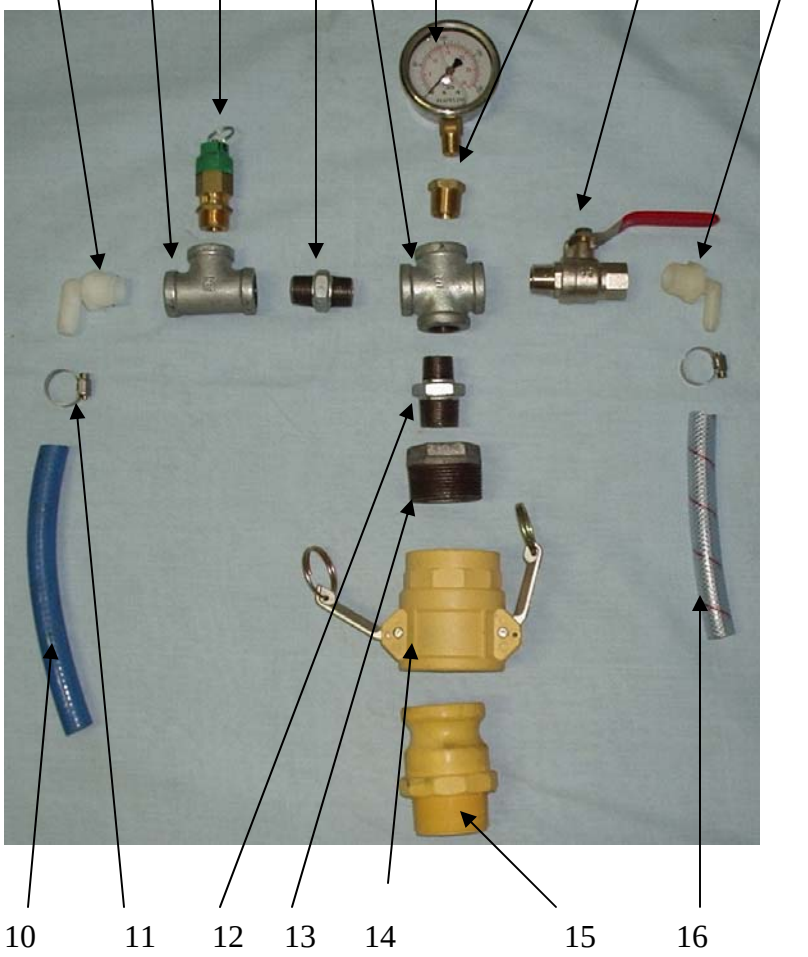
1	HO – MPT25BL	1” pressure hose
2	HC – BZ62012	1” clamp
3	NF – EL1010	1” x1 hose barb elbow nylon
4	BV – 25MF	1” ball valve m/f nickel
5	SF – SS2511	1” x 1 m/f elbow s/steel
6	SF – SS2415	1”x 1 ¼” reducing bush s/steel
7	SS – AAB126-5-80	1 ¼” spraying systems filter
8	BP – SHN32	1 ¼” nipple black poly
9	NF – EL11434	1 ¼” x ¾” hose barb elbow nylon

Foam marker tank assembly from fill point to bottom of tank



1	HO – NPT10	3/8” pressure hose
2	HC – BZ3506	½” clamp
3	NF – EL1212	½” x ½” hose barb elbow nylon
4	NF – M1200	½” nipple nylon
5	BV – 12FF	½” ball valve f/f
6	NF – RB1012	1” x ½” reducing bush nylon
7	GF – LCR25	1” cross gal
8	GF – LN25	1” x 1” nipple gal (to tank bottom)
9	NF – EL1010	1” x1” hose barb elbow nylon
10	NF – A1010	1” x1” hose barb nylon
11	BRACKET	1” x 1” socket bracket with u clamp
12	BV – 25MF	1” ball valve m/f
13	GF – LN4025	1 ½” x 1” reducing nipple gal
14	NY – 40DC	1 ½” camlock cap
15	NY – 40A	1 ½” male cam female thread nylon
16	SS – CP23173-EPR	filter seal
17	SS – AAB122-1/2-P	½” s/systems filter complete
18	SS – CP45102-3SSPP	filter screen red 50 mesh
19	NF – A1034	1” x ¾” hose barb nylon
20	HO – NPT25	1” clear braided pressure hose
21	BS – SS90FMT	90l s/steel foam tank (not pictured)

Foam marker assembly - top of tank

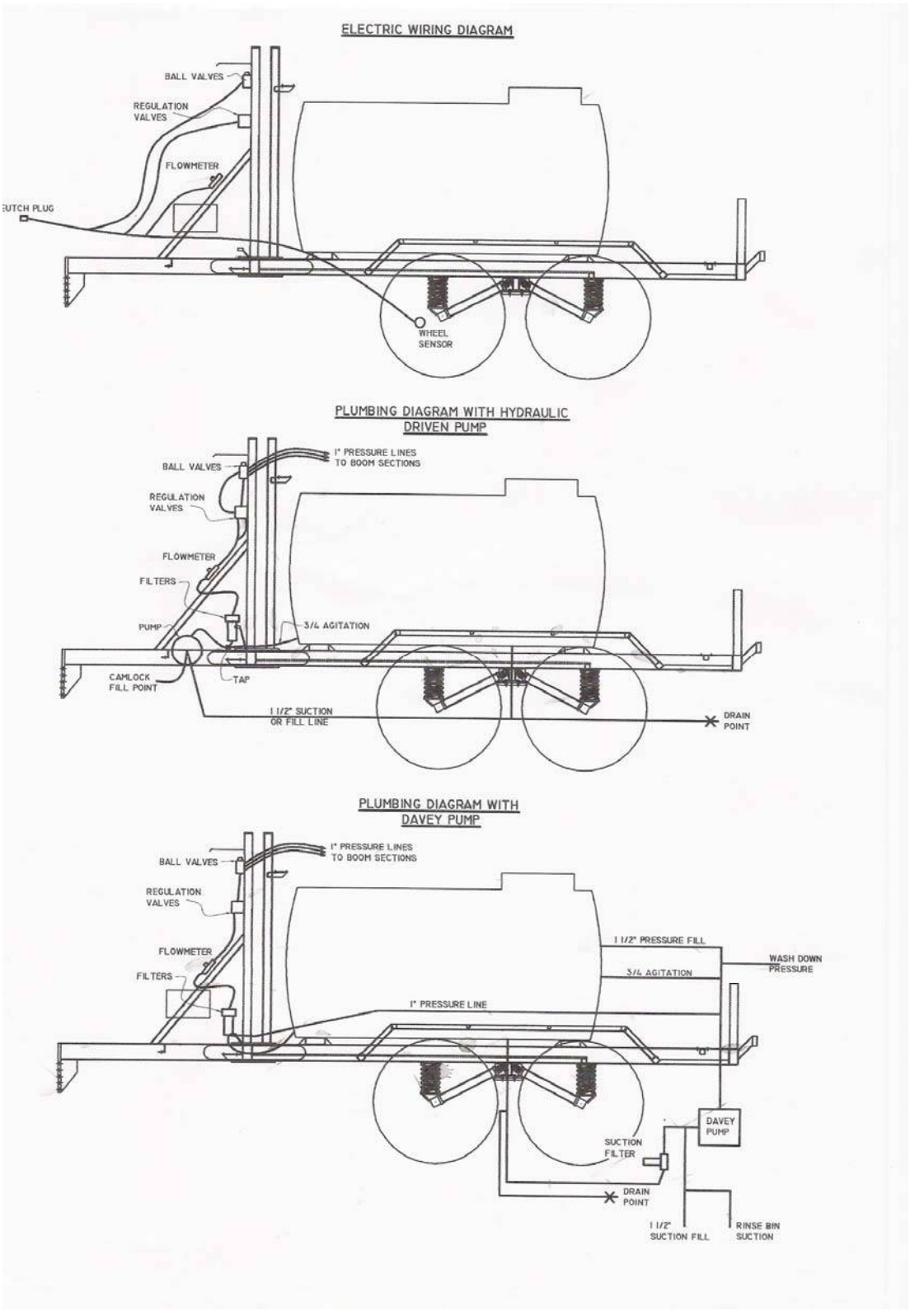


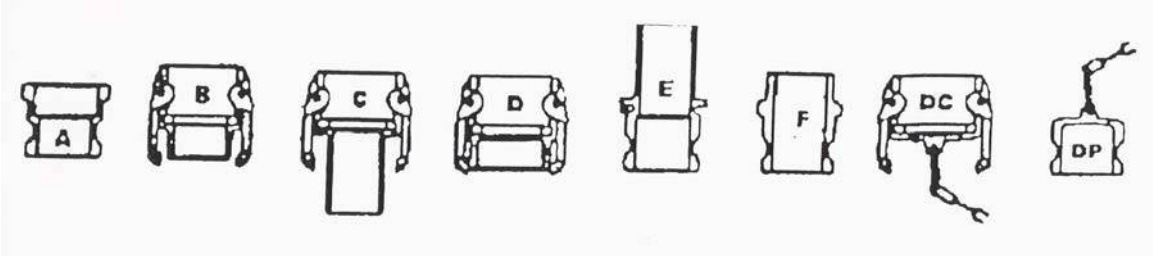
1	NF – EL1238	½” x 3/8” hose barb elbow nylon
2	GF – LT15	½” tee gal
3	JEN – 1807003	½” pressure relief valve (15 psi)
4	GF – LN15	½” nipple gal
5	GF – LCR15	½” cross gal
6	JEN – 1807003	pressure gauge 2 bar (30 psi)
7	BR – 2405	½” x ¼” reducing bush brass
8	BV – 12MF	½” ball valve m/f
9	NF – EL1238	½” x 3/8” hose barb elbow nylon
10	HO – NTP10	3/8” overflow hose (clear braided)
11	HC – BZ3504	3/8” clamp
12	GF – LN2015	¾” x ½” reducing nipple gal
13	GF – LB4020	1 ½” x ¾” reducing bush gal
14	NY – 40D	1 ½” camlock ff
15	NY – 40F	1 ½” male 1 ½” male bsp camlock
16	HO – CAC010	3/8” clear braided hose

Sundry Parts

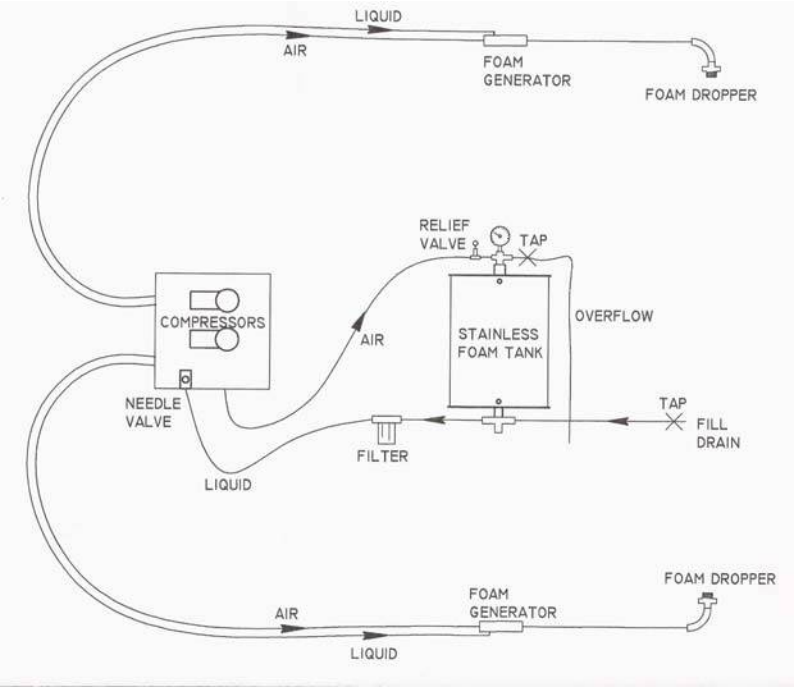
1	HY – SB0210-.32E1	2 x hyd accumulator
2	BS – 1366-2	2 x shock absorbers
3	PT –STA40	tank lid
	PT – STA41	mesh basket
4	PT – ST1000LP – ST3000LP	poly spray tank
5	BS-MG-20HD	20l fresh water tank
6	ST – HBP-26	lower swivel / hinge

BS – R- STOP	2 x rocking bar bump stop
BS – RR-658	rubber ring
ST – HBP-6	2 x middle boom catch
BS – STAY	2 x boom stay

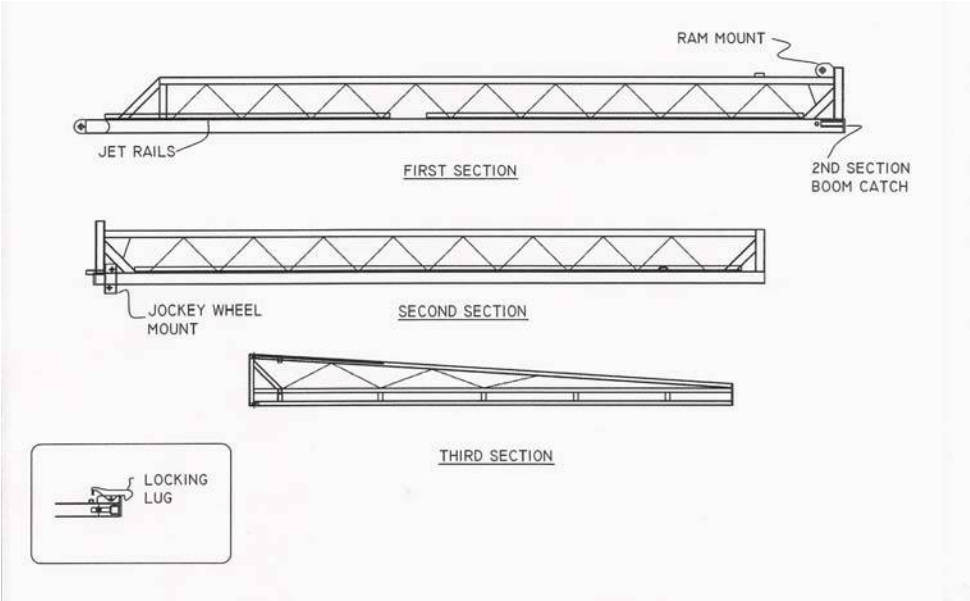

ELECTRIC WIRING DIAGRAM
BALL VALVES
REGULATION VALVES
FLOWMETER
UTCH PLUG
WHEEL SENSOR
PLUMBING DIAGRAM WITH HYDRAULIC DRIVEN PUMP
1" PRESSURE LINES TO BOOM SECTIONS
BALL VALVES
REGULATION VALVES
FLOWMETER
FILTERS
PUMP
3/4 AGITATION
CAMLOCK FILL POINT
TAP
1 1/2" SUCTION OR FILL LINE
DRAIN POINT
PLUMBING DIAGRAM WITH DAVEY PUMP
1" PRESSURE LINES TO BOOM SECTIONS
BALL VALVES
REGULATION VALVES
FLOWMETER
FILTERS
1 1/2" PRESSURE FILL
WASH DOWN PRESSURE
3/4 AGITATION
1" PRESSURE LINE
DAVEY PUMP
SUCTION FILTER
DRAIN POINT
1 1/2" SUCTION FILL
RINSE BIN SUCTION



Camlock codes



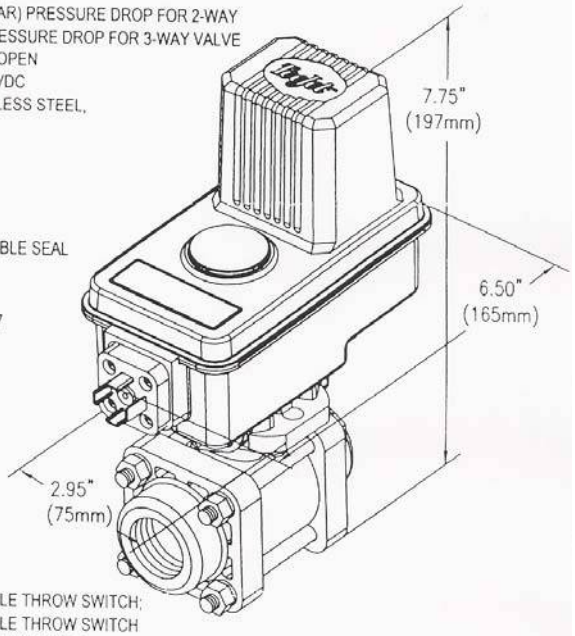
Foam marker plumbing diagram.



Boom sections

SPECIFICATIONS:

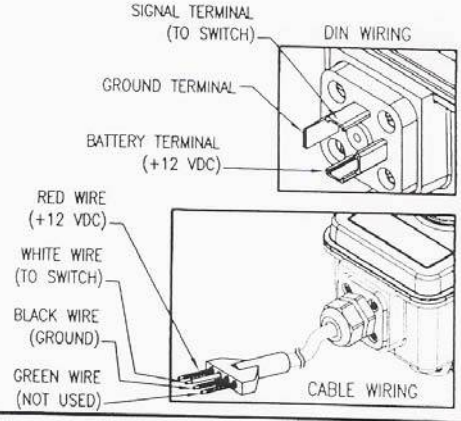
- MAXIMUM PRESSURE RATING: 300 PSI (20 BAR)
- FLOW RATE: 32 GPM (121 L/MIN) @ 5 PSI (.34 BAR) PRESSURE DROP FOR 2-WAY VALVE, 24 GPM (91 L/MIN) @ 5 PSI (.34 BAR) PRESSURE DROP FOR 3-WAY VALVE
- RESPONSE TIME: 0.6 SEC. FROM CLOSED TO OPEN
- CURRENT DRAW: 1.34 AMPS NOMINAL @ 13.8 VDC
- MATERIALS: POLYPROPLYENE, NYLON, STAINLESS STEEL, TEFLON®, AND VITON®



FEATURES INCLUDE:

- BUILT-IN DIN CONNECTOR (43650-A) WITH DOUBLE SEAL
- CABLE VERSION FEATURES ROUND POLYURETHANE JACKET
- MOTOR HEAD IS SEALED AND WELDED TO IP67
- QUICK RELEASE MOTOR HEAD ALLOWS MANUAL VALVE OPERATION
- GEARBOX USES DOUBLE WALL CONSTRUCTION TO ADD STRENGTH AND ENSURE PERMANENT LUBRICATION
- ALL METAL GEARS FOR STRENGTH AND DURABILITY
- AUTOMATIC RESETTABLE FUSE (DISCONNECT POWER FOR 20 SECONDS TO RESET)
- AVAILABLE FOR NEGATIVE OR POSITVE SWITCHED SPRAYER CONTROLS
- BEC STYLE MOTOR USES A SINGLE POLE, SINGLE THROW SWITCH; BE STYLE MOTOR USES A DOUBLE POLE, DOUBLE THROW SWITCH
- INLET AND OUTLET CONNECTIONS AVAILABLE IN 3/4" OR 1" FEMALE THREADS (NPT OR BSPT), 50-SERIES FLANGE OR QUICK CONNECT.
- STAINLESS STEM AND CHOICE OF STAINLESS STEEL OR POLYPROPYLENE BALL PROVIDE EXCELLENT CHEMICAL RESISTANCE

BEC STYLE MOTOR:



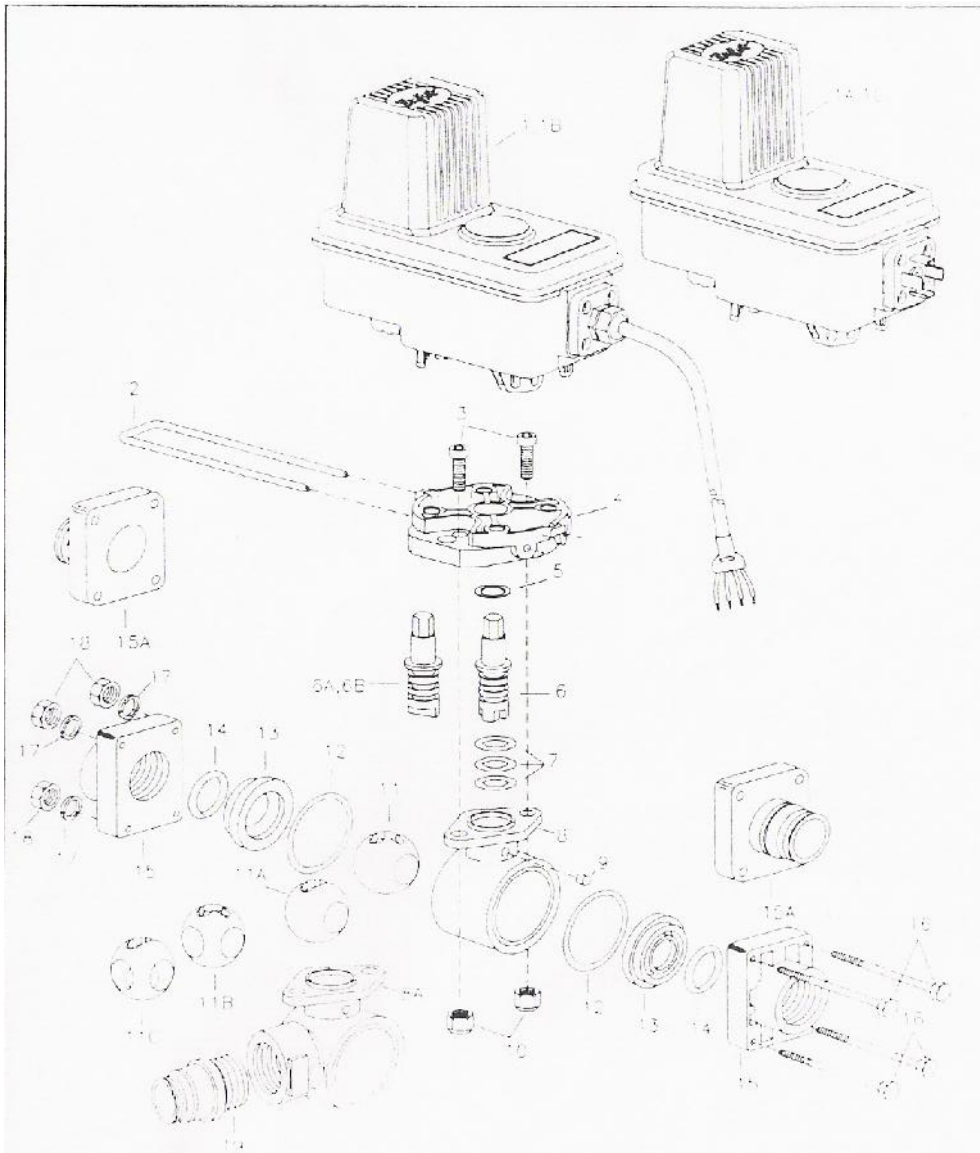
ORDERING INFORMATION:

344BEC-24-C - 0.5-METER CABLE CONNECTION, 1" NPT OUTLETS, POSTIVELY SWITCHED, 2-WAY VALVE
344BEC-23-C - DIN CONNECTION, 3/4" NPT OUTLETS, POSITIVELY SWITCHED, 2-WAY VALVE
SEE DATA SHEETS 56600 & 50515 FOR COMPLETE ORDERING INFORMATION
NOTE: DIN CABLES ARE AVAILABLE AND MAY BE ORDERED SEPARATELY

DESCRIPTION:
344BE AND 344BEC
DIRECTOVALVE®
ELECTRIC SHUT-OFF
BALL VALVES

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

Rev. No.	DATA SHEET 344BEC
Ref.	SHEET OF



ITM	PART NO	DESCRIPTION
1	50515-25CP01 *	BEC MOTOR, 25-RPM (0.6-SEC), 0.3-METER CABLE, POSITIVELY SWITCHED
	50515-25CP05 *	BEC MOTOR, 25-RPM (0.6-SEC), 0.5-METER CABLE, POSITIVELY SWITCHED
	50515-25CP15 *	BEC MOTOR, 25-RPM (0.6-SEC), 1.5-METER CABLE, POSITIVELY SWITCHED
	50515-25CP60 *	BEC MOTOR, 25-RPM (0.6-SEC), 6.0-METER CABLE, POSITIVELY SWITCHED
1A	50515-25DP *	BEC MOTOR, 25-RPM (0.6-SEC), DIN CONNECTION, POSITIVELY SWITCHED
1B	50533-25C03	BE MOTOR, 25-RPM (0.5-SEC), 0.3-METER CABLE (USE DPDT SWITCH)
	50533-25C05	BE MOTOR, 25-RPM (0.5-SEC), 0.5-METER CABLE (USE DPDT SWITCH)
	50533-25C15	BE MOTOR, 25-RPM (0.5-SEC), 1.5-METER CABLE (USE DPDT SWITCH)
	50533-25C60	BE MOTOR, 25-RPM (0.5-SEC), 6.0-METER CABLE (USE DPDT SWITCH)
1C	50533-25D	BE MOTOR, 25-RPM (0.5-SEC), DIN CONNECTION (USE DPDT SWITCH)
2	CP5057-SSPV	RETAINING CLIP, 304 STAINLESS STEEL
3	CP26197-7/8-SS	SOCKET HEAD CAP SCREW, STAINLESS STEEL (2 REQ'D)
4	CP5054-PP	MOTOR ADAPTER, POLYPROPYLENE (BLACK)
* 5	CP20125-TEF	THRUST WASHER, TEFLON
6	CP5663-SS	STEM, 303 STAINLESS STEEL (FOR POLYPROPYLENE BALL)
6A	CP5665-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)
8A	CP20102-3/4-NYB	BODY, NYLON (BLACK) (3-WAY, 3/4" NPT THREAD)
	CPB20102-3/4-NYB	BODY, NYLON (BLACK) (3-WAY, 3/4" BSPT THREAD)
	CP20102-1-NYB	BODY, NYLON (BLACK) (3-WAY, 1" NPT THREAD & QUICK CONNECT)
	CPB20102-1-NYB	BODY, NYLON (BLACK) (3-WAY, 1" BSPT THREAD)
* 9	CP20126-FELT	DUST PLUG, FELT
10	CP30435-1/4-SSNY	PLASTIC 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 (3 REQ'D)
* 13	CP20103-TEF	SEAL, TEFLON (2 REQ'D)
* 14	CP7717-2-213-VI	O-RING, VITON (2 REQ'D)
15	CP20104-3/4-NYB	END CAP, NYLON (BLACK) (3/4" NPT THREAD) (2 REQ'D)
	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)
16	CP20129-SS	BOLT, 1/4"-20 X 1" HEX, STAINLESS STEEL (4 REQ'D)
17	CP20128-SS	LOCK WASHER, 1/4", STAINLESS STEEL (4 REQ'D)
18	CP9535-SS	NUT, 1/4"-20 HEX, STAINLESS STEEL (4 REQ'D)
19	CP45526-NYB	THREADED QUICK CONNECT ADAPTER, NYLON (BLACK) (3-WAY ONLY)
	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 NEGATIVELY SWITCHED MOTORS SPECIFY "N" RATHER THAN "P" IN MOTOR PART NUMBER EXAMPLE: 50515-20CN03

DESCRIPTION:
344BE AND 344BEC
DIRECTOVALVE®
ELECTRIC BALL VALVE

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

Rev. No. 1	PARTS LIST
Ref.	PL344BEC

HYPRO

Series 9300 Hydraulically-Driven Centrifugal Pumps

Form L-0325C

Installation, Operation, Repair and Parts Manual

03-05

Description

SERIES 9303C & 9303S

Cast Iron & Stainless Steel Centrifugal Pumps

Max. Flow Rate: .....114 gpm
Max. Pressure: .....180 psi
Ports: .....1-1/2" NPT Inlet
.....1-1/4" 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.

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.

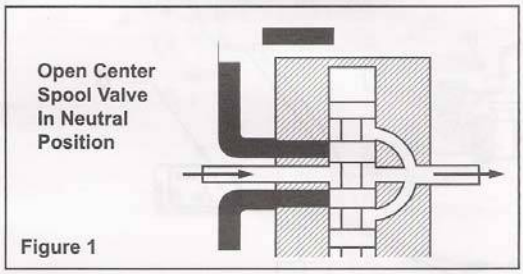


Figure 1

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.

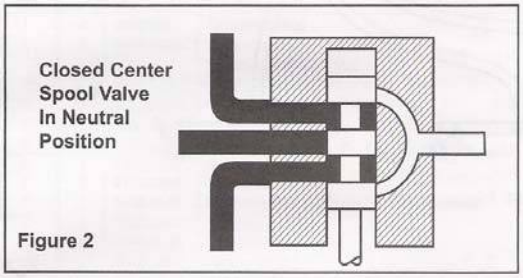


Figure 2

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.

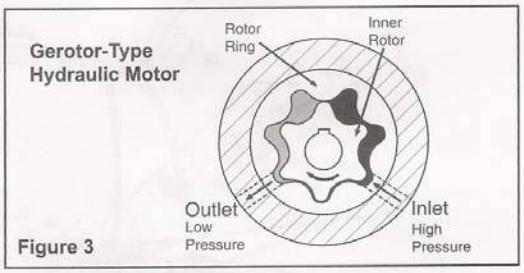


Figure 3

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.

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, provided the pressure differential across the hydraulic motor does not exceed 2200 psi (15.2 Mpa).

NOTE: For applications over 2200 psi hyd: use HM1 or HM5.

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, and 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 create if it were installed in the inlet line. Ensure that the

Plumbing Installation

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 port adapters on the hydraulic motor are sized to accommodate 1/2" NPT fittings. For maximum performance, the hydraulic lines should also be at least 1/2" [12.7 mm] in size. For lines longer than 8 feet [2.44 m] or for the HM3C models, hydraulic line size should be at least 3/4" [19.05 mm] in order to reduce heat generation.

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 and HM3C motors have a bypass screw set 1-1/2 turns from fully closed at the factory. HM2C and HM4C have the bypass screw 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, or fill the pump with FLUID FILM® and then drain it. A protective coating of FLUID FILM® will remain on the inner pump surfaces. Save the excess FLUID FILM® 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

Hypro 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)

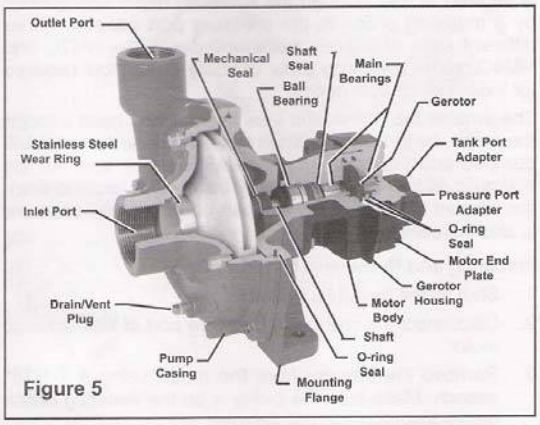


Figure 5

Pump Housing Disassembly

NOTE

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

1. 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.*]
2. 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.*]

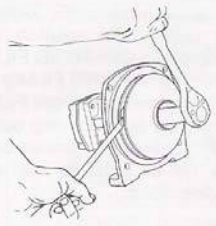


Figure 6

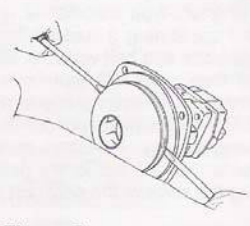


Figure 7

3. 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

1. 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).

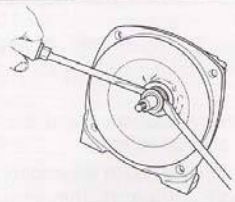


Figure 8

NOTE

In the case of a severe Pump Seal leak, inspect the Shaft/Bearing Assembly in the Hydraulic Motor for possible contamination.

2. 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.*]

3. 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

1. 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.*]
2. 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.

1. Lubricate the seal cavity in the Mounting Flange with WD-40®, LPS or equivalent. Do not lubricate the shaft.
2. 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.

3. 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.
4. 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).

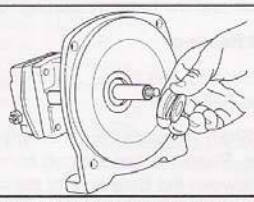


Figure 9

5. Install rubber gasket 1700-0100 over shaft against rotary portion of seal.

NOTE

On Models 9305C-HM3C-SP, 9505C-HM3C-BSP, 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.

6. 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.*]
7. Install the O-ring on the Mounting Flange. Replace the O-ring if worn or damaged.
8. 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

1. Remove the Mounting Flange from the Motor body and place Hydraulic Motor in vise (Figure 10).
2. Remove Tank Port Adapter and Pressure Port Adapter with large crescent wrench or 1-1/16" box end wrench (See Figure 10).
3. Using a 9/16" box end wrench, loosen the Nut on the Bypass Adjusting Screw (See Figure 10).
4. Using a small screwdriver, remove the Bypass Adjusting Screw from the Motor. (This will remove the Screw, Nut, Washer and Thread-Seal Gasket.)
5. Using a 1/4" Allen wrench, remove the Socket Head Cap Screws from the Motor End Plate (See Figure 10).
6. 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.)

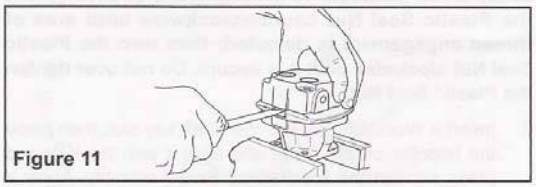


Figure 11

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.

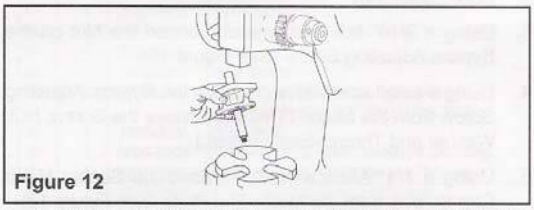


Figure 12

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).

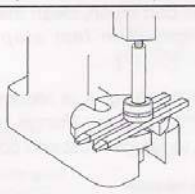


Figure 13

4. Inspect the sealing area of the Shaft for wear. Inspect other Shaft Assembly Components for wear and replace if necessary.
5. While Motor is completely disassembled, clean all parts in a solvent bath.

To Install New Shaft Seal

1. The sealing lips on a new Seal must be expanded to fit on the Shaft. Press seal onto large end of Shaft with seal lip facing out. Do not push Seal past keyway on Shaft.
2. Once seal lip has been expanded, remove the Seal from the Shaft.
3. With the seal lip facing the large end of the Shaft, slide the Seal over the threaded end of Shaft and gently push onto the raised area of the Shaft, stopping approximately 1/4" [6.35 mm] from the Large Retaining Ring groove.
4. Over the large end of the Shaft, install the Seal Spacer, Thrust Bearing Race, Thrust Bearing, second Thrust Bearing Race and the Large Retaining Ring.

To Install Shaft Bearing

1. Over the threaded end of the Shaft, install the Spacer Ring and the Ball Bearing.
2. Insert the Shaft (threaded end down) into the arbor press fixture. Place the two support bars opposite each other and between the Bearing and the fixture. Place on an arbor press and carefully press the Shaft down, allowing just enough room for the Retaining Ring next to the Bearing to be installed.

NOTE

Make sure the Spacer ring between the seal and Bearing is free floating (not binding).

NOTE

Should the Main Needle Bearings in the Hydraulic Motor need replacement, a new Body and/or End Plate with the Main Bearing already installed, must be used. If this occurs, check other internal parts of the Motor for damage and wear.

To Install the Shaft Assembly in the Motor Body

1. Place the Shaft Assembly into the Motor Body bearing bore with threaded end up (See Figure 14).

Figure 14

2. On arbor press, place Body on arbor press fixture.

NOTE

Make sure the surface edge of the fixture is smooth and clean.

NOTE

An un-threaded piece of pipe (1" dia. x 4" [25.4 mm x 101.6 mm] high) is needed to support the outer bearing race on the shaft ball bearing. Place this pipe over the shaft and press shaft assembly down until retaining ring can be installed in its groove in the bearing core of the motor body (Figure 15).

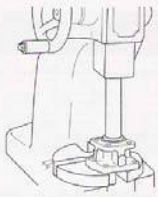


Figure 15

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 Woodruff Key or 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.

NOTE

The Woodruff Key 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 and the Outer Gerotor and Gerotor Housing with hydraulic oil or mineral oil.

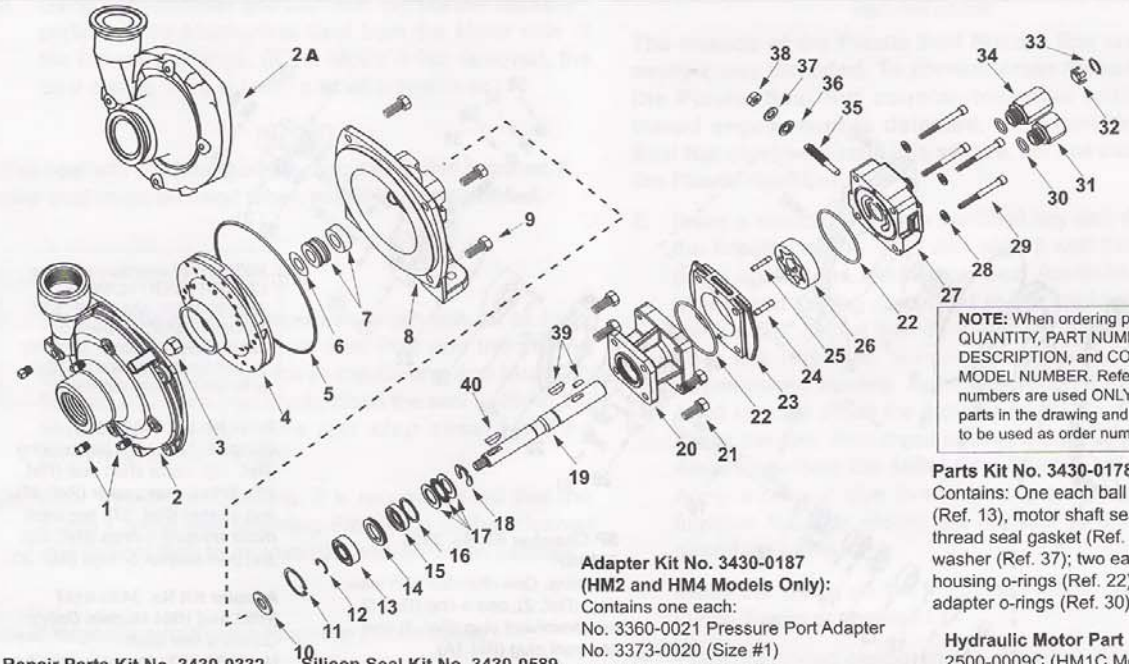
⚠WARNING

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

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.*]

Symptom	Probable Cause(s)	Corrective Action(s)
Low Discharge	Pump not primed.	— Remove topmost 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.
	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.
Hydraulic system overheating	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]. For large open-center systems, 3/4" [19.05 mm].

All 9303C and 9303S Series Pumps



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. 3430-0178
Contains: One each ball bearing (Ref. 13), motor shaft seal (Ref. 15), thread seal gasket (Ref. 36), and washer (Ref. 37); two each motor housing o-rings (Ref. 22), and port adapter o-rings (Ref. 30).

Hydraulic Motor Part Nos.
2500-0009C (HM1C Models)
2500-0010C (HM2C Models)
2500-0011C (HM3C Models)
2500-0012C (HM4C Models)
2500-0018C (HM5C Models)

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).

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)
3	1	2253-0002	Impeller Nut (9303C)
3	1	2253-0006	Impeller Nut (Model 9303S)
4	1	0401-9100P	Impeller (Nyglass, std.)(9303C)
4	1	0402-9100P	Impeller (Optional Polypropylene) (Std 9303S)
5	1	1720-0083	O-ring
6	1	1700-0100	Rubber Gasket (9303C)
7	1	2120-0009	Mechanical Seal (Viton) (Std 9303C)
7	1	3430-0589	Mechanical Seal (Silicon Carbide) (Std 9303S)
8	1	0750-9300C	Mounting Flange
8	1	0756-9300S	Mounting Flange (Model 9303S)
9	4	2210-0020	Hex Head Cap Screw (9303C)
9	4	2210-0125	Hex Head Cap Screw (Model 9303S)
10	1	1410-0056	Slinger Ring
11	1	1820-0013	Retaining Ring
12	1	1810-0014	Snap Ring
13	1	2000-0010	Ball Bearing
14	1	1410-0073	Spacer
15	1	2104-0005	Shaft Seal
16	1	1410-0074	Seal Spacer
17	1	2029-0014	Thrust Bearing Assembly—Consists of: (1) Thrust Bearing & (2) Thrust Brg. Races
18	1	1810-0026	Snap Ring
19	1	0509-2500	Shaft (HM2C & HM4C Models) 6-3/4" Long
19	1	0511-2501	Shaft (HM1C & HM5C Models) 7" Long
19	1	0510-2500	Shaft (HM3C Models) 7 -1/2" Long
20	1	0151-2500C	Motor Body (Includes Main Bearing)
21	4	2210-0005	Hex Head Cap Screw
22	2	1720-0110	O-ring
23	1	0701-2500C	Gerotor Housing (HM2C Models) 1/4" Wide

Ref. No.	Qty. Req'd.	Part No.	Description
23	1	0700-2500C	Gerotor Housing (HM1C Models) 1/2" Wide
23	1	0703-2500C	Gerotor Housing (HM4C Models) 5/16" Wide
23	1	0702-2500C	Gerotor Housing (HM3C Models) 1" Wide
23	1	0704-2500C	Gerotor Housing (HM5C Models) 5/8" Wide
24	1	1600-0045	Dowel Pin (HM2C & HM4C Models)
24	1	1600-0044	Dowel Pin (HM1C & HM5CModels)
24	1	1600-0052	Dowel Pin (HM3C Models)
25	1	1600-0042	Dowel Pin (HM2C & HM4C Models)
25	1	1600-0037	Dowel Pin (HM1C & HM5C Models)
25	1	1600-0068	Dowel Pin (HM3C Models)
26	1	3900-0022	Gerotor (HM1C Models)
26	1	3900-0023	Gerotor (HM2C Models)
26	1	3900-0024	Gerotor (HM3C Models)
26	1	3900-0025	Gerotor (HM4C Models)
26	1	3900-0048	Gerotor (HM5C Models)
27	1	0251-2500C	Motor End Plate (Includes Main Bearing)
28	4	2270-0039	Washer
29	4	2220-0045	Cap Screw (HM2C & HM4C Models)
29	4	2220-0021	Cap Screw (HM1C)
29	4	2220-0044	Cap Screw (HM3C Models)
29	4	2220-0032	Cap Screw (HM5C)
30	2	1720-0108	O-ring
31	1	3360-0021	Pressure Port Adapter
32	1	3260-0039	Poppet
33	1	1820-0023	Retaining Ring
34	1	3320-0016	Tank Port Adapter
35	1	3220-0029	Bypass Adjusting Screw
36	1	1700-0047	Gasket
37	1	2270-0027	Washer
38	1	2250-0038	Lock Nut
39	1	1610-0032	Roll Pin (HM2C & HM4C Models)
39	1	1610-0031	Roll Pin (HM1C & HM5C Models)
39	1	1610-0030	Woodruff Key (HM3C)
40	1	1610-0012	Woodruff Key (9303C)
40	1	04432	S.S. Woodruff Key (Model 9303S)

11. Foam Marker

ELECTRIC VALVES These stop and start foam production electrically from the cabin. It is important when stopping the air compressor to shut off liquid, to stop the liquid flooding the system. The liquid can run back up the air line. This can cause solution to gel and block the generator.

GENERATOR The foam generator is used to inject air into the liquid stream. Blockages can occur in new systems from dirt or bugs in the hoses. If the generator is removed for cleaning, to return it to its previous setting, screw generator in fully and the back out one and a half turns, and then lock with locknut.

In double sided systems if one side is working better than the other, adjust generator on bad side in or out until foam production is the same as the other side.

Annually, or more often if needed, clean the screen in the foam generator.

THE LIQUID FILTER The liquid filter should be 80 mesh or finer. If the filter is of larger mesh, screen in foam generator will block after a time (this will be worse with a steel tank due to rust.)

NEEDLE METERING VALVE The needle valve controls the amount of liquid entering the foam generator thus controlling the quantity and quality of foam produced.

COMPRESSOR Air flows from around 1.25 cubic ft/min and above can be used. The larger the air supply the greater the production of foam. Small electric compressors are popular. These compressors work quite well and need little or no air control, only a relief valve for safety.

The back pressure of foam in the foam line being the factor influencing system pressure. Larger engine powered compressors need the air to be regulated by a relief valve or better still an air regulator. The important thing is to have a stable air supply as fluctuating air pressures will cause fluctuating foam production.

FOAM LINE The foam line MUST be four meters long and ¾" /19mm in diameter. This gives the foam time to pack to a fine, dense consistency.

FOAMING AGENT Mix foam agent as per label recommendations. Foam agents do not have a long shelf life so only keep enough for the season. Some foam agents do not mix readily so mixing is very important.

Either bottom filling or putting a hose to the bottom of the tank after adding the foam agent should assure even mixing.

Some foam agents will come out of suspension even while spraying, causing a weaker foam towards the bottom of the tank. Adding some extra foam agent and mixing will solve this problem. Leaving foam mixture lying around in tanks when not being used allows it to go off. This does not take long, as little as 24 hours. If stopped for ½ a day stir up foam mixture, if it doesn't work well add some more foam agent and mix.

START UP

The foam generator works well with air pressures from approx. 6 psi/40 kpa to 15 psi/100 kpa. The more air pressure the more liquid that can be added making more foam. Start compressor. Allow one to two minutes for air pressure to build then open needle valve

approx ¼ to ½ a turn. (If the system is completely dry opening the needle valve fully until liquid appears at foam dispenser then back off to ¼ to ½ a turn will get system primed quicker). When foam appears wait about 10 to 20 seconds and then if it is too runny close needle valve slightly.

If foam is stiff but has air holes in it open needle valve slightly. All needle valve adjustments should be small. With small electric compressors pressure should slowly rise as good quality foam is produced. The back pressure in the foam line sets the pressure in the system.

The stronger the foam mix the higher the pressures will be. Usually between 6 psi/55 kpa and 15 psi/100 kpa. With larger compressors the pressure must be controlled by a relief valve or preferably an air regulator to between 6 psi/55 kpa and 15 psi/100.

TROUBLE SHOOTING

Foam too runny:	< Water too hard. < Mix not 50 to 1. (mixture may need to be stronger for cold or hard water). Foam weak or old. < Air jet blocked, usually in new system. < Small electric compressors can get dirt under or break the reed valves. This will cut down the air supply. < Screen in foam generator blocked with dirt or rust. This is caused by liquid filter being too coarse. It should be 80 mesh. < Needle valve is too far open. Close needle valve slightly.
Air pressure too low:	< Foaming agent weak or not 50 to 1 mix. < Compressor worn or reed valves not sealing. < Needle valve set for small foam requirements. This will reduce back pressure and hence gauge pressure. < Relief valve or fittings leaking..
Air pressure too high:	With small electric compressors air pressure should not normally exceed 12 psi/100 kpa. It would more likely be in the range of 6 psi/40 kpa to 12 psi/100 kpa. The stronger the mix the higher the pressure. Eg 40 to 1 mix.

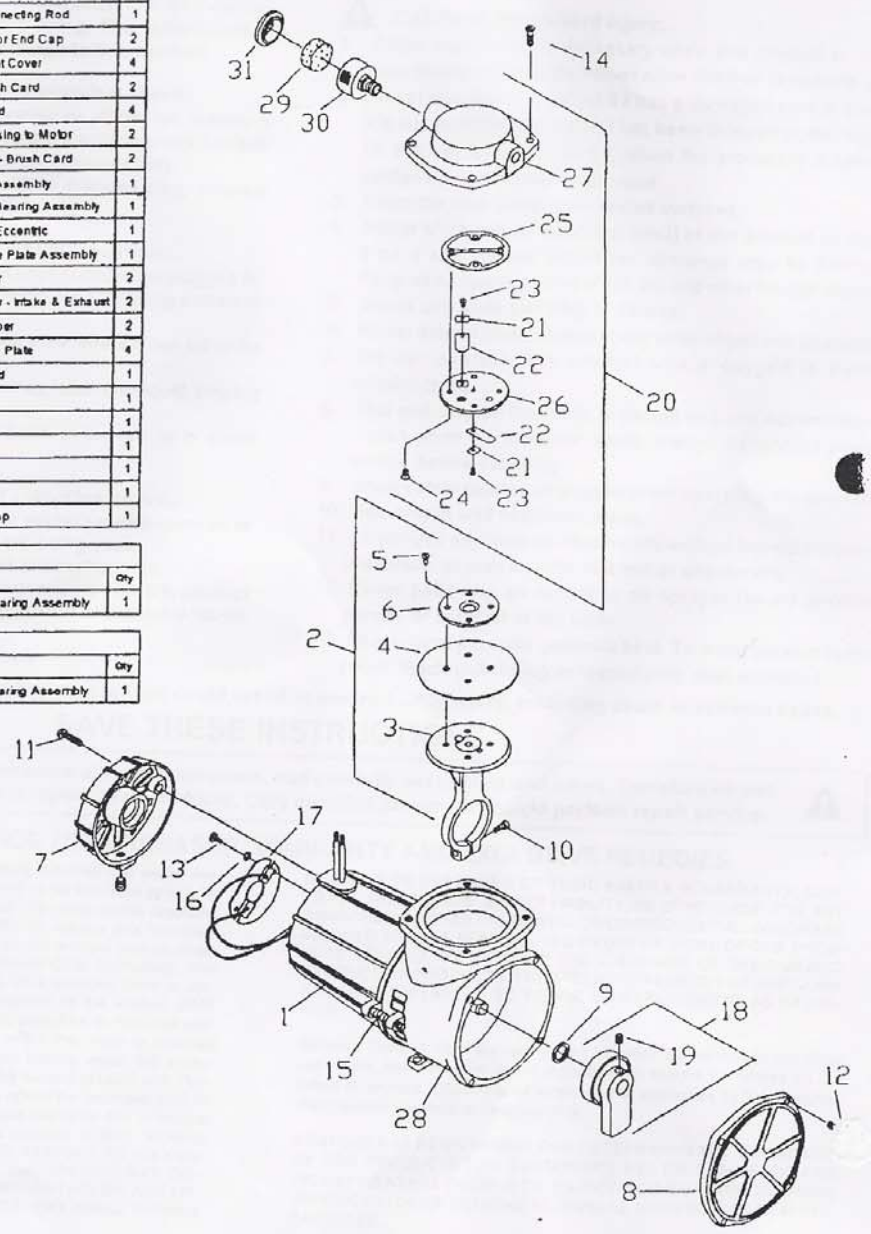
DRAWING AND PARTS LIST

Item No.	Part No.	Component Part	Description	Qty
1	602492-504		Motor Shell & Magnet Assembly	1
2	607180		Connecting Rod Assembly	1
3		607139	Connecting Rod	1
4		608148	Diaphragm	1
5		625540	Screw - Hold Down Plate	4
6		654649	Hold Down Plate	1
7	614381-504		Motor End Cap Assembly	1
8	614608		Front Cover	1
9	615403		Spacer - Eccentric	1
10	625114		Screw - Connecting Rod	1
11	625260		Screw - Motor End Cap	2
12	625266		Screw - Front Cover	4
13	625407		Screw - Brush Card	2
14	625444		Screw - Head	4
15	625506		Screw - Housing to Motor	2
16	626516		Lockwasher - Brush Card	2
17	627093		Brush Card Assembly	1
18	645373		Eccentric & Bearing Assembly	1
19		625244	Set Screw - Eccentric	1
20	660873-504		Head & Valve Plate Assembly	1
21		617045	Valve Keeper	2
22		621102	Valve Flapper - Intake & Exhaust	2
23		625160	Screw - Flapper	2
24		625606	Screw - Valve Plate	4
25		633439	Gasket - Head	1
26		654129	Valve Plate	1
27		660131-504	Head	1
28	664757-504		Housing	1
29	641034		Filter Foam	1
30	660763		Filter Body	1
31	660767		Filter Body Cap	1

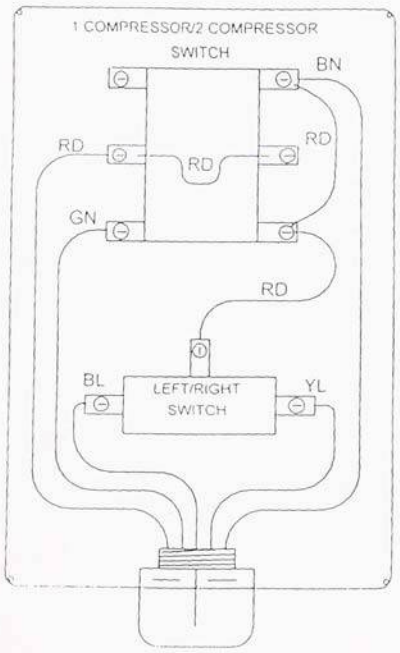
Model 107C DC 20/28-888				
Item	Delete	Add	Description	Qty
1	602492-504	602492-526	Motor Shell	1
7	614381-504	614381-526	M.E.C. Assembly	1
18	645373	645374	Eccentric & Bearing Assembly	1
20	660873-504	669079-526	Head & V.P.Assembly	1
24	625606	625141	Screw - Valve Plate	4
27	660131-504	661700-526	Head	1
28	664757-504	664762-526	Housing	1

Model 107C DC 20/28				
Item	Delete	Add	Description	Qty
18	645373	645374	Eccentric & Bearing Assembly	1

Model 107C DC 20				
Item	Delete	Add	Description	Qty
18	645373	645374	Eccentric & Bearing Assembly	1



WIRING DIAGRAM

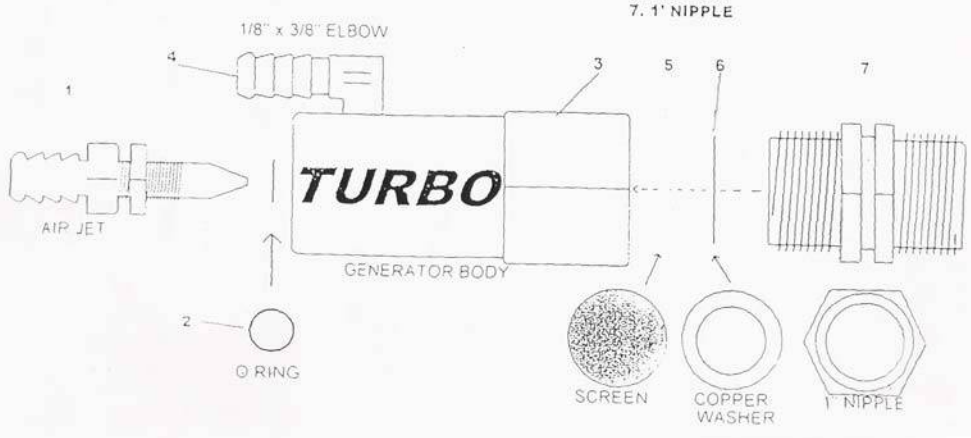


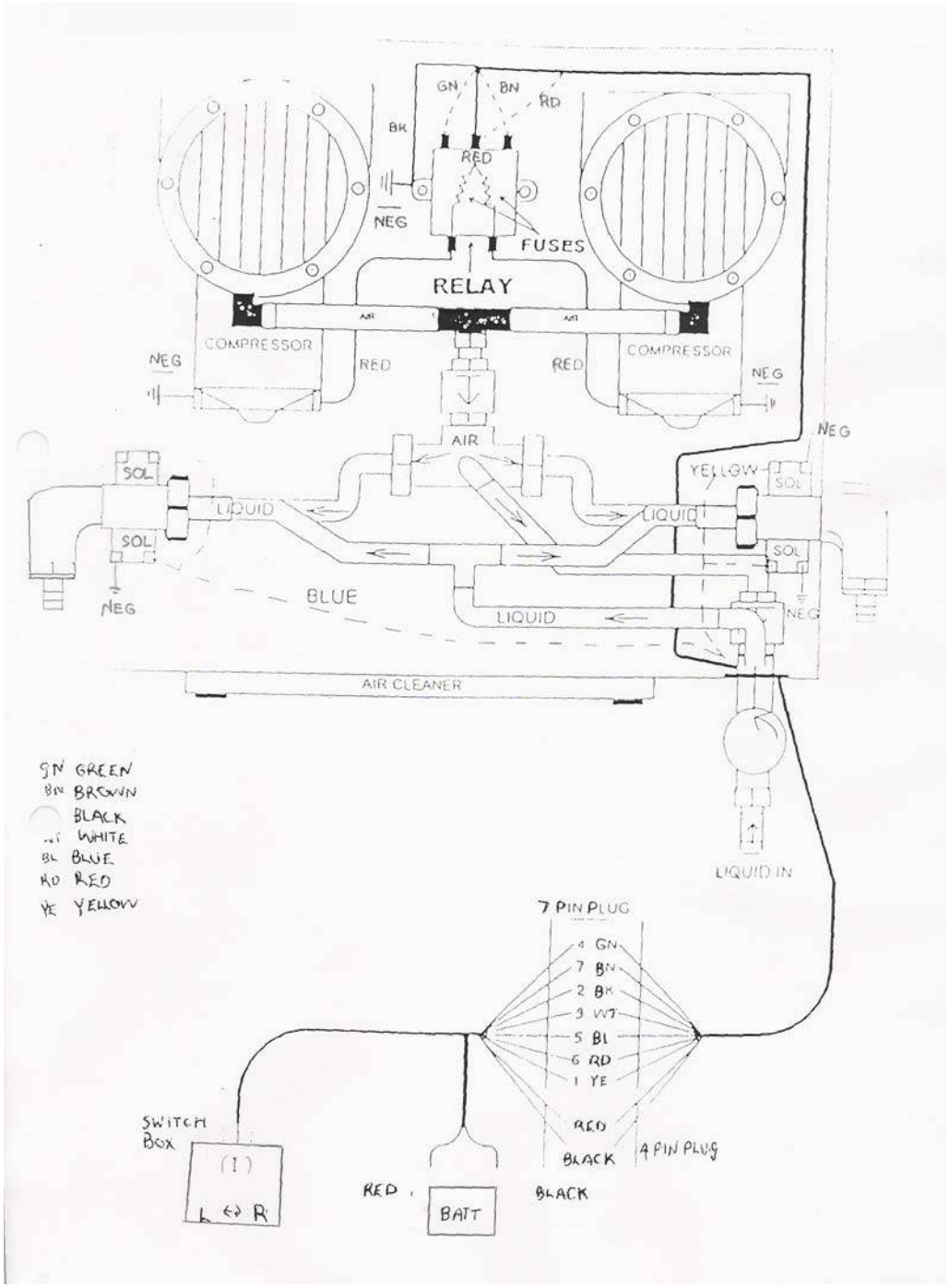
RD = RED
BL = BLUE
YL = YELLOW
GN = GREEN
BN = BROWN

Foam Generator

PARTS LIST

1. AIR JET
2. 'O' RING
3. GENERATOR BODY
4. ELBOW
5. SCREEN
6. WASHER
7. 1' NIPPLE




GN
BN
RD
BK
RED
NEG
FUSES
RELAY
AIR
COMPRESSOR
RED
RED
COMPRESSOR
NEG
NEG
AIR
SOL
LIQUID
SOL
NEG
BLUE
YELLOW
SOL
LIQUID
SOL
LIQUID
NEG
AIR CLEANER
LIQUID IN
GN GREEN
BN BROWN
BLACK
WHITE
BL BLUE
RD RED
YE YELLOW
7 PIN PLUG
4 GN
7 BN
2 BK
3 WT
5 BL
6 RD
1 YE
RED
BLACK
4 PIN PLUG
SWITCH BOX
(1)
L ↔ R
RED
BLACK
BATT

12 Nozzle Selection Charts

The following 7 pages reprinted with permission from Tee Jet catalogue 49m.

TeeJet® Broadcast Nozzle Selection Guide

	Herbicides				Fungicides		Insecticides	
	Soil Incorporated	Pre-Emerge	Post-Emerge		Contact	Systemic	Contact	Systemic
			Contact	Systemic				
XR TeeJet® Reference page 4			Excellent	Good	Excellent	Good	Excellent	Good
XRC TeeJet® Reference page 4			Excellent	Good	Excellent	Good	Excellent	Good
XR TeeJet® at pressures below 30 psi (2.0 bar) Reference page 4	Good	Good	Good	Very Good	Good	Very Good	Good	Very Good
XRC TeeJet® at pressures below 30 psi (2.0 bar) Reference page 4	Good	Good	Good	Very Good	Good	Very Good	Good	Very Good
Turbo TeeJet® Reference page 4			Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
Turbo TeeJet® at pressures below 30 psi (2.0 bar) Reference page 4	Good	Good	Good	Excellent	Good	Excellent	Good	Excellent
AI TeeJet® Reference page 4	Very Good	Very Good	Good	Excellent	Good	Excellent	Good	Excellent
AIC TeeJet® Reference page 4	Very Good	Very Good	Good	Excellent	Good	Excellent	Good	Excellent
TwinJet® Reference page 5			Excellent		Excellent		Excellent	
Turbo FloodJet® Reference page 5	Excellent	Excellent		Good		Good		Good
QCTF Turbo FloodJet® Reference page 8	Excellent	Excellent						
TurfJet® Reference page 5	Excellent	Excellent		Very Good		Very Good		Very Good

Characteristics of Common Spray Tip Materials

Ceramic
Superior wear life; highly resistant to abrasive and corrosive chemicals

Hardened Stainless Steel
Very good wear life; good durability and chemical resistance

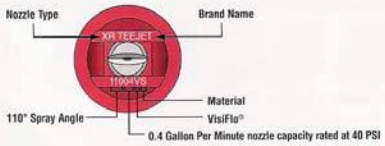
Stainless Steel
Good wear life; excellent chemical resistance; durable orifice

Polymer
Good wear life; good chemical resistance; orifice susceptible to damage when cleaned improperly

Brass
Poor wear life; susceptible to corrosion, especially with fertilizers

TeeJet® Spray Nozzle Information

Nozzle Nomenclature



Material Codes

VP	VS	VK	SS	HSS	VB	No Code
VisiFlo Polymer	VisiFlo Stainless Steel	VisiFlo Ceramic	Stainless Steel	Hardened Stainless Steel	VisiFlo Brass	Brass

Nozzle Type	Code	Nominal Spray Angle	Sizes	Available Materials						
				VP	VS	VK	SS	HSS	VB	Brass
Turbo TeeJet®	TT	110°	01-08	•						
AI TeeJet™	AI	110°	015-08		•					
AIC TeeJet™	AIC	110°	025-05	•	•	•				
XRC TeeJet™	XRC	110°	025-05	•	•	•				
XRC TeeJet™	XRC	80°	025-05		•					
AI TeeJet Even™	AI E	95°	015-08		•					
XR TeeJet®**	XR	80°, 110°	01-15	110°	•	•	•		110°	
DG TeeJet®	DG	80°, 110°	015-05	110°	•					
DG TeeJet Even®	DG E	95°	015-05		•					
TeeJet Standard®*	TP	65°, 80°, 110°	0067-20	•	•		•	•	110°	•
TeeJet Even®*	TP E	40°, 65°, 80°, 95°	01-15		•		•	•		•
TwinJet®	TJ60	40°, 65°, 80°, 110°	0134-10		•					•
TwinJet Even®	TJ60 E	40°, 80°	02-06		•					•
Turbo FloodJet®	TF	—	02-10	•	•					
	TFW	—	12 & 20 only							•
	TKT	—	3 & 5 only	•						
FloodJet®	TK	—	50-210		•		•			•
1/4K FloodJet®	1/4K	—	50-27				•			•
QCK FloodJet®	QCK	—	20-210		•					
Quick Turbo FloodJet®	QCTF	—	15-120		•					
TurfJet™	1/4TTJ	—	02-15	•	•					
FullJet®	FL	—	5-15	•	•					
AIUB TeeJet™	AIUB	85°	025-04		•					
TeeJet UB™	D25143-UB	85°	0075-04				•			•
OC TeeJet®*	OC	—	01-16				•			•
TQ TeeJet™	TQ	150°	01-09				•			•
TG Full Cone	TG	—	3-10				•			•
D-Disc/Core	D	—	1-16	•		•	•	•		•
ConeJet®	TX	—	1-26			•	•			•
TXA ConeJet®	TXA	80°	0050-04			•				
TXB ConeJet®	TXB	80°	0050-04			•				
StreamJet®	SJ3	36°	015-15	•						
	H1/4U	0°	02-80				•			•
	TP	0°	01-40				•			•

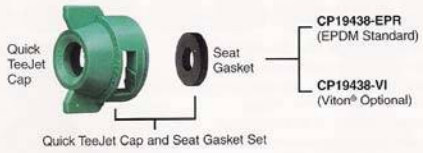
*Additional capacities and spray angles may be available, inquire.
**See below for additional material information.

XR TeeJet Materials and Sizes

Nozzle Type	Spray Angle	Sizes Available				
		VP	VS	VK	VB	SS
XR TeeJet	110°	015-08	01-08	02-08	01-08	10-15
XR TeeJet	80°	—	01-08	03-08	—	10-15

Quick TeeJet® Caps

Maximum Pressure 300 PSI (20 bar).



Quick TeeJet Cap and Seat Gasket Set

Color Code

1	2	3	4	5	6	7	8
Black	White	Red	Blue	Green	Yellow	Brown	Orange

Quick TeeJet Cap and Seat Gasket Set	For Use with Tip Number (Capacities)
 25612-*-NYR	XR(01-08), TP(0067-08), DG, TT, TQ
 25610-*-NYR	XR(10-15), TP(10-20)
 25598-*-NYR	TJ, AI, AIE, AIUB, SJ3
 25595-*-NYR	XR(01-08), TP(0067-08), DG
 25600-*-NYR	TF, TK-VS, TKT, TFW
 25608-*-NYR	TK, FL, TX, TG, D*** 8400 HOSE BARB
 26278-1-NYR**	DCER, TXB
 QJ4676-45-1/4-NYR**	1/4TTJ
 QJ4676-90-1/4-NYR**	1/4TTJ
 QJ4676-1/8-NYR**	—
 QJ(B)4676-1/4-NYR** (B) = BSPT	—
 19843-NYR**	Shut-off Cap

*Specify color code (see chart).
**Only available in black.
***Use seal CP18999-EPR.

TeeJet® Broadcast Nozzles

XR TeeJet® (XR)

Extended Range Flat Spray Tip

- Uniform coverage at lower pressures
- Smaller droplets at high pressures for thorough coverage
- Nozzle spacing – 20 inches (50cm)
- Spraying pressure – 15-60 PSI (1-4 bar)
- Automatic spray alignment with 25612-*-NYR Quick TeeJet® cap and gasket
- Automatic spray alignment for sizes 10 and 15 with 25610-*-NYR Quick TeeJet cap and gasket
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Examples:

XR8004VS – Stainless Steel with VisiFlo® color-coding
XR11004-VP – Polymer with VisiFlo color-coding
XR11004-VK – Ceramic with VisiFlo color-coding
XR8010SS – Stainless Steel
XR11004VB – Brass with VisiFlo color-coding

XRC TeeJet® (XRC)

Extended Range Flat Spray Tip

- XR TeeJet tip molded into Quick TeeJet cap provides automatic spray alignment
- Available in stainless steel, ceramic, and polymer in 110° spray angles...with VisiFlo color-coding, (80° stainless steel only)
- Includes tightly fitting washer that stays put and assures a good seal
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Examples:

XRC11004-VS – Stainless Steel with VisiFlo color-coding
XRC11004-VP – Polymer with VisiFlo color-coding
XRC11004-VK – Ceramic with VisiFlo color-coding
XRC8004-VS – Stainless Steel with VisiFlo color-coding

AI TeeJet® (AI)

Air Induction Spray Tip

- Depending on chemical, produces large, air-filled drops
- Larger droplets for less drift
- Uniform coverage in broadcast spraying
- Nozzle spacing – 20 inches (50cm)
- Spraying pressure – 30-115 PSI (2-8 bar)
- Polymer insert holder and pre-orifice with VisiFlo color-coding
- Automatic spray alignment with 25598-*-NYR Quick TeeJet cap and gasket
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Example:

AI11004-VS – Stainless Steel with VisiFlo color-coding

AIC TeeJet® (AIC)

Air Induction Spray Tip

- AI TeeJet nozzle molded into Quick TeeJet cap provides automatic spray alignment
- Available in stainless steel, ceramic, and polymer in 110° spray angles...with VisiFlo color-coding
- Includes tightly fitting washer that stays put and assures a good seal
- For application rates, see pages 6 and 7

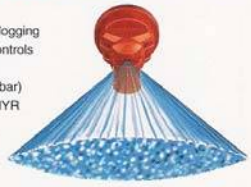
How to order:
Specify tip number. Examples:

AIC11004-VS – Stainless Steel with VisiFlo color-coding
AIC11003-VP – Polymer with VisiFlo color-coding
AIC11003-VK – Ceramic with VisiFlo color-coding

Turbo TeeJet® (TT)

Wide Angle Flat Spray Tip

- Large, round free passages to minimize clogging
- Excellent to use with automatic sprayer controls
- Excellent spray pattern quality
- Superior drift control from 15-90 PSI (1-6 bar)
- Automatic spray alignment with 25612-*-NYR Quick TeeJet cap and gasket
- For application rates, see pages 6 and 7



How to order:
Specify tip number. Example:

TT11001-VP – Polymer with VisiFlo color-coding

DG TeeJet® (DG)

Drift Guard Flat Spray Tip

- Large droplets to reduce drift
- Removable pre-orifice
- Nozzle spacing – 20 inches (50cm)
- Spraying pressure – 30-60 PSI (2-4 bar)
- Automatic spray alignment with 25612-*-NYR Quick TeeJet cap and gasket
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Examples:

DG8002VS – Stainless Steel with VisiFlo color-coding
DG11002-VP – Polymer with VisiFlo color-coding

TeeJet® Broadcast Nozzles

TwinJet® (TJ60)

Twin Flat Spray Tip

- Penetrates crop residue or dense foliage
- Smaller droplets for thorough spray coverage
- Nozzle spacing – 20 inches (50cm)
- Spraying pressure – 30-60 PSI (2-4 bar)
- Automatic spray alignment with 25598-*-NYR Quick TeeJet® cap and gasket
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Examples:

TJ60-8002VS – Stainless Steel with VisiFlo® color-coding
TJ60-8002 – Brass

Turbo FloodJet® (TF)

Wide Angle Flat Spray Tip

- Uniform coverage along boom
- Pre-orifice design produces large droplets to reduce drift
- Nozzle spacing – 20-40 inches (50-100cm)
- Spraying pressure – 10-40 PSI (0.7-3 bar)
- Can be used with No. 25600-* -NYR Quick TeeJet cap for automatic alignment
- For application rates, see pages 7 and 8

How to order:
Specify tip number. Examples:

TF-VS4 – Stainless Steel with VisiFlo color-coding
TF-VP4 – Polymer with VisiFlo color-coding

Turbo FloodJet® (TKT)

Wide Angle Flat Spray Tip

- Excellent spray distribution
- Wide spray angle at low pressure
- Ideal tip for residential and estate sprayers
- Recommended operating pressure range: 10-40 PSI (0.7-3 bar)
- VisiFlo color-coding for easy size identification
- All polymer construction
- Excellent resistance to corrosive solutions
- Can be used with No. 25600-* -NYR Quick TeeJet cap for automatic alignment
- For application rates, see page 8

How to order:
Specify tip number. Examples:

TKT-VP3 – Polymer with VisiFlo color-coding
TKT-VP5 – Polymer with VisiFlo color-coding

TeeJet® (TP)

Standard Flat Spray Tip

- Good spray penetration
- Uniform coverage along boom
- Nozzle spacing – 20 inches (50cm)
- Spraying pressure – 30-60 PSI (2-4 bar)
- Automatic spray alignment with 25612-*-NYR Quick TeeJet cap and gasket
- Automatic spray alignment for sizes 10 thru 20 with 25610-*-NYR Quick TeeJet cap and gasket
- For application rates, see pages 6 and 7

How to order:
Specify tip number. Examples:

TP8002VS – Stainless Steel with VisiFlo color-coding
TP11002VP – Polymer with VisiFlo color-coding
TP11002-HSS – Hardened Stainless Steel
TP8002-SS – Stainless Steel
TP8002 – Brass

TurfJet® (TTJ)

Wide Angle Flat Fan Spray Nozzle

- Very large droplets
- Direct replacement for plastic hollow-cone, low-drift nozzles
- More precise flow and distribution pattern
- Large orifice reduces clogging
- Nozzle spacing – 20-40 inches (50-100cm)
- Spraying pressure – 25-75 PSI (1.5-5 bar)
- Use Quick TeeJet cap QJ4676-*-NYR
- For application rates, see pages 7 and 8

How to order:
Specify tip number. Examples:

1/4TTJ04-VS – Stainless Steel with VisiFlo color-coding
1/4TTJ04-VP – Polymer with VisiFlo color-coding

Optimum Spray Heights

	50cm	75cm	100cm
65°	90cm	135cm	—
80°	75cm	110cm	—
110°	50cm	75cm	—
FullJets	75cm*	100cm*	125cm*
FloodJets TK, TF	60cm**	75cm**	100cm**

*Nozzle height based on 30 to 45 degree angle of orientation.

**Wide angle spray tip height is influenced by nozzle orientation. The critical factor is to achieve a double spray pattern overlap.

TeeJet® Broadcast and Turf Applications

Recommended Spraying Pressure Range:
(Consult your chemical label for specific application)

TT, Turbo TeeJet (1-6 bar)
AI, AI TeeJet (2-8 bar)
AIC, AIC TeeJet (2-8 bar)
XR, XR TeeJet (1-4 bar)
XRC, XRC TeeJet (1-4 bar)
TP, TeeJet Standard (2-4 bar)
DG, DG TeeJet (2-4 bar)
TJ, TwinJet (2-4 bar)
TF, Turbo FloodJet (0.7-3 bar)
TTJ, TurfJet (1.5-5 bar)
TQ, 150° Double Outlet (1.5-4 bar)
UB, Underleaf/End of Boom (1.5-4 bar)
AIUB, Underleaf/End of Boom (2-8 bar)
OC, Off Center (2-4 bar)

	bar	l/min	l/ha — 50cm													
			4 km/h	5 km/h	6 km/h	7 km/h	8 km/h	9 km/h	10 km/h	12 km/h	16 km/h	18 km/h	20 km/h	25 km/h	30 km/h	35 km/h
TP800050 TP1100050 (100)	2.0	0.16	48.0	38.4	32.0	27.4	24.0	21.3	19.2	16.0	12.0	10.7	9.6	7.7	6.4	5.5
	3.0	0.20	60.0	48.0	40.0	34.3	30.0	26.7	24.0	20.0	15.0	13.3	12.0	9.6	8.0	6.9
	4.0	0.23	69.0	55.2	46.0	39.4	34.5	30.7	27.6	23.0	17.3	15.3	13.8	11.0	9.2	7.9
TP800067 TP1100067 (100)	2.0	0.21	63.0	50.4	42.0	36.0	31.5	28.0	25.2	21.0	15.8	14.0	12.6	10.1	8.4	7.2
	3.0	0.26	78.0	62.4	52.0	44.6	39.0	34.7	31.2	26.0	19.5	17.3	15.6	12.5	10.4	8.9
	4.0	0.30	90.0	72.0	60.0	51.4	45.0	40.0	36.0	30.0	22.5	20.0	18.0	14.4	12.0	10.3
D25143-UB-8501 TQ150-01	1.0	0.23	69.0	55.2	46.0	39.4	34.5	30.7	27.6	23.0	17.3	15.3	13.8	11.0	9.2	7.9
	2.0	0.32	96.0	76.8	64.0	54.9	48.0	42.7	38.4	32.0	24.0	21.3	19.2	15.4	12.8	11.0
(TJ60, TP, XR) 8001	3.0	0.39	117	93.6	78.0	66.9	58.5	52.0	46.8	39.0	29.3	26.0	23.4	18.7	15.6	13.4
	4.0	0.45	135	108	90.0	77.1	67.5	60.0	54.0	45.0	33.8	30.0	27.0	21.6	18.0	15.4
(TP, TT, XR) 11001 (100)	5.0	0.50	150	120	100	85.7	75.0	66.7	60.0	50.0	37.5	33.3	30.0	24.0	20.0	17.1
	6.0	0.55	165	132	110	94.3	82.5	73.3	66.0	55.0	41.3	36.7	33.0	26.4	22.0	18.9
D25143-UB-85015 TQ150-015	1.0	0.34	102	81.6	68.0	58.3	51.0	45.3	40.8	34.0	25.5	22.7	20.4	16.3	13.6	11.7
	2.0	0.48	144	115	96.0	82.3	72.0	64.0	57.6	48.0	36.0	32.0	28.8	23.0	19.2	16.5
(DG, TP, XR, XRC) 80015	3.0	0.59	177	142	118	101	88.5	78.7	70.8	59.0	44.3	39.3	35.4	28.3	23.6	20.2
	4.0	0.68	204	163	136	117	102	90.7	81.6	68.0	51.0	45.3	40.8	32.6	27.2	23.3
(AI, DG, TP, TT, XR) 110015 (100)	5.0	0.76	228	182	152	130	114	101	91.2	76.0	57.0	50.7	45.6	36.5	30.4	26.1
	6.0	0.83	249	199	166	142	125	111	99.6	83.0	62.3	55.3	49.8	39.8	33.2	28.5
	7.0	0.90	270	216	180	154	135	120	108	90.0	67.5	60.0	54.0	43.2	36.0	30.9
	8.0	0.96	288	230	192	165	144	128	115	96.0	72.0	64.0	57.6	46.1	38.4	32.9
D25143-UB-8502 TQ150-02, OC-02	1.0	0.46	138	110	92.0	78.9	69.0	61.3	55.2	46.0	34.5	30.7	27.6	22.1	18.4	15.8
	2.0	0.65	195	156	130	111	97.5	86.7	78.0	65.0	48.8	43.3	39.0	31.2	26.0	22.3
(DG, TJ60, TP, XR, XRC) 8002	3.0	0.79	237	190	158	135	119	105	94.8	79.0	59.3	52.7	47.4	37.9	31.6	27.1
	4.0	0.91	273	218	182	156	137	121	109	91.0	68.3	60.7	54.6	43.7	36.4	31.2
(AI, DG, TJ60, TP, TT, XR) 11002 1/4TTJ02 (50)	5.0	1.02	306	245	204	175	153	136	122	102	76.5	68.0	61.2	49.0	40.8	35.0
	6.0	1.12	336	269	224	192	168	149	134	112	84.0	74.7	67.2	53.8	44.8	38.4
(TJ60 100)	7.0	1.21	363	290	242	207	182	161	145	121	90.8	80.7	72.6	58.1	48.4	41.5
	8.0	1.29	387	310	258	221	194	172	155	129	96.8	86.0	77.4	61.9	51.6	44.2
	1.0	0.57	171	137	114	97.7	85.5	76.0	68.4	57.0	42.8	38.0	34.2	27.4	22.8	19.5
	2.0	0.81	243	194	162	139	122	108	97.2	81.0	60.8	54.0	48.6	38.9	32.4	27.8
AIUB85025	3.0	0.99	297	238	198	170	149	132	119	99.0	74.3	66.0	59.4	47.5	39.6	33.9
(AI, AIC, XR, XRC) 110025 (50)	4.0	1.14	342	274	228	195	171	152	137	114	85.5	76.0	68.4	54.7	45.6	39.1
	5.0	1.28	384	307	256	219	192	171	154	128	96.0	85.3	76.8	61.4	51.2	43.9
	6.0	1.40	420	336	280	240	210	187	168	140	105	93.3	84.0	67.2	56.0	48.0
	7.0	1.51	453	362	302	259	227	201	181	151	113	101	90.6	72.5	60.4	51.8
	8.0	1.62	486	389	324	278	243	216	194	162	122	108	97.2	77.8	64.8	55.5
D25143-UB-8503 TQ150-03, OC-03	1.0	0.68	204	163	136	117	102	90.7	81.6	68.0	51.0	45.3	40.8	32.6	27.2	23.3
	2.0	0.96	288	230	192	165	144	128	115	96.0	72.0	64.0	57.6	46.1	38.4	32.9
(DG, TJ60, TP, XR, XRC) 8003	3.0	1.18	354	283	236	202	177	157	142	118	88.5	78.7	70.8	56.6	47.2	40.5
	4.0	1.36	408	326	272	233	204	181	163	136	102	90.7	81.6	65.3	54.4	46.6
(AI, AIC, DG, TJ60, TP, TT, XR, XRC) 11003 AIUB8503 (50)	5.0	1.52	456	365	304	261	228	203	182	152	114	101	91.2	73.0	60.8	52.1
	6.0	1.67	501	401	334	286	251	223	200	167	125	111	100	80.2	66.8	57.3
	7.0	1.80	540	432	360	309	270	240	216	180	135	120	108	86.4	72.0	61.7
(TJ60 100)	8.0	1.93	579	463	386	331	290	257	232	193	145	129	116	92.6	77.2	66.2

Note: *Always double check your application rates.*

TeeJet® Broadcast and Turf Applications

Recommended Spraying Pressure Range:
(Consult your chemical label for specific application)

TT, Turbo TeeJet (1-6 bar)
AI, AI TeeJet (2-8 bar)
AIC, AIC TeeJet (2-8 bar)
XR, XR TeeJet (1-4 bar)
XRC, XRC TeeJet (1-4 bar)
TP, TeeJet Standard (2-4 bar)
DG, DG TeeJet (2-4 bar)
TJ60, TwinJet (2-4 bar)
TF, Turbo FloodJet (0.7-3 bar)
TTJ, TurfJet (1.5-5 bar)
TQ, 150° Double Outlet (1.5-4 bar)
UB, Underleaf/End of Boom (1.5-4 bar)
AIUB, Underleaf/End of Boom (2-8 bar)
OC, Off Center (2-4 bar)

	bar	l/min	l/ha 50cm													
			4 km/h	5 km/h	6 km/h	7 km/h	8 km/h	9 km/h	10 km/h	12 km/h	16 km/h	18 km/h	20 km/h	25 km/h	30 km/h	35 km/h
D25143-UB-8504 TQ150-04, OC-04	1.0	0.91	273	218	182	156	137	121	109	91.0	68.3	60.7	54.6	43.7	36.4	31.2
	2.0	1.29	387	310	258	221	194	172	155	129	96.8	86.0	77.4	61.9	51.6	44.2
(DG, TJ60, TP, XR, XRC) 8004	3.0	1.58	474	379	316	271	237	211	190	158	119	105	94.8	75.8	63.2	54.2
	4.0	1.82	546	437	364	312	273	243	218	182	137	121	109	87.4	72.8	62.4
(AI, AIC, DG, TJ60, TP, TT, XR, XRC) 11004 AIUB8504 1/4TTJ04 TF-2	5.0	2.04	612	490	408	350	306	272	245	204	153	136	122	97.9	81.6	69.9
	6.0	2.23	669	535	446	382	335	297	268	223	167	149	134	107	89.2	76.5
	7.0	2.41	723	578	482	413	362	321	289	241	181	161	145	116	96.4	82.6
(50)	8.0	2.58	774	619	516	442	387	344	310	258	194	172	155	124	103	88.5
TQ150-05	1.0	1.14	342	274	228	195	171	152	137	114	85.5	76.0	68.4	54.7	45.6	39.1
	2.0	1.61	483	386	322	276	242	215	193	161	121	107	96.6	77.3	64.4	55.2
(DG, TP, XR, XRC) 8005	3.0	1.97	591	473	394	338	296	263	236	197	148	131	118	94.6	78.8	67.5
	4.0	2.27	681	545	454	389	341	303	272	227	170	151	136	109	90.8	77.8
(AI, AIC, DG, TP, TT, XR, XRC) 11005 1/4TTJ05 TF-2.5	5.0	2.54	762	610	508	435	381	339	305	254	191	169	152	122	102	87.1
	6.0	2.79	837	670	558	478	419	372	335	279	209	186	167	134	112	95.7
	7.0	3.01	903	722	602	516	452	401	361	301	226	201	181	145	120	103
(50)	8.0	3.22	966	773	644	552	483	429	386	322	242	215	193	155	129	110
TQ150-06 OC-06	1.0	1.37	411	329	274	235	206	183	164	137	103	91.3	82.2	65.8	54.8	47.0
	2.0	1.94	582	466	388	333	291	259	233	194	146	129	116	93.1	77.6	66.5
(TJ60, TP, XR, XRC) 8006	3.0	2.37	711	569	474	406	356	316	284	237	178	158	142	114	94.8	81.3
	4.0	2.74	822	658	548	470	411	365	329	274	206	183	164	132	110	93.9
(AI, TJ60, TP, TT, XR) 11006 1/4TTJ06 TF-3	5.0	3.06	918	734	612	525	459	408	367	306	230	204	184	147	122	105
	6.0	3.35	1005	804	670	574	503	447	402	335	251	223	201	161	134	115
	7.0	3.62	1086	869	724	621	543	483	434	362	272	241	217	174	145	124
(50)	8.0	3.87	1161	929	774	663	581	516	464	387	290	258	232	186	155	133
TQ150-08 OC-08	1.0	1.82	546	437	364	312	273	243	218	182	137	121	109	87.4	72.8	62.4
	2.0	2.58	774	619	516	442	387	344	310	258	194	172	155	124	103	88.5
(TJ60, TP, XR) 8008	3.0	3.16	948	758	632	542	474	421	379	316	237	211	190	152	126	108
	4.0	3.65	1095	876	730	626	548	487	438	365	274	243	219	175	146	125
(AI, TJ60, TP, TT, XR) 11008 1/4TTJ08 TF-4	5.0	4.08	1224	979	816	699	612	544	490	408	306	272	245	196	163	140
	6.0	4.47	1341	1073	894	766	671	596	536	447	335	298	268	215	179	153
	7.0	4.83	1449	1159	966	828	725	644	580	483	362	322	290	232	193	166
(50)	8.0	5.16	1548	1238	1032	885	774	688	619	516	387	344	310	248	206	177
(TP, XR) 8010 (TP, XR) 11010	1.0	2.28	684	547	456	391	342	304	274	228	171	152	137	109	91.2	78.2
	2.0	3.23	969	775	646	554	485	431	388	323	242	215	194	155	129	111
TJ60-8010 TJ60-11010 1/4TTJ10 TF-5	3.0	3.95	1185	948	790	677	593	527	474	395	296	263	237	190	158	135
	4.0	4.56	1368	1094	912	782	684	608	547	456	342	304	274	219	182	156
	5.0	5.10	1530	1224	1020	874	765	680	612	510	383	340	306	245	204	175
	6.0	5.59	1677	1342	1118	958	839	745	671	559	419	373	335	268	224	192
	7.0	6.03	1809	1447	1206	1034	905	804	724	603	452	402	362	289	241	207
(50)	8.0	6.45	1935	1548	1290	1106	968	860	774	645	484	430	387	310	258	221
(TP, XR) 8015 (TP, XR) 11015	1.0	3.42	1026	821	684	586	513	456	410	342	257	228	205	164	137	117
	2.0	4.83	1449	1159	966	828	725	644	580	483	362	322	290	232	193	166
1/4TTJ15 TF-7.5	3.0	5.92	1776	1421	1184	1015	888	789	710	592	444	395	355	284	237	203
	4.0	6.84	2052	1642	1368	1173	1026	912	821	684	513	456	410	328	274	235
(50)	5.0	7.64	2292	1834	1528	1310	1146	1019	917	764	573	509	458	367	306	262
TP8020 TP11020	1.0	4.56	1368	1094	912	782	684	608	547	456	342	304	274	219	182	156
	2.0	6.44	1932	1546	1288	1104	966	859	773	644	483	429	386	309	258	221
TF-10 (50)	3.0	7.89	2367	1894	1578	1353	1184	1052	947	789	592	526	473	379	316	271
	4.0	9.11	2733	2186	1822	1562	1367	1215	1093	911	683	607	547	437	364	312

Note: *Always double check your application rates.*

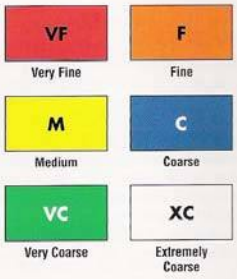
TeeJet® Drop Size

Nozzle selection is often based upon droplet size. The droplet size from a nozzle becomes very important when the efficacy of a particular crop chemical is dependent on coverage, or the prevention of spray leaving the target area is a priority.

The majority of the nozzles used in agriculture can be classified as producing either fine, medium or coarse droplets. Nozzles which produce fine droplets are usually recommended for post-emergence applications which require excellent coverage on leaf surfaces. The most common nozzles used in agriculture are those which produce medium-sized droplets. Nozzles producing medium-sized droplets can be used for contact and systemic herbicides, pre-emergence surface-applied herbicides, insecticides and fungicides.

An important point to remember when choosing a spray nozzle which produces a droplet size in one of the six categories, is that one nozzle can produce different droplet size classifications at different pressures. A nozzle might produce medium droplets at low pressures, while producing fine droplets as pressure is increased.

Droplet size classes are shown in the following tables to assist in choosing an appropriate spray tip.



Droplet size classifications are based on BCPC specifications and in accordance with ASAE Standard S-572 at the date of printing. Classifications are subject to change.

Turbo TeeJet® (TT)

	bar										
	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
TT11001	C	M	M	M	F	F	F	F	F	F	F
TT110015	C	C	M	M	M	M	M	F	F	F	F
TT11002	C	C	C	M	M	M	M	M	M	M	F
TT11003	VC	C	C	C	C	M	M	M	M	M	M
TT11004	XC	VC	C	C	C	C	C	C	M	M	M
TT11005	XC	VC	VC	VC	C	C	C	C	C	M	M
TT11006	XC	VC	VC	VC	C	C	C	C	C	C	M
TT11008	XC	XC	VC	VC	C	C	C	C	C	C	M

AI TeeJet® (AI) and AIC TeeJet® (AIC)

	bar											
	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5
AI110015	VC	VC	VC	VC	C	C	C	C	C	C	C	C
AI11002	VC	VC	VC	VC	VC	C	C	C	C	C	C	C
AI110025	XC	VC	VC	VC	VC	VC	VC	C	C	C	C	C
AI11003	XC	XC	VC	VC	VC	VC	VC	VC	C	C	C	C
AI11004	XC	XC	VC	VC	VC	VC	VC	VC	VC	C	C	C
AI11005	XC	XC	XC	VC	VC	VC	VC	VC	VC	C	C	C
AI11006	XC	XC	XC	VC	VC	VC	VC	VC	VC	VC	C	C
AI11008	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC	C	C

XR TeeJet® (XR) and XRC TeeJet® (XRC)

	bar						
	1	1.5	2	2.5	3	3.5	4
XR8001	M	F	F	F	F	F	F
XR80015	M	M	F	F	F	F	F
XR8002	M	M	M	M	F	F	F
XR8003	M	M	M	M	M	M	M
XR8004	C	M	M	M	M	M	M
XR8005	C	C	C	M	M	M	M
XR8006	C	C	C	C	C	C	C
XR8008	VC	VC	C	C	C	C	C
XR11001	F	F	F	F	F	VF	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	F	F	F	F	F
XR11003	M	M	F	F	F	F	F
XR11004	M	M	M	M	M	F	F
XR11005	C	M	M	M	M	M	F
XR11006	C	C	M	M	M	M	M
XR11008	C	C	C	C	M	M	M

TeeJet® (TP)

	bar				
	2	2.5	3	3.5	4
TP8001	F	F	F	F	F
TP80015	F	F	F	F	F
TP8002	M	M	F	F	F
TP8003	M	M	M	M	M
TP8004	M	M	M	M	M
TP8005	C	M	M	M	M
TP8006	C	C	C	C	C
TP8008	C	C	C	C	C
TP11001	F	F	F	VF	VF
TP110015	F	F	F	F	F
TP11002	F	F	F	F	F
TP11003	F	F	F	F	F
TP11004	M	M	M	F	F
TP11005	M	M	M	M	M
TP11006	M	M	M	M	M
TP11008	C	C	M	M	M

TwinJet® (TJ)

	bar				
	2	2.5	3	3.5	4
TJ60-6501	F	VF	VF	VF	VF
TJ60-650134	F	F	F	VF	VF
TJ60-6502	F	F	F	F	F
TJ60-6503	M	F	F	F	F
TJ60-6504	M	M	M	M	F
TJ60-6506	M	M	M	M	M
TJ60-6508	C	C	M	M	M
TJ60-8001	VF	VF	VF	VF	VF
TJ60-8002	F	F	F	F	F
TJ60-8003	F	F	F	F	F
TJ60-8004	M	M	F	F	F
TJ60-8006	M	M	M	M	M
TJ60-8008	C	M	M	M	M
TJ60-8010	C	C	C	M	M
TJ60-11002	F	VF	VF	VF	VF
TJ60-11003	F	F	F	F	F
TJ60-11004	F	F	F	F	F
TJ60-11006	M	M	M	F	F
TJ60-11008	M	M	M	M	M
TJ60-11010	M	M	M	M	M

Turbo FloodJet® (TF)

	bar				
	2	2.5	3	3.5	4
TF-2	XC	XC	XC	XC	XC
TF-2.5	XC	XC	XC	XC	XC
TF-3	XC	XC	XC	XC	XC
TF-4	XC	XC	XC	XC	XC
TF-5	XC	XC	XC	XC	XC
TF-7.5	XC	XC	XC	XC	XC
TF-10	XC	XC	XC	XC	XC

TurfJet® (TTJ)

	bar				
	2	3	3.5	4	5.5
1/4TTJ02-VS	XC	XC	XC	XC	XC
1/4TTJ04-VS	XC	XC	XC	XC	XC
1/4TTJ05-VS	XC	XC	XC	XC	XC
1/4TTJ06-VS	XC	XC	XC	XC	XC
1/4TTJ08-VS	XC	XC	XC	XC	XC
1/4TTJ10-VS	XC	XC	XC	XC	XC
1/4TTJ15-VS	XC	XC	XC	XC	XC

DGE TeeJet® (DG EVEN)

	bar				
	2	2.5	3	3.5	4
DG95015E	M	M	F	F	F
DG9502E	M	M	M	M	M
DG9503E	C	M	M	M	M
DG9504E	C	C	M	M	M
DG9505E	C	C	C	M	M

DG TeeJet® (DG)

	bar				
	2	2.5	3	3.5	4
DG80015	M	M	M	M	F
DG8002	C	M	M	M	M
DG8003	C	M	M	M	M
DG8004	C	C	M	M	M
DG8005	C	C	C	M	M
DG110015	M	F	F	F	F
DG11002	M	M	M	M	M
DG11003	C	M	M	M	M
DG11004	C	C	M	M	M
DG11005	C	C	C	M	M