

Parts & Service



**Spray Star 1750**  
**Model 15-600**  
**SN: 175G001**

**December 2007**

# CONTENTS

Introduction

## Introduction.....1-3

Introduction.....	1
General Safe Practices.....	2
Specifications .....	3
Optional Spray Equipment.....	3

Service

## Service.....4-9

Maintenance.....	4-6
Service Chart.....	7
End User's Service Chart.....	8
Wheel Creep.....	9
Storage.....	9

Diagrams

## Diagrams .....10-13

Wiring Diagram.....	10-11
Hydraulic Diagram.....	12-13

Parts

## Parts.....14-43

Body & Frame .....	14-15
Nose Cone .....	16-19
Front Axle .....	20-21
Oil Tank and Fuel Tank .....	22-23
Seat Panel.....	24-25
Engine Pumps and Exhaust.....	26-29
Spray Pump.....	30-31
Spray Tank.....	32-33
Turbo Quad Agitator .....	32-33
Park brake and Rear Axle.....	34-35
15-301 Orbitor .....	36-37
76-398 Hydrostatic Pump.....	38-39
76-197 Eaton Gear Pump.....	40-41
16-998 Hypro® Pump .....	42-43

Accessories

## Accessories .....44-98

Plumbing 1752 System (Raven 440) .....	44-45
Plumbing 1754 System (Raven 203) .....	46-47
Controls 1752 System (Raven 440) .....	48-49
Control 1754 System (Raven 203) .....	48-49
16-524 Motorized Control Valve .....	50-51
15-743 Manifold Ball valve .....	52-53
17-503 20' Spray Boom.....	54-57
15-493 Stainless Steel 18' Auto Boom .....	58-61
15-493 Boom Wiring Diagram .....	62-63
Nozzle Assembly .....	62-63
Turbo TurfJet Tips.....	64
XR TEEJET Tips .....	65
16-906 Electric Hose Reel .....	66-67
16-129 Hose Reel .....	68-69
17-507 Hose Reel Installation .....	70-73
Hose Reel Adjustments .....	74
Electric Hose Reel Wiring Diagram .....	74-75
17-505 Foam Marker Installation.....	76-81
14-291 Foamer .....	82-83
15-505 Motor Sub Assembly .....	84-85
15-511 Foam Nozzle Sub Assembly .....	86-87
17-506 Fresh Water Tank .....	88-89
14-515 Water Meter Kit (Gallons).....	90-91
15-618 Water Meter Kit (Liters) .....	90-91
15-619 Chemical Cleanload System .....	92-95
15' Star Shield Boom.....	96-98

Reference

## Reference .....99-100

Decal List.....	99
Quick Reference Replacement Parts .....	100
Limited Warranty .....	Inside Back Cover

Thank you for purchasing a **Smithco** product.

Read this manual and all other manuals pertaining to the Spray Star 1750 carefully as they have safety, operating, assembly and maintenance instructions. Failure to do so could result in personal injury or equipment damage.

Keep manuals in a safe place after operator and maintenance personnel have read them. Right and left sides are from the operator's seat, facing forward.

All **Smithco** machines have a Serial Number and Model Number. Both numbers are needed when ordering parts. The serial number plate on the Spray Star 1750 is located on the left main frame, by front bumper. Refer to engine manual for placement of engine serial number.

For easy access record your Serial and Model numbers here.

<b>SMITHCO</b>			<b>CE</b>
<small>WAYNE, PENNSYLVANIA 19087 USA 610-688-4009 Fax 610-688-6069</small>			
SERIAL NO.	kW/hp	DATE OF MFG.	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
MODEL NO.	lb/kg Empty	lb/kg Full	
<input type="text"/>	<input type="text"/>	<input type="text"/>	



Information needed when ordering replacement parts:

1. Model Number of machine
2. Serial Number of machine
3. Name and Part Number of part
4. Quantity of parts

## SAFE PRACTICES

1. It is your responsibility to read this manual and all publications associated with this machine.
2. Never allow anyone to operate or service the machine or its optional equipment without proper training and instructions. Never allow minors to operate any equipment.
3. Learn the proper use of the machine, the location and purpose of all the controls and gauges before you operate the equipment. Working with unfamiliar equipment can lead to accidents.
4. Wear all the necessary protective clothing and personal safety devices to protect your head, eyes, ears, hands and feet. Operate the machine only in daylight or in good artificial light.
5. Inspect the area where the equipment will be used. Pick up all debris you can find before operating. Beware of overhead obstructions and underground obstacles. Stay alert for hidden hazards.
6. Never operate equipment that is not in perfect working order or without decals, guards, shields, or other protective devices in place.
7. Never disconnect or bypass any switch.
8. Carbon monoxide in the exhaust fumes can be fatal when inhaled, never operate a machine without proper ventilation.
9. Fuel is highly flammable, handle with care.
10. Keep engine clean. Allow the engine to cool before storing and always remove the ignition key.
11. Disengage all drives and set park brake before starting the engine.
12. Never use your hands to search for oil leaks. Hydraulic fluid under pressure can penetrate the skin and cause serious injury.
13. This machine demands your attention. To prevent loss of control or tipping of the vehicle:
  - A. Use extra caution in backing up the vehicle. Ensure area is clear.
  - B. Do not stop or start suddenly on any slope.
  - C. Reduce speed on slopes and in sharp turns. Use caution when changing directions on slopes.
  - D. Stay alert for holes in the terrain and other hidden hazards.
14. Before leaving operator's position:
  - A. Disengage all drives.
  - B. Set park brake.
  - C. Shut engine off and remove the ignition key.
  - D. If engine has to run to perform any maintenance keep hands, feet, clothing and all other parts of body away from moving parts.
15. Keep hands, feet and clothing away from moving parts. Wait for all movement to stop before you clean, adjust or service the machine.
16. Keep the area of operation clear of all bystanders.
17. Never carry passengers.
18. Stop engine before making repairs/adjustments or checking/adding oil to the crankcase.
19. Use parts and materials supplied by **Smithco** only. Do not modify any function or part.
20. Use caution when booms are down as they extend out beyond the center line of the machine.
21. The tank is a confined space, take precaution.

***These machines are intended for professional maintenance on golf courses, sports turf, and any other area maintained turf and related trails, paths and lots. No guaranty as to the suitability for any task is expressed or implied.***





# SPECIFICATIONS SPRAY STAR 1750

## WEIGHTS AND DIMENSIONS

Length	120" (305 cm)
Width	65" (165 cm)
Width With Boom Open	240" (610 cm)
Height w/ ROPS	77" (195 cm)
Height w/ Booms Folded	110" (279 cm)
Wheel Base	68" (173 cm)
Weight Empty	1750 lbs (794 kg)
Weight Full	3500 lbs (1588 kg)

## SOUND LEVEL (DBA)

At ear level	96 dBA
At 3 ft. (0.914 m)	98 dBA
At 30 ft. (9.14 m)	88 dBA

## ENGINE

Make	Briggs & Stratton
Model#	543477
Type / Spec#	0160E1
Horsepower	31 hp (23 kW)
Fuel	Unleaded 87 Octane Gasoline Minimum
Cooling System	Air Cooled
Lubrication System	Full Pressure
Alternator	15 Amp

## WHEELS & TIRE

Front: Two 20 x 10.00 x 10 NHS Multi-Rib; 20 psi (1.4 bar)  
Rear: Two 24 x 13.00 x 12 NHS Multi-Trac; 20 psi (1.4 bar)

## SPEED

Infinitely Variable 0-12 m.p.h. (0-20 kph)

## BATTERY

	Automotive type 24F - 12 volt
BCI Group	Size 24
Cold Cranking Amps	900 minimum
Ground Terminal Polarity	Negative (-)
Maximum Length	10.25" (26 cm)
Maximum Width	6.88" (17 cm)
Maximum Height	10" (25 cm)

## FLUID CAPACITY

Crankcase Oil	See Engine Manual
Fuel	5 gallon (19 liters)
Hydraulic Fluid	5 gallon (19 liters)
Grade of Hydraulic Fluid	SAE 10W-40 API Service SJ or higher Motor Oil

# OPTIONAL EQUIPMENT

15-618	Water Meter Kit (Liters)	14-515	Water Meter Kit (Gallons)
15-619	Chemical Cleanload	17-506	Clear water Wash Tank
15-622	Canopy	17-521	Electric Hose Reel
17-505	Foam Marker	17-507	Manual Hose Reel
15-577	18' Manual Boom	15-493	18" Dry Boom
17-503	20' Spray Boom	10-300	18' Spray Boom w/ Contour Wheels
30-003	20' Spray boom w/ Contour Wheels		



# MAINTENANCE



## CAUTION

Before servicing or making adjustments to machine, stop engine and remove key from ignition.

## NOTE:

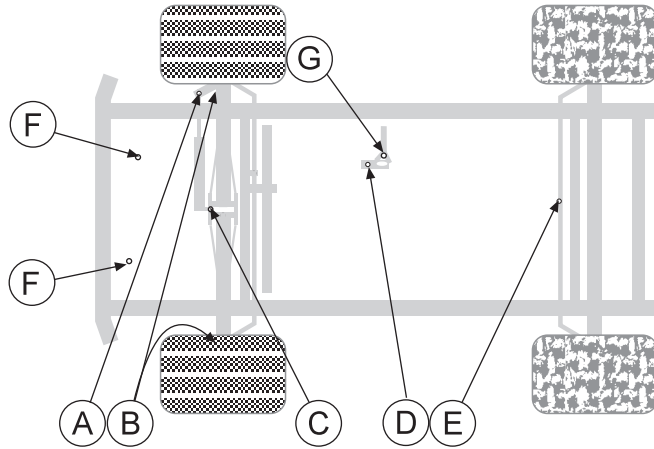
Use all procedures and parts prescribed by the manufacturer's. Read the engine manual before operation.

## LUBRICATION

Use No. 2 General purpose lithium base grease and lubricate every 100 hours. The Spray Star 1750 has 9

grease fittings.

- A. One on the rod end of hydraulic cylinder.
- B. One on each the right and left spindles.
- C. One on the center front pivot.
- D. One on the idler arm.
- E. One on the brake relay.
- F. One on each of the pedal relays.
- G. One on the shift arm.



## ELECTRICAL CONNECTIONS

Use dielectric grease on all electrical connections.

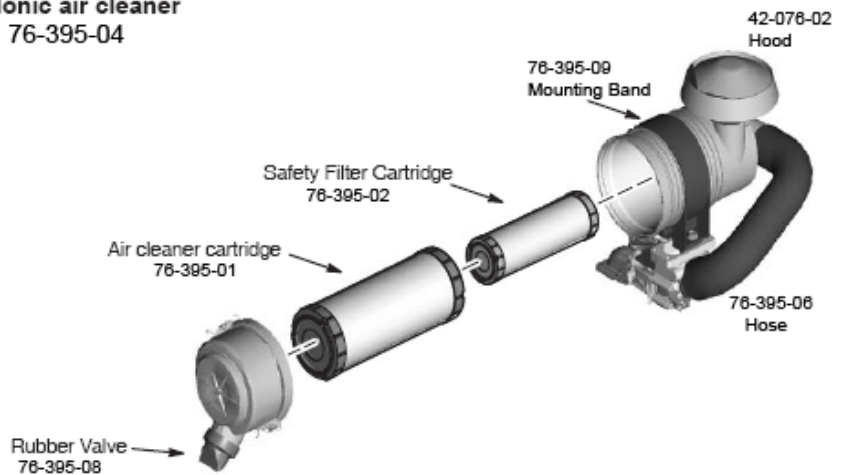
## AIR CLEANER ON ENGINE

1. Unclip the two clips, remove the cover and pull out the element.
2. To service, clean by tapping gently on flat surface. Do not oil. Replace if very dirty or damaged.
3. Clean out the inside of the body and cover.
4. Place the element into the body and put the cover back on..

## NOTE:

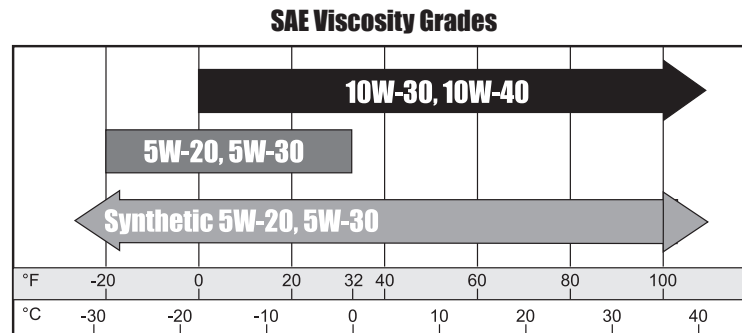
Do not use petroleum solvents, e.g., kerosene, which will cause cartridge to deteriorate. Do not use pressurized air to clean cartridge. Pressurized air can damage cartridge.

### Cyclonic air cleaner 76-395-04



## ENGINE OIL

Change and add oil according to chart below based on air temperature at the time of operation. Do not overfill. Use a high quality detergent oil classified "For Service SJ or higher" oil. Use no special additives with recommended oils. Do not mix oil with gasoline.



*Starting Temperature Range Anticipated Before Next Oil Change*

## HYDRAULIC OIL

1. Use SAE 10W-40 API Service SJ or higher motor oil.
2. For proper warranty, change oil every 500 hours or annually, which ever is first.
3. Oil level should be 2-2½" (5-6.4cm) from top of the tank when fluid is cold. Do not overfill.
4. After changing oil, run the machine for a few minutes. Check oil level and for leaks.
5. Always use extreme caution when filling hydraulic oil tank or checking level to keep system free of contaminants. Check and service more frequently when operating in extremely cold, hot or dusty conditions.
6. If the natural color of the fluid has become black or smells burnt, it is possible that an overheating problem exists.
7. If fluid becomes milky, water contamination may be a problem.
8. If either of the above conditions happen, change oil immediately after fluid is cool and find the cause. Take fluid level readings when the system is cold.
9. In extreme temperatures you can use straight weight oil. We recommend SAE 30W API Service SG when hot (above 90°F (33°C)) and SAE 10W API Service SJ or higher when cold (below 32°F (0°C) ambient temperature. Use either motor oil or hydraulic oil, but do not mix.
10. Oil being added to the system must be the same as what is already in the tank. Mark the tank fill area as to which type you put in.

## TIRE PRESSURE

Caution must be used when inflating a low tire to recommended pressure. Over inflating can cause tires to explode. All tires should be 20 psi (1.4bar). Improper inflation will reduce tire life considerably.

## WHEEL MOUNTING PROCEDURE

1. Set park brake. Turn machine off and remove key.
2. Block wheel on opposite corner.
3. Loosen nuts slightly on wheel to be removed.
4. Jack up machine being careful not to damage underside of machine.
5. Place wheel on hub lining up bolt holes.
6. Torque to 64-74 ft/lb (87-100Nm) using a cross pattern. Retorque after first 10 hours and every 200 hours thereafter.
7. Lower machine to ground and remove blocks and jack.



# MAINTENANCE

## BATTERY

Batteries normally produce explosive gases which can cause personal injury. Do not allow flames, sparks or any ignited object to come near the battery. When charging or working near battery, always shield your eyes and always provide proper ventilation.

Battery cable should be disconnected before using "Fast Charge".

Charge battery at 15 amps for 10 minutes or 7 amps for 30 minutes. Do not exceed the recommended charging rate. If electrolyte starts boiling over, decrease charging.

Always remove grounded (-) battery clamp first and replace it last. Avoid hazards by:

1. Filling batteries in well-ventilated areas.
2. Wear eye protection and rubber gloves.
3. Avoid breathing fumes when electrolyte is added.
4. Avoid spilling or dripping electrolyte.



**WARNING** Battery Electrolyte is an acidic solution and should be handled with care. If electrolyte is splashed on any part of your body, flush all contact areas immediately with liberal amounts of water. Get medical attention immediately.

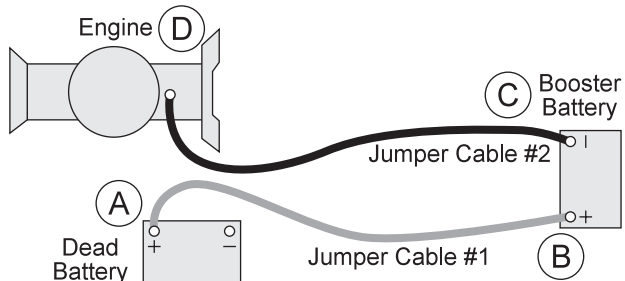


**WARNING** Use of booster battery and jumper cables. Particular care should be used when connecting a booster battery. Use proper polarity in order to prevent sparks.

### TO JUMP START (NEGATIVE GROUNDED BATTERY):

1. Shield eyes.
2. Connect ends of one cable to positive (+) terminals of each battery, first (A) then (B).
3. Connect one end of other cable to negative (-) terminal of "good" battery (C).
4. Connect other end of cable (D) to engine block on unit being started (NOT to negative (-) terminal of battery)

To prevent damage to other electrical components on unit being started, make certain that engine is at idle speed before disconnecting jumper cables.



# STORAGE

If the engine will be out of service for two or more months, use the following storage procedure.

1. Clean the exterior surfaces of the engine.
2. Change the oil and filter while the engine is still warm from operation.
3. The fuel system must be completely emptied, or the gasoline must be treated with a stabilizer to prevent deterioration.

If you choose to use a stabilizer, follow manufacturers recommendations, and add the correct amount for the capacity of fuel system. Fill fuel tank with clean, fresh gasoline. Run engine for 2-3 minutes to get stabilized fuel into carburetor. Close fuel shut-off valve when unit is being stored or transported.

To empty the system, drain fuel tank and carburetor, or run engine until tank and system are empty.

4. Remove the spark plugs. Add one tablespoon of engine oil into each spark plug hole. Install plugs, but do not connect the plug leads. Crank the engine two or three revolutions.
5. Store machine in a clean, dry place.



# SERVICE CHART



**CAUTION** Before servicing or making adjustments to the machine, stop engine, set park break, block wheels and remove key from ignition.



**NOTE:** Follow all procedures and **ONLY** use parts prescribed by the manufacturer. Read the engine manual before maintenance.

The suggested maintenance checklist is not offered as a replacement for the manufacturer's engine manual but as a supplement. You must adhere to the guidelines established by the manufacturer for warranty coverage. In adverse conditions such as dirt, mud or extreme temperatures, maintenance should be more frequent.

Maintenance Service Interval	Maintenance Procedure
After the first 8 operating hours	Torque the wheel lug nuts. (64-74 ft/lb (87-100 Nm)) Change the engine oil filter.
Before each use daily	Check the engine oil level. Clean area around muffler and controls. Check the hydraulic fluid level. Check the tire pressure. Check condition of hydraulic hoses and fittings. Inspect and clean the machine.
After the first 50 hours	Change Hydraulic Oil Filter.
Every 100 hours	Clean or change air filter. <sup>1&amp;2</sup> Clean pre-cleaner. <sup>1</sup> Change engine oil and filter. Replace spark plug . Lubricate machine. Clean or change remote air cleaner. Check the battery fluid level and cable connections.. Service exhaust sytem. Check belt tension .
Every 250 hours	Check engine valve clearance and adjust if necessary. Check idle speed. Clean battery terminals. Change hydraulic oil filter. Torque the wheel lug nuts. (64-74 ft/lb (87-100 Nm))
Every 500 hours or yearly	Change fuel filter. Change hydraulic oil and filter. Clean oil cooler fins. <sup>1</sup> Replace air filter <sup>2</sup> Replace fuel filter Clean air cooling system. <sup>1</sup> Check safety filter in remote air cleaner.

<sup>1</sup> In dusty conditions or when airborne debris is present, clean more often.

<sup>2</sup> Every third air filter change, replace the inner safety filter.



# END USER SERVICE CHART

*Duplicate this page for routine use*

Service

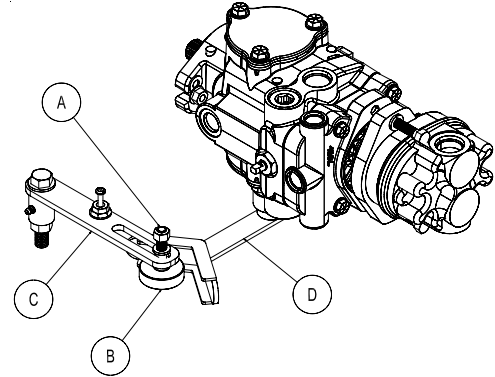
Maintenance Check Item	For the week of:						
	Mon	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
Check the Safety Seat Switch							
Check Steering Operation							
Check the fuel level							
Check the engine oil level.							
Clean the air filter							
Clean the engine cooling fins.							
Check for unusual engine noises							
Check the hydraulic oil level							
Check hydraulic hoses and fittings for damage							
Check for fluid leaks.							
Check the tire pressure							
Check the Instrumentation							
Inspect electrical system for frayed wires							
Check park brake adjustment							
Change oil filter.							
Change oil.							
Lubricate Machine							
Ensure all warning decals are intact.							

Areas of Concern		
Inspection Performed by:		
Item	Date	Information

## WHEEL CREEP

"Creep" is when the engine is running and hydrostatic transmission is in neutral, but due to inadequate alignment, wheels still move. Do the following procedure to stop this motion.

1. Lift up and support machine so rear wheels are off the ground and can turn freely.
2. In the engine compartment, the hydrostatic transmission is on the left side. The shift arm (D) is under the pump and comes out the side. The idler arm (B) has a bearing that runs in the notch of the shift arm. Loosen bolt (A).
3. With engine running, move bearing (B) so it centers on the shift arm (D) and 'wheel creep' stops.
4. Tighten all fasteners and test by using foot pedal linkage to see that 'creep' is removed.
5. Turn engine off and lower machine.



## SPRAY PUMP WITH BELT

Located to the right of the engine. The belt should have approximately  $1/2$ " (13mm) of deflection in the center of the top strand. Loosen and tighten the  $5/16$  -18 x  $1 1/4$  set screw located on the foot of the pump mount.

## PARK BRAKE

Turn knob clockwise on end of park brake to tighten. Turn it counter clockwise to loosen. If finer adjustment is needed turn clevis on brake cable to adjust length of cable.

## MASTER BOOM SWITCH (FOOT SWITCH)

The master boom switch, located on the left floorboard is used to override the master switch on the computer console of the spray systems. By pushing down it will turn on/off the booms. *For the 440 System* the Master Switch on the computer **must be off** for the master boom control switch to work.

## GROUND SPEED CONTROL (FOOT SWITCH)

The ground speed control does not work the same as an automotive type cruise. The ground speed control is located on the center floorboard and is used to lock forward speed.

## TO ENGAGE:

1. Flip rocker switch 'On' (green light).
2. Obtain desired speed with foot pedal.
3. Step on foot switch to lock speed.
4. Push foot switch again to disengage.

## SPEED CALIBRATION NUMBERS

The speed calibration numbers for the Spray Star 3182 is 612.

## SPRAY BOSS CONTROL

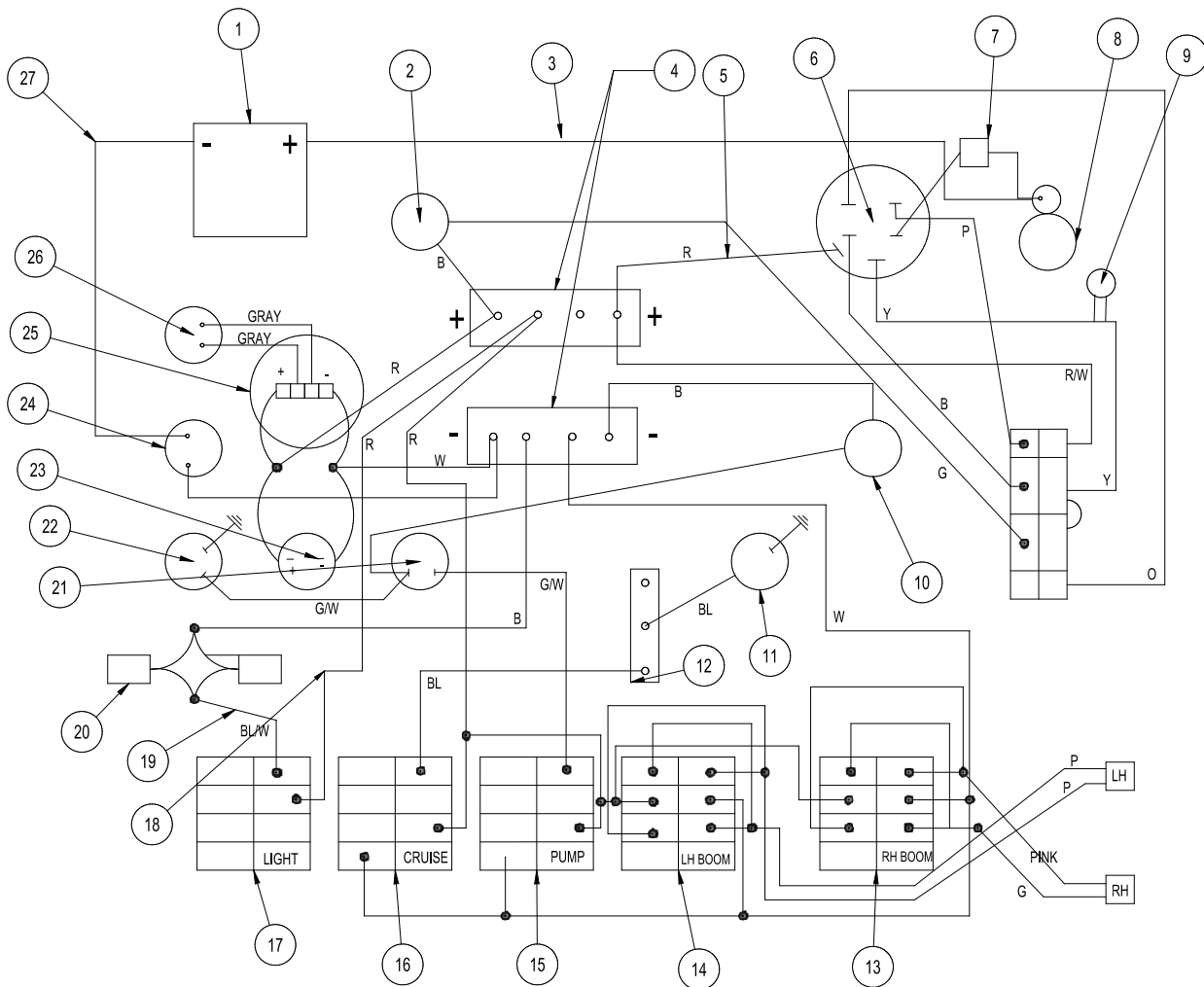
Engages and disengages speed boss. Forward is engage and all the way back is disengage. When the lever is engaged it sets a stop for the accelerator. The accelerator pedal must be used to maintain this speed. To adjust speed use the knob on the end of the lever, counter clockwise increases speed and clockwise decreases speed. Disengage the lever and you will have full accelerator pedal range.

# WIRING DIAGRAM

## Color Code Chart

Bl	Blue
Br	Brown
Y	Yellow
G	Green
O	Orange
R	Red
B	Black
P	Purple
W	White

Diagrams



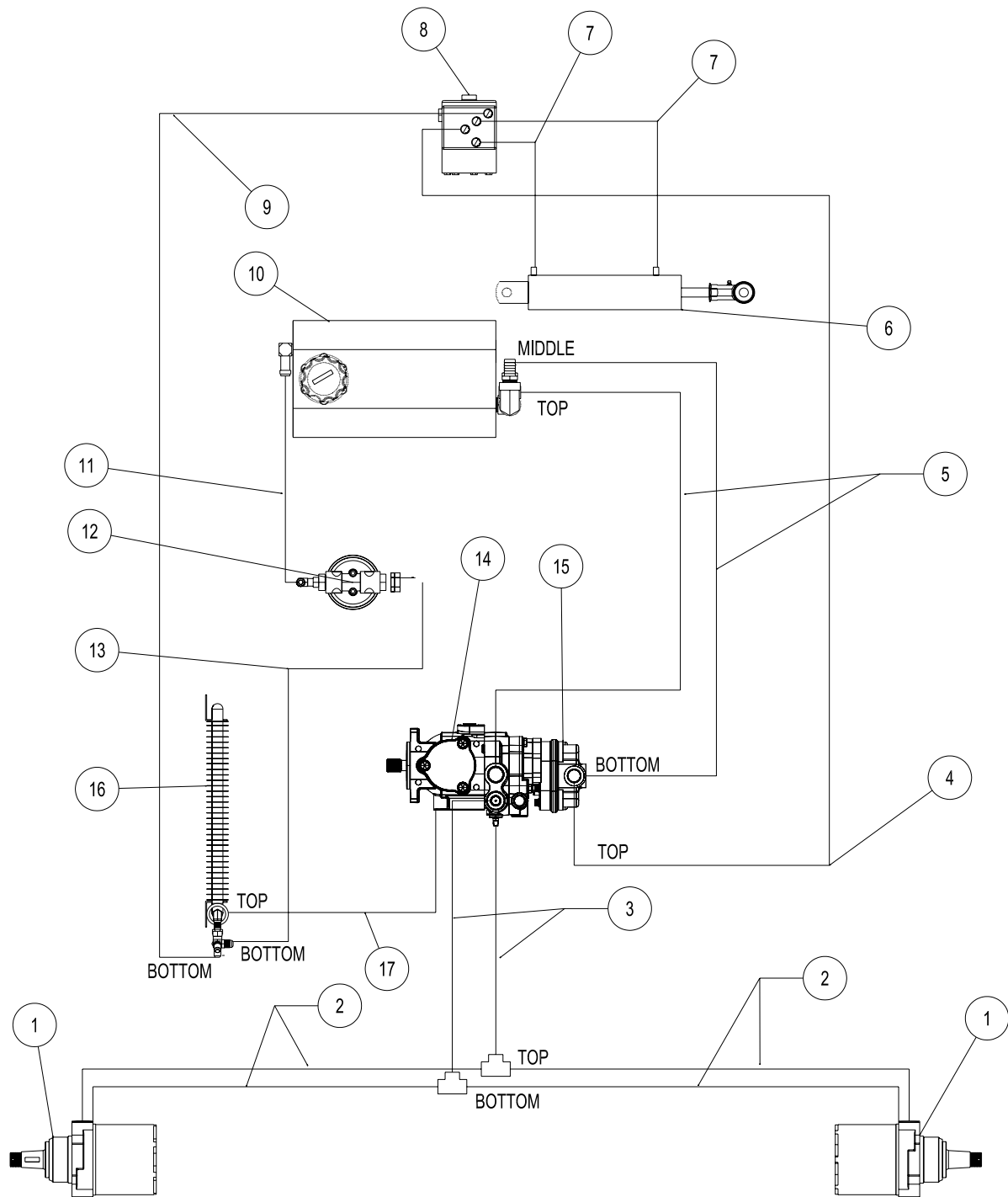
*To reset circuit breaker on ball valve, you must disconnect power to computer.*



# WIRING PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	33-216	Battery	1
2	50-359	Oil Temperature Light	1
3	75-518	Red Battery Cable	1
4	8935	Buss Bar	2
5	15-784	Ignition Jumper Wire	1
6	13-488	Key Switch	1
7	77-261	40 Amp Circuit Breaker	1
	8977	Red Boot	1
8		Solenoid	1
9	14-292	Seat Switch	1
10	77-207	Buzzer	1
11	33-084	Magnetic Coil	1
12	33-509	Master Boom Switch	1
13	Right Boom		
	15-725	Mount Panel End	1
	15-727	Switch Actuator - No light	1
	15-728	Switch Body, On-Off-On	1
14	Left Boom		
	15-729	Mount Panel Middle	1
	15-728	Switch Body, On-Off-On	1
	15-727	Switch Actuator - No light	1
15	Pump		
	15-729	Mount Panel Middle	1
	15-726	Switch Body - Light	1
	15-731	Actuator Amber	1
16	Cruise		
	15-729	Mount Panel Middle	1
	15-726	Switch Body - Light	1
	15-732	Actuator Green	1
17	Lights		
	15-725	Mount Panel End	1
	15-782	Switch Body, On-Off-On	1
	15-727	Switch Actuator - No light	1
18	8849-28	Black Wire	1
19	8957-32	Blue White Wire	1
20	34-201	Lights	2
21	33-480	Pressure Switch	1
22	16-998	Spray Pump	1
23	12-017	Hour Meter	1
24		Engine Block	1
25	10-202	Speedometer	1
26	16-883	Speed Sensor	1
27	76-327	Negative Battery Cable	1
	15-677	Wire Harness	1

# HYDRAULIC DIAGRAM



Diagrams

## HYDRAULIC DIAGRAM PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	76-238	Wheel Motor	2
2	15-681	Hydraulic Hose 23"	4
3	15-682	Hydraulic Hose 46 <sup>3</sup> / <sub>4</sub> "	2
4	15-685	Hydraulic Hose 101"	1
5	8832-33	<sup>3</sup> / <sub>4</sub> " Suction Hose	2
	18-040	Hose Clamp	4
6	75-714	Hydraulic Cylinder	1
7	15-687	Hydraulic Hose 75 <sup>1</sup> / <sub>2</sub> "	2
8	15-301	Orbitrol	1
9	15-686	Hydraulic hose 107 <sup>1</sup> / <sub>2</sub> "	1
10	60-473	Hydraulic Oil tank	1
11	8917-26	<sup>3</sup> / <sub>8</sub> " Suction Hose	1
	18-040	Hose Clamp	2
12	26-016	Oil Filter	1
	23-031	Replacement Filter	1
13	15-683	Hydraulic Hose 43 <sup>3</sup> / <sub>4</sub> "	1
14	76-398	Hydrostatic Pump	1
15	76-197	Gear Pump	1
16	15-624	Cooler	1
17	15-684	Hydraulic Hose 58"	1

## PUMP DISPLACEMENT

### 76-398 Hydrostatic Pump

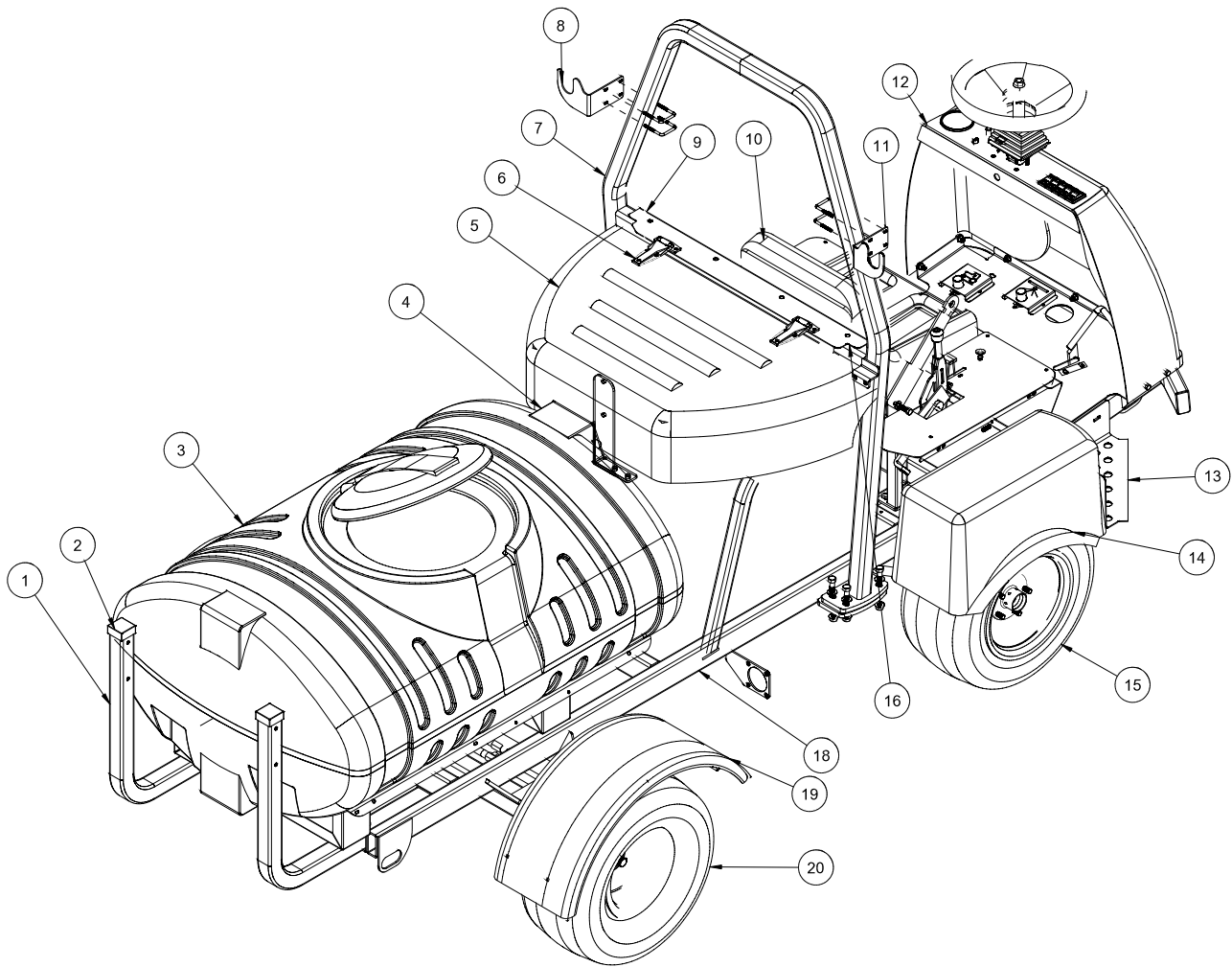
Displacement	Variable to 1.44 in <sup>3</sup> /R (23.6 cm <sup>3</sup> /R) 22.44 gpm (84.94 lpm) at 3600 rpm
Max Operating Speed	3600 rpm
Rated Pressure	3000 psi (206.8 bar)
Max Pressure	5000 psi (344.7 bar)
Max Inlet Vacuum	6 in Hg (.203 bar)
Max Inlet Temperature	225°F (107°C)
Max Allowable Case Pressure	25 psi (1.72 bar)

### 76-197 Gear Pump

**Displacement** .40 in<sup>3</sup>/R (6.6 cm<sup>3</sup>/R) 6.23 gpm (25.39 lpm)

**Over tightened fittings will result in crushing the cone which will create a leak.**

# BODY & FRAME DRAWING

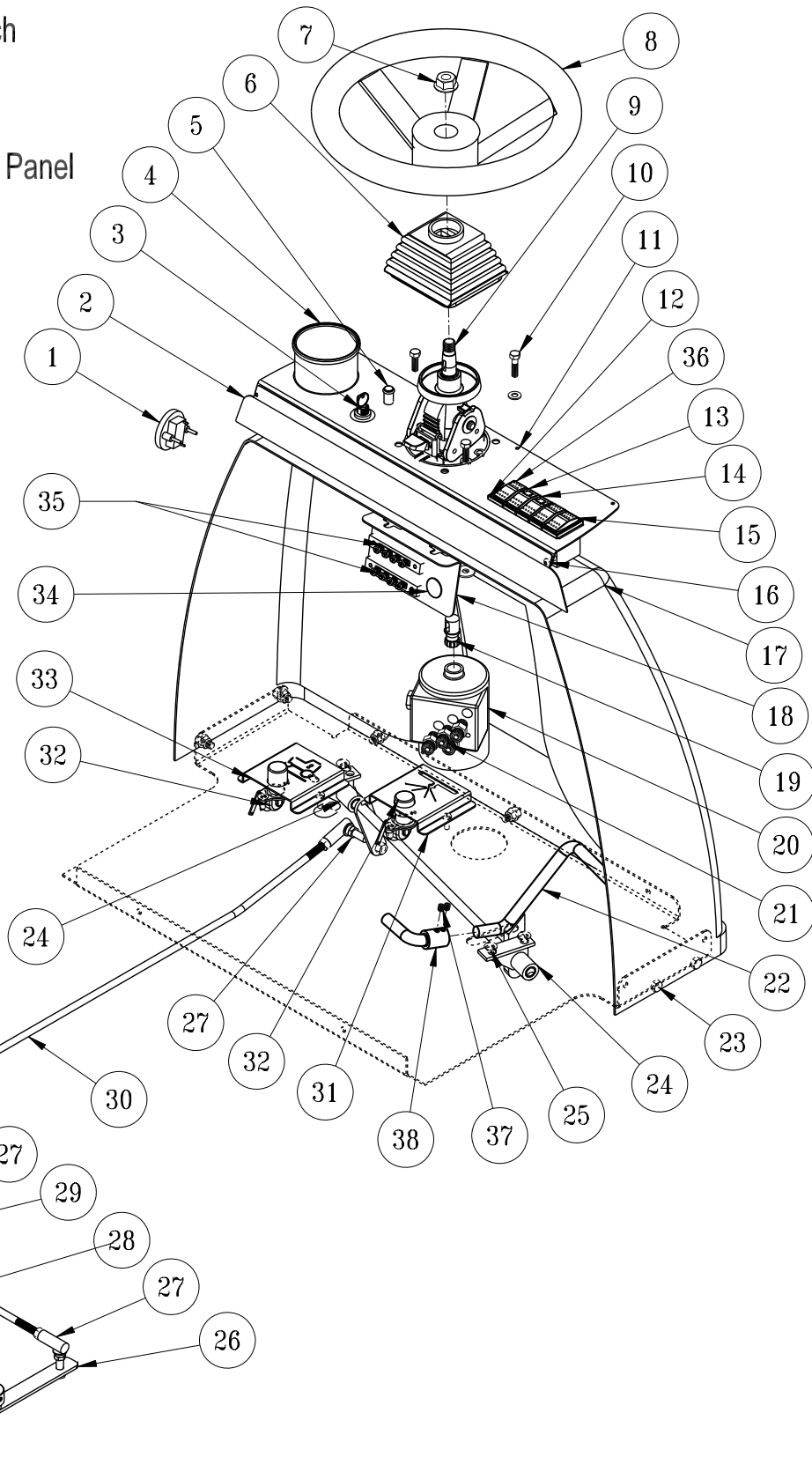
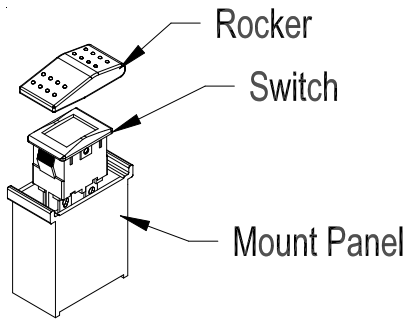


Parts

## BODY & FRAME PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	15-753	Boom Support Tube	2
2	16-557	Square Cap	2
3	14-451	Spray Tank	1
	16-953	Lid	1
4	15-787	Hood Support	1
	50-081	Rubber Bumper	1
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	1
5	15-765	Read Hood (fiberglass)	1
6	27-055	Hinge	2
	HSM-10-32-063	Machine Screw #10 - 32 x $\frac{5}{8}$	6
	HSM-10-32-100	Machine Screw #10 - 32 x 1	6
	HNFL-10-32	Flange Lock Nut #10 - 32	12
7	15-762	Roll Bar	1
8	15-710	LH Boom Holder	1
9	15-756	Back Panel	1
10	14-519	Seat	1
11	15-709	RH Boom Holder	1
12	15-822	Nose Cone (fiberglass)	1
	15-672	Decal, Dash Panel	1
13	15-751	RH Step	1
	15-752	LH Step	1
14	15-823	RH Front Fender	1
	15-767	LH Front Fender	1
15	16-857	Tire and Wheel	2
	16-857-01	Tire 20 x 10.00 - 10NHS 4 Ply	2
	16-857-02	Wheel	2
16	HB-12-13-200	Bolt $\frac{1}{2}$ - 13 x 2	8
	HW-12	Washer $\frac{1}{2}$	8
	HNFL-12-13	Flange Lock Nut $\frac{1}{2}$ - 13	8
18	15-701	Main Frame	1
19	10-168	Rear Fender	2
	10-154	Rear Fender Bracket	4
20	16-225	Tire and Wheel	2
	16-225-01	Tire 24 x 13.00 - 12NHS 4 Ply	2
	16-225-02	Wheel	2

# NOSE CONE DRAWING

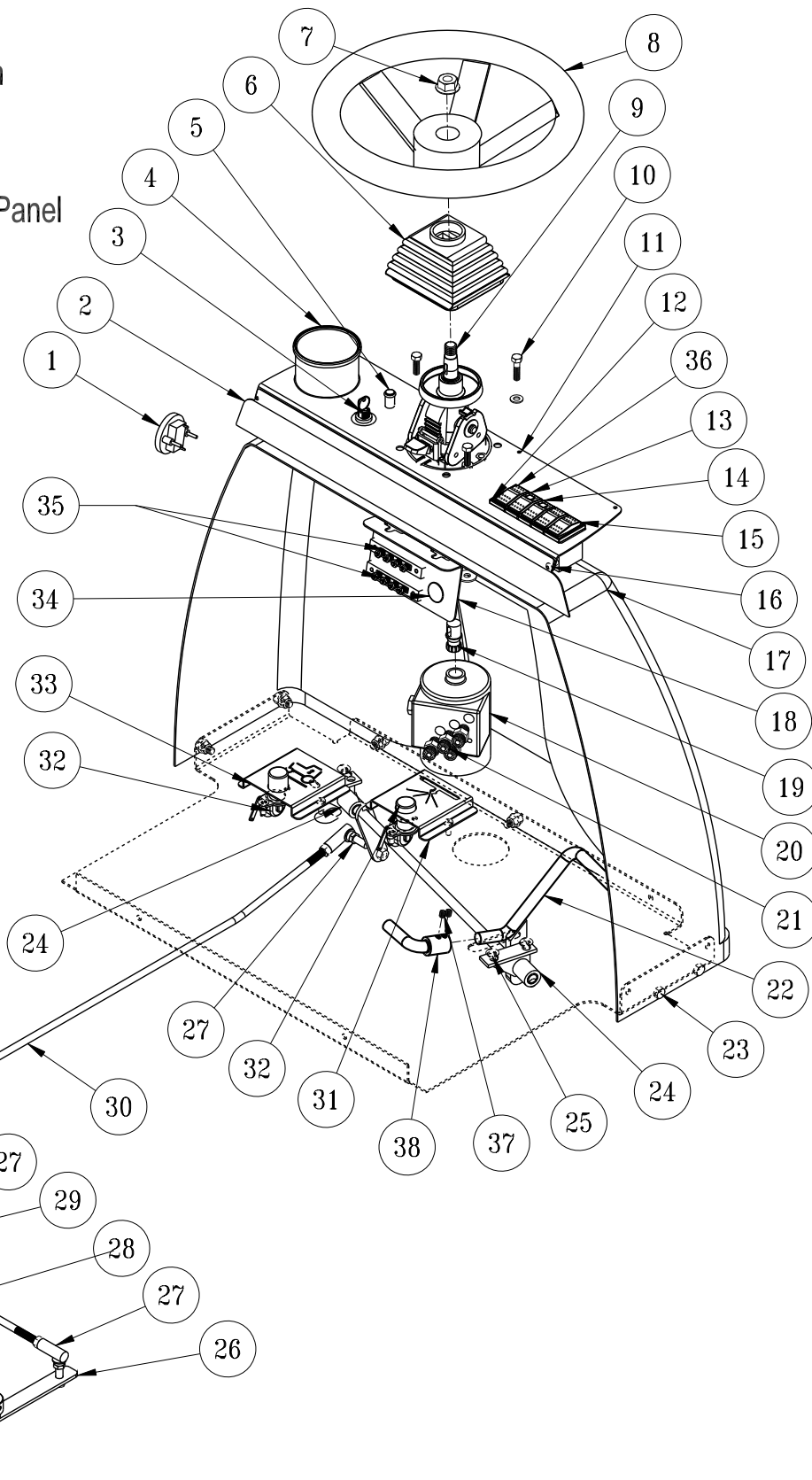
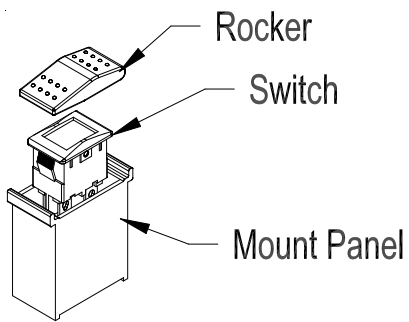


## NOSE CONE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	12-017	Hour Meter	1
2	15-721	Wire Cover	1
3	13-488	Ignition Switch	1
	15-784	Ignition Jumper Wire	1
4	10-202	Speedometer	1
5	50-359	Oil Indicator Light	1
6	76-364	Square Boot (comes with 76-362)	1
7	HNJ-58-18	Jam Nut $\frac{5}{8}$ - 18 (comes with 76-362)	1
8	13-718	Steering Wheel	1
	13-726	Steering Wheel Cap	1
9	76-362	Tilt Steering Column	1
	HWK-316-075	Woodruff Key $\frac{3}{16}$ x $\frac{3}{4}$ (comes with 76-362)	1
10	HB-516-18-125	Bolt $\frac{5}{16}$ - 18 x $1\frac{1}{4}$	2
	HB-516-18-150	Bolt $\frac{5}{16}$ - 18 x $1\frac{1}{2}$	2
	HW-14	Washer $\frac{1}{4}$	4
11	15-754	Dash Panel	1
	15-672	Decal, Dashboard 1750	1
12	Right Boom		
	15-725	Panel Mount End	1
	15-727	Switch Actuator	1
	15-728	Switch Body, On-Off-On	1
13	Cruise		
	15-729	Mount Panel, Middle	1
	15-726	Switch Body, Light	1
	15-732	Actuator, Green	1
14	Pump		
	15-729	Mount Panel, Middle	1
	15-726	Switch Body, Light	1
	15-731	Actuator, Amber	1
15	Left Boom		
	15-729	Mount Panel, Middle	1
	15-727	Switch Actuator	1
	15-728	Switch Body, On-Off-On	1
16	HSM-10-32-100	Machine Screw #10 - 32 x 1	6
	HWLM-6	Metric Lockwasher	6
	HNFL-516-18	Flange Lock Nut $\frac{5}{16}$ - 18	6
17	15-763	Nose Cone	1
18	15-759	Bussbar Mount	1
19	48-187	Stub Shaft	1
20	15-301	Orbitrol	1
21	18-169	Adapter	4
22	15-694	Foot Pedal Assembly	1
	76-299	Pedal Pad	1
23	HSTP-516-18-100	Machine Screw $\frac{5}{16}$ - 18 x 1	7
	HNFL-516-18	Flange Lock Nut $\frac{5}{16}$ - 18	7
24	76-296	Pedal Mount	2
25	HSTP-516-18-075	Machine Screw $\frac{5}{16}$ - 18 x $\frac{3}{4}$	4
	HNFL-516-18	Flange Lock Nut $\frac{5}{16}$ - 18	4
26	15-693	Shift Arm	1

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# NOSE CONE DRAWING



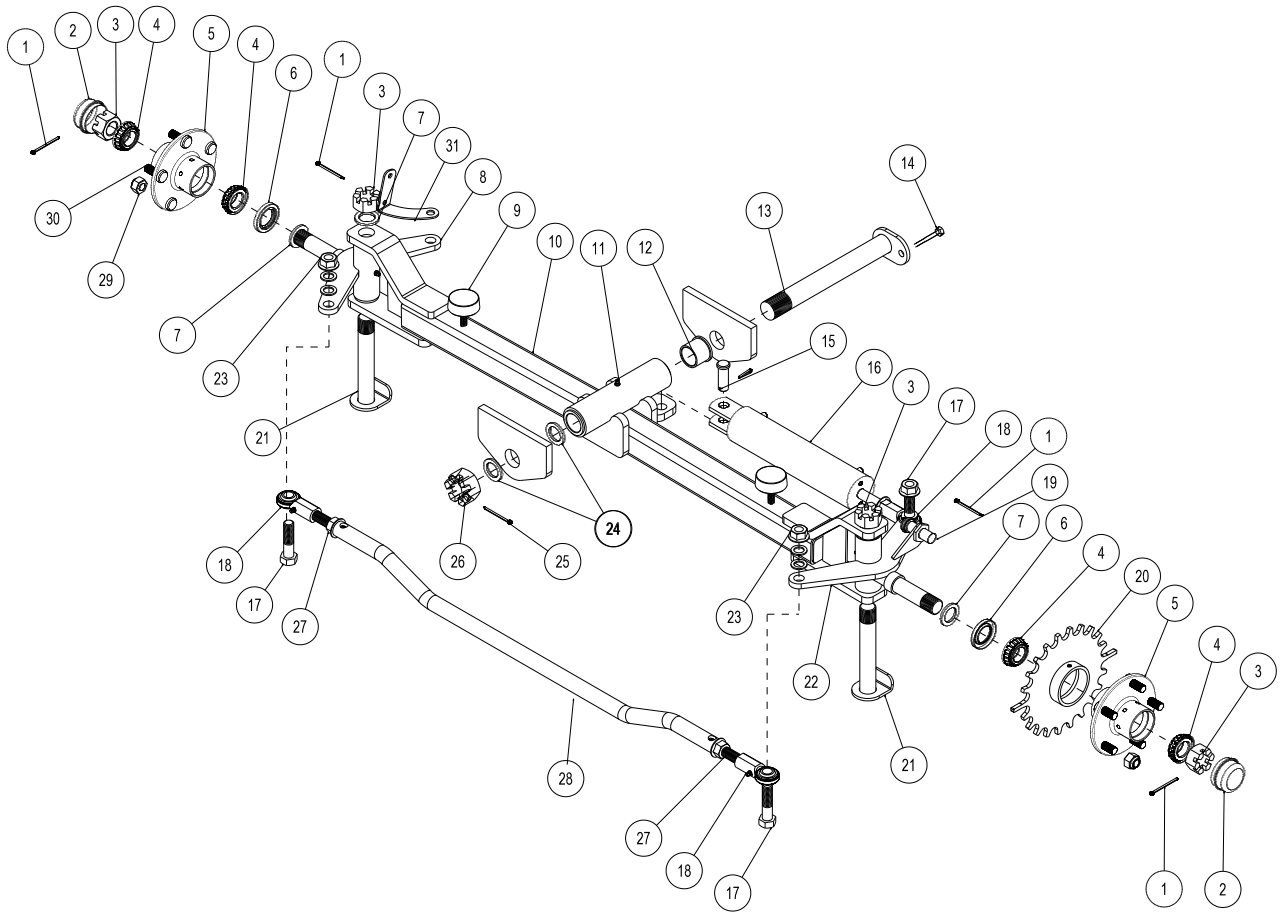
PARTS



## NOSE CONE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
27	21-173	Ball Joint $\frac{3}{8}$ - 24	4
	HN-38-24	Nut $\frac{3}{8}$ - 24	8
28	15-760	Short Foot Pedal Rod	1
29	15-692	Pedal Relay	1
30	15-761	Long Foot Pedal Rod	1
31	15-758	Spray Switch Plate (1752 only)	1
	HBM-6-1-16	Metric Hex Bolt #6 -1 x 16	2
32	33-509	Master Boom Switch (1752 only)	2
	HSM-10-32-063	Machine Screw #10-32 x $\frac{5}{8}$	4
	HNFL-10-32	Flange Nut #10 - 32	4
33	15-757	Cruise Switch Plate	1
	HBM-6-1-16	Metric Hex Bolt #6 -1 x 16	2
34	77-207	Buzzer	1
35	8935	Buss Bar	2
36	Lights		
	15-725	Panel Mount End	1
	15-727	Switch Actuator	1
	15-782	Switch Body, On-Off-On	1

# FRONT AXLE DRAWING

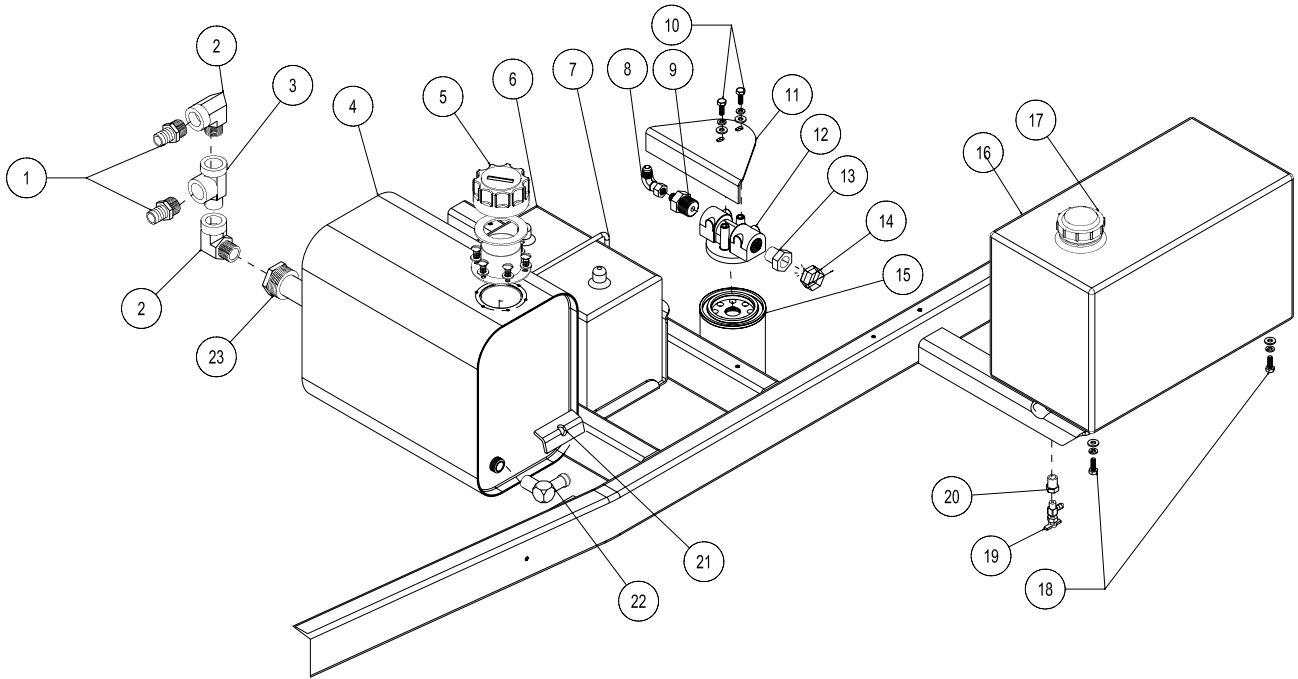


PARTS

# FRONT AXLE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	HP-18-150	Cotter Pin $\frac{1}{8}$ x $1\frac{1}{2}$	4
2	80-167*	Dust Cap	2
3	HNAR-100-14	Slotted Hex Jam Nut	4
4	11-043*	Bearing	4
5	80-019	Hub (includes all * items)	2
6	11-041*	Oil Seal	2
7	HMB-100-10	Machine Bushing 1 x 10GA	6
8	15-696	Spindle - LH	1
9	50-081	Rubber Insulators	2
10	15-699	Front Axle	1
11	HG-14-28-180	Grease Fitting $\frac{1}{4}$ - 28 x 180°	1
12	18-153	Bushing (part of 15-699)	2
13	14-344	Axle Pin	1
14	HB-516-18-125	Bolt $\frac{5}{16}$ - 18 x $1\frac{1}{4}$	1
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	1
15	HCP-58-175	Clevis Pin $\frac{5}{8}$ x $1\frac{3}{4}$	1
	HP-18-100	Cotter Pin $\frac{1}{8}$ x 1	1
16	75-714	Hydraulic Cylinder	1
	18-168	Elbow	2
	14-254	Seal Kit	
17	HB-58-11-250	Bolt $\frac{5}{8}$ - 11 x $2\frac{1}{2}$	3
18	18-154	Rod End	3
19	16-883	Magnetic Sensor	1
	HNJ-34-16	Jam Nut $\frac{3}{4}$ - 16	1
20	10-265	Hub with Sprocket	1
	HSSHS-516-18-038	Socket Head Set Screw $\frac{5}{16}$ - 18 x $\frac{3}{8}$	2
21	16-076	King Pin	2
22	15-695	Spindle - RH	1
23	HNTL-58-11	Lock Nut $\frac{5}{8}$ - 18	3
	HMB-58-14	Machine Bushing $\frac{5}{8}$ x 14GA	6
24	HMB-114-10	Machine Bushing $1\frac{1}{4}$ x 10GA	2
25	HP-18-200	Cotter Pin $\frac{1}{8}$ x 2	1
26	HNAT-114-12	Axle Nut $1\frac{1}{4}$ - 12	1
27	HNJ-58-18	Jam Nut $\frac{5}{8}$ - 18	3
28	15-690	Tie Rod	1
29	HNL-12-220*	Lug Nut $\frac{1}{2}$ - 20	10
30	27-022-02*	Stud $\frac{1}{2}$ - 20	10
31	15-715	Sensor Bracket (1752 only)	1

# OIL AND FUEL TANK DRAWING

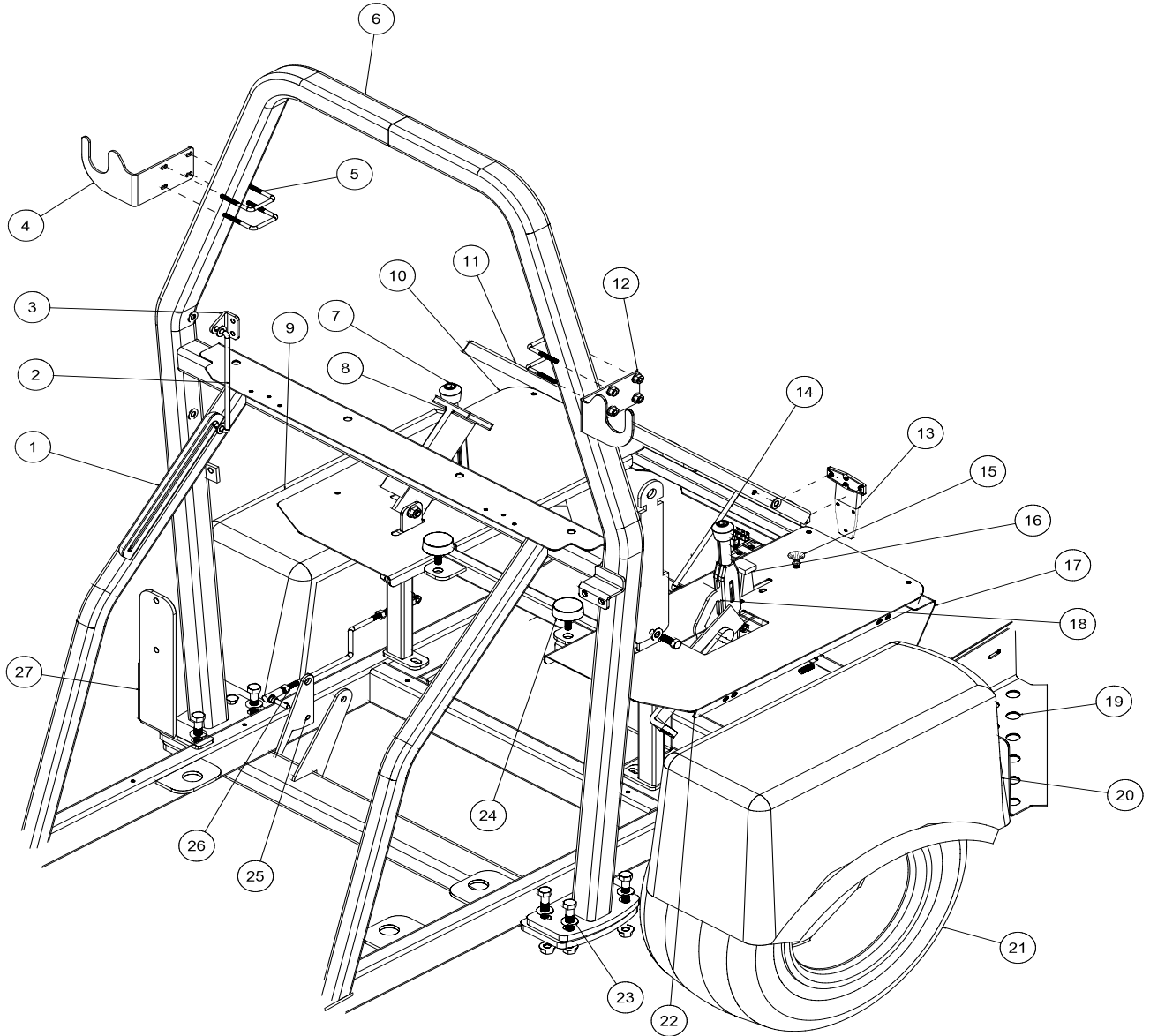


PARTS

## OIL AND FUEL TANK PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	18-249	Barb Fitting	2
2	18-140	Street Elbow	2
3	18-093	Straight Tee	1
4	60-473	Oil Tank	1
5	13-747	Filler Breather (complete)	1
	15-586-03	Gas Tank Neck	1
	HSTC-10-32-050	Thread Cutting Screwe 10-32 x 1/2	6
6	33-216	Battery	1
7	15-785	Battery Hold Down	1
	HNFL-14-20	Flange Lock Nut 1/4 - 20	2
8	18-202	Elbow	1
9	23-183	Male Connector	1
10	HB-14-20-075	Bolt 1/4 - 20 x 3/4	2
	HW-14	Washer 1/4	2
	HWL-14	Lock Washer	2
11		Part of Main Frame	
12	26-016	Oil Filter	1
13	18-008	Pipe Thread Reducer	1
14	23-143	Connector	1
15	23-031	Replacement Filter	1
16	15-491	Fuel Tank w/ Inserts	1
17	15-492	Cap with Gauge	1
18	HB-14-20-075	Bolt 1/4 -20 x 3/4	4
	HW-14	Washer 1/4	4
	HWL-14	Lock washer	4
19	15-039	Fuel Valve	1
	18-186	Hose Clamp	2
	8800-38	Fuel Hose 1/4 x 38"	1
20	18-042	Reducer Bushing	1
21	75-792	Tank Hold Down	2
	HB-516-18-150	Bolt 5/16 - 18 x 1 1/2	2
	HW-516	Washer 5/16	4
	HNFL-516-18	Flange Nut 5/16 - 18	2
22	23-142	Connector	1
23	60-213	Strainer	1

# SEAT PANEL DRAWING



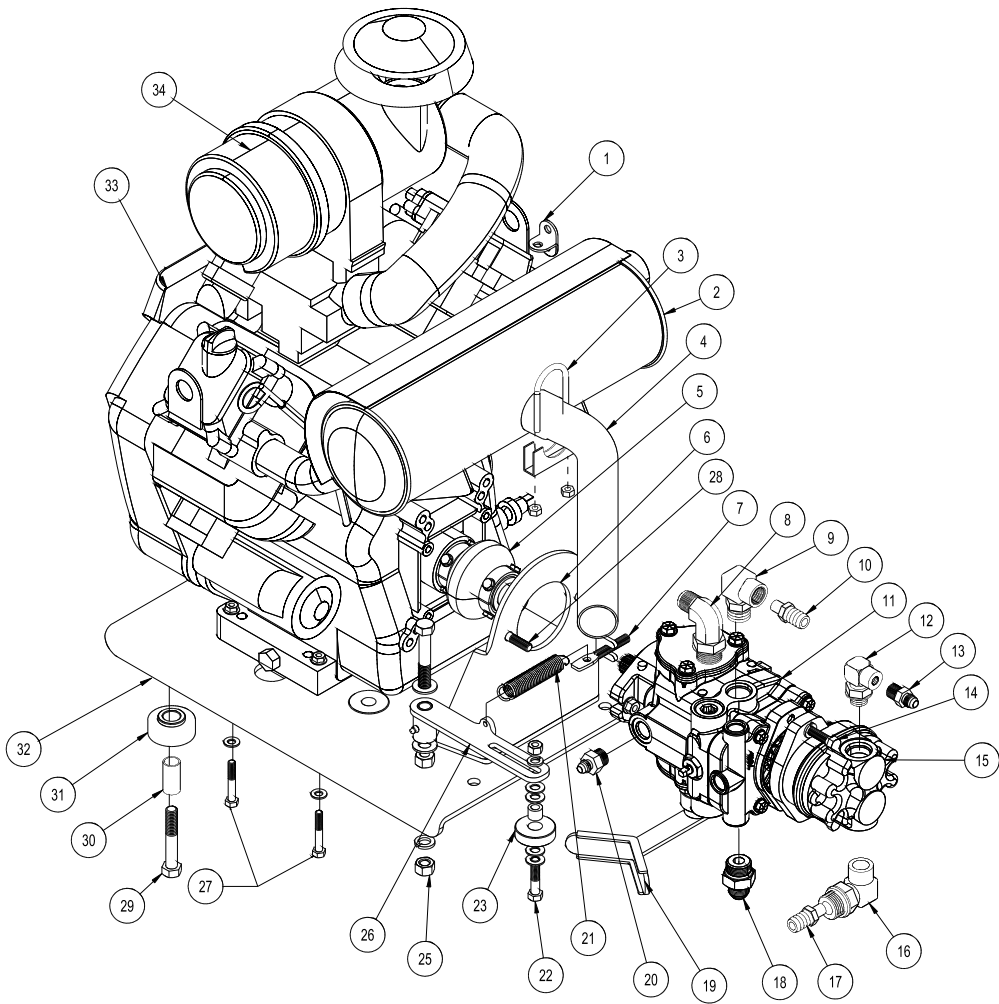
PARTS

## SEAT PANEL PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	15-723	Hood Latch	1
2	15-786	Hood Rod	1
	HW-38	Washer $\frac{3}{8}$	4
	HP-18-075	Cotter Pin $\frac{1}{8} \times \frac{3}{4}$	2
3	10-211	Hood Rod Mount	1
4	15-710	Boom Holder - LH	1
5	10-194	U-Bolt	4
	HW-14	Washer $\frac{1}{4}$	8
	HN-14-20	Nut $\frac{1}{4}$ - 20	8
6	15-762	Roll Bar	1
7	60-106	Speed Boss Lever	1
8	76-198-03	Seat Belt	1
	HB-716-14-100	Bolt $\frac{7}{16}$ -14 x 1	2
	HW-716	Washer $\frac{7}{16}$	2
	HNTL-716-14	Lock Nut $\frac{7}{16}$ -14	2
9	15-767	Front Fender - LH	1
	15-781	Plastic Cup Holder	1
10	15-713	Side Panel - LH	1
11	15-714	Seat Panel	1
12	15-709	Boom Holder - RH	1
13	27-055	Hinge	2
	HSM-10-32-063	Machine Screw #10-32 x $\frac{5}{8}$	12
	HN-10-32	Nut #10 - 32	12
14	15-786	Hood Rod	1
	HW-38	Washer $\frac{3}{8}$	4
	HP-18-075	Cotter Pin $\frac{1}{8} \times \frac{3}{4}$	2
15	80-020	Choke Cable	1
16	34-160	Throttle Cable	1
	34-160-01	Inner Cable	1
17	15-711	Front Panel	1
	HBFL-516-18-075	Flange Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	2
	HNFL-516-18	Flange Nut $\frac{5}{16}$ -18	2
18	60-106	Park Brake	1
19	15-751	Step - RH	1
	15-752	Step - LH	1
20	15-766	Front Fender - RH	1
21	16-857	Tire and Wheel	2
	16-857-01	Tire 20 x 10.00 - 10NHS 4 Ply	2
	16-857-02	Wheel	2
22	15-712	Side Panel - RH	1
23	HB-12-13-200	Bolt $\frac{1}{2}$ - 13 x 2	8
	HW-12	Washer $\frac{1}{2}$	8
	HNFL-12-13	Flange Lock Nut $\frac{1}{2}$ - 13	8
24	50-081	Rubber Insulator	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
25	15-706	Speed Boss Arm	1
26	15-707	Spray Boss Linkage	1
	11-100	Linkage Yolk	1
	21-462	Ball Joint	1
27	15-708	Valve Mount	1

# ENGINE, PUMPS AND EXHAUST DRAWING

PARTS



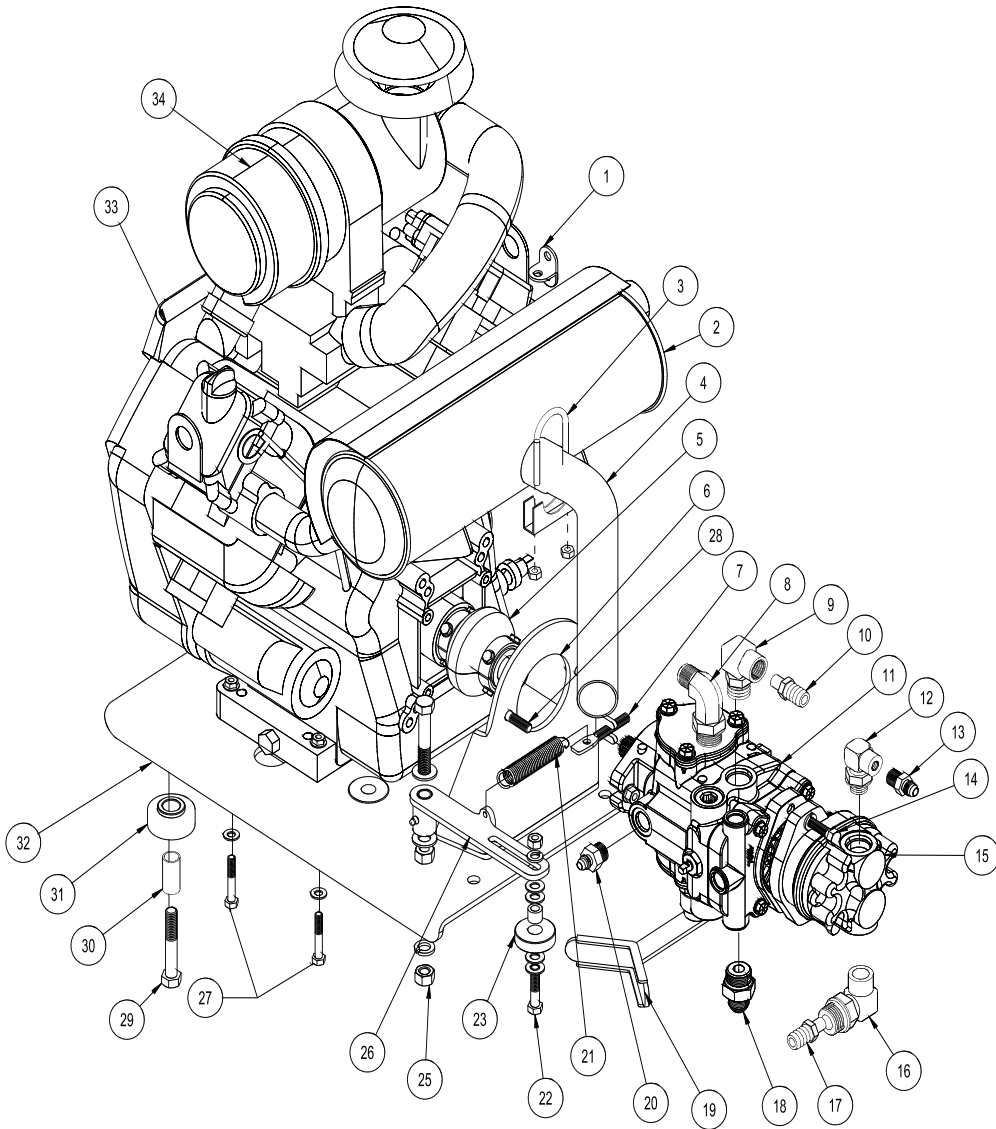


## ENGINE, PUMPS AND EXHAUST PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	76-270	Cable Mount	1
	HB-516-24-075	Bolt $\frac{5}{16}$ - 24 x $\frac{3}{4}$	1
	HWL-516	Lock Washer $\frac{5}{16}$	1
2	76-447	Muffler	1
3	50-394	Muffler Clamp	1
4	15-651	Tailpipe	1
5	76-400	Omega Pump Coupling	1
6	15-774	Pump Mount	1
	HB-38-16-125	Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	2
	HW-38	Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
7	42-537	Spade Bolt $\frac{3}{8}$ "	1
8	18-204	Elbow	1
9	23-130	Elbow	1
10	18-133	Hose Barb	1
11	76-398	Gear Pump	1
	23-145	O-ring	1
12	23-129	Elbow	1
13	23-188	Male Connector	1
14	HB-38-16-125	Bolt $\frac{3}{8}$ - 16 X $1\frac{1}{4}$	2
	HNFL-38-16	Flange Lock $\frac{3}{8}$ - 16	2
15	76-197	Gear Pump	1
16	23-133	Adjustable Elbow 90°	1
17	18-133	Hose Barb	1
18	15-702	Adapter	1
19	15-693	Shift Arm	1
	HSSHS-14-20-031	Set Screw $\frac{1}{4}$ - 20 x $\frac{5}{16}$	1
20	18-241	Straight Thread Connector	1
21	29-118	Spring	1
22	HB-38-16-175	Bolt $\frac{3}{8}$ - 16 x $1\frac{3}{4}$	1
	HW-38	Washer $\frac{3}{8}$	5
	HN-38-16	Nut $\frac{3}{8}$ - 16	1
	HWL-38	Lock Washer $\frac{3}{8}$	1
23	14-266	Ball Bearing	1
	18-270	Oilite Bushing	1
24	HSM-10-32-100	Machine Screw #10 - 32 x 1	
	HN-10-32	Nut #10 - 32	1
	HNFL-10-32	Flange Lock Nut #10 - 32	2
25	HB-12-13-300	Bolt $\frac{1}{2}$ - 13 x 3	1
	HN-12-13	Nut $\frac{1}{2}$ - 13	2
	HMB-12-14	Machine Bushing $\frac{1}{2}$ x 14GA	2
	HWL-12	Lock Washer $\frac{1}{2}$	1
	HG-14-28-180	Grease Fitting $\frac{1}{4}$ - 28 x 180°	1

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# ENGINE, PUMPS AND EXHAUST DRAWING

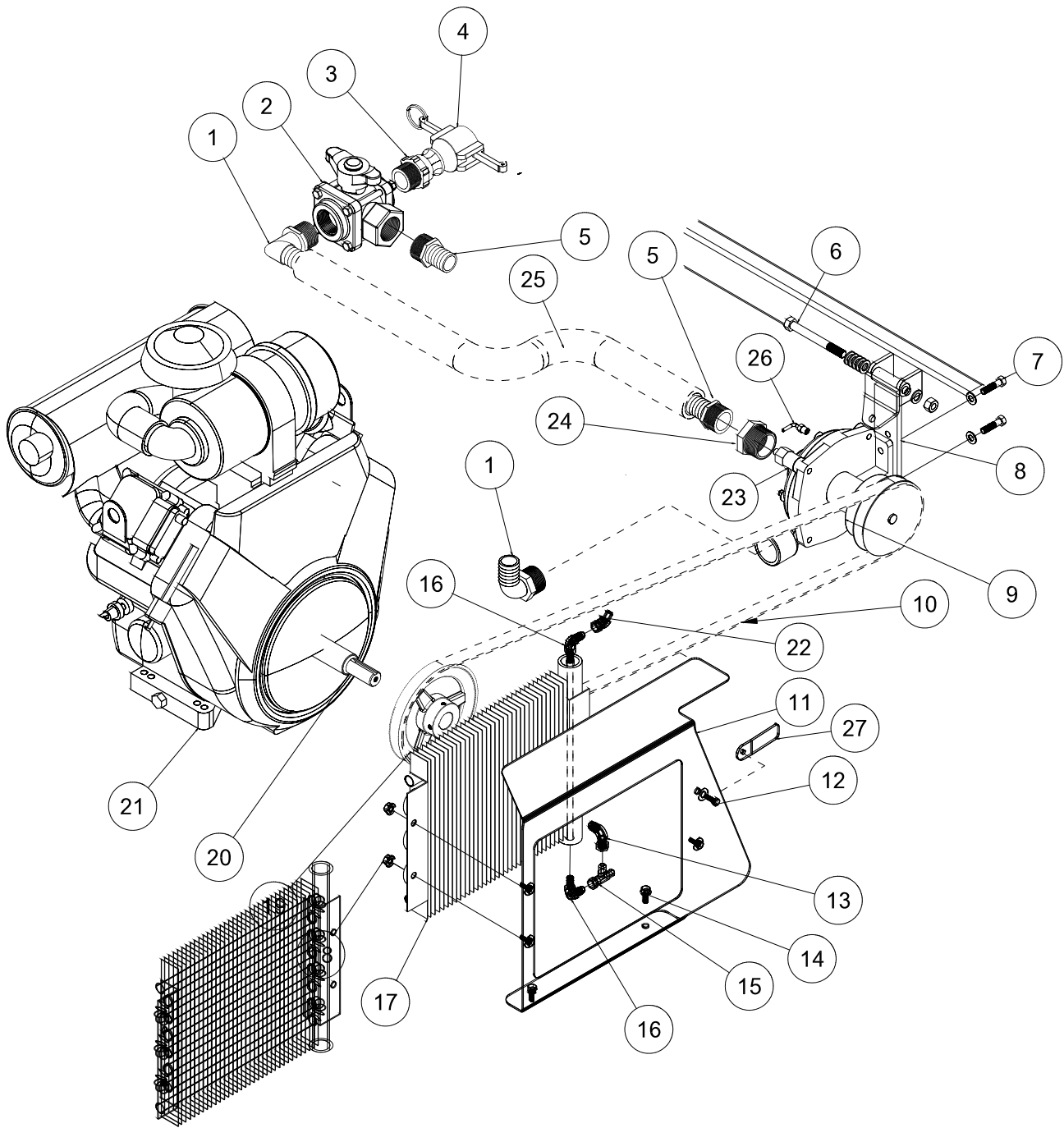


PARTS

## ENGINE, PUMPS AND EXHAUST PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
26	15-705	Idler Arm	1
27	HB-516-18-200	Bolt $\frac{5}{16}$ - 18 x 2	4
	HW-516	Washer $\frac{5}{16}$	4
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	4
28	HB-38-16-150	Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{2}$	2
	HW-516	Washer $\frac{5}{16}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
29	HB-12-13-300	Bolt $\frac{1}{2}$ - 13 x 3	3
30	60-168	Spacer	3
31	60-107	Rubber Insulator	6
32	15-678	Engine Plate	1
33	76-446	Engine, Briggs & Stratton 31HP	1
	21-161	Wire Block	1
34	76-395-04	Cyclonic Air Cleaner	1
	76-395-01	Air Cleaner Cartridge	1
	76-395-02	Safety Filter Cartridge	1

# SPRAY PUMP DRAWING

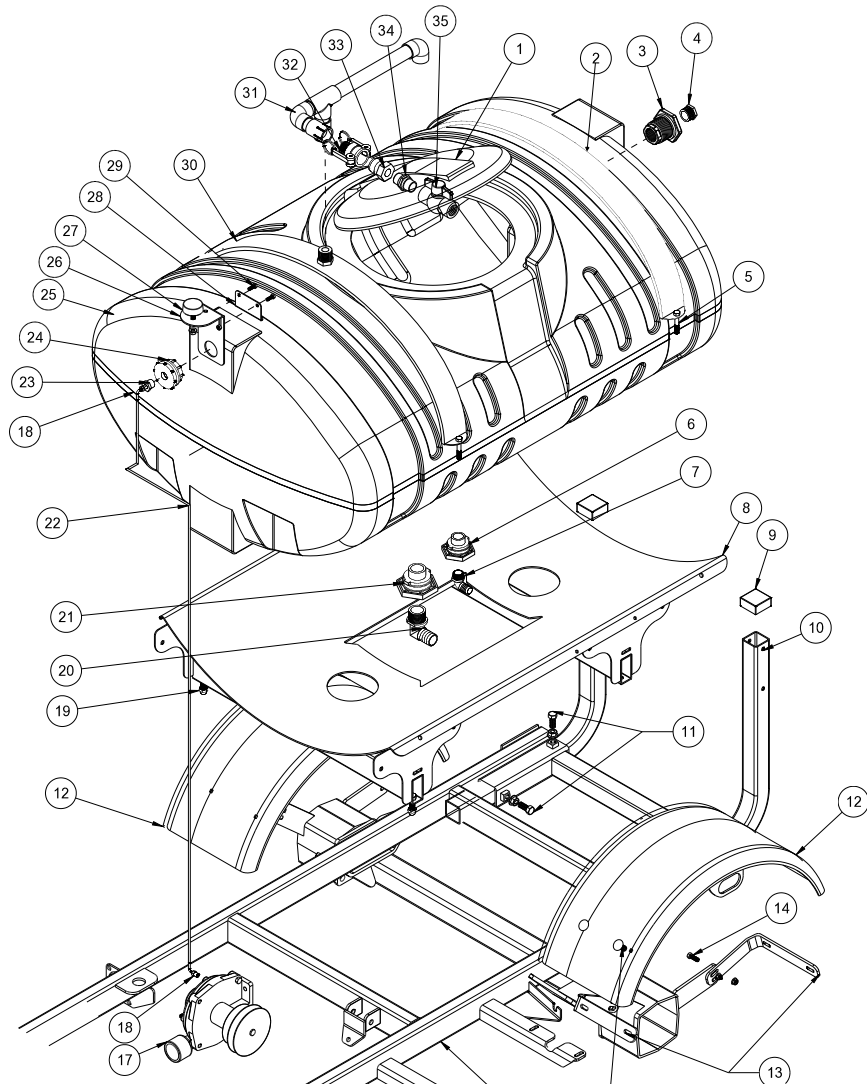


PARTS

# SPRAY PUMP PARTS LIST

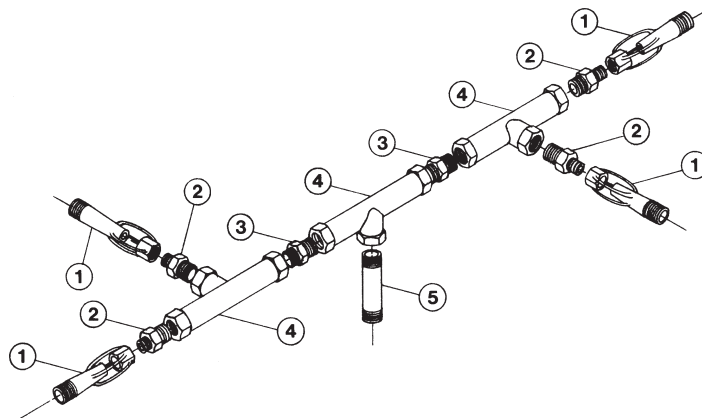
REF#	PART#	DESCRIPTION	QUANTITY
1	16-156	Elbow	1
2	18-372	3-Way Valve	1
3	16-180	Quick Coupler Male	1
4	16-935	Quick Coupler Cap	1
5	16-161	Fitting	2
6	HB-12-13-400	Bolt $\frac{1}{2}$ - 13 x 4	1
	HMB-12-14	Machine Bushing $\frac{1}{2}$ x 14GA	2
	HN-12-13	Nut $\frac{1}{2}$ - 13	1
7	HB-38-16-150	Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{2}$	2
	HW-38	Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
8	15-580	Pump Mount Arm	1
9	16-998	Spray Pump	1
10	15-704	Belt	1
11	15-688	Cooler Panel	1
12	HB-14-20-075	Bolt $\frac{1}{4}$ - 20 x $\frac{3}{4}$	4
	HW-14	Washer $\frac{1}{4}$	4
13	18-202	Elbow	1
14	HBFL-516-18-075	Flange Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	2
15	18-190	Tee	1
16	18-168	$\frac{3}{8}$ " Straight Elbow	2
17	15-624	Oil Cooler	1
18	HNFL-14-20	Flange Nut $\frac{1}{4}$ - 20	4
19	15-703	Pulley	1
20	76-411	Stub Shaft (comes with engine)	1
21	76-446	Briggs & Stratton 31 HP Engine	1
22	18-214	45° Elbow	1
23	33-480	Pressure Switch	1
24	16-825	Hex Bushing	1
25	8889-19	Suction Hose $1\frac{1}{4}$ " x 19"	1
	18-222	Hose Clamp	2
26	33-494	Male Elbow	1
27	15-764	Cooler Clamp	1

# TANK DRAWING



PARTS

# TURBO-QUAD AGITATOR DRAWING



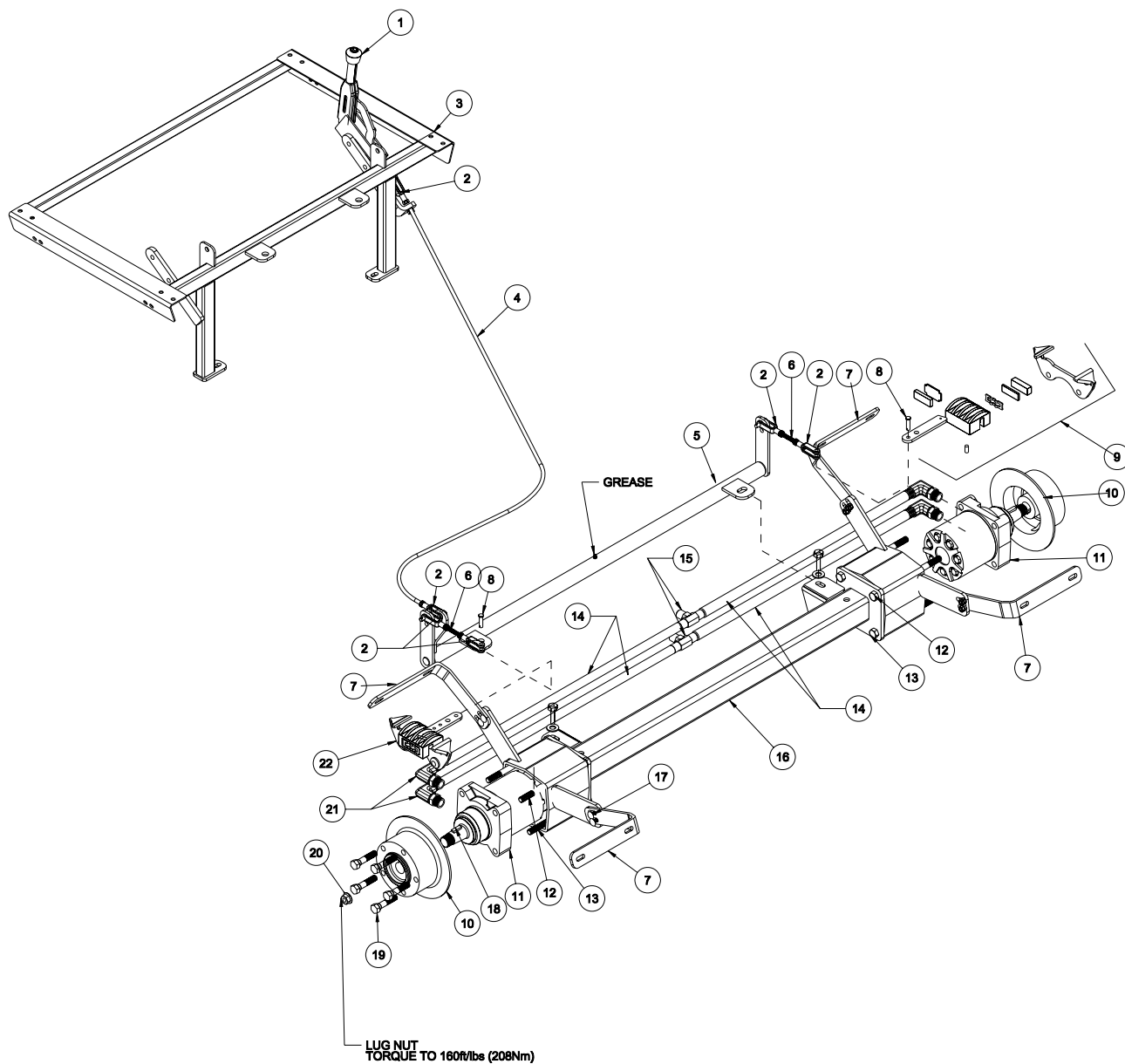
## TANK PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-953	16" Hinged Lid Well with Gasket	1
	16-953-01	Gasket (for Lid)	1
2	14-322	Tank Strap	1
3	16-945	1" Double Thread Fitting	1
4	16-162	1" Hex Plug (only 440)	1
5	HB-38-16-400	Bolt $\frac{3}{8}$ " - 16 x 4	2
	HB-38-16-350	Bolt $\frac{3}{8}$ " - 16 x $3\frac{1}{2}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ " - 16	4
6	16-150	$\frac{1}{2}$ " Double Thread Fitting (part of tank)	1
7	16-155	Elbow	1
8	15-733	Tank Carrier	1
9	16-557	Square Cap	2
10	15-753	Boom Support Tube	2
11	HB-12-13-150	Bolt $\frac{1}{2}$ " - 13 x $1\frac{1}{2}$	4
	HNJ-12-13	Jam Nut $\frac{1}{2}$ " - 13	4
12	10-168	Rear Fender	2
13	10-154	Rear Fender Brackets	4
14	HBFL-516-18-075	Flange Bolt $\frac{5}{16}$ " - 18 x $\frac{3}{4}$	8
	HNFL-516 - 18	Flange Nut $\frac{5}{16}$ " - 18	8
15	HBC-516-18-100	Carriage Bolt $\frac{5}{16}$ " - 18 x 1	8
	HNFL-516-18	Flange Lock Nut $\frac{5}{16}$ " - 18	8
16	15-701	Main Frame	1
17	16-998	Hypro Pump	1
18	33-494	Male Elbow	2
19	HB-12-13-125	Bolt $\frac{1}{2}$ " - 13 x $1\frac{1}{4}$	4
	HNFL-12-13	Flange Nut $\frac{1}{2}$ " - 13	4
20	16-156	Elbow	1
21	16-194	$1\frac{1}{4}$ " Anti Vortex Fitting (part of tank)	1
22	8954-30	Clear Hose $\frac{3}{16}$ "	1
23	33-496	Reducer Bushing $\frac{1}{2}$ " to $\frac{1}{8}$ "	1
24	33-495	Bulkhead Fitting	1
25	14-451	Spray Tank	1
26	15-787	Hood Support	1
27	50-081	Rubber Bumper	1
	HNFL-38-16	Flange Nut $\frac{3}{8}$ " - 16	1
28	15-788	Stop Adjustment	1
29	HB-14-20-075	Bolt $\frac{1}{4}$ " - 20 x $\frac{3}{4}$	2
	HNFL-14-20	Flange Nut $\frac{1}{4}$ " - 20	2
30	14-327	Front Tank Strap	1
31	14-365	Air Gap Filler	1
32	16-962	1" Coupler	1
	16-962-01	Buna-N Gasket (for 16-962)	1
33	16-961	1" Adapter	1
34	16-851	1" Nipple	1
35	18-448	1" Ball Valve	1

## TURBO-QUAD AGITATOR PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-036	Agitator Jet (Includes one each $\frac{1}{8}$ ", $\frac{5}{32}$ ", and $\frac{3}{16}$ " orifices)	4
2	16-173	Reducer $\frac{3}{4}$ " x $\frac{1}{2}$ "	4
3	16-158	Close Nipple $\frac{3}{4}$ " x $\frac{3}{4}$ "	2
4	16-157	Female Pipe Thread Tee $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ "	3
5	16-172	Nylon Nipple $\frac{3}{4}$ " NPT x $3\frac{1}{2}$ "	1

# PARK BRAKE AND REAR AXLE DRAWING



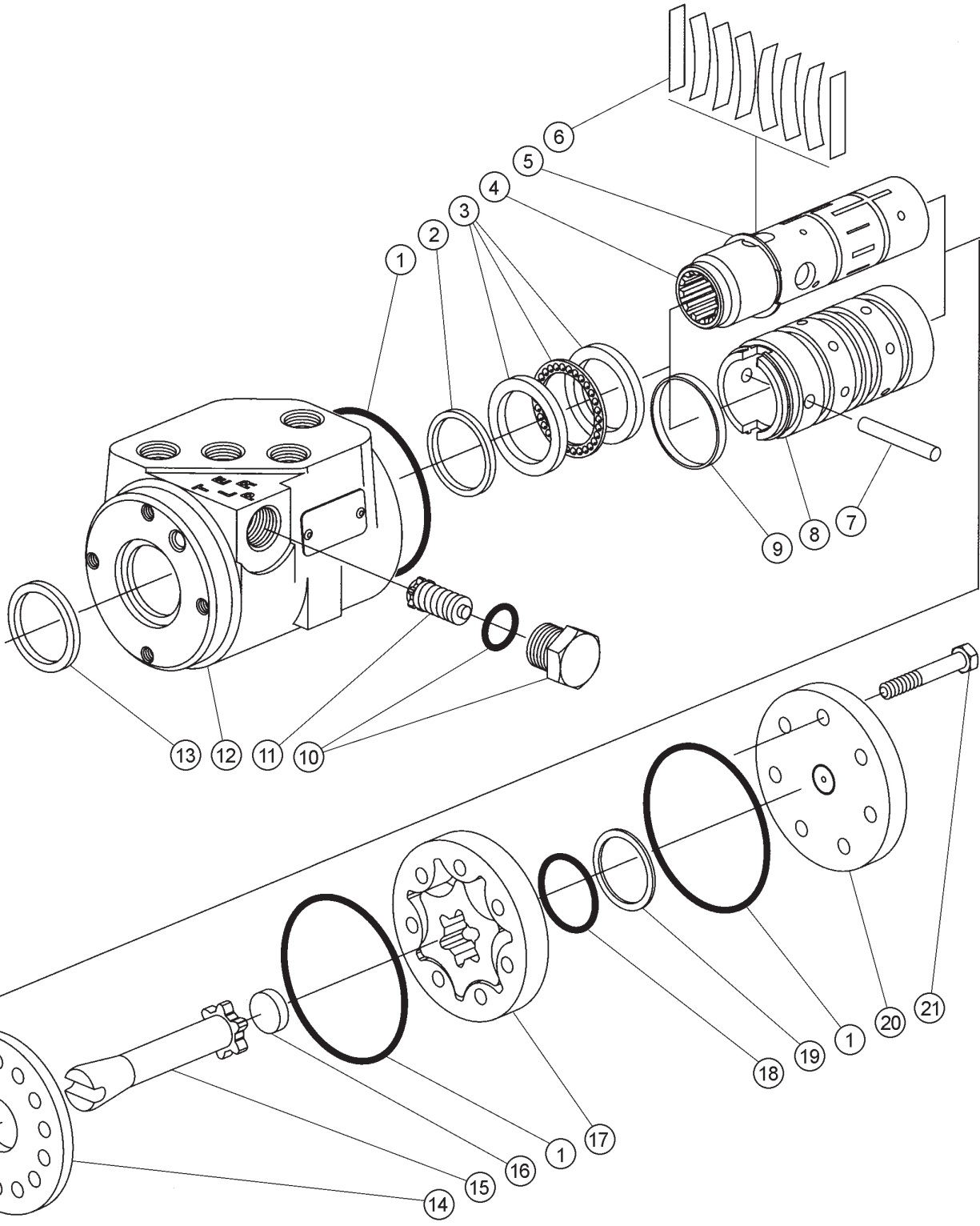
PARTS



## PARK BRAKE AND REAR AXLE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	60-106	Park Brake Lever Kit	1
2	11-100	Linkage Yoke $\frac{5}{16}$ "	6
	HN-516-24	Nut $\frac{5}{16}$ - 24	6
3	15-722	Seat Frame	1
4	60-347	Brake Cable	1
5	15-691	Brake Relay	1
6	34-021	Short Rod	2
	HN-516-24	Nut $\frac{5}{16}$ -24	4
7	10-154	Rear Fender Bracket	4
8	HCP-516-100	Clevis Pin $\frac{5}{16}$ x 1	5
	HP-18-075	Cotter Pin $\frac{1}{8}$ x $\frac{3}{4}$	5
9	76-241	Right Caliper CW	1
10	76-239	Brake Disc 5-hole	2
11	76-238	Wheel Motor	2
	HMB-12-14	Machine Bushing $\frac{1}{2}$ x 14GA	4
12	HB-12-13-800	Bolt $\frac{1}{2}$ - 13 x 8	4
	HNFL-12-13	Flange Lock Nut $\frac{1}{2}$ - 13	4
13	HB-12-13-750	Bolt $\frac{1}{2}$ - 13 x $7\frac{1}{2}$	4
	HNFL-12-13	Flange Lock Nut $\frac{1}{2}$ -13	4
14	15-681	Hydraulic Hose	4
15	34-057	Tee	2
16	15-700	Rear Axle	1
17	HBFL-516-18-075	Flange Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	8
	HNFL-516 - 18	Flange Nut $\frac{5}{16}$ - 18	8
18	HWK-516-100	Woodruff Key $\frac{5}{16}$ x 1 (comes with wheel motor)	2
19	60-268	Lug Bolt $\frac{1}{2}$ - 20 x $1\frac{5}{16}$	10
20	14-265	Lug Nut (comes with wheel motor)	2
21	34-122	Short Elbow	4
22	76-240	Left Caliper CCW	1

# 15-301 ORBITROL DRAWING



PARTS

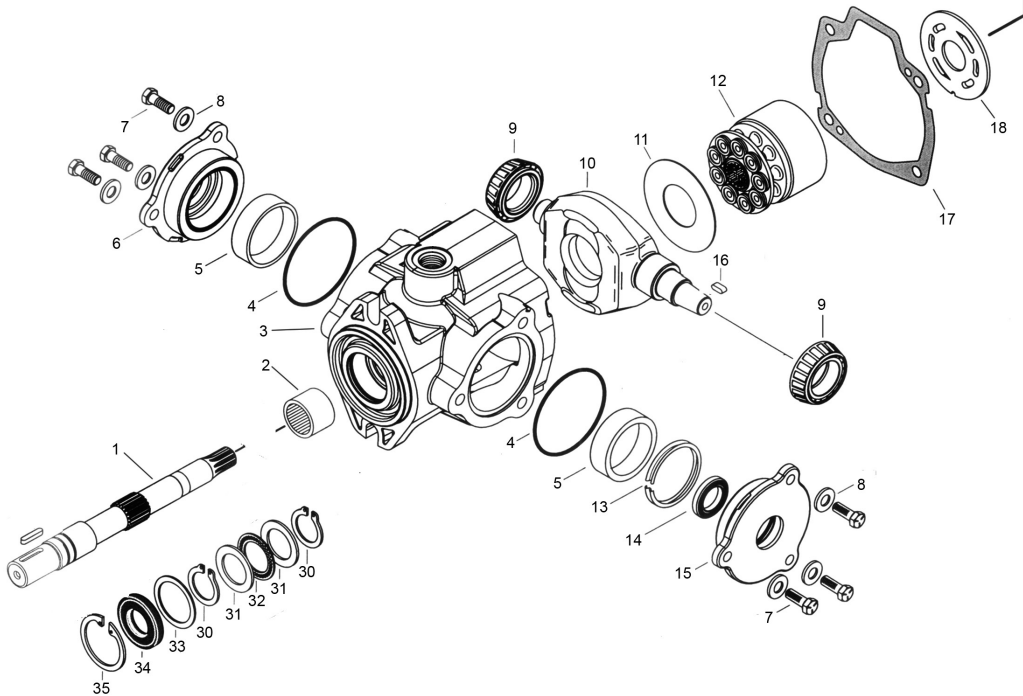
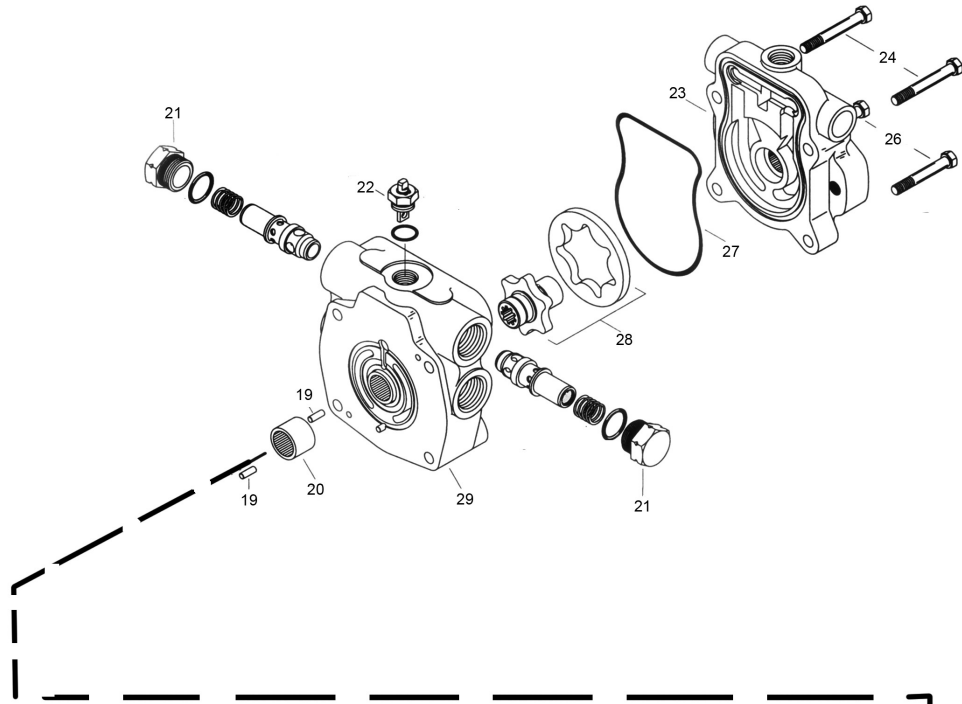
# 15-301 ORBITROL PARTS LIST

REF #	PART #	DESCRIPTION	QUANTITY
1*		O-Ring Seal	3
2*		Quad Seal	1
3	15-301-14	Bearing Kit	1
		Bearing Race	2
		Bearing	1
4		Spool	1
5	15-301-13	External Retaining Ring	1
6	15-301-15	Spring Centering Kit (Includes Ref# 9)	1
		Spring Spacer	2
		Centering Spring	6
		Spring Retaining Ring	1
7	15-301-08	Pin	1
8		Sleeve	1
9		Retainer	1
10	15-301-11	Plug and O-ring	1
*		O-Ring Seal	1
		Plug	1
11	15-301-12	Relief Valve/Check (1015 psi (70 bar))	1
12		Housing	1
13*		Dust Seal	1
14	15-301-06	Wear Plate	1
15	15-301-07	Drive	1
16	15-301-05	Spacer	1
17	15-301-04	Gerotor	1
18*		O-Ring	1
19*		Seal	1
20	15-301-03	End Cap	1
21	15-301-02	Cap Screw	7
*	15-301-01	Seal Kit	

## 15-301 ORBITROL SPECIFICATIONS

Maximum System Pressure	1015 psi (70 bar)
Maximum Back Pressure	150 psi (10 bar)
Maximum System Operating Temperature.	200°F (93°C)
Maximum Flow	4 gpm (15 lpm)
Maximum Temperature Differential between Steering Unit and System.	50°F (28°C)
Input Torque Powered	15-25 lb/in @ 100 psi tank pressure (2-3 Nm @ 7 bar)
Input Torque Maximum Non-powered	60 lb/ft (81 Nm)
Rotation Limits	None
Fluid	SAE 10W-40 API Service SJ or higher Motor Oil
Check Valve for Manual Steering	Yes
Relief Valve Setting	1015 psi (70 bar)
Ports	9/16" - 18 SAE O-Ring 4 Ports
Displacement	61 cu. in/ R (100 cu cm/R)

# 76-398 HYDROSTATIC PUMP DRAWING



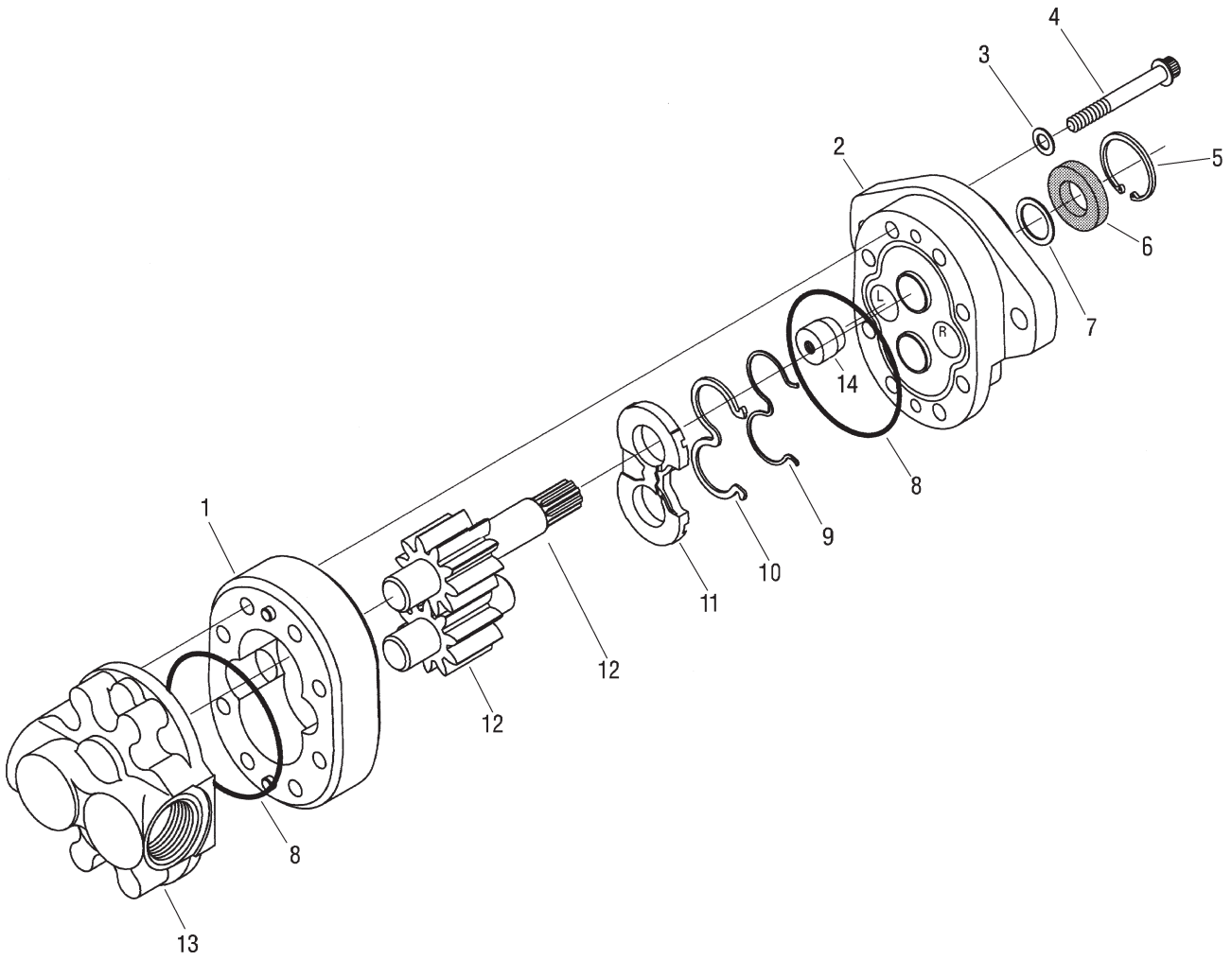
PARTS

## 76-398 HYDROSTATIC PUMP PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	76-398-01	Drive Shaft (splined)	1
2	60-343-08	Needle Bearing (with housing)	1
3	77-239-01	Housing	1
4	77-239-02	O-Ring	1
5	77-239-03	Thrust Bearing	2
6	77-239-04	Trunnion Cover	1
7	77-239-05	Pan Head Screw	2
8	77-239-06	Washer	6
9	77-239-07	Cone Bearing	2
10	77-239-08	Cam Plate	1
11	77-239-09	Swash Plate Insert	1
12	60-343-21	Rotating Kit	1
13	77-239-10	Crush Ring	1
14*	60-343-12	Shaft Seal	1
15	77-239-11	Seal Cover	1
16	77-239-12	Key	1
17*	77-239-13	Gasket	1
18	77-239-14	Back Plate	1
19	33-058-27	Dowel Pin	2
20	60-343-23	Bearing	1
21	77-239-15	Relief Valve	2
22	77-239-16	Tow Valve Assembly	1
23	76-160	Charge Pump Adaptor	1
24	77-239-17	Cap Screw	2
26	77-239-18	Cap Screw	2
27*	77-239-19	O-Ring	1
28	60-343-43	Gerotor and Coupler	1
29	77-239-20	End Cover Assembly	1
30*	77-239-21	Retaining Ring	2
31	60-343-05	Bearing Race	1
32	60-343-06	Thrust Bearing	1
33	60-343-03	Washer	2
34*	60-343-02	Shaft Seal	1
35*	60-343-01	Retaining Ring	1

\*            77-239-22            Seal Kit

# 76-197 EATON GEAR PUMP DRAWING

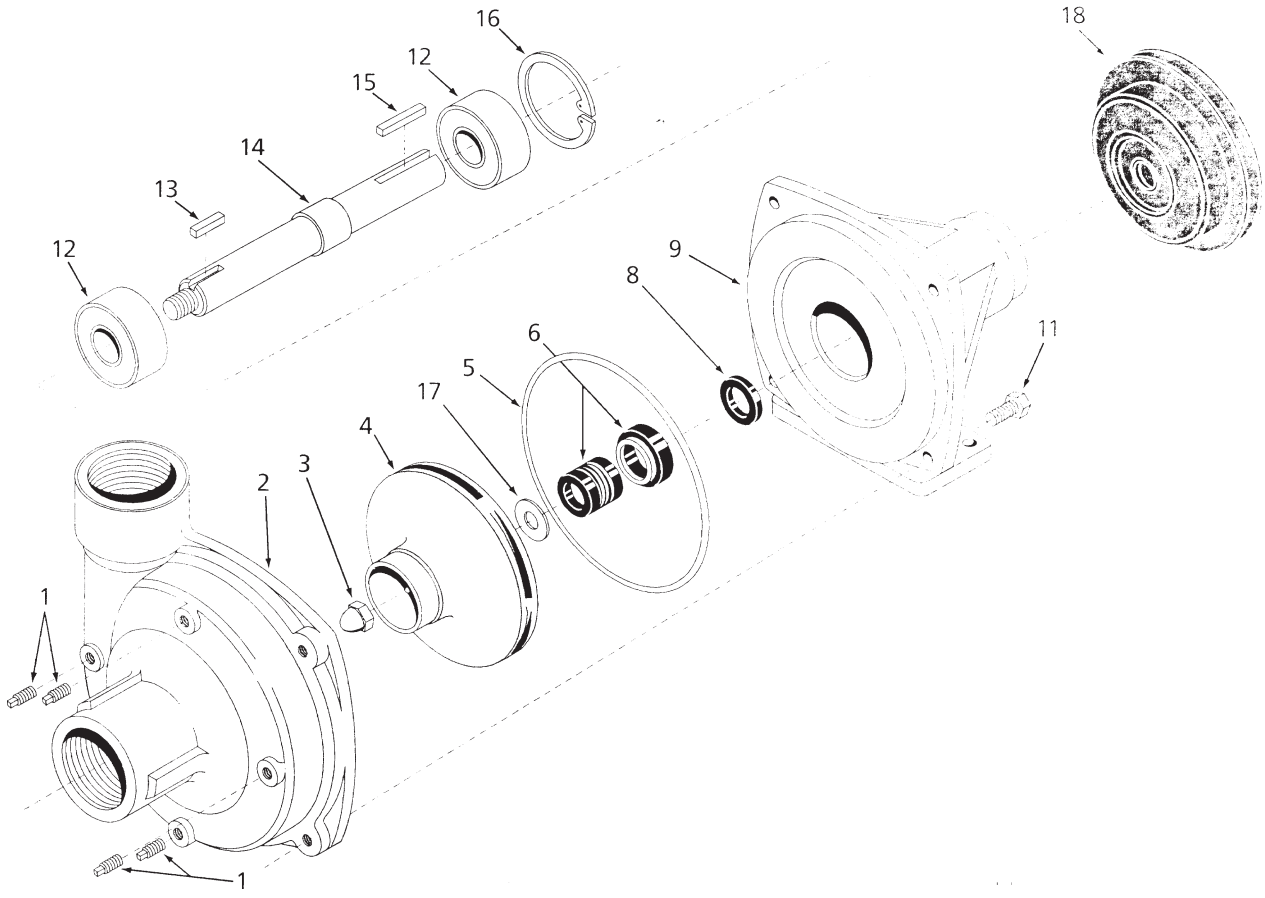


PARTS

## 76-197 EATON GEAR PUMP PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1		Body	1
2	76-197-01	Front Plate	1
3*		Washer	4
4	76-197-06	Cap Screw	8
5	76-197-07	Retaining Ring	1
6*		Shaft Seal	1
7	33-061-15	Washer	1
8*		O-Ring	2
9*		Backup Gasket	1
10*		Seal	1
11*		Wear Plate	1
12	76-197-04	Shaft (comes with Idler Gear)	1
13	76-197-02	Back Plate	1
14*		Plug	1
*	76-197-08	Seal Kit	

# 16-998 HYPRO PUMP DRAWING



PARTS



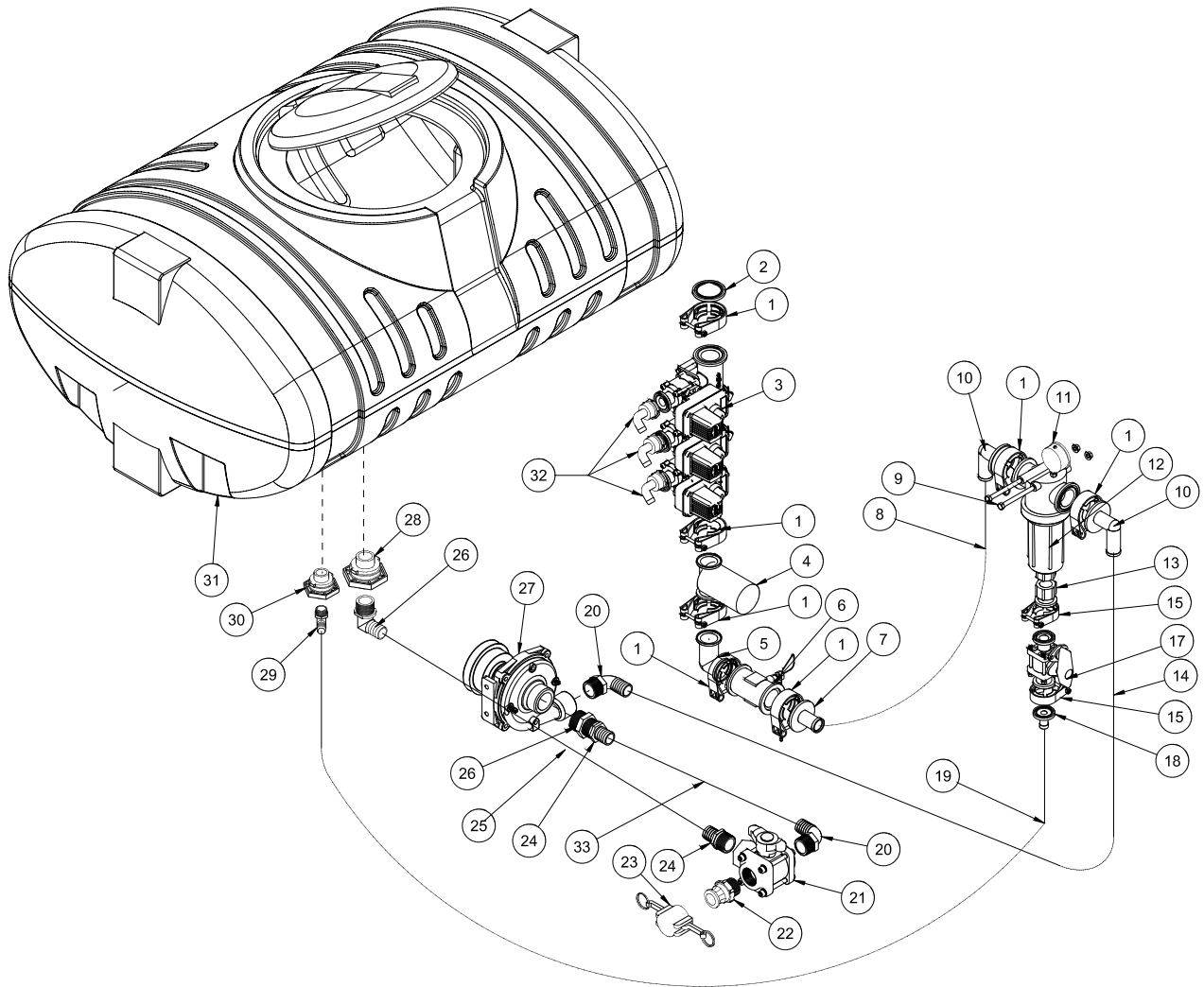
## 16-998 HYPRO® PUMP PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-998-01	Drain Plug	4
2	16-998-02	Pump Casing	1
3	16-998-03	Impeller Nut	1
4	16-966-16	Impeller	1
5*	16-998-04	O-Ring	1
6*	16-998-05	Mechanical Seal (Silicon Carbide)	1
8*	16-966-06	Slinger Ring	1
9	16-998-06	Mounting Flange	1
11	16-998-07	Bolt	4
12	16-966-10	Ball Bearing	2
13	16-998-08	Key	1
14	16-998-09	Pump Shaft	1
15	16-822-20	Key	1
16	16-966-13	Bearing Retainer	1
17*	16-998-10	Gasket	1
18	16-994-01	Clutch	1
*	16-967	Silicone - Carbon Seal Kit	

### **NOTE:**

When servicing the spray pump or filter, all control valves must be shut off if there is liquid in the tank.

# 1752 PLUMBING DRAWING (RAVEN 440)

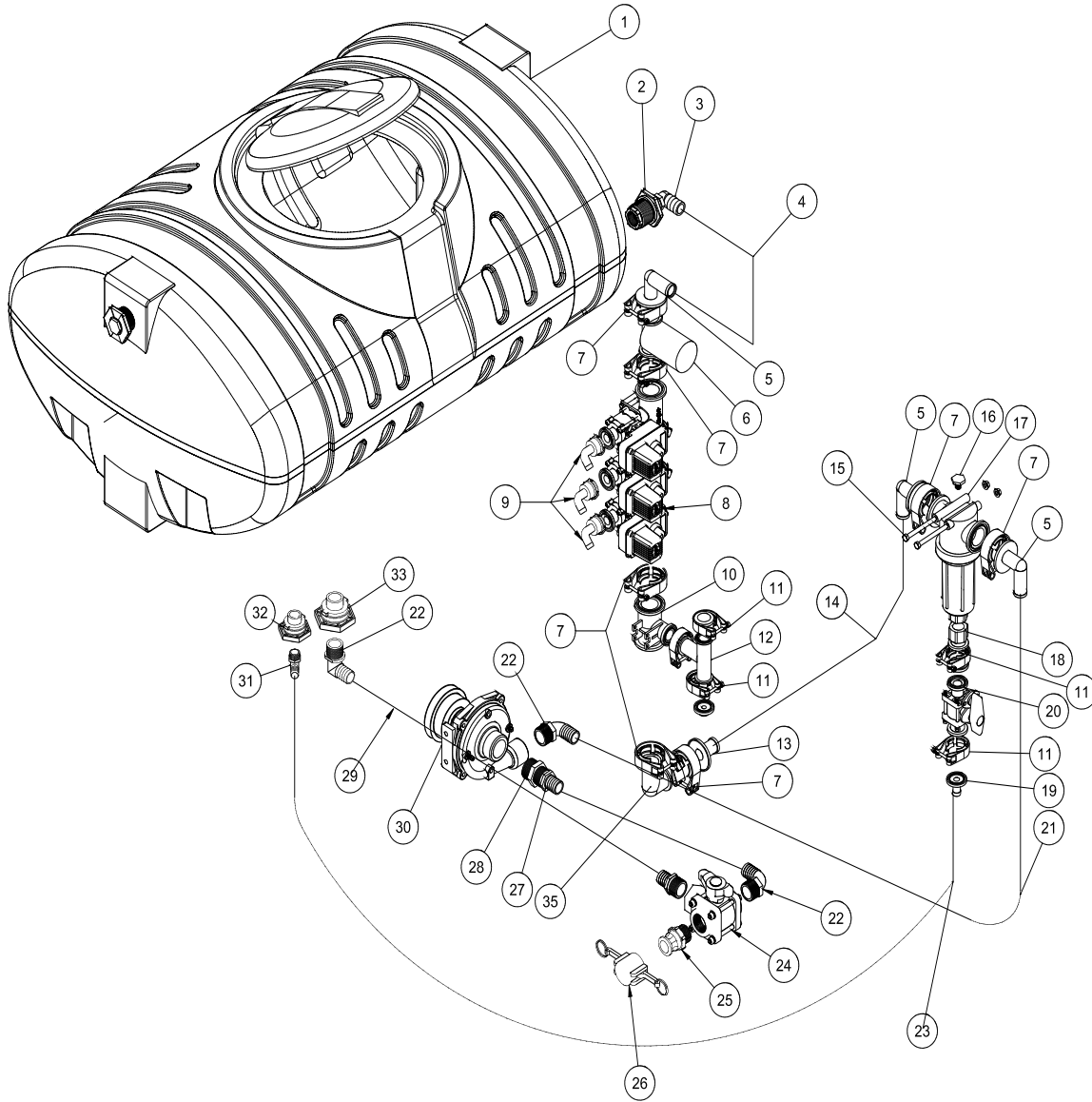


Accessories

## 1752 PLUMBING PARTS LIST (RAVEN 440)

REF#	PART#	DESCRIPTION	QUANTITY
1	15-741	75 Series Clamp	7
2	15-742	#75 Inlet Cover	1
3	15-743	Manifold Ball Valve	1
4	16-524	Motorized Control Valve	1
5	15-734	#75 Elbow Coupling	1
6	18-373	Flow Meter	1
7	15-744	#75 Hose Barb	1
8	8897-60	1 <sup>1</sup> / <sub>4</sub> Discharge Hose 60"	1
	18-116	Hose Clamp	2
9	HB-38-16-500	Bolt <sup>3</sup> / <sub>8</sub> - 16 x 5	2
	HNFL-38-16	Flange Nut <sup>5</sup> / <sub>16</sub> - 18	2
10	15-739	#75 90° Hose Barb	2
11	16-281	Liquid Filled Gauge	1
12	15-737	Flanged Strainer	1
13	15-735	#50 x 1" FPT Fitting	1
14	8897-66	1 <sup>1</sup> / <sub>4</sub> Discharge Hose 66"	1
	18-116	Hose Clamp	2
15	15-740	50 Series Clamp	2
17	15-738	Flanged Ball Valve	1
18	15-808	Flange Hose Barb, Straight	1
19	8896-66	1 Suction Hose 66"	1
	18-116	Hose Clamp	1
	18-040	Hose Clamp	1
20	16-156	Elbow	3
21	18-372	3-Way Valve	1
22	16-180	Quick Coupler Male	1
23	16-935	Quick Coupler Cap	1
24	16-161	Fitting	2
25	8889-38	1 <sup>1</sup> / <sub>4</sub> Suction Hose 38"	1
	18-116	Hose Clamp	2
26	16-825	Hex Bushing	1
27	16-998	Pump	1
28	16-194	1 <sup>1</sup> / <sub>4</sub> Anti Vortex Fitting (comes with tank)	1
29	16-155	Elbow	1
30	16-150	1/2" Double Threaded Fitting (comes with tank)	1
31	14-451	Spray tank	1
32	15-553	<sup>3</sup> / <sub>4</sub> -90° Hose Barb	3
	8887-120	<sup>3</sup> / <sub>4</sub> " Orange PVC Hose x 120"	3
	18-040	Hose Clamp	3
33	8889-19	1 <sup>1</sup> / <sub>4</sub> Suction Hose 19"	1
	18-116	Hose Clamp	2

# 1754 PLUMBING DRAWING (RAVEN 203)

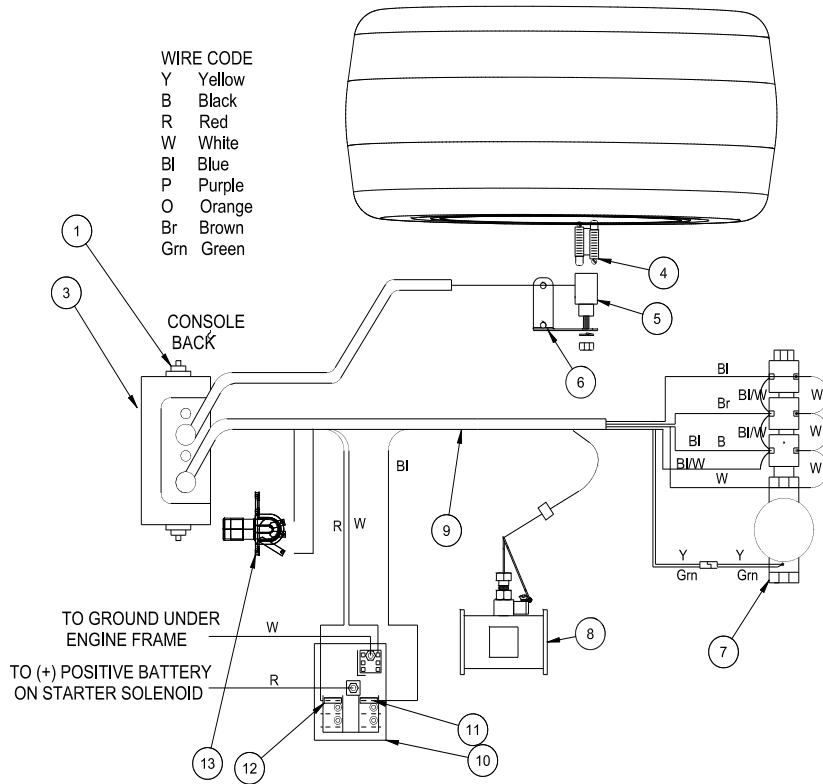


Accessories

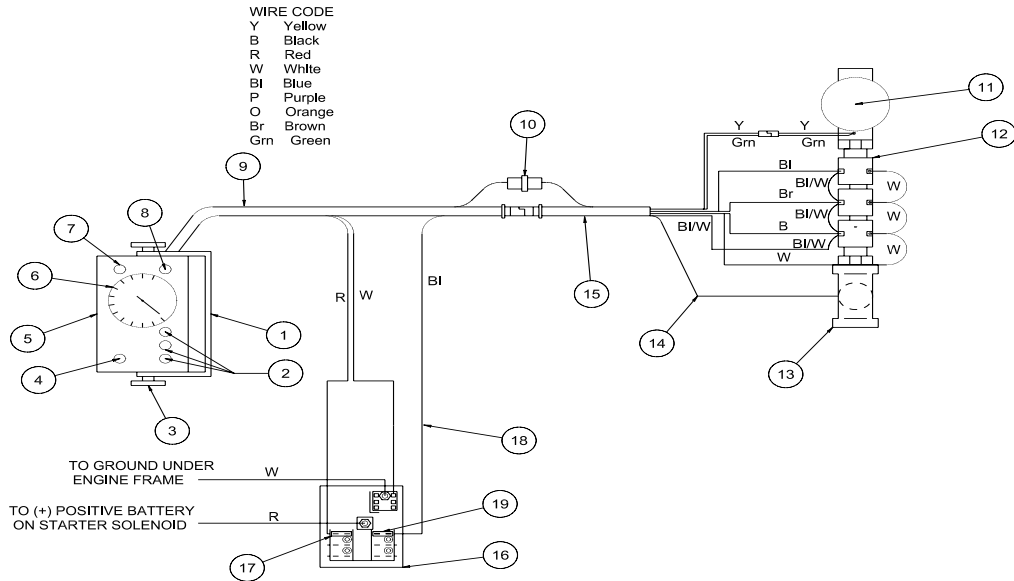
# 1754 PLUMBING PARTS LIST (RAVEN 203)

REF#	PART#	DESCRIPTION	QUANTITY
1	14-451	Spray Tank	1
2	16-945	Double Thread Fitting (inside tank)	1
3	15-779	Hose Barb	1
4	8897-26	1 <sup>1</sup> / <sub>4</sub> Discharge Hose 26"	1
	18-116	Hose Clamp	2
5	15-739	#75 90° Hose Barb	3
6	16-524	Motorized Control Valve	1
7	15-741	70 Series Clamp	7
8	15-743	Manifold Ball Valve	1
9	15-553	3 <sup>3</sup> / <sub>4</sub> -90° Hose Barb	3
	8887-120	3 <sup>3</sup> / <sub>4</sub> " Orange PVC Hose x 120"	3
	18-040	Hose Clamp	3
10	15-775	Reducer Tee	1
11	15-740	50 Series Clamp	6
12	15-776	#50 Tee	1
13	15-744	#75 Hose Barb	1
14	8897-60	1 <sup>1</sup> / <sub>4</sub> Discharge Hose 60"	1
	18-116	Hose Clamp	2
15	HB-38-16-500	Bolt 3 <sup>3</sup> / <sub>8</sub> - 16 x 5	2
	HNFL-38-16	Flange Nut 3 <sup>3</sup> / <sub>8</sub> - 16	2
16	15-780	Poly Hex Plug	1
17	15-737	Flanged Strainer	1
18	15-735	#50 1" FTP Fitting	1
19	15-808	Flange Hose Barb Straight	1
20	15-738	Flanged Ball Valve	1
21	8897-66	1 <sup>1</sup> / <sub>4</sub> Discharge Hose 66"	1
	18-116	Hose Clamp	2
22	16-156	Elbow	3
23	8896-66	1" Suction Hose 66"	1
	18-116	Hose Clamp	1
	18-040	Hose Clamp	1
24	18-372	3-Way Valve	1
25	16-180	Quick Coupler Male	1
26	16-935	Quick Coupler Cap	1
27	16-161	Fitting	2
28	16-825	Hex Bushing	1
29	8889-38	1 <sup>1</sup> / <sub>4</sub> Suction Hose 38"	1
	18-116	Hose Clamp	2
30	16-998	Pump	1
31	16-155	Elbow	1
32	16-150	1 <sup>1</sup> / <sub>2</sub> " Double Threaded Fitting (comes with tank)	1
33	16-194	1 <sup>1</sup> / <sub>4</sub> Anti Vortex Fitting (comes with tank)	1
34	8889-19	1 <sup>1</sup> / <sub>4</sub> Suction Hose 19"	1
	18-222	Hose Clamp	2
35	15-734	#75 Elbow Coupling	1

# CONTROLS 1752 SYSTEM DRAWING (RAVEN 440)



# CONTROL 1754 SYSTEM DRAWING (RAVEN 203)



## CONTROLS 1752 SYSTEM PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-558	Mounting Knob	2
2	15-716	Controller Box	1
3	16-525	Console (only)	1
4	33-089-04	Red Magnet Assembly	1
	33-089-05	Black Magnet Assembly	1
5	16-139	Magnetic Sensor	1
	HN-14-20	Nut $\frac{1}{4}$ - 20	2
	HWL-14	Lockwasher $\frac{1}{4}$	2
6	15-715	Sensor Bracket	1
7	16-524	Motorized Control Valve	1
8	18-373	Flow Meter	1
9	15-369	Console Control Cable	1
10	33-271	Fuse Block	1
11	33-273	Auto Blade Type Fuse 30 amp	1
12	33-508	Auto Blade Type Fuse 15 amp	1
13	33-509	Master boom Switch	1

10-225 Power Wire

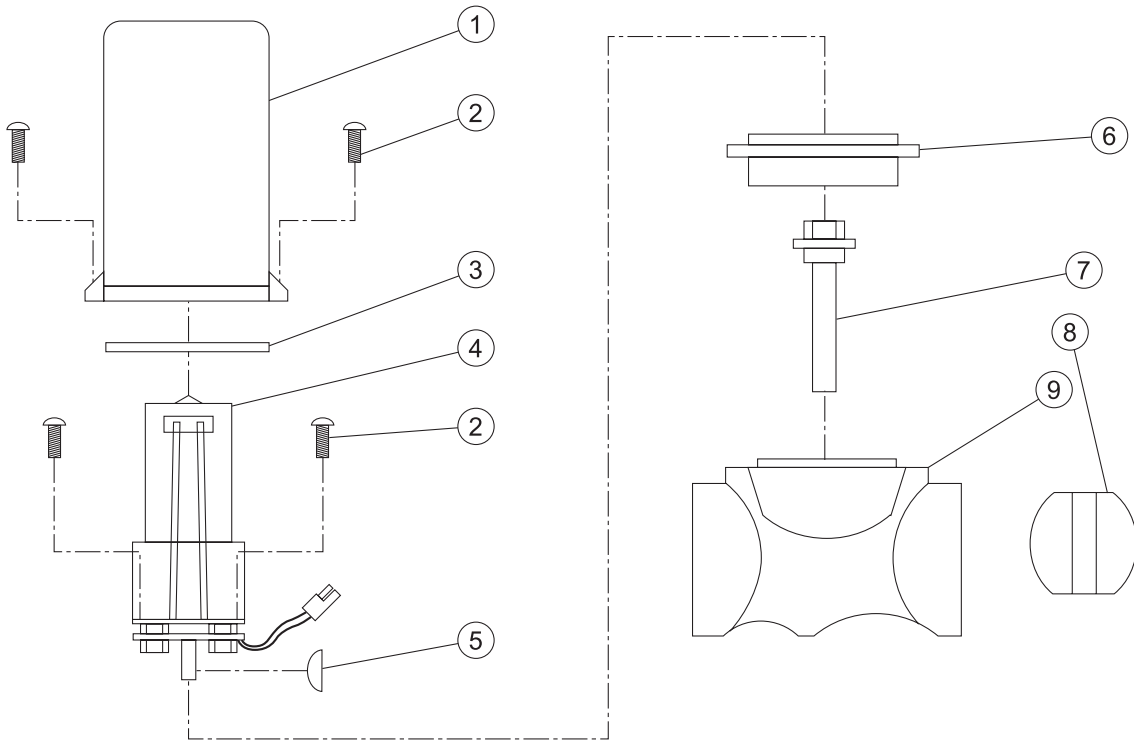
*Use Dielectric Grease On All Electrical Connections*

## CONTROL 1754 SYSTEM PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-958-01	Mounting Bracket	1
2	16-898	Boom Switch	3
3	16-900	Mounting Knob	2
4	16-899	Master Switch	1
5*	16-958	Console (only)	1
6	33-090-02	Liquid Filled Pressure Gauge	1
7	16-958-02	Fuse Holder	1
	16-525-03	Fuse 15 AMP	1
8	16-895	Pressure Switch	1
9*	16-958-04	Cable Assembly 8ft Enclosure Hook-Up	1
10*	16-958-05	Union Fitting	1
11*	15-624	Motorized Control Valve	1
12	15-743	Manifold Valve	1
13	15-775	Tee	1
14*	16-955	Tubing	1
15*	16-902	Cable Assembly 72" Solenoid Hook-Up	1
16	33-271	Fuse Block	1
17	33-508	Auto Blade Type Fuse 15 amp	1
18	10-225	Wire Harness (fuse block to electric valve)	1
19	33-273	Auto Blade Type Fuse 30 Amp	1
*	16-852	203 Sprayer Control Kit (includes all * items)	

*Use Dielectric Grease On All Electrical Connections*

# 16-524 MOTORIZED CONTROL VALVE DRAWING





## 16-524 MOTORIZED CONTROL VALVE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-870	Valve Cover	1
2*	16-524-01	#6 Self Tapping Screw $\frac{3}{4}$ " Long	6
3	16-897	Seal Tetraseal	1
4	16-875	Motor Assembly (For 16-524 on Spray Star 3002)	1
4	16-866-01	Motor Assembly (For 16-866 on Spray Star 3004)	1
5*	16-957	Woodruff Key	1
6*	16-524-04	Isolation Flange Assembly	1
7*	16-524-02	Coupler Shaft	1
8*	16-956	Butterfly	1
9*	16-524-03	Valve Body Assembly (for 16-524)	1
	16-995-01	Valve Body Assembly (for 16-995)	1
10	16-995-01		
*	16-524-05	1" Valve ISO-Body Kit (for 15-524)	
	16-955-02	1" Valve ISO-Body Kit (for 16-995)	

### WHEN SERVICING VALVE:

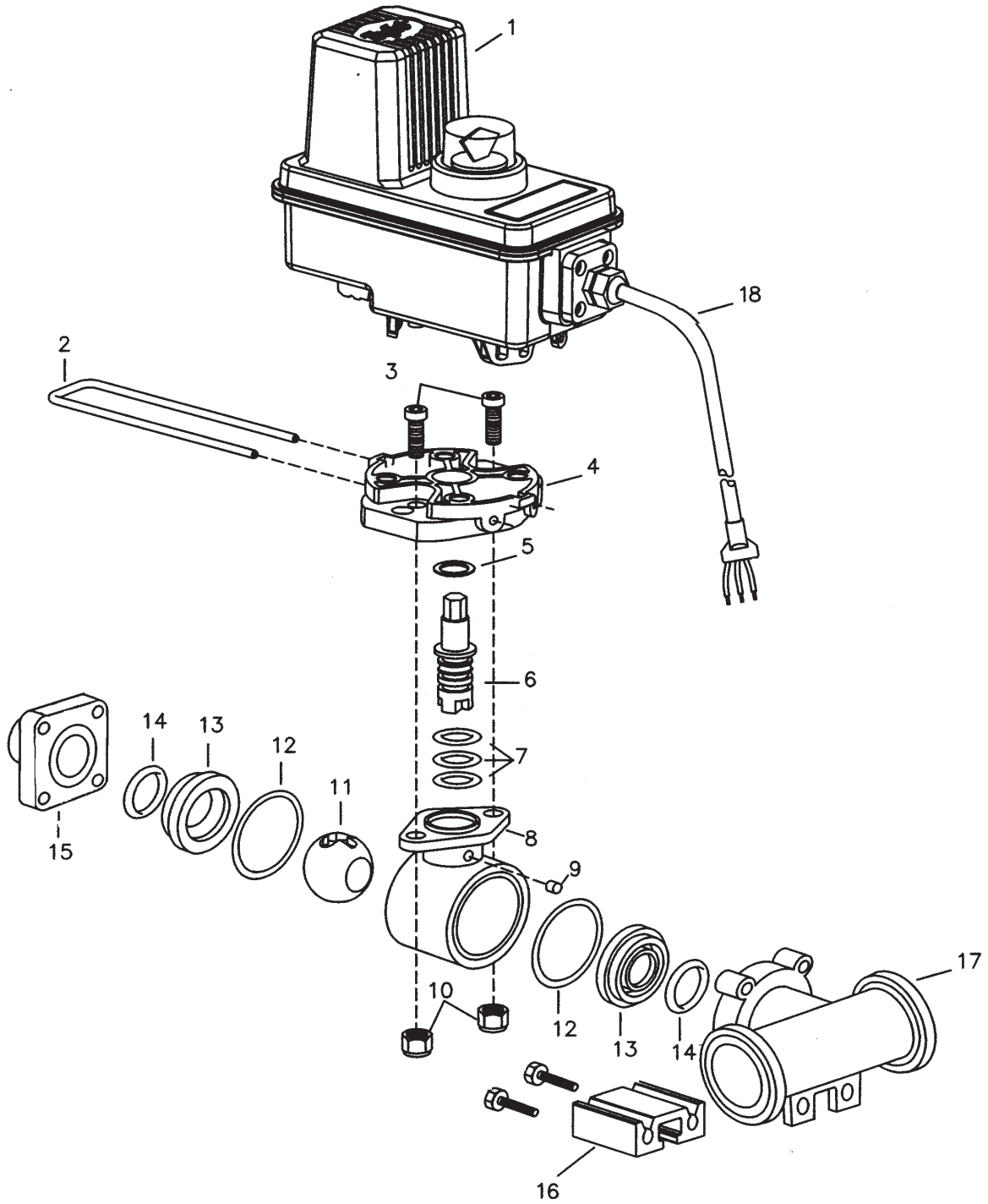
Replace valve body with ISO-Body Kit if valve has been leaking internally.

Replace motor assembly if the motor will not run or if the printed circuit board is corroded.

Before reassembling valve, remove the coupler shaft from the valve body. Apply Loctite to coupler shaft and woodruff key. Place the coupler shaft (Ref 7) and the woodruff key (Ref 5) onto the motor shaft. Plug motor into the valve connector coming from Sprayer Control Console. Check that the motor rotates in both directions. Motor must stop when coupler CAM releases printed circuit board switch button.

When reassembling valve, grease both sealing surfaces of coupler shaft. Insert coupler shaft into Iso-flange and be sure seal properly seats on shaft. Install on valve body and apply RTV 738 to mounting holes. Reassemble remaining items as shown in parts diagram on opposite side.

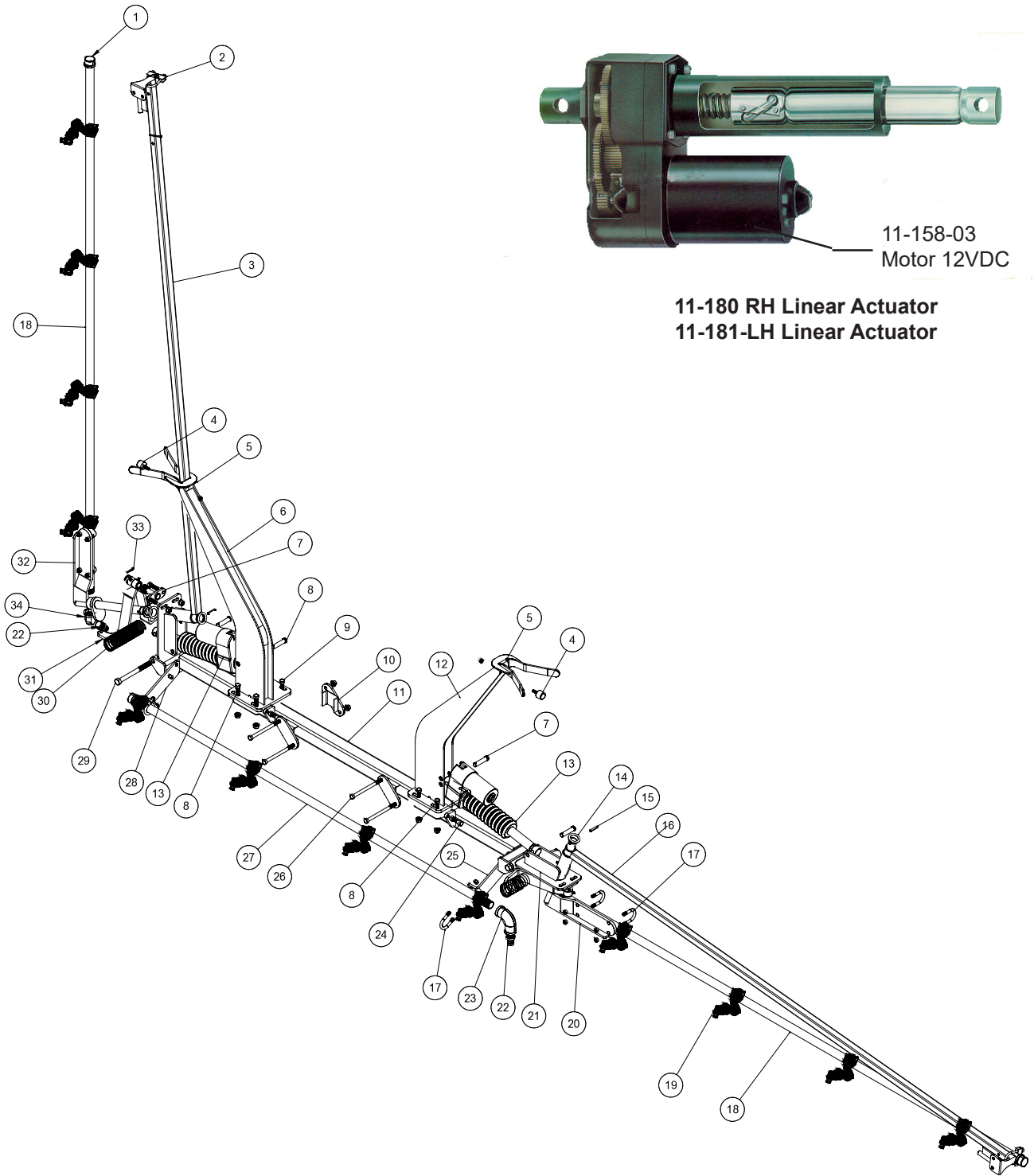
# 15-743 MSANIFOLD VALVE DRAWING



## 15-743 MANIFOLD VALVE PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY	
1	15-552-23	Motor		
2	15-552-24	Retaining Clip	1	
3	15-552-25	Socket Head Cap Screw, Stainless Steel	2	
4	15-552-26	Motor Adapter, Polypropylene	1	
5*	15-517-11	Thrust Washer, Teflon	1	
6	15-552-27	Stem, Stainless Steel	1	
7*	15-552-05	O-ring, Viton	3	
8	15-517-16	Body, Nylon	1	
9*	15-517-17	Dust Plug, Felt	1	
10		Lock Nut, Stainless Steel	2	
11	15-552-09	Ball, Polypropylene	1	
12*	15-552-13	Gasket, Viton	2	
13*	15-517-19	Seal, teflon	2	
14*	15-517-20	O-ring, Viton	2	
15	15-743-01	End Cap	1	
16	15-743-03	Mounting Rail aluminum	1	
17	15-743-02	#75 tee Body	1	4
*	15-552-10	Spare Parts Kit (includes all * items)		

# 17-503 20' SPRAY BOOM DRAWING



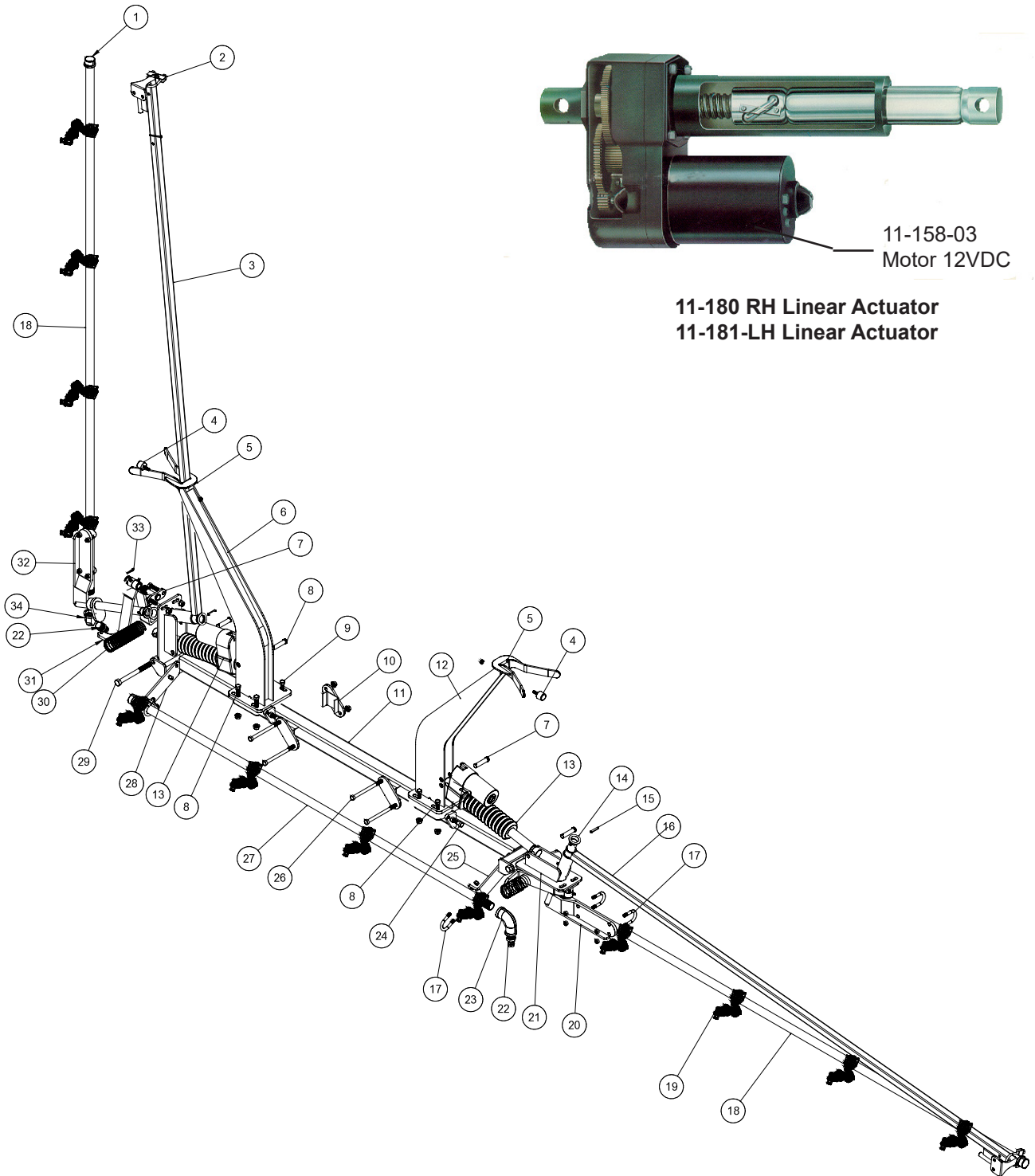
Accessories

## 17-503 20' SPRAY BOOM PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-926	Stainless Steel Cap $\frac{3}{4}$	3
2	13-498	U-Bolt Kit $1\frac{1}{8}$	2
3	33-333	Left Brush Guard	1
4	15-013	Rubber Bumper	2
	HNFL-14-20	Flange Lock Nut $\frac{1}{4}$ - 20	2
5	15-020	Grip Pad	4
6	10-316	LH Boom Holder	1
7	15-810	Pivot	2
	HMB-58-14	Machine Bushing $\frac{5}{8}$ - 14	8
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	4
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
8	HCPS-12-225	Stainless Steel Clevis Pin $\frac{1}{2}$ x $2\frac{1}{4}$	4
	HPS-18-100	Stainless Steel Cotter Pin $\frac{1}{8}$ x 1	4
9	HB-38-16-225	Bolt $\frac{3}{8}$ - 16 x $2\frac{1}{4}$	8
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	8
10	16-761	Boom Brackets	4
11	17-512	Center Mount	1
12	10-317	RH Boom Holder	1
13	11-180	RH Linear Actuator with 4" Stroke	1
	11-181	LH Linear Actuator with 4" Stroke	1
14	HMB-100-14	Machine Bushing 1 x 14GA	4
15	HRPS-14-150	Stainless Steel Roll Pin $\frac{1}{4}$ x $1\frac{1}{2}$	4
16	33-332	Right Brush Guard	1
17	16-024	U-Bolt $\frac{5}{16}$ - 24	6
	HWLS-516	Stainless Steel Lockwasher $\frac{5}{16}$	12
	HNS-516-24	Stainless Steel Nut $\frac{5}{16}$ - 24	12
18	16-928	Right and Left Tube	2
19	16-966	Nozzle Bodies	12
20	33-301	Right Pivot Bracket	1
21	15-813	Pivot Bracket	2
	15-494	Nylon Flange Bushing (part of 33-295)	4
	18-036	Oilite Bushing (part of 33-295)	4
	HSSQS-38-16-150	Stainless Steel Set Screw $\frac{3}{8}$ - 16 x $1\frac{1}{2}$	2
	HN-38-16	Nut $\frac{3}{8}$ - 16	2
22	18-249	Barb Fitting	3
23	16-925	Stainless Steel Pipe Elbow $\frac{3}{4}$ x 90°	3
24	HSSQS-38-16-150	Stainless Steel Set Screw $\frac{3}{8}$ - 16 x $1\frac{1}{2}$ (part of 17-512)	2
	HN-38-16	Nut $\frac{3}{8}$ - 16 (part of 17-512)	2
25	33-308	Right Center Tube Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	2
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
26	HBS-38-16-550	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $5\frac{1}{2}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
27	17-511	Center Tube	1
28	33-309	Left Center Tube Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	2
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2

(Continued on next page)

# 17-503 20' SPRAY BOOM DRAWING



Accessories

## 17-503 20' SPRAY BOOM PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
29	HBS-12-13-550	Stainless Steel Bolt $\frac{1}{2}$ - 13 x $5\frac{1}{2}$	2
	HNCL-12-13	Center Lock Nut $\frac{1}{2}$ - 13	2
30	15-495	Extension Spring	2
31	15-812	Right Cam Stop (must also order 15-811)	2
	15-811	Left Cam Stop (must also order 15-812)	2
	18-268	Oilite Bushing (part of 15-812)	2
	HMB-100-10	Machine Bushing 1 x 10GA	2
32	33-302	Left Pivot Bracket	1
33	HPS-18-100	Cotter Pin $\frac{3}{8}$ x 1	2

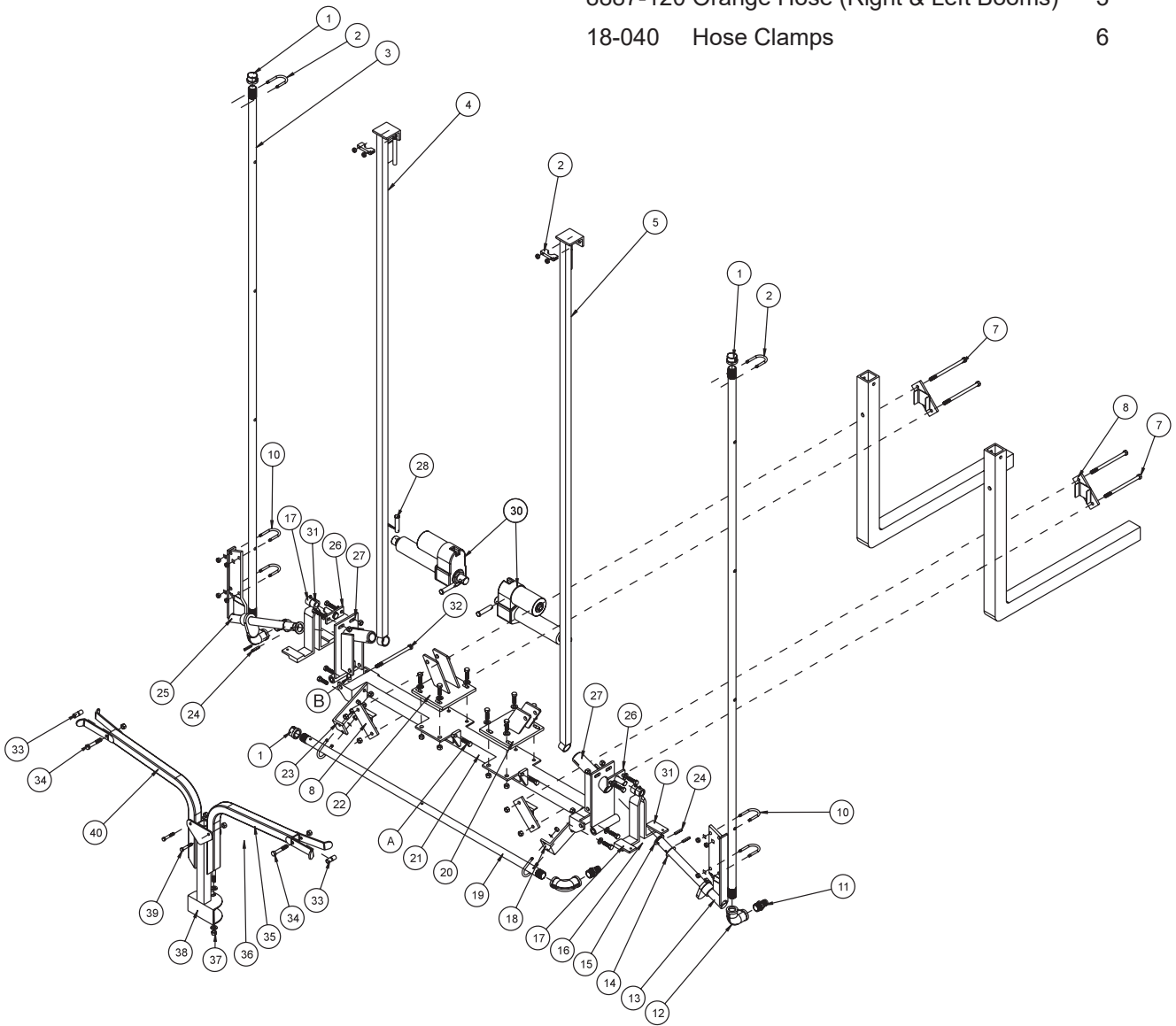
## INSTALLATION INSTRUCTION

For best results use Teflon<sup>®</sup> tape on all fittings.

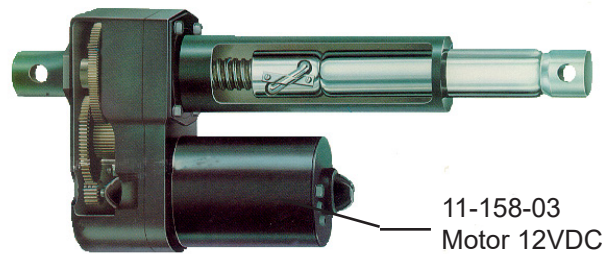
- The three boom assemblies are not on the packing list but are in carton. The long boom assemblies are the right and left booms. The labels are located on right and left pivot brackets (Ref 20 and 32). The small boom assembly is the center boom. You can NOT order these boom assemblies as one unit. Please refer to parts drawing for individual parts.
- Mount small boom assembly to rear upright support on sprayer using four boom brackets (Ref 10), four bolts,  $\frac{3}{8}$  - 16 x  $5\frac{1}{2}$  and four lock nuts,  $\frac{3}{8}$  - 16 (Ref 26). One boom bracket should go on boom assembly and one on upright support of sprayer. Do the same for right and left side. Place boom at desired level (approximately 20" (51 cm) nozzle height) and center. Tighten bolts.
- The actuator brackets are incorporated into the boom holders (Ref 6 and 12) on the center mount (Ref 11) using  $\frac{3}{8}$  - 16 x  $1\frac{1}{4}$  bolts, washers and lock nuts, with washers over the slots. Snug up the bolts so that you can adjust the boom holders with the set screws (Ref 24) on the center mount after booms have been mounted.
- Take right boom and slide pivot bracket (Ref 21) in center mount (Ref 11) and hold in place with  $\frac{1}{2}$  - 13 x  $5\frac{1}{2}$  bolt and  $\frac{1}{2}$  - 13 center lock nut (Ref 29). Do not over tighten, boom must be able to move up and down. Repeat for left boom.
- Mount actuator (Ref 13) fixed end to actuator bracket and ram end to pivot bracket using  $\frac{1}{2}$  x  $2\frac{1}{4}$  clevis pins and  $\frac{1}{8}$  x 1 cotter pins (Ref 8). It may be necessary to lift boom slightly for proper fit. Repeat process for other boom.
- Hook hoses to respective fittings using hose clamps (18-040). The hose coming from right side of sprayer goes to straight fitting on right boom. Center hose from sprayer goes to straight fitting on center boom. The left hose from sprayer goes to straight fitting on left boom. Be sure all clamps are tight.
- Connect wire harness to actuator. Use two nylon ties (22-075) to hold wire to fixed end of actuators.
- Use boom switches to completely extend actuator and lower booms.
- Using set screws (Ref 24) adjust actuator brackets so nozzles of booms are at same height with nozzles of center section. Tighten bolts holding actuator brackets to center mount and locknuts on set screws.
- Make certain set screws on the pivot brackets (Ref 21) on both sides are completely screwed in. Raise booms with boom switches all the way up, adjust set screws (Ref 24) so they contact the stop.

# 15-493 STAINLESS STEEL 18' AUTO BOOM DRAWING

- 8887-120 Orange Hose (Right & Left Booms) 3
- 18-040 Hose Clamps 6



ACCESSORIES



**11-178 Linear Actuator**  
Ref# 30

11-158-03  
Motor 12VDC

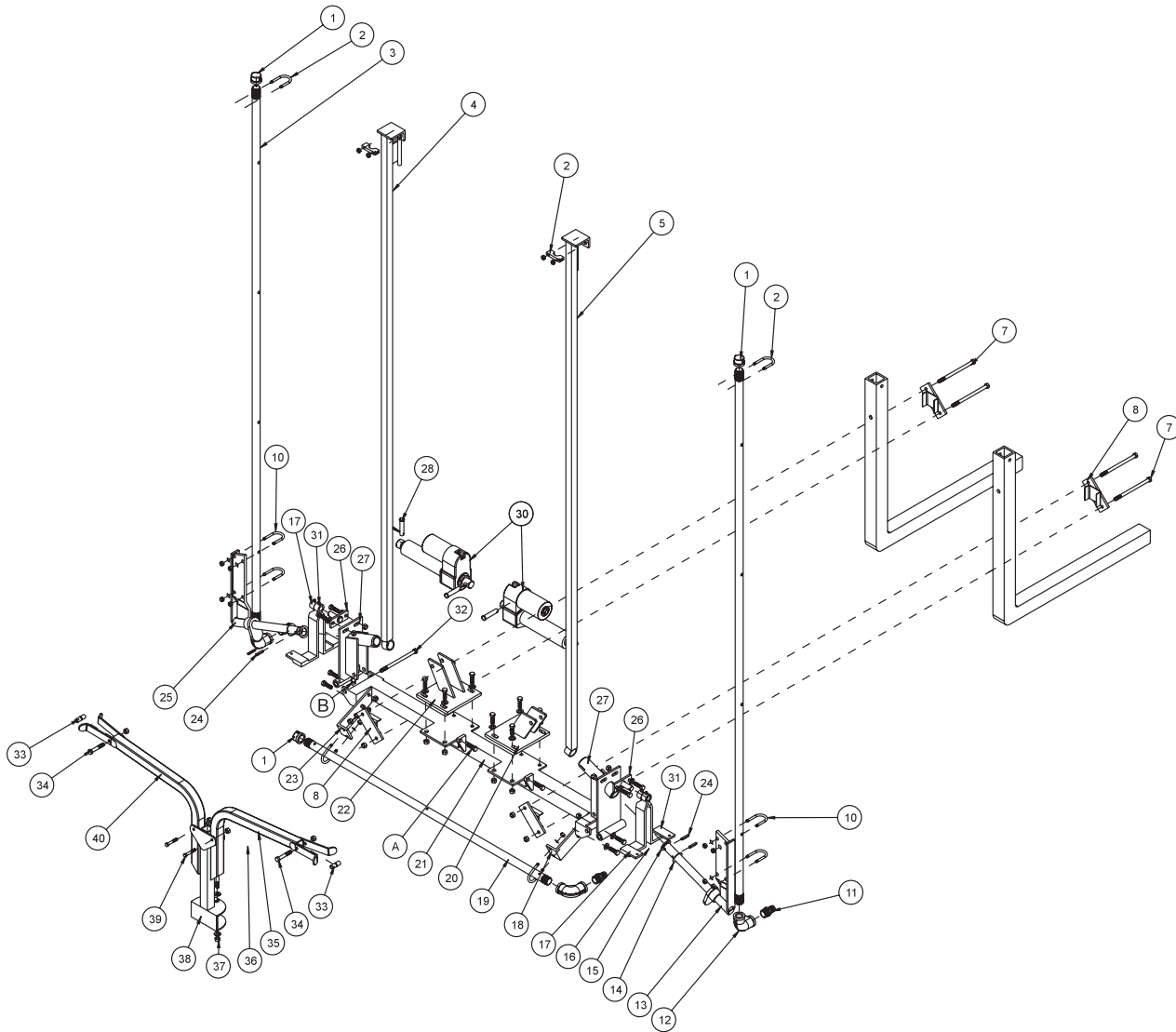


# 15-493 STAINLESS STEEL 18' AUTO BOOM PARTS LIST

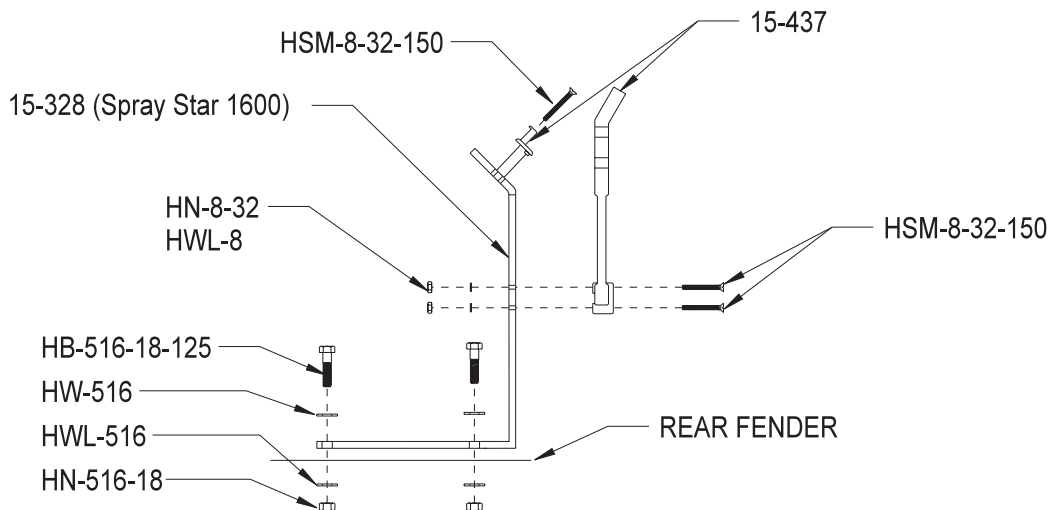
REF#	PART#	DESCRIPTION	QUANTITY
1	16-926	Stainless Steel Cap $\frac{3}{4}$	3
2	13-498	U-Bolt Kit $1\frac{1}{8}$	2
3	16-928	Right and Left Tube	2
4	33-333	Left Brush Guard	1
5	33-332	Right Brush Guard	1
7	HBS-38-16-550	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $5\frac{1}{2}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
8	16-761	Boom Brackets	4
10	16-024	U-Bolt $\frac{5}{16}$ - 24	6
	HWLS-516	Stainless Steel Lockwasher $\frac{5}{16}$	12
	HNS-516-24	Stainless Steel Nut $\frac{5}{16}$ - 24	6
11	18-249	Barb Fitting	3
12	16-925	Stainless Steel Pipe Elbow $\frac{3}{4}$ x 90°	3
13	33-301	Right Pivot Bracket	1
14	HMB-100-14	Machine Bushing 1 x 14GA	4
15	HMB-100-10	Machine Bushing 1 x 10GA	2
16	15-495	Extension Spring	2
17	15-812	Right Cam Stop (must also order 15-811)	2
18	33-308	Right Center Tube Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	2
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
19	16-927	Center Tube	1
20	33-330	Right Actuator Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	4
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
21	33-329	Center Mount	1
A	HSSQS-38-16-150	Stainless Steel Set Screw $\frac{3}{8}$ - 16 x $1\frac{1}{2}$ (part of 33-329)	2
	HN-38-16	Nut $\frac{3}{8}$ - 16 (part of 33-329)	2
22	33-331	Left Actuator Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	4
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
23	33-309	Left Center Tube Bracket	1
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	2
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
24	HRPS-14-150	Stainless Steel Roll Pin $\frac{1}{4}$ x $1\frac{1}{2}$	4
25	33-302	Left Pivot Bracket	1
26	15-810	Pivot	2
	HMBS-58-14	Stainless Steel Machine Bushing $\frac{5}{8}$ - 14	8
	HPS-18-100	Stainless Steel Cotter Pin $\frac{1}{8}$ x 1	2
	HBS-38-16-125	Stainless Steel Bolt $\frac{3}{8}$ - 16 x $1\frac{1}{4}$	4
	HWS-38	Stainless Steel Washer $\frac{3}{8}$	4
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
27	15-813	Pivot Bracket	2
	15-494	Nylon Flange Bushing (part of 33-295)	4
	18-036	Oilite Bushing (part of 33-295)	4
B	HSSQS-38-16-150	Stainless Steel Set Screw $\frac{3}{8}$ - 16 x $1\frac{1}{2}$	2
	HN-38-16	Nut $\frac{3}{8}$ - 16	2
28	HCPS-12-225	Stainless Steel Clevis Pin $\frac{1}{2}$ x $2\frac{1}{4}$	4
	HPS-18-100	Stainless Steel Cotter Pin $\frac{1}{8}$ x 1	4

(Continued on next page)

# 15-493 STAINLESS STEEL 18' AUTO BOOM DRAWING



## BOOM CARRIER DRAWING



ACCESSORIES

# 15-493 STAINLESS STEEL 18' AUTO BOOM PARTS LIST

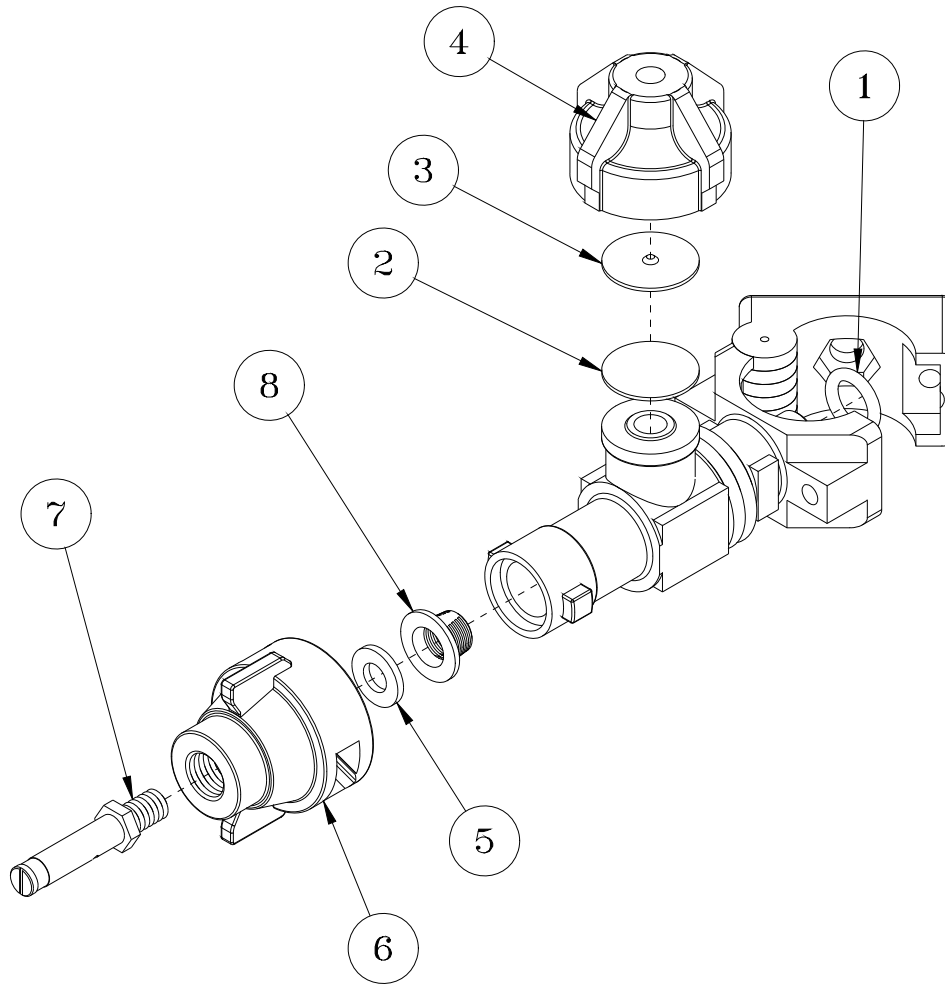
REF#	PART#	DESCRIPTION	QUANTITY
30	11-178	Linear Actuator with 4" Stroke	2
31	15-811	Left Cam Stop (must also order 15-812)	2
	18-268	Oilite Bushing (part of 15-811)	2
32	HBS-12-13-550	Stainless Steel Bolt $\frac{1}{2}$ - 13 x $5\frac{1}{2}$	2
	HNCL-12-13	Center Lock Nut $\frac{1}{2}$ - 13	2
33	18-289	Bushing $\frac{3}{8}$ ID - $\frac{1}{2}$ OD x $\frac{5}{8}$	4
34	HB-38-16-225	Bolt $\frac{3}{8}$ - 16 x $2\frac{1}{4}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
35	10-247	Right Boom Stabilizer	1
36	21-212	Extension Spring	1
37	HB-38-16-300	Bolt $\frac{3}{8}$ - 16 x 3	1
	HW-38	Washer $\frac{3}{8}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	1
38	10-162	Boom Support	1
39	HB-516-18-225	Bolt $\frac{5}{16}$ - 18 x $2\frac{1}{4}$	2
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	2
40	10-246	Left Boom Stabilizer	1

## INSTALLATION INSTRUCTIONS

For best results use teflon tape on all fittings.

- The three boom assemblies are not on the packing list but are in carton. The long boom assemblies are the right and left booms. The labels are located on right and left pivot brackets (Ref 13 and 25). The small boom assembly is the center boom. You can NOT order these boom assemblies as one unit. Please refer to parts drawing for individual parts.
- Mount small boom assembly to rear upright support on sprayer using four boom brackets (Ref 8), four bolts,  $\frac{3}{8}$  - 16 x  $5\frac{1}{2}$  and four lock nuts,  $\frac{3}{8}$  - 16 (Ref 7). One boom bracket should go on boom assembly and one on upright support of sprayer. Do the same for right and left side. Place boom at desired level (approximately 20" (51cm) nozzle height) and center. Tighten bolts.
- Put the actuator brackets (Ref 20 and 22) on the center mount (Ref 21) using  $\frac{3}{8}$  - 16 x  $1\frac{1}{4}$  bolts, washers and lock nuts, with washers over the slots. Snug up the bolts so that you can adjust actuator brackets with the set screws (Ref A) on the center mount after booms have been mounted.
- Take right boom and slide pivot bracket (Ref 27) in center mount (Ref 21) and hold in place with  $\frac{1}{2}$  - 13 x  $5\frac{1}{2}$  bolt and  $\frac{1}{2}$  - 13 center lock nut (Ref 32). Do not over tighten, boom must be able to move up and down.
- Mount actuator (Ref 30) fixed end to actuator bracket and ram end to pivot bracket using  $\frac{1}{2}$  x  $2\frac{1}{4}$  clevis pins and  $\frac{1}{8}$  x 1 cotter pins (Ref 28). It may be necessary to lift boom slightly for proper fit. Repeat process for other boom.
- Hook hoses to respective fittings using hose clamps (18-040). The hose coming from right side of sprayer goes to straight fitting on right boom. Center hose from sprayer goes to straight fitting on center boom. The left hose from sprayer goes to straight fitting on left boom. Be sure all clamps are tight.
- Connect wire harness to actuator. Use two nylon ties (22-075) to hold wire to fixed end of actuators.
- Use boom switches to completely extend actuator and lower booms.
- Using set screws (Ref A) adjust actuator brackets so nozzles of booms are at same height with nozzles of center section. Tighten bolts holding actuator brackets to center mount and locknuts on set screws.
- Make certain set screws (B) on both sides are completely screwed in. Raise booms with boom switches all the way up, adjust set screws (A) so they contact the stop.
- To install boom carriers (15-328) and latch (15-437) see diagram. The boom holders should point upward and latch pointing outward. Use 8 - 32 x  $1\frac{1}{2}$  machine screws, nuts and washers to install latch to boom carriers.
- To put booms into boom carriers, booms must be down. Push booms towards front of machine and lift boom slightly to clear fenders. Disconnect latch and put it over brush guard and reconnect.

# NOZZLE ASSEMBLY DRAWING



## NOZZLE ASSEMBLY PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1*	16-920-03	O-Ring	1
2*	16-920-05	Diaphragm Teflon (Optional)	1
3*	16-920-06	Diaphragm EPDM Rubber (Standard)	1
4*	16-798	Chemsaver End Cap	1
5	16-800	Gasket Viton	1
6	16-921	Cap	1
7	15-588	Turbo Turf Jet Tip #8	1
*	16-996	Body	1

**NOTE:** When the 16-920-05 Teflon Diaphragm is used, it is placed in the assembly in front of the 16-920-06 EPDM Rubber Diaphragm. Nozzles are located 20" (51 cm) apart on the right, left, and center tubes. There are predrilled holes in all tubes. The Nozzle should be at a 45° angle to the ground for proper application.

**NOTE:** For all 18' Booms: The eleven 16-996 bodies are installed on the boom sections. The eleven 16-800 viton gasket, 15-588 Turbo Turf Jet Tip #8 and 16-921 cap are in the small parts bag.

## TURBO TURFJET TIPS

This is a wide-angle (110°), hollow-cone, drift-reduction nozzle. Replaces conventional flooding nozzles in broadcast applications.

### FEATURES:

- Color-coding makes it easy to match nozzle flow rates for easy identification.
- Color-coding is available in sizes 1/4 TTJ02-VS through 1/4 TTJ15-VS.
- Uniform spray distribution.
- A large orifice opening and passages minimize clogging.
- The Turbo TurfJet nozzle's patented design element, a secondary swirl chamber in the nozzle cap, alters the swirling action of the liquid so that the fewer driftable lines are discharged from the secondary orifice.
- Spraying Pressure 25-75 PSI (1.5-5 bar).

### NOZZLE TILT

Delavan's extensive research on spray patterns has proven that a tilt of about 45° for flood Nozzles or tips will significantly improve the spray pattern uniformity.

The nozzle tilt reduces the effect of boom height variation and allows the spray nozzle to maintain a more fully developed pattern even when the nozzle outlet is below the recommended height for the best spray pattern uniformity.

### RECOMMENDED OVERLAP AND NOZZLE HEIGHT

Adjust spray height in the field to overlap a minimum of 30% of each edge of pattern. Adjust nozzle height until this is achieved. If a decision to tilt the nozzle is made, do it before measuring the width of the spray on the ground and adjusting nozzle height. See example below.

### DRIFTABLE FINES PRODUCED

(0.5 gpm at 40 psi)

Nozzle (.5 gpm Output)	Percent of Spray Volume less than 200 microns
Turbo TurfJet	< 1%

This is an extended range flat spray tip. It is excellent for Contact Pesticides and Growth Regulators and good for Systemic Pesticides.

**Contact Pesticides and Growth Regulators** - At medium pressures (20-30 psi) provides medium size droplets for good surface coverage and less drift. At higher pressures (30-60 psi) produces smaller droplets for better coverage. Wide angle 110° tips produce slightly smaller droplets than 80° tips at equal pressures.

**Systemic Pesticides** - At lower pressures (15-20 psi) produces larger spray droplets and reduces drift while still providing uniform coverage along the boom.

### FEATURES:

- Excellent spray distribution over a wide range of pressures (15-60 psi).
- Ideal for rigs equipped with sprayer controllers.
- Reduces drift at lower pressures, better coverage at higher pressures.
- Available in stainless steel and hardened stainless steel in 80° and 110° tip spray angles with VisiFlo color coding.

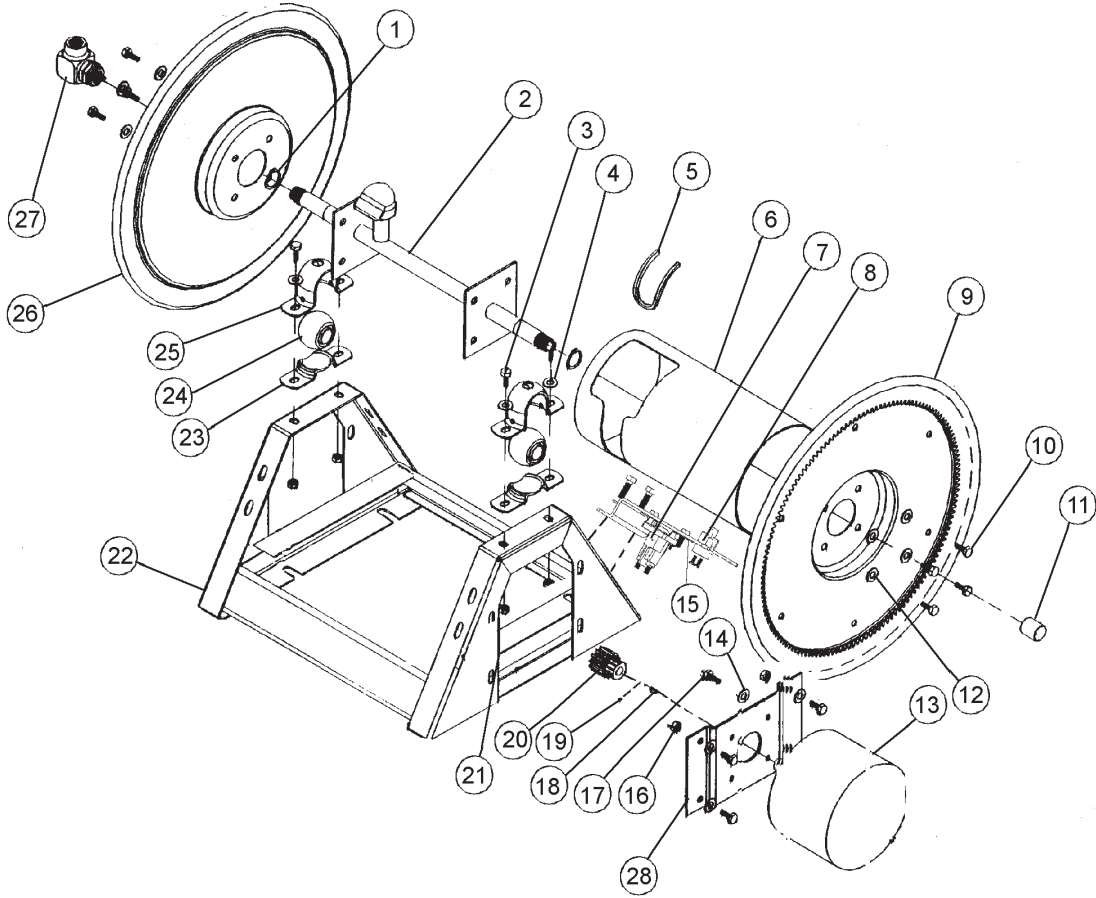
### RECOMMENDED OVERLAP

Adjust nozzle spray height to overlap 30% of each edge of pattern.

### NOZZLE HEIGHT

Suggested spray nozzle height with 20" spacing, tip spray angle of 80° should be 17-19", tip spray angle of 110° should be 12-14".

# 16-906 ELECTRIC HOSE REEL DRAWING

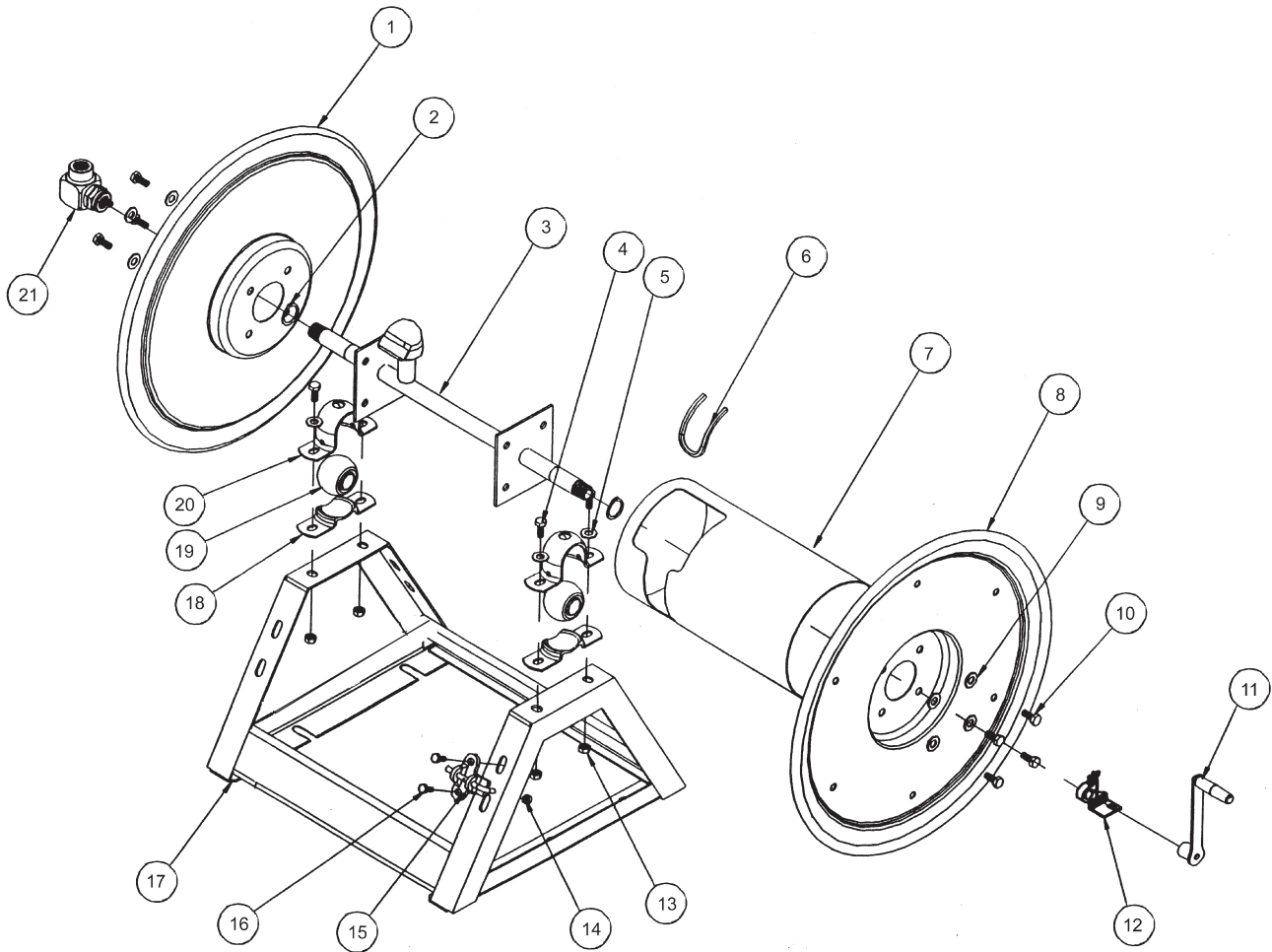




## 16-906 ELECTRIC HOSE REEL PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-906-25	Retaining Ring	2
2	16-906-22	Axle Assembly	1
3	HB-38-16-100	Bolt $\frac{3}{8}$ - 16 x 1	4
4	HW-38	Washer $\frac{3}{8}$	4
5	16-906-27	Trim, Drum Edge	1
6	16-906-21	Drum Center	1
7	12-015	Solenoid	1
	HB-14-20-075	Bolt $\frac{1}{4}$ - 20 x $\frac{3}{4}$	2
	HWL-14	Lockwasher $\frac{1}{4}$	2
	HN-14-20	Nut $\frac{1}{4}$ - 20	2
8	33-251	Switch	1
9	16-906-19	Disc and Gear Assembly	1
10	HB-516-18-075	Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	8
11	16-906-26	Pipe Cap $\frac{3}{4}$	1
12	HWL-516	Lockwasher $\frac{5}{16}$	8
13		Motor 12VDC	1
14	HW-516	Washer $\frac{5}{16}$	4
15	33-252	Switch and Solenoid Brkt	1
	HB-516-18-075	Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	2
	HW-516	Washer $\frac{5}{16}$	2
	HWL-516	Lockwasher $\frac{5}{16}$	2
	HN-516-18	Nut $\frac{5}{16}$ - 18	2
16	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	4
17	HB-516-18-100	Bolt $\frac{5}{16}$ - 18 x 1	4
18	16-906-17	Key	1
19		Set Screw	2
20	16-906-29	Pinion	1
21	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
22	16-906-18	Frame Assembly	1
23	16-906-08	Mounting Pillow Block (Bottom)	2
24	16-906-24	Bearing	2
25	16-906-07	Mounting Pillow Block (Top)	2
26	16-906-20	Disc 17 $\frac{1}{2}$	1
27	16-906-23	Swivel Assembly $\frac{3}{4}$	1
	16-906-30	Seal Kit (For 16-906-23)	1
28	16-906-28	Bracket 12VDC	1
29	16-980	Mount Bracket	2
	HB-516-18-175	Bolt $\frac{5}{16}$ - 18 x 1 $\frac{3}{4}$	4
	HW-516	Washer $\frac{5}{16}$	4
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	4
	16-982	Electric Hose Reel (only)	1

# 16-129 HOSE REEL DRAWING

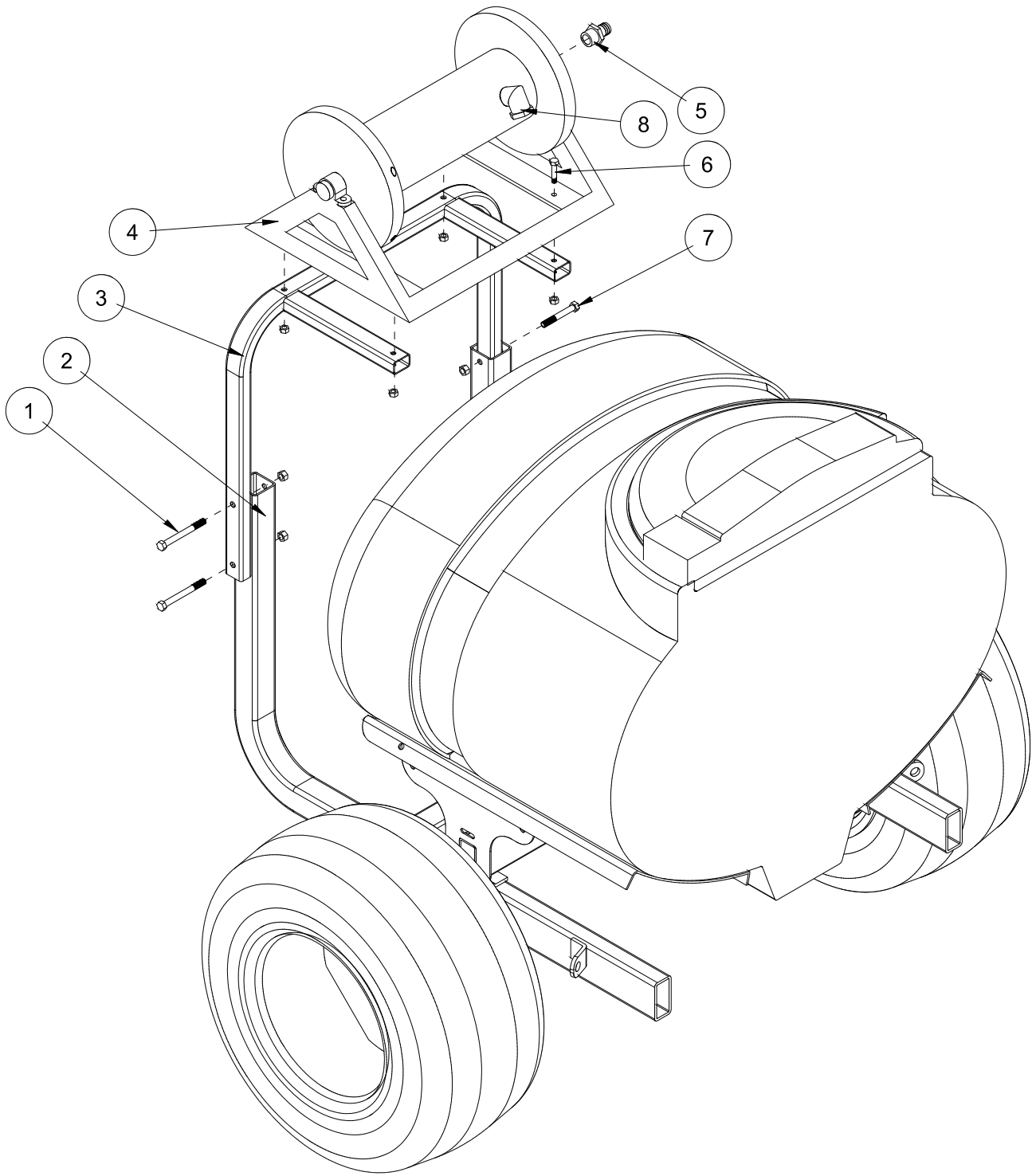


Accessories

## 16-129 HOSE REEL PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	16-129-11	Disc 17 $\frac{1}{2}$	1
2	16-906-25	Retaining Ring	2
3	16-906-22	Axle Assembly $\frac{3}{4}$	1
4	HB-38-16-100	Bolt $\frac{3}{8}$ - 16 x 1	4
5	HW-38	Washer $\frac{3}{8}$	4
6	16-906-27	Trim, Drum Edge	1
7	16-906-21	Drum Center	1
8	16-906-20	Disc 17 $\frac{1}{2}$ , Crank Side	1
9	HWL-516	Lockwasher $\frac{5}{16}$	8
10	HB-516-18-075	Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	8
11	16-129-09	Crank Assembly $\frac{3}{4}$	1
12	16-129-10	Brake Assembly $\frac{3}{4}$	1
13	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	4
14	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	2
15	16-129-08	Lock Pin Assembly	1
16	HB-516-18-075	Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	2
	HW-516	Washer $\frac{5}{16}$	2
17	16-129-07	Frame Assembly	1
18	16-906-08	Mounting Pillow Block (Bottom)	2
19	16-906-24	Bearing	2
20	16-906-07	Mounting Pillow Block (Top)	2
21	16-906-23	Swivel Assembly $\frac{3}{4}$	1
	16-906-30	Seal Kit ( For 16-906-23 )	1
22	16-980	Mount Bracket	2
	HB-516-18-175	Bolt $\frac{5}{16}$ - 18 x $1\frac{3}{4}$	4
	HW-516	Washer $\frac{5}{16}$	4
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	4

# 17-507 HOSE REEL DRAWING



Accessories

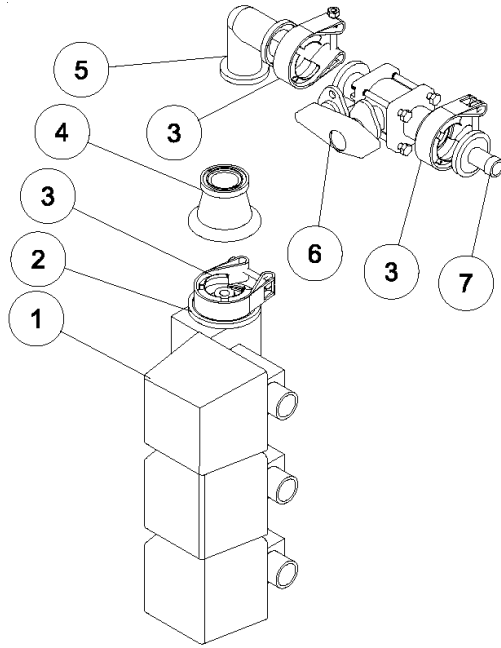
## 17-507 HOSE REEL PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	HB-38-16-350	Bolt $\frac{3}{8}$ - 16 x $3\frac{1}{2}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
2	14-325	Boom Carrier (part of machine)	2
3	10-221	Hose Reel Mount	1
4	16-906	Electric Hose Reel	1
	16-129	Manual Hose Reel	1
5	18-249	Brass Fitting $\frac{3}{4}$ MPT x $\frac{3}{4}$ HB	1
6	HB-516-18-150	Bolt $\frac{5}{16}$ - 18 x $1\frac{1}{2}$	4
	HNTL-516-18	Lock Nut $\frac{5}{16}$ - 18	4
7	HB-38-16-250	Bolt $\frac{3}{8}$ - 16 x $2\frac{1}{2}$	2
	HNTL-38-16	Lock Nut $\frac{3}{8}$ - 16	2
8	16-295	Hose Fitting	1

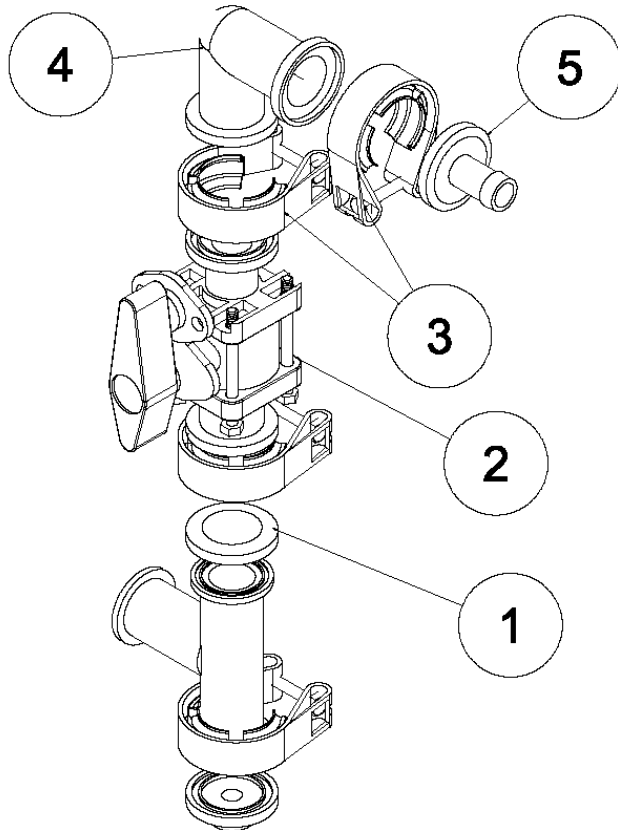
1. Wear protective clothing when draining the tank and taking apart the lines.
2. Drain tank and spray system in a safe and approved method insuring that no chemical or water remain in tank as you will be taking apart lines.
3. Remove key from ignition, set park brake and block wheels.
4. Remove square rubber covers on boom carriers.
5. Place hose reel bracket inside the boom carrier tube on left side and outside on right side with arms pointing toward front of machine.
6. Lower bracket until top hole in bracket lines up with hole in upright. Bolt as shown.
7. Put hose reel on hose reel bracket with fitting on left side of machine. Use four bolts  $\frac{5}{16}$  - 18 x  $1\frac{1}{2}$  and four  $\frac{5}{16}$  - 18 lock nuts to hold in place. Tighten bolts.
8. Put 18-249 barb fitting into hose reel.

(Continued on next page)

## 1752 (RAVEN 440 ) PLUMBING



## 1754 (SSC 203 ) PLUMBING



## 1752 PLUMBING PARTS LIST AND INSTALLATION

REF#	PART#	DESCRIPTION	QUANTITY
1	15-743	Electric ball Valve	1
2	15-742	Inlet Cover	1
3	15-740	50 Series Clamp	3
4	15-748	Reducer Coupling	1
5	15-736	#50 Elbow Coupling	1
6	15-738	Flanged Ball Valve	1
7	15-749	Hose Barb	1

### INSTALLATION INSTRUCTIONS

1. On the top of the Electric Spray Control Valve (Ref 1) you will find a cover. Remove clamp, o-ring and cover. Install a 15-748 reducer (Ref 4) in place of the cover you just removed. Reinstall clamp and o-ring and tighten. The cap will not be used again.
2. Install a 15-736 Elbow onto the top of the reducer with a 15-740 clamp (Ref 3) and O-ring. Rotate it 90° so it points to the rear of the machine, then tighten clamp.
3. Install the 15-738 ball valve (Ref 6) onto the elbow using a 15-740 clamp and O-ring. Tighten with the handle on the top or side.
4. Install the 15-749 Hose Barb (Ref 7) onto the open end of the ball valve with a 15-740 clamp and o-ring. Tighten.
5. Route the orange  $\frac{3}{4}$ " hose fro the hose barb to the hose barb on the hose reel and secure with a 18-040 Hose clamp.
6. Secure the orange hose to the machine with a nylon tie strap.

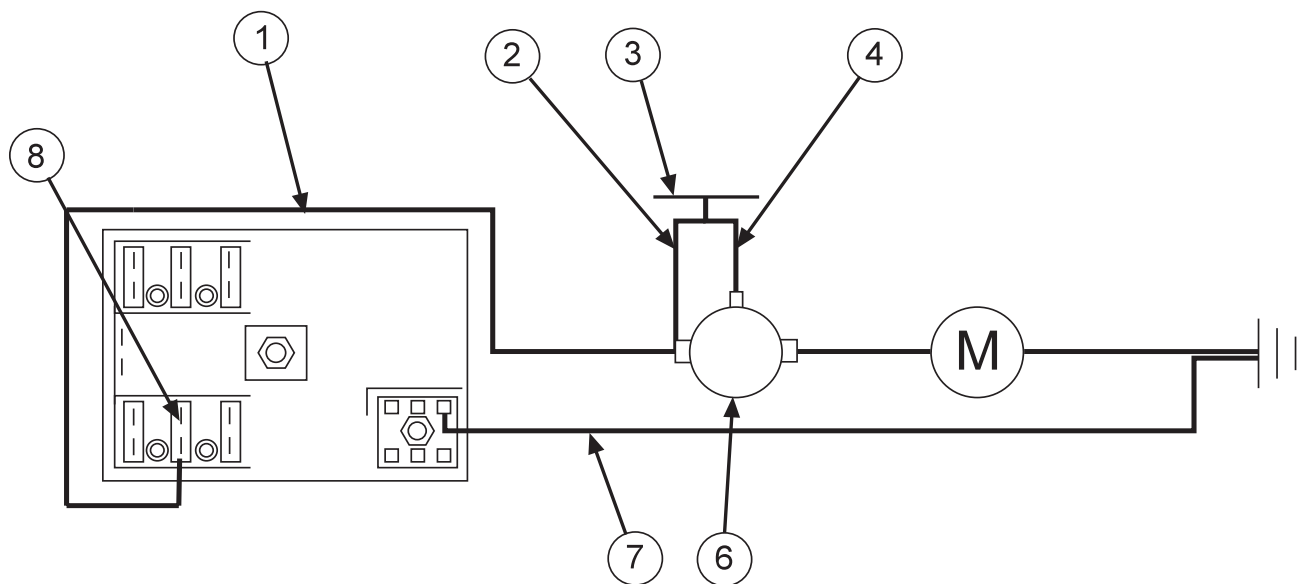
## 1754 PLUMBING PARTS LIST AND INSTALLATION

REF#	PART#	DESCRIPTION	QUANTITY
1	15-778	Blank Guage Port	1
2	15-738	Flanged Ball Valve	1
3	15-740	50 Series Clamp	2
4	15-736	#50 Elbow Coupling	1
5	15-749	Hose Barb	1

### INSTALLATION INSTRUCTIONS

1. Between the boom control valves and the fuel tank you will find a tee fitting with a black cap on top of it. Remove the clamp and the cap.
2. Install the 15-738 ball valve (Ref 2) onto the top of the tee using the clamp and o-ring you removed in step 1. The Handle can be positioned so it clears the other hoses by rotating it before the clamp is tightened. Tighten clamp when ball valve is in the position you wanted.
3. Install the 15-736 Elbow (Ref 4) on top of the ball valve pointing to the back of the machine and secure with 15-740 clamp(Ref 3) and O-ring. Tighten.
4. Install the 15-749 flanged hose barb (Ref 5) on to the open end of the elbow with a 15-740 clamp and O-ring. Tighten.
5. Route the orange  $\frac{3}{4}$ " hose from the hose barb you just installed to the hose barb on the hose reel. Secure with an 18-40 hose clamp. Secure orange hose to machine with 22-075 nylon ties.
6. You will have a reducer coupling, clamp and cap left over that you will not need.

## ELECTRIC HOSE REEL WIRING DIAGRAM



## HOSE REEL ADJUSTMENTS

### OPERATIONAL CHECK:

1. Pull hose off drum at least one full revolution. A clicking noise should be heard from locking mechanism.
2. Let the hose retract.
3. Pull the hose off until the first click is heard. Drum should lock when the hose tension is removed.
4. Continue pulling the hose, no more than one revolution, until no clicking is heard. Hose should rewind when tension is removed.

### HOSE REPLACEMENT PROCEDURE:

1. Facing swivel, turn the hose drum clockwise until all of the hose is removed from the drum and the drum is held by locking mechanism. Make sure spring is locked.
2. Remove hose clamps and disconnect hose from swivel. Remove old hose.
3. Insert new hose through roller guide, connect to swivel and reinstall hose clamps. Use spring guard over hose to protect the hose from being cut by the drum.
4. Remove check ball from old hose and install on replacement hose.
5. Carefully, keeping the tension on the hose, pull the hose to release the locking mechanism. Let the hose wind on the drum.



## ELECTRIC HOSE REEL WIRING PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
	8843-132	Flexguard $\frac{3}{8}$ " ID	1
1	8919-144	10GA Red Wire 144"	1
	8901	Slide-On Connector	1
2	16-979	Wire, Switch to Solenoid Hot Terminal	1
3	33-251	Push Button Switch	1
4	16-978	Wire, Switch to Solenoid Start Terminal	1
6	12-015	Solenoid	1
<b>SOLENOID TERMINALS</b>			
	HN -516-24	$\frac{5}{16}$ " - 24 Hex Nut	2
	HN -10-32	10 - 32 Hex Nut	1
7	8931-144	10GA White Wire 144"	1
	8901	Slide-On Connector	1
8	33-273	Auto Blade Type Fuse 30Amp	1

### CONNECTION INSTRUCTIONS

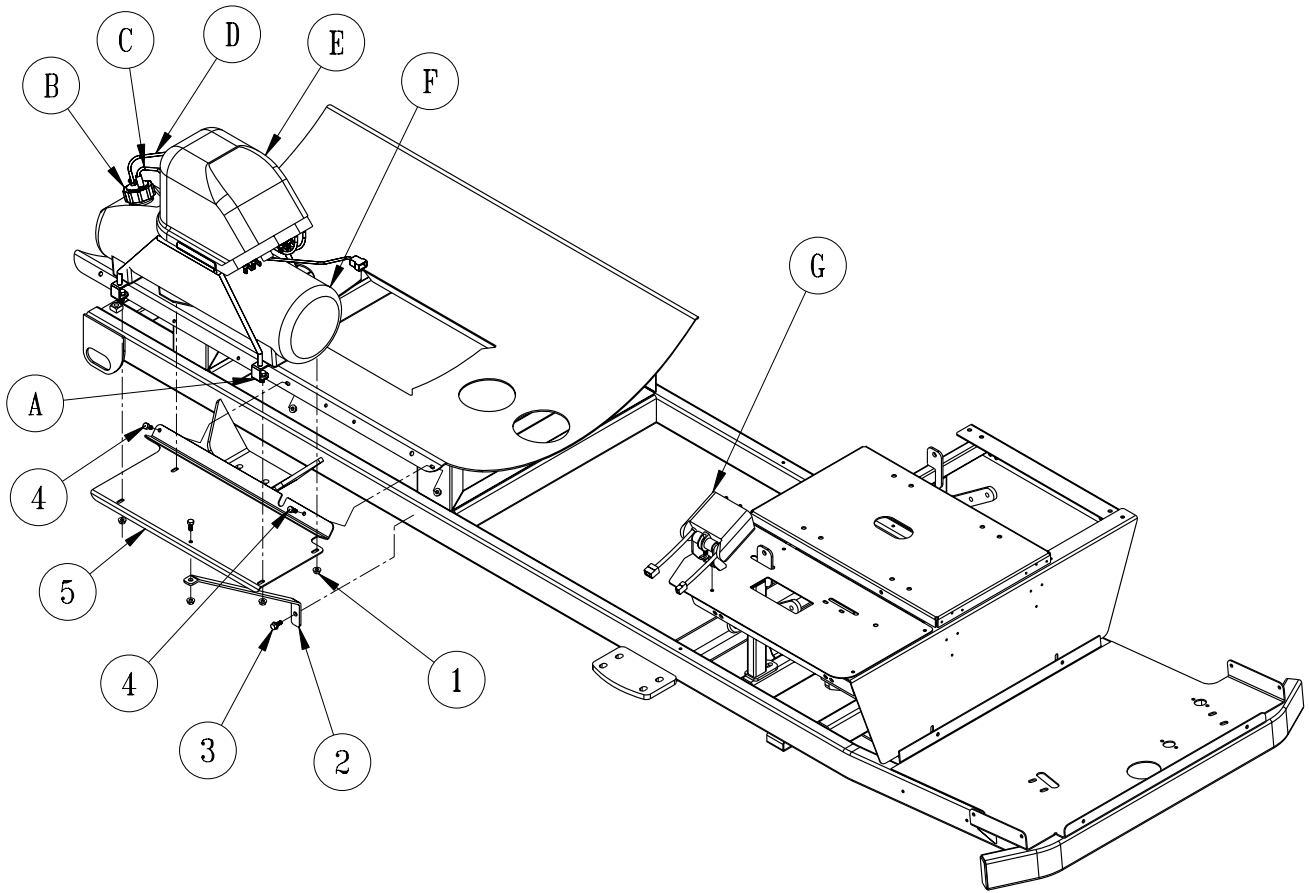
Route wire harness along side of tank and over to fuse block taking care to stay clear of moving parts or hot engine components. Cut off excess wire and strip back  $\frac{3}{8}$ ". Place one 8963 heat shrink ( $\frac{1}{4} \times 1\frac{1}{4}$ ) on each wire before crimping 8901 slide on connectors to the red and white wires. Connect the two wires to the fuse block first the red to the (+) positive and the white to the (-) negative. Put the 33-273 auto blade type fuse (30 amp) into fuse block.



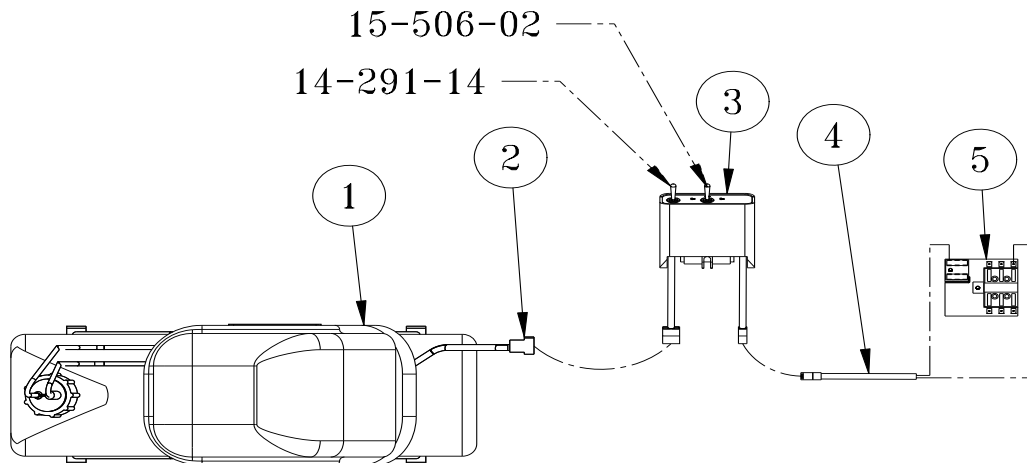
**WARNING** Make certain you are connecting positive (+) to positive; negative (-) to negative while attaching power leads. If you do not observe polarity, damage will result to electrical components.

*Use Dielectric Grease On All Electrical Connections*

# 17-505 FOAM MARKER FOR 1750 DRAWING



# WIRING DRAWING



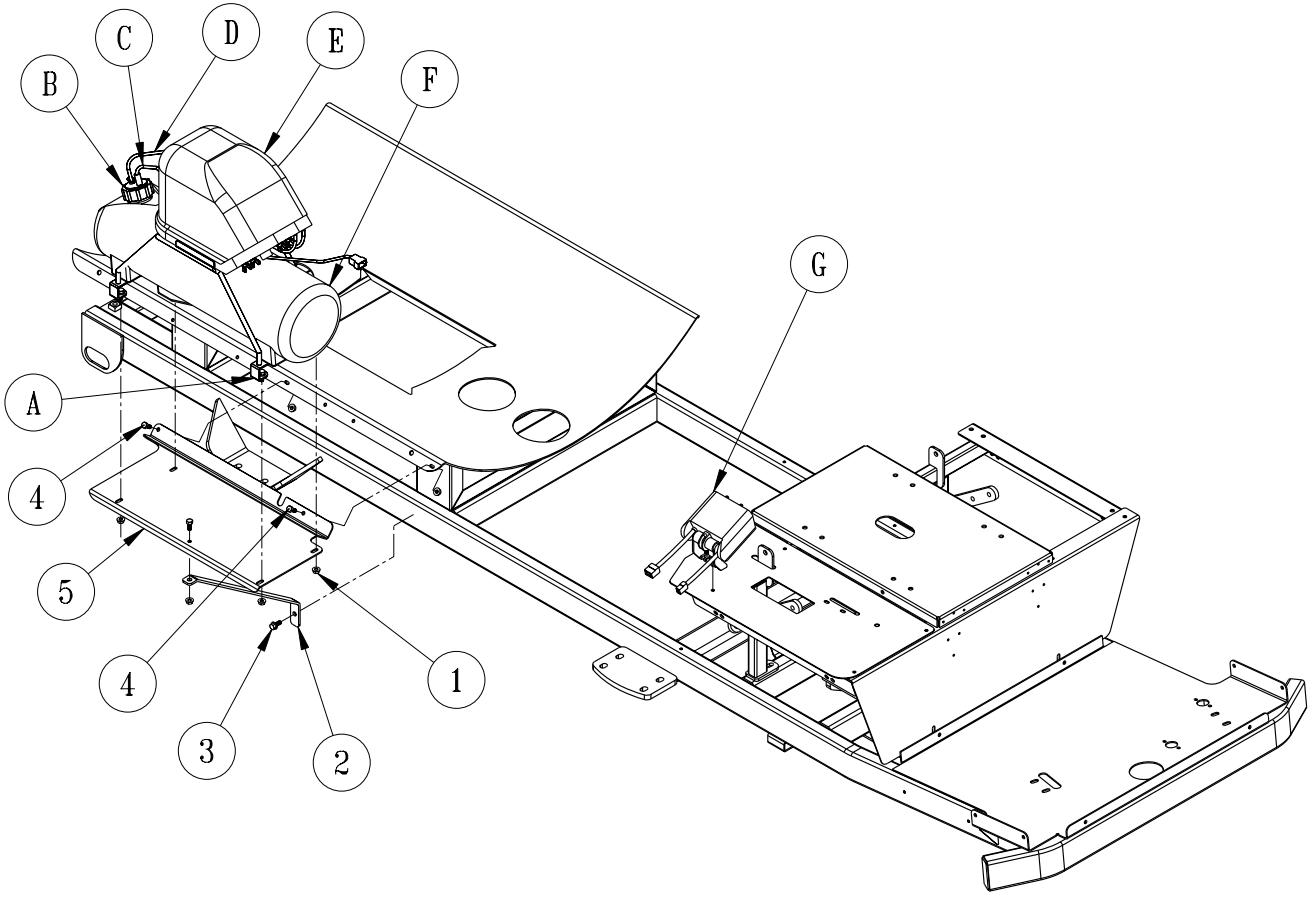
## 17-505 FOAM MARKER FOR 1750 PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	HBFL-516-18-075	Flange Bolt, $\frac{5}{16}$ -18 x $\frac{3}{4}$	7
	HNFL-516-18	Flange Lock Nut, $\frac{5}{16}$ - 18	7
2	15-689	Foamer Bottom Brace	1
3	HBFL-516-18-075	Flange Bolt, $\frac{5}{16}$ -18 x $\frac{3}{4}$	1
4	HN-14-20-075	Hex Bolt, $\frac{1}{4}$ -20 x $\frac{3}{4}$	2
	HBFL-14-20	Flange Lock Nut, $\frac{1}{4}$ -20	2
5	15-755	Mount Plate	1
A	14-291-04	Tank Bracket	2
B	14-284-02	Cap Assembly	1
C		Blue Tube	1
D		Clear Tube	1
E	14-291-03	Compressor Only	1
	14-291-01	Black Cover	1
F	14-291-02	Foamer Tank	1
G	14-291-05	Double Switch Box	1
	15-506-01	Fuse (F10A 250)	1
	15-506-02	Switch	1
A-G	14-291	Foamer (includes parts A-G)	1

## FOAM MARKER WIRING PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	14-291-03	Compressor	1
2	15-504-04	Wiring Harness	1
3	14-291-05	Switch Box	1
	15-506-01	Fuse (F10A 250V)	1
	15-506-02	Switch	1
4	15-509	Power Cable	1
5	33-271	Fuse Block (part of machine)	1
	33-507	Auto Blade Type Fuse 10 amp	1

# 17-505 FOAM MARKER FOR 1750 DRAWING



Accessories

# INSTALLATION INSTRUCTIONS

**Safety:** Before working on machine stop engine, set park brake, remove key from ignition and block wheels. Disconnect negative (-) battery terminal.

1. Mount the switch box to the panel to the right of the operator's seat. Remove the drill screw on the right hand rear side and mount the Switch Box (Ref. G) using this screw. The switch box must be mounted facing towards the operator's seat.

## WIRING

Use dielectric grease on all electrical connections. Connect power cable (15-509) to the switch box. Turn the switch off. Route the power wire to the fuse block (on the inside of the engine cover) out of the way of any heat or moving parts. Use nylon ties as needed. Cut the power wire with enough length to connect the fuse block. Put the slide on terminal with heat shrink onto the wire ends and connect to fuse block. Red to positive(+), black to negative(-). Insert 10 amp fuse into slot which has red wire attached to it.

## MOUNTING THE FOAMER UNIT

1. Position the Mount Plate (Ref. 5) as illustrated and mount to the Tank Carrier using two  $1/4$ -20 x  $3/4$  Flange Bolts and  $1/4$ -20 Flange Lock Nuts. Leave loose.
2. Connect Brace (Ref. 2) to the Mount Plate using one  $5/16$ -18 x  $3/4$  Flange Bolt and  $5/16$ -18 Flange Lock Nut. Tighten. Bolt Brace (Ref. 2) to the tapped hole in the mainframe using one  $5/16$ -18 x  $3/4$  Flange Bolt. Tighten.
3. Tighten hardware connecting Mount Plate (Ref. 5) to the Tank Carrier.
4. Place Foamer unit (Refs. A-G) on the Mount Plate (Ref. 5) and bolt in place with four  $5/16$ -18 x  $3/4$  Flange Bolts and  $5/16$ -18 Flange Lock nuts (Ref. 1). Foamer must be placed with the Cap Assembly (Ref. B) facing to the **rear** of the machine.
5. Tighten hardware.

## CONNECTING THE CAP ASSEMBLY

Connect the blue tube to the tank cap connector which is also connected to the large blue tube which hangs below the cap. This is the soap outlet tube. Connect the clear tube to the other connector on the tank cap. This is the air input tube. Tighten connectors hand tight, assembly tank cap onto tank.

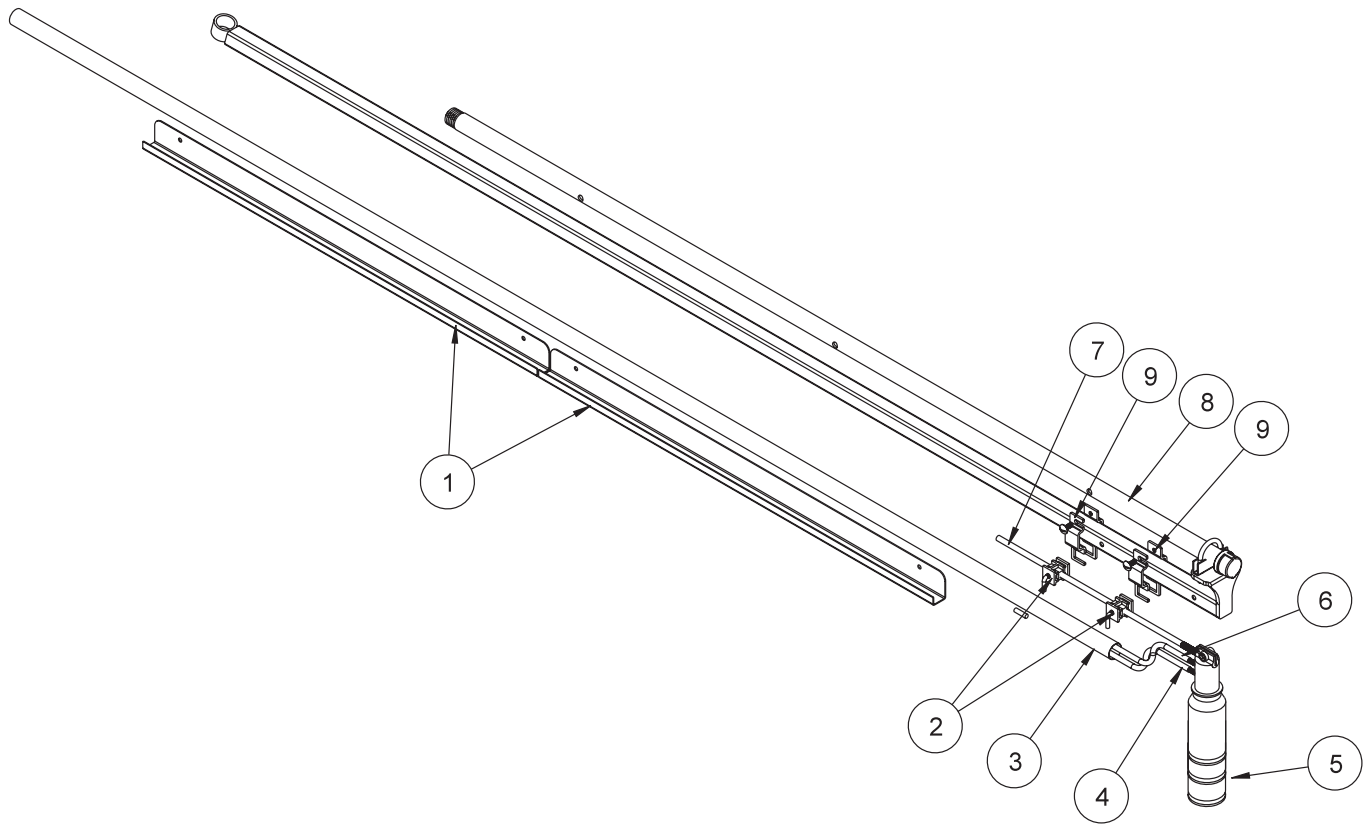
## HOSES

Being careful not to cut the tubing, cut the oversleeve back approximately 2" (5 cm) to expose blue and clear tubing. Remove blue wing nut from top connector of foam nozzle and slide it on the blue tube with the threads facing toward end of tube. Slide blue tube all the way over the top of the small tube on foam nozzle. Slide wing nut back to the threads and hand tighten. Follow the same steps for the clear tube and tube nut.

Route the tubing along underside of main frame using tie downs as necessary.

Install opposite ends of air-liquid tubes to compressor, again cutting back the oversleeve approximately 2" (5 cm) and inserting blue and clear tubes for the left boom section into the tubing connectors on the right side of compressor as far as possible. Follow the same steps for the right boom tubing. Notice the right boom is inserted into left side of compressor. To release tubing from compressor, hold black ring around tubing, and pull tube out.

# FOAMER NOZZLE MOUNT & HOSE GUARD MOUNT DRAWING



Accessories

## 17-505 FOAM MARKER PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	15-537	Foamer Hose Guard 31"	4
	HSDPS-14-075	Stainless Steel Pan Head Drill Screw $\frac{1}{4} \times \frac{3}{4}$	8
2	16-987	Foam Nozzle Mounting Kit	1 per boom
3	15-507	Foamer Tubing	2
4		Clear Tubing	
5	15-511	Foam Nozzle	2
6		Blue Tubing	
7	15-510-01	Nozzle Mounting Rod	2
8		Boom	
9	16-795	Square Clamp	4

## INSTALLATION INSTRUCTIONS

- Slide hose clamp onto drop tube of foam nozzle and attach restrictor bell.
- Place splined end of Nozzle mounting rod (Ref 7) into top of foam nozzle (Ref 5). Tighten screw.
- Slide two foam nozzle mounts (Ref 2) onto the rod. Place square clamps (Ref 9) on foam nozzle mounts and mount the square clamps to the boom (Ref 8). Adjust foam nozzle mounts and clamps so nozzle assembly will clear end of boom. Tighten foam nozzle mounts and square clamps to prevent side to side movement. Do the same to the other side.
- Being careful not to cut the tubing (Ref 3), cut the oversleeve back approximately 2" (5 cm) to expose blue (Ref 6) and clear tubing (Ref 4).
- Remove blue wing nut from top connector of foam nozzle and slide it on the blue tube with the threads facing toward end of tube. Slide blue tube all the way over the top of the small tube on foam nozzle. Slide wing nut back to the threads and hand tighten. Follow the same steps for the clear tube and tube nut.
- Route the tubing along underside of main frame using tie downs as necessary.
- Install opposite ends of air-liquid tubes to compressor, again cutting back the oversleeve approximately 2" (5 cm) and inserting blue and clear tubes for the left boom section into the tubing connectors (Ref A) on the right side of compressor as far as possible.
- Follow the same steps for the right boom tubing. Notice the right boom is inserted into left side of compressor. To release tubing from compressor, hold black ring around tubing, and pull tube out.
- Hose's must be routed on bottom of the boom square tubing.
- Mark 6 inches in from inside edge of foamer nozzle mounting bracket on square boom tubing.
- Place hose guard (Ref 1) flush with top of square tubing with edge on previous mark. The channel covers hoses on the bottom of the square tubing.
- Install hose guard using 2 drill screws (you may want to drill a  $\frac{3}{16}$  pilot hole first).
- Place another hose guard against first and install in same manner.
- Repeat process for other boom side.
- Connect small plastic electrical plug under compressor to electrical extension cable.
- For *Spray Star 1600* route extension cable under engine along the mainframe cross bar, using tie downs as necessary.
- Cut cable and strip casing, allowing enough length to connect to fuse block.
- Strip and connect slide on connectors to each wire and use the heat shrink.
- Connect black negative (-) wire to the ground and connect red wire to the positive (+).
- Insert 10 amp fuse into slot which red wire was attached to.

# FOAM MARKER DRAWING



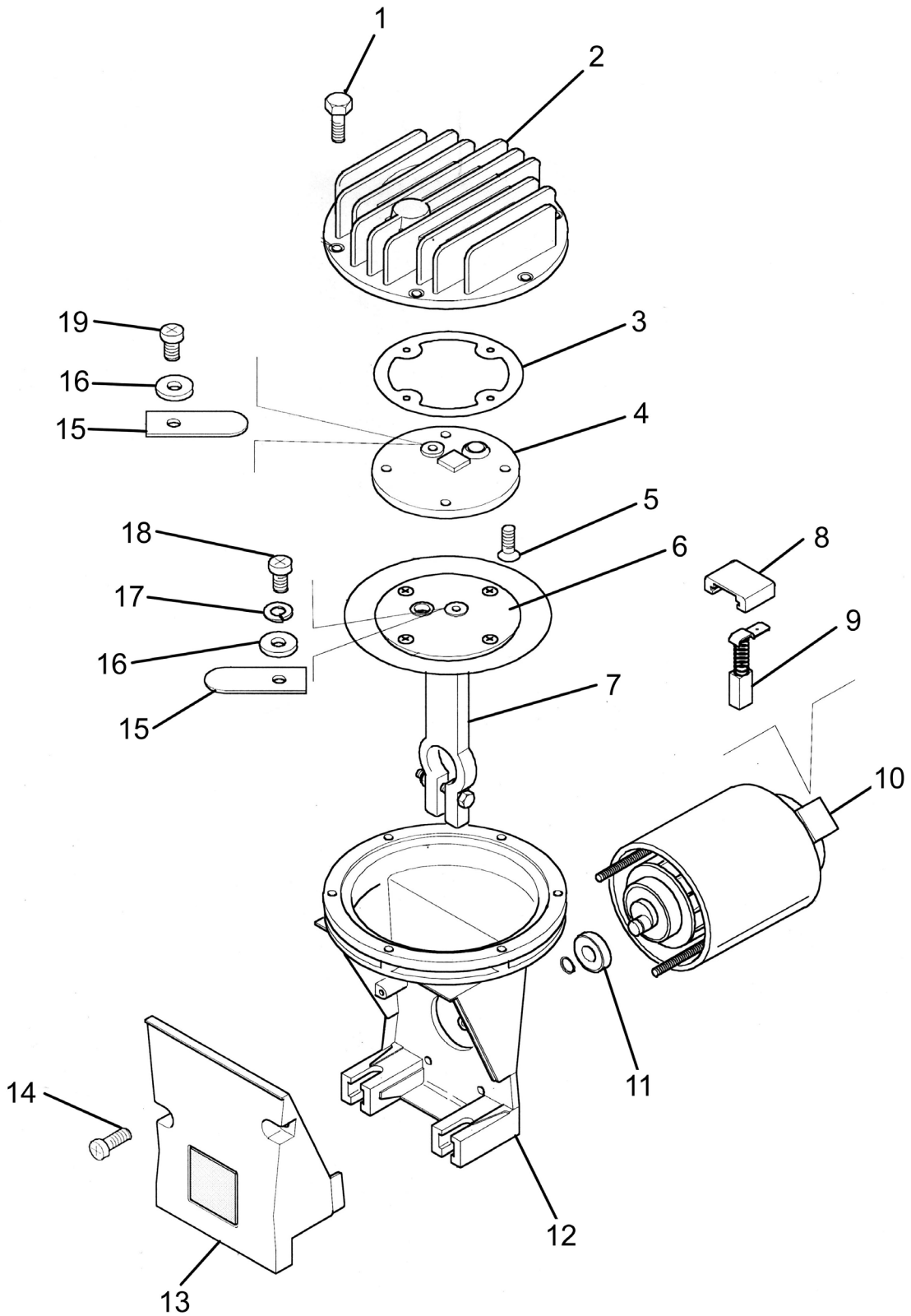
Accessories



## FOAM MARKER PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	15-507	Foamer Tubing	2
2	14-291-02	Tank	1
3	14-291-01	Black Cover	1
	14-291-03	Compressor	1
4	14-284-02	Cap Assembly	1
5	14-291-04	Tank Bracket	1
6	14-291-05	Double Switch Box	1
7	15-511	Foam Nozzle	1
8	15-510-01	Nozzle Mounting Rod	1
9	16-987	Foam Nozzle Mounting Kit	1

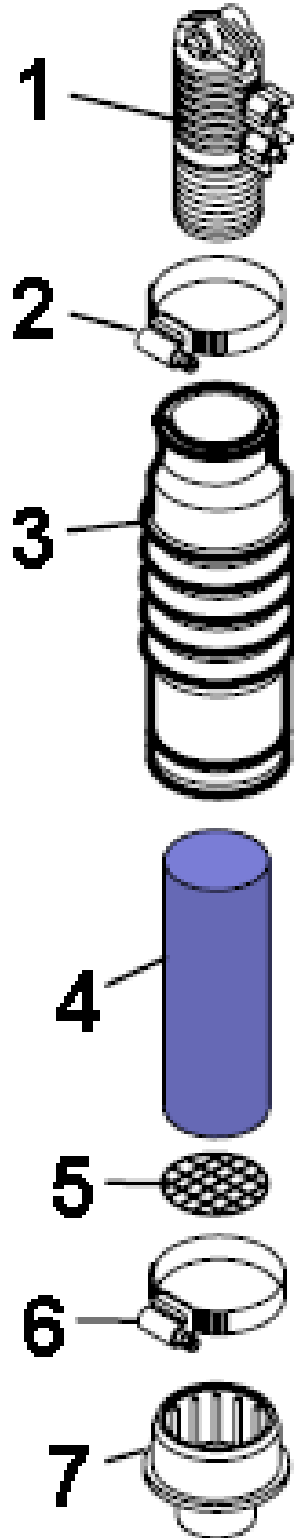
# 15-505 MOTOR SUB ASSEMBLY DRAWING



## 15-505 MOTOR SUB ASSEMBLY PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1†		Bolt	6
2		Head	1
3	15-505-01	Exhaust Manifold Gasket	1
4		Exhaust Manifold	1
5†		Manifold Screw	8
6†	15-505-03	Diaphragm	1
7†		Piston	1
8		Brush Retainer	2
9	15-505-06	Brush	2
10	15-505-07	12 Volt Electric Motor	1
11	15-505-05	Stainless Steel Bearing	1
12		Block	1
13		Cover	1
14		Cover Screw	2
15*		Exhaust Reed Valve	1
16*†		Washer	2
17*†		Split Lockwasher	1
18*†		Intake Valve Screw	1
19*		Exhaust Valve Screw	1
*	15-505-02	Intake Exhaust Valve Sub Assembly	
†	15-505-04	Intake Piston Sub Assembly	

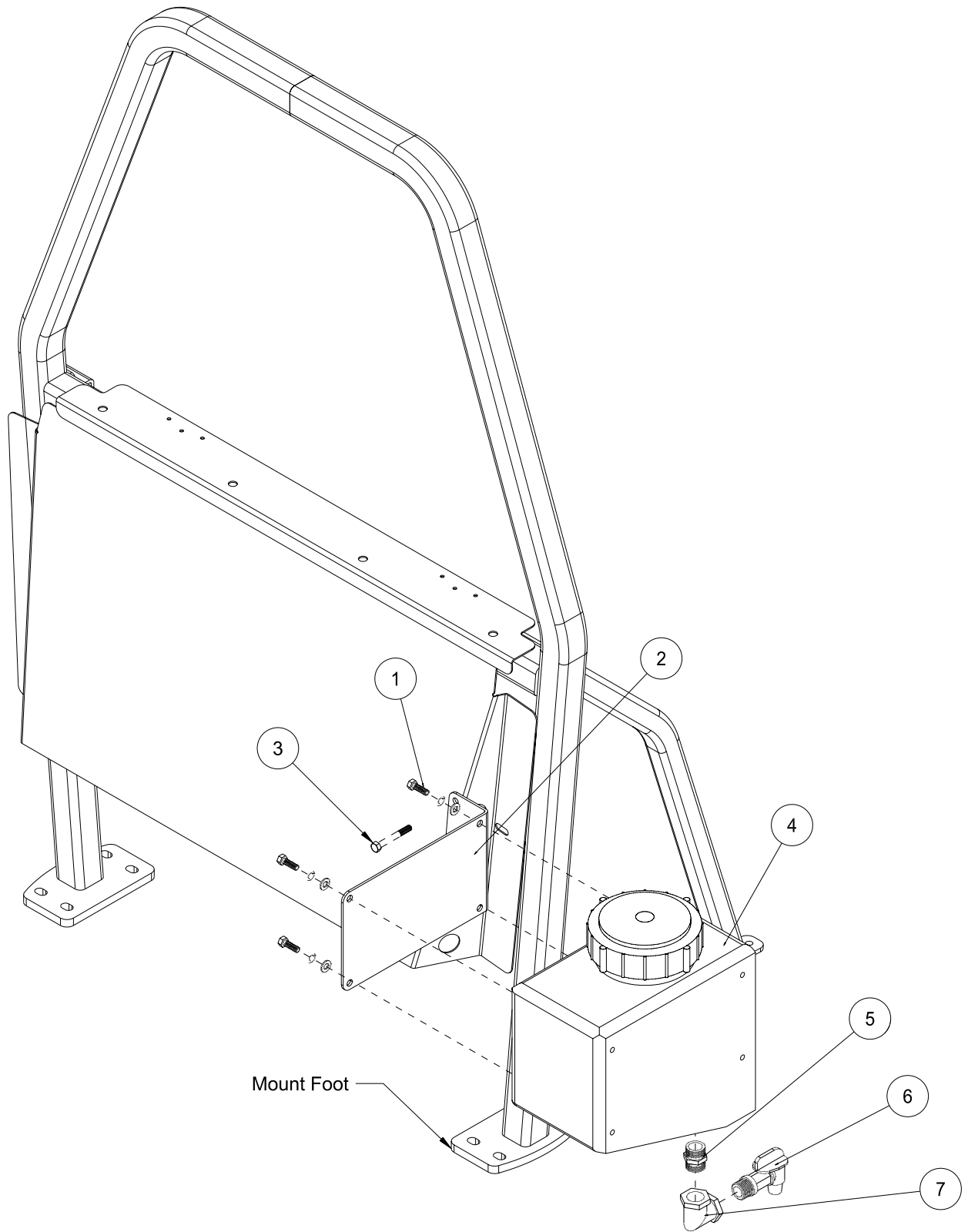
# 15-511 FOAM NOZZLE SUB ASSEMBLY DRAWING



## 15-511 FOAM NOZZLE SUB ASSEMBLY PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1*	15-511-01	Foam Nozzle Inlet Body	1
	15-510-01	Nozzle Mounting Rods	2
2*		Hose Clamp	1
3*		Drop Tube	1
4	15-511-08	Foam Sponge	1
5	15-511-09	Stainless Steel Screen	1
6		Hose Clamp	1
7	14-284-09	Foam Nozzle Reducer	1
*	15-511-07	Foam Nozzle Sub Assembly	

# 17-506 FRESH WATER TANK DRAWING



Accessories

## 17-506 FRESH WATER TANK PARTS LIST

REF#	PART#	DESCRIPTION	QUANTITY
1	HB-516-18-075	Bolt $\frac{5}{16}$ - 18 x $\frac{3}{4}$	4
	HW-516	Washer $\frac{5}{16}$	4
	HWL-516	Lock Washer $\frac{5}{16}$	4
2	15-750	Tank Mount Bracket	1
3	HB-38-16-275	Bolt $\frac{3}{8}$ - 16 x $2\frac{3}{4}$	2
	HNFL-38-16	Flange Lock Nut $\frac{3}{8}$ - 16	2
4	10-234	3 Gallon Rectangular Tank	1
5	16-158	Close Nipple $\frac{3}{4}$ x $\frac{3}{4}$	1
6	16-960	Spigot $\frac{3}{4}$ NPT	1
7	16-151	Elbow FPT $\frac{3}{4}$ x $\frac{3}{4}$	1

## INSTALLATION INSTRUCTIONS

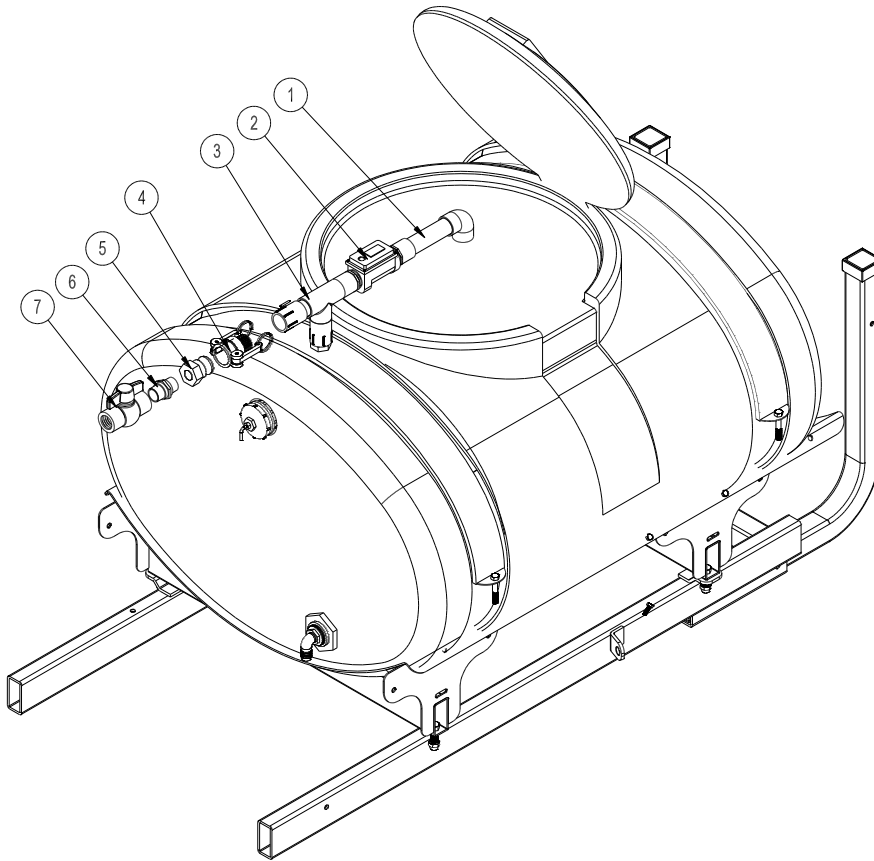
1. Fresh Water Wash Tank mounts on the left side of the Roll Bar just above the sprayer control valve.
2. Clamp the mount bracket to the roll bar post approximately 19" up from the mount foot and then mark the holes onto the tube with a center punch. Drill the two holes using a  $\frac{3}{8}$  drill bit.
3. Secure the bracket to the post with two  $\frac{3}{8}$  x  $2\frac{3}{4}$  bolts and flange lock nuts. Then tighten.
4. Install the nipple (Ref 5), elbow (Ref 7) and spigot (Ref 6) into the bottom of wash tank (Ref 4). Use thread tape on all threads.
5. Mount the tank onto the mount bracket (Ref 2) using four  $\frac{5}{16}$  x  $\frac{3}{4}$  bolts, washers and lockwashers. Tighten.
6. Rinse tank with clear water and check for leaks around fittings.



This tank is for fresh clear water **ONLY**. Do not put chemicals in this tank.

## 14-515 WATER METER KIT (GALLONS)

## 15-618 WATER METER KIT (LITERS)





## WATER KIT PARTS LIST

REF #	PART #	DESCRIPTION	QUANTITY
1	14-524	Filler Outlet	1
2	14-514	Water Meter	1
3	14-525	Filler Inlet	1
4	16-962	1"Quick Coupler (already on machine)	1
5	16-961	1" Adapter Quick Coupler (already on machine)	1

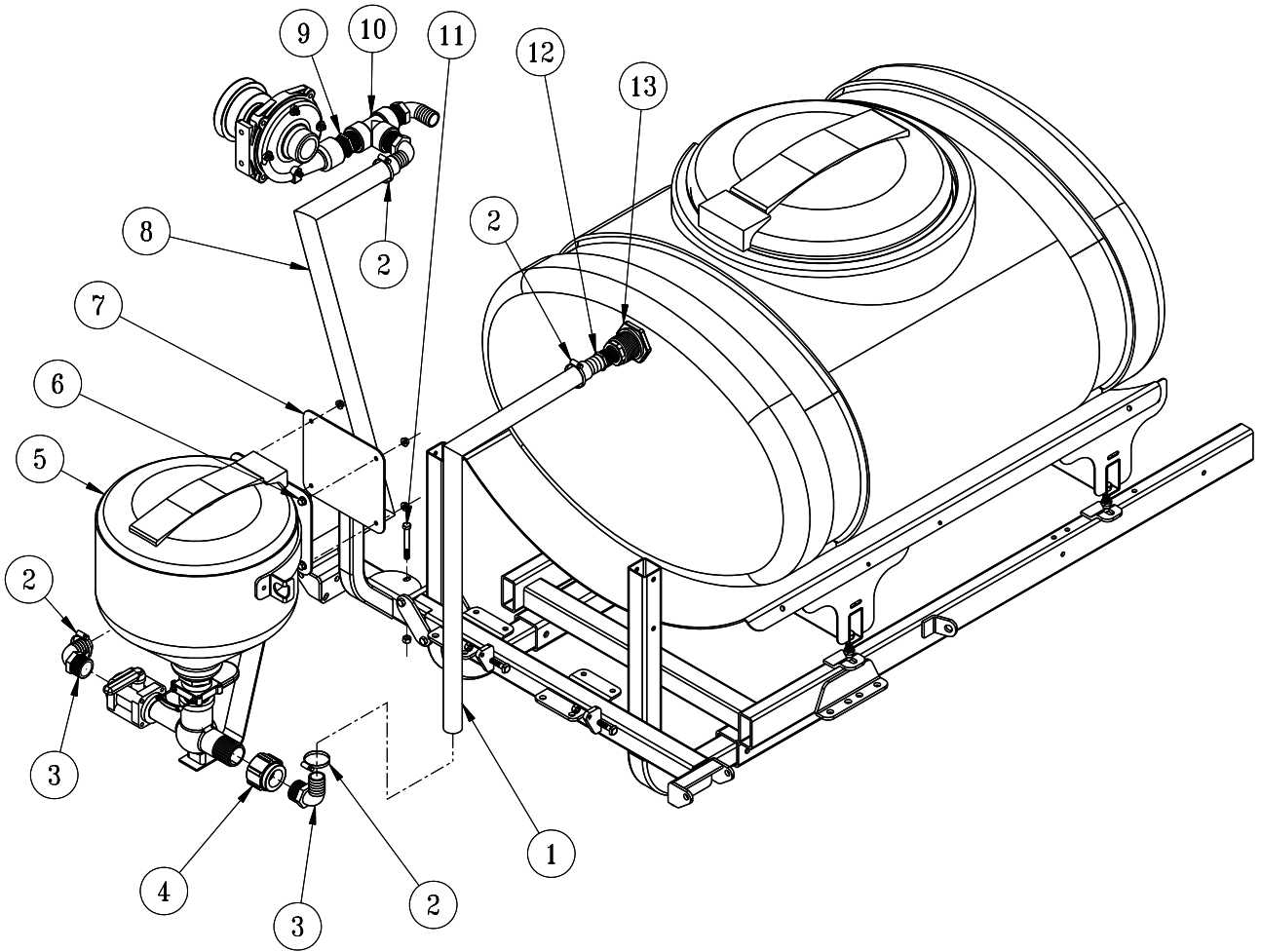
1. Thoroughly flush the service line upstream of the meter to remove dirt and debris.
2. The DLJ Meter is for use **only** with **COLD WATER** up to 122°F (50°C)
3. Slowly open any upstream valves to prevent damage to the meter.

### **Gallons to Cubic feet Conversion :**

Multiply gallons reading by 0.1337 to get cubic feet.

There are 7.48052 gallon per cubic foot.

# 15-619 CHEMICAL CLEANLOAD SAFE FILL SYSTEM



Accessories

## 15-619 CHEMICAL CLEANLOAD PART LIST

REF#	PART #	DESCRIPTION	QUANTITY
1	8889-25	1 1/4" Suction Hose 25"	1
2	18-116	Hose Clamp	4
3	16-156	90° Hose Barb	3
4	18-391	Coupling	1
5	15-620	Cleanload Assembly	1
6	HBFL-516-18-075	Flange Bolt, 5/16 - 18 x 3/4	4
	HNFL-516-18	Flange Lock Nut, 5/16 - 18	4
7	15-816	Mixer Mount	1
8	8889-88	1 1/4" Suction Hose 88"	1
9	16-880	Close Nipple	1
10	18-390	Pipe tee	1
11	HB-38-16-300	Hex Bolt, 3/8 - 16 x 3	1
	HNTL-38-16	Lock Nut, 3/8 - 16	1
12	16-159	Fitting	1
13	16-945	Fitting ( <i>part of tank</i> )	

## INSTALLATION INSTRUCTIONS

1. Make sure sprayer tank is empty and flush all chemical residue from sprayer. Always wear protective clothing, goggles and gloves.
2. Disconnect outlet hose from the spray pump then the 90° fitting from the pump.
3. Install the close nipple, tee, elbow and the 90° elbow that was removed from the pump. Always use thread sealant on all fittings. Tighten all Fittings. One of the 90° fittings should point towards the right side of the machine and the other one needs to point to the back of the machine.
4. Reinstall the outlet hose onto the spray pump and tighten hose clamp.
5. Install 88" of 1 1/4" suction hose onto the elbow on the pump that points back and tighten hose clamp.
6. Route the 88" hose to the back of the sprayer so it connects over the top of the left boom support tube.
7. Install Mixer Mount (Ref 7) onto the left hand side of the center boom section. The Mount will slide over the 2" tube under the actuator. Secure Mixer Mount with 3/8 x 3 bolt and lock nut. Tighten.
8. Mount Cleanload Assembly onto mixer mount using 5/16 x 3/4 flange bolts and flange nuts. Tighten.
9. Install 18-391 reducer coupling (Ref 4) onto outlet side. Then a 16-156 90° elbow (Ref 3) into the coupling pointing up and one into valve with yellow handle. Tighten fittings so that the elbow in the valve is pointing up and forward. The outlet fitting should be pointing up.
10. Remove the plug from the top back of the spray tank and install 16-159 hose barb (Ref 12) and tighten. Now the 25" hose can be installed from the tank to the outlet fitting and tighten with clamps.
11. The hose from the spray pump can be connected to the inlet fitting and tightened with clamps.
12. Make sure all hardware, fittings and clamps are tight. Add about 25 gallons of water to the spray tank. Start sprayer and circulate water through system to check for leaks.
13. Be sure to read start up, loading and shutdown instructions for Cleanload Assembly before using with chemicals. When working with chemicals **Always** wear protective clothing, goggles and gloves.

# OPERATING INSTRUCTION

## STARTUP

1. All Cleanload valves must be closed prior to starting: inlet ball valve, knife valve and hopper rinse ball valve.
2. Open lid to check for foreign objects which may hinder performance or contaminate the system.
3. Close and lock lid by turning cover clockwise.
4. Divert pump flow to Cleanload inlet line. A pressure of 30 PSI minimum and 150 PSI maximum must be used. Highest pressures increase eduction rate and available wand suction.
5. Turn inlet ball valve on (yellow handle).
6. Open knife valve, located on the bottom of hopper, by pushing handle in (red handle).
7. Unlock and open lid slowly by turning cover counterclockwise.

## LOADING LIQUID OR POWDERED CHEMICAL INTO HOPPER

8. Pour required amount of chemical into hopper. Avoid splashing liquids or powdered chemicals outside of hopper.
9. Rinse empty chemical containers if applicable. Place container opening over container rinse valve and press down. This will activate the rinse valve and rinse container.
10. Rinse Cleanload hopper. Close and lock lid by turning cover clockwise. Release the safety locking band on the hopper rinse ball valve and turn on for 20 seconds. Close ball valve and return locking band to locked position.
11. Open lid and inspect for chemical residue. Repeat step 10 as necessary.
12. Close knife valve by pulling red handle out towards you. Turn inlet (yellow handle) off.

## LOADING LIQUID AND/OR POWDERED CHEMICAL WITH SUCTION LANCE

**Note: Lance suction is dependent upon eductor pressure and flow. For best results, use highest pressure available up to 150 PSI maximum.**

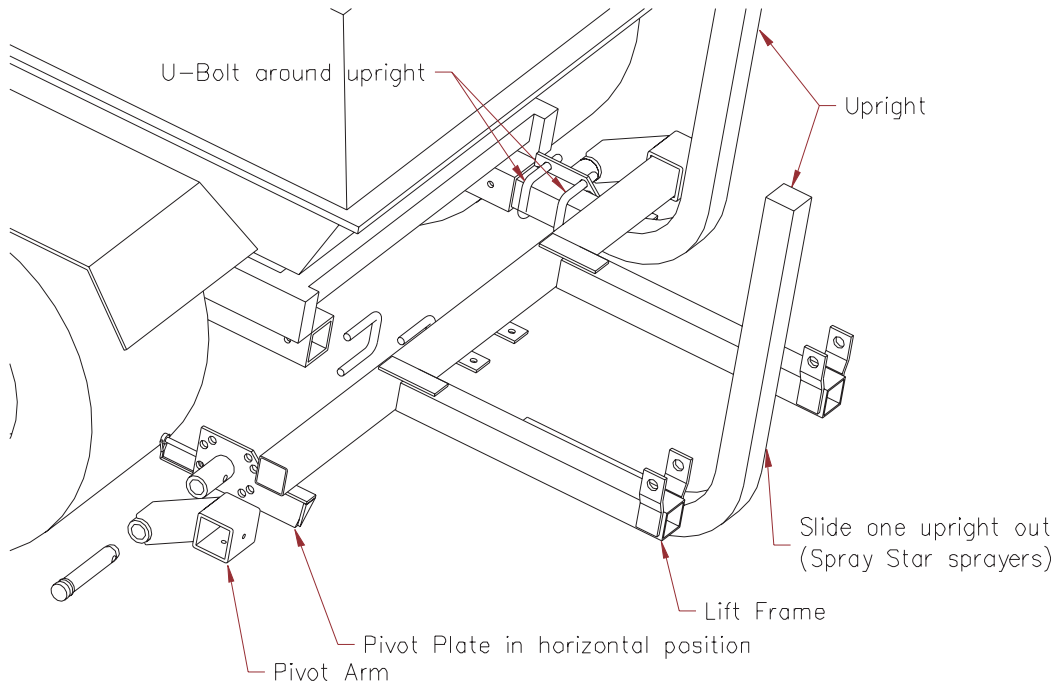
8. Insert lance body with o-ring into eductor until the o-ring is sealed.
9. Use the free end of the lance to pierce bag or container to vacuum powdered or liquid chemical.
10. Rinse lance. Place lance end into a clean container of water to rinse lance assembly.
11. Remove lance body from eductor and drain any remaining fluid into hopper.
12. Close knife valve (red handle). Turn inlet valve (yellow handle) off.

## SHUTDOWN

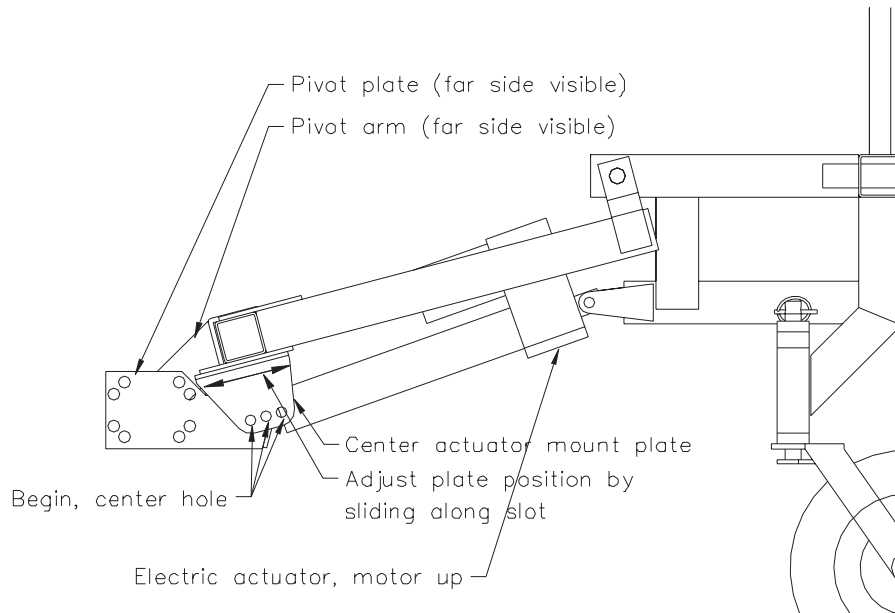
1. Ensure that:
  - All valves are closed. Be sure to close knife valve first. (Close by pulling red handle out towards you.)
  - Chemical residue has been cleaned.
  - Hopper lid is closed and locked by turning cover clockwise.
2. Divert pump flow back to normal operation.

Symptom	Corrective Action
Low education rate	<p>Check pump pressure and flow. Cleanload Eductor performance is based on flow and pressure to the system. Note requirements for high education rates.</p> <p>Increase outlet hose size back to tank.</p>
Plugged or clogged bottle rinse nozzle	<p>Disassemble rotary portion of nozzle from lower valve assembly and back flush until nozzle ports are clear of debris.</p>
Plugged or clogged tank rinse nozzle	<p>Disassemble rotary portion of nozzle from NPT hose barb and back flush until nozzle ports are clear of debris. Remove screen and flush with water to clear away foreign material.</p>
Fitting leaks	<p>Check for cracks in fitting. Replace fitting if necessary.</p> <p>Disassemble and add more joint seal in compound if leak occurs on threads.</p>

# STAR SHIELD ASSEMBLY DRAWING



**Figure 2: Lift frame attachment on Spray Star 1600 vehicle.**



**Figure 10: Center actuator position and level adjustment.**

# INSTALLATION INSTRUCTIONS

1. Locate the pivot plate. The pivot plate is shipped attached with two U-bolts and is pinned to the pivot arm with a 1" top link pin.
2. The mount the plate horizontal. The center of the pin should be about **11 ½ inches** from the ground and as close to the rear wheels of the utility vehicle as possible.
3. The pivot plate may be mounted higher or lower than suggested. By mounting the pivot plate higher than suggested increases how tight the sprayer folds into the transport position. Placing the plate lower increases the amount of down float for the sprayer.
4. Locating the sprayer closer to the vehicle's rear wheels increases sprayer float but you must make sure that there is enough clearance for the sprayer to float up i.e. avoid frame, tank, solenoids or other installed attachments.
5. The plate may be mounted to the utility vehicle by U-bolting around 2 inch tubing uprights.
6. Adjust the pivot arm position by loosening the two lock bolts and sliding over the tubing of the main lift frame. Lock the pivot arm into place by tightening the bolts and locking with the jam nut.
7. Attach center actuator. For this step it will help to have someone to hold the main frame level or support the boom with blocks so the actuator can be pinned easily.
8. Begin by pinning the rod end of the actuator to the center actuator mount plates on the lift frame. Use the center hole.  
**NOTE:** Make sure there is a spacer on each side of the center actuator shaft otherwise severe damage could occur to the actuator.
9. Pin the motor end of the actuator to the main frame. Locate the motor above the rod of the actuator for clearance.

## LEVEL SPRAYER

1. When all three booms are in the spray position, adjust the booms to be level with the ground. Loosen the four nuts holding the center actuator pin plates and adjust position by sliding plates on slot and tighten securely.  
**NOTE:** Center actuator should be fully retracted while adjusting.
2. If you require more range than sliding the plates can give use the next hole in the plate. If further adjustment is required the right and left plates may be swapped giving further range.

## PLUMBING

1. Attach flow meter columns.
2. The center column assembly attaches on the solenoid bar at the rear the vehicle. (The center flow indicator has the necessary nut and bolt in the backing plate.)

## WING FLOW METERS

1. The flow indicator for each wing attaches to the wing lift frame for that wing. On the back of each wing lift frame will be two ¼" bolts and lock washers to mount the columns with.
2. Attach and route the ¾" hose from the flow monitor to the appropriate sprayer solenoid. Secure hoses with the plastic quick clamps. Tie the hose in place along the lift frame with the supplied cable ties to avoid pinching or getting caught during folding.
3. Attach and route ½" hose from flow monitor to spray nozzle. Take care to ensure that each column is routed to the appropriate spray nozzle.
4. Test folding of all sections of the sprayer for possible problems in the routing of the sprayer hose.

*(Continued on next page)*

# INSTALLATION INSTRUCTIONS

## ELECTRICAL LIFT OPTION

1. Attach electric actuators.
2. If the spray vehicle has the appropriate electric controls you may use these otherwise continue from step number 4. Hook these control up so that each switch moves the appropriate section and up and down in the direction indicated by the switch.
3. If a boom section moves in the wrong direction, the electrical connector for that section will require swapping the incoming wires.
4. Mount the control box in an accessible spot near the operators seat.
5. Route the wires with the fuse link to the battery of the vehicle. Place the red wire on the positive terminal and the blue wire on the negative battery terminal. Tie wires securely in place away from excessive sources of heat or pinch points.
6. Route the three sets of wire from the control box to the electric actuators.
7. The red and black pair of wires go to the right wing. The green and black wires go to the center actuator. The Yellow and black wires go to the left wing.

## CURTAIN INSTALLATION

1. Attach curtains to booms while in the transport position. Use generous amounts of lubricant on the rope end, or top of the curtain. (Spray silicone recommended.)
2. Start by placing one end of the curtain into the slot at the middle rear of the shield. Slide the curtain through the slot. Take care to keep feeding curtain into the slot from the start point otherwise the curtain will come out at the start point.
3. Pull curtain until the start of the curtain meets and overlaps with the end of the curtain by 1-2".
4. If the curtain has excess length double check that the curtain has not been pulled too tight and is putting extreme stress on the curtain and shield. If the curtain is too tight keep feeding curtain either forwards or backwards to release tension so the curtain hangs straight.
5. Turn curtain support straps on underside of boom down so they are pointing at the ground. These give the curtain extra support in the event of severe wind conditions.
6. Repeat for the remaining boom sections.



## DECAL LIST

This is a list of decals located on the Spray Star 1750. Part number, description and location will help in reordering decals.

14-510	Decal, Tank Volume	Side of Spray Tank
14-520	Decal, Tank Volume 1750 Top	Lifd Well of Tank
14-511	Decal, Rear tank Volume	Rear of Tank
15-463	Decal, Spray Pump	Left Seat Panel
15-636	Decal, Spray Star 1750	Tank Sides
15-637	Decal, Control Panel	Right Control Panel
15-672	Decal, Dash	Dashboard
15-719	Decal, Speed Control	Left Control Panel
16-228	Decal, Towing	Front Seat Panel
25-279	Decal, Hot and Moving Parts	Cooler Mount
25-307	Decal, Gas	Cooler Mount
25-286	Decal, Pinch Point	Left and Right Side Panel
25-298	Decal, Warning Hot	Back Seat Panel
25-356	Decal, Tire Pressure	All 4 Tires
25-373	Decal, Smithco	Front Nose Cone
25-381	Decal, 96 dBA	Panel Behind Seat
27-077	Decal, Smithco - Round	Steering Wheel
27-093	Decal, Hydraulic Oil	On Oil Reservoir
25-277	Decal, Battery	Battery Plate
34-147	Decal, Smithco	Nosecone

# QUICK REFERENCE REPLACEMENT PARTS

## REPLACEMENT FILTERS

23-031	Hydraulic Oil Filter	
13-531	Oil Filter	
76-395-01	Air Cleaner Cartridge	Briggs # 841497
76-395-02	Safety Filte Cartridge	Briggs # 821136
13-488	Key Switch	
76-310	Key Set	

## REPLACEMENT BELTS

15-704	Spray Pump Belt
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## SEAL KITS

15-301	Power Steering Orbital Motor
15-301-01	Seal Kit
75-714	Hydraulic Cylinder
14-254	Seal Kit
11-158	Linear Actuators
11-158-01	Seal Kit
76-238	Wheel Motors
14-080	Seal Kit
76-398	Hydrostatic Pump
77-239-22	Seal Kit
76-197	Gear Pump
76-197-08	Seal Kit

## FLUIDS

Engine Oil	SAE 10W-40 API Service SJ or higher Motor Oil
Hydraulic Fluid	SAE 10W-40 API Service SJ or higher Motor Oil

## OTHER PARTS

16-953	Hinged Cover On Tank with Gasket	
16-953-01	Gasket For Cover	
	Spark Plugs	Champion type RC12YC (Gap 0.040 inch (1.02mm))

# The Smithco Commercial Products Two-Year Limited Warranty

Smithco, Inc. (Smithco) warrants your 2016 or newer Smithco Commercial Product (“Product”) purchased after October 1, 2016 to be free from defects in materials or workmanship for the period of time listed below. Where a warrantable condition exists, Smithco will repair the Product at no cost to you including diagnosis, labor (at the Smithco standard labor rate, subject to the Smithco flat rate schedule), and parts.

## Warranty Duration is:

- (1) Two years, 1500 operational hours\* from the date of delivery to the original purchaser or Five years from the date of original manufacturer of the product, whichever occurs first. (\*Products equipped with hour meter).
- (2) Products used in rental situations are covered for 90 days from date of delivery to original user/renter.

## Owner Responsibilities:

As the Product owner, you are responsible for required maintenance and adjustments stated in your Owner’s Manual. Failure to perform required maintenance and adjustments can be grounds for disallowing a warranty claim. **You are particularly responsible to train all present and future operators of this product on the safe operation of this product at your location.**

## Instructions for Obtaining Warranty Service:

You are responsible for notifying the Authorized Smithco Products Distributor from whom you purchased the Product as soon as you believe a warrantable condition exists and not later than 30 days from discovery of the condition.

If you need help locating an Authorized Smithco Distributor, or if you have questions regarding your warranty rights or responsibilities, you may contact us at:

Smithco Product Support Department  
200 West Poplar Ave.  
Cameron, Wisconsin 54822  
Telephone: 800-891-9435 E-Mail: [ProductSupport@Smithco.com](mailto:ProductSupport@Smithco.com)

## Maintenance Parts:

Parts scheduled for replacement as required maintenance (“Maintenance Parts”), are warranted for the period of time up to the scheduled replacement time for that part.

## Items/Conditions Not Covered:

Not all product failures or malfunctions that occur during the warranty period are defects in materials or workmanship. The items/conditions listed below are not covered by this warranty:



Product failures which result from the use of non-Smithco replacement parts, or from installation and use of add-on, modified, or unapproved accessories are not covered.



Product failures which result from failure to perform required maintenance and/or adjustments are not covered.



Product failures that result from operating the Product in an abusive, negligent or reckless manner are not covered.



This warranty does not apply to parts subject to consumption through use, unless found to be defective. Examples of parts which are consumed, or used up, during normal Product operation include, but are not limited to: blades, tines, teeth, scarifiers, rakes, plates, wear plates, castor wheels, tires, batteries, filters, belts, nozzles, etc.



This warranty does not apply to failures caused by outside influence. Items considered to be outside influence include, but are not limited to, weather, storage practices, contamination, use of unapproved coolants, lubricants, additives, or chemicals, etc.



This warranty does not apply to normal “wear and tear” items. Normal “Wear and Tear” includes, but is not limited to, damage to seats due to wear or abrasion, worn painted surfaces, scratched decals or windows, etc.



Smithco may require the return of failed parts or components in order to determine the validity of any warranty claim.



Smithco will not be obligated to replace components of other manufacturers if inspection by the original component manufacturer indicates that failure was due to normal wear and tear, expected consumption through use or improper care or service.

#### **Other Legal Disclaimers:**

The above remedy for product defects through repair or replacement by an authorized Smithco distributor or dealer is the purchaser’s sole remedy for any defect. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

**THERE ARE NO OTHER EXPRESS WARRANTIES OTHER THAN THOSE SET FORTH ABOVE. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE ARE LIMITED TO THE DURATION OF THE LIMITED WARRANTIES CONTAINED HEREIN.**

Some states may not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

**THE SMITHCO COMPANY IS NOT LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE USE OF THE PRODUCT, INCLUDING ANY COST OR EXPENSE OF PROVIDING A SUBSTITUTE PRODUCT OR SERVICE DURING PERIODS OF MALFUNCTION OR NON-USE.**

Some states may not allow the exclusion of indirect, incidental or consequential damages, so the above exclusion may not apply to you.

**Smithco neither assumes, nor authorizes any person to assume for it, any other liability in connection with the sale or use of this product.**

