

Class III
SPX Series
Patriot Sprayers

Troubleshooting Manual

87265690

CASE III

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CLASS III SPX SERIES SPRAYER TROUBLESHOOTING MANUAL

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Class III SPX Series Sprayer Troubleshooting Manual
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SAFETY

WARNING: *This safety alert symbol indicates important safety messages in this manual. When you see this symbol, carefully read the message that follows and be alert to the possibility of personal injury or death.*

To prevent injury, always follow the Warning, Caution and Danger notes in this section and throughout the manual.

Before servicing a machine, park the machine on hard level ground. Turn off the engine, apply the parking brake and remove the key from the key switch. Put blocks in front of and behind either the front or rear wheels.

WARNING: *Read the Operators Manual to familiarize yourself with the correct control functions.*

WARNING: *Operate the machine and equipment controls from the seat position only. Any other method could result in serious injury.*

WARNING: *This is a one person machine, no riders allowed.*

WARNING: *Before starting engine, study Operators Manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating. It is your responsibility to understand and follow manufacturers instructions on machine operation, service, and to observe pertinent laws and regulations. Operator and Parts Manuals may be obtained from your equipment dealer.*

WARNING: *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflective clothing.*

WARNING: *When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.*

WARNING: *When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure.*

WARNING: *When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way.*

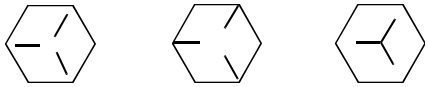
WARNING: *Always wear heat protective gloves to prevent burning your hands when handling heated parts.*

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TORQUE SPECIFICATIONS - DECIMAL HARDWARE

Use the torques in this chart when special torques are not given. These torques apply to fasteners with both UNC and UNF threads as received from suppliers dry, or when lubricated with engine oil. Not applicable if special graphites, Molydisulfide greases, or other extreme pressure lubricants are used.

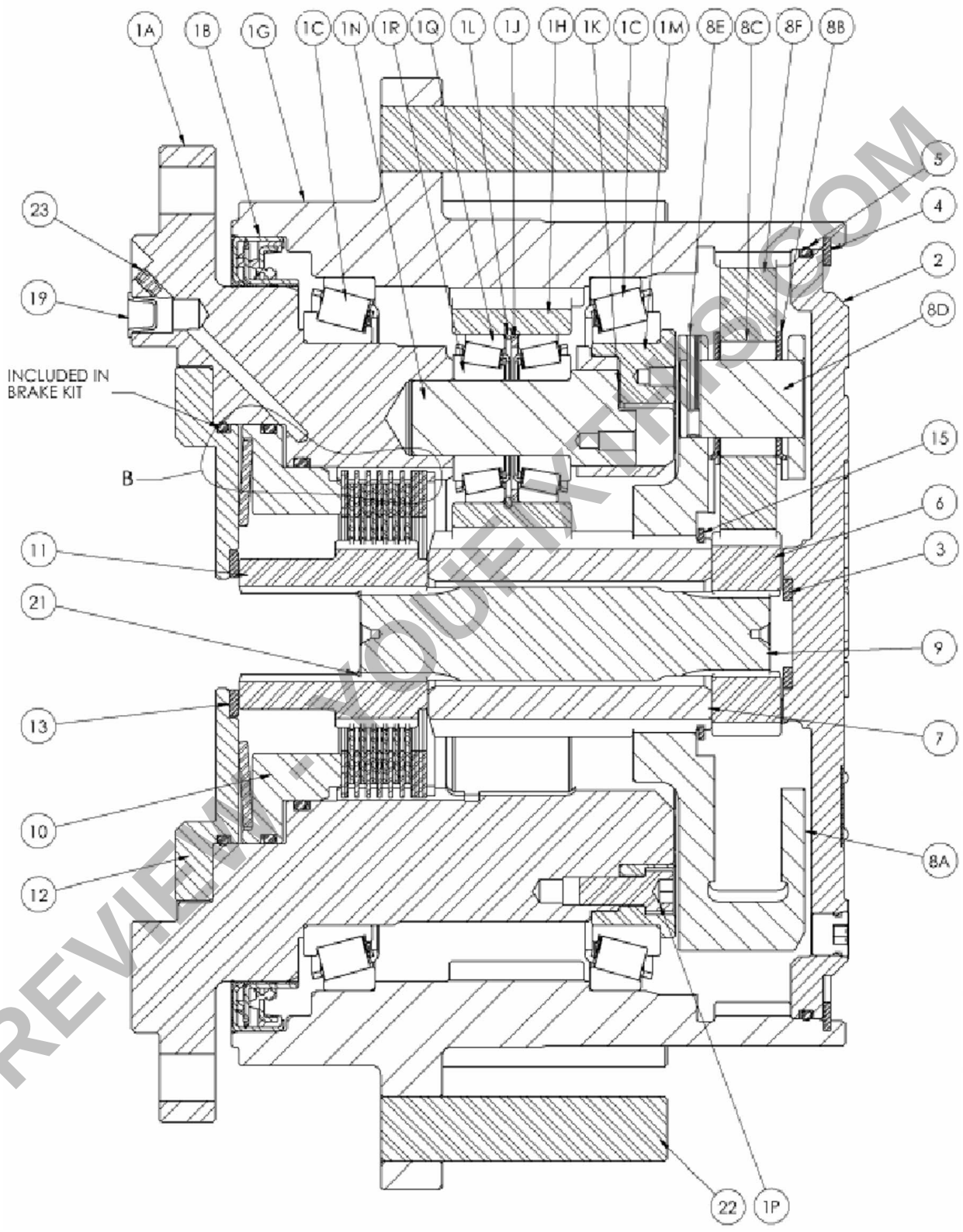
Grade 5 Bolts, Nuts and Studs		
		
Size	Pound-Inches	Newton Metres
1/4 inch	108 to 132	12 to 15
5/16 inch	204 to 252	23 to 28
3/8 inch	420 to 504	48 to 57
Size	Pound-Feet	Newton Metres
7/16 inch	54 to 64	73 to 87
1/2 inch	80 to 96	109 to 130
9/16 inch	110 to 132	149 to 179
5/8 inch	150 to 180	203 to 244
3/4 inch	270 to 324	366 to 439
7/8 inch	400 to 480	542 to 651
1.0 inch	580 to 696	787 to 944
1-1/8 inch	800 to 880	1085 to 1193
1-1/4 inch	1120 to 1240	1519 to 1681
1-3/8 inch	1460 to 1680	1989 to 2278
1-1/2 inch	1940 to 2200	2631 to 2983

Grade 8 Bolts, Nuts and Studs		
		
Size	Pound-Inches	Newton Metres
1/4 inch	144 to 180	16 to 20
5/16 inch	288 to 348	33 to 39
3/8 inch	540 to 648	61 to 73
Size	Pound-Feet	Newton Metres
7/16 inch	70 to 84	95 to 114
1/2 inch	110 to 132	149 to 179
9/16 inch	160 to 192	217 to 260
5/8 inch	220 to 264	298 to 358
3/4 inch	380 to 456	515 to 618
7/8 inch	600 to 720	814 to 976
1.0 inch	900 to 1080	1220 to 1465
1-1/8 inch	1280 to 1440	1736 to 1953
1-1/4 inch	1820 to 2000	2468 to 2712
1-3/8 inch	2380 to 2720	3227 to 3688
1-1/2 inch	3160 to 3560	4285 to 4827

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Assembly Drawing - C014



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NOTE: Gradually tighten the Countersunk bolts so that there is even pressure on the Belleville Spring.

50. Tighten the Countersunk Bolts (14) to 12 ft-lbs.
51. Install Brake Pressure Plug (23) into the brake port if not already installed.
52. Perform Roll Check, Leak Check and Brake Check to help ensure proper assembly.
53. Fill the unit half full with oil.

Assembly is now complete.

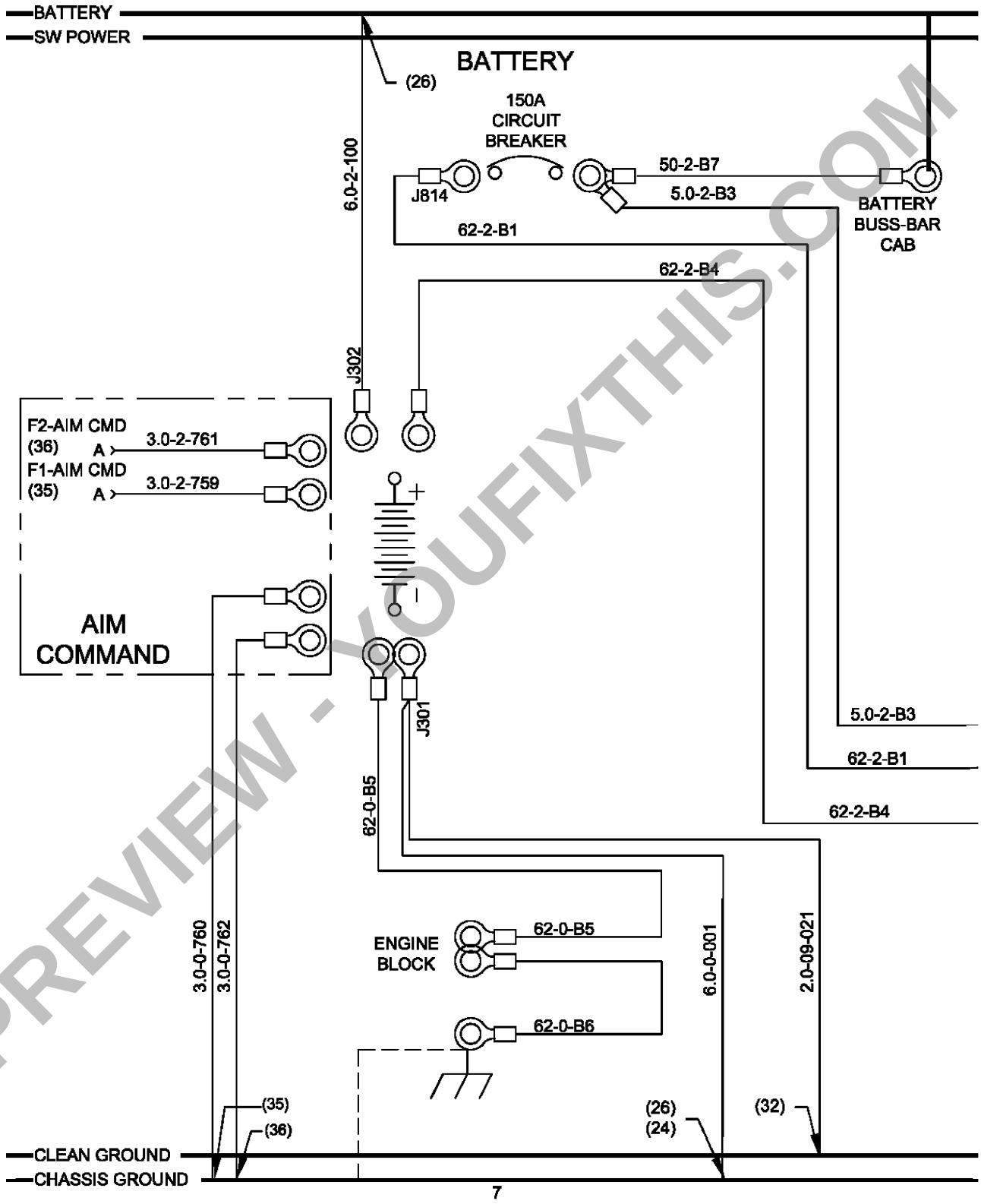
Parts List CO14

ITEM	QUANITY	DESCRIPTION	ITEM	QUANITY	DESCRIPTION
9	1	Input Shaft	1J	3	Output Planet Cup Spacer
11	1	Coupling	17	1	ID Plate
6	1	Input Sun Gear	1B	1	Main Seal
7	1	Output Sun Gear	10	1	Input Brake Kit
8D	3	Input Planet Shaft	1L	3	Output Planet Retaining Ring
8A	1	Input Carrier	15	1	Input Carrier Retaining Ring
8F	3	Input Planet Gear	21	1	Coupling Retaining Ring
1H	3	Output Planet Gear	4	1	Cover Retaining Ring
1N	3	Output Planet Shaft	8E	3	Roll Pin
1A	1	Spindle	18	2	Drive Screw
1M	1	Bearing Carrier	1P	15	Bearing Carrier Bolts
12	1	Mounting Adapter	14	4	Countersunk Bolts
2	1	Cover	5	1	Cover O'Ring
1G	1	Hub	23	1	Pressure Plug
3	1	Cover Thrust Washer	16	1	Drain Plug
8C	48	Needle Roller	25	1	Drain Plug
1C	2	Main Bearing Assembly	13	1	Mounting Adapter Thrust Washer
1Q	6	Output Planet Bearing Cup	8B	6	Input Planet Thrust Washer
1R	6	Output Planet Bearing Cone	22	10	Double-Threaded Stud
1K	3	Shim Kit			

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Battery



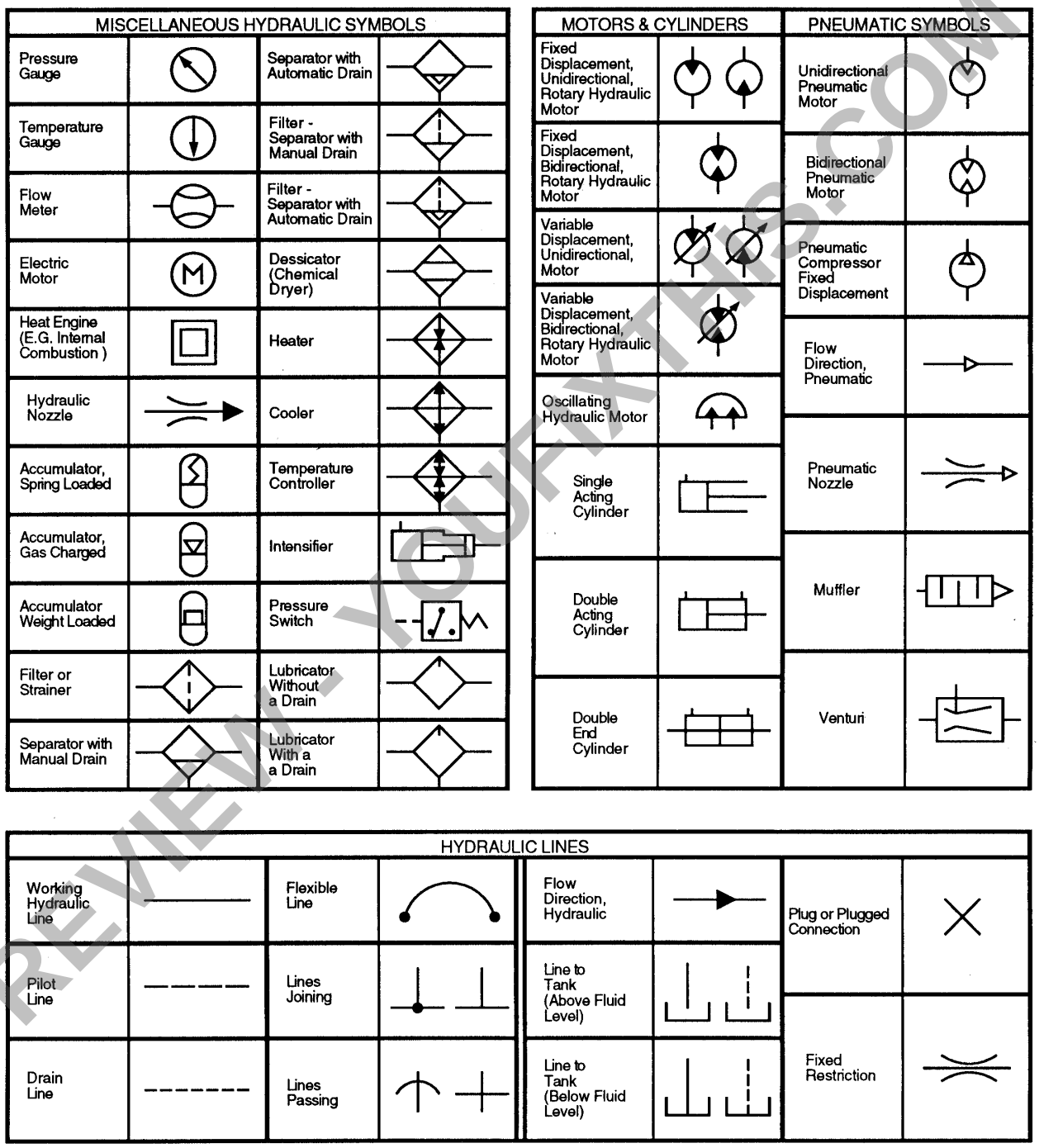
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HYDRAULIC SCHEMATIC SYMBOLS

Quick Reference Guide

Fluid Power Symbols
Quick Reference Guide



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FUEL INJECTION SYSTEM

Common Problems And Solutions.

SYMPTOM

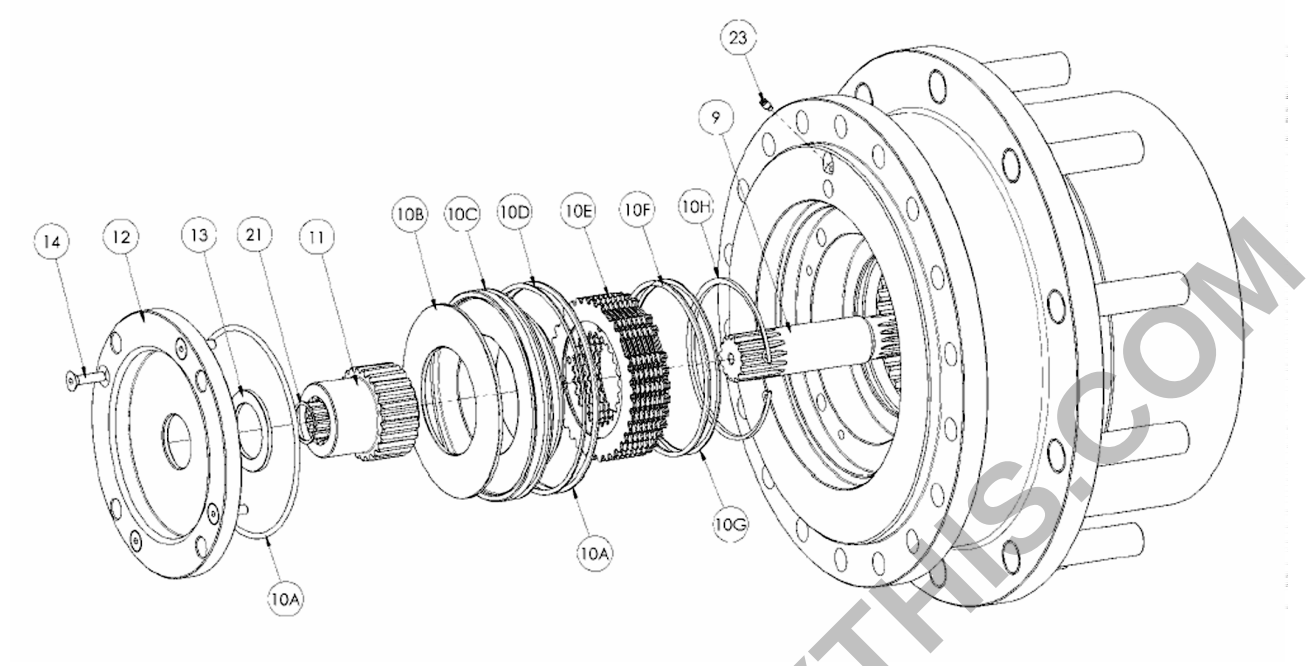
Starting Problem	Engine Surges At Idle	Rough Idle When Engine Is Warm	Engine Misses Under Load	Low Power	Excessive Fuel Consumption	Engine Cannot Be Shut Off	Poor Performance Or Black Smoke Or Low Power	Fog-Like Exhaust In Full-Load Range (White Or Blue)	Incorrect Idle Or Maximum Speed	Engine Does Not Rev Up	CAUSE	REMEDY
■		■	■	■			■	■		■	Improper fuel in tank.	Drain tank, fill with proper fuel.
■	■		■	■				■		■	Tank empty or tank vent blocked.	Fill tank/bleed system, check tank vent.
■	■	■	■				■	■		■	Air in the fuel system.	Bleed fuel system, eliminate air leaks.
■						■					Voltage supply malfunction / stop solenoid defective.	Correct electrical faults / replace stop solenoid.
■			■	■				■			Fuel filter blocked.	Replace fuel filter.
■			■	■				■			Fuel-supply lines blocked / restricted.	Test fuel supply lines-flush / replace.
■			■	■							Loose connections, injection lines leak or broken.	Tighten the connections, eliminate the leak.
■			■					■		■	Paraffin deposit in fuel filter.	Replace fuel filter.
■			■				■	■		■	Pump-to-engine timing incorrect.	Readjust timing.
		■	■		■		■				Injection nozzle defective.	Repair / replace.
		■	■		■		■				Engine air filter blocked.	Replace air filter element.
■	■	■	■	■	■		■				Injection sequence does not correspond to firing order.	Install fuel injection lines in the correct order.
	■		■	■				■	■	■	Overflow fitting interchanged with inlet fitting.	Install fittings in their proper position.
■	■				■		■		■	■	Cold-start device malfunction (If equipped).	Check cold-start mechanism (If equipped).
■		■		■			■			■	Low or uneven engine compression.	Repair as necessary.
■	■	■	■	■	■		■	■	■	■	Fuel injection defective or cannot be adjusted.	Replace.

NOTE: *It is assumed that the engine is in good working order and properly tuned, and that the electrical system has been checked and repaired as necessary.*

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C014 Main Disassembly



1. Perform Roll Check, Leak Check and Brake Check if applicable prior to disassembling the unit.
2. Drain oil from unit. Note the condition and the volume of the oil.
3. Place the Torque-Hub on a bench with the cover side down.
4. Remove the mounting adapter (12) by removing the 4 Countersunk Bolts (14).

NOTE: The spring force from the brake will force the Mounting Adapter (12) out. Gradually loosen each bolt so that the Mounting Adapter remains aligned during the disassembly.

5. Remove Thrust Washer (13) from the Mounting Adapter (12) counterbore or from the end of the Coupling (11).
6. Remove the O-Ring (10A) from the mounting Adapter.
7. Remove the Coupling (11).
8. Remove Retaining Ring (21) from the Coupling (11) bore.
9. Remove the Belleville Spring (10B) from the back of the Piston. (10C).
10. Slowly and carefully add light air pressure to the brake port of the Spindle (1A) until the Brake Piston (10C) is forced out of the spindle bore. Remove the Piston.
11. Remove the O-ring (10A) and Back-up Ring (10D) from the Piston (10C groove.
12. Remove the Brake Friction Plate Stack (10E) from the Spindle (1A).

NOTE: Try to keep the friction plates in the same order by removing them all together and then banding them together until re-assembly.

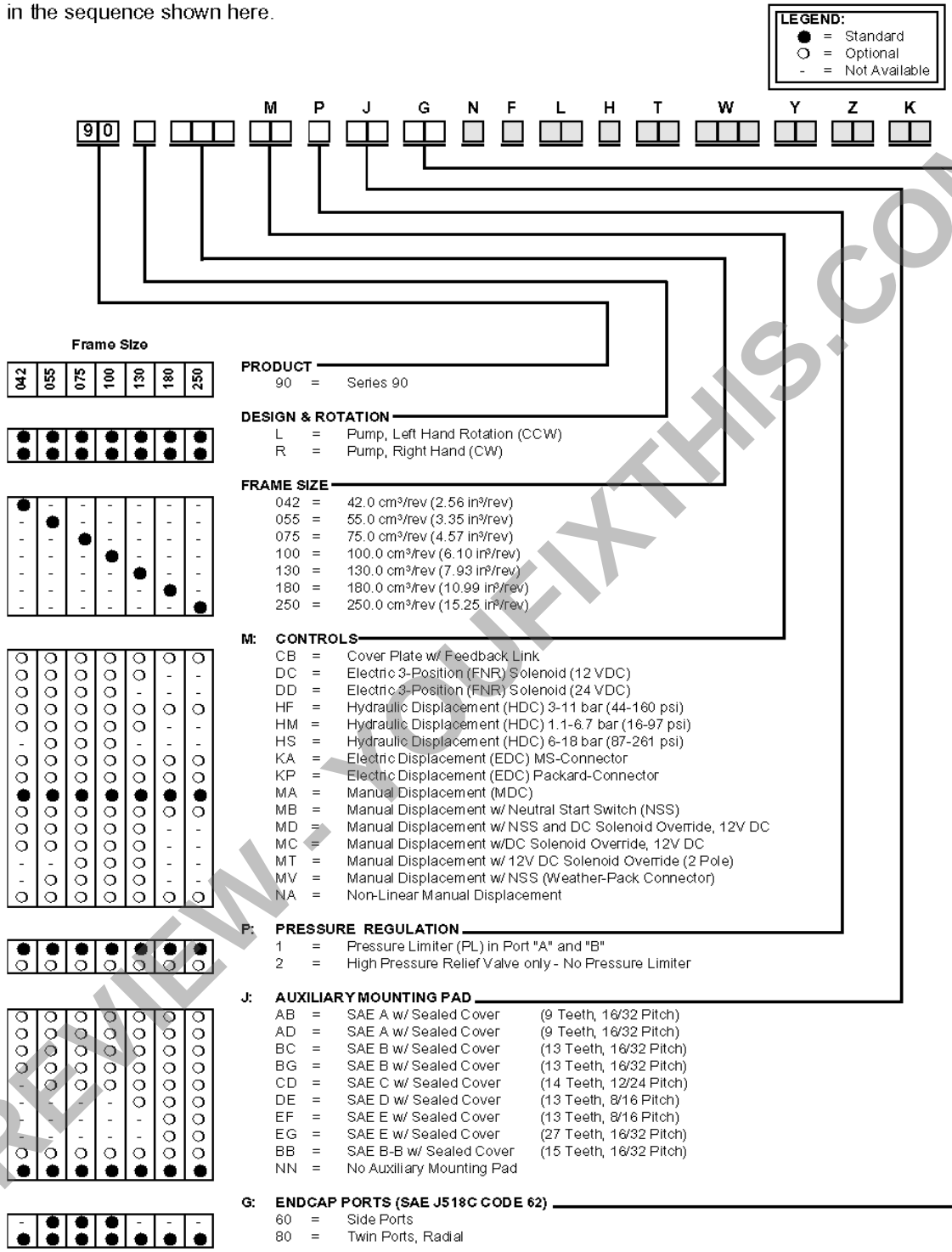
13. Remove the Brake Retaining Ring (10H), O-ring (10G) and Backup Ring (10F) from the Spindle (1A) bore.
14. Remove the Input Shaft (9).
15. Turn over the Torque Hub so that the Cover is up.

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Model Code Sheet

A specific model can be designated by generating a modular Model Code. The Model Code must be designated in the sequence shown here.



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A-1

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SPECIFICATIONS

Battery Type: ..... 12 Volt, Low Maintenance Type
Group Size 31

Rating: ..... 950 CCA at 0^{o}F (-17^{o}C)

Reserve Capacity: ..... 170 Minutes

Polarity: ..... Negative Ground

NOTE: *One battery is used on the Class III SPX Series Sprayers.*

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FLOW METER MAINTENANCE AND ADJUSTMENT PROCEDURE

1. Remove Flow Meter from sprayer and flush with clean water to remove any chemicals.
2. Remove flange bolts or clamp from the Flow Meter.
3. Remove the turbine hub and turbine from inside Flow Meter.
4. Clean turbine and turbine hub of metal filings or any other foreign material, such as wettable powders. Confirm that the turbine blades are not worn. Hold turbine and turbine hub in your hand and spin turbine. The turbine should spin freely with very little drag inside the turbine hub.
5. If transducer assembly is replaced or if turbine stud is adjusted or replaced, verify the turbine fit before reassembling. Hold turbine hub with turbine on transducer. Spin turbine by blowing on it. Tighten turbine stud until turbine stalls. Loosen turbine stud 1/3 turn. The turbine should spin freely.
6. Re-assemble Flow Meter.
7. Using a low pressure (5 psi) [34.5 kPa] jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/16 turn until the turbine spins freely.
8. If the turbine spins freely and cables have been checked per (See page 4003-6), “PROCEDURE TO TEST FLOW CABLES”, but Flow Meter still is not totalizing properly, replace Flow Meter transducer.

Procedure To Re-calibrate Flow Meter

1. Enter a METER CAL number of 10 [38] in the key labelled
2. Enter a TOTAL VOLUME of 0 in the key labelled
3. Switch OFF all booms.
4. Remove a boom hose and place it into a calibrated 5 gallon [19 liter] container.
5. Switch ON appropriate boom switch (for the hose that was just placed into the 5 gallon container) and the MASTER switch. Pump exactly 10 gallons [38 liters].
6. Readout in TOTAL VOLUME is the new METER CAL number. This number should be within +/- 3% of the calibration number stamped on the tag of the Flow Meter.
7. Repeat this procedure several times to confirm accuracy. (Always “zero out” the TOTAL VOLUME display before retesting).

NOTE: *For greatest precision, set METER CAL to 100 and pump 100 gallons (378 liters) of water.*

8. To verify Flow Meter calibration, fill applicator tank with a predetermined amount of measured liquid (i.e. 250 gallons). DO NOT RELY ON GRADUATION NUMBERS MOLDED INTO APPLICATOR TANK. Empty the applicator tank under normal operating conditions. If the number displayed under TOTAL VOLUME is different from the predetermined amount of measured liquid by more than +/- 3%, complete the following calculation:

   EXAMPLE:

   METER CAL = 720 [190]
   TOTAL VOLUME = 260 [984]
   Predetermined amount of measured liquid = 250 [946]

$$\text{Corrected METER CAL} = \frac{\text{METER CAL} \times \text{TOTAL VOLUME}}{\text{Predetermined amount of measured liquid}}$$

ENGLISH UNITS:	METRIC UNITS:
$= \frac{720 \times 260}{250} = 749$	$= \frac{[190] \times [984]}{[946]} = [198]$

   Corrected METER CAL = 749 [198]

9. Enter corrected METER CAL before resuming application.

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BATTERY MAINTENANCE

Electrolyte Level

Check the level of the electrolyte in each cell every 250 hours of operation or once a month whichever occurs first. The use of a large amount of water by the battery can be caused by high temperature during hot weather or a voltage regulator setting that is too high. Keep the electrolyte above the top of the separator plates at all times to prevent damage to the battery. If the level of the electrolyte is low, add distilled water or other clean water until the electrolyte is just below the split ring at the bottom of the cell opening. DO NOT OVERFILL. When water is added at ambient temperatures below 32^{o}F (0^{o}C) the battery must have a charge immediately to mix the water and electrolyte.

NOTE: *Add water only. DO NOT add electrolyte.*

Inspecting And Cleaning A Battery

Visually inspect the battery for dirt, corrosion and damage. Electrolyte and dirt on top of the battery can cause the battery to discharge by making a passage for current to flow.

If damage causes an electrolyte leak, replace the battery.

If the battery must be cleaned, remove the battery from the carrier and clean the battery, cable terminals and the carrier. Use Case Battery Saver and Cleaner (Part Number M20376) according to instructions on the product container. This cleaner needs no water. If Case Battery Saver is not available, remove all corrosion from the cable ends and battery terminals with a wire brush, then wash with a weak solution of baking soda and water or ammonia and rinse with clear water. DO NOT permit any type of cleaner to enter the cells of the battery.

Inspect the battery cables for damage. The positive battery cables must be inspected their entire length for chaffing or other damage that may cause a short circuit. Replace any battery cable that has damage.

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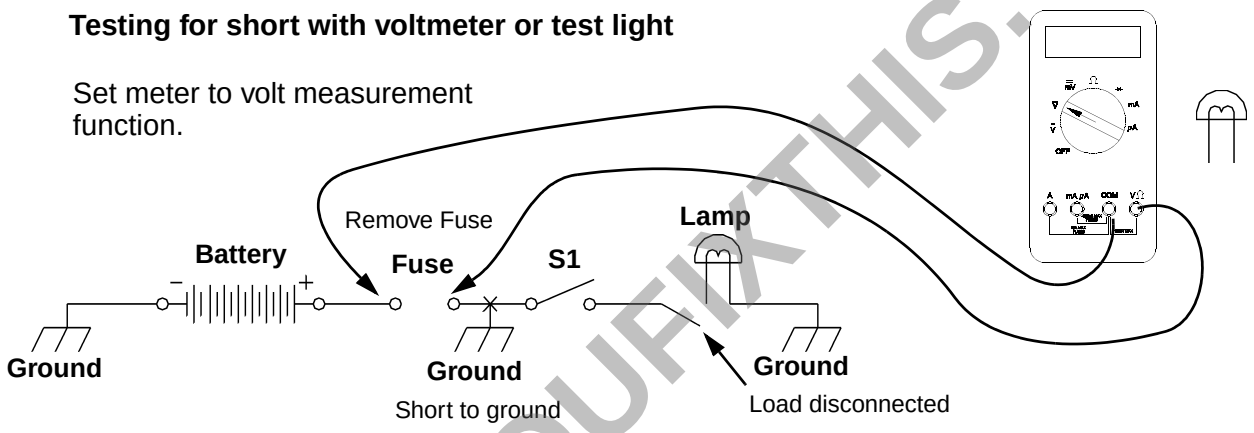
Testing for short to ground

Use a test light or voltmeter.

A test light works very well for the following procedure:

1. Remove the blown fuse and disconnect the load.
2. Connect a test light or voltmeter across the fuse terminals (be sure there is power at the fuse).
3. Beginning near the fuse block, wiggle the harness from side to side. Continue this at convenient points (about 6 inches apart would be ideal) while watching the test light or voltmeter.
4. When the test light glows, or the voltmeter registers, there is a short to ground in the wiring near that point.

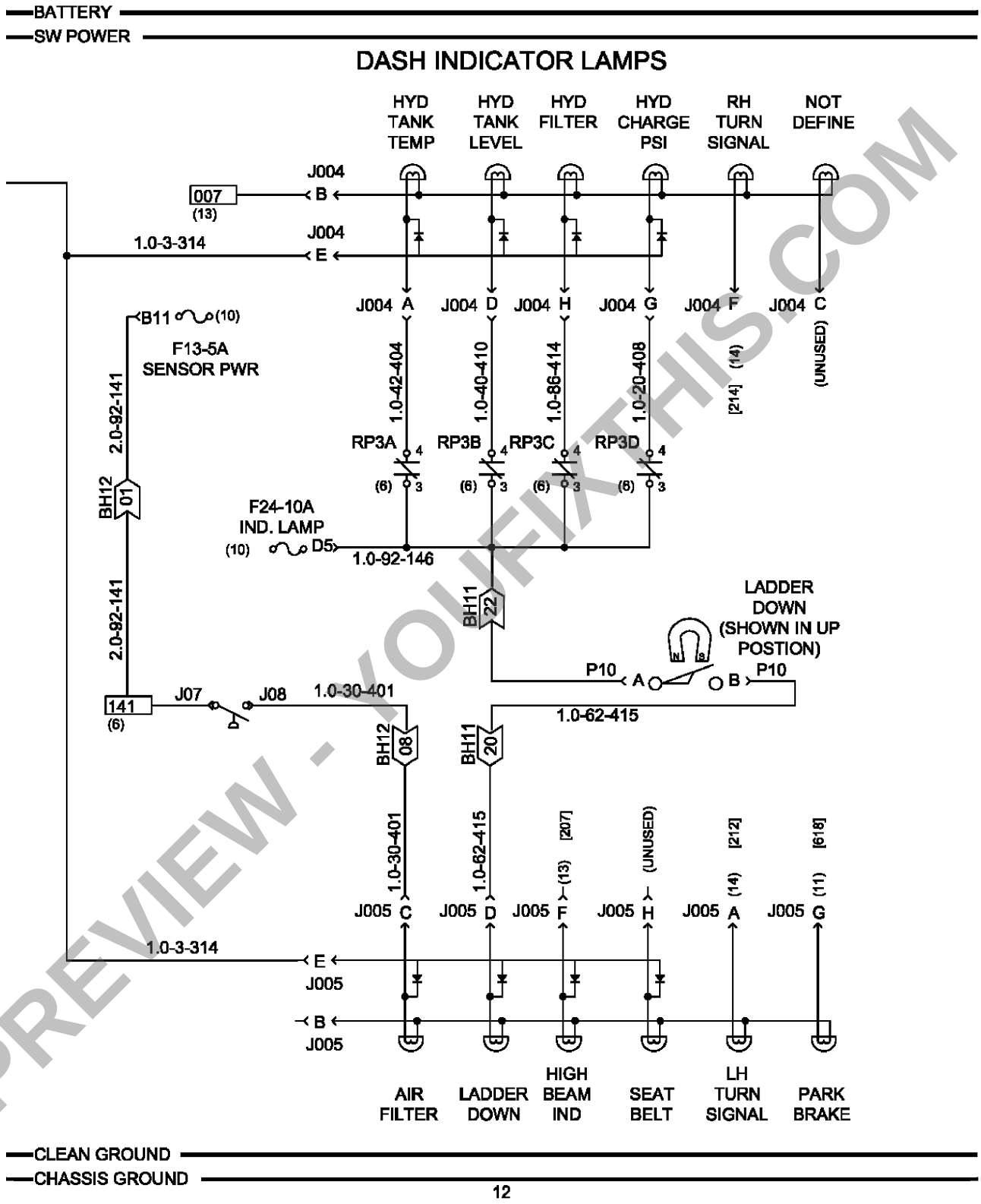
Testing for short with voltmeter or test light



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Dash Indicator Lamps



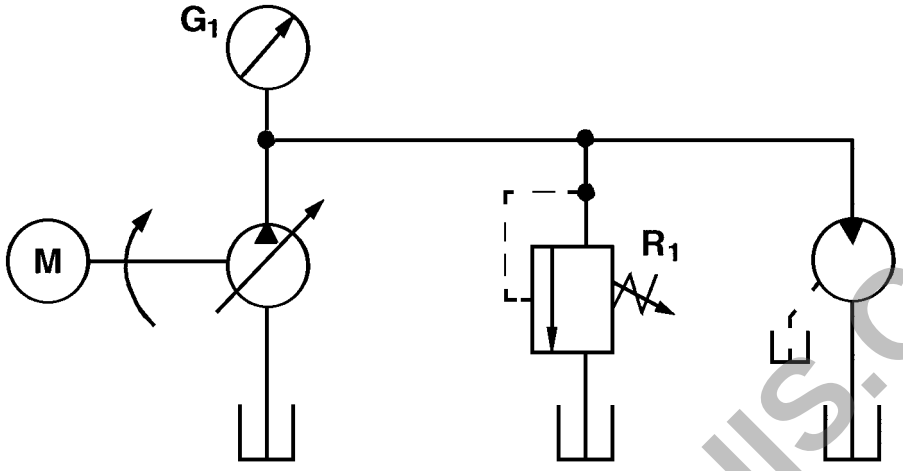
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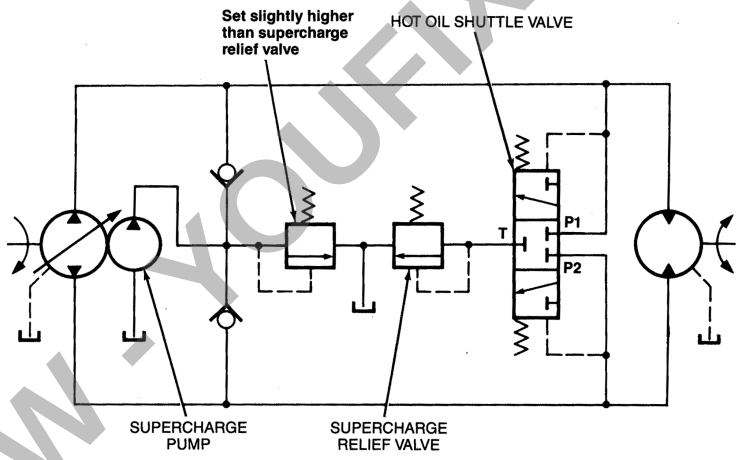
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HYDRAULIC SCHEMATICS AND DIAGNOSTICS

Open Loop



Closed Loop



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