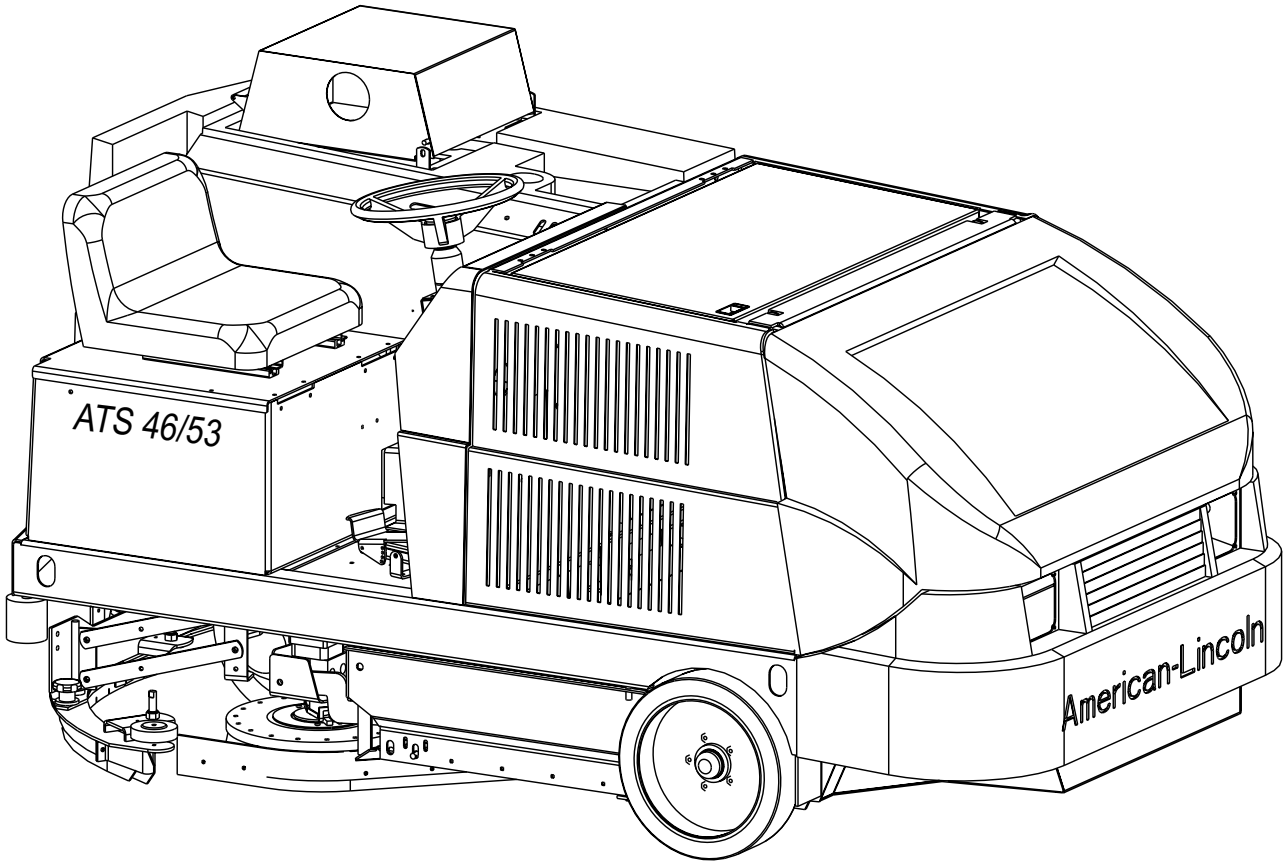
AMERICAN-LINCOLN TECHNOLOGY



ATS 46/53 SWEEPER/ SCRUBBER

HYDRAULIC & ELECTRICAL TROUBLESHOOTING GUIDE

Beginning with Serial No. 680001

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INTRODUCTION AND SAFETY PRECAUTIONS

The purpose of this guide is to provide a resource for technician training, troubleshooting, and component repair of the Model ATS 46/53 Sweeper/Scrubber hydraulic system. The guide is written for use by the experienced technician who is knowledgeable in mobile hydraulics and familiar with mobile industrial sweepers and scrubbers.

WARNING

For safety, observe the following warnings, failure to comply may create a serious risk of injury to yourself and others. This machine should not be used in hazardous locations including areas of volatile dust or vapor concentrations.

1. To avoid possible injury of property damage, read the operator's manual before using the machine.
2. Fire hazard. Fine dusts, fuels, solvents, and thinners can explode and cause severe burns.
3. Do not use with or near flammable materials and vapors. Use only with good ventilation.
4. Heavy machinery. Improper use can cause injury.
5. Operate only from the designated operator's position. Keep inside the body of the machine.
6. Do not leave the machine on a ramp or dock. After stopping the machine, turn all the switches off.
7. Do not dump the hopper over an open pit or dock. Do not dump the hopper when positioned on a grade (ramp). The machine must be level (horizontal).
8. Operate only when lids, doors, and access panels are securely closed.
9. Never travel with the hopper in the raised position.
10. The operator must exhibit extreme caution when negotiating, turning, and traveling across grades or ramps.
11. Start, stop, change direction, travel, and brake smoothly. Slow down when turning. Avoid uneven surfaces and loose materials.
12. Watch out for obstructions, especially overhead.
13. Carry no passengers on the machine.
14. Set parking brake whenever leaving the machine. Chock (block) the wheels if the machine is to be parked on a grade (ramp), or is to be worked on.
15. Never leave the operator's seat with the engine running.
16. Report damage or faulty operation immediately. Do not operate the machine until repairs have been completed.
17. Maintenance and repairs must be done by authorized personnel only.

WARNING

To maintain the stability of this sweeper/scrubber in normal operation, the counterweights, overhead guard, rear bumper guard, or any similar equipment, installed by the manufacturer as original equipment, should never be removed. If it becomes necessary to remove such equipment for repair or maintenance, this equipment must be reinstalled before the sweeper/scrubber is placed back in operation.

The four basic concepts of hydraulics are pressure, flow rate, pressure drop, and efficiency. A good understanding of these concepts and a working knowledge of hydraulic components provide the necessary tools for successful hydraulic troubleshooting.

Pressure - Pressure is defines as force applied over a surface and is measured as force per unit area (pounds/square inch or PSI). Hydraulic oil is an incompressible fluid, unlike air, therefore a force applied to an area of oil is transmitted throughout the fluid.

Flow Rate - Flow rate is defined as volume transferred over a period of time and is measured as volume per unit of time (gallons/minute or GPM). The flow rate of hydraulic oil determines the speed of hydraulic components including motors and cylinders.

Pressure Drop - Pressure drop is a decrease in pressure from one point to another in a hydraulic circuit. Pressure drop occurs when hydraulic oil does work, such as: creating heat due to friction and flow through restrictions, hoses, valves, cylinders, pumps, and motors; transmitting torque measurement of flow and pressure drop between two points in a hydraulic circuit, the amount of power used between these points may be determined.

Efficiency - Efficiency is a measure of actual performance compared to theoretical performance. Efficien cies are measured in percentages. In hydraulics, three types of efficiency are measured including: volu metric, mechanical, and overall.

Volumetric efficiency is necessary to calculate output flow rates of pumps and speeds of hydraulic motors and cylinders. For pumps and motors, volumetric efficiency indicates the amount of internal leakage between pressure and suction and case drain flow. Volumetric efficiency typically decreases with an increase in pressure.

Mechanical efficiency is necessary to calculate actual pressure output of pumps and torque output of hydraulic motors. Mechanical efficiency indicates energy wasted due to friction between shafts, bearings, seals, seal plates, and other mechanical components of pumps and motors.

Overall efficiency is necessary to calculate actualy power required to operate a pump or motor. Overall efficiency is the product of volumetric and mechanical efficincy.

NORMAL OPERATING SPEEDS, PRESSURES, AND FLOWS

System Characteristic	Operating Condition	Specification
Engine Speed	Full Throttle Loaded	2050 RPM Min ± 50
Wheel Drive Motor Speed	Full Pedal Forward @ No Load Full Pedal Reverse @ No Load	150 ± 10 RPM 65± 15 RPM
Main Broom Speed	Broom On, Sweep Position Broom On, Float Position	375± 50 RPM 250 ± 50 RPM
Side Broom Speed	Down Position	85 ± 10 RPM
Dust Vacuum Fan Speed	On Position	4000 ± 300 RPM
Scrub Brush Speed	Standard Scrub Heavy Scrub	185 ± 10 RPM 180 ± 10 RPM
Auxiliary Pump Pressure	Main Broom On is Sweep Position Main Broom On in Float Position Normal Scrub On Only Heavy Scrub On Only Main Broom in Float & Heavy Scrub Empty Hopper Lift Dump Door Held Open Dump Door Held Closed	850 ± 150 PSI 1000 ± 150 PSI 800 ± 150 PSI 1150 ± 150 PSI 1500 ± 200 PSI 1250 ± 200 PSI 2600 ± 100 PSI 2600 ± 100 PSI
Hydrostatic Drive Pump Pressure	Normal Acceleration Full Pedal freewheeling Forward Continuous Sweeping/Scrubbing Speed	2000 PSI Spike 350 ± 50 PSI 600 ± 50 PSI
Auxiliary Pump Output	High Throttle	9.0 ± 0.5 GPM
Hydrostatic Drive Pump Output	Full Pedal Forward @ No Load	11.0 ± 0.5 BPM

The ability to isolate and identify problems in a hydraulic system is greatly improved with the use of accurate troubleshooting equipment. The recommended equipment for troubleshooting the ATS 46/53 sweeper includes:

1. Hydraulic Pressure Gauge (0 to 3000 PSI Range)
   LHA model PGL-25-3000-S or equivalent

2. Photo Tachometer (0 to 15000 RPM Range)
   EXTECH model AC461893 or equivalent

3. Reflective Tape (for use with photo tachometer)
   EXTECH model AC461935 or equivalent

4. Flowmeter (0.5 to 4 GPM Range)
   HEDLAND model 600-004 or equivalent

5. Flowmeter (1.0 to 15 GPM Range)
   HEDLAND model 600-015 or equivalent

6. Adapter O-ring face seal “T” fittings, reducers,
   caps and plugs

7. Digital Multimeter (Electrical)
   FLUKE model 8024B or equivalent

American-Lincoln Kit P/N 0880-419 is available and includes: 0 to 3000 PSI hydraulic pressure gauge, #8 and #4 O-ring face seal “T” adapters, gauge hose, gauge-to-gauge adapters and a #8 to #4 O-ring face seal reducer.

TROUBLESHOOTING TABLE

Preliminary inspection is recommended prior to troubleshooting ATS 46/53 Sweeper/Scrubber hydraulic systems. The inspection should include the following: reservoir oil level, engine speed at high throttle, broom patterns, obvious oil leaks and hose connections.

PROBLEM	PROBABLE CAUSE	REMEDY
Main broom slow or will not turn	1. Dump door closed	1. Open dump door. (See "Dump Door Drifting Closed")
	2. Hopper switch damaged	2. Inspect hopper switch located on the rear of the hopper for continuity and adjustment. Adjust, repair or replace.
	3. Side broom or main broom obstructed	3. Remove obstruction.
	4. Low engine speed	4. Adjust engine governor to proper speed setting
	5. Damaged auxiliary pump	5. Measure the auxiliary pump output with a flow meter at high throttle. If the output flow is 0.5 GPM or below the normal minimum operating flow, replace or repair pump.
	6. Damaged flow divider cartridge	6. Measure side broom speed with a photo-tach. If the speed is 10 rpm above the maximum normal operating speed, replace the cartridge.
	7. Damaged relief valve	7. Inspect main manifold relief cartridge (RV1) O-rings for damage and replace O-rings as required. Hold the dump door lever in the open position and measure the pressure at the auxiliary pump. The gauge should read 2600 ± 100 PSI. If the gauge reads less that 2400 PSI, reset or replace the relief valve.
	8. Damaged solenoid valve	8. Inspect the solenoid valve (SV1) cartridge O-rings in the main manifold for damage and replace the O-rings as required. Also inspect the cartridge for signs of contamination and replaced as required.
	9. Damaged vacuum motor	9. Measure auxiliary pump pressure at the pump with the main broom on and in float. If the gauge reads above 2000 PSI inspect the scrub motors for seizure and repair or replace as required.
	10. Damaged scrum motor	10. Measure auxiliary pump pressure at the pump with the main broom on and in normal scrub on. If the gauge reads above 2000 PSI, inspect the scrub motor for seizure and replace or repair.
	11. Damaged main broom motor	11. Repair or replace motor.
Side broom slow	1. Damaged flow divider cartridge	1. Measure the flow leaving the port "P1" of the main manifold valve with a flow meter. If the flow is below 0.65 gpm, replace the cartridge (FR1).
	2. Damaged solenoid valve	2. Inspect the side broom solenoid valve (SV1).cartridge O-rings in the cylinder control manifold for damage and replace the O-rings as required. Also inspect the cartridge for signs of contamina-tion and replace the cartridge as needed
	3. Damaged side broom motor	3. Repair or replace the motor

PROBLEM	PROBABLE CAUSE	REMEDY
Poor dust control	1. Dust control filter damaged	1. Inspect dust control panel filter and dust filter compartment for signs of filter gasket damage or clogged filter. Repair or replace the panel filter.
	2. Worn flaps	2. Inspect the hopper, wheel well, and broom chamber flaps for wear and proper adjustment. Adjust or replace flaps as required. Also inspect the gasket which makes the rear of the hopper to the dust control fan. Repair or replace as required.
	3. Damaged main broom motor	3. Measure main broom speed with a phototach. If the speed is 50 rpm or below the normal minimum operating speed, see Main Broom Slow Troubleshooting section.
	4. Damaged vacuum fan motor	4. Measure impeller speed with a phototach If the speed is 200 rpm or below normal minimum operating speed, replace or repair the motor.
Scrub brushes slow	1. Damaged main broom motor	1. Measure main broom speed with a phototach. If the speed is 50 rpm or below the normal minimum operating speed, see Main Broom Slow Troubleshooting section.
	2. Damaged solenoid valve	2. Inspect the solenoid valve (SV2) cartridge O-rings in the main manifold for damage and replace the O-rings as required. Also inspect the cartridge for signs of contamination and replace the cartridge as required.
	3. Damaged scrub motor	3. Repair or replace motor(s).
Scrub deck drifts down	1. Damaged solenoid valve	1. Inspect SV2 in cylinder control valve for O-ring damage and debris. Repair or replace.
	2. Damaged deck cylinder	2. Repair or replace the scrub deck cylinder
Scrub deck slow or will not lift	1. Low hydraulic oil level.	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Scrub deck obstructed	2. Remove obstruction.
	3. Damaged valve and/or coil	3. Check the continuity of SV3 coil on the cylinder control valve. With a voltmeter across the harness leads to the coil, activate the scrub deck lift switch. With the switch in the "RAISE" position, the meter should read 12volts. If the voltage reading is 0, inspect the harness and scrub deck switch and replace as required. If the voltage reading is 12, inspect SV3. Repair or replace the valve and/or coil as required.
	4. Damaged check valve	4. Install a pressure gauge as port "C2" on the cylinder control manifold. With the machine on and the "HEAVY SCRUB" switch activated, the gauge should read 200 ± 25 PSI. If the reading is below 175 PSI, inspect the O-ring on SV3, SV4,and SV5 and repair or replace the cartridges as required. If the solenoid valves appear functional and the condition remain, replace the check valve.
	5. Damaged deck cylinder.	5. If the condition remains after the above efforts, repair or replace the scrub deck cylinder.

TROUBLESHOOTING TABLE

PROBLEM	PROBABLE CAUSE	REMEDY
Scrub deck will not lower (Cont.)	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge
	2. Scrub deck obstructed	2. Remove obstruction.
	3. Damaged valve and/or coil	3. Check the continuity of SV3 coil on the cylinder control valve. With a voltmeter across the harness leads to the coil, activate the scrub deck lift switch. With the switch in the "LOWER" position, the meter should read 12volts. If the voltage reading is 0, inspect the harness and scrub deck switch and replace as required. If the voltage reading is 12, inspect SV2. Repair or replace the valve and/or coil as required.
	4. Damaged check valve	4. Install a pressure gauge as port "C2" on the cylinder control manifold. With the machine on and the "HEAVY SCRUB" switch activated, the gauge should read 200 ± 25 PSI. If the reading is below 175 PSI, inspect the O-ring on SV3, SV4, and SV5 and repair or replace the cartridges as required. If the solenoid valves appear functional and the condition remain, replace the check valve (CV1).
	5. Damaged deck cylinder	5. If the condition remains after the above efforts, repair or replace the scrub deck cylinder.
No heavy scrub	1. Damaged valve and/or coil	1. Check the continuity of SV5 coil on the cylinder control valve. With a voltmeter across the harness leads to the coil, activate the scrub deck lift switch. With the switch in the "LOWER" position, the meter should read 12volts. If the voltage reading is 0, inspect the harness and scrub deck switch and replace as required. If the voltage reading is 12, inspect SV5. Repair or replace the valve and/or coil as required.
	2. Damaged check valve	2. Install a pressure gauge as port "C2" on the cylinder control manifold. With the machine on and the "HEAVY SCRUB" switch activated, the gauge should read 200 ± 25 PSI. If the reading is below 175 PSI, inspect the O-ring on SV3, SV4, and SV5 and repair or replace the cartridges as required. If the solenoid valves appear functional and the condition remain, replace the check valve (CV1).
	3. Damaged deck cylinder	3. If the condition remains after the above efforts, repair or replace the scrub deck cylinder

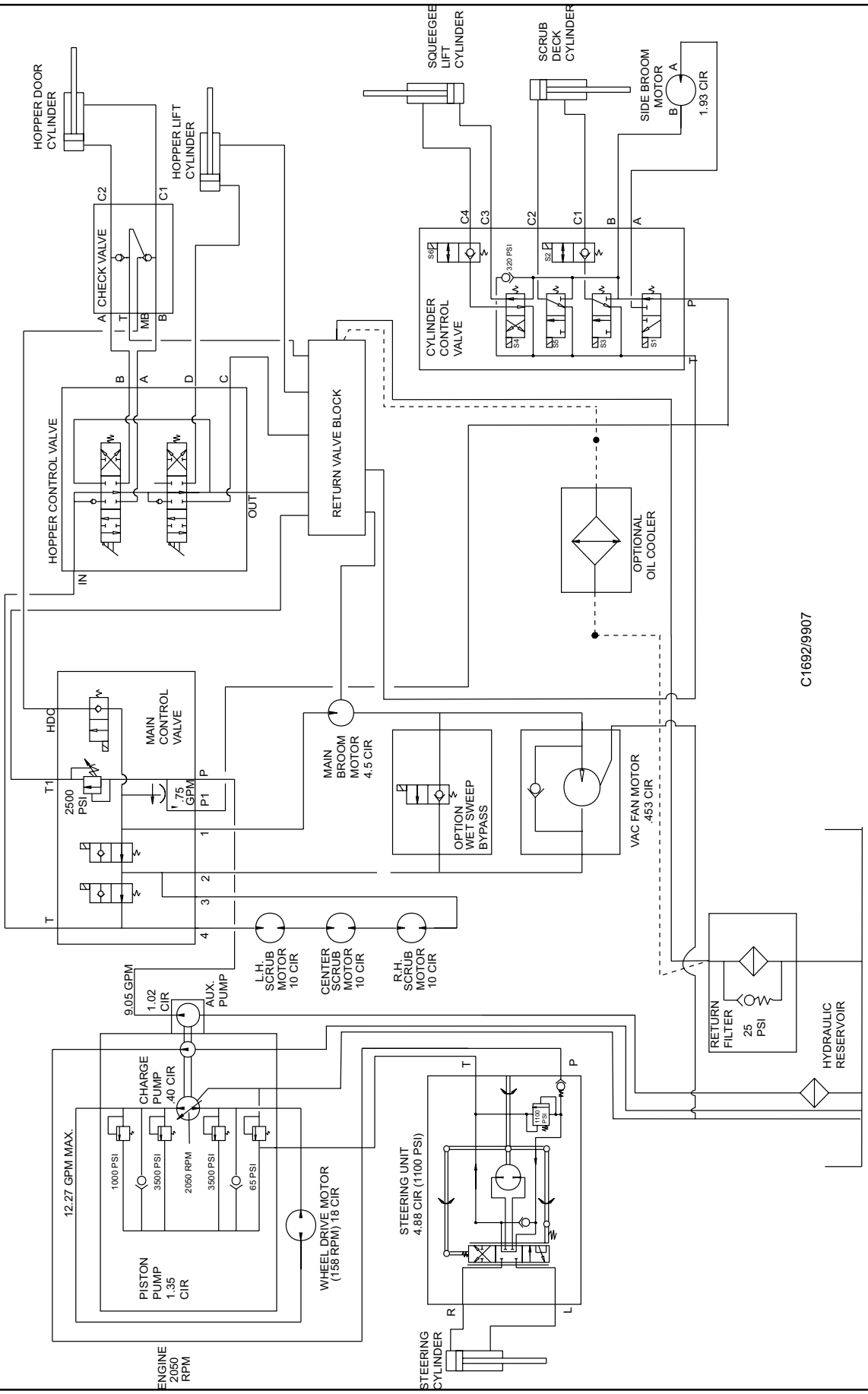
PROBLEM	PROBABLE CAUSE	REMEDY
Squeegee slow or will not lift	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Squeegee obstructed	2. Remove obstruction.
	3. Damaged valve and/or coil	3. Check the continuity of SV4 coil on the across cylinder control valve. With a voltmeter the harness leads to the coil, activate the scrub deck lift switch. With the switch in the "RAISE" position, the meter should read 12volts. If the voltage reading is 0, inspect the harness and scrub deck switch and replace as required. If the voltage reading is 12, inspect SV4. Repair or replace the valve and/or coil.
	4. Damaged check valve	4. Install a pressure gauge as port "C3" on the cylinder control manifold. With the machine on and squeegee switch in the "LOWER" position, the gauge should read 200 ± 25 PSI. If the reading is below 175 PSI, inspect the O-ring on SV3, SV4, and SV5 and repair or replace the cartridges as required. If the solenoid valves appear functional and the condition remain, replace the check valve (CV1).
	5. Damaged squeegee cylinder	5. If the condition remains after the above efforts, repair or replace the squeegee cylinder.
Squeegee drifts down	1. Damaged solenoid valve	1. Inspect SV6 in the cylinder control valve for O-ring damage and debris. Repair or replace.
	2. Damaged deck cylinder	2. Repair or replace the squeegee cylinder.
Squeegee will not lower	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Squeegee obstructed	2. Remove obstruction
	3. Low hydraulic oil level	3. Check the continuity of SV6 coil on the cylinder control valve. With a voltmeter across the harness leads to the coil, activate the scrub deck lift switch. With the switch in the "LOWER" position, the meter should read 12volts. If the voltage reading is 0, inspect the harness and scrub deck switch and replace as required. If the voltage reading is 12, inspect SV4. Repair or replace the valve and/or coil as required.
	4. Squeegee obstructed	4. Install a pressure gauge as port "C3" on the cylinder control manifold. With the machine on and squeegee switch in the "LOWER" position, the gauge should read 200 ± 25 PSI. If the reading is below 175 PSI, inspect the O-ring on SV3, SV4, and SV5 and repair or replace the cartridges as required. If the solenoid valves appear functional and the condition remain, replace the check valve (CV1).
	5. Damaged valve and/or coil	5. If the condition remains after the above efforts, repair or replace the squeegee cylinder.

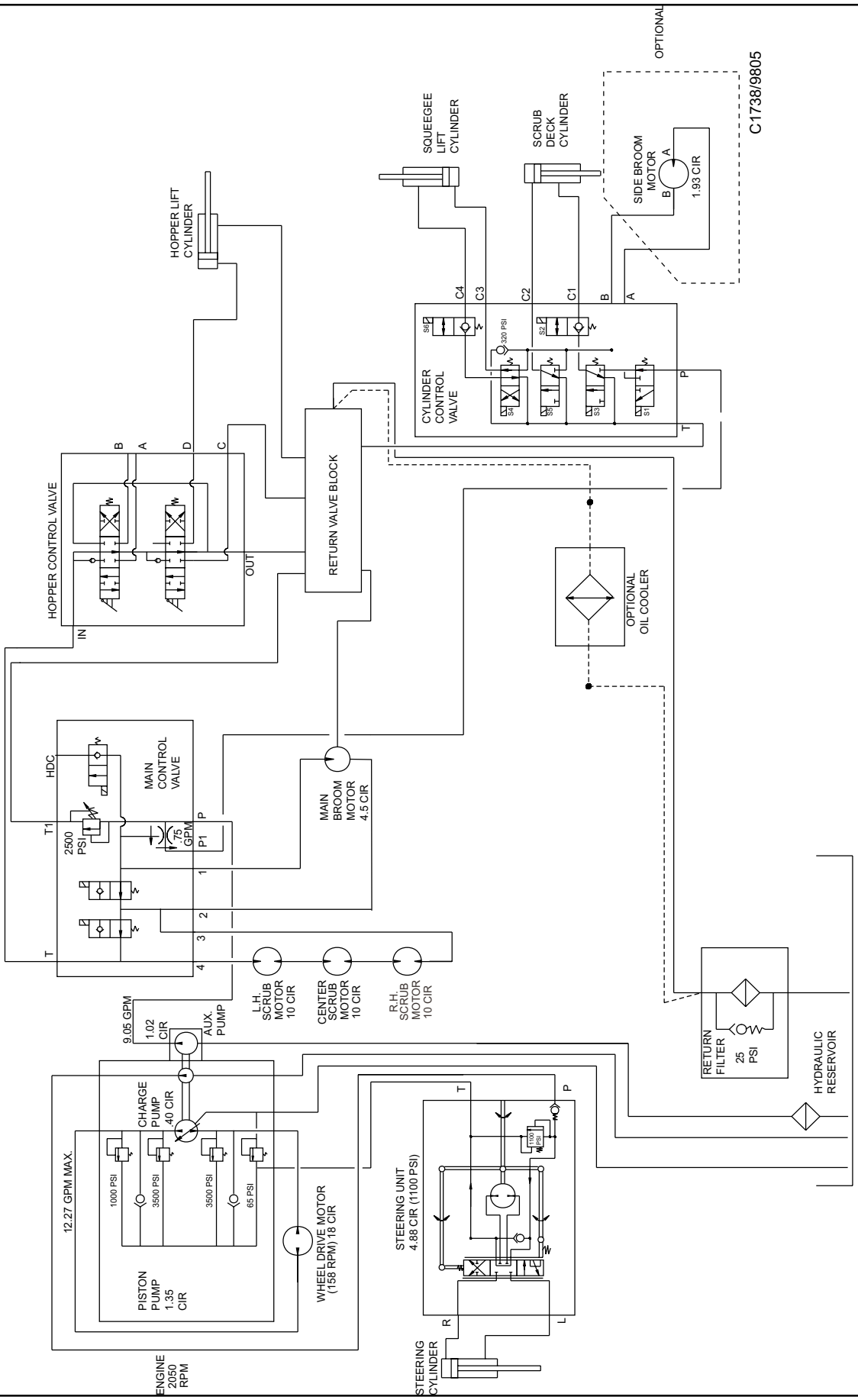
TROUBLESHOOTING TABLE

PROBLEM	PROBABLE CAUSE	REMEDY
Hopper lift cylinder slow or will not lift	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Hopper overloaded.	2. Inspect hopper load and manually unload hopper if overloaded.
	3. Air in cylinders	3. Purge the cylinders by cycling the dump system at least five (5) times.
	4. Relief valve damaged	4. Install a pressure gauge at the auxiliary pump output "T" fitting. Activate and hold the dump door lever in the "OPEN" position. This will cause the relief valve RV1 in the main manifold to open. The gauge will indicate the valve's setting. If the reading is below 2300 PSI, readjust or replace the valve to achieve the 2600 ± 100 PSI setting.
	5. Damaged hopper control valve	5. If above efforts fail, replace the valve.
Dump door does not function	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Door obstructed	2. Inspect the dump door for obstructions and binding and repair as required.
	3. Damaged relief valve	3. Install a pressure gauge at the auxiliary pump output "T" fitting. Activate and hold the dump door lever in the "OPEN" position. This will cause the relief valve RV1 in the main manifold to open. The gauge will indicate the valve's setting. If the reading is below 2300 PSI, readjust or replace the valve to achieve the 2600 ± 100 PSI setting.
	4. Damaged control valve	4. Cycle the dump door to the closed position and hold the dump door lever. The gauge should read 2600 ± 100 PSI. If it does not, repair or replace the hopper control valve.
Power steering binding or hard	1. Damaged yoke bearings	1. Inspect drive wheel yoke for bearing play and tighten or replace as required.
	2. Damaged steering unit	2. Install a pressure gauge at a "P" of the steering control unit. Block the front wheels and jack up the rear of the machine and place on jack stands such that the rear wheel clears the floor. Start the machine and operate the steering wheel. If the pressure gauge reads more than 400 PSI while steering (except at the full left and right stops), and the wheel remains difficult to turn, repair or replace unit.
	3. Damaged steering cylinder	3. Repair or replace the steering cylinder
	4. Damaged hydrostatic drive pump's charge pump	4. Install a pressure gauge at the auxiliary pump output "T" fitting. Activate and hold the dump door lever in the "OPEN" position. This will cause the relief valve RV1 in the main manifold to open. The gauge will indicate the valve's setting. If the reading is below 2300 PSI, readjust or replace the valve to achieve the 2600 ± 100 PSI setting.

PROBLEM	PROBABLE CAUSE	REMEDY
Noise in system	1. Low hydraulic oil level	1. Inspect the oil level in the reservoir and add oil until visible in the sight gauge.
	2. Air entering suction line	2. Inspect the suction hose for damaged O-rings or ruptures. Replace the hose of O-rings as required.
	3. Drive belt slipping	3. Inspect the auxiliary pump drive belt and tighten or replace as required.
	4. Relief valve setting low	4. Install pressure gauges at the "T" fittings of the auxiliary pumps. If the maximum pressure reading is below 1000 PSI with the steering wheel turned to the right or left hand stop. adjust the relief valve in the pump. If the maximum pressure reading at port "B" of the belt driven pump is below 1500 PSI, adjust the relief valve in the squeegee vacuum motor. If the maximum pressure reading to the output of the auxiliary pump is below 2500 PSI, adjust the relief manifold.
	5. Hydraulic motor damaged	5. Inspect the hydraulic motors for bearing wear by checking motor shaft end-play. Replace damaged motor(s).
Slow wheel motor speed	1. Engine speed low	1. Adjust engine governor to proper speed setting.
	2. Pedal linkage incorrectly adjusted	2. Inspect and readjust linkage as required
	3. Piston pump damaged	3. Measure pump output flow with a flow meter. If the flow is 0.5 gpm below the minimum normal operating flow, repair or replace the pump
	4. Drive motor damaged	4. If above efforts fail, replace the motor.
Dump door drifting closed	1. Damaged check valve block	1. Remove check valve block and inspect for debris or damage and repair or replace as required.
	2. Damaged dump door	2. Repair or replace the dump door cylinder
	3. Damaged control valve	3. Repair or replace the contol valve

ATS 46/53 VARIABLE DUMP HYDRAULIC SCHEMATIC




C1738/9805
OPTIONAL
SQUEEGEE LIFT CYLINDER
SCRUB DECK CYLINDER
SIDE BROOM MOTOR
1.93 CIR
HOPPER LIFT CYLINDER
CYLINDER CONTROL VALVE
320 PSI
RETURN VALVE BLOCK
HOPPER CONTROL VALVE
OPTIONAL OIL COOLER
MAIN CONTROL VALVE
HDC
2500 PSI
.75 GPM
MAIN BROOM MOTOR 4.5 CIR
L.H. SCRUB MOTOR 10 CIR
CENTER SCRUB MOTOR 10 CIR
R.H. SCRUB MOTOR 10 CIR
9.05 GPM
1.02 CIR
AUX. PUMP
RETURN FILTER
25 PSI
HYDRAULIC RESERVOIR
CHARGE PUMP 40 CIR
12.27 GPM MAX.
1000 PSI
3500 PSI
3500 PSI
65 PSI
PISTON PUMP 1.35 CIR
WHEEL DRIVE MOTOR (158 RPM) 16 CIR
STEERING UNIT 4.88 CIR (1100 PSI)
1100 PSI
STEERING CYLINDER
ENGINE 2050 RPM

SERVICE PARTS

ITEM	DESCRIPTION	A-L P/N	SERVICE PARTS	A-L P/N
1	Piston pump	7-60-05023	Seal Kit	
2	Gear Pump (NBD)	0885-067	Seal Kit	0780-152
3	Main Broom Motor	0882-040	Seal Kit	0880-448
4	Dust Vacuum Motor	0882-048	Seal Kit	
5	Scrub Motor	0782-111	Seal Kit	0780-070
6	Side Broom Motor	0885-061	Seal Kit	0880-293
7	Wheel Motor	0885-092	Rear Motor Seal Kit	
			Shaft Seal Kit	
8	Main Manifold	7-88-00094	Flow Divider (FR1)	7-12-02001
			Relief Valve (RV1)	7-12-02002
			Solenoid Valve (1, 2)	7-12-02003
			Solenoid Valve (SV3)	7-12-02004
			Solenoid Coil	7-14-07005
9	Cylinder Control Manifold	7-88-00069	Solenoid Valve (SV1, 2, 3)	7-12-02005
			Solenoid Valve (SV4)	7-12-02006
			Solenoid Valve (SV2, 6)	7-12-02007
			Check Valve (CV1)	7-12-02008
			Solenoid Coil	7-14-07004
10	Hopper Control Valve	8-88-00053	Seal Kit	0880-367
11	Hopper Door Check Valve	8-88-00064		
12	Vari-Dump Low	8-17-05022		
13	Lift Cylinder	8-17-05029	Seal Kit	0880-506
14	Dump Door Cylinder	7-17-05011	Seal Kit	7-70-00021
15	Scrub Deck Cylinder	7-17-05011		
16	Squeegee Cylinder Lift	7-17-05019		
17	Steer Cylinder	7-17-05010	Seal Kit	7-70-00021
18	Return Filter	7-24-04031	Filter Element	7-24-04032
19	Steer Control Unit	8-60-05034	Seal Kit	
20	Suction Strainer	8-24-04115	N/A	N/A
21	Oil Cooler (OPTION)	8-62-01010	N/A	N/A

INTRODUCTION

The ATS 46/53 hydraulic cylinder control manifold valve contains the hydraulic control valves for the side broom sweeping, scrub deck and squeegee lifting systems. The following description outlines the function of each cartridge valve in this manifold.

DESCRIPTION

The ATS 46/53 cylinder control manifold valve contains six (6) solenoid valves and one (1) spring check valve. The solenoid valves are designated SV1, SV2, SV3, SV4, SV5, and SV6 and the spring check valve is designated CV1.

SV1 This 2-position 3-way solenoid spool valve directs oil entering port “P” from the main manifold valve “P1” port.. (P/N 7-12-02005)

When SV1 is not energized, pressurized oil is directed from port “P” to SV3, SV4, SV5, and CV1 and port “A” is blocked. Oil does not flow through port “B” since it is the return from the side broom motor powered by oil from port “A”. This is the side broom “OFF” position.

When SV1 is energized, pressurized oil is directed for port “P” to port “A”. Returning oil enters port “B” and supplies SV3, SV4, SV5, and CV1. This is the side broom “ON” position.

SV2 This 2-position 2-way poppet solenoid valve controls return oil from port “C1” and serves as the “scrub deck lock valve”. (P/N 7-12-02007)

When SV2 is not energized, oil may only flow from SV3 to port “C1” but no tin the opposite direction. This traps oil in the rod end of the scrub deck cylinder and maintains the raised position of the scrub deck.

When SV2 is energized, oil may flow both directions between SV3 and port “C1”. This allows oil trapped in the rod end of the scrub deck cylinder to return to the tank through SV3 to port “T” which lowers the scrub deck (SV3 must also be de-energized).

SV3 This 2-position 3-way solenoid spool valve directs oil SV1 or port “B”. (P/N 7-12-02005)

When SV3 is not energized, pressurized oil from SV1 (if the side broom if off) or port “B” (if the side broom is on) is blocked while oil from SV2 (if SV2 is energized) is directed to port “T”. In this condi tion, thescrub deck is in the up position (if SV2 is not energized) or in the lower/down position (regard less of the condition of SV2).

When SV3 is energized, pressurized oil from SV1 or port “B” id directed through SV2 to port “C1” while access to port “T” from SV3 is blocked. In this condition, the scrub deck is in the raise position (regardless of the condition of SV2).

SV4 This 2-position, 4-way solenoid spool valve directs the oil leaving SV1 or port “B” and raises and lowers the squeegee. (P/N 7-12-02006)

When SV4 is not energized, oil from SV1 (if the side broom is off) or port “B” (if the side broom is on) is directed through port “C3” to the base end of the squeegee cylinder while oil is allowing to flow from SV6 (if SV6 is energized) to port “T”/ This is the squeegee DOWN position.

When SV4 is energized, oil from SV1 or port “B” is directed through SV6 to port “C4” and the rod end of the squeegee cylinder. In addition, oil is permitted to flow between port “C3” and port “T”. This is the squeegee RAISE/UP position.

CYLINDER CONTROL MANIFOLD VALVE (7-88-00069)

SV5 This 2-position, 3-way solenoid spool valve directs from SV1 or port “B”. (P/N 7-12-02005)

When SV5 is not energized, oil is permitted to flow from port “C2” to port “T” while pressurized oil from SV1 (if the side broom is off) or port “B” (if the side broom is on) is blocked. In this condition, the scrub deck may be in the RAISE or DOWN/FLOAT position.

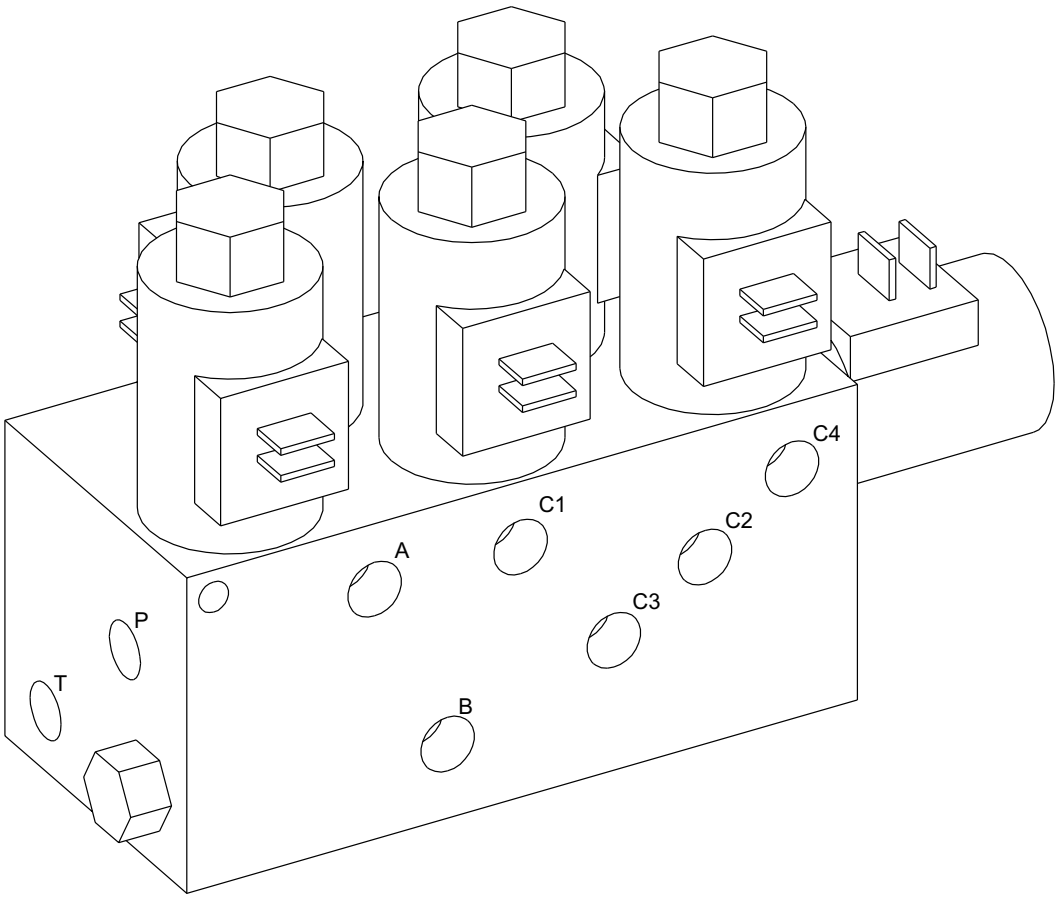
When SV5 is energized, pressurized oil is directed from SV1 or port “B” to port “C2” while port “T” is blocked. In this condition, the scrub deck is in the HEAVY DOWN position.

SV6 This 2-position, 2-way poppet solenoid valve controls return oil from port “C4” and serves as the “squeegee lock valve”. (P/N 7-12-02007)

When SV6 is not energized, oil may flow from SV4 to port “C4” but nor in the opposite direction, This traps oil in the base end of the squeegee cylinder an maintains the raised position of the squeegee.

When SV6 is energized, oil may flow both directions between SV4 and port “C4”. This allows oil trapped in the base end of the scrub deck cylinder to return to tank through SV4 to port “T” which lowers the squeegee (SV4 must also be de-energized).

CV1 This ball/spring style check valve receives the oil supplied at port “P”. It maintains a minimum of 200 PSI at port “P” and provides a maximum pressure setting for the scrub deck and squeegee cylinders. This valve also provides and limits the pressure for the HEAVY SCRUB position of the scrub deck. (P/N 7-12-02008)



C1740/9706

C1740

INTRODUCTION

The ATS 46/53 hydraulic main manifold valve contains the hydraulic control valves for the main broom sweeping, scrubbing, and hopper lifting systems. The following description outlines the function of each cartridge valve in this manifold.

DESCRIPTION

The ATS 46/53 main manifold valve contains three (3) solenoid valves, one (1) priority flow divider valve, and one (1) relief valve. The solenoid valves are designated SV1, SV2, and SV3, the priority flow divider valve is designated FR1, and the relief valve is designated RV1.

FR1 This priority flow divider valve divides and directs the incoming auxiliary pump flow entering the manifold at port “P”. (P/N 7-12-02001)

Since FR1 is a 0.75 gpm valve, it directs 0.75 gpm from the supply oil entering port “P” out port “P1” to the cylinder control manifold valve. The remainder of the supply oil over and above 0.75 gpm (bypass oil) is directed to SV1. FR1 is a priority valve which means that the 0.75 gpm must be satis fied before oil is permitted to bypass to SV1. This explains why the side broom, scrub deck cylinder, and squeegee cylinder function at normal speed regardless of engine speed (pump flow).

SV1 This 2-position, 2-way poppet solenoid valve directs the bypass oil from FR1. (P/N 7-12-02003)

When SV1 is not energized, SV1 is open and allows bypass oil from FR1 to flow to SV2. This is the main broom and dust control “OFF” position.

When SV1 is energized, SV1 is closed and the direct path to SV2 is blocked. Bypass oil flows from FR1 out port “1” to the main broom and dust control motors. This is the main broom and dust control “ON” position.

SV2 This 2-position, 2-way poppet solenoid valve is identical to SV1 and directs the oil returning through port “2” or the oil flowing through SV1. (P/N 7-12-02003)

When SV2 is not energized, SV2 is open and allows oil from either SV1 (if the sweeping system is off) or port “2” (if the sweeping system is on) to flow through port “T”. This is the scrub brush “OFF” position.

When SV2 is energized, SV2 is closed and the direct path to port “T” is blocked. Oil flows from either SV1 or port “2” to SV3. This is the scrub brush “ON” position.

SV3 This 2-position, 4-way solenoid spool valve directs the oil leaving SV1 or port “2” when SV2 is ener gized and determines which direction the scrub brushes rotate. (P/N 7-12-02004)

When SV3 is not energized, oil from SV1 (if sweeping system is off) or port “2” (If sweeping system is on) is directed through port “3” to the scrub brush motors. The return oil from the scrub brush motors flows through port “4” and is directed by SV3 to port “T”. This results in the “normal” scrub brush direction of rotation.

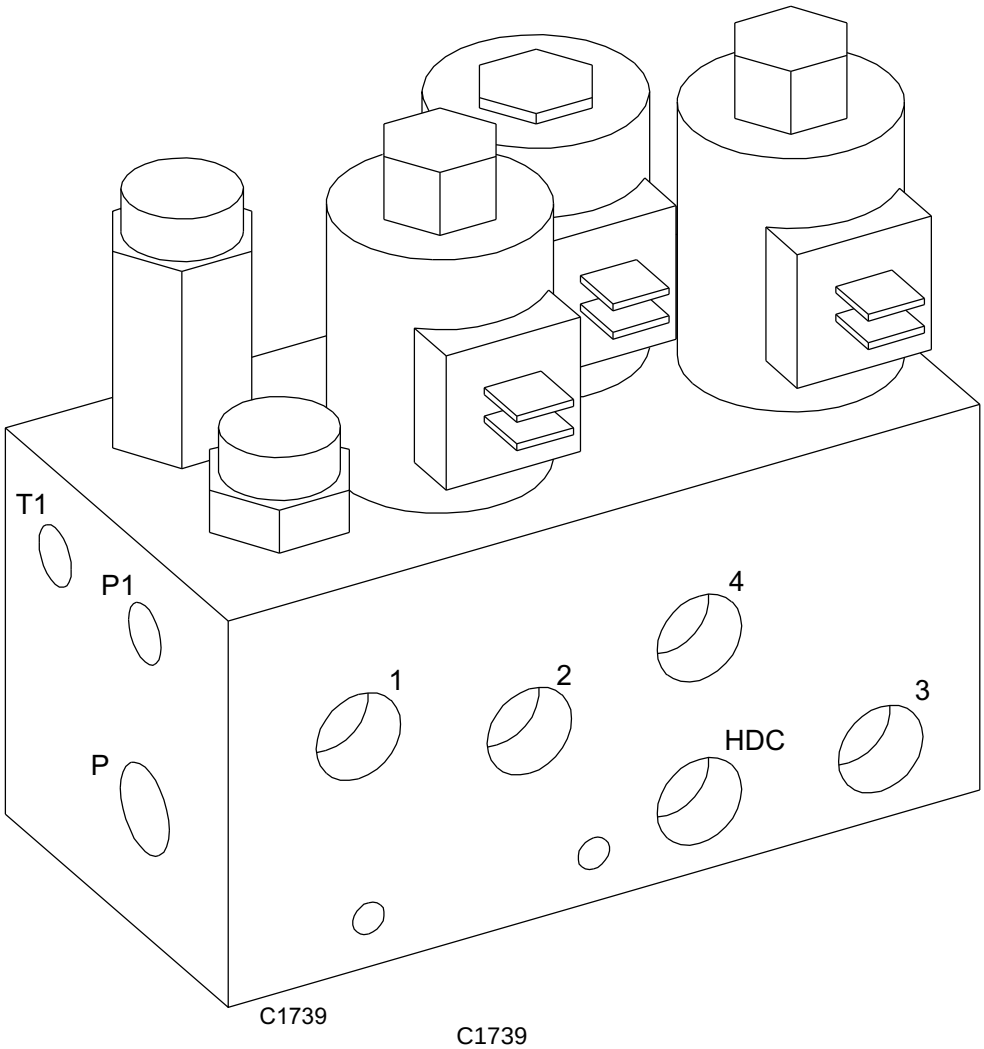
When SV3 is energized, oil from SV1 or port “2” is directed through port “4” to the scrub brush motors. The return oil from the scrub brush motors flows through port “3” and is directed by SV3 to port “T”.

This results in the “reversed” scrub brush direction of rotation.

RV1 This poppet style relief valve limits the pressure of the bypass oil leaving FR1 (may be measured at port “1”). If serves to protect the auxiliary pump, main broom motor, dust control motor, and scrub motors. (P/N 7-12-02002)

Under normal operation, oil pressure remains below 2,500 PSI at port “1” and RV1 remains closed.

When 2,500 PSI is achieved at port “1”, RV1 opens and permits oil to flow directly to port “T1” and back to tank. This condition will typically occur under the following conditions: the main broom or scrub brushes are stalled against as obstruction, the hopper dump door is opened or closed com pletely, the hopper is raised to the maximum height, or the hopper is loaded above its rated capacity.



C1739

ELECTRICAL TROUBLESHOOTING GUIDE
46/53 IN. SWEEPER/SCRUBBER

CAUTION STATEMENT

As with all electrical equipment, caution is essential when troubleshooting. Remove all watches, rings, and jewelry before proceeding. Take care when doing power checks. Take time needed to place meter leads correctly so as not to short to nearby terminals and/or electrical connections. Do not forget to disconnect power at the battery when doing continuity checks or damage to your test meter may result. All troubleshooting should be done by a qualified technician experienced in DC voltage and DC testing equipment.

GENERAL STATEMENT

The following guide will present each electrical circuit separately, not including options, unless they are in electrical series with the standard machine.

1. “Power Off” means key switch is turned off.

2. “Power Disconnect” means battery disconnected from the machine.

3. All voltages are taken with the battery connected and the key switch on unless noted otherwise.

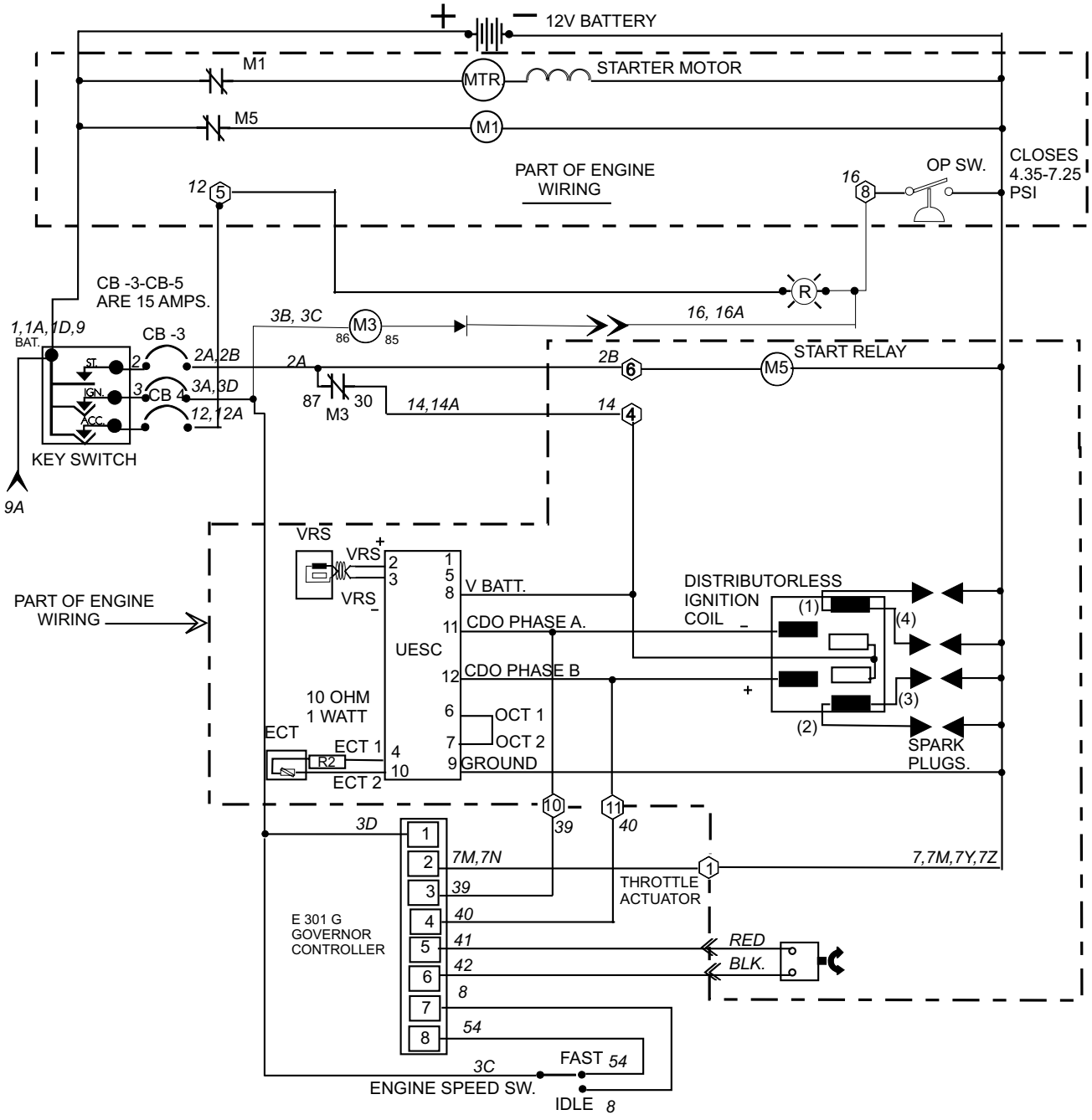
4. All voltage readings are taken with the meter (-) lead connection to the battery (-) or the (-) side of the hour meter unless otherwise specified.

5. All continuity readings are taken with the key switch off and the battery disconnected.

CRANKING CIRCUIT WITH LESS THEN 4.35 PSI

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch in START position
3. CB-3, CB-4 & CB-5 closed
4. M3 energized (NO OIL PRESSURE)
5. M1 & M5 energized
6. Battery voltage present on terminals #4 & #6 on 11 term. strip on engine
7. Battery voltage on engine speed switch and #1 terminal on electronic governor
8. Good ground on #2 of the electronic governor and #1 on 11 terminal strip

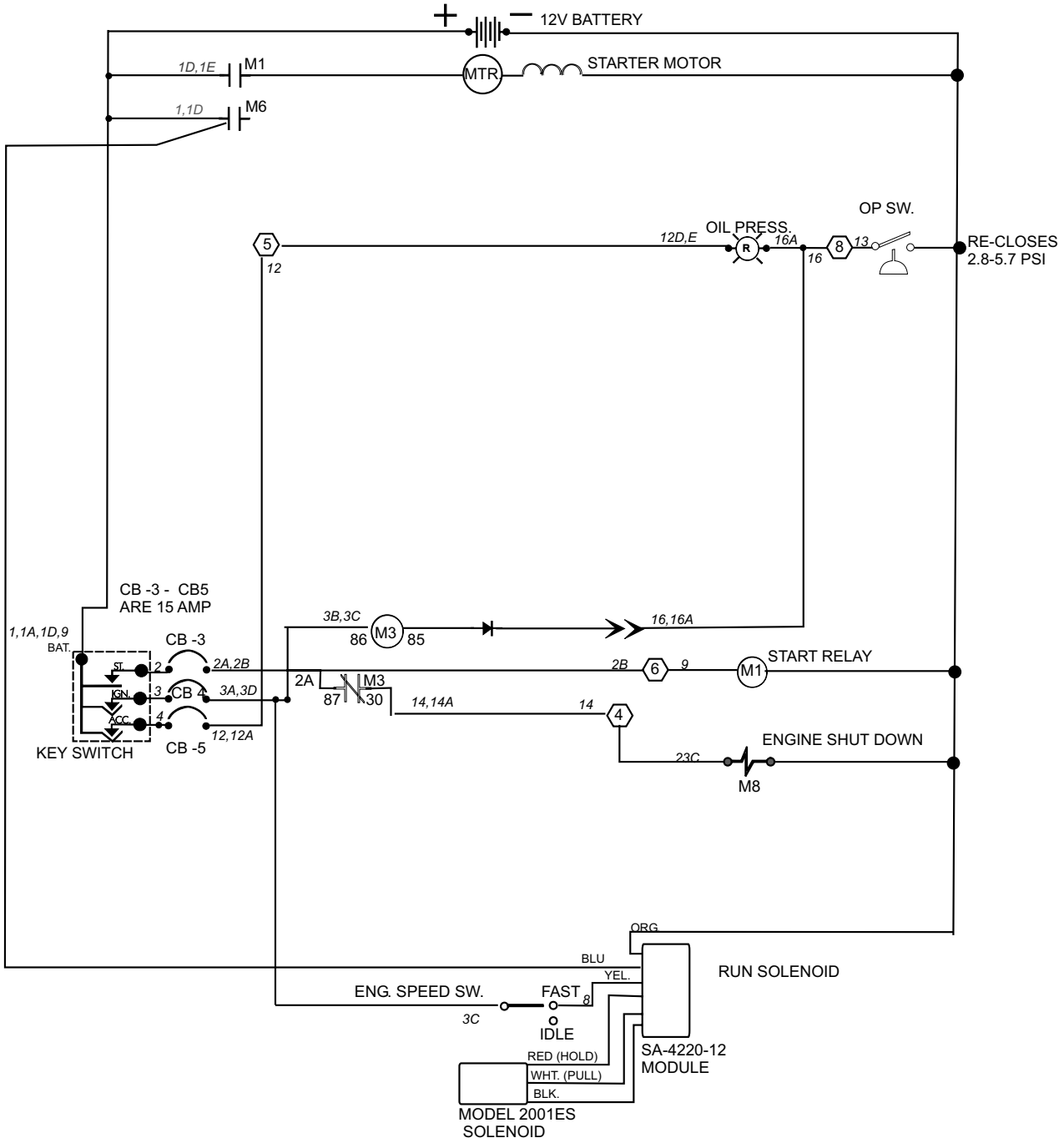


T133

CRANKING CIRCUIT WITH LESS THEN 2.8. PSI

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch in START position
3. CB-3, CB-4 & CB-5 closed
4. M3 energized (NO OIL PRESSURE)
5. M1 energized
6. Battery voltage present on terminals #4 & #6 on 11 term. strip on engine
7. Battery voltage on engine speed switch and Blue lead on run solenoid.
8. Good ground on the run solenoid. (Orange Wire)

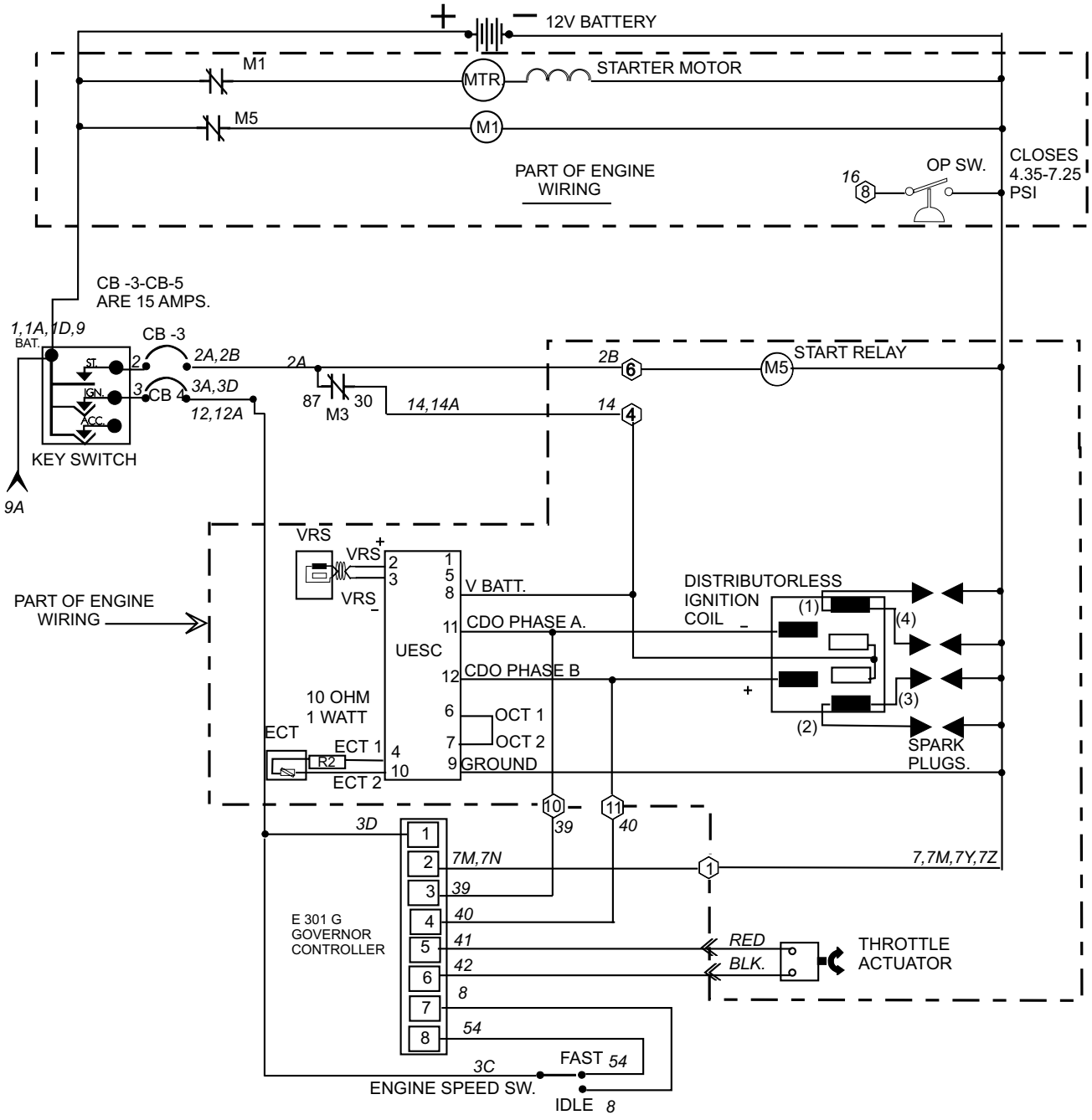


T134

CRANKING CIRCUIT WITH MORE THEN 4.35 PSI

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch in START position
3. CB-3, CB-4 closed
4. M3 not energized (OIL PRESSURE)
5. M1 & M5 energized
6. Battery voltage present on terminals #4 & #6 on 11 term. strip on engine
7. Battery voltage on engine speed switch and #1 terminal on electronic governor
8. Good ground on #2 of the electronic governor and #1 on 11 terminal strip

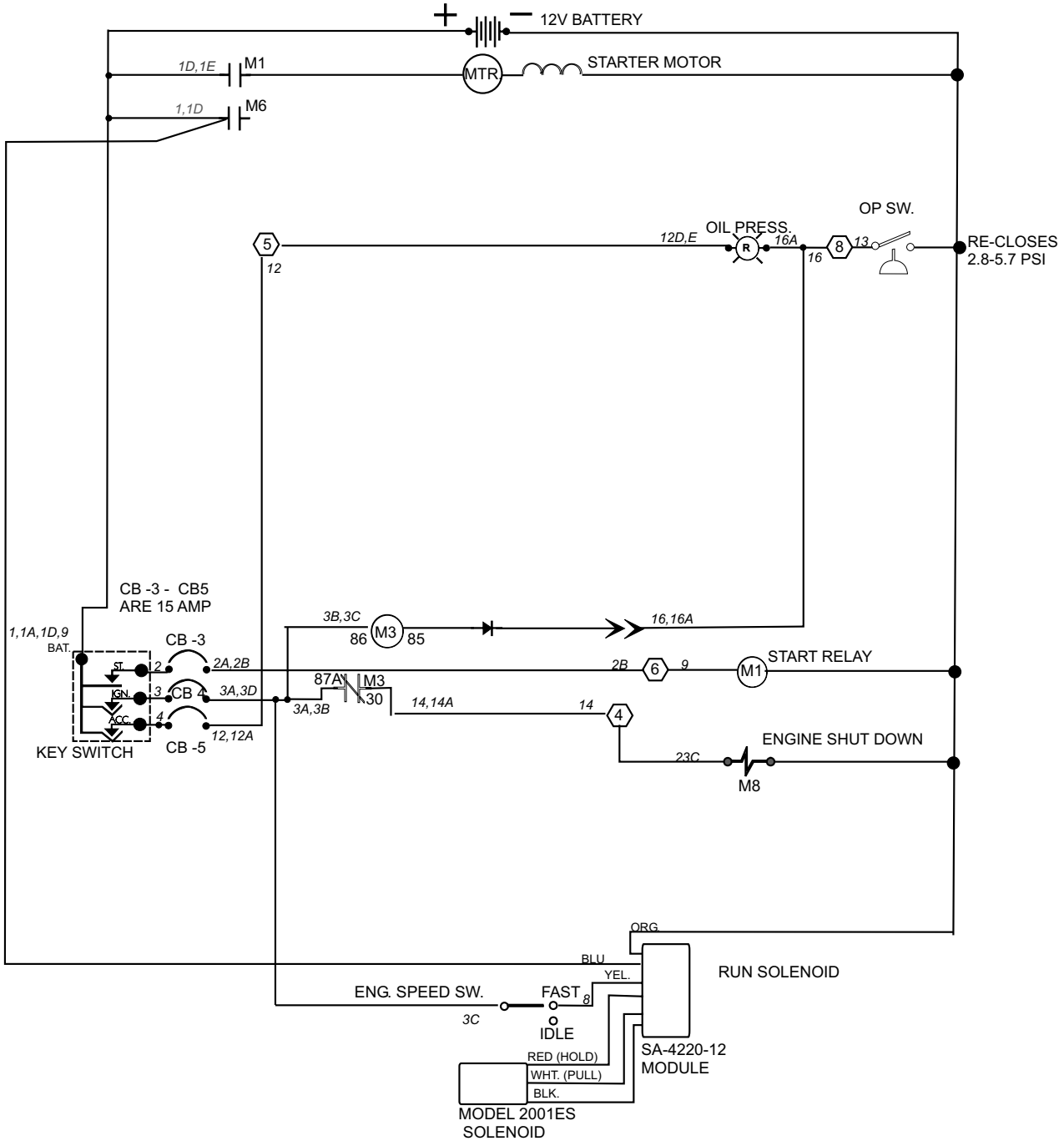


T101

CRANKING CIRCUIT WITH MORE THEN 5.7. PSI

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch in START position
3. CB-3, CB-4 & CB-5 closed
4. M3 energized (NO OIL PRESSURE)
5. M1 energized
6. Battery voltage present on terminals #4 & #6 on 11 term. strip on engine
7. Battery voltage on engine speed switch and (Blue) lead on run solenoid.
8. Good ground on the run solenoid. (Orange Wire)



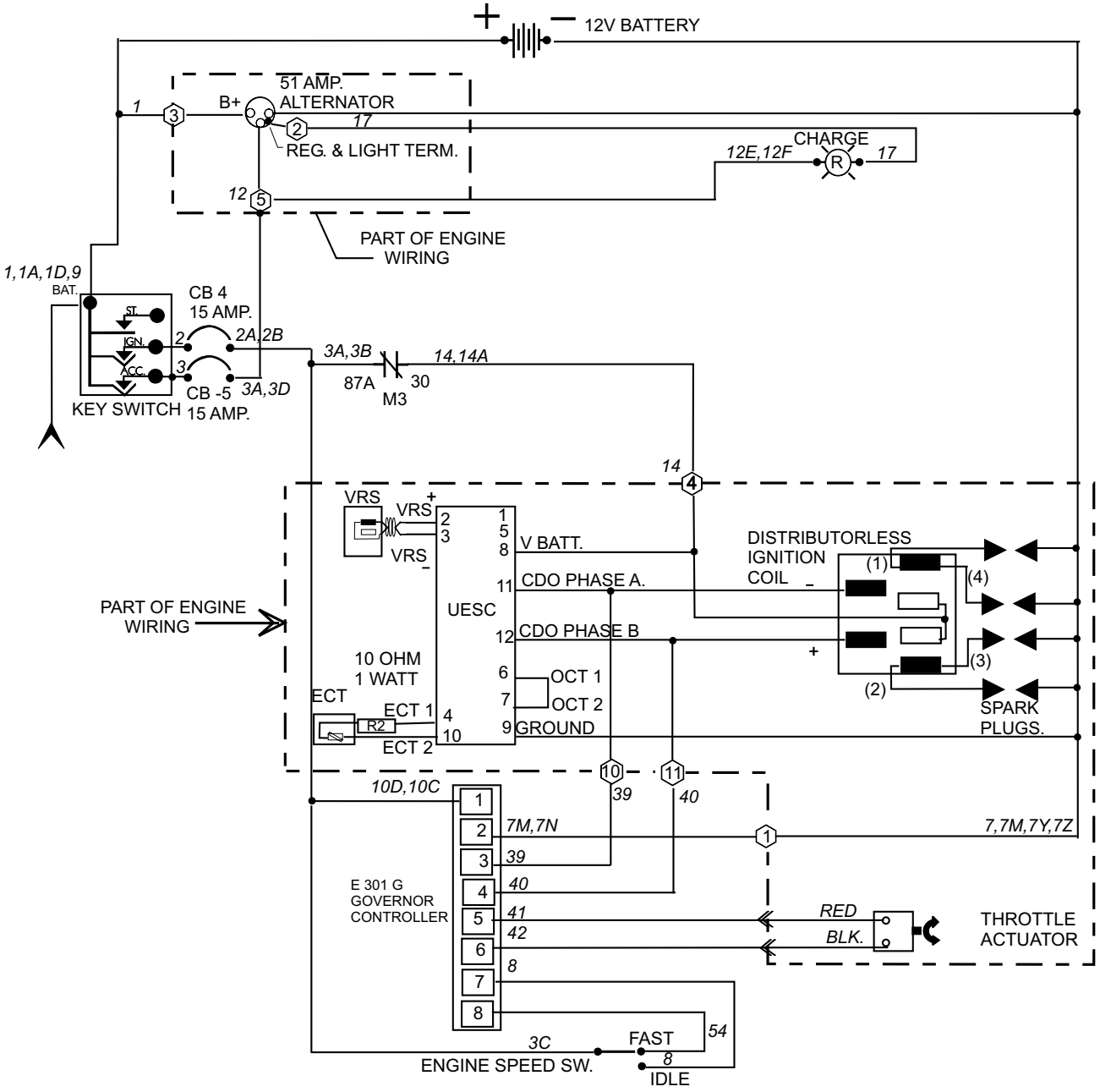
T102

RUN CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch on
3. CB-4 & CB-5 closed
4. M3 denergized (OIL PRESSURE)
5. Voltage-13.5-14.6 VDC present on terminals #3,4 & 5 on 11 term. strip on engine
6. 13.5-14.6 VDC on engine speed switch and #1 terminal on electronic governor
7. Good ground on #2 of the electronic governor and #1 on 11 terminal strip

If voltage is present and ground on terminal #1 is good check electronic governor, engine speed switch as well as the throttle actuator wiring.

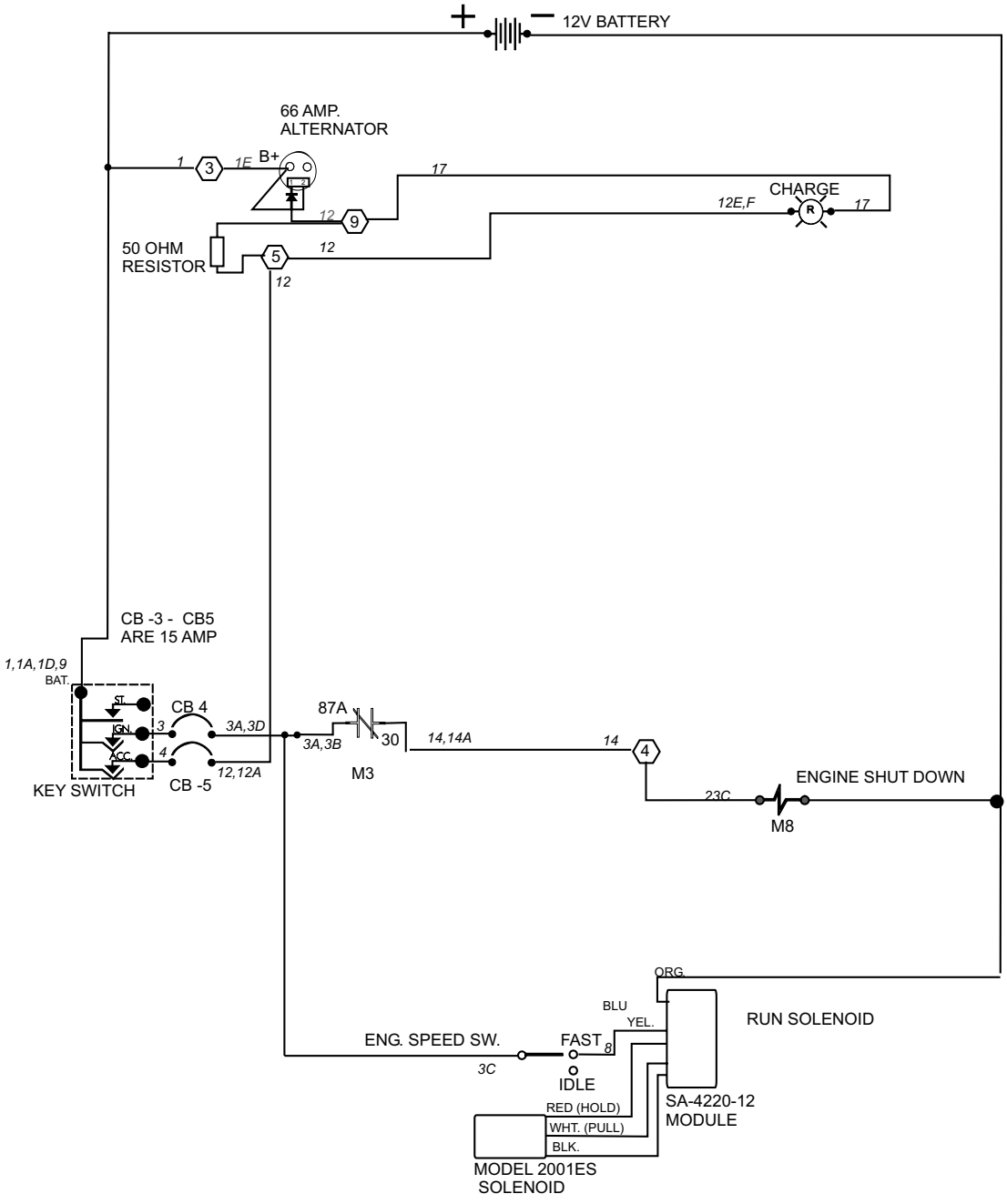


T103

RUN CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch in ignition position
3. CB-4 & CB-5 closed
4. M3 not energized (OIL PRESSURE)
5. M8 energized
6. Battery voltage present on terminals #4 & #6 on 11 term. strip on engine
7. Battery voltage on engine speed switch and (Blue) lead on run solenoid.
8. Good ground on the run solenoid. (Orange Wires)



T104

GOVERNOR CIRCUIT

CAUTION

BE SURE THAT TERMINAL #4 IS DISCONNECTED BEFORE CONNECTING OR DISCONNECTING TERMINAL #1

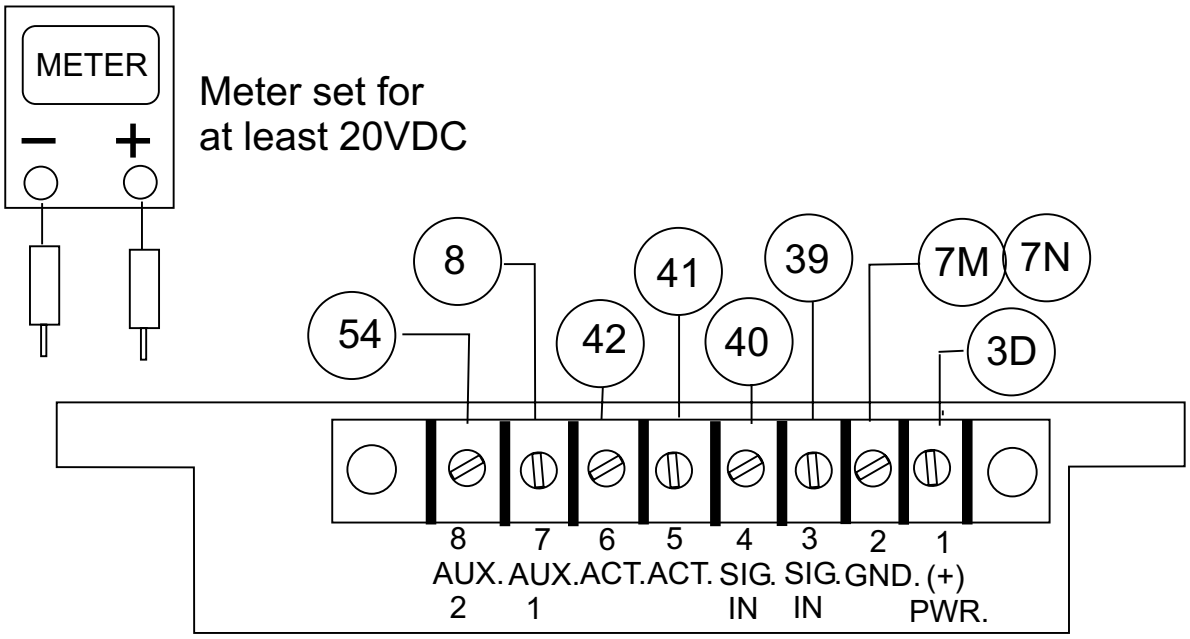
Make all connections with all power OFF

All voltage readings are between #2 (-lead) and the other terminals and may very slightly

Power should NEVER be applied to the actuator without also being applied to terminal #1 or damage will result

	KEY SWITCH IGNITION POSITION	IDLE	SPEED
PIN - #8	3.29 VDC	14.23 VDC	3.29 VDC
PIN - #7	BATTERY VOLTAGE	14.23 VDC	3.29 VDC
PIN - #6	BATTERY VOLTAGE	11.86 VDC	10.80 VDC
PIN - #5	BATTERY VOLTAGE	14.22 VDC	14.30 VDC
PIN - #4	-.01 VDC	14.04 VDC	14.02 VDC
PIN - #3	-.01 VDC	14.04 VDC	14.02 VDC
PIN - #2	NEGATIVE LEAD OF THE METER		
PIN - #1	BATTERY VOLTAGE	14.23 VDC	14.31 VDC

T122



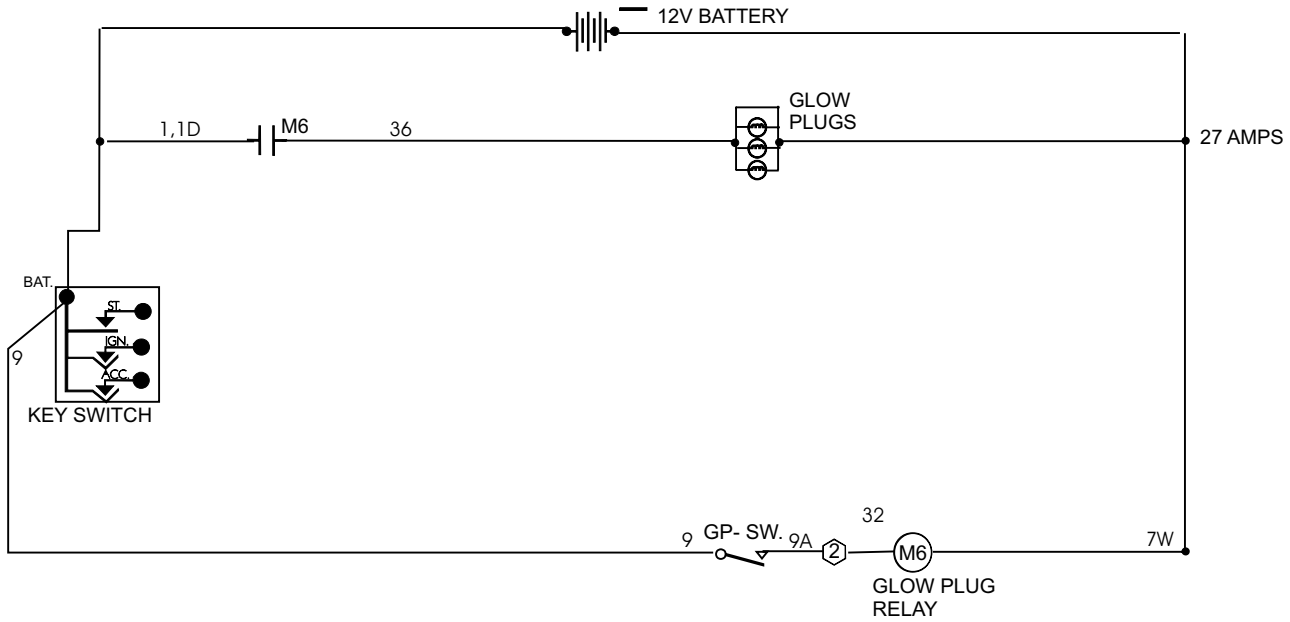
T105

GLOW PLUG CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. M6 energized
3. Battery voltage present on terminal #2 on 11 term. strip on engine
4. Glow plugs switch closed

Start at the glow plugs (Wire #36) and check for battery voltage, if none check M6. If there is voltage on (Wires #1D, 1E) but not on (Wire #36) then M6 is not closed. Check for battery voltage at the coil of M6 (Wire #32), if none and there is a good ground on (Wire #7W), then work your way back to term. #2 on engine terminal strip. Continue checking back through glow plugs switch (Wire 9) to the battery (+).



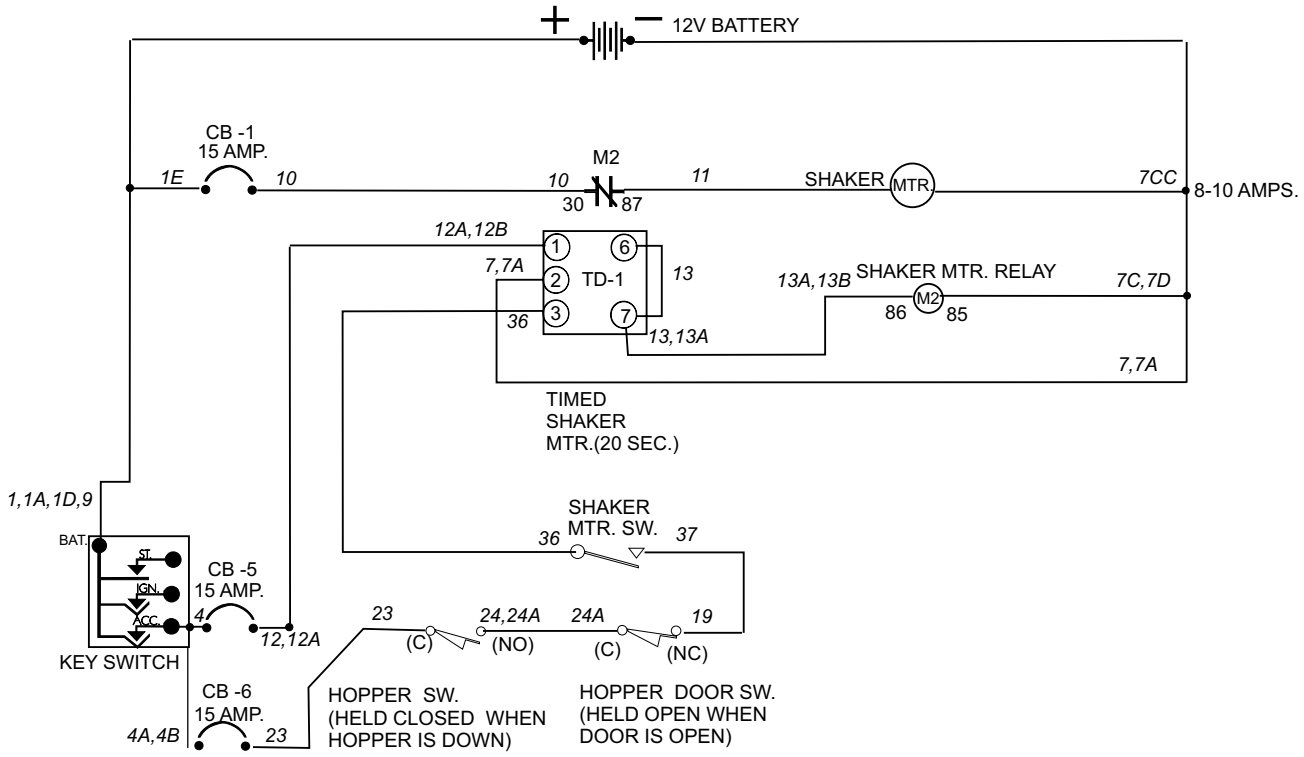
T121

SHAKER MOTOR CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch on
4. M2 energized
5. Hopper switch closed (Hopper Down)
6. Shaker sw. momentarily closed
7. TD-1 closed between pins #1 & #6 (For 20 seconds)
8. Hopper door switch is closed

Start at the shaker motor (Wires #11 & 7c), place (+) meter lead on (Wire #11) & (-) meter lead on (Wire # 7c), depress the shaker motor switch. If no voltage is present and the gnd. is good then check M2 (Wire #11) if no voltage on #87 of M2 but there is on #30 of M2 then check #86 on M2. M2 #86 only gets voltage through TD-1, this 20 sec. timer gets voltage from pin #1 to pin #6 when pin #3 is pulsed by the shaker motor switch. If no voltage on pin #1,check CB-5 back through the key switch. If no voltage on pin #3 with shaker switch depressed then check the shaker switch, hopper switch, hopper door switch, CB-6 back to the key switch.

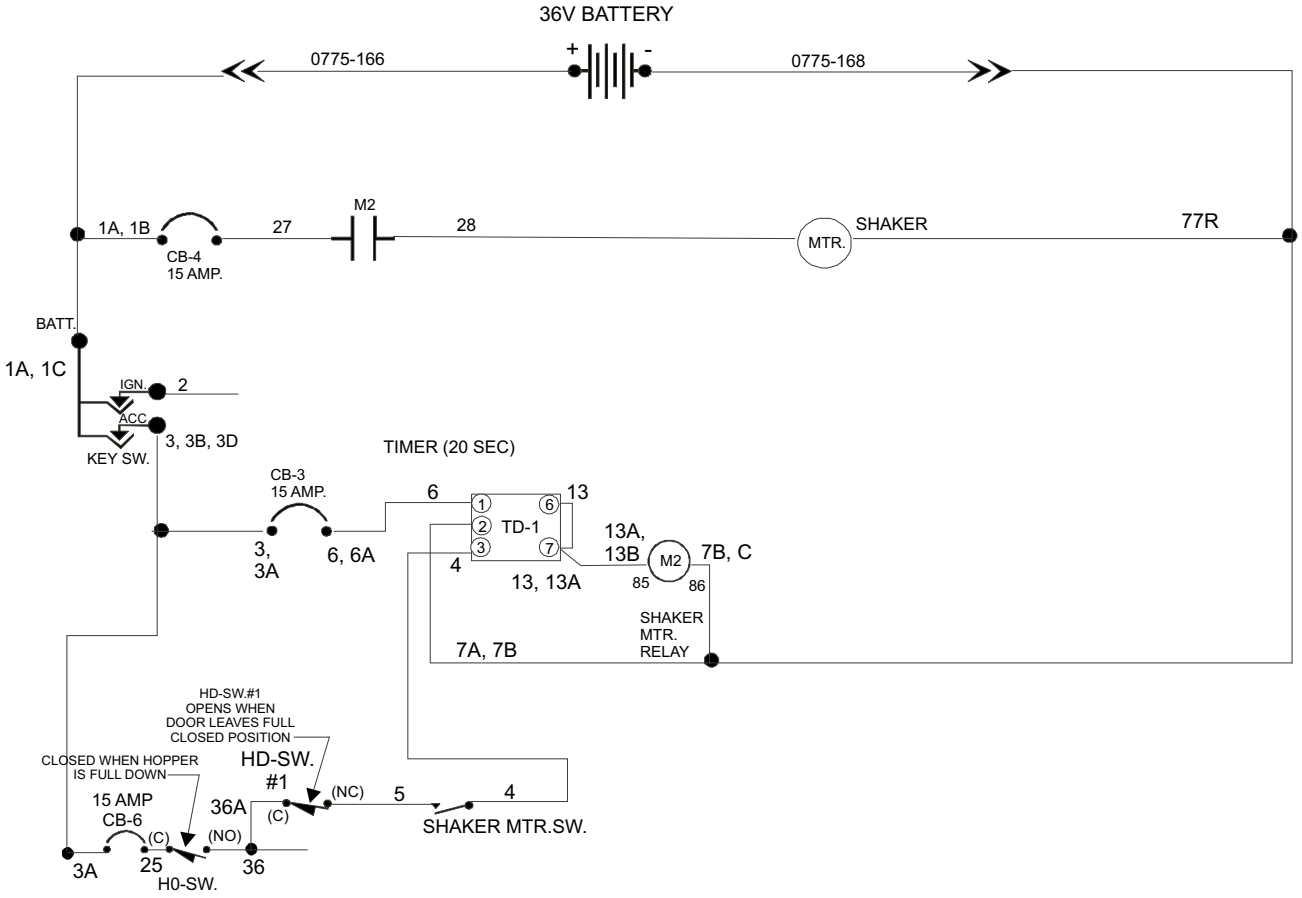


T106

SHAKER MOTOR CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-3, CB-4 and CB-6 closed
4. Relay M2 closed
5. TD-1 energized
6. Hopper switch closed (Hopper Down)
7. Hopper Door switch#1 closed (Hopper Door closed)
8. Shaker motor switch momentary closed (Pulsed)



T123

MAIN AND SIDE BROOM CIRCUITS

Conditions necessary for circuits to work

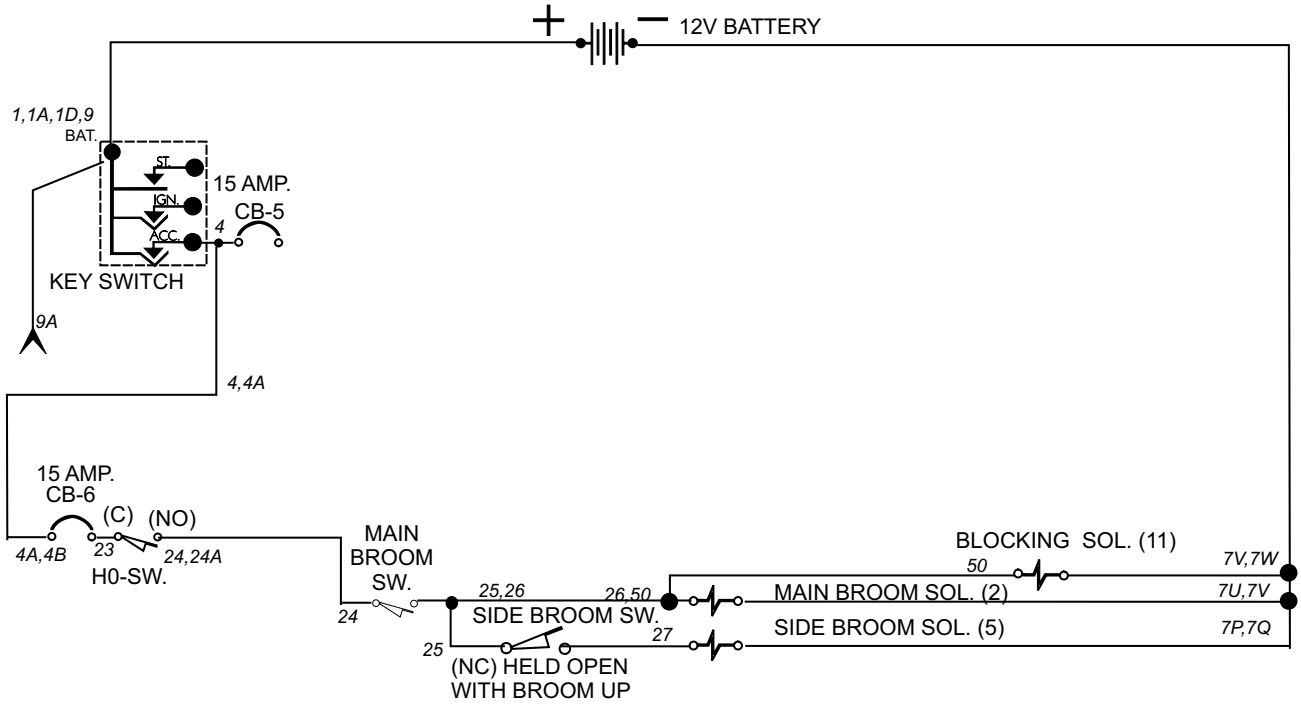
1. Battery Voltage
2. Key switch in on
3. CB-6 closed
4. Hopper switch closed (HOPPER DOWN)
5. Main broom switch closed
6. Side broom switch closed
7. Good ground on solenoids (2) Main Broom (5) Side Broom

Start at main broom solenoid (2) and work your way back through main broom switch, CB-6 to key switch.

For side broom start at solenoid (5), then work your way back through side broom switch, main broom switch and CB-6 to key switch.

Note

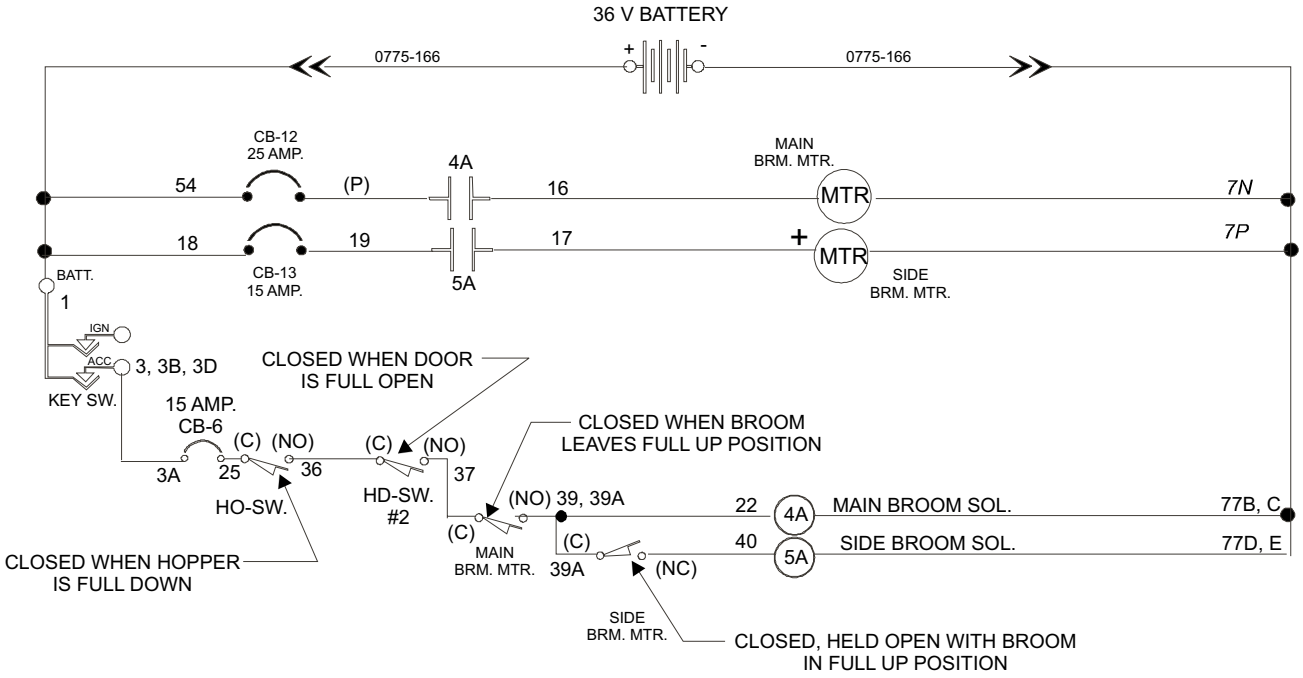
When main broom solenoid (2) is energized solenoid (11) blocking solenoid is also energized. Solenoid (11) holds hopper door open or opens it when main broom is down and running.



MAIN AND SIDE BROOM CIRCUITS

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-6, CB-12 and CB-13 closed
4. Hopper switch closed (HOPPER DOWN)
5. Hopper door #2 switch closed (Hopper door full open)
6. Main broom switch closed
7. Side broom switch closed
8. Solenoids (4A) and (5A) energized and contacts closed.



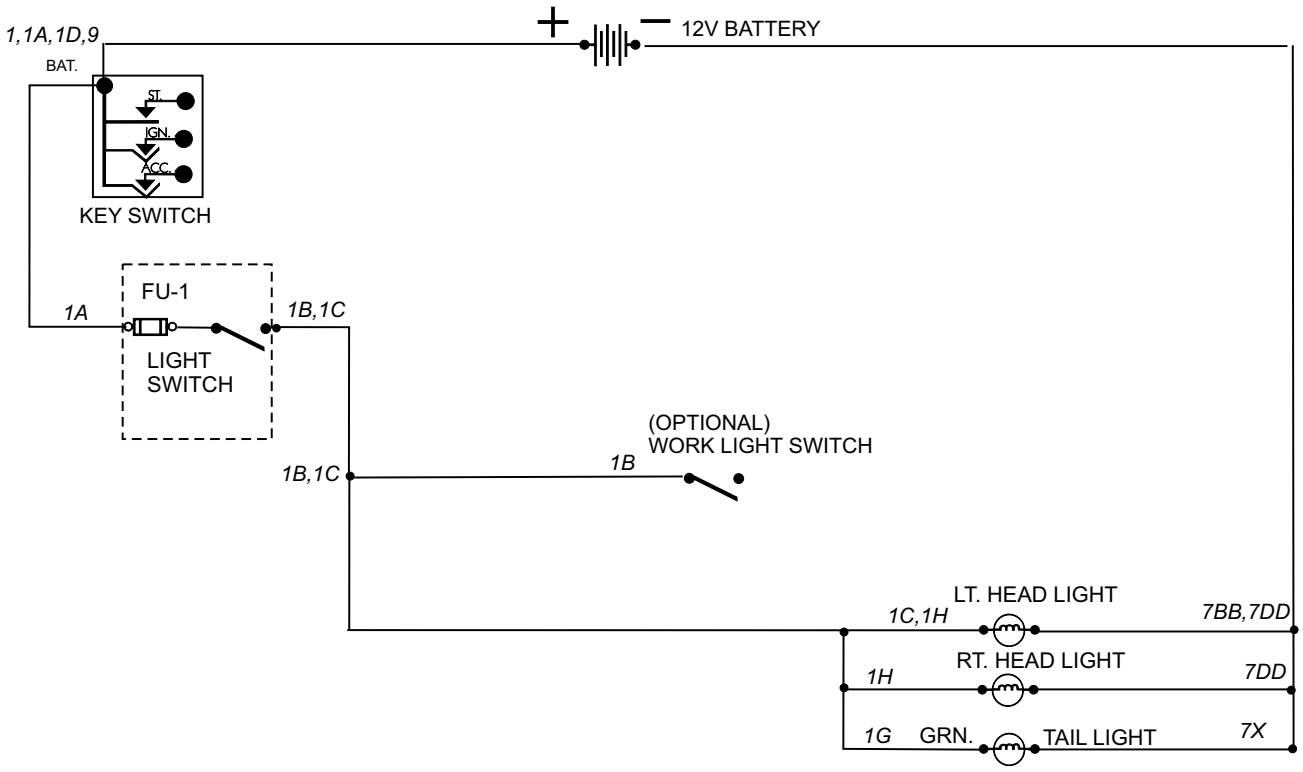
T124

HEAD, TAIL & SWITCH LIGHTS

Conditions necessary for circuits to work

1. Battery Voltage
2. Light switch closed

Check each affected light for voltage on the hot side, One of the (Wires That Start With The #1) and the ground side (Wires That Start With #7). If no voltage is present on the hot side and the ground circuit checks out, check back through the light switch to the key switch.

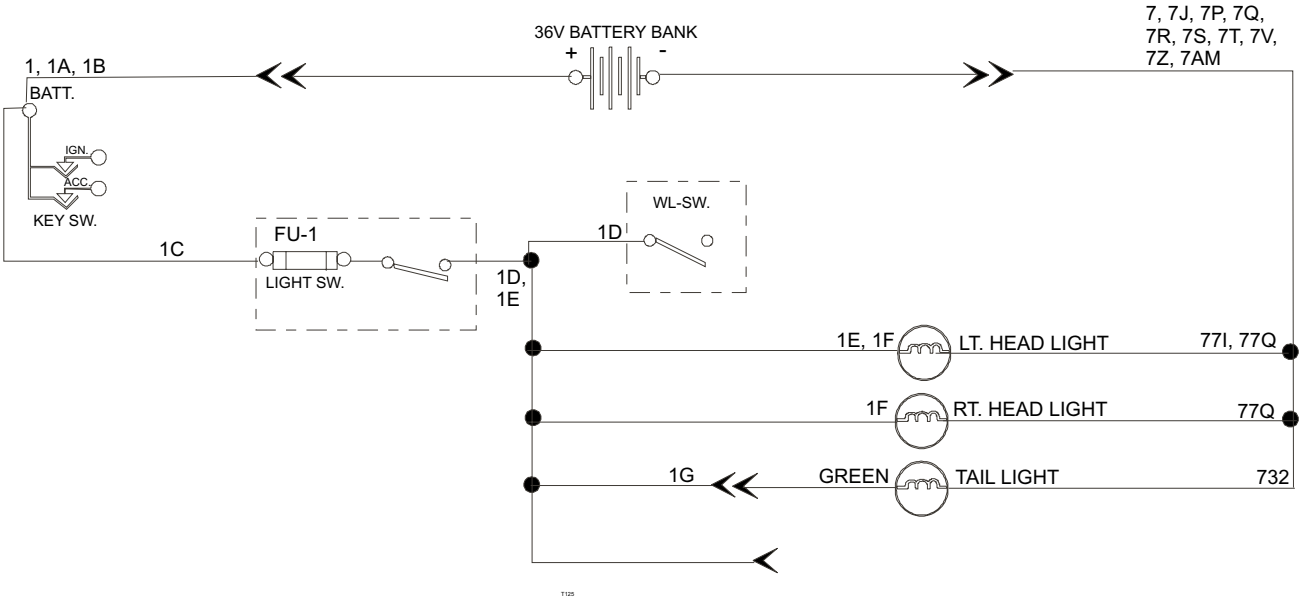


T109

HEAD & TAIL LIGHTS

Conditions necessary for circuits to work

1. Battery Voltage
2. Light switch closed
3. Fuse in light switch good (closed)



T125

SQUEEGEE & VACUUM CIRCUITS

Conditions necessary for circuits to work

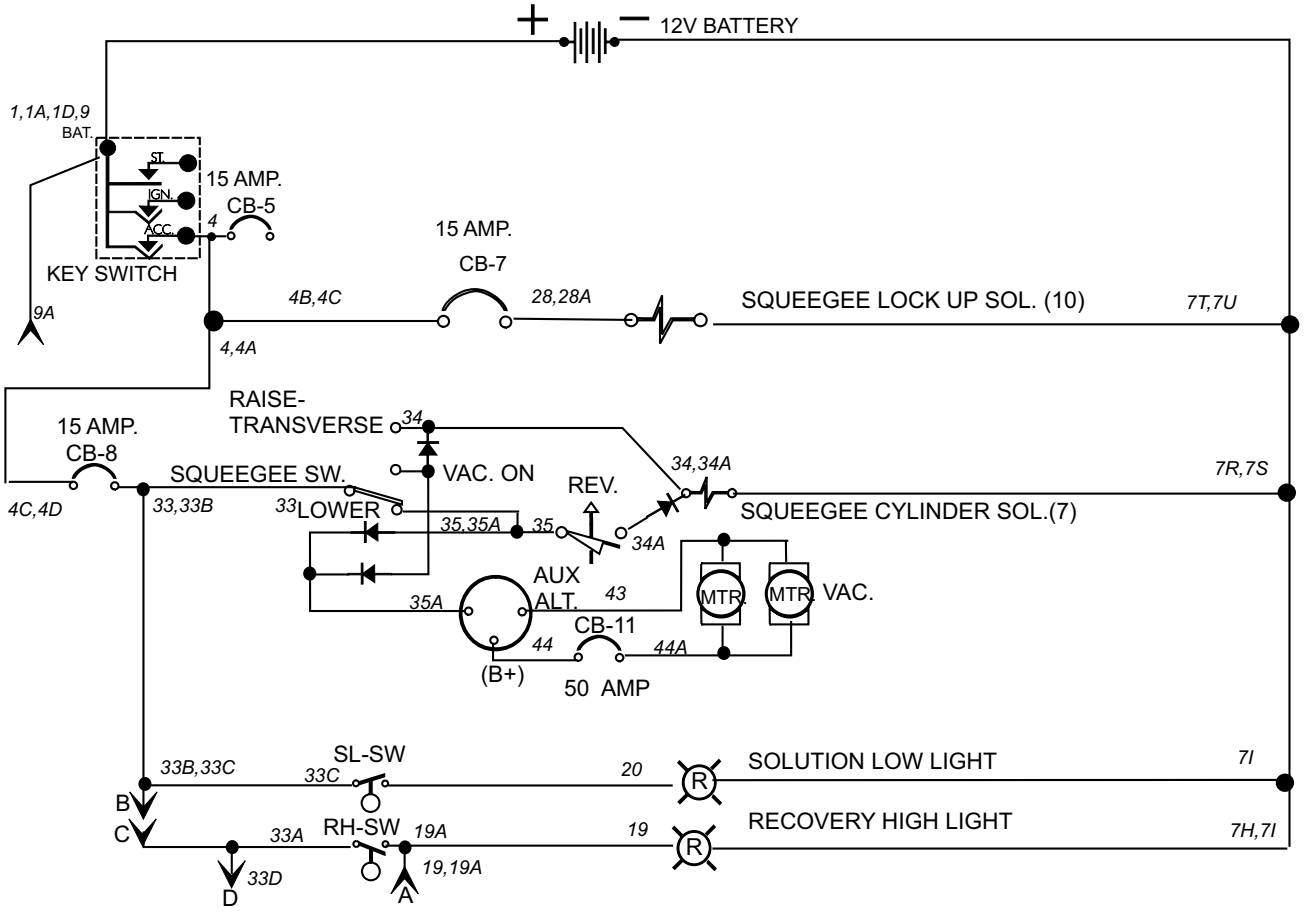
1. Battery Voltage
2. Key switch on
3. CB-7, CB-8 & CB-11 closed
4. Squeegee switch in lower position
5. Squeegee solenoid (7) energized
6. Engine running

Squeegee lock up solenoid (10) holds squeegee up when engine is turned off.

Vacuum motors will run between 38v-42volts with engine RPM at2000.

Squeegee switch works like this:

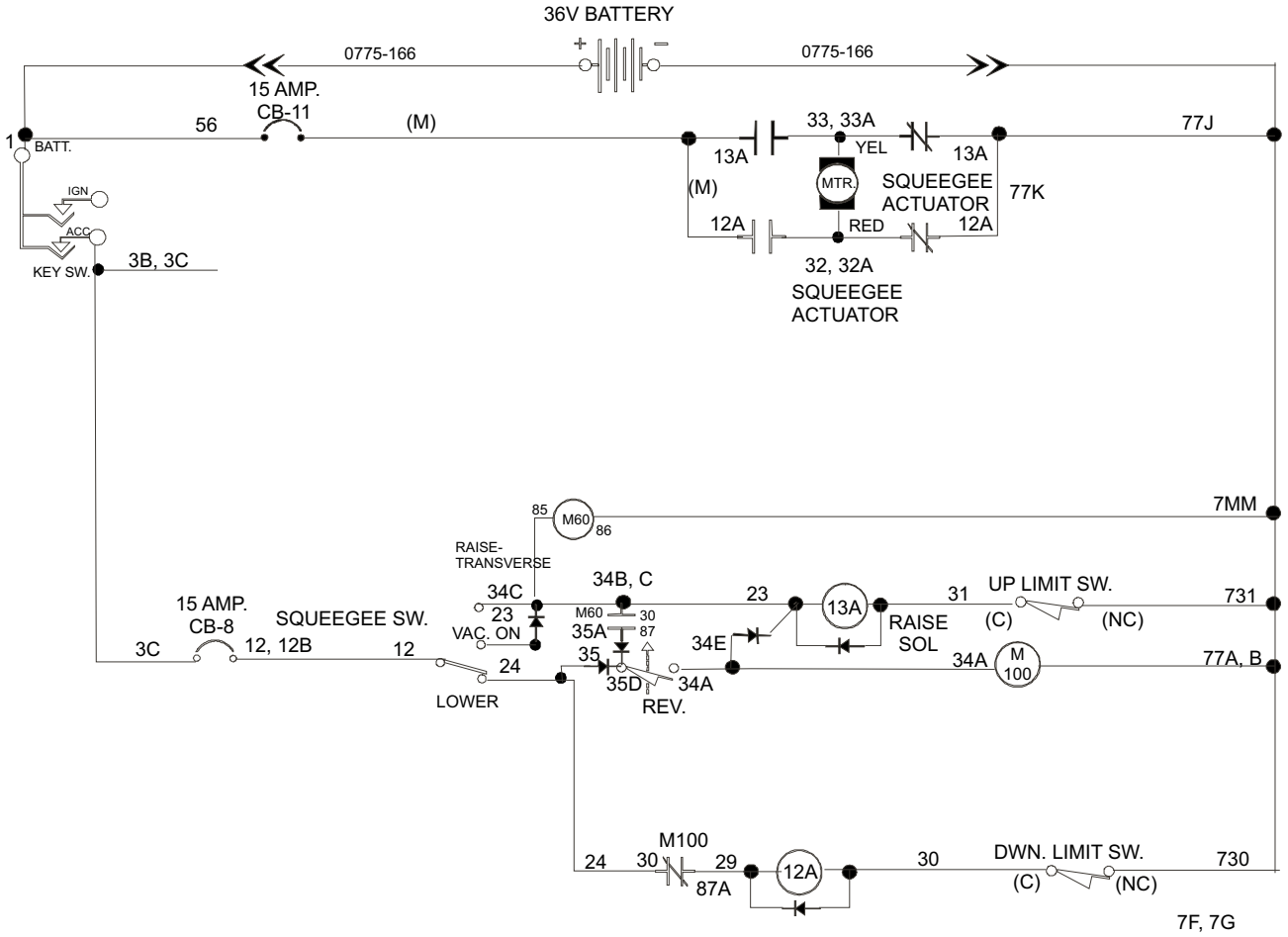
1. Squeegee switch (TOP) position-Squeegee up & vac. off.
2. Squeegee switch (MIDDLE) position-Squeegee up vac. on.
3. Squeegee switch (BOTTOM) position-Squeegee down & vac. on.



SQUEEGEE CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-11 and CB-15 closed
4. Solenoid 13A energized for UP position
5. Squeegee switch either in UP or Middle position
6. Squeegee up limit switch closed until squeegee in full up position
7. Solenoid 12A energized for DOWN position
8. Squeegee switch in LOWER position
9. Squeegee down limit switch closed until squeegee in full down position
10. M100 not energized (closed)

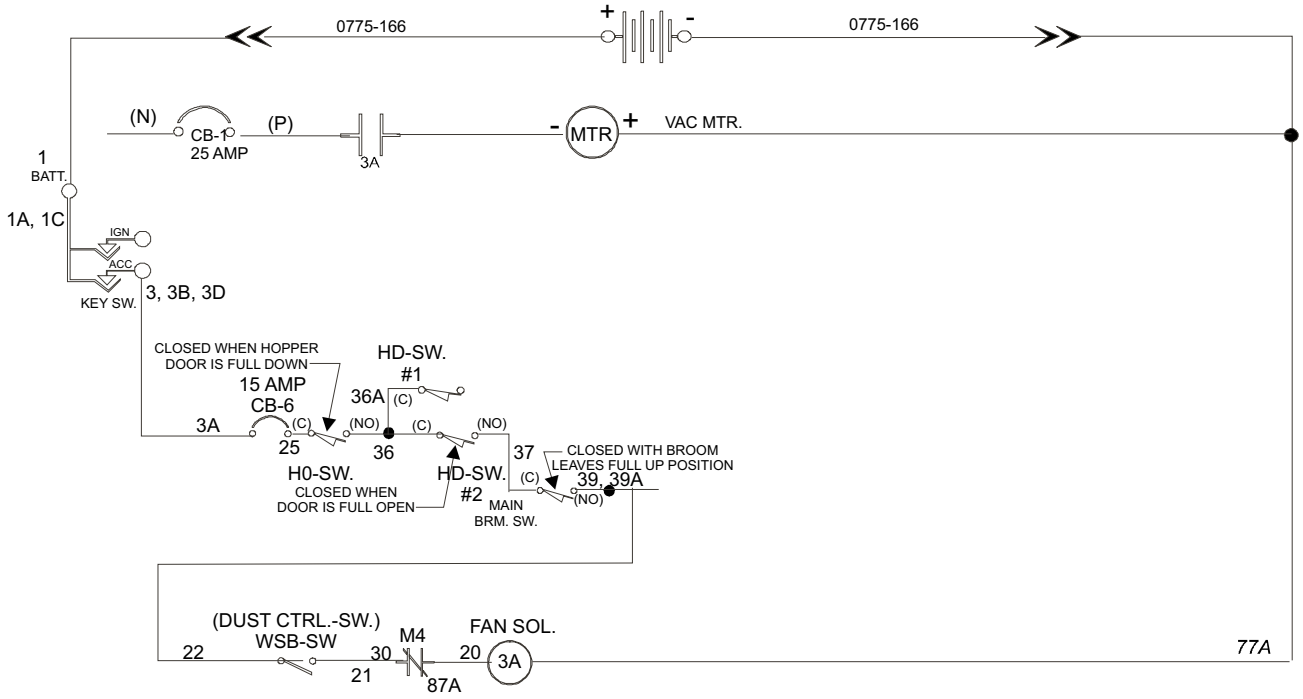


T126

HOPPER VACUUM CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-1 and CB-6 closed
4. Solenoid 3A closed
5. M4 closed (De-energized)
6. Hopper switch closed (Hopper Down)
7. Hopper Door switch#2 closed (Hopper Door full open)
8. Dust control switch closed
9. Main Broom switch closed (Main Broom not in full up position)



T127

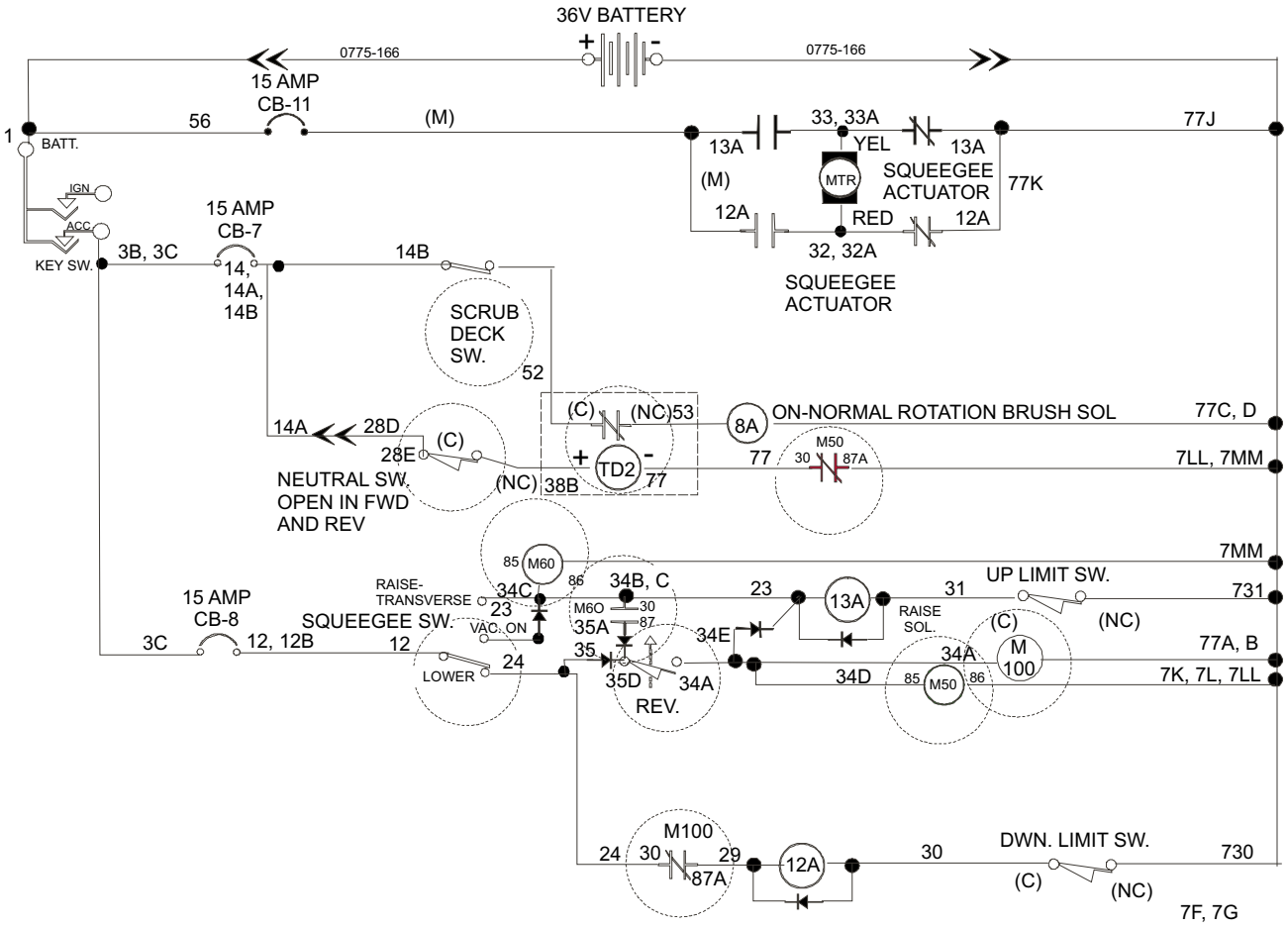
SQUEEGEE AND BRUSH CIRCUITS

1. Scrub deck switch when closed, current goes through TD-2 (NC) contacts and energizes solenoid #8A turning on the brushes if Neutral switch is in FWD. or REV.

2. TD-2 when energized turns (Off) the scrub brushes, this can be done by remaining in neutral for longer then 2 seconds.(Neutral switch closed)

3. TD-2 can be de-energized in two ways. (Scrub brushes on)
   A) Driving in forward or reverse.
   B) By energizing M50 via the foot pedal through the closed contacts of M60 that is energized by the squeegee switch in either the (Middle or Up) position.

4. M100 is energized whenever the foot pedal is placed in reverse regardless of the position of the squeegee switch. M100 when energized stops the squeegee actuator from lowering by de-energizing solenoid 12A thus allowing for double scrub. When the squeegee switch is in the (UP) or (Middle), M100 uses the M60 circuit through the (Reverse switch).When the squeegee switch is in the (Down) position the circuit to M100 just goes through the (Reverse switch).

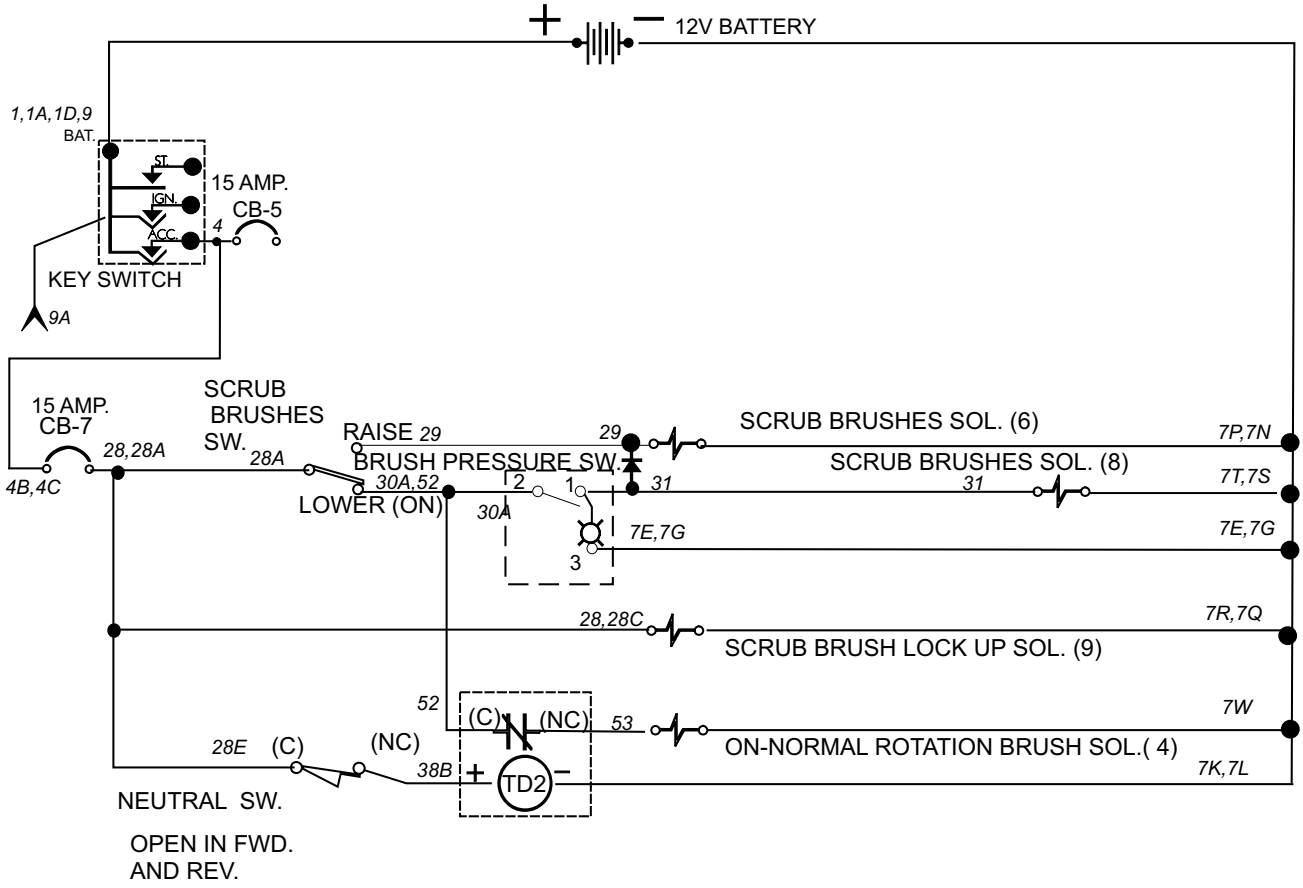


BRUSHES CIRCUITS

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch on
3. CB-7 closed
4. Brush switch in lower position
5. Solenoid (4) energized
6. Engine running
7. Neutral switch in either forward or reverse position

Brush lock up solenoid (9) holds brush deck up and off when engine is turned off. With neutral switch in (Neutral), brushes will shut off after 2 seconds. Bush pressure switch closed, energizes solenoids (6 & 8).

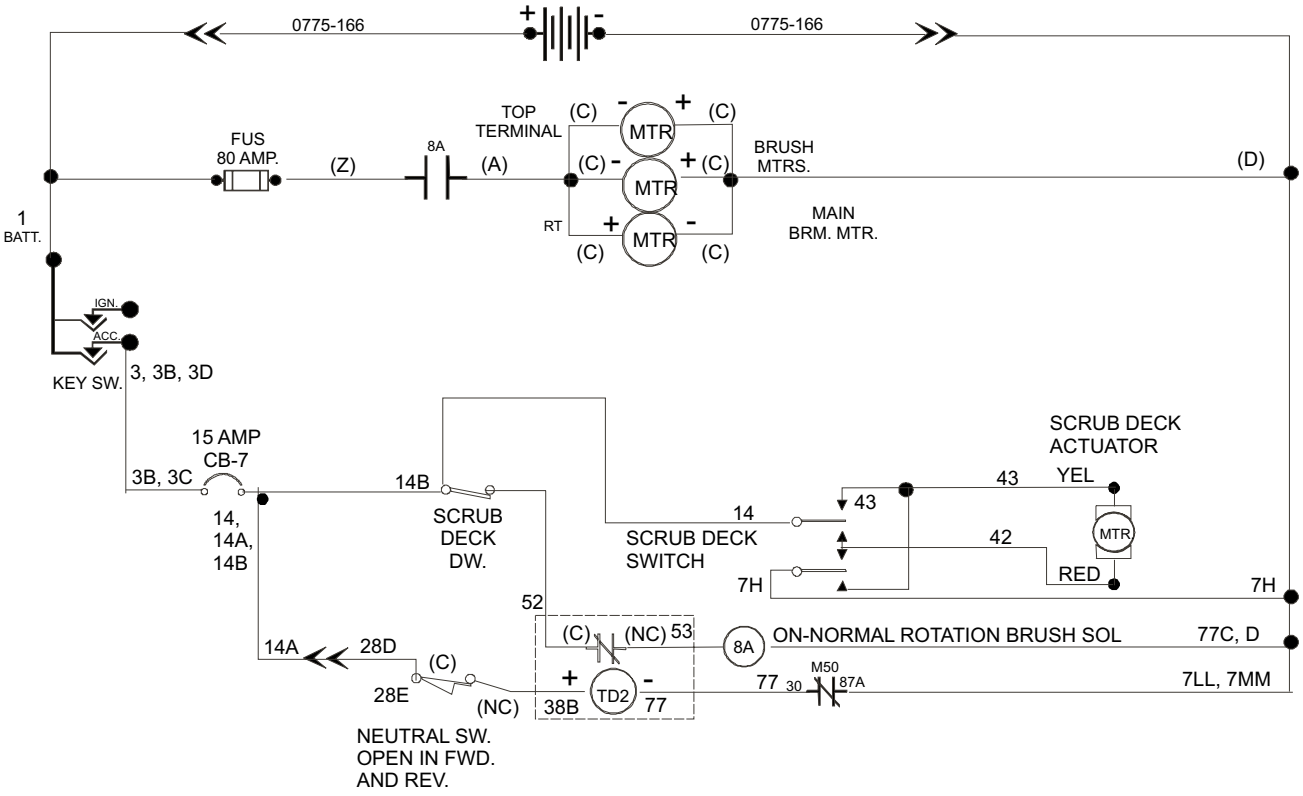


T112

BRUSH CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-7 and FU-3 closed
4. Solenoid 8A closed
5. Scrub Deck switch closed (Scrub Deck Down)
6. Neutral switch in either FWD. or REV.
7. TD-2 is de-energized

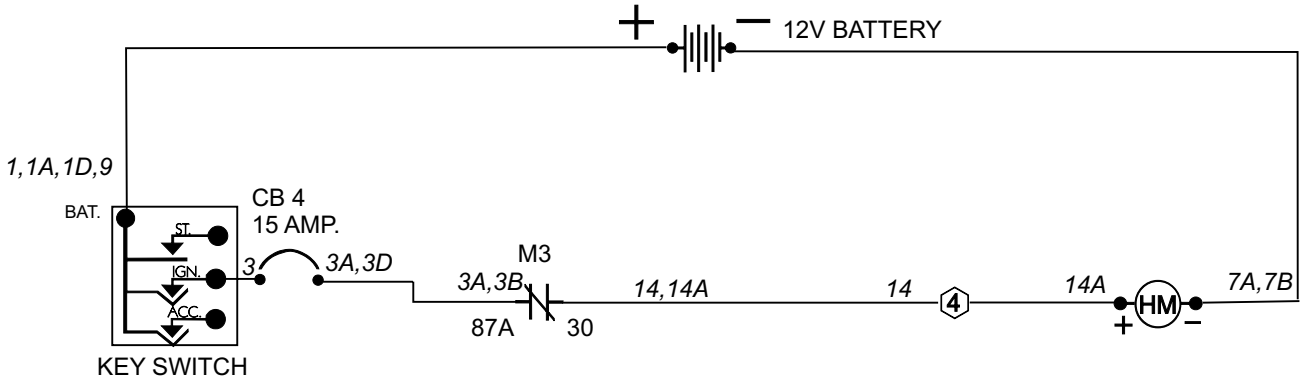


HOUR METER & HORN CIRCUITS (GAS & DIESEL)

HOUR METER CIRCUIT

Conditions necessary for circuit to work
1. Battery Voltage
2. Key switch on
3. CB-4 closed
4. M3 denergized (Oil pressure)
5. Good ground on hour meter

Check voltage at (+) side of meter (Wire #14A), if no voltage check Terminal 87A on M3 (Wires 3A, 3B) on back through CB-4 to the key switch.

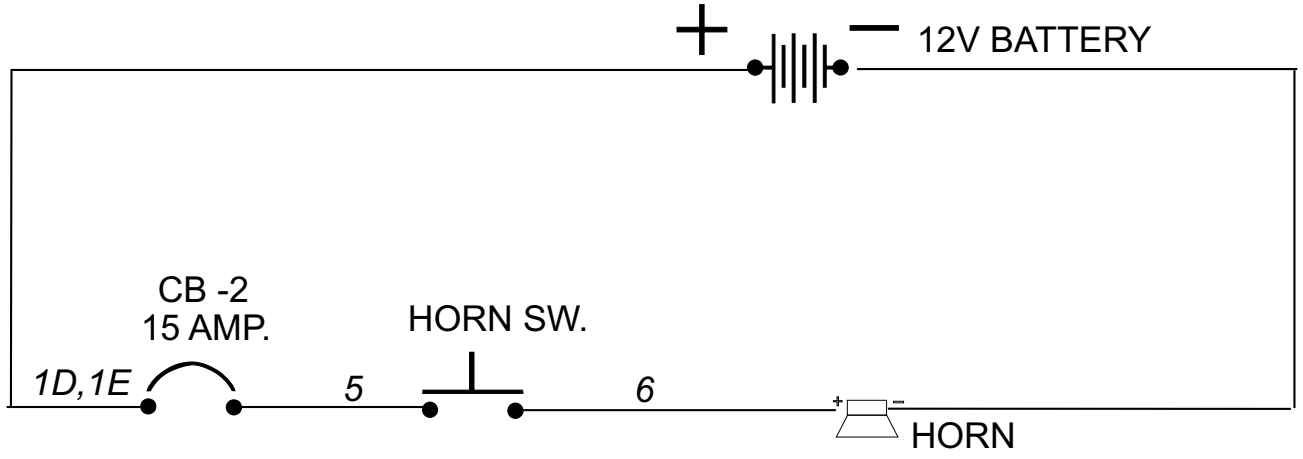


T113

HORN CIRCUIT

Conditions necessary for circuit to work
1. Battery Voltage
2. Horn switch depressed
3. CB-2 closed

Check for voltage at horn (Wire #6), if no voltage, check horn switch (Wire #5), then CB-2 (Wires #1D, 1E) on back to the battery.

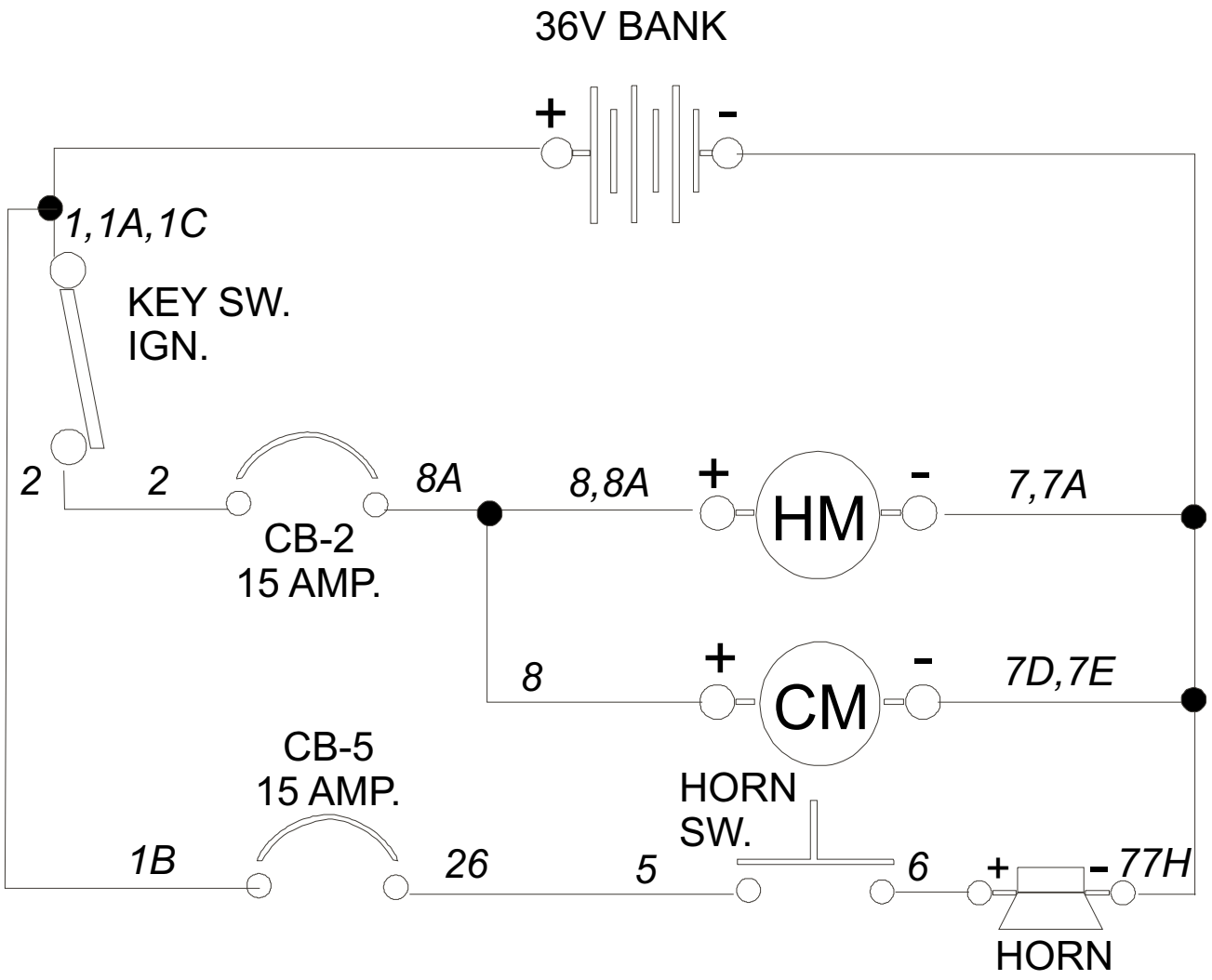


T114

HORN, HOUR AND CONDITION METER CIRCUITS

Conditions necessary for circuits to work:

1. Battery voltage
2. Key switch on
3. CB-2 and CB-5 closed
4. Horn button depressed (for horn only)



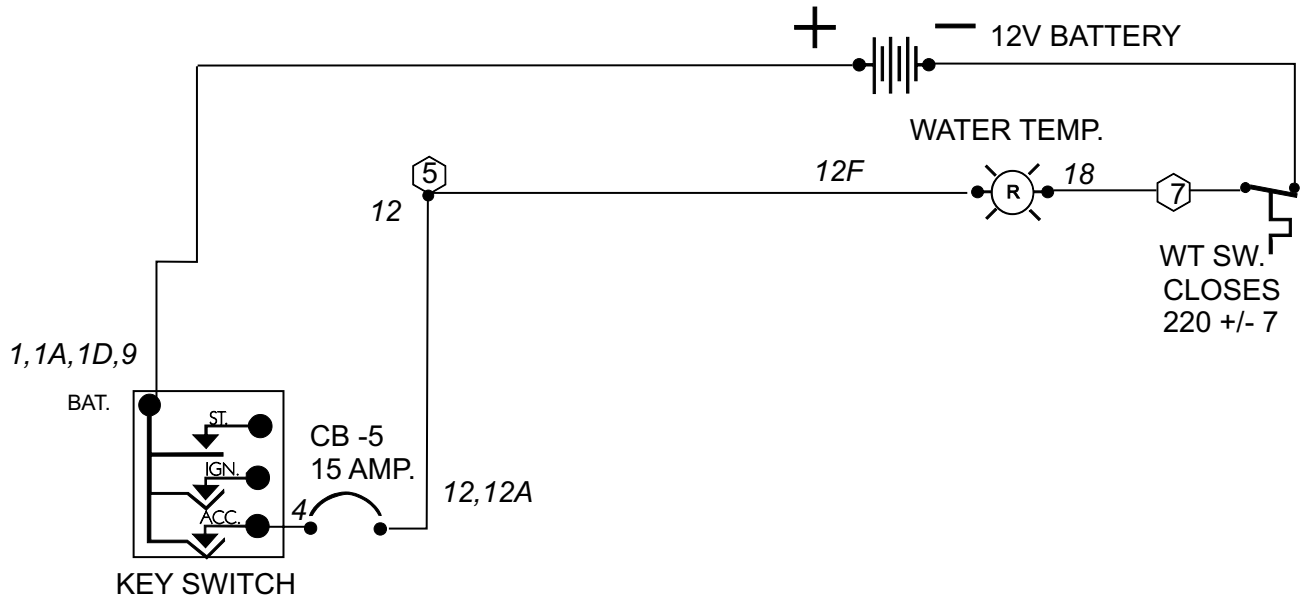
T130

FUEL GAUGE CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch on
3. CB-5 closed
4. Good fuel gauge sender
5. Good ground on fuel gauge meter

Check for voltage at (I) terminal on meter, if voltage is not present, then check CB-5 on back to the key switch.



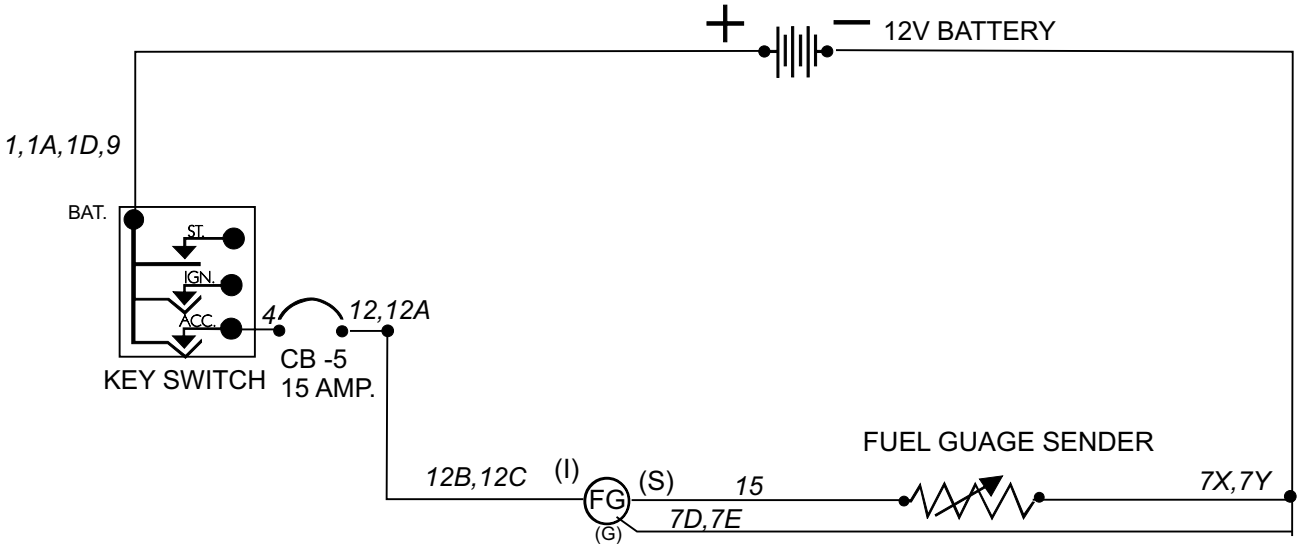
T110

WATER TEMPERATURE CIRCUIT

Conditions necessary for circuit to work

1. Battery Voltage
2. Key switch on
3. Water temperature switch closed (over 220F)
4. CB-5 closed

Check voltage at terminal #7 (Wire #18) on 11 terminal strip on engine, if no voltage, check back through CB-5 to the key switch.

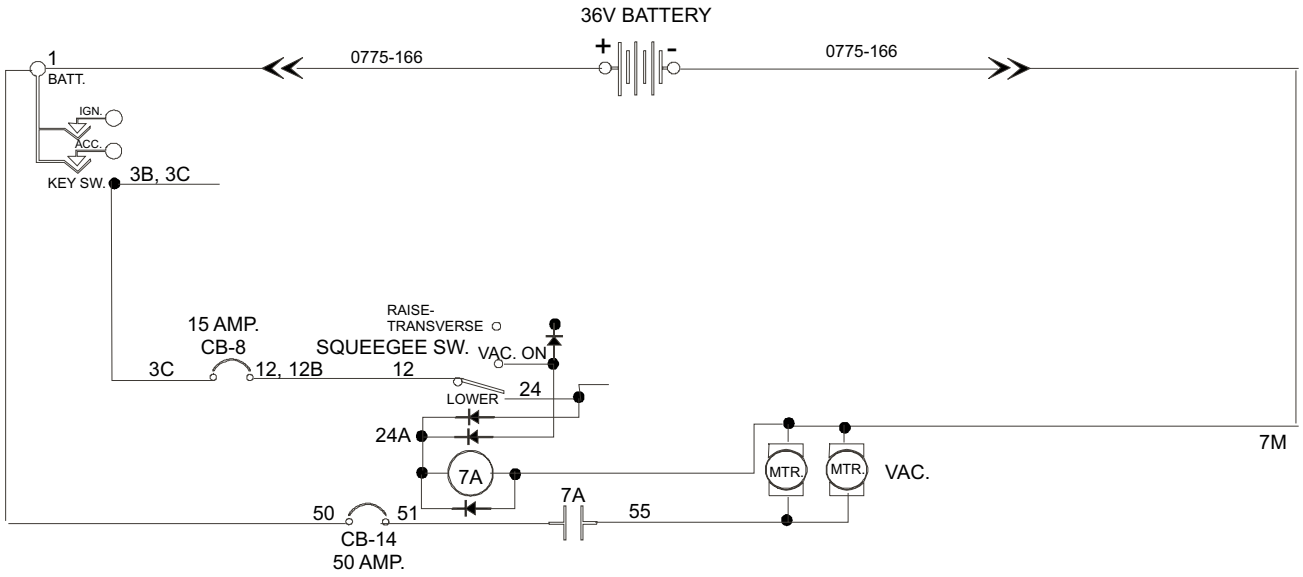


T115

4 HP MOTOR CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2 . Key switch in on
3. CB-3 and FU2 closed
4. Solenoid 1A closed

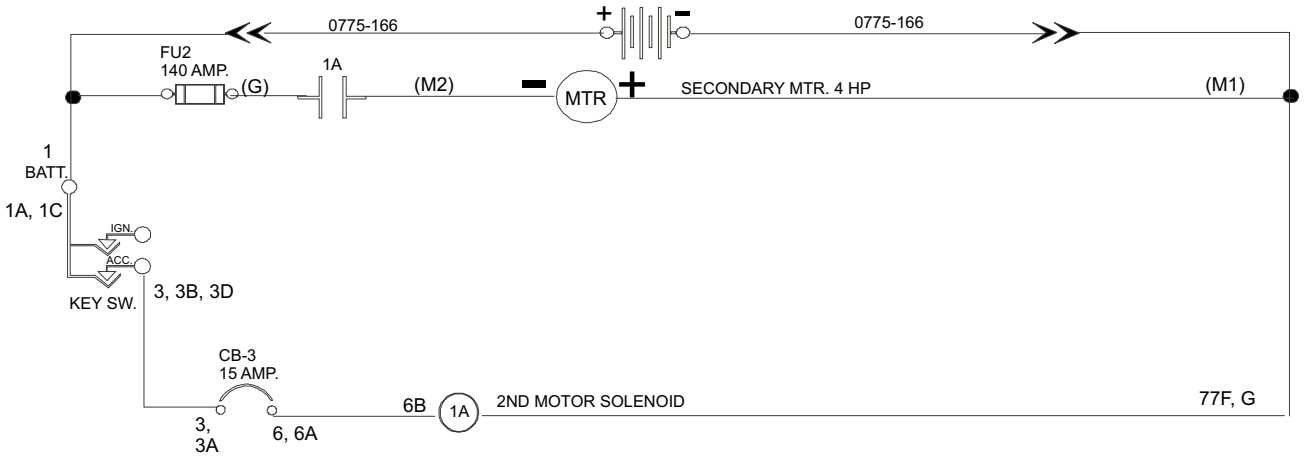


T131

VACUUM CIRCUIT

Conditions necessary for circuits to work

1. Battery Voltage
2. Key switch in on
3. CB-8 and CB-14 closed
4. Solenoid 7A closed
5. Squeegee Switch in (Middle or Lower Position)



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