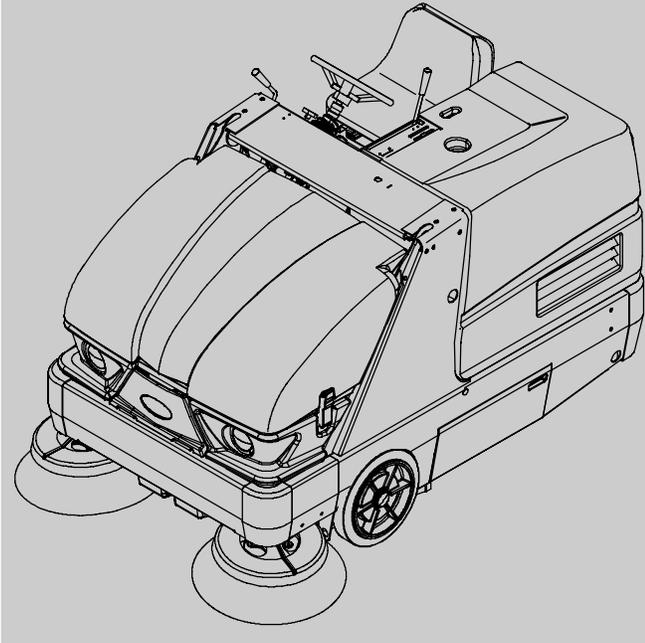




S20

(Gas/LPG/Diesel)



Sweeper Service Information Manual



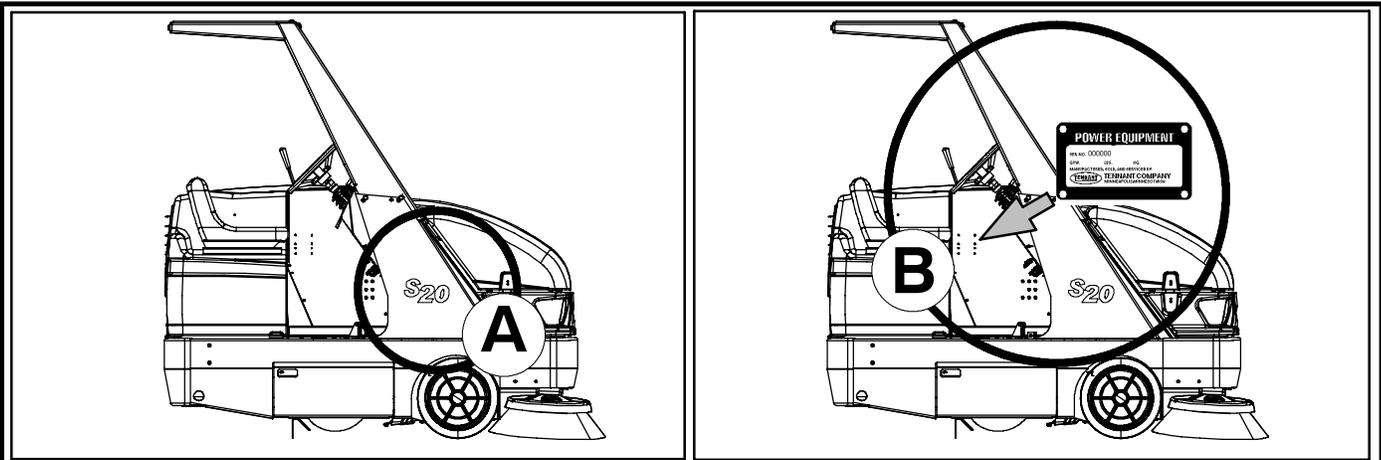
SweepSmart™ System
ShakeMax™ 360

North America / International

www.tennantco.com

9006724
Rev. 00 (11-2009)





Ref	Part No.	Serial Number	Description	Qty.
1	82681	(000000-)	Bracket Wldt, Lpg Mount	1
2	63810	(000000-)	Latch Assy, Lpg Tank Mtg, W/Nut	4
3	51839	(000000-)	Nut Adjustable, Lpg Tank Mtg	2
4	49263	(000000-)	Tie, Cable	3
5	82556	(000000-001039)	Bracket, Vaporizer	1
6	54930	(000000-)	Vaporizer, LPG	1

FOR REPLACEMENT PARTS

Identify machine model and serial number.

1. **(A)** Identify the machine model.
2. **(B)** Identify the machine serial number from the data plate.

Refer to the TENNANT Parts Manual.

NOTE: Only use TENNANT Company supplied or equivalent parts. Parts and supplies may be ordered online, by phone, by fax or by mail.

MACHINE DATA

Please fill out at time of installation for future reference.

Model No. - _____

Serial No. - _____

Machine Options - _____

Sales Rep. - _____

Sales Rep. phone no. - _____

Customer Number - _____

Installation Date - _____



PROTECT THE ENVIRONMENT

Please dispose of packaging materials, old machine components such as batteries, hazardous fluids, including antifreeze and oil, in an environmentally safe way according to local waste disposal regulations.



Always remember to recycle.

Tennant Company

PO Box 1452

Minneapolis, MN 55440

Phone: (800) 553-8033 or (763) 513-2850

www.tennantco.com

Thermo-Sentry, 1-STEP, EasyOpen, MaxPro, InstantAccess, II-Speed, Perma-Filter, Duramer, Lower Total Cost of Ownership, Touch-N-Go, and Cab Forward ErgoSpace are US registered and unregistered trademarks of Tennant Company.

Specifications and parts are subject to change without notice.

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SAFETY PRECAUTIONS

The following precautions are used throughout this manual as indicated in their description:

 **WARNING: To warn of hazards or unsafe practices that could result in severe personal injury or death.**

 **CAUTION: To warn of unsafe practices that could result in minor or moderate personal injury.**

FOR SAFETY: To identify actions that must be followed for safe operation of equipment.

Do not use the machine other than described in this Operator Manual. The machine is not designed for use on public roads.

The following information signals potentially dangerous conditions to the operator or equipment:

 **WARNING: Moving belt and fan. Keep away.**

 **WARNING: Machine emits toxic gases. Serious injury or death can result. Provide adequate ventilation.**

 **WARNING: Raised hopper may fall. Engage hopper support bar.**

 **WARNING: Lift arm pinch point. Stay clear of hopper lift arms.**

 **WARNING: Burn hazard. Hot surface. Do NOT touch.**

 **WARNING: Machine can emit excessive noise. Hearing loss can result. Wear hearing protection. (Cab option only).**

 **WARNING: Accident may occur. Do not operate vacuum wand while driving. (Vacuum wand option only).**

FOR SAFETY:

1. **Do not operate machine:**
 - Unless trained and authorized.
 - Unless operator manual is read and understood.
 - If it is not in proper operating condition.
 - In flammable or explosive areas.
 - In areas with possible falling objects unless equipped with overhead guard.
2. **Before starting machine:**
 - Check for fuel, oil, and liquid leaks.
 - Keep sparks and open flame away from refueling area.
 - Make sure all safety devices are in place and operate properly.
 - Check brakes and steering for proper operation.
 - Adjust seat and fasten seat belt (if so equipped).
3. **When starting machine:**
 - Keep foot on brake and directional pedal in neutral.
4. **When using machine:**
 - Do not pick up burning or smoking debris, such as cigarettes, matches or hot ashes
 - Use brakes to stop machine.
 - Go slow on inclines and slippery surfaces.
 - Use care when reversing machine.
 - Move machine with care when hopper is raised.
 - Make sure adequate clearance is available before raising hopper.
 - Do not raise hopper when machine is on an incline.
 - Do not carry passengers on machine.
 - Always follow safety and traffic rules.
 - Report machine damage or faulty operation immediately.
5. **Before leaving or servicing machine:**
 - Stop on level surface.
 - Set parking brake.
 - Turn off machine and remove key.

SAFETY PRECAUTIONS

- 6. When servicing machine:**
 - **Avoid moving parts. Do not wear loose clothing or jewelry.**
 - **Block machine tires before jacking machine up.**
 - **Jack machine up at designated locations only. Support machine with jack stands.**
 - **Use hoist or jack that will support the weight of the machine.**
 - **Wear eye and ear protection when using pressurized air or water.**
 - **Disconnect battery connections before working on machine.**
 - **Avoid contact with battery acid.**
 - **Avoid contact with hot engine coolant.**
 - **Do not remove cap from radiator when engine is hot.**
 - **Allow engine to cool.**
 - **Keep flames and sparks away from fuel system service area. Keep area well ventilated.**
 - **Use cardboard to locate leaking hydraulic fluid under pressure.**
 - **Use Tennant supplied or approved replacement parts.**

- 7. When loading/unloading machine onto/off truck or trailer:**
 - **Turn off machine.**
 - **Use truck or trailer that will support the weight of the machine.**
 - **Use winch. Do not drive the machine onto/off the truck or trailer unless the load height is 380 mm (15 in) or less from the ground.**
 - **Set parking brake after machine is loaded.**
 - **Block machine tires.**
 - **Tie machine down to truck or trailer.**

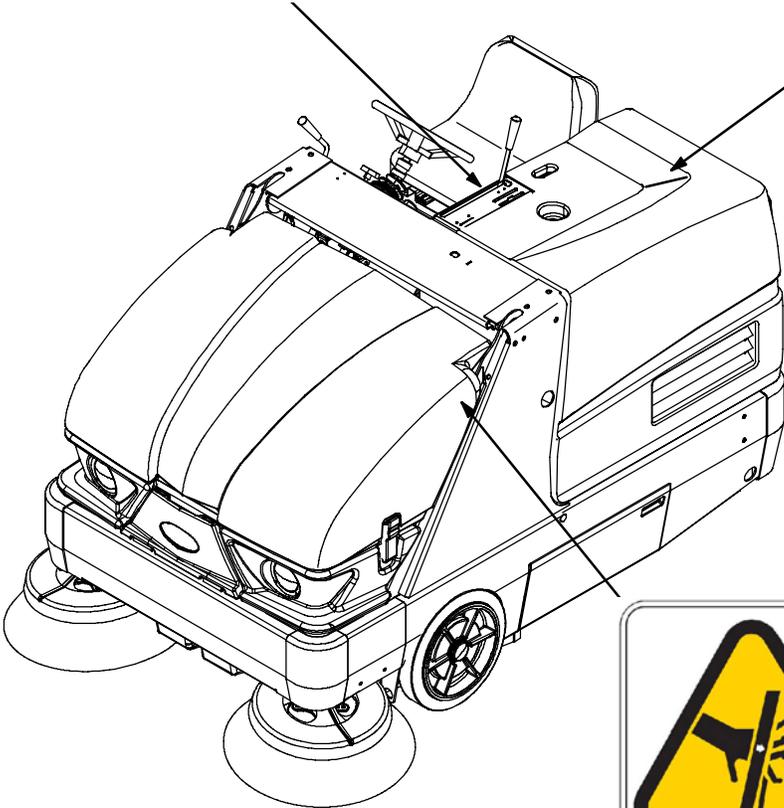
The following safety labels are mounted on the machine in the locations indicated. If any label becomes damaged or illegible, install a new label in its place.

EMISSIONS LABEL - Located on the side of the operator compartment.

 	<p>▲ WARNING</p> <p>Machine emits toxic gases. Serious injury or death can result. Provide adequate ventilation.</p>	<p>▲ AVERTISSEMENT</p> <p>La machine produit des gaz toxiques. Ces gaz peuvent provoquer des blessures ou la mort. Veillez à ce que l'endroit soit bien aéré.</p>	<p>▲ ADVERTENCIA</p> <p>La máquina emite gases tóxicos. Pueden provocar lesiones graves o fatales. Asegúrese de que existe suficiente ventilación.</p>
	<p>28174</p>		

FAN AND BELT LABEL - Located on engine belt guard.

<p>▲ WARNING</p> 
<p>Moving belt and fan. Keep away.</p>
<p>▲ AVERTISSEMENT</p> <p>La courroie et le ventilateur sont en mouvement. Ne vous approchez pas.</p>
<p>▲ ADVERTENCIA</p> <p>Correa y ventilador en movimiento. Manténgase alejado.</p>



	<p>▲ WARNING</p> <p>Lift arm pinch point. Stay clear of hopper lift arms.</p>
	<p>▲ AVERTISSEMENT</p> <p>Attention au point d'articulation du bras d'élévation. Ne vous approchez pas des bras d'élévation de la trémie.</p>
	<p>▲ ADVERTENCIA</p> <p>Punto de pinzamiento del brazo elevador. No se acerque a los brazos elevadores de la caja colectoras.</p>

HOPPER LIFT ARMS LABEL - Located on both hopper lift arms.

 	<p>▲ WARNING</p> <p>Machine can emit excessive noise. Hearing loss can result. Wear hearing protection.</p>	<p>▲ AVERTISSEMENT</p> <p>La machine peut produire un bruit excessif. Une perte de l'audition peut en résulter. Protégez-vous les oreilles.</p>	<p>▲ ADVERTENCIA</p> <p>La máquina puede producir ruido excesivo. Puede causar pérdida de capacidad auditiva. Lleve protección para los oídos.</p>
	<p>28132</p>		

HEARING PROTECTION LABEL - Located only on machines with cab option.

SAFETY PRECAUTIONS

RAISED HOPPER LABEL - Located on the hopper support bar.

 	▲ WARNING Raised hopper may fall. Engage hopper support bar.	▲ AVERTISSEMENT La trémie levée peut tomber. Engagez la barre de support de la trémie.	▲ ADVERTENCIA La caja colectoras en posición elevada puede caer. Monte la barra de apoyo.
	<small>21128</small>		

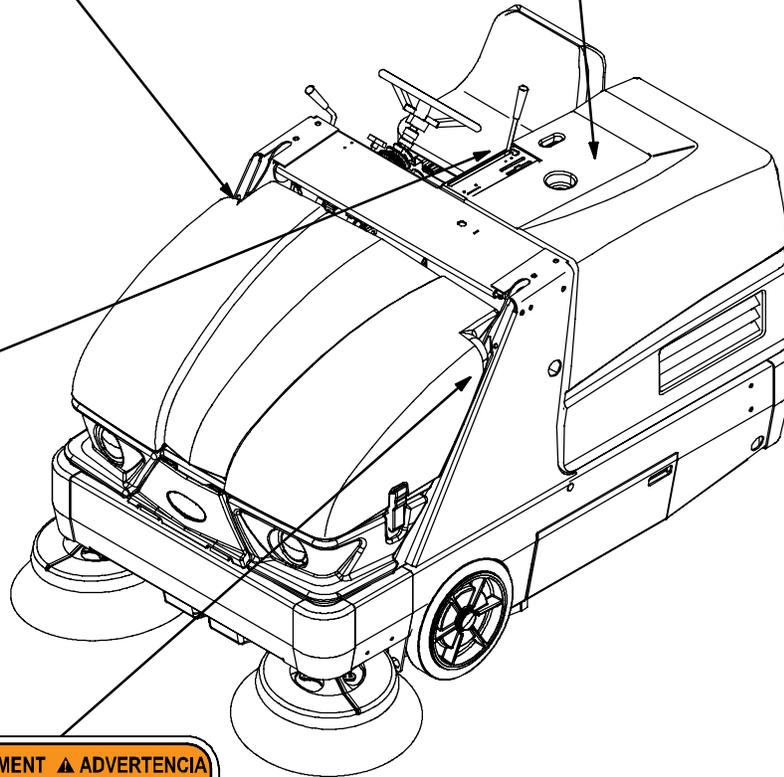
HOT SURFACE LABEL - Located on the exhaust shield.

	▲ WARNING Burn hazard, Hot surface. Do NOT touch.
	▲ AVERTISSEMENT Risque de brûlures. Surface chaude. Ne pas toucher.
	▲ ADVERTENCIA Peligro de quemaduras. Superficie caliente. NO tocar.
<small>387758</small>	

FOR SAFETY LABEL - Located on the side of the operator compartment.

FOR SAFETY

<small>27464</small> Read manual before operating machine.
POUR VOTRE SECURITE
Lisez le manuel avant d'utiliser la machine.
PARA SEGURIDAD
Lea el manual antes de operar la máquina.



 	▲ WARNING Raised hopper may fall. Engage hopper support bar.	▲ AVERTISSEMENT La trémie levée peut tomber. Engagez la barre de support de la trémie.	▲ ADVERTENCIA La caja colectoras en posición elevada puede caer. Monte la barra de apoyo.
	<small>26128</small>		

RAISED HOPPER LABEL - Located on the hopper lift arm.

 	▲ WARNING Accident may occur. Do not operate vacuum or blower wand while driving.	▲ MISE EN GARDE Un accident pourrait se produire. N'activez pas le manche aspirant ou soufflant lorsque vous conduisez.	▲ ADVERTENCIA Podría provocar accidentes. No utilice el tubo de aspiración ni el soplador mientras conduce.
	<small>37702</small>		

VACUUM WAND LABEL - Located on the optional vacuum wand.

354902

GENERAL

MACHINE

INFORMATION

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual**
- * Always Disconnect Battery (Negative terminal 1st) when removing or replacing components**

DURING TESTS:

- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action**

NOTE: Troubleshooting charts may be shown with optional equipment. The optional equipment may not be specified in these charts. Some machines may not be equipped with all components shown.

SPECIFICATIONS**GENERAL MACHINE DIMENSIONS/CAPACITIES**

Item	Dimension/capacity
Length	2090 mm (82.3 in)
Length with side brush	2248 mm (88.5 in)
Width	1230 mm (48.5 in)
Width with side brush	1260 mm (49.5 in)
Height without overhead guard	1260 mm (49.5 in)
Height with overhead guard	2085 mm (82.1 in)
Track	1135 mm (44.7 in)
Wheelbase	1135 mm (44.7 in)
Main sweeping brush diameter	355 mm (14 in)
Main sweeping brush length	910 mm (36 in)
Side brush diameter	580 mm (23 in)
Sweeping path width with side brush	1270 mm (50 in)
Sweeping path width with dual side brushes	1575 mm (62 in)
Main sweeping brush pattern width	50 to 75 mm (2 to 3 in)
Hopper weight capacity (polyethylene hopper)	340 kg (750 lb)
Hopper weight capacity (optional steel hopper)	318 kg (700 lb)
Hopper volume capacity (polyethylene hopper)	310 L (11 ft ³)
Hopper volume capacity (optional steel hopper)	319 L (11.25 ft ³)
Dust filter area	7.4 m ² (80 ft ²)
Minimum ceiling dump height	2490 mm (98 in)
Weight - empty	1110 kg (2450 lb)
GVWR (Gross Vehicle Weight Rating)	1674 kg (3690 lb)
Operating sound level at operator ear	80 ±1.5 dBA
Vibration level at steering wheel does not exceed	0.2 m/s ²

GENERAL MACHINE PERFORMANCE

Item	Measure
Maximum forward speed	10 km/h (6 mph)
Maximum reverse speed	4.8 km/h (3 mph)
Minimum aisle turn width, left	2415 mm (95 in)
Minimum turning radius, right	2113 mm (83.2 in)
Minimum turning radius, left	1625 mm (64 in)
Maximum rated incline with empty hopper	14° / 25%
Maximum rated incline with full hopper	10° / 17.6%

POWER TYPE

Engine	Type	Ignition	Cycle	Aspiration	Cylinders	Bore	Stroke
Kubota DF972 Gas/LP	Piston	Distributorless solid state	4	Natural	3	74.5 mm (2.93in)	73.6 mm (2.90 in)
	Displacement		Net power, governed			Net power, maximum	
	962 cc (58.70 cu in)		17.9 kw (24 hp) @ 2500 rpm			24 kw (32 hp) @ 3600 rpm	
	Fuel		Cooling system			Electrical system	
	Gasoline, 87 octane minimum, unleaded. Fuel tank: 27.6 L (7.3 gal)		Water/ethylene glycol antifreeze			12 V nominal	
	LPG, Fuel tank: 15 kg (33 lb)		Total: 8 L (2 gal) Radiator: 4 L (1 gal)			40 A alternator	
	Idle speed		(Fast) governed speed			Firing order	
	1350 ± 50 rpm		2500 ± 50 rpm			1-2-3	
	Spark plug gap		Valve clearance, cold			Engine lubricating oil with filter	
	1 mm (0.043 in)		0.135 to 0.165 mm (0.0053 to 0.0064 in) intake and exhaust			10W30 SAE-SJ/SL 3.4L (3.6 qts.)	

POWER TYPE

Engine	Type	Ignition	Cycle	Aspiration	Cylinders	Bore	Stroke
Kubota D1005	Piston	Diesel	4	Natural	3	76 mm (2.99 in)	73.6 mm (2.90 in)
	Displacement		Net power, governed			Net power, maximum	
	1001 cc (61.08 cu in)		14 kw (18.7 hp) @ 2500 rpm			19.4 kw (26 hp) @ 3600 rpm	
	Fuel		Cooling system			Electrical system	
	Diesel Fuel tank: 27.6 L (7.3 gal)		Water/ethylene glycol antifreeze			12 V nominal	
			Radiator: 4 L (1 gal) Total: 8 L (2 gal)			30 A alternator	
	Idle speed		(Fast) governed speed under load			Engine lubricating oil with filter	
1350 ± 50 rpm		2500 ± 50 rpm			5.1 L (5.4 qt) SAE-CD/CE rated		

STEERING

Type	Power source	Emergency steering
Rear wheel, hydraulic cylinder and rotary valve controlled	Hydraulic accessory pump	Manual

HYDRAULIC SYSTEM

System	Capacity	Fluid Type
Hydraulic reservoir	19.3 L (5.1 gal)	TENNANT part no. 65869 - above 7° C (45° F)
Hydraulic total	20.8 L (5.5 gal)	TENNANT part no. 65870 - below 7° C (45° F)

S20 Service Information

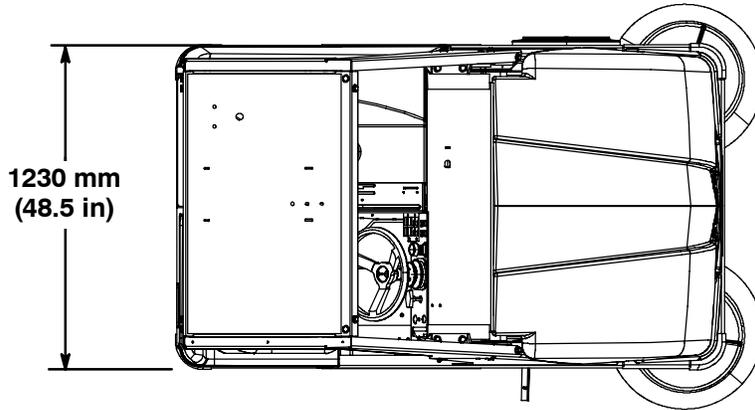
BRAKING SYSTEM

Type	Operation
Service brakes	Mechanical drum brakes (2), one per front wheel, rod actuated
Parking brake	Utilize service brakes, rod actuated

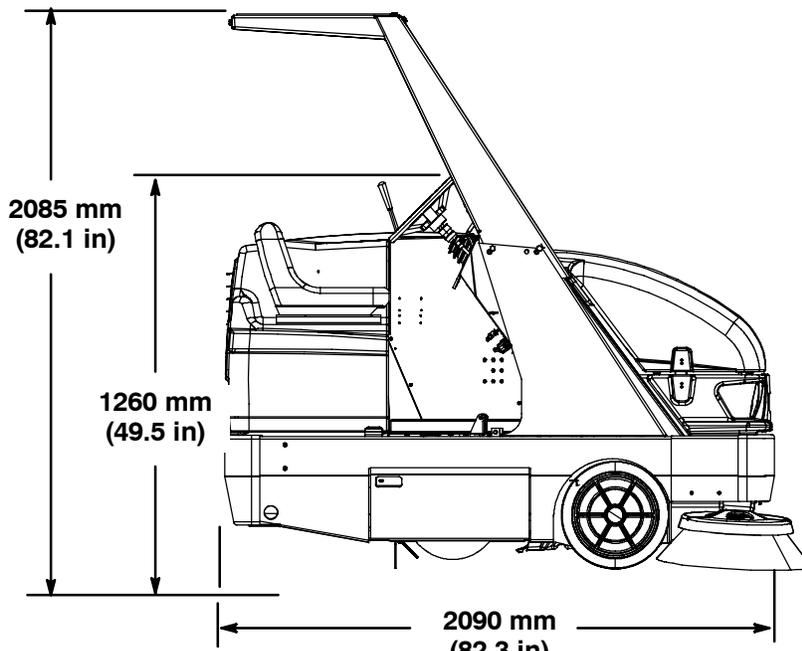
TIRES

Location	Type	Size	Pressure
Front (2)	Solid	89 x 410 mm (3.5 X 16 in)	-
Rear (1)	Pneumatic	150 x 410 mm (6 X 16 in)	795 kPa (115 psi)

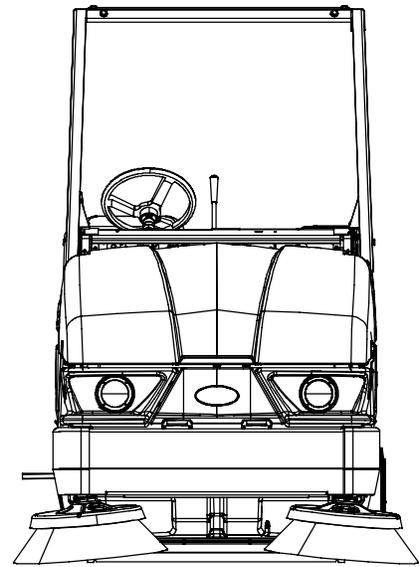
MACHINE DIMENSIONS



TOP VIEW



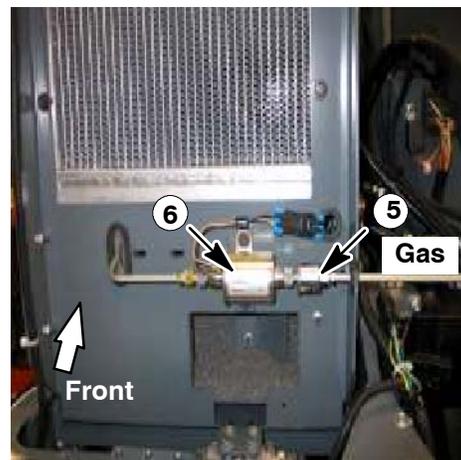
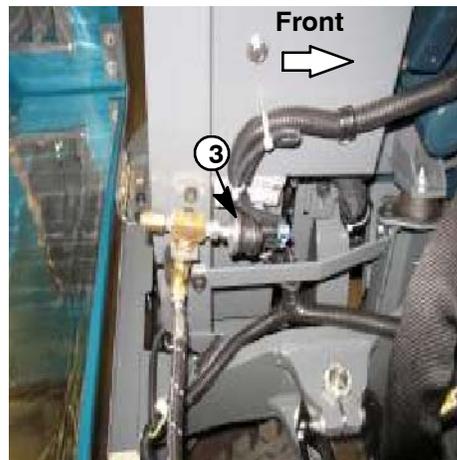
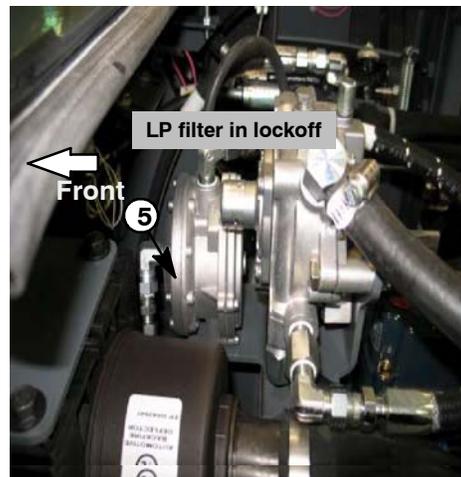
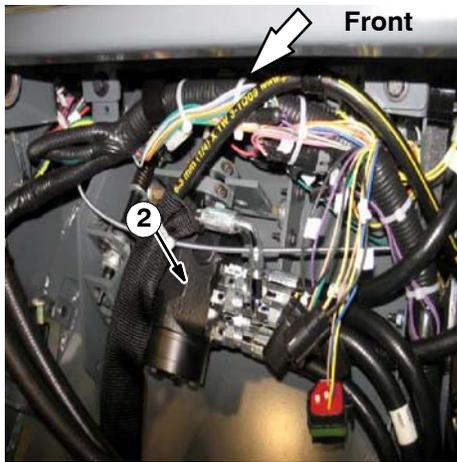
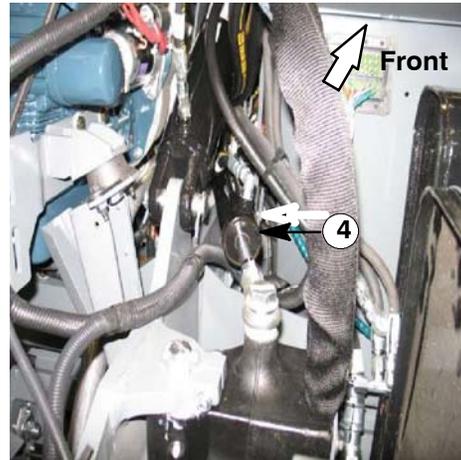
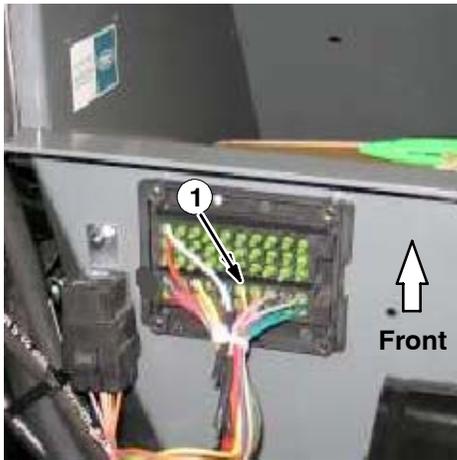
SIDE VIEW



FRONT VIEW

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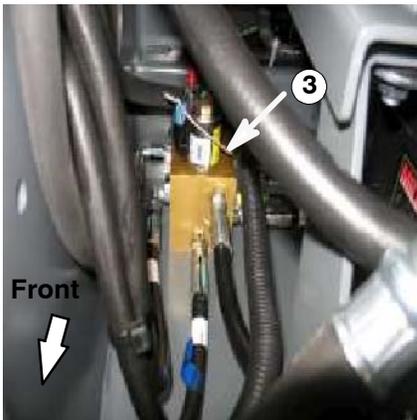
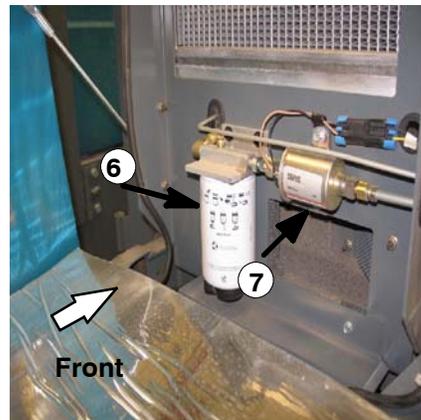
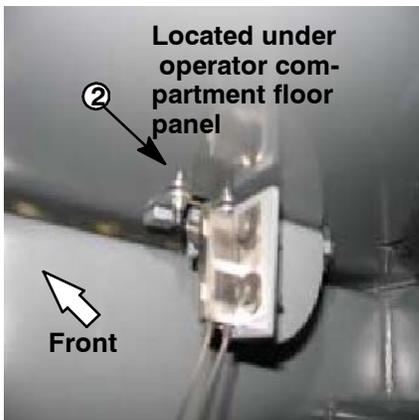
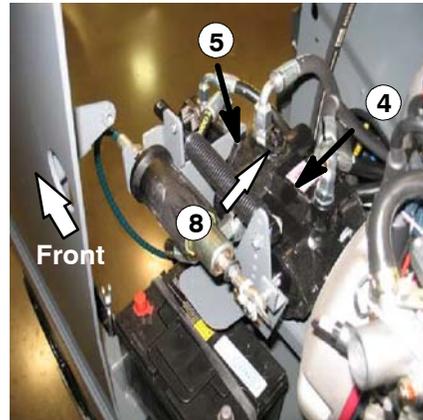
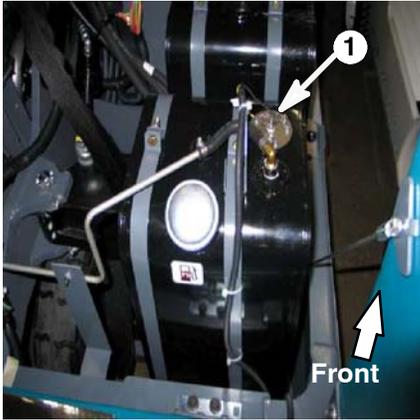
COMPONENT LOCATOR



1. Fuse & relay panel
2. Steering Valve
3. Low Fuel Pressure Switch (LPG)
4. Steering Cylinder
5. Fuel Filter

6. Fuel Pump (gas)

COMPONENT
LOCATOR



- 1. Fuel Sending Unit
- 2. Brake light switch
- 3. Hydraulic Solenoid Control Valve
- 4. Propeller System Hydraulic Pump
- 5. Accessory Hydraulic Pumps

- 6. Fuel Filter (diesel)
- 7. Fuel Pump (diesel)
- 8. Tow By-Pass

SYMBOL DEFINITIONS

These symbols identify controls, displays, and features on the machine.



Filter shaker



Vacuum fan on



Vacuum fan off



Fast engine speed



Idle engine speed



Hopper down



Hopper up



Hopper door open



Hopper door close (lever)



Main brush down and on



Main brush up and off



Battery charging system



Engine oil pressure



Thermo-Sentry



Clogged dust filter



Hopper door closed (light)



Clogged hydraulic filter



LPG fuel level low



Hourmeter



Steering wheel tilt



Off



On



Start



Horn



Operating lights



Hazard light



Engine water temperature



Engine choke (Gasoline Only)



Side brush up and off



Side brush pressure



Side brush down and on



Parking brake



Brush pressure (Decrease)



Brush pressure (Increase)



Turn clockwise



Turn counterclockwise



Unleaded fuel only



Glow plugs



Diesel fuel only

**FOR OPERATOR AND MAINTENANCE CHARTS, REFER TO OPERATORS
MANUAL**

MAINTENANCE & REPAIR

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual**
- * Always disconnect Battery (Negative terminal 1st) when removing or replacing electrical components**

DURING TESTS:

- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action**

NOTE: Troubleshooting charts may be shown with optional equipment. The optional equipment may not be specified in these charts. Some machines may not be equipped with all components shown.

HOPPER DUST FILTER

REPLACING THE HOPPER DUST FILTER

Shake the dust filter at the end of every shift and before removing the filter from the machine. Inspect and clean the filter after every 100 hours of operation. Replace damaged dust filters.

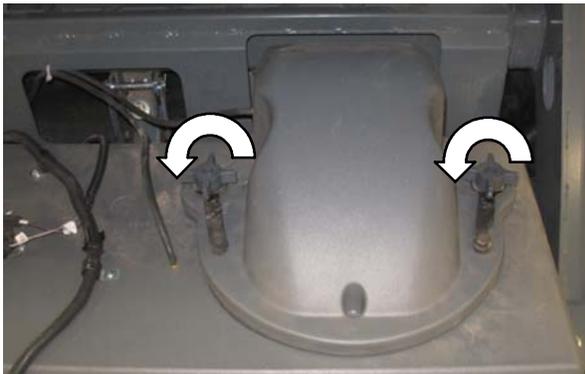
NOTE: Clean the filter more often if used in extremely dusty conditions.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, and turn off machine.

1. Unlatch and open the hopper cover. Support the hopper cover open with the hopper cover prop rod.



2. Remove the dust filter cover.
NOTE: Do not operate filter shaker or raise hopper with dust filter cover removed. Shaker motor damage can occur.



3. Remove the dust filter from the hopper.



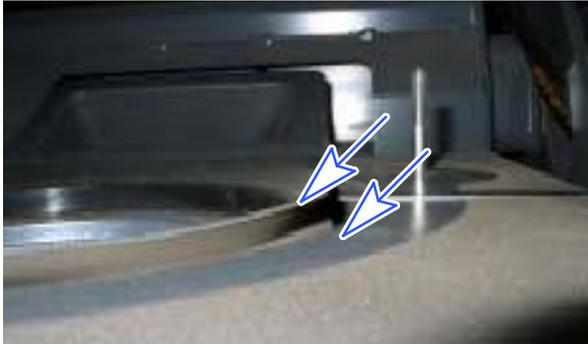
4. Clean or discard the dust filter element. Refer to *CLEANING THE DUST FILTER*.
5. Clean dust and debris from the dust filter tray.



6. Reinstall the dust filter.
7. Reinstall the dust filter cover.
8. Close the hopper cover.

HOPPER DUST FILTER MEASUREMENT

Check 1/8" thick shaker spacer for wear, replace as necessary. With hopper dust filter cover removed and cyclone cover latches locked, check filter seal measurement for proper height. Top of seal should measure 6.35mm (.25") above filter cover mounting base, as shown below. This will allow proper sealing of filter with filter cover installed.



FILTER SEAL HEIGHT ADJUSTMENT

***Safety Note* Cyclone filter box assembly is heavy, assistance recommended for removal.**

Remove filter box assembly from hopper. With cyclone cover in place and latched, mark seal height measurement at 4 places; RF-LF-RR-and LR areas of filter box. 4 - M10 screw locations for shaker mounting tray are shown below. Loosen shaker tray mounting bolts and adjust tray to obtain proper seal filter height measurement and tighten as necessary. Reassemble filter box, using new seals where needed.



ELECTRICAL

TROUBLESHOOTING

INFORMATION

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual**

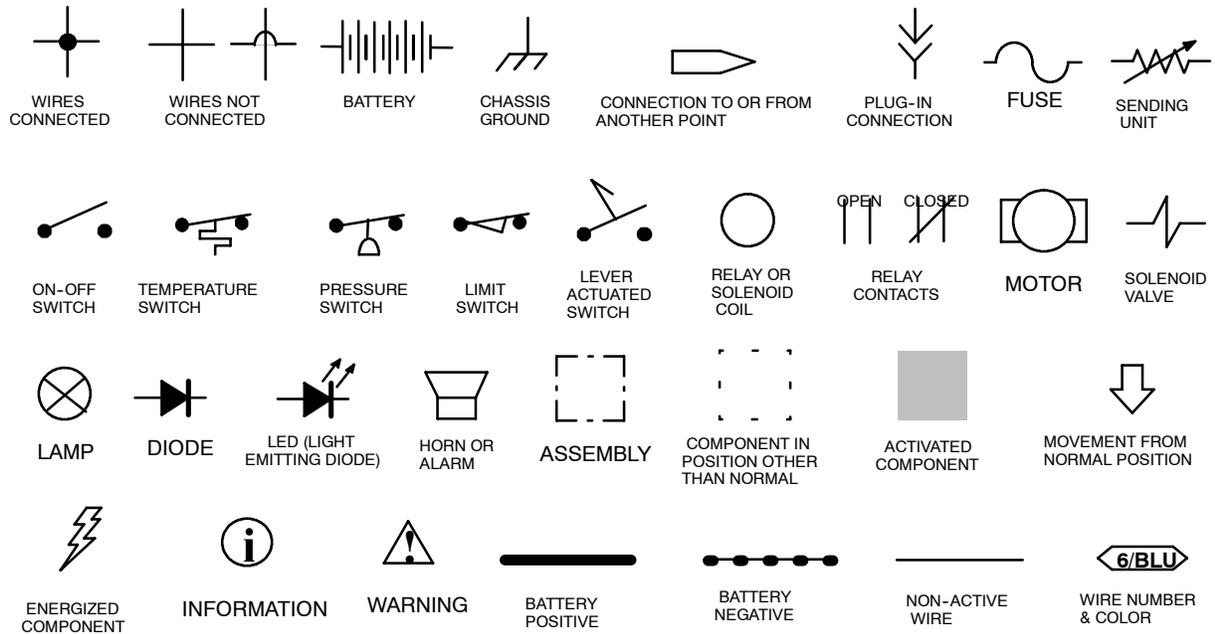
- * Always disconnect Battery (Negative terminal 1st) when removing or replacing components**

DURING TESTS:

- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action**

NOTE: Troubleshooting charts may be shown with optional equipment. The optional equipment may not be specified in these charts. Some machines may not be equipped with all components shown.

ELECTRICAL SYMBOLS AND ABBREVIATIONS

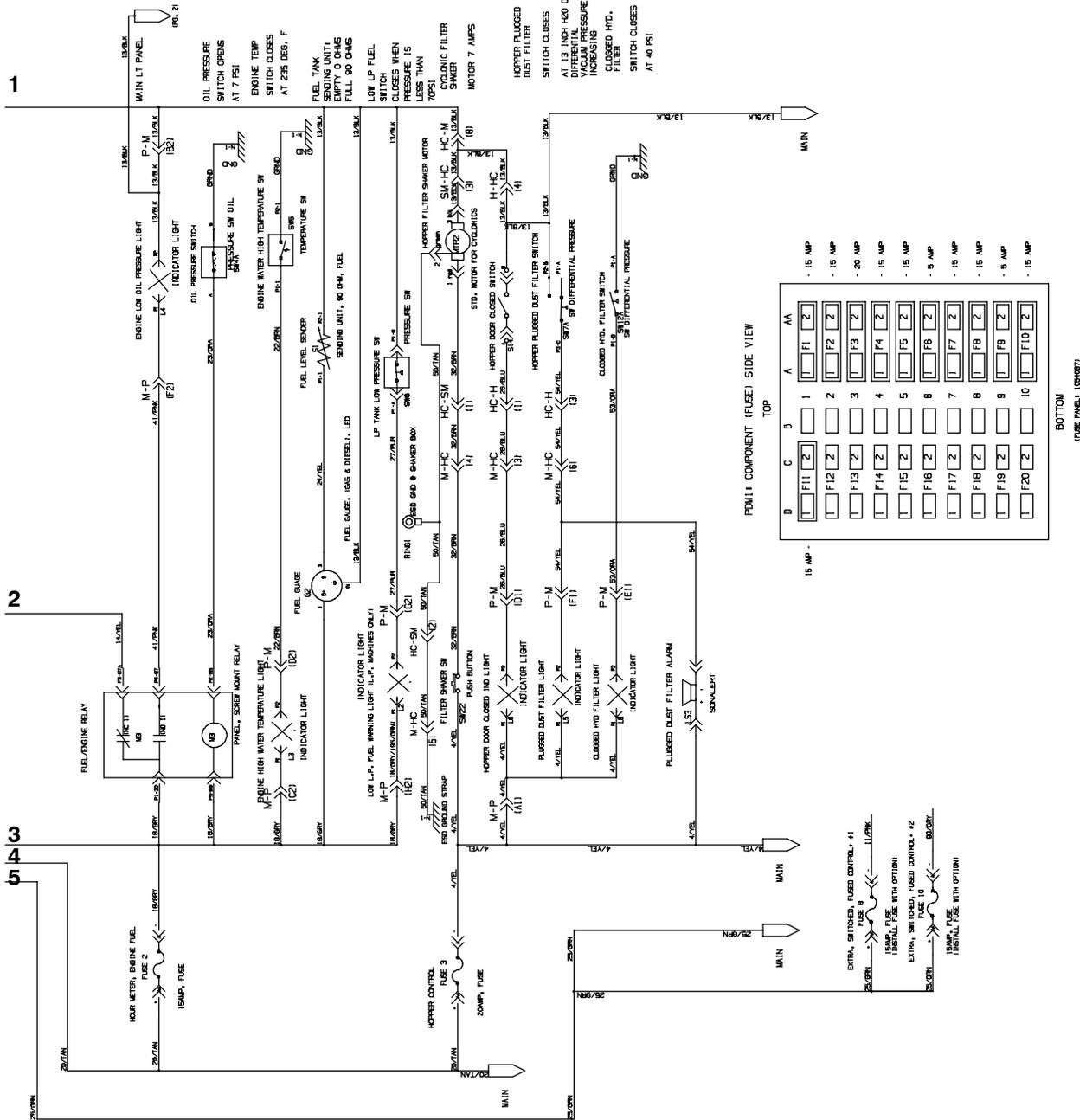


ABBREVIATIONS

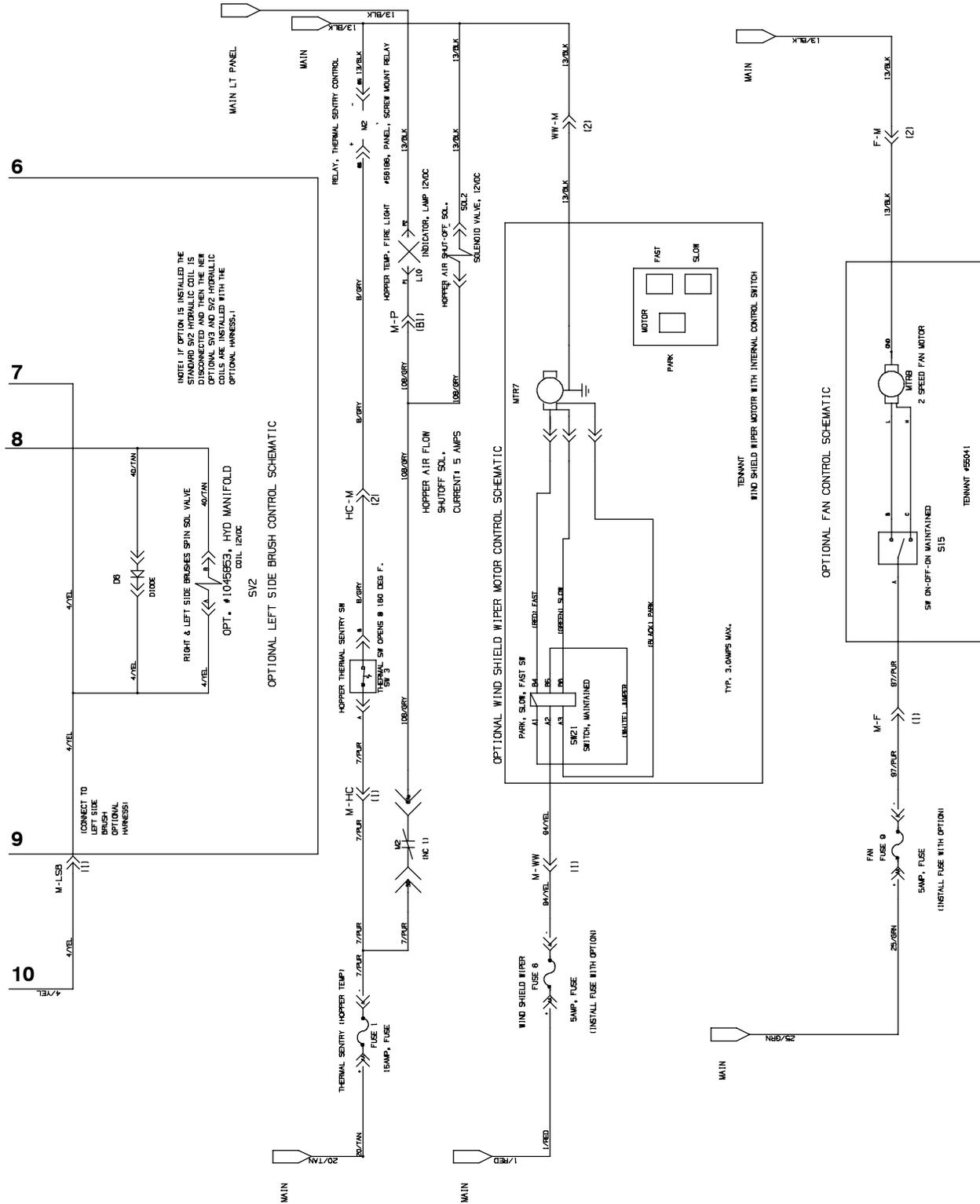
A	Amps
ACT	Actuator
B+	Battery Positive
CKT	Circuit
D	Diode
F	Fuse
GND	Ground
LP	Lamp
M	Relay Coil
MTR	Motor
NC	Normally Closed
NO	Normally Open
PM	Permanent Magnet
S or SW	Switch
SV	Solenoid Valve
TMR	Timer
VDC	Volts, Direct Current

Wire Colors	
BLK	Black
BLU	Blue
BRN	Brown
GRN	Green
GRY	Gray
ORA	Orange
PNK	Pink
PUR	Purple
RED	Red
TAN	Tan
WHT	White
YEL	Yellow

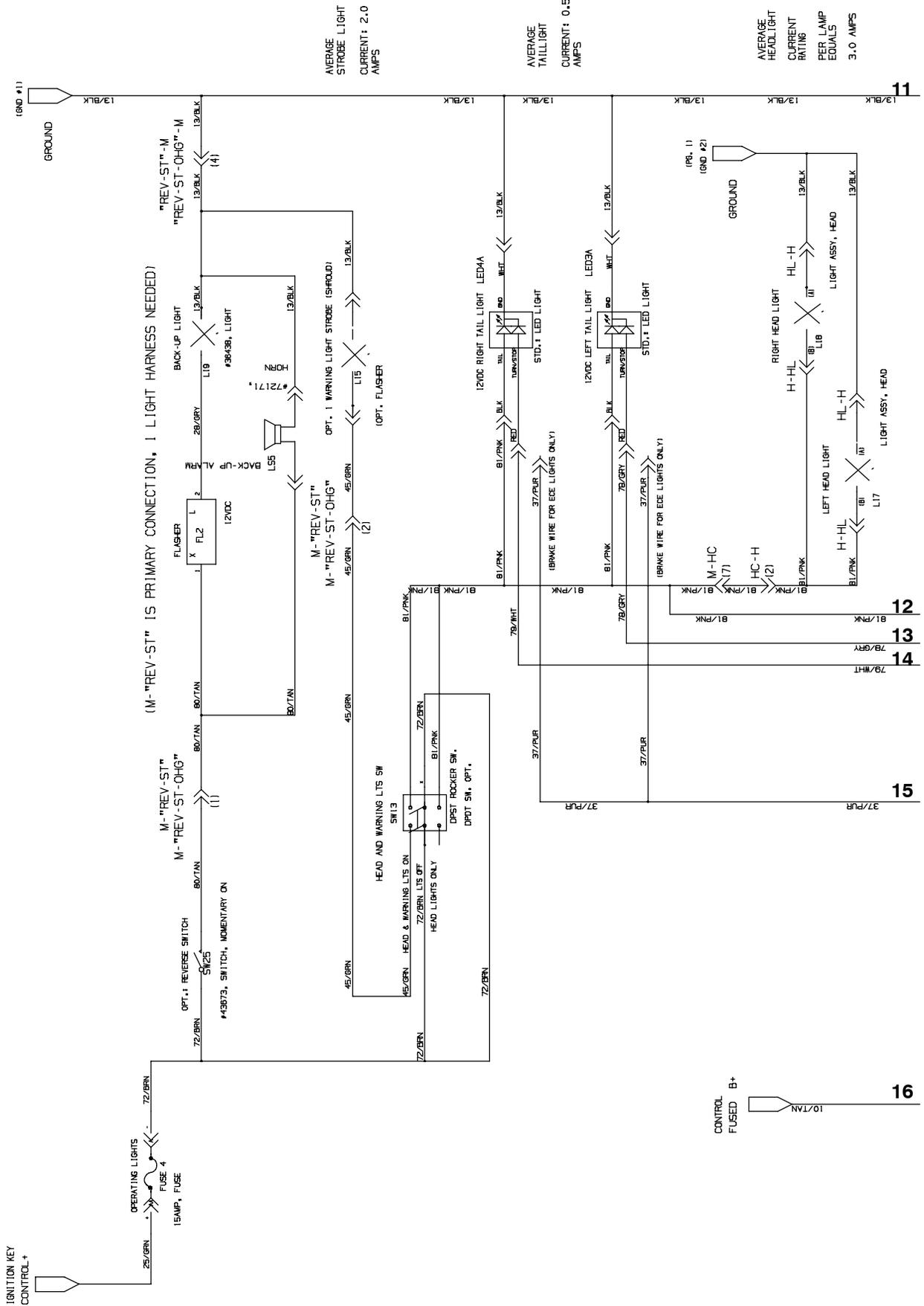
ELECTRICAL SCHEMATIC FIG. 2 - GAS/LP



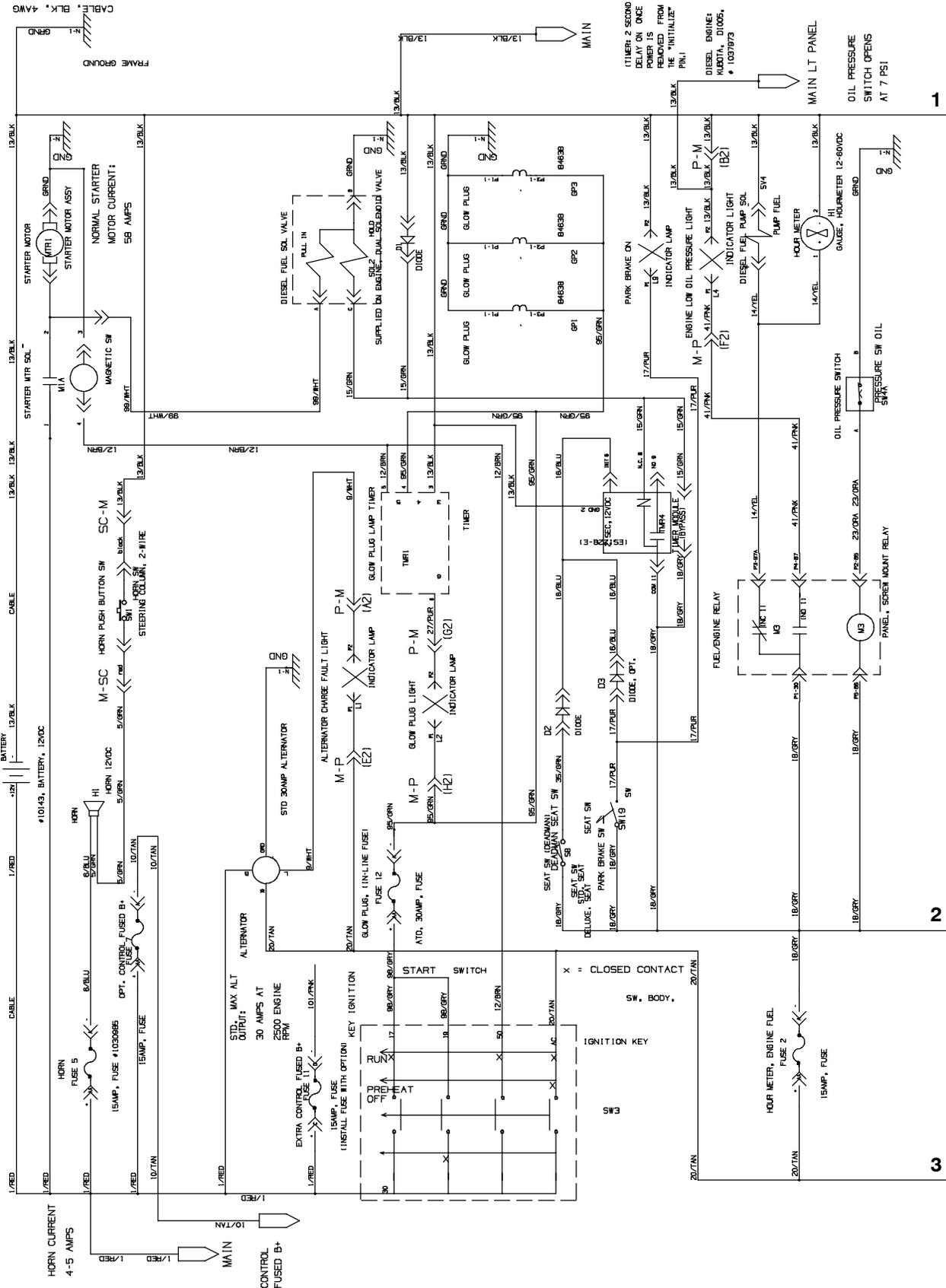
ELECTRICAL SCHEMATIC FIG. 4 - GAS/LP



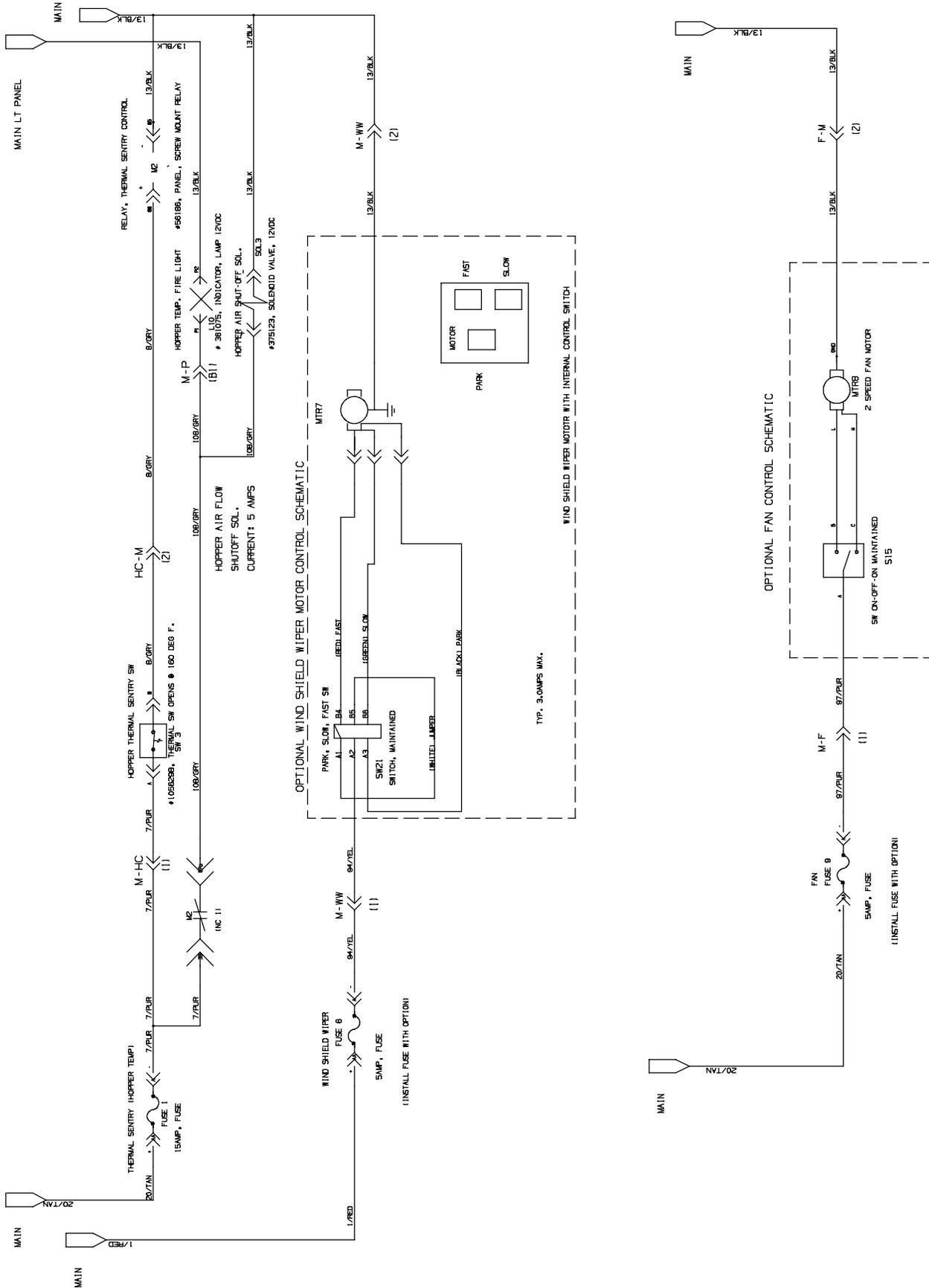
ELECTRICAL SCHEMATIC FIG. 5 - GAS/LP



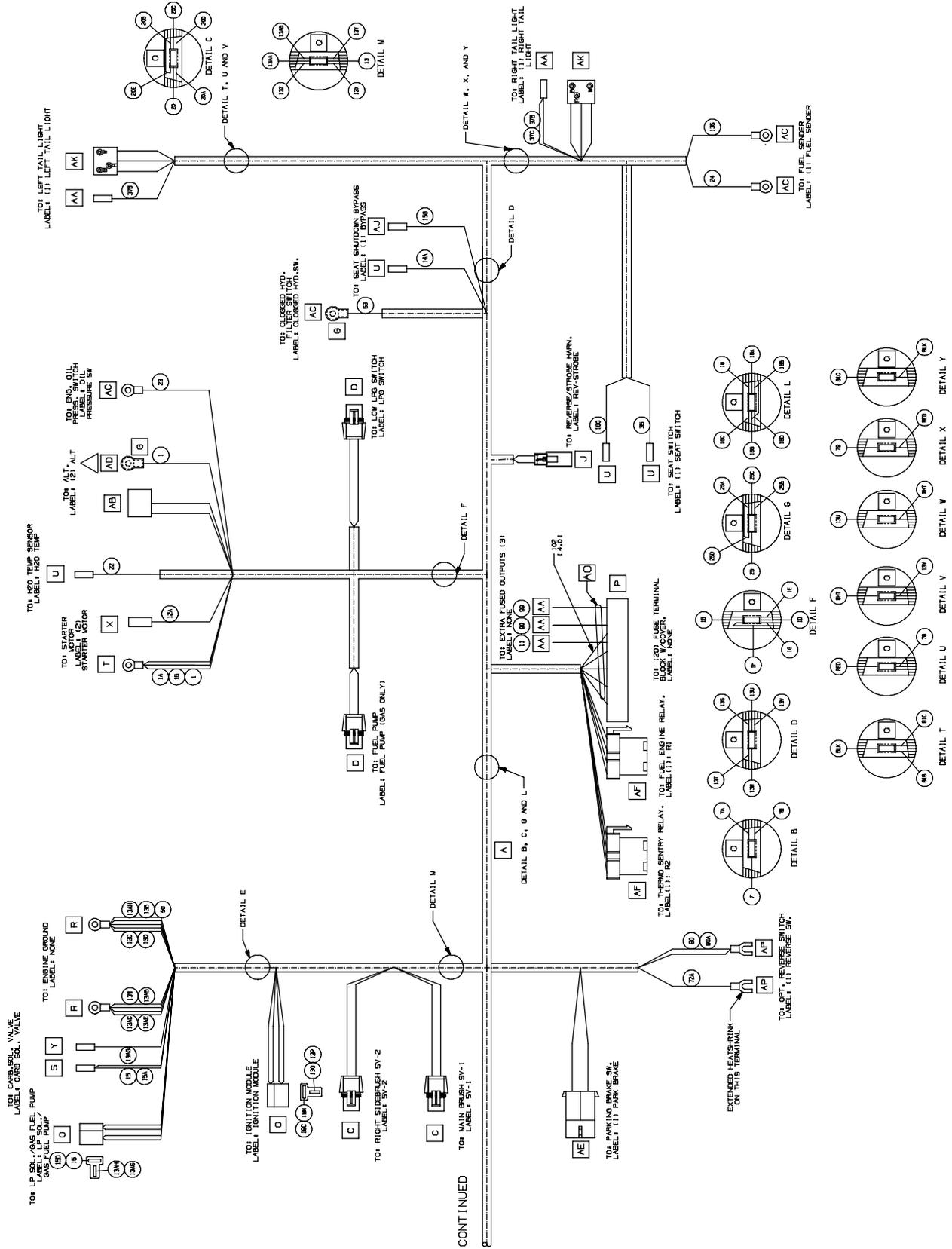
ELECTRICAL SCHEMATIC FIG. 7 - DIESEL



ELECTRICAL SCHEMATIC FIG. 10 - DIESEL



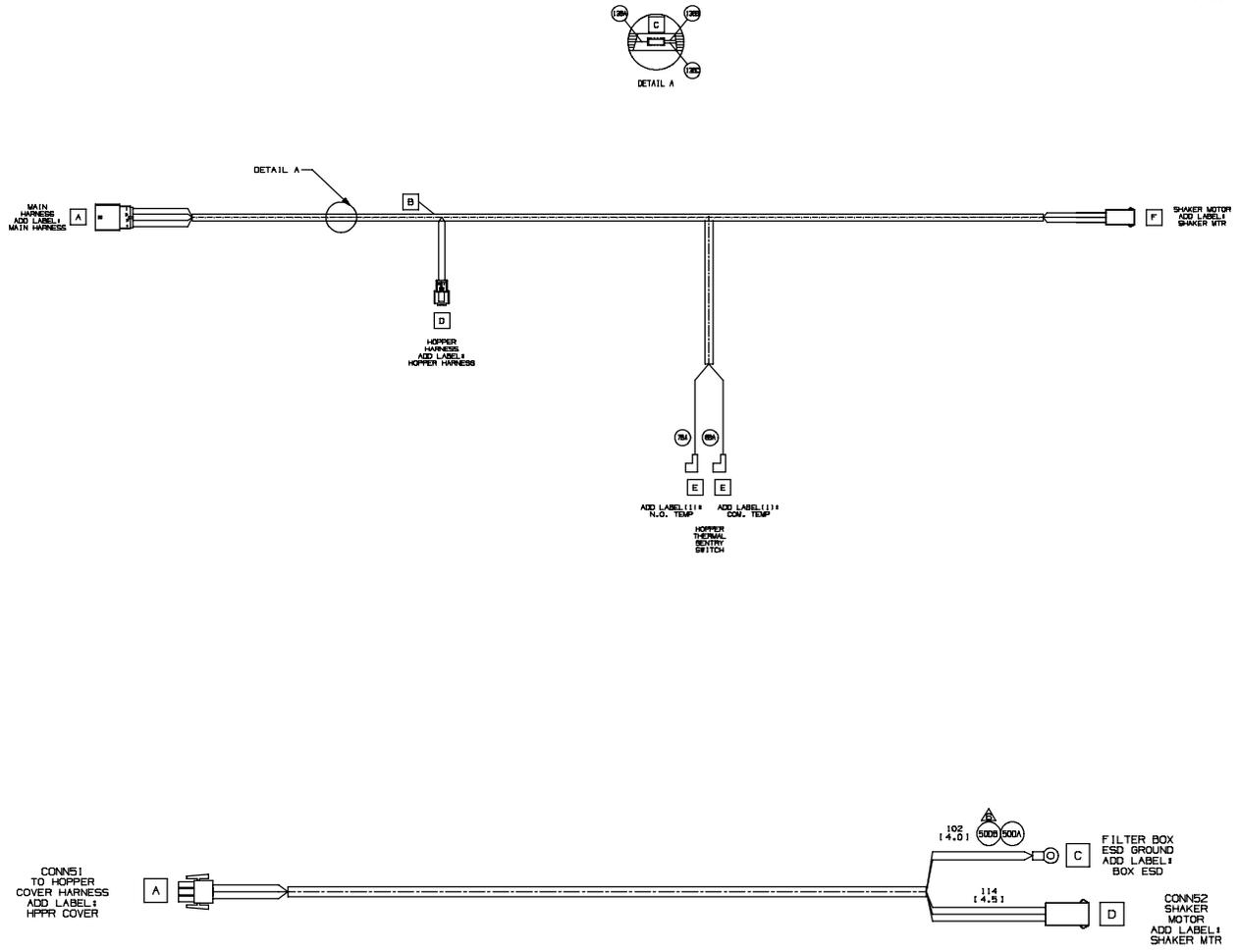
WIRE HARNESSES GROUP FIG. 14 - GAS/LP



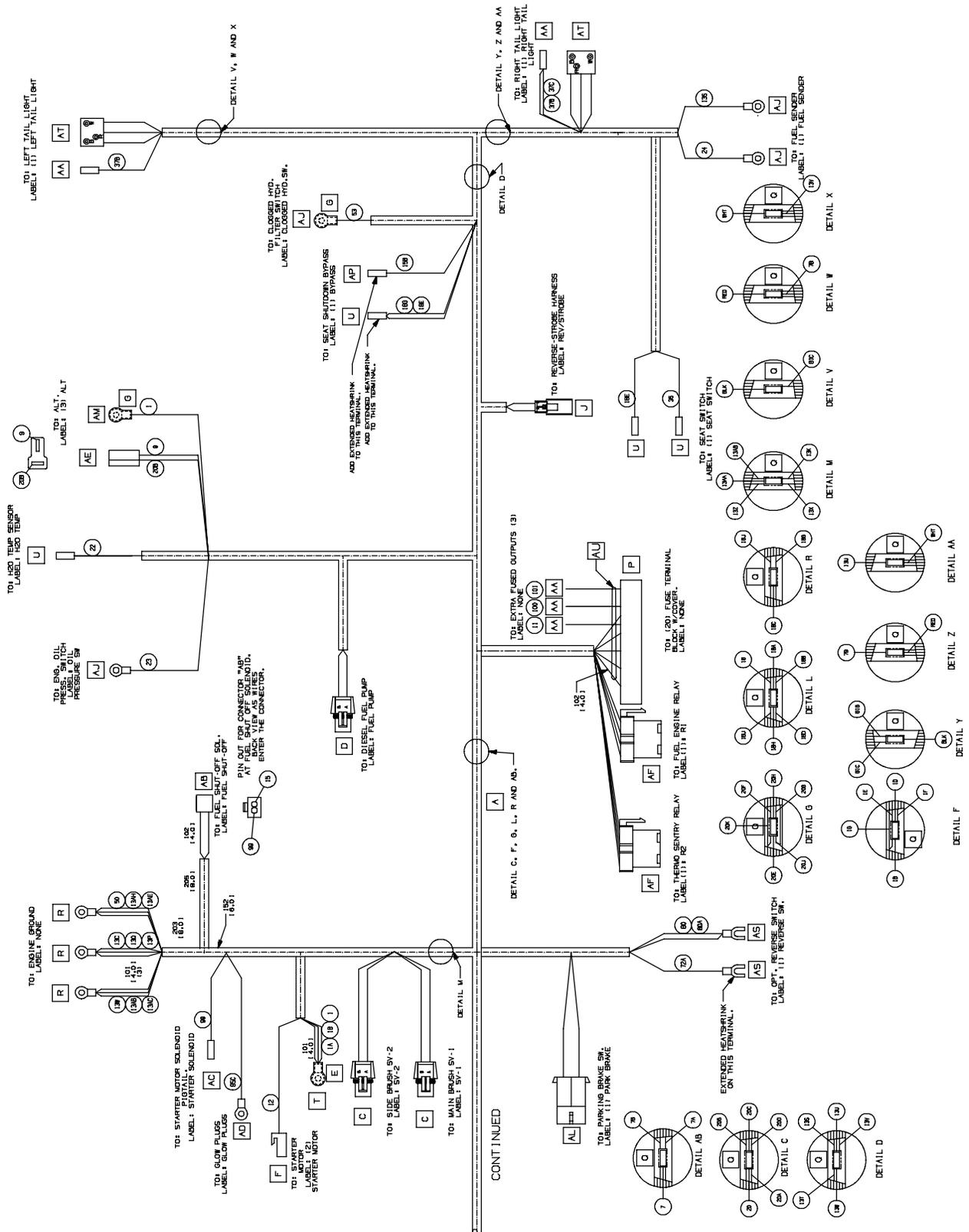
CONTINUED

WIRE HARNESSES GROUP FIG. 16 - GAS/LP

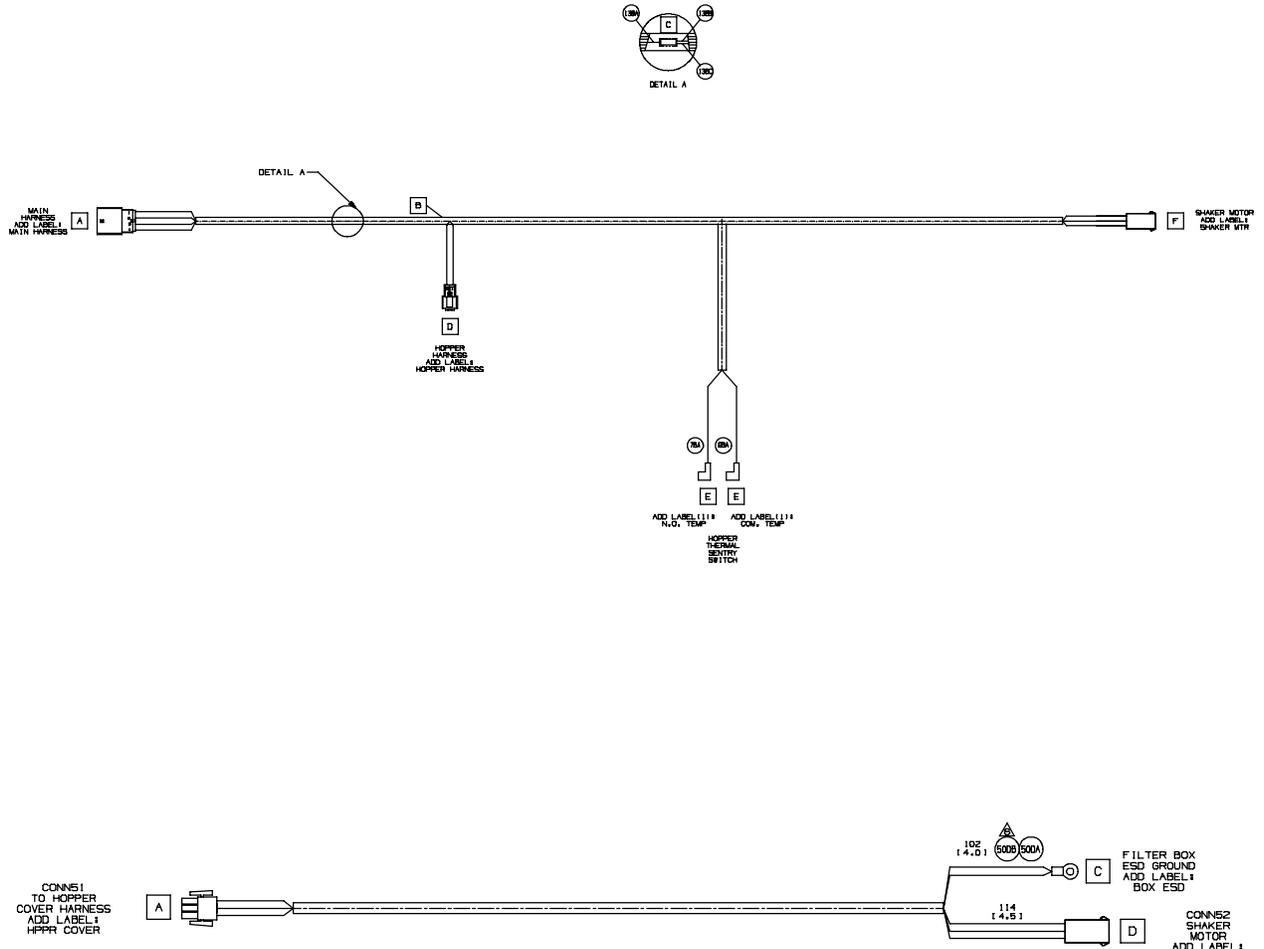
354981



WIRE HARNESSES GROUP FIG. 18 - DIESEL

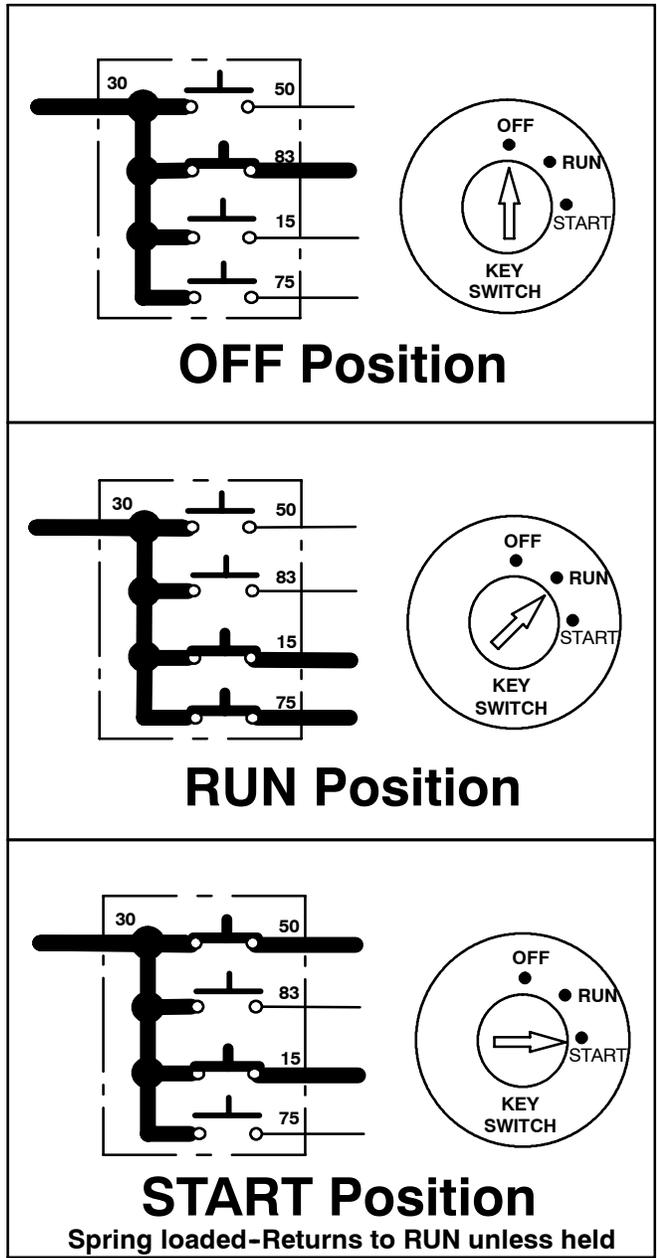


WIRE HARNESSES GROUP FIG. 20 - DIESEL



354982 - D

KEY SWITCH INFORMATION (GAS/LPG ONLY)

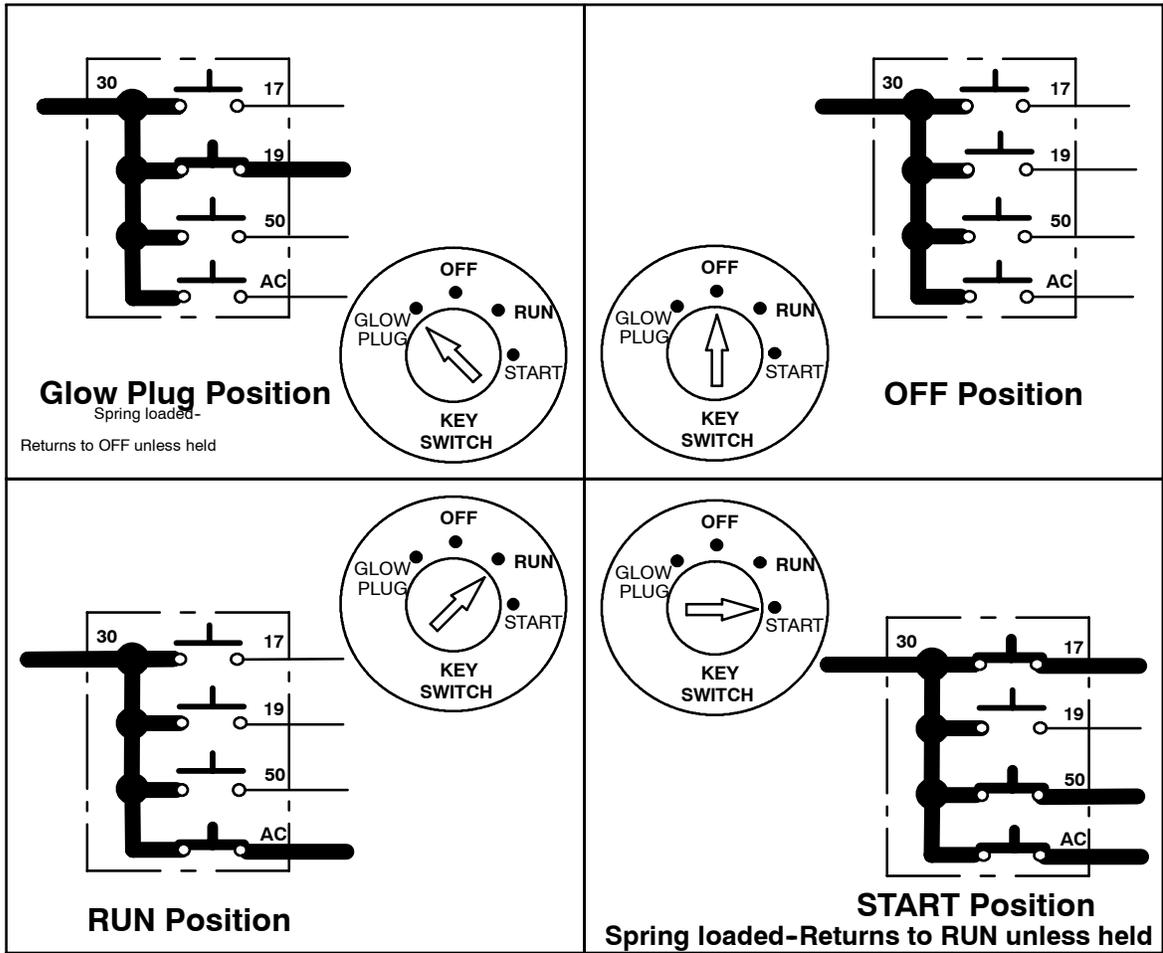


Key Switch position	Key Switch pin terminal				
	30	50	83	15	75
OFF	●	—	●		
RUN	●	—	●	—	●
START	●	●	—	●	

“●—●” Indicates a common connection

i Common connections in various switch positions should be less than 0.2 vdc per connection (under load).

KEY SWITCH INFORMATION (DIESEL ONLY)

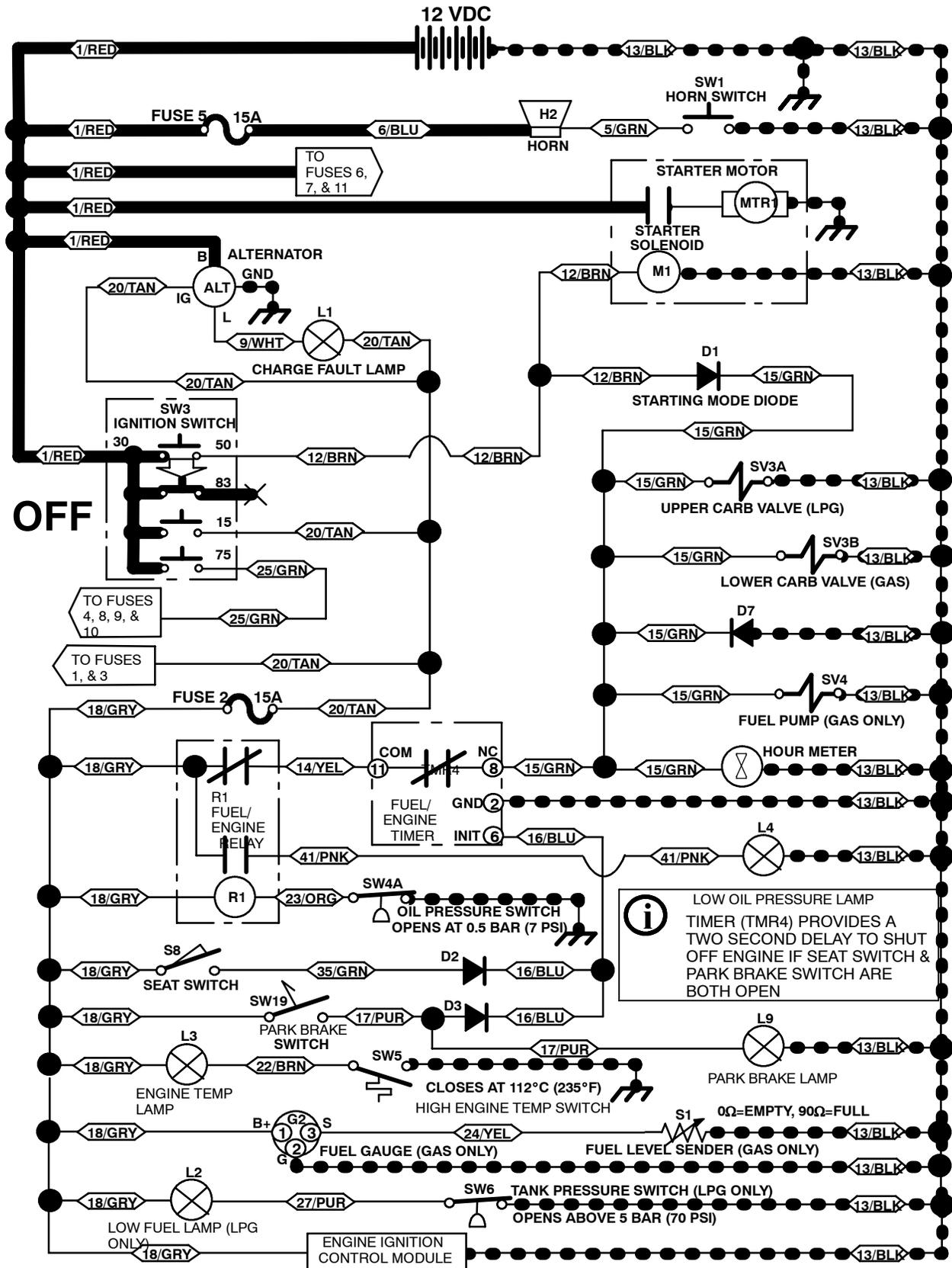


		Key Switch pin terminal				
		30	17	19	50	AC
Key Switch position	Glow Plug	● ——— ●				
	OFF	No Connections				
	RUN	●	●	●	●	●
	START	●	●	●	●	●

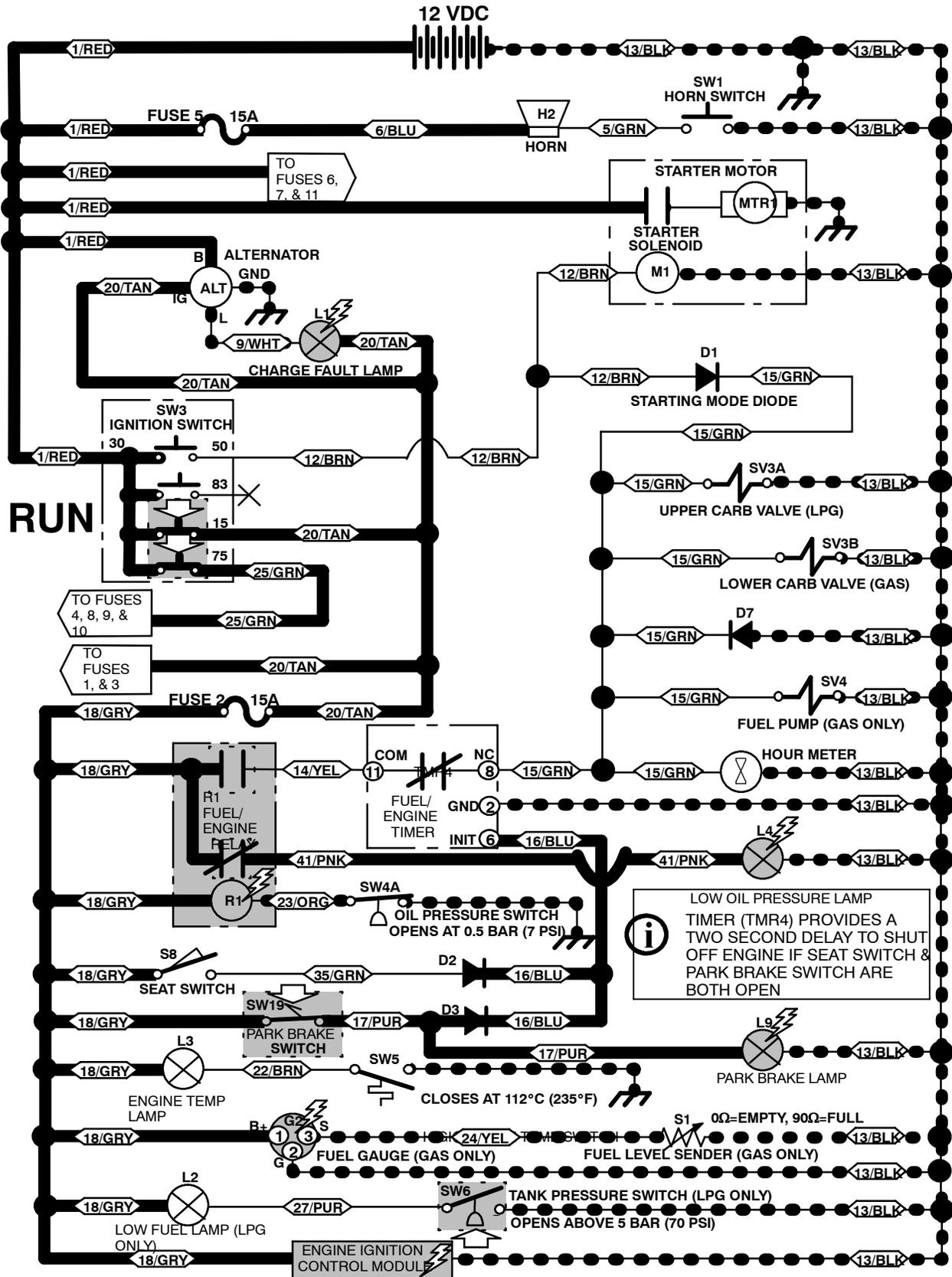
“● ——— ●” Indicates a common connection

i Common connections in various switch positions should be less than 0.2 vdc per connection (under load).

KEY OFF POWER DISTRIBUTION (GAS/LPG ONLY)

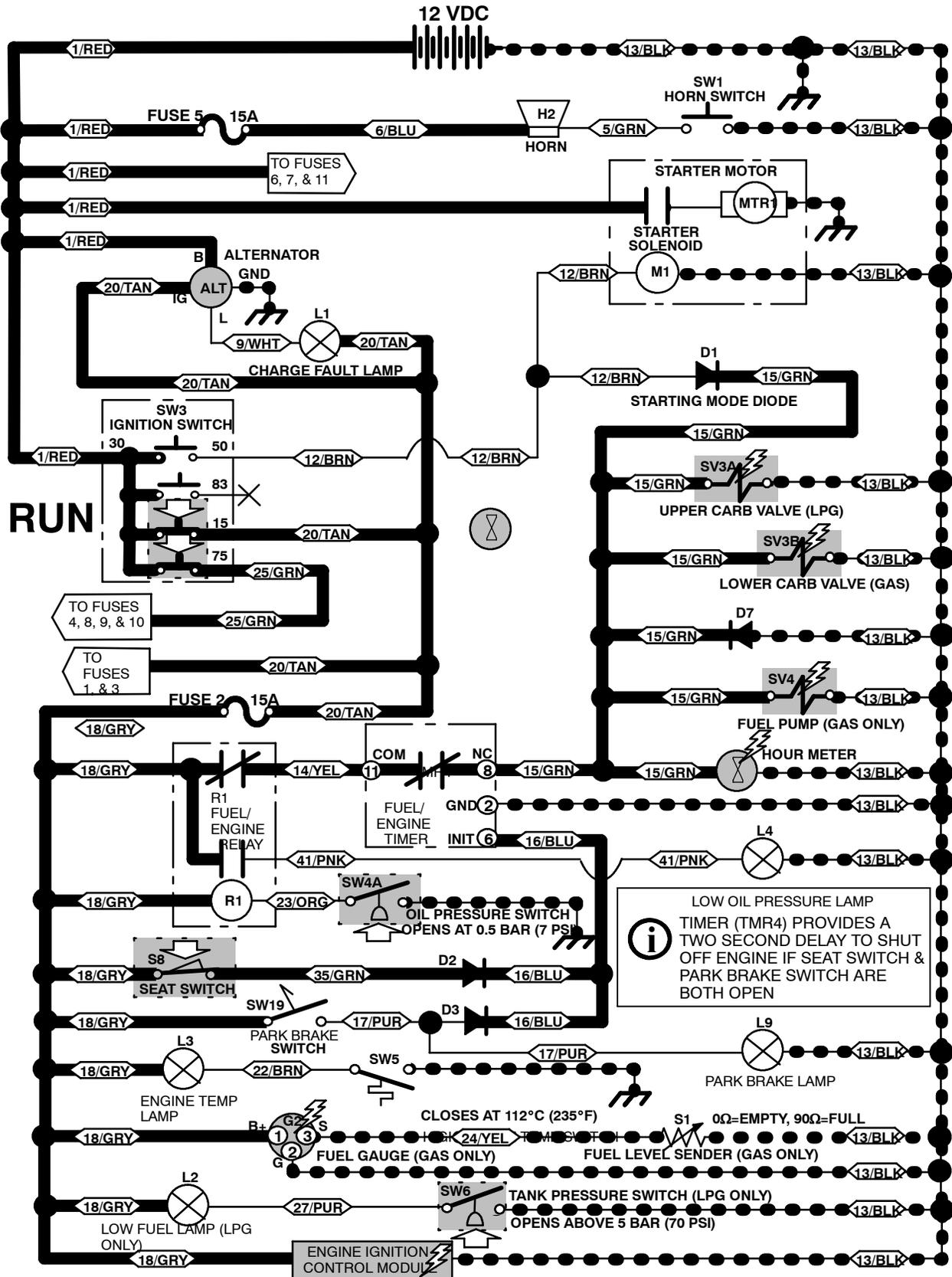


KEY ON, ENGINE OFF POWER DISTRIBUTION (GAS/LPG ONLY)

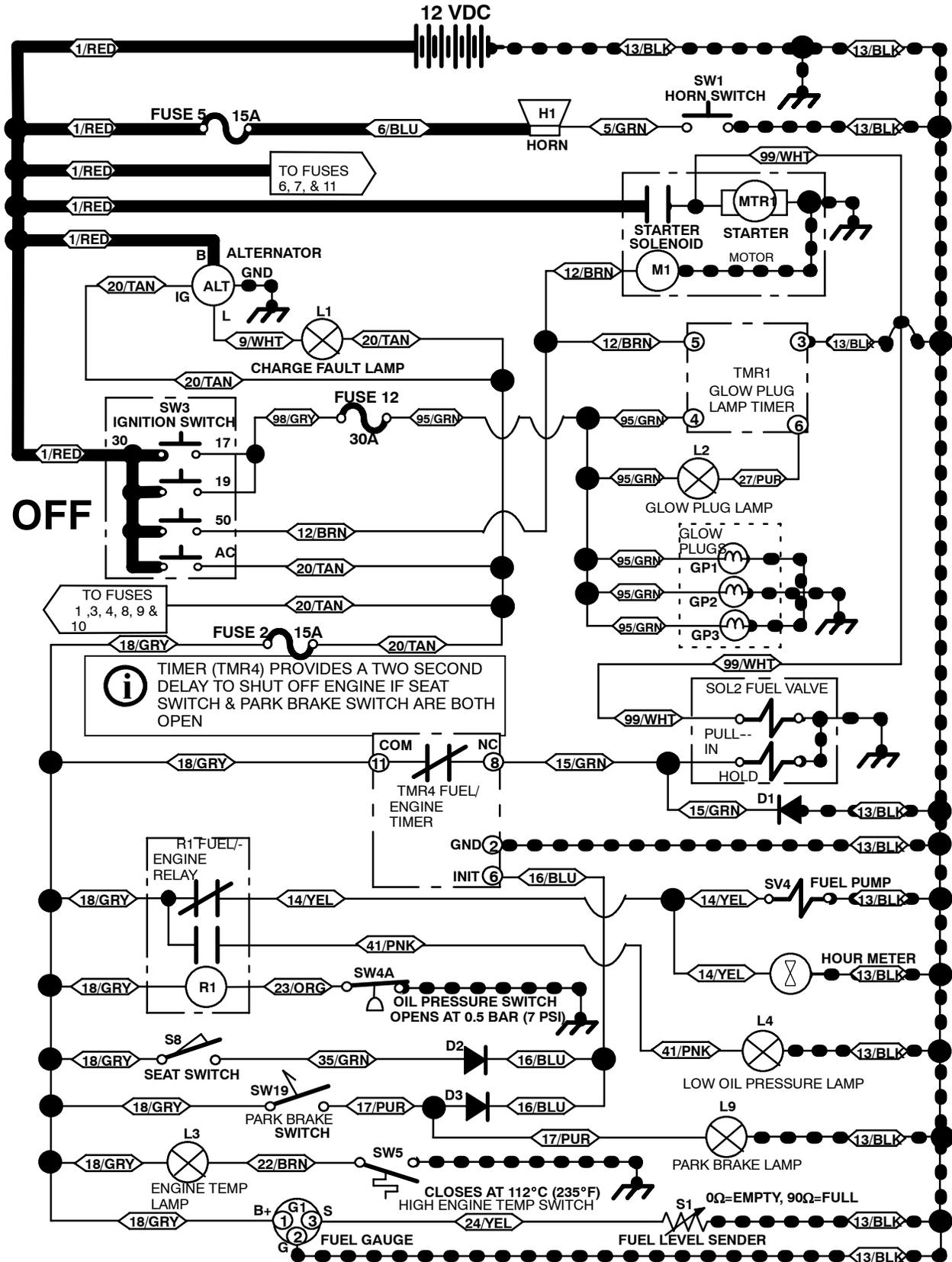


S20 Service Information

KEY ON, ENGINE RUNNING POWER DISTRIBUTION (GAS/LPG ONLY)

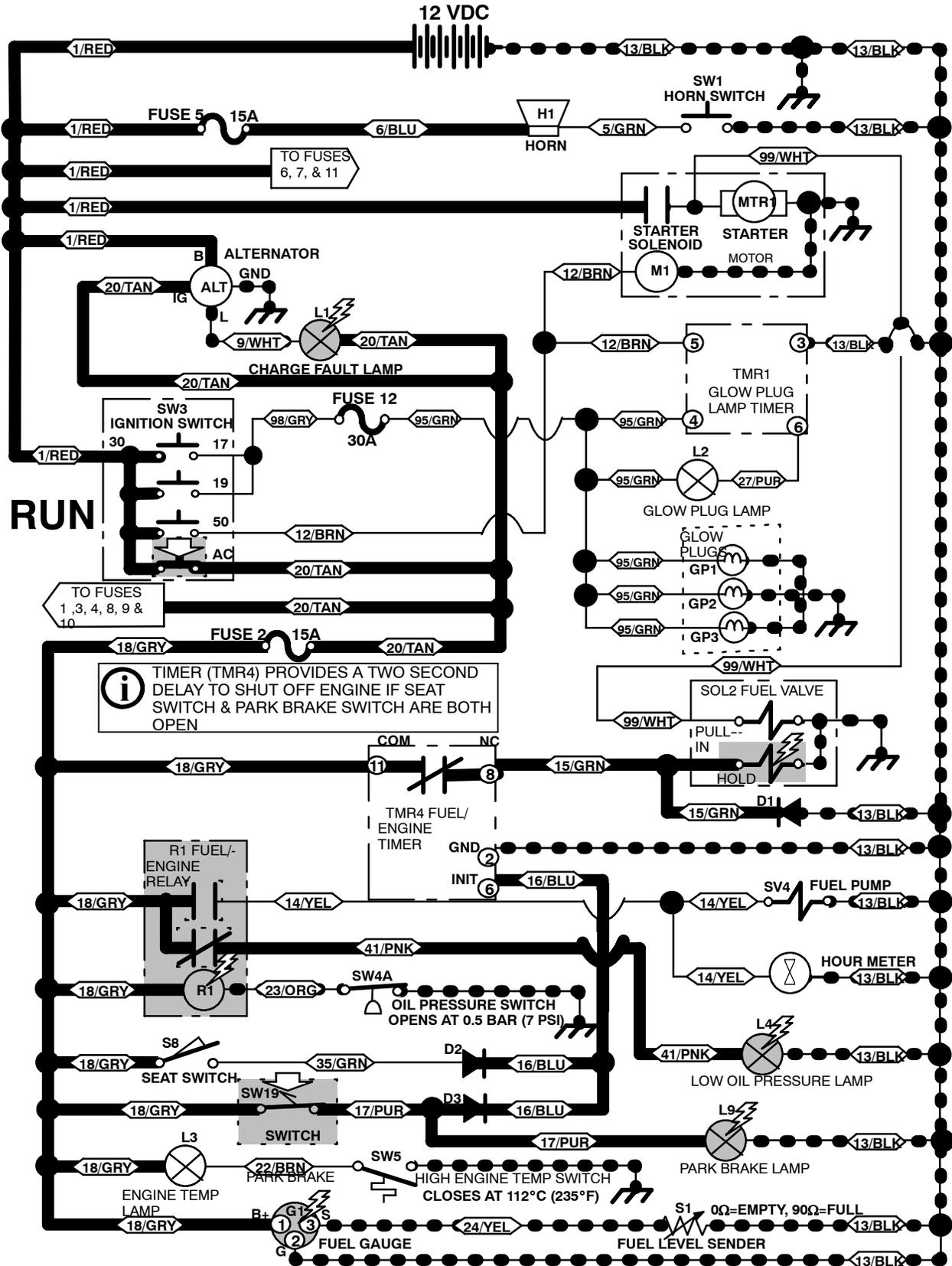


KEY OFF POWER DISTRIBUTION (DIESEL ONLY)

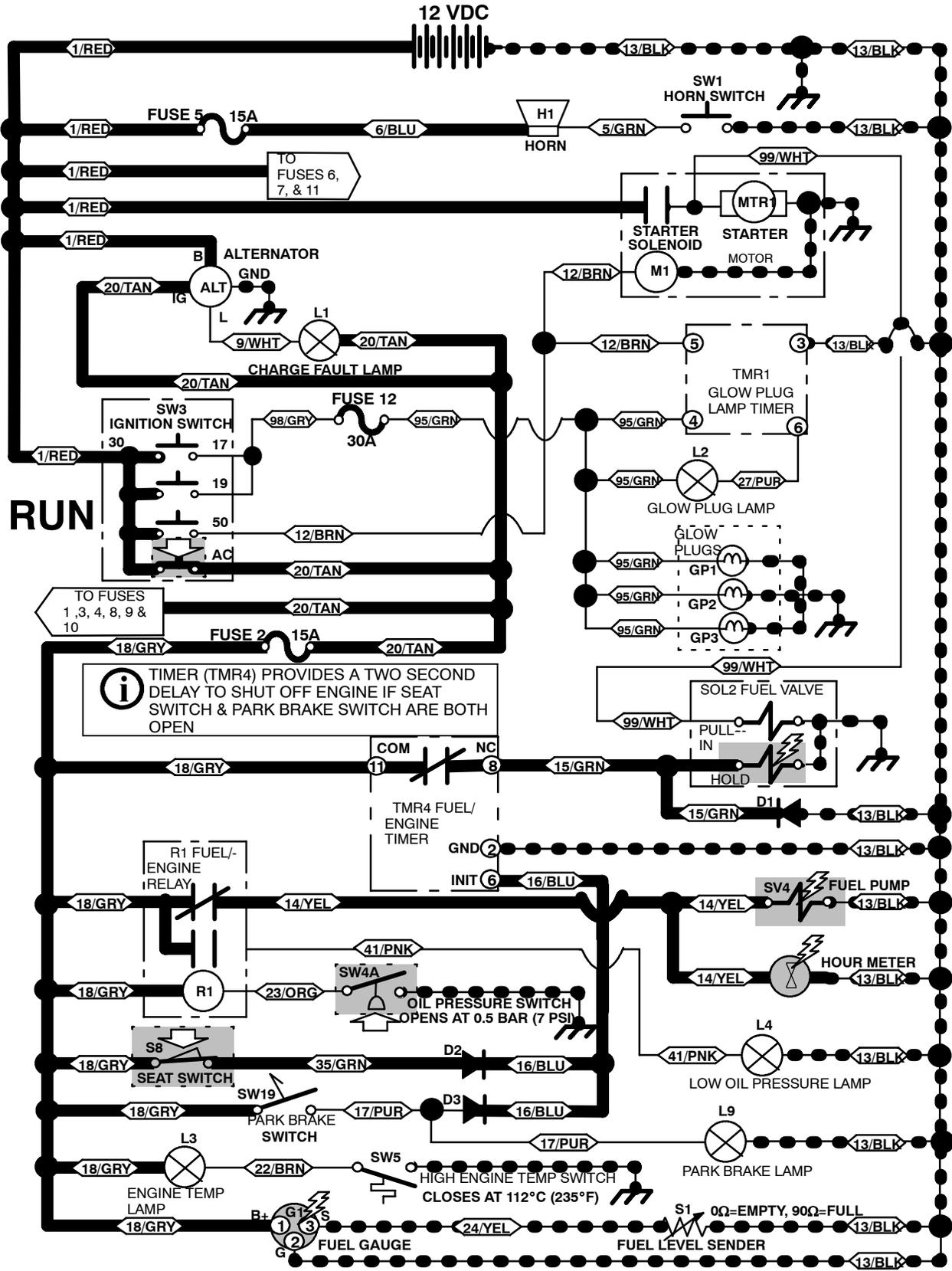


S20 Service Information

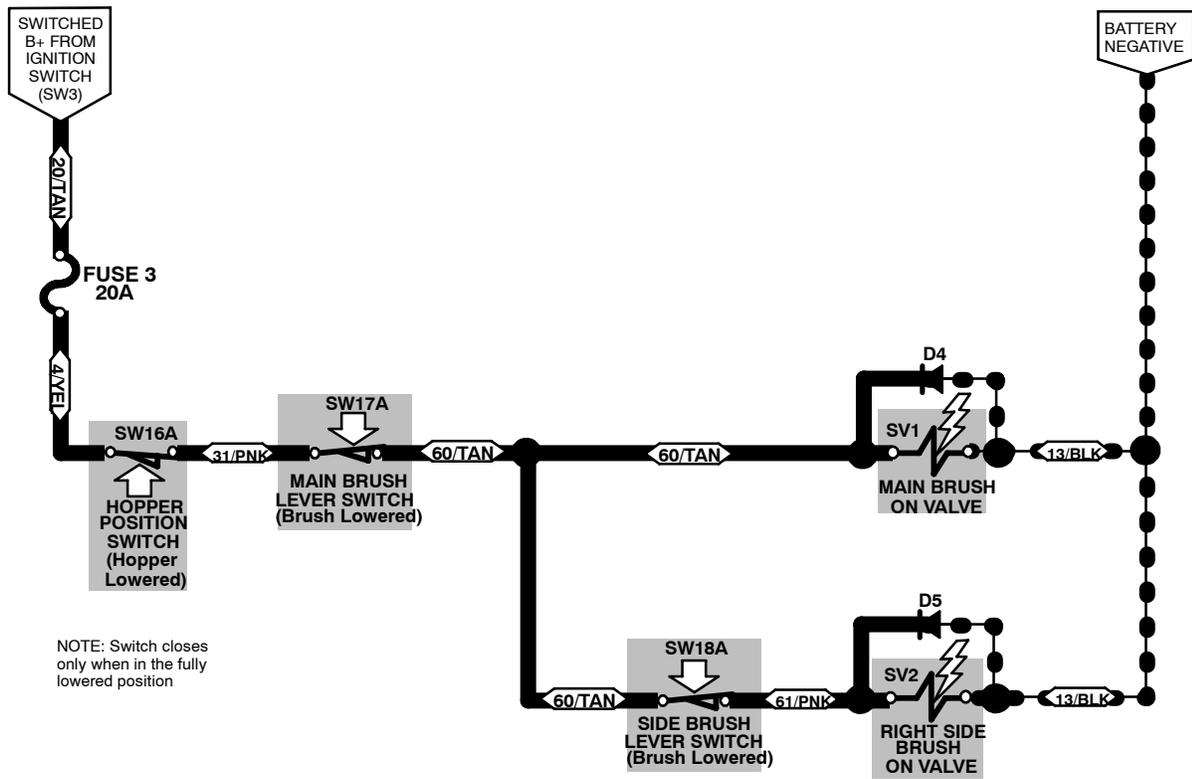
KEY ON, ENGINE OFF POWER DISTRIBUTION (DIESEL ONLY)



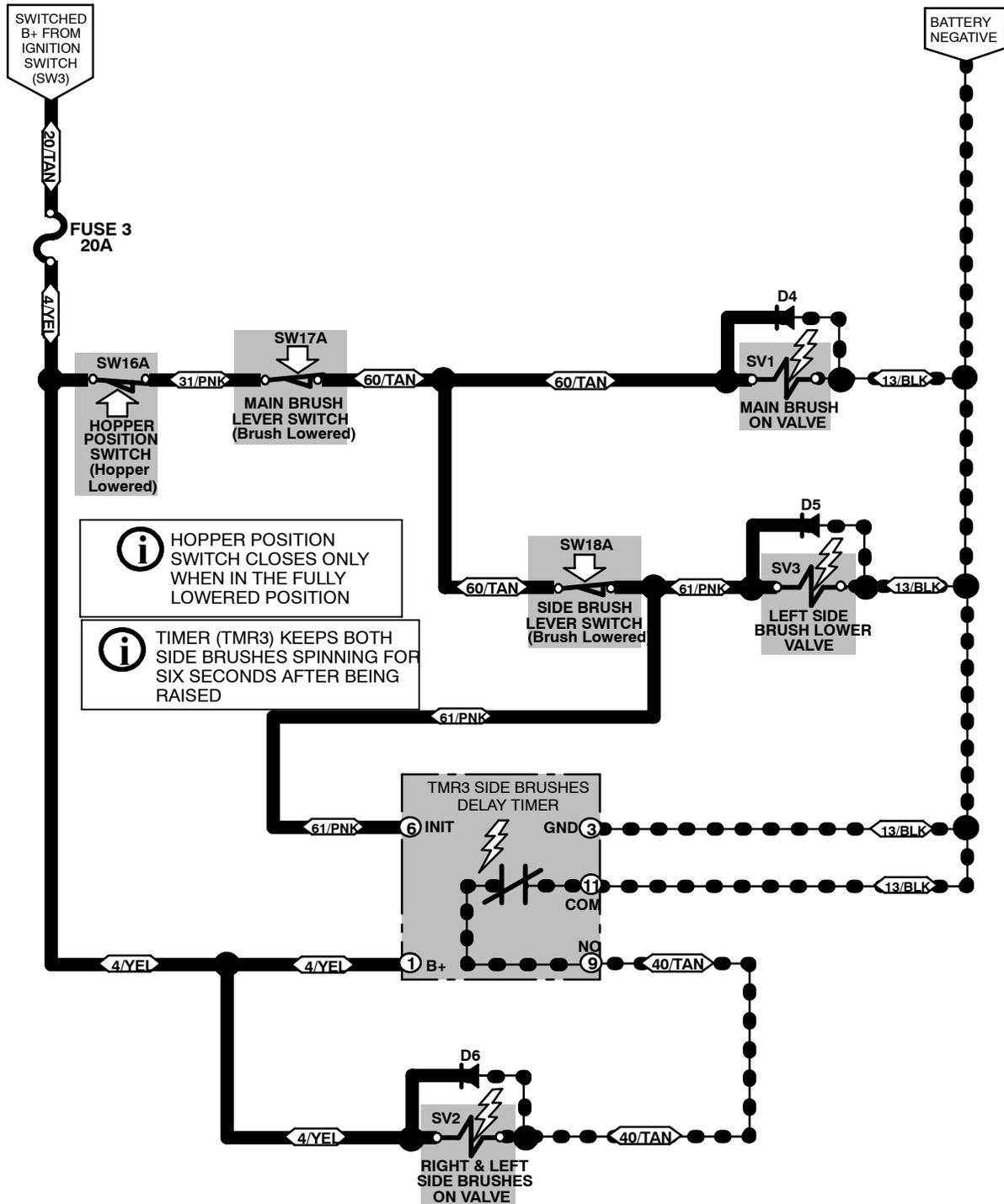
KEY ON, ENGINE RUNNING POWER DISTRIBUTION (DIESEL ONLY)



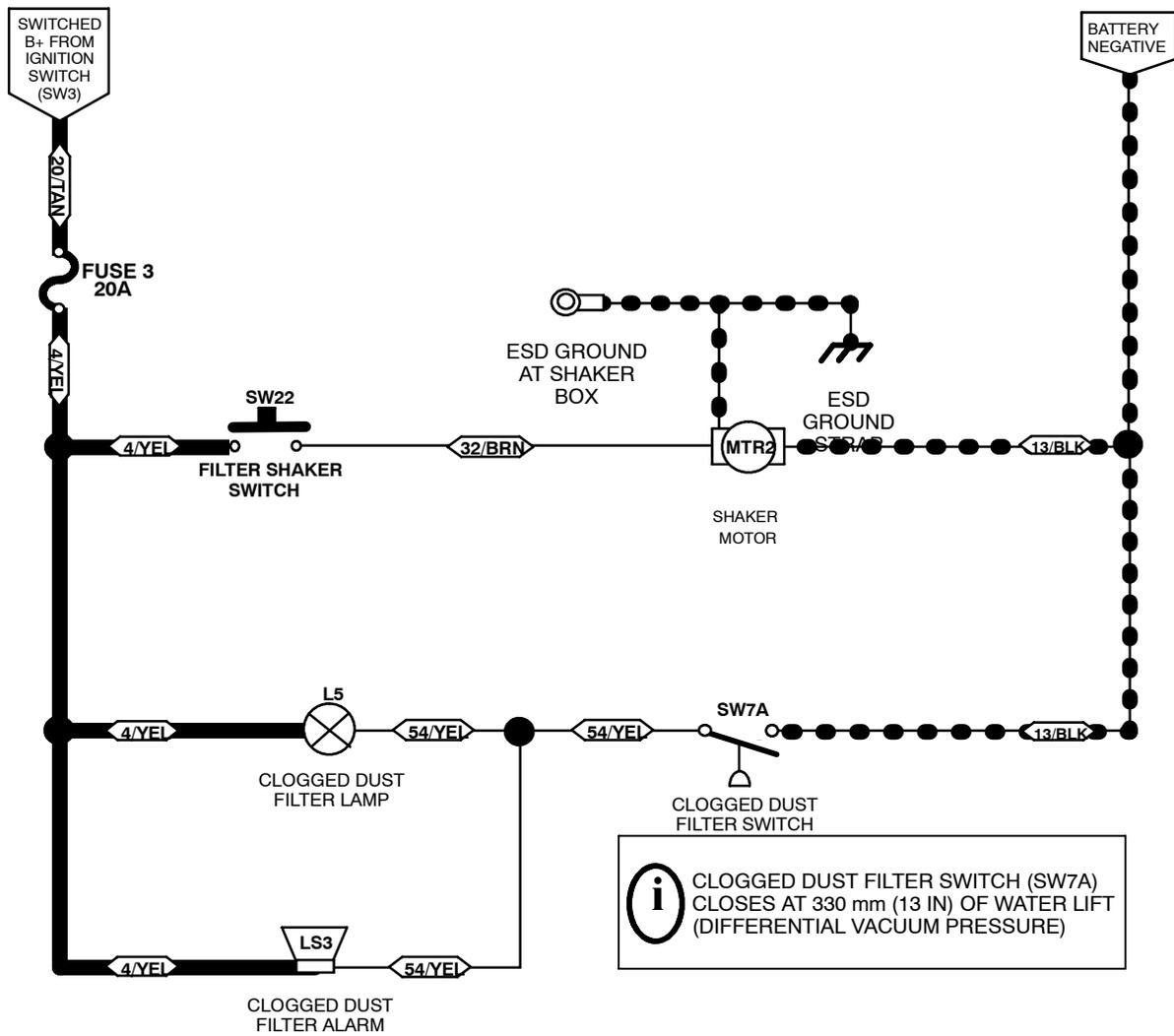
MAIN BRUSH AND SIDE BRUSH ON (STANDARD)



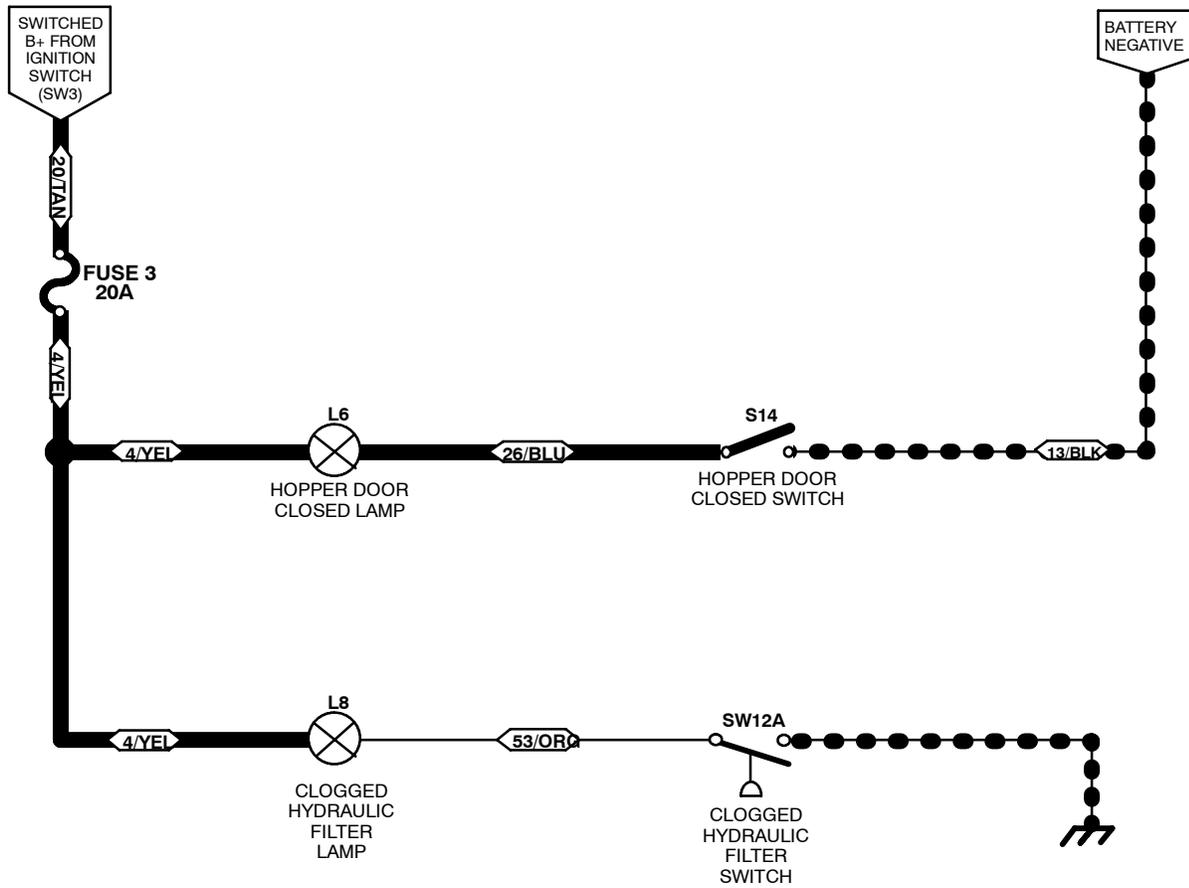
MAIN BRUSH & SIDE BRUSHES ON (WITH OPTIONAL LEFT SIDE BRUSH)



FILTER SHAKER AND CLOGGED DUST FILTER CIRCUITS

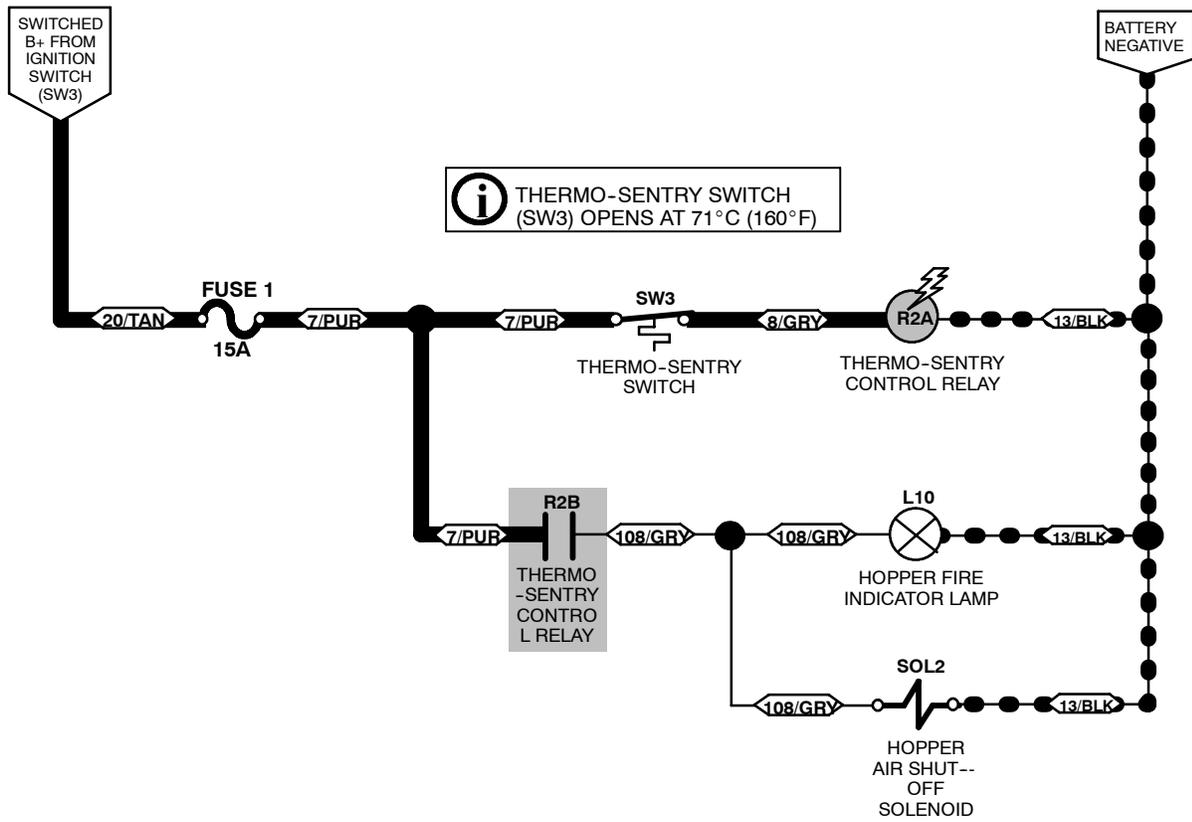


HOPPER DOOR CLOSED LAMP & CLOGGED HYDRAULIC FILTER LAMP CIRCUITS

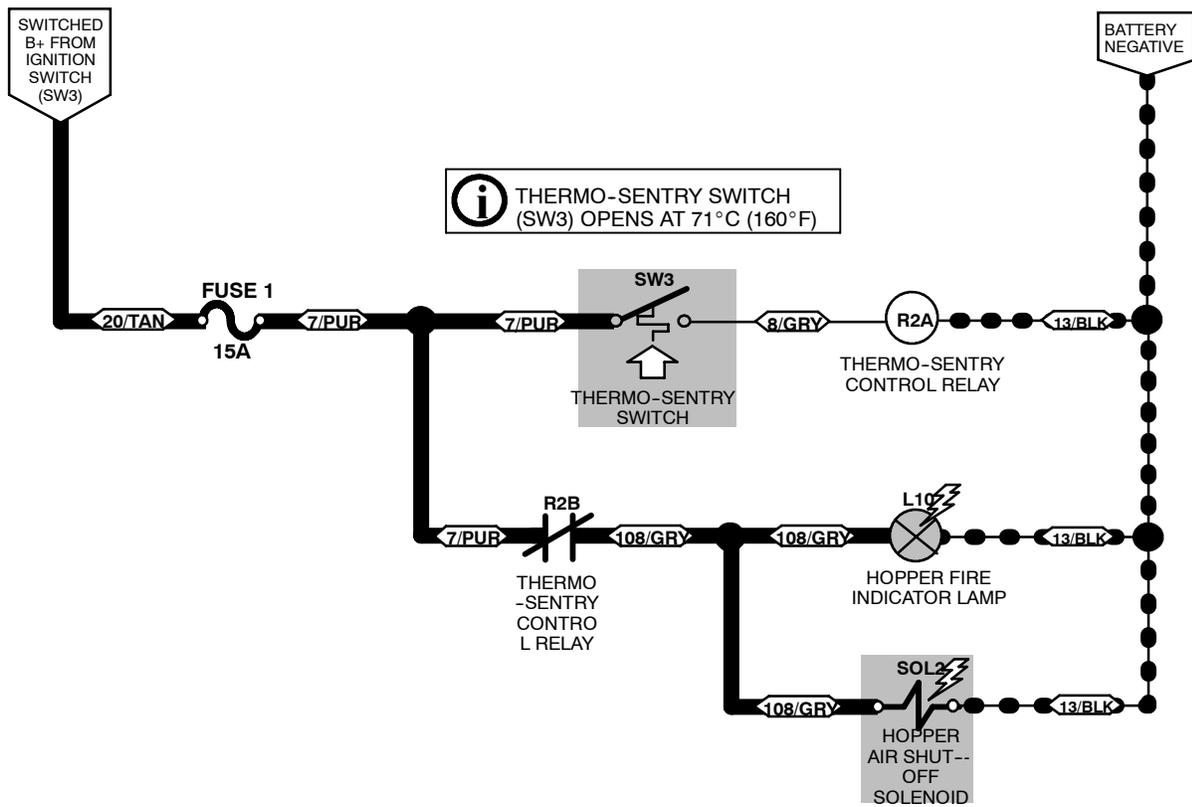


i CLOGGED HYDRAULIC FILTER SWITCH (SW12A) CLOSSES AT 2.75 BAR (40 PSI)

HOPPER THERMO SENTRY CIRCUIT (NORMAL OPERATION)



HOPPER THERMO SENTRY CIRCUIT (FIRE IN HOPPER)



HYDRAULIC

TROUBLESHOOTING

INFORMATION

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual
- * Engine & Hydraulic Oil Must Be At Normal Operating Temperatures after Running Machine and Hydraulics a Minimum of 5 Minutes
- * Examine Machine For Any Linkage Binding or Mechanical Problems

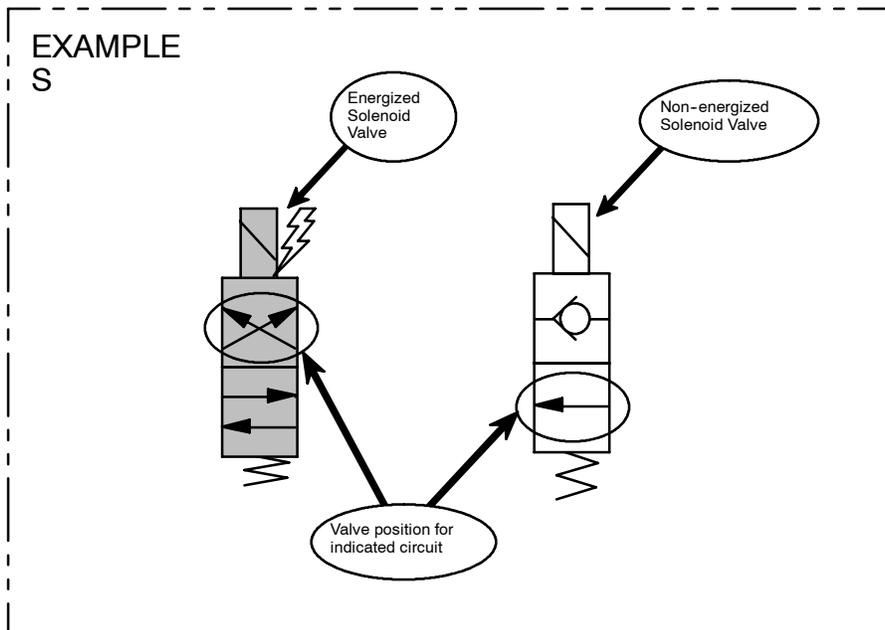
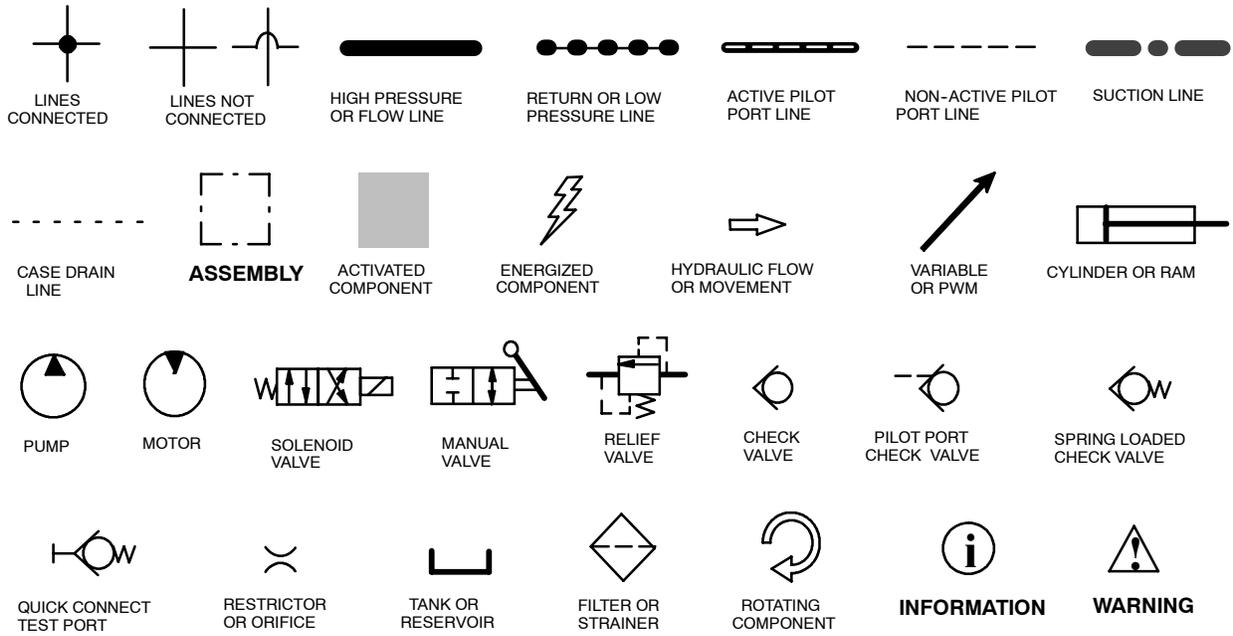
DURING TESTS:

- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action
- * Maintain Normal Main Brush Pressure as Listed in Operator's Manual

NOTE: Troubleshooting charts may be shown with optional equipment. The optional equipment may not be specified in these charts. Some machines may not be equipped with all components shown.

GENERAL INFORMATION

Commonly Used Hydraulic Symbols

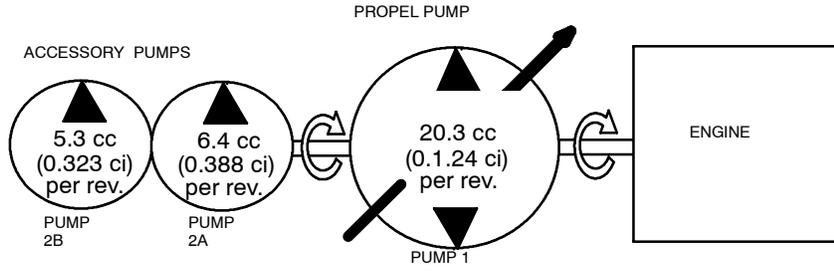


Commonly Used Abbreviations				
AUX	Auxiliary		MFLD	Manifold
CC	Cubic Centimeters		MTR	Motor
CK	Check Valve		OR	Orifice
CM	Centimeters		PC	Pilot Port Check Valve
CU	Cubic		PMP	Pump
CV	Control Valve		PSI	Pounds Per Square Inch
CYL	Cylinder		PSWITCH	Pressure Switch
DC	Direct Current		PWM	Pulse Width Modulation
DCn	Disconnect (Test Port)		RES	Reservoir
FLTR	Filter		RH	Right Hand
GPM	Gallons Per Minute		RPM	Revolutions Per Minute
HTX	Heat Exchanger		RV	Relief Valve
IN	Inches		SC	Spring Loaded Check Valve
kPa	KiloPascals		STRN	Strainer
LH	Left Hand		SV	Solenoid Valve
LPM	Liters Per Minute		SW	Switch
M	Motor (Combustion)		V	Volts

Hydraulic Manifold Port Markings				
C	Cylinder Connection		P	Pump Connection
G	Test Port		PS	Pressure Switch Connection
M	Motor Connection		T	Tank Connection

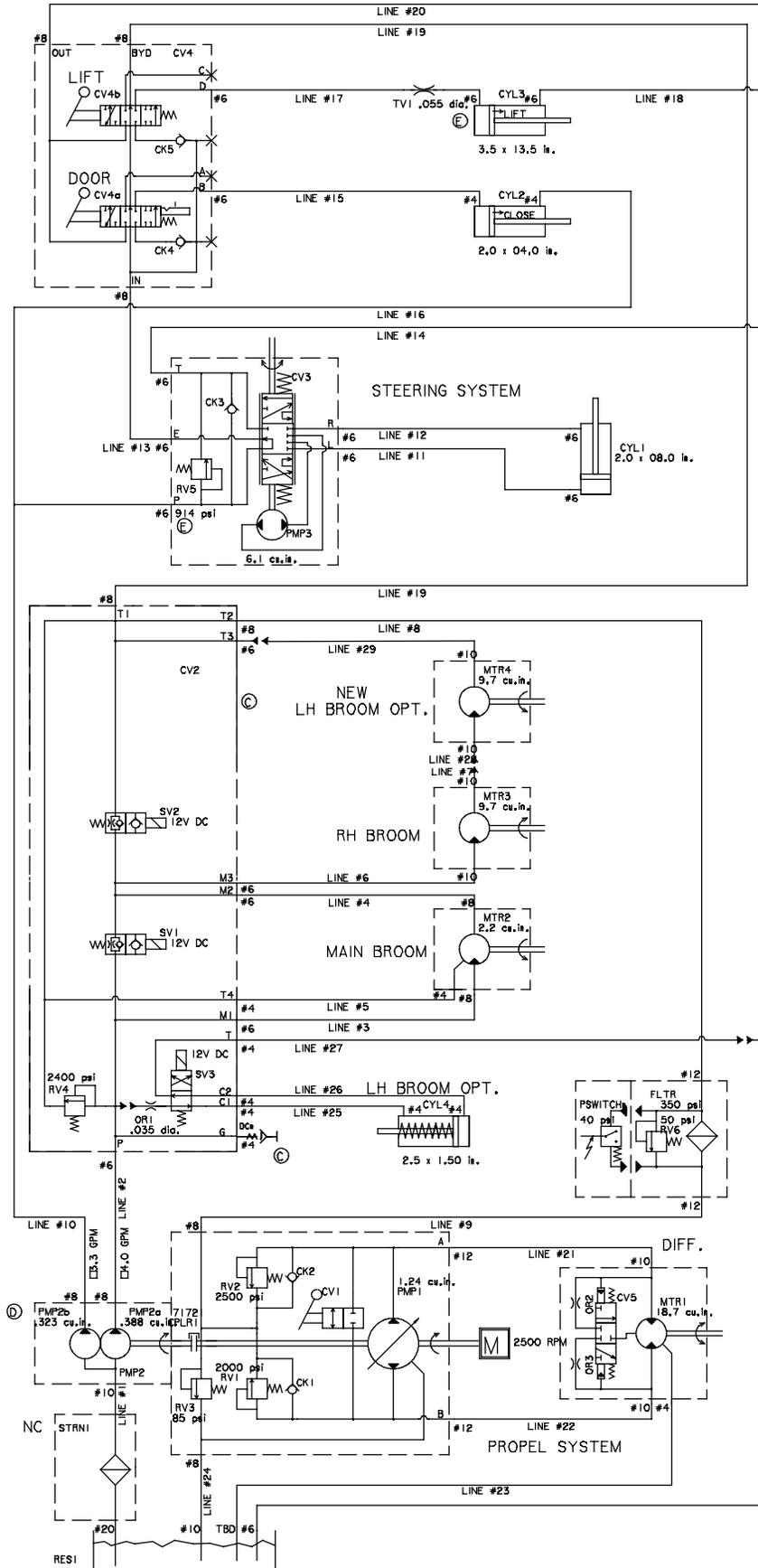
GENERAL INFORMATION

Hydraulic Pump Flow Rates (typical)



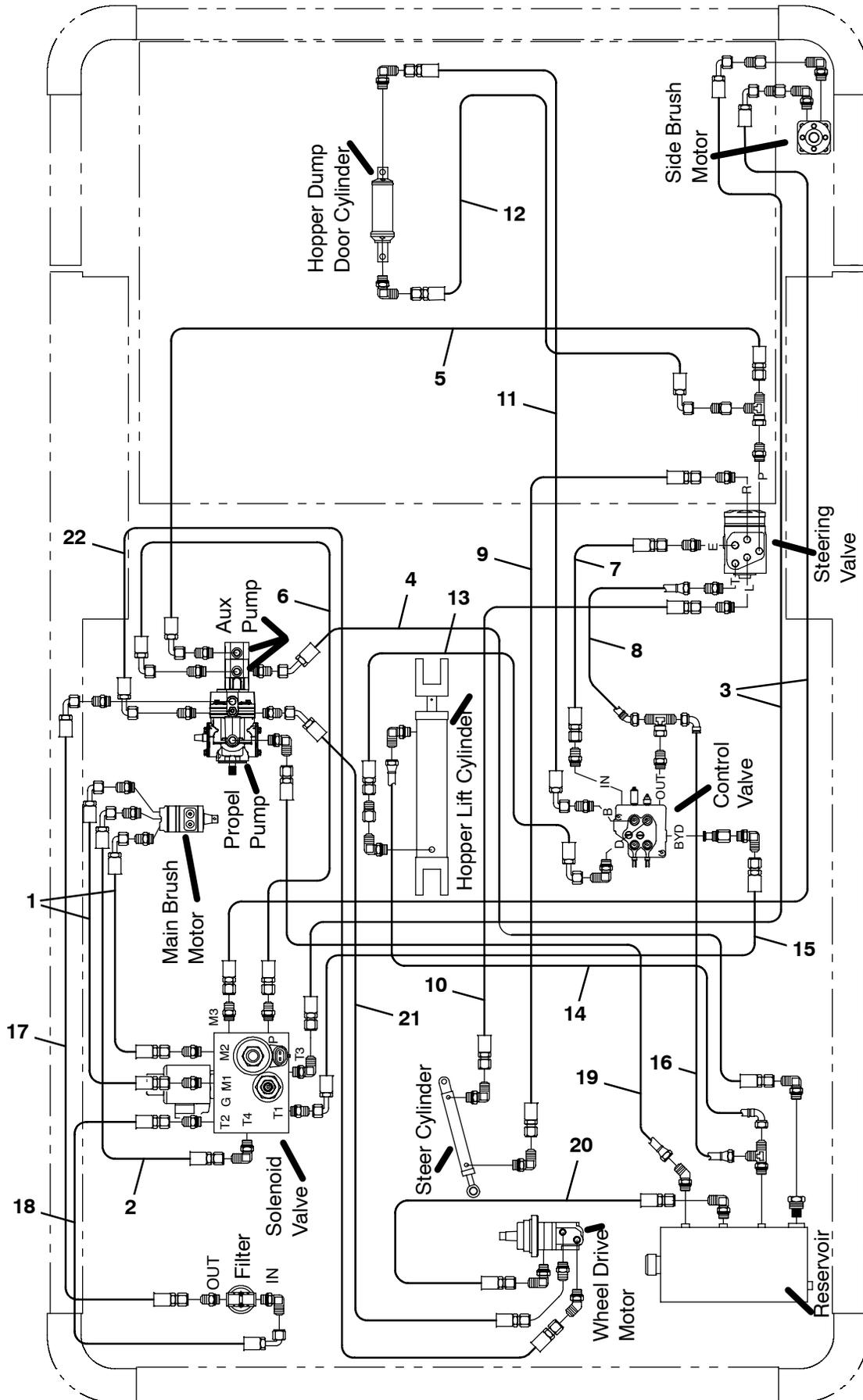
Pump	Displacement	Volume @ 2500RPM
Pump 1	20.3 cc (1.24 ci)	MAX. 50.75 lpm (13.4 gpm)
Pump 2A	6.4 cc (0.388 ci)	16 lpm (4.2 gpm)
Pump 2B	5.3 cc (0.323 ci)	13.25 lpm (3.5 gpm)

HYDRAULIC SCHEMATIC



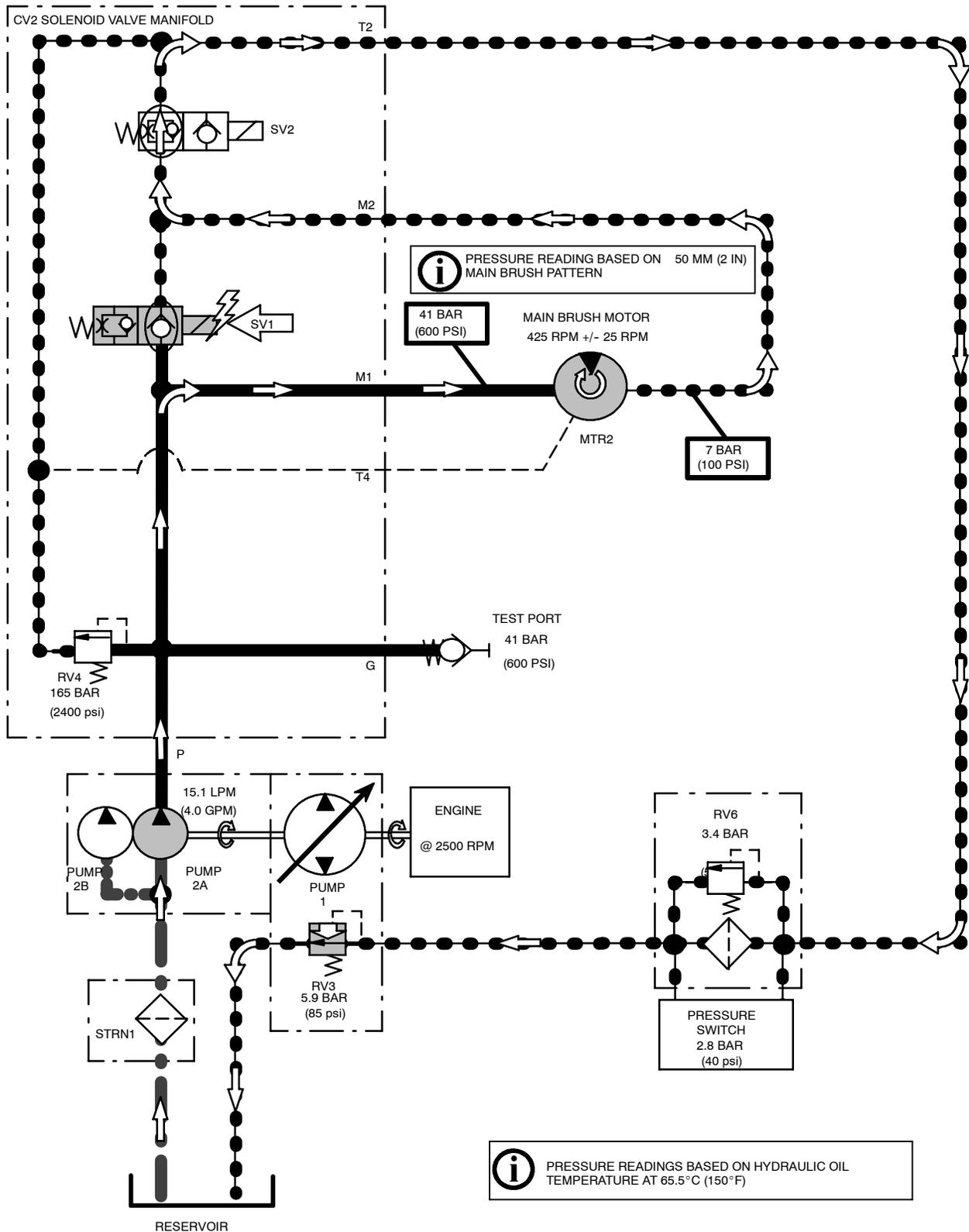
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HYDRAULIC HOSE GROUP

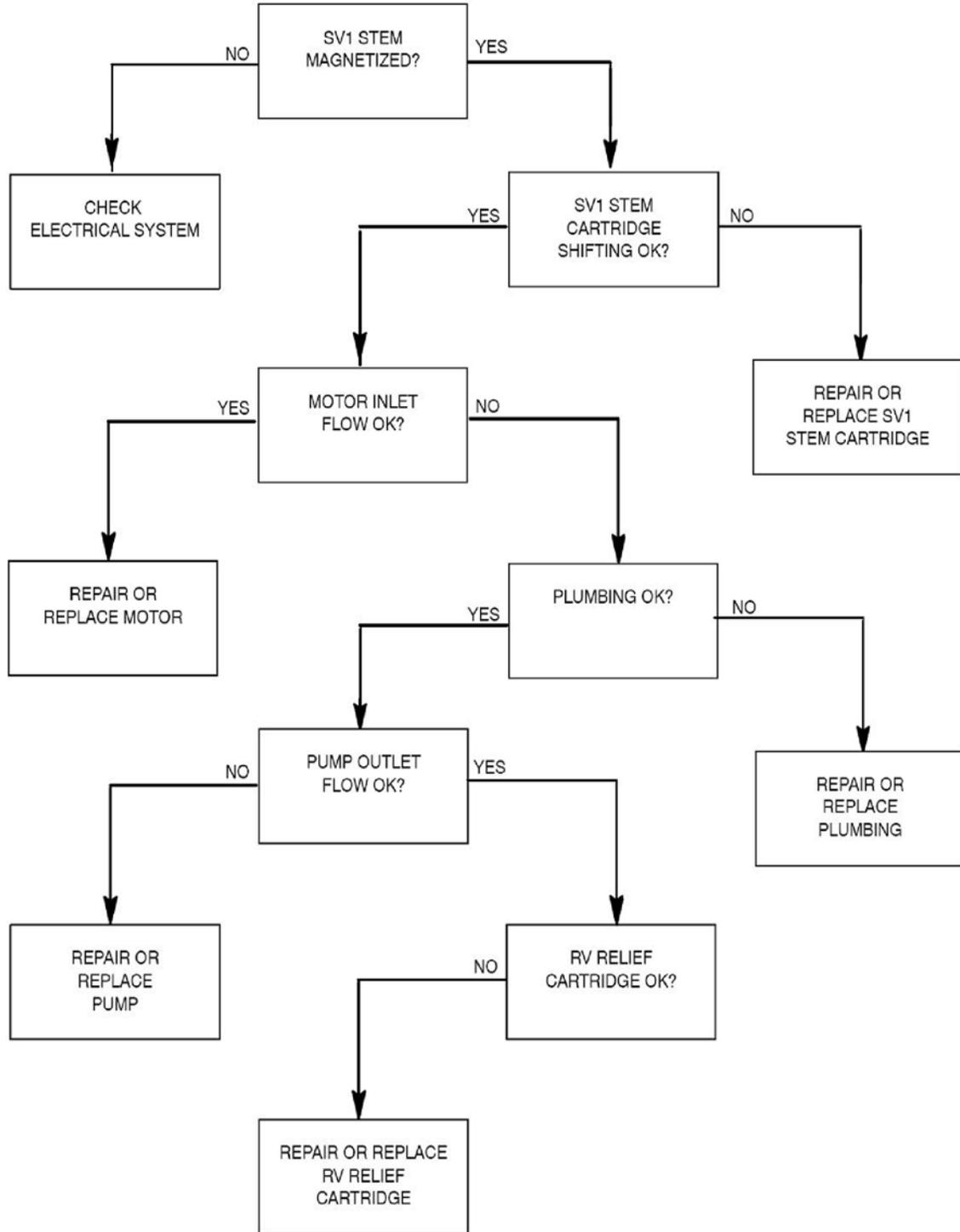


MAIN BRUSH ON

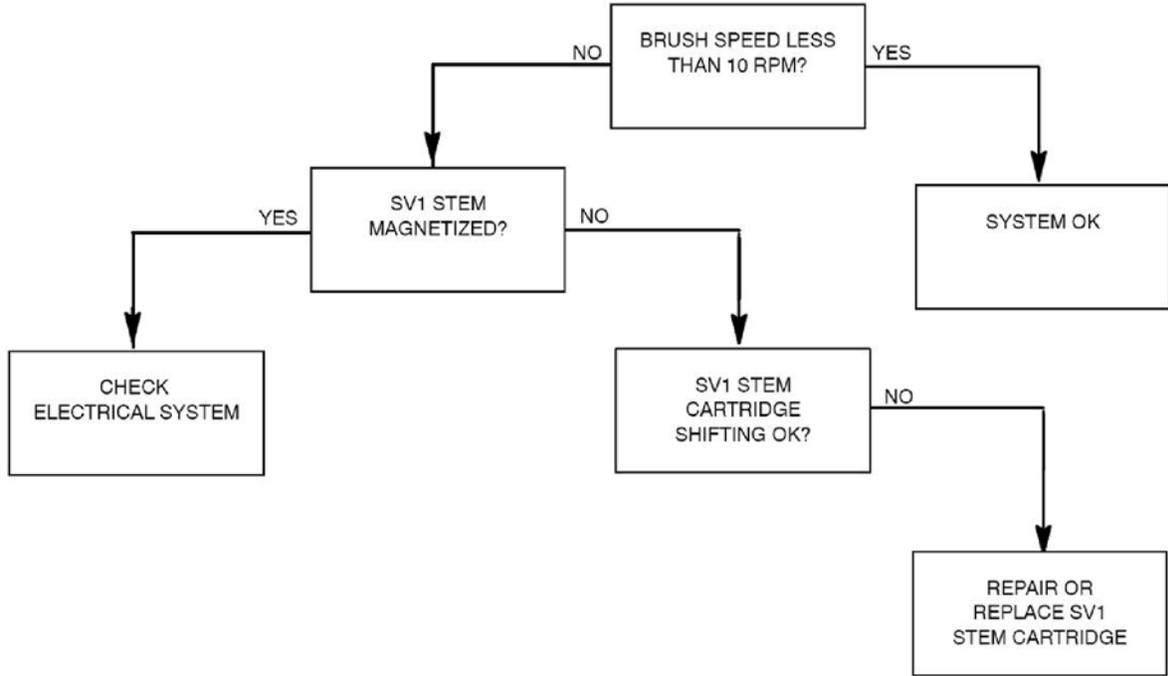
Conditions: Engine Running, Main Brush Lowered, Hopper Lowered



MAIN BRUSH DOES NOT TURN ON

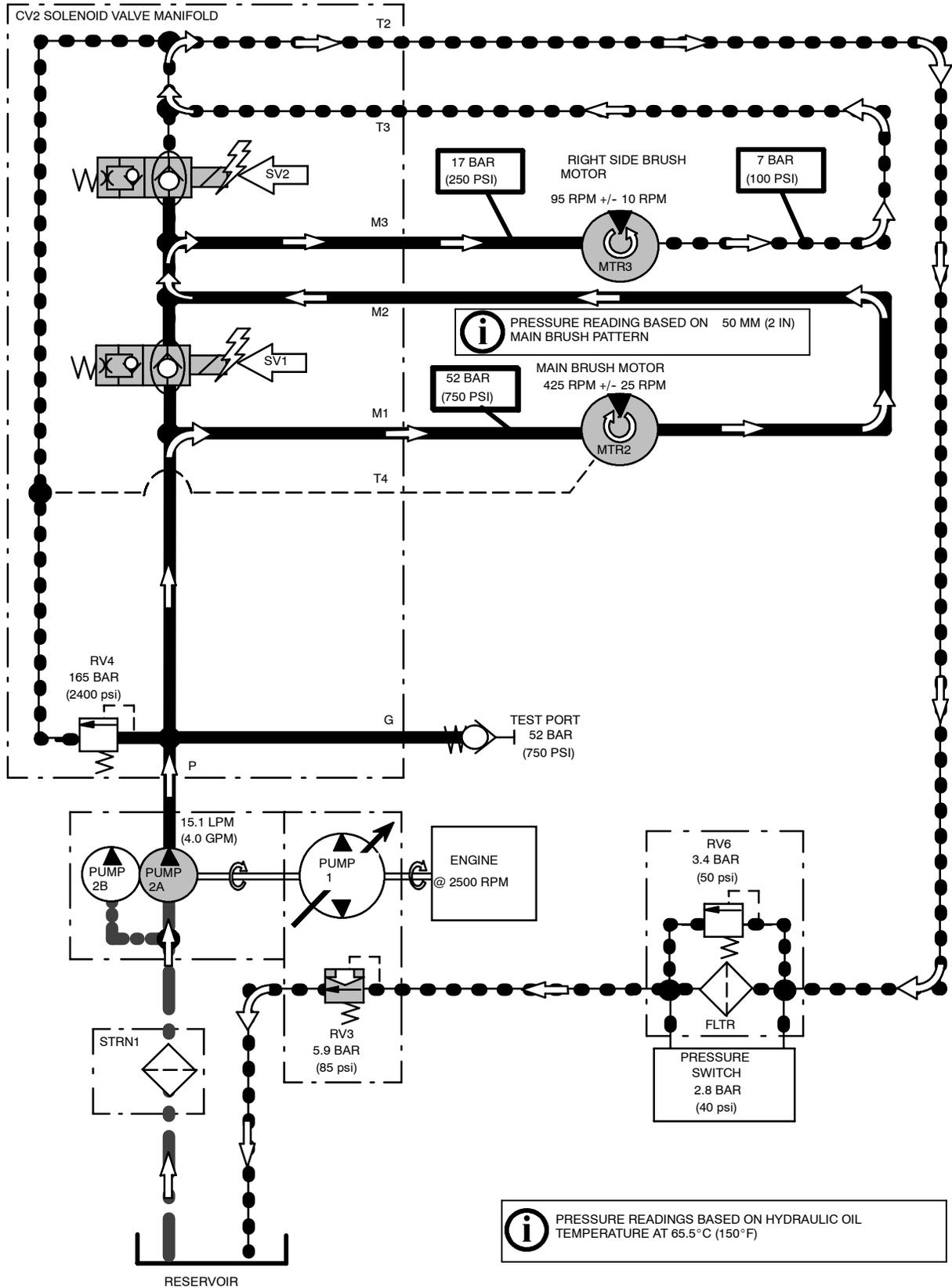


MAIN BRUSH DOES NOT TURN OFF



MAIN AND SIDE BRUSH ON (STANDARD)

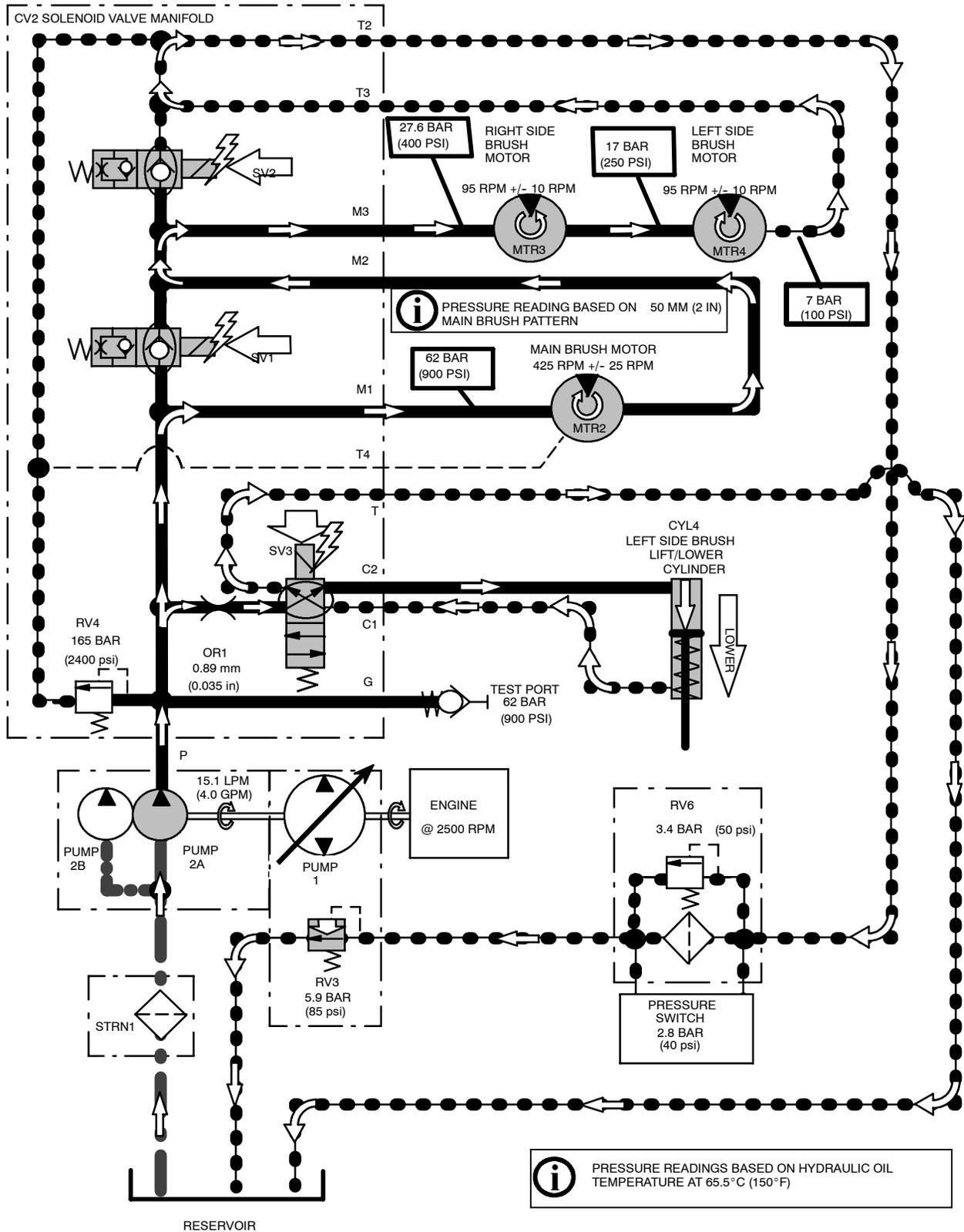
Conditions: Engine Running, Main & Side Brush Lowered, Hopper Lowered



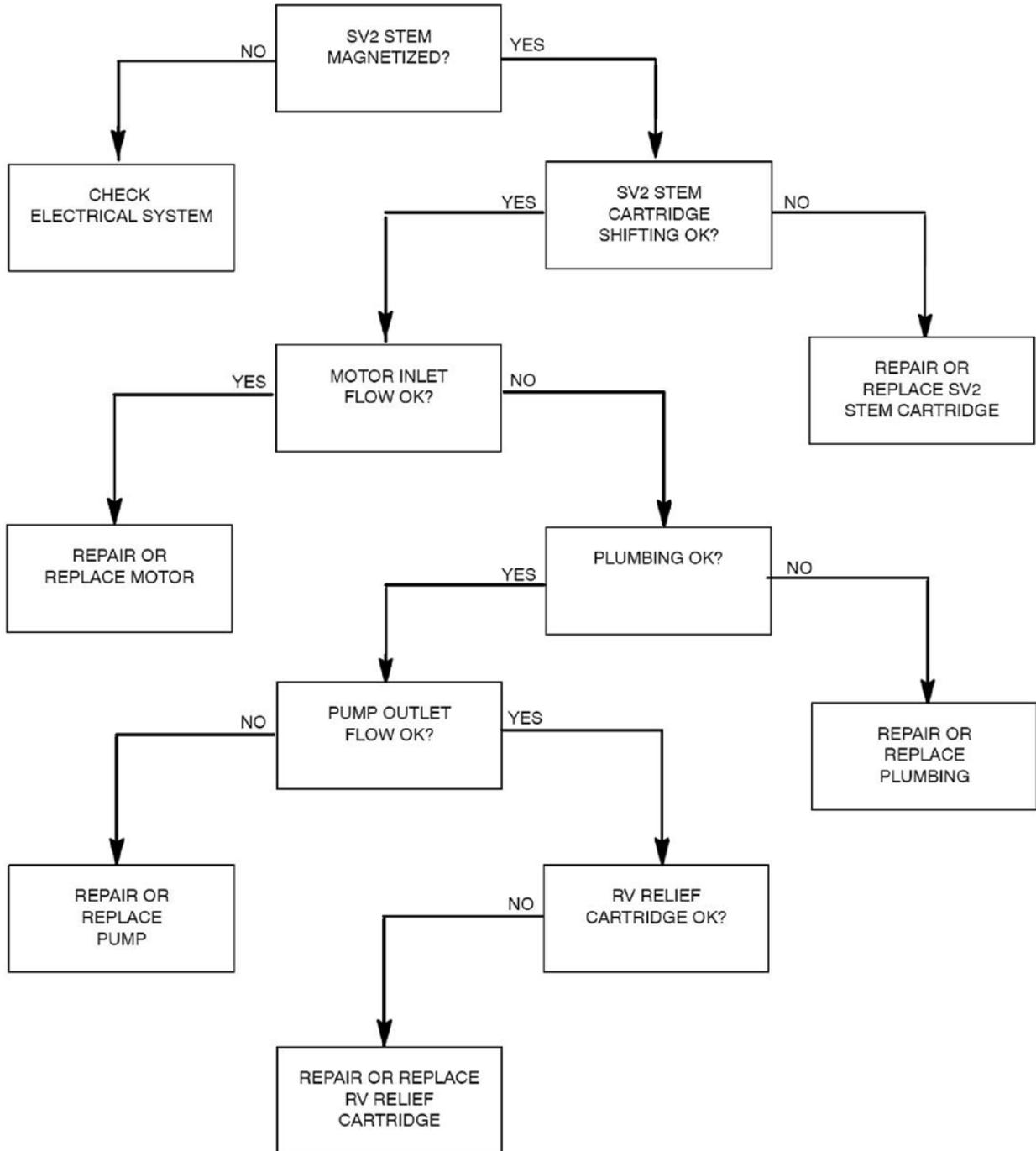
S20 Service Information

MAIN AND SIDE BRUSHES ON (WITH OPTIONAL LEFT SIDE BRUSH)

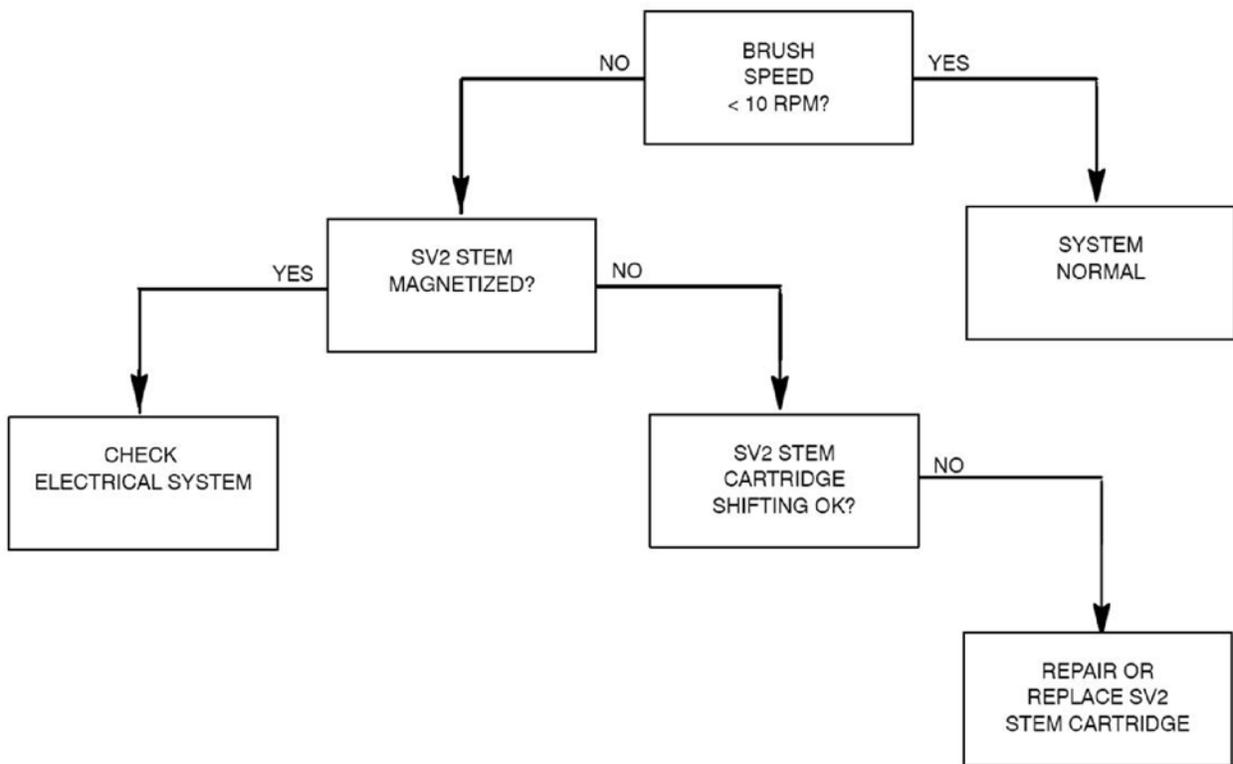
Conditions: Engine Running, Main & Side Brushes Lowered, Hopper Lowered



SIDE BRUSH(ES) DOES NOT TURN ON

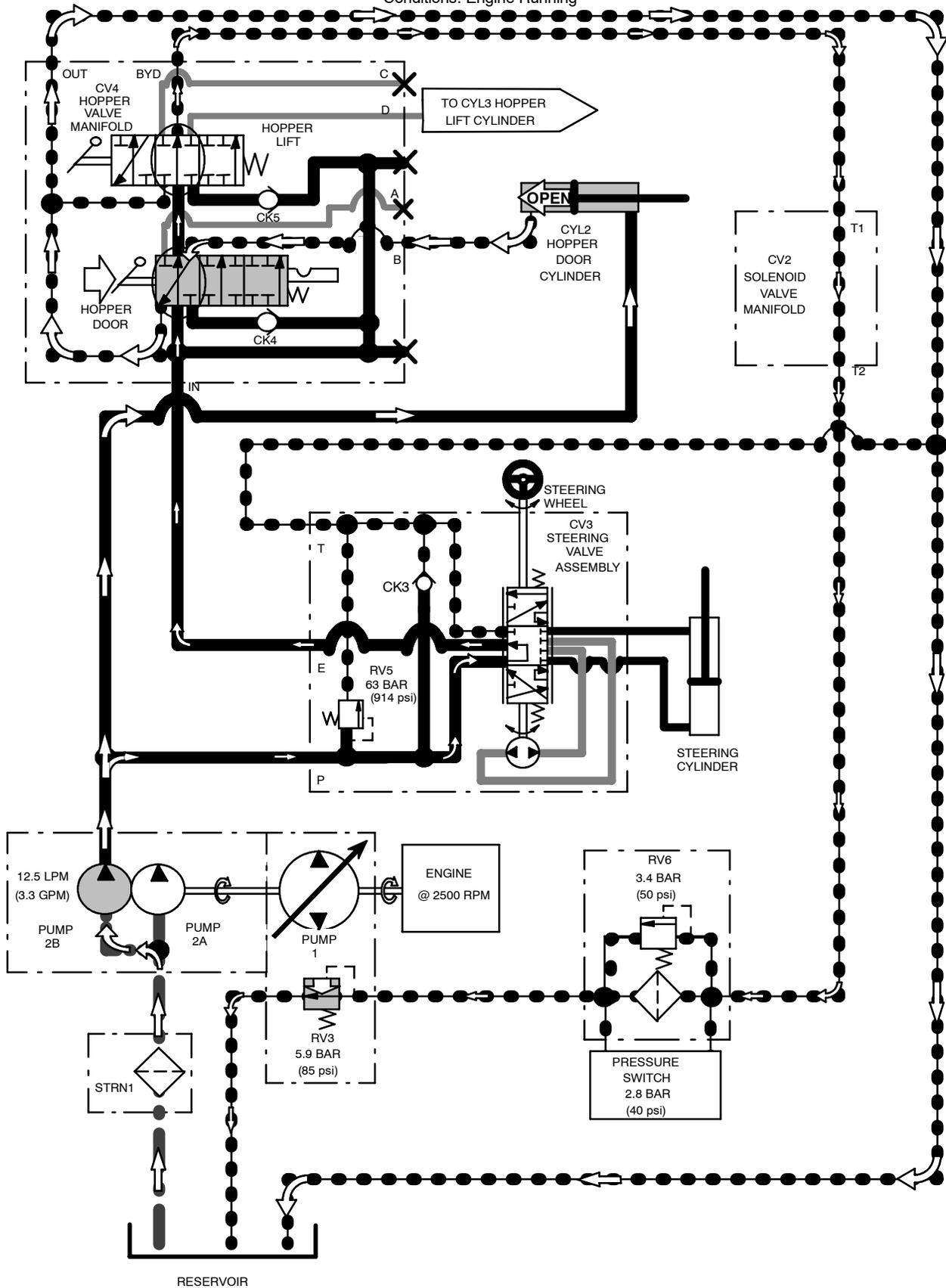


SIDE BRUSH(ES) DOES NOT TURN OFF

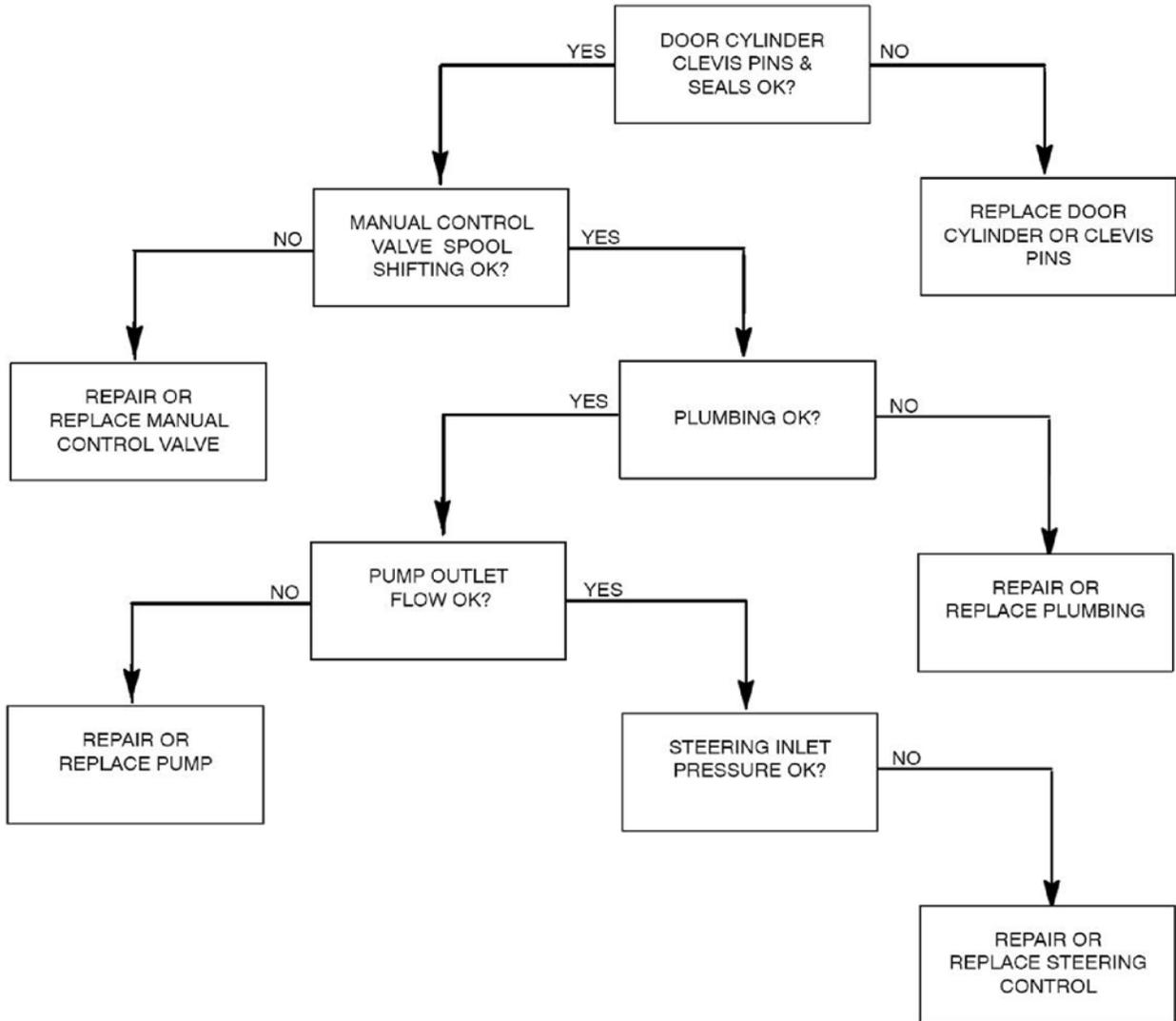


HOPPER DOOR OPEN

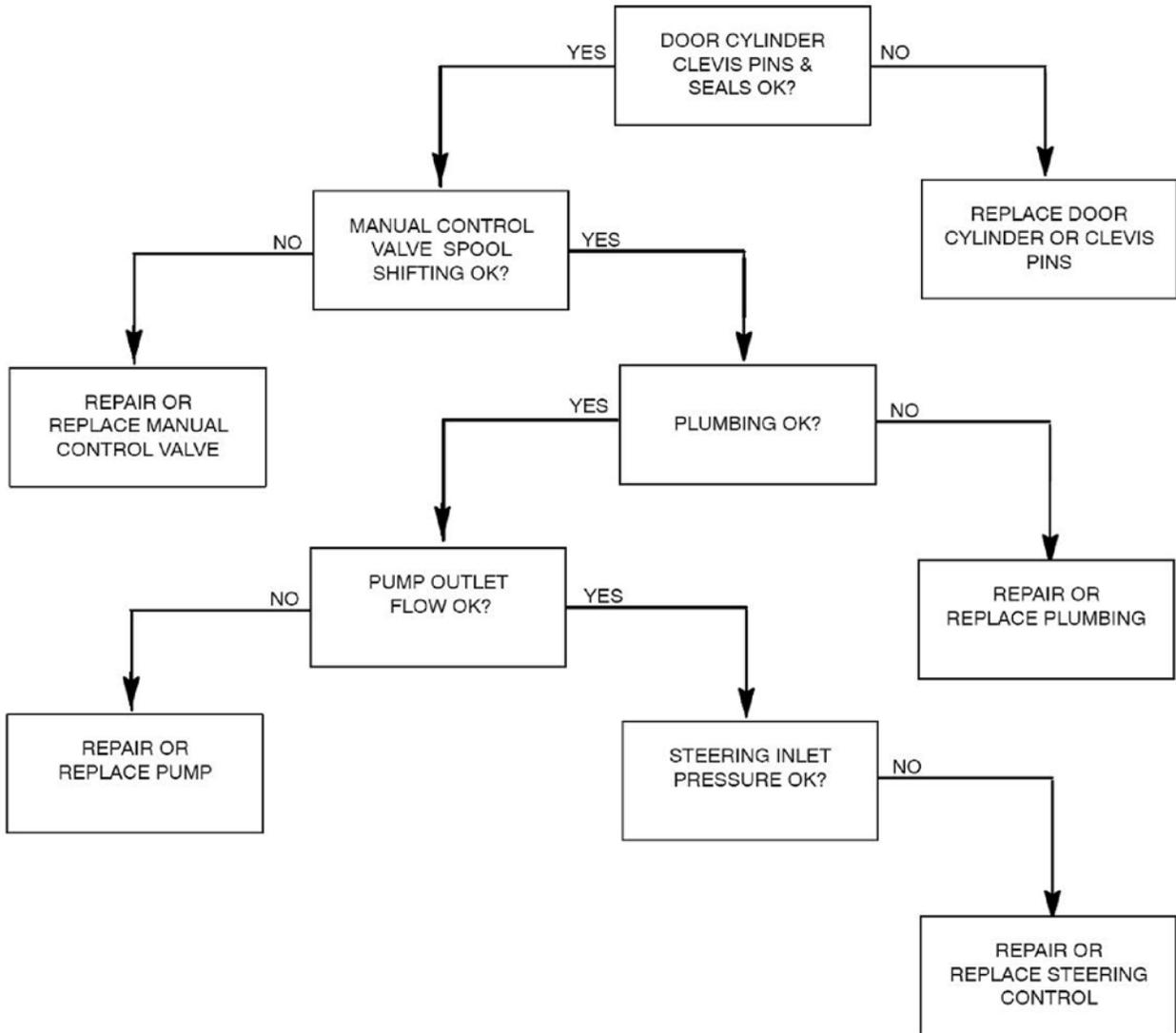
Conditions: Engine Running



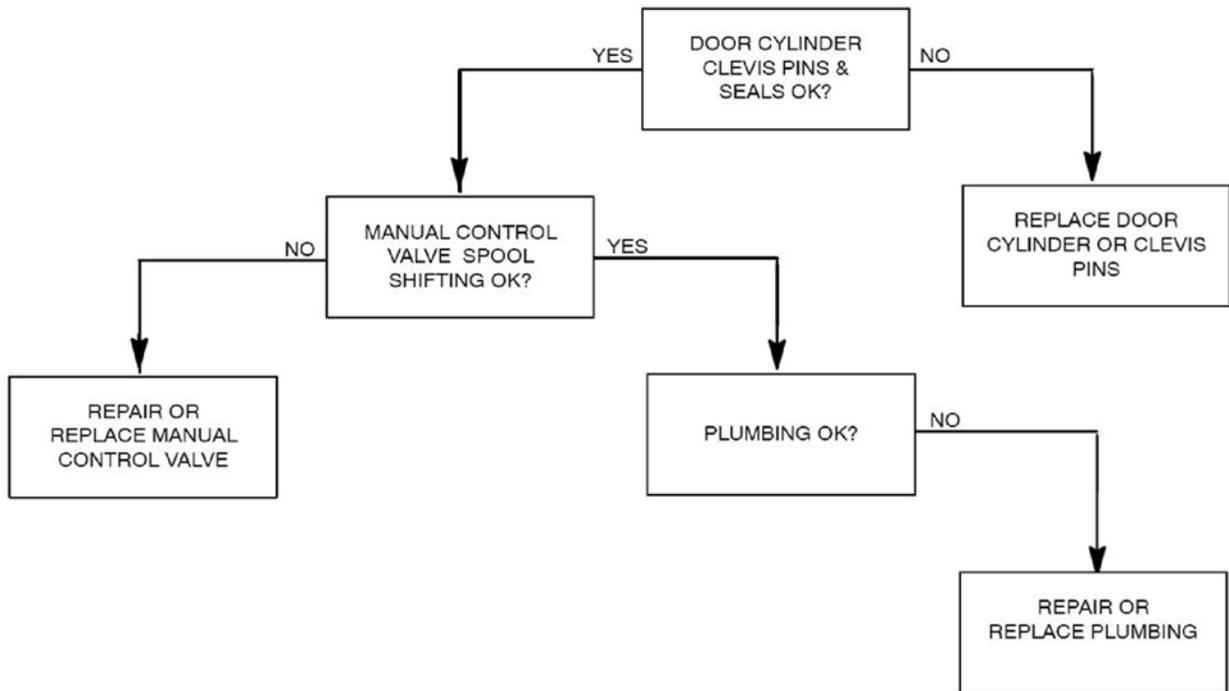
HOPPER DOOR DOES NOT OPEN



HOPPER DOOR DOES NOT CLOSE

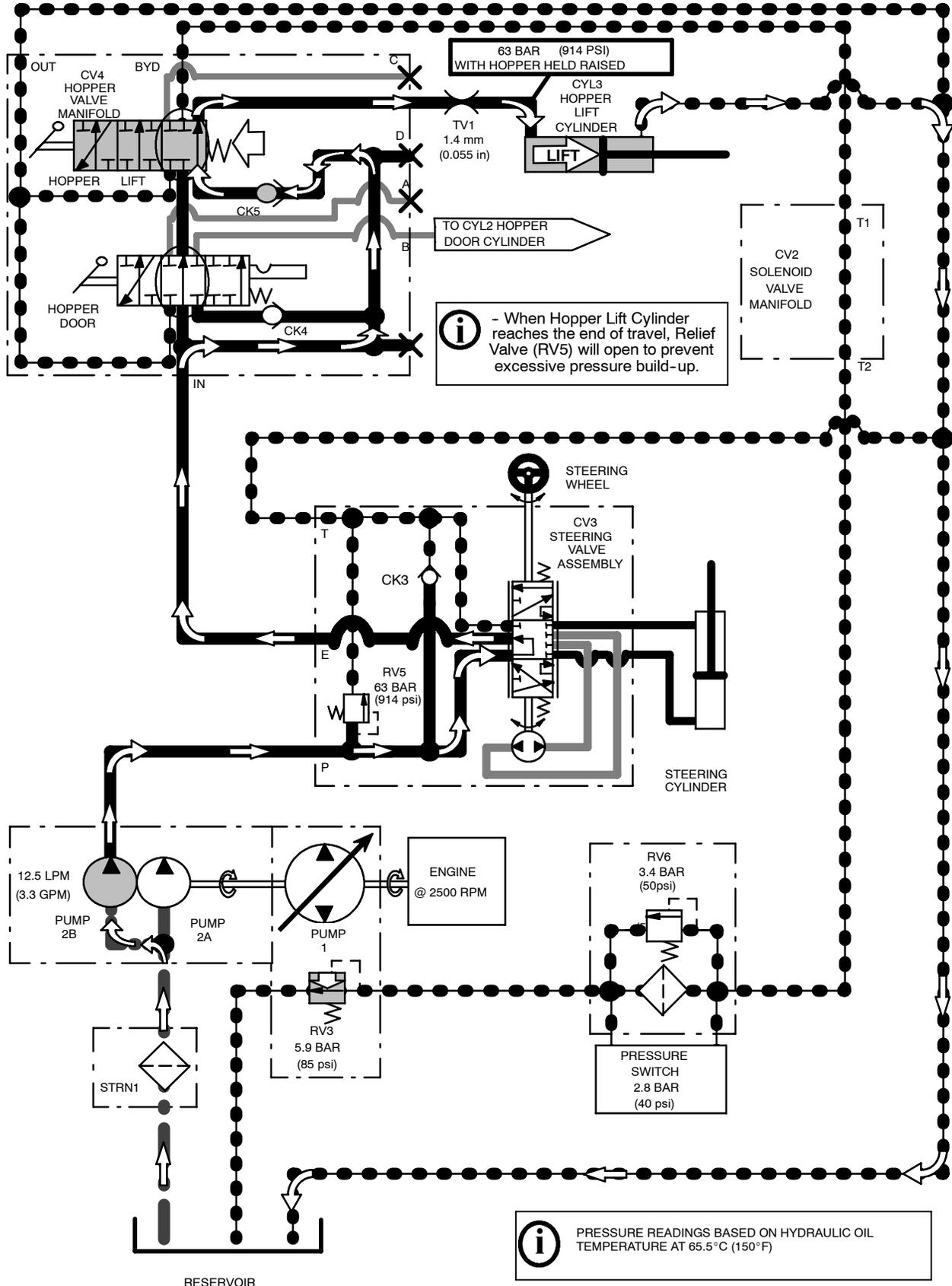


HOPPER DOOR DOES NOT STAY CLOSED

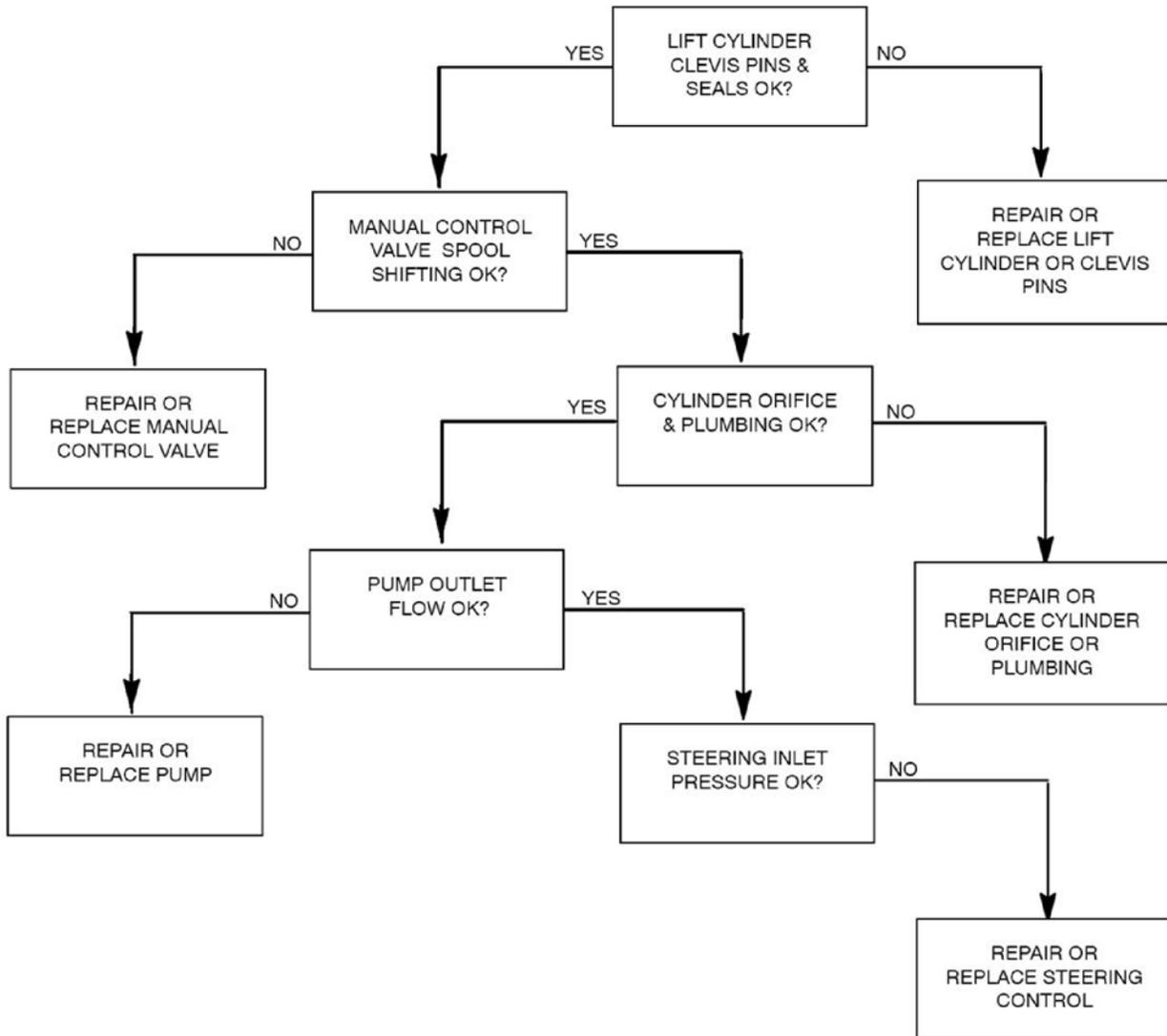


HOPPER LIFT

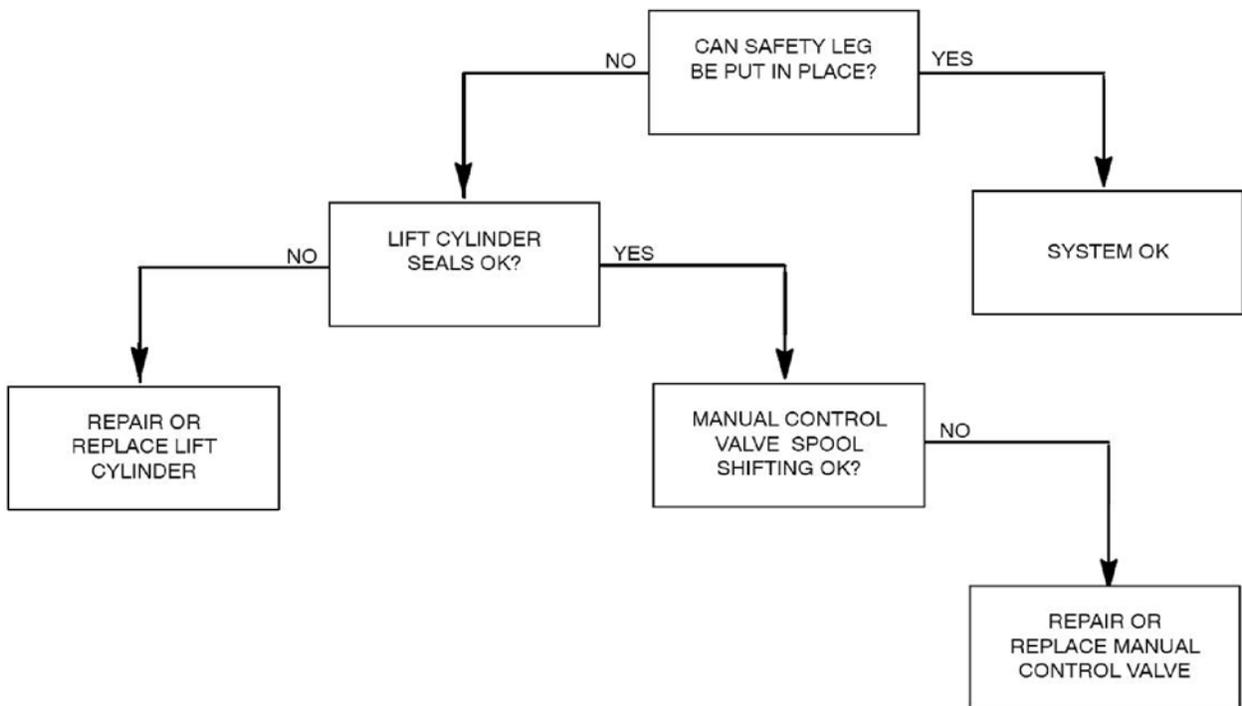
Conditions: Engine Running



HOPPER DOES NOT RAISE

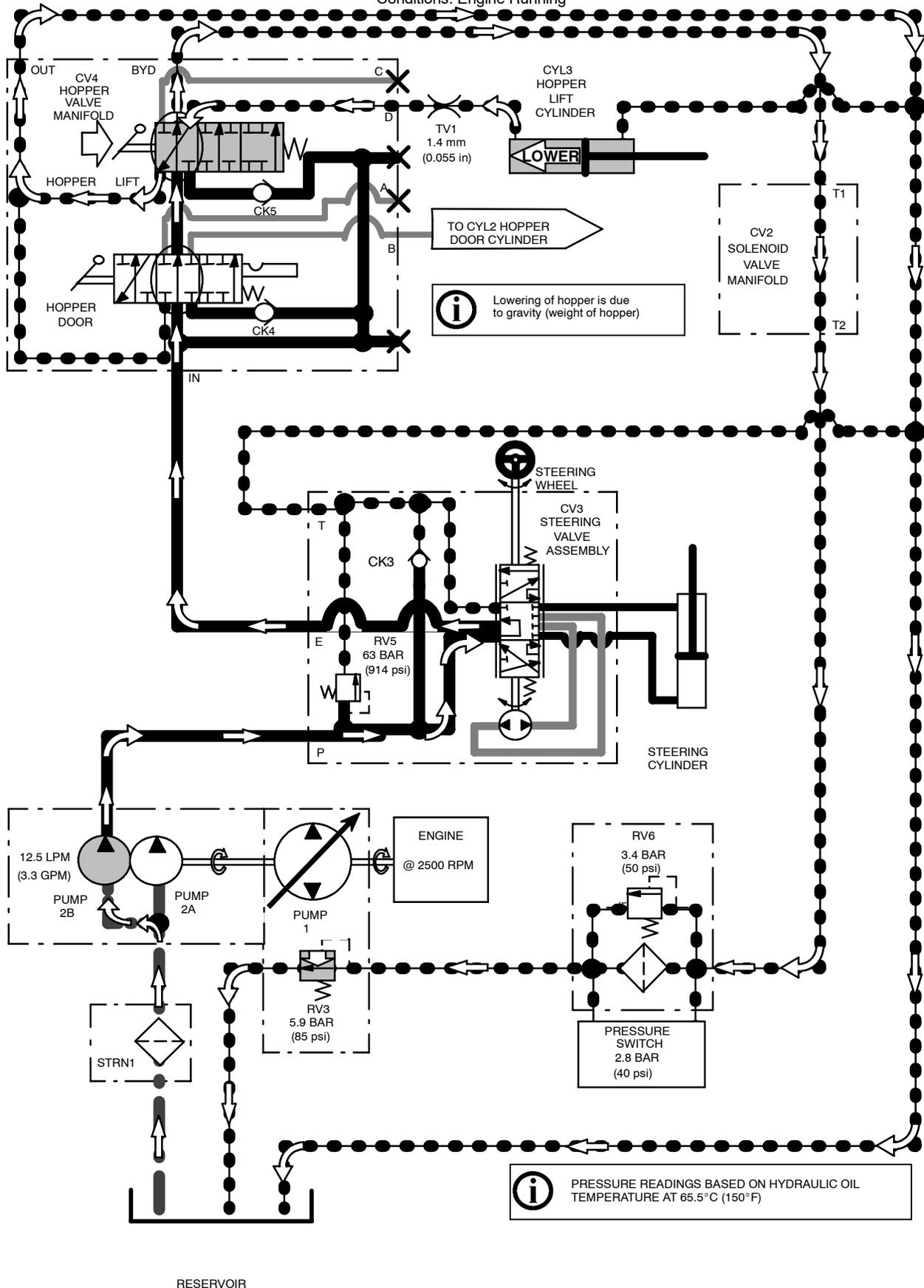


HOPPER DOES NOT STAY IN RAISED POSITION

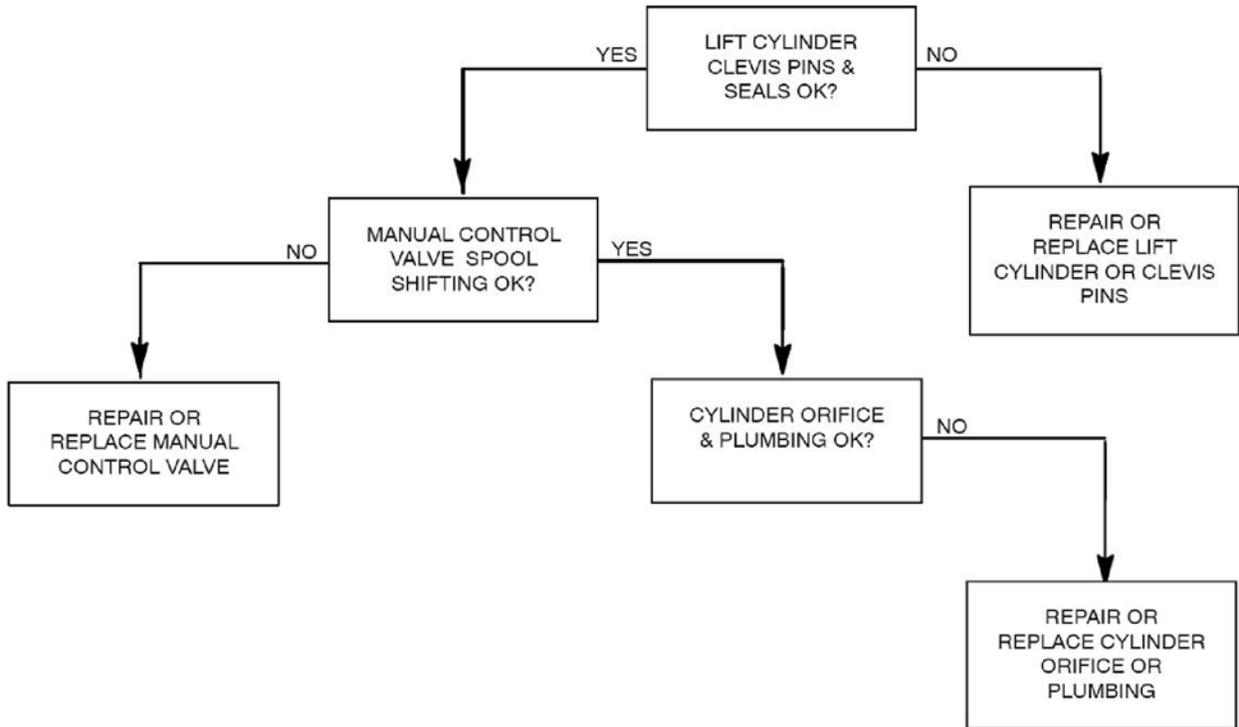


HOPPER LOWER

Conditions: Engine Running

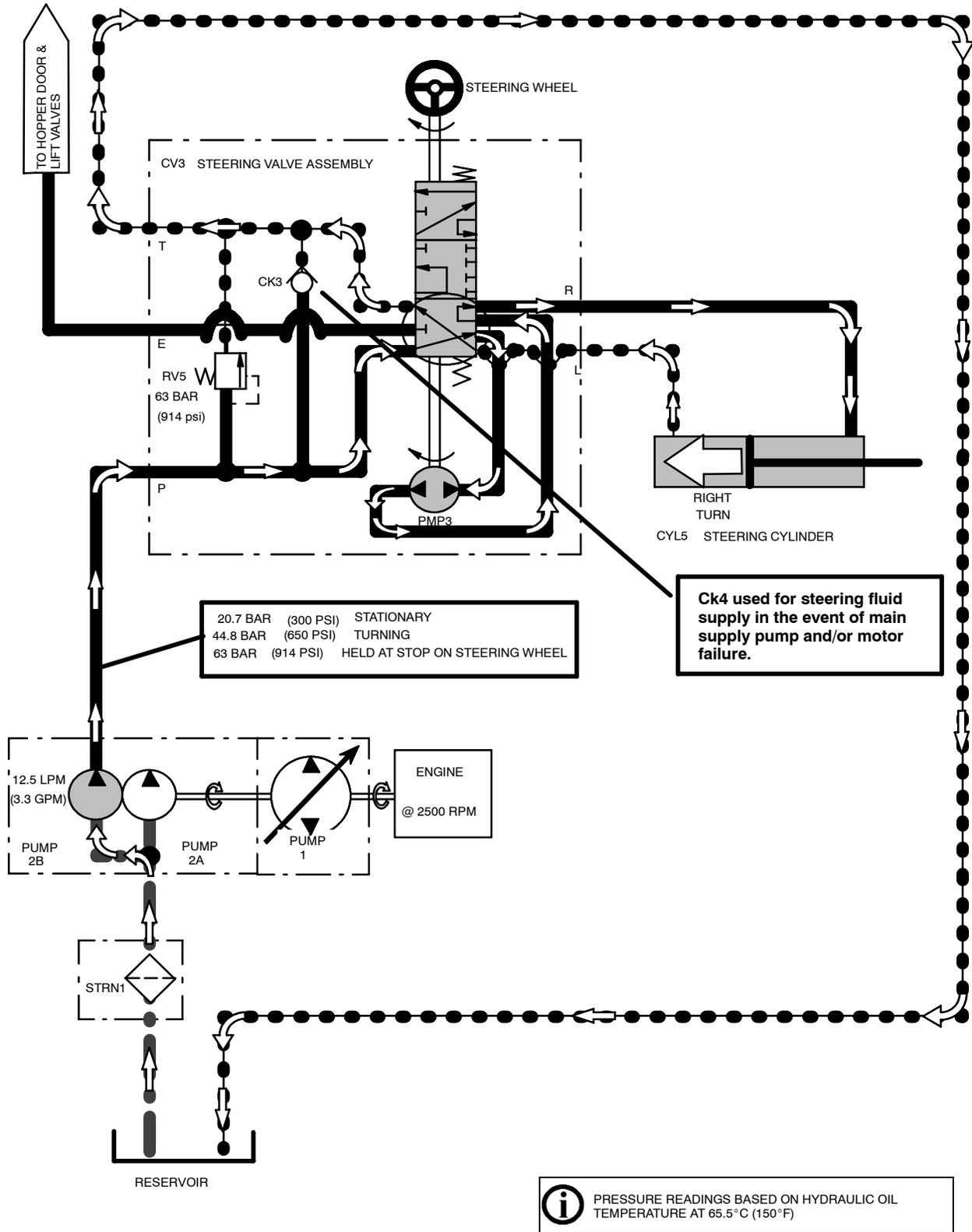


HOPPER DOES NOT LOWER



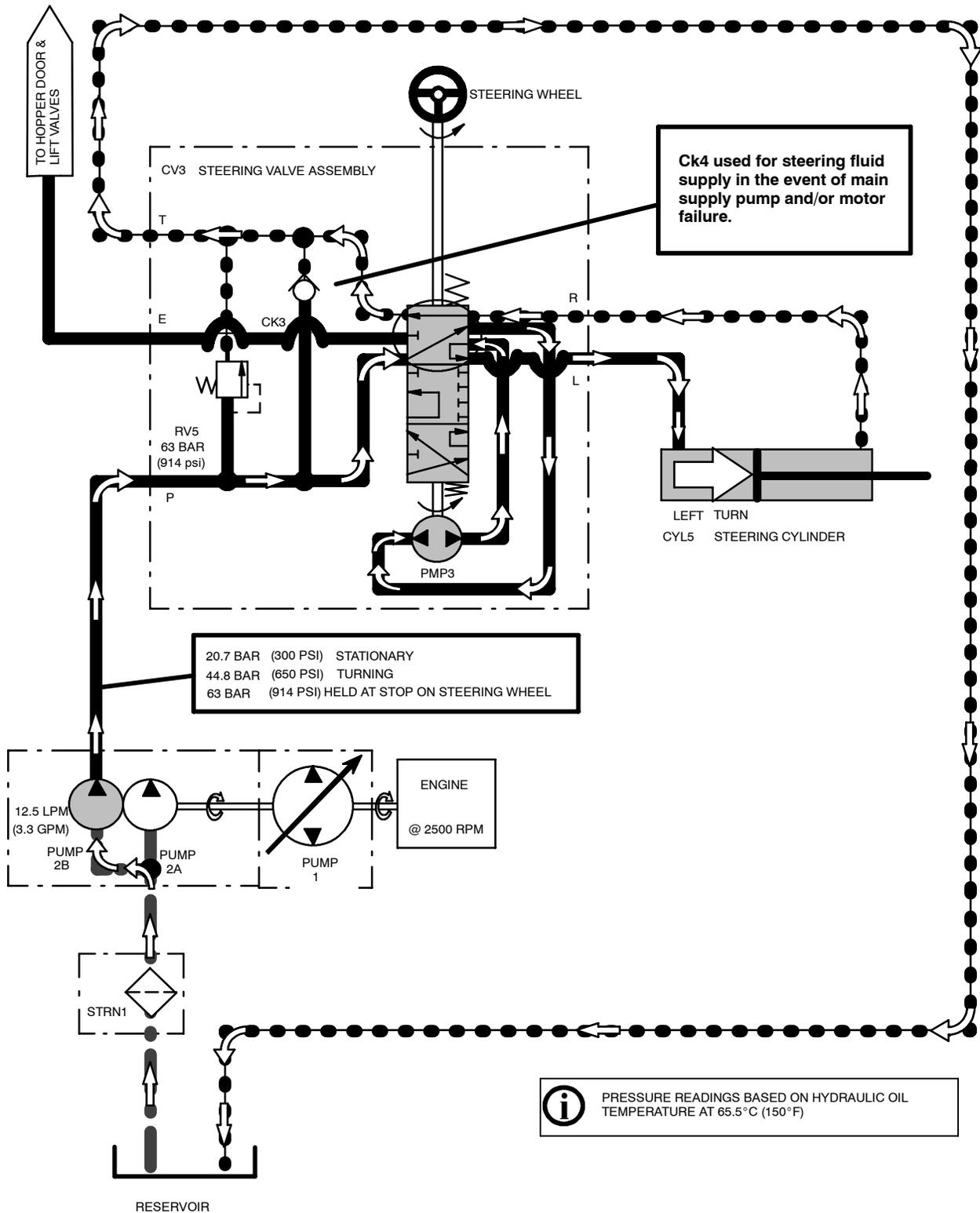
STEERING SYSTEM - RIGHT TURN

Conditions: Engine Running

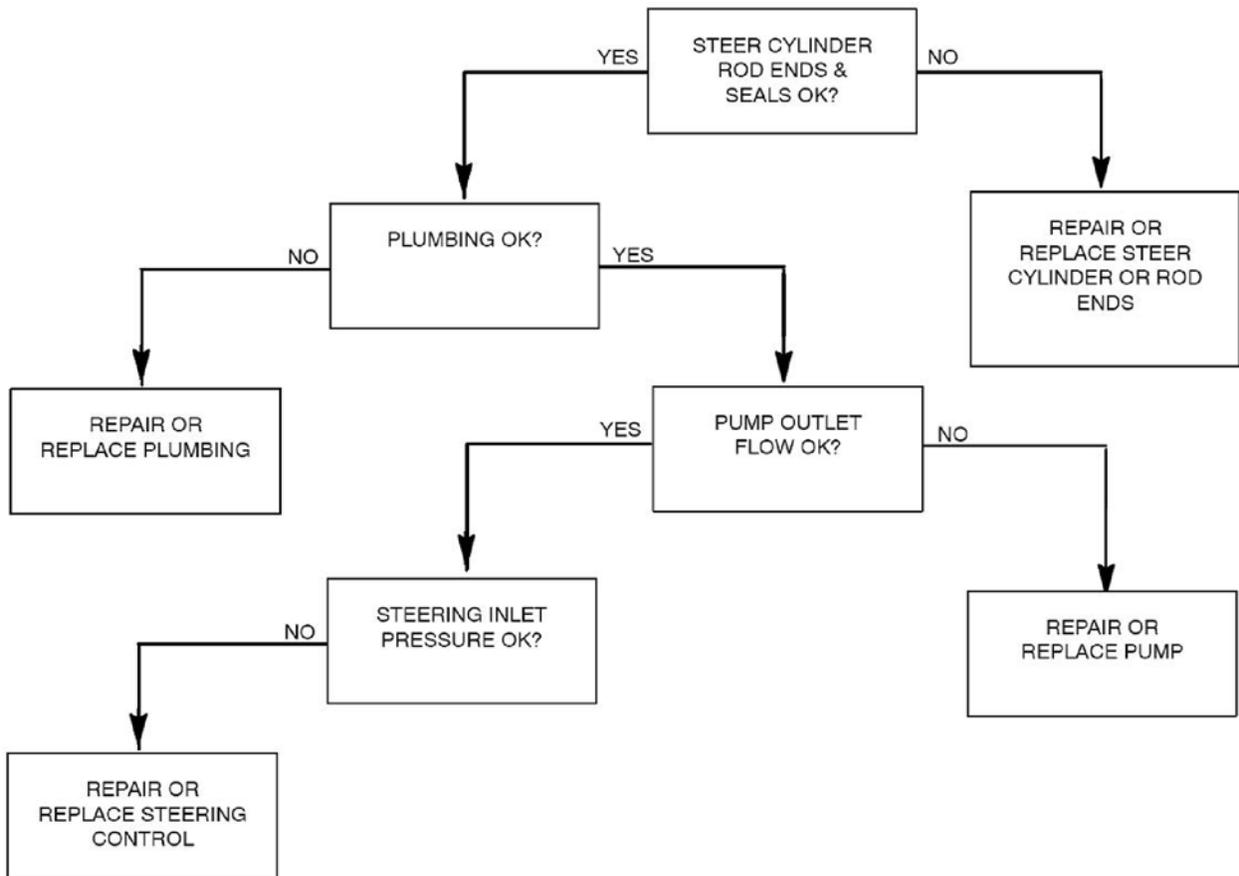


STEERING SYSTEM - LEFT TURN

Conditions: Engine Running

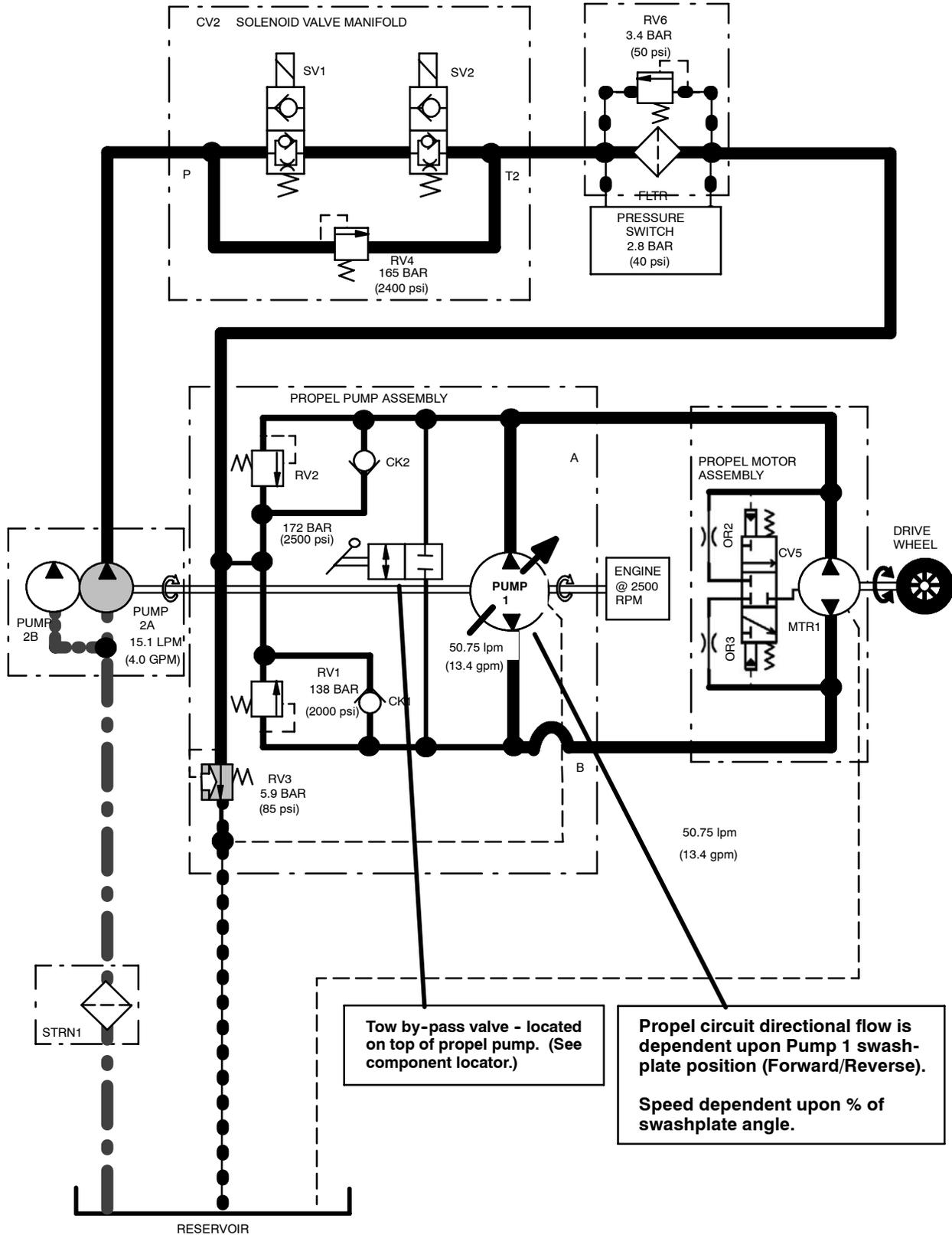


STEERING SYSTEM NOT WORKING PROPERLY



PROPEL SYSTEM

Conditions: Engine Running



Tow by-pass valve - located on top of propel pump. (See component locator.)

Propel circuit directional flow is dependent upon Pump 1 swashplate position (Forward/Reverse).
Speed dependent upon % of swashplate angle.

i PRESSURE READINGS BASED ON HYDRAULIC OIL TEMPERATURE AT 65.5°C (150°F)