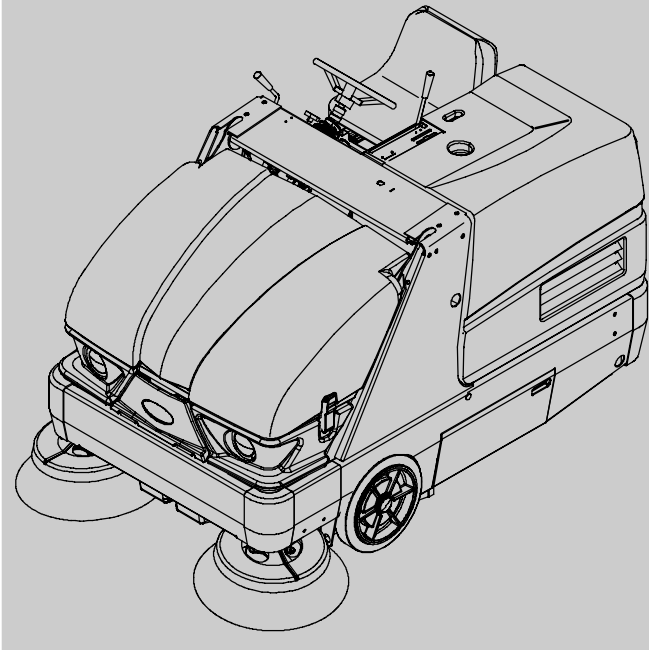




S20

(Electric)



Sweeper Service Information Manual



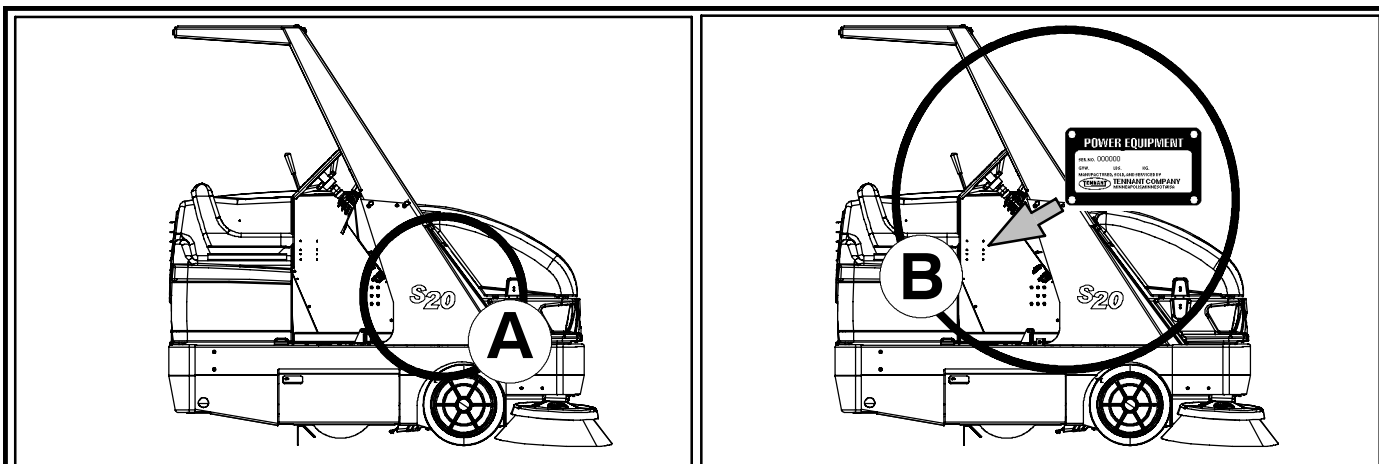
SweepSmart™ System
ShakeMax™ 360

North America / International

www.tennantco.com

9006709
Rev. 00 (11-2009)





Ref	Part No.	Serial Number	Description	Qty.
1	82681	(000000-)	Bracket W/dt, 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.

Read this manual completely and understand the machine before operating or servicing it.


This machine will provide excellent service. However, the best results will be obtained at minimum costs if:

- The machine is operated with reasonable care.
- The machine is maintained regularly - per the machine maintenance instructions provided.
- The machine is maintained with manufacturer supplied or equivalent parts.



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.

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 - _____

Tennant Company

PO Box 1452

Minneapolis, MN 55440

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

www.tennantco.com

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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:** Batteries emit hydrogen gas. Explosion or fire can result. Keep sparks and open flame away. Keep covers open when charging.

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

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

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

 **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:**
 - 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.

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.**
 - **Use cardboard to locate leaking hydraulic fluid under pressure.**
 - **Use Tennant supplied or approved replacement parts.**

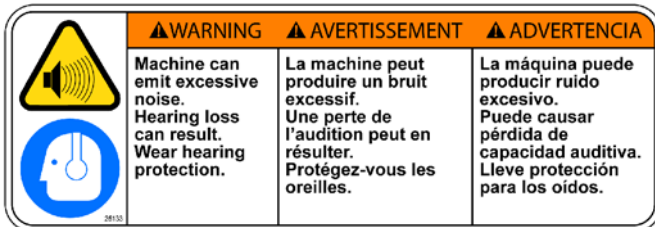
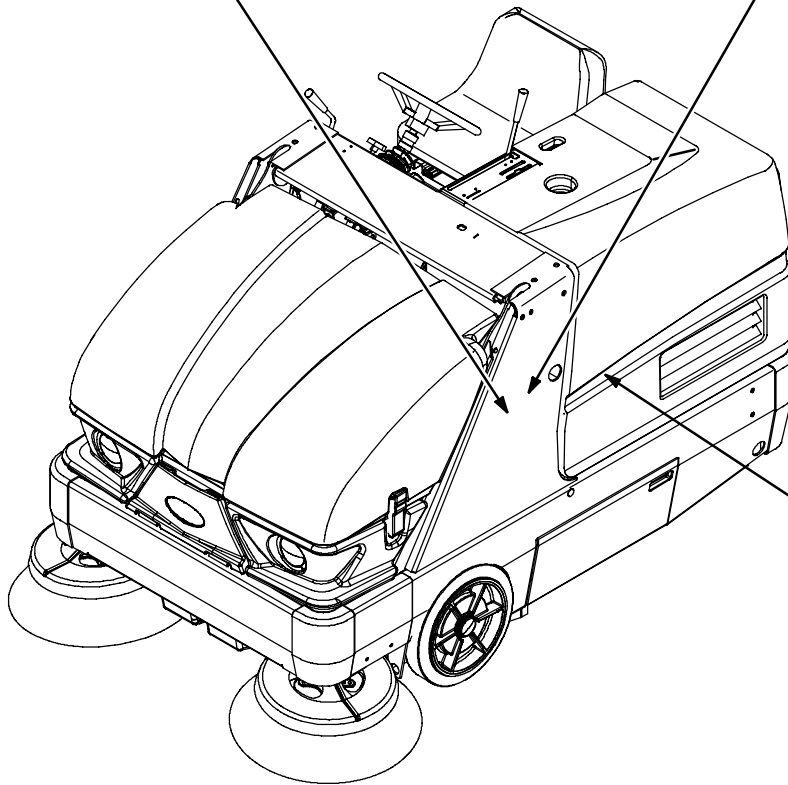
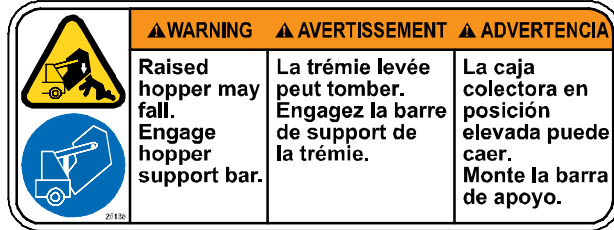
7. **When loading/unloading machine onto/off truck or trailer:**
 - **Turn off machine.**
 - **Use truck or trailer that will support the weight of the machine.**
 - **Use winch. Do not drive the machine onto/off the truck or trailer unless the load height is 380 mm (15 in) or less from the ground.**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

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



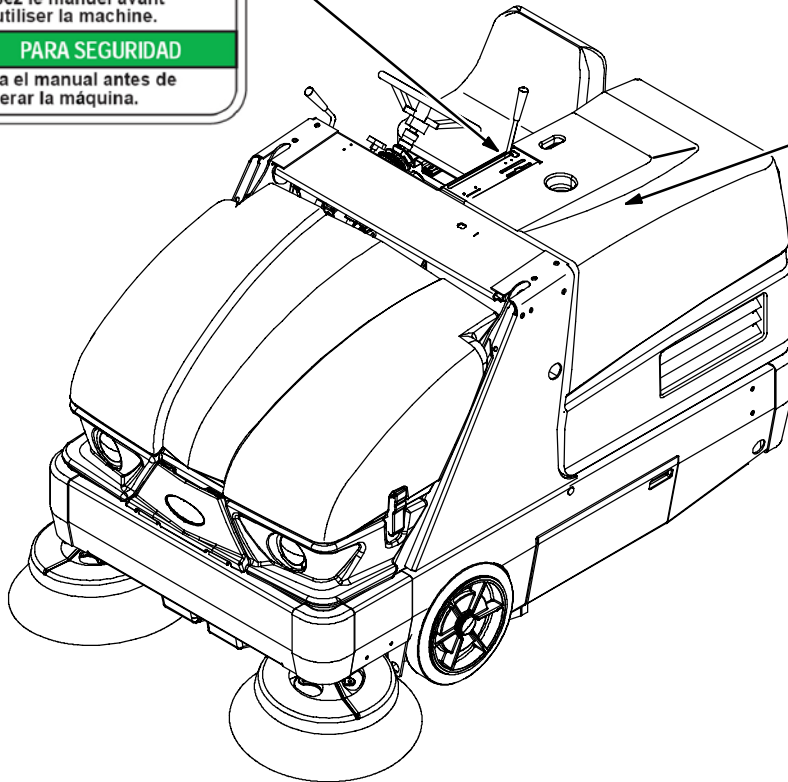
RAISED HOPPER LABEL - Located on the hopper support bar.



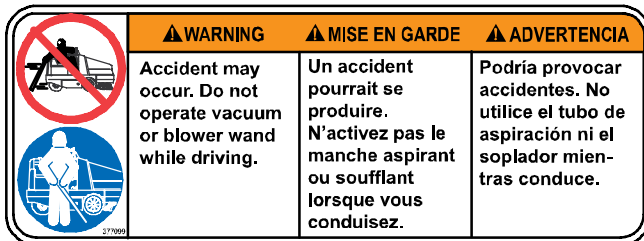
HEARING PROTECTION LABEL - Located only on machines with cab option.

FAN AND BELT LABEL - Located on belt guard.

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



BATTERY CHARGING LABEL - Located on back of main electrical panel.



VACUUM WAND LABEL - Located on the optional vacuum wand.

GENERAL

MACHINE

INFORMATION

BEFORE CONDUCTING TESTS:

- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual
- * Always unhook Battery when removing or replacing components

DURING TESTS:

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

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	1395 mm (55 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	295 kg (650 lb)
Hopper volume capacity	310 L (11 ft ³)
Dust filter area	7.4 m ² (80 ft ²)
Minimum ceiling dump height	2490 mm (98 in)
Weight - without batteries	1045 kg (2300 lb)
Weight - with batteries	1350 kg (2975 lb)
GVWR (Gross Vehicle Weight Rating)	2028 kg (4470 lb)
Operating sound level at operator ear	N/A
Vibration level at steering wheel does not exceed	2.5 m/s ²

GENERAL MACHINE PERFORMANCE

Item	Measure
Maximum forward speed	8 km/h (5 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	10° / 17.6%
Maximum rated incline with full hopper	8° / 14.1%

POWER TYPE

Type	Quantity	Volts	Ah Rating	Weight
Batteries	6	6	315 @ hr rate	58 kg (127 lb)
	2	18	340 @ hr rate	245 kg (540 lb)
	2	18	440 @ hr rate	299 kg (660 lb)

Type	Use	VDC	Kw (hp)
Electric Motors	Propelling	36	1.6 (2.1)
	Accessory	36	3 (4)

Type	VDC	A	Hz	Phase	VAC
Chargers	36	50	60	1	240
	36	75	60	1	variable
	36	75	60	3	variable
	36	50	50	1	230
	36	75	50	3	variable
	36	45	50/60	1	variable

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	10.6 L (2.8 gal)	TENNANT part no. 65870
Hydraulic total	12.1 L (3.2 gal)	
Propelling gearbox	2.6 L (2.7 qt)	SAE 90 Gear weight lubricant

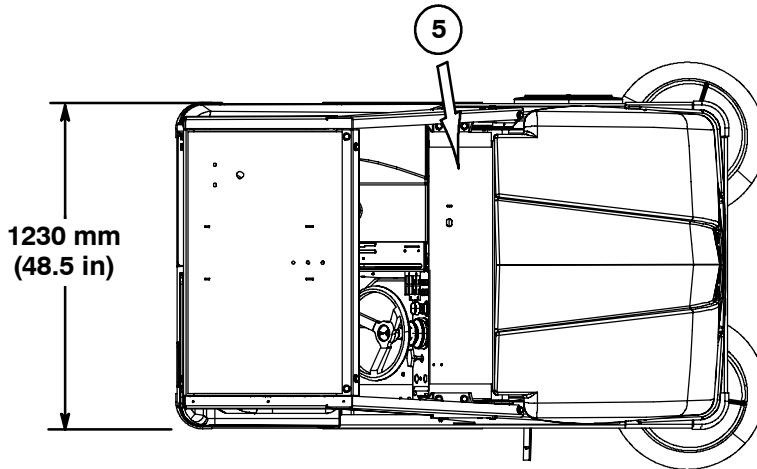
BRAKING SYSTEM

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

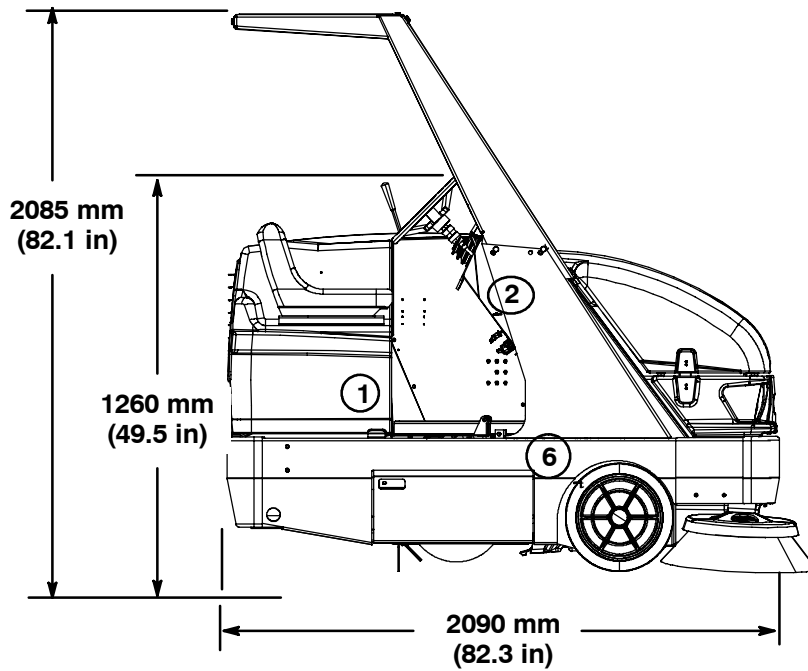
TIRES

Location	Type	Size
Front (2)	Solid	89 x 410 mm (3.5 X 16 in)
Rear (1)	Solid	102 x 410 mm (4 x 16 in)

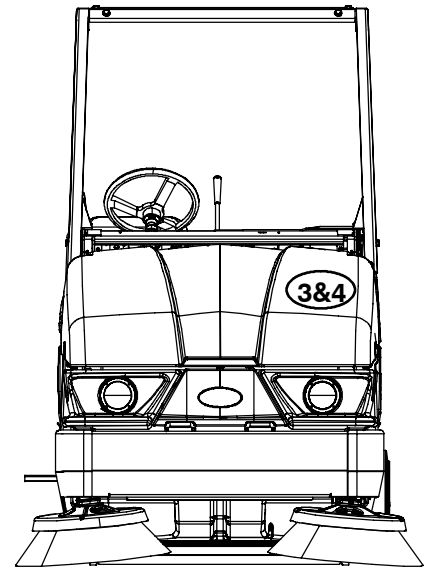
MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

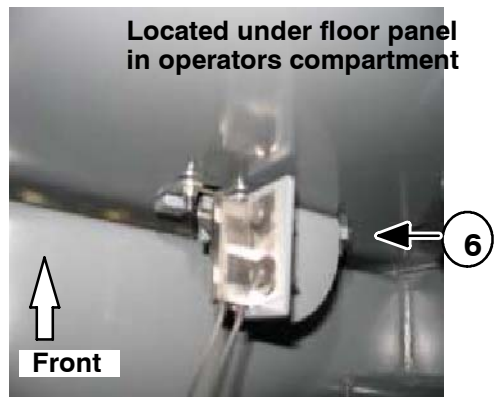
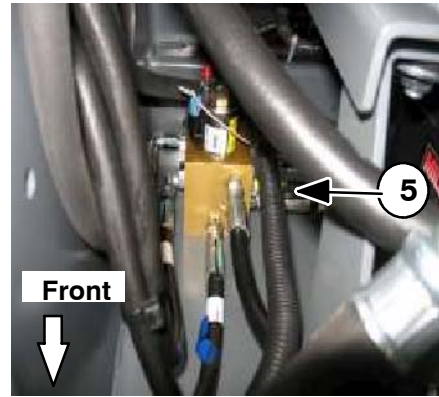
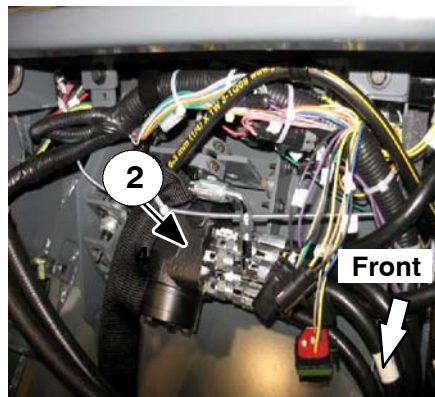
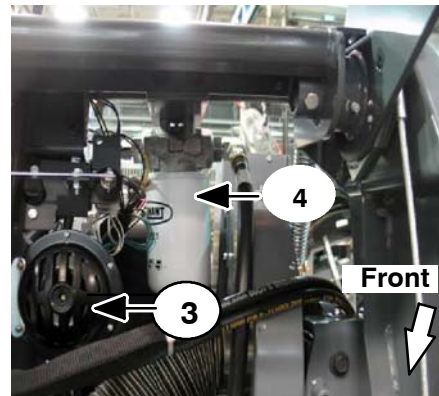
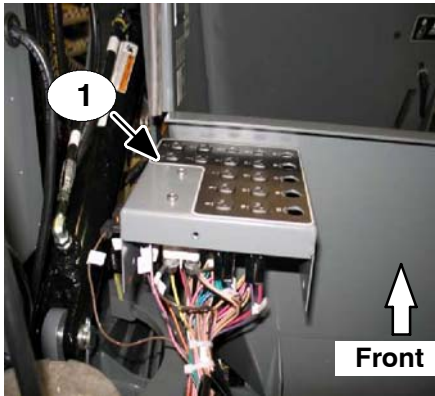


FRONT VIEW

Numbering above refers to component locations shown on next page.

354901

COMPONENT LOCATOR



- 1. Fuse & relay panel
- 2. Steering Valve
- 3. Horn
- 4. Hydraulic filter
- 5. Hydraulic valve
- 6. Brake light switch

SYMBOL DEFINITIONS

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



Filter shaker



Vacuum fan on



Vacuum fan off



Hopper down



Hopper up



Hopper door open



Hopper door close (lever)



Main brush down and on



Main brush up and off



Battery charging system



Clogged dust filter



Thermo-Sentry



Hopper door closed (light)



Hour meter



Steering wheel tilt



Off



On



Start



Horn



Side brush down and on



Side brush up and off



Operating lights



Hazard light



Side brush pressure



Parking brake



Clogged hydraulic filter



Brush pressure (Increase)



Brush pressure (Decrease)



Turn counterclockwise



Turn clockwise



Circuit breaker #1



Circuit breaker #2



Circuit breaker #3



Circuit breaker #4



Circuit breaker #5



Circuit breaker #6



Circuit breaker #7



Circuit breaker #8



Circuit breaker #9



Circuit breaker #10



Circuit breaker #11



Circuit breaker #12



Circuit breaker #13



Circuit breaker #14



Circuit breaker #15



Circuit breaker #16



Circuit breaker #17



Circuit breaker #18



Circuit breaker #19

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 unhook Battery when removing or replacing electrical components

DURING TESTS:

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

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.

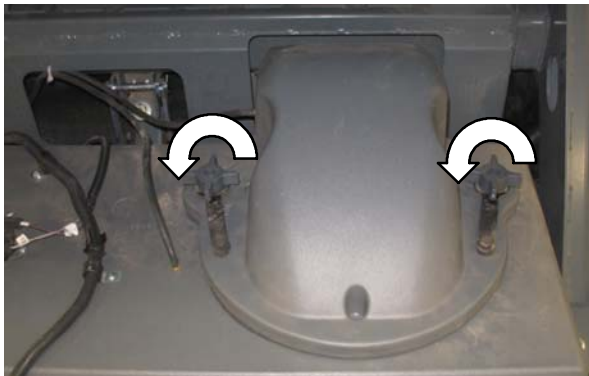
NOTE: Clean the filter more often if used in extremely dusty conditions.

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.



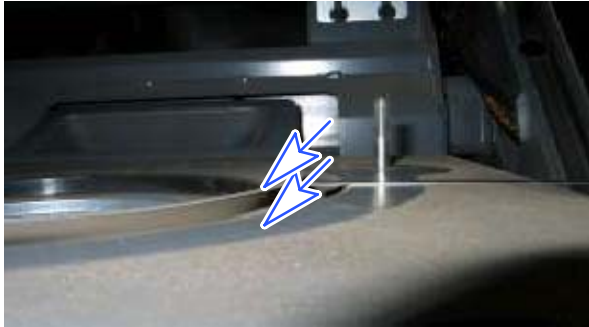
4. Clean or discard the dust filter element. Refer to *CLEANING THE DUST FILTER*.
5. Clean dust and debris from the dust filter tray.



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 7.62 mm (.25") above filter cover mounting base, as shown below. This will allow proper sealing of filter with filter cover installed and seal compressed.



FILTER SEAL HEIGHT ADJUSTMENT

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 as needed.



HYDRAULIC TROUBLESHOOTING INFORMATION

BEFORE CONDUCTING TESTS:

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

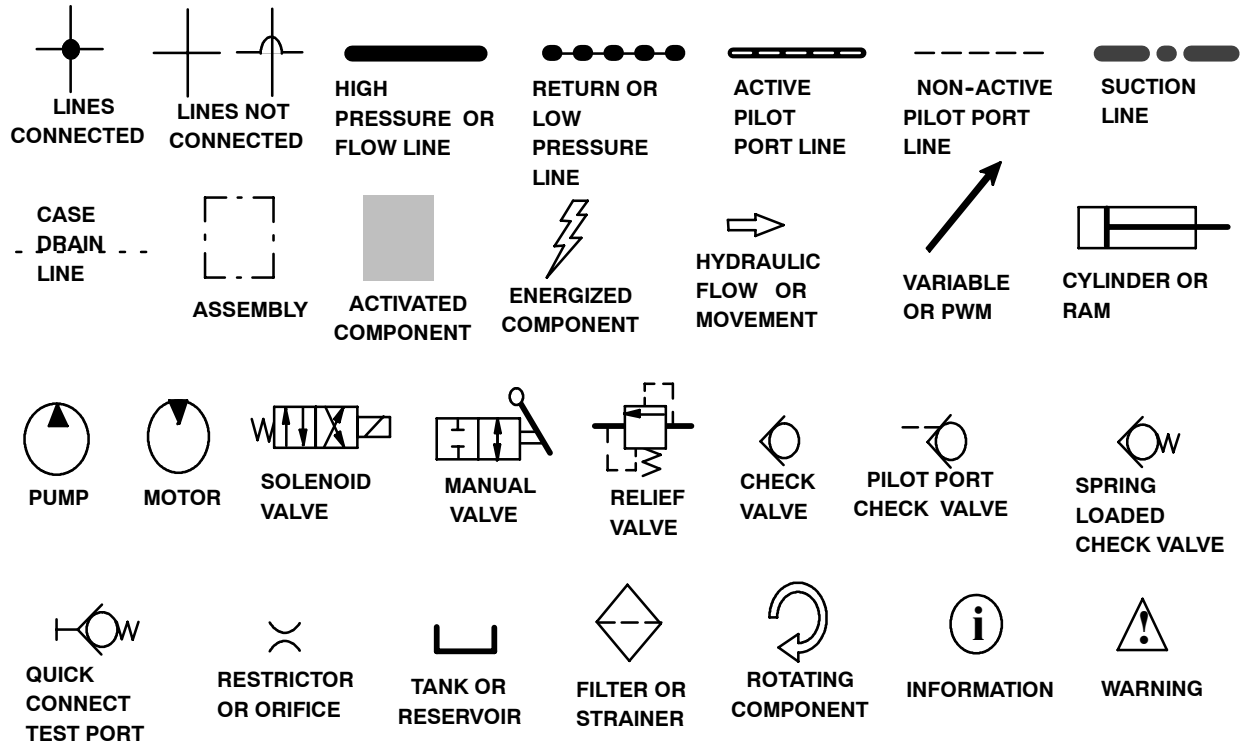
- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action
- * Maintain Normal Main Brush Pressure as Listed in Operator's Manual

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.

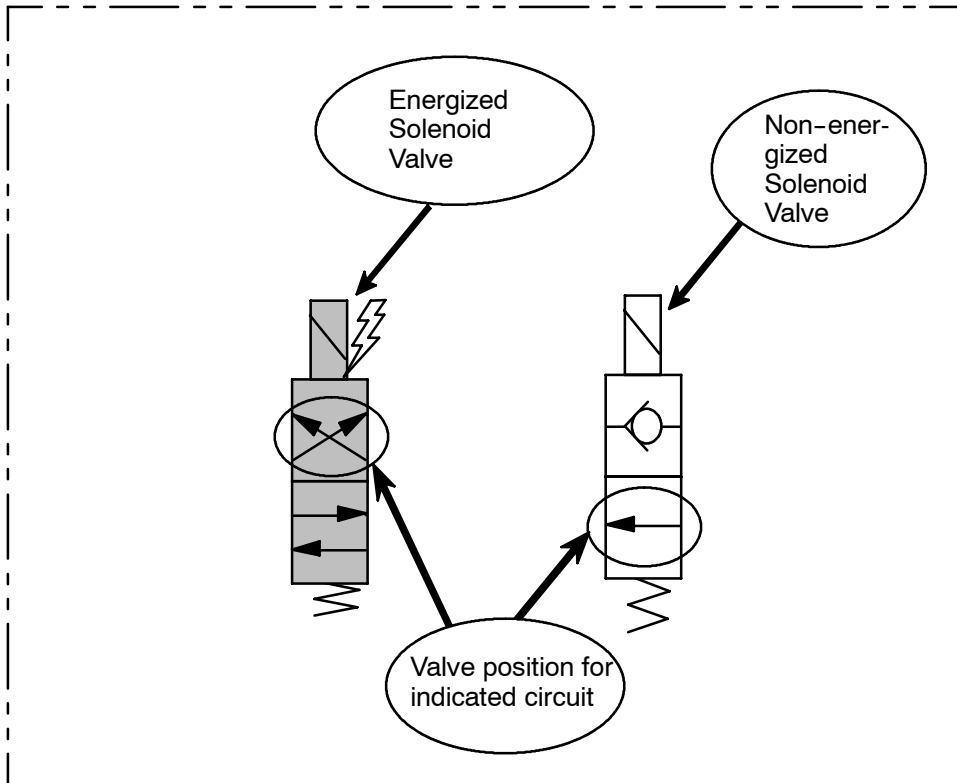
GENERAL INFORMATION

Page 1 of 2

Commonly Used Hydraulic Symbols



EXAMPLES

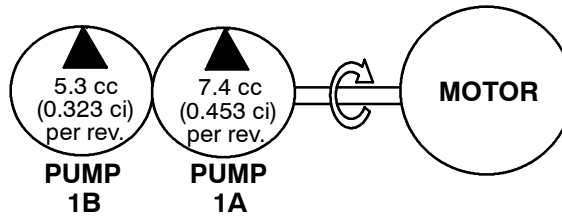


General Information

Page 2 of 2

Hydraulic Pump Flow Rates (typical)

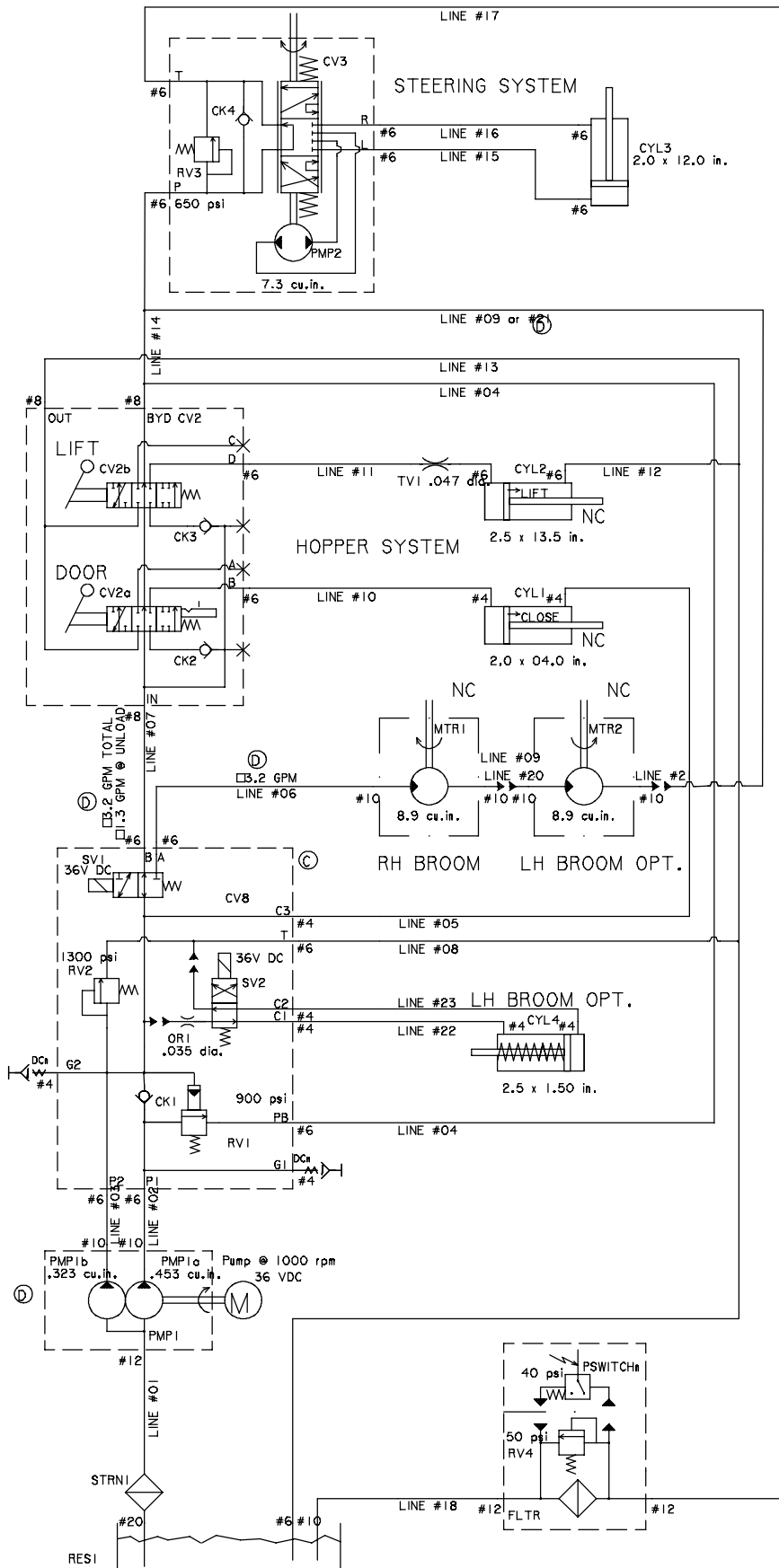
ACCESSORY PUMPS



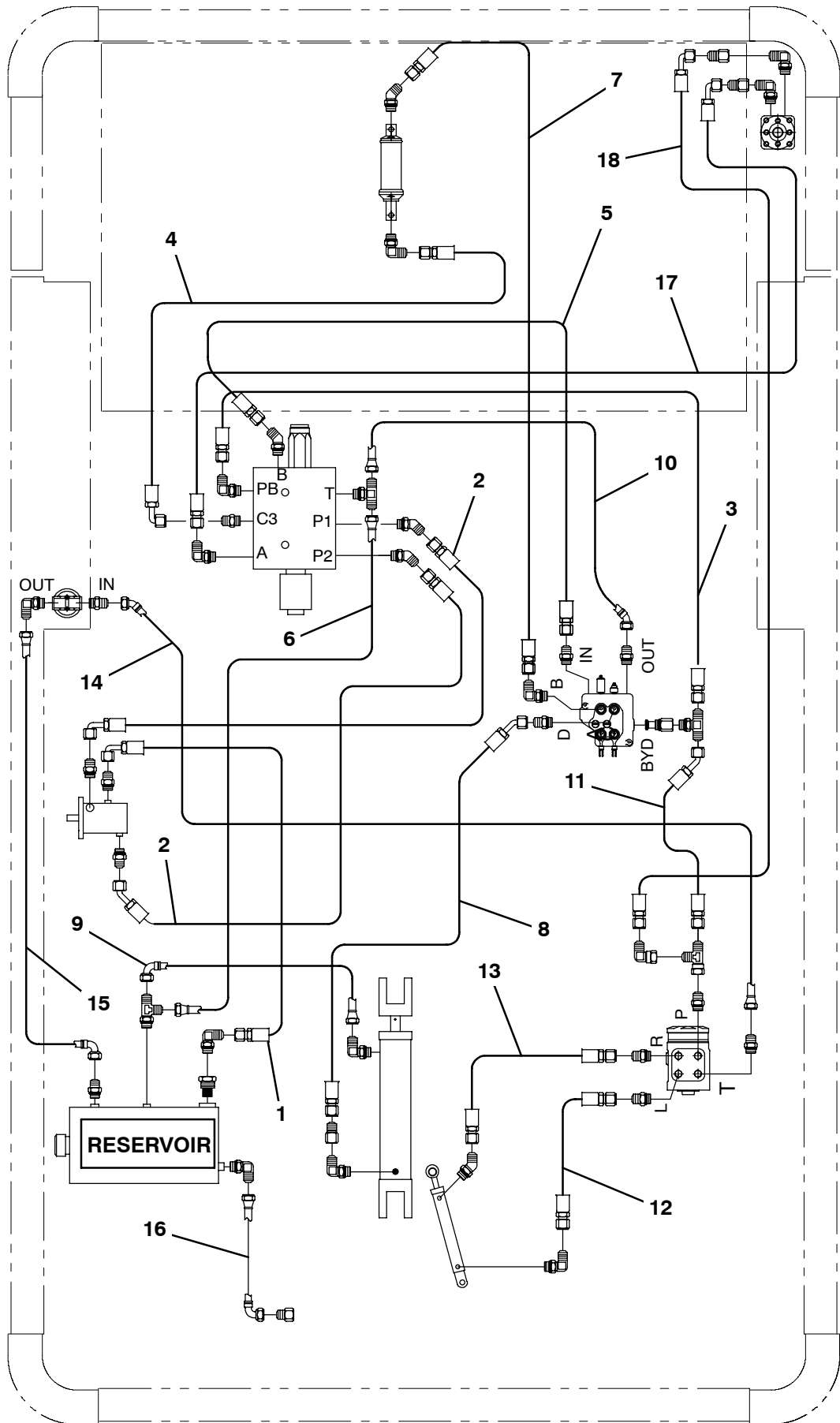
Commonly Used Abbreviations			
AUX	Auxiliary	MFLD	Manifold
CC	Cubic Centimeters	MTR	Motor
CK	Check Valve	OR	Orifice
CM	Centimeters	PC	Pilot Port Check Valve
CU	Cubic	PMP	Pump
CV	Control Valve	PSI	Pounds Per Square Inch
CYL	Cylinder	PSWITCH	Pressure Switch
DC	Direct Current	PWM	Pulse Width Modulation
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

HYDRAULIC SCHEMATIC

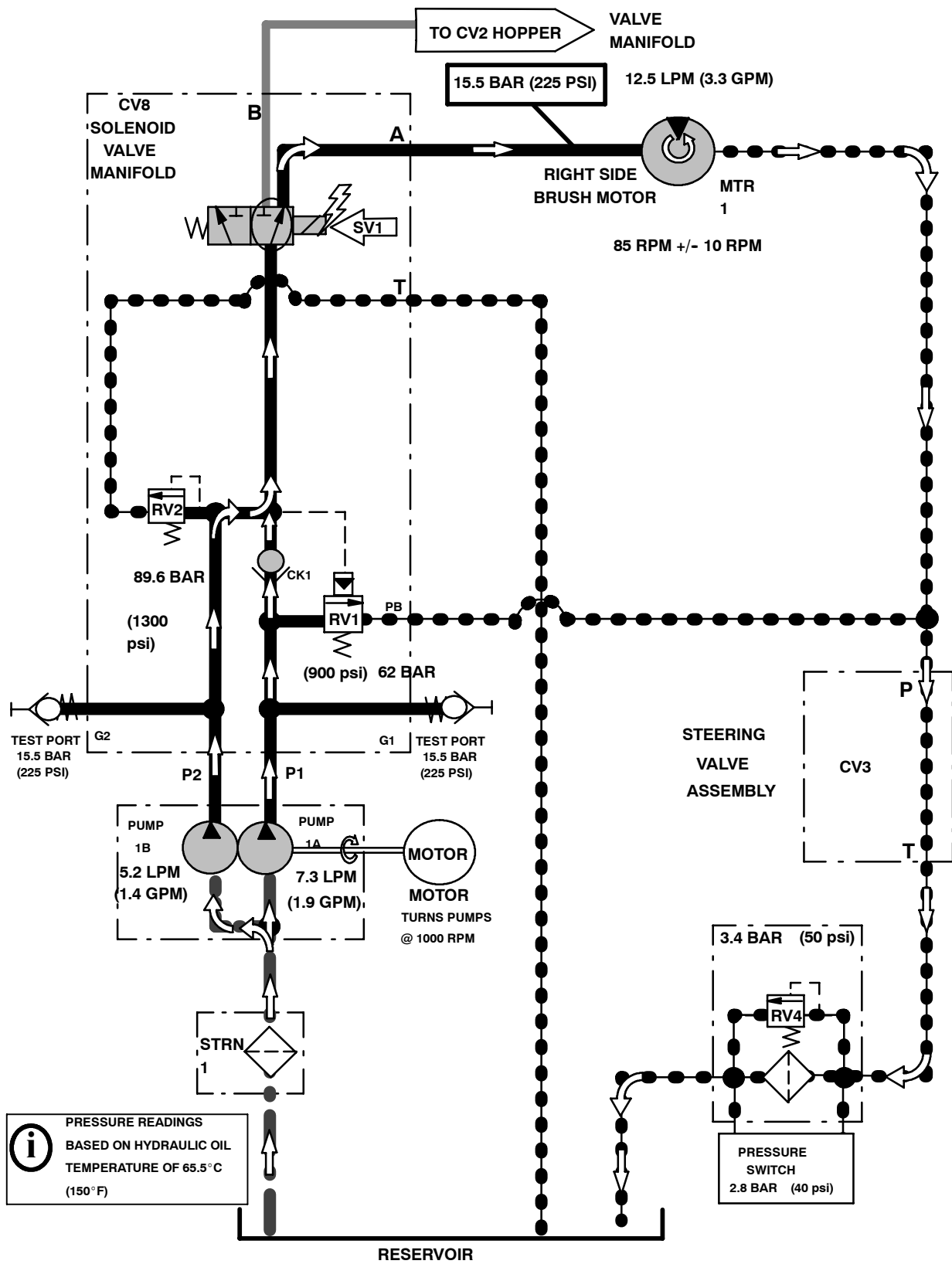


OVERALL HYDRAULIC HOSE DIAGRAM



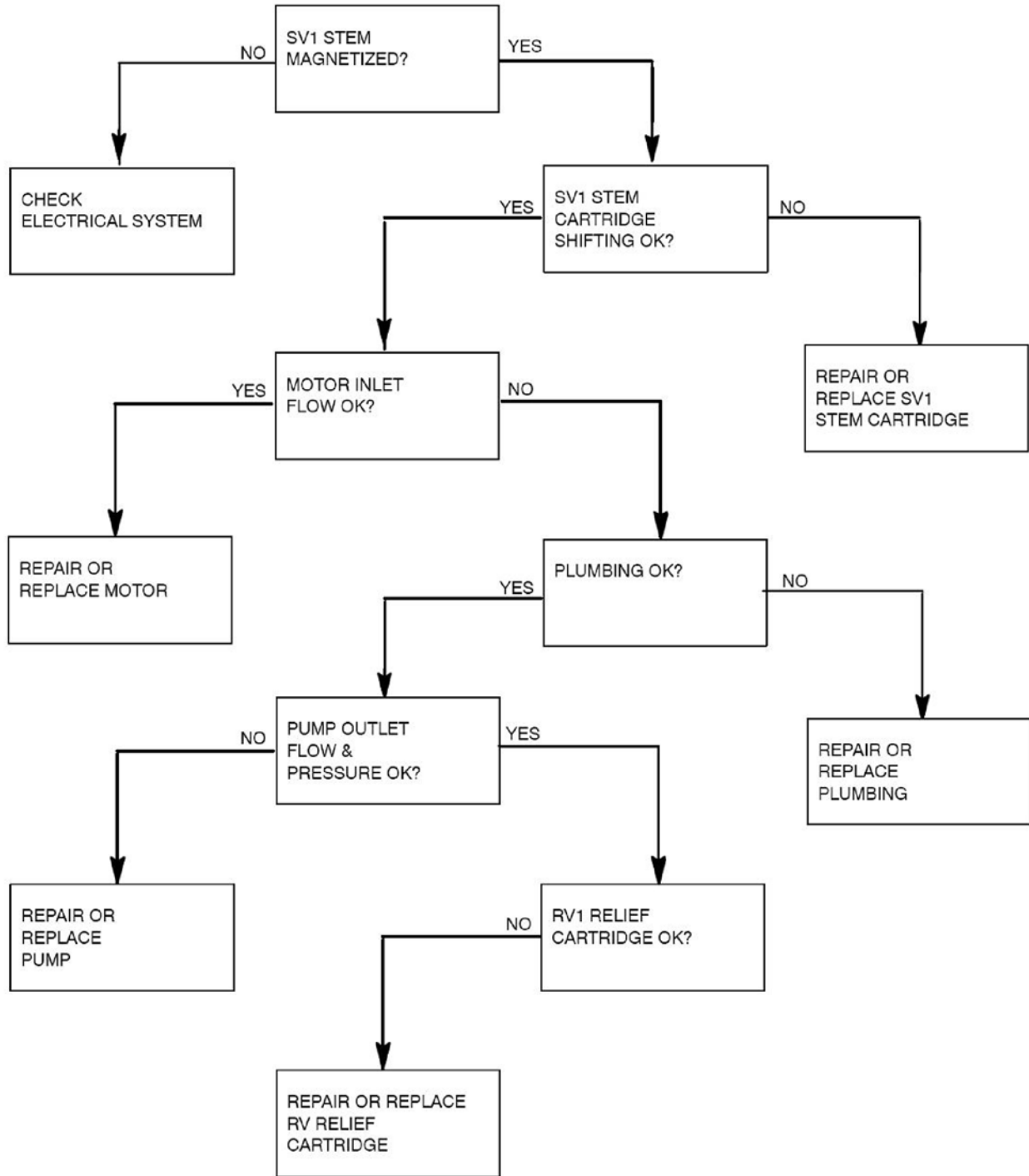
SIDE BRUSH ON (STANDARD)

Conditions: Key ON, Side Brush Lowered

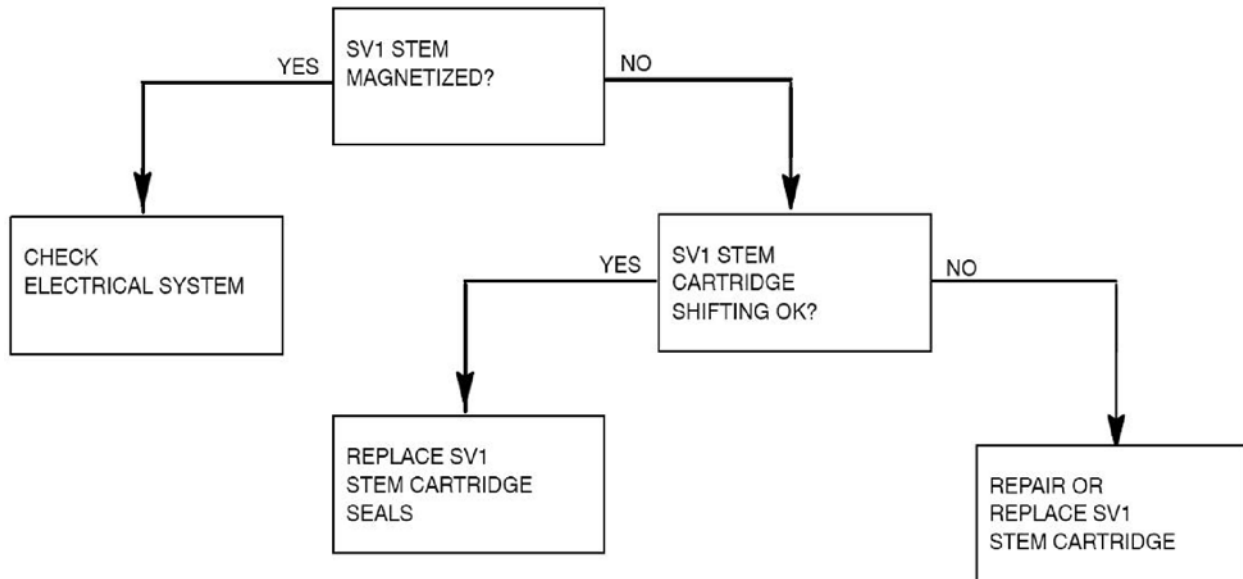


i PRESSURE READINGS
BASED ON HYDRAULIC OIL
TEMPERATURE OF 65.5°C
(150°F)

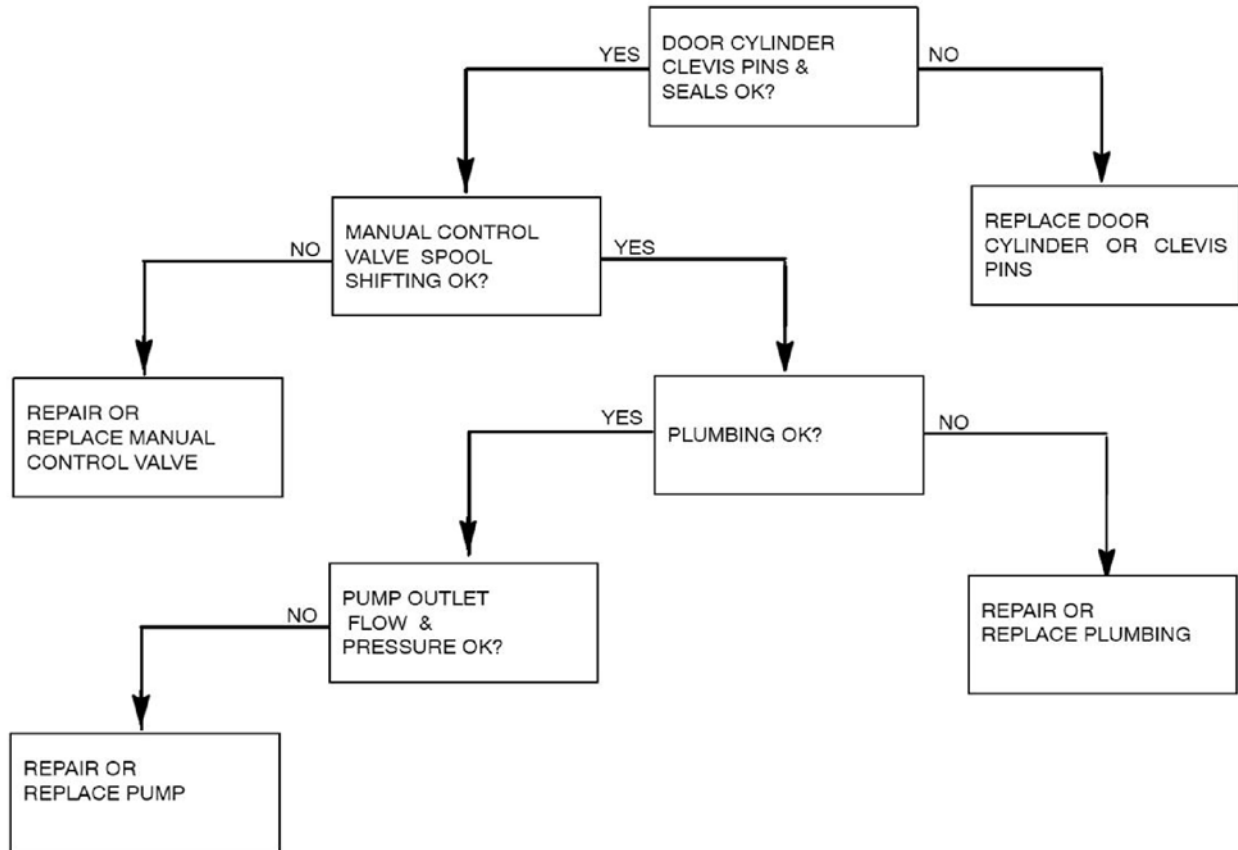
SIDE BRUSH(ES) DOES NOT TURN ON



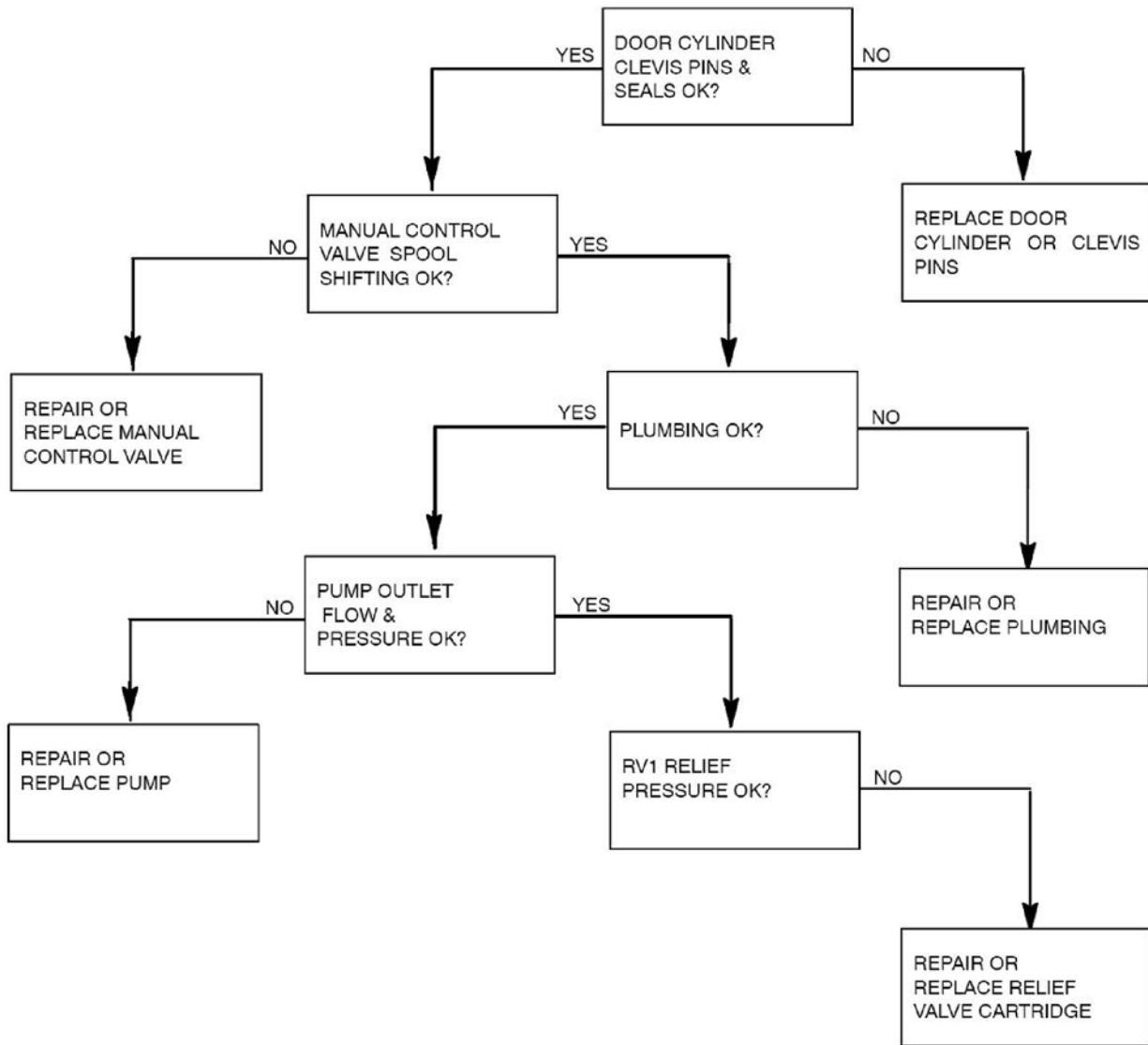
SIDE BRUSH(ES) DOES NOT TURN OFF



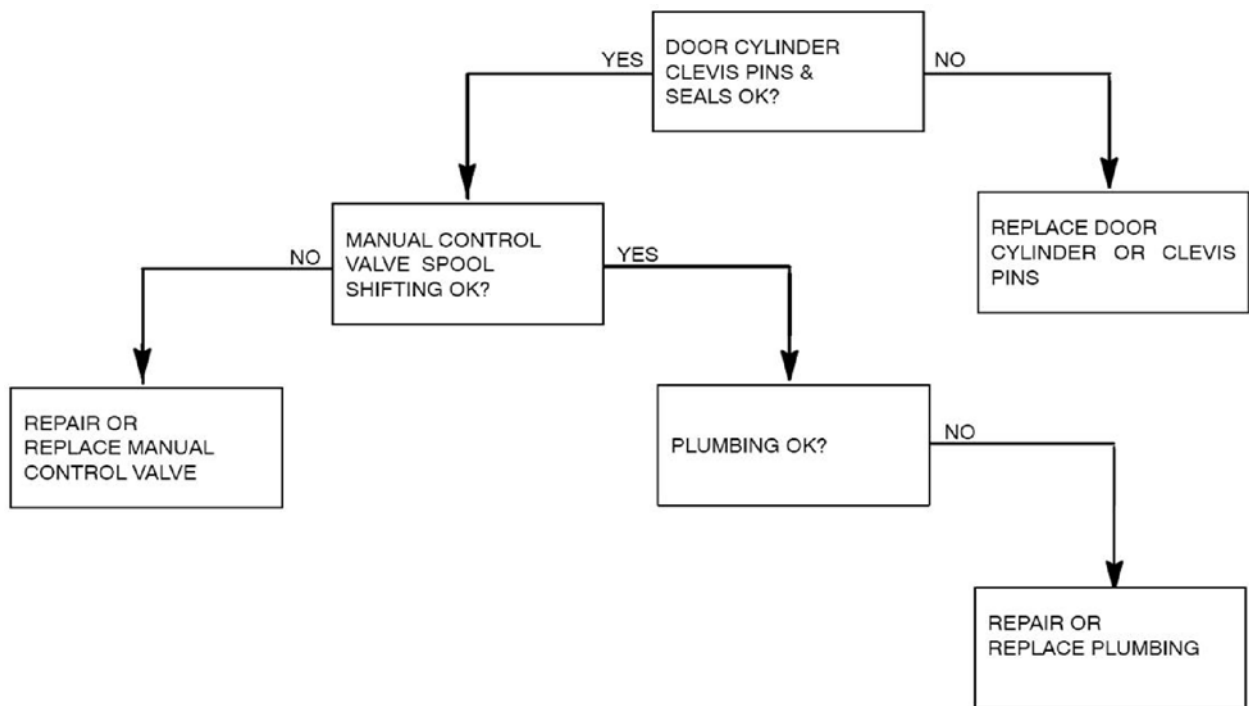
HOPPER DOES NOT OPEN



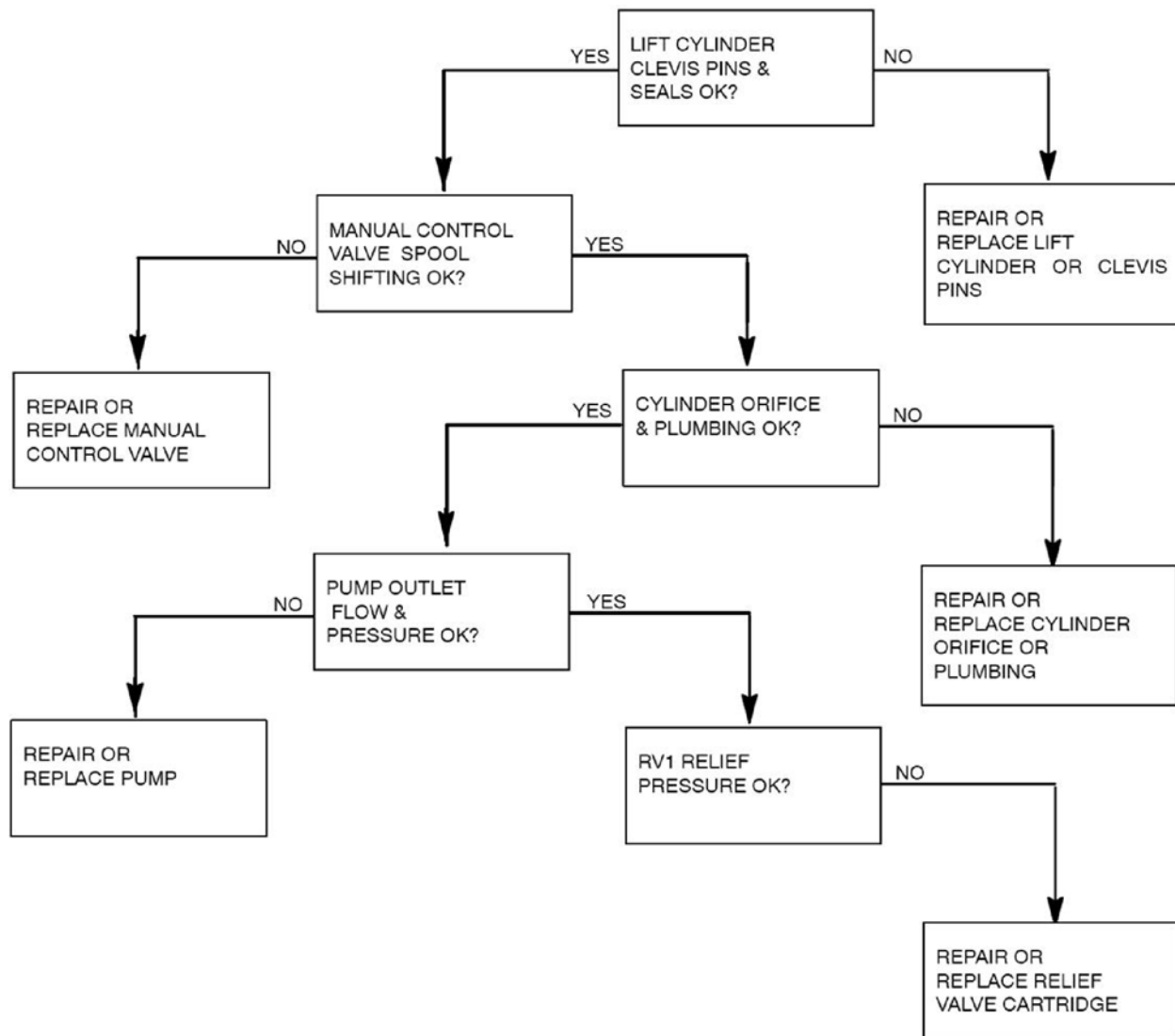
HOPPER DOOR DOES NOT CLOSE



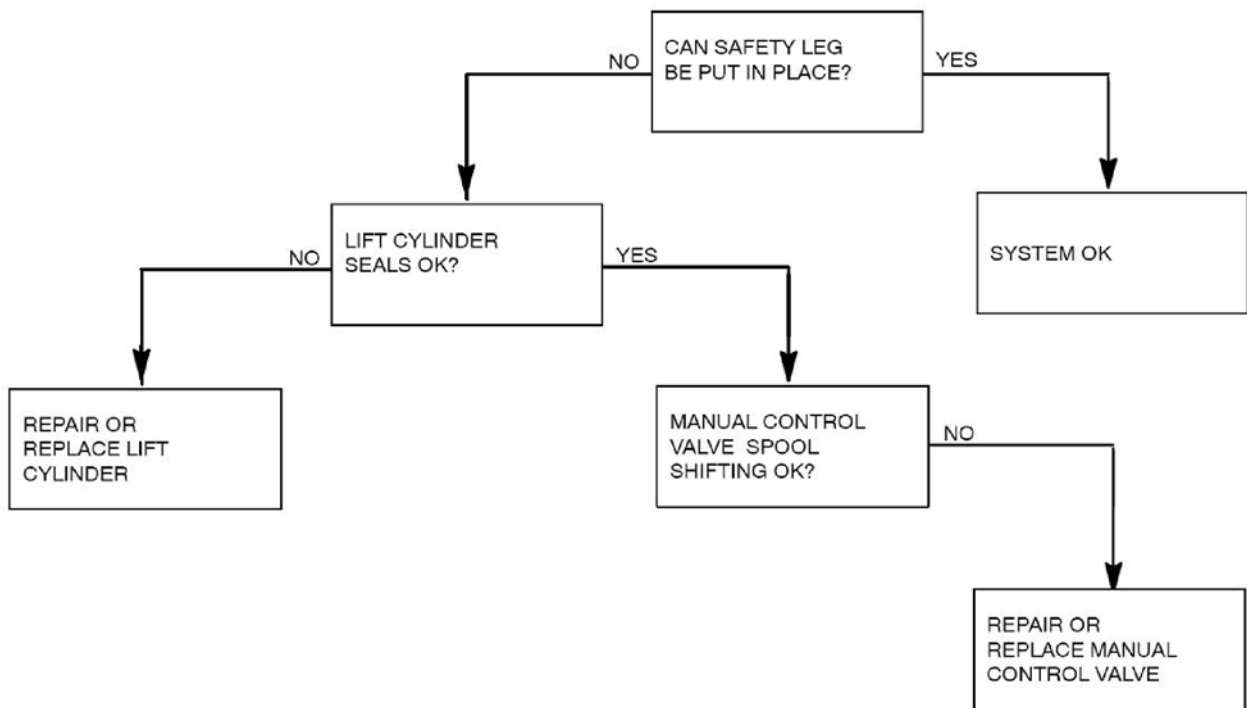
HOPPER DOOR DOES NOT STAY CLOSED



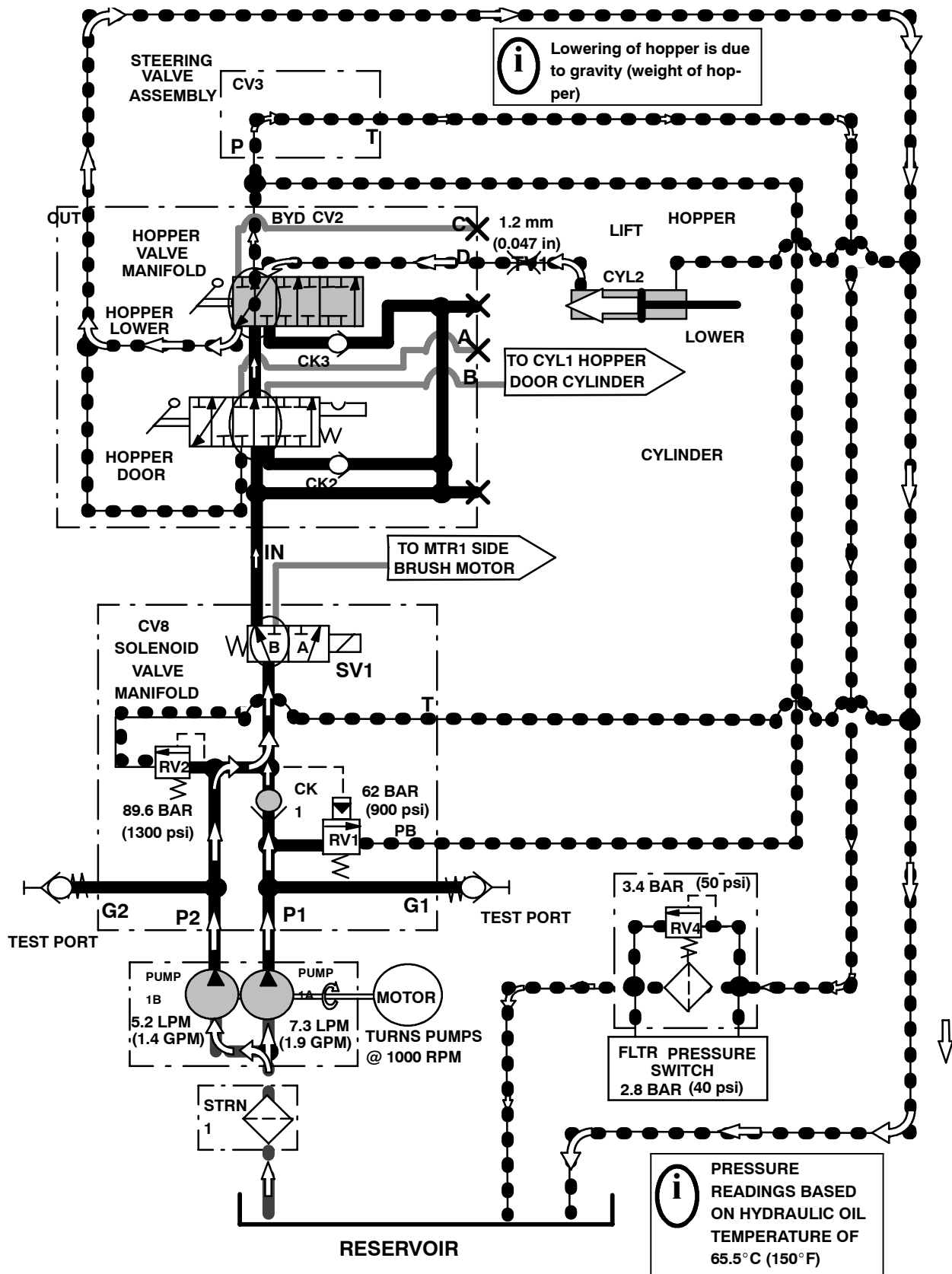
HOPPER DOES NOT RAISE



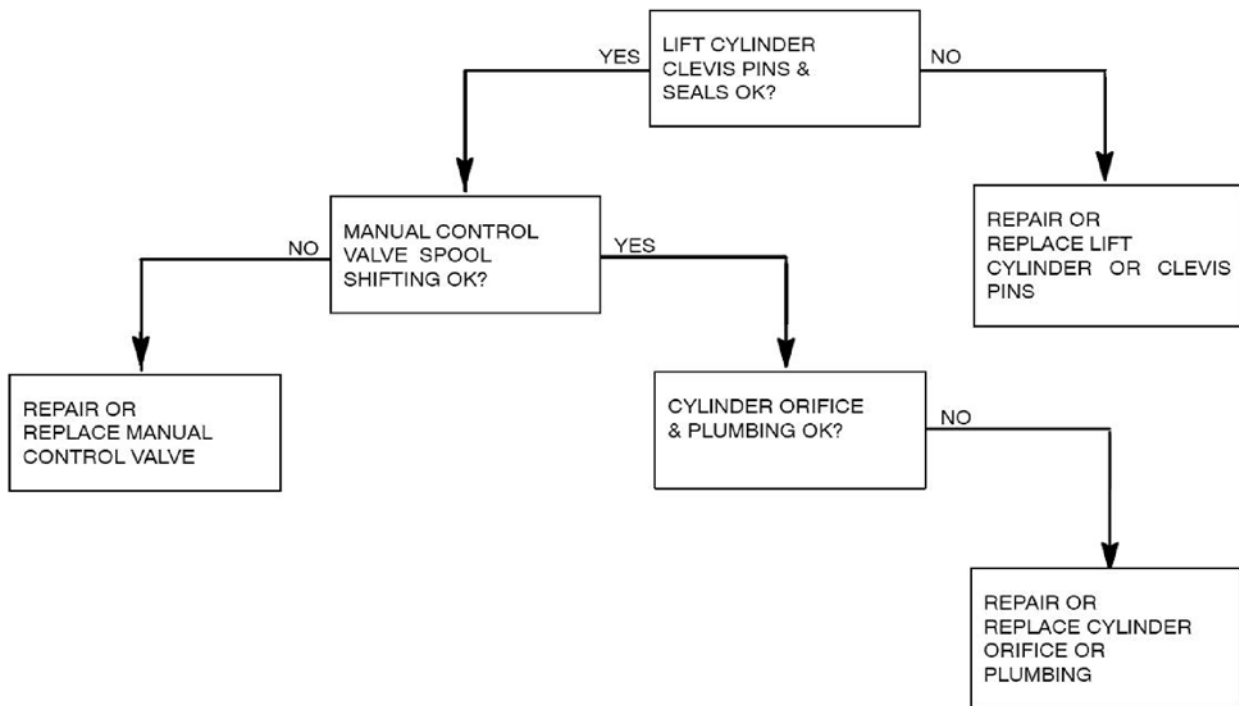
HOPPER DOES NOT STAY IN RAISED POSITION



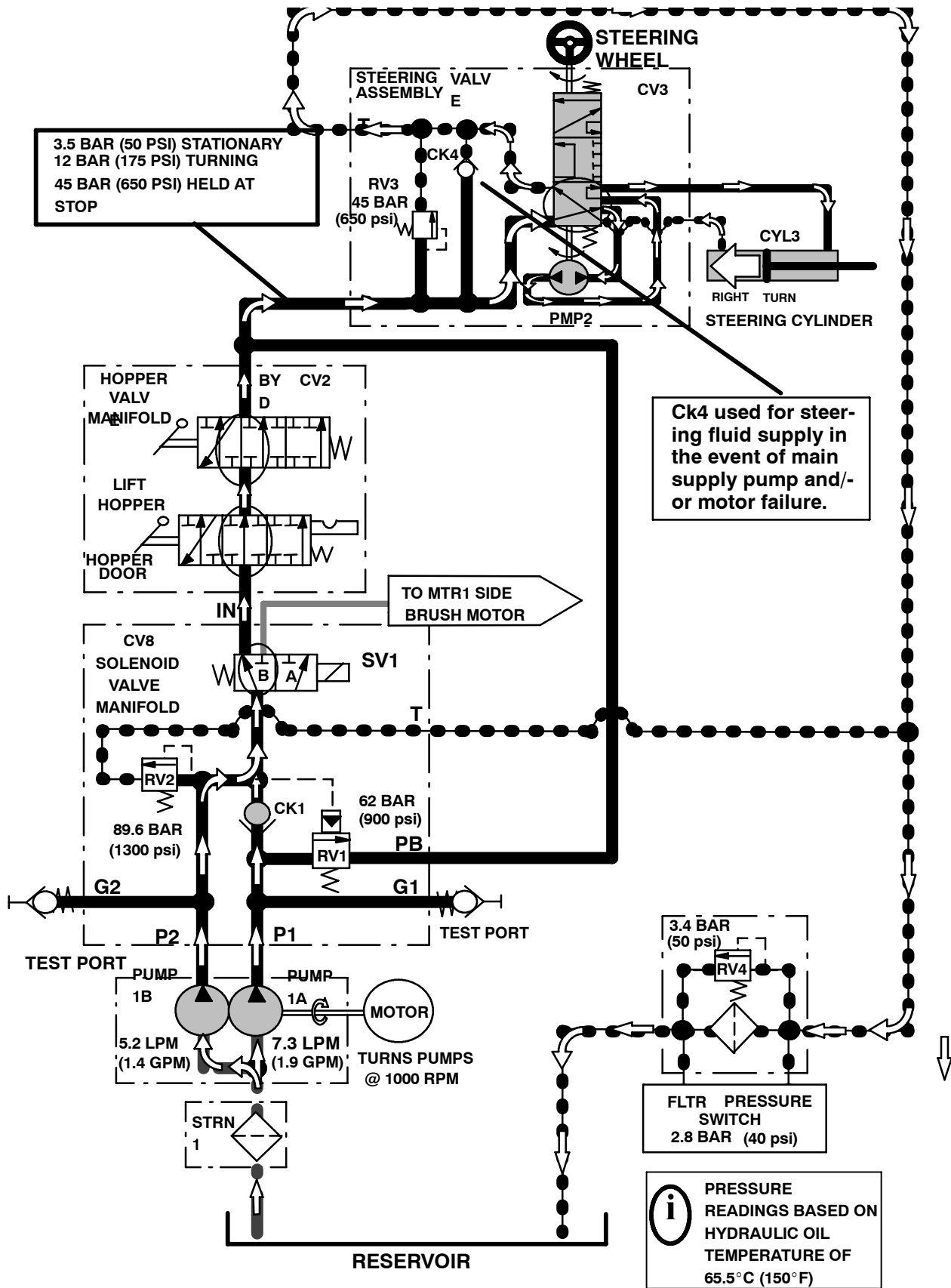
HOPPER LOWER



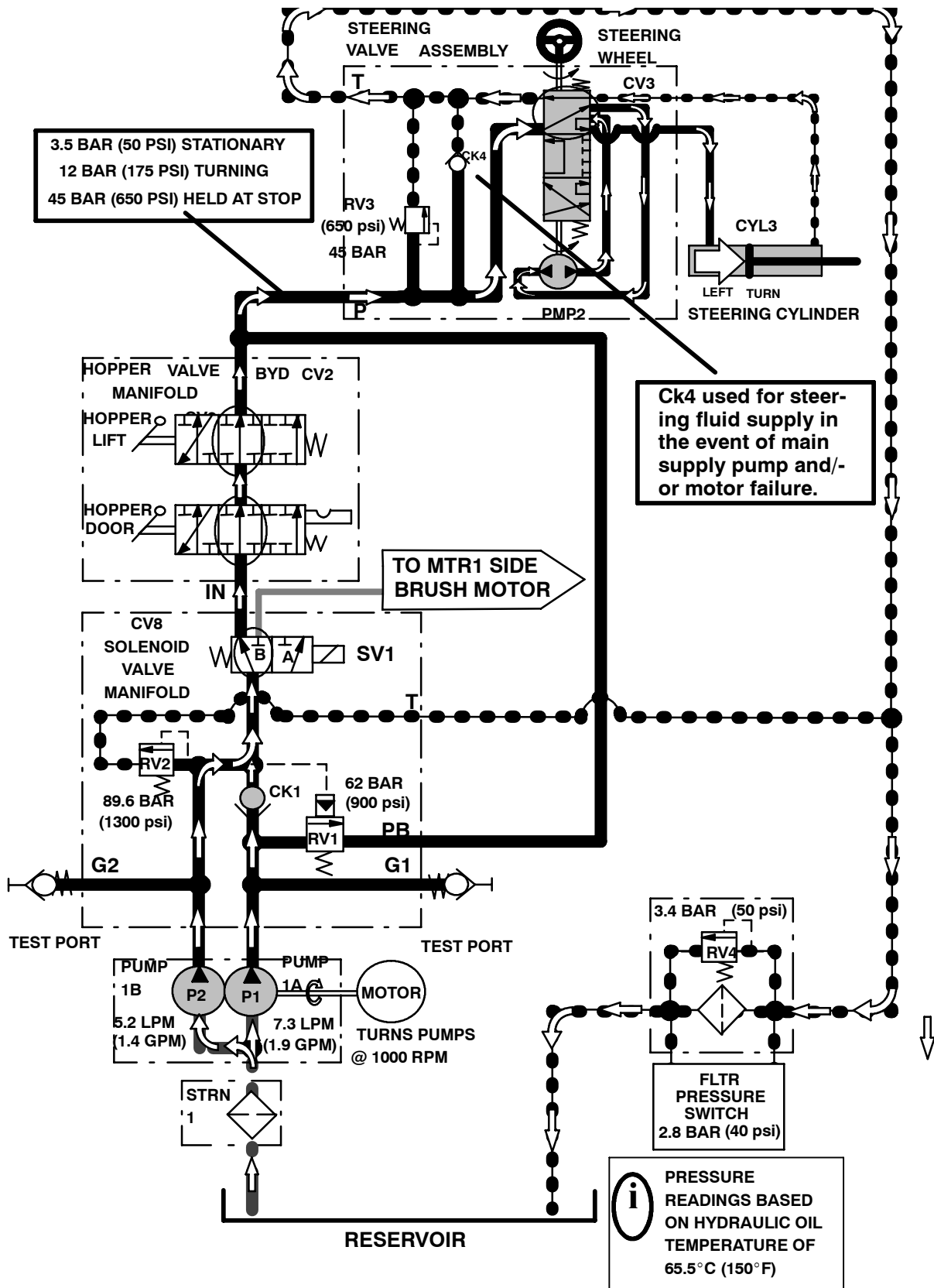
HOPPER DOES NOT LOWER



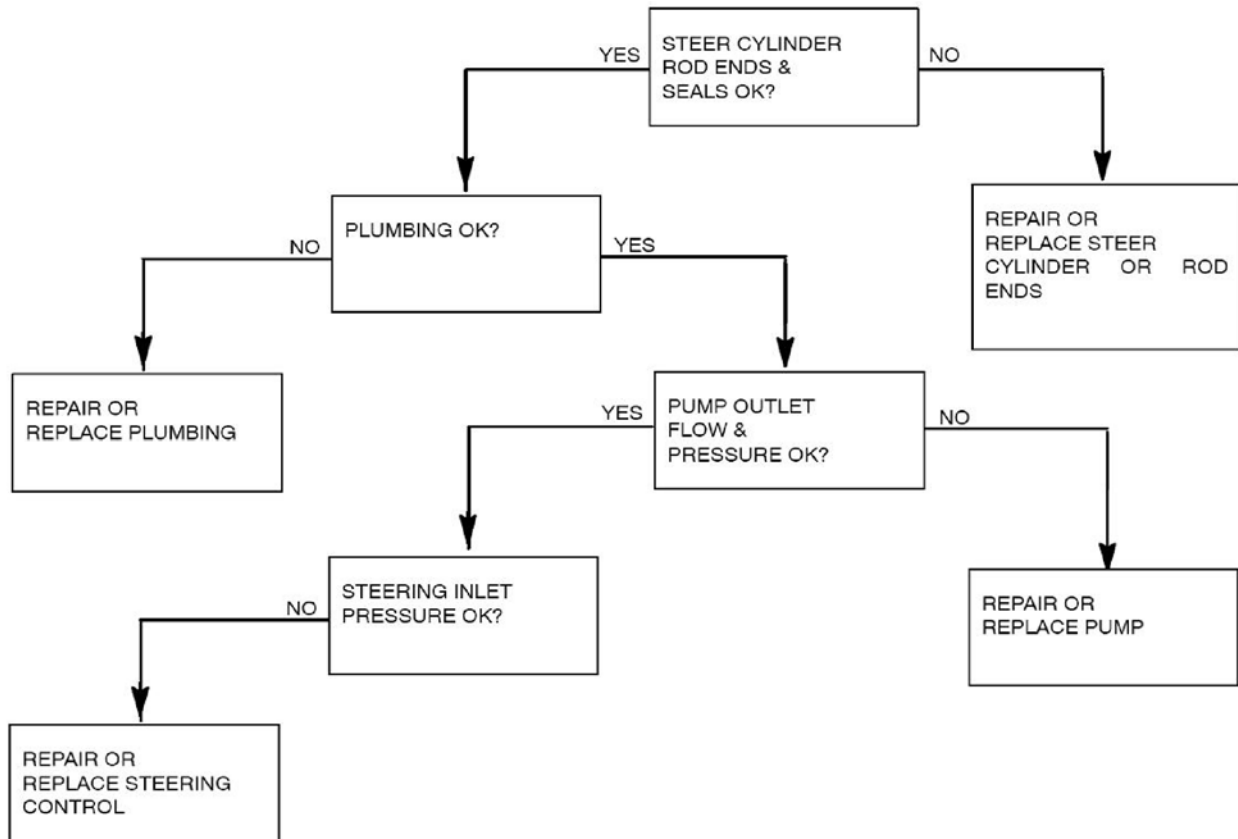
STEERING SYSTEM - RIGHT TURN



STEERING SYSTEM - LEFT TURN



STEERING SYSTEM NOT WORKING PROPERLY



ELECTRICAL

INFORMATION

BEFORE CONDUCTING TESTS:

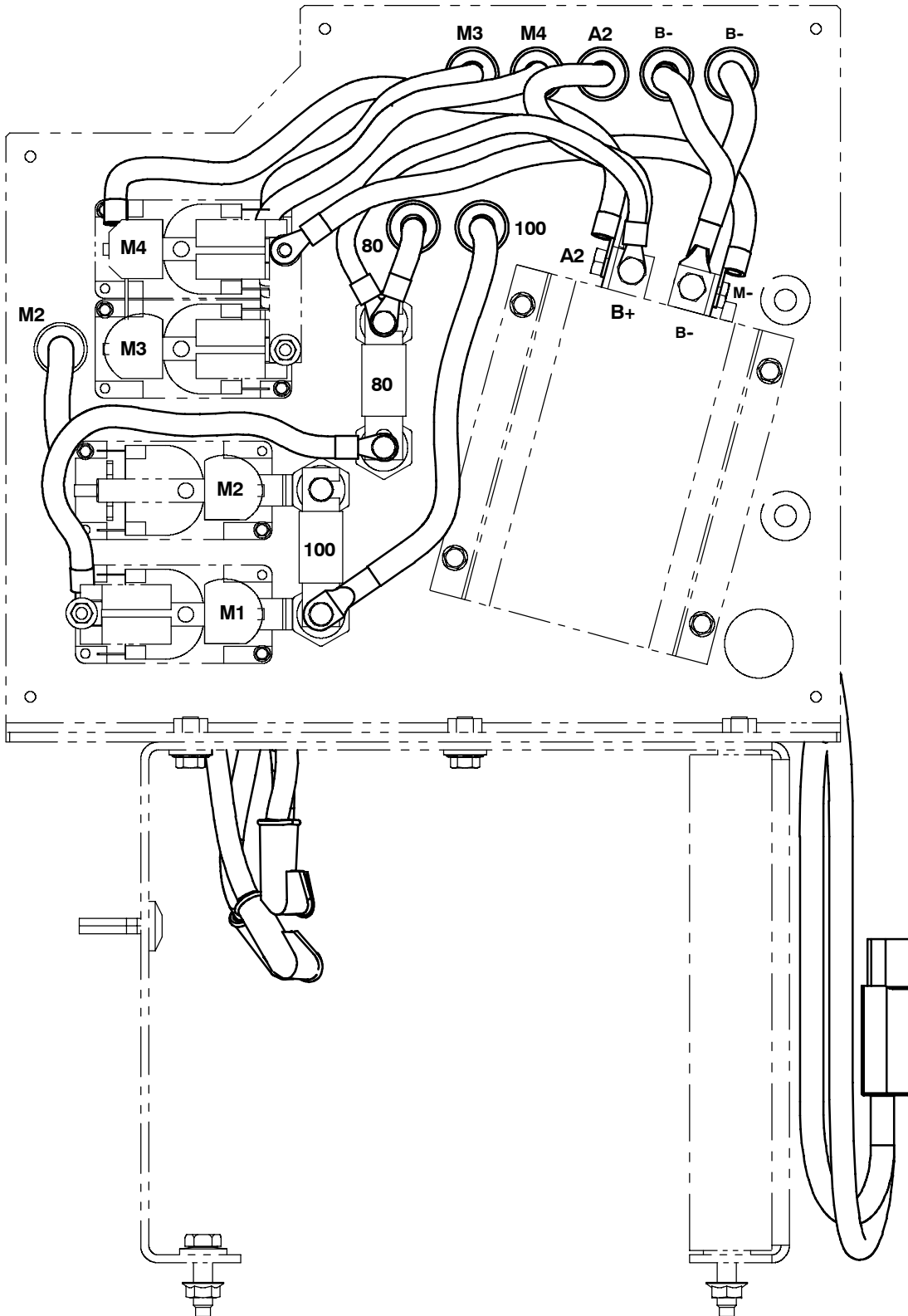
- * Read and Follow ALL Safety Warnings and Precautions as mentioned at the beginning of this manual
- *Hydraulic Oil Must Be At Normal Operating Temperatures after Running Machine and Hydraulics a Minimum of 5 Minutes
- * Examine Machine For Any Linkage Binding or Mechanical Problems

DURING TESTS:

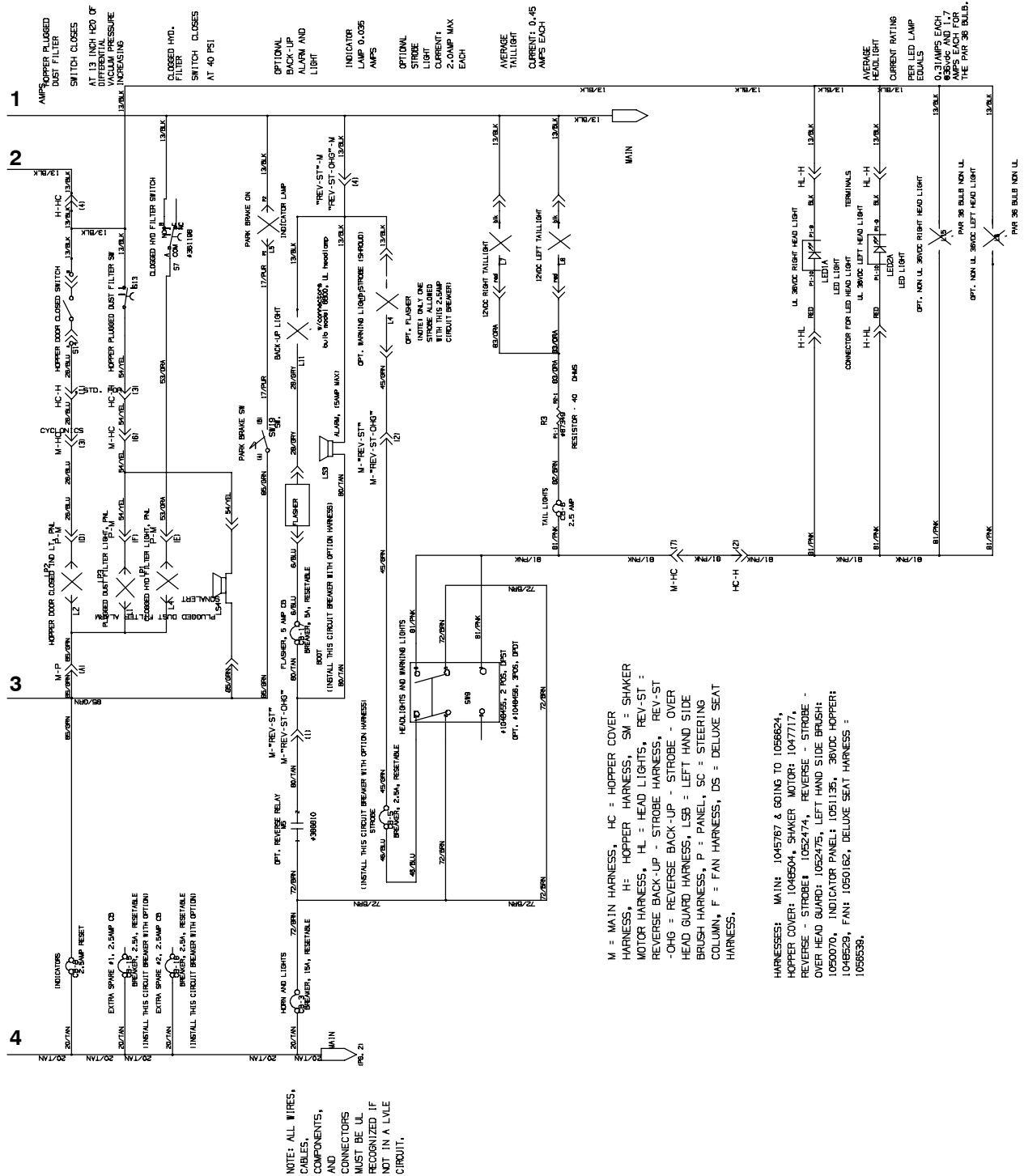
- * Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action
- * Maintain Normal Main Brush Pressure as Listed in Operator's Manual

ELECTRICAL CONTROL BOX GROUP

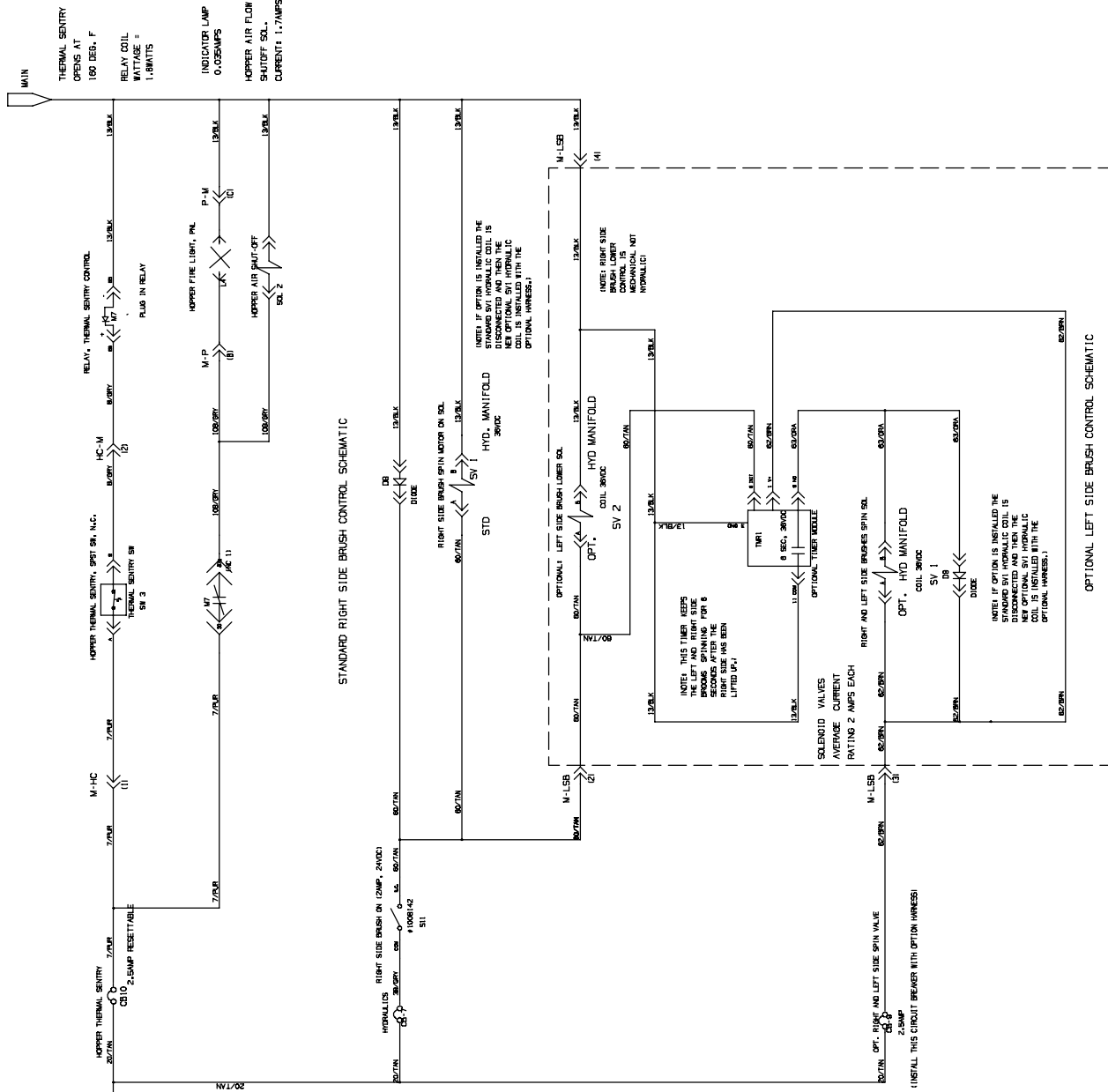
Contactor locations



ELECTRICAL SCHEMATIC FIG 2



ELECTRICAL SCHEMATIC FIG. 3



ELECTRICAL SCHEMATIC FIG. 4

