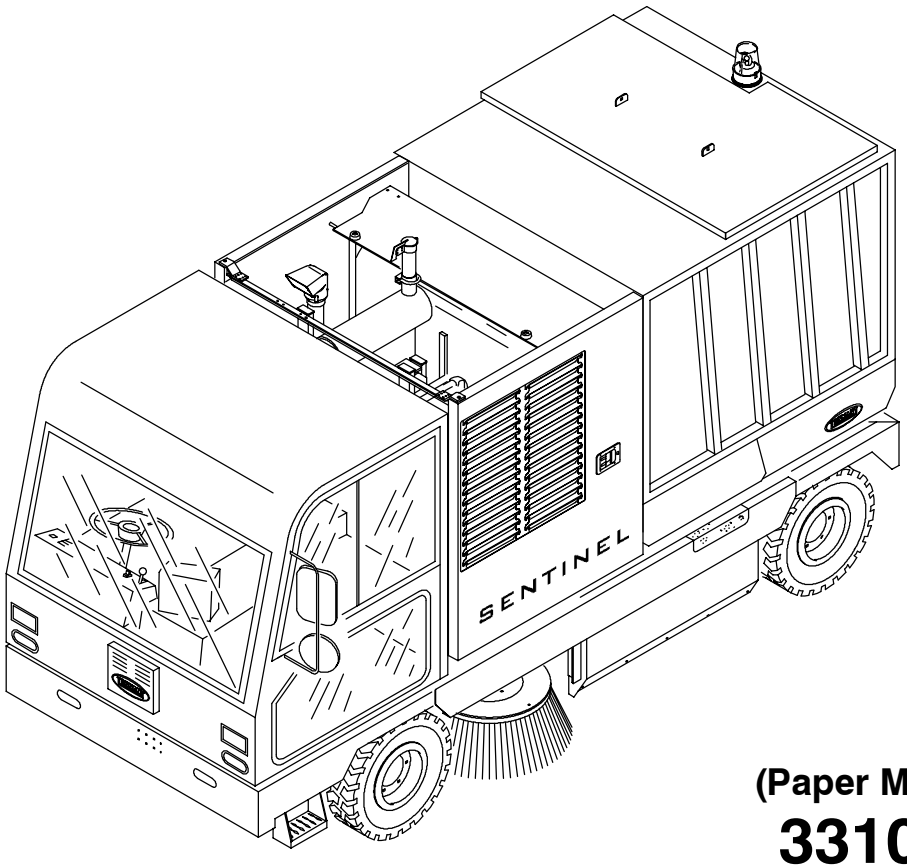
TENNANT

SENTINEL

Service Information Manual



(Paper Manual)

331019

Rev. 00

331005 (CD-ROM)

This manual provides service information for the TENNANT Model SENTINEL.

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 maintenance instructions provided.
- The machine is maintained with TENNANT supplied or approved parts.

Paper Manual Number – 331019

CD–ROM Manual Number – 331005

Revision: 00

Published: 12–03

CALIFORNIA PROPOSITION 65 WARNING:
Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

SENTINEL ELECTRICAL

Troubleshooting Manual

BEFORE CONDUCTING TESTS:

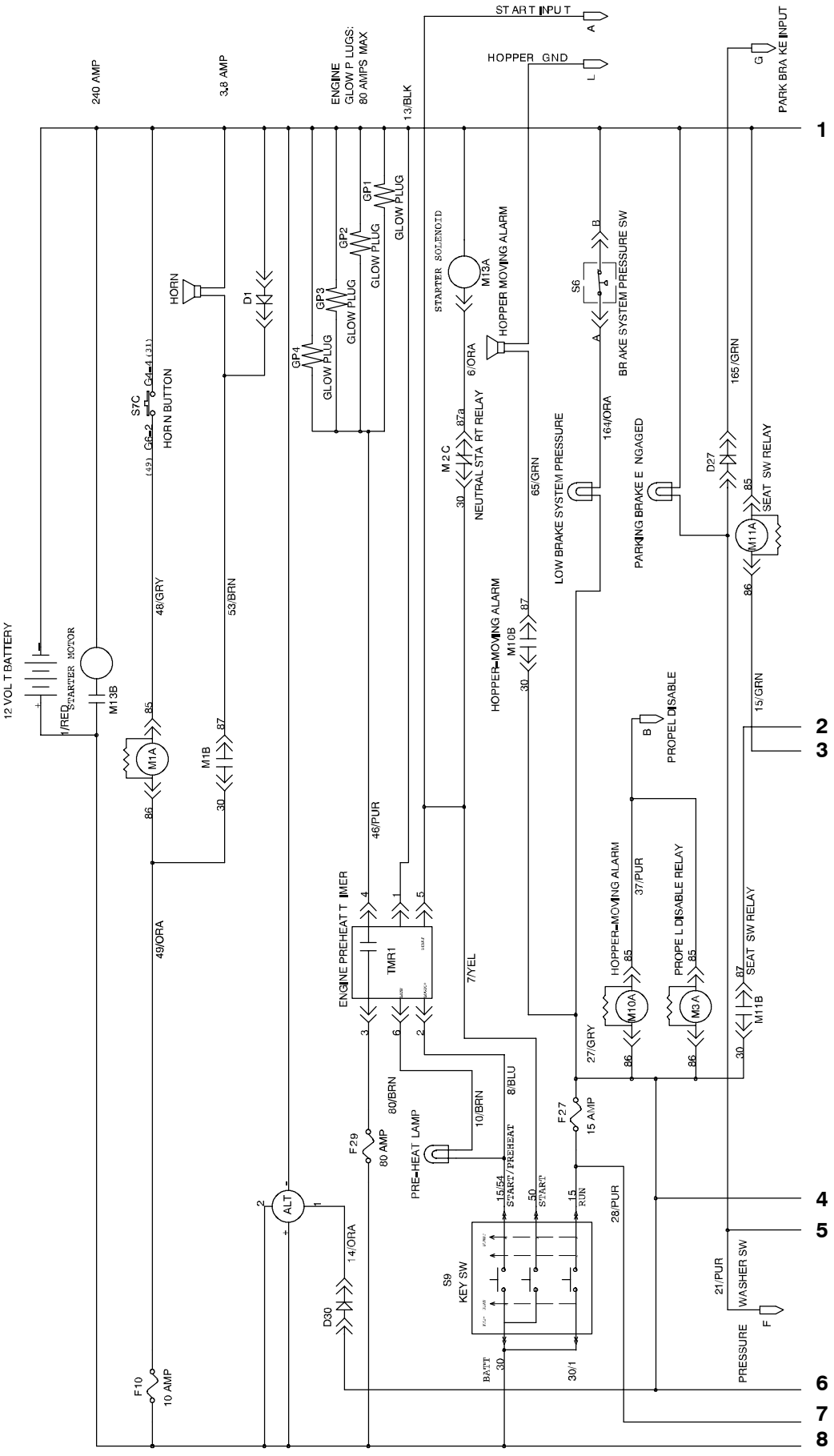
*** Read and Follow ALL Safety Warnings and Precautions in Operator's Manual**

DURING TESTS:

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

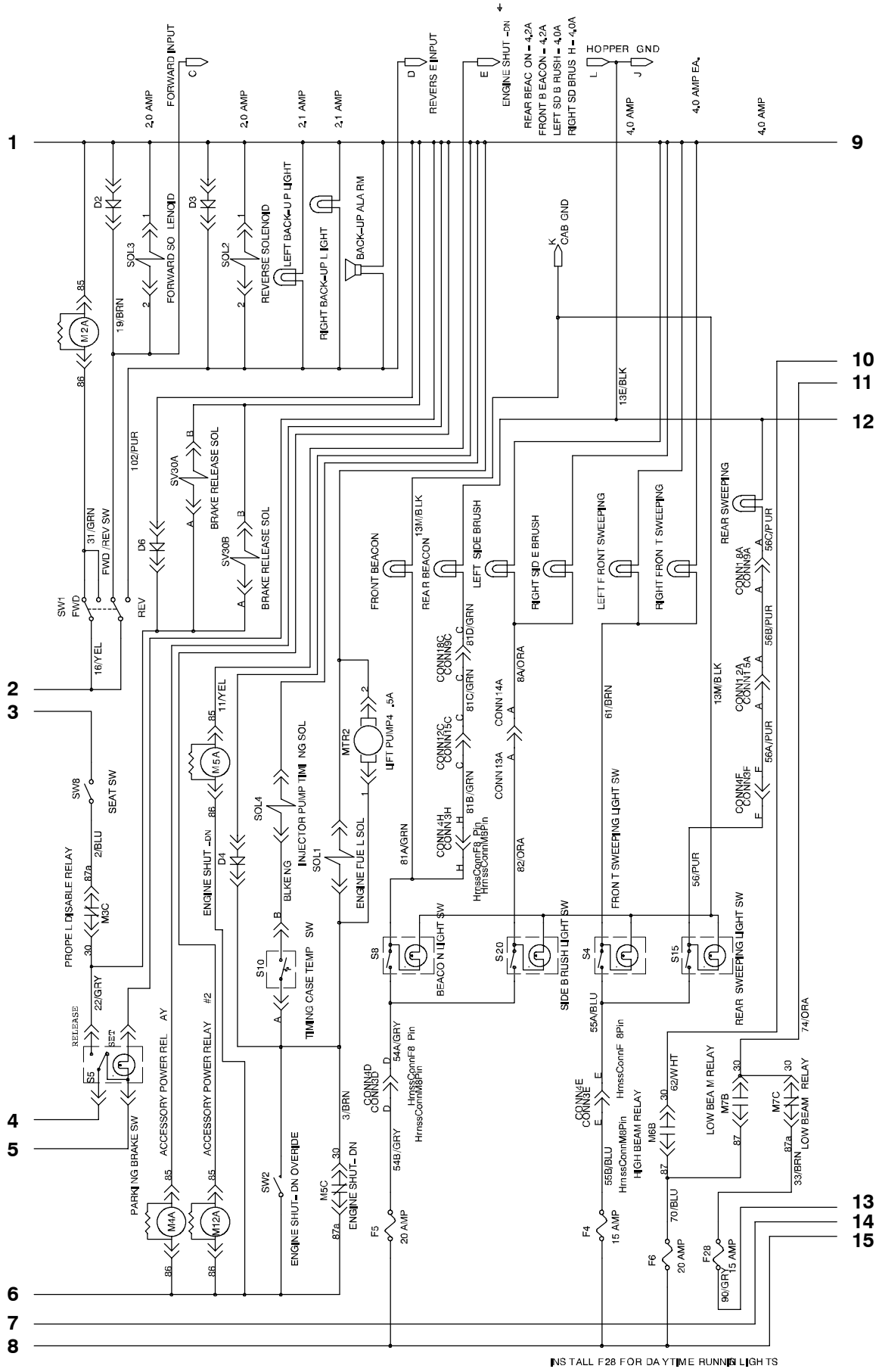
NOTE: Troubleshooting charts are shown with optional equipment. The optional equipment is not specified in these charts. Some machines may not be equipped with all components shown.

Sentinel Wiring Diagram (page 1 of 6)

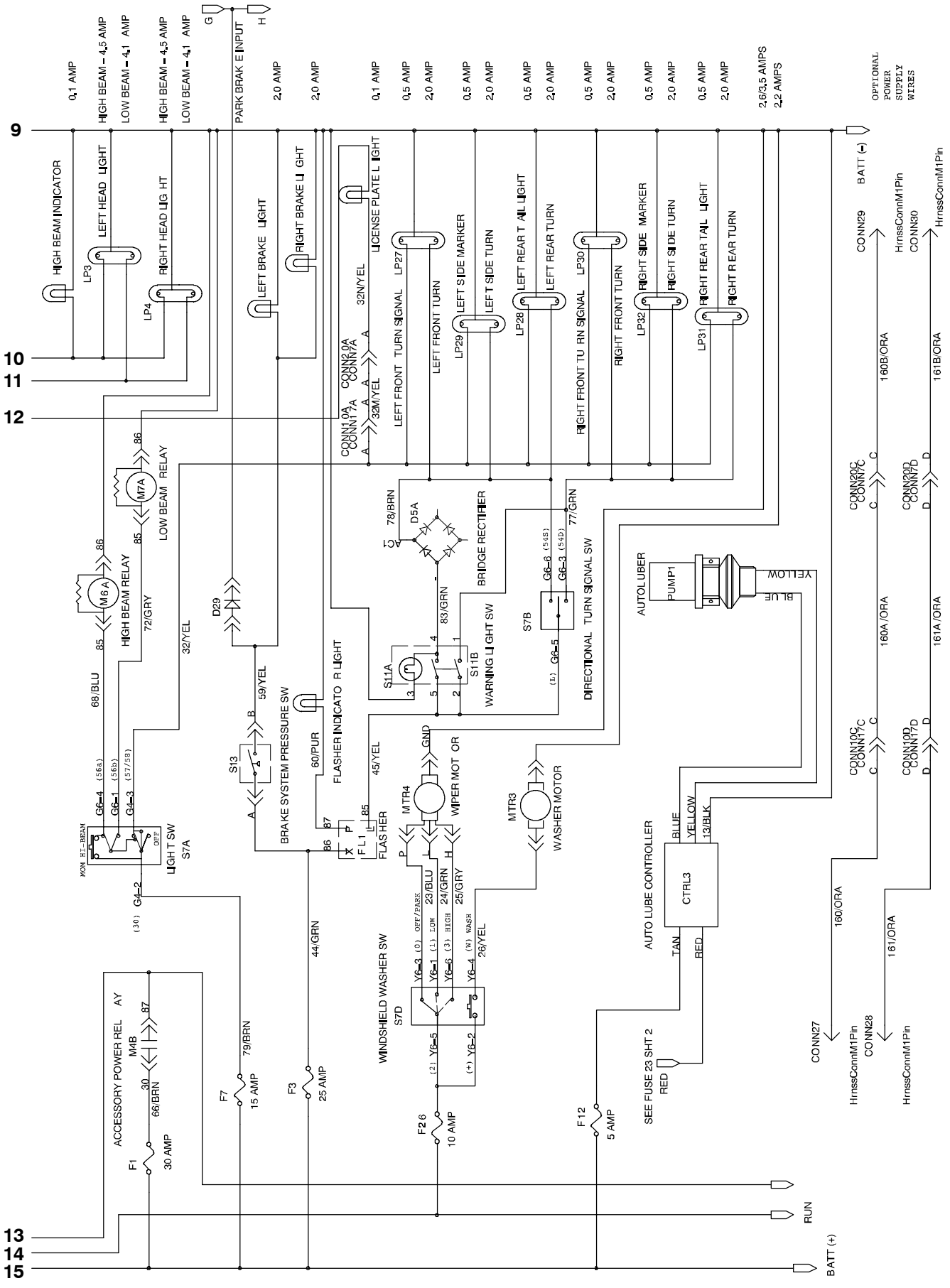


Sentinel 331000 (6-03)

Sentinel Wiring Diagram (page 2 of 6)

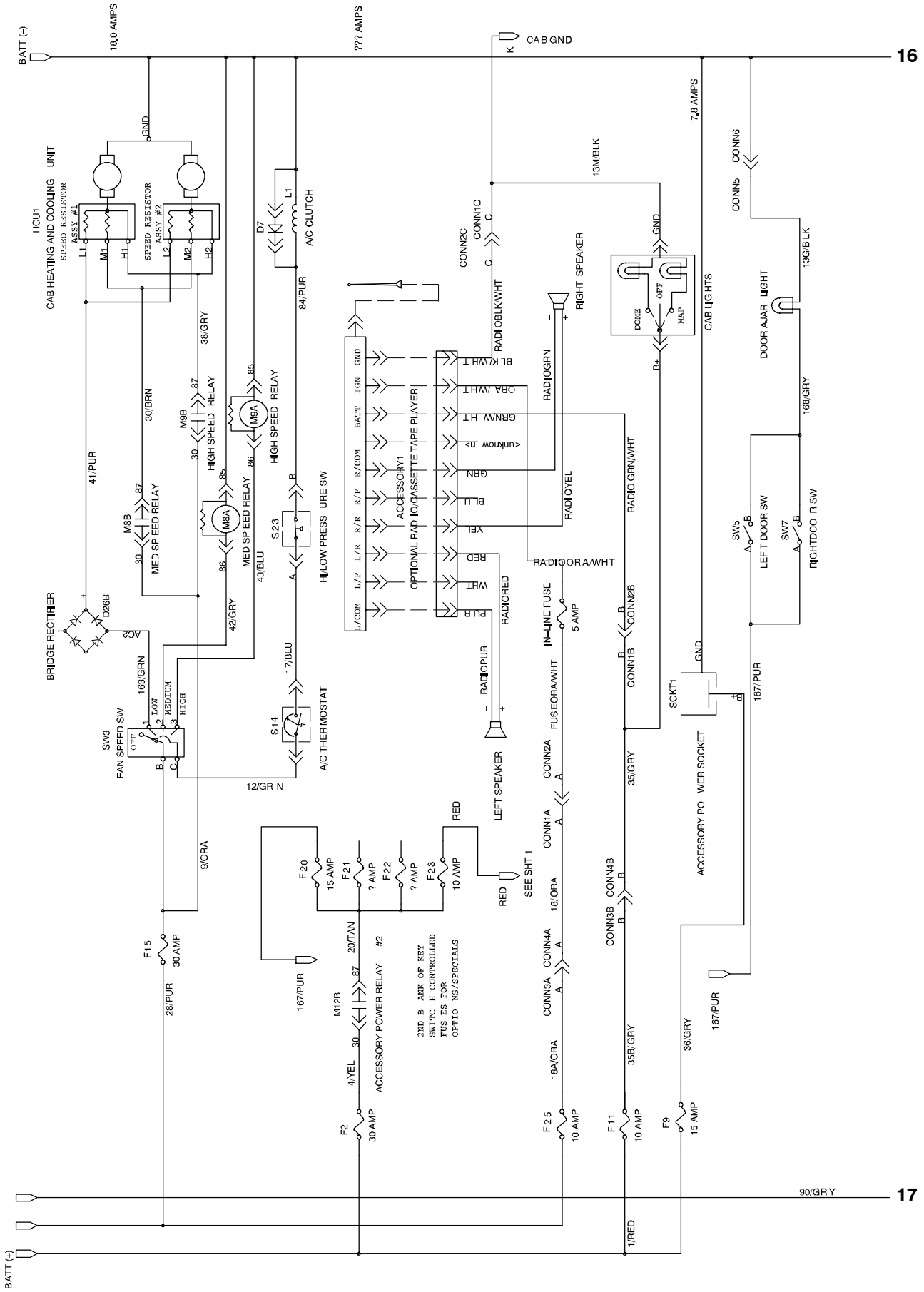


Sentinel Wiring Diagram (page 3 of 6)

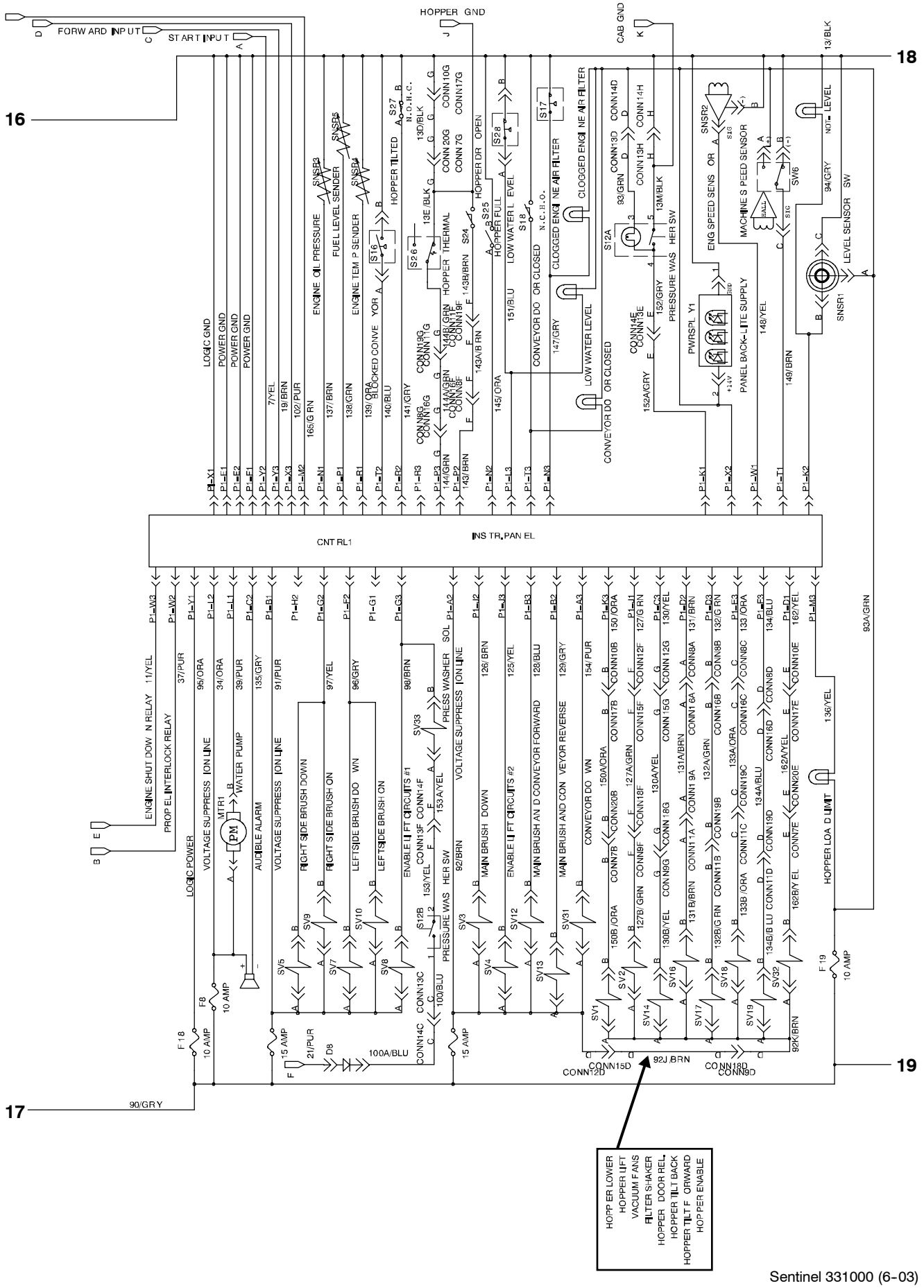


Sentinel 331000 (6-03)

Sentinel Wiring Diagram (page 4 of 6)

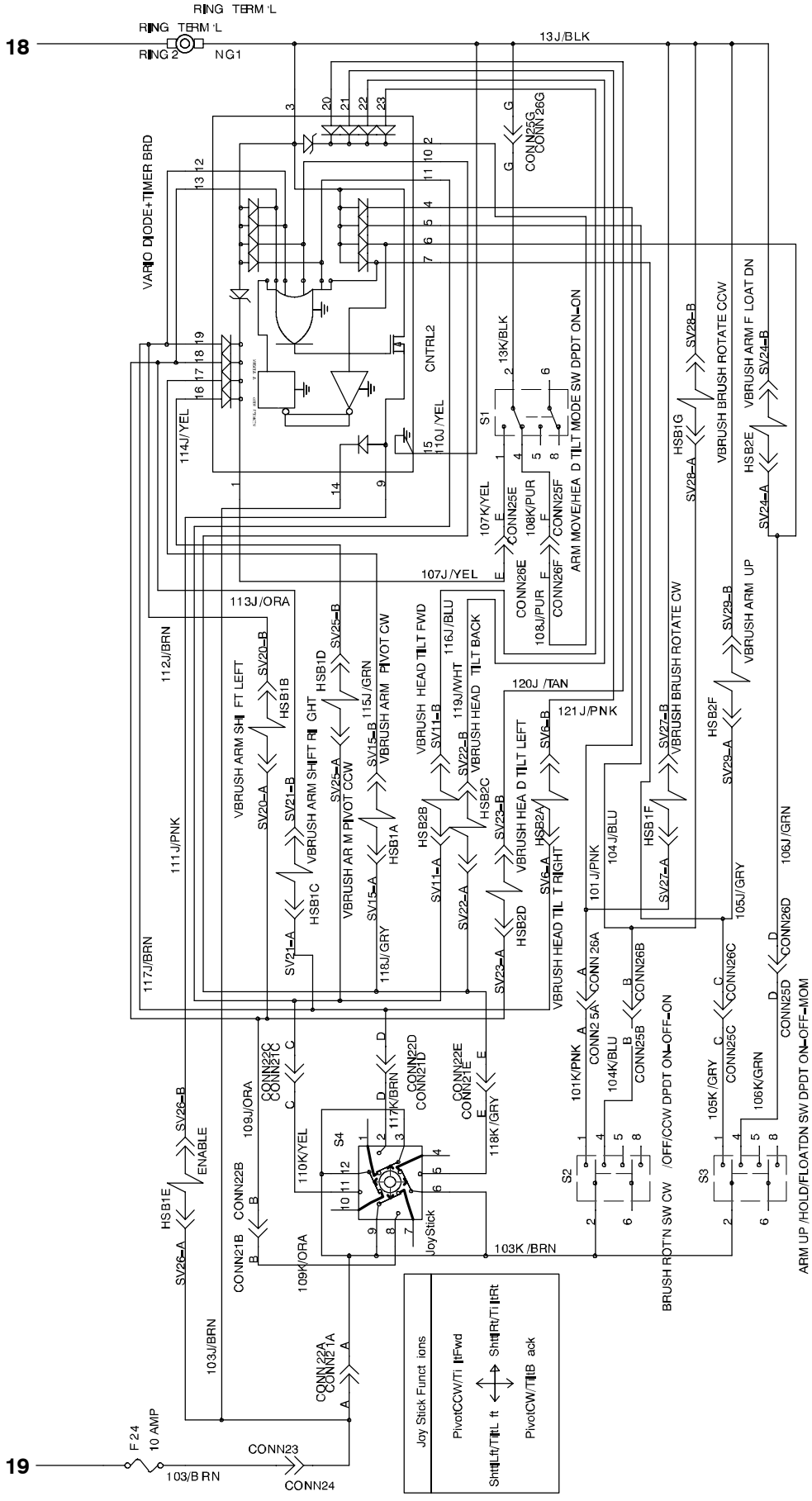


Sentinel Wiring Diagram (page 5 of 6)



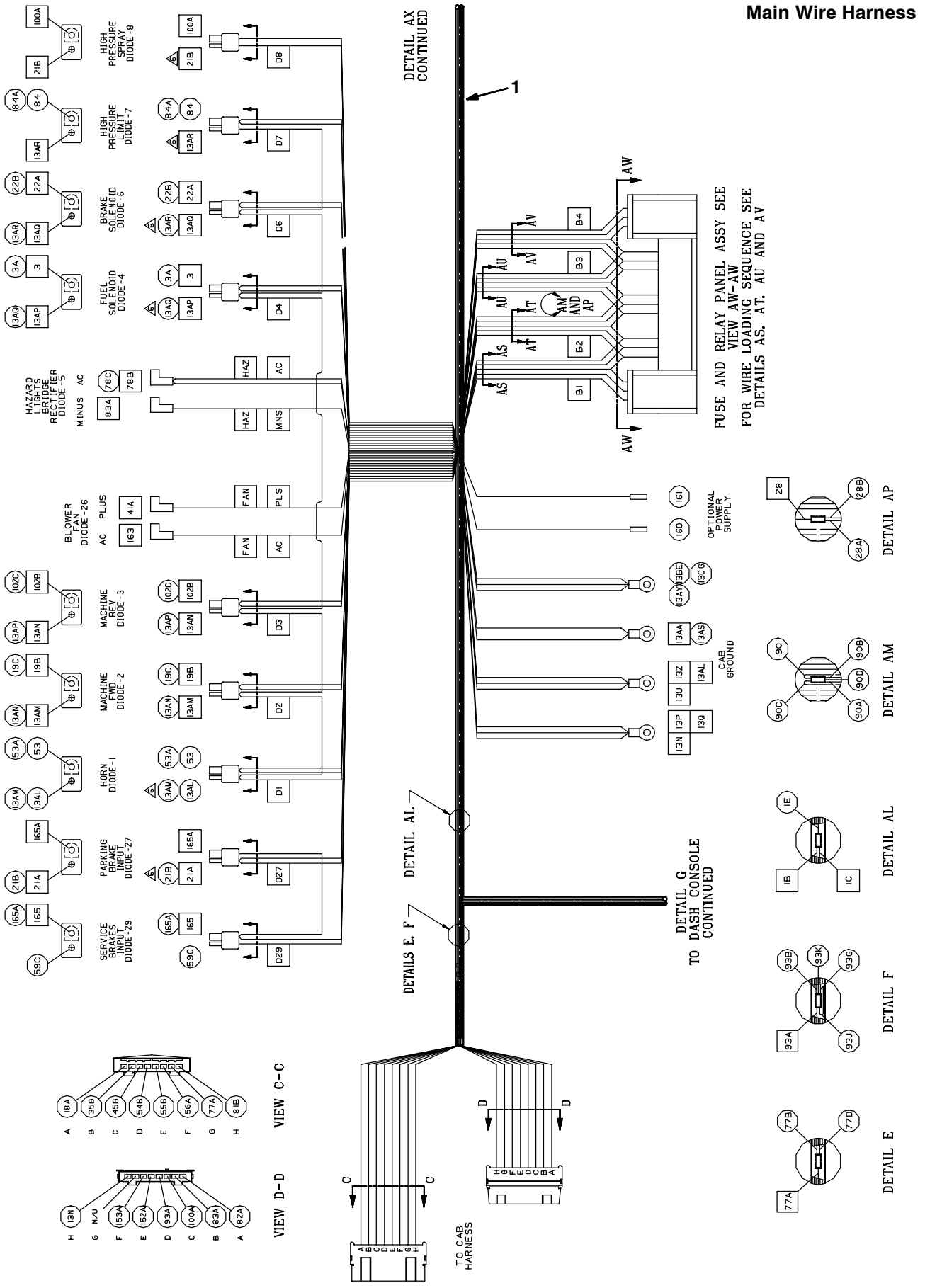
Sentinel 331000 (6-03)

Sentinel Wiring Diagram (page 6 of 6)



Sentinel Wiring Harness Detail (page 1 of 19)

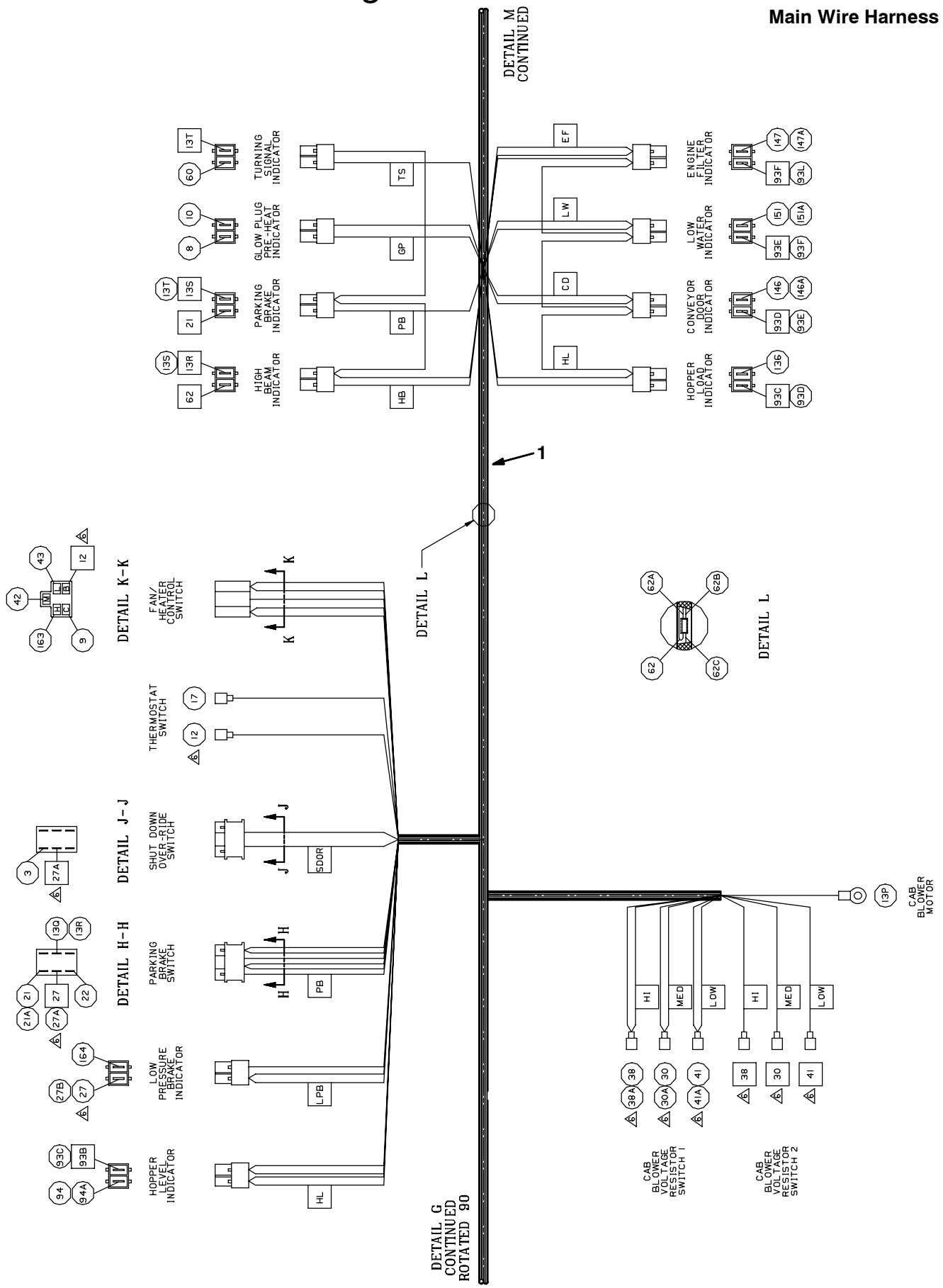
Main Wire Harness



Sentinel 331000 (6-03)

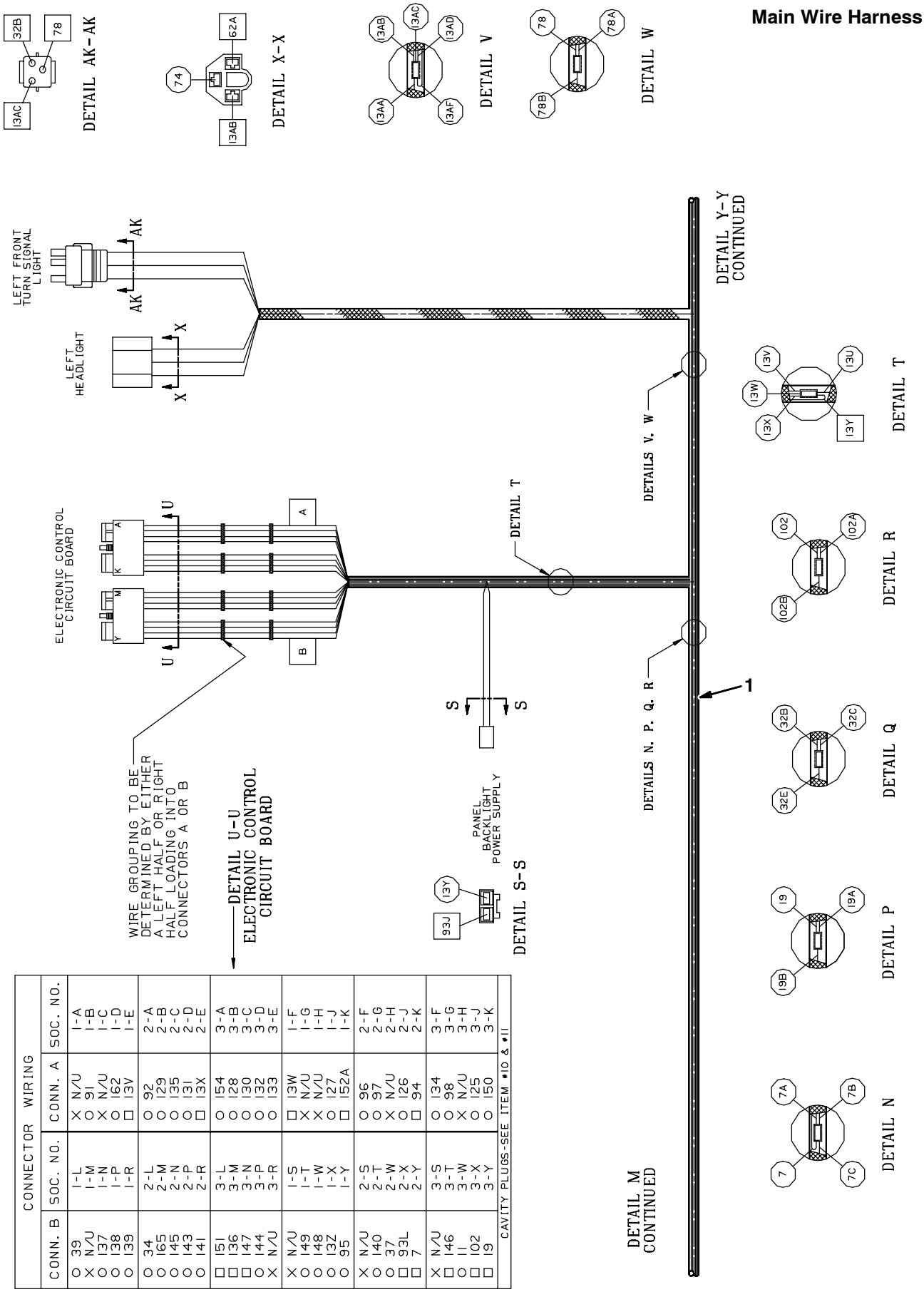
Sentinel Wiring Harness Detail (page 2 of 19)

Main Wire Harness



Sentinel Wiring Harness Detail (page 3 of 19)

Main Wire Harness

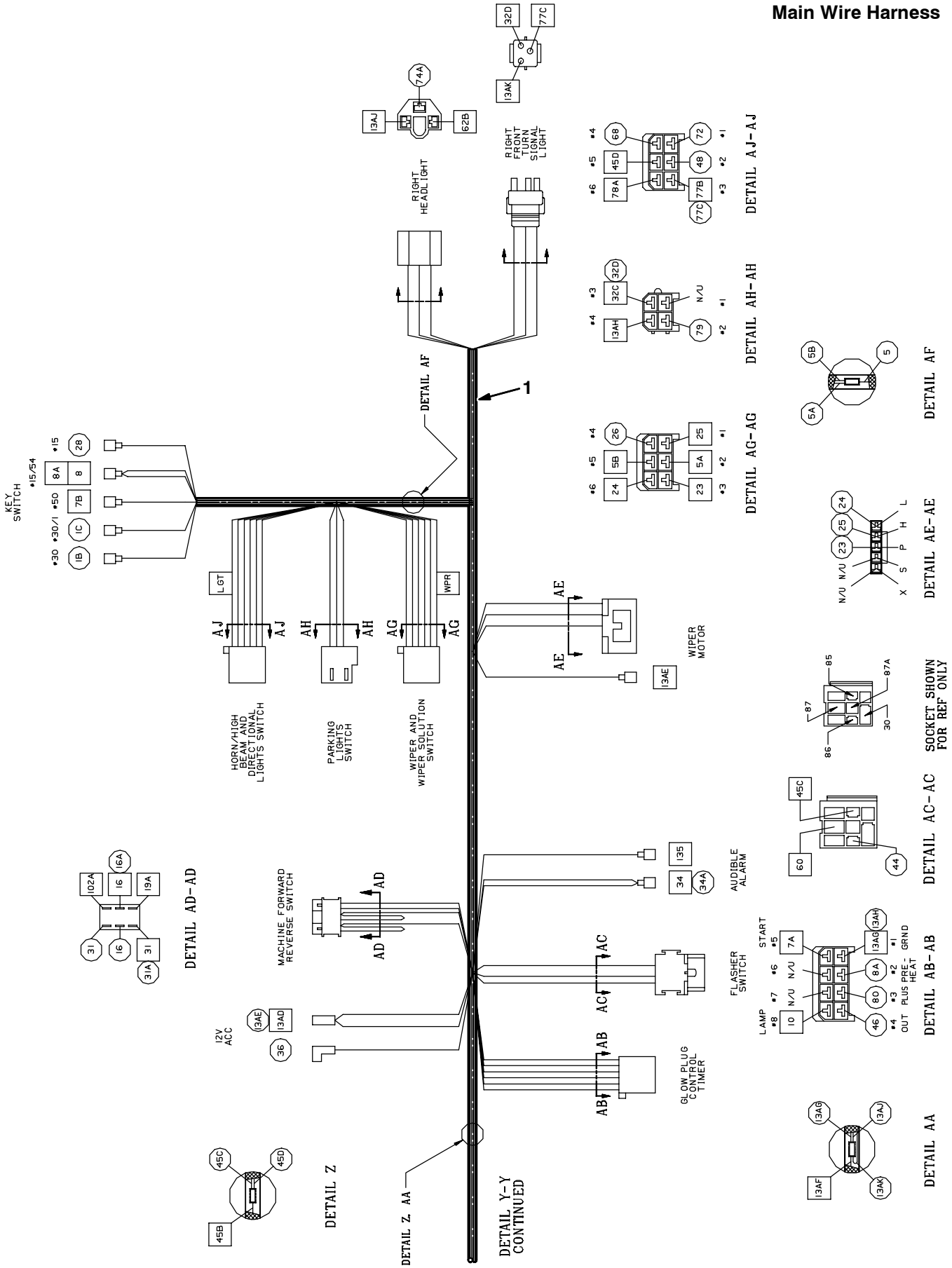


CONNECTOR WIRING			
CONN. B	SOC. NO.	CONN. A	SOC. NO.
O 39	1-L	X N/U	1-A
X N/U	1-M	O 91	1-B
O 137	1-N	X N/U	1-C
O 138	1-P	O 162	1-D
O 139	1-R	□ 13V	1-E
O 34	2-L	O 92	2-A
O 165	2-M	O 129	2-B
O 145	2-N	O 135	2-C
O 143	2-P	O 131	2-D
O 141	2-R	□ 13X	2-E
□ 151	3-L	O 154	3-A
□ 136	3-M	O 128	3-B
□ 147	3-N	O 130	3-C
O 144	3-P	O 132	3-D
X N/U	3-R	O 133	3-E
X N/U	1-S	□ 13W	1-F
O 149	1-T	X N/U	1-G
O 148	1-W	X N/U	1-H
O 137	1-X	O 127	1-J
O 95	1-Y	□ 152A	1-K
X N/U	2-S	O 96	2-F
O 140	2-T	O 97	2-G
O 37	2-W	X N/U	2-H
□ 93L	2-X	O 126	2-J
□ 7	2-Y	□ 94	2-K
X N/U	3-S	O 134	3-F
□ 146	3-T	O 98	3-G
O 11	3-W	X N/U	3-H
O □ 102	3-X	O 125	3-J
□ 19	3-Y	O 150	3-K
CAVITY PLUGS-SEE ITEM #10 & #11			

Sentinel 331000 (6-03)

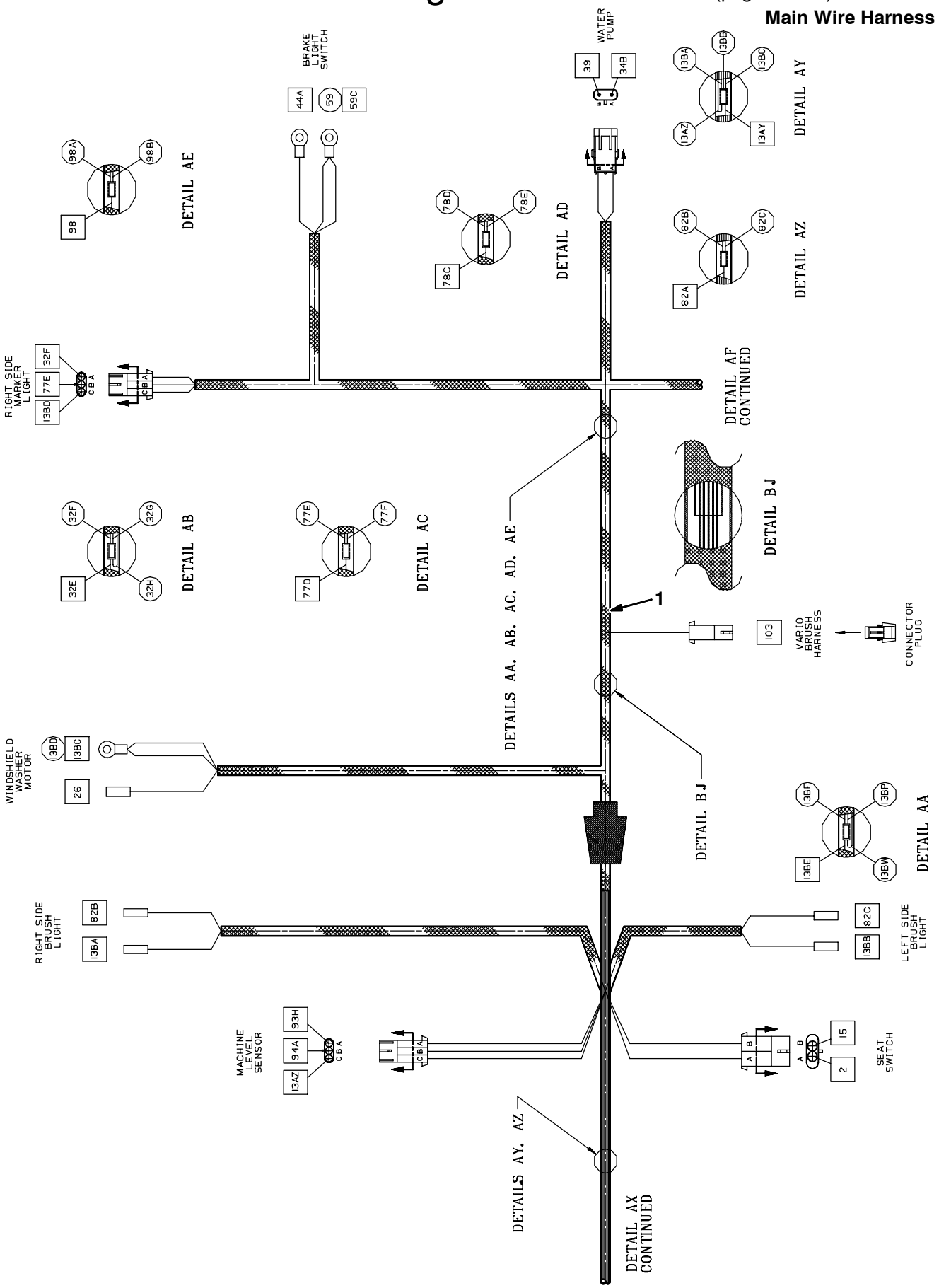
Sentinel Wiring Harness Detail (page 4 of 19)

Main Wire Harness



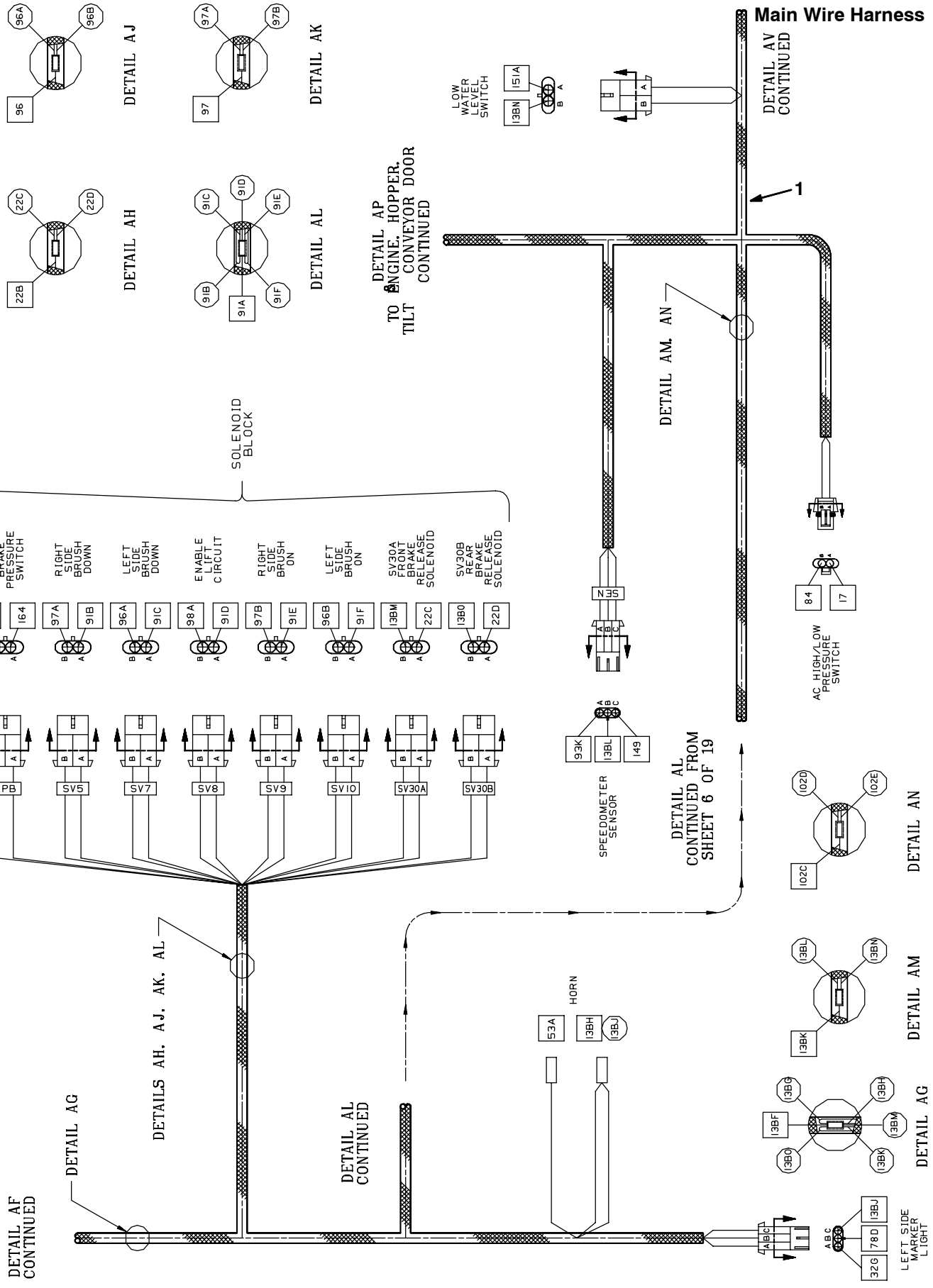
Sentinel Wiring Harness Detail (page 5 of 19)

Main Wire Harness



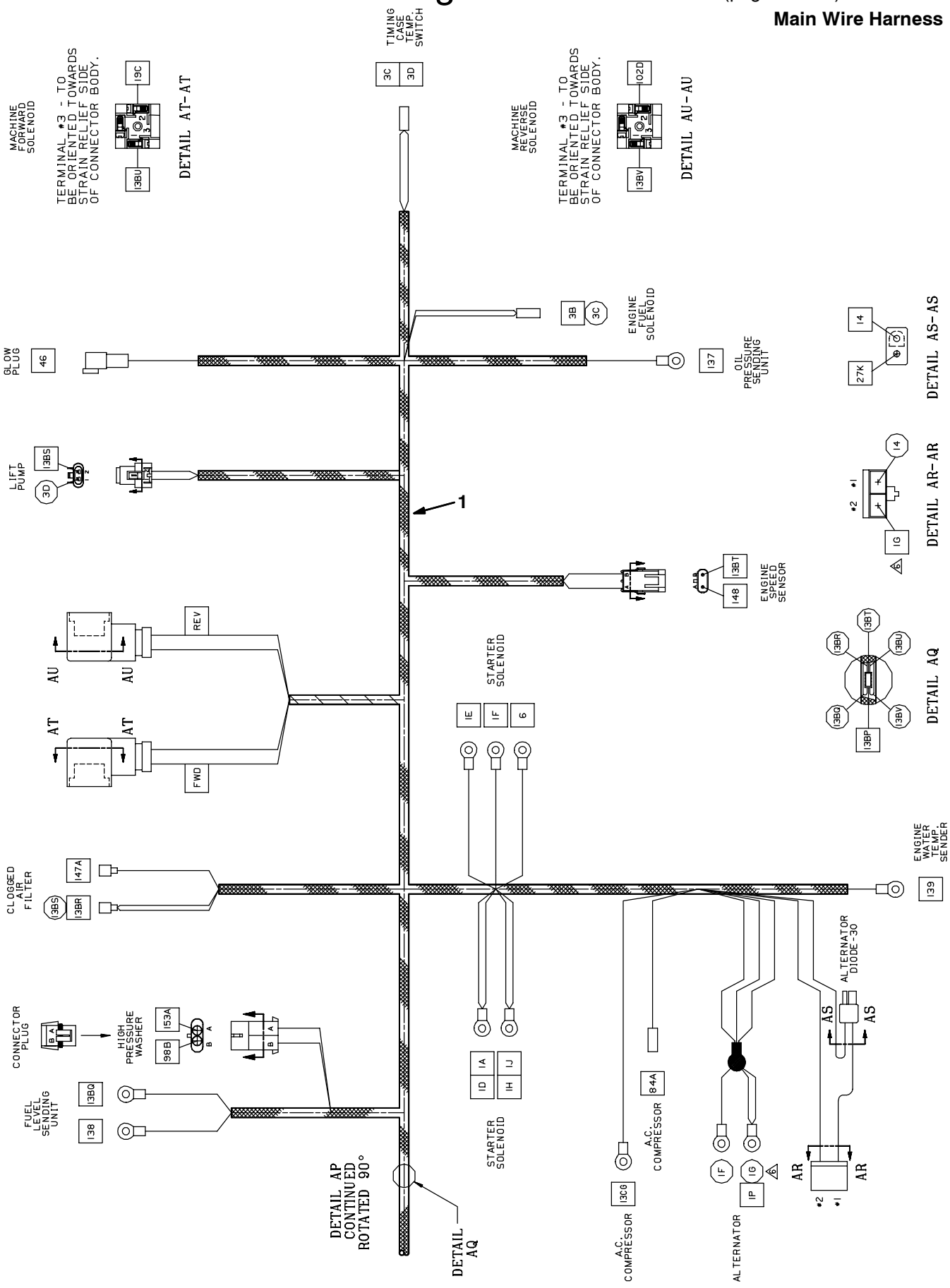
Sentinel 331000 (6-03)

Sentinel Wiring Harness Detail (page 6 of 19)



Sentinel Wiring Harness Detail (page 7 of 19)

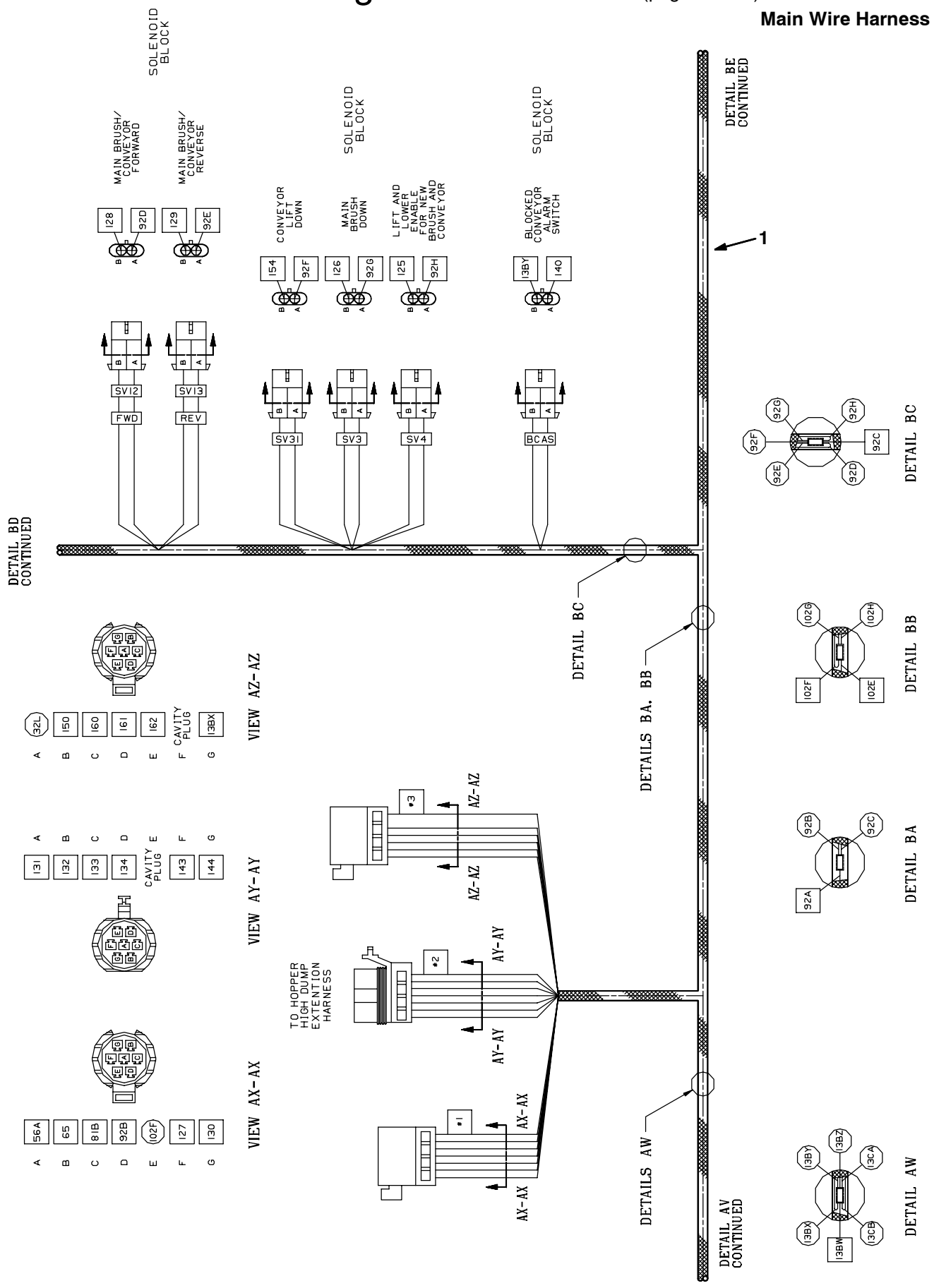
Main Wire Harness



Sentinel 331000 (6-03)

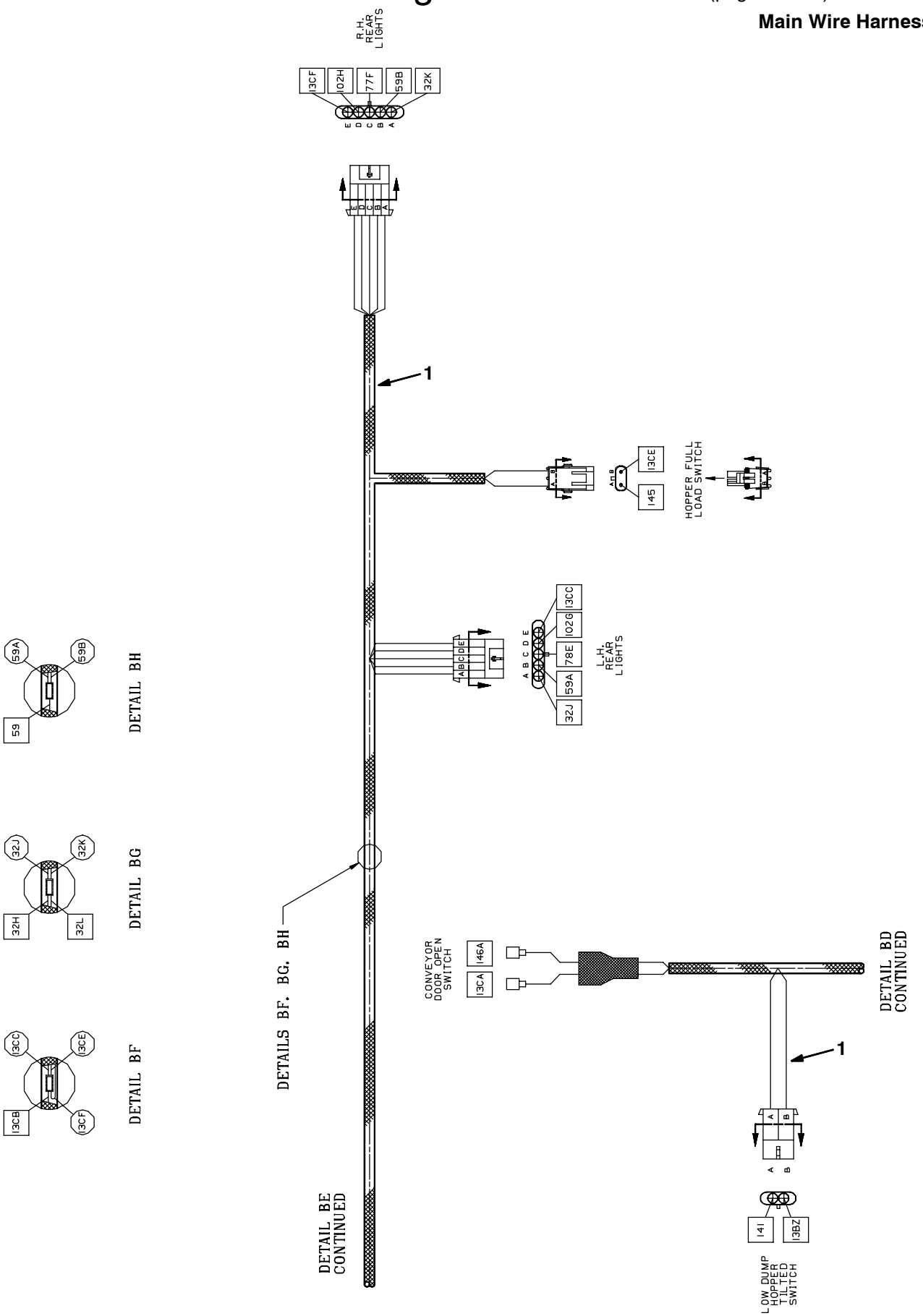
Sentinel Wiring Harness Detail (page 8 of 19)

Main Wire Harness



Sentinel Wiring Harness Detail (page 9 of 19)

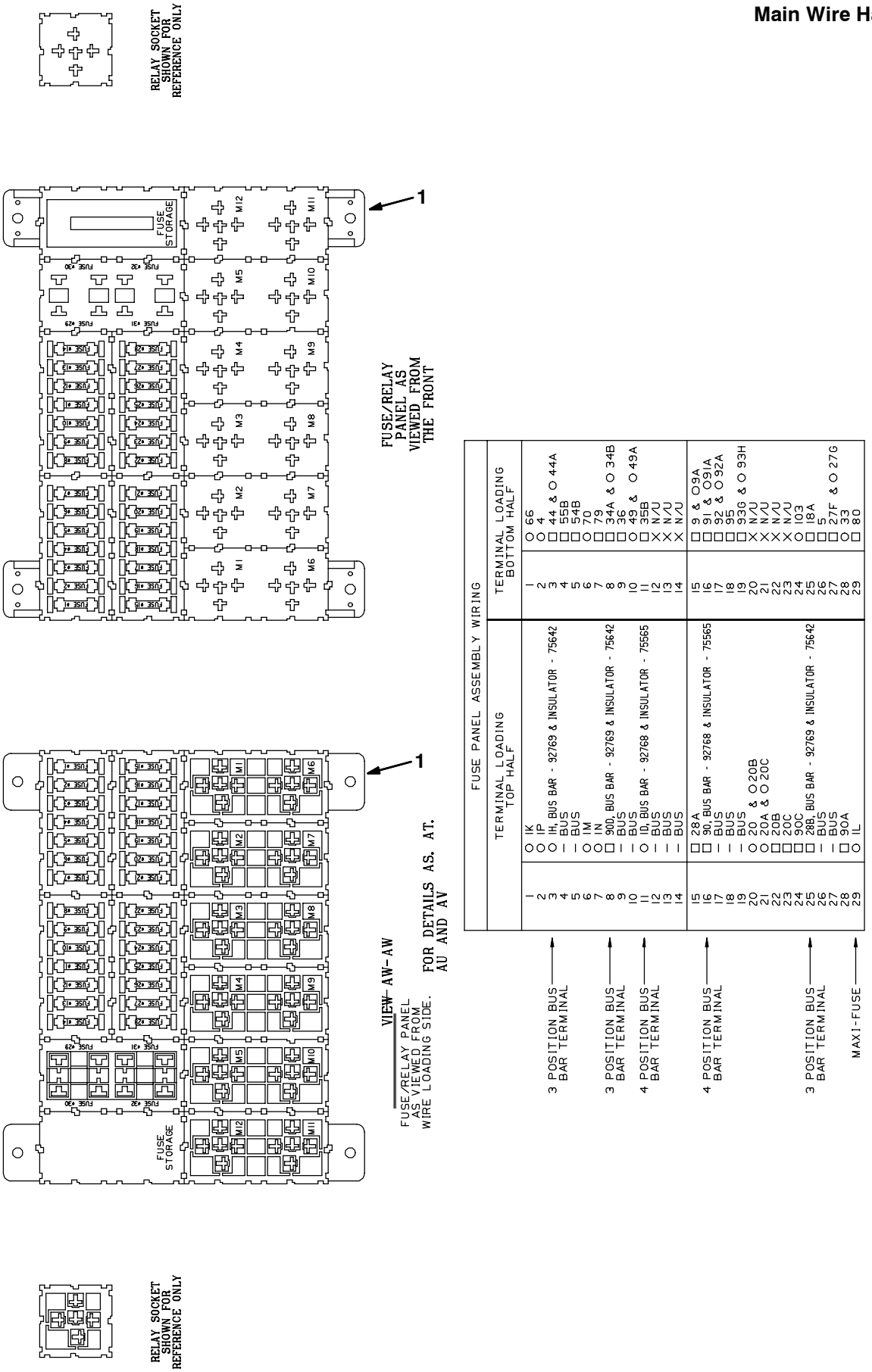
Main Wire Harness



Sentinel 331000 (6-03)

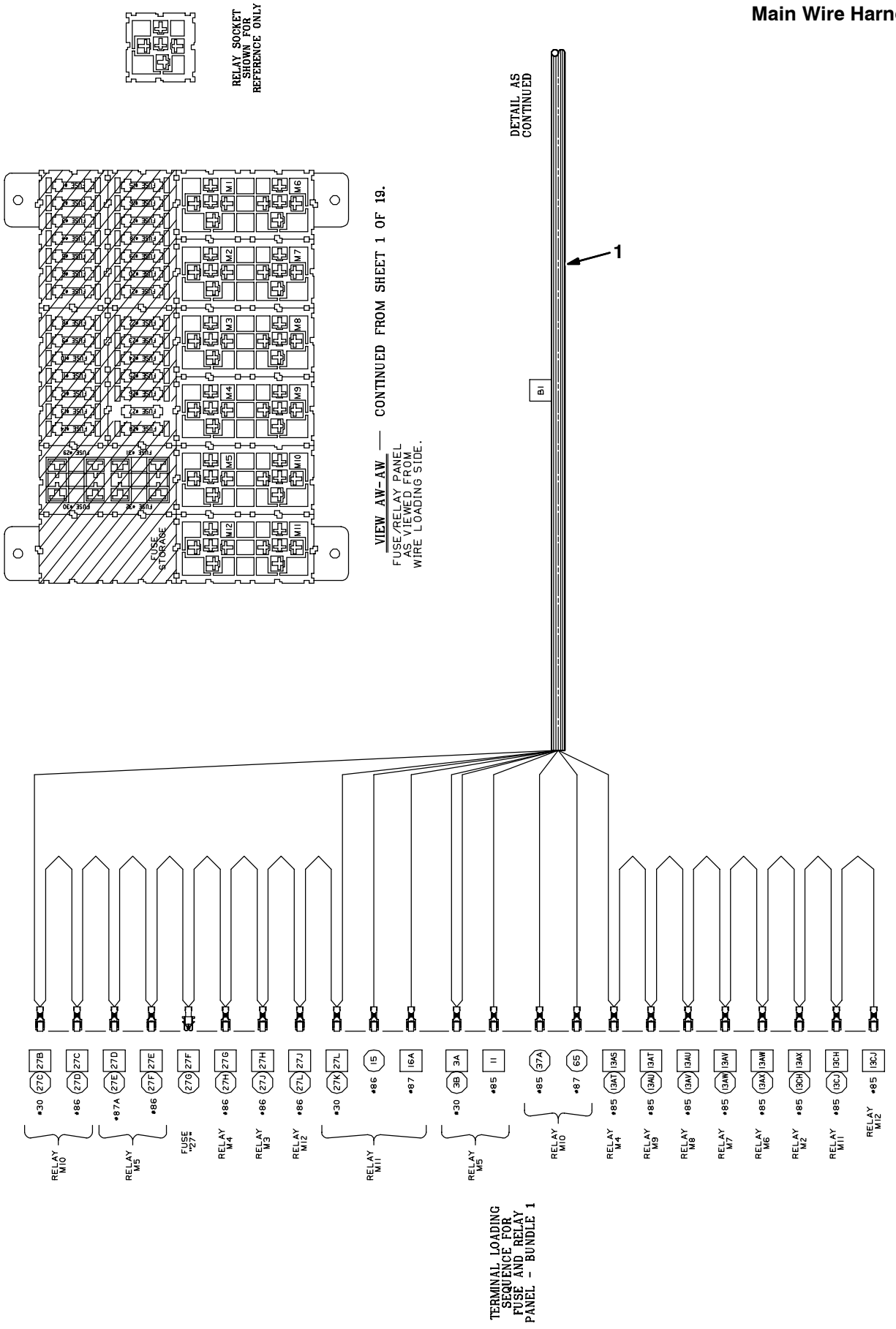
Sentinel Wiring Harness Detail (page 10 of 19)

Main Wire Harness



Sentinel Wiring Harness Detail (page 11 of 19)

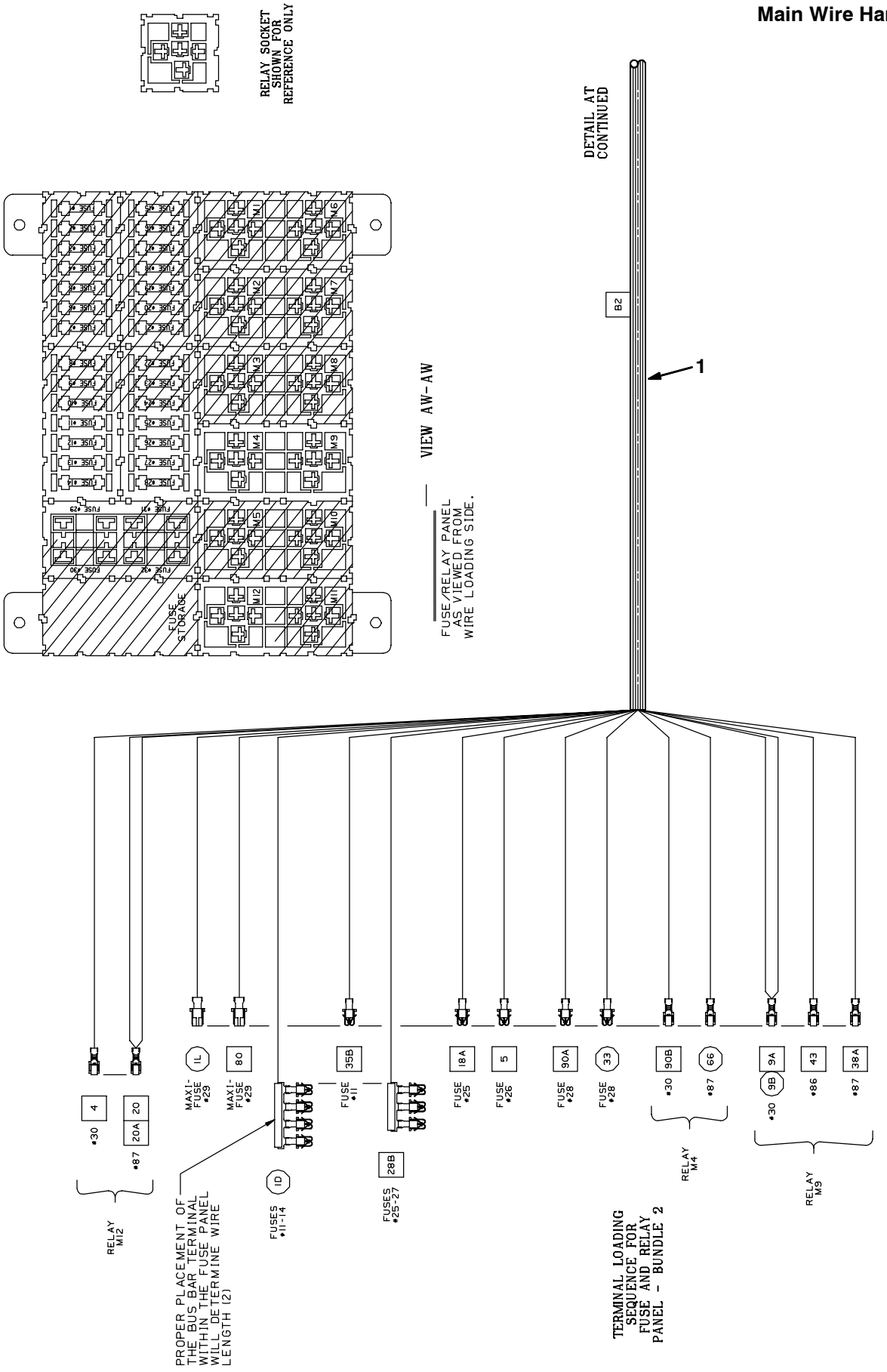
Main Wire Harness



Sentinel 331000 (6-03)

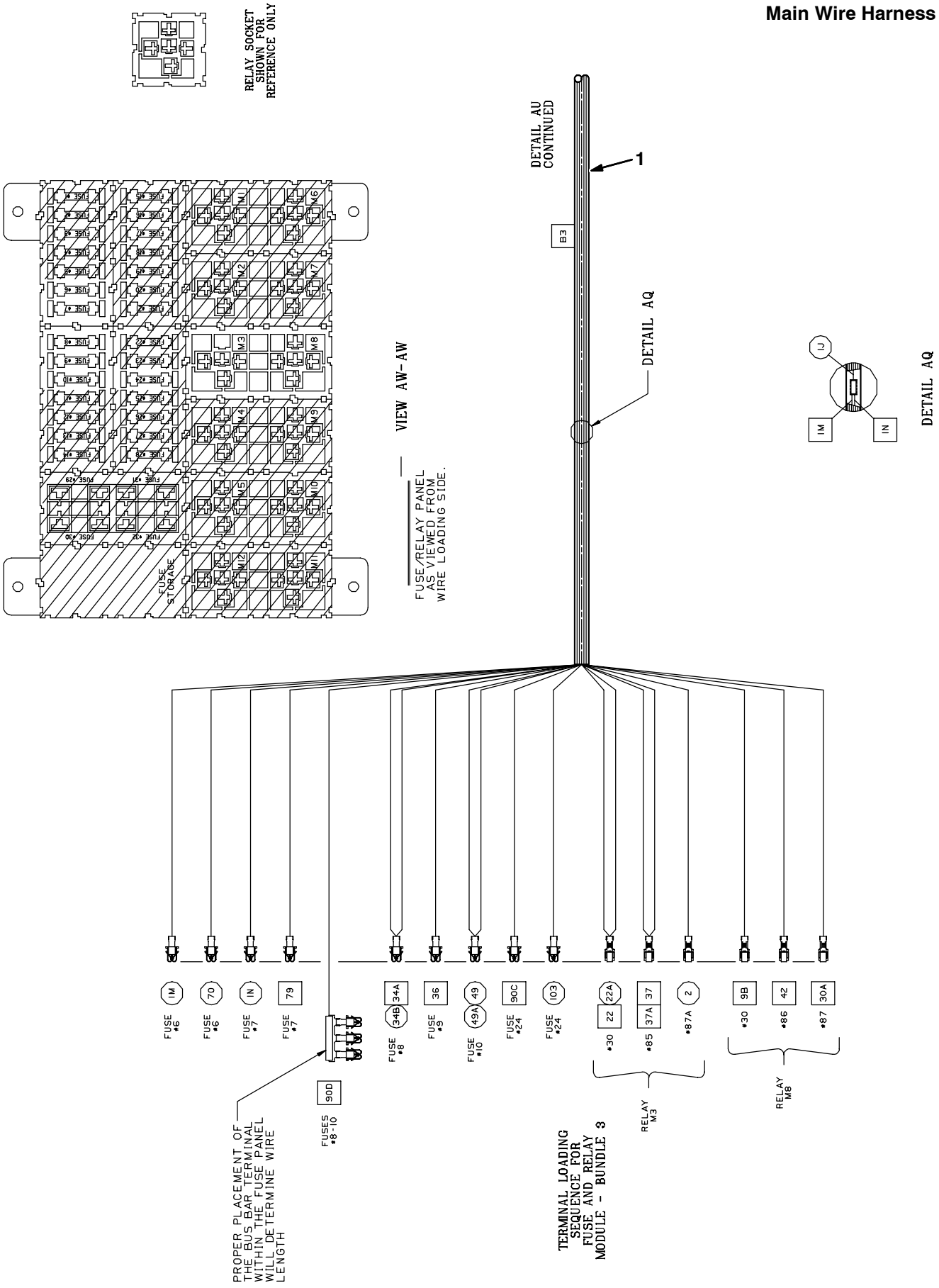
Sentinel Wiring Harness Detail (page 12 of 19)

Main Wire Harness



Sentinel Wiring Harness Detail (page 13 of 19)

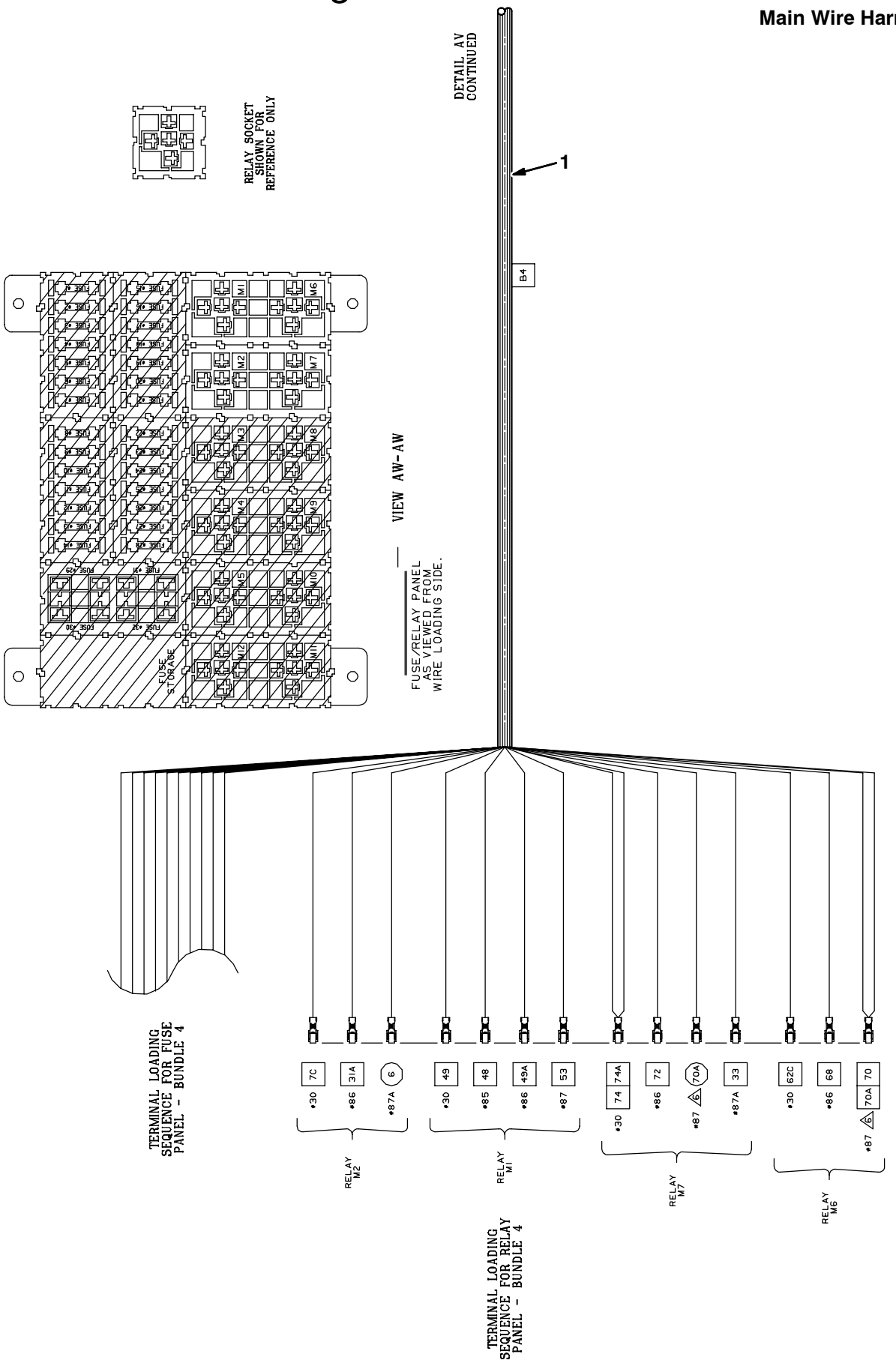
Main Wire Harness



Sentinel 331000 (6-03)

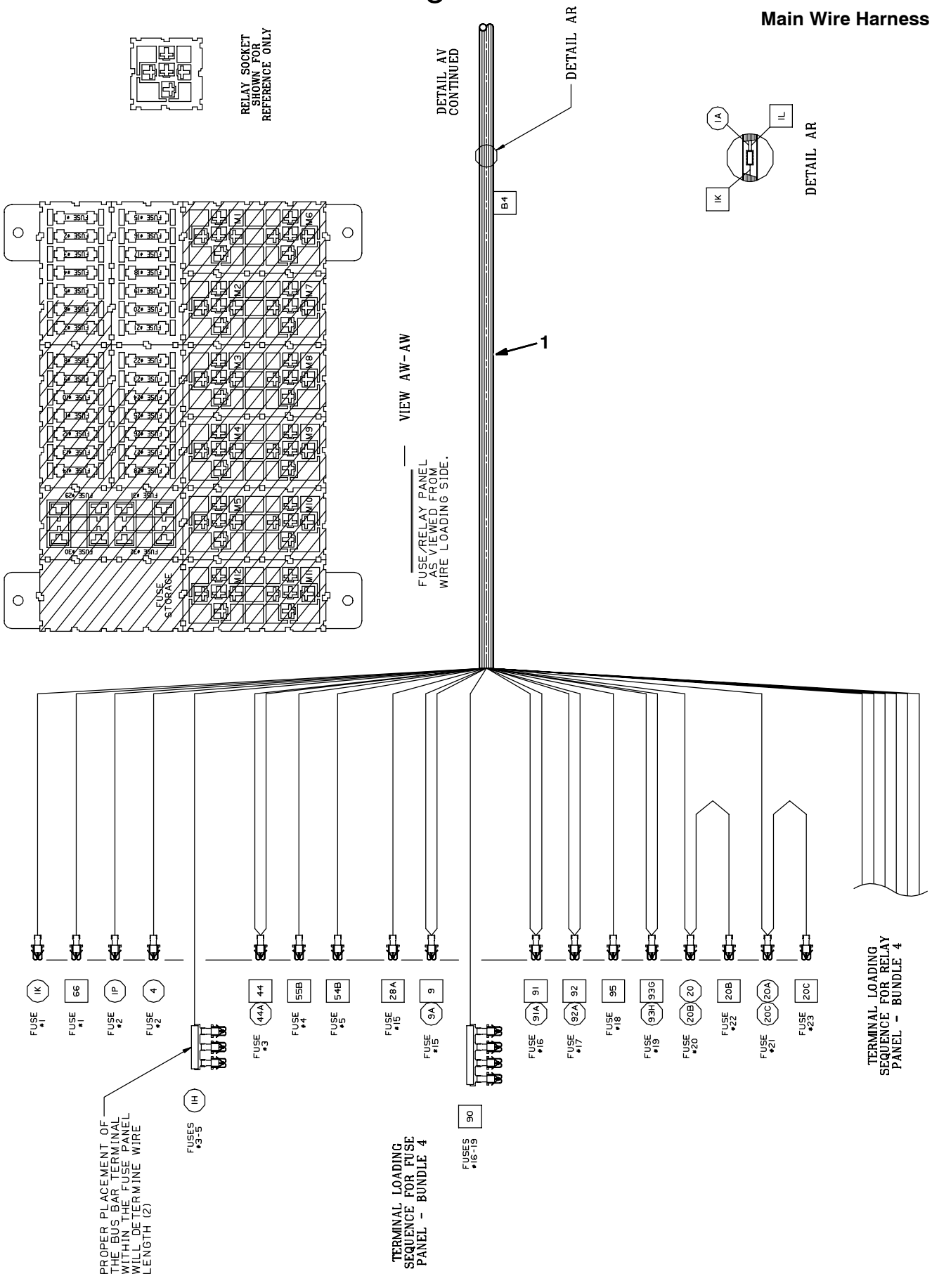
Sentinel Wiring Harness Detail (page 14 of 19)

Main Wire Harness



Sentinel Wiring Harness Detail (page 15 of 19)

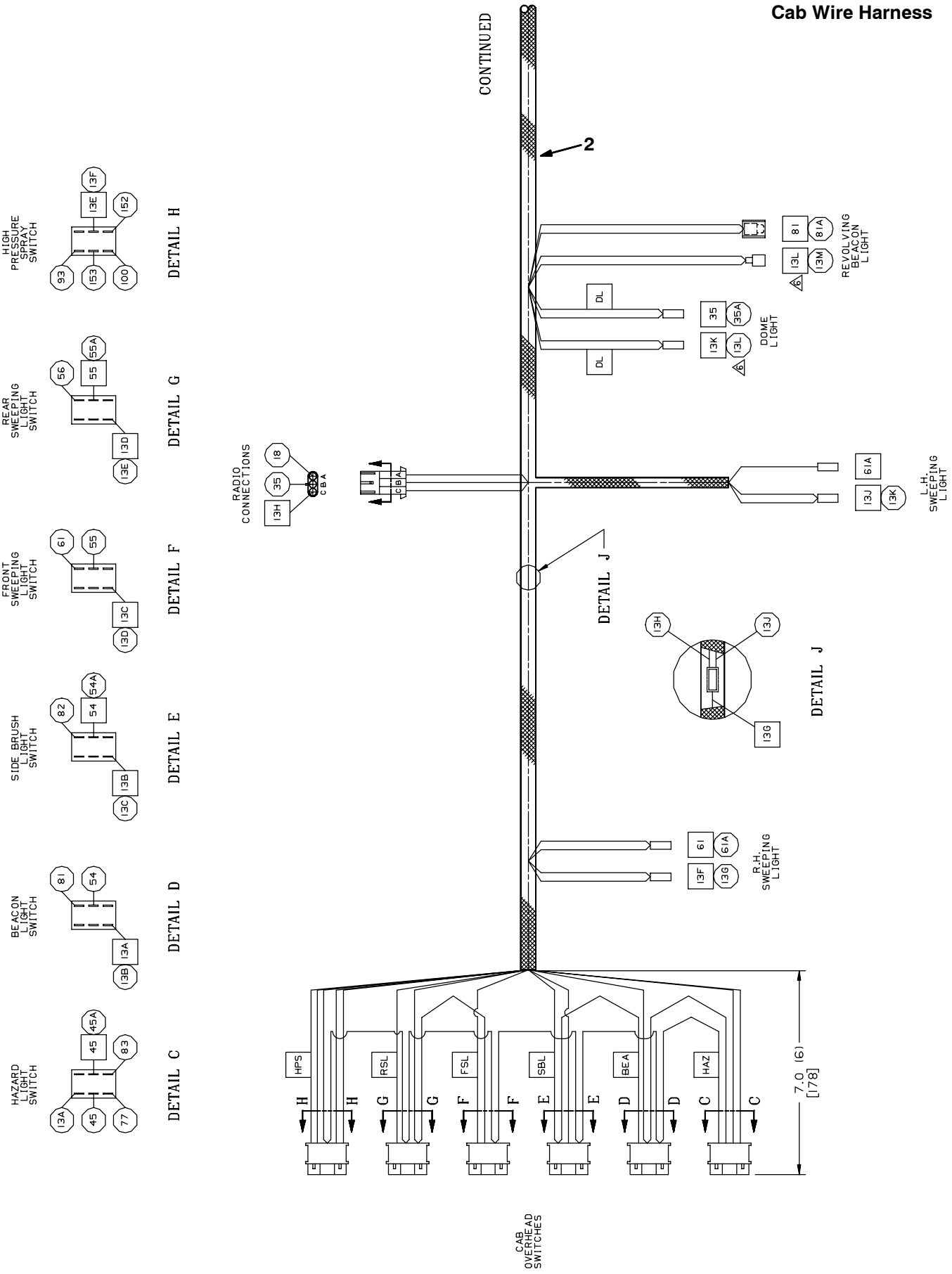
Main Wire Harness



Sentinel 331000 (6-03)

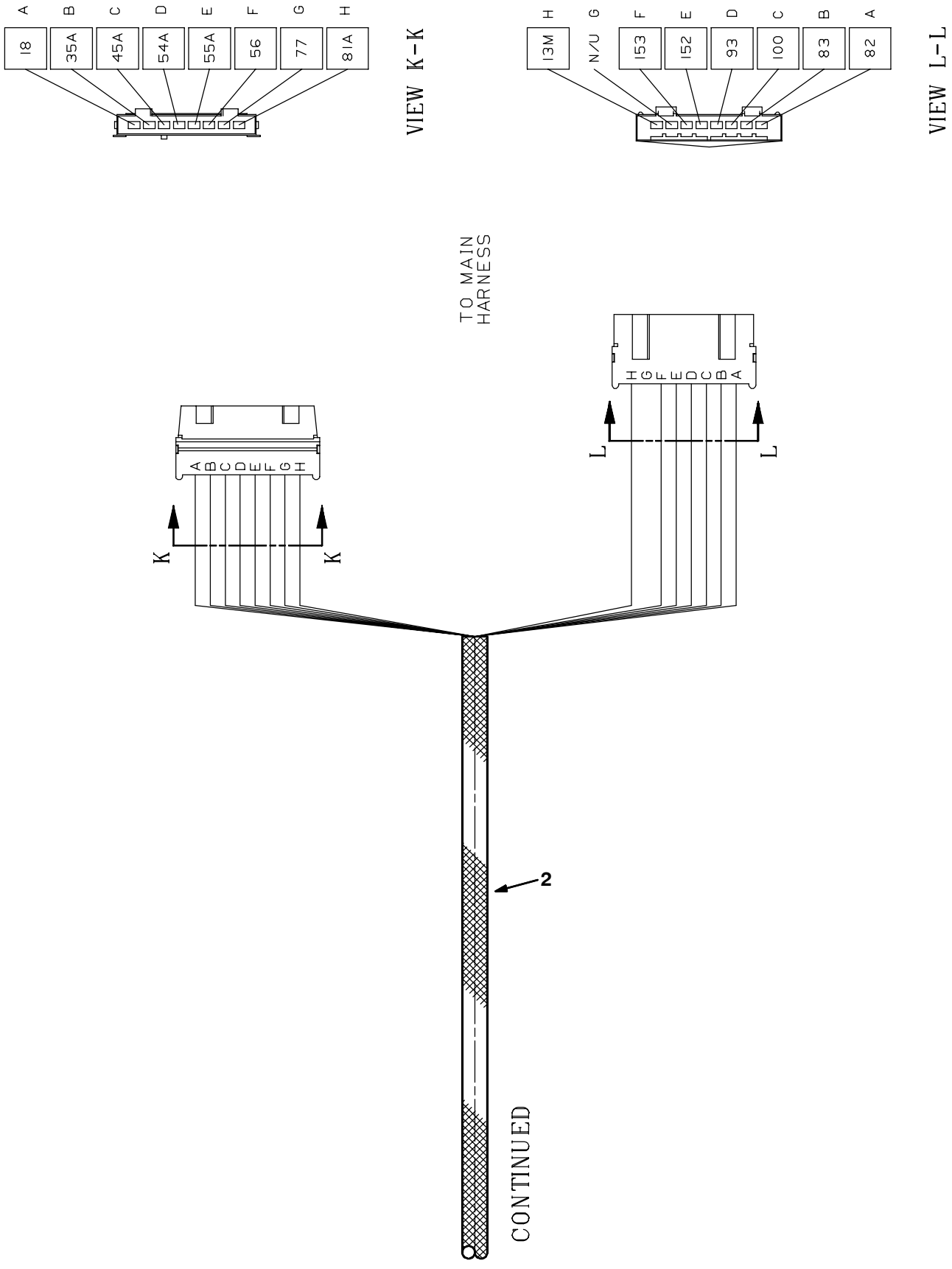
Sentinel Wiring Harness Detail (page 16 of 19)

Cab Wire Harness



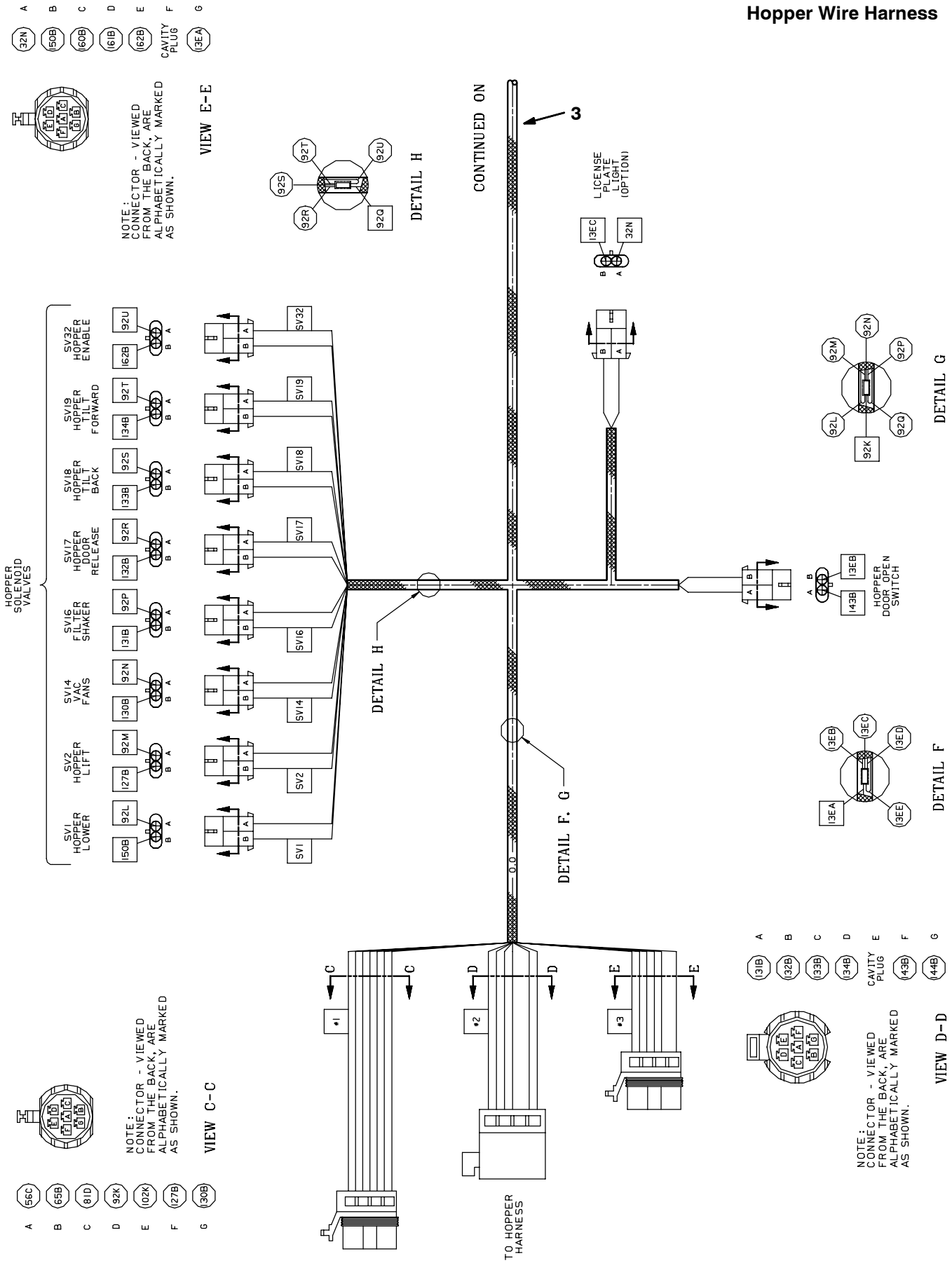
Sentinel Wiring Harness Detail (page 17 of 19)

Cab Wire Harness



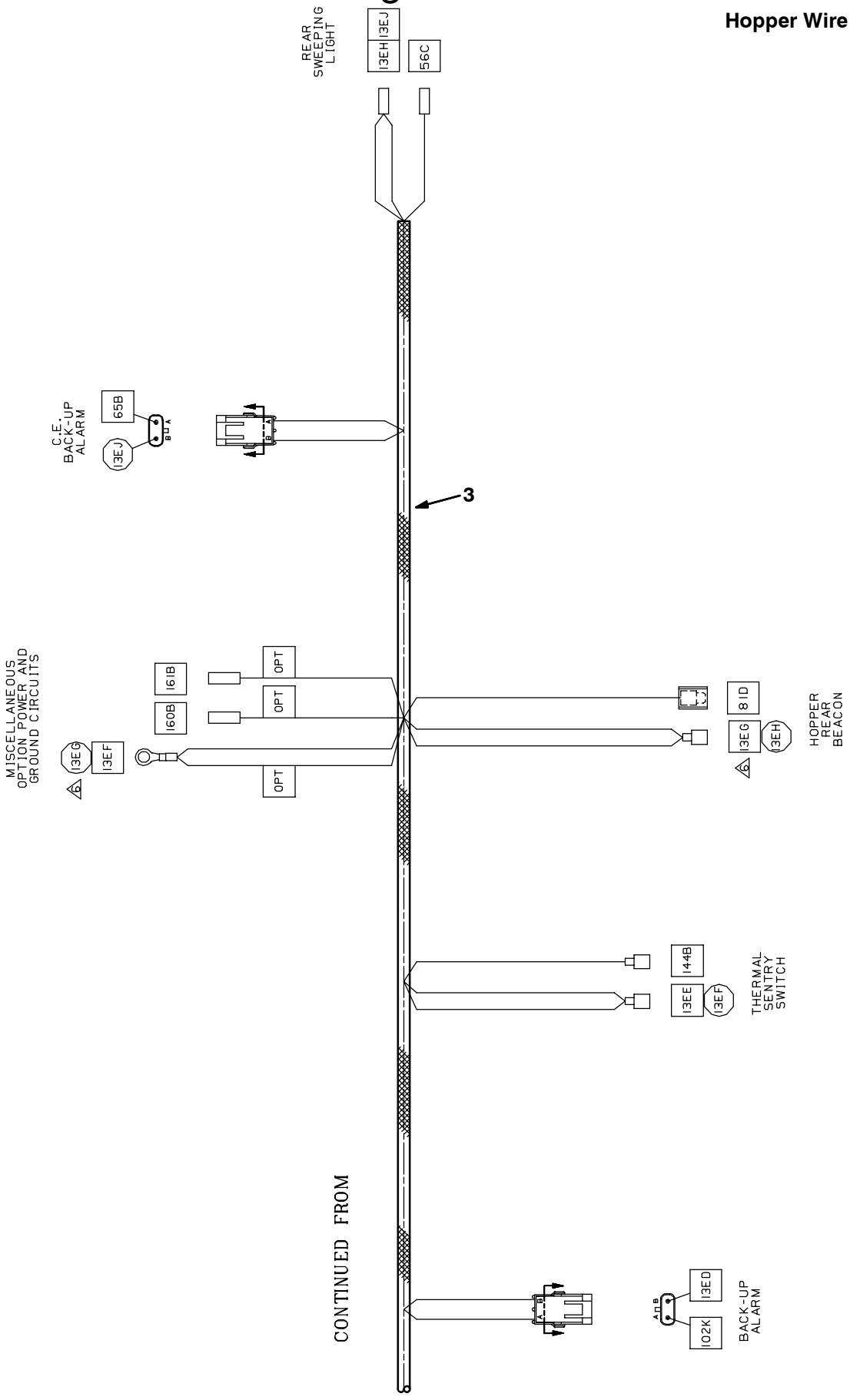
Sentinel Wiring Harness Detail (page 18 of 19)

Hopper Wire Harness



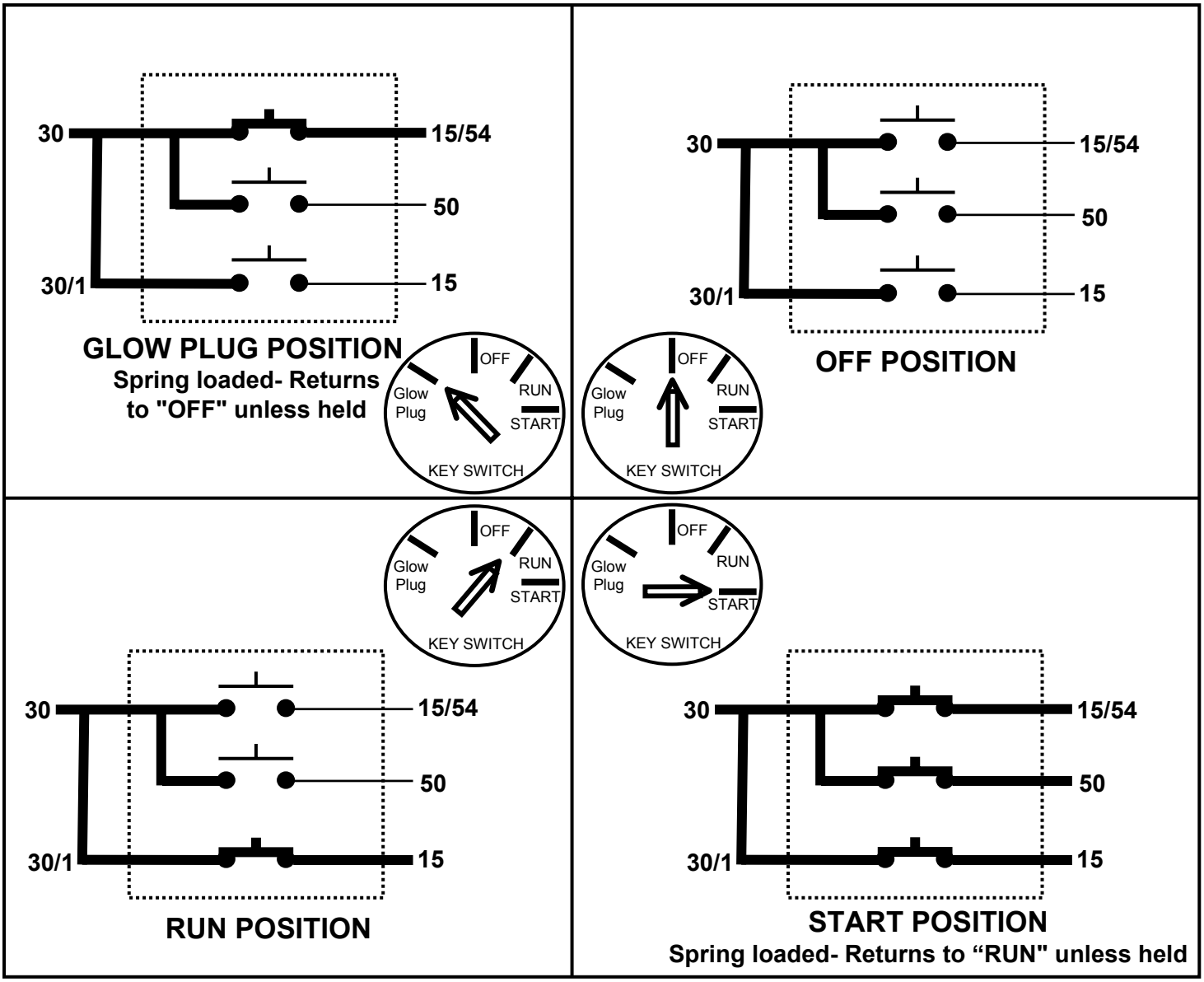
Sentinel Wiring Harness Detail (page 19 of 19)

Hopper Wire Harness



Sentinel 331000 (6-03)

Sentinel Key Switch

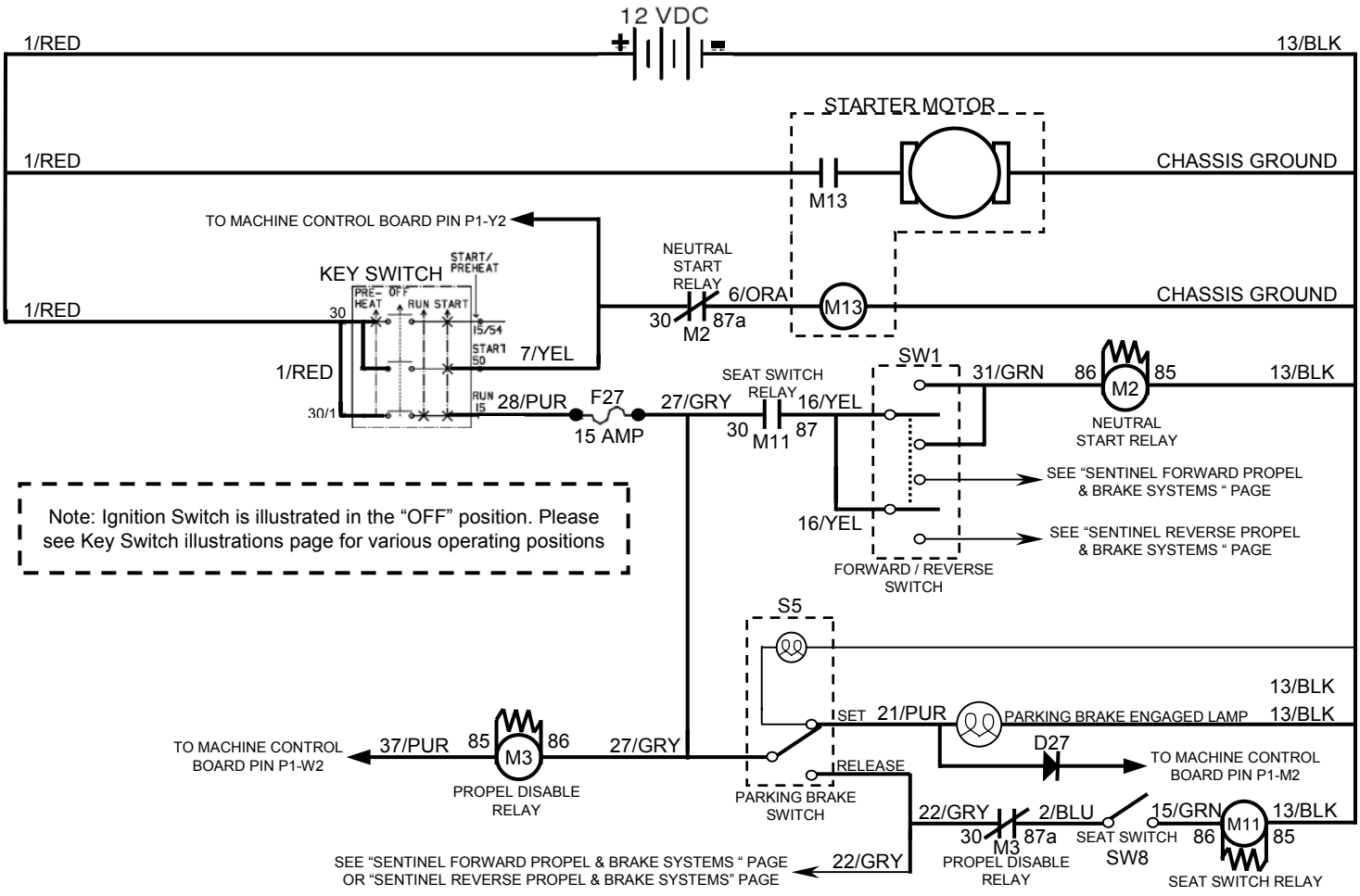


KEY SWITCH POSITION	SWITCH TERMINAL MARKING: 30, 30/1	15/54	50	15
GLOW PLUG	●	●		
OFF	NO CONNECTIONS			
RUN	●			●
START	●	●	●	●

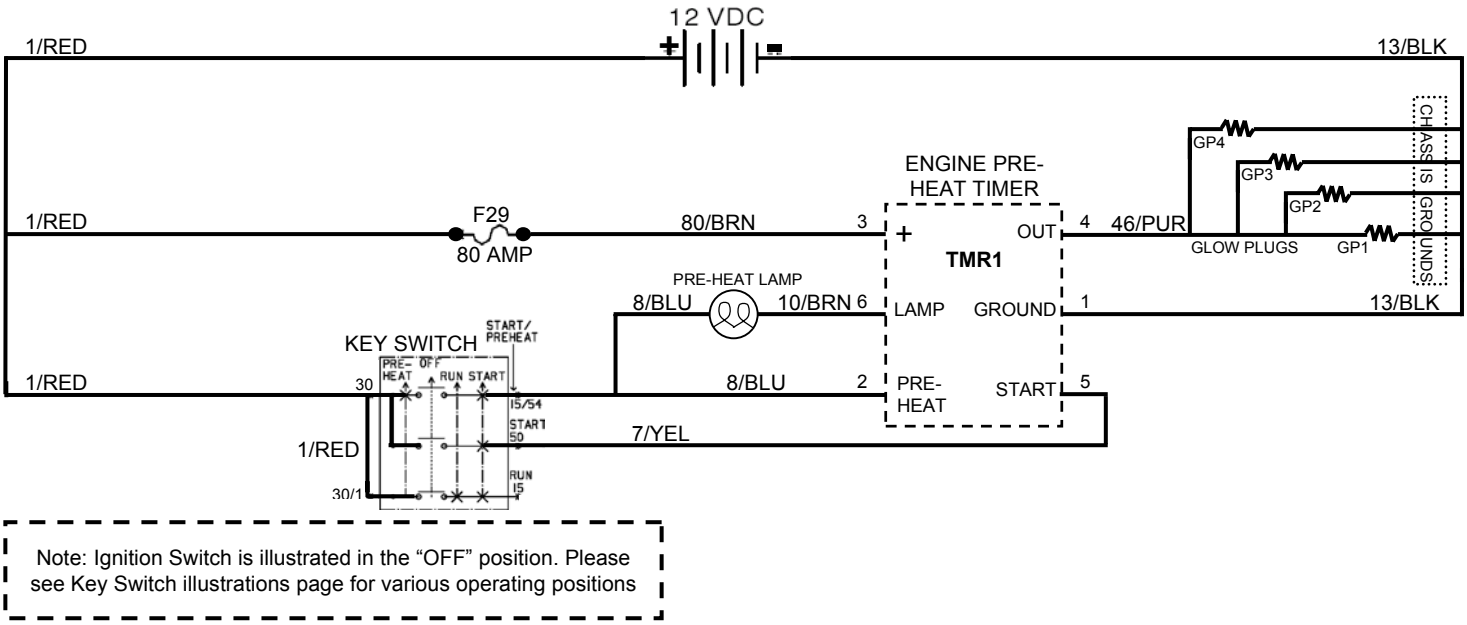
“●—●“ Indicates a common connection

NOTE: Common connections in various switch positions should be less than 1Ω

Sentinel Starting System

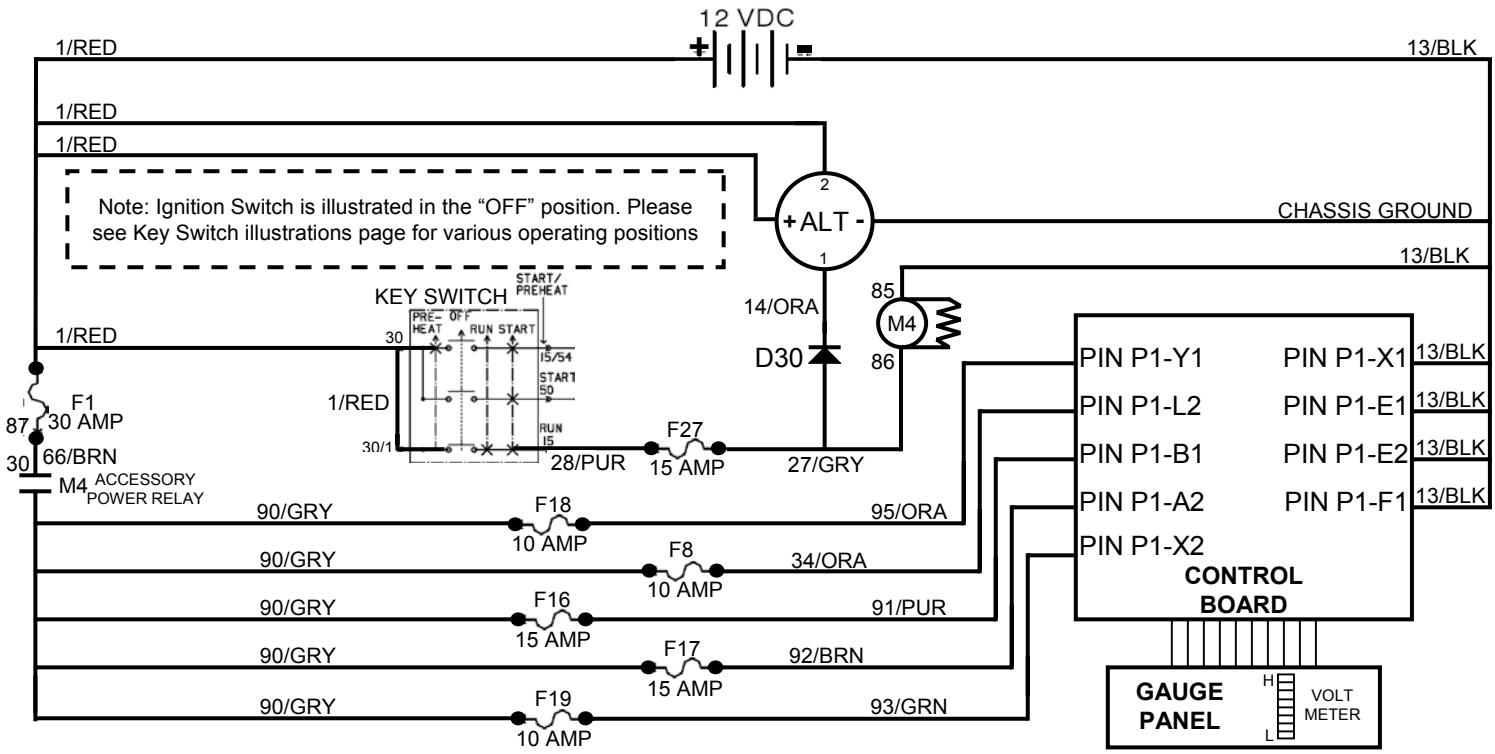


Sentinel Glow Plugs System



Note: Ignition Switch is illustrated in the “OFF” position. Please see Key Switch illustrations page for various operating positions

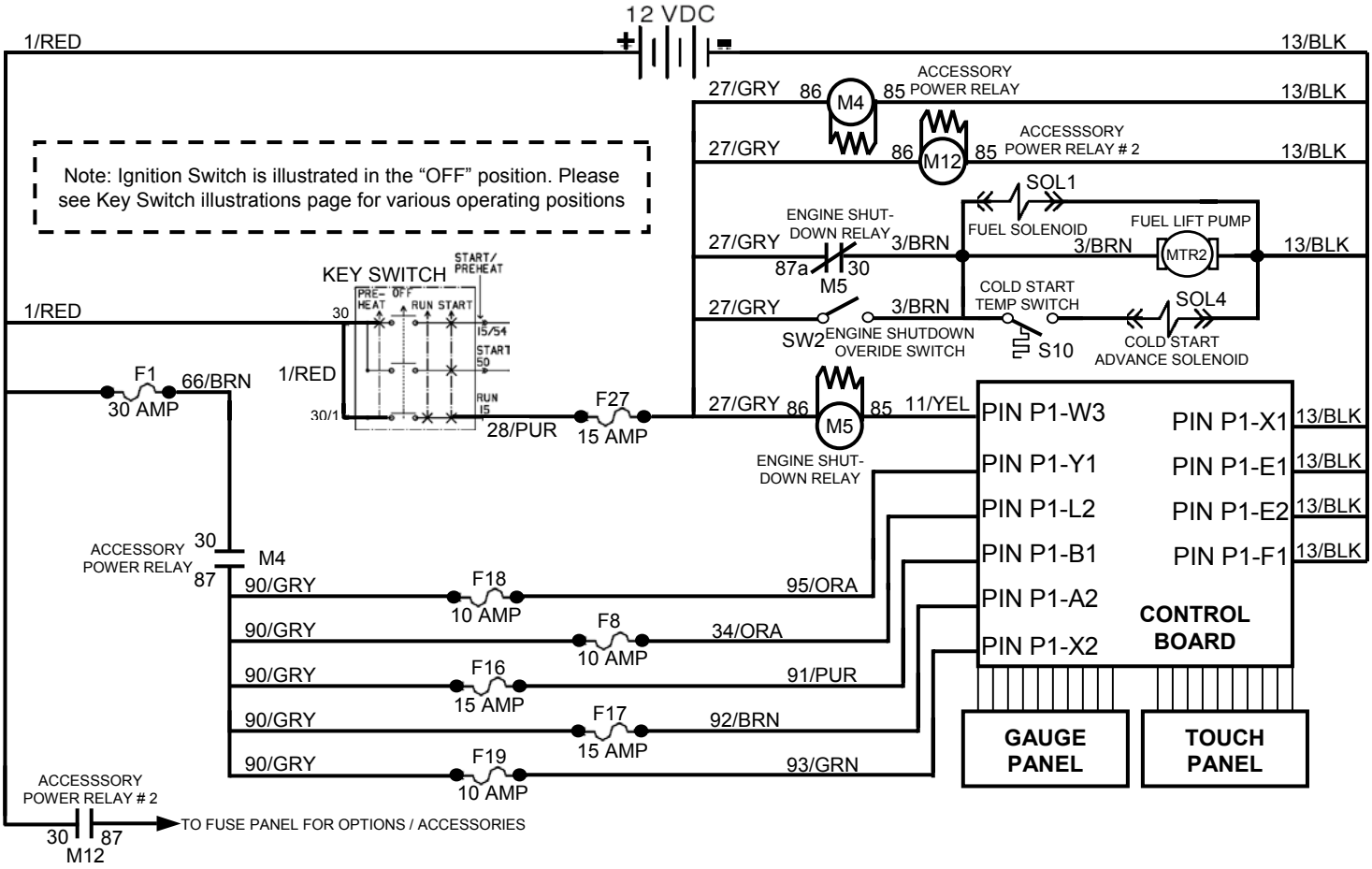
Sentinel Charging System



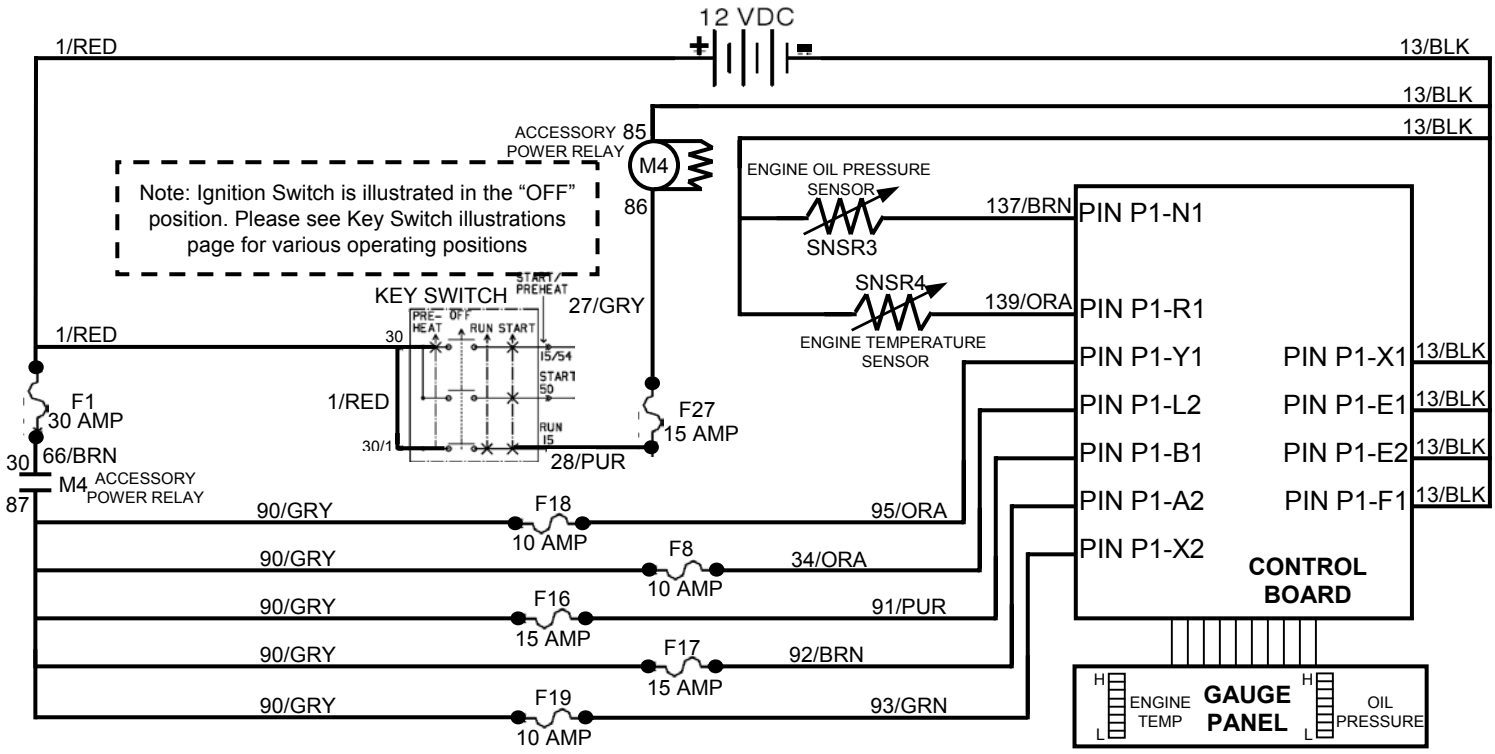
Approximate values for Volt Meter Gauge

# of LED's	status	voltage
8	flashing	15.45 V or higher
7	on	14.95 V
6	on	14.35 V
5	on	13.75 V
4	on	13.3 V
3	on	12.8V
2	on	12.2V
2	flashing	12.15 V or lower

Sentinel Power-Up & Fuel System



Sentinel Engine Oil Pressure & Temperature Sensors



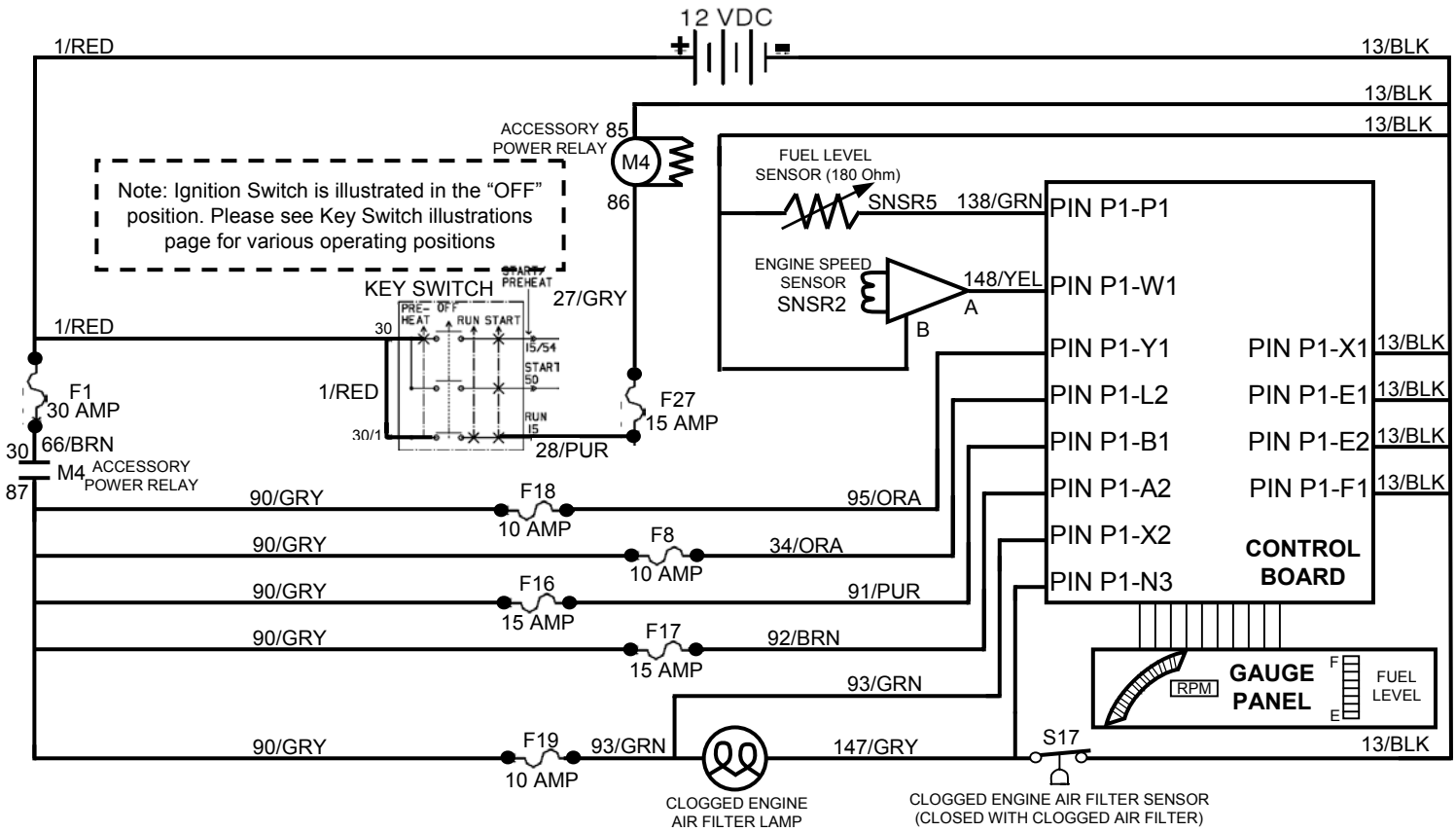
Approximate values for Temperature Gauge & Sensor

# of LED's	status	voltage @ sensor	engine temp.
8	flashing / engine shutdown	< 0.88 V	above 240°
8	flashing	0.88 V	240°
7	on	1.04 V	225°
6	on	1.19 V	215°
5	on	1.35 V	205°
4	on	1.51 V	195°
3	on	1.82 V	180°
2	on	2.31 V	160°
1	on	3.35 V	140°
0	all LED's off	> 3.35 V	below 140°

Approximate values for Oil Pressure Gauge

# of LED's	status	engine oil pressure
8	on	107 psi
7	on	82 psi
6	on	52 psi
5	on	41 psi
4	on	28 psi
3	on	16 psi
2	flashing	below 16 psi
2	flashing / engine shutdown	below 5 psi

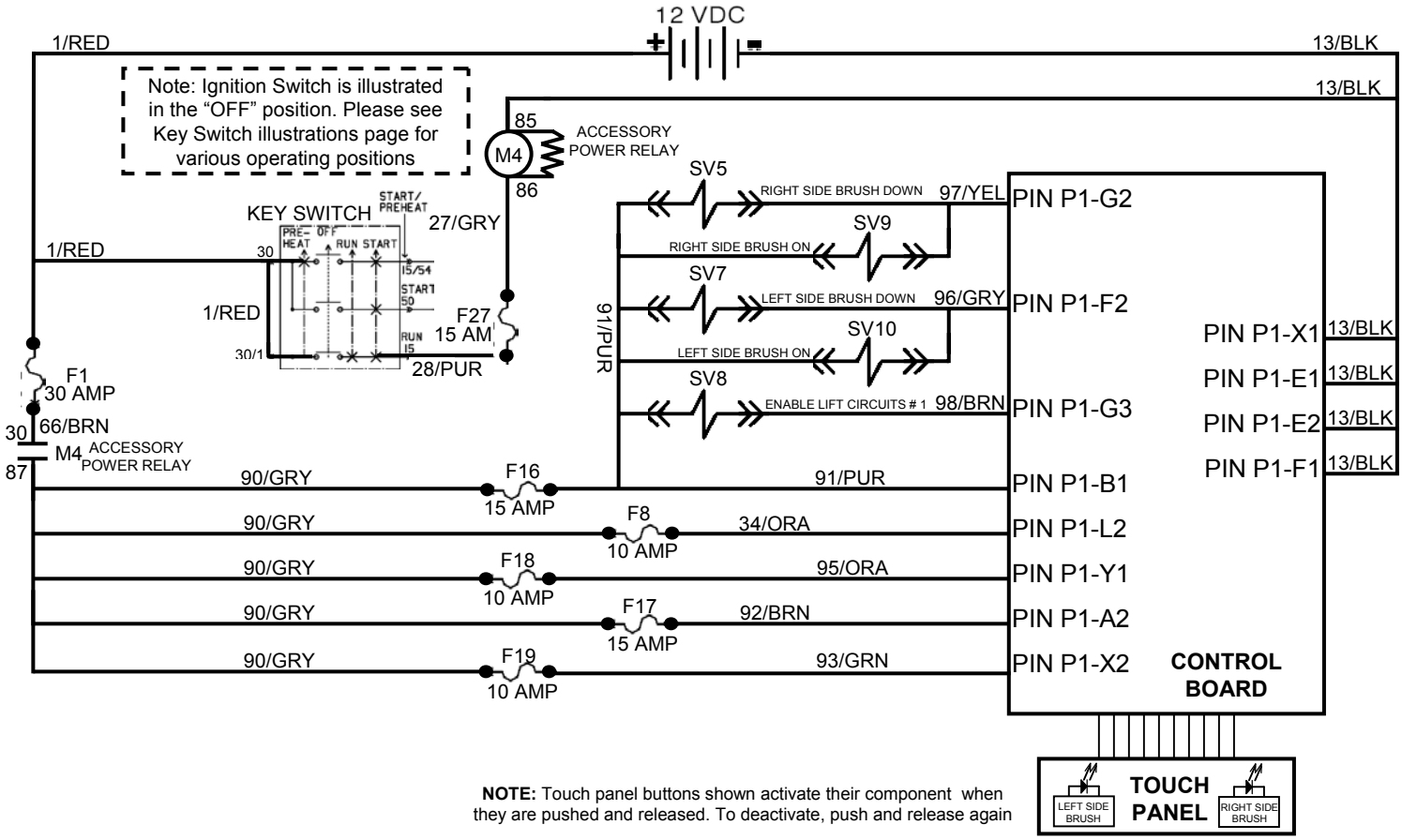
Sentinel Engine Air Filter, Speed & Fuel Level Sensors



Approximate values for Fuel Level Gauge & Sensor

# of LED's	status	resistance	fuel level
8	on	180 ohms	full
7	on	100 ohms to	between
6	on	180 ohms	half & full
5	on	80 ohms to	half
4	on	100 ohms	
3	on	0 ohms to	between
2	on	80 ohms	empty & half
1	flashing	0 ohms	empty

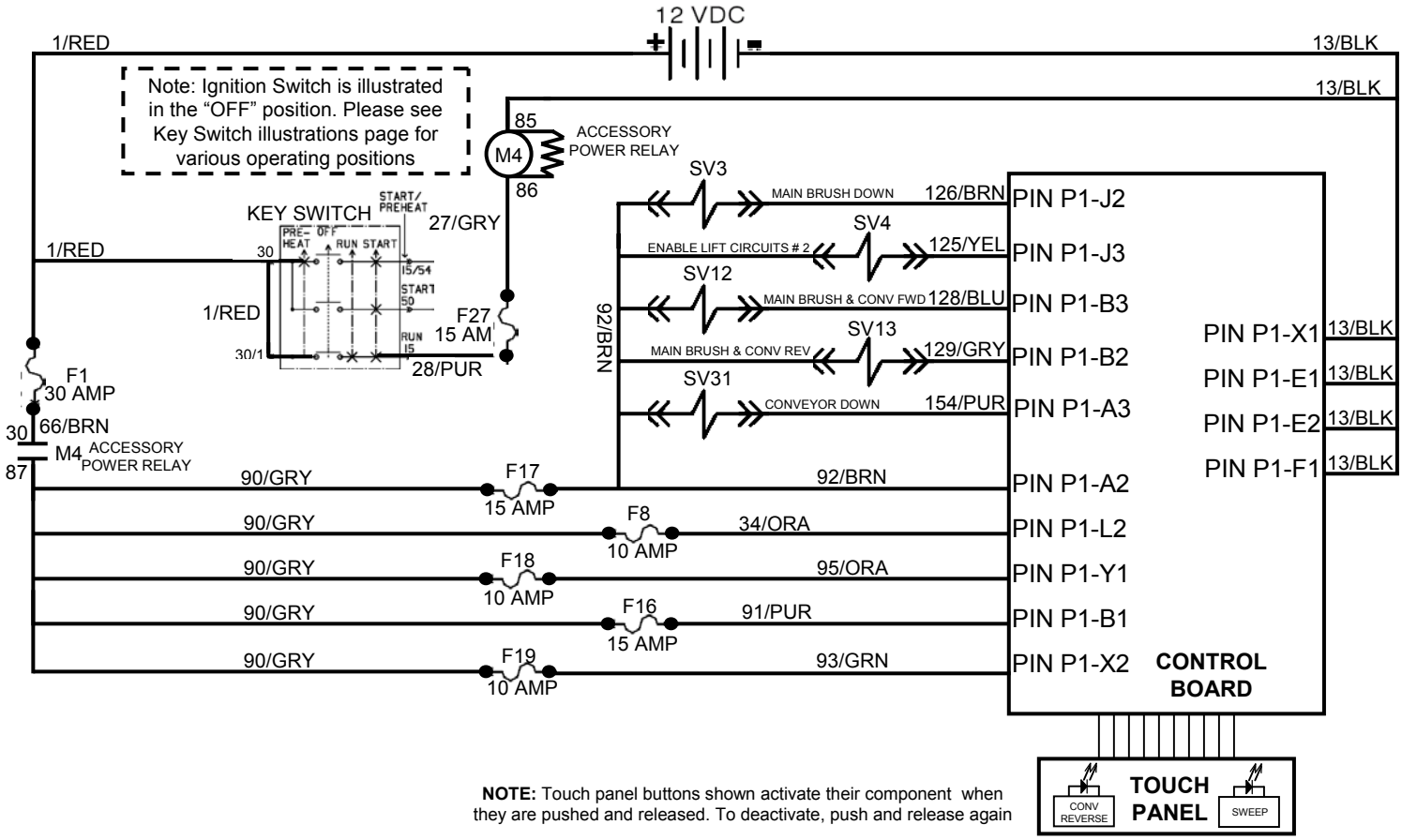
Sentinel Right & Left Brush Systems



NOTE: Touch panel buttons shown activate their component when they are pushed and released. To deactivate, push and release again

NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

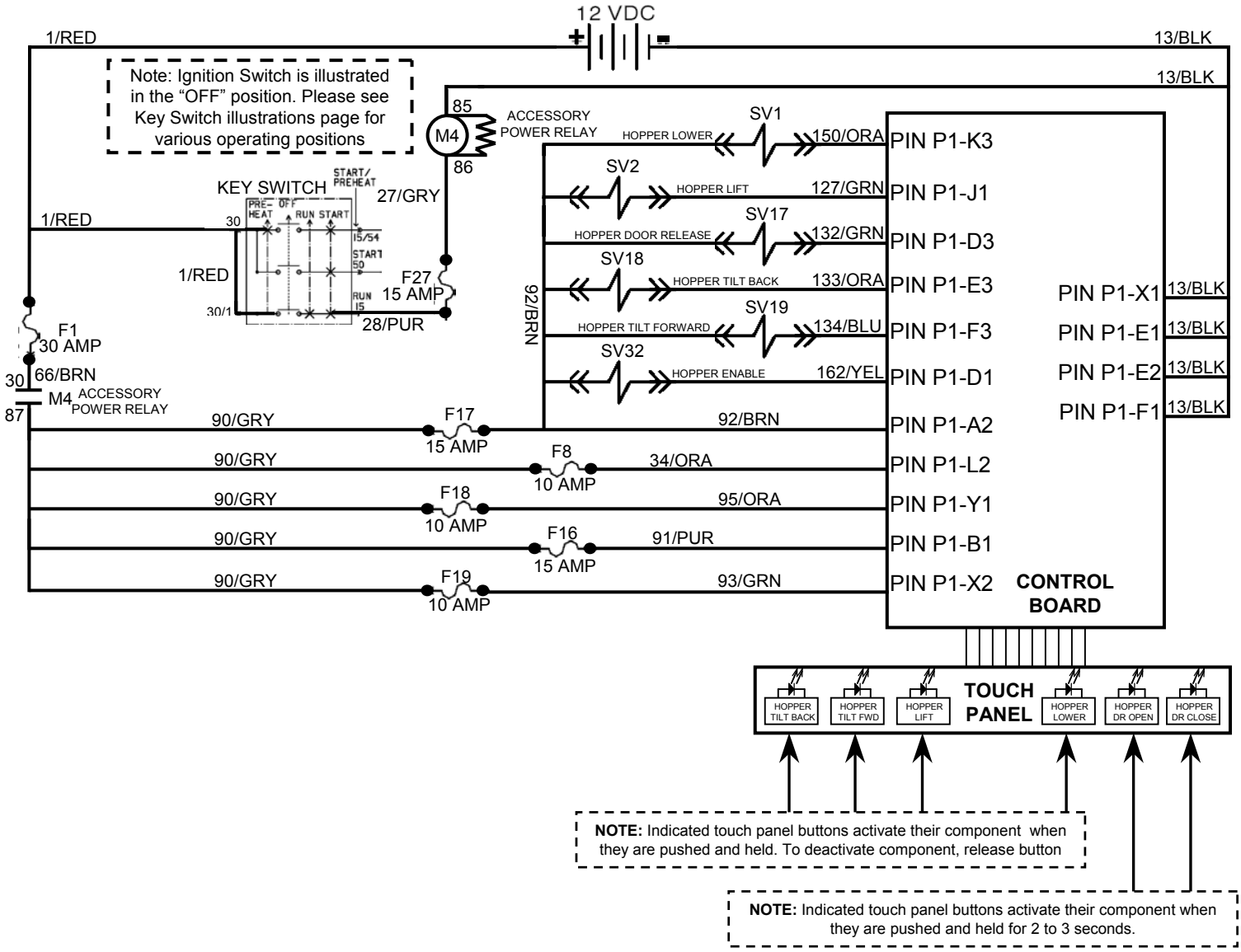
Sentinel Main Brush & Conveyor Systems



NOTE: Touch panel buttons shown activate their component when they are pushed and released. To deactivate, push and release again

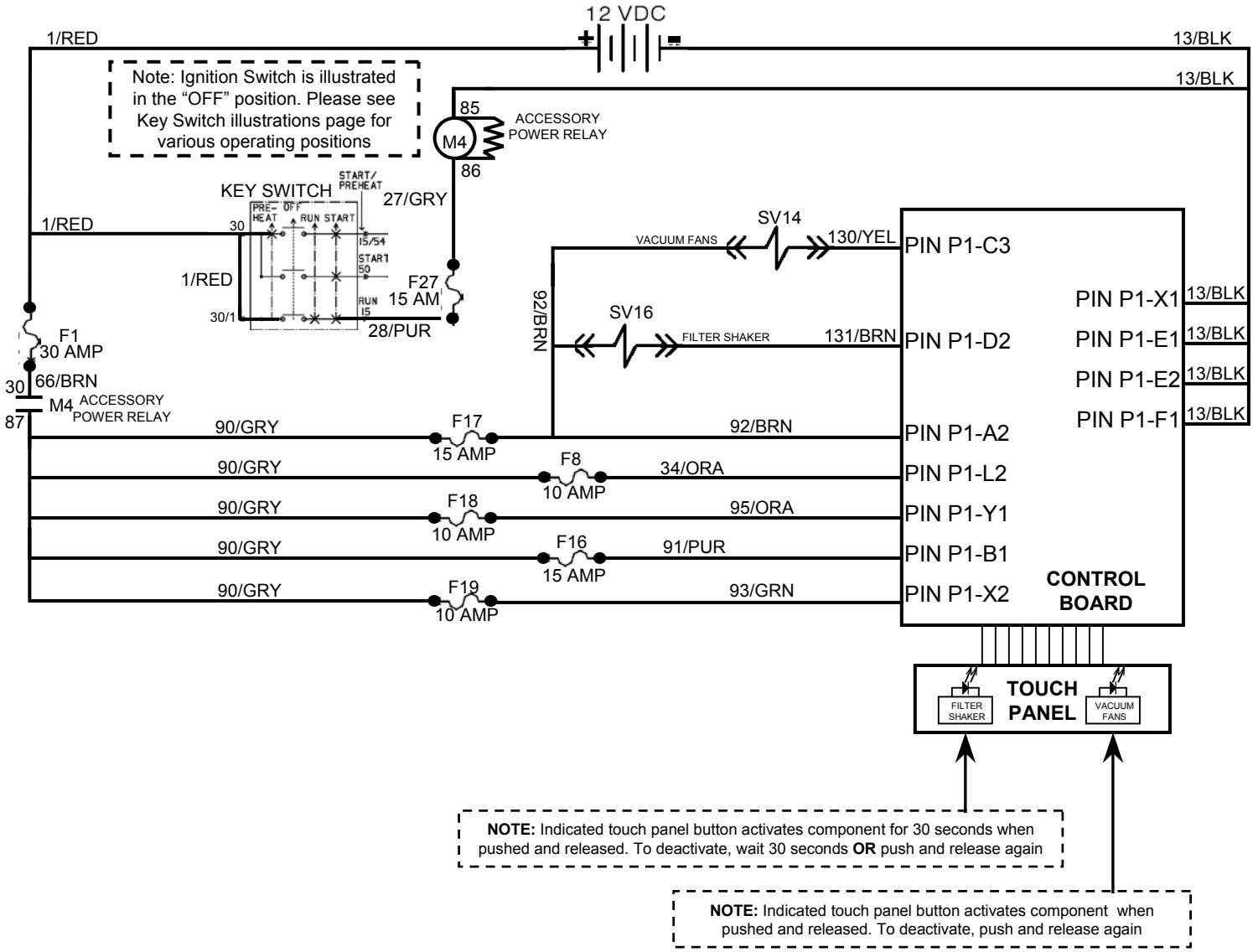
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Hopper System



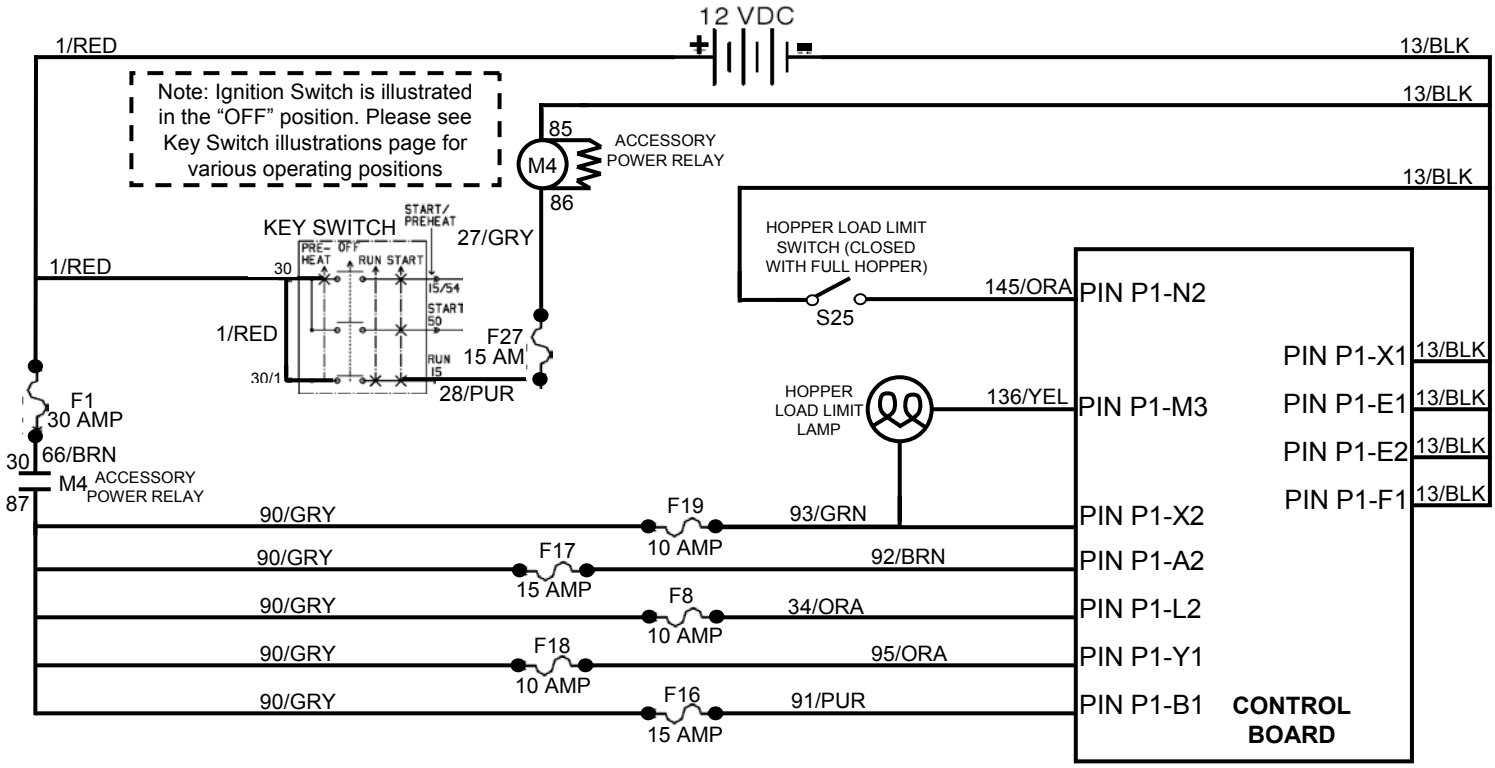
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Vacuum Fan & Filter Shaker Systems



NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Hopper Full Sensing System



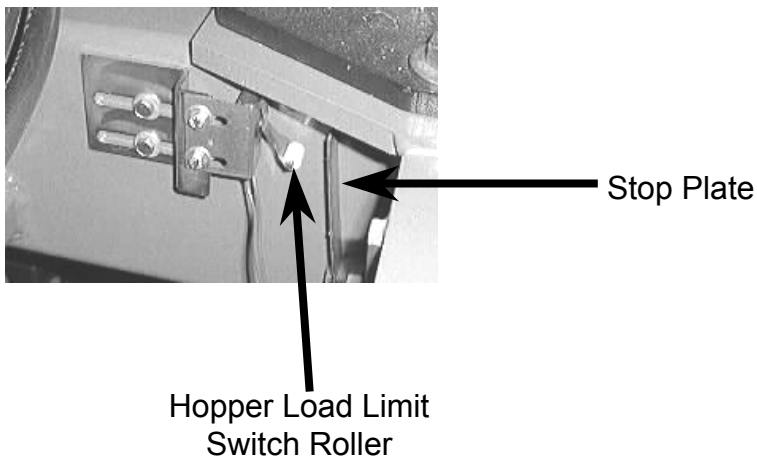
TO ADJUST HOPPER LOAD LIMIT SWITCH:

LOW DUMP

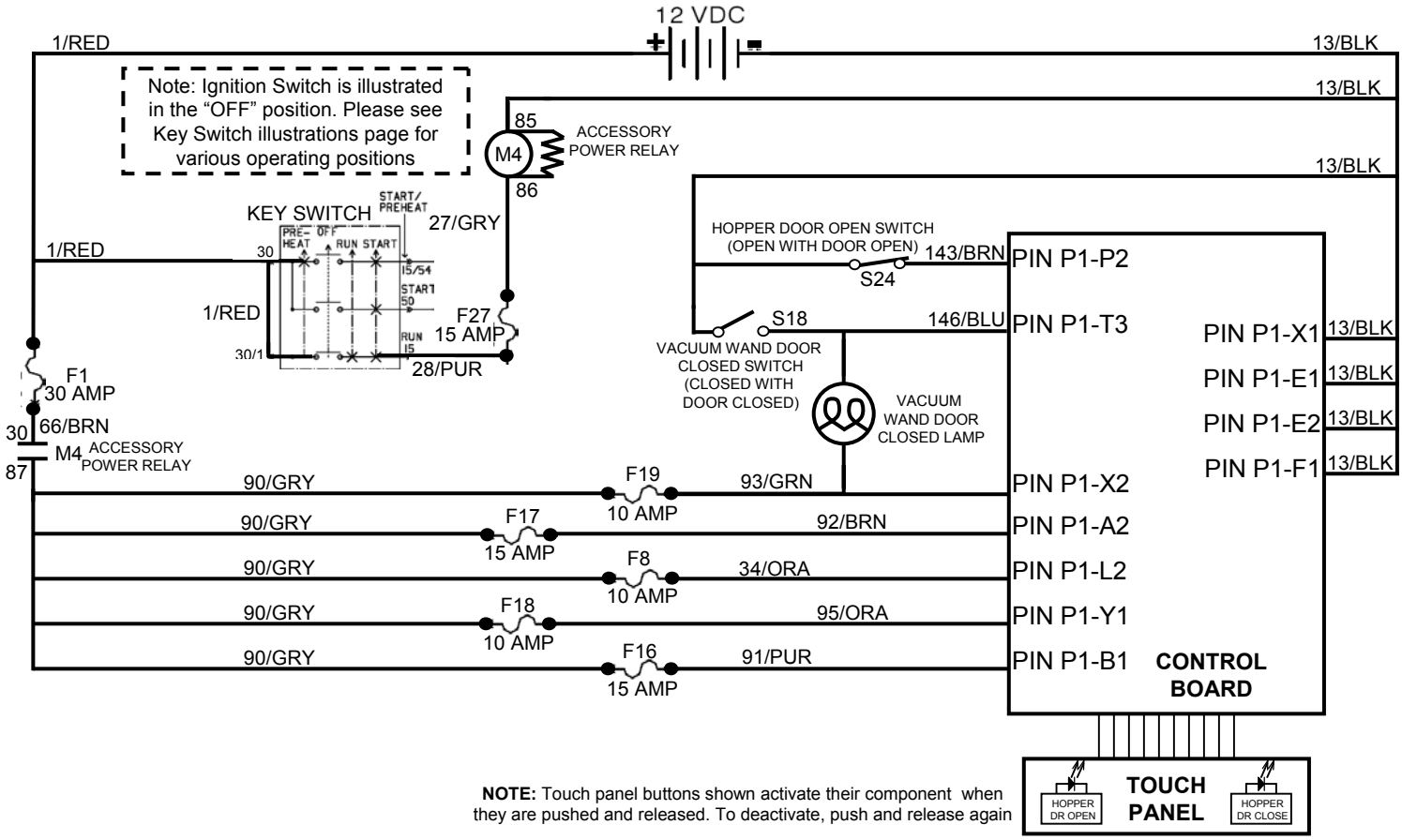
Set hopper load limit switch to 1/2" (12.5 mm) from roller to stop plate

HIGH DUMP

Set hopper load limit switch to 7/16" (11 mm) from roller to stop plate

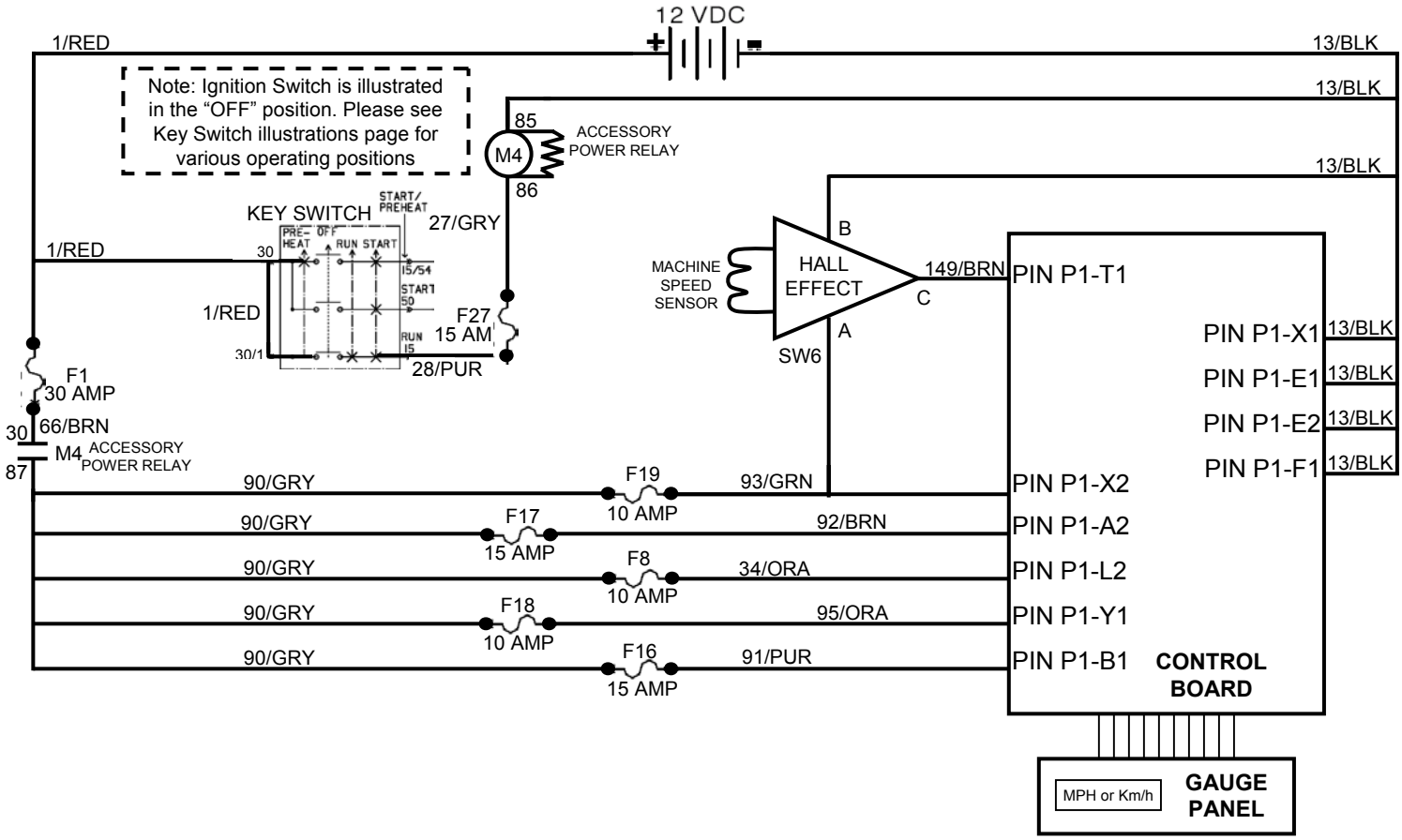


Sentinel Hopper Door & Vacuum Wand Door Sensing Systems

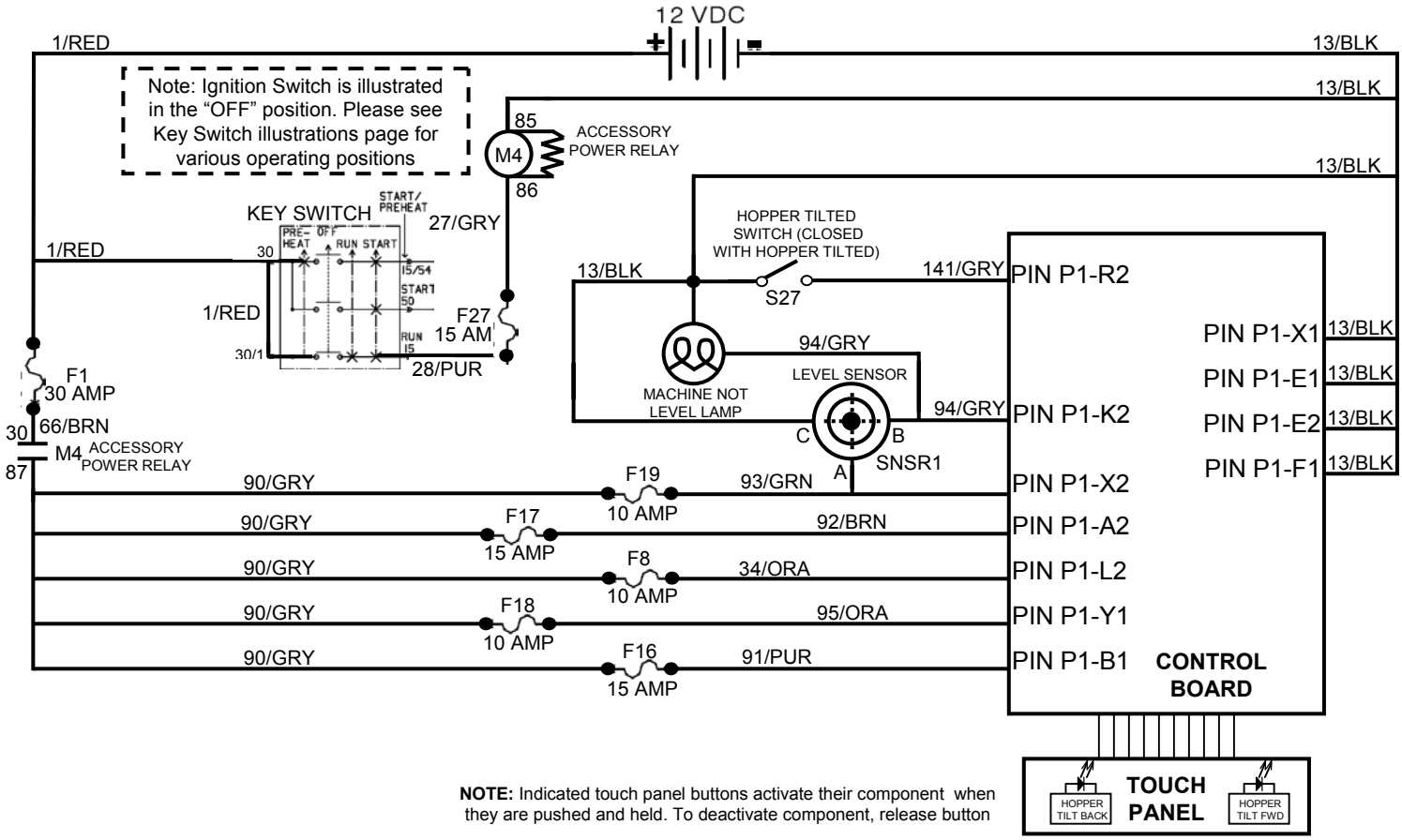


NOTE: Touch panel buttons shown activate their component when they are pushed and released. To deactivate, push and release again

Sentinel Machine Speed Sensing System

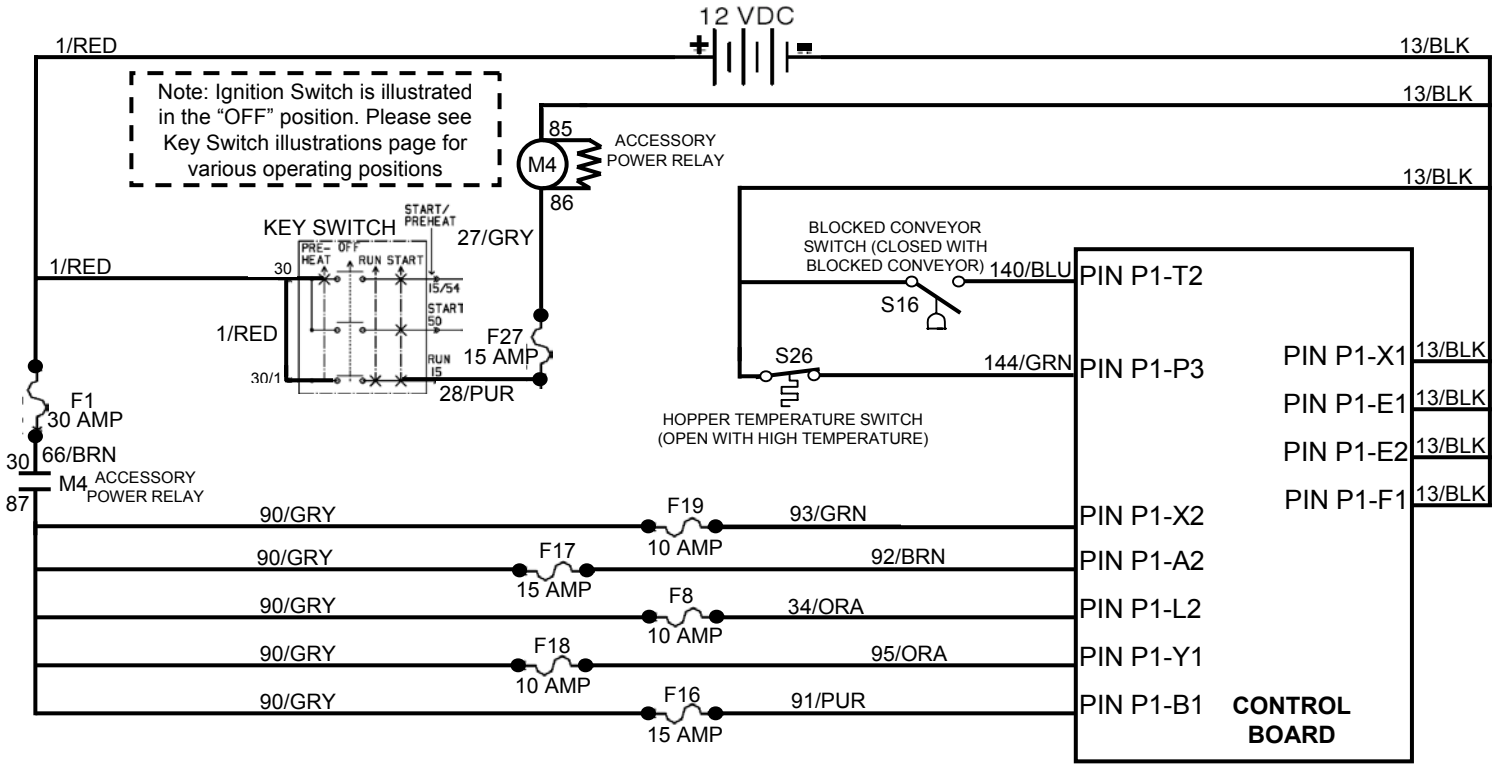


Sentinel Level & Hopper Tilt Sensing Systems

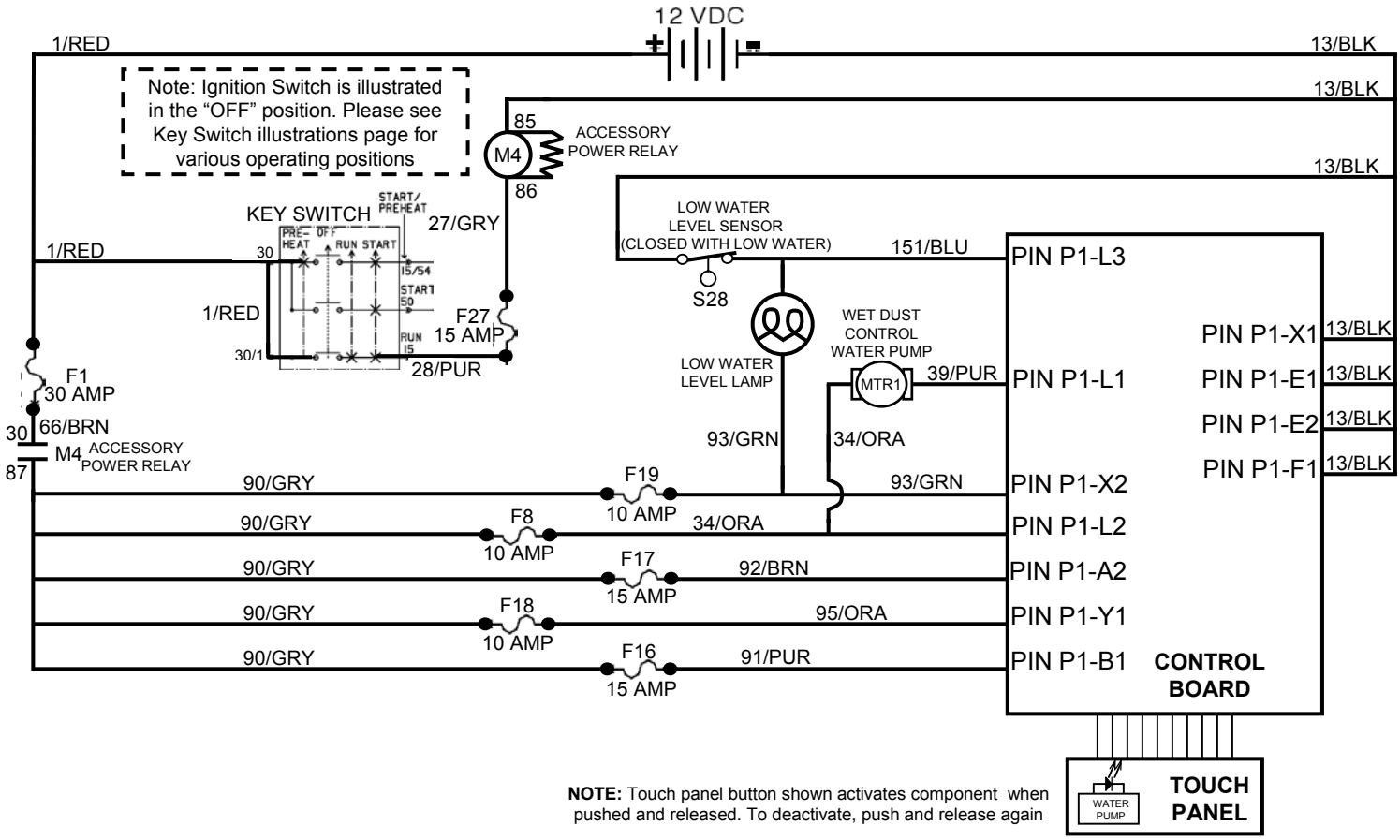


NOTE: Indicated touch panel buttons activate their component when they are pushed and held. To deactivate component, release button

Sentinel Blocked Conveyor & Hopper Temp. Sensing Systems

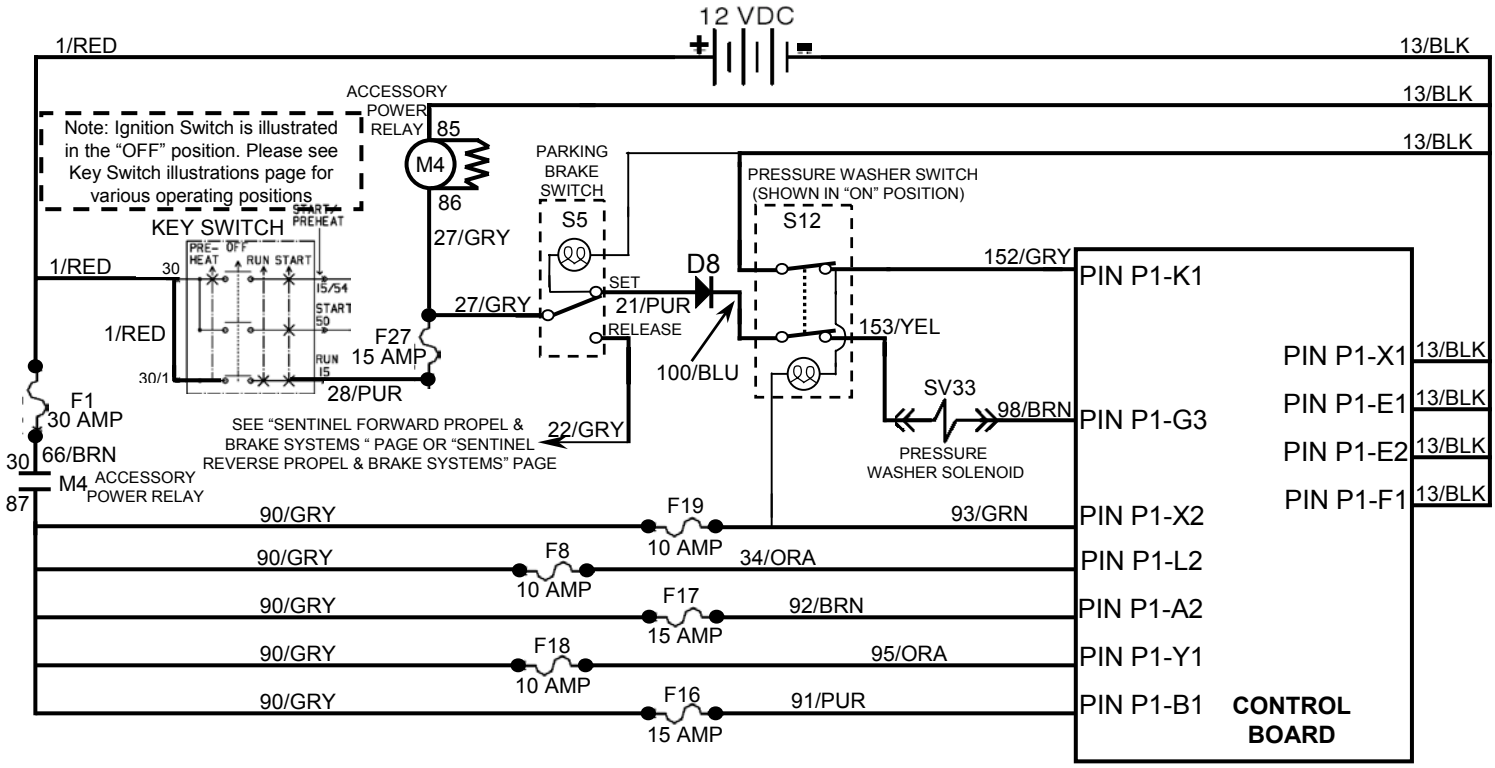


Sentinel Wet Dust Control System



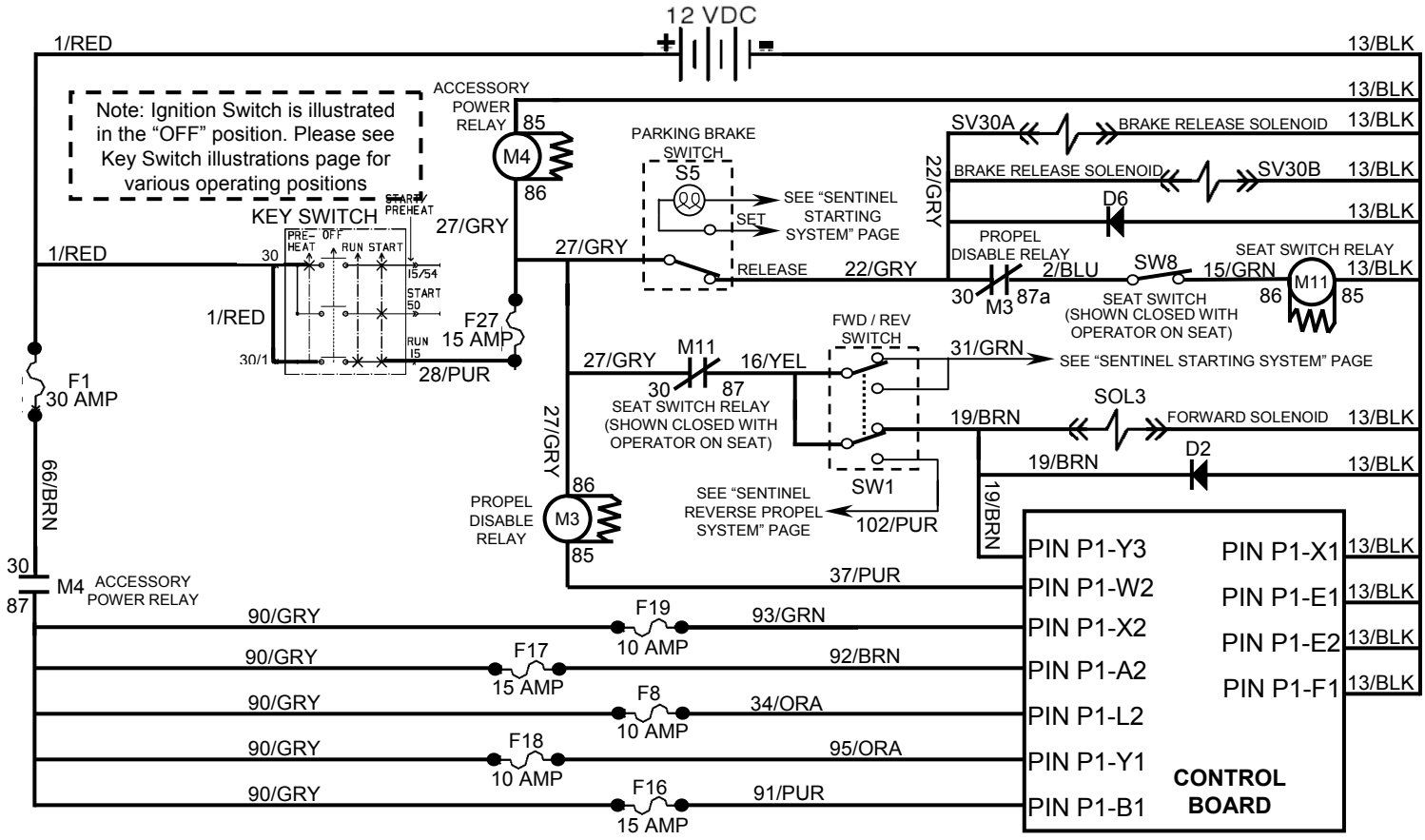
NOTE: Touch panel button shown activates component when pushed and released. To deactivate, push and release again

Sentinel Pressure Washer System



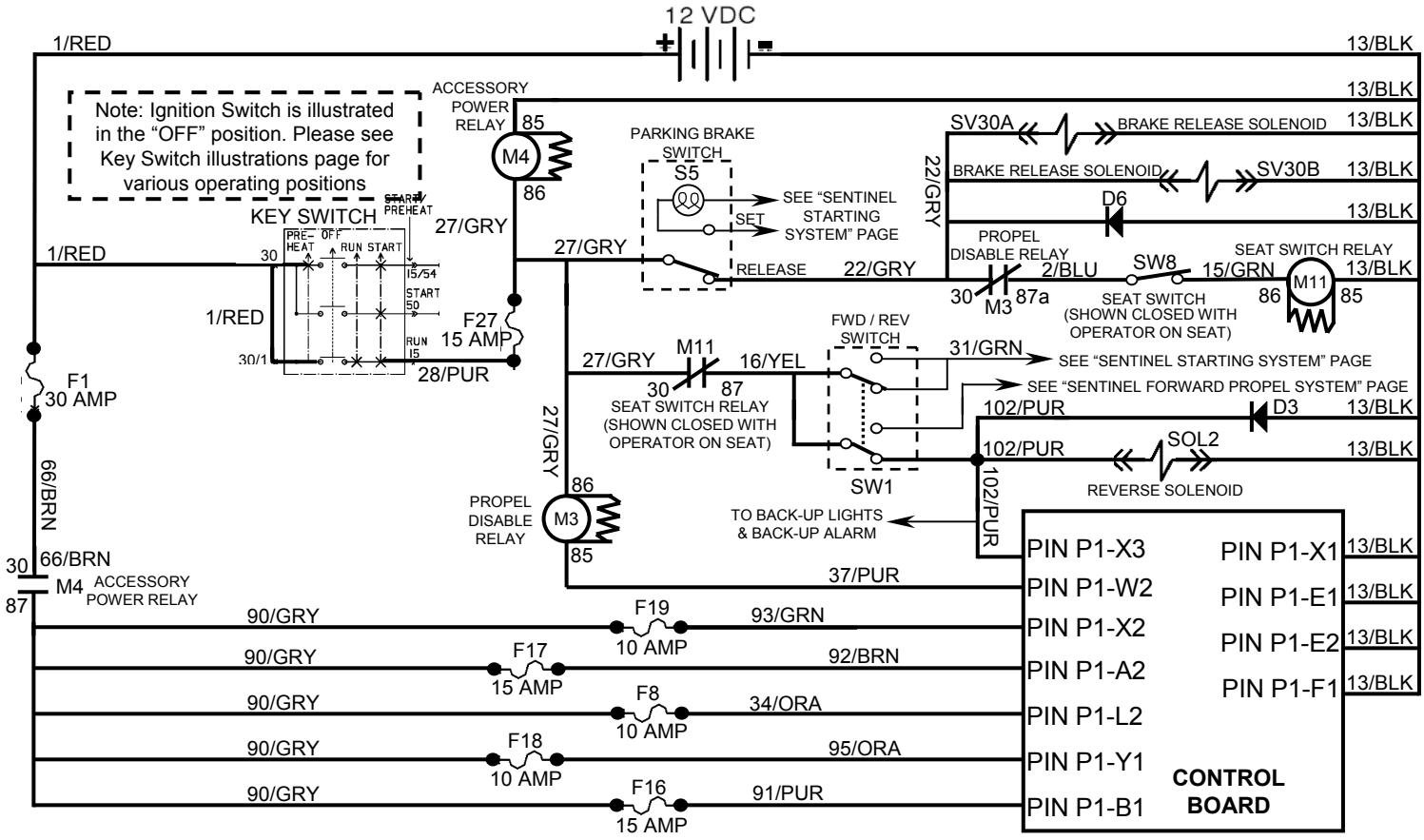
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Forward Propel & Brake Systems



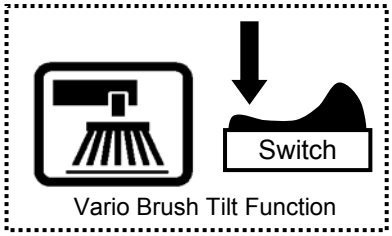
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

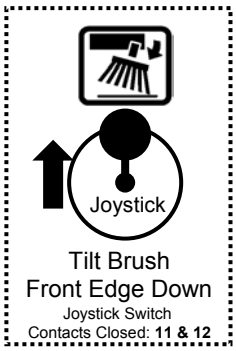
Sentinel Reverse Propel & Brake Systems

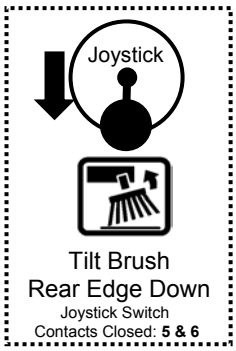


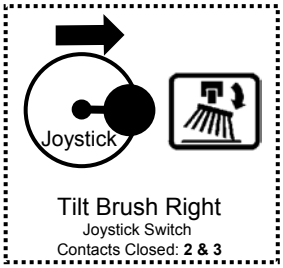
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

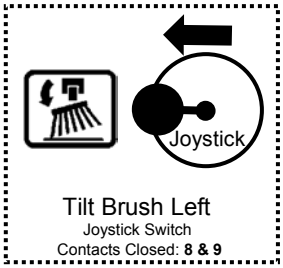
Sentinel Vario Brush Tilt System

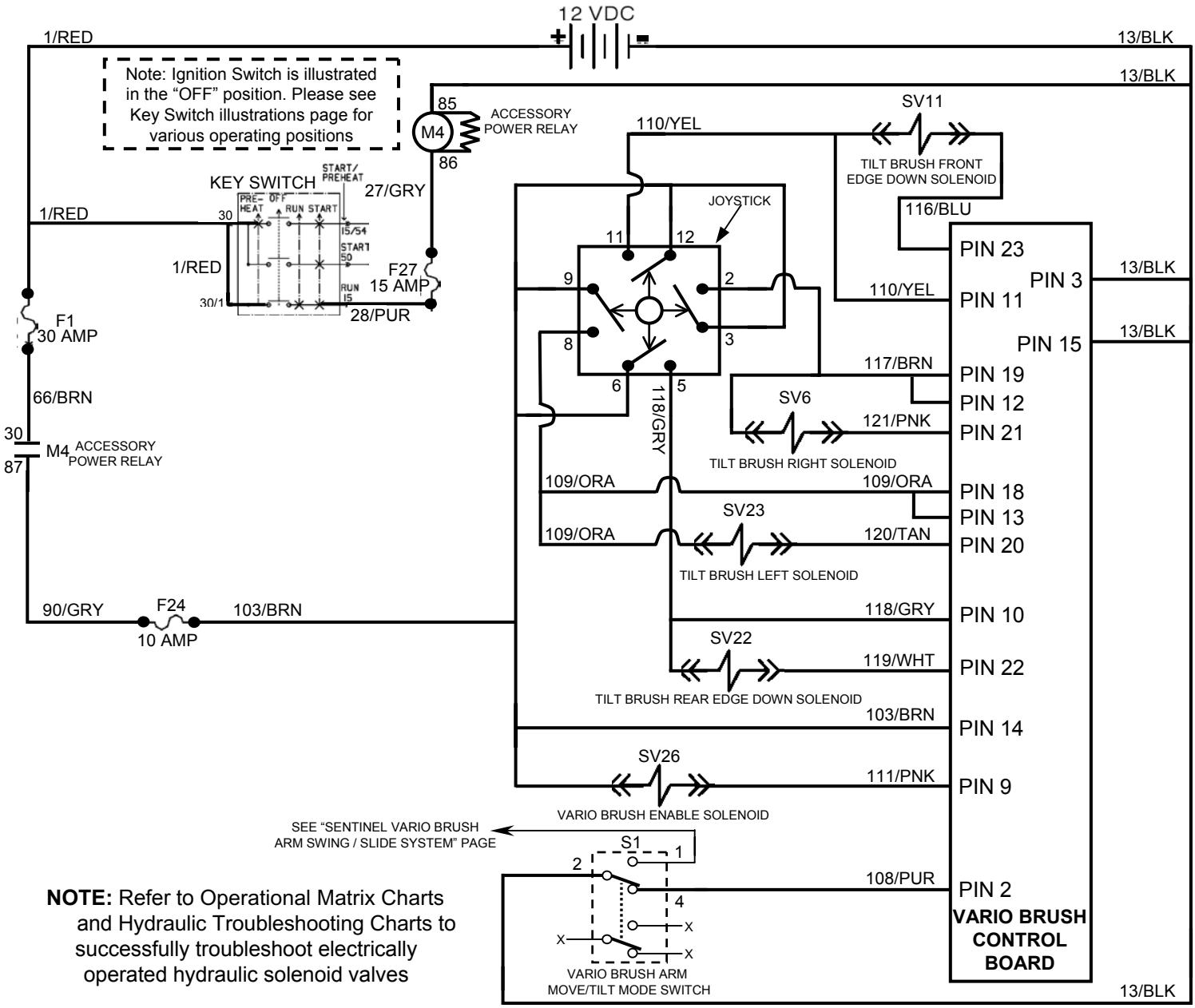






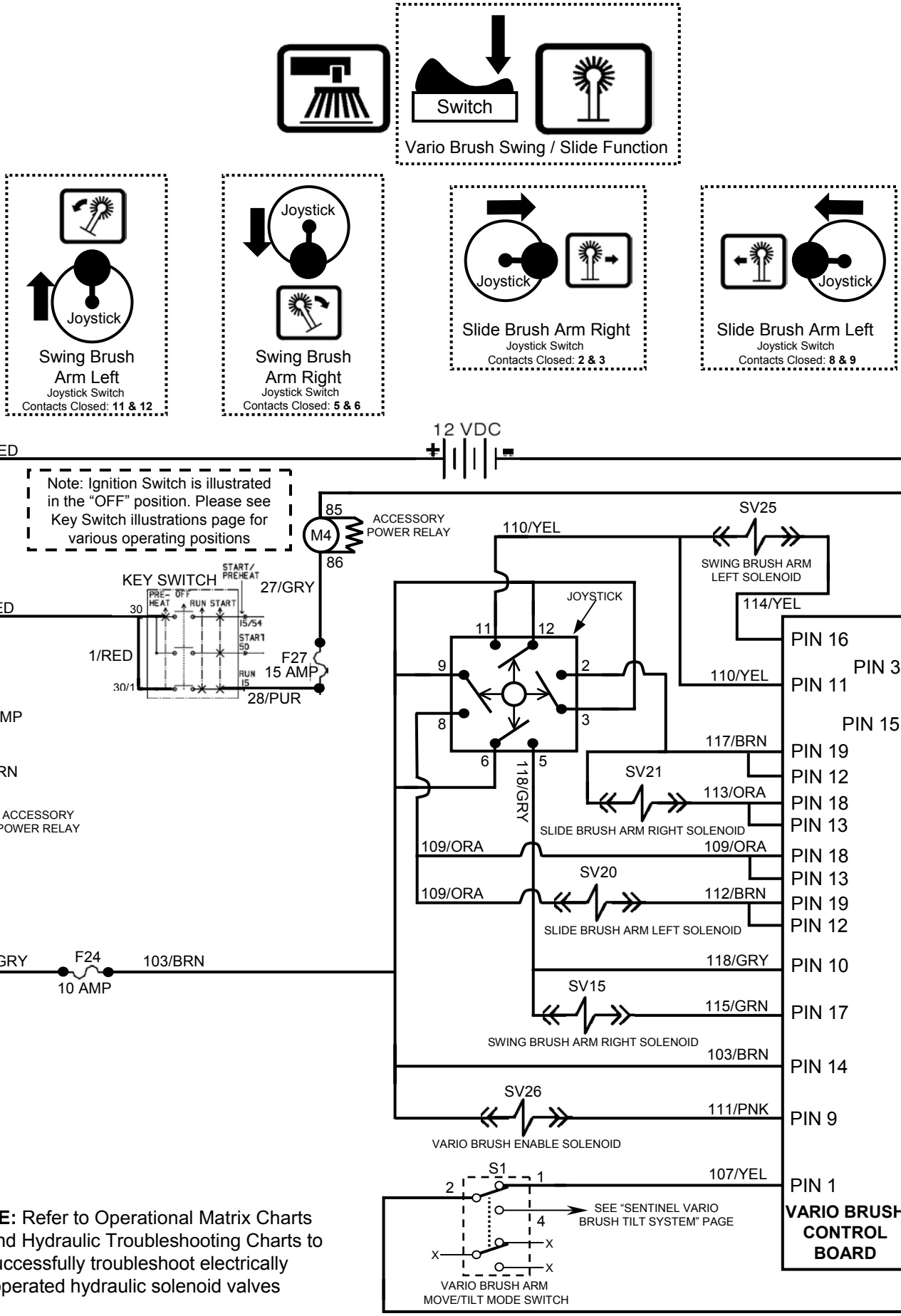






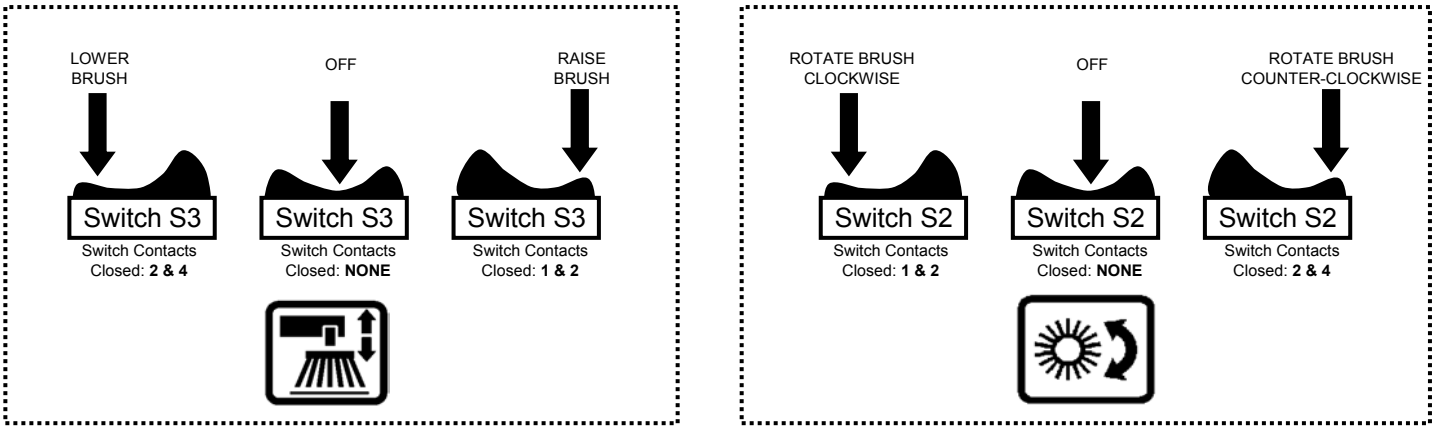
NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

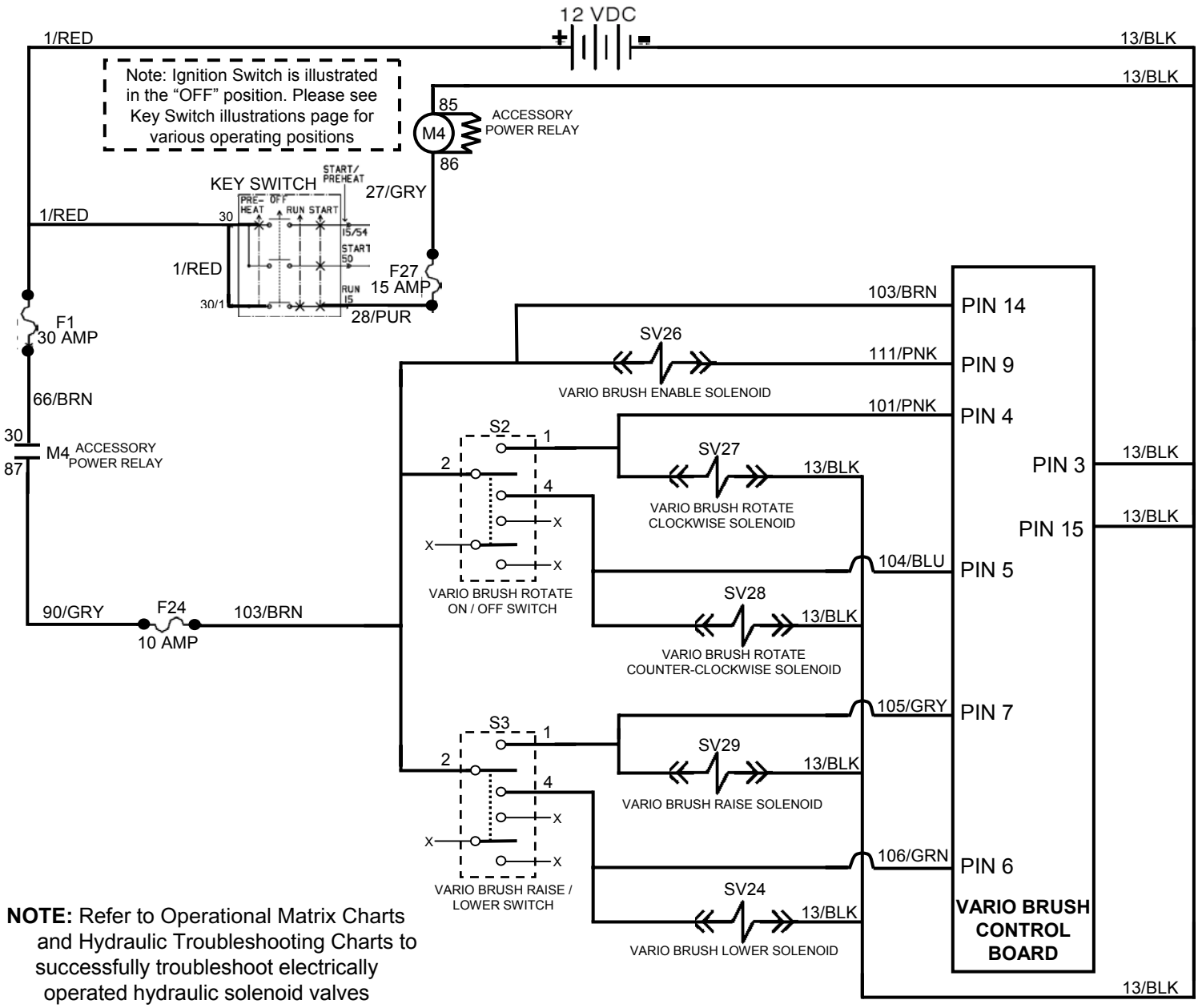
Sentinel Vario Brush Arm Swing / Slide System



NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Vario Brush Raise / Lower & Rotate Systems





NOTE: Refer to Operational Matrix Charts and Hydraulic Troubleshooting Charts to successfully troubleshoot electrically operated hydraulic solenoid valves

Sentinel Operating Modes

Operating Modes	Entry Sequence (how to activate)	Indicator
Normal Mode; *Normal operation.*	Default (when key is turned on) To exit turn off key	● None
Manual Mode; *Manually operate discrete functions without interlocks.*	1. Push and hold the Vac fan button 2. Turn on the key 3. Hold the button for 15 seconds 4. Release the Vac fan button 5. To exit turn off key	● "Manual" appears in the hour meter window.
Input Display Mode; *Display the state of floats, limit switches, and sensors.*	1. Push and hold the Left side brush button 2. Turn on the key 3. Hold the Left side brush button for 15 seconds 4. Release the Left side brush button 5. To exit turn off key	● Pin numbers and signal levels at the pin are displayed on the tach, speedo, hour meter, and odometer displays. The pins are displayed as alpha characters (a z), numeric (1 3), and signal level (0 1). 0 represents 0 volts, 1 represents 5 volts.
Toggle Units Mode; *Toggle between miles and kilometers for speedometer and odometer.*	1. Push and hold the Hopper door open button 2. Turn on the key 3. Hold the Hopper door open button for 15 seconds 4. Release the Hopper door open button 5. To exit turn off key	● Tach, speedo, hour meter, and odometer windows will display the numbers for controller pins that have failed self test.
Display Error Mode; *Display pin numbers that failed self test.*	1. Push and hold the Right Side Brush button 2. Turn on the key 3. Hold the Right Side Brush button for 15 seconds 4. Release the Right Side Brush button 5. To exit turn off key	● Self test will re-run. If all out puts pass self test, the "OK" symbol will appear on the display. If any output pins fail self test, the failing pins will be scrolled on the display. *NOTE: The water pump output will only be tested in this mode. Because of water that may drip during self test, this output is not tested during normal start-up.*

Sentinel Operational Matrix (page 1 of 2)

Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Vacuum Fan Motor	On or Activated	SV14	Vac Fan LED On = Vac Fan Running (see notes)	Hopper Control		P7	M9	M10	RV4	2750 psi	Hopper Thermal Sentry Close at 150 degrees F, (self resetting) --If this happens the Vac Fan LED will flash (blink) and Vac Fan will turn off.	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Shaker Motor	On or Activated	SV16 & SV32	Shaker LED On = Shaker Running (30 second run cycle)	Hopper Control		P7	M5	M6	RV4	2750 psi	-	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Hopper System	Hopper Door Latch, Close	SV32 (SV32 for 4 seconds, see notes)		Hopper Control		P7	C12	C11	RV4	2750 psi	-	SV32 stays on for four (4) seconds to allow maximum pressure and fuild flow to Hopper Door Cylinder. Door is held closed by hydraulic pressure on piston end (always). To open door CV4 Check Valve is "unchecked" by fluid pressure, RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Door Latch, Open	SV17 & SV32	Must hold button to operate	Hopper Control		P7	C11	C12	RV4	2750 psi	-	SV32 stays on until Hopper Close button, os Hopper lift/lower/forward/back is pushed. SV17 stays on until hopper closed button is pushed. RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Tilt Back (DUMP)	SV18 & SV32	Must hold button to operate	Hopper Control		P7	C10	C9	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate.	CV5 Check Valve in circuit, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders RV4@2750psi, OR5 @0.063 in Hopper Control Block. Check valves in cylinders on piston ends.
Hopper System	Hopper Tilt Forward (Normal Sweep)	SV19 & SV32	Must hold button to operate	Hopper Control		P7	C10	C9	RV7	1250 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	CV5 Pilot Check Valve in circuit is unseated by fluid pressure via SV19, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders. OR5 @0.063 in Hopper Control Block. Pilot Check valves on cylinder piston end is unseated by pressure via SV19 to allow cylinders to tilt forward (rest position).
Hopper System	High Dump (Option) Lift	SV2 & SV32	Must hold button to operate	Hopper Control		P7	C2	C11	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.
Hopper System	High Dump (Option) Down	SV1	Must hold button to operate	Hopper Control		P7	C2	C11	-	-	Parking or Service Brake must be applied for this system to operate.	Gravity lowers the hopper. Hydraulic fluid moves to return side of system via SV1. Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.

Sentinel Operational Matrix (page 2 of 2)

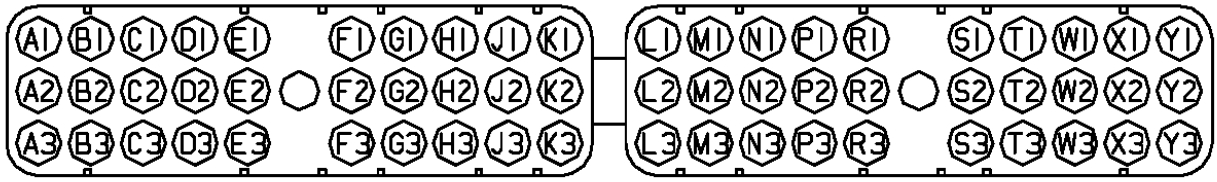
Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Conveyor System	Lift & tension chains	SV4		Main Brush Control		P5	C4	C3	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Conveyor Lift Cylinder. Restrictor 0.040 at C4
Conveyor System	Lower & tension chains	SV4 & SV31		Main Brush Control		P5	C3	C4	RV3	2750 psi	-	Restrictor 0.040 at C4
Conveyor System	Operate main brush motor and conveyor forward	SV12	This is a press and release to operate button.	Main Brush Control		P5	M7	M8	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	Overlaod switch is set at 2400 psi, Overload LED will turn on. If "jammed" RV3 will relaese pressure.
Conveyor & Main Brush Systems	Operate motors forward (Normal sweep)	SV4 & SV12	This is a press and release to operate button.	Main Brush Control		P5	M8	M7	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	If "jammed" RV3 will relaese pressure. If conveyor is down, brush motor/conveyor will run in reverse when down, if up brush motor/conveyor will run in reverse when up. If system in sweep and reverse is pressed wil cause to run in reverse, pressing again will cause sweep rotation. If in up positoin, pressing will cause to run in reverse, pressing again will cause motion to stop.
	Operate motors reverse	SV4 & SV13										
Main Brush	Lift	SV4		Main Brush Control		P5	C6	-	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Main Broom Cylinder. Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6
	Down/Lower	SV3 & SV4		Main Brush Control		P5	-	T10	-	-	-	Pressure unseats Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6
Side Brushes	Operate right brush motor and down	SV5 & SV9		Side Brush Valve	G1	P3	C7 & M1	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV5. Pilot operated check vlave at PC2. SV9 controls Right Side Brush
	Operate left brush motor and down (Option)	SV7 & SV10		Side Brush Valve	G1	P3	C8 & M3	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV7. Pilot operated check vlave at PC1. SV10 controls Right Side Brush
	Lift	SV8										

Enable Lift Circuit # 1		SV8
Enable Lift Circuit # 2		SV4

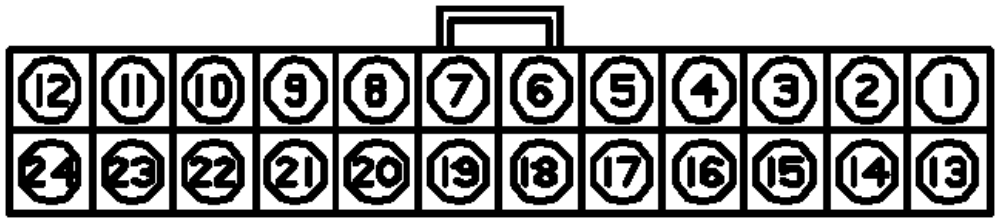
Reference Component Location Chart for location of components on the Sentinel

Sentinel Connector Pin Designations

MACHINE CONTROL BOARD CONNECTOR PIN DESIGNATIONS



VARIO BRUSH CONTROL BOARD CONNECTOR PIN DESIGNATIONS

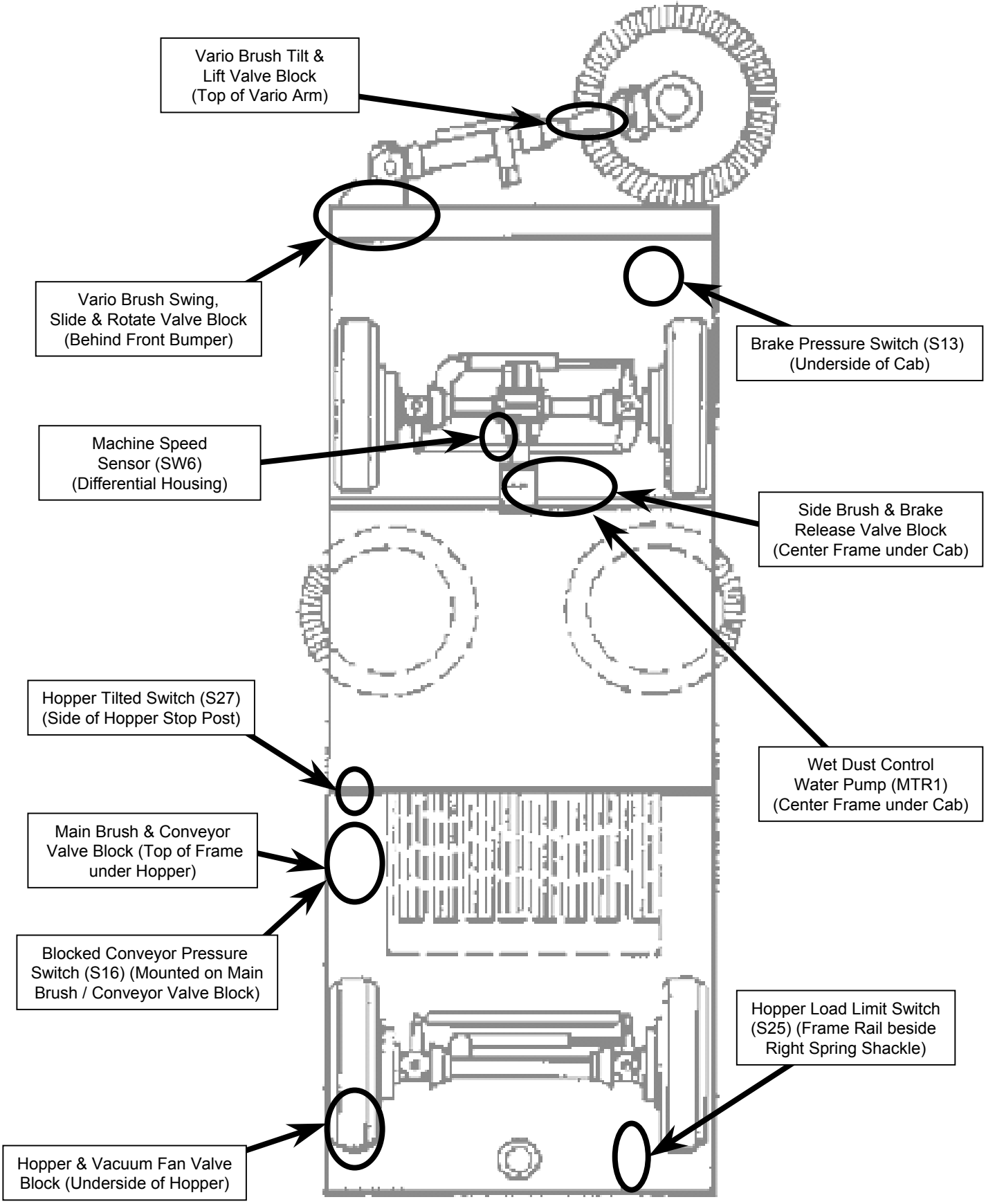


NOTE: View shown from wire harness side of connector

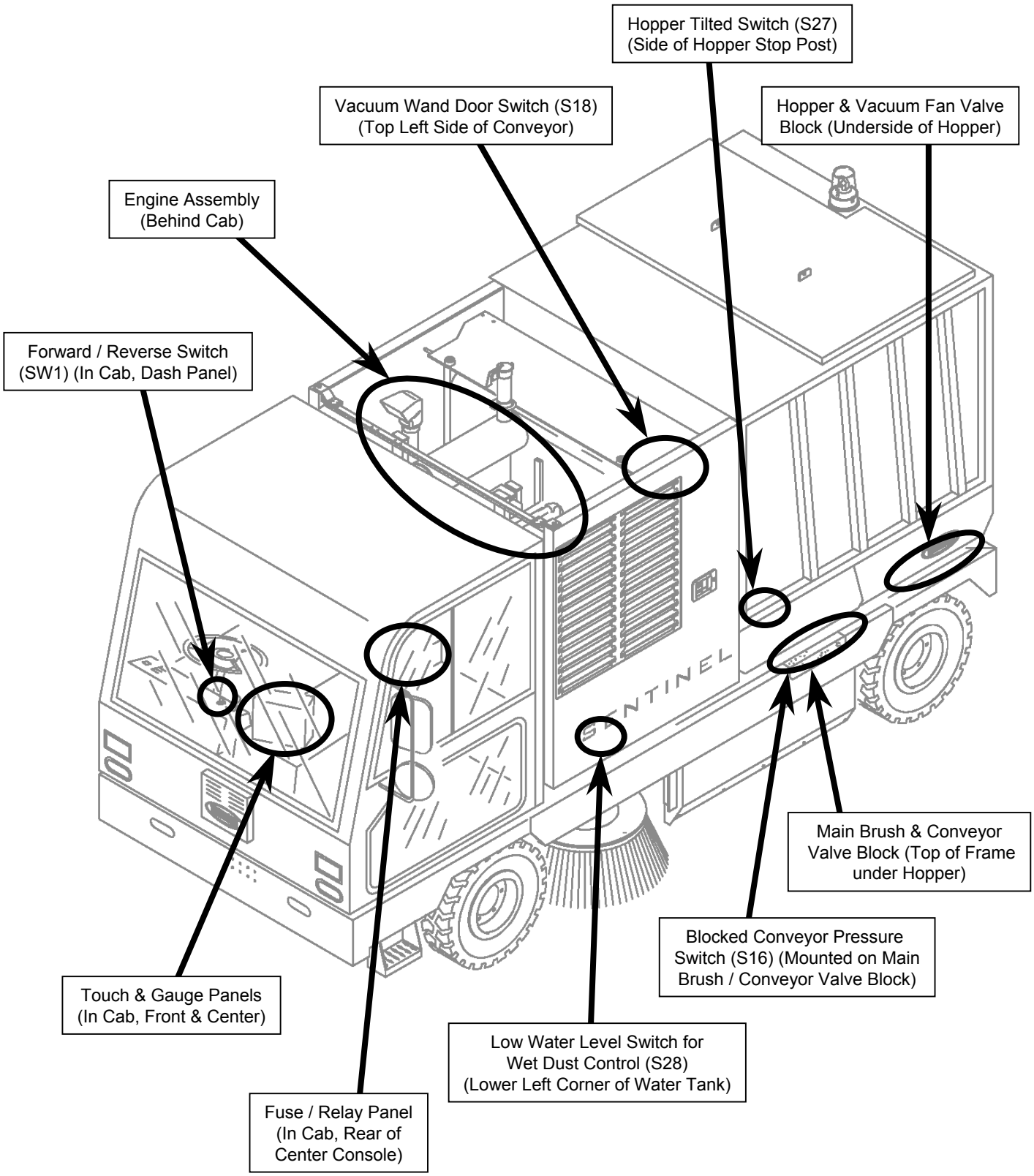
Sentinel Fuse Chart

Fuse	Rating	Circuit Protected
F-1	30 A	Accessory
F-2	30 A	Accessory
F-3	25 A	Turn Signals
F-4	15 A	Night Lights
F-5	20 A	Rotating / Sidebrush
F-6	20 A	Headlight
F-7	15 A	Taillight / Marker
F-8	10 A	Water Pump
F-9	15 A	Accessory Power Socket
F-10	10 A	Horn
F-11	10 A	Domelight / Radio
F-12	5 A	Auto Lube (option)
F-13		Open
F-14		Open
F-15	30 A	Heater / Air Conditioner
F-16	15 A	Logic Power
F-17	15 A	Hopper Control
F-18	10 A	Logic
F-19	10 A	Sensors
F-20		Open
F-21		Open
F-22		Open
F-23	10 A	Auto Lube (option)
F-24	10 A	Vario Front Brush
F-25	10 A	Radio
F-26	10 A	Wipers
F-27	15 A	Neutral Start Propel
F-28	15 A	Daytime Running Lights
F-29	80 A	Preheat

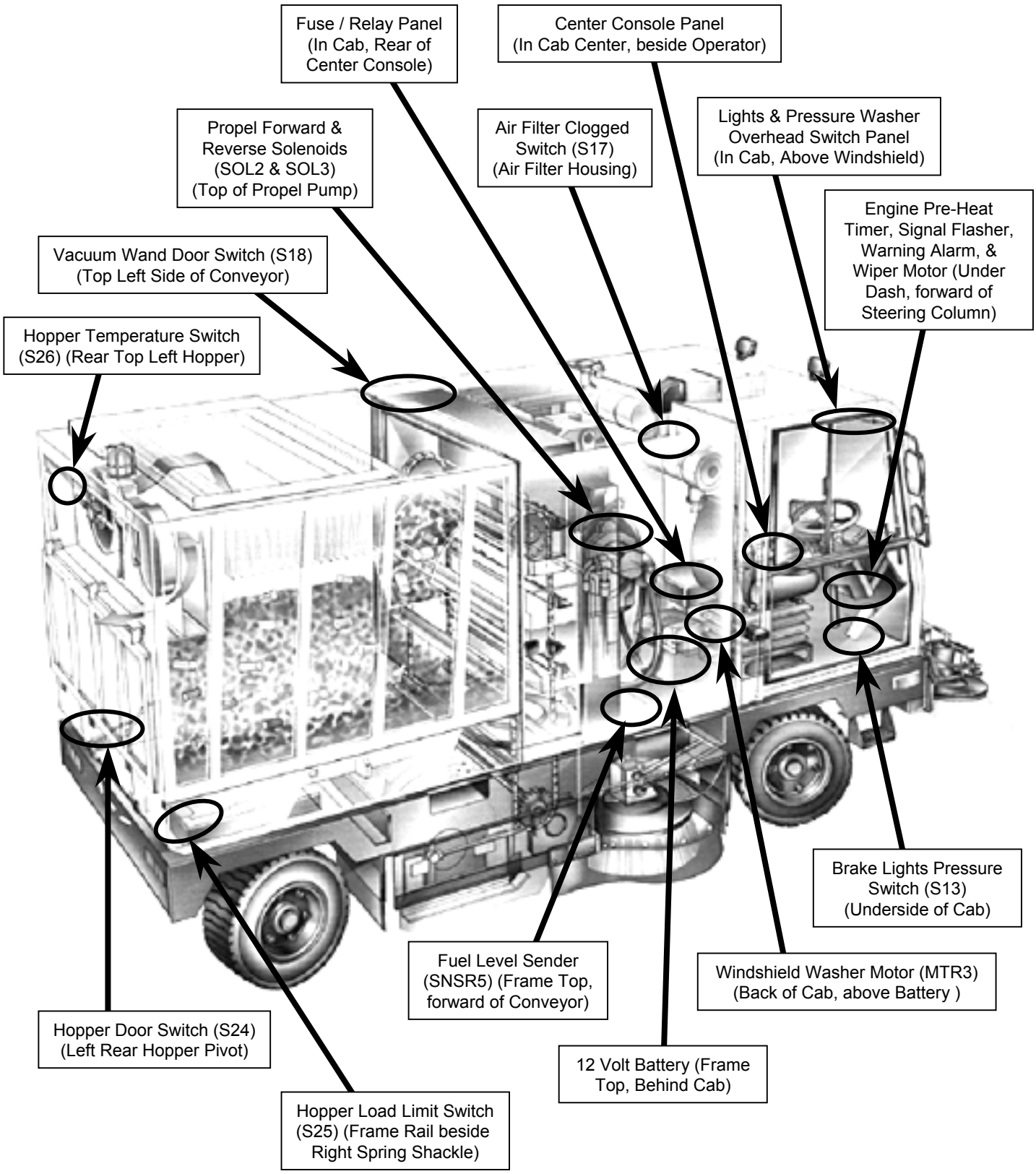
Sentinel Component Locator (page 1 of 7)



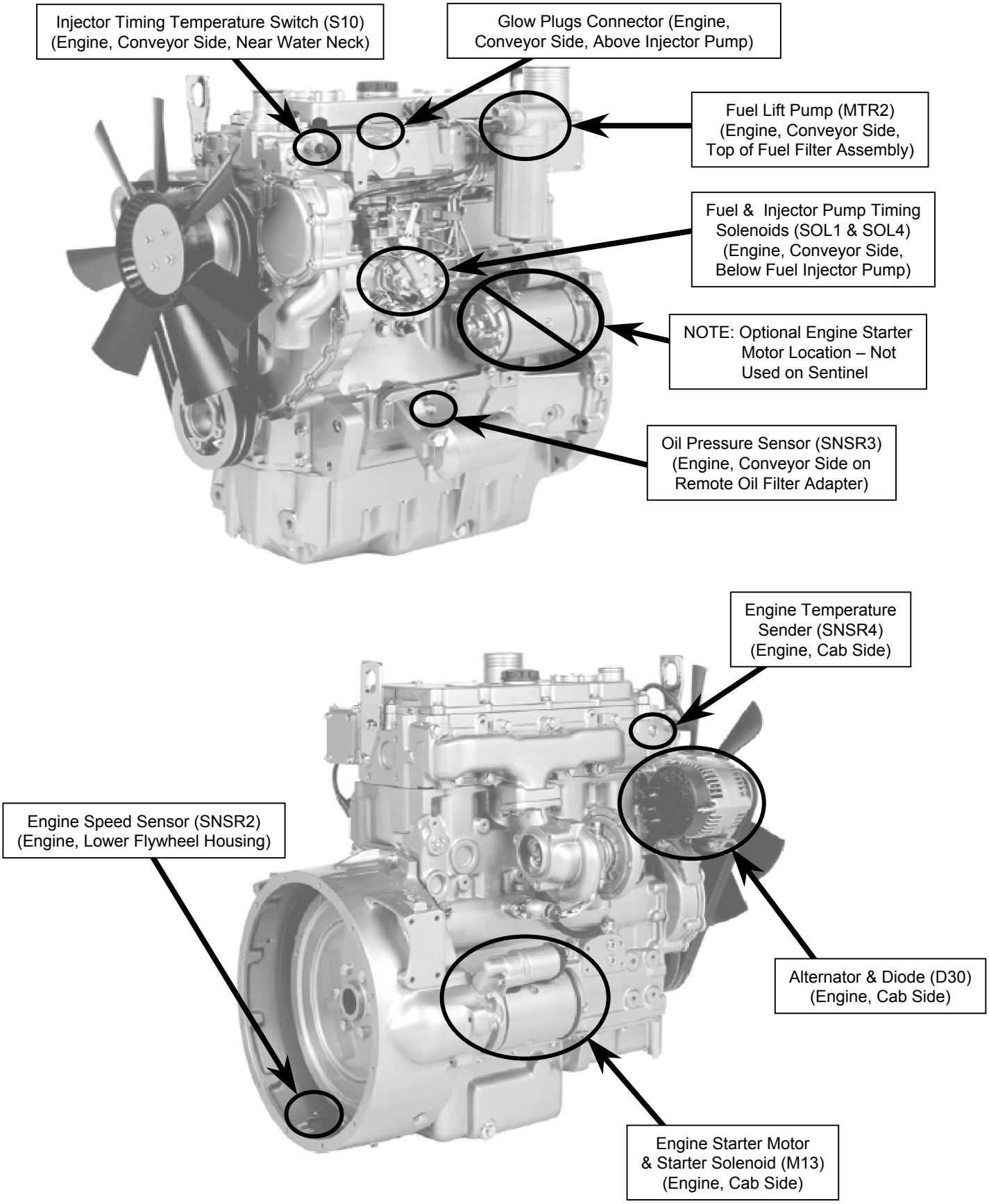
Sentinel Component Locator (page 2 of 7)



Sentinel Component Locator (page 3 of 7)



Sentinel Component Locator (page 4 of 7)



Sentinel Component Locator (page 5 of 7)

SWITCHES

component #	page #(s)	description	location
S1	x	Vario brush arm move/tilt mode	In cab, mounted to operator's door
S2	x	Vario brush rotate CW or CCW	In cab, mounted to operator's door
S3	x	Vario brush raise/lower	In cab, mounted to operator's door
S4	3	Front sweeping lights	In cab, mounted in overhead switch panel
S5	3	Parking brake	In cab, center console
S6	1	Pressure, brake system low	On Side Brush & Brake Release hydraulic valve block
S7	x	Head lights,turn,horn,wiper,washer	In cab, mounted to steering column
S8	3	Beacon light	In cab, mounted in overhead switch panel
S9	x	Key switch (ignition)	In cab, mounted to steering column
S10	4	Temperature, injector pump timing	Engine, conveyor side, near water neck
S11	3	4-way warning lights	In cab, mounted in overhead switch panel
S12	3	Pressure washer	In cab, mounted in overhead switch panel
S13	1 & 3	Brake lights	Underside of cab, below brake pedal
S14	3	A/C thermostat	In cab, center console
S15	3	Rear sweeping lights	In cab, mounted in overhead switch panel
S16	1 & 2	Pressure, blocked conveyor	Left frame under front of hopper
S17	3	Restriction, air filter	Air filter housing on engine, cab side
S18	2 & 3	Vacuum wand door	Left side conveyor, top
S20	3	Side brush lights	In cab, mounted in overhead switch panel
S23	x	Pressure, A/C charge	On A/C dryer near A/C condenser
S24	3	Hopper door	Left rear hopper pivot
S25	1 & 3	Hopper load limit	Right rear leaf spring
S26	3	Temperature, hopper	Left rear hopper, top
S27	1 & 2	Hopper tilt	Left hopper stop post
S28	2	Low water level (for wet dust control)	Water tank, left front bottom
SW1	2	Forward / reverse	In cab, dash panel
SW2	3	Engine shut-down override	In cab, center console
SW3	3	Fan speed	In cab, center console
SW6	1	Machine speed sensor	Left differential housing
SW8	x	Operator seat switch	In cab, under operator's seat
JOYSTICK	x	Vario brush arm move/tilt	In cab, mounted to operator's door

SENSORS

component #	page #(s)	description	location
SNSR1	x	Machine level (inclinometer)	In cab, under fuse/relay panel
SNSR2	4	Engine speed	Engine, lower flywheel housing
SNSR3	4	Pressure, engine oil	Engine, conveyor side, on remote oil filter adapter
SNSR4	4	Temperature, engine coolant	Engine, cab side, near water neck
SNSR5	3	Fuel level	Frame top, right side, forward of conveyor

ELECTRIC MOTORS

component #	page #(s)	description	location
MTR1	1	Water pump (wet dust control)	Frame mount, center, under cab
MTR2	4	Fuel lift pump	Engine, conveyor side, top of fuel filter assembly
MTR3	3	Washer pump	Back side of cab, above battery
MTR4	3	Wiper motor	In Cab, under dash, forward of steering column
HCU1	x	Heating & cooling unit	In cab, center console, forward of fuse/relay panel
STARTER	4	Engine starter motor	Engine, cab side

Sentinel Component Locator (page 6 of 7)

FUSES, RELAYS, & DIODES

component #	page #(s)	description	location
F1 to F29	2 & 3	Electrical fuses	In cab, rear center console fuse panel (see Fuse Chart)
M1	2 & 3	Horn relay	In cab, rear center console fuse panel
M2	2 & 3	Neutral start relay	
M3	2 & 3	Propel disable relay	
M4	2 & 3	Accessory power relay # 1	
M5	2 & 3	Engine shut-down relay	
M6	2 & 3	High beam relay (headlights)	
M7	2 & 3	Low beam relay (headlights)	
M8	2 & 3	Medium speed relay (heater & A/C fan)	
M9	2 & 3	High speed relay (heater & A/C fan)	
M10	2 & 3	Hopper moving alarm relay	
M11	2 & 3	Seat switch relay	
M12	2 & 3	Accessory power relay # 2	
M13	4	Starter motor solenoid	Engine, cab side, mounted to starter top
D1	2 & 3	Suppression diode, horn	In cab, rear center console, below fuse panel
D2	2 & 3	Suppression diode, forward propel solenoid	
D3	2 & 3	Suppression diode, reverse propel solenoid	
D4	2 & 3	Suppression diode, fuel solenoids & lift pump	
D5A	2 & 3	Blocking bridge rectifier, warning lights	
D6	2 & 3	Suppression diode, brake release solenoids	
D7	2 & 3	Suppression diode, A/C clutch	
D8	2 & 3	Blocking diode, pressure washer	
D26B	2 & 3	Blocking bridge rectifier, heater & A/C fan	
D27	2 & 3	Blocking diode, parking brake input	
D29	2 & 3	Blocking diode, service brake input	
D30	4	Blocking diode, alternator	Engine, cab side, near alternator

MISCELLANEOUS COMPONENTS

component #	page #(s)	description	location
ALT	4	Alternator	Engine, cab side
FL1	3	Turn & warning lights flasher	In cab, under dash, forward of steering column
GP1 to GP4	4	Engine glow plugs	Engine, top
L1	x	A/C clutch	Near engine cooling fan, belt driven
LS3	3	Warning alarm	In cab, under dash, forward of steering column
PWRSPLY1	2	Panel backlight power supply	In cab, mounted behind touch & gauge panels
TMR1	3	Engine glow plugs timer	In cab, under dash, forward of steering column
VARIO	2 & 3	Vario brush control board	In cab, rear center console, below fuse panel

Sentinel Component Locator (page 7 of 7)

HYDRAULIC VALVE BLOCKS

component #	page #(s)	description	location
767009	x	Pressure Washer	Frame top, right side, forward of fuel filler neck
767212	1 & 3	Front & rear brakes	Underside of cab, below brake pedal
768899	1 & 2	Hopper & Vacuum Fan	Left rear, underside of hopper
771010	1	Side Brush & Brake Release	Frame mount, center, under cab
771011	1	Vario Swing, Slide, & Rotate	Behind front bumper
771012	1	Vario Arm	Top of Vario arm
771019	1 & 2	Main Brush & Conveyor	Left frame under front of hopper

SOLENOID VALVE COILS

component #	page #(s)	description	location
SV1	1 & 2	Hopper lower	On Hopper & Vacuum Fan hydraulic valve block
SV2	1 & 2	Hopper lift	
SV3	1 & 2	Main brush down	On Main Brush & Conveyor hydraulic valve block
SV4	1 & 2	Enable	
SV5	1	Right side brush down	On Side Brush & Brake Release hydraulic valve block
SV6	1	Tilt Vario brush right	On Vario Arm hydraulic valve block
SV7	1	Left side brush down	On Side Brush & Brake Release hydraulic valve block
SV8	1	Enable	
SV9	1	Right side brush rotate	
SV10	1	Left side brush rotate	
SV11	1	Tilt Vario brush front edge down	On Vario Arm hydraulic valve block
SV12	1 & 2	Main brush & conveyor forward	On Main Brush & Conveyor hydraulic valve block
SV13	1 & 2	Main brush & conveyor reverse	
SV14	1 & 2	Vacuum fans	On Hopper & Vacuum Fan hydraulic valve block
SV15	1	Swing Vario brush arm right	On Vario Swing, Slide, & Rotate hydraulic valve block
SV16	1 & 2	Shaker, panel filter	On Hopper & Vacuum Fan hydraulic valve block
SV17	1 & 2	Hopper door release	
SV18	1 & 2	Hopper tilt back	
SV19	1 & 2	Hopper tilt forward	
SV20	1	Slide Vario brush arm left	On Vario Swing, Slide, & Rotate hydraulic valve block
SV21	1	Slide Vario brush arm right	
SV22	1	Tilt Vario brush rear edge down	On Vario Arm hydraulic valve block
SV23	1	Tilt Vario brush left	
SV24	1	Vario brush lower	
SV25	1	Swing Vario brush arm left	On Vario Swing, Slide, & Rotate hydraulic valve block
SV26	1	Enable Vario brush	
SV27	1	Vario brush rotate clockwise	
SV28	1	Vario brush rotate counter-clockwise	
SV29	1	Vario brush raise	On Vario Arm hydraulic valve block
SV30A	1	Brake release	On Side Brush & Brake Release hydraulic valve block
SV30B	1	Brake release	
SV31	1 & 2	Conveyor down	On Main Brush & Conveyor hydraulic valve block
SV32	1 & 2	Enable hopper	On Hopper & Vacuum Fan hydraulic valve block
SV33	x	Pressure washer	On Pressure Washer hydraulic valve block
SOL1	4	Engine fuel	Engine, conveyor side, below fuel injector pump
SOL2	3	Reverse propel	Top of propel pump
SOL3	3	Forward propel	Top of propel pump
SOL4	4	Injector pump timing	Engine, conveyor side, below fuel injector pump

SENTINEL HYDRAULIC

Troubleshooting Manual

BEFORE CONDUCTING TESTS:

*** Read and Follow ALL Safety Warnings and Precautions in Operator's 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

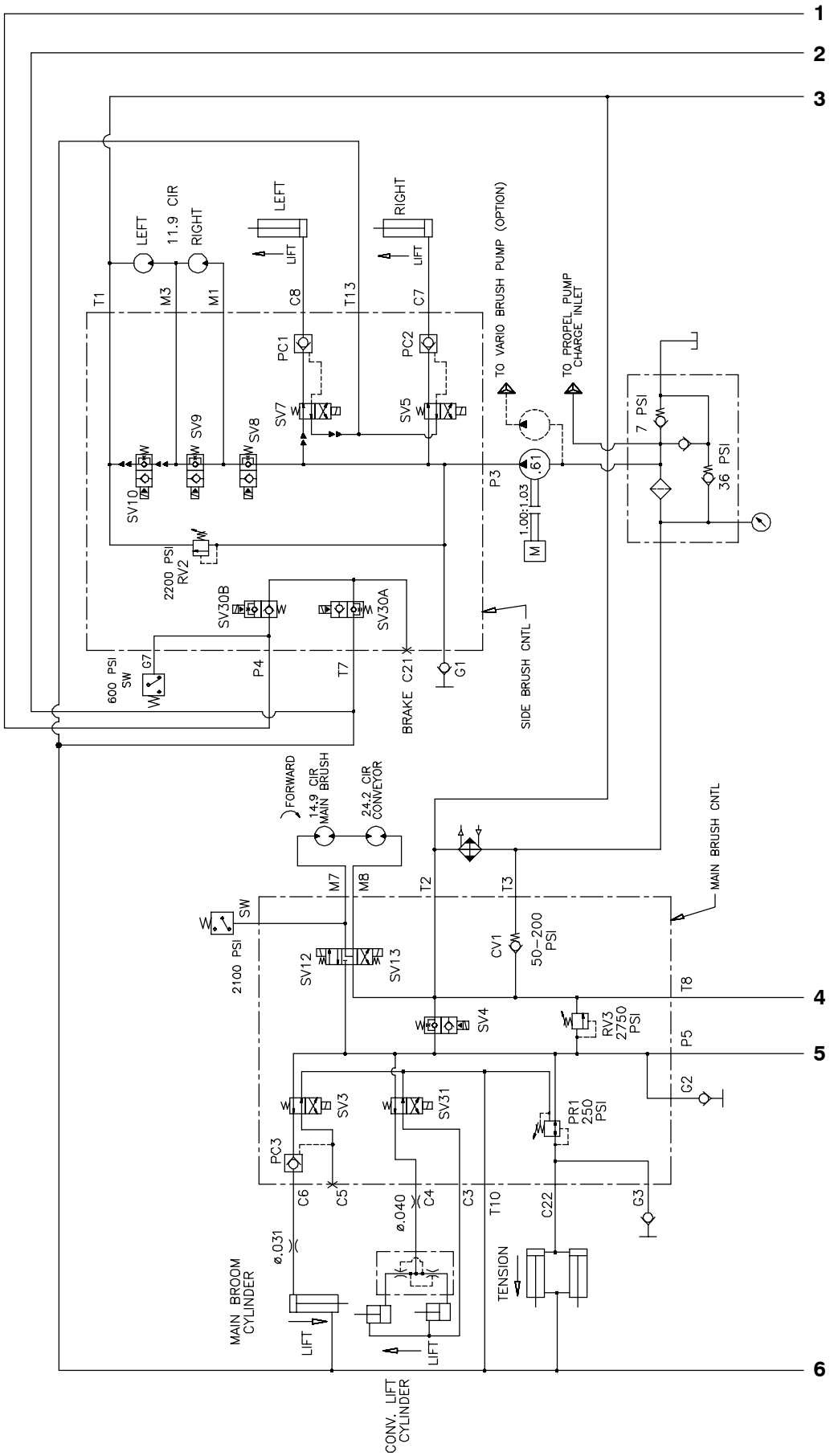
DURING TESTS:

*** Maintain Normal Main Brush Pressure as Listed in Operator's Manual**

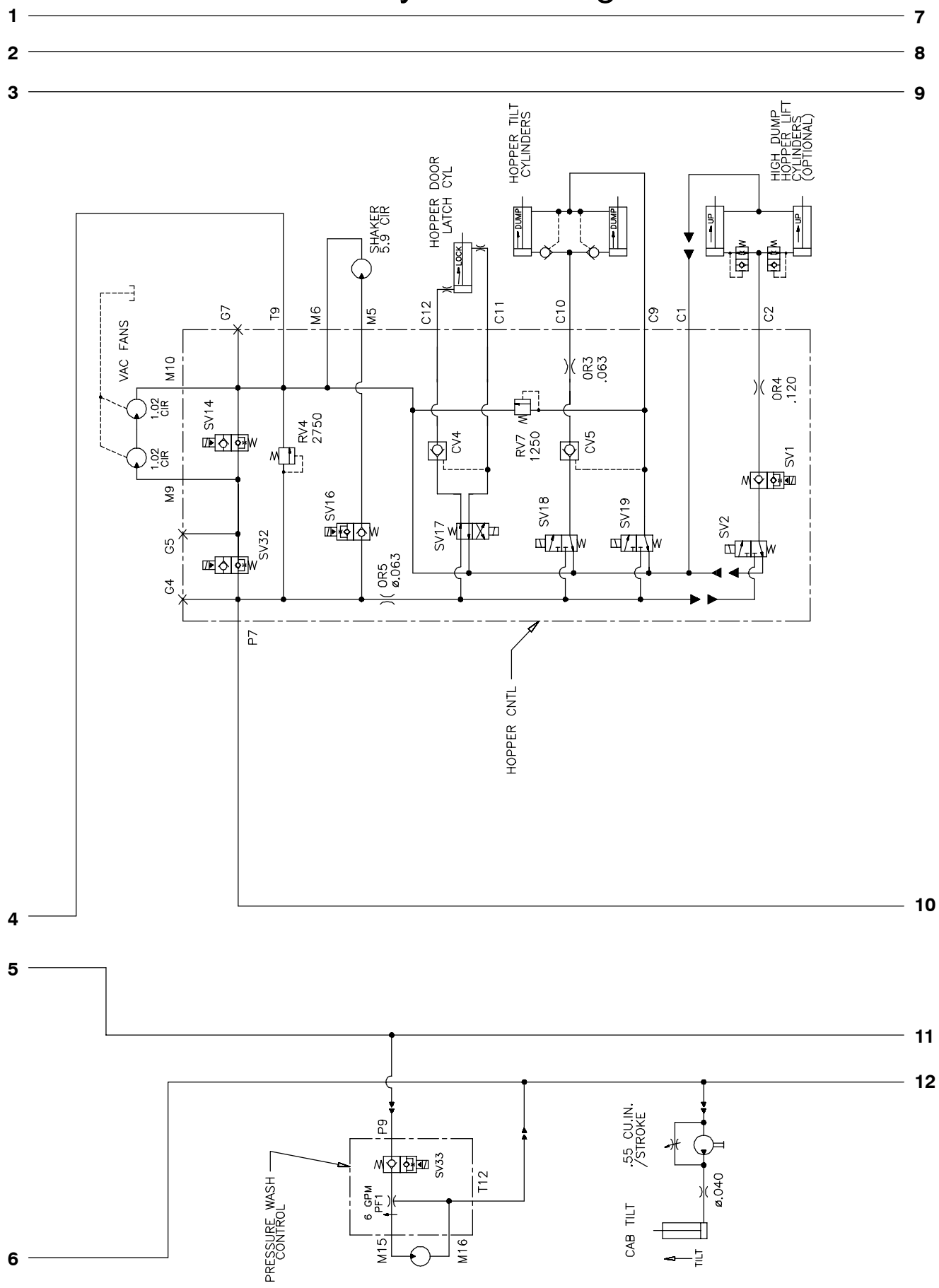
*** Call Technical Services if Diagnostic Time Exceeds One Hour With Unknown Cause or Course of Action**

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

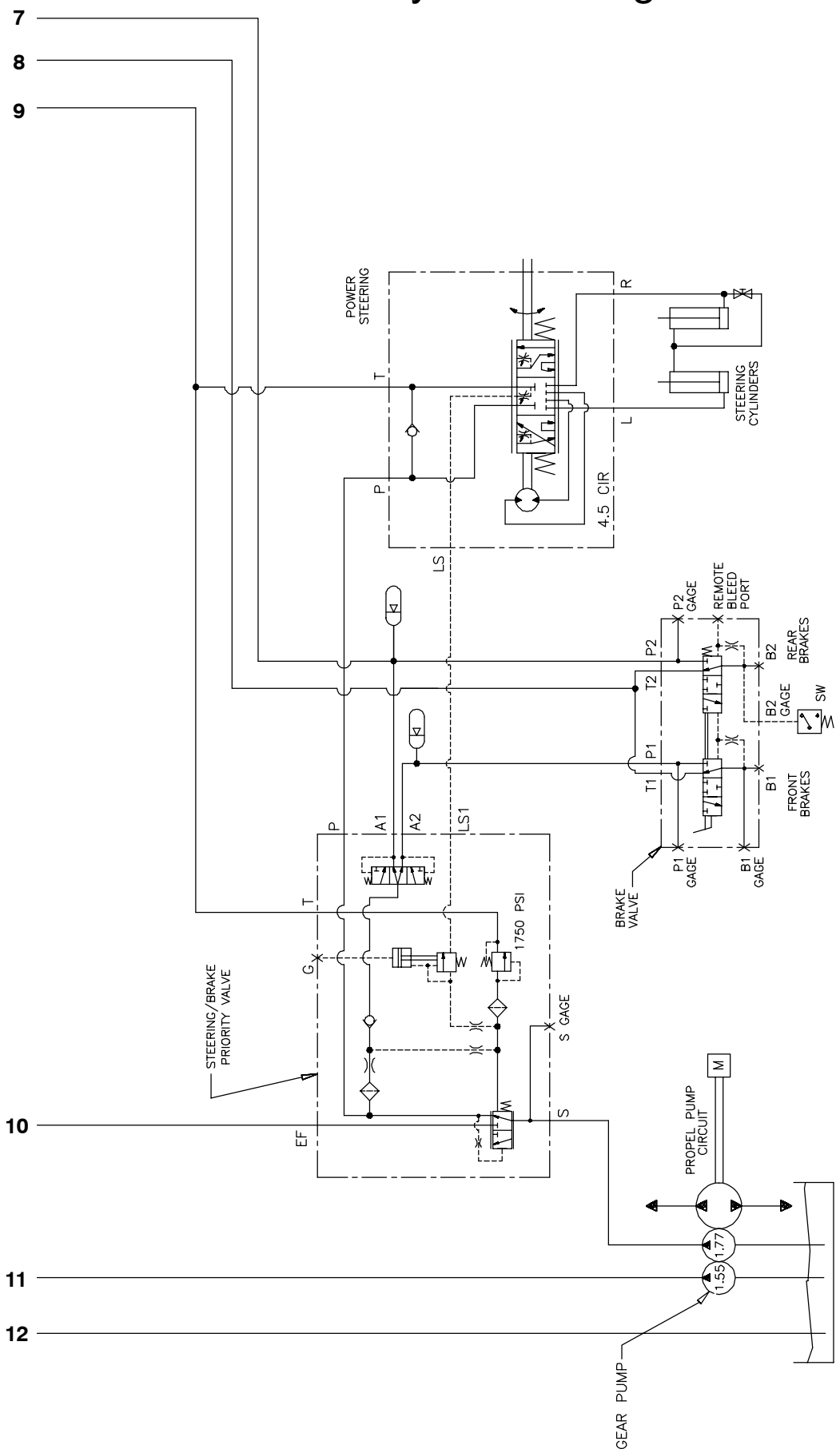
Sentinel Hydraulic Diagram (page 1 of 5)



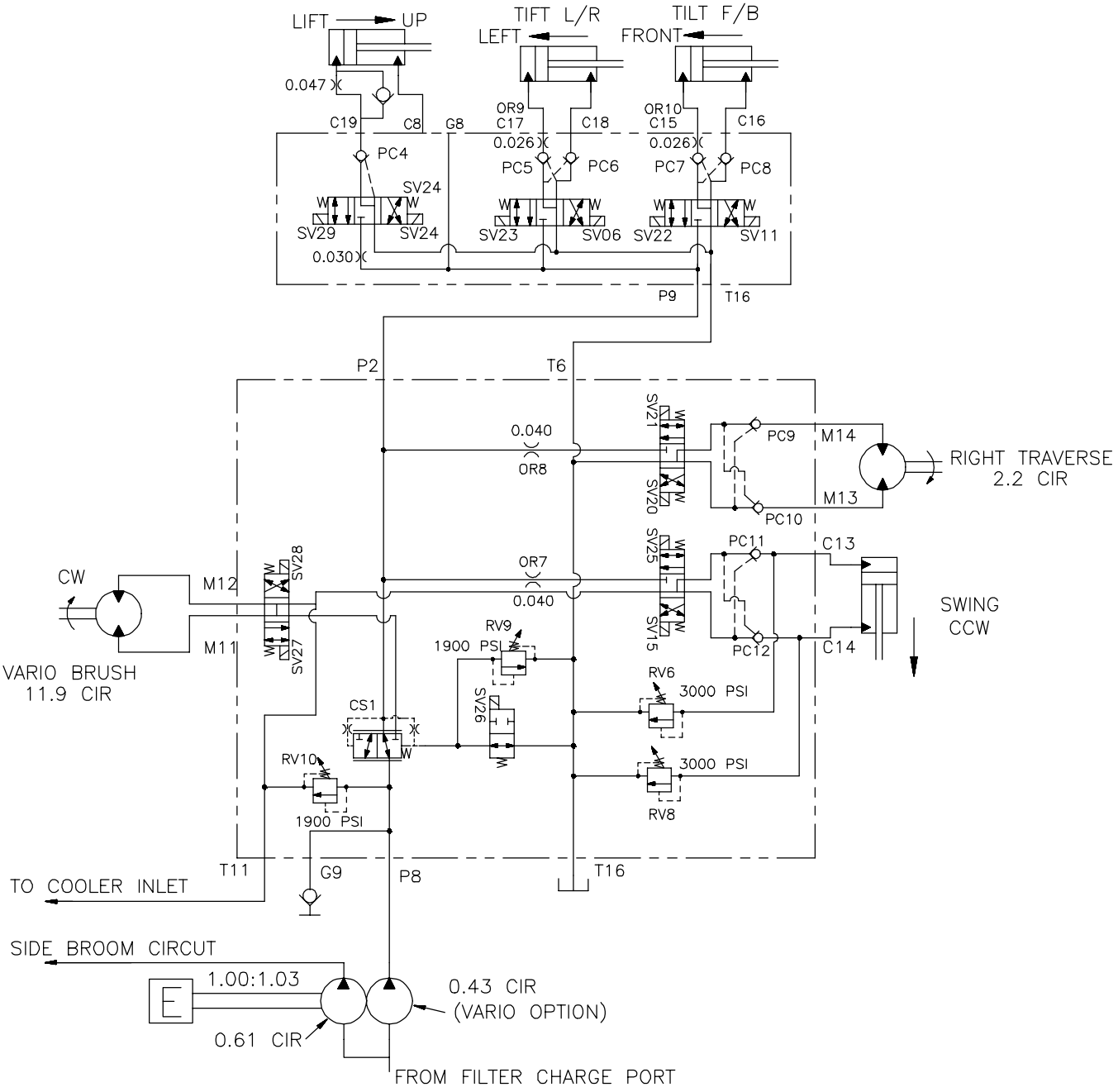
Sentinel Hydraulic Diagram (page 2 of 5)



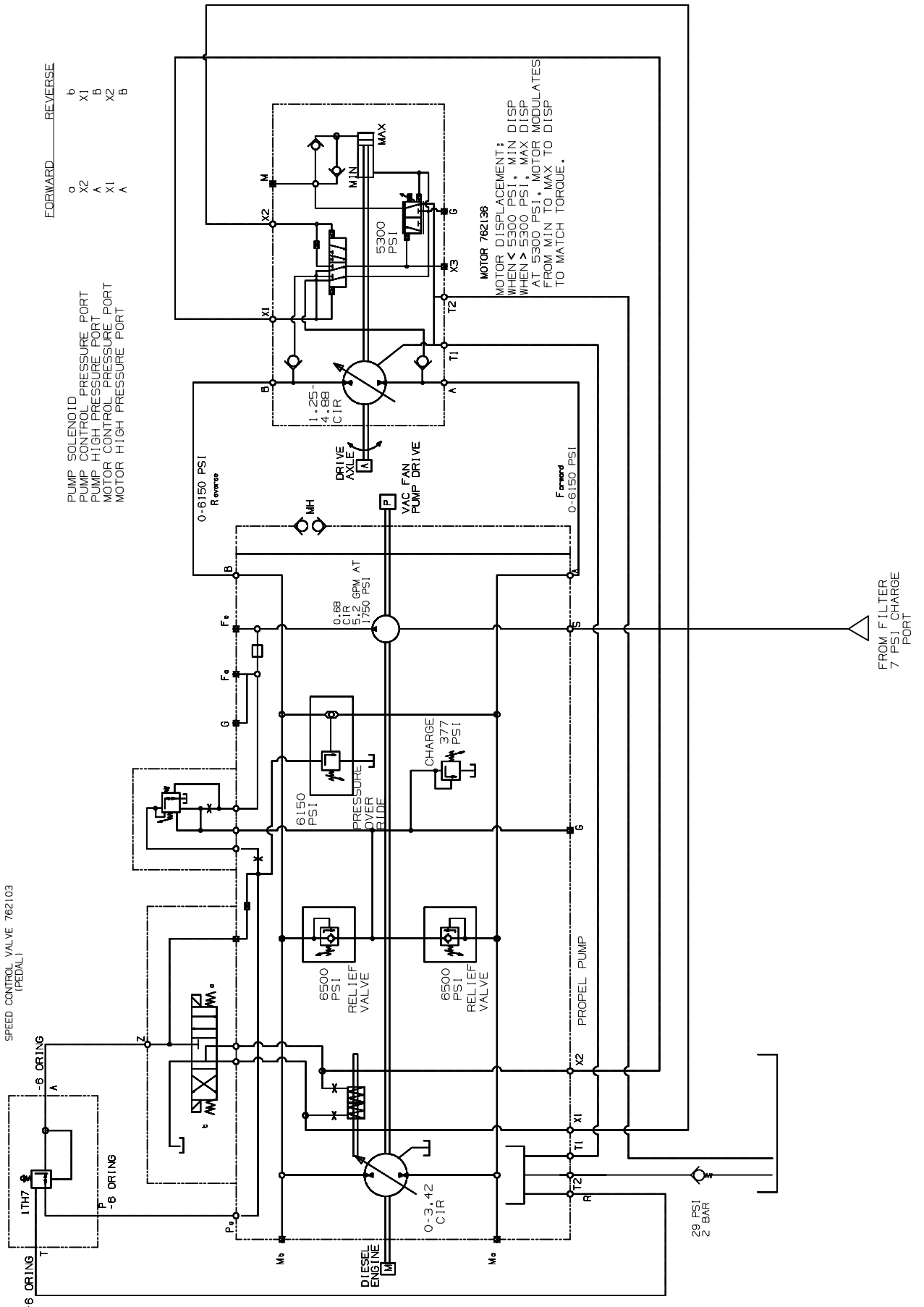
Sentinel Hydraulic Diagram (page 3 of 5)



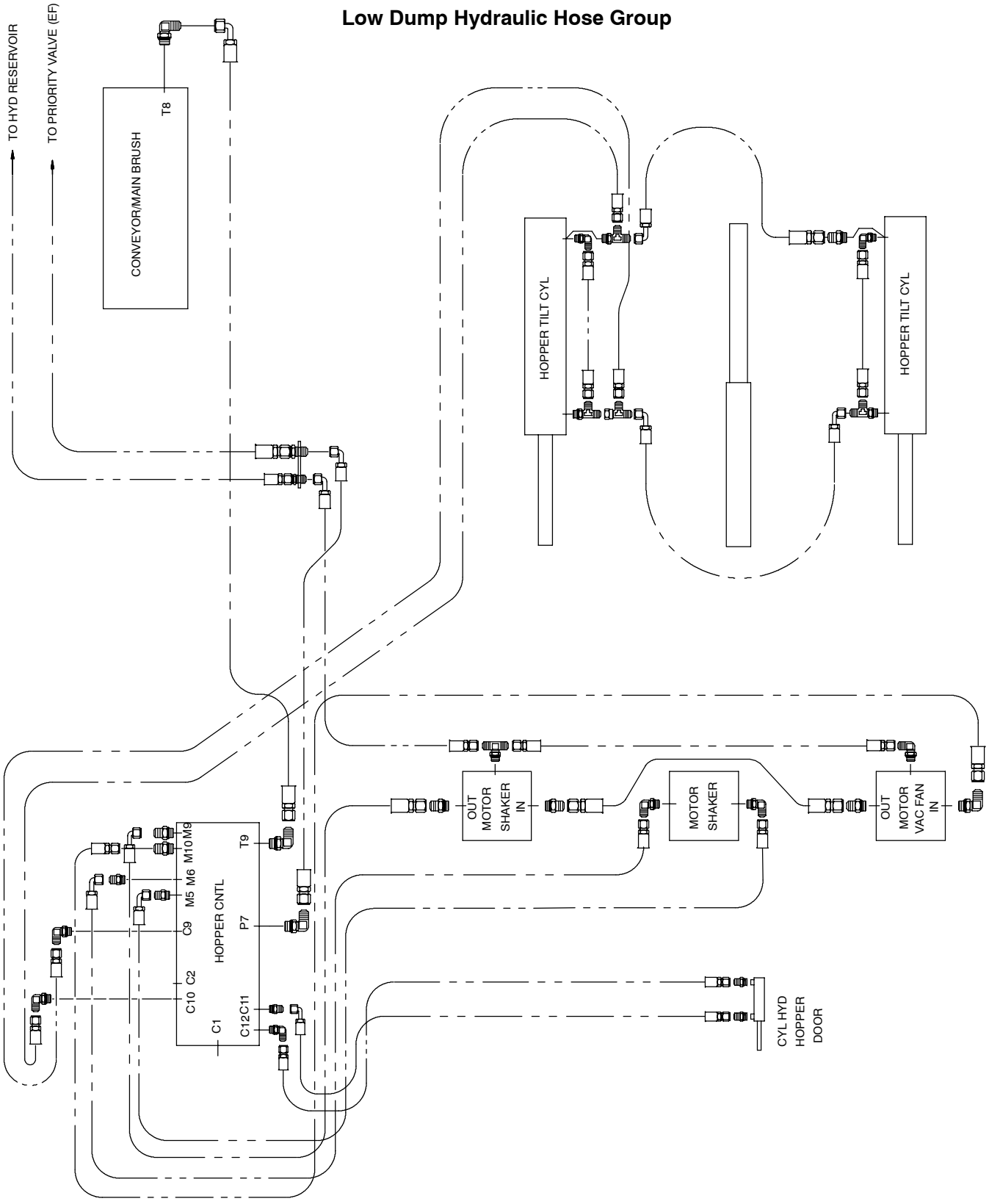
Sentinel Hydraulic Diagram (page 4 of 5)



Sentinel Hydraulic Diagram (page 5 of 5)

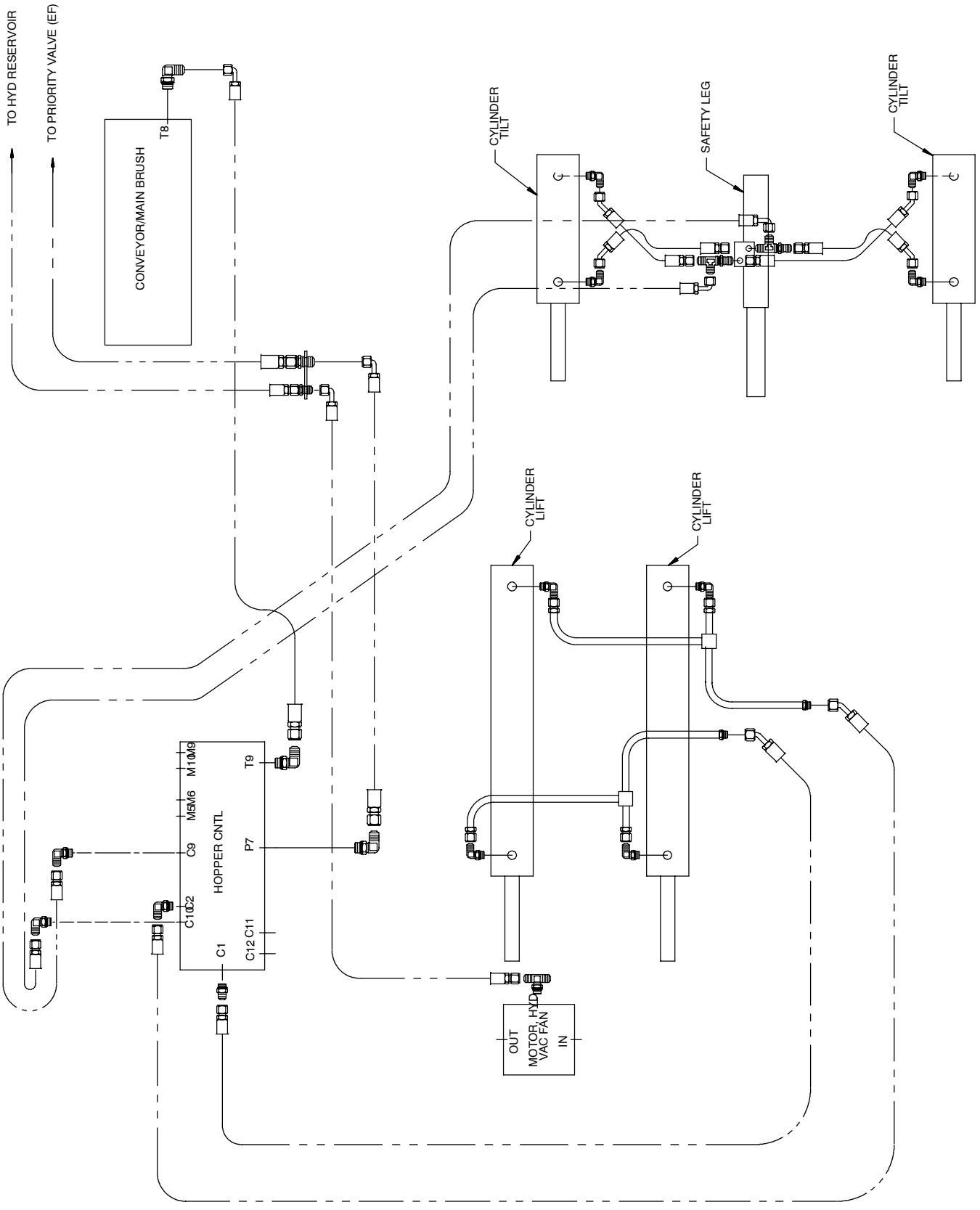


Sentinel Hydraulic Hose Diagram (page 1 of 11)

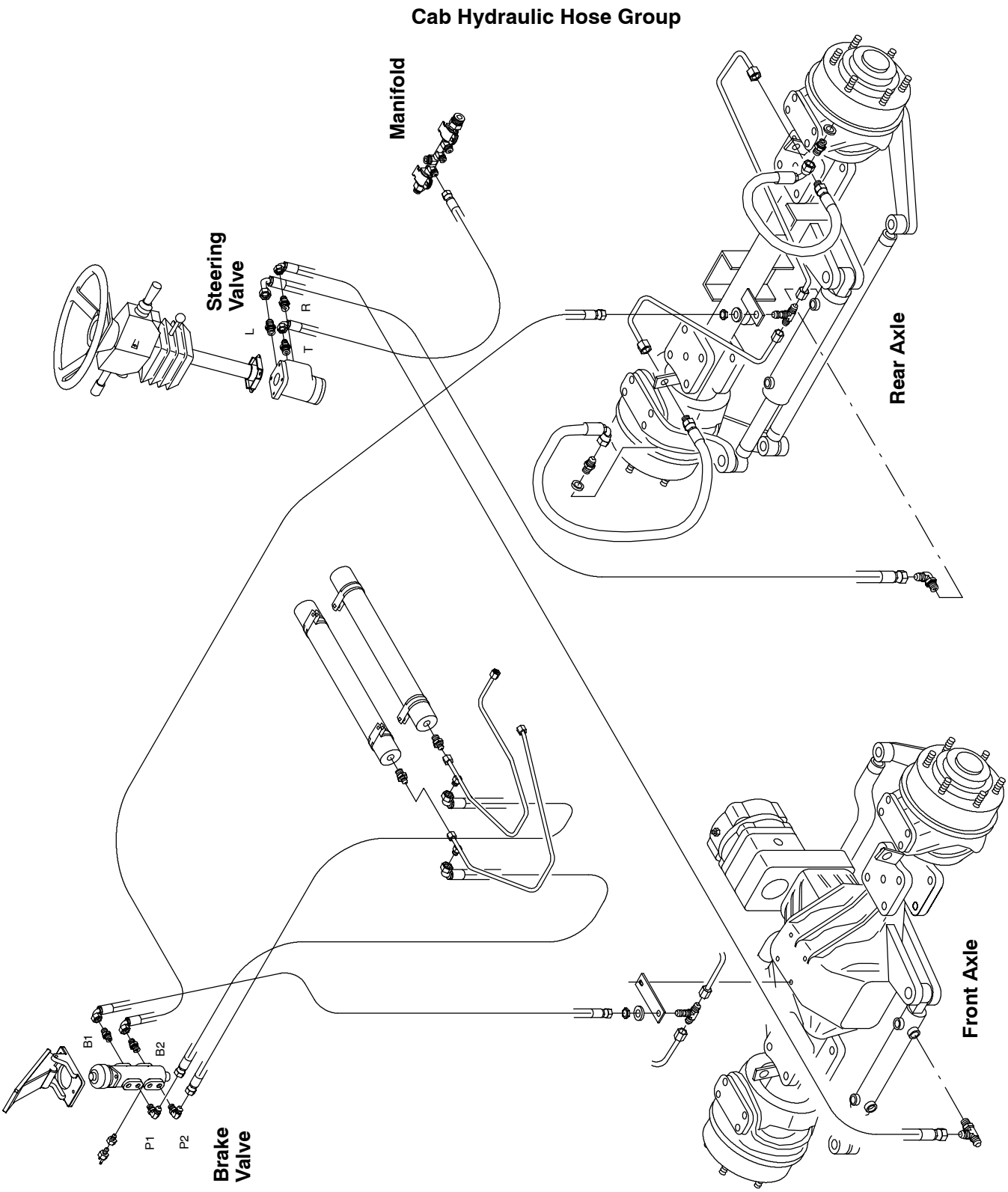


Sentinel Hydraulic Hose Diagram (page 2 of 11)

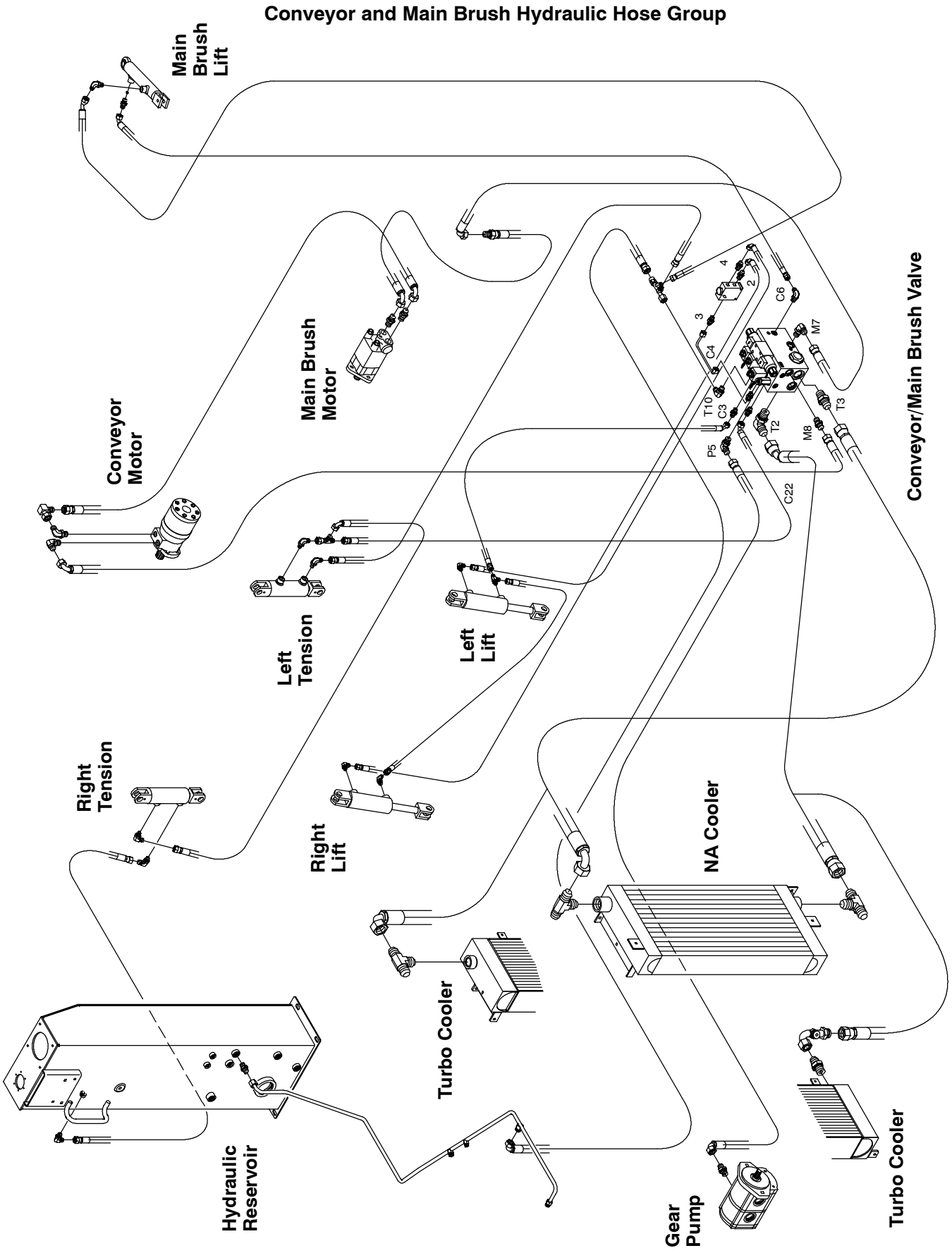
High Dump Hopper Hydraulic Hose Group



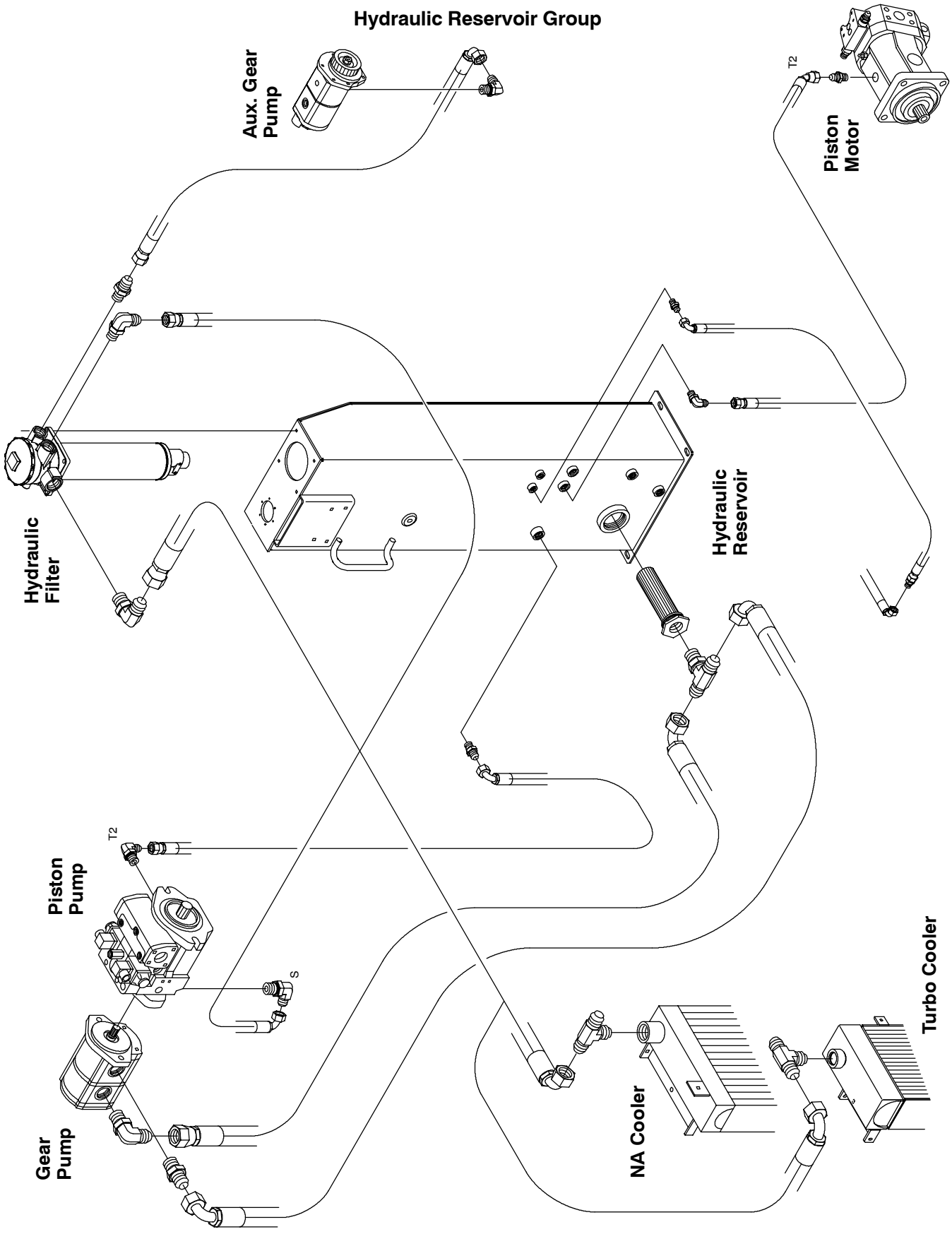
Sentinel Hydraulic Hose Diagram (page 3 of 11)



Sentinel Hydraulic Hose Diagram (page 4 of 11)

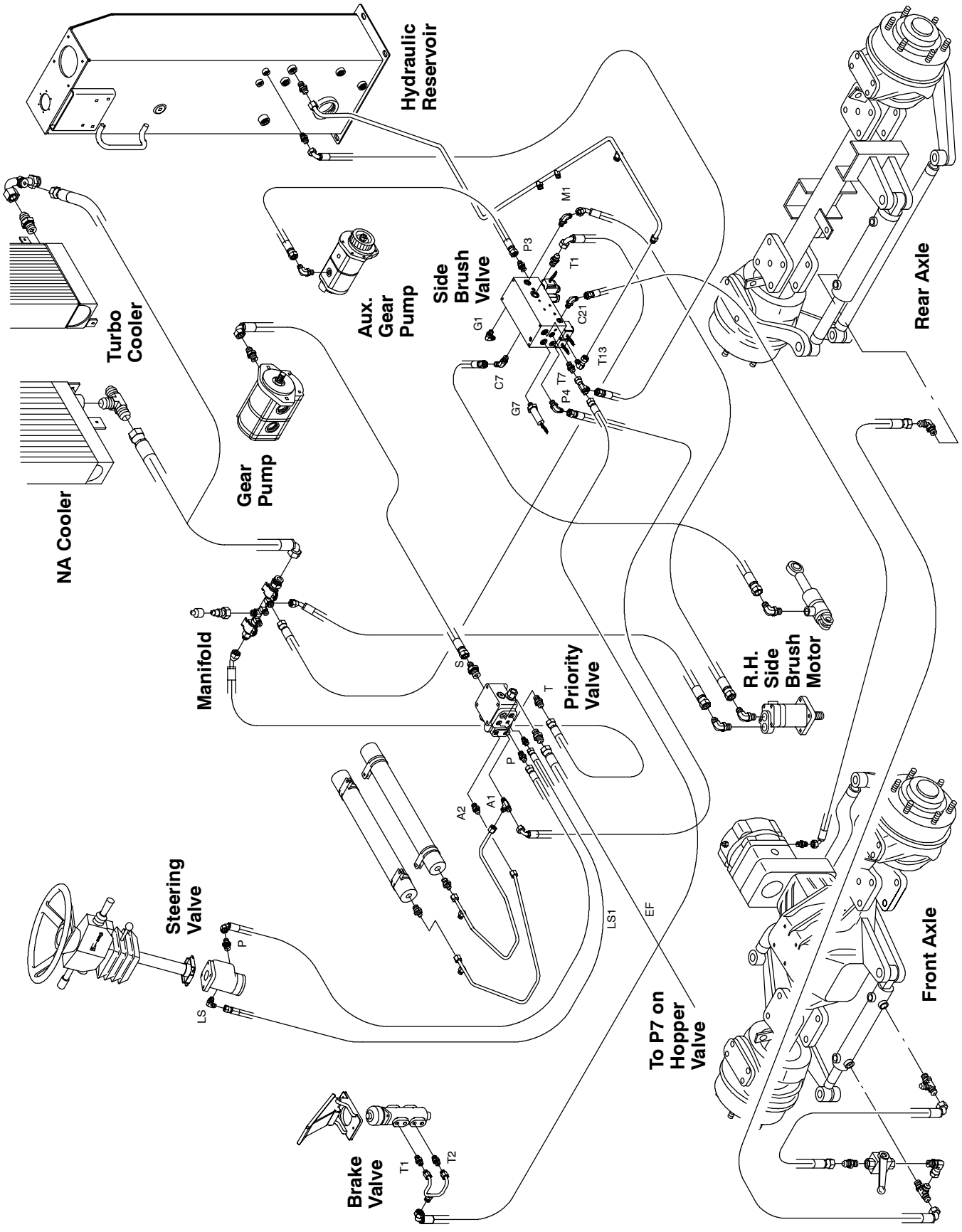


Sentinel Hydraulic Hose Diagram (page 5 of 11)



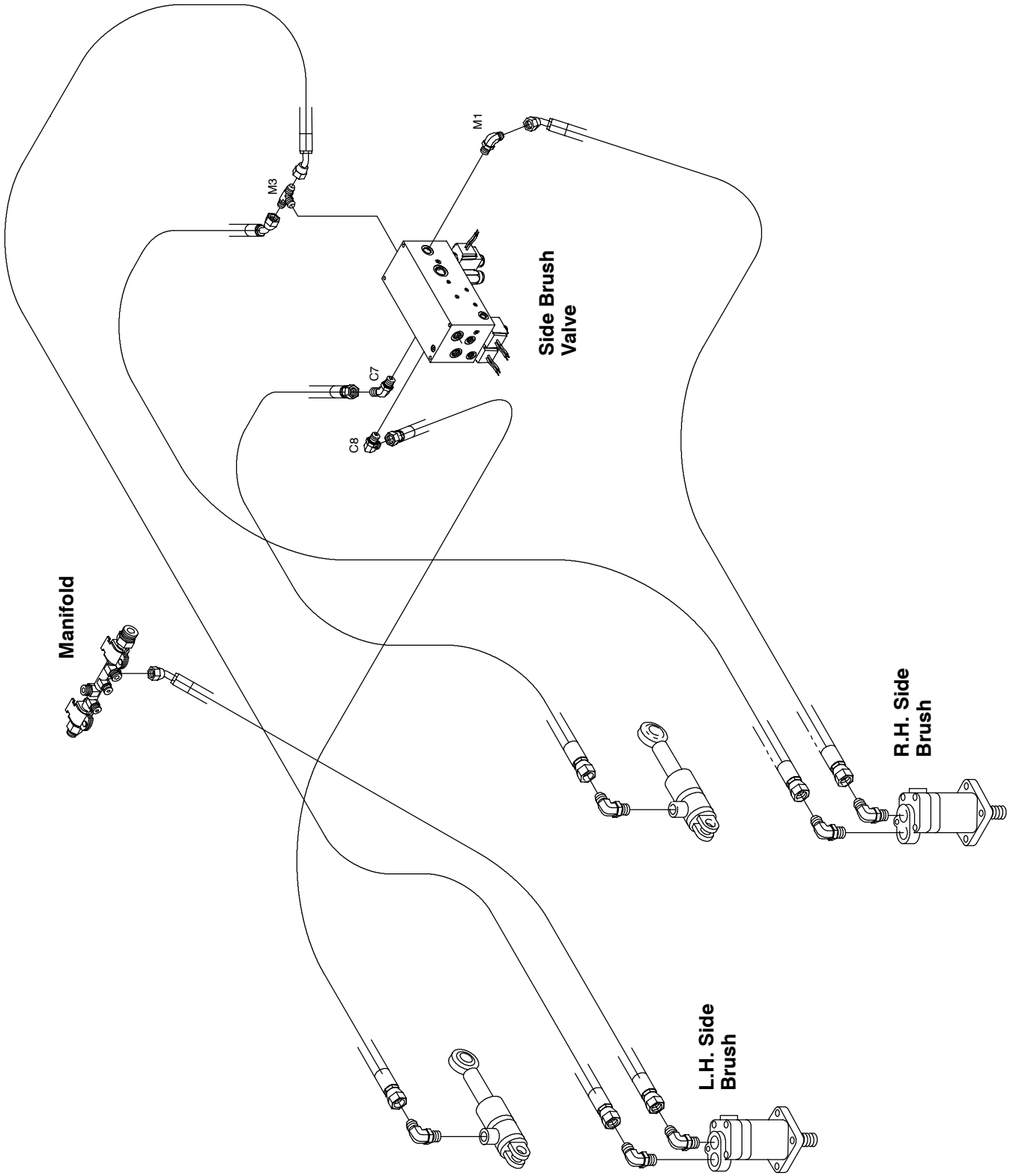
Sentinel Hydraulic Hose Diagram (page 6 of 11)

Steer, Brakes, Side Brush hydraulic Hose Group

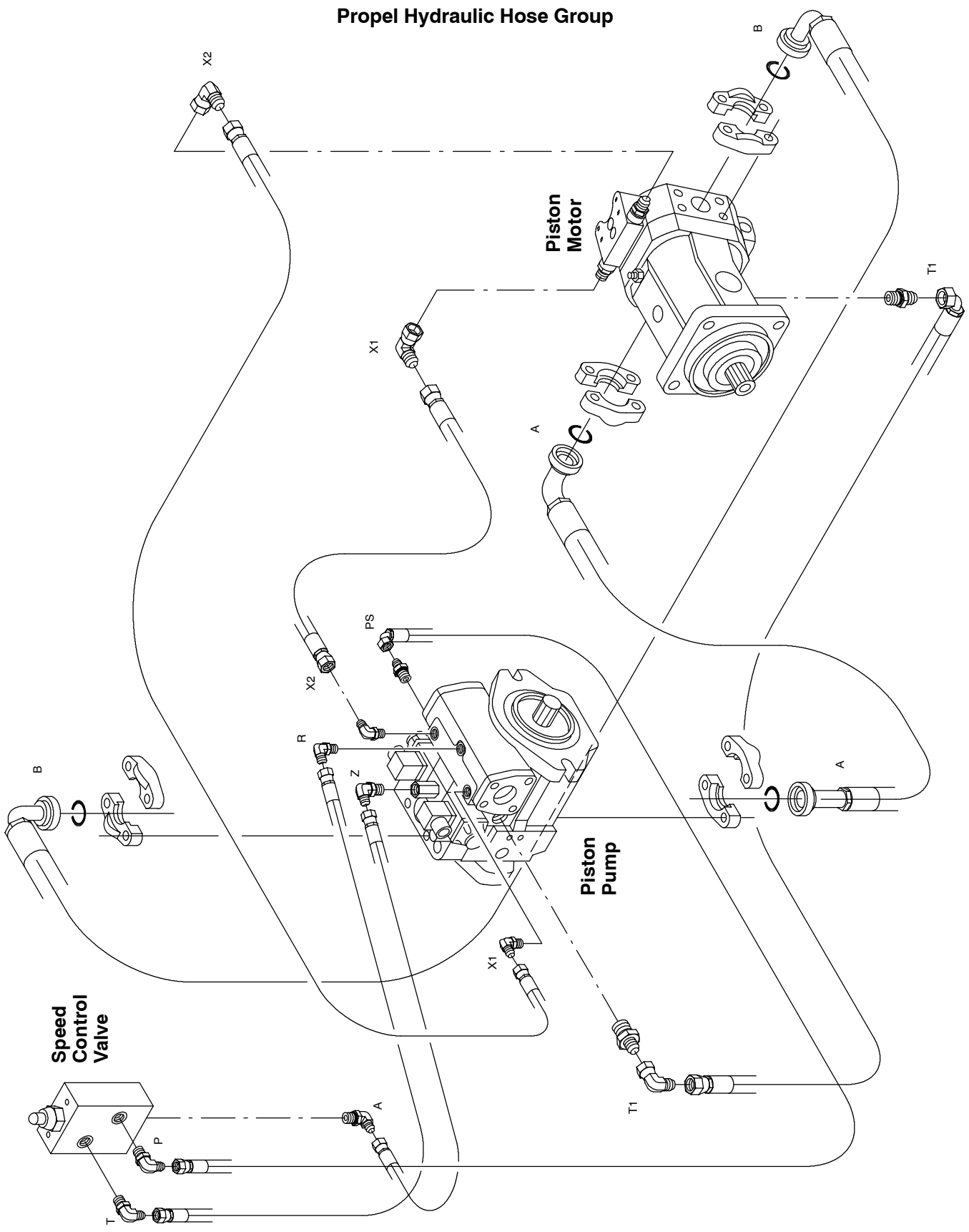


Sentinel Hydraulic Hose Diagram (page 7 of 11)

Left Side Brush Hydraulic Hose Group

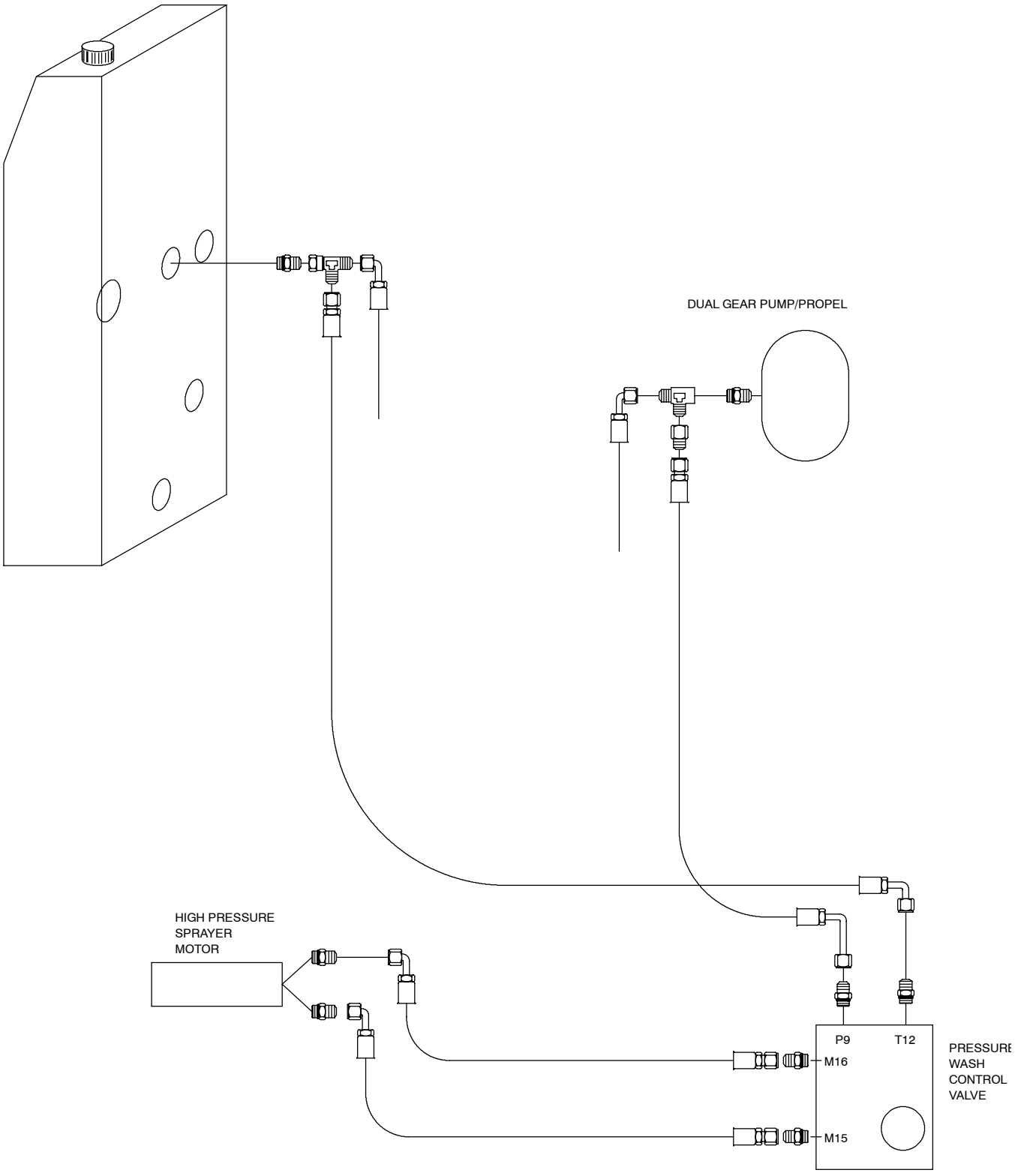


Sentinel Hydraulic Hose Diagram (page 8 of 11)



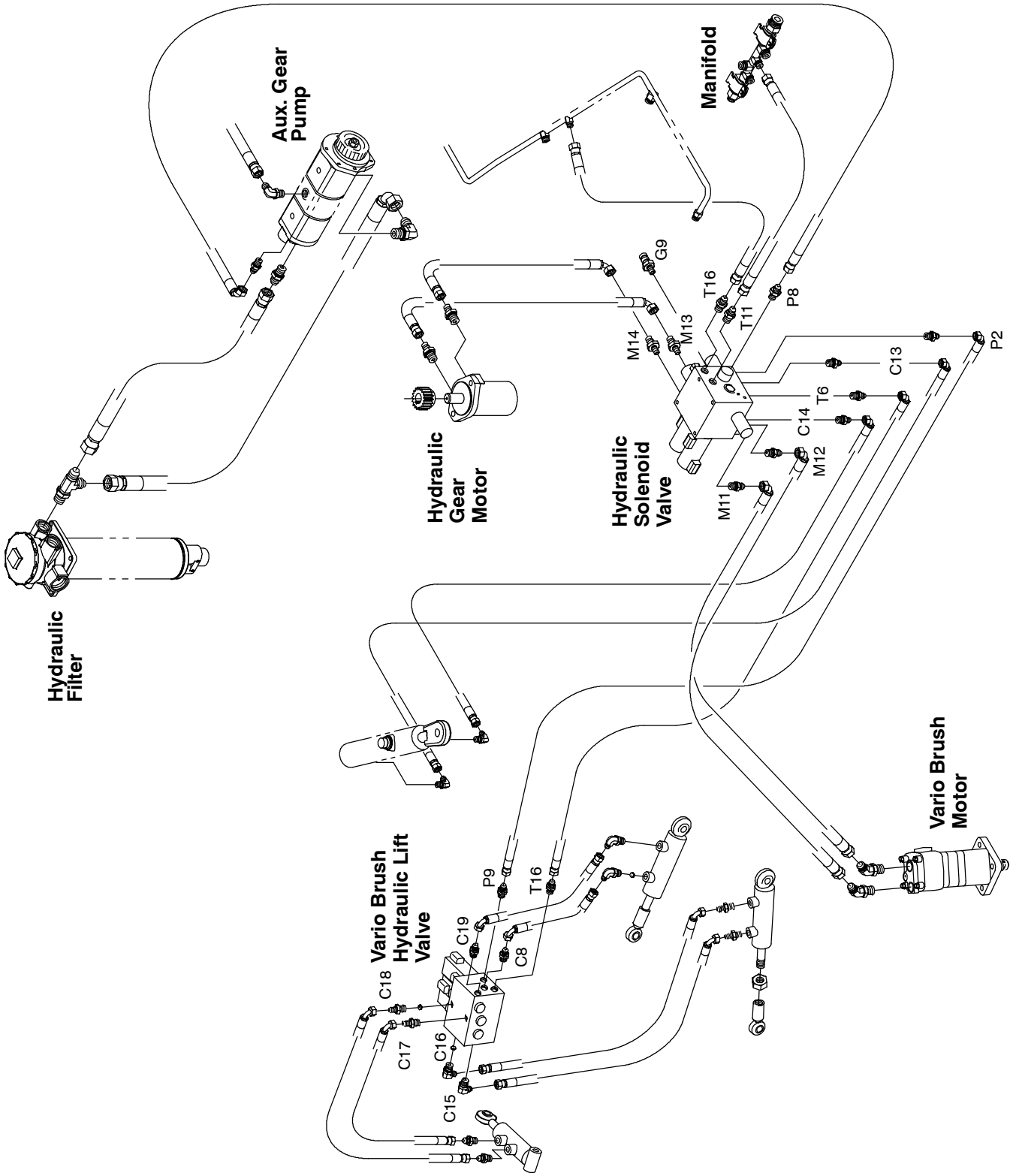
Sentinel Hydraulic Hose Diagram (page 9 of 11)

High Pressure Sprayer Hydraulic Hose Group



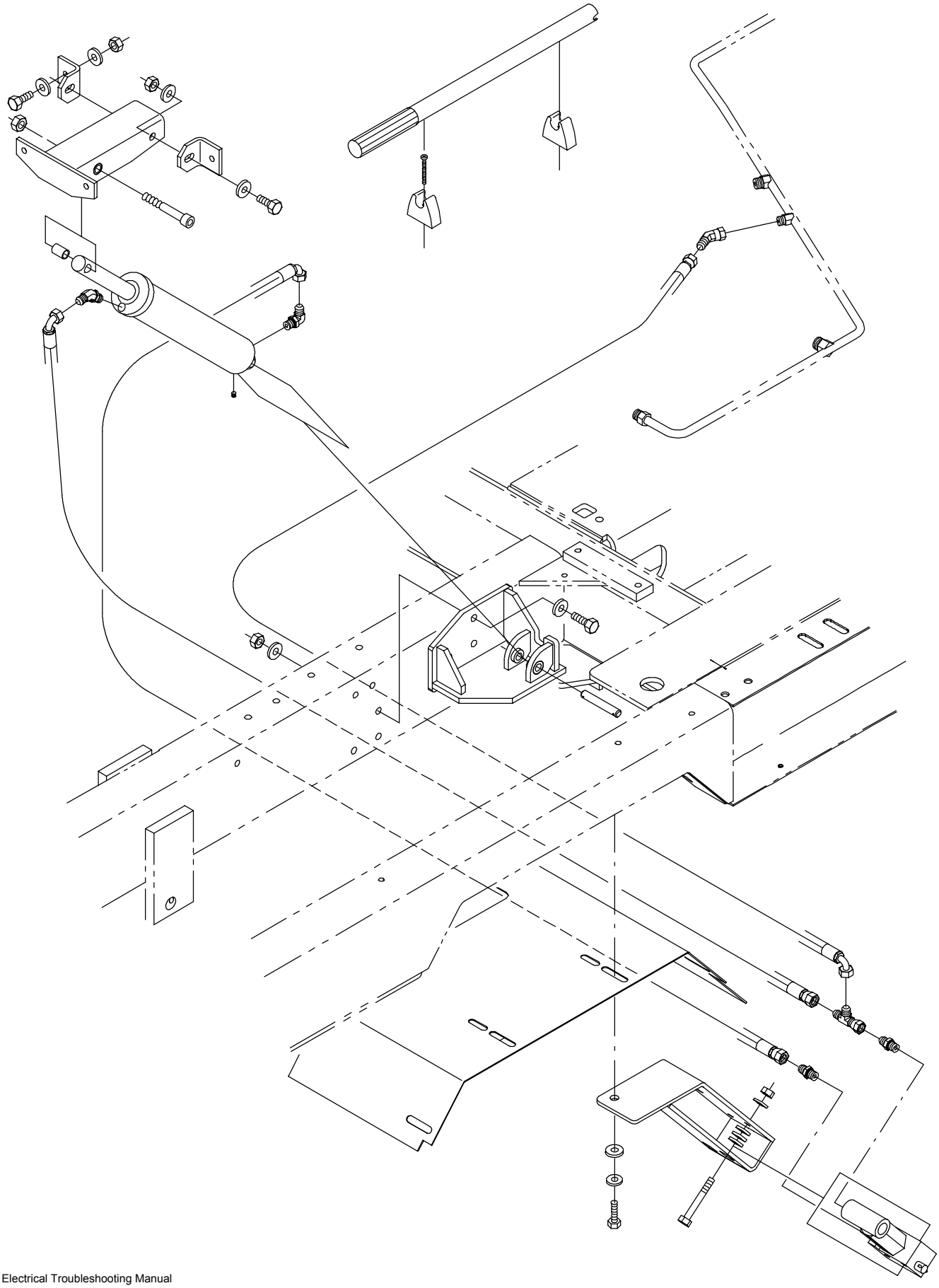
Sentinel Hydraulic Hose Diagram (page 10 of 11)

Vario Brush Hydraulic Hose Group



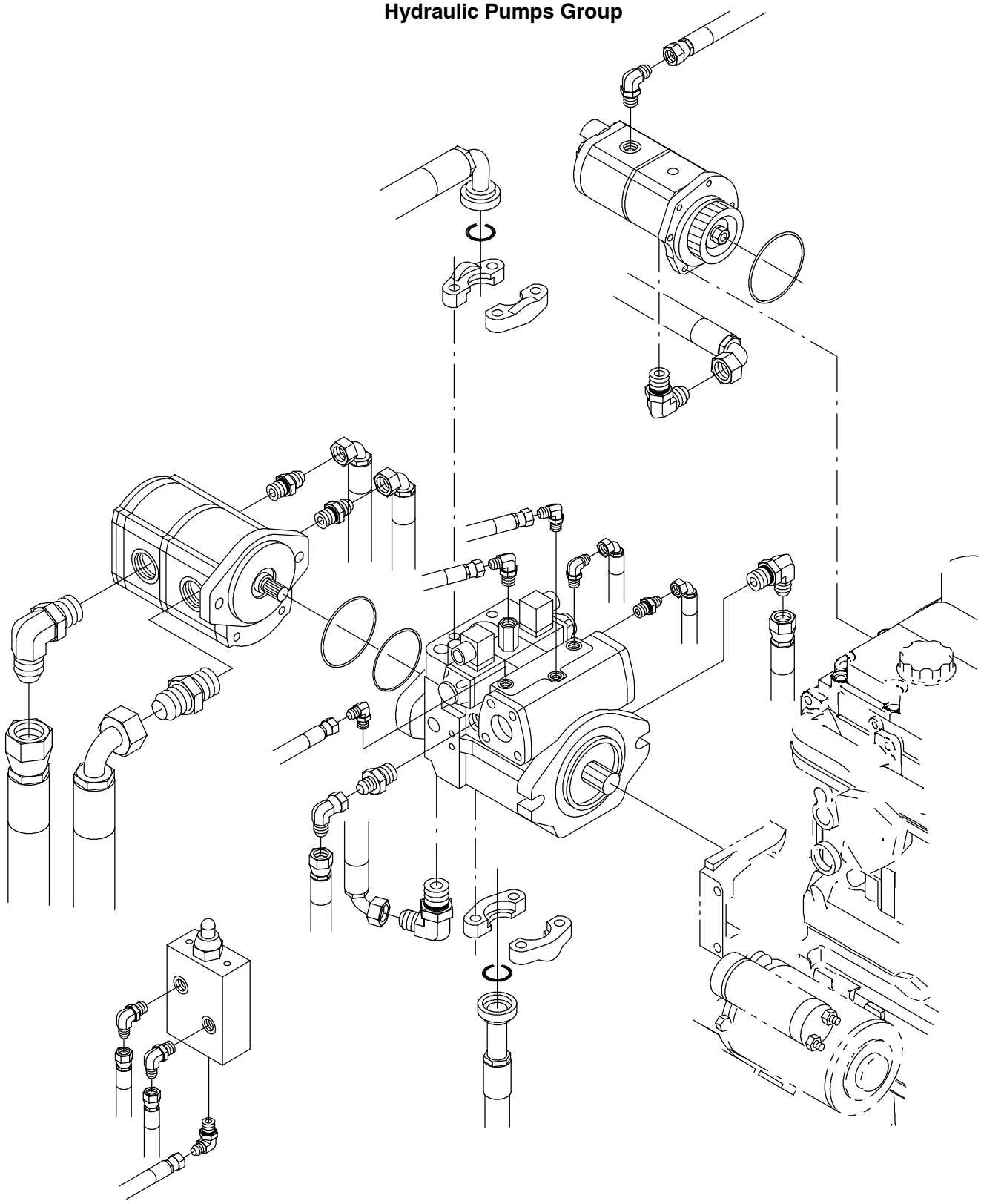
Sentinel Hydraulic Hose Diagram (page 11 of 11)

Cab Tilt Group



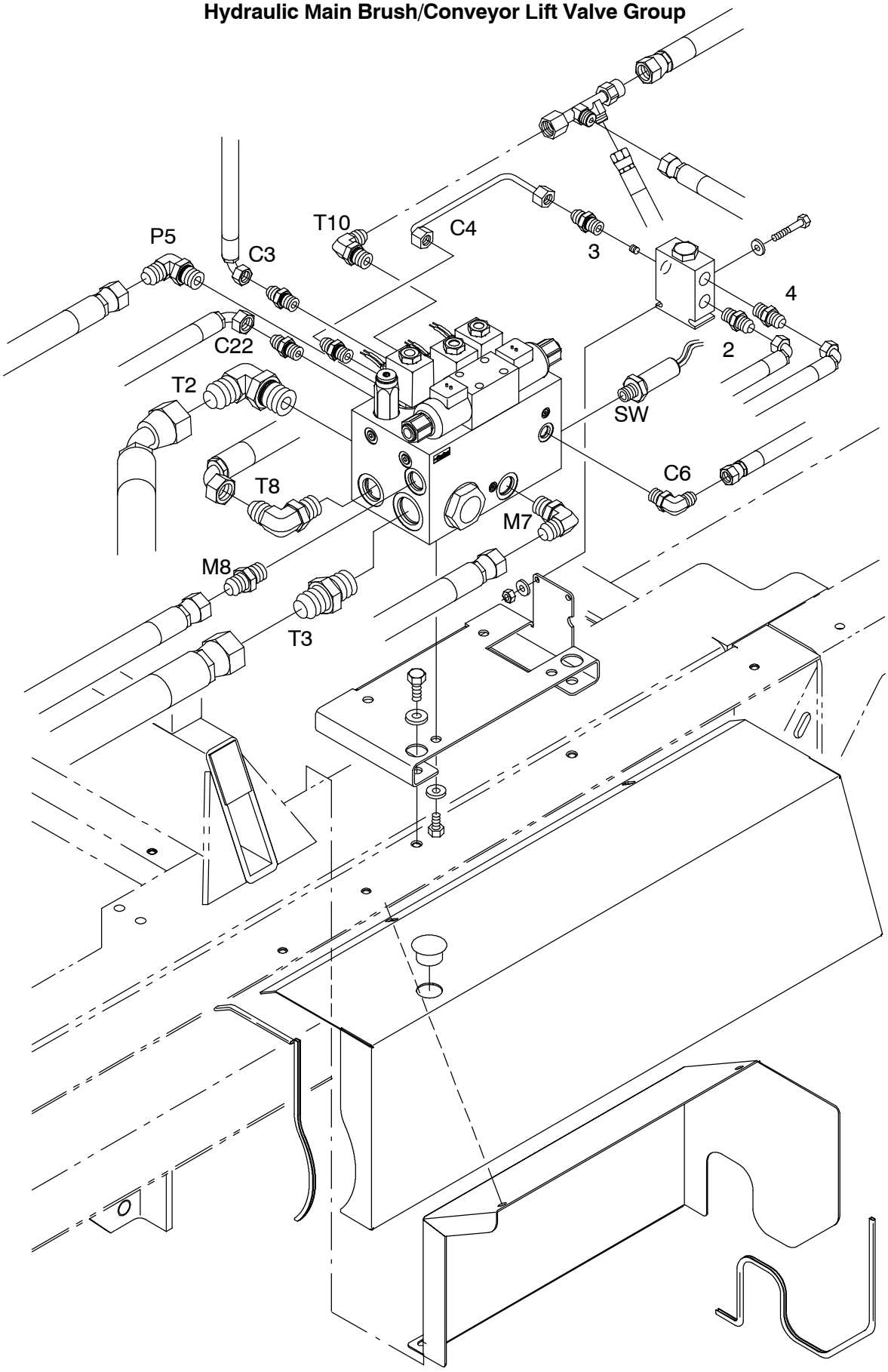
Sentinel Hydraulic Pumps & Valves (page 1 of 8)

Hydraulic Pumps Group



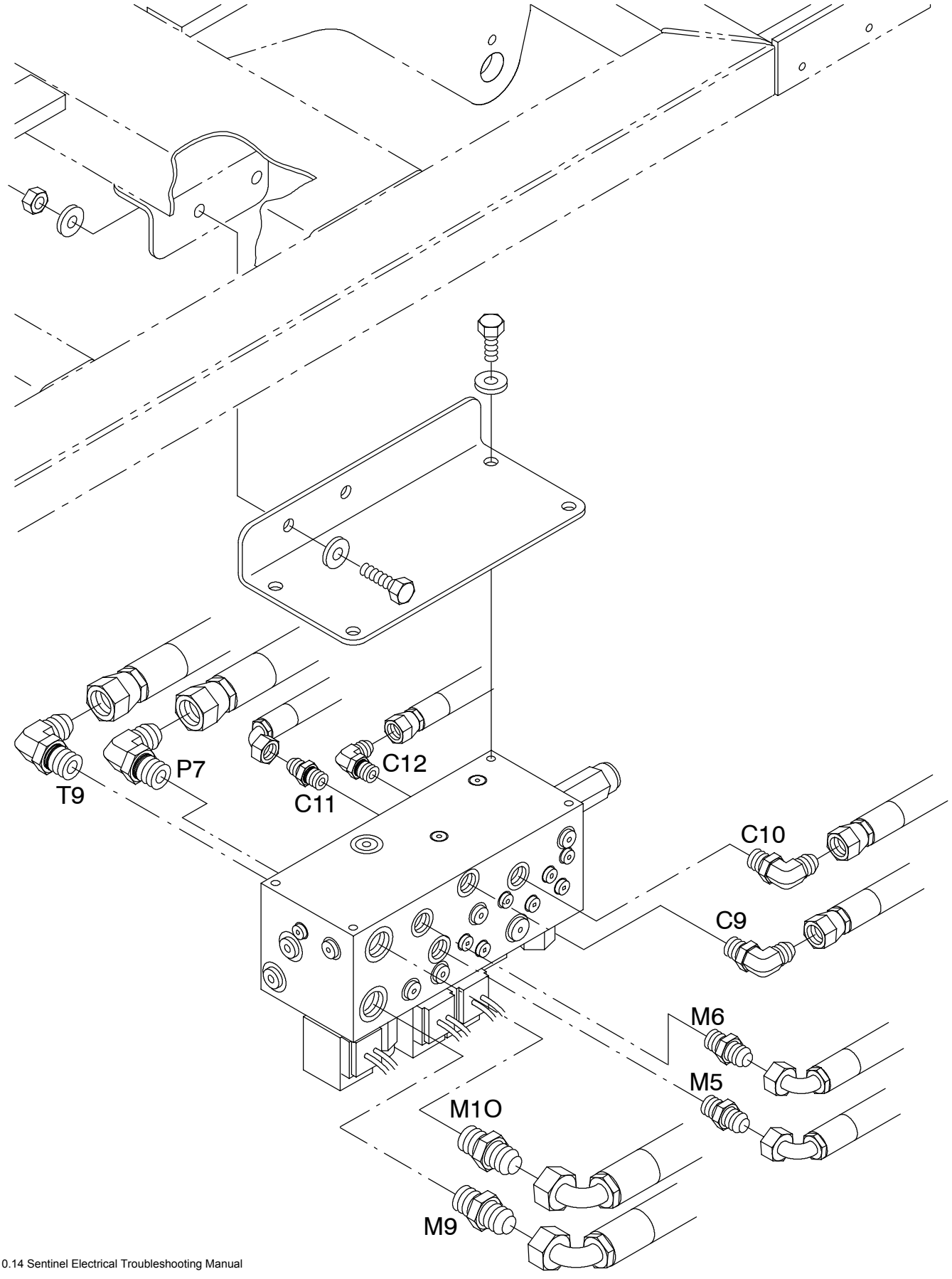
Sentinel Hydraulic Pumps & Valves (page 2 of 8)

Hydraulic Main Brush/Conveyor Lift Valve Group



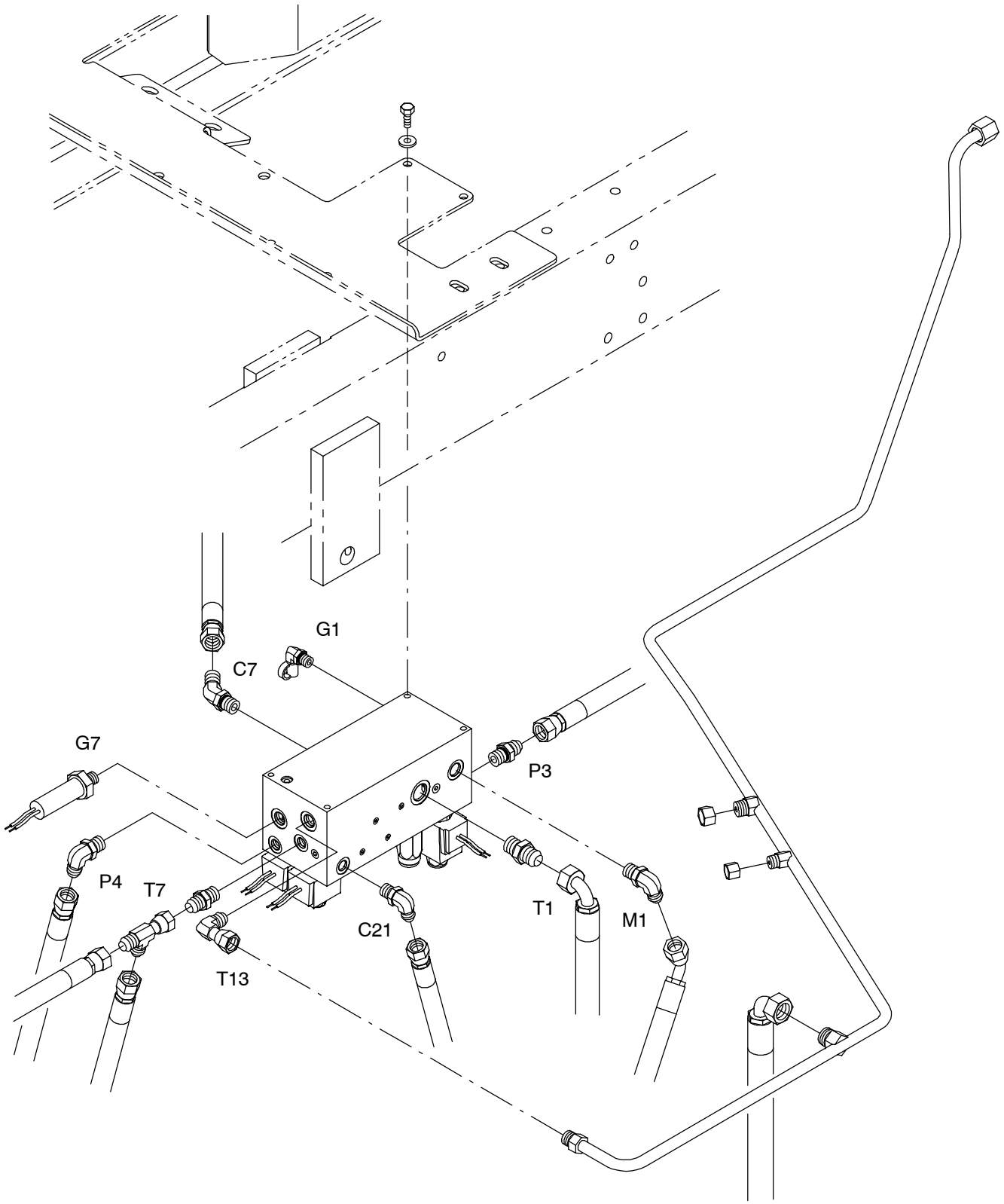
Sentinel Hydraulic Pumps & Valves (page 3 of 8)

Hydraulic Hopper Control Valve Group



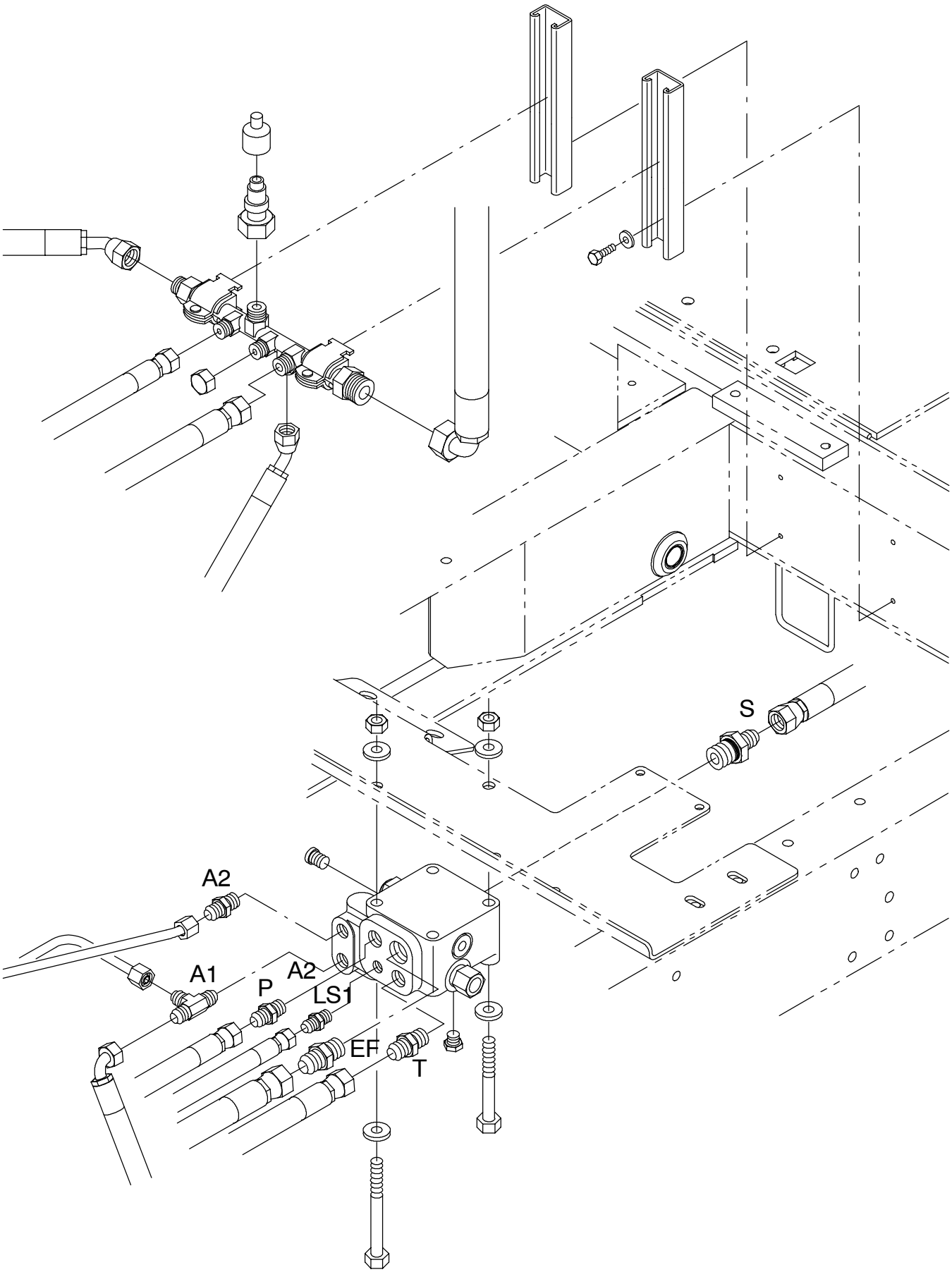
Sentinel Hydraulic Pumps & Valves (page 4 of 8)

Hydraulic Side Brush Valve Group



Sentinel Hydraulic Pumps & Valves (page 5 of 8)

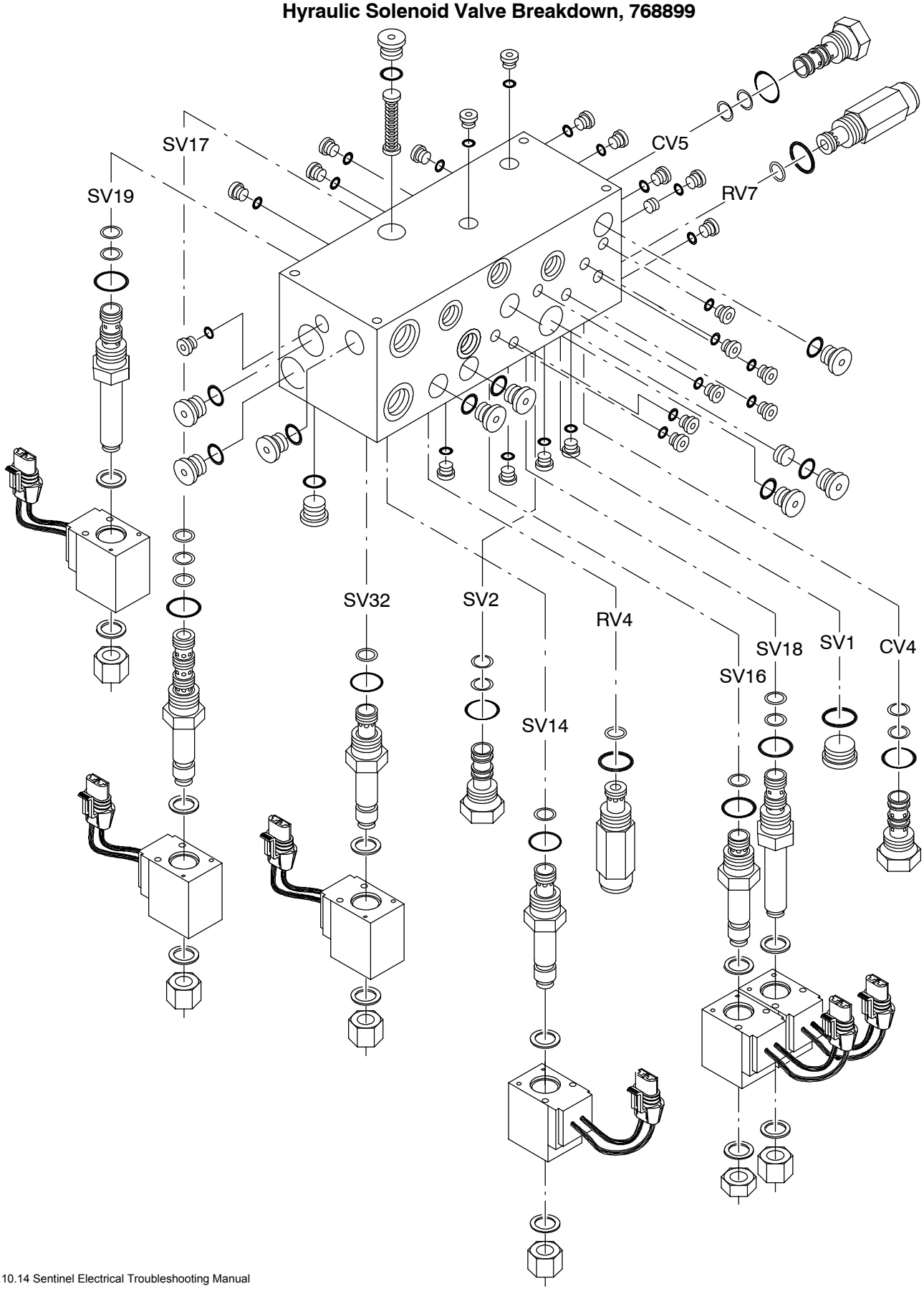
Hydraulic Manifold and Priority Group



Sentinel Hydraulic Pumps & Valves (page 6 of 8)

Hopper Functions & Vacuum Fans Valve Block

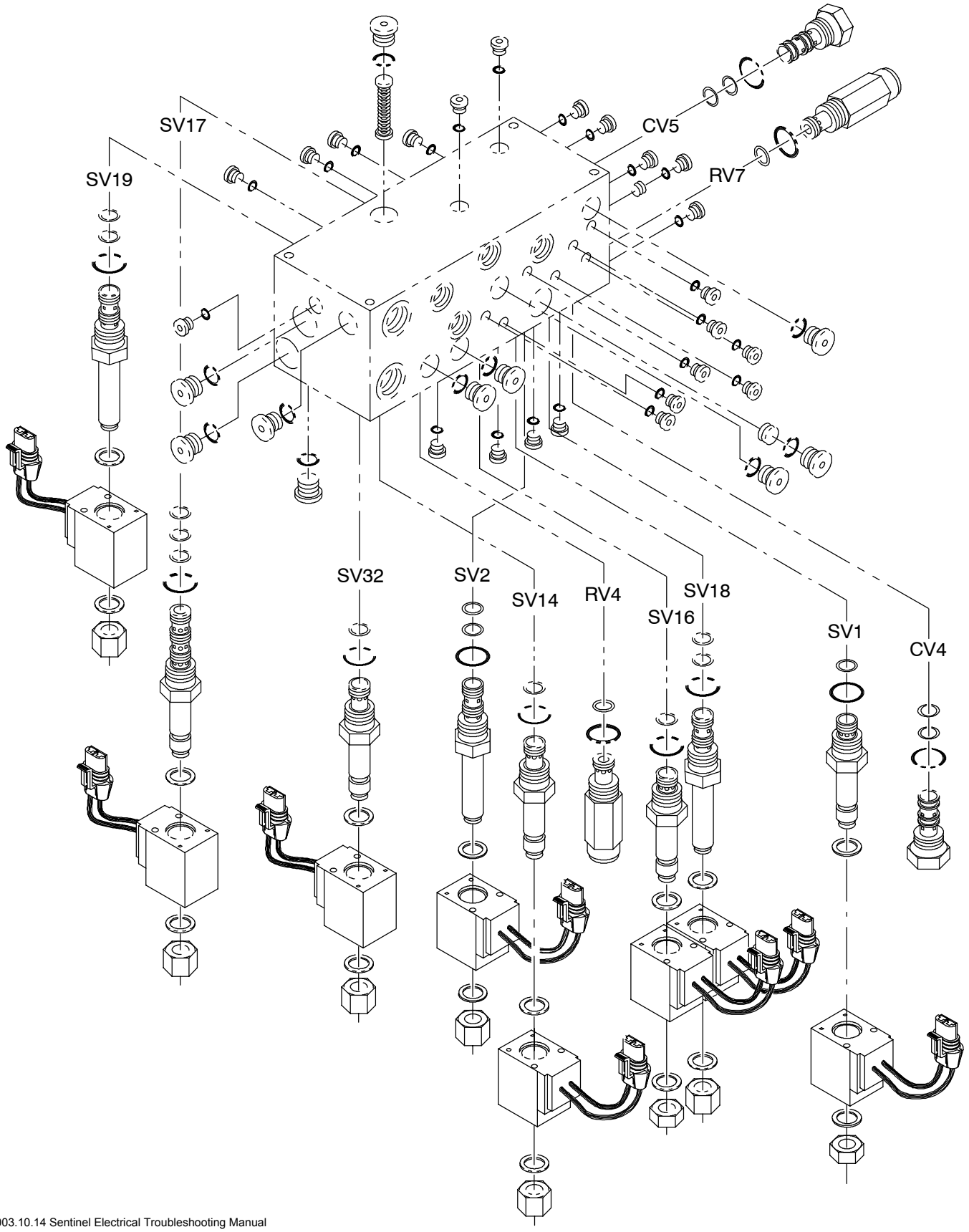
Hyraulic Solenoid Valve Breakdown, 768899



Sentinel Hydraulic Pumps & Valves (page 7 of 8)

Hopper Functions & Vacuum Fans Valve Block

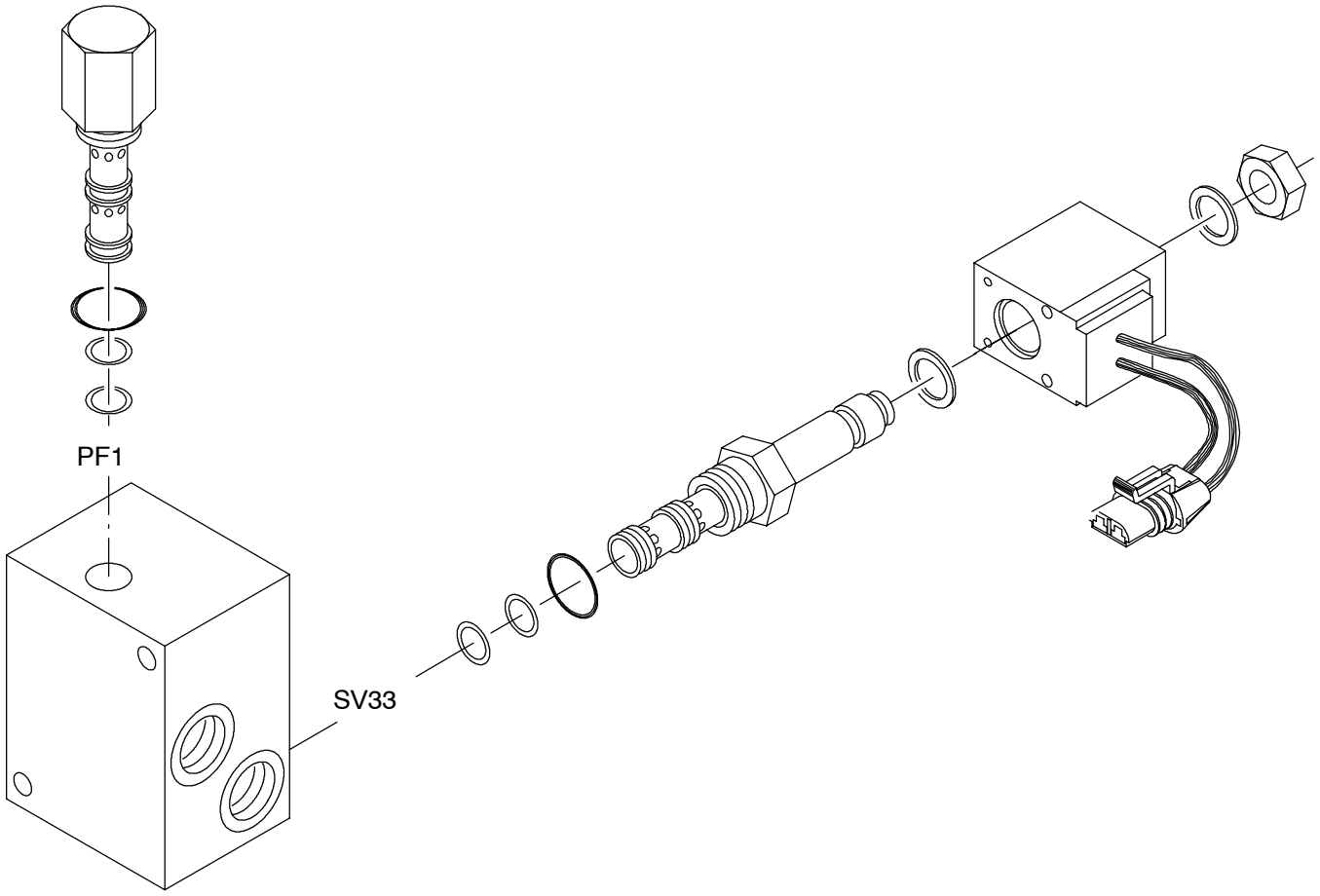
Hydraulic Solenoid Valve Breakdown, 768899
(For High Dump Hopper Lift Option)



Sentinel Hydraulic Pumps & Valves (page 8 of 8)

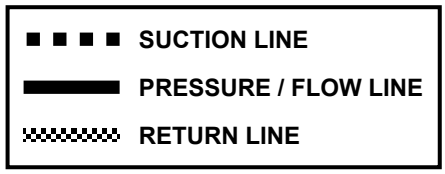
Pressure Washer Valve Block

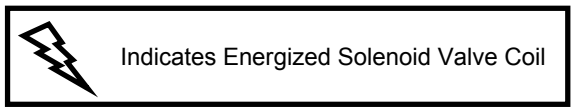
Hydraulic Solenoid Valve Breakdown, 767009

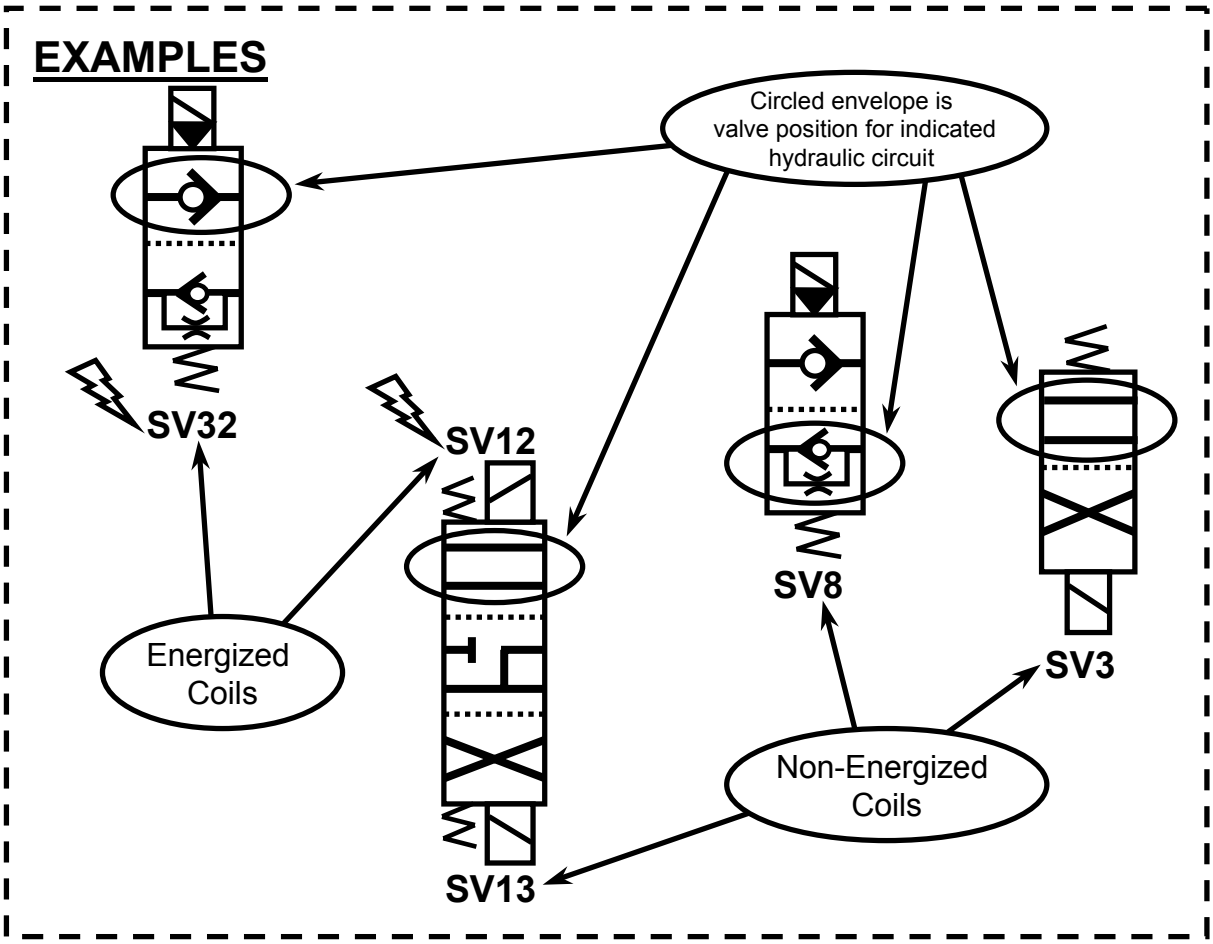


EXPLANATION OF ABBREVIATIONS

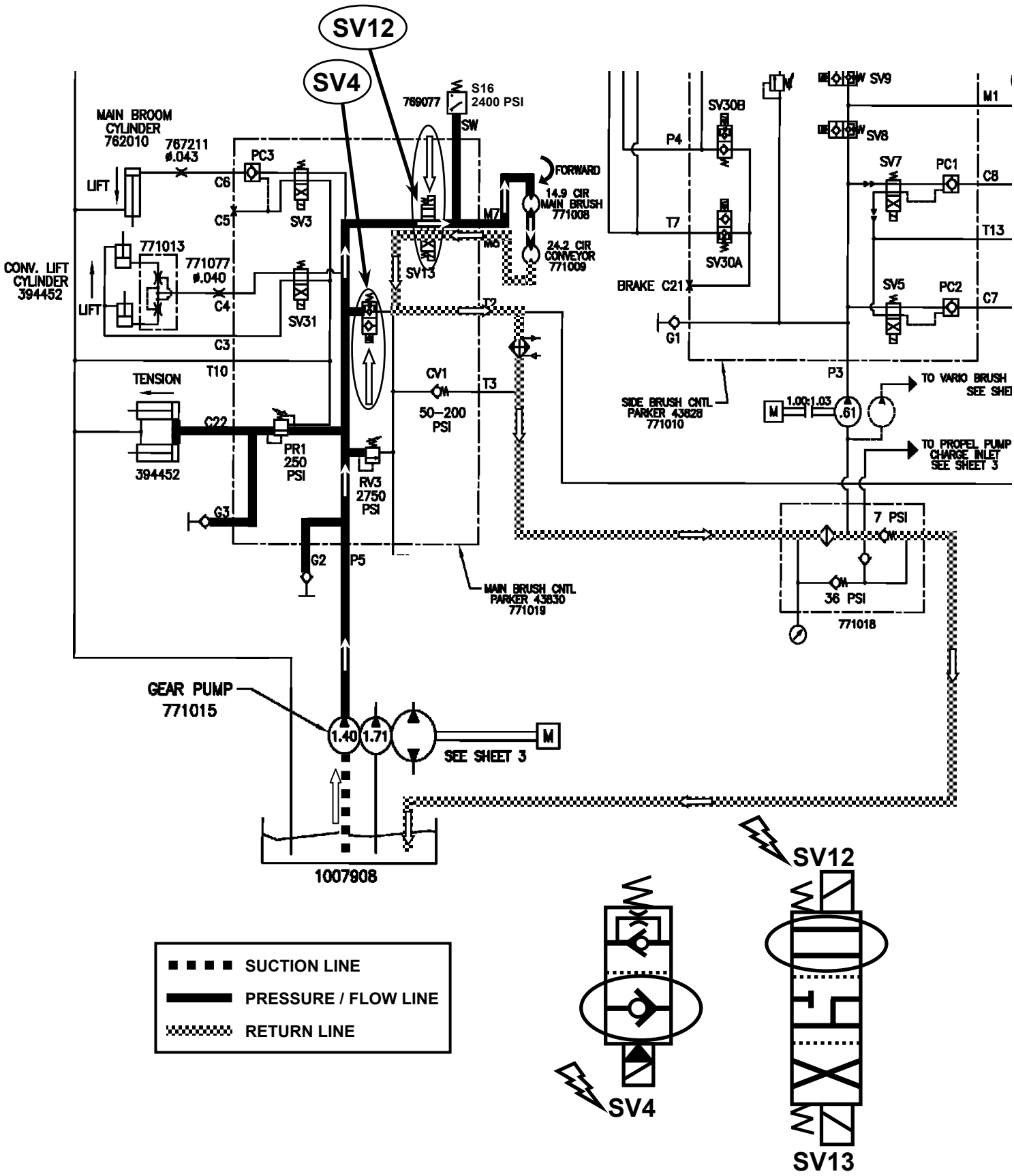
AUX.....Auxiliary
CK.....Check Valve
CM.....Centimeters
CU.....Cubic
CV.....Control Valve
CYL.....Cylinder
DC.....Disconnect Coupler (Hydraulic)
DC.....Direct Current (Electrical)
FLTR.....Filter
GPM.....Gallons per Minute
HTX.....Heat Exchanger
IN.....Inches
LH.....Left Hand
LPM.....Liters per Minute
M.....Motor (Combustion)
MTR.....Motor (Hydraulic)
OR.....Orifice
PC.....Pilot Port Check Valve
PMP.....Pump
PSI.....Pounds per Square Inch
PSWITCH.....Pressure Switch
RES.....Reservoir
RH.....Right Hand
RPM.....Revolutions per Minute
RV.....Relief Valve
STRN.....Strainer
SV.....Solenoid Valve
TV.....Throttle Valve
V.....Volts



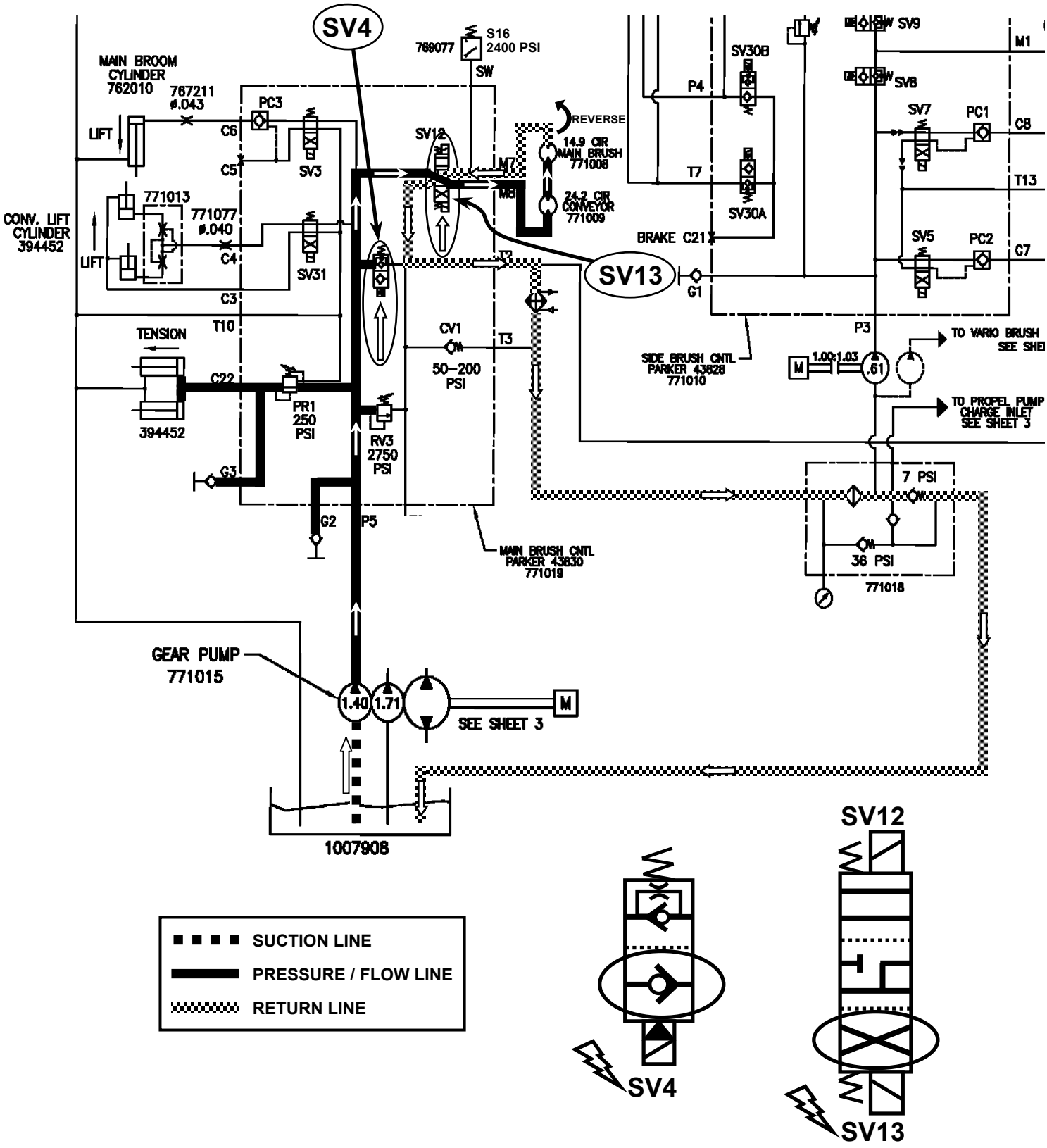




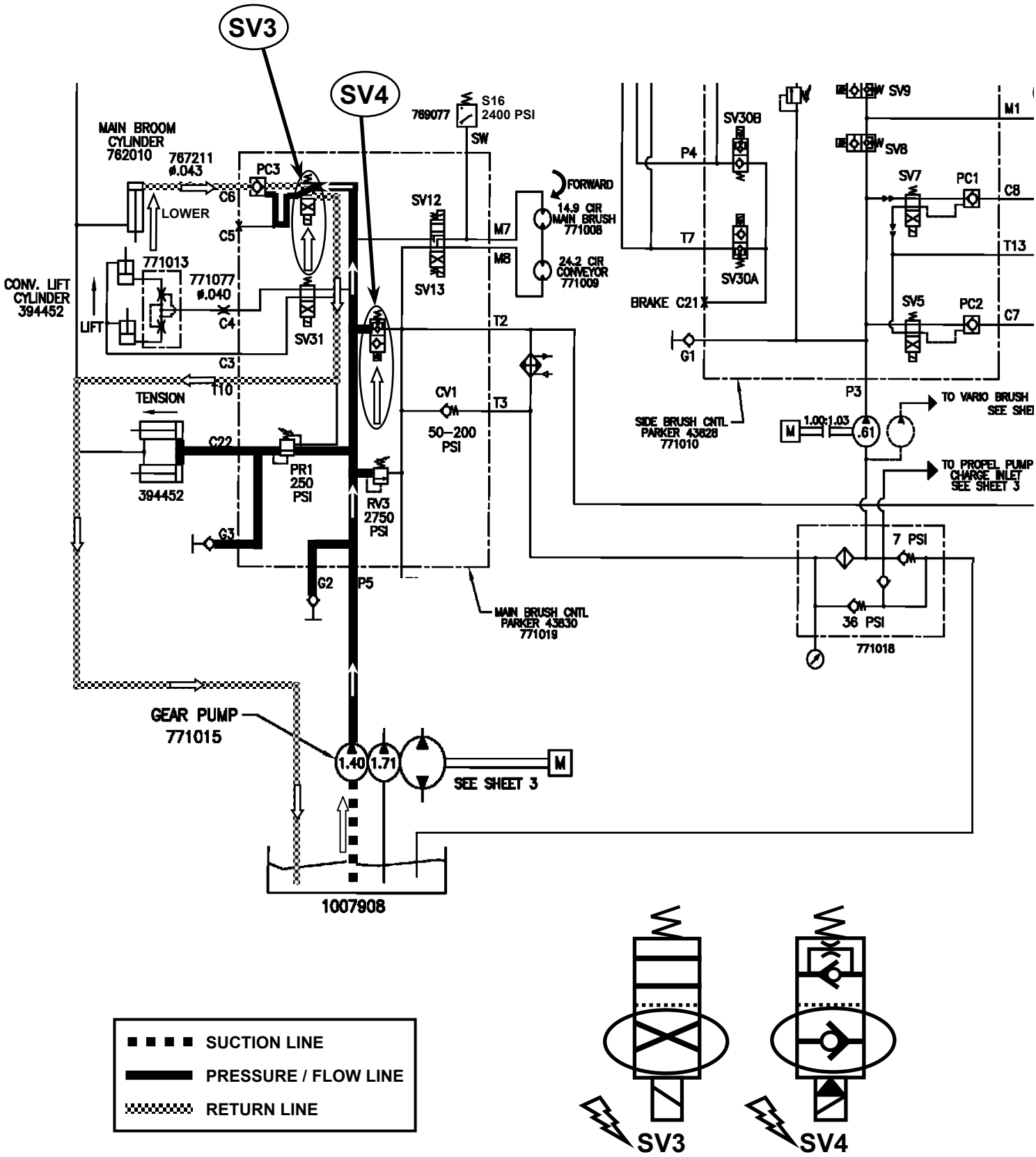
Sentinel Conveyor & Main Brush Forward



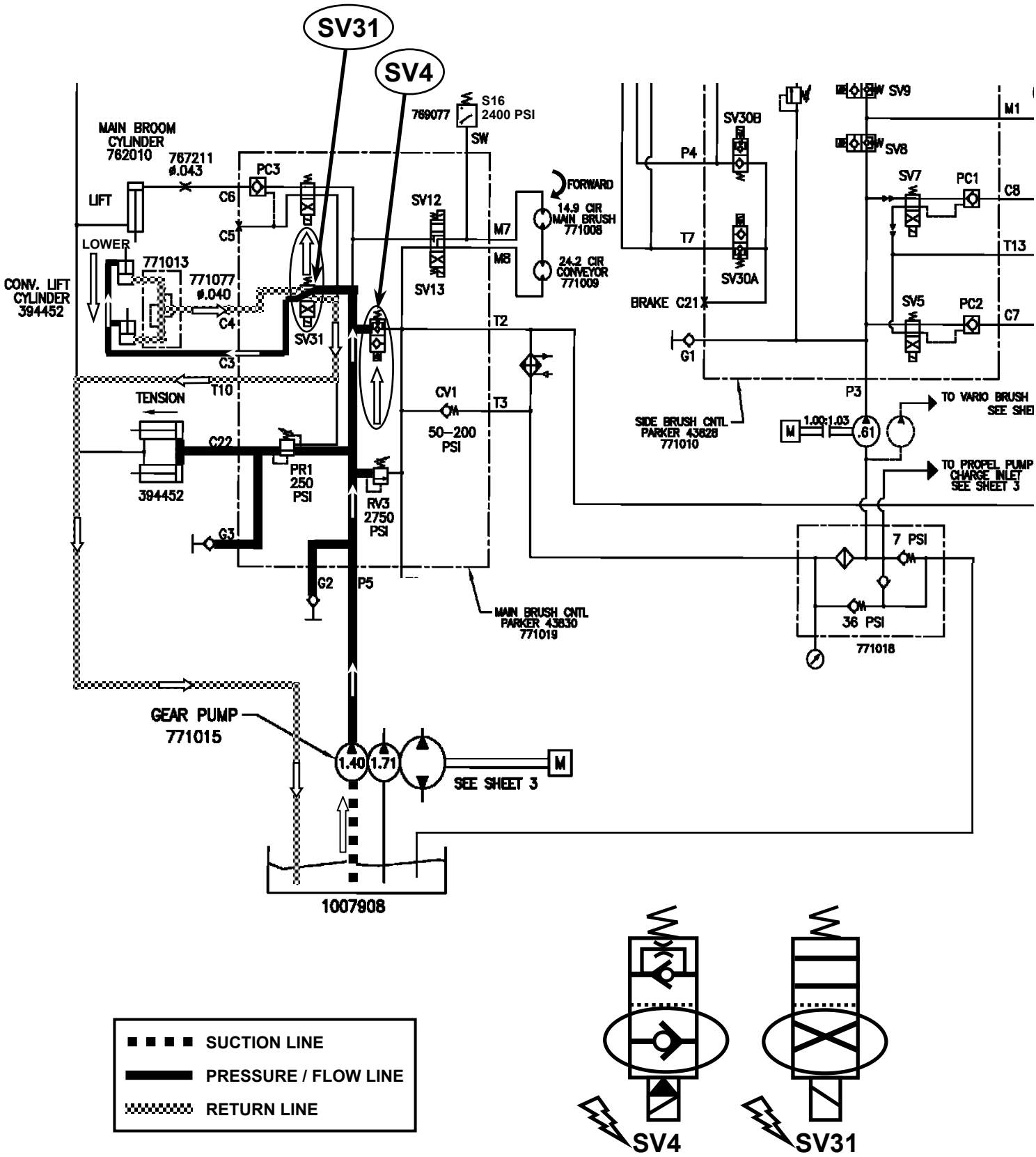
Sentinel Conveyor & Main Brush Reverse



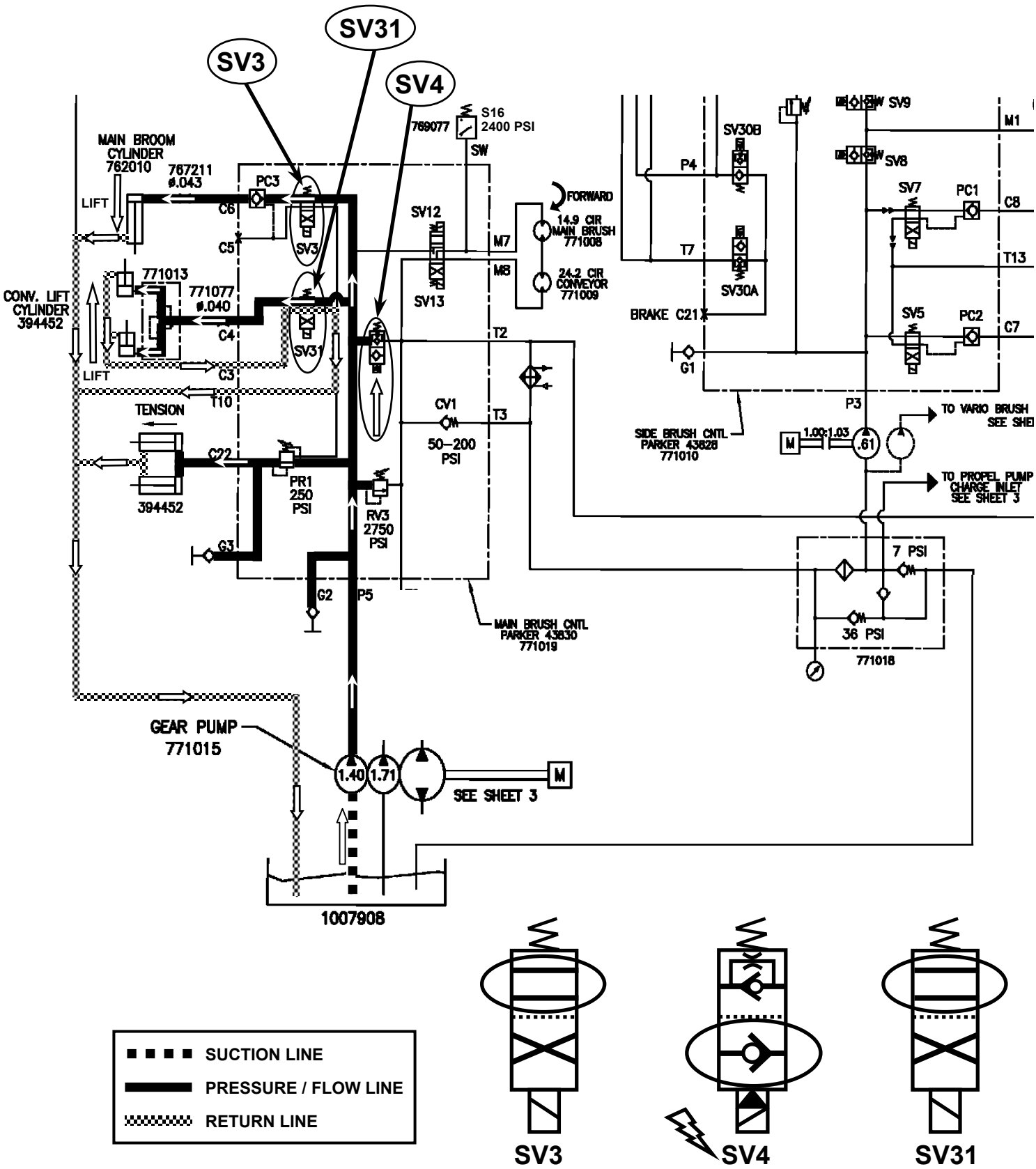
Sentinel Main Brush Lower



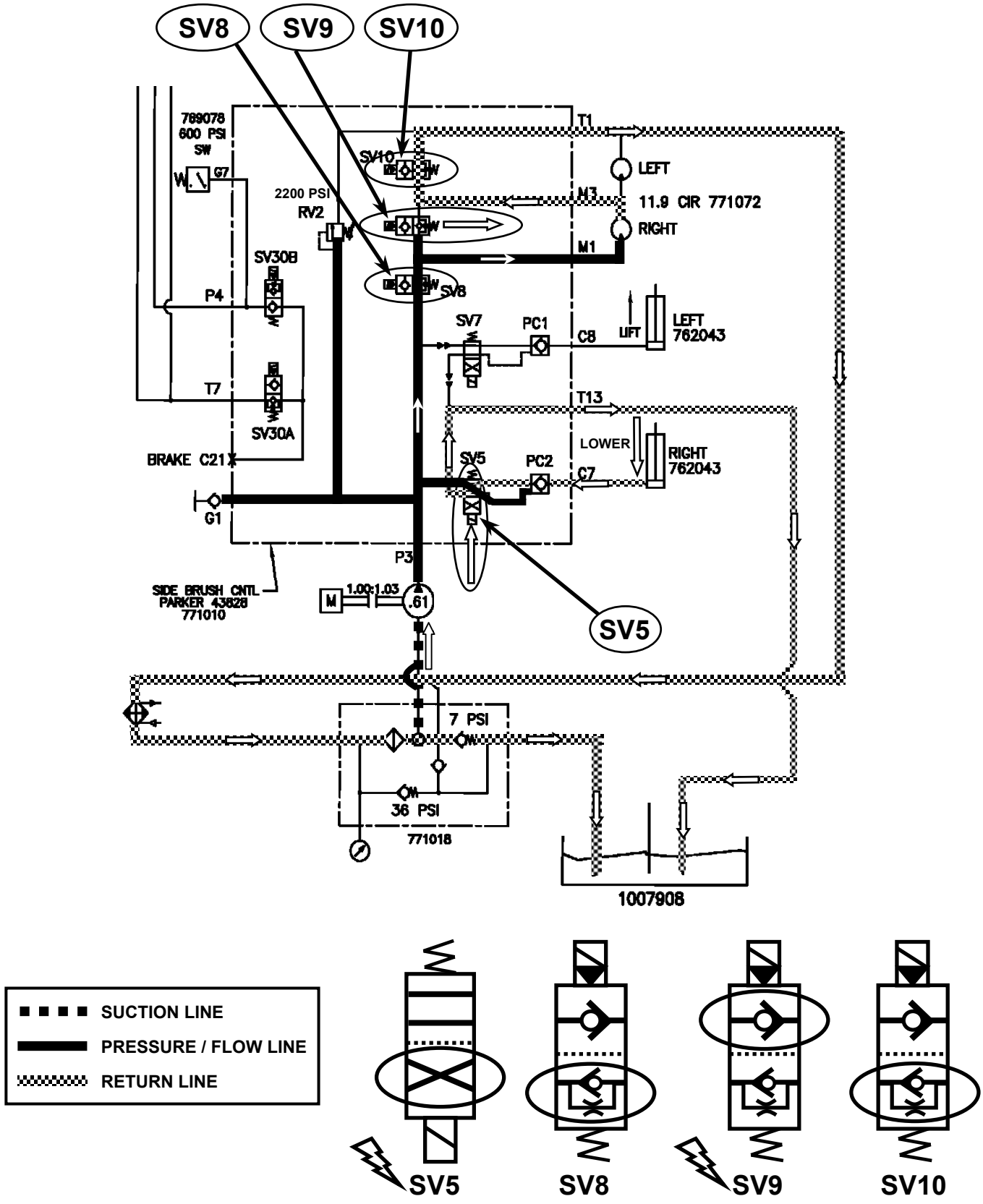
Sentinel Conveyor Lower



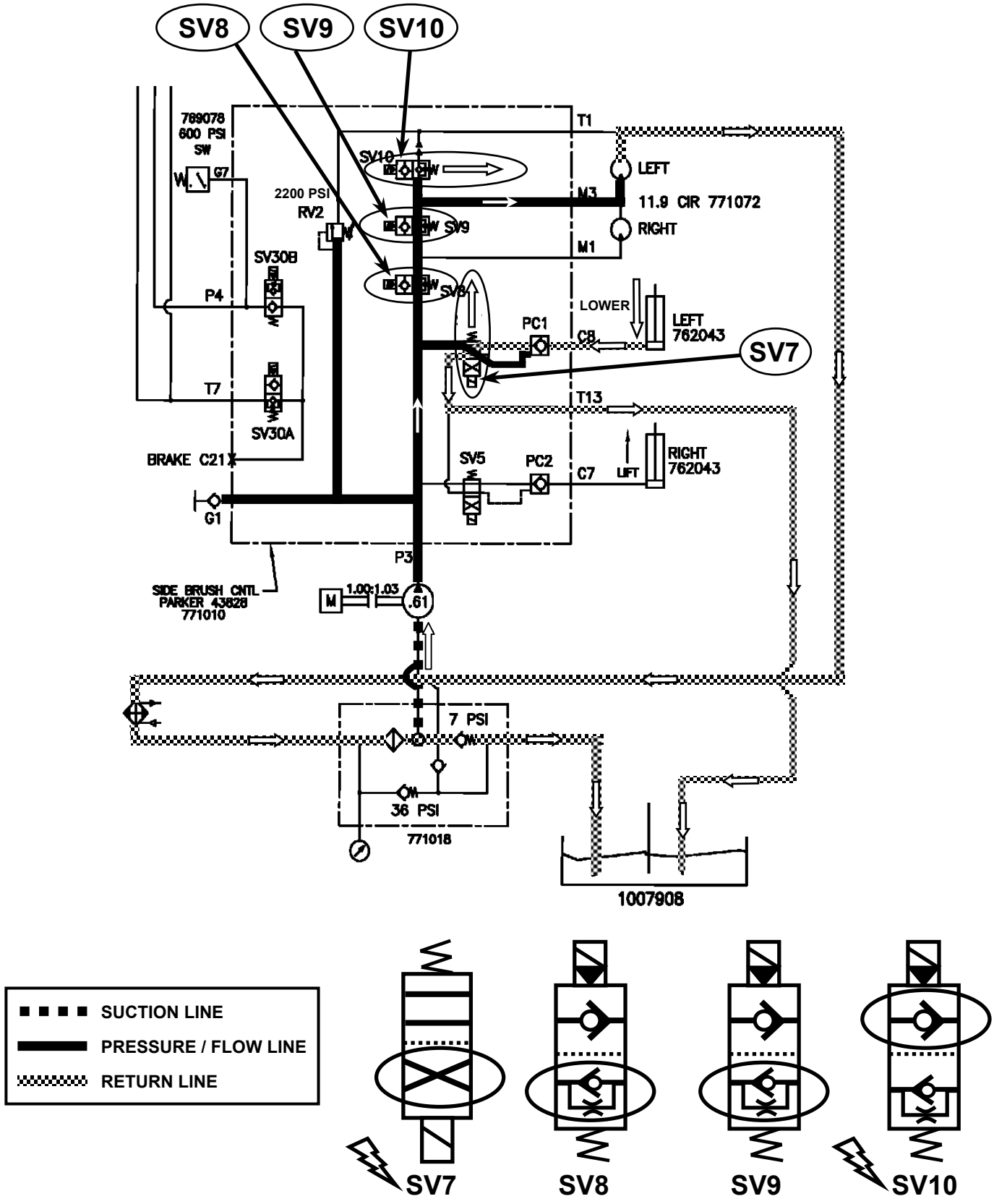
Sentinel Main Brush Lift, Conveyor Lift, & Conveyor Chain Tension



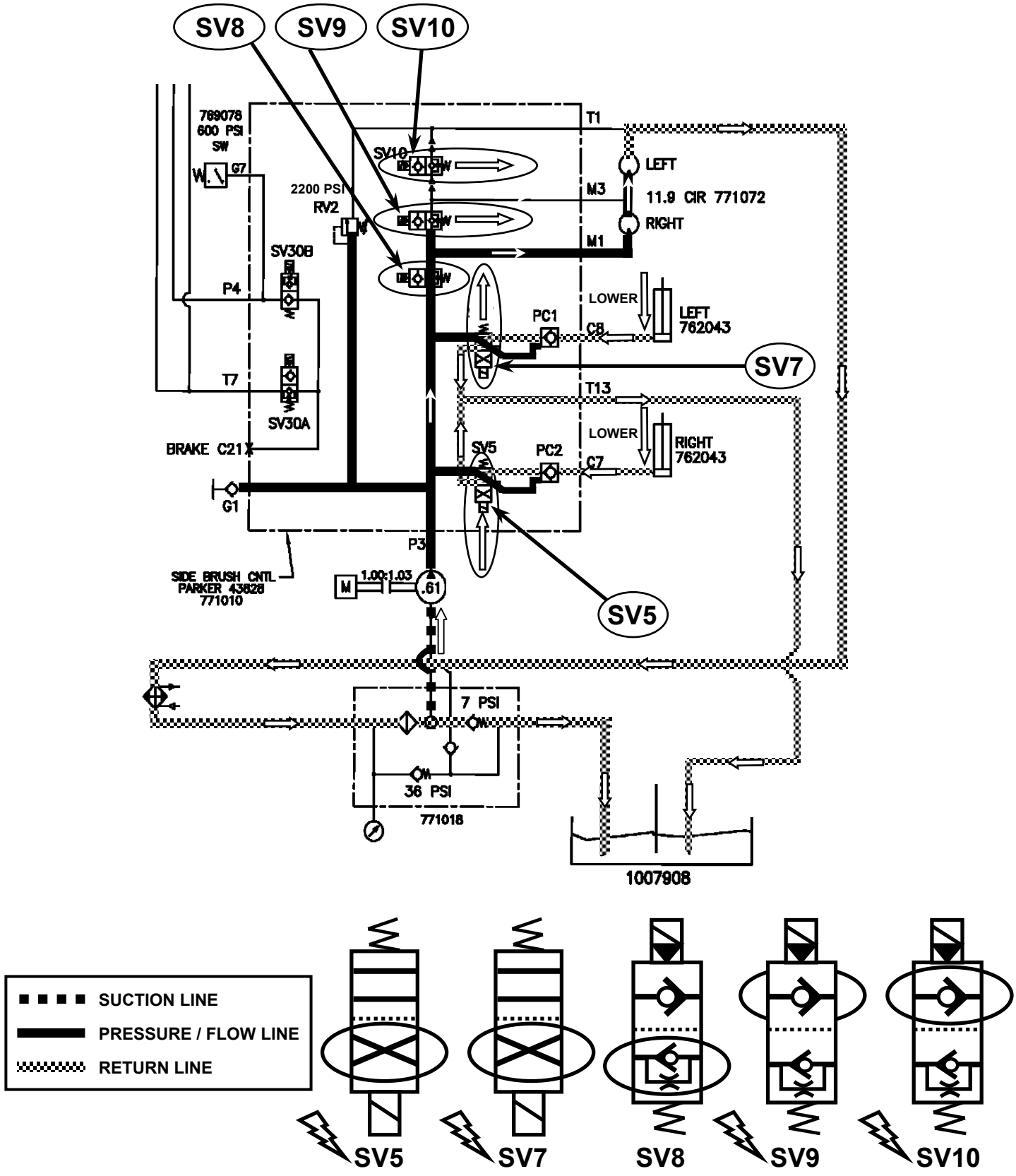
Sentinel Right Side Brush Rotate & Lower



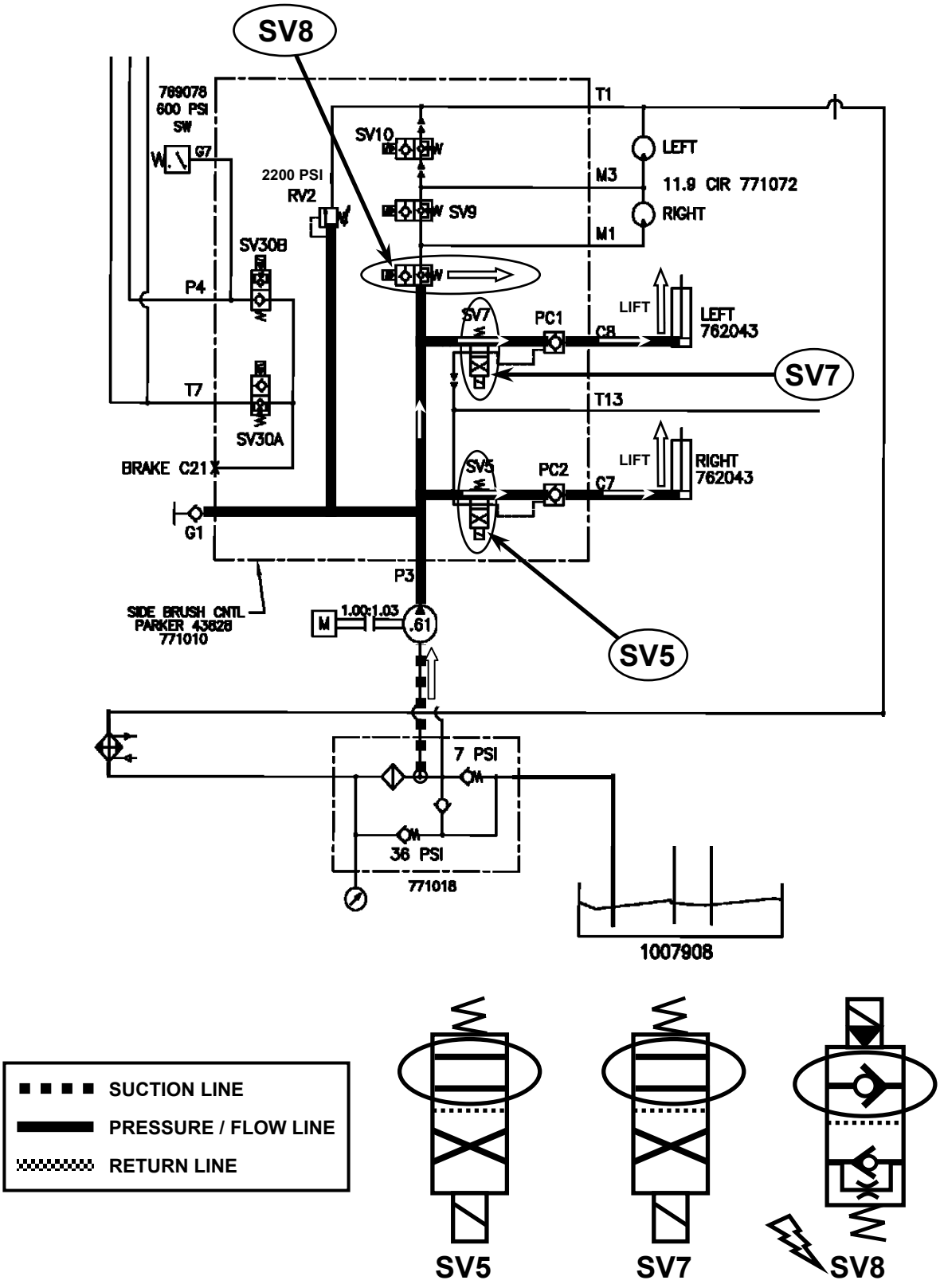
Sentinel Left Side Brush Rotate & Lower



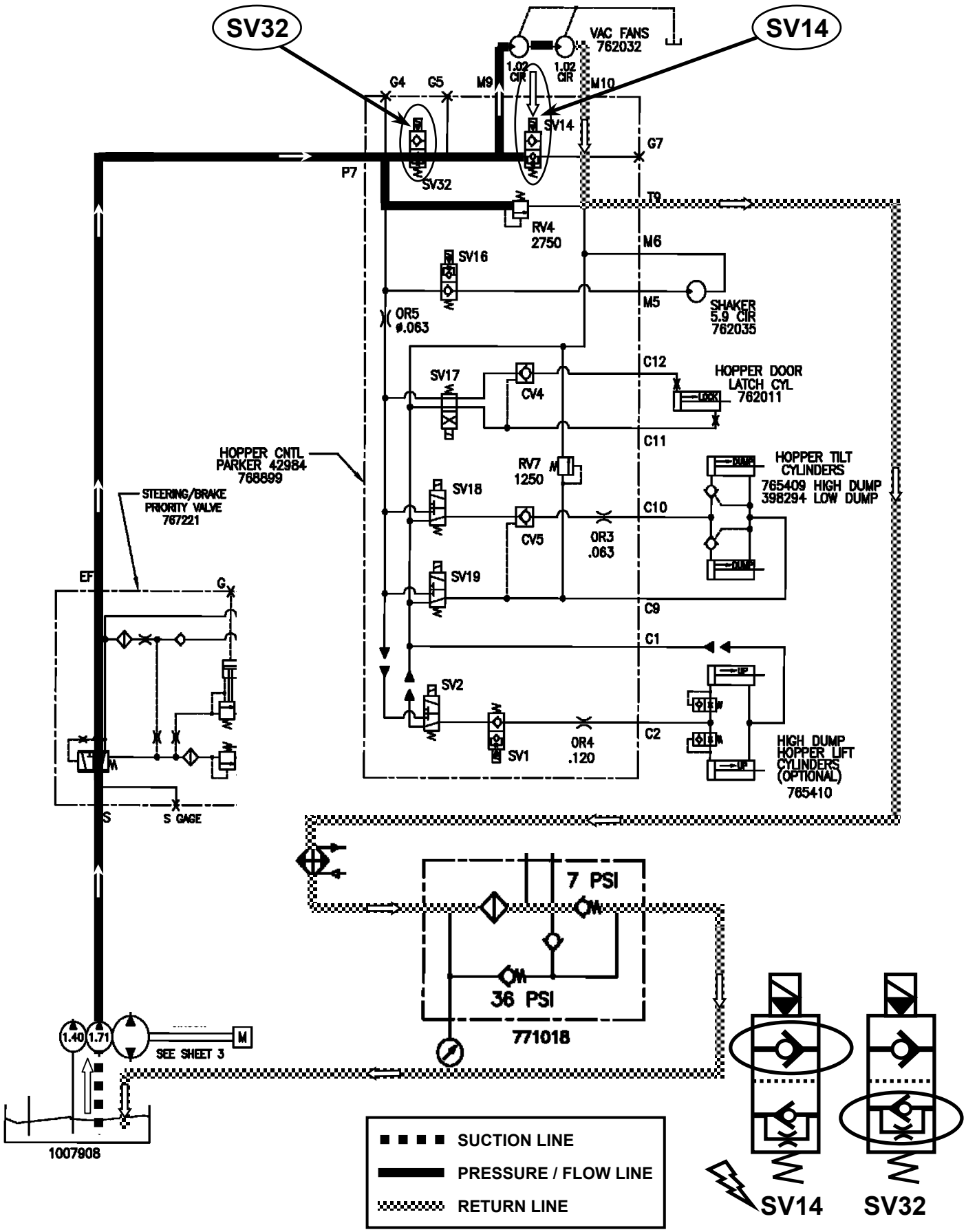
Sentinel Right & Left Side Brush Rotate & Lower



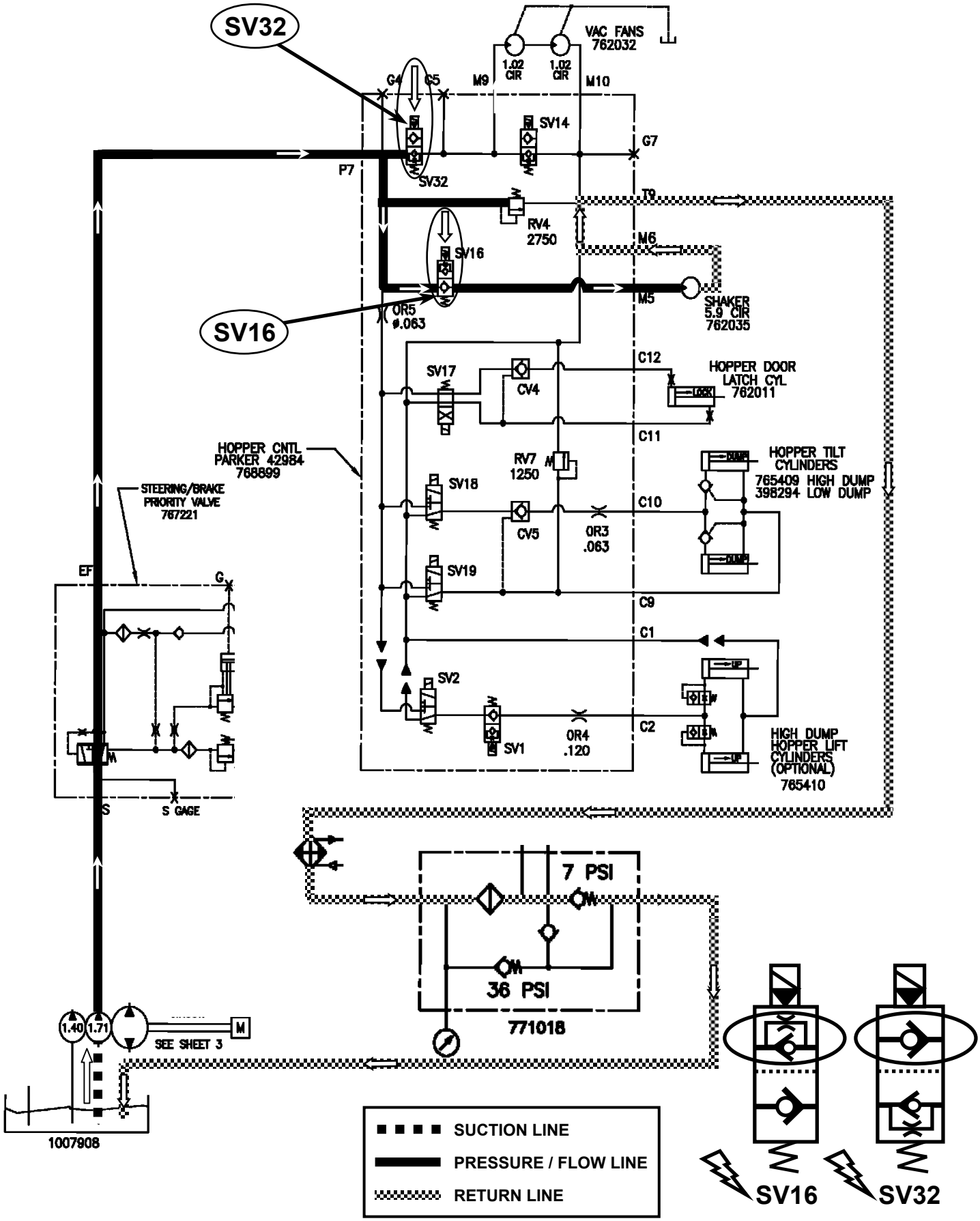
Sentinel Right & Left Side Brush Lift



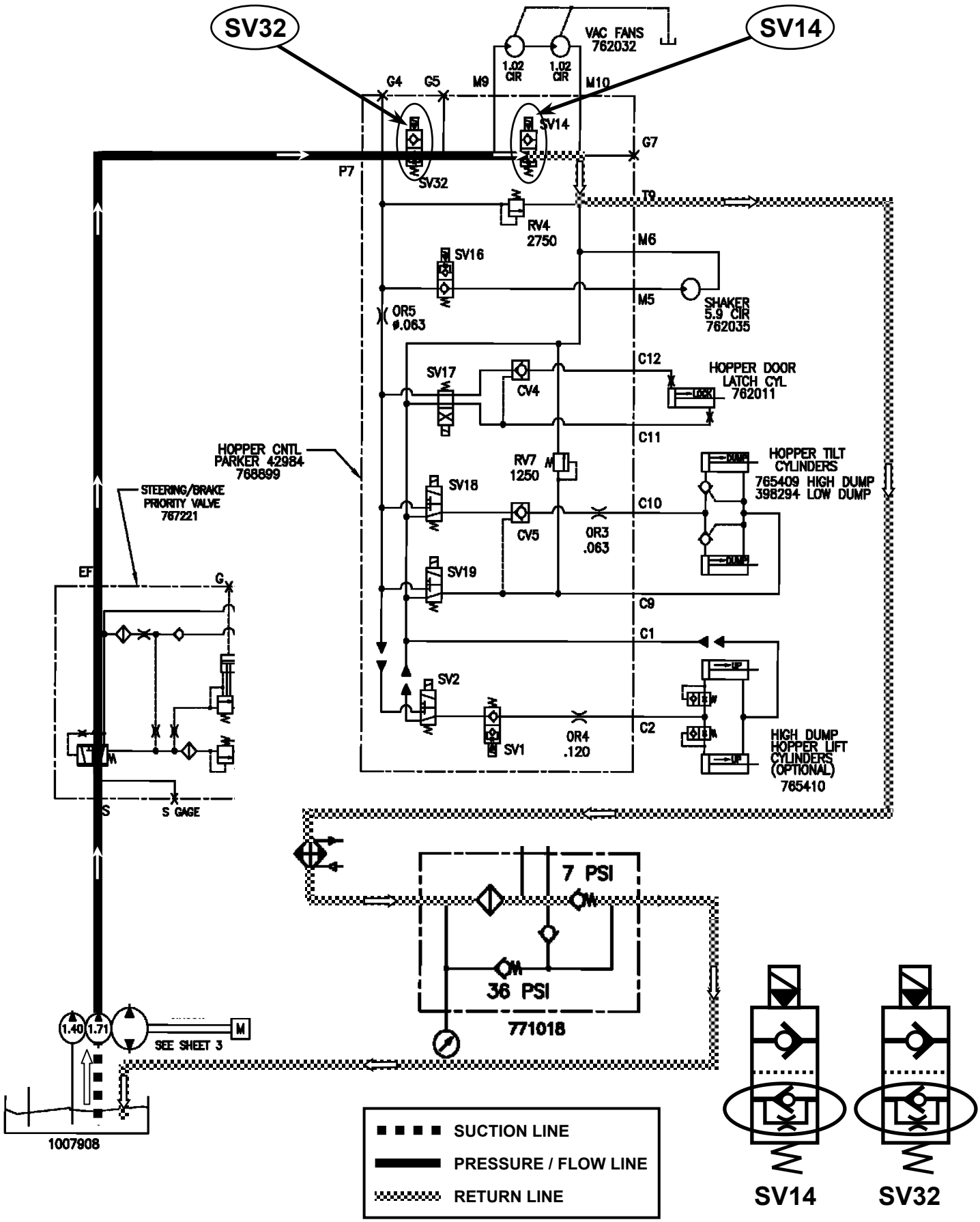
Sentinel Vacuum Fans Run



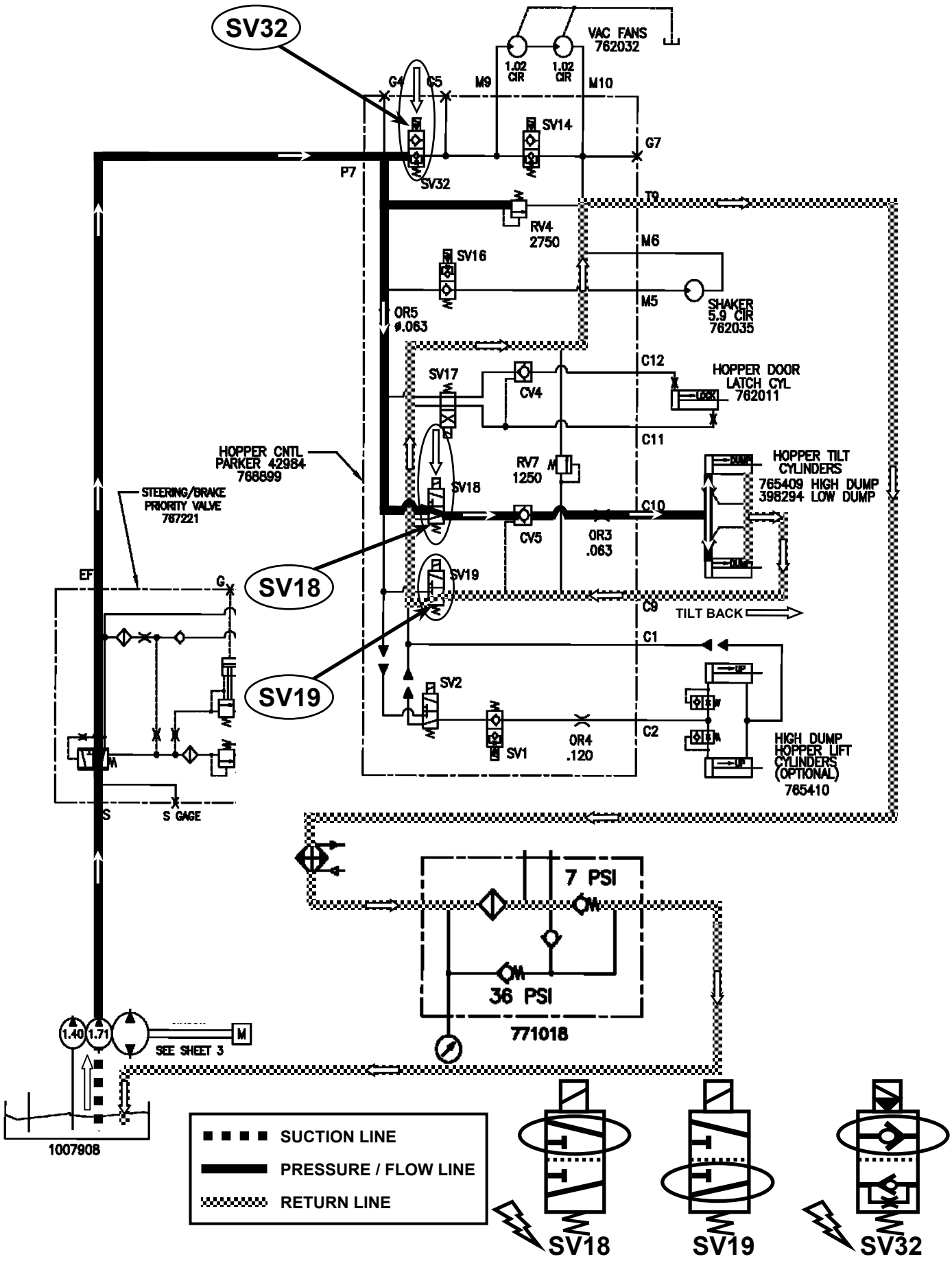
Sentinel Shaker Run



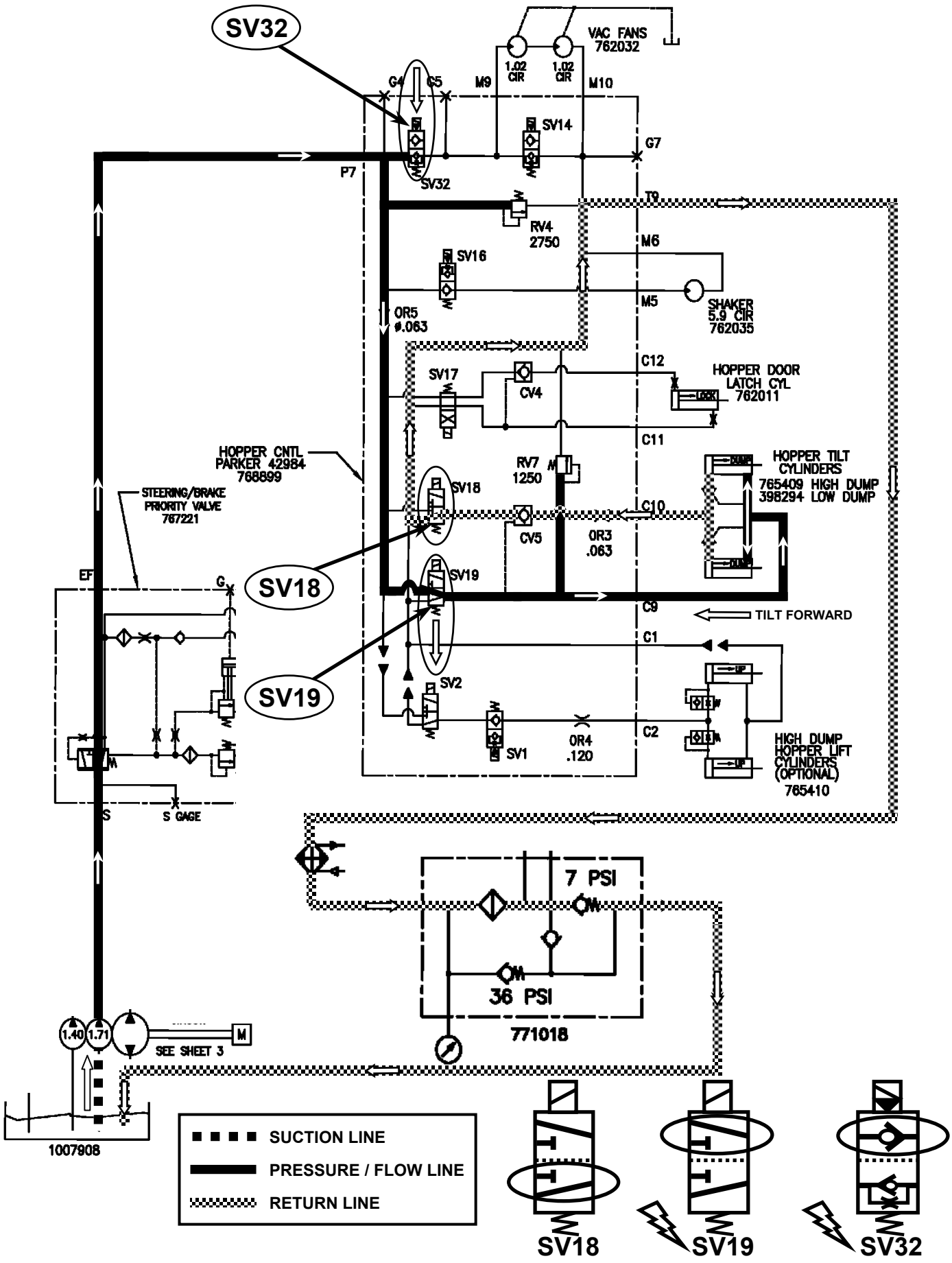
Sentinel Vacuum Fans & Shaker Off



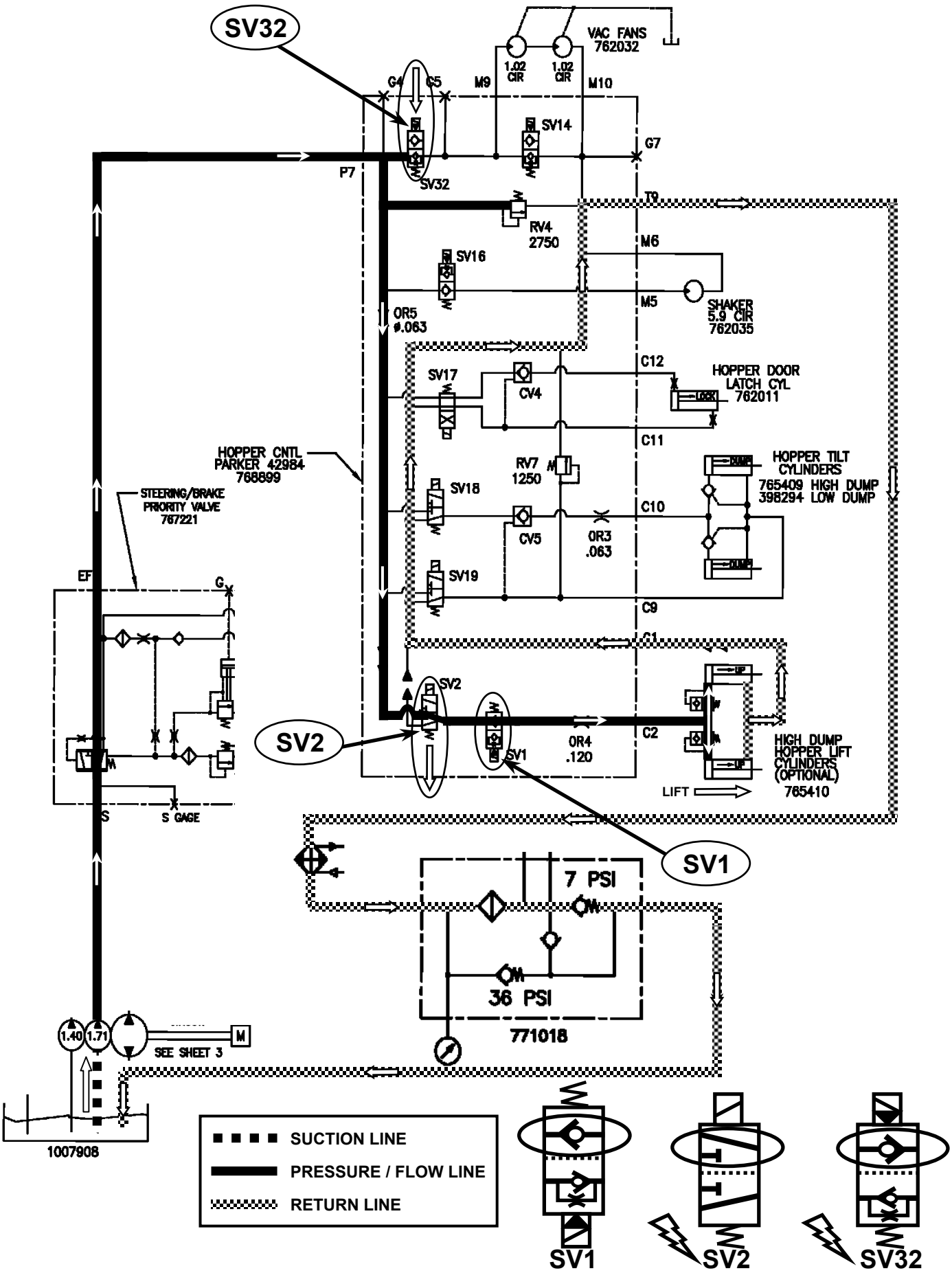
Sentinel Hopper Tilt Back (Dump)



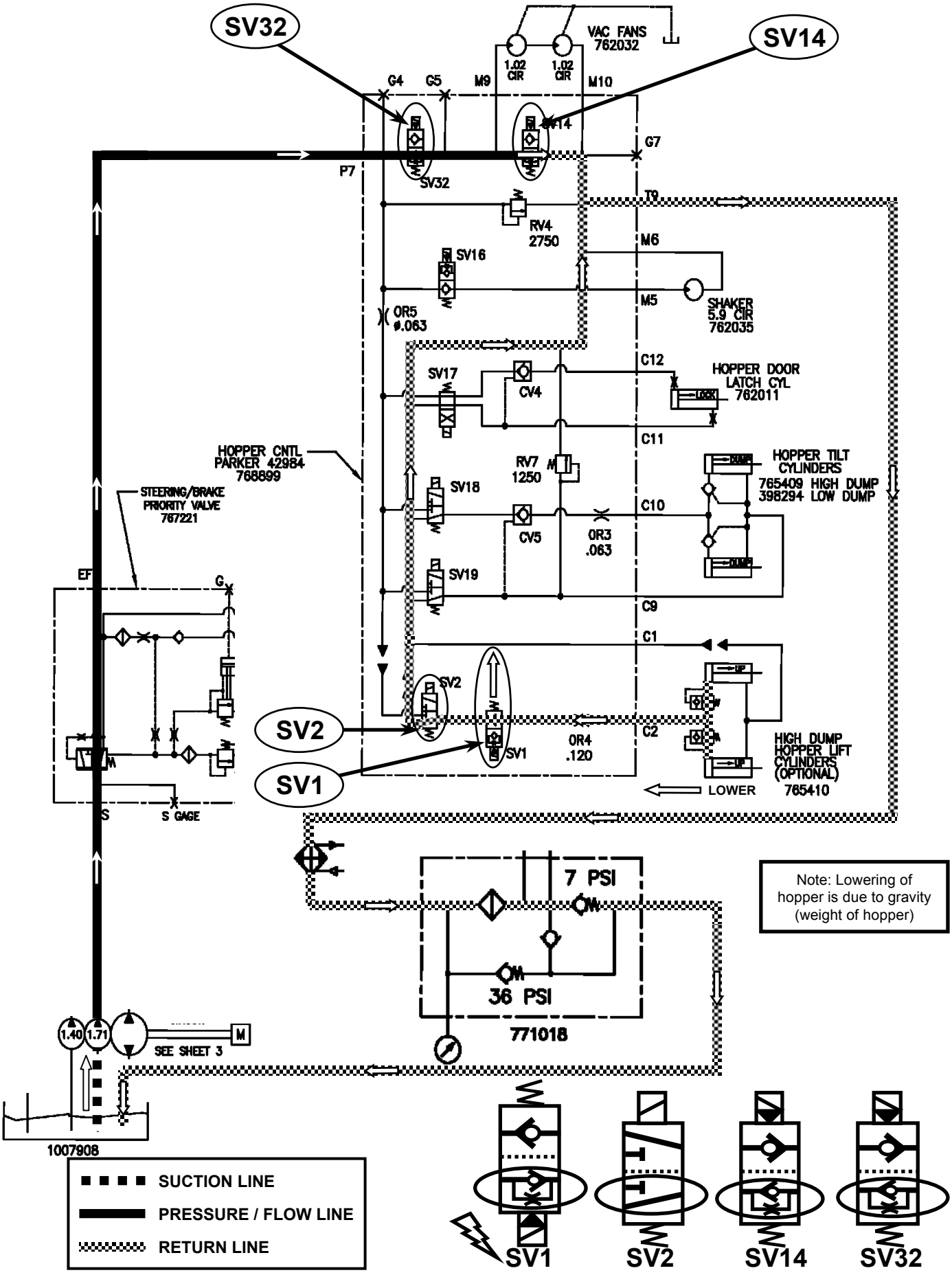
Sentinel Hopper Tilt Forward (Normal Sweep Position)



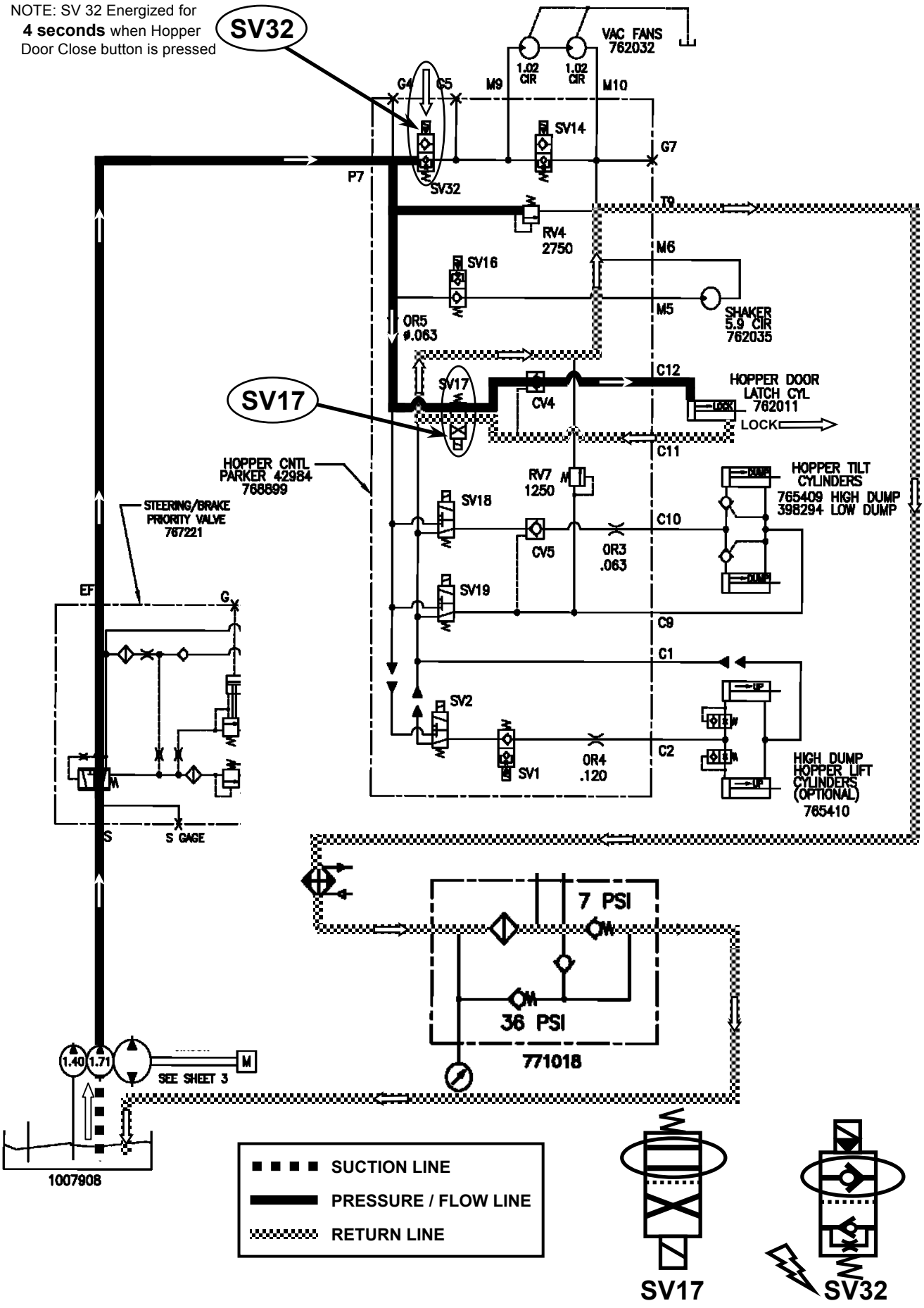
Sentinel Hopper Lift (High Dump)



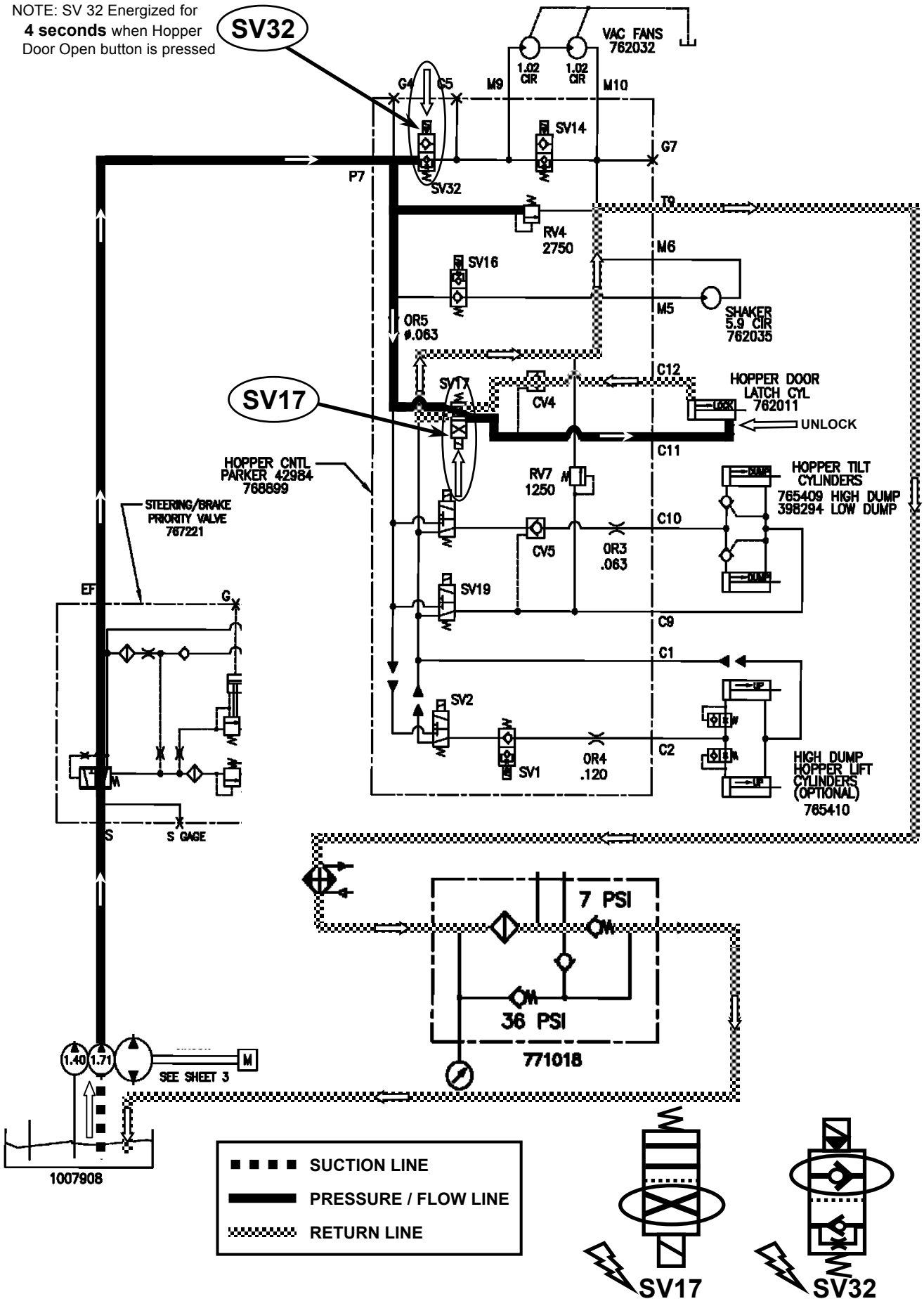
Sentinel Hopper Lower (High Dump)



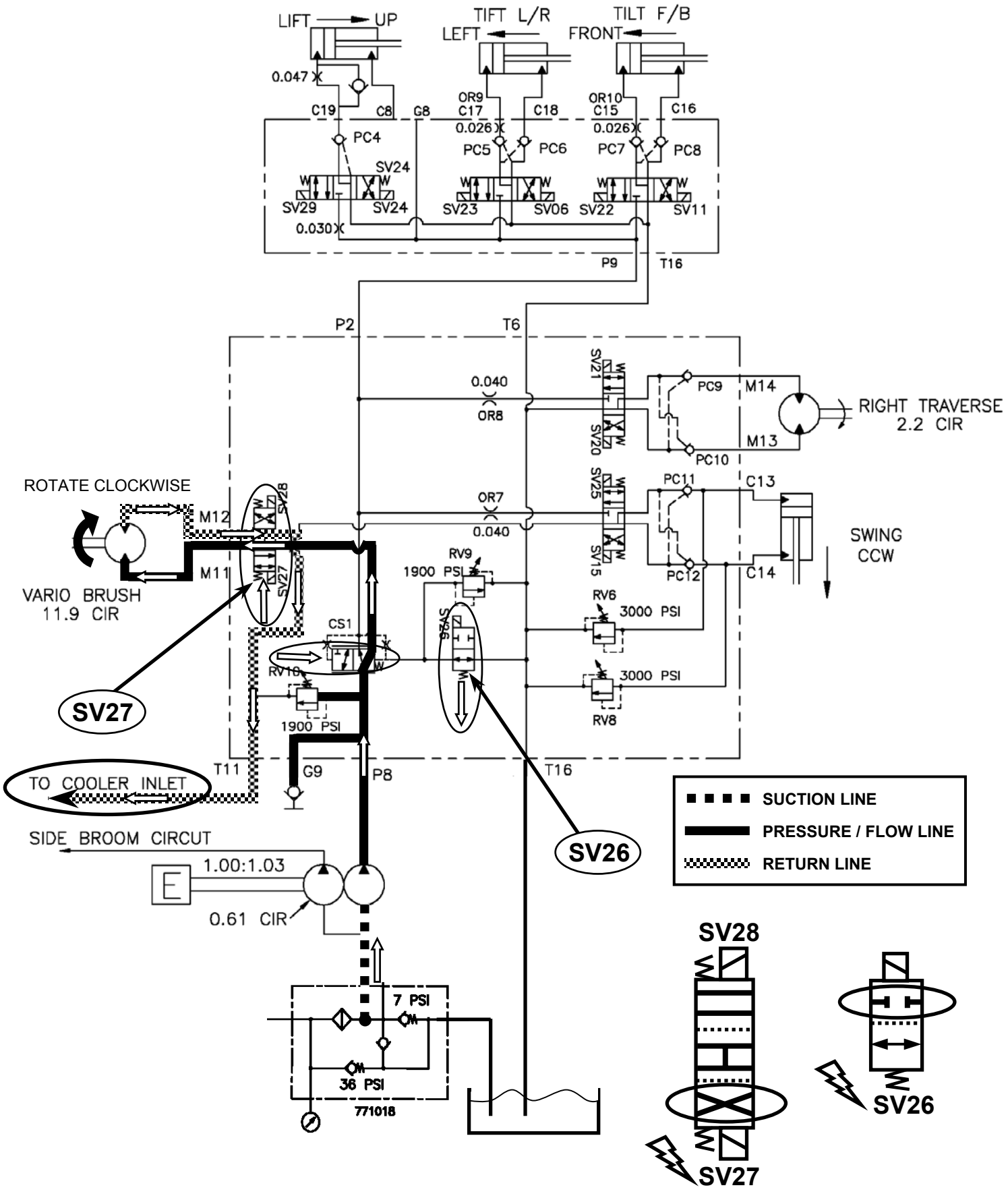
Sentinel Hopper Door Lock (Latch Closed)



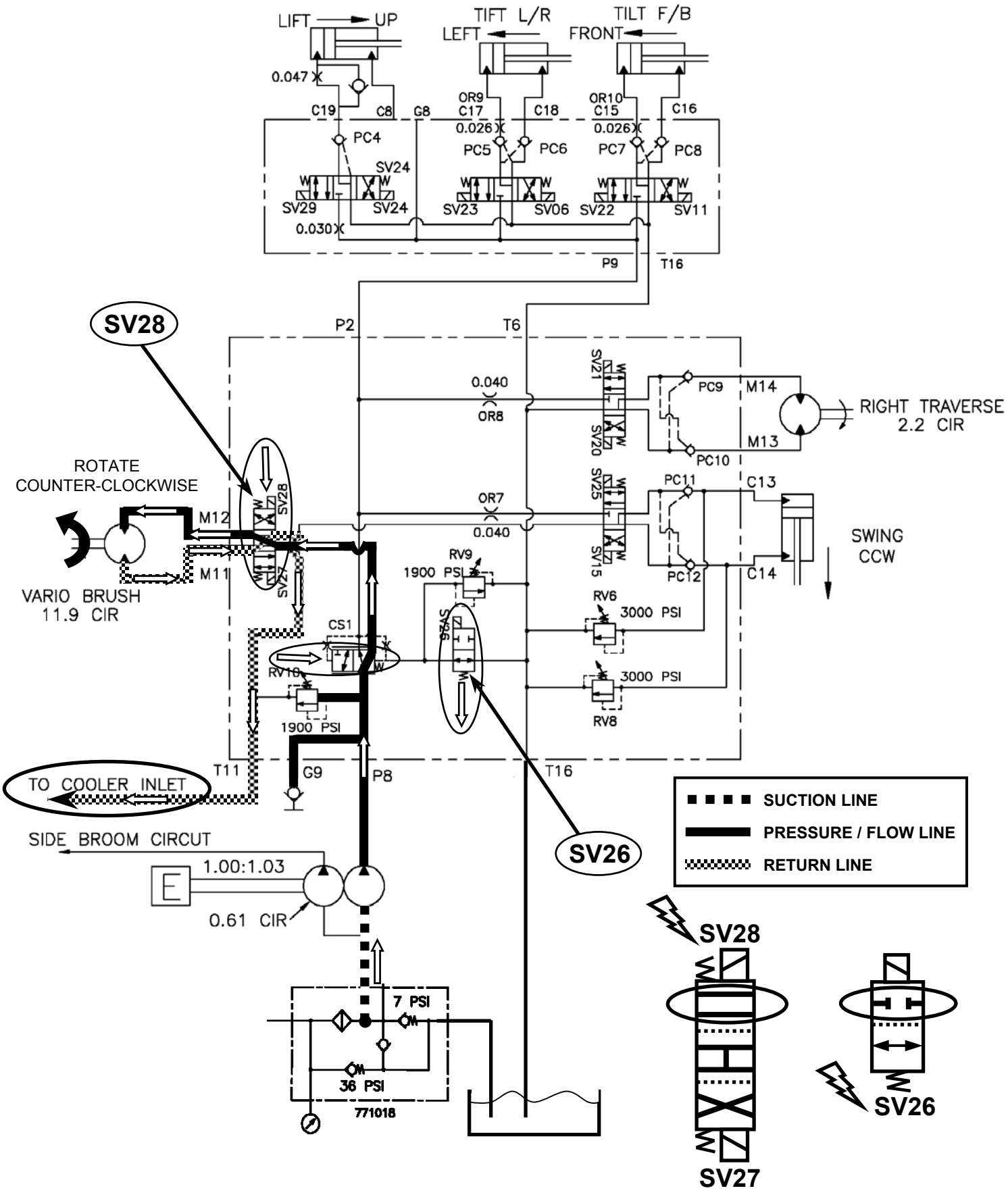
Sentinel Hopper Door Unlock (Latch Open)



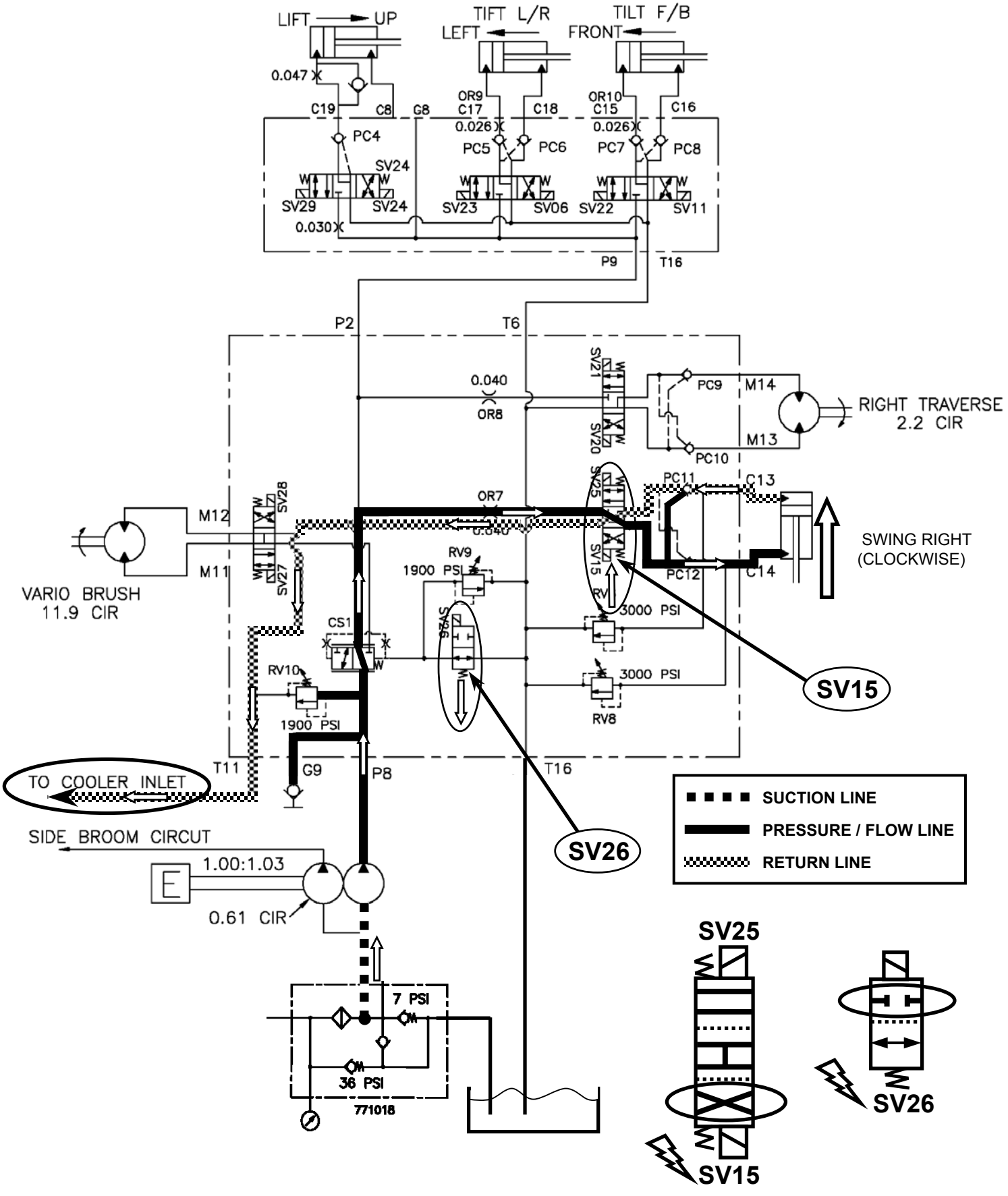
Sentinel Vario Brush Rotate Clockwise



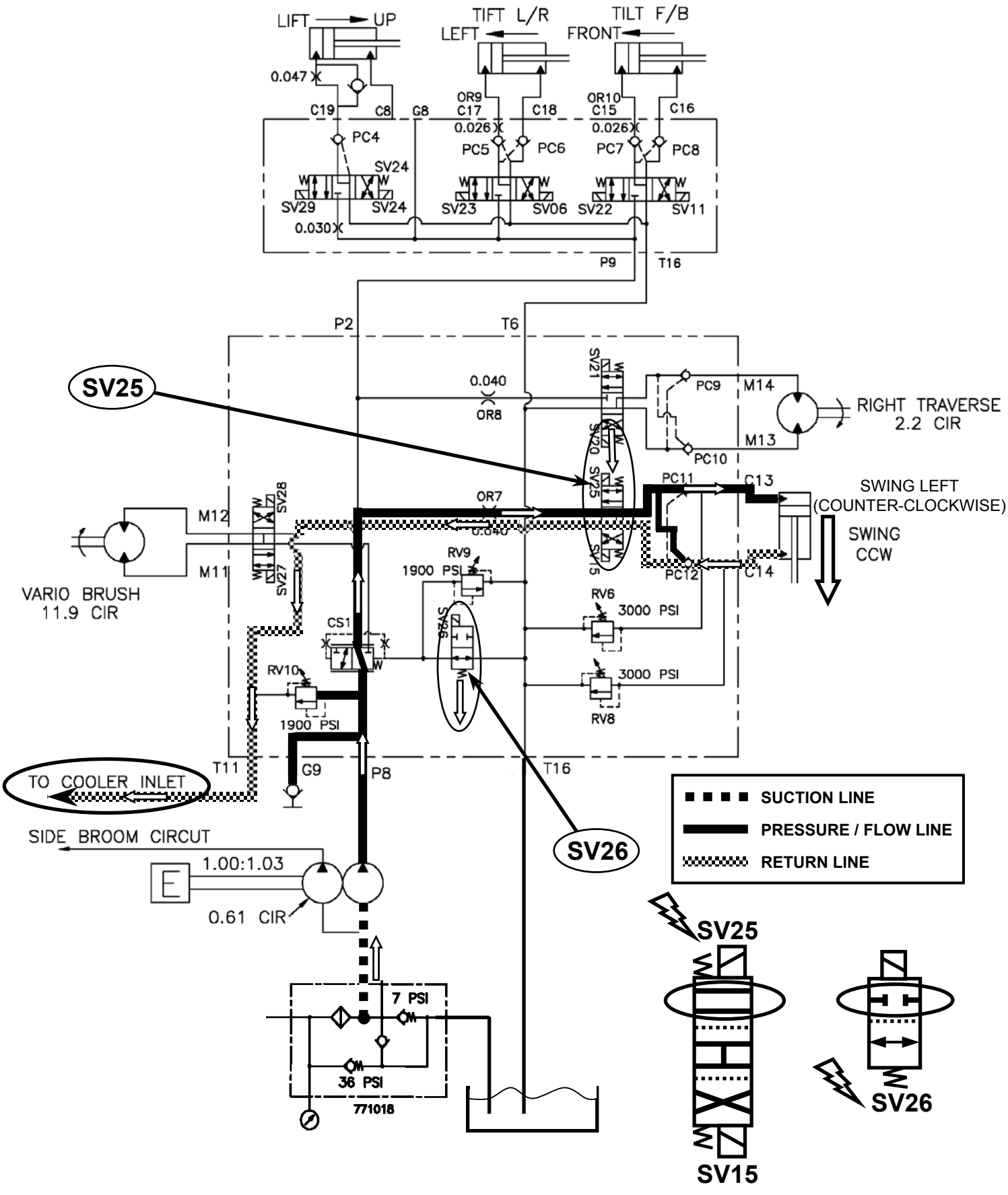
Sentinel Vario Brush Rotate Counter-Clockwise



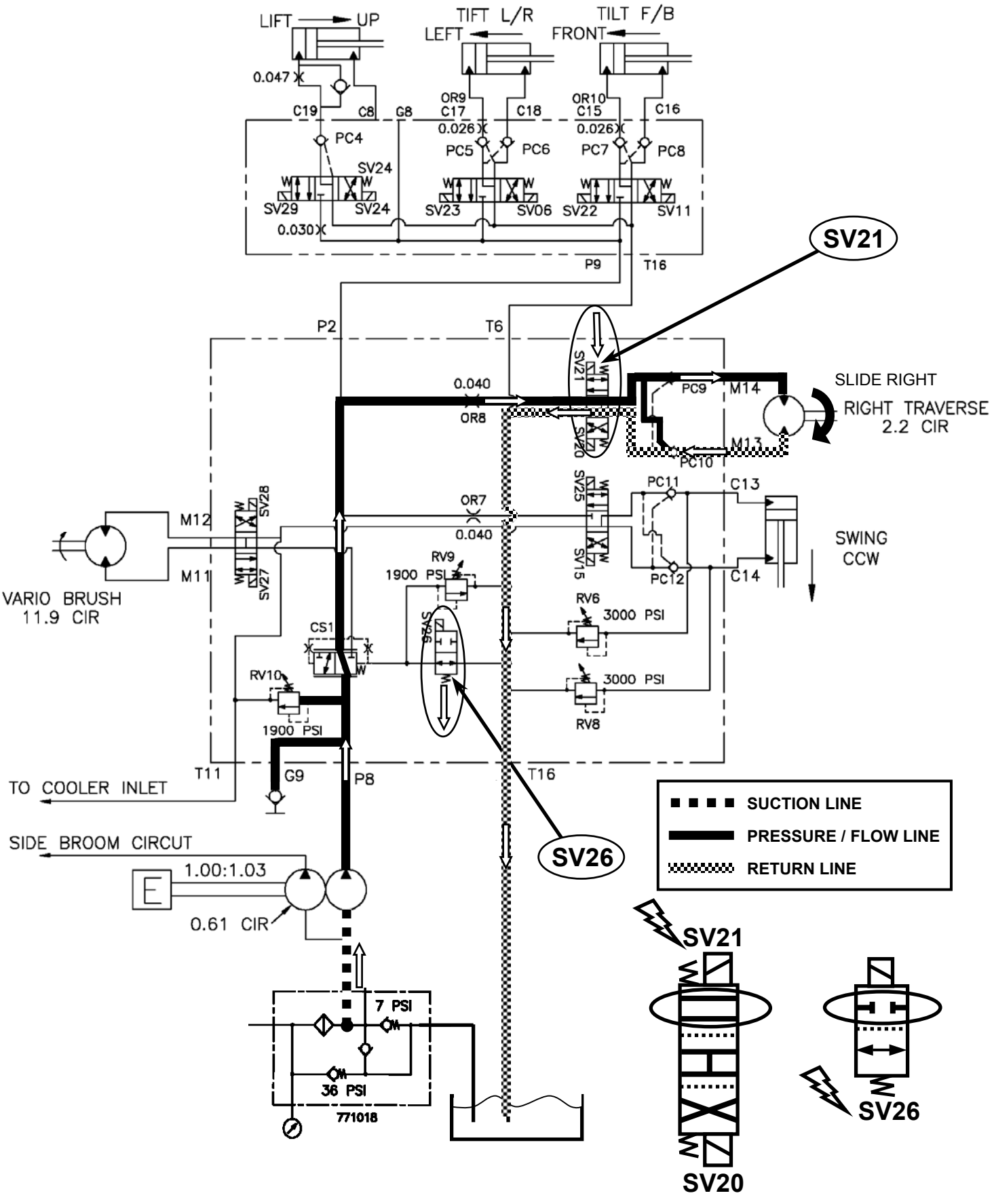
Sentinel Vario Brush Swing Right (Clockwise)



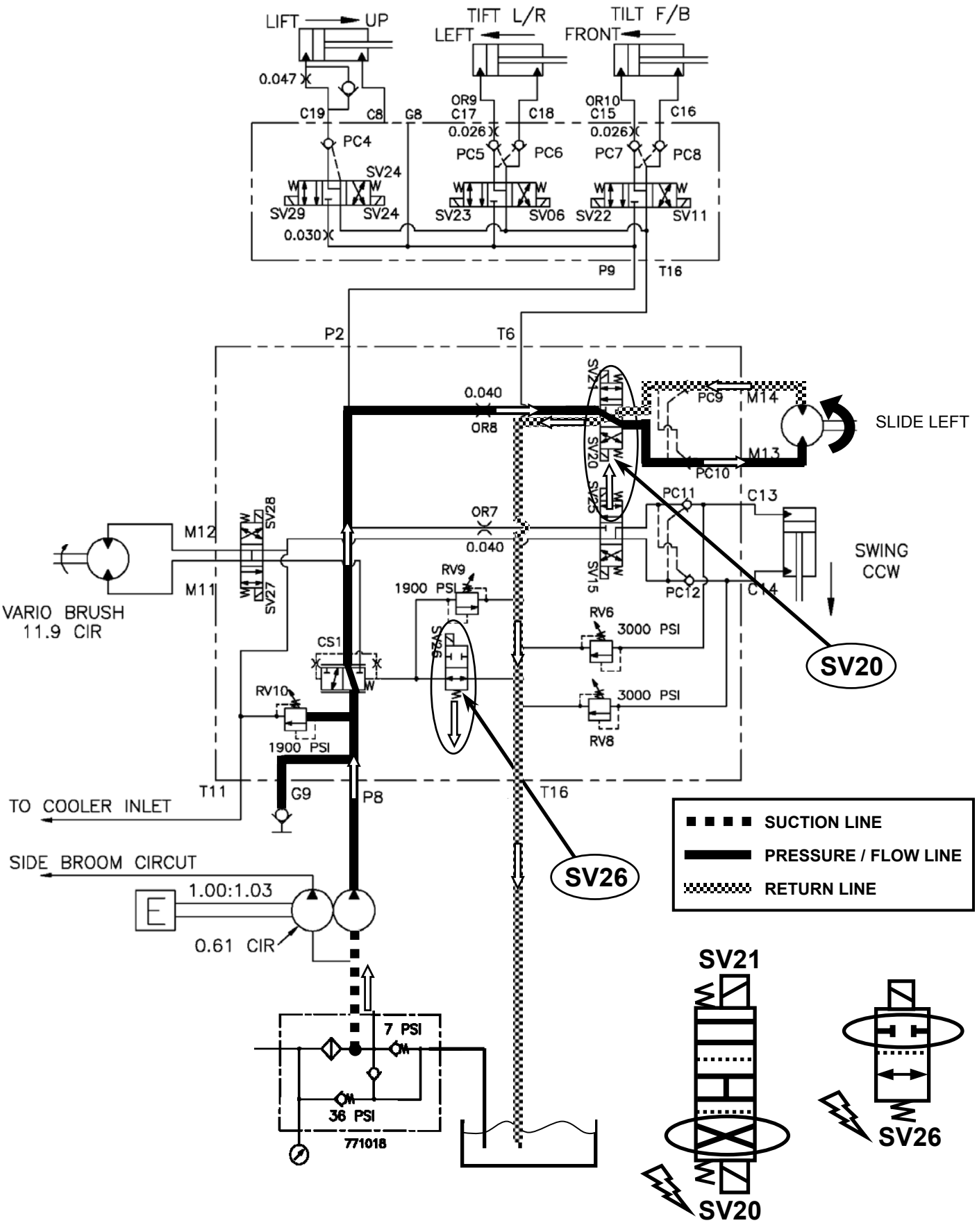
Sentinel Vario Brush Swing Left (Counter-Clockwise)



Sentinel Vario Brush Slide Right



Sentinel Vario Brush Slide Left



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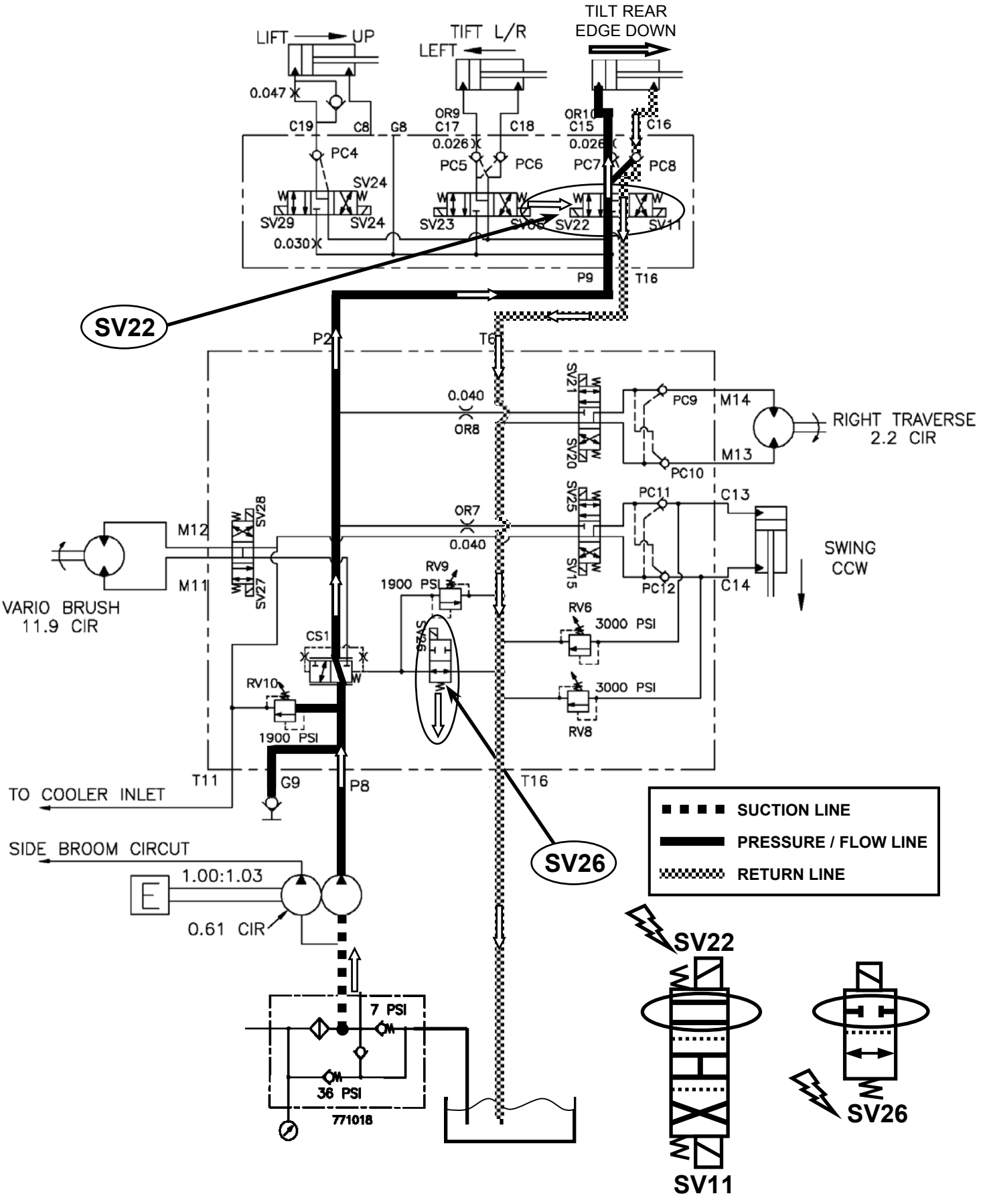

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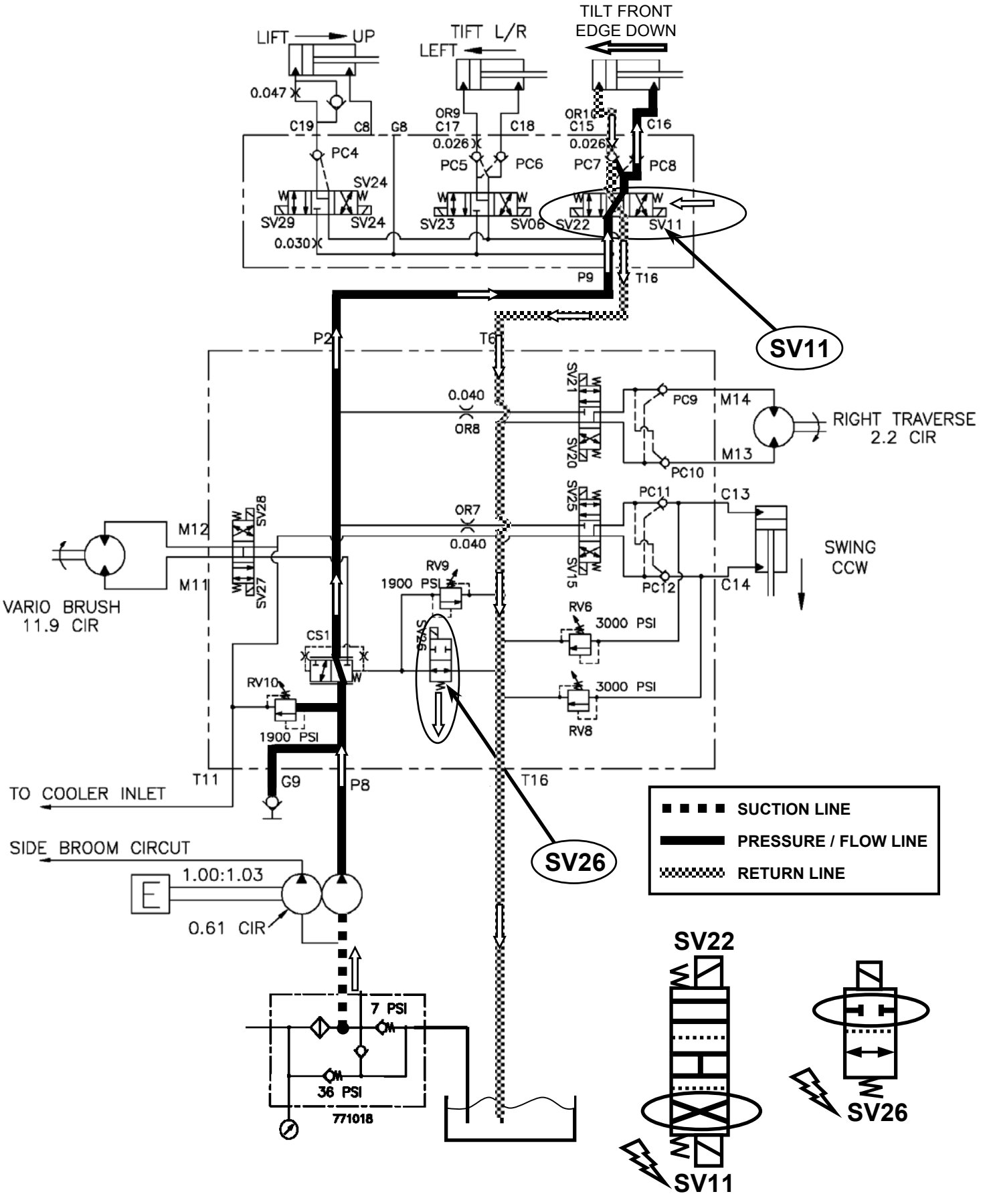

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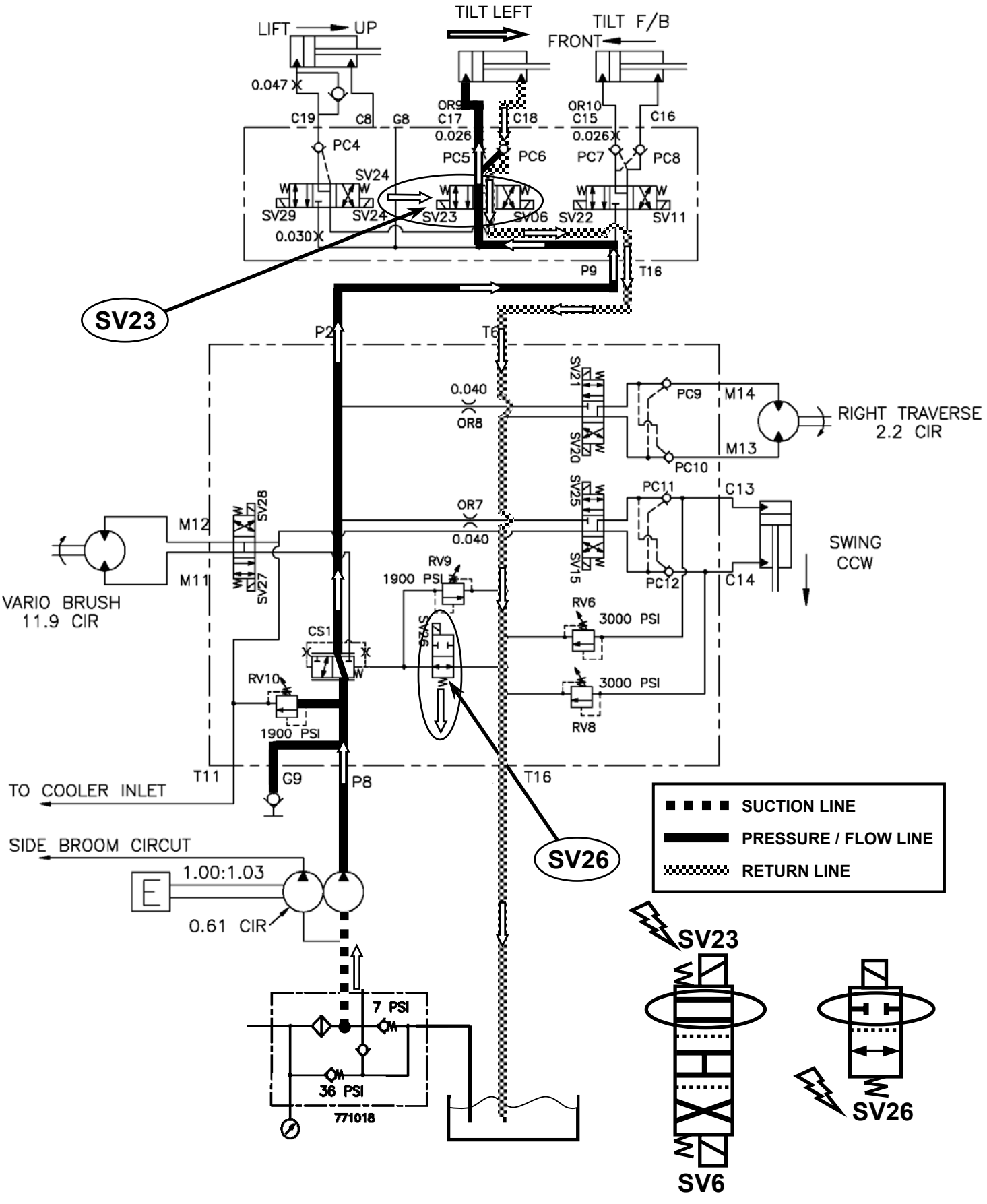

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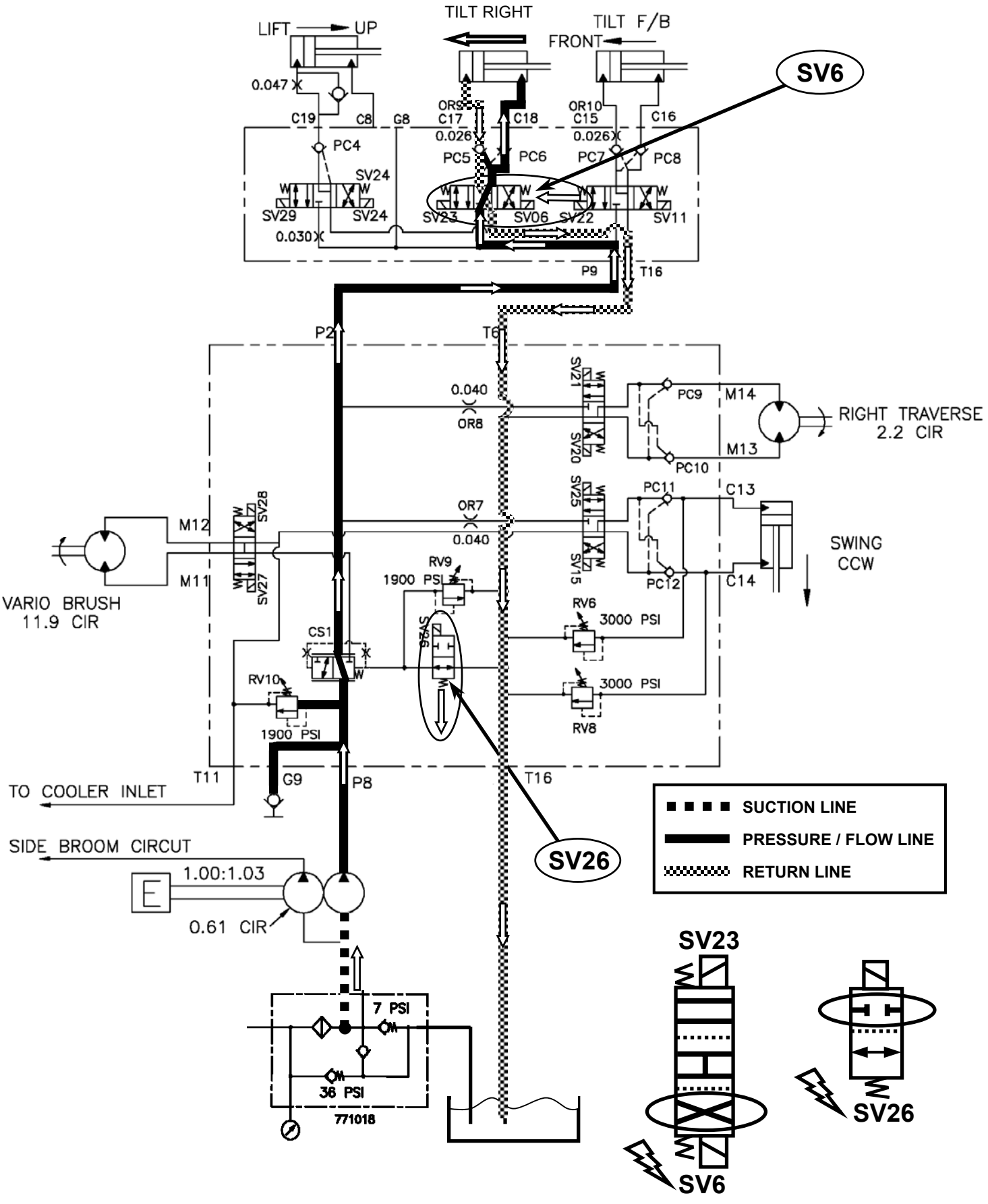
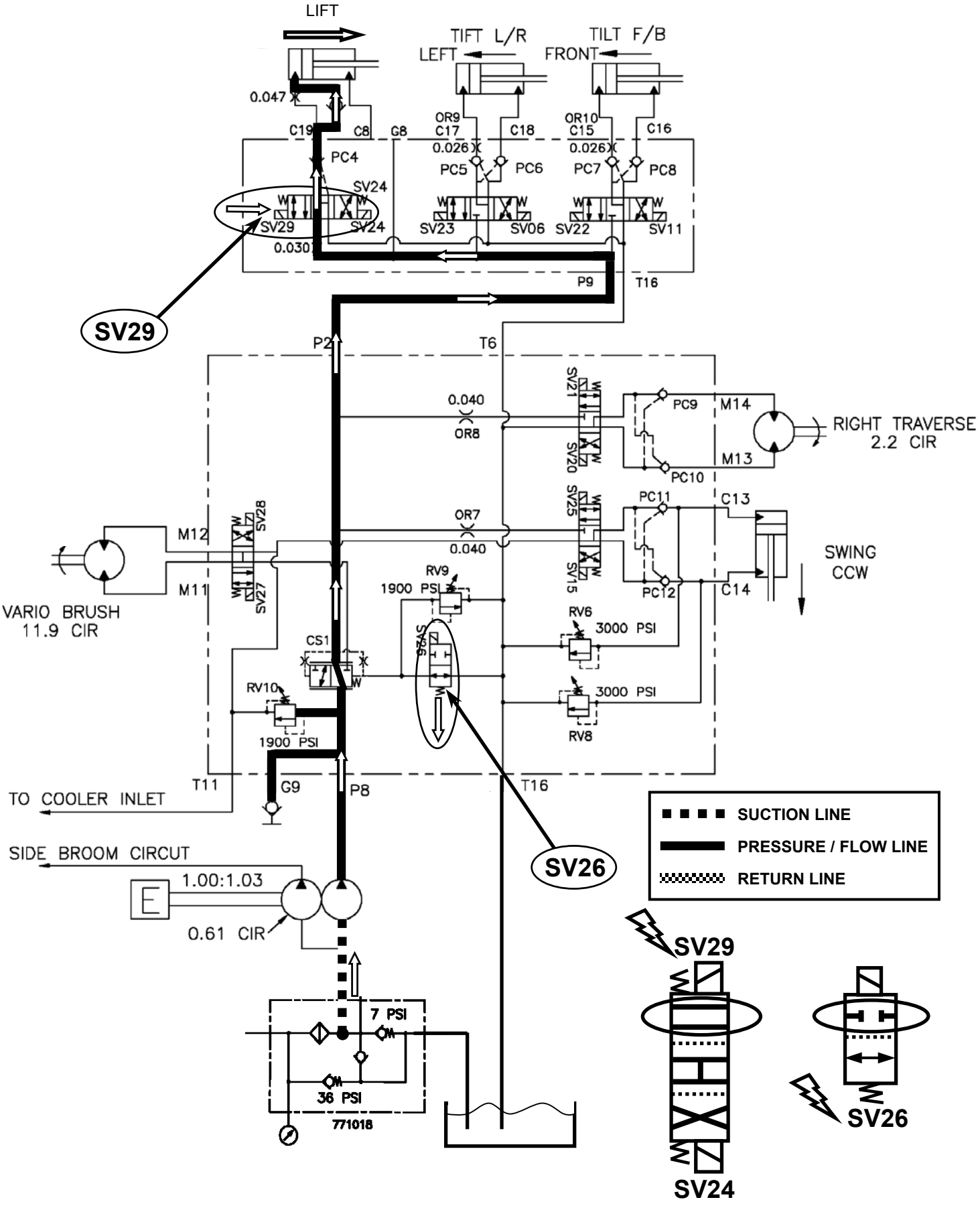
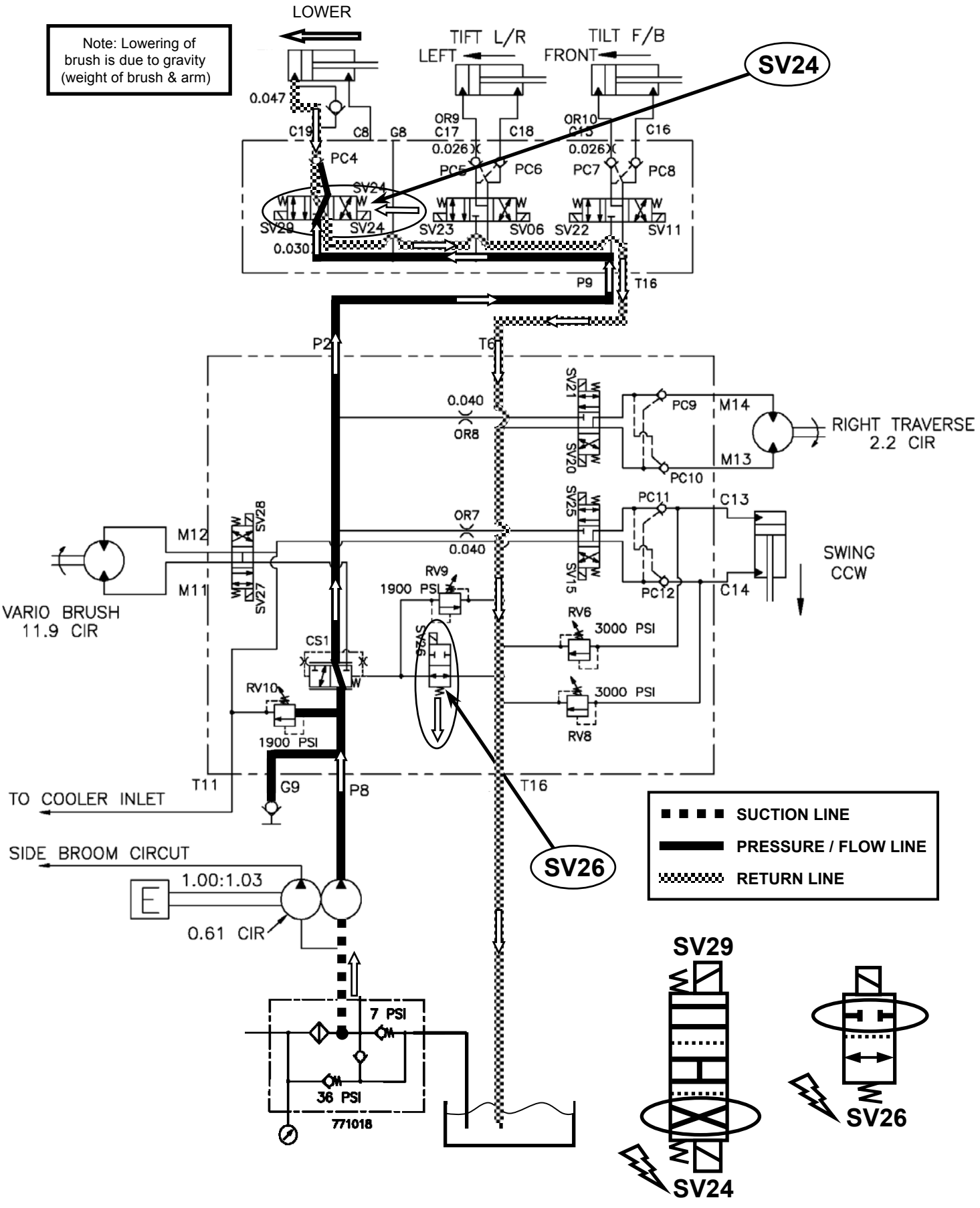


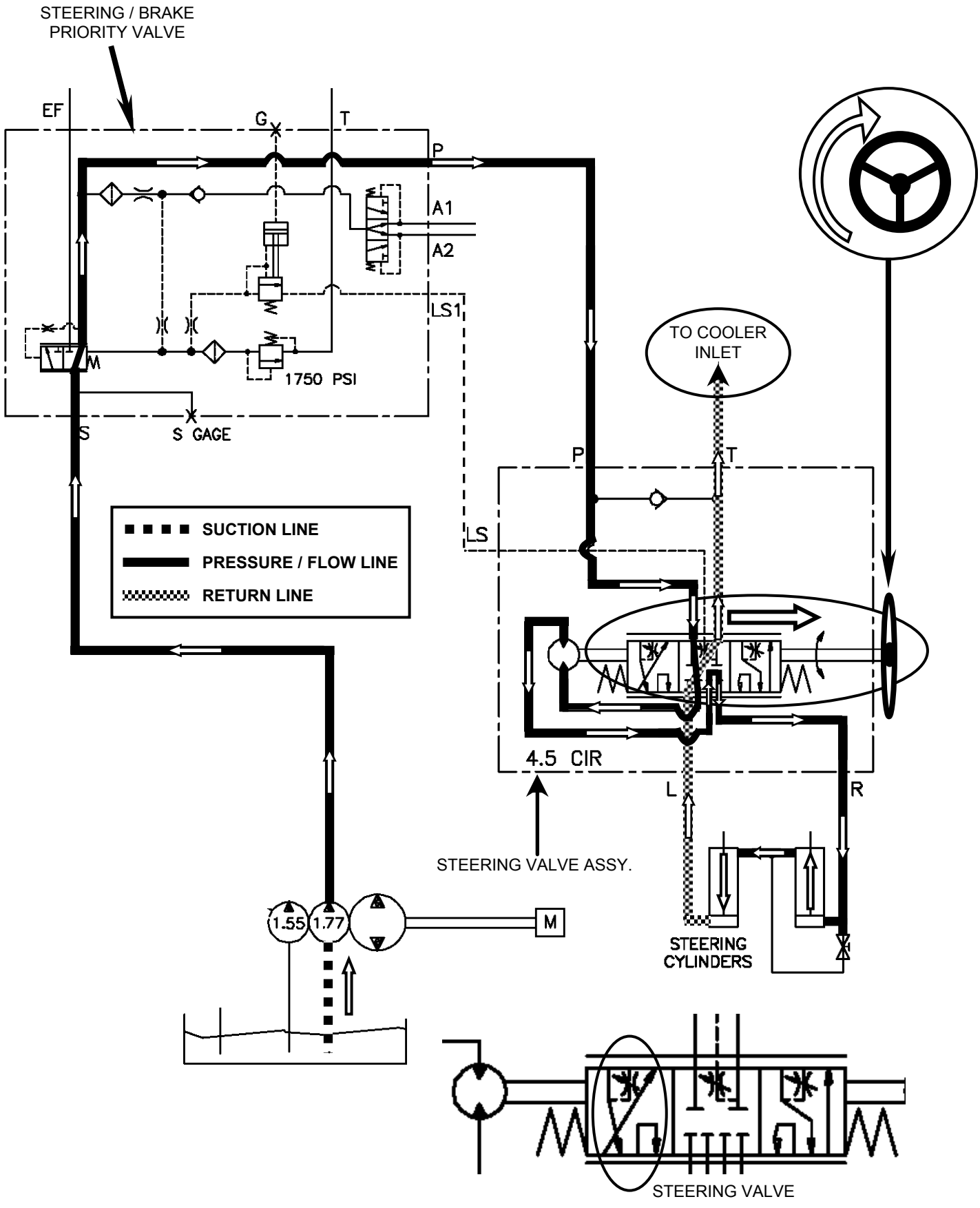
Sentinel Vario Brush Lift



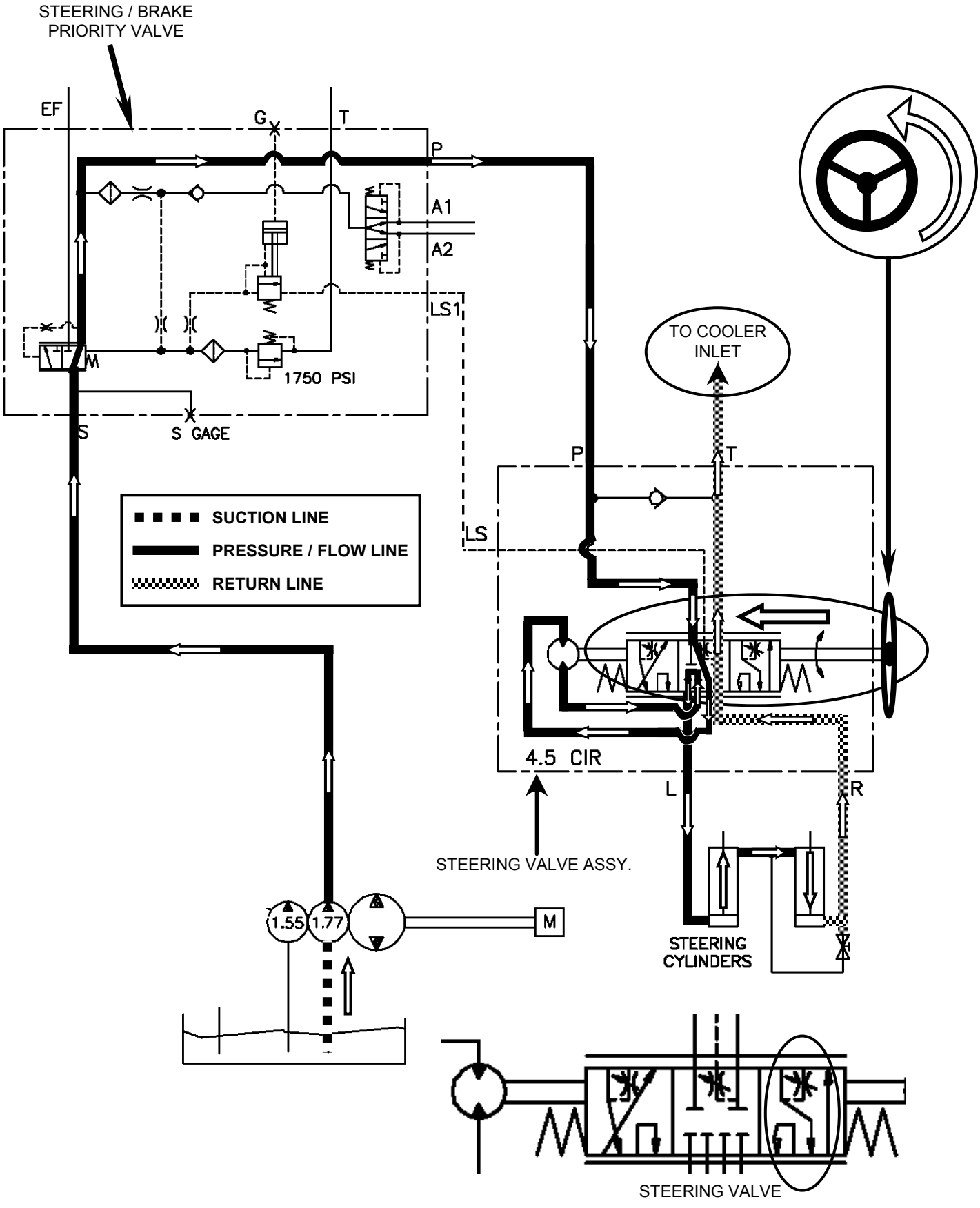
Sentinel Vario Brush Lower



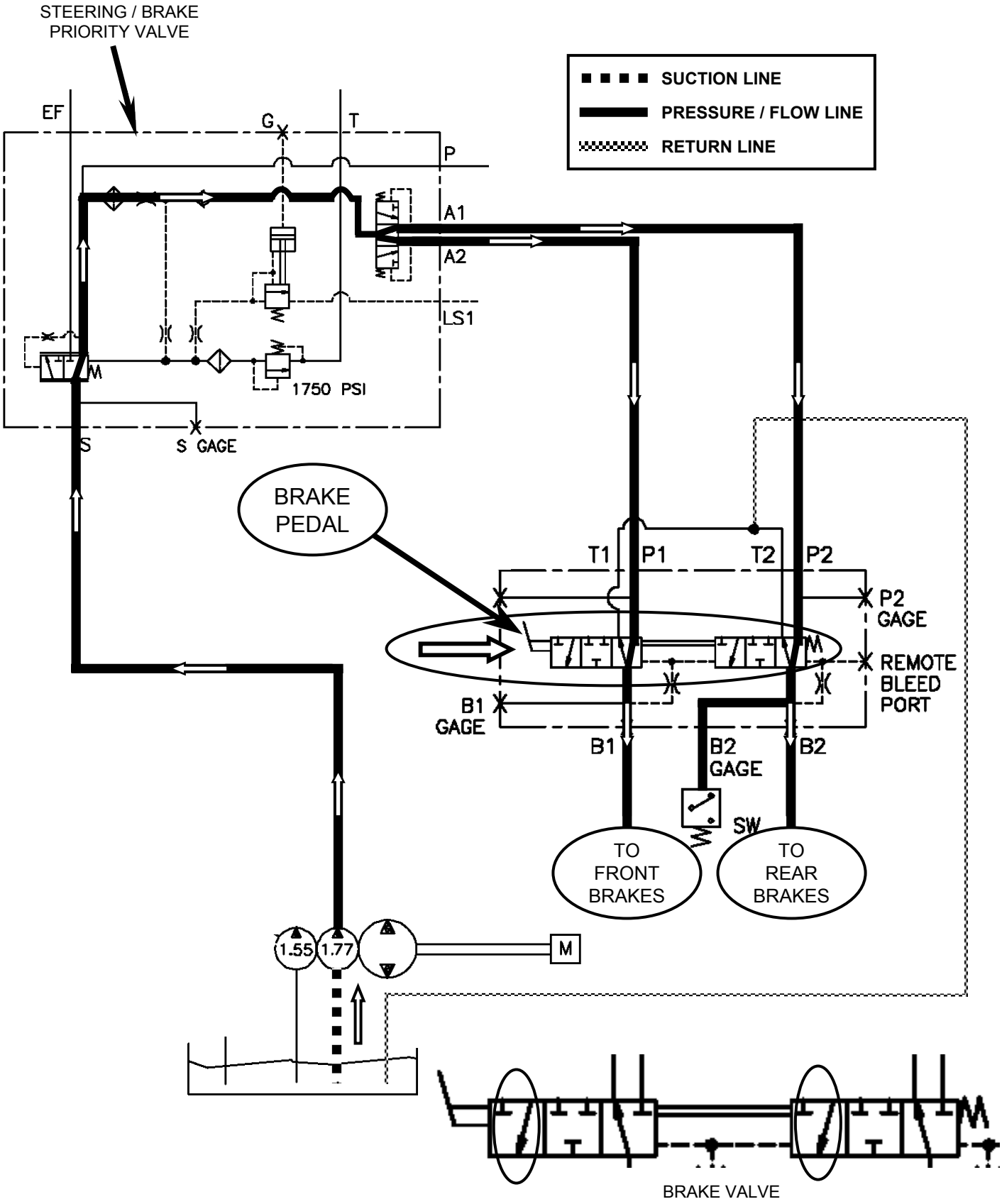
Sentinel Right Turn



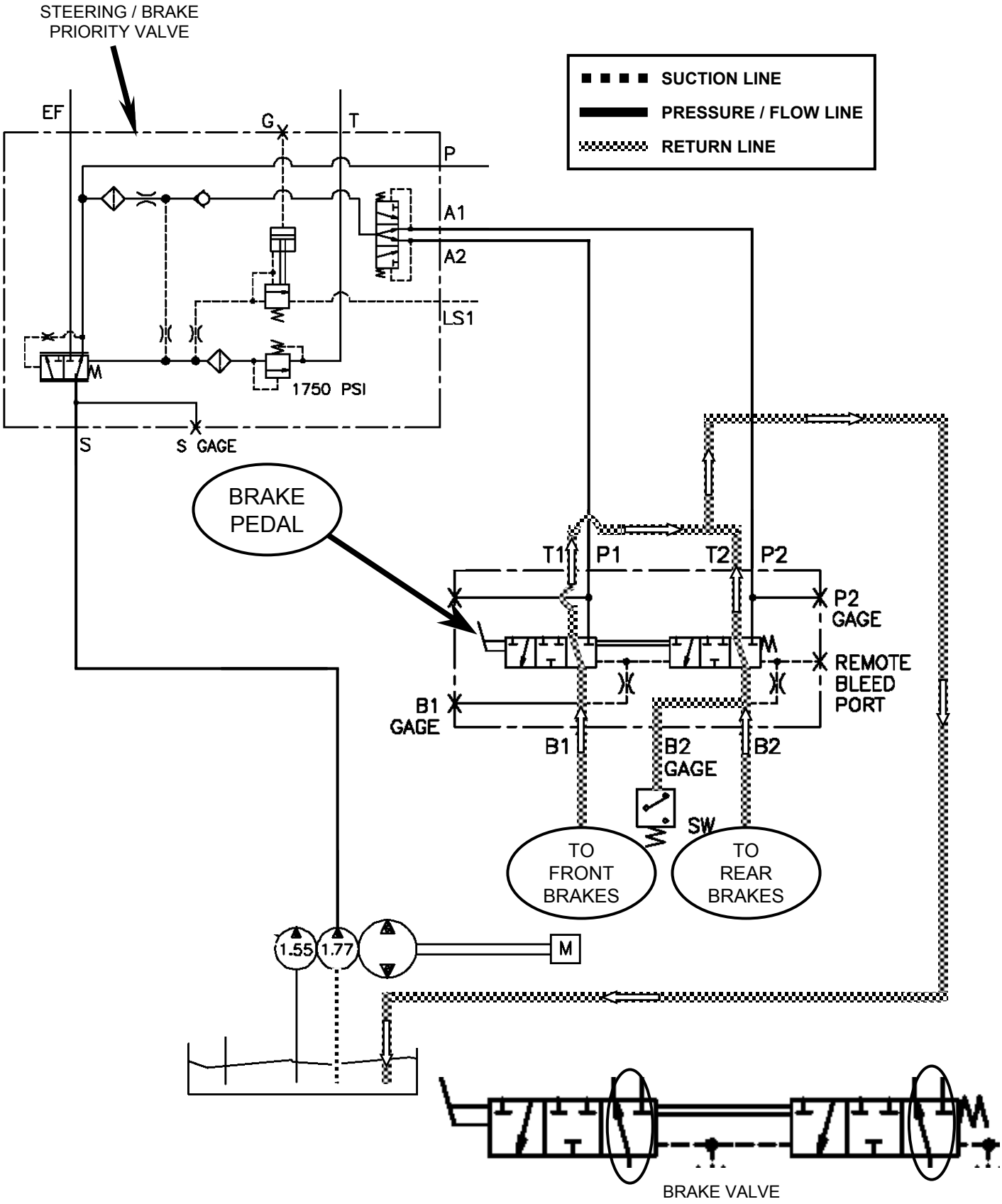
Sentinel Left Turn



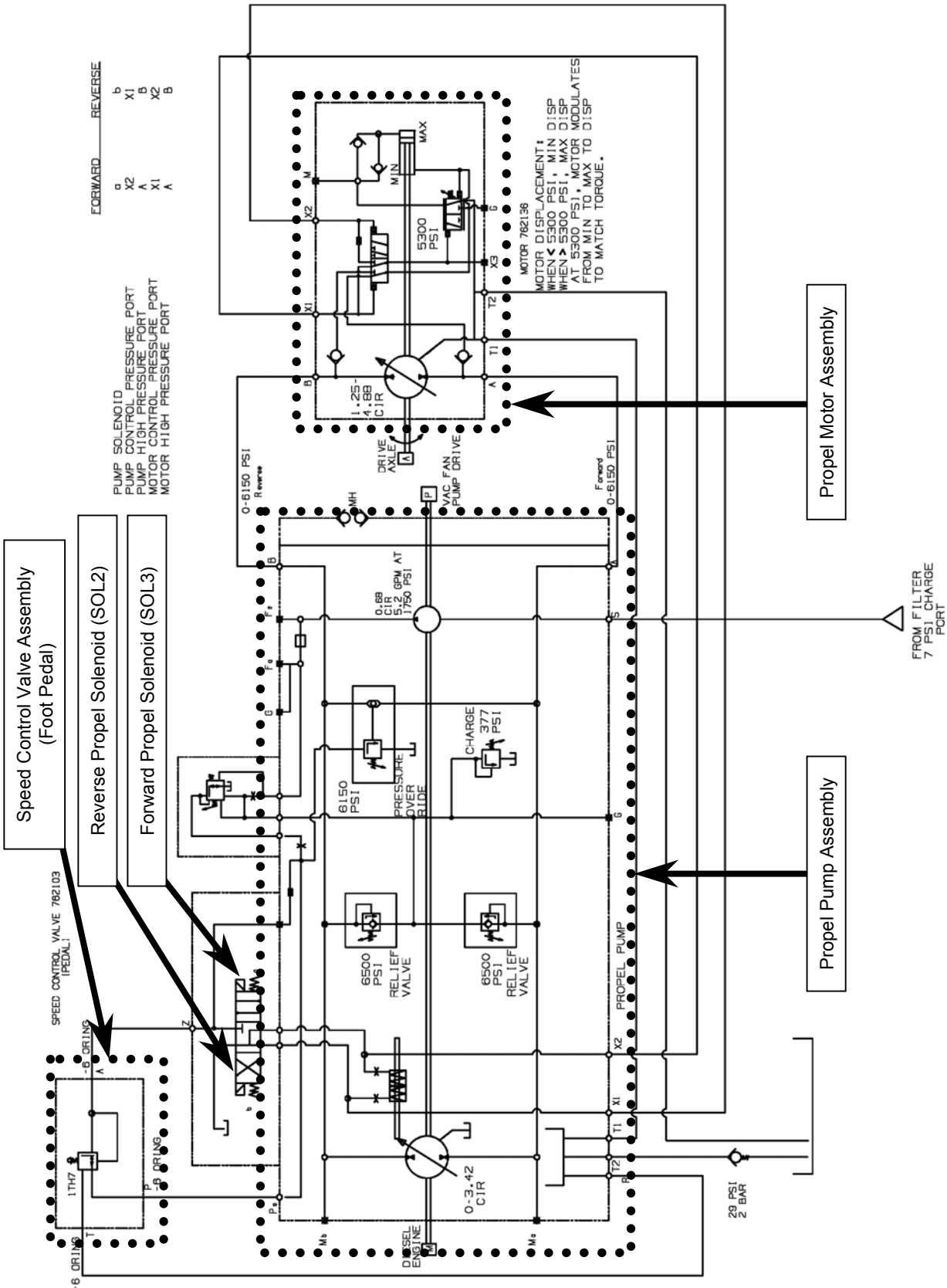
Sentinel Brake Pedal (Push)



Sentinel Brake Pedal (Release)



Sentinel Propel System (page 1 of 2)

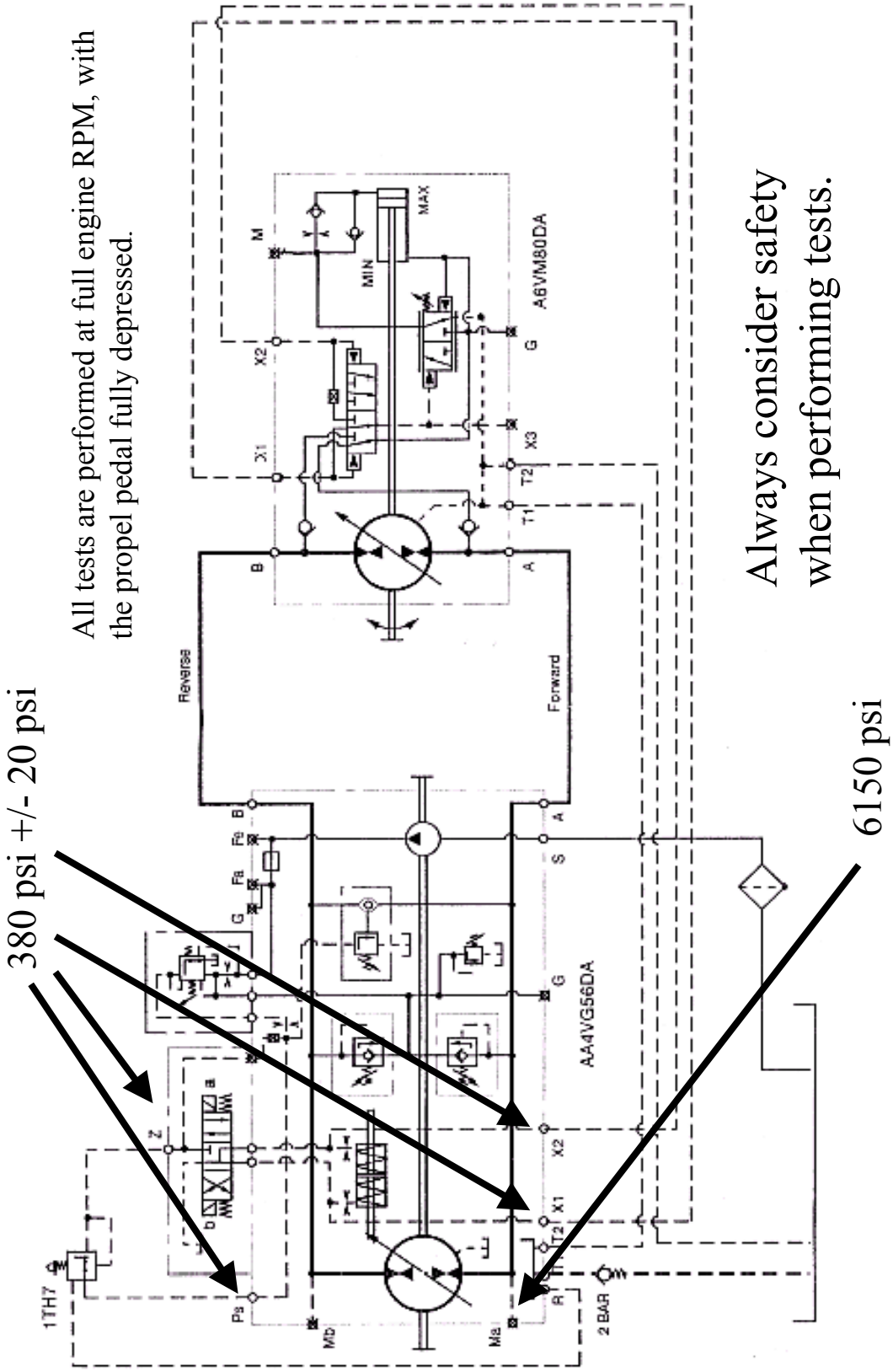


Sentinel Propel System (page 2 of 2)

Propel Troubleshooting Tip Sheet

All tests are performed at full engine RPM, with the propel pedal fully depressed.

Always consider safety when performing tests.



Sentinel Operational Matrix (page 1 of 2)

Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Vacuum Fan Motor	On or Activated	SV14	Vac Fan LED On = Vac Fan Running (see notes)	Hopper Control		P7	M9	M10	RV4	2750 psi	Hopper Thermal Sentry Close at 150 degrees F, (self resetting) --If this happens the Vac Fan LED will flash (blink) and Vac Fan will turn off.	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Shaker Motor	On or Activated	SV16 & SV32	Shaker LED On = Shaker Running (30 second run cycle)	Hopper Control		P7	M5	M6	RV4	2750 psi	-	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Hopper System	Hopper Door Latch, Close	SV32 (SV32 for 4 seconds, see notes)		Hopper Control		P7	C12	C11	RV4	2750 psi	-	SV32 stays on for four (4) seconds to allow maximum pressure and fuild flow to Hopper Door Cylinder. Door is held closed by hydraulic pressure on piston end (always). To open door CV4 Check Valve is "unchecked" by fluid pressure, RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Door Latch, Open	SV17 & SV32	Must hold button to operate	Hopper Control		P7	C11	C12	RV4	2750 psi	-	SV32 stays on until Hopper Close button, os Hopper lift/lower/forward/back is pushed. SV17 stays on until hopper closed button is pushed. RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Tilt Back (DUMP)	SV18 & SV32	Must hold button to operate	Hopper Control		P7	C10	C9	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate.	CV5 Check Valve in circuit, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders RV4@2750psi, OR5 @0.063 in Hopper Control Block. Check valves in cylinders on piston ends.
Hopper System	Hopper Tilt Forward (Normal Sweep)	SV19 & SV32	Must hold button to operate	Hopper Control		P7	C10	C9	RV7	1250 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	CV5 Pilot Check Valve in circuit is unseated by fluid pressure via SV19, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders. OR5 @0.063 in Hopper Control Block. Pilot Check valves on cylinder piston end is unseated by pressure via SV19 to allow cylinders to tilt forward (rest position).
Hopper System	High Dump (Option) Lift	SV2 & SV32	Must hold button to operate	Hopper Control		P7	C2	C11	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.
Hopper System	High Dump (Option) Down	SV1	Must hold button to operate	Hopper Control		P7	C2	C11	-	-	Parking or Service Brake must be applied for this system to operate.	Gravity lowers the hopper. Hydraulic fluid moves to return side of system via SV1. Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.

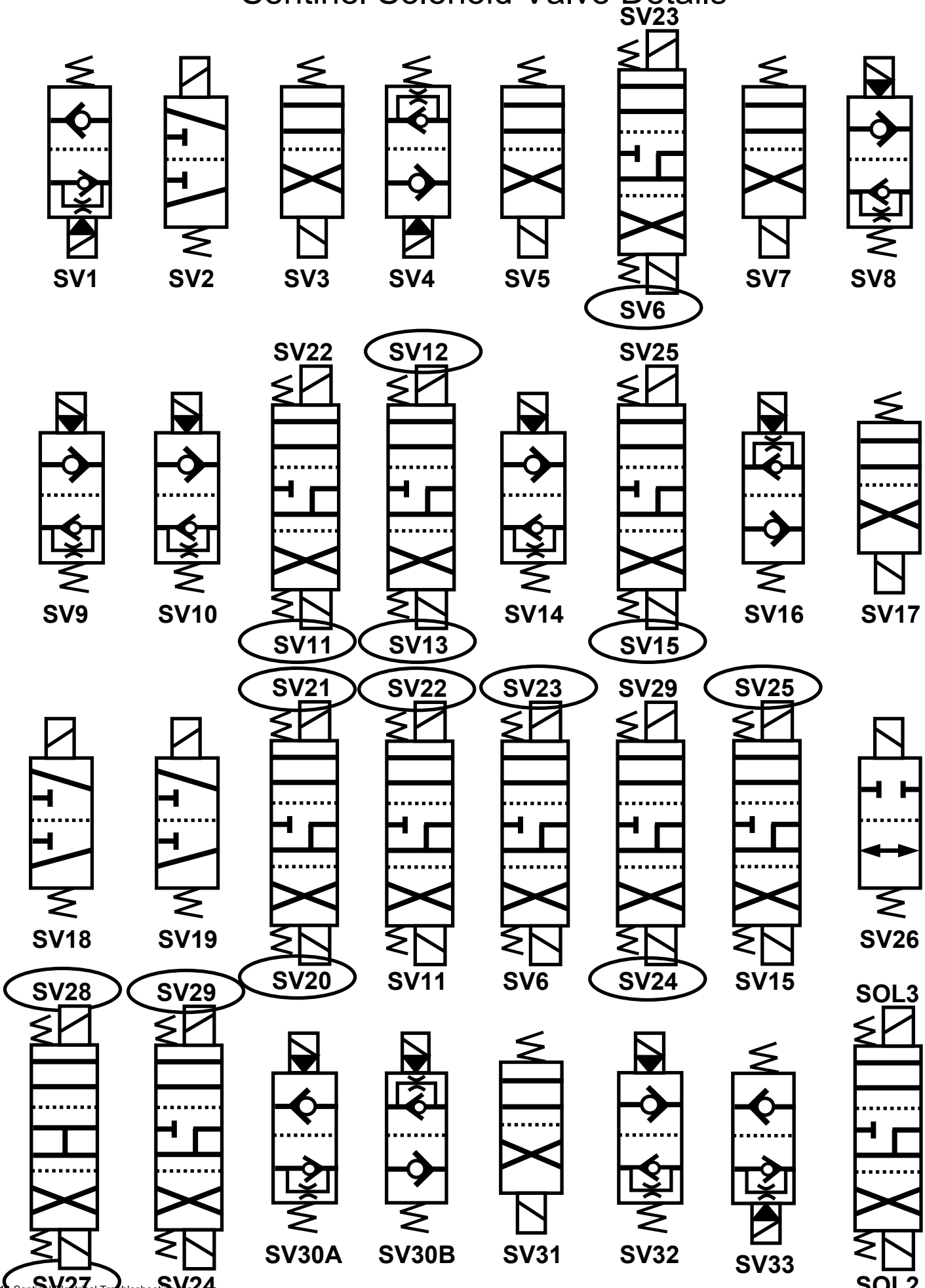
Sentinel Operational Matrix (page 2 of 2)

Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Conveyor System	Lift & tension chains	SV4		Main Brush Control		P5	C4	C3	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Conveyor Lift Cylinder. Restrictor 0.040 at C4
Conveyor System	Lower & tension chains	SV4 & SV31		Main Brush Control		P5	C3	C4	RV3	2750 psi	-	Restrictor 0.040 at C4
Conveyor System	Operate main brush motor and conveyor forward	SV12	This is a press and release to operate button.	Main Brush Control		P5	M7	M8	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	Overlaod switch is set at 2400 psi, Overload LED will turn on. If "jammed" RV3 will relaese pressure.
Conveyor & Main Brush Systems	Operate motors forward (Normal sweep)	SV4 & SV12	This is a press and release to operate button.	Main Brush Control		P5	M8	M7	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	If "jammed" RV3 will relaese pressure. If conveyor is down, brush motor/conveyor will run in reverse when down, if up brush motor/conveyor will run in reverse when up. If system in sweep and reverse is pressed wil cause to run in reverse, pressing again will cause sweep rotation. If in up positoin, pressing will cause to run in reverse, pressing again will cause motion to stop.
	Operate motors reverse	SV4 & SV13										
Main Brush	Lift	SV4		Main Brush Control		P5	C6	-	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Main Broom Cylinder. Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6
	Down/Lower	SV3 & SV4		Main Brush Control		P5	-	T10	-	-	-	Pressure unseats Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6
Side Brushes	Operate right brush motor and down	SV5 & SV9		Side Brush Valve	G1	P3	C7 & M1	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV5. Pilot operated check vlave at PC2. SV9 controls Right Side Brush
	Operate left brush motor and down (Option)	SV7 & SV10		Side Brush Valve	G1	P3	C8 & M3	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV7. Pilot operated check vlave at PC1. SV10 controls Right Side Brush
	Lift	SV8										

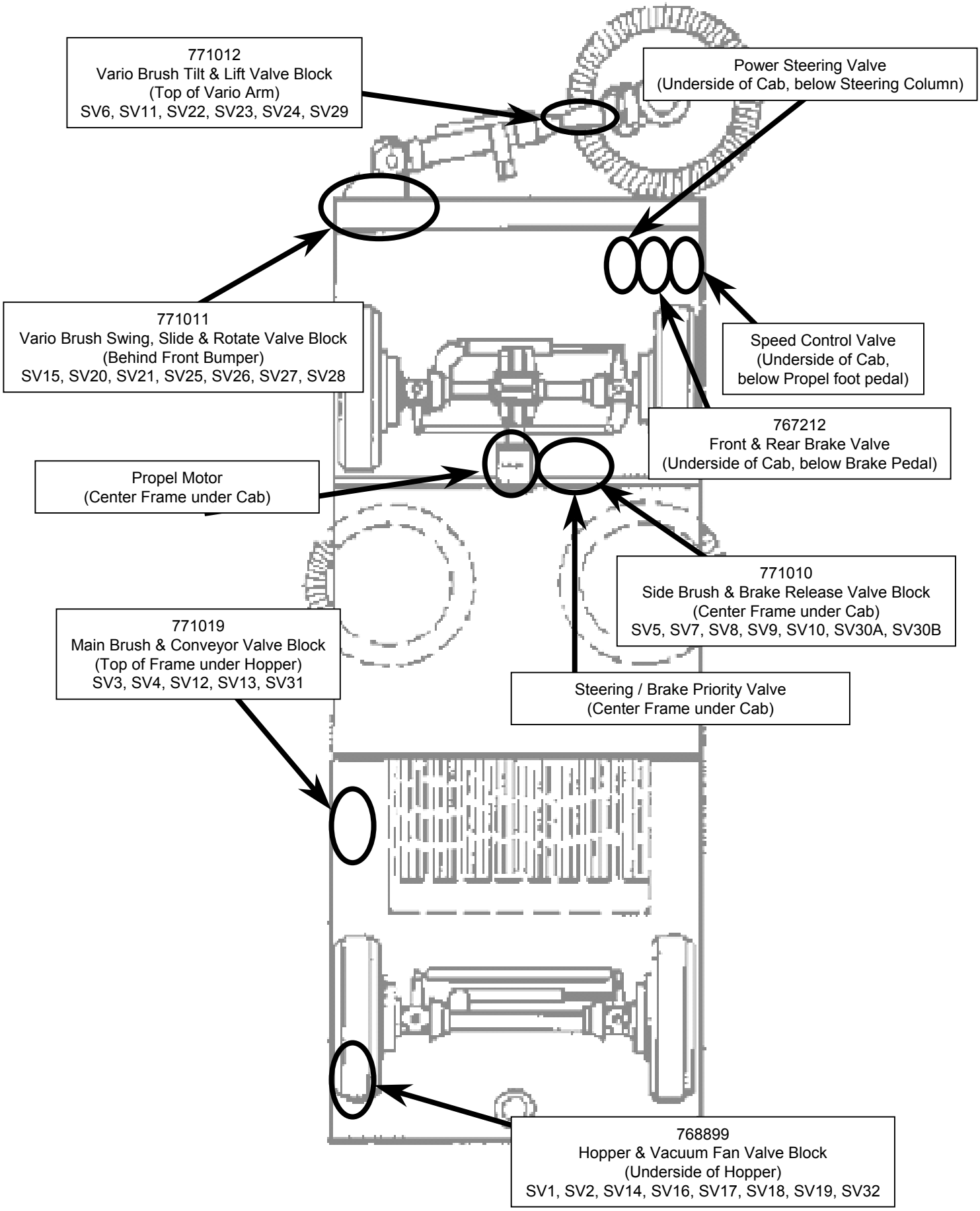
Enable Lift Circuit # 1		SV8
Enable Lift Circuit # 2		SV4

Reference Component Location Chart for location of components on the Sentinel

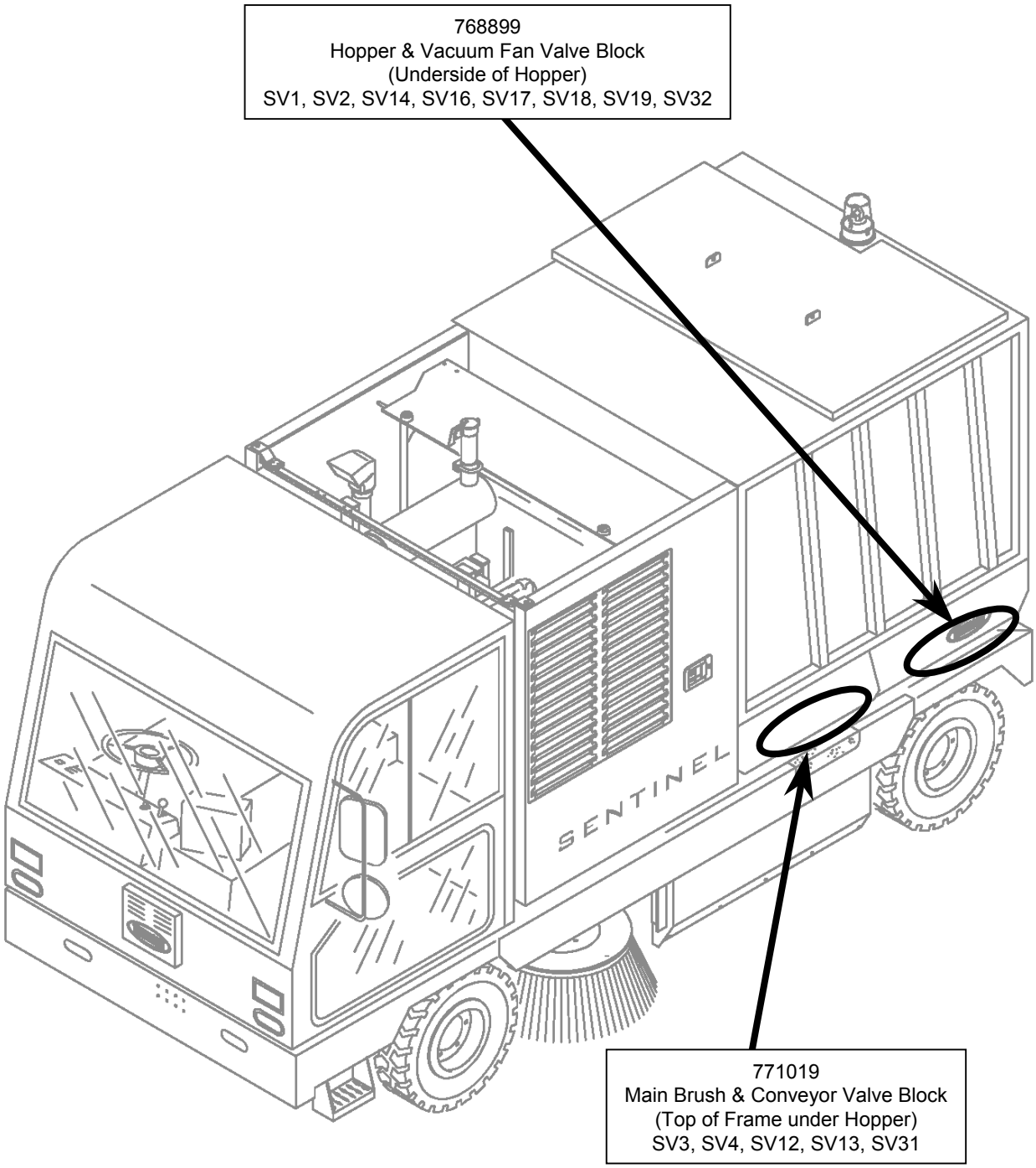
Sentinel Solenoid Valve Details



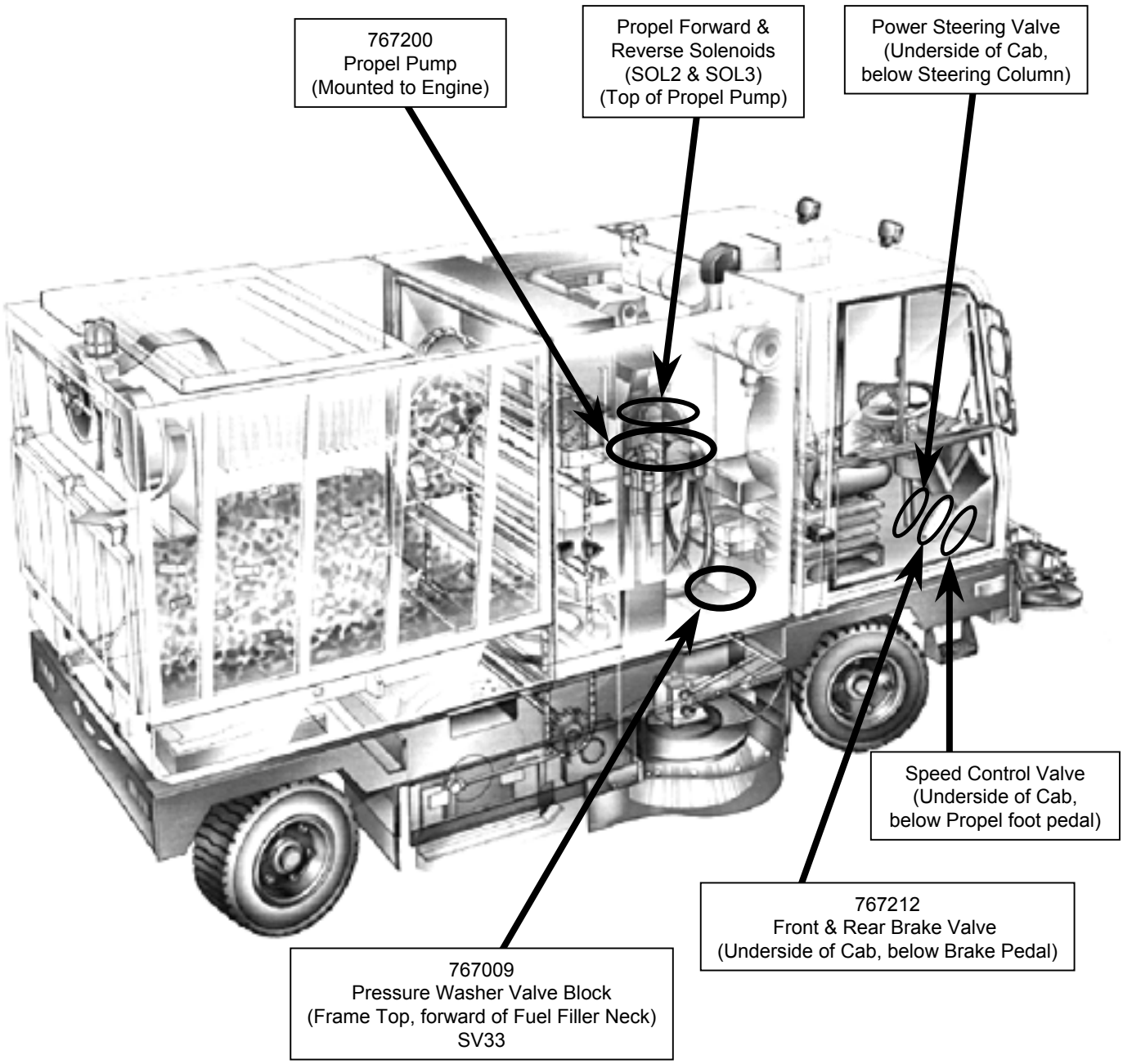
Sentinel Component Locator (page 1 of 5)



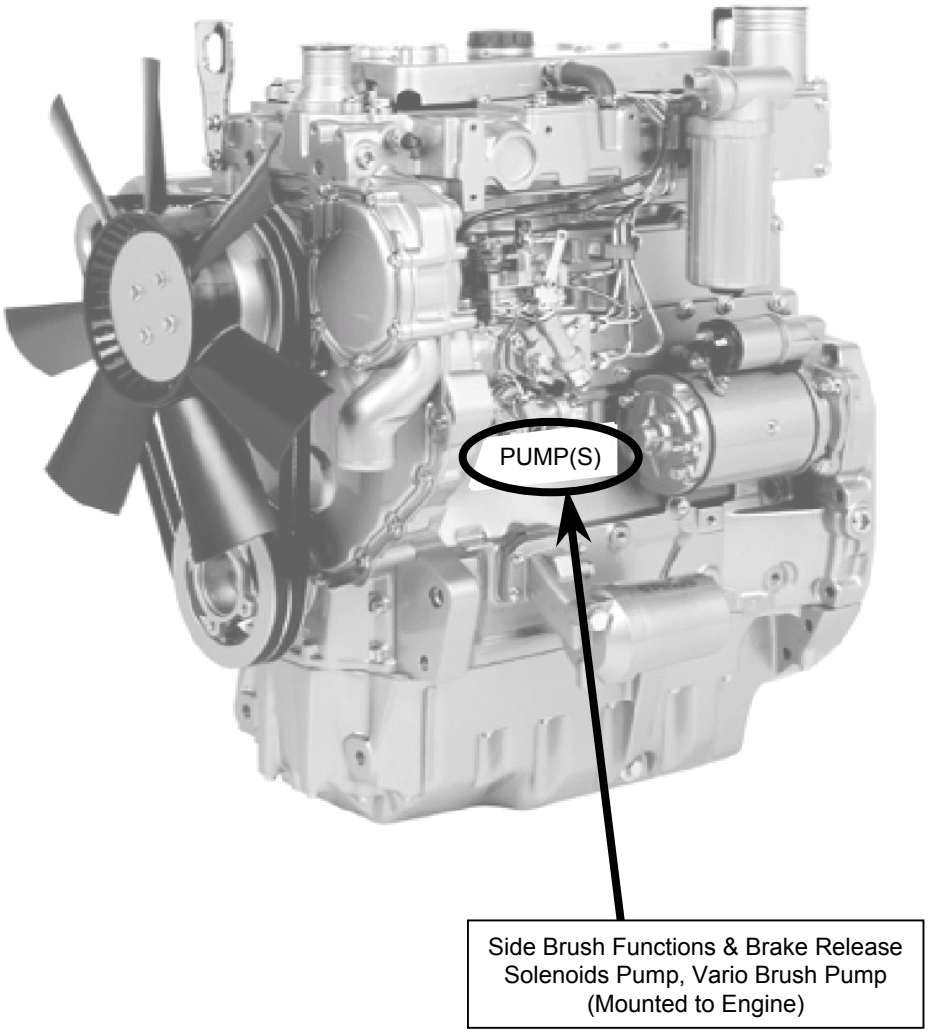
Sentinel Component Locator (page 2 of 5)



Sentinel Component Locator (page 3 of 5)



Sentinel Component Locator (page 4 of 5)



Sentinel Component Locator (page 5 of 5)

HYDRAULIC VALVE BLOCKS

component #	page #(s)	description	location
767009	3	Pressure Washer	Frame top, right side, forward of fuel filler neck
767212	1 & 3	Front & rear brakes	Underside of cab, below brake pedal
768899	1 & 2	Hopper & Vacuum Fan	Left rear, underside of hopper
771010	1	Side Brush & Brake Release	Frame mount, center, under cab
771011	1	Vario Swing, Slide, & Rotate	Behind front bumper
771012	1	Vario Arm	Top of Vario arm
771019	1 & 2	Main Brush & Conveyor	Left frame under front of hopper

SOLENOID VALVE COILS

component #	page #(s)	description	location
SV1	1 & 2	Hopper lower	On Hopper & Vacuum Fan hydraulic valve block
SV2	1 & 2	Hopper lift	
SV3	1 & 2	Main brush down	On Main Brush & Conveyor hydraulic valve block
SV4	1 & 2	Enable	
SV5	1	Right side brush down	On Side Brush & Brake Release hydraulic valve block
SV6	1	Tilt Vario brush right	On Vario Arm hydraulic valve block
SV7	1	Left side brush down	On Side Brush & Brake Release hydraulic valve block
SV8	1	Enable	
SV9	1	Right side brush rotate	
SV10	1	Left side brush rotate	
SV11	1	Tilt Vario brush front edge down	On Vario Arm hydraulic valve block
SV12	1 & 2	Main brush & conveyor forward	On Main Brush & Conveyor hydraulic valve block
SV13	1 & 2	Main brush & conveyor reverse	
SV14	1 & 2	Vacuum fans	On Hopper & Vacuum Fan hydraulic valve block
SV15	1	Swing Vario brush arm right	On Vario Swing, Slide, & Rotate hydraulic valve block
SV16	1 & 2	Shaker, panel filter	On Hopper & Vacuum Fan hydraulic valve block
SV17	1 & 2	Hopper door release	
SV18	1 & 2	Hopper tilt back	
SV19	1 & 2	Hopper tilt forward	
SV20	1	Slide Vario brush arm left	On Vario Swing, Slide, & Rotate hydraulic valve block
SV21	1	Slide Vario brush arm right	
SV22	1	Tilt Vario brush rear edge down	On Vario Arm hydraulic valve block
SV23	1	Tilt Vario brush left	
SV24	1	Vario brush lower	
SV25	1	Swing Vario brush arm left	On Vario Swing, Slide, & Rotate hydraulic valve block
SV26	1	Enable Vario brush	
SV27	1	Vario brush rotate clockwise	
SV28	1	Vario brush rotate counter-clockwise	
SV29	1	Vario brush raise	On Vario Arm hydraulic valve block
SV30A	1	Brake release	On Side Brush & Brake Release hydraulic valve block
SV30B	1	Brake release	
SV31	1 & 2	Conveyor down	On Main Brush & Conveyor hydraulic valve block
SV32	1 & 2	Enable hopper	On Hopper & Vacuum Fan hydraulic valve block
SV33	x	Pressure washer	On Pressure Washer hydraulic valve block
SOL2	3	Reverse propel	Top of propel pump
SOL3	3	Forward propel	Top of propel pump

WHELEN®
ENGINEERING COMPANY INC.
Route 145, Winthrop Road,
Chester, Connecticut 06412
Phone: (860) 526-9504
Fax: (860) 526-4078
Internet: www.whelen.com
Sales e-mail: autosale@whelen.com
Canadian Sales e-mail: autocan@whelen.com
Customer Service e-mail: custserv@whelen.com

Installation and Operating Guide: Traffic Advisor Control Head Models TACTL1A, TACTL3A & TACTL4A

Safety First

This document provides all the necessary information to allow your Whelen product to be properly and safely installed. Before beginning the installation and/or operation of your new product, the installation technician and operator must read this manual completely. Important information is contained herein that could prevent serious injury or damage.

- **Proper installation of this product requires the installer to have a good understanding of automotive electronics, systems and procedures.**
- **If mounting this product requires drilling holes, the installer MUST be sure that no vehicle components or other vital parts could be damaged by the drilling process. Check both sides of the mounting surface before drilling begins. Also de-burr any holes and remove any metal shards or remnants. Install grommets into all wire passage holes.**
- **If this product is mounted with tape or Velcro™, clean the mounting surface with a 50/50 mix of isopropyl alcohol and water and dry thoroughly.**
- **Do not install this product or route any wires in the deployment area of your air bag. Equipment mounted or located in the air bag deployment area will damage or reduce the effectiveness of the air bag, or become a projectile that could cause serious personal injury or death. Refer to your vehicle owners manual for the air bag deployment area. The User/Installer assumes full responsibility to determine proper mounting location, based on providing ultimate safety to all passengers inside the vehicle.**
- **For this product to operate at optimum efficiency, a good electrical connection to chassis ground must be made. The recommended procedure requires the product ground wire to be connected directly to the NEGATIVE (-) battery post.**
- **If this product uses a remote device to activate or control this product, make sure that this control is located in an area that allows both the vehicle and the control to be operated safely in any driving condition.**
- **Do not attempt to activate or control this device in a hazardous driving situation.**
- **It is recommended that these instructions be stored in a safe place and referred to when performing maintenance and/or reinstallation of this product.**
- **FAILURE TO FOLLOW THESE SAFETY PRECAUTIONS AND INSTRUCTIONS COULD RESULT IN DAMAGE TO THE PRODUCT OR VEHICLE AND/OR SERIOUS INJURY TO YOU AND YOUR PASSENGERS!**

Form No.13484C (051402)

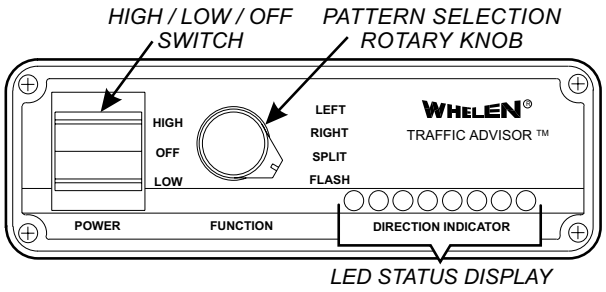
Important Note: This manual is used for both 12-volt (TACTL*A) and 24-volt (TACTL2*A) versions of TACTL-series control switch. All 24-volt versions are identical to their 12-volt counterparts in both fuction & operation. However, any fusing and wiring differences will be documented in the appropriate sections (example: The TACTL1A (12V) & TACTL21A (24V) require different fuse ratings).

The TACTL-series Control Head features a four-function rotary switch that allows the user to select from left arrow, right arrow, split arrow, or flash pattern. Dip switches on the rear panel determine which of the following patterns will be displayed when "flash" is selected (see "Dip Switch Programming" on page 3).

- **One Lamp Sequence to Triple Flash**
- **One Lamp Sequence to Double Flash**
- **Sequence to Solid**
- **Solid Arrow**
- **Two Lamp Sequences**
- **Three Lamp Sequences**
- **Four Lamp Sequences**
- **Sequence On / Sequence Off**
- **Remote Flash Control (TACTL1A Only)**

Remote Flash Control is the new feature on the TACTL1A. This allows for the remote activation of the flash function when the T/A head is off. Turning on the control head overrides the auxiliary control. This is ideal for activation with a slide switch control.

FRONT VIEW



A Center-Off Rocker Switch is used to turn the unit On and Off, in either High or Low power mode. The TACTL has an LED status display that provides a visual indication of the current light pattern.

Installation: Mounting Control Head

1. Position the bail strap in the selected mounting location. Using an awl or other suitable tool, scribe the surface where the mounting hole are to be drilled.

Caution: As mounting the TACTL will require drilling, it is absolutely necessary to make sure that no other vehicle components could be damaged in the process. Check both sides of the mounting surface before starting. If damage is likely, select a different mounting location.

2. Drill the mounting holes in the areas scribed in step 1. The size of the drill bit should be determined by the size of the mounting hardware (customer supplied) and thickness of the mounting surface.
3. Using your mounting hardware, secure the bail strap to the mounting location.

Note: There are 2 sets of holes on the Bail Strap for positioning the control head at 2 different heights (see Page 3).

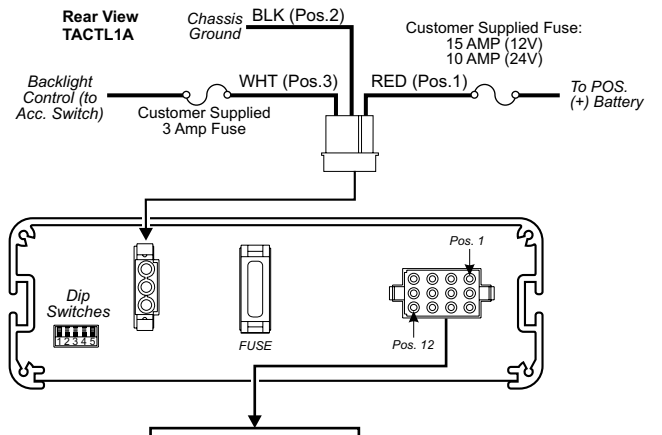
4. With the bail strap in place, insert the carriage bolt along with the external tooth lockwasher (supplied) into the assembly hole from the inner side of the Bail Strap as shown.
5. Place the split lockwasher and the acorn nut on the protruding bolt on the outer side of the bail strap. Loosely secure the acorn nut to the carriage bolt.
6. Now slide the control head onto the carriage bolts. Once it is in the position that the customer has chosen, tighten the acorn nuts until the unit is firmly secured.

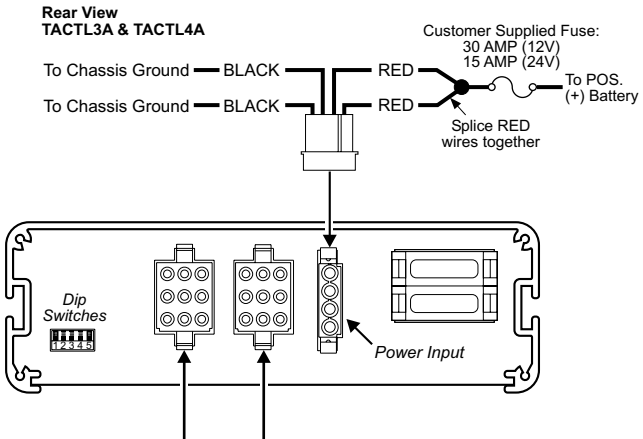
Wiring the Traffic Advisor System

1. Plug the connector into the back of the control head unit (See "Rear View" next page).
2. Extend the RED and BLACK wires to the battery.
3. Connect the RED wire to one end of a user supplied fuse block. *Do not connect this unit to the battery yet.*
4. Connect the BLACK wire to the vehicle's chassis ground
5. Extend and connect the WHITE wire to the accessory switch for the back light controls (TACTL1A only).
6. Route the cable from the TA to the control head.
7. Following the pin charts for your model on page 3, insert the contact wires into their positions. Check that the wires are fully inserted by pulling back on them firmly.
8. Plug the connector(s) into the back of the control head.

WARNING! All customer supplied wires that connect to the positive terminal of the battery must be sized to supply at least 125% of the maximum operating current and fused *at the battery* to carry the load (see "Wire Chart" on page 3).

The installation of your Traffic Advisor System will be complete after the fuse block wire is connected to the POSITIVE (+) terminal of the battery. After this connection has been made, inspect the fuses at the control head and at the battery. If either of these fuses are blown, carefully inspect all of the circuit wires and make sure they are wired correctly. Replace blown fuses with one of an identical amp rating as the original. If these fuses blow after installation or activation, contact Whelen Engineering Technical Support.



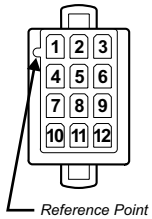


PIN	TO:	WIRE
1	Lamp 1	BRN
2	Lamp 2	RED
3	Lamp 3	ORN
4	Lamp 4	YEL
5	Lamp 5	GRN
6	Lamp 6	BLU

PIN	TO:	WIRE
7	Lamp 7	VIO
8	Lamp 8	GRY
9	+BAT	WHT
10	N/C	N/C
11	N/C	N/C
12	Aux Input*	WHT/BLU

*Requires a SP/ST switch and a 3 Amp fuse. (Customer Supplied)

REAR VIEW OF PIN HOUSING



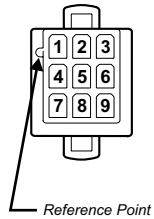
RIGHT SIDE CONNECTOR

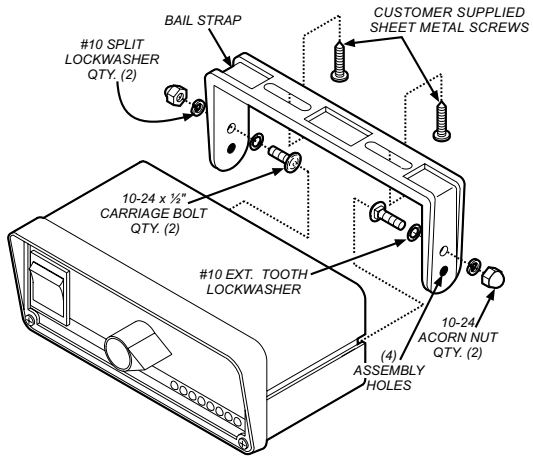
PIN	TO:	WIRE
1	LAMP 5	GRN
2	+ BATTERY	WHT
3	LAMP 6	BLU
4	+ BATTERY	WHT
5	LAMP 7	VIO
6	+ BATTERY	WHT
7	LAMP 8	GRY
8	+ BATTERY	WHT
9	N/C	N/C

LEFT SIDE CONNECTOR

PIN	TO:	WIRE
1	LAMP 1	BRN
2	+ BATTERY	WHT
3	LAMP 2	RED
4	+ BATTERY	WHT
5	LAMP 3	ORG
6	+ BATTERY	WHT
7	LAMP 4	YEL
8	+ BATTERY	WHT
9	N/C	N/C

REAR VIEW OF PIN HOUSING





RECOMMENDED WIRE SIZE

POWER WIRES	AUXILIARY CONTROL WIRES
13 FT. ..... 14 AWG	26 FT. ..... 18 AWG
21 FT. ..... 12 AWG	42 FT. ..... 16 AWG
33 FT. ..... 10 AWG	

DIP SWITCH PROGRAMMING: (TACTL1A & TACTL4A)

DIP SWITCH SETTING					LEFT	RIGHT	SPLIT	FLASH
1	2	3	4	5				
X	X	D	D	D	Sequence Triple Flash	Sequence Triple Flash	Sequence Triple Flash	Single Flash
X	X	U	D	D	Sequence Double Flash	Sequence Double Flash	Sequence Double Flash	Double Flash
X	X	D	U	D	Sequence to Solid	Sequence to Solid	Sequence to Solid	Double Flash
X	X	U	U	D	Solid Half Arrow	Solid Half Arrow	AlternatingSolid Half Arrow	Double Flash
X	X	D	D	U	Sequence Two Lamps	Sequence Two Lamps	Sequence Two Lamps	Double Flash
X	X	U	D	U	Sequence Three Lamps	Sequence Three Lamps	Sequence Three Lamps	Double Flash
X	X	D	U	U	Sequence Four Lamps	Sequence Four Lamps	Sequence Four Lamps	Double Flash
X	X	U	U	U	Sequence On Sequence Off	Sequence On Sequence Off	Sequence On Sequence Off	Double Flash

UP = *6 LIGHT ARRAY* **DOWN =** *8 LIGHT ARRAY* **U =** *UP* **D =** *DOWN*

UP = *ENABLE END LAMPS* **DOWN =** *DISABLE END LAMPS*

To shut end-cap arrows off on T/A bars for a non-directional warning.

DIP SWITCH PROGRAMMING: (TACTL3A)

DIP SWITCH SETTING					LEFT	RIGHT	SPLIT	FLASH
1	2	3	4	5				
X	X	D	D	D	Sequence Triple Flash	Sequence Triple Flash	Sequence Triple Flash	Alt Arrow Tips/ Solid Bar
X	X	U	D	D	Sequence to Solid	Sequence to Solid	Sequence to Solid	Alt Arrow Tips/ Solid Bar
X	X	D	U	D	Sequence On/ Sequence Off	Sequence On/ Sequence Off	Sequence On/ Sequence Off	Alt Arrow Tips/ Solid Bar
X	X	U	U	D	Solid Full Arrow	Solid Full Arrow	Solid Full Arrow	Alt Arrow Tips/ Solid Bar
X	X	D	D	U	Solid Full Arrow	Solid Full Arrow	Solid Full Arrow	Arrow Tips
X	X	U	D	U	Solid Full Arrow	Solid Full Arrow	Solid Full Arrow	Solid Bar
X	X	D	U	U	Solid Half Arrow	Solid Half Arrow	Solid Full Arrow	Arrow Tips
X	X	U	U	U	Solid Half Arrow	Solid Half Arrow	Solid Full Arrow	Solid Bar

UP = Normal **DOWN =** Reversed (Swap Left & Right) **U =** *UP* **D =** *DOWN*

UP = New Array Patterns **DOWN =** Old Array Patterns

WHELEN®
ENGINEERING COMPANY INC.

ROUTE 145, WINTHROP ROAD
CHESTER, CONNECTICUT 06412-0684
TELEPHONE: (860) 526-9504
FAX: (860) 526-4078

Installation Manual for TA836A Traffic Advisor

Installation: Mounting the Traffic Advisor

The Traffic Advisor (T/A) mounting feet can be adjusted so that no matter what the angle of the selected mounting surface, the Traffic Advisor can deliver optimum visibility. See page 2.

CAUTION: *Do not connect the T/A System to power until the installation is completed. When servicing or trouble shooting always disconnect it from the power source.*

1. Remove the two lower brackets of the mounting feet from the mounting kit and secure them to the upper brackets with the supplied hardware. (Pg. 2)
2. Slide the mounting feet to their desired position inside the groove, and secure them with the hardware supplied (Pg. 2).
3. Slightly loosen the hex nuts holding the upper and lower brackets together and place the T/A in the desired position on the proposed mounting surface. Adjust the lower brackets of the mounting feet to rest firmly on the mounting surface. Trace the outline of these brackets on that surface. If the T/A's power cable is to pass through the mounting surface, be sure to mark the area for this passage hole.
4. Remove the T/A from the mounting surface and separate the lower brackets of the mounting feet from the upper brackets. Align these brackets with the outlines traced in the previous step. Trace mounting hole locations onto mounting surface.

NOTE: *Make sure that the lower bracket is facing in the same direction as it was facing, when it was outlined on the mounting surface as indicated in step 3.*

5. Examine the back side of the mounting surface to insure that no damage will occur when drilling the mounting holes. Drill mounting holes with a 7/32" drill. If a wire passage hole has been marked, drill the hole using a drill bit sized for the cable and for an appropriately sized grommet (customer supplied).
6. Secure lower brackets to mounting surface. (Pg. 2)
7. Lower the T/A assembly onto the two lower brackets secured to the mounting surface. Secure both brackets together with the supplied hex head screw, internal tooth lock washer, split lock washer and hex nut, in the same order as indicated on page 2. Before tightening the upper and lower brackets together, adjust the T/A to an angle best suited to its mounting location.

NOTE: *There are two holes that can be used when assembling lower and upper brackets together, to position the T/A assembly at two different heights (Pg. 2).*

8. Slide the cable through the wire passage hole and route the cable to the control head mounting location. Refer to diagram on page 2, and your control head manual for wiring.

Servicing the Traffic Advisor Assembly:

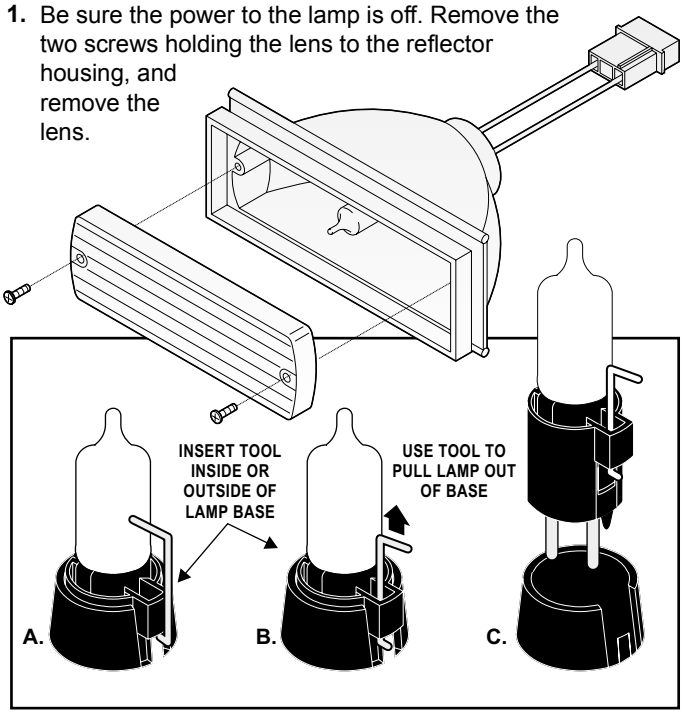
The Traffic Advisor can be field serviced without difficulty. If you need to replace the reflector, remove the end cap, disconnect the reflector from the internal wire harness and slide the reflector out of the extrusion. Use the same procedure in reverse order for reassembly. (Pg. 2)

Halogen Lamp Replacement:

WARNING: *Replacing any bulb requires the use of safety glasses to prevent injury. To avoid injury, do not attempt to replace the lamp with your fingers. Use a lamp replacement tool or other suitable tool.*

To Replace a Snap-In Bulb:

1. Be sure the power to the lamp is off. Remove the two screws holding the lens to the reflector housing, and remove the lens.



2. Locate the removal tool included with your new bulb. Use the small end of the tool on either the outside (A) or inside (B) of the base to lift the base of the bulb assembly away from the socket as shown. Continue to lift until bulb is free.
3. Insert the alignment tab of the new bulb into the bulb holder and press downwards to lock the new bulb into place.

Form No.13248E (040400)

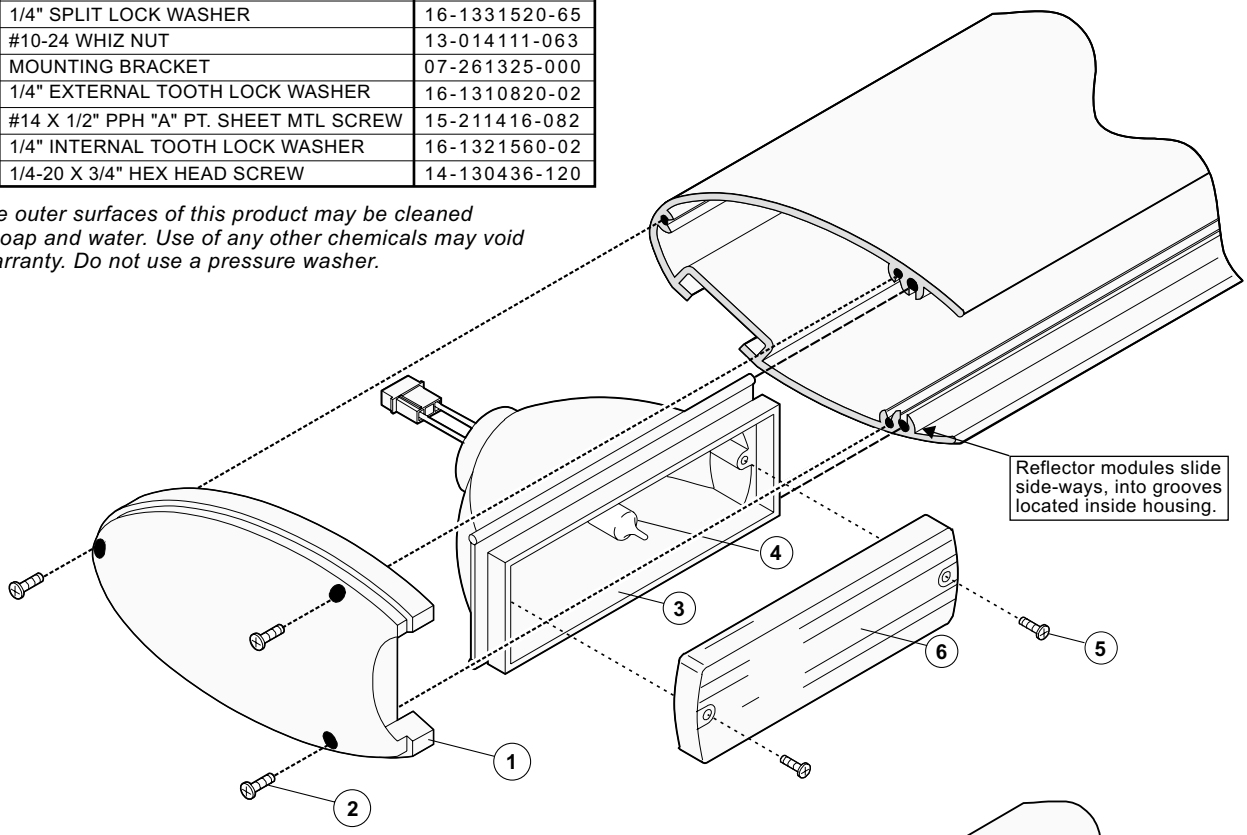
TA836A PARTS LIST

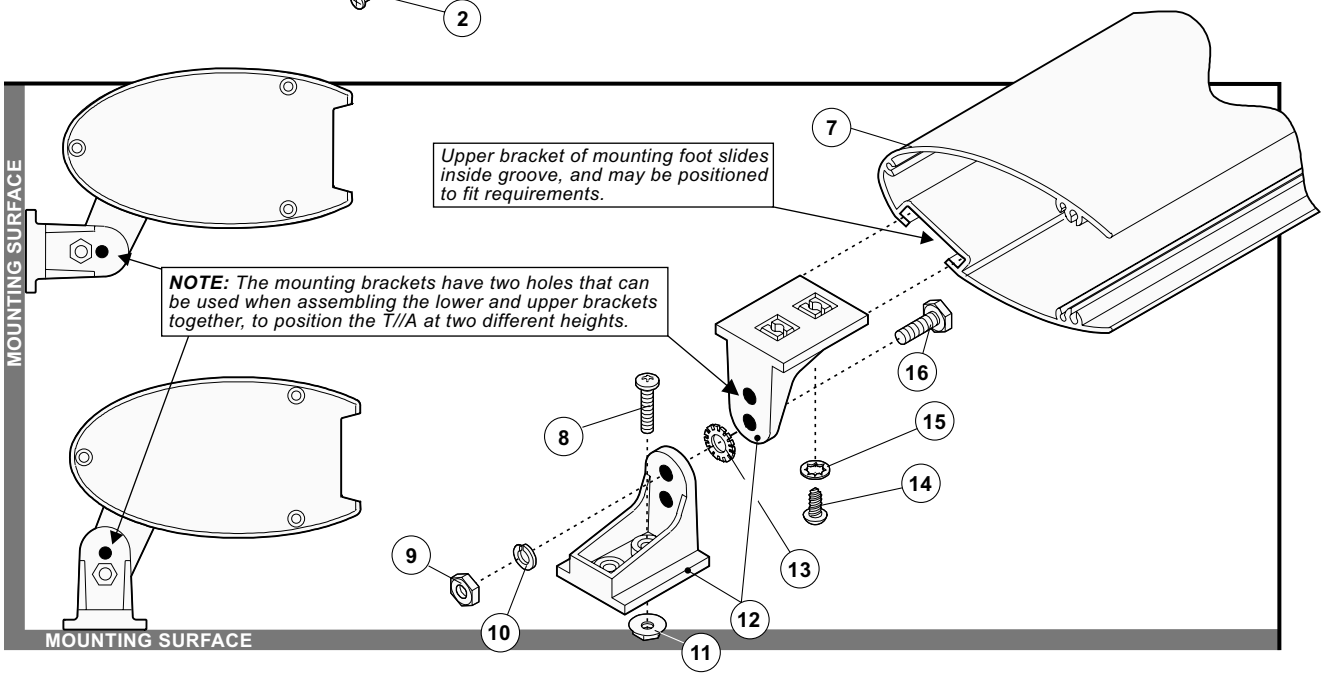
ITEM	QTY.	DESCRIPTION	PART NUMBER
1	2	ENDCAP	11-261326-000
2	6/8	#6-32 X 1/2" PPH SELF TAP MACH. SCREW	14-062216-083
3	8	52 HALOGEN REFLECTOR HOUSING	02-0283375-00
4	8	SNAP-IN HALOGEN LAMP - 12V / 20W	34-0041987-04
4	8	SNAP-IN HALOGEN LAMP - 28V / 35W	34-0041987-02
5	16	#6 X 1/2" PPH THREAD FORMING SCREW	15-065419-080
6	8	POLYCARBONATE OPTIC LENS / AMBER	68-1161313-10
7	1	HOUSING BASE / ALUMINUM	11-314126-000
8	2	#10-24 X 1-1/4" PPH MACHINE SCREW	14-104216-200
9	2	1/4-20 X 7/16" HEX NUT	13-130120-070
10	2	1/4" SPLIT LOCK WASHER	16-1331520-65
11	2	#10-24 WHIZ NUT	13-014111-063
12	4	MOUNTING BRACKET	07-261325-000
13	2	1/4" EXTERNAL TOOTH LOCK WASHER	16-1310820-02
14	2	#14 X 1/2" PPH "A" PT. SHEET MTL SCREW	15-211416-082
15	2	1/4" INTERNAL TOOTH LOCK WASHER	16-1321560-02
16	2	1/4-20 X 3/4" HEX HEAD SCREW	14-130436-120

NOTE: *The outer surfaces of this product may be cleaned with mild soap and water. Use of any other chemicals may void product warranty. Do not use a pressure washer.*

SPECIFICATIONS

Input Voltage.....*12.8 VDC ±20% (25.6 VDC ±20%)*
Back Light Voltage.....*12.8 VDC ±20% (25.6 VDC ±20%)*
Power Per Lamp..... *20W(12V) / 35W(28V)*
Input Current..... *1.5 AMPS / LAMP (12V & 24V)*
Back Light Current..... *100MA(12V) / 50MA(24V)*
Candel Power High..... *770 CANDELA (AMBER)*
Candel Power Low.....*300 CANDELA (AMBER)*
Sweep Rate.....*40 CYCLES PER. (MIN.)*





Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Vacuum Fan Motor	On or Activated	SV14	Vac Fan LED On = Vac Fan Running (see notes)	Hopper Control		P7	M9	M10	RV4	2750 psi	Hopper Thermal Sentry Close at 150 degrees F, (self resetting) --If this happens the Vac Fan LED will flash (blink) and Vac Fan will turn off.	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Shaker Motor	On or Activated	SV16	Shaker LED On = Shaker Running (30 second run cycle)	Hopper Control		P7	M5	M6	RV4	2750 psi	-	Shaker motor cannot be operated with the Vac Fan operating. If Shaker Motor is turned on with Vac Fan operating, the Vac Fan is shut off and the Vac Fan LED will stay on until the Shaker Motor stops running (Shaker Motor LED will be on when shaking). There is a five (5) second delay before the Shaker motor starts if the Vac Fan was on.
Hopper System	Hopper Door Latch, Close	SV17 & SV32 (SV32 for 4 seconds, see notes)		Hopper Control		P7	C12	C11	RV4	2750 psi	-	SV32 stays on for four (4) seconds to allow maximum pressure and fuild flow to Hopper Door Cylinder. Door is held closed by hydraulic pressure on piston end (always). To open door CV4 Check Valve is "unchecked" by fluid pressure, RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Door Latch, Open	SV17 & SV32	Must hold button to operate	Hopper Control		P7	C11	C12	RV4	2750 psi	-	SV32 stays on until Hopper Close button, os Hopper lift/lower/forward/back is pushed. SV17 stays on until hopper closed button is pushed. RV4@2750psi, OR5 @0.063 in Hopper Control Block.
Hopper System	Hopper Tilt Down (rest)	SV18	Must hold button to operate	Hopper Control		P7	C10	C9	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate.	CV5 Check Valve in circuit, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders RV4@2750psi, OR5 @0.063 in Hopper Control Block. Check valves in cylinders on piston ends.
Hopper System	Hopper Tilt Forward	SV19	Must hold button to operate	Hopper Control		P7	C10	C9	RV7	1250 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	CV5 Pilot Check Valve in circuit is unseated by fluid pressure via SV19, OR3@0.063 located in Hopper Control Block, before Tilt Cylinders. OR5 @0.063 in Hopper Control Block. Pilot Check valves on cylinder piston end is unseated by pressure via SV19 to allow cylinders to tilt forward (rest position)
Hopper System	High Dump (Option) Lift	SV2	Must hold button to operate	Hopper Control		P7	C2	C11	RV4	2750 psi	Parking or Service Brake must be applied for this system to operate. Machine level sensor must indicate machine is level.	Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.
Hopper System	High Dump (Option) Down	SV1	Must hold button to operate	Hopper Control		P7	C2	C11	-	-	Parking or Service Brake must be applied for this system to operate.	Gravity lowers the hopper. Hydraulic fluid moves to return side of system via SV1. Cylinders have "velocity valves" in line connection on piston end of cylinder. Velocity valves prevent sudden falling of hopper if hose breaks. OR5 @0.063 in Hopper Control Block. OR4 @0.120 in Hopper Block.

Enable Lift Circuit # 1		SV8
Enable Lift Circuit # 2		SV4

Component	Function	Energized Coils	Notes	Valve Block	Test Port	Feed Port	Exit Port	Return Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Conveyor System	Lift	SV31		Main Brush Control		P5	C4	C3	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Conveyor Lift Cylinder. Restrictor 0.040 at C4
Conveyor System	Lower	SV31		Main Brush Control		P5	C3	C4	RV3	2750 psi	-	Restrictor 0.040 at C4
Conveyor System	Operate main brush motor and conveyor forward	SV12	This is a press and release to operate button.	Main Brush Control		P5	M7	M8	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	Overlaod switch is set at 2400 psi, Overload LED will turn on. If "jammed" RV3 will relaese pressure.
Conveyor System	Operate motor reverse	SV13	This is a press and release to operate button.	Main Brush Control		P5	M8	M7	RV3 (see note)	2750 psi	RPM must be under 2000 for Main Brush and Conveyor to operate. Hopper up or tilted or Up/Tilt buttons pressed. (LED's blinking)	If "jammed" RV3 will relaese pressure. If conveyor is down, brush motor/conveyor will run in reverse when down, if up brush motor/conveyor will run in reverse when up. If system in sweep and reverse is pressed wil cause to run in reverse, pressing again will cause sweep rotation. If in up positoin, pressing will cause to run in reverse, pressing again will cause motion to stop.
Side Brushes	Operate left brush motor and down (Option)	SV7 & SV10		Side Brush Valve	G1	P3	C8 & M3	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV7. Pilot operated check vlave at PC1. SV10 controls Right Side Brush
	Operate right brush motor and dwon	SV5 & SV9		Side Brush Valve	G1	P3	C7 & M1	T1 & T13	RV2	2200 psi		SV8 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Right Side Brush Lift Cylinder through SV5. Pilot operated check vlave at PC2. SV9 controls Right Side Brush
Main Brush	Lift	SV3		Main Brush Control		P5	C6	-	RV3	2750 psi	-	SV4 stays on for four (4)??? seconds to allow maximum pressure and fuild flow to Main Broom Cylinder. Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6
	Down/Lower	SV3		Main Brush Control		P5	-	T10	-	-	-	Pressure unseats Pilot Check PC3 in Main Brush Control block. Restrictor 0.031 at C6

The following assumes that the PTOs are engaged and operating.

Component	Function	Energized Coils	Notes	Valve Block	Location	Feed Port	Exit Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
Vacuum Fan Motor	Operate	SV7 (PWM)	Motor speed and system max pressure vary with current to coil SV7.	Hopper Valve	On Hopper	P1	M1	no		Hopper Thermal Sentry (S16) / Display msg, Shaker motor	Speed varies with engine speed.
Shaker Motor	Operate	SV37, SV6	System max pressure is 3000 psi.	Hopper Valve	On Hopper	P1	M3	no			60 second timer in controller
Hopper System	Lift	SV1, SV25B	System max pressure is 3000 psi.	Main Valve	Above Main Broom	P4	C12	RV1	2700	Parking Brake / Display msg, conveyor back switch / Display msg	Power to SV23A and SV25B supplied through conveyor back switch (S12). These valveds cannnot be energised when the conveyor back switch is not made.
	Lower	SV1, SV25A	System max pressure is 3000 psi.	Main Valve	Above Main Broom	P4	C12	RV1	2700		Velocity fuses prevent hopper from lowering at fast speed.
	Dump hopper and open chute	SV37, SV23B	System max pressure is 3000 psi.	Hopper Valve	On Hopper	P1	C1, C2, C3, C4	no		Parking Brake / Display msg, conveyor back switch / Display msg	Power to SV23A and SV25B supplied through conveyor back switch (S12). These valveds cannnot be energised when the conveyor back switch is not made.
	Return hopper home and close chute	SV37, SV23A	G11 max pressure is 3000 psi.	Hopper Valve	On Hopper	P1	C1, C2, C3, C4	no			Velocity fuses prevent hopper from tilting at fast speed.
Conveyor System	Tilt in	SV1, SV20A	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C17, C18	no		Hopper Down Switch / Display msg	Conveyor will not tilt in until hopper down switch (S11)is closed. Conveyor will tilt forward when the hopper down switch is made, and the hopper down button is released (after lowering the hopper) Converyor will tilt in when sweep engergized
	Tilt out	SV1, SV20B	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C17, C18	no			Conveyor will tilt out when hopper lift or tilt are engaged
	Lift	SV1, SV19B	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C19, C20	no			Conveyor will lift when sweep is disengaged
	Lower	SV1, SV19A	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C19, C20	no			
	Operate motor forward	SV2 (PWM)	Motor speed and system max pressure vary with current to coil SV2.	Side Brush Valve	Right Side	P2	M10, M11	no		Operation inhibited when reverse gear is selected	Stall Switch SW24. Speed varies with engine speed and sweep mode.
	Operate motor reverse	SV2 (PWM), SV4	Motor speed and system max pressure vary with current to coil SV2.	Side Brush Valve	Right Side	P2	M10, M11	no			Stall Switch SW24. Reverse operation is momentary
Side Brushes	Operate left brush motor	SV11 (PWM)	Motor speed and system max pressure vary with current to coil SV11.	Side Brush Valve	Right Side	P2	M4	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	Varies with engine speed and touch-panel adjustment.
	Lower left brush	SV1, SV38	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C7	PR1/SV 35	200	Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
	Maintain left brush on the ground	SV38		Side Brush Valve	Right Side	P2	C7	PR1/SV 35	200	Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
	Lift left brush	SV1, SV16	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C7	no			
	Operate right brush motor	SV9 (PWM)	Motor speed and system max pressure vary with current to coil SV9.	Side Brush Valve	Right Side	P2	M7	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	Varies with engine speed and touch-panel adjustment.
	Lower right brush	SV1, SV39	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C5	PR1/SV 35	200	Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	

The following assumes that the PTOs are engaged and operating.

Component	Function	Energized Coils	Notes	Valve Block	Location	Feed Port	Exit Port	Relief Valve in circuit	Relief Valve Pressure Setting	Interlock/Indicator	Notes
	Maintain right brush on the ground	SV39		Side Brush Valve	Right Side	P2	C5	PR1/SV 35	200	Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
	Lift right brush	SV1, SV15	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C5	no			
	Adjust brush pattern lift pressure	SV35 (PWM) or PR1	PR1 is manual valve, SV35 is PWM valve (option)	Side Brush Valve	Right Side	P2	C5	PR1/SV 35	200	Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	Fixed valve (PR1) is option; set at 250 psi. Adjustable option (SV35) varies with touch-panel adjustment. Stems share common cavity. Measure at G1 with right brush on.
Side Skirts	Lift	SV1, SV31B	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C9, C10	no			
	Lower	SV1, SV31A	System max pressure is 3000 psi.	Side Brush Valve	Right Side	P2	C9, C10	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
Main Brush	Lift	SV1, SV27	System max pressure is 3000 psi.	Main Valve	Above Main Broom	P4	C22	no			
	Lower	SV28	Drag shoes must be lowered also.	Main Valve	Above Main Broom	P4	C22	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
	Maintain brush on ground	SV28		Main Valve	Above Main Broom	P4	C22	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	
	Adjust brush pattern lift pressure	SV29 (PWM)	max pressure varies with current to coil.	Main Valve	Above Main Broom	P4	C22	no			Varies with engine speed and sweep mode. Measure at G2.
	Operate motor	SV13 (PWM), SV14	Motor speed and system max pressure vary with current to coil SV1.	Main Valve	Above Main Broom	P4	M9	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	Varies with engine speed and sweep mode.
Drag Shoes	Lift	SV1, SV17	System max pressure is 3000 psi.	Main Valve	Above Main Broom	P4	C15, C16	no			
	Lower	SV1, SV43	System max pressure is 3000 psi.	Main Valve	Above Main Broom	P4	C15, C16	no		Operation inhibited when reverse gear is selected. Operation inhibited when hopper down switch is open / Display msg	

Centurion Switch and LED Operation

	Notes	PTO LED	Sweep LED	Gutter Broom LED	Vac Fan LED	Water LED	Conveyor Water LED	Conveyor Forward LED	Conveyor Reverse LED	Conveyor Tilt LED	Hopper Lift LED	Hopper Lower LED	Hopper Dump LED	Shaker LED
PTO Operation														
PTO button Pressed ON		"ON"												
SWEEP button Pressed ON		"ON"												
Hopper Lift, Lower, Dump or Home buttons pressed ON		"ON"												
Side Brush button pressed ON		"ON"												
Conveyor button pressed ON		"ON"												
PTO button Pressed OFF		"OFF"												
SWEEP button Pressed OFF		"OFF"												
Sweep Operation														
SWEEP button Pressed ON			"ON"											
SWEEP button Pressed OFF			"OFF"											
Gutter Broom Operation														
Gutter Broom button Pressed ON	*			"ON"										
Gutter Broom button Pressed OFF	**			"OFF"										
Vacuum Fan Operation														
Vac Fan button Pressed ON	*				"ON"									
Vac Fan button Pressed OFF	**				"OFF"									
Water Pump Operation														
(front, conveyor, left/right gutter brooms)														
Water Valve(s) button(s) Pressed ON	*					"ON"								
Water Valve(s) button(s) Pressed OFF	**					"OFF"								
Thermal Sentry -- Fire in Hopper -- Thermal Sentry "Tripped"							"ON"							
Conveyor Forward Operation														
Conveyor "Forward" button Pressed ON	*							"ON"						
Conveyor "Forward" button Pressed OFF	**							"OFF"						
Conveyor Reverse Operation														
Conveyor Reverse button "Pressed and Held ON"									"ON"					
Conveyor Tilt Operation														
Conveyor Tilt button Pressed "ON" for tilt in	***									"ON"				
Hopper Lift														
Hopper "Lift" button Pressed ON to lift hopper											"ON"			
Hopper "Lower" button Pressed "ON" to lower hopper												"ON"		
Hopper Home Operation														
Hopper "Home" button Pressed "ON" to move hopper to home position												"ON"		
Hopper Dump Operation														
Hopper "Dump" button Pressed "ON" to dump hopper													"ON"	
Shaker Operation														
Shaker button Pressed "ON" (60 second shake cycle) after 15 second delay	****													"ON"

Notes:

- ***** **Sweep button will start this operation if it was on when sweep last cancelled**
- ****** **Canceling sweep will turn this function off**
- ******* **Sweep button will automatically tilt conveyor in when sweep operation started**
- ******** **Active for 60 seconds**

Read Notes:	Pin Number		Active Voltage	Inactive Voltage	Fuse Number	Fuse Amp Rating	Wire Number	Solenoid Number	Solenoid Location	Description	Amp Draw per Solenoid	Typ Solenoid Resistance	Notes
	1	Connects #1 Vario Mode Switch											
	2	Connects #4 Vario Mode Switch											
	3	Ground	0vDC	0vDC	-	-	N/A			Power Ground			
Note	4	Connects #1 Brush Rotation Switch					101K/Pink						
Note	4	Output	0 vDC	B+	F24	10	101K/Pink	SV27		Vario Brush Rotate	6-8 ohms	1.5-2.0 amps	Fuse is through
Note	5	Connects #4 Brush Rotation Switch					104J/Blue						
										Vario Brush Rotate			Fuse is through
Note	5	Output	0 vDC	B+	F24	10	104J/Blue	SV28		Counter ClockWise	6-8 ohms	1.5-2.0 amps	Brush Rotation
Note	6	Connects #4 Arm Up/Hold Switch					106J/Green						
Note	6	Output	0 vDC	B+	F24	10	106J/Greer	SV24		Vario Brush Float	6-8 ohms	1.5-2.0 amps	Fuse is through
Note	7	Connects #1 Arm Up/Hold Switch					105J/Gray						
Note	7	Output	0 vDC	B+	F24	10	105J/Gray	SV29		Vario Brush Up	6-8 ohms	1.5-2.0 amps	Fuse is through
	8	Not Used	Not used										
	9	Output	0 vDC	B+	F24	10	111J/Pink	SV26		Enable Solenoid	6-8 ohms	1.5-2.0 amps	
	10												
	11												
	12												
	13												
	14	Key On, Power Input	B+	B+	F18	15	103J/Brown			Key On, Power			
	15	Ground	0vDC	0vDC	-	-	110J/Yellow			Power Ground			
	16												
	17												
	18												
	19												
	20												

Output
Ground, Power
Key On, Power Input

Sentinel Vario Brush Control Board Pin Voltage Chart

Connector Number	Pin Number		Active Voltage	Inactive Voltage	Fuse Number	Fuse Amp Rating	Wire Number	Solenoid Number	Solenoid Location	Description	Amp Draw per Solenoid	Solenoid Resistance	Notes
	1	Connects #1 Vario Mode Switch											
	2	Connects #4 Vario Mode Switch											
	3	Ground	0vDC	0vDC	-	-	N/A			Power Ground			
	4	Connects #1 Brush Rotation Switch					101K/Pink						
	5	Connects #4 Brush Rotation Switch					104J/Blue						
	6	Connects #4 Arm Up/Hold Switch					108K/Green						
	7	Connects #1 Arm Up/Hold Switch					105J/Gray						
	8												
	9		0 vDC	B+	F24	10	111J/Pink	SV26		Enable Solenoid			
	10												
	11												
	12	Connects to #19											
	13	Connects to #18											
	14	Key On, Power Input	B+	B+	F18	15	103J/Brown						
	15	Ground	0vDC	0vDC	-	-	110J/Yellow			Power Ground			
	16		0 vDC	B+			114J/Yellow	SV25		Vario Brush Arm Pivot Counter Clockwise			
	17		0 vDC	B+			115J/Green			Vario Brush Arm Pivot Clockwise			
	18												
	19												

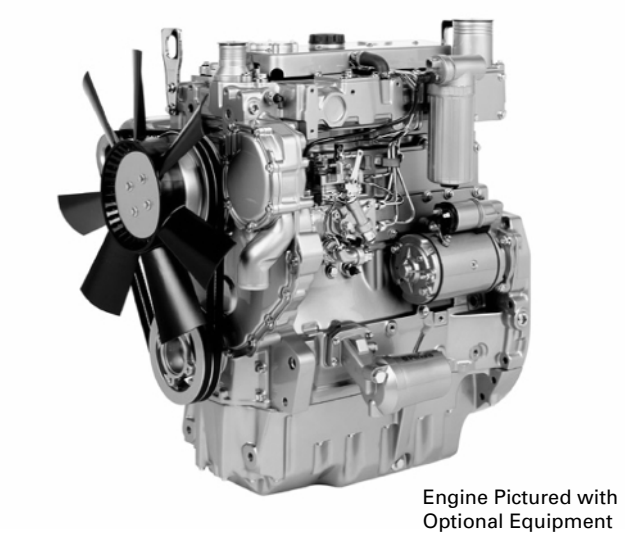
CATERPILLAR®

Industrial Diesel Engine

3054C 3054E

Naturally Aspirated

50-64 bkW/67-86 bhp



Engine Pictured with Optional Equipment

CATERPILLAR® ENGINE SPECIFICATIONS

In-Line 4 Cylinder, Four-Stroke-Cycle Diesel
Bore — mm (in) 105 (4.13)
Stroke — mm (in)..... 127 (5.00)
Displacement — liter (cu in) 4.41 (269)
Combustion System ..... Direct injection
Rotation (from flywheel end) .. Counterclockwise
Capacity for Liquids — L (U.S. qts)
  Cooling System (engine only)..... 7 (7.4)
  Lube Oil System (refill) typical..... 6.9 (7.3)
Weight, Net Dry (approximate) —
  kg (lb) 291 (641)

BENEFITS

- **HIGH PERFORMANCE**
  Horsepower and torque capabilities optimized.
- **QUALITY BY DESIGN FOR DURABILITY**
  Product design and process improvements have been used from early stages to enhance engine reliability and durability.
- **CLEAN AND QUIET POWER**
  Cleaner, meeting EPA Tier 2 emissions standards and free from visible smoke throughout operational speed range. Quieter, with up to 3 dBA reduction in bare engine noise.
- **EASY LOW-COST MAINTENANCE**
  Convenient positioning of service points for easy accessibility. Service intervals at 500 hours as standard.
- **WEB SITE**
  For additional information on all your power requirements, visit www.cat.com.

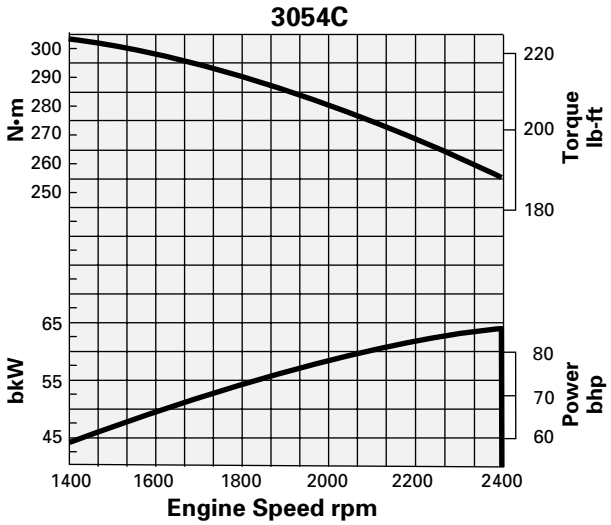
STANDARD EQUIPMENT

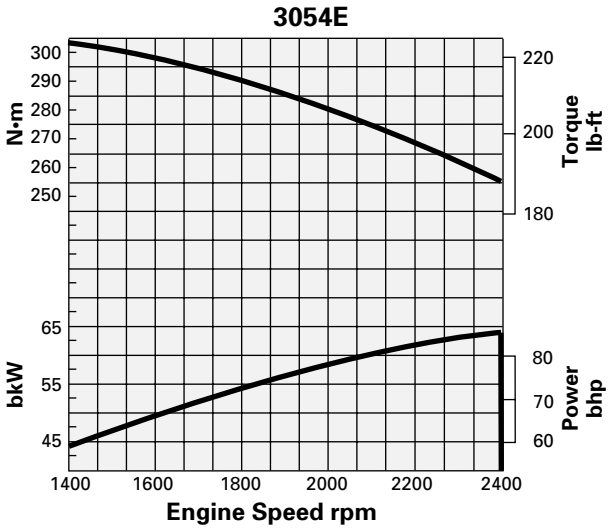
Cast iron engine block
Flywheel and flywheel housing
Ecoplus oil and fuel filters
Electronic control module (on 3054E)
Glow plug starting aid
Integral inlet manifold
Cast iron exhaust manifold — center side outlet
Gear-driven coolant pump
Alternator — 12V and 24V; 55, 65, 85, 100 amp
Provision for PTOs
Choice of cooling fans
Starter motor — 12V and 24V
Plastic J2044 fuel system standard
Choice of lube oil sump
Choice of dipstick positions
Choice of filter positions
Choice of water outlet
Optional balancer

CATERPILLAR FACILITIES ISO 9001 CERTIFIED

PERFORMANCE DATA

Naturally Aspirated

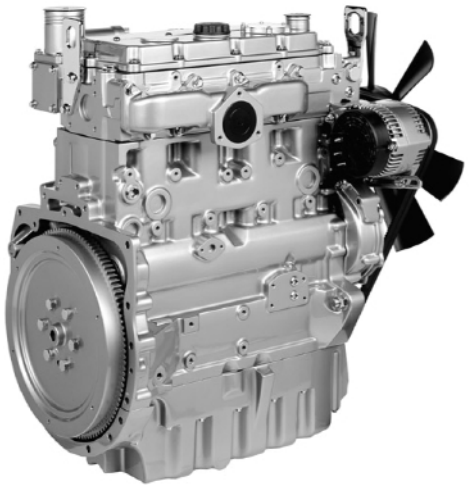




Gross Intermittent Power = SAE J1995

Other ratings are available.

Lower power ratings should not be read from these curves.



DIMENSIONS

Length	mm (in)	663 (26.1)
Width	mm (in)	563 (22.2)
Height	mm (in)	775 (30.5)
Weight	kg (lb)	291 (641)

Note: Dimensions and weight depend on final specifications.

RATING DEFINITIONS AND CONDITIONS

Intermittent is the horsepower and speed capability of the engine which can be used for about one hour, followed by an hour of operation at or below the continuous rating.

Continuous is the horsepower and speed capability of the engine which can be used without interruption or load cycling.

Additional ratings are available for specific customer requirements. Consult your Caterpillar dealer.

Ratings are based on SAE J1995 standard conditions of 100 kPa (29.61 in Hg) and 25° C (77° F). These ratings also apply at ISO/TR14396, standard conditions and to DIN6271 and BS5514 standard conditions of 100 kPa (29.61 in Hg), 27° C (81° F) and 30% relative humidity.

Fuel consumption is based on fuel oil having an LHV of 42 780 kJ/kg (18 390 Btu/lb) and weighing 845-850 g/liter (7.052-7.094 lb/U.S. gal). Power ratings are based on engine equipped with fuel, lube oil, and jacket water pumps but without fan.

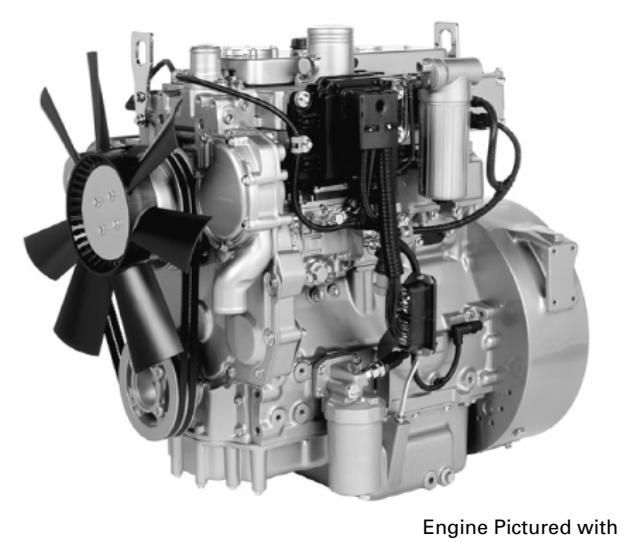
CATERPILLAR®

Industrial Diesel Engine

3054C 3054E

Turbocharged

60-86 bkW/80-115 bhp



Engine Pictured with Optional Equipment

CATERPILLAR® ENGINE SPECIFICATIONS

In-Line 4 Cylinder, Four-Stroke-Cycle Diesel
Bore — mm (in) 105 (4.13)
Stroke — mm (in)..... 127 (5.00)
Displacement — liter (cu in) 4.41 (269)
Combustion System ..... Direct injection
Rotation (from flywheel end) .. Counterclockwise
Capacity for Liquids — L (U.S. gal)
  Cooling System (engine only)..... 7 (7.4)
  Lube Oil System (refill) typical..... 6.9 (7.3)
Weight, Net Dry (approximate) —
  kg (lb) 306 (674)

BENEFITS

- **HIGH PERFORMANCE**
  Horsepower and torque capabilities optimized.
- **QUALITY BY DESIGN FOR DURABILITY**
  Product design and process improvements have been used from early stages to enhance engine reliability and durability.
- **CLEAN AND QUIET POWER**
  Cleaner, meeting EPA Tier 2 emissions standards and free from visible smoke throughout operational speed range. Quieter, with up to 3 dBA reduction in bare engine noise.
- **EASY LOW-COST MAINTENANCE**
  Convenient positioning of service points for easy accessibility. Service intervals at 500 hours as standard.
- **WEB SITE**
  For additional information on all your power requirements, visit www.cat.com.

STANDARD EQUIPMENT

Cast iron engine block
Flywheel and flywheel housing
Ecoplus oil and fuel filters
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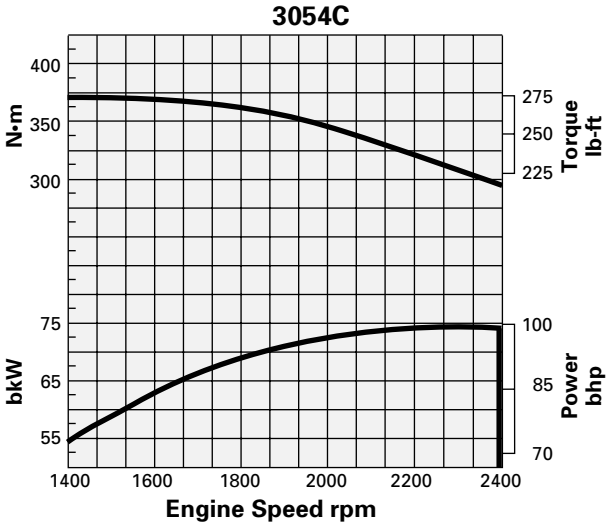
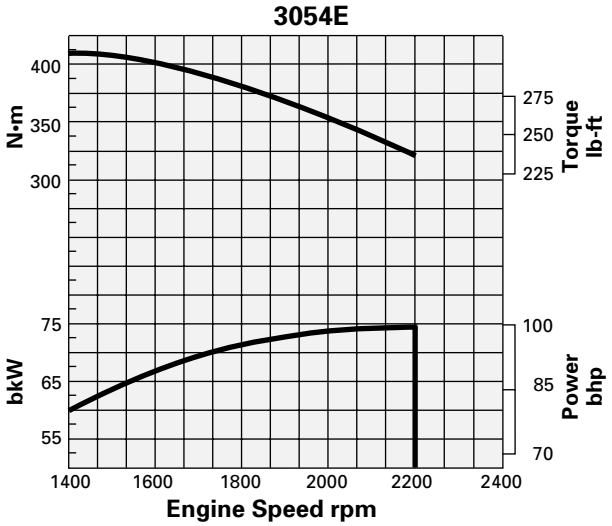
Cast iron exhaust manifold — center side outlet
Gear-driven coolant pump
Alternator — 12V and 24V; 55, 65, 85, 100 amp
Provision for PTOs
Choice of cooling fans
Starter motor — 12V and 24V
Plastic J2044 fuel system standard
Choice of turbo outlet orientation
Choice of lube oil sump
Choice of dipstick positions
Choice of filter positions
Choice of water outlet
Optional balancer

CATERPILLAR FACILITIES ISO 9001 CERTIFIED

PERFORMANCE DATA

Turbocharged





Gross Intermittent Power = SAE J1995

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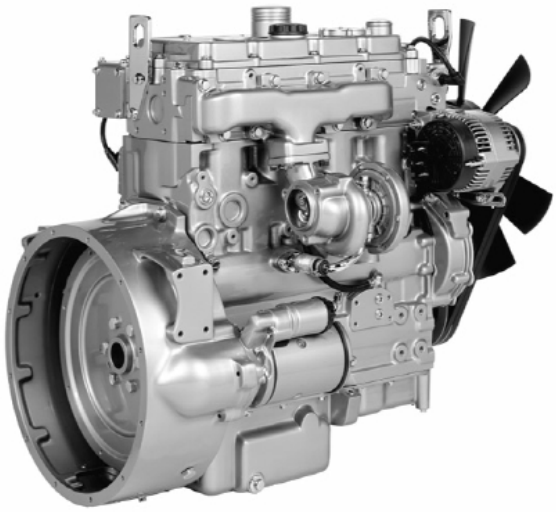

DIMENSIONS

Length	mm (in)	663 (26.1)
Width	mm (in)	597 (23.5)
Height	mm (in)	810 (31.9)
Weight	kg (lb)	306 (674)

Note: Dimensions and weight depend on final specifications.

RATING DEFINITIONS AND CONDITIONS

Intermittent is the horsepower and speed capability of the engine which can be used for about one hour, followed by an hour of operation at or below the continuous rating.

Continuous is the horsepower and speed capability of the engine which can be used without interruption or load cycling.

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Ratings are based on SAE J1995 standard conditions of 100 kPa (29.61 in Hg) and 25° C (77° F). These ratings also apply at ISO/TR14396, standard conditions and to DIN6271 and BS5514 standard conditions of 100 kPa (29.61 in Hg), 27° C (81° F) and 30% relative humidity.

Fuel consumption is based on fuel oil having an LHV of 42 780 kJ/kg (18 390 Btu/lb) and weighing 845-850 g/liter (7.052-7.094 lb/U.S. gal). Power ratings are based on engine equipped with fuel, lube oil, and jacket water pumps but without fan.

Torque Standard

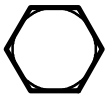
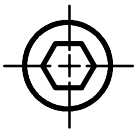
Inch Fasteners

Thread Size	SAE Grade 1	SAE Grade 2 Carriage Bolts	Thread Cutting Thread Rolling	SAE Grade 5 Socket and Stainless Steel	SAE Grade 8	Headless Socket Set Screws	Square Head Set Screws	
4 (.112)	(5)–(6.5)					(4)–(6)		INCH POUNDS
5 (.125)	(6)–(8)					(9)–(11)		
6 (.138)	(7)–(9)		(20)–(24)			(9)–(11)		
8 (.164)	(12)–(16)		(40)–(47)			(17)–(23)		
10 (.190)	(20)–(26)		(50)–(60)			(31)–(41)		
1/4 (.250)	4–5	5–6	7–10	7–10	10–13	6–8	17–19	FOOT POUNDS
5/16 (.312)	7–9	9–12	15–20	15–20	20–26	13–15	32–38	
3/8 (.375)	13–17	16–21		27–35	36–47	22–26	65–75	
7/16 (.438)	20–26	26–34		43–56	53–76	33–39	106–124	
1/2 (.500)	27–35	39–51		65–85	89–116	48–56	162–188	
5/8 (.625)		80–104		130–170	171–265		228–383	
3/4 (.750)		129–168		215–280	313–407		592–688	
1 (1.000)		258–335		500–650	757–984		1281–1489	

Torque Foot Pounds (Inch Pounds) Zinc Plated

Torque Standard

Inch Fasteners

Fastener Identification	Type	Material	Nominal Size	Mechanical Properties		
				Proof Load (PSI)	Yield Strength Min (PSI)	Tensile Strength Min (PSI)
	SAE Grade 1 Machine Screws	Low or Medium Carbon Steel	#2 Thru #10			55,000
			1/4 Thru 1 1/2	33,000	36,000	60,000
	SAE Grade 2 Carriage Bolts	Low or Medium Carbon Steel	1/4 Thru 3/4	55,000	57,000	74,000
			Over 3/4 Thru 1 1/2	33,000	36,000	60,000
	Stainless Steel	18–8 Austenitic Stainless Steel			50,000	90,000
	SAE Grade 5	Medium Carbon Steel Quenched Tempered	1/4 Thru 1	85,000	92,000	120,000
			Over 1 to 1 1/2	74,000	81,000	105,000
	Socket Screws	High Carbon Alloy Steel Quenched Tempered		136,000		160,000
	SAE Grade 8	Medium Carbon Al-loy Quenched Tempered	1/4 Thru 1 1/2	120,000	130,000	150,000

Torque Standard

METRIC Fasteners

Thread Size	4.8/5.6	8.8 Stainless Steel	10.9	12.9	Set Screws	
M3	43–56 Ncm	99–128 Ncm	139–180 Ncm	166–215 Ncm	61–79 Ncm	NEWTON CENTIMETERS
M4	99–128 Ncm	223–290 Ncm	316–410 Ncm	381–495 Ncm	219–285 Ncm	
M5	193–250 Ncm	443–575 Ncm	624–810 Ncm	747–970 Ncm	427–554 Ncm	
M6	3.3–4.3 Nm	7.6–9.9 Nm	10.8–14 Nm	12.7–16.5 Nm	7.5–9.8 Nm	
M8	8.1–10.5 Nm	18.5–24 Nm	26.2–34 Nm	31–40 Nm	18.3–23.7 Nm	NEWTONMETERS
M10	16–21 Nm	37–48 Nm	52–67 Nm	63–81 Nm		
M12	28–36 Nm	64–83 Nm	90–117 Nm	108–140 Nm		
M14	45–58 Nm	102–132 Nm	142–185 Nm	169–220 Nm		
M16	68–88 Nm	154–200 Nm	219–285 Nm	262–340 Nm		
M20	132–171 Nm	300–390 Nm	424–550 Nm	508–660 Nm		
M22	177–230 Nm	409–530 Nm	574–745 Nm	686–890 Nm		
M24	227–295 Nm	520–675 Nm	732–950 Nm	879–1140 Nm		

Zinc Plated

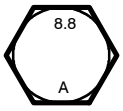
Conversion Tables

Ncm to Inch Pound x 0.08851
Nm to Foot Pound x 0.7376

Inch Pound to Ncm x 11.2982
Foot Pound to Nm x 1.3558

Torque Standard

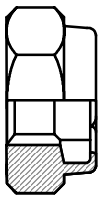
METRIC Fasteners

Fastener Identification	Type Class	Material	Nominal Size	Mechanical Properties		
				Yield Stress (Min) MPa	Yield Point .2% Elongati (Min) MPa	Tensile Strength (Min) MPa
	3.6/4.6 Carriage Bolts	Low or Medium Carbon Steel		190 (27,550 PSI) 240 (34,800 PSI)		330 (47,850 PSI) 400 (58,000 PSI)
	4.8 Pan Head Machine Screws	Low or Medium Carbon Steel		340 (49,300 PSI)		420 (60,900 PSI)
	A2–70 Stainless Steel	Austenitic Stainless Steel		450 (65,300 PSI)		700 (101,000 PSI)
	8.8 Hex Head (Grade 5)	Medium Carbon Steel Quenched Tempered	≤ M16		640 (92,800 PSI)	800 (116,000 PSI)
			> M16		660 (95,700 PSI)	830 (120,350 PSI)
	10.9 Hex Head Flat Head (Grade 8)	Medium Carbon Steel Quenched Tempered			940 (136,300 PSI)	1040 (150,800 PSI)
	12.9 Socket Head	Alloy Steel			1100 (159,500 PSI)	1220 (176,900 PSI)

Conversion Table

Mega Pascals to Pounds per Square Inch x 145.138

Torque Standard

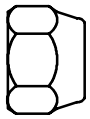


Nylon Insert Lock Nuts
Nut-Hex Light THIN
(Cad or Zinc Plated)

Size	Grade 2 Bolt	Grade 5 Bolt
1/4–20	5–8	7–8
1/4–28	4–6	5–6
5/16–18	8–14	13–14
5/16–24	9–14	13–14
3/8–16	12–18	15–18
3/8–24	12–18	16–18
1/2–13	26–40	37–40
1/2–20	27–42	41–42
5/8–11	58–89	73–89
5/8–18	60–92	82–92

Torque in Foot Pounds

Torque Standard



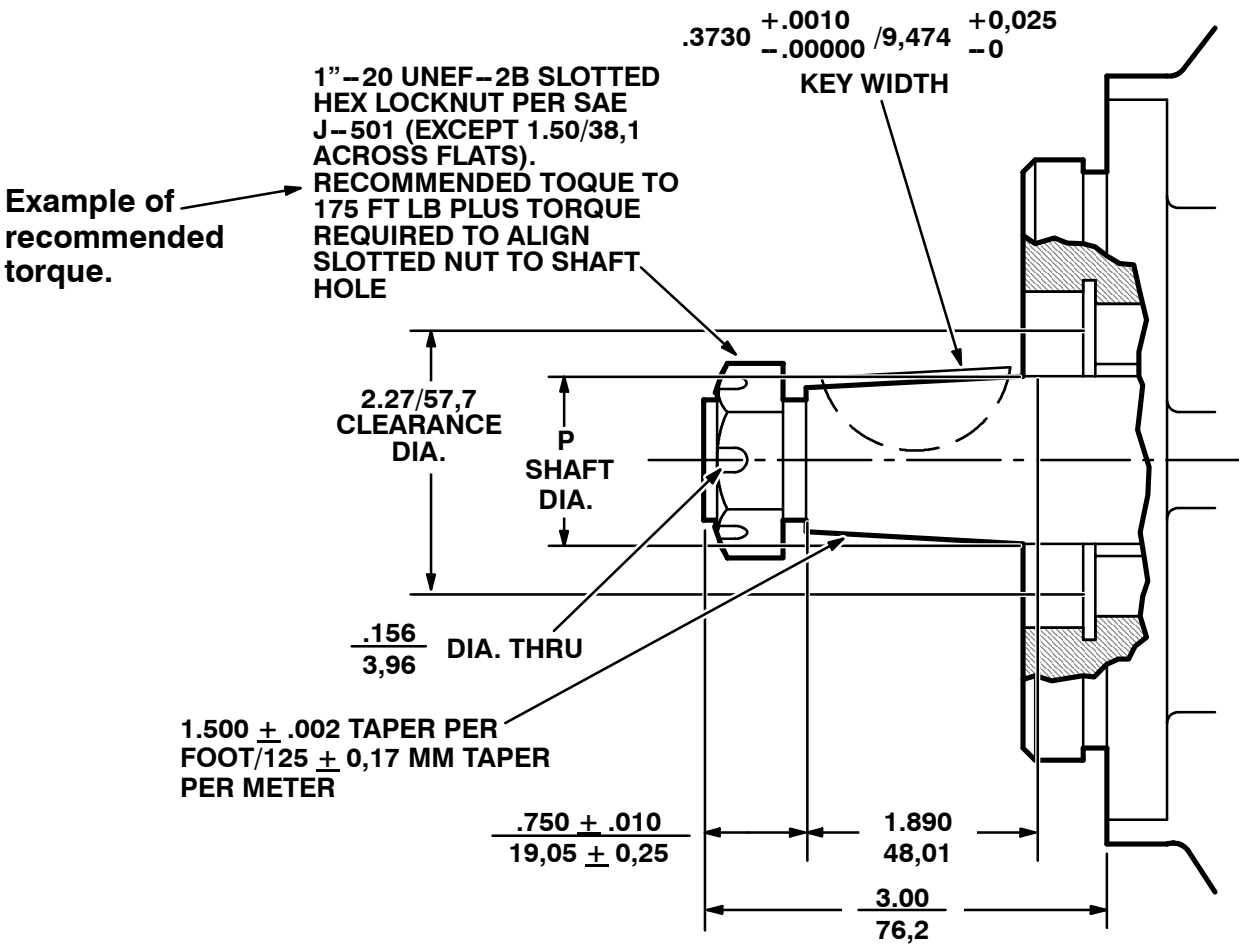
Wheel Bolt and Nuts

Stud or Bolt Size and Thread	Recommended Torque in Foot Pounds
7/16–20	75–85
1/2–20	75–85
9/16–18	80–90
5/8–18	140–170

Wheel Bearing Adjustment

1. Tighten the spindle nut to 12 ft lbs while turning the wheel assembly forward by hand to fully seat the bearings.
2. Back off the nut to the “just loose” position.
3. Hand tighten the spindle nut. Loosen the spindle nut until either hole in the spindle lines up with a slot in the nut. (Not more than 1/2 flat.)
4. Install the cotter pin. Bend the ends of the cotter pin against the nut, cut off extra length to ensure ends will not interfere with the dust cap.

Tightening Nuts on Tapered Shafts

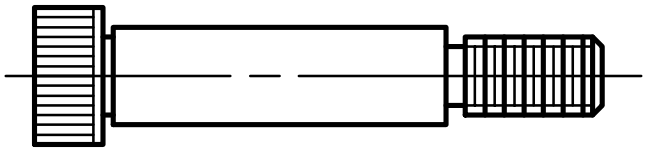


Check with the manufacturer to see what the recommended maximum torque is. Tighten the slotted nut to a lower torque, and then tighten the nut to align the cotter pin hole with the slot on the nut. Do not exceed the recommended torque. Do not back off the nut to align the holes.

Motor	Tapered Shaft	Nut Info.	Torque Specification Recommendations
A&H Series	1.00 dia.	.75−16 UNF 1.107 Hex	150 ft lb dry 125 ft lb lubricated Plus torque to align for pin
2000 Series	1.25 dia.	1−20 UNEF 1.44 Hex	225 ft lb dry 225 ft lb lubricated PLUS torque to align for pin
4000 Series	1.625 dia.	1.25−18 UNEF 2.187 Hex	475 ft lb dry 375 ft lb lubricated PLUS torque to align for pin
6000 Series	1.75 dia.	1.25−18 UNEF 2.187 Hex	475 ft lb dry 375 ft lb lubricated PLUS torque to align for pin

Torque Standard

Shoulder Bolts



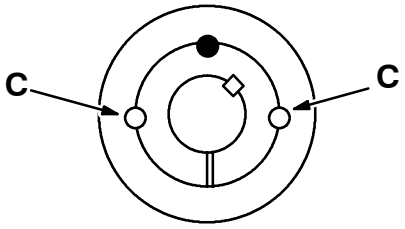
Nominal Diameter	Thread Size	Recommended Seating Torque
.250	10–24	45 In Lbs
.312	1/4–20	9 Ft Lbs
.375	5/16–18	19 Ft lbs
.500	3/8–16	32 Ft Lbs
.625	1/2–13	82 Ft Lbs
.750	5/8–11	164 Ft Lbs

Metric

Nominal Diameter	Thread Size	Recommended Seating Torque
6	M5x0.8	7 Nm
8	M6x1.0	12 Nm
10	M8x1.25	29 Nm
12	M10x1.5	57 Nm
16	M12x1.75	100 Nm

Taper Lock® Bushings

IMPORTANT: Follow all these instructions carefully. This is necessary to insure satisfactory performance.



1008 to 3030

To Install

1. Clean shaft, bore and outside of bushing, and hub bore of all oil, lacquer, and dirt.
2. Insert bushing in hub. Match the hole pattern, not threaded holes (each hole will be threaded on one side only).
3. Oil setscrews and thread into those half threaded holes indicated by C on above diagram.
4. Alternately torque setscrews to recommended torque setting in chart below.
5. Using a block, sleeve, or drift, hammer large end of bushing (do not hammer bushing directly).
6. Repeat steps 4 and 5 until torque wrench reading after hammering is the same as before hammering.
7. Fill all unoccupied holes with grease.

To Remove

1. Remove all setscrews.
2. Insert setscrews in holes indicated by ● on the diagram. Loosen bushing by alternately tightening setscrews.
3. To reinstall, complete all seven (7) steps installation steps.

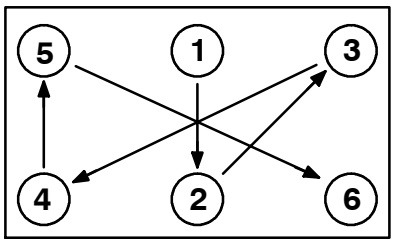
Recommended Wrench Torque

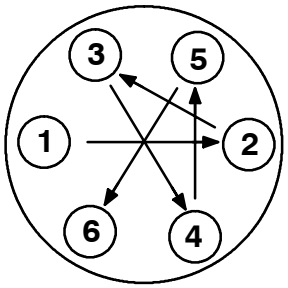
Bushing No.	Screws	Wrench Torque (Pound-Inch)	Hammer Size
1008, 1108 1210, 1215, 1310 1610, 1615	1/4” Setscrews 3/8” Setscrews 3/8” Setscrews	55 175 175	6 lb 6 lb 6 lb
2012 2517, 2525 3020, 3030	7/16” Setscrews 1/2” Setscrews 5/8” Setscrews	280 430 800	6 lb 6 lb 6 lb

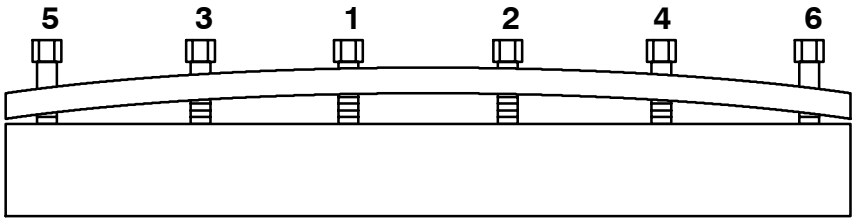
If two bushings are used on same component and shaft, fully tighten one bushing before working on the other.

Sequence Tightening

On some assemblies, it is advisable to use a crisscross pattern. Always avoid starting in one spot and tightening one after another in a row. Remember that the object is to tighten the parts in such a manner that even stress is set up throughout, at the same time allowing the parts to be drawn together so that their mating surfaces will contact.







Torque in Steps

1. Run each fastener, in proper sequence, up to the recommended torque.
2. Repeat the process of running up each fastener, in proper sequence, up to the recommended torque.
3. If necessary, repeat step two until all the fasteners are tightened to the recommended torque.

GREASE JOCKEY®

Centralized On-Board Chassis Lubrication System

Installation & Maintenance Instructions

Table of Content

GREASE JOCKEY®

SYSTEM DESCRIPTION

The Grease Jockey ® system is controlled by a timer, which activates either an air solenoid valve or an electric motor to drive a pump. The pump supplies grease into the main supply line for delivery to localized distribution modules.

These modules are made up of manifolds with metering valves and distribution lines for each lube point in that localized area. The meters are designed to dispense a precise amount of grease at each lube cycle. Meter size is chosen by a ratio of the smallest to largest lube point requirements in the system.

The pump must pressurize the system, then vent it to allow the metering valves to reset for the next cycle. The use of a fluid grease to achieve proper flow characteristics is required.

SYSTEM COMPONENTS

TIMER

The timer on an air operated pump system is a compact solid state device housed in a high impact resistant plastic enclosure. It has seven lube cycle interval settings from 1/2 to 6 hours, plus a test position and a manual run button.

The timer operates the system only while the vehicle's ignition is turned on. A memory function keeps track of elapsed-cycle-time even if the ignition switch is turned off. When the predetermined cycle time has elapsed, the timer signals the pump to initiate a lubrication cycle. If the vehicle's ignition is turned off before the interval is complete, the timer's memory "holds" the time count until the vehicle is restarted.

When the cycle-time dial is switched from one range to another, the manual run button should be pressed to initiate the new cycle time setting (otherwise, the new time is added to any time that remains from the previous lube cycle).

When rapid repetitive cycles are needed, set the cycle-time dial to the "test" position and press the manual run button. In this mode the timer signals the pump to cycle approximately once every minute. (45 seconds on and 15 seconds off). This rapid cycling continues as long as the timer remains in the "test" position. Always reset the timer dial to it's proper setting.

SOLENOID

The air valve used with the air operated pump threads into the port on the bottom of the pump. It is a 3-way, normally closed, free venting valve available with either a 12 or 24 VDC 9 watt continuous duty rated coil. The coil is molded and potted with a 6" lead of 16 AWG wire and a weather tight (male) connector. The air valve has a 1/8" NPT inlet port and a 1/4" NPT male thread outlet port. The maximum operating pressure is 150 psi. A 22' wire harness with a weather tight (female) connector to mate with the solenoid is available (included with kits).

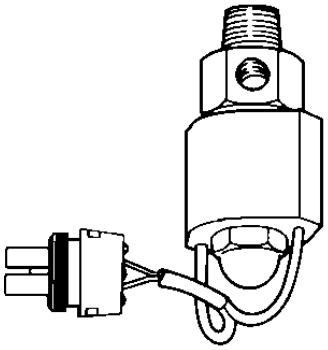
Recommended Timer Setting:

Fig. 2

Timer Setting	Driving Conditions
1/2 or 1 hr.	Off Highway
1.5 or 2 hr.	Start + stop city, heavy salt, snow and ice, rough pavement, wet climate, heavy loads, dusty roads.
3 hr.	Normal city or highway driving, normal climate, moderate loads.

These are recommended settings only. Experience with individual applications will determine timer setting.

Fig. 3

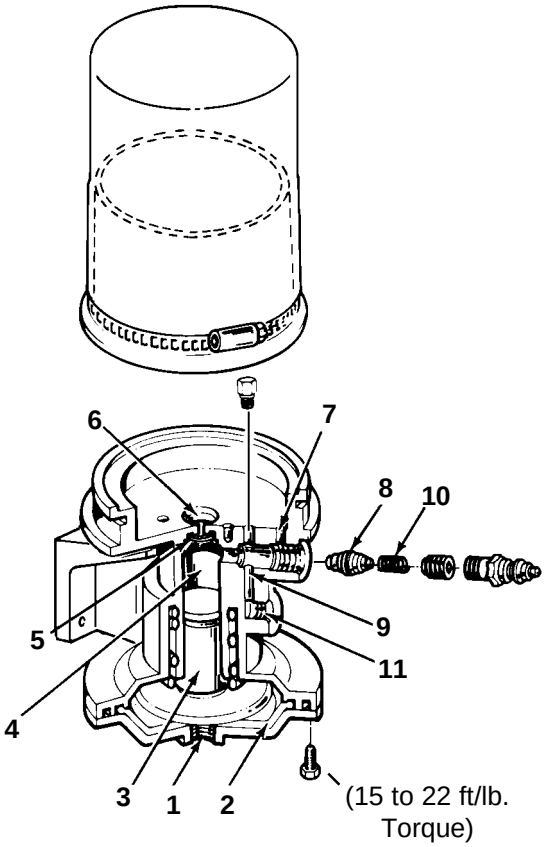


AIR OPERATED PUMP

The air pump (Ref. Fig. 4) operates when the 3-way air solenoid valve is actuated by the timer and air pressure is applied to the air chamber port (1) and diaphragm (2). This forces the spring-loaded pump piston (3) upward compressing the grease in chamber (4). This pressure seats the flapper valve (5) against the reservoir opening (6) and grease flows toward port (9).

Simultaneously, pressure is applied behind the spring-loaded check valve poppet (8) through port (9) sealing off passage way (7). Grease flows into the main lines through outlet (11).

After completion of an on-time cycle, the 3-way air valve exhausts the air in the pump. The pump piston spring forces the pump piston (3) down allowing the flapper valve (5) to unseat from the reservoir opening (6). Grease from the reservoir is drawn into chamber (4) just vacated by the pump piston (3). System pressure is relieved through port (9) to port (7) back to the reservoir as check valve (8) is returned by spring (10).



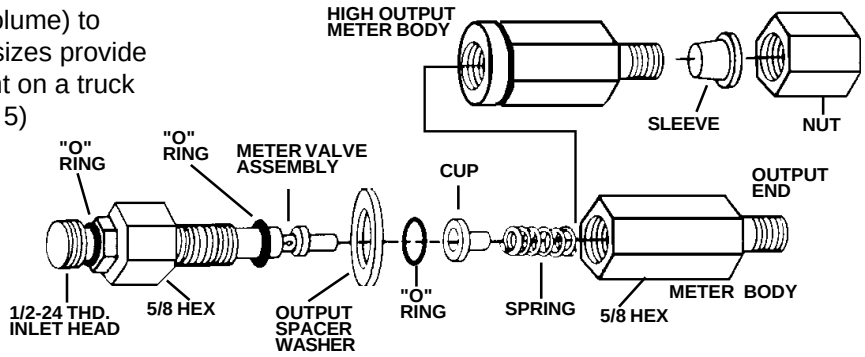
MODULES

A module is an assembly that distributes the grease from the main line to a group of lube points. It is made up of a manifold, mounting stem, meters (metering valves), 3/16" OD tubing, and fittings. One manifold can hold as many as 12 meters. Plugs are available to close off any manifold port that is not required. The manifold mounts with the ported stud through a 5/8" hole. Main lines may be connected at either end of the manifold or at the end of the mounting stud.

METERS

Meters are positive displacement, spring-reloaded, dispensing devices designed for use in Grease Jockey systems operating at 900 to 1200 psi. These meters are available in 9 sizes (based on output volume) to meet various lube requirements. These 9 sizes provide adequate choices to supply every lube point on a truck chassis, including the fifth wheel. (See Fig. 5)

Fig. 5



Meters can be identified by the following characteristics:

Meter Size	No. of Washers in Meter Body	Grove on Hex	Output (Cu.in.)
0	0	no	.001
1	1	no	.003
2	2	no	.006
3	3	no	.009
4	4	no	.012
5	1		.015
6	2	For special applications only	.018
7	3		.021
8	4	yes	.024

TUBING

Only Grease Jockey heavy wall nylon tubing should be used in the system. Use 3/16" OD lines for lube point distribution and 5/16" OD for main lines with brass fittings. (Tube inserts are required on ALL 5/16" line connections). Other adapters, fittings, connectors, and mounting hardware are available form Lubriquip. **DO NOT substitute air brake tubing for lube lines, the pressure rating is NOT adequate for lubrication system use.**

GREASE

A fluid lithium grease of NLGI grade "0" or "00" with an "EP" additive is standard for this type system. Lubriquip 550-400-020 is available from your Grease Jockey distributor.

INSTALLATION KITS

There are standard "automatic" Grease Jockey kits for single axle tractors and for tandem axle tractors. Also available are custom kits for other applications and trailer systems. See page 18 for kits part numbers.

ELECTRIC SYSTEMS

ELECTRIC MOTOR DRIVEN PUMP

The motor (1) is energized. The gear pump (2) begins to turn, causing grease to flow into chamber (3). As pressure builds, the shuttle valve assembly (4) moves outward, sealing the fill tube opening (5). As pressure continues to build, the spring-loaded ball check (6) inside the shuttle valve moves outward. The grease flows through the shuttle valve and out passage (7) into the main line through outlet (8).

After completion of the on-time cycle, the motor shuts off. The gear pump stops turning and pressure inside the shuttle valve is released. The shuttle valve is forced back inward by the spring (9). System pressure is vented through the fill tube and port (10) back to reservoir.

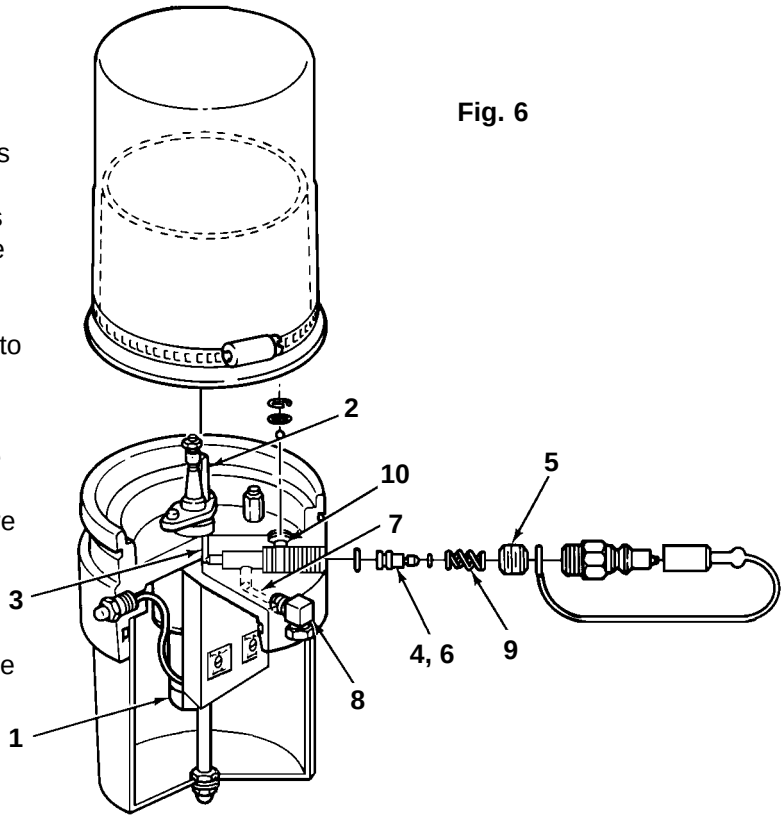
The timer is mounted under the pump motor cover. It is a potted "ice cube" style device with settings for lube cycle intervals from 6 to 480 minutes and settings for cycle on-time intervals of 10 to 1,000 seconds. A manual run button is located on the outside of the pump housing.

The lube cycle clock (settings in minutes) runs continuously regardless of the status of the vehicle. Only when the vehicle switch is in the "ON" position will a lubrication cycle be initiated.

The cycle on-time determines the motor run time (settings in seconds). Typically this setting is short in length (approx. 40 sec.). Longer run times would only be needed for systems with large numbers of lube points and long lengths of main line.

There is a pressure relief built inside the pump to guard against dead head flow situations.

Fig. 6



ELECTRIC PUMP WIRING

The timer for an electric pump is an integral part of the pump assembly. (Ref. Fig. 7)

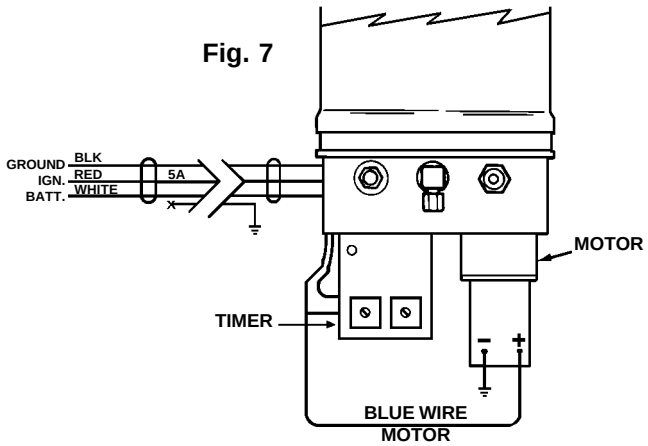
a) Connect the RED lead to the positive side of the vehicle ignition switch. Install a fuse at this connection. 10 Amp for a 12 VDC system
5 Amp for a 24 VDC system

b) Connect the WHITE lead to the battery positive terminal circuit. Install a 5 Amp fuse at this connection.

c) Connect the BLACK lead to an environmentally protected battery negative terminal.

d) The GREEN lead is not used and may be clipped or grounded.

Fig. 7

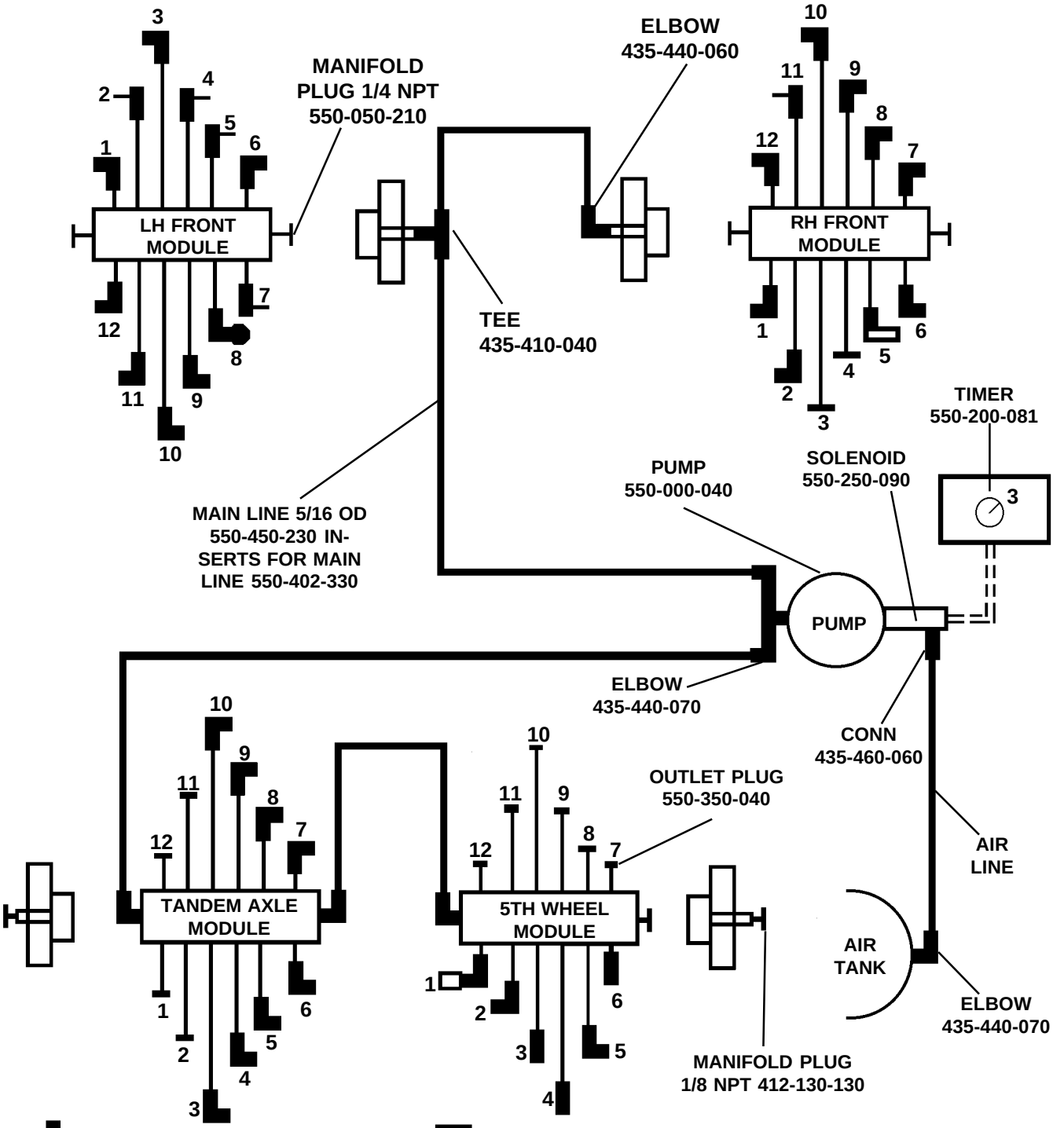


LUBRIQUIP, INC. CLEVELAND OH

TYPICAL LUBRICATION LAYOUT FOR A TANDEM AXLE TRACTOR & 5TH WHEEL

CUSTOMER: _____ VEH#: _____ DATE: _____

KIT#: _____ END USER: _____



CUSTOMER NAME: _____ **LOCATION:** _____

VEHICLE# : _____ **TYPE:** **TYPICAL LUBRICATION LAYOUT FOR A TANDEM AXLE TRACTOR & 5TH WHEEL** **MILEAGE:** _____

KIT#: _____ **DATE:** _____

POINT#	DESCRIPTION	INJ#	COLOR	BUNDLE#	FITTING
LEFT HAND FRONT MODULE:					
1	KING PIN UPPER	3	ORANGE	UNMARKED	1/8 ELBOW
2	TIE ROD	2	BLACK	UNMARKED	1/4 ELBOW
3	KING PIN LOWER	3	BLUE	UNMARKED	1/8 ELBOW
4	DRAG LINK	2	ORANGE	UNMARKED	1/4 ELBOW
5	DRAG LINK	2	BLACK	UNMARKED	1/4 ELBOW
6	SPRING PIN	3	ORANGE	UNMARKED	1/8 ELBOW
7	CLUTCH LINKAGE	0	BLACK	UNMARKED	1/4 ELBOW
8	STEERING BOX	0	BLACK	UNMARKED	SNAP ON ELBOW
9	SLACK ADJUSTER	1	ORANGE	2	1/8 ELBOW
10	"S" CAM	0	BLACK	2	1/8 ELBOW
11	SPRING SHACKLE	3	BLACK	1	1/8 ELBOW
12	SPRING SHACKLE	3	ORANGE	1	1/8 ELBOW
RIGHT HAND FRONT MODULE:					
1	SPRING SHACKLE	3	ORANGE	1	1/8 ELBOW
2	SPRING SHACKLE	3	BLACK	1	1/8 ELBOW
3	PLUG				
4	PLUG				
5	CLUTH C/SHAFT LH	0	BLACK	UNMARKED	1/8 ST ELBOW + 1/8 CONN
6	CLUTH C/SHAFT RH	0	ORANGE	UNMARKED	1/8 ELBOW
7	SPRING PIN	3	BLACK	UNMARKED	1/8 ELBOW
8	SLACK ADJUSTER	1	ORANGE	2	1/8 ELBOW
9	"S" CAM	0	BLACK	2	1/8 ELBOW
10	KING PIN LOWER	3	BLUE	UNMARKED	1/8 ELBOW
11	TIE ROD	2	BLACK	UNMARKED	1/4 ELBOW
12	KING PIN UPPER	3	ORANGE	UNMARKED	1/8 ELBOW
TANDEM AXLE MODULE:					
1	PLUG				
2	PLUG				
3	"S" CAM	0	BLACK	UNMARKED	1/8 ELBOW
4	SLACK ADJUSTER	1	ORANGE	UNMARKED	1/8 ELBOW OR 1/4 ELBOW
5	"S" CAM	0	BLACK	UNMARKED	1/8 ELBOW
6	SLACK ADJUSTER	1	ORANGE	UNMARKED	1/8 ELBOW OR 1/4 ELBOW
7	SLACK ADJUSTER	1	ORANGE	UNMARKED	1/8 ELBOW OR 1/4 ELBOW
8	"S" CAM	0	BLACK	UNMARKED	1/8 ELBOW
9	SLACK ADJUSTER	1	ORANGE	UNMARKED	1/8 ELBOW OR 1/4 ELBOW
10	"S" CAM	0	BLACK	UNMARKED	1/8 ELBOW
11	PLUG				
12	PLUG				
5TH WHEEL MODULE:					
1	FACE PLATE	8	ORANGE	UNMARKED	1/8 ELBOW + EXTENSION
2	FIFTH WHEELL PIVOT	1	BLACK	UNMARKED	1/8 ELBOW
3	FACE PLATE	8	BLUE	UNMARKED	1/8 CONN
4	FACE PLATE	8	BLUE	UNMARKED	1/8 CONN
5	FIFTH WHEEL PIVOT	1	BLACK	UNMARKED	1/8 ELBOW
6	FACE PLATE	8	ORANGE	UNMARKED	1/8 CONN
7	THROUGH POINT #12 ARE PLUGGED				

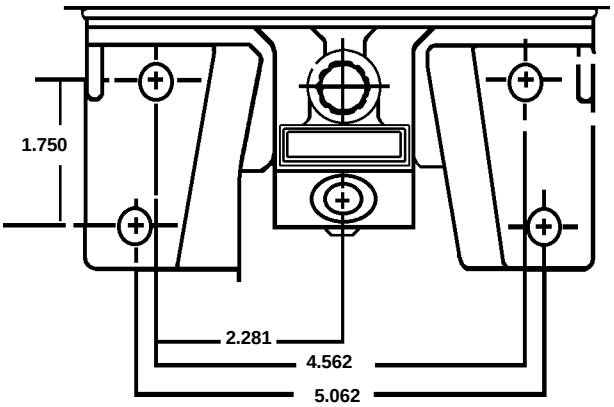
LUBE POINT FITTING; DESCRIPTION AND PART NUMBER:

1/8 ST ELBOW = 509-110-000
1/8 ELBOW = 435-440-030
1/8 CONN = 435-460-030
EXTENSION = 509-027-000
1/4 SAE ELBOW = 550-400-800 + 435-460-030
SNAP ON ELBOW = 550-402-380

INSTALLATION STEPS

All lube points should be properly filled with grease before removal of zerk fittings to change to tube connector fittings.

Fig. 8



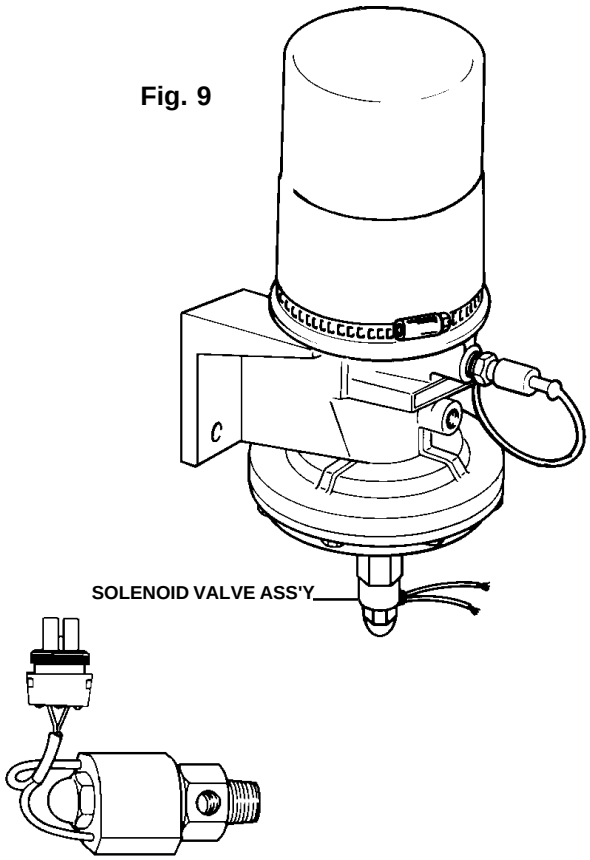
Step 1- PUMP

Pump mounting is the same for either an air or electric pump. Select a location that is visible, accessible for filling the reservoir, and protected. The mounting holes and dimensions are the same on both styles of pump. (See Fig. 8) A bracket is available to assist in mounting the pump. The pump inlet is gravity fed; therefore the pump must set vertically.

Use all four bolts in mounting.

Note: When using an electric pump omit step 2. For step 3 refer to page 9.

Fig. 9



Step 2 - SOLENOID

On air driven pumps the solenoid valve threads into the air chamber at the bottom of the pump. (See Fig. 9) Be sure you have the correct voltage (12 or 24 VDC) to match your vehicles electrical system. Use a thread sealant on all air supply fittings. The air supply line should run from the aux. air tank only. Connect the air supply line to the "in" port of the solenoid valve.

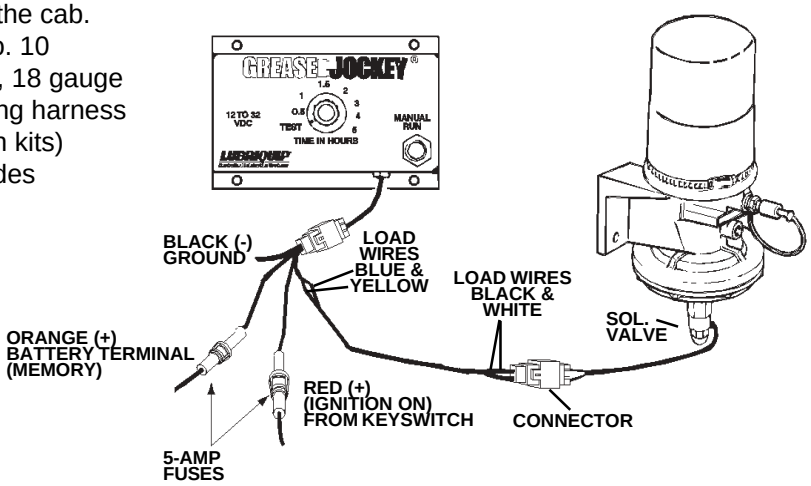
A 22' harness wire to supply the signal from the timer is available (included in standard kits). This harness comes with a weather tight connector to mate with the solenoid connector. (see Step 3).

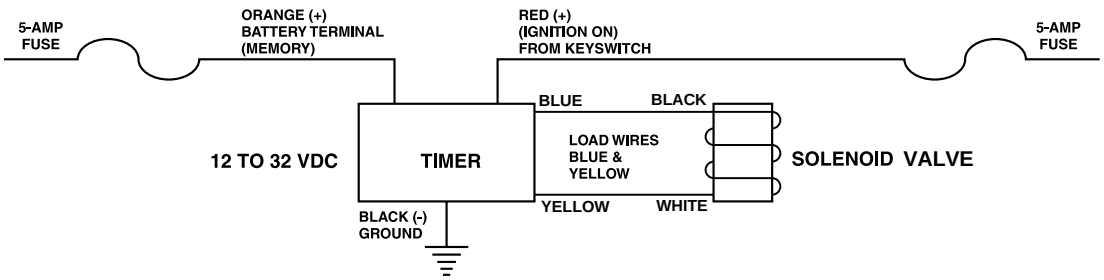
IMPORTANT - ALL connections between the timer and solenoid (blue and yellow leads) MUST be moisture-proof and safe from grounding.

Step 3 - TIMER

The timer for an air operated system should be mounted in a protected but readily accessible location inside the cab. The timer housing has four 7/32" dia. holes for No. 10 mounting screws. The timer leads are a 5-strand, 18 gauge 8" wire harness with a Packard connector. A wiring harness with a mating connector is available (supplied with kits) which simplifies installation of the timer and provides excellent connection integrity. (See part list).

NEGATIVE GROUND SYSTEM





NOTE: Timer must be installed horizontally as shown in picture with cable leads pointing down.

After mounting the timer;

a) Connect the BLUE and YELLOW leads to the wires from the pump mounted solenoid. (See Fig. 10).

IMPORTANT - CAUTION, DO NOT ground the blue and yellow wires to the solenoid. This could cause damage to the timer.

b) Connect the RED lead to the positive side of the vehicle ignition switch. Install a 5 amp fuse at this connection.

c) Connect the ORANGE lead to the battery positive terminal circuit. Install a 5 amp fuse at this connection.

d) Connect the BLACK lead to the chassis ground.

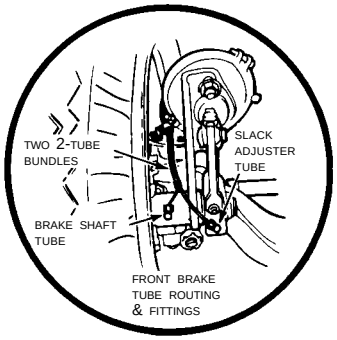
Step 4 - MODULES

Modules

The modules are mounted with a ported stud through a 5/8" hole. Mount all modules on the frame rail or a cross member close to the points they will be lubricating. Grease Jockey kits come with module assemblies for each strategic area of the chassis to be lubricated. Refer to the typical system layout on page (6).

Fig. 11

The unused ports in the manifolds should have plugs in them. If additional lube points are needed these plugs can be replaced with appropriate sized meters and lines.



Step 4a - Left Front Module

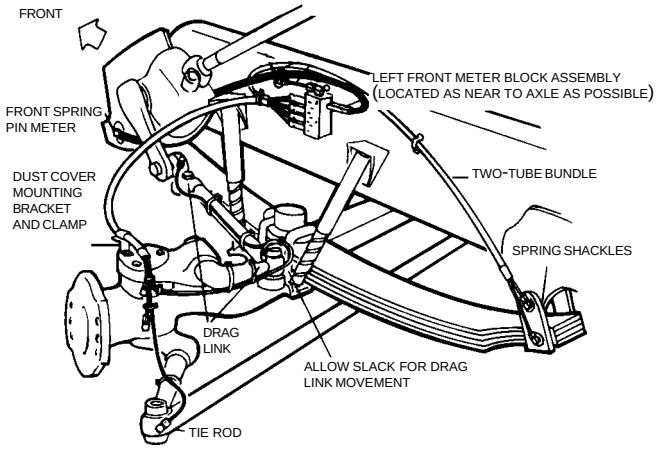
This assembly contains the meters, hardware, and tubing for 2 king pin, 1 spring pin, 2 spring shackle pins, 1 tie rod, 2 drag link, 1 S-cam, and 1 slack adjuster lube points. Optional points from this module typically are linkage and steering box points. (Ref. Fig. 12)

Step 4b - Right Front Module

This assembly contains the meters, hardware, and tubing for 2 king pin, 1 spring pin, 2 spring shackles, 1 tie rod, 2 clutch cross shaft, 1 S-cam, and 1 slack adjuster lube points. Optional points from this module typically may be body pivot pins. (Ref. Fig. 13).

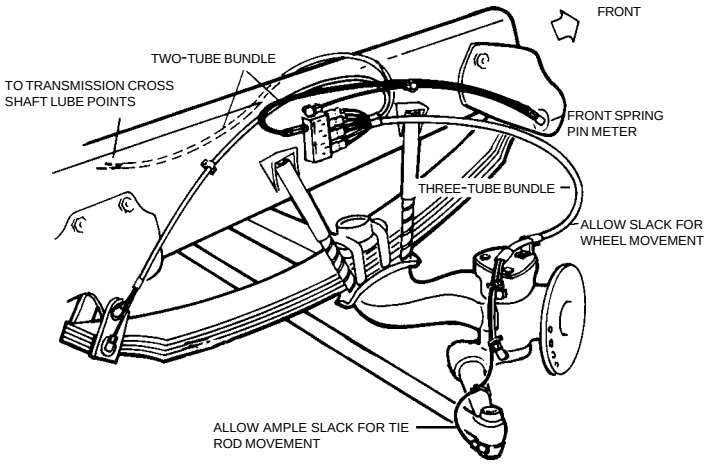
LEFT FRONT -

Fig. 12



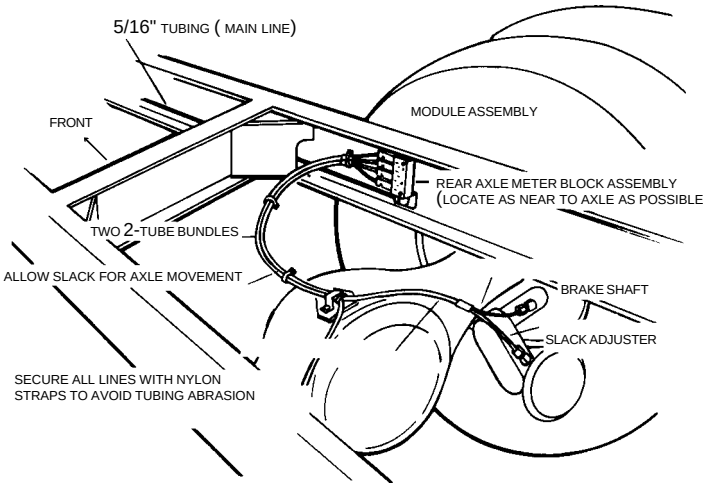
RIGHT FRONT -

Fig. 13



REAR AXLE(S) -

Fig. 14



Step 4c - Rear Axle(s)

This assembly contains the meters, hardware, and tubing for (2 or 4) S-cam and (2 or 4) slack adjuster lube points. The number of points is determined by the application (single or tandem axle). Optional points for this module may be spring pin points or trailer system meters. (Ref. Fig. 14).

Step 4d - Fifth Wheel

This assembly contains the meters, hardware, and tubing for 4 face plate and 2 pivot pin lube points (Ref. Fig. 15).

NOTE: Most 5th wheel plates do not have grease fittings in the plate. This requires four holes to be drilled and tapped (1/8" NPT) through the plate. These meters should be #8.

Step 5 - TUBING

When installing the tubing, AVOID routing any tubing close to a heat source such as an exhaust manifold, muffler, turbocharger, etc.

Route tubes where they can be tied down securely with plastic tie straps or tube clamps and yet flex or move with moving parts.

Always use approved 3/16" and 5/16" OD Lubriquip tubing. Non-approved nylon or air brake tubing should NOT be used. (Ref. page 4).

The 3/16" tubing comes in three configurations. Single tubes are black or orange, 2 tube bundles have a black and an orange tube inside a sheath. A 3 tube bundle has a black, blue and orange tube inside a sheath. The orange tube is connected to the highest output meter. The blue tube is connected to a lesser or equal output meter. The black tube is connected to the lowest or equal output meter of the bundle group.

For example, on the front chassis module, either left or right, a 3 tube bundle is connected to two #3 meters and a #2 meter (orange and blue tubes go to the upper and lower king pin lube points and the black tube goes to the tie rod end lube point).

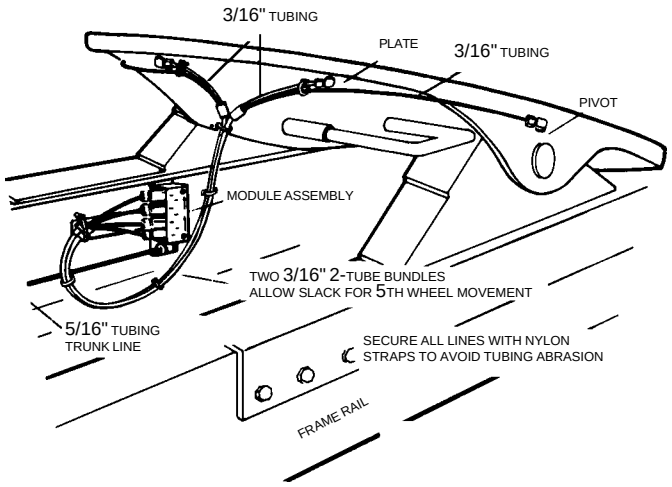
TUBING PREPARATION;

1) Measure approximate lengths of tube bundles, leaving extra length for trimming at the lube points.

2) Cut the outside sheath on tube bundles back to the point where this bundle meets it's first lube point. Be careful not to puncture or cut the tubes inside. Use a stripper to help prevent damage to the tubes.

FIFTH WHEEL -

Fig. 15



3) Peel back the outside sheath and cut off the excess. Be careful not to sever the remaining sheath or tubes.

4) Align tubing with fitting and make cuts square and clean with an anvil type cutter. NOTE: Allow ample slack for tube movement and ease of installation.

TUBING

A self aligned ferrule is supplied with all 3/16" and 5/16" fittings. It is not necessary to remove the nut and ferrule to seat the tube into the fitting. Care should be taken to make sure the tube is well seated into each fitting. Brass inserts are supplied with kits for use with the 5/16" tubing. These inserts MUST be used at every 5/16" connection.

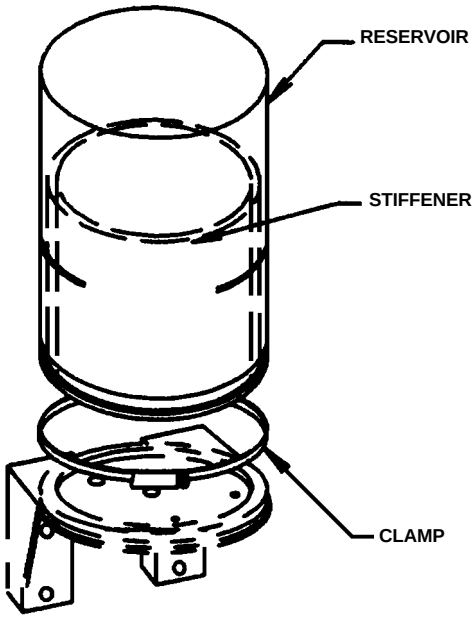
The 5/16" tube is the main line tubing routed from the pump to the manifolds. It may also be used as the air supply line to the solenoid. It should be routed inside the frame and secured well for protection.

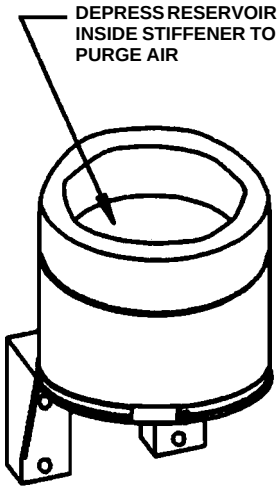
Step 6 - System Fill + Start Up

Use lubricant part number 550-400-020 from Lubriquip, or a quality NLGI "0" or "00" lithium base with an "EP" additive grease.

When using a flexible style reservoir be sure the top of the bag is depressed inside the stiffener as far as possible to purge the air from the reservoir.

Fill the reservoir through the fill stud until it takes the original shape (top of reservoir slightly domed). **DO NOT OVER FILL**.





Step 7 - Purging air from the main line:

Note: Check the vehicle air supply. At least 100 PSI gauge pressure is required.

All the air must be removed from the main lines and manifolds. Follow the next 5 steps carefully.

1) All of the 1/4" NPT end port and 1/8" NPT stud plugs on the module manifolds should be removed.

2) With the vehicle ignition switch turned ON. Set timer at the test position and press the manual run button.

3) As the pump cycles , check the open module ports for flow of grease with no air.

4) When the flow of grease from a port is free of air close the port and continue this process until all ports have been checked. Check the open port closest to the pump first proceeding to the port furthermost from the pump last. This will push out the air in the main line(s).

Note: The 3/16" distribution lines are pre-filled. They should not require purging of air.

5) Let the system run in the test position for a few minutes. Check all line connections to be sure they are holding pressure. Check at lube points to be sure lubricant is moving to this point in the system.

At this point the system should be running correctly and you should reset the timer to the desired setting for your application.

Timer settings are dependent upon your application. As a starting point refer to Fig. 2.

If any part of the system has not functioned as it should please refer to the troubleshooting section of this bulletin.

This would be a good time to complete the GREASE JOCKEY in service PM procedure and warranty card. (See page 13).

Note: The Grease Jockey PM procedure shown on page 15 is a simplified procedure for regular preventative maintenance intervals.

GREASE JOCKEY IN SERVICE PM PROCEDURE & WARRANTY REGISTRATION

PLEASE PRINT

Name: _____ In Service Date: _____

Company: _____ Tel #: _____

Address: _____ State: _____ Zip: _____

Vehicle #: _____ Vehicle Make: _____ Mileage: _____

REFER TO GREASE JOCKEY SCHEMATIC FOR LUBE POINT LOCATION

1. Fill the Grease Jockey reservoir with grease (use fluid grease NLGI 00 Lithium EP). Connect grease filler pump quick disconnect to the mating quick disconnect at the base of the Grease Jockey lube system pump. CAUTION: Do not over fill the reservoir. Full reservoir: YES _____ NO _____

2. **RECORD THE SETTING OF THE GREASE JOCKEY TIMER (it should not be on TEST)**
   Air operated system (timer usually mounted in Cab); 0.5 ___ 1 ___ 1.5 ___ 2 ___ 3 ___ 4 ___ 6 ___ hours.
   Electric operated system; 8 ___ 15 ___ 30 ___ 60 ___ 90 ___ 120 ___ 180 ___ 240 ___ 360 ___ Minutes

3. Set the Grease Jockey timer to the TEST position (at the test position a Grease Jockey air operated system will cycle approx. every minute, 45 seconds on 15 seconds off; an electrically operated system will cycle approx. every 2 minutes, 45 seconds on 75 seconds off).

4. Turn the ignition switch to the on position (engine not running). The Grease Jockey system will begin to cycle in the TEST mode (**for air operated systems the vehicle air pressure must be at least 100 psi**).

5A. AIR OPERATED PUMP & SOLENOID VALVE (**Air operated system**):
Check the operation of the pump and solenoid (Listen for the solenoid to click on. Approx. 45 seconds later air will exhaust from the bottom of the solenoid as the pump piston moves back);
Pump Working: YES _____ NO _____ Solenoid Working: YES _____ NO _____

5B. ELECTRICALLY OPERATED PUMP (Electrically operated system):
Check the operation of the pump (listen to the pump motor running during the 45 second on time).
Pump Working; YES _____ NO _____

6. Check main lines and secondary lines for damage (Look for; accumulation of grease where there should be none; broken lines; lines not connected to, or leaking around, the fitting);

   Condition of main lines (5/16" OD) Okay: _____ Line problem: _____
   Condition of distribution lines (3/16" OD) Okay: _____ Line problem: _____

7. Check chassis lube points for signs of FRESH grease;
   Signs of fresh grease at lube points; YES: _____ NO: _____

8. **IMPORTANT: RESET THE GREASE JOCKEY TIMER TO THE SETTING RECORDED AT STEP 2.**
   CAUTION; The timer should never be left at the TEST position
   Timer Reset to: _____ **Hours/Minutes** _____

9. Detail any problems: (refer to the troubleshooting sheet for corrective action or call Lubriquip for technical assistance at the number shown below: _____

_____

_____

_____

_____ Inspected by: _____

Tear out this page at the perforation and
RETURN A COPY OF THIS COMPLETED FORM FOR WARRANTY REGISTRATION:

By Fax: (216) 581-8945
By Mail: Fold on lines, tape edge and mail it, postage paid.

LUBRIQUIP®

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NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO 15866 CLEVELAND OH

POSTAGE WILL BE PAID BY ADDRESSEE

LUBRIQUIP INC
A UNIT OF IDEX CORPORATION
18901 CRANWOOD PARKWAY
CLEVLAND OH 44128-4085

GREASE JOCKEY PM Procedure

PM/Inspection by: _____ Date: _____

PM Type: _____ Location: _____

Vehicle # _____ Mileage: _____

REFER TO GREASE JOCKEY LUBE SYSTEM SCHEMATIC FOR LUBE POINT LOCATION/PARTS.

1. Check chassis lube points for signs of FRESH grease;

   a) grease at lube points adequate: _____

   b) too much grease at lube points: ALL _____ One _____

   c) not enough grease at all lube points: _____

   d) no sign of fresh grease at lube points: ALL _____ Some _____ One _____

2. Check main lines and secondary lines for damage. (Look for accumulation of grease where there should be none.) Check lines for wear or chafing.

   a) Condition of main lines: Okay _____ Line Problem _____

   b) Condition of distribution lines; Okay _____ Line Problem _____

3. Check that the air pressure is at least 100 psi. If not build up the pressure (air operated pump only). Turn the ignition switch to on (the engine does not have to be running).

4a. AIR OPERATED PUMP:

Press the manual override button on the timer (located in the cab). Check operation of the pump and solenoid (Listen for the solenoid to click on. 45 seconds later air will exhaust from the bottom of the solenoid as the pump piston moves back);

Pump OK _____ Pump not working _____
Solenoid OK _____ Solenoid not working _____

4b. ELECTRICALLY OPERATED PUMP:

Press the manual override button located on the pump body. Listen to motor operating.

Pump OK _____ Pump not working _____

5. Check level of reservoir;

Full _____ Half _____ Less than half _____

6. Fill reservoir with grease. (Use fluid grease NLGI "00" Lithium EP).
Connect grease filler pump quick disconnect to the mating quick disconnect at the base of the automatic lube system pump. CAUTION do not over fill reservoir.
YES _____ NO _____

7. Detail all problems and corrective action. (Refer to troubleshooting section for corrective actions.)

_____

_____

_____

_____

_____

_____

LUBRIQUIP, INC., A UNIT of IDEX Corporation, 18901 Cranwood Pkwy., Cleveland, Ohio 44128

Telephone: 1-800-USA-LUBE

TROUBLESHOOTING THE GREASE JOCKEY

	PROBLEM	CAUSE	CORRECTIVE ACTION
(1b)	Too much grease at all lube points.	Timer cycle too frequent	Adjust the timer one click to a higher time cycle. (example from 2 to 3 hours).
	Too much grease at one lube point.	Meter leaking	Remove and replace meter
(1c)	Not enough grease at all lube points.	Timer cycle is too infrequent	Adjust the timer one click to a lower time cycle. (example from 3 to 2 hours).
(1d)	No sign of fresh grease at all points.	Lubricant reservoir empty	Fill lubicant reservoir
		Lubricant reservoir filled with heavy grease which will not work in system.	Remove and clean reservoir, refill with proper lubricant. Remove main line plugs from meter blocks, and cycle pump until old lubricant is removed from lines, replace main line plugs.
		Blown fuse, or break in wiring circuit	Check for electrical short circuit or broken wire, & Repair.
		Broken air line (air pump only)	Repair or replace line
		Inoperative solenoid air valve (Air pump only)	Check electrical circuit to make sure voltage is reaching the solenoid coil from the timer. Connect a meter from the supply "black" wire to the return "white" wire at the connector of the solenoid. Do not connect direct to grouond! Repair or replace wiring as required: Check coil resistance for approx. 20 ohms. Check valve opertion; repair or replace if necessary.
		Inoperative air pump	See 4a page 17
		Inoperative electric pump	See 4b page 17
		Inoperative timer	With the ignition switch on, check the input voltage of both the memory (orange) and the (red) switch wires; If there is not 12 VDC (or greater) repair electric supply. Set the timer to TEST. Check the output signal to the solenoid. Connect a meter from the timer supply to the return, NOT to a ground. (At the timer connector the supply is the blue wire and yellow is the return), (At the solenoid connector the supply may be a black wire and return a white wire). It should show 12 VDC during the On cycle (approx. 45 sec.) and 2 VDC or less during the off period (approx. 15 sec.) If there is no signal or a constant 12 VDC output, check lines from the timer to the solenoid for grounding or breakage; replace timer if necessary.
		Main line broken	See 2a page 17

TROUBLESHOOTING THE GREASE JOCKEY

	PROBLEM	CAUSE	CORRECTIVE ACTION
	No sign of fresh grease at some lube points.	Main line broken	See 2a below
		Air lock in main line	Purge main line of air; See page 12, Step 7.
	No sign of fresh grease at one lube point	Secondary line damaged	See 2b below
		Meter inoperative	Replace meter
		Lube point fitting has broken off	Remove broken fitting and replace
(2a)	Main lube line damaged	Trapped and broken, rubbed through	Replace or repair (re-route or protect the line to prevent the damage from happening again). Purge with grease to expel air before connecting new main line into system. Be sure to use a tube insert at all main line connections.
		Main line has popped out of fitting	Refit line to the fitting using a new compression sleeve and a tube insert.
(2b)	Secondary line damaged	Trapped and broken, rubbed through	Replace or repair (re-route or protect the line to prevent the damage from happening again).
		Secondary line has popped out of fitting.	Refit line to the fitting using a new compression sleeve.
		Lube point fitting has broken off.	Remove broken fitting and replace.
(4a)	Air-operated pump not working	Solenoid valve not working	See 1d. "Inoperative solenoid air valve" - page 16
		Air line damaged	Repair or replace if necessary.
		Low air pressure	Build up air pressure in truck system.
		Electrical circuit to timer or solenoid is damaged	Check connections; repair or replace if necessary.
		Timer is not working	Repair or replace timer.
(4b)	Electrically operated pump not working	Electrical circuit is damaged	Check electrical circuit to make sure voltage is reaching motor.
		Inoperative motor	Repair or replace motor if necessary.

( ) Refer to Grease Jockey PM Procedure on Page 15

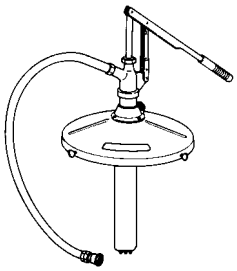
For more information call: 1-800-USA-LUBE

PARTS LIST

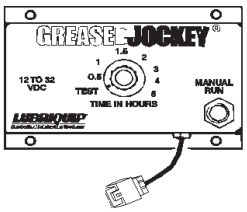
Description	Part Number
Installation kit: 30 pt single axle tractor, air pump, and flexible reservoir	550-500-105
34 pt tandem axle tractor, air pump, and flexible reservoir	550-500-155
30 pt single axle tractor, electric drive pump, flexible reservoir	550-501-445
34 pt tandem axle tractor, electric drive pump, flexible reservoir	550-501-435
Air pump repair/rebuild kit	550-400-792
Flexible reservoir replacement kit	550-400-780
6lb. rigid reservoir replacement kit	550-402-530
E-Z Luber Installation kit: 6 pt manual trailer system	550-502-051
12 pt manual trailer system	550-502-061
Trailer add on kit to attach an "E-Z Luber system to a tractor with a GJ system	550-502-320

AIR PUMP ASSY.
W/FLEX RESER.
550-000-040

AIR PUMP ASSY.
W/RIGID RESER.
550-001-050

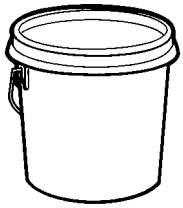


FILLER PUMP
ASSEMBLY
550-000-020

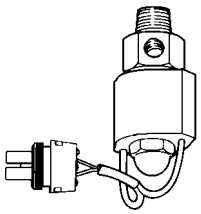


TIMER FOR AIR SYSTEM
(12-32) VDC
550-200-081

WIRE LEAD
for air pump timer
550-250-120



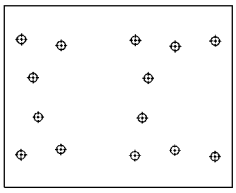
35 LB. CAN GREASE
550-400-020
NLGI "00"
Non-Moly



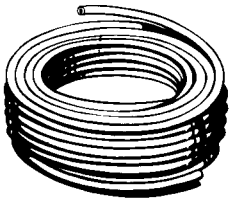
SOLENOIL AIR VALVE
12 VDC - 550-250-090
24 VDC - 550-250-010

WIRE LEAD (22 ft.)
for air solenoid valve
550-250-140

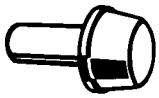
PARTS LIST Con't



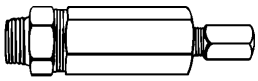
UNIVERSAL PUMP
MOUNTING BRACKET
550-402-690



MAIN LINE TUBING
5/16" OD (60 FT.)
550-450-230
3/16" OD (60 FT.)
550-450-190



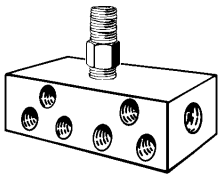
METER OUTPUT
PORT PLUG
550-150-130



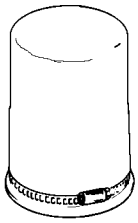
METER VALVES

#	= Size
550-100-000	= 0
550-100-010	= 1
550-100-020	= 2
550-100-030	= 3
550-100-040	= 4
550-100-080	= 8

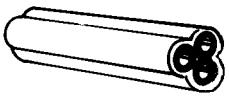
METER OUTPUT
SIZING SPACER
550-150-020



12 PORT MANIFOLD
WITH STUD, MODULE
550-350-145

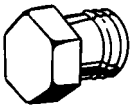


FLEX. RESERV.
10LB CAPACITY
560-002-630
(CLAMP NOT INCLUDED)
(461-300-859)

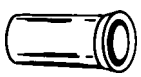


DISTRIBUTION LINES
3/16" OD TUBING
BUNDLES(10FT.) Prefilled

550-450-100 = 3 Tube bundle
550-450-020 = 2 Tube bundle
550-450-210 = 1 Tube black
550-450-810 = 1 Tube orange

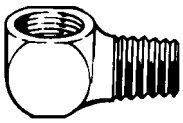


MANIFOLD METER
PORT PLUG
550-350-040

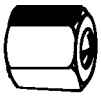


5/16" TUBING
INSERT (PKG. 20)
550-402-330

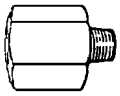
PARTS LIST con't



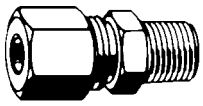
ELBOW, STREET
(1/8"NPT to 1/8" NPT)
509-110-000
(3/8"NPT to 3/8" NPT)
509-117-000



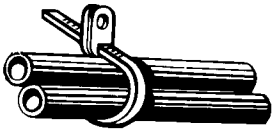
NUT, TUBE
3/16" Tube - 435-702-340
5/16" Tube - 435-702-503



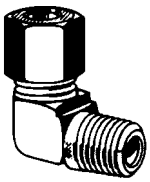
ADAPTER, STRAIGHT
1/8"NPT to 1/4"-28 SAE MALE
550-400-880



MALE CONNECTOR
(3/16" tube, 1/8" NPT)
435-460-030
5/16" tube, 1/8"NPT
435-460-060
5/16" tube, 1/4"NPT
435-460-070

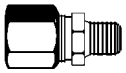


NYLON TIE STRAPS
(11.5")
550-400-230 - 36 pcs
550-402-340 - 100 pcs

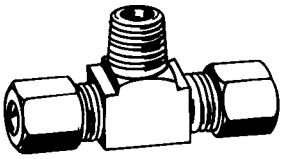


MALE 90^0 ELBOW CONNECTOR
(3/16 tube, 1/8 NPT)
435-440-030
(5/16" tube, 1/8"NPT)
435-440-060
(5/16" tube, 1/4" NPT)
435-440-070

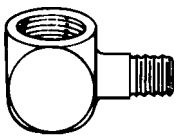
TUBE UNION
for 3/16" tube -
435-470-020
for 5/16" tube -
435-470-040



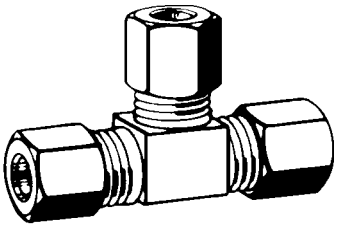
FITTING ADAPTER - STRAIGHT
1/4"-28 SAE X 3/16"T
435-702-367



1/8"NPT MALE BRANCH TEE
5/16" tube run -
435-410-040

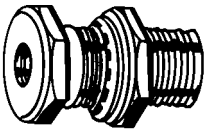


ELBOW, STREET
1/8" NPT to
1/4" - 28 SAE MALE
550-400-800

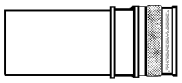


TEE, TUBE UNION
for 5/16" tube -
435-420-030

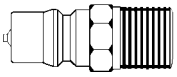
PARTS LIST con't



BULKHEAD FITTING
550-400-450



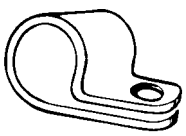
RESERVOIR FILL
CONNECTOR (QD)
FEMALE,
1/4" NPT (FEMALE)
550-050-230



RESERVOIR FILL
CONNECTOR (QD) MALE
3/8" NPT (MALE)
550-050-300

1/8"NPT
EXTENSION (.75") -
509-027-000

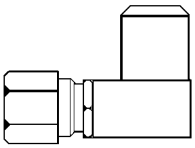
EXTENSION (1.25")
509-028-000



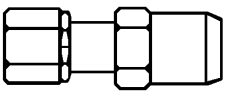
CLAMPS
(932 dia. hole)
550-400-040 = 5/16"
550-400-070 = 3/8"
550-400-050 = 7/16"
550-400-080 = 1/2"
550-400-060 = 5/8"

ELECTRIC PUMP
Assy, Flex. Reservoir with
timer for
12 VDC - 550-002-095
24 VDC - 550-002-105

WIRING LEAD
for electric pump
492-240-244



ZERK ADAPTORS,
PRESS ON:
(3/16" TUBE CONNECTION)
ELBOW - 550-402-860



ZERK ADAPTORS,
PRESS ON:
(3/16" TUBE CONNECTION)
STRAIGHT - 550-402-870

SERVICE START-UP KIT

550-402-800

CONSISTS OF: SOLENOID VALVE, TUBE AND TUBE BUNDLES, INJECTORS, FITTINGS, TUBE INSERTS, AND AN AIR PUMP REPAIR KIT

CERTIFICATE A3061 UL REGISTERED FIRM ISO 9001
LUBRIQUIP®

LUBRIQUIP®
Lubrication & Dispensing Solutions

B-GJ30050-0701