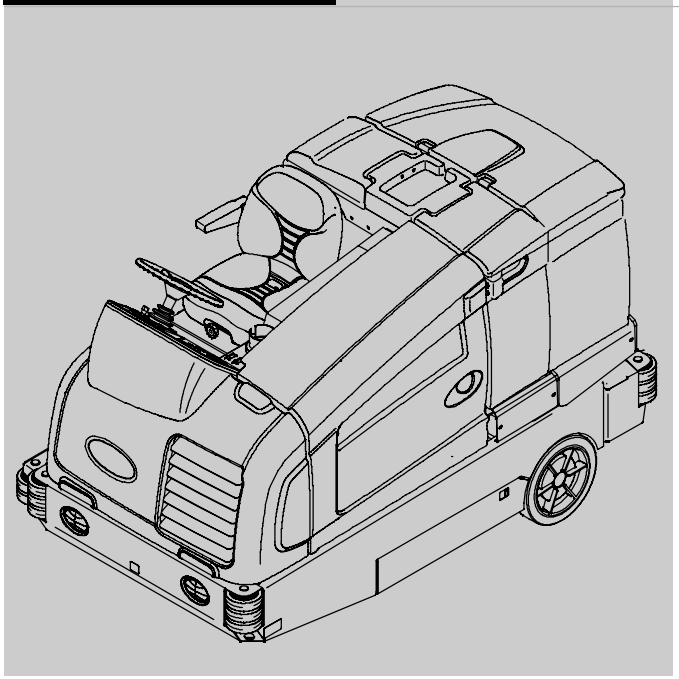
TENNANT®

T20



Service Information Manual

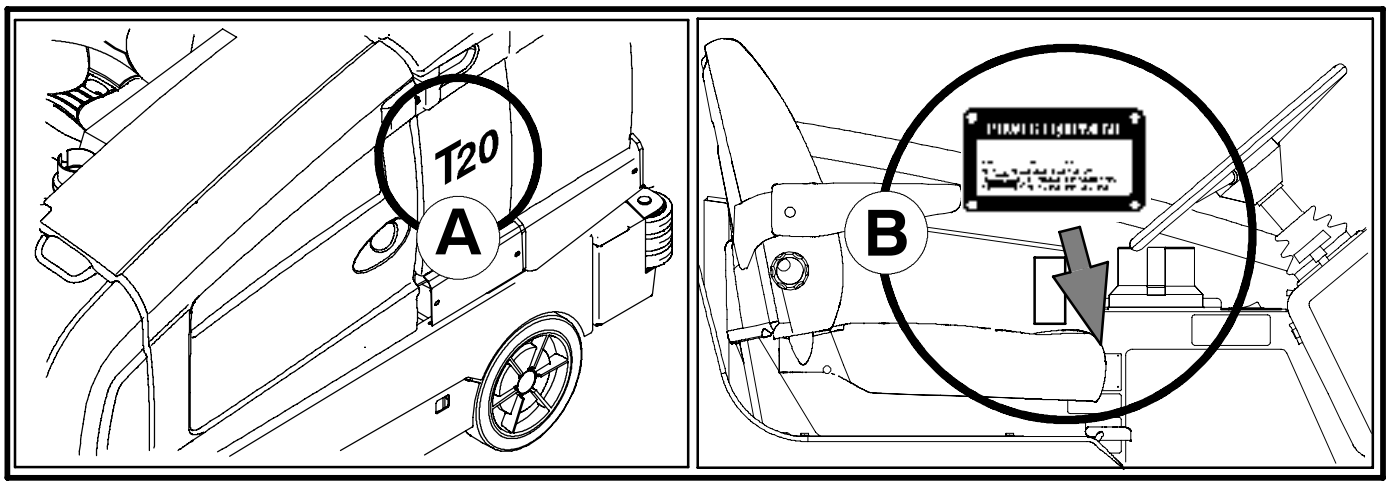
FaST®
Foam Scrubbing Technology

The Safe Scrubbing Alternative®

Hygenic® Fully Cleanable Tanks
FloorSmart ™ Integrated Cleaning System
ES® Extended Scrub System

331475
Rev. 00 (02-2007)

www.tennantco.com



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

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

Tennant Company
PO Box 1452
Minneapolis, MN 55440
Phone: (800) 553-8033 or (763) 513-2850
www.tennantco.com

T20 Service Information Manual

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T20 Service Information Manual

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T20 Safety Precautions

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

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

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

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

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

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

WARNING: Flammable materials can cause an explosion or fire. Do not use flammable materials in tank.

WARNING: Flammable materials or reactive metals can cause an explosion or fire. Do not pickup.

WARNING: Moving belt and fan. Keep away.

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

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

CAUTION: LPG engine will run for a few seconds after key is turned off. Apply parking brake before leaving machine.

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.

FOR SAFETY:

1. **Do not operate machine:**
   - **Unless trained and authorized.**
   - **Unless operator manual is read and understood.**
   - **If it is not in proper operating condition.**
   - **In flammable or explosive areas.**
   - **In areas with possible falling objects unless equipped with overhead guard.**

2. **Before starting machine:**
   - **Check for fuel, oil, and liquid leaks.**
   - **Keep sparks and open flame away from refueling area.**
   - **Make sure all safety devices are in place and operate properly.**
   - **Check brakes and steering for proper operation.**

3. **When starting machine:**
   - **Keep foot on brake and directional pedal in neutral.**

4. **When using machine:**
   - **Use brakes to stop machine.**
   - **Go slow on inclines and slippery surfaces.**
   - **Use care when reversing machine.**
   - **Do not carry passengers on machine.**
   - **Always follow safety and traffic rules.**
   - **Report machine damage or faulty operation immediately.**
   - **Follow mixing and handling instructions on chemical containers.**

T20 Safety Precautions

5. **Before leaving or servicing machine:**
   - **Stop on level surface.**
   - **Set parking brake.**
   - **Turn off machine and remove key.**

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

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

GENERAL MACHINE INFORMATION

T20 Electrical Component Locator

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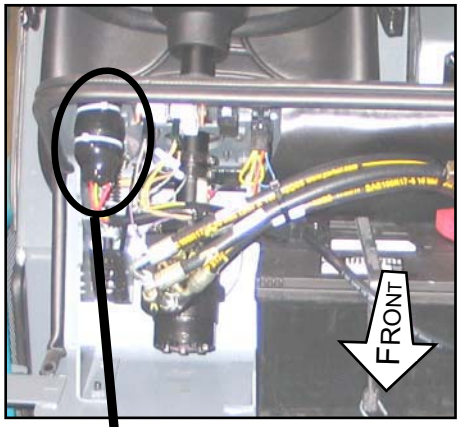
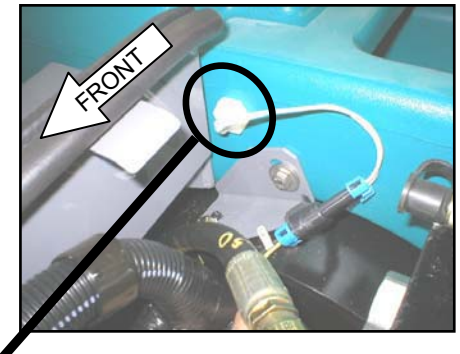
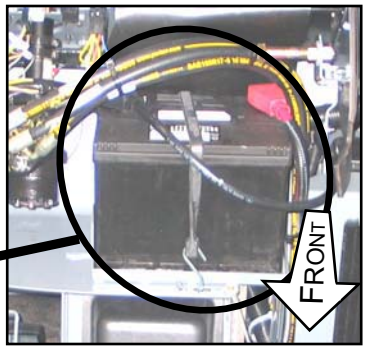
IGNITION SWITCH S-1

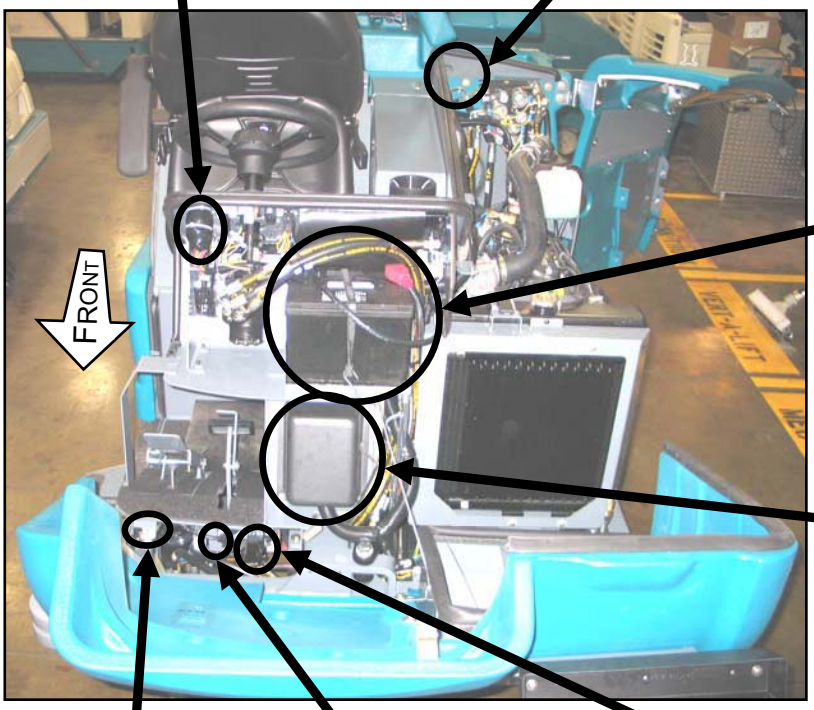


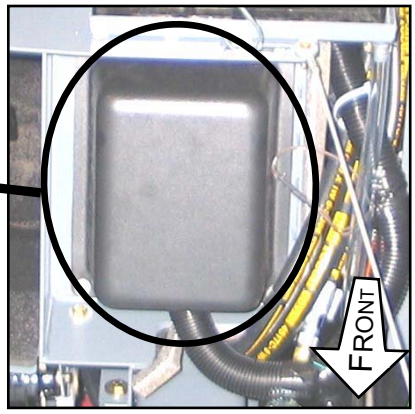
SOLUTION TANK FULL SWITCH S-14



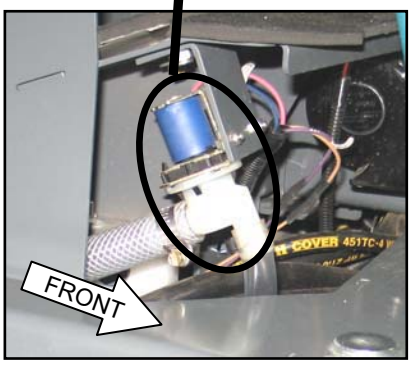
BATTERY



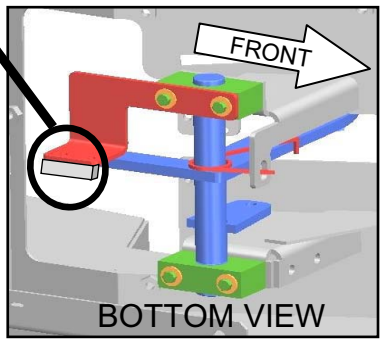




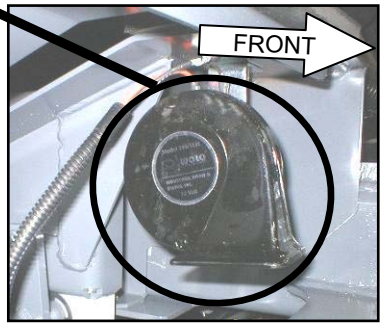
FUSE/RELAY PANEL



SIDE BRUSH SOLUTION VALVE SOL-7



BRAKE LIGHT SWITCH S-3



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T20 Electrical Component Locator

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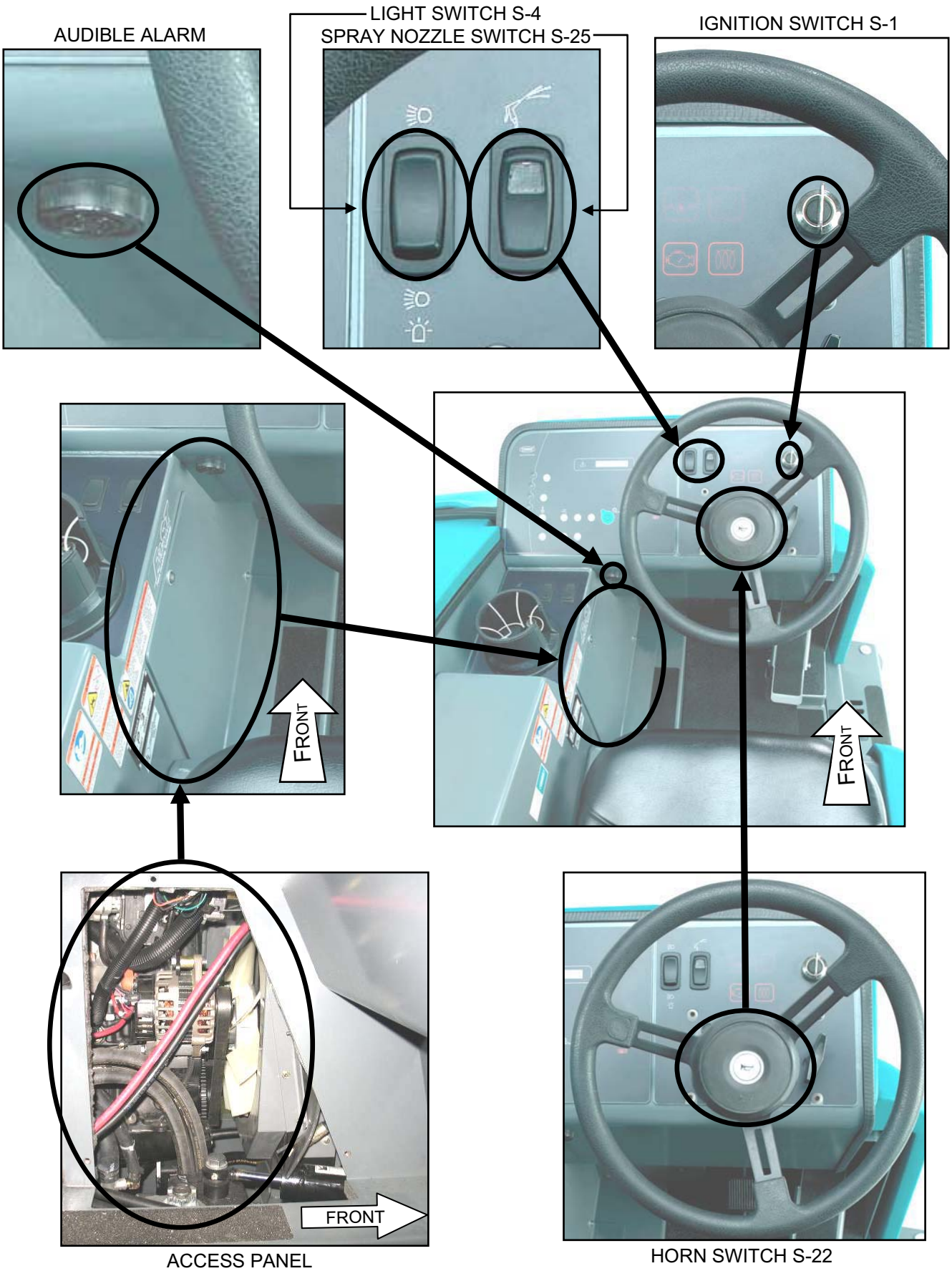

T20 Electrical Component Locator

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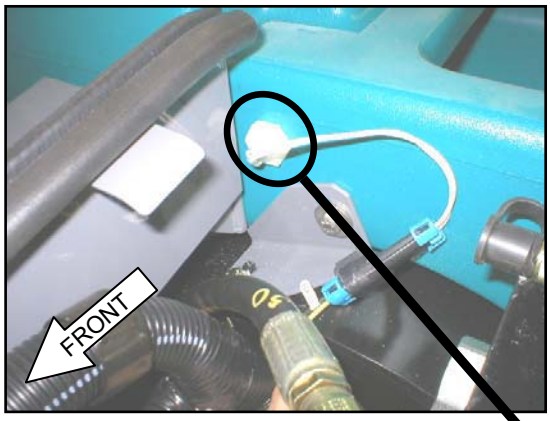
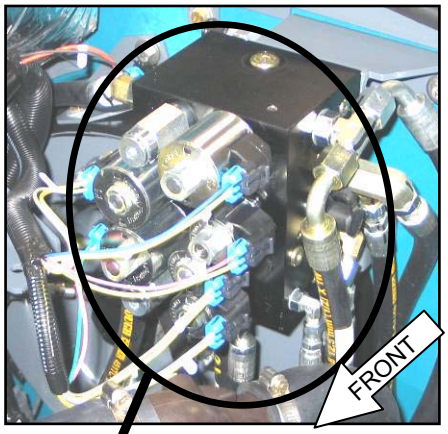
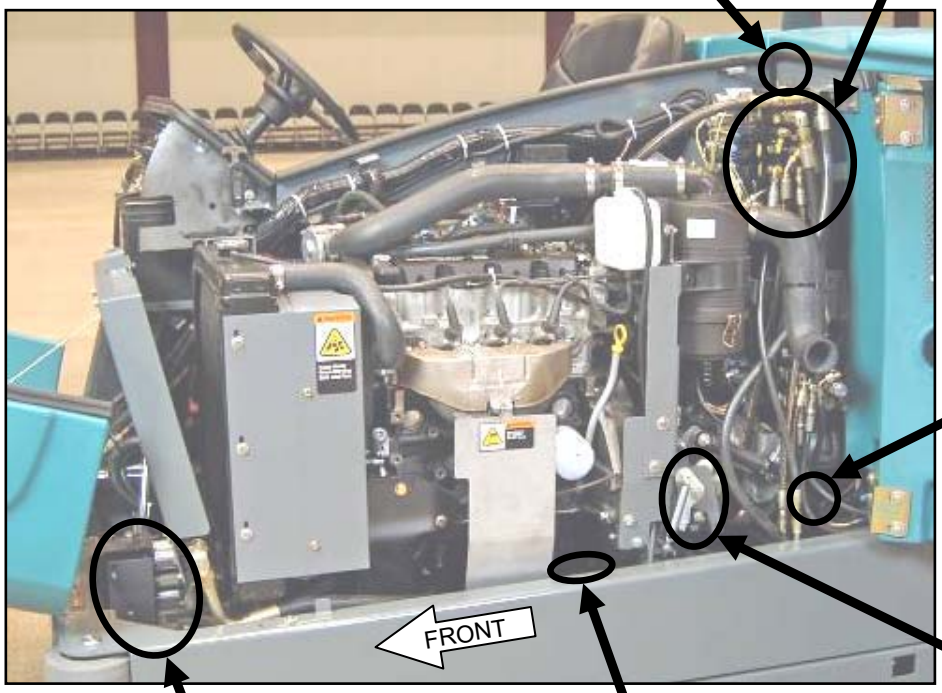
SOLUTION TANK FULL SWITCH S-14

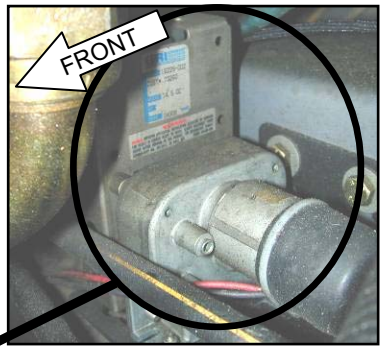


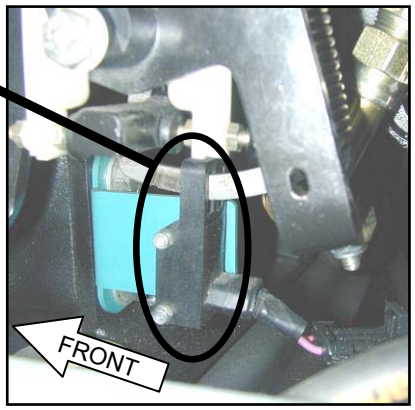
SCRUB VALVE
SV1, SV2, SV3, SV4,SV6, SV7



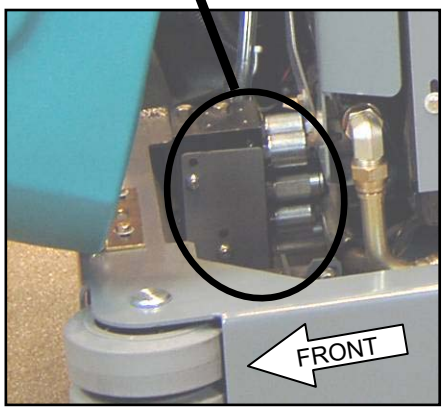


DETERGENT PUMP

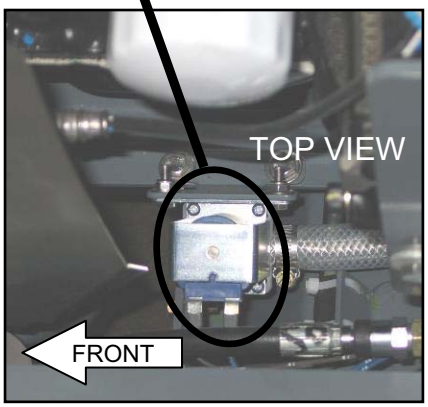




PROPEL PEDAL
POSITION SENSOR



SIDE BRUSH VALVE
SV8, SV10, SV11, SV12



MAIN BRUSH SOLUTION
VALVE SOL-3

T20 Electrical Component Locator

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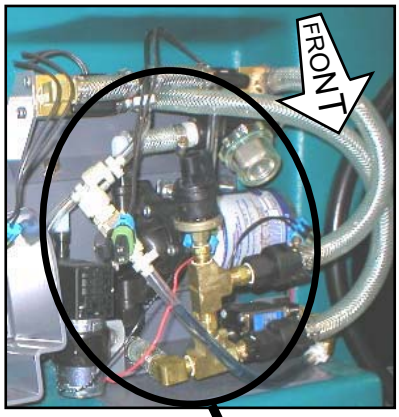
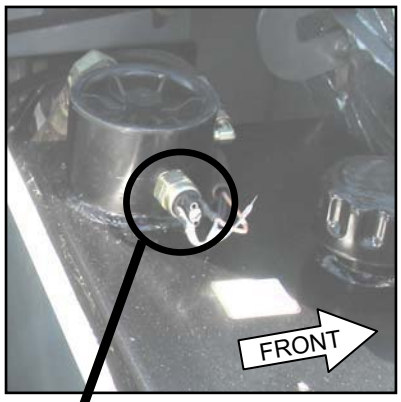
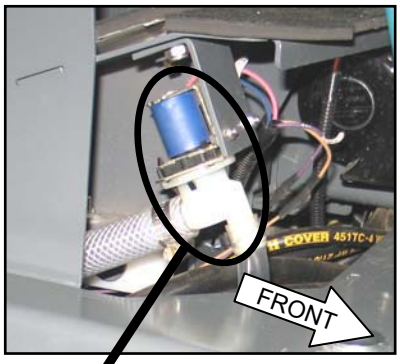
FaST COMPONENTS

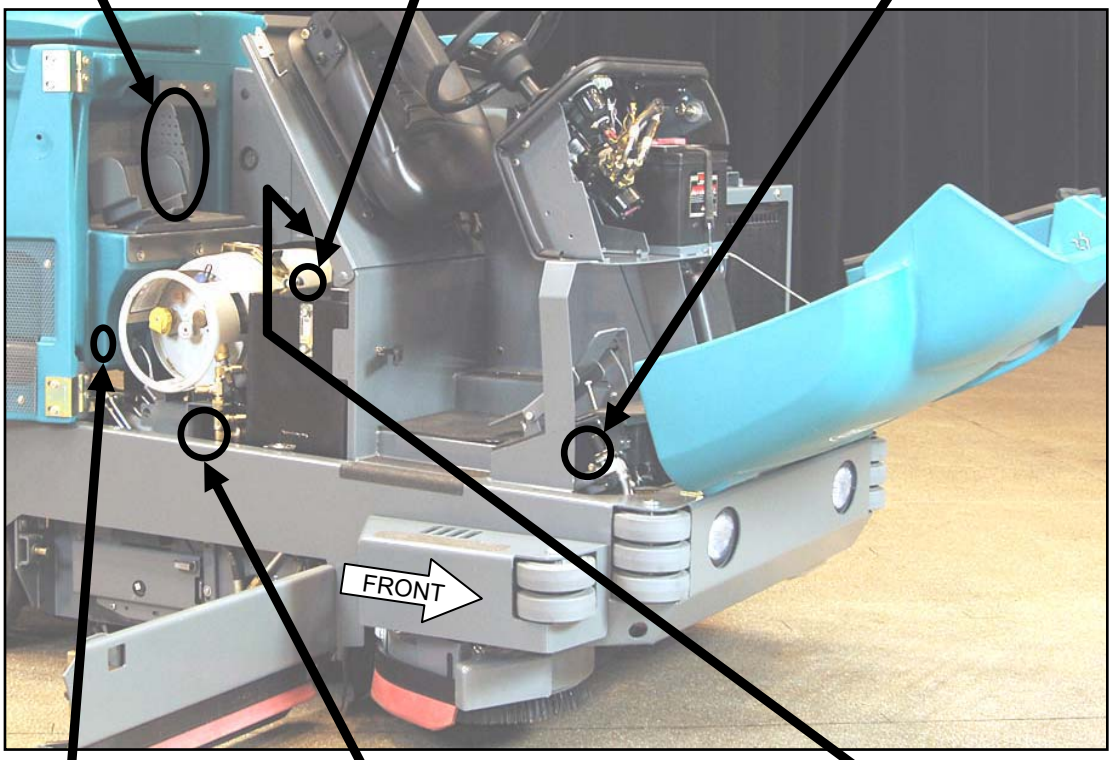


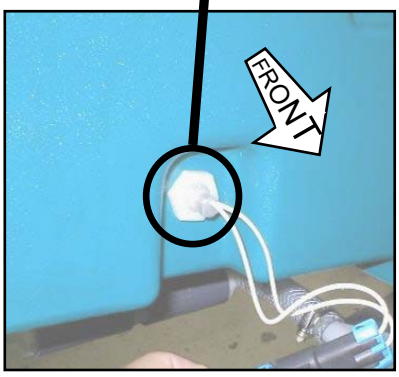
HYDRAULIC FILTER
CLOGGED SWITCH S-17



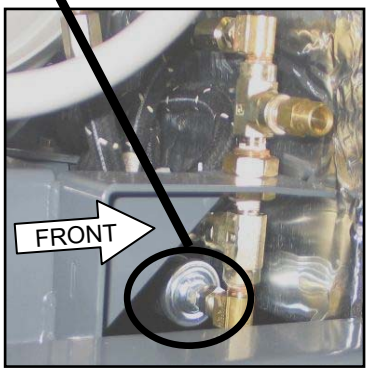
SIDE BRUSH SOLUTION
VALVE SOL-7



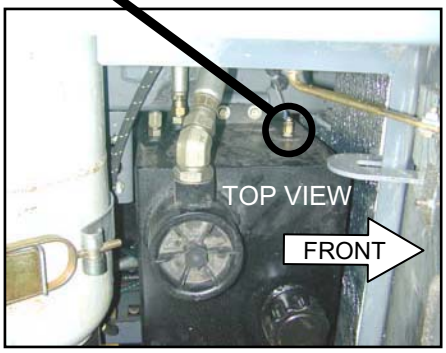




SOLUTION TANK EMPTY
SWITCH S-19



LPG LOW FUEL
PRESSURE SWITCH S-8



HYDRAULIC OIL TEMPERATURE
SENSOR S-20 (BACK SIDE)

T20 Electrical Component Locator

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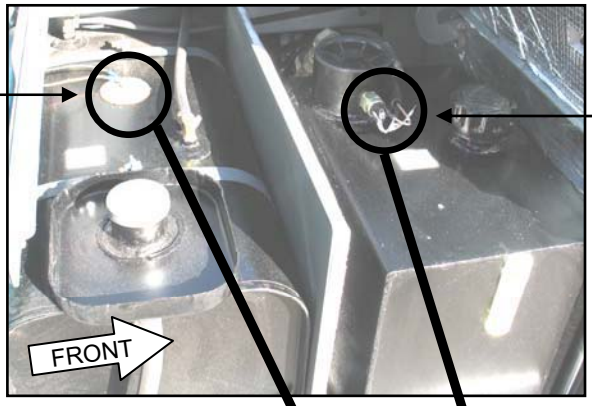
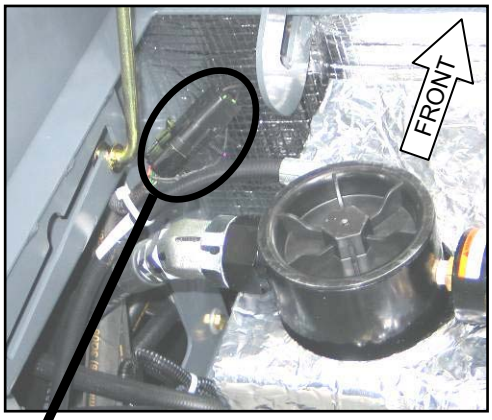
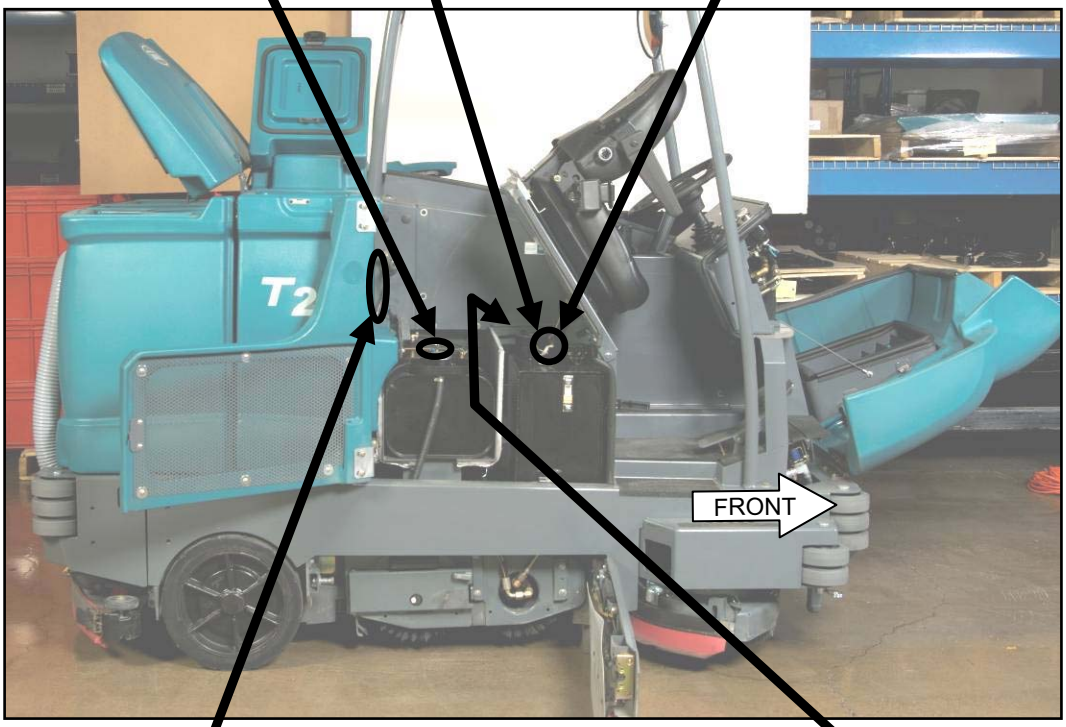
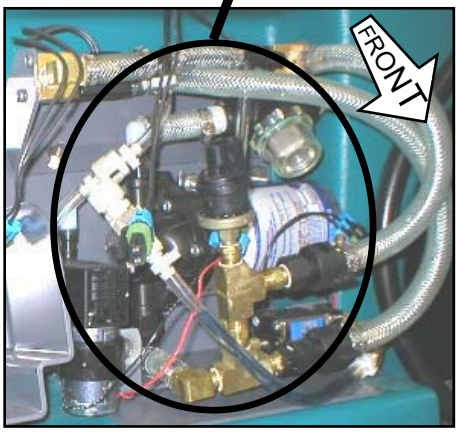
GAS/DIESEL FUEL LEVEL SENDER S-7
HYDRAULIC FILTER CLOGGED SWITCH S-17



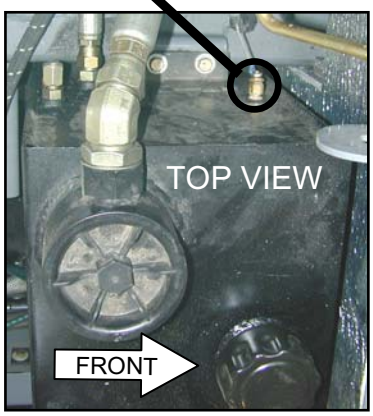
GAS/LPG ENGINE
DIAGNOSTIC CONNECTOR







FaST COMPONENTS



HYDRAULIC OIL TEMPERATURE
SENSOR S-20 (BACK SIDE)

T20 Electrical Component Locator

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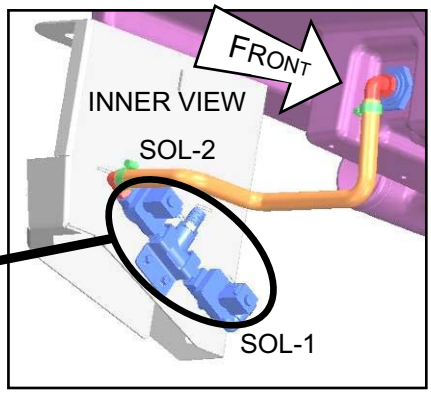
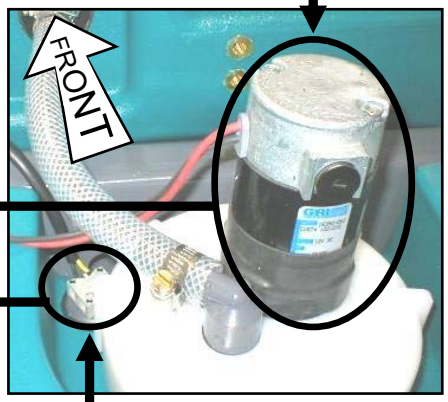
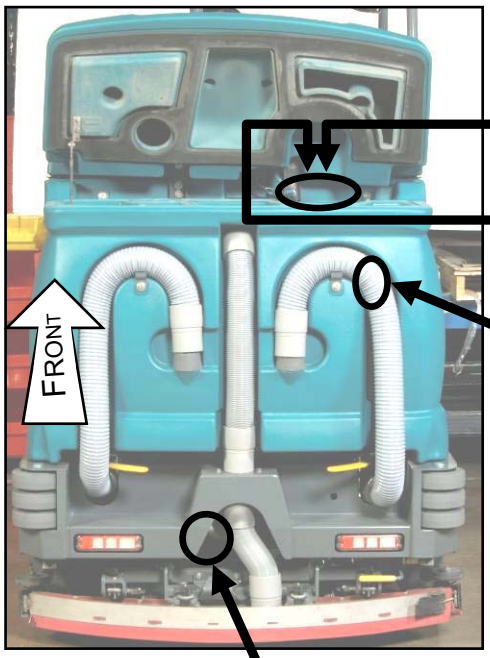
AUTO FILL SOLENOID VALVES

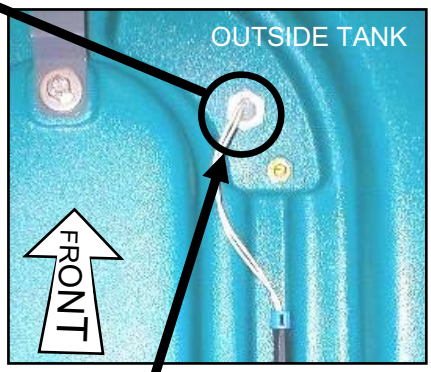


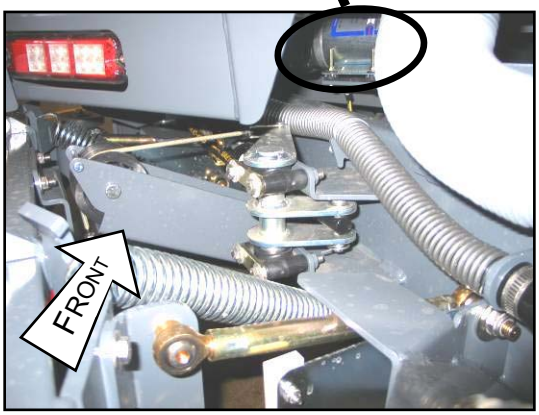
ES PUMP



RECOVERY TANK HALF FULL SWITCH S-16







SPRAY NOZZLE/WAND PUMP

RECOVERY TANK FULL SWITCH S-15

T20 Electrical Component Locator

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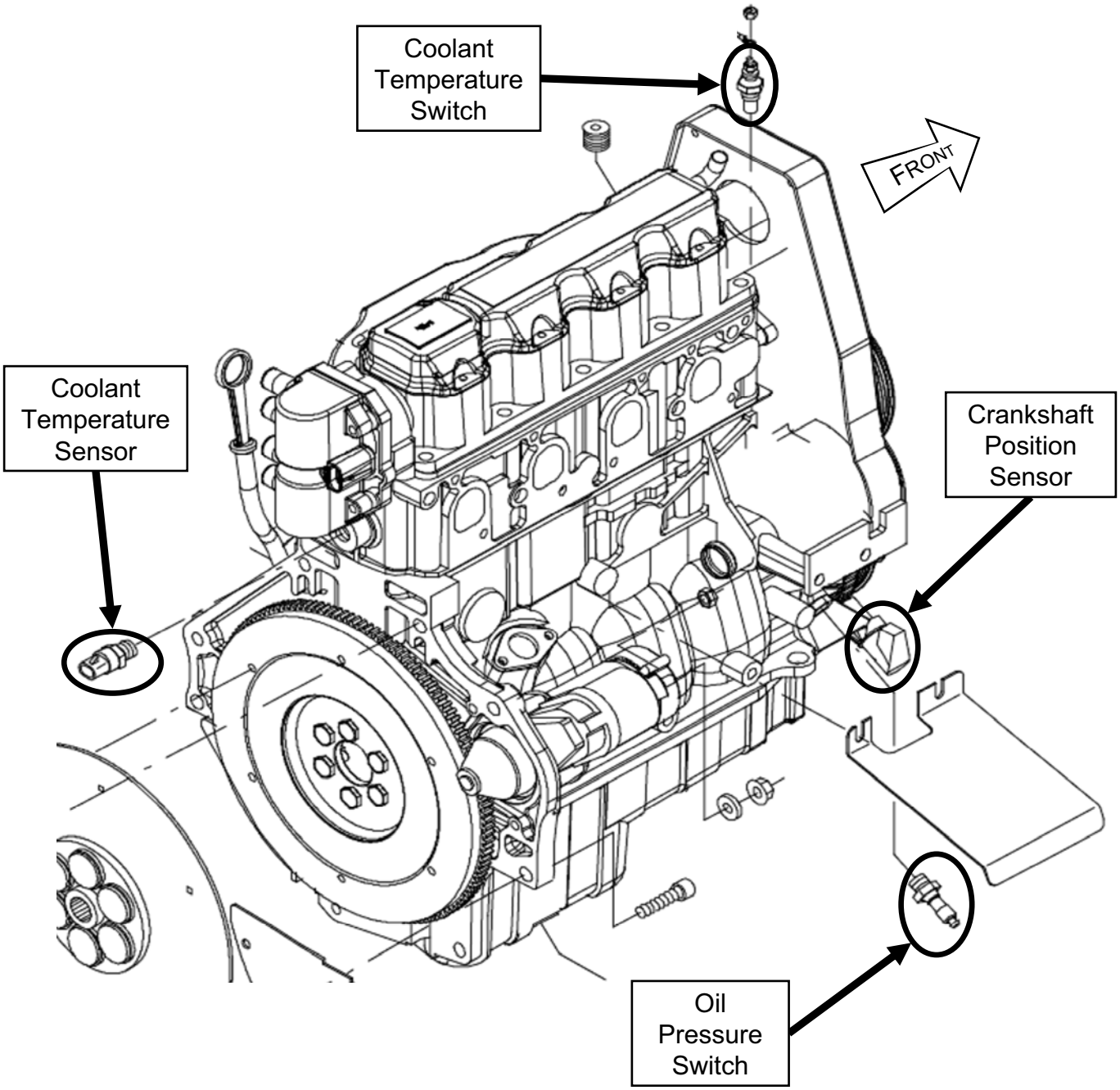
Gas / LPG Engine



T20 Electrical Component Locator

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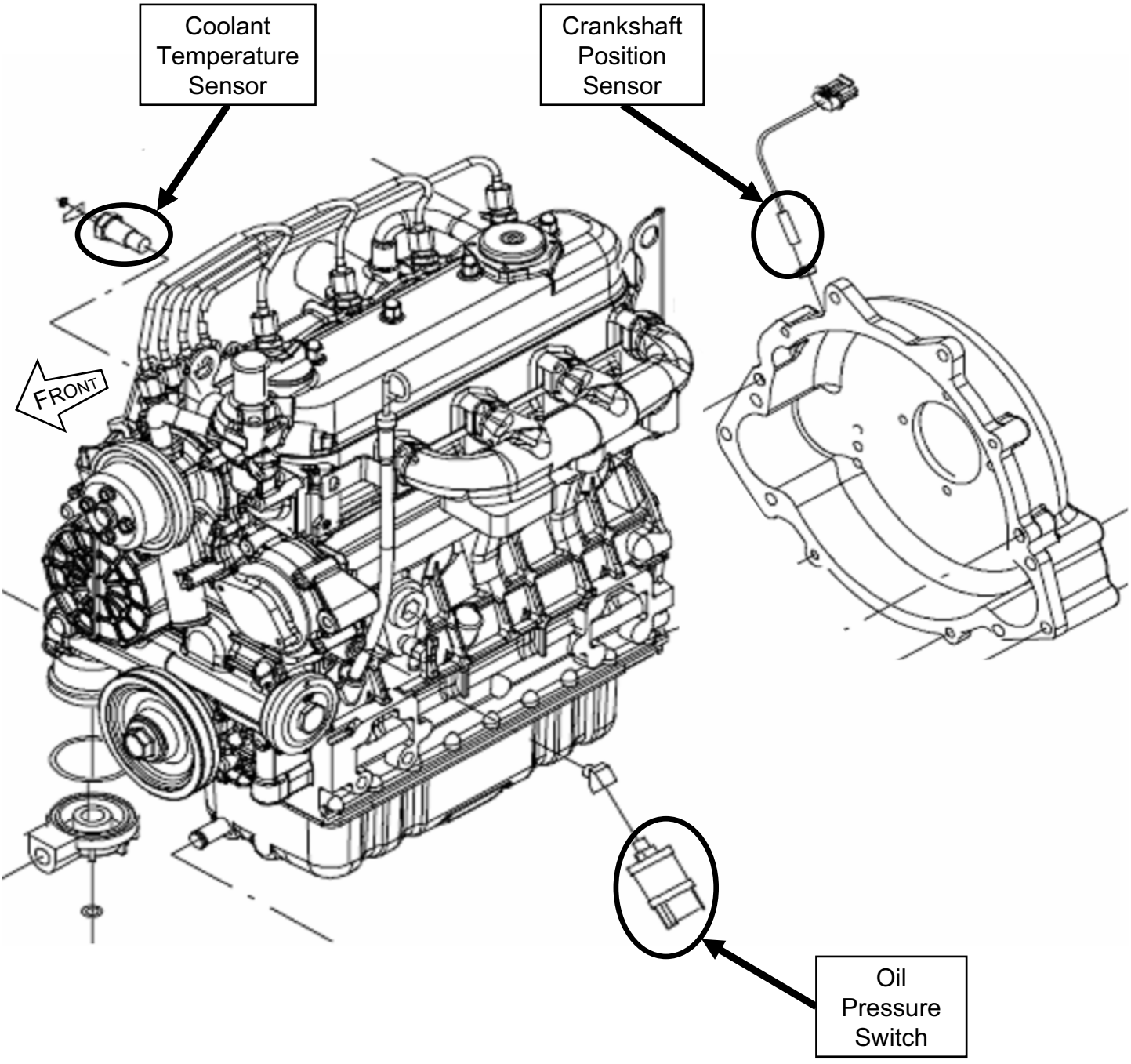
Diesel Engine



T20 Hydraulic Component Locator

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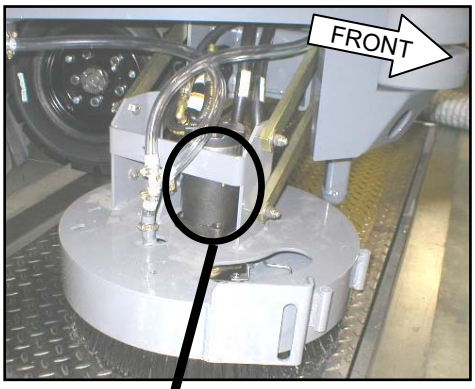
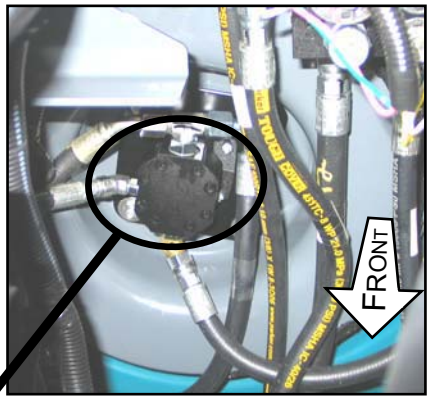
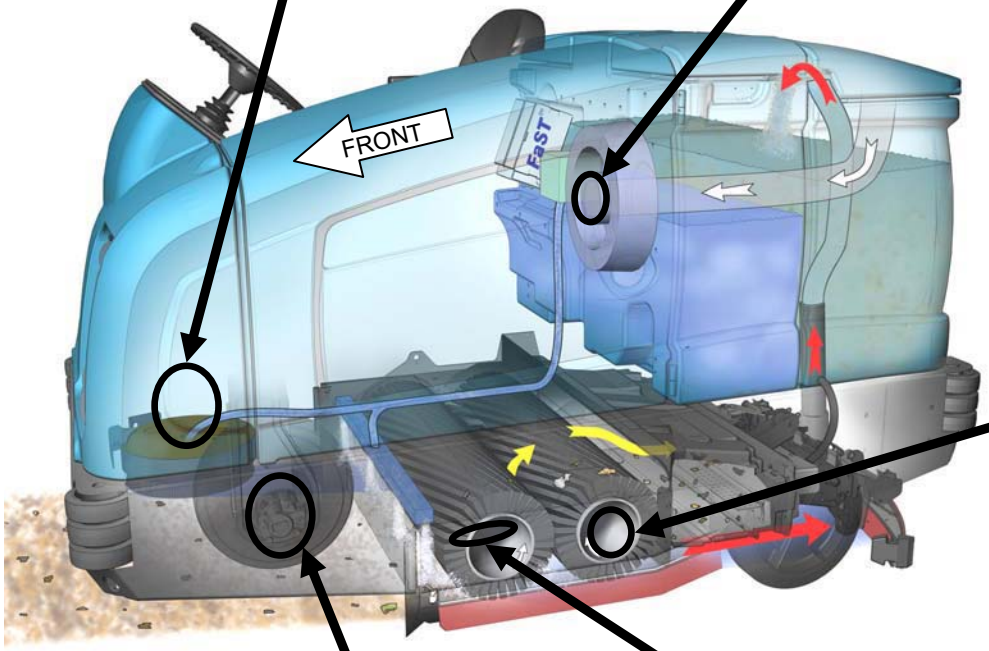
SIDE BRUSH MOTOR

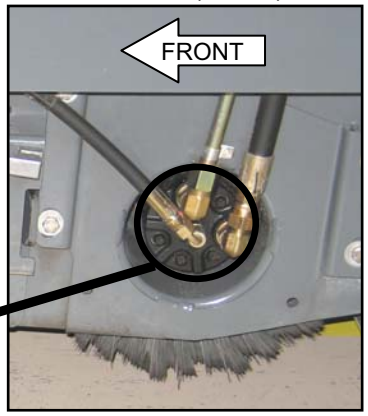


VACUUM FAN MOTOR

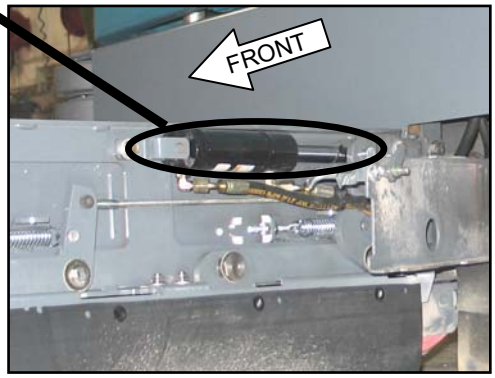




CYLINDRICAL MAIN BRUSH MOTOR (REAR)



PROPEL MOTOR



LEFT SIDE SQUEEGEE LIFT CYLINDER

T20 Hydraulic Component Locator

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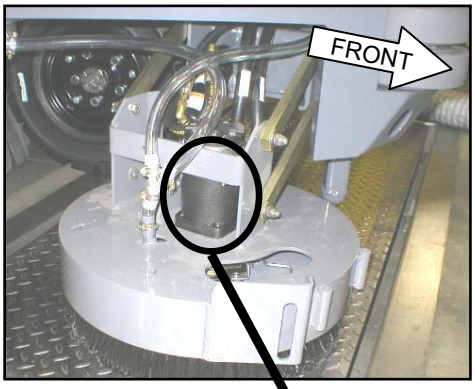
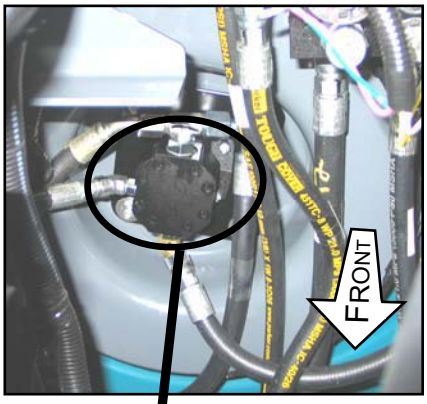
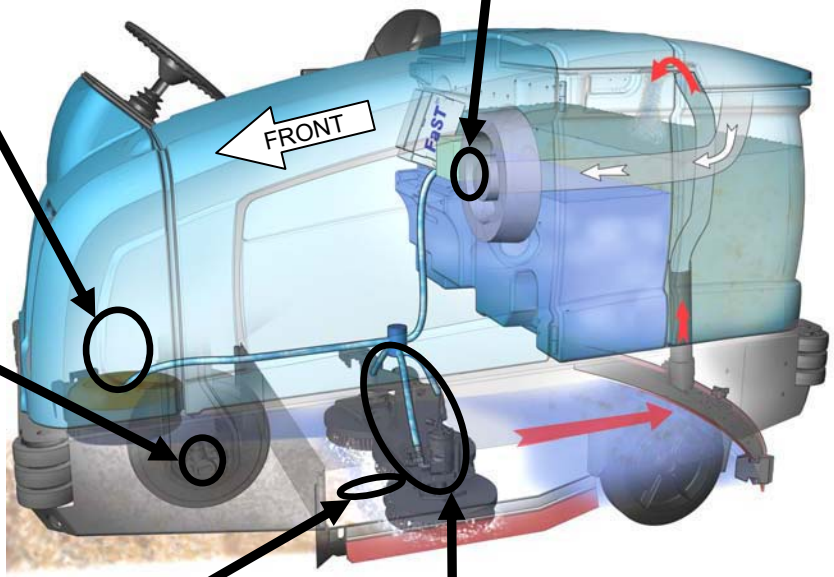
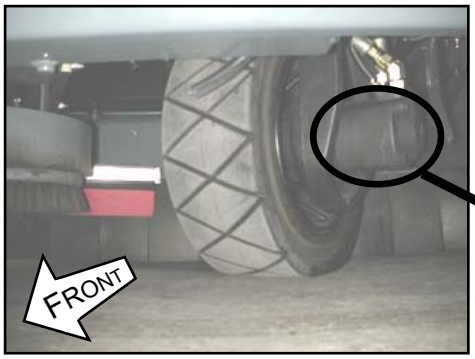
SIDE BRUSH MOTOR



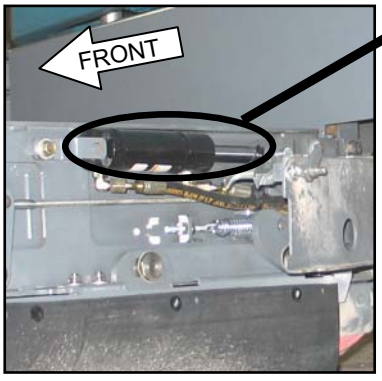
VACUUM FAN MOTOR



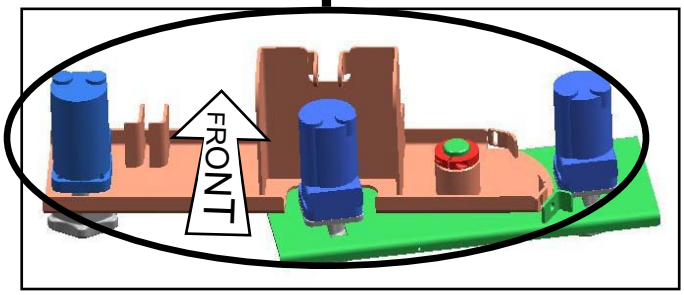




PROPEL MOTOR



LEFT SIDE SQUEEGEE LIFT CYLINDER



DISK MAIN BRUSH MOTORS

T20 Hydraulic Component Locator

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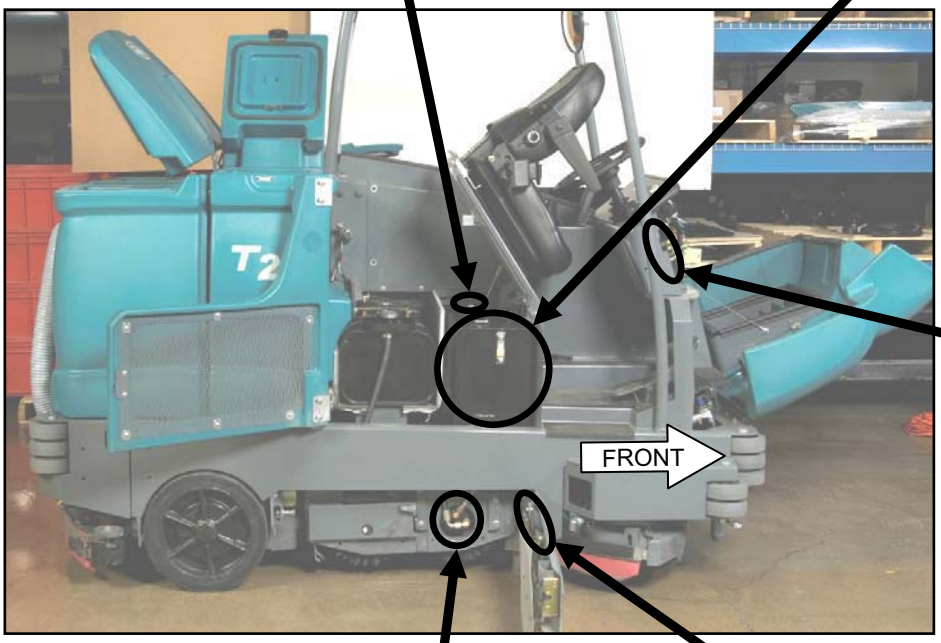
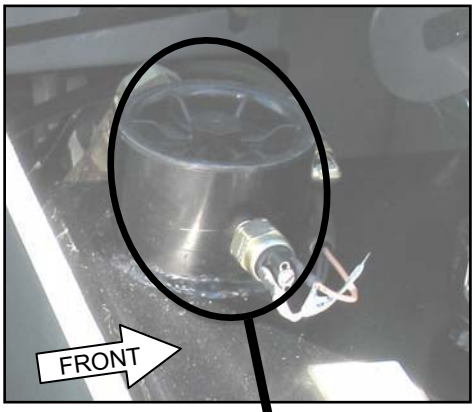
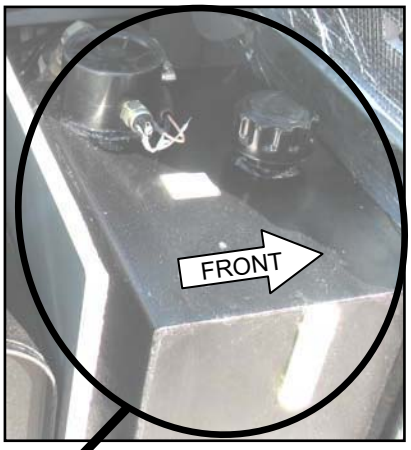


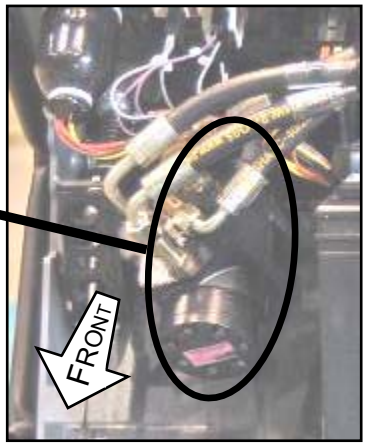
HYDRAULIC OIL FILTER

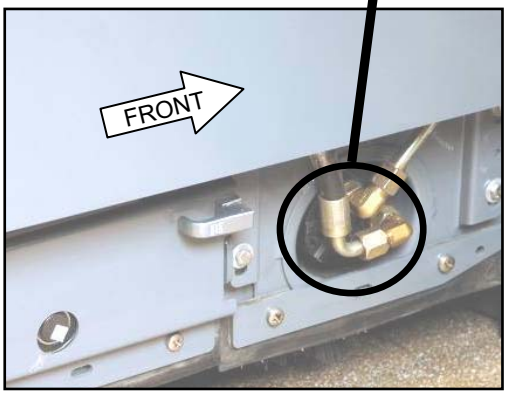


HYDRAULIC OIL RESERVOIR

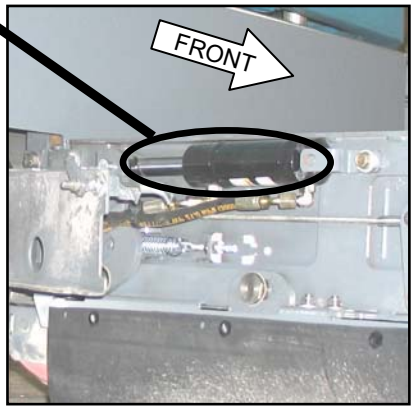


STEERING VALVE





CYLINDRICAL MAIN BRUSH MOTOR (FRONT)



RIGHT SIDE SQUEEGEE LIFT CYLINDER

T20 Hydraulic Component Locator

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See pages 16 and 17 for more information on the Scrub and Side Brush manifolds

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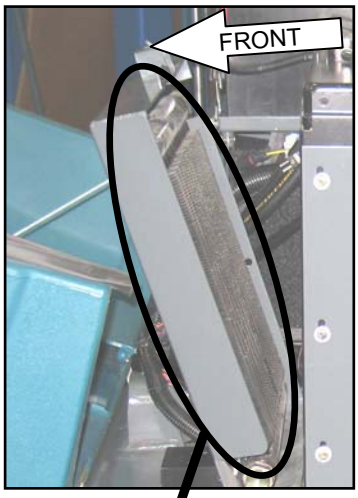
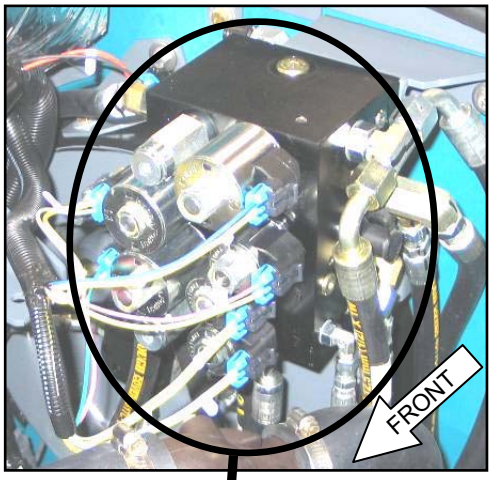
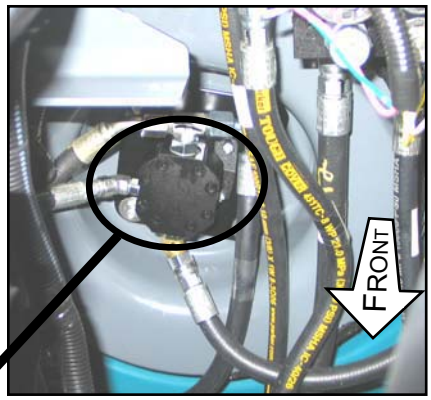
HYDRAULIC OIL HEAT EXCHANGER

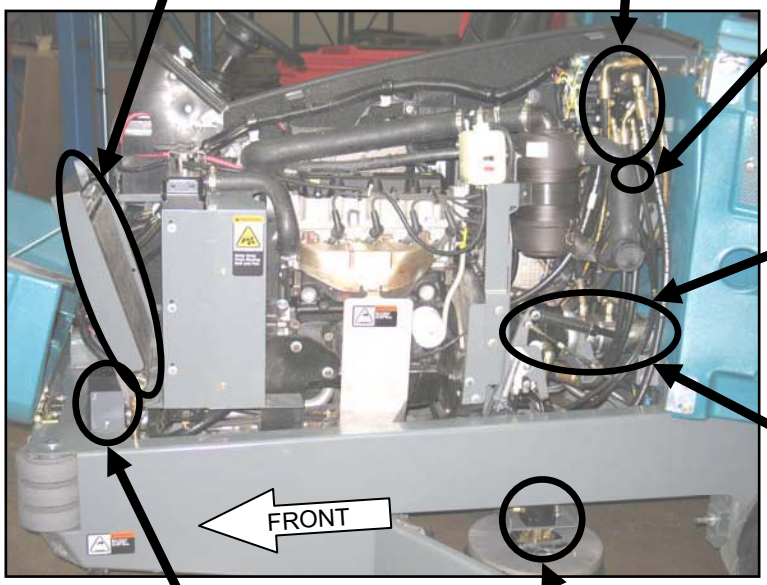


SCRUB MANIFOLD
SV1, SV2, SV3, SV4,SV6, SV7
RV1, RV2, CV1, PC1, PC2

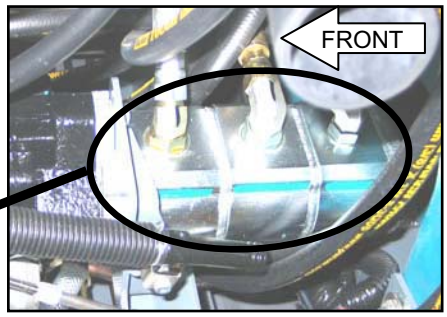


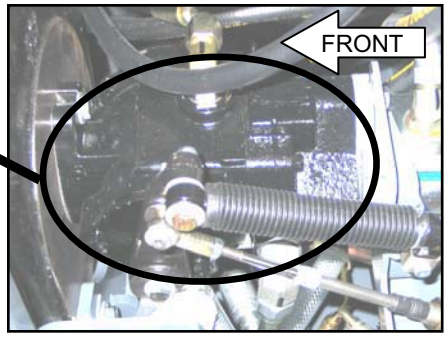
VACUUM FAN MOTOR



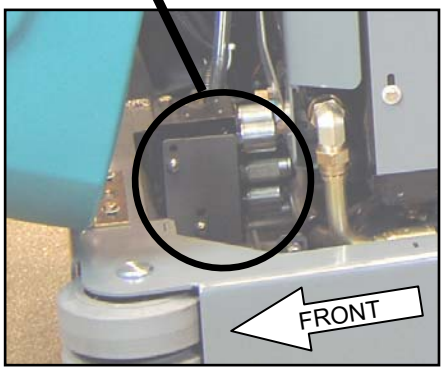


ACCESSORY PUMPS

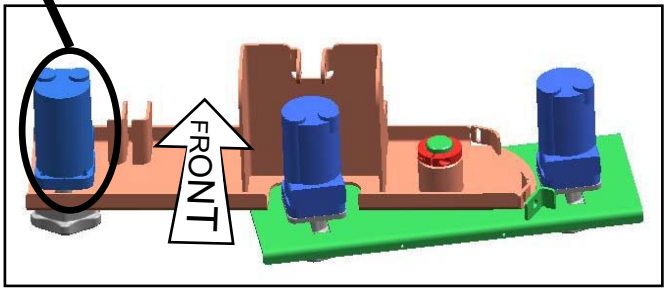




PROPEL PUMP



SIDE BRUSH MANIFOLD
SV8, SV10, SV11, SV12, PR1, PC8



DISK MAIN BRUSH MOTORS

T20 Hydraulic Component Locator

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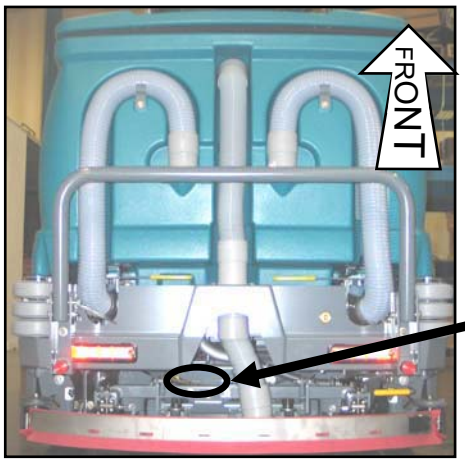
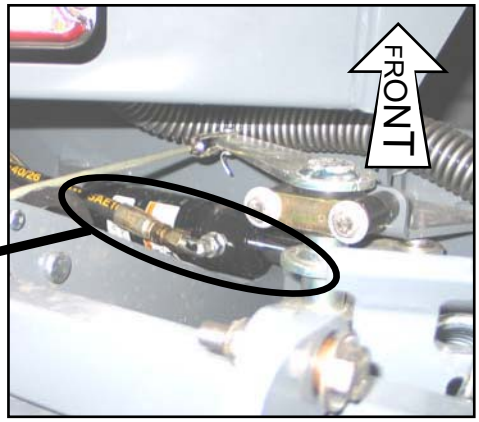
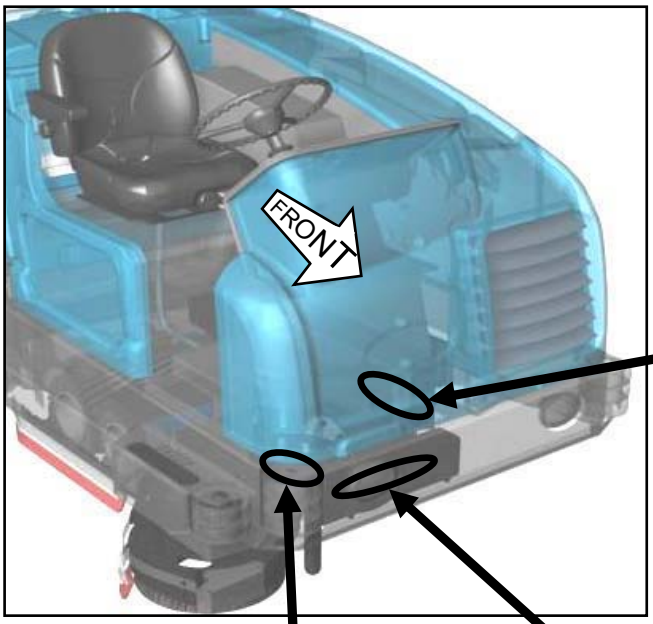
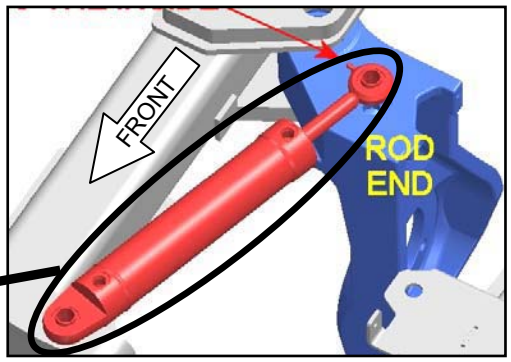


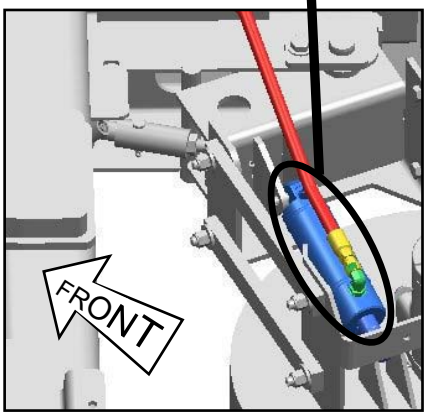
MAIN SQUEEGEE LIFT CYLINDER



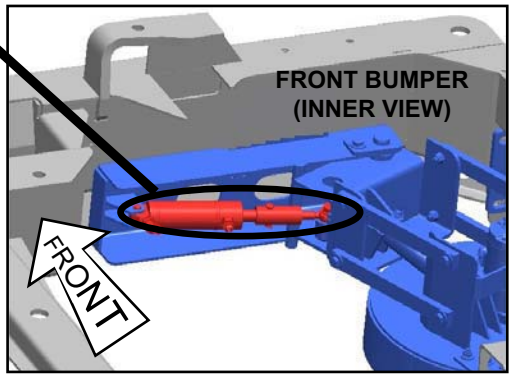


STEERING CYLINDER





SIDE BRUSH LIFT CYLINDER



SIDE BRUSH EXTEND CYLINDER

T20 Hydraulic Component Locator

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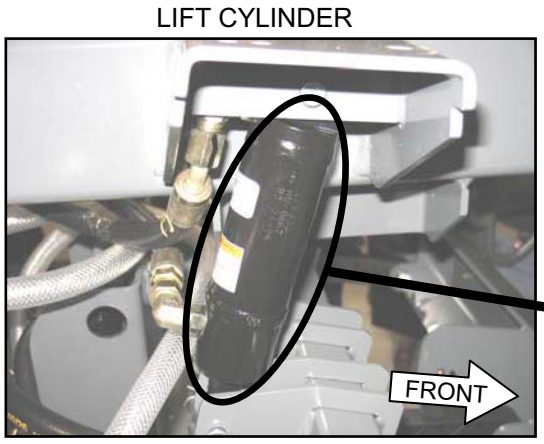
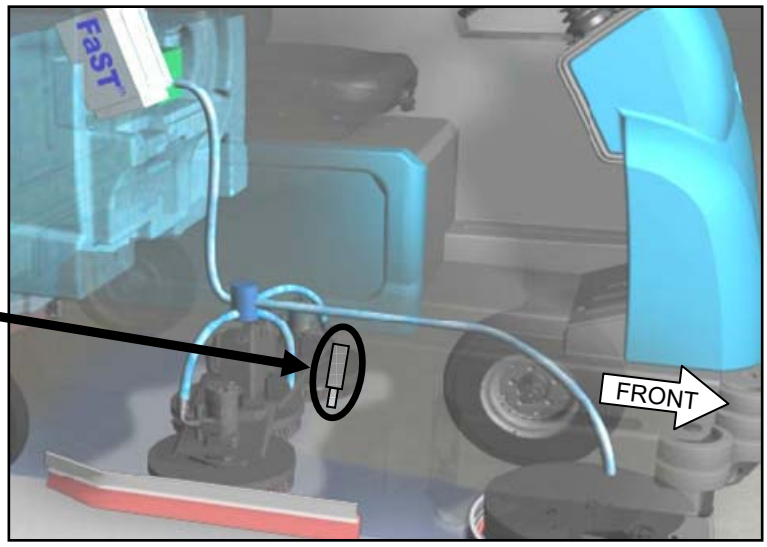
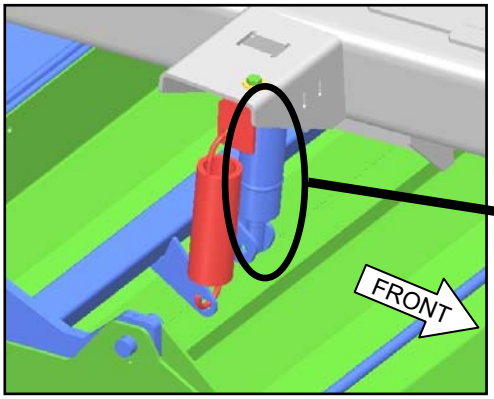
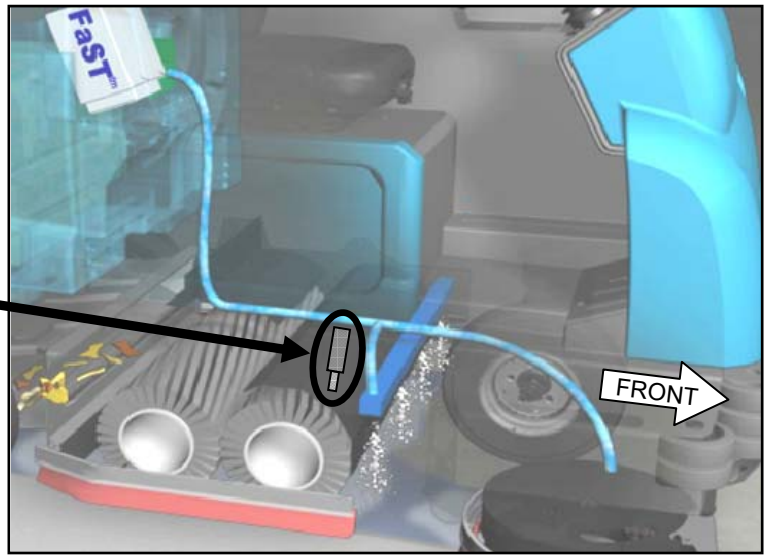
DISK SCRUB HEAD
LIFT CYLINDER





CYLINDRICAL SCRUB HEAD
LIFT CYLINDER





T20 Hydraulic Component Locator

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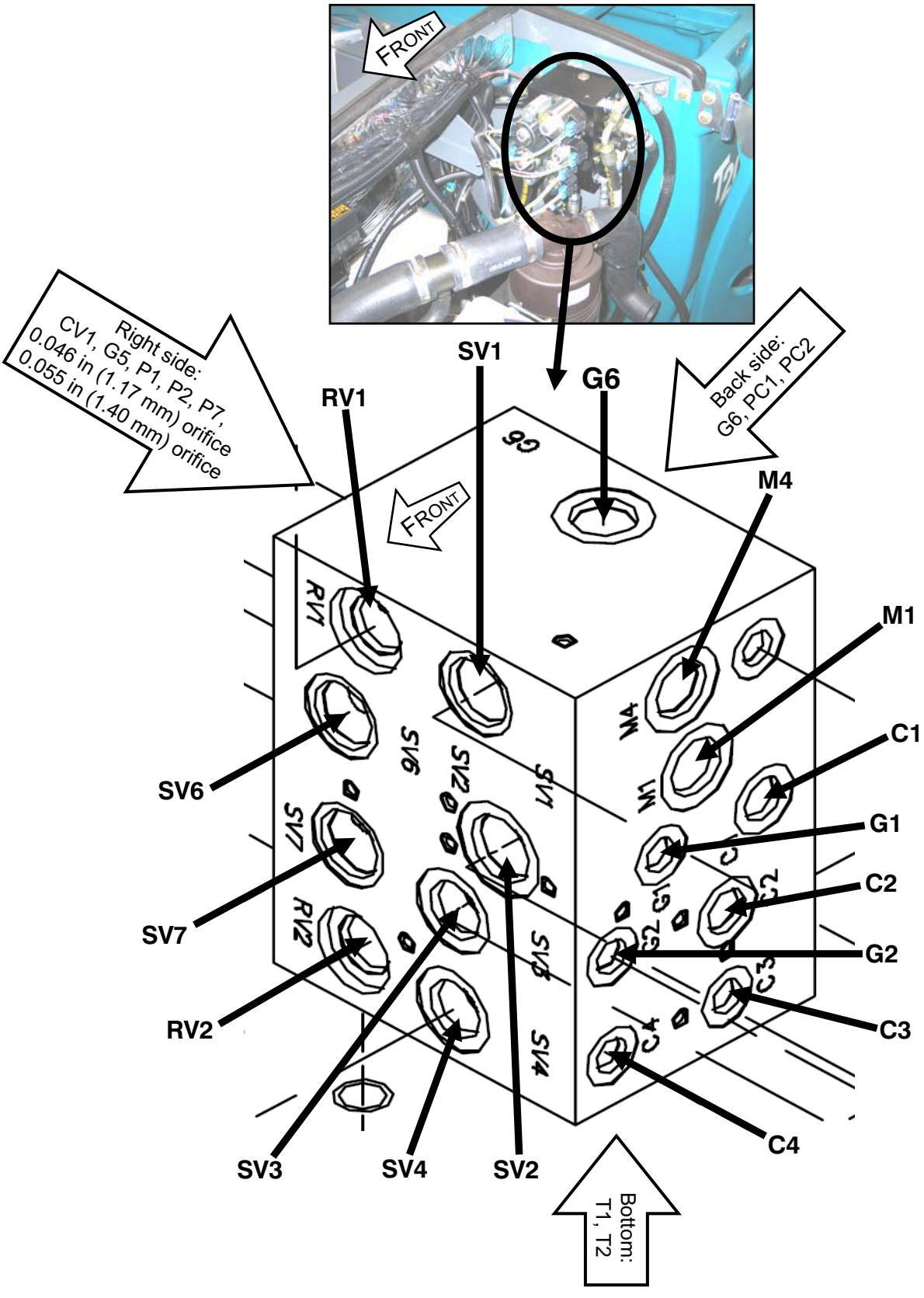
SCRUB MANIFOLD DETAILS



T20 Hydraulic Component Locator

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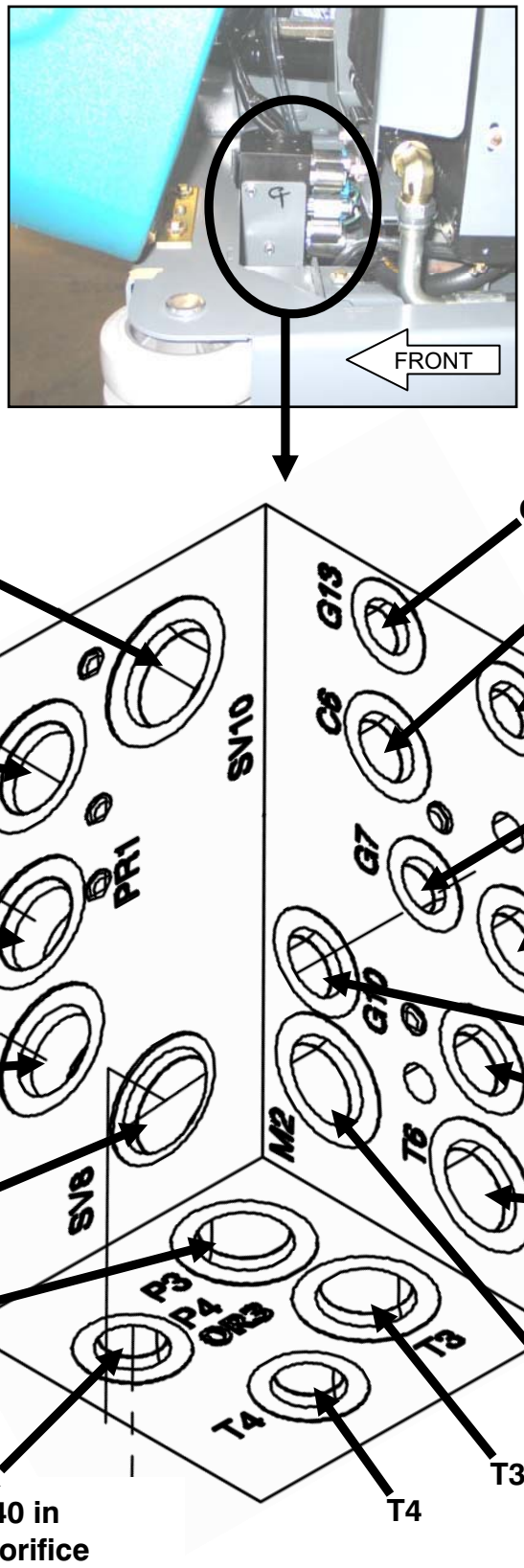
SIDE BRUSH MANIFOLD DETAILS



T20 Specifications

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GENERAL MACHINE DIMENSIONS/CAPACITIES

Item	Dimension/capacity
Length	2410 mm (95 in)
Height	1470 mm (58 in)
Height (with overhead guard)	2120 mm (83.5 in)
Width/frame (roller to roller)	1270 mm (50 in)
Width (rear squeegee)	1300 mm (51 in)
Width (with side brush)	1470 mm (58 in)
Cleaning path width (main brush length)–Cylindrical Brush	1020 mm (40 in)
Cleaning path width (with scrubbing side brush)–Cylindrical Brush	1370 mm (54 in)
Cleaning path width (with sweeping side brush)–Cylindrical Brush	1420 mm (56 in)
Main brush diameter (2)–Cylindrical Brush	300 mm (12 in)
Cleaning path width (main brush length)–Disk Brush	1070 mm (42 in)
Main brush diameter (3)–Disk Brush	360 mm (14 in)
Side brush diameter–scrubbing	410 mm (16 in)
Side brush diameter–sweeping (cylindrical only)	530 mm (21 in)
Solution tank capacity	303 L (80 gallons)
Recovery tank capacity	360 L (95 gallons)
Debris tray volume capacity	31 L (1.1 ft^3)
Debris tray weight capacity	50 kg (110 lbs)
Weight – empty	1497 Kg (3300 lbs)
GVWR	2223 Kg (4900 lbs)
Transport ground clearance	80 mm (3 in)
Operating Sound Level At Operator Ear	81 ±1.5 dBA
Vibration level at steering wheel does not exceed	0.2 m/s^2

GENERAL MACHINE PERFORMANCE

Item	Measure
Minimum aisle turn	2790 mm (110 in)
Travel speed forward (maximum)	12.9 Km/h (8 mph)
Travel speed reverse (maximum)	4.8 Km/h (3 mph)
Maximum rated climb and descent at GVWR	10°/18%
Maximum rated climb and descent angle when scrubbing	8°/14%

HYDRAULIC SYSTEM

System	Capacity	Fluid Type
Hydraulic reservoir	38 L (10 gal)	TENNANT part no. 65869 – above 7° C (45° F) TENNANT part no. 65870 – below 7° C (45° F)
Hydraulic total	45 L (12 gal)	

STEERING

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

T20 Specifications

POWER TYPE

Engine	Type	Ignition	Cycle	Aspiration	Cylinders	Bore	Stroke
GM 1.6	Piston	Distributorless-type spark	4	Natural	4	79 mm (3.11 in)	81.5 mm (3.21 in)
	Displacement		Net power, governed			Net power, maximum	
	1600 cc (98 cu in)		23.2 kw (32 hp) @ 2400 rpm			39.5 kw (53 hp) @ 4000 rpm	
	Fuel		Cooling system			Electrical system	
	Gasoline, 87 octane minimum, unleaded Fuel tank: 42 L (11.2 gal)		Water/ethylene glycol antifreeze			12 V nominal	
	LPG, Fuel tank: 15 kg (33 lb)		Total: 7.5 L (2 gal)			75 A alternator	
			Radiator: 3.8 L (1 gal)				
	Idle speed, no load		(Fast) governed speed, under load			Firing order	
	950 ± 50 rpm		2400 ± 50 rpm			1–3–4–2	
	Spark plug gap		Valve clearance, cold			Engine lubricating oil with filter	
	1 mm (0.04 in)		No Adjustment OHC Engine			3.5 L (3.7 qt) 5W30 SAE–SG/SH	

Engine	Type	Ignition	Cycle	Aspiration	Cylinders	Bore	Stroke
Kubota V1505–B	Piston	Diesel	4	Natural	4	78 mm (3.07 in)	78.4 mm (3.08 in)
	Displacement		Net power, governed			Net power, maximum	
	1500 cc (91.4 cu in)		24.6 kw (34 hp) @ 2400 rpm			27.2 kw (37.5 hp) @ 3000 rpm	
	Fuel		Cooling system			Electrical system	
	Diesel Fuel tank: 42 L (11.2 gal)		Water/ethylene glycol antifreeze			12 V nominal	
			Total: 7.5 L (2 gal)			37 A alternator	
			Radiator: 3.8 L (1 gal)				
	Idle speed, no load		(Fast) governed speed, under load			Engine lubricating oil without filter	
	950 ± 50 rpm		2400 ± 50 rpm			6 L (6.35 qt) Diesel rated engine oil above CD grade only	

BRAKING SYSTEM

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

T20 Specifications

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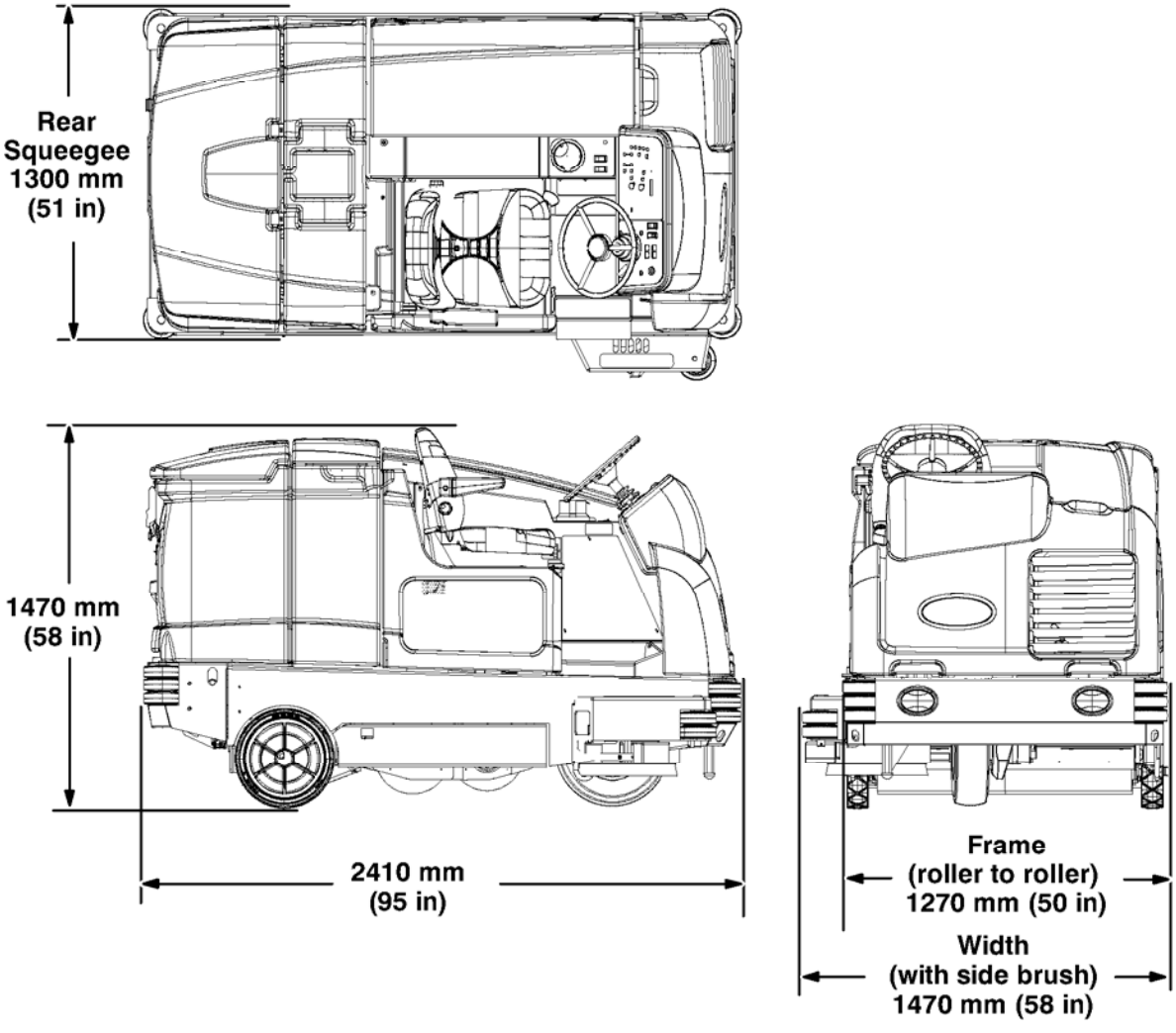
TIRES

Location	Type	Size
Front (1)	Solid	140 mm x 460 mm (5.5 in x 18 in)
Rear (2)	Solid	90 mm x 410 mm (3.5 in x 16 in)

FaST SYSTEM

Item	Measure
Solution pump	12 Volt DC, 11A, 11.6 LPM (3.0 GPM) open flow, 45 psi bypass setting
Low solution flow rate	2.7 LPM (0.7 GPM)
High solution flow rate	5.4 LPM (1.4 GPM)
Detergent pump	12 Volt DC
Low concentrate flow rate	2.6 CC/Minute (0.085 Liquid Ounces/Minute)
High concentrate flow rate	5.2 CC/Minute (0.17 Liquid Ounces/Minute)
Air pump	12 Volt DC, 0.6 Maximum Amp draw
Air pump flow rate	8.7 LPM (0.3 CFM) open flow

MACHINE DIMENSIONS



T20 Basic Troubleshooting

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Trailing water–poor or no water pickup	Scrub vacuum fan turned off	Turn on vacuum fan
	Worn squeegee blades	Rotate or replace squeegee blades
	Squeegee out of adjustment	Adjust squeegee
	No detergent in solution tank causing squeegee to chatter	Add detergent to solution tank
	Vacuum hose clogged	Flush vacuum hoses
	Vacuum screen dirty	Clean vacuum screen
	Recovery tank cover seals worn	Replace seals
	Debris caught in squeegee	Remove debris
	Vacuum hose to squeegee or recovery tank disconnected or damaged	Reconnect or replace vacuum hose
	Recovery tank cover not completely closed	Check for obstructions and make sure cover is closed properly
Scrub vacuum fan will not turn on	Vacuum fan / squeegee button turned off	Turn on Vacuum fan / squeegee button
	Recovery tank full	Drain recovery tank
	Foam filling recovery tank	Empty recovery tank
		Use less detergent/or use defoamer
	Recovery tank sensor dirty or stuck	Clean or replace sensor
Little or no solution flow to the floor (Conventional Scrubbing Mode)	Solution tank empty	Fill solution tank
	Solution flow turned off	Turn on solution flow
	Solution supply lines plugged	Flush solution supply lines
Poor scrubbing performance	*1-STEP Scrub button* not on	Turn on *1-STEP Scrub button*
	Improper detergent or brushes	Call Tennant service representative
	Solution tank empty	Fill solution tank
	Debris caught on main brushes	Remove debris
	Worn main brushes	Replace brushes
	Brush pressure set too light	Increase brush pressure

T20 Basic Troubleshooting

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Problem	Cause	Remedy
FaST System does not operate	FaST button is turned off	Turn on the FaST button
	Clogged FaST-PAK supply hose and/or connector	Soak connector and hose in warm water and clean
	FaST-PAK carton is empty or not connected	Replace FaST-PAK carton and/or connect supply hose
	FaST system is not primed	To prime, operate the FaST solution system for a few minutes
	Clogged filter screen	Drain solution tank, remove and clean filter screen
	Blown fuse	Call Tennant service representative
	Faulty solution pump	Call Tennant service representative
ES System does not operate	*ES button* is turned off	Turn on *ES button*
	ES sensor in tank dirty	Clean sensor
	Clogged ES pump filter	Clean ES filter
	Water level in recovery tank too low	Fill recovery tank about half full
	Water level in solution tank too low	Fill solution tank

MAINTENANCE

Information

BEFORE CONDUCTING TESTS:

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

*** Always use an ESD (Electrostatic Discharge) strap when working near the Control Board**

*** Be cautious when working near Control Board – *Battery voltage is always present, even with Key OFF***

*** Always unhook Battery when removing or replacing components**

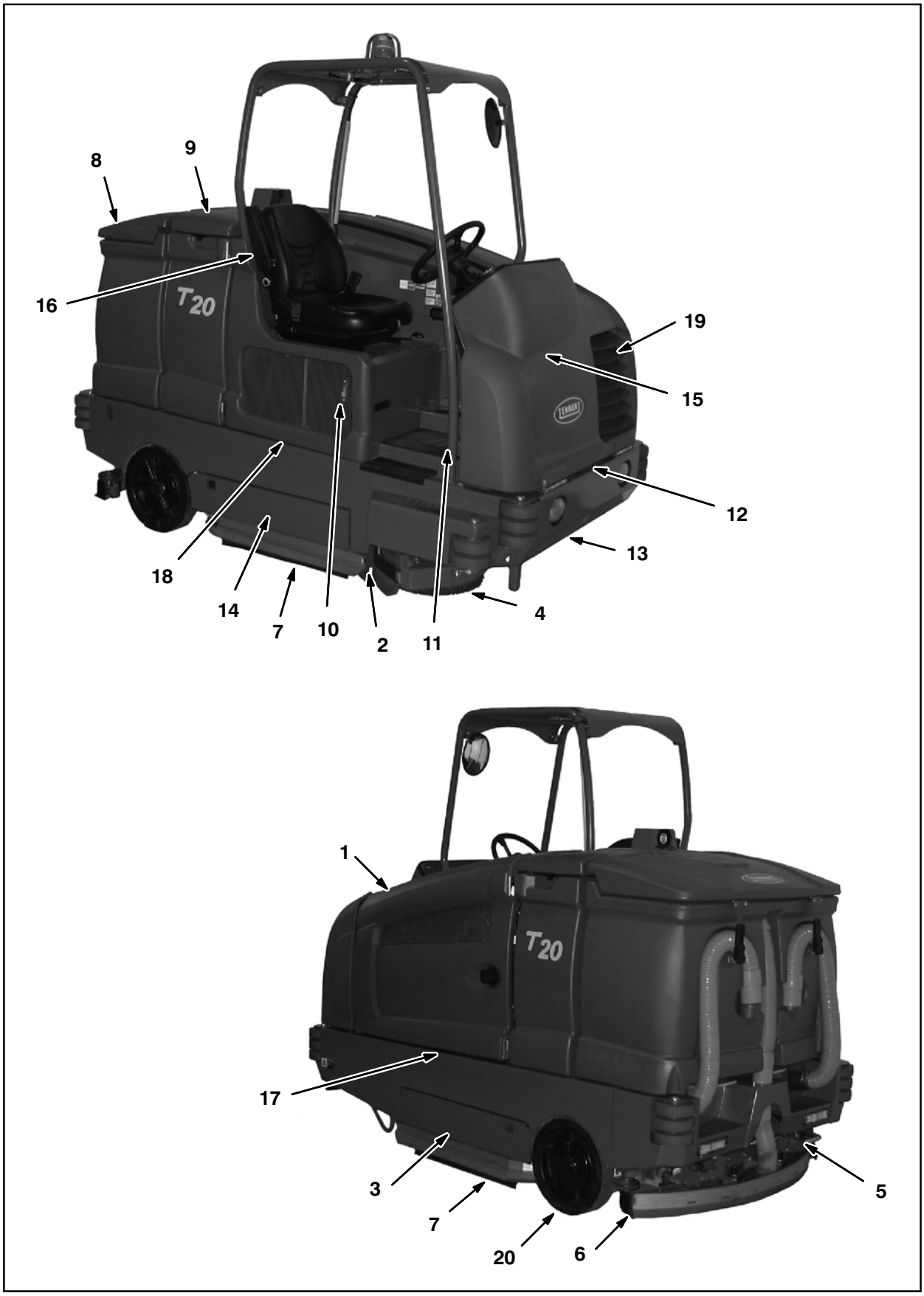
DURING TESTS:

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

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

MAINTENANCE

M



MAINTENANCE CHART

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
Daily	1	Engine	Check oil level	EO	1
			Check coolant level in reservoir	WG	1
			Check belt tension	–	1
	10	Hydraulic fluid reservoir	Check fluid level	HYDO	1
	8, 9	Tank cover seals	Check for damage or wear	–	3
	3, 14	Main brushes (Cylindrical)	Check for damage and wear	–	2
	3, 14	Main brushes or pads (Disk)	Check for damage and wear	–	3
	4	Side brush (option)	Check for damage and wear	–	1
			Check squeegee blade for damage and wear	–	1
	6	Rear squeegee blade	Check for damage and wear	–	1
			Check deflection	–	1
	7	Side squeegee blades	Check for damage and wear	–	2
	8	Recovery tank	Clean	–	1
	8	Recovery tank, ES mode (option)	Clean ES filter	–	1
	9	Solution tank, ES mode (option)	Clean	–	1
	5	Debris tray	Clean debris tray, screen, and hose	–	1
50 Hours	16	FaST filter screen (Option)	Clean	–	1
	3, 14	Main brushes (Cylindrical)	Check brush pattern and rotate front to rear	–	2
	13	Front wheel	Torque wheel nuts **(after initial 50 hours only)**	–	1
	15	Battery	Clean and tighten battery cable connections **(after initial 50 hours only)**	–	1
100 Hours	19	Radiator	Clean core exterior	–	1
			Check coolant level	WG	1
	19	Hydraulic cooler	Clean core exterior	–	1
	1	Engine	Change oil and filter	EO	1
	13, 20	Tires	Check for damage	–	3
	6	Rear squeegee casters	Lubricate	SPL	2
	6	Rear squeegee	Check leveling	–	1
	2	Scrub head skirt	Check for damage or wear	–	1
	3, 14	Disk scrub head stop bumper	Check for damage or wear	–	2

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
200 Hours	12	Front wheel support bearings	Lubricate	SPL	2
	17, 18	Torque tube (Cylindrical brushes)	Lubricate	SPL	4
	3, 14	Torque tube (Disk brushes)	Lubricate	SPL	4
	3	Pivot shaft (Disk brushes)	Lubricate	SPL	4
	12	Steering cylinder	Lubricate	SPL	1
	1, 19	Radiator hoses and clamps	Check for tightness and wear	–	2
	11	Parking brake	Check adjustment	–	1
	11	Brake pedal	Check adjustment	–	1
	16	FaST air filter (Option)	Clean	–	1
400 Hours	1	Engine	Clean and re-gap or replace spark plugs (Gas/LPG)	–	4
			Replace air filter	–	1
			Replace fuel filter (LPG/Diesel)	–	1
800 Hours	10	Hydraulic reservoir	Change hydraulic fluid	HYDO	1
			Replace strainer outlet		1
			Replace filler cap		1
			Replace fluid filter	–	1
	1	Engine	Check timing belt (Gas/LPG)	–	1
			Replace fuel filter (Gasoline)	–	1
	–	Hydraulic hoses	Check for wear and damage	–	All
	1, 19	Cooling system	Flush	WG	2
	13	Propelling motor	Torque shaft nut	–	1
	13	Front wheel	Torque wheel nuts	–	1
	15	Battery	Clean and tighten battery cable connections	–	1
2000 Hours	1	Engine	Replace timing belt (Gas/LPG)	–	1

LUBRICANT/FLUID

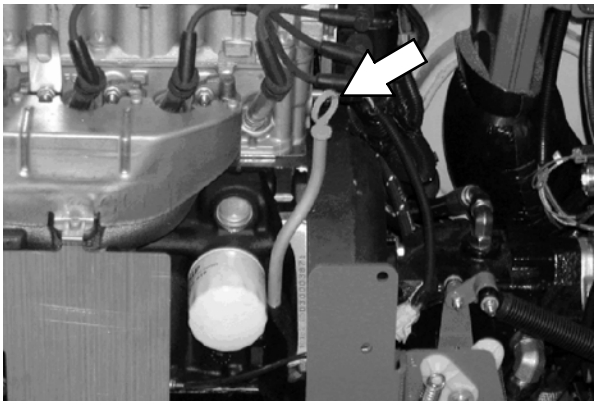
EO . . . . . Engine oil, Gas/LPG: 10W30 SAE--SG/SH only; Diesel: Rating above CD grade only
HYDO . Tennant or approved hydraulic fluid
WG . . . Water and ethylene glycol anti-freeze, -34° C (-30° F)
SPL . . . Special lubricant, Lubriplate EMB grease (Tennant part number 01433-1)

NOTE: More frequent maintenance intervals may be required in extremely dusty conditions.

LUBRICATION

GAS/LPG ENGINE OIL

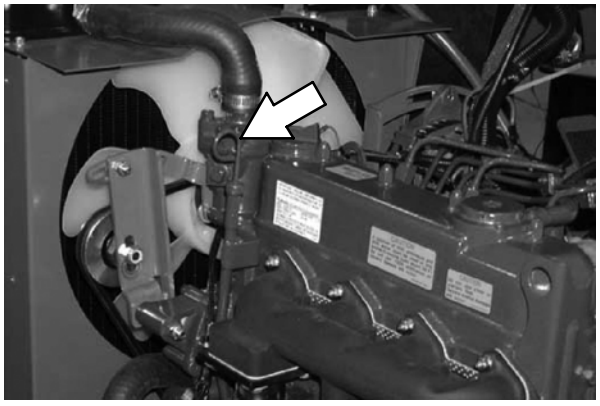
Check the engine oil level daily. Change the oil and oil filter after every 100 hours of operation.



Fill the engine with oil until the oil is between the indicator marks on the dipstick. DO NOT fill past the top indicator mark. The engine oil capacity is 3.5 L (3.7 qt) with oil filter.

DIESEL ENGINE OIL

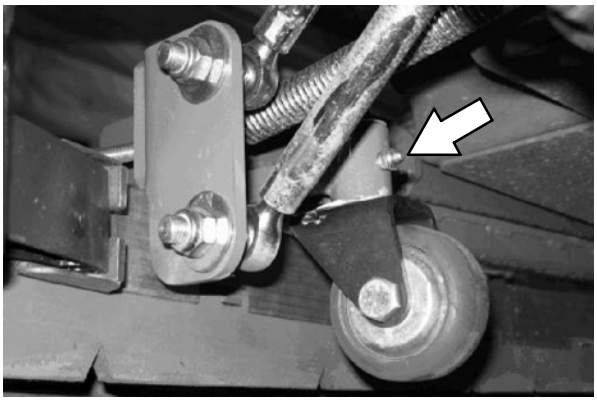
Check the engine oil level daily. Change the oil and oil filter after every 100 hours of operation. Use engine oil with a diesel rating above CD grade only.



Fill the engine with oil until the oil is between the indicator marks on the dipstick. DO NOT fill past the top indicator mark. The engine oil capacity is 6 L (6.35 qt) with oil filter.

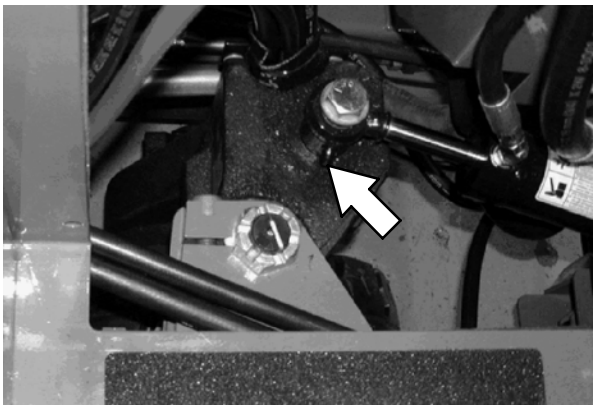
SQUEEGEE CASTER BEARINGS

Lubricate the squeegee caster bearings after every 100 hours of operation.



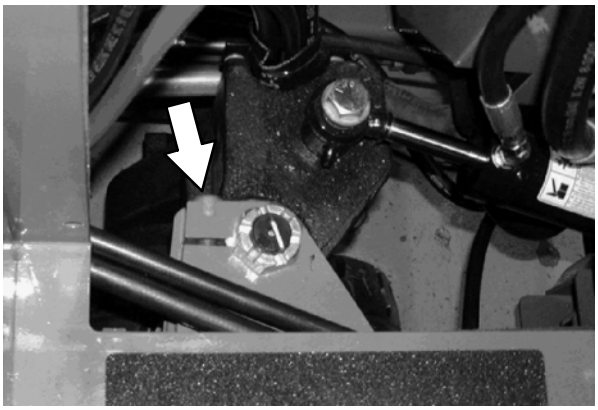
STEERING CYLINDER BEARING

Lubricate the steering cylinder after every 200 hours of operation. The steering cylinder bearing is located next to the front wheel support.



FRONT WHEEL SUPPORT BEARING

Lubricate the front wheel support bearings after every 200 hours of operation. Both front wheel support grease fittings are located underneath the frame support plate.



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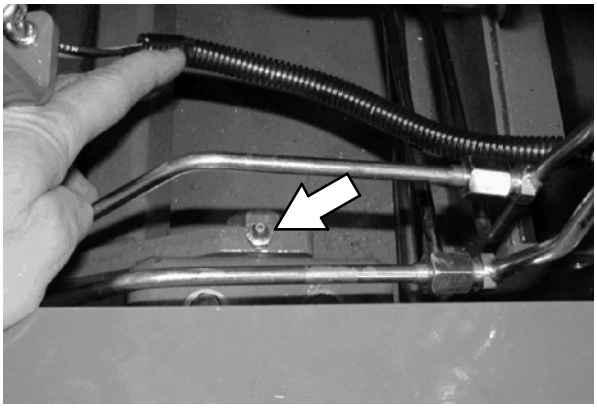
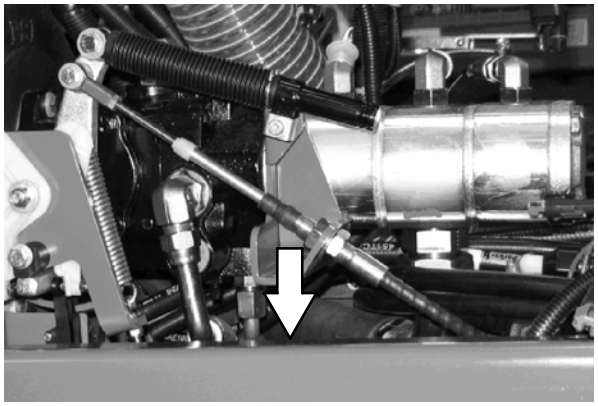
TORQUE TUBES–CYLINDRICAL BRUSHES

Lubricate the torque tubes after every 200 hours of operation. The torque tube grease fittings on the operator side of the machine are located beneath the fuel tank.

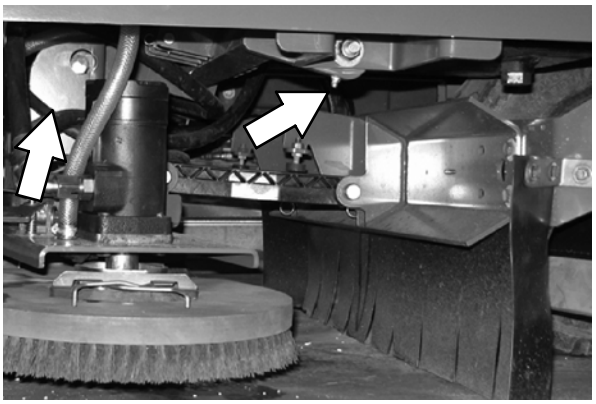


On the other side of the machine the torque tube grease fittings are located beneath the propel pump.



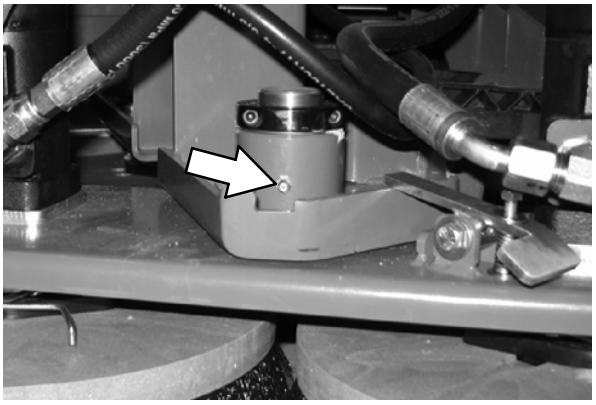
TORQUE TUBES–DISK BRUSHES

Lubricate the three torque tube fittings after every 200 hours of operation. The first two fittings are located on each side of the machine and the third is located above the center brush.



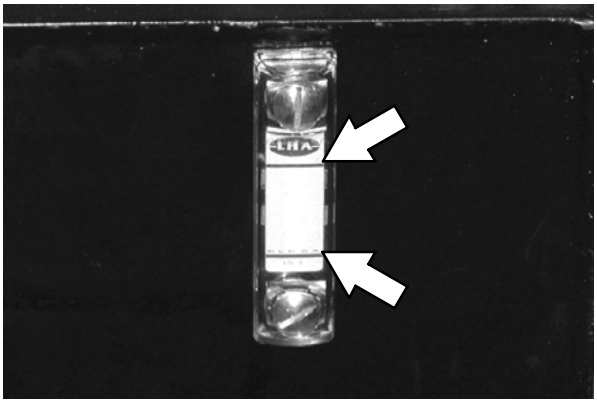
PIVOT SHAFT–DISK BRUSHES

Lubricate the pivot shaft after every 200 hours of operation.



HYDRAULICS

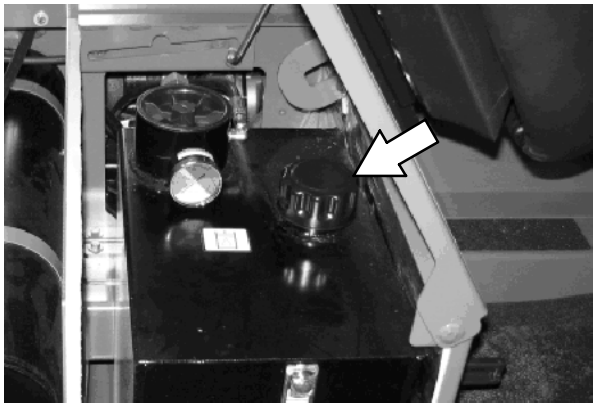
Check the hydraulic fluid level at operating temperature daily. The hydraulic fluid level should be between the two lines on the hydraulic gauge.



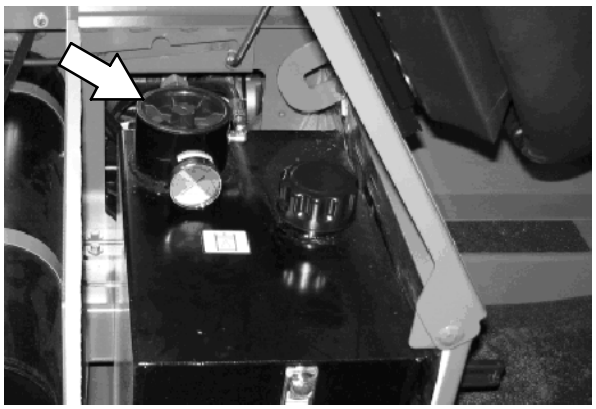
ATTENTION! Do not overfill the hydraulic fluid reservoir or operate the machine with a low level of hydraulic fluid in the reservoir. Damage to the machine hydraulic system may result.

Drain and refill the hydraulic fluid reservoir with new hydraulic fluid after every 800 hours of operation.

Replace the filler cap after every 800 hours of operation. Apply a light film of hydraulic fluid onto the filler cap gasket before installing the cap onto the reservoir.



Replace the hydraulic fluid filter after every 800 hours of operation or if the hydraulic reservoir gauge is in the yellow/red zone when the reservoir hydraulic fluid is approximately 32°C (90° F).



Replace the hydraulic strainer outlet after every 800 hours of operation.

HYDRAULIC FLUID

Tennant hydraulic fluid is specially selected to meet the needs of Tennant machines. There are two fluids available for different temperature ranges:

Tennant part no.	Ambient Temperature
65869	above 7° C (45° F)
65870	below 7° C (45° F)

High temperature fluids have a higher viscosity (thicker) and should only be used in high temperature environments. Low temperature fluids have a lower viscosity (thinner) and should only be used in cold temperature environments. Select the appropriate hydraulic fluid for the environment where the machine is operated. Using improper hydraulic fluids can cause premature failure of hydraulic components.

If using a locally-available hydraulic fluid, be sure the specifications match Tennant hydraulic fluid specifications. Substitute fluids can cause premature failure of hydraulic components.

ATTENTION! Hydraulic components depend on system hydraulic fluid for internal lubrication. Malfunctions, accelerated wear, and damage will result if dirt or other contaminants enter the hydraulic system.

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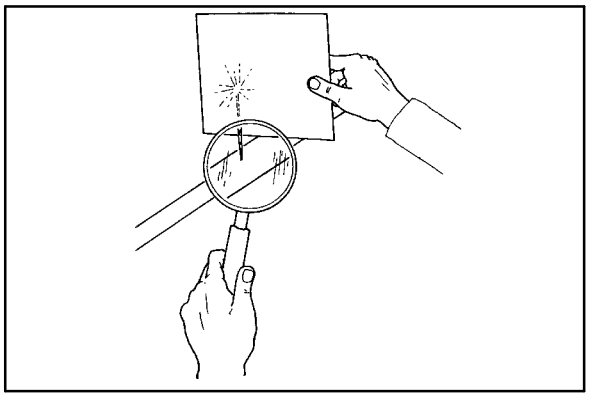
HYDRAULIC HOSES

Check the hydraulic hoses after every 800 hours of operation for wear or damage.

FOR SAFETY: When servicing machine, use cardboard to locate leaking hydraulic fluid under pressure.

High pressure fluid escaping from a very small hole can almost be invisible, and can cause serious injuries.



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Consult a physician immediately if injury results from escaping hydraulic fluid. Serious infection or reaction can occur if proper medical treatment is not given immediately.

Contact a mechanic or supervisor if a leak is discovered.

ENGINE

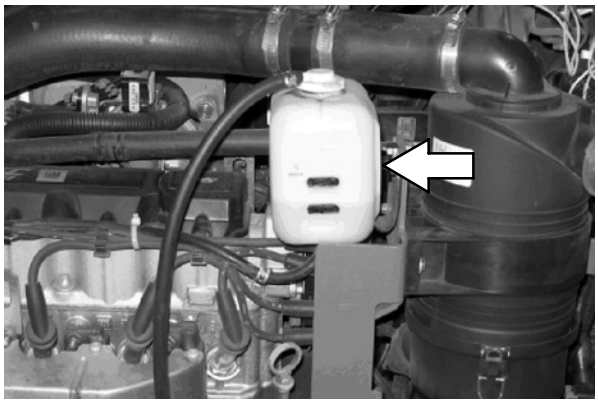
COOLING SYSTEM

FOR SAFETY: When servicing machine, avoid contact with hot engine coolant.

Check the coolant level in the reservoir daily. The coolant level must be between the two indicator marks when the engine is cold.

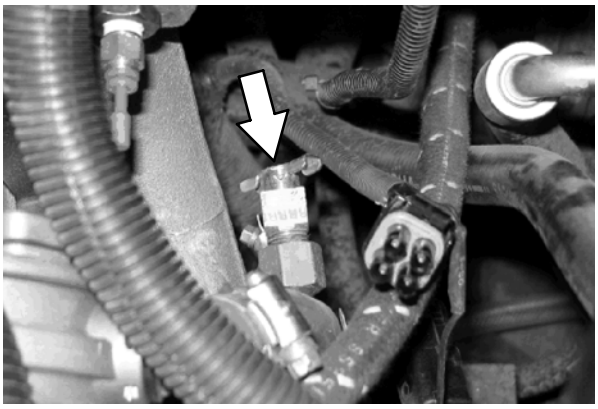
FOR SAFETY: When servicing machine, do not remove cap from radiator when engine is hot. Allow engine to cool.

Check the coolant level in the radiator after every 100 hours of operation. Refer to the label on the coolant container for water/coolant mixing instructions.

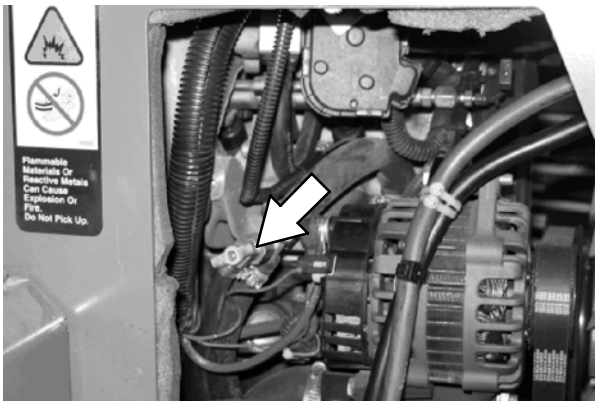


The cooling system must be completely filled with coolant to keep the engine from overheating. When filling the cooling system, open the drain cocks to bleed the air from the system.

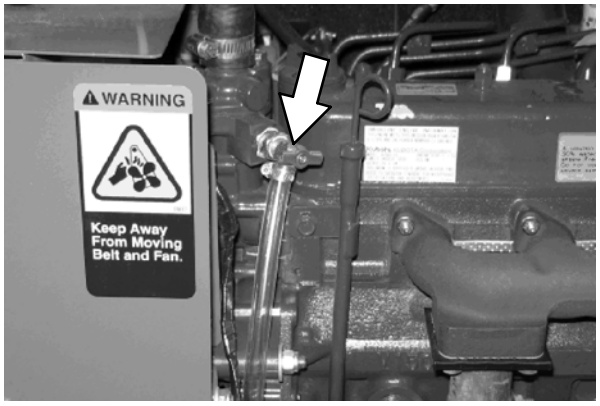
Location of drain cock on LPG machines.



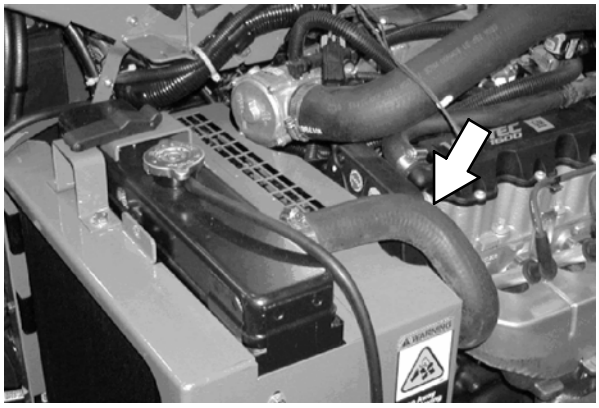
Location of drain cock on gasoline machines. Remove the panel from operators compartment to access the drain cock.



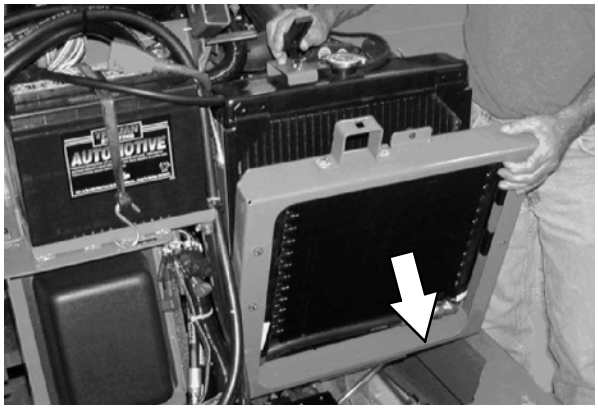
Location of drain cock on diesel machines.



Check the radiator hoses and clamps after every 200 hours of operation. Tighten loose clamps. Replace damaged hoses and clamps.



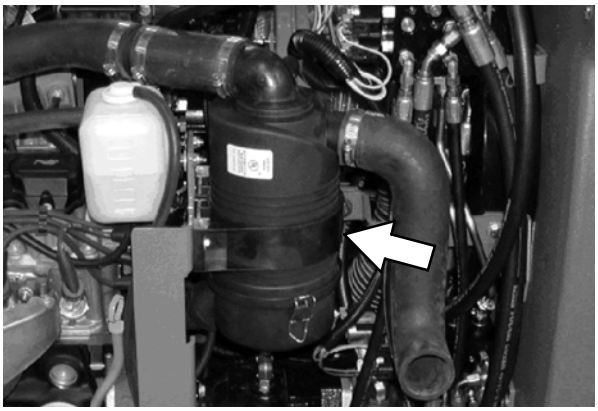
Check the radiator core exterior and hydraulic cooler fins for debris after every 100 hours of operation. Blow or rinse all dust through the grille and radiator fins, in the opposite direction of normal air flow. Be careful to not bend the cooling fins when cleaning. Clean thoroughly to prevent the fins from becoming encrusted with dust. To avoid cracking the radiator, allow the radiator and cooler fins to cool before cleaning.



FOR SAFETY: When servicing machine, wear eye and ear protection when using pressurized air or water.

AIR FILTER

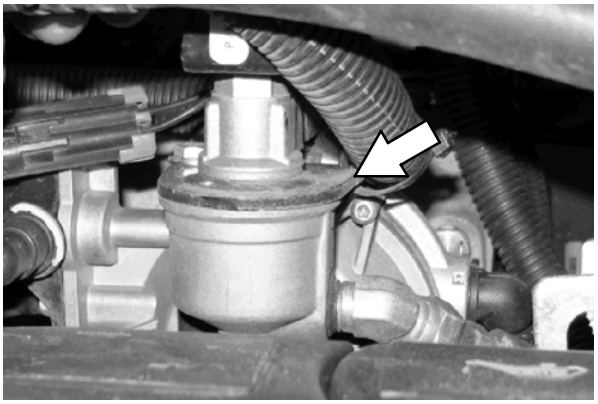
Replace the air filter after every 400 hours of operation.



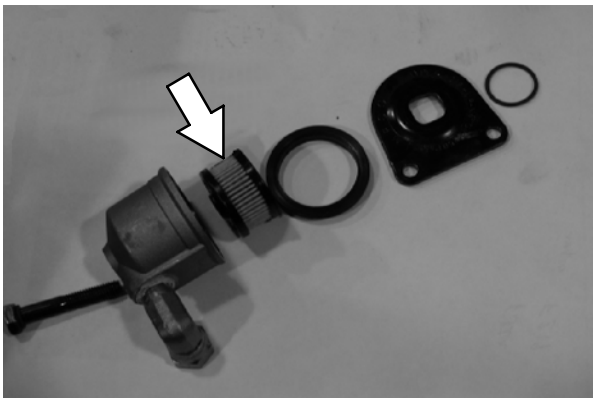
FUEL FILTER (LPG)

Replace the LPG fuel filter after every 400 hours of operation.

FOR SAFETY: When servicing machine, keep flames and sparks away from fuel system service area. Keep area well ventilated.



Disassemble the fuel lock off valve to access the LPG fuel filter.



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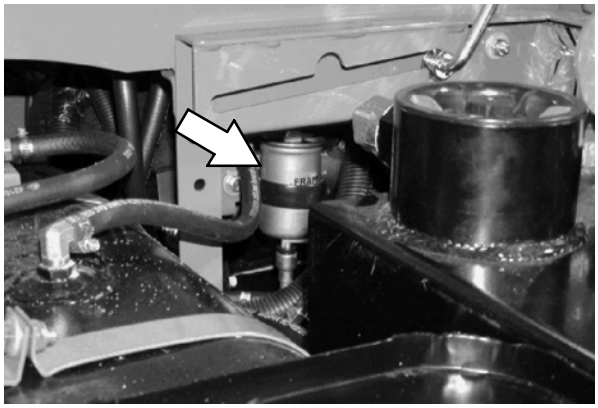
FUEL FILTER (Gasoline)

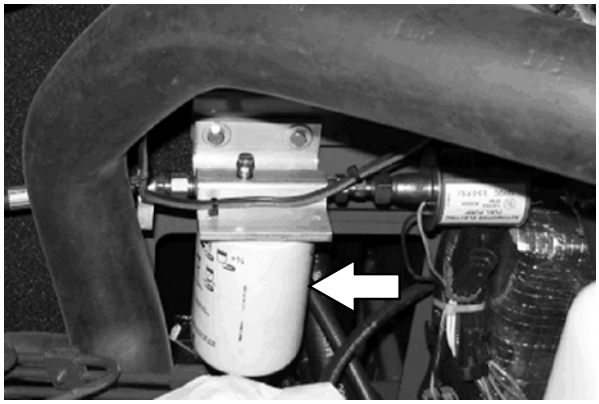
Replace the gasoline fuel filter after every 800 hours of operation.

FOR SAFETY: When servicing machine, keep flames and sparks away from fuel system service area. Keep area well ventilated.



FUEL FILTER (DIESEL)

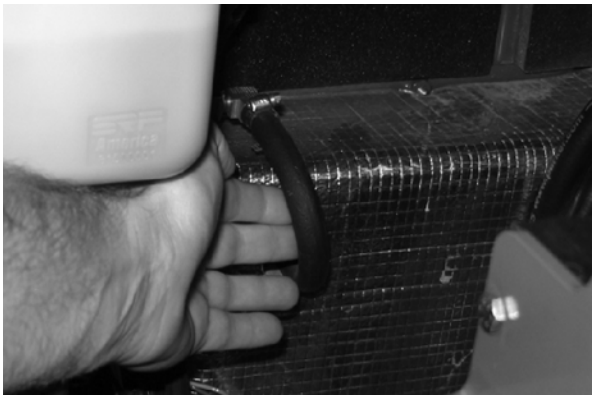
Replace the diesel fuel filter after every 400 hours of operation.

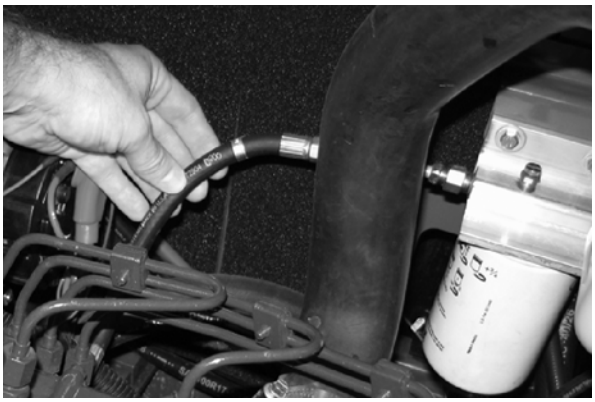


FOR SAFETY: When servicing machine, keep flames and sparks away from fuel system service area. Keep area well ventilated.

FUEL LINES (DIESEL)

Check the fuel lines every 50 hours of operation. If the clamp band is loose, apply oil to the screw of the band and securely tighten the band.





The diesel rubber fuel lines can become worn-out whether the engine has been used much or not. Replace the fuel lines and clamp bands every two years.

FOR SAFETY: When servicing machine, keep flames and sparks away from fuel system service area. Keep area well ventilated.

If the fuel lines and clamp bands are found worn or damaged before two years' time; replace or repair them at once. Bleed the fuel system after replacement of any fuel lines, see PRIMING THE FUEL SYSTEM. When the fuel lines are not installed, plug both ends with clean cloth or paper to prevent dirt from entering the lines. Dirt in the lines can cause fuel injection pump malfunction.

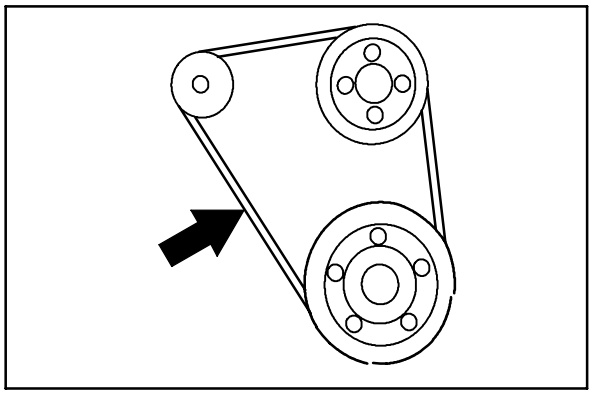
PRIMING THE DIESEL FUEL SYSTEM

Typical diesel fuel systems require priming to remove pockets of air from the fuel lines and fuel components. This is usually required after running out of fuel, changing fuel filter elements or repairing a fuel system component. Air in the fuel prevents smooth engine operation.

This fuel system however is self-priming. The return line comes from the top of the injector that allows the air to escape through the return line.

ENGINE BELT

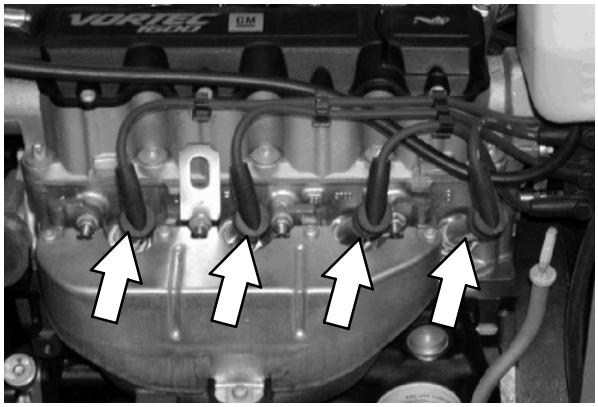
Check the belt tension daily. Adjust tension as necessary. Proper belt tension is 13 mm (0.50 in) from a force of 4 to 5 kg (8 to 10 lb) applied at the mid-point of the longest span.



WARNING: Moving belt and fan. Keep away.

SPARK PLUGS

Clean or replace, and set the gap of the spark plugs after every 400 hours of operation. The proper spark plug gap is 1 mm (0.042 in).



TIMING BELT

Check the timing belt after every 800 hours of operation.

Replace the timing belt after every 2000 hours of operation.

BATTERY

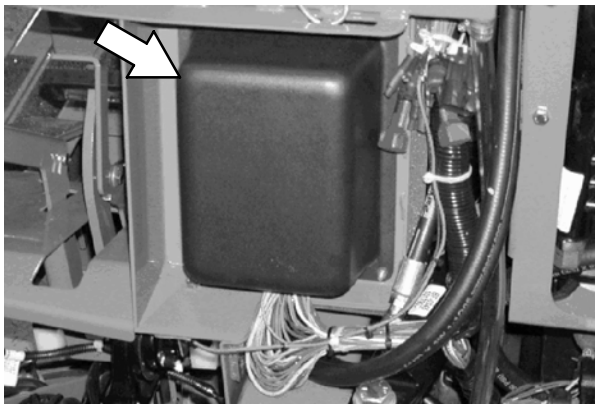
Clean and tighten the battery connections after the first 50 hours of operation and after every 800 hours after that. Do not remove the vent plugs from the battery or add water to the battery.

FOR SAFETY: When servicing machine, avoid contact with battery acid.

FUSES AND RELAYS

RELAY PANEL FUSES AND RELAYS

Fuses are one-time protection devices designed to protect the wire harness by stopping the flow of current in the event of a circuit overload. *Relays* switch the electrical power going to the machine electrical systems on/off. Remove the relay panel cover to access *fuses* and *relays*.



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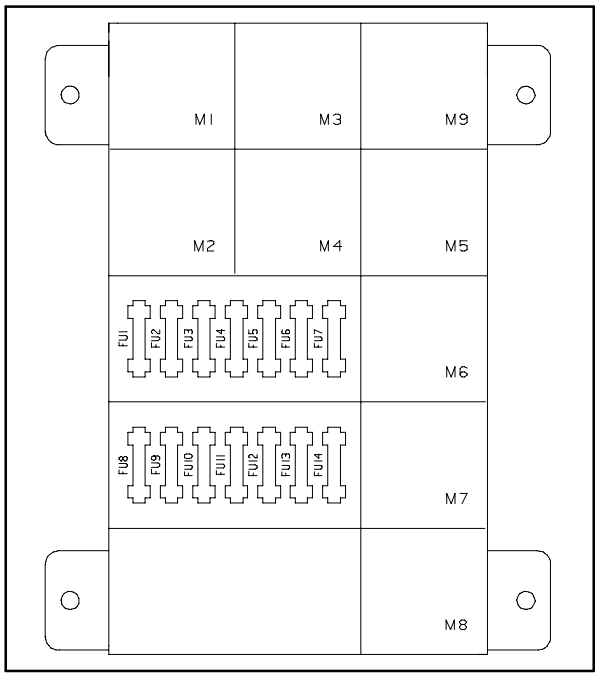
NOTE: Always replace a fuse with a fuse of the same amperage. Extra 15 Amp fuses are provided inside the relay panel drawer on the relay panel.

Refer to the diagram below for locations of the *fuses* and *relays* on the relay panel. The M10 relay for the optional spray nozzle is located behind the battery.



Refer to the table below for the *fuses* and circuits protected.

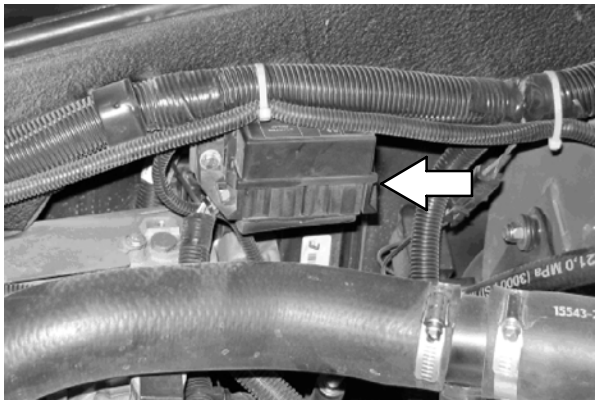
Fuse	Rating	Circuit Protected
FU1	15 A	Auxiliary Relays/Engine Controls
FU2	15 A	Not Used
FU3	15 A	Horn
FU4	15 A	Not Used
FU5	15 A	Scrub Vacuum/Main Brush/ Squeegee Down
FU6	15 A	Enable/Side Brush
FU7	15 A	Solution/Auto Fill/Reverse
FU8	15 A	ES/FaST/Detergent/Spray Wand
FU9	15 A	Lights
FU10	15 A	Unswitched B+ for controller board
FU11	15 A	Not Used: Options
FU12	15 A	Spray Nozzle Pump
FU13	15 A	Not Used
FU14	15 A	Not Used

Refer to the table below for the *relays* and circuits controlled.

Relay	Rating	Circuit Controlled
M1	12 VDC, 40 A	Auxiliary 1
M2	12 VDC, 40 A	Auxiliary 2
M3	12 VDC, 40 A	Not Used
M4	12 VDC, 40 A	Reverse
M5	12 VDC, 40 A	Horn
M6	12 VDC, 40 A	Shutdown
M7	12 VDC, 40 A	Starter
M8	12 VDC, 40 A	Starter (Diesel only)
M9	12 VDC, 40 A	Starter Timer (Diesel only)
M10	12 VDC. 40 A	Fuel Pump (Diesel only)
M11	12 VDC. 40 A	FaST Water Pump (located in FaST harness)
M12	12 VDC. 40 A	Spray Wand (located in Spray wand harness)

ENGINE HARNESS FUSES AND RELAYS

The *engine harness fuses* and *relays* are located in the fuse box on the side panel inside the engine compartment. Refer to the fuse box cover for locations of engine harness fuses and relays.



NOTE: Always replace a fuse with a fuse of the same amperage.

SCRUB BRUSHES AND PADS

The machine can be equipped with either *disk* or *cylindrical* scrub brushes, or cleaning pads. Check scrub brushes or pads daily for wire or string tangled around the brush or brush drive hub. Also check brushes or pads for damage and wear.

DISK BRUSHES

The scrub brushes should be replaced if a large number of bristles are missing or if bristle length is less than 19 mm (0.75 in).

Cleaning pads must be placed on pad drivers before they are ready to use. The cleaning pad is held in place the center disk.

Cleaning pads need to be cleaned immediately after use with soap and water. Do not wash the pads with a pressure washer. Hang pads, or lay pads flat to dry.

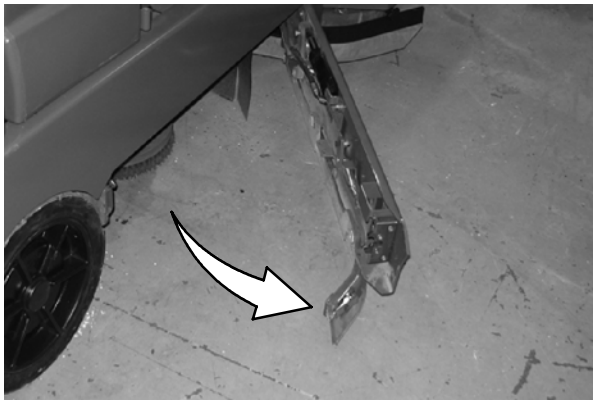
NOTE: Always replace brushes and pads in sets. Otherwise one brush or pad will be more aggressive than the other.

REPLACING DISK BRUSHES OR PAD DRIVER

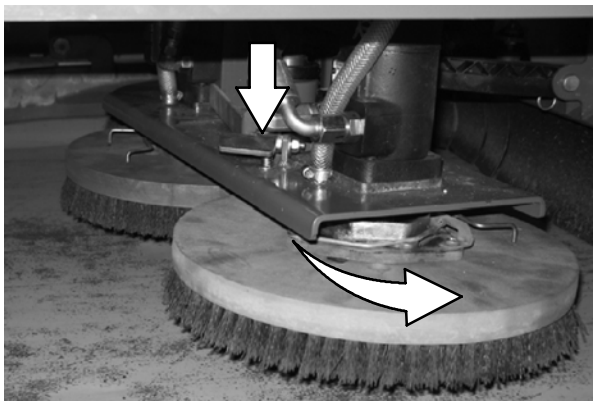
1. Raise the scrub head.

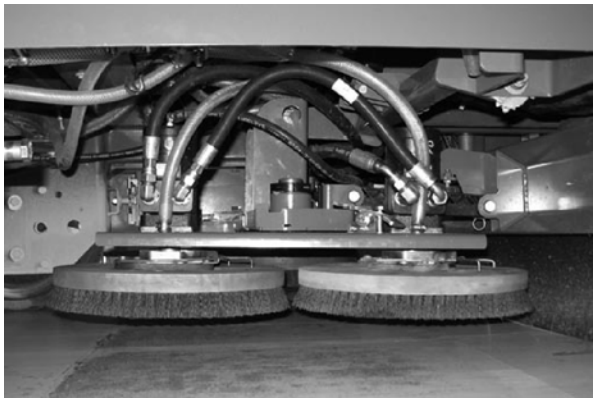
FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, and turn off machine.

2. Open the right outer brush door.



3. Hold down the release lever and rotate the adjustable disk brush head until it is possible to access the center brush.





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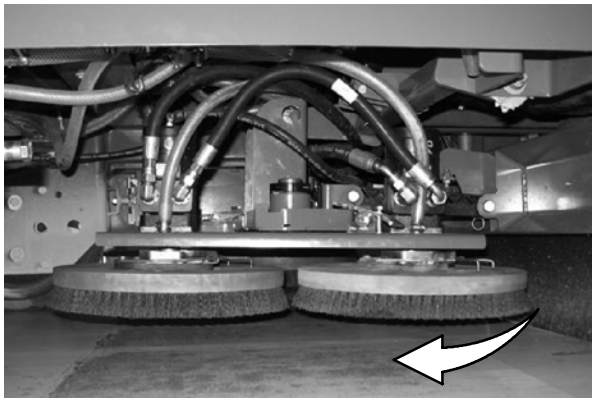
4. Turn the brushes until the spring handles are visible.

5. Squeeze the spring handles and let the brushes drop to the floor.

6. Remove the brushes from underneath the scrub head.

7. Place the new brushes underneath the scrub head and lift each brush up onto the hub until the brush locks onto the hub.

8. Rotate the disk brush head back to the scrub position until the head locks into place.



9. Close the right outer brush door.

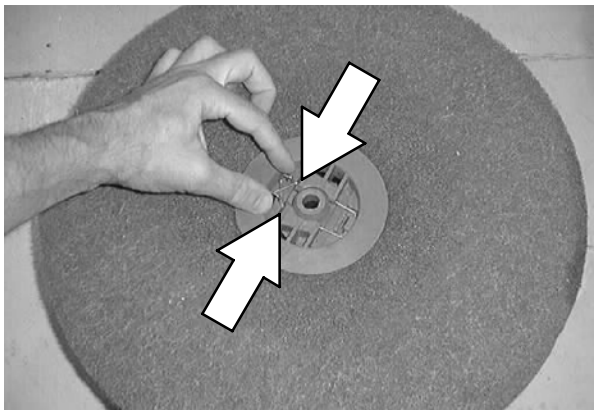
10. Open the left outer brush door and repeat the procedure for the left brush.

NOTE: The center brush can only be accessed from the right side of the machine.

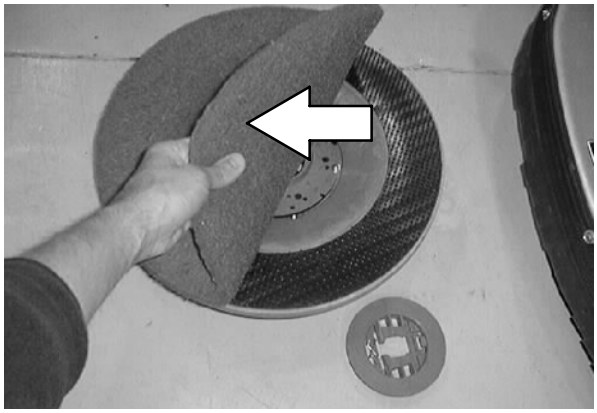
REPLACING DISK PADS

1. Remove the pad driver from the machine.

2. Squeeze the spring clip together to remove the center disk.



3. Flip or replace the scrub pad, center the scrub pad on the pad driver. Then reinstall the center disk to secure the pad in place on the pad driver.



4. Reinsert the pad driver into the machine.

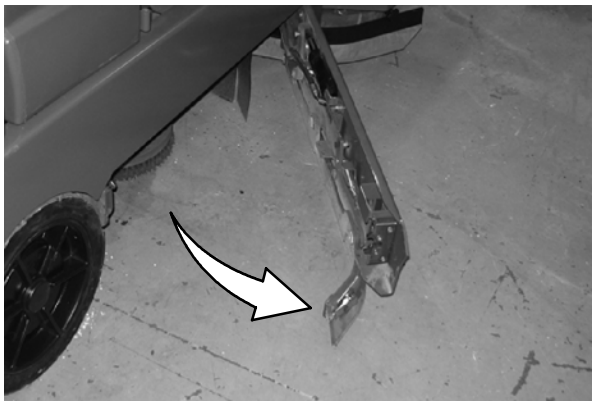
CHECKING THE DISK SCRUB HEAD STOP BUMPERS

The disk scrub head stop bumpers keep the scrub head parallel with the floor when in the raised position. This protects the brushes when transporting. Check the lift stop bumpers after every 100 hours of operation for wear or damage.

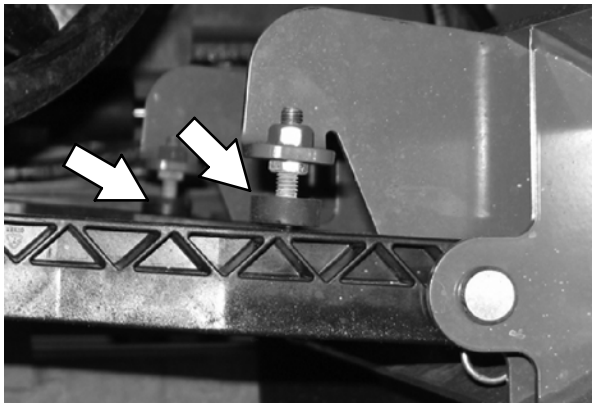
1. Raise the scrub head.

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

2. Open the right and left outer brush doors.



3. Inspect the scrub head stop bumpers. Adjust the bumpers if the scrub head is not parallel with the floor. Replace worn or damaged bumpers.



CYLINDERICAL BRUSHES

Check the brush pattern and rotate the brushes from front-to-rear after every 50 hours of machine operation for maximum brush life and best scrubbing performance.

The cylindrical brushes should be replaced if large amounts of bristles are missing, or if the remaining bristle length is less than 15 mm (0.62 in).

NOTE: Replace worn brushes in pairs. Scrubbing with brushes of unequal bristle length will result in diminished scrubbing performance.

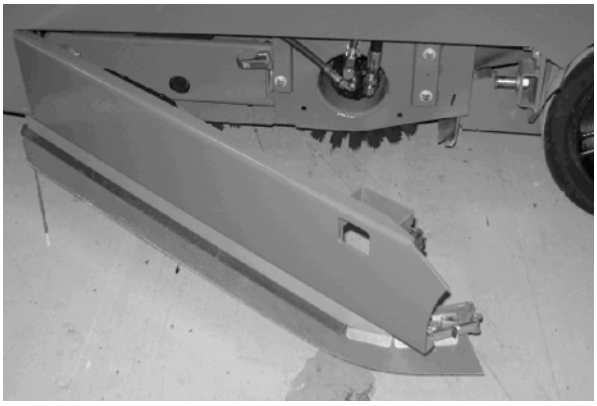
REPLACING OR ROTATING CYLINDERICAL BRUSHES

The front brush can be accessed on the left side of the machine and rear brush can be accessed on the right side of the machine.

1. Raise the scrub head.

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

2. Open the outer brush doors.



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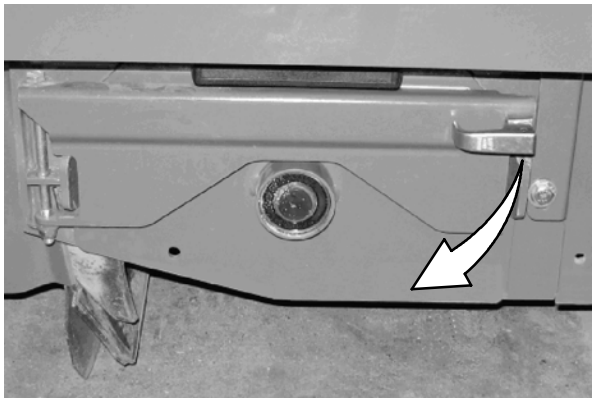
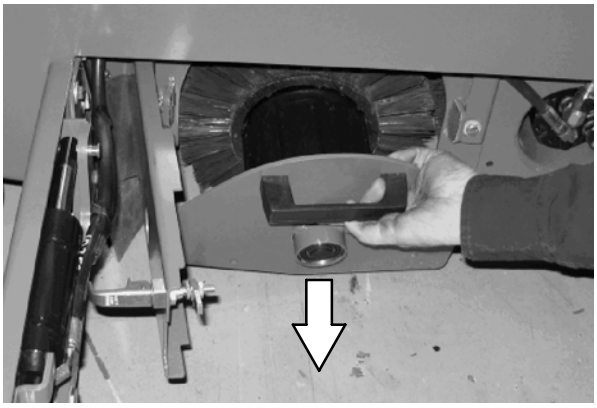
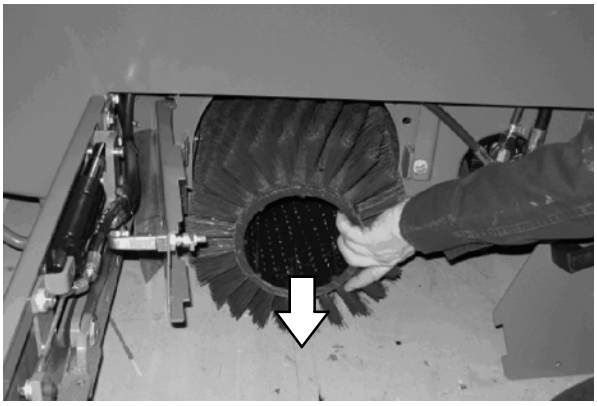
3. Open the inner brush doors.



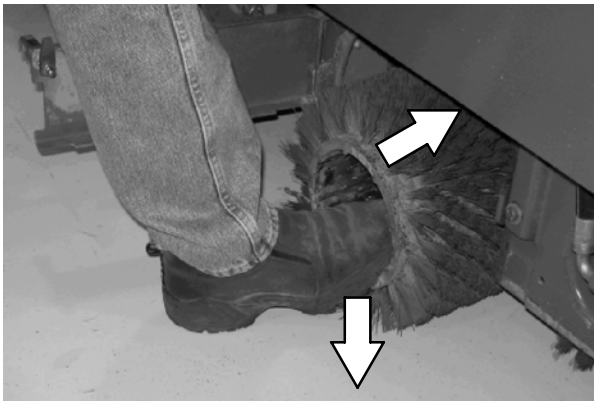
4. Remove the brush idler plates.



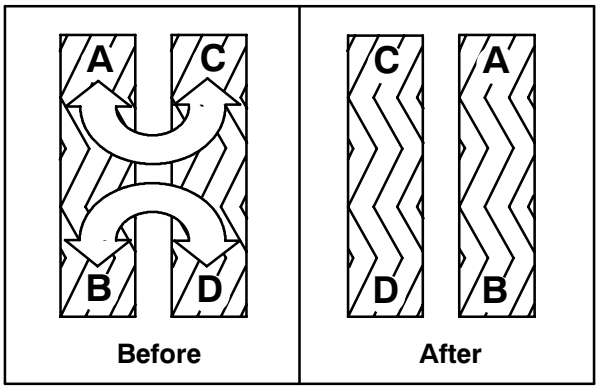
5. Pull the brushes out from the scrub head.



6. Install the new or rotated brushes by pushing down on the ends while sliding them onto the drive motor hubs.



7. If rotating the existing brushes, only rotate front to rear. Do NOT rotate end-for-end.



8. Reinstall the brush idler plates.

9. Close the inner and outer brush doors.

10. Check and adjust the brush pattern if needed. Refer to *CHECKING CYLINDERICAL BRUSH PATTERN*.

CHECKING CYLINDERICAL BRUSH PATTERN

1. Apply chalk, or a similar marking material, to a smooth and level section of the floor.

NOTE: If chalk or other material is not available, allow the brush to spin on the floor for two minutes. A polish mark will remain on the floor.

2. Raise the scrub head, then position the brushes over the chalked area.

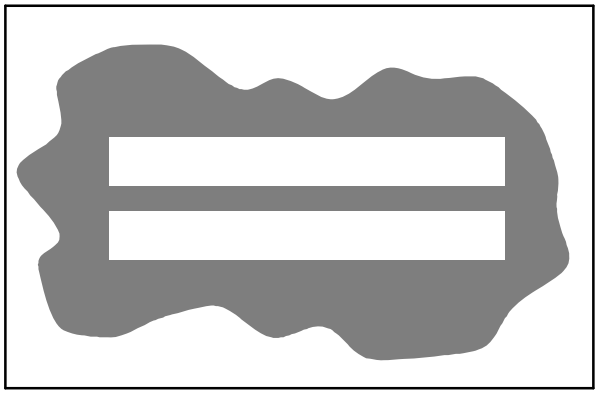
3. Set the parking brake.

4. Press the *1-STEP Scrub button* to lower the scrub head. Set the brush pressure to the lowest setting and allow the brushes to operate for 15 to 20 seconds. Keep the scrub head in one spot in the chalked area.

5. Raise the scrub head, release the parking brake, and drive the machine away from the chalked area.

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

6. Observe the brush patterns. If the brush pattern is the same width across the entire length of each brush and both brushes are the same width, no adjustment is necessary.



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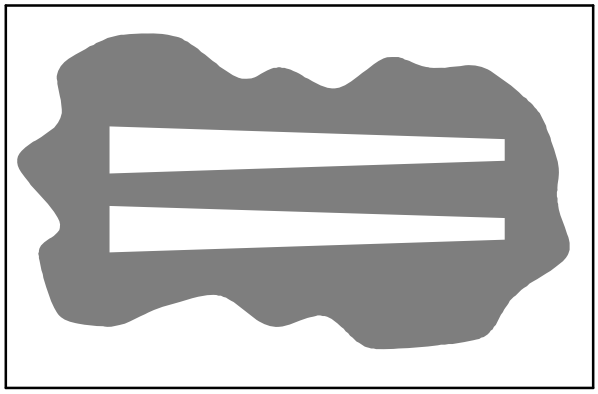
7. If the brush patterns are tapered, see *ADJUSTING THE CYLINDERICAL BRUSH TAPER* section of this manual.



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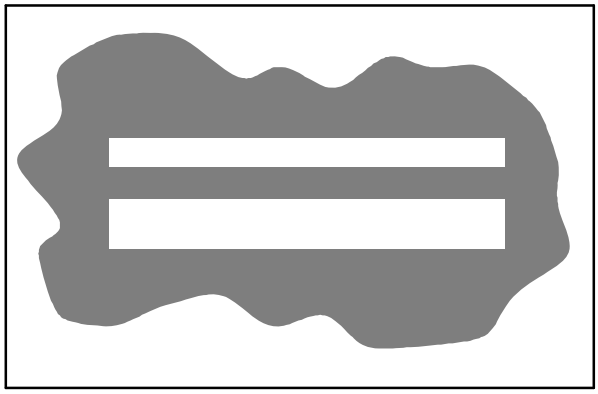
8. The brush patterns should be 75 to 130 mm (3 to 5 in) wide with the brushes in the lowered position and both patterns should be the same width. If the width of the brushes is not the same, see *ADJUSTING THE CYLINDERICAL BRUSH WIDTH* section of this manual.



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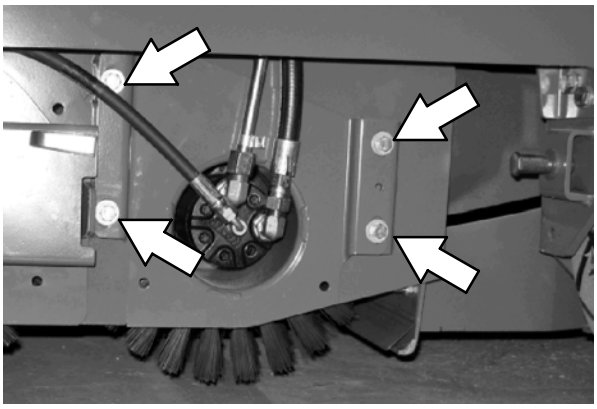
ADJUSTING THE CYLINDERICAL BRUSH TAPER

1. Loosen the four mounting bolts on the brush drive housing.

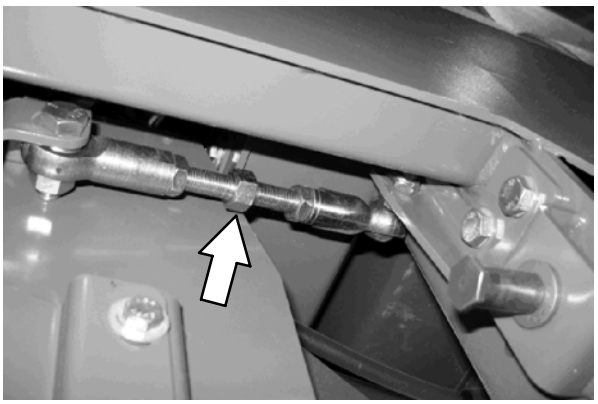


2. Move the brush drive housing up to decrease the pattern width on that side of the scrub head or down to increase the pattern width on that side of the scrub head.
3. Tighten the mounting bolts.
4. Recheck the pattern. Readjust if necessary.

ADJUSTING THE CYLINDERICAL BRUSH WIDTH

1. Adjust the length of the drag links on both sides of the scrub head. Lengthen the drag links to increase the rear brush pattern width. Shorten the drag links to increase the front brush pattern. Always adjust the nut on each drag link an equal number of turns.

NOTE: Two full turns of the drag link adjustment bolt will change the brush pattern approximately 25 mm (1 in).



2. Recheck the pattern. Readjust if necessary.

SIDE BRUSH (OPTION)

Check the side brush daily for wear or damage. Remove any tangled string or wire from the side brush or side brush drive hub.

REPLACING THE SIDE BRUSH

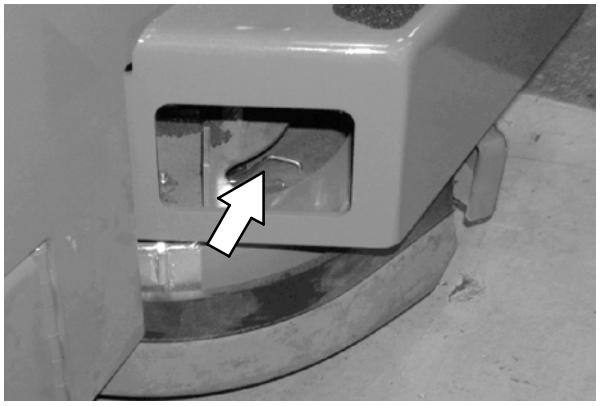
Replace the side brush when it no longer cleans effectively or when the remaining bristles are 19 mm (0.75 in) or less in length.

1. If necessary, raise the side brush.

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

2. Turn the brush until the spring handles are visible through the access hole in the side brush assembly.

3. Squeeze the spring handles and let the side brush drop to the floor.



4. Remove the side brush from underneath the side brush assembly.

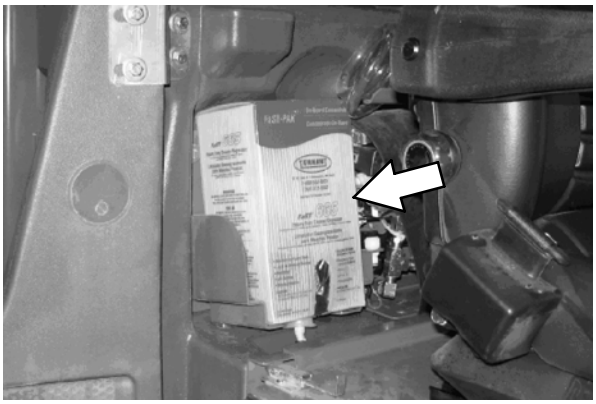
5. Place the new side brush underneath the side brush assembly and lift the side brush up onto the side brush hub until the brush locks onto the hub.

FaST SYSTEM

REPLACING THE FaST-PAK CARTON

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

1. Open the side access door.
2. Slide the seat completely forward.
3. Squeeze the button on the FaST supply hose connector, then pull the empty FaST-PAK carton out from the compartment and discard.



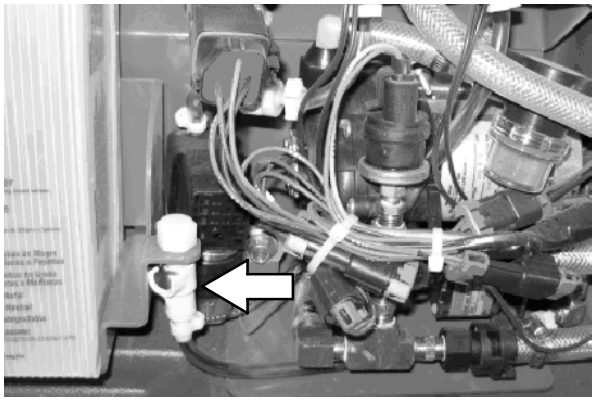
4. Remove the perforated knock outs from the new FaST-PAK carton. Do Not remove the bag from the carton. Pull out the hose connector located on the bottom of the bag and remove the hose cap from the connector.

NOTE: The FaST-PAK Floor Cleaning Concentrate is specially designed for use with the FaST system scrubbing application. NEVER use a substitute. Other cleaning solutions may cause FaST system failure.

5. Slide the FaST-PAK carton into the FaST-PAK bracket.
6. Connect the FaST supply hose to the FaST-PAK hose connector.
7. Scrub with the FaST system for a few minutes to allow the detergent to reach maximum foaming.

CLEANING THE FaST SUPPLY HOSE CONNECTOR

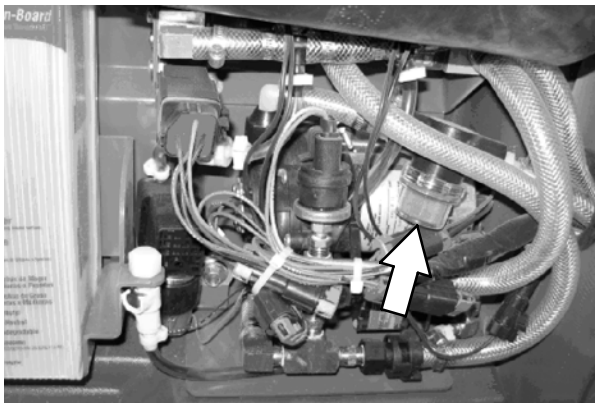
Soak the connector in warm water if detergent buildup is visible. When a FaST-PAK carton is not installed, store the supply hose connector on the storing plug to prevent the hose from clogging.



CLEANING THE FaST SYSTEM FILTER SCREEN

The FaST system filter screen filters water from the solution tank as the water flows into the FaST system.

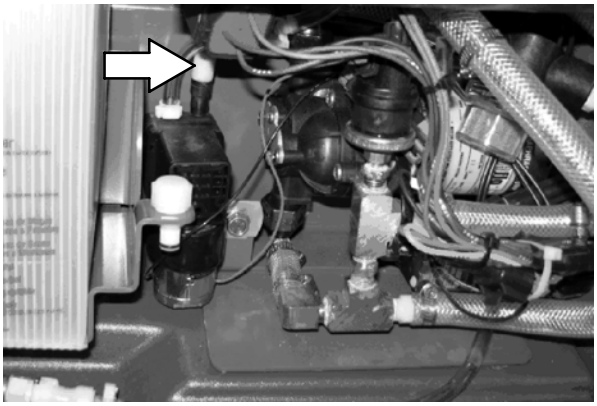
Remove the filter screen bowl and clean the filter screen after every 50 hours of operation. Empty the solution tank before removing the filter.



CLEANING THE FaST SYSTEM AIR PUMP FILTER

Remove and clean the air filter with compressed air after every 200 hours of FaST scrubbing.

FOR SAFETY: When servicing machine, wear eye protection when using pressurized air or water.



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SQUEEGEE BLADES

Check the squeegee blades for damage and wear daily. When the blades become worn, rotate the blades end-for-end or top-to-bottom to a new wiping edge. Replace blades when all edges are worn.

Check the deflection of the squeegee blades daily or when scrubbing a different type of surface. Check the leveling of the rear squeegee every 100 hours of operation.

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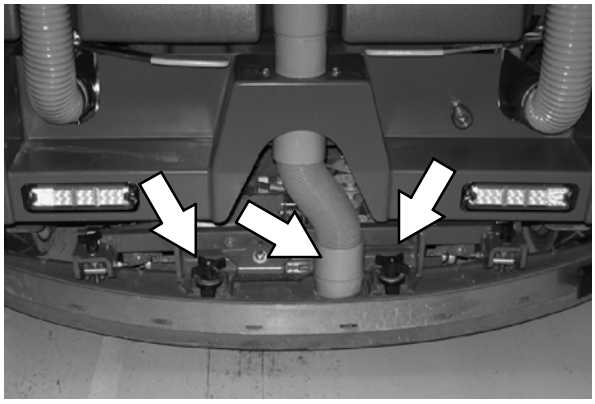
REPLACING (OR ROTATING) THE REAR SQUEEGEE BLADES

1. Lower the scrub head.

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

2. Disconnect the vacuum hose from the rear squeegee assembly.

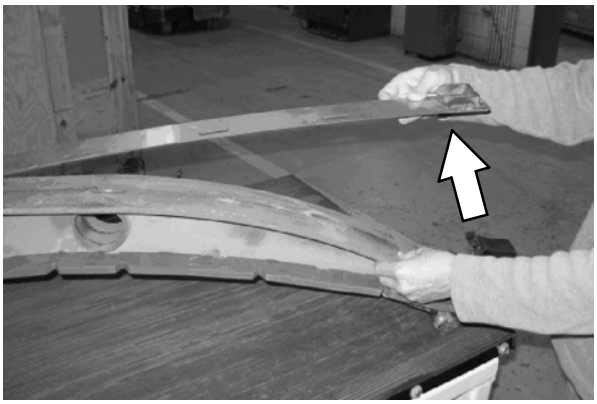


3. Remove both mounting knobs from the rear squeegee assembly.

4. Turn on the machine, raise the scrub head, and turn off the machine.

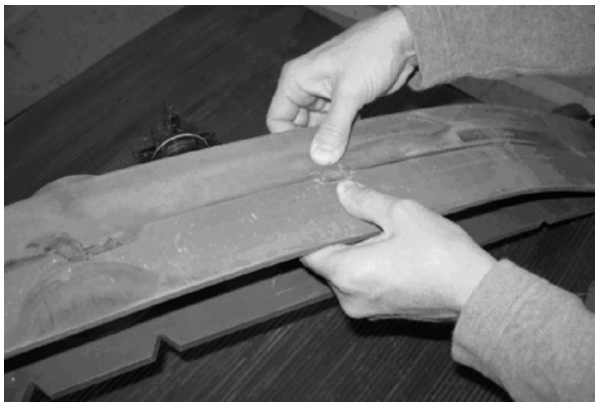
5. Remove the rear squeegee assembly from the machine.

6. Loosen the rear retaining band tension latch and open the retaining band.

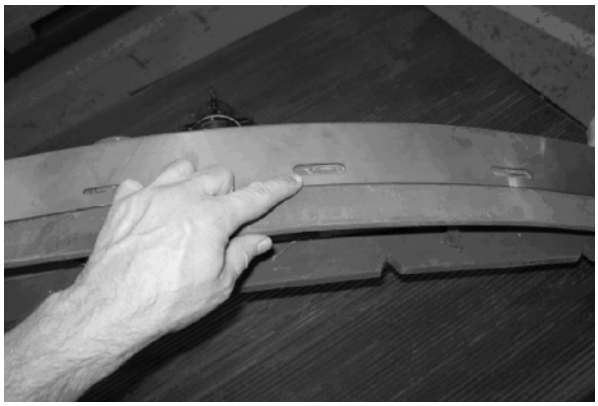


7. Remove the rear squeegee.

8. Install the new rear squeegee blade or rotate the existing blade to the new edge. Be sure all the holes in the squeegee blade are hooked onto the tabs.



9. Reinstall the rear retaining band aligning the tabs with the holes.

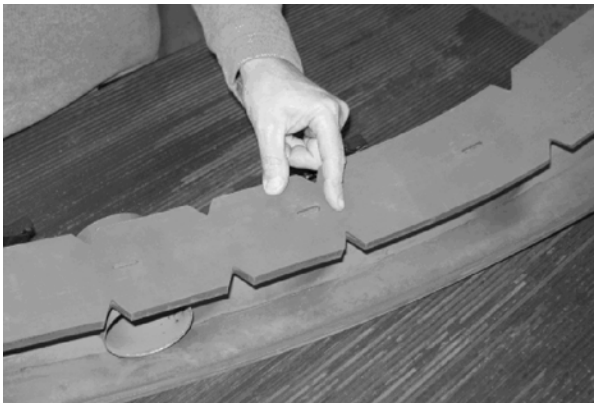


10. Tighten the rear retaining band tension latch.

11. Loosen the front retaining band tension latch and open the retaining band.

12. Remove the front squeegee.

13. Install the new front squeegee blade or rotate the existing blade to the new edge. Be sure the holes in the squeegee blade are hooked onto the tabs.



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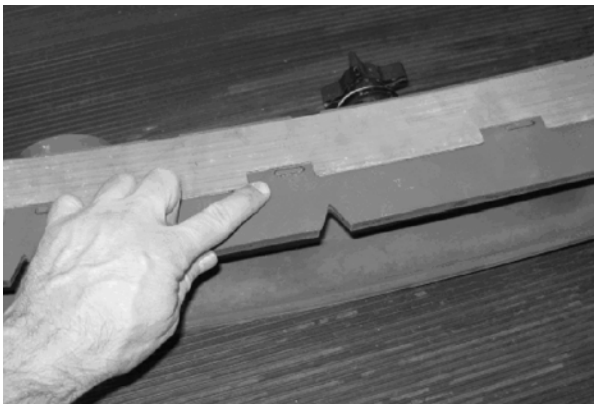
14. Reinstall the front retaining band aligning the tabs with the notches.



15. Tighten the front retaining band tension latch.

16. Reinstall the rear squeegee assembly onto the machine.

17. Check and adjust the rear squeegee if necessary. Refer to *ADJUSTING THE REAR SQUEEGEE BLADE DEFLECTION* and *LEVELING THE REAR SQUEEGEE* sections of this manual.

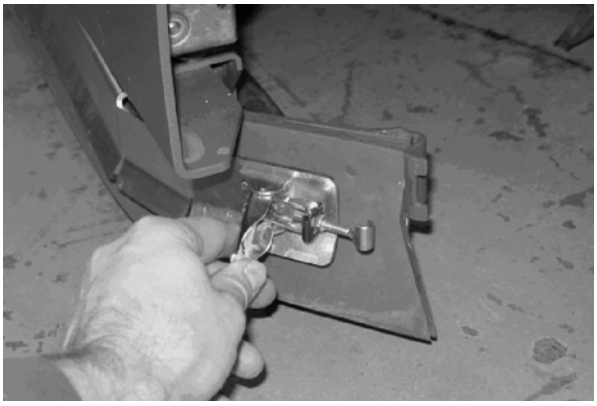
REPLACING OR ROTATING THE SIDE SQUEEGEE BLADES

1. If necessary, raise the scrub head.

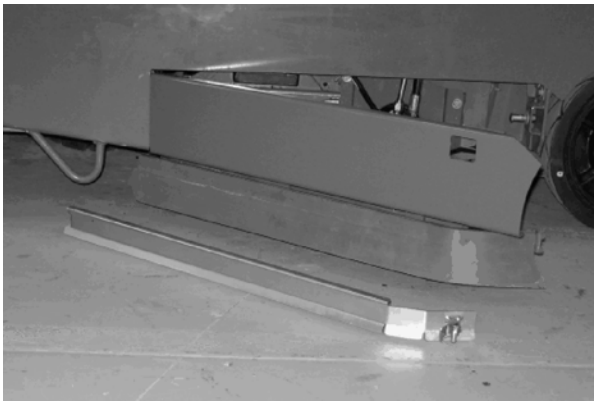
FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, and turn off machine.

2. Open the outer brush doors.

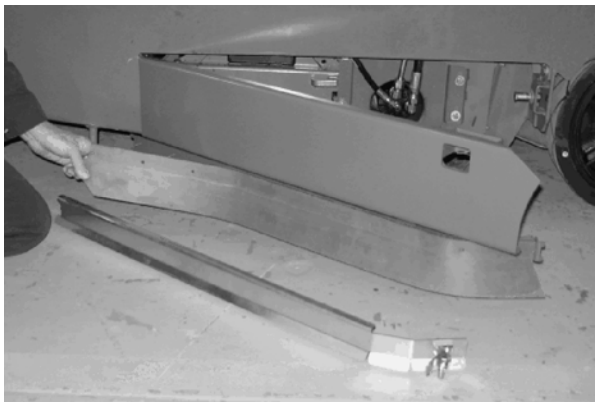
3. Unhook the latch on the side squeegee retaining band from the side squeegee assembly.



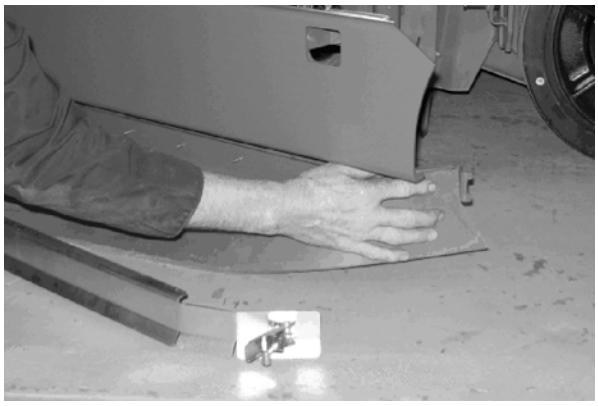
4. Remove the retaining band from the side squeegee assembly.



5. Remove the side squeegee blade. If the outer edge of the squeegee blade is not worn, rotate the squeegee blade with the blade from the other side of the machine. Discard the squeegee blade if both edges are worn.

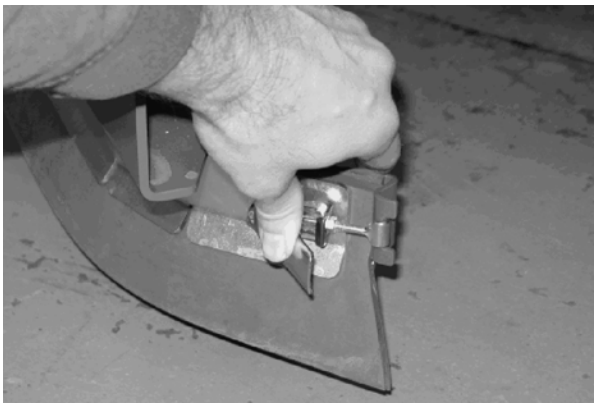


6. Install the new or rotated squeegee blades.



7. Reattach the side squeegee retaining band to the side squeegee assembly.

8. Hook the latch on the side squeegee retaining band.



9. Close the outer brush door.

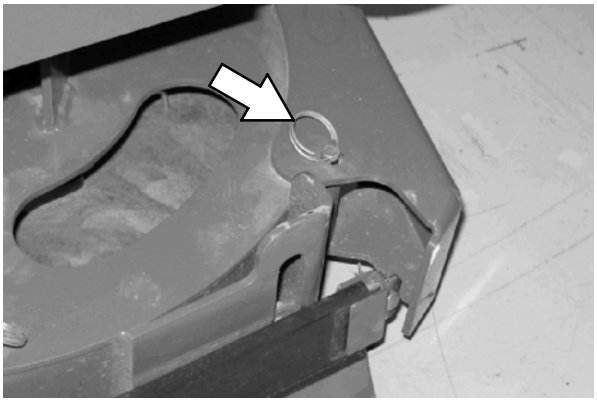
REPLACING THE SIDE BRUSH SQUEEGEE BLADE (OPTION)

Check the side brush squeegee blade for damage and wear daily. Replace the blade if the leading edge is torn or worn half-way through the thickness of the blade.

1. If necessary, raise the scrub head.

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

2. Pull the pin from the squeegee bumper and open the squeegee bumper.



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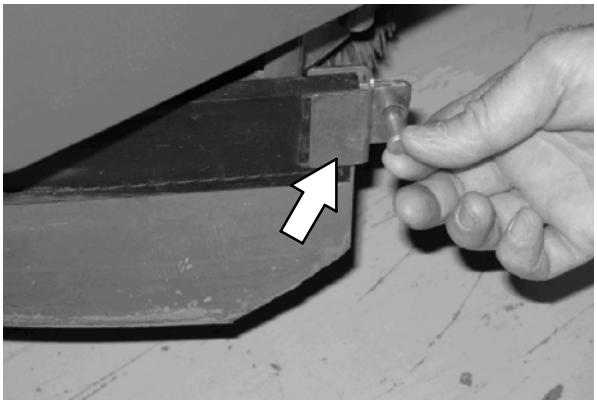
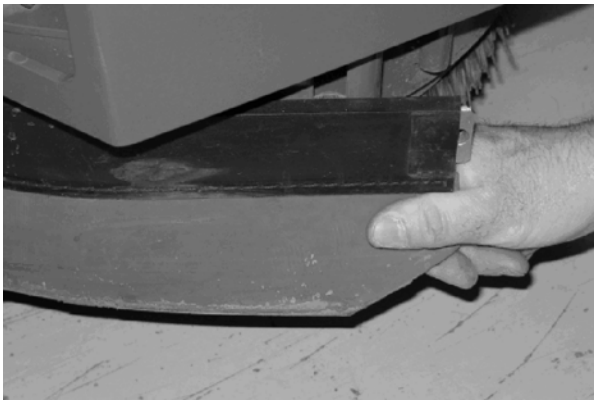
3. Remove the clevis pin and squeegee retainer.



4. Pull the squeegee out from the side brush assembly.



5. Slide the new squeegee into the side brush assembly.

6. Reinstall the squeegee retainer and clevis pin.

7. Close the squeegee bumper and reinsert the pin.

LEVELING THE REAR SQUEEGEE

Leveling the squeegee assures the entire length of the squeegee blade is in even contact with the surface being scrubbed. Perform this adjustment on an even and level floor.

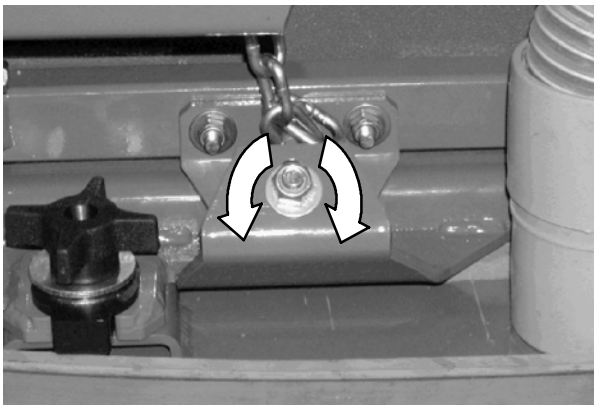
1. Lower the squeegee and drive the machine forward a few meters (feet).

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

2. Look at the deflection of the squeegee over the full length of the squeegee blade.

3. If the deflection is not the same over the full length of the blade, turn the squeegee levelling nut to make adjustments.

   DO NOT *disconnect the suction hose from the squeegee frame when leveling squeegee.*



4. Turn the squeegee leveling nut counter-clockwise to decrease the deflection at the ends of the squeegee blade.

   Turn the squeegee leveling nut clockwise to increase the deflection at the ends of the squeegee blade.

5. Drive the machine forward with the squeegee down to recheck the squeegee blade deflection if adjustments were made.

6. Readjust the squeegee blade deflection if necessary.

ADJUSTING THE REAR SQUEEGEE BLADE DEFLECTION

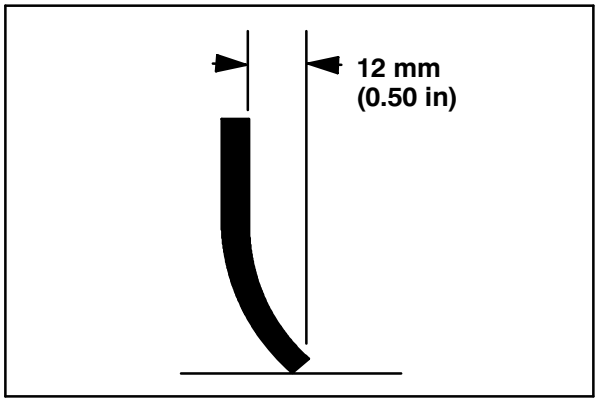
Deflection is the amount of curl the overall squeegee blade has when the machine moves forward. The best deflection is when the squeegee wipes the floor dry with a minimal amount of deflection.

NOTE: Make sure the squeegee is level before adjusting the deflection. See LEVELING THE REAR SQUEEGEE.

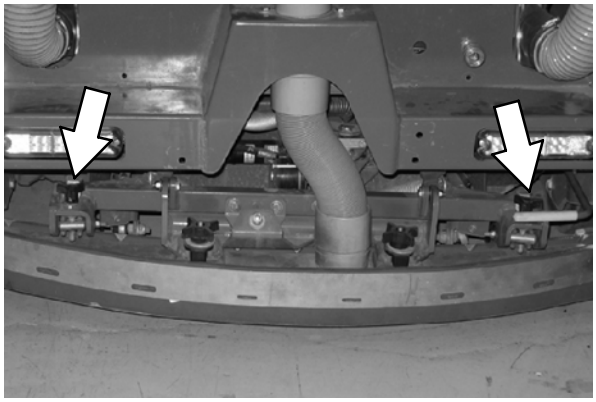
1. Lower the squeegee and drive the machine forward a few meters (feet).

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

2. Look at the amount of deflection or “curl” of the squeegee blade. The correct amount of deflection is 12 mm (0.50 in) for scrubbing smooth floors and 15 mm (0.62 in) for rough floors.



3. To adjust the overall squeegee blade deflection, turn the adjustment knobs counterclockwise to increase deflection or clockwise to decrease deflection.



4. Drive the machine forward again to recheck the squeegee blade deflection after adjustments are made.

5. Readjust the squeegee blade deflection if necessary.

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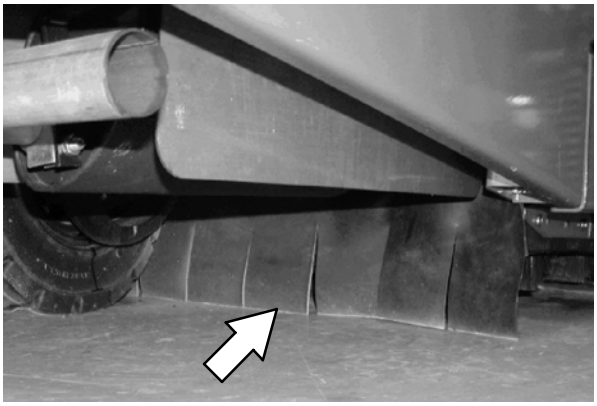
SKIRTS AND SEALS

SCRUB HEAD SKIRT

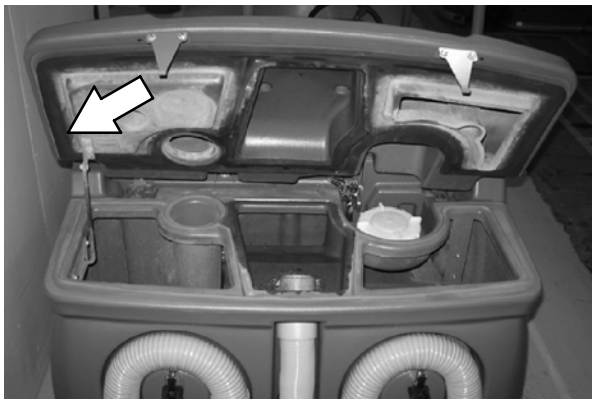
Check the skirt for damage and wear after every 100 hours of operation.



The skirts should be between 0 to 6 mm (0 to 0.25 in) from the floor when the scrub head is down.

RECOVERY TANK SEAL

Check the recovery tank cover seal for damage and wear daily.



SOLUTION TANK SEALS

Check each solution tank cover seal for damage and wear daily.

BRAKES AND TIRES

BRAKES

The mechanical brakes are located on the rear wheels. The brakes are operated by the foot brake pedal and connecting cables.

Check the brake adjustment after every 200 hours of operation.

PARKING BRAKE

The parking brake is set with the parking brake pedal that activates the brakes.

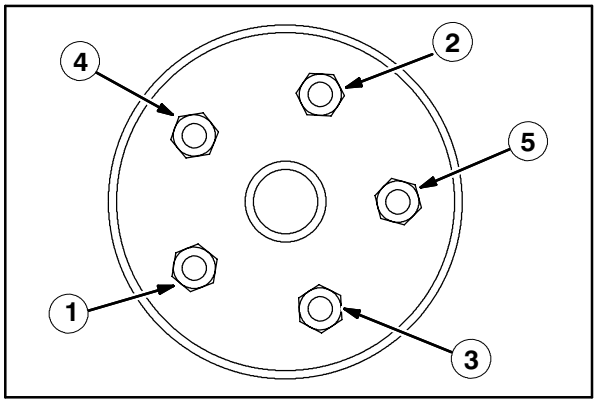
Check the parking brake adjustment after every 200 hours of operation.

TIRES

Check tires for damage and wear after every 100 hours of operation.

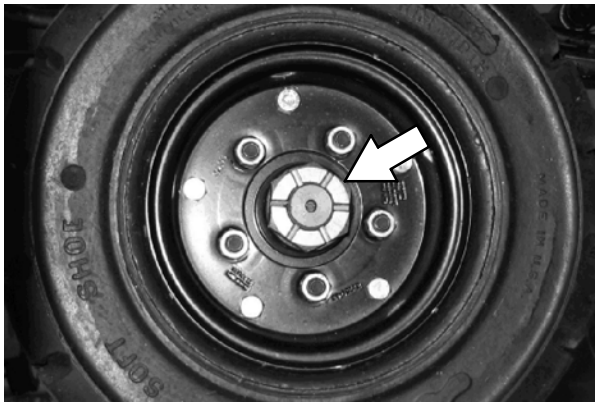
FRONT WHEEL

Torque the front wheel nuts twice in the pattern shown to 122 to 149 Nm (90 to 110 ft lb) after the first 50 hours of operation, and after every 800 hours there after.



PROPELLING MOTOR

Torque the shaft nut to 508 Nm (375 ft lb) lubricated, 644 Nm (475 ft lb) dry, after every 800 hours of operation.



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PUSHING, TOWING, AND TRANSPORTING THE MACHINE

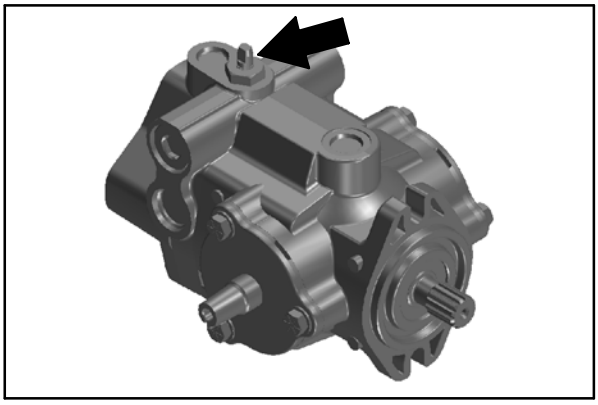
PUSHING OR TOWING THE MACHINE

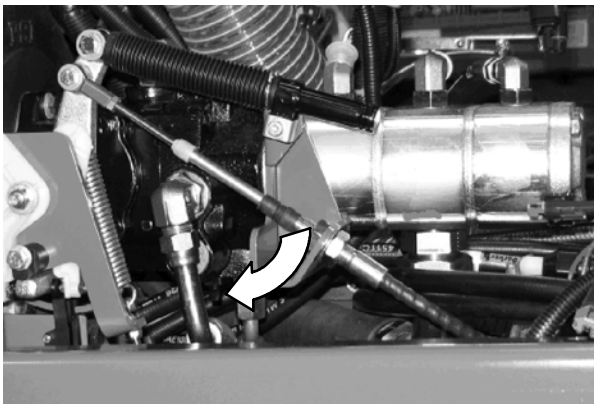
If the machine becomes disabled, it can be pushed from the front or rear, but only towed from the front.

The propelling pump has a bypass valve to prevent damage to the hydraulic system when the machine is being pushed or towed. This valve allows a disabled machine to be moved for a *very short distance* and at a speed to not exceed 1.6 kp/h (1 mph). The machine is NOT intended to be pushed or towed a long distance or at a high speed.

ATTENTION! Do not push or tow machine for a long distance or damage may occur to the propelling system.

Turn the bypass valve located on the bottom of the propelling pump 90° (either direction) from the normal position before pushing or towing the machine. Return the bypass valve back to the normal position when through pushing or towing the machine. **Do Not** use the bypass valve during normal machine operation.





TRANSPORTING THE MACHINE

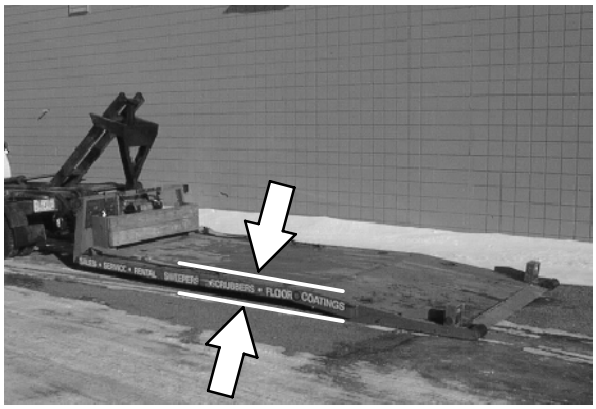
1. Raise the squeegee, scrub head, and brushes.

NOTE: Empty the debris tray, the recovery tank, and the solution tank before transporting.

2. Position the rear of the machine at the loading edge of the truck or trailer.

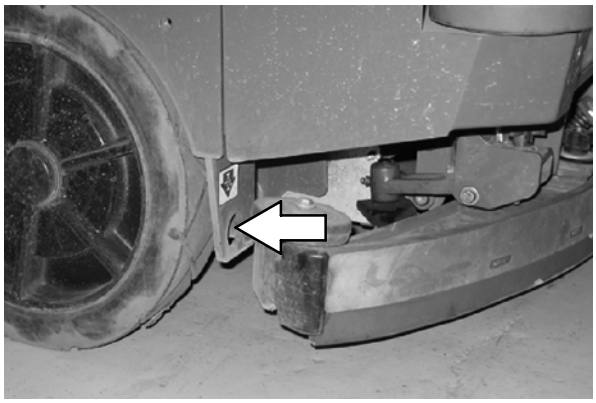
3. If the loading surface is not horizontal or is higher than 380 mm (15 in) from the ground, use a winch to load machine.

   If the loading surface is horizontal and 380 mm (15 in) or less from the ground, the machine may be driven onto the truck or trailer.



FOR SAFETY: When loading machine onto truck or trailer, use winch. Do not drive the machine onto the truck or trailer unless the loading surface is horizontal AND is 380 mm (15 in) or less from the ground.

4. To winch the machine onto the truck or trailer, attach the winching chains to the holes in the rear jacking brackets behind the rear tires.

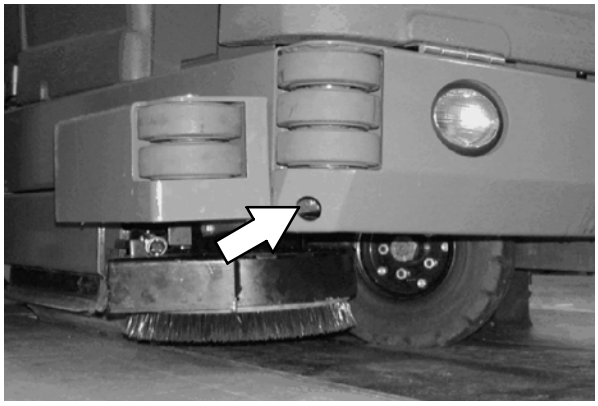


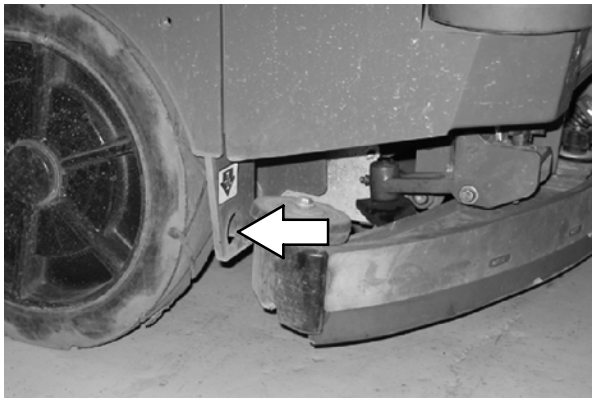
5. Position the machine as close to the front of the trailer or truck as possible.

6. Set the parking brake and place a block behind each wheel to prevent the machine from rolling.

7. Lower the scrub head.

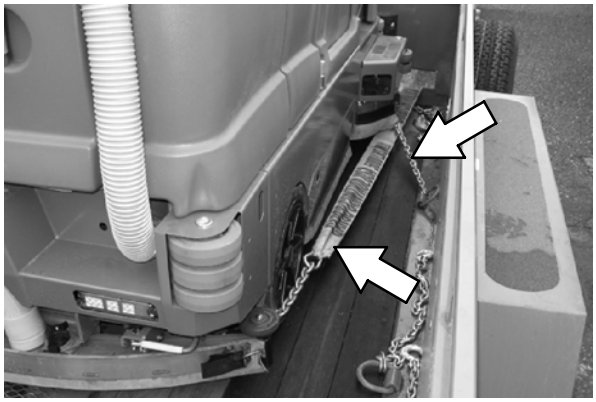
8. Connect the tie-down straps to the holes in the right and left lower corners in front of the machine and the holes in the rear jacking brackets behind the rear tires.





9. Route the tie-downs to the opposite ends of the machine and hook them to the brackets on the floor of the trailer or truck. Tighten the tie-down straps.

NOTE: It may be necessary to install tie-down brackets to the floor of the trailer or truck.



10. If the loading surface is not horizontal or is higher than 380 mm (15 in) from the ground, use a winch to unload machine.

    If the loading surface is horizontal AND is 380 mm (15 in) or less from the ground, the machine may be driven off the truck or trailer.

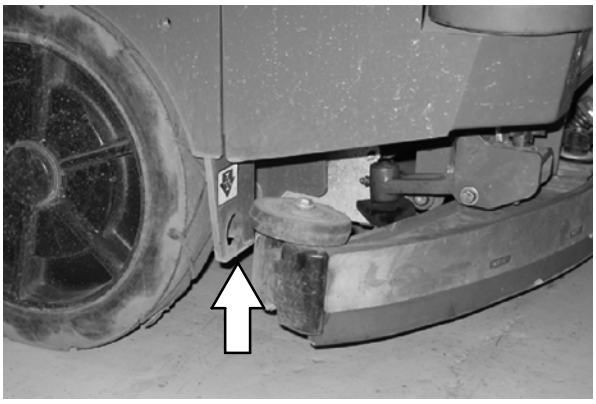
FOR SAFETY: When unloading machine off truck or trailer, use winch. Do not drive the machine off the truck or trailer unless the loading surface is horizontal AND 380 mm (15 in) or less from the ground.

M

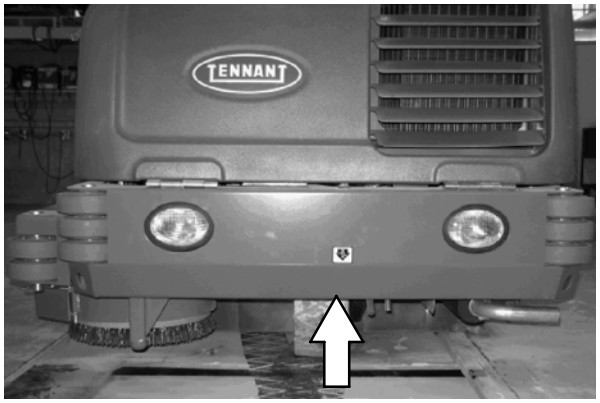
MACHINE JACKING

Empty the debris tray, recovery tank, and solution tank before jacking up the machine. Jack up the machine at the designated locations. Use a hoist or jack capable of supporting the weight of the machine. Use jackstands to support the machine. Always stop the machine on a flat, level surface and block the tires before jacking up the machine.

Rear jacking locations are located directly behind the rear tires on each side of the machine.



Front jacking locations are located on the frame directly in front of the front tire.



FOR SAFETY: Before leaving or servicing machine, stop on level surface.

FOR SAFETY: When servicing machine, block machine tires before jacking machine up. Use a hoist or jack that will support the weight of the machine. Jack machine up at designated locations only. Support machine with jack stands.

STORAGE INFORMATION

The following steps should be taken prior to storing the machine for extended periods.

1. Drain and clean the solution and recovery tanks. Open the recovery tank and solution tank covers to allow the air to circulate.
2. Park the machine in a cool, dry area. Do not expose the machine to rain. Store indoors.
3. Remove the battery, or charge battery every three months.

FREEZE PROTECTION

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

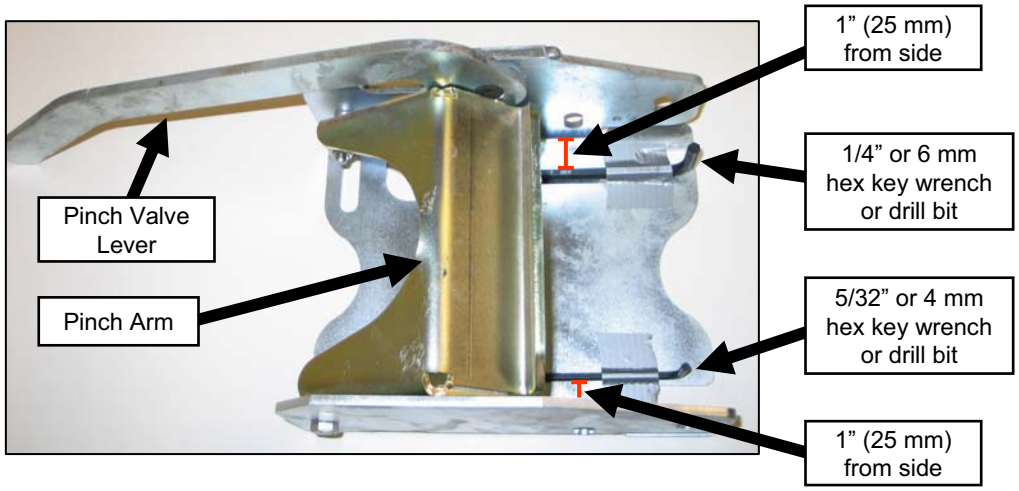
1. Be sure the solution tank and recovery tank are empty.
2. Pour 3.8 L (1 gal) of premixed automotive windshield washer solution into the solution tank.
3. Turn the key to the on position **(without starting the machine)**.
4. Press the *1-STEP Scrub button*.
5. Repeatedly press the *Solution increase button (+)* until the solution flow is at the highest setting.
6. Press the *directional pedal* to circulate the windshield washer solution completely through the system.
7. Press the *1-STEP Scrub button* again to turn off the system and turn the key to the off position.
8. The remaining washer solution does not need to be drained from the solution tank.

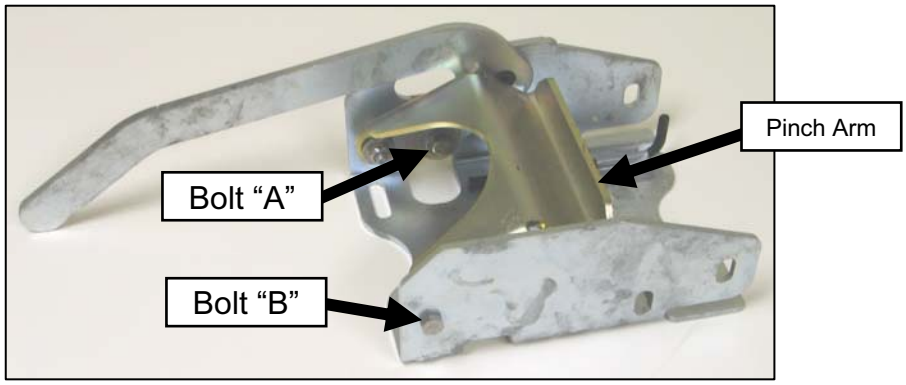
NOTE: Storing or transporting machines equipped with the ES or the FaST system in freezing temperatures requires special procedures. Consult a TENNANT representative for more information.

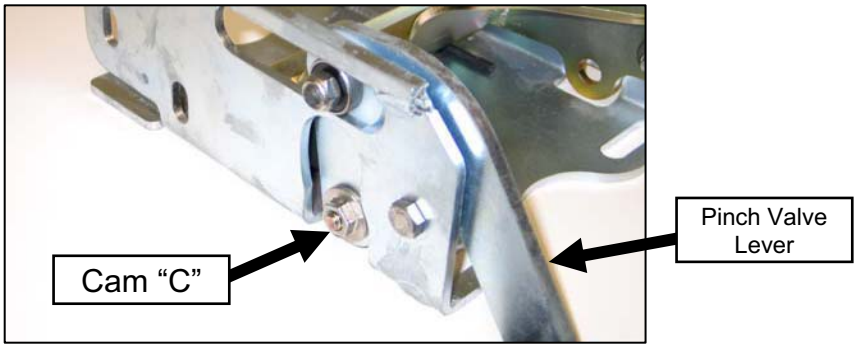
Solution & Recovery Tanks Pinch Valve Adjustments

Procedure to adjust Solution & Recovery Tank pinch valves:

1) Place a 1/4” or 6 mm hex key wrench or drill bit approximately 1” (25 mm) from the **LEVER** side of the pinch valve bracket. Secure with tape.
2) Place a 5/32” or 4 mm hex key wrench or drill bit approximately 1” (25 mm) from the **NON-LEVER** side of the pinch valve bracket. Secure with tape.
3) Loosen bolts “A” and “B”.
4) Apply downward pressure to Pinch Arm.
5) Turn cam “C” on Pinch Valve Lever until contact is made with the 1/4” or 6 mm hex key wrench or drill bit.
6) While keeping downward pressure on the Pinch Arm, ensure that contact is made with the 5/32” or 4 mm hex key wrench or drill bit on the **NON-LEVER** side.
7) Tighten bolts “A” & “B”.
8) Verify proper clearances have been attained. Repeat procedure if needed.







M

ELECTRICAL

Troubleshooting Information

BEFORE CONDUCTING TESTS:

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

*** Always use an ESD (Electrostatic Discharge) strap when working near the Control Board**

*** Be cautious when working near Control Board – *Battery voltage is always present, even with Key OFF***

*** Always unhook Battery when removing or replacing components**

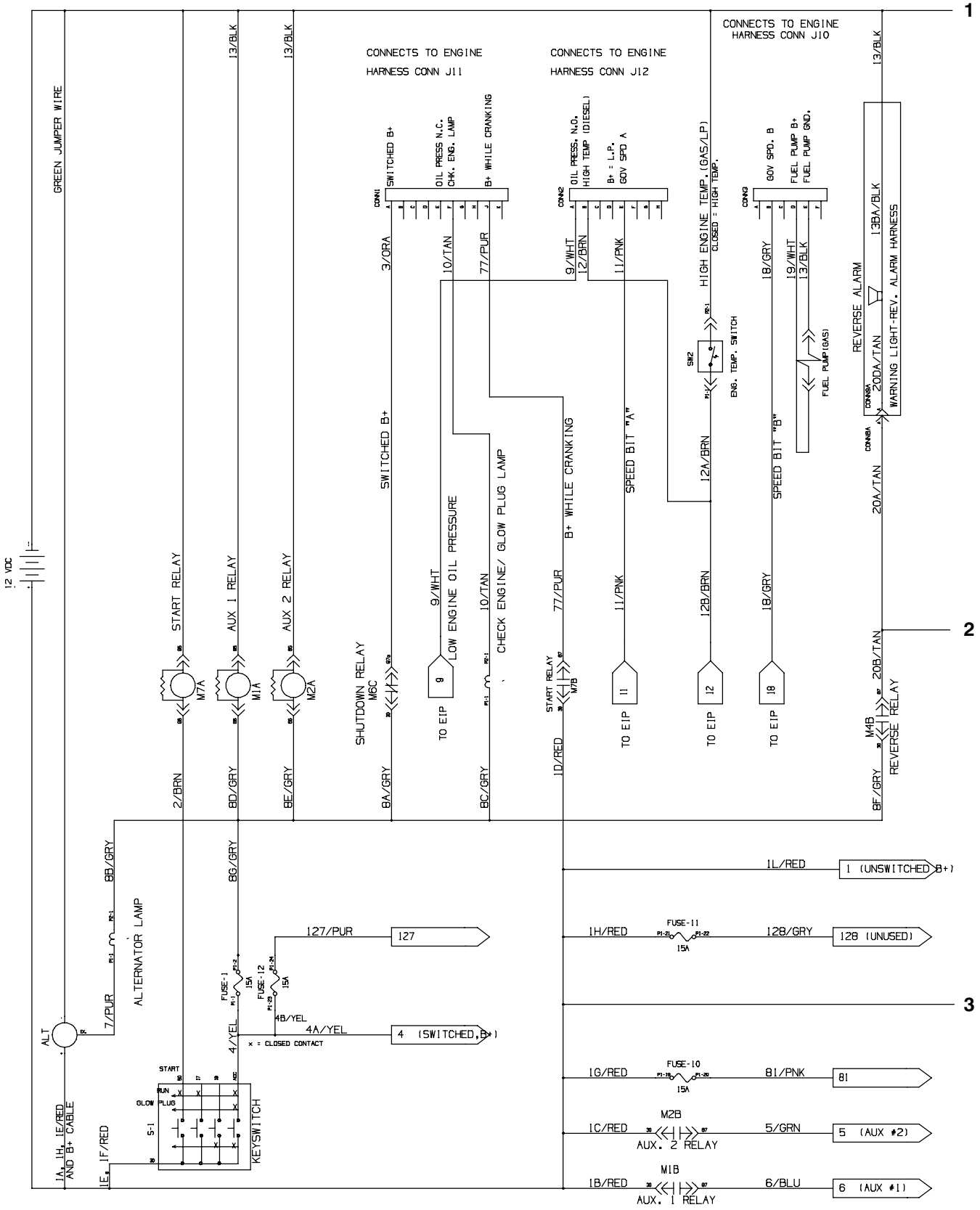
DURING TESTS:

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

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

T20 Electrical Schematic

(Page 1 of 7)

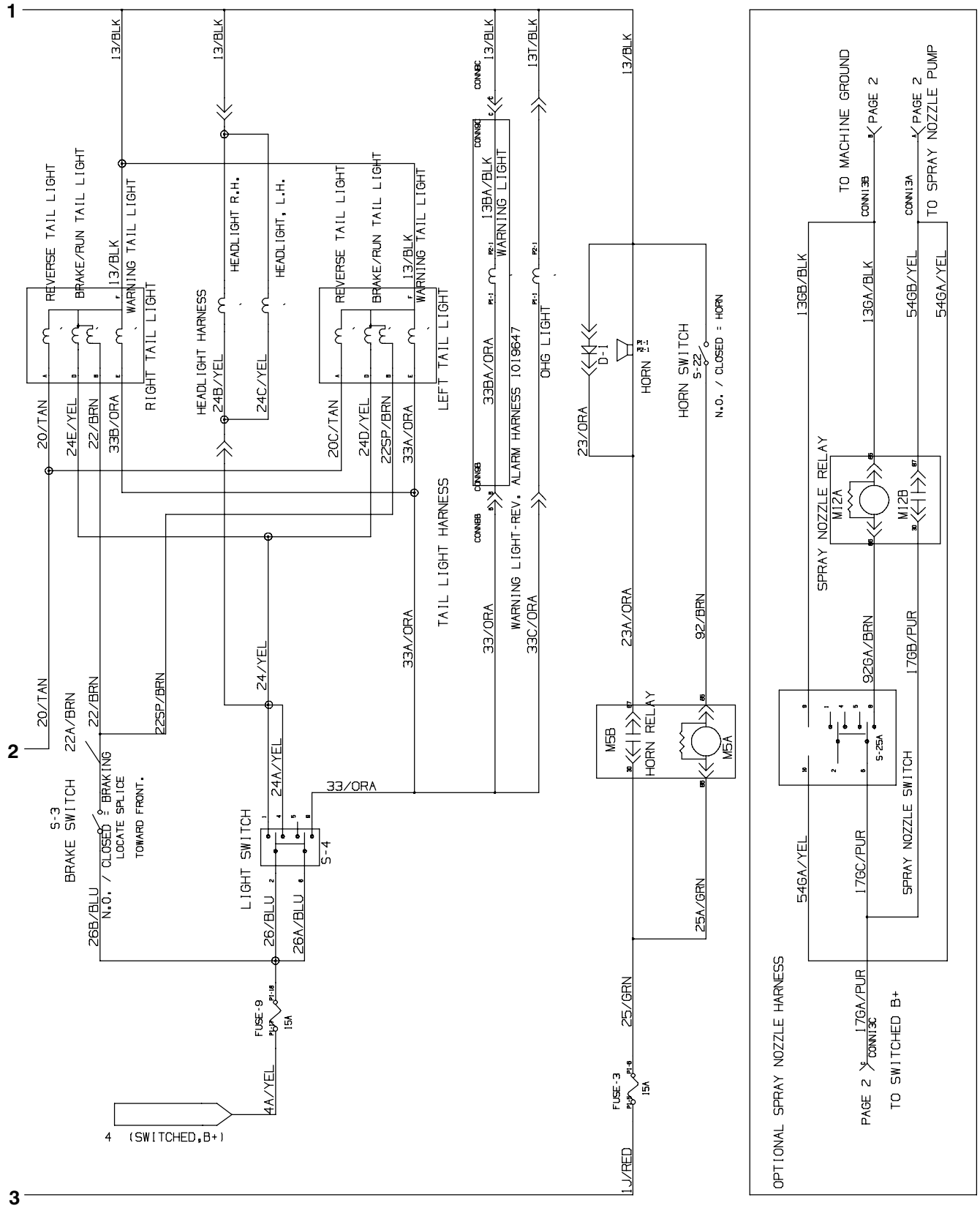


NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

1029601

T20 Electrical Schematic

(Page 2 of 7)

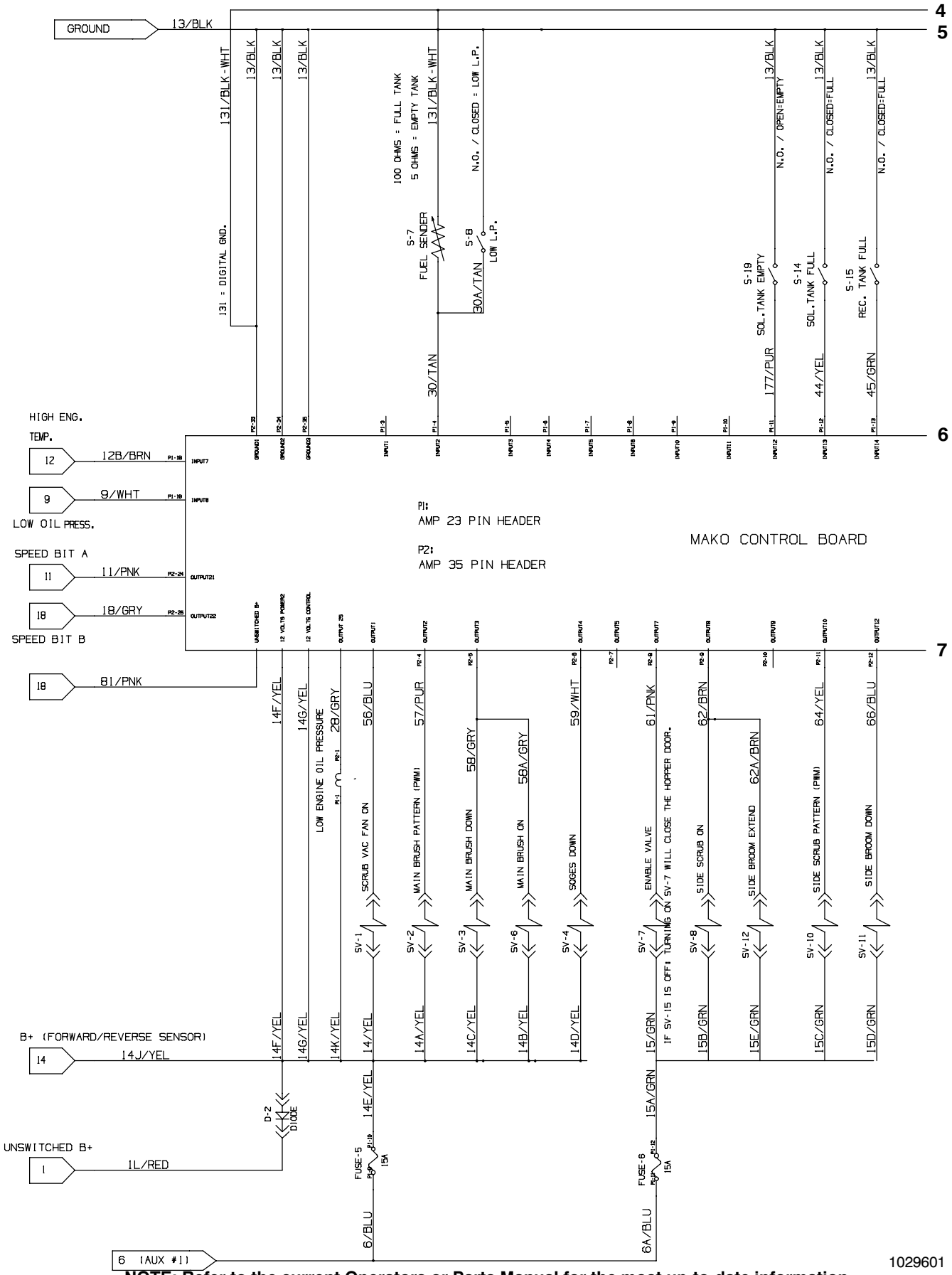


1029601

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Electrical Schematic

(Page 3 of 7)



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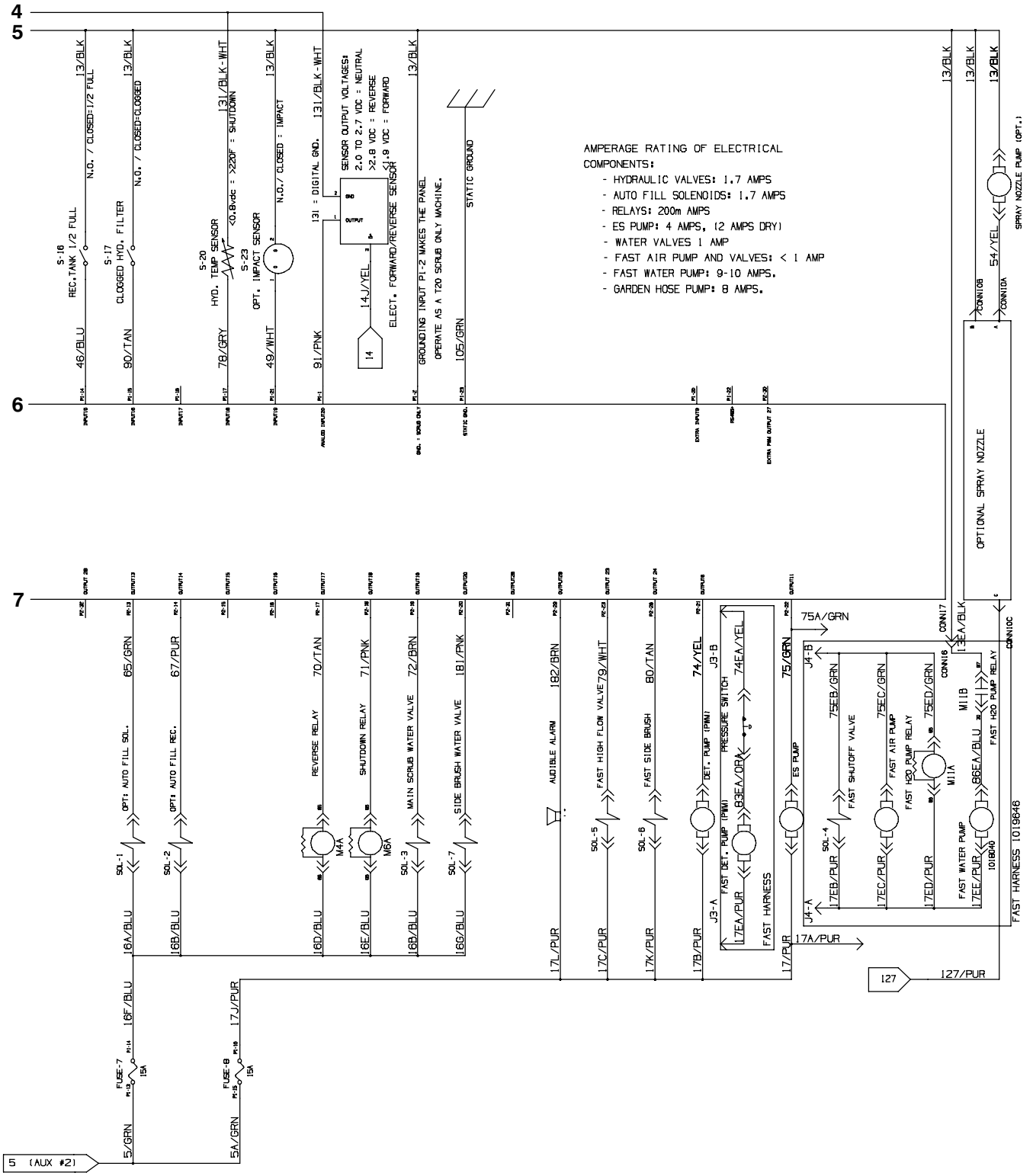
T20 Electrical Schematic

(Page 4 of 7)



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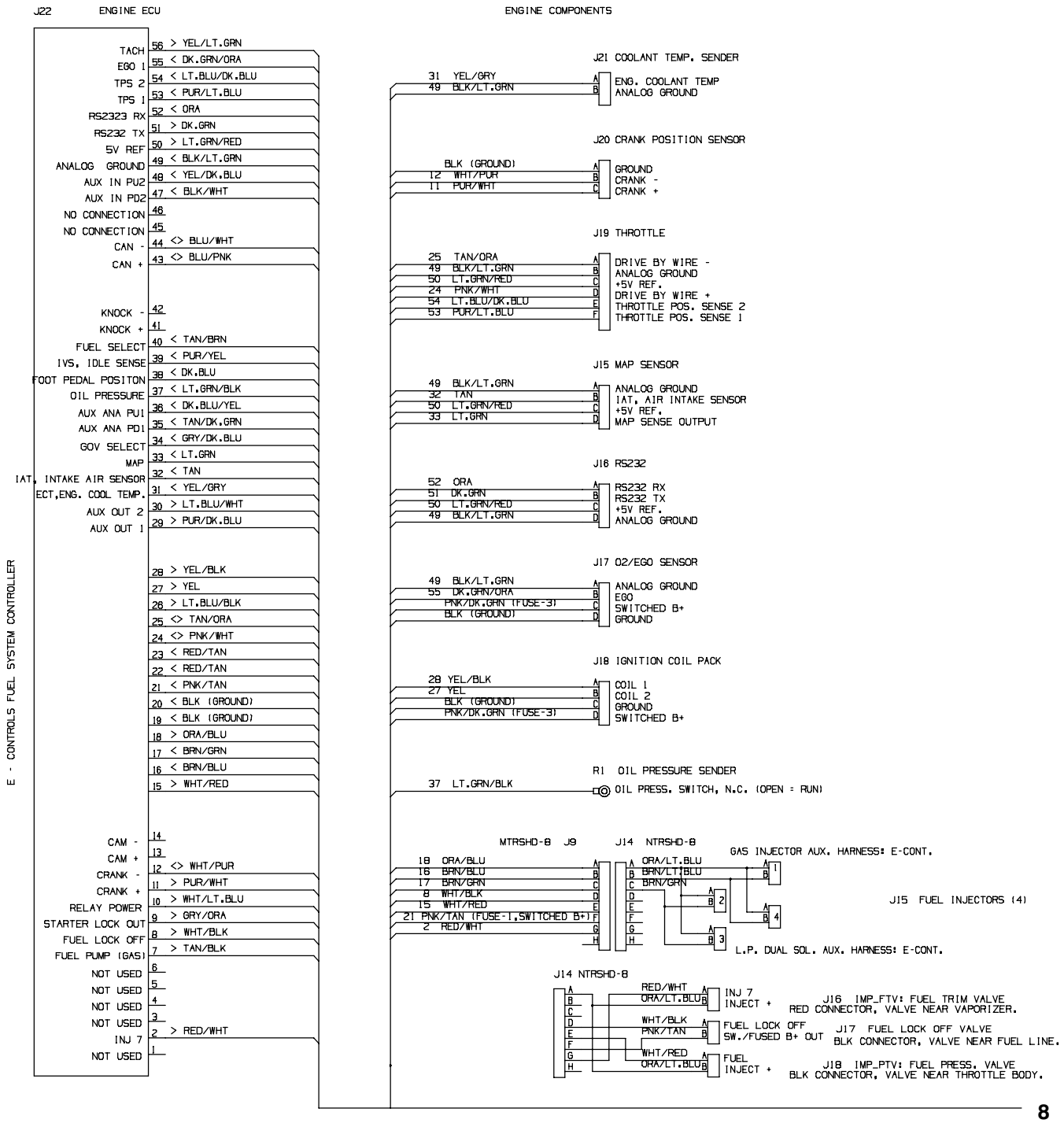
T20 Electrical Schematic

(Page 5 of 7)

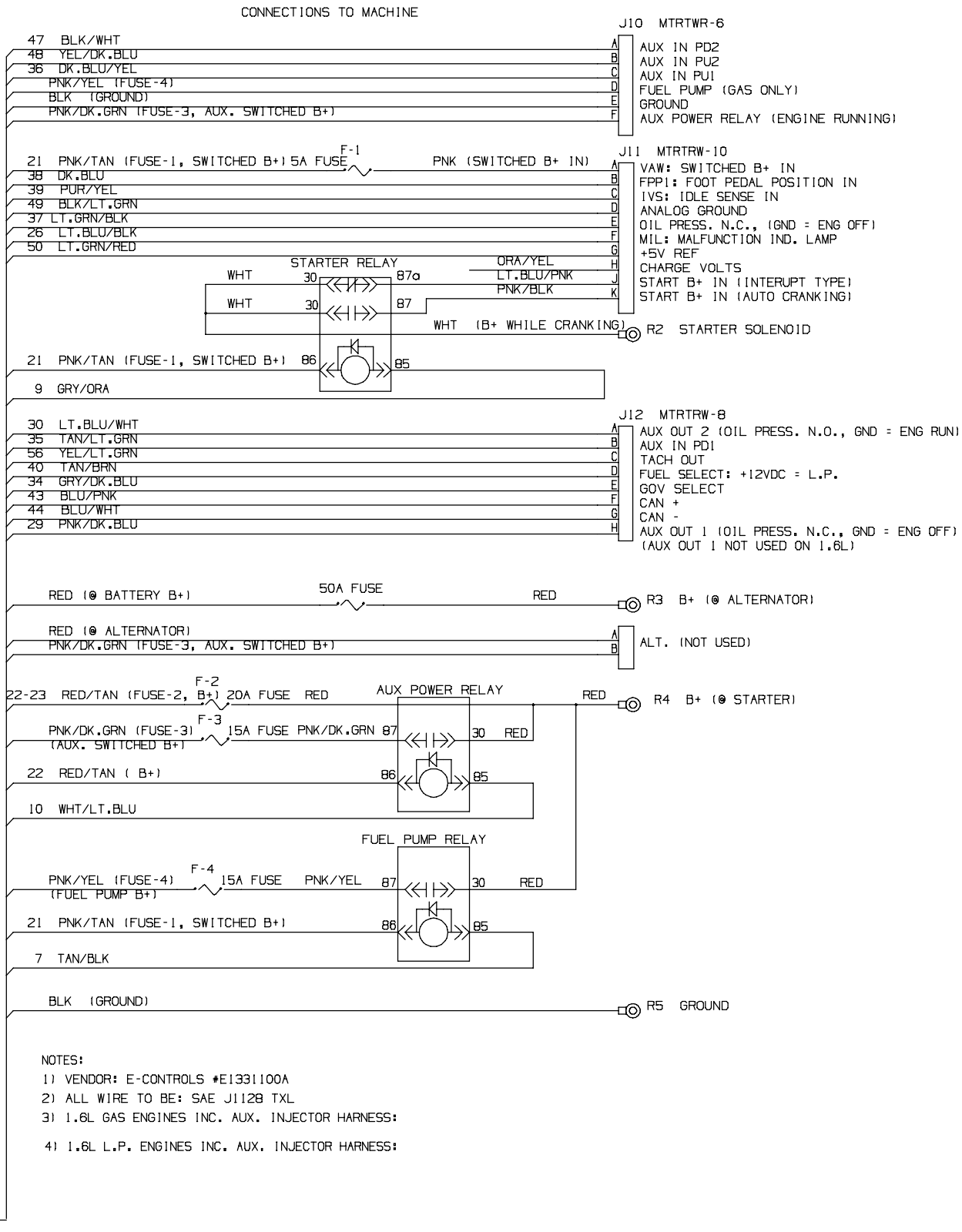


1029601

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Electrical Schematic

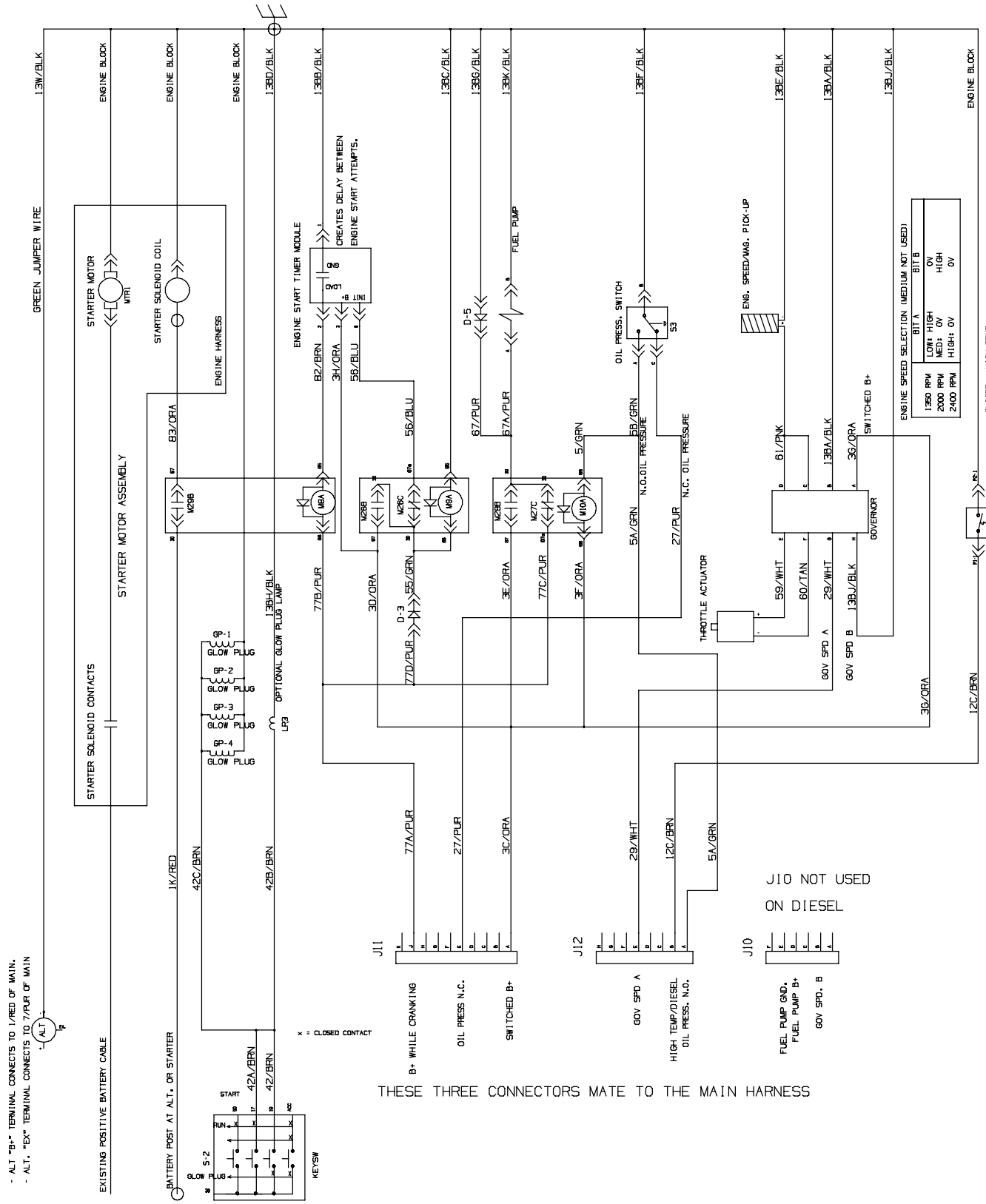
(Page 6 of 7)



1029601

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Electrical Schematic

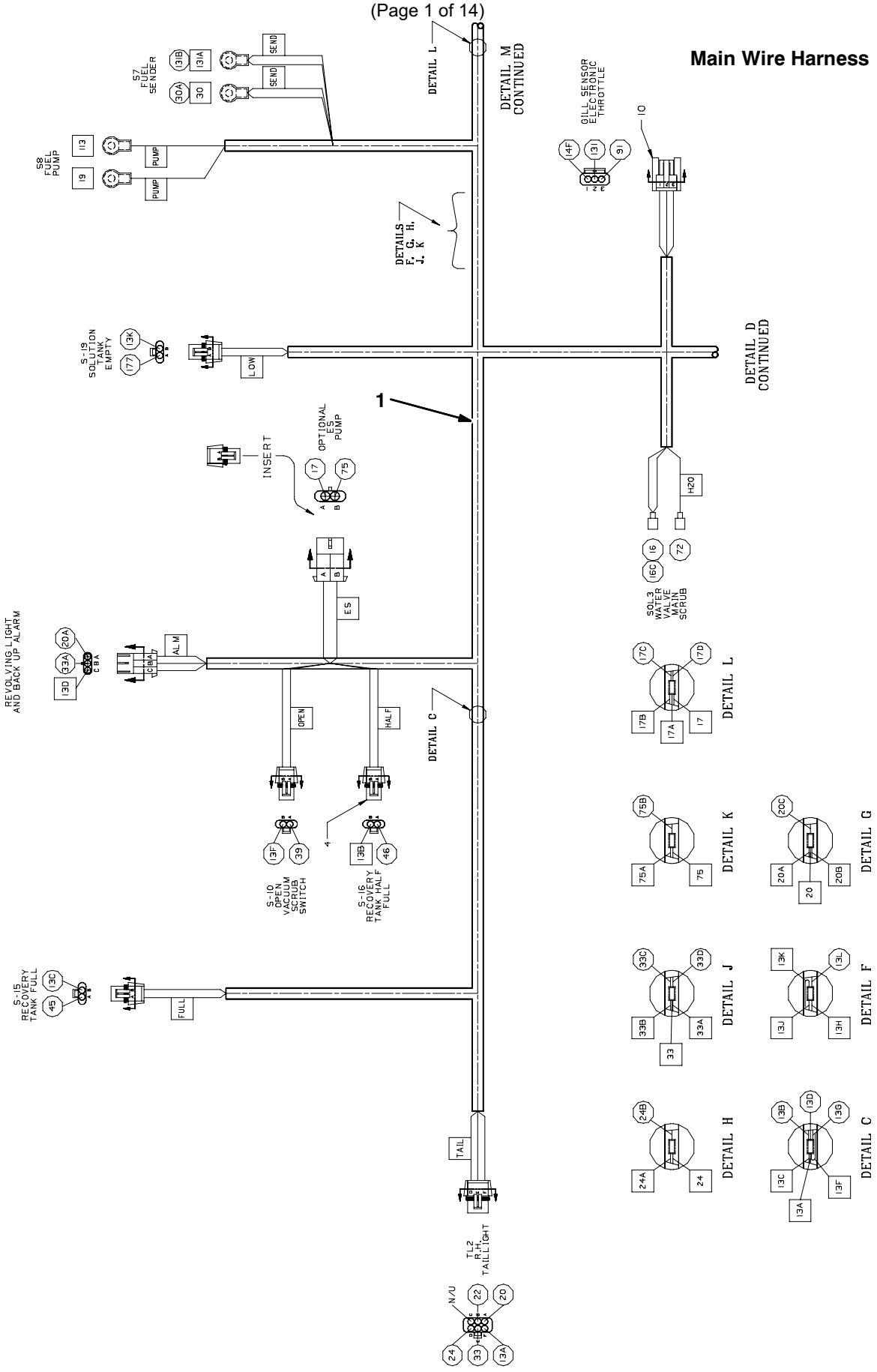


NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail

(Page 1 of 14)

Main Wire Harness



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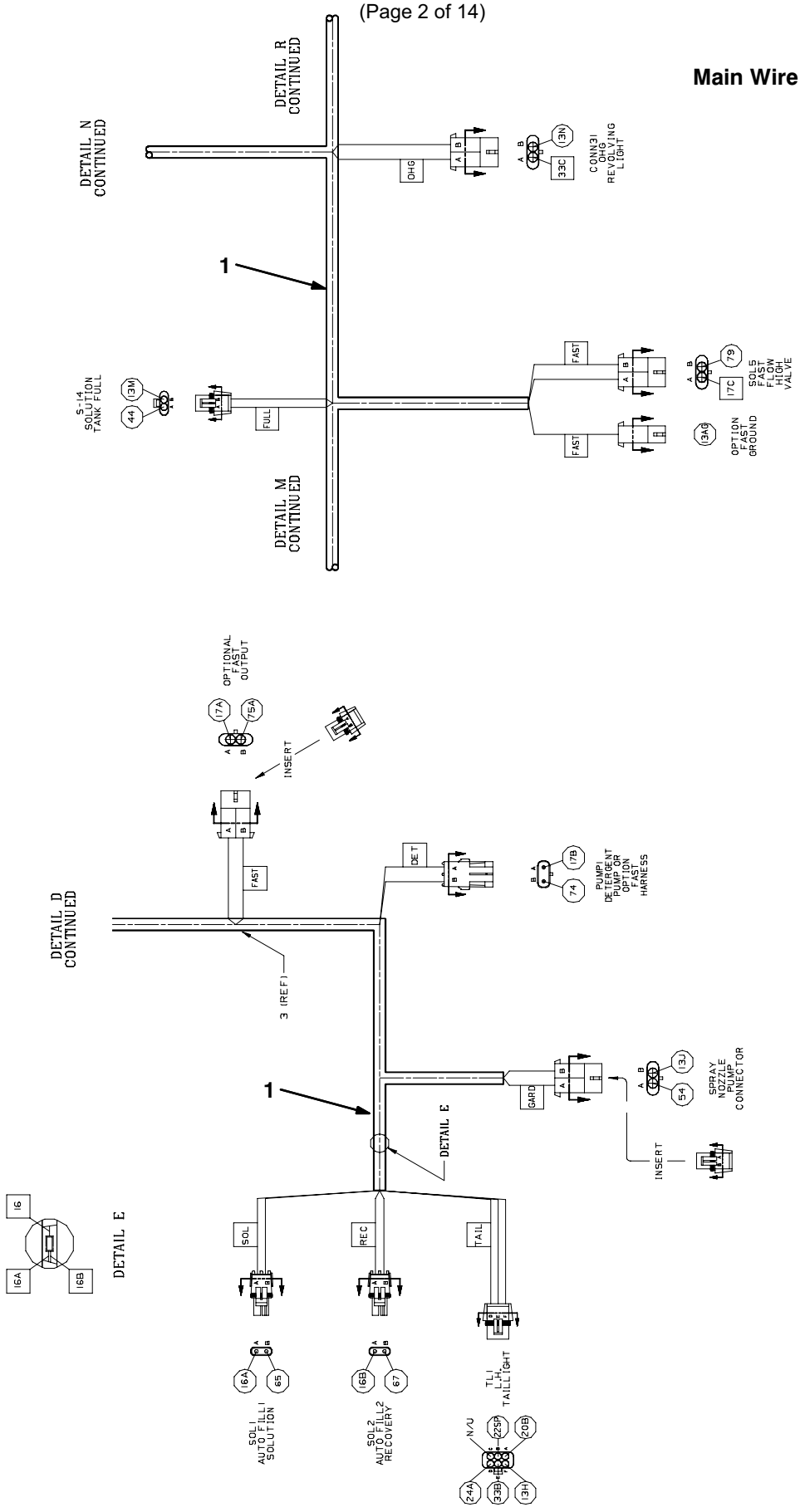
T20 Wiring Harness Detail

(Page 2 of 14)

Main Wire Harness



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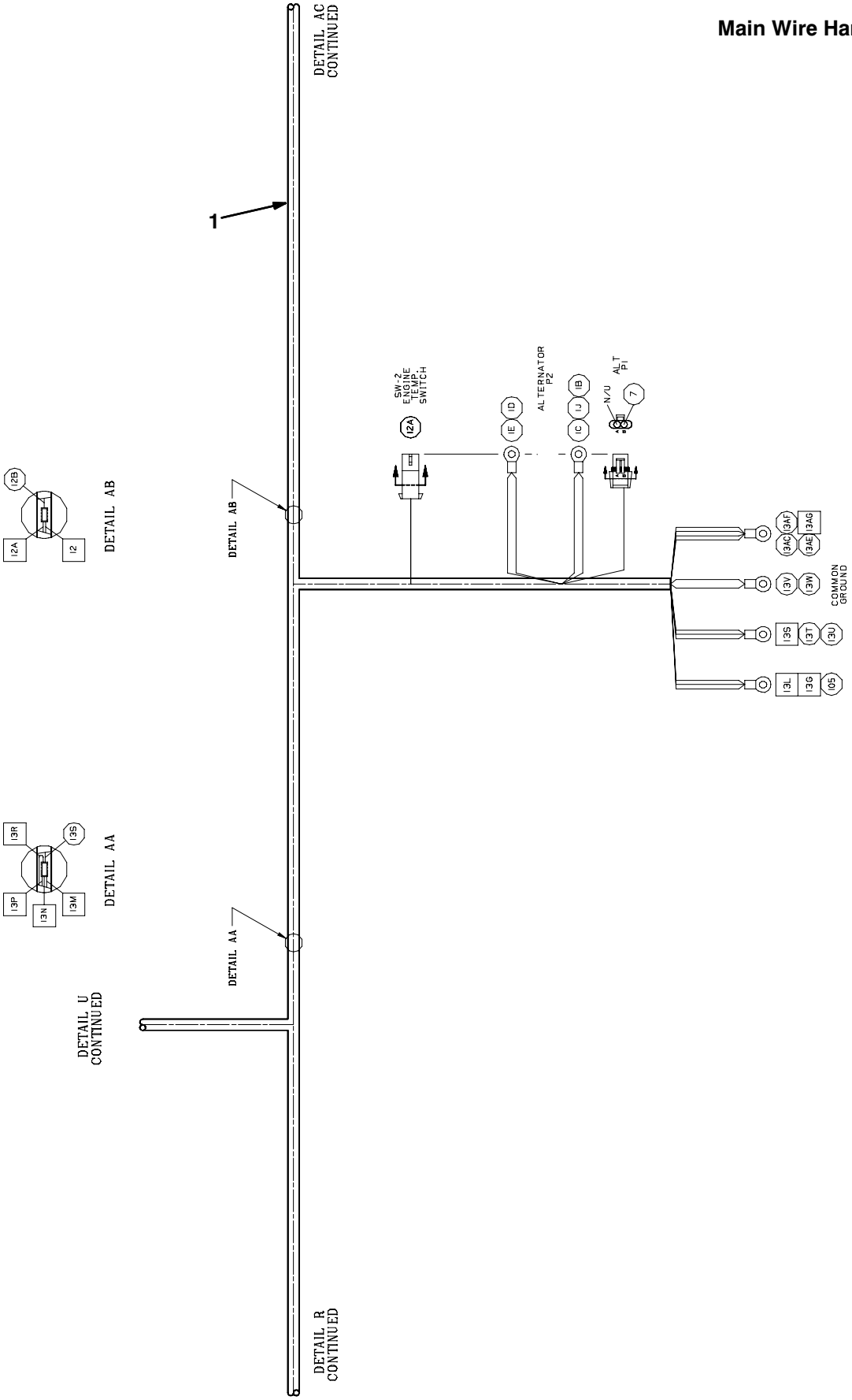
T20 Wiring Harness Detail

Main Wire Harness

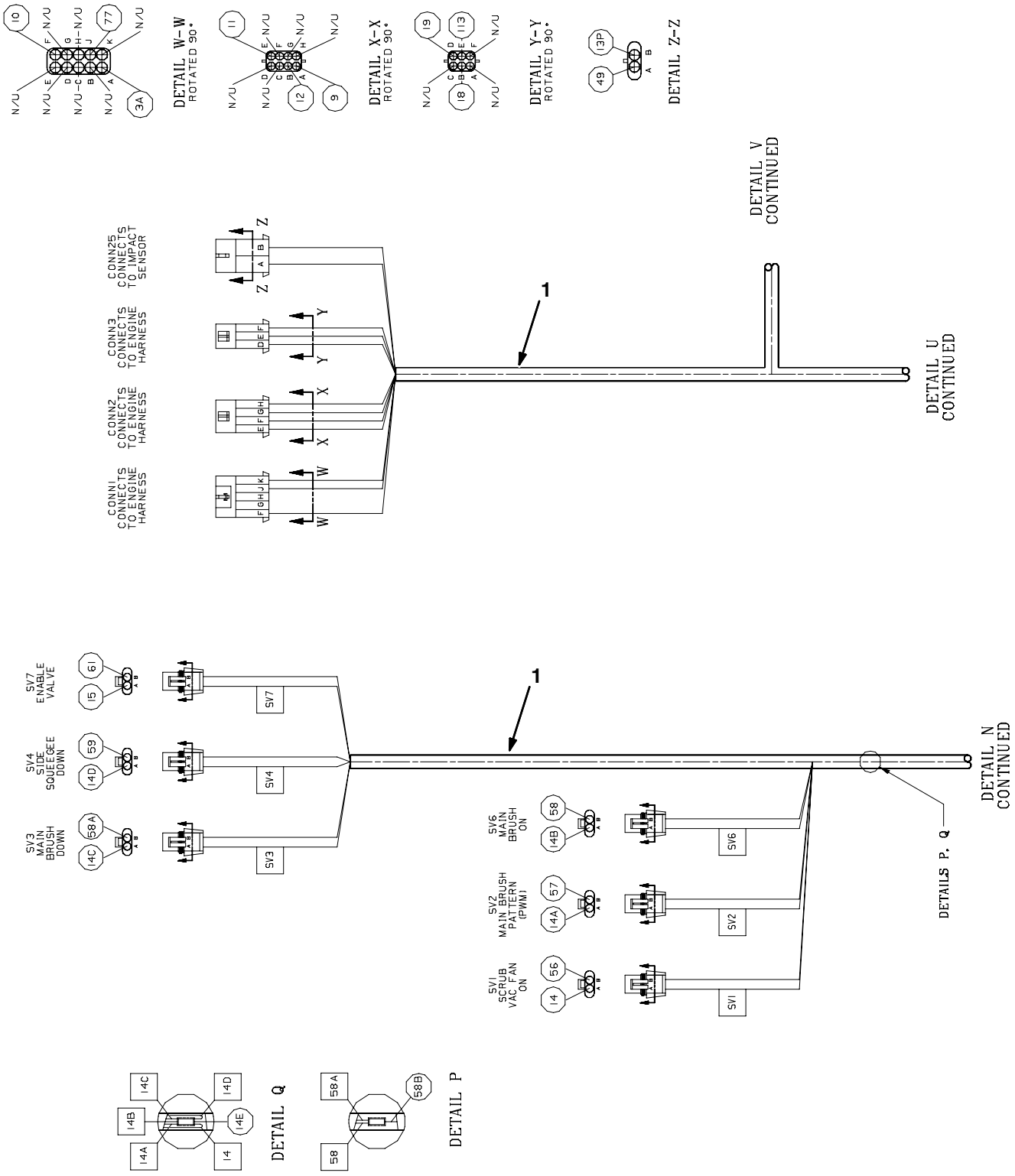


E

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

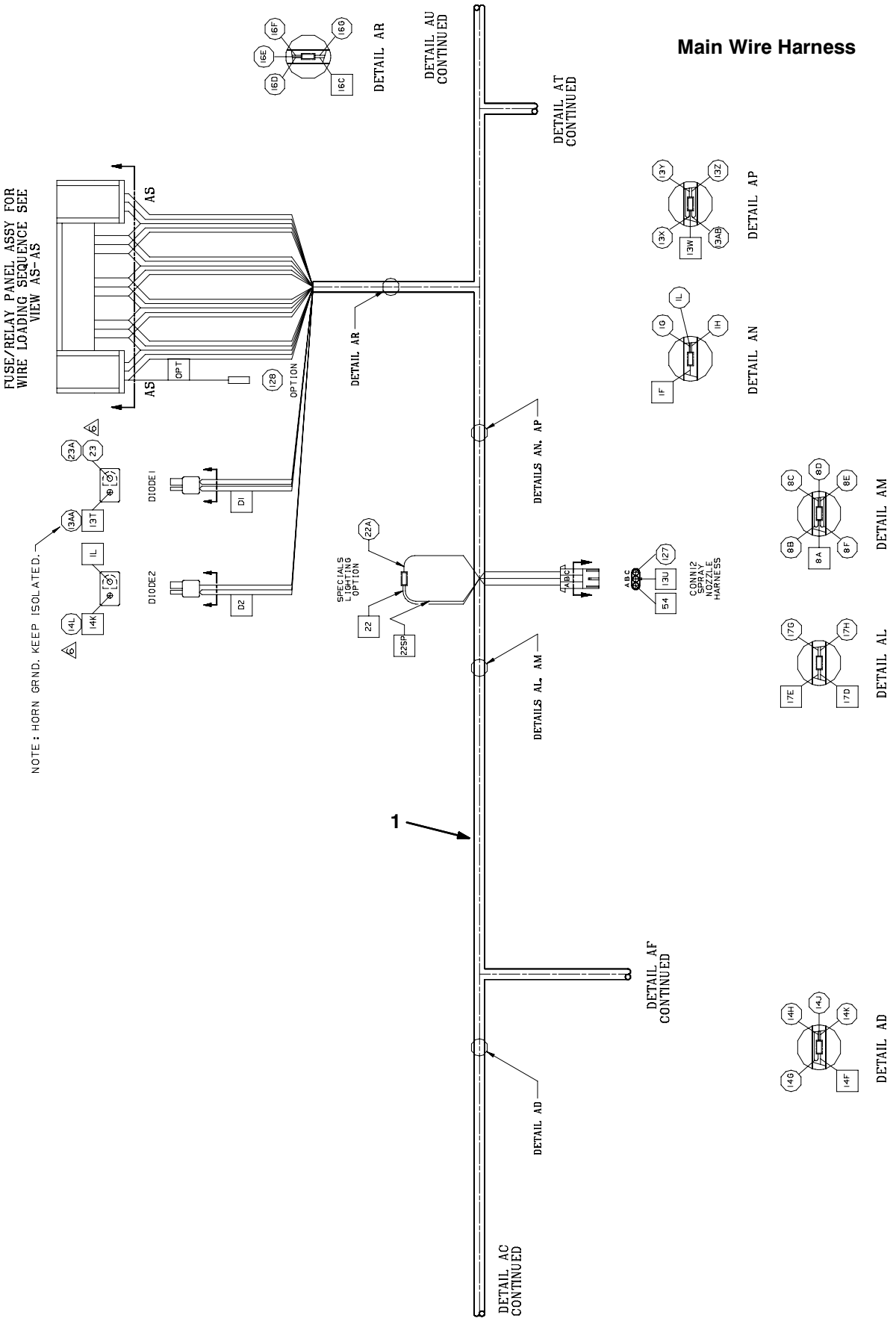
T20 Wiring Harness Detail

Main Wire Harness



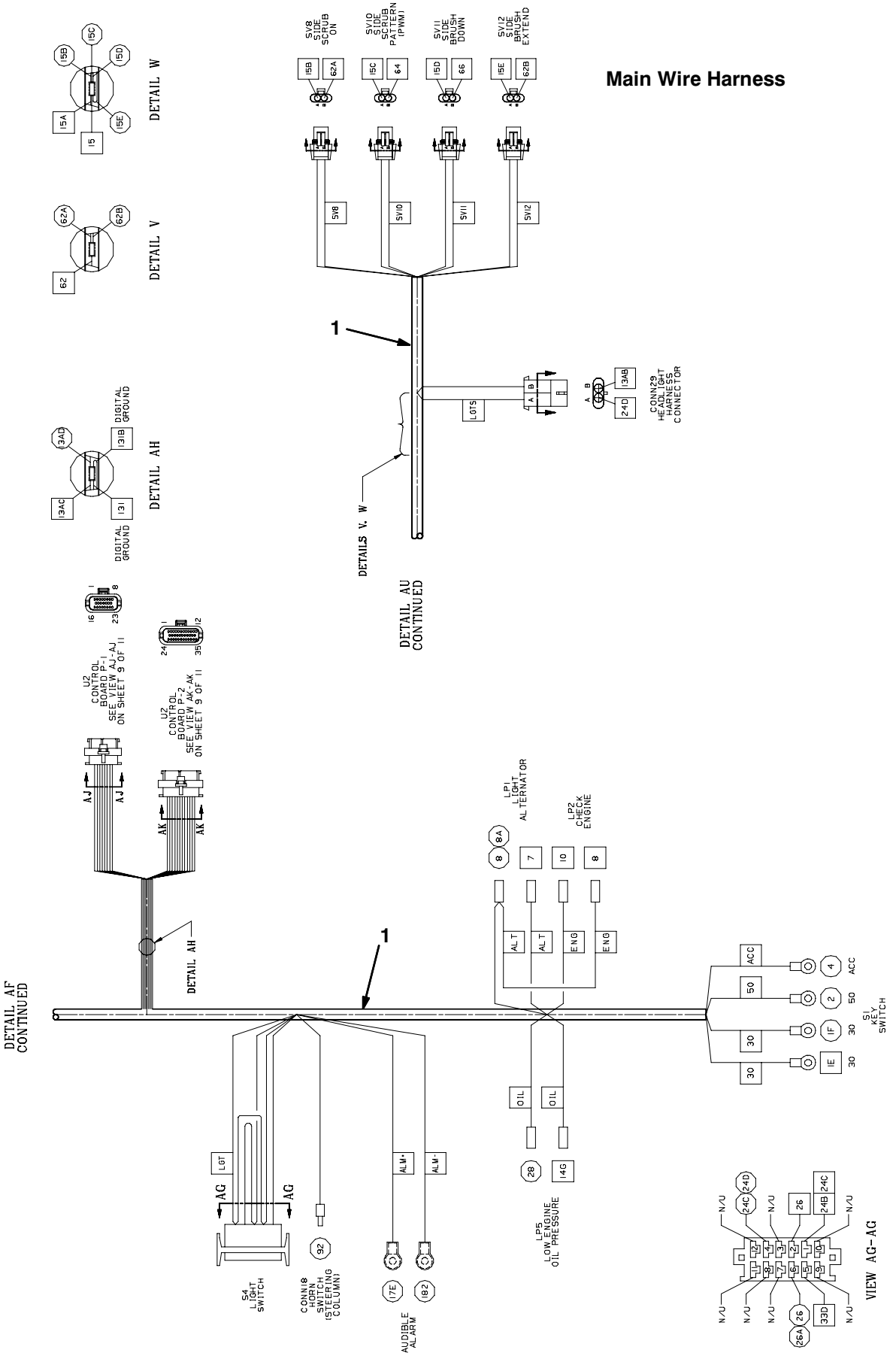
NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

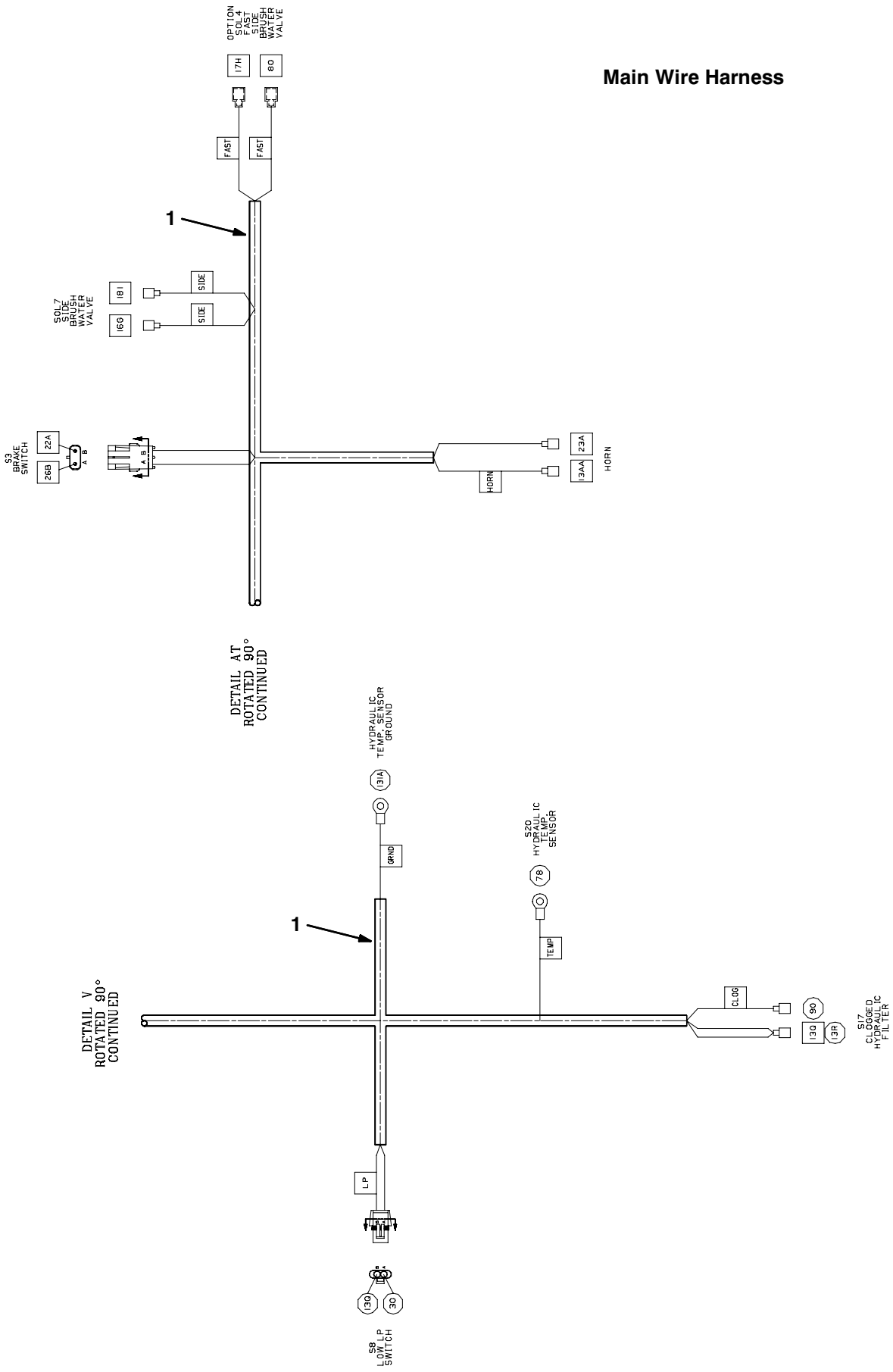
T20 Wiring Harness Detail



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail

Main Wire Harness



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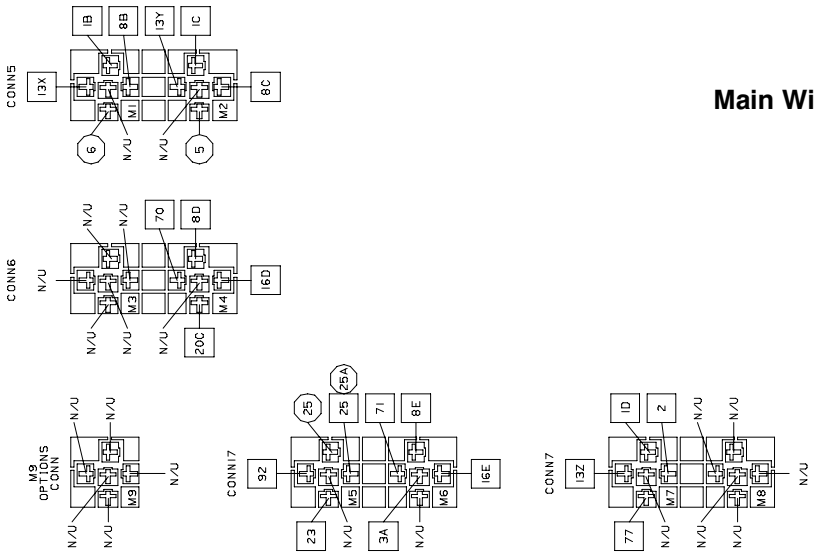
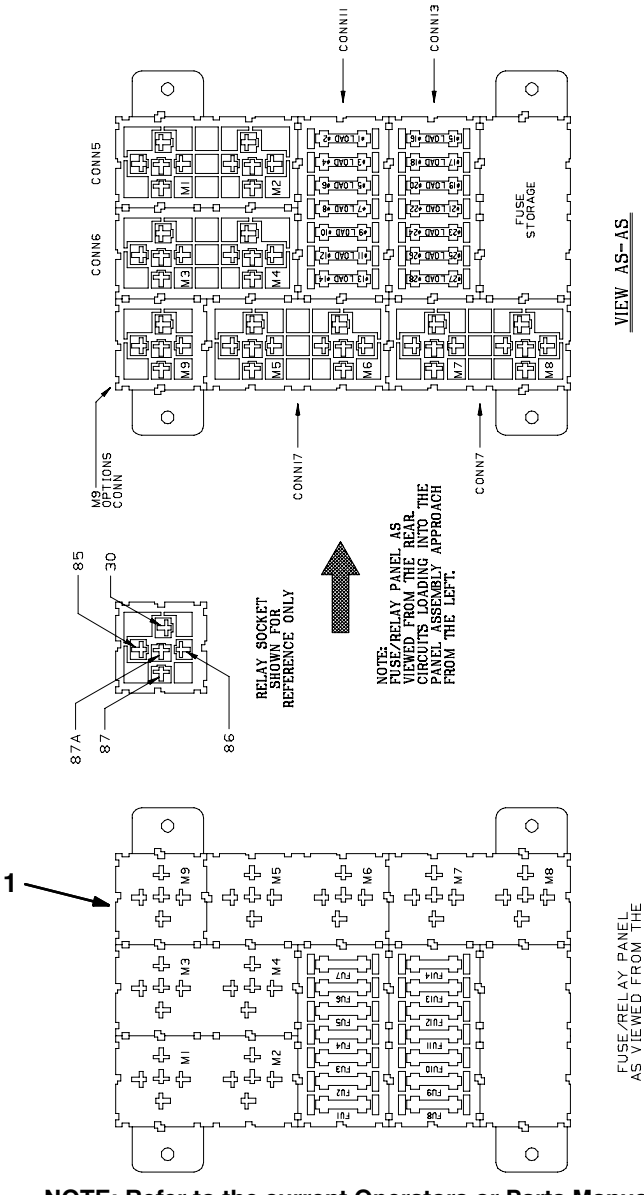
T20 Wiring Harness Detail

Main Wire Harness





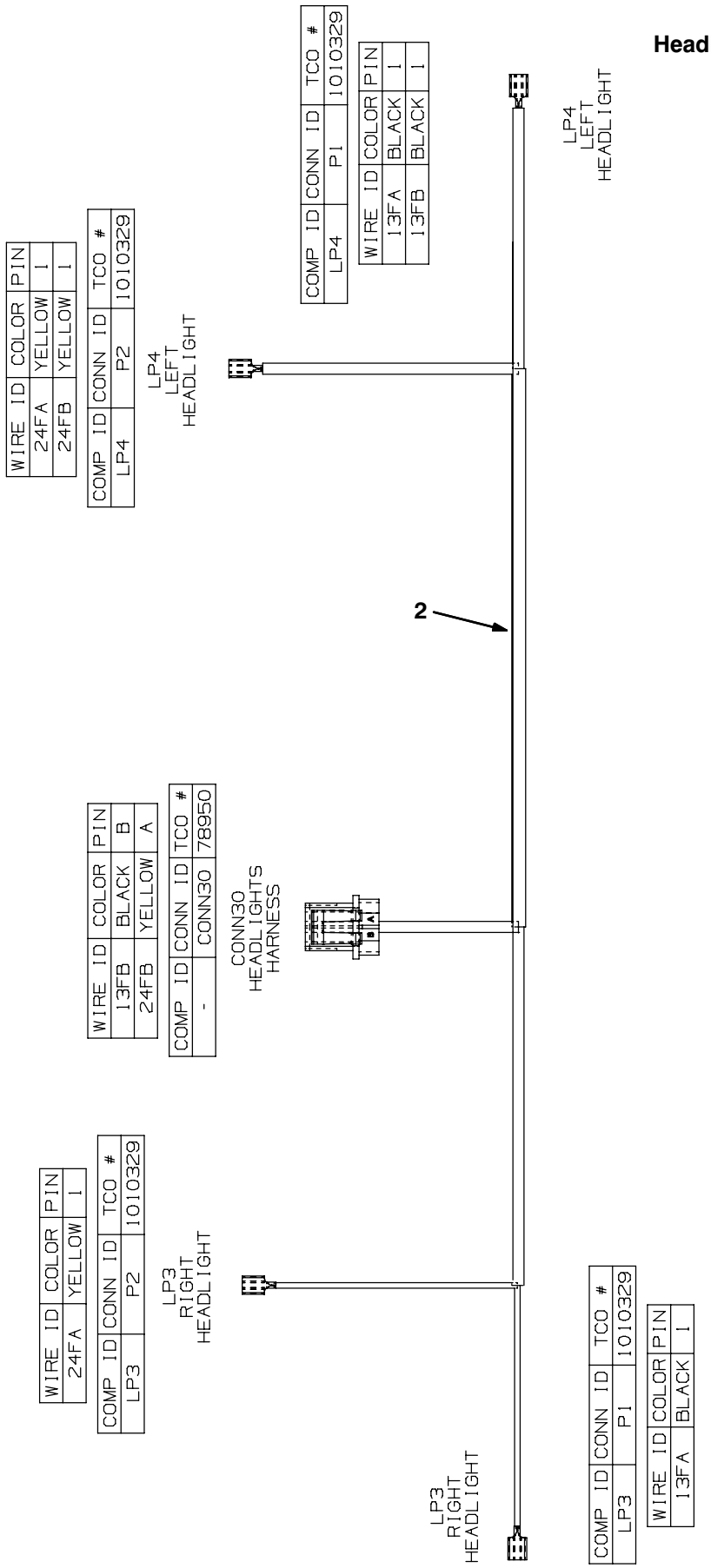
FUSE PANEL ASSEMBLY WIRING

	CONN11 PIN POSITION	CONN11 TERMINAL LOADING BOTTOM HALF	CONN11 PIN POSITION	CONN11 TERMINAL LOADING TOP HALF
FUSE 1	1	□ 4 & ○ 4A	2	□ 8F
FUSE 2	3	X N/U	4	X N/U
FUSE 3	5	□ IJ	6	□ 25A
FUSE 4	7	X N/U	8	X N/U
FUSE 5	9	□ 6 & ○ 6A	10	□ 14E & □ 14L
FUSE 6	11	□ 6A	12	○ 15A
FUSE 7	13	□ 5 & ○ 5A	14	○ □ 16F
	CONN13 PIN POSITION	CONN13 TERMINAL LOADING BOTTOM HALF	CONN13 PIN POSITION	CONN13 TERMINAL LOADING TOP HALF
FUSE 8	15	□ 5A	16	□ 17G
FUSE 9	17	□ 4A & ○ 4C	18	□ 26A & ○ 26B
FUSE 10	19	□ IG	20	□ 8I
FUSE 11	21	□ IH	22	□ 12B
FUSE 12	23	□ 4C	24	□ 12T
FUSE 13	25	X N/U	26	X N/U
FUSE 14	27	X N/U	28	X N/U

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail

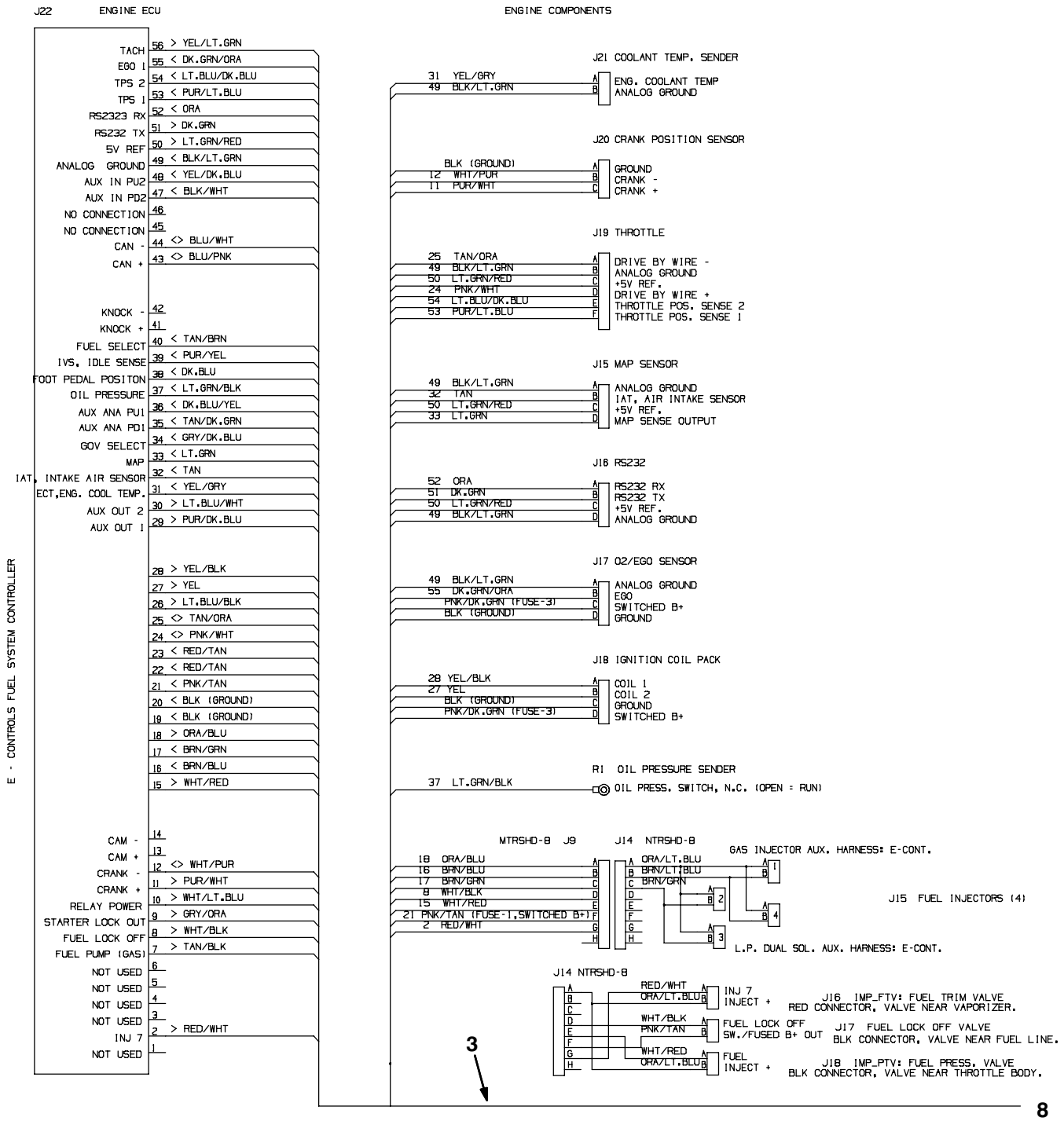
Headlight Wire Harness



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

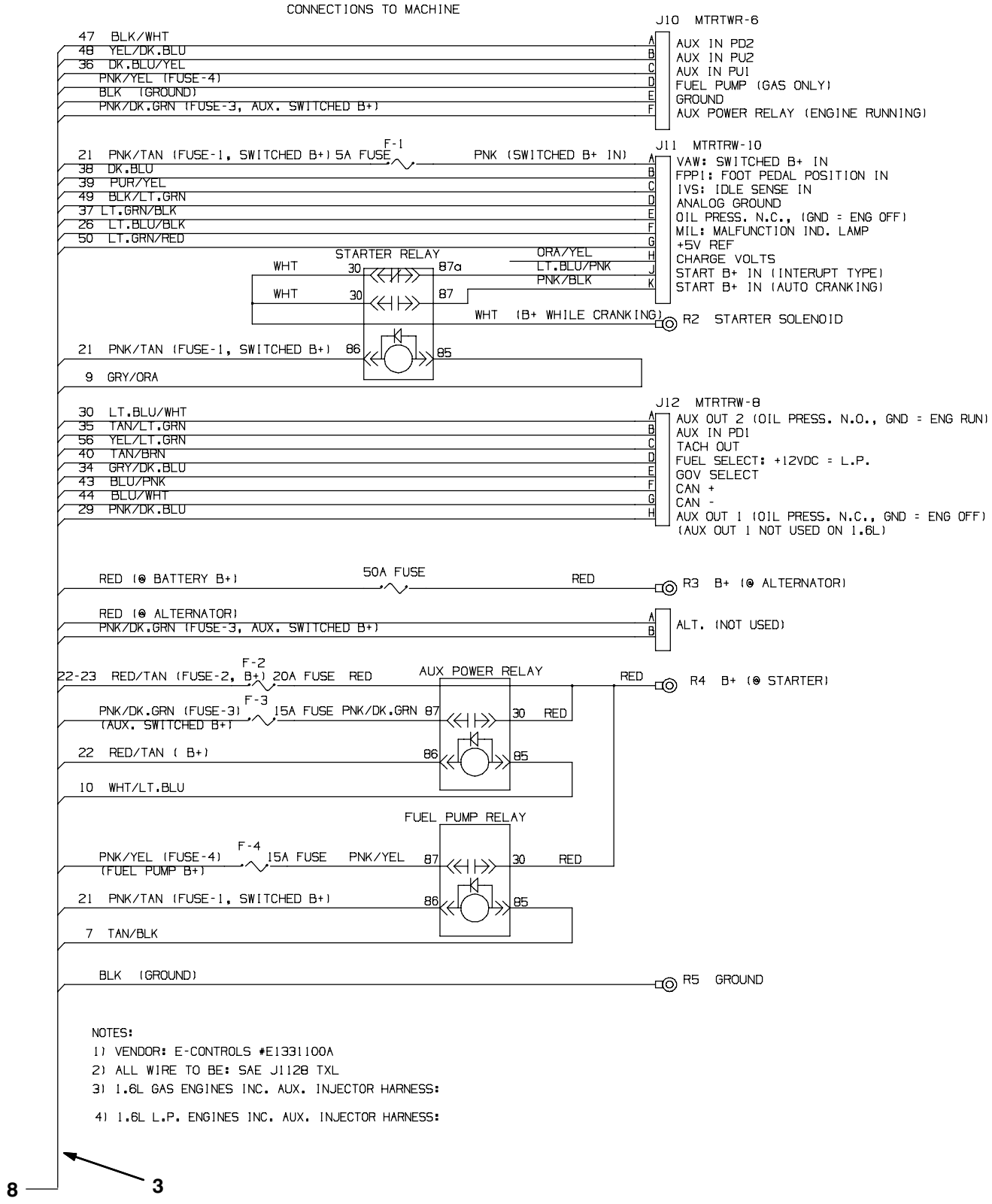
T20 Wiring Harness Detail

(Page 10 of 14)



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

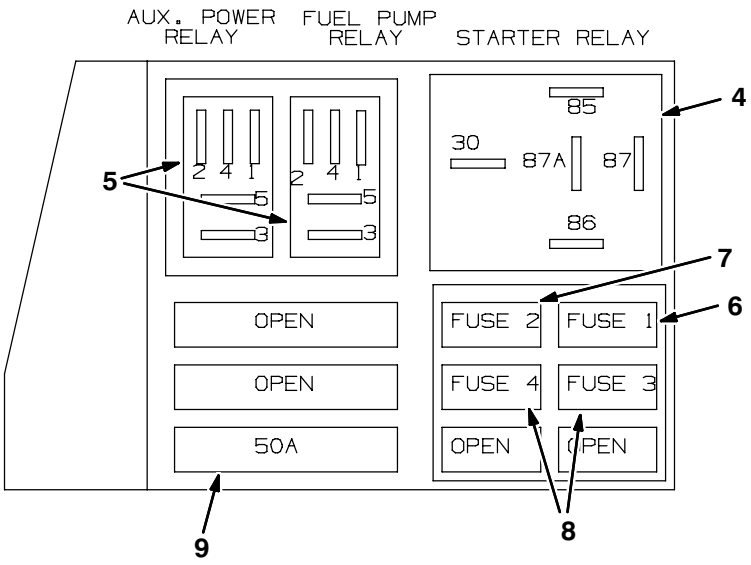
T20 Wiring Harness Detail



E

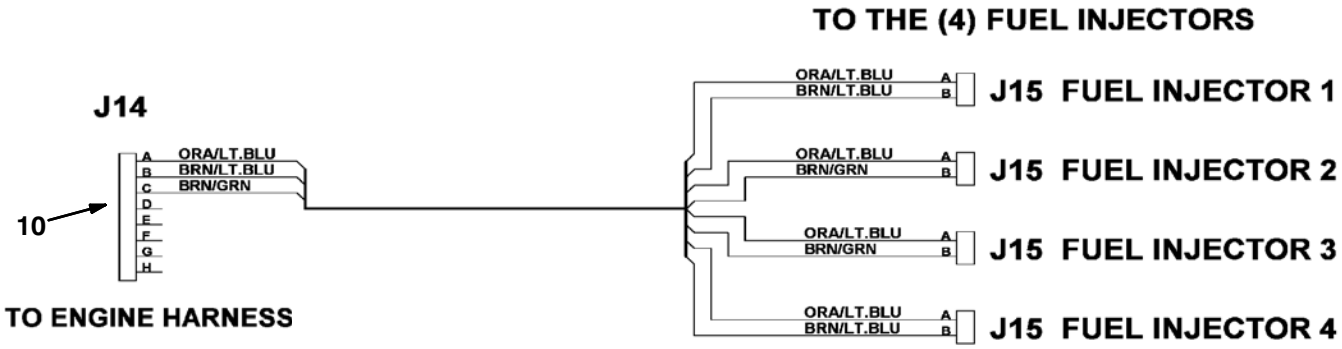
NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail

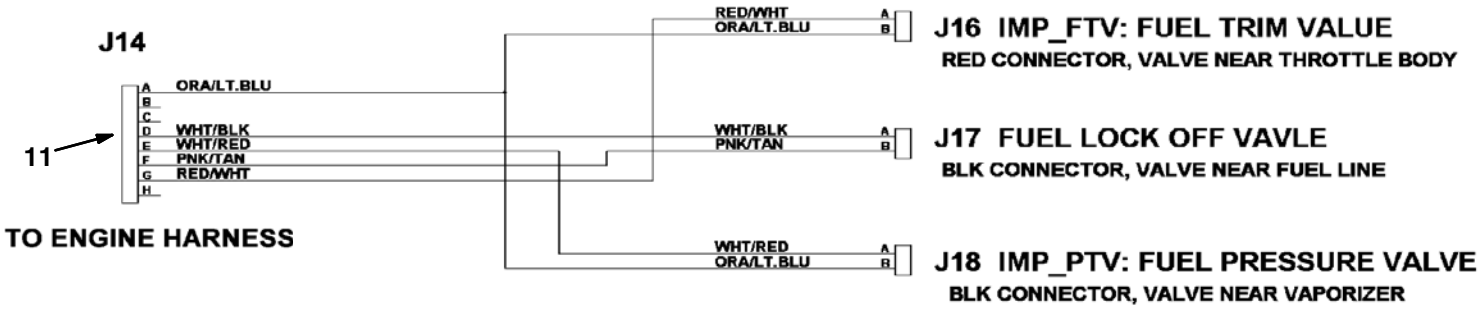


E

GAS INJECTOR AUX. HARNESS



L.P. DUAL SOL. AUX. HARNESS



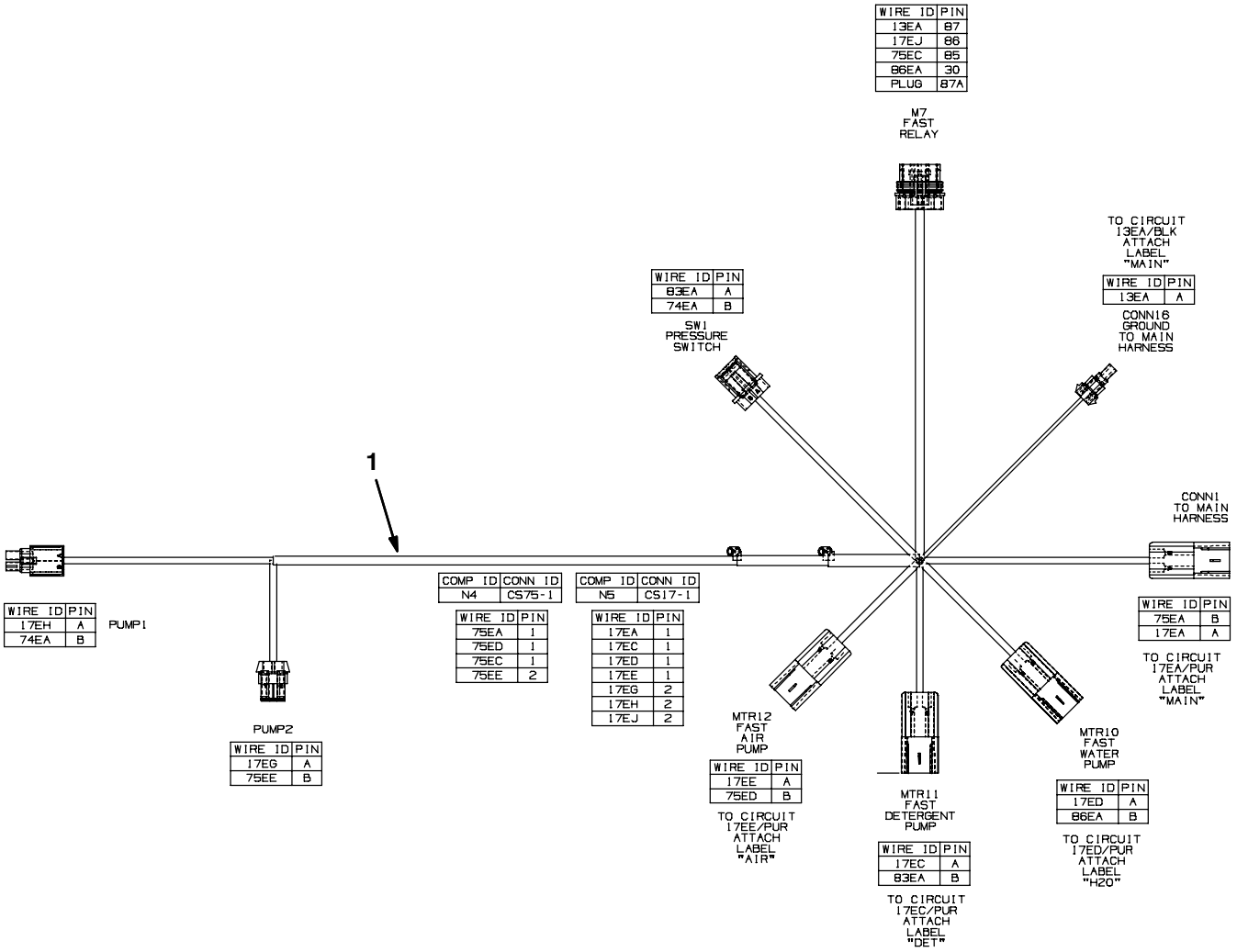
NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Wiring Harness Detail

Ref.	Serial Number	Description	Qty.
1	(000000-)		1
2	(000000-)	Harness, Headlight [M20 And T20]	1
3	(000000-)	Harness, Eng [1.6l, Gm, E-cntrl]	1
4	(000000-)	Relay, 12vdc, 20a, Spdt	1
5	(000000-)	Relay, 12vdc, 40a, Spdt	2
6	(000000-)	Fuse, 5 Amp, [Min-5]	1
7	(000000-)	Fuse, 20 Amp, [Min-20]	1
8	(000000-)	Fuse, 15 Amp, [Min-15]	2
9	(000000-)	Fuse, 50amp	1
10	(000000-)	Harness, Injector, Gas [1.6l,Gm,E-cntrl]	1
11	(000000-)	Harness, Injector, Lpg [1.6l,Gm,E-cntrl]	1

T20 Wiring Harness Detail

Fast Wire Harness Group



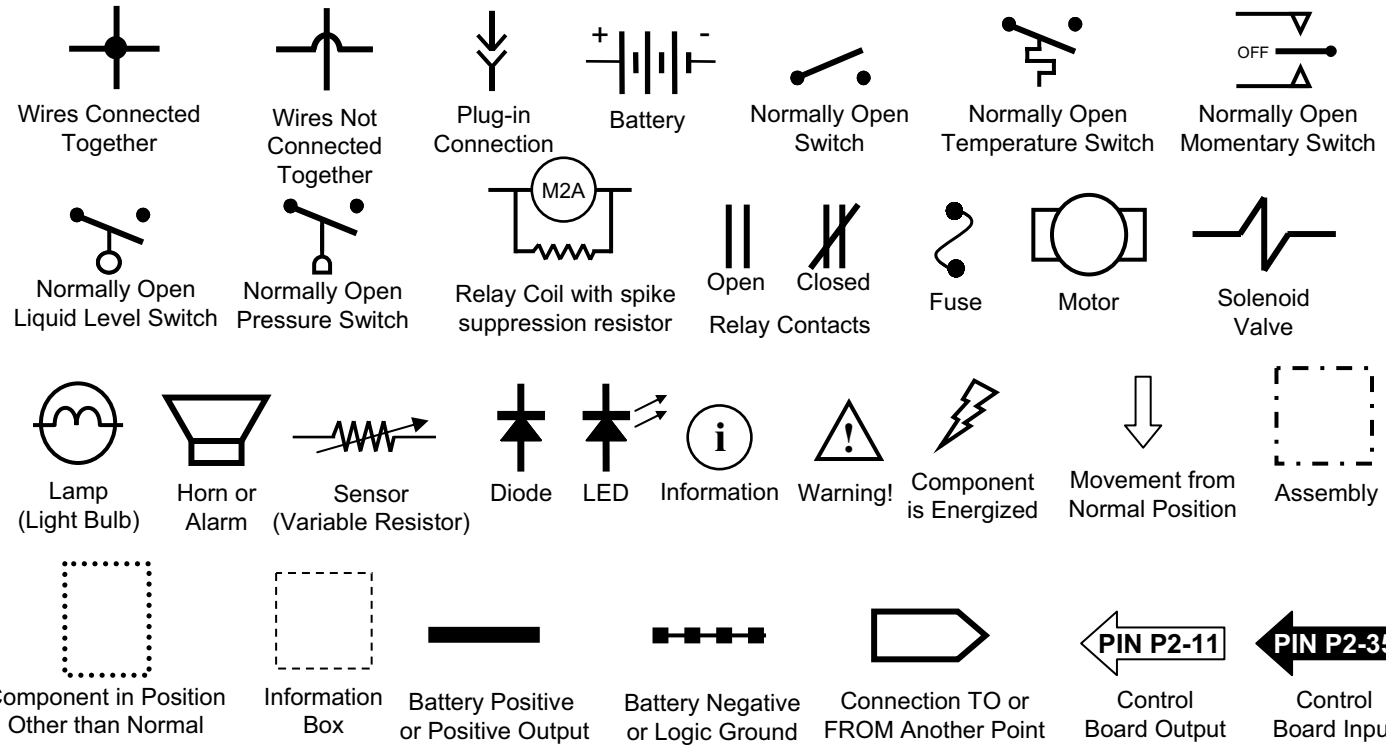
1019646

Ref.	Serial Number	Description	Qty.
1	(000000-)	Harness [Fast, M20 And T20]	1

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

Commonly Used Electrical Symbols & Terms

NOTE: The term “NORMALLY” refers to the component’s “at rest” or “de-energized” position

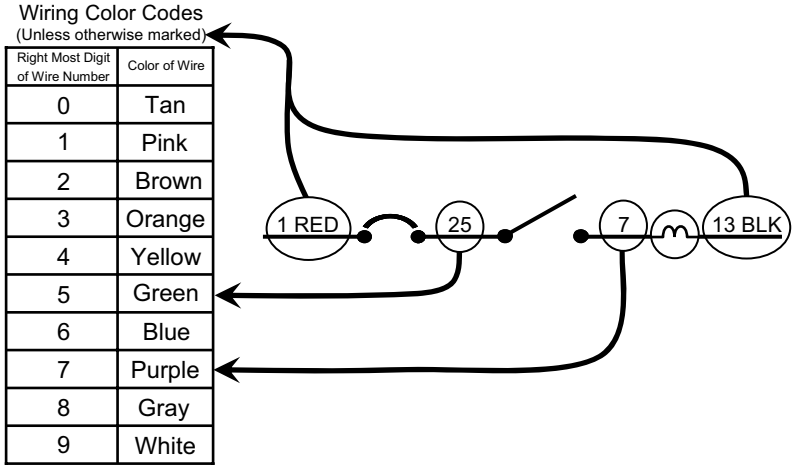


E

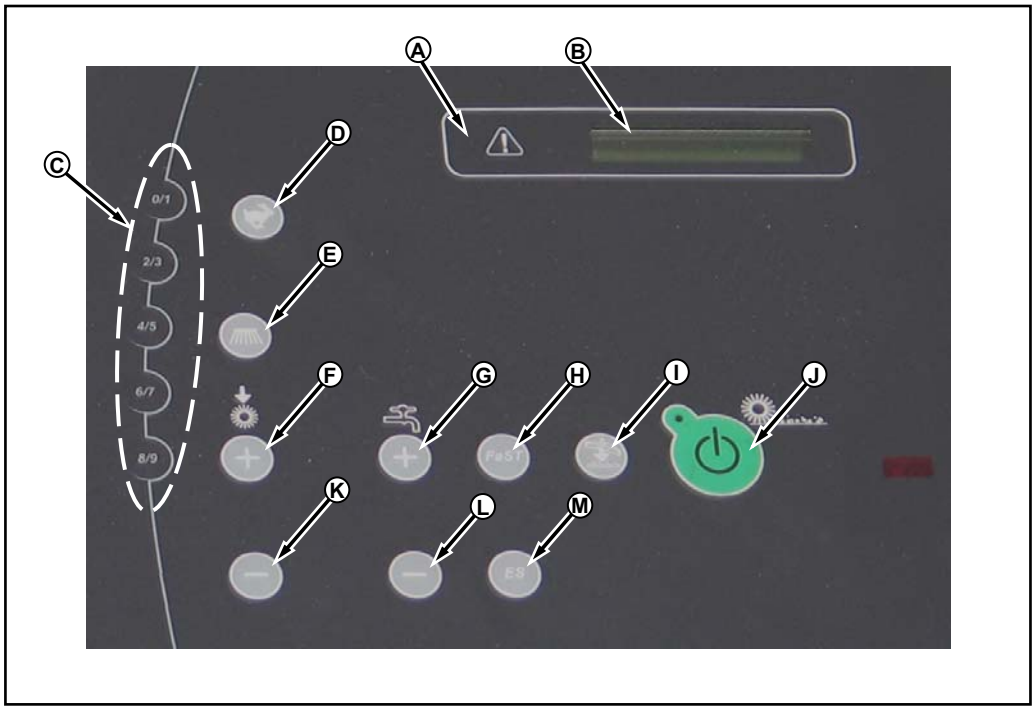
Terms & Abbreviations

ECM – Engine Control Module
LED – Light Emitting Diode
MIL – Malfunction Indicator Lamp
PWM – Pulse Width Modulation (A method of using controlled on/off times to regulate the voltage and current supplied to an electrical device)
SV – Solenoid Valve
SW – Switch

Example of Wiring Numbers & Colors:



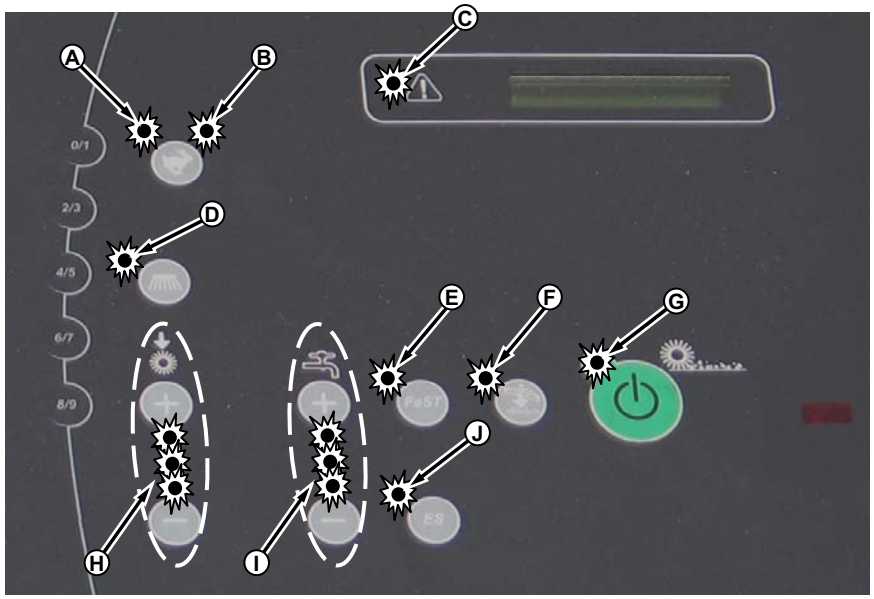
T20 Touch Panel Detail



E

A. Fault indicator light
B. Hour meter / fuel indicator / fault code indicator
C. Supervisor control buttons
D. Engine speed button
E. Side brush button (option)
F. Brush pressure increase button (+)
G. Solution increase button (+)
H. FaST button (option)
I. Scrub vacuum fan / squeegee button
J. 1-STEP scrub button
K. Brush pressure decrease button (-)
L. Solution decrease button (-)
M. ES (Extended Scrub) button (option)

T20 Touch Panel LED's Detail



E

A. Low Engine Speed Indicator
B. High Engine Speed Indicator
C. Fault/Condition Indicator
D. Side Brush ON Indicator
E. FaST System ON Indicator
F. Scrubbing Vacuum Fan ON & Squeegee System ON Indicator
G. 1-STEP Scrub ON Indicator
H. Brush Pressure Indicators (1 LED=Low, 2 LED's=Medium, 3 LED's=High)
I. Solution Volume Indicators (1 LED=Low, 2 LED's=Medium, 3 LED's=High)
J. ES (Extended Scrub) System ON Indicator

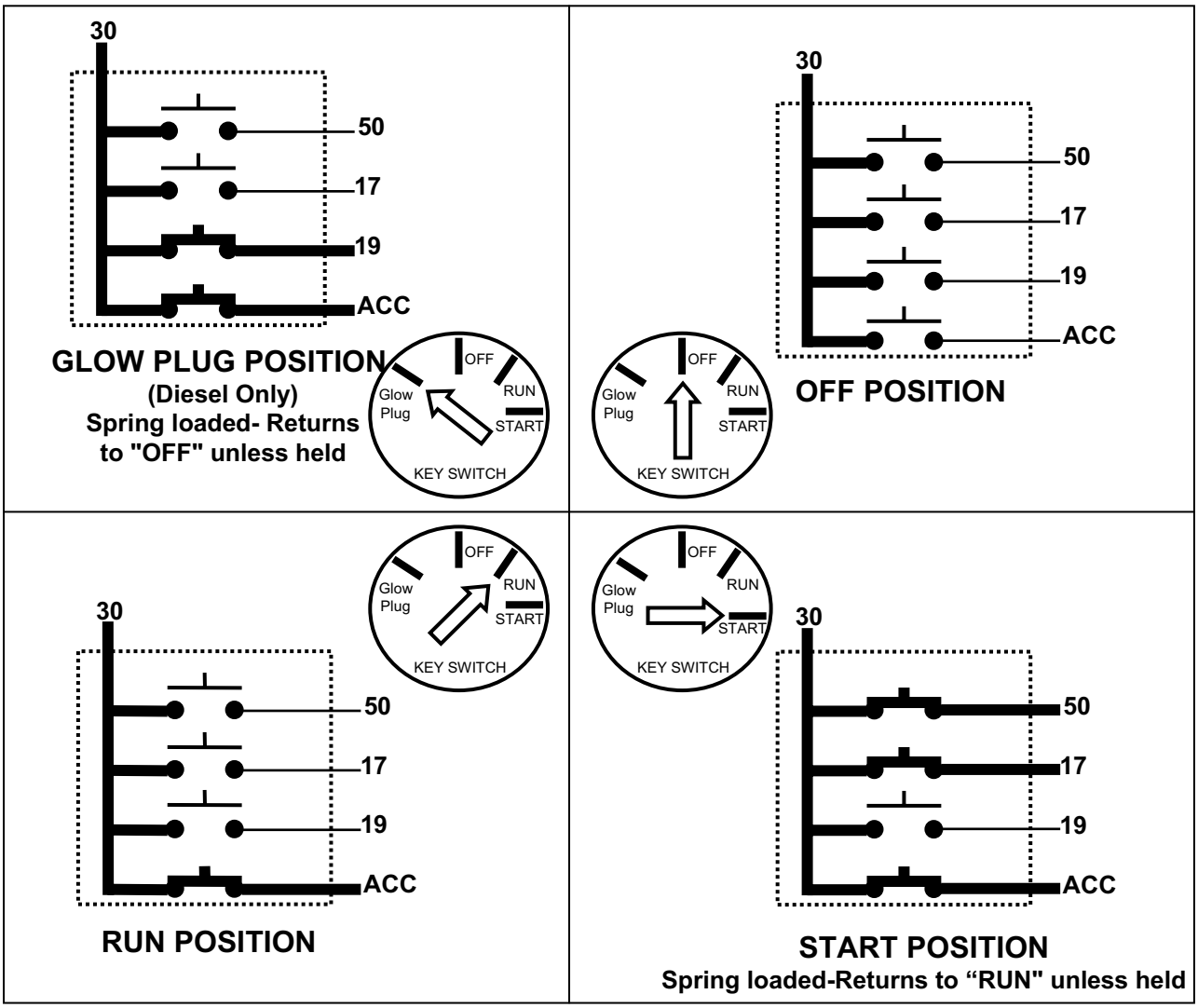
T20 Option Components

The following chart lists various options and the electrical and/or hydraulic components that are associated with the option. Refer to the “notes” section for any components that are deleted from a standard machine in order to have the installed option.

option	added components	E or H	component #	notes
Side Brush	Side Brush ON Solenoid Valve	E,H	SV-8	
	Side Brush Pressure Solenoid Valve	E,H	SV-10	
	Side Brush Down Solenoid Valve	E,H	SV-11	
	Side Brush Extend Solenoid Valve	E,H	SV-12	
	FaST Side Brush Valve	E	SOL-6	
	Side Brush Water Valve	E	SOL-7	
	Side Brush Manifold	H	x	
	Side Brush Lift Cylinder	H	x	
	Side Brush Extend Cylinder	H	x	
	Side Brush Motor	H	x	
ES (Extended Scrub)	Solution Tank Auto Fill Water Valve	E	SOL-1	If machine has ES option, the following components will ***not*** be on the machine: FaST Water Pump, FaST Water Pump Relay (M11), FaST Detergent Pump, FaST Air Pump, FaST Enable Valve (SOL-4), FaST High Flow Valve (SOL-5), FaST Side Brush Valve (SOL-6)
	Recovery Tank Auto Fill Water Valve	E	SOL-2	
	Solution Tank Full Switch	E	S-14	
	Recovery Tank Half Full Switch	E	S-16	
	Detergent Pump	E	x	
	ES Pump	E	x	
Spray Hose	Spray Hose Pump	E	x	
	Spray Hose Relay	E	M12	
	Spray Hose Switch	E	S-25	

E = Electrical Component
H = Hydraulic Component

T20 Key Switch



KEY SWITCH POSITION	SWITCH TERMINAL MARKING				
	30	50	17	19	ACC
GLOW PLUG	●			●	●
OFF	NO CONNECTIONS				
RUN	●				●
START	●	●	●		●

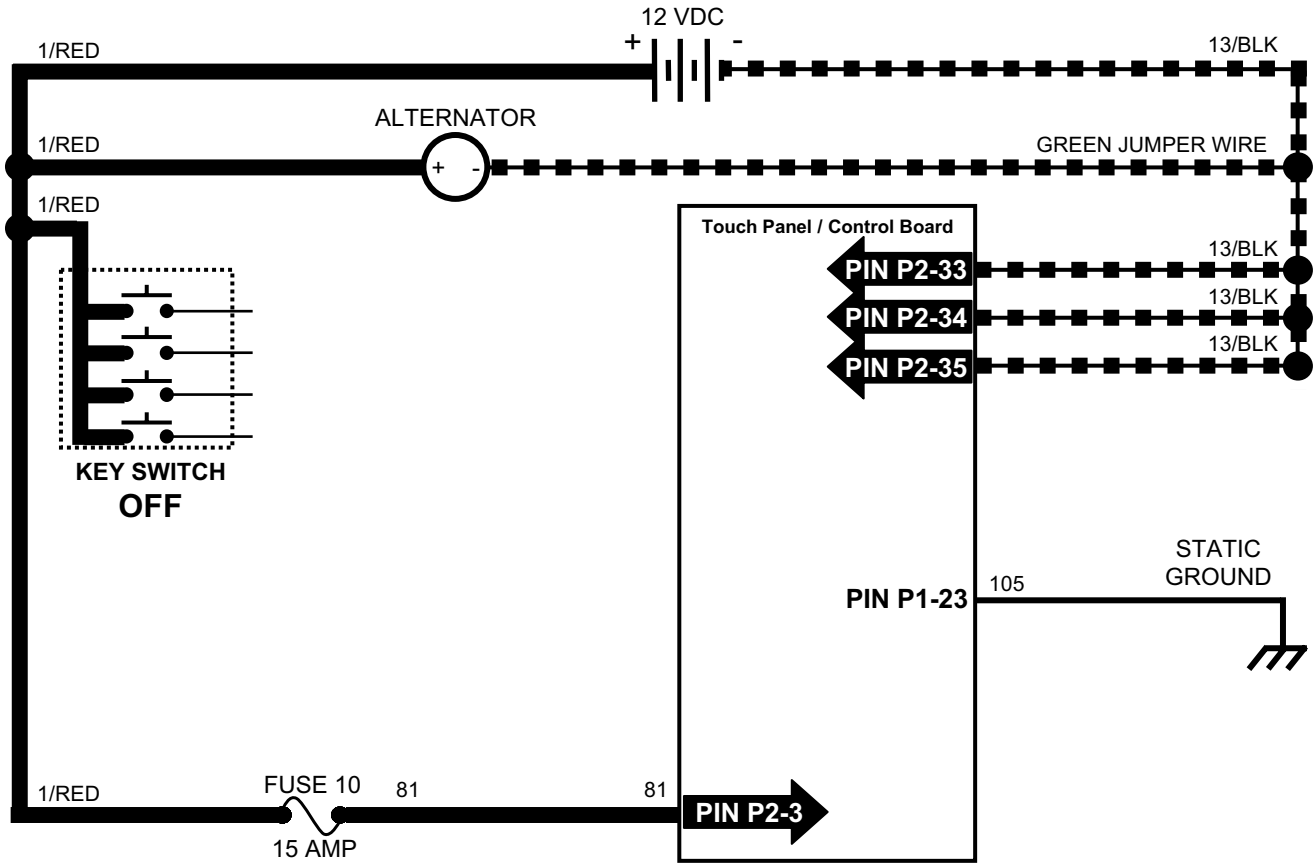
"●—●" Indicates a common connection

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

E

T20 Key OFF Power Distribution

Conditions: Key off



Be cautious when working near Control Board -
Battery voltage is always present, even with Key OFF

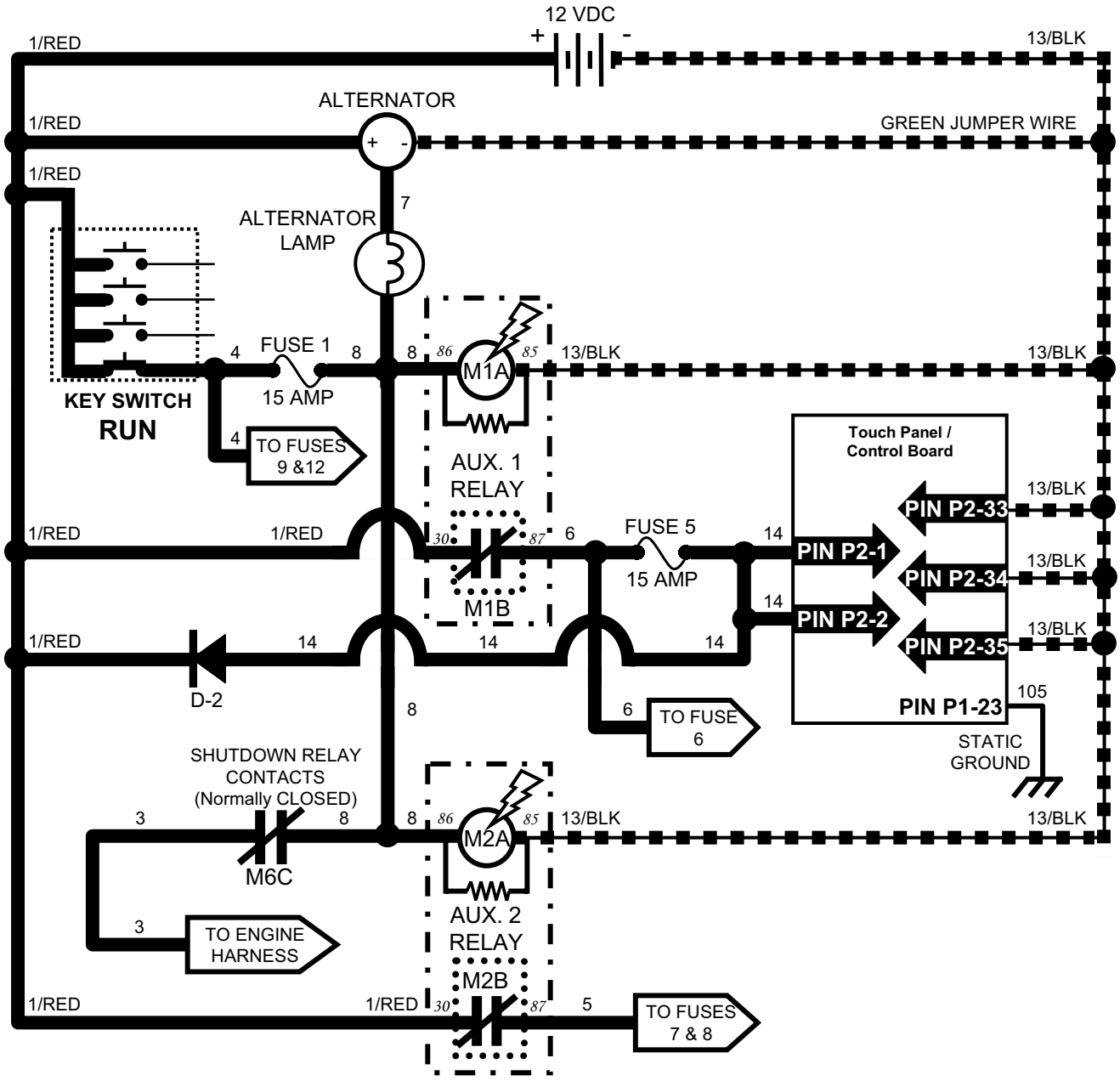
Pin P2-3 supplies power to the on-board clock only. Disconnecting battery, removing Fuse 10, or removing connector P2 from Control Board will require the clock to be reset.

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

T20 Key ON Power Distribution

Conditions: Key on, engine off



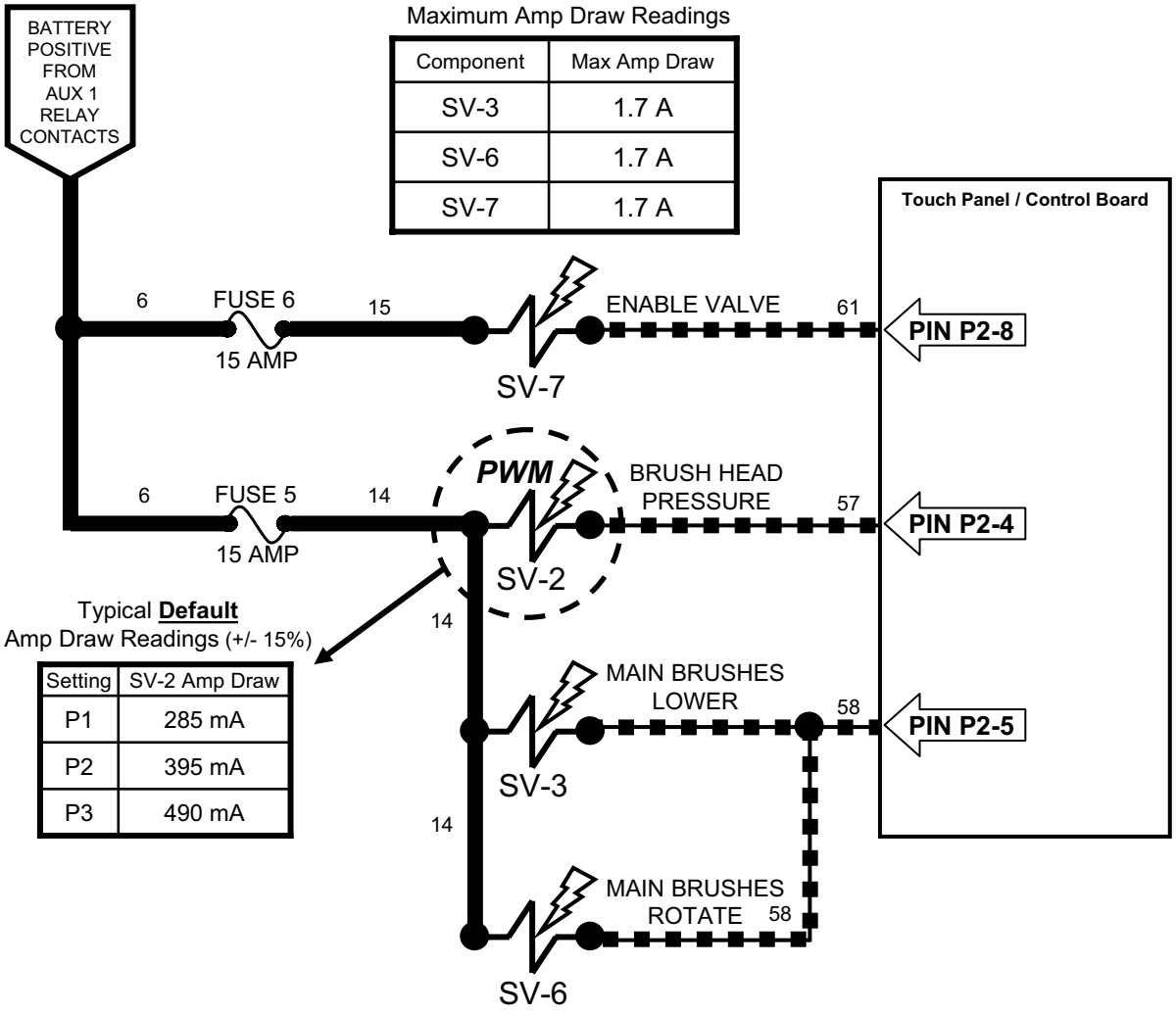
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

E

T20 Main Brushes ON

Conditions: Key on, engine running, scrubbing system on, propel forward or reverse



Maximum Amp Draw Readings

Component	Max Amp Draw
SV-3	1.7 A
SV-6	1.7 A
SV-7	1.7 A

Typical **Default** Amp Draw Readings (+/- 15%)

Setting	SV-2 Amp Draw
P1	285 mA
P2	395 mA
P3	490 mA

Pressure settings P1, P2, & P3 are the Touch Panel LED indicators for Brush down pressure

SV-2 is controlled by PWM; A higher duty cycle (more Brush Pressure LED's lit on Touch Panel) will result in more brush down pressure

Wiring Color Codes
(Unless otherwise marked)

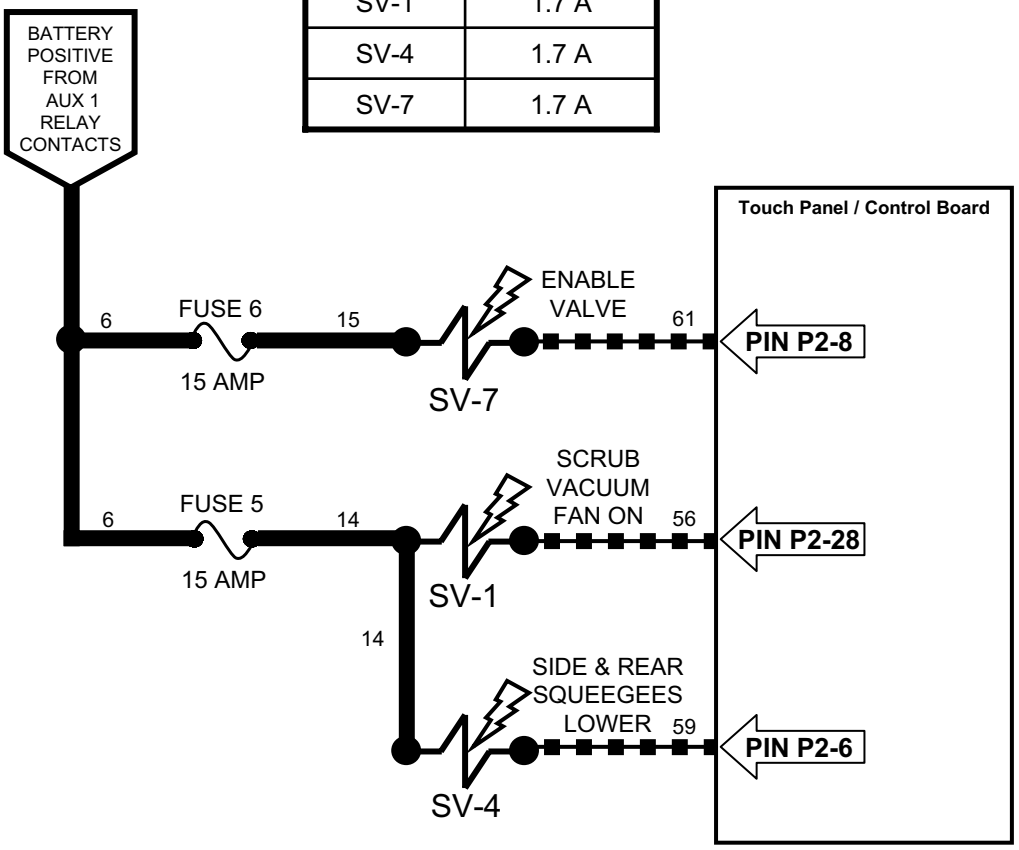
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

T20 Scrub Vacuum Fan ON & Squeegees DOWN

Conditions: Key on, engine running, scrubbing system & scrub vacuum on, propel forward

Maximum Amp Draw Readings

Component	Max Amp Draw
SV-1	1.7 A
SV-4	1.7 A
SV-7	1.7 A



Reverse propel will turn OFF SV-4 (Pin P2-6) and raise the side and rear squeegees.

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

Any condition that cancels the scrub functions will also turn OFF the scrub vacuum fan and raise squeegees.

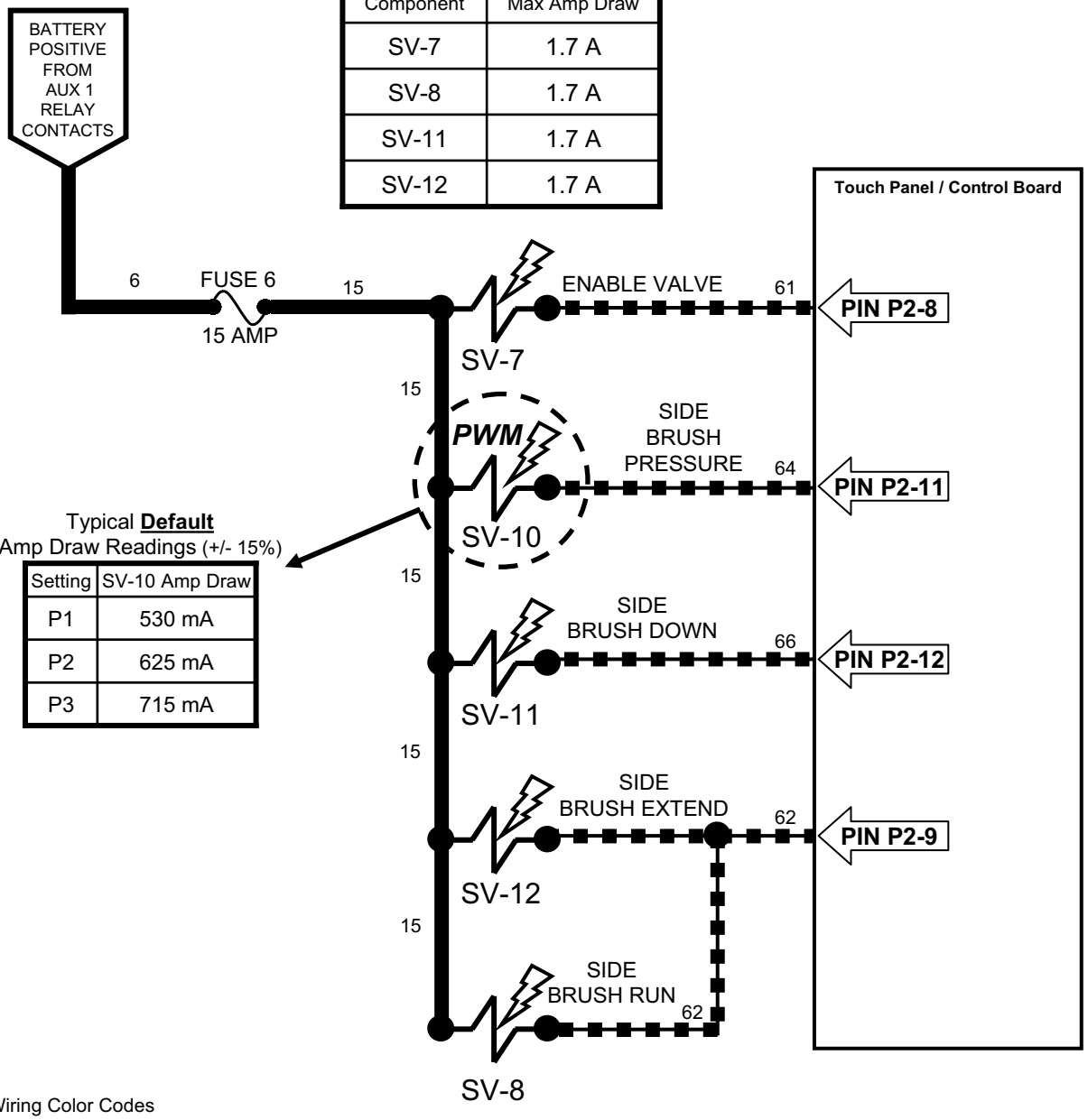
E

T20 Side Brush ON

Conditions: Key on, engine running, scrubbing system on, side brush on, propel forward or reverse

Maximum Amp Draw Readings

Component	Max Amp Draw
SV-7	1.7 A
SV-8	1.7 A
SV-11	1.7 A
SV-12	1.7 A



Typical **Default**
Amp Draw Readings (+/- 15%)

Setting	SV-10 Amp Draw
P1	530 mA
P2	625 mA
P3	715 mA

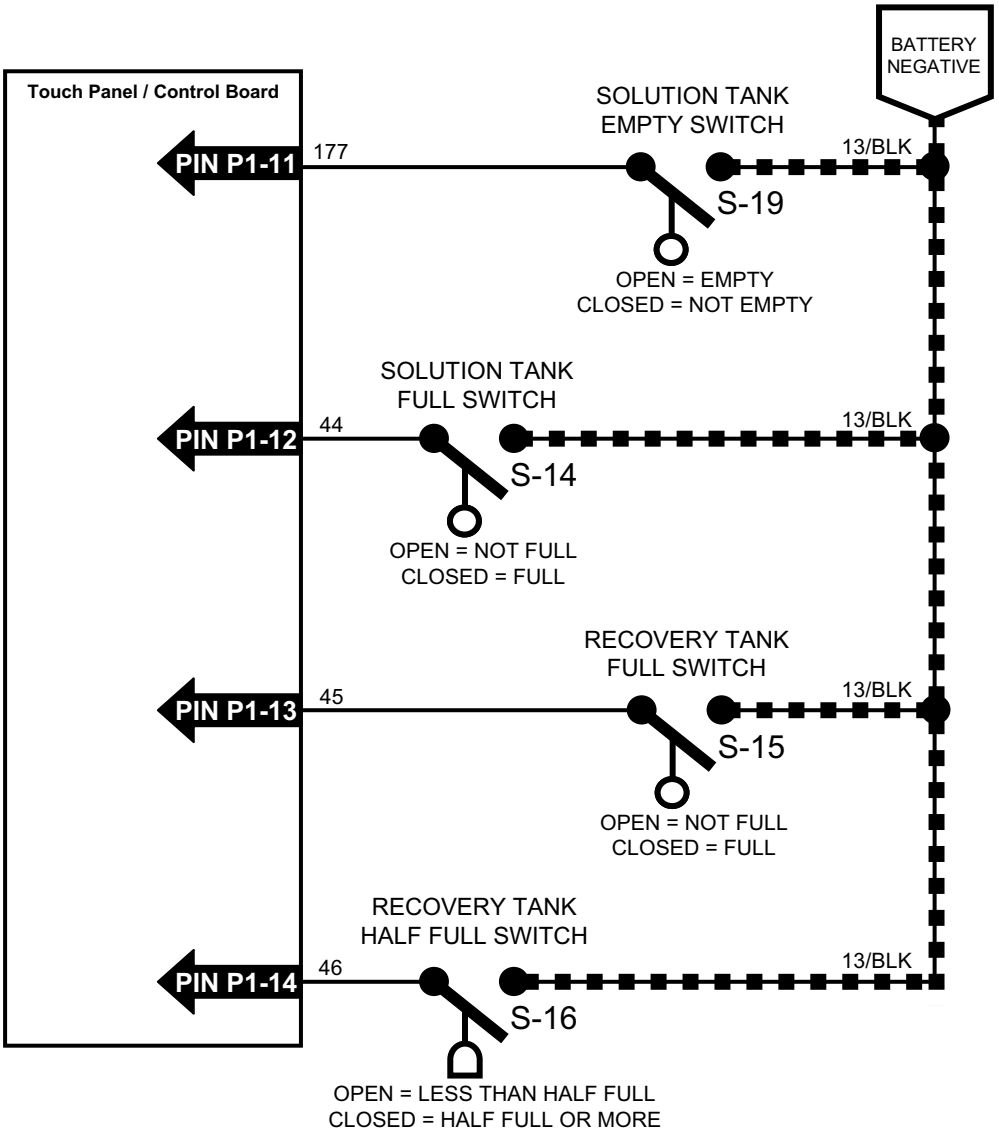
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

Pressure settings P1, P2, & P3 are the Touch Panel LED indicators for Brush down pressure

SV-10 is controlled by PWM; A higher duty cycle (more Brush Pressure LED's lit on Touch Panel) will result in more brush down pressure

T20 Tank Level Switches

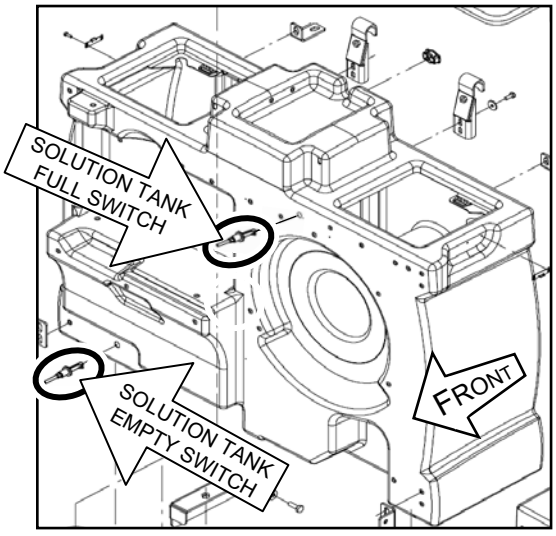


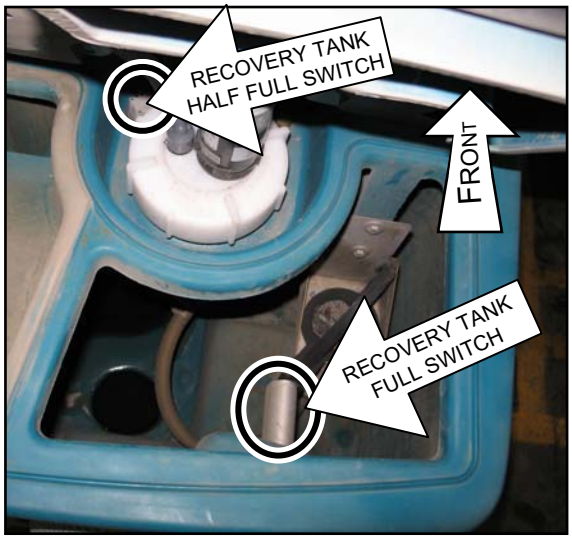
S-14, S-15, & S-19 are Float Switches; S-16 is a Pressure Tube Switch

The Tank Level Switches must be closed for 5 seconds before any output is affected

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White





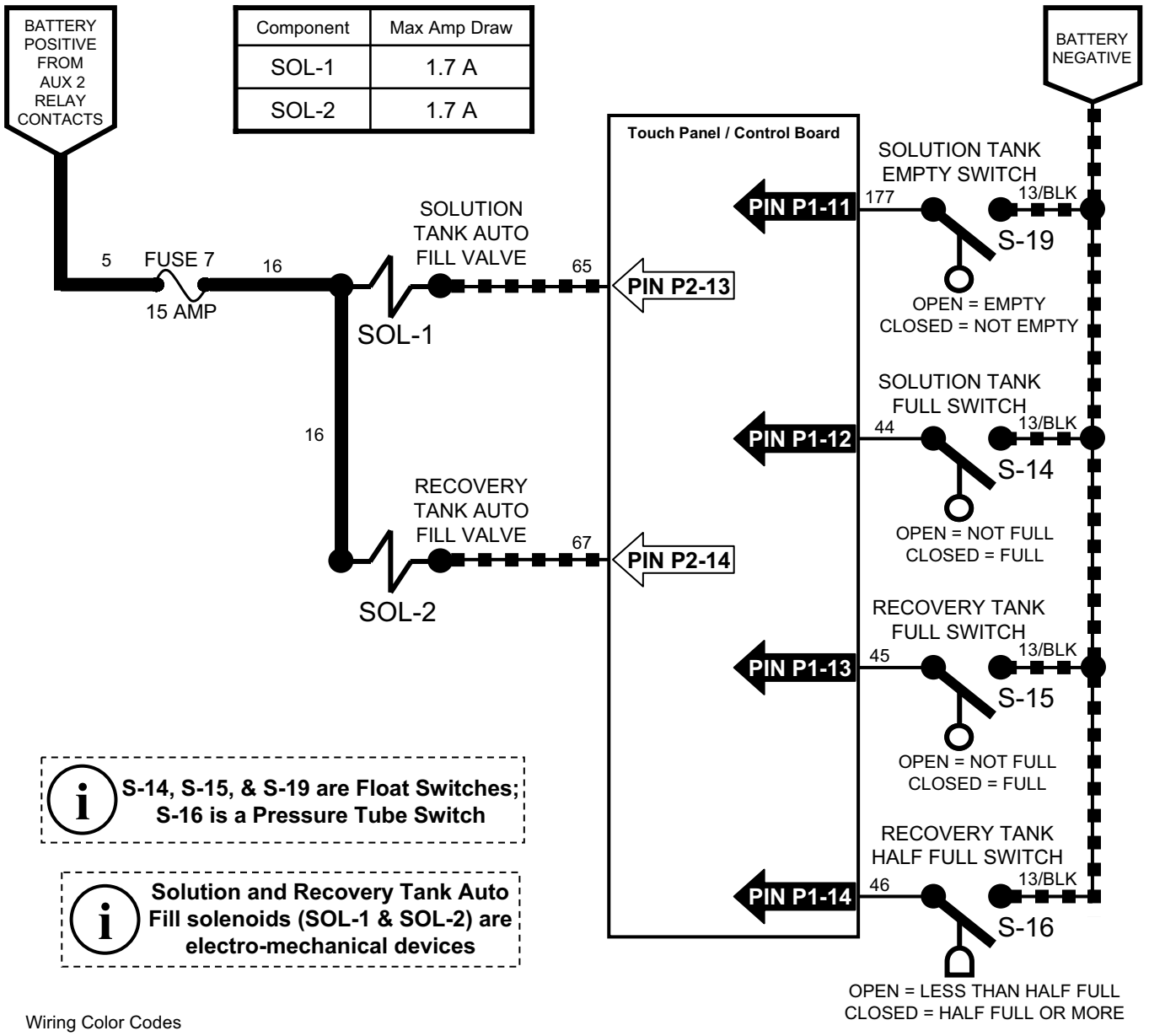
E

T20 Auto Fill Solenoids (ES equipped Machines Only)

Conditions: Key on, water source connected to machine, solution tank NOT full, recovery tank less than half full

Maximum Amp Draw Readings

Component	Max Amp Draw
SOL-1	1.7 A
SOL-2	1.7 A



S-14, S-15, & S-19 are Float Switches; S-16 is a Pressure Tube Switch

Solution and Recovery Tank Auto Fill solenoids (SOL-1 & SOL-2) are electro-mechanical devices

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

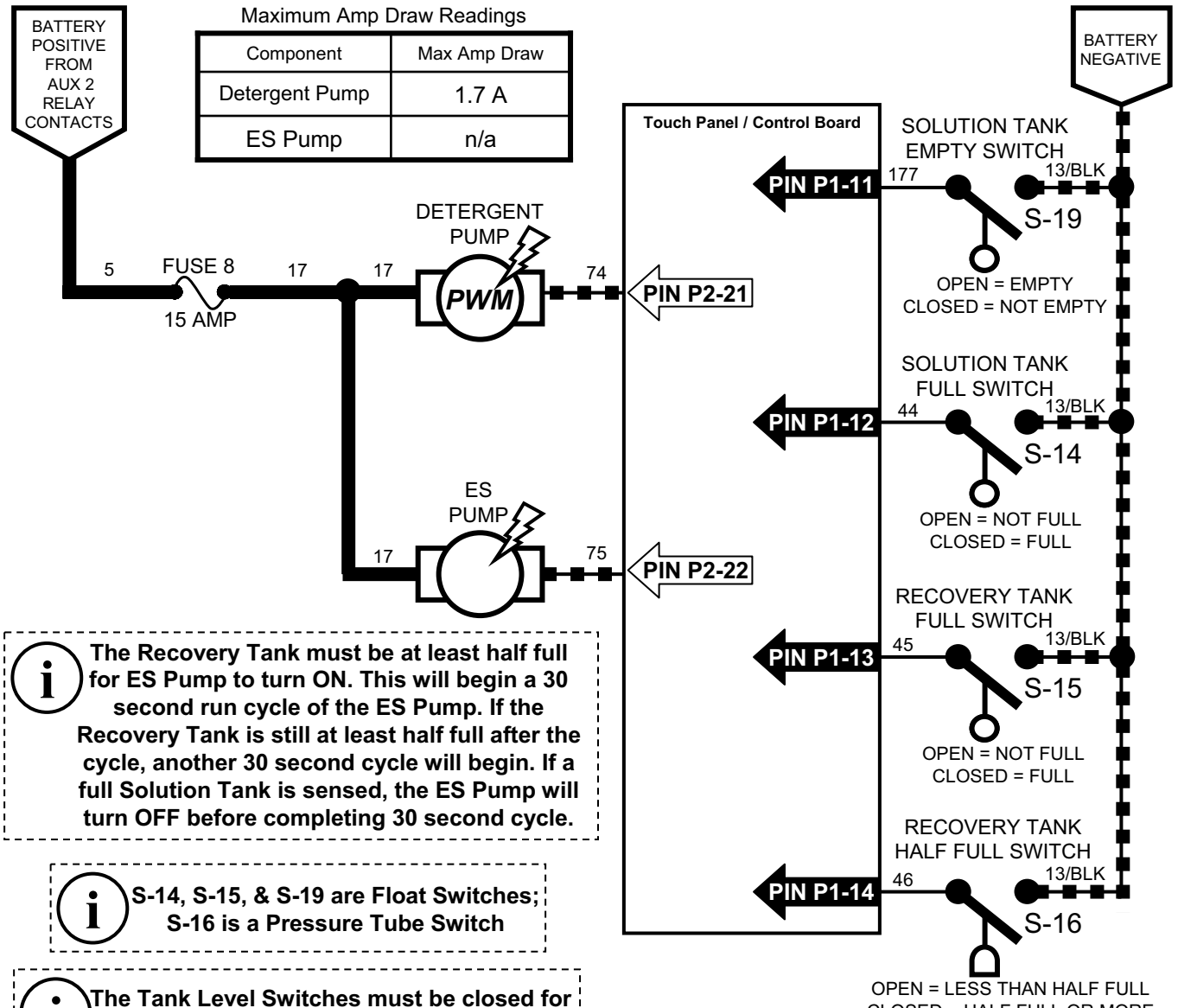
Machine must be in neutral and Solution Tank Full Switch OPEN (tank not full) to activate Solution Tank Auto Fill Valve (SOL-1)

Machine must be in neutral and Recovery Tank Half Full Switch OPEN (tank less than half full) to activate Recovery Tank Auto Fill Valve (SOL-2)

The Tank Level Switches must be closed for 5 seconds before any output is affected

T20 Conventional Detergent Pump & ES Pump

Conditions: Key on, engine running, scrubbing system on, ES system on, recovery tank half full or more, solution tank not full, two or three solution LED's lit



Maximum Amp Draw Readings

Component	Max Amp Draw
Detergent Pump	1.7 A
ES Pump	n/a

The Recovery Tank must be at least half full for ES Pump to turn ON. This will begin a 30 second run cycle of the ES Pump. If the Recovery Tank is still at least half full after the cycle, another 30 second cycle will begin. If a full Solution Tank is sensed, the ES Pump will turn OFF before completing 30 second cycle.

S-14, S-15, & S-19 are Float Switches; S-16 is a Pressure Tube Switch

The Tank Level Switches must be closed for 5 seconds before any output is affected

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

The Detergent Pump is controlled by PWM; A higher duty cycle (more Solution LED's lit on Touch Panel) will result in more detergent & solution applied to floor

Low Water and Detergent Pump OFF

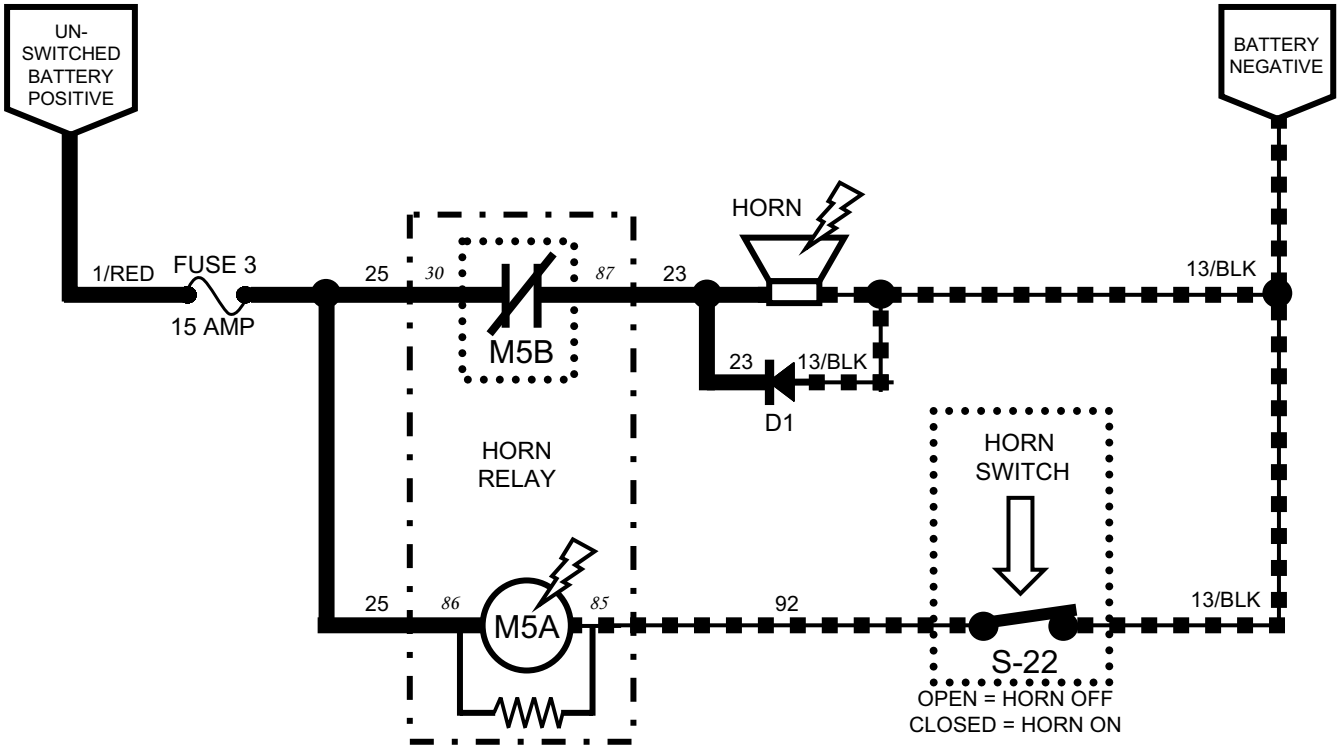
Medium Water and Detergent Pump LOW

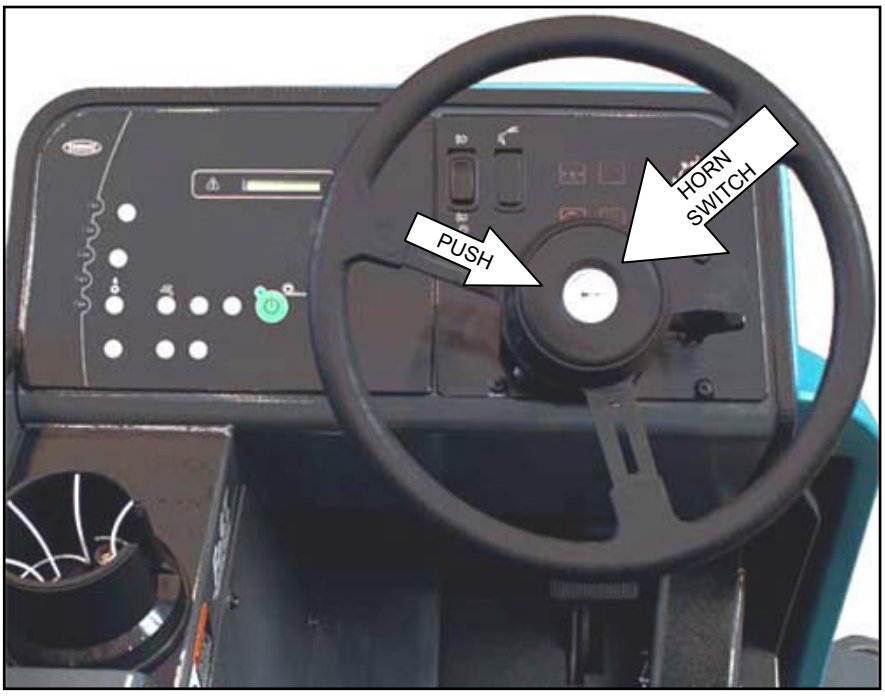
High Water and Detergent Pump HIGH

E

T20 Horn

Conditions: Horn switch activated



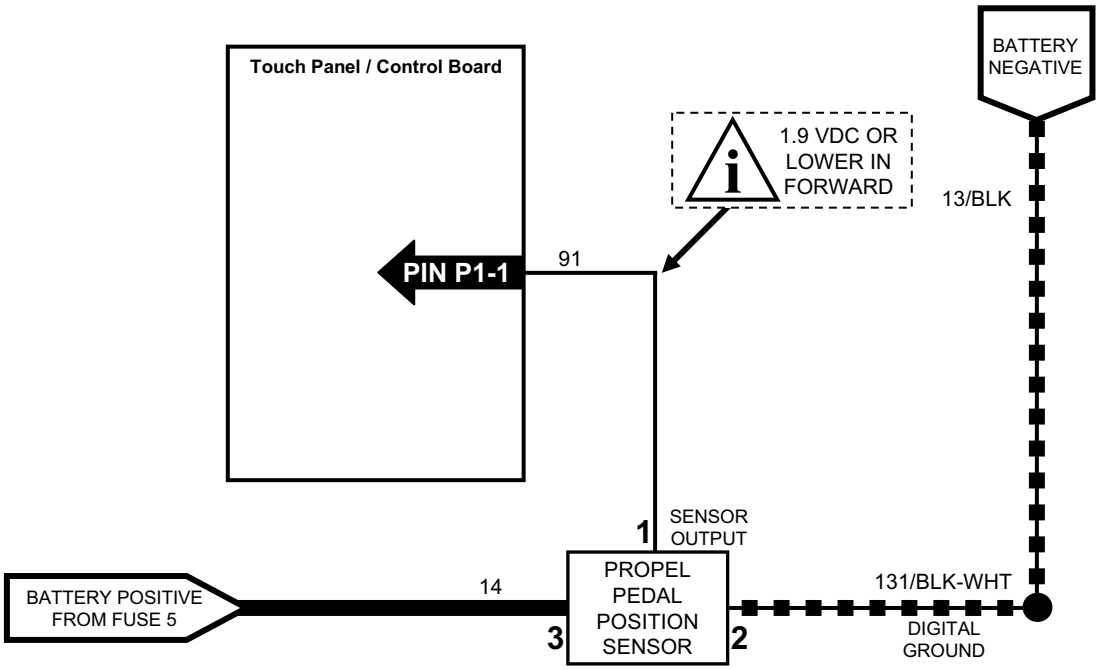


Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

T20 Forward Propel

Conditions: Key on, propel pedal pushed for forward travel



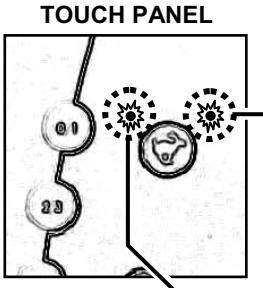
SENSOR OUTPUT VOLTAGES:
2.0 to 2.7 VDC = NEUTRAL
2.8 VDC OR HIGHER = REVERSE
1.9 VDC OR LOWER = FORWARD

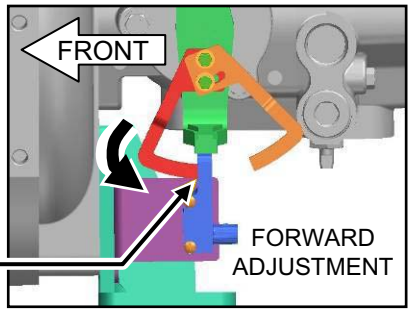
E

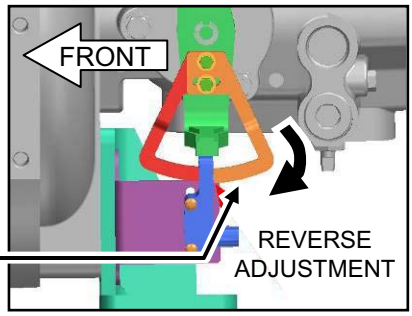
Propel Pedal Position Sensor Arms Adjustment

1) Enter Input Diagnostics Mode
2) Loosen sensor arms hardware
3) Tighten top bolt to snug
4) Slide arm until the light goes ON
5) **Back arm out until the light goes OFF**
6) Retighten all hardware

NOTE: Use the High Engine Speed LED to adjust the arm closest to the front of machine (forward adjustment), and the Low Engine Speed LED to adjust the arm closest to the rear of machine (reverse adjustment).

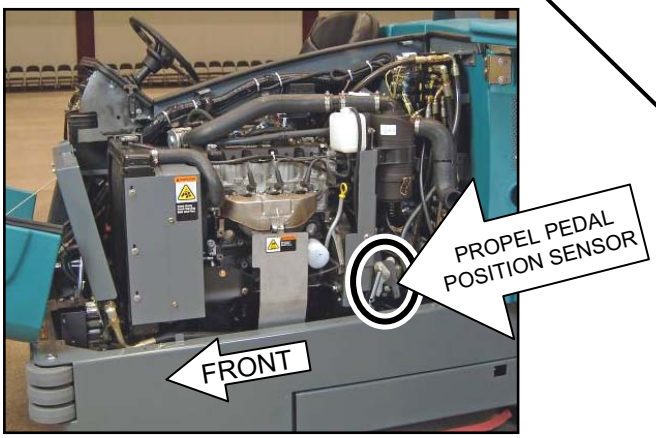






Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

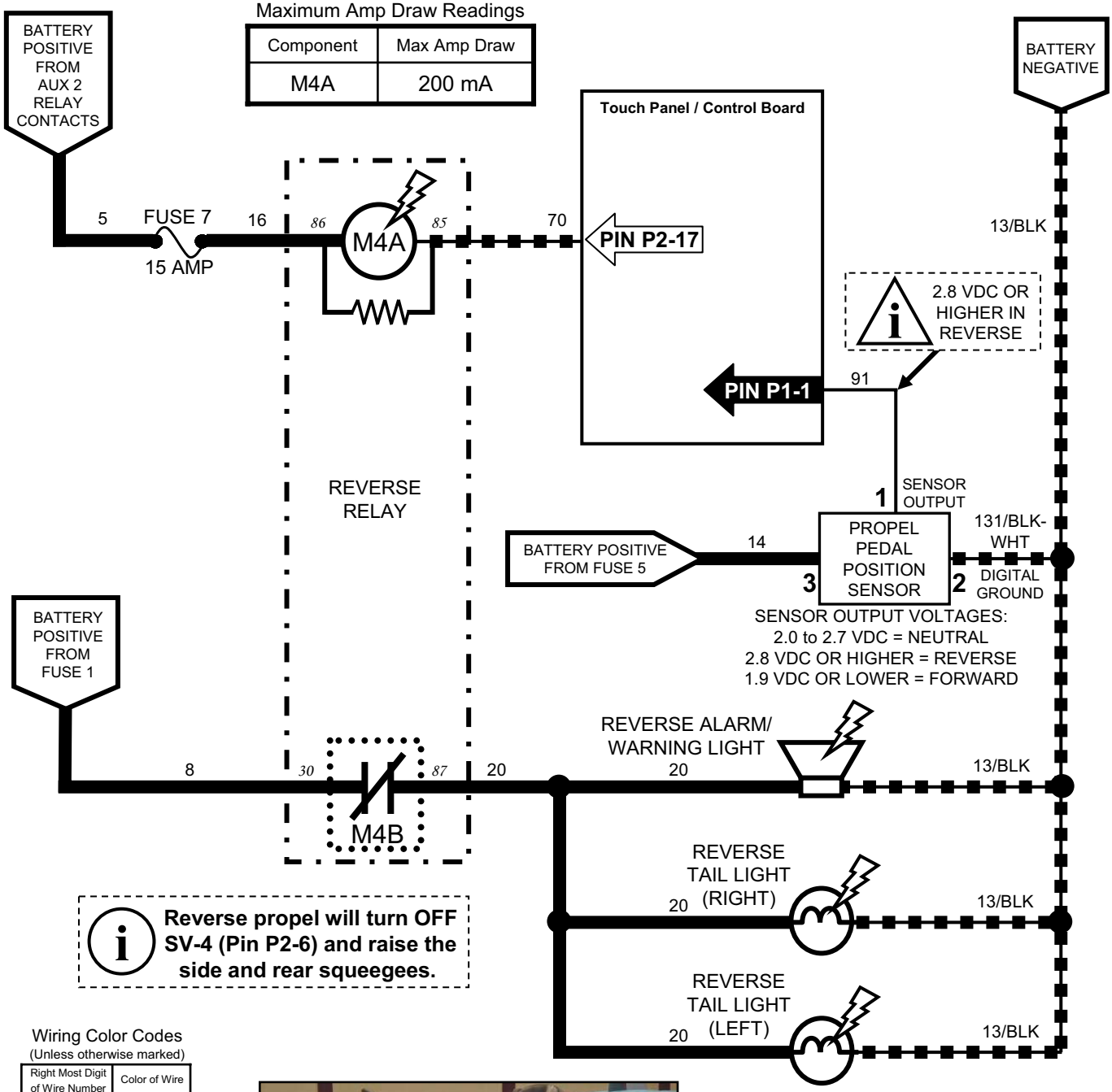


T20 Reverse Propel

Conditions: Key on, propel pedal pushed for reverse travel

Maximum Amp Draw Readings

Component	Max Amp Draw
M4A	200 mA

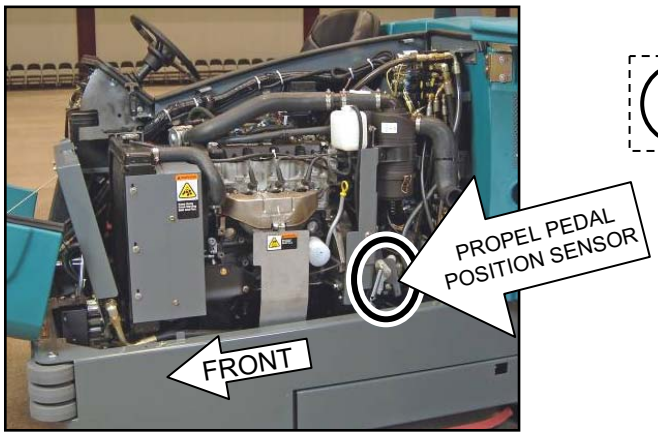


Reverse propel will turn OFF SV-4 (Pin P2-6) and raise the side and rear squeegees.

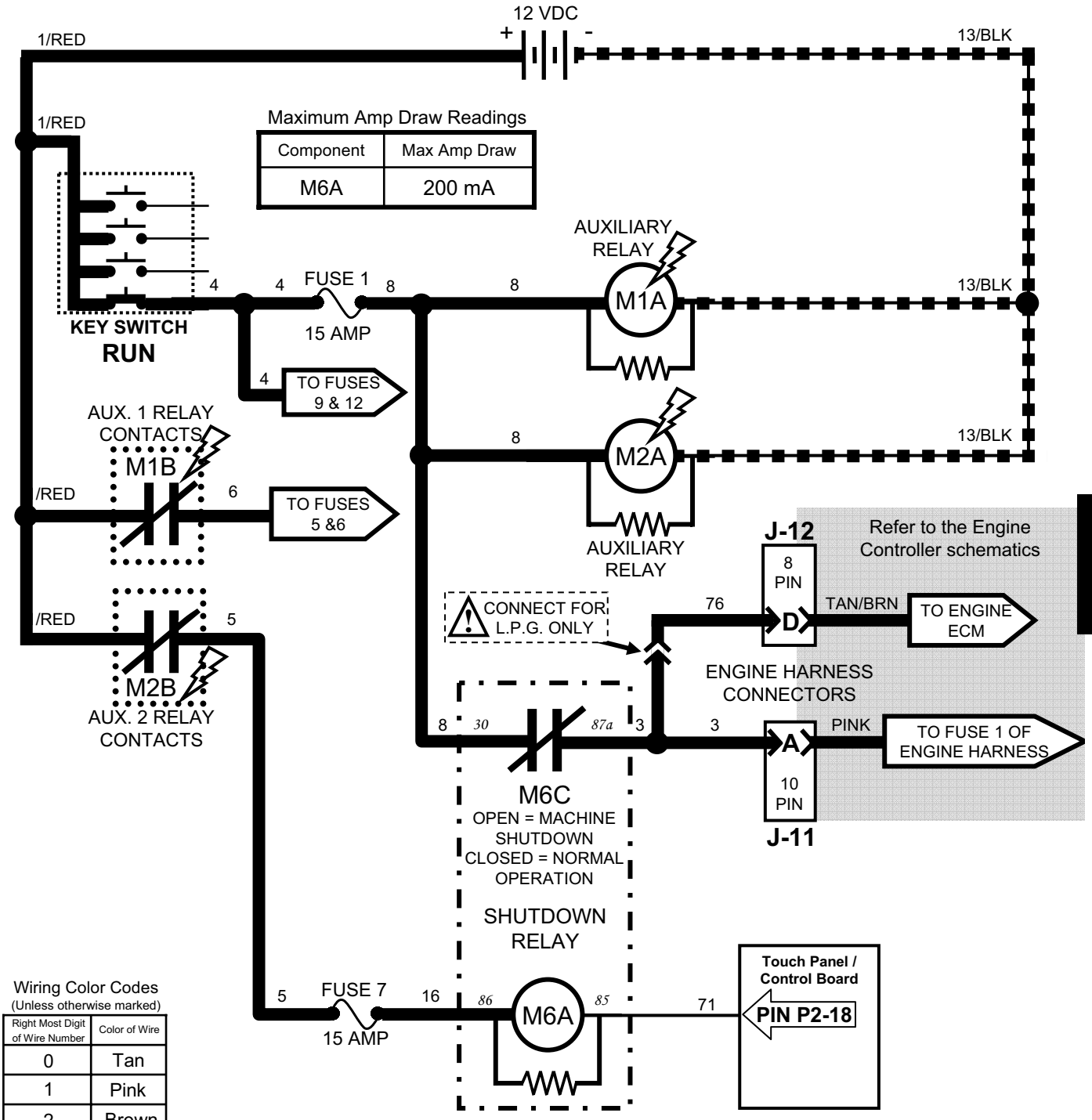
See Forward Propel page for information on adjusting Propel Pedal Position Sensor

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



T20 Shutdown Relay (Normal Machine Operation)
(Gas/LPG)



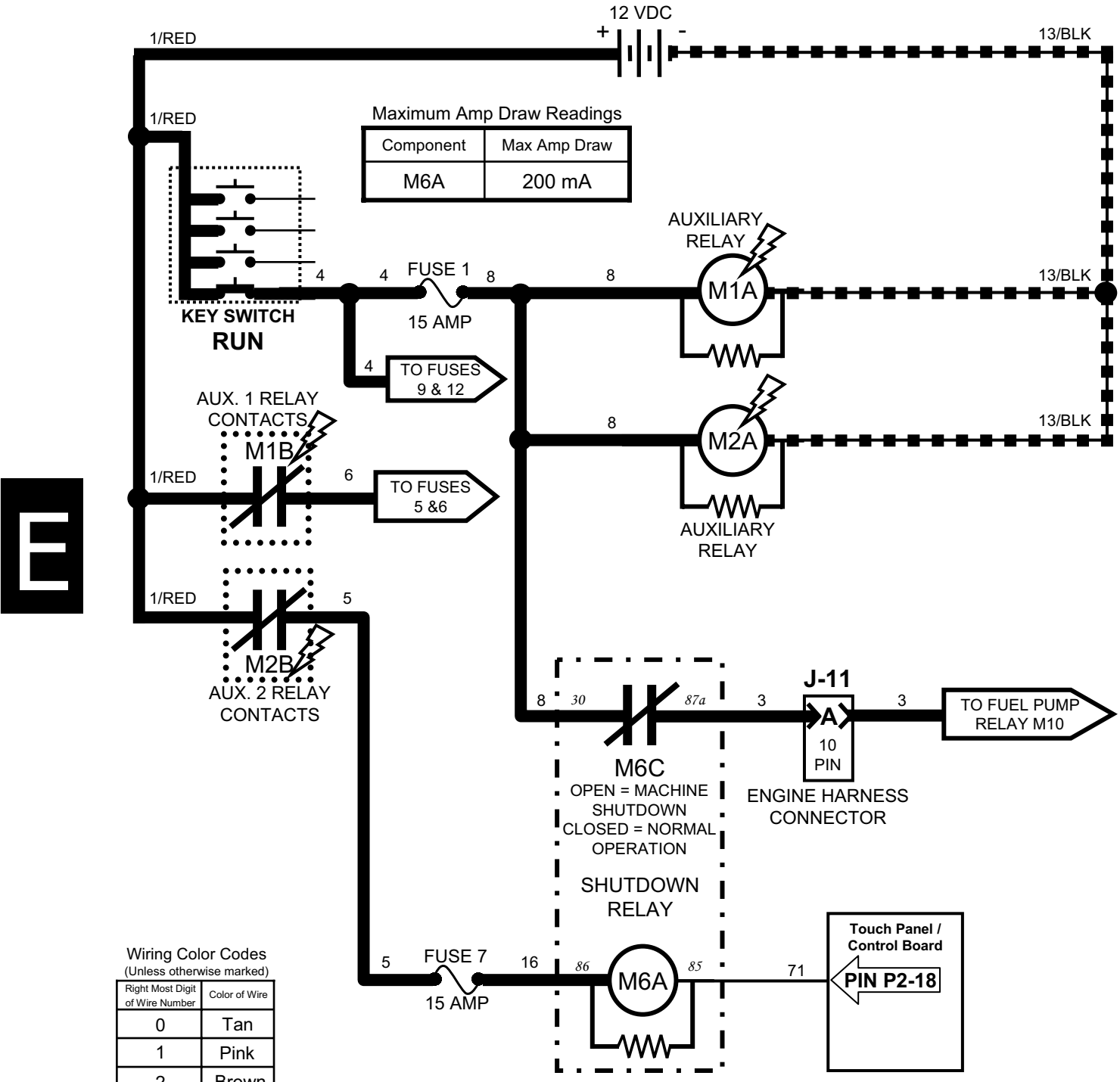
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

The Shutdown system is used to turn OFF the engine under certain conditions on machines with certain optional equipment

When control board turns ON M6A, the engine ECM loses power, and the engine shuts OFF

T20 Shutdown Relay (Normal Machine Operation)
(Diesel)



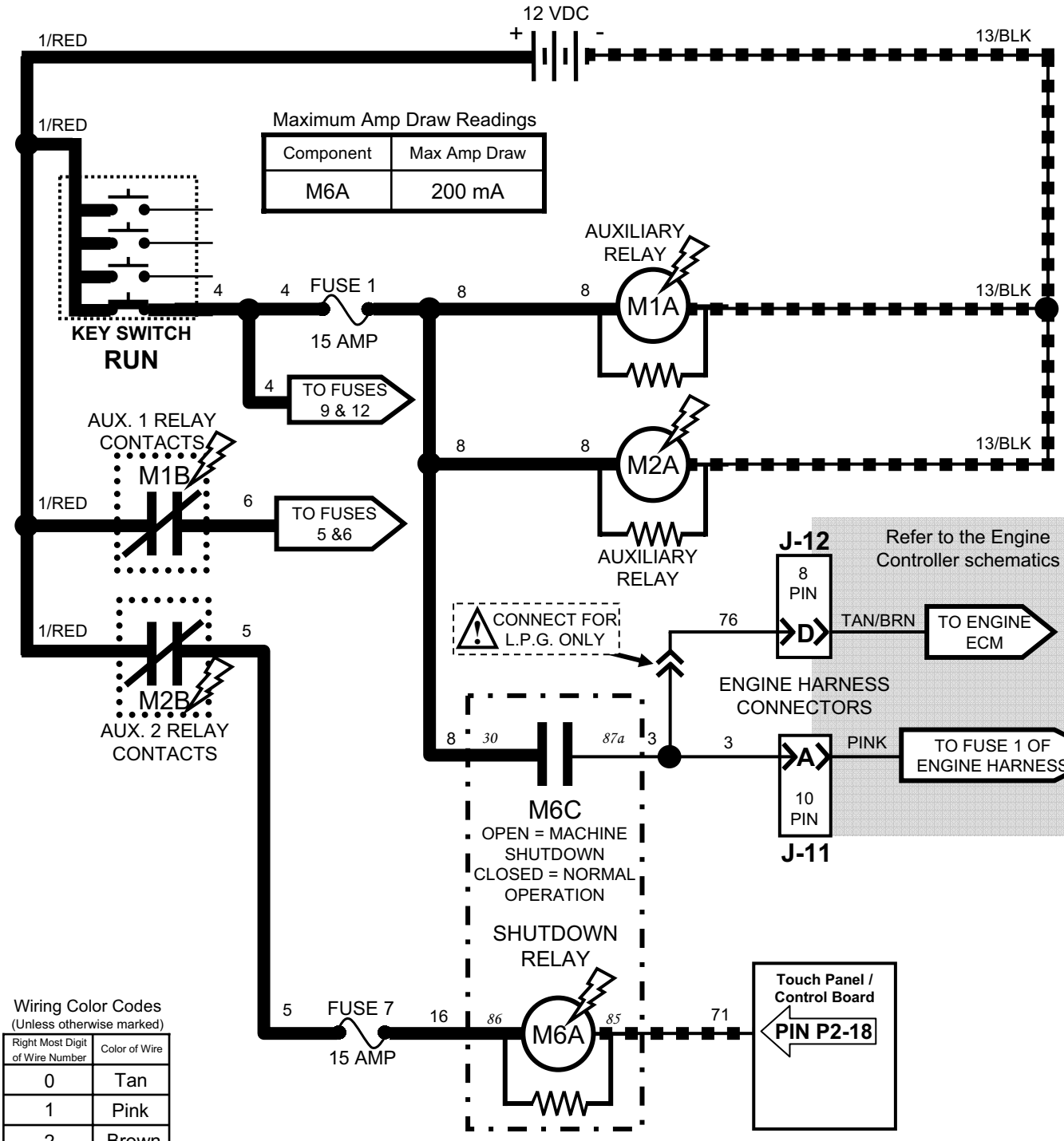
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

The Shutdown system is used to turn OFF the engine under certain conditions on machines with certain optional equipment

When control board turns ON M6A, the engine ECM loses power, and engine shuts OFF

T20 Shutdown Relay (Shutdown Mode)
(Gas/LPG)



Wiring Color Codes
(Unless otherwise marked)

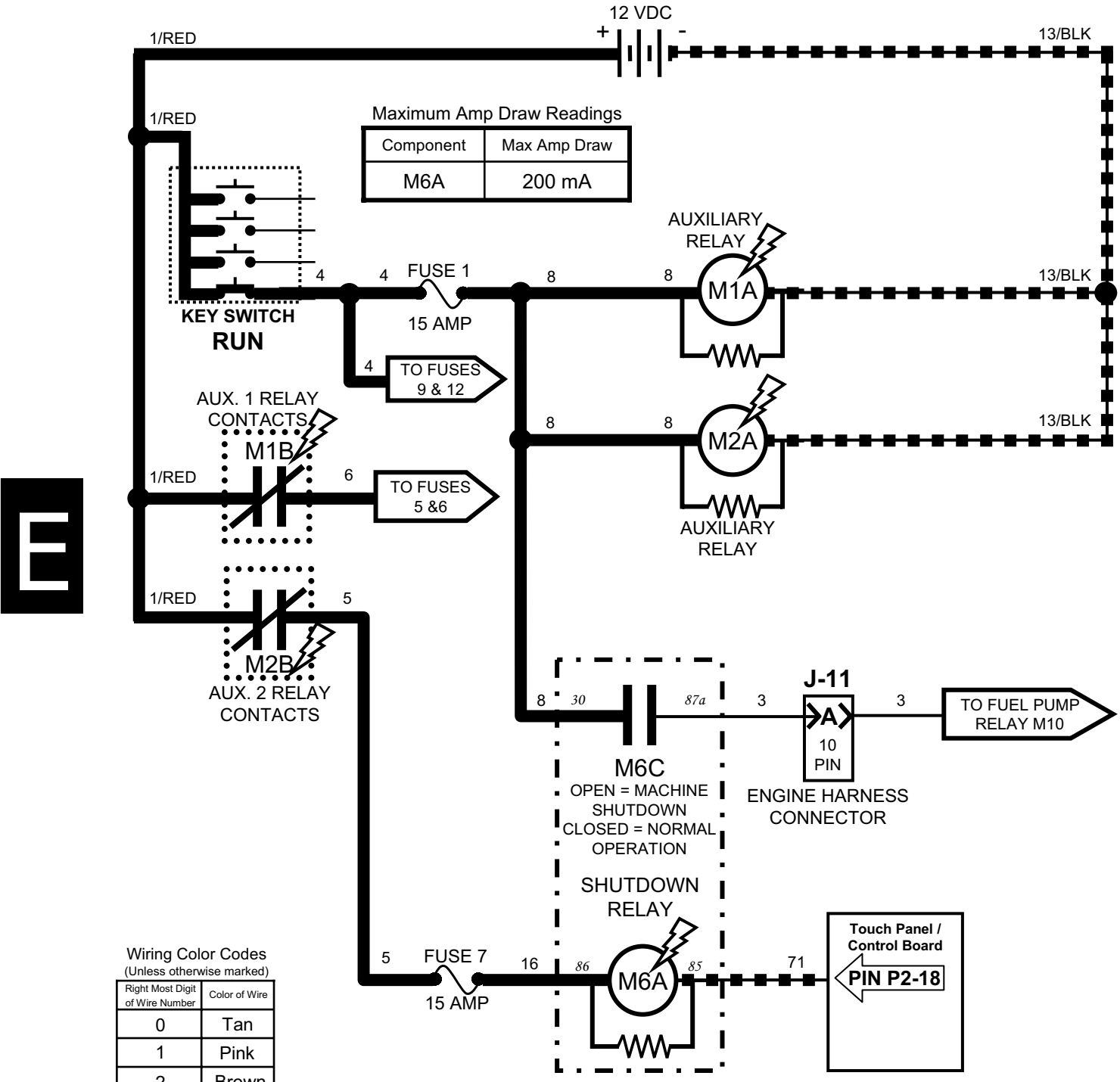
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

The Shutdown system is used to turn OFF the engine under certain conditions on machines with certain optional equipment

When control board turns ON M6A, the engine ECM loses power, and engine shuts OFF

E

T20 Shutdown Relay (Shutdown Mode)
(Diesel)



Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

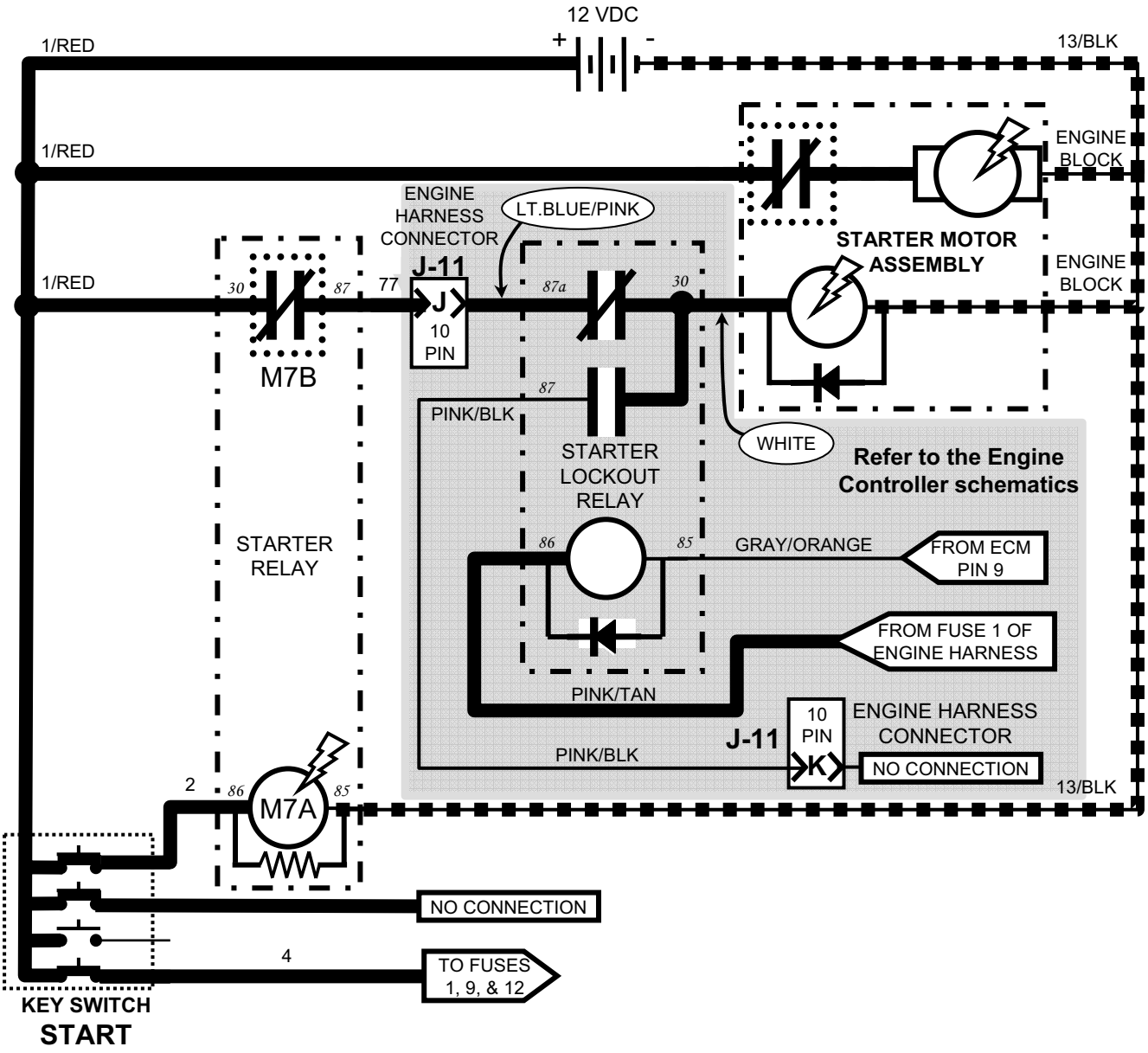
The Shutdown system is used to turn OFF the engine under certain conditions on machines with certain optional equipment

When control board turns ON M6A, the engine ECM loses power, and engine shuts OFF

T20 Starting System ON

Conditions: Key turned to start position

(Gas/LPG)



Wiring Color Codes
(Unless otherwise marked)

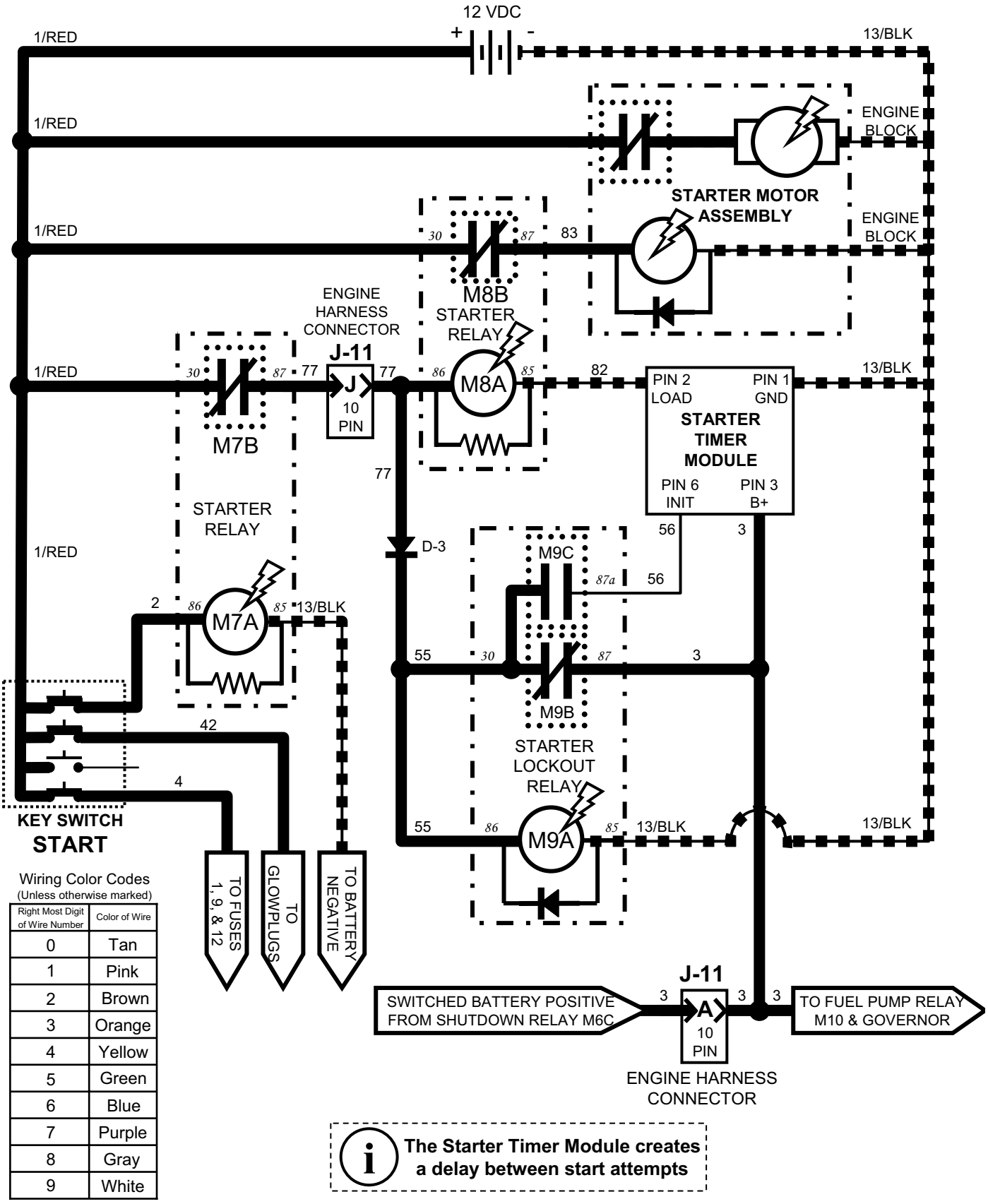
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

E

T20 Starting System ON

Conditions: Key turned to start position

(Diesel)



Wiring Color Codes
(Unless otherwise marked)

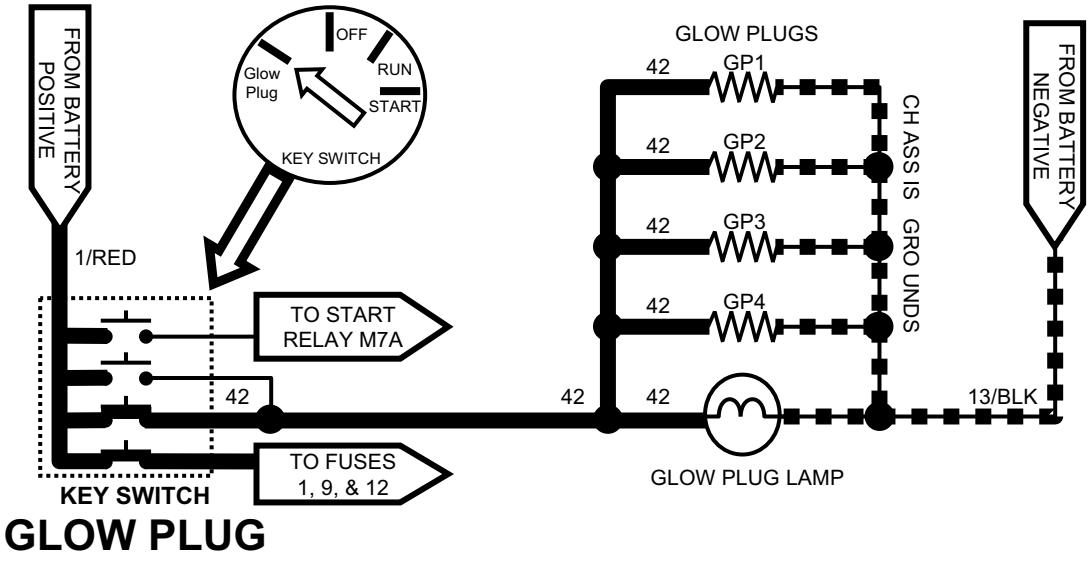
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

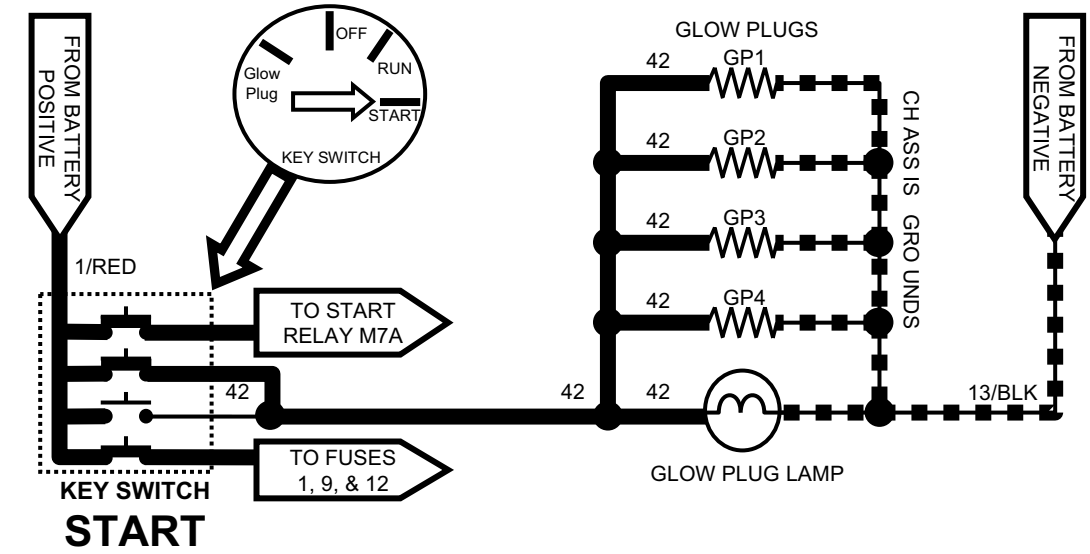
The Starter Timer Module creates a delay between start attempts

T20 Glow Plugs ON

Conditions: Key turned to start or glow plug position

(Diesel)





Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

The Glow Plugs are ON *only* when ignition switch is in the "Glow Plug" or "Start" position

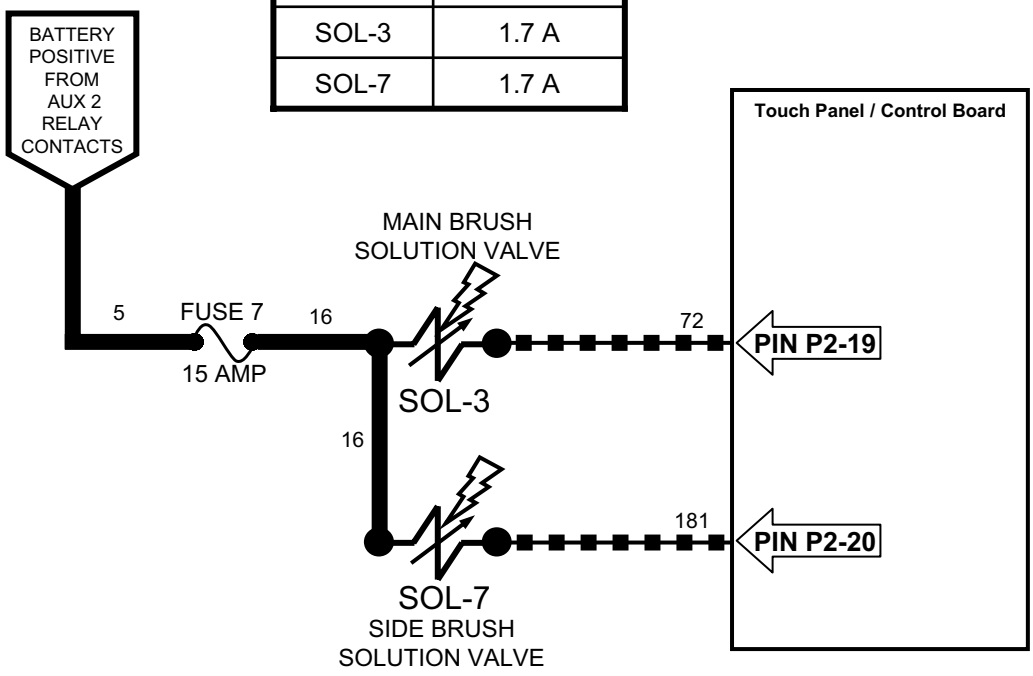
E

T20 Conventional Main & Side Brush Solution Valves

Conditions: Key on, scrubbing system on, side brush on, forward or reverse propel, one or more solution LED's lit

Maximum Amp Draw Readings

Component	Max Amp Draw
SOL-3	1.7 A
SOL-7	1.7 A



E

The Solution Valves are pulsed slowly to adjust the solution volume. Less OFF time (more Solution LED's lit on Touch Panel) will result in more solution applied to floor

The Solution Valves will function only while propelling forward or reverse during scrub operation

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

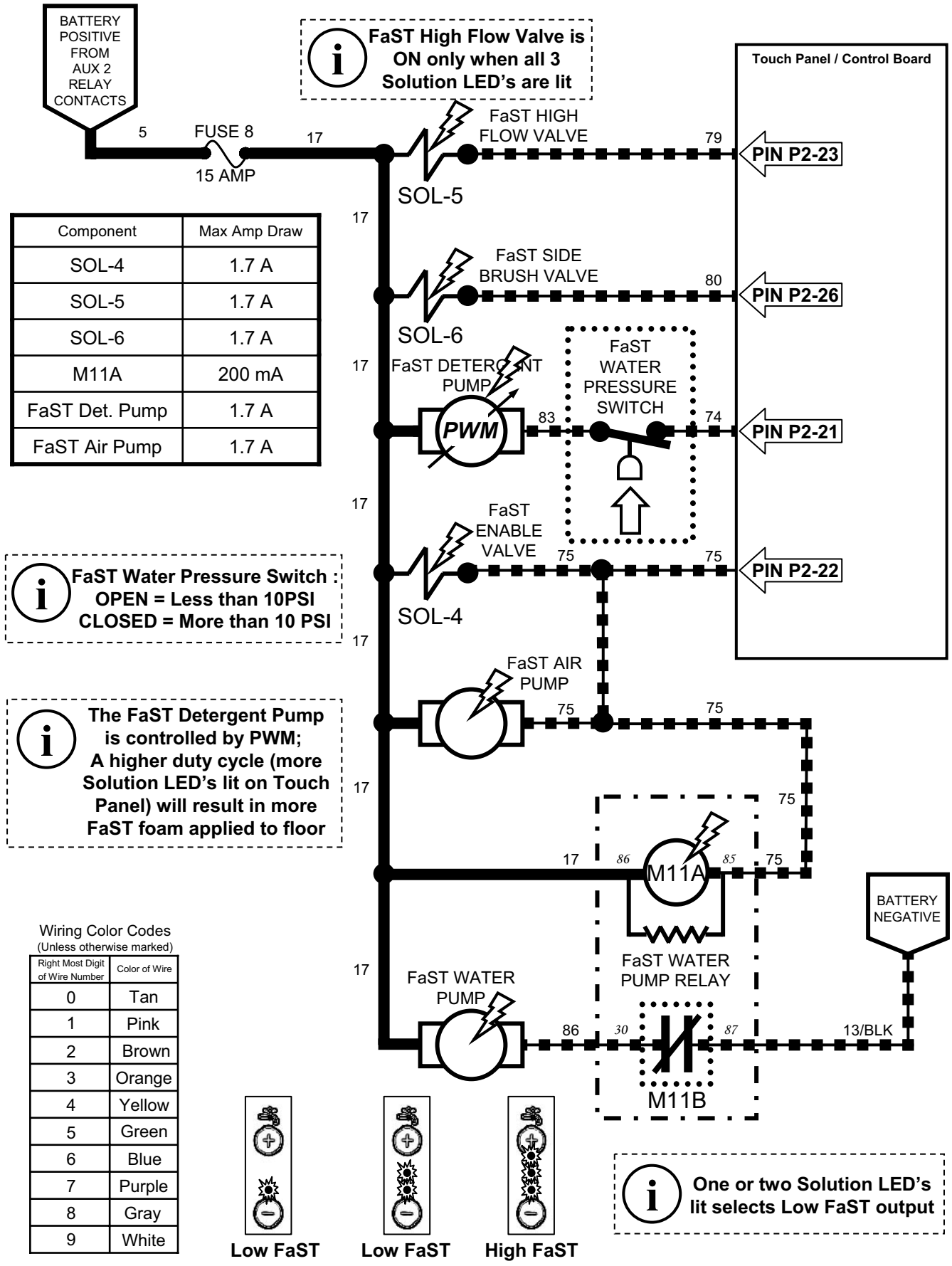
Low Solution

Medium Solution

High Solution

T20 FaST System ON

Conditions: Key on, scrubbing system on, side brush on, forward or reverse propel, THREE solution LED's lit



Component	Max Amp Draw
SOL-4	1.7 A
SOL-5	1.7 A
SOL-6	1.7 A
M11A	200 mA
FaST Det. Pump	1.7 A
FaST Air Pump	1.7 A

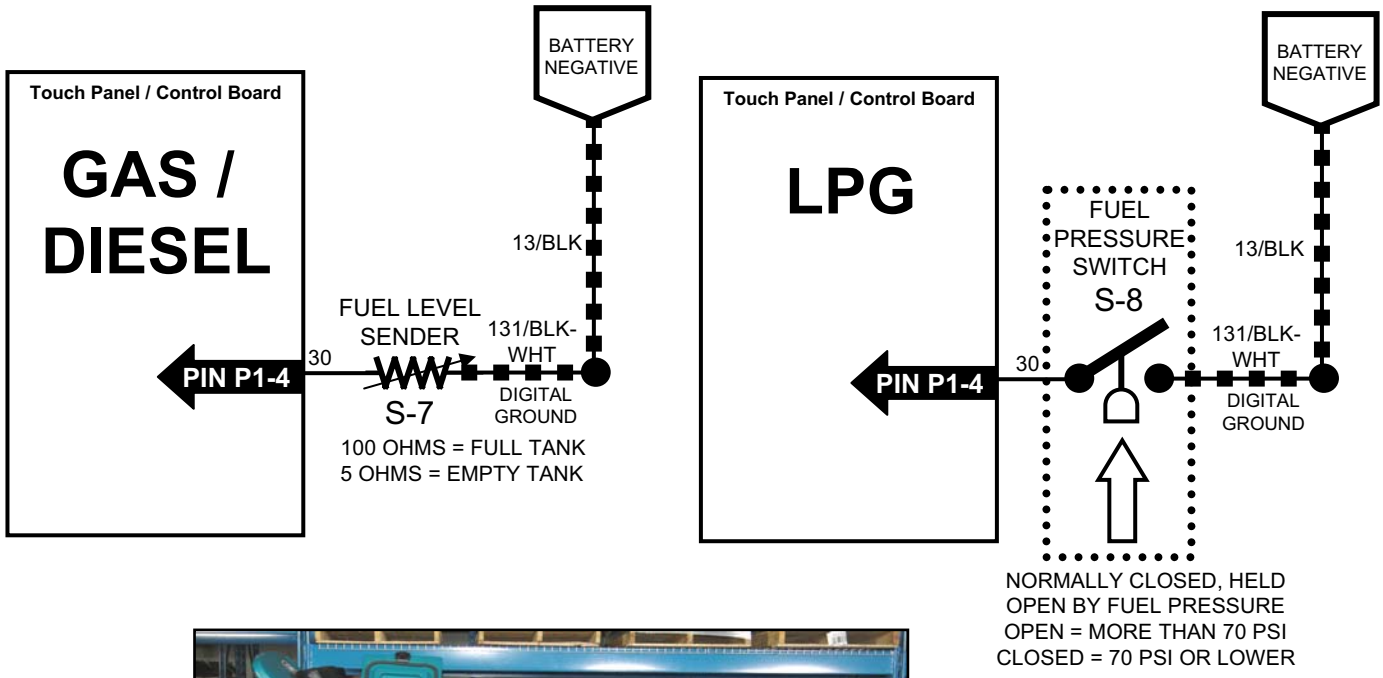
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

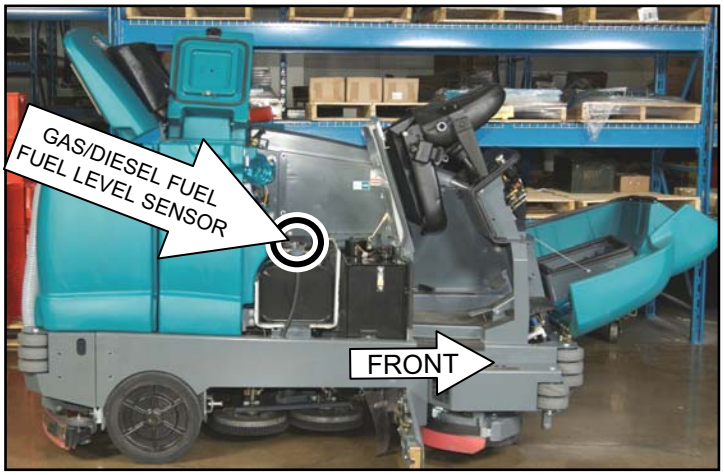
E

T20 Fuel Level Sensors

Conditions: Key on

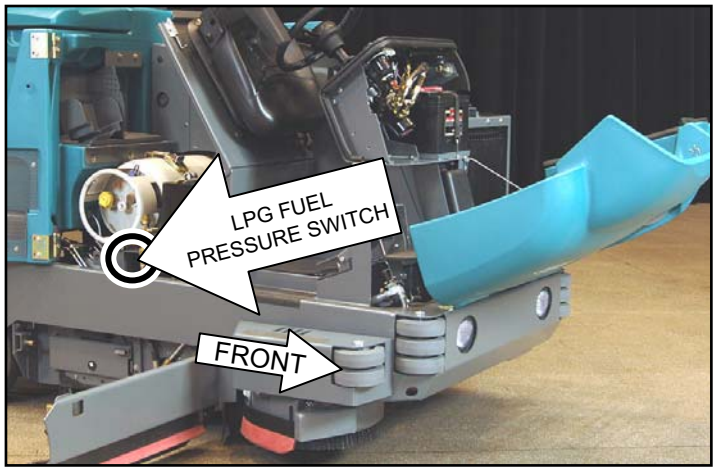


E

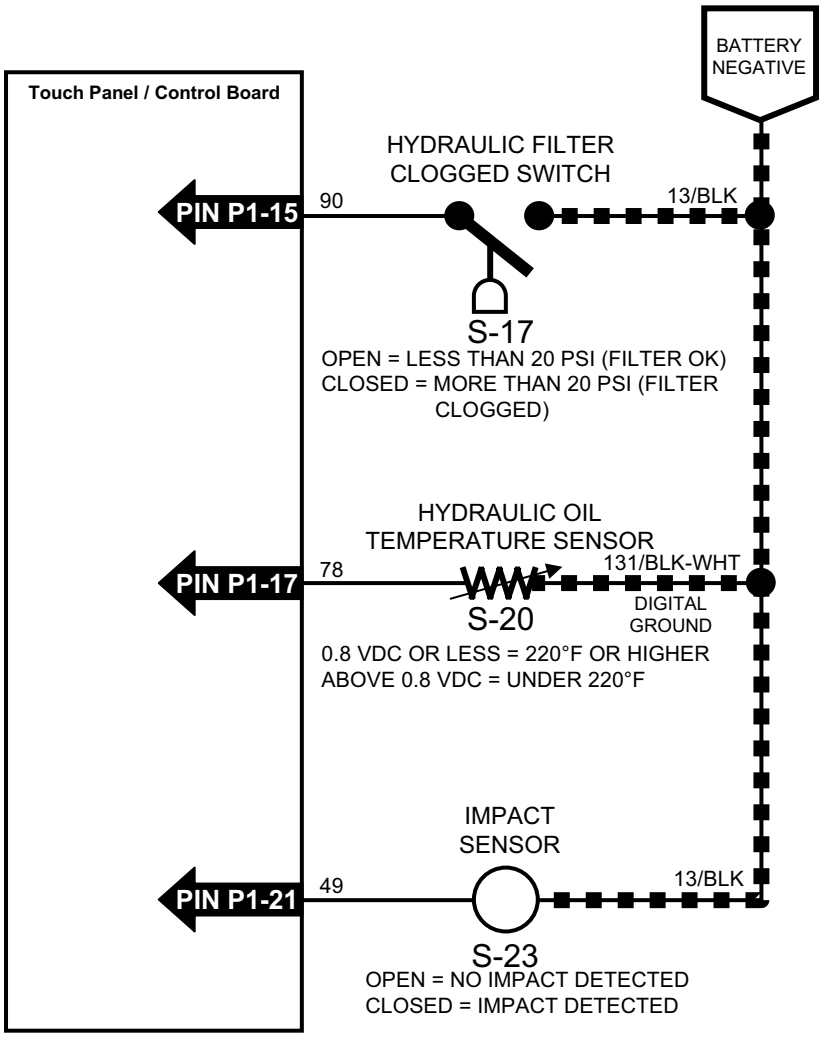


Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



T20 Impact, Hydraulic Temperature, & Hydraulic Filter Sensors

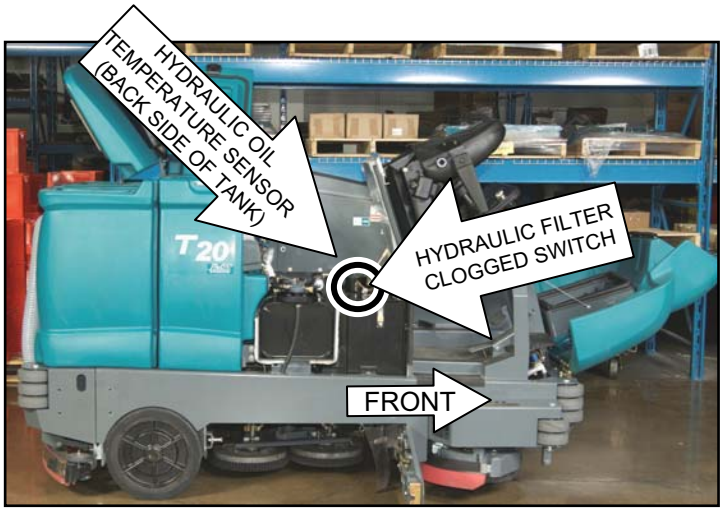


The Hydraulic Filter Clogged Switch will not be sensed until after the machine has run for 5 minutes to allow the hydraulic oil to warm up

Impact Sensor S-23 is used only on machines with certain optional equipment

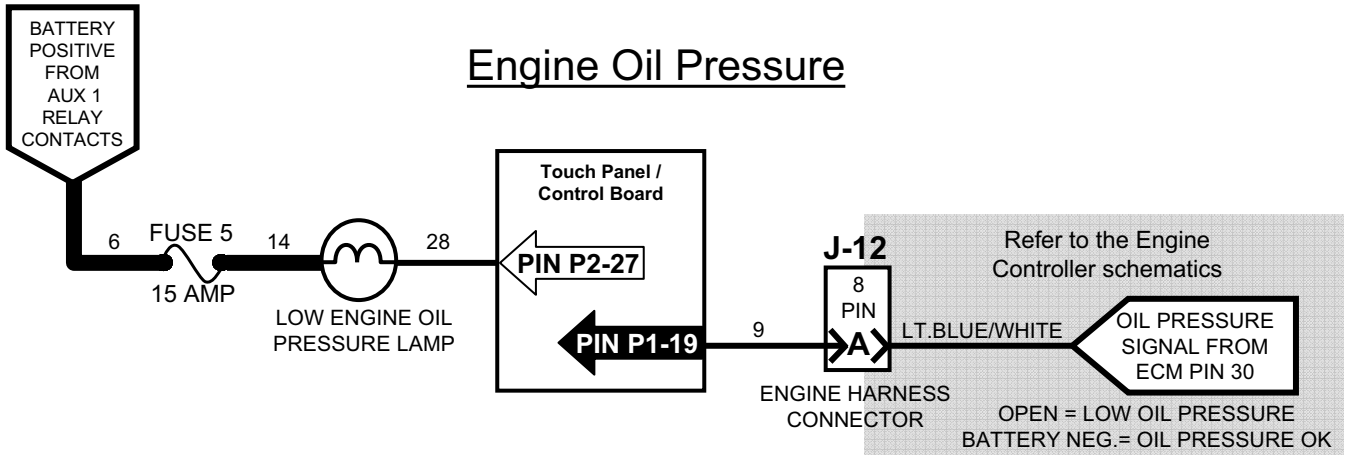
Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

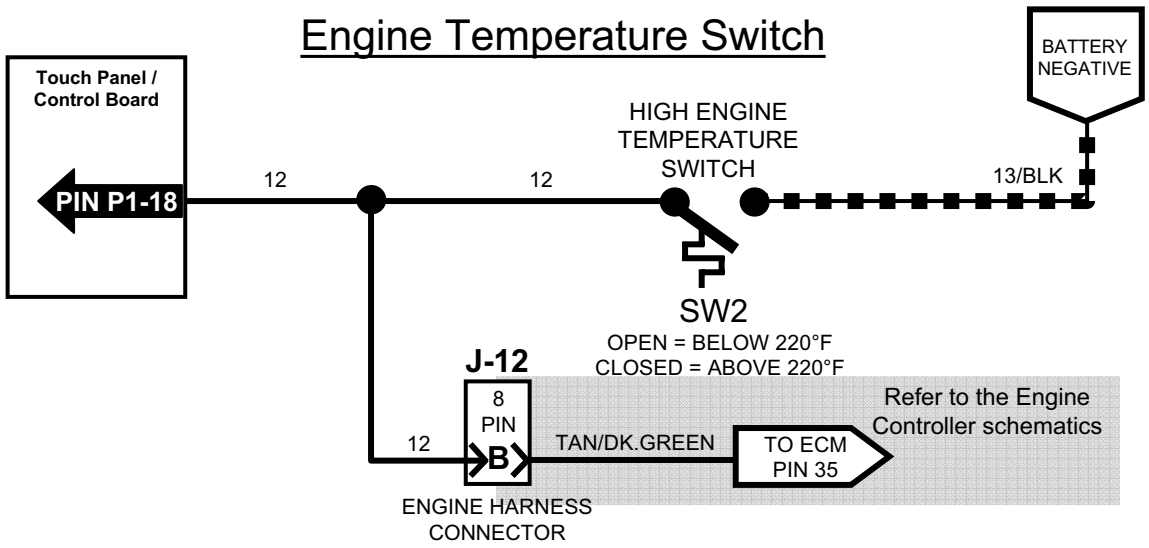


T20 Engine Oil Pressure, Temperature, & MIL Systems
(Gas/LPG)

Engine Oil Pressure



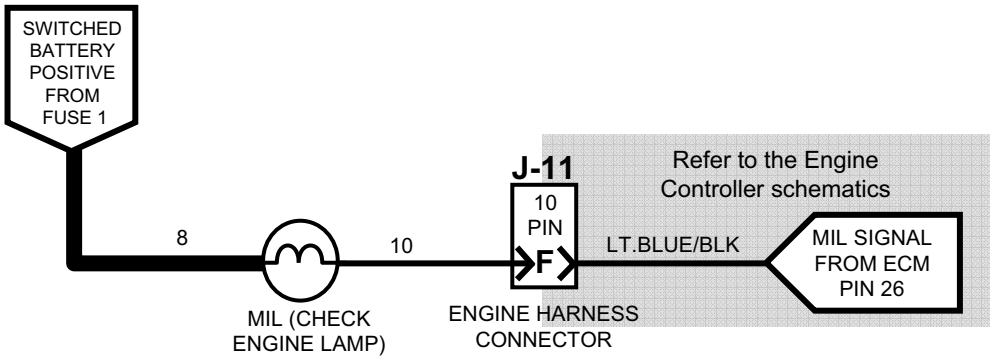
Engine Temperature Switch



Malfunction Indicator Lamp

Wiring Color Codes
(Unless otherwise marked)

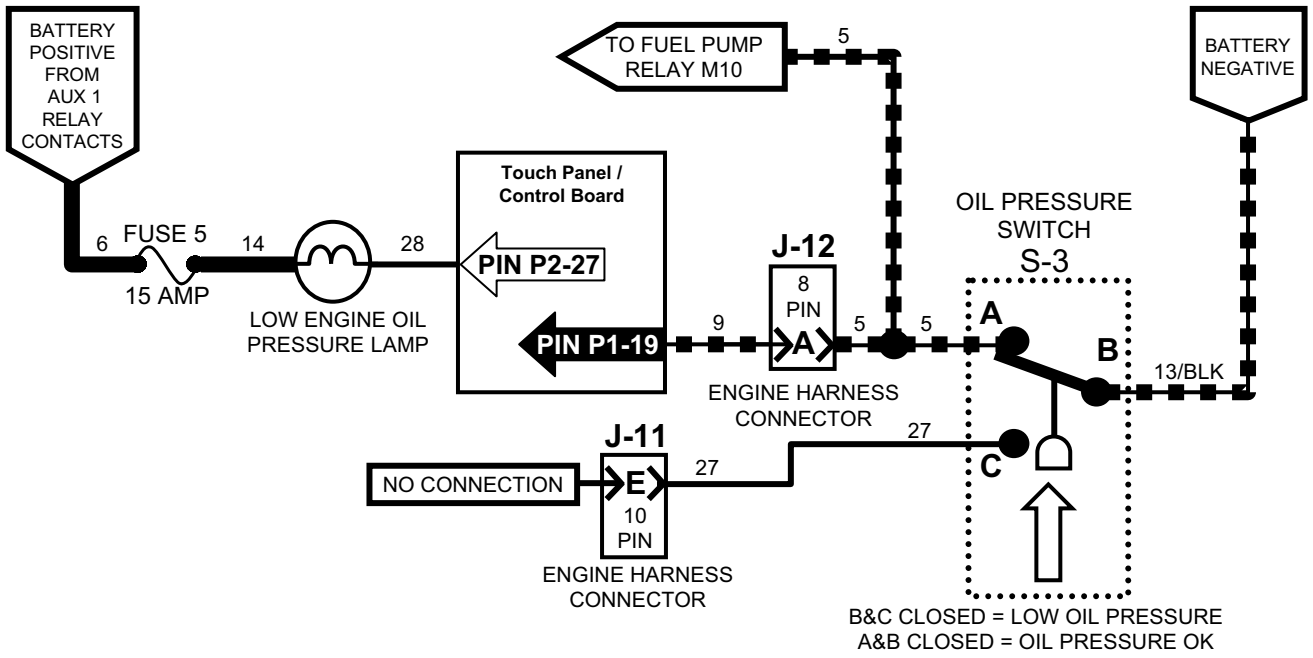
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White



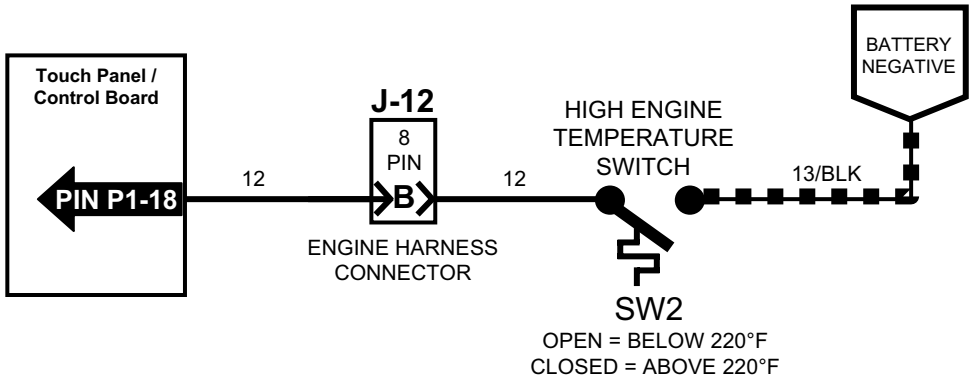
T20 Engine Oil Pressure & Temperature Systems
(Diesel)

Engine Oil Pressure Switch

This drawing is shown with key switch ON, and engine running



Engine Temperature Switch



Wiring Color Codes
(Unless otherwise marked)

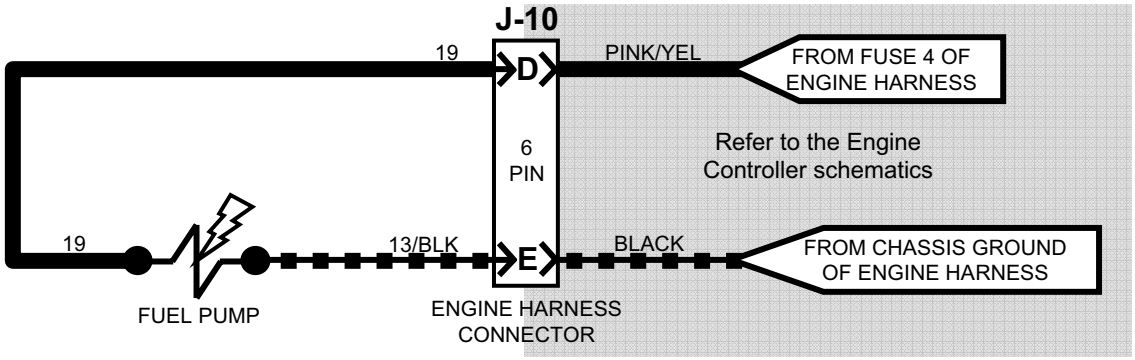
Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

E

T20 Fuel Pump & Engine Speed Control
(Gas/LPG)

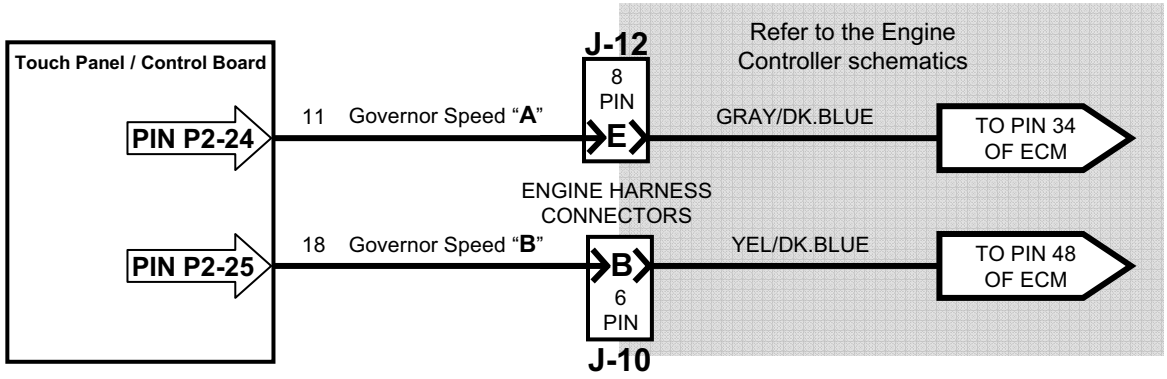
Fuel Pump (Gasoline Only)

This drawing is shown with key switch ON, and engine running



E

Speed Control Output

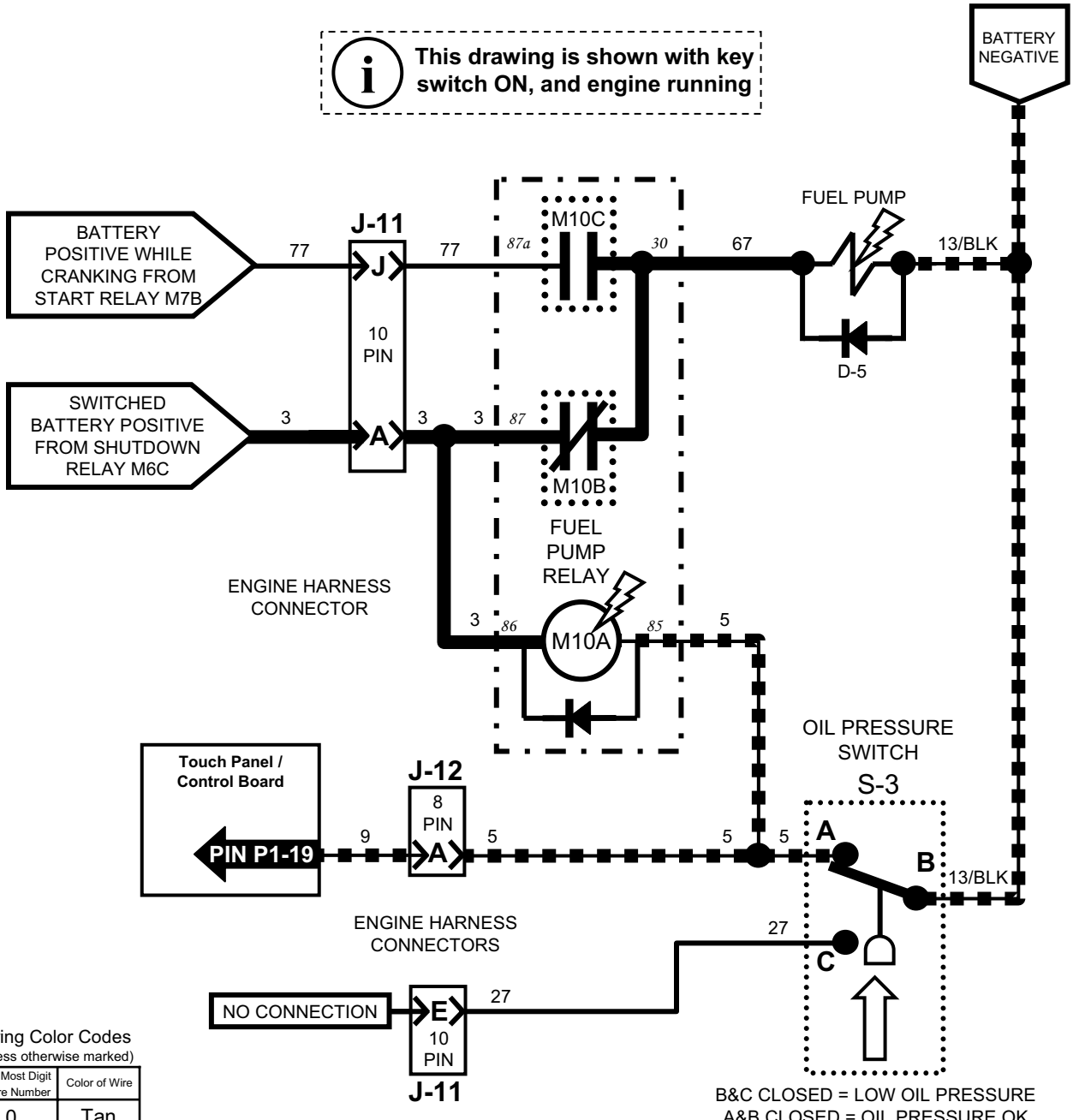


Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

ENGINE SPEED CHART	Low Engine Speed	High Engine Speed
Engine RPM	950 (+/- 25)	2400 (+/- 25)
Voltage Speed "A"	5 VDC	0 VDC
Voltage Speed "B"	0 VDC	0 VDC

T20 Fuel Pump
(Diesel)

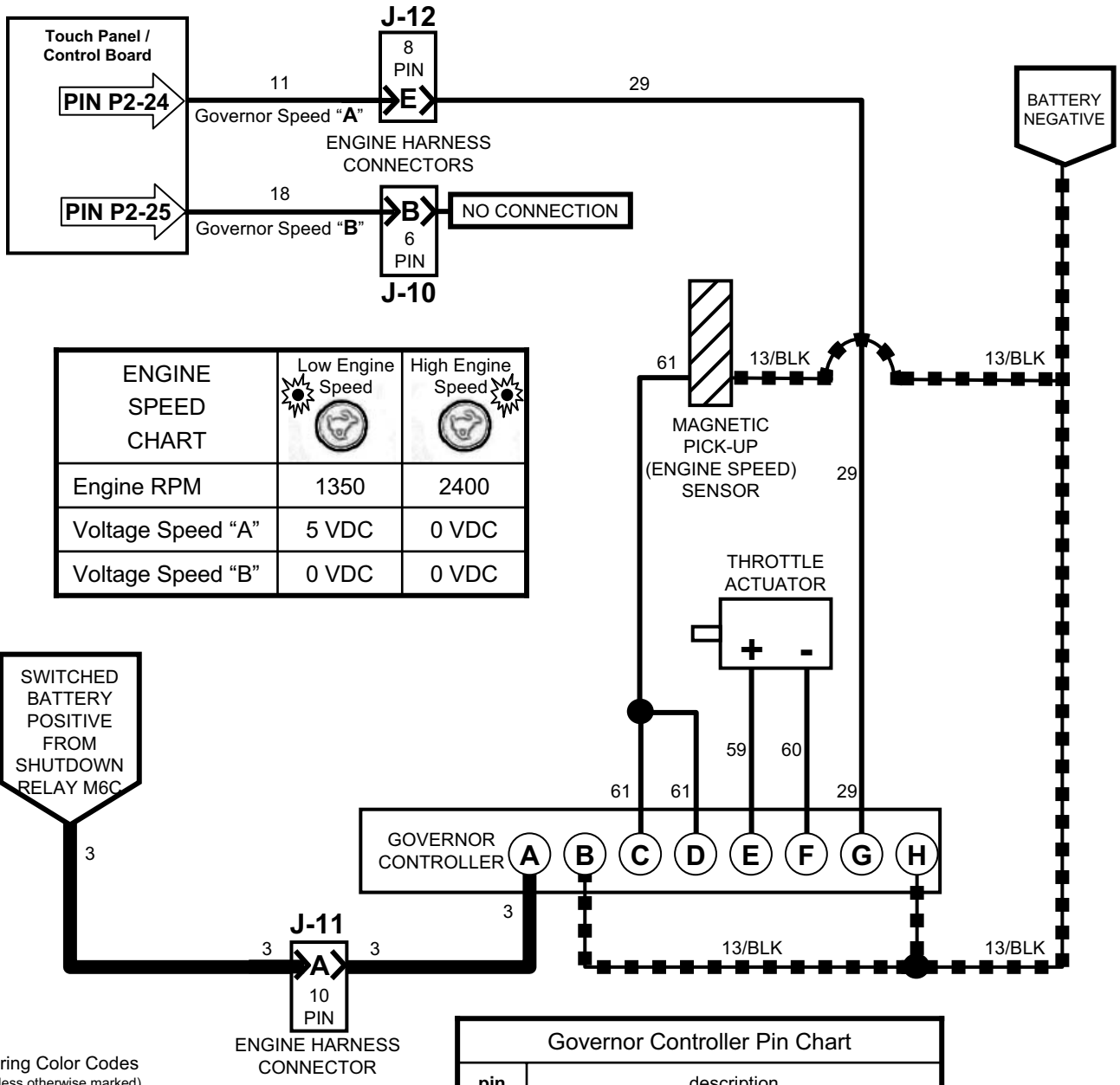


Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

E

T20 Engine Speed Control
(Diesel)



ENGINE SPEED CHART	Low Engine Speed	High Engine Speed
Engine RPM	1350	2400
Voltage Speed "A"	5 VDC	0 VDC
Voltage Speed "B"	0 VDC	0 VDC

Wiring Color Codes
(Unless otherwise marked)

Right Most Digit of Wire Number	Color of Wire
0	Tan
1	Pink
2	Brown
3	Orange
4	Yellow
5	Green
6	Blue
7	Purple
8	Gray
9	White

Governor Controller Pin Chart	
pin	description
A	INPUT – Battery Positive
B	INPUT – Battery Negative
C	INPUT – Engine Speed Sensor
D	INPUT – Engine Speed Sensor
E	OUTPUT – Throttle Actuator **(PWM)**
F	OUTPUT – Throttle Actuator
G	INPUT – Engine Speed Selection "A"
H	INPUT – Engine Speed Selection "B"

T20 Enable/Disable Chart

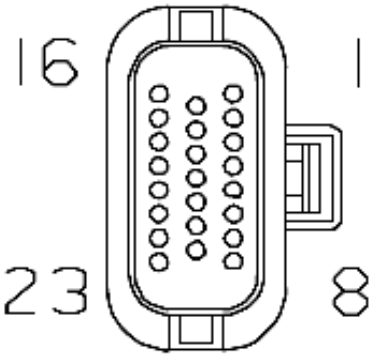
M20 Control Board Inputs and the Outputs they Control	Input →		Fuel Level Sender (Gas, Diesel)	Fuel Pressure Switch Closed (LPG)	Solution Tank Full Switch Closed	Recovery Tank Full Switch Closed	Recovery Tank Half Full Switch Closed	Clogged Hydraulic Filter Switch Closed	Soution Tank Empty Switch Closed	Hydraulic Oil Temperature Sensor above 230F	Impact Sensor Closed	Propel Pedal Sensor FORWARD	Propel Pedal Sensor REVERSE	Propel Pedal Sensor NEUTRAL	Touch Panel Input(s) Required to **ENABLE**	Touch Panel Input(s) Required to **DISABLE**	Notes
Output ↓	component #		S-7	S-8	S-14	S-15	S-16	S-17	S-19	S-20	S-23	n/a	n/a	n/a			
		pin	P1-4	P1-4	P1-12	P1-13	P1-14	P1-15	P1-11	P1-17	P1-21	P1-1	P1-1	P1-1			
Scrub Vacuum Fan Valve ON	SV-1	P2-28				D									OneStep Scrub ON; Squeegee/Scrub Vacuum ON	OneStep Scrub OFF; Squeegee/Scrub Vacuum OFF; Low Engine Speed Selected	
Main Brush Head Down Pressure Valve ON	SV-2	P2-4				D						E see notes	E see notes	Refer to Notes	OneStep Scrub ON	OneStep Scrub OFF; Low Engine Speed Selected	Propel required to to get full operational down pressure
Main Brush Head Lower Valve ON	SV-3	P2-5				D						E see notes	E see notes	Refer to Notes	OneStep Scrub ON	OneStep Scrub OFF; Low Engine Speed Selected	Propel required to to get full operational down pressure
Rear and Side Squeegees Lower Valve ON	SV-4	P2-6				D						E	D	E	OneStep Scrub ON; Squeegee/Scrub Vacuum ON	OneStep Scrub OFF; Low Engine Speed Selected; Squeegee/Scrub Vacuum OFF	
Main Brushes Spin Valve ON	SV-6	P2-5				D						E see notes	E see notes	Refer to Notes	OneStep Scrub ON	OneStep Scrub OFF; Low Engine Speed Selected	Propel required to to get full operational down pressure
Hydraulic Enable Valve ON	SV-7	P2-8													Turning ON Any Touch Panel Function OR Selecting High Engine Speed	Refer to Notes	Turns OFF automatically if not required (SV-7 is required for all hydraulic functions EXCEPT sweep and scrub vacuum fans)
Side Brush Spin Valve ON	SV-8	P2-9				D						E	E		Side Brush ON (after OneStep Scrub ON)	OneStep Scrub OFF; Low Engine Speed Selected; Side Brush OFF	
Side Brush Down Pressure Valve ON	SV-10	P2-11				D						E	E		Side Brush ON (after OneStep Scrub ON)	OneStep Scrub OFF; Low Engine Speed Selected; Side Brush OFF	
Side Brush Lower Valve ON	SV-11	P2-12				D											
Side Brush Extend Valve ON	SV-12	P2-9				D						E	E		Side Brush ON (after OneStep Scrub ON)	OneStep Scrub OFF; Low Engine Speed Selected; Side Brush OFF	
Auto-Fill Solution Tank Valve ON	SOL-1	P2-13			D												
Auto-Fill Recovery Tank Valve ON	SOL-2	P2-14					D										
Main Brushes Solution Valve ON	SOL-3	P2-19				D											
ES Pump ON ***OR*** FaST Enable Valve, Air Pump & Water Pump Relay ON	SOL-4, M11	P2-22			D ES only	D	E ES only										
FaST High Flow Valve ON	SOL-5	P2-23				D											
FaST Side Brush Valve ON	SOL-6	P2-26				D											
Side Brush Solution Valve ON	SOL-7	P2-20				D											
Reverse Propel Relay ON	M4A	P2-17															
Shut Down Relay ON	M6A	P2-18															
Detergent Pump ON ***OR*** FaST Detergent Pump ON	n/a	P2-21				D											
Audible Alarm	n/a	P2-29	E when low	E when low				E	E	E							
Low Engine Oil Pressure Lamp	n/a	P2-27															If low oil pressure, engine ECM will shutdown the engine after a time delay
Governor Speed Bit "A"	n/a	P2-24															
Governor Speed Bit "B"	n/a	P2-25															

E = Input required to ENABLE output D = Input required to DISABLE output

T20 Control Board Connectors

socket #	wire #	color	type	goes to	
P1-1	91	pink	input		Forward/Reverse Propel Sensor
P1-2	13	black	input		Unswitched Battery Negative
P1-3	x	x	x		empty
P1-4	30	tan	input	S-7 or S-8	Fuel Level Sensor or LPG Pressure Switch
P1-5	x	x	x		empty
P1-6	x	x	x		empty
P1-7	x	x	x		empty
P1-8	x	x	x		empty
P1-9	x	x	x		empty
P1-10	x	x	x		empty
P1-11	177	purple	input	S-19	Solution Tank Empty Switch
P1-12	44	yellow	input	S-14	Solution Tank Full Switch
P1-13	45	green	input	S-15	Recovery Tank Full Switch
P1-14	46	blue	input	S-16	Recovery Tank Half Full Switch
P1-15	90	tan	input	S-17	Clogged Hydraulic Filter Switch
P1-16	x	x	x		empty
P1-17	78	gray	input	S-20	Hydraulic Temperature Sensor
P1-18	12	brown	input	SW2	High Engine Temperature Switch
P1-19	9	white	input		Engine Oil Pressure Signal
P1-20	x	x	x		empty
P1-21	49	white	input	S-23	Impact Sensor
P1-22	x	x	x		empty
P1-23	105	green	ground		Static Ground

Connector P1

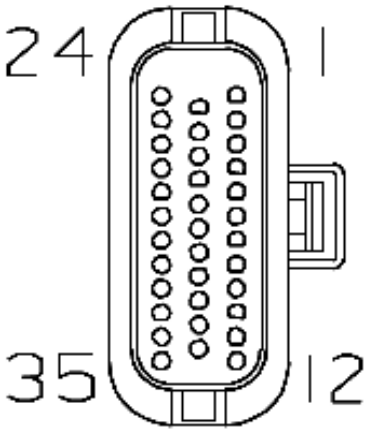


Viewed from wire side of connector

E

socket #	wire #	color	type	goes to	
P2-1	14	yellow	power		Switched Battery Positive
P2-2	14	yellow	power		Switched Battery Positive
P2-3	81	pink	power		Unswitched Battery Positive
P2-4	57	purple	output	SV-2	Brush Head Pressure Solenoid Valve
P2-5	58	gray	output	SV-3, SV-6	Brush Head Down & ON Solenoid Valves
P2-6	59	white	output	SV-4	Squeegees Down Solenoid Valve
P2-7	x	x	x		empty
P2-8	61	pink	output	SV-7	Hydraulic Enable Solenoid Valve
P2-9	62	brown	output	SV-8, SV-12	Side Brush ON & Down Solenoid Valves
P2-10	x	x	x		empty
P2-11	64	yellow	output	SV-10	Side Brush Pressure Solenoid Valve
P2-12	66	blue	output	SV-11	Side Brush Down Solenoid Valve
P2-13	65	green	output	SOL-1	Solution Tank Auto Fill Water Valve
P2-14	67	purple	output	SOL-2	Recovery Tank Auto Fill Water Valve
P2-15	x	x	x		empty
P2-16	x	x	x		empty
P2-17	70	tan	output	M4A	Reverse Relay
P2-18	71	pink	output	M6A	Shutdown Relay
P2-19	72	brown	output	SOL-3	Main Brush Head Water Valve
P2-20	181	pink	output	SOL-7	Side Brush Water Valve
P2-21	74	yellow	output		Detergent Pump or FaST Pressure Switch
P2-22	75	green	output	SOL-4, M11A	ES Pump or FaST Enable Valve, Air Pump, Water Pump Relay
P2-23	79	white	output	SOL-5	FaST High Flow Valve
P2-24	11	pink	output		ECM (Governor Speed Bit "A")
P2-25	18	gray	output		ECM (Governor Speed Bit "B")
P2-26	80	tan	output	SOL-6	FaST Side Brush Valve
P2-27	28	gray	output		Low Engine Oil Pressure Lamp
P2-28	56	blue	output	SV-1	Scrub Vacuum Fan Valve
P2-29	182	brown	output		Audible Alarm
P2-30	x	x	x		empty
P2-31	x	x	x		empty
P2-32	x	x	x		empty
P2-33	13	black	ground		Unswitched Battery Negative
P2-34	13	black	ground		Unswitched Battery Negative
P2-35	13	black	ground		Unswitched Battery Negative

Connector P2



Viewed from wire side of connector

T20 Fault Indicators

The following table describes fault codes communicated to the operator. A fault code is indicated by blinking a Fault LED (red), sounding an alarm, and also by displaying the fault name on the LCD. Faults can be cleared when they are no longer present ***and*** one of the action buttons (i.e. One-Step) is depressed. If there is more than one fault, they are displayed for about a second one after the other.

Fault	LCD Display	Description
Hydraulic Filter Clogged	**F3: CLOGGED HYD**	Indicates the hydraulic filter is clogged.
Solution Tank empty	**F6: SOL. TANK E**	Indicates the solution tank is empty.
Recovery Tank Full	**F7: REC. TANK FULL**	Indicates the recovery tank is full and shuts down the entire Scrub system.
High Engine Temperature	**F8: HIGH ENG TEMP**	Indicates high engine temperature.
High Hydraulic Temperature	**F9: HIGH HYD TEMP**	Indicates excessive hydraulic temperature
Low Fuel	**F10: LOW FUEL**	Low fuel indicator (blinking lowest fuel gauge block).
Squeegee Disconnected (Option)	**F11: OPEN SCB VAC**	Indicates squeegee may have broken free.

T20 Condition & Warning Indicators

The following table describes displayed conditions or warnings. If a condition is sensed, the condition or warning code will be displayed on the LCD. Conditions are typically caused by activating buttons that are unavailable. For example: the Sweep vacuum fan is unavailable when the scrub functions are active.

Condition	LCD DISPLAY	Description
FaST system is selected by the operator and the machine is not configured with the FaST option.	**C3: NO FAST MODE**	Only machines with the FaST system installed (and programmed to be FaST machines) can turn ON the FaST system.
ES system is selected by the operator and the machine is not configured with the ES option.	**C4: NO ES MODE**	Only machines with the ES system installed (and programmed to be ES machines) can turn ON the ES system.
FaST or ES system is selected by the operator and the machine is not configured with the ES or FaST option.	**C5: NO ES/FAST**	Only machines with the ES or FaST system installed (and programmed to be ES or Fast machines) can turn ON the ES or FaST system.
Side Brush button is activated alone without 1-STEP Sweep/Scrub.	**C6: NO SIDE BRUSH**	The T20 machine is NOT programmed to operate with only the side brush ON.

T20 Configuration Modes

Configuration modes are designed for use by a technician for setup purposes.

To enter Configuration Mode:

1) Press "**4/5**" and **Side-Brush** buttons simultaneously.
2) While holding the "**4/5**" and **Side-Brush** buttons, turn the ignition key switch to the "RUN" position.
3) Continue holding the "**4/5**" and **Side-Brush** buttons until "**CONFIG MODE**" is displayed on the screen, then release the buttons.

While In Configuration Mode:

Each single activation of the "**2/3**" button will scroll through the various configurations available. Each configuration is displayed one at a time on the LCD. Once the desired configuration mode is displayed, push the "**0/1**" to select the displayed mode.

The following tables show the different configuration modes the machine can be placed in.

Mode	Entry Sequence / Indicator	Function / Notes
Entering Pressure Adjust Mode	1) Enter Configuration Mode (See instructions above.) 2) Press "**2/3**" button until "PRESS.ADJ MODE" is displayed. 3) Press "**0/1**" button again to select pressure adjust mode. "READY" is displayed on LCD screen.	Allows adjustment of the main and side Scrubbing down pressure levels. While adjustment is being made, each bar on the LCD represents approximately 125mA of current through the associated down pressure valve. Note: All down pressures can be reset to the factory settings. See "Reset Factory Default Down Pressures" mode.
Reset Factory Default Down Pressures	1) Put the machine into pressure adjust mode. (See instructions above.) 2) Press "**4/5**" button to reset all the down pressures. "SET TO DEFAULT" is displayed on LCD screen.	Resets all the down pressure defaults to the factory default levels.
Adjusting Main Scrub Brush Down Pressure	1) Put the machine into pressure adjust mode. (See instructions above.) 2) Press 1-STEP Scrub button to select Scrub pressure adjust. The 1-STEP Scrub LED is ON. 3) Use brush pressure "**+**" or "**-**" buttons to select which pressure level to adjust (Low/Medium/High). 4) Press "**0/1**" button to increase the down pressure OR press "**8/9**" button to decrease the down pressure. 5) Press 1-STEP Scrub button again or turn key switch OFF to save new down pressure settings.	Adjusts main scrub brush down pressures. Bars on bar graph represent solenoid valve current when adjusting the down pressure. Each bar indicates approximately 125mA of valve current.

T20 Configuration Modes

To enter Configuration Mode:

1) Press "**4/5**" and **Side-Brush** buttons simultaneously.
2) While holding the "**4/5**" and **Side-Brush** buttons, turn the ignition key switch to the "RUN" position.
3) Continue holding the "**4/5**" and **Side-Brush** buttons until "**CONFIG MODE**" is displayed on the screen, then release the buttons.

To enter Pressure Adjust Mode:

1) Enter Configuration Mode (See instructions above.)
2) Press "**2/3**" button until "PRESS.ADJ MODE" is displayed.
3) Press "**0/1**" button again to select pressure adjust mode. "READY" is displayed on LCD screen.

Mode	Entry Sequence / Indicator	Function / Notes
Adjusting Side Scrub Brush Down Pressure	1) Put the machine into pressure adjust mode. (See instructions above.) 2) Press Side Brush button to select Side Scrub Brush pressure adjust. The Side Brush LED is ON. 3) Use brush pressure "**+**" or "**-**" buttons to select which pressure level to adjust (Low/Medium/High). 4) Press "**0/1**" button to increase the down pressure OR press "**8/9**" button to decrease the down pressure. 5) Press Side Brush button again or turn key switch OFF to save new down pressure settings.	Adjusts Side Scrub brush down pressures. Bars on bar graph represent solenoid valve current when adjusting the down pressure. Each bar indicates approximately 125mA of valve current.
Disable *BOTH* ES and FaST Systems	1) Enter Configuration Mode. 2) Press "**2/3**" button until "C5: NO ES/FAST" is displayed. 3) Press "**0/1**" button to disable ES and FaST systems. "DONE" is displayed on LCD screen.	This is a set-up mode that disables both ES and FaST functions.
Enable FaST System (also disables the ES system)	1) Enter Configuration Mode. 2) Press "**2/3**" button until "FAST MODE" is displayed. 3) Press "**0/1**" button to enable the FaST system. "DONE" is displayed on LCD screen.	This is a set-up mode that enables the FaST system, and disables the ES system.
Enable ES System (also disables the FaST system)	1) Enter Configuration Mode. 2) Press "**2/3**" button until "ES MODE" is displayed 3) Press "**0/1**" button to enable the ES system. "DONE" is displayed on LCD screen.	This is a set-up mode that enables the ES system, and disables the FaST system.

T20 Configuration Modes

To enter Configuration Mode:

1) Press "**4/5**" and **Side-Brush** buttons simultaneously.
2) While holding the "**4/5**" and **Side-Brush** buttons, turn the ignition key switch to the "RUN" position.
3) Continue holding the "**4/5**" and **Side-Brush** buttons until "**CONFIG MODE**" is displayed on the screen, then release the buttons.

Mode	Entry Sequence / Indicator	Function / Notes
Contrast Adjust Mode	1) Enter Configuration Mode. 2) Press "**2/3**" button until "CONTRAST ADJUST" is displayed. 3) Press "**0/1**" button to select mode. "SET CONTRAST" is displayed on screen. 4) Press and hold "**0/1**" button to increase screen contrast OR press and hold "**8/9**" to decrease screen contrast.	This allows the setting of the contrast of the LCD screen display.
Detergent Delivery Level Adjustment Mode	1) Enter Configuration Mode. 2) Press "**2/3**" button until "SET DET LEVEL" is displayed. 3) Press "**0/1**" button to enter mode. "READY" is displayed on screen. 4) Press button shown below to select the desired detergent delivery level: "**0/1**" – HEAVY "**2/3**" – NORMAL "**4/5**" – LIGHT "**6/7**" – OFF The selected level is displayed on screen.	Allows for the adjustment of the Detergent level flow. There are four selections: HEAVY, NORMAL, LIGHT, and OFF. NOTE: "NORMAL" means factory default detergent delivery level.
Water Delivery Level Adjustment Mode	1) Enter Configuration Mode. 2) Press "**2/3**" button until "SET WATER LEVEL" is displayed. 3) Press "**0/1**" button to enter mode. "READY" is displayed on screen. 4) Press button shown below to select the desired water delivery level: "**0/1**" – HEAVY WATER "**2/3**" – NORMAL WATER "**4/5**" – ECONOMY WATER The selected level is displayed on screen.	Allows for the adjustment of the Water flow. There are three selections: HEAVY, NORMAL, and ECONOMY. NOTE: "NORMAL" means factory default water delivery level.

T20 Diagnostic Modes

To enter Configuration Mode:

1) Press "**4/5**" and **Side-Brush** buttons simultaneously.
2) While holding the "**4/5**" and **Side-Brush** buttons, turn the ignition key switch to the "RUN" position.
3) Continue holding the "**4/5**" and **Side-Brush** buttons until "**CONFIG MODE**" is displayed on the screen, then release the buttons.

<table>
<tr><th>Mode</th><th>Entry Sequence / Indicator</th><th>Function / Notes</th></tr>
<tr><td rowspan="2">Self Test Mode</td><td>1) Enter Configuration Mode.
2) Press "2/3" button until "SELF TEST" is displayed.
3) Press "0/1" button to run the self test. When Self Test is finished, "DONE" & the software revision date is shown (mmddyy).</td><td>This diagnostic test determines the status of the electrical load on each output. All output pins with open or shorted electrical loads are displayed on the screen with the control board pin number, and the condition of that output. If no faults are detected an "OK" message is displayed.</td></tr>
<tr><td colspan="2">Self Test Mode Notes:
• The LCD screen will show "DONE" when the Self-Test is complete. <u>It will not show "PASS" or FAIL".</u>
• All unused outputs will show "OPEN" if the machine is not equipped with certain options.
Some examples of this may be:
– Solution Tank Auto Fill Valve (P2-13 OPEN)
– Recovery Tank Auto Fill Valve (P2-14 OPEN)
• The Detergent Pump output (P2-21) will show "OPEN" on machines equipped with the FaST system because of the FaST Water Pressure Switch (open when Water Pump is not running). To allow the Self-Test to check the FaST Detergent Pump output, place a jumper wire across the terminals of the Detergent Pump electrical connector.</td></tr>
<tr><td>Manual Mode</td><td>1) Enter Configuration Mode.
2) Press "2/3" button until "MANUAL MODE" is displayed.
3) Press "0/1" button to select Manual Mode. "MANUAL MODE OPR" is displayed on screen.</td><td>Allows the technician to turn on machine functions regardless of the status of the sensed inputs.
EX: The ES pump will turn on when ES is selected, regardless of the state of the tank float switches.</td></tr>
<tr><td rowspan="2">Input Display Mode
(This mode is used to test input sensors and circuitry)</td><td>1) Enter Configuration Mode
2) Press "2/3" button until "INPUT MODE" is displayed.
3) Press "0/1" button to select Input Mode. "READY" is displayed on screen.</td><td>Each LED on the panel represents the state of one of the control board inputs. If the input is grounded (0V), the associated LED is turned ON. If the input NOT grounded (open), the associated LED is turned off. Each input (bold) has an associated LED as described below:</td></tr>
<tr><td colspan="2">
<table>
<tr><th>LED</th><th>Input</th></tr>
<tr><td>One Step Scrub LED</td><td>Clogged Hydraulic Filter</td></tr>
<tr><td>Squeegee/Scrub Vacuum Fan LED</td><td>High Engine Temp</td></tr>
<tr><td>Low Engine Speed LED</td><td>Reverse</td></tr>
<tr><td>High Engine Speed LED</td><td>Forward</td></tr>
<tr><td>Side Brush LED</td><td>Impact Sense</td></tr>
<tr><td>Scrub Pressure Low LED</td><td>Solution Tank Empty</td></tr>
<tr><td>Solution Level High LED</td><td>Solution Tank Full</td></tr>
<tr><td>Solution Tank Medium LED</td><td>Recovery Tank Full</td></tr>
<tr><td>Solution Tank Low LED</td><td>Recovery Tank Half Full</td></tr>
<tr><td>Red warning LED</td><td>Open Scrub Vacuum</td></tr>
</table>
</td></tr>
</table>

E

HYDRAULIC

Troubleshooting Information

BEFORE CONDUCTING TESTS:

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

*** Engine & Hydraulic Oil Must Be At Normal Operating Temperatures after Running Machine and Hydraulics a Minimum of 5 Minutes**

*** Examine Machine For Any Linkage Binding or Mechanical Problems**

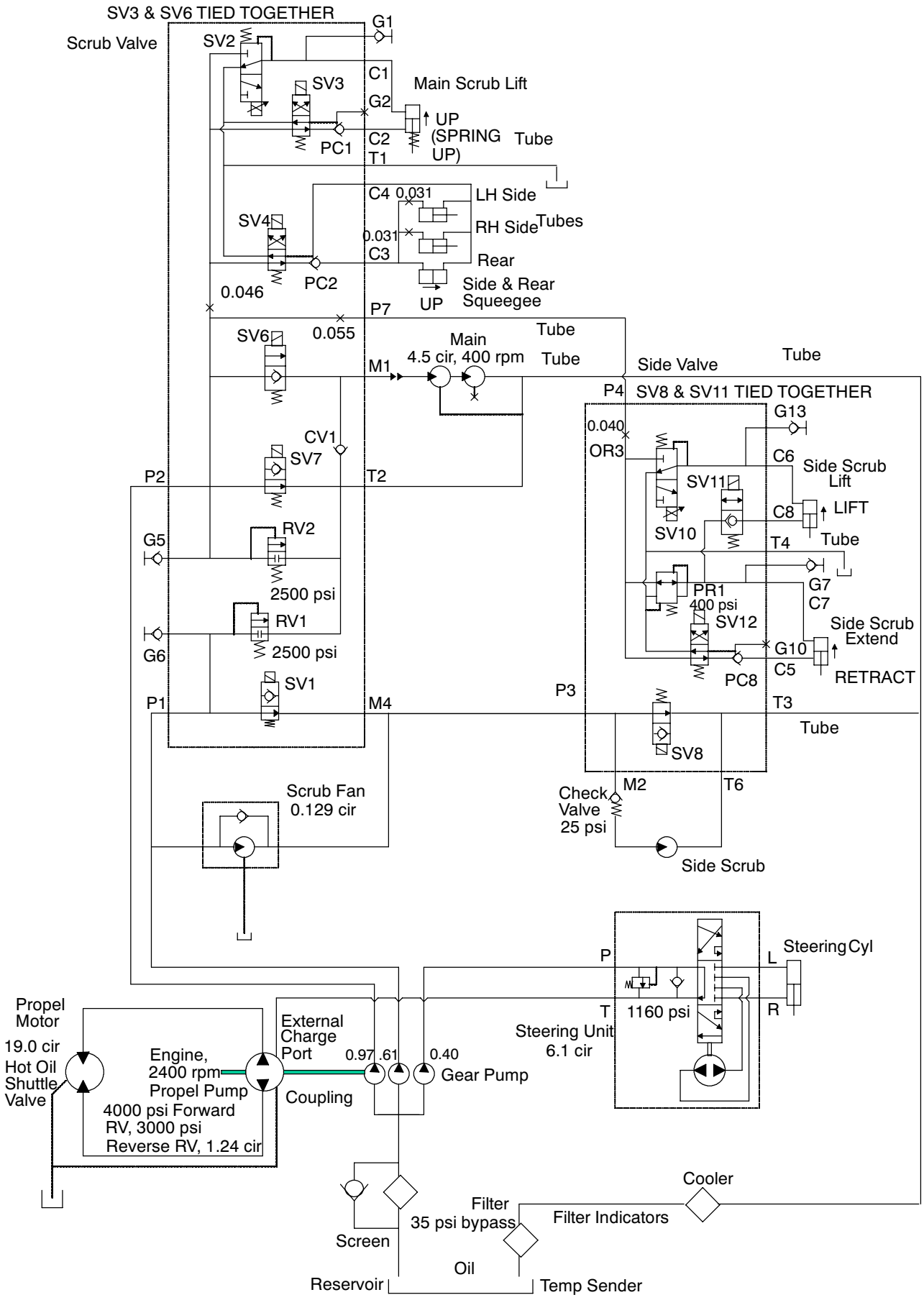
DURING TESTS:

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

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

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

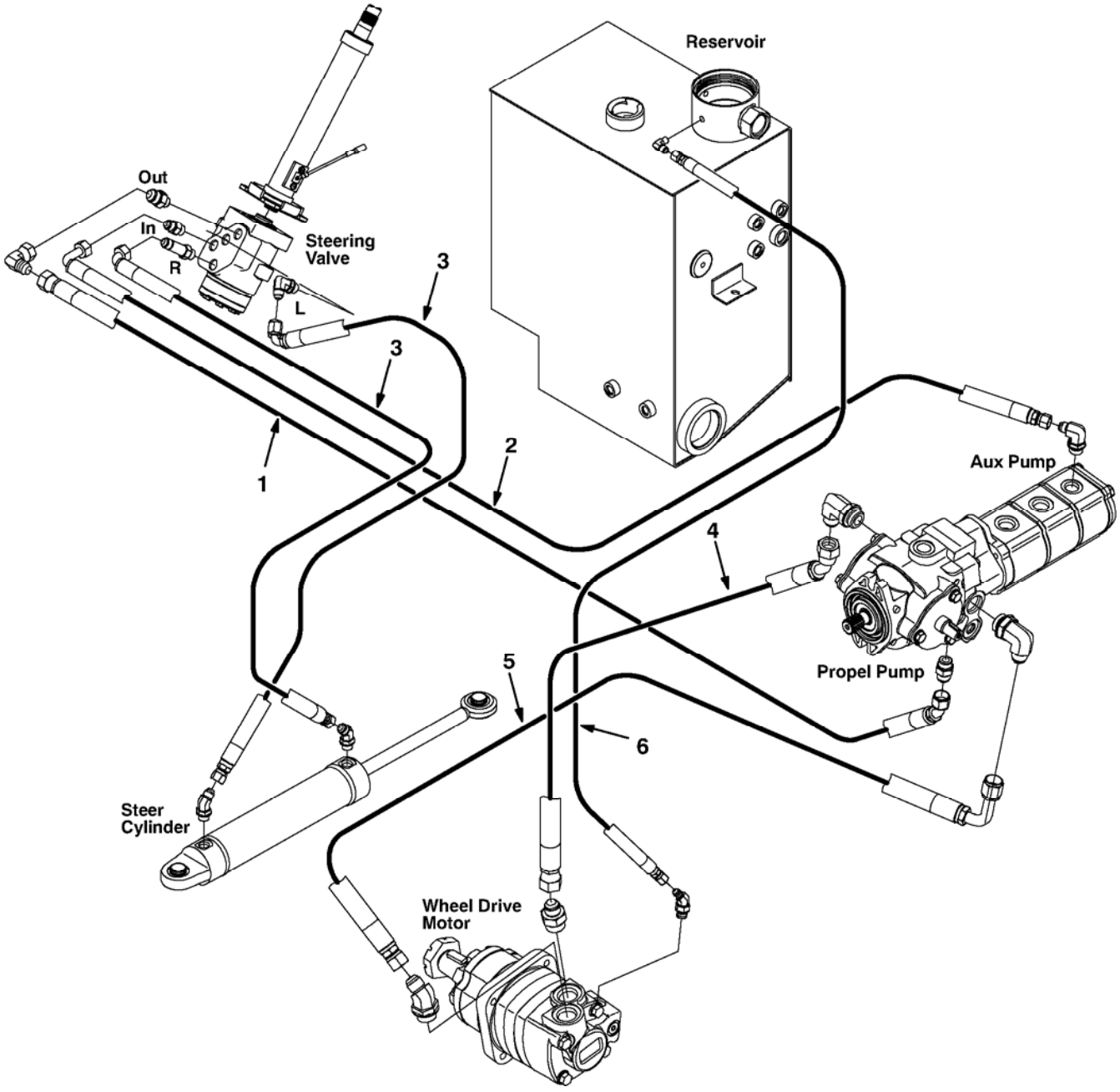
T20 Hydraulic Schematic



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Hose Group, Steering and Propel

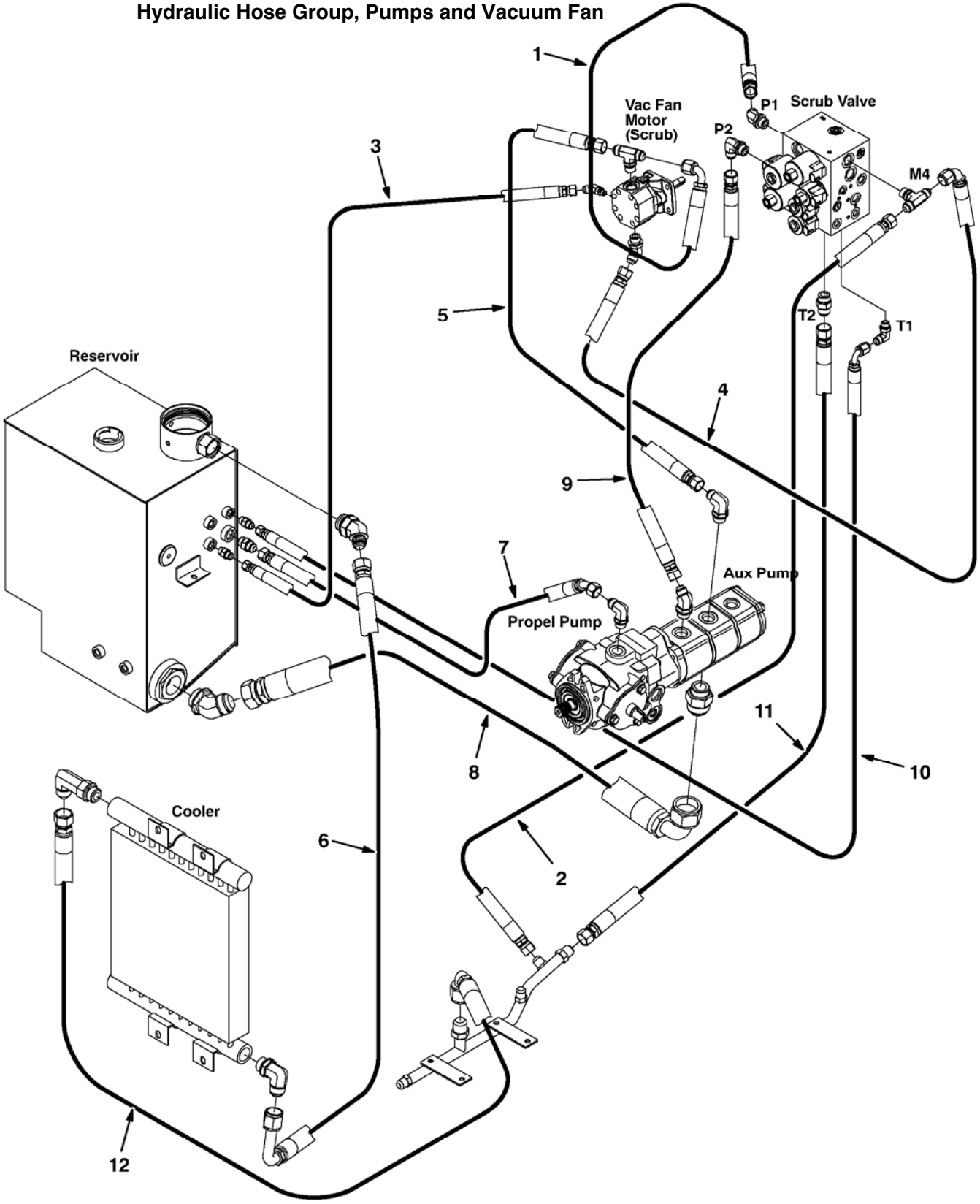


Ref.	Serial Number	Description	Qty.
1	(000000–)	Hose, Hyd, Tc08, Jf08e45/Jf08str, 96.0	1
2	(000000–)	Hose, Hyd, Tc06, Jf06e90/Jf06str, 104.0	1
3	(000000–)	Hose, Hyd, Tc06, Jf06e90/Jf06str, 040.0	2
4	(000000–)	Hose, Hyd, Spcl, Jf10e45/Jf10str, 58.0	1
5	(000000–)	Hose, Hyd, Spcl, Jf10e90/Jf10str, 63.0	1
6	(000000–)	Hose, Hyd,Med04, Jf04str/Jf04str, 066.0	1

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Hose Group, Pumps and Vacuum Fan



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NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

354401

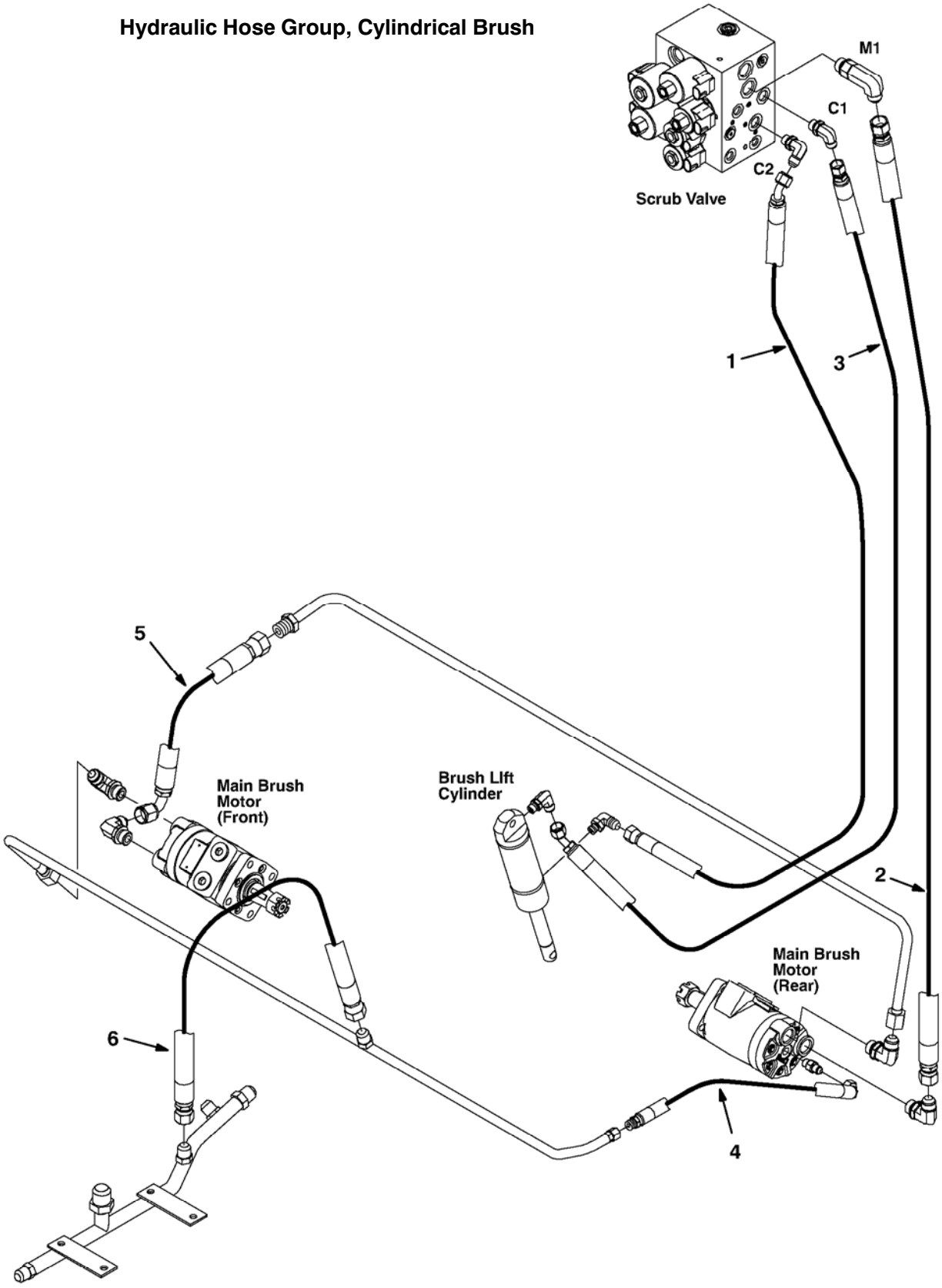
Hydraulic Hose Group, Pump and Vacuum Fans

Ref.	Serial Number	Description	Qty.
1	(000000-)	Hose, Hyd, Tc08, Jf08e90/Jf08str, 046.0	1
2	(000000-)	Hose, Hyd, Med08, Jf08e90/Jf08str, 062.0	1
3	(000000-)	Hose, Hyd, Med06, Jf06str/Jf06str, 033.0	1
4	(000000-)	Hose, Hyd, Tc08, Jf08str/Jf08e90, 031.0	1
5	(000000-)	Hose, Hyd, Tc08, Jf08e45/Jf08str, 26.0	1
6	(000000-)	Hose, Hyd, Med12, Jf12e90/Jf12str, 50.0	1
7	(000000-)	Hose, Hyd, Med08, Jf08str /Jf08e45, 21.0	1
8	(000000-)	Hose, Hyd, Suc20, Jf20str /Jf20e90, 29.0	1
9	(000000-)	Hose, Hyd, Tc08, Jf08str/Jf08str, 21.0	1
10	(000000-)	Hose, Hyd, Med06, Jf06e90/Jf06str, 042.0	1
11	(000000-)	Hose, Hyd, Med10, Jf10str/Jf10str, 41.0	1
12	(000000-)	Hose, Hyd, Tc12, Jf12e90/Jf12str, 044.0	1

H

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Hose Group, Cylindrical Brush



H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

354402

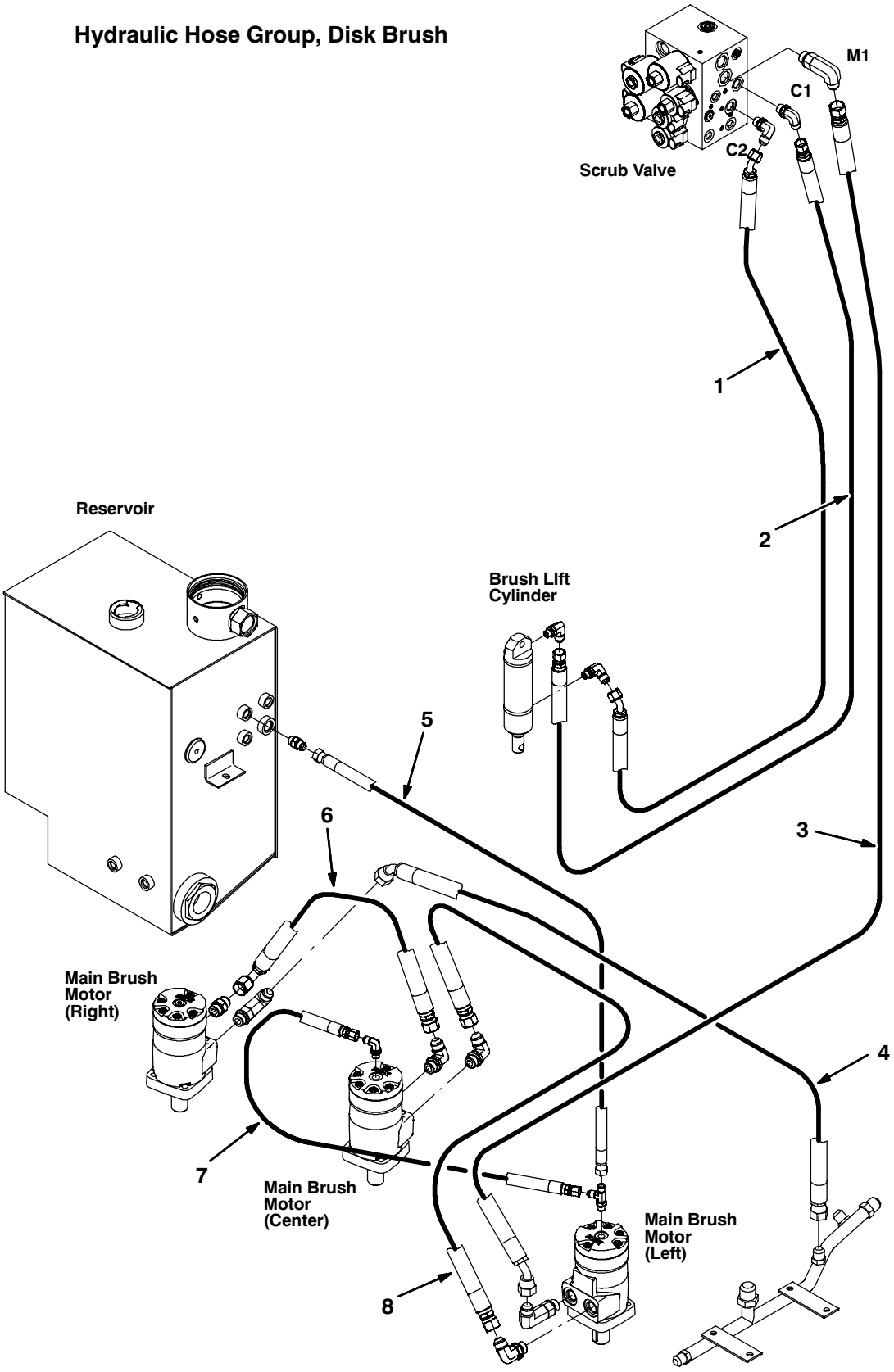
Hydraulic Hose Group, Cylindrical Brush

Ref.	Serial Number	Description	Qty.
1	(000000–)	Hose, Hyd, Tc06, Jf06str /Jf06e45, 54.0	1
2	(000000–)	Hose, Hyd, Tc08, Jf08str/Jf08str, 48.0	1
3	(000000–)	Hose, Hyd, Tc 06, Jf06str /Jf06e45, 56.0	1
4	(000000–)	Hose, Hyd, Med04, Jf04e90/Jf04str, 016.0	1
5	(000000–)	Hose, Hyd, Tc08, Jf08e90/Jf08str, 13.0	1
6	(000000–)	Hose, Hyd, Med08, Jf08str/Jf08str, 022.0	1

H

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Hose Group, Disk Brush



H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

354403

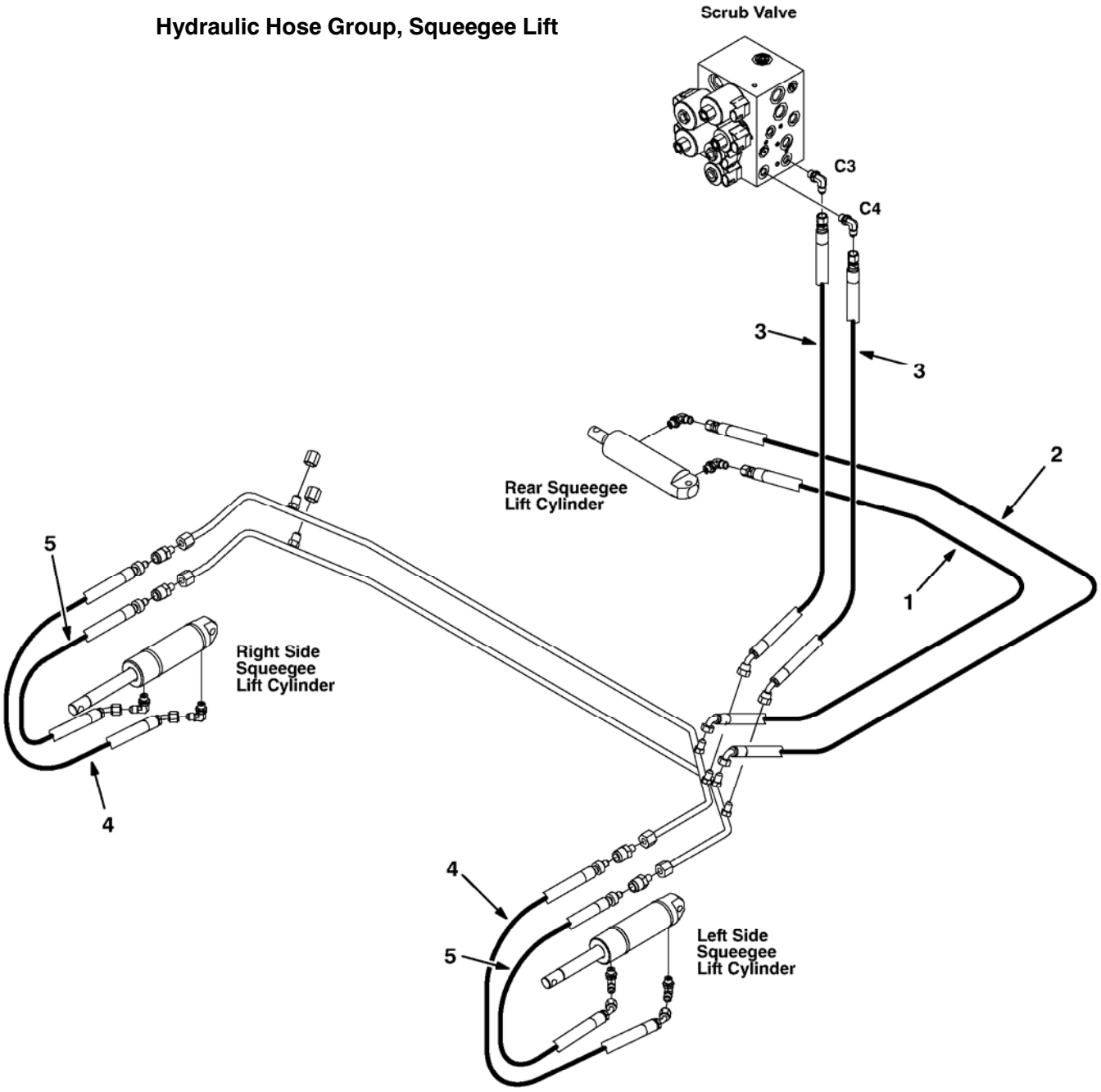
Hydraulic Hose Group, Disk Brush

Ref.	Serial Number		Description	Qty.
1	(000000–	)	Hose, Hyd, Tc06, Jf06str /Jf06e45, 54.0	1
2	(000000–	)	Hose, Hyd, Tc 06, Jf06str /Jf06e45, 56.0	1
3	(000000–	)	Hose, Hyd, Tc08, Jf08e45/Jf08str, 052.0	1
4	(000000–	)	Hose, Hyd, Med08, Jf08e45/Jf08str, 046.0	1
5	(000000–	)	Hose, Hyd, Tc04, Jf04str/Jf04str, 036.0	1
6	(000000–	)	Hose, Hyd, Tc08, Jf08e90/Jf08str, 020.0	1
7	(000000–	)	Hose, Hyd, Tc04, Jf04str/Jf04str, 036.0	1
8	(000000–	)	Hose, Hyd, Tc08, Jf08str/Jf08str, 040.0	1

H

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Hose Group, Squeegee Lift



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NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

354391

Hydraulic Hose Group, Squeegee Lift

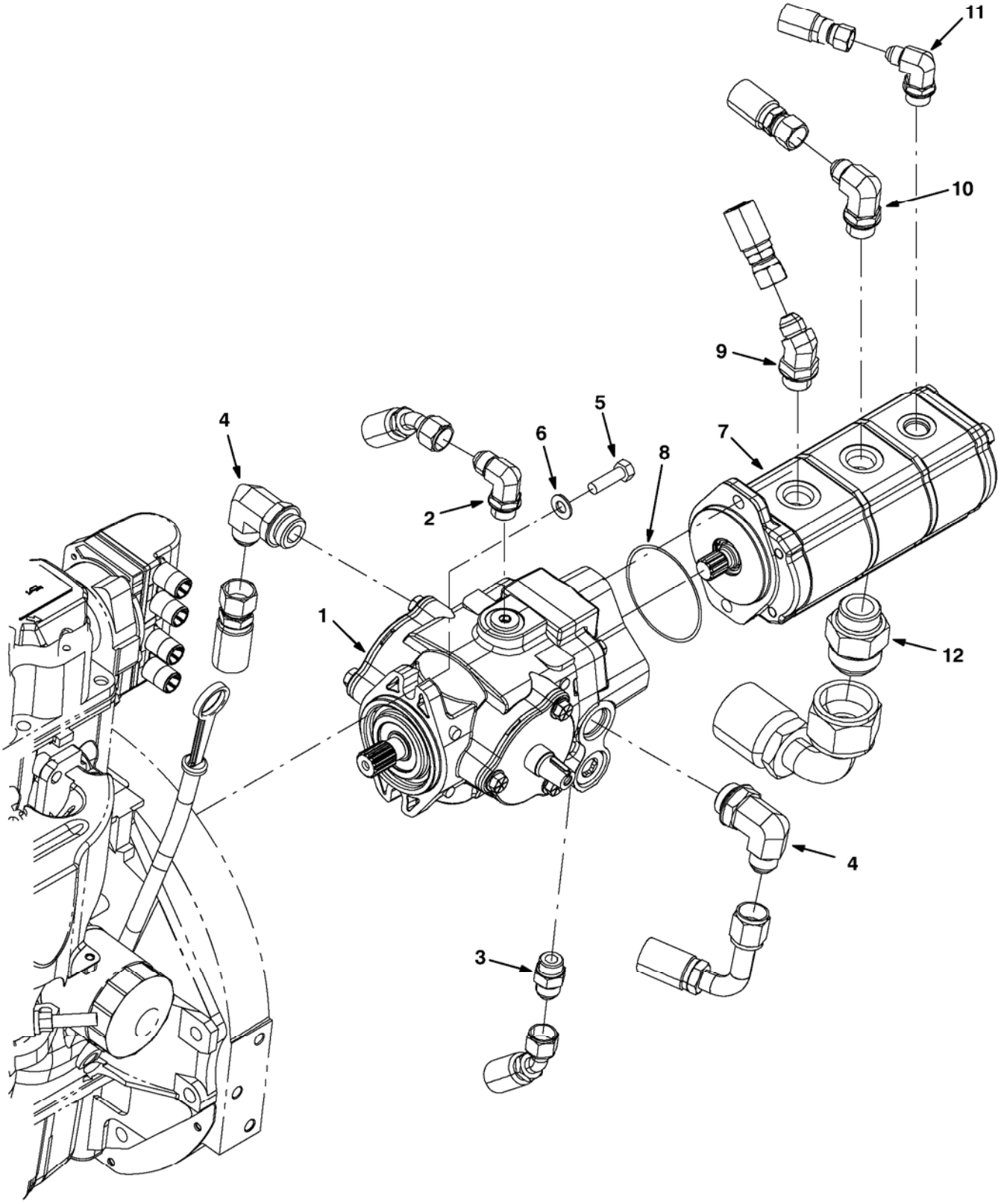
Ref.	Serial Number		Description	Qty.
1	(000000-	)	Hose, Hyd, Tc04, Jf04e90/Jf04str, 42.0l	1
2	(000000-	)	Hose, Hyd, Tc04, Jf04e90/Jf04str, 46.0l	1
3	(000000-	)	Hose, Hyd,Tc 04, Jf04str /Jf04e45 , 35.0	2
4	(000000-	)	Hose, Hyd, Tc04, Jf04e45/Qm06, 28.0	2
5	(000000-	)	Hose, Hyd, Tc04, Jf04e45/Qm06, 26.0	2

H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Pumps Group



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

1017697

Hydraulic Pumps Group

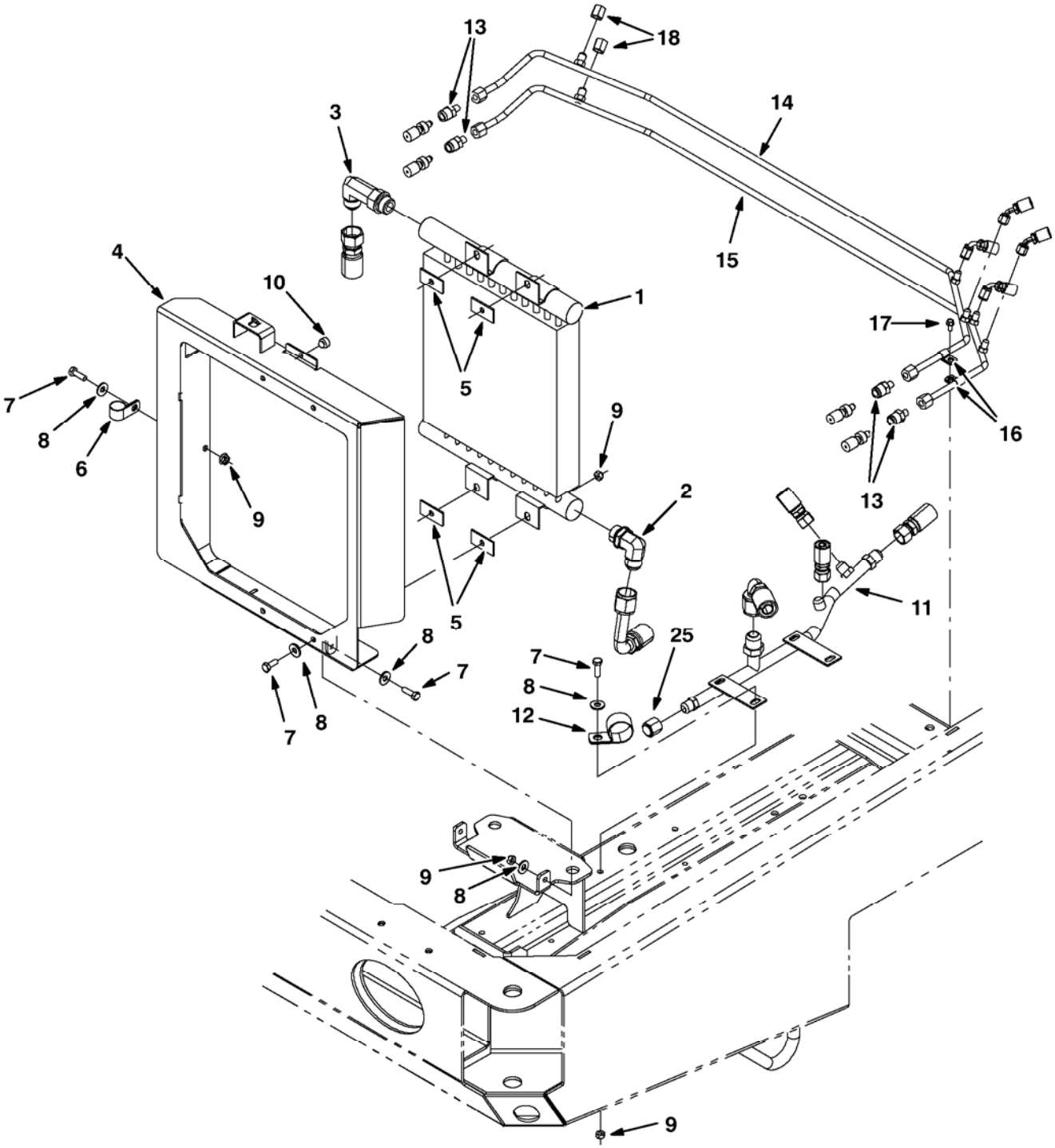
Ref.	Serial Number	Description	Qty.
1	(000000-)	Pump, Hyd, Piston, Var, 1.24 4000, Cw (See Breakdown)	1
2	(000000-)	Fitting, Hyd, E90, Jm08/Om08	1
3	(000000-)	Fitting, Hyd, Str, Jm08/Om08	1
4	(000000-)	Fitting, Hyd, E90, Jm10/Om12	2
5	(000000-)	Screw, Hex, .38-16 X 1.25, 5	22
6	(000000-)	Washer, Flat, 0.38 Sae	2
7	(000000-)	Pump, Hyd, Gear, Ext, 3, 00.97 2500, Cw	1
8	(000000-)	Seal, Org, .069 X 3.06id	11
9	(000000-)	Fitting, Hyd, E45, Jm08/Om10	1
10	(000000-)	Fitting, Hyd, E90, Jm08/Om10	1
11	(000000-)	Fitting, Hyd, E90, Jm06/Om08	1
12	(000000-)	Fitting, Hyd, Str, Jm20/Om16	1

H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Cooler and Tubes Group



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NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

1017692

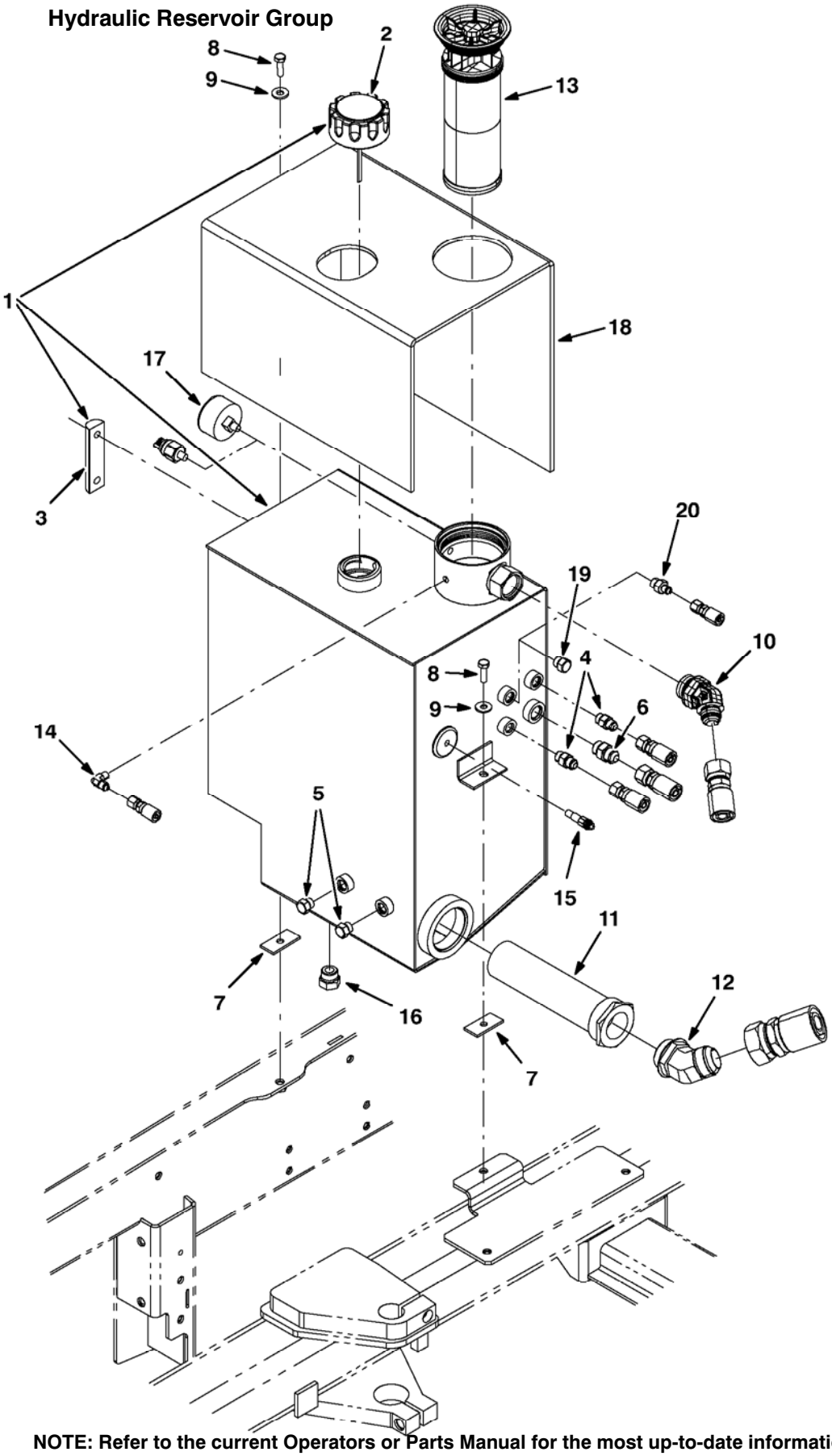
Hydraulic Cooler and Tubes Group

Ref.	Serial Number		Description	Qty.
1	(000000-	)	Cooler, Hyd, 25gpm 325btu Of12 13x12x2	1
2	(000000-	)	Fitting, Hyd, E90, Jm12/Om12	1
3	(000000-	)	Fitting, Hyd, E90, Jm12/Om12, L	1
4	(000000-	)	Bracket Wldt, Cooler, Hyd Fluid	1
5	(000000-	)	Pad, Tank, Hyd	4
6	(000000-	)	Clamp, Cable, Stl, 1.00d X 0.62w, 1h	1
7	(000000-	)	Screw, Hex, M8 X 1.25 X 25, 8.8	9
8	(000000-	)	Washer, Flat, 0.31 Std	15
9	(000000-	)	Nut, Hex, Flng, M8 X 1.25	9
10	(000000-	)	Bumper, Rbr, 0.6d 0.34t .3d Tip	1
11	(000000-	)	Tube, Hyd, Main Return [M20]	1
12	(000000-	)	Clamp, Cable, Stl, 1.50d X 1.00w, 1h	1
13	(000000-	)	Fitting, Hyd, Str, Spcl	4
14	(000000-	)	Tube, Hyd, Sqge	1
15	(000000-	)	Tube, Hyd, Sqge	1
16	(000000-	)	Clamp, Cable, Stl, 0.44d X 0.62w, 1h	2
17	(000000-	)	Screw, Hex, M6 X 1.0 X 12, Fmg	1
18	(000000-	)	Fitting, Hyd, Cap, Jf06	2

H

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Reservoir Group



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

1017692

Hydraulic Reservoir Group

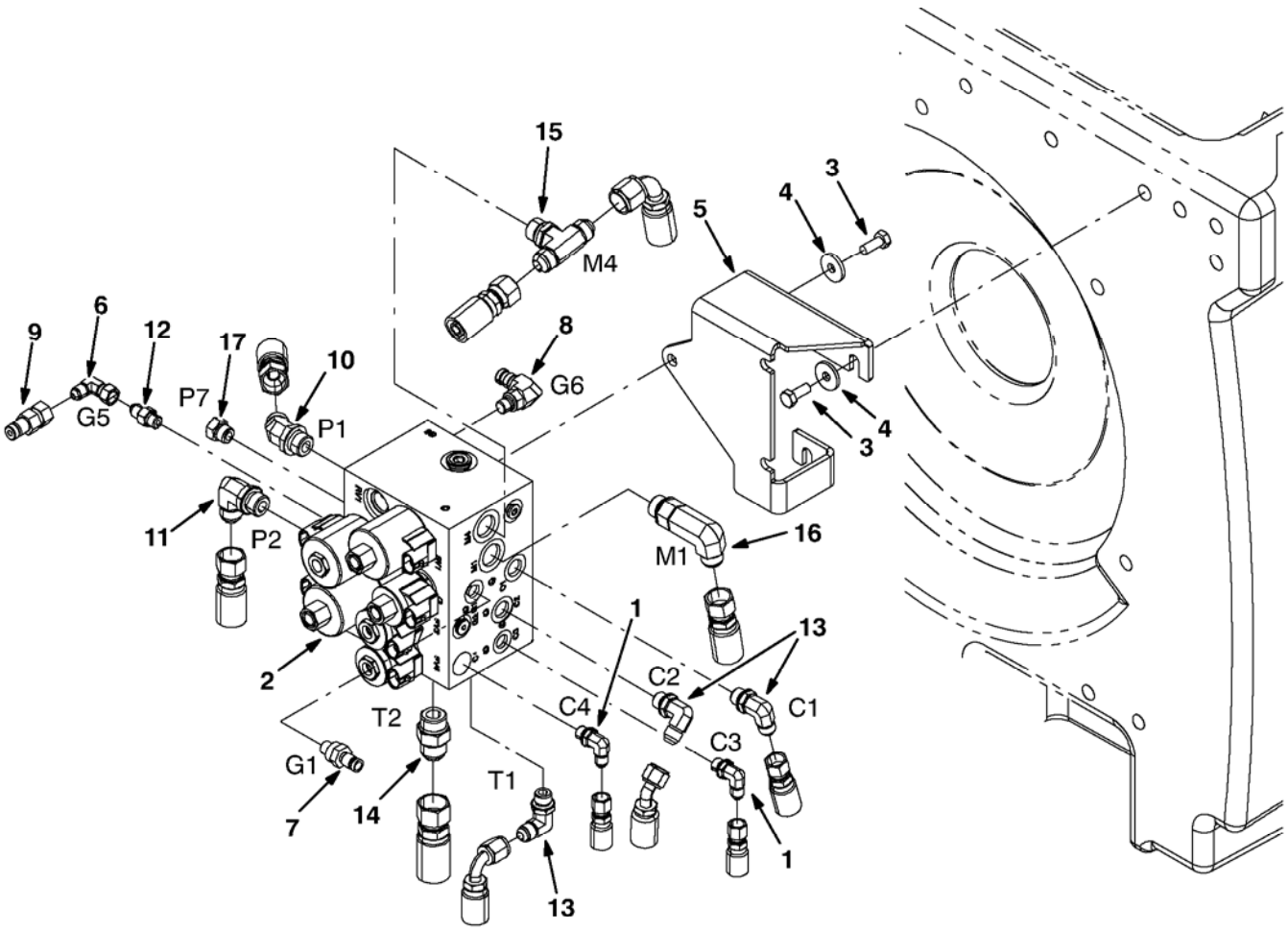
Ref.	Serial Number	Description	Qty.
1	(000000-)	Reservoir, Hyd, 10.0Gal, Replmt	1
2	(000000-)	Cap, Breather, Hyd, 2.4 Ds	1
3	(000000-)	Gauge, Sensing, Level	1
4	(000000-)	Fitting, Hyd, Str, Jm06/Om06	2
5	(000000-)	Fitting, Hyd, Plug, Om06	2
6	(000000-)	Fitting, Hyd, Str, Jm08/Om08	1
7	(000000-)	Pad, Tank, Hyd	2
8	(000000-)	Screw, Hex, M8 X 1.25 X 25, 8.8	2
9	(000000-)	Washer, Flat, 0.31 Std	2
10	(000000-)	Fitting, Hyd, E45, Jm12/Om16	1
11	(000000-)	Strainer, Hyd, 25gpm 100mesh Psi	1
12	(000000-)	Fitting, Hyd, E45, Jm20/Om20	1
13	(000000-)	Filter Assy [Pt4 936498]	1
14	(000000-)	Fitting, Hyd, E90, Jm04/Pm02	1
15	(000000-)	Send-Unit, Water, Temp, 04npt 113oh/195d	1
16	(000000-)	Fitting, Hyd, Plug, Om10	1
17	(000000-)	Indicator, Press, 60psi	1
18	(000000-)	Insulation, Thermal, Hydraulic Blanket	1
19	(000000-)	Fitting, Hyd, Plug, Om06 (Cylindrical Scrub Head)	1
20	(000000-)	Fitting, Hyd, Str, Jm04/Om06 (Disk Scrub Head)	1

H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Hydraulic Valves Group



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NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

1017692

Hydraulic Valves Group

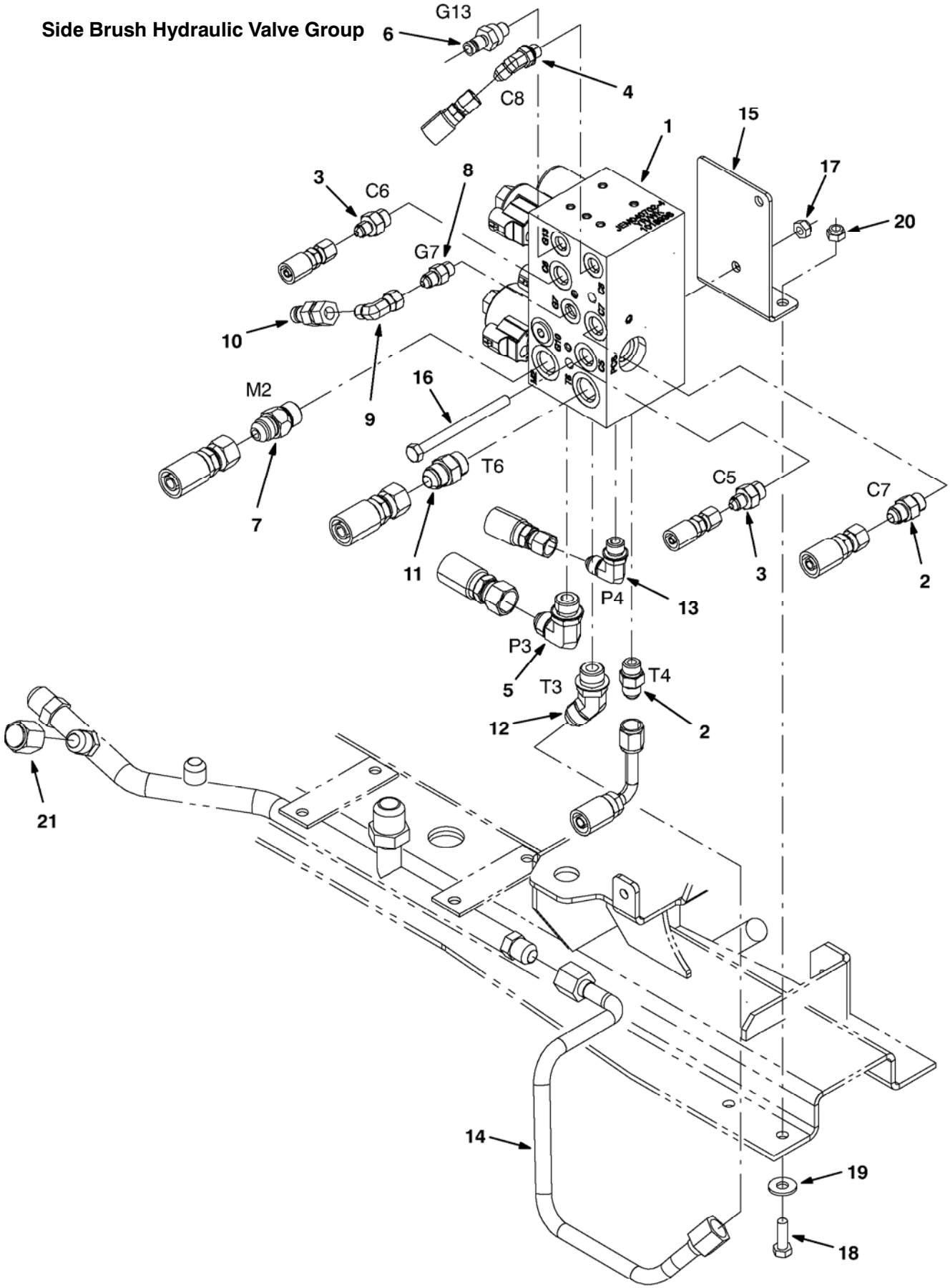
Ref.	Serial Number	Description	Qty.
1	(000000-)	Fitting, Hyd, E90, Jm04/Om04	2
2	(000000-)	Valve, Cntrl, Hyd (See Breakdowns)	1
3	(000000-)	Screw, Hex, M8 X 1.25 X 20, Ss	6
4	(000000-)	Washer, Flat, 0.32b 1.00d .12, Ss	6
5	(000000-)	Bracket, Mtg, Valve, Hyd, Scb	1
6	(000000-)	Fitting, Hyd, E90, Jf04/Jm04	1
7	(000000-)	Fitting, Hyd, Str, Om04/Qm04	1
8	(000000-)	Fitting, Hyd, E90, Om04/Qm04	1
9	(000000-)	Fitting, Hyd, Str, Jf04/Qm04	1
10	(000000-)	Fitting, Hyd, E45, Jm08/Om08	1
11	(000000-)	Fitting, Hyd, E90, Jm08/Om08	1
12	(000000-)	Fitting, Hyd, Str, Jm04/Om04	1
13	(000000-)	Fitting, Hyd, E90, Jm06/Om06	3
14	(000000-)	Fitting, Hyd, Str, Jm10/Om10	1
15	(000000-)	Fitting, Hyd, Tee, Jm08/Jm08/Om08, Br	1
16	(000000-)	Fitting, Hyd, E90, Jm08/Om08, L	1
17	(000000-)	Fitting, Hyd, Plug, Om06	1

H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

Side Brush Hydraulic Valve Group



NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

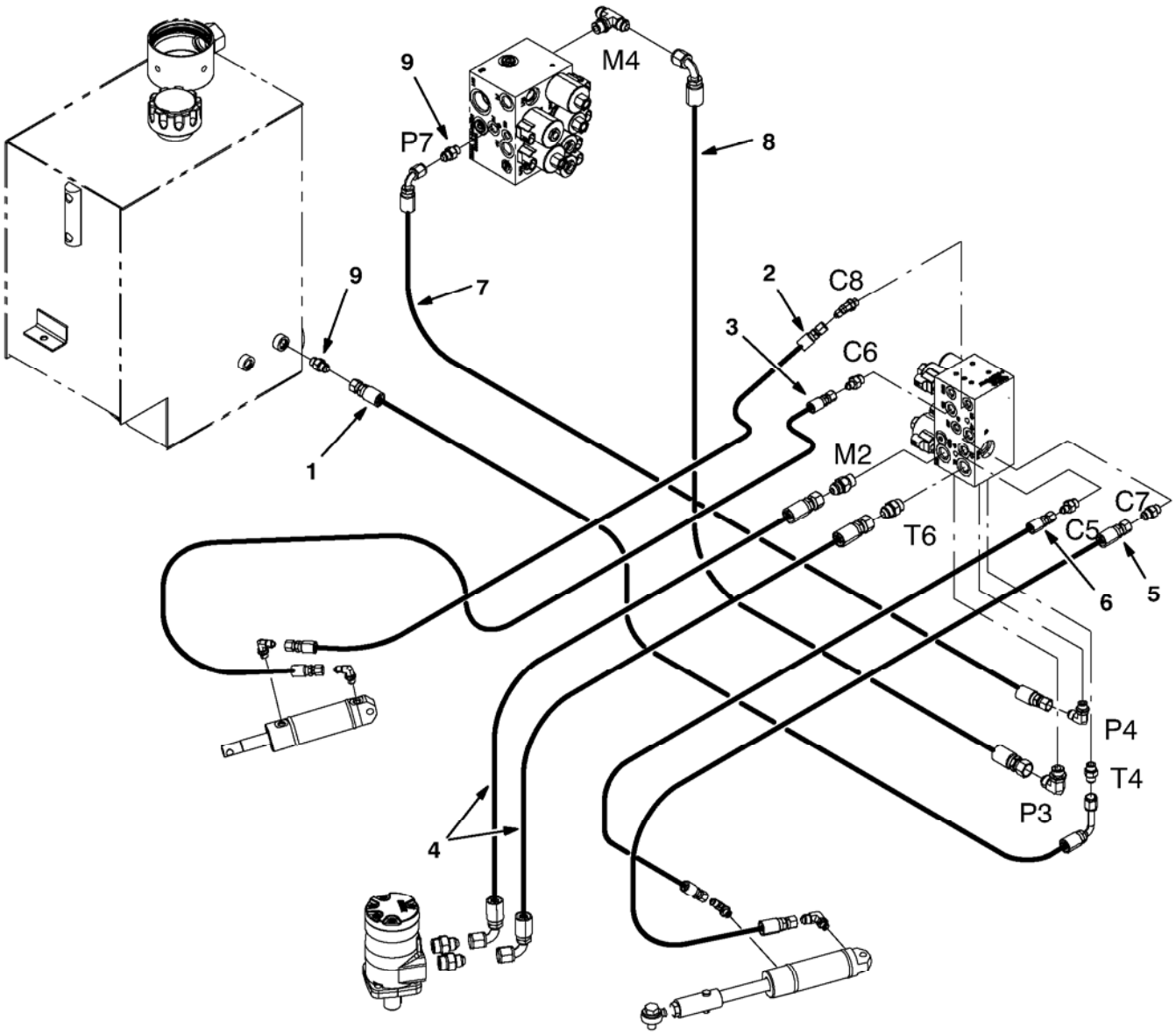
1017708

Side Brush Hydraulic Valve Group

Ref.	Serial Number		Description	Qty.
1	(000000-	)	Valve, Cntrl, Hyd [M20 And T20] (See Breakdown)	1
2	(000000-	)	Fitting, Hyd, Str, Jm06/Om06	2
3	(000000-	)	Fitting, Hyd, Str, Jm04/Om06	2
4	(000000-	)	Fitting, Hyd, E45, Jm04/Om04	1
5	(000000-	)	Fitting, Hyd, E90, Jm08/Om08	1
6	(000000-	)	Fitting, Hyd, Str, Om04/Qm04	1
7	(000000-	)	Valve, Hyd, Check, Jm08/Om08 5000psi	1
8	(000000-	)	Fitting, Hyd, Str, Jm04/Om04	1
9	(000000-	)	Fitting, Hyd, E90, Jf04/Jm04	1
10	(000000-	)	Fitting, Hyd, Str, Jf04/Qm04	1
11	(000000-	)	Fitting, Hyd, Str, Jm08/Om08	1
12	(000000-	)	Fitting, Hyd, E45, Jm08/Om08	1
13	(000000-	)	Fitting, Hyd, E90, Jm06/Om06	1
14	(000000-	)	Tube, Hyd, 08 Jf08/Jf08	1
15	(000000-	)	Bracket, Valve, Sba [M20 And T20]	1
16	(000000-	)	Screw, Hex, M8 X 1.25 X 100, 8.8	2
17	(000000-	)	Nut, Hex, Lock, M8 X 1.25, Nl	2
18	(000000-	)	Screw, Hex, M8 X 1.25 X 25, Ss	2
19	(000000-	)	Washer, Flat, 0.31, Std	2
20	(000000-	)	Nut, Hex, Lock, M8 X 1.25, Nl, Ss	2
21	(000000-	)	Fitting, Hyd, Cap, Jf08	1

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

Side Brush Hydraulic Hose Group



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NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Hose, Pump & Valve Drawings

1017708

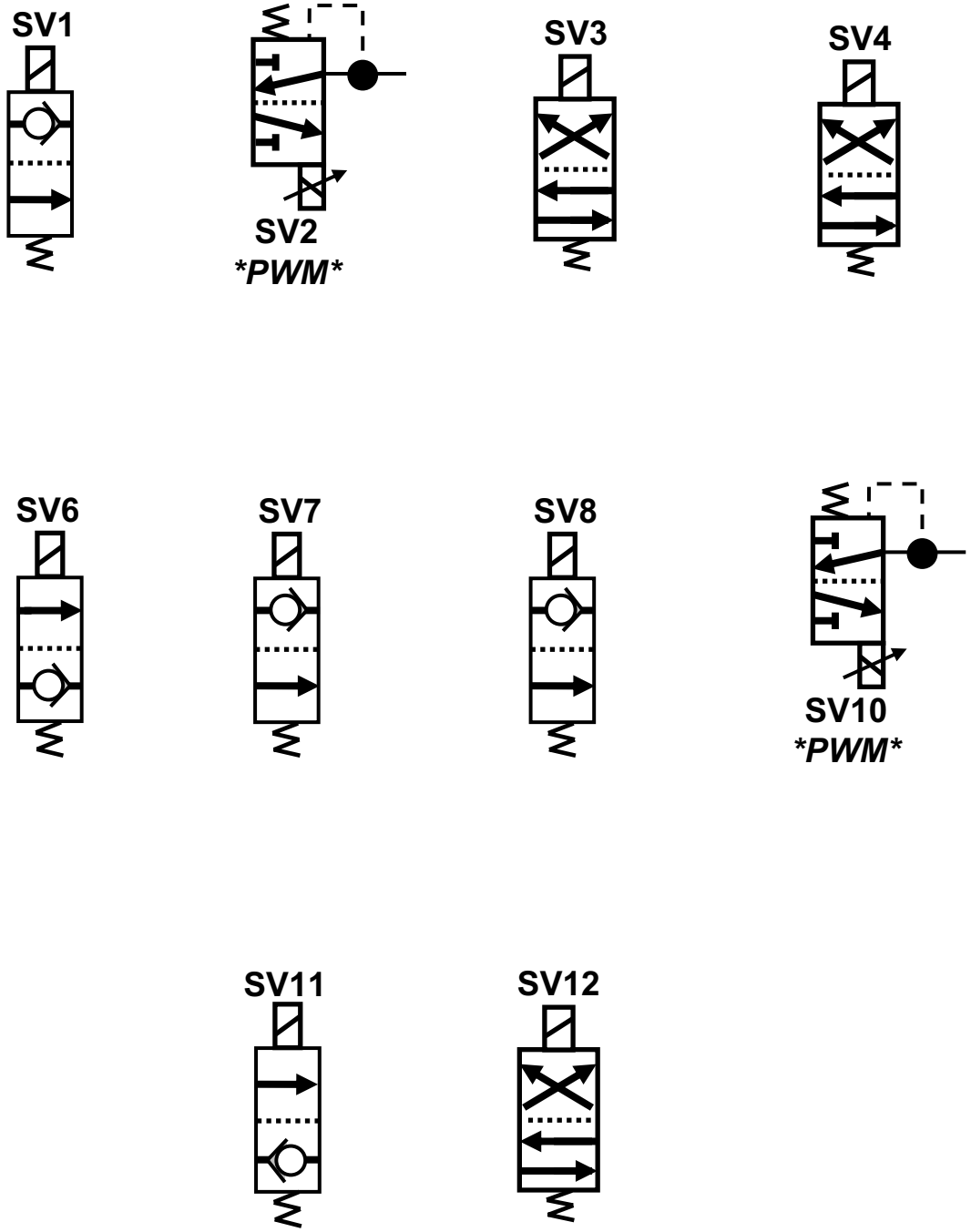
Side Brush Hydraulic Hose Group

Ref.	Serial Number		Description	Qty.
1	(000000-	)	Hose, Hyd, Med06, Jf06e90l/Jf06str,038.0	1
2	(000000-	)	Hose, Hyd, Tc06, Jf06str/Jf06str, 033.0	1
3	(000000-	)	Hose, Hyd, Tc04, Jf04str /Jf04str, 39.0	1
4	(000000-	)	Hose, Hyd, Tc08, Jf08e90/Jf08str, 034.0	2
5	(000000-	)	Hose, Hyd, Tc06, Jf06str /Jf06str, 23.0	1
6	(000000-	)	Hose, Hyd, Tc04, Jf04str /Jf04str, 20.0	1
7	(000000-	)	Hose, Hyd, Tc06, Jf06str /Jf06e90, 74.0	1
8	(000000-	)	Hose, Hyd, Tc08, Jf08e90/Jf08str, 084.0	1
9	(000000-	)	Fitting, Hyd, Str, Jm06/Om06	2

H

NOTE: Refer to the current Operators or Parts Manual for the most up-to-date information

T20 Hydraulic Solenoid Valve Details



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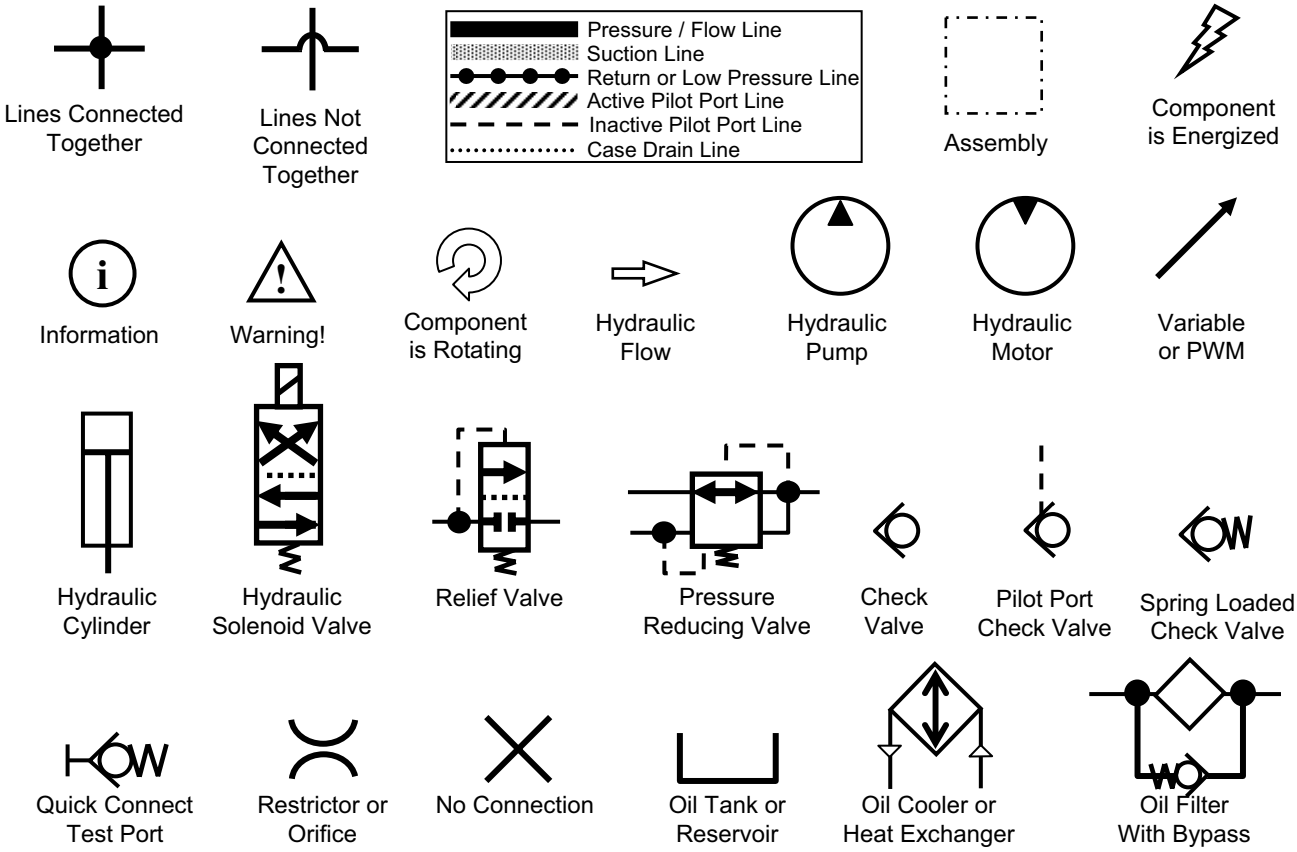
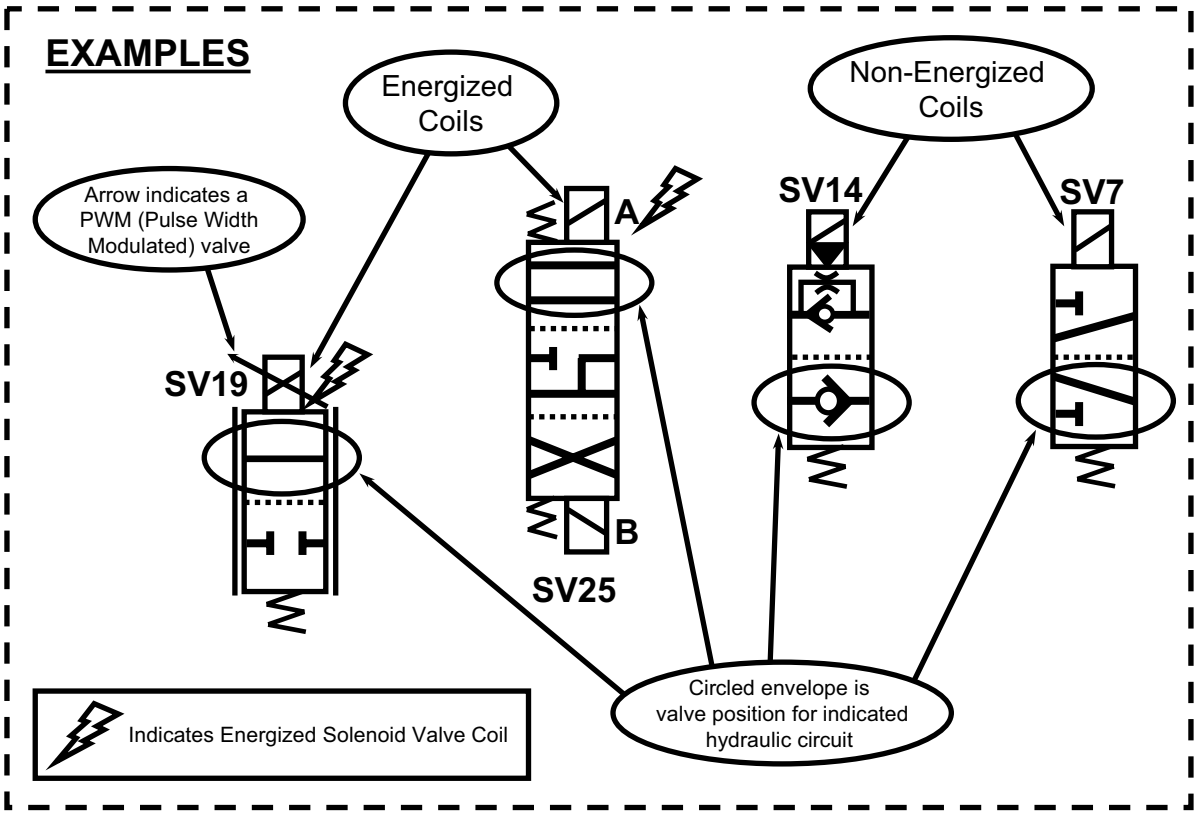
T20 General Information

Commonly Used Hydraulic Symbols





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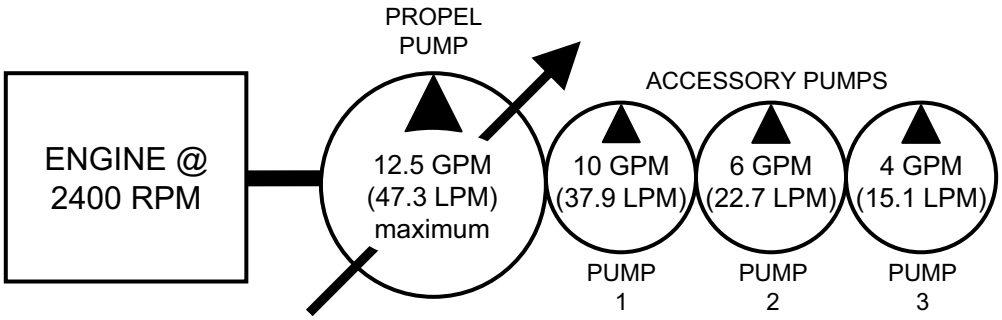
T20 General Information

(Page 2 of 2)

T20 Hydraulic Pump Flow Rates (typical)



Commonly Used Abbreviations

AUX	Auxiliary
CIR	Cubic Inch Displacement per Revolution
CK	Check Valve
CM	Centimeters
CONV	Conveyor
CU	Cubic
CV	Control Valve
CYL	Cylinder
DC	Disconnect Coupler (Hydraulic)
DC	Direct Current (Electrical)
E	Engine (Combustion)
FLTR	Filter
GPM	Gallons Per Minute
HTX	Heat Exchanger
IN	Inches
LH	Left Hand
LPM	Liters Per Minute
LS	Load Sense
M	Motor (Combustion)

MFLD	Manifold
MTR	Motor (Hydraulic)
OR	Orifice
PC	Pilot Port Check Valve
PMP	Pump
PR	Pressure Relief Valve
PSI	Pounds Per Square Inch
PTO	Power Take Off
PWM	Pulse Width Modulation
RES	Reservoir
RH	Right Hand
RPM	Revolutions Per Minute
RV	Relief Valve
SC	Spring Loaded Check Valve
STRN	Strainer
SV	Solenoid Valve
SW	Switch
TV	Throttle Valve
V	Volts

Typical Hydraulic Manifold Port Markings

C	Hydraulic Cylinder Connection
G	Test Port
LS	Load Sense Port

M	Hydraulic Motor Connection
P	Pump Connection
R or T	Return Port (To Tank)

H

T20 Operating Matrix

Component / System	Function	Test Port	Test Port Location	Energized Coil(s)	Notes	Manifold(s) containing Solenoid Valve(s)	Location	Feed Port	Exit Port	Relief Valve in circuit	Relief Valve Pressure Setting (PSI)
Scrub Head	Down	G1	Scrub Manifold	SV2, SV3, SV7*	SV2 is PWM controlled; Down pressure varies with current to SV2; SV3 and SV6 are tied together electrically	Scrub Manifold	Left side, engine compartment, beside vacuum fan	C1	C2	RV2	2500
	Up	G5	N/A	SV7*				C2	C1		
Squeegees, Side and Rear	Down	G5	Scrub Manifold	SV4, SV7*	Use Manual Mode during testing	Scrub Manifold	Left side, engine compartment, beside vacuum fan	C4	C3	RV2	2500
	Up	G5	N/A	SV7*				C3	C4		
Main Brushes	Operate	G5	Scrub Manifold	SV6, SV7*	Use Manual Mode during testing to obtain full down pressure; SV3 and SV6 are tied together electrically	Scrub Manifold	Left side, engine compartment, beside vacuum fan	M1	Tank	RV2	2500
Scrub Fan	Operate	G6	Scrub Manifold	SV1		Scrub Manifold	Left side, engine compartment, beside vacuum fan	Accessory Pump # 2	P3	RV1	2500
Side Brush	Operate	G6	Scrub Manifold	SV8	Use Manual Mode during testing	Side Brush Manifold	Left front corner of frame	M2	T6	RV1	2500
Side Brush	Up	G5	Side Valve	SV7*	Operate Side Brush up and down using Manual Mode--Watch change in pressure on G5 and/or G13; SV8 and SV11 tied together electrically	Side Brush Manifold	Left front corner of frame	C8	C6	RV2	2500
	Down	G13		SV10, SV11, SV7*				C6	C8		
	Retract	G5		SV7*				C5	C7		
	Extend	G7		SV12, SV7*				C7	C5		

* SV7 is Enable Solenoid for the given functions

T20 Option Components

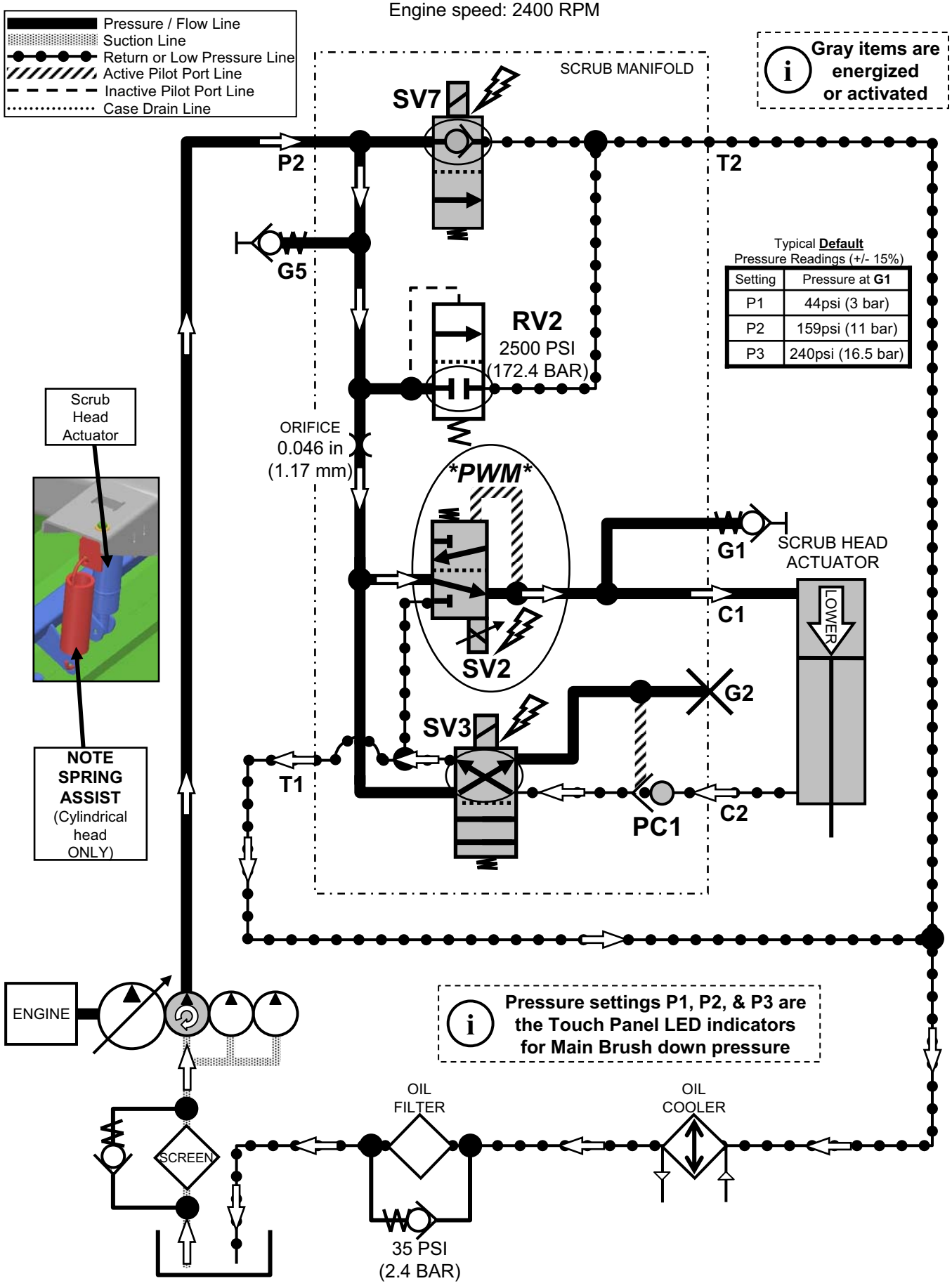
The following chart lists various options and the electrical and/or hydraulic components that are associated with the option. Refer to the “notes” section for any components that are deleted from a standard machine in order to have the installed option.

option	added components	E or H	component #	notes
Side Brush	Side Brush ON Solenoid Valve	E,H	SV-8	
	Side Brush Pressure Solenoid Valve	E,H	SV-10	
	Side Brush Down Solenoid Valve	E,H	SV-11	
	Side Brush Extend Solenoid Valve	E,H	SV-12	
	FaST Side Brush Valve	E	SOL-6	
	Side Brush Water Valve	E	SOL-7	
	Side Brush Manifold	H	x	
	Side Brush Lift Cylinder	H	x	
	Side Brush Extend Cylinder	H	x	
	Side Brush Motor	H	x	
ES (Extended Scrub)	Solution Tank Auto Fill Water Valve	E	SOL-1	If machine has ES option, the following components will ***not*** be on the machine: FaST Water Pump, FaST Water Pump Relay (M11), FaST Detergent Pump, FaST Air Pump, FaST Enable Valve (SOL-4), FaST High Flow Valve (SOL-5), FaST Side Brush Valve (SOL-6)
	Recovery Tank Auto Fill Water Valve	E	SOL-2	
	Solution Tank Full Switch	E	S-14	
	Recovery Tank Half Full Switch	E	S-16	
	Detergent Pump	E	x	
	ES Pump	E	x	
Spray Hose	Spray Hose Pump	E	x	
	Spray Hose Relay	E	M12	
	Spray Hose Switch	E	S-25	

E = Electrical Component
H = Hydraulic Component

T20 Scrub Head Lower

Engine speed: 2400 RPM



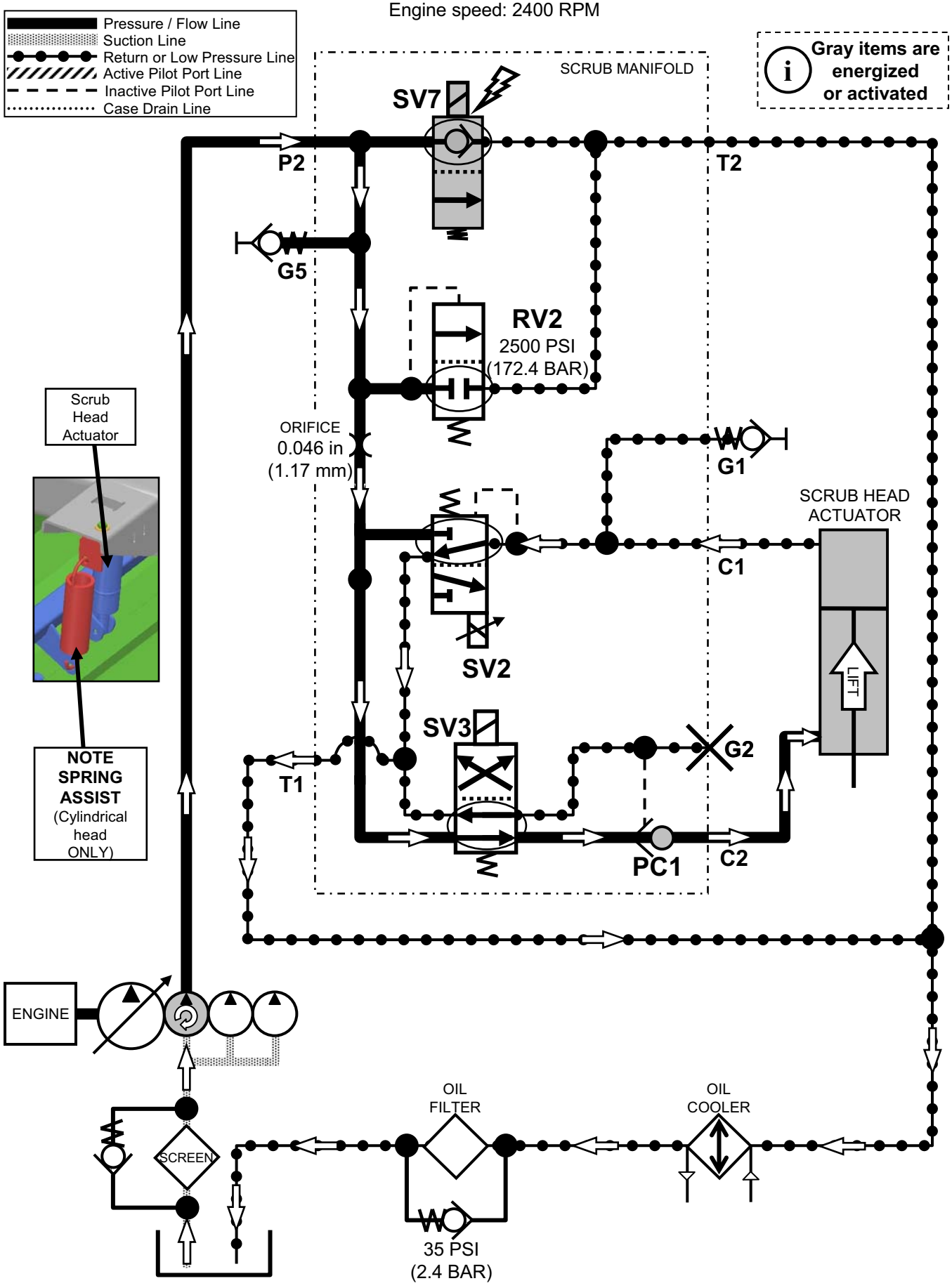
Typical **Default** Pressure Readings (+/- 15%)

Setting	Pressure at **G1**
P1	44psi (3 bar)
P2	159psi (11 bar)
P3	240psi (16.5 bar)

H

T20 Scrub Head Lift

Engine speed: 2400 RPM



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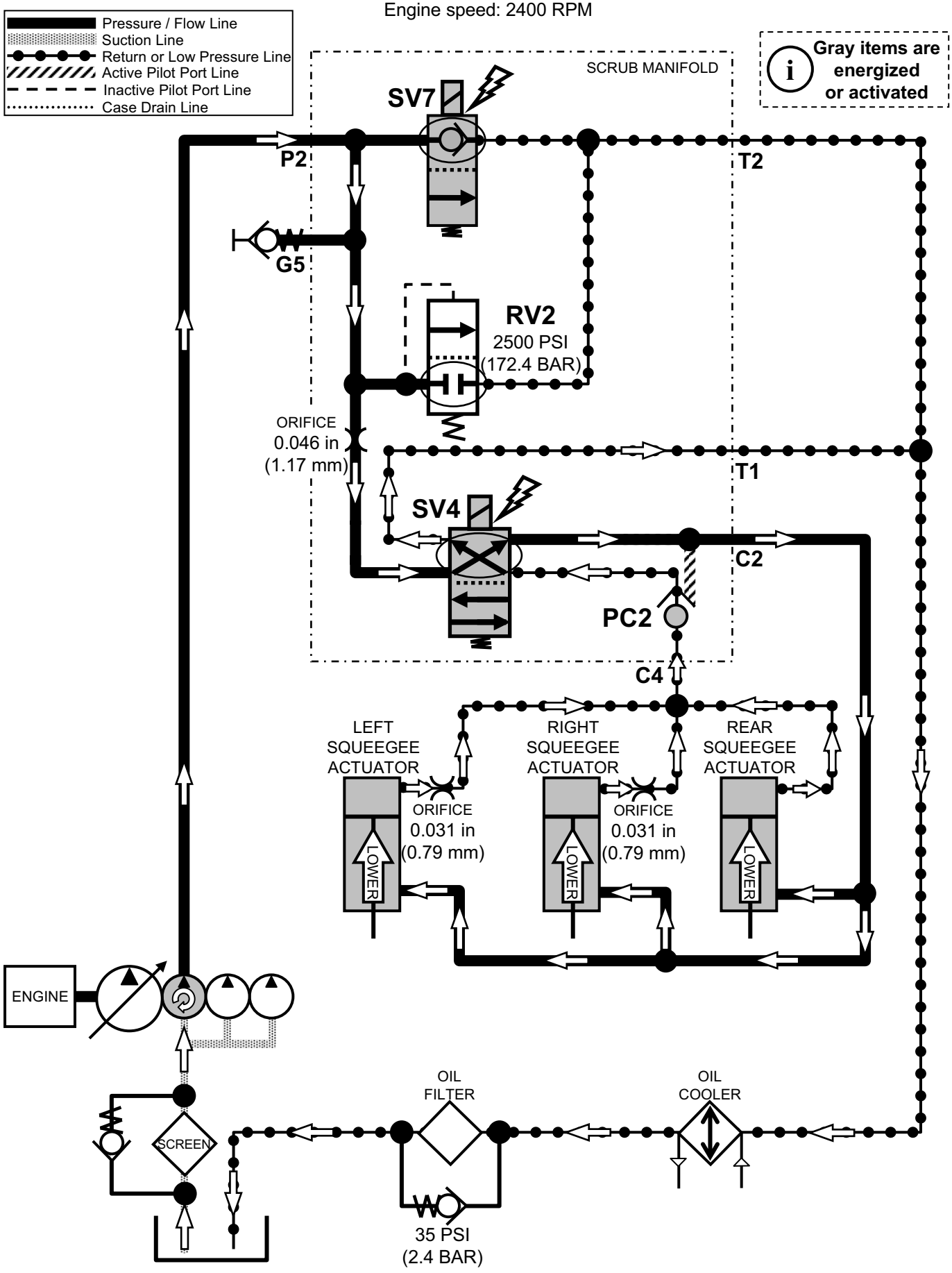
T20 Squeegees Lower

Engine speed: 2400 RPM



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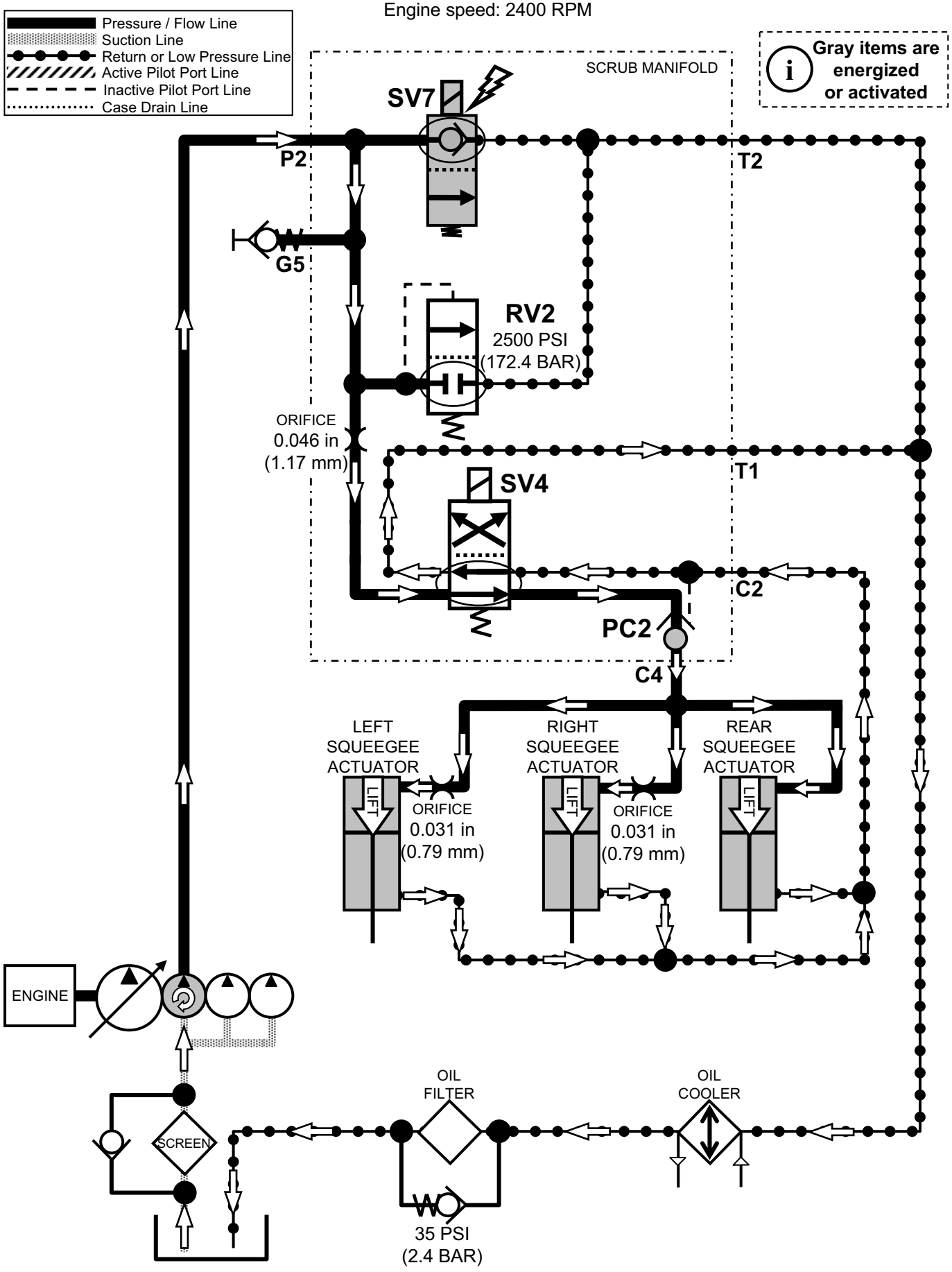
T20 Squeegees Lift

Engine speed: 2400 RPM



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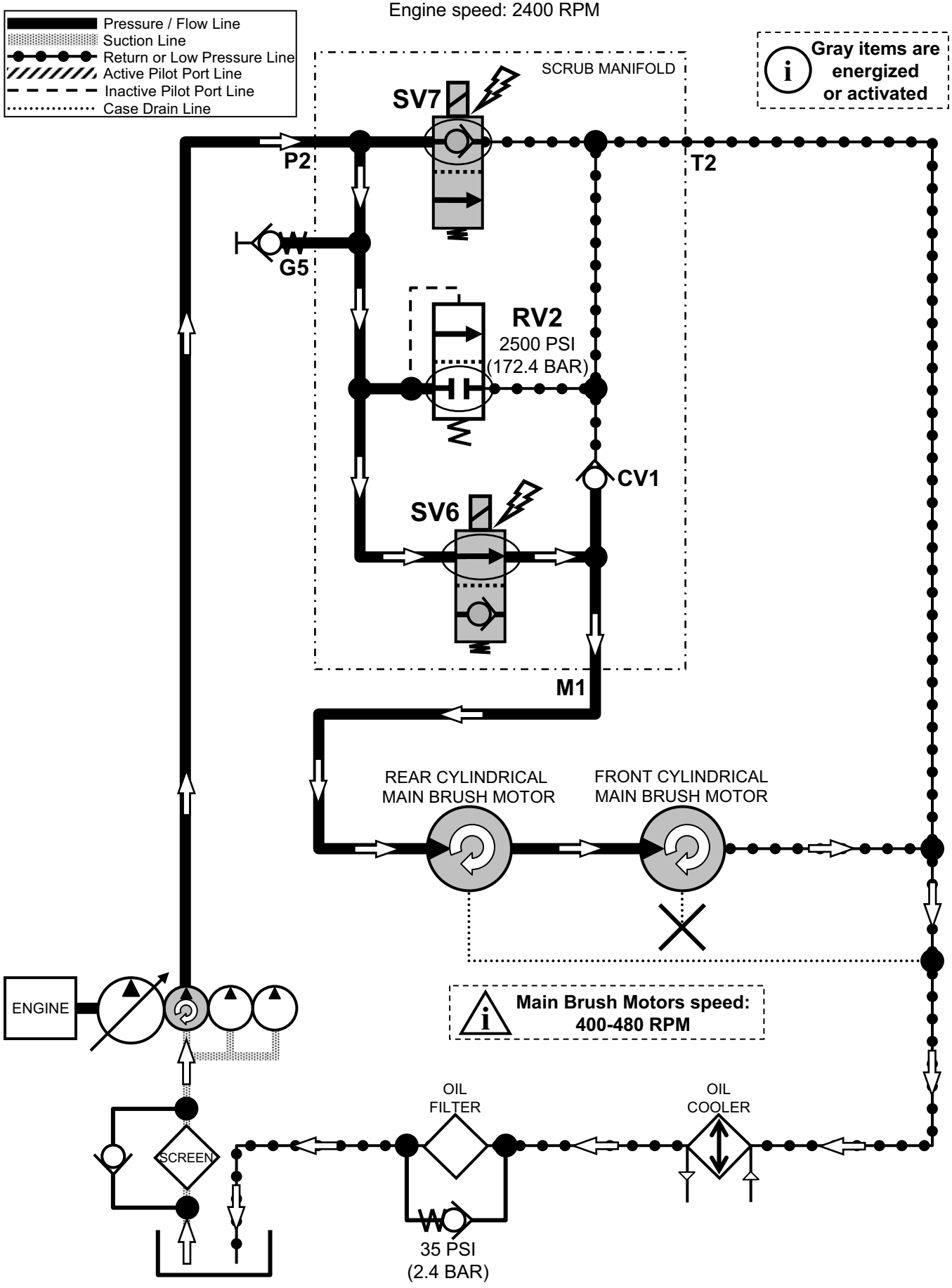
T20 Main Brushes ON (Cylindrical Only)

Engine speed: 2400 RPM



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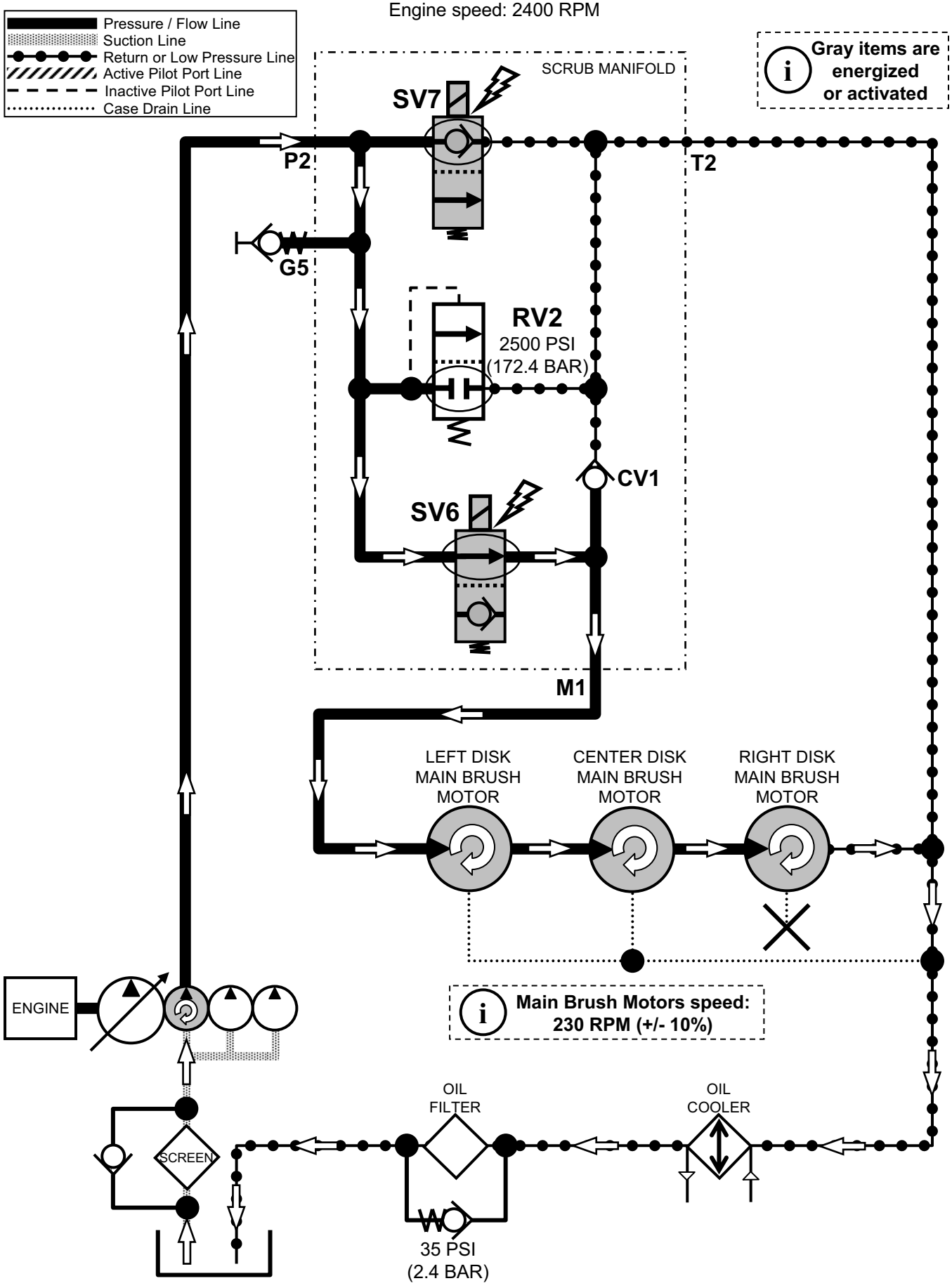
T20 Main Brushes ON (Disk Only)

Engine speed: 2400 RPM



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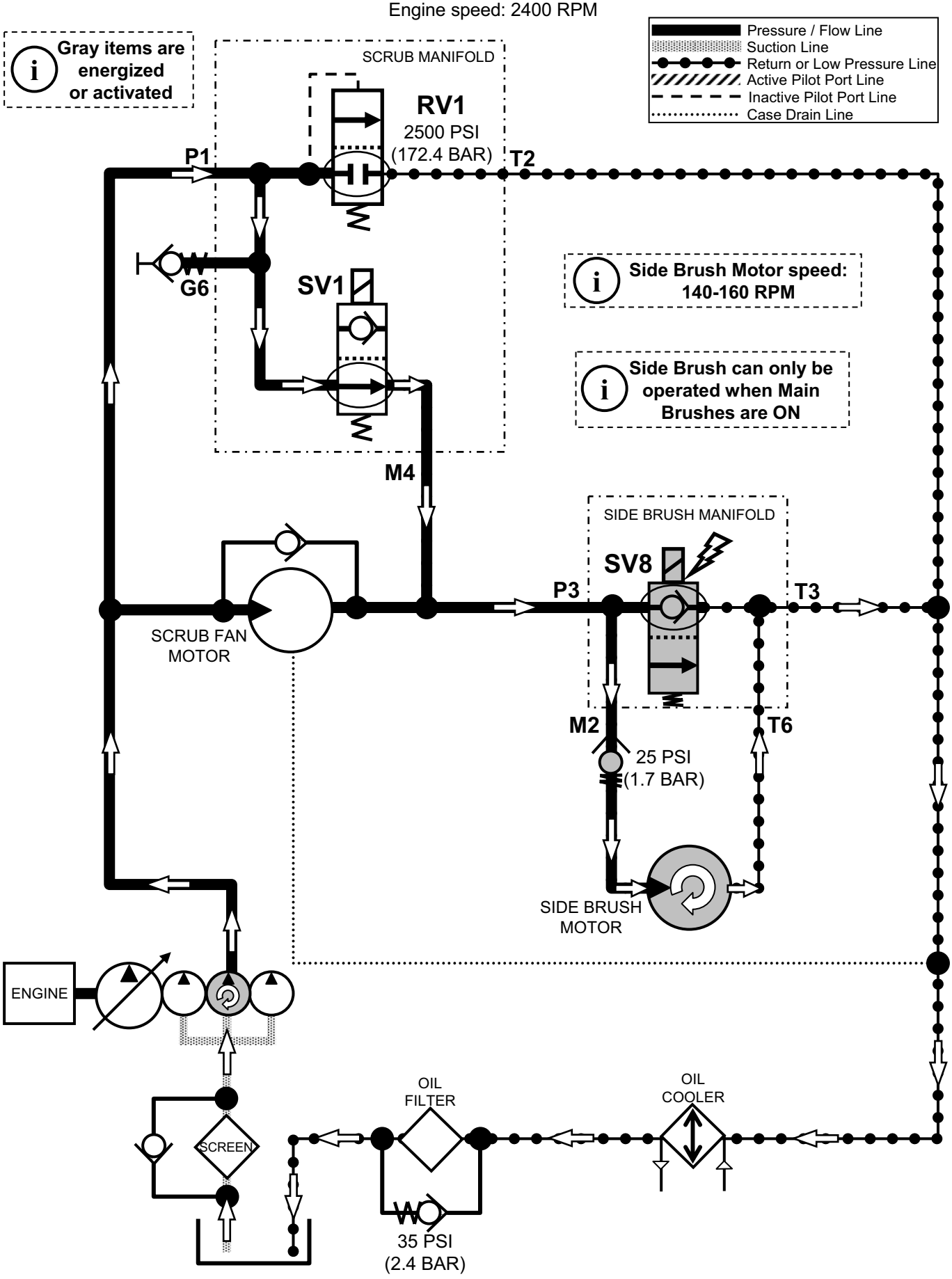
T20 Side Brush ON

Engine speed: 2400 RPM



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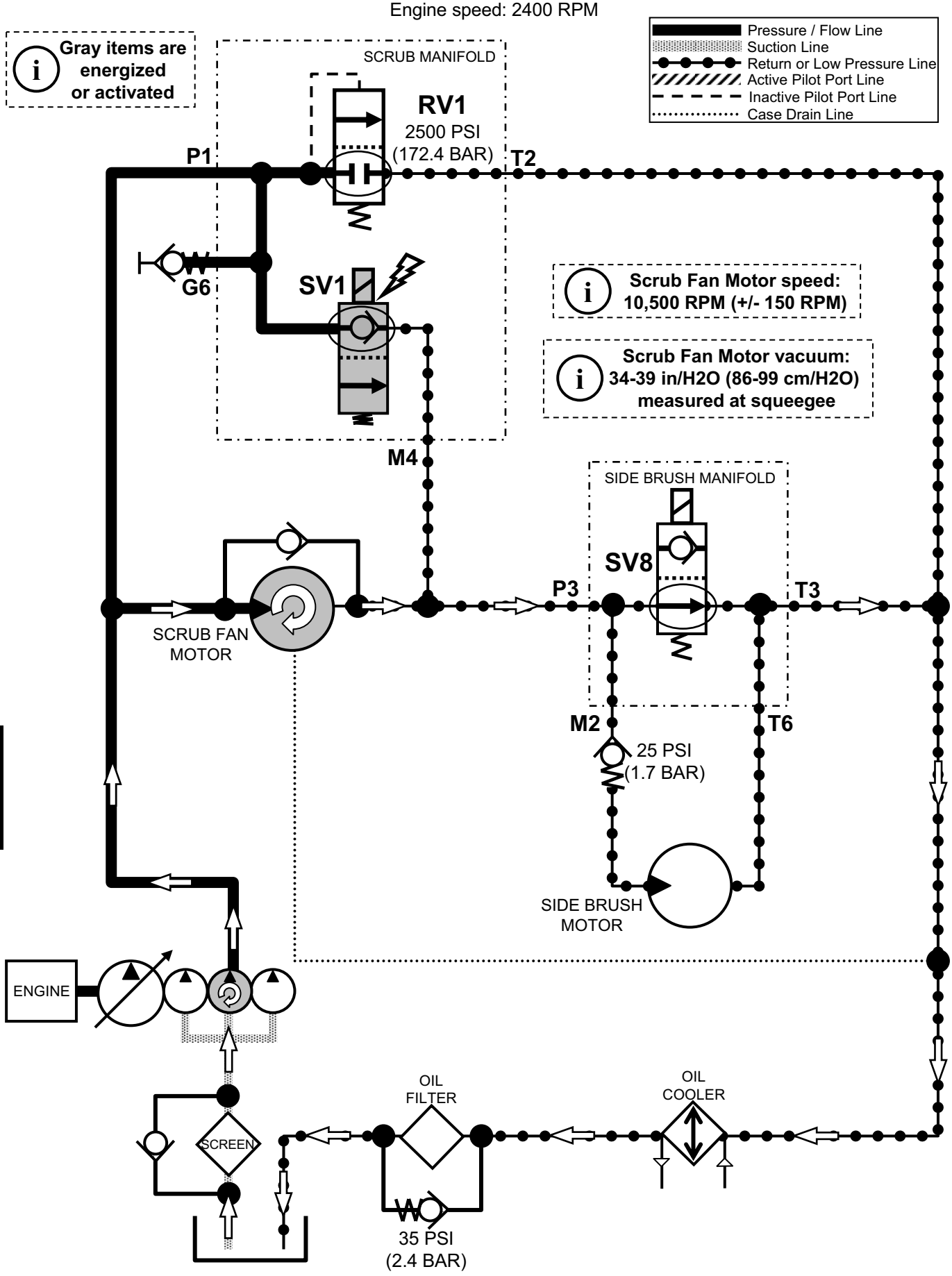
T20 Scrub Vacuum Fan ON

Engine speed: 2400 RPM



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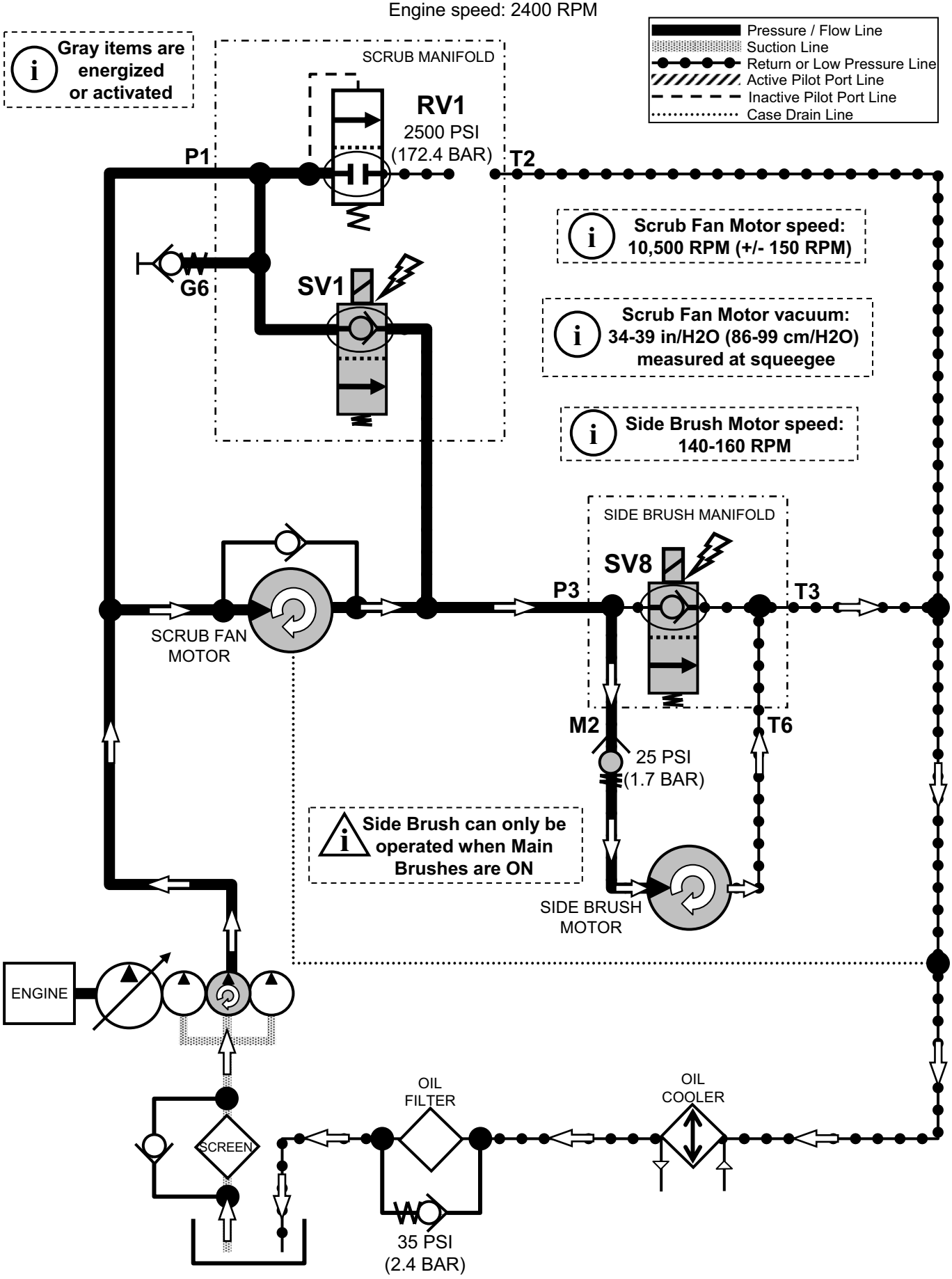
T20 Scrub Vacuum Fan & Side Brush ON

Engine speed: 2400 RPM



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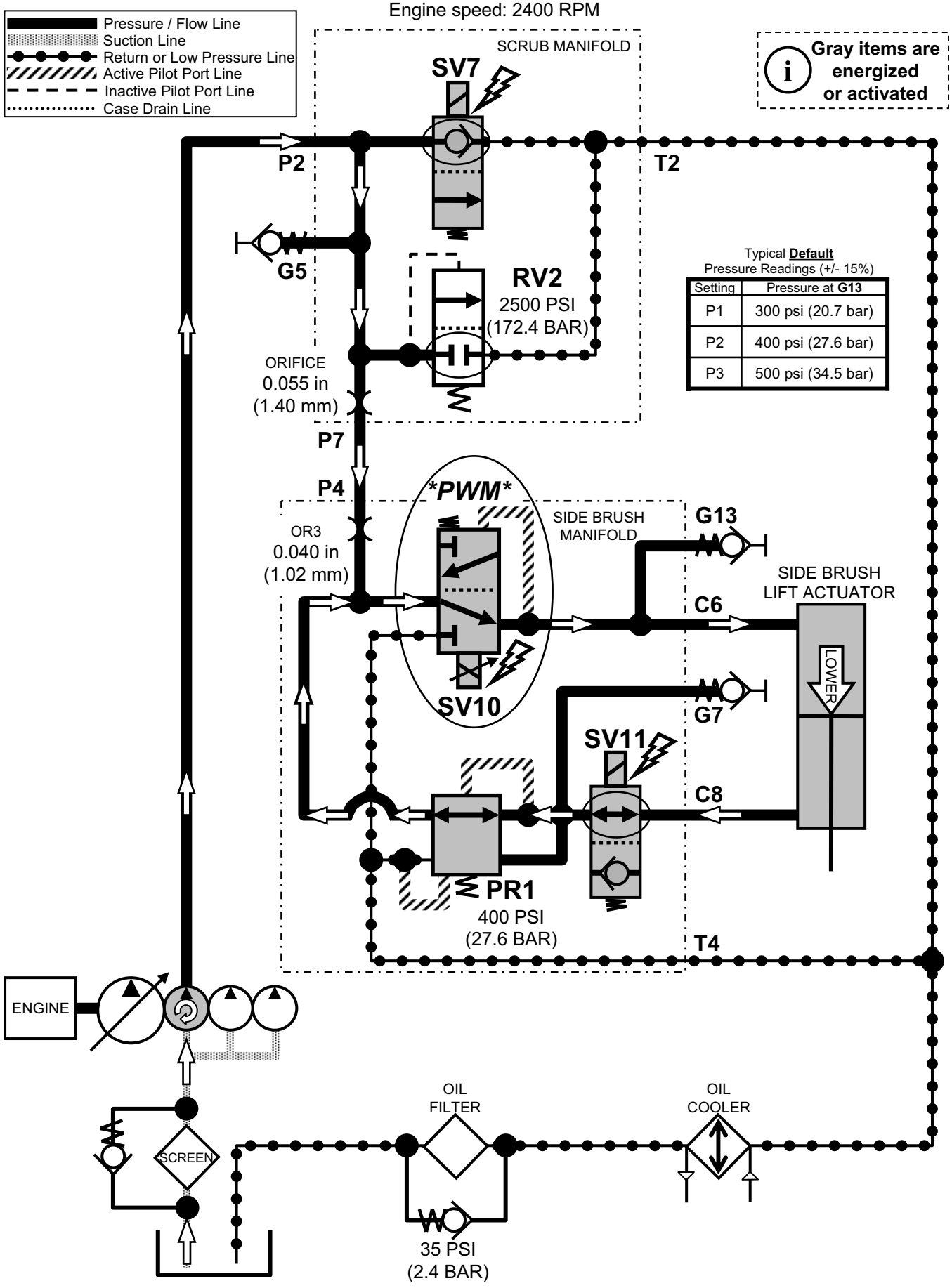
T20 Side Brush Lower

Engine speed: 2400 RPM



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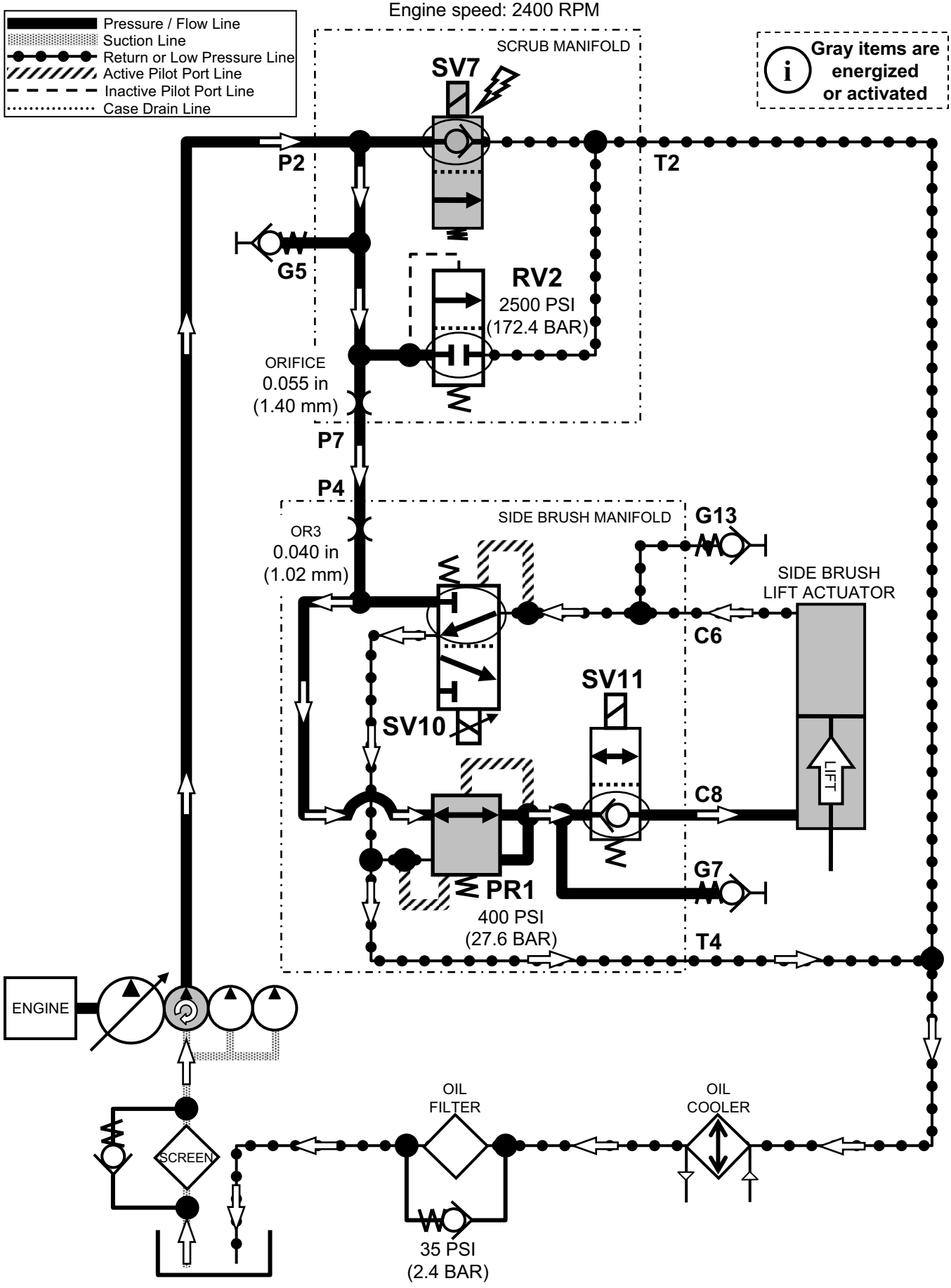
T20 Side Brush Lift

Engine speed: 2400 RPM



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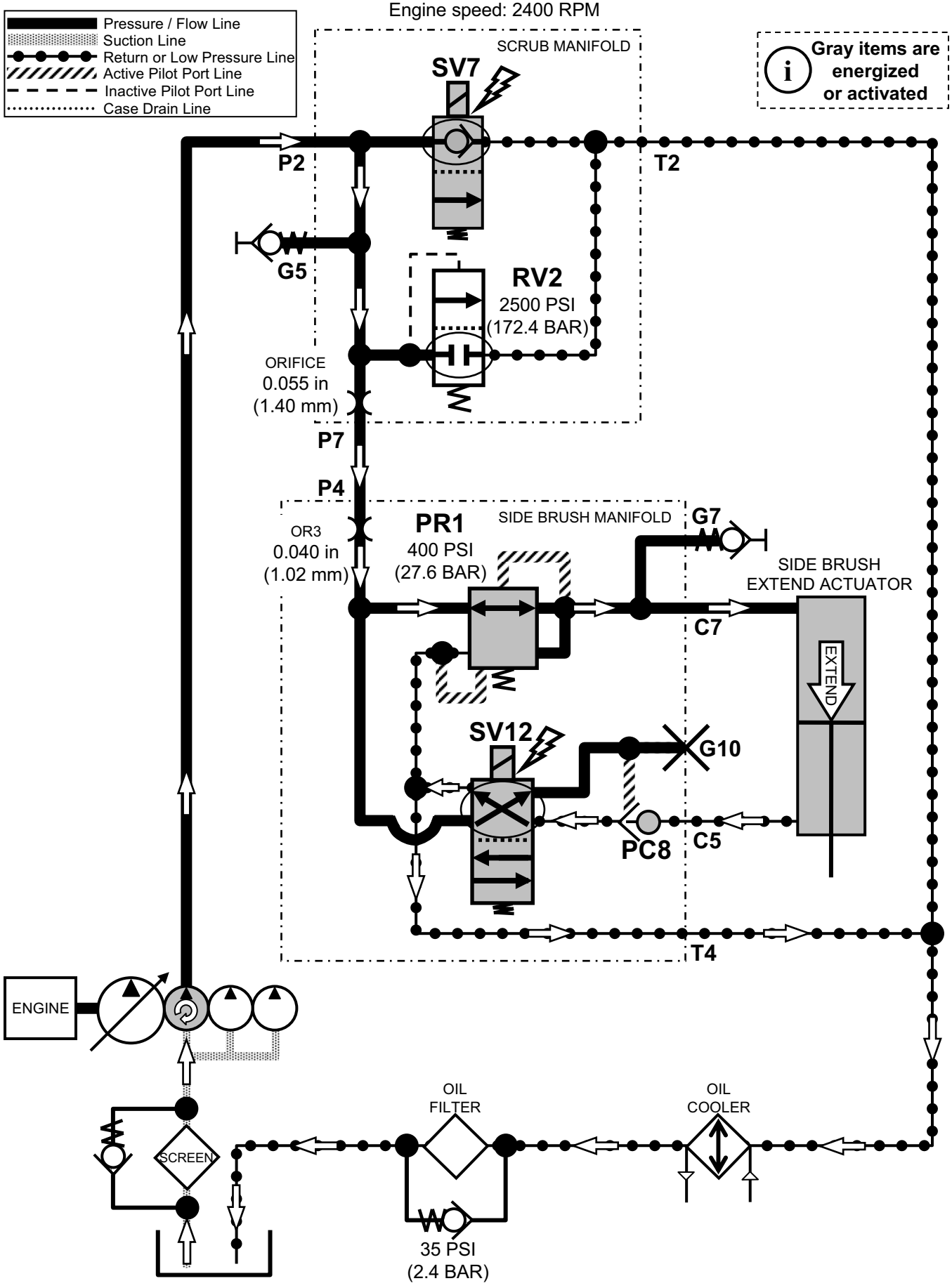
T20 Side Brush Extend

Engine speed: 2400 RPM



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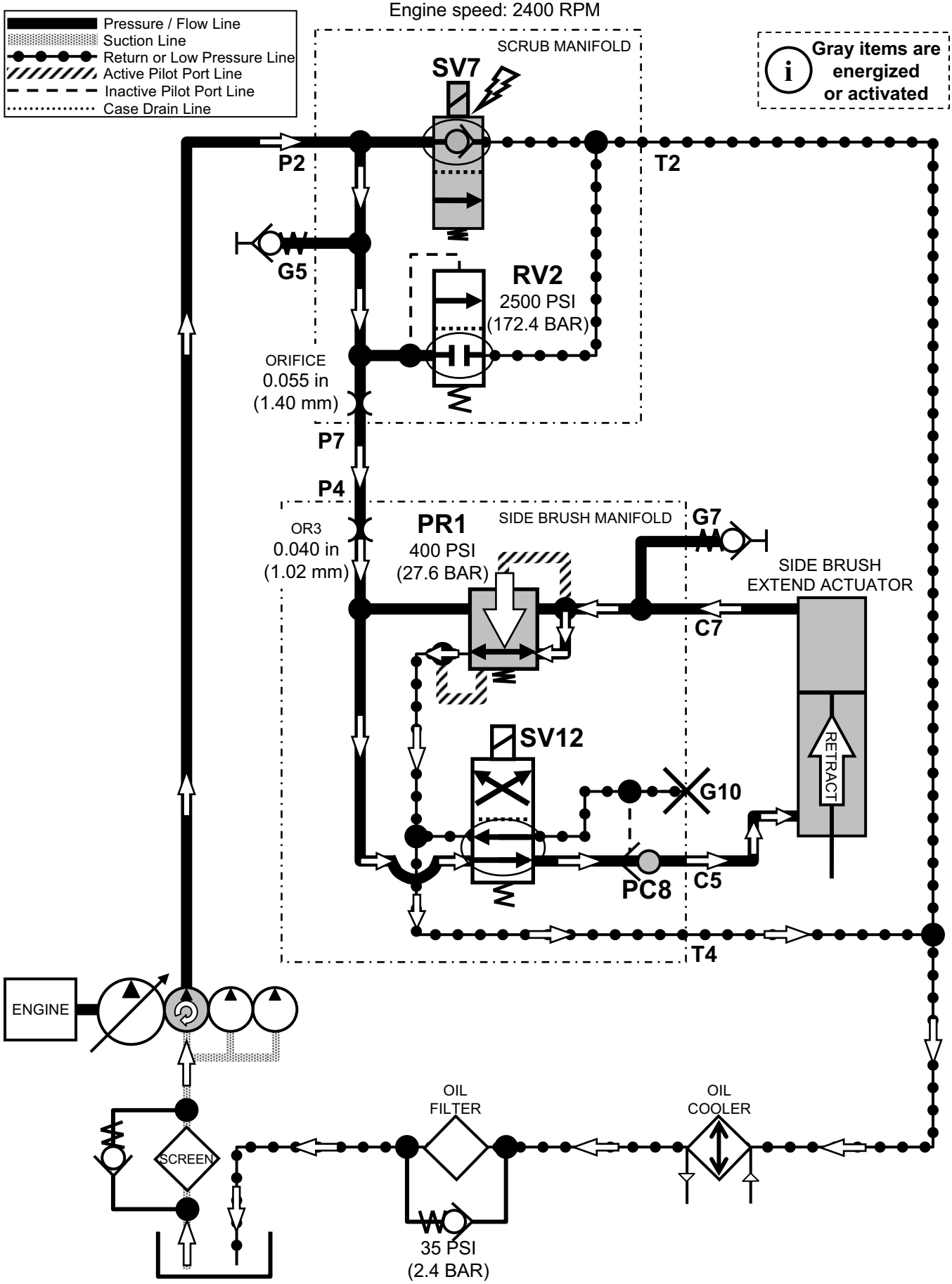
T20 Side Brush Retract

Engine speed: 2400 RPM



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