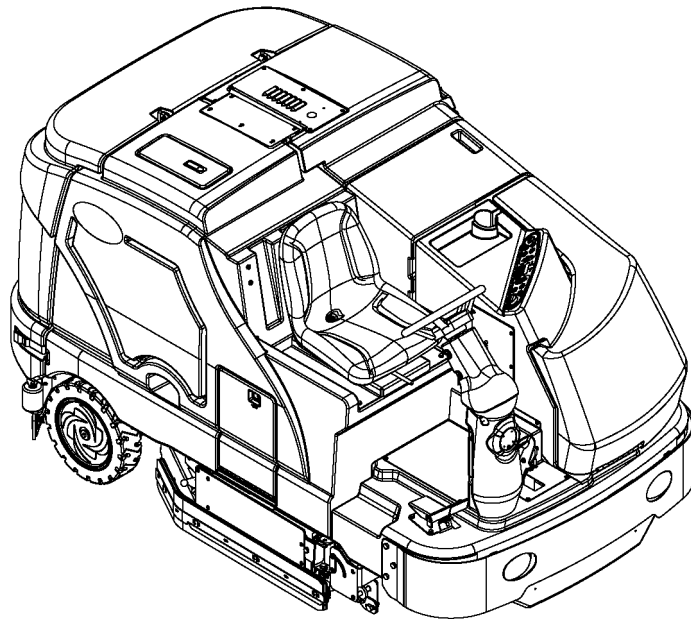


Condor XL™



Service Manual

Advance Models:

56110000(LPG/48"), 56110001(Petrol/48"), 56110002(Diesel/48"), 56110003(LPG/60"),
56110004(Petrol/60"), 56110005(Diesel/60"), 56110006(LPG/62"), 56110007(Petrol/62"),
56110008(Diesel/62"), 56110009(LPG/67"), 56110010(Petrol/67"), 56110015(Diesel/67")
56111035(LPG-AXP/48"), 56111036(Petrol-AXP/48"), 56111037(Diesel-AXP/48")
56111038(LPG-AXP/60"), 56111039(Petrol-AXP/60"), 56111040(Diesel-AXP/60")
56111041(LPG-AXP/62"), 56111042(Petrol-AXP/62"), 56111043(Diesel-AXP/62")
56111044(LPG-AXP/67"), 56111045(Petrol-AXP/67"), 56111046(Diesel-AXP/67")



**Nilfisk
Advance**

setting standards

7/09 FORM NO. 56043124

TABLE OF CONTENTS

SAFETY INSTRUCTIONS	4
GENERAL INFORMATION	5-7
DIAGNOSTIC AND SERVICE TOOLS	8-9
TECHNICAL SPECIFICATIONS	10-13
MAINTENANCE	14-19
PM CHECKLIST	20-21
KNOW YOUR MACHINE	22-24
CONTROL PANEL	24
CONTROL PANEL DIAGNOSTICS	25-26
ELECTRICAL SYSTEM	27-40
FAULT CODE SYSTEM DIAGNOSTICS	27
MAIN CONTROL BOARD FAULT CODES	28-31
ENGINE ELECTRICAL COMPONENT LOCATIONS – GM 1.6 GASOLINE	32
ENGINE ELECTRICAL COMPONENT LOCATIONS – GM 1.6 LPG	33
ENGINE ELECTRICAL COMPONENT LOCATIONS – KUBOTA DIESEL	34
ELECTRICAL COMPONENT LOCATIONS	35-37
CONTROL BOARD CONNECTORS	38-40
ADJUSTMENTS/REPAIRS	41-46
SIDE BROOM LIFT ACTUATOR MOTOR ADJUSTMENT	41
BRAKE TENSION ADJUSTMENT	42
FOOT PEDAL/HYDROBACK OVERVIEW & NEUTRAL ADJUSTMENT	42-43
PUSH/PULL CONTROL CABLE REPLACEMENT	44
HYDROBACK REPLACEMENT	45
FOOT PEDAL NEUTRAL DEADBAND ADJUSTMENT	45
SIDE BRUSH TILT ADJUSTMENT	46
TRACTION DRIVE MOTOR HOSE ROUTING	46
GENERAL MACHINE TROUBLESHOOTING GUIDE TABLE OF CONTENTS	47
TROUBLESHOOTING GUIDES	48-61
CONTROL BOARD PROGRAMMING OPTIONS	62-66
ENGINE SYSTEM	67-72
ENGINE SPECIFICATIONS	67
MISCELLANEOUS ENGINE INFORMATION	68
GM 1.6L GASOLINE FUEL SYSTEM DESCRIPTION	68
ENGINE DIAGNOSTICS	69-70
1.6L DTC CODES	71
GM 1.6L ENGINE FUSE BOX & WIRING	72
HYDRAULIC SYSTEM	73-83
HYDRAULIC SYSTEM COMPONENTS	73
HYDRAULIC COMPONENT LOCATION	
HYDRAULIC CYLINDERS	74
HYDRAULIC MOTORS	75
HYDRAULIC PUMPS	76
HYDRAULIC VALVE BLOCK/MANIFOLD	77
HYDRAULIC SYSTEM TROUBLESHOOTING	77
TEST PORT NOMINAL PRESSURE READINGS	78-79
SCRUB LIFT CYLINDER OVERVIEW	80
HYDRAULIC TRUTH TABLE	81
HYDRAULIC MANIFOLD ASSEMBLY COMPONENT LOCATION KEY	81-82
APPENDIX	84-98
ELECTRICAL INPUT/OUTPUT TABLE	84-87
FAULTS	88
SOLUTION FLOW DIAGRAM – STANDARD WITH RIGHT FRONT SCRUB	89
SOLUTION FLOW DIAGRAM – ACCESSORIES	90
SOLUTION FLOW DIAGRAM – AXP	91
SOLUTION FLOW DIAGRAM – EXTENDED SCRUB	92
HYDRAULIC SCHEMATIC	93
WIRING DIAGRAM	94-95
WIRING SCHEMATIC	96-97
ENGINE HARNESS GM 1.6L GAS	98
ENGINE HARNESS GM 1.6L LPG	99
WIRING HARNESS COMPONENT DESCRIPTION	100
SWITCH SEQUENCES FOR MAIN CONTROLLER PROGRAMMING OPTIONS	101

CAUTIONS AND WARNINGS

SYMBOLS

Advance uses the symbols below to signal potentially dangerous conditions. Always read this information carefully and take the necessary steps to protect personnel and property.

DANGER!

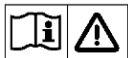
Is used to warn of immediate hazards that will cause severe personal injury or death.

WARNING!

Is used to call attention to a situation that could cause severe personal injury.

CAUTION!

Is used to call attention to a situation that could cause minor personal injury or damage to the machine or other property.



Read all instructions before using.

GENERAL SAFETY INSTRUCTIONS

Specific Cautions and Warnings are included to warn you of potential danger of machine damage or bodily harm.

DANGER!

- * This machine emits exhaust gases (carbon monoxide) that can cause serious injury or death, always provide adequate ventilation when using machine.

WARNING!

- * This machine shall be used only by properly trained and authorized persons.
- * While on ramps or inclines, avoid sudden stops when loaded. Avoid abrupt sharp turns. Use low speed down hills. Clean only while ascending (driving up) the ramp.
- * To avoid hydraulic oil injection or injury always wear appropriate clothing and eye protection when working with or near hydraulic system.
- * Turn the key switch **(50)** off (O) and disconnect the batteries before servicing electrical components.
- * Never work under a machine without safety blocks or stands to support the machine.
- * Do not dispense flammable cleaning agents, operate the machine on or near these agents, or operate in areas where flammable liquids exist.
- * Do not clean this machine with a pressure washer.

CAUTION!

- * This machine is not approved for use on public paths or roads.
- * This machine is not suitable for picking up hazardous dust.
- * Use care when using scarifier discs and grinding stones. Advance will not be held responsible for any damage to floor surfaces caused by scarifiers or grinding stones.
- * When operating this machine, ensure that third parties, particularly children, are not endangered.
- * Before performing any service function, carefully read all instructions pertaining to that function.
- * Do not leave the machine unattended without first turning the key switch **(50)** off (O), removing the key and applying the parking brake.
- * Turn the key switch **(50)** off (O) before changing the brushes and before opening any access panels.
- * Take precautions to prevent hair, jewelry or loose clothing from becoming caught in moving parts.
- * Use caution when moving this machine in below-freezing temperature conditions. Any water in the solution or recovery tanks or in the hose lines could freeze.
- * Before use, close and latch all doors and hoods.

SAVE THESE INSTRUCTIONS

INTRODUCTION

Service Manual Purpose

This manual is a technical resource that Nilfisk-Advance expects to be utilized when servicing a Condor XL. It contains information deemed necessary to provide basic troubleshooting, maintenance and repairs within a reasonable timeframe (example - 2-3 hours). If your repair involves multiple visits to repair the same problem, or the repair cannot be completed within 3-4 hours, a call to Nilfisk-Advance Technical Support is needed to alert the factory to potential issues and/or provide the customer with an acceptable level of service. Refer to the website www.advance-us.com for additional information not contained herein as well updates or expanded instructions to procedures noted here.

Note: Bold numbers in parentheses in text indicate an illustrated item.

Note: All references to right, left, front and rear in this manual are as seen from the operator's position (seat).

General Machine Description

The Condor XL machines are industrial automatic rider sweeper/scrubbers with multiple sweep/scrub single pass coverages. All models use dual cylindrical scrub brooms with variable scrub pressure and solution flow rates. Different models are available with front mounted side brooms (single and dual) and right side disc scrub.

Parts and Service

Repair should be performed by an Authorized Nilfisk-Advance Service Center that employs factory-trained service personnel and maintains an inventory of Nilfisk-Advance original replacement parts and accessories.

Nameplate

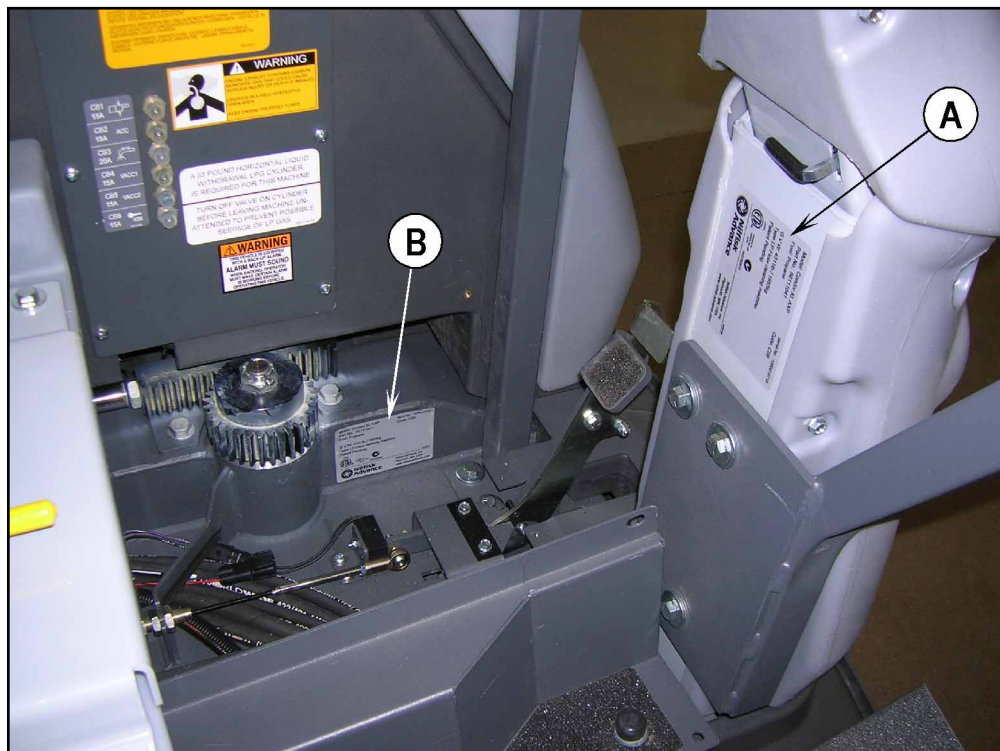
See Figure 1. The Model Number and Serial Number of the machine are shown on the nameplate **(A)** located on the steering column support, and on a second nameplate **(B)** beneath the floor plate attached to steering spindle support.

MODEL NUMBER _____

SERIAL NUMBER _____

This information is required when ordering repair parts for the machine or contacting Nilfisk-Advance Technical Support.

FIGURE 1



JACKING THE MACHINE

⚠ CAUTION!

Never work under a machine without safety stands or blocks to support the machine.

When jacking the machine, do so at designated locations. See Tie Down/Jacking Locations (C) in Figure 2.

TRANSPORTING THE MACHINE

⚠ CAUTION!

Before transporting the machine on an open truck or trailer, make sure that:

- All access doors are latched securely.
- The machine is tied down securely. See Tie Down/Jacking Locations (C) in Figure 2.
- The machine Parking Brake (28) is set.

TOWING OR PUSHING A DISABLED MACHINE

⚠ CAUTION!

The machine's drive propelling pump is manufactured with an adjustable tow valve. This valve prevents damage to the hydraulic system when the machine is being towed/pushed short distances without the use of the engine.

See Figure 3. The tow valve is controlled by the Tow Valve Lever (34) which is accessed by opening and propping up the Engine Cover (3). Pull the Tow Valve Lever out to disengage the hydrostatic lock between the motor and pump.

The hydrostatic pump can be damaged if the machine is towed with the valve in the normal working position (Tow Valve Lever pushed IN). **Note:** If the tow valve is left in free-wheeling position (Tow Valve Lever pulled OUT) the hydrostatic pump can't drive the machine FWD or REV. No damage will result, just reset the valve to the normal working position by pushing the lever IN. Tow or push the machine no faster than a normal walking pace (2-3 miles per hour) and for short distances only. If the machine is to be moved long distances, the front drive wheel needs to be raised off the floor and placed on a suitable transport dolly.

FIGURE 2

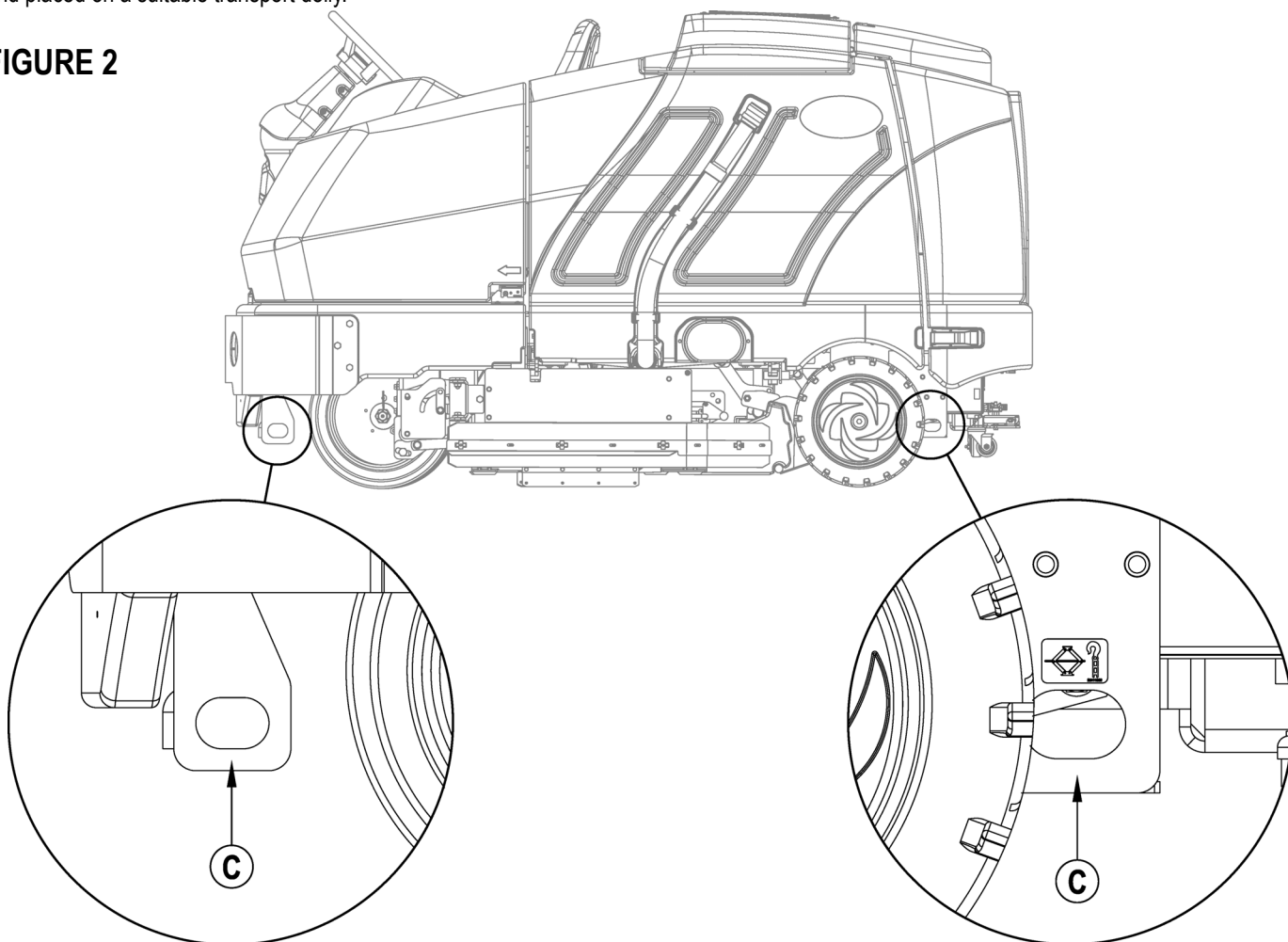
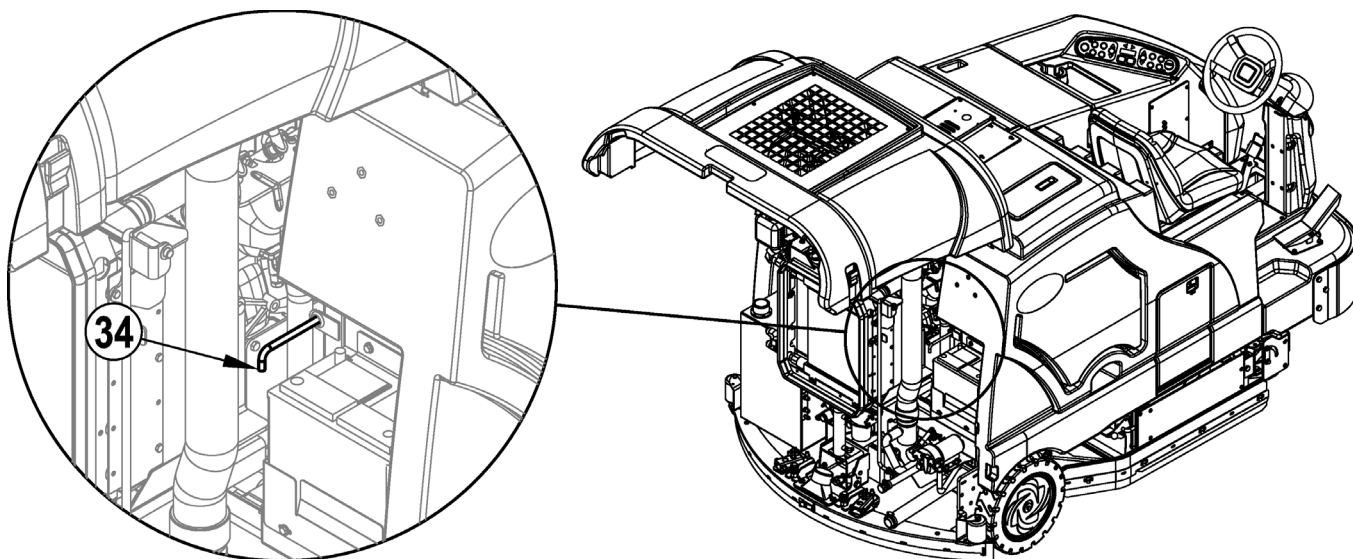


FIGURE 3



OTHER MANUALS AVAILABLE

The manuals listed below can be found via Nilfisk-Advance's two electronic supported databases. They are: Nilfisk-Advance website (www.advance.us.com) and EzParts service/parts CD-ROM.

- **Parts List** - Form Number 56042484 (all systems w/optional kits and accessories)
- **Instructions for Use** - Form Number 56041705 (English, Spanish)
- **Engine Manuals**
 - PSI Tier II 1.6L PFI Certified Engine Service Manual G/LP PSI1P6LPFI-A
 - Kubota V1505TE Diesel Engine Operator Manual
(English, French, German, Italian, Spanish) 16622-8916-3
 - Kubota V1505TE Diesel Engine Service Manual (English, French, German) 97897-01640
 - Kubota V1505TE Diesel Engine Service Manual (English) 97897-02432

DIAGNOSTIC AND SERVICE TOOLS

In addition to a full set of metric and standard tools, the following items are required in order to successfully and quickly perform troubleshooting and repair of Nilfisk-Advance Industrial floor cleaning equipment.

- Laptop computer loaded with current version of EzParts, Adobe Reader and (preferably cellular) internet access
- Digital voltmeter (DVM) with DC current clamp
- Hydrometer
- Battery load tester for checking 6V and 12V batteries
- Automotive fuel pressure test gauge (used on gasoline engines)
- Static control wrist strap
- Set of torque wrenches
- Hard (printed) copies of service manuals for regularly serviced machines (available at www.advance-us.com and other Nilfisk-Advance web-sites)
- These tools are also available from Nilfisk-Advance, Inc.:
 - 56407502 Actuator power cord adapter
 - 56205281 Vacuum water lift gauge



– 56109084 PSI engine service kit (see photo)



– 56504450 PSI LP test kit (see photo)



- 56305647 PSI diagnostic communication cable and software (see photo)



- PSI diagnostics cable, 4-pin – 8-pin (Gen1 old style) (see photo)



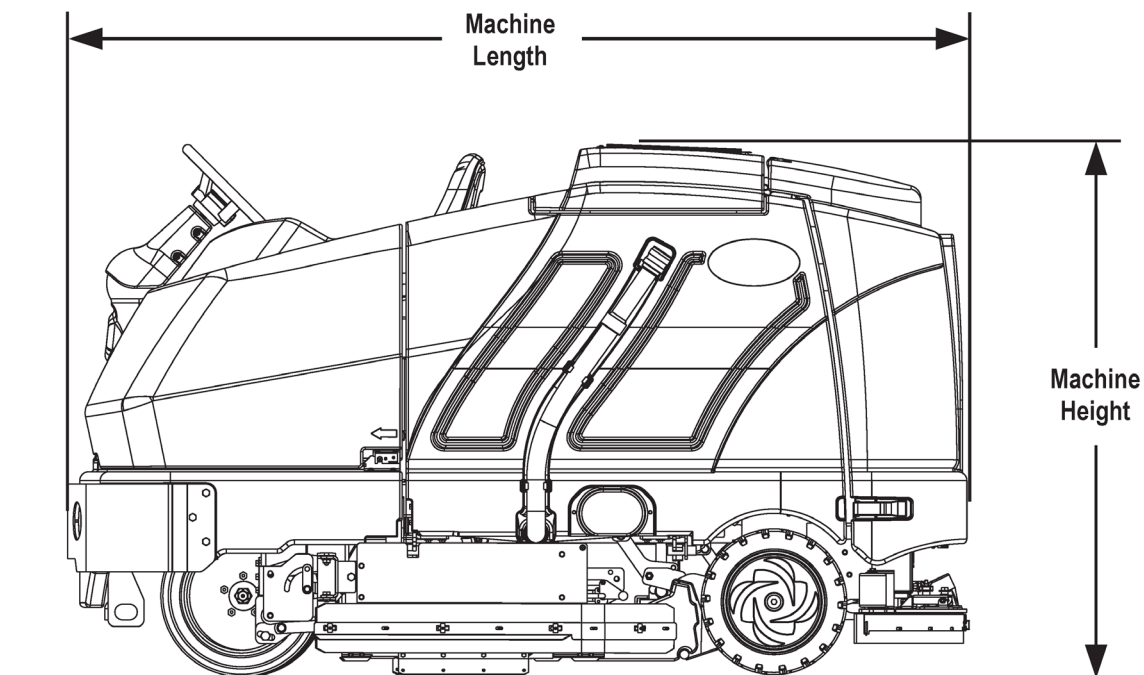
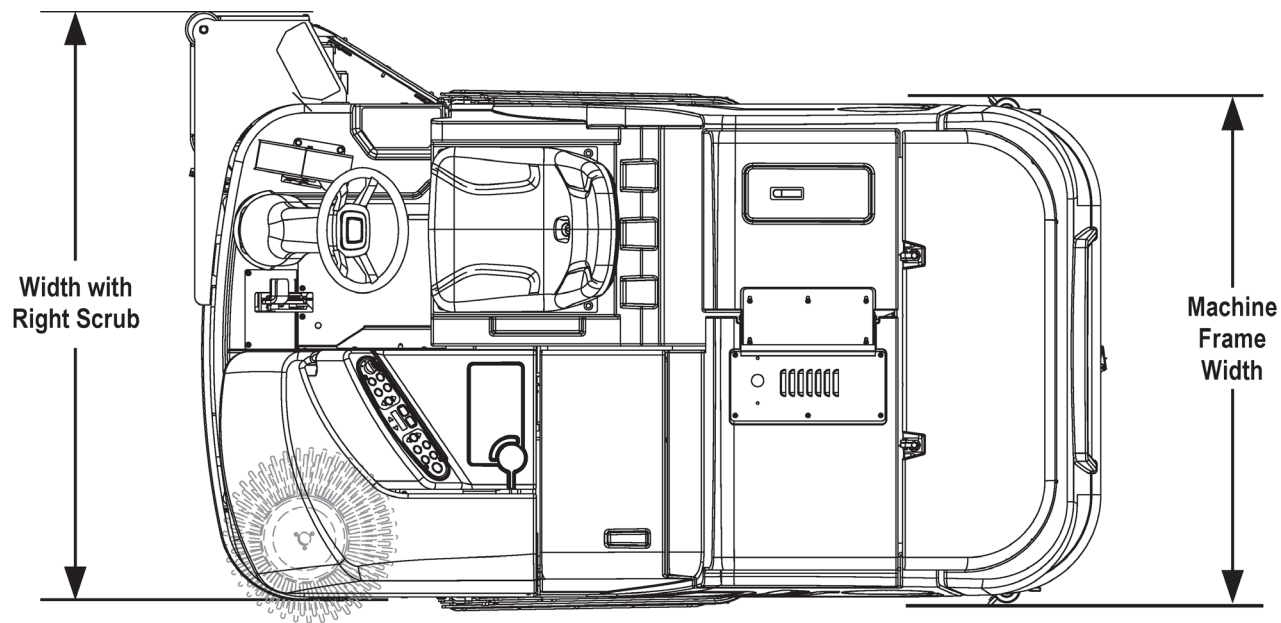
- 56504516 Hydraulic test gauge w/connector 3000 psi range (see photo)

TECHNICAL SPECIFICATIONS

General Machine Dimensions and Capacities

Length	100 in (254 cm)
Height	58 in (147 cm)
Height (with overhead guard)	84 in (213 cm)
Width/frame (roller to roller)	56 in (142 cm)
Width (with rear squeegee)	57 in (144.7 cm)
Width (with right side scrub brush)	66 in (167.6 cm)
Cleaning path width (main brush only)	48 in (121.9 cm) deck size all models
Cleaning path width (with right side scrub brush)	60 in (152.4 cm)
Cleaning path width (dual sweep)	62 in (157.4 cm)
Cleaning path width (left sweep/right scrub)	67 in (170 cm)
Main brush diameter and length	11 in x 48 in (27.9 cm x 121.9 cm)
Side scrub brush (right)	16 in (40.6 cm)
Side broom sweep	20 in (50.8 cm)
Solution tank capacity (3 in from top)	100 gal. (378L)
Recovery tank (shutoff)	100 gal. (378L)
Scrub brush pressure (in lbs) three settings	(1) 150 (2) 250 (3) 400
Main brush RPM	400 RPM @2200 engine RPM
Debris hopper volume capacity	1.5 ft ³ (.04 m ³)
Debris hopper weight capacity	150 lbs (68 Kg)
Weight empty	2975 lbs (1349 Kg)
Weight GVWR	4135 lbs (1875 Kg)
Minimum aisle turn	119 in (302 cm)
Transport ground clearance	3 inches (7.62 cm) when in transport
Operator sound level @ operator ear	82.4 dBA @ 2200 RPM
Vibration level @ steering wheel does not exceed	.80 m/s
Certification	ETL

FIGURE 4



Fastener Torque Specifications

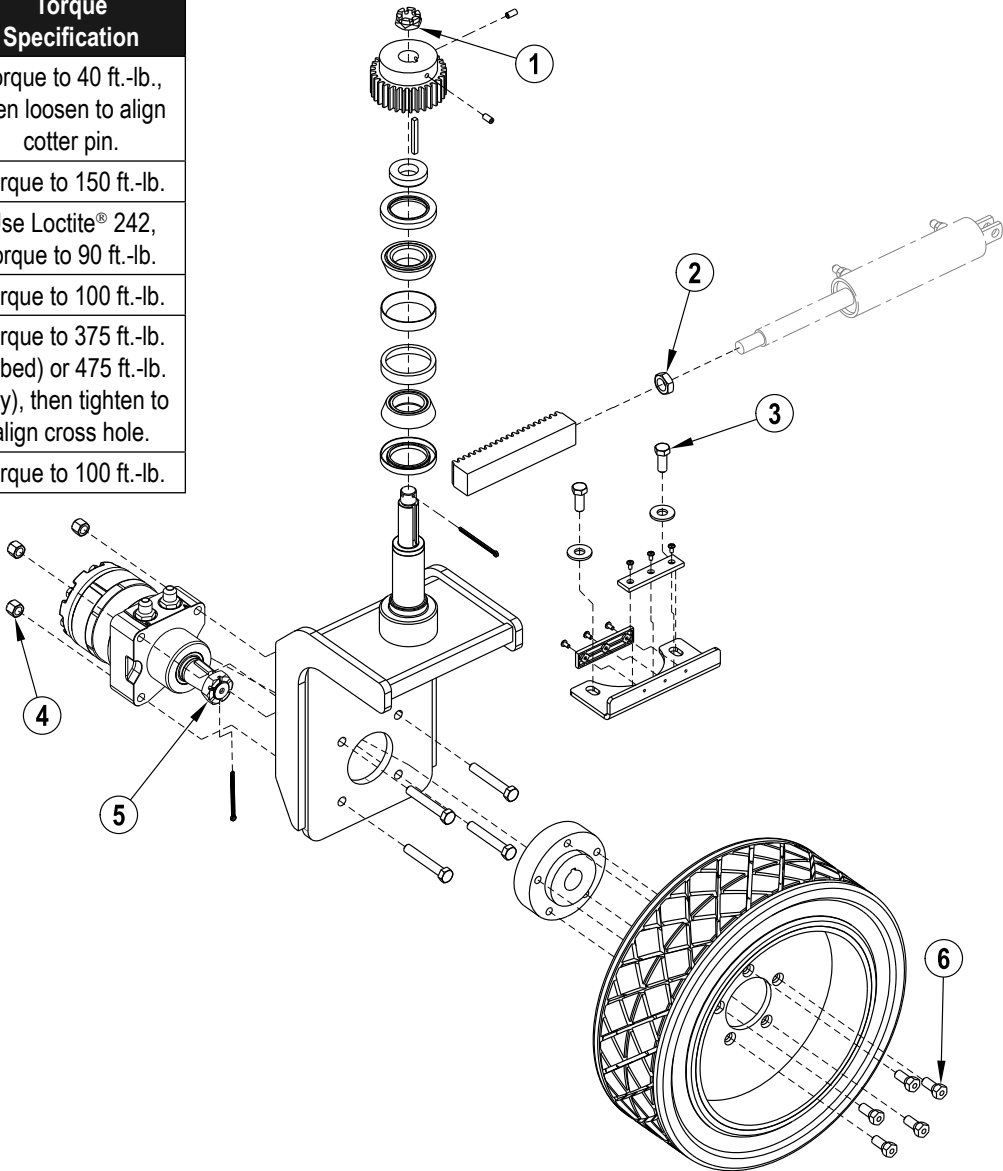
Standard Torque Specifications (unless otherwise specified)	Size	Plated Steel	Stainless Steel
	#10	42 in.-lb.	28 in.-lb.
	1/4"	100 in.-lb.	67 in.-lb.
	5/16"	17 ft.-lb.	11 ft.-lb.
	3/8"	31 ft.-lb.	20 ft.-lb.
	1/2"	75 ft.-lb.	50 ft.-lb.
	3/4"	270 ft.-lb.	180 ft.-lb.
	M5	61 in.-lb.	36 in.-lb.
	M6	9 ft.-lb.	62 in.-lb.
	M8	22 ft.-lb.	13 ft.-lb.
	M10	44 ft.-lb.	25 ft.-lb.
	M12	70 ft.-lb.	40 ft.-lb.

Drive Wheel System Torque Specifications

See Figure 5

Item No.	Description	Torque Specification
1	Steering Castle (Spindle) Nut	Torque to 40 ft.-lb., then loosen to align cotter pin.
2	3/4"-16 Hex Jam Nut	Torque to 150 ft.-lb.
3	1/2"-20 x 1.25 Hex Screw	Use Loctite® 242, torque to 90 ft.-lb.
4	1/2"-13 Nyloc Hex Nut	Torque to 100 ft.-lb.
5	Drive Wheel Motor Spindle Nut	Torque to 375 ft.-lb. (lubed) or 475 ft.-lb. (dry), then tighten to align cross hole.
6	Wheel Studs	Torque to 100 ft.-lb.

FIGURE 5



TECHNICAL SPECIFICATIONS

Power System Performance

Engine		See the ENGINE SYSTEM/ENGINE SPECIFICATIONS section
Engine speeds	4-cylinder 1.6L GM (gasoline and LP)	Idle - 1200 RPM
		Normal Run - 2200 RPM
		High Output Turbo - 2400 RPM
	4-cylinder 1505 Kubota Diesel	Idle - 1300 RPM
		Normal Run - 2200 RPM
		High Output Turbo - 2400 RPM
Transport speed forward		8 mph (12.8 kph)
Transport speed reverse		3 mph (4.8 kph)
Grade ability – Cleaning		6° / 10.5% - all models
Grade ability – Transporting		9° / 16% - all models

Hydraulic

Hydraulic reservoir	10 gal. (37.8 L), fluid type: 10W-30 engine oil
Hydraulic system components	See hydraulic manual section

Steering Brakes and Tires

Steering	Front wheel, hydraulic cylinder and rotary valve controlled
Brakes (service)	Mechanical drum brakes, one on each rear wheel, cable actuated
Tire (front 1) drive/steer	Size 18 in x 6 in (457 mm x 152 mm) P7 solid
Tire (rear 2) load bearing	Size 16 in x 4 in (406 mm x 101 mm) solid

Solution and Chemical System Delivery Rates

Solution system flow rates (five settings)	Setting 1 – 1.6 gal/min (6 L/min)
	Setting 2 – 1.9 gal/min (7.2 L/min)
	Setting 3 – 2.3 gal/min (8.7 L/min)
	Setting 4 – 2.7 gal/min (10.2 L/min)
	Setting 5 – 3.1 gal/min (11.7L/min)
AXP detergent dispensing system	Refillable cartridge, Qty (2) 2.5 gal (9.5L)
	Available dilution rates: 300:1, 256:1, 200:1, 150:1, 128:1, 100:1, 64:1, 50:1, 32:1, 26:1

Extended Scrub System

Dust Guard system (side broom dust control)	Standard nozzle size .015" dia. Flow volume – .033 gal/min (0.125 L/min) @ 40 psi.
	Optional nozzle size .026 Dia. Flow volume – .1 gal/min (.379 L/min) @ 40 psi.

MAINTENANCE

MAINTENANCE SCHEDULE

Keep the machine in top condition by following the maintenance schedule closely. Maintenance intervals given are for average operating conditions. Machines used in severe environments may require service more often. In general:

- Keep the fuel tank filled (gasoline and diesel). This helps to reduce condensation and moisture entering the fuel system.
- Be aware of the red Warning Indicator Light (62), the yellow Attention Indicator Light (66) and the LCD Display (64) on the operator panel for icons and fault codes that indicate a critical or non-critical fault condition. Note: Refer to the MAIN CONTROL BOARD WARNING AND ATTENTION INDICATOR LIGHTS section for a listing and explanation of the LCD display icons and fault codes.
- Reference the engine service manual for recommended engine service intervals and procedures.

Recommended Service Materials

- Engine Oil (5W-30)
- Hydraulic Oil (10W-30)
- Manufacturer-recommended Coolant (antifreeze) 50/50 mix
- Lithium-base Grease
- Loctite® (or equivalent) thread sealant in the appropriate grades
- Never-Seez® (or equivalent) anti-seize compound

Daily Maintenance

Maintenance Item	Procedure
Perform "After Use" maintenance steps	"After use" maintenance is normally the responsibility of the machine operator. See "AFTER USE" maintenance steps in the operator manual.
Engine	Check the engine oil level
	Check the engine coolant level in the reservoir
	Check for engine and coolant leaks
	Check the air cleaner service indicator and service the air filter when the indicator is shown red
Operator panel	Check for a hydraulic filter plugged indicator light (66) on the operator panel display (64)
Hydraulic system	Check the oil level in the hydraulic oil reservoir (level should be to bottom of screen)
	Check for any hydraulic leaks
Recovery tank	Check the cover gasket for damage/wear
	Check that the drain hose cap is sealed
	Drain and clean the inside of the tank, flush with clean water
Squeegee pick up tool	Clean the tool, check the blades for damage/wear and deflection
Scrub housing side skirts	Check for damage/wear on both the main and right side
Scrub brushes, main and right side scrub	Check for debris wrapped around the brushes and for damage/wear
Wet debris hopper	Clean the hopper, debris screen and hose
Parking brake and foot pedal brake	Check for proper operation of brakes, make adjustments as needed

Maintenance Every 15-20 Hours

Maintenance Item	Procedure
Battery	Check the electrolyte level in the battery
	Check the battery cables and connections
Solution tank filter	Inspect and clean the debris filter on the solution filter system
Solution delivery trough	Clean the drain holes
AXP detergent system	Purge the chemical delivery lines
Scrub deck skid plates	Inspect for wear (replace if worn to 1/8 inch)
Scrub brushes	Rotate and flip the main scrub brushes
Dust Guard	Clean the dust control system spray nozzles

MAINTENANCE MAINTENANCE SCHEDULE

Maintenance Every Month (see Figure 6)

Maintenance Item	Procedure
Squeegee Caster Wheel Axle and Pivot (A)	Pump a small amount of grease into each grease fitting on the machine until grease seeps out around the bearings.
Steering Rack (A)	Apply grease to lubricate
Angle adjustment knob threads on the squeegee mount (A)	
Squeegee tool end wheels (B)	Apply light machine oil to lubricate
Fuel Tank Cover Latch (B)	
Recovery Tank Latch (B)	
AXP Cover Latch (B)	
Brake Pedal (parking brake) linkage (B)	

Maintenance Every 150 Hours

Maintenance Item	Procedure
Engine maintenance	Change the engine oil and oil filter. *Also review the engine manufacturer's additional maintenance requirements
Radiator and oil cooler	Inspect and clean the exterior core cooling fins
Steering	Inspect and apply grease to the spur gear and rack
LP fuel system electronic pressure regulator (EPR) – LP engines only	Inspect and drain any oil buildup from the LP fuel system EPR

Maintenance Every 400 Hours

Maintenance Item	Procedure
Air intake housing and hoses	Inspect the complete air intake system for correct routing, kinks, restrictions, sound tight connections, holes and cracks in hoses
Hydraulic hoses	Inspect for leaks, wear
Battery	Check electrolyte level; check terminals for corrosion, loose connections
Fuel Filter	Replace fuel filter cartridge (located before injector pump). Use Nilfisk-Advance p/n 56419086
	Replace the fuel filter at the electronic fuel pump

Maintenance Every 800-1000 Hours

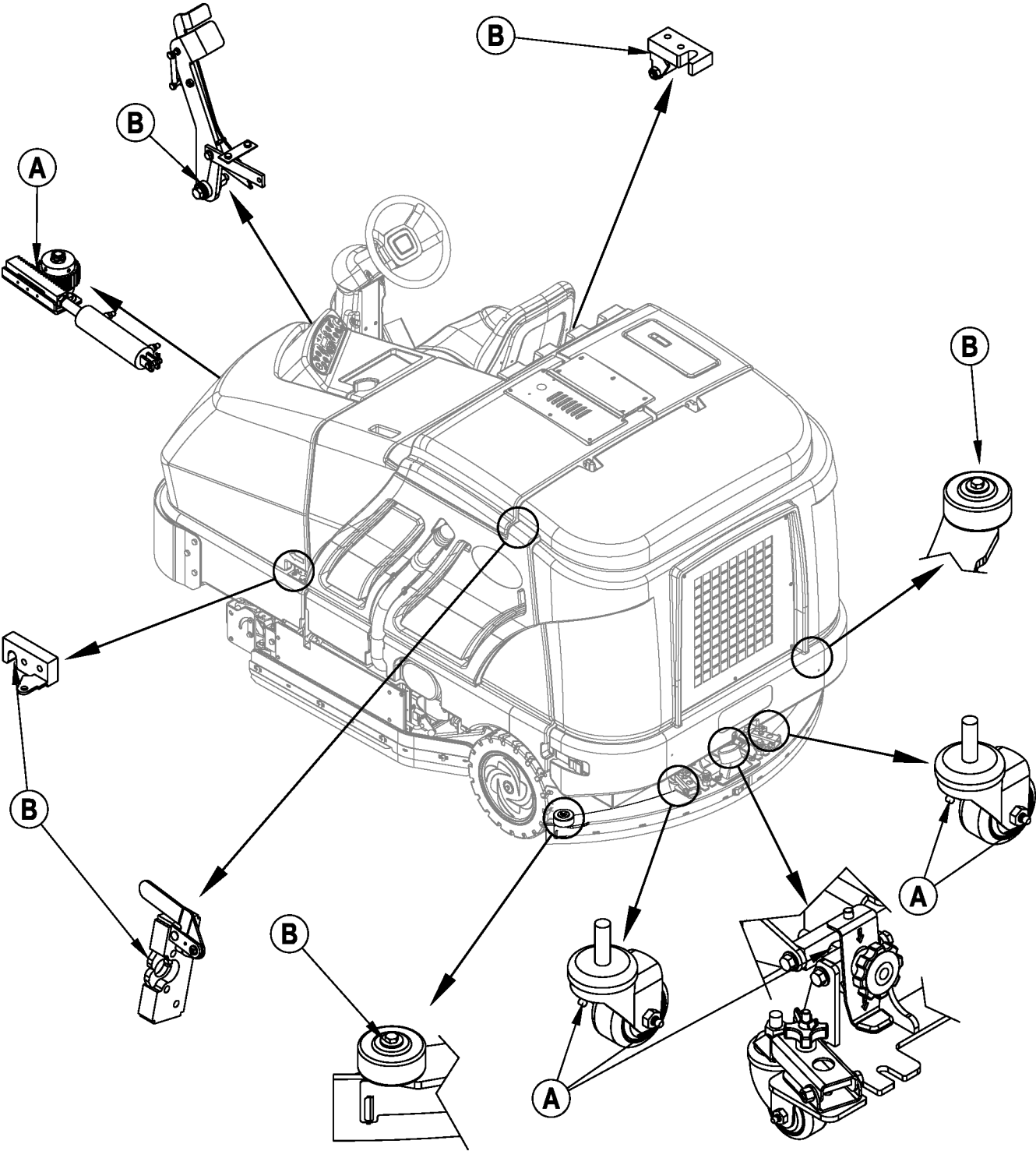
Maintenance Item	Procedure
Engine maintenance	Change the spark plugs
Hydraulic oil reservoir	Change the reservoir oil and filter
Radiator	Flush and refill radiator with 50/50 mix of water and anti freeze

Maintenance Every 2000 Hours

Maintenance Item	Procedure
Engine maintenance	* Review the engine manufacturer's additional maintenance requirements

Note: The engine maintenance schedule shown lists the recommended engine service intervals. Refer to the OTHER MANUALS AVAILABLE/Engine Manuals section for list of available engine manufacturers' service manuals. Refer to these manuals for more complete maintenance and service information and instructions.

FIGURE 6



LUBRICATION
POINTS

MAINTENANCE

HYDRAULIC OIL

Open and prop the Engine Cover (3) to access the hydraulic oil reservoir. Remove the Fill Cap (44) from the tank and look to the bottom of the filler screen. If the oil level is below the bottom of the filler screen, add 10W-30 motor oil until the bottom of the filler screen is covered. (The oil level should not be higher than 1/2" (12.7mm) above the bottom of the filler screen.) Change and flush the oil if major contamination from a mechanical failure occurs.

ENGINE MAINTENANCE

ENGINE OIL – GASOLINE / PETROL AND LPG

Check the engine oil level when the machine is parked on a level surface and the engine is cool. Change the engine oil after the first 35 hours of operation and every 150 hours after that. Use any SF or SG rated oil meeting API specifications and suited to seasonal temperatures. Refer to the engine manufacturers' service manuals for oil capacities and additional engine specifications. Replace the oil filter with every oil change.

TEMPERATURE RANGE

Above 60° F (15° C)

Below 60° F (15° C)

OIL WEIGHT

SAE 10W-30

SAE 5W-30

ENGINE OIL – DIESEL

Check the engine oil level when the machine is parked on a level surface and the engine is cool. Change the engine oil after the first 35 hours of operation and every 150 hours after that. Use CF, CF-4 or CG-4 oil meeting API specifications and suited temperatures.

***Important:** Reference the oil/fuel type note below for further diesel oil recommendations. Refer to the engine manufacturers' service manuals for oil capacities and additional engine specifications. Replace the oil filter with every oil change.

TEMPERATURE RANGE

Above 77 °F (25 °C)

32 °F to 77 °F (0 °C to 25 °C)

Below 32 °F (0 °C)

OIL WEIGHT

SAE 30 or 10W-30

SAE 20 or 10W-30

SAE 10W or 10W-30

* Diesel Lubricating Oil Note:

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use with a low-sulfur fuel used in on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

Recommended lubricating oil when low-sulfur or high-sulfur fuel is employed

Lubricating Oil class	Fuel		Remarks
	Low sulfur (0.5 % ≥)	High sulfur	
CF	O	O	TBN ≥ 10
CF-4	O	X	
CG-4	O	X	

O : Recommended

X : Not recommended

SPECIAL LIQUID PROPANE FUEL SYSTEM MAINTENANCE ON THE GM 1.6L ENGINE

Every 150 hours inspect and drain any oil buildup from the LP fuel system electronic pressure regulator (EPR). During the course of normal operation, oils or "heavy ends" may build inside the chambers of the propane regulator. These oils and heavy ends may be a result of poor fuel quality, contamination of the fuel supply chain, or regional variation in the makeup of the fuel. If the oil buildup is significant it can affect the function of the fuel control system. **Note:** Reference the Tier 2 PSI 1.6l PFI certified engine service manual, form # PSI1P6LPFI-A, and follow the procedure to drain the EPR regulator.

MAINTENANCE

ENGINE COOLANT

CAUTION!

Do not remove the radiator cap when the engine is hot.

To check the engine coolant level, open and prop the Engine Cover (3) and observe the coolant level in the Coolant Overflow Tank (6). If the level is low, add a 50/50 mix of water and the recommended type antifreeze. Clean the radiator and oil cooler exteriors by washing with low-pressure water or using compressed air every 150 hours. **Service Note:** The oil cooler tips out for easy cleaning.

ENGINE AIR FILTER MAINTENANCE

Check the Engine Air Filter Service Indicator (5) before each use of the machine. Do not service the air filter unless the red flag is visible in the service indicator.

CAUTION!

When servicing the engine air filter elements, use extreme care to prevent loose dust from entering the engine. Dust can severely damage the engine.

The engine air filter contains a Primary (outer) and a Safety (inner) filter element. The Primary Element can be cleaned twice before being replaced. The Safety Element should be replaced every third time that the Primary Filter Element is replaced. Never attempt to clean the Inner Safety Element.

To clean the Primary Filter Element, unsnap the two clips at the end of the air filter and remove the end housing. Pull the primary element out. Clean the element with compressed air (maximum pressure 100 psi) or wash it with water (maximum pressure 40 psi). DO NOT put the element back into the canister until it is completely dry.

MAINTENANCE

AXP SYSTEM

You will need to purge the system of the previous detergent when switching to a different detergent. **SERVICE NOTE:** Move machine over floor drain before purging because a small amount of detergent will be dispensed in the process.

To Purge When Changing Chemicals (the scrub system must be off):

- 1 Disconnect and remove the detergent cartridge.
- 2 Turn the key switch (50) on and wait a few seconds for the start-up sequence to finish.
- 3 Press and hold the detergent switch (61) for approximately two seconds.
- 4 Release the switch when the chemical purge icon (E) appears on the display and the indicator on the detergent switch (61) starts flashing.

Note: Once activated, the purge process takes at least 10 seconds. See the illustration on this page for Detergent System indicators. Normally one purge cycle is adequate to purge the system.

To Purge Weekly (the scrub system must be off):

- 1 Disconnect and remove the detergent cartridge.
- 2 Install and connect a Cartridge filled with clean hot water.
- 3 Turn the key switch (50) on and wait a few seconds for the start-up sequence to finish.
- 4 Press and hold the detergent switch (61) for approximately two seconds.
- 5 Release the switch when the chemical purge icon (E) appears on the display and the indicator on the detergent switch (61) starts flashing.

Note: Once activated, the purge process takes at least 10 seconds. See the illustration on this page for Detergent System indicators. Normally one purge cycle is adequate to purge the system.

Note: The Detergent Box (C) has Detergent Level Viewing Slots (D) for referencing the amount of detergent remaining in the cartridge(s). When the detergent level is nearing the bottom of this slot, refill or replace the cartridge(s).

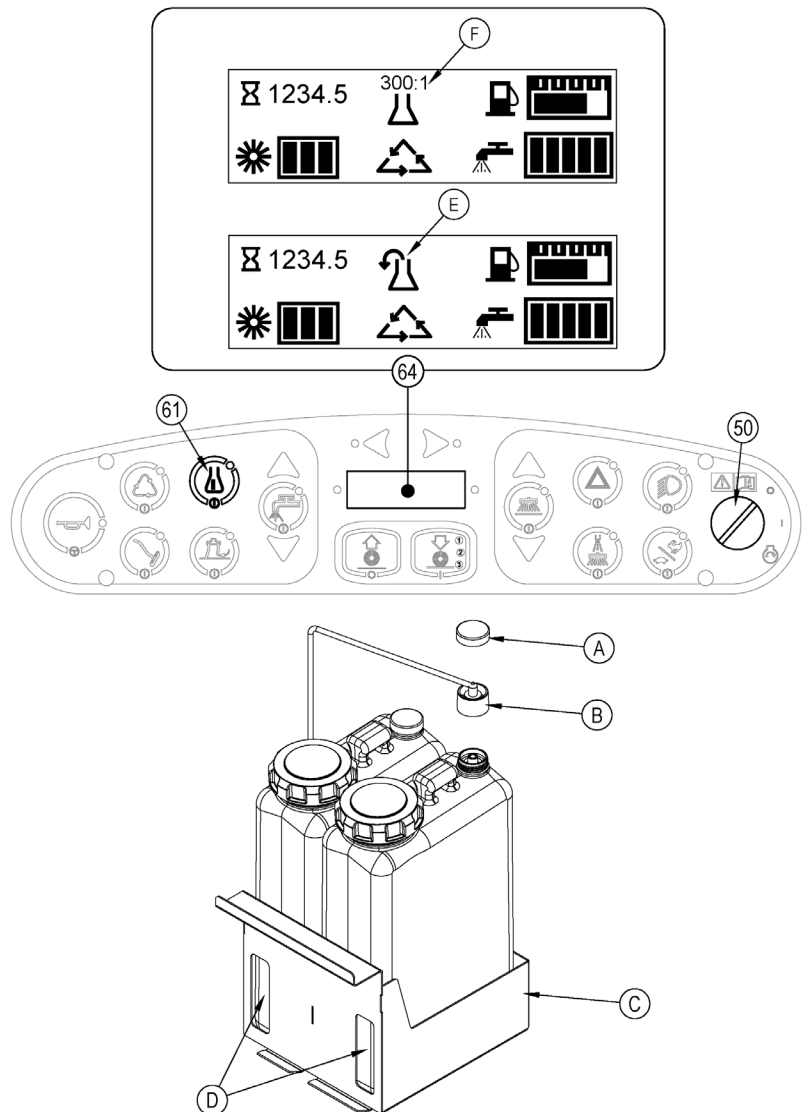
To Change the Detergent Mix Ratio (the scrub system must be on):

- 1 Press and hold the detergent switch (61) for two seconds.
- 2 Release the switch once the detergent switch light begins flashing.
- 3 While the light is flashing, press and release the detergent switch to select the next detergent mixture ratio. Once the desired ratio is selected, the detergent system will return to normal operation within three seconds.

Note: The detergent mixture (F) will be displayed for approximately 10 seconds each time the scrub mode changes, or each time the detergent switch is pressed. Once set, the detergent flow rate automatically increases and decreases with the solution flow rate, but the detergent mix ratio will remain the same. If an operator would prefer the flexibility of setting different detergent dilutions ratios for different solution flow rates, this specific programming option can be found in the Appendix.

Note: During scrubbing, the detergent system can be turned off at any time by pressing the Detergent ON/OFF Switch (61) to allow scrubbing with water only. No detergent is dispensed until the scrub system is activated and the Drive Pedal (29) is pushed forward.

Service Note: Follow the "To Purge Weekly" instructions above if the machine is going to be stored for an extended period of time, or if you plan to discontinue use of the detergent (AXP) system.



Advance Condor XL 48/60/62/67 G/P/D
PM Checklist

Customer _____

Address _____

City _____ **St** _____ **Zip** _____

Model _____ **Serial** _____ **Hours** _____

Defect Codes

A needs adjustment
B binding
C dirty or contaminated
D damaged, bent or torn
L leaks
M missing
W worn out

Ref	OPERATIONAL INSPECTION ITEMS	OK	Defect Codes (circle)	Does Not Work
1	Check drive pedal sensor operation (to test depress drive pedal and start the engine, it should not start.)		A B C	
2	Engine starting with pedal in neutral (if it will not start check pedal calibration programming)		A	
3	Engine idle speed, GM/1200 RPM & Kubota/1300 RPM		A rough	
4	Normal operational speed (run switch setting) 2200 RPM		A low power	
	Turbo high speed (hold 2200 RPM switch setting for 2 sec. to enter) 2400 RPM			
5	Drive pedal linkage (check for FWD/REV drive and any neutral creep)		A B	
6	Drive system performance (max Fwd 8 mph)		Noisy sluggish	
7	Brakes (check both service & parking)		A B W	
8	Steering		excessive play	
9	Right side scrub brush raise/lower (model option if equipped)		B D L	
10	Right side scrub brush on/off (must have main scrub turned on)		B L	
11	Side sweep broom(s) raise/lower (model option if equipped)		A B	
12	Side broom(s) on/off		B L	
13	Dust guard (sweep dust control) On/Off (model option if equipped)		A C L	
14	Scrub system (Raise/Lower and auto scrubbing functions)		<----->	
15	Main scrub brushes On/Off (will drift)		<----->	
16	Scrub Brush (pressure settings 1,2 &3)		A B	
17	Solution control (On/Off and flow volume min/max)		C D	
18	Test & purge the detergent AXP system (model option if equipped)		C L W	
19	Squeegee system (raise/lower and auto lift in reverse)		<----->	
20	Vacuum Performance (Sealed water lift 34" @ 2200 RPM)		C L	
21	Headlights, gauges and (optional) accessories rotating beacon, backup alarm		<----->	
22	Tilt steering mechanism and seat adjustment lever		<----->	
23				

Ref	VISUAL INSPECTION ITEMS	Comments	OK	Defect Codes (circle)	Does Not Work
24	Side sweep broom(s) bristles	min wear 3 inches		A B D W	
25	Side broom motor(s)			B L	
26	Scrub brush motor(s)	Also RT scrub brush		B L	
27	Main scrub brushes, check for wear and rotate (1.75" length)	Min wear .875		D W	
28	Scrub deck housing & door skirts			C D W	
29	Solution system pumps and solenoid valves	as many as 4 pumps		C L W	
30	Solution tank, delivery hoses & filter	clean filter screen		C L M	
31	Vacuum impellor motor & hose			C L D	
32	Recovery tank screen & float	clean screen		B C	
33	Recovery tank cover gasket			D L W	
34	Recovery tank drain hose & cap			C D L M	
35	Squeegee pick-up hose	back flush		C L	

Ref	VISUAL INSPECTION ITEMS (continued)	Comments	OK	Defect Codes (circle)	Does Not Work
36	Squeegee tool & blades	clean & rotate		C D W	
37	Squeegee casters, leveler adjustment knob & linkage	grease		C W	
38	Hydraulic lift cylinders (squeegee, RT side & main scrub deck)			B L	
39	Battery	clean & water		C	
40	Engine, oil level, hoses & belts			C D L	
41	Engine air cleaner element (inner & outer)	check SVR indicator		C L	
42	Engine coolant level	fill at reservoir		C L	
43	Radiator & oil cooler core blockage	clean		C D L	
44	Hydraulic oil reservoir level (10W-30 engine oil only)	to bottom of screen		C L	
45	Hydraulic system hoses & fittings			L	
46	Propulsion (drive) pump dump valve (tow valve)			B D	
47	Propulsion drive & accessory pump			L	
48	Propulsion pump hydro back cable & clevis connections			A B D	
49	Propulsion pump hydraulic filter			C L	
50	Gasoline/Diesel fuel tank, filter & lines			C L W	
51	LP tank, hoses & fittings			L W	
52	LP fuel filter	SVR life 1500 Hrs		C	
53	LP fuel regulator, lock off valve & hoses			L	
54	Diesel glow plug function light	hard starting		<---->	
55	Gasoline & Diesel fuel tank strainer	yearly		C	
56	Brake cable and parking brake pedal			A B	
57	Circuit breaker panel			D M W	
58	Front tire (check lug nut torque 100 FT LB, 135Nm)			A	
59	Front drive wheel motor, steer spindle, rack & cylinder	grease pinion & rack		D L W	
60	Front & rear tires	tread wear		C W	
61	Scrub housing debris hopper (tray)	clean		C	
62	Scrub housing recovery hose & pick-up screen	back flush/clean		C	
63	Dust guard spray nozzles & strainers	clean		C L W	
64					
65					
66					
67					
68					
69					
70					
71					

NOTE: For additional service information see service manual form number 56043124 and operators manual form number 56041705.

Defect Codes A needs adjustment C dirty or contaminated M missing
 B binding D damaged, bent or torn W worn out
 L leaks

WORK COMPLETED BY:

ACKNOWLEDGED BY:

 Service Technician Signature

 Date

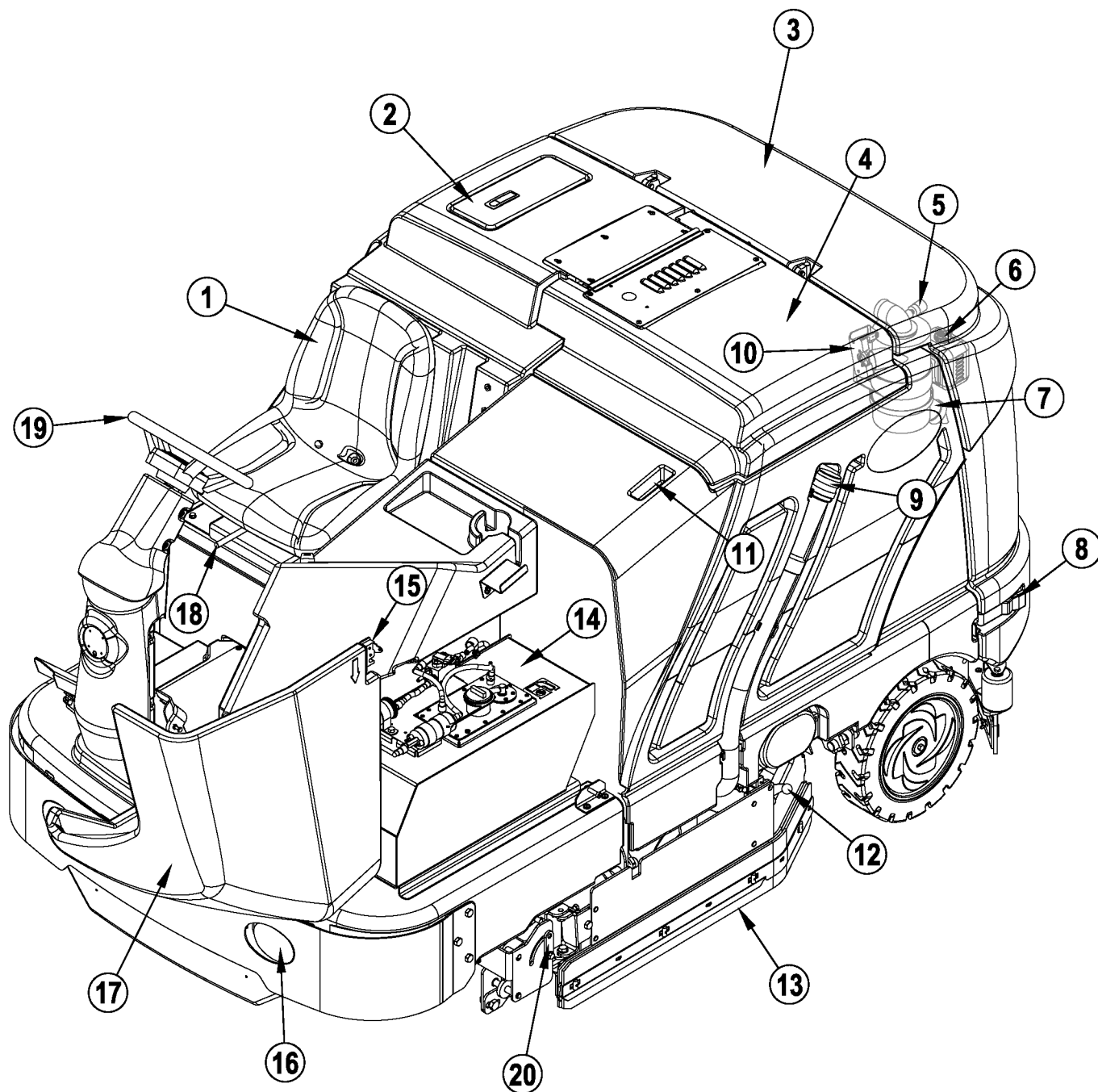
 Customer Signature

 Date

KNOW YOUR MACHINE

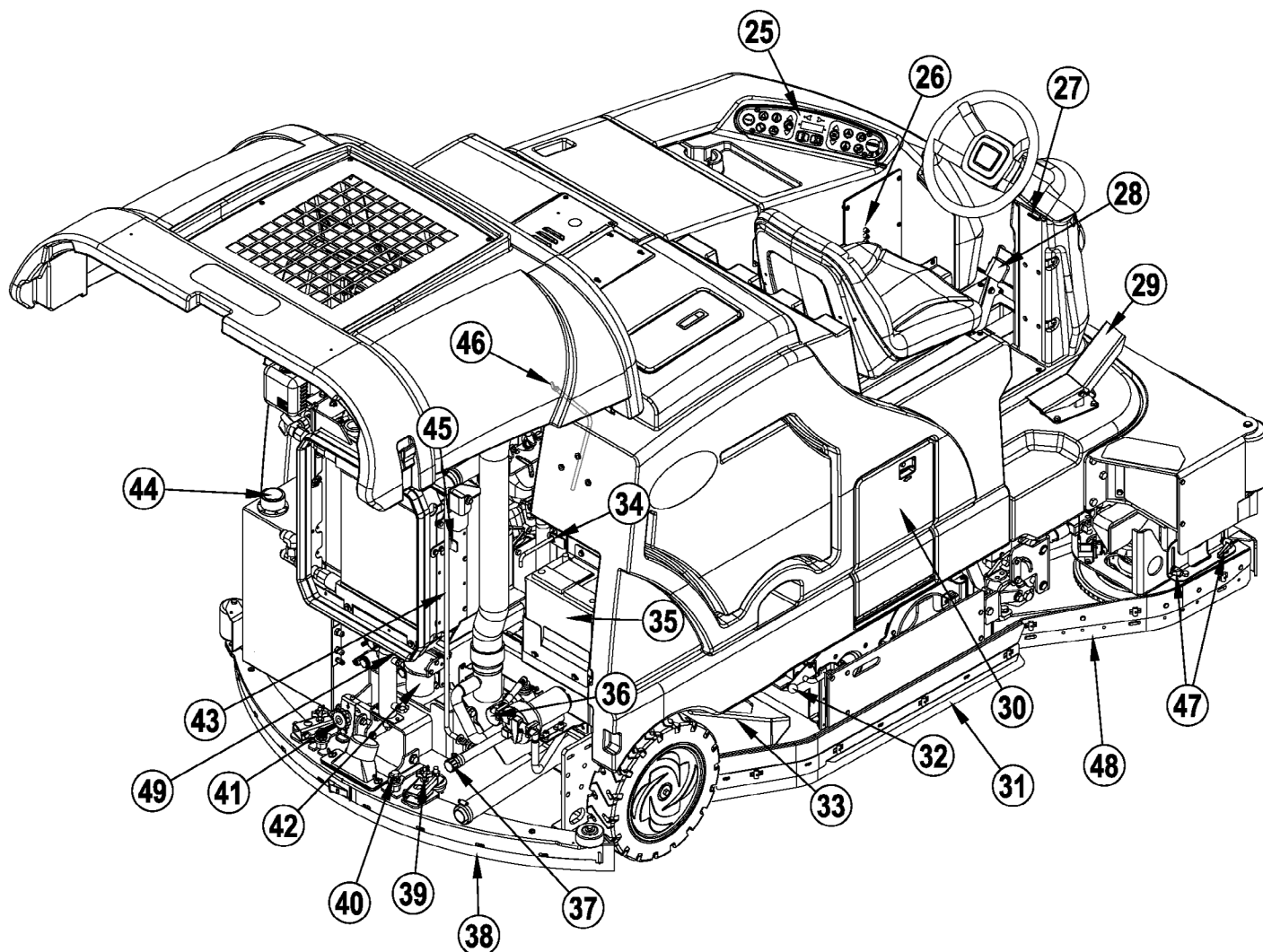
As you read this manual you will occasionally run across a bold number in parentheses; for example: (2). These numbers refer to items on the next four pages. Refer to these pages whenever necessary to locate an item mentioned in the text.

- | | | | |
|----|-------------------------------------|----|--------------------------------|
| 1 | Operator's Seat | 11 | Recovery Tank Tilt Out Grip |
| 2 | Solution Tank Fill Cover | 12 | Left Side Skirt Latch |
| 3 | Engine Cover | 13 | Left Side Skirt |
| 4 | Recovery Tank Cover | 14 | Fuel Tank (petrol tank shown) |
| 5 | Engine Air Filter Service Indicator | 15 | Fuel Tank Cover Latch |
| 6 | Coolant Overflow Tank | 16 | Headlight |
| 7 | Engine Air Filter | 17 | Fuel Tank Cover |
| 8 | Engine Cover Latch | 18 | Operator Seat Adjustment Lever |
| 9 | Recovery Tank Drain Hose | 19 | Steering Wheel |
| 10 | Recovery Tank Tilt Out Latch | 20 | Double Scrub Skirt Holder |



KNOW YOUR MACHINE (CONTINUED)

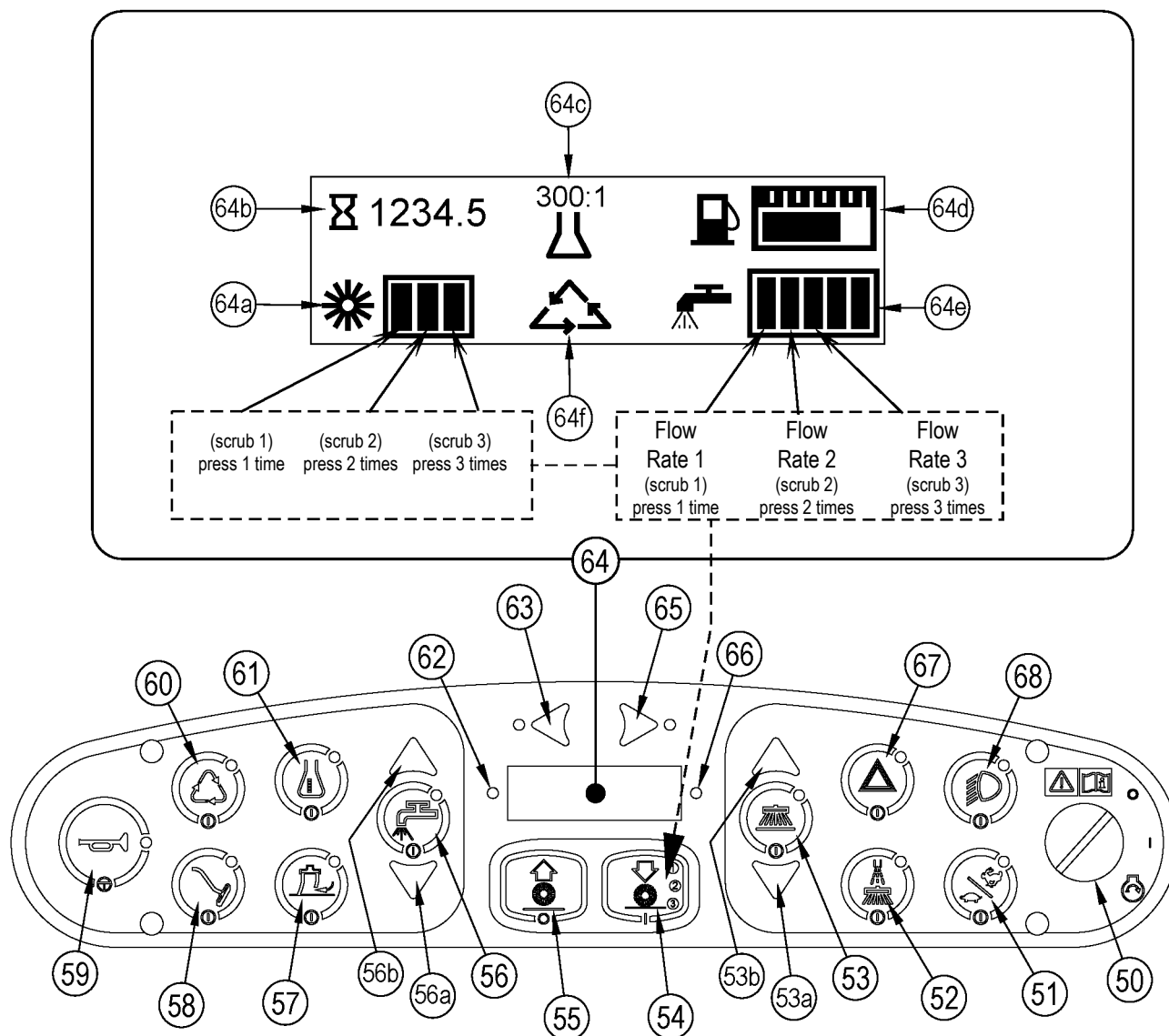
- | | | | |
|----|---|----|------------------------------------|
| 25 | Control Panel | 38 | Squeegee Assembly |
| 26 | Circuit Breaker Panel (see Troubleshooting) | 39 | Squeegee Height Adjust Knob |
| 27 | Steering Wheel Tilt Adjust Lever | 40 | Squeegee Mount Wrench |
| 28 | Brake Pedal / Parking Brake | 41 | Squeegee Tilt Adjust Knob |
| 29 | Drive Pedal, Directional/Speed | 42 | Engine Oil Filter |
| 30 | AXP Cartridge Compartment | 43 | Engine Cover Prop Rod |
| 31 | Right Side Skirt | 44 | Hydraulic Oil Reservoir Filler Cap |
| 32 | Right Side Skirt Latch | 45 | Oil Cooler Tilt Out Latch |
| 33 | Hopper | 46 | Engine Oil Dipstick |
| 34 | Tow Valve Lever | 47 | Right Scrub Skirt Retainer Knobs |
| 35 | Battery | 48 | Right Scrub Skirt Assembly |
| 36 | Solution Filter | 49 | Engine Oil Drain (under radiator) |
| 37 | Solution Tank Drain Hose | | |



KNOW YOUR MACHINE

CONTROL PANEL

- | | |
|-------------------------------------|---|
| 50 Key Switch | 61 Detergent System (AXP models only) |
| 51 Engine Speed Switch | 62 Warning Indicator Light (RED) (see page 25) |
| 52 Dust Guard | 63 Left Turn Signal (optional) |
| 53 Side Broom/Scrub ON / OFF Switch | 64 Display |
| 53a Side Broom DOWN adjust Switch | 64a Scrub Pressure Indicator |
| 53b Side Broom UP adjust Switch | 64b Hour Meter |
| 54 Scrub ON / Scrub Mode Select | 64c AXP Indicator (optional) |
| 55 Scrub OFF | 64d Fuel Gauge |
| 56 Solution Switch | 64e Solution Flow Indicator |
| 56a Solution Flow Decrease Switch | 64f Extended Scrub Indicator (optional) |
| 56b Solution Flow Increase Switch | 65 Right Turn Signal (optional) |
| 57 Vacuum Switch | 66 Attention Indicator Light (YELLOW) (see page 26) |
| 58 Wand Switch (optional) | 67 Emergency Flashers (optional) |
| 59 Horn Switch | 68 Headlights |
| 60 Extended Scrub Switch (optional) | |



MAIN CONTROL BOARD WARNING AND ATTENTION INDICATOR LIGHTS

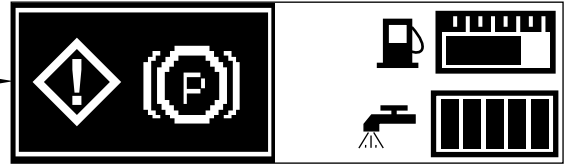
The main control board uses a red warning indicator light (62) and a yellow warning indicator light (66) and special dash panel icons to communicate specific monitored operational (modes) activities to the machine operator. When an operational activity or electrical circuit operational problem is sensed, the red warning and/or yellow attention lights and appropriate icon are displayed. See short explanation for each icon for the two light groups below.

Red Warning Indicator Light (62)

62A - Parking brake icon;

Displayed icon shows the operator that the parking brake is set. Operator needs to release the brake pedal, then the icon and light will disappear.

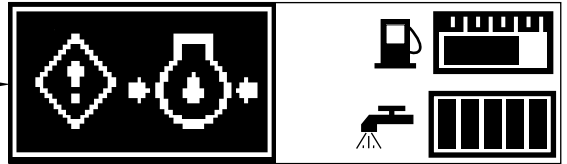
62a



62B - Diesel oil pressure icon;

Active when low engine oil pressure in the diesel engine is sensed. Check for possible causes for low oil pressure such as engine crankcase level is low, improper oil viscosity, fault in oil pressure switch S28, excessive engine wear or defective internal oil pump (relief valve). **Note:** This icon display is for the Kubota diesel engine only. The GM 1.6L has a low oil pressure monitor that is activated through the 62C engine service display icon.

62b



62C - Engine service icon;

Sets when the GM 1.6L engines ECM (electronic control module) activates an engine fault code. See the ENGINE SYSTEM/ENGINE DIAGNOSTICS section for more detailed diagnostic help.

62c



62D - Battery low icon;

Indicates low battery voltage. Check alternator output, test the battery, clean and tighten cables.

62d



62E - Controller critical fault icon;

The main control board has sensed a specific system component failure(s) and displays a two-digit number with a wrench icon. See the controller fault (error) code description table for troubleshooting actions. **Note:** Some critical faults will prevent the operation of certain machine functions.

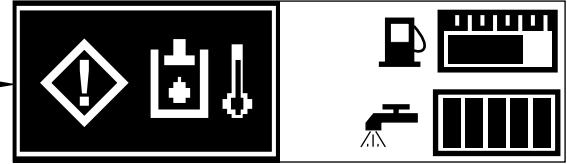
62e



62F - Hydraulic temperature icon;

Icon sets when the hydraulic oil temperature exceeds an average operating temp greater than 220 degrees F for longer than 15 seconds. Possible causes include low oil level in reservoir, debris blocking airflow at the oil cooler, hydraulic component overloads.

62f



62G Low fuel icon;

Icon sets when the fuel sensors read low fuel levels from the liquid fuel tank (gasoline/diesel) or low pressure from the LP storage cylinder. Refill the gasoline/diesel tank 10 gal capacity. Replace the 33 lbs liquid capacity LP cylinder.

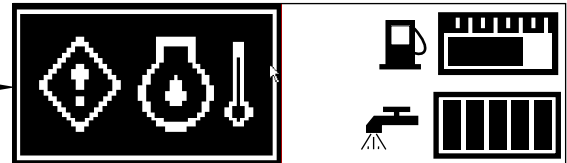
62g



62H Engine coolant temperature icon;

High coolant temperature sensed causes an engine fault. Check for low coolant level in radiator, debris blocking airflow through the radiator, fan damage, loose fan belt, leaks, bad engine water pump, engine overload at high ambient temperature.

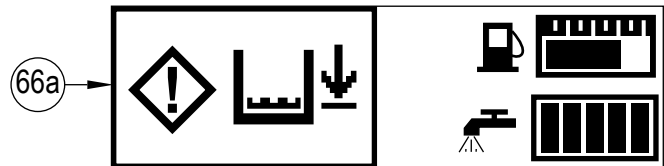
62h



Yellow Attention Indicator Light (66)

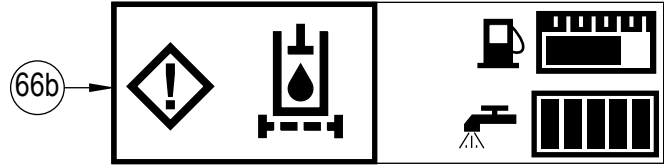
66A Solution low icon;

Comes on when the solution level in the tank is low (xx gallons remaining). Fill above the xx gallon level to clear the light and display.



66B Hydraulic filter plugged;

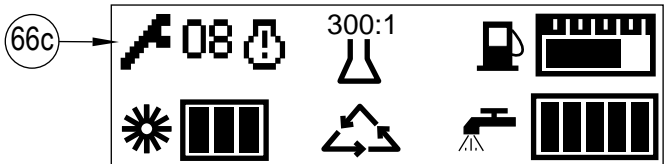
Comes on to indicate that the filter needs to be replaced (serviced). Note the oil temperature must be above 100 degrees F for a plugged filter to activate the icon (this prevents a false indication with cold oil start-ups).



66C Controller non critical fault icon;

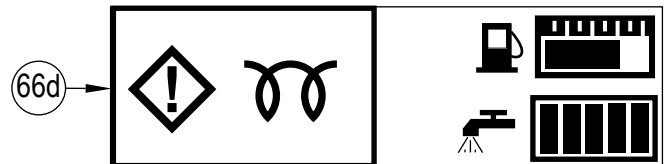
The main control board has sensed specific system component failure(s) and displays a two-digit number and the wrench symbol. See the controller fault (error) codes description table for troubleshooting actions.

Note: When non-critical faults exist, hour meter will be displayed in rotation with faults.



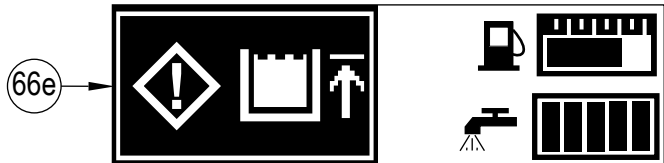
66D Diesel start glow plug icon;

Comes on to indicate that the key switch is in the run position and the glow plugs are activated (heating up) for their timed 10 seconds. The engine can be cranked to start when the yellow attention light and display icon go out.



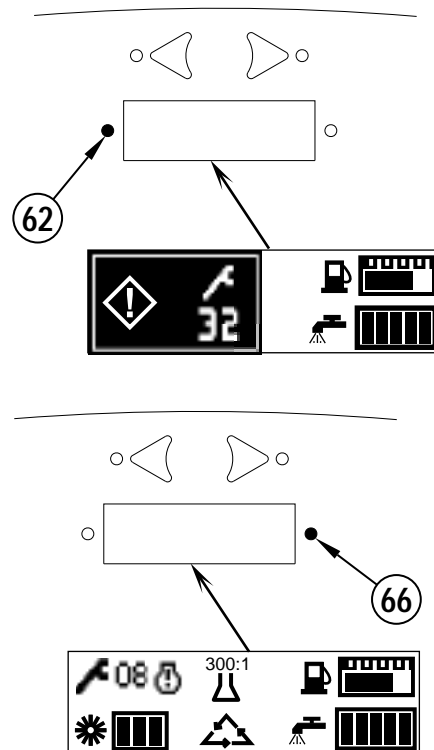
66E Recovery tank full icon;

The tank float has sensed a high water level. The operator needs to empty the waste water from the tank. If tank is empty and icon is displayed, service (clean) the tank float (could be stuck). Also check the float circuit wiring for an open.



EXAMPLES:

- The main controller board shows the engine service 62C icon with a two-digit fault code (38) and wrench symbol. This is a critical engine fault code that indicates the main control board received a run-inhibit signal from the ECM (gasoline and LP) or governor (diesel) that will shut down the engine.
- The main controller board shows the non-critical controller fault code 66C icon with a two-digit code (08) and wrench symbol. This is a non-critical fault code that indicates the right side scrub solution solenoid valve is over its current limit. The right side scrub system will shut off but the rest of the machine systems will continue to operate.



ELECTRICAL SYSTEM

FAULT CODE SYSTEM DIAGNOSTICS

The following table describes the systems that are disabled for each fault code. This is included to assist the technician in understanding the machine response to a specific fault code status.

Note: "X" means the corresponding machine system is disabled (turned off).

Display Code	Fault Description	Recovery System	Scrub System	Solution System	Chemical System	Side Scrub System	Side Sweep System	Side Mist System	Recycle System
00	Solution pump(s) M4 and M6 over current			x	x				x
01	Scrub brush pressure valve solenoids over current (L5andL7)		x	x	x				
02	Main power relay K1 over current	x	x	x	x	x	x	x	x
03	Wash hose pump M8 over current								
04	Dust guard mist pump M5 over current							x	
05	No speed input 2200 RPM @ ECM								
06	No speed input 2400 RPM @ ECM								
07	Main solution solenoid valve L10 over current			x	x				
08	RT side scrub solution solenoid L11 over current					x			
09	Vacuum fan solenoid L1 over current	x	x	x	x				
10	Not used								
11	Squeegee UP solenoid L3 over current	x	x	x	x				
12	Squeegee DN solenoid L2 over current	x	x	x	x				
13	Scrub motor solenoid L4 over current		x	x	x				
14	Glow plug relay K4 coil over current								
15	Scrub cylinder lock solenoid L6 over current		x	x	x				
16	RT side scrub/sweep motor solenoid L8 over current					x	x		
17	Back Up alarm over current								
18	RT side scrub lift cylinder solenoid L9 over current					x			
19	Horn over current								
20	Left turn signal lamp over current								
21	Right turn signal lamp over current								
22	Head and tail lamp over current								
23	Left stop lamp over current								
24	Right stop lamp over current								
25	20A circuit breaker CB1 over current								
26	20A circuit breaker CB2over current								
27	15A circuit breaker CB3 over current								
28	20A circuit breaker CB4 over current								
29	10A circuit breaker CB5 over current								
30	Side sweep lift M7 actuator over current						x		
31	#1 Chemical pump M10 over current (AXP)				x				
32	#2 Chemical pump M11 over current (AXP)				x				
33	Engine hot fault (diesel)	x	x	x	x	x	x	x	x
34	Hydraulic oil temperature fault								
35	Low voltage fault (battery)								
36	Service engine fault GM (non critical)								
37	Low oil pressure (diesel engine)	x	x	x	x	x	x	x	x
38	Engine fault (critical)	x	x	x	x	x	x	x	x
39	Hydraulic filter fault (plugged)								

ELECTRICAL SYSTEM

MAIN CONTROL BOARD FAULT CODES

Fault codes are organized by machine systems (functions). The RED warning light **(62)** or the Yellow attention light **(66)** will display on the operators' control dash panel showing a two-digit number and wrench icon. Listed below is a description and brief comment for each fault code.

Note: C = Critical NC = Non-Critical

Recovery System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
09 C	Vacuum fan solenoid over current	Check L1 solenoid coil wiring for problems (+ GRN/BRN and - BRN/YEL). Check coil resistance; less than 6 ohms - replace. Also see vacuum fan on and squeegee down electrical ladder detail.
11 C	Squeegee UP solenoid over current	Check L3 solenoid coil wiring for problems (+ GRN/BRN and - BRN/GRN). Check coil resistance; less than 6 ohms - replace. Also see vacuum fan off and squeegee up electrical ladder detail.
12 C	Squeegee DN solenoid over current	Check L2 solenoid coil wiring for problems (+ GRN/BRN and - RED/GRN). Check coil resistance; less than 6 ohms - replace. Also see vacuum fan on and squeegee down electrical ladder detail.

Scrub System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
13 C	Scrub brush motor solenoid over current	Check L4 solenoid coil wiring for problems (+ ORN and - ORN/BLU). Check coil resistance; less than 6 ohms - replace. Also see main scrub on and side sweep/RT scrub electrical ladder detail.
15 C	Scrub cylinder lock solenoid over current	Check L6 solenoid coil wiring for problems (+ ORN and - YEL/BLU). Check coil resistance; less than 6 ohms - replace. Also see main scrub on and RT scrub brushes deck pressure electrical ladder detail.
01 C	Scrub brush pressure valve solenoids over current	Check L5 down and L7 up pressure valve solenoid coils (on same fault line) for wiring problems, L5 wire colors (+ ORN and - WHT/VIO) and L7 (+ ORN and ORN/RED). Check coil resistance; less than 1.8 ohms - replace. Also see main scrub on and right scrub brushes deck pressure electrical ladder detail and further specs.

Solution System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
00 C	Solution pump(s) over current	Check M4 main solution pump and M6 optional recycle pump wiring for problems (on same fault line), M4 wire colors (+GRN/BRN and - GRN/BLU) and M6 (+GRN/BRN and - GRA/ORN). Check pump motors for short circuits replace as needed.
07 NC	Main solution solenoid valve over current	Check L10 solenoid coil wiring for problems (+ ORN and - YEL/GRN). Check coil resistance; less than 6 ohms - replace. Also see main scrub and RT side scrub solution valves and pump electrical ladder detail.

Chemical System AXP

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
31 NC	Chemical pump #1 over current	Check #1 chemical pump M10 and #2 chemical pump M11 wiring for problems, #1 pump wire colors (+RED/WHT and - RED/BLU), #2 (+ BLK/YEL and - BLK/RED). Check pump motors for short circuit replace as needed.
32 NC	Chemical pump #2 over current	See pump #1

ELECTRICAL SYSTEM

MAIN CONTROL BOARD FAULT CODES

Side Scrub System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
18 NC	RT Side scrub lift solenoid over current	Check L9 solenoid coil wiring for problems (+ ORN and - GRN/VIO). Check coil resistance; less than 6 ohms - replace. Also see main scrub and right side scrub lift electrical ladder detail.
16 NC	RT side scrub/sweep motor solenoid valve over current	Check L8 solenoid coil wiring for problems (+ ORN and - BLK/WHT). Check coil resistance; less than 6 ohms - replace. Also see main scrub on and side sweep/right scrub electrical ladder detail.
08 NC	RT side scrub solution solenoid valve over current	Check L11 solenoid coil wiring for problems (+ ORN and - BLU/YEL). Check coil resistance; less than 10 ohms - replace. Also see main scrub and right side scrub solution valves and pump electrical ladder detail.

Side Sweep System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
30	Side sweep lift actuator over current	Three wires supply power to the M7 side broom lift actuator motor check wiring for problems. Wire colors J3-4 BLU/RED (+) DN otherwise open, J3-5 WHT/RED (-) UP otherwise open, J3-7 GRA/VIO common wire + UP and - DN. Test current draw full load 20A +/-2A max. Check for frozen or binding lift linkage, repair/replace as needed.
16 NC	RT side scrub/sweep motor solenoid valve over current	Check L8 solenoid coil wiring for problems (+ ORN and - BLK/WHT). Check coil resistance; less than 6 ohms - replace. Also see main scrub on and side sweep/right scrub electrical ladder detail.

Side Mist System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
04 NC	Side sweep mist pump over current	Check Pump motor M5 wiring for problems (+ BLU and - YEL/BLK). Test current draw 3.9A full load max. Note: 24V pump operating @ 12V

Recycle System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
00 C	Extend scrub pump over current	Check Pump motor M6 wiring for problems (+ GRN/BLU and - GRA/ORN). Same fault line used for main solution pump M4 and M6.

Engine Speed System

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
05 C	2200 RPM no input @ ECM	Check for 12V (+) from controller wire J2-29 (GRA/ORN) to battery ground (-) with the engine speed switch 51 active. Should read 12V if 0V T.S the throttle wire, then if still 0V substitute a good know controller and dashboard panel. If 12V and no 2200 RPM throttle response test engine controller out put to specific throttle control G/LP/D. See engine wiring diagram for additional help.
06 NC	2400 RPM no input @ECM	Check for 12V (+) from controller wire J2-30 (GRA/BLU) to battery ground (-) with the engine speed switch 51 active. Should read 12V if 0V T.S the throttle wire, then if still 0V substitute a good know controller and dashboard panel. If 12V and no 2400 RPM throttle response test engine controller out put to specific throttle control G/LP/D.
10	Not used	

ELECTRICAL SYSTEM

MAIN CONTROL BOARD FAULT CODES

Faults Non-Board

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
03 NC	Wash hose pump over current	Check Pump motor M8 wiring for problems (+ BLU and - BLU/RED). Check pump motor for short circuit (spec XA) replace as needed. Test current draw 12.5A full load max @12V.
19 NC	Horn over current	Check H4 horn wiring for problems (+ ORN/GRN and - WHT/YEL). Check horn for short circuit (spec 4A@12V) replace as needed.
17 NC	Back Up Alarm over current	Check optional back up alarm wiring for problems (+ ORN/GRN and - BLU/BLK). Check horn for short circuit (spec .25A at 12V, electronic alarm) replace as needed.
02 C	Main power relay K1 coil over current	Check K1 relay coil wiring for problems (+ ORN/GRN and - BLU/GRN). Check coil resistance; less than 36 ohms - replace. Also see main power distribution electrical ladder detail. (Spec .29A@12V) replace as needed.
25 C	20A Circuit breaker CB1 over current	Control board has sensed open circuit fault for CB1 power for head/tail and turn signal lamps. Check for GRA/RED wire shorted to ground.
26 C	20A Circuit breaker CB2 over current	Control board has sensed open circuit fault for CB2 power for mist pump (M5) and (M8) wash hose pump. Check for Blue wire shorted to ground.
27 C	15A Circuit breaker CB3 over current	Control board has sensed open circuit fault for CB3 power for side broom actuator motor (M7). Check for Violet wire shorted to ground.
28 C	20A Circuit breaker CB4 over current	Control board has sensed open circuit fault for CB4 power for hydraulic solenoid manifold coils (L4-L 11). Check for Orange wire shorted to ground.
29 C	10A Circuit breaker CB5 over current	Control board has sensed open circuit fault for CB5 power for hydraulic solenoid manifold coils (L1, L2 and L3) also PumpsM4 and M6. Check for GRN/BRN wire shorted to ground.
20 NC	Left turn signal lamp over current	Check left turn signal wiring for problems (+ YEL and - BLK). Check lamp for short (see the I/O table for circuit spec).
21 NC	Right turn signal lamp over current	Check right turn signal wiring for problems (+ GRN and - BLK). Check lamp for short (see the I/O table for circuit spec).
22 NC	Head and tail lamp over current	Check head and tail lamp wiring for problems (+ BRN, YEL/RED, ORN/BLU and - BLK). Check lamps for short (see the I/O table for circuit spec).
23 NC	Left stop lamp over current	Check left stop lamp wiring for problems (+ ORN/BRN and - BLK). Check lamps for short (see the I/O table for circuit spec).
24 NC	Right stop lamp over current	Same as left stop lamp just different wire color (+ YEL/RED and - BLK).
14 NC	Glow plug relay K4 coil over current	Check K4 relay coil wiring for problems (+ ORN/GRN and - WHT/ORN). Check coil resistance; less than 36 ohms - replace. Also see diesel glow plug starting circuit electrical ladder detail.

ELECTRICAL SYSTEM

MAIN CONTROL BOARD FAULT CODES

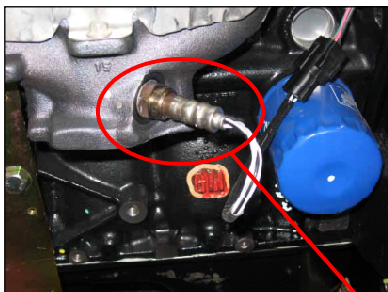
Other Faults Non-board

Code#	Fault Description by System Family	Troubleshooting Actions and Comments
35 C	Low voltage fault (battery)	One of the red display panel warning indicator lights see the explanation for icon 62D
37 C	Low oil pressure fault	Diesel only - causes engine fault to set. One of the red display panel warning indicator lights see the explanation for icon 62I
33 C	Engine hot fault	Coolant temperature high –causes engine fault, sets on diesel machine only.
38 C	Engine fault	Occurs if engine temperature too high (diesel), oil pressure low (diesel), or engine run has change to ignition inhibit and key is on (gas and propane). Note: Engines will shut down. See engine section for the list of engine codes and process for reading (extracting) codes.
36 NC	Service engine fault	Gasoline, LP engine (GM 1.6) only, sets when ECM activates MIL output-could be for mf++-any different reasons. See engine section for the list of engine codes and process for reading (extracting) codes.
34 C	Hydraulic temperature fault	Sets when hydraulic oil temperature exceeds 220 F for 15 seconds.
39 NC	Hydraulic filter fault	Sets to warn operator that oil filter is plugged and needs to be replaced. Note: Only activates when oil temperature is above 100 degrees F (this prevents false signal upon cold engine start up).

ELECTRICAL SYSTEM

ENGINE ELECTRICAL COMPONENT LOCATIONS – GM 1.6 GASOLINE

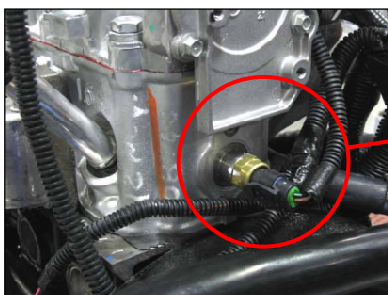
O₂ Sensor (in exhaust manifold)
(pre CATCON)



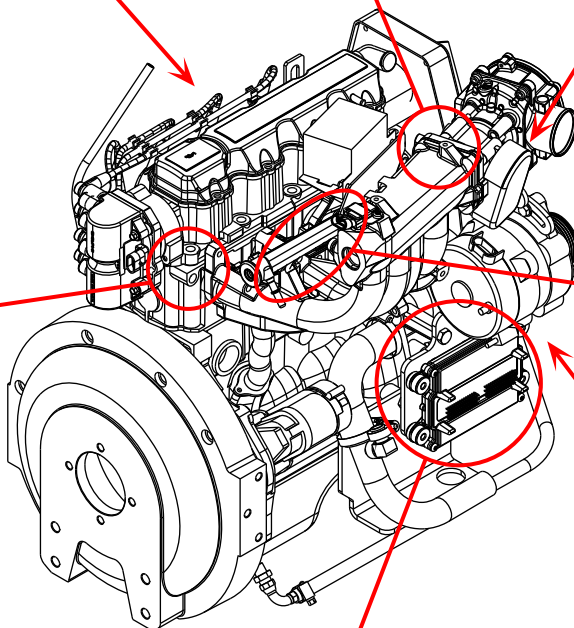
TMAP Sensor



ETC (Electronic Throttle Control)



ECT (Engine Coolant Temperature)
Sensor



Fuel Injectors and Connectors



Fuel Pump and Manifold
(mounted on fuel tank)



ECM and Oil Pressure Switch

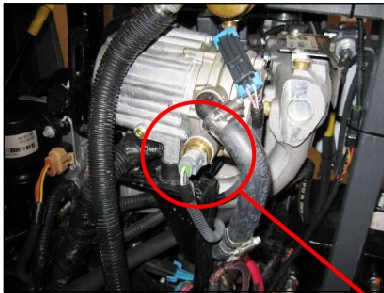


Crank Position Sensor

ELECTRICAL SYSTEM

ENGINE ELECTRICAL COMPONENT LOCATIONS – GM 1.6 LPG

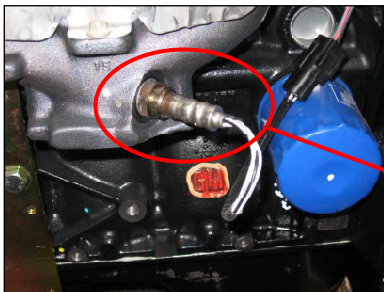
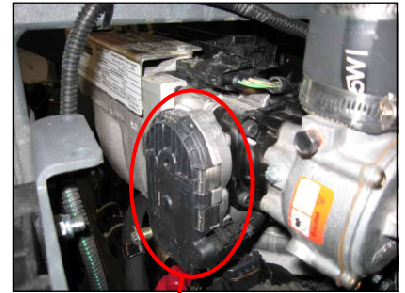
Fuel Temperature Sensor
(mounted on EPR – LPG only)



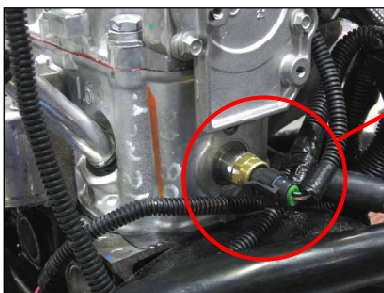
TMAP Sensor



ETC (Electronic Throttle Control)



O₂ Sensor (in exhaust manifold)



ECT (Engine Coolant Temperature) Sensor



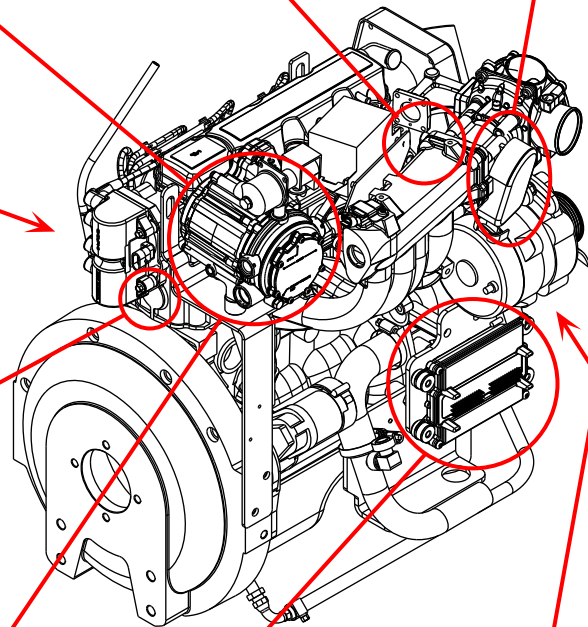
EPR and Fuel Lockout and Filter



ECM and Oil Pressure Switch

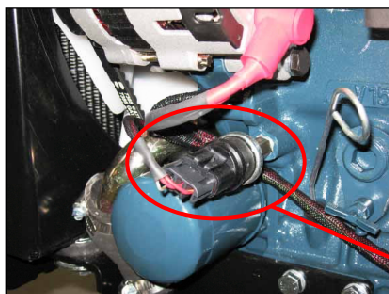


Crank Position Sensor



ELECTRICAL SYSTEM

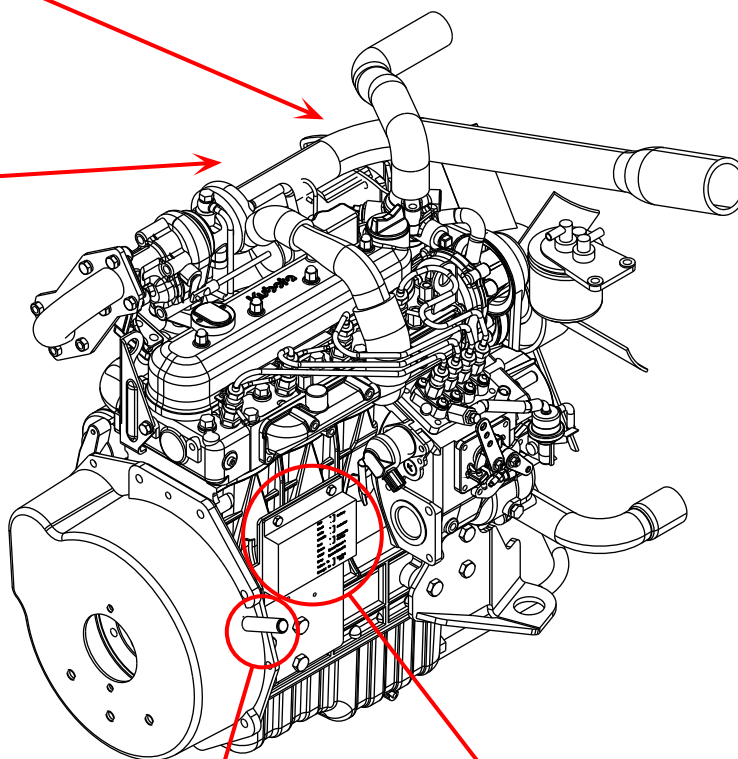
ENGINE ELECTRICAL COMPONENT LOCATIONS – KUBOTA DIESEL



Oil Pressure Sensor
(above oil filter)



Coolant Temperature Sensor
(above alternator)



Governor Engine Speed
Magnetic Pickup



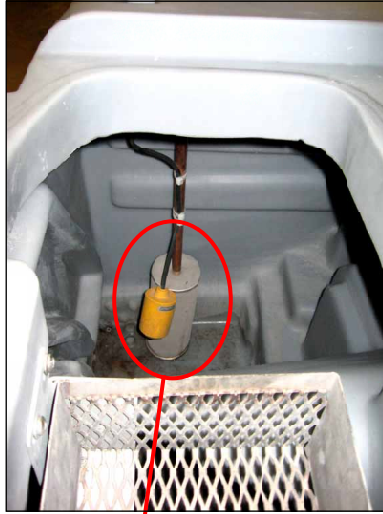
Woodward Governor and
Throttle Actuator

ELECTRICAL SYSTEM ELECTRICAL COMPONENT LOCATIONS

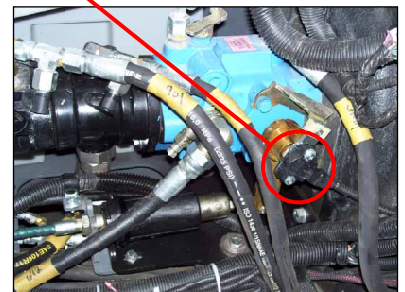
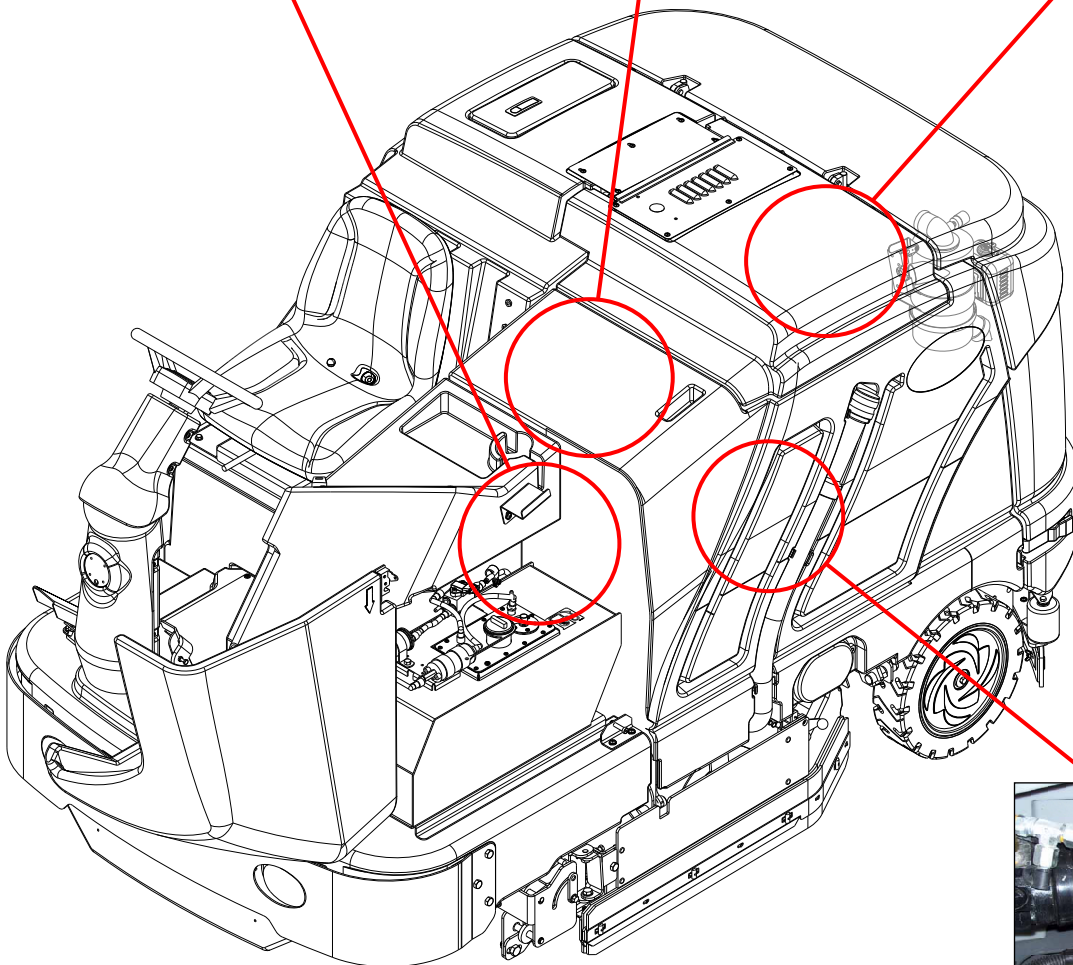
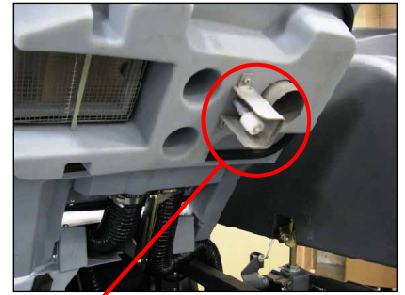
Extended Scrub Pump



Extended Scrub Float Switch



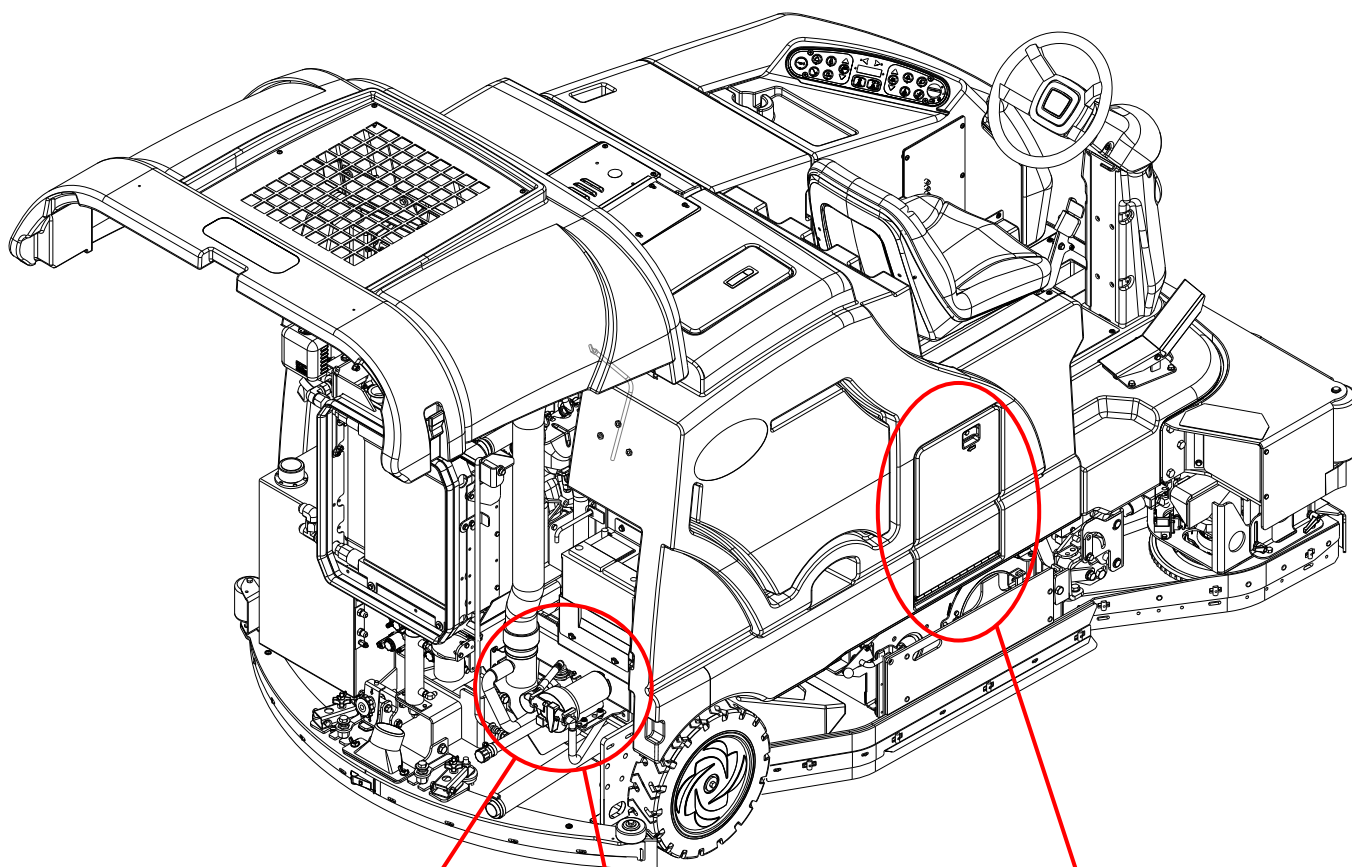
Recovery Tank Full Switch



Drive Pedal Sensor

ELECTRICAL SYSTEM

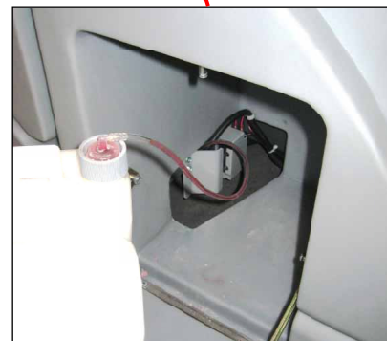
ELECTRICAL COMPONENT LOCATIONS



Mist Pump (if so equipped)



**Solution Pump (top) and
Wash Pump (bottom)**



**AXP Pumps
(behind cover panel)**

ELECTRICAL SYSTEM CONTROL BOARD ASSEMBLY

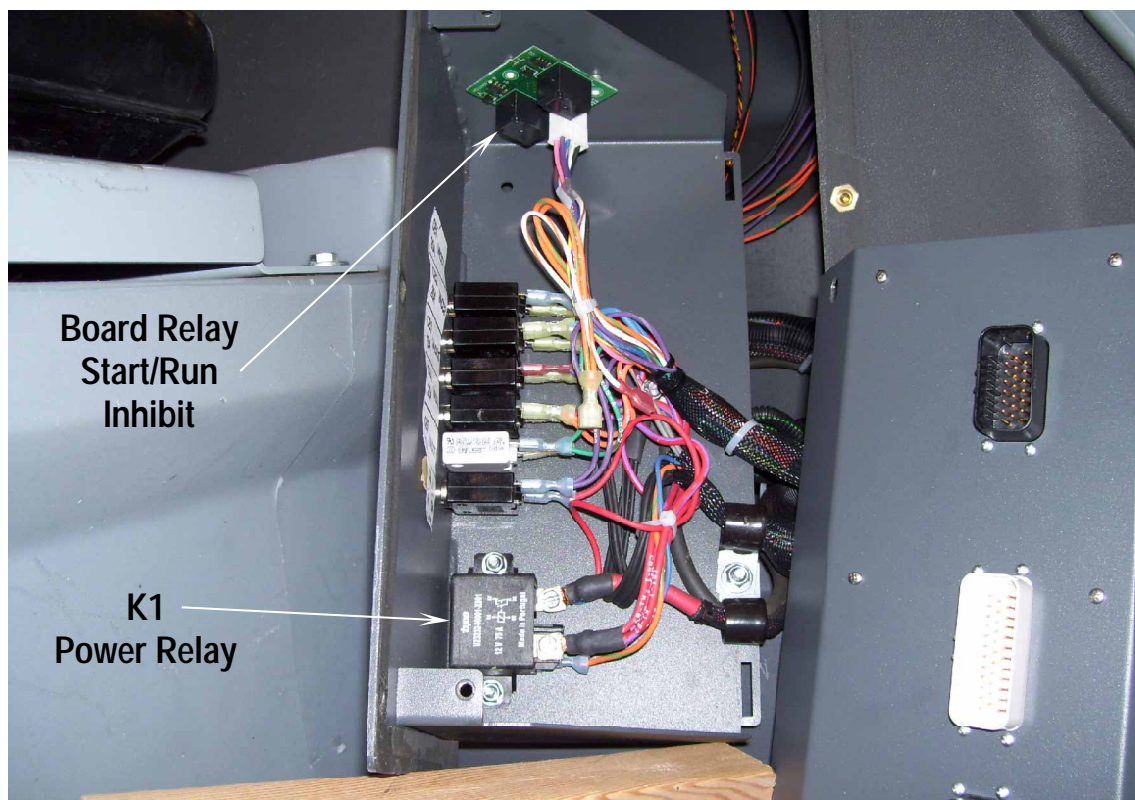
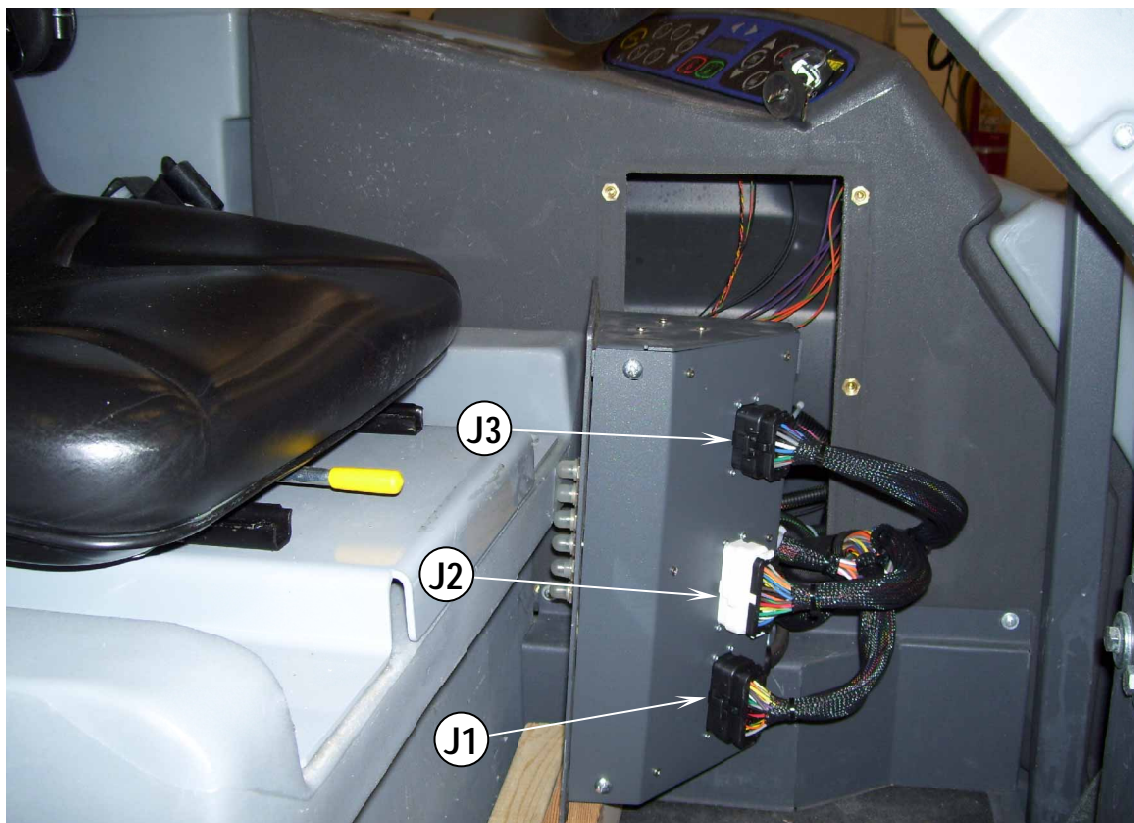
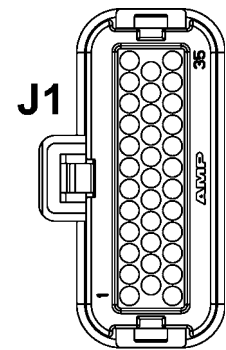


TABLE 1 – CONTROL BOARD CONNECTORS

Note: Also refer to the I/O Tables in the Appendix

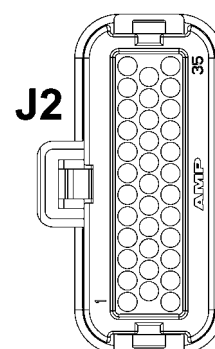
Condor XL J1 Main Control Board Connectors

Pin#	Wire#	Color	Type	Goes to
J1-1	18-1	GRA	input	Engine control module output (run signal)
J1-2	20-1	BLK/YEL	-CANbus	User interface panel (membrane switches)
J1-3	20-1	ORN/BLK	+CANbus	User interface panel (membrane switches)
J1-4				Open
J1-5				Open
J1-6				Open
J1-7	18-1	GRA/BLK	input	Fuel level sensor for either petrol/diesel,/LP
J1-8				Open
J1-9				Open
J1-10	18-1	BRN/WHT	output	Foot pedal position potentiometer (sensor high)
J1-11	18-1	YEL/GRA	output	Foot pedal position potentiometer (sensor low)
J1-12	18-1	ORN/GRN	input	Key switch ignition switch (run)
J1-13				Open
J1-14				Open
J1-15				Open
J1-16	18-1	RED/BLK	input	S29 Horn switch
J1-17				Open
J1-18	16-1	BLK	ground	Chassis ground X-49
J1-19	18-1	GRN/ORN	input	Sender hydraulic oil temperature
J1-20	18-1	VIO/WHT	input	S6 Brake switch
J1-21	18-1	VIO/YEL	input	S3 Solution empty switch
J1-22	18-1	WHT/BRN	output	Relay PCB (start inhibit pin #J7-3)
J1-23				Open
J1-24	18-2	VIO/BRN	input	Ignition switch start position
J1-25	18-1	GRN/YEL	input	Engine control module (MIL output signal)
J1-26				Open
J1-27	18-1	GRA/YEL	input	S2 Recovery tank full switch
J1-28				Open
J1-29				Open
J1-30	18-1	VIO/BLU	input	Engine control module (engine coolant temperature output)
J1-31	18-1	ORN/GRA	input	Foot pedal position potentiometer (sensor wiper)
J1-32	18-1	RED/YEL	input	S4 Hydraulic filter switch
J1-33	18-1	BRN/BLU	input	S7 Extend scrub level switch
J1-34	18-1	YEL/WHT	output	Relay PCB (ignition inhibit pin #J7-7)
J1-35				Open



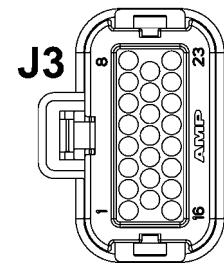
Condor XL J2 Main Control Board Connectors

Pin#	Wire#	Color	Type	Goes to
J2-1	18-1	BLU/GRN	- output	K1 power relay coil
J2-2	18-1	BLK/WHT	- output	S8 side sweep scrub solenoid coil
J2-3	18-1	GRN/VIO	- output	S9 side scrub lift solenoid coil
J2-4	18-1	YEL/BLU	- output	S6 scrub cylinder lock solenoid coil
J2-5	18-1	RED/GRA	- output	S2 squeegee down solenoid coil
J2-6	18-1	BRN/GRN	- output	S3 squeegee up solenoid coil
J2-7	18-1	ORN/BLU	- output	S4 scrub brush solenoid coil
J2-8	18-1	BRN/YEL	- output	S1 vacuum fan solenoid coil
J2-9				Open
J2-10	18-1	BLU/YEL	- output	L11 solenoid valve, right solution
J2-11	18-1	BLU/BLK	- output	H3 back-up alarm (optional)
J2-12	16-1	ORN	+ input	CB4 circuit breaker 20A
J2-13	18-1	WHT/ORN	- output	K4 glow plug relay coil
J2-14				Open
J2-15				Open
J2-16				Open
J2-17	16-2	BLK	- input	X49 control box ground
J2-18	16-3	BLK	- input	X49 control box ground
J2-19				Open
J2-20				Open
J2-21				Open
J2-22	18-1	YEL/GRN	- output	L10 solenoid valve, main solution
J2-23	18-3	GRN/BRN	+ input	CB5 circuit breaker 10A
J2-24	18-1	ORN/RED	- output	S7 scrub pressure proportional solenoid (up)
J2-25				Open
J2-26	18-1	WHT/VIO	- output	S5 scrub pressure proportional solenoid (down)
J2-27				Open
J2-28				Open
J2-29	18-1	GRA/ORN	+ output	X2 throttle input (12V 2200 RPM)
J2-30	18-1	GRA/BLU	+ output	X2 throttle input (12V 2400 RPM)
J2-31	18-1	YEL	+ output	LP6 left front turn lamp
J2-32	18-1	GRN	+ output	LP5 right front turn lamp
J2-33	18-1	ORN/BRN	+ output	LP4 left rear stop/turn lamp
J2-34	18-1	YEL/RED	+ output	LP3 right rear stop/turn lamp
J2-35	18-2	GRA/ORN	+ output	M6 extended scrub pump



Condor XL J3 Main Control Board Connectors

Pin#	Wire#	Color	Type	Goes to
J3-1	16-2	GRA/RED	+ input	CB1 Circuit Breaker, 20A
J3-2	16-1	GRN/BLU	- output	M4 solution pump
J3-3				Open
J3-4	16-1	BLU/BRN	output	M7 side broom actuator extend (red wire)
J3-5	16-1	WHT/RED	output	M7 side broom actuator retract (black wire)
J3-6				Open
J3-7	16-1	GRA/VIO		M7 side broom actuator common (white wire)
J3-8	16-6	BRN	+ output	LP2 left and right headlights and taillights
J3-9	16-1	GRA/RED	+ input	CB1 Circuit Breaker, 20A
J3-10				Open
J3-11	16-4	BLK	- input	X49 control box ground
J3-12	16-5	BLK	- input	X49 control box ground
J3-13	16-6	BLK	- input	X49 control box ground
J3-14	16-3	BLU	+ input	CB2 Circuit Breaker, 20A
J3-15	16-2	BLU	+ input	CB2 Circuit Breaker, 20A
J3-16	18-1	VIO	+ input	CB3 Circuit Breaker, 15A
J3-17	18-1	WHT/YEL	+ output	horn
J3-18	16-1	YEL/BLK	- output	M5 mist pump
J3-19	18-1	BLK/RED	- output	M11 chemical pump 2 (AXP)
J3-20	18-1	BLK/YEL	+ output	M11 chemical pump 2 (AXP)
J3-21	18-1	RED/BLU	- output	M10 chemical pump 1 (AXP)
J3-22	18-1	RED/WHT	+ output	M10 chemical pump 1 (AXP)
J3-23	16-1	BLU/RED	- output	M8 wand pump



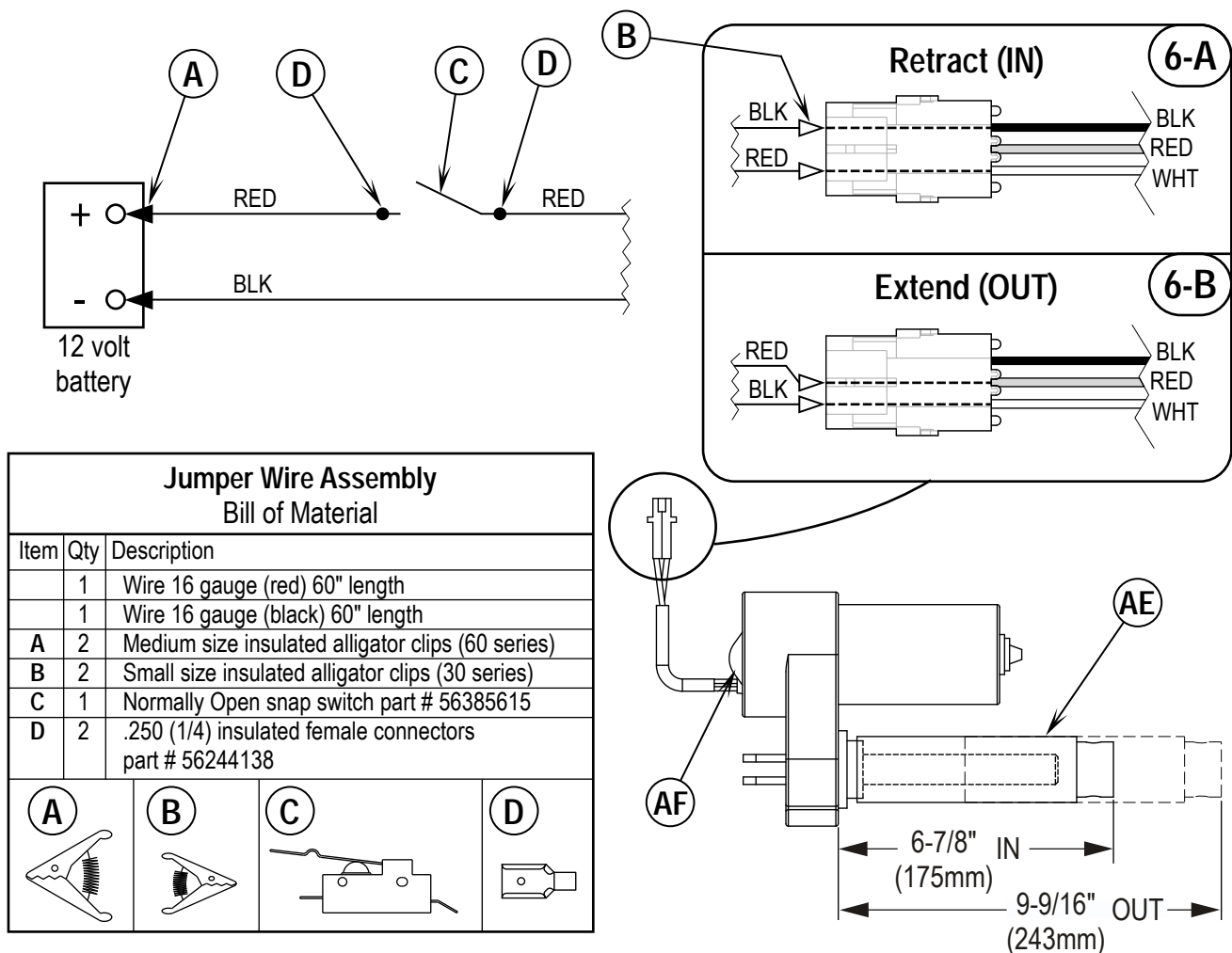
ADJUSTMENTS/REPAIRS

SIDE BROOM LIFT ACTUATOR MOTOR ADJUSTMENT

- See Figure 7. This shows the jumper wiring needed to connect the machine battery to the three-wire connector on the actuator.
Note: Reference the bill of materials for building the two jumper wires. **Important Service Note:** The power cord adapter (p/n 56407502) normally used on all other two-wire actuator motors should not be used.
- See Figures 7-A and 7-B. The wiring diagram illustrates the correct battery polarity (+ and -) power inputs to operate the actuator motor for both extending and retracting the drive nut.
- See Figure 7-A. Connect the jumper wiring as shown to run the actuator motor in the retracted (IN) mode.
- Hold the drive nut tube (AE) and press the switch to run the drive nut toward the motor housing (it's IN limit).
- Measure the position of the drive nut on the actuator shaft, then compare it to the retracted dimension specification shown in Figure 7. Manually turn the steel drive nut tube to match the IN position shown.
- See Figure 7-B. Connect the jumper wiring to run the actuator motor in the extended (OUT) mode.
- Hold the drive nut tube (AE) and press the switch to run the drive motor to the out position waiting for the motor to stop (reaching its Out limit).
- Measure the position of the drive nut on the actuator shaft and compare the measurement with the OUT position shown in Figure 7.
- If the measurement doesn't match the dimension shown, it will be necessary to remove the large rubber Adjuster Cover (AF). **Note:** Use a 1/2" (13mm) socket to turn the outside hex adjuster. Each click of the top adjuster (cam) will change the nut travel 1/16" (1.6mm). To extend the travel of the drive nut, turn the adjuster clockwise. To retract the travel of the nut, turn the adjuster counterclockwise.
- After each adjustment, hold the drive nut tube, run the actuator IN and OUT and check both dimensions. **Note:** When checking the directional travel dimensions remember to change the connections (battery polarity) of the jumper wires.
- Check that the drive nut limits are set correctly, then reinstall the Adjuster Cover (AF).

Service Tip: Leave the correctly-adjusted actuator motor in the out (extended) position when you reinstall the motor.

FIGURE 7



ADJUSTMENTS/REPAIRS

BRAKE TENSION ADJUSTMENT

- 1 See Figure 8. Remove the Floor Weldment to access the Rod End (A).
- 2 Remove the Nyloc® Nut (B) and remove the Rod End (A) from the Brake Pedal Assembly.
- 3 Loosen the Jam Nut (C) and rotate the Rod End (A) in the appropriate direction to adjust the brake tension.
- 4 When the brake tension has been adjusted, tighten the Jam Nut (C).
- 5 Reinstall the Rod End (A) into the Brake Pedal Assembly, then reinstall and tighten the Nyloc® Nut (B).
- 6 Check the brake tension as follows:
 - a. Jack up the rear of the machine to get the rear wheels off of the ground.



CAUTION!

Make sure to follow the instructions in the JACKING THE MACHINE section. Jack the machine at the designated locations only.

- b. Manually rotate the rear wheels to check the brake tension. The tension is set correctly when the wheels cannot be rotated with the parking brake applied to three “clicks”, but will rotate freely when the parking brake is off.
 - c. Readjust the brake tension as necessary following steps 2 through 5 above.
- 7 When the brake tension is adjusted correctly, lower the machine and reinstall the Floor Weldment.

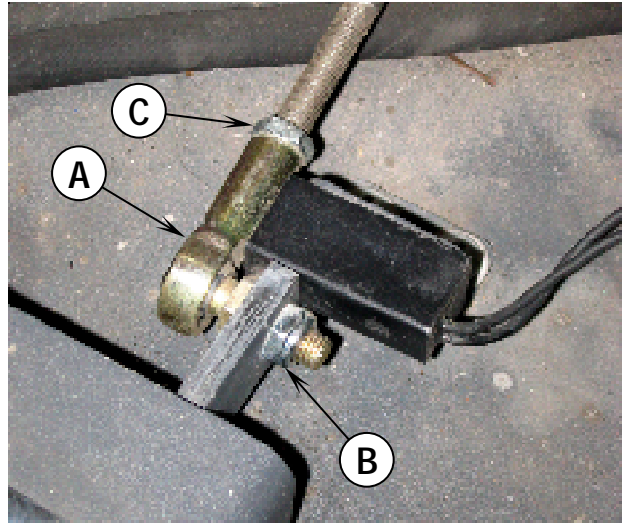


FIGURE 8

FOOT PEDAL/HYDROBACK SYSTEM OVERVIEW

See Figure 9. A Hydroback centering unit (D), installed between the Push/Pull Control Cable (A) and the drive Piston Pump Lever Weldment (E), returns the pedal and Piston Pump (G) to the neutral position when the pedal is released. A rotary potentiometer, called the Rotary Sensor (F), is attached to the Piston Pump, and the resistance through the Rotary Sensor will vary with the position of the Piston Pump Lever Weldment. When the engine is started, the Control Board (Driver Box) checks the Rotary Sensor resistance to confirm that the drive pedal and Piston Pump are in the neutral position before the engine can be started. This is to prevent the machine from moving forward or backward when the engine is first started, or unless the drive pedal is depressed.

The resistance that the Control Board must see through the Rotary Sensor in order to allow the engine to be started is defined as a nominal resistance, plus or minus a percentage of the nominal resistance. This resistance range is referred to as the neutral “deadband.” If the Control Board fails to see the Rotary Sensor resistance in the deadband, it will send a “start-inhibit” signal to the Relay PCB which will prevent the engine from starting.

Once the engine is started with the machine in neutral, the Control Board will enable the solution, scrub and vacuum systems once it sees that the resistance through the Rotary Sensor is out of the deadband due to the drive pedal being depressed.

Dependable starting and responsive operation depends on the drive pedal and Piston Pump returning to a repeatable neutral position when the pedal is released.

ADJUSTMENTS/REPAIRS

FOOT PEDAL/HYDROBACK NEUTRAL ADJUSTMENT

Note: When servicing the hydrostatic drive system, always check for any machine creeping (movement) when the machine is in neutral with the engine running. The machine must not move either forward or reverse after the drive pedal is released. If machine creeps in neutral, or if you replace the Hydroback, pedal cable or Rotary Sensor, you will need to set the hydrostatic drive neutral position, then recalibrate the neutral deadband setting.

- 1 Empty and remove the recovery tank to access the Hydroback Adjuster Plate (I).

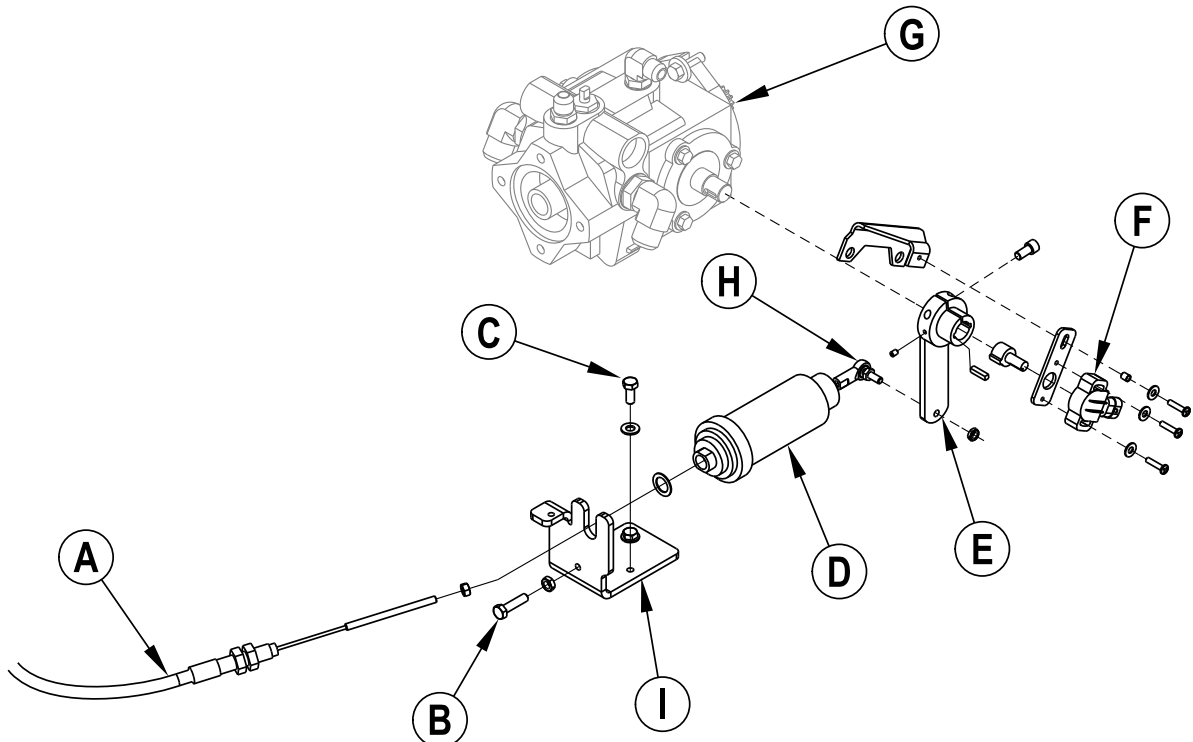


CAUTION!

Make sure to follow the instructions in the JACKING THE MACHINE section. Jack the machine at the designated locations only.

- 2 Block the rear wheels.
- 3 Jack up the front of the machine until the front drive wheel is off the floor.
- 4 Place supports at the front corners of the machine.
- 5 Start the engine and observe the direction of the drive wheel rotation.
- 6 Loosen the two 5/16"-18 hex head screws (C) holding the Adjuster Plate to the chassis.
- 7 See Figure 9. Loosen the jam nut and turn the Adjustment Screw (B) clockwise or counterclockwise to move the Adjuster Plate and Hydroback unit (D) as required to stop any wheel movement. The Piston Pump Lever Weldment (E) on the Piston Pump (G) is now in the neutral position.
- 8 Tighten the two 5/16"-18 hex head screws to secure the Adjuster Plate to the chassis.
- 9 Tighten the jam nut on the Adjustment Screw.
- 10 Test the neutral adjustment by activating the drive pedal in both forward and reverse, then letting the drive pedal return to the neutral position. Readjust the Adjuster Plate neutral position if the neutral setting is not repeatable. If you can't get a repeatable neutral position, replace the Hydroback unit and/or Push/Pull Control Cable (A) as necessary.
- 11 Check the maximum forward and reverse wheel speeds and adjust the pedal stops as necessary. Refer to the GENERAL HYDRAULIC SPECIFICATIONS TABLE in the HYDRAULIC SYSTEM section for nominal wheel speeds.
- 12 Turn the engine off, then see if it will restart. If engine will not start, the Rotary Sensor (F) is probably out of its neutral (deadband) range and needs to be recalibrated. See the FOOT PEDAL NEUTRAL/DEADBAND ADJUSTMENT section for programming instructions.
- 13 Lower the machine and reinstall the recovery tank.

FIGURE 9



ADJUSTMENTS/REPAIRS

PUSH/PULL CONTROL CABLE REPLACEMENT

- 1 Lower the side broom(s).
- 2 Empty and remove the recovery tank.



CAUTION!

Make sure to follow the instructions in the JACKING THE MACHINE section. Jack the machine at the designated locations only.

- 3 Block the rear wheels.
- 4 Jack up the front of the machine. This will make it easier to access the Push/Pull Control Cable **(A)** and mounting hardware by the foot pedal assembly.
- 5 From underneath the machine, note the position and spacing of the two jam nuts and star washer holding the old Push/Pull Control Cable in the mounting fork by the drive pedal. Loosen the jam nuts and remove the Cable from the mounting fork.
- 6 Disconnect the rod end on the old Cable from the foot pedal assembly.
- 7 Loosen the locknut, then remove the rod end and locknut from the Cable.
- 8 Remove the two jam nuts and star washer from the old Push/Pull Control Cable. (This will make it easier to remove the old Cable from the machine.)
- 9 See Figure 9. Loosen the jam nut holding the old Push/Pull Control Cable and Hydroback in the mounting fork by the Piston Pump **(G)**.
- 10 Disconnect the Rod End **(H)** from the Piston Pump Lever Weldment **(E)**.
- 11 Loosen the locknut, then remove the Rod End and locknut from the old Push/Pull Control Cable.
- 12 Remove the four jam nuts and two star washers from the new Push/Pull Control Cable. (This will make it easier to pull the new Cable through the machine.)

Service Note: To thread the new Push/Pull Control Cable from the foot pedal assembly to the Hydroback, we recommend that you SECURELY attach the new Cable to the old Cable, then carefully pull the new Cable through the old Cable routing path in the machine. This will eliminate a lot of disassembly and reassembly work.

- 13 Once the new Push/Pull Control Cable has been threaded through the machine, disconnect it from the old Cable.
- 14 Reinstall the two jam nuts and star washer onto the pedal end of the Push/Pull Control Cable. Position the jam nuts and star washer in the same location as noted in step 5 above.
- 15 Remove the red plastic thread protector sleeve from the new Push/Pull Control Cable, then install the locknut and rod end onto the new Cable.
- 16 Reinstall the rod end into the foot pedal assembly.
- 17 Position the new Push/Pull Control Cable into the mounting fork by the drive pedal. Make sure the star washer is located on the rear side of the mounting fork, then tighten the two jam nuts.
- 18 Reinstall one jam nut and a star washer onto the Hydroback end of the new Push/Pull Control Cable. (Only one jam nut is needed to fasten the Cable and Hydroback to the rear mounting fork.)
- 19 Remove the red plastic thread protector sleeve from the new Push/Pull Control Cable, then install the Cable into the Hydroback. Note that the smaller end of the Cable will thread through the rear of the Hydroback, and the larger threads on the outside of the Cable will thread directly into the front of the Hydroback.
- 20 Install the locknut and Rod End onto the new Push/Pull Control Cable.
- 21 Reinstall the Rod End into the Piston Pump Lever Weldment.
- 22 Position the Push/Pull Control Cable and attached Hydroback into the mounting fork by the Piston Pump. Make sure the star washer is located on the rear side of the mounting fork and contacts the front of the Hydroback, then tighten the jam nut.
- 23 After installing a new Push/Pull Control Cable, set the foot pedal/Hydroback neutral position according to the instructions in the FOOT PEDAL/HYDROBACK NEUTRAL ADJUSTMENT section.

ADJUSTMENTS/REPAIRS

HYDROBACK REPLACEMENT

- 1 Empty and remove the recovery tank.
- 2 **See Figure 9.** Loosen the jam nut holding the Push/Pull Control Cable (**A**) and Hydroback (**D**) in the mounting fork by the Piston Pump (**G**).
- 3 Disconnect the Rod End (**H**) from the Piston Pump Lever Weldment (**E**).
- 4 Loosen the locknut and remove the Rod End and locknut from the Push/Pull Control Cable.
- 5 Remove (unscrew) the old Hydroback from the Push/Pull Control Cable.
- 6 Install the new Hydroback unit onto the Cable. Note that the smaller end of the Cable will thread through the rear of the Hydroback and the larger threads on the outside of the Cable will thread directly into the front of the Hydroback.
- 7 Reinstall the locknut and Rod End onto the Push/Pull Control Cable.
- 8 Reinstall the Rod End into the Piston Pump Lever Weldment.
- 9 Position the Push/Pull Control Cable and attached Hydroback into the mounting fork by the Piston Pump. Make sure the star washer is located on the rear side of the mounting fork and contacts the front of the Hydroback, then tighten the jam nut.
- 10 After installing a new Hydroback unit, set the foot pedal/Hydroback neutral position according to the instructions in the FOOT PEDAL/HYDROBACK NEUTRAL ADJUSTMENT section.

FOOT PEDAL NEUTRAL DEADBAND ADJUSTMENT

The resistance through the Rotary Sensor (rotary potentiometer) attached to the hydrostatic Piston Pump linkage will vary with the position of the linkage. The Control Board must see the resistance through the Rotary Sensor within a particular range, called the neutral "deadband", to confirm the Piston Pump is in neutral before the Board will allow the engine to start.

Once the engine is started, depressing the drive pedal moves the Rotary Sensor out of the deadband range. When the Control Board sees the resistance from the Rotary Sensor out of the deadband range, it activates the various scrub/sweep functions.

Whenever you change or repair the drive pedal linkage components or the hydrostatic unit, or if you replace the Rotary Sensor or Control Board, you will have to recalibrate the neutral deadband position and set the sensitivity.

- 1 Depress the foot pedal to full reverse position, then allow the pedal to slowly return to its neutral position. Do not move the pedal during the remainder of this procedure.
 - 2 Press and hold the Engine Speed Switch (**51**), then turn the ignition Key Switch (**50**) to the run (on) position. Continue to hold the Engine Speed Switch until all the display panel lights turn off (approximately three seconds), then release the Switch.
 - The first line of the LCD display will read "PEDAL CALIBRATION".
 - The second line of the display will read "Place Pedal in Neutral" with an arrow to the left of the line.
 - The third line of the display will read "Neutral Deadband".
 - 3 Press the green Scrub ON Switch (**54**).
 - The first line of the LCD display will read "Neutral Set".
 - The second line of the display will show the resistance value, in ohms, that the Control Board is reading through the Rotary Sensor. Note that it's normal for this value to drift a little.
 - 4 Press the green Scrub ON Switch to set the nominal deadband resistance value. The display will return to the previous menu.
 - 5 Press the Side Broom Down Switch (**53a**) to move the arrow to the left of the "Neutral Deadband" line.
 - 6 Press the green Scrub ON Switch to display the "Neutral Deadband" range menu. The percentages shown are the limits the resistance from the Rotary Sensor can vary from the "Neutral Set" resistance and still be in the deadband range and allow the engine to start.
 - 7 Press the Side Broom Up and Down Switches (**53**) to scroll through the available percentages. Note that 3% is the factory default value.
- Note:** The ideal neutral deadband percentage range is one that allows reliable starting, yet still actuates the scrub functions with minimal pedal travel.
- 8 When the arrow is to the left of the desired percentage value:
 - Press the green Scrub ON Switch. The display will return to the previous menu and the new percentage value will be saved.
 - Press the red Scrub Off Switch to return to the previous menu without changing the percentage value.
 - 9 Turn the ignition key switch to the off position. The new settings will be saved and remain in effect until they are changed again.

ADJUSTMENTS/REPAIRS

SIDE BRUSH TILT ADJUSTMENT

- 1 See Figure 10. Disconnect one of the two Rod Ends from its mounting tab.
- 2 Loosen the Jam Nut.
- 3 Rotate either Rod End to lengthen or shorten the Rod/Rod End assembly as necessary to get the correct brush angle to the floor.

Note: The nominal factory dimension between the Rod End stud centers is 7.5" ± 0.06 " (190.5 mm ± 1.5 mm).

- 4 Make sure the threaded stud on the Rod End will align with the matching hole in the mounting tab, then tighten the Jam Nut.
- 5 Reinstall the Rod End into the mounting tab.
- 6 Run the brush up and down to check for correct brush angle with the floor.
- 7 Repeat steps 1 through 5 above as necessary.

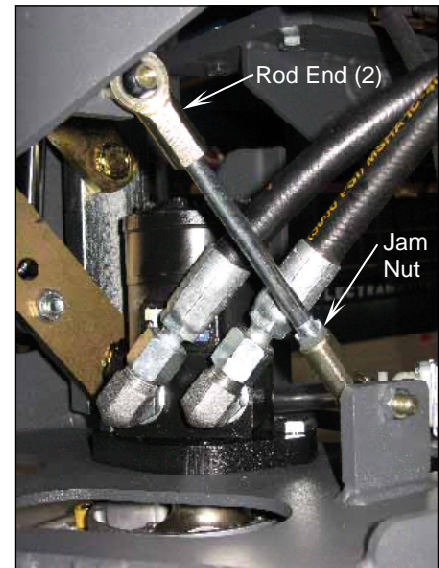


FIGURE 10

TRACTION DRIVE MOTOR HOSE ROUTING

If the traction drive motor or the Hydraulic Hoses to the motor are replaced or repaired, it's important to route the Hoses correctly when reinstalled to prevent wear or damage to the Hoses and surrounding components.

When reinstalling the traction drive motor Hydraulic Hoses:

- 1 Tighten the hoses at the bulkhead fittings on the frame.
- 2 Turn the steering wheel all the way toward the left.
- 3 Make sure the Hoses are routed up and inside the channel in the Drive Wheel Weldment as shown in Figure 11, and flat against the bottom of the Frame as shown in Figure 12 below.
- 4 Twist the Hoses as necessary so they lie flat against the top of the Frame as shown in Figure 12, then tighten the fittings at the traction drive motor.
- 5 Turn the steering wheel all the way toward the left and right several times to make sure the Hoses are not rubbing against the surrounding components.

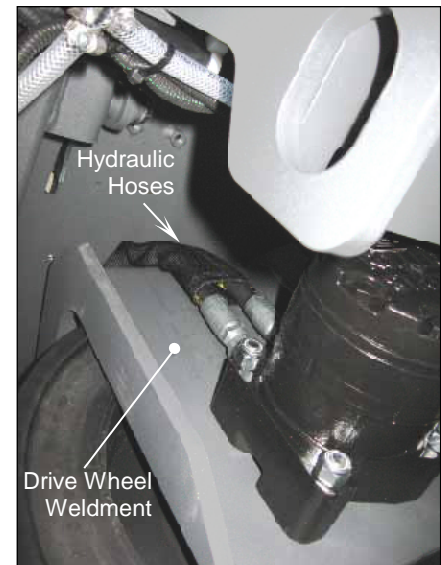


FIGURE 11

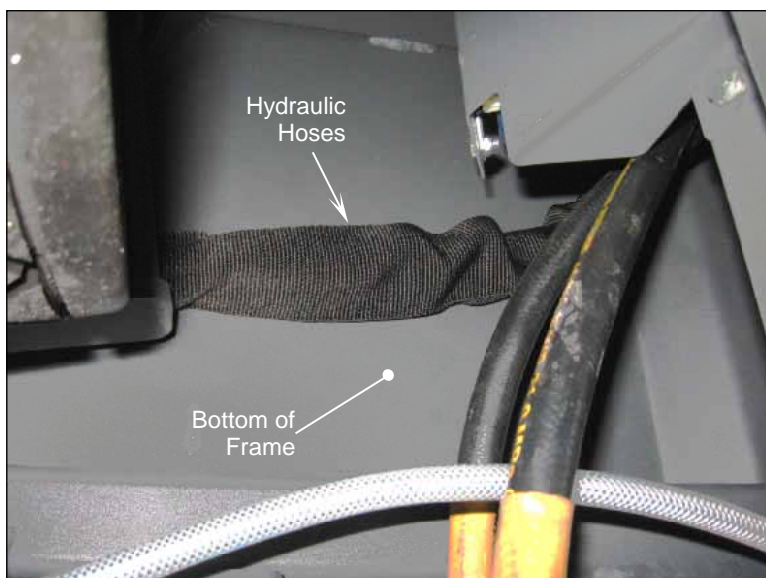


FIGURE 12

GENERAL MACHINE SYMPTOM TROUBLESHOOTING GUIDE TABLE OF CONTENTS

K1 POWER RELAY ON	48
CONNECTOR CALLOUT – ENGINE START RELAY MODULE	49
ENGINE START/RUN RELAY GM.....	50
ENGINE START/RUN RELAY KUBOTA	51
ENGINE SPEED MAGNETIC PICKUP (WOODWARD GOVERNOR).....	52
MAIN SCRUB DECK RIGHT SCRUB DOWN	53
MAIN SCRUB AND SIDE SWEEP/SCRUB ON.....	54
VACUUM FAN ON AND SQUEEGEE DOWN	55
VACUUM FAN OFF AND SQUEEGEE UP	56
MAIN AND RIGHT SIDE SCRUB BRUSH SOLUTION VALVES AND PUMP	57
MAIN AND RIGHT SIDE SCRUB BRUSH(ES) DECK PRESSURE	58
AXP PCB ASSEMBLY	59

ELECTRICAL SYSTEM

CONNECTOR CALLOUT – ENGINE START RELAY MODULE

Pin#	Color	Type	Voltage	Pin Description and Function
J7-1	VIO/ GRA	Input	B+	Module relays load power supply
J7-2	BLU/ PINK	Output	B+	Engine ECU starter relay command
J7-3	WHT/ BRN	Input	0V Floats	Engine start inhibit signal *
J7-4	BLK	Input	B-	Module relays coil ground supply
J7-5	PINK	Output	B+	Engine ECU ignition run relay command
J7-6	VIO/ BRN	Input	B+	Module starter relay Bat +coil signal
J7-7	YEL/ WHT	Input	0V Floats	Engine run inhibit signal **
J7-8	ORN/ GRN	Input	B+	Module ignition relay Bat+ coil signal

*** Note:** The normal condition for the start inhibit is in its non-inhibited state. A float voltage of approximately 8V (when referenced to B-) is measured when the key is in the start position. When inhibited, the signal is pulled to ground, will read 0V and will prevent the engine from cranking. This prevents the starter relay from being energized.

**** Note:** The normal condition for the run inhibit is its non-inhibited state. A float voltage of approximately 10V (when referenced to B-) is measured when the key is in the start/run and run positions. When inhibited, the signal is pulled to ground, will read 0V and will prevent the engine ECU from receiving its needed input switch command. This prevents the ignition system from firing, and if the engine is running will cause it to shut down.

Important: See the list for possible reasons the inhibit functions (start and run) could be active or inhibited.

Possible causes for start inhibit to be active causing the engine not to crank.

- Drive pedal sensor switch R1 not calibrated; follow programming instructions to calibrate foot pedal sensor.
- Drive pedal activated out off neutral (out of the calibrated deadband range):
 - Remove foot from drive pedal.
 - Adjust or repair the Hydroback/cable and/or drive Piston Pump linkage.
- The control panel displays the critical fault icon 62E showing code #38. See the main control board fault code table code 38 TS explanation and the engine section for engine code diagnostics.

Possible causes for run inhibit to be active causing the engine to shut down (stop running).

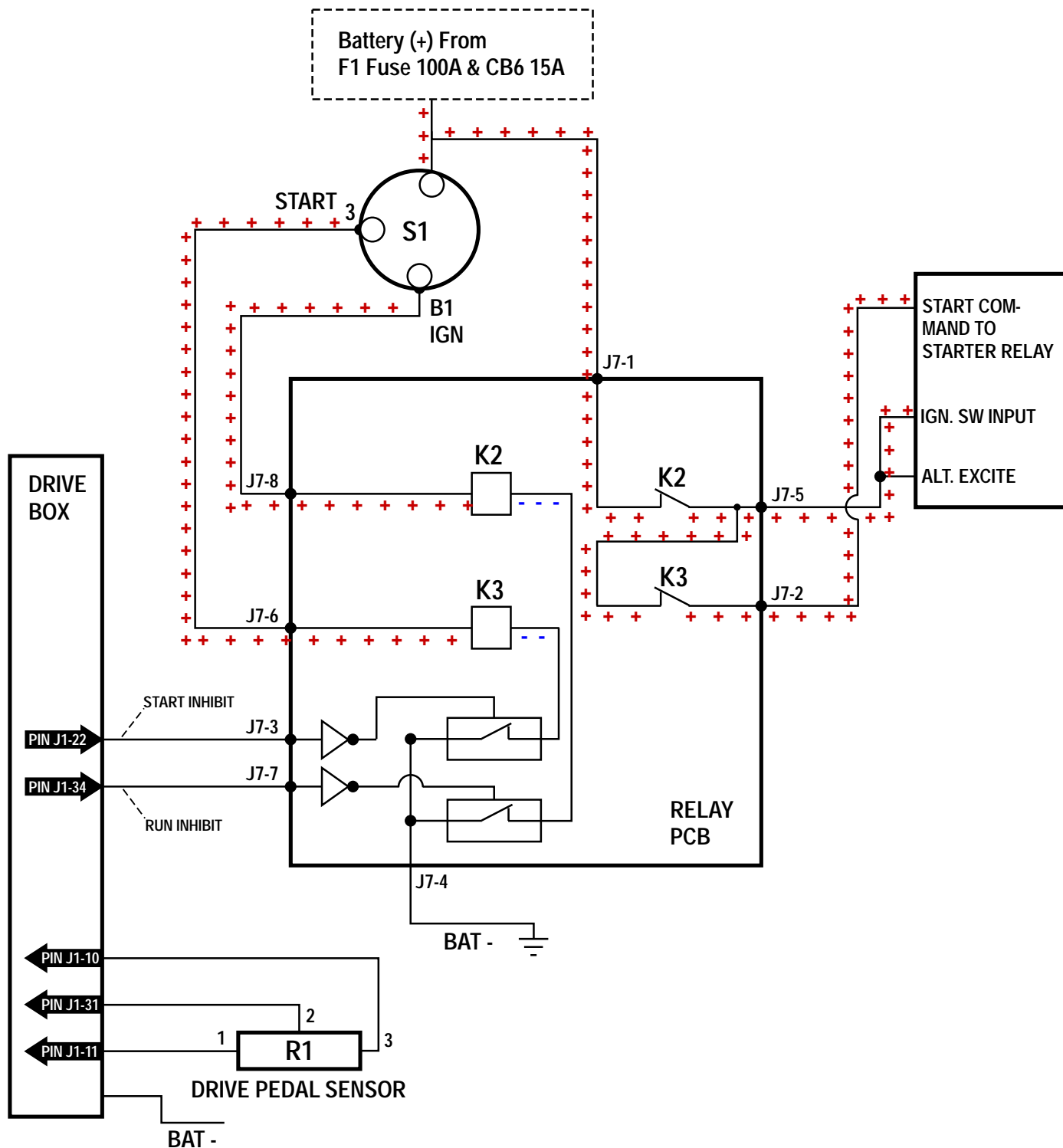
- Loss of the engine run signal input to the main control board Pin # J1-1 (GRA):
 - A good LP/G (GM 1.6L) engine run signal will test 0V when measured (referenced) to B- ground. The run signal is lost when the voltage reads 12V.
 - A good diesel (Kubota) engine run signal will test 12V when measured (referenced) to B- ground. The run signal is lost when the voltage reads 0V.
- The operator control panel displays the critical fault icon 62E showing code #38. See main control board fault code table code 38 TS explanation and the engine section for engine code diagnostics.

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

ENGINE START/RUN RELAY 1.6L GM

Conditions;

- First turn the S1 Key Switch to Start position, then release to its run position.
- Foot pedal in Neutral.



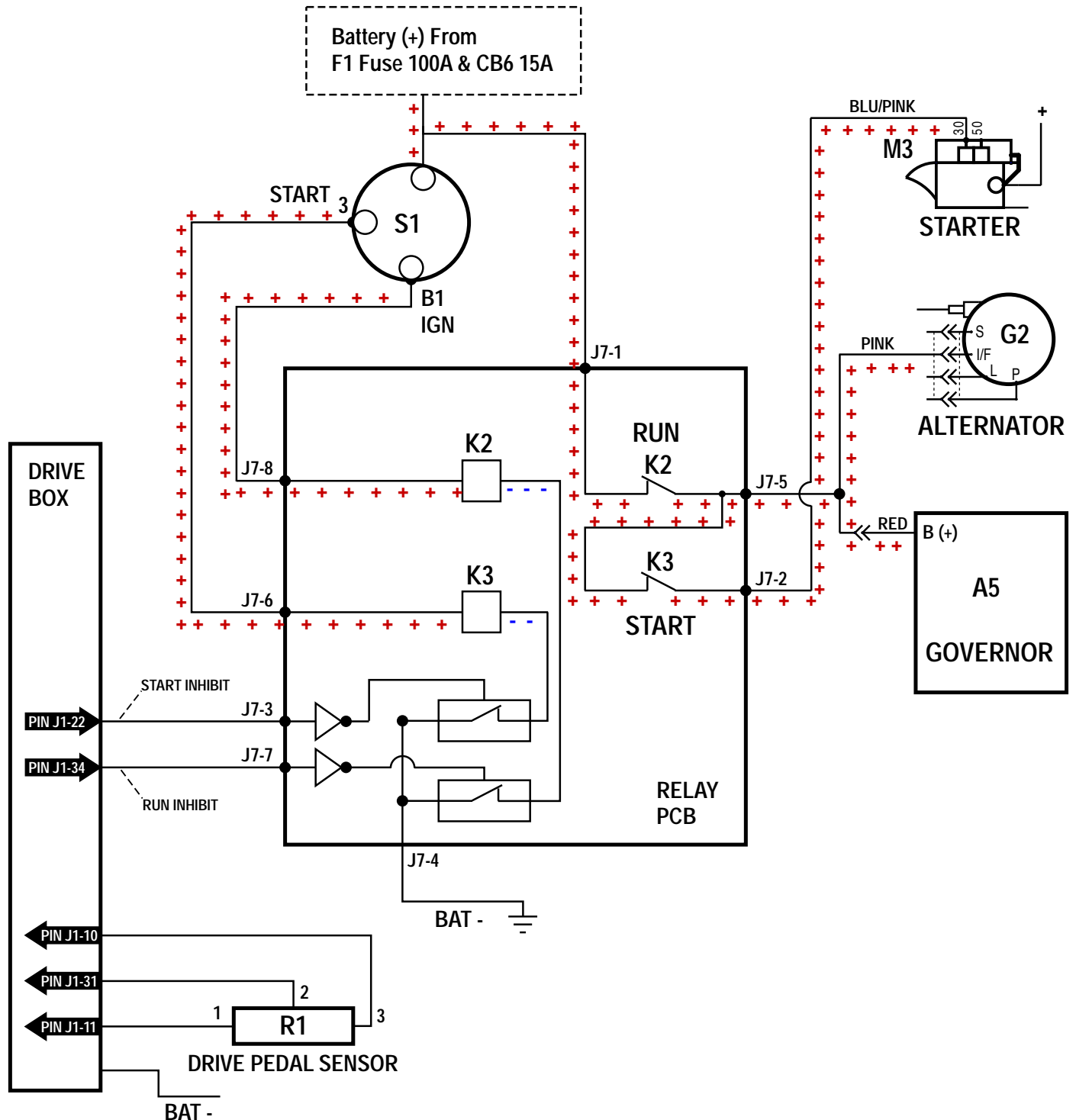
Note: See connector callout page for engine run/start relay module for more details on circuit functions.

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

ENGINE START/RUN RELAY KUBOTA DIESEL

Conditions;

- First turn the key S1 to the run position, the glow plug icon will appear on the operator display panel. Next wait until the glow icon goes out then turn the key to the start position and release to the run position.
- Foot pedal in Neutral

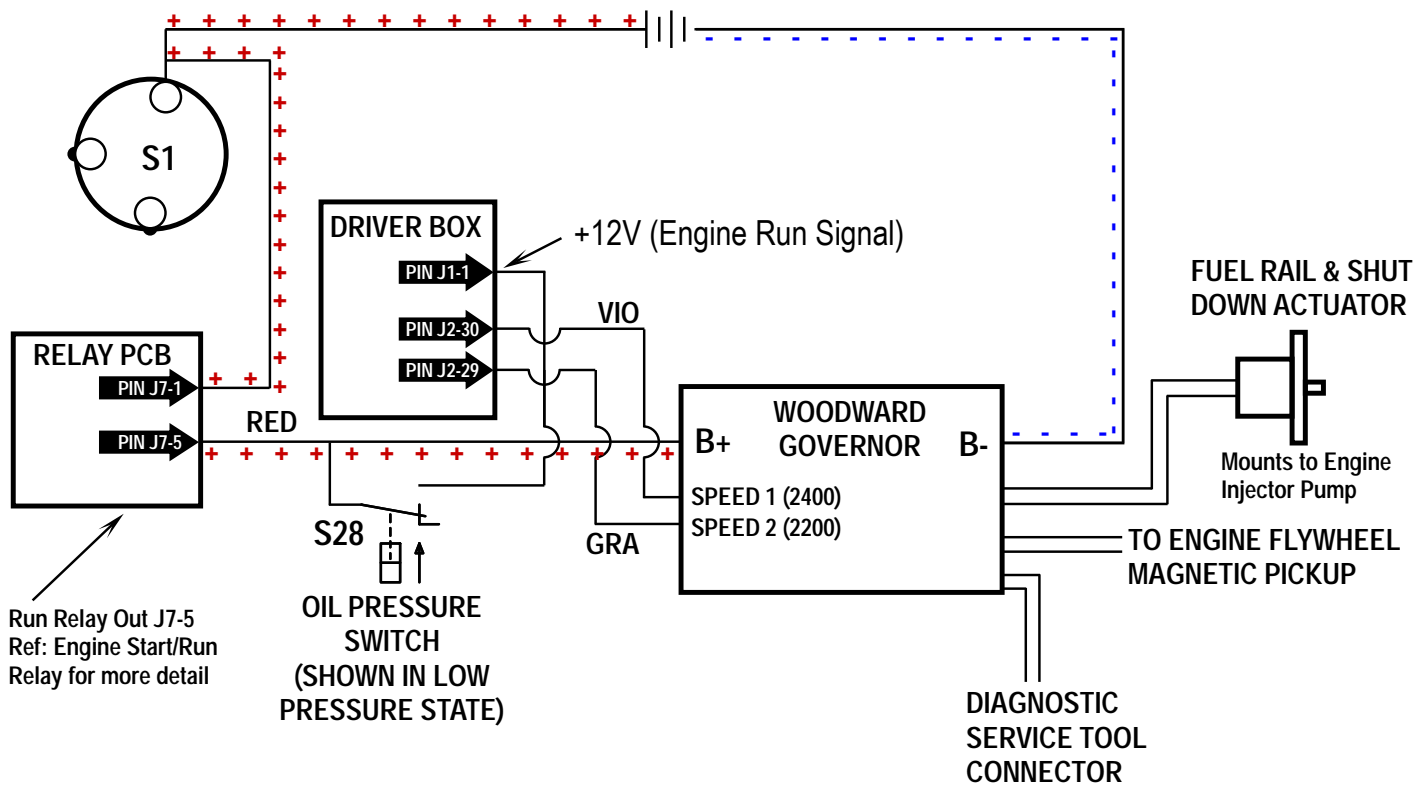


Note: See connector callout page for engine run/start relay module for more details on circuit functions.

ELECTRICAL SYSTEM
TROUBLESHOOTING GUIDE

DIESEL ENGINE WILL NOT RUN @ HIGH SPEED OR TURBO SPEED (KUBOTA)

- Conditions;
- With engine started and running press the engine speed switch. Note: When speed switch indicator light is not on the engine will run at low idle. Press once and indicator will turn green (high speed 2200 rpm), hold switch for more than 2 seconds engine will run at its highest (turbo speed 2400 rpm) speed. Press again the engine will revert back to high speed then again to idle. See additional trouble-shooting notes for control circuit details.



Component	Current Amps	Coil Ohms
Actuator	1-1.5 Amps	3.2 ohms

Pin#	Wire Color	Function	Voltage at 1300 RPM	Voltage at 2200 RPM	Voltage at 2400 RPM
J2-30 on Driver Box	VIO	Input from Driver Box	0	0	+12 VDC
J2-29 on Driver Box	GRA	Input from Driver Box	0	+12 VDC	0

ELECTRICAL SYSTEM

TROUBLESHOOTING NOTES FOR KUBOTA ENGINE SPEED GOVERNING SYSTEM

Problem: Engine will not run @ high speed 2200rpm or turbo speed 2400 rpm settings

Model of governor used: APECS 3000 Mfg. by Woodward (manual # SE-4049). Additional information can be found on their website.

Possible causes

Things to check

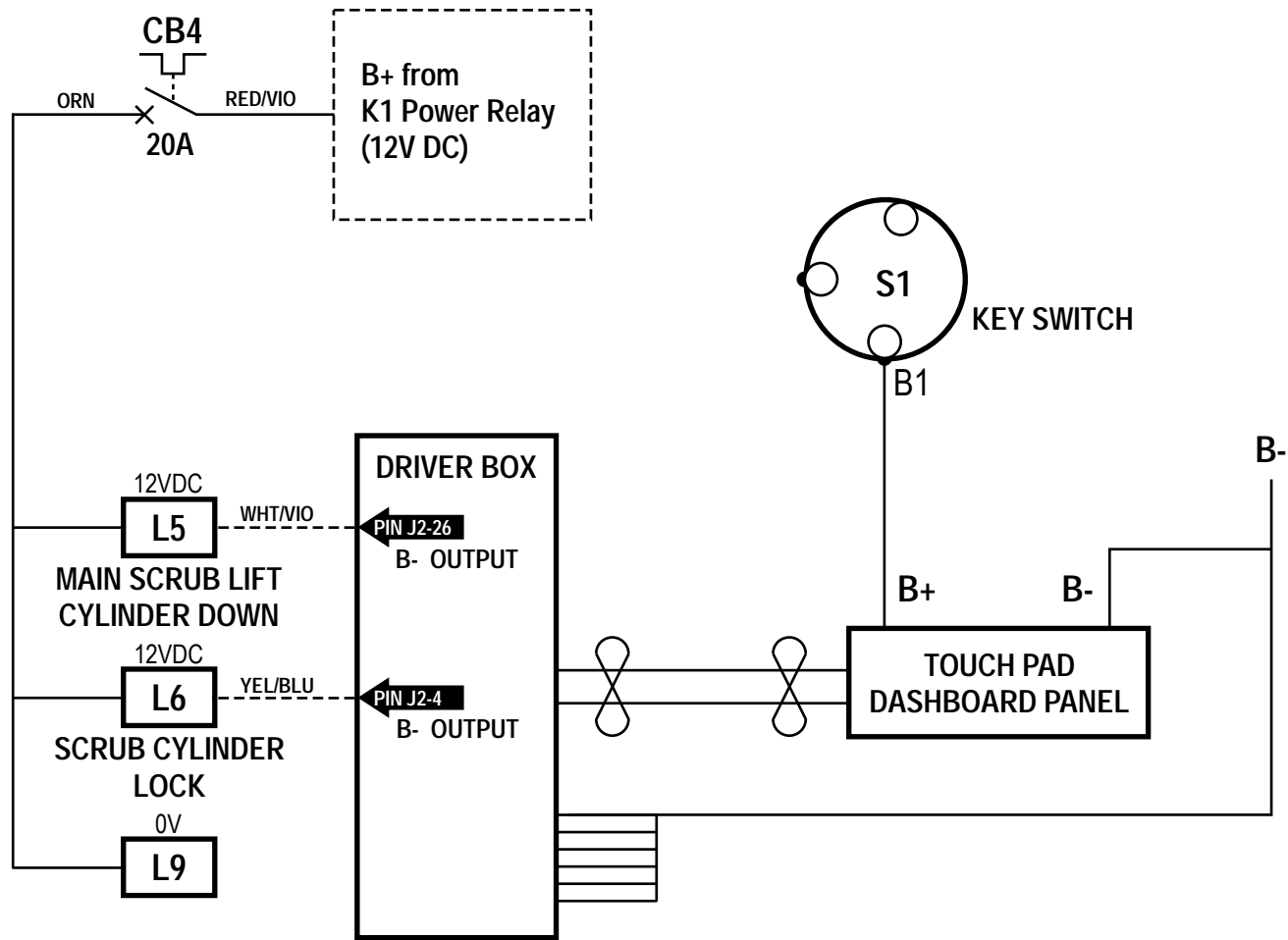
Electrical control circuit

- With key switch ON check for battery voltage at the governor control box (B+ & B-) inputs, correct value 12 VDC.
- Press the engine speed selection button (located on the operator control panel) with engine cranking/running and test for 12VDC @ the governor speed select inputs 1 & 2. See ladder diagram for speed selection voltage relationships.
- If 0 volts check continuity of speed select input wiring from governor to the main controller.
- If wiring check is ok substitute a new main controller (driver box) & dash board panel.
- Check status lamp on governor for fault codes, reference flash code table found on APECS 3000 website.
- Test governor controller actuator out put voltage at different speed selection modes (approx value 3.9 VDC).
- Check continuity of fuel control actuator wiring.
- Test the fuel control actuator for an open circuit (specification is 3.2 Ohms).
- With the engine cranking or running, check the governor magnetic pickup (RPM speed sensor) voltage signal (approx. x VAC).
- Remove and inspect the magnetic speed pickup sensor for damage. When reinstalling, thread sensor in until it makes contact with the fly wheel then back out a ½ turn.

ELECTRICAL SYSTEM
TROUBLESHOOTING GUIDE

MAIN SCRUB DECK and RIGHT SIDE SCRUB DOWN

- Conditions;
- Key ON.
 - Engine running.
 - Scrub ON mode selected



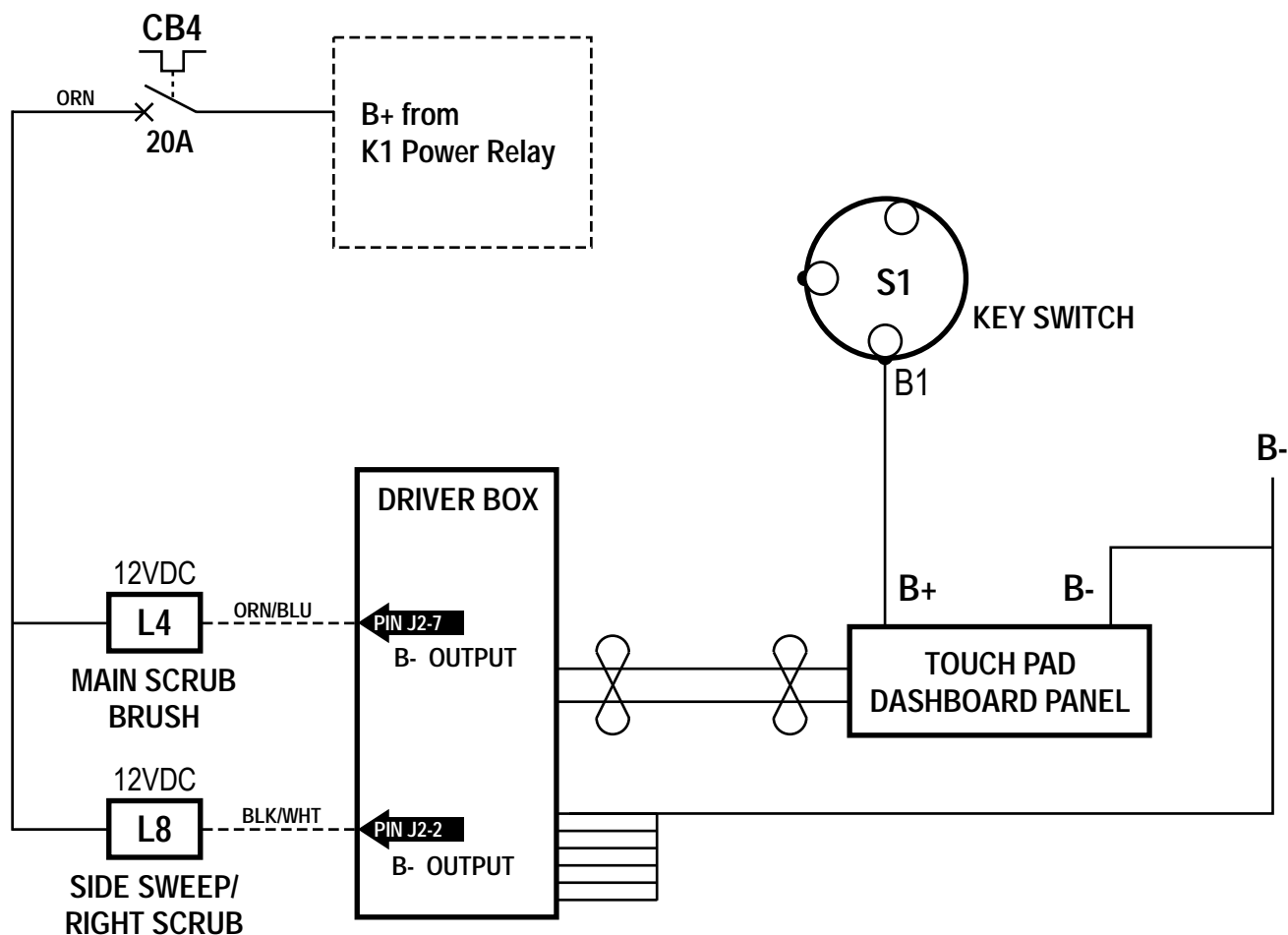
Component	Current Amps	Coil Ohms
L5	2.1 Amps	2.2 ohms
L6	1.5 Amps	8 ohms
L9	1.5 Amps	8 ohms

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

MAIN SCRUB and SIDE SWEEP/SCRUB ON

Conditions;

- Key ON.
- Engine running.
- Scrub ON mode selected.
- Foot pedal activated (out of neutral).

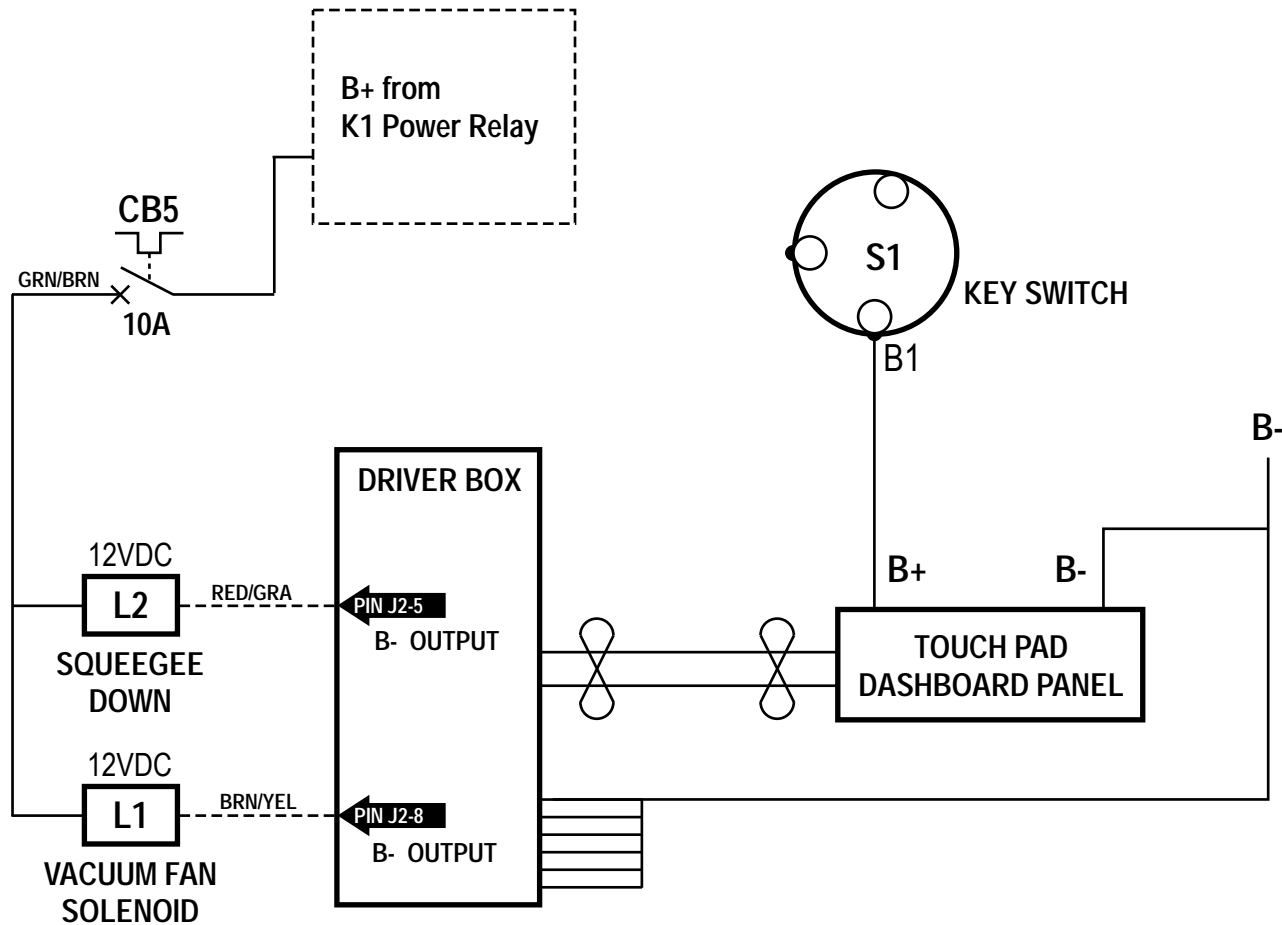


Component	Current Amps	Coil Ohms
L4	1.5 Amps	8 ohms
L8	1.5 Amps	8 ohms

ELECTRICAL SYSTEM
TROUBLESHOOTING GUIDE

VACUUM FAN ON and SQUEEGEE DOWN

- Conditions;
- Key ON
 - Engine running
 - Scrub On Mode selected or vacuum switch selected
 - Foot Pedal activated (out of neutral)



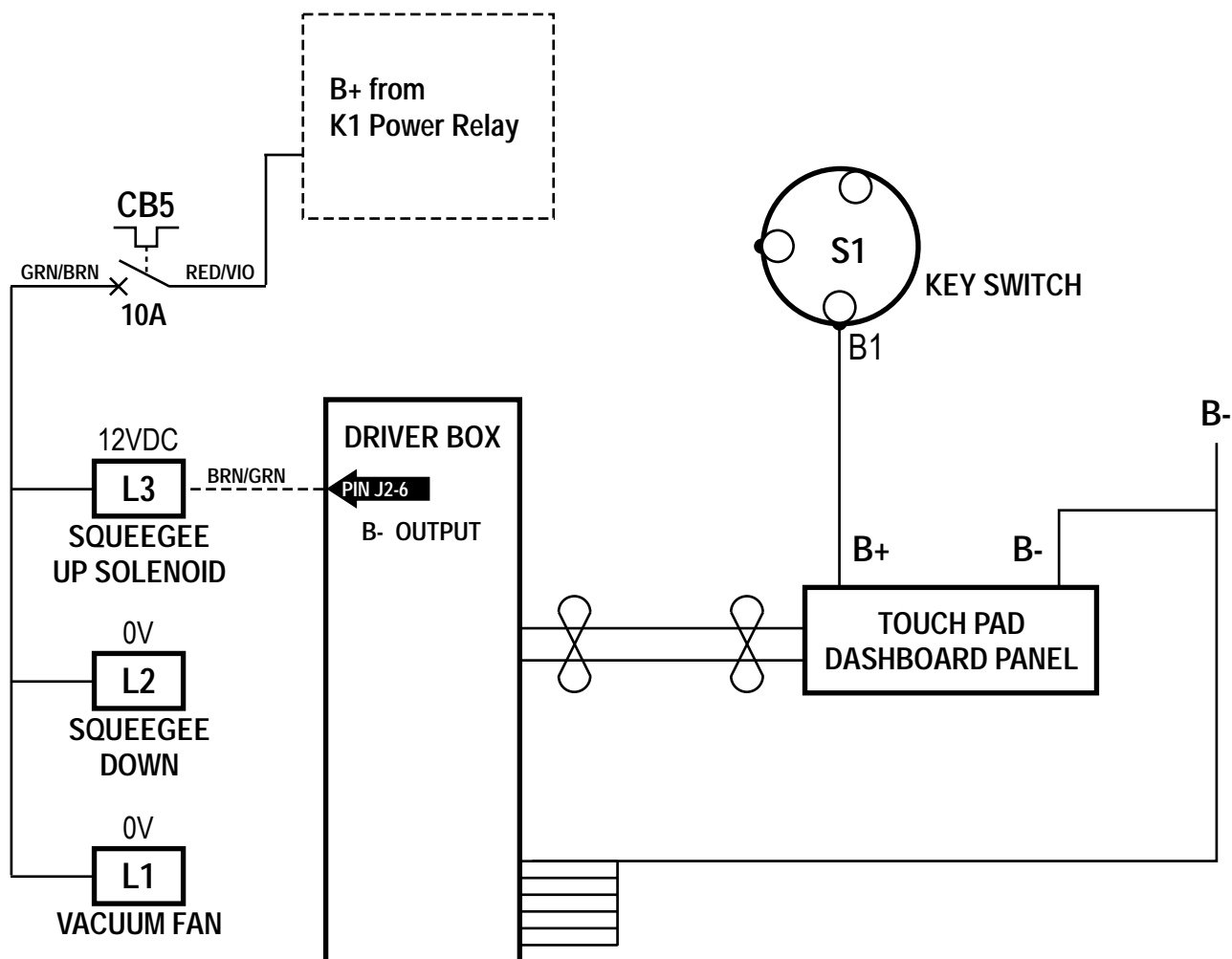
Component	Current Amps	Coil Ohms
L1	1.5 Amps	8 ohms
L2	1.5 Amps	8 ohms

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

VACUUM FAN OFF and SQUEEGEE UP

Conditions;

- Key ON
- Engine running
- Scrub Off Mode selected or vacuum switch turned off
- Foot Pedal placed in reverse squeegee will raise (up)

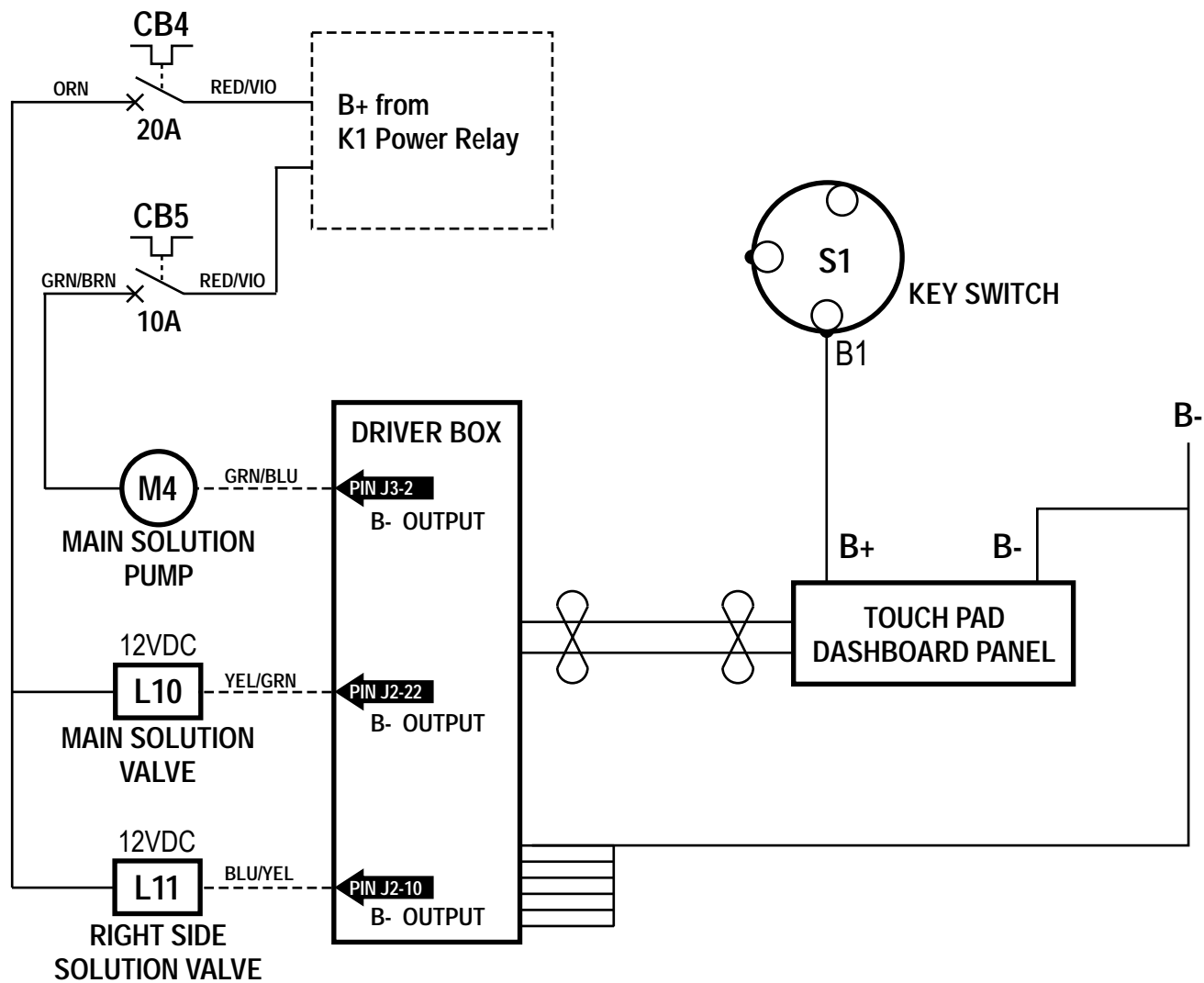


Component	Current Amps	Coil Ohms
L3	1.5 Amps	8 ohms

ELECTRICAL SYSTEM
TROUBLESHOOTING GUIDE

MAIN and RIGHT SIDE SCRUB BRUSH SOLUTION VALVES and PUMP

- Conditions;
- Key ON.
 - Engine running
 - Scrub System ON.
 - Foot Pedal Activated (out of neutral in forward direction)



Component	Current Amps	Coil Ohms
L10	1.5 Amps	8 ohms
L11	1.0 Amps	12 ohms
M4*	11.5 Amps @ FLA	-

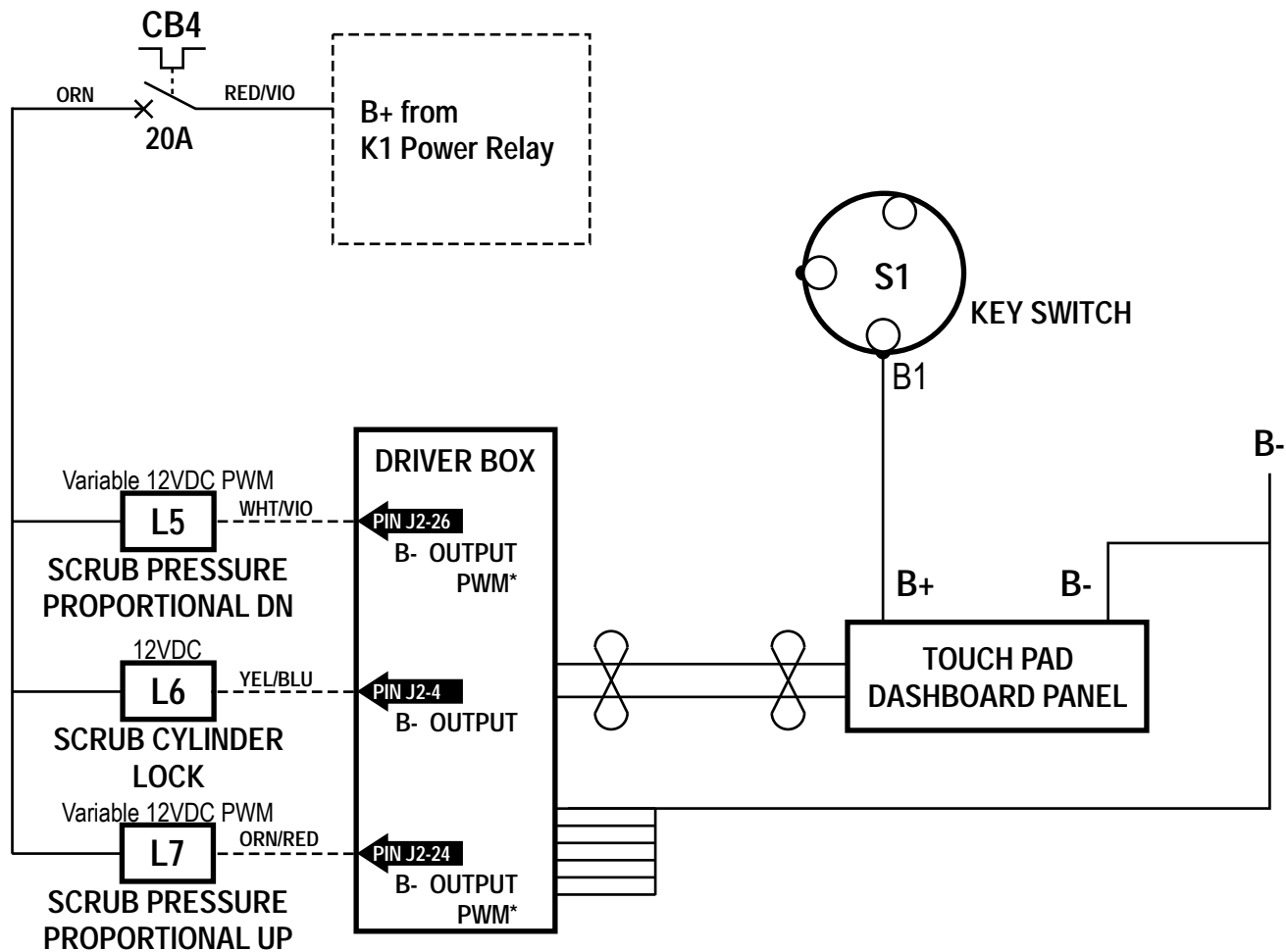
*FLA = Full Load Amps

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

MAIN and RIGHT SIDE SCRUB BRUSH(ES) DECK PRESSURE

Conditions;

- Key ON.
- Engine running.
- Scrub System ON.
- Foot pedal activated (out of neutral).



Component	Current Amps	Coil Ohms
L5	2.1 Amps	2.2 ohms
L6	1.5 Amps	8 ohms
L7	2.1 Amps	2.2 ohms

Pressure Setting	L5 Coil Amp draw readings ($\pm 10\%$)
1	1.38 - 1.75 amps (varies with scrub setting selected)
2	
3	

Pressure Setting	L7 Coil Amp draw readings ($\pm 10\%$)
1	1.45 to 1.75 amps (all three scrub pressure settings)
2	
3	

*PWM = Pulse Width Modulated

ELECTRICAL SYSTEM

TROUBLESHOOTING NOTES FOR SCRUB LIFT CYLINDER OVERVIEW

Problem: Scrub deck pressures will not change inoperative in its three settings

Possible causes

Things to check

Electrical control circuit

- Check coil resistance on both L5 & L7 solenoids (spec 2.2 Ohms).
- Check solenoid wiring continuity from main controller for both L5 & L7
- Using an AMP clamp check both solenoids current draw (Ref. chart for specification).
- Substitute a new main controller (driver box) if solenoid coils and wiring check good but no current is found when activating scrub deck pressure circuit function.
- If electrical control circuits test OK see possible causes for the Hydraulic load circuit problems.

Hydraulic load circuit

- Inspect for binding and any possible mechanical damage to the deck lift cylinder and deck lift linkage.
- Remove the S5 & S7 scrub lift cylinder valve cartridges from its manifold.
 - Inspect, clean and operate the cartridges out side of the manifold if functional reinstall.
- Connect a hydraulic pressure gauge at the test ports TP4 & TP5 and check system operating pressures (see chart for specifications).
- If after replacement of a valve cartridge(s) and the deck pressures still do not function correctly, replace the hydraulic lift cylinder.

ELECTRICAL SYSTEM TROUBLESHOOTING GUIDE

AXP PCB ASSEMBLY

- The signal controlling the chemical pump is extremely complex and field troubleshooting should take a functional approach. Substitute with a known good chemical pump to check operation. If the known good pump does not operate, and the wiring and control inputs to the AXP system are correct, the main controller Driver Box is probably defective. Check the resistance of the chemical pump before replacing the main controller Driver Box so as not to damage it if the pump is defective.
- The Solution Pump (-) line provides a switched ground return for the pump. When the solution pump is "ON" a 7.8KHz signal with a varying duty cycle and average voltage will appear between this pin and B+. Measuring with a DC voltmeter will give a signal in the range of 0 to 12 volts. Changing the flow rate solution bars on the LCD should produce a relative increase or decrease of the meter reading.

ELECTRICAL SYSTEM

CONTROL BOARD PROGRAMMING OPTIONS

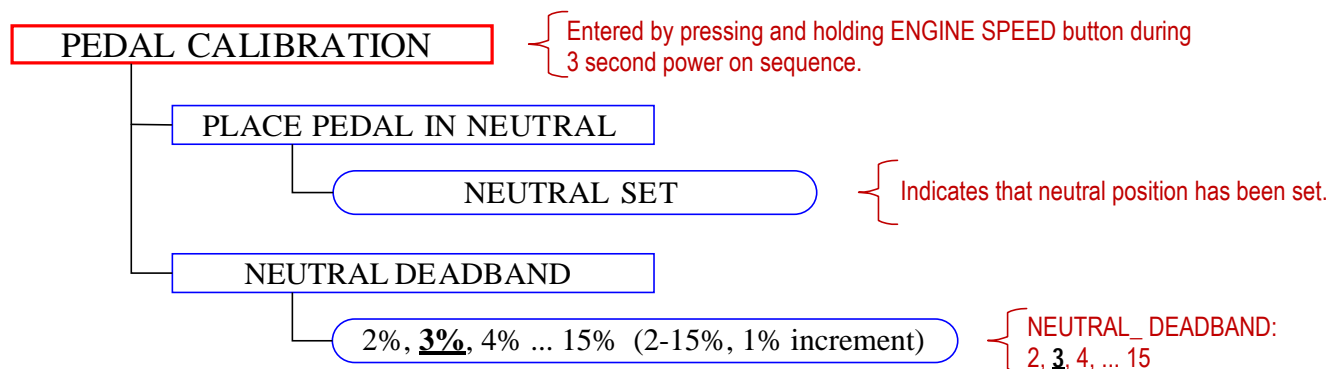
Foot Pedal Neutral Position and Deadband Adjustment

FACTORY DEFAULT: 3%

RANGE: 2% - 15%

Whenever you change or repair the drive pedal linkage components or the hydrostatic unit, or if you replace the Rotary Sensor or Control Board, you will have to recalibrate the neutral deadband position and set the sensitivity as follows:

- 1 Depress the foot pedal to full reverse position, then allow the pedal to slowly return to its neutral position. Do not move the pedal during the remainder of this procedure.
 - 2 Press and hold the Engine Speed switch (51), then turn the ignition Key Switch (50) to the run (on) position. Continue to hold the Engine Speed switch until all the display panel lights turn off (approximately three seconds), then release the switch.
 - The first line of the LCD display will read "PEDAL CALIBRATION".
 - The second line of the display will read "Place Pedal in Neutral" with an arrow to the left of the line.
 - The third line of the display will read "Neutral Deadband".
 - 3 Press the green Scrub ON Switch (54).
 - The first line of the LCD display will read "Neutral Set".
 - The second line of the display will show the resistance value, in ohms, that the Control Board is reading through the Rotary Sensor. Note that it's normal for this value to drift a little.
 - 4 Press the green Scrub ON Switch to set the nominal deadband resistance value. The display will return to the previous menu.
 - 5 Press the Side Broom Down Switch (53a) to move the arrow to the left of the "Neutral Deadband" line.
 - 6 Press the green Scrub ON Switch to display the "Neutral Deadband" range menu. The percentages shown are the limits the resistance from the Rotary Sensor can vary from the "Neutral Set" (nominal) resistance and still be in the deadband range and allow the engine to start.
 - 7 Press the Side Broom Up and Down Switches (53) to scroll through the available percentages.
- Note:** The ideal neutral deadband percentage range is one that allows reliable starting, yet still actuates the scrub functions with minimal pedal travel. The factory default value is 3%.
- 8 When the arrow is to the left of the desired percentage value:
 - Press the green Scrub ON Switch to save the new percentage value. The display will return to the previous menu.
 - Press the red Scrub Off Switch to return to the previous menu without changing the percentage value.
 - 9 Turn the ignition key switch to the off position. The new settings will be saved and remain in effect until they are changed again.



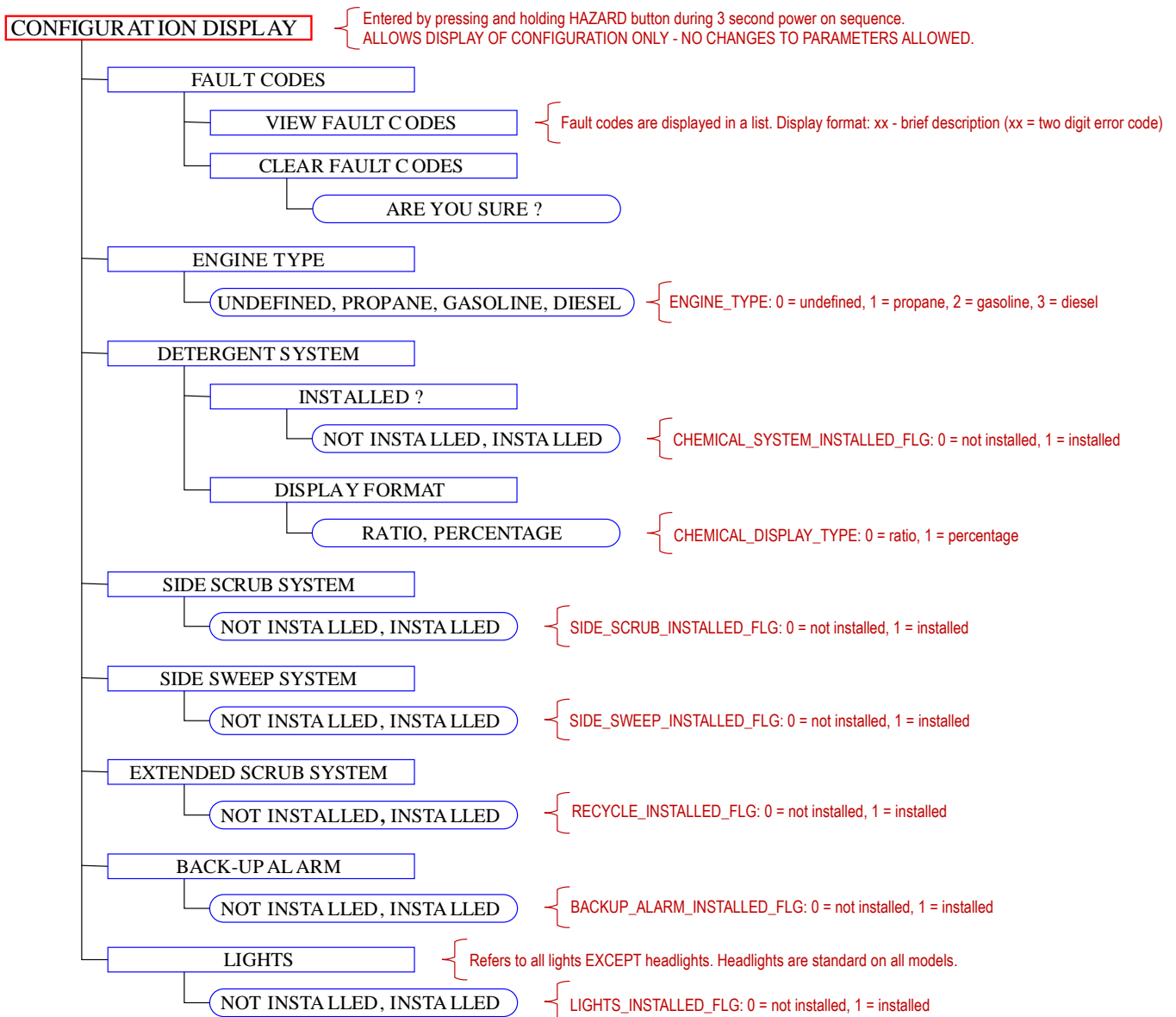
ELECTRICAL SYSTEM

CONTROL BOARD PROGRAMMING OPTIONS

Configuration Display Menu

Note: The Configuration Display will only display the active configured settings and fault codes. You cannot make any changes to the machine configuration from the Configuration Display other than clearing the fault codes. See the **Configuration Menu** section for instructions on how to change the machine configuration.

- 1 Press and hold the Emergency Flashers switch (67).
- 2 Turn the ignition Key Switch (50) to the run (on) position.
- 3 Continue to hold the Emergency Flashers switch until all the display panel lights turn off (approximately three seconds), then release the switch. The first line of the LCD display will read "CONFIGURATION DISPLAY".
- 4 Press the Side Broom Up (53b) and Side Broom Down (53a) switches to scroll through the display menu items as shown in the chart below.
- 5 When the arrow is pointing to a menu item:
 - a. Press the green Scrub On switch (54) to display the next level of menu items.
 - b. Press the red Scrub Off switch (55) to return to the previous menu level.
- 6 To exit the Configuration Display, turn the ignition Key Switch to the off position.

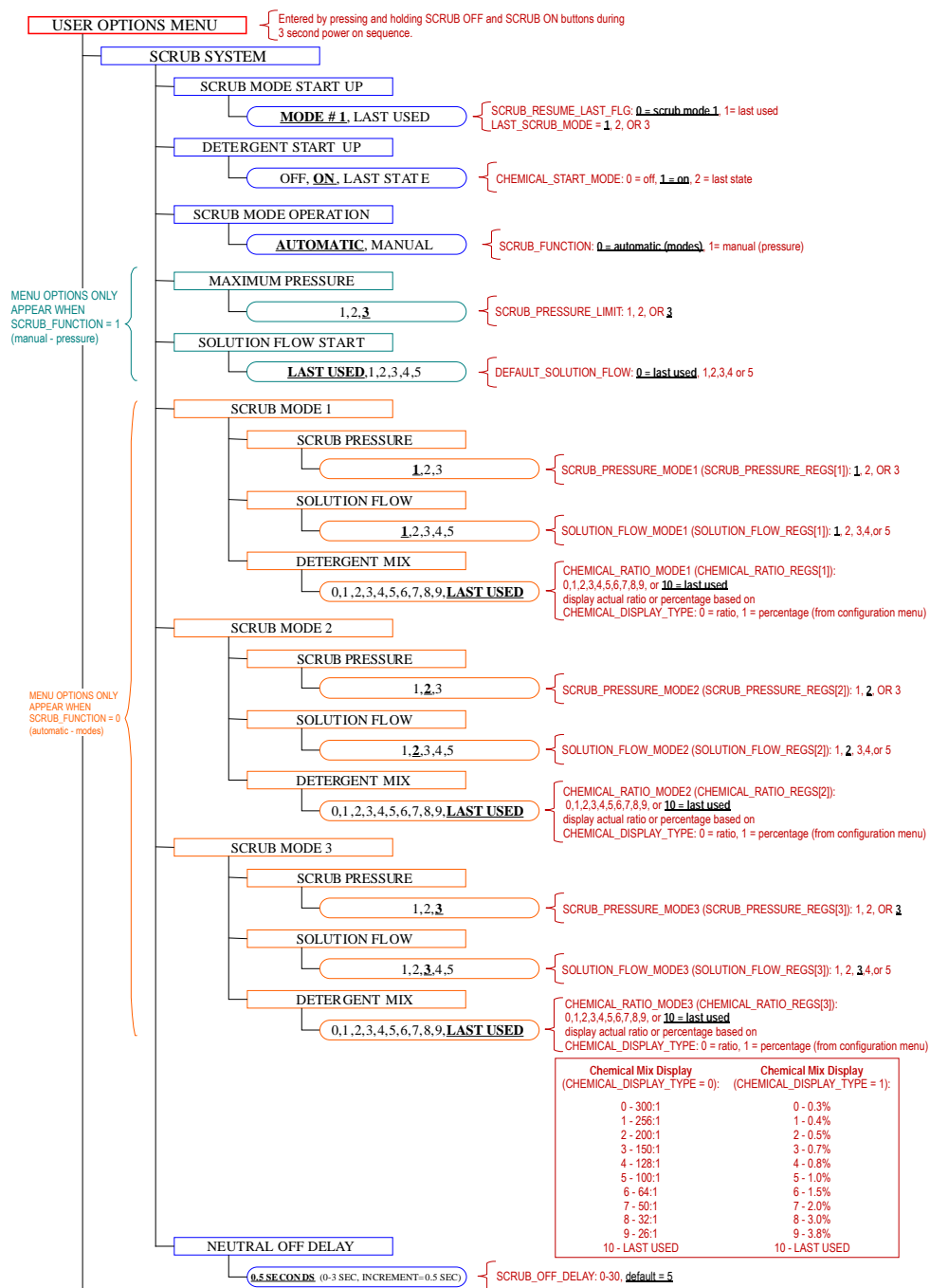


ELECTRICAL SYSTEM

CONTROL BOARD PROGRAMMING OPTIONS

User Options Menu

- 1 Press and hold in the red Scrub Off switch (55) and the green Scrub On switch (54).
- 2 Turn the ignition Key Switch (50) to the run (on) position.
- 3 Continue to hold the Scrub Off and the Scrub On switches until all the display panel lights turn off (approximately three seconds), then release the switches. The first line of the LCD display will read "USER OPTIONS MENU".
- 4 Press the Side Broom Up (53b) and Side Broom Down (53a) switches to scroll through the options menu items as shown in the chart below.
- 5 When the arrow is pointing to the desired menu item, press the green Scrub On switch (54) to display the next level of menu options.
- 6 Press the Side Broom Up (53b) and Side Broom Down (53a) switches to select the desired option.
- 7 When the arrow is pointing to an option:
 - Press the green Scrub On switch (54) to select the option. The display will then return to the previous menu level.
 - Press the red Scrub Off switch (55) to return to the previous menu level without selecting the option.
- 8 To save the new setting(s), turn the ignition Key Switch to the off position. The new setting(s) will be saved and remain in effect until changed again.



USER OPTIONS MENU (continued)

Entered by pressing and holding SCRUB OFF and SCRUB ON buttons during 3 second power on sequence.

SOLUTION IN REVERSE

OFF, ON

SOLUTION_IN_REVERSE_FLG: 0 = OFF (false), 1 = ON (true)

RECOVERY SYSTEM

SQUEEGEE UP DELAY

15 SECONDS (5-30 SEC, INCREMENT=1 SEC)

SQUEEGEE_OFF_DELAY: 50-300, default = 150

VACUUM OFF DELAY

10 SECONDS (10-30 SEC, INCREMENT=1 SEC)

VACUUM_OFF_DELAY: 100-300, default = 100

TIMEOUT MODE

NORMAL, IN NEUTRAL

RECOVERY_TIMEOUT_MODE: 0 = normal, 1 = in neutral

CONTROL LOCKS

UNLOCK, DETERGENT, DETERGENT & SOLUTION

CONTROL_LOCK: 0 = unlock, 1 = detergent mix only, 2 = detergent mix and solution flow

SIDE SCRUB SYSTEM

Only appears when SIDE_SCRUB_INSTALLED_FLG = 1 (from configuration menu)

START UP STATE

OFF, ON, LAST STATE

SIDE_SCRUB_START_MODE: 0 = off, 1 = on, 2 = last state

SIDE SWEEP SYSTEM

Only appears when SIDE_SWEEP_INSTALLED_FLG = 1 (from configuration menu)

BROOM START UP

OFF, ON, LAST STATE

SIDE_SWEEP_START_MODE: 0 = off, 1 = on, 2 = last state

DUST GUARD START UP

OFF, ON, LAST STATE

SIDE_MIST_START_MODE: 0 = off, 1 = on, 2 = last state

EXTENDED SCRUB SYSTEM

Only appears when RECYCLE_INSTALLED_FLG = 1 (from configuration menu)

START UP STATE

OFF, ON, LAST STATE

RECYCLE_START_MODE: 0 = off, 1 = on, 2 = last state

OPERATING MODE

USE ANYTIME, USE CLEAN FIRST

RECYCLE_OP_MODE: 0 = use anytime, 1 = use clean first

ENGINE IDLE DELAY

20 SECONDS (10-250 SEC, INCREMENT = 1 SEC)

IDLE_TIME_OUT: 100-2500, default = 200

BACK-UP ALARM

Only appears when BACKUP_ALARM_INSTALLED_FLG = 1 (from configuration menu)

OFF, REVERSE, FORWARD & REVERSE

BACKUP_ALARM_OP_MODE: 0 = off, 1 = reverse only, 2 = forward and reverse

LIGHTS

NORMAL, ALWAYS ON

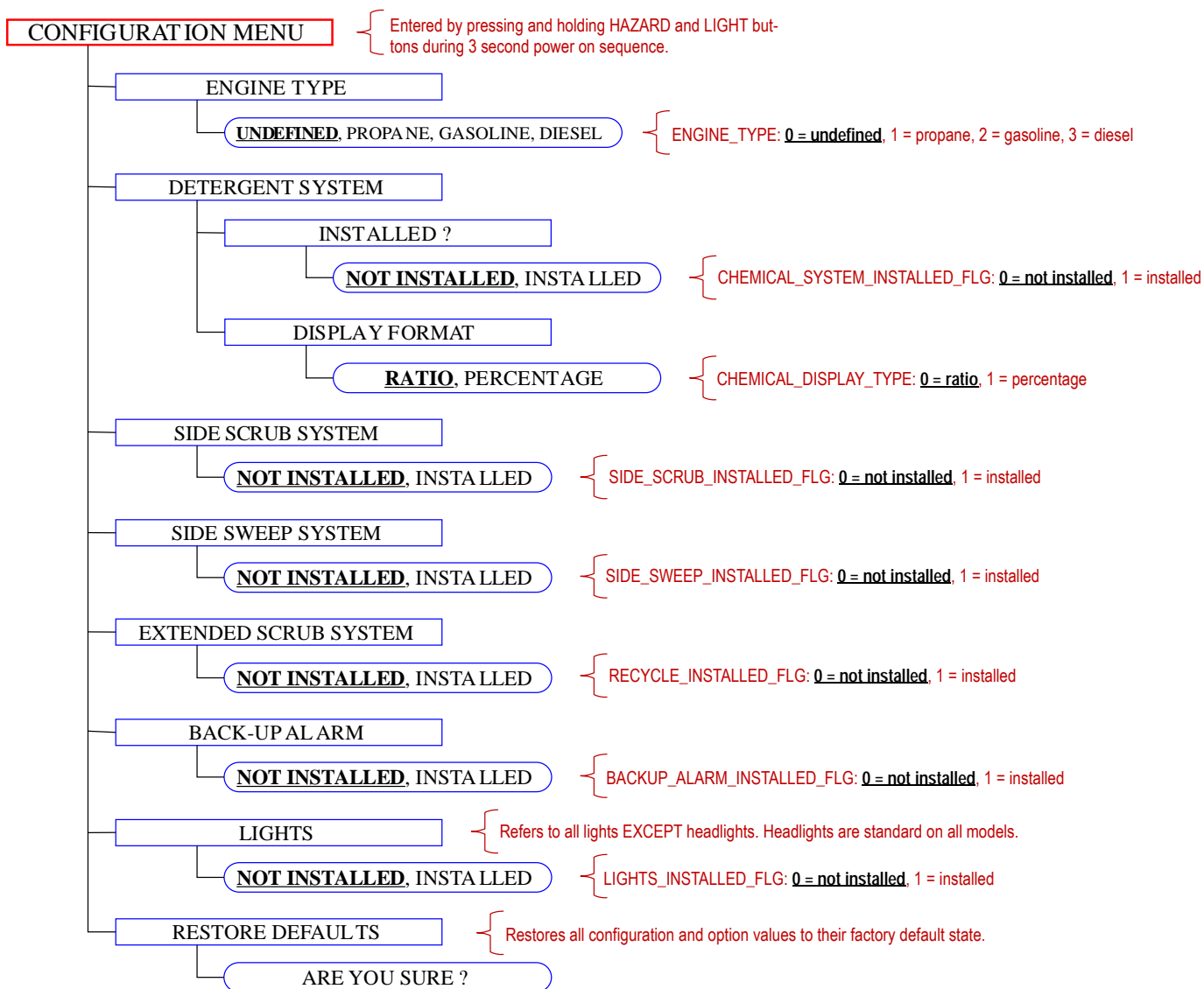
LIGHTS_OP_MODE: 0 = normal, 1 = always on

ELECTRICAL SYSTEM

CONTROL BOARD PROGRAMMING OPTIONS

Configuration Menu

- 1 Press and hold the Emergency Flashers (67) and Headlight (68) switches.
- 2 Turn the ignition Key Switch (50) to the run (on) position.
- 3 Continue to hold the Emergency Flashers and Headlight switches until all the display panel lights turn off (approximately three seconds), then release the switches. The first line of the LCD display will read "CONFIGURATION MENU".
- 4 Press the Side Broom Up (53b) and Side Broom Down (53a) switches to scroll through the configuration menu items as shown in the chart below.
- 5 When the arrow is pointing to the desired menu item, press the green Scrub On switch (54) to display the next level of configuration options.
- 6 Press the Side Broom Up (53b) and Side Broom Down (53a) switches to select the desired option.
- 7 When the arrow is pointing to the configuration option:
 - Press the green Scrub On switch (54) to select the option. The display will then return to the previous menu level.
 - Press the red Scrub Off switch (55) to return to the previous menu level without selecting the option.
- 8 To save the new setting(s), turn the ignition Key Switch to the off position. The new setting(s) will be saved and remain in effect until changed again.



ENGINE SYSTEM

ENGINE SPECIFICATIONS

1.6 liter GM

Engine type		Vertical, liquid Cooled, 4 Cylinder, Single Overhead cam Distributor-less
Displacement		98 Cubic inches (1600 cc)
Fuel	Gasoline	87 Octane Unleaded Gasoline with no more than 10% Ethanol by volume
	LP	33-lb. Tank Size (liquid withdrawal system)
Spark Plugs		AC Delco p/n 93206675, Gap .032 -.035 (.8 mm-.9 mm)
Spark Plug Wiring		Match numbered coil position to spark plug number (front to rear 1, 2, 3 and 4)
Engine Firing Order		1-3-4-2
Ignition Timing		Fixed (controlled by engine ECM)
Engine Rotation		CCW (flywheel end)
Valve lifters		Hydraulic
Oil Capacity		3.7 qt. (3.5L) with Oil Filter
Oil Pressure		21 psi (minimum with engine hot at idle)
Cooling System		3.5 qt. (Engine Only)

Kubota V1505-B-1

Engine Type	Vertical, liquid cooled, 4 cylinder, 4-cycle diesel engine
Displacement	91.41 cubic inches (1498cc)
Fuel	Diesel fuel No. 2-D (ASTM D975)
Injection Pump	Bosch MD type mini pump
Engine firing order	1-3-4-2
Injection Timing (before TDC)	19 degrees
Oil Capacity	5.5 qt. (5.2L) / Oil Pan depth 4.9" (12.4 cm)
Cooling Capacity	8 qt. (7.5L)
Horsepower	46 gross @2800 RPM, 41 Int @2400 RPM
Idle Speeds	Low idle 1300 RPM, High idle 2400 RPM

Note: Refer to the engine manufacturer's Operator and Service manuals for more detailed engine specifications and service data.

ENGINE SYSTEM

MISCELLANEOUS ENGINE SYSTEM INFORMATION

Engine Overheating Problems

Use the checklist below as a guide to thoroughly check the engine cooling system.

- Check the coolant level in the overflow tank and radiator.
- Inspect and clean the radiator and hydraulic oil cooler.
- Check for correct operation of the belt-driven engine cooling fan (slippage).
- Check to see that the engine thermostat opens.
- Check for correct water pump operation.
- Check the engine crankcase oil level.

Over-temperature Protection

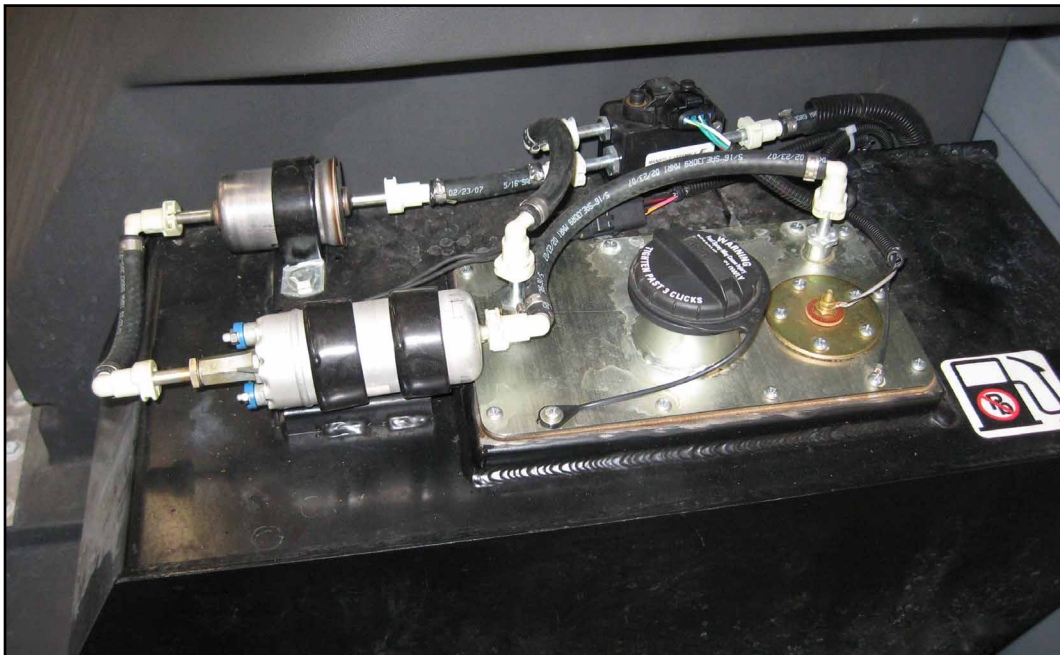
The GM 1.6L engine will set a diagnostic test code (DTC 116) after five seconds at temperatures over 215 °F, and the ECM will derate the engine power to level one (maximum throttle position of 50%). If the engine continues to overheat, it will set a code (DTC 217) after 10-15 seconds at temperatures over 225 °F, then the engine will shut down.

Loss of Oil Pressure Protection

The engine will shut down if the oil pressure drops to 3-7 psi.

GM 1.6L GASOLINE FUEL SYSTEM DESCRIPTION

This engine is equipped with a fuel injector rail that does not have a pressure regulator. Fuel pressure for this engine is regulated by the engine's ECM controlling the fuel pump via pulse width modulation. The ECM receives fuel pressure and temperature feedback from the gasoline fuel sensor manifold and uses this information to control the ground side of the fuel pump. Fuel pressure is regulated by the ECM pulse width modulating (PWM) the fuel pump. The fuel pressure and temperature sensor manifold has a return or "bleed" circuit that is comprised of a .020" orifice and a 6 psi check valve that connects back to the equipment fuel tank. This circuit is used to bleed off any vapor that develops in the line and returns a small amount of fuel to the tank. The fuel comes from the fuel tank and passes through the in-line fuel pump. Fuel exits the fuel pump, passes through the filter and then enters the fuel pressure and temperature manifold assembly. Fuel flows through the feed circuit and is delivered to the fuel injector rail. Fuel that enters the bleed circuits through the bypass valve in the manifold is returned to the fuel tank.



ENGINE SYSTEM ENGINE DIAGNOSTICS

Accessing Engine Diagnostic Information Using the Controller Interface Kit and a PC

The Controller Interface Kit (p/n 56305647 shown on page 9) allows you to connect a laptop PC to the engine to view the various engine parameters, configuration settings and error codes, and displays the engine software and hardware information. Note that this is the preferred way to view the engine diagnostic information. To use the Controller Interface Kit:

- 1 Install the software from the provided CD onto your PC.
- 2 Connect the USB connector on the kit cable to a USB port in your PC.

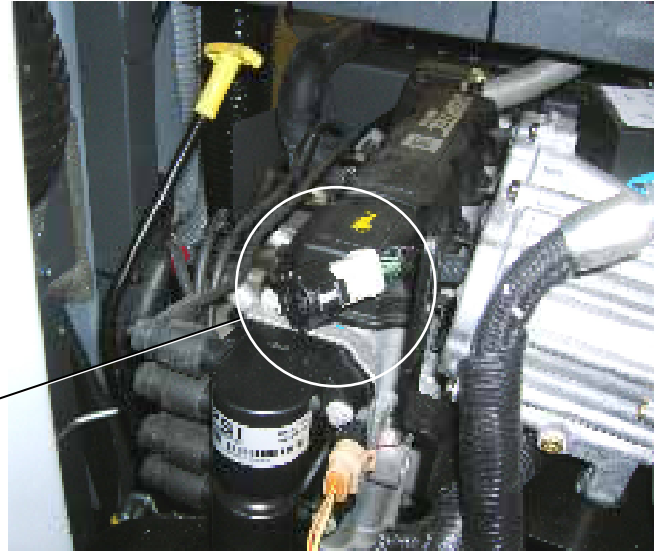
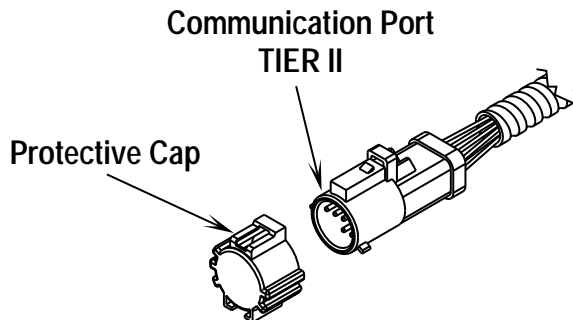


FIGURE 13

- 3 See Figure 13. Remove the Protective Cap, then connect the kit cable to the Communication Port on the engine.

Note: The minimum system requirements for the software in the Controller Interface Kit are as follows:

- Windows XP, 2000 or 98SE (Second Edition) operating system
- Minimum processor speed – Pentium II 450 MHz
- Minimum RAM requirements:
 - Windows XP – 256 MB
 - Windows 2000 – 128 MB
 - Windows 98SE – 128 MB
- At least one available RS232 serial or USB port. Note that the USB driver does not support Windows 98 SE.



ENGINE SYSTEM

ENGINE DIAGNOSTICS

Accessing Engine DTC Error Codes Manually

You can access the engine DTC (diagnostic test code) error codes manually without using a Controller Interface Kit and PC. The codes will be shown through a sequence of blinks on the Warning Indicator Light (62). To access the codes:

- 1 See Figure 14. Remove the Protective Cap from the Communication Port on the engine.
- 2 Use a wire to jumper pin #1 to pin #4 as shown in Figure 14.
- 3 Turn the key switch (50) to the on position. You can now read the error codes by observing the blinks on the Warning Indicator Light (62). Be ready to write down any codes that may be stored.

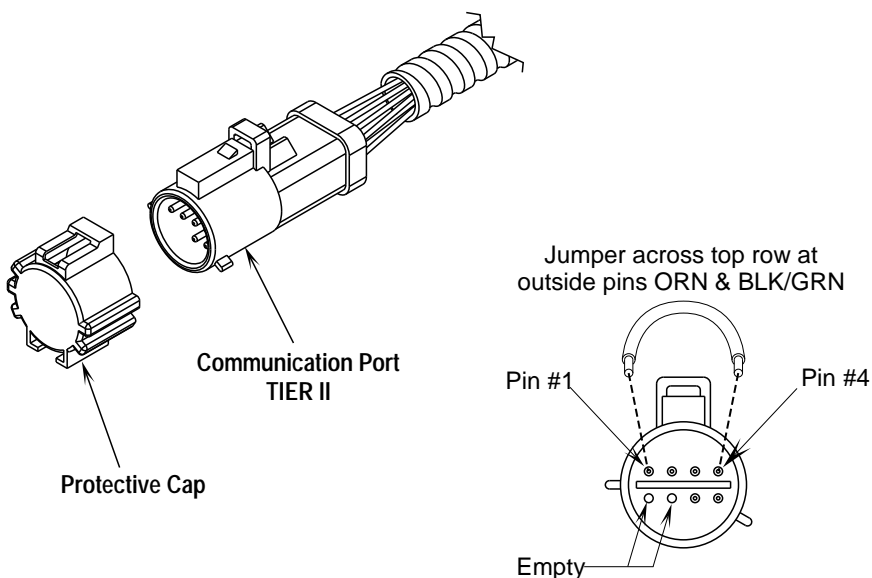


FIGURE 14

Note: The light will always blink “1-6-5-4” three times at the beginning and at the end of the error code number display series.

For example, error code “118”, indicating an ECT (engine coolant temperature) High Voltage condition, would be indicated as follows:

- a The light will show one blink, a short pause, six blinks, a short pause, five blinks, a short pause, then one blink. Note that this 1-6-5-4 sequence is not an error code, but will be repeated three times to indicate the beginning of the error code number display series.
- b The light will show the first actual error code (118 in this example) with one blink, a short pause, one blink, a short pause, then eight blinks. This 1-1-8 sequence will be repeated three times, then the light will blink the next error code number sequence in the series (if present).
- c When all of the error code number sequences have been displayed, the light will blink the 1-6-5-4 sequence three times again to indicate the end of the error code number series.
- d The light will then repeat steps a through c above.

ENGINE DIAGNOSTICS

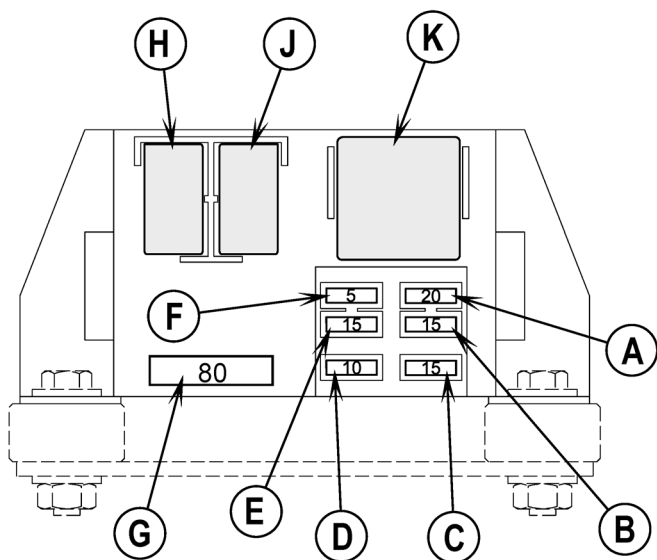
1.6L DTC CODE TO SPN:FMI CODE CROSS REFERENCE

DTC Code	Description	SPN Code	FMI Code
16	Crank Never Synced at Start	636	8
91	Fuel Pump Low Voltage	94	4
92	Fuel Pump High Voltage	94	3
107	MAP Low Voltage	106	4
108	MAP High Pressure	106	16
111	IAT Higher Than Expected 1	105	15
112	IAT Low Voltage	105	4
113	IAT High Voltage	105	3
116	ECT Higher Than Expected 1	110	15
117	ECT Low Voltage	110	4
118	ECT High Voltage	110	3
121	TPS 1 Lower Than TPS 2	51	1
122	TPS 1 Signal Voltage Low	51	4
123	TPS 1 Signal Voltage High	51	3
127	IAT Higher Than Expected 2	105	0
129	BP Low Pressure	108	1
134	EGO 1 Open/Inactive	724	10
154	EGO 2 Open/Inactive	520208	10
171	Adaptive Learn High Gasoline	520200	0
172	Adaptive Learn Low Gasoline	520200	1
182	Fuel Temp Gasoline Low Voltage	174	4
183	Fuel Temp Gasoline High Voltage	174	3
187	Fuel Temp LPG Low Voltage	520240	4
188	Fuel Temp LPG High Voltage	520240	3
217	ECT Higher Than Expected 2	110	0
219	Max Govern Speed Override	515	15
221	TPS 2 Signal Voltage Low	51	0
222	TPS 2 Signal Low Voltage	520251	4
223	TPS 2 Signal High Voltage	520251	3
336	Crank Sync Noise	636	2
337	Crank Loss	636	4
420	Gasoline Cat Monitor	520211	10
524	Oil Pressure Low	100	1
562	System Voltage Low	168	17
563	System Voltage High	168	15
601	Flash Checksum Invalid	628	13

DTC Code	Description	SPN Code	FMI Code
604	RAM Failure	630	12
606	COP Failure	629	31
642	External 5V Reference Low	1079	4
643	External 5V Reference High	1079	3
685	Power Relay Open	1485	5
686	Power Relay Shorted	1485	4
687	Power Relay Short to Power	1485	3
1111	Fuel Rev Limit	515	16
1112	Spark Rev Limit	515	0
1151	Closed Loop Multiplier High LPG	520206	0
1152	Closed Loop Multiplier Low LPG	520206	1
1155	Closed Loop Multiplier High Gasoline	520204	0
1156	Closed Loop Multiplier Low Gasoline	520204	1
1161	Adaptive Learn High LPG	520202	0
1162	Adaptive Learn Low LPG	520202	1
1165	LPG Cat Monitor	520213	10
1171	LPG Pressure Higher Than Expected	520260	0
1172	LPG Pressure Lower Than Expected	520260	1
1173	EPR Comm Lost	520260	31
1174	EPR Voltage Supply High	520260	3
1175	EPR Voltage Supply Low	520260	4
1176	EPR Internal Actuator Fault	520260	12
1177	EPR Internal Circuitry Fault	520260	12
1178	EPR Internal Comm Fault	520260	12
1612	RTI 1 Loss	629	31
1613	RTI 2 Loss	629	31
1614	RTI 3 Loss	629	31
1615	A/D Loss	629	31
1616	Invalid Interrupt	629	31
1626	CAN Tx Failure	639	12
1627	CAN Rx Failure	639	12
1628	CAN Address Conflict Failure	639	13
2111	Unable to Reach Lower TPS	51	7
2112	Unable to Reach Higher TPS	51	7
2229	BP Pressure High	108	0

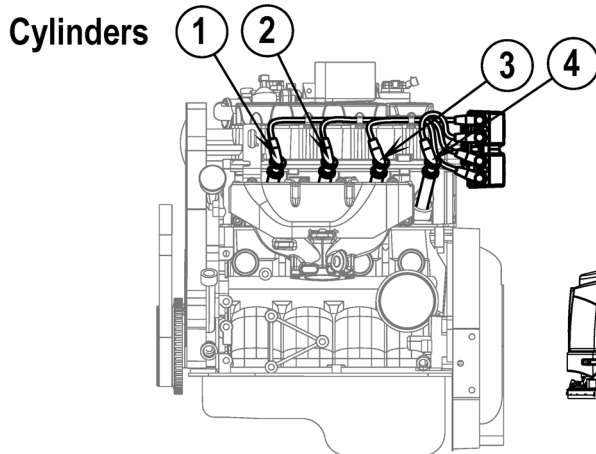
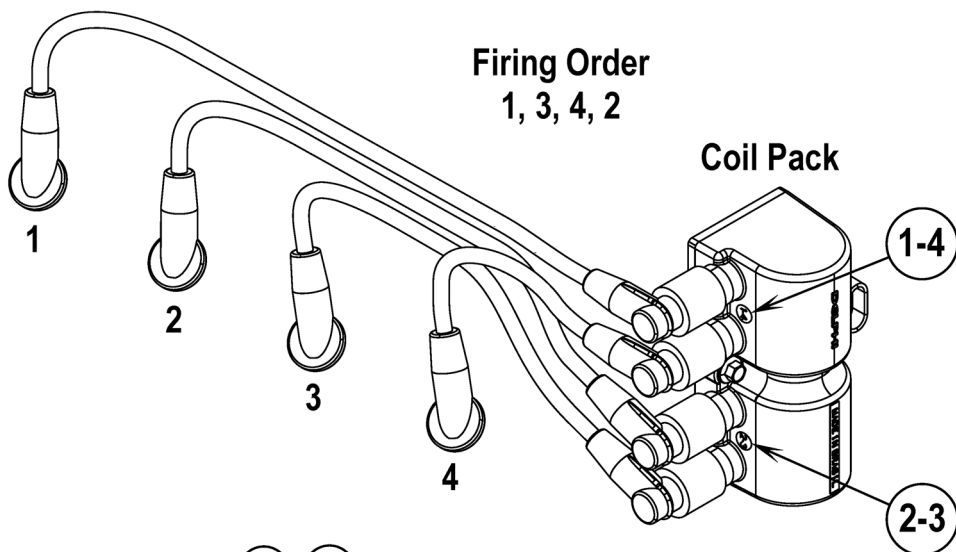
ENGINE SYSTEM

Engine Fuse Box



- A - F2 20 Amp Fuse for:
 - ECM input
- B - F4 15 Amp Fuse for:
 - ignition
- C - F6 15 Amp Fuse for:
 - starter relay coil
- D - F3 10 Amp Fuse for:
 - EPR
- E - F5 15 Amp Fuse for:
 - Fuel Pump relay coil
- F - F1 5 Amp
 - VSW
- G - 80 Amp Maxi-Fuse
 - alternator power relay coil
- H - Power Relay Alternator
- J - Fuel Pump Relay
- K - Engine Starter Relay

Firing Order 1, 3, 4, 2

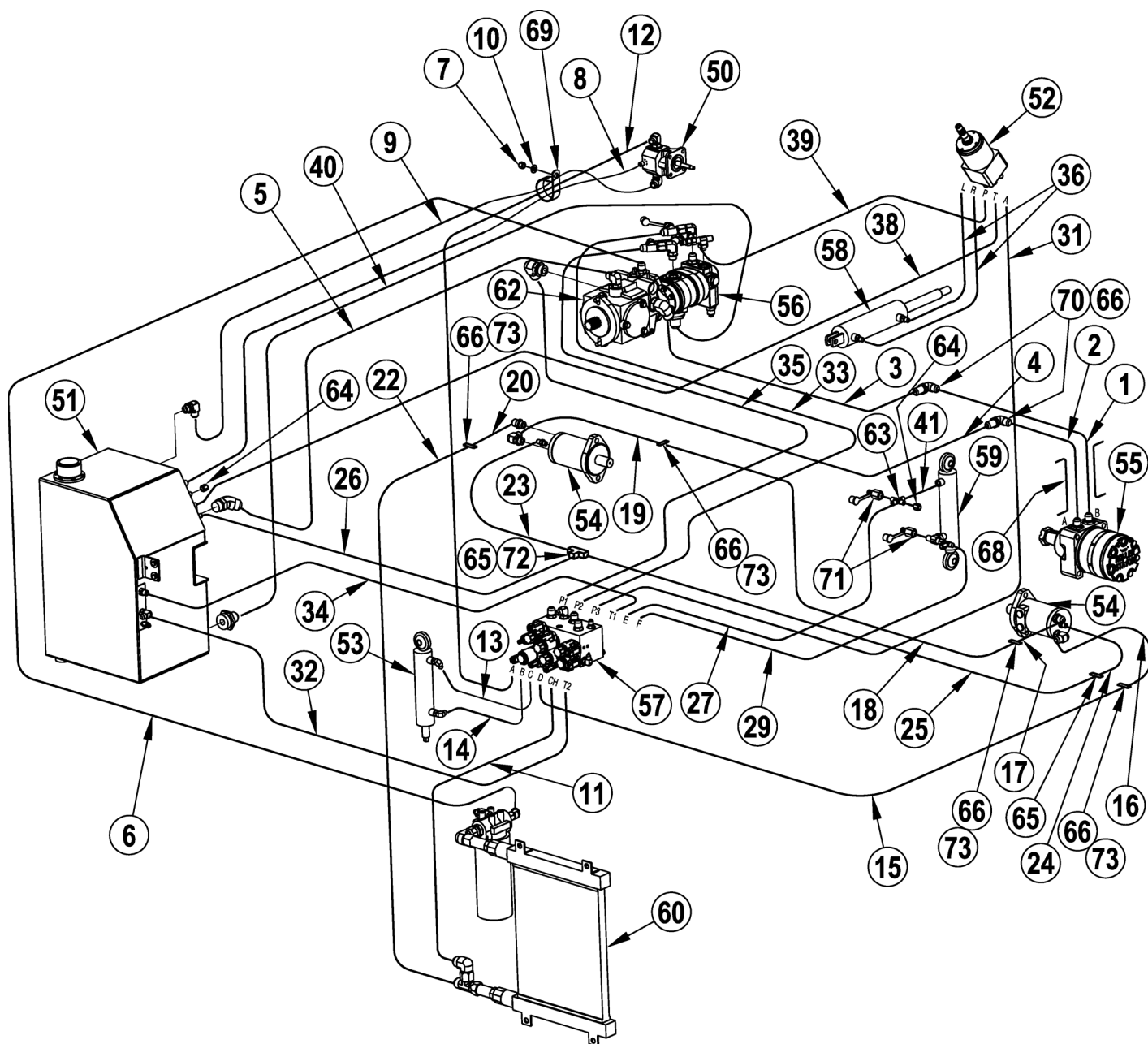


HYDRAULIC SYSTEM

HYDRAULIC SYSTEM COMPONENTS

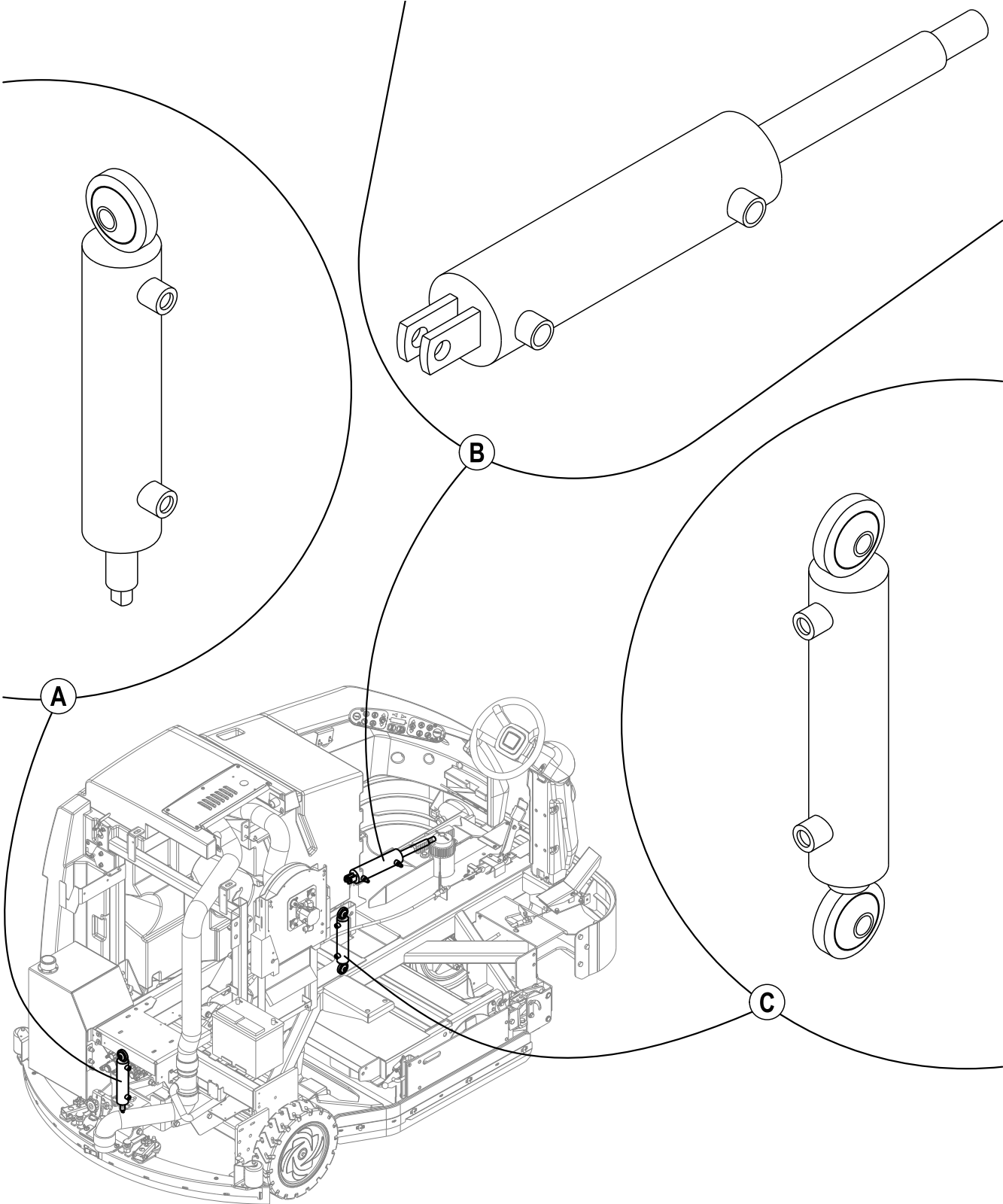
Item	Description
50	Fan Motor Assembly
51	Reservoir Ass'y
52	Steering Pump Ass'y
53	Squeegee Cylinder Ass'y
54	Hydraulic Motor Ass'y
55	Drive Motor Ass'y
56	Pump Assembly, Low Speed
57	Valve Block Ass'y
58	Cylinder Assembly, Steer
59	Scrub Lift Cyl. Ass'y
60	Oil Cooler Ass'y

Item	Description
62	Pump Assembly
63	Union Cross
64	End Cap, Flare Tube
65	Locknut, Bulkhead
66	Locknut, Bulkhead
68	Sleeve, Nylon
69	Clamp, P
70	Elbow, 90 Bulkhead Union
71	Nipple, Test
72	TEE, BULKHEAD RUN



HYDRAULIC SYSTEM
HYDRAULIC CYLINDERS

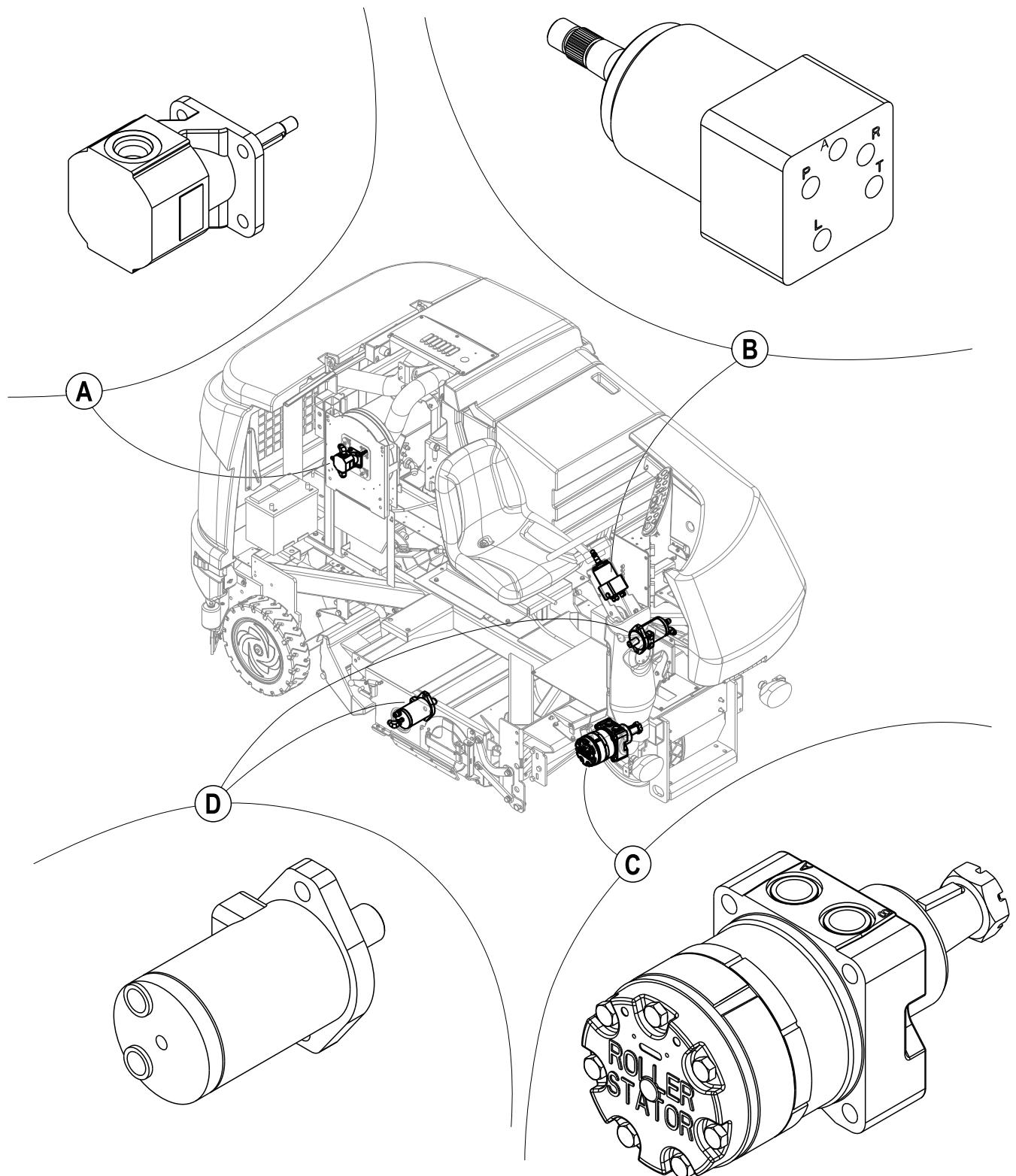
Item	Ref. No.	Qty	Description
A	56110261	1	Squeegee Cylinder Ass'y
B	56110412	1	Cylinder Assembly, Steer
C	56110425	1	Scrub Lift Cylinder Ass'y



HYDRAULIC SYSTEM

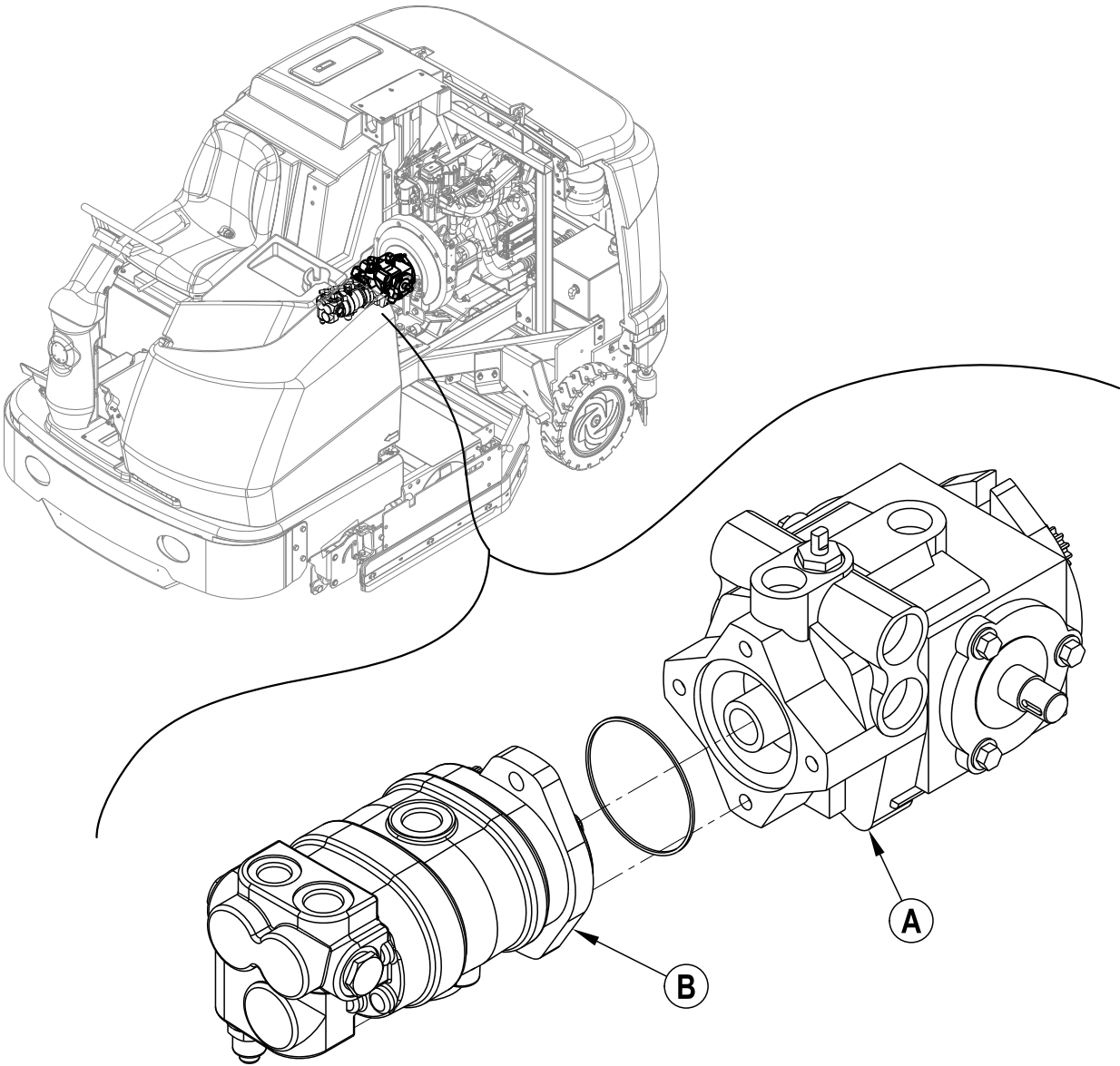
HYDRAULIC MOTORS

Item	Ref. No.	Qty	Description
A	56110062	1	Vacuum Fan Motor Assembly
B	56111517	1	Steering Pump Assembly
C	56110369	1	Drive Motor Assembly
D	56110339	1	Main Broom Motor Assembly



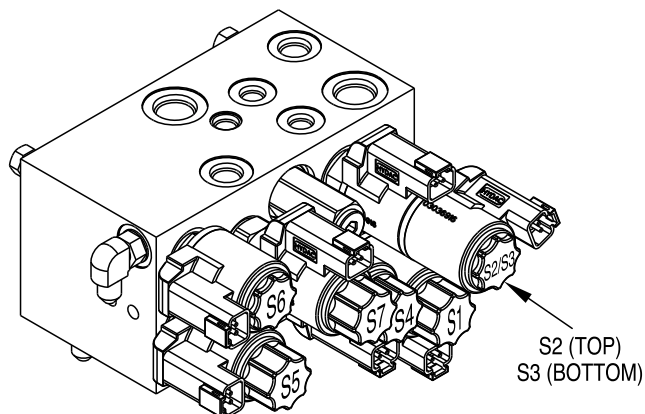
HYDRAULIC SYSTEM
HYDRAULIC PUMPS

Item	Ref. No.	Qty	Description
A	56111085	1	Propulsion (transport) Pump Assembly
B	56110372	1	Accessory Pump Assembly

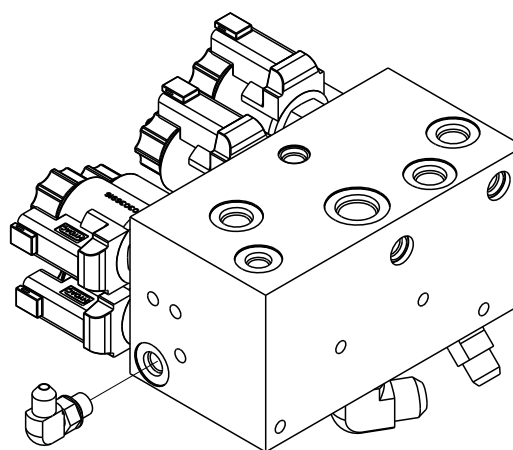


HYDRAULIC SYSTEM

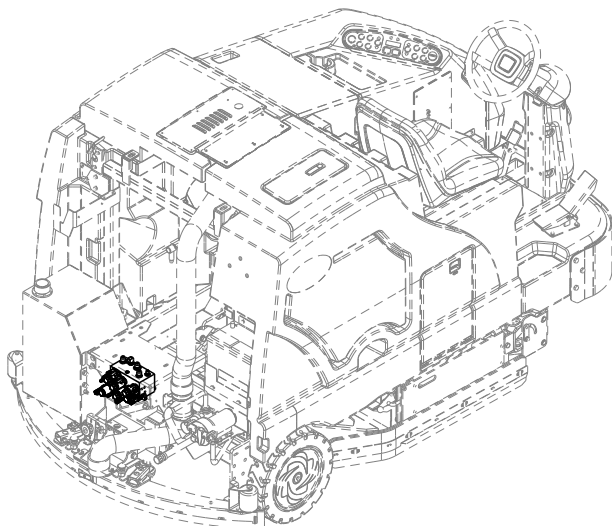
HYDRAULIC VALVE BLOCK/MANIFOLD



BOTTOM VIEW



FRONT



HYDRAULIC SYSTEM TROUBLESHOOTING

Accurate measurements are the key to troubleshooting a hydraulic system. Once measurements are obtained, they can be compared with specifications to analyze a problem.

You can use digital tachometers, flow gauges or pressure gauges to troubleshoot the hydraulic system. The pressure gauge should have a range of 0 to 3000 psi (see the DIAGNOSTIC AND SERVICE TOOLS section) and have a Parker Diagnostics connector number PD222. The most convenient way to check for oil flow is to check the RPM of the motor that is performing poorly. Refer to the GENERAL HYDRAULIC SPECIFICATIONS TABLE to determine the motor RPM. If the motor speed is correct, the pump is producing the correct amount of oil flow. However, this does not mean that if a motor is running too slow the problem is in the pump.

The following information should be used to check for correct motor RPM, system pressure and relief valve settings. The readings are nominal figures and there will be variations due to manufacturing tolerances and system oil temperature. If any reading varies greater than 20 percent, there will be a noticeable loss of performance and the problem should be corrected.

HYDRAULIC SYSTEM

TEST PORT NOMINAL PRESSURE READINGS

Note: See Figure 15 and the GENERAL HYDRAULIC SPECIFICATIONS TABLE.

Note: 100 psi = 6.9 bar

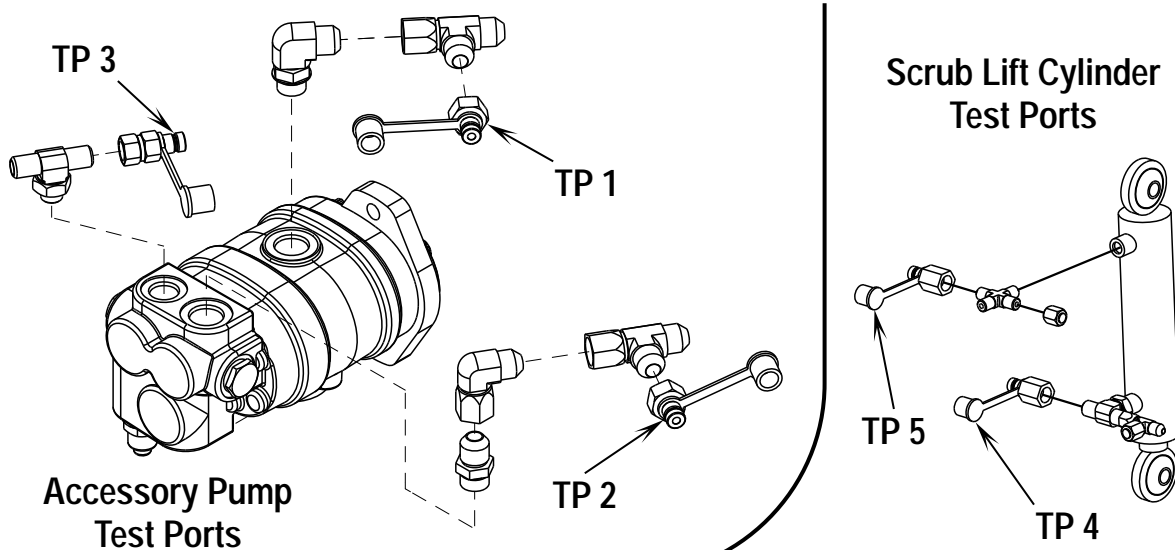
1 Insert the pressure gauge into the test port.

Note: The Lower Test Port (TP 4) on the Scrub Lift Cylinder is easier to access if you lower the scrub deck.

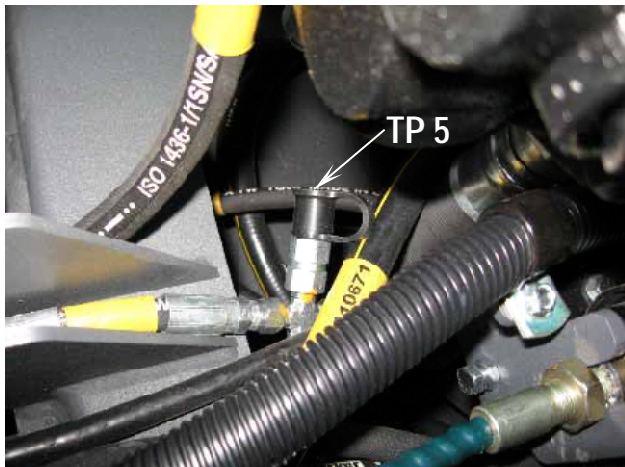
2 Run the engine in high throttle position and allow the hydraulic oil to warm up.

- The bypass pressure is the pressure reading with no motor or cylinder operating.
- The operational pressure is the pressure range in which the motor or cylinders will operate.
 - A much lower than normal bypass pressure could indicate a gear pump problem.
 - If the bypass pressure remains the same after turning the function on, there could be a problem in the control valve or circuit.
 - If the operational pressure is within range but the motor speed is too slow, the problem could be in the motor.
 - If the broom motor operational PSI reading is above the bypass psi but is below the operational psi, check the broom adjustment and wear.
 - Check individual system troubleshooting sections of this manual for additional information.

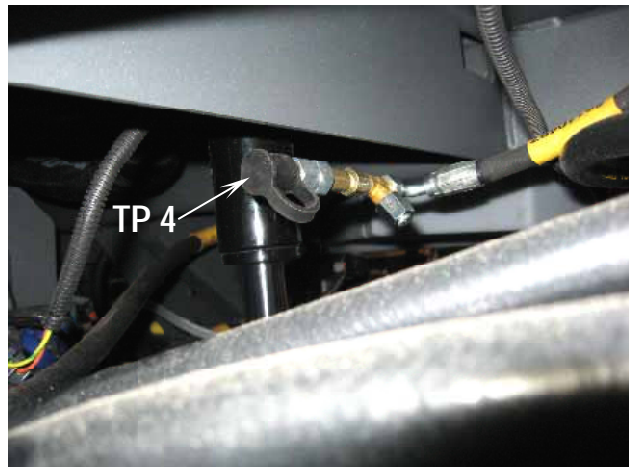
FIGURE 15



Upper Test Port (TP 5) on the Scrub Lift Cylinder



Lower Test Port (TP 4) on the Scrub Lift Cylinder



HYDRAULIC SYSTEM

GENERAL HYDRAULIC SPECIFICATIONS TABLE

Accessory Pump 1 Circuits	Displacement Cu. In.	GPM	RPM IN	RPM OUT	PSI	Relief PSI
Accessory pump 1, engine @ 2200 RPM no systems running (test port TP1)	.58	5.52	2200		* 120	2700
Vacuum Fan motor (open fan)	.129	5.52		8600	2040	2700
Vacuum water lift sealed @ 2200 RPM, 33.7 in/H ₂ O						

Accessory Pump 2a Circuits	Displacement Cu. In.	GPM	RPM IN	RPM OUT	PSI	Relief PSI
Accessory Pump 2a non-priority branch, engine @ 2200 RPM, no systems running (test port TP2)	1.20	8.42	2200		*370	2700
Main scrub brush motors (only) setting (A) no load broom off floor and ** scrub setting #3 pressure	4.5		2200	415 400	A 850 1700**	
Main scrub and RT side scrub motors #3 pressure			2200		1880	
Right side brush motor speed	11.3			160		
Main scrub and dual sweep			2200		1780	
Side sweep broom motor speed	17.9			100		
Main scrub, RT scrub and LT sweep			2200		1950	
Squeegee cylinder 1.50 x 5.00			2200		315	

Accessory Pump 2b Circuits	Displacement Cu. In.	GPM	RPM IN	RPM OUT	PSI	Relief PSI
Accessory Pump 2b priority branch, engine @ 2200 RPM no systems running (test port TP3)	1.20	3.0	2200		* 296	1500
Steering unit (driving and turning)	4.5				500	

	Test Port	Pressure Type	Controlled by	Pressure Setting	PSI
Scrub lift cylinder 1.50 x 5.00, engine at 2200 RPM	TP4	Lift Pressure	Proportioning Valve S7	1	750 - 774
				2	750 - 767
				3	745 - 779
	TP5	Down Pressure	Proportioning Relief Valve S5	1	333 - 346
				2	393 - 412
				3	458 - 499

Propulsion Pump Circuits	Displacement Cu. In.	GPM	RPM IN	RPM OUT	PSI	Relief PSI
Hydrostat pump charge pressure					250	
Hydrostatic pump	1.44	13.7	2200			
Forward drive wheel motor speed test @ 8 mph level ground, smooth concrete, no accessory systems running, foot at full speed forward, set 153 RPM @ 2400 RPM	18.3			FWD 153	1060@ 2200 RPM 1200@ 2400 RPM	F 3500
Reverse same as above @ 4 mph, set 78 RPM @2400 RPM				REV 78		R 2500

Hydraulic Reservoir Capacity		
Hydraulic reservoir capacity:	10 gallons	Oil Type: 10W-30

* The bypass pressure is the pressure reading with no motor or cylinder operating (flow through).

** Scrub brush system hydraulic pressure under load setting #3

HYDRAULIC SYSTEM

SCRUB LIFT CYLINDER OVERVIEW

The scrub lift cylinder is controlled by two proportioning hydraulic valves that work together, on opposite ends of the lift cylinder, to produce the desired main scrub deck pressure. (Reference Hydraulic Schematic in Appendix).

- The lift pressure (scrub pressure up) is controlled by Proportioning Valve S7 which gets its signal from pin J2-24 on the Driver Box.
 - The down pressure (scrub pressure down) is controlled by Proportioning Valve S5 which gets its signal from pin J2-26 on the Driver Box.
- The Driver Box signals are pulse width modulated (PWM) signals (voltages) which open the valves proportionally to produce the appropriate hydraulic pressures on both the piston and rod ends of the scrub lift cylinder. This combination of up and down forces on the lift cylinder applies the correct amount of downward force to the main scrub deck to produce the desired scrub pressure.

Note that the signals to the valves allow the valves to “dither” (oscillate in a slight back-and-forth motion) (high frequency) to prevent the valves from sticking.

The table below shows the hydraulic pressures to the Valves and the solenoid coil current draws at the three scrub pressures.

Proportioning Valve	Pressure Type	Scrub Pressure Setting	Hydraulic Pressure at Test Port TP4	Valve Solenoid Coil Current Draw
S7	Scrub Pressure Up	1	750 to 774 psi	1.45 to 1.75 amps (all three scrub pressure settings)
		2	750 to 767 psi	
		3	745 to 779 psi	

Proportioning Valve	Pressure Type	Scrub Pressure Setting	Hydraulic Pressure at Test Port TP5	Valve Solenoid Coil Current Draw
S5	Scrub Pressure Down	1	333 to 346 psi	1.38 - 1.75 amps (varies with scrub setting selected)
		2	393 to 412 psi	
		3	458 to 499 psi	

HYDRAULIC SYSTEM

HYDRAULIC TRUTH TABLE

Electrical Solenoid's Energized Status – Component to Operate									
Solenoid Functions	S1	S2	S3	S4	S5	S6	S7	S8	S9
Recovery Tank Fan	X								
Squeegee Down		X							
Squeegee UP			X						
Scrub Brushes ON				X					
Scrub Brush Pressure Setting Regular #1					X	X	X		
Scrub Brush Pressure Setting Heavy #2					X	X	X		
Scrub Brush Pressure Setting Extreme #3					X	X	X		
Right Side Scrub Brush Pressure Settings 1, 2 and 3					X	X	X		X
Scrub Brushes OFF									
Right Scrub ON				X				X	
Dual Side Broom Sweep ON				X				X	

HYDRAULIC MANIFOLD ASSEMBLY COMPONENT LOCATION KEY

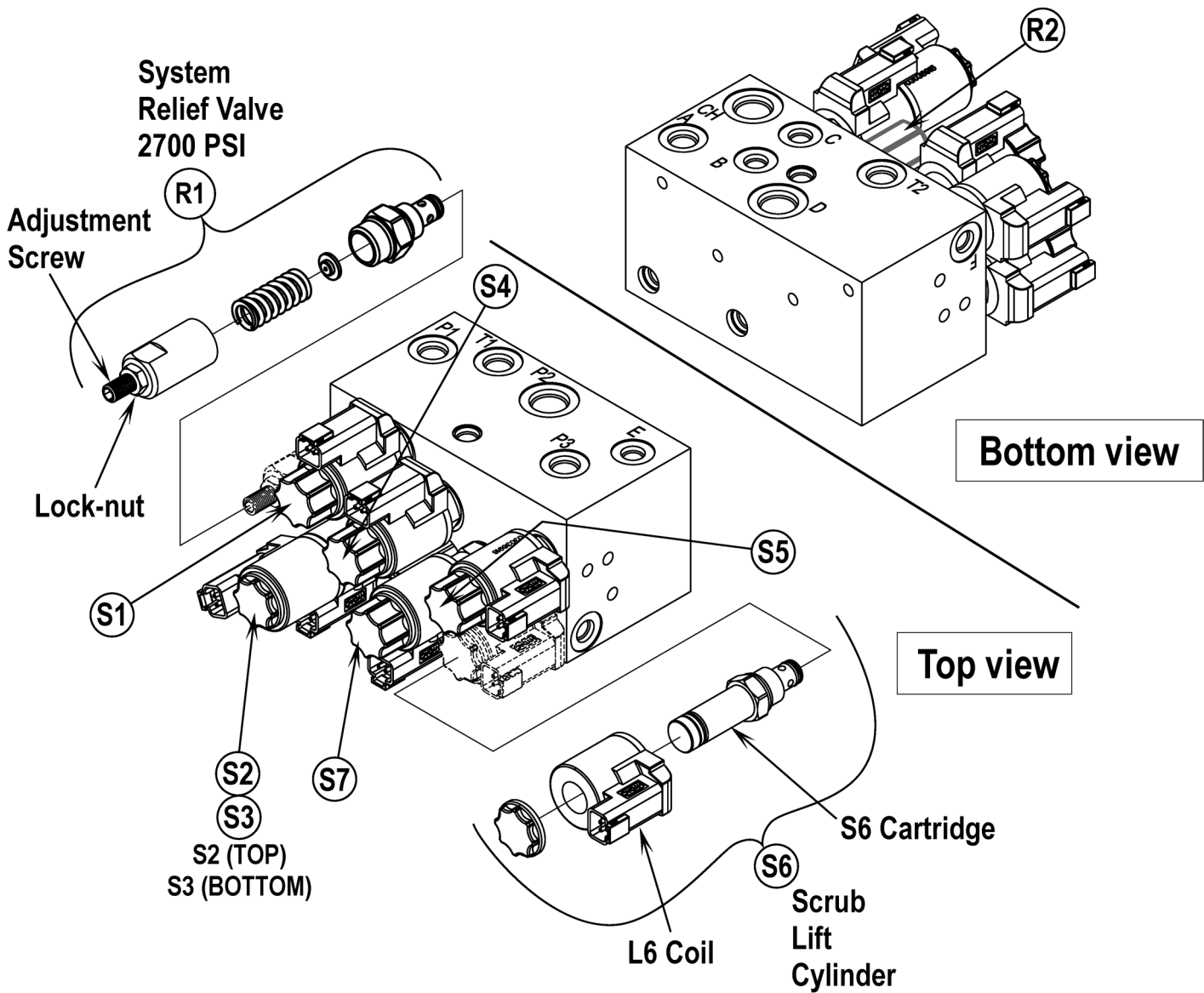
Note: the combined electrical solenoid and hydraulic valve cartridge assembly can be serviced separately.

- Notes:**
- (A) The S1, S2, S3, S4 and S6 solenoid coils w/connectors are the same, and the S5 and S7 solenoid coils w/connectors are the same, and can be swapped for troubleshooting purposes.
 - (B) The S8 and S9 solenoid coils w/connectors are both different and only one of each is used.
 - (C) The S1 and S4 valve cartridges are the same, the S2 and S3 valve cartridges are the same, and can be swapped for troubleshooting purposes.
 - (D) The S5, S6, S7, S8 and S9 valve cartridges are all different and only one of each is used.

Item#	Component Description and Hydraulic Circuit Function
L1/S1	Solenoid coil and valve cartridge, vacuum fan motor, coil 8 ohms
L2/S2	Solenoid coil and valve cartridge, squeegee lift cylinder DOWN (top), coil 8 ohms
L3/S3	Solenoid coil and valve cartridge, squeegee lift cylinder UP (bottom), coil 8 ohms
L4/S4	Solenoid coil and valve cartridge, scrub/sweep system motors, coil 8 ohms
L5/S5	Solenoid coil and valve cartridge, scrub pressure DN, proportional relief, coil 2.2 ohms
L6/S6	Solenoid coil and valve cartridge, scrub lift cylinder lock, coil 8 ohms
L7/S7	Solenoid coil and valve cartridge, scrub pressure UP, proportional relief coil 2.2 ohms
R1	Solenoid coil and valve cartridge, pressure relief, vacuum fan, 2700 psi
R2	Solenoid coil and valve cartridge, pressure relief, scrub brush(s), 2700 psi
L8/S8	Solenoid coil and valve cartridge, right scrub/sweep system, coil 8 ohms
L9/S9	Solenoid coil and valve cartridge, right scrub lift cylinder, coil 8 ohms

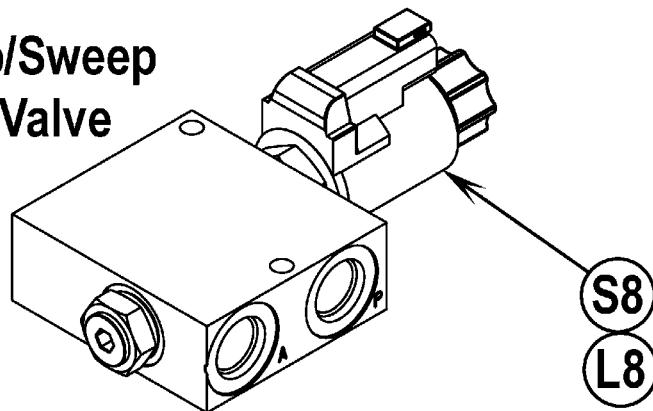
HYDRAULIC SYSTEM

Hydraulic Manifold top and bottom views shown

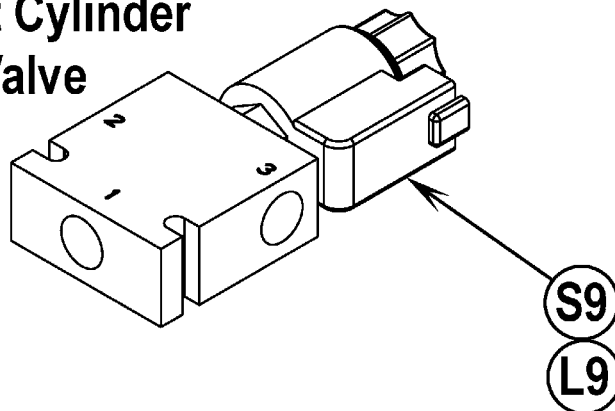


HYDRAULIC SYSTEM

**Right Scrub/Sweep
Solenoid Valve**



**Right Scrub Lift Cylinder
Solenoid Valve**



APPENDIX

TABLE 2 – ELECTRICAL INPUT/OUTPUT TABLE

MAIN CONTROL BOARD

Ladder Diagram: 56111804

Main (Control) PCB: 56111782

Main PCB Assembly: 56111781

Main PCB Schematic: 56111783

Pin ID * = no connection on Rev C Board	Designation	Pin Assignment	Signal Characteristic	Nominal Voltage at Connector (when activated)	Reference To:	Load Or Supply Characteristics	Comments
J1-1	Input	Engine Run	Digital Voltage	0V (for Gas/Propane); B+ (for Diesel)	B-	Engine Control Module Output	Switch to ground, ground = run, float = not running (for Gas/Propane); Switch to Vbat (for Propane)
J1-2	CANbus	CANL	Canbus (-)	0-5V	J1-3	Differential Serial Data	User interface panel serial communication
J1-3	CANbus	CANH	Canbus (+)	0-5V	J1-2	Differential Serial Data	User interface panel serial communication
J1-7	Input	Fuel Level Sensor (gas and diesel)	Variable Resistance	0.40-1.66V	B-	Variable Resistance to Ground, 33-240 ohms	Nominal voltage provided is subject to change if additional resolution is required
J1-10	5V output	Throttle Position (3.3V-A)	3.3v-A	+3.3V	B-	Pedal Position Potentiometer End 5K ohm	Drive pedal sensor High side
J1-11	Ground Output	Throttle Position Ground	Ground	0V	B-	Pedal Position Potentiometer End 5K ohm	Drive pedal sensor Low side
J1-12	Input	Ignition Input Voltage	Analog Voltage	B+	B-	System Voltage	From key switch Ignition position
J1-16	Input	Horn Switch	Digital Voltage	0V	B-	Switch to Ground	Push button switch - ground or open - closed to activate horn
J1-18	Ground	Ground	Ground	0V	B-	Ground	
J1-19	Input	Hydraulic Fluid Temp	Variable Resistance	0.16-2.24V	B-	Variable Resistance to Ground, 12-500 ohms	
J1-20	Input	Brake Pedal Switch	Digital Voltage	0V	B-	Switch to Ground	Closes when brake pedal released
J1-21	Input	Solution Empty Switch	Digital Voltage	0V	B-	Switch to Ground	Ground or open, closes when tank is empty
J1-22	Output	Start Inhibit	Low Side Driver	0V	B-	MOSFET Gate On Relay PCB Assy. - 3 Ma@12V	Ground or float
J1-24	Input	Start KEY-POS Switch	Digital Voltage	B+	B-	System Voltage	From key switch
J1-25	Input	Check Engine Switch	Digital Voltage	0V	B-	Engine Control Module Low Side Output	Switch to ground,

Pin ID * = no connection on Rev C Board	Designation	Pin Assignment	Signal Characteristic	Nominal Voltage at Connector (when activated)	Reference To:	Load Or Supply Characteristics	Comments
J1-27	Input	Recovery Full Switch	Digital Voltage	0V	B-	Switch to Ground	Level switch, ground or open, opens when tank is full
J1-30	Input	Engine Coolant Temp	Analog Voltage	0.34-2.93	B-	Engine Control Module Low Side Output	
J1-31	Input	Throttle Position Sensor	Analog Voltage	0-5V	B-	Pedal Position Potentiometer Wiper 5K ohm	Drive Pedal sensor wiper (0-5K ohm)
J1-32	Input	Hydraulic Filter Switch	Digital Voltage	0V	B-	Switch to Ground	Ground or open, closed when filter plugged
J1-33	Input	Extend Scrub Lvl Switch	Digital Voltage	0V	B-	Switch to Ground	Ground or open, closed when tank is empty
J1-34	Output	Ignition Inhibit	Low Side Driver	0V	B-	MOSFET Gate On Relay PCB Assy. - 3 Ma@12V	Ground or float
J2-1	Output	Main Power Relay	Low Side Driver	0V	B-	Relay Coil - 0.29A@12V	46 ± 5 ohms
J2-2	Output	Side Sweep/ Scrub Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-3	Output	Side Scrub Lift Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-4	Output	Scrub Lock Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-5	Output	Squeegee Down Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-6	Output	Squeegee Up Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-7	Output	Scrub Brush Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-8		Vacuum Motor Solenoid	Low Side Driver	0V	B-	Hydraulic Coil - 1.5A@12V	8 ohms @ 20°C
J2-10		Side Scrub Solution Solenoid	Low Side Driver	0V	B-	Solution Solenoid - 1.0A@12V	11W
J2-11	Output	Backup Audible Alarm	Low Side Driver	0V	B-	Electronic Alarm 0.25A@12V	

Pin ID * = no connection on Rev C Board	Designation	Pin Assignment	Signal Characteristic	Nominal Voltage at Connector (when activated)	Reference To:	Load Or Supply Characteristics	Comments
J2-12	Power (B+)	Circuit Breaker 4 (VACC4)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 4 (20A)
J2-13	Output	Glow Plug Relay	Low Side Driver	0V	B-	Relay Coil - 0.29A@12V	46 ± 5 ohms
J2-17	Ground	Ground	Ground	0V	B-	Ground	
J2-18	Ground	Ground	Ground	0V	B-	Ground	
J2-22	Output	Main Solution Solenoid	Low Side Driver	0V	B-	Solution Solenoid - 1.5A@12V	17W
J2-23	Power (B+)	Circuit Breaker 5 (VACC5)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 5 (10A)
J2-24	Output	Scrub Pressure Up	Low Side PWM Driver	PWM 0-12V	B-	Hydraulic Coil - 2.1A@12V	2.2 ohms @ 20°C
J2-26	Output	Scrub Pressure Down	Low Side PWM Driver	PWM 0-12V	B-	Hydraulic Coil - 2.1A@12V	2.2 ohms @ 20°C
J2-29	Output	ECM Engine 2200 RPM	High Side Driver	12V	B-	Engine Control Module Input	12V for 2400 RPM, float otherwise
J2-30	Output	ECM Engine 2400 RPM	High Side Driver	12V	B-	Engine Control Module Input	12V for 2200 RPM, float otherwise
J2-31	Output	Left Front Turn Lamp	High Side Driver	12V	B-	Incandescent Lamp - 0.33A@12V	0.4A@14.5V (4W turn lamp)
J2-32	Output	Right Front Turn Lamp	High Side Driver	12V	B-	Incandescent Lamp - 0.33A@12V	0.4A@14.5V (4W turn lamp)
J2-33	Output	Left Rear Stop/Turn	High Side Driver	12V	B-	Incandescent Lamp - 2.2A@12V	2.7A@14.5V (26W stop and turn lamp)
J2-34	Output	Right Rear Stop/Turn	High Side Driver	12V	B-	Incandescent Lamp - 2.2A@12V	2.7A@14.5V (26W stop and turn lamp)
J2-35	Output	Extended Scrub Pump	Low Side PWM Driver	PWM 0 - 12V	B-	Pump Motor 11.5FLA @ 12V, 46 LRA	5KHz variable duty cycle
J3-1	Power (B+)	Circuit Breaker 1 (VACC1)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 1 (20A)
J3-2	Output	Main Solution Pump	Low Side PWM Driver	PWM 0 - 12V	B-	Pump Motor 11.5FLA @ 12V, 46 LRA	5KHz variable duty cycle
J3-4	Output	Side Sweep Actuator - HI (Red Lead)	H-Bridge Driver	12V	B-	Actuator Motor 20 ± 2FLA, 80LRA (Est.)	Bridge (switching power/ground) (+) for Down, otherwise open

Pin ID * = no connection on Rev C Board	Designation	Pin Assignment	Signal Characteristic	Nominal Voltage at Connector (when activated)	Reference To:	Load Or Supply Characteristics	Comments
J3-5	Output	Side Sweep Actuator - LO (Black Lead)	H-Bridge Driver	0V	B-	Actuator Motor 20 ± 2FLA, 80LRA (Est.)	Bridge (switching power/ground) (-) for Up, otherwise open
J3-7	Output	Side Sweep Actuator - MID (White, Common Lead)	H-Bridge Driver	B+ or 0V	B-	Actuator Motor 20 ± 2FLA, 80LRA (Est.)	Bridge (switching power/ground) (+) for Up, (-) for Down
J3-8	Output	Head / Tail Lamps	High Side Driver	12V	B-	Incandescent Lamp - 9.3@12V	11.3A@14.5V (2x 50W head-lamp, 2x 5.6W tail lamp)
J3-9	Output	Circuit Breaker 1 (VACC1)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 1 (20A)
J3-11	Ground	Ground	Ground	0V	B-	Ground	
J3-12	Ground	Ground	Ground	0V	B-	Ground	
J3-13	Ground	Ground	Ground	0V	B-	Ground	
J3-14	Power (B+)	Circuit Breaker2 (VACC2)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 2 (20A)
J3-15	Power (B+)	Circuit Breaker 2 (VACC2)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 2 (20A)
J3-16	Power (B+)	Circuit Breaker 3 (VACC3)	Power	12-15VDC	B-	System Voltage	Power from circuit breaker 3 (15A)
J3-17	Output	Horn	Low Side Driver	0V	B-	Electromagnetic Horn 4A@12V	
J3-18	Output	Side Sweep Mist Pump	Low Side Driver	0V	B-	Pump Motor 3.9 FLA @ 24V, 16 LRA	24V pump operated at 12V
J3-19	Output	AXP Chem Pump 2 (-)	H-Bridge Driver	0 to B+	B-	0.65a @ 12v	Pulsed on and off at a rate less than 10 Hz
J3-20	Output	AXP Chem Pump 2 (+)	H-Bridge Driver	0 to B+	B-	0.65a @ 12v	Pulsed on and off at a rate less than 10 Hz
J3-21	Output	AXP Chem Pump 1 (-)	H-Bridge Driver	0 to B+	B-	0.65a @ 12v	Pulsed on and off at a rate less than 10 Hz
J3-22	Output	AXP Chem Pump 1(+)	H-Bridge Driver	0 to B+	B-	0.65a @ 12v	Pulsed on and off at a rate less than 10 Hz
J3-23	Output	Wand Solution Pump	Low Side Driver	0V	B-	Pump Motor 12.5FLA@12V, 50 LRA	

Note: B- = Ground = 0V, B+ = system voltage = 12-15VDC

APPENDIX
FAULTS

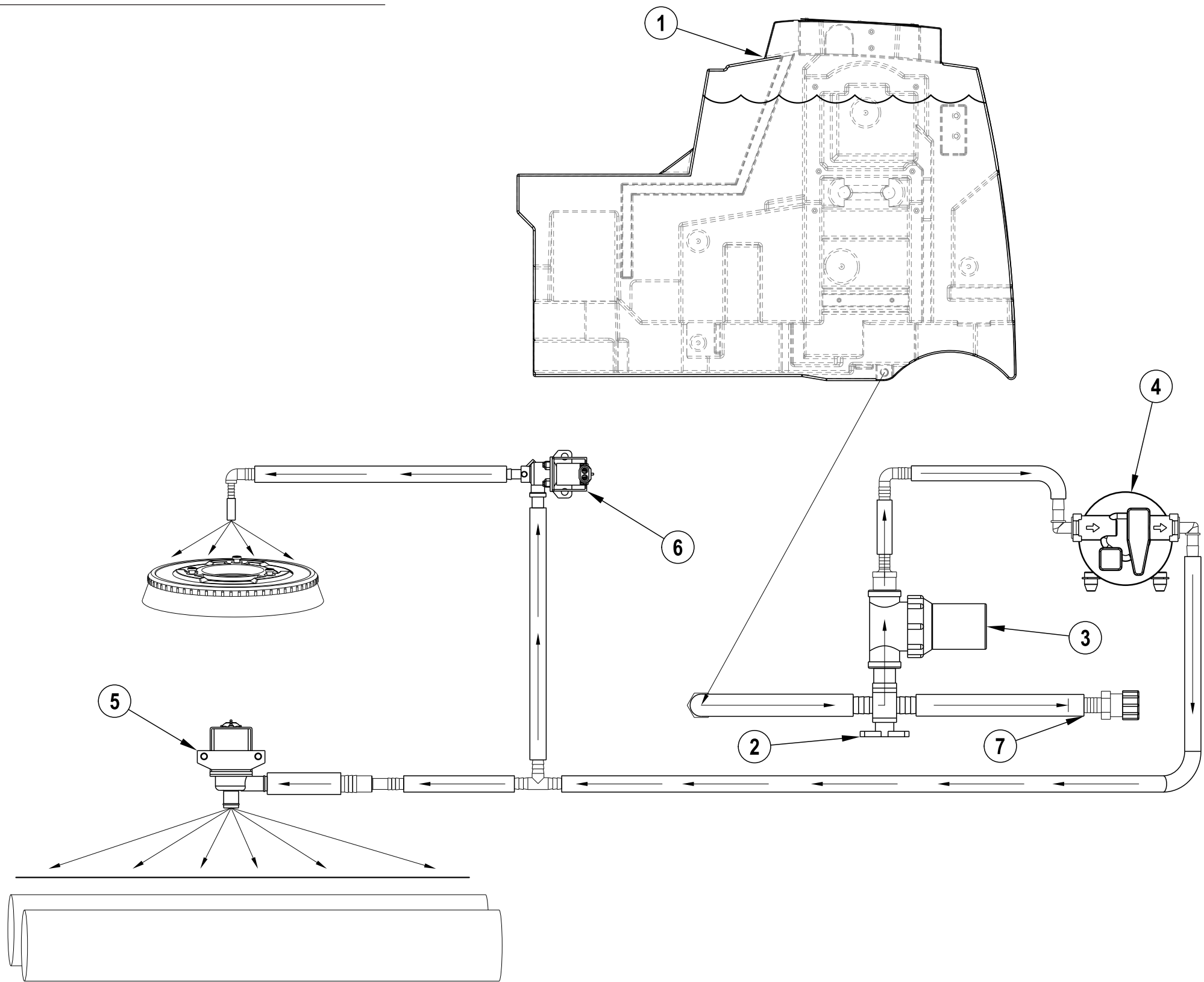
sort	Inhibits:										System Fault Name	Fault Code	Inputs [logic ORed unless specified] [Name used in flow charts]	Inputs [Name used in program code]	Comments
	recovery system	scrub system	solution system	chemical system	side scrub system	side mist system	recycle system	non-critical fault	critical fault	other fault					
	x	x	x	x				x	x	x	RECOVERY_SYSTEM_FAULT_FLG	09	VACUUM_FAULT_FLG	FAULT_VACUUM_MOTOR_SOLENOID	set if any of the following are set
								x	x	x		11	SQUEEGEE_UP_FAULT_FLG	FAULT_SQUEEGEE_UP_SOLENOID	
								x	x	x		12	SQUEEGEE_DOWN_FAULT_FLG	FAULT_SQUEEGEE_DOWN_SOLENOID	
											SCRUB_SYSTEM_FAULT_FLG	13	SCRUB_MOTOR_FAULT_FLG	FAULT_SCRUB_BRUSH_SOLENOID	set if any of the following are set
												15	SCRUB_LOCK_FAULT_FLG	FAULT_SCRUB_CYLINDER_LOCK_SOLENOID	up and down pressure valves on same fault line
												01	SCRUB_PRESSURE_FAULT_FLG	FAULT_SCRUB_PRESSURE	
											SOLUTION_SYSTEM_FAULT_FLG	00	SOLUTION_PUMP_FAULT_FLG	FAULT_SOLUTION_PUMP	set if any of the following are set
												07	SOLUTION_VALVE_FAULT_FLG	FAULT_MAIN_SOLUTION_SOLENOID	same fault line used for clean and recycle pumps
											CHEMICAL_SYSTEM_FAULT_FLG	31	CHEMICAL_PUMP1_FAULT_FLG		
												32	CHEMICAL_PUMP2_FAULT_FLG		set if any of the following are set
											SIDE_SCRUB_SYSTEM_FAULT_FLG	18	SIDE_SCRUB_LIFT_FAULT_FLG	FAULT_SIDE_SCRUB_LIFT_SOLENOID	set if any of the following are set
												16	SIDE_CLEAN_MOTOR_FAULT_FLG	FAULT_SIDE_SWEEP_SCRUB_SOLENOID	
												08	SIDE_SOLUTION_FAULT_FLG	FAULT_SIDE_SCRUB_SOLUTION_SOLENOID	
											SIDE_SWEEP_SYSTEM_FAULT_FLG	30	SIDE_SWEEP_LIFT_FAULT_FLG	FAULT_ACTUATOR	set if any of the following are set
												16	SIDE_CLEAN_MOTOR_FAULT_FLG	FAULT_SIDE_SWEEP_SCRUB_SOLENOID	
											SIDE_MIST_SYSTEM_FAULT_FLG	04	SIDE_MIST_PUMP_FAULT_FLG	FAULT_SIDE_SWEEP_MIST_PUMP	set if any of the following are set
											RECYCLE_SYSTEM_FAULT_FLG	00	SOLUTION_PUMP_FAULT_FLG	FAULT_SOLUTION_PUMP	set if any of the following are set
											ENGINE_SPEED_FAULT_FLG	05	2200RPM_OUT_FAULT_FLG	FAULT_ECM_2200	set if any of the following are set
												06	2400RPM_OUT_FAULT_FLG	FAULT_ECM_2400	same fault line used for clean and recycle pumps
															set if any of the following are set
												10	RECYCLE_SOLUTION_VALVE_FAULT_FLG	FAULT_RECYCLE_SOLUTION_SOLENOID	not used
												03	SPRAY_HOSE_FAULT_FLG	FAULT_WAND_SOLUTION_PUMP	
												19	HORN_FAULT_FLG	FAULT_HORN	
												17	BACKUP_ALARM_FAULT_FLG	FAULT_BACKUP_ALARM	
												02	MAIN_RELAY_FAULT_FLG	FAULT_MAIN_POWER_RELAY	inhibits ALL functions
	x	x	x	x	x	x						25	VACC1_FAULT_FLG	FAULT_VACC1	
												26	VACC2_FAULT_FLG	FAULT_VACC2	
												27	VACC3_FAULT_FLG	FAULT_VACC3	
												28	VACC4_FAULT_FLG	FAULT_VACC4	
												29	VACC5_FAULT_FLG	FAULT_VACC5	
												20	LEFT_TURN_FAULT_FLG	FAULT_LEFT_TURN_LAMP	
												21	RIGHT_TURN_FAULT_FLG	FAULT_RIGHT_TURN_LAMP	
												23	LEFT_STOP_FAULT_FLG	FAULT_LEFT_STOP_LAMP	
												24	RIGHT_STOP_FAULT_FLG	FAULT_RIGHT_STOP_LAMP	
												22	HEAD_TAIL_LAMP_FAULT_FLG	FAULT_HEAD_LAMPS	
												14	GLOW_PLUG_OUT_FAULT_FLG	FAULT_GLOW_PLUG_RELAY	diesel model only
												35	LOW_VOLTAGE_FAULT_FLG		low voltage when engine is running
	x	x	x	x	x	x						37	LOW_OIL_PRESSURE_FLG		diesel only - causes ENGINE_FAULT_FLG to be set
												33	ENGINE_HOT_FLG		coolant temperature high - causes ENGINE_FAULT_FLG to be set on diesel machines
												38	ENGINE_FAULT_FLG		occurs if engine temp too high (diesel), oil pressure low (diesel), or if engine run has changed to false and key is on (gas & propane)
	x	x	x	x	x	x						36	SERVICE_ENGINE_FLG		set when ECM activates MIL output - could be for many different reasons
												34	HYDRAULIC_TEMP_FAULT_FLG		Set if hydraulic temperature exceeds 220°F for 15 seconds
												39	HYDRAULIC_FILTER_FAULT_FLG		Set if hydraulic temperature greater than or equal to 100°F AND hydraulic filter input is active.

APPENDIX

SOLUTION FLOW DIAGRAM - STANDARD WITH RIGHT FRONT SCRUB

Item	Description
1	Solution Tank
2	Solution Flow Control Valve
3	Solution Filter
4	Main Solution Pump (M4)
5	Main Solution Valve (L10)
6	*Right Solution Valve (L11)
7	Solution Tank Drain Hose

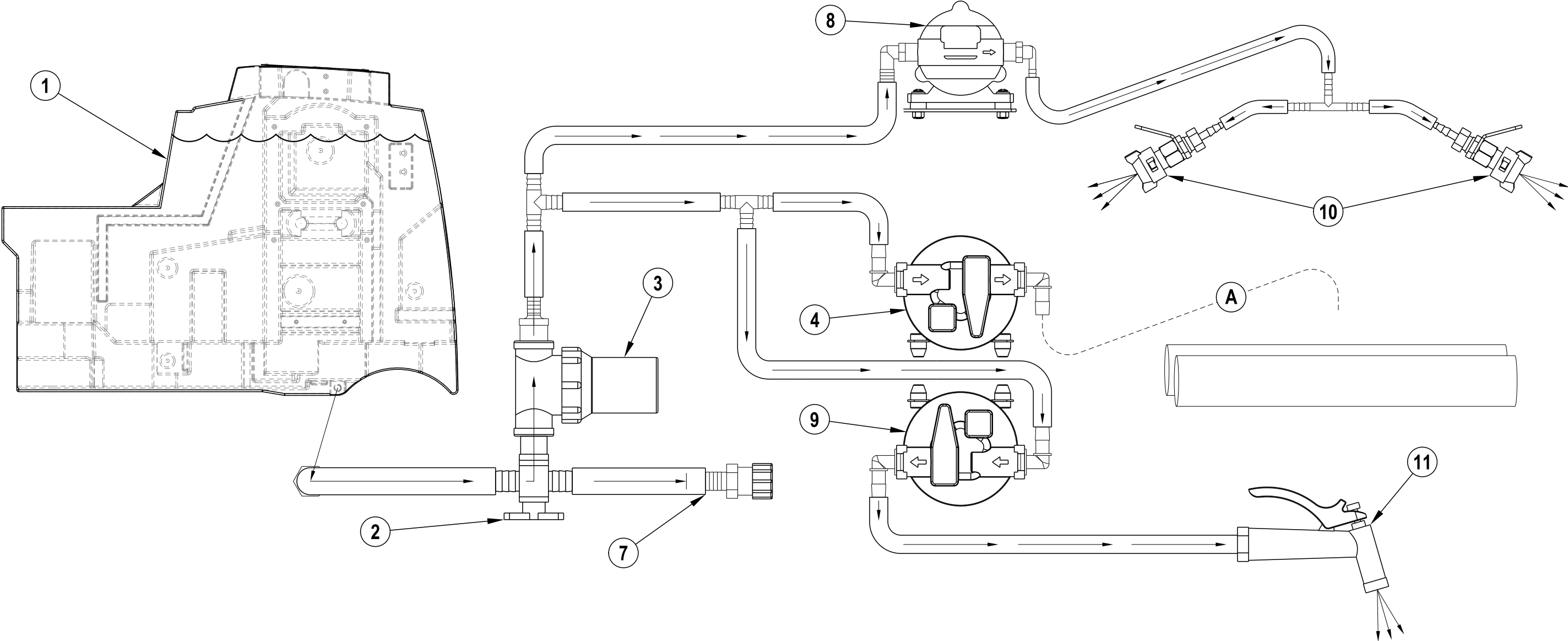
* = Only if equipped with Right Front Scrub.



SOLUTION FLOW DIAGRAM - ACCESSORIES

Item	Description
1	Solution Tank
2	Solution Flow Control Valve
3	Solution Filter
4	Main Solution Pump (M4)
7	Solution Tank Drain Hose
8	Mist Pump (M5)
9	Wand Pump (M8)
10	Mist Spray Nozzles
11	Wash Hose Spray Gun

A = Solution flow to the scrub deck see "Solution Flow Diagram – Standard with Right Front Scrub" for more details.

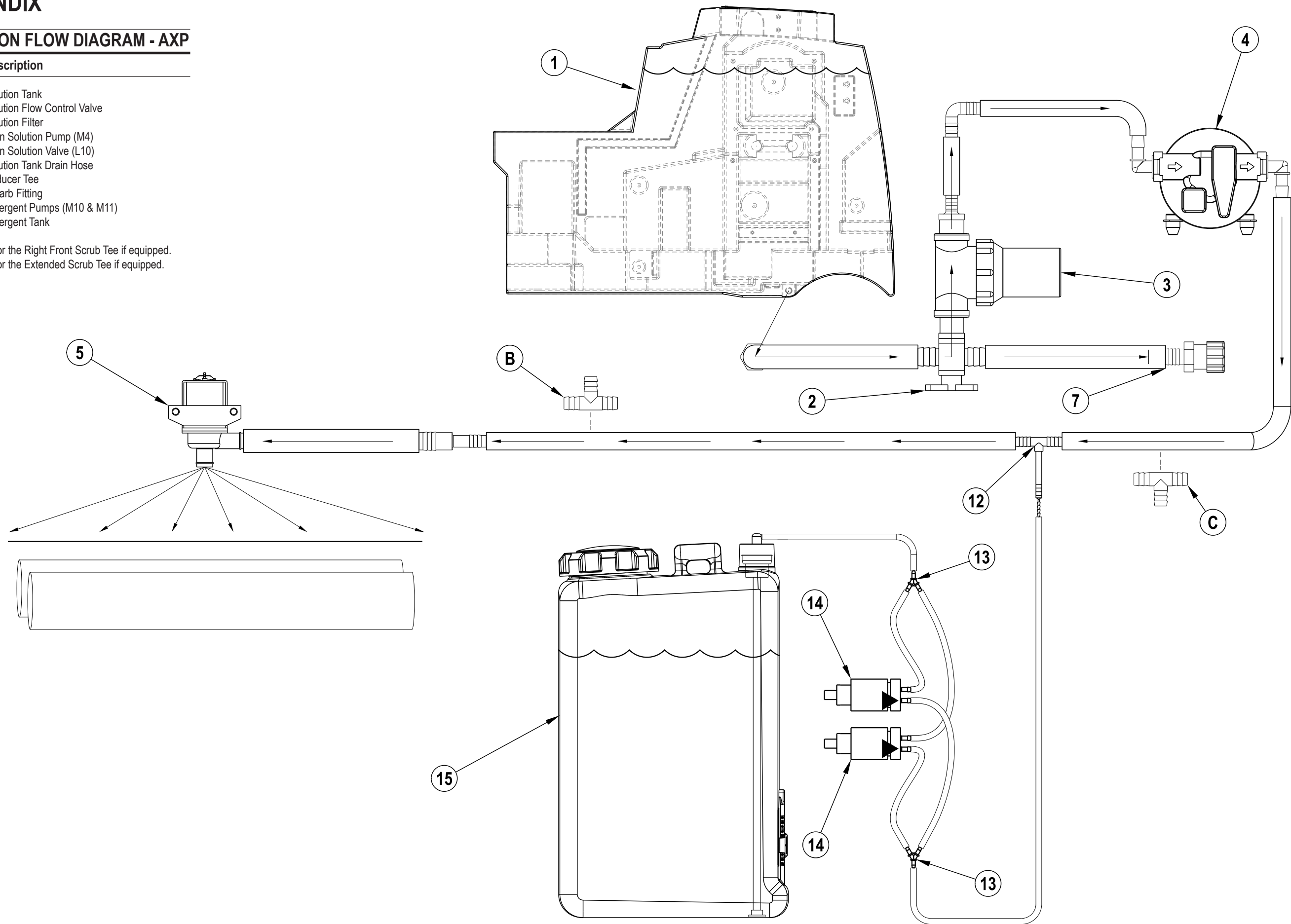


APPENDIX

SOLUTION FLOW DIAGRAM - AXP

Item	Description
1	Solution Tank
2	Solution Flow Control Valve
3	Solution Filter
4	Main Solution Pump (M4)
5	Main Solution Valve (L10)
7	Solution Tank Drain Hose
12	Reducer Tee
13	Y Barb Fitting
14	Detergent Pumps (M10 & M11)
15	Detergent Tank

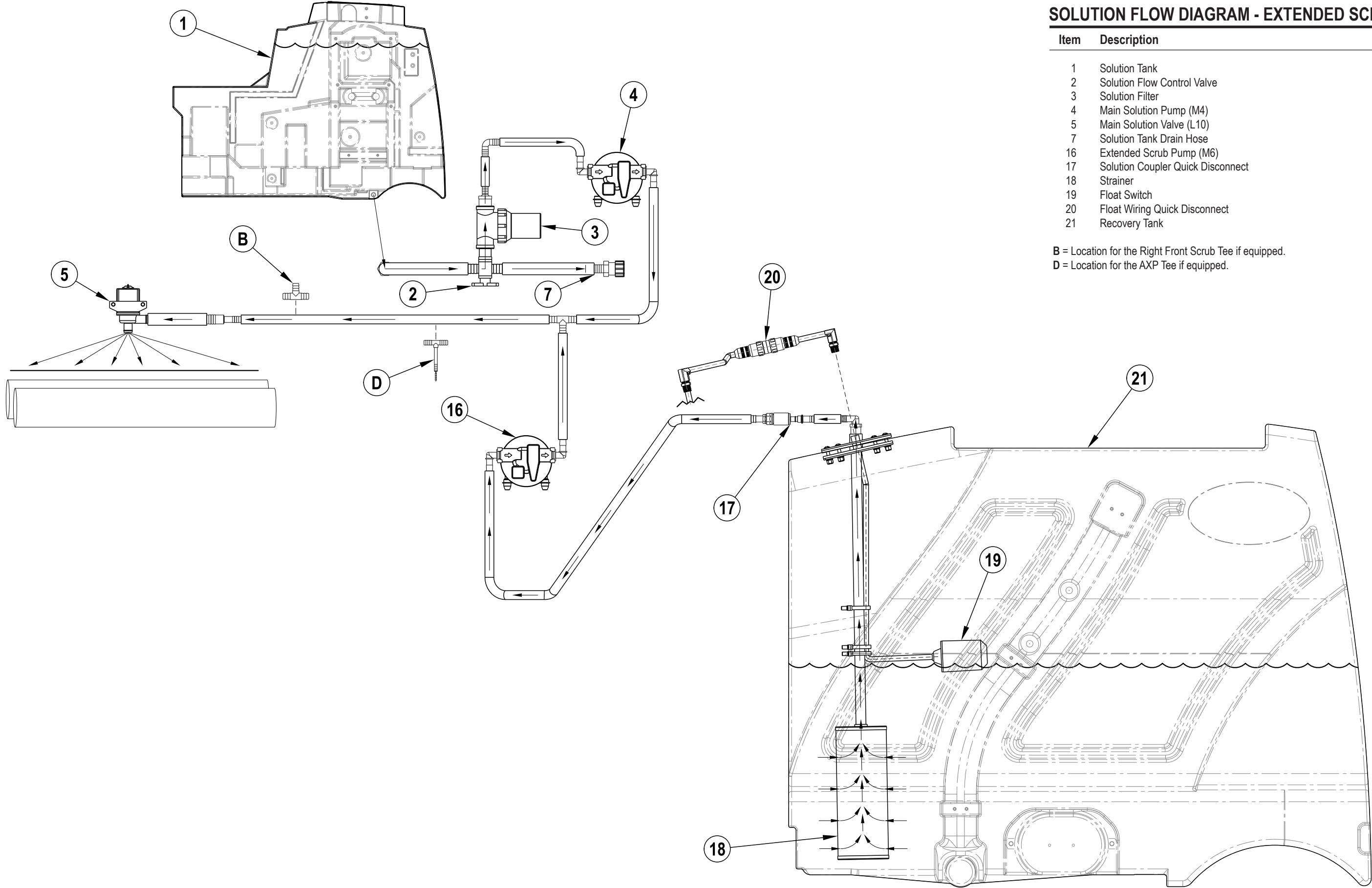
B = Location for the Right Front Scrub Tee if equipped.
C = Location for the Extended Scrub Tee if equipped.



SOLUTION FLOW DIAGRAM - EXTENDED SCRUB

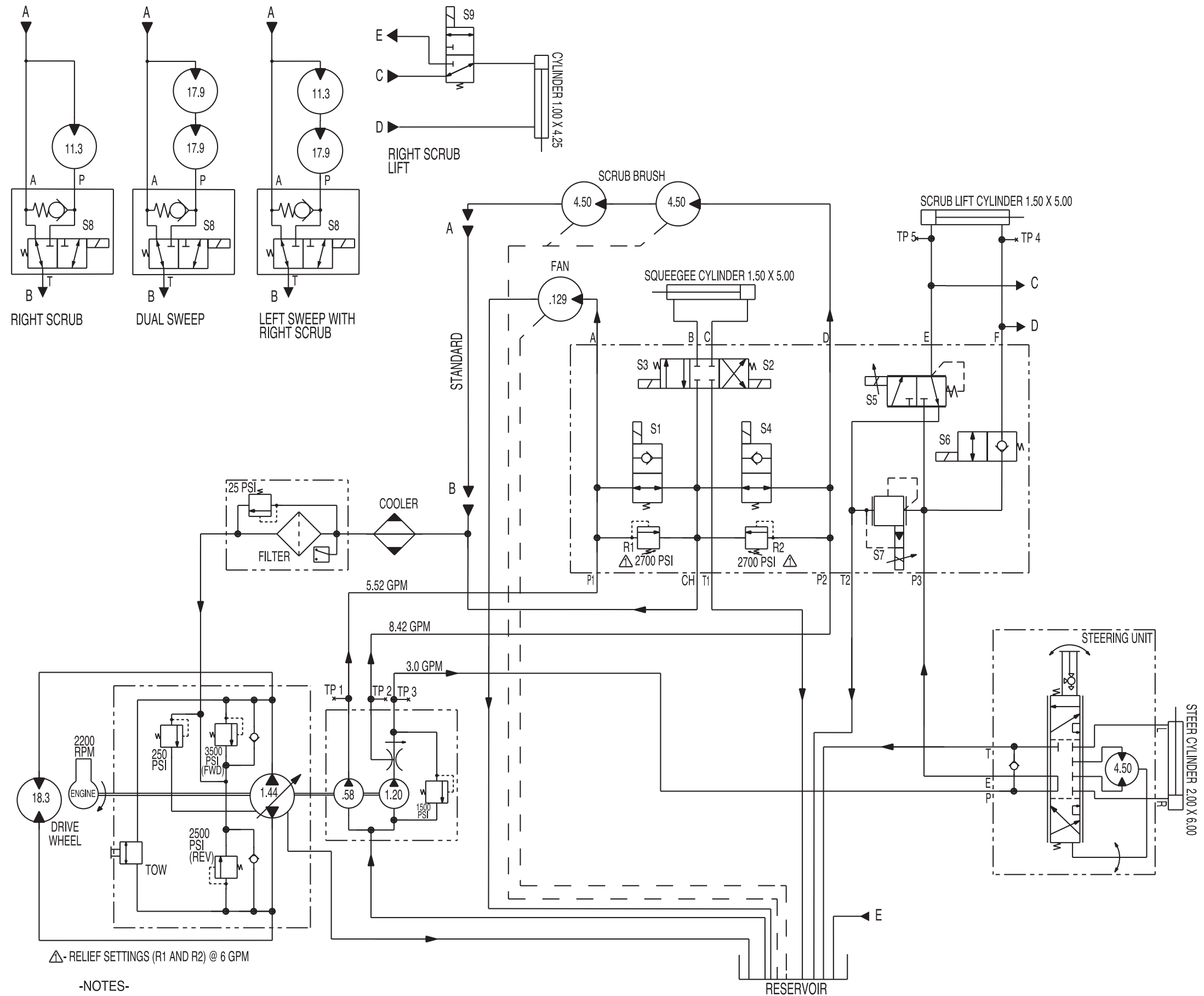
Item	Description
1	Solution Tank
2	Solution Flow Control Valve
3	Solution Filter
4	Main Solution Pump (M4)
5	Main Solution Valve (L10)
7	Solution Tank Drain Hose
16	Extended Scrub Pump (M6)
17	Solution Coupler Quick Disconnect
18	Strainer
19	Float Switch
20	Float Wiring Quick Disconnect
21	Recovery Tank

B = Location for the Right Front Scrub Tee if equipped.
D = Location for the AXP Tee if equipped.



APPENDIX

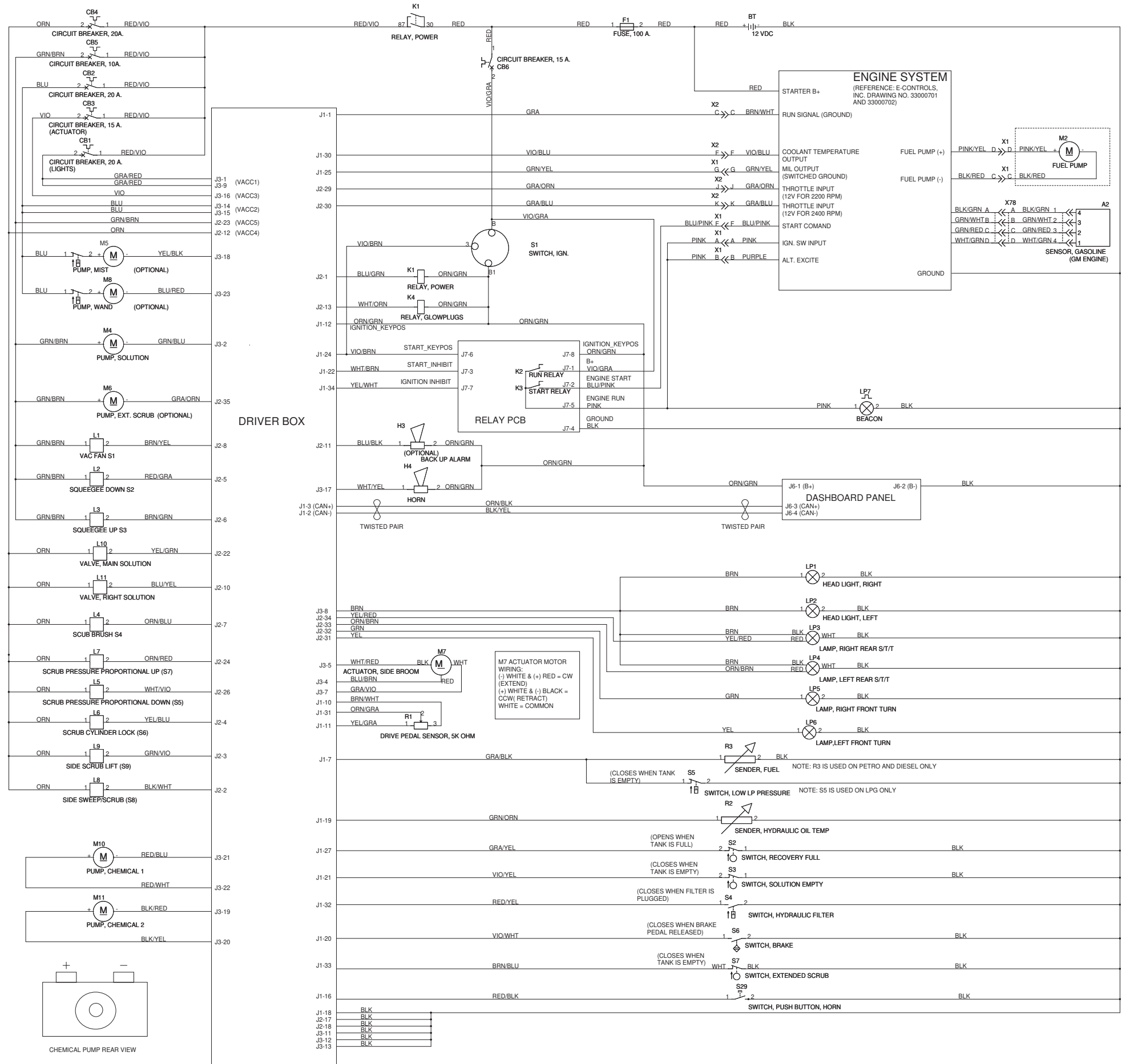
HYDRAULIC SCHEMATIC



APPENDIX

WIRING DIAGRAM - W/GM ENGINE

Item	Description	Item	Description
A2	Gasoline Sensor, Assy	M2	Fuel Pump (Gasoline/Petrol)
BT	Battery 12V	M4	Pump, Solution
CB1	Circuit Breaker, 20 Amp (lights)	M5	Pump, Mist (optional)
CB2	Circuit Breaker, 20 Amp	M6	Pump, Ext. Scrub (optional)
CB3	Circuit Breaker, 15 Amp (actuator)	M7	Actuator, Side Broom
CB4	Circuit Breaker, 20 Amp	M8	Pump, Wand (optional)
CB5	Circuit Breaker, 10 Amp	M10	Pump, Chemical 1
CB6	Circuit Breaker, 15 Amp	M11	Pump, Chemical 2
F1	Fuse, 100 Amp	R1	Drive Pedal Sensor, 5K Ohm
H3	Back-Up Alarm (optional)	R2	Sender, Hydraulic Oil Temp
H4	Horn	R3	Sender, Fuel (Petrol and Diesel models only)
K1	Relay, Power	S1	Switch, Ignition
K2	Relay, Run	S2	Switch, Recovery Full
K3	Relay, Start	S3	Switch, Solution Empty
K4	Relay, Glow Plugs	S4	Switch, Hydraulic Filter
L1	Vacuum Fan Valve, S1	S5	Switch, Low LP Pressure (LPG only)
L2	Squeegee Down Valve, S2	S6	Switch, Brake
L3	Squeegee Up Valve, S3	S7	Switch, Extended Scrub
L4	Scrub Brush Valve, S4	S29	Switch, Push Button, Horn
L5	Scrub Pressure Proportional Down Valve, S5		
L6	Scrub Cylinder Lock Valve, S6		
L7	Scrub Pressure Proportional Up Valve, S7		
L8	Side Sweep/Scrub Valve, S8		
L9	Side Scrub Lift Valve, S9		
L10	Main Solution Valve		
L11	Right Solution Valve		
LP1	Headlight, Right		
LP2	Headlight, Left		
LP3	Lamp, Right Rear S/T/T		
LP4	Lamp, Left Rear S/T/T		
LP5	Lamp, Right Front Turn		
LP6	Lamp, Left Front Turn		
LP7	Beacon		



APPENDIX

WIRING DIAGRAM - W/KUBOTA DIESEL ENGINE

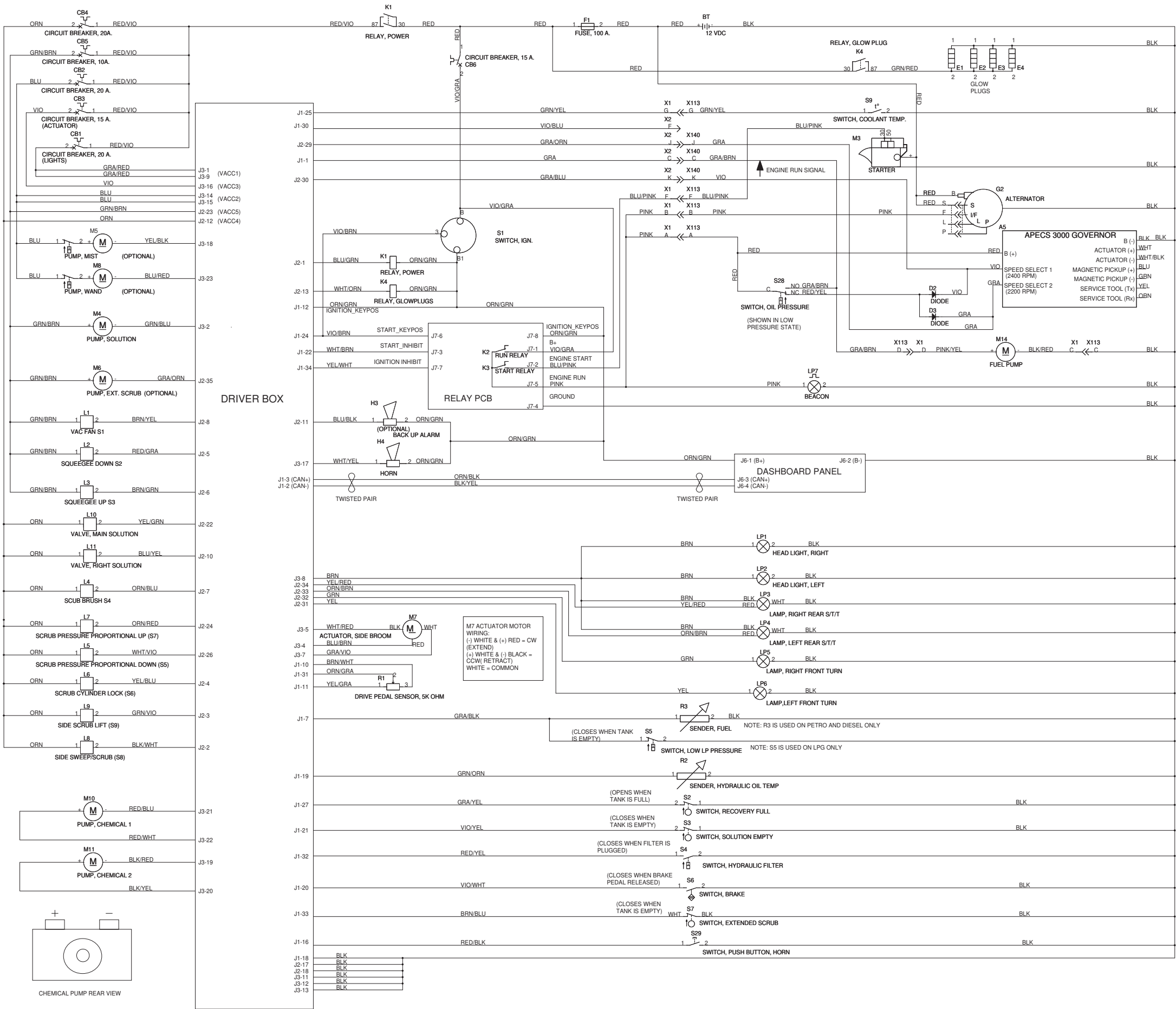
Item	Description	Item	Description
------	-------------	------	-------------

A5	APECS 3000 Governor	M3	Starter
BT	Battery 12V	M4	Pump, Solution
CB1	Circuit Breaker, 20 Amp (lights)	M5	Pump, Mist (optional)
CB2	Circuit Breaker, 20 Amp	M6	Pump, Ext. Scrub (optional)
CB3	Circuit Breaker, 15 Amp (actuator)	M7	Actuator, Side Broom
CB4	Circuit Breaker, 20 Amp	M8	Pump, Wand (optional)
CB5	Circuit Breaker, 10 Amp	M10	Pump, Chemical 1
CB6	Circuit Breaker, 15 Amp	M11	Pump, Chemical 2
D2	Diode	M14	Fuel Pump
D3	Diode	R1	Drive Pedal Sensor, 5K Ohm

E1	Glow Plug	R2	Sender, Hydraulic Oil Temp
E2	Glow Plug	R3	Sender, Fuel
E3	Glow Plug	S1	Switch, Ignition
E4	Glow Plug	S2	Switch, Recovery Full
		S3	Switch, Solution Empty
		S4	Switch, Hydraulic Filter
		S6	Switch, Brake
		S7	Switch, Extended Scrub
		S9	Switch, Coolant Temp.
		S28	Switch, Oil Pressure
		S29	Switch, Push Button, Horn

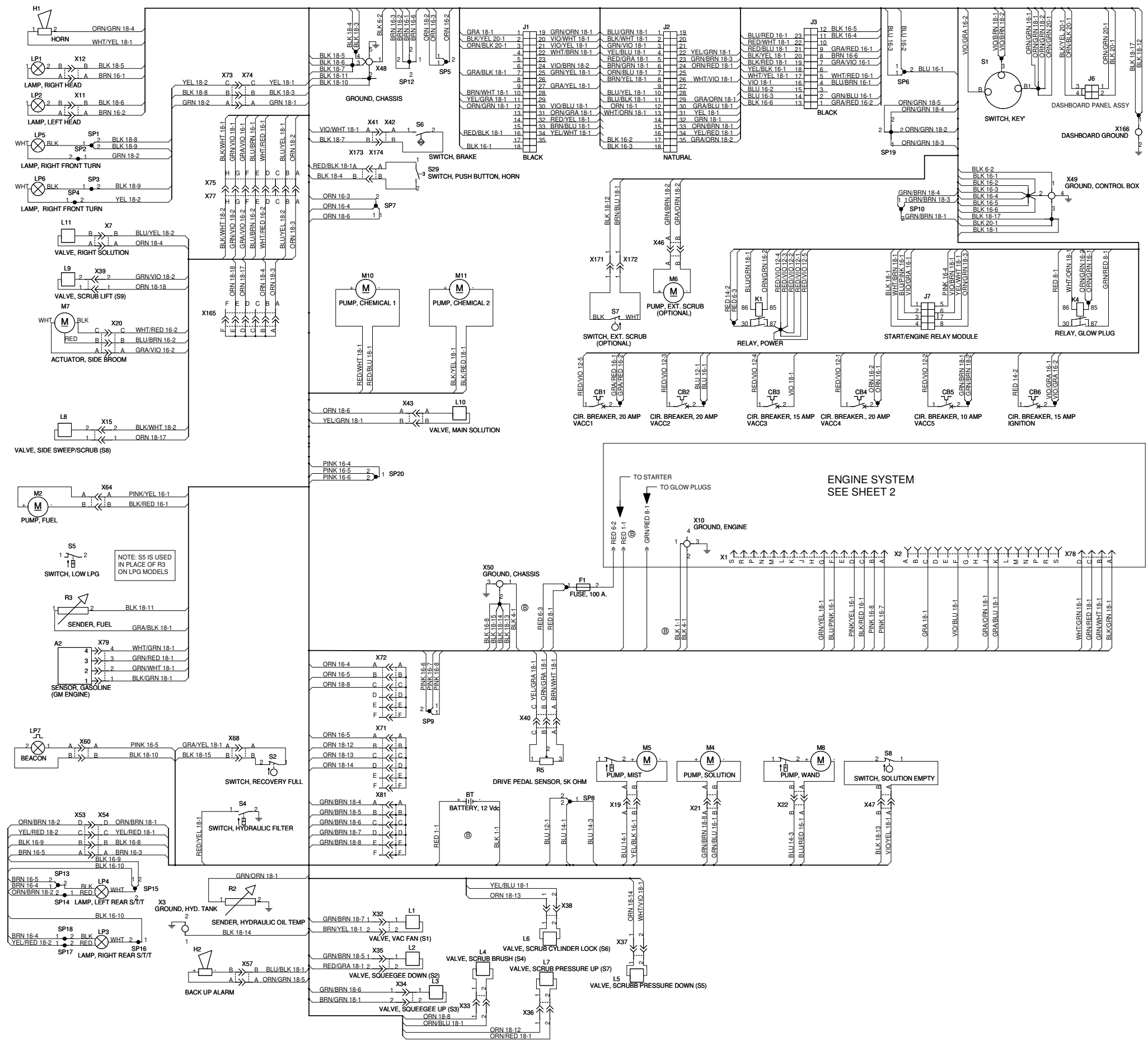
K1	Relay, Power		
K2	Relay, Run		
K3	Relay, Start		
K4	Relay, Glow Plugs		
L1	Vacuum Fan Valve, S1		
L2	Squeegee Down Valve, S2		
L3	Squeegee Up Valve, S3		
L4	Scrub Brush Valve, S4		
L5	Scrub Pressure Proportional Down Valve, S5		
L6	Scrub Cylinder Lock Valve, S6		
L7	Scrub Pressure Proportional Up Valve, S7		
L8	Side Sweep/Scrub Valve, S8		
L9	Side Scrub Lift Valve, S9		
L10	Main Solution Valve		
L11	Right Solution Valve		

LP1	Headlight, Right		
LP2	Headlight, Left		
LP3	Lamp, Right Rear S/T/T		
LP4	Lamp, Left Rear S/T/T		
LP5	Lamp, Right Front Turn		
LP6	Lamp, Left Front Turn		
LP7	Beacon		



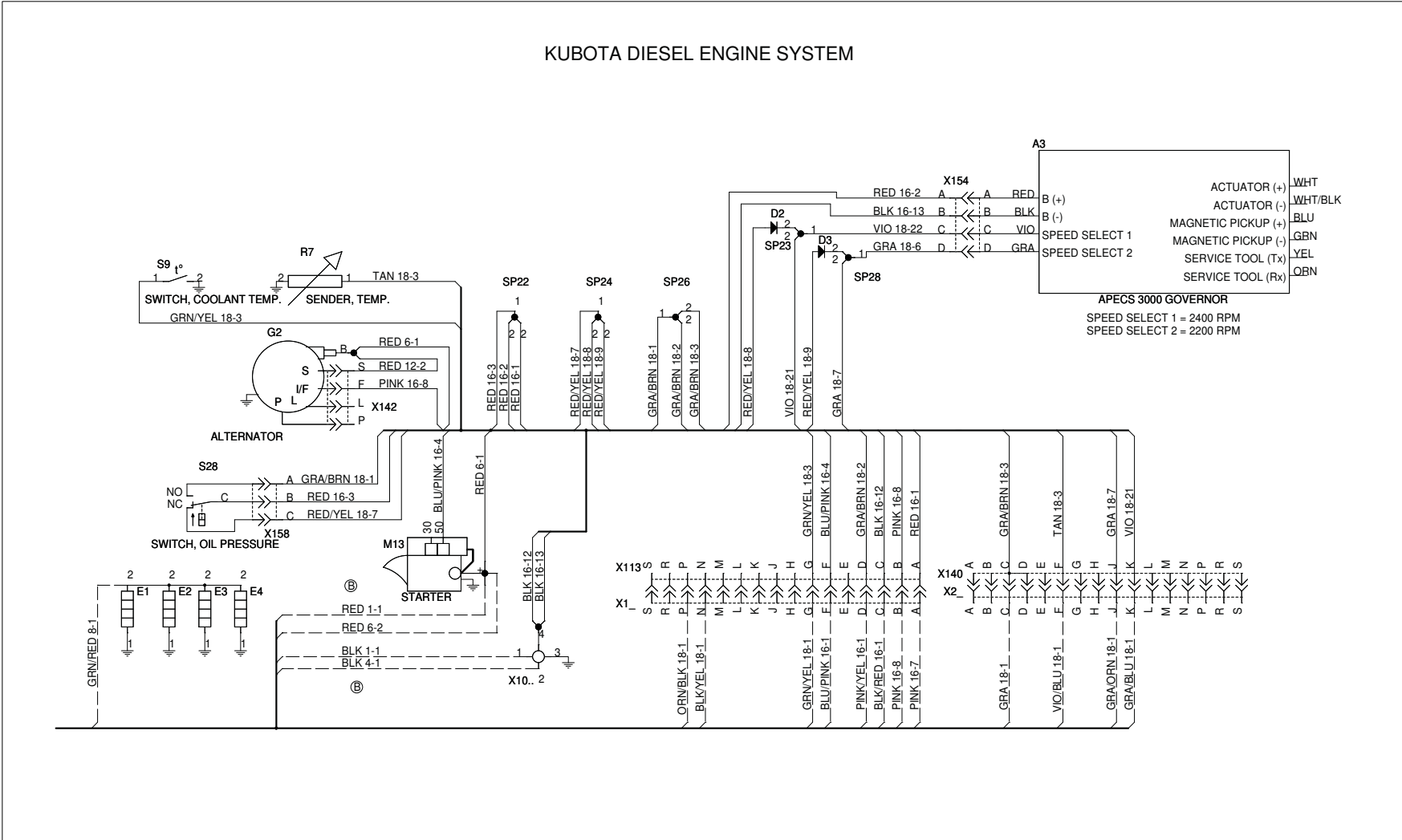
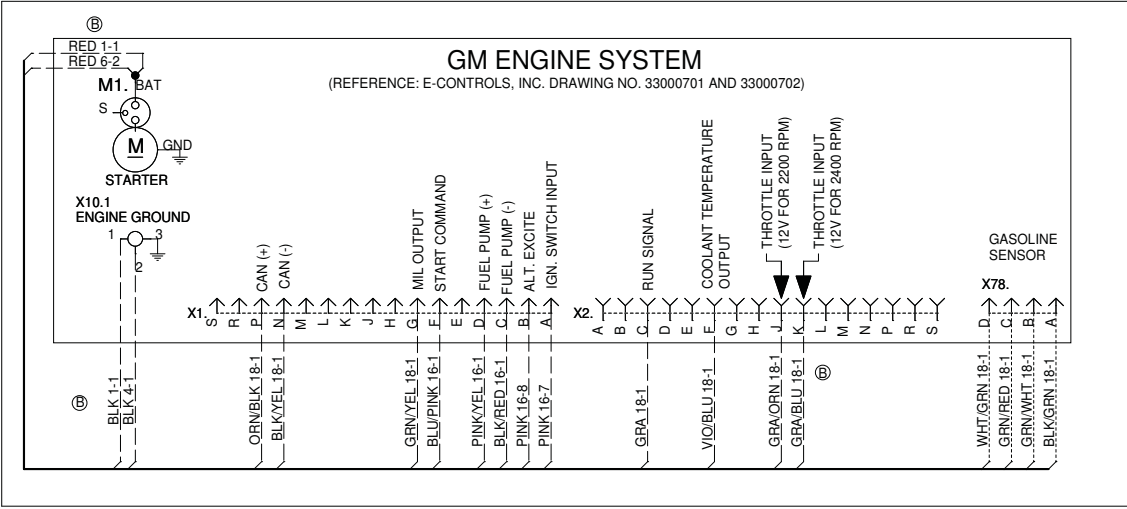
APPENDIX

WIRING SCHEMATIC 1 of 2



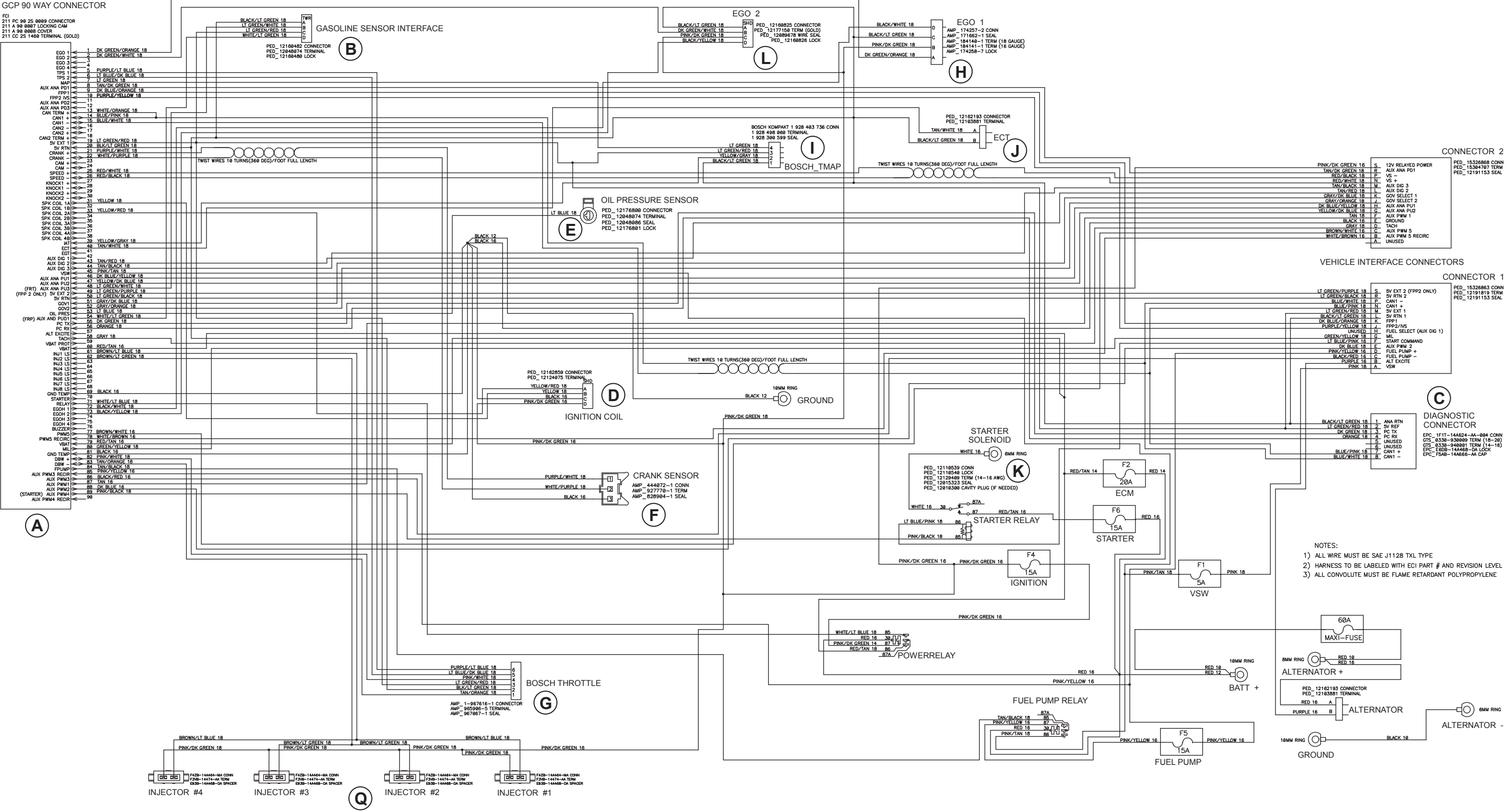
APPENDIX

WIRING SCHEMATIC 2 of 2

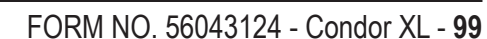


GCP 90 WAY CONNECTOR

FOI
211 PC 90 2S 0009 CONNECTOR
211 A 90 0007 LOCKING CAM
211 A 90 0008 COVER
211 CC 2S 1400 TERMINAL (GOLD)



APPENDIX



APPENDIX

Wiring Harness Item	Wiring Harness Component Description
A	ECM Wiring Connector (90 Pins)
B	Gasoline/Petrol Fuel Sensor Interface Connector (fuel pressure regulation and temperature sensor manifold assembly)
C	Engine Diagnostic Communication Port (8 Pin) (MIL shorting location)
D	Ignition Coil Pack Wiring Connector
E	Engine Oil Pressure Switch
F	Crankshaft Position Sensor Connector
G	Throttle Fly Actuator Motor Connector (Bosch)
H	EGO #1 Sensor Wiring Connector
I	Combined TMAP Engine Air Temperature and MAP Sensor Wiring Connector
J	Engine Coolant Temperature (ECT) Sensor Connector
K	Engine Starter Solenoid Wire Connector
L	EGO #2 Sensor Wiring Connector
M	LPG Fuel Lockoff Wiring Connector
N	LPG Temp Sensor Wiring Connector
P	EPR Connector (LPG) Fuel Regulator
Q	Gasoline Fuel Injectors

Definition of Terms for Computerized Engine Controllers

- ANA-RTN:
- ECM: Engine Control Module
- EGO: Exhaust Gas Oxygen Sensor (O2)
- EPR: Electronic Pressure Regulator
- IAT: Intake Manifold Air Temperature
- MAP: Intake Manifold Absolute Pressure
- MIL: Malfunction Indicator Light
- VSW: Switched Battery Voltage
- VBAT: Battery Voltage

EGO 1	1	DK GREEN/ORANGE 18
EGO 2	2	DK GREEN/ORANGE 18
EGO 3	3	
EGO 4	4	
TPS 1	5	PURPLE/LT BLUE 18
TPS 2	6	LT BLUE/DK BLUE 18
MAP	7	LT GREEN 18
AUX ANA PD1	8	TAN/DK GREEN 18
FPP1	9	DK BLUE/ORANGE 18
FPP2 IVS	10	PURPLE/YELLOW 18
AUX ANA PD2	11	
AUX ANA PD3	12	
CAN TERM +	13	WHITE/ORANGE 18
CAN1 +	14	BLUE/PINK 18
CAN1 -	15	BLUE/WHITE 18
CAN2 -	16	
CAN2 +	17	
CAN2 TERM +	18	
5V EXT 1	19	LT GREEN/RED 18
5V RTN	20	BLK/LT GREEN 18
CRANK +	21	PURPLE/WHITE 18
CRANK -	22	WHITE/PURPLE 18
CAM +	23	
CAM -	24	
SPEED +	25	RED/WHITE 18
SPEED -	26	RED/BLACK 18
KNOCK1 +	27	
KNOCK1 -	28	
KNOCK2 +	29	
KNOCK2 -	30	
KNOCK2	31	YELLOW 18
SPK COIL 1A	32	
SPK COIL 1B	33	YELLOW/RED 18
SPK COIL 2A	34	
SPK COIL 2B	35	
SPK COIL 3A	36	
SPK COIL 3B	37	
SPK COIL 4A	38	
SPK COIL 4B	39	YELLOW/GRAY 18
IAT	40	TAN/WHITE 18
ECT	41	
EGT	42	
AUX DIG 1	43	TAN/RED 18
AUX DIG 2	44	TAN/BLACK 18
AUX DIG 3	45	PINK/TAN 18
VSW	46	DK BLUE/YELLOW 18
AUX ANA PU1	47	YELLOW/DK BLUE 18
AUX ANA PU2	48	LT GREEN/WHITE 18
(FRT) AUX ANA PU3	49	LT GREEN/PURPLE 18
(FPP 2 ONLY) 5V EXT 2	50	LT GREEN/BLACK 18
5V RTN	51	GRAY/DK BLUE 18
GOV1	52	GRAY/ORANGE 18
GOV2	53	LT BLUE 18
OIL PRES	54	WHITE/LT GREEN 18
(FRP) AUX AND PUD1	55	DK GREEN 18
PC TX	56	ORANGE 18
PC RX	57	
ALT EXCITE	58	GRAY 18
TACH	59	
VBAT PROT	60	RED/TAN 16
VBAT	61	BROWN/LT BLUE 18
INJ1 LS	62	BROWN/LT GREEN 18
INJ2 LS	63	
INJ3 LS	64	
INJ4 LS	65	
INJ5 LS	66	
INJ6 LS	67	
INJ7 LS	68	
INJ8 LS	69	BLACK 16
GND TEMP	70	
STARTER	71	WHITE/LT BLUE 18
RELAY	72	BLACK/WHITE 18
EGOH 1	73	BLACK/YELLOW 18
EGOH 2	74	
EGOH 3	75	
EGOH 4	76	
BUZZER	77	BROWN/WHITE 16
PWM5	78	WHITE/BROWN 16
PWM5 RECIRC	79	RED/TAN 16
VBAT	80	GREEN/YELLOW 18
MIL	81	BLACK 16
GND TEMP	82	PINK/WHITE 18
DBW +	83	TAN/ORANGE 18
DBW -	84	TAN/BLACK 18
FPUMP	85	PINK/YELLOW 16
AUX PWM3 RECIR	86	BLACK/RED 16
AUX PWM3	87	TAN 16
AUX PWM1	88	DK BLUE 16
AUX PWM2	89	PINK/BLACK 18
(STARTER) AUX PWM4	90	
AUX PWM4 RECIR		

ECM
Harness Connectors

CONNECTOR 2		
PINK/DK GREEN 16	S	12V RELAYED POWER
TAN/DK GREEN 18	R	AUX ANA PD1
RED/BLACK 18	P	VS -
RED/WHITE 18	N	VS +
TAN/BLACK 18	M	AUX DIG 3
TAN/RED 18	L	AUX DIG 2
GRAY/DK BLUE 18	K	GOV SELECT 1
GRAY/ORANGE 18	J	GOV SELECT 2
DK BLUE/YELLOW 18	H	AUX ANA PU1
YELLOW/DK BLUE 18	G	AUX ANA PU2
TAN 18	F	AUX PWM 1
BLACK 16	E	GROUND
GRAY 18	D	TACH
BROWN/WHITE 16	C	AUX PWM 5
WHITE/BROWN 16	B	AUX PWM 5 RECIRC
	A	UNUSED

CONNECTOR 1		
LT GREEN/PURPLE 18	S	5V EXT 2 (FPP2 ONLY)
LT GREEN/BLACK 18	R	5V RTN 2
BLUE/WHITE 18	P	CAN1 -
BLUE/PINK 18	N	CAN1 +
LT GREEN/RED 18	M	5V EXT 1
BLACK/LT GREEN 18	L	5V RTN 1
DK BLUE/ORANGE 18	K	FPP1
PURPLE/YELLOW 18	J	FPP2/IVS
UNUSED	H	FUEL SELECT (AUX DIG 1)
GREEN/YELLOW 18	G	MIL
LT BLUE/PINK 16	F	START COMMAND
DK BLUE 18	E	AUX PWM 2
PINK/YELLOW 16	D	FUEL PUMP +
BLACK/RED 16	C	FUEL PUMP -
PURPLE 16	B	ALT EXCITE
PINK 18	A	VSW

GASOLINE SENSOR INTERFACE (GASOLINE MODELS ONLY)		
WHITE/LT GREEN 18	D	
LT GREEN/RED 18	C	
LT GREEN/WHITE 18	B	
BLACK/LT GREEN 18	A	

DIAGNOSTIC CONNECTOR		
BLACK/LT GREEN 18	1	ANA RTN
LT GREEN/RED 18	2	5V REF
DK GREEN 18	3	PC TX
ORANGE 18	4	PC RX
	5	UNUSED
	6	UNUSED
BLUE/PINK 18	7	CAN1 +
BLUE/WHITE 18	8	CAN1 -

ECM Detail

Machine
Harness Connectors

X2		
THROTTLE INPUT (12V FOR 2400 RPM)	N	
THROTTLE INPUT (12V FOR 2200 RPM)	M	
	L	
	K	GRA/BLU J2-30
	J	GRA/ORN J2-29
	H	
COOLANT TEMP. OUTPUT	G	
	F	VIO/BLU J1-30
	E	
	D	
RUN SIGNAL (GROUND)	C	GRA J1-1
	B	
	A	

X1		
	S	
	R	
CAN1 (-)	P	
CAN1 (+)	N	
	M	
	L	
	K	
	J	
	H	
MIL OUTPUT	G	GRN/YEL 18-1
START COMMAND	F	BLU/PINK 16-1
	E	
FUEL PUMP (+)	D	PINK/YEL 16-1
FUEL PUMP (-)	C	BLK/RED 16-1
ALT. EXCITE	B	PINK 16-7
IGN. SWITCH INPUT	A	PINK 16-4

X78		
	D	WHT/GRN 18-1
	C	GRN/RED 18-1
	B	GRN/WHT 18-1
	A	BLK/GRN 18-1

APPENDIX

SWITCH SEQUENCES FOR MAIN CONTROLLER PROGRAMMING OPTIONS

Programming Option	Switches Pressed to Access Option
Foot Pedal Neutral/Deadband	Engine Speed (51)
Configuration Display	Emergency Flashers (67)
User Options Menu	<ul style="list-style-type: none">• Scrub OFF Switch (55)• Scrub ON Switch (54)
Configuration Menu	<ul style="list-style-type: none">• Emergency Flashers (67)• Headlight (68)



**Nilfisk
Advance**

setting standards

Nilfisk-Advance, Inc.
14600 21st Avenue North
Plymouth, MN 55447-3408
www.nilfisk-advance.com
Phone: 800-989-2235
Fax: 800-989-6566
©2009 Nilfisk-Advance, Inc.