OPERATING INSTRUCTIONS

MQ WHITEMAN RIDE-ON POWER TROWEL MD80

U.S. Revision #0 (05/22/24)
AUS Version 1.0 (May 2025)

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OPERATION MANUAL

MULTIQUIP®

WHITEMAN

MODEL MD80

HYDRAULIC RIDE-ON TROWEL

(VANGUARD 61G200 40 HP GASOLINE ENGINE)

Revision #0 (05/22/24)

To find the latest revision of this publication or associated parts manual, visit our website at:
www.multiquip.com

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PN: 48711


WARNING
CANCER &
REPRODUCTIVE HARM
www.P65Warnings.ca.gov
P/N 38707

⚠ WARNING

SILICOSIS WARNING

Grinding/cutting/drilling of masonry, concrete, metal and other materials with silica in their composition may give off dust or mists containing crystalline silica. Silica is a basic component of sand, quartz, brick clay, granite and numerous other minerals and rocks. Repeated and/or substantial inhalation of airborne crystalline silica can cause serious or fatal respiratory diseases, including silicosis. In addition, California and some other authorities have listed respirable crystalline silica as a substance known to cause cancer. When cutting such materials, always follow the respiratory precautions mentioned above.

⚠ WARNING

RESPIRATORY HAZARDS

Grinding/cutting/drilling of masonry, concrete, metal and other materials can generate dust, mists and fumes containing chemicals known to cause serious or fatal injury or illness, such as respiratory disease, cancer, birth defects or other reproductive harm. If you are unfamiliar with the risks associated with the particular process and/or material being cut or the composition of the tool being used, review the material safety data sheet and/or consult your employer, the material manufacturer/supplier, governmental agencies such as OSHA and NIOSH and other sources on hazardous materials. California and some other authorities, for instance, have published lists of substances known to cause cancer, reproductive toxicity, or other harmful effects.

Control dust, mist and fumes at the source where possible. In this regard use good work practices and follow the recommendations of the manufacturers or suppliers, OSHA/NIOSH, and occupational and trade associations. Water should be used for dust suppression when wet cutting is feasible. When the hazards from inhalation of dust, mists and fumes cannot be eliminated, the operator and any bystanders should always wear a respirator approved by NIOSH/MSHA for the materials being used.

MD80 Ride-On Trowel

NOTICE

Specifications are subject to change without notice.

Training Checklist			
No.	**Description**	**OK?**	**Date**
1	Read operation manual completely		
2	Machine layout, location of components, checking of engine and hydraulic oil levels		
3	Fuel system, refueling procedure		
4	Operation of spray and lights		
5	Operation of controls (machine not running)		
6	Safety controls, safety stop switch operation		
7	Emergency stop procedures		
8	Startup of machine, pre-heat, engine choke		
9	Maintaining a hover		
10	Maneuvering		
11	Pitching		
12	Matching blade pitch. Twin-Pitch™		
13	Concrete finishing techniques		
14	Shutdown of machine		
15	Lifting of machine (lift loops)		
16	Machine transport and storage		

Daily Pre-Operation Checklist		✓	✓	✓	✓	✓	✓
1	Engine oil level						
2	Hydraulic oil level						
3	Radiator coolant level						
4	Condition of blades						
5	Blade pitch operation						
6	Safety stop switch operation						

DO NOT operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.

SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER, WARNING, CAUTION** or **NOTICE**.

SAFETY SYMBOLS

DANGER

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY**.

WARNING

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY**.

CAUTION

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY**.

NOTICE

Addresses practices not related to personal injury.

Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
 	Rotating parts hazards
	Pressurized fluid hazards
	Hydraulic fluid hazards

SAFETY DECALS

Decals associated with the safe operation of this equipment are defined below.

DECAL	DEFINITION
	**CAUTION** Burn Hazard **HOT PARTS** can burn skin. **DO NOT** touch **hot parts**. Allow machine sufficient amount of time to cool before performing maintenance.
	**WARNING** Lifting/Crush Hazard **NEVER** allow any person to stand underneath the trowel while lifting. **DO NOT** lift trowel with pans attached. **ALWAYS** make sure handle is securely attached.
	**WARNING** Cancer and Reproductive Harm This equipment may contain or produce chemicals and substances known to cause cancer, birth defects and other reproductive harm. **ALWAYS** work in a well-ventilated area and **ALWAYS** wear approved safety equipment.
	**DANGER** Guard Hazard **DO NOT** operate equipment with guards removed. Serious bodily injury could result.
	**DANGER** Training This machine to be operated by qualified personnel only. Ask for training as needed.
	**DANGER** Inhalation Hazard **DO NOT** use this equipment in an **enclosed area**. The engine used with this equipment emits harmful levels of carbon monoxide which can cause **severe bodily harm — even death!**
	**DANGER** Rotating Blade Hazard Keep hands, fingers, and feet clear of engine fan blades and guard rings. Moving parts can cut. **DO NOT** remove guards. Stop engine before servicing.
	**WARNING** Fire, Smoking, Explosion, Inhalation Hazard **DO NOT** smoke or light matches near this equipment. This equipment contains **highly flammable** fuel. **DO NOT** use this equipment in an enclosed area.

DECAL	DEFINITION
	**NOTICE** Radio Noise This product complies with Canadian ICES-002.
	**NOTICE** Read Manual To avoid injury, you must read and understand the operator's manual before using this machine.
	**NOTICE** Protective Clothing **ALWAYS** wear appropriate clothing when operating the trowel.
	**NOTICE** Lifting Location Attach a suitable lifting device here to lift the unit.
	**NOTICE** Tie-Down Location **ALWAYS** tie-down equipment during transport.
	**NOISE LEVEL** Indicates value of the sound power of the equipment measured at operator's seat.
	**UNLEADED GASOLINE** The engine used in this equipment runs on **unleaded gasoline**.
	**WARNING** **NEVER** disable or disconnect the seat switch. It is provided for operator safety. Injury may result if it is disabled, disconnected or improperly maintained.

GENERAL SAFETY

⚠ CAUTION

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.

- Avoid wearing jewelry or loose-fitting clothes that may snag on the controls or moving parts, as this can cause serious injury.
- **NEVER** operate this equipment when on medication or when not feeling well due to fatigue or illness.

- **NEVER** operate this equipment under the influence of drugs or alcohol.

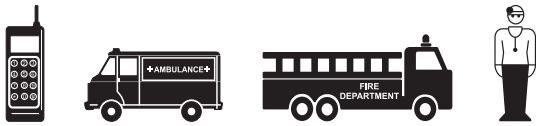
- **ALWAYS** clear the work area of any debris, tools, etc. that would constitute a hazard while the equipment is in operation.
- No one other than the operator is to be in the working area when the equipment is in operation.
- **NEVER** use the equipment for any purpose other than its intended purposes or applications.

NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to the user may result.
- **ALWAYS** know the location of the nearest **fire extinguisher**.

- **ALWAYS** know the location of the nearest **first aid kit**.

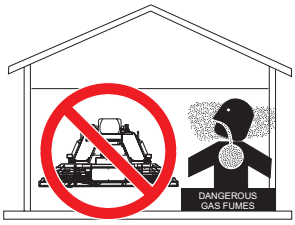
- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site**. Also, know the phone numbers of the nearest **ambulance**, **doctor** and **fire department**. This information will be invaluable in the case of an emergency.



TROWEL SAFETY

⚠ DANGER

- Engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause **DEATH** if inhaled.
- The engine of this equipment requires an adequate free flow of cooling air. **NEVER** operate this equipment in any enclosed or narrow area where the free flow of air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.



- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing **severe bodily harm or even death**.

⚠ WARNING

- **NEVER** use your hand to find hydraulic leaks. Use a piece of wood or cardboard. Hydraulic fluid injected into the skin must be treated by a knowledgable physician immediately or **severe injury or death** can occur.

- **ALWAYS** keep clear of rotating or moving parts while operating the trowel.

- **NEVER** disconnect any **emergency or safety devices**. These devices are intended for operator safety. Disconnection of these devices can cause **severe injury, bodily harm or even death**. Disconnection of any of these devices will void all warranties.

⚠ CAUTION

- **NEVER** allow passengers or riders on the trowel during operation.
- **NEVER** lubricate components or attempt service on a running machine.
- **NEVER** place your feet or hands inside the guard rings while starting or operating this equipment.

NOTICE

- **ALWAYS** keep the machine in proper running condition.
- Fix damage to the machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.
- A safety manual for operating and maintenance personnel of concrete power trowels produced by the Association of Equipment Manufacturers (AEM) can be obtained for a fee by ordering through their website at www.aem.org.

  Order FORM PT-160

ENGINE SAFETY

⚠ WARNING

- **NEVER** place hands or fingers inside the engine compartment while the engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the trowel.

⚠ CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing the equipment.

NOTICE

- **DO NOT** allow the engine to run unattended at a high idle position for longer than 5 minutes. The hydraulic system will overheat if the engine idles for too long without spinning the rotors.
- **NEVER** run the engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service the air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.

FUEL SAFETY

⚠ DANGER

- **NEVER** start the engine near spilled fuel or combustible fluids. Fuel is extremely flammable and its vapors can cause an **explosion** if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **NEVER** overfill the fuel tank, as spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **NEVER** smoke around or near the equipment. **Fire or explosion** could result from fuel vapors or if fuel is spilled on a hot engine.

BATTERY SAFETY

⚠ DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **NEVER** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an **explosion** could occur.

⚠ WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.

- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **DO NOT** charge the battery if frozen. The battery can **explode**. When frozen, warm the battery to at least 61°F (16°C).
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gases.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.

- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.

⚠ CAUTION

- **ALWAYS** disconnect the **NEGATIVE** battery terminal before performing service on the equipment.
- **ALWAYS** keep battery cables in good, working condition. Repair or replace all worn cables.

TRANSPORTING SAFETY

⚠ CAUTION

- **DO NOT** allow any person or animal to stand underneath the equipment while it is being lifted.
- Ride-on trowels are very heavy and awkward to move around. Use proper heavy lifting procedures. **NEVER** attempt to lift the trowel by the guard rings.
- **NEVER** use the grab bars for lifting of the trowel. **ALWAYS** attach lifting slings/chains to the **lift loops only**.
- **NEVER** lift the trowel with the operator on the machine.

NOTICE

- Two lifting straps should have a minimum lifting capacity of 2,120 pounds (962 kg) and the lifting gear must be capable of lifting at least this amount.
- **NEVER** transport the trowel with float pans attached unless safety catches are used and are specifically cleared for such transport by the manufacturer.
- **NEVER** hoist the trowel more than three feet off the ground with float pans attached.
- Before lifting, make sure that the lift loops are not damaged.
- **ALWAYS** make sure the crane or lifting device has been properly secured to the lift loops of the equipment.
- **ALWAYS** shut down the engine before transporting.
- **DO NOT** lift the equipment while the engine is running.
- Tighten the fuel tank cap securely and close the fuel cock to prevent fuel from spilling.
- **NEVER** lift the trowel to unnecessary heights.
- **ALWAYS** tie down equipment during transport by securing the equipment with straps. Inspect the straps to make sure they are not frayed or damaged.

TOWING SAFETY

⚠ CAUTION

- Check with your local, county or state safety towing regulations, in addition to meeting ***Department of Transportation (DOT) safety towing regulations***, before towing the trowel.

ENVIRONMENTAL SAFETY/DECOMMISSIONING

NOTICE

Decommissioning is a controlled process used to safely retire a piece of equipment that is no longer serviceable. If the equipment poses an unacceptable and unrepairable safety risk due to wear or damage or is no longer cost effective to maintain (beyond life-cycle reliability) and is to be decommissioned (demolition and dismantlement), be sure to follow the rules below.

- **NEVER** pour waste or oil directly onto the ground, down a drain, or into any water source.
- Contact your country's Department of Public Works or a recycling agency in your area and arrange for proper disposal of any electrical components, waste, or oil associated with this equipment.

- When the life cycle of this equipment is over, remove the battery and bring it to an appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.
- When the life cycle of this equipment is over, it is recommended that the trowel frame and all other metal parts be sent to a recycling center.

  Metal recycling involves the collection of metal from discarded products and its transformation into raw materials to use in manufacturing new products.

  Recyclers and manufacturers alike promote the process of recycling metal. Using a metal recycling center promotes energy cost savings.

EMISSIONS INFORMATION

NOTICE

The gasoline engine used in this equipment has been designed to reduce harmful levels of carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NOx) contained in exhaust emissions.

This engine has been certified to meet US EPA evaporative emissions requirements in the installed configuration.

Attempts to modify or make adjustments to the engine emission system by unauthorized personnel without proper training could damage the equipment or create an unsafe condition.

Additionally, modifying the fuel system may adversely affect evaporative emissions, resulting in fines or other penalties.

Emission Control Label

The emission control label is an integral part of the emission system and is strictly regulated.

The label must remain with the engine for its entire life.

If a replacement emission label is needed, please contact your authorized engine distributor.

WORK SAFELY!

WARNING

Failure to comply with these lifting instructions may result in **sling failure** and **severe personal injury or death**.

Only **qualified personnel** with proper training should perform this procedure. Follow all rigging and lifting safety rules when performing this procedure.

LIFTING SAFETY

CAUTION

- **NEVER** allow any person to stand underneath the equipment while lifting.
- Ride-on trowels are very heavy and awkward to move around. Use proper heavy lifting procedures and **DO NOT** attempt to lift the trowel by the guard rings.
- **NEVER** use the grab bars for lifting of the trowel. **ALWAYS** attach lifting slings to the **lift loops only**.
- **NEVER** lift the trowel with the operator on the machine.

NOTICE

- **NEVER** hoist the trowel more than three feet off of the ground with float pans attached.
- Before lifting, make sure that the lift loops are not damaged.
- **ALWAYS** make sure any lifting device has been properly secured to the lift loops of the trowel.
- **DO NOT** lift the trowel to unnecessary heights.
- **ALWAYS** shut down the engine before transporting.
- Tighten the fuel tank cap securely and close the fuel cock to prevent fuel from spilling.

SLING INSPECTION

Inspect the lifting slings provided with your trowel (Figure 1) **before each use**. If replacement slings are needed, refer to the parts manual included with your trowel for part numbers, and order from your Multiquip parts dealer or importer.

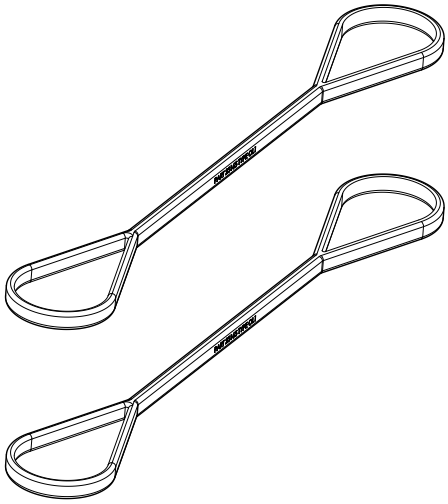
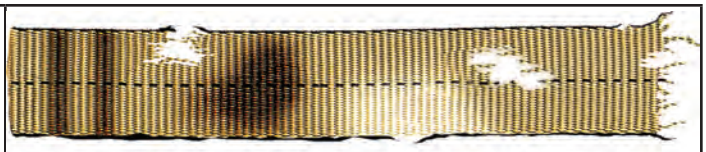
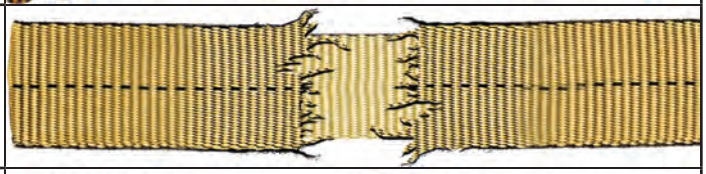
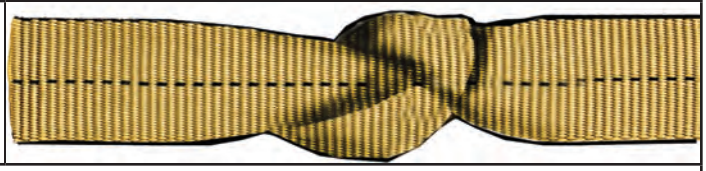


Figure 1. Lifting Slings

The Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926.251 (e)(8)—*Removal from service* requires that the slings be inspected prior to each use, and **removed from service immediately** if any of the following conditions are found:

■ Holes, tears, cuts, or snags ■ Embedded particles ■ Abrasive wear that exposes core fibers	
■ Missing or unreadable Rated Capacity tags ■ Melting, charring, weld spatter, or chemical burns	
■ Broken or worn stitching that exposes the core fibers	
■ Knots	
■ Any other condition which may cause doubt as to the strength of the sling	

LIFTING PROCEDURE

The correct lifting slings (Figure 1) have been supplied with your trowel, in accordance to its weight per Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926.251—*Rigging equipment for material handling*.

⚠ WARNING

ALWAYS inspect the lifting slings **before each use**.

NOTICE

MAKE SURE the forklift has adequate lifting capacity to lift the trowel.

The proper sling hitch method for connecting the lifting slings to the ride-on trowel is the **choker hitch**. The rated capacity of the slings for this method is indicated on the sling labels. **DO NOT** use any other type of sling hitch!

1. Secure the **lifting slings** to the **lift loops** (Figure 2), located to the left and right of the operator's seat.

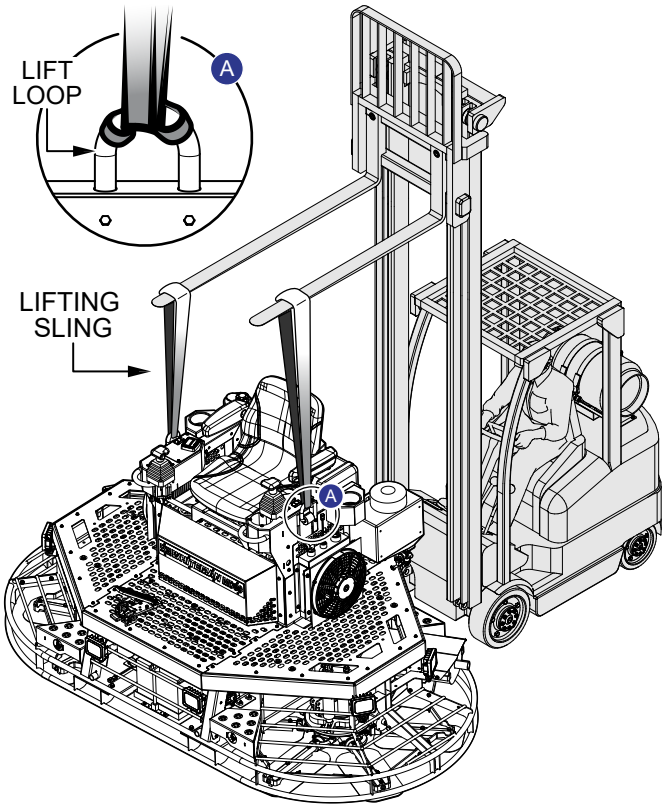


Figure 2. Lifting The Trowel (Lift Loops)

2. Insert forklift forks through the loops at the ends of the lifting slings. Keep the slings as close to vertical as possible.
3. If the **choke angle** (Figure 3) is **120 degrees or less**, the lifting strength of the slings must be de-rated as shown in Table 1, in accordance with ASME Standard B30.9.

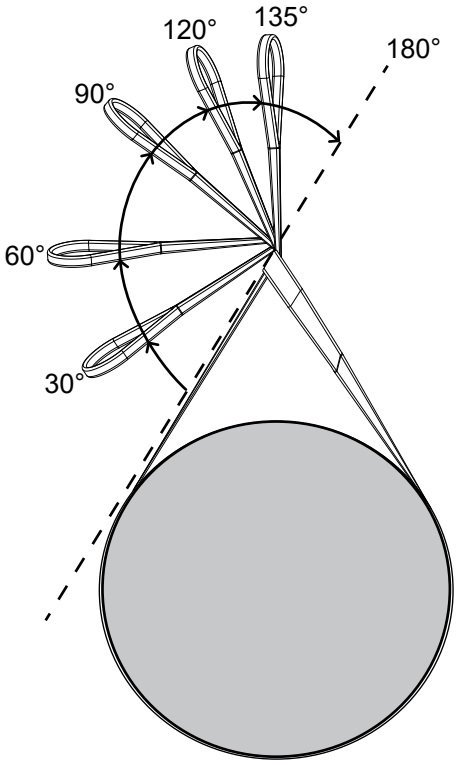


Figure 3. Choke Angle

Table 1. Choker Hitch Sling Capacity

Choke Angle (°)	Rated Capacity (%)
Over 120	100
90–120	87
60–89	74
30–59	62
0–29	49

Forklift Pockets

Another method for lifting the trowel is with the forklift pockets. Insert forklift forks through the forklift pockets as shown in Figure 4.

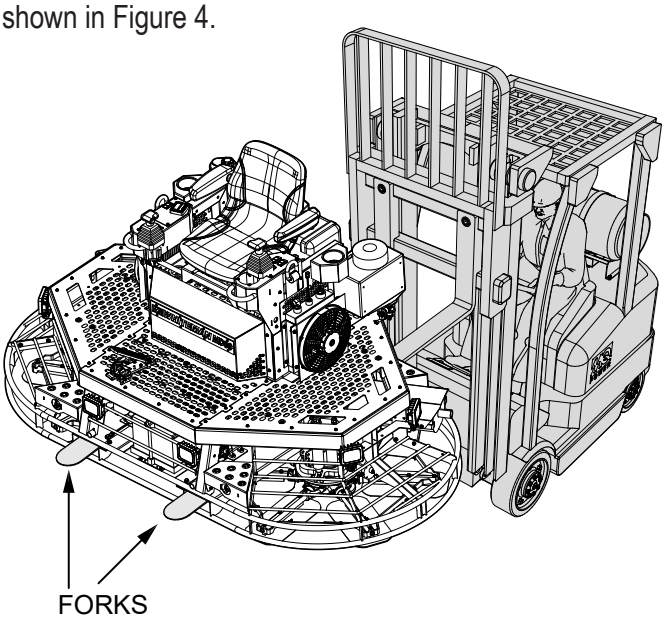


Figure 4. Lifting The Trowel (Forklift Pockets)

TRANSPORTING THE TROWEL

After the trowel has been lifted onto a flatbed truck, do the following:

1. Locate the **tie-down symbols** (Figure 5) on each side of the trowel.

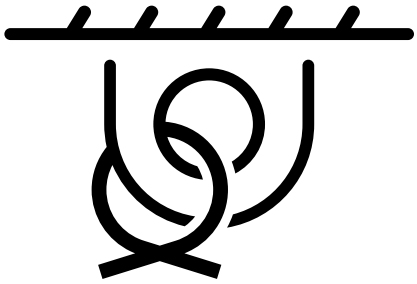


Figure 5. Tie-Down Symbol

2. Attach suitable tie-down straps to the locations marked by the tie-down symbols. Be sure to connect the tie-down strap hooks directly to the trowel as shown in Figure 6. **DO NOT** wrap the tie-downs around the frame as shown in Figure 7.

NOTICE

Use tie-downs with flat hooks or U-hooks only.

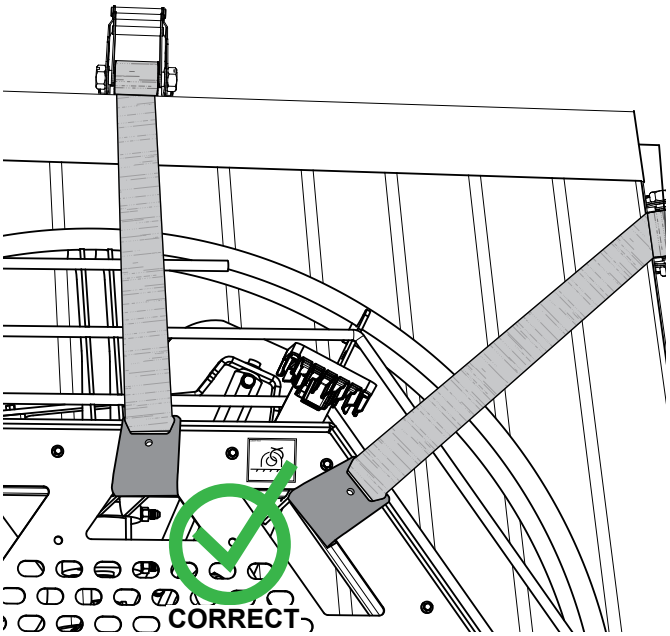


Figure 6. Tie-Down Method (Correct)

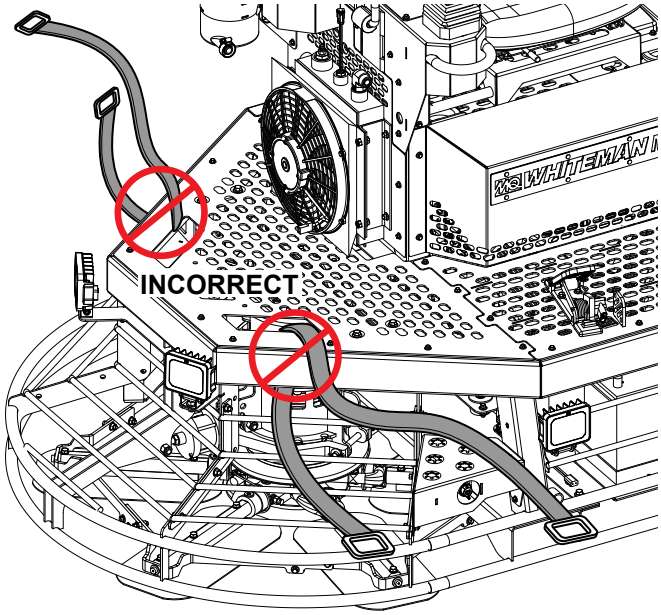


Figure 7. Tie-Down Method (Incorrect)

3. Secure the trowel to a flatbed with the tie-down straps, making sure they are properly tied to prevent movement of the trowel during transport.

Table 2. Trowel Specifications	
Trowel Model	MD80
Operating Weight	1,515 lb. (687.2 kg)
Shipping Weight	1,941 lb. (880.4 kg)
Maximum Rotor Speed	160 rpm
Blades per Rotor	6
Path Width	91 in. (2,311 mm)
Hydraulic Oil Reservoir Capacity	0.45 gallons (1.70 liters)
Hydraulic Oil Type	Parker DuraClean ISO 46
Fuel Tank Capacity	8 gal. (30.2 liters)

Table 3. Engine Specifications	
Engine Model	Vanguard 61G200
Engine Type	V-Twin EFI, OHV
Number of Cylinders	2
Displacement	60.60 in³ (993 cm³)
Compression Ratio	8.5:1
Bore × Stroke	3.37 × 3.41 in. (86 × 87 mm)
Gross Power Output	40.0 hp (29.8 kW) @ 3,600 rpm
Ignition System	Computer-controlled battery ignition
Lubrication System	Full pressure with oil cleaner
Lube Oil Capacity	78 oz. (2.3 liters)
Lube Oil Type	API Service SF, SG, SH, SJ or higher
Spark Plug Gap	0.030 in. (0.76 mm)
Spark Plug Torque	180 lbf·ft (20 N·m)
Fuel Type	minimum 87 octane unleaded gasoline

Table 4. MD80 Noise and Vibration Emissions	
Guaranteed Sound Pressure Level at Operator Station per ISO 11201, in dB(A)	91
Guaranteed Sound Power Level per ISO 3744, in dB(A)	121
Whole Body Vibration per ISO 13105: ΣA(8), in m/sec^2	0.001

NOTES:

1. *Sound pressure and power levels are "A" weighted measures per ISO 226:2003 (ANSI S1.4-1981). They are measured using operating conditions of the machine which generate the most repeatable but highest values of the sound levels. Under normal circumstances, the sound level will vary depending on the condition of the material being worked upon.*
2. *The vibration level indicated is the vector sum of the RMS (root mean square) values of amplitudes on each axis, standardized to an 8-hour exposure period, and obtained using operating conditions of the machine that generate the most repeatable but highest values in accordance with the applicable standards for the machine.*
3. *Per EU Directive 2002/44/EC, the daily exposure action value for whole body vibration is 0.5 m/s^2 ΣA(8). The daily exposure limit value is 1.15 m/s^2 ΣA(8).*

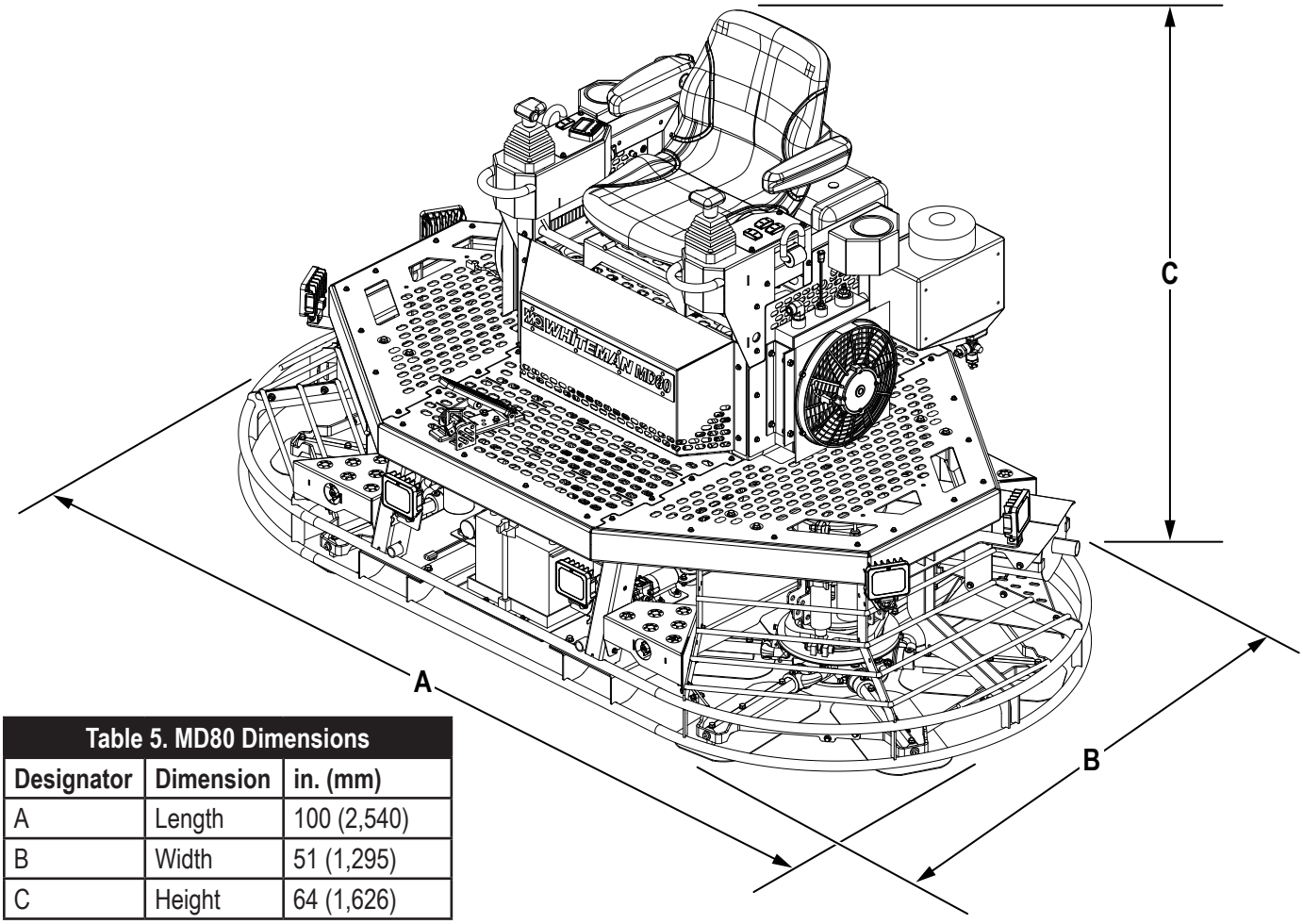


Table 5. MD80 Dimensions		
Designator	**Dimension**	**in. (mm)**
A	Length	100 (2,540)
B	Width	51 (1,295)
C	Height	64 (1,626)

Figure 8. MD80 Dimensions

INTENDED USE

Operate the MD80 ride-on trowel, tools, and components in accordance with the manufacturer's instructions. Use of any other tools for stated operation is considered contrary to designated use. The risk of such use lies entirely with the user. The manufacturer cannot be held liable for damages as a result of misuse.

SAFE OPERATION

Read all safety information carefully. Safety instructions will be found throughout this manual and on the machine. Keep all safety information in good, readable condition. Operators should be well trained on the operation and maintenance of the trowel.

FAMILIARIZATION

The MD80 ride-on power trowel is designed for the floating and finishing of concrete slabs.

Walk around the trowel and take note of the major components—engine, blades, air cleaner, fuel system, ignition switch, etc. Make sure there is always a proper level of lubricating oil in the engine and a proper level of hydraulic oil in the hydraulic oil reservoir.

Before using your trowel, test it on a flat, watered-down section of finished concrete. This test run will familiarize you with the trowel's controls and will increase your confidence in operating the trowel. You will learn how the trowel handles under actual operating conditions. Refer to the ***Operation*** section of this manual for more information.

ENGINE

The MD80 is equipped with a Vanguard 61G200 40-horsepower gasoline engine. Refer to the engine owner's manual for specific instructions regarding engine operation and maintenance.

BLADES

The blades of the MD80 finish concrete as they are rotated across the surface. Blades are classified as *combination* (10 or 8 inches wide) or *finish* (6 inches wide). The MD80 is equipped with six blades per rotor equally spaced in a radial pattern and attached to a vertical rotating shaft by means of a spider assembly.

OPTIMIZED HYDRAULIC SYSTEM

The spider assemblies are powered by two high-torque hydraulic motors driven by an axial-piston, tandem hydraulic pump for increased overall system performance.

HYDRAULIC STEERING

Dual palm-grip joystick controls are provided for steering. Located to the left and right of the operator's seat, the joysticks are linked to three hydraulic steering cylinders located within the frame of the machine.

DIAGNOSTIC DISPLAY

The MD80 is equipped with a diagnostic display that communicates with the engine's electric control unit (ECU) and the trowel's machine control unit (MCU) using the SAE J1939 Controller Area Network (CAN) bus protocol.

TRAINING

For proper training, please use the ***Training Checklist*** form located in the front of this manual. This checklist will provide an outline for an experienced operator to provide training to a new operator.

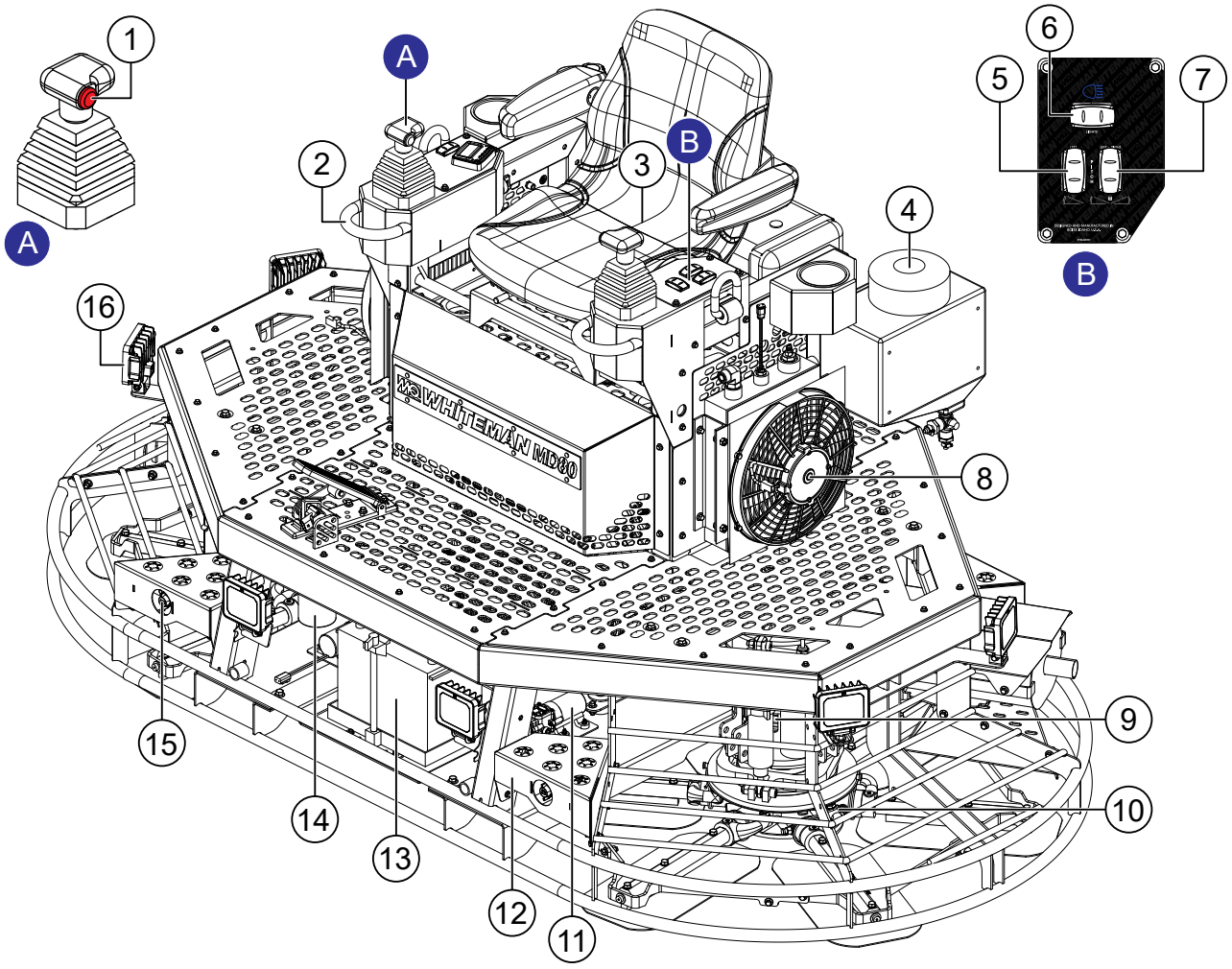


Figure 9. Trowel Components

1. **Retardant Spray Control Buttons (2)** — Control the flow of retardant spray through the nozzles at the front of the trowel. Located on the steering control handles.

2. **Grab Bars (2)** — Always use the grab bars to lift yourself onto the trowel.

> **⚠ WARNING**
>
> **NEVER** use the grab bars for lifting of the trowel for transport. **ALWAYS** attach lifting slings/chains to the **lift loops only**. Refer to the ***Lifting and Transporting*** section for details.

3. **Seat Switch** — Safety feature stops blade rotation when the operator leaves the seat. The trowel blades will not turn and engine speed will not rise above idle unless the operator is seated.

4. **Retardant Spray Tank** — Holds up to 3 gallons (11.3 liters) of retardant. Remove the filler cap to add retardant to the tank.

5. **Blade Pitch Control Switch (Left Pitch)** — Adjusts the left-side blade pitch independently of the right side.

6. **Light Switch** — Activates the 6 LED trowel lights.

7. **Blade Pitch Control Switch (Twin Pitch™)** — Adjusts the blade pitch on both rotors simultaneously.

8. **Hydraulic Coolers (2)** — Maintain the optimum hydraulic oil operating temperature.

9. **Hydraulic Motors (2)** — These direct-drive hydraulic motors rotate the spider assemblies.

10. **Spider Assemblies (2)** — Each spider assembly contains six trowel arms with 8-inch combination blades equally spaced in a radial pattern.

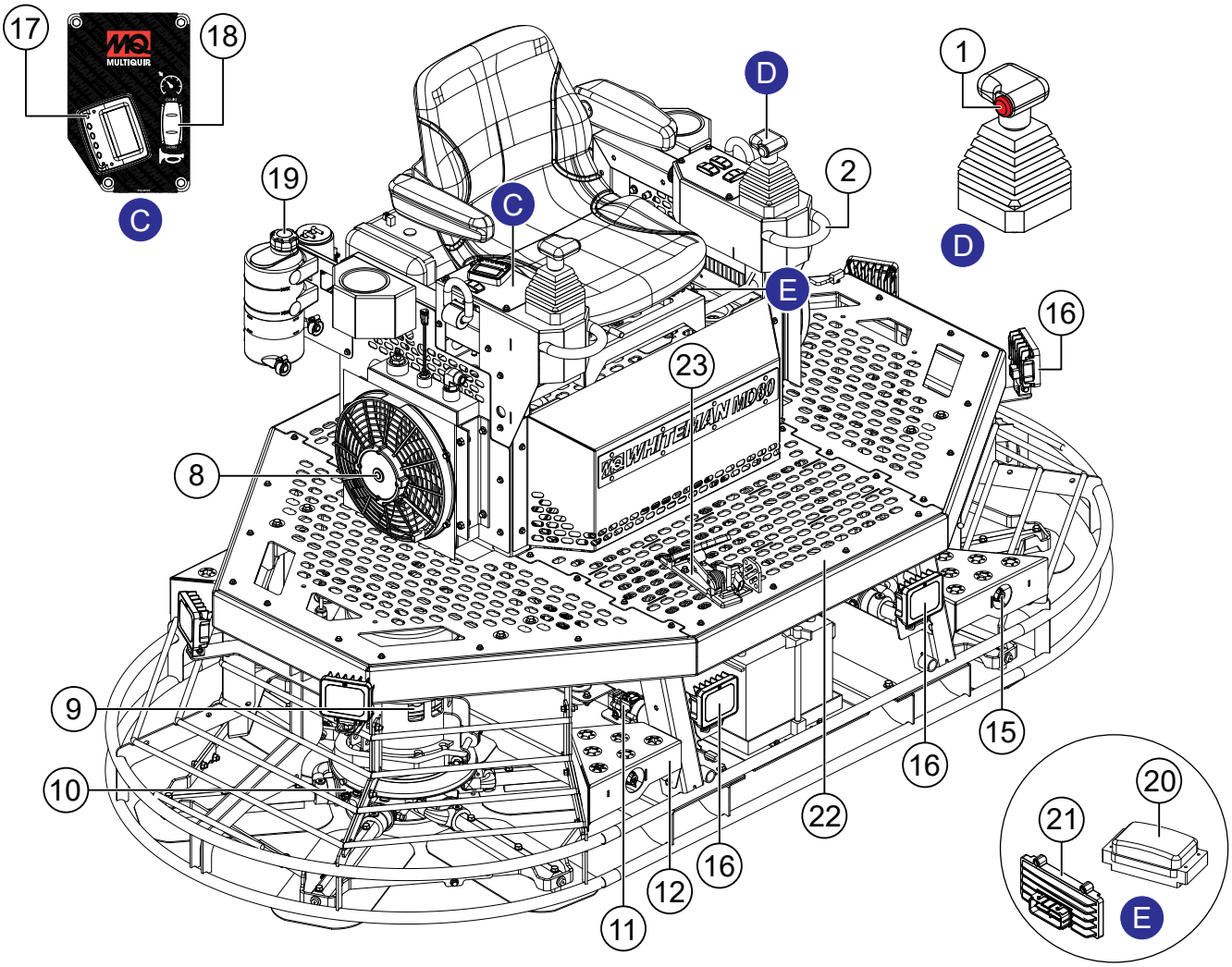


Figure 10. Trowel Components (Cont.)

11. **Retardant Spray Pumps (2)** — Deliver retardant spray from the retardant tank to the spray nozzles. Actuated by the buttons on the steering control handles.
12. **Steps (4)** — Use to mount and dismount the trowel.
13. **Battery** — Provides +12VDC to the electrical system.
14. **Hydraulic Filter** — Filters hydraulic fluid as it enters the system. Equipped with 10-micron glass-filled filter media.
15. **Retardant Spray Nozzles (2)** — Provide uniform coverage of retardant over the slab surface.
16. **Lights (6)** — 20-watt LED lights provide illumination for indoor or nighttime finishing.
17. **Diagnostic Display** — 2.3-inch LCD color display provides trowel information at a glance. See the ***Operation*** and ***Troubleshooting*** sections for more information.
18. **Horn/Cruise Control Rocker Switch** — Use to activate the horn or to activate/deactivate cruise control.
19. **Hydraulic Oil Reservoir** — Holds up to 0.45 gallons (1.70 liters) of hydraulic oil. Use Parker DuraClean ISO 46 or equivalent hydraulic oil only.
20. **Power Distribution Module** — Contains machine fuses and relays.
21. **Machine Control Unit (MCU)** — Connects to machine sensors, switches, actuators, fuse box, engine, and display to control the machine.
22. **Trowel Platform** — Spacious platform provides easy access to the operator's seat and service areas.
23. **Foot Pedal** — Controls rotor speed. See the ***Operation*** section for more information.

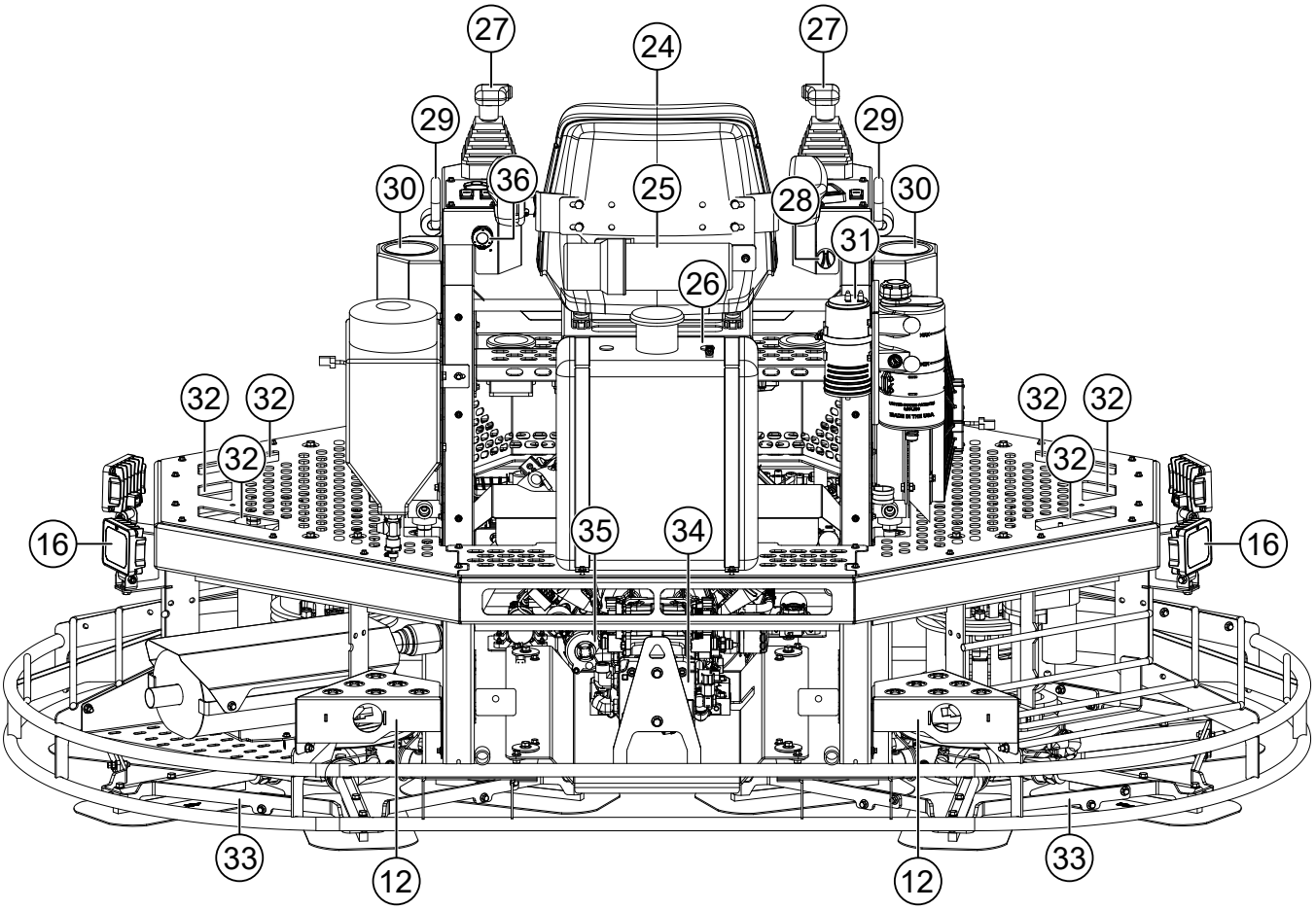


Figure 11. Trowel Components (Cont.)

24. **Operator's Seat** — Adjustable operator's seat with armrests. Tilts forward for service access.

25. **Document Holder** — Storage for trowel and engine manuals.

26. **Fuel Tank** — Holds 8 gallons (30.2 liters) of gasoline. Remove the fuel filler cap to add gasoline to the fuel tank. Use 86 octane or higher unleaded gasoline only.

27. **Steering Control Handles (2)** — Located to the left and right of the operator, these dual palm-grip joysticks are linked to three hydraulic steering cylinders. Refer to the ***Operation*** section to learn more about steering.

28. **Ignition Switch** — Insert the ignition key here and turn clockwise to start the engine.

29. **Lift Loops (2)** — Attach lifting slings here to lift the trowel. Refer to the ***Lifting and Transporting*** section for more information.

30. **Cup Holders (2)** — Stainless steel cup holders.

31. **Carbon Canister** — Container filled with activated charcoal reduces emissions and increases fuel efficiency by trapping gasoline vapor emitted by the fuel system and releasing it to the engine.

32. **Tie-Down Locations (6)** — Secure tie-down straps to these attachment points when transporting the trowel.

33. **Stabilizer Rings (2)** — Sectional design provides enhanced stability and facilitates maintenance.

34. **Hydraulic Pump** — Variable displacement, axial-piston, tandem hydraulic pump drives the hydraulic motors that rotate the blades.

35. **Engine** — Vanguard 61G200 40-horsepower gasoline engine. Refer to the ***Components (Engine)***, ***Operation***, and ***Maintenance*** sections for more information.

36. **Service Port** — Connect the Whiteman Service Tool (WST) here to install and update trowel software and perform adjustments and calibrations.

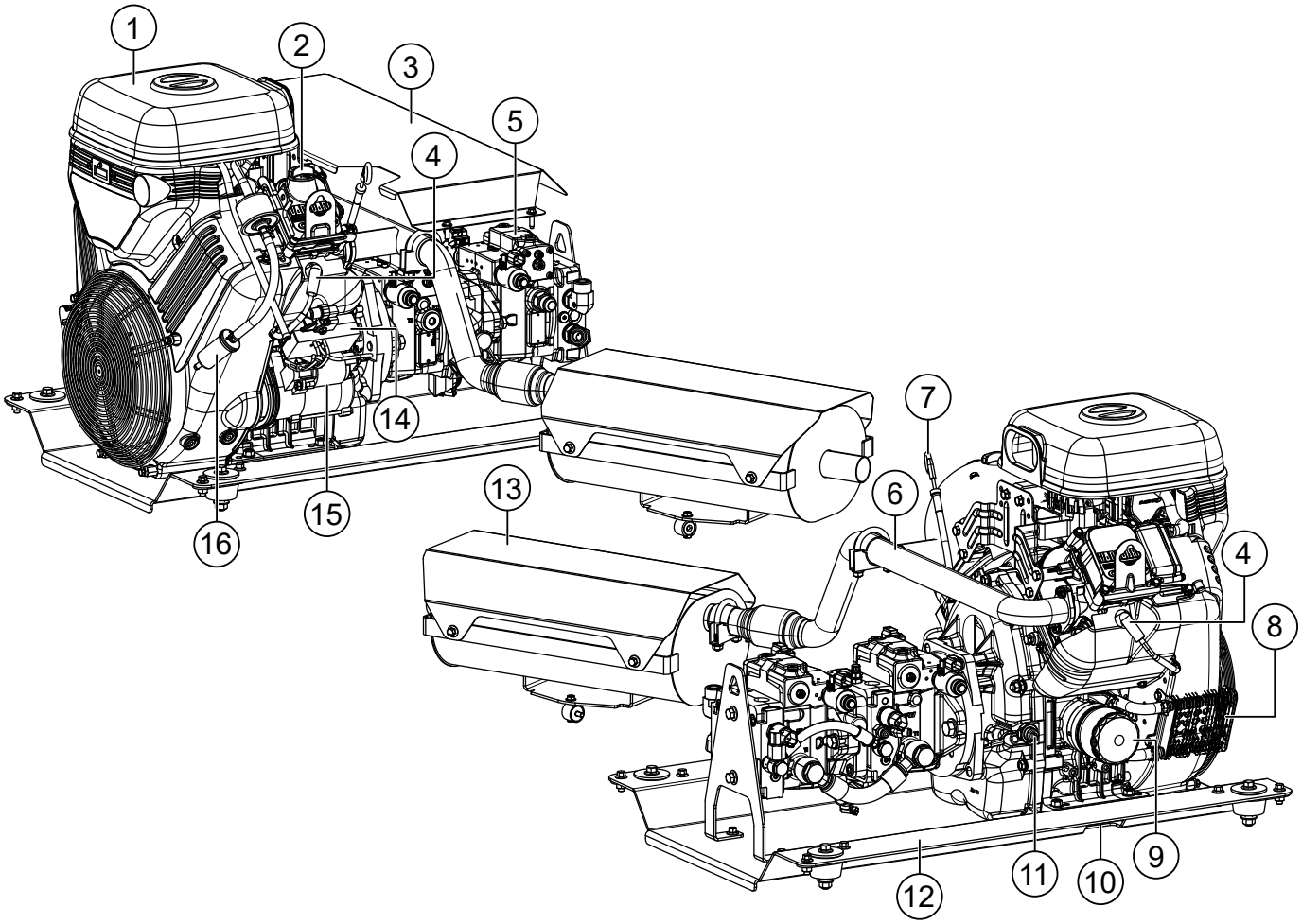


Figure 12. Vanguard 61G200 Engine Assembly

The MD80 utilizes a **Vanguard 61G200 gasoline engine** (Figure 12) equipped with the following components:

1. **Air Cleaner** — Prevents dirt and debris from entering the engine's combustion chambers.
2. **Oil Filler Port** — Remove the cap to add fresh oil as specified in Table 3.
3. **Engine Heat Shield** — Contains the heat generated by the engine and exhaust system.
4. **Spark Plugs (2)** — Provide spark to the ignition system. Set the spark plug gap to 0.030 in. (0.76 mm).
5. **Hydraulic Pump** — Variable displacement, axial-piston, tandem hydraulic pump drives the hydraulic motors that rotate the blades.
6. **Exhaust Manifold** — Collects the exhaust gases from the engine cylinders into one exhaust pipe.
7. **Oil Dipstick** — Remove to check the amount and condition of oil in the crankcase.
8. **Oil Cooler** — Maintains the optimal lubricating oil operating temperature.
9. **Oil Filter** — Filters lubricating oil contaminants.
10. **Oil Drain** — Remove the drain bolt to drain engine oil from the crankcase.
11. **Oil Pressure Sensor** — Continuously monitors engine oil pressure.
12. **Engine Mount with Rubber Isolators**— Secures the engine/pump assembly to the trowel frame while reducing engine noise and vibration.
13. **Muffler with Heat Shield and Isolators** — Reduces noise and vibration from the engine exhaust system.
14. **Regulator Rectifier** — Converts AC from the charge coil into DC for battery charging and limits the output when the battery is fully charged.
15. **Starter/Solenoid** — Starts the engine when the ignition key is rotated to the **START** position.
16. **Fuel Filter** — Filters fuel contaminants.

BATTERY

⚠ CAUTION

Use all safety precautions specified by the battery manufacturer when handling the battery. See the ***Safety Information*** section of this manual for details on battery safety.

1. Make sure the battery is well secured in the battery tray with the two **battery bolts** (Figure 13).

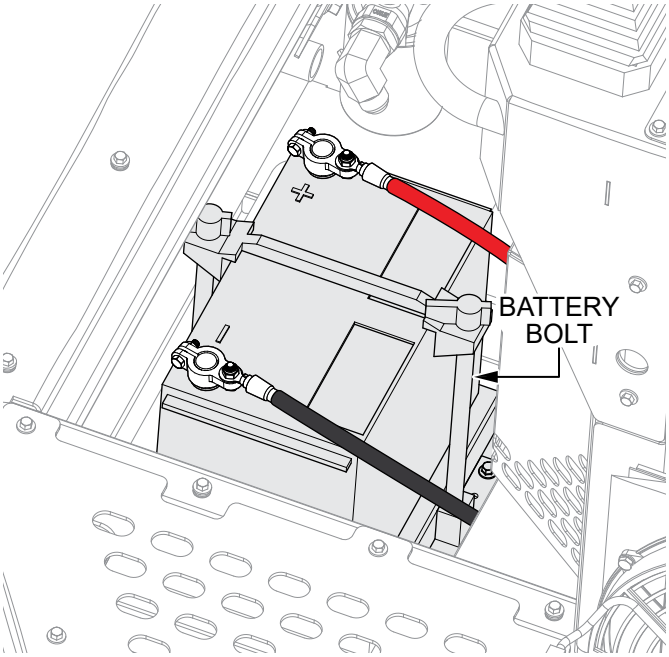


Figure 13. Battery Connection

2. Connect the positive **(RED)** battery cable to the positive **(+)** terminal on the battery, then connect the negative **(BLACK)** battery cable to the negative **(–)** terminal. See Figure 13.

ENGINE OIL

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Pull the **engine oil dipstick** (Figure 14) out of its holder and wipe it with a clean rag.

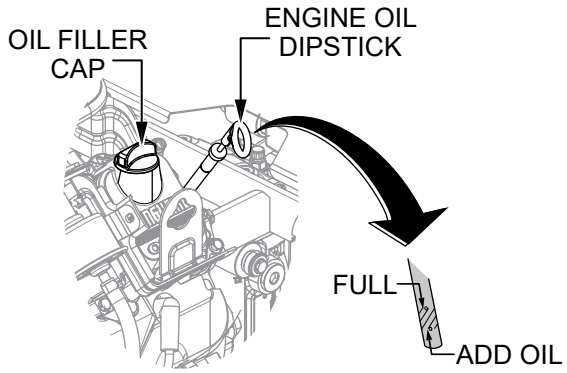


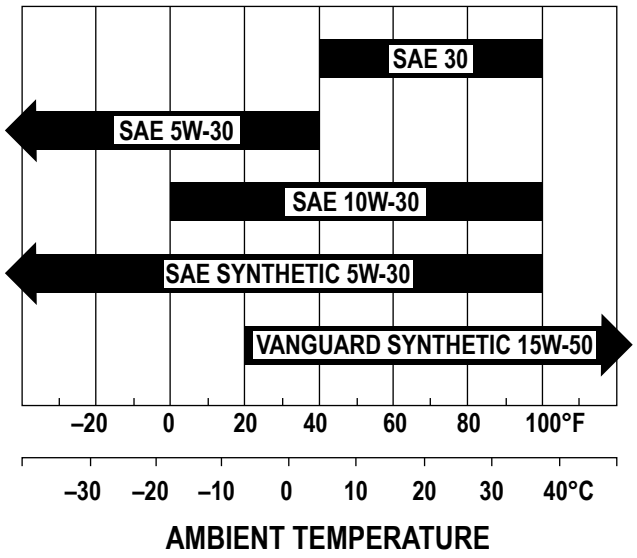
Figure 14. Engine Oil Dipstick And Filler Cap

3. Fully insert the dipstick then remove it again.
4. Determine if engine oil is low. Oil should be between the upper and lower marks (Figure 14) on the dipstick.
5. If the oil is below the lower mark on the dipstick, remove the **oil filler cap** (Figure 14) and add engine oil up to the upper mark on the dipstick. Refer to Table 6 for recommended oil viscosity.

⚠ CAUTION

NEVER overfill the oil pan. **ALWAYS** allow time for any added oil to make its way to the oil pan before rechecking the level.

Table 6. Recommended Oil Viscosity Grades



NOTICE

Use motor oil that meets or exceeds the requirements for **API service category SF, SG, SH, SJ or higher**.

6. When replacing the dipstick, make sure it is fully inserted into its holder to keep the crankcase sealed.

HYDRAULIC OIL

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Visually inspect the level of hydraulic oil in the **hydraulic oil reservoir** (Figure 17). Hydraulic oil should be visible between the **MIN** and **MAX** lines on the reservoir.

⚠ CAUTION

Hydraulic oil can get **HOT!**
ALWAYS allow hydraulic oil to cool before removing the fill cap. **NEVER** remove the fill cap when the oil is hot or spillage will occur. **ALWAYS** clean up any spilled hydraulic oil immediately.

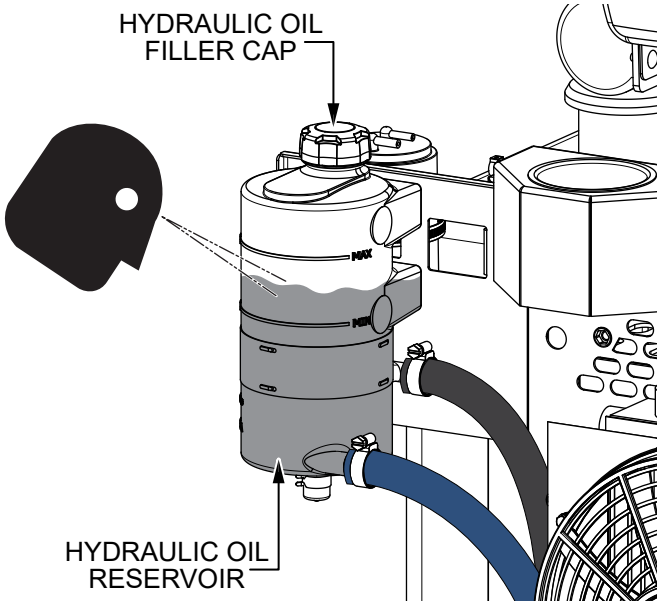


Figure 15. Hydraulic Oil Level Inspection

3. If the hydraulic oil level is low, remove the **hydraulic oil filler cap** (Figure 15), and add hydraulic oil up to a level midway between the **MIN** and **MAX** lines on the reservoir. **DO NOT** overfill. Use only Parker DuraClean ISO 46 hydraulic oil or equivalent. Replace the filler cap when finished.

FUEL

⚠ DANGER

Gasoline fuel is **highly flammable** and can be dangerous if mishandled.

NEVER smoke while refueling. **NEVER** attempt to refuel while the engine is hot or running.

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Visually inspect the fuel level in the **fuel tank** (Figure 16).

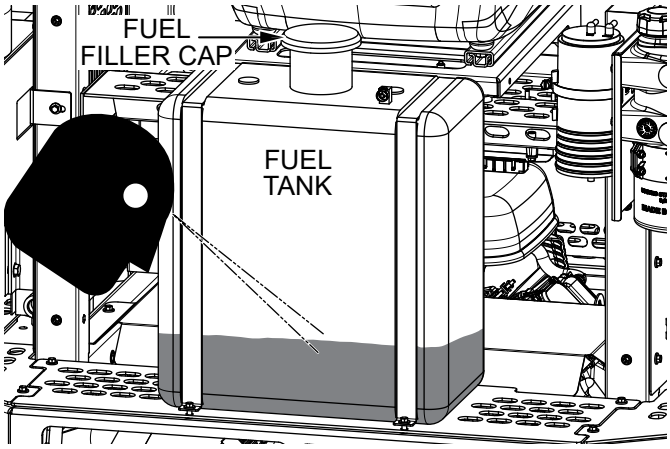


Figure 16. Fuel Level Inspection

3. If fuel is low, remove the **fuel filler cap** (Figure 16) and fill the tank with clean, fresh, 87 octane or higher unleaded gasoline. **DO NOT** overfill. The fuel tank holds 8 gallons (75.7 liters) of gasoline.

⚠ DANGER

Fuel spillage on a **hot** engine can cause a **fire** or **explosion**. If fuel spillage occurs, wipe up the spilled fuel completely to prevent fire hazards. **NEVER** smoke around or near the trowel.

4. Replace the fuel filler cap when finished adding fuel.

The following section is intended to assist the operator with operation of the trowel. It is extremely important to read this section carefully before attempting to use the trowel in the field. **DO NOT** operate the trowel until this section is thoroughly understood.

CAUTION

ALWAYS wear approved eye and hearing protection while operating the trowel.

WARNING

NEVER operate the trowel in a confined area or enclosed area structure that does not provide an ample, free flow of air.

NOTICE

This trowel is equipped with a safety seat switch. The trowel blades will not rotate unless an operator is sitting in the seat or the drive bypass function is enabled.

STARTING THE ENGINE

1. While standing in front of the trowel, grasp one of the **grab bars** and place a foot on one of the **steps**. Lift yourself onto the trowel platform and sit down in the operator's seat (Figure 17).

NOTICE

DO NOT grab the steering control joysticks to lift yourself onto the trowel. Damage to the joysticks may result. **ALWAYS** use the grab bars to lift yourself onto the trowel.

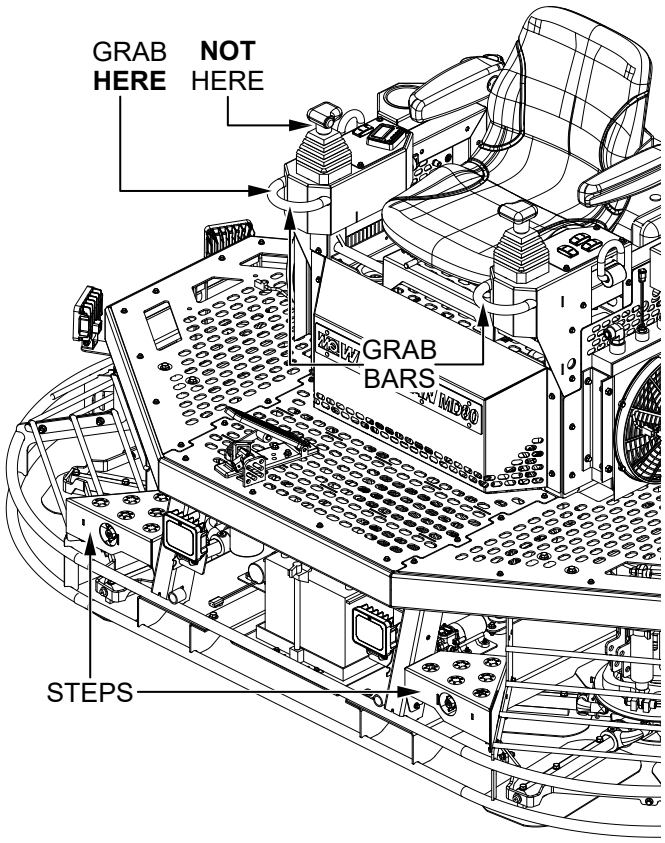


Figure 17. Grab Bars

2. Insert the **ignition key** into the **ignition switch** (Figure 18).

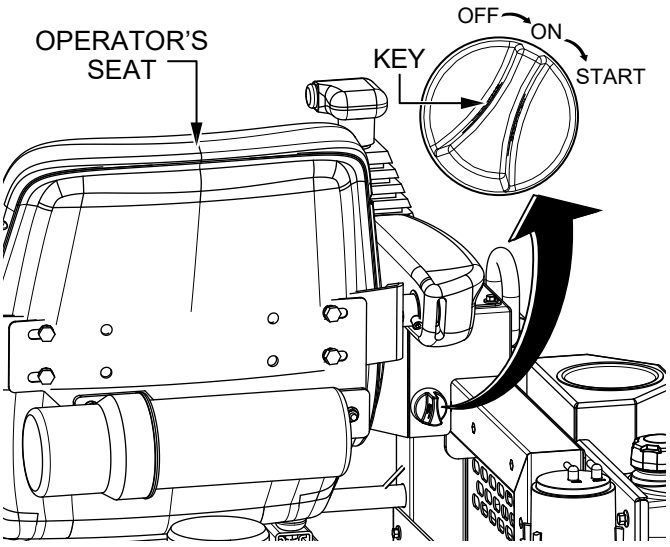


Figure 18. Ignition Key Switch

3. Turn the ignition key **clockwise** to the **ON** position (Figure 18). The **diagnostic display** will turn on as shown in Figure 19.

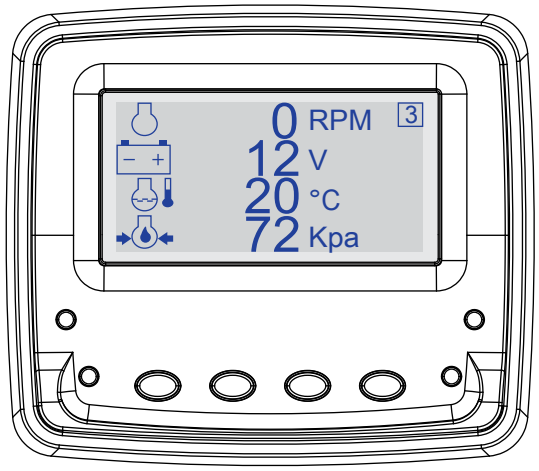


Figure 19. Diagnostic Display (Key Switch ON)

4. Turn the ignition key fully **clockwise** to the **START** position and listen for the engine to start. Once the engine has started, release the ignition key. The throttle speed will default to idle (1,750 rpm).See Figure 20.

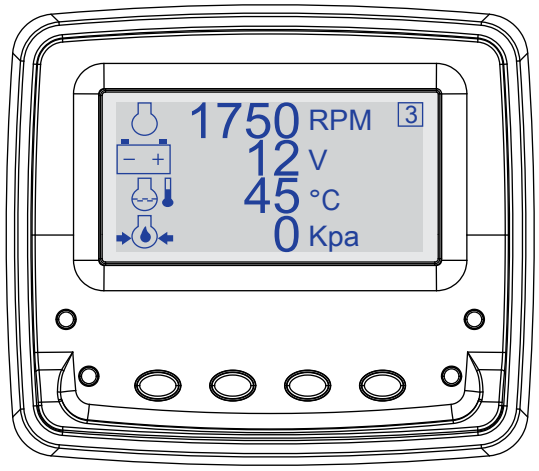


Figure 20. Diagnostic Display (Engine Idle)

5. With the engine running, the diagnostic display will show the following data:
   - Engine speed in RPM
   - Battery voltage
   - Coolant temperature in °C
   - Engine oil pressure in kPa
6. Let the engine warm up for 2–3 minutes. Listen for any abnormal sounds.
7. If the **amber LEDs** are **ON** (Figure 21), and the **Check Engine icon** is shown on the display, there is an active fault condition. Shut down the engine and correct the problem before continuing operation. Refer to the ***Troubleshooting*** section for more information.

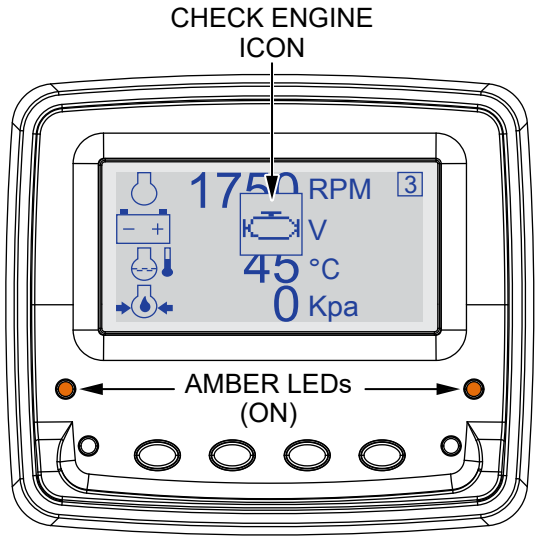


Figure 21. Diagnostic Display (Active Fault)

TESTING THE SEAT SWITCH

Make sure the safety seat switch is operational prior to using the trowel each day.

1. With the engine running, depress the foot pedal to start rotating the blades. Observe that the blades are rotating.
2. Rise from the operator's seat.
3. Verify that the blades stop rotating while the engine continues to run.
4. If blade rotation has stopped, the seat switch is working.
5. If blade rotation continues, the seat switch is not working. Stop the engine immediately and correct the problem.

⚠ WARNING

NEVER disable or disconnect the seat switch. It is provided for operator safety. Injury may result if it is disabled, disconnected, or improperly maintained.

Operator Presence Safety Interlocks

1. Full engine throttle is allowed only when operator presence is detected.
2. Engine speed changes to idle (1,750 rpm) when the operator leaves the seat or the foot pedal is released.

STEERING

Two palm-grip **joysticks** (Figure 22), located to the left and right of the **operator's seat**, provide directional control for the trowel.

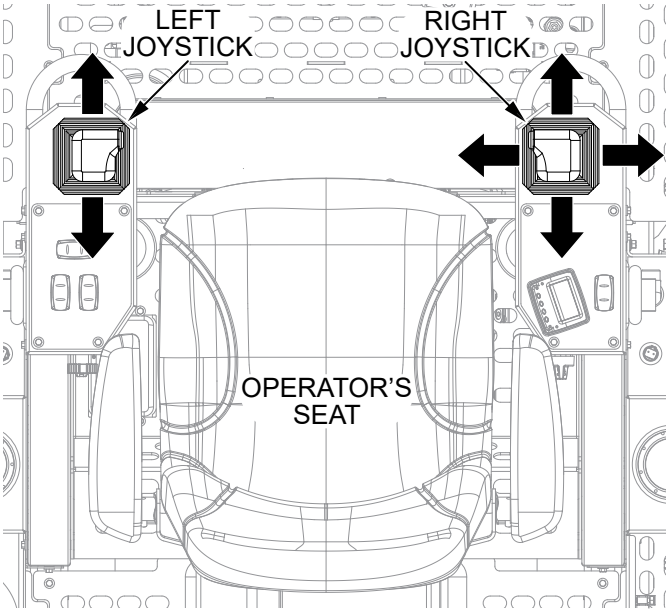


Figure 22. Steering Control Joysticks

Table 7 illustrates the various directional positions of the joysticks and their effect on the movement of the trowel.

> ***NOTICE***
>
> All directional references with respect to the joysticks are from the operator's seat position.

Table 7. Joystick Directional Positioning

CONTROL JOYSTICK & DIRECTION	RESULT
Move **LEFT** Joystick FORWARD	Causes only the left side of the ride-on trowel to move forward.
Move **LEFT** Joystick BACKWARD	Causes only the left side of the ride-on trowel to move backward.
Move **RIGHT** Joystick FORWARD	Causes only the right side of the ride-on trowel to move forward.
Move **RIGHT** Joystick BACKWARD	Causes only the right side of the ride-on trowel to move backward.
Move **BOTH** Joysticks FORWARD	Causes the ride-on trowel to move forward in a straight line.
Move **BOTH** Joysticks BACKWARD	Causes the ride-on trowel to move backward in a straight line.
Move **RIGHT** Joystick to the RIGHT	Causes the ride-on trowel to move to the right.
Move **RIGHT** Joystick to the LEFT	Causes the ride-on trowel to move to the left.

The **foot pedal** (Figure 23) controls engine and rotor speed. The position of the foot pedal determines the rotational speed of the rotors. Slow rotor speed is obtained by slightly depressing the foot pedal. Maximum rotor speed is obtained by fully depressing the foot pedal.

NOTICE

Engine throttle will accelerate to full speed (3,600 rpm) when the foot pedal is depressed and the operator's presence is detected.

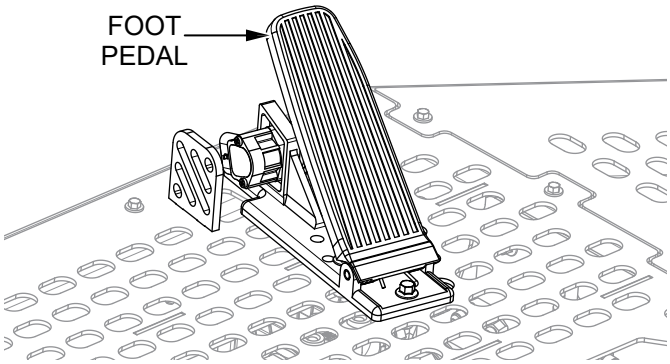


Figure 23. Foot Pedal

1. Push both the left and right joysticks **forward** (Figure 24).

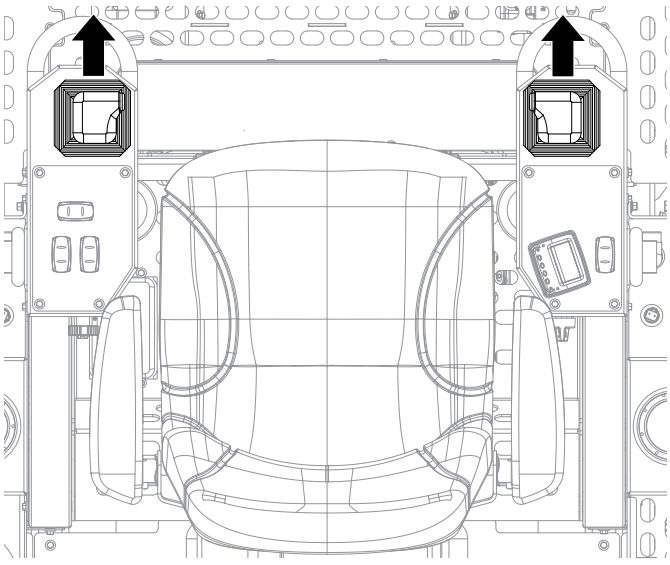


Figure 24. Joysticks (Forward)

2. With your right foot, slowly press the foot pedal halfway. Notice that the trowel begins to move in a forward direction. Release both joystick controls to stop forward movement, then remove your right foot from the foot pedal.
3. Practice holding the machine in one place as you increase blade speed. When about 75% of maximum blade speed has been reached, the blades will be moving at proper finishing speed. The machine may be difficult to keep in one place. Trying to keep the trowel stationary is good practice for operation.
4. Practice maneuvering the trowel using the information listed in Table 7. Practice controlled motions as if you are finishing a slab of concrete. Practice edging and covering a large area.
5. Try adjusting the pitch of the blades. This can be done with the trowel stopped or while the trowel is moving. Test the operation of the retardant spray and lights.
6. Pull both the left and right joysticks **backward** (Figure 25) and repeat steps 2 through 5 while substituting the word 'reverse' for 'forward'.

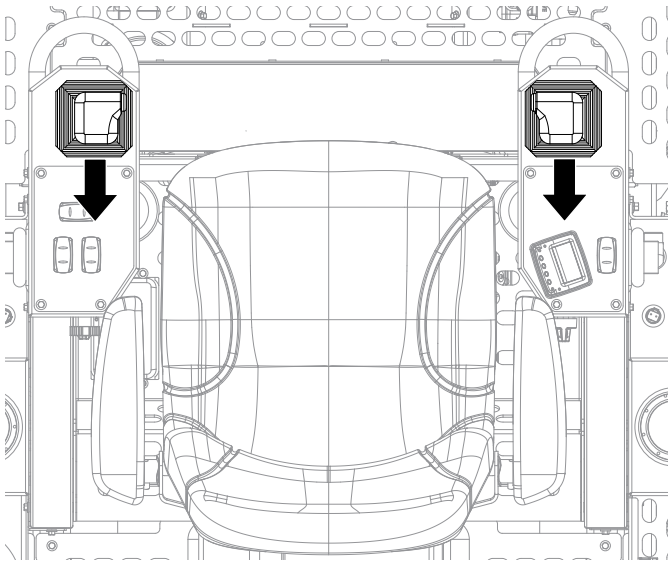


Figure 25. Joysticks (Reverse)

CRUISE CONTROL

Engaging **cruise control** will set and maintain rotor speed. The cruise control feature allows an operator to release the foot pedal during operation.

1. Start the engine and depress the **foot pedal** (Figure 23) to increase rotor speed to the desired speed.
2. Press the **cruise control button** (Figure 26).

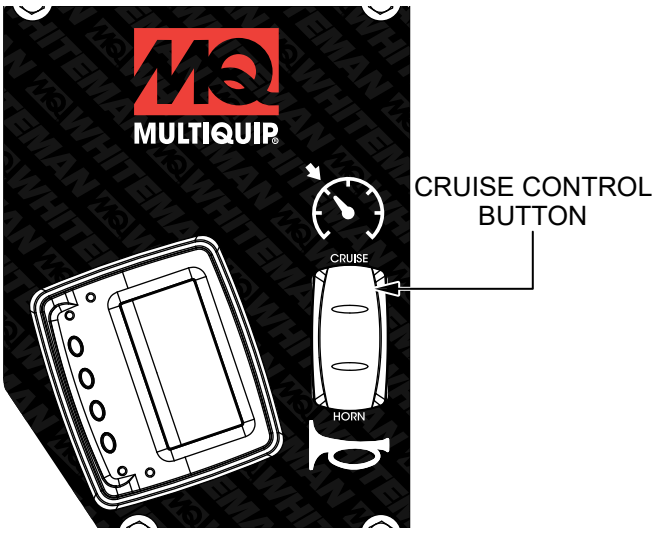


Figure 26. Cruise Control Button

3. Release the foot pedal. The rotors will maintain the set speed.
4. Disengage cruise control by doing any of the following:
   - Press the foot pedal.
   - Stand up from the operator's seat.
   - Press the cruise control button again.

Cruise Control Safety Interlocks

Cruise control will be disabled if the following occurs:

1. Operator presence is not detected (not sitting in seat).
2. An engine or machine fault code is active.
3. The foot pedal calibration process has been started.

BLADE PITCH

1. Press **UP** or **DOWN** on the **Twin Pitch™ switch** (Figure 27) to change pitch on both rotors simultaneously (but non-synchronously).

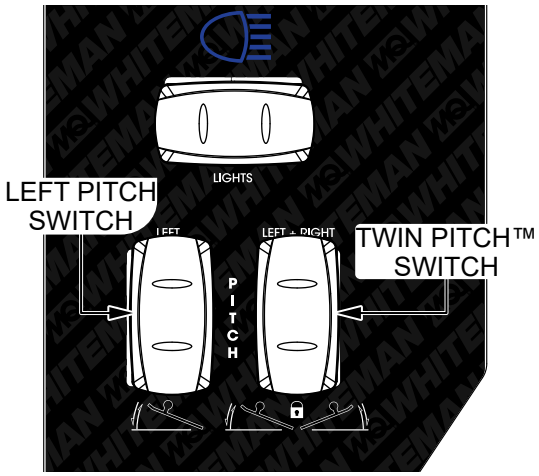


Figure 27. Blade Pitch Switches

2. Press **UP** or **DOWN** on the **Left Pitch switch** (Figure 27) to change pitch on the left rotor only. The right rotor pitch will remain constant.

ENGINE SHUTDOWN

1. Take your foot off of the foot pedal and allow the engine to idle for a few minutes.
2. Turn the ignition key **counterclockwise** to the **OFF** position, then remove the key.
3. Clean and remove any debris from the trowel.

FLOAT PAN INSTALLATION

Float pans attach to the trowel arms and allow early floating on wet concrete and easy movement from wet to dry areas. They are also very effective at embedding large aggregates and surface hardeners.

WARNING

ALWAYS install float pans either in the work area or in an area that is next to and level with the work area.

NEVER lift the trowel with float pans attached.

1. Make sure the trowel blades are pitched flat.
2. Lift the trowel just enough to slide a **float pan** under the **blades**. Lower the finisher onto the pan with the blades between the **blade stops** (Figure 28).

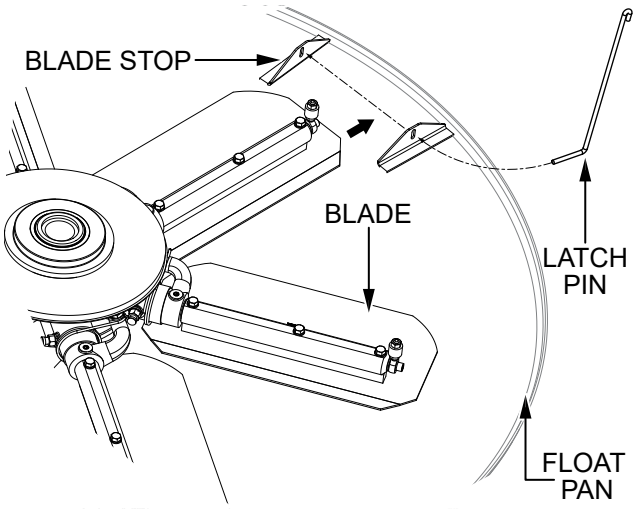


Figure 28. Float Pan Installation (Latch Pins)

3. Route a **latch pin** through the holes in the blade stops as shown in Figure 28.
4. After it has been routed through the **blade stop** holes, rotate the **latch pin** so the end that is bent approximately 90 degrees lays flat on the surface of the **float pan**. See Figure 29.

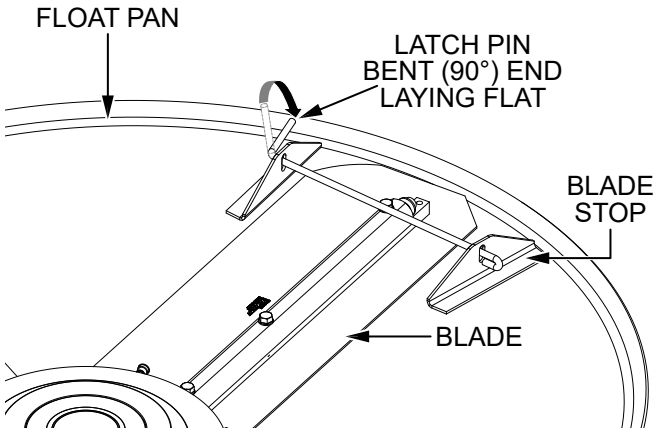


Figure 29. Latch Pin Placement

5. Make sure the blade edges are secured between the blade stops, and the latch pin is secured completely over the blade, locking it in place.
6. Repeat steps 2–4 for the remaining finisher blades.
7. Make sure the float pans are well secured to the blades before the trowel is put back into operation.
8. Periodically check the latch pins during normal operation to ensure they are still in the correct position.

Table 8. Inspection/Maintenance*1		Every 8 Hours Or Daily	Every Year Or 100 Hours	Every Year Or 250 Hours	Every Year Or 400 Hours
Engine	Check Lubricating Oil Level	X			
	Clean or Replace Air Cleaner Filter*2,3		X		
	Clean Pre-Cleaner (If Installed)*2		X		
	Replace Lubricating Oil and Oil Filter		X		
	Replace Spark Plugs		X		
	Service Exhaust System		X		
	Check/Adjust Valve Clearance			X	
	Replace Air Cleaner Filter*3				X
	Replace Fuel Filter				X
	Service Air Cooling System*2				X
	Clean Oil Cooler Fins*2				X
Trowel	Lubricate Spiders and Thrust Collars	X			
	Inspect Electrical Wiring for Cuts, Abrasions, or Corrosion	After first 50 hours, then every 100 hours			
	Replace Spider Assembly Retaining Hardware	After first 25 hours, then every 100 hours			
	Check All Fasteners for Tightness	Every 400 hours			
	Replace Hydraulic Oil and Filter	After first 100 hours, then every 250 hours			

*1 For commercial use, log hours of operation to determine proper maintenance intervals.

*2 Service more frequently when used in dusty areas.

*3 Every third air filter change, replace the inner safety filter (if installed).

⚠ CAUTION

Certain maintenance operations or machine adjustments require specialized knowledge and skill. Attempting to perform maintenance operations or adjustments without the proper knowledge, skills, or training could result in equipment damage or injury to personnel. When in doubt, consult your dealer.

Use Table 8 as a general maintenance guideline. For more detailed engine maintenance instructions, refer to the Vanguard engine owner's manual.

CLEANUP

NEVER allow concrete to harden on the trowel. Wash any concrete off the trowel with water immediately after use. Be careful to not spray a hot engine or muffler. An old paint brush or broom may help loosen any concrete that has started to harden.

ENGINE AIR CLEANER

The engine air cleaner is equipped with a **paper air filter** (Figure 30) and a **foam pre-cleaner**. Remove the **air cleaner cover** and inspect the filter elements. Clean or replace dirty filter elements. **ALWAYS** replace damaged filter elements.

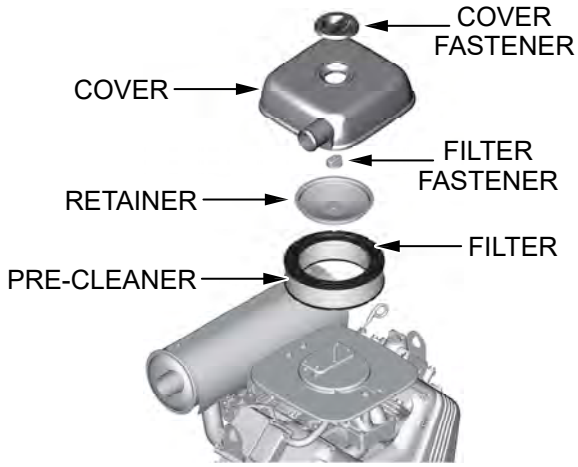


Figure 30. Engine Air Cleaner

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Remove the **air cleaner cover fastener** (Figure 30).
3. Remove the **air cleaner cover** (Figure 30).
4. Remove the **filter fastener** and **retainer** (Figure 30).
5. Remove the **air filter** (Figure 30).
6. Remove the **pre-cleaner** (Figure 30) from the air filter.
7. To clean the air filter, lightly tap the filter several times on a hard surface.

NOTICE

DO NOT use pressurized air or solvents to clean the air filter. Using pressurized air could result in damage to the filter, and solvents will dissolve the filter. **NEVER** try to brush off dirt; brushing will force dirt into the fibers. Replace the paper filter element if it is excessively dirty.

8. Clean the pre-cleaner in water with liquid detergent, rinse, and allow to dry thoroughly. **DO NOT** lubricate the pre-cleaner.
9. Once it is dry, reinstall the pre-cleaner onto the paper air filter.
10. Install the air filter with pre-cleaner and secure with the retainer and filter fastener.
11. Reinstall the air cleaner cover and secure with the cover fastener. Make sure the fastener is tight.

NOTICE

NEVER run the engine with the air cleaner removed.

NOTICE

Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear.

ENGINE OIL

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Pull the **engine oil dipstick** (Figure 31) out of its holder and wipe it with a clean rag.

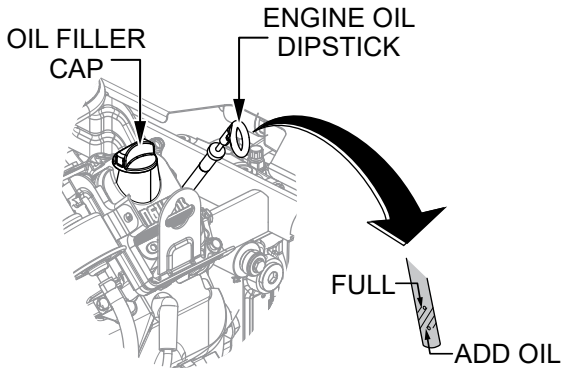


Figure 31. Engine Oil Dipstick And Filler Cap

3. Fully insert the dipstick then remove it again.
4. Determine if engine oil is low. Oil should be between the **upper and lower marks** (Figure 31) on the dipstick.
5. If the oil is below the lower mark on the dipstick, remove the **oil filler cap** (Figure 31) and add engine oil up to the upper mark on the dipstick. Refer to Table 3 for engine oil capacity and Table 6 for recommended oil viscosity.

⚠ CAUTION

NEVER overfill the oil pan. **ALWAYS** allow time for any added oil to make its way to the oil pan before rechecking the level.

NOTICE

Use motor oil that meets or exceeds the requirements for **API service category SF, SG, SH, SJ or higher**.

6. When replacing the dipstick, make sure it is fully inserted into its holder to keep the crankcase sealed.

Changing Engine Oil And Filter

NOTICE

ALWAYS drain the engine oil while the oil is **warm**.

1. Make sure the engine is **OFF** but still warm.
2. Disconnect the spark plug wires and keep them away from the spark plugs.
3. Disconnect the negative (black) battery cable from the negative **(–)** battery terminal.
4. Remove the engine oil dipstick.
5. Remove the **oil drain plug** (Figure 32) and allow the oil to drain into a suitable container.

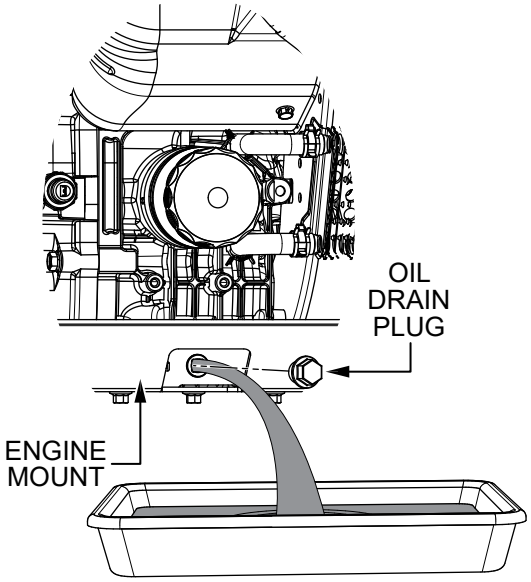


Figure 32. Draining The Engine Oil

6. After the oil has fully drained, reinstall the oil drain plug and tighten securely.

7. Using a **filter wrench** (Figure 33), remove the **engine oil filter**.

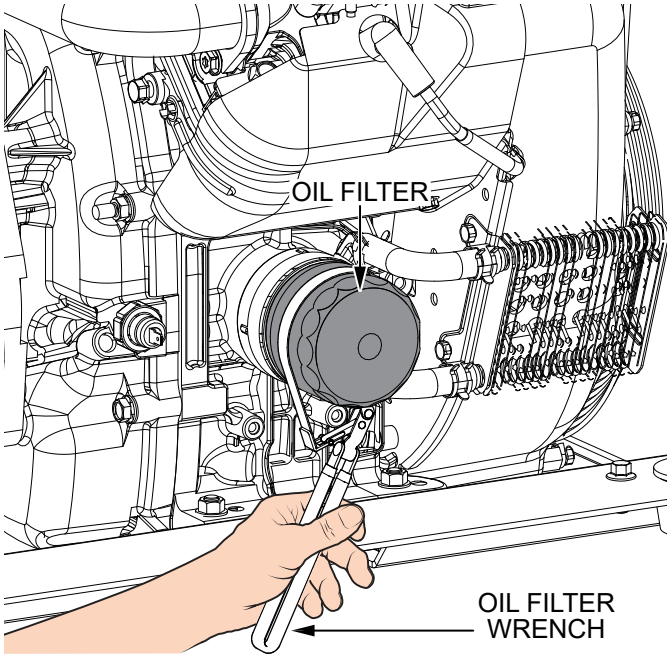


Figure 33. Oil Filter Removal

8. Clean the sealing surface where the filter mounts onto the engine.
9. Lightly coat the **gasket** of the new oil filter (Figure 34) with clean engine oil.

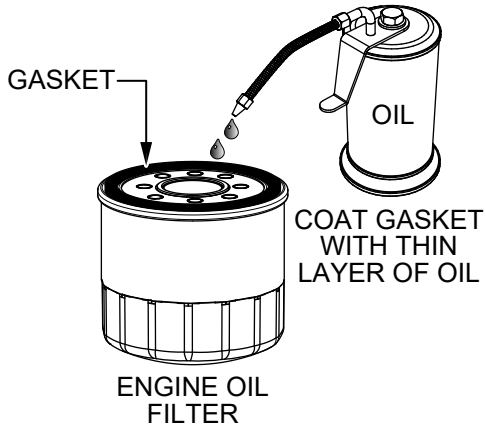


Figure 34. Lubricate New Oil Filter Gasket

10. Install the new filter by hand until it contacts the engine sealing surface, then tighten it another 1/2 to 3/4 turn. **DO NOT** use a filter wrench or any other tool to tighten the filter.
11. Remove the oil filler cap and slowly add lubricating oil to the engine. **DO NOT** overfill. Wait one minute, then check the oil level as described in the previous section.
12. Replace the oil filler cap and make sure the dipstick is fully inserted.
13. Reconnect the spark plug wires to the spark plugs.
14. Reconnect the negative (black) battery cable to the negative **(–)** battery terminal.

SPARK PLUGS

1. Make sure the engine is cool before servicing the spark plugs.
2. Disconnect the spark plug caps, and remove any dirt from around the spark plug area.
3. Remove the spark plugs using a spark plug wrench.
4. Inspect the **spark plugs** (Figure 35). Replace a spark plug if it is damaged or badly fouled, if the **sealing washer** is in poor condition, or if the **electrode** is worn.

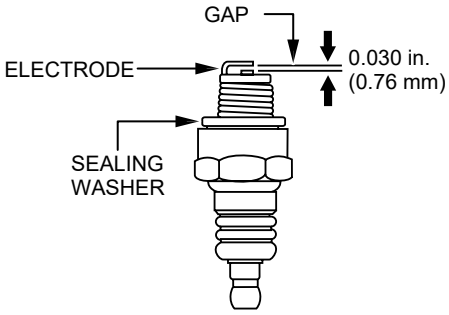


Figure 35. Engine Spark Plug

5. Measure the spark plug **electrode gap** (Figure 35) with a wire-type feeler gauge. If necessary, adjust the gap to 0.030 in. (0.76 mm) by carefully bending the side electrode.
6. Install the spark plug carefully, by hand, to avoid cross-threading.
7. After the spark plug is seated, use a spark plug wrench to compress the sealing washer. Torque to 180 lbf·ft (20 N·m).
8. Attach the spark plug caps to the spark plugs.

NOTICE

A loose spark plug can overheat and damage the engine. Overtightening the spark plug can damage the threads in the cylinder head.

FUEL FILTER

WARNING

Before replacing the fuel filter, **ALWAYS** drain the fuel tank or close the fuel shutoff valve. If the fuel tank is not drained, fuel leakage can occur and cause a fire or explosion.

1. Remove the **hose clamps** (Figure 36) securing the **fuel lines** to the **fuel filter**.

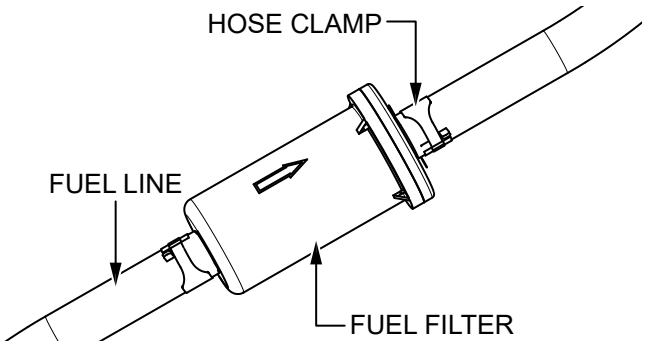


Figure 36. Fuel Filter Replacement

2. Twist and pull the fuel lines (Figure 36) off of the fuel filter.
3. Examine the fuel lines for cracks or leaks. Replace the fuel lines if necessary.
4. Replace the fuel filter.
5. Install the fuel lines onto the fuel filter and secure with hose clamps.

HYDRAULIC OIL FILTER

Change the **hydraulic oil filter** (Figure 37) after the first 100 hours of use, then every 250 hours. Use 10-micron, glass-filled filter elements only.

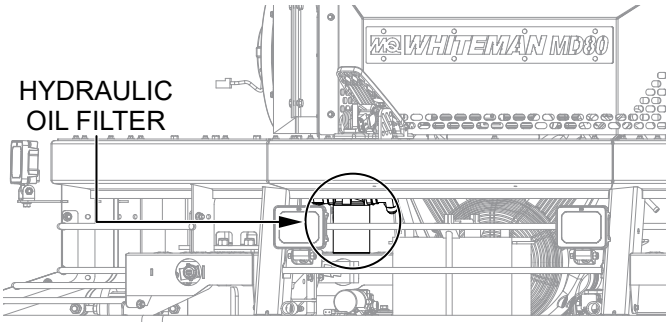


Figure 37. Hydraulic Oil Filter

Draining The Hydraulic Oil

CAUTION

Hydraulic oil can get **HOT!**

ALWAYS allow hydraulic oil to cool before performing this procedure.

1. Place an appropriate container beneath the **hydraulic oil reservoir** (Figure 38) to catch the hydraulic oil as it drains.

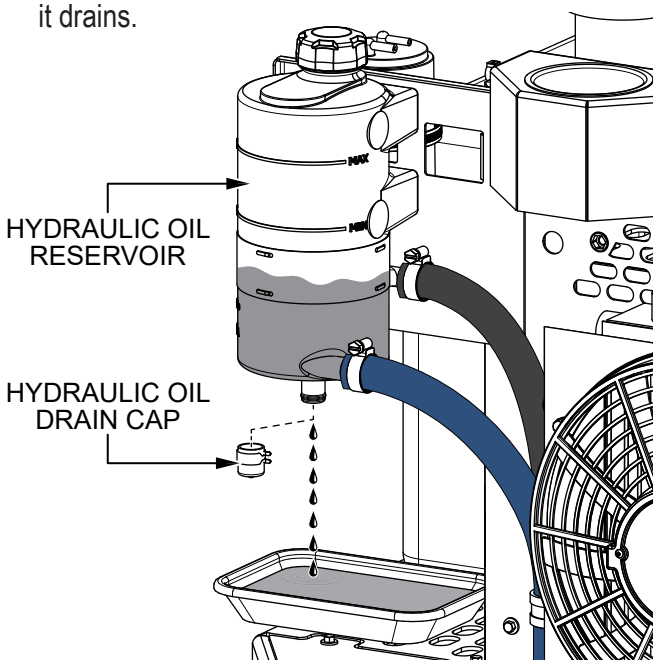


Figure 38. Draining The Hydraulic Oil

2. Remove the **hydraulic oil drain cap** (Figure 38) and allow the hydraulic oil to drain completely from the reservoir. Replace the drain cap when finished.

BATTERY

1. Check and clean the battery terminals for corrosion.
2. Disconnect the negative **(–)** battery terminal during storage. If the unit will be stored where the ambient temperature will drop to –15°C or less, remove and store the battery in a warm, dry place.
3. Check the manufacturer's recommendations for maintaining and charging the battery.

NOTICE

NEVER attempt to charge a battery that is frozen. **The battery can explode** unless first allowed to thaw.

TROWEL LUBRICATION

Regular lubrication is required to maintain your trowel in optimal working condition. Schedule maintenance lubrication according to Table 9 below.

Table 9. Trowel Lubrication Schedule

Location	# of Shots	Interval
Spiders	1 to 1½	Every day
Thrust Collars	1	Every day

Spiders (Daily)

Perform the following lubrication procedure after **every 8 hours of operation**.

1. Locate one of the **Zerk grease fittings** on either **spider assembly** (Figure 39). Remove the **Zerk fitting cap** and set it aside.

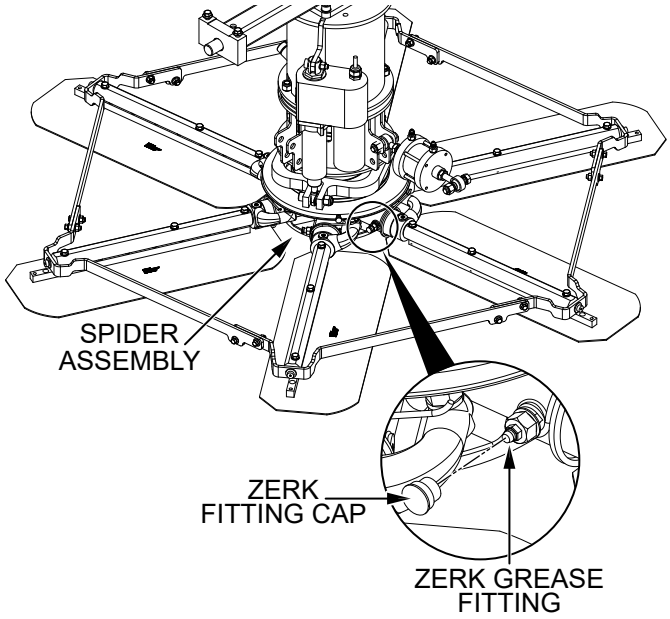


Figure 39. Spider Lubrication

2. Wipe the Zerk grease fitting clean to prevent abrasive material from entering the fitting during lubrication.
3. Lubricate the Zerk grease fitting with 1–1½ shots of multipurpose grade grease. Replace the Zerk grease fitting cap when finished.
4. Repeat steps 1–3 for the remaining grease fittings (total of 12) on both spider assemblies.

Thrust Collars (Daily)

Perform the following lubrication procedure after **every 8 hours of operation**.

1. Locate the **Zerk grease fitting** on either thrust collar (Figure 40). Remove the **Zerk fitting cap** and set it aside.

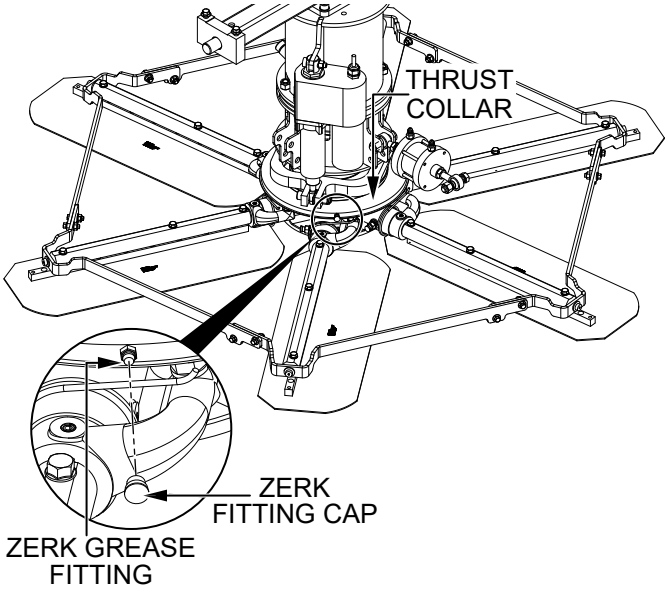


Figure 40. Thrust Collar Lubrication

2. Wipe the Zerk grease fitting clean to prevent abrasive material from entering the fitting during lubrication.
3. Lubricate the Zerk grease fitting with one shot of multipurpose grade grease. Replace the Zerk grease fitting cap when finished.
4. Repeat steps 1–3 for the grease fitting on the remaining thrust collar.

CHANGING BLADES

It is recommended to change **ALL** of the trowel blades at the same time. If only one or some of the blades are changed, the machine will not finish consistently and the machine may wobble or bounce.

1. Place the machine on a flat, level surface. Pitch the blades as flat as possible using the blade pitch controls. Note the blade orientation on the trowel arms. This is important for ride-on trowels as the two sets of blades counter-rotate. Lift the trowel up and place blocks under the main guard rings to support it.
2. Remove the bolts and lock washers on a trowel arm, then remove the blade.
3. Scrape all concrete and debris from the trowel arm to allow proper seating of the new blade.
4. Install the new blade, maintaining the proper blade orientation as noted earlier.
5. Reinstall the bolts and lock washers.
6. Repeat steps 2–5 on all remaining trowel arms.

BLADE PITCH ADJUSTMENT

Maintenance adjustment of blade pitch is made by adjusting a bolt on the **trowel arm lever** (Figure 41). This bolt is the contact point of the **trowel arm** with the lower wear plate on the thrust collar.

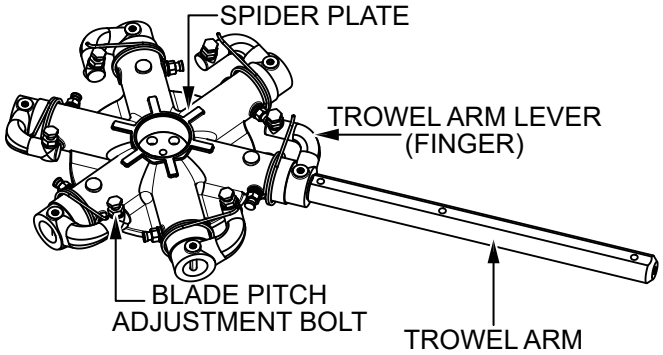


Figure 41. Blade Pitch Adjustment Bolt

The goal of adjustment is to promote consistent blade pitch and finishing quality. If blades are wearing unevenly, look for the following indications that adjustment may be necessary.

- Is one blade completely worn out while the others look new?
- Does the machine have a perceptible rolling or bouncing motion when in use?
- Do the guard rings rock up and down?

The easiest and most consistent way to make adjustments on the trowel arm levers is to use the **trowel arm adjustment tool** (P/N 9177). It comes with all the hardware necessary to perform this adjustment and instructions on how to use the tool.

If a trowel arm adjustment tool is not available and you can see or feel which blade is pulling harder, a temporary field adjustment can be made by adjusting the bolt that corresponds to that blade.

A better way to determine which blades need adjustment is to place the machine on a known **FLAT** surface (e.g. a steel plate) and pitch the blades as flat as possible. Look at the adjustment bolts. They should all barely make contact with the lower wear plate on the spider. If you can see that one of them is not making contact, some adjustment will be necessary.

Adjust the 'high' bolts that are touching the wear plate down to the level of the one that is not touching, or adjust the 'low' bolt up to the level of the higher ones. If possible, adjust the low bolt up to the level of the rest of the bolts. This is the fastest way, but may not always work. Verify that the blades pitch correctly after adjustment.

Blades that are incorrectly adjusted often will not be able to pitch flat. This can occur if the adjusting bolts are raised too high. Conversely, adjusting bolts that are too low will not allow the blades to be pitched high enough for finishing operations.

If the machine is still finishing poorly after blade pitch adjustment has been made, check the trowel blades, arms, and arm bushings for adjustment, wear, or damage.

NOTICE

After any blade adjustment, the pitch system should be recalibrated with the Whiteman Service Tool.

SPIDER ALIGNMENT

A clean, level area to test the trowel prior to and after trowel arm adjustment is essential. Any uneven spots in the floor or debris under the trowel will give an incorrect perception of alignment. A 3/4-inch-thick, flat steel plate is ideal for testing.

1. Place the trowel in a clean, level test area.
2. Pitch the blades as flat as possible. The adjustment bolts should all barely make contact with the lower wear plate on the spider. Figure 42 illustrates the correct alignment for a spider assembly as shipped from the factory.

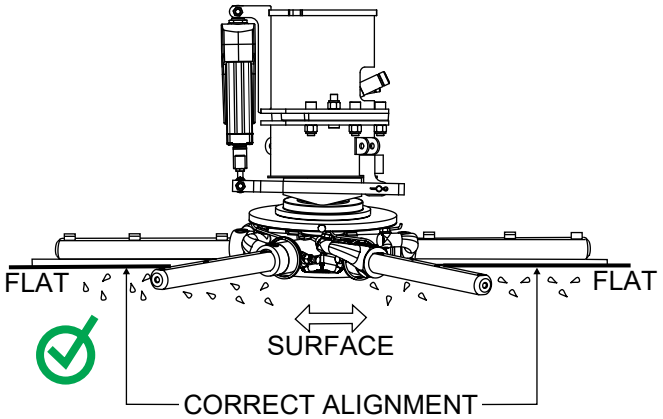


Figure 42. Correct Spider Alignment

3. If any adjustment bolts are not making contact with the lower wear plate, adjustment will be necessary. Figure 43 illustrates incorrect alignment, worn spider bushings, or bent trowel arms.

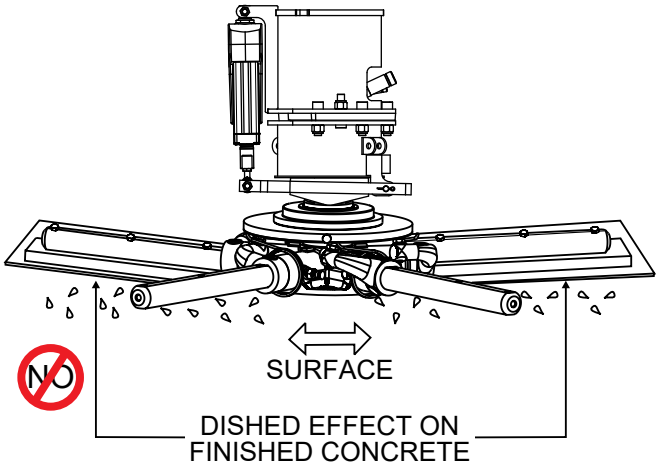


Figure 43. Incorrect Spider Alignment

SPIDER REMOVAL

To fully remove a spider assembly from the hydraulic motor shaft:

1. Disconnect the negative **(BLACK)** battery cable from the negative **(–)** terminal on the battery.
2. Lift the trowel as shown in the ***Lifting and Transporting*** section.
3. Place the trowel on **heavy-duty jack stands** (Figure 44) on secure, level ground in an area that is free of dirt and debris.

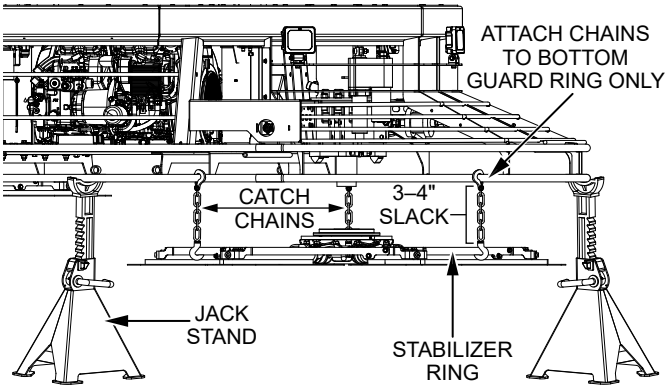


Figure 44. Preparation For Spider Removal

⚠ CAUTION

The bolt removal process may result in the sudden separation of the spider assembly from the hydraulic motor shaft. The use of catch chains is recommended to prevent the spider assembly from falling and striking personnel, causing bodily harm.

4. Attach one end of three equally spaced straps or **catch chains** to the **stabilizer ring** (Figure 44). Attach the other end of these straps or chains to the **bottom guard ring** in a manner that would prevent the spider assembly from falling.

⚠ CAUTION

DO NOT use the intermediate guard rings to support the spider assembly.

NOTICE

Make sure the catch chains are positioned so that they are equally spaced, with **no more than 3 to 4 inches of slack**.

5. Remove the **spider hub cap plug** (Figure 45) and set it aside.

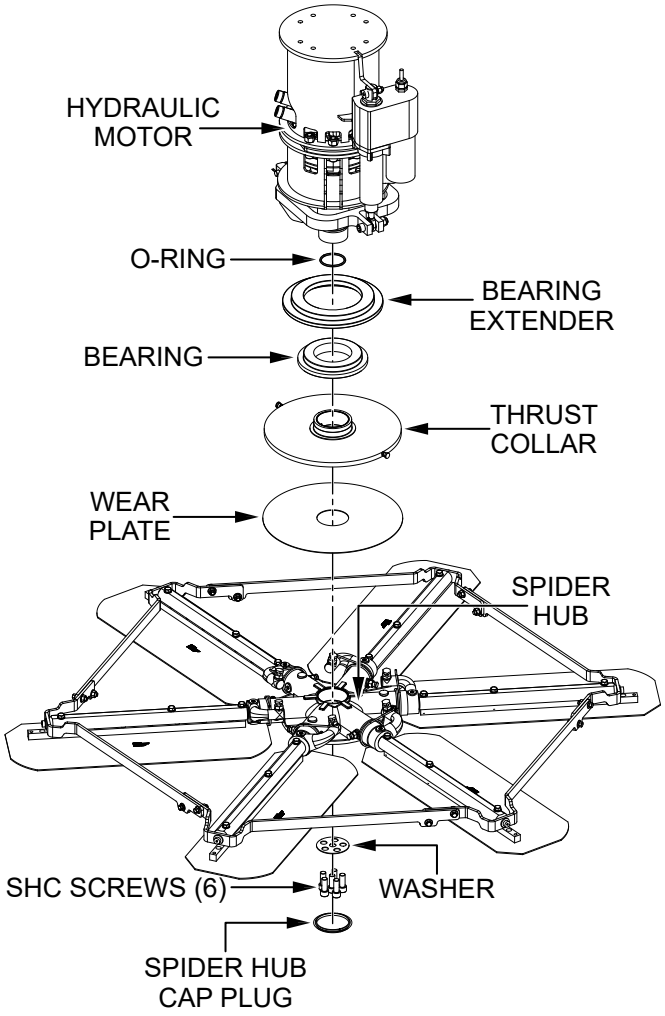


Figure 45. Rotor Assembly Components

6. Remove and set aside the **six socket-head screws** securing the **spider hub** to the **hydraulic motor shaft** (Figure 45).

7. When reassembling:
    a. Apply Loctite Blue 246 thread sealant to the socket-head screw *in the center* and torque to 40 lbf·ft (54.2 N·m).
    b. Apply Loctite Blue 246 thread sealant to the five remaining socket-head screws and torque the screws in a star pattern to 60 lbf·ft (81.3 N·m).
    c. Re-torque all five socket head screws in a star pattern to 90 lbf·ft (122 N·m).
    d. Re-torque all five socket head screws in a star pattern to 113 lbf·ft (153.2 N·m).

Trowel Blade Removal

Remove the three **hex head screws** securing the **trowel blades** to the trowel arms (Figure 46). Set the blades and screws aside.

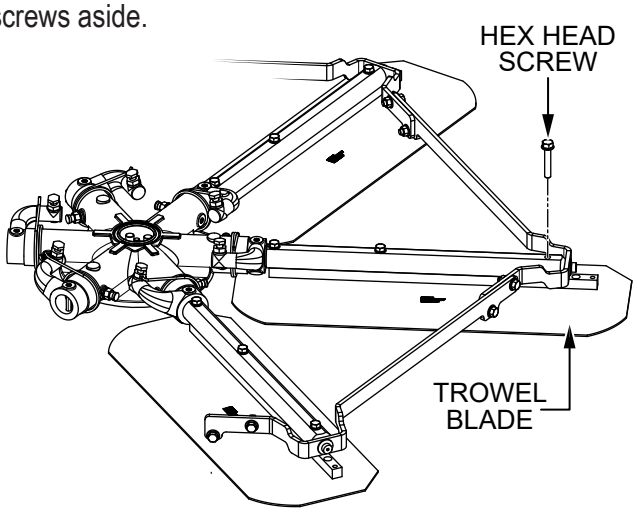


Figure 46. Blade Removal

Trowel Arm Removal

1. Remove the hardware securing the **stabilizer struts** to the trowel arms (Figure 47). Set the struts and hardware aside.

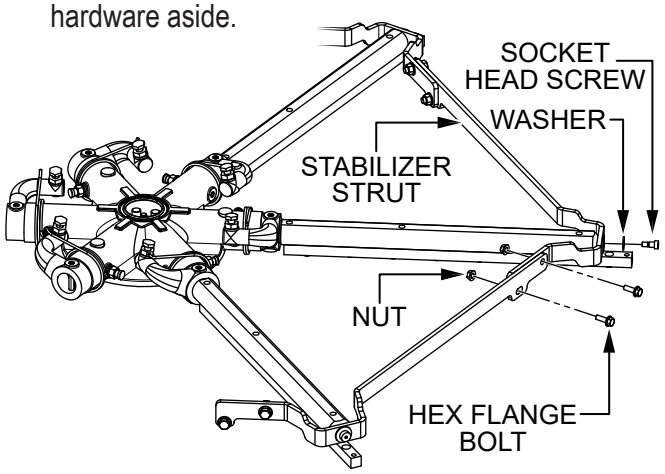


Figure 47. Stabilizer Ring Removal

2. Each **trowel arm** is held in place at the **spider hub** by a hex head screw (Zerk grease fitting). Remove the **hex head screw** (Figure 48) from the spider hub.

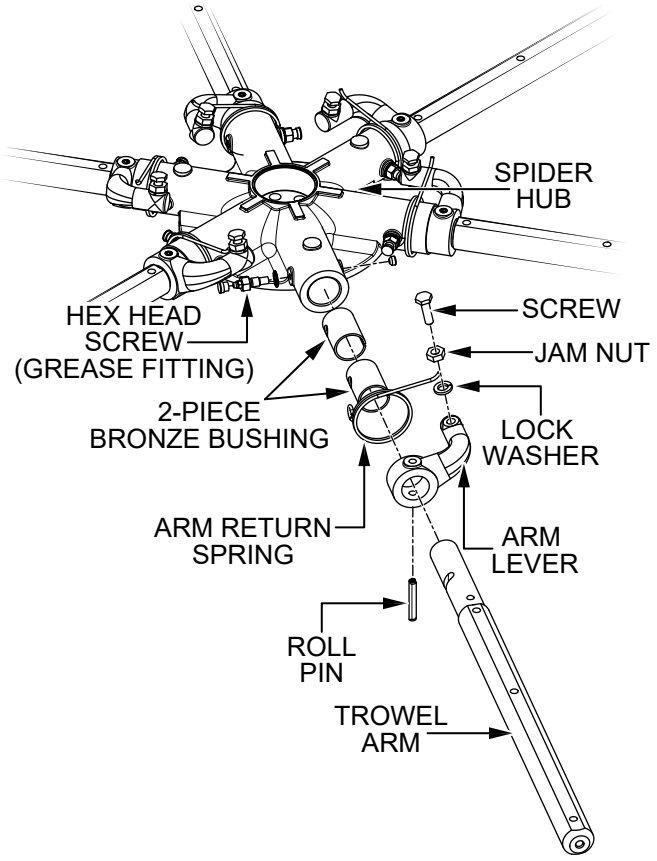


Figure 48. Trowel Arm Removal

3. Remove the **trowel arm** (Figure 48) from the **spider hub**.
4. Should the trowel arm insert (bronze bushing) come out with the trowel arm, remove the bushing from the trowel arm and set it aside. If the bushing is retained inside the spider hub, carefully remove the bushing.
5. Examine the **bronze trowel arm bushings** (Figure 49), and clean them if necessary. Replace the bushings if they are worn or out of round.

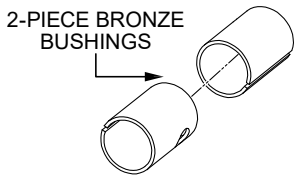


Figure 49. Bronze Bushings

6. Wire brush any buildup of concrete from all six sides of the trowel arm.
7. Repeat steps 2–6 for the remaining trowel arms.

Checking Trowel Arm Straightness

Trowel arms can be damaged by rough handling such as dropping the trowel on a pad or by striking exposed plumbing, forms or rebar while in operation. A bent trowel arm will prevent smooth, fluid rotation of the blades. If bent trowel arms are suspected, examine them for straightness as follows:

1. Place the trowel arm onto a thick steel plate, granite slab, or any other surface which is flat and true (Figure 50).

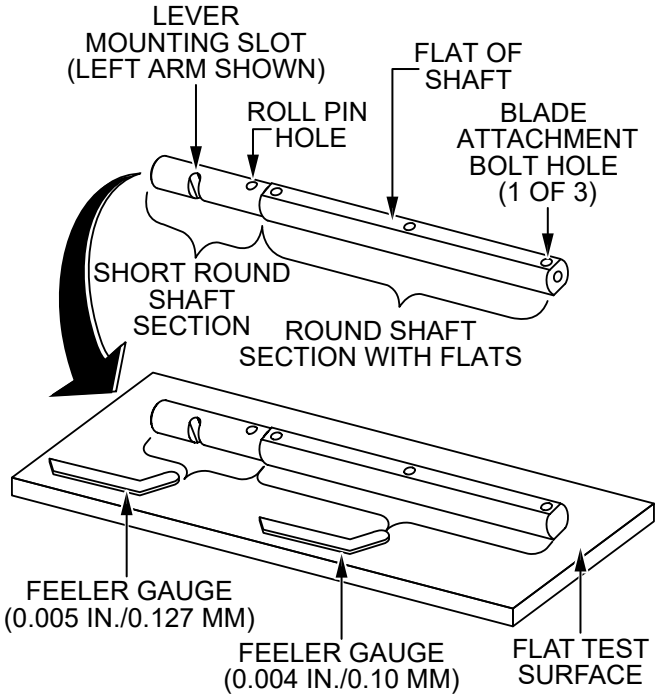


Figure 50. Checking Trowel Arm Straightness

2. Check each of the flat sides of the trowel arm (Figure 50). A **feeler gauge** of **0.004 in. (0.10 mm)** should not pass between the flat of the trowel arm and the test surface along its length on the test surface.
3. Check the clearance between the **short round shaft section** and the test surface as one of the flat sections of the arm rests on the test surface (Figure 50). Rotate the arm to each of the flat sections and check the clearance of the round shaft. Use a **feeler gauge** of **0.005 in. (0.127 mm)**. Each section should have the same clearance between the round of the trowel arm shaft and the test surface.
4. Replace the trowel arm if it is bent or uneven.

Trowel Arm Adjustment

Figure 51 illustrates a **trowel arm adjustment tool**. As a trowel arm is locked into the adjustment tool, the trowel arm bolt is adjusted to where it contacts a stop on the fixture. This will consistently adjust all of the trowel arms, keeping the finisher as flat and evenly pitched as possible.

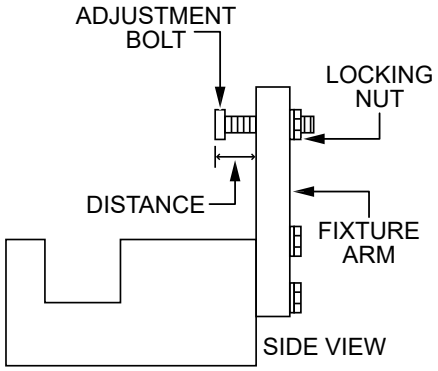


Figure 51. Trowel Arm Adjustment Tool (Side View)

1. Locate a trowel arm adjustment tool (P/N 9177).
2. Place the **fixture arm** in the correct position (up or down) for the trowel arm's direction of rotation. For trowel arms that rotate **clockwise**, place the fixture arm in the **UP** position (Figure 52**A**). For trowel arms that rotate **counterclockwise**, place the fixture arm in the **DOWN** position (Figure 52**B**).

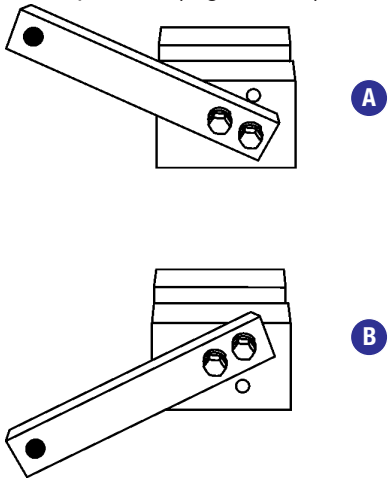


Figure 52. Fixture Arm Position

3. Adjust the fixture **adjustment bolt distance** shown in Figure 51 to **0.15 in. (3.81 mm)**.
4. Unscrew the **locking bolts** on the adjustment tool and place the **trowel arm** into the fixture channel as shown in Figure 53. A thin **shim** may be required to cover the blade holes on the trowel arm. Make sure to align the **trowel arm adjustment bolt** with the **fixture adjustment bolt**.

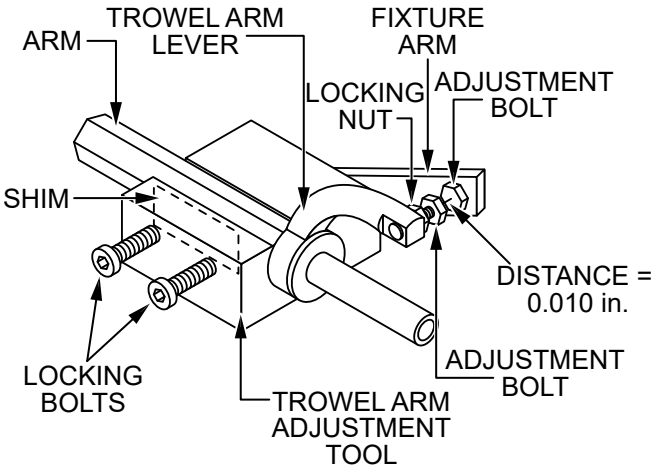


Figure 53. Trowel Arm Adjustment

5. Tighten the **locking bolts** (Figure 53) with an Allen wrench to secure the trowel arm in place.
6. Loosen the **locking nut** on the **trowel arm lever** (Figure 53), then turn the **trowel arm adjustment bolt** until it barely touches **(0.010")** the **fixture adjustment bolt**.
7. Once the adjustment has been made, tighten the locking nut on the trowel arm lever to lock it in place.
8. Loosen the locking bolts and remove the trowel arm.
9. Repeat steps 2–8 for the remaining trowel arms.
10. Recalibrate pitch with the Whiteman Service Tool.

Reassembly

1. Clean and examine the entire spider assembly including the upper and lower wear plates and thrust collar. Wire brush any concrete or rust buildup. Replace any spider components that are damaged or out-of-round.
2. Make sure the bronze trowel arm bushings are not damaged or out-of-round. Clean the bushings if necessary. Replace any bronze bushing that is damaged or worn.

3. Reinstall the bronze bushings onto the trowel arm.
4. Repeat steps 2–3 for each trowel arm.
5. Make sure that the spring tensioner is in the correct position to exert tension on the trowel arm.
6. Insert all trowel arms with levers (with bronze bushings already installed) into the spider hub, using care to align the grease holes on the bronze bushings with the grease hole fittings on the spider hub.
7. Lock the trowel arms in place by tightening the hex head bolts with Zerk grease fittings and jam nuts.
8. Reinstall the blades onto the trowel arms.
9. Reinstall the stabilizer struts onto the spider assembly.
10. Lubricate all grease points (Zerk fittings) with premium Lithum 12-based grease, conforming to NLG1 Grade #2 consistency.

SPIDER BOLT REPLACEMENT

Existing bolts on both spider assemblies may self loosen due to normal material yield. Replace the left- and right-side spider assembly socket-head bolts (6 per side) and hardened washers (1 per side) after the first 25 hours of operation, then every 100 hours of operation thereafter.

1. Perform steps 1–4 of the ***Spider Removal*** procedure.
2. Remove the left-side **spider hub cap plug** (Figure 54) and set it aside.

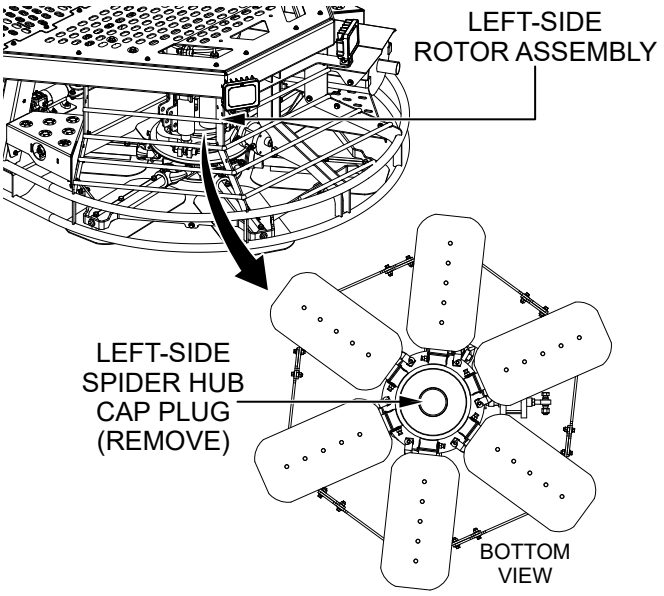


Figure 54. Remove Left-Side Spider Hub Cap Plug

⚠ CAUTION

The bolt removal process may result in the sudden separation of the spider assembly from the hydraulic motor shaft. Make sure catch chains have been properly installed.

3. Remove and discard the **six M14-2.0 × 30 mm SHC bolts** and **one hardened washer** (Figure 55) securing the left-side spider assembly to the bottom of the left-side hydraulic motor.

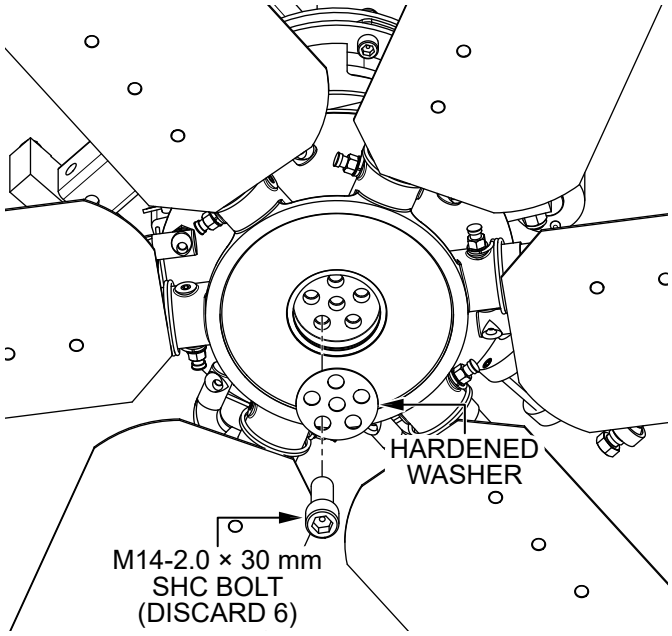


Figure 55. Remove Left-Side Spider Hardware

4. Using an M14 × 2.0 tap, recut the threads of the six empty bolt holes to remove any Loctite residue.

5. Use **brake cleaner** (Figure 56**A**) to clean out any debris from the empty bolt holes. When finished, use **compressed air** (Figure 56**B**) to remove any remaining residue.

NOTICE

Make sure the bolt holes are **clean and completely dry** before installing the new bolts.

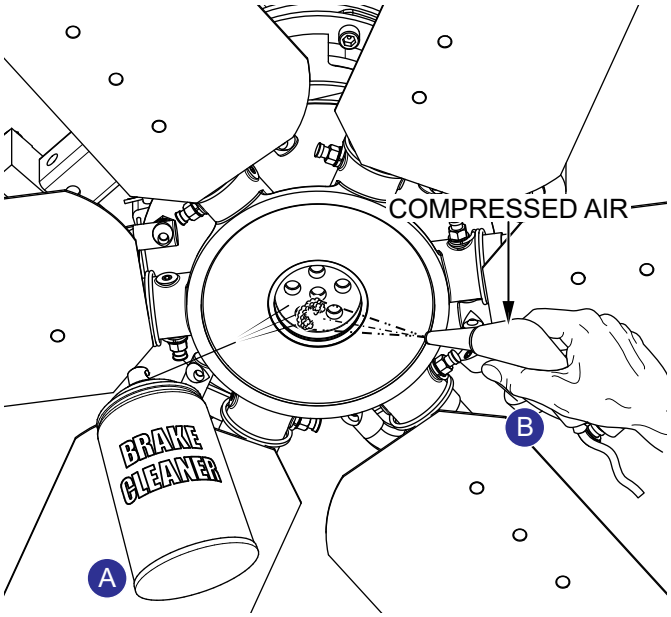


Figure 56. Clean Bolt Holes

6. Apply Loctite Blue 246 to the threads on one new M14-2.0 × 30 mm SHC bolt.

7. Install the new **M14-2.0 × 30 mm SHC bolt** *in the center position* along with a **new hardened washer** as shown in Figure 57. Torque the center bolt to 40 lbf·ft (54.2 N·m).

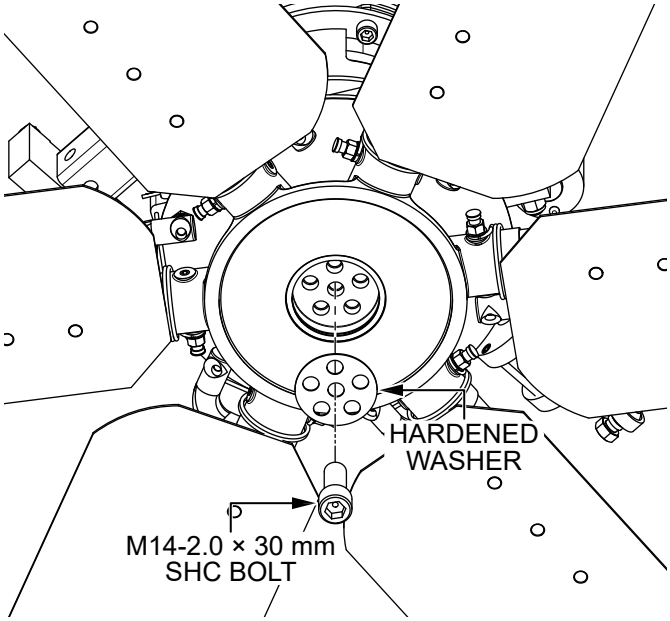


Figure 57. Install New Center Bolt And Washer

8. Apply Loctite Blue 246 to the threads on five more new M14-2.0 × 30 mm SHC bolts.

9. Install the five new **M14-2.0 × 30 mm SHC bolts** as shown in Figure 58. Torque the bolts in a star pattern to 60 lbf·ft (81.3 N·m).

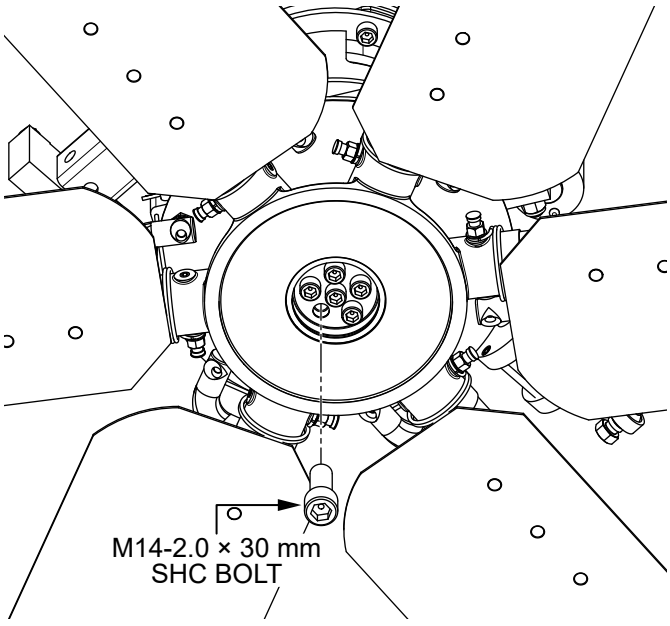


Figure 58. Install Five New Bolts

10. Re-torque the five bolts in a star pattern to 90 lbf·ft (122 N·m).

11. Re-torque the five bolts in a star pattern to 113 lbf·ft (153.2 N·m).
12. Reinstall the left-side spider hub cap plug.
13. Repeat steps 2–12 on the right-side spider assembly.

PREPARATION FOR LONG-TERM STORAGE

1. Disconnect and remove the battery.
2. Drain all fuel from the fuel tank.
3. Clean the trowel exterior with a cloth soaked in clean oil.
4. Cover the trowel with a plastic sheet and store it out of direct sunlight in a moisture- and dust-free location.

TROWEL DECOMMISSIONING

Decommissioning is a controlled process used to safely retire a piece of equipment that is no longer serviceable. If the equipment poses an unacceptable and unrepairable safety risk due to wear or damage, or is no longer cost effective to maintain (beyond life-cycle reliability), and is to be decommissioned (demolition and dismantlement), the following procedure must be performed:

1. Drain all fluids completely. These may include oil, gasoline, hydraulic oil, and antifreeze. Dispose of all fluids properly in accordance with local and governmental regulations. **NEVER** pour fluids on the ground or down drains or sewers.
2. Remove the battery and bring it to an appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.
3. The remainder can be brought to a salvage yard or metal reclamation facility for further dismantling.

FAULTS

When a fault occurs, the trowel's horn will begin a repeating cycle of 5 beeps every 30 seconds. The **amber LEDs** on the diagnostic display will turn **ON** (Figure 59), and the **Check Engine icon** will be shown on the display. When this happens:

1. Press the button on the right side of the display to view the active fault code (Figure 60).

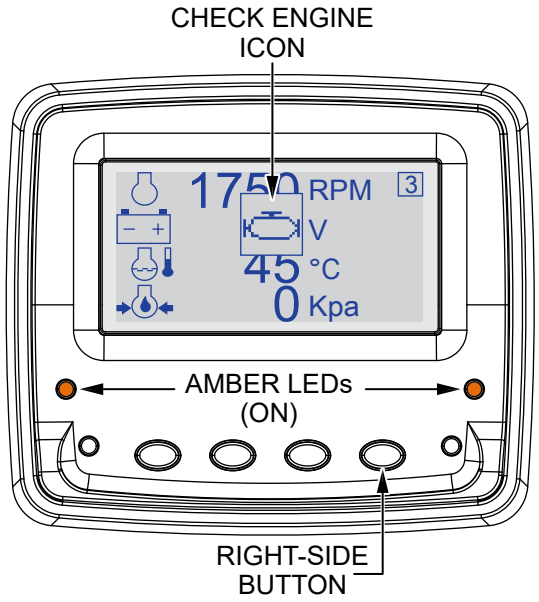


Figure 59. Diagnostic Display (Active Fault)

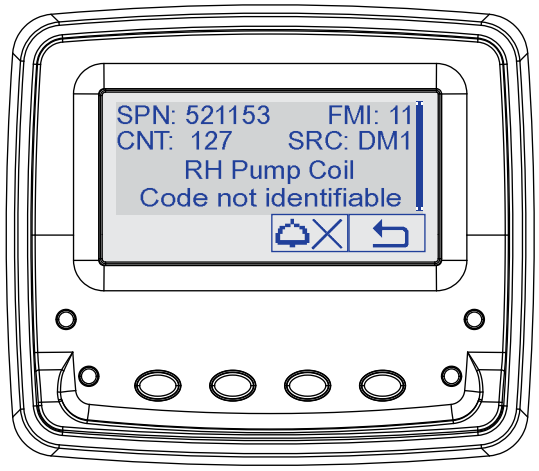


Figure 60. Diagnostic Display (Fault Code Screen)

2. Shut down the engine and correct the problem.

Until the fault has been cleared and machine power has been restored, the horn's beeping cycle will continue to repeat while the engine is running or the ignition key is in the ON position.

NOTICE

NEVER operate the trowel with the horn disabled or disconnected. Serious damage to the trowel may occur as a result.

For a complete list of fault codes, see Table 10 (machine codes) and Table 11 (engine codes).

Table 10. Machine Fault Codes

Name	SPN	FMI	Description
LH Hyd. Pressure Low Alarm	521110	1	LH Loop Pressure < 5 bar
LH Hyd. Pressure Low Warning	521110	17	LH Loop Pressure < 15 bar
LH Hyd. Pressure High Stage 1	521110	0	LH Loop Pressure > 400 bar
RH Hyd. Pressure Low Alarm	521111	1	RH Loop Pressure < 5 bar
RH Hyd. Pressure Low Warning	521111	17	RH Loop Pressure < 15 bar
RH Hyd. Pressure High Stage 1	521111	0	RH Loop Pressure > 400 bar
LH Rotor Speed Fault	521127	11	No Speed Detected W\RH Speed > 30
RH Rotor Speed Fault	521128	11	No Speed Detected W\LH Speed > 30
Pedal A Fault	521131	11	
LH Fan Fault	521139	11	
RH Fan Fault	521140	11	
LH Pump Coil Fault	521152	11	
RH Pump Coil Fault	521153	11	
Pedal B Fault	521156	11	
Pedal Sync Fault	521237	11	

Table 11. Engine Fault Codes			
Name	**SPN**	**FMI**	**Description**
Throttle Position Sensor (TPS)	51	2	Intermittent Fail
		3	Signal Voltage High
		4	Signal Voltage Low/Open
		7	Signal Voltage Out of Range
		13	Signal Voltage Out of Range
Pedal Value	91	3	Signal Voltage High
		4	Signal Voltage Low/Open
Manifold Absolute Pressure (MAP) Sensor	102	3	Signal Voltage High
		4	Signal Voltage Low/Open
Manifold Air Temperature (MAT) Sensor	105	2	Intermittent Fail
		3	Signal Voltage High/Open
		4	Signal Voltage Low
Engine Head Temperature (EHT) Sensor	110	0	Head Over Temperature
		2	Intermittent Fail
		3	Signal Voltage High/Open
		4	Signal Voltage Low
Battery Voltage	158	3	Voltage High
		4	Voltage Low
Battery Voltage	168	3	Voltage High
		4	Voltage Low
Engine Over Speed Detection	190	15	Over Speed Detected
Crankshaft Wrong Tooth Number	636	2	Additional Edges Detected
		8	Missing or Additional Tooth Detected
Crankshaft Loss of Synchronization	637	2	Gap Position Incorrect
		7	Missing Crankshaft Sensor Signal
		8	Crankshaft Fail During Valid Teeth Phase
CAN Bus Offline	639	19	Data Error
Cylinder 1 Fuel Injector	651	3	Signal Voltage High
		4	Signal Voltage Low/Open
Cylinder 2 Fuel Injector	652	3	Signal Voltage High
		4	Signal Voltage Low/Open
Oxygen (O_2) Sensor	724	3	Sensor Shorted High
		4	Sensor Shorted Low
		5	Sensor Open
Voltage Protection	818	3	5V Supply Shorted High
		4	5V Supply Shorted Low
		16	Over Temperature
Cylinder 1 Ignition Coil	1268	3	Signal Voltage High
		4	Signal Voltage Low/Open

Table 11. Engine Fault Codes			
Cylinder 2 Ignition Coil	1269	3	Signal Voltage High
		4	Signal Voltage Low/Open
Electric Lift Fuel Pump Failure	1347	3	Circuit Shorted High
		4	Circuit Shorted Low
		5	Circuit Open
Main Relay	1485	3	Circuit Shorted High
		4	Circuit Shorted Low
		5	Circuit Open
Oxygen (O_2) Control	1695	4	Lean Air/Fuel Ratio
		20	Sensor Correction Too High
		21	Sensor Correction Too Low
Electronic Throttle Control (ETC)	5419	3	Driver Pin 1 Shorted High
		4	Driver Pin 1 Shorted Low
		5	Driver Circuit Open
		6	Driver Shorted Between Pins 1 & 2
		8	Pulse Width Modulation Out of Range
		16	Driver Over Temperature
		16	Driver Over Temperature **WARNING**
Heated Oxygen (HO_2) Sensor	5871	3	Heater Shorted High
		4	Heater Shorted Low
		5	Heater Circuit Open

NOTICE

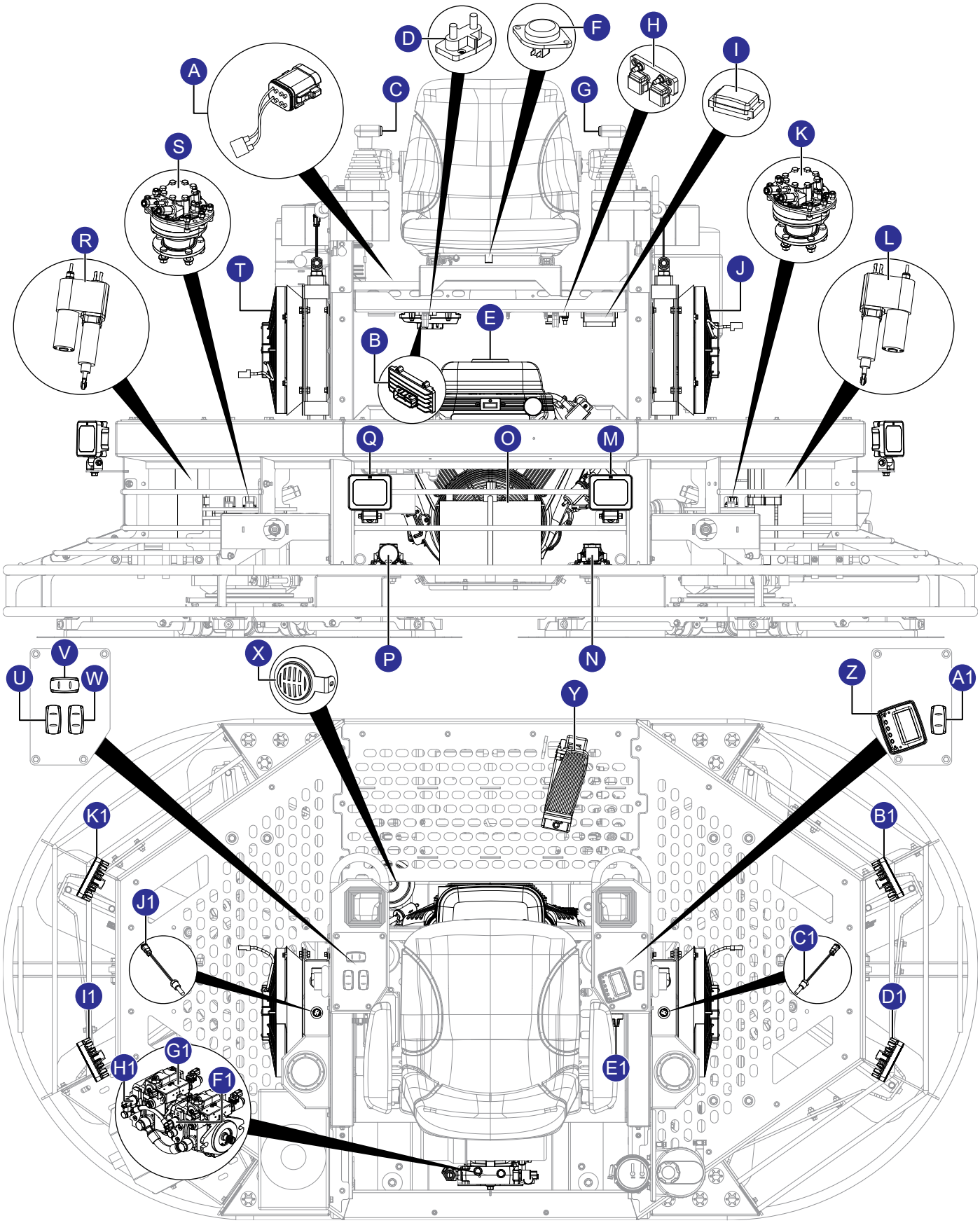
Fault code list may be outdated. Always refer to the engine manufacturer for the latest information regarding engine diagnostics and troubleshooting.

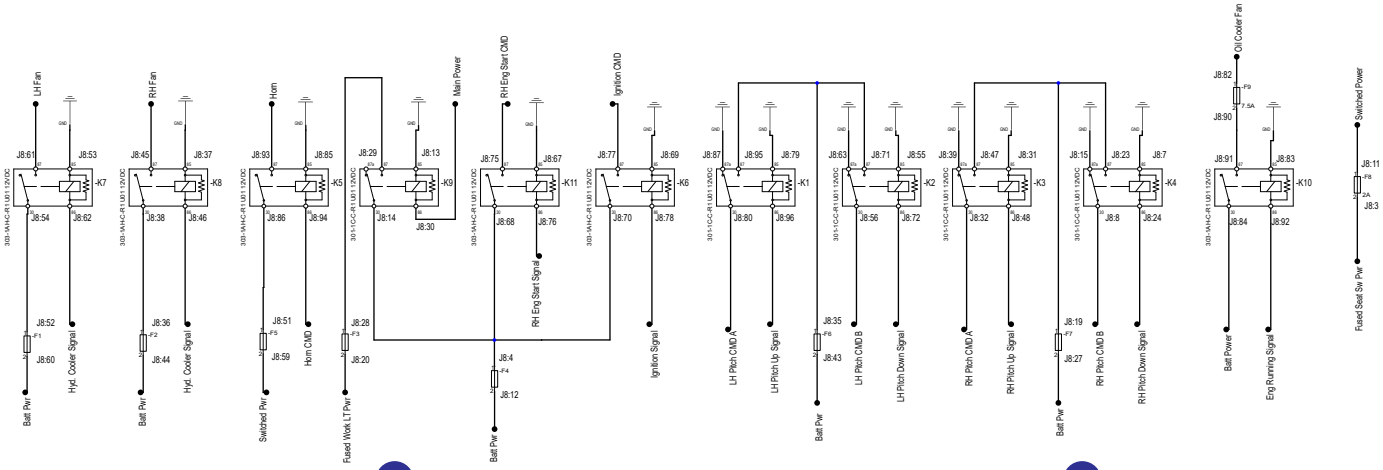
Troubleshooting (Ride-On Hydraulic Trowel)		
Symptom	**Possible Problem**	**Solution**
Seat switch not functioning.	Other problems?	Check seat function with the electronic service tool.
	Loose wire connections?	Check wiring. Replace as necessary.
	Bad contacts?	Replace seat cushion (contains the switch).
If trowel bounces, rolls concrete, or makes uneven swirls in concrete.	Blades?	Make certain blades are in good condition, not excessively worn. Finish blades should measure no less than 2" (50 mm) from the blade bar to the trailing edge, combo blades should measure no less than 3.5" (89 mm). Trailing edge of blade should be straight and parallel to the blade bar.
	Spider?	Check that all blades are set at the same pitch angle as measured at the spider. A field adjustment tool is available for height adjustment of the trowel arms.
	Bent trowel arms?	Check the spider assembly for bent trowel arms. If one of the arms is even slightly bent, replace it immediately.
	Trowel arm bushings?	Check the trowel arm bushings for tightness. This can be done by moving the trowel arms up and down. If there is more than 1/8" (3.2 mm) of travel at the tip of the arm, the bushings should be replaced. All bushings should be replaced at the same time.
	Thrust collar?	Check the flatness of the thrust collar by rotating it on the spider. If it varies by more than 0.02" (0.5 mm) replace the thrust collar.
	Thrust collar bushing? Blade torsion spring hanging below blade?	Check the thrust collar by rocking it on the spider. If it can tilt more than 1/16" (1.6 mm) as measured at the thrust collar O.D., replace the bushing in the thrust collar.
	Thrust bearing worn?	Check the thrust bearing to see that it is spinning freely. Replace if necessary.
	Blade pitch?	Check blades for consistent pitch. Adjust per Maintenance section instructions if necessary.
Machine has a perceptible rolling motion while running.	Spider finger screws?	Adjust per procedure in Maintenance section.
	Yoke?	Check to make sure that both fingers of the yoke press evenly on the wear cap. Replace yoke as necessary.
	Blade pitch?	Check to ensure that each blade is adjusted to have the same pitch as all other blades. Adjust per Maintenance section in manual.

Troubleshooting (Ride-On Hydraulic Trowel) Continued		
Symptom	**Possible Problem**	**Solution**
Lights not working.	Wiring?	Check all electrical connections, including the master on/off switch and check to see if wiring is in good condition with no shorts. Replace as necessary.
	Lights?	Check to see if light bulbs are still good. Replace if broken.
Retardant spray not working.	Retardant?	Check retardant level in tank. Fill tank as required.
	Wiring?	Check all electrical connections, including the master on/off switch connections. Replace components and wiring as necessary.
	Bad switch?	Check the continuity of the master on/off switch. Replace if broken.
	Bad spray pump?	If pump has a voltage present when the switch is turned on, but does not operate and electrical connections to the pump are good, replace the pump.
	Bad fuse?	Check fuse. Replace fuse if defective.
Steering is unresponsive.	Blade speed out of adjustment?	See section on blade speed adjustment.
	Worn components?	Check for wear of steering bearings and linkage components replace if necessary.
	Pivots?	Check to ensure free movement of hydraulic drive motors.
	Hydraulic pressure?	Check to ensure that hydraulic steering pressure is adequate. See section on checking hydraulic steering pressure.
Operating position is uncomfortable.	Seat adjusted for operator?	Adjust seat with lever located on the front of the seat.
Pitch system not working.	Wiring?	Check and repair wiring and connectors as necessary.
	Actuators?	Check actuator faults with the Whiteman Service Tool (WST).

Troubleshooting (Engine)		
Symptom	**Possible Problem**	**Solution**
Difficult to start, fuel is available, but no spark at spark plug.	Spark plug bridging?	Check gap, insulation or replace spark plug.
	Carbon deposit on spark plug?	Clean or replace spark plug.
	Short circuit due to deficient spark plug insulation?	Check spark plug insulation, replace if worn.
	Improper spark plug gap?	Set to proper gap.
	Spark plug is red?	Check transistor ignition unit.
	Spark plug is bluish white?	If insufficient compression, repair or replace engine. If injected air leaking, correct leak. If carburetor jets clogged, clean carburetor.
	No spark present at tip of spark plug?	Check if transistor ignition unit is broken, and replace defective unit. Check if voltage cord cracked or broken and replace. Check if spark plug is fouled and replace.
	No oil?	Add oil as required.
	Oil pressure alarm lamp blinks upon starting? (if applicable)	Check automatic shutdown circuit, oil sensor. (if applicable)
Difficult to start, fuel is available, and spark is present at the spark plug.	ON/OFF switch is shorted?	Check switch wiring, replace switch.
	Ignition coil defective?	Replace ignition coil.
	Improper spark gap, points dirty?	Set correct spark gap and clean points.
	Condenser insulation worn or short circuiting?	Replace condenser.
	Spark plug wire broken or short circuiting?	Replace defective spark plug wiring.
Difficult to start, fuel is available, spark is present and compression is normal.	Wrong fuel type?	Flush fuel system, replace with correct type of fuel.
	Water or dust in fuel system?	Flush fuel system.
	Air cleaner dirty?	Clean or replace air cleaner.
	Choke open?	Close choke.
Difficult to start, fuel is available, spark is present and compression is low.	Suction/exhaust valve stuck or protruded?	Reseat valves.
	Piston ring and/or cylinder worn?	Replace piston rings and/or piston.
	Cylinder head and/or spark plug not tightened properly?	Torque cylinder head bolts and spark plug.
	Head gasket and/or spark plug gasket damaged?	Replace head and spark plug gaskets.
No fuel present at injectors.	No fuel in fuel tank?	Fill with correct type of fuel.
	Fuel filter/lines clogged?	Replace fuel filter.
	Fuel tank cap breather hole clogged?	Clean or replace fuel tank cap.
	Air in fuel line?	Bleed fuel line.

ELECTRICAL COMPONENT LOCATOR



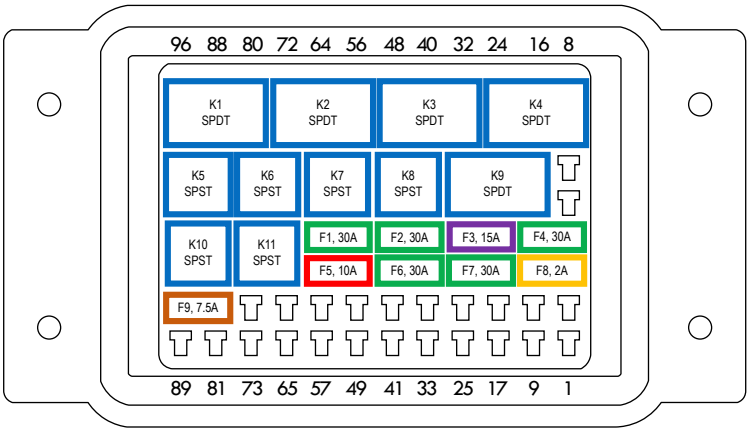


I

MAIN HARNESS J8

PDMU3AC1

FUSE AND RELAY BOX (FRONT)



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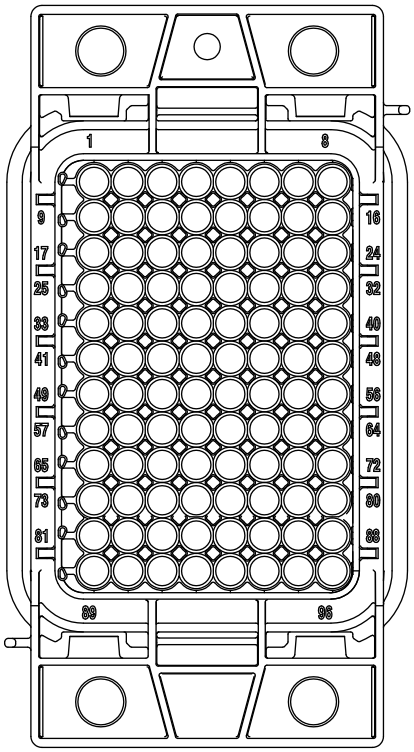
MAIN HARNESS J8

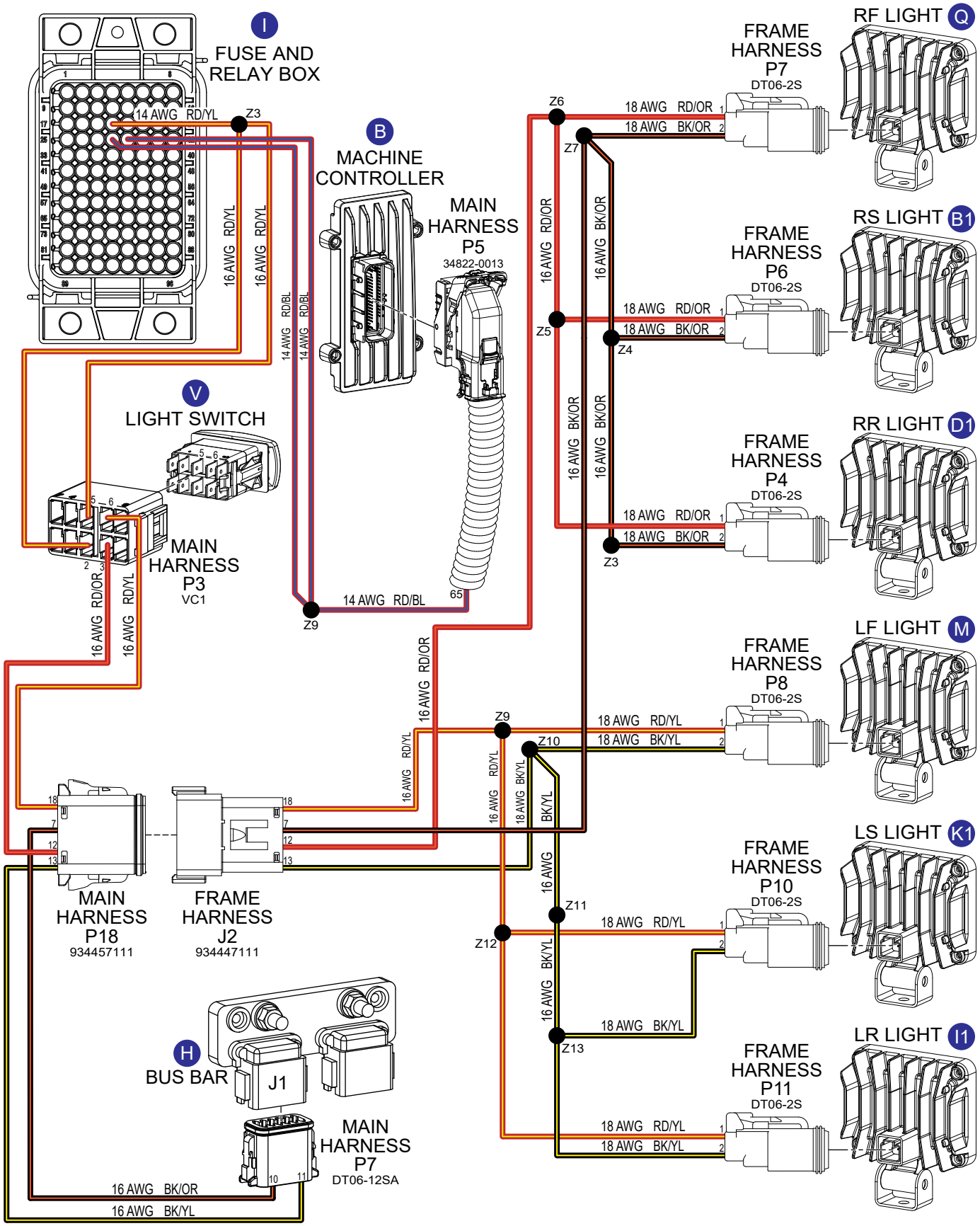
PDMU3AC1

FUSE AND RELAY BOX (REAR)



DEVICE PLACEMENT			
REFERENCE	FUNCTION	DEVICE	PART NUMBER
K1	RELAY, LEFT PITCH UP	12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC
K2	RELAY, LEFT PITCH DOWN	12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC
K3	RELAY, RIGHT PITCH UP	12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC
K4	RELAY, RIGHT PITCH DOWN	12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC
K5	RELAY, HORN	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
K6	RELAY, IGNITION	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
K7	RELAY, LEFT FAN	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
K8	RELAY, RIGHT FAN	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
K9	RELAY, MAIN	12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC
K10	RELAY, OIL COOLER FAN	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
K11	RELAY, STARTER	12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC
F1	FUSE, LEFT FAN	MINI FUSE, 30A	WAYTEK 46259
F2	FUSE, RIGHT FAN	MINI FUSE, 30A	WAYTEK 46259
F3	FUSE, LIGHTS	MINI FUSE, 15A	WAYTEK 46256
F4	FUSE, MAIN	MINI FUSE, 30A	WAYTEK 46259
F5	FUSE, ACCESSORY	MINI FUSE, 10A	WAYTEK 46255
F6	FUSE, LEFT PITCH	MINI FUSE, 30A	WAYTEK 46259
F7	FUSE, RIGHT PITCH	MINI FUSE, 30A	WAYTEK 46259
F8	FUSE, SEAT SWITCH	MINI FUSE, 2A	WAYTEK 46250
F9	FUSE, OIL COOLER FAN	MINI FUSE, 7.5A	WAYTEK 46254

DEVICE TOTALS		
DEVICE	PART NUMBER	QUANTITY
12V, 35A 5-PIN MICRO	301-1C-C-R1 U01 12VDC	5
12V, 20A 4-PIN MICRO	303-1AH-C-R1 U01 12VDC	6
MINI FUSE, 30A	WAYTEK 46259	5
MINI FUSE, 15A	WAYTEK 46256	1
MINI FUSE, 10A	WAYTEK 46255	1
MINI FUSE, 7.5A	WAYTEK 46254	1
MINI FUSE, 2A	WAYTEK 46250	1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FUSE AND RELAY BOX
14 AWG RD/YL
Z3
B
MACHINE CONTROLLER
MAIN HARNESS P5
34822-0013
65
16 AWG RD/YL
16 AWG RD/YL
14 AWG RD/BL
14 AWG RD/BL
V
LIGHT SWITCH
MAIN HARNESS P3
VC1
16 AWG RD/OR
16 AWG RD/YL
14 AWG RD/BL
Z9
Z6
Z7
Z5
Z4
Z3
16 AWG RD/OR
16 AWG BK/OR
16 AWG BK/OR
16 AWG BK/OR
RF LIGHT Q
FRAME HARNESS P7
DT06-2S
18 AWG RD/OR
18 AWG BK/OR
RS LIGHT B1
FRAME HARNESS P6
DT06-2S
18 AWG RD/OR
18 AWG BK/OR
RR LIGHT D1
FRAME HARNESS P4
DT06-2S
18 AWG RD/OR
18 AWG BK/OR
16 AWG RD/YL
Z9
Z10
16 AWG RD/YL
18 AWG BK/YL
16 AWG BK/YL
18 AWG BK/YL
LF LIGHT M
FRAME HARNESS P8
DT06-2S
18 AWG RD/YL
18 AWG BK/YL
MAIN HARNESS P18
934457111
FRAME HARNESS J2
934447111
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Z11
Z12
16 AWG BK/YL
Z13
LS LIGHT K1
FRAME HARNESS P10
DT06-2S
18 AWG RD/YL
18 AWG BK/YL
H
BUS BAR
J1
MAIN HARNESS P7
DT06-12SA
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LR LIGHT I1
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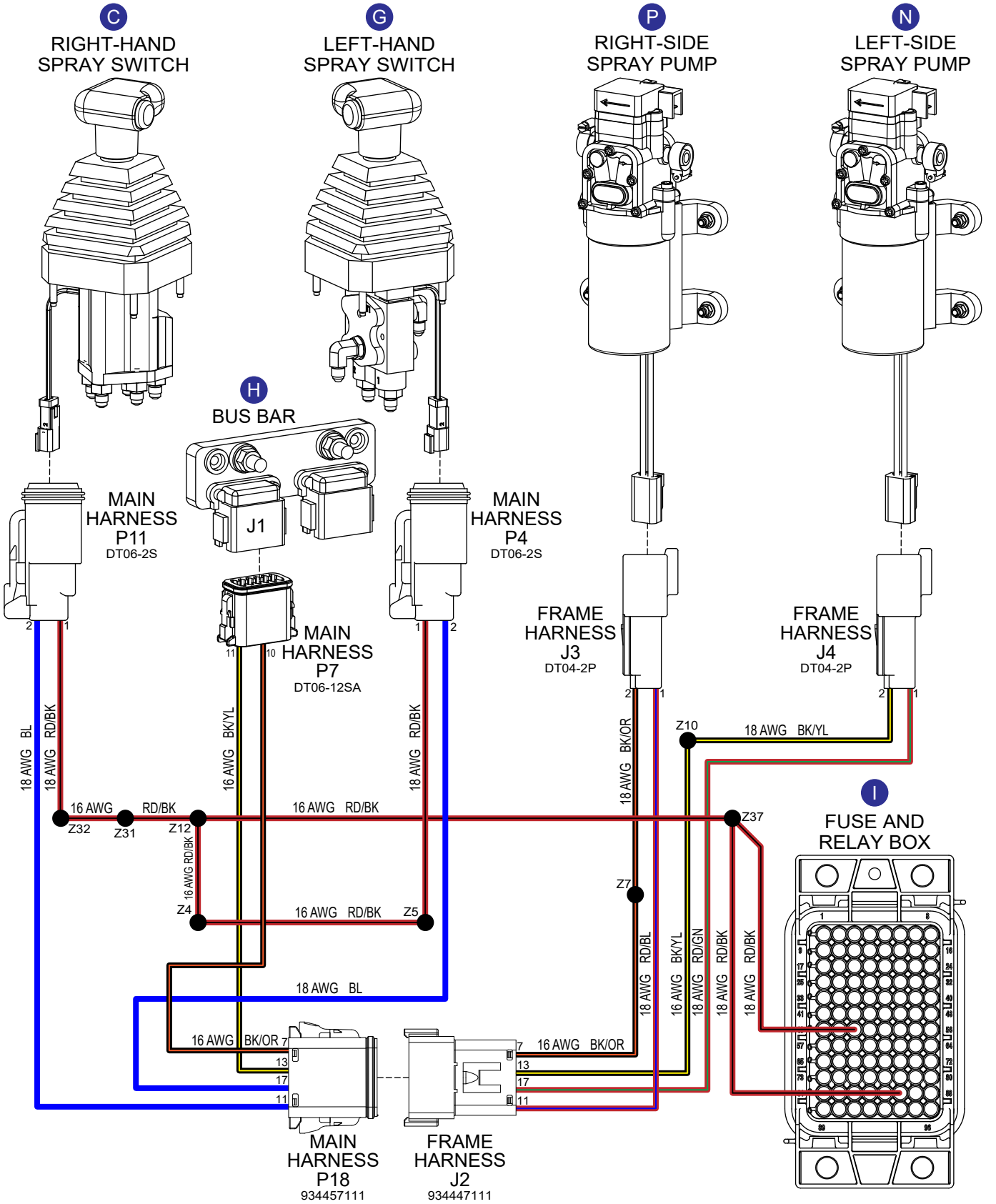
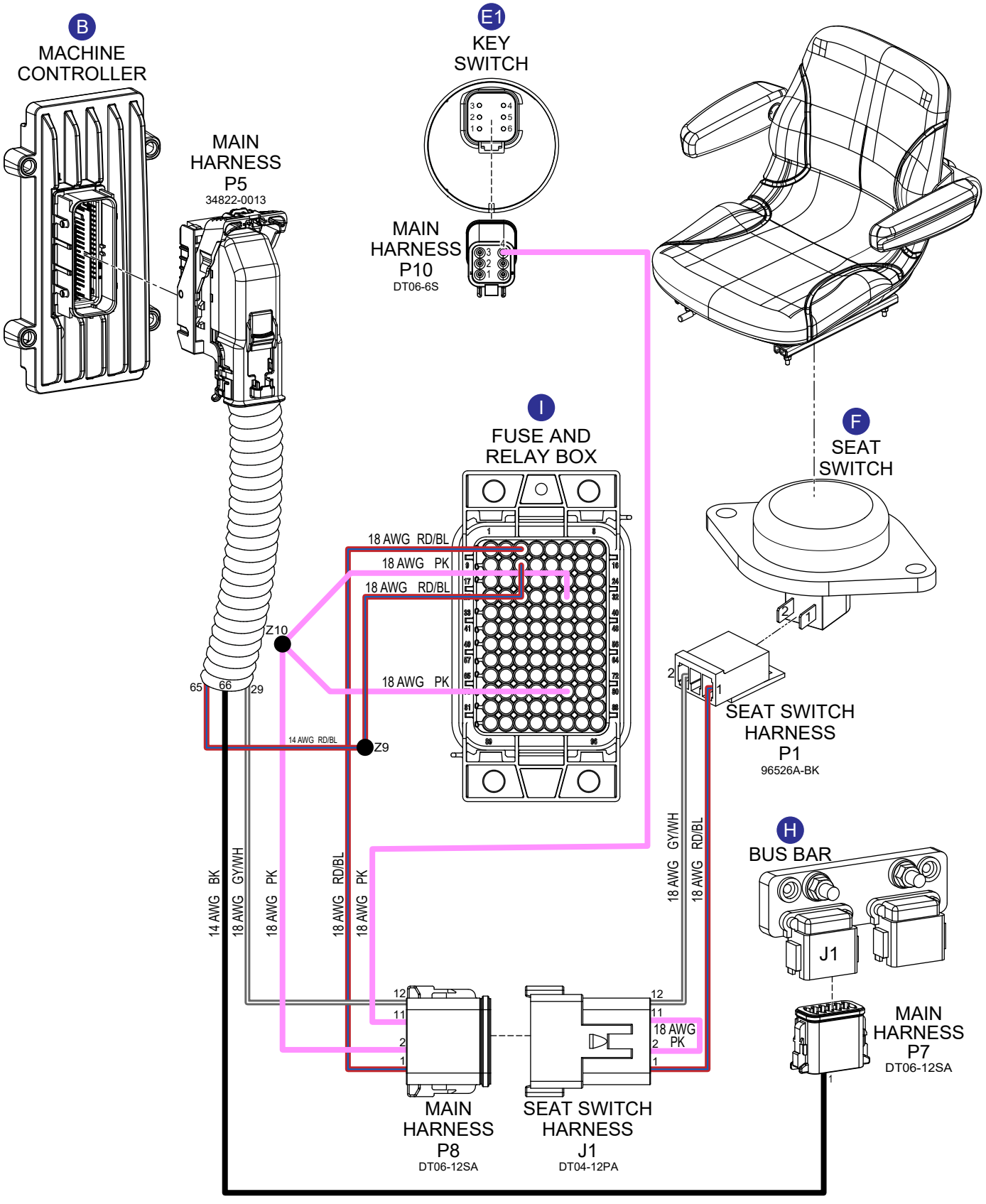
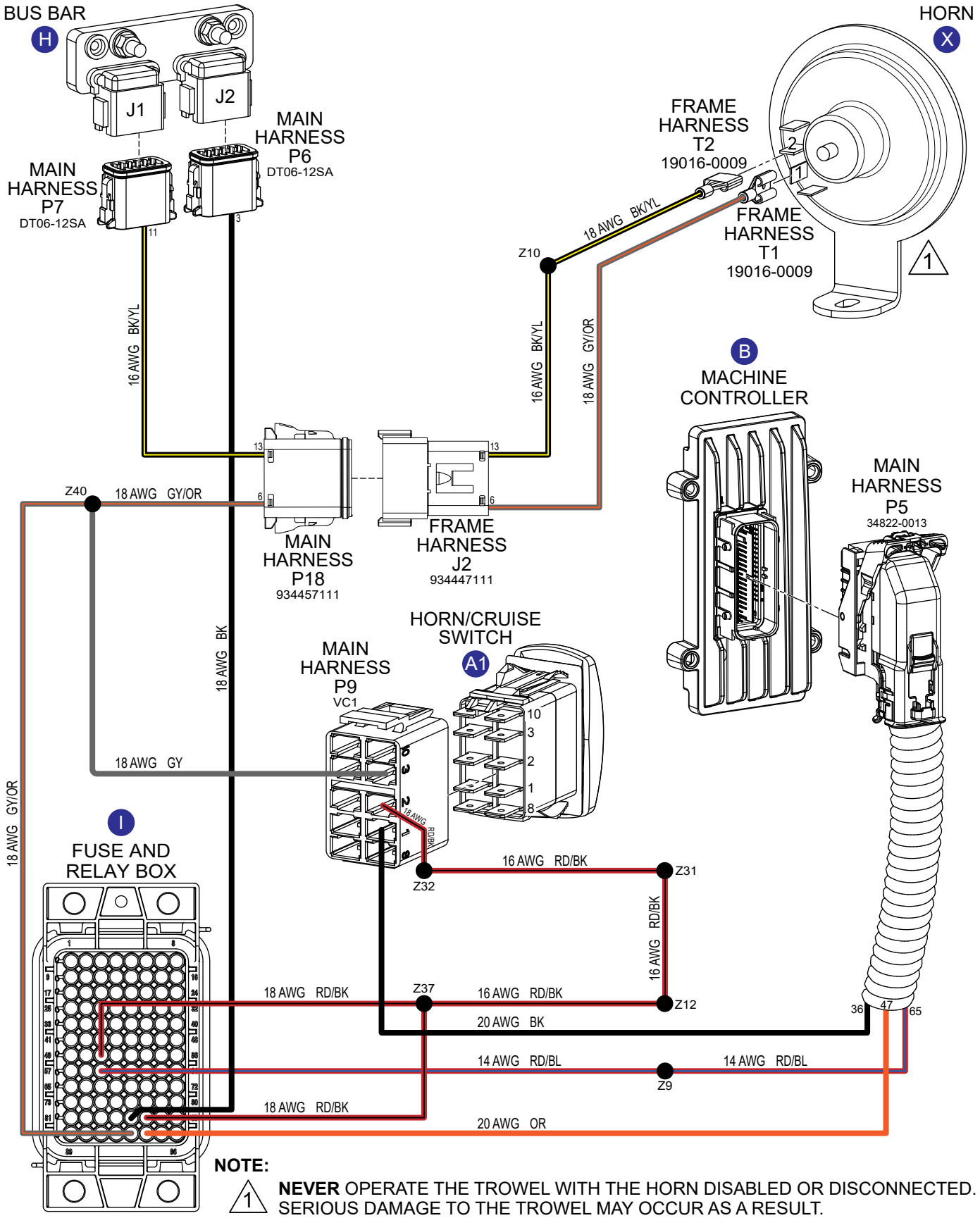
18 AWG BK/YL


C
RIGHT-HAND SPRAY SWITCH
G
LEFT-HAND SPRAY SWITCH
P
RIGHT-SIDE SPRAY PUMP
N
LEFT-SIDE SPRAY PUMP
H
BUS BAR
J1
MAIN HARNESS P11
DT06-2S
MAIN HARNESS P4
DT06-2S
MAIN HARNESS P7
DT06-12SA
FRAME HARNESS J3
DT04-2P
FRAME HARNESS J4
DT04-2P
I
FUSE AND RELAY BOX
MAIN HARNESS P18
934457111
FRAME HARNESS J2
934447111
18 AWG BL
18 AWG RD/BK
16 AWG RD/BK
16 AWG BK/YL
18 AWG BK/OR
18 AWG RD/BL
16 AWG BK/YL
18 AWG RD/GN
Z32
Z31
Z12
Z37
Z10
Z4
Z5
Z7

SEAT SWITCH WIRING DIAGRAM

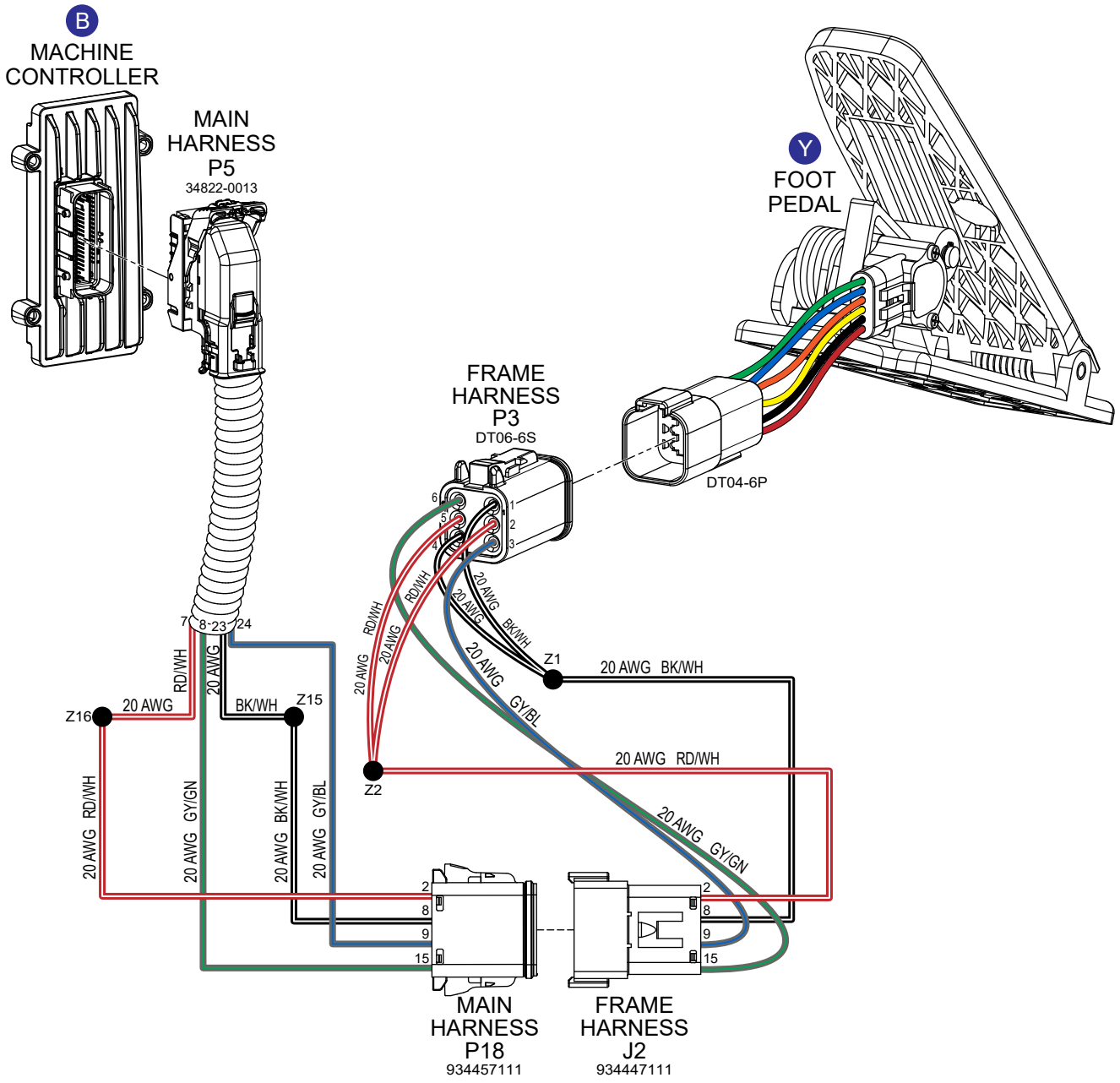


HORN/CRUISE CONTROL WIRING DIAGRAM

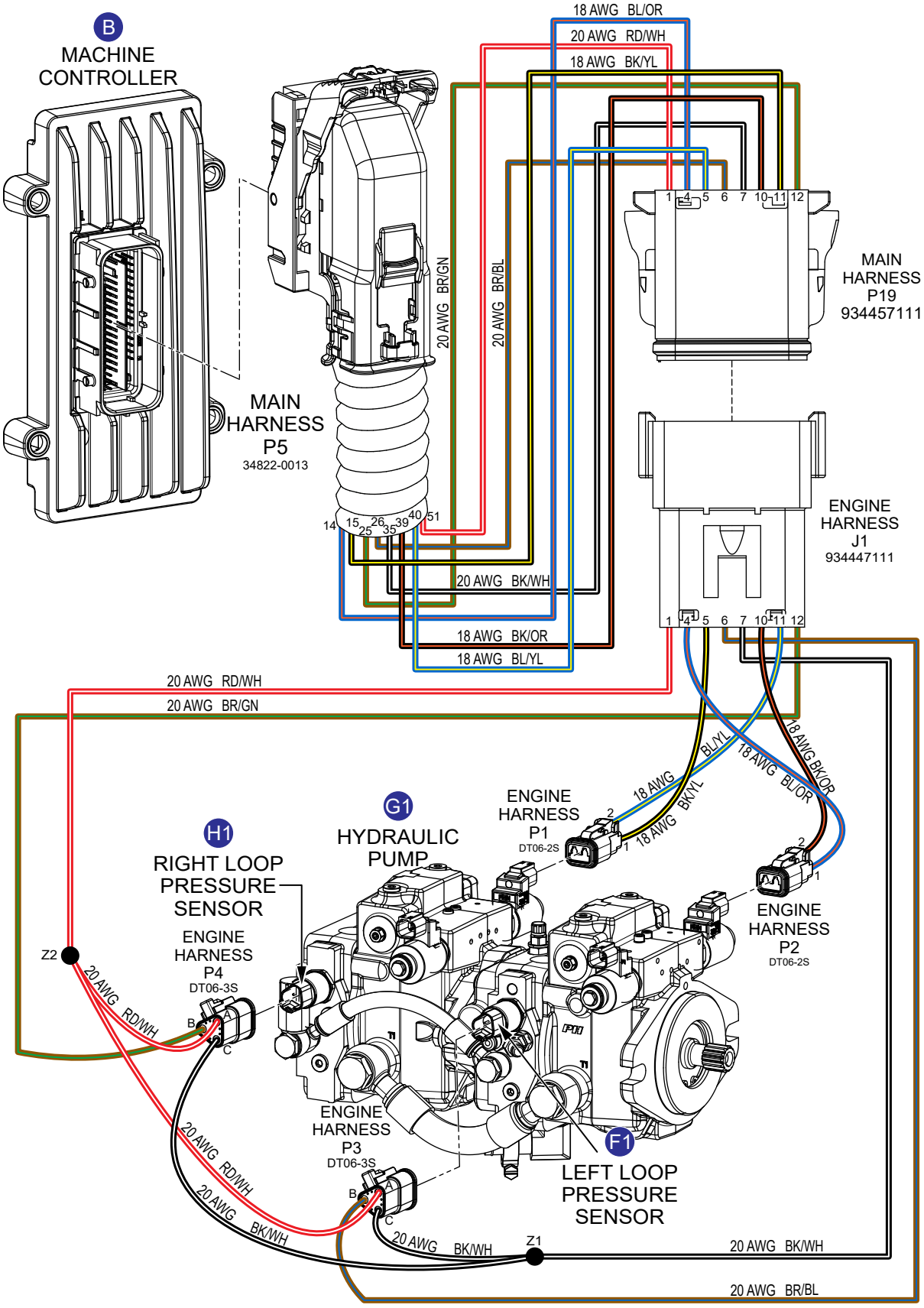


NOTE:

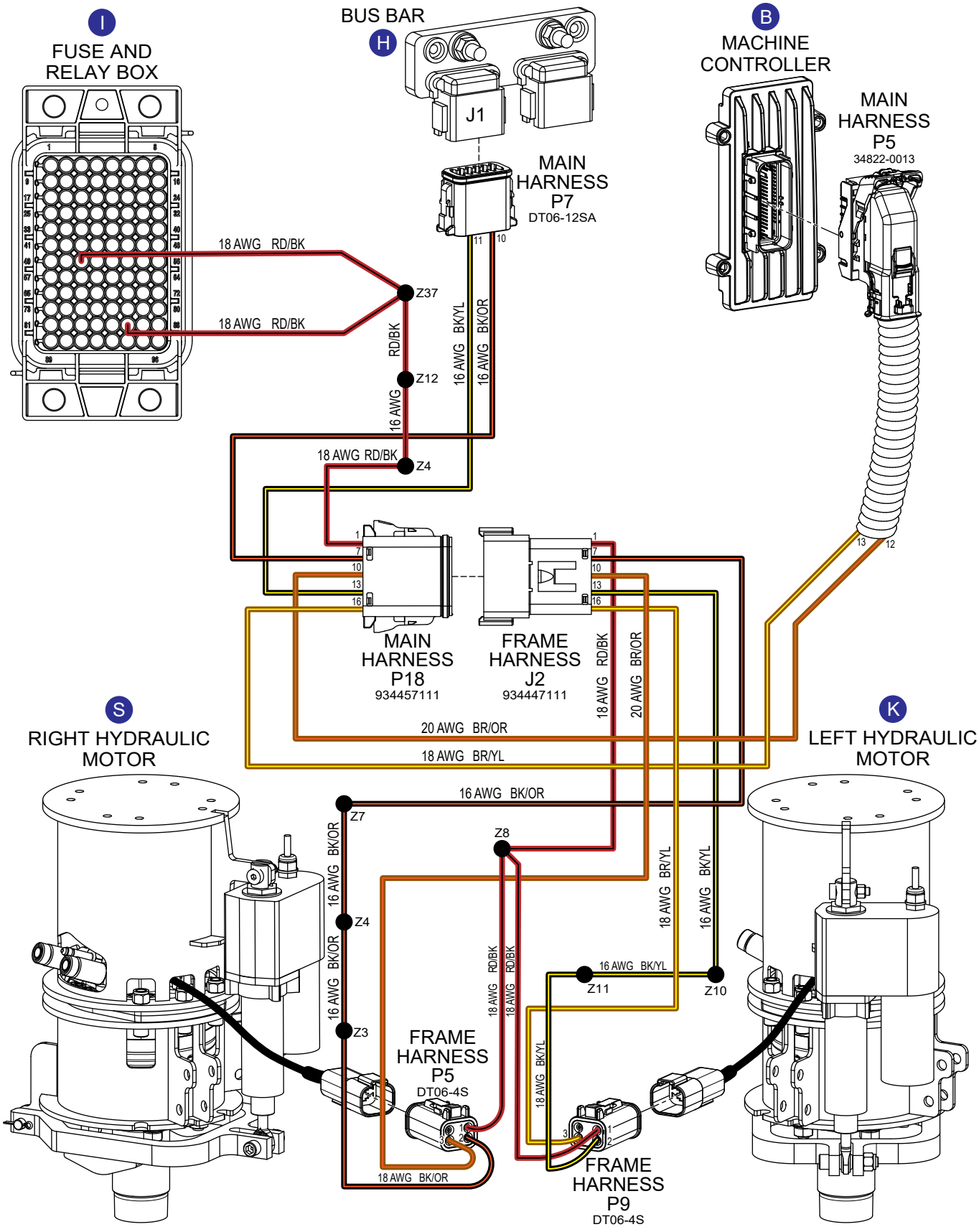
1 **NEVER** OPERATE THE TROWEL WITH THE HORN DISABLED OR DISCONNECTED. SERIOUS DAMAGE TO THE TROWEL MAY OCCUR AS A RESULT.

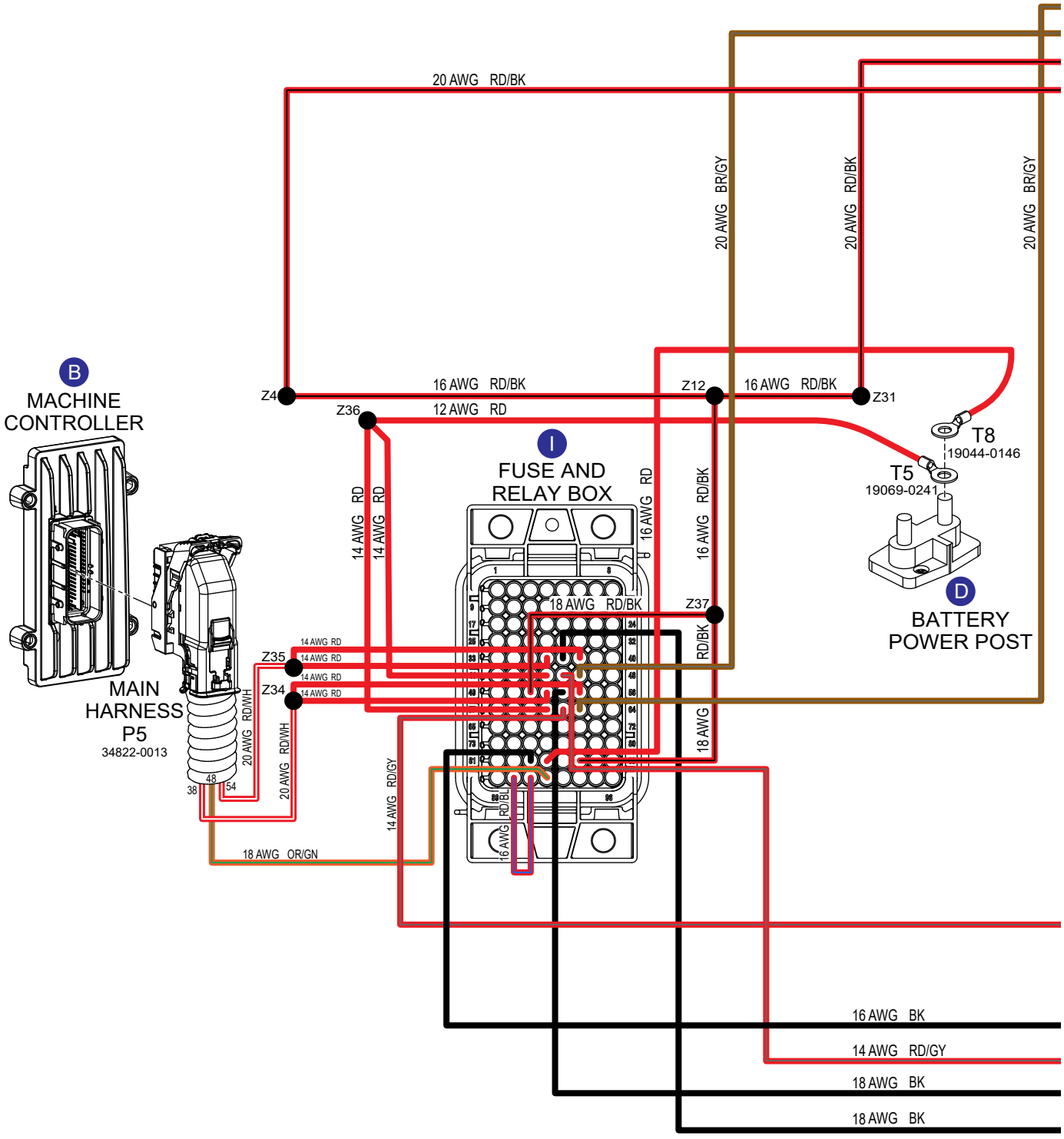

B
MACHINE CONTROLLER
MAIN HARNESS P5
34822-0013
Y
FOOT PEDAL
FRAME HARNESS P3
DT06-6S
DT04-6P
7
8
23
24
RD/WH
20 AWG
BK/WH
Z16
Z15
Z1
Z2
20 AWG BK/WH
20 AWG RD/WH
20 AWG GY/BL
20 AWG GY/GN
20 AWG BK/WH
20 AWG GY/BL
20 AWG RD/WH
20 AWG GY/GN
MAIN HARNESS P18
934457111
FRAME HARNESS J2
934447111

HYDRAULIC PUMP WIRING DIAGRAM

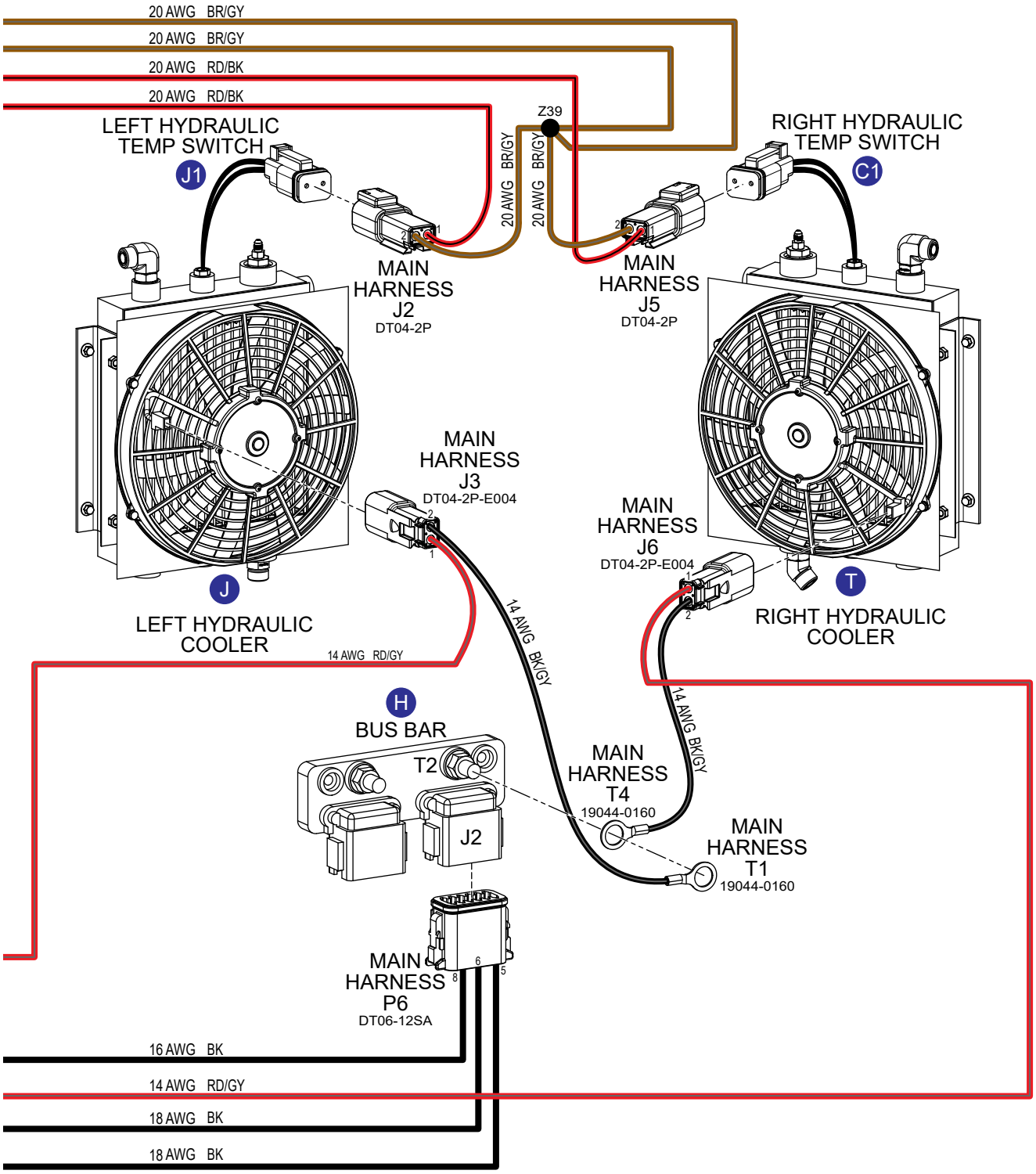


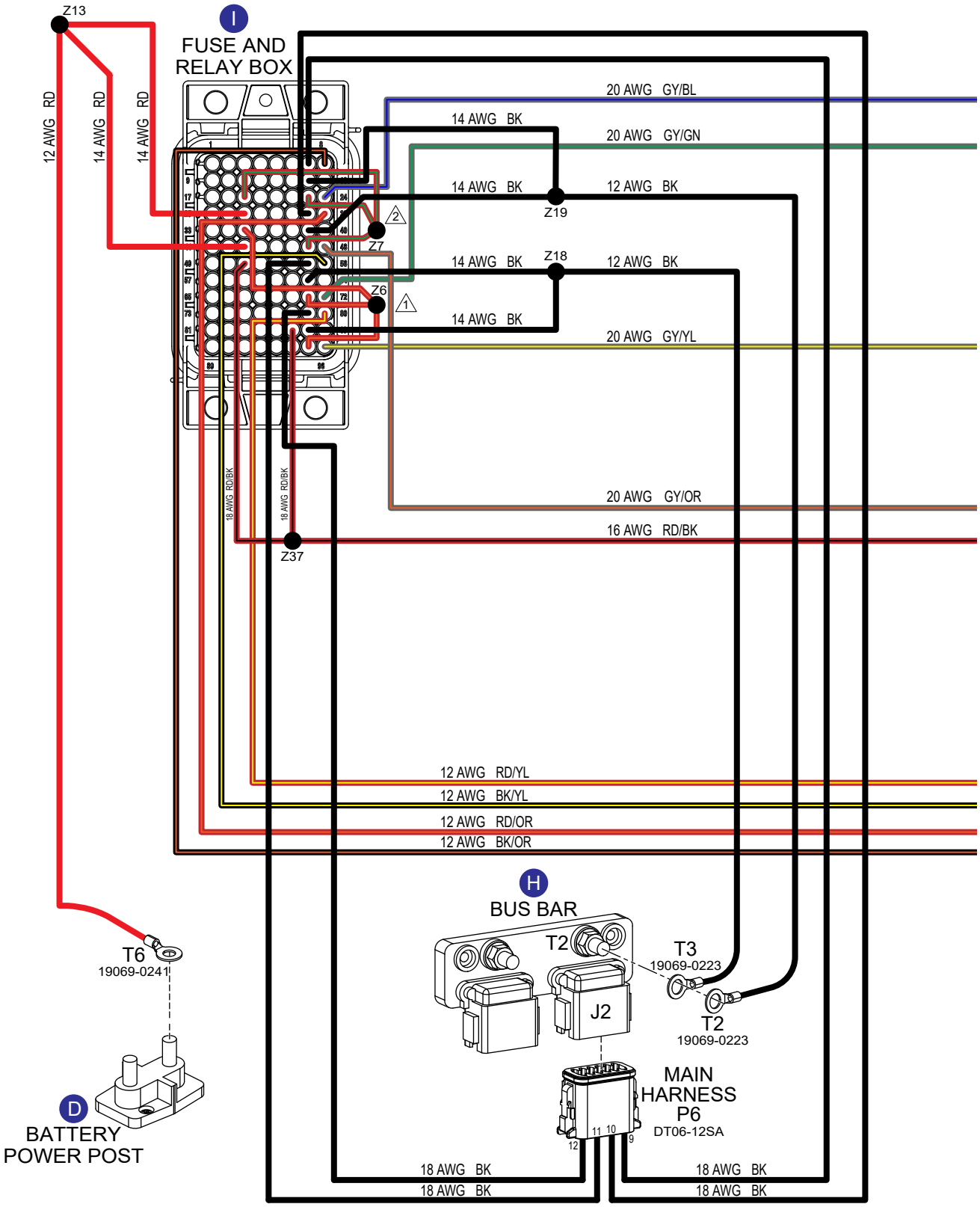
HYDRAULIC MOTORS WIRING DIAGRAM



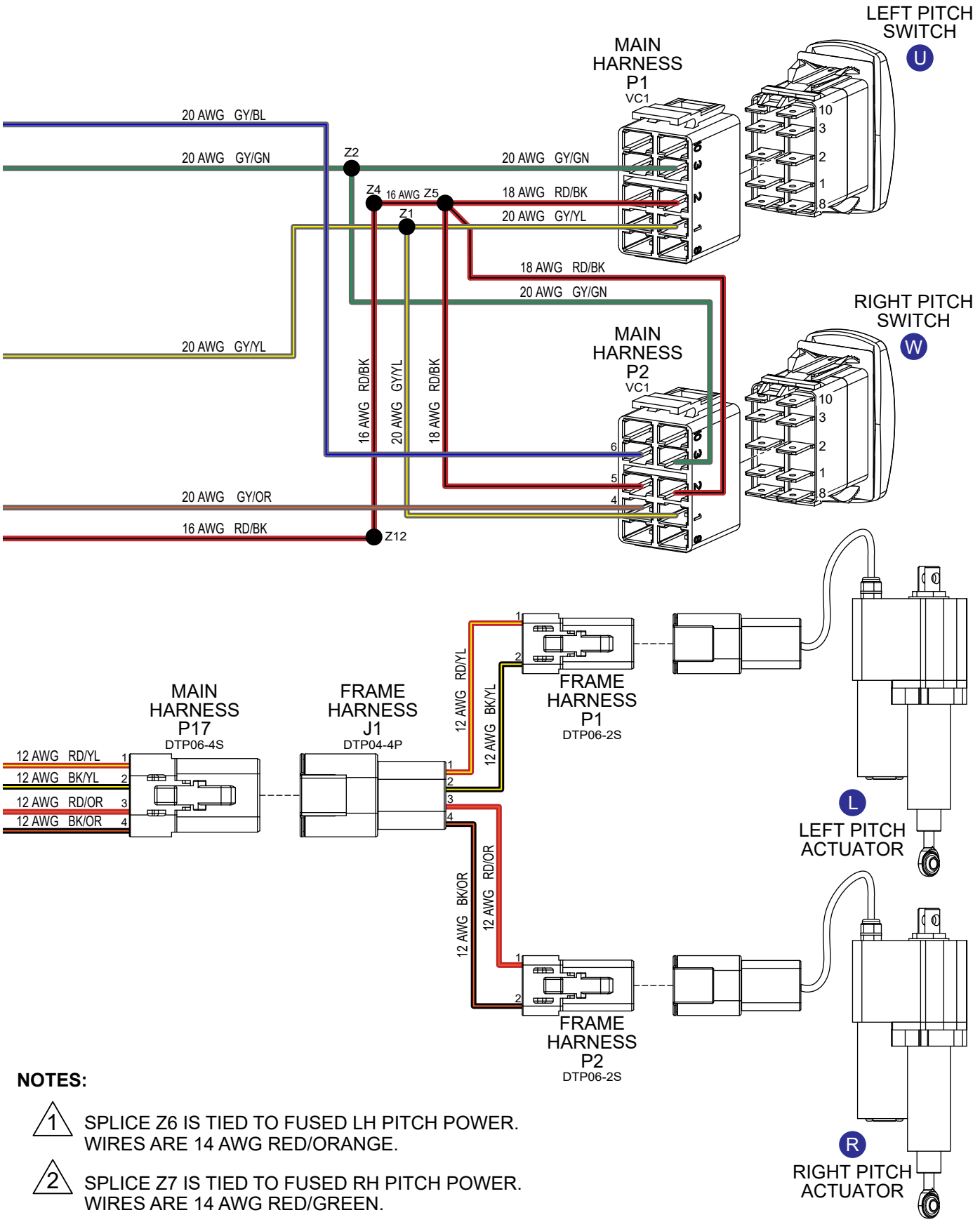

B
MACHINE CONTROLLER
MAIN HARNESS P5
34822-0013
I
FUSE AND RELAY BOX
D
BATTERY POWER POST
T8
19044-0146
T5
19069-0241
Z4
Z12
Z31
Z36
Z35
Z34
Z37
20 AWG RD/BK
20 AWG BR/GY
20 AWG BR/GY
20 AWG RD/BK
16 AWG RD/BK
12 AWG RD
16 AWG RD/BK
14 AWG RD
14 AWG RD
16 AWG RD
16 AWG RD/BK
18 AWG RD/BK
14 AWG RD
14 AWG RD
14 AWG RD
14 AWG RD
20 AWG RD/WH
20 AWG RD/WH
18 AWG OR/GN
14 AWG RD/GY
16 AWG RD/BL
18 AWG
16 AWG BK
14 AWG RD/GY
18 AWG BK
18 AWG BK

HYDRAULIC COOLERS WIRING DIAGRAM




Z13
I
FUSE AND
RELAY BOX
12 AWG RD
14 AWG RD
14 AWG RD
20 AWG GY/BL
14 AWG BK
20 AWG GY/GN
14 AWG BK
12 AWG BK
Z19
Z7
Z18
14 AWG BK
12 AWG BK
Z6
14 AWG BK
20 AWG GY/YL
18 AWG RD/BK
18 AWG RD/BK
20 AWG GY/OR
16 AWG RD/BK
Z37
12 AWG RD/YL
12 AWG BK/YL
12 AWG RD/OR
12 AWG BK/OR
H
BUS BAR
T2
T3
19069-0223
J2
T2
19069-0223
T6
19069-0241
MAIN
HARNESS
P6
DT06-12SA
D
BATTERY
POWER POST
18 AWG BK
18 AWG BK
18 AWG BK
18 AWG BK

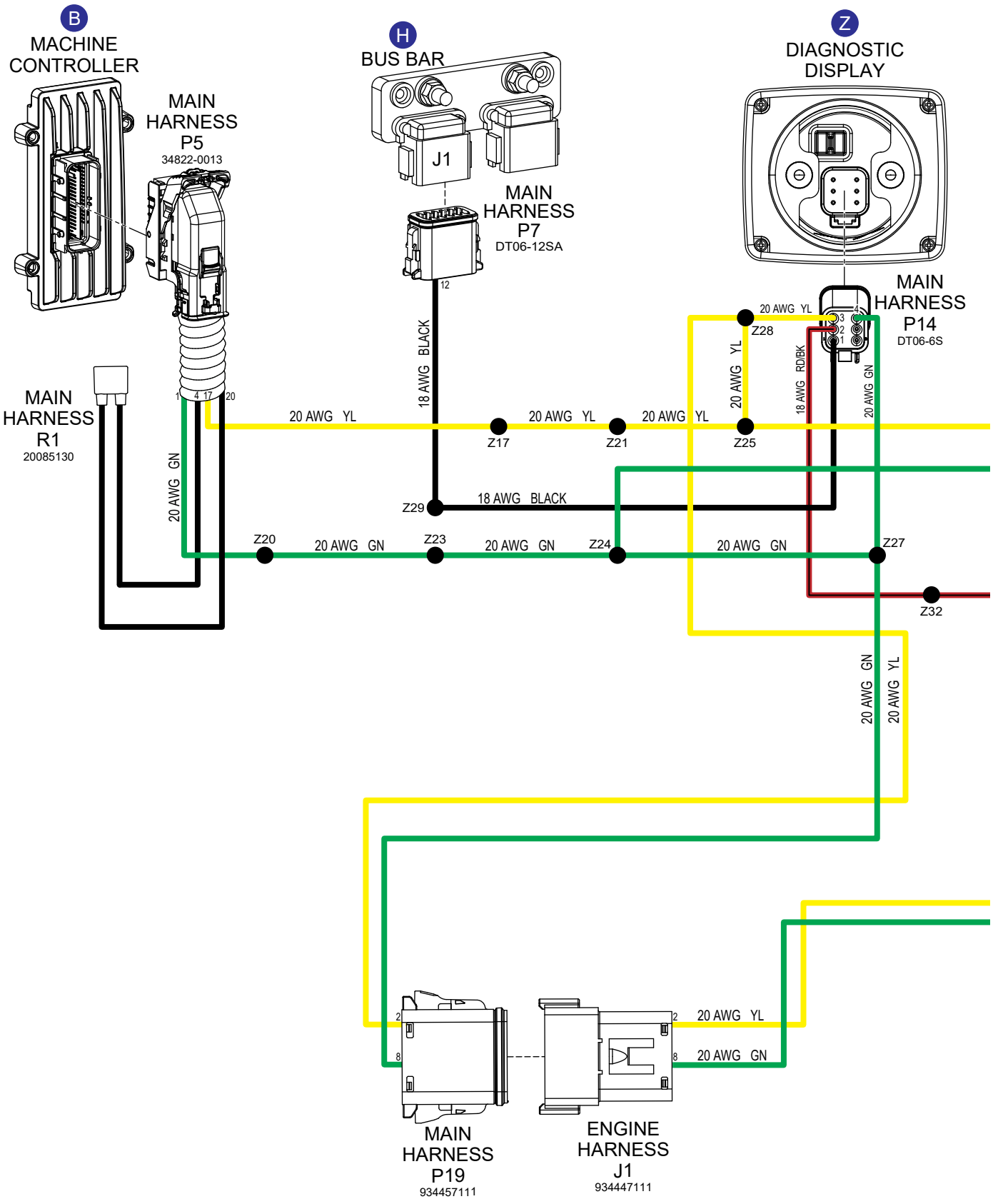
PITCH WIRING DIAGRAM

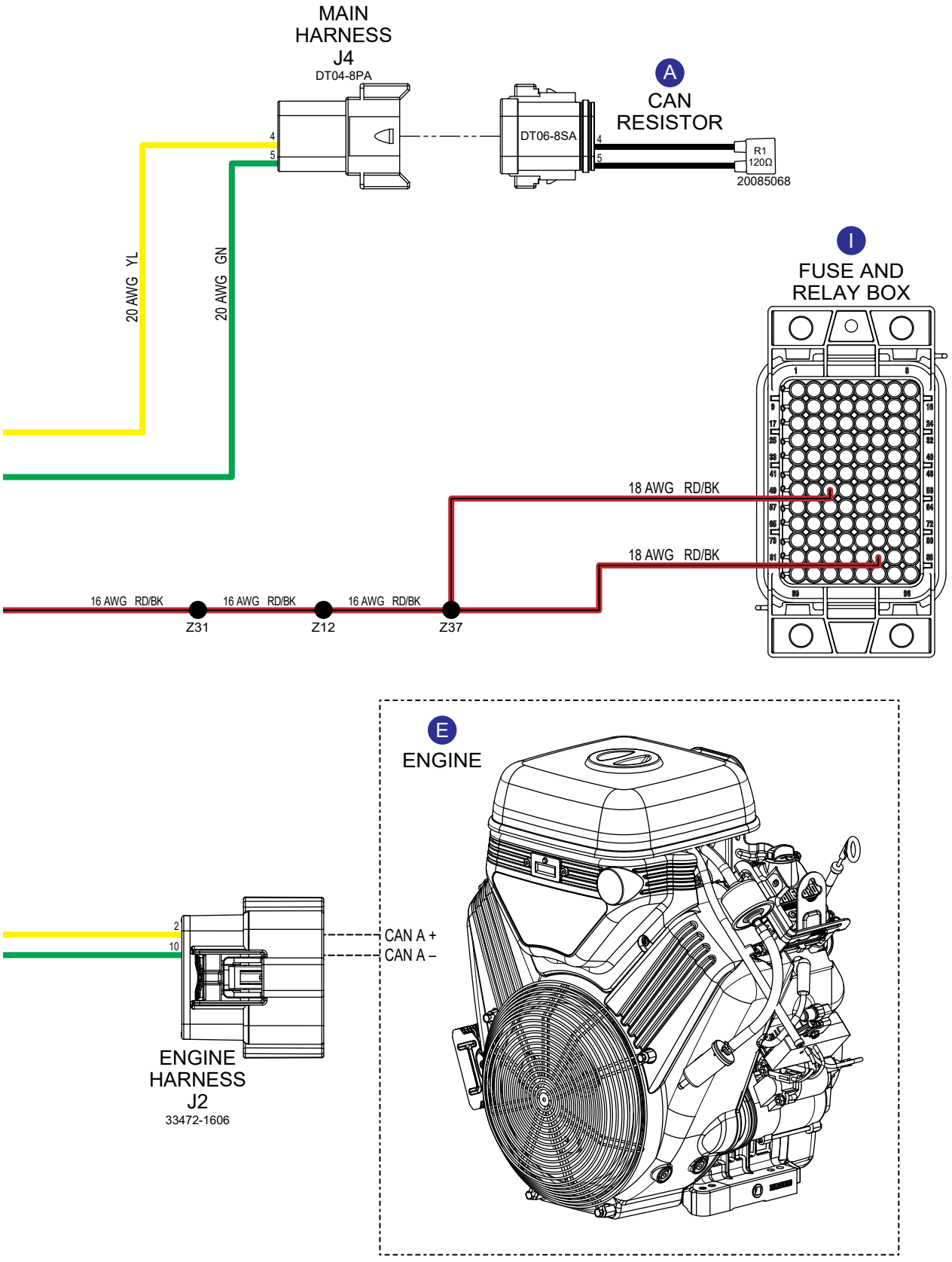


NOTES:

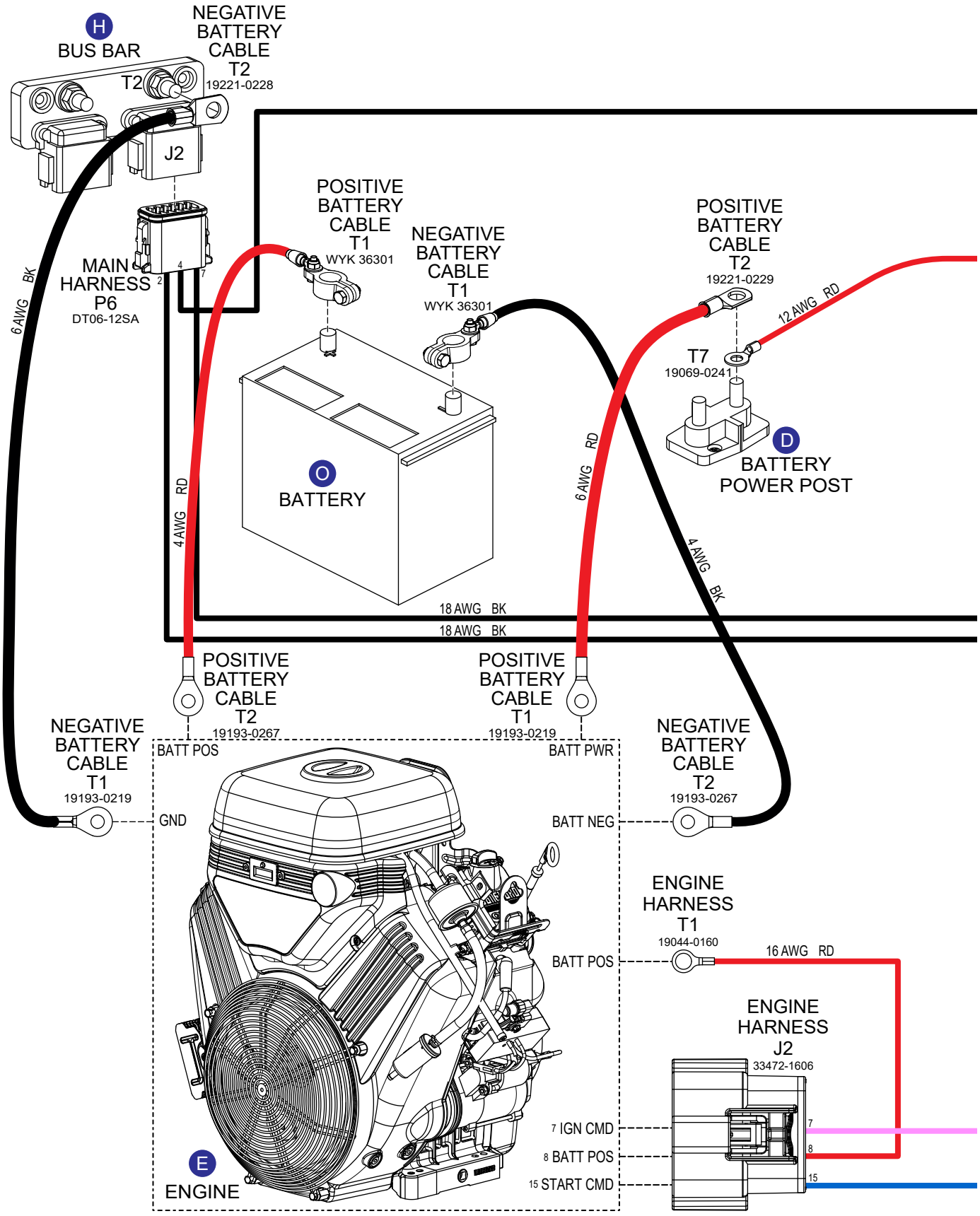
1. SPLICE Z6 IS TIED TO FUSED LH PITCH POWER. WIRES ARE 14 AWG RED/ORANGE.
2. SPLICE Z7 IS TIED TO FUSED RH PITCH POWER. WIRES ARE 14 AWG RED/GREEN.

DISPLAY AND CAN WIRING DIAGRAM

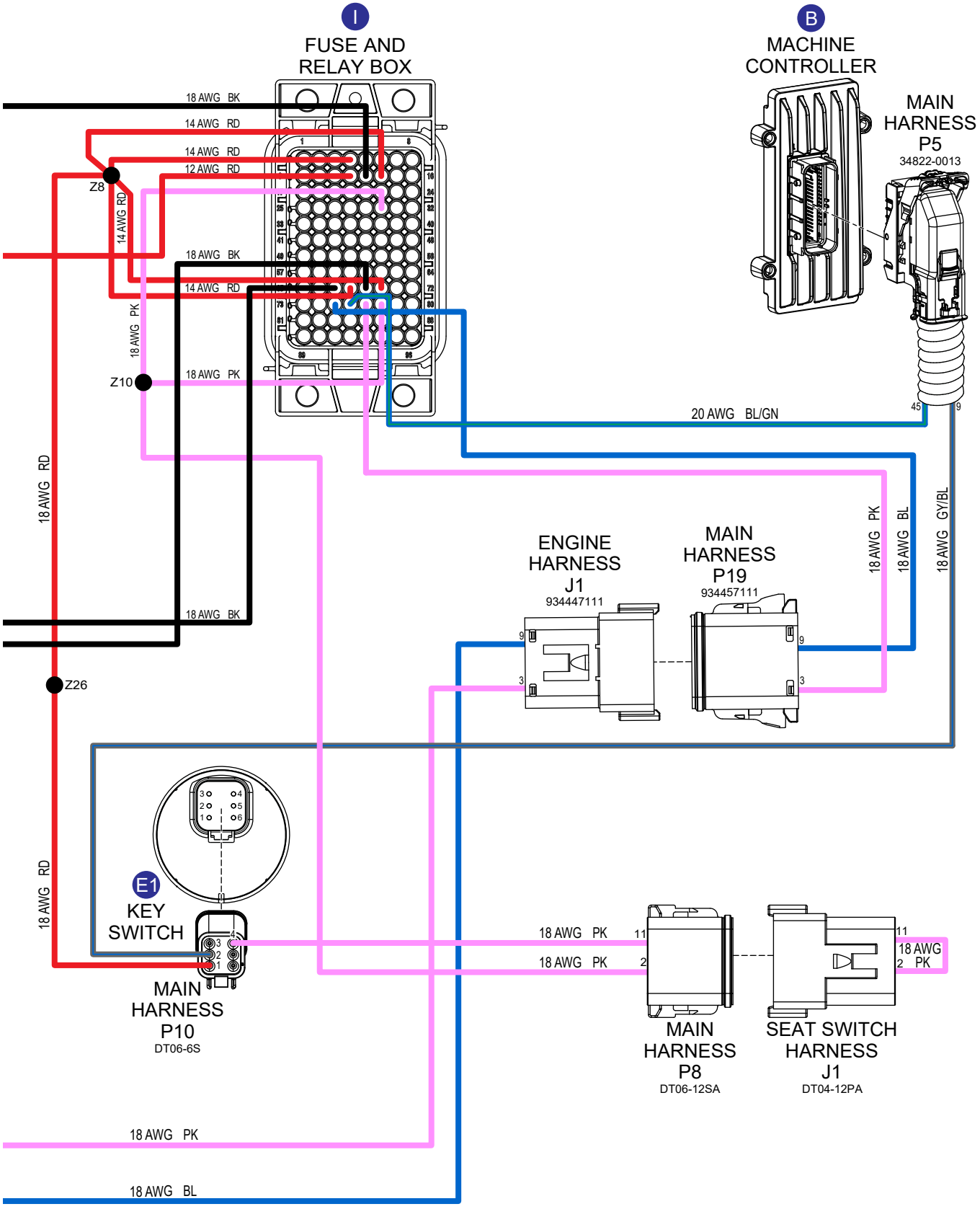


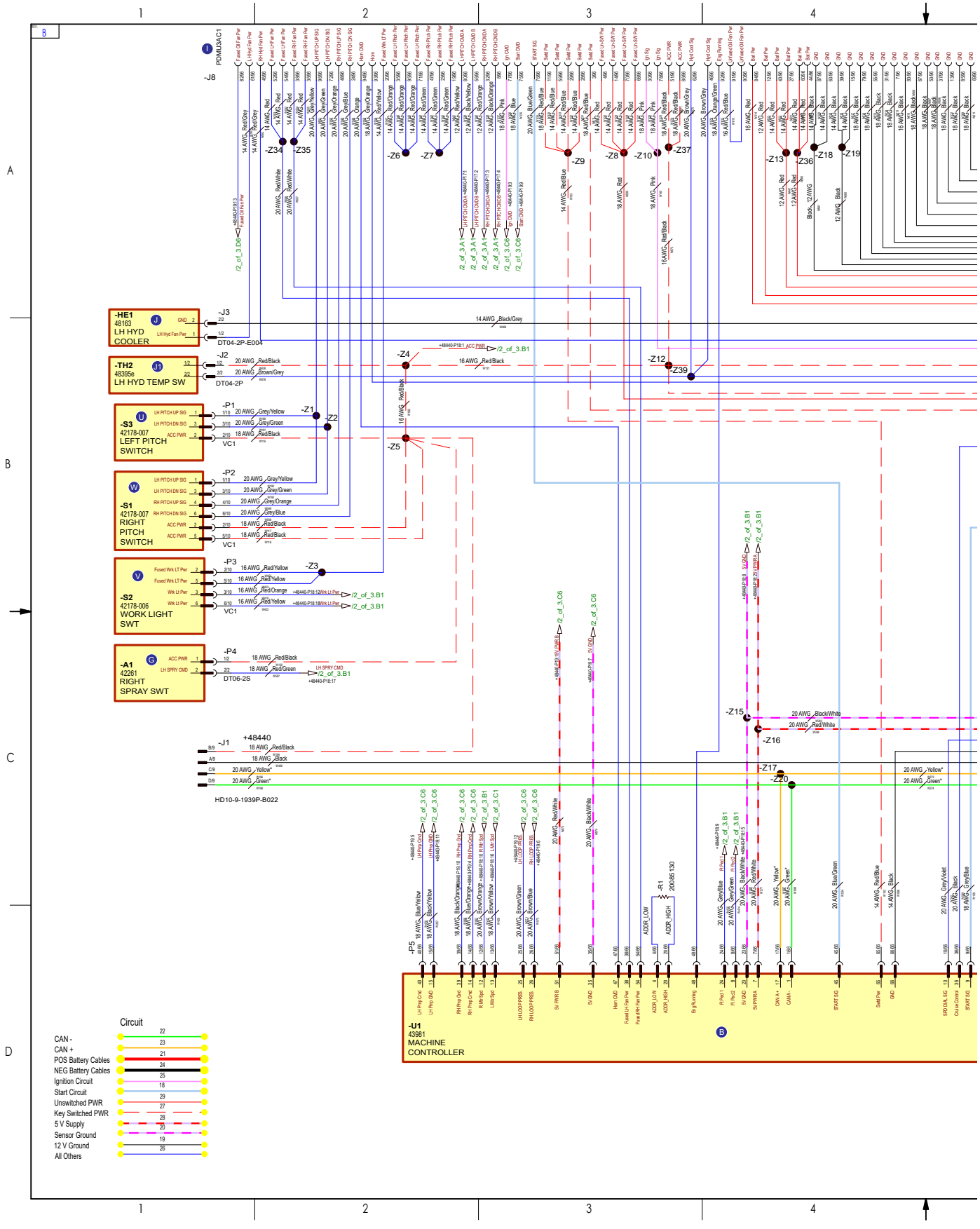

MAIN
HARNESS
J4
DT04-8PA
4
5
DT06-8SA
A
CAN
RESISTOR
R1
120Ω
20085068
20 AWG YL
20 AWG GN
I
FUSE AND
RELAY BOX
18 AWG RD/BK
18 AWG RD/BK
16 AWG RD/BK
16 AWG RD/BK
16 AWG RD/BK
Z31
Z12
Z37
E
ENGINE
2
10
CAN A +
CAN A –
ENGINE
HARNESS
J2
33472-1606

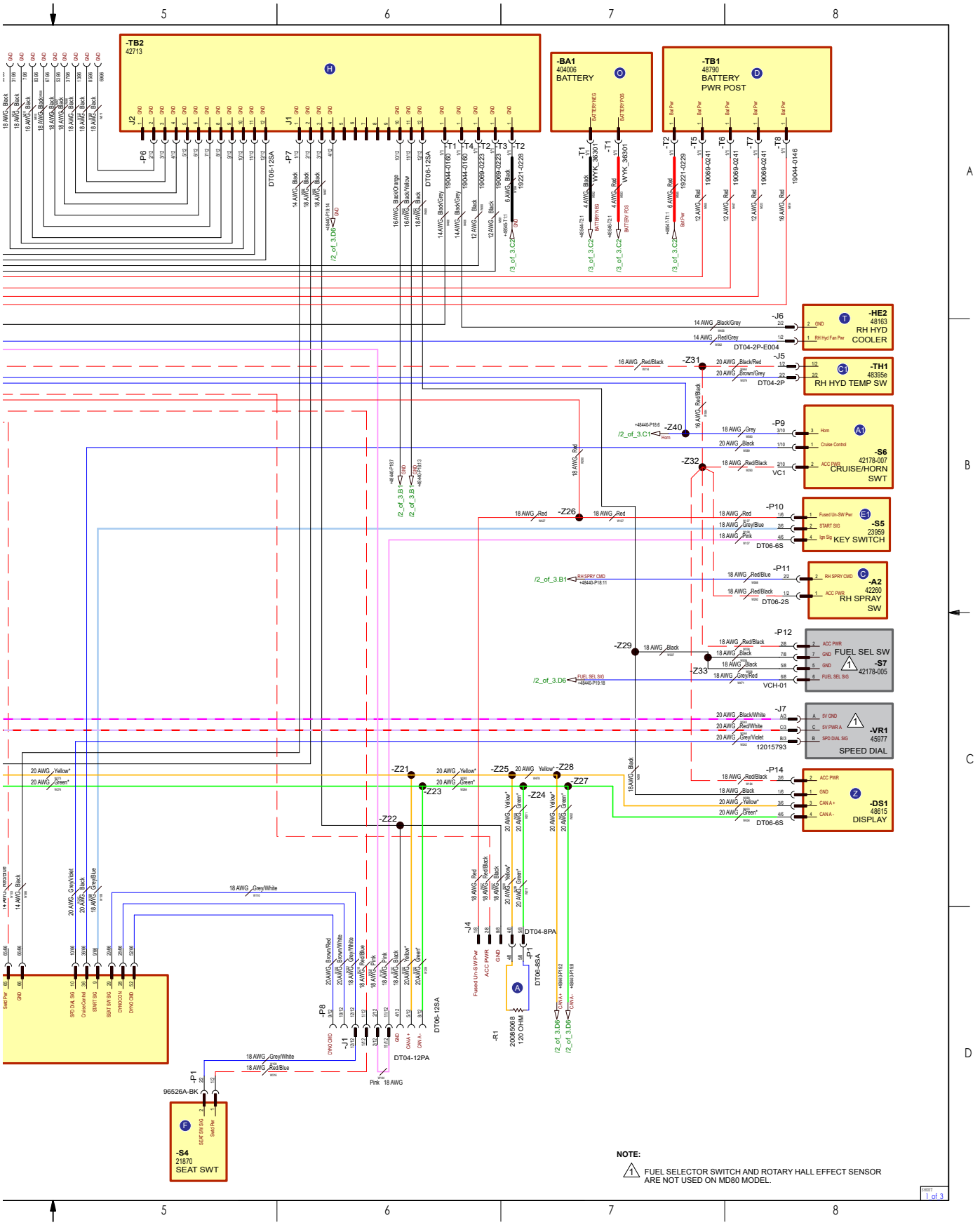
POWER AND IGNITION WIRING DIAGRAM

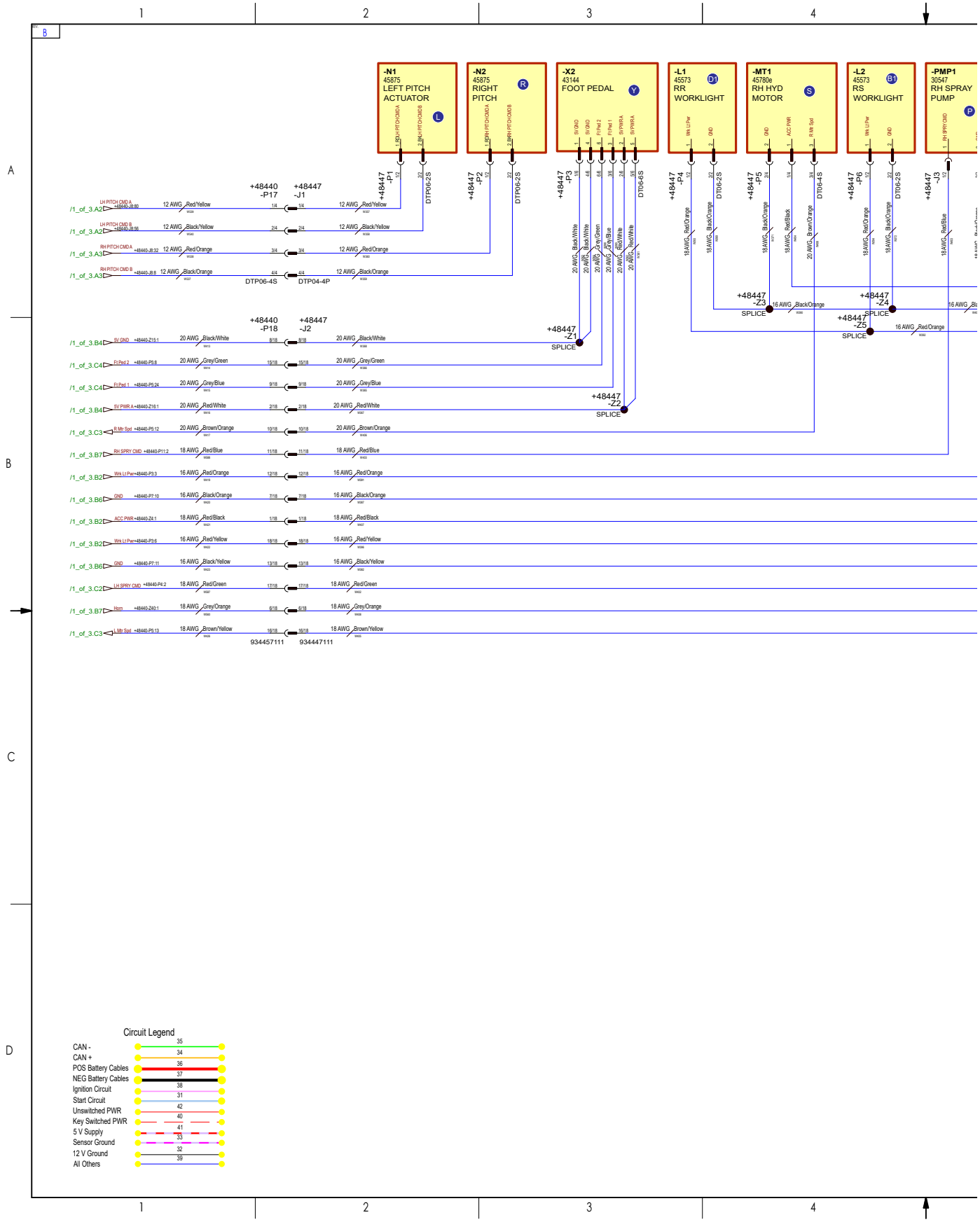


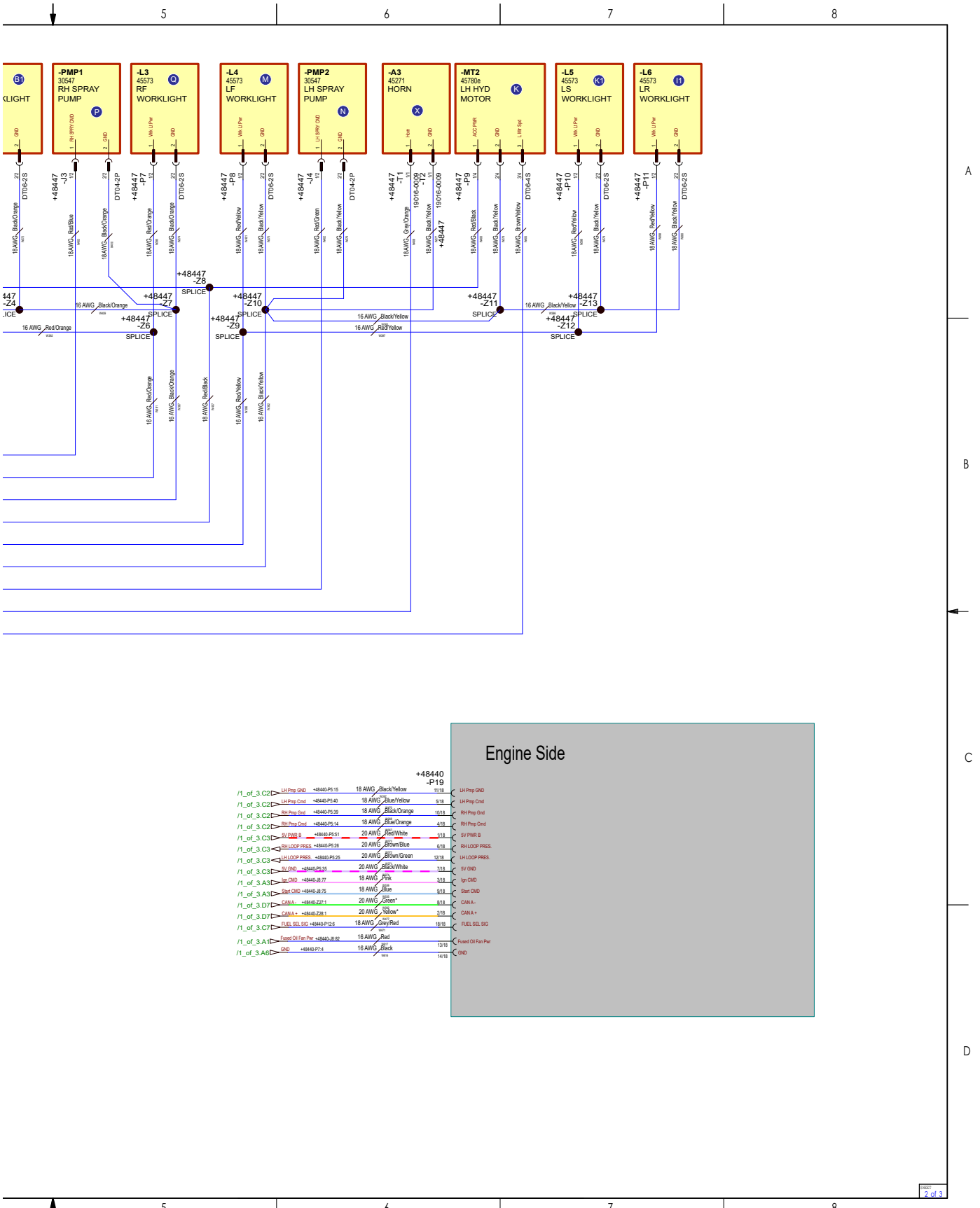
POWER AND IGNITION WIRING DIAGRAM

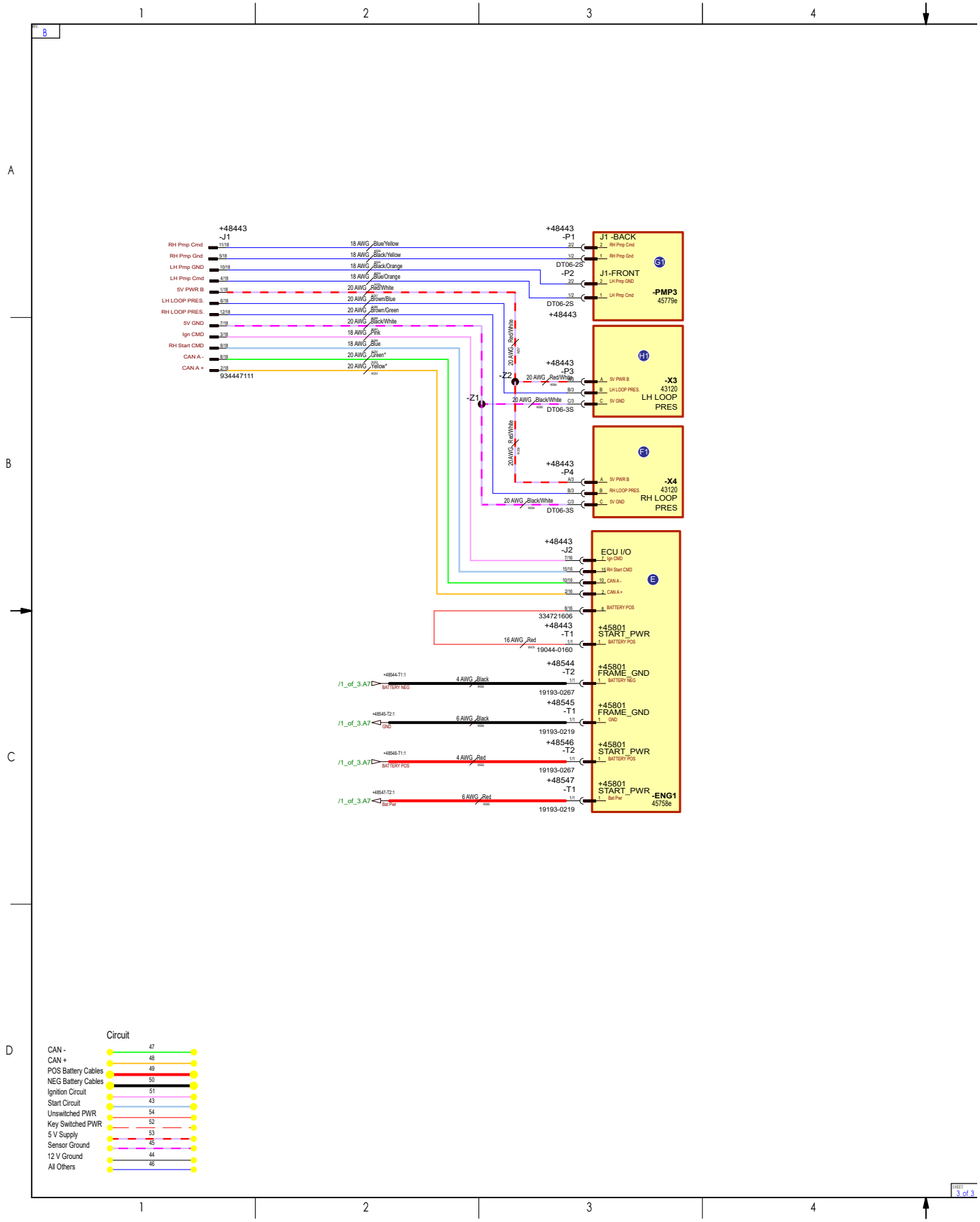


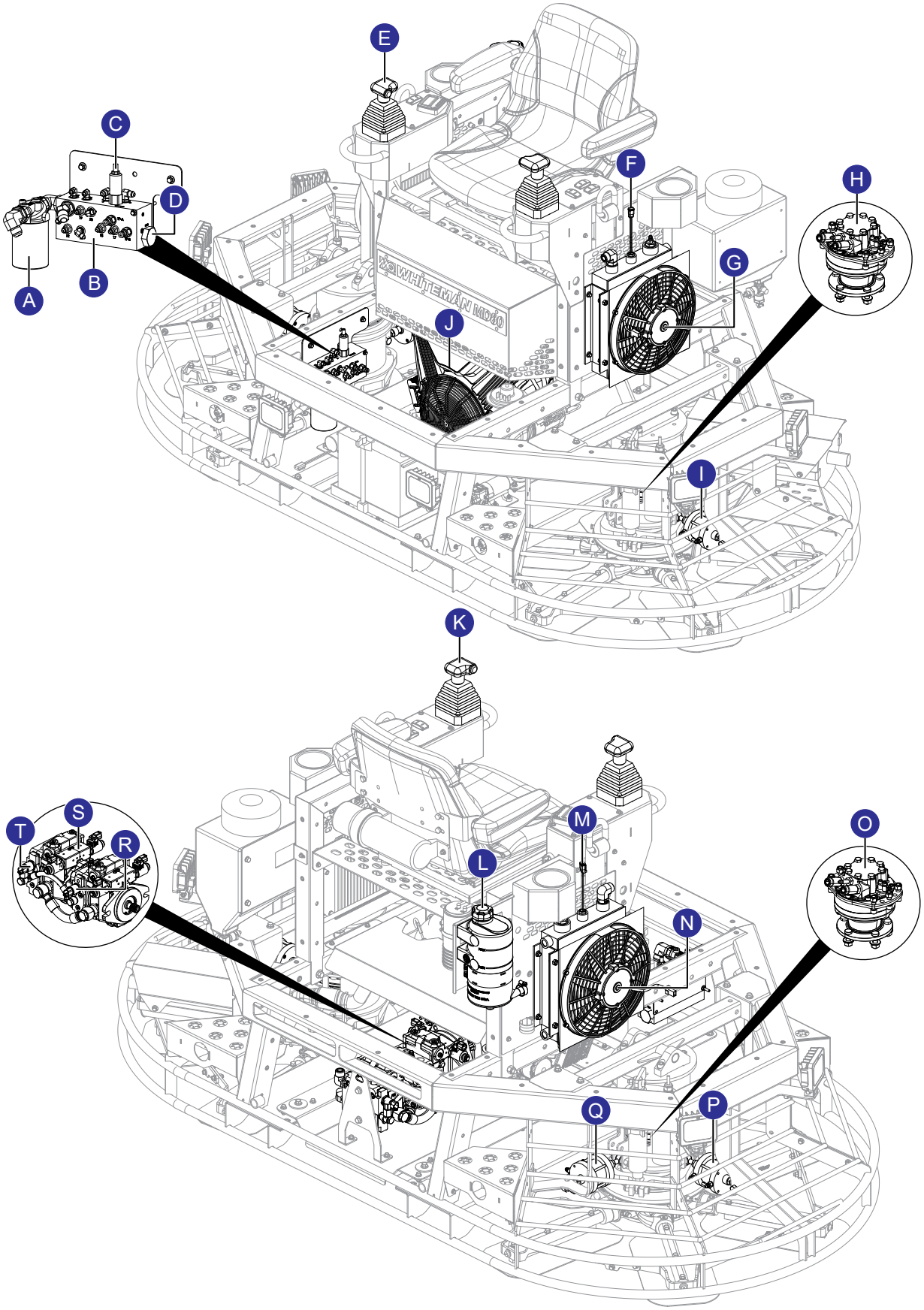

-J8
PDM03AC1
-HE1
48163
LH HYD
COOLER
DT04-2P-E004
-TH2
48395e
LH HYD TEMP SW
DT04-2P
-S3
42178-007
LEFT PITCH
SWITCH
-S1
42178-007
RIGHT
PITCH
SWITCH
-S2
42178-006
WORK LIGHT
SWT
-A1
42261
RIGHT
SPRAY SWT
DT06-2S
-P1
-P2
-P3
-P4
-P5
VC1
-J1
+48440
HD10-9-1939P-B022
-U1
43981
MACHINE
CONTROLLER
-R1
200 Ω 1/3 W
Circuit
CAN -
CAN +
POS Battery Cables
NEG Battery Cables
Ignition Circuit
Start Circuit
Unswitched PWR
Key Switched PWR
5 V Supply
Sensor Ground
12 V Ground
All Others

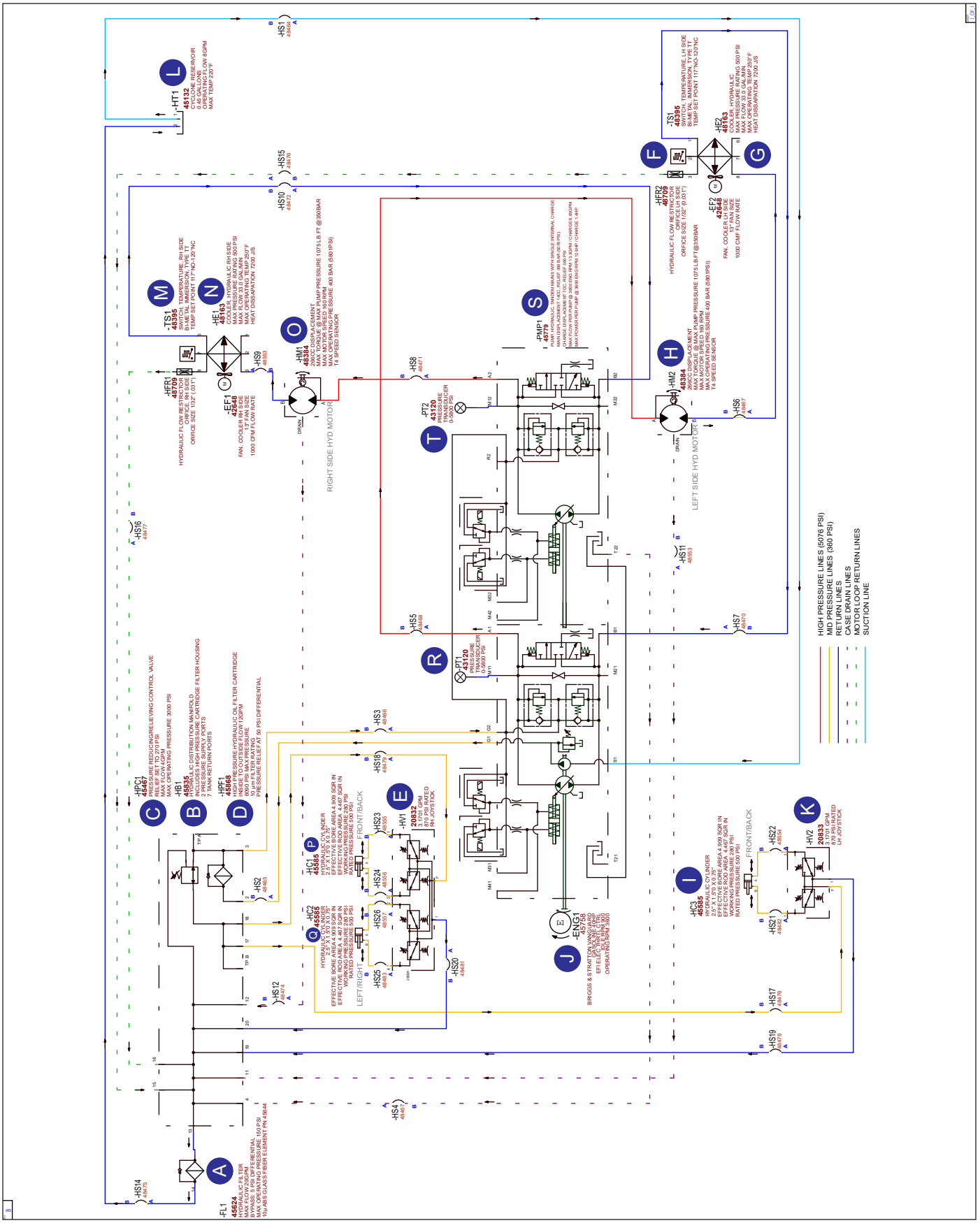

-TB2
42713
-BA1
404006
BATTERY
-TB1
48790
BATTERY
PWR POST
-HE2
48163
RH HYD
COOLER
-TH1
48395e
RH HYD TEMP SW
-S6
42178-007
CRUISE/HORN
SWT
-S5
23959
KEY SWITCH
-A2
42260
RH SPRAY
SW
FUEL SEL SW
-S7
42178-005
-VR1
45977
SPEED DIAL
-DS1
48615
DISPLAY
-S4
21870
SEAT SWT
DT04-12PA
DT04-8PA
DT06-6S
DT06-2S
DT04-2P
DT04-2P-E004
DT06-125A
DT06-8SA
20086068
120 OHM
NOTE:
FUEL SELECTOR SWITCH AND ROTARY HALL EFFECT SENSOR
ARE NOT USED ON MD80 MODEL.


-N1
45875
LEFT PITCH ACTUATOR
-N2
45875
RIGHT PITCH
-X2
43144
FOOT PEDAL
-L1
45573
RR WORKLIGHT
-MT1
45780e
RH HYD MOTOR
-L2
45573
RS WORKLIGHT
-PMP1
30547
RH SPRAY PUMP
+48440 -P17
+48447 -J1
+48447 -P18
+48447 -J2
DTP06-4S
DTP04-4P
SPLICE
Circuit Legend
CAN -
CAN +
POS Battery Cables
NEG Battery Cables
Ignition Circuit
Start Circuit
Unswitched PWR
Key Switched PWR
5 V Supply
Sensor Ground
12 V Ground
All Others


5
6
7
8
A
B
C
D
-PMP1
30547
RH SPRAY
PUMP
-L3
45573
RF
WORKLIGHT
-L4
45573
LF
WORKLIGHT
-PMP2
30547
LH SPRAY
PUMP
-A3
45271
HORN
-MT2
45780e
LH HYD
MOTOR
-L5
45573
LS
WORKLIGHT
-L6
45573
LR
WORKLIGHT
+48447 -Z8 SPLICE
+48447 -Z7 SPLICE
+48447 -Z6 SPLICE
+48447 -Z10 SPLICE
+48447 -Z9 SPLICE
+48447 -Z11 SPLICE
+48447 -Z13 SPLICE
+48447 -Z12 SPLICE
16 AWG Black/Orange
16 AWG Red/Orange
16 AWG Black/Yellow
16 AWG Red/Yellow
Engine Side
+48440 -P19


+48443
-J1
934447111
RH Pmp Cmd
RH Pmp Gnd
LH Pmp GND
LH Pmp Cmd
5V PWR B
LH LOOP PRES.
RH LOOP PRES.
5V GND
Ign CMD
RH Start CMD
CAN A -
CAN A +
18 AWG Blue/Yellow
18 AWG Black/Yellow
18 AWG Black/Orange
18 AWG Blue/Orange
20 AWG Red/White
20 AWG Brown/Blue
20 AWG Brown/Green
20 AWG Black/White
18 AWG Pink
18 AWG Blue
20 AWG Green*
20 AWG Yellow*
+48443
-P1
DT06-2S
J1 -BACK
RH Pmp Cmd
RH Pmp Gnd
-P2
J1-FRONT
LH Pmp GND
LH Pmp Cmd
-PMP3
45779e
+48443
-P3
DT06-3S
-X3
43120
LH LOOP PRES
5V PWR B
LH LOOP PRES.
5V GND
+48443
-P4
DT06-3S
-X4
43120
RH LOOP PRES
-Z1
-Z2
20 AWG Red/White
20 AWG Black/White
+48443
-J2
ECU I/O
Ign CMD
RH Start CMD
CAN A -
CAN A +
BATTERY POS
334721606
+48443
-T1
19044-0160
16 AWG Red
+45801
START_PWR
BATTERY POS
+48544
-T2
19193-0267
4 AWG Black
+45801
FRAME_GND
BATTERY NEG
+48545
-T1
19193-0219
6 AWG Black
+45801
FRAME_GND
GND
+48546
-T2
19193-0267
4 AWG Red
+45801
START_PWR
BATTERY POS
+48547
-T1
19193-0219
6 AWG Red
+45801
START_PWR
Bat Pwr
-ENG1
45758e
/1_of_3.A7
Circuit
CAN -
CAN +
POS Battery Cables
NEG Battery Cables
Ignition Circuit
Start Circuit
Unswitched PWR
Key Switched PWR
5 V Supply
Sensor Ground
12 V Ground
All Others


E
C
D
F
H
A
B
G
J
I
K
T
S
R
M
O
L
N
Q
P


HIGH PRESSURE LINES (5076 PSI)
MID PRESSURE LINES (360 PSI)
RETURN LINES
CASE DRAIN LINES
MOTOR LOOP RETURN LINES
SUCTION LINE
RIGHT SIDE HYD MOTOR
LEFT SIDE HYD MOTOR
FRONT/BACK
LEFT/RIGHT

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ABN 80 069 961 968

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