OPERATION MANUAL

MQ WHITEMAN®

MODEL
MD81
HYDRAULIC RIDE-ON TROWEL
(KUBOTA V1505-CR-TE5 DIESEL ENGINE)

Revision #0 (10/27/26)

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: 52315


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.

MD81 Ride-On Trowel

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DISCLAIMER:

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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		
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
	**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.
	**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.
	**NOTICE** **DO NOT** spray liquids or pressure wash electrical components or wiring.
	**DIESEL FUEL** The engine used in this equipment runs on **ultra-low sulfur diesel fuel only**.

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

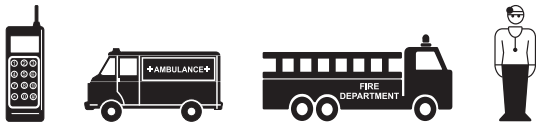
- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. 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**.



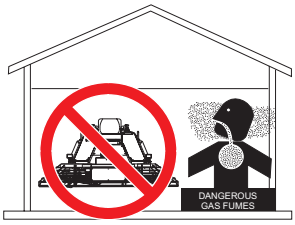
- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site**. Also, know the phone numbers of the nearest **ambulance**, **doctor** and **fire department**. This information will be invaluable in the case of an emergency.



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.
- Keep fingers, hands, hair and clothing away from all moving parts to prevent injury.



- **DO NOT** remove the radiator cap while the engine is hot. High-pressure boiling water will gush out of the radiator and severely scald any persons in the general area of the trowel.
- **DO NOT** remove the coolant drain plug while the engine is hot. Hot coolant will gush out of the coolant tank and severely scald any persons in the general area of the trowel.



- **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 4,960 pounds (2,250 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 diesel 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.
- **ALWAYS** attach lifting slings to the **lift loops only**. **NEVER** use the grab bars for lifting of the trowel.
- **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.

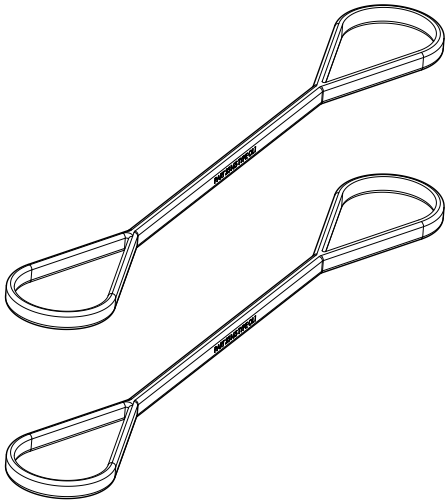
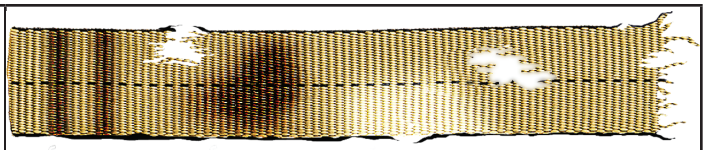
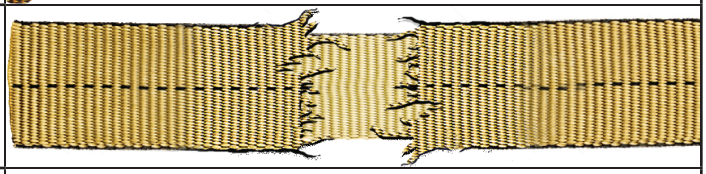
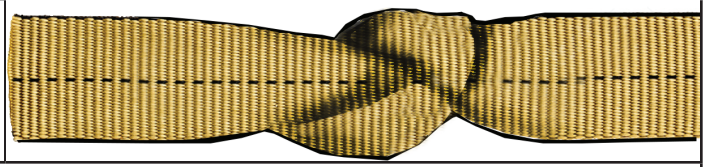


Figure 1. Lifting Slings

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**.

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.

⚠ WARNING

ALWAYS attach lifting slings/chains to the **lift loops only**. **NEVER** use the grab bars for lifting of the trowel.

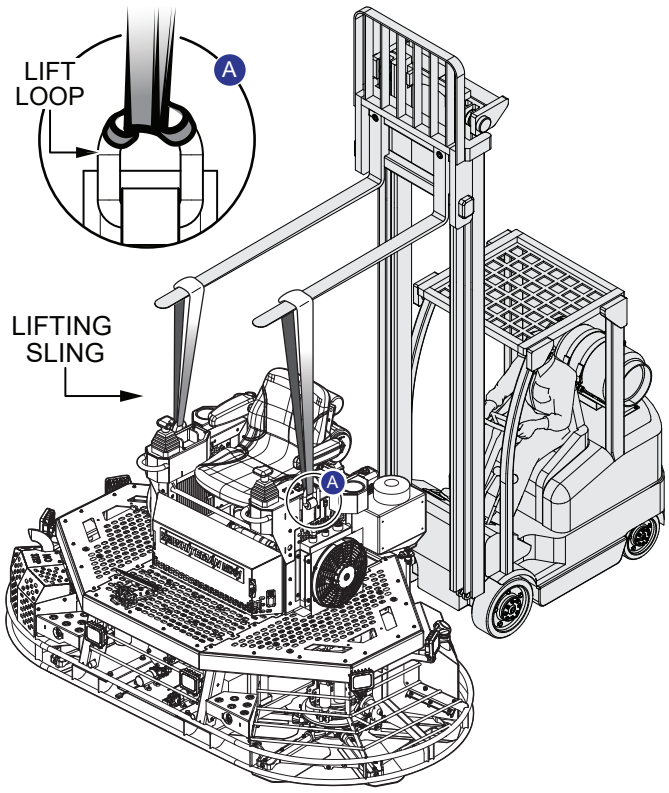


Figure 2. Lifting The Trowel (Lift Loops)

2. Insert forklift forks through the loops at the ends of the lifting slings. Keep the slings as close to vertical as possible.

NOTICE

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

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.

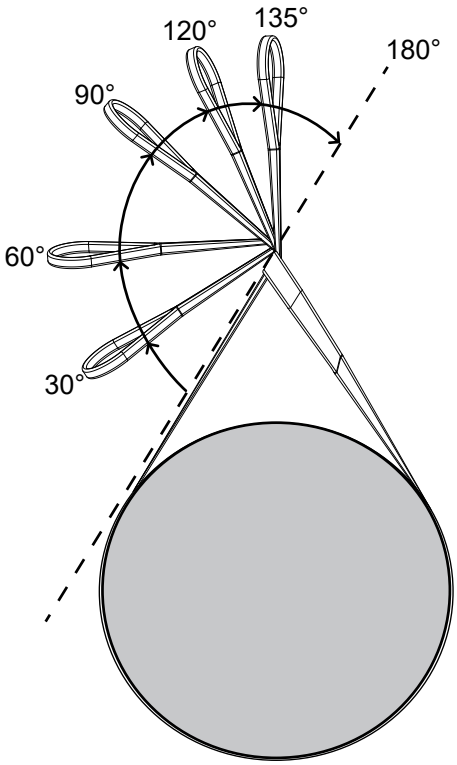


Figure 3. Choke Angle

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.

NOTICE

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

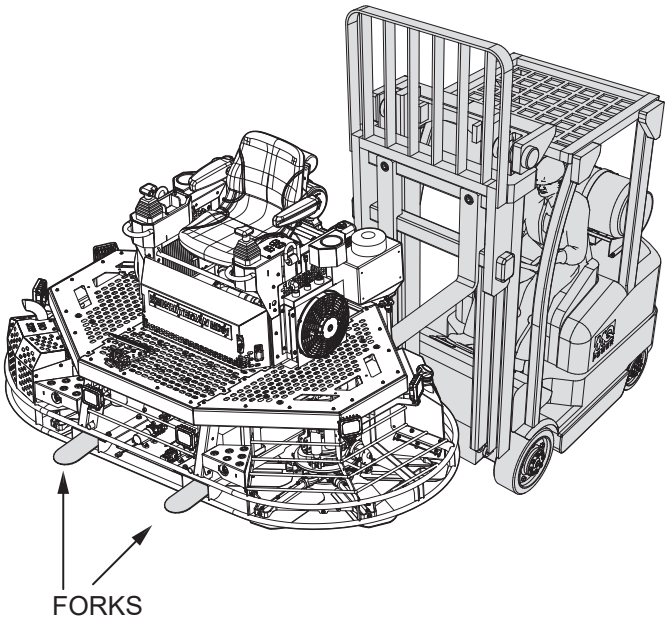


Figure 4. Lifting The Trowel (Forklift Pockets)

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.

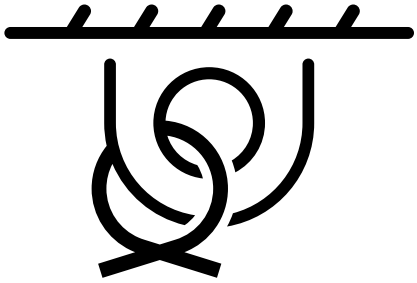


Figure 5. Tie-Down Symbol

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.

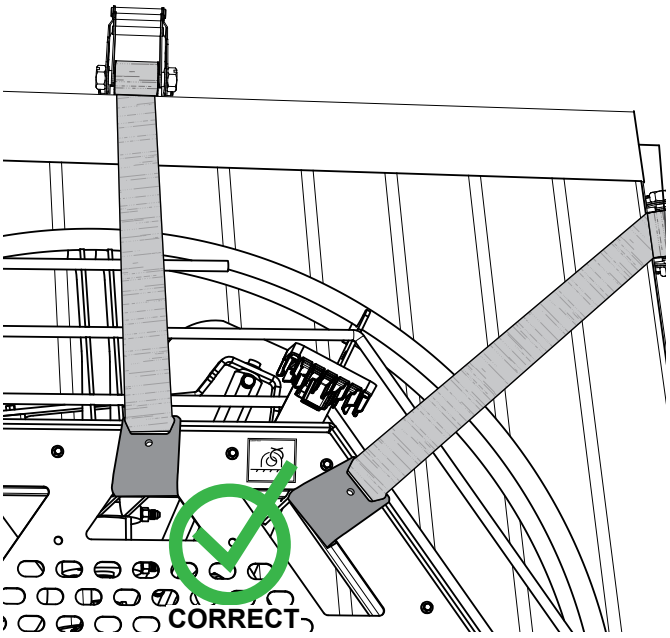


Figure 6. Tie-Down Method (Correct)

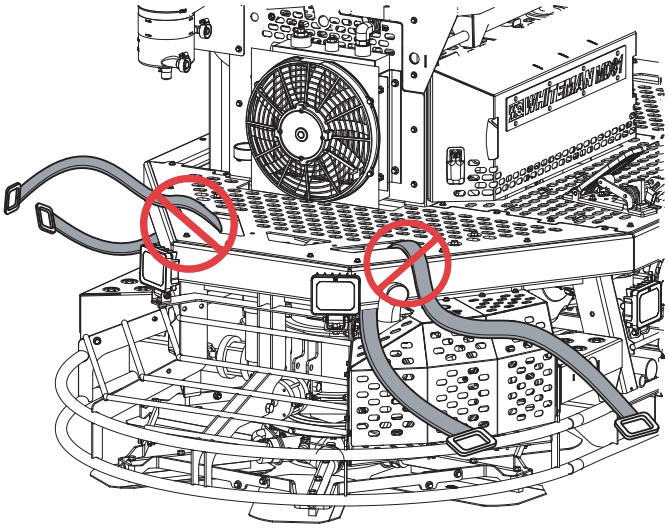


Figure 7. Tie-Down Method (Incorrect)

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	MD81
Operating Weight	1,865 lb. (845.9 kg)
Shipping Weight	2,165 lb. (982.0 kg)
Maximum Rotor Speed	160 rpm
Blades per Rotor	6
Path Width	91 in. (2,311 mm)
Hydraulic Oil Reservoir Capacity	0.45 gal. (1.70 L)
Hydraulic Oil System Capacity	9.5 qt. (8.99 L)
Hydraulic Oil Type	Parker DuraClean ISO 46
	Chevron Rando HDZ ISO 46
	Shell Tellus S2 VX 68

Table 3. Engine Specifications	
Model	Kubota V1505-CR-TE5
Type	Vertical, water-cooled, 4-cycle, turbocharged
Number of Cylinders	4
Bore × Stroke	3.07 × 3.09 in. (78.0 × 78.4 mm)
Displacement	91.41 in.³ (1.498 L)
Rated Output	44.3 hp (33.0 kW) @ 3,000 rpm
Maximum Torque	87.5 lbf·ft (118.6 N·m) @ 2,000 rpm
Combustion System	Direct injection
Lube Oil Type	CJ-4, CK-4
Lube Oil Capacity	1.8 gal. (6.7 L)
Coolant Type	50% ethylene-glycol type long-life coolant + 50% distilled water
Coolant Capacity	7.25 qt. (6.86 L)
Fuel Type	Ultra-low sulfur diesel
Fuel Capacity	9.0 gal. (34 L)

Table 4. MD81 Noise and Vibration Emissions	
Guaranteed Sound Pressure Level at Operator Station per ISO 11201, in dB(A)	97
Guaranteed Sound Power Level per ISO 3744, in dB(A)	126
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).*

NOTICE

Specifications are subject to change without notice.

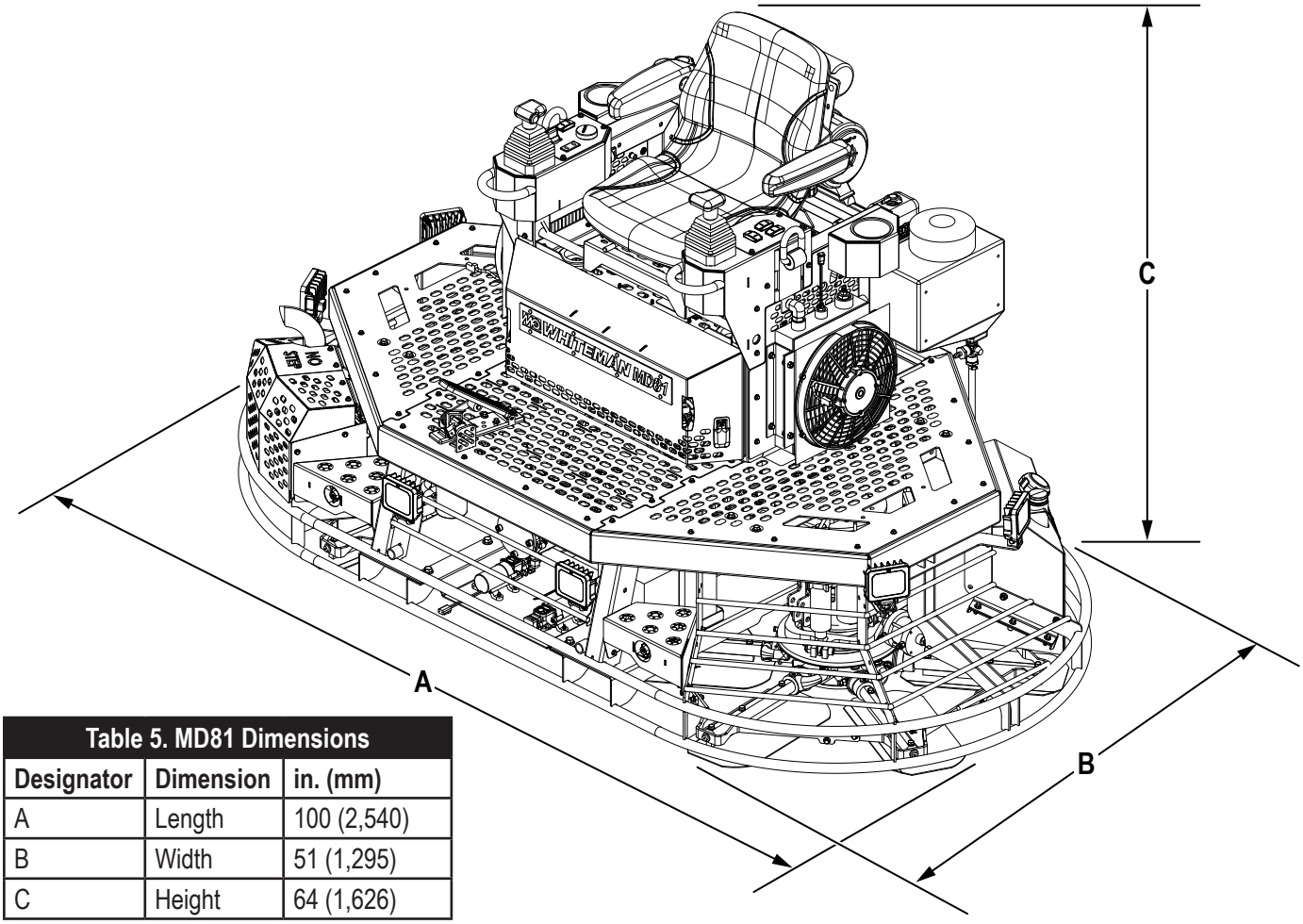


Table 5. MD81 Dimensions		
Designator	**Dimension**	**in. (mm)**
A	Length	100 (2,540)
B	Width	51 (1,295)
C	Height	64 (1,626)

Figure 8. MD81 Dimensions

INTENDED USE

Operate the MD81 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 MD81 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 MD81 is equipped with a Kubota V1505-CR-TE5 diesel engine. Refer to the engine operator's manual for specific instructions regarding engine operation and maintenance.

BLADES

The blades of the MD81 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 MD81 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 MD81 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.

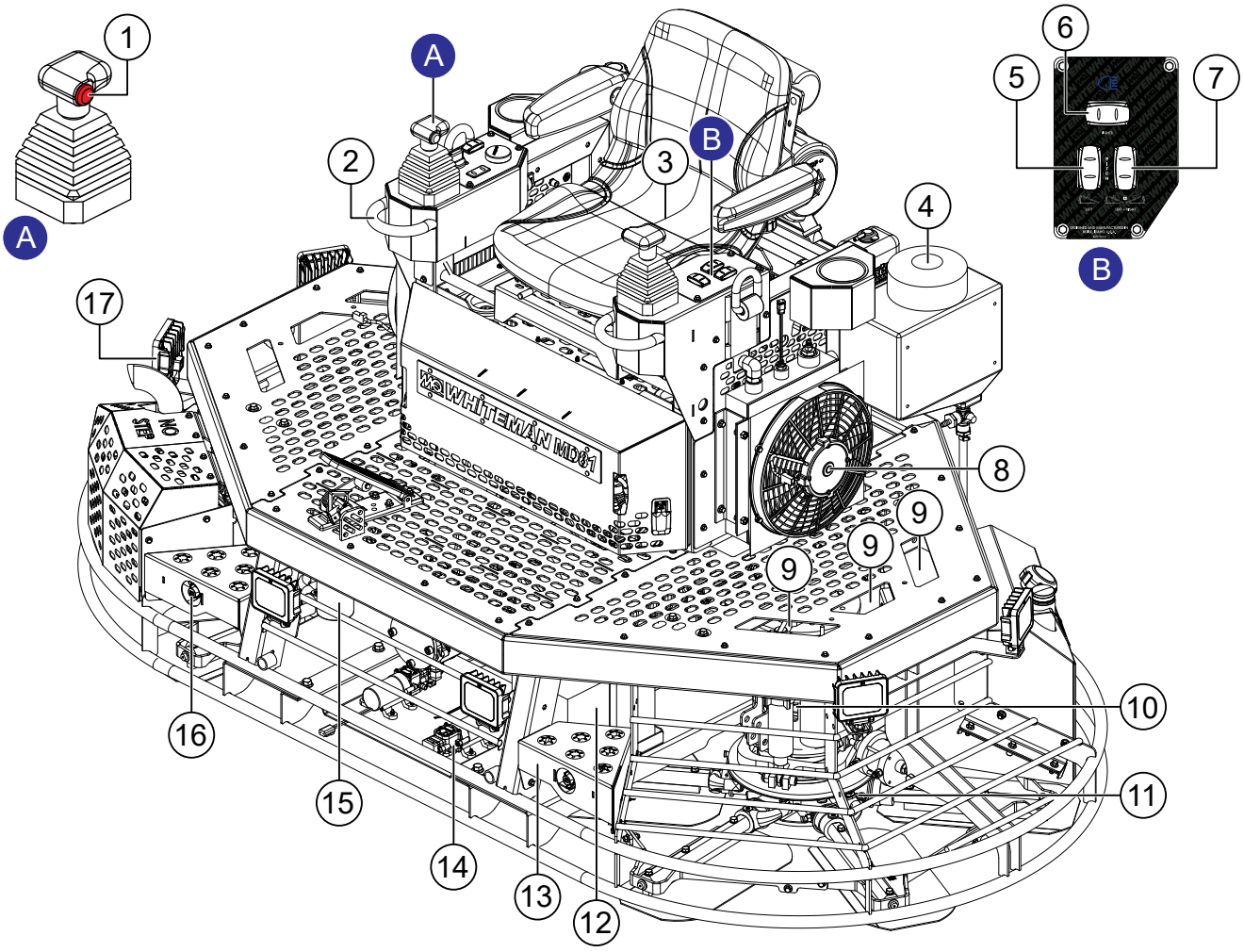


Figure 9. Trowel Components

1. **Retardant Spray Control Buttons (2)** — Left- and right-hand buttons 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)** — Left- and right-side hydraulic coolers maintain the optimum hydraulic oil operating temperature.
9. **Tie-Down Locations (6)** — Secure tie-down straps to these attachment points when transporting the trowel.

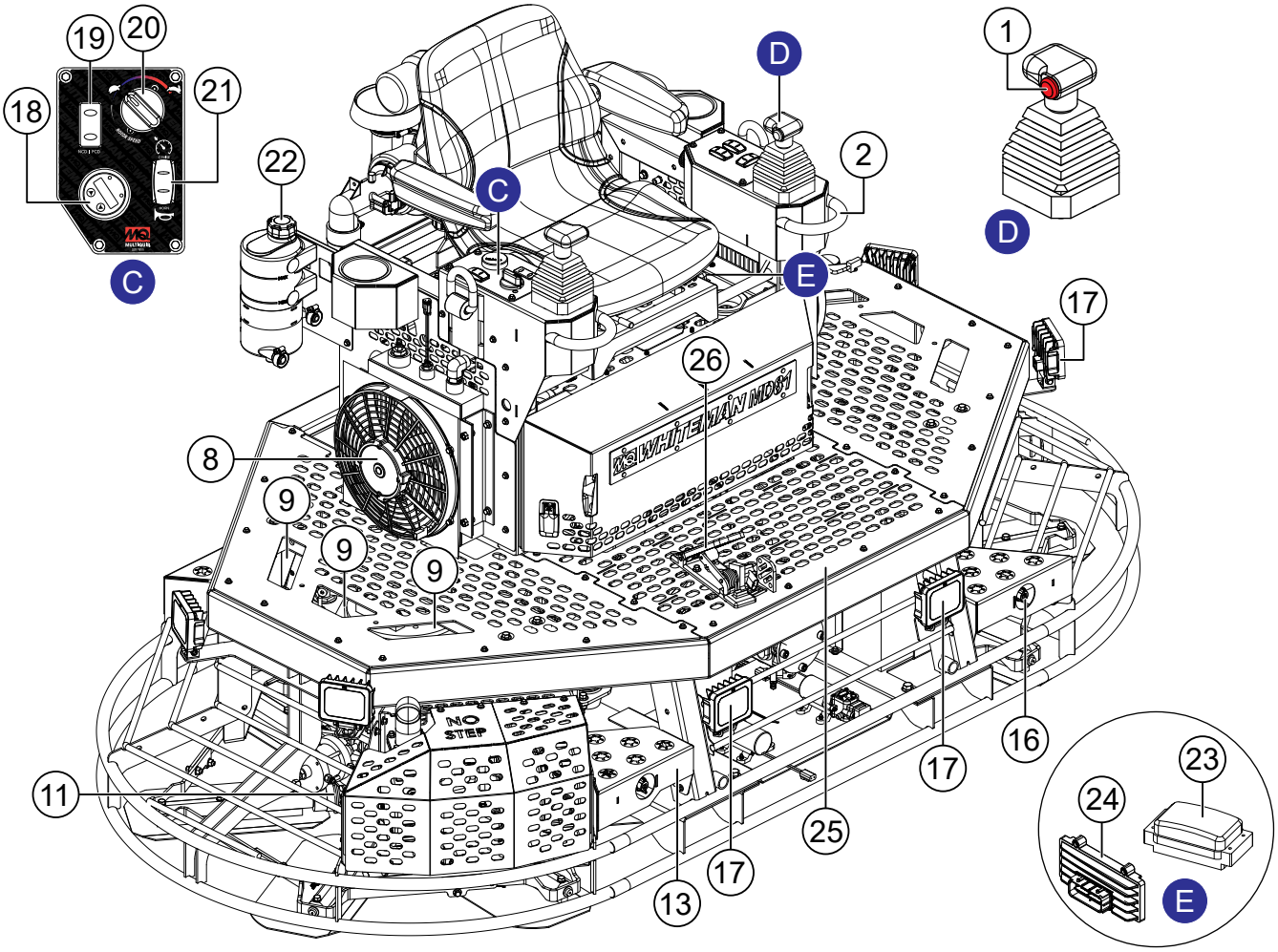


Figure 10. Trowel Components (Cont.)

10. **Hydraulic Motors (2)** — Left- and right-side direct-drive hydraulic motors rotate the spider assemblies.
11. **Spider Assemblies (2)** — Left- and right-side spider assemblies each contain six trowel arms with 8-inch combination blades equally spaced in a radial pattern.
12. **Battery** — Provides +12VDC to the electrical system.
13. **Steps (4)** — Use the steps to mount and dismount the trowel.
14. **Retardant Spray Pumps (2)** — Left- and right-side pumps deliver retardant spray from the retardant tank to the spray nozzles. Actuated by the buttons on the steering control handles.
15. **Hydraulic Filter** — Filters hydraulic fluid as it enters the system. Equipped with 10-micron glass-filled filter media.
16. **Retardant Spray Nozzles (2)** — Left- and right-side nozzles provide uniform coverage of retardant over the slab surface.
17. **Lights (6)** — 20-watt LED lights provide illumination for indoor or nighttime finishing.
18. **Diagnostic Display** — J1939-compliant device provides parameter data, displays active and stored fault messages, and tracks machine and engine hours. See the Diagnostic Display section for more information.
19. **NCD/PCD Warning Indicator** — Indicates emission system errors relating to NOx control diagnosis (NCD) and PM control diagnosis (PCD). Refer to the ***Troubleshooting*** section for more information.

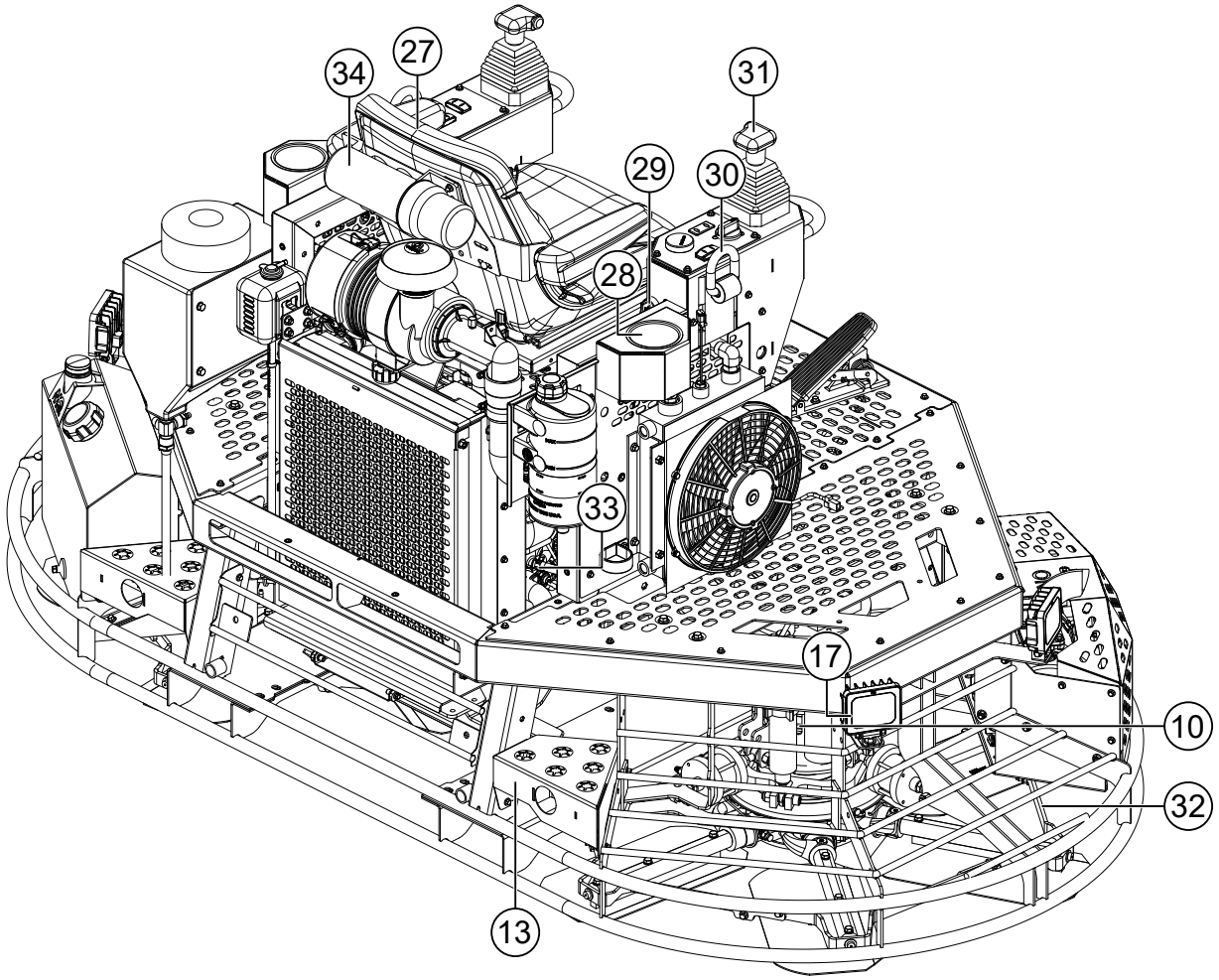


Figure 11. Trowel Components (Cont.)

20. **Rotor Speed Dial** — Scales rotor speed as determined by the foot pedal. TURTLE (slow) position = 1/3 foot pedal signal, RABBIT (fast) position = full foot pedal signal. See the ***Operation*** section for more information.
21. **Horn/Cruise Control Rocker Switch** — Use to activate the horn or to activate/deactivate cruise control.
22. **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.
23. **Power Distribution Module** — Contains machine fuses and relays.
24. **Machine Control Unit (MCU)** — Connects to machine sensors, switches, actuators, fuse box, engine, and display to control the machine.
25. **Trowel Platform** — Spacious platform provides easy access to the operator's seat and service areas.
26. **Foot Pedal** — Controls engine/rotor speed. See the ***Operation*** section for more information.
27. **Operator's Seat** — Adjustable operator's seat with armrests. Tilts forward for service access.
28. **Cup Holders (2)** — Left- and right-hand stainless steel cup holders.
29. **Ignition Switch** — Insert the ignition key here and turn clockwise to start the engine.
30. **Lift Loops (2)** — Attach lifting slings here to lift the trowel. Refer to the ***Lifting and Transporting*** section for more information.

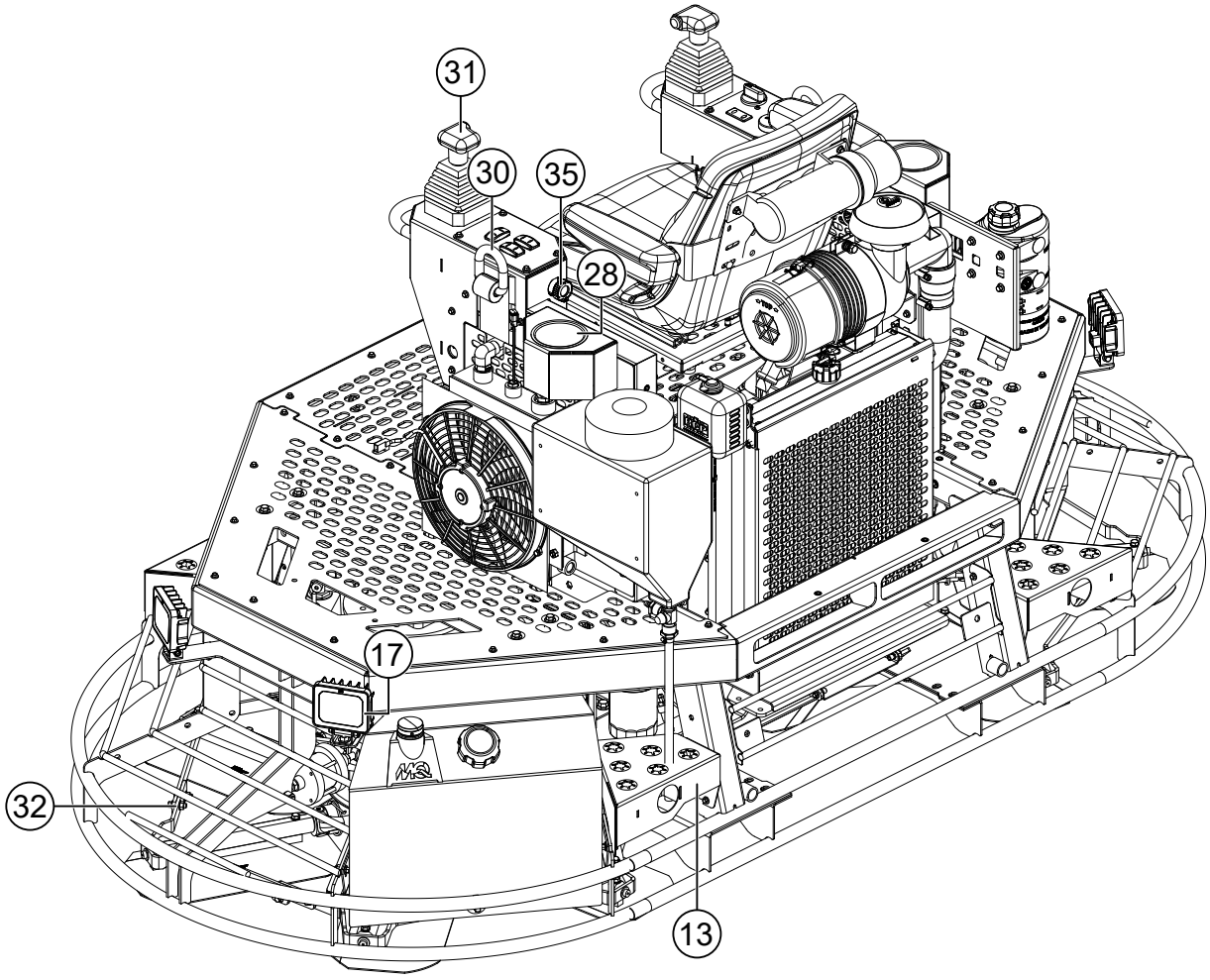


Figure 12. Trowel Components (Cont.)

31. **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.
32. **Stabilizer Rings (2)** — Sectional design provides enhanced stability and facilitates maintenance.
33. **Engine/Hydraulic Pump Assembly** — Kubota V1505-CR-TE5 diesel engine powering a variable displacement, tandem hydraulic pump. Refer to the ***Components (Engine)***, ***Operation***, and ***Maintenance*** sections for more information.
34. **Document Holder** — Storage for trowel and engine manuals.
35. **Service Port** — Connect the Whiteman Service Tool (WST) here to install and update trowel software and perform adjustments and calibrations.

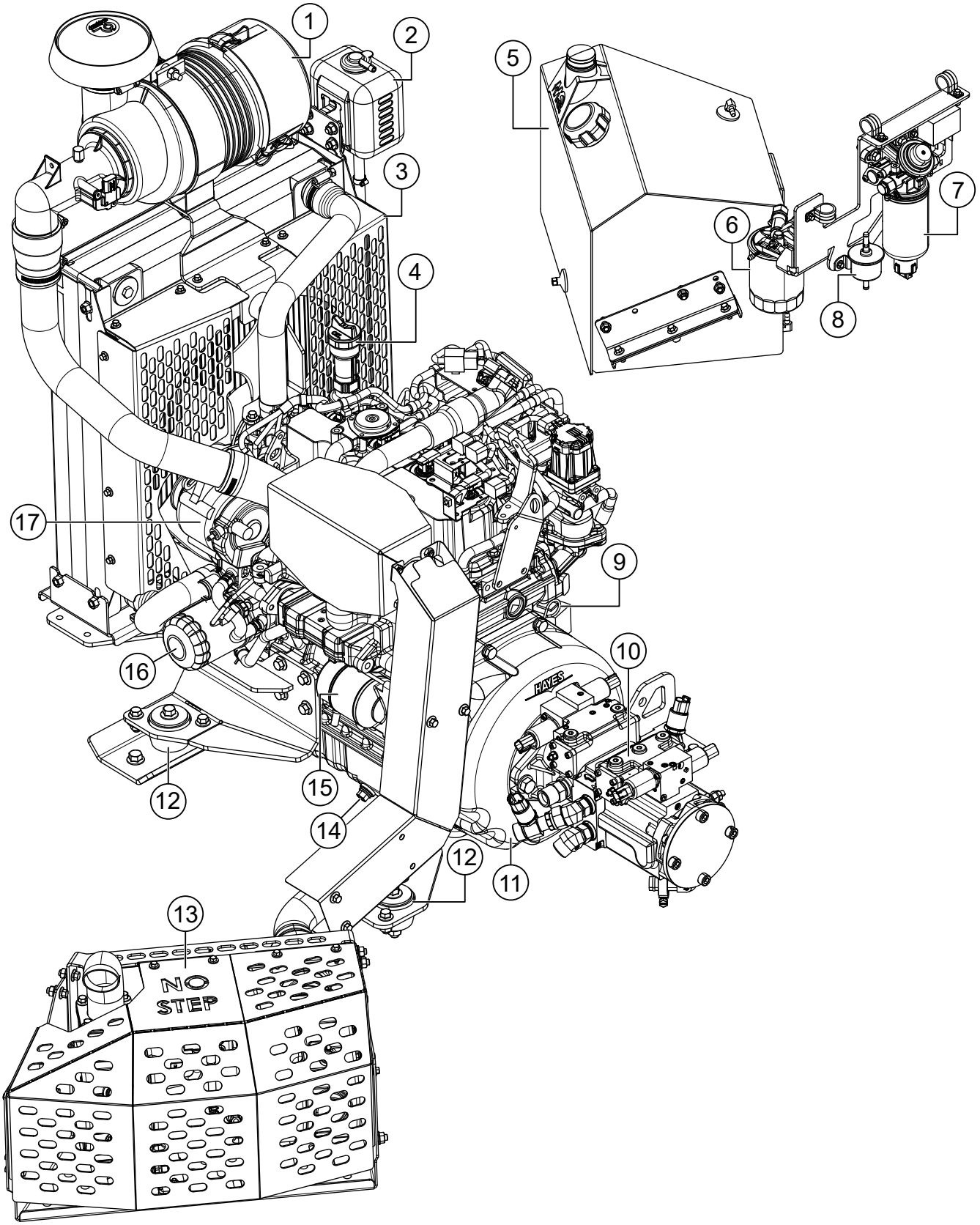


Figure 13. Kubota V1505-CR-TE5 Engine Assembly

The MD81 utilizes a **Kubota V1505-CR-TE5 diesel engine** (Figure 13) equipped with the following components:

1. **Air Cleaner** — Prevents dirt and debris from entering the engine's combustion chambers.
2. **Overflow Bottle** — Supplies coolant to the radiator when the coolant level is low. Fill to the level indicated on the bottle.
3. **Radiator** — Dissipates heat generated by the engine during combustion to prevent overheating.
4. **Oil Filler Port** — Remove the cap to add fresh lubricating oil as specified in Table 3.
5. **Fuel Tank** — Holds up to 9 gallons (34 liters) of fuel. Remove the fuel filler cap to add fuel to the tank. Use ultra-low sulfur diesel fuel only.
6. **Fuel Filter** — Filters fuel contaminants.
7. **Fuel Water Separator** — Removes water from diesel fuel before it reaches the engine.
8. **Fuel Pump** — Delivers fuel from the tank to the engine.
9. **Oil Dipstick** — Remove to check the amount and condition of oil in the crankcase.
10. **Hydraulic Pump** — Variable displacement, tandem hydraulic pump drives the hydraulic motors that rotate the blades.
11. **Coupler** — Connects the engine to the hydraulic pump.
12. **Engine Mounts with Rubber Isolators (4)** — Secure the engine to the trowel frame and reduce noise and vibration.
13. **Muffler with DPF/DOC** — Reduces noise from the engine exhaust system. Contains a diesel particulate filter (DPF) which captures and combusts particulate matter (PM) in the exhaust gas. A diesel oxidation catalyst (DOC) uses post-injection of unburned fuel to actively regenerate the DPF. Refer to the ***Maintenance*** section for more information.
14. **Oil Drain Plug (2)** — Remove the oil drain plug to drain lubricating oil from the engine crankcase.
15. **Starter/Solenoid** — Starts the engine when the ignition key is rotated to the START position.
16. **Oil Filter** — Filters lubricating oil contaminants.
17. **Alternator** — Provides power to the electrical system and charges the battery.

NOTICE

For more information, refer to the Kubota engine operator's manual.

The **diagnostic display** (Figure 14) is located on the right-hand control console and provides instrumentation via the SAE J1939 controller area network (CAN). The display enables equipment operators to view many different engine parameters and service codes.

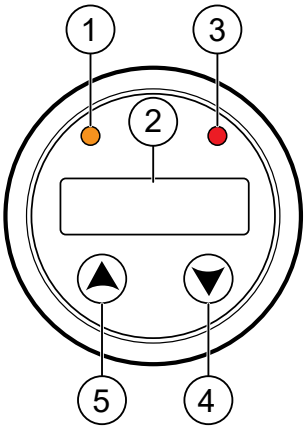


Figure 14. Diagnostic Display

The keypad on the diagnostic display is a capacitive touch-sensing system. There are no mechanical switches to wear or stick. This display unit will operate in extreme hot or cold weather conditions.

The engine's engine control unit (ECU) diagnoses engine faults and the trowel's machine control unit (MCU) diagnoses machine faults. Both sets of faults can be reviewed on the display's Active Faults and Stored Faults menu screens. See Table 6 for a complete list of actions available on the diagnostic display. See Table 13 – Table 20 for a complete list of fault codes.

The following definitions describe the controls and functions of the diagnostic display (Figure 14).

1. **Warning Lamp (Amber)** — When lit (AMBER), a minor fault has occurred. The operator should shut down the machine *as soon as possible* and correct the fault.
2. **Display Screen** — Graphical backlight LCD screen.
3. **Stop Lamp (Red)** — When lit (RED), a major fault has occurred. The operator should shut down the machine *immediately* and correct the fault.
4. **Down Arrow Button** — Press to scroll downward through the display menu options.
5. **Up Arrow Button**— Press to scroll upward through the display menu options.

Display Parameters

The following are some of the parameters displayed on the diagnostic display:

- Engine Speed (Eng RPM)
- Engine Oil Pressure (Oil Pres)
- Engine Coolant Temperature (Cool Tmp)
- Voltage (Sys Volt)
- Total Engine Hours (Eng Hrs)
- Percent Load at Current RPM (Load @ RPM)
- Engine Oil Temperature (Oil Temp)

Table 6. Diagnostic Display Menu		
Menu Item	**Options**	**Action**
Show 1-Up	Switch to the parameter display.	Press and hold the Up and Down Arrow buttons momentarily. When the buttons are released, broadcast parameters are displayed.
Active Faults	The Active Faults (Active FLTS) menu shows the suspect parameter number (SPN), failure mode identifier (FMI), and occurrence count (OC) for faults currently broadcasting on the CAN bus. When a new fault message is received, the display automatically switches to Active Faults.	The left (Amber, Warning) or right (Red, Shutdown) LED lights to indicate the status of the fault. If there is more than one fault, the display automatically scrolls through each fault. To return to the Main menu, press and release the Up and Down Arrow buttons simultaneously.
Stored Faults	The Stored Faults (Stored FLTS) menu shows the SPN, FMI, and OC for any stored faults. A message is sent to the ECU, and the ECU responds with what is stored in history. No information will be displayed if there are no stored faults.	Use the Up and Down Arrow buttons to scroll through the list if there is more than one stored fault. To return to the Main Menu, press and release the Up and Down Arrow buttons simultaneously.
Set Units	The Set Units menu will allow the user to select between the following unit settings: English Metric kPa Metric BAR Exit An asterisk (*) to the right of a setting indicates it is the current setting.	To enter the Set Units menu, momentarily press both Arrow buttons and release. Scroll through the options using the Down Arrow button. Choose a unit by momentarily pressing the Up and Down arrow buttons. An asterisk displays at the right. To leave this menu, scroll down to EXIT, press both Arrow buttons and release.
Set 1-Up	Use this menu to set the parameters you want to monitor. An asterisk (*) to the right of the parameter indicates it is selected.	Press the Up and Down Arrow buttons at the same time to select the currently displayed parameter. Press the Up and Down Arrow buttons at the same time while Exit is displayed to return to the main menu. Exit is the last item in the parameter list.

Table 6. Diagnostic Display Menu		
Menu Item	**Options**	**Action**
Scroll ON/OFF	When Scroll is ON, the parameters you select to display automatically scroll with about 5 seconds on each parameter reading. If Scroll is OFF, view parameters manually by pressing the Up or Down Arrow button.	To toggle ON or OFF, press the Up and Down Arrow buttons at the same time.
Machine Hours ON/OFF	When set to ON, machine hours are calculated by the display unit once the RPM is above 100.	Scroll to Machine Hours. To toggle ON or OFF, press the Up and Down Arrow buttons at the same time.
Tier 4 ON/OFF	When Tier 4 is set to OFF, other Tier 4 menu items are not available.	To toggle ON or OFF, press the Up and Down Arrow buttons at the same time. If Tier 4 is ON, and there is Tier 4 activity, the Tier 4 symbols show at the left of the screen beside the parameter data.
Set Tier 4	Auto – Automatically displays all Tier 4 information (symbols) from the CAN and allows for Auto Regeneration of a Tier 4 engine through CAN messaging. Request – Sends a request to the ECU to perform a regeneration. Inhibit – Sends a message to the ECU to prevent a regeneration from occurring. None – Not sending any Tier 4 messages. Exit – Return to the Main menu.	Momentarily press the Up and Down arrows to reach the Tier 4 menu. Select and set a Tier 4 choice by pressing the Up/Down arrows. An asterisk shows next to the selection.
Backlight	The Backlight menu allows you to select the desired backlight level. The range is 0–100% in 5% increments.	Press the Up and Down buttons at the same to toggle into and out of the adjustment screen.

BATTERY

See Figure 15.

⚠ 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 properly secured in the battery tray with the **battery strap**.

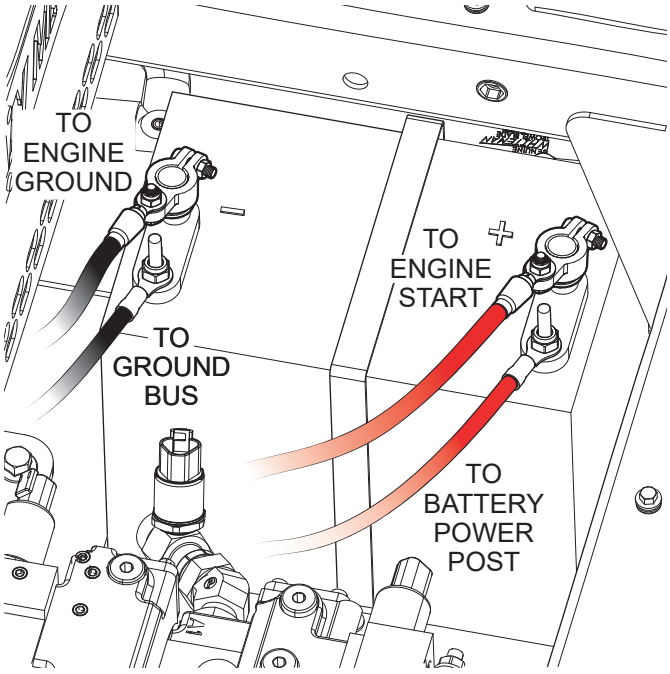


Figure 15. Battery Connections

2. Connect the red wire from the battery power post to the small positive **(+)** terminal on the battery.
3. Connect the positive **(RED)** battery cable to the large positive **(+)** terminal on the battery.
4. Connect the black wire from the ground bus to the small negative **(−)** terminal on the battery.
5. Connect the negative **(BLACK)** battery cable to the large negative **(−)** terminal on the battery.

ENGINE OIL

See Figure 17.

NOTICE

ALWAYS check the engine oil level before starting or more than 5 minutes after stopping the engine.

NOTICE

Engine oil should be American Petroleum Institute (API) service classification **CJ-4** or **CK-4**.

NOTICE

When using a brand of engine oil that is different than the previous one, be sure to drain all of the previous oil before adding the new oil. See ***Changing Engine Oil and Filter*** in the **Maintenance** section of this manual.

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Remove the **front panel** (Figure 16) to access the **engine oil dipstick**.

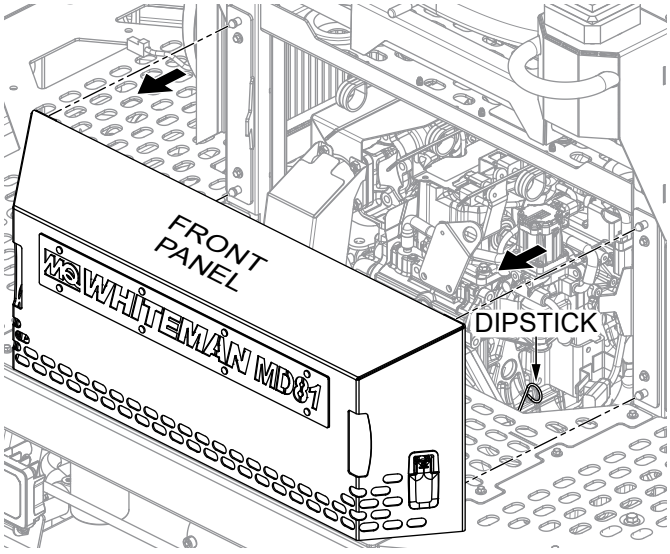


Figure 16. Front Panel

3. Pull the **engine oil dipstick** (Figure 17) out of its holder and wipe it with a clean rag.

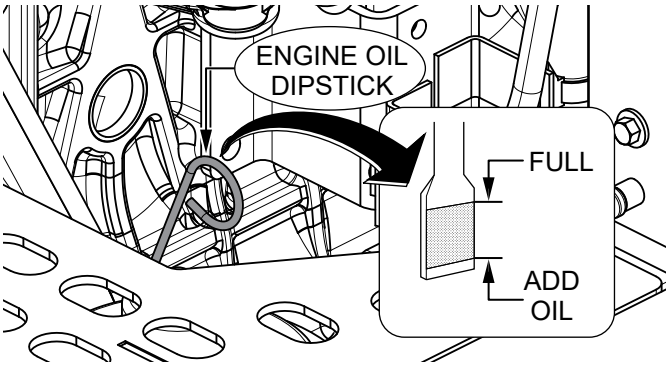


Figure 17. Engine Oil Dipstick

4. Fully insert the dipstick then remove it again.
5. Determine if engine oil is low. Oil should be between the upper and lower marks on the dipstick.
6. If the oil is below the lower mark on the dipstick, remove the **oil filler cap** (Figure 18) and add engine oil up to the upper mark on the dipstick. Tilt the seat forward to access the oil filler cap. Refer to Table 3 for engine oil capacity and Table 7 for recommended oil viscosity.

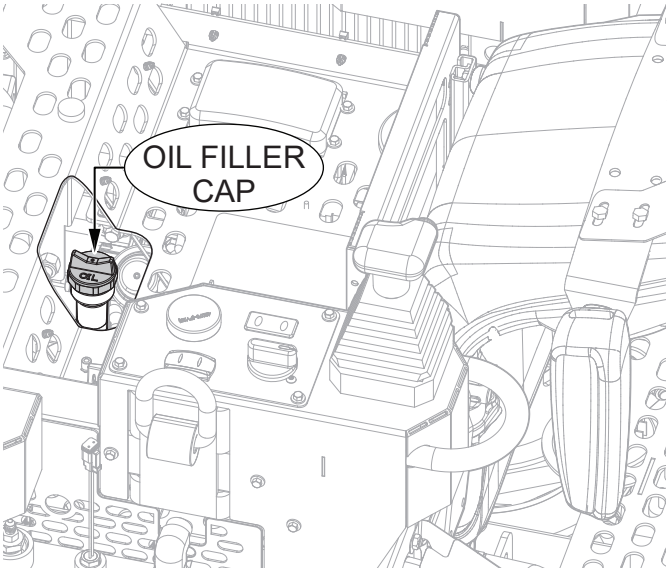


Figure 18. Oil FIller Cap

NOTICE

NEVER overfill the oil pan. **ALWAYS** wait at least 5 minutes for any added oil to drain down to the oil pan before rechecking the level.

Table 7. Recommended Oil Viscosity	
Ambient Temperature	**Oil Type**
Above 77°F (25°C)	SAE 10W-30 or 10W-40 or 15W-40
14°F to 77°F (−10°C to 25°C)	
Below 14°F (−10°C)	SAE 10W-30 or 10W-40

ENGINE COOLANT

Kubota recommends ethylene glycol (EG) type long-life coolant for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the Kubota engine owner's manual for further details.

⚠ WARNING



When adding coolant/antifreeze mix to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. The possibility of **hot coolant** exists which can cause **severe burns**.

Day-to-day addition of coolant is performed at the reserve tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 8 for engine/radiator and reserve tank coolant capacities.

Table 8. Coolant Capacity	
Engine and Radiator	7.25 qt. (6.86 L)
Reserve Tank	1.05 qt. (1.0 L)

NOTICE

Check the coolant level daily. Normally, only the coolant level in the reserve tank needs to be checked. However, the radiator cap should be opened once a week to verify that coolant is visible (full) inside the radiator.

Verify that the coolant level in the **coolant reserve tank** (Figure 19) is between the **LOW** and **FULL** markings on the tank.

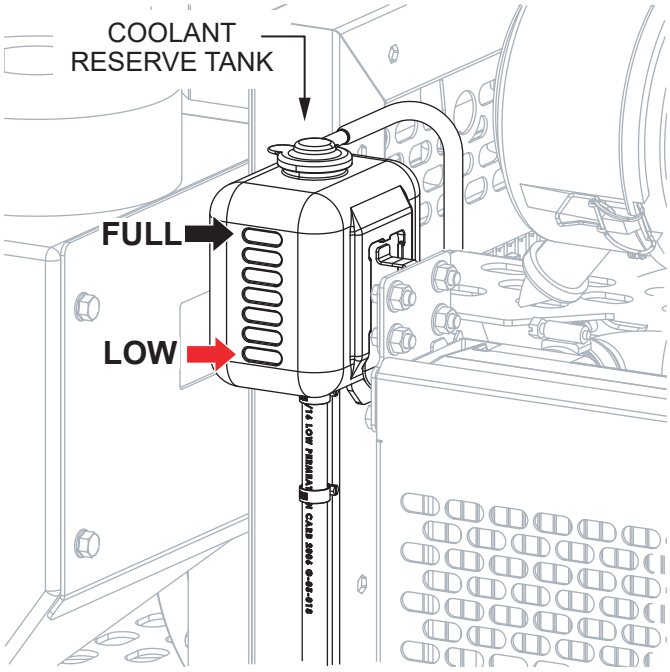


Figure 19. Coolant Reserve Tank

HYDRAULIC OIL

See Figure 20.

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**. Hydraulic oil should be visible between the **MIN** and **MAX** lines on the reservoir.

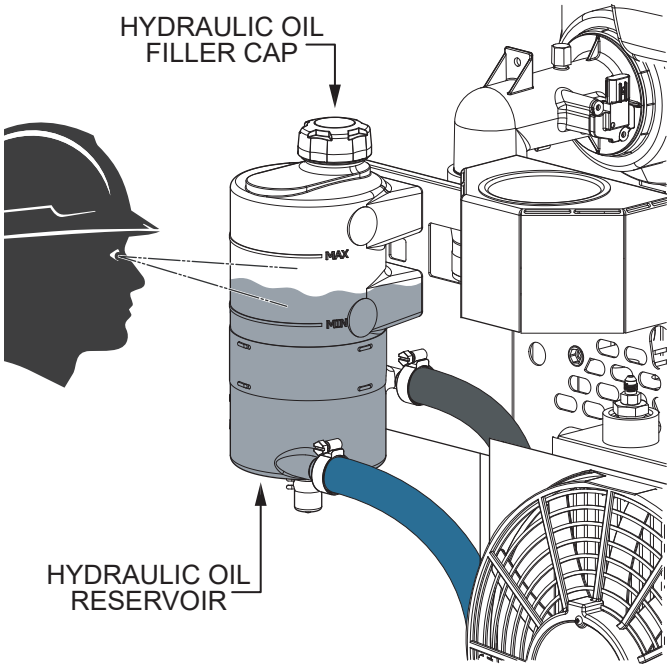


Figure 20. Hydraulic Oil Level Inspection

⚠ 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.

3. If the hydraulic oil level is low, remove the **hydraulic oil filler cap**, and add hydraulic oil up to a level midway between the **MIN** and **MAX** lines on the reservoir. **DO NOT** overfill. Refer to Table 2 for appropriate hydraulic oil types. Replace the filler cap when finished.

FUEL

See Figure 21.

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 on or near the trowel. Make sure the engine is **OFF** before refueling.

WARNING



Diesel fuel and its vapors are dangerous to your health and the surrounding environment. Avoid inhalation of fumes and contact with skin.

1. Make sure the trowel is secured on a level surface with the engine stopped.
2. Read the **fuel gauge** on the fuel tank to determine if the fuel level is low.

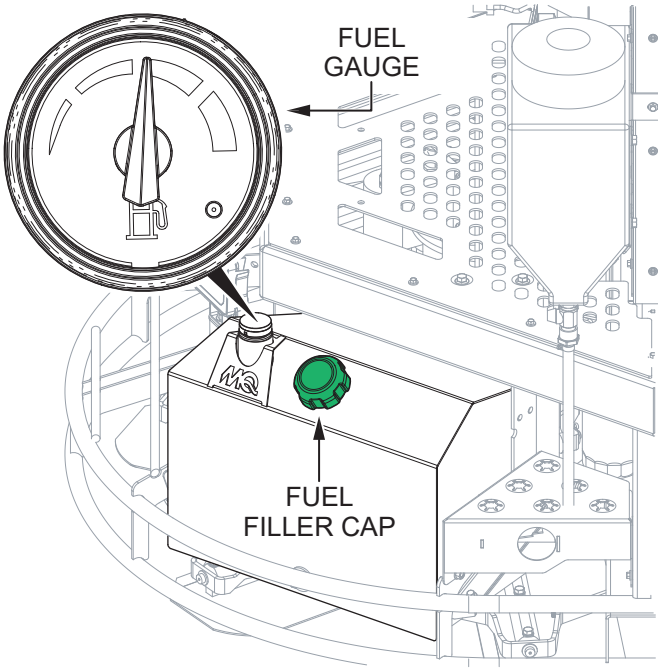


Figure 21. Fuel Level Inspection

3. If fuel is low, remove the **fuel filler cap** and fill the tank with clean, fresh, ultra-low sulfur diesel fuel. **DO NOT** overfill. The fuel tank holds 9 gallons (34 liters) of fuel.
4. Replace the fuel filler cap when finished.

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.

⚠ WARNING



Operate the trowel only in areas with adequate ventilation. **NEVER** operate in confined areas or in areas where the free flow of air is restricted.

⚠ CAUTION



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

NOTICE

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

BOARDING THE TROWEL

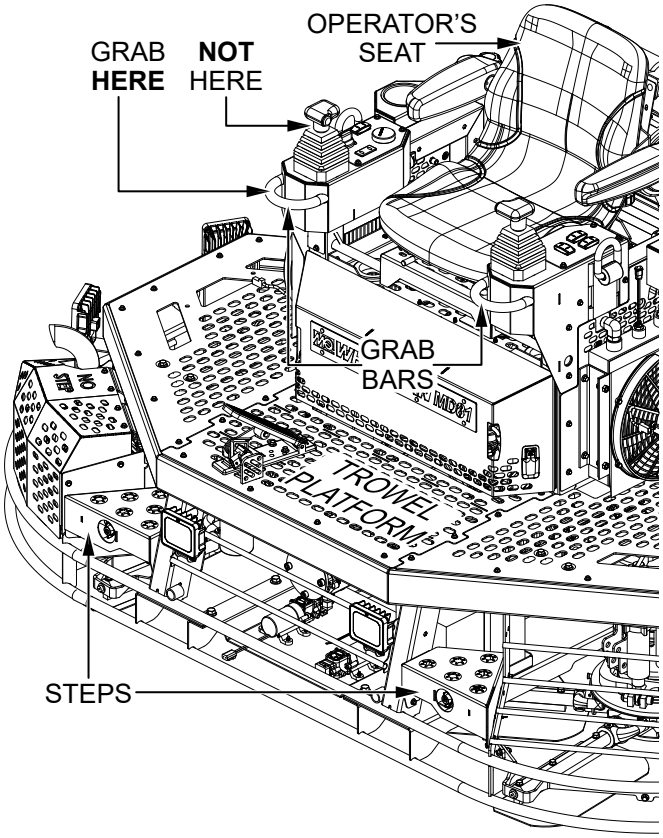


Figure 22. Boarding The Trowel

While standing in front of the trowel, grasp one of the **grab bars** (Figure 22) and place a foot on one of the **steps**. Lift yourself onto the **trowel platform** and sit down in the **operator's seat**.

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.

STARTING THE ENGINE

1. Insert the **ignition key** into the **ignition switch** (Figure 23).

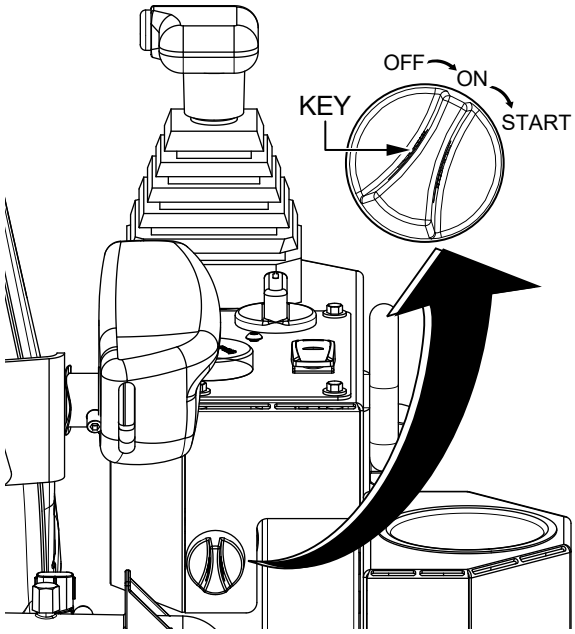


Figure 23. Ignition Key Switch

2. Turn the ignition key clockwise to the **ON** position (Figure 23). The **AMBER and RED LEDs** on the **diagnostic display** (Figure 24) will flash and the **menu display** will cycle through the preset parameters until the engine is started.

NOTICE

In cold weather conditions, the message **WAIT TO START** will appear on the display and both LEDs will light to indicate engine preheating. **DO NOT** attempt to start the engine while this message is displayed. When the engine is ready to start, the message will disappear and the display will begin cycling through parameter readings.

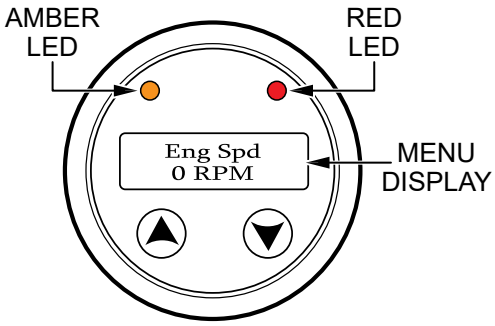


Figure 24. Diagnostic Display

3. 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.
4. Let the engine warm up for 2–3 minutes. Listen for any abnormal sounds.
5. The diagnostic display's amber and red LEDs (Figure 24) will turn **OFF** if no engine or machine faults are present.
6. If the amber or red LED is **ON**, 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.

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 (1,050 rpm) when the operator leaves the seat or the foot pedal is released.

ENGINE AND ROTOR SPEED

Foot Pedal

The **foot pedal** (Figure 25) controls engine and rotor speed. The position of the foot pedal determines the rotational speed of the blades. Lightly depress the foot pedal to rotate the blades slowly. Increase pressure on the foot pedal to increase rotor speed. Fully depress the foot pedal to rotate the blades at full speed.

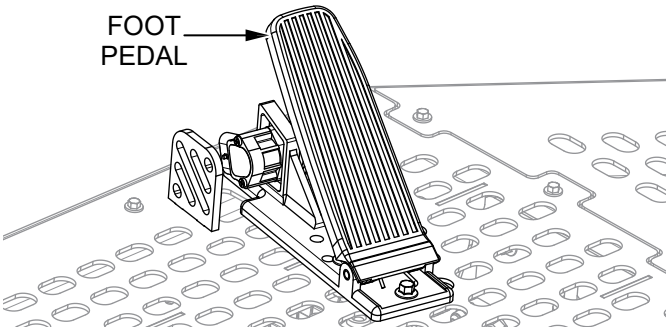


Figure 25. Foot Pedal

NOTICE

Engine throttle will accelerate to full speed (3,000 rpm) when the foot pedal is depressed and the operator's presence is detected.

Rotor Speed Dial

The **rotor speed dial** (Figure 26) scales the rotor speed determined by the foot pedal signal.

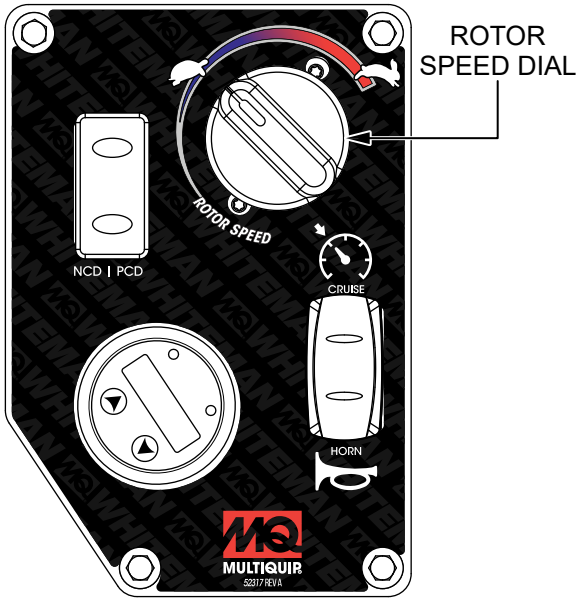


Figure 26. Rotor Speed Dial

When the rotor speed dial is placed in the **TURTLE** (slow) position, rotor speed will be 1/3 of the foot pedal signal. When placed in the **RABBIT** (fast) position, rotor speed will be 100% of the foot pedal signal. To attain maximum rotor speed (160 rpm), the foot pedal must be fully depressed *and* the rotor speed dial must be in the **RABBIT** (fast) position.

Cruise Control

Engaging **cruise control** will set and maintain engine 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 25) to increase engine speed.
2. Press the **cruise control button** (Figure 27).

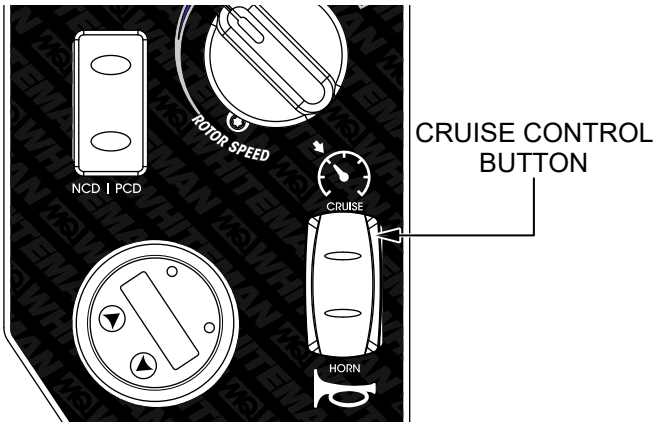


Figure 27. Cruise Control Button

3. Release the foot pedal. The engine will maintain the set speed.
4. Use the **rotor speed dial** (Figure 26) to increase or decrease rotor speed while cruise control is engaged.
5. 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 28) to change pitch on both rotors simultaneously (but non-synchronously).

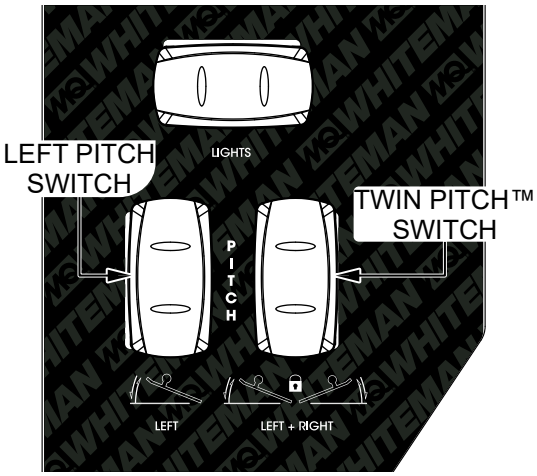


Figure 28. Blade Pitch Switches

2. Press **UP** or **DOWN** on the **Left Pitch switch** (Figure 28) to change pitch on the left rotor only. The right rotor pitch will remain constant.

STEERING

Two palm-grip **joysticks** (Figure 29), located to the left and right of the **operator's seat**, provide directional control for the trowel.

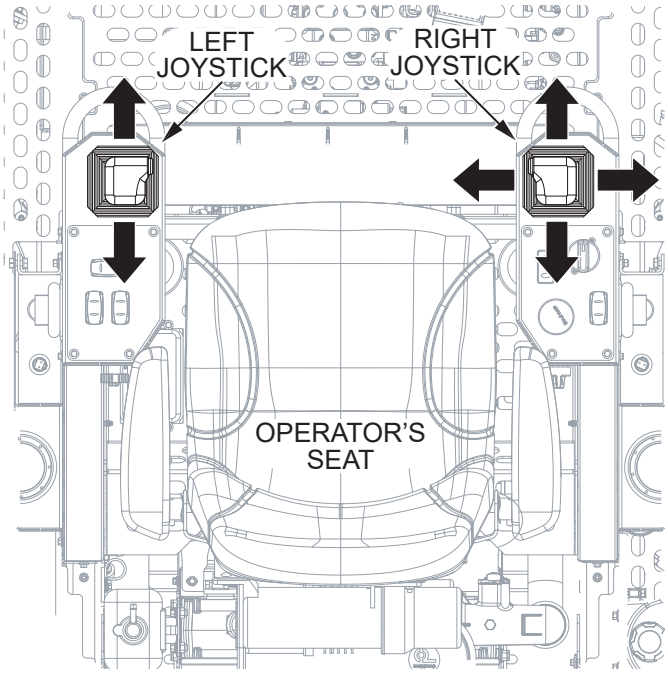


Figure 29. Steering Control Joysticks

Table 9 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 9. 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.

1. Push both the left and right joysticks **forward** (Figure 30).

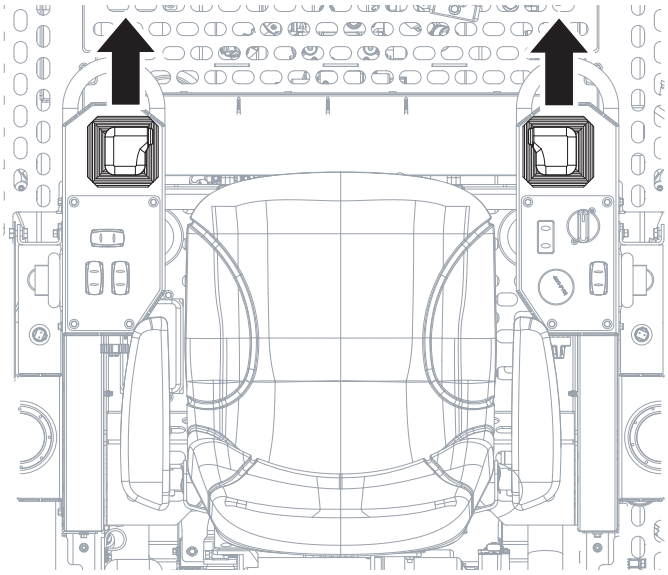


Figure 30. Joysticks (Forward)

2. With your right foot, slowly depress 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 rotor 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 9. 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 31) and repeat steps 2 through 5 while substituting the word 'reverse' for 'forward'.

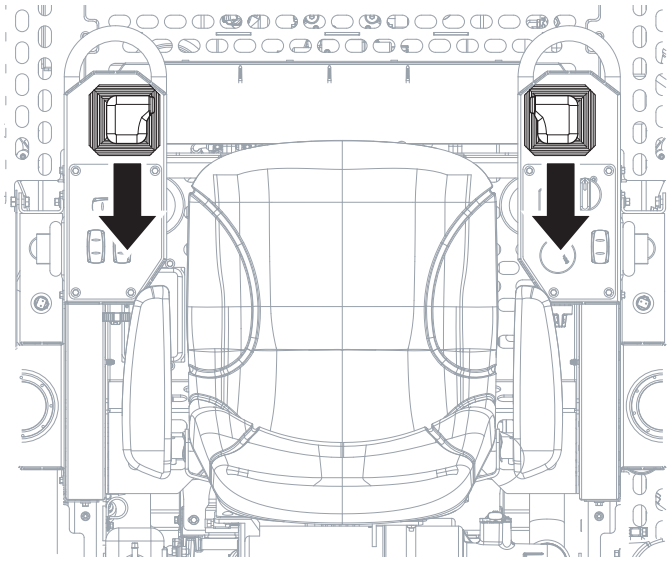


Figure 31. Joysticks (Reverse)

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 32).

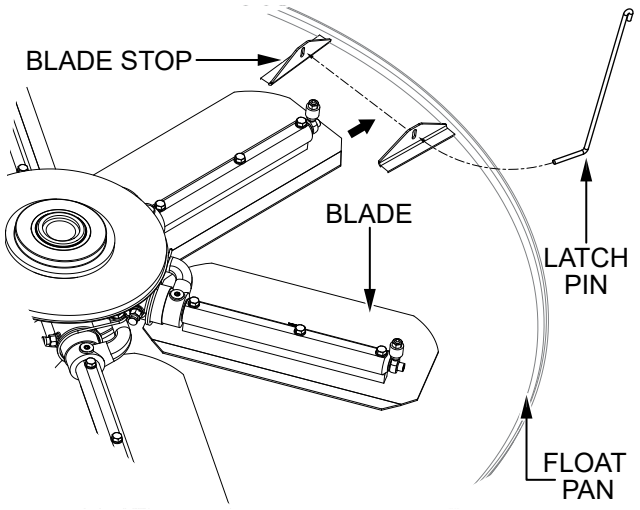


Figure 32. Float Pan Installation (Latch Pins)

3. Route a **latch pin** through the holes in the blade stops as shown in Figure 32.
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 33.

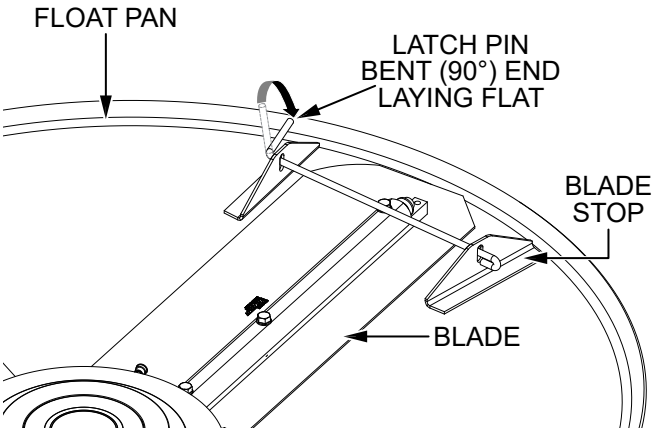


Figure 33. Latch Pin Placement

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 10. Maintenance Schedule											
Item	Maintenance Interval										
	Daily	After First 50 Hours	Every 50 hours	Every 100 hours	Every 250 hours	Every 400 hours	Every 500 hours	Every 1,500 hours	Every 3,000 hours	Every Year	Every 2 Years
Engine Maintenance											
Check engine oil level	X										
Check fuel level and refuel as necessary	X										
Check coolant level	X										
Check fan belt	X										
Change engine oil		X			X						
Replace oil filter cartridge		X				X					
Check fuel pipes and clamp bands			X								
Drain water separator (Type 1)			X								
Clean air cleaner element*1				X							
Adjust fan belt tension				X							
Check intake air line				X						X	
Check radiator hoses and clamp bands	**Every 100 hours of operation or 6 months**										
Replace fuel filter cartridge*4						X					
Clean water separator (Type 1)*3						X					
Remove sediment in fuel tank*3							X				
Clean radiator core (outside)*3							X				
Clean radiator inside*3							X				
Replace water separator filter (Type 2)*3	**Every 500 hours or 1 year**										
Replace fan belt*3	**Every 500 hours or 2 years**										
Check valve clearance*3	**Every 800 hours**										
Check injector tip*3,*5								X			
Check EGR cooler*3,*5								X			
Check head cover valve*3								X			
Check turbo charger*3,*5									X		
Check EGR system*3,*5									X		
Clean DPF*3,*5									X		
Replace air cleaner element*2,*3										X	
Check DPF related piping*3										X	
Check EGR piping*3										X	
Check exhaust manifold for cracks or gas leak and for looseness or damage										X	
Replace water rubber piping										X	
Replace rubber piping related to oil separator*3											X
Replace DPF related rubber piping*3											X
Replace intake air line and suction air pressure takeout rubber piping*3											X
Replace EGR cooler rubber piping*3											X
Replace lubricant rubber piping*3											X

Table 10. Maintenance Schedule

Item	Maintenance Interval										
	Daily	After First 50 Hours	Every 50 hours	Every 100 hours	Every 250 hours	Every 400 hours	Every 500 hours	Every 1,500 hours	Every 3,000 hours	Every Year	Every 2 Years
Engine Maintenance											
Change radiator coolant (LLC)											X
Replace radiator hoses and clamp bands*3											X
Replace fuel pipes and clamp bands*3,*4											X
Replace intake air line*3											X
Drain water separator (Type 2)*3	**Service as required**										
Trowel Maintenance											
Lubricate spiders and thrust collars	X										
Inspect electrical wiring for cuts, abrasions, or corrosion		X		X							
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 Air cleaner should be cleaned more often in dusty conditions than in normal conditions.

*2 After 6 times of cleaning.

*3 Consult your local KUBOTA Dealer for this service.

*4 When using biodiesel fuel, replace the fuel filter cartridge, fuel hoses and clamp bands with new ones at half intervals.

*5 Items are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emissions regulations. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instructions. Please see the Warranty Statement in detail.

- The items listed above other than marked *5 are not necessary to keep the emission-related warranty valid.
- Failure to perform maintenance will cause problems that will significantly degrade engine performance.

⚠ 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 10 as a general maintenance guideline. For additional engine maintenance instructions, refer to the Kubota engine owner's manual.

TROWEL 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** (Figure 34) is equipped with a dry-type filter element. Never apply oil to the air cleaner.

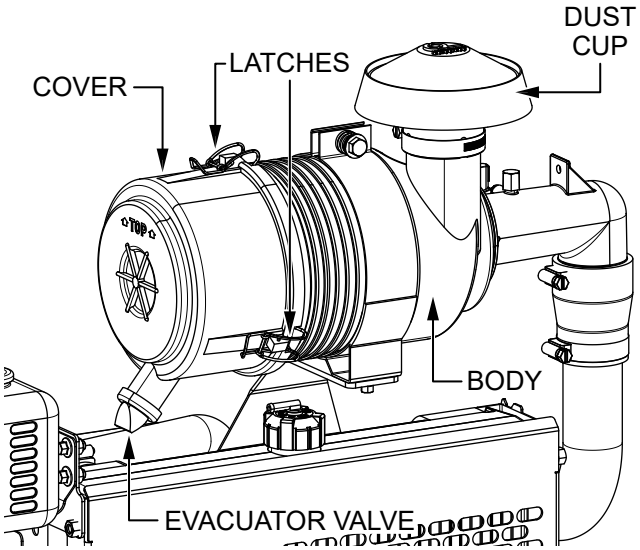


Figure 34. Engine Air Cleaner

1. To remove large dust and dirt particles, open the **evacuator valve** (Figure 34) once a week under ordinary conditions, or daily when used in dusty conditions.
2. Release the **latches** (Figure 34) and remove the **air cleaner cover** to inspect the filter element. Clean or replace the filter element if it is dirty. Avoid touching the element except when cleaning. Replace the element if it is damaged.
3. When dry dust adheres to the filter element, blow clean, dry compressed air through the element from the inside out. Compressed air pressure must be less than 30 psi (2.1 kgf/cm ,205 kPa). Maintain a reasonable distance between the nozzle and the filter.
4. Replace the filter element every year or every 6 cleanings.
5. Replace the filter element if it is excessively dirty (heavily stained).
6. If the inside of the **air cleaner body** (Figure 34) is dirty or wet, wipe it clean with a dry cloth.
7. Open and clean out the **dust cup** (Figure 34) before it becomes half full with dust, usually once a week under ordinary conditions, or daily when used in dusty conditions.

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.

REPLACING ENGINE OIL AND FILTER

1. Make sure the engine is **OFF** and has had sufficient time to cool.
2. Remove the engine oil dipstick.
3. Remove the **oil drain plug** and **gasket** (Figure 35), and allow the oil to drain into a suitable container.

> ***NOTICE***
>
> Engine oil will drain more easily when the oil is **warm**.

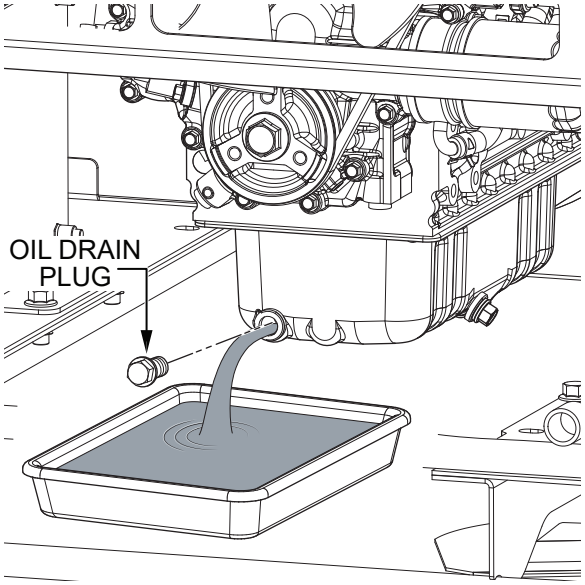


Figure 35. Draining The Engine Oil

4. After the oil has fully drained, replace the drain plug gasket and reinstall the oil drain plug with the new gasket. Tighten securely.
5. Remove the oil filler cap and slowly add new engine oil up to the upper limit of the oil level gauge. **DO NOT** overfill.
6. Replace the oil filler cap and make sure the dipstick is fully inserted.
7. Using a filter wrench (Figure 36), remove the **engine oil filter**.

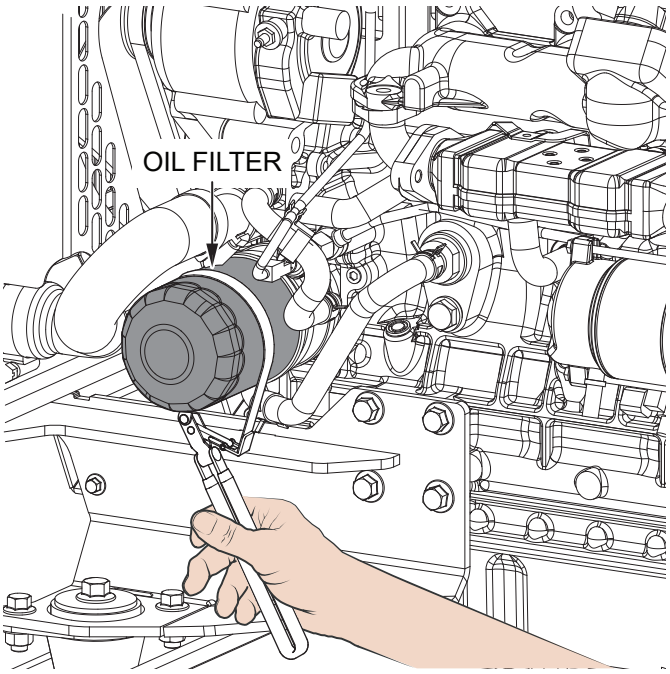


Figure 36. Oil Filter Removal

8. Clean the sealing surface where the filter mounts onto the engine.
9. Lightly coat the **gasket** of the new oil filter (Figure 37) with clean engine oil.

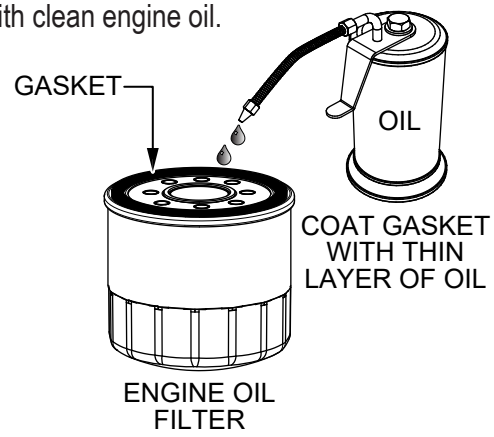


Figure 37. Lubricate New Oil Filter Gasket

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. After the oil filter has been replaced, the engine oil level normally decreases a little. Therefore, run the engine for awhile and check for oil leaks through the seal before rechecking the engine oil level. Add oil if necessary.

HYDRAULIC OIL FILTER

Change the **hydraulic oil filter** (Figure 38) after the first 100 hours of use, then every 250 hours. Use 10-micron, glass-filled filter elements only.

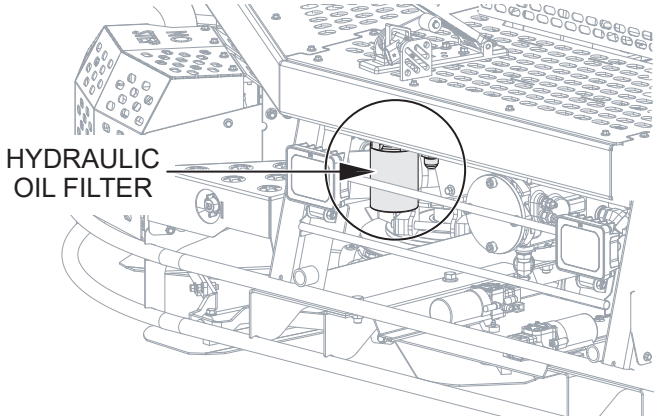


Figure 38. Hydraulic Oil Filter

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 39) to catch the hydraulic oil as it drains.

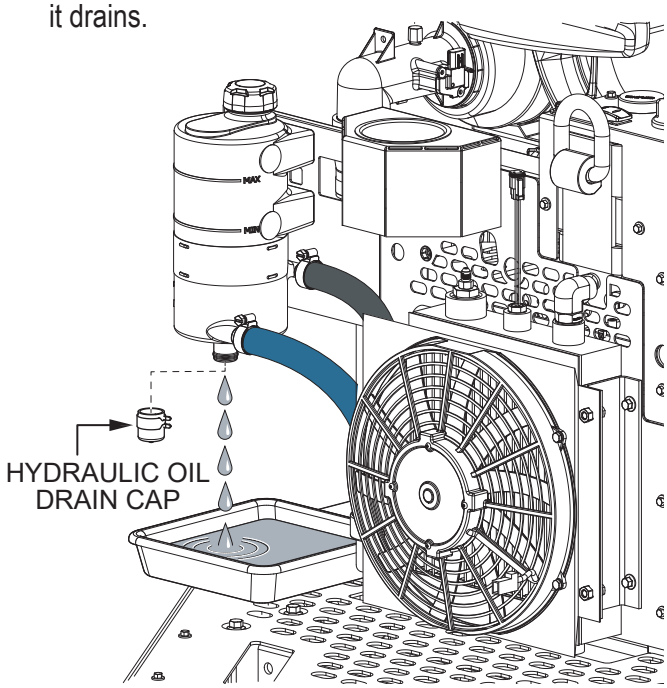


Figure 39. Draining The Hydraulic Oil

2. Remove the **hydraulic oil drain cap** (Figure 39) and allow the hydraulic oil to drain completely from the reservoir. Replace the drain cap when finished.

CHARGE PRESSURE

Check the charge pressure at the **charge pressure test port** (Figure 40) on the **steering block**. Remove the platform at the front of the trowel to access the steering block and hydraulic pump.

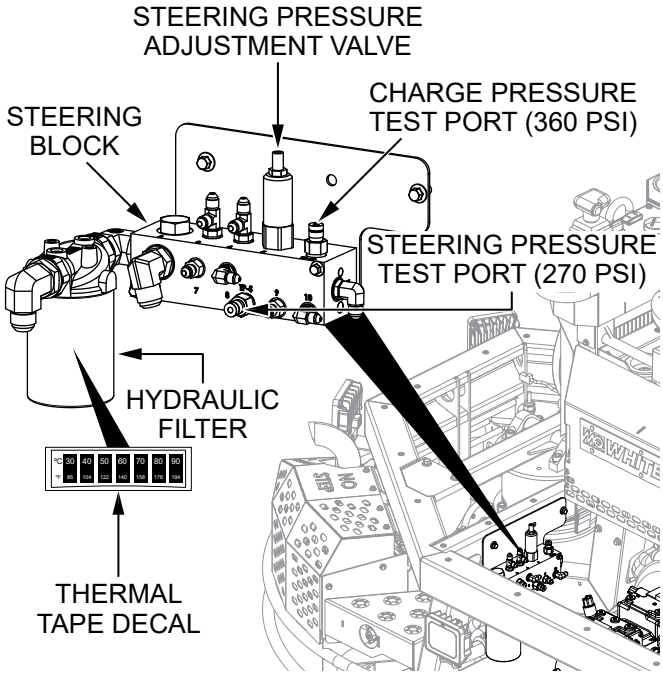


Figure 40. Steering Block Charge Pressure And Steering Pressure Components

Checking The Charge Pressure

1. Make sure the trowel is turned **OFF**.
2. Using a Parker PD242 diagnostic test port coupler, connect a 300–600 psi pressure test gauge to the **charge pressure test port** (Figure 40) on the **steering block**.
3. Verify the hydraulic oil level is correct. Refer to ***Hydraulic Oil*** in the ***Setup and Inspection*** section.
4. Start the engine as described in the ***Operation*** section.
5. Allow the hydraulic system to warm up to 140°F (60°C). Hydraulic temperature is indicated by the **thermal tape decal** (Figure 40) on the **hydraulic filter**.

6. Press and hold the **Cruise Control button** (Figure 27) for 5 seconds to bring the engine up to full speed (3,000 rpm).
7. Observe the pressure test gauge and record the reading. Standard factory charge pressure setting is 360 psi.

Adjusting The Charge Pressure

Remove the protective cap on the **charge pressure adjustment valve** (Figure 41) and adjust the charge pressure as needed. Replace the protective cap when finished.

NOTICE

Charge pressure factory setting is 360 ± 10 psi.

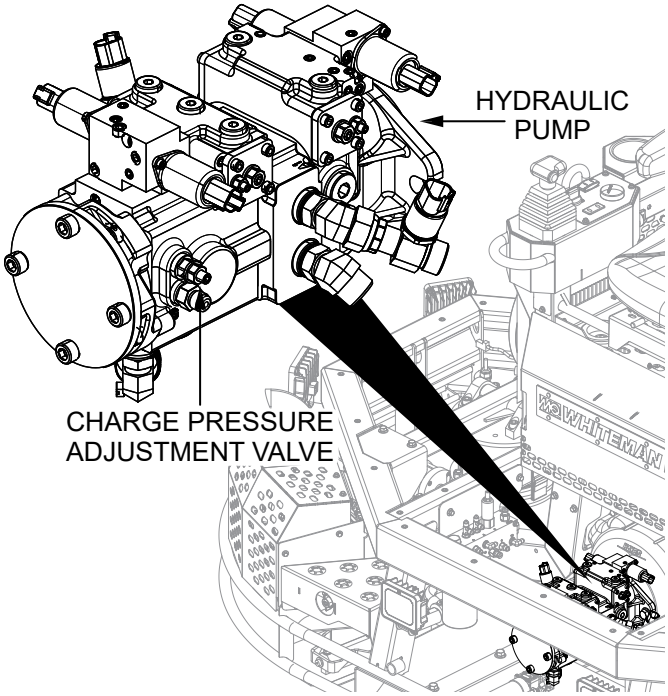


Figure 41. Charge Pressure Adjustment Valve

STEERING PRESSURE

Check the steering pressure at the **steering pressure test port** (Figure 40) on the **steering block**. Access the steering block beneath the platform at the front of the trowel.

NOTICE

A charge pressure test must be done prior to performing a steering pressure test. Refer to the previous page.

Checking The Steering Pressure

1. Make sure a charge pressure test has been performed.
2. Make sure the trowel is turned **OFF**.
3. Using a Parker PD242 diagnostic test port coupler, connect a 300–600 psi pressure test gauge to the **steering pressure test port** (Figure 40) on the **steering block**.
4. Verify the hydraulic oil level is correct. Refer to ***Hydraulic Oil*** in the ***Setup and Inspection*** section.
5. Start the engine as described in the ***Operation*** section.
6. Allow the hydraulic system to warm up to 140°F (60°C). Hydraulic temperature is indicated by the **thermal tape decal** (Figure 40) on the **hydraulic filter**.
7. Press and hold the **Cruise Control button** (Figure 27) for 5 seconds to bring the engine up to full speed (3,000 rpm).
8. Observe the pressure test gauge and record the reading. Standard factory steering pressure setting is 270 psi.

Adjusting The Steering Pressure

NOTICE

Steering pressure factory setting is 270 psi. Steering pressure must **NEVER** exceed 360 psi nor fall below 125 psi or **SYSTEM DAMAGE MAY OCCUR**.

- Steering pressure can be adjusted to provide the operator with a faster or slower steering response. Higher pressure provides a faster steering response and lower pressure results in a slower steering response.
- Remove the protective cap on the **steering pressure adjustment valve** (Figure 40) and adjust the steering pressure as needed. Replace the protective cap and reinstall the front platform 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 11 below.

Table 11. Trowel Lubrication Schedule

Components	No. of Zerk Fittings	No. of Shots per Fitting	Interval
Spiders (2)	6 each	1 to 1½	Every day
Thrust Collars (2)	2 each	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 42). Remove the **Zerk fitting cap** and set it aside.

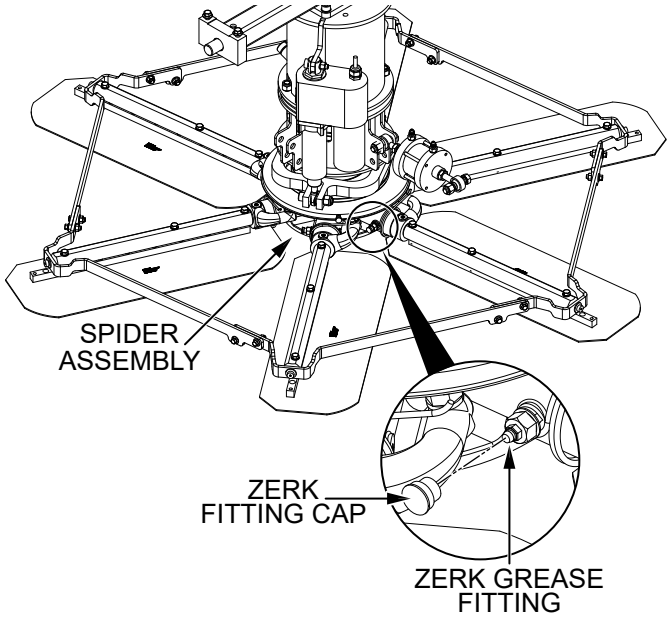


Figure 42. Spider Lubrication

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 fittings (2)** on either thrust collar (Figure 43). Remove the **Zerk fitting caps** and set them aside.

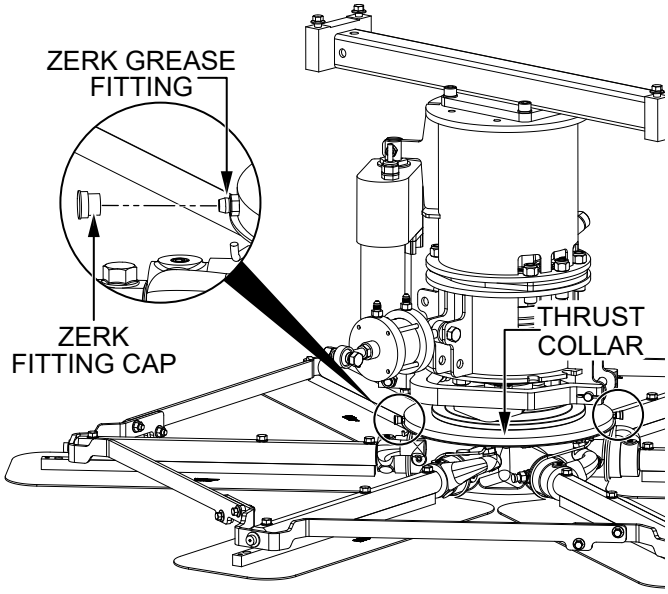


Figure 43. Thrust Collar Lubrication

2. Wipe the Zerk grease fittings clean to prevent abrasive material from entering the fittings during lubrication.
3. Lubricate both of the Zerk grease fittings with one shot each of multipurpose grade grease. Replace the Zerk grease fitting caps when finished.
4. Repeat steps 1–3 for the grease fittings 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 44). This bolt is the contact point of the **trowel arm** with the lower wear plate on the thrust collar.

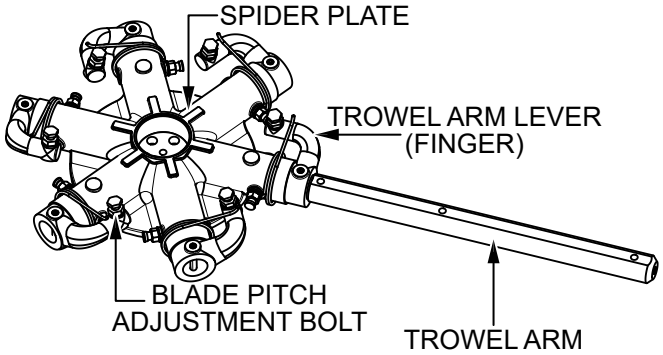


Figure 44. Blade Pitch Adjustment Bolt

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 45 illustrates the correct alignment for a spider assembly as shipped from the factory.

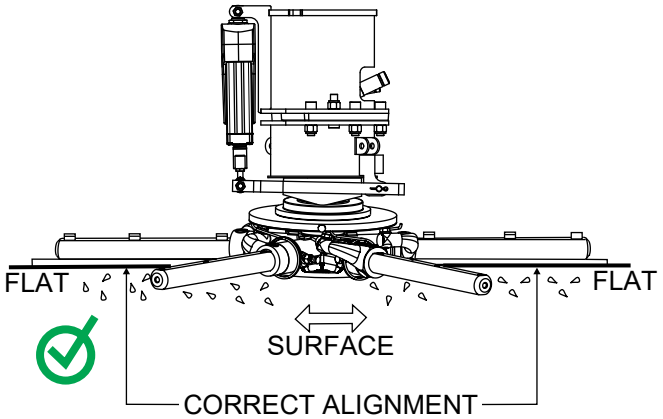


Figure 45. Correct Spider Alignment

3. If any adjustment bolts are not making contact with the lower wear plate, adjustment will be necessary. Figure 46 illustrates incorrect alignment, worn spider bushings, or bent trowel arms.

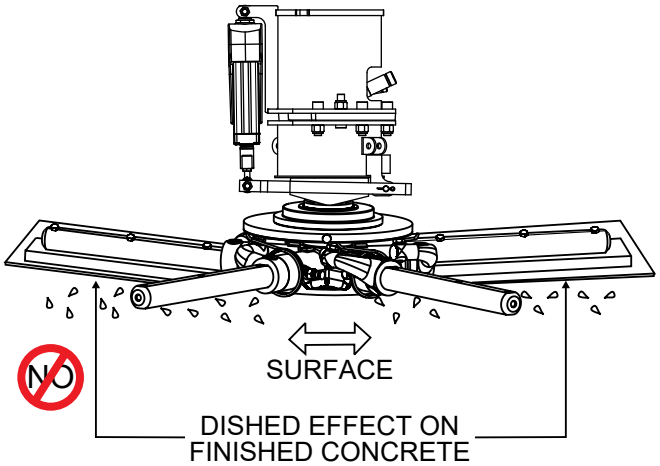


Figure 46. Incorrect Spider Alignment

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 47) on secure, level ground in an area that is free of dirt and debris.

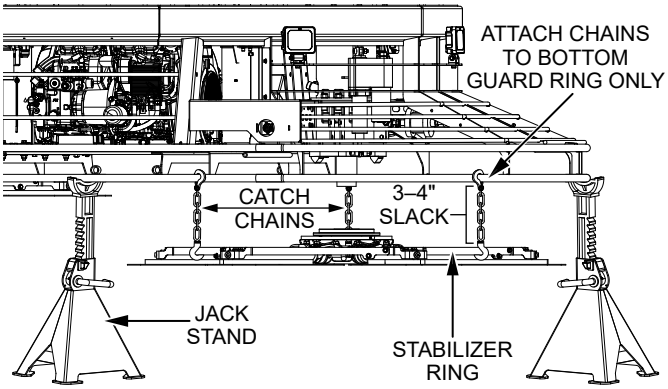


Figure 47. Preparation For Spider Removal

⚠ 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 47). 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 48) and set it aside.

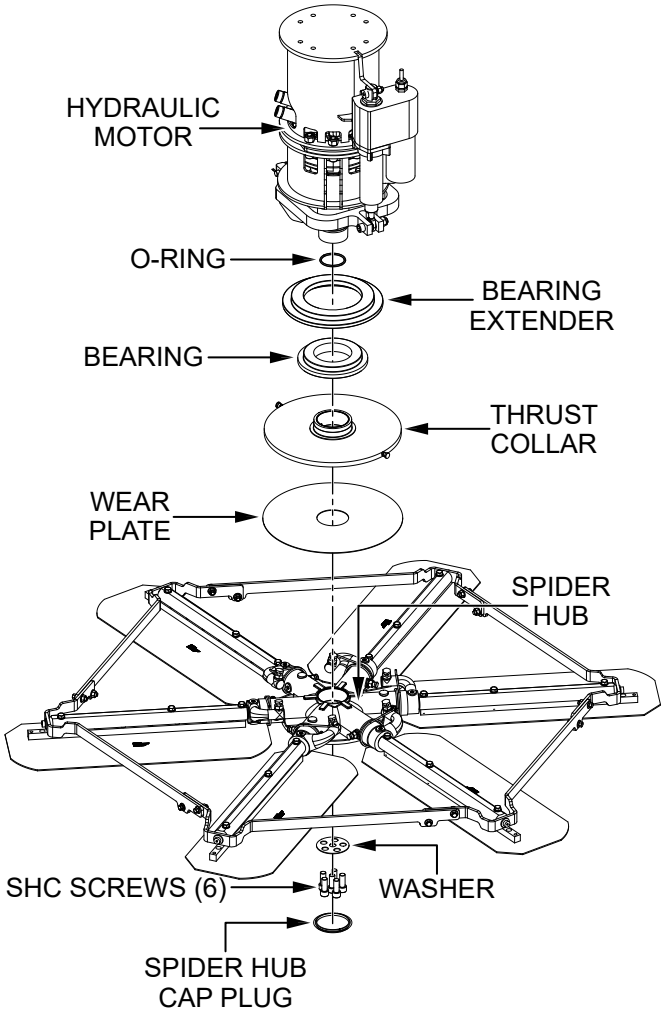


Figure 48. Rotor Assembly Components

6. Remove and set aside the **six socket-head screws** securing the **spider hub** to the **hydraulic motor shaft** (Figure 48).
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 49). Set the blades and screws aside.

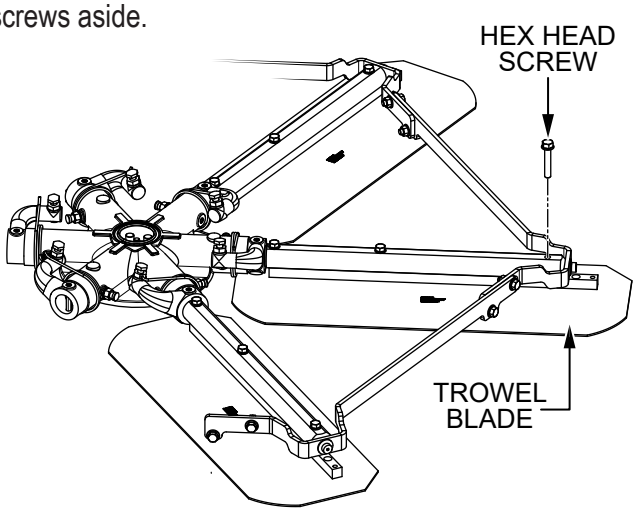


Figure 49. Blade Removal

Trowel Arm Removal

1. Remove the hardware securing the **stabilizer struts** to the trowel arms (Figure 50). Set the struts and hardware aside.

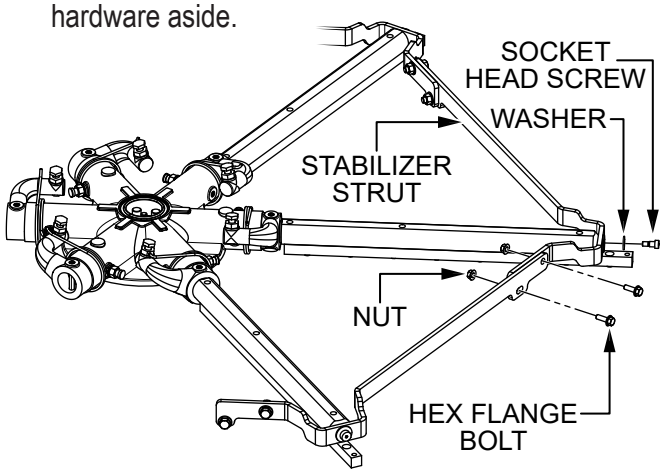


Figure 50. Stabilizer Ring Removal

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 51) from the spider hub.

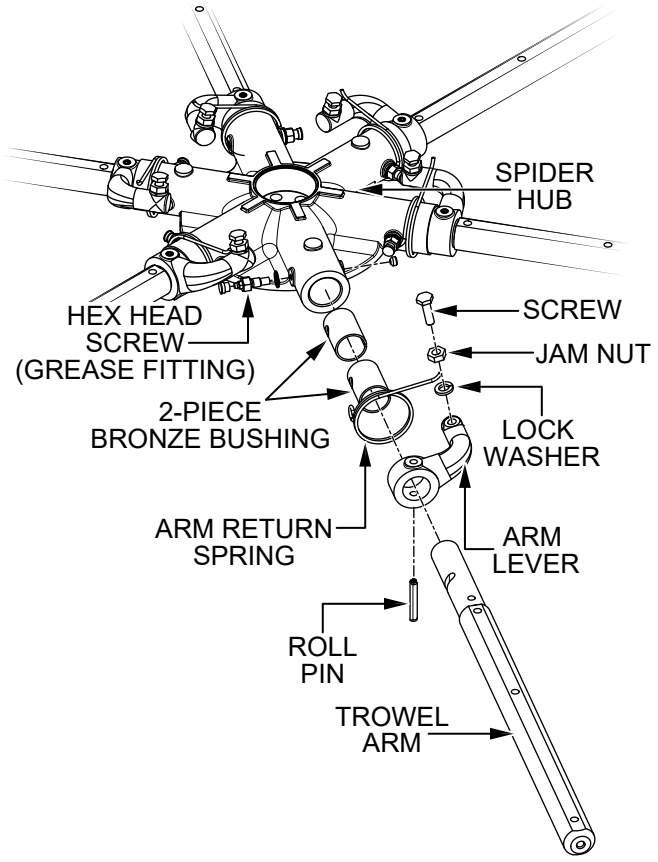


Figure 51. Trowel Arm Removal

3. Remove the **trowel arm** (Figure 51) 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 52), and clean them if necessary. Replace the bushings if they are worn or out of round.

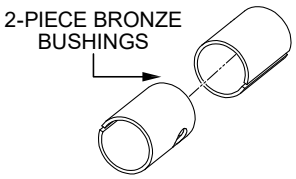


Figure 52. Bronze Bushings

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 53).

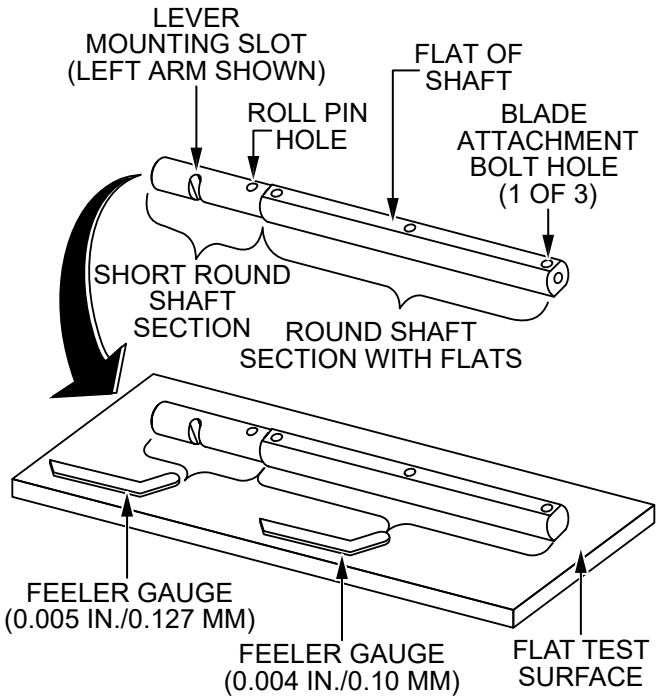


Figure 53. Checking Trowel Arm Straightness

2. Check each of the flat sides of the trowel arm (Figure 53). 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 53). 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 54 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.

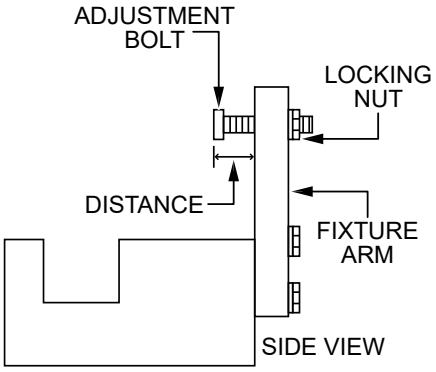


Figure 54. Trowel Arm Adjustment Tool (Side View)

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 55**A**). For trowel arms that rotate **counterclockwise**, place the fixture arm in the **DOWN** position (Figure 55**B**).

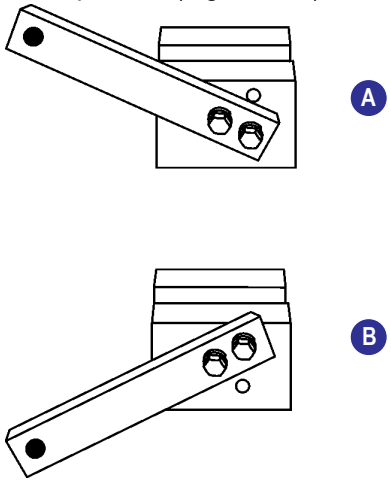


Figure 55. Fixture Arm Position

3. Adjust the fixture **adjustment bolt distance** shown in Figure 54 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 56. 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**.

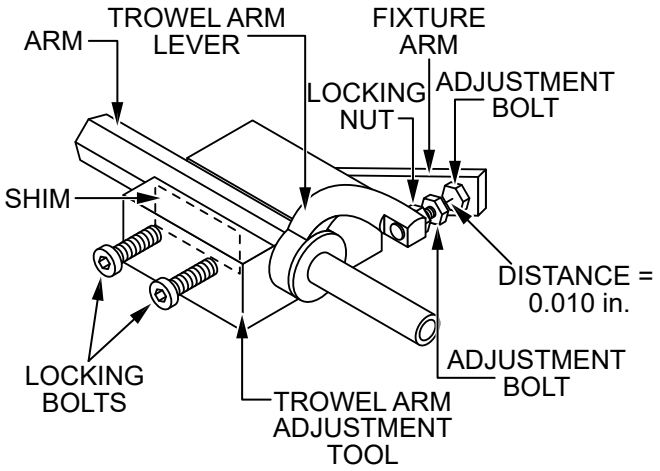


Figure 56. Trowel Arm Adjustment

5. Tighten the **locking bolts** (Figure 56) with an Allen wrench to secure the trowel arm in place.
6. Loosen the **locking nut** on the **trowel arm lever** (Figure 56), 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 57) and set it aside.

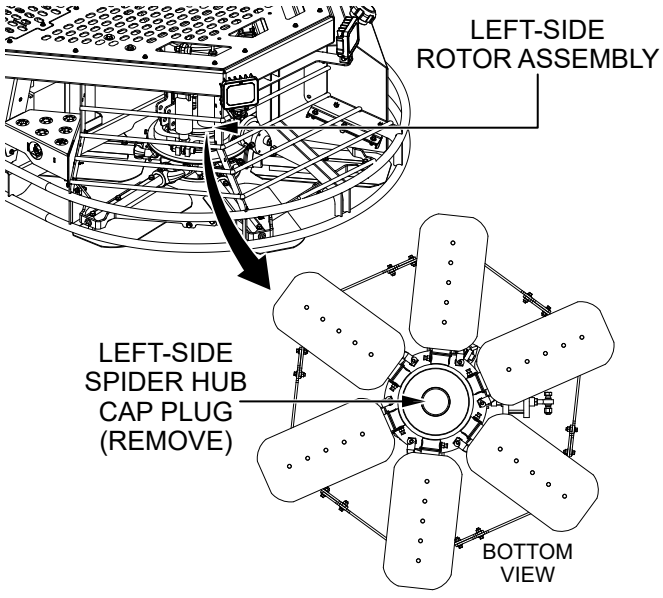


Figure 57. Remove Left-Side Spider Hub Cap Plug

⚠ 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 58) securing the left-side spider assembly to the bottom of the left-side hydraulic motor.

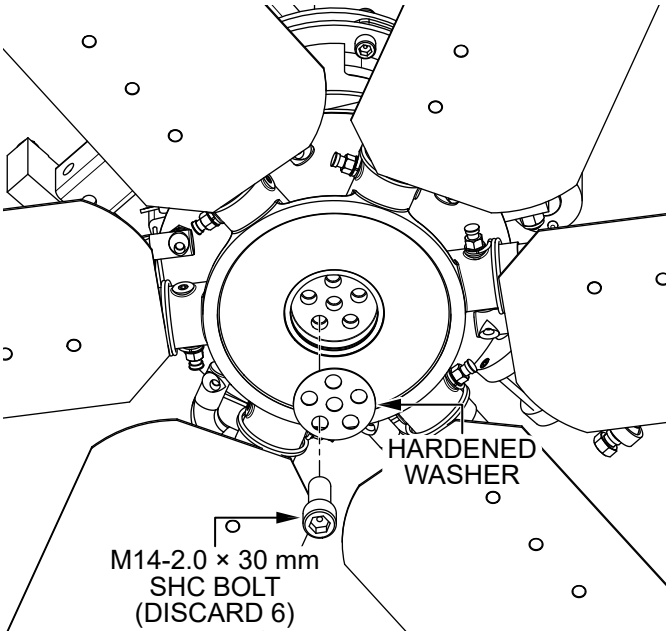


Figure 58. Remove Left-Side Spider Hardware

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 59**A**) to clean out any debris from the empty bolt holes. When finished, use **compressed air** (Figure 59**B**) to remove any remaining residue.

NOTICE

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

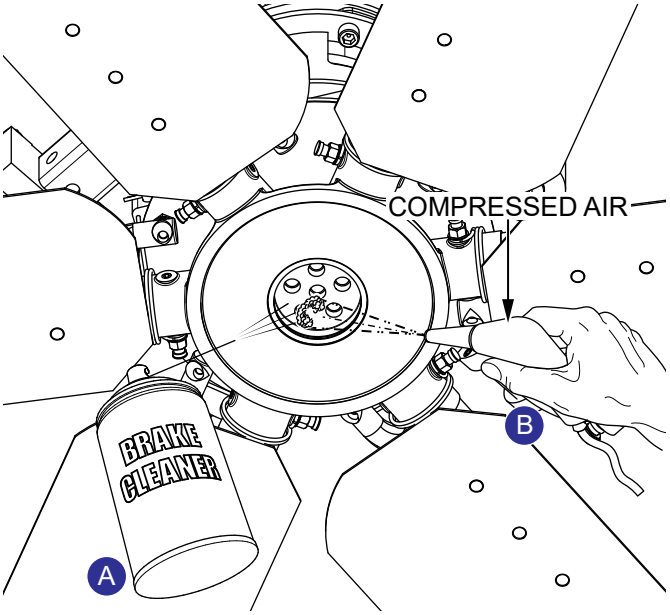


Figure 59. Clean Bolt Holes

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 60. Torque the center bolt to 40 lbf·ft (54.2 N·m).

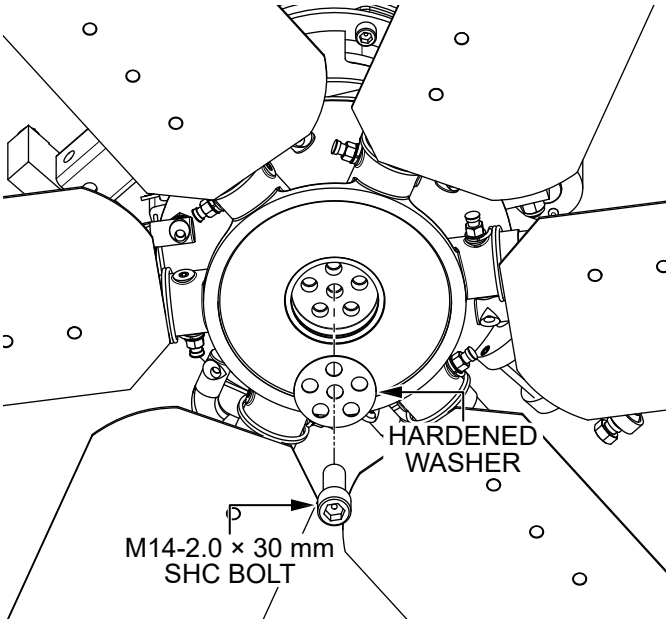


Figure 60. Install New Center Bolt And Washer

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 61. Torque the bolts in a star pattern to 60 lbf·ft (81.3 N·m).

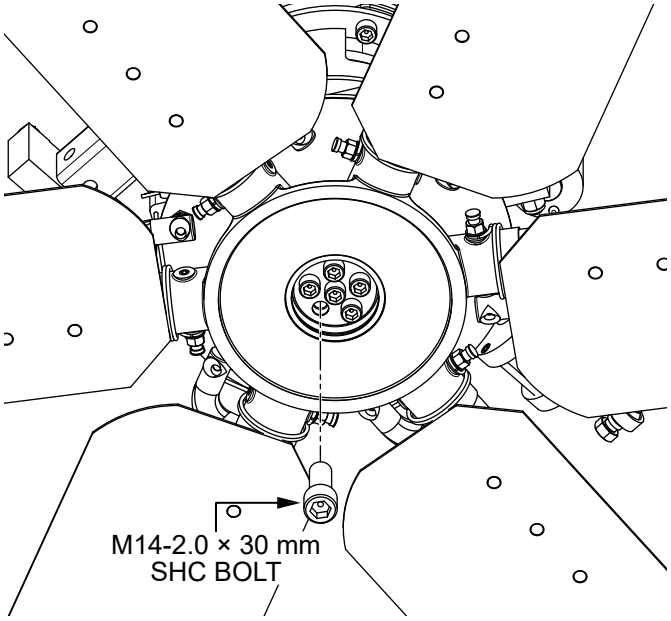


Figure 61. Install Five New Bolts

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.

EMISSION CONTROL SYSTEM

The Kubota V1505-CR-TE5 diesel engine is equipped with an emission control system consisting of a **diesel particulate filter (DPF)** and a **diesel oxidation catalyst (DOC)**. The DPF and DOC are housed within one unit (Figure 62).

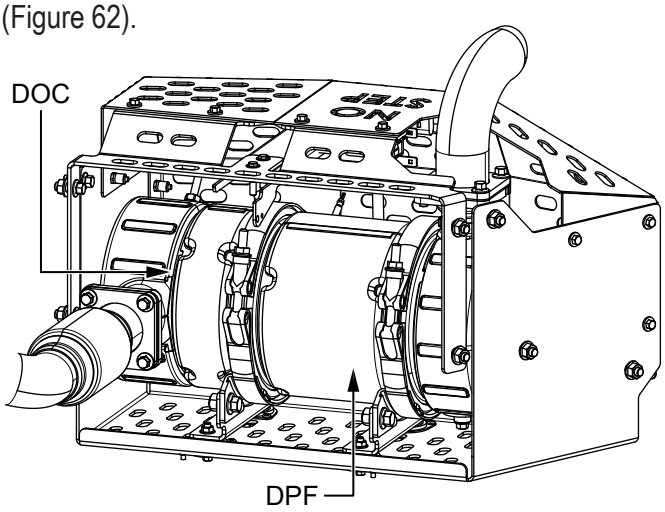


Figure 62. DPF/DOC Unit

These devices help filter out large amounts of harmful nitrogen oxides (NO_x) and particulate matter (PM) which are emitted by diesel engines. These exhaust emissions pose serious environmental and health risks. It is important to maintain and service this DPF/DOC emission safety device on a periodic basis.

Diesel Oxidation Catalyst (DOC)

Exhaust gases first enter the DOC, which uses a chemical process to break down pollutants in the exhaust stream into less harmful components. This process also generates heat which is necessary for proper functioning of the DPF.

Diesel Particulate Filter (DPF)

The DPF physically captures particulate matter (PM) in the exhaust gas, which then spontaneously combusts when the exhaust gas temperature is high.

REGENERATION

Soot accumulated in the DPF is removed via the regeneration process. There are three types of regeneration:

Passive Regeneration

Occurs continuously during normal operation. The operator is not notified.

Automatic Active Regeneration

Automatic controlled regeneration with the aid of post-injection to raise the exhaust temperature. Machine operation is not interrupted. The Inhibit switch must be OFF to enable regeneration.

Parked Active Regeneration

The operator is notified that a parked regeneration is required when soot reaches a predetermined level. Machine operation is restricted during regeneration. The machine must be parked at a safe location. The operator can cancel the parked regeneration at any time during the event.

SAFETY GUIDELINES FOR REGENERATION

For the safe operation of equipment, protection of the surrounding area, and prevention of bodily harm, use the guidelines below when regeneration is required:

- **DO NOT** perform regeneration in conditions where it may be unsafe due to high exhaust temperatures.
- **DO NOT** operate the unit in an area with poor ventilation.
- If operating the engine indoors, install exhaust/ventilation equipment and ensure that there is sufficient ventilation.
- If you begin to feel sick, stop the unit immediately and ventilate the area.
- During the regeneration process, the area above and around the generator should be free of any type of debris or flammable/combustible materials, as temperatures during the regeneration process can reach as high as 1,292°F (700°C).

REGENERATION PROCEDURES

DPF/Regeneration indicators (Table 12) are shown on the left side of the diagnostic display's main screen (Figure 63). Use the Up Arrow and Down Arrow buttons to scroll through the diagnostic display screens. Press both buttons simultaneously to make a selection. The current selection is indicated by an asterisk (*).

Initiate Parked Regen

The Inhibit switch is **OFF** by default, which allows automatic active regeneration. When parked active regeneration is needed, the operator will be notified by the **Regen Needed icon** (Figure 63) on the diagnostic display. To initiate a parked active regeneration:

1. Park the trowel in a safe location. Make sure the surrounding area is well ventilated and free of any flammable material.
2. From the main screen on the diagnostic display (Figure 63), press the Up Arrow and Down Arrow buttons simultaneously to enter the menu system.

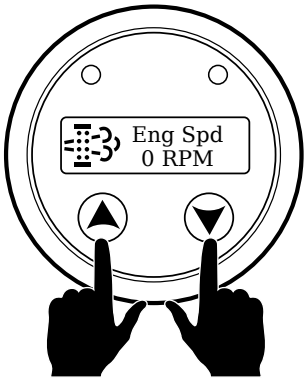


Figure 63. Main Screen (Regen Needed)

3. Scroll until **SET TIER 4** is shown on the display (Figure 64). This submenu contains the engine regeneration controls. Press the Up Arrow and Down Arrow buttons simultaneously to enter the submenu.

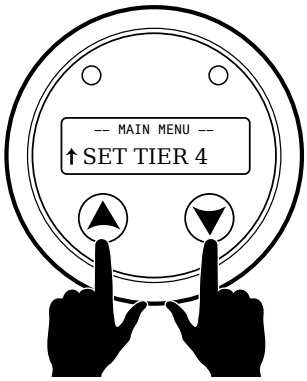


Figure 64. Set Tier 4 Submenu

4. **AUTO** (Inhibit switch **OFF**) is the factory default. The asterisk (*) next to **AUTO** indicates this is the current selection.

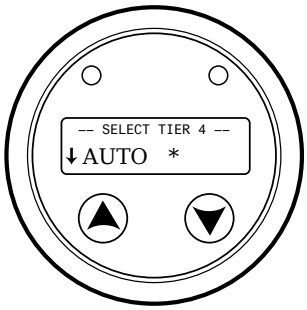


Figure 65. AUTO (Factory Default)

5. Scroll until **REQUEST** is shown on the display (Figure 66), then press the Up Arrow and Down Arrow buttons simultaneously. This will initiate a parked active regeneration.

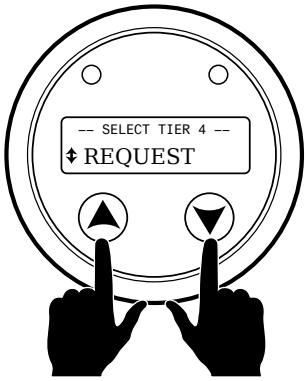


Figure 66. REQUEST (Parked Regen)

6. The **Active Regen icon** (Table 12) will appear on the main screen while regeneration is occurring.

NOTICE

If a parked regeneration is not intiated after the Regen Needed icon is displayed, a power de-rate will occur.

Inhibit Switch ON

To avoid the higher exhaust temperatures caused by regeneration, turn the Inhibit switch **ON** to prevent active regeneration:

1. Access the Set Tier 4 submenu as shown above.
2. Scroll until **INHIBIT** is shown on the display (Figure 67).

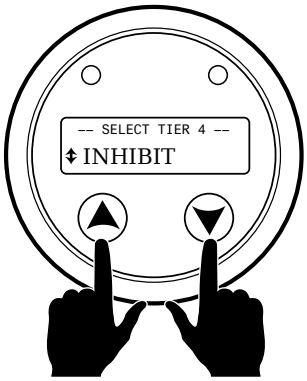


Figure 67. INHIBIT (Select To Inhibit Regen)

3. Press the Up Arrow and Down Arrow buttons simultaneously to turn the Inhibit switch **ON**.

Inhibit Switch OFF

To allow active regeneration, turn the Inhibit switch **OFF**:

1. Access the Set Tier 4 submenu as shown above.
2. Scroll until **AUTO** is shown on the display (Figure 68).

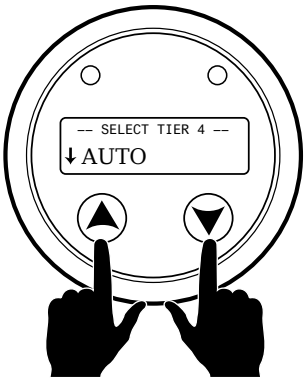


Figure 68. AUTO (Select To Allow Regen)

3. Press the Up Arrow and Down Arrow buttons simultaneously to turn the Inhibit switch OFF.

Return To Main Screen

1. After making your selections, scroll until **EXIT** is shown on the display (Figure 69), then press the Up Arrow and Down Arrow buttons simultaneously to exit the Set Tier 4 submenu.

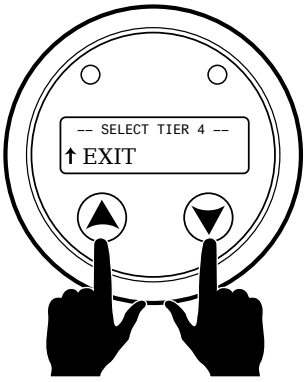


Figure 69. Select EXIT

2. Scroll until **SHOW 1-UP** is shown on the display (Figure 70), then press the Up Arrow and Down Arrow buttons simultaneously to exit the Main menu.

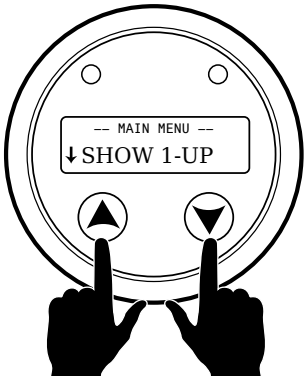


Figure 70. Select SHOW 1-UP

ACCUMULATION OF ASH

The regeneration process removes soot, not ash, from the DPF. Ash comes from burned engine lubricants and consists of inorganic oxides, primarily calcium sulfate ($CaSO_4$). Ash connot be cleaned via the normal regeneration process. To remove ash, the DPF must be removed and serviced. This cleaning process must be performed by specialists, as ash consists of toxic materials. The service interval is every 3,000 hours of operation. Refer to Table 10.

NOTICE

Use only API CJ-4 or CK-4 engine oil to help prevent ash accumulation in the DPF. Do not use anti-corrosion, fuel additives, etc. as these contribute to ash accumulation.

Table 12. Regeneration Indicators					
Regeneration Level	**Regeneration Condition**	**Inhibit Switch Status** 	**Active Regen Icon** 	**Regen Needed Icon** 	**Malfunction Indicator Icon** 
Level 0: Passive Regeneration	Regeneration not needed	ON	OFF	OFF	OFF
Level 0: Passive Regeneration	Regeneration not needed	OFF	OFF	OFF	OFF
Level 1: Active Regeneration	Active regeneration needed	ON	OFF	ON	OFF
	Active regeneration occurring	OFF	ON	ON	OFF
Level 2: Active Or Parked Regeneration	Active/parked regeneration needed	ON	OFF	Flashing	OFF
	Active/parked regeneration occurring	OFF	ON	ON	OFF
Level 3: De-Rating Power	Parked regeneration needed	ON	OFF	Flashing	ON SPN: 3701 FMI: 15
	Parked regeneration occurring	OFF	ON	ON	ON SPN: 3701 FMI: 15
Level 4: De-Rating Power	Parked regeneration needed by service tool	ON	OFF	Flashing	ON SPN: 3701 FMI: 16
	Parked regeneration occurring by service tool	OFF	ON	ON	ON SPN: 3701 FMI: 16
Level 5: Engine Stop	DPF service required; Active and parked regeneration disabled	ON	OFF	Flashing	ON SPN: 3701 FMI: 00
		OFF	OFF	Flashing	ON SPN: 3701 FMI: 00

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 engine oil, fuel, 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. On the diagnostic display, the left LED (Amber, Warning) or right LED (Red, Shutdown) will turn **ON** to indicate the status of the fault, and the screen will automatically switch to the Active Faults menu. When this happens, shut down the engine and correct the problem. See Table 13 for machine fault codes and Table 14 – Table 20 for engine fault codes.

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.

NOTICE

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

Table 13. 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 14. Engine Fault Codes

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
NE-G phase shift NE: Crankshaft position sensor G: Camshaft position sensor	P0016	636	7	Engine Position Sensor	Large phase shift between NE pulse and G pulse	- Engine is operating low idle speed or more - Battery voltage is normal - Sensor supply voltage VCC# is normal - NE signal is normal - G signal is normal - Coolant temperature is 10 deg. C (50 deg. F) or more	(Approximately) Phase difference between NE pulse and G pulse is within +/-15 degree	10 times or more	Output limitation: Approximately 75% of normal condition			ON	Inhibit	(Invalid G signal) - Engine hesitates at start-up	Diagnostic counter = zero or Key switch turn OFF	Delay time varies with engine speed in proportional relation 30 sec at 800 rpm 15 sec at 1600 rpm
High rail pressure	P0088	157	0	Engine Injector Metering Rail 1 Pressure	Actual pressure exceeds the command pressure (detects high pressure exceeding the using range)	- Rail pressure sensor is normal - Sensor supply voltage VCC# is normal	Actual pressure is 197 MPa (2010 kg/cm2, 28600 psi) or more	one sec or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Diagnostic counter = zero or Key switch turn OFF	30 sec
SCV stuck	P0089	1347	7	Engine Fuel Pump Pressurizing Assembly #1	SCV stuck at open position (Actual rail pressure continuously exceeds the command rail pressure)	- Supply pump is normal and pump calibration has been executed - Engine is operating (Q: 4 mm3/st or more) - Injector is normal - Battery voltage is normal - Sensor supply voltage VCC# is normal - Rail pressure sensor is normal	Discharge request of supply pump goes 0 mm3/st or less and the actual rail pressure is 10 MPa (100 kg/cm2, 1400 psi) higher than command pressure Above state continues for 26 seconds or more	one time or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Fuel leak (in high pressured fuel system)	P0093	1239	1	Engine Fuel Leakage 1	Fuel leak from high pressured fuel system (Fuel consumption is calculated from the difference of fuel pressure of before and after the injection, and the error will be detected when excess fuel consumption is found)	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Rail pressure sensor is normal - Supply pump (SCV) is normal - Injector and injector drive circuit are normal - NE signal is active [Engine is operating (700 rpm or more)] - No DTC of P0088, P0089	(a) the flow volume which is calculated from the difference of rail pressure (decrease) (b) total volume of injection and leakage Fuel leak is judged with following conditions: when the difference of (a) and (b) is 400 mm3/st or above, (a) is higher than (b), and fuel leak is not from opening pressure limiter	one time or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Intake air temp. error: Low	P0112	172	4	Engine Air Inlet Temperature	Ground short circuit of sensor or harness	- Battery voltage is normal	Voltage of intake air temperature sensor is 0.05 V or less	2.8 sec or more	During start-up = -20 deg. C (-4 deg. F) [default value] Under other conditions = 40 deg. C (104 deg. F) [default value]			ON	Inhibit	- White smoke increases at low temperature	Diagnostic counter = zero or Key switch turn OFF	30 sec
Intake air temp. error: High	P0113	172	3	Engine Air Inlet Temperature	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal	Voltage of intake air temperature sensor is 4.9 V or more	2.8 sec or more	During start-up = -20 deg. C (-4 deg. F) [default value] Under other conditions = 40 deg. C (104 deg. F) [default value]			ON	Inhibit	- White smoke increases at low temperature	Diagnostic counter = zero or Key switch turn OFF	30 sec
Coolant temperature sensor: Low	P0117	110	4	Engine Coolant Temperature	Ground short circuit of sensor or harness	- Battery voltage is normal	Voltage of coolant temperature sensor is 0.1 V or less	2.8 sec or more	During start-up = -25 deg. C (-13 deg. F) [default value] Under other conditions = 80 deg. C (176 deg. F) [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- White smoke increases at low temperature - Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Coolant temperature sensor: High	P0118	110	3	Engine Coolant Temperature	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal	Voltage of coolant temperature sensor is 4.9 V or more	2.8 sec or more	During start-up = -25 deg. C (-13 deg. F) [default value] Under other conditions = 80 deg. C (176 deg. F) [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- White smoke increases at low temperature - Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Fuel temperature sensor: Low	P0182	174	4	Engine Fuel Temperature 1	Ground short circuit of sensor or harness	- Battery voltage is normal	Voltage of temperature sensor in supply pump is 0.1 V or less	2.8 sec or more	During start-up = -20 deg. C (-4 deg. F) [default value] Under other conditions = 45 deg. C (113 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	30 sec
Fuel temperature sensor: High	P0183	174	3	Engine Fuel Temperature 1	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal	Voltage of temperature sensor in supply pump is 4.9 V or more	2.8 sec or more	During start-up = -20 deg. C (-4 deg. F) [default value] Under other conditions = 45 deg. C (113 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	30 sec
Rail pressure sensor: Low	P0192	157	4	Engine Injector Metering Rail 1 Pressure	Ground short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Voltage of rail pressure sensor is 0.59 V or less	transient	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open Engine forcibly stopped 60 sec later	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine running noise increases - White smoke increases - Engine stops	Key switch turn OFF	—

Table 15. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Rail pressure sensor: High	P0193	157	3	Engine Injector Metering Rail 1 Pressure	Open circuit or +B short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Voltage of rail pressure sensor is 4.875 V or above	transient	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open Engine forcibly stopped 60 sec later	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine running noise increases - White smoke increases - Engine stops	Key switch turn OFF	—
Injector charge voltage: High	P0200	523535	0	proprietary	Injector charge voltage: High	- Battery voltage is normal - CPU is normal	Injector charge voltage: High	10 sec or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open Engine forcibly stopped 60 sec later			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops	Key switch turn OFF	—
Open circuit of harness or coil in 1st cylinder injector	P0201	651	3	Engine Injector Cylinder #01	Open circuit of harness Open circuit of injector coil	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Open circuit of harness or Open circuit of injector coil	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions	Key switch turn OFF	—
Open circuit of harness or coil in 3rd cylinder injector	P0202	653	3	Engine Injector Cylinder #03	Open circuit of harness Open circuit of injector coil	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Open circuit of harness or Open circuit of injector coil	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions	Key switch turn OFF	—
Open circuit of harness or coil in 4th cylinder injector	P0203	654	3	Engine Injector Cylinder #04	Open circuit of harness Open circuit of injector coil	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Open circuit of harness or Open circuit of injector coil	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions	Key switch turn OFF	—
Open circuit of harness or coil in 2nd cylinder injector	P0204	652	3	Engine Injector Cylinder #02	Open circuit of harness Open circuit of injector coil	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Open circuit of harness or Open circuit of injector coil	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions	Key switch turn OFF	—
Engine overheat	P0217	110	0	Engine Coolant Temperature	Overheat of engine coolant temperature	- Coolant temperature sensor is normal	Engine coolant temperature is 120 deg. C (248 deg. F) or more	5 sec or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- Insufficient output - Overheat	Diagnostic counter = zero or Key switch turn OFF	30 sec
Engine overrun	P0219	190	0	Engine Speed	Engine speed exceeds threshold speed	- Key switch is ON	Engine speed is 4800 rpm or more	3 revolutions or more	Stop injection (Q = 0 mm3/st)			ON	Inhibit	- Overrun	Diagnostic counter = zero or Key switch turn OFF	Immediately
Boost pressure sensor: Low	P0237	102	4	Engine Intake Manifold #1 Pressure	Ground short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Voltage of boost pressure sensor is 0.2 V or less	2.8 sec or more	65 kPa (0.663 kg/cm2, 9.43 psi) [default value]	Default value is set in consideration with high altitude usage		ON	Inhibit	- Insufficient output	Key switch turn OFF	—
Boost pressure sensor: High	P0238	102	3	Engine Intake Manifold #1 Pressure	Open circuit or +B short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Voltage of boost pressure sensor is 4.9 V or more	2.8 sec or more	65 kPa (0.663 kg/cm2, 9.43 psi) [default value]	Default value is set in consideration with high altitude usage		ON	Inhibit	- Insufficient output	Key switch turn OFF	—
No input of NE sensor (Crank position sensor) pulse	P0335	636	8	Engine Position Sensor	Open circuit or short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Engine is not stalled	No recognition of NE sensor pulse	10 times or more	Output limitation: Approximately 75% of normal condition			ON	Inhibit	(Running only with G signal) - Faulty starting - Engine vibration increases slightly - Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Delay time varies with engine speed in proportional relation 30 sec at 800 rpm 15 sec at 1600 rpm
NE sensor (Crank position sensor) pulse number error	P0336	636	2	Engine Position Sensor	Open circuit or short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Engine speed is 350 rpm or more	Pulse count per rotation is not 56 teeth	10 times or more	Output limitation: Approximately 75% of normal condition			ON	Inhibit	(Running only with G signal) - Faulty starting - Engine vibration increases slightly - Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Delay time varies with engine speed in proportional relation 30 sec at 800 rpm 15 sec at 1600 rpm
No input of G sensor (Camshaft position sensor) pulse	P0340	723	8	Engine Speed 2	Open circuit or short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Engine is not stalled	No recognition of G sensor pulse	10 times or more	None			ON	Inhibit	(Invalid G signal) - Engine hesitates at start-up	Diagnostic counter = zero or Key switch turn OFF	Delay time varies with engine speed in proportional relation 30 sec at 800 rpm 15 sec at 1600 rpm
G sensor (Camshaft position sensor) pulse number error	P0341	723	2	Engine Speed 2	Open circuit or short circuit of sensor or harness Failure of sensor	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Engine speed is 350 rpm or more	Pulse count per rotation is not 5 teeth	10 times or more	None			ON	Inhibit	(Invalid G signal) - Engine hesitates at start-up	Diagnostic counter = zero or Key switch turn OFF	Delay time varies with engine speed in proportional relation 30 sec at 800 rpm 15 sec at 1600 rpm
+B short of starting aid relay driving circuit	P0380	523544	3	proprietary	+B short or open circuit of starting aid relay driving circuit	- Battery voltage is normal - Open circuit: During starting aid relay drive command is activated - +B short: Key switch is ON	+B short or open circuit of harness	one sec or more	None			ON	Inhibit	(At low temperature) - Faulty starting - White smoke increases	Key switch turn OFF	—
Ground short of starting aid relay driving circuit	P0380	523544	4	proprietary	Ground short circuit of starting aid relay driving circuit	- Battery voltage is normal - During starting aid relay drive command is activated	Ground short or circuit of harness	one sec or more	None			ON	Inhibit	(At low temperature) - Faulty starting - White smoke increases	Key switch turn OFF	—
Oil pressure error	P0524	100	1	Engine Oil Pressure	Oil pressure switch	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated - 10 sec or more after engine start [Engine speed is 950 rpm or more]	Oil pressure switch ON: continues one sec or more	transient	None			ON	Inhibit	- Engine stops	Key switch turn OFF	—

Table 16. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Battery voltage: Low	P0562	168	4	Battery Potential / Power Input 1	Open circuit, short circuit or damage of harness Failure of battery	- Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	Not monitored during cranking ECU recognition of battery voltage is 8 V or less	one sec or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Diagnostic counter = zero or Key switch turn OFF	30 sec
Battery voltage: High	P0563	168	3	Battery Potential / Power Input 1	Open circuit, short circuit or damage of harness Failure of battery	- Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	ECU recognition of battery voltage is 16 V or more	one sec or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
QR data error	P0602	523538	2	proprietary	QR data read error	- Key switch is ON	QR data read error from EEPROM	transient	Nozzle correction is not executed Output limitation: Approximately 75% of normal condition	To cover each injector dispersion		ON	Inhibit	- Insufficient output	Key switch turn OFF	—
No QR data	P0602	523538	7	proprietary	QR data is unwritten	- Key switch is ON	Area of QR data on EEPROM is vacant	transient	Nozzle correction factor = 0 [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	- Insufficient output	Key switch turn OFF	—
ECU FLASH ROM error	P0605	628	2	Program Memory	FLASH ROM error	- Key switch is ON	Check-sum error	one time or more	Engine stops without delay			ON	Inhibit	- Engine stops	Key switch turn OFF	—
ECU CPU (Main IC) error	P0606	1077	2	Engine Fuel Injection Pump Controller	Failure of CPU	- Key switch is ON - Battery voltage is 10 V or more - Starter switch signal (ECU: V12 terminal) is not activated	CPU fatal error	one time or more	Engine stop			ON	Inhibit	- Engine stops	Key switch turn OFF	—
ECU CPU (Monitoring IC) error	P0606	523527	2	proprietary	Failure of monitoring IC of CPU	- Key switch is ON - Battery voltage is 10 V or more - Starter switch signal (ECU: V12 terminal) is not activated	Failure of monitoring IC of CPU	one time or more	Engine stop			ON	Inhibit	- Engine stops	Key switch turn OFF	—
Injector charge voltage: Low	P0611	523525	1	proprietary	Injector charge voltage: Low Failure of charge circuit of ECU	- Battery voltage is normal - CPU is normal	Injector charge voltage: Low Failure of charge circuit of ECU	transient	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
SCV drive system error	P0628	1347	4	Engine Fuel Pump Pressurizing Assembly #1	Open circuit or ground short circuit of SCV	- Battery voltage is normal - Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	Open circuit or ground short of SCV	2.6 sec or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open Engine forcibly stopped 60 sec later	Engine speed may go down due to low fuel pressure regardless limp home de-rating Engine may stop automatically before stopped forcibly by ECU		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops	Key switch turn OFF	—
+B short circuit of SCV	P0629	1347	3	Engine Fuel Pump Pressurizing Assembly #1	+B short circuit of SCV	- Battery voltage is normal - Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	+B short circuit of SCV	2.6 sec or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open Engine forcibly stopped 60 sec later			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions - Engine stops	Key switch turn OFF	—
Sensor supply voltage 1: Low	P0642	3509	4	Sensor supply voltage 1	Sensor supply voltage 1 error or recognition error	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated	Voltage to sensor is 4.375 V or less	transient	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	Emission related		ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Sensor supply voltage 1: High	P0643	3509	3	Sensor supply voltage 1	Sensor supply voltage 1 error or recognition error	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated	Voltage to sensor is 5.625 V or more	transient	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	Emission related		ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Sensor supply voltage 2: Low	P0652	3510	4	Sensor supply voltage 2	Sensor supply voltage 2 error or recognition error	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated	Voltage to sensor is 4.375 V or less	transient	Output limitation: Approximately 75% of normal condition	Emission related		ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Sensor supply voltage 2: High	P0653	3510	3	Sensor supply voltage 2	Sensor supply voltage 2 error or recognition error	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated	Voltage to sensor is 5.625 V or more	transient	Output limitation: Approximately 75% of normal condition	Emission related		ON	Inhibit	- Faulty starting - Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Main relay is locked in closed position	P0687	1485	2	ECM Main Relay	Failure of main relay	- Key switch turn OFF - Engine stops	Main relay stays active longer than 1 sec without command	2 times or more	None			ON	Inhibit	- Battery goes dead	Diagnostic counter = zero or Key switch turn OFF	5.3 sec
Pump seizing 1	P1274	523539	2	proprietary	High pressure 1 error	- Sensor supply voltage VCC# is normal - Rail pressure sensor is normal	(Approximate parameter) Rail pressure of 230 MPa (2350 kg/cm2, 33400 psi) or more continues 1 sec under the condition of 500 rpm or more [Threshold changes depending on the engine speed. 2600 rpm should be used as a reference]	one time or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF To avoid extremely high pressure in injection system		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—

Table 17. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Pump seizing 2	P1275	523540	2	proprietary	High pressure 2 error	- Sensor supply voltage VCC# is normal - Rail pressure sensor is normal	(Approximate parameter) Rail pressure of more than 197 MPa (2010 kg/cm2, 28600 psi), and less than 230 MPa (2350 kg/cm2, 33400 psi) continues total time for 35 seconds under condition of 500 rpm or more [Threshold changes depending on the engine speed. 2600 rpm should be used as a reference] Or, rail pressure of more than 80 MPa (820 kg/cm2, 12000 psi) continues total time for 1 second under condition of less than 500 rpm [Threshold changes depending on the engine speed. 200 rpm should be used as a reference]	one time or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF To avoid extremely high pressure in injection system		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
ECU internal power supply error	P1C00	523634	2	proprietary	ECU internal power supply error	- Battery voltage is normal - Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	Abnormal of ECU internal power supply	2.8 sec or more	None			ON	Inhibit	-	Key switch turn OFF	-
ECU internal IC error	P1C01	523635	2	proprietary	ECU internal IC error	- Battery voltage is normal - Key switch is ON	Internal ECU communication error	2 times or more	None			ON	Inhibit	-	Key switch turn OFF	
ECU internal memory error	P1C02	523636	2	proprietary	ECU internal memory error	- Key switch is ON	ECU internal EEPROM memory error	transient	Low idle			ON	Inhibit	-	Key switch turn OFF	-
Battery voltage too low	P1C04	168	1	Battery voltage too low	Open circuit, short circuit or damage of harness Failure of battery	- Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	ECU recognition of battery voltage is below 6 V Not monitored during cranking	2 sec or more	Engine stop			ON	Inhibit	- Engine stops	Key switch turn OFF	-
Accelerator position sensor 1: Low	P2122	91	4	Accelerator Pedal Position 1	Ground short circuit or open circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC2 is normal	Voltage of accelerator position sensor 1 is 0.3 V or less	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	3 sec
Accelerator position sensor 1: High	P2123	91	3	Accelerator Pedal Position 1	+B short circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC2 is normal	Voltage of accelerator position sensor 1 is 4.8 V or more	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	3 sec
Accelerator position sensor 2: Low	P2127	29	4	Accelerator Pedal Position 2	Ground short circuit or open circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC1 is normal	Voltage of accelerator position sensor 2 is 0.3 V or less	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	3 sec
Accelerator position sensor 2: High	P2128	29	3	Accelerator Pedal Position 2	+B short circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC1 is normal	Voltage of accelerator position sensor 2 is 4.8 V or more	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	3 sec
Accelerator position sensor error (CAN)	P2131	523543	2	proprietary	Accelerator position sensor signal error (sensor or harness open circuit, ground short circuit etc.)	- Battery voltage is normal - Key switch turn ON - Starter switch signal (ECU: V12 terminal) is not activated	Accelerator position sensor error signal received by CAN	transient	Not applicable (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF (CAN signal recovers)	Immediately
Injector drive circuit open in No. 1 & 4 cylinder simultaneously	P2146	523523	2	proprietary	Wiring harness open circuit	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Wiring harness open circuit	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
No. 1 & 4 cylinder injector short to ground at power supply side, or all cylinder injector short to ground	P2147	523523	4	proprietary	Wiring harness short to ground	- Engine is operating - Battery voltage is normal	Wiring harness short to ground	8 times or more	Injectors which have error stop injection Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
No. 1 & 4 cylinder injector short to +B at power supply side, or all cylinder injector short to +B	P2148	523523	3	proprietary	Wiring harness short to +B	- Engine is operating - Battery voltage is normal	Wiring harness short to +B	8 times or more	Injectors which have error stop injection Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Injector drive circuit open in No. 2 & 3 cylinder simultaneously	P2149	523524	2	proprietary	Wiring harness open circuit	- Engine is operating - Battery voltage is normal - During injection - CPU is normal	Wiring harness open circuit	8 times or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
No. 2 & 3 cylinder injector short to ground at power supply side, or all cylinder injector short to ground	P2150	523524	4	proprietary	Wiring harness short to ground	- Engine is operating - Battery voltage is normal	Wiring harness short to ground	8 times or more	Injectors which have error stop injection Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
No. 2 & 3 cylinder injector short to +B at power supply side, or all cylinder injector short to +B	P2151	523524	3	proprietary	Wiring harness short to +B	- Engine is operating - Battery voltage is normal	Wiring harness short to +B	8 times or more	Injectors which have error stop injection Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	To minimize PM emission to DPF Injectors which have no error are operated		ON	Inhibit	- Insufficient output - Engine vibration increases - Worsening exhaust gas emissions - Engine stops in some cases	Key switch turn OFF	—
Barometric pressure sensor error (Low side)	P2228	108	4	Barometric Pressure	Sensor or ECU internal circuit short to ground	- Battery voltage is normal	Barometric pressure sensor voltage: 0.5 V or less	2.8 sec or more	65 kPa (0.663 kg/cm2, 9.43 psi) [default value]	Default value is set in consideration with high altitude usage		ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Immediately
Barometric pressure sensor error (High side)	P2229	108	3	Barometric Pressure	Sensor or ECU internal circuit short to +B	- Battery voltage is normal	Barometric pressure sensor voltage: 4.5 V or more	2.8 sec or more	65 kPa (0.663 kg/cm2, 9.43 psi) [default value]	Default value is set in consideration with high altitude usage		ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Immediately

Table 18. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. If DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Water in fuel filter failure (Optional)	P3014	97	31	Water in Fuel Indicator	Water level in fuel filter	- Battery voltage is normal - Key switch is ON - Starter switch signal (ECU: V12 terminal) is not activated	Sedimenter switch ON	transient	None			ON	Permit	- Insufficient output - Engine stops	Diagnostic counter = zero or Key switch OFF	—
CAN2 Bus off	U0075	523547	2	proprietary	CAN2 +B or ground short circuit or high traffic error	- Battery voltage is normal - Key switch is ON	CAN2 bus off	2 sec or more	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output - Transmitted CAN data are invalid	Key switch turn OFF	—
CAN1 Bus off	U0077	523604	2	proprietary	CAN1 +B or ground short circuit or high traffic error	- Battery voltage is normal - Key switch is ON	CAN1 bus off	2 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Transmitted CAN data are invalid	Key switch turn OFF	—
CAN-Kubota frame error	U0081	523548	2	proprietary	CAN-Kubota original frame open circuit error	- Battery voltage is normal - Key switch turn OFF to ON - Starter switch signal (ECU: V12 terminal) is not activated - NO error of "CAN2 Bus off"	CAN2 Kubota frame open circuit error	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Key switch turn OFF	—

DTC Code LIST (Aftertreatment related)

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. If DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Intake air temp. built-in MAF sensor: Low	P0072	171	4	Ambient Air Temperature	Ground short circuit of sensor or harness	- Battery voltage is normal	Intake air temp. built-in MAF sensor voltage: 0.1 V or less	2.8 sec or more	25 deg. C (77 deg. F) [default value]			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
Intake air temp. built-in MAF sensor: High	P0073	171	3	Ambient Air Temperature	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal	Intake air temp. built-in MAF sensor voltage 4.9 V or more	2.8 sec or more	25 deg. C (77 deg. F) [default value]			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
Intake air volume: Low	P0101	132	1	Engine Inlet Air Mass Flow Rate	Engine inlet air mass flow rate lacking (Disconnect turbo blower intake hose)	- Engine is operating 1150 rpm or more - Coolant temp. is 15 deg. C (59 deg. F) or more (Coolant temp. sensor is normal) - MAF sensor is normal - EGR valve is normal - Intake throttle valve is normal - Battery voltage is normal	Engine inlet air mass flow rate: less than half of target value	10.0 sec or more	Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open			ON	Inhibit	- Insufficient output	Key switch turn OFF	—
MAF sensor: Low Removal of MAF sensor (NCD)	P0102	132	4	Engine Inlet Air Mass Flow Rate	Open circuit or ground short circuit of sensor or harness	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated - Sensor supply voltage is normal	Mass air flow sensor voltage: 0.1 V or less	2.8 sec or more	Sensor output: 0.7 times of target value at normal condition [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open NCD inducement pattern	Engine is not stopped forcibly by ECU However KUBOTA strongly recommends operator to stop engine as soon as possible NCD		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Diagnostic counter = zero	—
MAF sensor: High	P0103	132	3	Engine Inlet Air Mass Flow Rate	+B short circuit of sensor or harness	- Battery voltage is normal - Engine speed is between 950 rpm and 3200 rpm - Target intake mass air flow is 211 kg/h or less and it continues for 3 sec - Sensor supply voltage is normal	Mass air flow sensor voltage: 4.9 V or more at normal operation condition	2.8 sec or more	Sensor output: 0.7 times of target value at normal condition [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle full open	Engine is not stopped forcibly by ECU However KUBOTA strongly recommends operator to stop engine as soon as possible		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Fuel high temp.	P0181	174	0	Fuel Temperature	Fuel temp. high	- Passed 300 sec after cranking - Engine speed is 800 rpm or more - Fuel temp. sensor is normal	Fuel temp. more than 90 deg. C	10 sec or more	Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	30 sec
EGR actuator open circuit	P0403	523574	3	proprietary	EGR actuator open circuit	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR actuator open error signal received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
EGR actuator coil short	P0404	523574	4	proprietary	EGR actuator coil short	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR actuator coil short error signal received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
EGR position sensor failure	P0409	523572	4	proprietary	EGR position sensor failure	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR position sensor error signal received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Exhaust gas temperature sensor 1: Low	P0543	3242	4	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Ground short circuit of sensor or harness	-Exhaust gas temp. sensor T0, T1 and T2 are normal - Battery voltage is normal	DPF inlet temp. sensor (T1) voltage: 0.08 V or less	5 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
Exhaust gas temperature sensor 1: High	P0544	3242	3	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal - Other exhaust temperature sensor is normal - Coolant temp. is 65 deg. C (149 deg. F) or more continues longer than 10 min after engine starting - T0 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec or T2 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec	DPF inlet temp. sensor (T1) voltage: 4.92 V or more	120 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
Exhaust gas temperature sensor 0: Low	P0546	4765	4	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Ground short circuit of sensor or harness	- Exhaust gas temp. sensor T0, T1 and T2 are normal - Battery voltage is normal	DOC inlet temp. sensor (T0) voltage: 0.08 V or less	5 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
Exhaust gas temperature sensor 0: High	P0547	4765	3	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal - Other exhaust temperature sensor is normal - Coolant temp. is 65 deg. C (149 deg. F) or more continues longer than 5 min after engine starting - T1 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec or T2 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec	DOC inlet temp. sensor (T0) voltage: 4.92 V or more	120 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—

Table 19. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
EEPROM check sum error	P1990	523700	13	proprietary	Kubota-EEPROM check sum error	- Battery voltage is normal	EEPROM check sum error	transient	None			ON	Inhibit	-	Key switch turn OFF	—
Removal of DPF system (PCD)	P1A28	3936	7	Aftertreatment Diesel Particulate Filter System	Removal of DPF	- refer to P3018, P2455	Exhaust temperature sensor T0, T1, and T2 and differential pressure sensor are fault (open circuit)	transient	No inducement	PCD		ON	Permit	-	Diagnostic counter = zero	—
Intake throttle feedback error	P2108	523580	2	proprietary	Intake throttle feedback error	- Battery voltage is normal	(Approximate parameter) Deviation of throttle position is not corrected in 20 times of duty error recovery action	5 sec or more	Output limitation: Approximately 75% of normal condition Intake throttle full open			ON	Inhibit	-	Key switch turn OFF	—
Accelerator position sensor correlation error	P2135	91	2	Accelerator Pedal Sensor 1	Deviation from designed correlation in two sensors	- Battery voltage is normal - Accelerator position sensor 1 is normal - Accelerator position sensor 2 is normal	Deviation from designed correlation in two sensors	transient	Forced idle (Accelerator = 0%)			ON	Inhibit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	3 sec
EGR actuator valve stuck	P2413	523575	7	proprietary	EGR actuator valve stuck	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR actuator valve stuck error signal received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
EGR (DC motor) overheat	P2414	523576	2	proprietary	EGR (DC motor) overheat	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR (DC motor) temp. error signal (thermistor: 125 deg. C or more) received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
EGR (DC motor) temp. sensor failure	P2415	523577	2	proprietary	EGR (DC motor) temp. sensor failure	- Battery voltage is normal - NO DTC of U0077 "CAN1 Bus off" - EGR control line is normal	EGR (DC motor) temp. sensor error signal received via CAN	2.8 sec or more	Output limitation: Approximately 75% of normal condition EGR stop			ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Key switch turn OFF	—
Exhaust gas temperature sensor 2: Low	P242C	3246	4	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Ground short circuit of sensor or harness	- Exhaust gas temp. sensor T0, T1 and T2 are normal - Battery voltage is normal	DPF outlet temp. sensor (T2) voltage: 0.08 V or less	5 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
Exhaust gas temperature sensor 2: High	P242D	3246	3	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Open circuit or +B short circuit of sensor or harness	- Other exhaust temperature sensor is normal - Coolant temp. is 65 deg. C (149 deg. F) or more continues longer than 10 min after engine starting - T0 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec or T1 is between 100 deg. C (212 deg. F) and 800 deg. C (1472 deg. F): continues longer than 10 sec	DPF outlet temp. sensor (T2) voltage: 4.92 V or more	120 sec or more	0 deg. C (32 deg. F) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
DPF differential pressure sensor: Low	P2454	3251	4	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Ground short circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Starter switch signal (ECU: V12 terminal) is not activated	DPF differential pressure sensor voltage: 0.21 V or less	2.8 sec or more	0 kPa (0.0 kg/cm2, 0.0 psi) [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Key switch turn OFF	—
DPF differential pressure sensor: High Failures of PCD system (PCD)	P2455	3251	3	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Open circuit or +B short circuit of sensor or harness	- Battery voltage is normal - Sensor supply voltage VCC# is normal - Starter switch signal (ECU: V12 terminal) is not activated	DPF differential pressure sensor voltage: 4.7 V or more	2.8 sec or more	0 kPa (0.0 kg/cm2, 0.0 psi) [default value] Output limitation: Approximately 75% of normal condition	PCD		ON	Inhibit	-	Diagnostic counter = zero	—
Intake throttle lift sensor: Low	P2621	523582	4	proprietary	Intake throttle lift sensor: Low	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Intake throttle lift sensor voltage: 0.1 V or less	2.8 sec or more	Output limitation: Approximately 75% of normal condition Intake throttle full open			ON	Inhibit	-	Key switch turn OFF	—
Intake throttle lift sensor: High	P2622	523582	3	proprietary	Intake throttle lift sensor: High	- Battery voltage is normal - Sensor supply voltage VCC# is normal	Intake throttle lift sensor voltage: 4.89 V or more	2.8 sec or more	Output limitation: Approximately 75% of normal condition Intake throttle full open			ON	Inhibit	-	Key switch turn OFF	—
Emission deterioration	P3001	3252	0	Aftertreatment 1 Exhaust Gas Temperature 2 Preliminary FMI	DOC is heated up due to unburned fuel	- Other than during regeneration mode - Coolant temp. is 65 deg. C (149 deg. F) or more continues longer than 5 min after engine starting	T1 - T0 is 250 deg. C (482 deg. F) or more	60 sec or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	To minimize PM emission to DPF		ON	Inhibit	- Insufficient output	Key switch turn OFF	—
Emergency Exhaust gas temperature sensor 0: High	P3002	4765	0	Aftertreatment 1 Exhaust Gas Temperature 1 Preliminary FMI	DOC inlet temp. (T0): High	- Exhaust gas temp. sensor T0, T1, and T2 are normal - Battery voltage is normal	DOC inlet temp. (T0): 700 deg. C (1292 deg. F) or more	2.0 sec or more	Stop injection (Q = 0 mm3/st) Engine stop Inhibit starter relay activation until exhaust temp. reduces down to 300 deg. C (572 deg. F)	In case engine ECU is not involved to drive starter, starter activation should be inhibited by other way until exhaust temp. reduces down to 300 deg. C (572 deg. F)		ON	Inhibit	- Engine stops - Inhibited cranking until down to 300 deg. C (572 deg. F)	Under 300 deg. C (572 deg. F) and Key switch turn OFF	—
Emergency Exhaust gas temperature sensor 1: High	P3003	3242	0	Aftertreatment 1 Exhaust Gas Temperature 2 Preliminary FMI	DPF inlet temp. (T1): High	- Exhaust gas temp. sensor T0, T1 and T2 are normal - Battery voltage is normal	DPF inlet temp. (T1): 715 deg. C (1319 deg. F) or more	9.0 min or more	Stop injection (Q = 0 mm3/st) Engine stop Inhibit starter relay activation until exhaust temp. reduces down to 300 deg. C (572 deg. F)	In case engine ECU is not involved to drive starter, starter activation should be inhibited by other way until exhaust temp. reduces down to 300 deg. C (572 deg. F)		ON	Inhibit	- Engine stops - Inhibited cranking until down to 300 deg. C (572 deg. F)	Under 300 deg. C (572 deg. F) and Key switch turn OFF	—
Emergency Exhaust gas temperature sensor 2: High	P3004	3246	0	Aftertreatment 1 Exhaust Gas Temperature 3 Preliminary FMI	DPF outlet temp. (T2): High	- Exhaust gas temp. sensor T0, T1, and T2 are normal - Battery voltage is normal	DPF outlet temp. (T2): 820 deg. C (1508 deg. F) or more	2.0 sec or more	Stop injection (Q = 0 mm3/st) Engine stop EGR stop Intake throttle 0% open (Close) Inhibit starter relay activation until exhaust temp. reduces down to 300 deg. C (572 deg. F)	In case engine ECU is not involved to drive starter, starter activation should be inhibited by other way until exhaust temp. reduces down to 300 deg. C (572 deg. F)		ON	Inhibit	- Engine stops - Inhibited cranking until down to 300 deg. C (572 deg. F)	Under 300 deg. C (572 deg. F) and Key switch turn OFF	—
Excessive PM3	P3006	3701	15	Diesel Particulate Filter Status	PM accumulation level 3	- Battery voltage is normal	PM accumulation more than trigger level Regeneration level = 3	transient	Output limitation: Approximately 50% of normal condition	To minimize PM emission		ON	Permit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Immediately
Excessive PM4	P3007	3701	16	Diesel Particulate Filter Status	PM accumulation level 4	- Battery voltage is normal	PM accumulation more than trigger level Regeneration level = 4	transient	Output limitation: Approximately 50% of normal condition	To minimize PM emission		ON	Permit	- Insufficient output	Diagnostic counter = zero or Key switch turn OFF	Immediately

Table 20. Engine Fault Codes (Continued)

HMI behavior (Recommendation)	Warning	Caution	Engine stop

DTC	ISO 14229 P-Code	J1939-73 SPN	J1939-73 FMI	SPN Name SAE J1939	Detection item	DTC set preconditions	DTC set parameter	Time to action or number of error detection	Limp home action by engine ECU (system action)	Remark	HMI behavior (Recommendation)	Engine warning light	Parked regen. if DTC occurred	Behavior during malfunction	Recovery from error	Delay time for recovery
Excessive PM5	P3008	3701	0	Diesel Particulate Filter Status	PM accumulation level 5	- Battery voltage is normal	PM accumulation more than trigger level Regeneration level = 5	transient	Output limitation: Approximately 50% of normal condition	To minimize PM emission Engine is not stopped forcibly by ECU However KUBOTA strongly recommends operator to stop engine as soon as possible		ON	Inhibit	- Insufficient output	Key switch turn OFF (Reset by Service tool)	—
Boost pressure: Low	P3011	132	15	Engine Inlet Air Mass Flow Rate	Disconnect the hose between the turbo blower out and intake flange	- Battery voltage is normal - Other than during regeneration mode - Engine speed is 1850 rpm or more - MAF sensor is normal - EGR valve is normal - Intake throttle valve is normal - Boost pressure sensor is normal - Barometric pressure sensor is normal - Coolant temp. sensor is normal - Coolant temp. is 50 deg. C (122 deg. F) or more continues longer than 5 min after engine starting	Boost pressure sensor output is less than target level in high air flow operating condition	10 sec or more	Output limitation: Approximately 50% of normal condition Speed limitation (Accelerator limitation: 50%) EGR stop Intake throttle full open	Engine power is restricted by boost pressure signal accordingly To minimize PM emission to DPF		ON	Inhibit	- Insufficient output	Key switch turn OFF	—
Low coolant temp. in parked regeneration	P3012	523589	17	proprietary	During regeneration mode, Engine warm-up condition is not satisfied (coolant temp. is low)	- During parked active regeneration mode	Engine coolant temp. stays less than 55 deg. C (131 deg. F) for a certain period under parked regeneration process	transient	None			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF (Leaving from parked active regeneration status)	Immediately
Parked regeneration time out	P3013	523590	16	proprietary	Time out error: regeneration incomplete due to low temperature of DPF	- During parked active regeneration mode - Coolant temp. is 55 deg. C (131 deg. F) or more	Coolant temperature is 55 deg. C (131 deg. F) or more and parked active regeneration process has not completed within a specified time	transient	None			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF (Leaving from parked active regeneration status)	Immediately
Loss of Function of DPF system (PCD)	P3015	3936	2	Aftertreatment Diesel Particulate Filter System	Loss of function of DPF	- Differential Pressure sensor is normal	Abnormal low output of differential pressure sensor continues more than a certain period	transient	No inducement	PCD		ON	Permit	-	Diagnostic counter = zero	—
All exhaust temp. sensor failure	P3018	523599	0	proprietary	All exhaust temp. sensor failure simultaneously	- Engine speed is 1600 rpm or more - Quantity of injection is 12 mm3/st or more - Coolant temp. is 65 deg. C (149 deg. F) or more continues longer than 300 sec - Intake air temp. is 0 deg. C (32 deg. F) or more - Passed 100 sec after cranking	All exhaust temp. sensor failure (sensor low) simultaneously	100 sec or more	Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
Initial pump-calibration incomplete	P3019	523600	0	proprietary	Pump-calibration history	- Battery voltage is normal	Initial pump calibration incomplete	transient	None			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
High exhaust gas temp. after emergency high temp. DTC	P3023	523601	0	proprietary	Exhaust gas temperature sensor 0, 1, 2 output	- Battery voltage is normal	All exhaust temp. (T0, T1, T2) reduce to 300 deg. C (572 deg. F)	transient	Engine stop Inhibit starter relay activation until all exhaust temp. (T0, T1, T2) reduces down to 300 deg. C (572 deg. F)			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
High frequency of regeneration	P3024	523602	0	proprietary	Time interval from the end time to the start time of the regeneration	- Battery voltage is normal - Key switch is ON	Regeneration time interval within 30 min occurs three times continuously	transient	Output limitation: Approximately 50% of normal condition EGR stop			ON	Permit	- Worsening exhaust gas emissions (NOx)	Key switch turn OFF (Reset by Service tool)	—
Overheat pre-caution	P3025	523603	15	proprietary	Coolant temp.	- Coolant temp. sensor is normal	Engine coolant temperature is 110 deg. C (230 deg. F) or more	transient	None			ON	Inhibit	- Worsening exhaust gas emissions (NOx)	Diagnostic counter = zero or Key switch turn OFF	Immediately
Removal of EGR system (NCD)	U0076	523578	2	proprietary	No communication with EGR	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	Interruption of CAN	1.3 sec or more	Output limitation: Approximately 75% of normal condition EGR stop NCD inducement pattern	NCD		ON	Inhibit	- Insufficient output - Worsening exhaust gas emissions	Diagnostic counter = zero	—
CAN CCVS (Parking switch and Vehicle speed) frame error	U0082	523591	2	proprietary	CAN_CCVS communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN CCVS frame time out error	0.5 sec or more	Parking switch = OFF, Vehicle speed = 0 [default value]			ON	Inhibit	-	Key switch turn OFF	—
CAN CM1 (Regen switch) frame error	U0083	523592	2	proprietary	CAN_CM1 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN CM1 frame time out error	2.0 sec or more	Regeneration inhibit = ON, Parked regeneration switch = OFF [default value]			ON	Inhibit	-	Key switch turn OFF	—
CAN DDC1 (Transmission) frame error	U0084	523593	2	proprietary	CAN_DDC1 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN DDC1 frame time out error	0.5 sec or more	Accelerator non-linear processing flag = 0 [default value] Accelerator non-linear processing invalid			ON	Inhibit	-	Key switch turn OFF	—
CAN ETC2 (Neutral switch) frame error	U0085	523594	2	proprietary	CAN_ETC2 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN ETC2 frame time out error	0.5 sec or more	Neutral SW = OFF [default value]			ON	Inhibit	-	Key switch turn OFF	—
CAN ETC5 (Neutral switch) frame error	U0086	523595	2	proprietary	CAN_ETC5 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN ETC5 frame time out error	0.5 sec or more	Neutral switch = OFF [default value]			ON	Inhibit	-	Key switch turn OFF	—
CAN TSC1 frame error	U0087	523596	2	proprietary	CAN_TSC1 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	No request to "TSC1 buffer" continues 3 times after over-ride control request (other than 0x00)	60 msec or more	Override control mode = Normal mode [default value]			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately
CAN EBC1 frame error	U0089	523598	2	proprietary	CAN_EBC1 communication stopping	- Battery voltage is normal - Starter switch signal (ECU: V12 terminal) is not activated	CAN EBC1 frame time out error	0.5 sec or more	Non shutdown [default value] Output limitation: Approximately 75% of normal condition			ON	Inhibit	-	Diagnostic counter = zero or Key switch turn OFF	Immediately

NCD/PCD INDICATOR

Located on the right-hand control panel, the **NCD/PCD Warning indicator** (Figure 71) notifies the operator when there is a failure of the emission control system due to tampering or removal of NO_x control diagnostic system components (NCD) or particulate control diagnostic system components (PCD). See Table 21 for NCD/PCD fault codes.

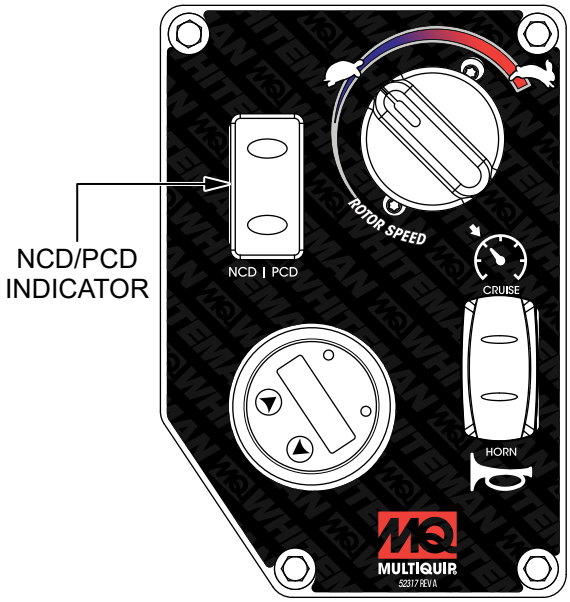


Figure 71. NCD/PCD Warning Indicator

Table 21. NCD/PCD Fault Codes

NCD/PCD	Fault	P-Code	SPN	FMI	Parameter	Limp Home Action
PCD	Removal of DPF system	P1A28	3936	7	Exhaust temperature sensor T0, T1, and T2 and differential pressure sensor fault (open circuit)	No inducement
PCD	Loss of function of DPF system	P3015	3936	2	Abnormal low output of differential pressure sensor continues more than a certain period	No inducement
PCD	Failures of PCD system Differential pressure sensor 1: High	P2455	3251	3	DPF differential pressure sensor voltage: 4.7 V or more	Differential pressure: 0 kPa [default value] Output limitation: Approximately 75% No inducement
NCD	Removal of EGR system No communication with EGR	U0076	523578	2	Interruption of CAN	Output limitation: Approximately 75% of normal condition EGR stop NCD inducement pattern*
NCD	Removal of MAF sensor (MAF sensor: Low)	P0102	132	4	Mass air flow sensor voltage: 0.1 V or less	Sensor output: 0.7 × target value at normal condition [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle 100% open NCD inducement pattern*

* Inducement reduction level 1: Within 50% of maximum torque; within 60% of rated speed. Intended to disable the functionality of the machine and to substantially limit the ability to perform any useful work with the machine. Not intended to prohibit the machine's mobility or ability to idle.

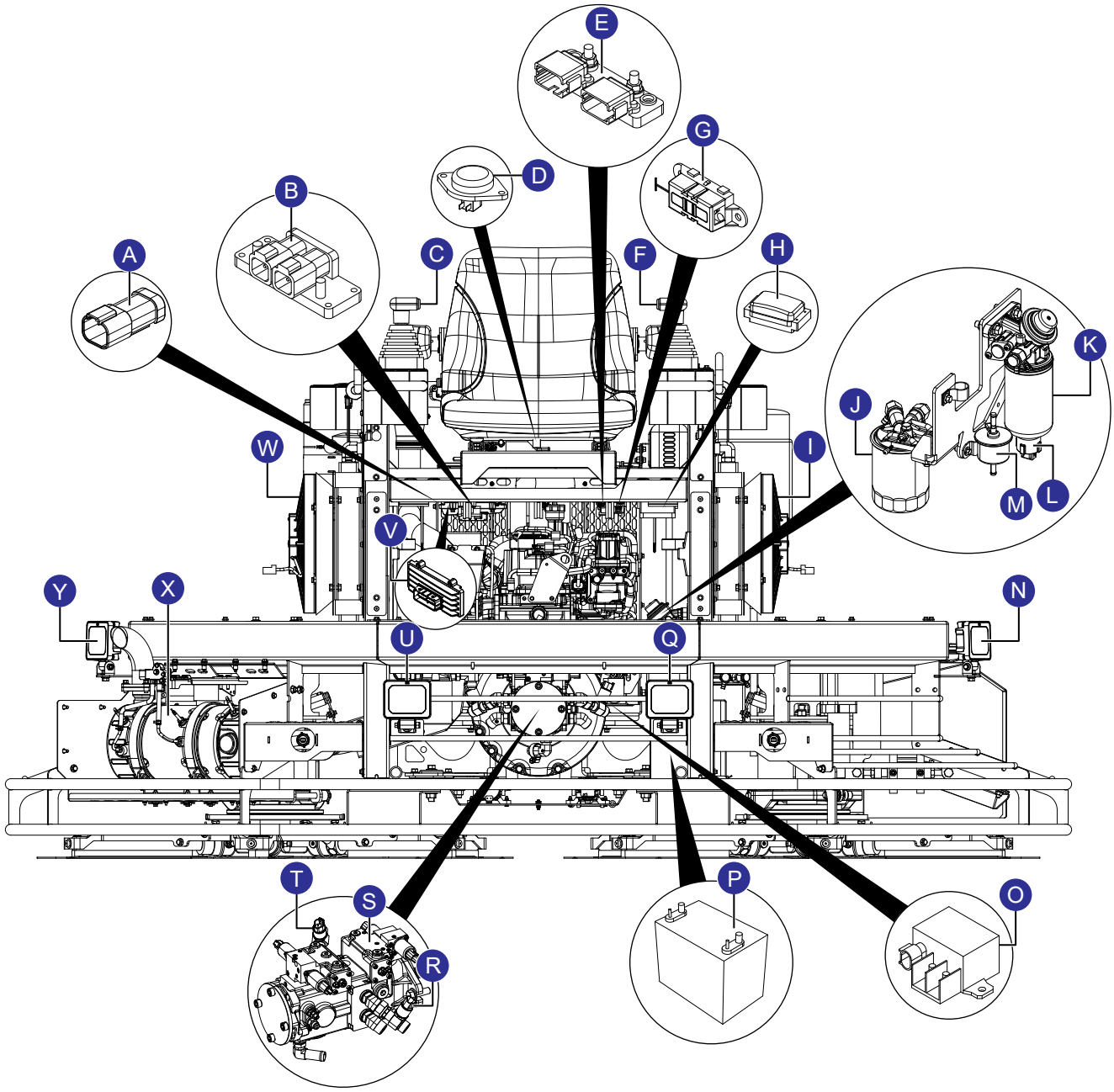
* Inducement reduction level 2: No available net torque; nearly idle speed. Intended to strongly motivate the operator to remedy the problem by effectively disabling the machine.

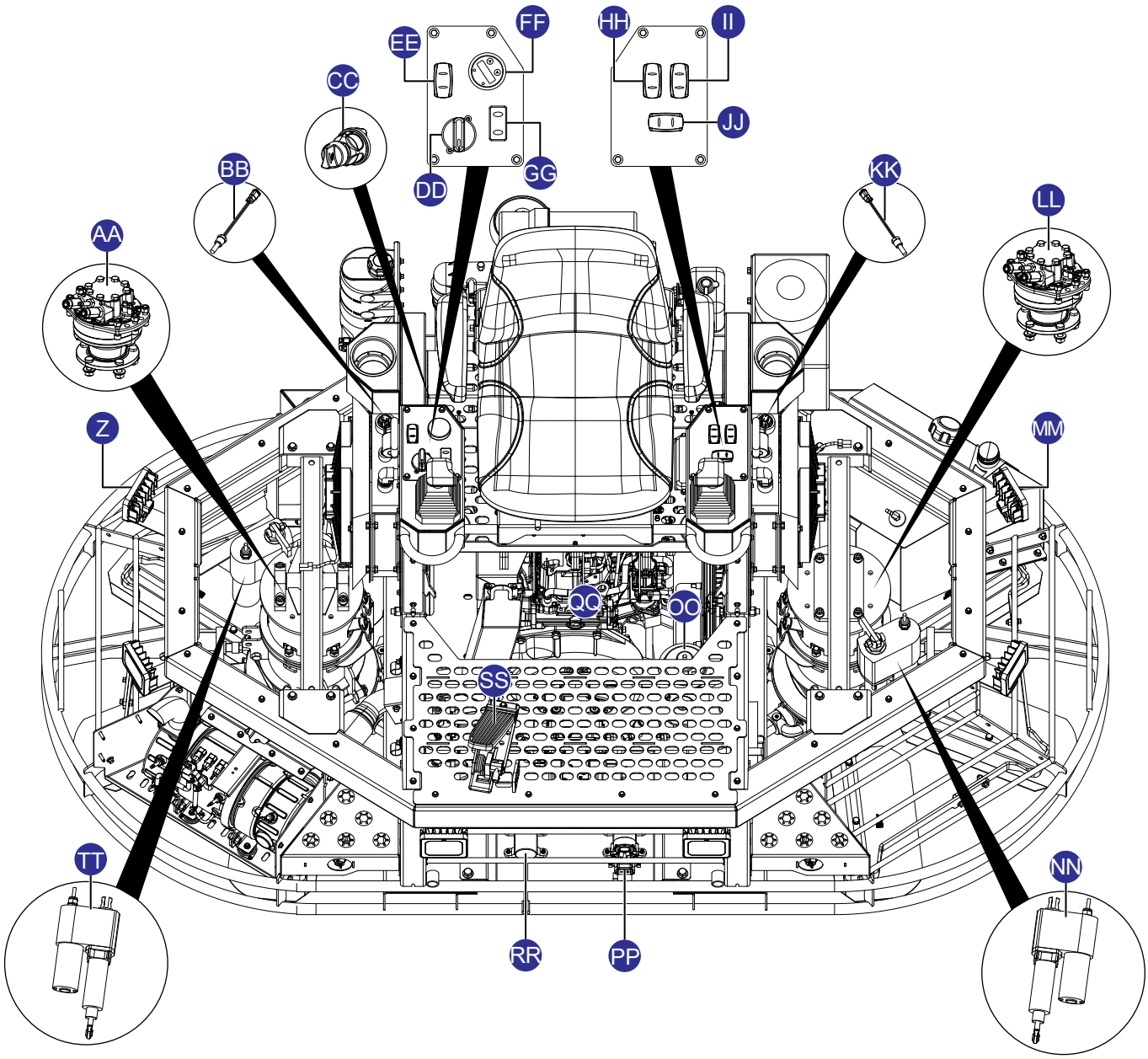
Troubleshooting (Ride-On Hydraulic Trowel)		
Symptom	**Possible Problem**	**Solution**
Seat switch not functioning.	Other problems?	Check seat function with the electronic service tool.
	Loose wire connections?	Check wiring. Replace as necessary.
	Bad contacts?	Replace seat cushion (contains the switch).
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.

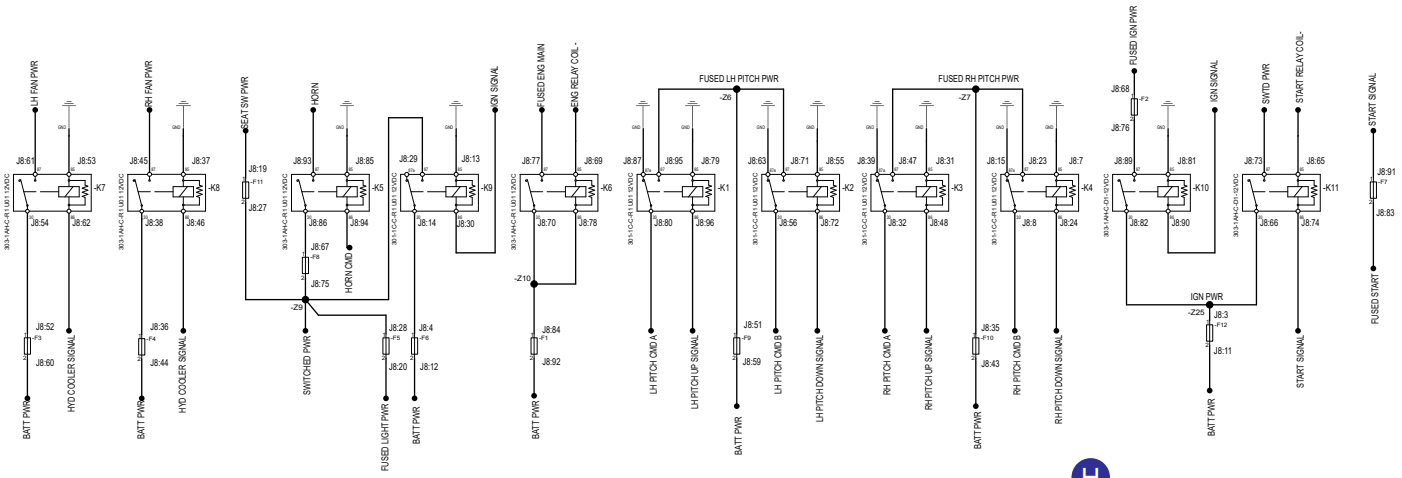
Troubleshooting (Ride-On Hydraulic Trowel) Continued		
Symptom	**Possible Problem**	**Solution**
Lights not working.	Wiring?	Check all electrical connections, including the master on/off switch and check to see if wiring is in good condition with no shorts. Replace as necessary.
	Lights?	Check to see 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**
Difficulty starting the engine.	Fuel is thick and doesn't flow?	Check the fuel tank, and remove water, dirt and other impurities.
		Check the fuel filter cartridge and replace it if necessary.
	Engine oil becomes thick in cold weather and engine cranks slow?	Use oils of different viscosities, depending on ambient temperatures. (Use 10W-30 in winter season.)
	Battery is discharged and the engine will not crank?	Charge the battery.
Output is insufficient.	Fuel is insufficient?	Refuel.
		Check the fuel system. (Bleed the fuel system if necessary.)
	Overheating of moving parts?	Consult your KUBOTA dealer.
	Air cleaner is dirty?	Clean the element.
	The output is limited because of a fault?	Check the engine warning lamp. (If a fault occurs, it means that the ECU might be in the output limiting mode.)
Engine suddenly stops.	Lack of fuel?	Refuel.
		Check the fuel system. (Bleed the fuel system if necessary.)
	Overheating of moving parts?	Consult your KUBOTA dealer.
	Air cleaner is dirty?	Clean the element.
	Forced stop due to a fault?	Check the engine warning lamp. (If a serious fault occurs, it means that the ECU might have forced the engine to a stop.)
Engine must be stopped immediately.	Engine revolution suddenly decreases or increases?	Check the adjustments and the fuel system.
	Unusual sound is heard?	Check all moving parts carefully.
	Color of exhaust suddenly turns dark?	Check the DPF.
	Oil lamp lights up during operation?	Check the lubricating system.
		Check to see if the engine bearing clearances are within factory specs.
		Check the function of the relieve valve in the lubricating system.
		Check pressure switch.
		Check filter base gasket.
	Engine warning lamp lights up?	Consult your KUBOTA Dealer.
	DPF service lamps light up?	Consult your KUBOTA Dealer.

Troubleshooting (Engine) Continued		
Engine overheats.	Engine oil insufficient?	Check oil level. Replenish oil as required.
	Fan belt broken or elongated?	Change belt or adjust belt tension.
	Coolant insufficient?	Replenish coolant.
	Excessive concentration of antifreeze?	Add water only or change to coolant with the specified mixing ratio.
	Radiator net or radiator fin clogged with dust?	Clean net or fin carefully.
	Inside of radiator or coolant flow route corroded?	Clean or replace radiator and parts.
	Fan or radiator or radiator cap defective?	Replace defective parts.
	Thermostat defective?	Check thermostat and replace if necessary.
	Temperature gauge or sensor defective?	Check temperature with thermometer and replace if necessary.
	Overload running?	Reduce load.
	Head gasket defective or coolant leakage?	Replace parts.


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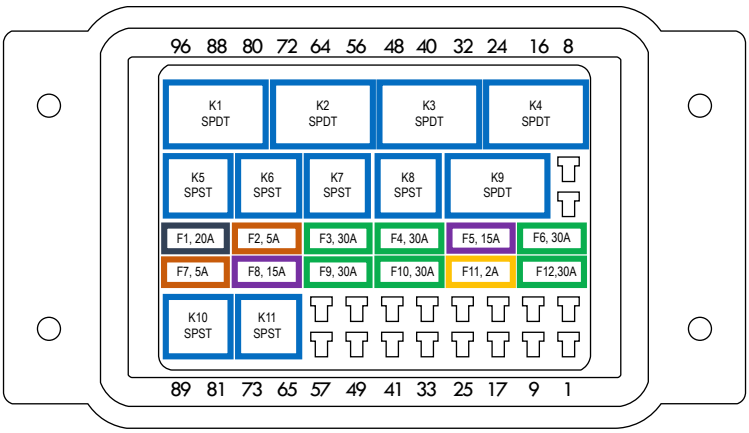

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MAIN HARNESS J8
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FUSE AND RELAY BOX (FRONT)

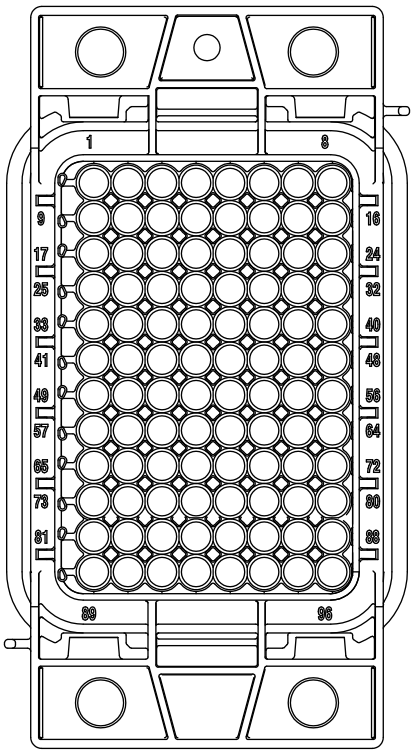


DEVICE PLACEMENT			
REFERENCE	FUNCTION	DEVICE	PART NUMBER
K1	RELAY, LEFT PITCH UP	12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)
K2	RELAY, LEFT PITCH DOWN	12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)
K3	RELAY, RIGHT PITCH UP	12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)
K4	RELAY, RIGHT PITCH DOWN	12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)
K5	RELAY, HORN	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
K6	RELAY, ENGINE, MAIN	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
K7	RELAY, LEFT FAN	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
K8	RELAY, RIGHT FAN	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
K9	RELAY, MAIN	12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)
K10	RELAY, IGNITION	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
K11	RELAY, STARTER	12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)
F1	FUSE, ENGINE, MAIN	MINI FUSE, 20A	WAYTEK 46257
F2	FUSE, IGNITION SWITCH	MINI FUSE, 5A	WAYTEK 46253
F3	FUSE, LEFT FAN	MINI FUSE, 30A	WAYTEK 46259
F4	FUSE, RIGHT FAN	MINI FUSE, 30A	WAYTEK 46259
F5	FUSE, LIGHTS	MINI FUSE, 10A	WAYTEK 46255
F6	FUSE, MAIN	MINI FUSE, 30A	WAYTEK 46259
F7	FUSE, STARTER	MINI FUSE, 5A	WAYTEK 46253
F8	FUSE, ACCESSORY	MINI FUSE, 15A	WAYTEK 46256
F9	FUSE, LEFT PITCH	MINI FUSE, 30A	WAYTEK 46259
F10	FUSE, RIGHT PITCH	MINI FUSE, 30A	WAYTEK 46259
F11	FUSE, SEAT SWITCH	MINI FUSE, 2A	WAYTEK 46250
F12	FUSE, MAIN, START/IGNITION	MINI FUSE, 30A	WAYTEK 46259

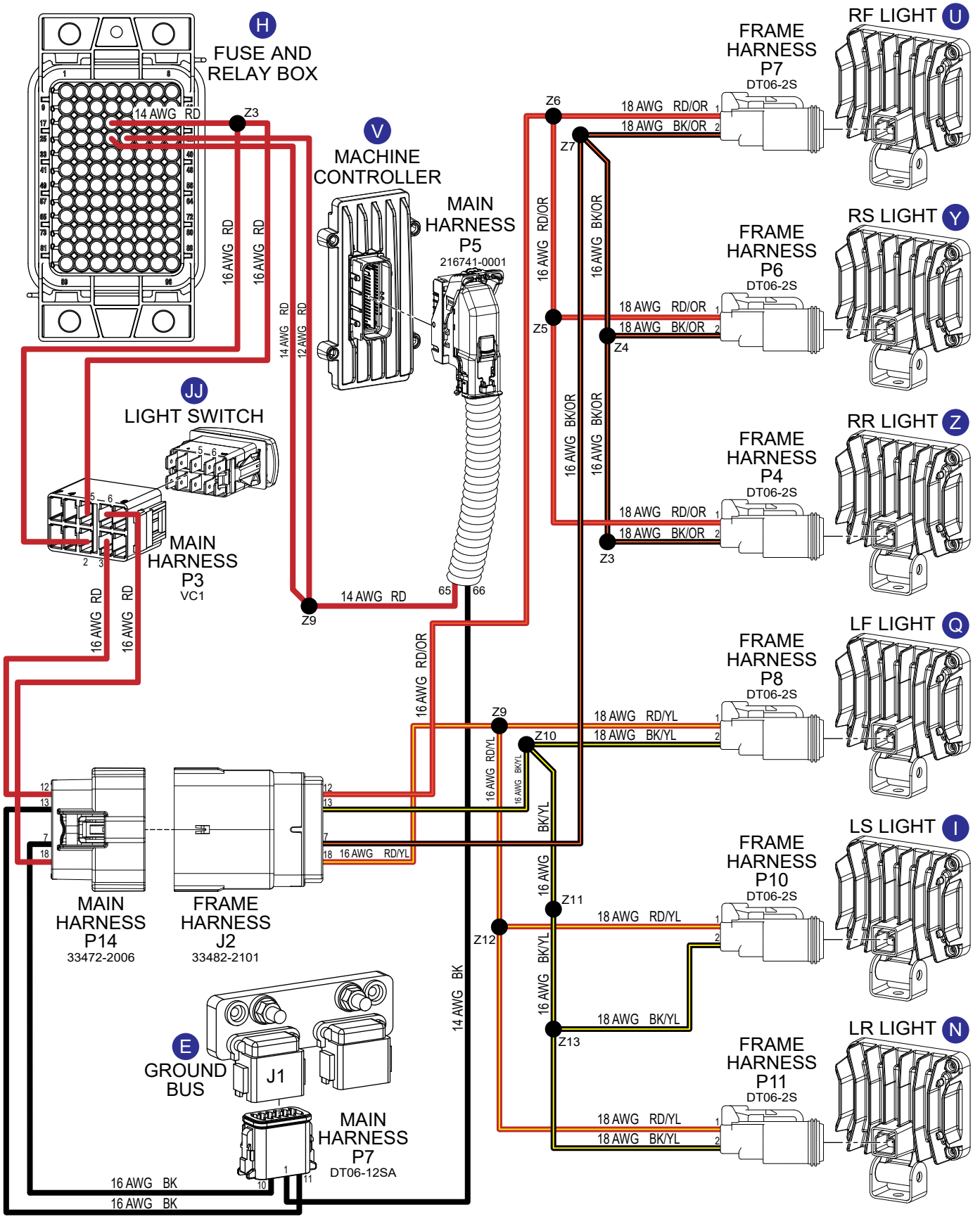
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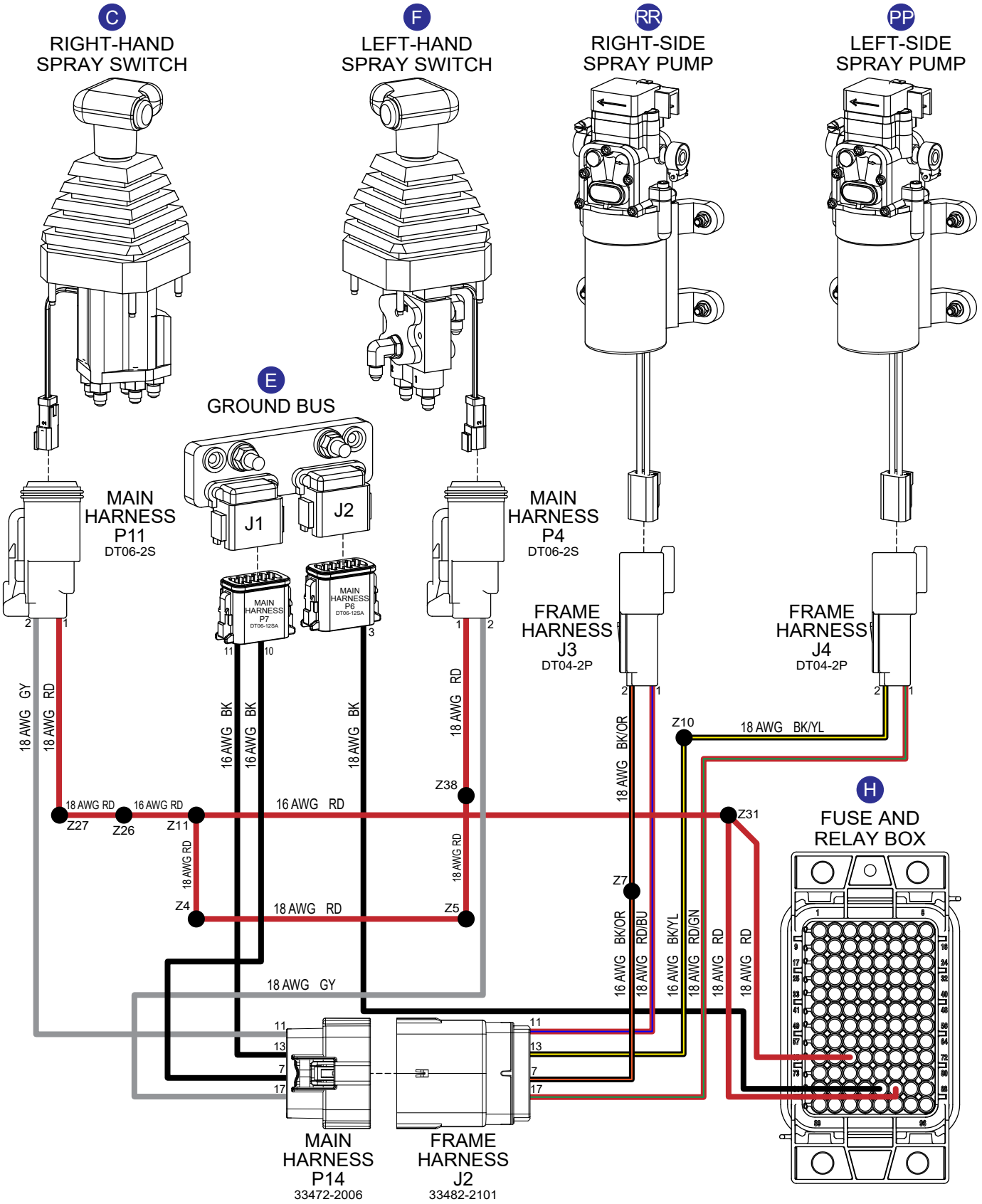
MAIN HARNESS J8
PDMU3AC1

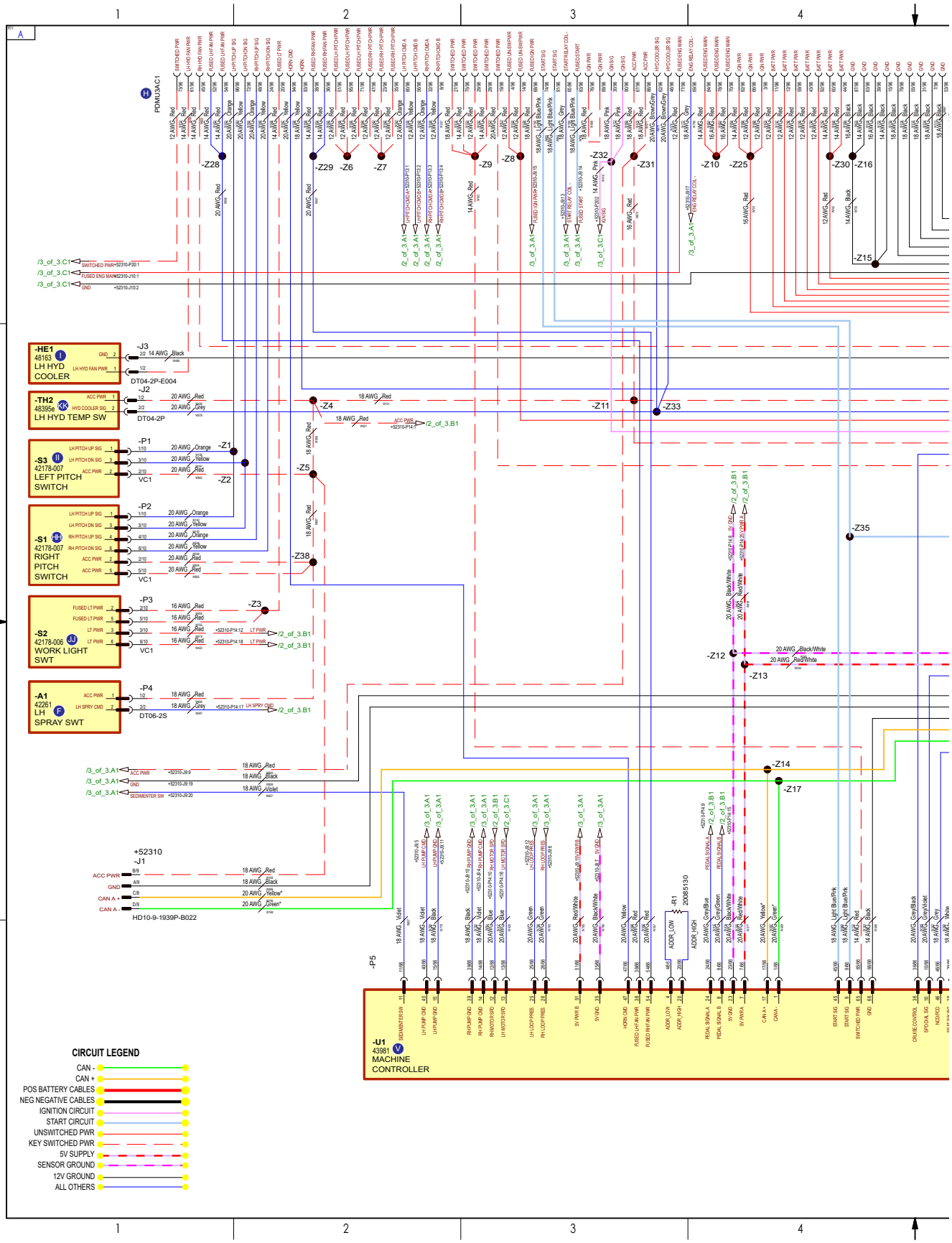
FUSE AND RELAY BOX (REAR)

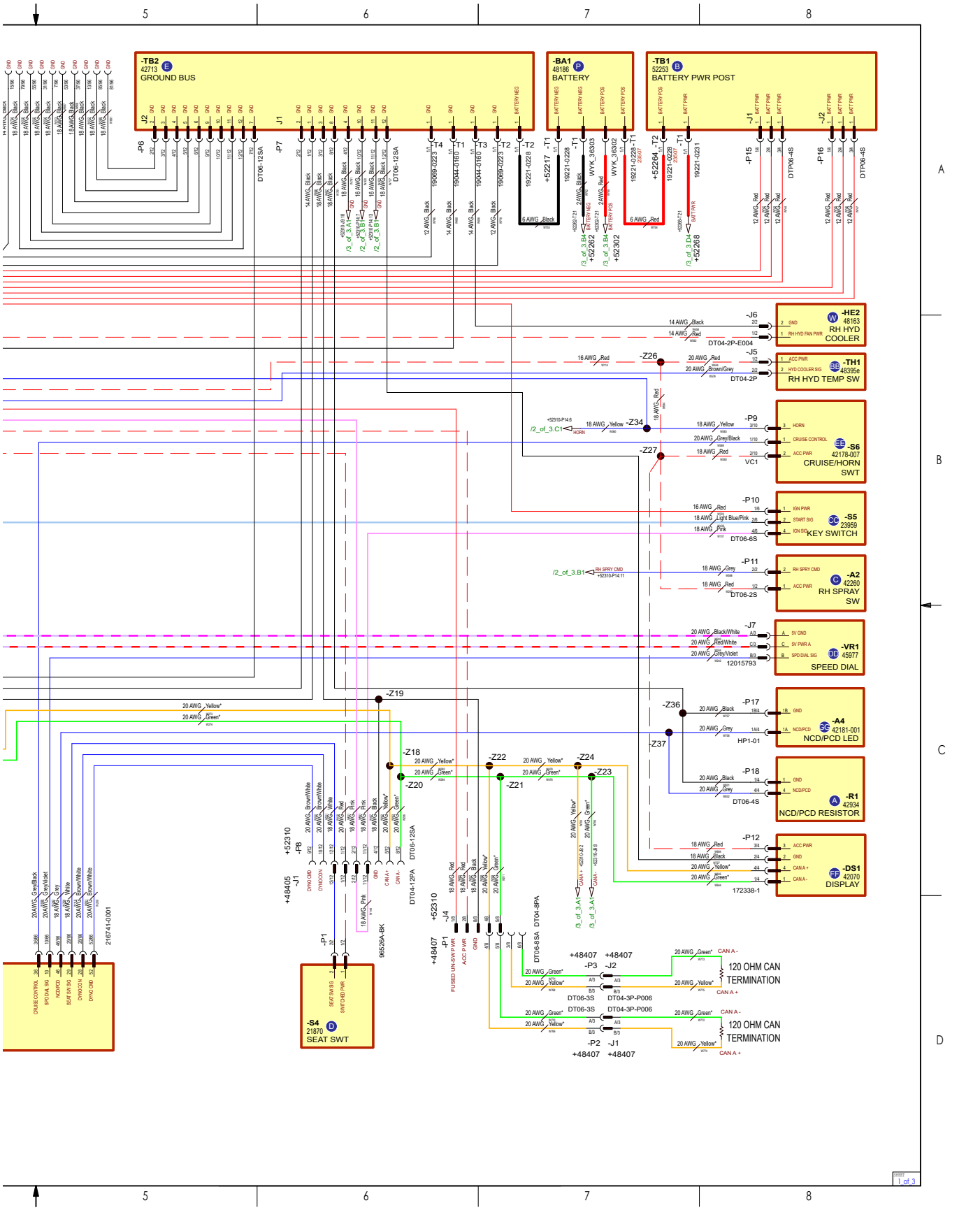


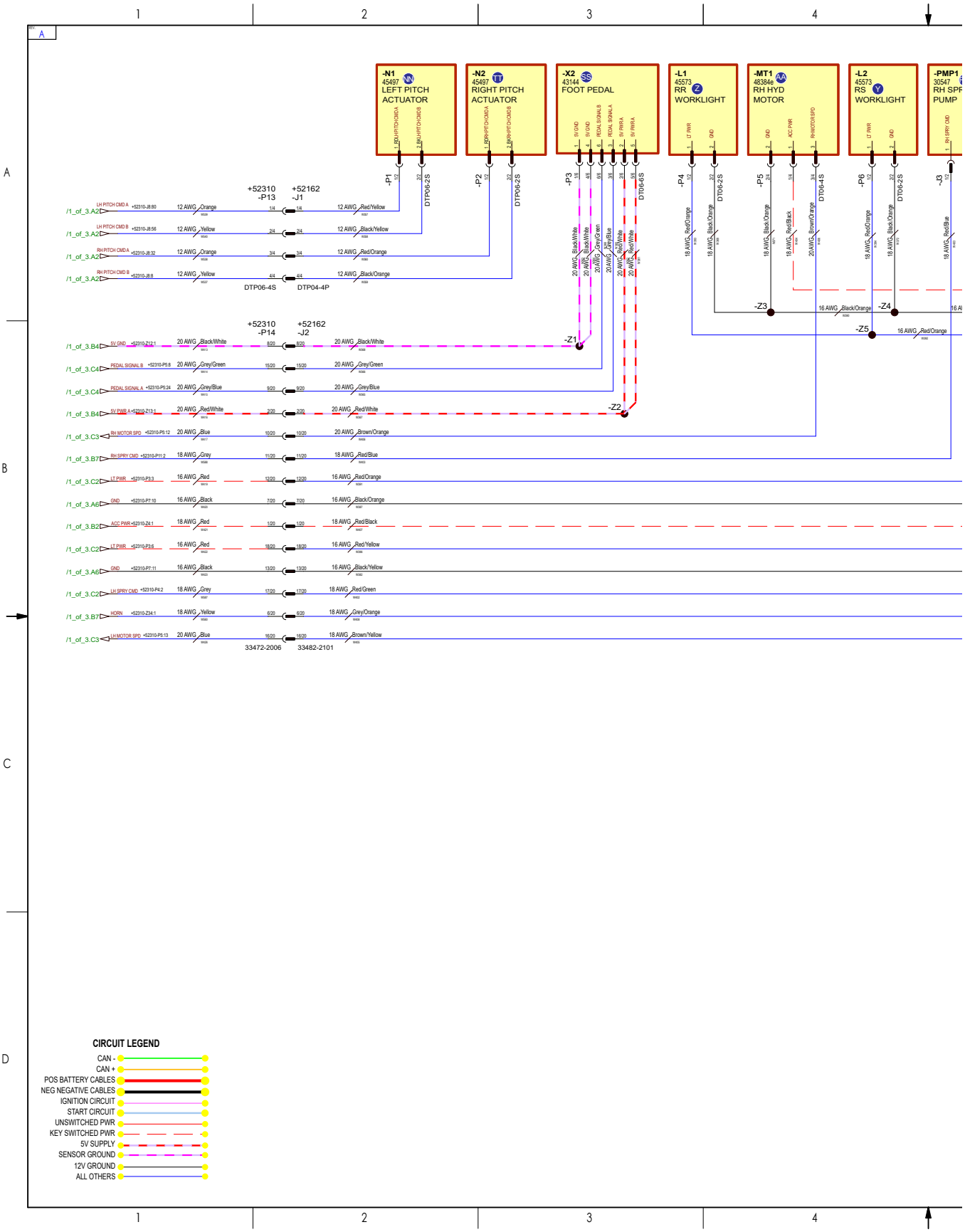
DEVICE TOTALS		
DEVICE	PART NUMBER	QUANTITY
12V, 35A 5-PIN MICRO	301-1C-C-D1-12VDC (301-1C-C-R1 U01)	5
12V, 20A 4-PIN MICRO	303-1AH-C-D1 12VDC (303-1AH-C-R1 U01)	6
MINI FUSE, 30A	WAYTEK 46259	6
MINI FUSE, 20A	WAYTEK 46257	1
MINI FUSE, 15A	WAYTEK 46256	1
MINI FUSE, 10A	WAYTEK 46255	1
MINI FUSE, 5A	WAYTEK 46253	2
MINI FUSE, 2A	WAYTEK 46250	1

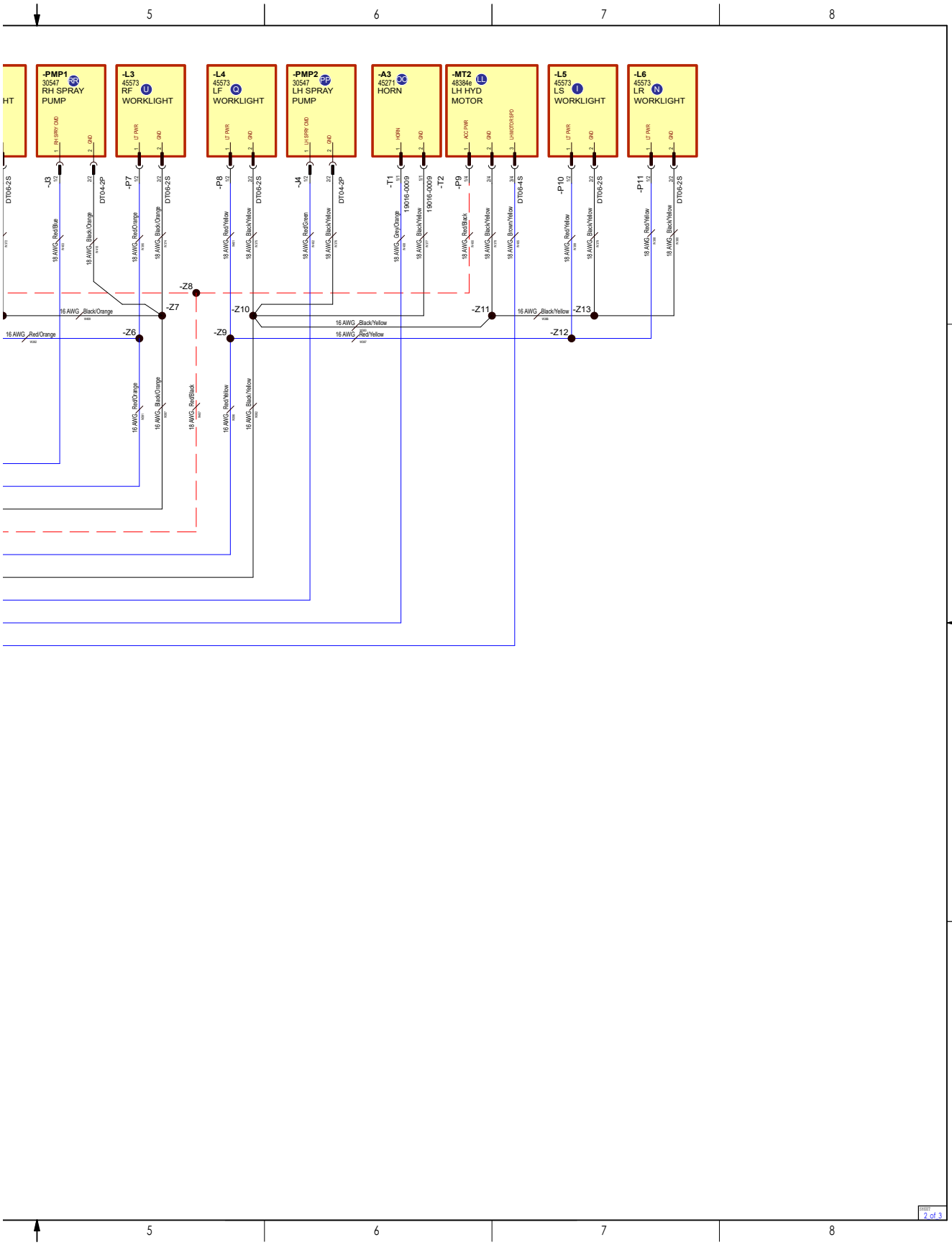

H
FUSE AND RELAY BOX
14 AWG RD
Z3
V
MACHINE CONTROLLER
MAIN HARNESS P5
216741-0001
16 AWG RD
16 AWG RD
14 AWG RD
12 AWG RD
JJ
LIGHT SWITCH
MAIN HARNESS P3
VC1
16 AWG RD
16 AWG RD
14 AWG RD
Z9
65
66
Z6
Z7
Z5
Z4
Z3
16 AWG RD/OR
16 AWG BK/OR
16 AWG BK/OR
16 AWG BK/OR
FRAME HARNESS P7
DT06-2S
FRAME HARNESS P6
DT06-2S
FRAME HARNESS P4
DT06-2S
18 AWG RD/OR
18 AWG BK/OR
RF LIGHT U
RS LIGHT Y
RR LIGHT Z
16 AWG RD/OR
Z9
Z10
16 AWG RD/YL
16 AWG BK/YL
18 AWG RD/YL
18 AWG BK/YL
FRAME HARNESS P8
DT06-2S
LF LIGHT Q
MAIN HARNESS P14
33472-2006
FRAME HARNESS J2
33482-2101
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Z11
Z12
Z13
18 AWG RD/YL
18 AWG BK/YL
FRAME HARNESS P10
DT06-2S
LS LIGHT I
FRAME HARNESS P11
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16 AWG BK
16 AWG BK

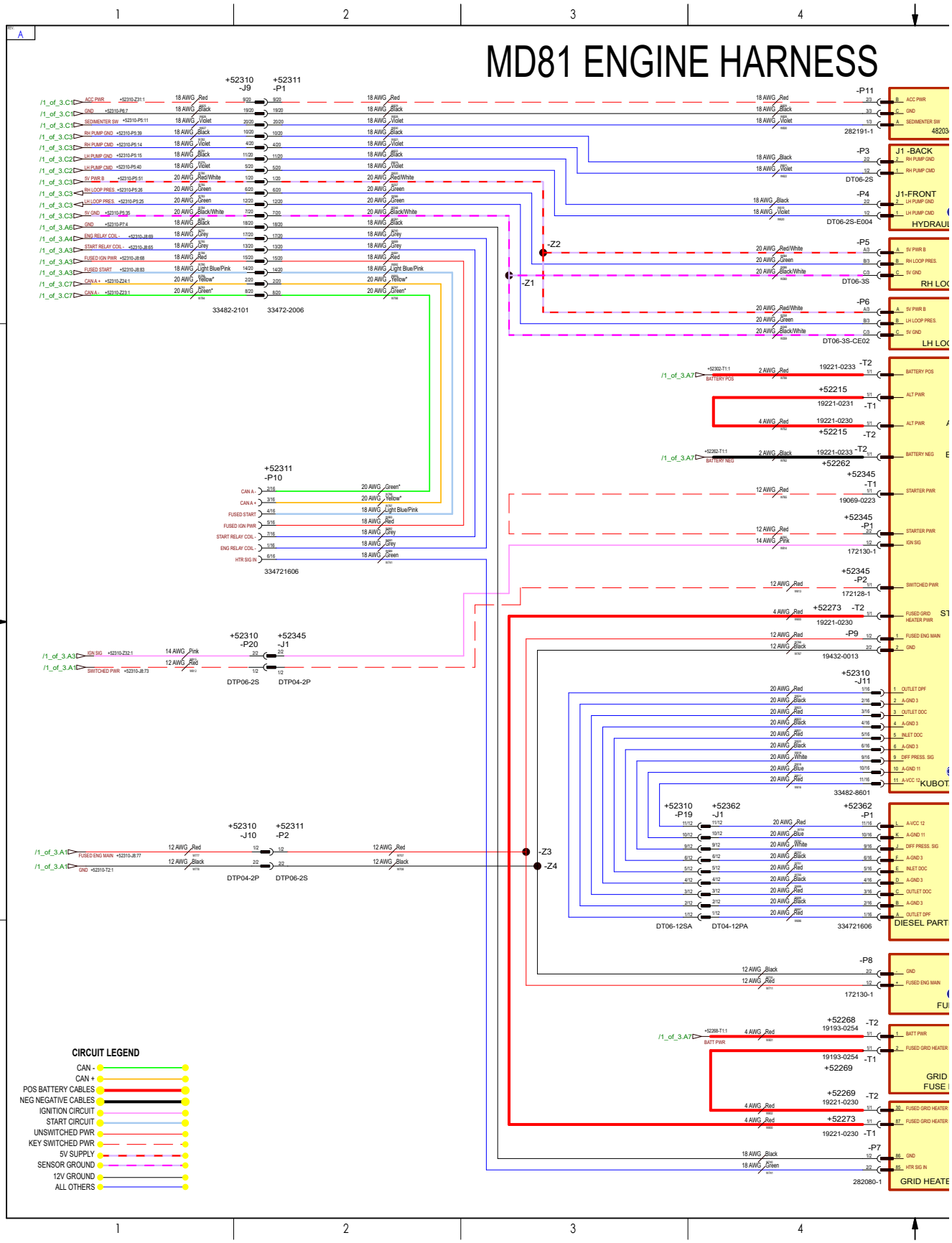

C
RIGHT-HAND SPRAY SWITCH
F
LEFT-HAND SPRAY SWITCH
RR
RIGHT-SIDE SPRAY PUMP
PP
LEFT-SIDE SPRAY PUMP
E
GROUND BUS
J1
J2
MAIN HARNESS P11 DT06-2S
MAIN HARNESS P7 DT06-12SA
MAIN HARNESS P6 DT06-12SA
MAIN HARNESS P4 DT06-2S
FRAME HARNESS J3 DT04-2P
FRAME HARNESS J4 DT04-2P
18 AWG GY
18 AWG RD
16 AWG BK
18 AWG RD
18 AWG BK
16 AWG BK
18 AWG BK
18 AWG RD
18 AWG BK/OR
Z10
18 AWG BK/YL
Z38
18 AWG RD
16 AWG RD
Z31
H
FUSE AND RELAY BOX
Z27
Z26
Z11
Z4
Z5
Z7
18 AWG GY
16 AWG BK/OR
18 AWG RD/BU
16 AWG BK/YL
18 AWG RD/GN
18 AWG RD
18 AWG RD
MAIN HARNESS P14 33472-2006
FRAME HARNESS J2 33482-2101

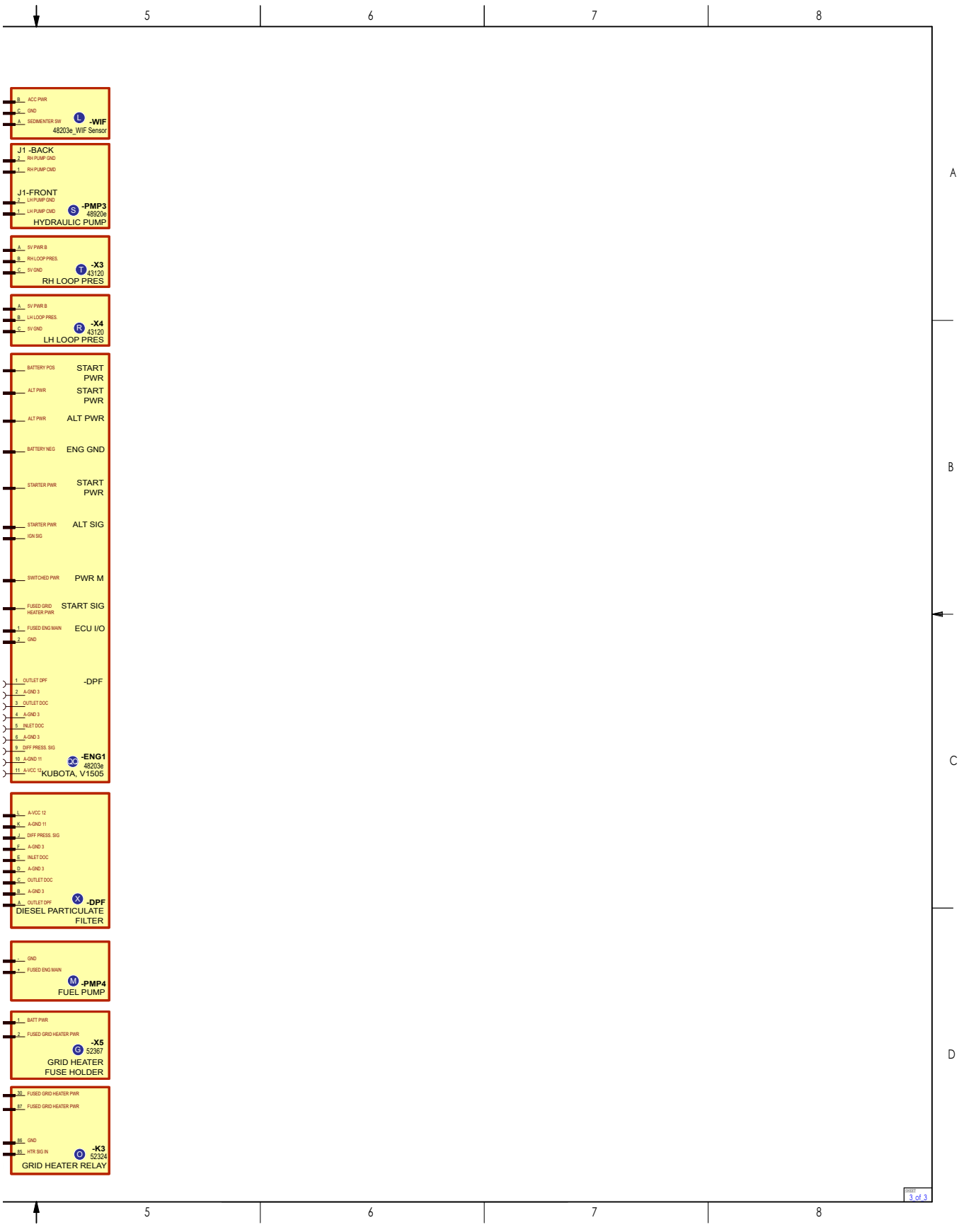

-U1
43981
MACHINE
CONTROLLER
-P5
-HE1
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LH HYD
COOLER
-TH2
48395e
LH HYD TEMP SW
-S3
42178-007
LEFT PITCH
SWITCH
-S1
42178-007
RIGHT
PITCH
SWITCH
-S2
42178-006
WORK LIGHT
SWT
-A1
42261
LH
SPRAY SWT
+52310
-J1
HD10-9-1939P-B022
-R1
20085130
CIRCUIT LEGEND
CAN -
CAN +
POS BATTERY CABLES
NEG NEGATIVE CABLES
IGNITION CIRCUIT
START CIRCUIT
UNSWITCHED PWR
KEY SWITCHED PWR
5V SUPPLY
SENSOR GROUND
12V GROUND
ALL OTHERS

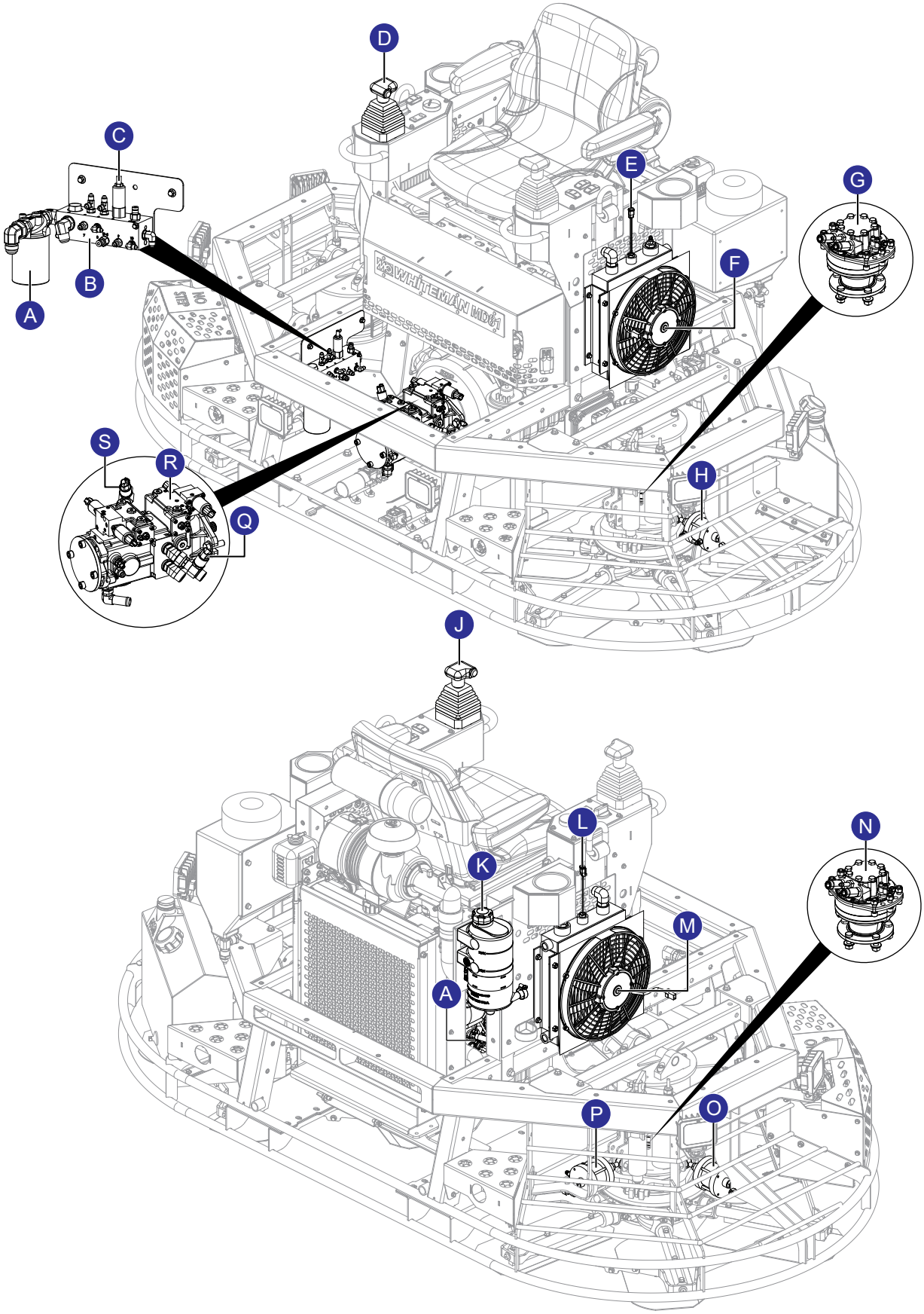

-TB2
42713
GROUND BUS
-BA1
48186
BATTERY
-TB1
52253
BATTERY PWR POST
-HE2
48163
RH HYD
COOLER
-TH1
48395e
RH HYD TEMP SW
-S6
42178-007
CRUISE/HORN
SWT
-S5
23959
KEY SWITCH
-A2
42260
RH SPRAY
SW
-VR1
45977
SPEED DIAL
-A4
42181-001
NCD/PCD LED
-R1
42934
NCD/PCD RESISTOR
-DS1
42070
DISPLAY
-S4
21870
SEAT SWT
120 OHM CAN
TERMINATION
120 OHM CAN
TERMINATION
DT06-12SA
DT04-2P-E004
DT04-2P
DT06-6S
DT06-2S
DT06-4S
DT04-12PA
DT04-8PA
DT06-8SA
DT06-3S
DT04-3P-P006
216741-0001
965-26A-BK
172338-1
12015793
HP1-01
VC1

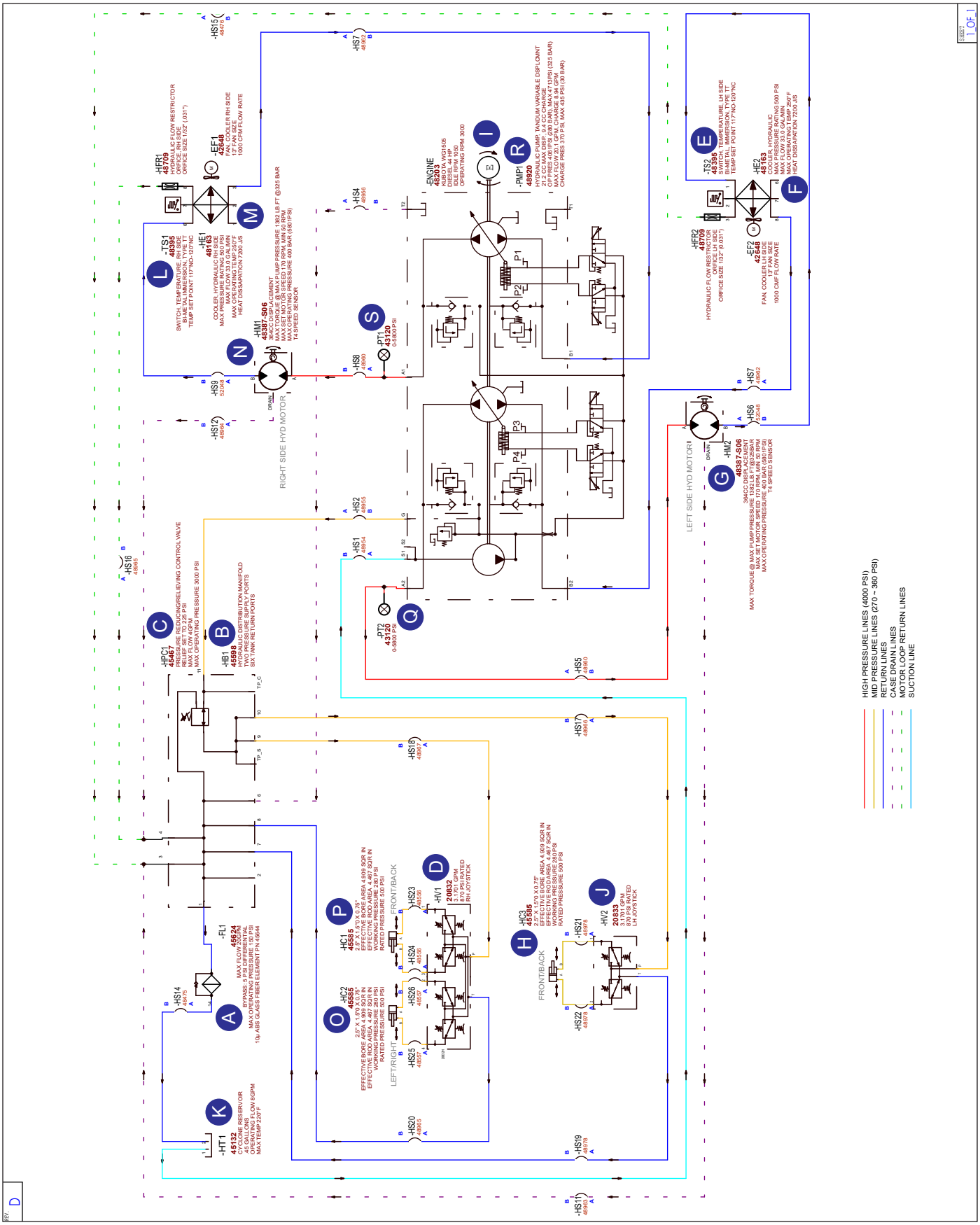

-N1
45497
LEFT PITCH ACTUATOR
-N2
45497
RIGHT PITCH ACTUATOR
-X2
43144
FOOT PEDAL
-L1
45573
RR WORKLIGHT
-MT1
48384
RH HYD MOTOR
-L2
45573
RS WORKLIGHT
-PMP1
30547
RH SPR PUMP
+52310 -P13
+52162 -J1
+52310 -P14
+52162 -J2
DTP06-4S
DTP04-4P
DTP06-2S
DTP06-6S
DTP06-4S
-Z1
-Z2
-Z3
-Z4
-Z5
CIRCUIT LEGEND
CAN -
CAN +
POS BATTERY CABLES
NEG NEGATIVE CABLES
IGNITION CIRCUIT
START CIRCUIT
UNSWITCHED PWR
KEY SWITCHED PWR
5V SUPPLY
SENSOR GROUND
12V GROUND
ALL OTHERS

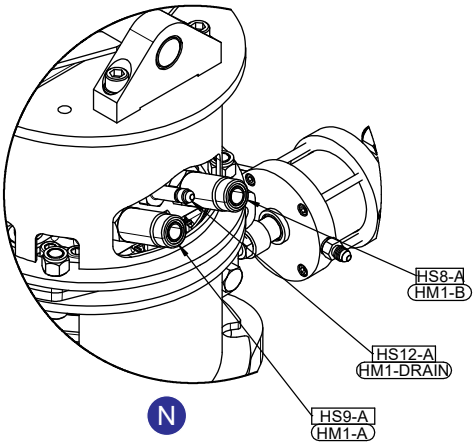

5
6
7
8
A
B
C
D
-PMP1
30547
RH SPRAY
PUMP
-L3
45573
RF
WORKLIGHT
-L4
45573
LF
WORKLIGHT
-PMP2
30547
LH SPRAY
PUMP
-A3
45271
HORN
-MT2
48384e
LH HYD
MOTOR
-L5
45573
LS
WORKLIGHT
-L6
45573
LR
WORKLIGHT
-Z6
-Z7
-Z8
-Z9
-Z10
-Z11
-Z12
-Z13
16 AWG Black/Orange
16 AWG Red/Orange
16 AWG Black/Yellow
16 AWG Red/Yellow
2 of 3


MD81 ENGINE HARNESS
CIRCUIT LEGEND
CAN -
CAN +
POS BATTERY CABLES
NEG NEGATIVE CABLES
IGNITION CIRCUIT
START CIRCUIT
UNSWITCHED PWR
KEY SWITCHED PWR
5V SUPPLY
SENSOR GROUND
12V GROUND
ALL OTHERS
-Z1
-Z2
-Z3
-Z4
33482-2101
33472-2006
334721606
DTP06-2S
DTP04-2P
DTP04-2P
DTP06-2S
DT06-12SA
DT04-12PA
33482-8601
DT06-2S
DT06-2S-E004
DT06-3S
DT06-3S-CE02
282191-1
282080-1
172130-1
172128-1
19069-0223
19221-0230
19221-0231
19221-0233
19432-0013
19193-0254
KUBOT
DIESEL PART
GRID HEATE
FUSE


5
6
7
8
A
B
C
D
B ACC PWR
C GND
A SEDIMENTER SW
L
-WIF
48203e_WIF Sensor
J1 -BACK
2 RH PUMP GND
1 RH PUMP CMD
J1-FRONT
2 LH PUMP GND
1 LH PUMP CMD
S
-PMP3
48920e
HYDRAULIC PUMP
A 5V PWR B
B RH LOOP PRES.
C 5V GND
T
-X3
43120
RH LOOP PRES
A 5V PWR B
B LH LOOP PRES.
C 5V GND
R
-X4
43120
LH LOOP PRES
BATTERY POS
START PWR
ALT PWR
START PWR
ALT PWR
ALT PWR
BATTERY NEG
ENG GND
STARTER PWR
START PWR
STARTER PWR
IGN SIG
ALT SIG
SWITCHED PWR
PWR M
FUSED GRID HEATER PWR
START SIG
1 FUSED ENG MAIN
2 GND
ECU I/O
1 OUTLET DPF
2 A-GND 3
3 OUTLET DOC
4 A-GND 3
5 INLET DOC
6 A-GND 3
9 DIFF PRESS. SIG
10 A-GND 11
11 A-VCC 12
QC
-ENG1
48203e
KUBOTA, V1505
-DPF
L A-VCC 12
K A-GND 11
J DIFF PRESS. SIG
F A-GND 3
E INLET DOC
D A-GND 3
C OUTLET DOC
B A-GND 3
A OUTLET DPF
X
-DPF
DIESEL PARTICULATE FILTER
GND
FUSED ENG MAIN
M
-PMP4
FUEL PUMP
1 BATT PWR
2 FUSED GRID HEATER PWR
G
-X5
52367
GRID HEATER FUSE HOLDER
30 FUSED GRID HEATER PWR
87 FUSED GRID HEATER PWR
86 GND
85 HTR SIG IN
O
-K3
52324
GRID HEATER RELAY
3 of 3

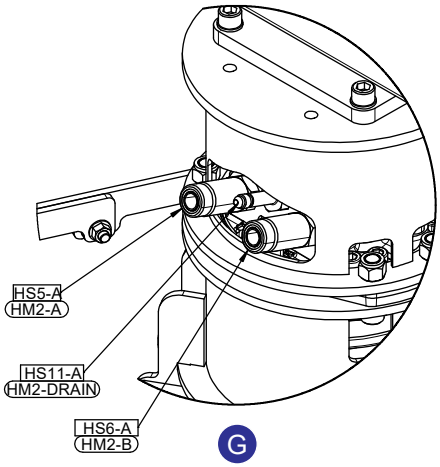

D
C
E
G
F
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A
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R
Q
H
J
L
N
K
M
A
P
O


HIGH PRESSURE LINES (4000 PSI)
MID PRESSURE LINES (270 ~ 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
-ENGINE 48203 KUBOTA V903 505 CUBIC INCHES 44 HP IDLE RPM 1050 OPERATING RPM 3000
-PMP1 48820 HYDRAULIC PUMP, TANDUM VARIABLE DISPLCMNT 21.2 CC MAX DISP., 9.4 CC CHARGE MAX FLOW 30 GPM @ 3000 RPM, MAX PRES 4,000 PSI (325 BAR) CHARGE PRES 370 PSI, MAX 435 PSI (30 BAR)
-HM1 48387-S06 MAX TORQUE @ MAX PUMP PRESSURE 1,392 LB FT @325 BAR MAX SET MOTOR SPEED 170 RPM, MIN 50 RPM MAX OPERATING PRESSURE 400 BAR (5801PSI) 14 SPEED SENSOR
-HM2 48387-S06 MAX TORQUE @ MAX PUMP PRESSURE 1392 LB FT@325BAR MAX SET MOTOR SPEED 170 RPM, MIN 50 RPM MAX OPERATING PRESSURE 400 BAR (5801PSI) 14 SPEED SENSOR
-HPC1 45467 PRESSURE REDUCING/RELIEVING CONTROL VALVE RELIEF SETTING 3000 PSI MAX FLOW 4GPM MAX OPERATING PRESSURE 3000 PSI
-HB1 45698 HYDRAULIC DISTRIBUTION MANIFOLD TWO PRESSURE SUPPLY PORTS SIX TANK RETURN PORTS
-HC1 45685 2.5" X 1.5"D X 0.75" EFFECTIVE BORE AREA 4.909 SQR IN EFFECTIVE ROD AREA 4.407 SQR IN WORKING PRESSURE 280 PSI RATED PRESSURE 500 PSI
-HC2 45682 2.5" X 1.5"D X 0.75" EFFECTIVE BORE AREA 4.909 SQR IN EFFECTIVE ROD AREA 4.407 SQR IN WORKING PRESSURE 280 PSI RATED PRESSURE 500 PSI
-HC3 45685 2.5" X 1.5"D X 0.75" EFFECTIVE BORE AREA 4.909 SQR IN EFFECTIVE ROD AREA 4.407 SQR IN WORKING PRESSURE 280 PSI RATED PRESSURE 500 PSI
-HV1 20832 3.1701 GPM 870 PSI RATED 8V-20-7-0-0C
-HV2 20833 3.1701 GPM 870 PSI RATED LH APPLY/TRK
-FL1 45624 MAX FLOW 200 GPM BYPASS: 3 GPM RECIRCULATING MAX OPERATING PRESSURE 150 PSI 10µ ABS GLASS FIBER ELEMENT PN 45644
-HT1 45132 CYCLONE RESERVOIR 45 GALLONS OPERATING FLOW 8GPM MAX TEMP 220°F
-HFR1 48709 HYDRAULIC FLOW RESTRICTOR ORIFICE RH SIDE ORIFICE SIZE 1/32" (.031")
-HFR2 48709 HYDRAULIC FLOW RESTRICTOR ORIFICE LH SIDE ORIFICE SIZE 1/32" (0.031")
-EF1 42648 FAN, COOLER RH SIDE 13" FAN SIZE 1000 CFM FLOW RATE
-EF2 42648 FAN, COOLER LH SIDE 13" FAN SIZE 1000 CMF FLOW RATE
-HE1 48163 COOLER, HYDRAULIC MAX PRESSURE RATING 500 PSI MAX FLOW 33.0 GAL/MIN MAX OPERATING TEMP 250°F HEAT DISSAPATION 7200 J/S
-HE2 48163 COOLER, HYDRAULIC MAX PRESSURE RATING 500 PSI MAX FLOW 33.0 GAL/MIN MAX OPERATING TEMP 250°F HEAT DISSAPATION 7200 J/S
-TS1 48395 SWITCH, TEMPERATURE, RH SIDE BI-METAL IMMERSION, TY PE TT TEMP SET POINT 117°NO-120°NC
-TS2 48395 SWITCH, TEMPERATURE, LH SIDE BI-METAL IMMERSION, TY PE TT TEMP SET POINT 117°NO-120°NC
-PT1 43120 0-5800 PSI
-PT2 43120 0-5800 PSI
-HS1 48934
-HS2 48935
-HS4 48936
-HS5 48940
-HS6 52048
-HS7 48862
-HS8 48900
-HS9 52048
-HS10 48940
-HS11 48940
-HS12 48934
-HS14 48935
-HS15 48472
-HS16 48935
-HS17 48940
-HS18 48940
-HS19 48940
-HS20 48940
-HS21 48972
-HS22 48972
-HS23 48936
-HS24 48936
-HS25 48936
-HS26 48936
REV D
SHEET 1 OF 1



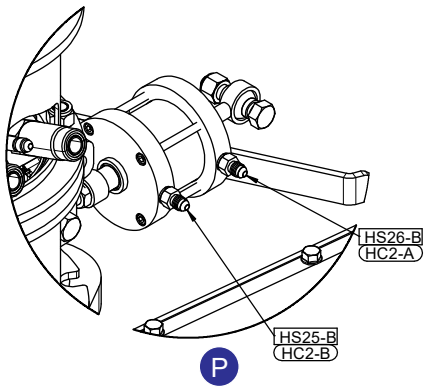
N

RIGHT MOTOR



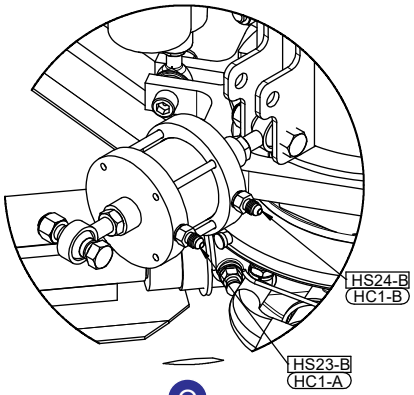
G

LEFT MOTOR



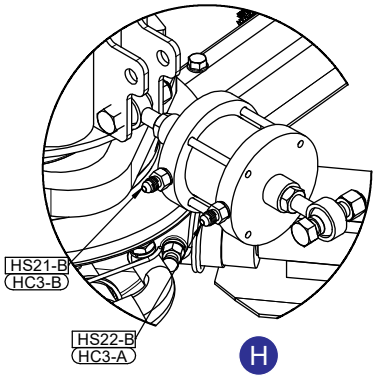
P

RIGHT REAR STEERING CYL



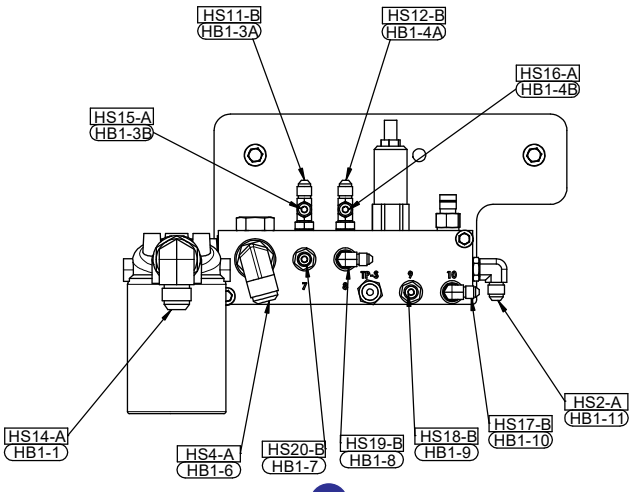
O

RIGHT STEERING CYL



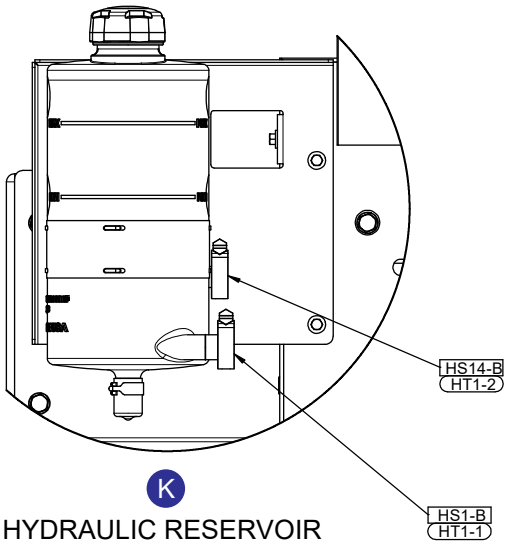
H

LEFT STEERING CYL



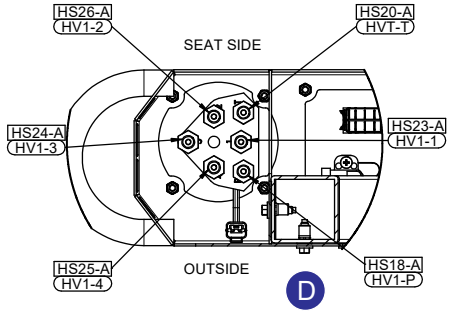
B

HYDRAULIC MANIFOLD

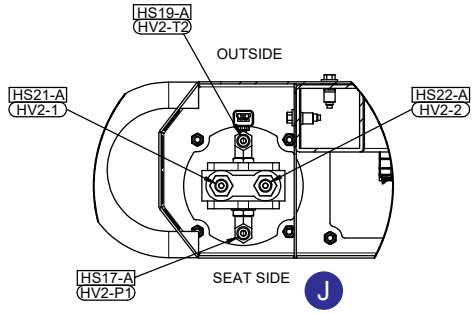


K

HYDRAULIC RESERVOIR



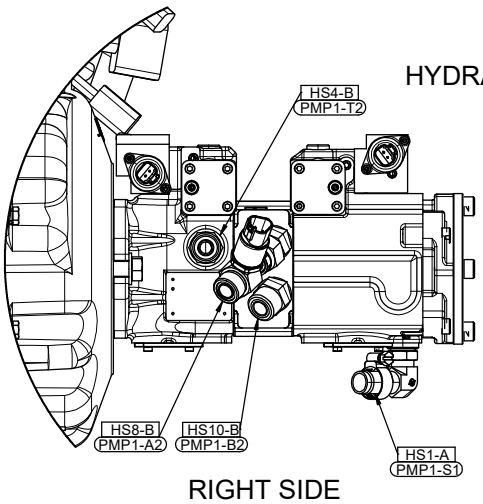
RIGHT JOYSTICK



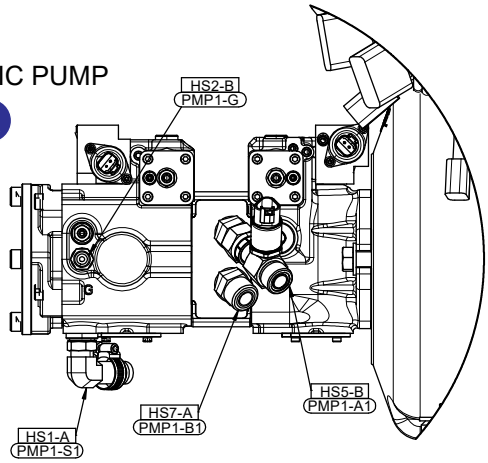
LEFT JOYSTICK

HYDRAULIC PUMP

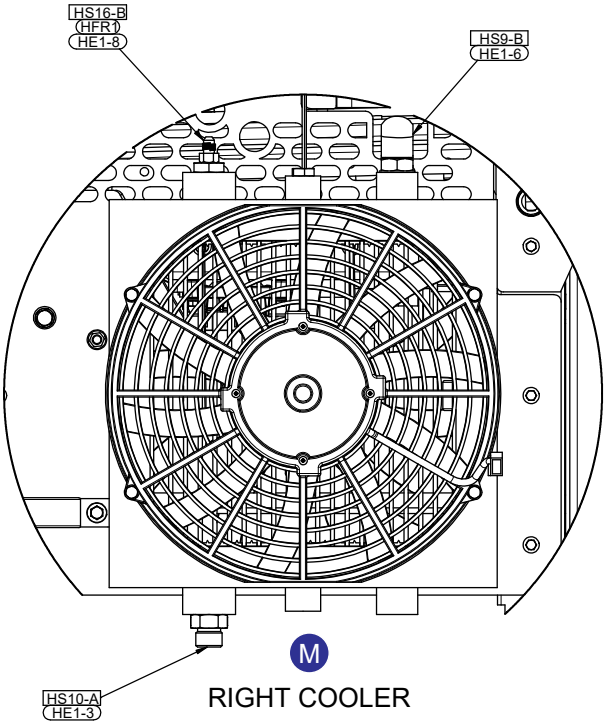
R



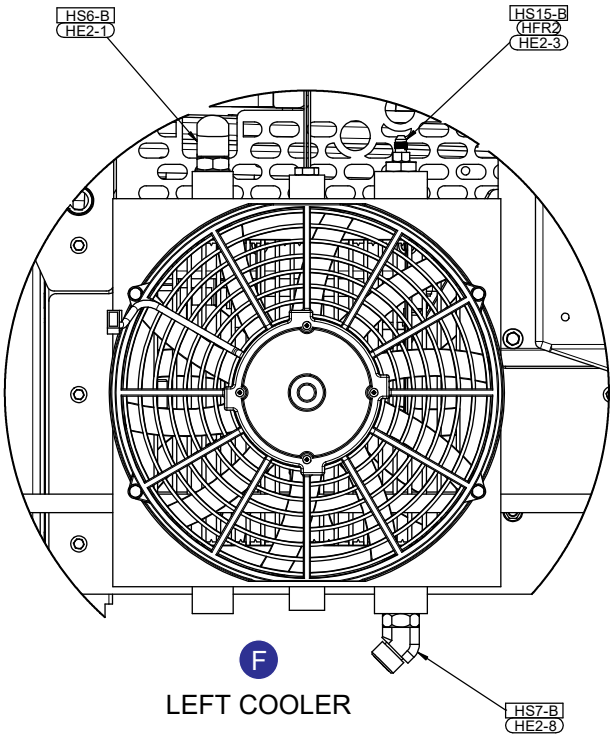
RIGHT SIDE



LEFT SIDE



RIGHT COOLER



LEFT COOLER

OPERATION MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON-HAND WHEN CALLING

UNITED STATES

Multiquip Inc.

(310) 537- 3700
6141 Katella Avenue Suite 200
Cypress, CA 90630
E-MAIL: mq@multiquip.com
WEBSITE: www.multiquip.com

CANADA

Multiquip

(450) 625-2244
4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
E-MAIL: infocanada@multiquip.com

UNITED KINGDOM

Multiquip (UK) Limited Head Office

0161 339 2223
Unit 2, Northpoint Industrial Estate, Globe Lane,
Dukinfield, Cheshire SK16 4UJ
E-MAIL: sales@multiquip.co.uk

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