

OPERATION MANUAL



WHITEMAN

MODEL HHXDF4-DF5

RIDE-ON TROWEL

(Kubota WG972 Dual Fuel Gasoline/Propane Engine)

Revision #7 (03/24/21)



THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PN: 32651

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PROPOSITION 65 WARNING



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SILICOSIS/RESPIRATORY WARNINGS

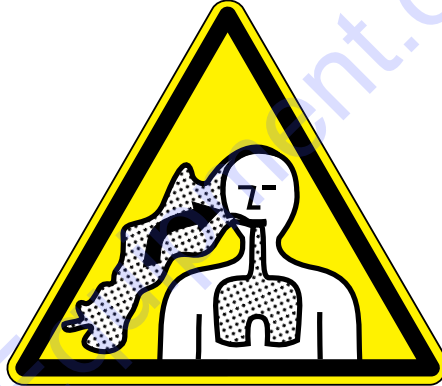
⚠ WARNING



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.

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NOTICE

Specifications are subject to change without notice.

NOTES

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TRAINING CHECKLIST

This checklist lists some of the minimum requirements for machine maintenance and operation. Please feel free to detach it and make copies. Use this checklist whenever a new operator is to be trained or it can be used as a review for more experienced operators.

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

DAILY PRE-OPERATION CHECKLIST

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						
7	Steering control operation						

SAFETY INFORMATION

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 INFORMATION

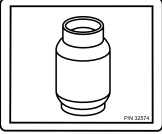
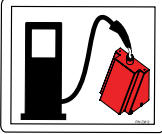



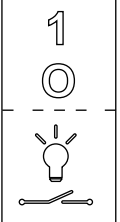

DECALS




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

DECAL	DEFINITION
	<p>DANGER Rotating Blade Hazard</p> <ul style="list-style-type: none"> 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.
	<p>NOTICE Read Manual</p> <p>To avoid injury you must read and understand operator's manual before using this machine.</p>
	<p>DANGER Belt Guard Hazard</p> <p>Keep hands and fingers clear from engine belts. Moving parts can crush. DO NOT remove belt guards.</p>
	<p>CAUTION Lifting/Crush Hazard</p> <ul style="list-style-type: none"> 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. On Quick Pitch™ models make sure T-Handle latch is locked (engaged).
	<p>DANGER Training</p> <p>This machine to be operated by qualified personnel only. Ask for training as needed.</p>
	<p>NOTICE Lifting Point</p> <p>Attach lifting strap to this point.</p>
	<p>NOTICE Protective Clothing</p> <p>ALWAYS wear appropriate clothing before operating trowel.</p>

DECAL	DEFINITION
	<p>DANGER Flying Objects Hazard</p> <p>To avoid injury, DO NOT disassemble spring cylinders without qualified service personnel. Possibility exist of severe bodily harm and injury.</p>
	<p>DANGER No Water Warning</p> <p>DO NOT add water to the retardant tank.</p>
	<p>DANGER Inhalation Hazard</p> <p>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!</p>
	<p>DANGER DO NOT Remove Guards, Hazard</p> <p>DO NOT operate equipment with guards removed. Serious bodily injury could result.</p>
	<p>LEFT-SIDE BLADE PITCH</p> <p>Indicates left-side blade pitch direction.</p>
	<p>RIGHT-SIDE BLADE PITCH</p> <p>Indicates right-side blade pitch direction.</p>
	<p>CAUTION Burn Hazard</p> <ul style="list-style-type: none"> HOT PARTS can burn skin. DO NOT touch hot parts. Allow machine sufficient amount of time to cool before performing maintenance.

SAFETY INFORMATION

DECAL	DEFINITION
	<p>PROPANE/LPG TANK</p> <p>The engine used in this equipment can run on <i>LPG/propane fuel</i>.</p>
	<p>UNLEADED GASOLINE</p> <p>The engine used in this equipment can run on <i>unleaded gasoline</i>.</p>
	<p>GASOLINE FUEL SELECTION MODE</p> <p>When fuel selection rocker switch is in this position, indicates that unit is in the <i>unleaded gasoline</i> mode.</p>
	<p>LPG/PROPANE FUEL SELECTION MODE</p> <p>When fuel selection rocker switch is in this position, indicates that unit is in the <i>LPG/Propane</i> mode.</p>
	<p>CAUTION</p> <p>Cold Weather Conditions Cold weather starting below 40°F (4°C). Run engine 3-5 minutes while moving steering controls before depressing blade control pedal.</p>
	<p>LIGHT SWITCH</p> <p>When light rocker switch is in position 1 all halogen lights will turn on. Position 0 will turn off all lights.</p>
	<p>NOISE LEVEL</p> <p>Indicates value of the sound power of the equipment measured at operator's seat.</p>

DECAL	DEFINITION
	<p>LUBRICATION POINT</p> <p>Indicates that lubrication is required where this icon is displayed.</p>
 	<p>DANGER Fire Hazard</p> <p>DO NOT light matches around or near this equipment. This equipment contains highly flammable fuel. If ignited, could start a fire causing equipment damage and severe bodily harm — even death!</p>
 	<p>DANGER Fire Hazard</p> <p>DO NOT smoke around or near this equipment. This equipment contains highly flammable fuel. If ignited, could start a fire causing equipment damage and severe bodily harm — even death!</p>
	<p>DANGER Explosion Hazard</p> <p>Hot steam or coolant may escape when radiator cap is removed, causing severe burns. Allow radiator to cool before removing cap.</p>

SAFETY INFORMATION

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 not feeling well due to fatigue, illness or when under medication.
- **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.
- **DO NOT** 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 user may result.

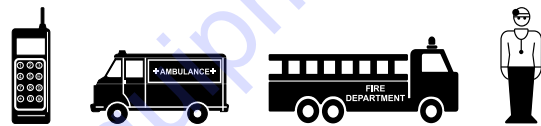
- **ALWAYS** know the location of the nearest fire extinguisher.



- **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**.

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



- **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**.



SAFETY INFORMATION

WARNING

- If applicable, **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 knowledgeable 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 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

- **DO NOT** place hands or fingers inside engine compartment when 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 equipment.



NOTICE


- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service 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.



SAFETY INFORMATION

FUEL SAFETY (GASOLINE)

DANGER

- **DO NOT** 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.
- **DO NOT** overfill tank, since 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.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine. 


FUEL SAFETY (LPG/PROPANE)

DANGER

- **DO NOT** fill propane tank within 25 ft. (7.62 m) of buildings and line of adjoining structures that may be a source of ignition.
- Remove all combustible materials including dry grass and leaves within 25 ft. (7.62 m) of LPG dispenser.
- Before filling, visually inspect propane tank for dents, cracks and excessive corrosion.
- **NEVER** fill propane tank if damaged, corroded, displays leaks at fittings\valves or contains foreign material.
- **NEVER** fill propane tank if pressure relief or fill valves are damaged.

- **ALWAYS** fill propane tank in a well-ventilated area, away from sparks and open flames. LP Gas is odourless and invisible.

- **DO NOT** fill the propane tank while the engine is running or hot.

- **DO NOT** smoke around or near the equipment. Fire or explosion could result from gas vapors. 

- Accumulation of LP Gas vapors may result in the development of an oxygen-deficient atmosphere which carries a risk of asphyxiation.

- **NEVER** enter a gas cloud area. This condition produces a oxygen-deficient atmosphere that could be fatal.

CAUTION

- **ALWAYS** use protective gloves when handling propane tank. LP Gas will cause cold burns if it comes into contact with the skin.

- The eyes and body must be protected when handling all LP Gas products. **ALWAYS** wear protective eye safety glasses and clothing.

- LP Gas is heavier than air, an underground or low level leak might not be detected immediately. Low level leaks might not be detected immediately.

SAFETY INFORMATION

BATTERY SAFETY

DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** 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 battery if frozen. 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

- **NEVER** allow any person or animal to stand underneath the equipment while lifting.
- Ride-on trowels are very heavy and awkward to move around. Use proper heavy lifting procedures and **DO NOT** attempt to lift the trowel by the guard rings.
- **NEVER** lift trowel with the operator on the machine.



NOTICE


- The easiest way to lift the trowel is to utilize the lift loops that are welded to the frame. These lift loops are located to the left and right sides of the operator's seat.

A strap/chain can be attached to these lift loops, allowing a forklift or crane to lift the trowel up onto and off of a slab of concrete. The strap or chain should have a minimum of 2,000 pounds (1,000 kg) lifting capacity and the lifting gear must be capable of lifting at least this amount.
- **NEVER** transport 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 crane or lifting device has been properly secured to the lift loops of the equipment.
- **ALWAYS** shutdown engine before transporting.
- **NEVER** lift the equipment while the engine is running.
- Tighten fuel tank cap securely and close fuel cock to prevent fuel from spilling.
- Use adequate lifting cable (wire or rope) of sufficient strength.
- **DO NOT** lift machine to unnecessary heights.
- **ALWAYS** tie down equipment during transport by securing the equipment with straps. Inspect straps to make sure they are not frayed or damaged.

SAFETY INFORMATION

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 your trowel. 
- In order to reduce the possibility of an accident while transporting the trowel on public roads, **ALWAYS** make sure the trailer that supports the trowel and the towing vehicle are mechanically sound and in good operating condition.
- **ALWAYS** shutdown engine before transporting
- Make sure the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer “gross vehicle weight rating.”
- **ALWAYS** inspect the hitch and coupling for wear. **NEVER** tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both towing vehicle and trailer. **Manufacturer recommends that trailer tires be inflated to 50 psi cold.** Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with a **safety chain**.
- **ALWAYS** properly attach trailer's safety chains to towing vehicle.
- **ALWAYS** make sure the vehicle and trailer directional, backup, brake and trailer lights are connected and working properly.
- DOT Requirements include the following:
 - Connect and test electric brake operation.
 - Secure portable power cables in cable tray with tie wraps.
- The maximum speed for highway towing is 55 MPH unless posted otherwise. Recommended off-road towing is not to exceed 15 MPH or less depending on type of terrain.
- Avoid sudden stops and starts. This can cause skidding, or jack-knifing. Smooth, gradual starts and stops will improve towing.

- Avoid sharp turns to prevent rolling.
- Trailer should be adjusted to a level position at all times when towing.
- Raise and lock trailer wheel stand in up position when towing.
- Place **chock blocks** underneath wheel to prevent rolling while parked.
- Place support blocks underneath the trailer's bumper to prevent tipping while parked.
- Use the trailer's swivel jack to adjust the trailer height to a level position while parked.

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 rules below.

- **DO NOT** 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 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 battery and bring to 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 a new product.

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

EMISSIONS INFORMATION (GASOLINE)

NOTICE

The engine used in this equipment is a dual fuel engine (gasoline/LPG). The gasoline side of the engine has been designed to reduce harmful levels of carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NOx) contained in gasoline exhaust emissions.

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

Attempting 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.

EMISSIONS INFORMATION (LPG)

NOTICE

The LPG (propane) side of the engine used in this equipment uses components that meet US EPA Phase 3 and CARB Large Spark Ignited (LSI) emission regulations.

Any modifications to the fuel system or any adjustments made to the engine will cause the engine to be in **non compliance** with emission regulations.

Emission Control Label

The emission control label is an integral part of the emission system and is strictly controlled by regulation(s).

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

If a replacement emission label is needed, please contact Discount-equipment.

LIFTING AND TRANSPORTING

WORK SAFELY!

WARNING



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

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

LIFTING SAFETY

CAUTION

- **NEVER** allow any person to stand underneath the equipment while lifting.
- Ride-on trowels are very heavy and awkward to move around. Use proper heavy lifting procedures and **DO NOT** attempt to lift the trowel by the guard rings.
- **NEVER** 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.
- **NEVER** lift the trowel while the engine is running.
- 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 Discount-equipment.

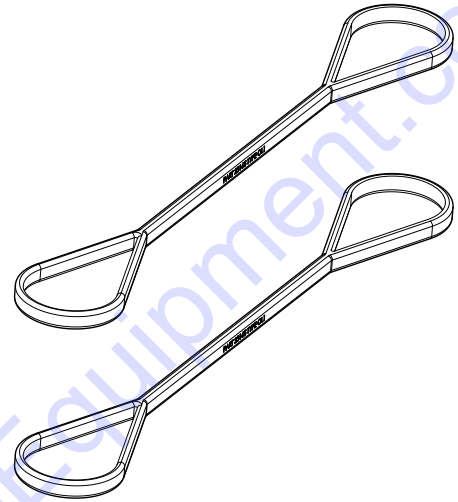






Figure 1. Lifting Slings

LIFTING AND TRANSPORTING

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:

<ul style="list-style-type: none">■ Holes, tears, cuts, or snags■ Embedded particles■ Abrasive wear that exposes core fibers	
<ul style="list-style-type: none">■ Missing or unreadable Rated Capacity tags■ Melting, charring, weld spatter, or chemical burns	
<ul style="list-style-type: none">■ Broken or worn stitching that exposes the core fibers	
<ul style="list-style-type: none">■ Knots	
<ul style="list-style-type: none">■ Any other condition which may cause doubt as to the strength of the sling	

LIFTING AND TRANSPORTING

LIFTING PROCEDURE

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

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

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

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

1. Secure the two lifting slings to the lift loops located on the left and right side of the trowel (Figure 2).

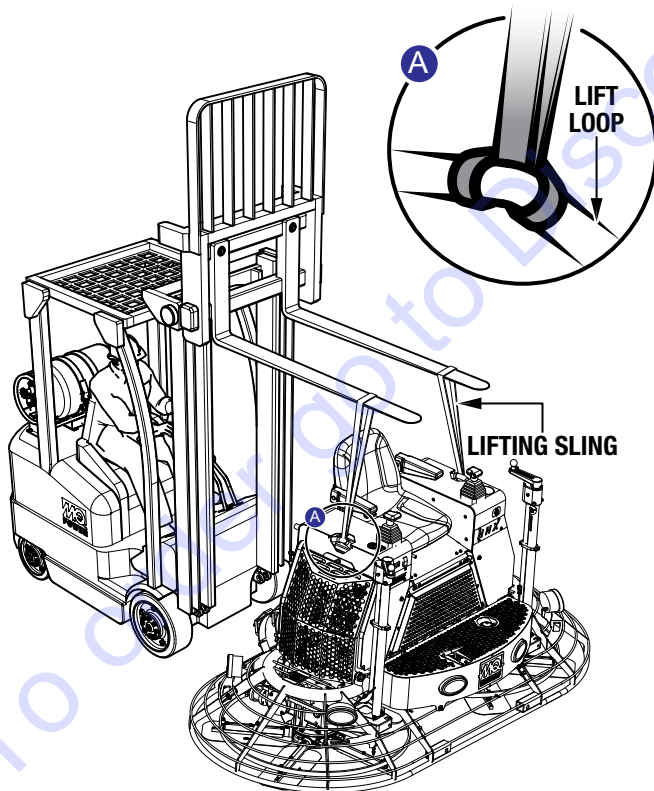


Figure 2. Lifting the Trowel

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

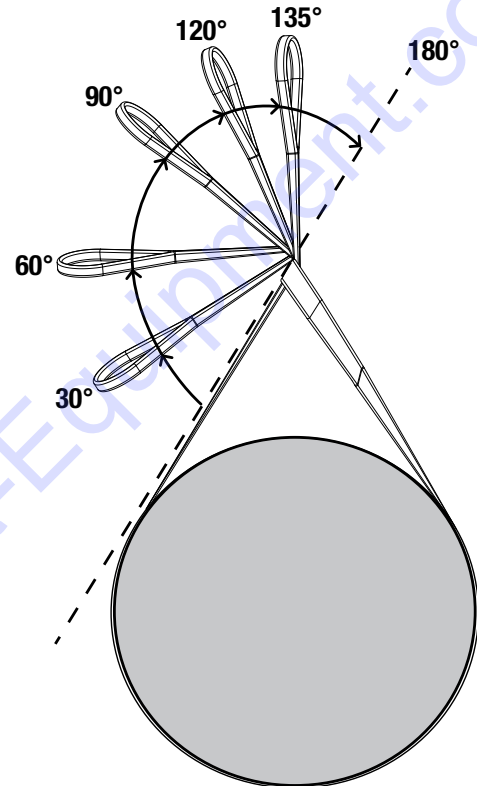


Figure 3. Choke Angle

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

SPECIFICATIONS (TROWEL)

Table 2. HHXDF4-DF5 Specifications

Operating Weight	1,654 lb. (750 kg)
Shipping Weight	1,790 lb. (812 kg)
Blade Tip Speed	1,425 fpm (7.24 m/s)
Rotor Speed	40–170 rpm
Path Width	91 in. (231 cm)
Fuel Tank Capacity	9.5 gallons (36 liters)
Hydraulic Oil Type	Parker DuraClean™ ISO 46
Hydraulic Oil Capacity	3.4 gallons (12.9 liters)

Table 3. HHXDF4-DF5 Noise and Vibration Emissions

Guaranteed ISO 11201:2010 Based Sound Pressure Level at Operator Station in dB(A)	98
Guaranteed ISO 3744:2010 Based Sound Power Level in dB(A)	130
Whole Body Vibration per ISO 2631-1:1997+A1:2010 in $m/s^2 \Sigma A(8)$	0.04

NOTES:

1. Sound pressure and power levels are “A” weighted measures per ISO 226:2003 (ANSI S1.4-1981). They are measured with the 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 $0.5 m/s^2 \Sigma A(8)$. The daily exposure limit value is $1.15 m/s^2 \Sigma A(8)$.

SPECIFICATIONS (ENGINE)

Table 4. Engine Specifications		
Engine Type	Vertical, water-cooled, 4-cycle, dual fuel (gasoline/LPG)	
Number of Cylinders	3	
Bore x Stroke	2.93 x 2.90 in. (74.5 x 73.6 mm)	
Total Displacement	0.962 liters (58.7 in. ³)	
Intake System	Naturally aspirated	
ISO Net Continuous	17.5 kW/3,600 min ⁻¹ (rpm) 23.5 kW/3,600 min ⁻¹ (rpm)	
ISO/SAE Net Intermittent	22.0 kW/3,600 min ⁻¹ (rpm) 29.5 kW/3,600 min ⁻¹ (rpm)	
SAE Gross Intermittent	23.1 kW/3,600 min ⁻¹ (rpm) 31.0 kW/3,600 min ⁻¹ (rpm)	
Maximum Bare Speed	3,850–3,950 min ⁻¹ (rpm)	
Minimum Bare Idling Speed	1,400–1,600 min ⁻¹ (rpm)	
Cylinder Head	Overhead valve	
Ignition System	Distributor—less solid stage type	
Governor	Centrifugal ball type/electronic governor	
Direction of Rotation	Counterclockwise (viewed from flywheel)	
Spark Plug	NGK BKR4E	
Spark Plug Gap	0.024–0.027 in. (0.6–0.7 mm)	
Ignition Timing	0.31 rad (21°) before T.D.C./3,600 min ⁻¹ (rpm)	
Firing Order	1-2-3	
Compression Ratio	9.2:1	
Lubricating System	Forced lubrication by trochoid pump	
Oil Pressure Indication	Electrical type switch	
Lubricating Filter	Full-flow paper filter (cartridge type)	
Cooling System	Pressurized radiator (not included with basic model), forced circulation with water pump	
Starting System	Electric starting with starter (12 V, 0.7 kW)	
Battery	12 V, 35 Ah or equivalent	
Fuel Type	Gasoline	Unleaded automobile gasoline
	Liquid Propane	HD-5 (standard commercial LP gas)
Fuel Capacity	Gasoline	9.5 gallons (36 liters)
	Liquid Propane	33.5 lb. (15.2 kg/36.3 liters)
Lubricating Oil	Better than SH class (API) SAW 10W30	
Lubricating Oil Capacity	0.9 gallons (3.4 liters)	
Catalytic Muffler/Converter	Three-way catalyst	
Dry Net Weight	159 lb. (72.0 kg)	
Application	General power source	
Dimensions (L x W x H1 x H2)	17.40 x 15.80 x 19.80 x 6.26 in. (443 x 402 x 503 x 159 mm)	

DIMENSIONS

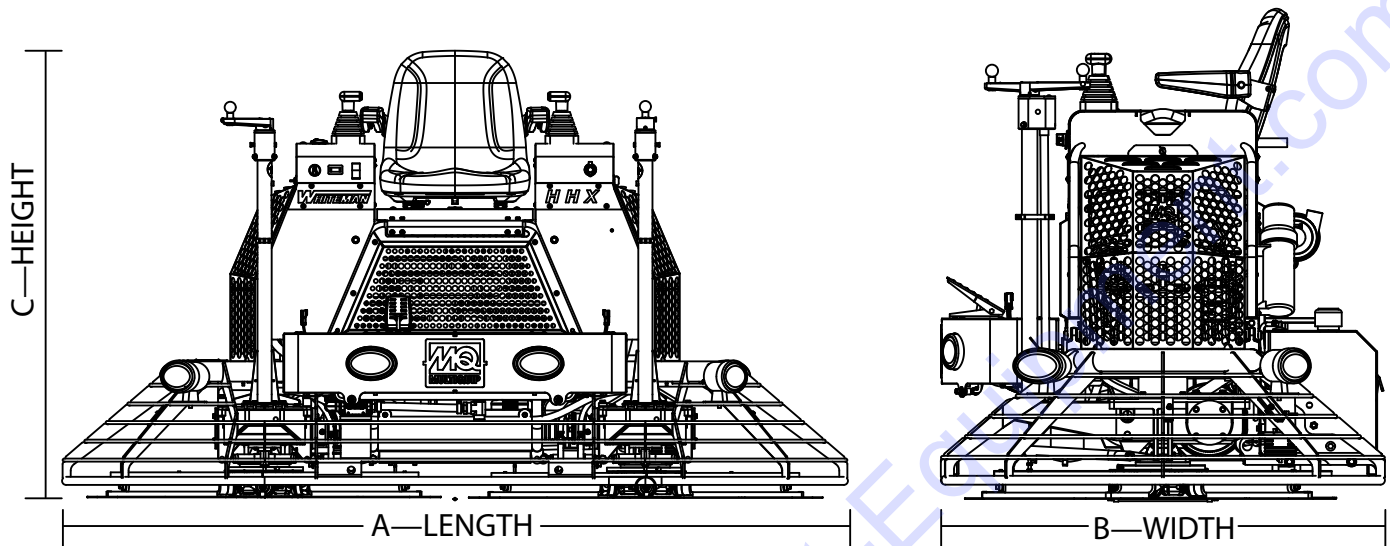


Figure 4. HHXDF4-DF5 Dimensions

Table 5. HHXDF4-DF5 Dimensions	
Measurement	in. (cm)
(A) Length	98 (249)
(B) Width	50 (127)
(C) Height	54 (137)

INTENDED USE

Operate the HHXDF4-DF5 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.

FAMILIARIZATION

The HHXDF4-DF5 ride-on trowel is designed for the floating and finishing of concrete slabs.

Walk around your trowel and observe the major components—the engine, blades, air cleaner, fuel system, fuel shut-off valve, ignition switch, etc. Ensure engine and gearbox lubricant levels are within the proper operating range and maintain the proper level of hydraulic fluid in the hydraulic fluid reservoir.

Read all safety instructions 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.

Grasp the operator control joysticks and move them around a bit. Observe how moving the control joysticks causes the gearboxes and frame to move.

Notice the foot pedal which controls engine and blade speed. Also look at the main driveline of the trowel. Take note of how the belts look—this is the way the belts should look when adjusted properly.

Before using your trowel, test it on a flat, watered-down section of finished concrete. This trial test run will familiarize you with the trowel's controls and indicators and will increase your confidence in using the trowel. You will learn how the trowel handles under actual operating conditions.

ENGINE

The HHXDF4-DF5 ride-on trowel is equipped with a liquid-cooled, 31 hp, Kubota WG972 engine which operates on gasoline or liquid propane gas (LPG)—a dual fuel (DF) engine. Refer to the engine owner's manual included with the trowel for specific instructions regarding engine operation. If the original manual is lost or damaged, contact Discount-equipment.

BLADES

The blades of the trowel finish the concrete as they are swirled around the surface. Blades are classified as *combination* (10 or 8 inches wide) or *finish* (6 inches wide). The HHXDF4-DF5 is equipped with five blades per rotor equally spaced in a radial pattern and attached to a vertical rotating shaft by means of a **spider assembly**.

GEARBOXES

The HHXDF4-DF5 is equipped with two separate gearbox assemblies enclosed in rugged cast aluminum gear cases. The gearbox casing holds 50% more oil than competitors, which allows more lubrication to be provided to critical points.

HYDRAULIC STEERING

Dual palm-grip joystick controls located to the left and right of the operator are provided for steering. The joysticks are linked to three hydraulic steering cylinders located within the frame of the machine. Refer to the **Operation** section of this manual for a detailed explanation of how the joystick controls affect steering of the trowel.

LPG TANK

This trowel features an optional LPG fuel tank which may be used instead of gasoline fuel. Switching between gasoline and LPG fuel systems during operation may be performed uninterrupted.

CONSTANT VELOCITY JOINTS (CV JOINTS)

Constant velocity joints ensure the efficient transfer of power to the drive shaft and maintain the timing of the gearboxes without any chance of slippage.

TRAINING

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

COMPONENTS (TROWEL)

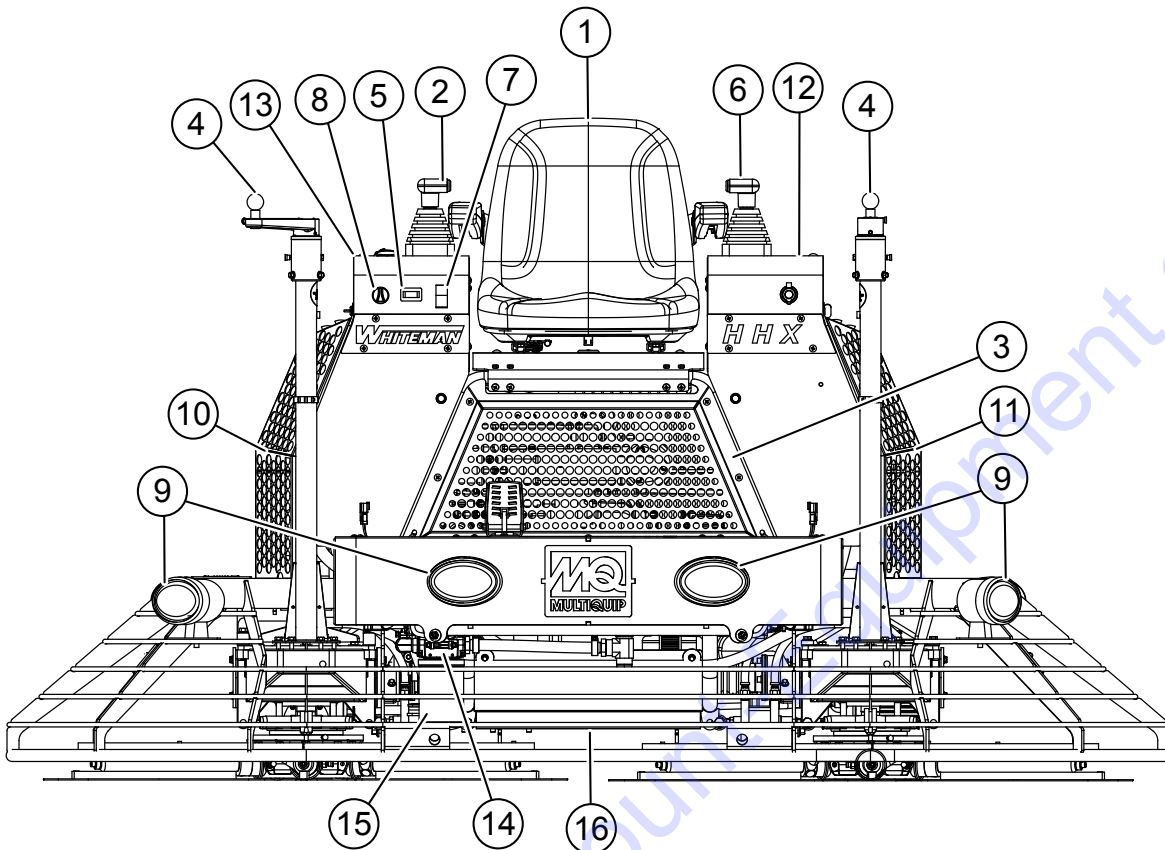


Figure 5. HHXDF4-DF5 Front

1. **Seat** — Place for the operator to sit. The engine will not start and the blades will not rotate unless the operator is seated. The seat is adjustable fore and aft for operator comfort.
2. **Steering Control (Right Side)** — Moves the right rotor forward or reverse. Moves the trowel left or right.
3. **Front Guard** — Remove this guard cover to access the left side of the engine and other internal components.
4. **Pitch Control** — Adjusts blade pitch separately for each side of the trowel.
5. **Hour Meter** — Indicates the number of hours the machine has been in use or the engine has been running.
6. **Steering Control (Left Side)** — Moves the left rotor in a forward or reverse direction only.
7. **Light Switch** — ON/OFF switch for the six halogen lights.
8. **Ignition Switch** — Turn clockwise to start the engine.
9. **Lights** — Six 12-volt LEDs (four in front, two in rear) provide better visibility when working indoors.
10. **Right Side Guard** — Remove to access the radiator and to allow the right clamshell to open for service.
11. **Left Side Guard** — Remove to access the battery and to allow the left clamshell to open for service.
12. **Left Side Clamshell** — Remove two bolts to open for service and maintenance access.
13. **Right Side Clamshell** — Remove two bolts to open for service and maintenance access.
14. **Bypass Indicator** — Sight glass located in-line and just above the hydraulic bypass filter. System is in a bypass condition when the indicator is in the red.
15. **Hydraulic Bypass Filter** — Filters contaminants from the hydraulic system during a bypass condition.
16. **Magnetic Drain Plug** — Remove to drain hydraulic oil from the hydraulic system.

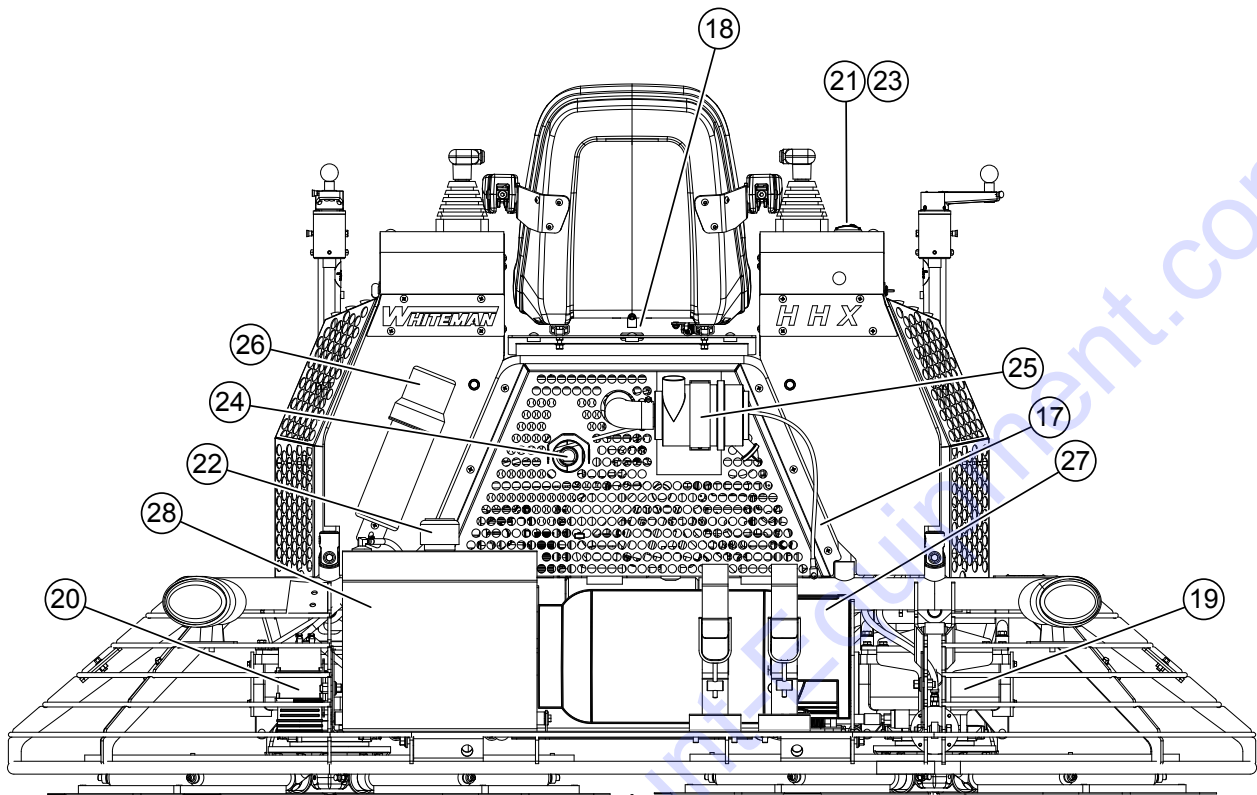


Figure 6. HHXDF4-DF5 Rear

17. **Rear Guard** — Remove to access the right side of the engine and internal components for service and maintenance.
18. **Seat Switch** — Recognizes when the operator is seated. Trowel blades will not turn and engine speed will not rise above idle unless the operator is seated.
19. **Right-Side Spider** — Consists of trowel arms, blades, wear plate, thrust collar, etc.
20. **Left-Side Spider** — Consists of trowel arms, blades, wear plate, thrust collar, etc.
21. **Fuel Selection Switch** — When the rocker switch is pressed to the right, **PROPANE** mode is selected, and the **GREEN** light is **ON**. When the rocker switch is pressed to the left, **GAS** mode is selected, and the **GREEN** light is **OFF**.
22. **Fuel Filler Cap/Fuel Gauge** — Remove this cap to add fuel when the fuel gauge indicates low fuel level.
23. **Engine Status Gauge** — Multi-cluster gauge indicates the following:
- Low pressure oil LED
 - Overheat LED
 - Auxiliary LEDs
 - Glow plug pre-heat LED
 - Battery charge LED
24. **Exhaust Outlet** — Exhaust gases are routed through the muffler and out of the back of the rear guard.
25. **Air Filter Assembly** — Helps prevent dirt and debris from entering the fuel system. Lift the locking latch on the canister to gain access to the filter element.
26. **Documentation Canister** — Storage for trowel and engine manuals or any other relevant documentation.
27. **Propane Tank** — Holds 33.5 lb. (36.3 liters) of propane. Uses HD-5 or HD-10 liquid propane. HD-5 is recommended.
28. **Fuel Tank (Gasoline)** — Holds 9.5 gallons (36 liters) of gasoline. Use either 87 or 89 octane rated gasoline.

COMPONENTS (TROWEL)

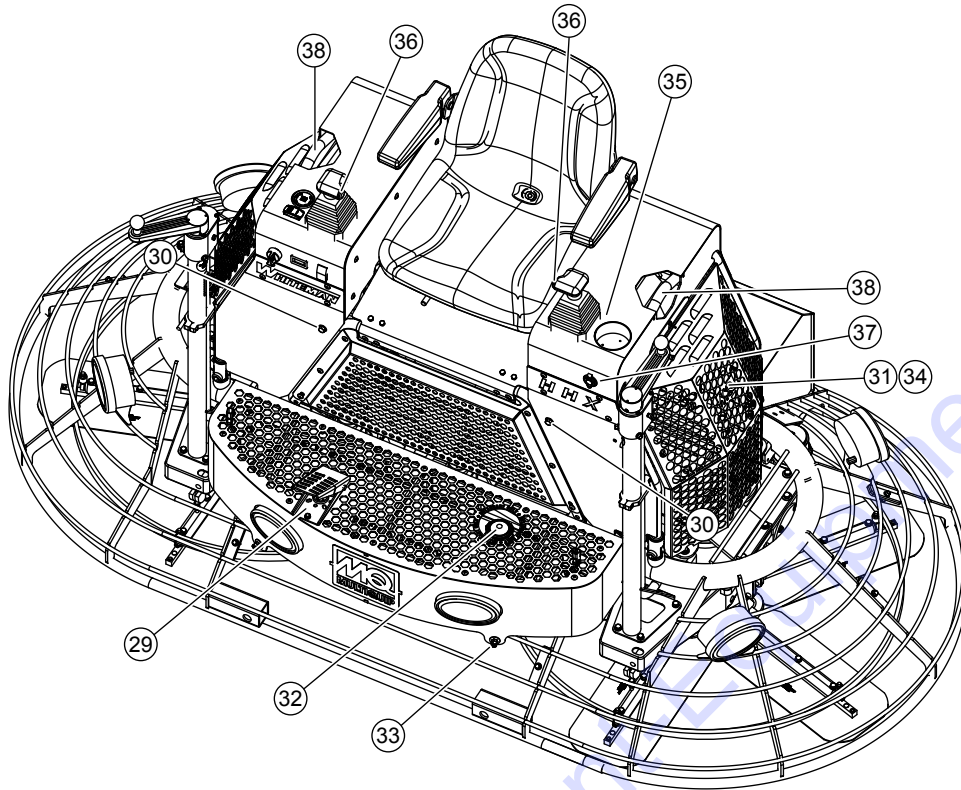


Figure 7. HHXDF4-DF5

29. **Foot Pedal** — Controls blade speed. Slow blade speed is obtained by slightly depressing the foot pedal. Maximum blade speed is obtained by fully depressing the foot pedal.
30. **Clamshell Securing Bolt Location (4 Places)** — Remove to open the clamshell.
31. **Battery** — Provides +12VDC power to the electrical system.
32. **Retardant Spray Filler Cap** — Remove this cap to add spray retardant.
33. **Spray Nozzles** — Two retardant spray nozzles are used with the trowel.
34. **Hydraulic Oil Reservoir** — Hydraulic fluid top-off point.
35. **Hydraulic Pressure Test Port** — Connect a test gauge to the test port to determine hydraulic pressure during operation.
36. **Retardant Spray Control Buttons (Left and Right)** — When pressed, allows retardant spray to flow through the spray nozzle located at the front of the machine.
37. **12VDC Power Port** — Accessory power port for charging personal electronic devices.
38. **Lift Points** — Located on the left and right sides of the main frame. Use when the trowel must be lifted onto a concrete slab.

COMPONENTS (ENGINE)

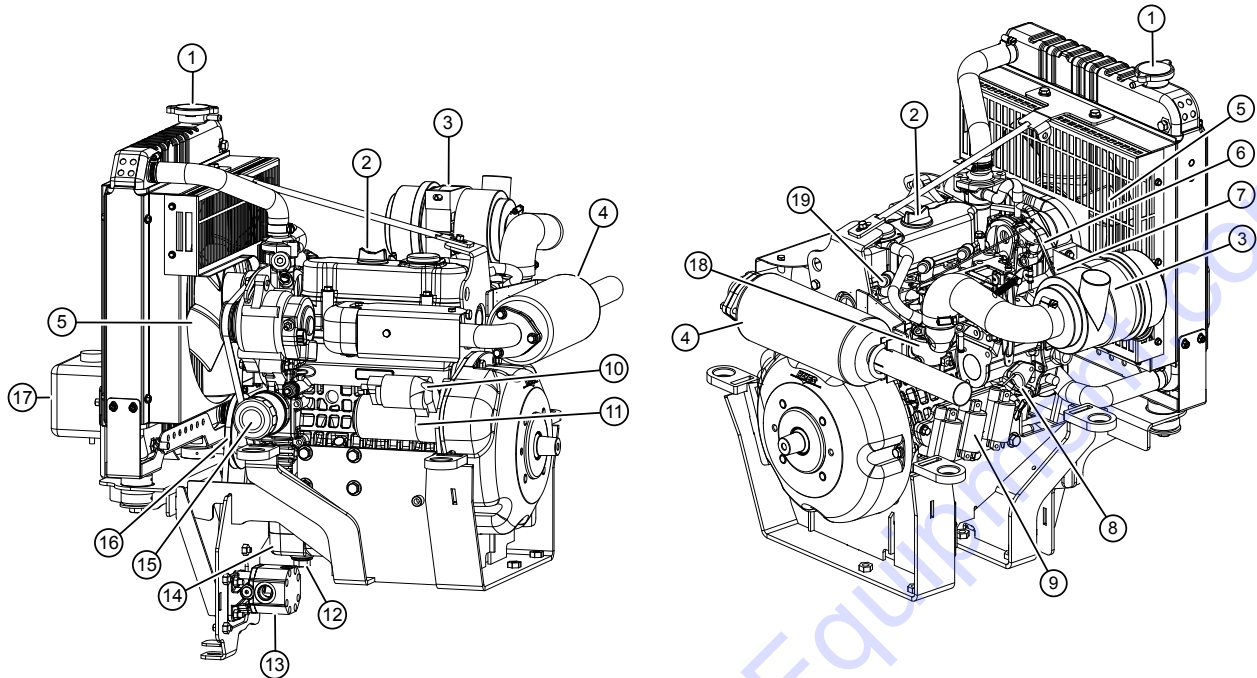


Figure 8. Engine Components

1. **Radiator/Filler Cap** — Holds coolant/water necessary to keep the engine at a safe operating temperature. Remove this cap to add water/antifreeze when cool.
2. **Engine Oil Filler Cap** — Remove to add engine oil.
3. **Air Filter** — Helps provide a clean source of air flow to the engine.
4. **Muffler** — Reduces noise and emissions. **NEVER** touch the muffler while the engine is running.
5. **Fan** — Provides cooling air to the radiator.
6. **Governor Lever** — Restricts engine speed (high idle or low idle) through a speed control device linked to the accelerator system.
7. **Vaporizer** — Vaporizes liquid fuel gases. Primary function is to heat up LPG.
8. **Oil Dipstick** — Remove to check the amount and condition of oil in the crankcase. Lift the seat to access. Add oil as required.
9. **Ignition Coil** — Regulates coolant temperature.
10. **Electric Starter** — Starts the engine when the ignition key is rotated to the **START** position.
11. **Alternator** — Provides current to the electrical system and charges the battery.
12. **Oil Drain Plug** — Remove to drain crankcase oil. Always dispose of used oil and oil filters in an environmentally safe manner. **NEVER** allow used oil to drain onto the ground or into a water runoff drain. Torque to 24–27 lbf·ft (33–37 N·m).
13. **Hydraulic Pump** — Distributes hydraulic oil through the engine system.
14. **Oil Pan** — Holds a maximum of 3.6 quarts (3.4 liters) of motor oil.
15. **Oil Filter** — Filters engine oil for dirt and debris.
16. **Fan Belt** — Driven by the engine crankshaft during operation, drives the water pump/fan as well as the alternator.
17. **Coolant Recovery Tank** — Holds a maximum of 1.0 quarts (0.95 liters) of excess radiator coolant.
18. **Carburetor** — Low-emission carburetor equipped with an ideal fuel-air mixture valve with a limiter which allows adjustment.
19. **Spark Plug** — Provides spark to the ignition system. Set the spark plug gap to 0.024–0.027 inch (0.6–0.7 mm). Clean the spark plug once a week.

RIGHT SEAT FRAME CONTROLS AND INDICATORS

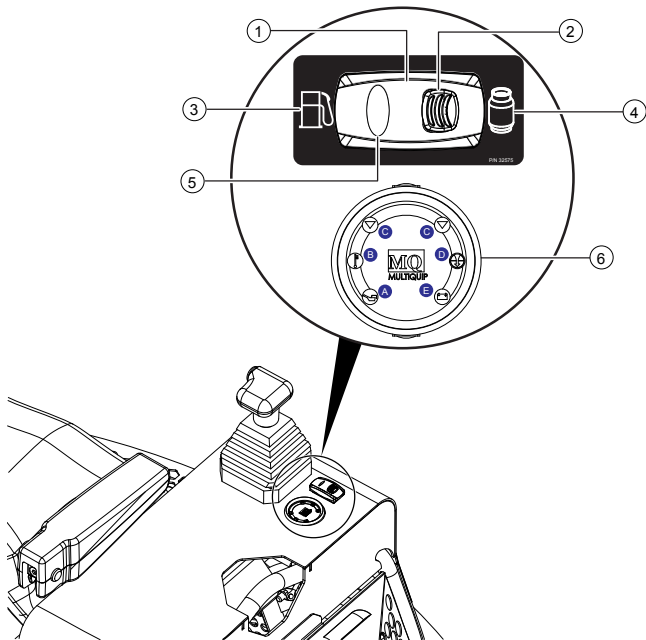
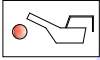
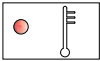
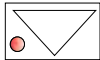

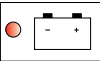


Figure 9. Control Box

The controls and functions on the right seat frame are described below (Figure 9).

1. **Fuel Selection Rocker Switch** — Two position rocker switch selects either gasoline or propane fuel systems. When the rocker switch is pressed to the right, **PROPANE** mode is selected. When pressed to the left, **GAS** mode is selected.
2. **Fuel Selection Rocker Switch Lock** — Sliding lock tab prevents unwanted fuel system changes during operation. Slide the **switch lock** to the left and hold, then select the desired gas mode. Once the mode has been selected, release the fuel selection rocker switch.
3. **Gas Mode** — Indicates the required position of the fuel selection rocker switch to use **GASOLINE** during operation.
4. **LPG Mode** — Indicates the required position of the fuel selection rocker switch to use **PROPANE** during operation.
5. **Fuel Selection Indicator** — **GREEN LED** indicator illuminates when **PROPANE** is selected. **GREEN LED** indicator is **NOT** illuminated when **GAS** is selected.

6. **Engine Status Gauge** — Multi-cluster gauge indicates the following:

- a. **Low Oil Pressure LED** — When **ON**, indicates that the oil pressure has dropped to 7 psi (48.3 kPa). This condition will cause the engine to shut down. During normal operation of the trowel this LED should remain **OFF**. 
- b. **Overheat LED** — This LED turns **ON** when the cooling water temperature rises above 239°F, ± 37.4°F (115°C, ± 3°C). If this LED turns **ON** during normal operation of the pump, the emergency shutdown device will stop the engine automatically. 
- c. **Auxiliary LEDs** — These status LEDs are not used on this trowel. 
- d. **Glow Plug Pre-Heat LED** — This LED turns **ON** when the preheat system is in process. When the LED turns **OFF**, the preheat period is complete and the engine may be started. 
- e. **Battery Charge LED** — When **ON**, indicates that the charging system is not working properly. This condition will cause the engine to shut down. 

There is a **Daily Pre-Operation Checklist** at the front of this manual. Make copies of this checklist and use it on a daily basis.

NOTICE

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

WARNING

Failure to understand the operation of this trowel may result in **severe personal injury** or damage to the trowel.

ENGINE OIL

1. When checking or adding oil, place the machine so the engine is level.
2. Pull the engine oil dipstick from its holder (Figure 10).

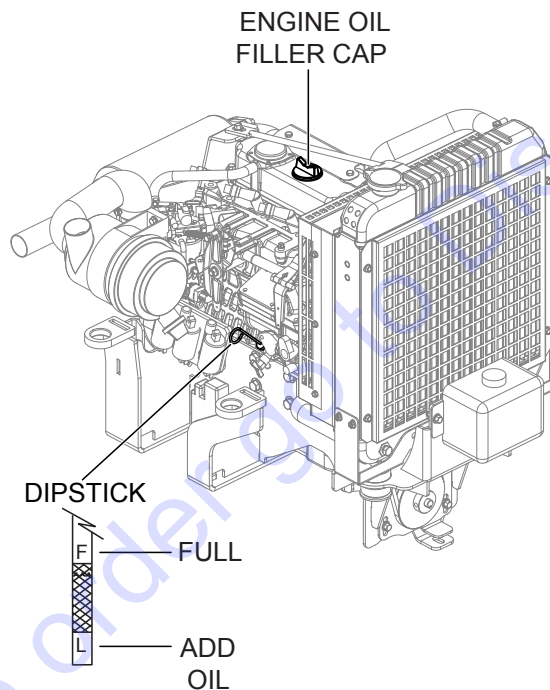


Figure 10. Engine Oil Check and Fill

3. Determine if engine oil is low. The oil should be between the upper limit and lower limit (add oil) lines.

4. If oil is below the 'Add Engine Oil' line, add oil up to the upper limit on the dipstick. Allow enough time for any added oil to make its way to the oil pan before rechecking.

CAUTION

NEVER overfill the oil pan with engine oil. Always keep the engine oil level between the upper and lower limit lines on the dipstick.

GEARBOX OIL

1. Check the gearbox oil level in each gearbox by observing the sight glass at the rear of the gearbox. See Figure 11.

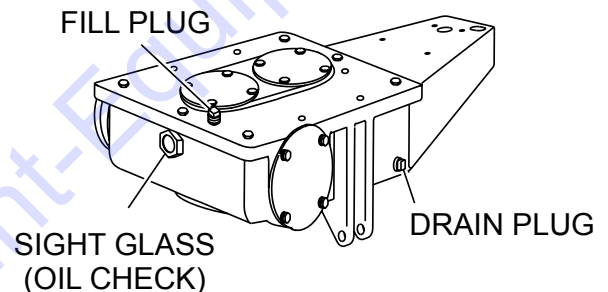


Figure 11. Gearbox Oil

2. The gearbox oil capacity is 1 US gallon (3.79 liters). The oil level of the gearbox should be at the halfway point of the sight glass. If additional oil is required, unscrew the oil fill plug located on top of the gearbox and refill with ISO 220 AGMA Grade 5EP industrial synthetic gear oil.

HYDRAULIC OIL

1. Check the hydraulic oil condition through the hydraulic oil reservoir (Figure 12) next to the battery. Replace the hydraulic oil if dirty or if bubbles are present.

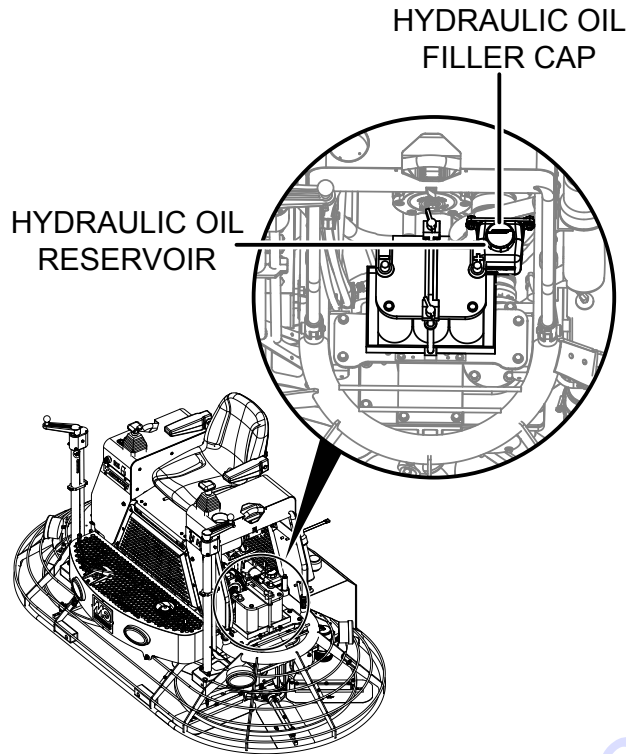
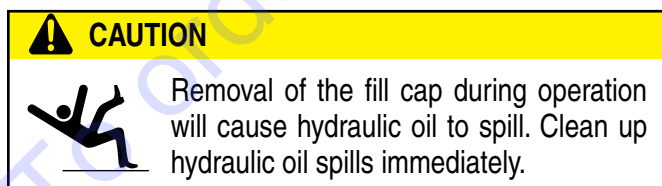
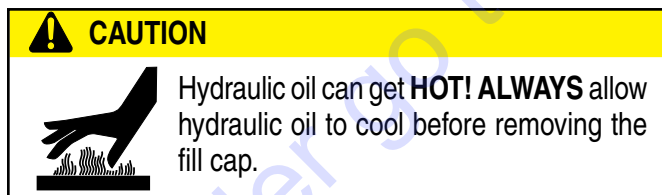


Figure 12. Hydraulic Oil Reservoir

2. Determine if the hydraulic oil is low in the hydraulic reservoir. **DO NOT** remove the fill cap while the oil is hot or spillage will occur.



3. To add hydraulic oil, remove the fill cap on the hydraulic oil reservoir. Use Parker DuraClean™ ISO 46 or equivalent.

HYDRAULIC FLUID FILTER

To determine if the hydraulic fluid filter needs to be changed, view the sight gauge above the hydraulic filter located beneath the foot platform. If the gauge reads in the red area, indicating a filter bypass condition, the filter needs to be replaced.

FUEL CHECK (GASOLINE)

⚠ WARNING

NEVER smoke while refueling! Gasoline fuel is **highly flammable** and can be dangerous if mishandled.

⚠ WARNING



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

1. To check the engine fuel level, place the trowel on a flat, secure surface with the engine stopped.
2. Turn the ignition key to the **START** position and read the fuel gauge to determine if the engine fuel level is low (Figure 13).



Figure 13. Fuel Gauge

3. If the fuel level is low, remove the fuel filler cap (**RED**), located at the top of the fuel tank (**BLACK**) behind the operator's seat, and fill with unleaded 87 or 89 octane rated (anti-knock index) gasoline fuel. Handle fuel safely. Motor fuels are highly flammable and can be dangerous if mishandled. Wipe up any spilled fuel immediately.

NOTICE

Using lower than 87 octane gasoline may cause heavy pinging resulting in engine damage.

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

FUEL CHECK (LPG/PROPANE)

1. Turn the shutoff valve knob (Figure 14) clockwise to release propane gas.

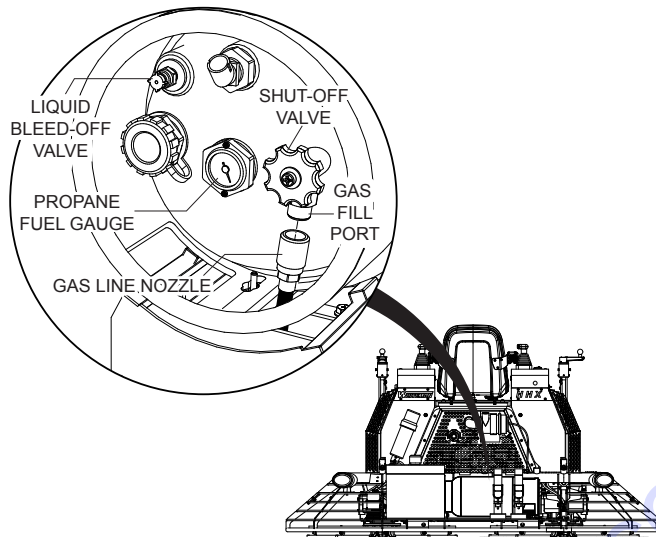


Figure 14. Propane Tank Shut-Off Valve

2. Read the propane fuel gauge (Figure 15) located on top of the propane tank.

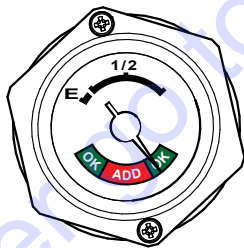


Figure 15. Propane Tank Fuel Gauge

3. If the propane fuel level is low, removal of the empty propane tank from the trowel is required.

NOTICE

HD-5 propane is the highest grade propane available. HD-10 propane is a grade below HD-5 propane. HD-5 propane is recommended as HD-10 propane may cause engine components to 'gum,' or stick, during operation, resulting in engine damage.

Propane Tank Removal

1. Place the trowel on secure, level ground with the engine turned **OFF**.
2. **CLOSE** the shutoff valve on the propane tank (Figure 16).

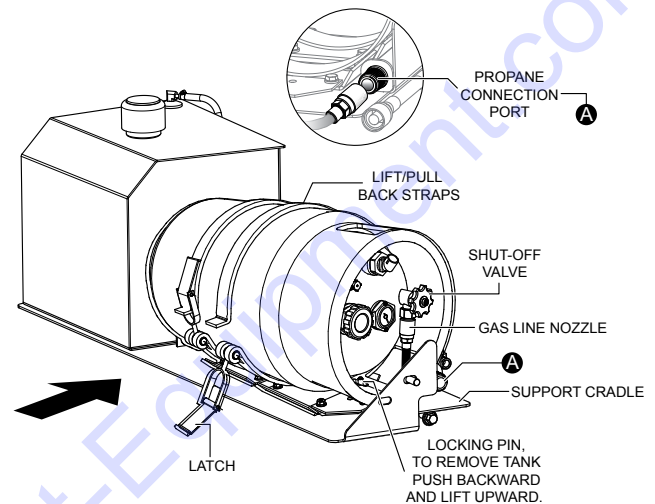


Figure 16. Propane Tank Removal

3. Disconnect the LPG gas line nozzle from the propane tank fill port.
4. Secure the LPG gas nozzle/hose to the propane connection port below the propane tank.
5. Release the propane tank strap latches.
6. To remove the propane tank, push backward and lift upward.
7. Align the propane tank locking slot with the locking pin on the tank support cradle and place the new propane tank into the support cradle.
8. Secure the propane tank using the straps with locking latches.
9. Reconnect the LPG gas line nozzle to the propane tank fill port.
10. **OPEN** the shutoff valve on the propane tank.

The purpose of this section is to assist the user in setting up a **new** trowel. If your trowel is already assembled (seat, handles, knobs and battery), this section can be skipped.

BATTERY SETUP

⚠ CAUTION

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

1. This trowel is shipped with an installed, unconnected, wet-charged battery. This battery may need to be charged for a brief period of time as per manufacturer's instructions.
2. Connect the positive cable (**RED**) to the positive terminal on the battery first, then connect the negative cable (**BLACK**) to the negative terminal (Figure 17).

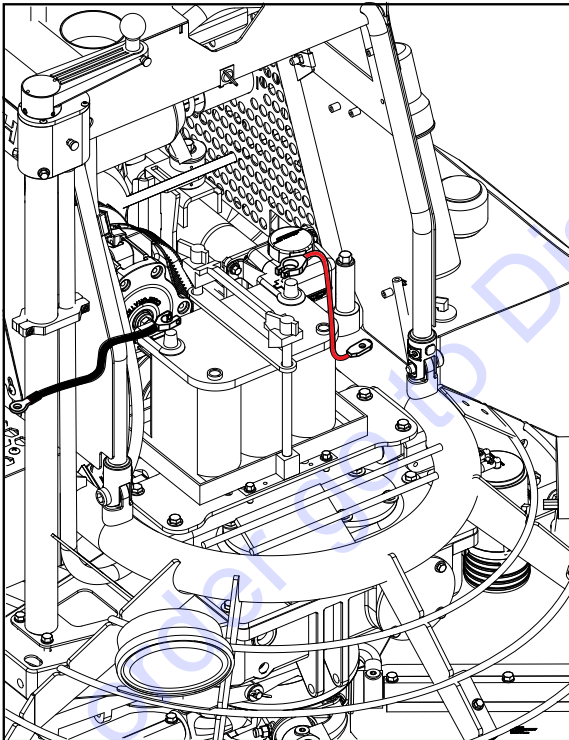


Figure 17. Battery Box

STARTING THE ENGINE

NOTICE

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

WARNING

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

WARNING



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

CAUTION



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

CAUTION

NEVER place hands or feet inside the guard rings while the engine is running. **ALWAYS** shut the engine down before performing any kind of maintenance service on the trowel.

1. With one foot on the ground and the other foot placed on the footstep, grasp the lifting handles and lift yourself onto the trowel. Then sit down in the operator's seat.

NOTICE

NEVER grab the joysticks to lift yourself onto the trowel. Pulling on the joysticks repeatedly will weaken the units. **ALWAYS** use the lifting handles to lift yourself on the trowel.

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

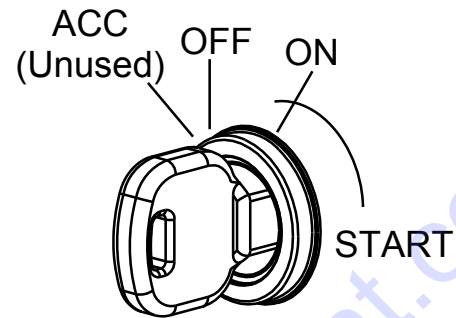


Figure 18. Ignition Switch and Key

3. Turn the ignition key clockwise to the **ON** position.
4. Select the desired fuel mode: **GAS** or **LPG**.
5. Slide the rocker switch lock (Figure 19) to the left and hold. This unlocks the fuel selection rocker switch.

NOTICE

The **fuel selection rocker switch** must be unlocked before **GAS** or **LPG** mode can be selected. Slide the **switch lock** to the left and hold, then select the desired fuel mode. Once the mode has been selected, release the fuel selection rocker switch.

6. To select **GAS** mode, press down on the left side of the fuel selection rocker switch. The **GREEN** light is **OFF** (Figure 19).

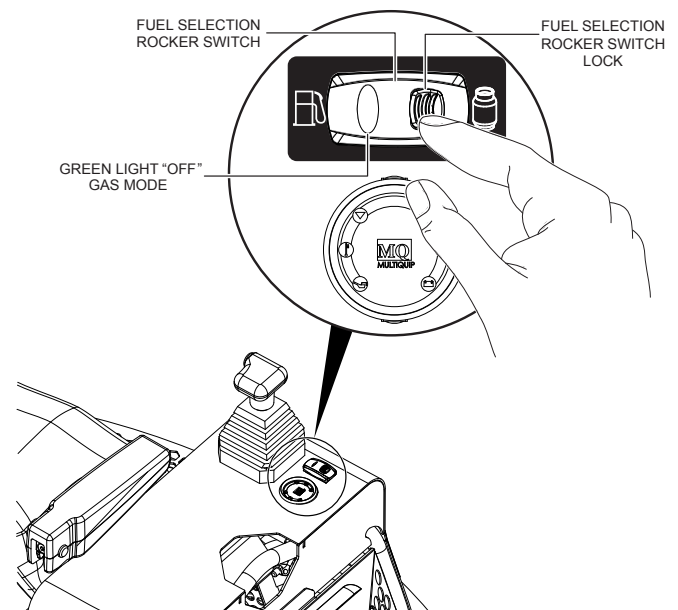


Figure 19. Fuel Selection Switch (Gas Mode)

7. To select **LPG** mode, press down on the right side of the fuel selection rocker switch. The **GREEN** light is **ON** (Figure 20).

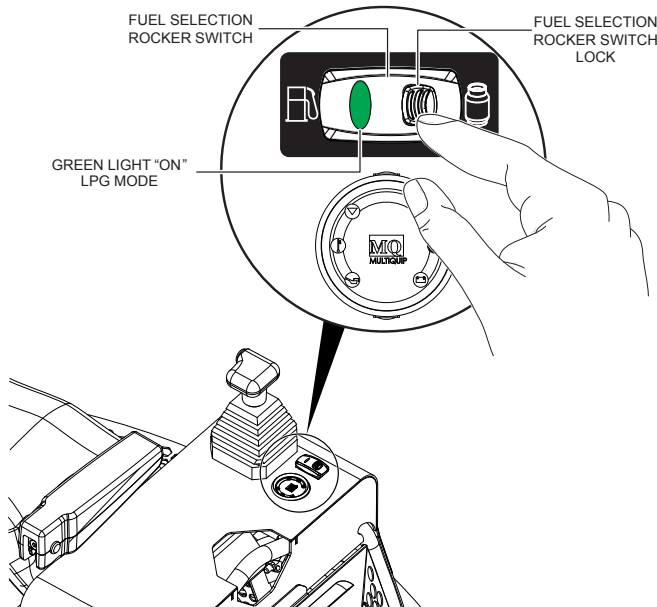


Figure 20. Fuel Selection Switch (LPG Mode)

NOTICE

The engine does not need to be stopped for the switching of fuel modes. The fuel mode may be changed during trowel operation.

8. The foot pedal (Figure 21) controls blade speed. Slow blade speed is obtained by slightly depressing the foot pedal. Maximum blade speed is obtained by fully depressing the pedal.

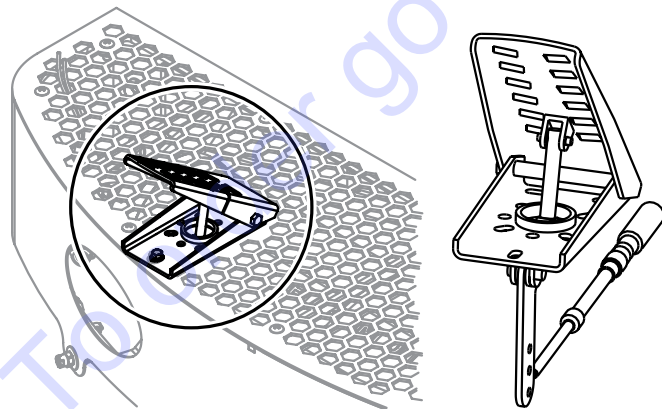


Figure 21. Blade Speed Control Foot Pedal

9. Keep your foot **OFF** the foot pedal. Adjust the choke if the engine is cold, but in all circumstances, start the engine at **idle** (without touching the foot pedal).
10. Turn the ignition key fully clockwise to the **START** position. Once the engine has started, release the ignition key. The throttle speed defaults to idle to allow the engine to warm to operating temperature.
11. Verify that the oil pressure and charge lamps (Figure 22) are **ON**.

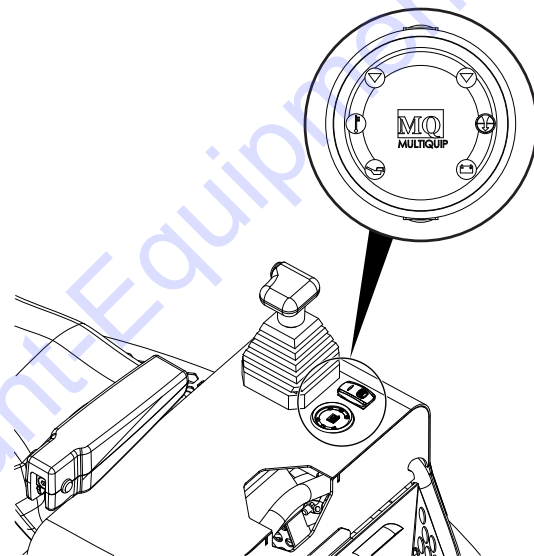


Figure 22. Oil Pressure/Charge Lamps

12. Let the engine idle for 3 to 5 minutes. Listen for any abnormal sounds. If choke is applied, push the choke to the open position as soon as the engine will run smoothly.
13. If the engine fails to start in this manner, consult the engine owner's manual supplied with the trowel.
14. Repeat this section a few times to get fully acquainted with the engine starting procedure.

TESTING THE SEAT SWITCH

⚠ WARNING

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

1. With the engine running, press the foot pedal to begin blade rotation. Observe that the blades are rotating.
2. Rise from the operator's seat.
3. Verify that blade rotation stops 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 machine immediately and correct the problem.

STEERING

Two joysticks (Figure 23) located to the left and right of the operator's seat provide directional control for the trowel. Table 6 illustrates the various directional positions of the joysticks and their effect on the trowel.

NOTICE

All directional references with respect to the steering control joysticks are from the operator's seat position.

1. Push both the left and right control joysticks forward. See Figure 23.

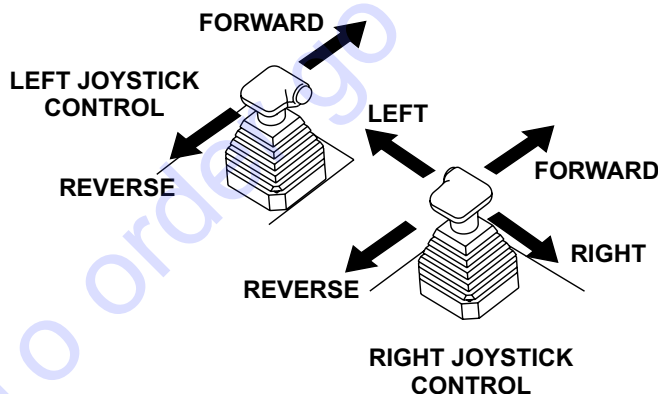


Figure 23. Left and Right Control Joysticks

2. With your right foot, quickly depress the foot pedal **halfway**. Notice that the trowel begins to move in a forward direction. Return both joystick controls to their neutral position 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. The blades will be moving at proper finishing speed when about 75% of maximum blade speed has been reached. 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 6. Practice controlled motions as if finishing a slab of concrete. Practice edging and covering a large area.

Table 6. Control 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 Joysticks to the RIGHT → →	Causes the ride-on trowel to move to the right. →→
Move RIGHT Joysticks to the LEFT ← ←	Causes the ride-on trowel to move to the left. ←←

5. Try adjusting the pitch of the blades. This can be done with the trowel stopped or while the trowel is moving, whichever feels more comfortable. Test the operation of optional equipment like retardant spray and lights if equipped.
6. Push both the left and right joysticks backward and repeat steps 2 through 5 while substituting the word *reverse* for *forward*.

BLADE PITCH

Sometimes it may be necessary to match blade pitch between the two sets of blades. There are some indications that this may be necessary. For example, the differences in pitch could cause a noticeable difference in finish quality between the two sets of blades. Or, the difference in blade pitch could make the machine difficult to control. This is due to the surface area in contact with the concrete—the blade set with the greater contact area tends to stick to the concrete more.

Matching Blade Pitch for Both Sets of Blades

Trowels equipped with Twin Pitch™ controls may need to have blade pitch synchronized between the two sets of blades. Blade synchronization is easily accomplished by performing the following procedure. Refer to Figure 24.

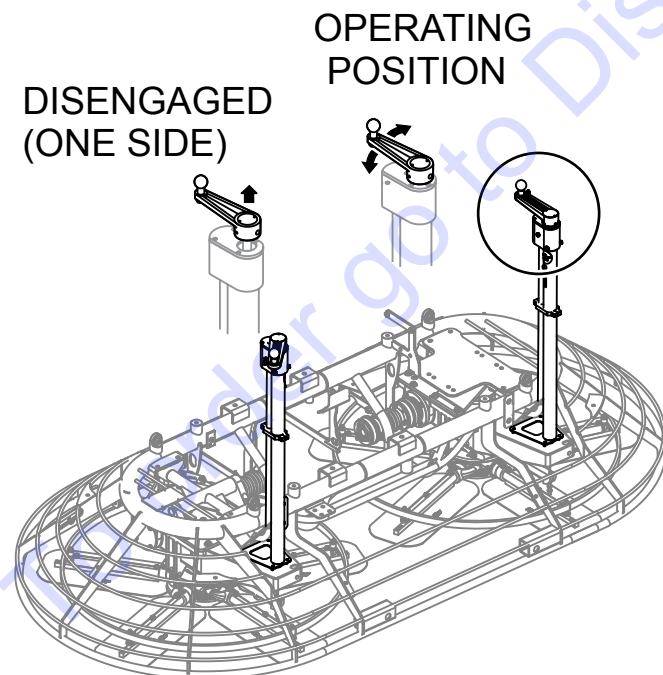


Figure 24. Pitch Towers

1. Lift the pitch adjustment handle on either side. Once lifted, that side is now disconnected from the Twin Pitch™ system.
2. Adjust to match the opposite side.
3. When adjusted, lower the handle to the Twin Pitch™ operating position.

ENGINE SHUTDOWN

1. Release the foot pedal to stop blade rotation and idle the engine. Verify that blade rotation has stopped and the engine is still running.
2. Let the engine idle for 3–5 minutes.

NOTICE

Failure to allow the engine to idle for 5 minutes before shutting the engine **OFF** may lead to damage.

3. Turn the ignition key counterclockwise to the **OFF** position, then remove the key.
4. If **LPG** mode was in use, turn the shutoff valve knob clockwise to **CLOSE** (Figure 25).

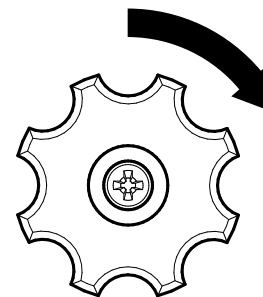


Figure 25. Propane Tank Shut-Off Valve (Closed)

5. Clean and remove any foreign debris from the trowel.

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MAINTENANCE

Table 7. Engine Maintenance Schedule

Item	Daily	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every Year	Every 1000 Hours	Every After 1000 Hours	Every 2 Years
Checking engine oil level	X							
Checking and replenishing coolant	X							
Checking air cleaner element	If necessary							
Checking LPG tank setting condition	If necessary							
Checking LPG fuel connector	X							
Cleaning air cleaner		X						
Checking gasoline fuel hose and clamp bands		X						
Checking LPG fuel hose and clamp bands		X						
LPG fuel check		X						
Checking battery electrolyte level		X						

MAINTENANCE

Table 8. Engine Maintenance Schedule (Continued)

Item	Daily	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every Year	Every 1000 Hours	Every After 1000 Hours	Every 2 Years
Cleaning spark plug			X					
Checking fuel filter			X					
Check fan belt tension and damage			X					
Changing engine oil		X		X				
Replacing oil filter cartridge		X		X				
Checking LPG tank setting condition				X				
Checking radiator hoses and clamp bands				X				
Replacing air cleaner element (replace after 6 times cleaning)					X			
Replacing gasoline fuel hose, clamp bands and fuel filter					X			

MAINTENANCE

Table 9. Engine Maintenance Schedule (Continued)

Item	Daily	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every Year	Every 1000 Hours	Every After 1000 Hours	Every 2 Years
Cleaning fuel tank inside					X			
Cleaning water jacket and radiator interior					X			
Replacing spark plugs							X	
Checking coolant hose of LPG vaporizer							X	
Checking vacuum lock hose of LPG vaporizer							X	
Draining tar							X	
Checking valve clearance							X	
Cleaning combustion chamber							If necessary	
Replacing intake air line								X
Replacing breather hose								X

MAINTENANCE

Table 10. Engine Maintenance Schedule (Continued)

Item	Daily	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every Year	Every 1000 Hours	Every After 1000 Hours	Every 2 Years
Replacing LPG fuel hose and clamp bands								X
Replacing coolant hose of LPG vaporizer								X
Replacing vacuum lock hose of LPG vaporizer								X
Checking primary chamber								X
Checking air tight of secondary chamber								X
Checking vacuum lock system								X
Replacing radiator hoses and clamp bands								X
Replacing battery								X
Replacing ignition wires								X
Changing radiator coolant (I.L.C.)								X

MAINTENANCE

When performing any maintenance on the trowel or engine, follow all safety messages and rules for safe operation stated at the beginning of this manual. See the engine manual supplied with your machine for an appropriate engine maintenance schedule and troubleshooting guide.

WARNING

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. If in doubt, consult Discount-equipment.

MAINTENANCE SCHEDULE

Daily (8–10 Hours)

1. Thoroughly remove dirt and oil from the engine and control area.
2. Check the fluid levels in the engine and gearboxes, and fill as necessary. Check the air filter. See the section on air filter servicing.
3. Relube the arms, thrust collars, and steering links.

Weekly (30–50 Hours)

1. Replace blades if necessary.
2. Check and clean or replace the engine air filter as necessary. See the following section on air filter maintenance.
3. Replace the engine oil and filter as necessary. See the following section on oil and filter maintenance.
4. Check and retighten all fasteners as necessary.

Monthly (100–150 Hours)

1. Remove, clean, reinstall and relube the arms and thrust collars. Adjust the blade arms.
2. Replace gearbox lubricant after the first 100 hours of operation, then replace every 500–600 hours.
3. Check the drive belt for excessive wear.
4. Replace the engine oil and filter as necessary. See the engine manual.

Yearly (500–600 Hours)

1. Check the arm bushings, thrust collar bushings, shaft seals, and belts. Replace if necessary.
2. Check the pitch control cables for wear.
3. Replace gearbox lubricant.
4. Check and adjust blade speed.

CHECKING THE SERPENTINE DRIVE BELT

The drive belt needs to be changed as soon as it begins to show signs of wear. **NEVER** reuse a belt under any circumstances. Indications of excessive belt wear are fraying, squealing when in use, belts that emit smoke, or a burning rubber smell when in use.

To gain access to the drive belt (Figure 26), remove the drive belt guard cover, then visually inspect the drive belt for signs of damage or excessive wear. If the drive belt is worn or damaged, replace the drive belt.

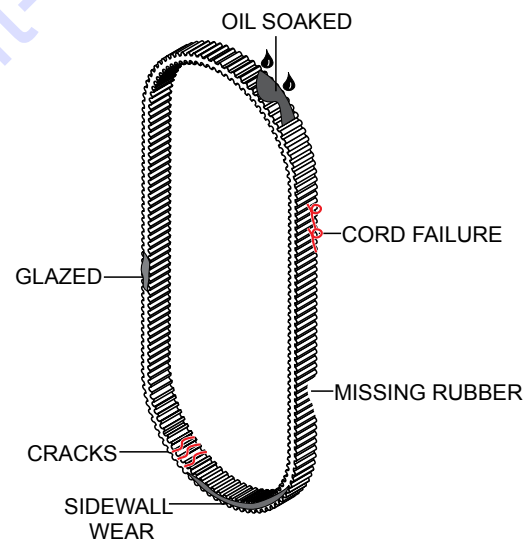


Figure 26. Drive Belt Inspection


WARNING



NEVER attempt to insert hands or tools into the drive belt area while the engine is running and the safety guard has been removed. Keep fingers, hands, hair, and clothing away from all moving parts to prevent bodily injury.

MAINTENANCE

WARNING



DO NOT remove the drive belt guard cover until the muffler has cooled. Allow the entire trowel to cool down before performing this procedure.

FAN BELT TENSION

A slack fan belt may contribute to overheating or insufficient charging of the battery. Inspect the fan belt for damage or wear and adjust it in accordance with the Kubota engine owner's manual.

The fan belt tension is proper if the fan belt bends 0.28–0.35 in. (7–9 mm) between the fan drive pulley and alternator as shown in Figure 27.

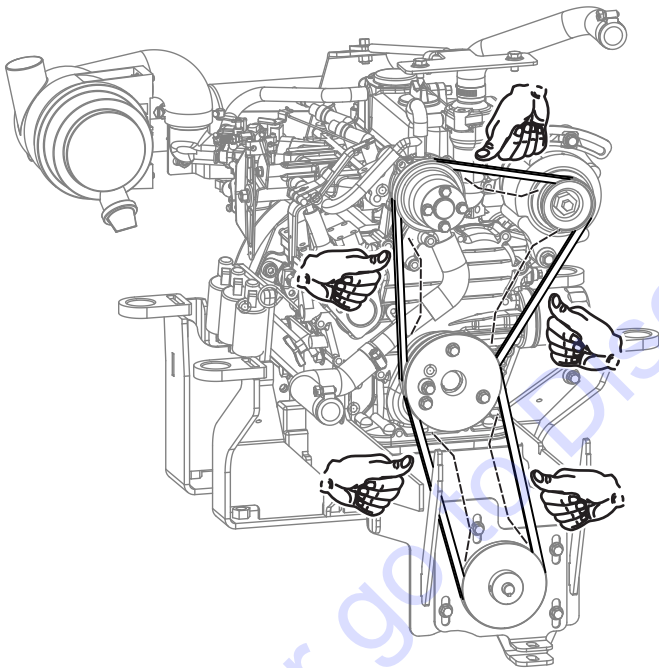


Figure 27. Fan Belt Tension

ENGINE OIL

NOTICE

To achieve proper engine performance and durability, only use engine oils that have an API rating of SM or newer.

1. When checking or adding oil, place the machine so the engine is level.
2. Pull the engine oil dipstick from its holder.

3. Determine if engine oil is low. Oil should be between the upper limit and lower limit (add oil) lines.
4. If oil is below the 'Add Engine Oil' line, add oil up to the upper limit on the dipstick. Allow enough time for any added oil to make its way to the oil pan before rechecking.

Changing Engine Oil and Filter

Change the engine oil and filter after the first 50 hours of use, then every 3 months or 200 hours for standard operation (every 150 hours for severe operation). Refer to Table 11 for recommended oil viscosity. Refer to Figure 28 for location of parts.

Table 11. Recommended Viscosity Grades							
← 10W ←							
← 20W ←							
SAE 10W-30 →							
SAE 15W-40 →							
# 30 →							
°F -20	0	20	32	40	60	80	100
°C -30	-20	-10	0	10	20	30	40
TEMPERATURE RANGE EXPECTED BEFORE NEXT OIL CHANGE							

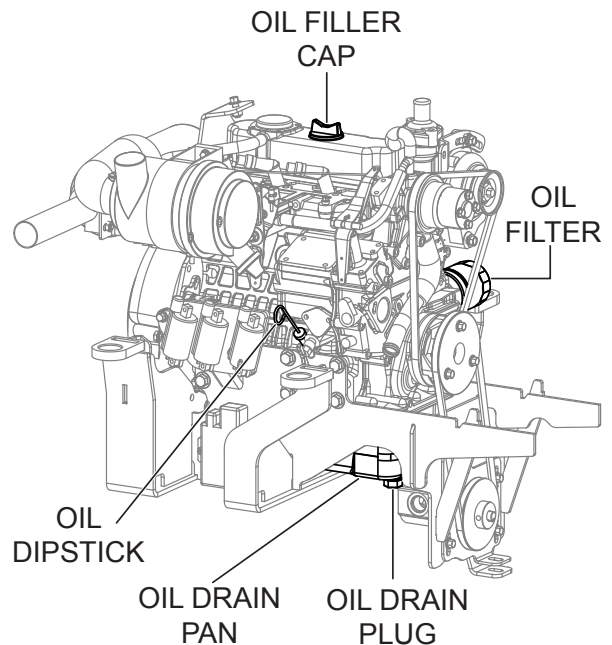


Figure 28. Engine Service Oil Components

1. Remove the oil filler cap while draining the oil to allow the engine to drain easily.
2. Remove the drain plug to drain the oil.
3. After the oil is sufficiently drained, securely tighten the drain plug.
4. Using a filter wrench, turn the oil filter counterclockwise to remove.
5. Clean the sealing surface on the engine where the filter mounts.
6. Coat the seal of the new oil filter with clean engine oil. Install the new filter first by hand until it contacts the engine sealing surface. Then tighten it another 3/4 turn using the filter wrench.
7. Fill the engine with oil until it shows between the upper and lower limits on the dipstick. **DO NOT** overfill.
8. Crankcase oil capacity with oil filter replacement is 3.5 quarts (3.3 liters).
9. Run the engine briefly for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

Oil Filter (200 Hours)

1. Replace the engine oil filter (Figure 29) every other oil change or every 200 hours of operation. Refer to the engine manual for specific details on how to perform this operation.

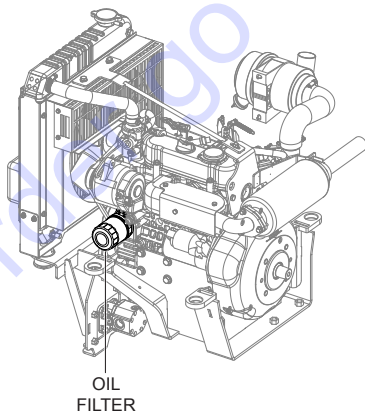


Figure 29. Oil Filter

2. Be sure to coat the seal of the new oil filter with clean engine oil.

FUEL FILTER

Replace the engine fuel filter (Figure 30) every year. Refer to the engine manual for specific details on how to perform this operation.

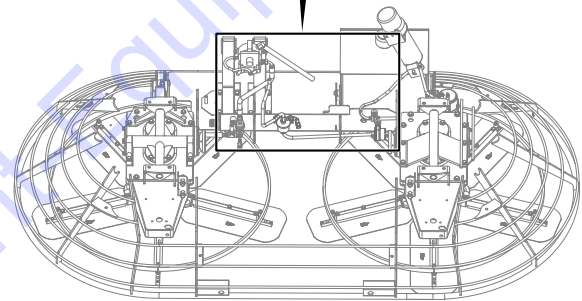
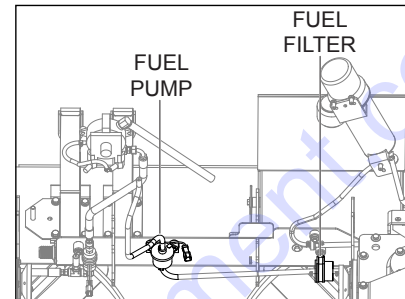


Figure 30. Fuel Filter

FUEL TANK

NOTICE

NEVER store the trowel with fuel in the tank for an extended period of time. Completely drain the fuel system (tank, lines, etc.) if the unit is to be put into long-term storage.

For shorter or intermediate periods of storage, the tank should be filled to avoid condensation that could cause contamination of the fuel.

Removing Water from the Fuel Tank

After prolonged use, water and other impurities accumulate in the bottom of the fuel tank. Occasionally inspect the fuel tank for water contamination and drain the contents if necessary.

During cold weather, the more empty volume inside the tank, the easier it is for water to condense. This can be reduced by keeping the tank full with unleaded gasoline.

Cleaning Inside the Fuel Tank

If necessary, drain the fuel inside the fuel tank completely. Use a spray washer to wash out any deposits or debris that have accumulated inside the tank.

Adding Fuel

When adding fuel, always use clean, fresh, unleaded 87 or 89 octane rated fuel.

Fuel Tank Inspection

In addition to cleaning the fuel tank, the following components should be inspected for wear:

- **Fuel Hoses** — Inspect nylon and rubber hoses for signs of wear, deterioration or hardening.
- **Fuel Tank Lining** — Inspect the fuel tank lining for excessive amounts of oil or other foreign matter.

SPARK PLUGS

1. Make sure the engine is cool before servicing the spark plugs.
2. Disconnect the spark plug caps. Check for dirt and remove any dirt from around the spark plug area.
3. Remove the spark plugs.
4. Replace the spark plugs if they are damaged, the sealing washer is in poor condition, or the electrode is worn.
5. Measure the spark plug electrode gap (Figure 31) with a wire-type feeler gauge. If needed, adjust the gap to 0.024–0.027 in. (0.6–0.7 mm) by carefully bending the side electrode.

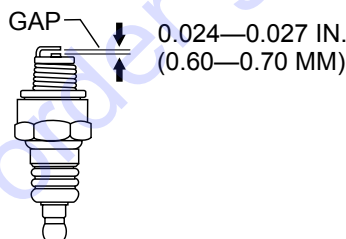


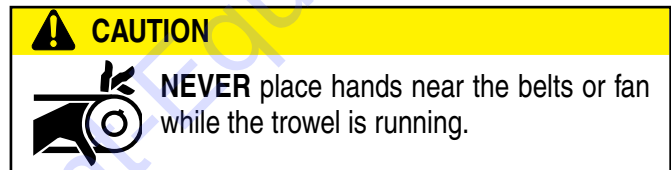
Figure 31. Spark Plug Gap Adjustment

6. Install the spark plug carefully by hand to avoid cross-threading.
7. After the spark plug is seated, tighten with a spark plug wrench to compress the sealing washer.

8. **When installing a new spark plug**, tighten 1/2 turn after the spark plug seats to compress the washer.
9. **When reinstalling the original spark plug**, tighten 1/8–1/4 turn after the spark plug seats to compress the washer.
10. Tighten the spark plugs to 15–18 lbf·ft (20–24 N·m, 2.0–2.5 kgf/m).
11. Reattach the spark plug caps.

OIL AND FUEL LINES

1. Check the oil and fuel lines and connections regularly for leaks or damage. Repair or replace as necessary.
2. Replace the oil and fuel lines every two years to maintain their performance and flexibility.



HYDRAULIC OIL FILTER

1. Change the hydraulic oil and filters (Figure 32) after the first 100 hours of use, then after every 250 hours. Use 10-micron absolute synthetic media filters.

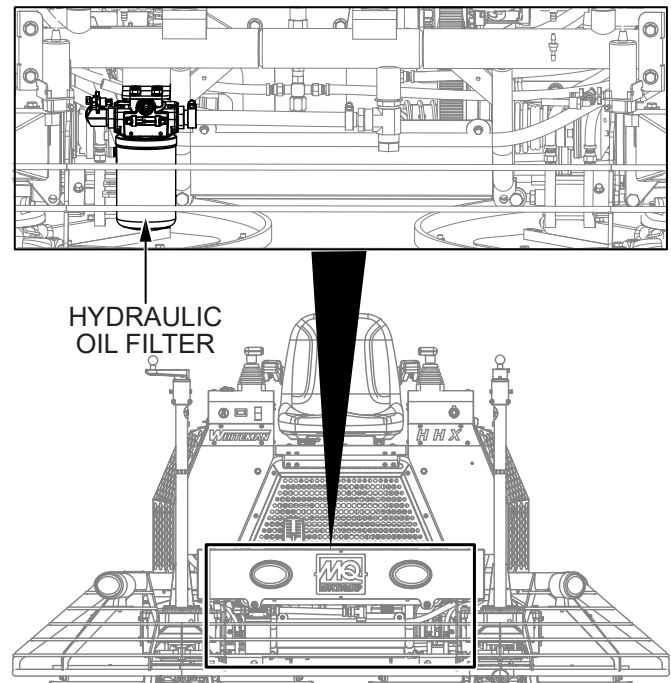


Figure 32. Hydraulic Oil Filter

AIR CLEANER (DAILY)

The Kubota WG972 engine is equipped with a replaceable, high-density, paper air cleaner element. Check the air cleaner daily or before starting the engine. Check for and correct heavy buildup of dirt and debris along with loose or damaged components every day (Figure 33).

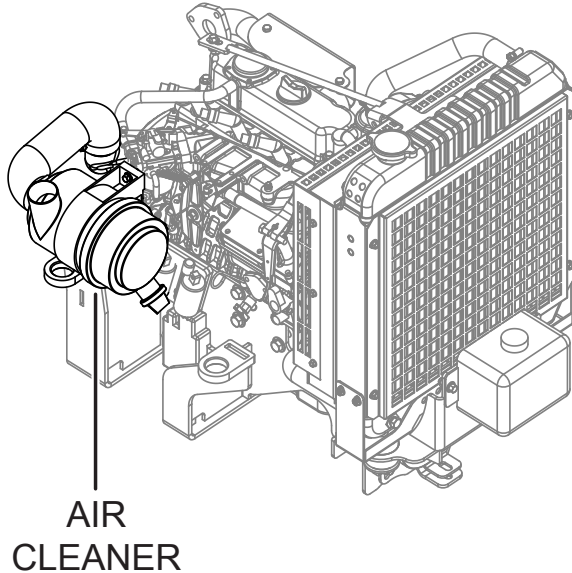


Figure 33. Air Cleaner

1. Unlock the cover clamps and remove the cover.
2. Remove the cartridge from the air cleaner body.
3. Clean the cartridge by gently tapping the end with the handle of a screwdriver. Replace the cartridge if very dirty or damaged.
4. Carefully clean out the air cleaner cover.
5. Install the cartridge into the air cleaner body.
6. Install the cover and lock the cover clamps.

NOTICE

Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

RADIATOR/COOLING SYSTEM

CAUTION



HOT coolant can cause **severe burns**. **NEVER** remove the cap while the radiator is **HOT**.

NOTICE

The engine manufacturer recommends that the cooling system be filled with a 50/50 mixture of coolant and water.

1. Check the radiator for leaks that would indicate corrosion or damage.
2. Check the coolant/antifreeze level daily. Top off as necessary. Always use clean, soft water and add a long-life coolant/antifreeze. Use the mixing ratios specified by the antifreeze manufacturer. Replace coolant/antifreeze at least once a year.
3. Check the radiator hoses for fatigue or cracking. Replace if the integrity of the hoses is in doubt.
4. Check the radiator cap seal and replace as necessary.

Refer to the engine manual for additional information.

RADIATOR CLEANING

1. Blow off dirt and dust from the fins and radiator with 28 psi (193 kPa) or less of compressed air (Figure 34). Be careful to not damage the fins with the compressed air.

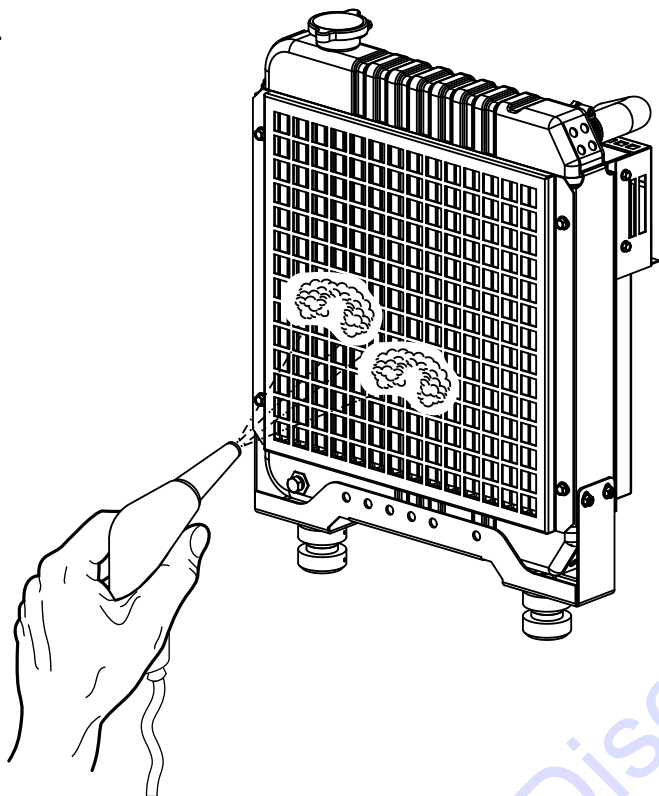


Figure 34. Radiator Cleaning

2. If there is a large amount of contamination on the fins, clean with detergent and rinse thoroughly with tap water.

NOTICE

NEVER use high-pressure water, compressed air at greater than 28 psi (193 kPa), or a wire brush to clean the radiator fins. Radiator fins damage easily.

OIL/WATER SEPARATOR

Drain water from the bottom of the fuel filter by loosening the drain plug and allowing the water to drain out. Refer to your engine manual for specific details to perform this operation.

BATTERY/CHARGING SYSTEM

1. Check and clean the battery terminals for corrosion.
2. Check and keep the battery electrolyte between the upper and lower limits indicated on the battery. **NEVER** operate or recharge without sufficient fluid in the battery.
3. **NEVER** attempt to charge a battery that is frozen. The battery can explode unless first allowed to thaw.
4. 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.

LONG-TERM STORAGE

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

NOTICE

NEVER store the trowel with fuel in the tank for an extended period of time. Completely drain the fuel system (tank, lines, etc.) if the unit is to be put into long-term storage.

For shorter or intermediate periods of storage, the tank should be filled to prevent condensation that could contaminate the fuel.

CLEAN-UP

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.

TROWEL LUBRICATION

Regular lubrication is required to maintain your trowel in optimal working condition. Schedule maintenance lubrication according to Table 12 below.

Table 12. Trowel Lubrication Schedule		
Location	# of Shots	Interval
Spiders	1 to 1½	Every day
Thrust Collars	1	Every day
Pillow Blocks	1	Every day
Pitch Levers	1	Once a month
Pitch Towers	1	Every 6 months

Spiders (Daily)

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

1. Locate one of the Zerk grease fittings on either spider assembly (Figure 35). Remove the Zerk fitting cap and set it aside.

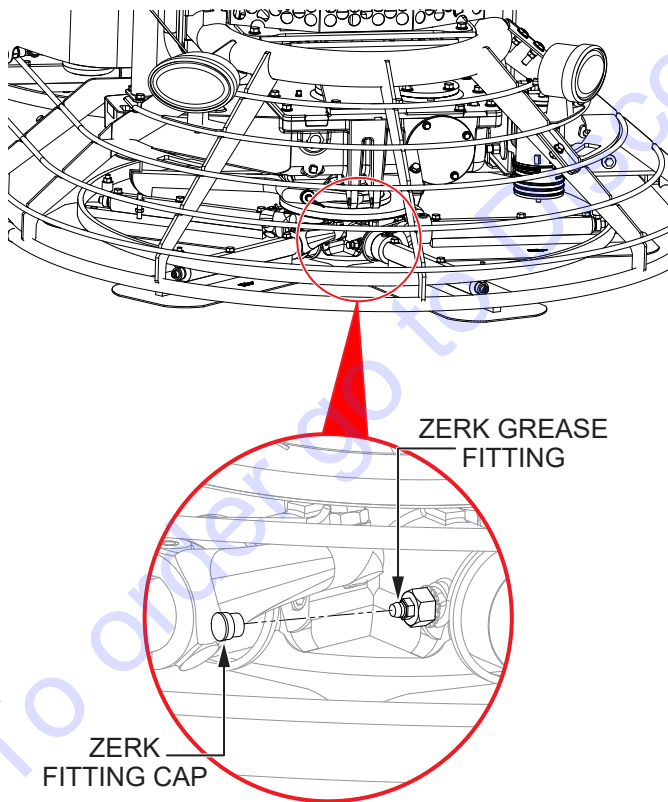


Figure 35. Spider Lubrication

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 on both spider assemblies.

Thrust Collars (Daily)

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

1. Locate the Zerk grease fitting on either thrust collar (Figure 36). Remove the Zerk grease fitting cap and set it aside.

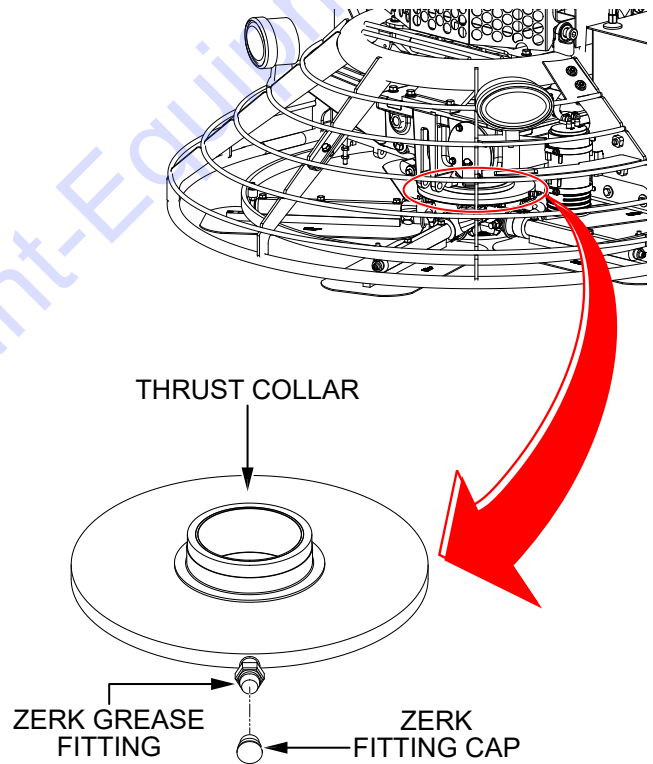


Figure 36. Thrust Collar Lubrication

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

Pillow Block Bearings (Daily)

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

1. Locate the grease port plate (Figure 37) at the rear of the trowel, just to the left of the fuel tank. These two grease ports lubricate the pillow block bearings.
2. Wipe the grease ports clean to prevent abrasive material from entering the port during lubrication.

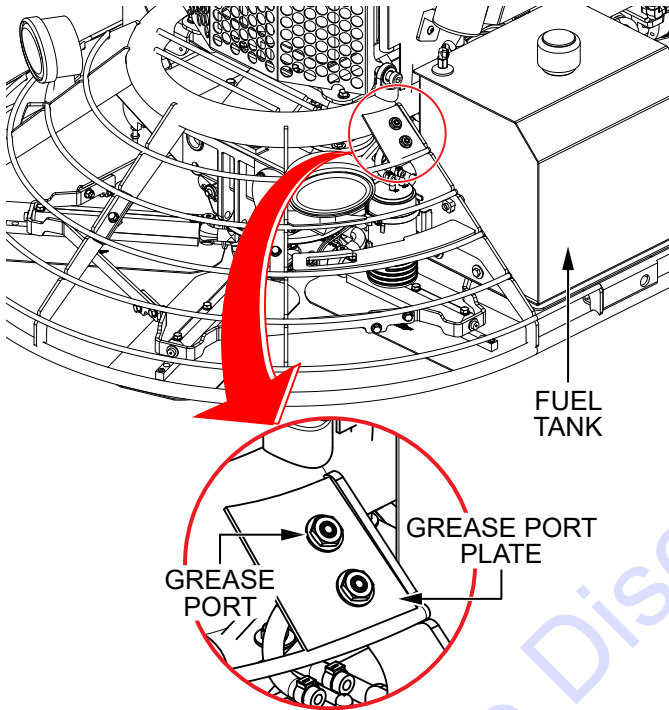


Figure 37. Pillow Block Bearing Lubrication

3. Lubricate each grease port with one shot of multipurpose grade grease.

Pitch Adjustment Levers (Monthly)

Perform the following lubrication procedure **once a month**.

1. Locate the Zerk grease fitting next to the knob on either pitch adjustment lever (Figure 38). Remove the Zerk grease fitting cap and set it aside.

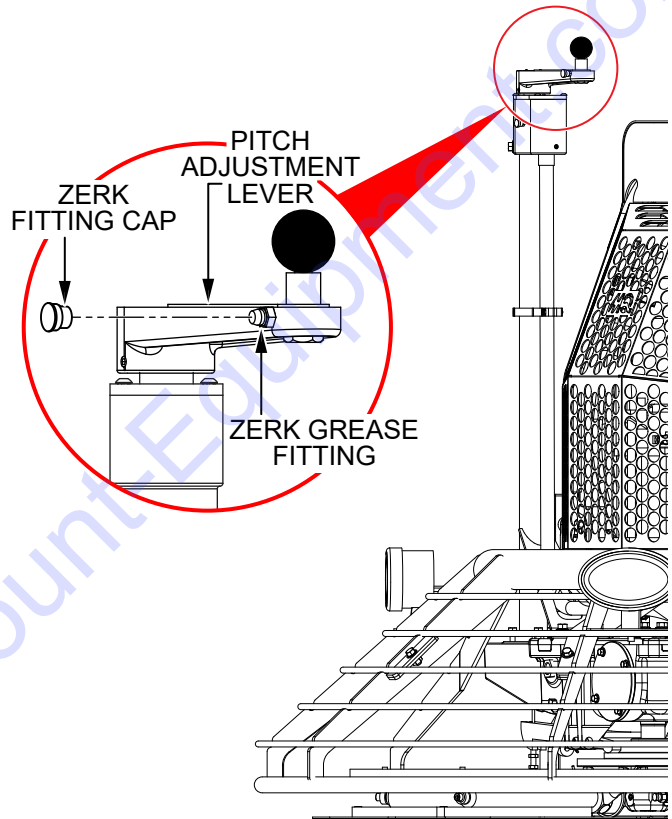


Figure 38. Pitch Adjustment Lever Lubrication

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

Pitch Tower (Every 6 Months)

Perform the following lubrication procedure **once every 6 months**.

1. Locate the Zerk grease fitting just below the pitch adjustment lever on either pitch tower (Figure 39). Remove the Zerk grease fitting cap and set it aside.

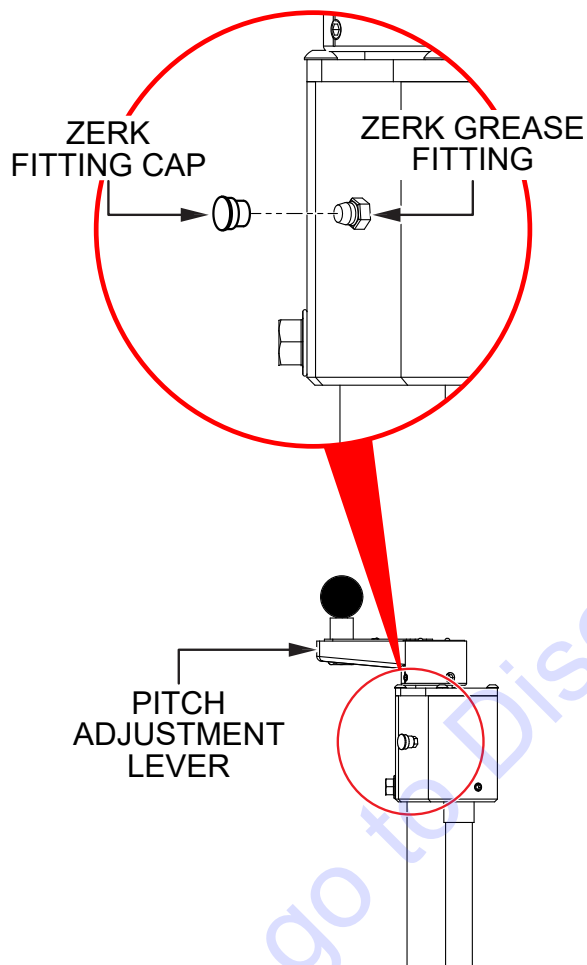


Figure 39. Pitch Tower Lubrication

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

BLADE PITCH ADJUSTMENT

Maintenance adjustment of blade pitch is made by adjusting a bolt (Figure 40) on the arm of the trowel blade finger. This bolt is the contact point of the trowel arm with the lower wear plate on the thrust collar. The goal of adjustment is to promote consistent blade pitch and finishing quality.

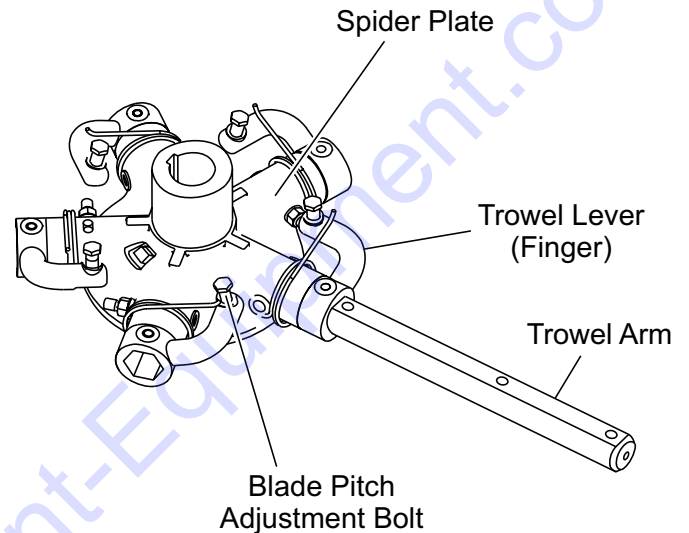


Figure 40. Blade Pitch Adjustment Bolt

Look for the following indications if blades are wearing unevenly. If so, 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 while the machine is running?
- Do the pitch control towers rock back and forth?

The easiest and most consistent way to make adjustments on the trowel arm fingers 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 this tool.

If a trowel arm adjustment tool is not available but immediate adjustment is necessary, temporary field adjustment can be made if you can identify which blade is pulling harder. Simply adjust 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 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 after adjustment that the blades pitch correctly.

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 adjustments have been made, blades, trowel arms, and trowel arm bushings should be checked for adjustment, wear, or damage. See the following sections.

CHANGING THE BLADES

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

1. Place the machine on a flat, level surface. Adjust the blade pitch control to make the blades as flat as possible. Note the blade orientation on the trowel arm. This is important for ride-on trowels as the two sets of blades counter-rotate. Lift the machine up, placing blocks under the main guard ring to support it.
2. Remove the bolts and lock washers on a trowel arm, and then remove the blade.
3. Scrape all concrete and debris from the trowel arm. This is important to properly seat the new blade.
4. Install the new blade, maintaining the proper orientation for direction of rotation.
5. Reinstall the bolts and lock washers.
6. Repeat steps 2–5 for all remaining blades.

Steering Adjustment

The steering assist adjustment should be performed only by qualified service technicians. For HHX-G5 steering adjustment instructions, refer to MQ Whiteman Service Bulletin 200925.

TROWEL ARM ADJUSTMENT

Use the following procedure to check and adjust trowel arms when the trowel is finishing poorly or in need of routine maintenance.

Look for the following indications. Trowel arm misalignment, worn spider bushings or bent trowel arms may be the cause.

- Are the blades wearing unevenly? 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 while the machine is running?

A clean, level area to test the trowel prior to and after is essential. Any unlevel spots in the floor or debris under the trowel blades will give an incorrect perception of adjustment. Ideally, a 5-foot × 5-foot, 3/4-inch-thick, **FLAT** steel plate should be used for testing.

1. Place the trowel in a flat, level 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. If one is not making contact, adjustment will be necessary (Figure 41).

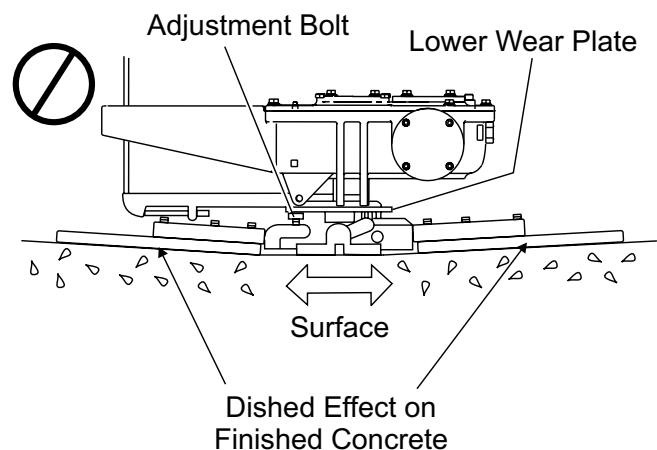


Figure 41. Incorrect Spider Plate Alignment

Figure 41 illustrates incorrect alignment, worn spider bushings, or bent trowel arms. Check that the adjustment bolt is barely touching (0.10" max. clearance) the lower wear plate. All alignment bolts should be spaced the same distance from the lower wear plate.

Figure 42 illustrates the correct alignment for a spider plate as shipped from the factory.

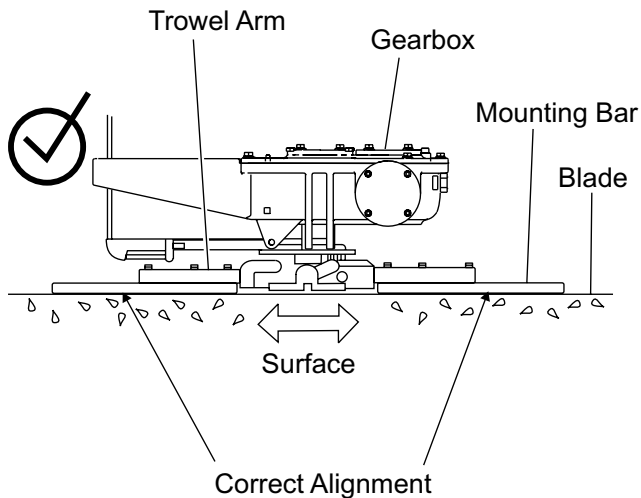


Figure 42. Correct Spider Plate Alignment

Spider Removal

1. Locate the cone point square head set screw and attached jam nut found on the side of the spider assembly (Figure 43).

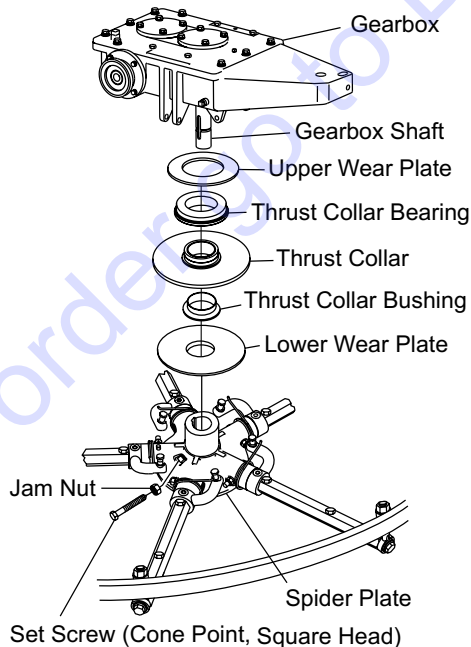


Figure 43. Spider/Gearbox Removal

2. Loosen the jam nut and cone point square head set screw.
3. Carefully lift the upper trowel assembly off of the spider assembly. A slight tap with a rubber mallet may be necessary to dislodge the spider from the main shaft of the gearbox.

Trowel Blade Removal

Remove the trowel blades by removing the three hex head bolts (Figure 44) from the trowel arm. Set the blades aside.

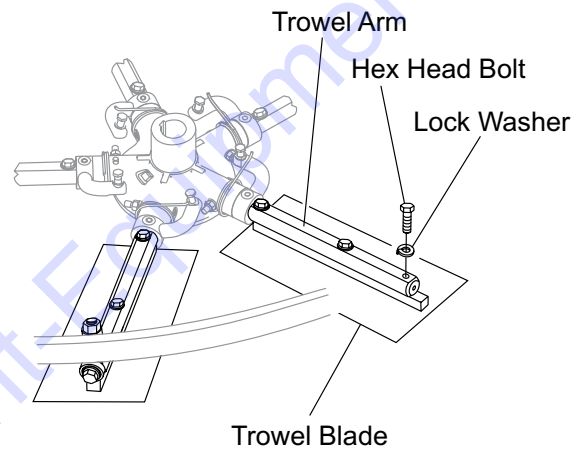


Figure 44. Trowel Blades

Trowel Arm Removal

1. Remove the hardware securing the stabilizer ring to the trowel arm (Figure 45).

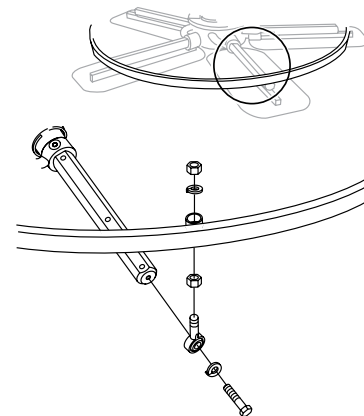


Figure 45. Stabilizer Ring

- Each trowel arm is held in place at the spider plate by a hex head bolt (Zerk grease fitting) and a roll pin. Remove both the hex head bolt and the roll pin from the spider plate (Figure 46).

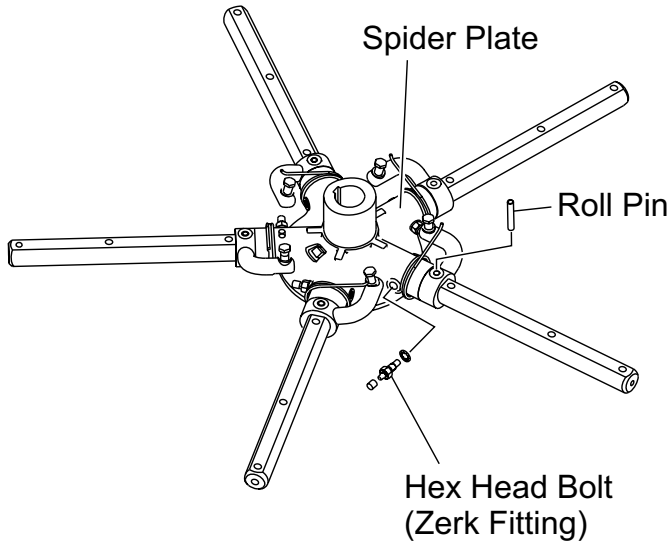


Figure 46. Remove Zerk Grease Fitting and Roll Pin

- Remove the trowel arm from the spider plate.
- Should the trowel arm insert (bronze bushing) come out with the trowel arm, remove the bushing from the trowel arm and set it aside in a safe place. If the bushing is retained inside the spider plate, carefully remove the bushing. See Figure 47.

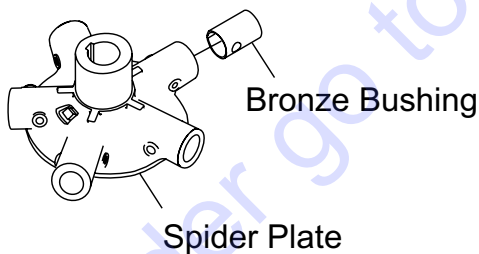


Figure 47. Bronze Bushing

- Examine the bronze trowel arm bushing (Figure 47), and clean it if necessary. Replace the bushing if it is worn or out of round.
- Wire brush any buildup of concrete from all six sides of the trowel arm. Repeat this for the remaining arms.

Checking Trowel Arm Straightness

Trowel arms can be damaged by rough handling (e.g. dropping the trowel on the pad), or by striking exposed plumbing, forms or rebar while in operation. A bent trowel arm will prevent the trowel from rotating in a smooth, fluid motion. If bent trowel arms are suspected, check for flatness as follows. Refer to Figure 48 and Figure 49.

Lever Mounting Slot (Left Arm Shown)

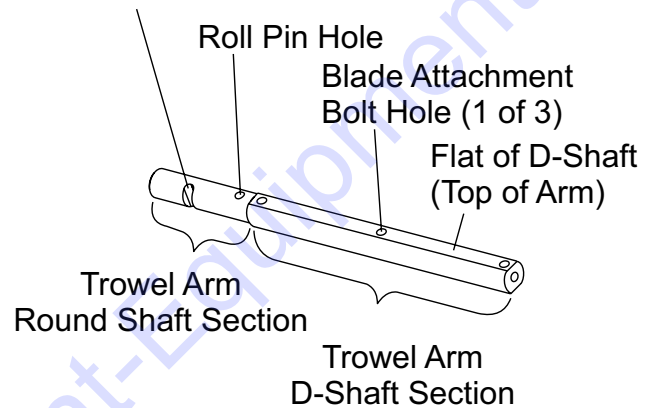


Figure 48. Trowel Arm

- Use a thick steel plate, granite slab, or any surface which is true and flat (Figure 49) to check all six sides of each trowel arm for flatness.

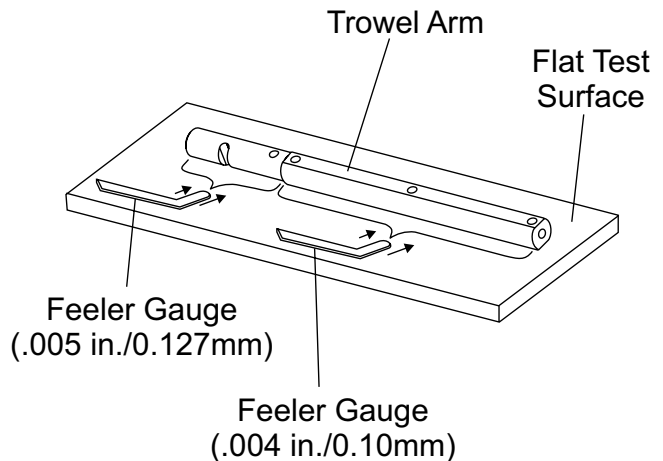


Figure 49. Checking Trowel Arm Flatness

- Check each of the six sides of the trowel arm hex section. A feeler gauge of .004 inch (0.10 mm) should not pass between the flat of the trowel arm and the test surface along its length on the test surface. See Figure 49.

3. Check the clearance between the round shaft and the test surface as one of the flat hex sections of the arm rests on the test surface. Rotate the arm to each of the flat hex sections and check the clearance of the round shaft. Use a feeler gauge of .005 inch (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 found to be uneven.

Trowel Arm Adjustment

Figure 50 illustrates the trowel arm adjustment tool with a trowel arm inserted. As each trowel arm is locked into the fixture, the 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.

1. Locate the trowel arm adjustment tool (P/N 9177).

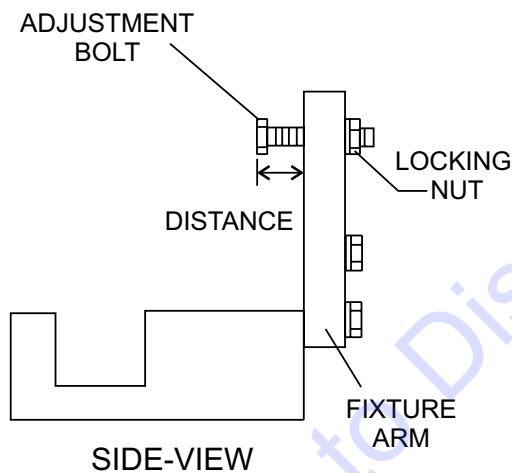


Figure 50. Trowel Arm Adjustment Tool Side View

2. Make sure the fixture arm is positioned correctly (up or down) for the trowel arm rotation. For trowel arms with **CLOCKWISE** blade rotation, place the fixture arm in the **UP** position (Figure 51A). For trowel arms with **COUNTERCLOCKWISE** blade rotation, place the fixture arm in the **DOWN** position (Figure 51B).

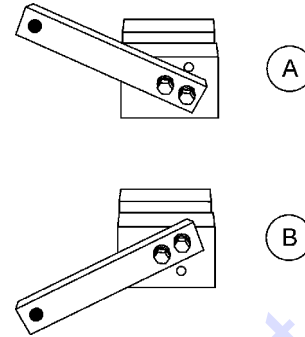


Figure 51. Trowel Arm Adjustment Setup

3. Unscrew the locking bolts on the adjustment tool and place the trowel arm into the fixture channel as shown in Figure 52. A thin shim may be required to cover the blade holes on the trowel arm. Make sure to align the trowel adjustment bolt with the fixture adjustment bolt.

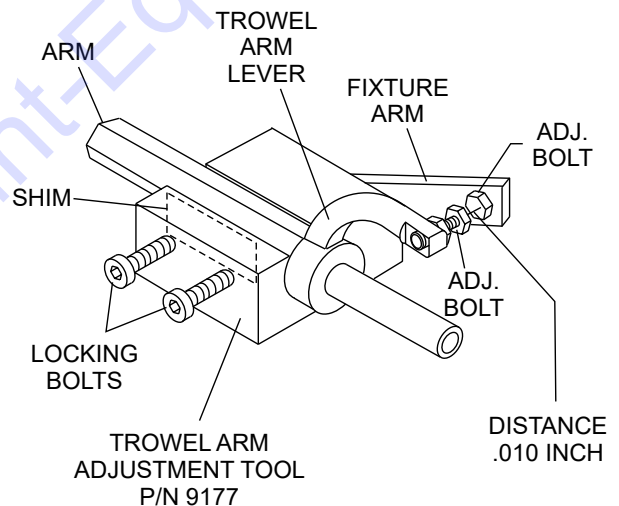


Figure 52. Trowel Arm Adjustment Tool Components

4. Use an Allen wrench to tighten the locking bolts securing the trowel arm in place.
5. Adjust the bolt distance shown in Figure 50 to match one of the arms. The other arms will be adjusted to match this distance.
6. Loosen the locking nut on the trowel arm lever, then turn the trowel arm adjusting bolt until it barely touches (.010") the fixture adjusting bolt.
7. Once the correct adjustment is made, tighten the lock nut on the trowel arm to lock it in place.

- Loosen the locking nuts on the adjustment tool and remove the trowel arm.
- Repeat steps for the remaining trowel arms.


Reassembly

- Clean and examine the upper and lower wear plates and the thrust collar. Examine the entire spider assembly. Wire brush any concrete or rust buildup. If any of the spider components are found to be damaged or out of round, replace them.
- Make sure that the bronze trowel arm bushing is not damaged or out of round. Clean the bushing if necessary. If the bronze bushing is damaged or worn, replace it.
- Reinstall the bronze bushing onto the trowel arm.
- Repeat steps 2–3 for each trowel arm.
- Make sure that the spring tensioner is in the correct position to exert tension on the trowel arm.
- Insert all trowel arms with levers into the spider plate (with bronze bushings already installed), using care to align the grease hole on the bronze bushing with the grease hole fitting on the spider plate.
- Lock the trowel arms in place by tightening the hex head bolt with Zerk grease fitting and jam nut.
- Reinstall the blades onto the trowel arms.
- Reinstall the stabilizer ring onto the spider assembly.
- Lubricate all grease points (Zerk fittings) with premium lithum-12-based grease, conforming to NLG1 grade #2 consistency.

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. There are two methods for installing pans: Z-clips or latch pins.

WARNING



Lifting/crush hazard. **NEVER** lift the trowel with float pans attached.

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 while float pans are attached.

Installing Float Pans with Z-Clips

- Lift the trowel just enough to slide float pans with Z-clips under the blades (Figure 53). Slowly lower the trowel onto the pans with the blades adjacent to the Z-clips.

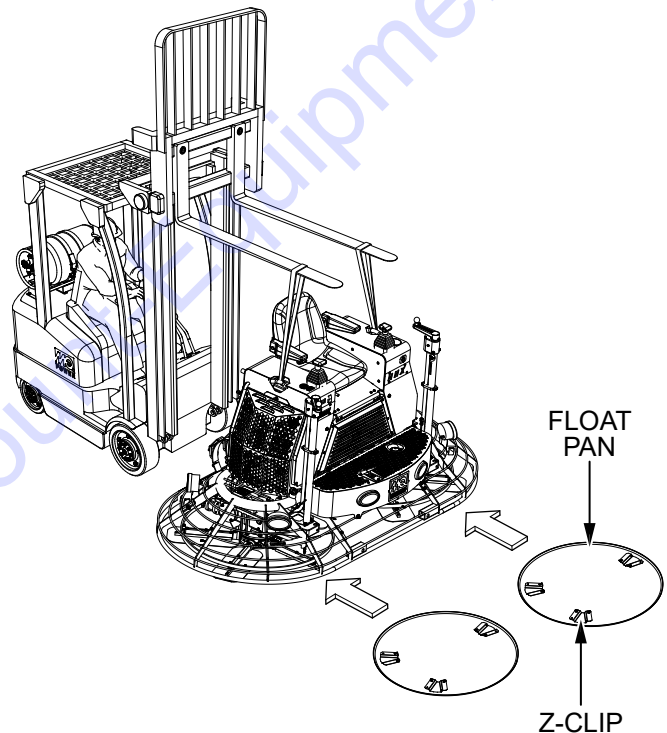


Figure 53. Float Pan Positioning

2. Rotate the blades into position under the Z-clips (Figure 54). Make sure the blades are rotated in the same direction as when the machine is in operation, or use the engine to rotate the blades into position.

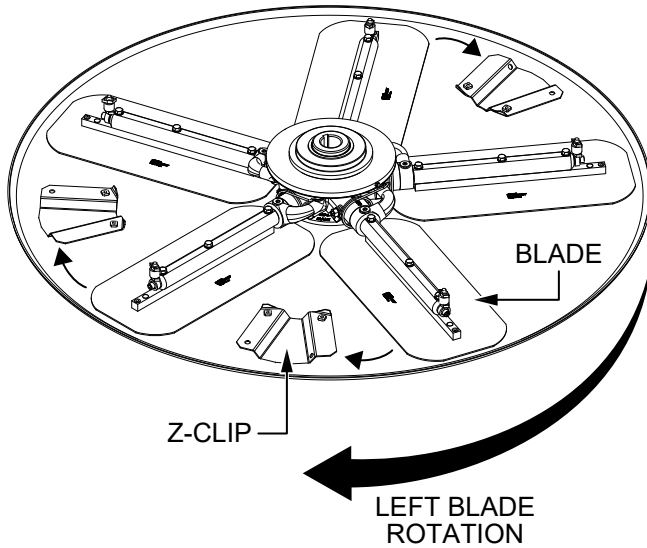


Figure 54. Blade Rotation

3. Attach the blade tie-downs to the far side of the Z-clips using the tie-down knobs as shown in Figure 55.

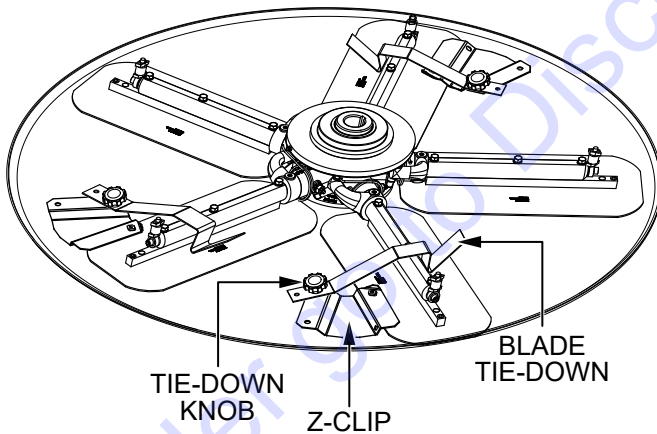


Figure 55. Float Pan Installation (Z-Clips)

4. Make sure the blade edges are secured under the Z-clips and the tie-downs are secured completely over the edges of the blade bar before the machine is put back into operation.

Installing Float Pans with Latch Pins

1. Lift the trowel just enough to slide the float pan under the blades. Lower the trowel onto the pan with the blades between the blade stops (Figure 56).

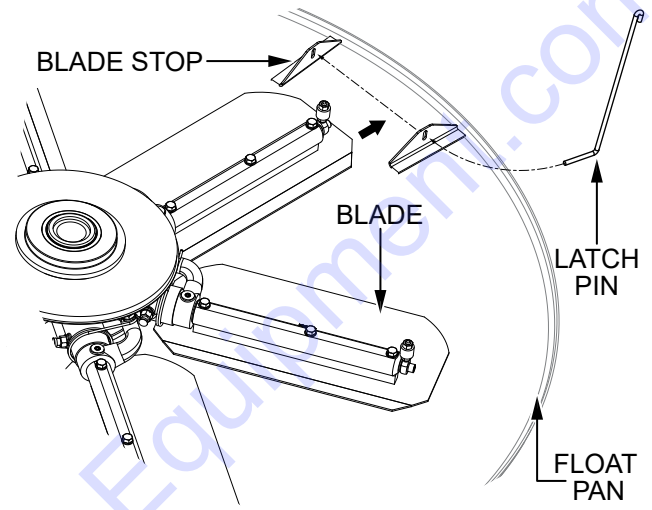


Figure 56. Float Pan Installation (Latch Pins)

2. Rotate the blades so that the blades fit between the blade stops (Figure 56). Be sure to rotate the blades in the same direction as during operation, or use the engine to rotate the blades into position.
3. Route the latch pins through the holes in the blade stops as shown in Figure 56.
4. After it has been routed through the blade stop holes, rotate each latch pin so the end that is bent approximately 90 degrees lays flat on the surface of the float pan. See Figure 57.

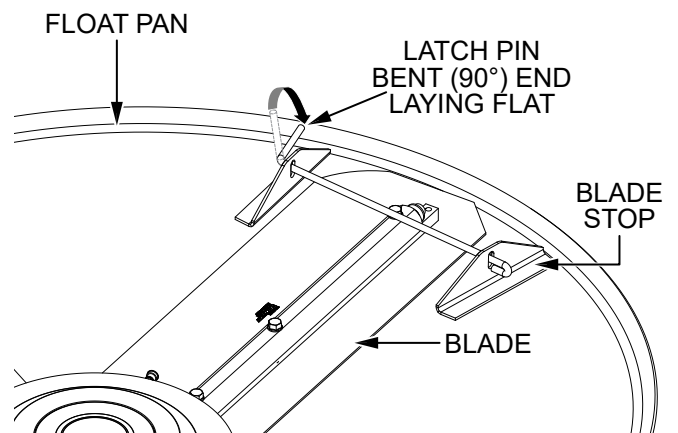


Figure 57. Latch Pin Placement

5. Make sure the blade edges are secured between the blade stops, and the latch pins are secured completely over the blades, locking them in place.
6. Periodically check the latch pins during normal operation to ensure they are still in the correct position.

HYDRAULIC STEERING PRESSURE

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 knowledgeable physician **immediately** or **severe injury or death** can occur.

Many hydraulic problems are a result of low fluid levels. Before checking any other possibilities, make sure the hydraulic fluid is at the proper level in the hydraulic fluid tank.

Checking the Steering Pressure

CAUTION

This procedure requires **two or more people to perform**. The trowel will need to be 'run up' while remaining stationary or otherwise held in position. If a hover is difficult to maintain, the trowel can be butted up next to 2 or 3 stakes or some other immovable items.

1. Remove the left-side access cover and insert the test pressure gauge (300 to 600 psi) into the left steering valve's diagnostic quick coupler as shown in Figure 58.

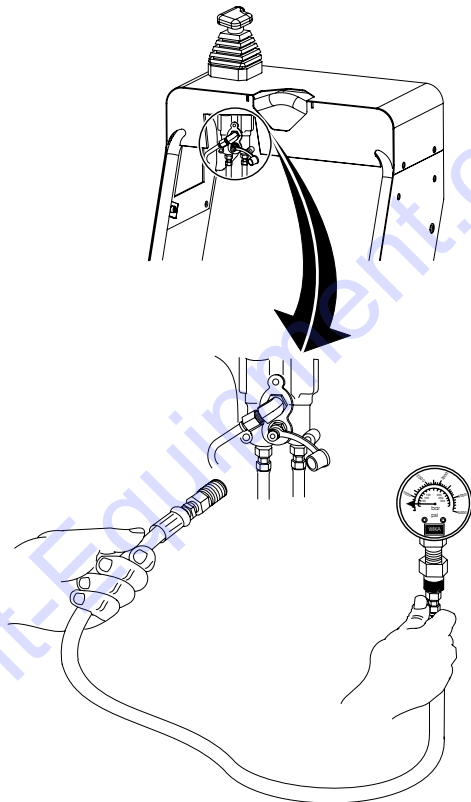


Figure 58. Steering Pressure Check

2. Verify that the hydraulic fluid level is correct.
3. Start the engine and allow the unit to warm up.
4. Move the throttle lever to **FULL** engine RPMs.
5. View the gauge and record the reading.

Interpreting the Pressure Reading

NOTICE

Charge/steering pressure must **NEVER** exceed 300 psi nor fall below 150 psi. Pressure that is too high may result in pressure leaks while pressure that is too low may result in system damage.

The left steering valve's factory setting is 230 psi. However, some operators may prefer more responsive steering (higher pressure required—300 psi maximum) and some operators may prefer a 'softer feel' (lower pressure required—not less than 150 psi).

Steering Pressure Adjustment

Remember, the trowel will need to be kept stationary during 'run-up' while the pressure is checked.

1. Remove the front grille guard.
2. Loosen the jam nut on the pilot relief valve (Figure 59).

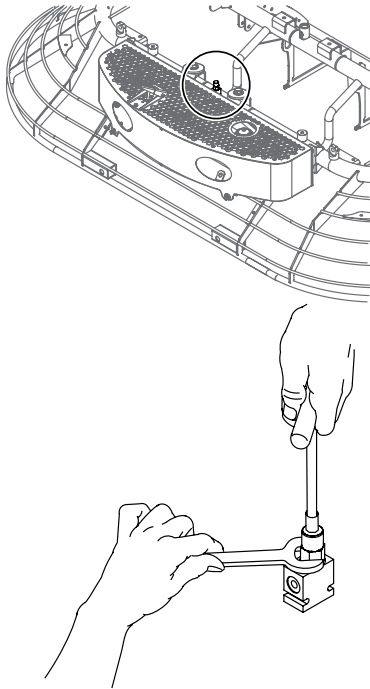


Figure 59. Steering Pressure Adjustment

3. Use an Allen wrench to adjust the steering pressure to the desired setting (between 150 and 300 psi). See the **Checking Steering Pressure** procedure.
4. Retighten the jam nut.
5. Remove the pressure gauge and reinstall the access grille.

DECOMMISSIONING THE TROWEL

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 take place:

1. Drain all fluids completely. These may include oil, gasoline, hydraulic oil, and antifreeze. Dispose of 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 (see the **Safety Information** section).
3. The remainder can be brought to a salvage yard or metal reclamation facility for further dismantling.

TROUBLESHOOTING

Troubleshooting (Ride-On Trowel)		
Symptom	Possible Problem	Solution
Engine running rough or not at all.	Stop switch malfunction?	Make sure that the stop switch is functioning when the operator is seated. Replace switch if necessary.
	Fuel?	Look at the fuel system. Make sure there is fuel being supplied to the engine. Check to ensure that the fuel filter is not clogged.
	Ignition?	Check to ensure that the ignition switch has power and is functioning correctly.
Safety stop switch not functioning.	Bad contacts?	Replace switch.
	Loose wire connections?	Check wiring. Replace as necessary.
	Other problems?	Consult engine manufacturer's manual.
Trowel bounces, rolls concrete, or makes uneven swirls in concrete.	Blades?	Make sure blades are in good condition, not excessively worn. Finish blades should measure no less than 2 inches (50mm) from the blade bar to the trailing edge, combo blades should measure no less than 3.5 inches (89mm). Trailing edge of blade should be straight and parallel to the blade bar.
	Pitch Adjustment?	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 (contact Discount-equipment).
	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 inch (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 inch (0.5 mm) replace the thrust collar.
	Thrust collar bushing?	Check the thrust collar by rocking it on the spider. If it can tilt more than 1/16 inch (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.
Machine has a perceptible rolling motion while running.	Main shaft?	The main output shaft of the gearbox assembly should be checked for straightness. The main shaft must run straight and cannot be more than 0.003 inch (0.08 mm) out of round at the spider attachment point.
	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

Troubleshooting (Ride-On Trowel) - continued		
Symptom	Possible Problem	Solution
Lights (optional) not working.	Wiring?	Check all electrical connections in the lighting circuit. Verify wiring is in good condition with no shorts. Replace defective wiring or components immediately.
	Lights?	If +12VDC is present at light fixture connector when light switch is activated and light does not turn on, replace light bulb.
	Bad switch?	Check the continuity of light switch. Replace light switch if defective.
	Bad fuse?	Check fuse. Replace fuse if defective.
Retardant spray (optional) not working.	Retardant?	Check retardant level in tank. Fill tank as required.
	Wiring?	Check all electrical connections in the spray pump circuit. Verify wiring is in good condition with no shorts. Replace defective wiring or components immediately.
	Bad switch?	Check the continuity of both left and right spray switches (palm handles). Replace spray switch if defective..
	Bad spray pump?	If +12VDC is present at pump connector when spray switch is activated and pump does not operate, replace spray pump.
	Bad fuse?	Check fuse. Replace fuse if defective.
Steering is unresponsive.	Blade speed out of adjustment?	See section on blade speed adjustment.
	Pivots?	Check to ensure free movement of hydraulic drive motors.
	Hydraulic pressure?	Check to ensure that hydraulic pressure is adequate. See section on checking hydraulic pressure.
Operating position is uncomfortable.	Seat adjusted for operator?	Adjust seat with lever located on the front of the seat.
Linkage on Twin Pitch Tower not working.	Broken pitch tower components?	Inspect all pitch tower components. Replace all defective components immediately.
	Defective drive pitch cable?	Inspect drive pitch cable. Replace if defective or broken.
Clutch slipping or sluggish response to engine speed change.	Worn belts?	Replace belt.
	Clutch out of adjustment?	Adjust per instructions in maintenance section of this manual.
	Worn or defective clutch parts?	Replace parts as necessary.
	Worn bearings in gearbox?	Rotate input shaft by hand. If shaft rotates with difficulty, check the input and output shaft bearings. Replace as necessary.
	Worn or broken gears in gearbox?	Verify that the gearbox shaft rotates when the input shaft is rotated. Replace both the worm and worm gear as a set.

TROUBLESHOOTING

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

TROUBLESHOOTING

Troubleshooting (Engine) - continued		
Symptom	Possible Problem	Solution
Weak in power, compression is proper and does not misfire.	Air cleaner dirty?	Clean or replace air cleaner.
	Improper level in carburetor?	Check float adjustment, rebuild carburetor.
	Defective spark plug?	Clean or replace spark plug.
	Improper spark plug?	Set to proper gap.
Weak in power, compression is proper but misfires.	Water in fuel system?	Flush fuel system and replace with correct type of fuel.
	Dirty spark plug?	Clean or replace spark plug.
	Ignition coil defective?	Replace ignition coil.
Engine overheats.	Wrong type of fuel?	Replace with correct type of fuel.
	Cooling fins dirty?	Clean cooling fins.
	Intake air restricted?	Clear intake of dirt and debris. Replace air cleaner elements as necessary.
	Oil level too low or too high?	Adjust oil to proper level.
Rotational speed fluctuates.	Governor adjusted incorrectly?	Adjust governor.
	Governor spring defective?	Replace governor spring.
	Fuel flow restricted?	Check entire fuel system for leaks or clogs.
Recoil starter malfunctions. (if applicable)	Recoil mechanism clogged with dust and dirt?	Clean recoil assembly with soap and water.
	Spiral spring loose?	Replace spiral spring.
Starter malfunctions.	Loose, damaged wiring?	Ensure tight, clean connections on battery and starter.
	Battery insufficiently charged?	Recharge or replace battery.
	Starter damaged or internally shorted?	Replace starter.
Burns too much fuel.	Over-accumulation of exhaust products?	Check and clean valves. Check muffler and replace if necessary.
	Wrong spark plug?	Replace spark plug with manufacturer's suggested type.
Exhaust color is continuously white.	Lubricating oil is wrong viscosity?	Replace lubricating oil with correct viscosity.
	Worn rings?	Replace rings.
Exhaust color is continuously black.	Air cleaner clogged?	Clean or replace air cleaner.
	Choke valve set to incorrect position?	Adjust choke valve to correct position.
	Carburetor defective, seal on carburetor broken?	Replace carburetor or seal.
	Poor carburetor adjustment, engine runs too rich?	Adjust carburetor.
Will not start, no power with key ON. (if applicable)	ON/OFF device not activated ON?	Turn on ON/OFF device.
	Battery disconnected or discharged?	Check cable connections. Charge or replace battery.
	Ignition switch/wiring defective?	Replace ignition switch. Check wiring.

TROUBLESHOOTING

Table 13. Troubleshooting (General)

Symptom	Probable Cause	Solution
Engine will not turn over.	Engine jammed?	Check engine to find the problem and repair it.
	Battery discharged?	Charge.
	Starter malfunctioning?	Repair or replace.
	Wires disconnected?	Repair and replace.
Engine turns over slowly but does not start.	Increased resistance of moving parts?	Repair or replace.
	Excessively high viscosity engine oil at low temperature?	Use specified engine oil.
Engine turns over at normal speed but does not start.	Compression leak?	Check the compression pressure and repair.
	Improper valve clearance?	Adjust.
	Defective ignition coil?	Replace.
	Defective spark plug?	Adjust spark plug gap or replace.
	Defective ignitor?	Replace.
	Clogged air cleaner?	Clean or replace.
Rough low-speed running and idling.	Defective ignition coil?	Replace.
	Defective spark plug?	Adjust spark plug gap or replace.
	Defective ignitor?	Replace.
	Incorrect governor adjustment?	Adjust.
	Improper valve clearance?	Adjust.
Rough high-speed running.	Defective ignitor?	Replace.
	Defective spark plug?	Adjust spark plug gap or replace.
	Defective ignition coil?	Replace.
	Incorrect governor adjustment?	Adjust.
Engine speed does not increase.	Incorrect governor adjustment?	Adjust.
	Defective ignitor?	Replace.
	Clogged air cleaner?	Clean or replace.
Deficient output.	Improper intake or exhaust valve settings?	Replace.
	Incorrect governor adjustment?	Adjust.
	Excessive carbon in engine?	Remove carbon.
	Improper valve clearance?	Adjust.
	Piston ring and cylinder worn?	Replace.
	Clogged air cleaner?	Clean or replace.

TROUBLESHOOTING

Table 14. Troubleshooting (General) (Continued)

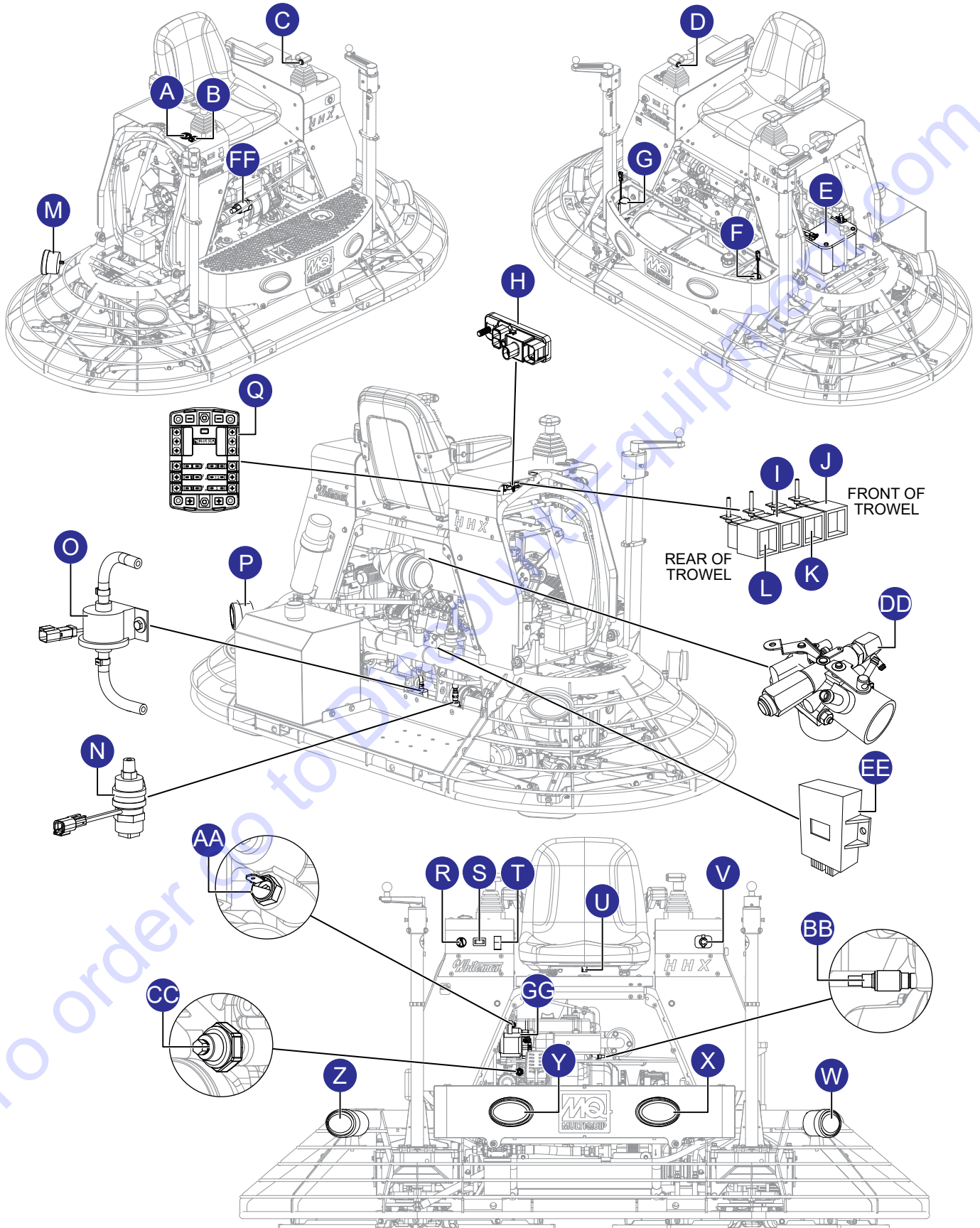
Symptom	Probable Cause	Solution
Engine noise.	Improper valve clearance?	Adjust.
	Spark knock due to low-octane fuel or carbon?	Use higher-octane fuel and remove carbon.
	Rattles from loosely mounted external components?	Retighten.
Exhaust flames.	Defective ignition coil?	Replace.
	Defective high-tension cord?	Replace.
	Defective spark plug?	Adjust spark plug or replace.
	Wires disconnected or defective wire?	Reconnect/replace.
	Bad connection of the high-tension cord and spark plug?	Reconnect.

TROUBLESHOOTING

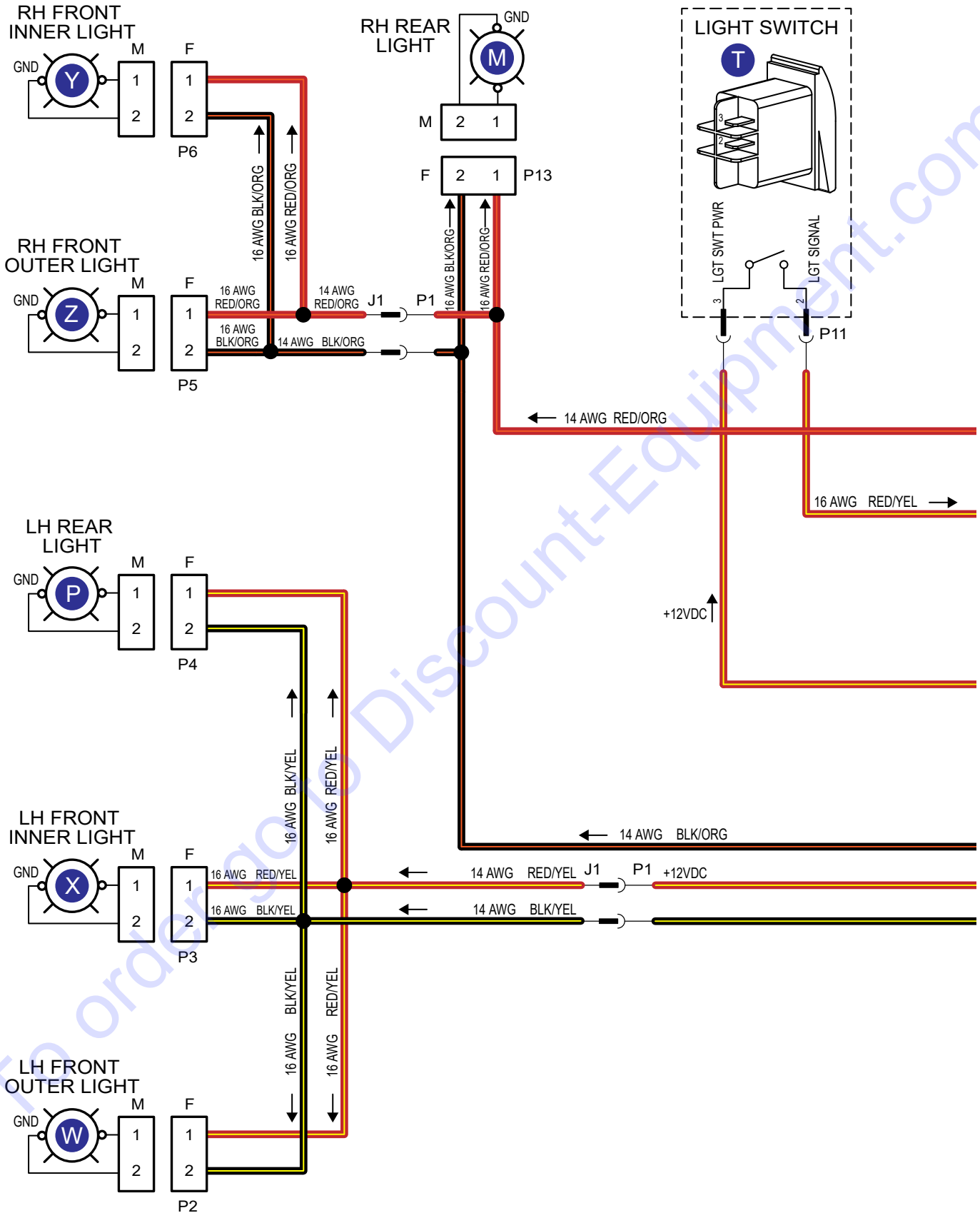
Table 15. Troubleshooting (Gasoline and LPG Fuel)

Fuel Type	Symptom	Probable Cause	Solution
Gasoline fuel	Engine turns over at normal speed but does not start.	No fuel?	Replenish fuel.
		Defective fuel system?	Check fuel line and carburetor and repair.
		Over choked?	Clean spark plug.
		Flooding carburetor?	Check carburetor and repair/replace.
	Rough low-speed running and idling.	Incorrect carburetor idle adjustment?	Adjust.
Engine speed does not increase.	Incorrect carburetor adjustment?	Adjust.	
LPG fuel	Engine turns over at normal speed but does not start.	No LPG fuel?	Replenish LPG fuel. Check LPG tank valve. Check shutoff solenoid valve.
		Defective vacuum lock system?	Check vacuum hose. Replace vaporizer.
		Defective throttle lever position?	Set throttle lever to the low idle position.
	Rough low-speed running and idling.	Shortage of gas supply?	Replenish LPG fuel. Check shutoff solenoid valve.
		Defective idling?	Replenish vaporizer. Drain tar from vaporizer.
	Defective output.	LPG density is rich?	Replace vaporizer.
		Shortage of LPG?	Repair or replace fuel system. Replace vaporizer.

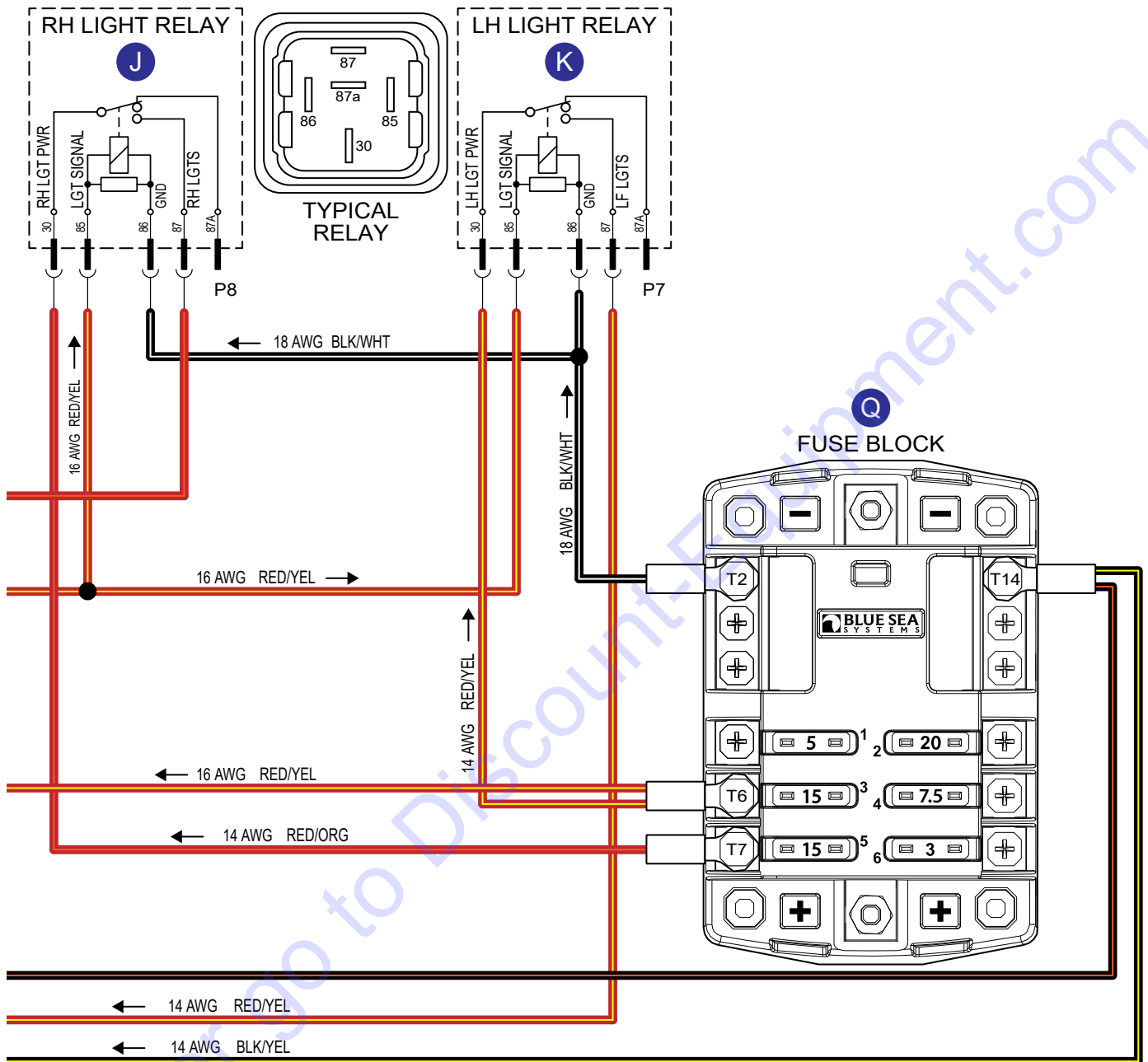
ELECTRICAL COMPONENT LOCATOR



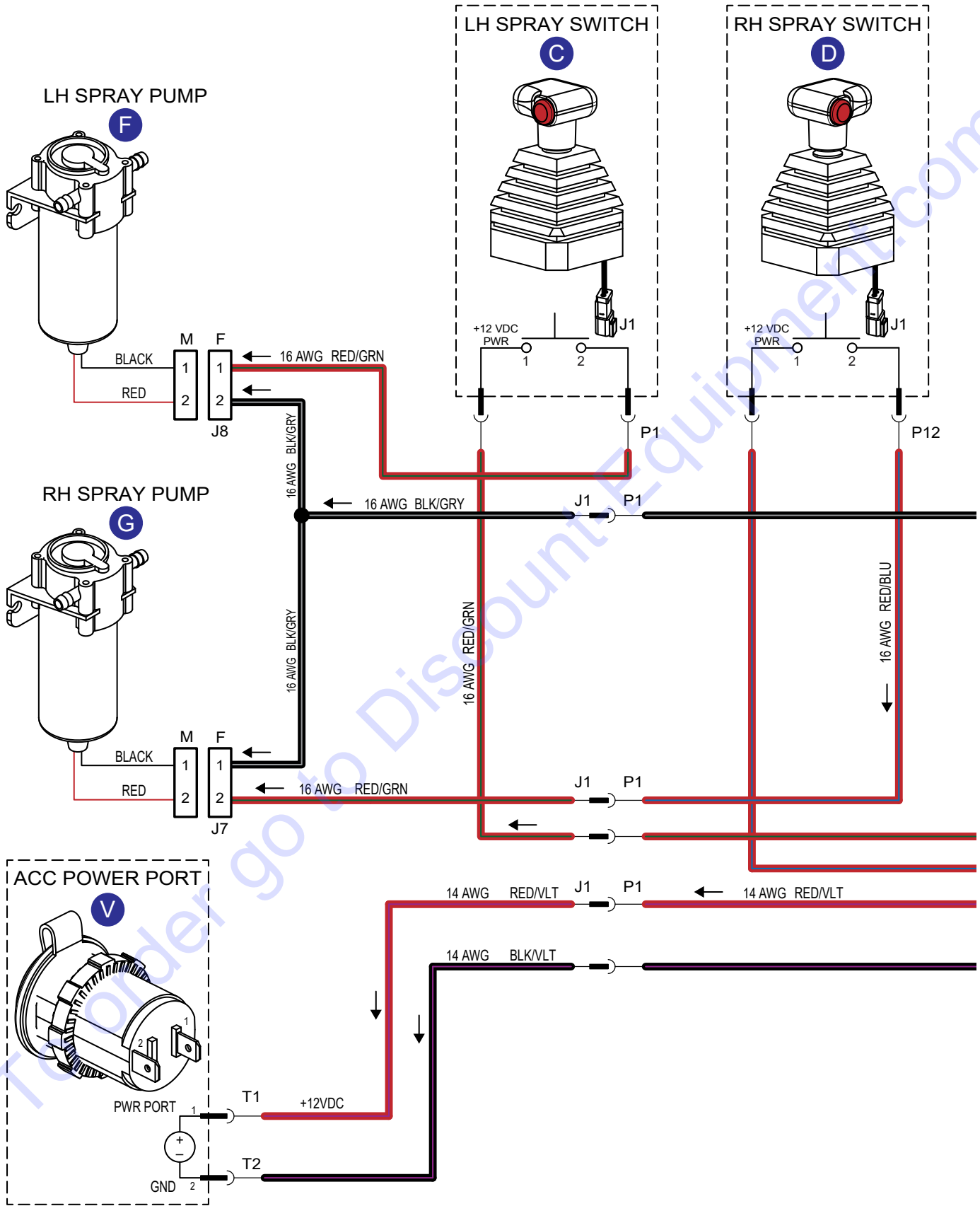
ELECTRICAL WIRING DIAGRAM (LIGHTS)



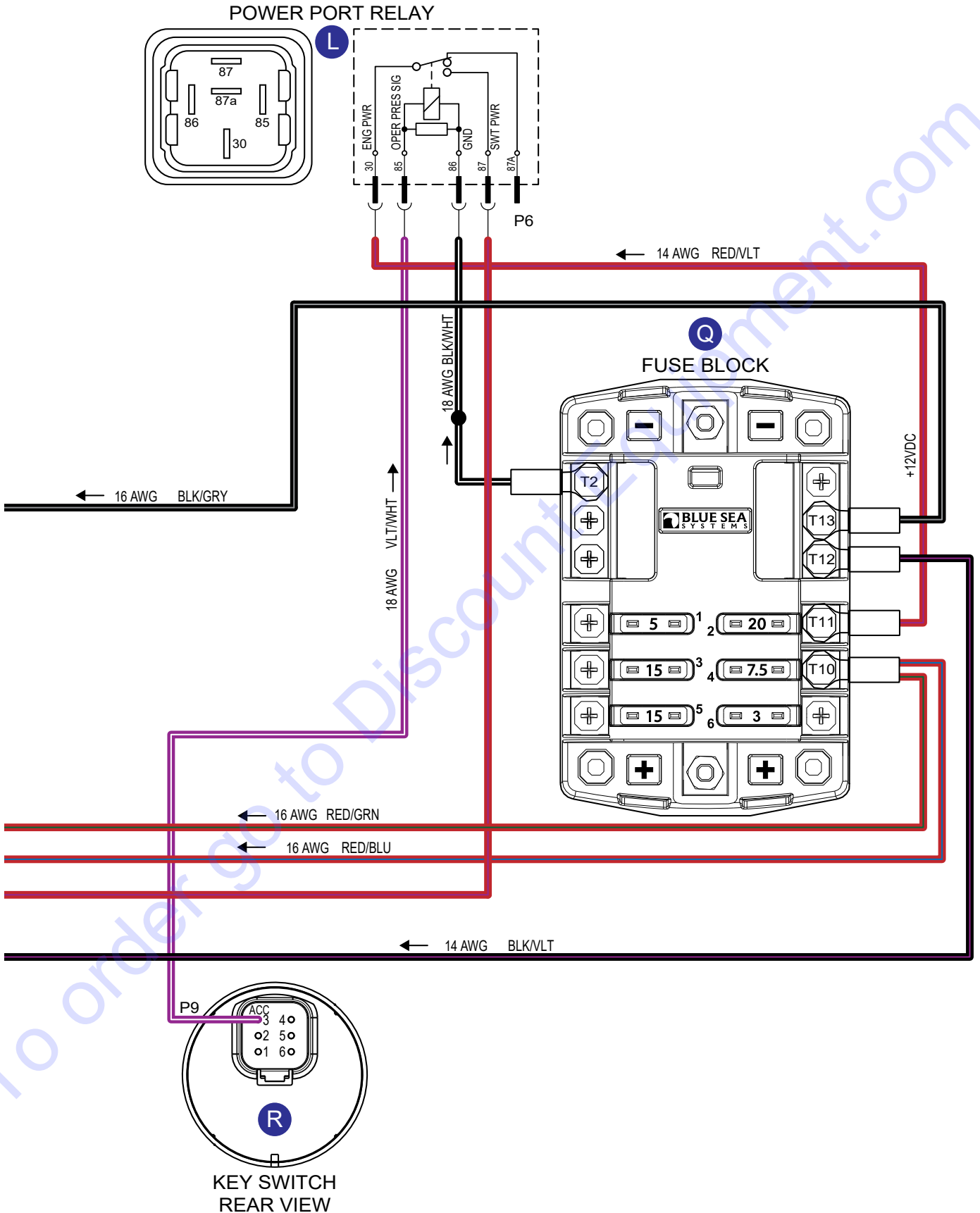
ELECTRICAL WIRING DIAGRAM (LIGHTS)



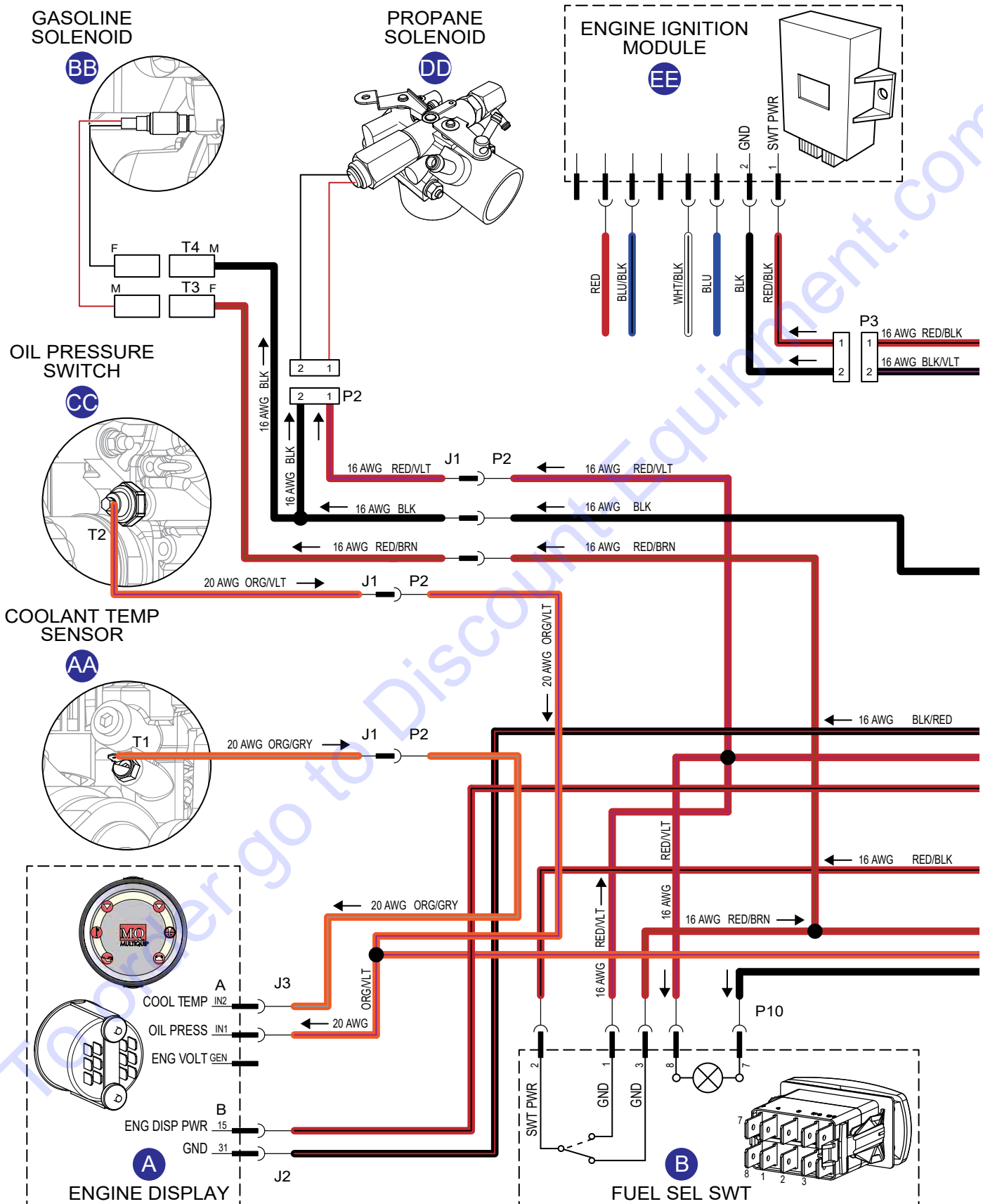
ELECTRICAL WIRING DIAGRAM (SPRAY/ACCESSORIES)



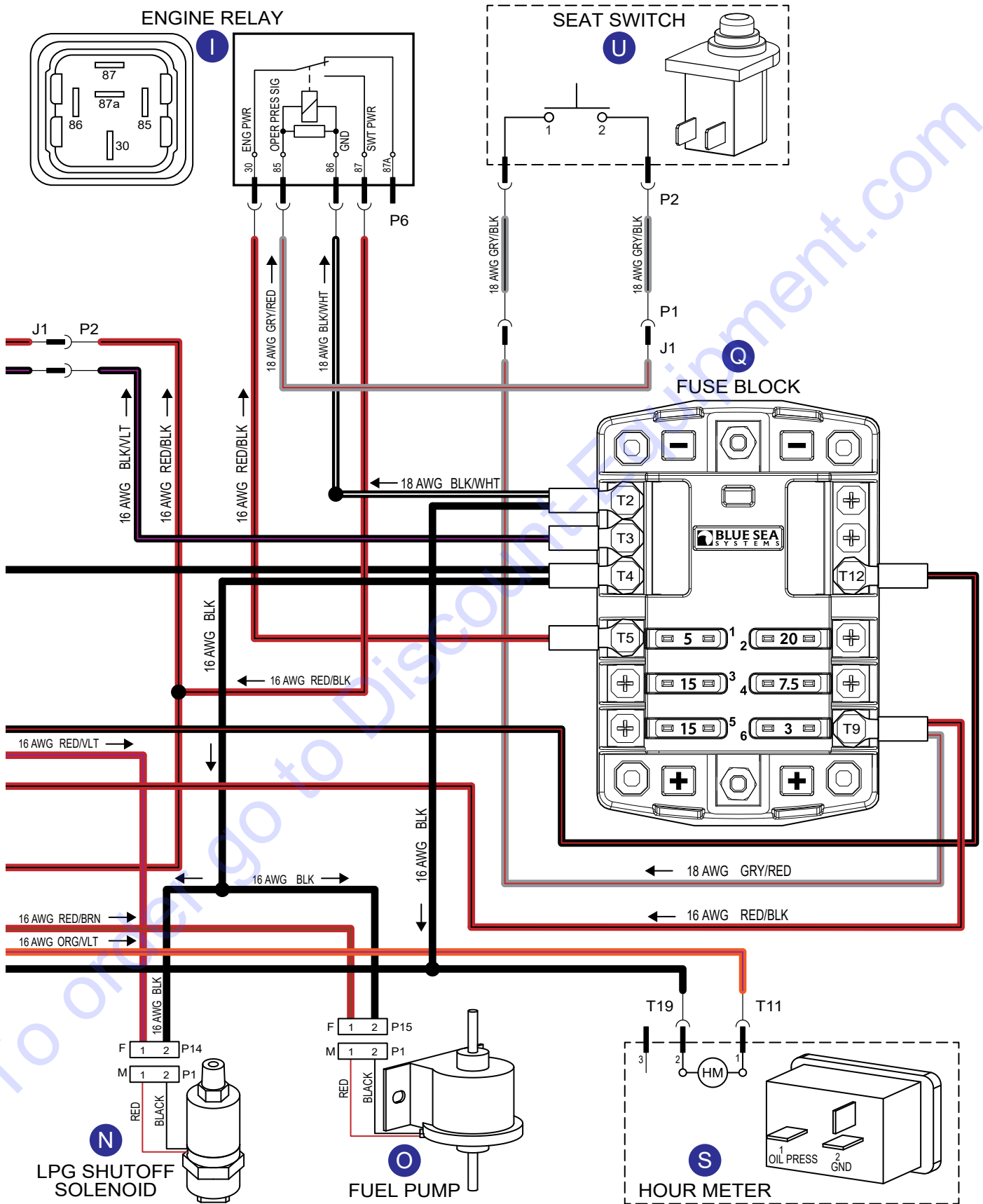
ELECTRICAL WIRING DIAGRAM (SPRAY/ACCESSORIES)



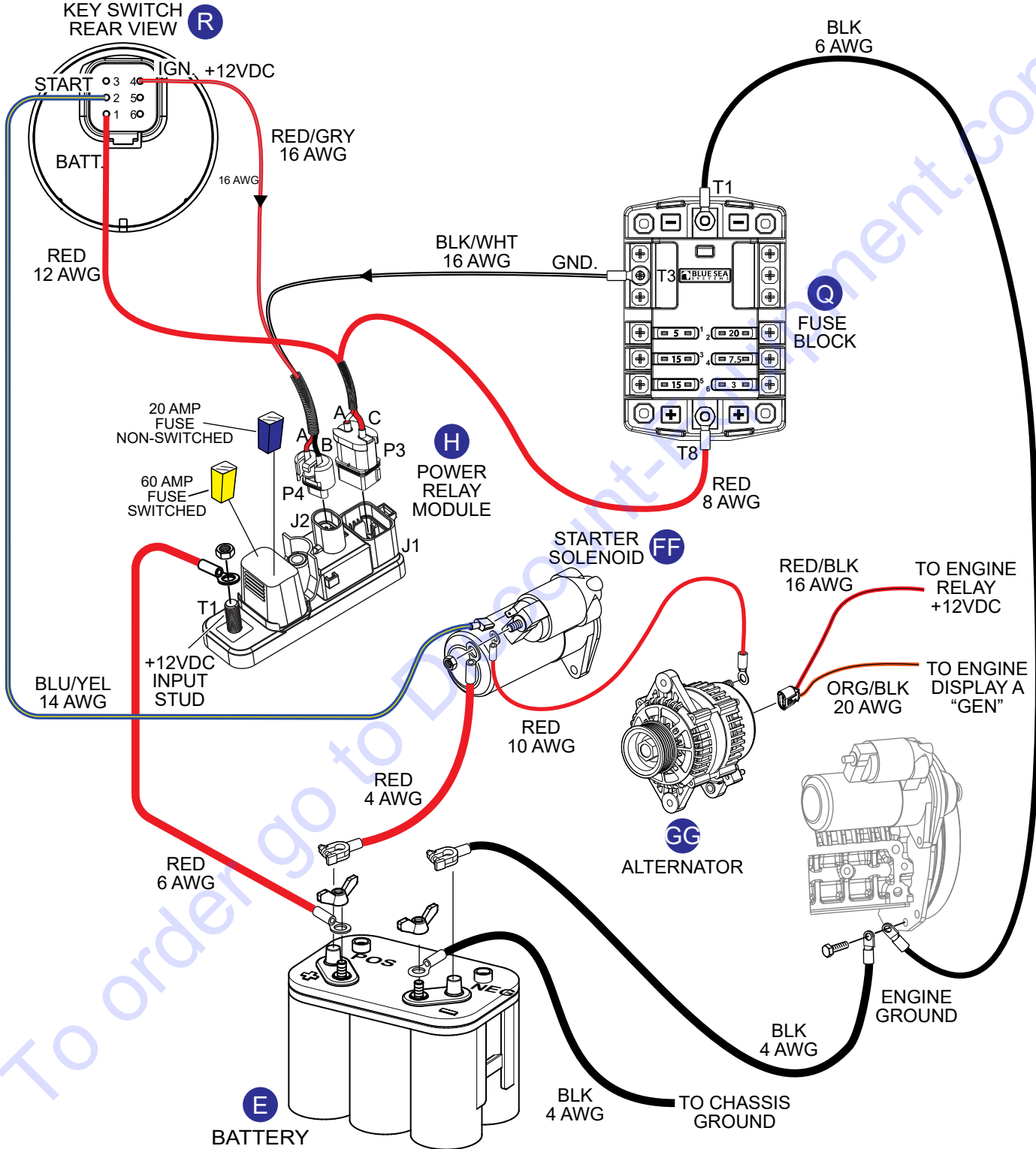
ELECTRICAL WIRING DIAGRAM (ENGINE/SEAT SWITCH)



ELECTRICAL WIRING DIAGRAM (ENGINE/SEAT SWITCH)



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