OPERATION MANUAL

MULTIQUIP®

MODEL
HTNS5S-2
RIDE-ON POWER TROWEL
(SUBARU EH722 EFI GASOLINE ENGINE)

Revision #0 (03/14/17)

Original Version

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

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PN: 24443

⚠ WARNING

Gasoline engine exhaust and some of its constituents, and some dust created by power sanding, sawing, grinding, drilling and other construction activities contain chemicals know to cause cancer, birth defects and other reproductive harm.

Some examples of these chemicals are:

- **Lead from lead-based paints**
- **Crystalline silica from bricks**
- **Cement and other masonry products**
- **Arsenic and chromium from chemically treated lumber**

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: ALWAYS work in a well-ventilated area, and work with approved safety equipment, such as dust masks that are specially designed to filter out microscopic particles.

⚠ 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.

HTNS5S-2 Ride-On Trowel

NOTICE

Specifications are subject to change without notice.

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

DAILY PRE-OPERATION CHECKLIST

Daily Pre-Operation Checklist		✓	✓	✓	✓	✓	✓
1	Engine oil level						
2	Condition of blades						
3	Blade pitch operation						
4	Safety stop switch operation						
5	Steering control operation						

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

SAFETY MESSAGES

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

SAFETY SYMBOLS

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Addresses practices not related to personal injury.

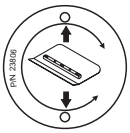
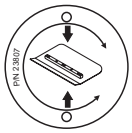
Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

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

DECALS

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

DECAL	SAFETY HAZARD
	**WARNING** Rotating Blade Hazard • Keep hands and feet clear of guard rings. • Stop engine before servicing.
	**WARNING** Read Manual To avoid injury you must read and understand operator's manual before using this machine.
	**WARNING** Lifting Crush Hazard • **NEVER** allow any person to stand underneath the trowel while lifting. • **DO NOT** lift trowel with pans attached. • **ALWAYS** make sure handle is securely attached. • On Quick Pitch™ models make sure T-Handle latch is locked (engaged).
	**ALWAYS** wear protective clothing when operating this equipment
	**WARNING** Training This machine to be operated by qualified personnel. Ask for training as needed.
	**WARNING** Guard Hazard **NEVER** operate this equipment with guards removed. Keep hands clear.

DECAL	SAFETY HAZARD
	**DANGER** Spring Compression Hazard • **DO NOT** disassemble. • Spring inside is under compression.
	**WARNING** Lethal Exhaust Gas Hazard • Inhaling exhaust fumes can result in severe injury or death. • Only operate equipment in well ventilated areas. **DO NOT** inhale exhaust gases/fumes.
	**WARNING** **DO NOT** Use Water Hazard
	Lifting Point. Attach lifting strap to this point
	**CAUTION** Burn Hazard • **HOT PARTS** can burn skin. • **DO NOT** touch hot parts. Allow machine a sufficient amount of time to cool before performing maintenance.
	Use ***unleaded*** gasoline only.
	Lubrication Point. Apply grease.
	Right-Hand Pitch Control. Turn clockwise to ***raise*** blade. Counterclockwise to ***lower*** blade
	Left-Hand Pitch Control. Turn clockwise to ***lower*** blade. Counterclockwise to ***raise*** blade

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.

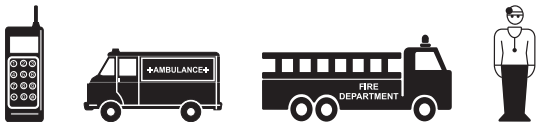
NOTICE

- 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 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.**

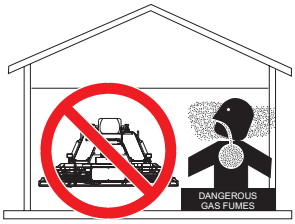
- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site.** Also, know the phone numbers of the nearest **ambulance, doctor** and **fire department.** This information will be invaluable in the case of an emergency.



TROWEL SAFETY

⚠ DANGER

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



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

⚠ WARNING

- **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 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.

FUEL SAFETY

⚠ 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.

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.

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 or 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 rope.

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

NOTICE

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

Emission Control Label

The emission control label is an integral part of the emission system and is strictly controlled by regulations.

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

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

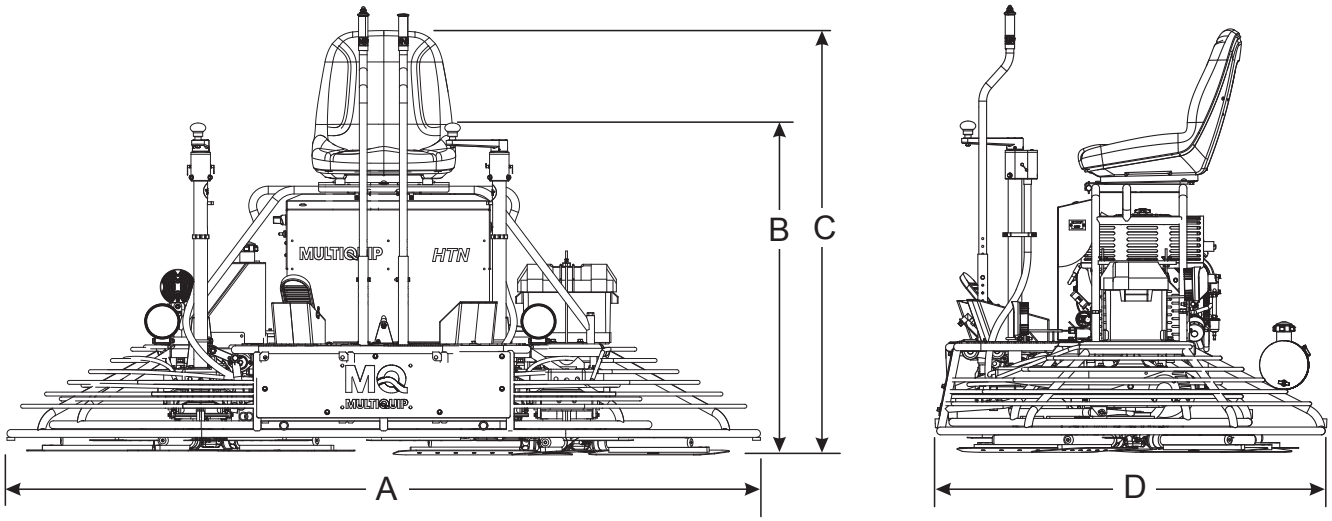


Figure 1. Dimensions

Table 1. Trowel Specifications	
Model	HTNS5S-2
A–Length – cm (in.)	241.3 (95)
B–Height (Handle) cm (in.)	104 (41)
C–Height (Seat) – cm (in.)	132 (52)
D–Width – cm (in.)	122 (48)
Weight – kg (lb.) Operating	320.5 (705)
Weight – kg (lb.) Shipping	400 (882)
Engine (Continuous) – kW (hp/rpm)	14.9 (20/3600)
Engine (Maximum) – kW (hp/rpm)	20.9 (28/4000)
Fuel Tank – liters (gallons)	30 (7.9)
Blades Per Rotor	5
Rotor rpm (Dry Concrete)	60–80
Path Width – cm (in.)	241.8 (95.2)
Gear Box Oil Capacity – ml (oz.)	1686 (57) ISO-VG640

Table 2. HTNS5S-2 Noise and Vibration Emissions	
Model	**HTNS5S-2**
Guaranteed ISO 11201:2010 Based Sound Pressure Level at Operator Station in dB(A)	TBD
Guaranteed ISO 3744:2010 Based Sound Power Level in dB(A)	TBD
Whole Body Vibration Per ISO 2631-1:1997+A1:2010 in m/s^2 $\Sigma A(8)$	TBD

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 condition of the machine which generates 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 condition of the machine that generates 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 $\Sigma A(8)$.*

Table 3. Engine Specifications/Dimensions	
Model	**Subaru EH722 EFI Engine**
Type	Air-Cooled, 4-Cycle, V-Twin Cylinder, Horizontal P.T.O. Shaft, OHV, Gasoline Engine
Bore x Stroke	84 mm x 65 mm (3.31 in. x 2.56 in.)
Piston Displacement	720 cm^3 (43.9 cu. in.)
Continuous Output	14.9 kW (20 hp) @ 3600 rpm
Maximum Output	20.9 kW (28 hp) @ 4000 rpm
Max. Torque	52.2 N·m (462 lb-in.) @ 2800 rpm
Direction of Rotation	Counterclockwise as viewed from P.T.O. shaft side
Engine Oil Capacity SAE 10W-30 API Service Class SE or later	4-Stroke, API, SF or SG SAE #20, #30, or 10W-30 General Use 1.55 Liters (1.64 Quarts/0.41 gallons)
Fuel	Unleaded Gasoline
Starting System	Electric Starter
Spark Plug Type	BPR5ES (NGK) or BPR4EY (NGK)
Spark Plug Gap	0.7 mm – 0.8 mm (0.03 in.)
L x W x H	317 x 477 x 480 mm (12.5 x 18.8 x 18.9 in.)
Weight (dry)	101.3 kg (46 lb.)

HTNS5S-2 SERIES RIDE-ON POWER TROWEL FAMILIARIZATION

The HTNS5S-2 trowel is designed for the floating and finishing of concrete slabs.

Walk around your trowel. Take notice of all the major components—engine, blades, air cleaner, fuel system, fuel shut-off valve, ignition switch etc. Check that there is oil in the engine, and gear oil in the gearbox assembly.

Read all the 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.

Look at the operator control levers. Grab the control levers and move them around a bit. Notice how moving the control levers causes the gearboxes and frame to move.

Notice the foot pedal which controls the engine speed. Look at the main drive line of the trowel. Take note and reference 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 test run will increase your confidence in using the trowel, and will familiarize you with the trowel's controls and indicators. In addition, you will understand how the trowel will handle under actual operating conditions.

ENGINE

This trowel is equipped with an air-cooled, Subaru EH722 EFI, 28 hp, gasoline engine. Refer to the engine owner's manual for specific instructions regarding engine operation. This manual is included with the trowel at the time of shipping. Contact your nearest Multiquip Dealer if you need a replacement.

BLADES

The blades of the trowel finish the concrete as they are rotated around the surface. Blades are classified as combination (10 or 8 inches wide) and finish (6 inches wide). This trowel 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.

Figure 2 and Figure 3 show the location and functions of the controls, indicators and general maintenance parts. Some controls may perform more than one function.

GEARBOXES

The HTNS5S-2 trowel consists of two separate gearbox assemblies that are enclosed in rugged cast aluminum gear cases. The main gear is a high quality bronze and steel composite. The worm gear is composed of hardened steel.

Cooling fins are integrated into the gearbox to provide maximum cooling for the gearbox oil. The gearbox casing holds 50% more oil capacity than competitors, which allows more lubrication to be provided to critical points.

STEERING LEVERS

Dual control levers located in front of the operator's seat are provided for steering the trowel.

Push the left control lever forward and pull the right control lever backward to rotate the trowel clockwise on approximately a center axis. Pull the left control lever backward and push the right control lever forward and the trowel will rotate counterclockwise. See Table 5 for a complete description of the control levers' directional positioning.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

A continuously variable transmission (CVT) has been installed to obtain maximum drive torque.

This is accomplished by continually adjusting the drive ratio to obtain optimum torque and speed during all phases of finishing, from low speed, high torque to high speed burnishing.

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 training, please use the "Training Checklist" located in the front of this manual. This checklist is not intended to be a substitute for proper training, but will provide an outline for an experienced operator to provide training to a new operator.

1. **Seat** — Engine will not start unless operator is seated.
2. **Retardant Spray Control Button** — Sprays retardant through the nozzle at the front of the machine.
3. **Steering Control Levers** — Direct the unit forward, reverse, left, or right.
4. **Twin Pitch Control** — Both pitch towers are linked together. One crank may be turned to adjust the blade pitch simultaneously or individually controlled for each set of blades. Turn the crank as marked on its top surface to increase or decrease blade pitch.
5. **Left Front Light** — 12V LED light, used for night operation.
6. **Left Foot Riser** — Operator foot rest pedal.
7. **Spray Nozzle** — Spray nozzle for retardant.
8. **Right Foot Pedal** — Controls blade speed. Slow blade speed is accomplished by slightly pressing the foot pedal. Maximum blade speed is accomplished by fully pressing the foot pedal.
9. **EZ Mover Boss** — Front attachment point for EZ Mover. Used to move the trowel.
10. **Right Front Light** — 12V LED light, used for night operation.
11. **Oil Pressure Warning/Indicator Light** — When illuminated, indicates the oil pressure has dropped below safe operating limits. This condition will cause the engine to shutdown. During normal operation of the trowel, this LED should remain **OFF.**
12. **Light Switch** — Turns on four LED lights—two in front, two in rear.
13. **Engine Stop Switch** — Located within the seat. Operator must be sitting in the seat for the engine to start. If operator exits seat, engine will stop.
14. **Ignition Switch (Control Panel)** — With key inserted, turn clockwise to start engine.
15. **Lift Loops** — Located on both sides of the main frame. Used to lift the trowel.

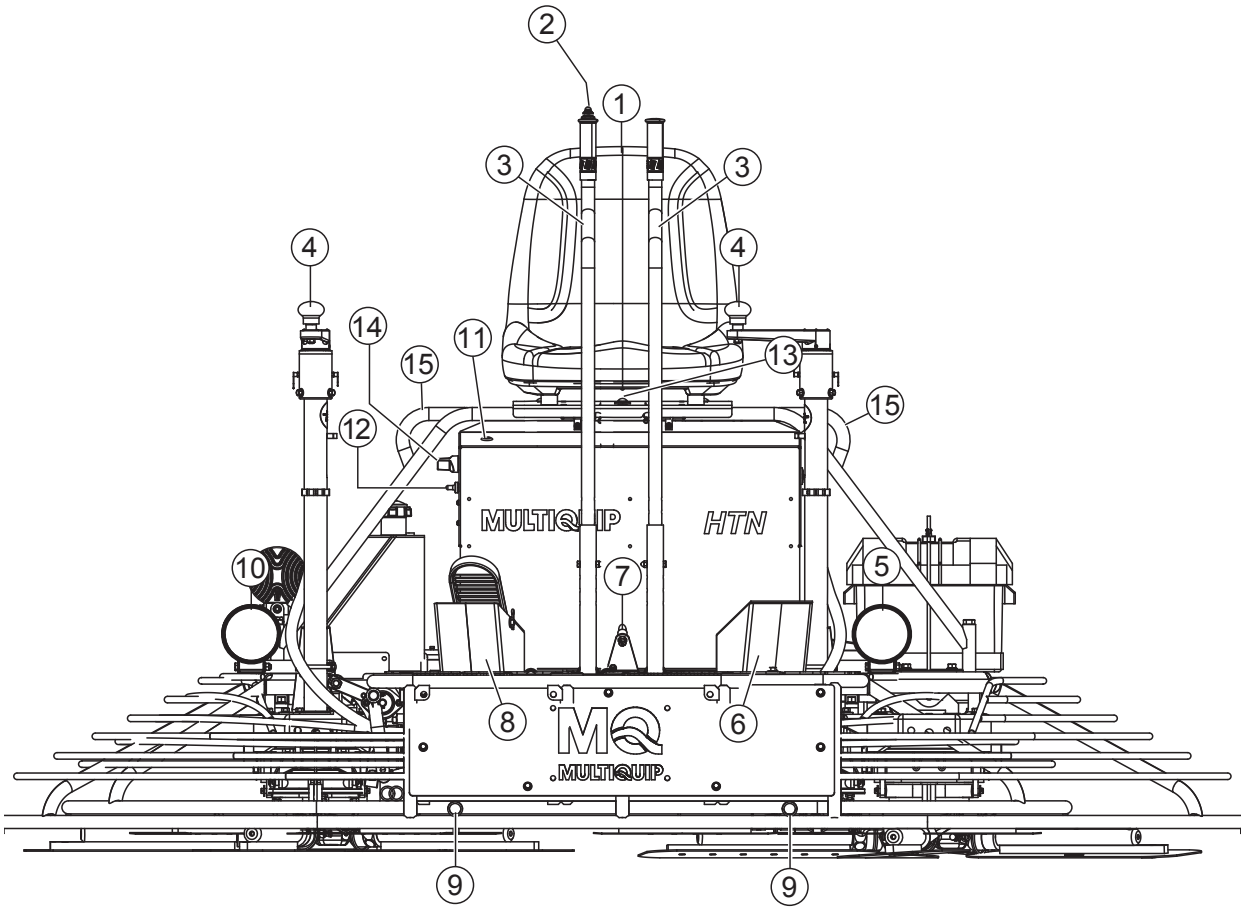


Figure 2. Components – Front

16. **Right Rear Light** — 12V LED light, used for night operations.
17. **Battery** — Provides +12V DC power to the electrical system.
18. **Retardant Spray Pump** — Delivers retardant to the spray nozzle.
19. **Engine** — Air-cooled Subaru EH722 EFI, 28 hp, gasoline engine.
20. **Right-Side Spider** — Consists of trowel arms, blades, wear plate, and thrust collar.
21. **EZ Mover Boss** — Rear attachment point for EZ Mover. Used to transport the trowel.
22. **Retardant Spray Tank** — Holds 5 gallons (18.9 L) of retardant.
23. **Left-Side Spider** — Consists of trowel arms, blades, wear plate, and thrust collar.
24. **Fuel Tank** — Holds 7.9 gallons (30 L) of unleaded gasoline.
25. **Fuel Filler Cap** — Remove this cap to add unleaded gasoline to the fuel tank. Make sure cap is tightened securely. **DO NOT** overfill.
26. **Belt Guard** — Encloses drive belt used in conjunction with clutch.
27. **Left Rear Light** — 12V LED light, used for night operations.

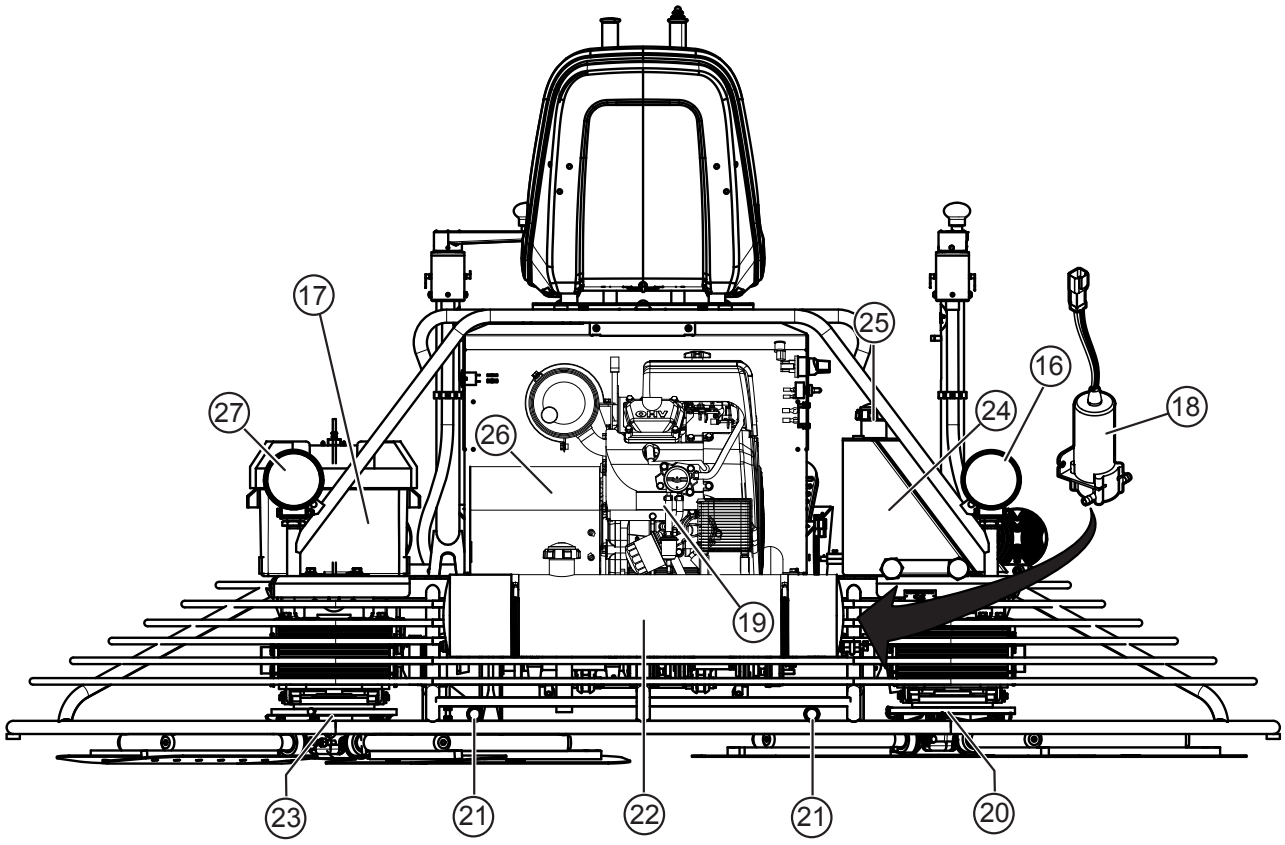


Figure 3. Components – Rear

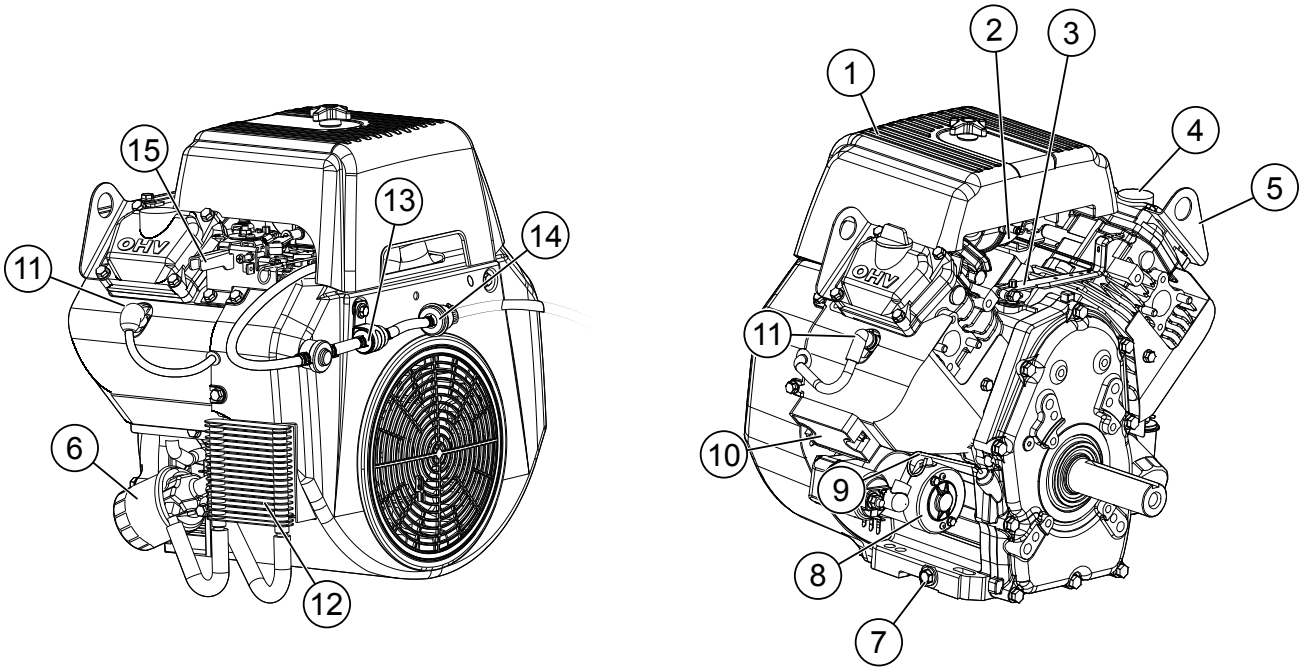


Figure 4. Engine Components

INITIAL SERVICING

The engine (Figure 4) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the engine manufacturer's manual for instructions and details for operation and servicing.

1. **Air Cleaner** — Prevents dirt and other debris from entering the fuel system. Remove the air cleaner cover to gain access to the urethane foam and paper filter elements.
2. **Throttle** — Used to adjust engine RPM speed. This lever is connected to the throttle lever cable located in the foot pedal.
3. **Governor Lever** — On the crankcase exterior. Helps to move governor components to open or close the carburetor.
4. **Oil Filler Cap** — Remove to add engine oil through the filler port as recommended in Table 4.
5. **Lifting Hook** — Attach to a suitable lifting device whenever lifting of the trowel is required.
6. **Oil Filter** — Prevents dirt and other debris from entering the engine oil. Torque the oil filter between 9.9 – 14.7 N·m (16.3 – 19.8 ft-lb.).
7. **Oil Drain Plug** — Used to drain crankcase oil. Always dispose of used oil and oil filters in an environmentally safe manner. **DO NOT** allow used oil to drain onto the ground or into a water runoff drain.
8. **Electric Starter** — Starts the engine when ignition key is rotated to the **"START"** position.
9. **Oil Gauge/Dipstick** — Remove this measuring rod to determine if the engine oil is low or needs to be changed.
10. **Voltage Regulator** — Maintains constant voltage during engine operation.
11. **Spark Plug** — Provides spark to the ignition system. Set the spark plug gap to 0.7 – 0.8 mm (0.03 inches). Clean the spark plug once a week.
12. **Oil Cooler** — Holds and uses engine oil as a coolant necessary to keep the engine at a safe operating temperature.
13. **Fuel Pump** — Electric pump transfers fuel to the fuel system.
14. **Fuel Filter** — Filters fuel for contaminants.
15. **Speed Control Lever** — Controls the speed of the engine. Move the hand lever forward to increase engine/blade speed, backwards to decrease engine/blade speed.

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.

NOTICE

The new trowel cannot be placed into service until the setup installation instructions are completed.

Before packaging and shipping, the HTNS5S-2 trowel was run and tested at the factory. If there are problems, please let us know.

CONTROL HANDLE ASSEMBLY

The steering control handles are not attached to the trowel's two lower handles at the time of shipment. To attach the steering control handles to the two lower handle assemblies, perform the following:

1. Remove the bolts from the plastic bag tied to the control towers.
2. Remove all protective wrapping and straps from the control handles.
3. Slip the top (loose) piece into the base of the corresponding handle, making sure to line up the holes.
4. Install the bolt through the lined up holes and tighten the acorn nut onto the threaded end.

NOTICE

Some models are equipped with adjustable height handles. Adjust the height by placing the bolt through the set of holes that corresponds to the most comfortable height.

5. Pay close attention to any wires that may be inside the control handles. **DO NOT** pinch or cut any wires during installation.
6. Inside the plastic bag of parts are two knobs for the pitch control tower cranks. Install these two knobs onto the tower crank levers.

SEAT ASSEMBLY

The seat is not installed on the trowel for shipping purposes. To attach the seat, perform the following:

1. Remove the seat from the protective wrapping.
2. Insert studs on bottom of seat through holes in mounting plate.
3. Install and tighten the provided nuts.
4. Connect the engine stop switch (operator's seat) cable to the mating plug as shown in Figure 5.

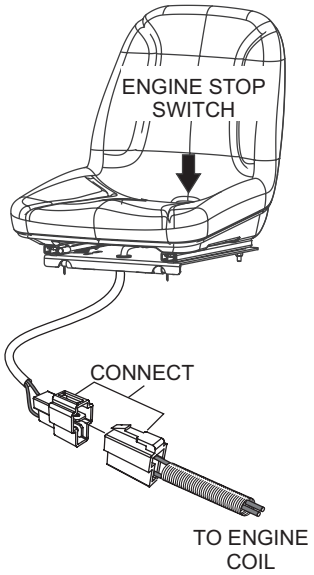


Figure 5. Engine Stop Switch Connection

BATTERY SETUP

This trowel was shipped with a wet charged battery. This battery may need to be charged for a brief period of time as per the manufacturer instructions.

⚠ CAUTION

Use all safety precautions specified by the battery manufacturer when working with the battery. Reference the “Safety” section of this manual for additional information.

To install the battery onto the trowel, make sure that the battery is well-seated in the battery box. Connect the negative cable (**BLACK**) to the negative terminal on the battery first, then connect the positive cable (**RED**) to the positive terminal. Close the plastic battery box cover and secure the battery box.

The following section is intended as a basic guide for trowel operation, and is not to be considered a complete guide to concrete finishing. It is strongly suggested that all operators (experienced and novice) read *Concrete Slabs on Grade* published by the American Concrete Institute, Detroit Michigan.

DO NOT use your trowel until this section is thoroughly understood.

⚠ CAUTION

Failure to understand the operation of the trowel could result in severe damage to the machine or personal injury.

ENGINE OIL LEVEL

ALWAYS check engine oil before each use.

1. Pull the engine oil dipstick (Figure 6) from its holder.

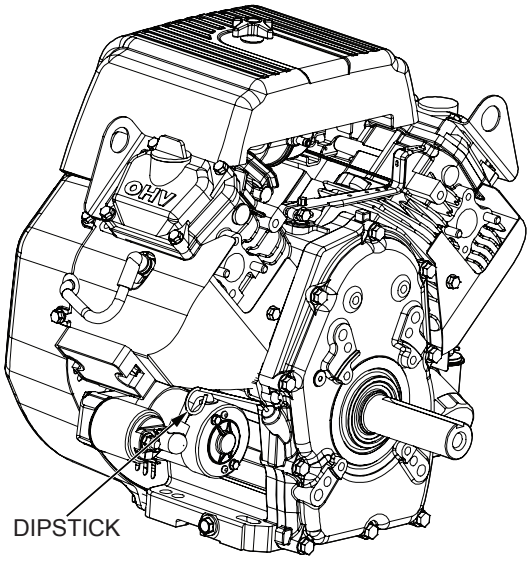


Figure 6. Engine Oil Dipstick

2. Determine if engine oil is low (Figure 7). Oil level should be between the upper and lower levels on the oil gauge.

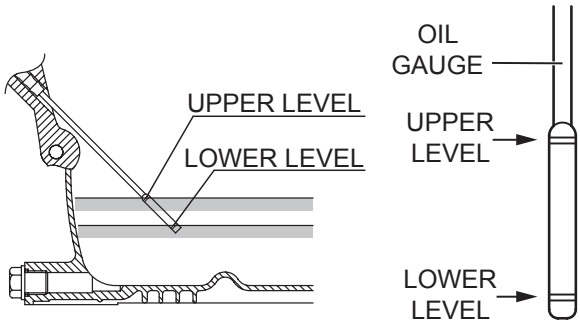
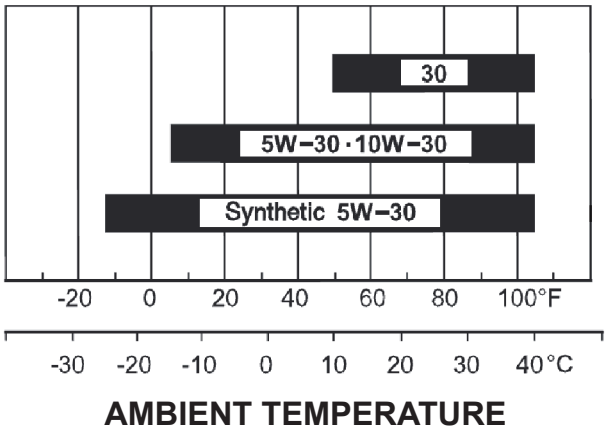


Figure 7. Checking Engine Oil Level

3. If engine oil is low, remove oil filler cap and add correct amount of engine oil to bring oil to a normal, safe level. Use oil as recommended in Table 4.

Table 4. Recommended Viscosity Grades



NOTICE

To prevent extensive engine wear or damage, **ALWAYS** maintain the proper oil level in the crankcase. **NEVER** operate the engine with the oil level beyond the upper or lower limits on the dipstick.

GEARBOX OIL LEVEL

1. Check the gearbox oil level in both gearboxes by removing the plug and ensuring that the oil is at the correct level (Figure 8).

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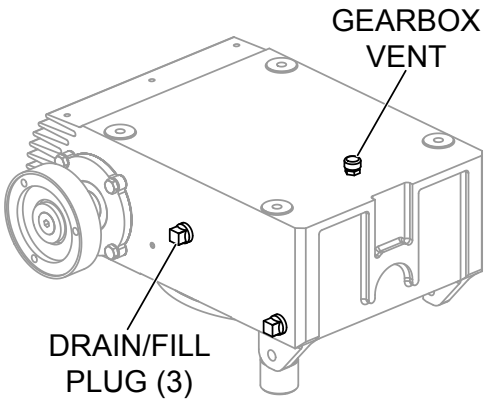


Figure 8. Checking Gearbox Oil Level

2. Fill the gearbox just to the level of the fill plug (Figure 8). The gearbox oil level capacity is 1686 ml (57 oz.). Fill gearbox with ISO-VG640 oil if necessary.

FUEL CHECK

DANGER

Handle fuel safely. Motor fuels are highly flammable and can be dangerous if mishandled. **DO NOT** smoke while refueling. **DO NOT** attempt to refuel the trowel when the engine is hot or running. If fuel is spilled, **DO NOT** attempt to start the engine until any fuel residue has been completely wiped up and the area surrounding the engine is dry.

Remove fuel cap from fuel tank and visually inspect fuel level (Figure 9). Determine if the engine fuel is low. If fuel level is low, fill tank with unleaded gasoline.

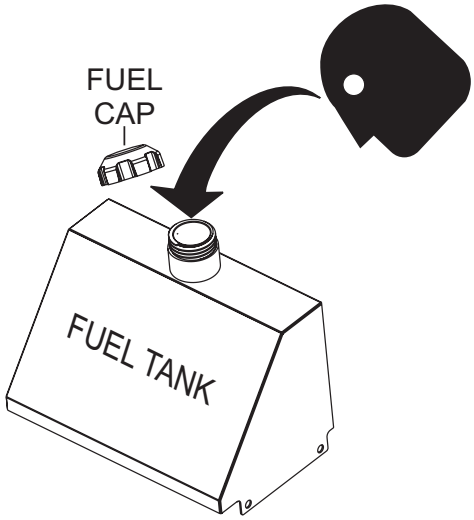


Figure 9. Fuel Gauge

CV BELT

Visually examine the CV belt (Figure 10) and determine if it is full of tiny cracks, frayed, peeling, has pieces of rubber missing, or is otherwise damaged.

Also, examine the belt and determine if it is ***oil soaked*** or ***glazed*** (hard shiny appearance on the sides of the belt). Either of these two conditions can cause the belt to run hot, which can weaken it and increase the chance of it breaking.

If the CV belt exhibits any of the above wear conditions, replace the CV belt immediately.

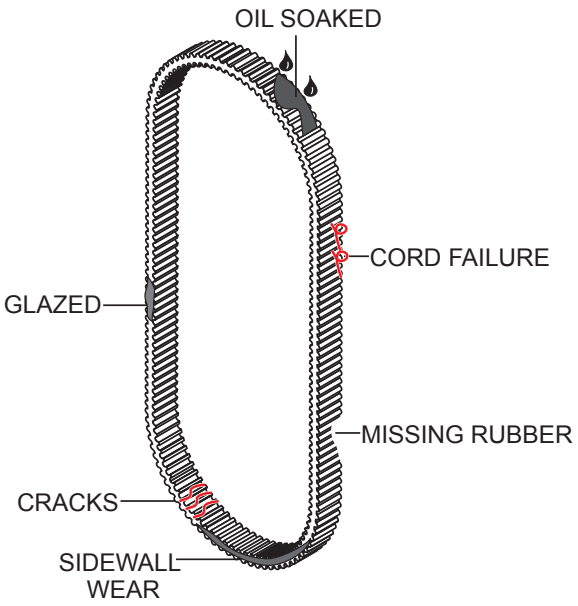


Figure 10. CV Belt Inspection

IMPORTANT INFORMATION BEFORE YOU START

1. This trowel is equipped with a safety stop switch. This switch is located beneath the seat assembly. The engine will not start unless an operator is sitting in the operator's seat. The weight of an operator presses the electrical switch, which allows the engine to start.

⚠ WARNING

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

2. The safety stop switch should be used to stop the engine after every use. Doing so will ensure the switch is working properly, thus providing safety for the operator. Remember to turn the key to the **"OFF"** position after stopping the machine. Not doing so will drain the battery.
3. The right foot pedal (Figure 11) controls blade and engine speed. The position of the foot pedal determines the blade speed. Slow blade speed is obtained by slightly pressing the pedal. Maximum blade speed is obtained by fully pressing the pedal.

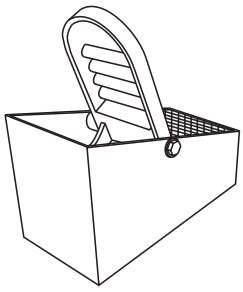


Figure 11. Blade Speed Control Foot Pedal

STARTING THE ENGINE

1. With one foot on the ground and the other foot placed on the trowel's platform, grab the frame near the seat and lift yourself onto the trowel. Sit in the operator's seat and ensure that the control handles, foot pedal, and control panel items can be accessed comfortably.
2. Keep your foot **OFF** the blade speed control pedal. **ALWAYS** start the engine at idle (without touching the pedal).
3. Insert the ignition key into the ignition switch (Figure 12).

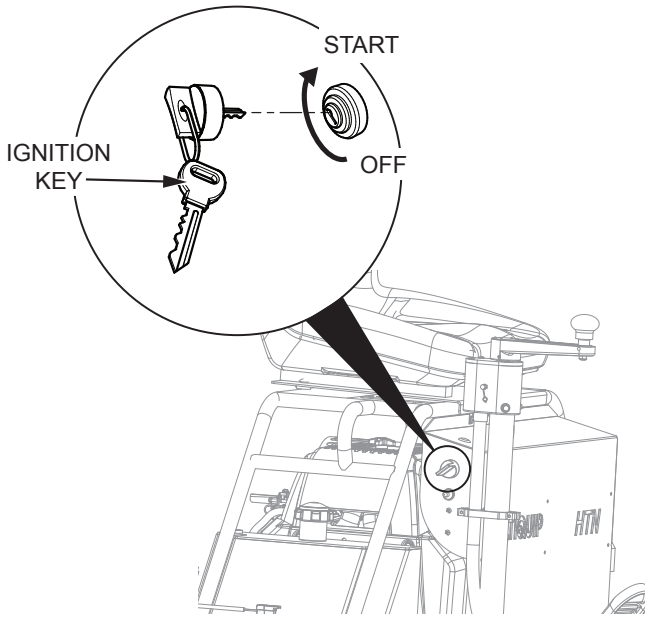


Figure 12. Ignition Key

4. Turn the ignition key clockwise and listen for the engine to start (Figure 12). Once the engine starts, release the ignition key.

NOTICE

If the engine fails to start in this manner, consult the engine owner's manual supplied with the trowel.

5. Test the safety stop switch by standing up briefly. The switch under the seat should cause the engine to stop. If the switch fails to shut down the engine, turn off the engine with the key switch and repair the safety stop switch. See the "Troubleshooting" section for possible causes.
6. Let the engine idle for 3–5 minutes.

STEERING

Two control levers located in front of the operator's seat provide directional control for the HTNS5S-2 trowel. Table 5 illustrates the various directional positions of the joysticks and their effect on the trowel.

1. Push both the left and right control levers forward. See Figure 13.

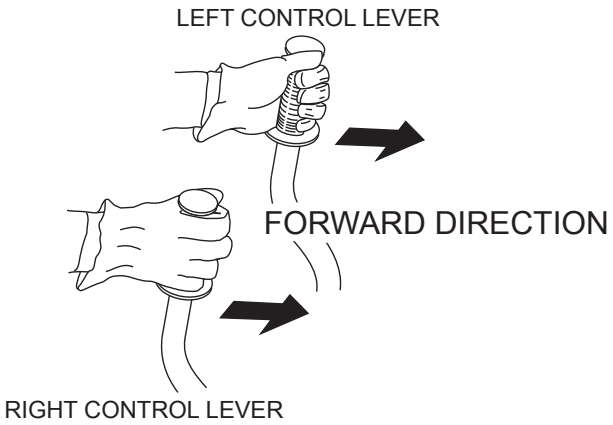


Figure 13. Control Levers Forward

2. With your right foot, quickly press the right 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 right foot pedal.
3. Practice holding the trowel in one place as you increase blade speed. The blades will be moving at proper finishing speed when approximately 75% of maximum blade speed has been reached. The trowel 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 5. Try to practice controlled motions as if you were finishing a slab of concrete. Practice edging and covering a large area.
5. Try adjusting the pitch of the blades. This can be done while the trowel is stopped or moving—whichever feels comfortable. Test the operation of optional equipment like retardant spray and lights if equipped.
6. Pull both the left and right joysticks backward and repeat steps 2 through 5 while substituting the word 'reverse' for 'forward'.

Table 5. Control Lever 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 **BOTH** Joysticks to the RIGHT	Causes the ride-on trowel to move to the right.
Move **BOTH** Joysticks to the LEFT	Causes the ride-on trowel to move to the left.

⚠ CAUTION

Trowel arms can be damaged by rough handling or by striking exposed plumbing or forms while in operation. **ALWAYS** look out for objects which might cause damage to the trowel arms.

Use the following table as a general maintenance guideline when servicing your engine. For more detailed engine maintenance information, refer to the engine owner's manual supplied with your engine.

Engine Maintenance Schedule							
DESCRIPTION (3)	**OPERATION**	**BEFORE**	**FIRST MONTH OR 10 HRS.**	**EVERY 3 MONTHS OR 25 HRS.**	**EVERY 6 MONTHS OR 50 HRS.**	**EVERY YEAR OR 100 HRS.**	**EVERY 2 YEARS OR 200 HRS.**
Engine Oil	Check	X					
	Change		X				
Air Cleaner	Check	X					
	Change			X (1)			
All Nuts and Bolts	Re-tighten if necessary	X					
Spark Plugs	Check/Clean				X		
	Replace						X
Cooling Fins	Check				X		
Spark Arrester	Clean					X	
Fuel Tank	Clean					X	
Fuel Filter	Check					X	
Idle Speed	Check/ Adjust					X (2)	
Valve Clearance	Check/ Adjust						X (2)
Fuel Lines	Check	Every 2 years (replace if necessary) (2)					

(1) Service more frequently when used in ***dusty*** areas.

(2) These items should be serviced by your service dealer unless you have the proper tools and are mechanically proficient. Refer to the Subaru Engine Shop Manual for service procedures.

(3) For commercial use, log hours of operation to determine proper maintenance intervals.

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.

At the front of this manual there is a “Daily Pre-Operation Checklist”. Make copies of this checklist and use it on a daily basis.

⚠ WARNING

Accidental starts can cause **SEVERE INJURY OR DEATH**.

ALWAYS place the ON/OFF switch in the **OFF** position.

Disconnect and ground spark plug leads and disconnect negative battery cable from battery before servicing.

⚠ WARNING

Some maintenance operations may require the engine to run. Ensure that the maintenance area is well ventilated. Exhaust contains poisonous carbon monoxide gas that can cause unconsciousness and may result in **DEATH**.

⚠ CAUTION

ALWAYS allow the engine to cool before servicing. **NEVER** attempt any maintenance work on a hot engine.

AIR CLEANER

Thoroughly remove dirt and oil from the engine and control area. Clean or replace the air cleaner elements as necessary. Check and retighten all fasteners as necessary.

1. Unscrew the knob on top of the air cleaner cover and remove cover (Figure 14). Set knob and cover aside.

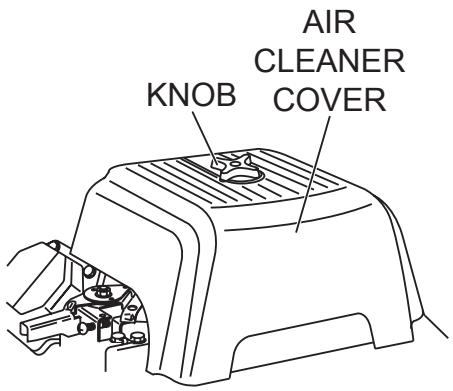


Figure 14. Air Cleaner Cover Removal

2. Remove the air cleaner urethane foam and paper filter elements (Figure 15).

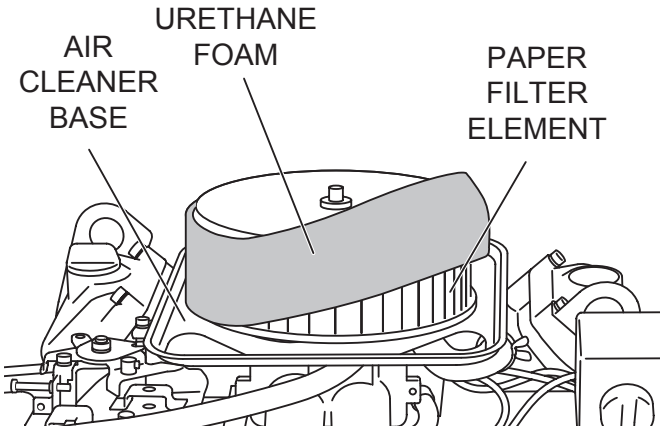


Figure 15. Removing Air Filter Urethane Foam and Paper Elements

3. Tap the paper filter element several times on a hard surface to remove dirt, or blow compressed air, not exceeding 207 kPa (2.1 kgf/cm^2, 30 psi), through the filter element from the inside out (Figure 16). **NEVER** brush off dirt. Brushing will force dirt into the fibers. Replace the paper filter element if it is excessively dirty.

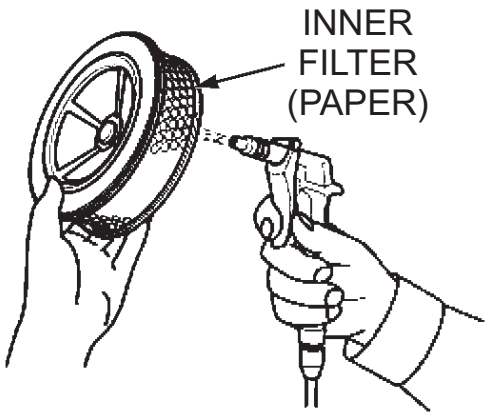


Figure 16. Clean Air Filter Element

⚠ CAUTION

Wear protective equipment such as approved safety glasses or face shields and dust masks or respirators when cleaning air filters with compressed air.

4. Clean urethane foam element in warm, soapy water or nonflammable solvent. Rinse and dry thoroughly. Dip the element in clean engine oil and thoroughly squeeze out the excess oil from the element before reinstalling.

NOTICE

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

CHANGING ENGINE OIL (100 HOURS)

1. Drain the engine oil while the oil is warm (Figure 17).

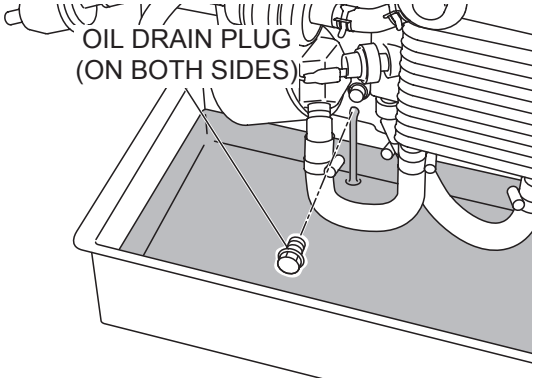


Figure 17. Draining Engine Oil

2. Remove the oil drain bolt and sealing washer and allow the oil to drain into a suitable container (Figure 17).
3. Reinstall oil drain bolt with sealing washer and tighten securely.
4. Replace engine oil with recommended type oil as listed in Table 4. For engine oil capacity, see Table 3. **DO NOT** overfill.

OIL FILTER (200 HOURS)

5. Replace the engine oil filter (Figure 18) every 200 hours.

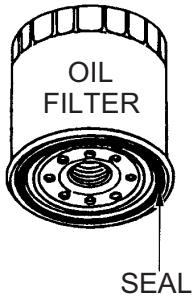


Figure 18. Oil Filter

6. Be sure to coat the seal of any new oil filter with clean engine oil (Figure 18).

OIL AND FUEL LINES (1,000 HOURS/YEARLY)

- Check the oil and fuel hoses and connections regularly for leaks or damage. Repair or replace as necessary.
- Replace the oil and fuel hoses every year to maintain their performance and flexibility.

IN-LINE FUEL FILTER CHANGE

Replace the engine in-line fuel filter (Figure 19) every year or 200 hours.

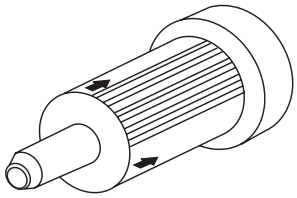


Figure 19. In-Line Fuel Filter

SPARK PLUG ADJUSTMENT

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 with a 5/8-inch spark plug wrench.
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 20) with a wire-type feeler gauge. If needed, adjust the gap to 0.7–0.8 mm (0.03 in.) by carefully bending the side electrode.

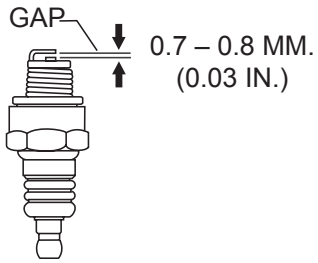


Figure 20. Spark Plug Gap Adjustment

6. Install the spark plug carefully, by hand, to avoid cross-threading.
7. After the spark plug is seated, tighten with a 5/8-inch 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. Reattach the spark plug caps.

ENGINE TUNE-UP

See your engine manual for specific information on tuning up your engine, checking and gapping the spark plugs, etc.

NOTICE

See the engine manual supplied with your machine for appropriate engine maintenance schedule and troubleshooting guide.

LONG TERM STORAGE

- Drain the fuel tank completely, or add STA-BIL to the fuel.
- Remove spark plug and pour a few drops of motor oil into the cylinder. Crank engine 3–4 times so that oil reaches all internal parts.
- Clean exterior with a cloth soaked in clean oil.
- Remove the battery.
- Store unit covered with plastic sheet in moisture-free and dust-free location, out of direct sunlight.

⚠ CAUTION

NEVER store the trowel with fuel in the tank for any extended period of time. Always clean up spilled fuel immediately.

Trowel Maintenance Schedule						
Check Item	OPERATION	DAILY	Periodic Maintenance Interval			
			Every 25 Hrs	Every 50 Hrs	Every 100–125 Hrs	Every 500 Hrs
Relube arms, thrust collar, steering linkage	Grease			X		
Remove, clean, reinstall, and relube arms and thrust collar	Clean				X	
Check, and replace if necessary, arm bushings and thrust collar bushings	Check			X		
Check blades for excessive wear or damage, and replace if necessary	Check	X				
Adjust blade speed if necessary	Check					X
Gearbox lubricant	Replace				1st time	X
Drive belt	Check		X			
Fasteners	Check	X				

CHECKING THE DRIVE BELT

The drive belt needs to be replaced as soon as it starts to show signs of wear. **NEVER** use a defective drive belt under any circumstances. Indications of excessive belt wear are fraying, squealing when in use, a belt that emits smoke, or a burning rubber smell when in use.

Under normal operating conditions, a drive belt may last approximately six months. If your drive belt is not attaining this life span, check the drive belt for proper pulley alignment and spacing.

BELT GUARD REMOVAL

1. Remove the four screws that secure the belt guard to the frame, and set aside (Figure 21).

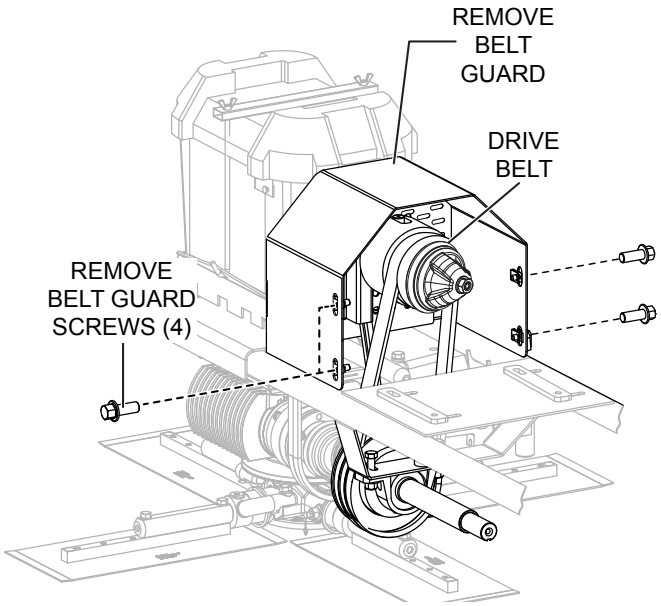


Figure 21. Belt Guard Removal

2. Once the belt guard has been removed, visually inspect the drive belt for signs of damage or excessive wear (Figure 22). If the drive belt is worn or damaged, replace it.

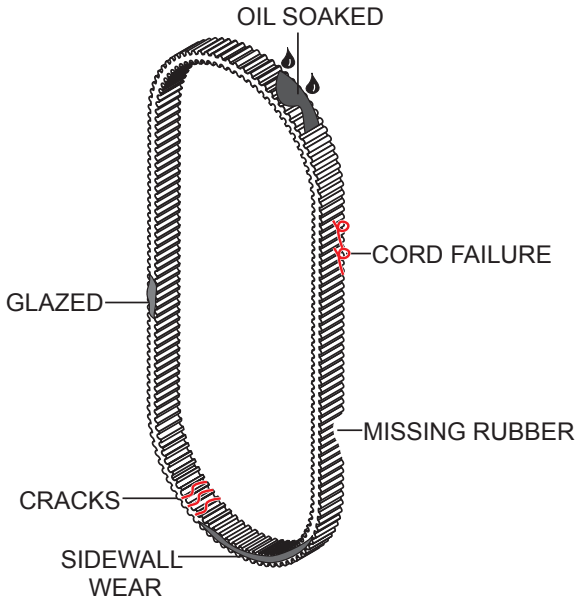


Figure 22. Drive Belt Inspection

3. Ensure that the drive belt is correctly tensioned.
4. Ensure that the lower drive pulley is properly aligned.

WARNING

DO NOT attempt to insert hands or tools into the belt area while the engine is running. **NEVER** run the engine with the safety guards removed. Keep fingers, hands, hair and clothing away from all moving parts to prevent bodily injury.

WARNING

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

SPARE DRIVE BELT REMOVAL

The HTNS5S-2 trowel is equipped with a replacement (spare) drive belt, which is mounted to the belt guard. **ALWAYS** make sure there is a spare drive belt installed in the spare belt holder before the trowel is placed into operation.

In the event of a drive belt failure, the replacement (spare) drive belt can be used for quick replacement at the job site and continued trowel operation.

1. Remove the four screws (Figure 21) that secure the belt guard to the frame, and set aside.
2. Remove the nuts and flat washers (Figure 23) that secure the spare belt holder to the belt guard, and set aside.

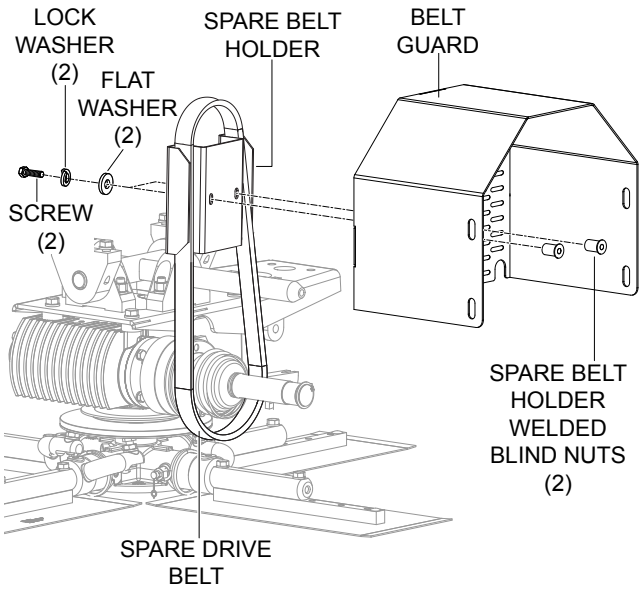


Figure 23. Spare Drive Belt Removal

3. Lift spare belt holder and free the spare drive belt from the holder (Figure 23). Take care not to contaminate the spare drive belt with grease or dirt.
4. Cut existing drive belt from clutch and lower drive pulley, and discard.
5. Ensure all remnants of existing drive belt have been removed from the sheaves/grooves of the clutch and lower pulley.
6. Loosen the four engine mounting bolts and slide the engine toward the rear of the trowel.
7. Slide the spare drive belt over the clutch and place it on the upper drive pulley, then pull it down and place it on the lower drive pulley.

SPARE DRIVE BELT INSTALLATION

NOTICE

To reinstall a new spare drive belt onto the spare belt holder, it will be necessary to disassemble the CV-joint from the left-side gearbox coupler.

CV-Joint Assembly Removal (Left-Side)

After the replacement (spare) belt has been installed onto the clutch and lower pulley, it will be necessary to install a new spare drive belt into the spare belt holder.

Perform the procedure shown below to install a new drive belt into the spare belt holder:

1. Starting at the left-side gearbox, use a 1/4-inch hex wrench to remove the three bolts and washers that secure the CV-joint to the left-side gearbox (Figure 24). Retain mounting hardware for later use.

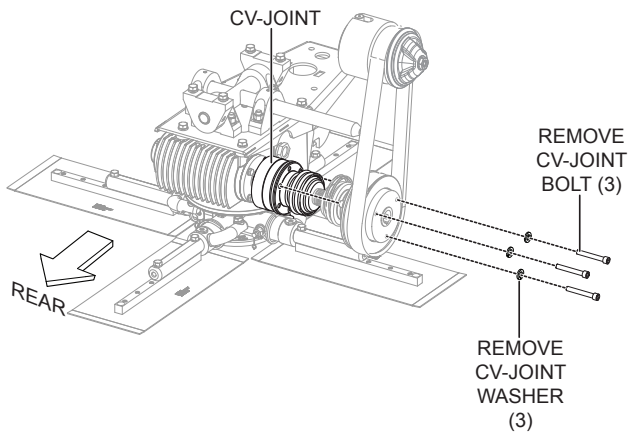


Figure 24. Disconnecting CV-Joint

2. Separate the CV-joint from the left-side gearbox coupler (Figure 25). Push the CV-joint inward so that a gap exists between the coupler and the CV-joint.

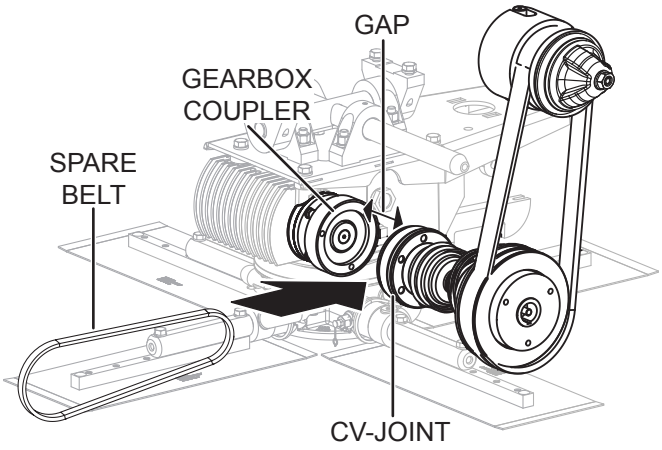


Figure 25. Spare Drive Belt Installation

3. Slide the new spare drive belt into the gap between the left-side gearbox and the CV-joint (Figure 25).

4. Place new spare drive belt into the spare belt holder (Figure 26).

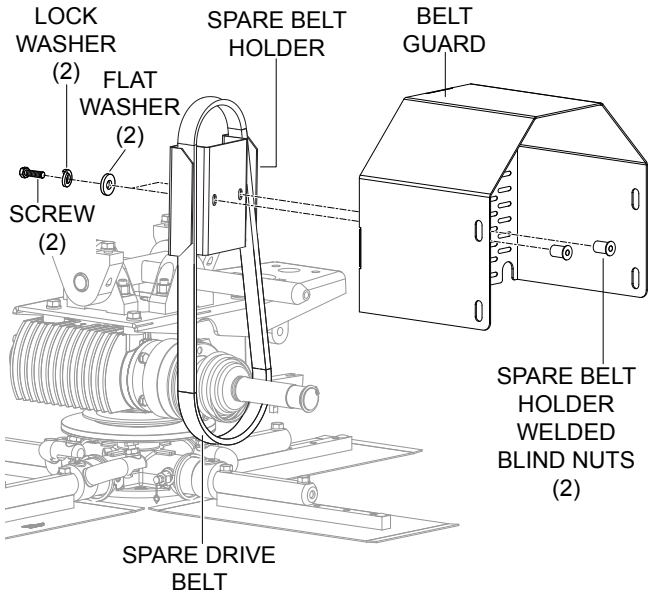


Figure 26. Attaching Spare Belt Holder

5. Reattach spare belt holder to belt guard with hardware that was removed earlier (Figure 26).

6. Apply a thin coat of RTV silicone to mating surfaces of the CV-joint and left-side gearbox coupler (Figure 27).

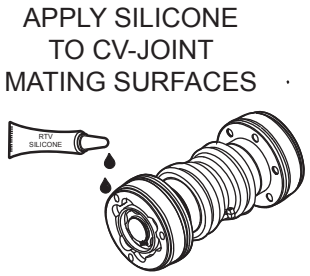


Figure 27. Applying RTV Silicone

7. Reconnect the CV-joint to the left-side gearbox coupler with mounting hardware that was removed earlier.

8. Reinstall belt guard onto frame with screws that were removed earlier.

BLADE PITCH

Matching Blade Pitch for Both Sets of Blades

Sometimes it may be necessary to match blade pitch between the two sets of blades. There are indications that this may be necessary—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 trowel 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.

Single Pitch

On a single-pitch trowel, each spider assembly is pitched individually, forcing the operator to constantly make adjustments on each pitch tower.

Twin Pitch™

On trowels equipped with Twin Pitch™ controls, blade pitch may be synchronized between the two sets of blades. This is easily accomplished by performing the following procedure. Refer to Figure 28.

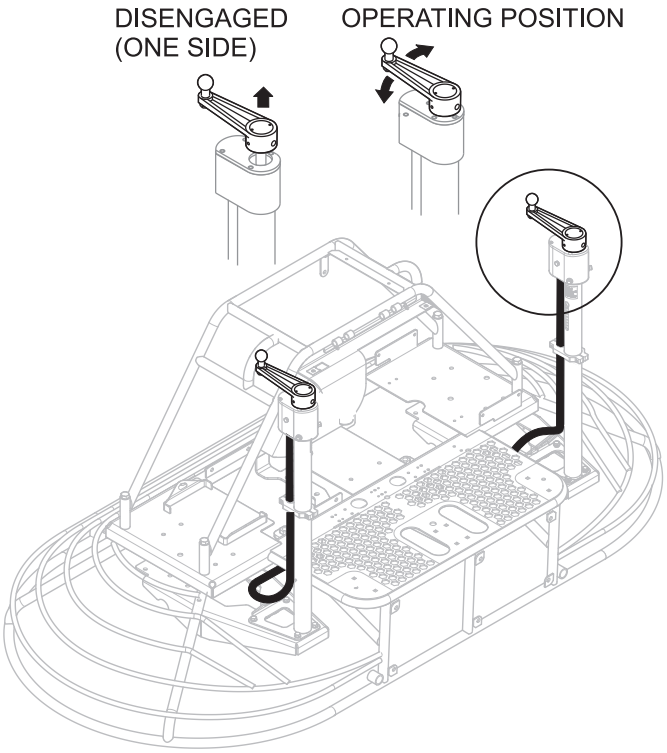


Figure 28. Twin Pitch™ Handle Adjustment

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

Blade Pitch Adjustment Procedure

Maintenance adjustment of blade pitch is made by adjusting a bolt on the arm of the trowel blade finger (Figure 29). This bolt is the contact point of the trowel arm to the lower wear plate on the thrust collar. The goal of adjustment is to promote consistent blade pitch and finishing quality.

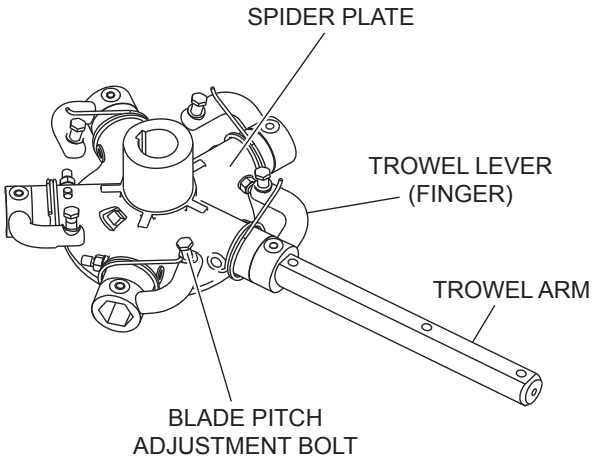


Figure 29. Blade Pitch Adjustment Bolt

If blades are wearing unevenly, look for the following indications. 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?
- While the machine is running, does the trowel guard ring rock up and down relative to the ground?
- 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 necessary hardware to complete this adjustment, and instructions on how to utilize this tool.

If a trowel arm adjustment tool is not available and immediate adjustment is necessary, a temporary field adjustment can be made. If you can see or feel which blade is pulling harder, 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 metal 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 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. After adjustment, verify that the blades pitch correctly.

Blades that are incorrectly adjusted will often 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, after making blade pitch adjustments, the machine is still finishing poorly, check blades, trowel arms, and trowel arm bushings for adjustment, wear, or damage. See the following sections.

Changing Blades

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

1. Place the trowel on a flat, level surface.
2. 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.
3. Lift the machine up, placing blocks under the main guard ring to support it.
4. Remove the bolts and lock washers on the trowel arm, then remove the blade.
5. Scrape all concrete and debris from the trowel arm. This is important to properly seat the new blade.
6. Install the new blade, maintaining the proper orientation for direction of rotation.
7. Reinstall the bolts and lock washers.
8. Repeat steps 2–5 for all remaining blades.

Clean-Up

Never allow concrete to harden on the trowel. Immediately after use, wash any concrete off the trowel with water, being careful not to spray a hot engine or muffler. An old paint brush or broom may help loosen any concrete that has started to harden.

Trowel Arm Adjustment Procedure

NOTICE

The following procedure should be performed to adjust trowel arms when the trowel is finishing poorly or in need of routine maintenance.

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

1. To determine which blades need adjustment, place the trowel in the test area and look for the following conditions:
   - Pitch the blades as flat as possible and 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.
   - Is the trowel wearing out blades unevenly (e.g. one blade is completely worn out while the others look new)?

Figure 30 illustrates worn spider bushings or bent trowel arms. Ensure adjustment bolt is barely touching lower wear plate (0.10" max. clearance). All alignment bolts should be spaced the same distance from the lower wear plate.

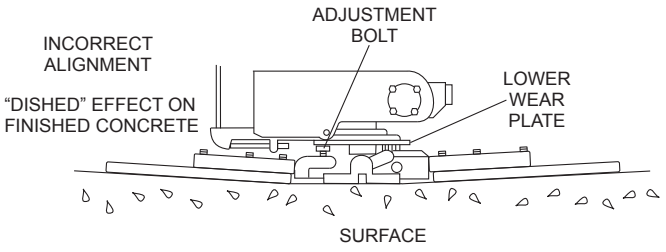


Figure 30. Incorrect Spider Plate Alignment

Figure 31 illustrates the correct alignment for a spider plate, as shipped from the factory.

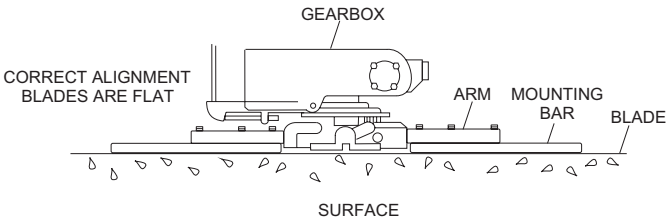


Figure 31. Correct Spider Plate Alignment

2. Start engine, bring trowel blades up to full speed, and look for the following conditions:

   • Does the trowel have a perceived rolling or bouncing motion?

   • Does the guard ring rock up and down relative to the ground?

Trowel Blade Removal

1. Remove trowel blade from trowel arm by removing the three hex head bolts and lock washers from the trowel arm (Figure 32). Set blade and hardware aside.

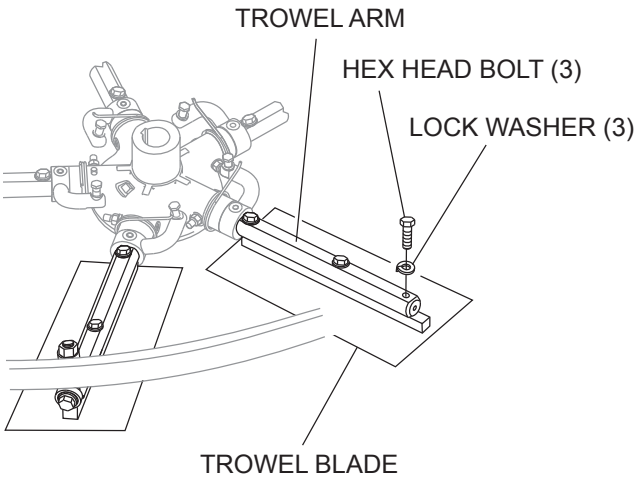


Figure 32. Trowel Blade Removal

2. Wire brush any build-up of concrete from all six sides of the trowel arm. Repeat steps 1–2 for the remaining four arms.

Trowel Arm Removal

1. Each trowel arm is held in place at the spider plate by a hex head bolt (with Zerk grease fitting) and a roll pin (Figure 33). Remove the hex head bolt/Zerk grease fitting and the roll pin from the spider plate.

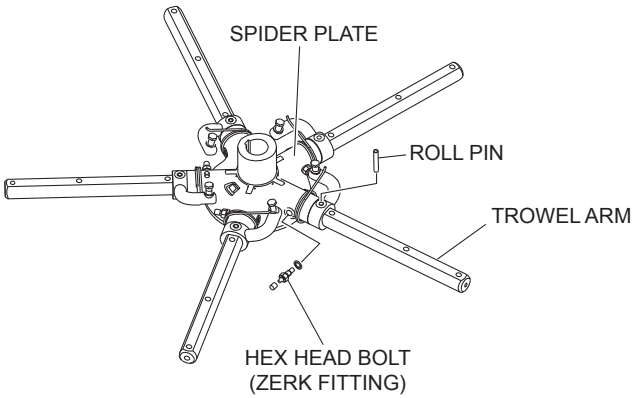


Figure 33. Remove Hex Head Bolt and Roll Pin

2. Remove the trowel arm from the spider plate.
3. If the trowel arm insert (bronze bushing) comes out with the trowel arm, remove the bushing from the trowel arm and set aside in a safe place. If the bushing is retained inside the spider plate, carefully remove the bushing.
4. Examine the bronze trowel arm bushing insert (Figure 34), and clean if necessary. Replace bushing if out-of-round or worn.

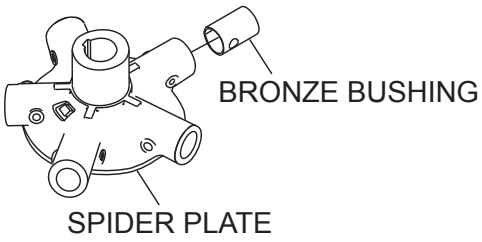


Figure 34. Bronze Bushings

Checking Trowel Arm Straightness

Trowel arms can be damaged by rough handling (such as dropping the trowel on the pad), or by striking exposed plumbing, forms, or rebar while in operation. A bent trowel arm will prevent smooth, fluid rotation. If bent trowel arms are suspected, check for flatness as follows. Refer to Figure 35 and Figure 36.

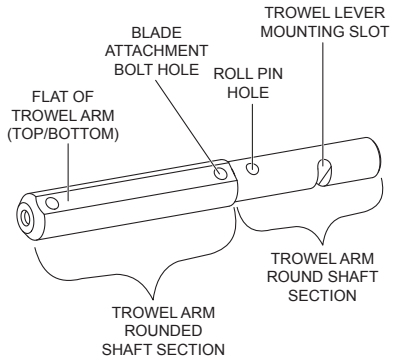


Figure 35. Trowel Arm

1. Use a thick, steel plate, granite slab, or other surface which is true and flat, to check trowel arms for flatness. Use the flat top and bottom sides for reference.
2. Check the top and bottom sides of the trowel arm. A feeler gauge of 0.10 mm (.004") should not pass between the flat of the trowel arm and the test surface along its length.

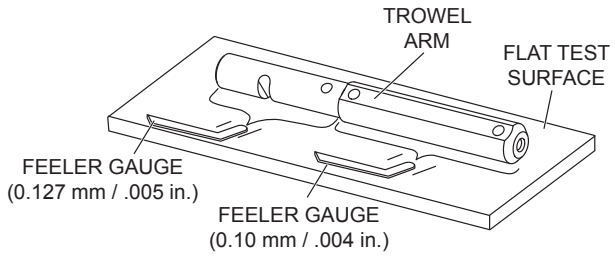


Figure 36. Checking Trowel Arm Flatness

3. Check the clearance between the round shaft and the test surface as either the top or bottom flat section of the arm rests on the test surface. Rotate the arm to the opposite flat section and check the clearance of the round shaft. Use a feeler gauge of 0.127 mm (.005"). 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 uneven or bent.

Trowel Arm Adjustment

1. Locate the trowel arm adjustment tool (P/N 9177). See Figure 37.

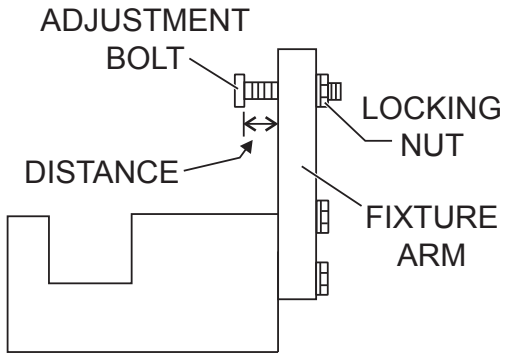


Figure 37. Trowel Arm Adjustment Tool

2. Ensure the fixture arm is at the proper setting (up or down) for your trowel arm rotation. See Figure 38.

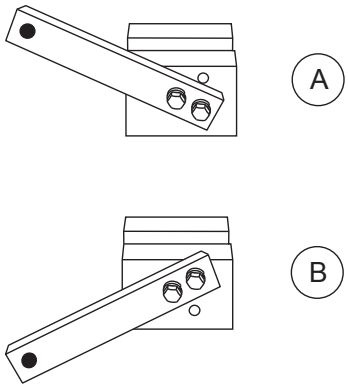


Figure 38. Trowel Arm Adjustment Setup

NOTICE

Arms with **clockwise** blade rotation use the fixture arm in the **UP** position (**A** in Figure 38). Arms with **counterclockwise** blade rotation use the fixture arm in the **DOWN** position (**B** in Figure 38).

3. Figure 39 illustrates the adjustment fixture with a trowel arm inserted. As each trowel arm is locked into the fixture, the arm bolt is adjusted until it contacts a stop on the fixture. This will consistently adjust all of the trowel arms, keeping the finisher as flat and evenly pitched as possible.

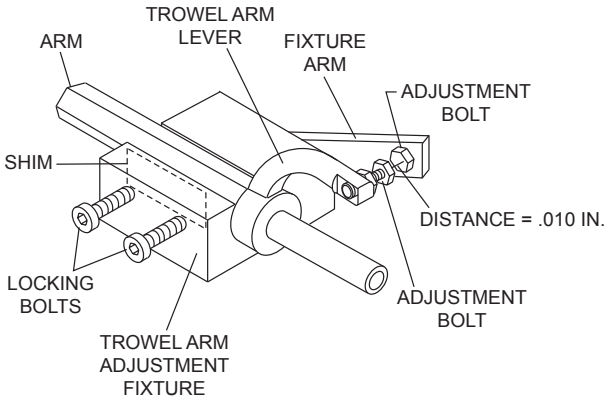


Figure 39. Trowel Arm Adjustment Fixture

4. Unscrew the locking bolts on the adjustment tool and place the trowel arm into the fixture channel (Figure 39). 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.
5. Use a hex wrench to tighten the locking bolts securing the trowel arm in place.
6. Adjust the bolt distance shown in Figure 39 to match one of the arms. The other arms will be adjusted to match this distance.
7. 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.
8. Once the correct adjustment is made, tighten the locking nut on the trowel arm to lock in place.
9. Loosen locking nut on the adjustment fixture, and remove trowel arm.
10. Repeat steps 4–9 for the remaining trowel arms.

Reassembly

1. Clean and examine the upper and lower wear plates and thrust collar. Examine the entire spider assembly. Wire brush any concrete or rust build-up. If any of the spider components are damaged or out-of-round, replace them.
2. 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.
3. Reinstall bronze bushing onto trowel arm.
4. Repeat steps 2–3 for each trowel arm.
5. Make sure that the spring tensioner is in the correct position to exert tension on the trowel arm.
6. Insert all trowel arms with levers into spider plate (with bronze bushing already installed), using care to align grease hole on bronze bushing with grease hole fitting on spider plate.
7. Lock trowel arms in place by tightening the hex head bolt with Zerk grease fitting and jam nut.
8. Reinstall the blades onto the trowel arms.
9. Install stabilizer ring onto spider assembly.
10. Lubricate all grease points (Zerk fittings) with premium Lithium 12-based grease, conforming to NLG1 Grade #2 consistency.

INSTALLING PANS ONTO FINISHER BLADES

Round discs, commonly referred to as “pans,” attach to the spider arms and allow early floating on wet concrete and easy movement from wet to dry areas. They are also very effective in embedding large aggregates and surface hardeners.

WARNING

Lifting/crush hazard. **DO NOT** lift trowel with pans attached.

WARNING

ALWAYS install pans either in the work area or in an area that is next to and level with the work area. **DO NOT** lift the trowel while the pans are attached.

Refer to Figure 40 when installing pans onto finisher blades using Z-clips.

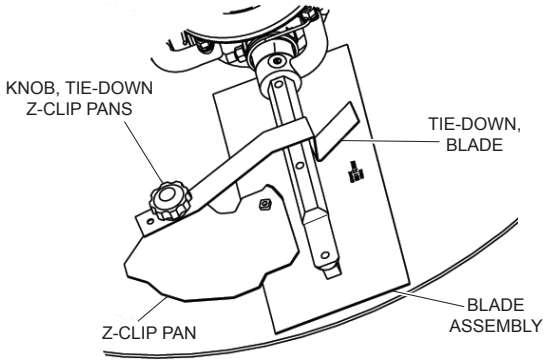


Figure 40. Z-Clip Finisher Pan Installation

1. Lift trowel just enough to slide pan under blades. Lower finisher onto pan with blades adjacent to Z-clips.
2. Rotate blades into position under Z-clips. Ensure that the blades are rotated in the direction of travel when the machine is in operation, or use the engine to rotate the blades into position.
3. Attach the blade tie-downs to the far side of the Z-clip brackets with tie-down knobs.
4. Check to 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.

Refer to Figure 41 when installing pans onto finisher blades using latch pins.

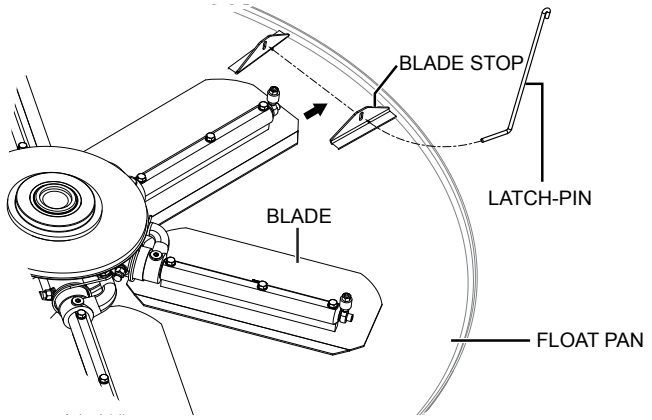


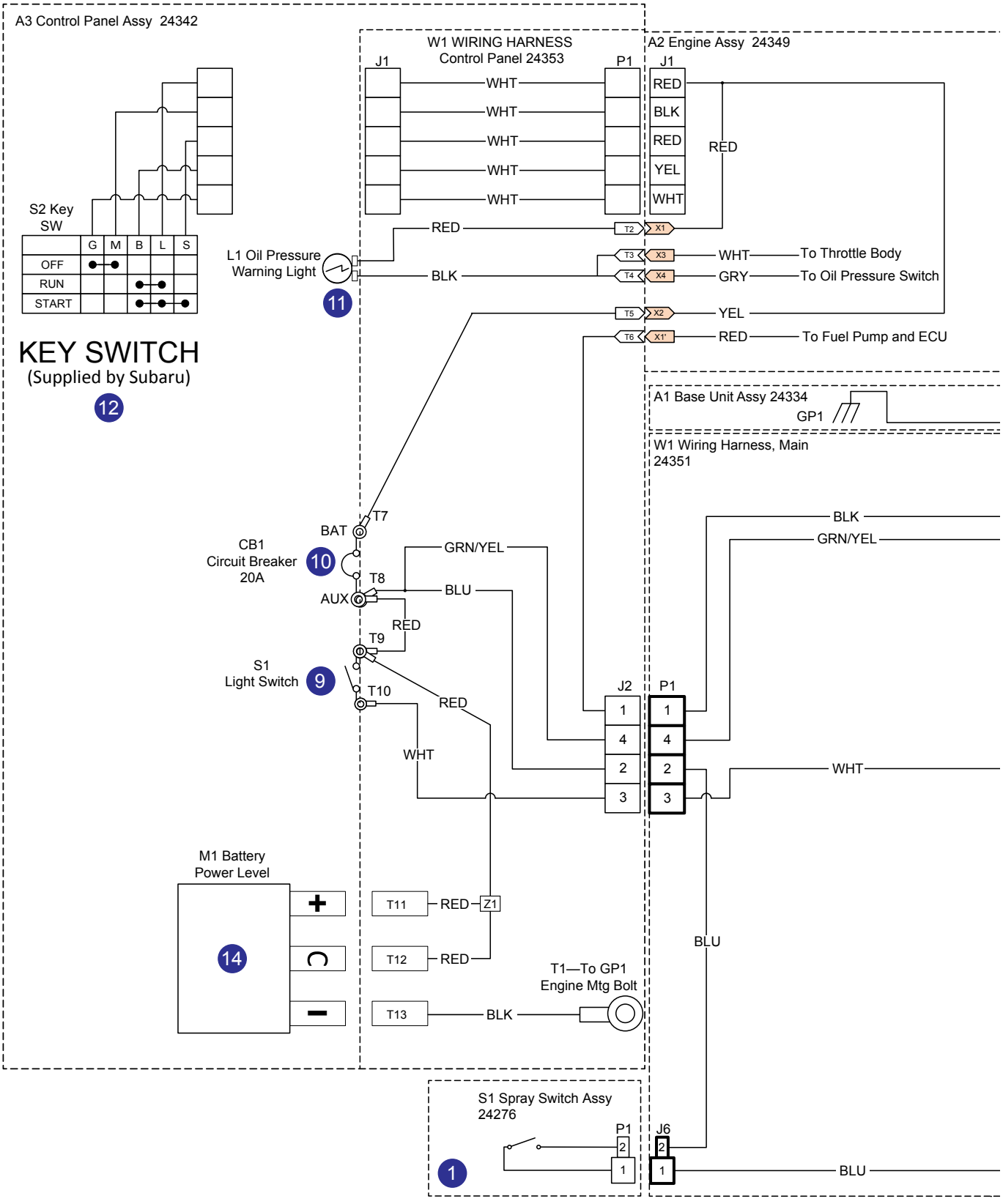
Figure 41. Latch Pin Finisher Pan Installation

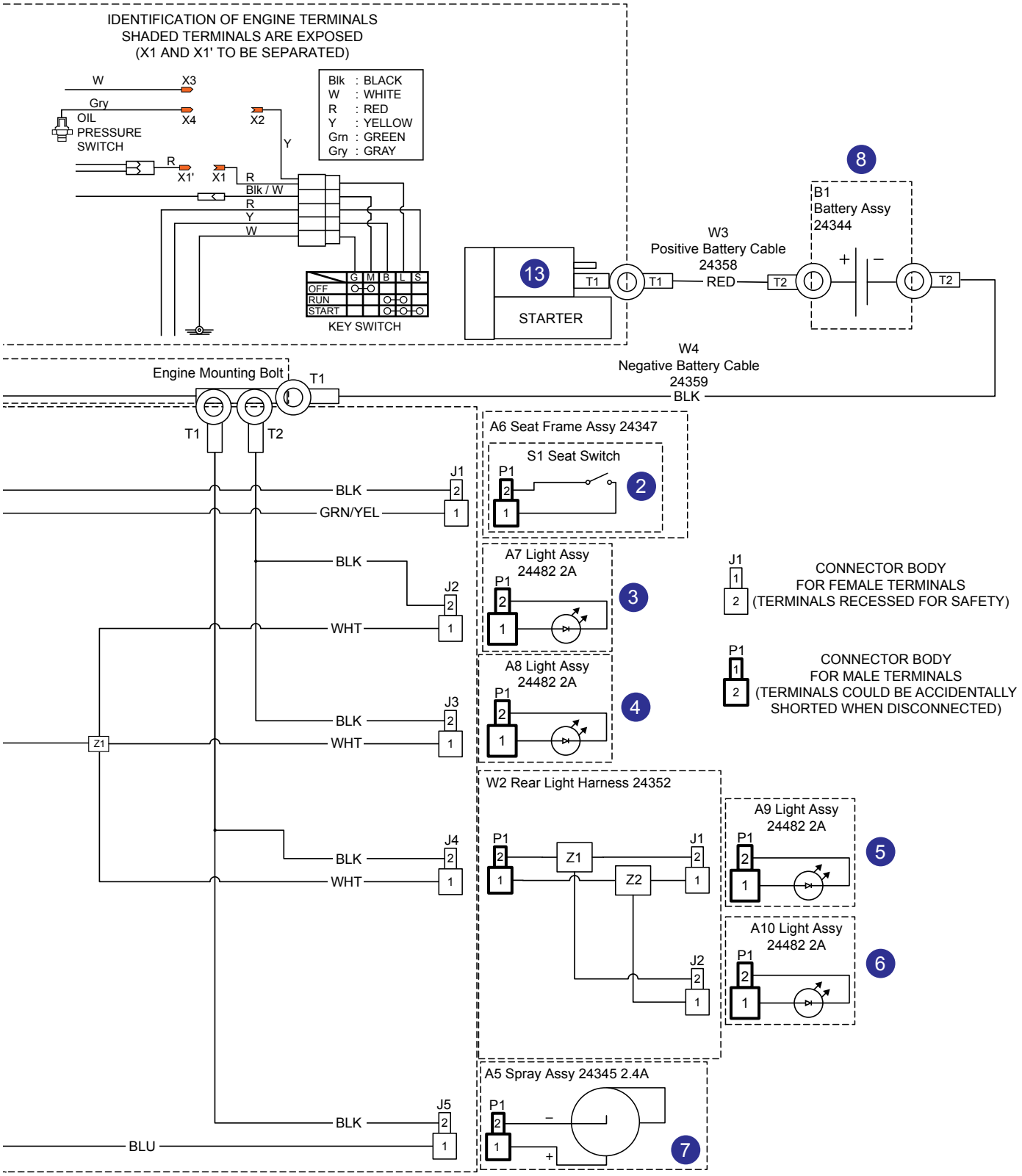
1. Lift trowel just enough to slide pan under blades. Lower finisher onto pan with blades between the blade stops.
2. Fit blades between the blade stops. Ensure that the blades are rotated in the direction of travel when the machine is in operation, or use the engine to rotate the blades into position.
3. Route the latch pin through the blade stop holes.
4. Check to make sure the blade edges are secured between the blade stops, and the latch pins are secured completely over the blade before the machine is put back into operation.

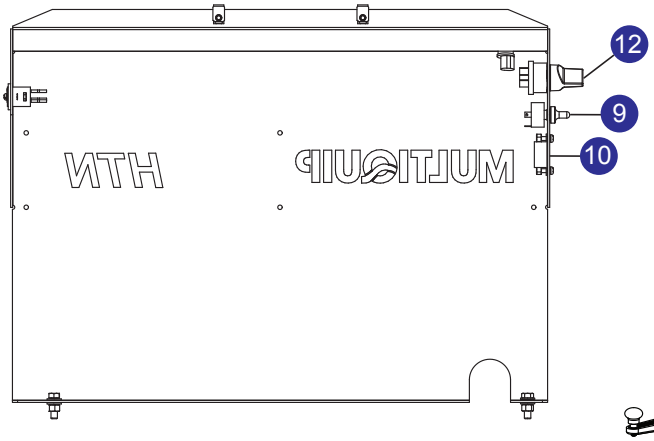
DECOMMISSIONING TROWEL/COMPONENTS

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

1. Drain all fluids completely, including oil, gasoline, hydraulic oil and antifreeze. Dispose of fluids properly in accordance with local and governmental regulations. Never pour on ground or dump down drains or sewers.
2. Remove battery and bring to appropriate facility for lead reclamation. Use safety precautions when handling batteries (refer to Set-up section).
3. The remainder can be brought to a salvage yard or metal reclamation facility for further dismantling.


A3 Control Panel Assy 24342
W1 WIRING HARNESS
Control Panel 24353
A2 Engine Assy 24349
J1
P1
J1
WHT
WHT
WHT
WHT
WHT
RED
BLK
RED
YEL
WHT
RED
S2 Key SW
G M B L S
OFF
RUN
START
L1 Oil Pressure Warning Light
11
RED
BLK
T2
X1
T3
X3
WHT
To Throttle Body
T4
X4
GRY
To Oil Pressure Switch
T5
X2
YEL
T6
X1'
RED
To Fuel Pump and ECU
KEY SWITCH
(Supplied by Subaru)
12
A1 Base Unit Assy 24334
GP1
W1 Wiring Harness, Main
24351
BAT
T7
CB1
Circuit Breaker
20A
10
GRN/YEL
T8
AUX
BLU
RED
T9
S1
Light Switch
9
T10
RED
WHT
J2
P1
1
4
2
3
BLK
GRN/YEL
WHT
M1 Battery
Power Level
14
+
−
T11
RED
Z1
T12
RED
T13
BLK
T1—To GP1
Engine Mtg Bolt
BLU
S1 Spray Switch Assy
24276
P1
J6
2
1
1
BLU


IDENTIFICATION OF ENGINE TERMINALS
SHADED TERMINALS ARE EXPOSED
(X1 AND X1' TO BE SEPARATED)
W
X3
Gry
OIL
PRESSURE
SWITCH
X4
X2
Y
R
X1'
X1
R
Blk / W
R
Y
W
Blk : BLACK
W : WHITE
R : RED
Y : YELLOW
Grn : GREEN
Gry : GRAY
G M B L S
OFF
RUN
START
KEY SWITCH
13
STARTER
T1
T1
W3
Positive Battery Cable
24358
RED
T2
8
B1
Battery Assy
24344
+
–
T2
W4
Negative Battery Cable
24359
BLK
Engine Mounting Bolt
T1
T1
T2
BLK
GRN/YEL
J1
2
1
A6 Seat Frame Assy 24347
S1 Seat Switch
P1
2
1
2
BLK
WHT
J2
A7 Light Assy
24482 2A
P1
3
BLK
WHT
J3
Z1
A8 Light Assy
24482 2A
4
BLK
WHT
J4
W2 Rear Light Harness 24352
Z1
Z2
A9 Light Assy
24482 2A
5
A10 Light Assy
24482 2A
6
BLK
BLU
J5
A5 Spray Assy 24345 2.4A
7
J1
CONNECTOR BODY
FOR FEMALE TERMINALS
(TERMINALS RECESSED FOR SAFETY)
P1
CONNECTOR BODY
FOR MALE TERMINALS
(TERMINALS COULD BE ACCIDENTALLY
SHORTED WHEN DISCONNECTED)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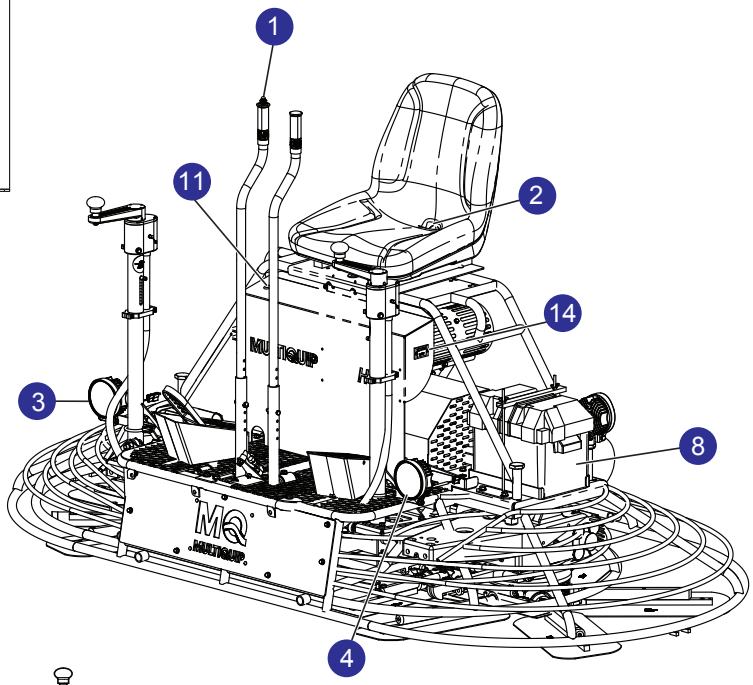
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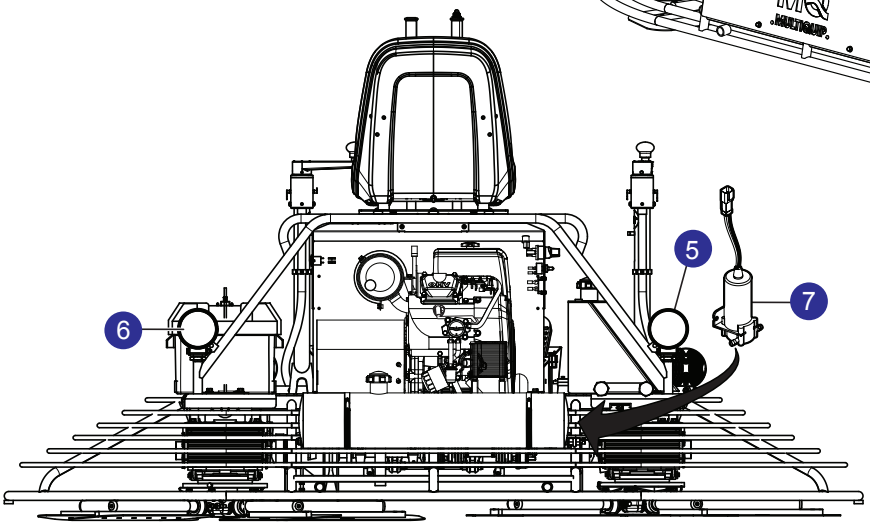
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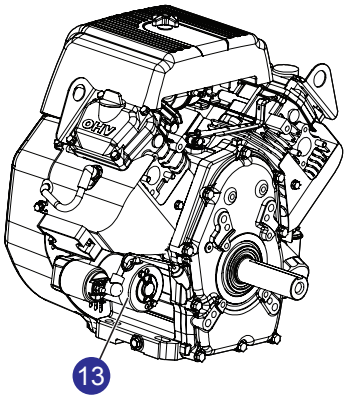
13

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 transistor ignition unit is broken, and replace defective unit. Check if voltage cord cracked or broken and replace. Check if spark plug if 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 (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 (Ride-On Mechanical 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 that 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 Parts Department).
	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 (Ride-On Mechanical 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.
	Steering linkage out of adjustment?	Adjust the connecting linkage found at the base of the handle. Contact your MQ field service manager for instructions.
	Worn components?	Check for wear of steering bearings and linkage components. Replace if necessary.
Operating position is uncomfortable.	Seat adjusted for operator?	Adjust seat with lever located on the front of the seat.
Power head on Electric Pitch (optional) not working.	Broken or loose parts?	If the motor runs and the pitch is not affected, parts inside the power head may be loose or broken. Return power head to dealer for service.
	Wiring?	Check all electrical connections and wiring. Check the continuity at the power head unit. Verify that there is voltage present at the power head switch with the key switch in the “on” position.
	Switch?	Check the continuity of the switch. If switch is malfunctioning, replace immediately.
Linkage on Twin Pitch not working.	Crank handles?	Make sure that both crank handles are pushed down as far as possible to ensure that the linkage is engaged.
	Broken part?	Replace all broken parts immediately.
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.

OPERATION MANUAL

HERE'S HOW TO GET HELP

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

CHINA

MQ Shanghai, China

No. 1355 Heng Cang Road
Ma Lu Town Jia Ding District
Shanghai, China 201818

Tel. 011 86 21 59512076
Fax 011 86 21 59512336

Contact: Xiwen Shi
xshi@multiquip.com

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