

OPERATION MANUAL



***WHITEMAN* SERIES**
MODEL HTXD6i
HYDRAULIC RIDE-ON TROWEL
(YANMAR 4TNV84T-Z-DSA2 DIESEL ENGINE)

Revision #3 (06/29/18)



THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PN: 32043

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 **WARNING** 

CALIFORNIA — Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

SILICOSIS/RESPIRATORY WARNINGS

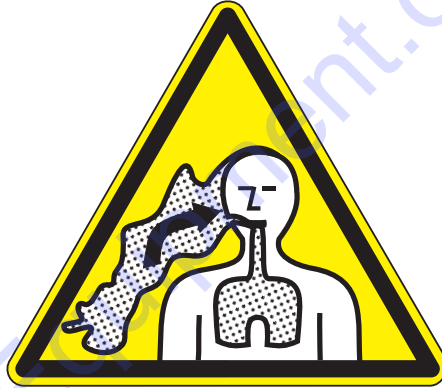
! WARNING



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.

HTXD6i Ride-On Trowel

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NOTICE

Specifications are subject to change without notice.

TRAINING CHECKLIST

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						

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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 Explosion Hazard Hot steam or coolant may escape when radiator cap is removed, causing severe burns. Allow radiator to cool before removing cap.</p>
	<p>DANGER Guard Hazard DO NOT operate equipment with guards removed. Serious bodily injury could result.</p>
	<p>DANGER Training This machine to be operated by qualified personnel only. Ask for training as needed.</p>
	<p>DANGER Inhalation Hazard DO NOT use this equipment in an enclosed area. The engine used with this equipment emits harmful levels of carbon monoxide which can cause severe bodily harm — even death!</p>
	<p>DANGER Rotating Blade Hazard Keep hands, fingers, and feet clear of engine fan blades and guard rings. Moving parts can cut. DO NOT remove guards. Stop engine before servicing.</p>
	<p>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.</p>
	<p>NOTICE Read Manual To avoid injury, you must read and understand the operator's manual before using this machine.</p>
	<p>NOTICE Protective Clothing ALWAYS wear appropriate clothing when operating the trowel.</p>
	<p>NOISE LEVEL Indicates value of the sound power of the equipment measured at operator's seat.</p>

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.

SAFETY INFORMATION

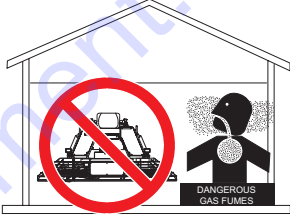

NOTICE

- 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

- 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.

SAFETY INFORMATION



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. 

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. 

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.



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.

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. **Trailer tires should 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 unreparable 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 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.

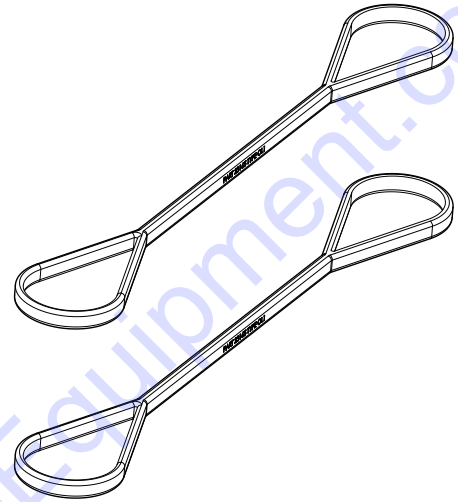
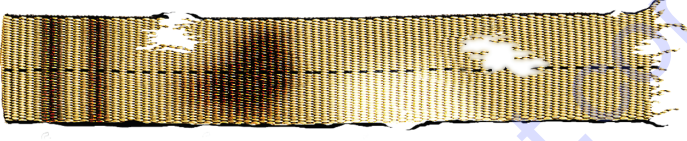

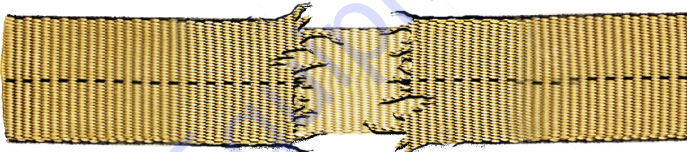
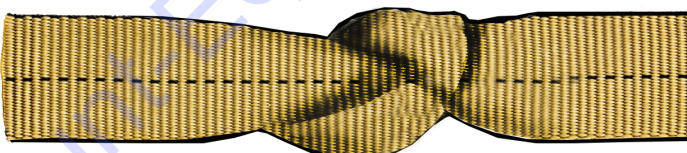


Figure 1. Lifting Slings

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).

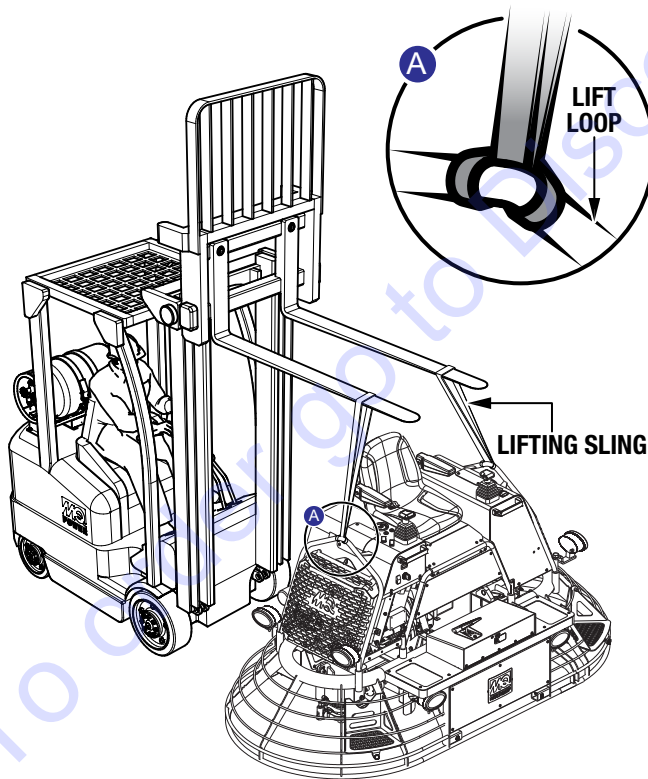


Figure 2. Lifting the Trowel

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.

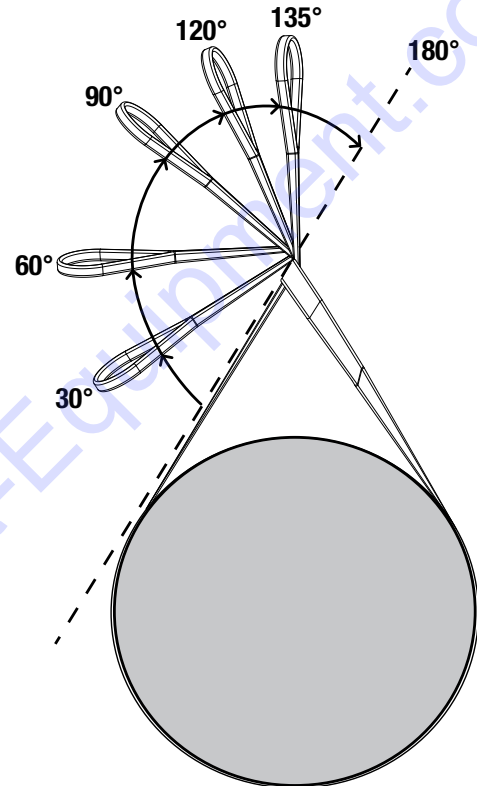


Figure 3. Choke Angle

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

LIFTING AND TRANSPORTING

TRANSPORTING THE TROWEL

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

1. Attach suitable tie-down straps to the trowel. Route the tie-down straps on both sides as shown in Figure 4.

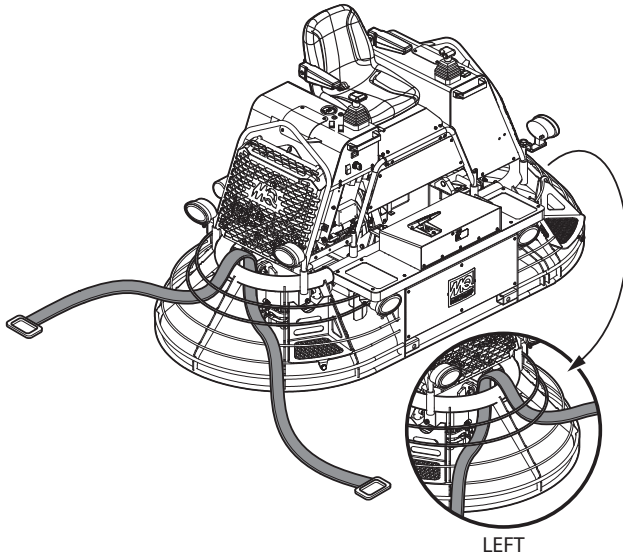


Figure 4. Routing Tie-down Straps

2. Secure the trowel to the flatbed with the two straps, making sure they are properly tied to prevent movement of the trowel during transport.

Table 2. Trowel Specifications	
Operating weight	2,165 lb. (982 kg)
Shipping weight	2,077 lb. (942 kg) (less pallet material)
Blade tip speed	1,924 ft./min. (9.9 m/s)
Fuel tank	11 gallons (42 liters)
Rotor speed	0–160 rpm
Path width	92 in. (233.7 cm)
Hydraulic oil	Parker Duraclean™ ISO 46

Table 3. Engine Specifications	
Model	Yanmar 4TNV84T-Z-DSA2
Type	Vertical, 4-cycle, water-cooled, direct-injected, turbocharged diesel engine
No. of cylinders	4
Bore x stroke	3.31 x 3.54 in. (84 x 90 mm)
Displacement	121.74 in. ³ (1.995 liters)
Maximum output	55 hp (41 kW) @ 3,000 rpm
Cooling system	Liquid-cooled (radiator)
Lube oil capacity	7.08 quarts (6.7 liters) dipstick upper limit
P.T.O. position	Flywheel end
Starting method	Electric starting
Recommended battery capacity	12V-64 Ah (5h rating)
Engine coolant capacity	2.9 quarts (2.7 liters)
Charging system	Alternator
Dimensions (L x W x H)	25.55 x 19.65 x 28.08 in. (649 x 499 x 713 mm)
Dry net weight	374.79 lb. (170 kg)

Table 4. Noise and Vibration Emissions	
Guaranteed ISO 11201:2010 Based Sound Pressure Level at Operator Station in dB(A)	88
Guaranteed ISO 3744:2010 Based Sound Power Level in dB(A)	106
Whole Body Vibration per ISO 2631-1:1997+A1:2010 in m/s ² ΣA(8)	0.01

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/s² ΣA(8). The daily exposure limit value is 1.15 m/s² ΣA(8).

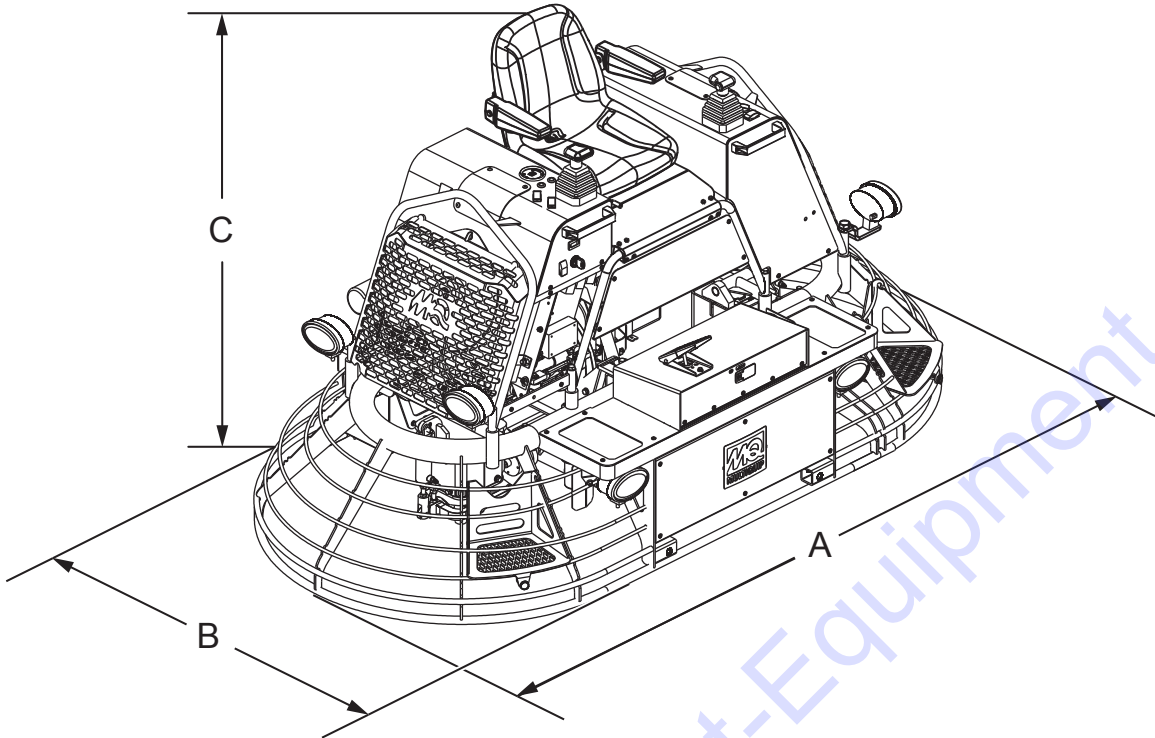


Figure 5. HTXD6i Dimensions

Table 5. Trowel Dimensions	
A – Length – in. (cm)	96.75 (246)
B – Width – in. (cm)	50.0 (127)
C – Height – in. (cm)	57.0 (145)

GENERAL INFORMATION

INTENDED USE

Operate the HTXD6i 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 HTXD6i Ride-On Power Trowel is designed for the floating and finishing of concrete slabs.

Take a walk around your trowel. Take notice of all the major components like the engine, blades, air cleaner, fuel system, fuel shut-off valve, ignition switch, etc. Check that there is always a proper level of oil in the engine and a proper level of hydraulic oil in the hydraulic oil reservoir.

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

Before using your trowel, test it on a flat, watered-down section of finished concrete. This trial test run will increase your confidence in using the trowel and at the same time it will familiarize you with the trowel's controls and indicators. In addition you will understand how the trowel will handle under actual conditions.

ENGINE

This trowel is equipped with a Yanmar 4TNV84T diesel engine. Refer to the engine owner's manual for specific instructions regarding engine operation.

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) and finish (6 inches wide). This trowel is equipped with six blades per rotor equally spaced in a radial pattern and attached to a vertical rotating shaft by means of a spider assembly.

Independent hydrostatic drive motors are coupled to the engine-powered hydrostatic pump. Each motor drives a spider assembly.

HYDRAULIC STEERING

Dual palm grip joystick controls located to the left and right of the operator are provided for steering the HTX Ride-On Trowel. The joysticks are linked to three hydraulic steering cylinders located within the frame of the machine.

HYDRAULIC PUMP

The hydraulic pump delivers controlled flow of hydraulic fluid to the hydraulic motors.

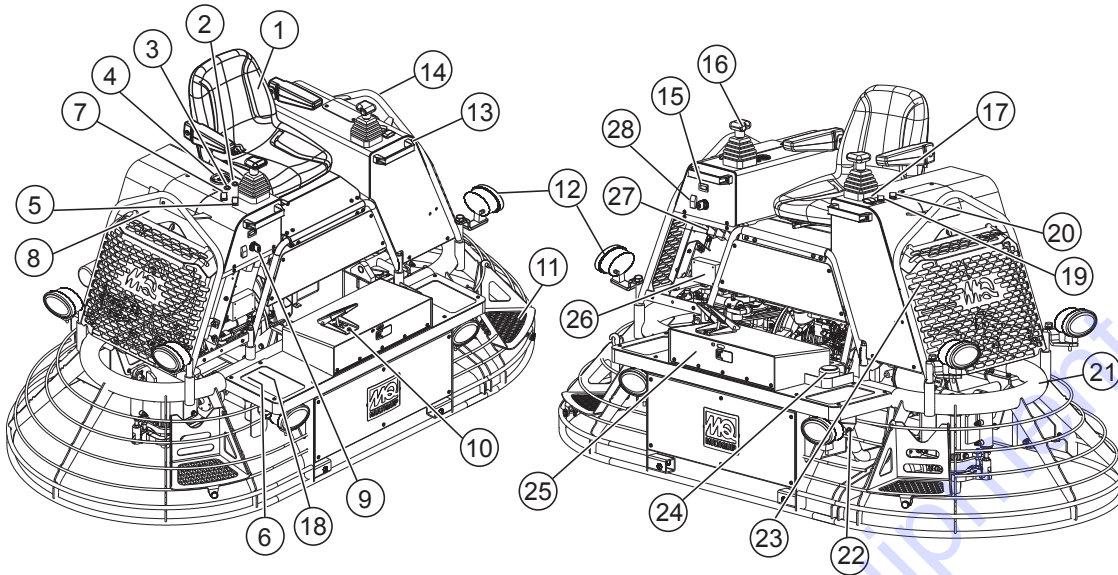


Figure 6. Components (Front)

1. **Seat** — Place for operator to sit. Trowel blades will not rotate unless the operator is seated. Seat is adjustable.
2. **Stop Lamp (Red)** — Used to relay trouble code information that is severe enough to warrant stopping the trowel.
3. **Warning Lamp (Amber)** — Used to relay trouble code information that is reporting a problem with the system but the trowel need not be immediately stopped.
4. **Indicators:**
 - Oil Indicator Light** — Not connected on this machine.
 - Water Temperature Light** — Lights red when water temperature is high.
 - Charge Indicator** — Lights red when the electrical system is not charging properly.
 - Aux 1** — Cold start lamp, indicates when the cold start sequence is enabled.
 - Aux 2** — Filter condition lamp indicates when the hydraulic filter needs service.
 - Cold Start Aid** — Indicates when the engine cold start aid is enabled.
5. **Throttle Switch** — Controls the speed of the engine. Press up to increase engine speed (high), down to decrease engine speed (low).
6. **Fuel/Water Separator** — Separates water, dirt and sludge from fuel, preventing engine component wear.
7. **Cruise Control Switch** — Press this switch to engage the cruise control. Press again to disengage.
8. **Pitch Block (Behind Grill Guard)** — Measure at the service port and adjust pitch pressure at the pitch block.
9. **Ignition Switch** — With key inserted, turn the switch clockwise to start the engine.
10. **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.
11. **Removable Steps (Left and Right)** — Provides safe footing for mounting and dismounting the trowel. When removed, provides access to the spider and blade assemblies.
12. **Lights** — Six low-voltage halogen lights are provided with this unit.
13. **Grab Handles** — Use to assist safe mounting and dismounting of the trowel.
14. **Lift Loops** — Located on both the left and right sides of the main frame. Used when the trowel must be lifted onto a concrete slab.
15. **Hour Meter** — Indicates the number of hours the machine has been used.
16. **Retardant Spray Control Buttons (Left/Right)** — When pressed, allows retardant spray to flow through the spray nozzle located at the front of the machine.

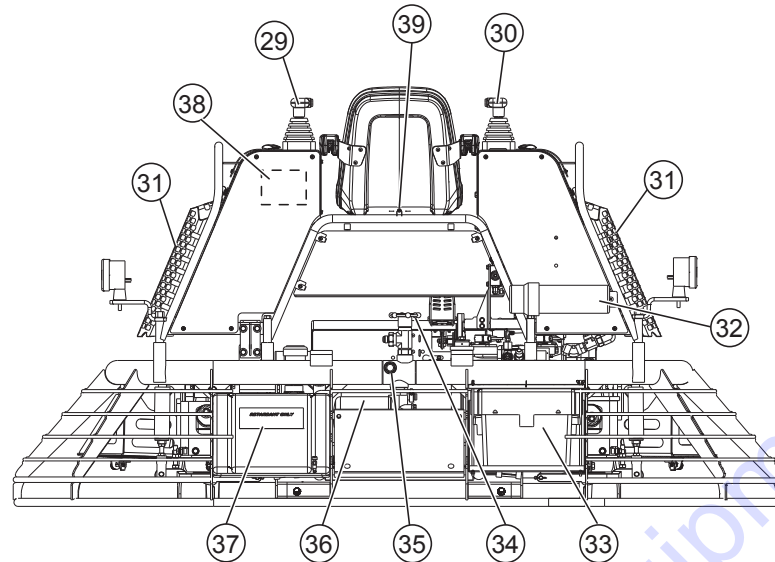


Figure 7. Components (Rear)

17. **Pitch Mode Switch** — Sets the blade pitch system mode of operation to either auto or manual.
18. **Fuel Pump**— Provides fuel flow to the injection pump.
19. **Blade Pitch Control (Twin Pitch)** — Adjusts the pitch on both rotors simultaneously but non-synchronously.
20. **Blade Pitch Control Switch (Left Side)** — Adjusts the left-side blade pitch independently of the right side.
21. **Hydraulic Reservoir** — Part of the frame. Holds hydraulic oil necessary for pump operation.
22. **Spray Nozzles** — Spray nozzle for retardant. Two spray nozzles are supplied with this unit.
23. **Overflow Bottle (Behind Grill Guard)** — Supplies water or coolant to the radiator when the radiator water or coolant level is low. Fill to the indicated level as shown on bottle.
24. **Fuel Gauge/Filler Cap** — Indicates the amount of fuel in the fuel tank. Remove this cap to add fuel.
25. **Toolbox Compartment** — Storage for tools.
26. **Fuse Box** — Contains fuses for control electronics.
27. **Relays** — Relays for lights and the safety bypass switch.
28. **Light Switch** — When activated, turns on six halogen lights. Lights offer better visibility when working indoors.
29. **Steering Control (Left Side)** — Allows the unit to move in a forward or reverse direction only.
30. **Steering Control (Right Side)** — Allows the unit to move in a forward, reverse, left, or right direction.
31. **Grill Guards (Left and Right)** — Protects the operator from moving components. Remove for maintenance access.
32. **Documentation Canister** — Storage for documentation and other information regarding the trowel.
33. **Battery** — Provides +12V DC to the electrical system.
34. **Hydraulic Oil Filler Cap** — Remove this cap to add hydraulic oil. Open **ONLY** when the system is cooled down and all expanded oil has returned to the reservoir.
35. **Hydraulic Oil Sight Glass** — Indicates the level of hydraulic oil in the reservoir.
36. **Hydraulic Suction Filter** — Filters hydraulic fluid prior to entering the system. 10-micron absolute synthetic media.
37. **Retardant Spray Tank** — Holds 5 gallons of retardant, water, or other liquid.
38. **Hydraulic Oil Expansion Tank** — Accommodates expanding hydraulic oil as it gets hot. The oil gravity flows back to the reservoir as it cools down, therefore **NEVER** open the hydraulic oil filler cap when the system is warm and the oil has expanded.
39. **Safety Bypass Switch** — The trowel will not move unless an operator is sitting in the seat. The weight of an operator activates the switch, allowing the rotors to turn.

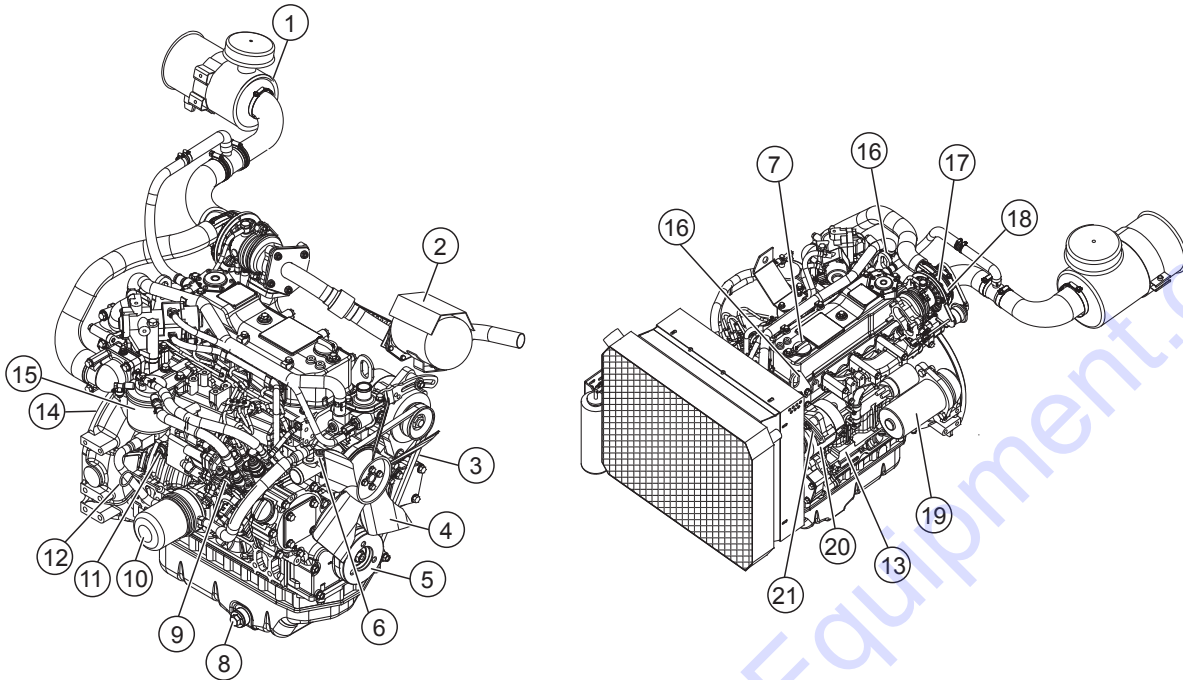


Figure 8. Basic Engine

1. **Air Filter** — Helps provide a clean source of air flow to the turbocharger and engine.
2. **Muffler** — Exhaust gases are routed through here.
3. **Fan belt** — Driven by the engine crank during operation, drives the water pump/fan as well as the alternator.
4. **Cooling Fan** — Driven by the V-belt, the cooling fan cools the engine by cooling water/antifreeze mixture that circulates through the engine block and cylinder head.
5. **Crankshaft V-Pulley** — Check the fan V-belt between the V-pulley and the alternator to determine proper belt tension.
6. **Water Pump** — Circulates coolant flow through the engine.
7. **Oil Filler Port** — Remove to add fresh crankcase oil.
8. **Oil Drain Plug** — Remove plug to drain crankcase oil.
9. **Injection Pump** — Provides equal fuel flow to injectors.
10. **Oil Filter** — Spin-on type, filters oil for contaminants.
11. **Oil Pressure Switch** — Monitors oil level.
12. **Oil Dip Stick** — Remove to check the amount and condition of oil in the crankcase.
13. **ECO Governor** — Controls engine RPM.
14. **Flywheel** — Main power is taken off from flywheel end.
15. **Fuel Filter** — Removes dirt and water from the fuel.
16. **Lifting Eye** — Two lifting eyes are provided if removal/installation of the engine becomes necessary.
17. **Air Intake Port** — Provides air from the air cleaner to the turbocharger unit.
18. **Turbocharger** — Provides pressurized intake air to the cylinder by means of a turbine energized by exhaust gas that rotates the blower.
19. **Starter** — Starts the engine when the ignition key is rotated to the **START** position.
20. **Alternator** — Provides current to the electrical system and charges the battery. Driven by means of a crankshaft/V-belt pulley system.
21. **Fan Belt Tension Adjustment** — This bolt provides means to adjust the V-belt tension at the alternator bracket.

NOTICE

The following sections are intended to assist the operator with inspection of the HTXD6i ride-on trowel. It is extremely important that these sections are read carefully before attempting to use the trowel in the field. **DO NOT** use your ride-on trowel until these sections are thoroughly understood.

WARNING

Failure to understand the operation of the HTXD6i ride-on trowel could result in severe personal injury or damage to the trowel.

ENGINE OIL

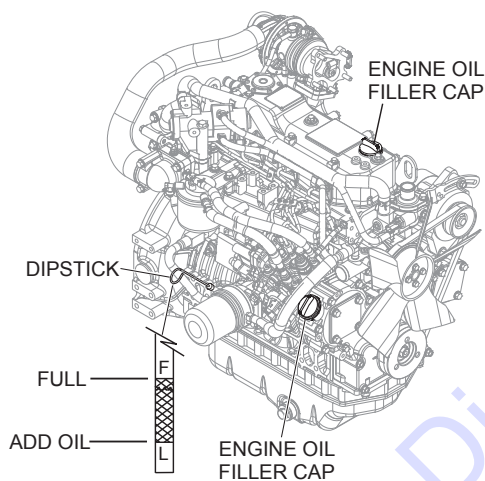


Figure 9. Engine Oil Check and Fill

1. When checking or adding oil, place the machine so the engine is level.
2. Pull the engine oil dipstick from its holder (Figure 9).
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.

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.

HYDRAULIC OIL

1. Check the hydraulic oil condition through the sight glass (Figure 10). Replace hydraulic oil if dirty or if bubbles are present.

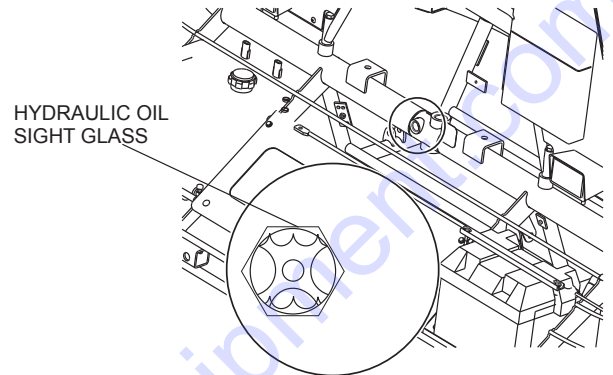


Figure 10. Hydraulic Oil Sight Glass

2. Determine if the hydraulic oil is low. The hydraulic tank has an elevated overflow bottle. **NEVER** remove the fill cap while the oil is hot or spillage will occur.

CAUTION



Hydraulic oil can get **HOT!** **ALWAYS** allow hydraulic oil to cool before removing the fill cap.

CAUTION



Removal of the fill cap when oil fills the sight glass will cause hydraulic oil to spill. Clean up hydraulic oil spills immediately.

3. To add hydraulic oil, remove the fill cap on the hydraulic tank. Fill to overflow with hydraulic system coolant. Use Parker Duraclean™ ISO 46 or equivalent.

FUEL

1. Determine if engine fuel is low (Figure 11).

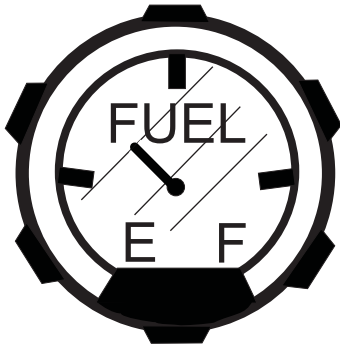


Figure 11. Fuel Gauge

2. If the fuel level is low, remove the fuel filler cap and fill with ASTM D975 No. 1D or No. 2D diesel fuel. Handle fuel safely. Motor fuels are highly flammable and can be dangerous if mishandled.
3. Below are additional technical fuel requirements:

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 0.5% by volume. Less than 0.05% is preferred. For electronically controlled engines, it is mandatory to use fuel that contains less than 0.1% sulfur content.
In general, using a high-sulfur fuel may result in corrosion inside the cylinder. Low sulfur (300–500 mg/kg sulfur content) or ultra-low sulfur fuel should be used.
- Never mix kerosene, used engine oil, or residual fuels with the diesel fuel.
- The water and sediment in the fuel should not exceed 0.05% by volume.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Poor quality fuel can reduce engine performance and/or cause engine damage.
- Fuel additives are not recommended. Some fuel additives may cause poor engine performance.
- The ash content must not exceed 0.01% by volume.

- The carbon residue content must not exceed 0.01% by volume. Less than 0.1% is preferred.
- The total aromatics content should not exceed 35% by volume. Less than 30% is preferred.
- The PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.
- The metal content of Na, Mg, Si, and Al should be equal or lower than 1 mass ppm.
- Lubricity: The wear mark of WS1.4 should be Max 0.018 in (μm) at HFRR test.
- This trowel can use biodiesel fuel. Refer to the Yanmar service manual for details.



WARNING



NEVER smoke while refueling. **NEVER** attempt to refuel the ride-on trowel while the engine is hot or running.

NOTICE

NEVER store the ride-on 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 time, the tank should be filled to avoid condensation that could cause contamination of the fuel.

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 put into service until the setup instructions are completed. These instructions only need to be performed at the time of unpacking a new trowel.

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 was shipped with a wet charged battery. This battery may need to be charged for a brief period of time as per manufacturer's instructions.
2. To install the battery on the trowel, make sure that the battery is well seated in the battery box (Figure 12).

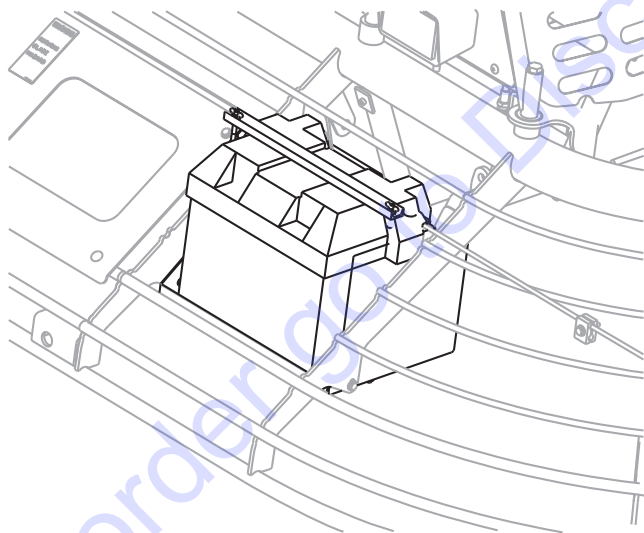


Figure 12. Battery Box

3. Connect the positive cable to the positive terminal on the battery first, then connect the negative cable to the negative terminal.
4. Close the plastic battery box cover and secure the battery box.

STARTING THE ENGINE

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 before operating the ride-on power 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 trowel's platform, grasp the grab 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 grab handles to lift yourself on the trowel.

2. This trowel is equipped with a safety bypass switch. The trowel will not move unless an operator is sitting in the seat. While the engine can be started and will continue to run with the operator off the seat, the rotors will not rotate. The weight of an operator activates a switch within the seat, allowing the rotors to turn.

WARNING

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

NOTICE

It is recommended that the operation of the safety bypass switch is checked prior to performing any troweling operations. Doing this will verify that the switch is working properly contributing to safe operation of the machine.

3. Insert the ignition key into the ignition switch (Figure 13).

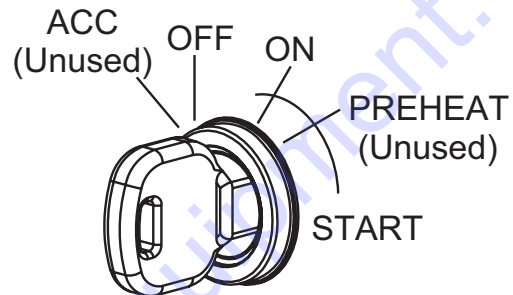


Figure 13. Ignition Switch and Key

4. Turn the ignition key clockwise to the **ON** position. The Aux1, Aux 2, Coolant Temp, Cruise, and Pitch Mode lights (Figure 14) will light for 10 seconds and the Charge Lamp will remain on until the engine starts. The coolant fan will run for 10 seconds.



Figure 14. Indicator Lights

5. When the Aux1 light turns off, turn the ignition key fully clockwise to the **START** position and listen for the engine to start. Once the engine has started, release the ignition key. The throttle speed defaults to idle. Let the engine warm for a few minutes.

NOTICE

The throttle will default to full speed when the foot pedal is depressed and operator presence is detected.

6. Repeat this section a few times to get fully acquainted with the engine starting procedure.

ENGINE THROTTLE

The engine throttle has three primary speed settings: Idle, Charge, and Operating RPM.

1. Each press of the Throttle Switch (Figure 15) steps it from idle to operating speed if operator presence is detected.

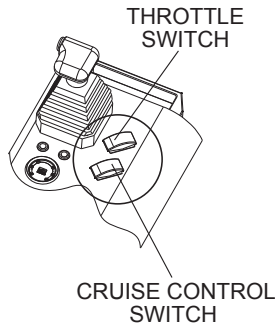


Figure 15. Throttle Switch

2. The speed defaults to idle at startup or when no operator presence is detected.
3. The speed defaults to full speed when the foot pedal is depressed and operator presence is detected.

Battery Management

Idle speed is raised automatically to prevent battery drain when:

- Hydraulic oil cooler fan is running.
- Lights are on
- Battery voltage drops below preset voltage

Cold Start

1. Idle speed is raised automatically to expedite bringing the machine to operating temperature when:
 - Hydraulic oil is below preset temperature (Oil forces across relief valve to raise oil temperature).
 - Engine coolant temperature is below preset temperature.
2. **Aux1** on indicator will light when machine is in cold start mode.

Safety Interlocks

1. Full engine throttle is allowed only when operator presence detected.
2. Engine speed changes to idle when the operator leaves the seat or the foot pedal is released for more than a set period of time.

PUMP STROKE

Stroke is proportionally controlled by the foot pedal input position via feedback from the stroke position sensor.

Safety Interlock

1. Pump is automatically de-stroked if operator presence not detected.
2. Upon startup, the foot pedal will not control pump stroke if the pedal is depressed unless it has been released after startup. This prevents the machine from unintentionally moving when started.
3. Pump is automatically de-stroked if an error is detected from the foot pedal sensor.
4. Stroke position is directly controlled by the foot pedal if an error is detected from the stroke sensor.

CRUISE CONTROL

Setting the Cruise Control will set and maintain a set pump stroke position command.

1. Press the cruise control switch (Figure 16) to engage the cruise control. The cruise control switch LED indicator lights when cruise control is engaged.

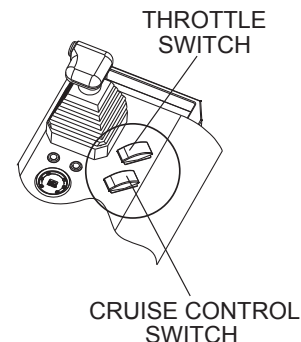


Figure 16. Cruise Control Switch

2. Press the cruise control switch again to disengage the cruise control. The cruise control switch LED indicator will turn off when cruise control is disengaged.

3. The cruise control can also be disengaged by the operator resuming control of pump stroke by depressing the foot pedal after releasing.

Safety Interlocks

1. An error is detected in either pedal position sensor, or stroke position sensor.
2. Operator presence is not detected.
3. An error code is received from the engine.

POWER MANAGEMENT

1. Pump stroke command is scaled when engine load reaches a threshold capacity, maintaining maximum rotor speed and preventing the engine from stalling.
2. The pedal will not be able to stroke the pump until the engine is at full RPM.

HYDRAULIC OIL COOLER FAN CONTROL

The hydraulic oil cooler fan is controlled based on oil temperature. Fan turns on and off at preset temperatures.

HYDRAULIC OIL FILTER MONITORING

The operator is alerted via Aux 2 on the engine/machine monitor if the filter needs service when the filter switch is activated and the oil is at operating temperature.

FAULT ALERTING

Red Stop Lamp

This lamp is used to relay trouble code information that is severe enough to warrant stopping the trowel due to a detected fault code (J1939) from the engine, foot pedal sensor, stroke valve, or very high hydraulic temperatures.

Amber Warning Lamp

This lamp is used to relay trouble code information that reports a problem but does not need to be immediately addressed due a detected fault code (J1939) from the engine, foot pedal sensor, stroke valve, or very high hydraulic temperatures.

STEERING

Two joysticks (Figure 17 and Figure 18) located to the left and right of the operator's seat provide directional control for the HTXD6i ride-on trowel. Table 3 illustrates the various directional positions of the joysticks and their effect on the ride-on trowel.

NOTICE

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

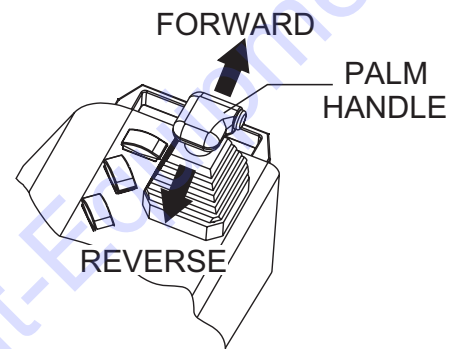


Figure 17. Left Joystick Control

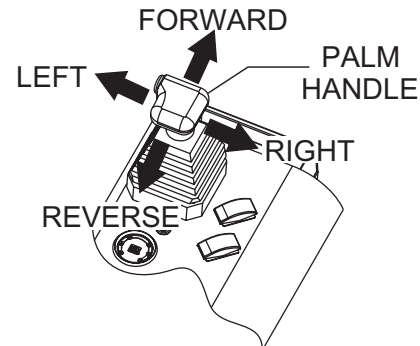


Figure 18. Right Joystick Control

See Table 6 for steering and directional relationship to joystick control movement.

Table 6. Joystick Directional Positioning	
CONTROL JOYSTICK & DIRECTION	RESULT
Move LEFT Joystick FORWARD ↑	Causes only the left side of the ride-on trowel to move forward.
Move LEFT Joystick BACKWARD ↓	Causes only the left side of the ride-on trowel to move backward.
Move RIGHT Joystick FORWARD ↑	Causes only the right side of the ride-on trowel to move forward.
Move RIGHT Joystick BACKWARD ↓	Causes only the right side of the ride-on trowel to move backward.
Move BOTH Joysticks FORWARD ↑ ↑	Causes the ride-on trowel to move forward in a straight line.
Move BOTH Joysticks BACKWARD ↓ ↓	Causes the ride-on trowel to move backward in a straight line.
Move RIGHT Joystick to the RIGHT ⇒⇒⇒	Causes the ride-on trowel to move to the right.
Move RIGHT Joystick to the LEFT ⇐⇐⇐	Causes the ride-on trowel to move to the left.

1. The foot pedal (Figure 19) solely controls blade speed. The position of the foot pedal determines the blade speed. Slow blade speed is obtained by slightly depressing the pedal. Maximum blade speed is obtained by fully depressing the pedal.

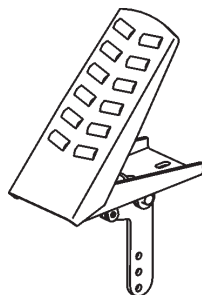


Figure 19. Blade Speed Control Foot Pedal

2. Push both the left and right joysticks forward (Figure 20).

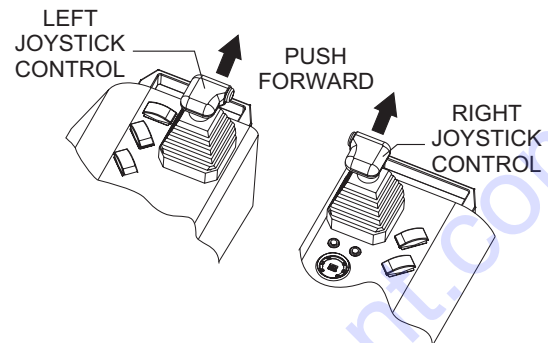


Figure 20. Joystick Control Forward Direction

3. With your right foot, slowly depress the foot pedal halfway. Notice that the ride-on trowel begins to move in a forward direction. Release both joystick controls to stop forward movement, then remove your right foot from the foot pedal.
4. Practice holding the machine in one place as you increase blade speed. When about 75% of maximum blade speed has been reached, the blade will be moving at proper finishing speed. The machine may be difficult to keep in one place. Trying to keep the ride-on trowel stationary is good practice for operation.
5. Practice maneuvering the ride-on trowel using the information listed in Table 6. Try to practice controlled motions as if you were finishing a slab of concrete. Practice edging and covering a large area.
6. Try adjusting the pitch of the blades. This can be done with the ride-on trowel stopped or while the trowel is moving. Test the operation of optional equipment like retardant spray and lights.
7. Pull both the left and right joysticks backward (Figure 21) and repeat steps 3 through 6 while substituting the word 'reverse' for 'forward.'

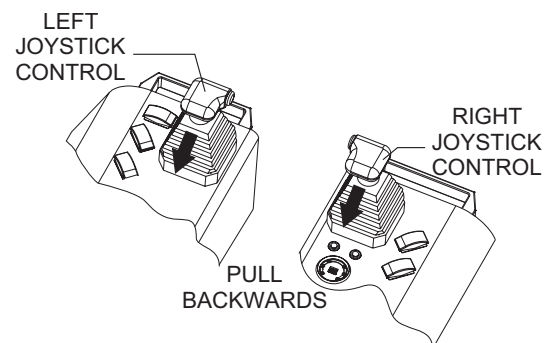


Figure 21. Joystick Control Reverse Direction

BLADE PITCH CONTROL

There are two modes of operation for the blade pitch system that can be set by the Pitch Mode Switch (Figure 22):

- Smart Pitch™
- Manual

The trowel blades can be pitched for various finishing operations with the two rocker switches located on the left control panel next to the left joystick control (Figure 22).

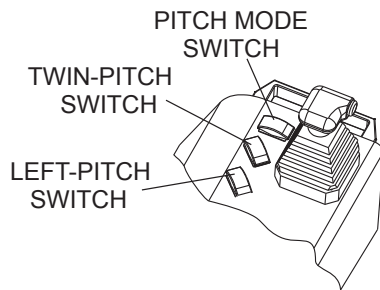


Figure 22. Blade Pitch Control

Smart Pitch™ Mode

When the Pitch Mode Switch is in the Smart Pitch™ position (indicator light on), the twin pitch and left pitch switches operate as follows:

1. When the Twin Pitch Switch (3-position, center off) is pressed (up or down), the right- and left-hand rotor pitch are changed and then the left-hand rotor pitch is synchronized to the right hand as follows:
 - a. The Twin Pitch Switch (up or down) causes the RH Pitch (up or down) Coil and LH Pitch (up or down) Coil and Pitch Dump Valve Coil to be actuated changing the pitch of the blades.
 - b. When the operator achieves the desired pitch on the right-hand blades and releases the Twin Pitch Switch, the LH Pitch (up or down) coil and Pitch Dump Valve Coil are actuated until the calibrated LH Pitch Position signal matches calibrated RH Pitch Position signal (.010" by default). During this time the Pitch Mode Light will flash (.1 s on, .1 s off).
2. When the Left Pitch Switch (3-position, center off) is pressed, the pitch on the left rotor will be changed, while the pitch on the right rotor will remain constant. The Pitch Mode Light will turn off, to indicate pitch function is in the unsynchronized state.

NOTICE

Moving the switches forward increases the pitch while moving them backward decreases the pitch.

NOTICE

Momentarily depressing the Twin Pitch Switch will resynchronize the pitch.

Manual Mode (Pitch Mode Light is Off)

1. When the Twin Pitch Switch is pressed (up or down), the pitch on both rotors will be changed simultaneously but non-synchronously.
2. When the Left Pitch Switch is pressed the pitch on the left rotor will be changed, while the pitch on the right rotor will remain constant.

NOTICE

IMPORTANT! To get blades absolutely flat for using float pans, pitch them as follows:

Press and hold down both pitch switches until mode light blinks before installing float pans.

Panning Mode

When both the Twin Pitch Switch and Left Pitch Switch are pressed in the down position and held for preset period (5s by default), the machine will enter Panning Mode.

1. The RH Pitch DN Coil and LH Pitch DN Coil will be activated, pulling the yokes upward against Retracted Cylinder Stop, deactivating the pitch system, and allowing the blades to float for panning.
2. The Pitch Mode Light will flash (.9 s on .1 s off) when in this mode.
3. The machine will remain in this mode until either the Twin Pitch Switch or Left Pitch Switch is activated in the upward direction.

ENGINE SHUTDOWN

1. Return the throttle switch (Figure 23) to idle and allow the engine to idle for 5 minutes.

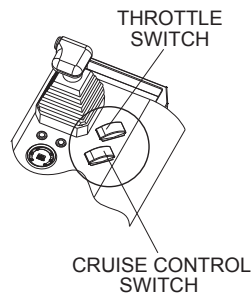


Figure 23. Engine Shutdown

NOTICE

Failure to allow the engine to idle for 5 minutes before shutting off the engine may lead to turbocharger damage.

2. Turn the ignition key counterclockwise to the **OFF** position then remove the key.
3. Clean and remove any foreign debris from the trowel.

MAINTENANCE

Table 7. Maintenance Schedule

System	Check Item	DAILY	Periodic Maintenance Interval						
			Every 50 Hrs	Every 100 Hrs	Every 250 Hrs	Every 500 Hrs	Every 1000 Hrs	Every 1500 Hrs	Every 2000 Hrs
Engine	Check Air Cleaner	X							
	Clean Air Cleaner Element				X				
	Replace Air Cleaner Element					X			
	Check and Refill Engine Coolant	X							
	Check and Clean Radiator Fins		X						
	Check and Adjust Cooling Fan V-Belt		X 1st time		X 2nd time and after				
	Drain, Flush, and Refill Cooling System With New Coolant						X or yearly which- ever comes first		
	Check Engine Oil Level	X							
	Drain and Fill Engine Oil			X 1st time		X 2nd time and after			
	Replace Engine Oil Filter			X 1st time		X 2nd time and after			
Check and Refill Fuel Tank Level	X								
Drain Fuel Tank					X				
Drain Fuel Filter/Water Separator			X						
Check Fuel Filter/Water Separator	X								
Clean Fuel Filter/Water Separator						X			
Replace Fuel Filter						X			
Trowel	Change Hydraulic Oil and Filter			X 1st time	X 2nd time and after				
	Relube Arms, Thrust Collar, and Clutch	X							
	Remove, Clean, Reinstall, and Relube Arms, and Thrust Collar			X					
	Check and replace if necessary, arm bushings and thrust collar bushings.					X			
	Check blades for excessive wear or damage and replace as necessary.	X							
	Adjust Blade Speed						X (if needed)		

CAUTION

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

AIR CLEANER

This Yanmar engine is equipped with a replaceable, high-density, paper air cleaner element. Some will have an inner element that is used as a backup filter should the outer element become damaged.

See Figure 24 for air cleaner components.

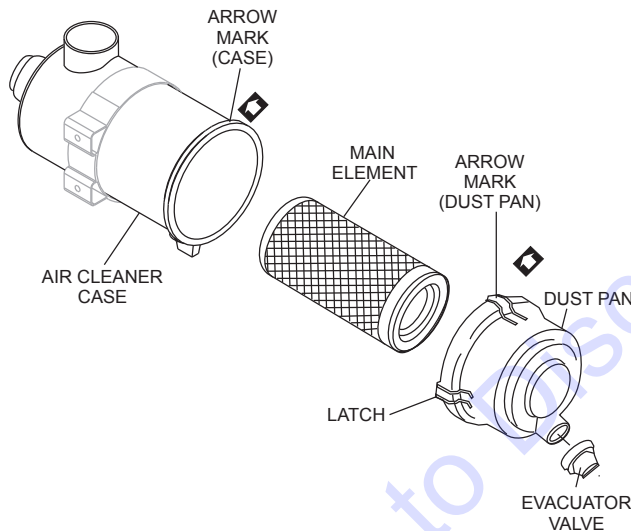


Figure 24. Air Cleaner Components

1. Check the air cleaner daily or before starting the engine.
2. Check for and correct heavy buildup of dirt and debris along with loose or damaged components.
3. Replace the element if it is found to be damaged, excessively dirty, or oily.

NOTICE

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

Air Cleaner Service

CAUTION



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

To service the air cleaner perform the following steps. See Figure 24 for location of parts.

1. Release the latches located on either side of the air cleaner dust pan. Remove the dust pan.
2. Remove the air cleaner element.
3. Blow low-pressure air from the inside of the element to dislodge the dust and dirt. Do not use excessive air pressure or the element will be damaged and will need to be replaced.
4. Replace the element if it is damaged or excessively dirty.
5. Clean the inside of the dust pan.
6. Reinstall the element or, if equipped, the precleaner over the paper air cleaner element.
7. Reinstall the air cleaner dust pan and secure the latches.

NOTICE

NEVER run the engine with the air cleaner removed or without an element.

RADIATOR/COOLING SYSTEM

CAUTION



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

1. Check the radiator for leaks that would indicate corrosion or damage.
2. Check the cooling water 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 cooling water 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 your engine manual for additional information.

RADIATOR CLEANING

1. Blow off dirt and dust from fins and radiator with 28 psi (0.19 MPa) or less of compressed air (Figure 25). Be careful to not damage the fins with the compressed air.

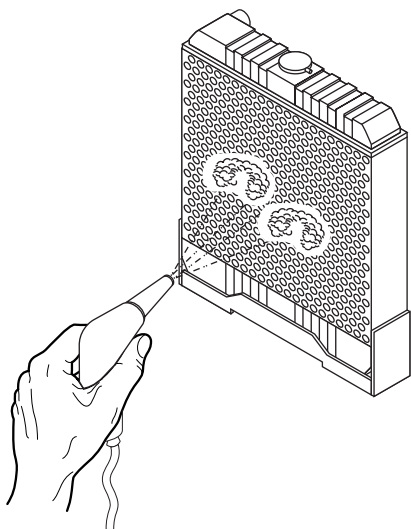


Figure 25. Radiator Cleaning

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

CAUTION

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

FAN BELT TENSION

A slack fan belt may contribute to overheating, or to insufficient charging of the battery. Inspect the fan belt for damage and wear and adjust it in accordance with the Yanmar Engine Owner's Manual.

The fan belt tension is proper if the fan belt bends 10 to 14 mm when depressed with the thumb as shown in Figure 26.

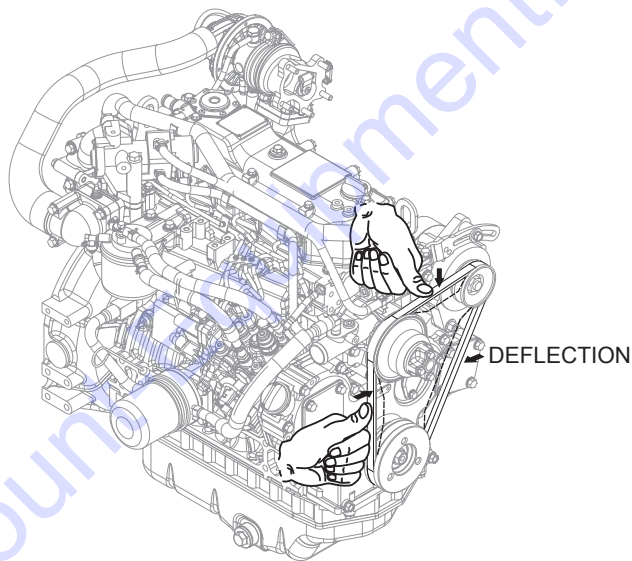


Figure 26. Fan Belt Tension

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.
3. Determine if engine oil is low. Oil should be between the upper limit and lower limit (add oil) lines.
4. If the 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 6 months or 250 hours. Refer to Table 8 for recommended oil viscosity. Refer to Figure 27 for location of parts.

Table 8. 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										

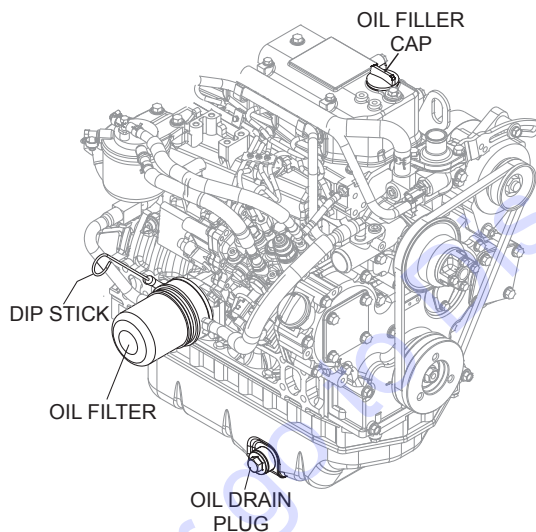


Figure 27. Engine Oil Service Components

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. 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. 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.

FUEL FILTER

1. Replace the engine fuel filter element (Figure 28) every 500 hours.

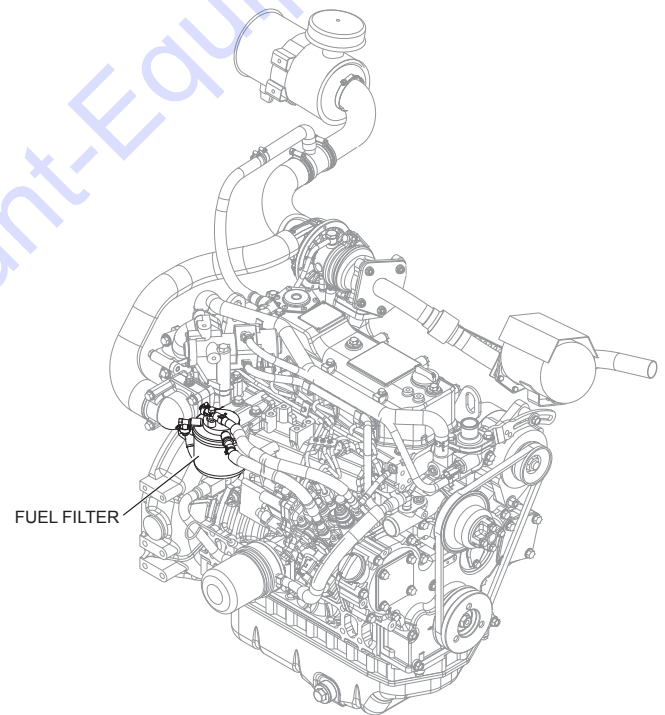


Figure 28. Fuel Filter

Refer to your engine manual for specific details to perform this operation.

FUEL/WATER SEPARATOR

Inspect the fuel/water separator (Figure 29) daily. If the fuel/water separator has collected a significant amount of water and sediment at the bottom of the cup, it should be drained off. Refer to your engine manual for specific details to perform this operation.

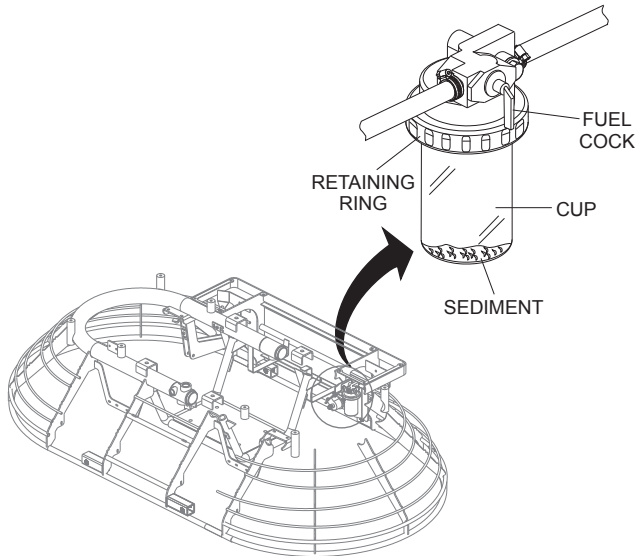


Figure 29. Fuel/ Water Separator

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 the line's performance and flexibility.

CAUTION



NEVER place hands near the belts or fan while the trowel is running.

ENGINE TUNE-UP

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

NOTICE

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

WARNING

ALWAYS disconnect battery cables before attempting any service or maintenance on the ride-on trowel.

HYDRAULIC OIL FILTER

1. Change the hydraulic oil and filter (Figure 30) after the first 100 hours of use, then change every 250 hours. Use 10-micron absolute synthetic media filter.

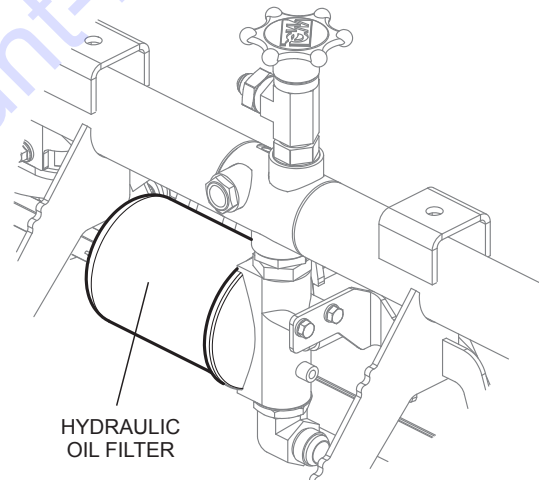


Figure 30. Hydraulic Oil Filter

BATTERY/CHARGING SYSTEM

1. Check and clean the battery terminals for corrosion.
2. **NEVER** attempt to charge a battery that is frozen. The battery can explode unless first allowed to thaw.
3. Disconnect the negative (-) terminal of the battery 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.
4. Check the manufacturer's recommendations for maintaining and charging the battery.

TROWEL LUBRICATION

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

Table 9. Trowel Lubrication Schedule		
Location	# of Shots	Interval
Spiders	1 to 1½	Every day
Thrust collars	1	Every day

Spiders (Daily)

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

1. Locate one of the Zerk grease fittings on either spider assembly (Figure 31). Remove the Zerk fitting cap and set it aside.

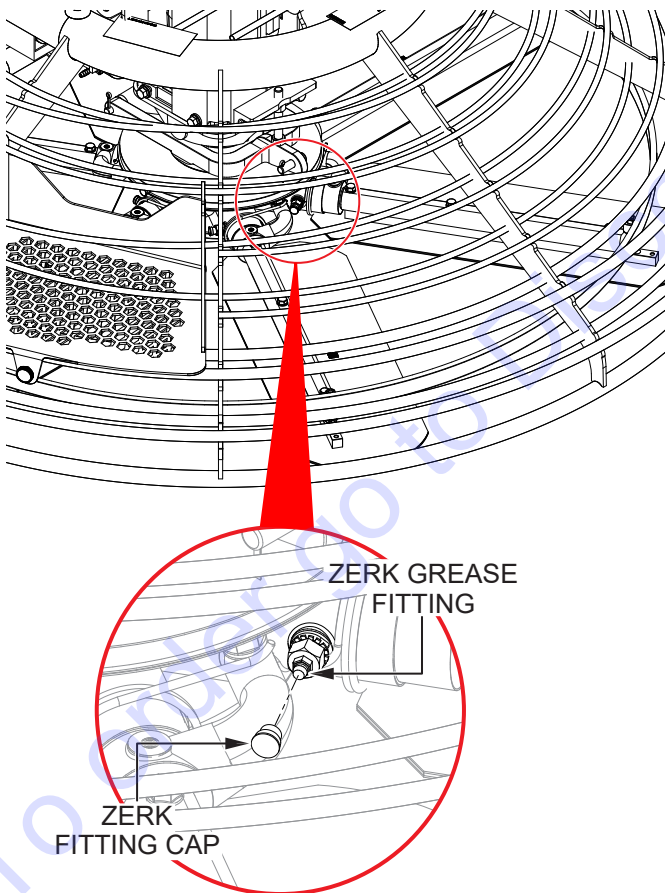


Figure 31. Spider Lubrication

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 32). Remove the Zerk grease fitting cap and set it aside.

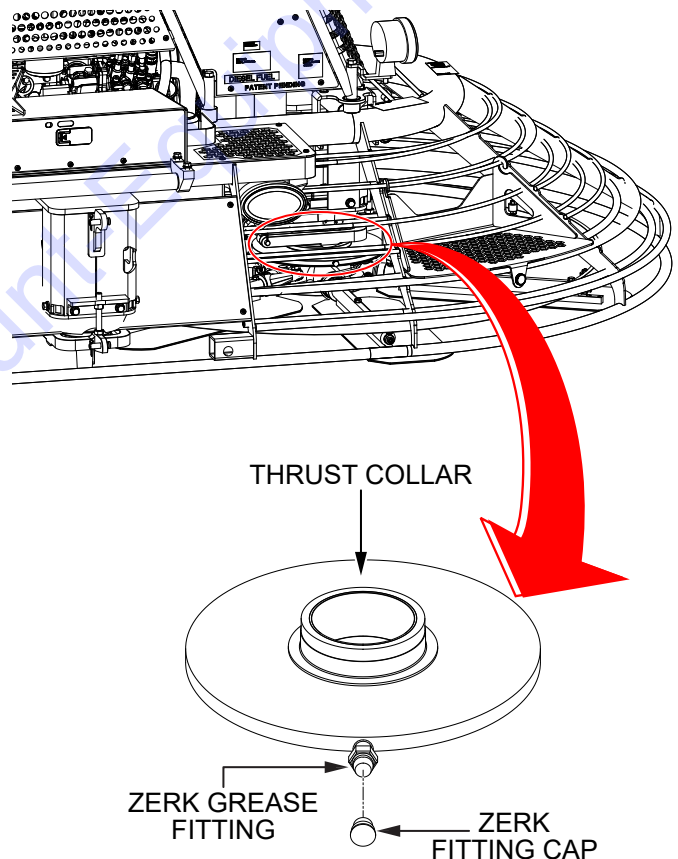


Figure 32. Thrust Collar Lubrication

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.

INSTALLING PANS ONTO FINISHER BLADES

These round discs, sometimes referred to as 'pans,' attach to the spiders 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.

Refer to Figure 33 when installing pans onto finisher blades.

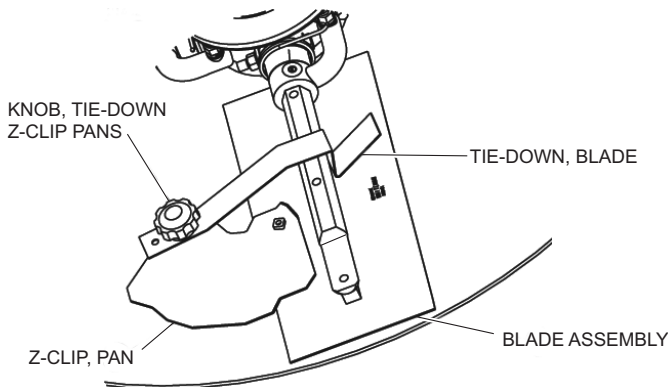


Figure 33. Z-Clip Finisher Pan Installation

1. Lift the trowel just enough to slide the pan under the blades. Lower the finisher onto the pan with the blades adjacent to the Z-clips.
2. Rotate the blades into position under the Z-clips. Ensure that the blades are rotated in the same direction of travel as 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 the tie-down knobs as shown in Figure 33.
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.

LONG TERM STORAGE

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

CAUTION

NEVER store the ride-on trowel with fuel in the tank for an extended period of time. Always clean up spilled fuel immediately.

TROUBLESHOOTING

Troubleshooting (Ride-On Hydraulic Trowel)		
Symptom	Possible Problem	Solution
Safety stop switch not functioning.	Other problems?	Consult engine manufacturer's manual.
	Loose wire connections?	Check wiring. Replace as necessary.
	Bad contacts?	Replace seat cushion (contains the switch).
If trowel "bounces, rolls concrete, or makes uneven swirls in concrete"..	Blades?	Make certain blades are in good condition, not excessively worn. Finish blades should measure no less than 2" (50mm) from the blade bar to the trailing edge, combo blades should measure no less than 3.5" (89mm). Trailing edge of blade should be straight and parallel to the blade bar.
	Spider?	Check that all blades are set at the same pitch angle as measured at the spider. A field adjustment tool is available for height adjustment of the trowel arms (see Optional 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" (3.2 mm) of travel at the tip of the arm, the bushings should be replaced. All bushings should be replaced at the same time.
	Thrust collar?	Check the flatness of the thrust collar by rotating it on the spider. If it varies by more than 0.02" (0.5 mm) replace the thrust collar.
	Thrust collar bushing?	Check the thrust collar by rocking it on the spider. If it can tilt more than 1/16" (1.6 mm) [as measured at the thrust collar O.D.], replace the bushing in the thrust collar.
	Thrust bearing worn?	Check the thrust bearing to see that it is spinning freely. Replace if necessary.
Machine has a perceptible rolling motion while running.	Blade pitch?	Check blades for consistent pitch. Adjust per Maintenance Section instructions if necessary.
	Spider Finger Screws?	Adjust per procedure in Maintenance Section.
	Yoke?	Check to make sure that both fingers of the yoke press evenly on the wear cap. Replace yoke as necessary.
	Blade Pitch?	Check to ensure that each blade is adjusted to have the same pitch as all other blades. Adjust per maintenance section in manual.

NOTICE

Refer to the MQ Setup/Inspection/Test Procedures Manual for troubleshooting details.

TROUBLESHOOTING

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

TROUBLESHOOTING

Troubleshooting (Diesel Engine)		
Symptom	Possible Problem	Solution
Engine will not start or start is delayed, although engine can be turned over.	No Fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and clean tank.
	Faulty fuel supply line?	Replace or repair fuel line.
	Compression too low?	Check piston, cylinder and valves. Adjust or repair per engine repair manual.
	Fuel pump not working correctly?	Repair or replace fuel pump.
	Oil pressure too low?	Check engine oil pressure.
	Low starting temperature limit exceeded?	Comply with cold starting instructions and proper oil viscosity.
	Defective battery?	Charge or replace battery.
	Air or water mixed in fuel system?	Check carefully for loosened fuel line coupling, loose cap nut, etc.
At low temperatures engine will not start.	Engine oil too thick?	Refill engine crankcase with correct type of oil for winter environment.
	Defective battery?	Replace battery.
Engine fires but stops soon as starter is switched off.	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
	Defective fuel pump?	Replace fuel pump.
Engine stops by itself during normal operation.	Fuel tank empty?	Add fuel.
	Fuel filter blocked?	Replace fuel filter.
	Defective fuel pump?	Replace fuel pump.
	Mechanical oil pressure shutdown sensor stops the engine due to low oil?	Add oil. Replace low oil shutdown sensor if necessary.
Low engine power, output and speed.	Fuel tank empty?	Replace fuel filter.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure that tank is adequately vented.
	Leaks at pipe unions?	Check threaded pipe unions tape and tighten unions as required.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level.
	Injection pump wear?	Use No. 2-D diesel fuel only. Check the fuel injection pump element and delivery valve assembly and replace as necessary.

TROUBLESHOOTING

Troubleshooting (Diesel Engine) - continued		
Symptom	Possible Problem	Solution
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.
Engine overheats.	Too much oil in engine crankcase?	Drain off engine oil down to uppermark on dipstick.
	Entire cooling air system contaminated/ blocked?	Clean cooling air system and cooling fin areas.
	Fan belt broken or elongated?	Change belt or adjust belt tension.
	Coolant insufficient?	Replenish coolant.
	Radiator net or radiator fin clogged with dust?	Clean net or fin carefully.
	Fan, radiator, or radiator cap defective?	Replace defective part.
	Thermostat defective?	Check thermostat and replace if necessary.
	Head gasket defective or water leakage?	Replace parts.
Engine oil pressure indicator stays on.	Faulty engine oil pressure switch?	Contact Discount-equipment.
	No or low level of engine oil?	Check and adjust oil level as necessary.
	Clogged engine oil filter	Replace engine oil filter.
Engine coolant indicator turns on.	Low engine coolant level?	Add engine coolant.
	Dirty radiator fins?	Clean radiator fins.
	Engine coolant leaking?	Contact Discount-equipment.
	V-Belt loose or damaged?	Adjust or replace V-belt.
	Contaminated engine coolant?	Contact Discount-equipment.
	Faulty engine coolant pump?	Contact Discount-equipment.
Battery indicator turns on.	V-belt loose or damaged?	Adjust or replace V-belt.
	Battery Failure?	Check battery condition.
	Faulty Alternator?	Contact Discount-equipment.

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