

OPERATION AND PARTS MANUAL



***WHITEMAN* SERIES**

MODEL HHN31VTCSL5

RIDE-ON POWER TROWEL

(B & S VANGUARD DM950 GASOLINE ENGINE)

Revision #8 (05/03/12)

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: 20382



CALIFORNIA — Proposition 65 Warning

Engine exhaust and some of its constituents, and some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to the State of California 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.

SILICOSIS/RESPIRATORY WARNINGS

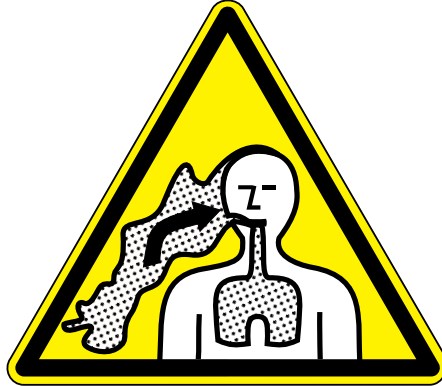
⚠ WARNING



SILICOSIS WARNING

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

⚠ WARNING



RESPIRATORY HAZARDS

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

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

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NOTICE

Specifications and part numbers are subject to change without notice.

PARTS ORDERING PROCEDURES

Ordering parts has never been easier! Choose from three easy options:

Effective:
January 1st, 2006

www.multiquip.com



Order via Internet (Dealers Only):

Order parts on-line using Multiquip's SmartEquip website!

- View Parts Diagrams
- Order Parts
- Print Specification Information



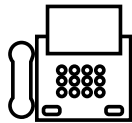
If you have an MQ Account, to obtain a Username and Password, E-mail us at: parts@multiquip.com.

To obtain an MQ Account, contact your District Sales Manager for more information.

Goto www.multiquip.com and click on **Order Parts** to log in and save!

Use the **internet** and qualify for a **5% Discount** on *Standard orders* for all orders which include complete part numbers.*

Note: Discounts Are Subject To Change



Order via Fax (Dealers Only):

All customers are welcome to order parts via Fax.

Domestic (US) Customers dial:
1-800-6-PARTS-7 (800-672-7877)

Fax your order in and qualify for a **2% Discount** on *Standard orders* for all orders which include complete part numbers.*

Note: Discounts Are Subject To Change



Order via Phone: Domestic (US) Dealers Call:
1-800-427-1244

Non-Dealer Customers:

Contact your local Multiquip Dealer for parts or call 800-427-1244 for help in locating a dealer near you.



International Customers should contact their local Multiquip Representatives for Parts Ordering information.

When ordering parts, please supply:

- | | |
|---|--|
| <input type="checkbox"/> Dealer Account Number | <input type="checkbox"/> Specify Preferred Method of Shipment: |
| <input type="checkbox"/> Dealer Name and Address | <input checked="" type="checkbox"/> UPS/Fed Ex <input checked="" type="checkbox"/> DHL |
| <input type="checkbox"/> Shipping Address (if different than billing address) | <input type="checkbox"/> Priority One <input checked="" type="checkbox"/> Truck |
| <input type="checkbox"/> Return Fax Number | <input type="checkbox"/> Ground |
| <input type="checkbox"/> Applicable Model Number | <input type="checkbox"/> Next Day |
| <input type="checkbox"/> Quantity, Part Number and Description of Each Part | <input type="checkbox"/> Second/Third Day |

NOTICE

All orders are treated as *Standard Orders* and will ship the same day if received prior to 3PM PST.

WE ACCEPT ALL MAJOR CREDIT CARDS!



TRAINING CHECKLIST

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, 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	Condition of blades						
3	Blade pitch operation						
4	Safety stop switch operation						
5	Steering control operation						

SAFETY INFORMATION

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



SAFETY MESSAGES

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

SAFETY SYMBOLS

! DANGER

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

! WARNING

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

! CAUTION

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

NOTICE

Addresses practices not related to personal injury.

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

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

SAFETY INFORMATION

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.



SAFETY INFORMATION

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.

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.



SAFETY INFORMATION

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

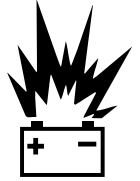
- **DO NOT** start the engine near spilled fuel or combustible fluids. Fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids.
- **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.

SAFETY INFORMATION

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.

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

NOTICE

- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters. 
- **DO NOT** use food or plastic containers to dispose of hazardous waste.
- **DO NOT** pour waste, oil or fuel directly onto the ground, down a drain or into any water source.

SPECIFICATIONS/DIMENSIONS

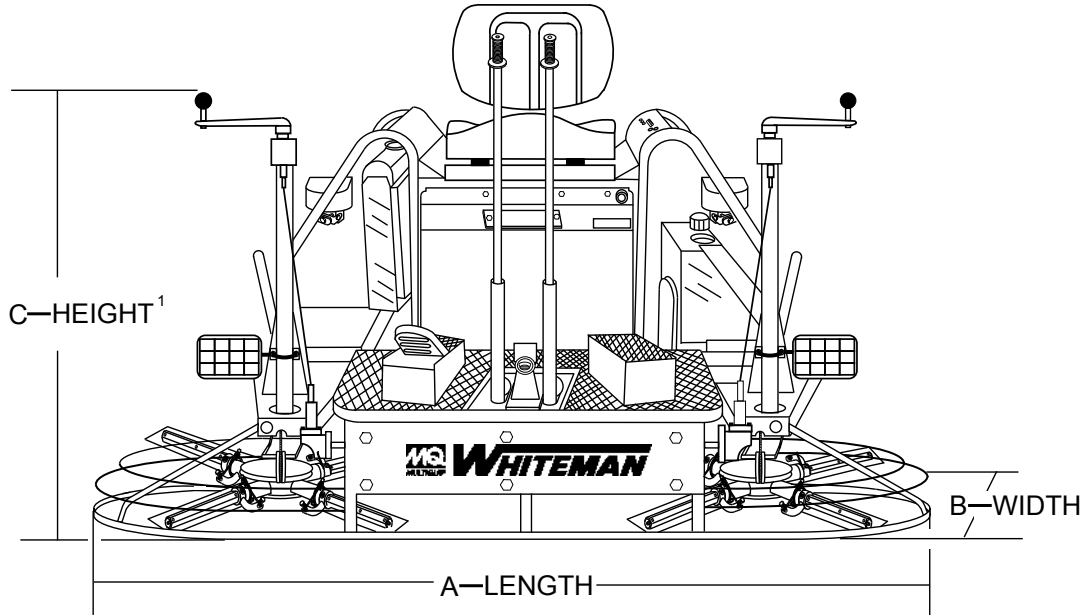


Figure 1. HHN31VTCSL5 Dimensions

Table 1. HHN31VTCSL5 Dimensions/Specifications	
Specification Parameter	HNN31V (Vanguard)
A-Length – in. (cm)	97.0 (246.4)
B-Width – in. (cm)	50.0 (127)
C-Height – in. (cm) ¹	46.0 (117)
Weight – lbs. (kgs.) Operating	1,042 (477)
Weight – lbs. (kgs.) Shipping	1,224 (555)
Engine – H.P.	31
Fuel Tank – gallons (liters)	5 (19)
Rotor – RPM	60 to 160
Path Width – in. (cm)	91 (231)
Lubrication Oil	ISO 220 GR 5EP
Gear Box Oil Capacity	144 OZ.
Fuel Consumption (Full Load)	0.54 LB/BHP-HR
Radiator Capacity	1.0 GAL.

Table 2. Noise and Vibration Emissions	
Guaranteed ISO 11201:2010 Based Sound Pressure Level at Operator Station in dB(A)	97
Guaranteed ISO 3744:2010 Based Sound Power Level in dB(A)	117
Whole Body Vibration Per ISO 2631-1:1997+A1:2010 in $m/s^2 \Sigma A(8)$	0.19

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	
Model	Briggs & Stratton Vanguard DM950G
Type	Gasoline Engine
Cylinders	3
Piston Displacement	58.1 cu.in. (952 cc)
Bore and Stroke	2.83 in.x 3.07 in. (72 mm x 78 mm)
Max. Torque	51.7 ft lbs (70.1 N-m) @ 220rpm
Engine Oil Capacity	3.5 qt. (3 liters)
Fuel Tank	5 gal.(18.9 liters)
Dry Weight	159 lbs. (72.1 Kg)
Dimensions (L x W x H)	17.09 in. x 17.44 in. x 20.54 in. (434 mm x 443 mm x 522 mm)

GENERAL INFORMATION

HHN RIDE-ON TROWEL FAMILIARIZATION

The HHN series Ride-On Power Trowel is designed for the floating and finishing of concrete slabs.

Take a walk around the HHN Ride-On Power Trowel. Take notice of all the major components (see Figure 2 and Figure 3) like the engine, blades, air cleaner, fuel system, fuel shut-off valve, ignition switch etc. Check that there is always oil in the engine, and gear oil in the gear box 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 HHN Ride-On Power Trowels.

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

Notice the foot pedal which controls the engine speed. Also take a look at the main driveline 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 HHN Ride-On Power 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

The HHN Ride-On Power Trowel is equipped with a liquid cooled 31 HP Vanguard gasoline engine. Refer to the engine owner's manual for specific instructions regarding engine operation. This manual is included with the ride-on trowel at the time of shipping from Whiteman. Please contact your nearest Multiquip Dealer for a replacement should the original manual disappear.

BLADES

The blades of the ride-on power 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). The HHN ride-on power trowels are 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 of the controls, indicators and general maintenance parts. Each control may perform more than one function.

GEARBOXES

The HHN Ride on Power Trowel consist of two separate gearbox assemblies that are enclosed in rugged cast aluminum gear cases.

The gearbox casing holds 50% more oil capacity than competitors, which allows more lubrication to be provided to critical points.

STEERING ASSIST

Dual control levers located in front of the operator's seat are provided for steering the HHN Ride on Power Trowel. The control levers are linked to two spring loaded cylinders.

Push the left control lever forward and pull the right control lever backward and the trowel will rotate 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 4 for a complete description on the control levers directional positioning.

CONSTANT VELOCITY JOINTS (CV-JOINTS)

Constant velocity joints insure 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.

COMPONENTS

1. **Seat** — Place for operator to sit. Engine will not start unless operator is seated. Seat is adjustable, fore and aft for operator comfort.
2. **Steering Control Lever (right side)** — Allows the unit to move in either a forward, reverse left or right direction.
3. **Retardant Spray Control Buttons** — When pressed allows retardant spray to flow through the spray nozzle located at the front of the machine.
4. **Twin Pitch Control** — Adjusts the blade pitch for right side of the trowel. Turn the crank as marked on its top surface to increase or decrease blade pitch.
5. **Twin Pitch Control** — Adjusts the blade pitch for left side of the trowel. Turn the crank as marked on its top surface to increase or decrease blade pitch.
6. **Steering Control Lever (left side)** — Allows the unit to move in either a forward, reverse left or right direction.
7. **Light Switch** — When activated, turns on four halogen lights. Lights offer better visibility when working indoors.
8. **Ignition Switch** — With key inserted turn clockwise to start engine.
9. **Oil Indicator Light** — Lights red when oil pressure is low.
10. **Water Indicator Light** — Lights red when water temperature is high.
11. **Charge Indicator** — Lights red when electrical system is not charging properly.
12. **Hour Meter** — Indicates number of hours the key switch is in the "ON" position.
13. **Choke Control Lever** — In cold weather pull this lever forward about half way to start engine. After engine warms push knob all the way in.
14. **Fuel Gauge/Filler Cap** — Indicates the amount of fuel in the fuel tank. Remove this cap to add fuel.
15. **Fuel Tank** — Holds 5 gallons of unleaded gasoline.
16. **Spare Belt Carrier** — Contains a spare belt. Belt is used on the drive pulley.
17. **Left Foot Riser** — Operator foot rest pedal.
18. **Spray Nozzles** — Spray nozzle for retardant.
19. **Right Foot Pedal** — Controls blade speed. Slow blade speed is accomplished by slightly depressing the foot pedal. Maximum blade speed is accomplished by fully depressing the foot pedal.

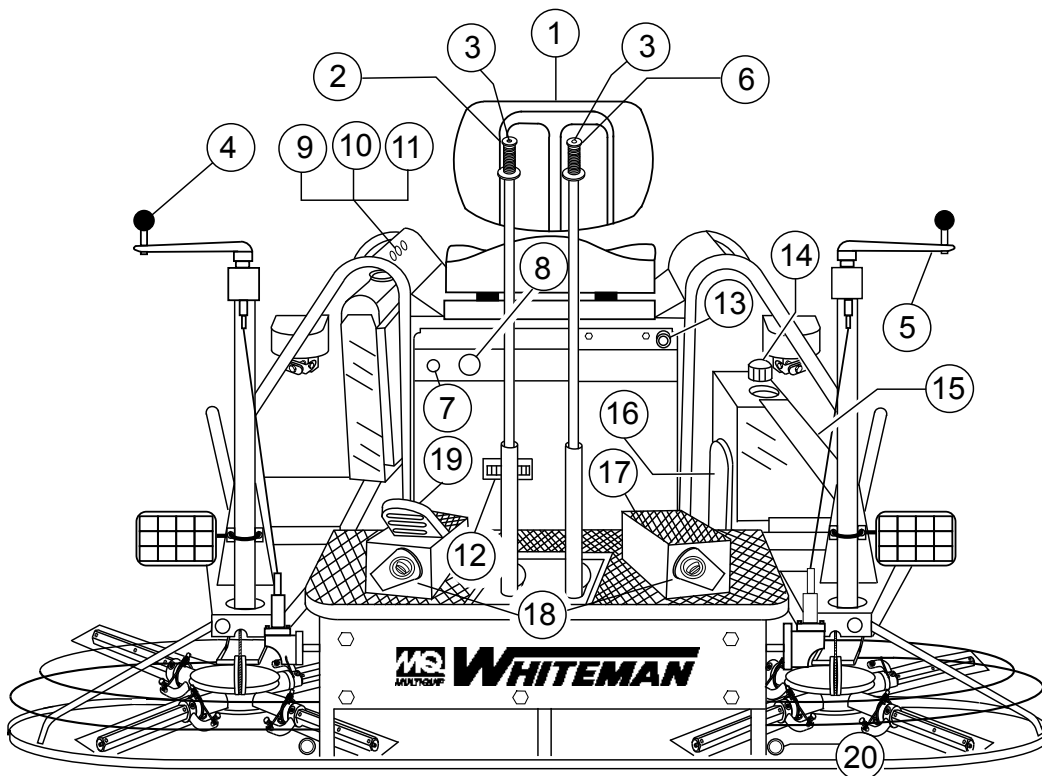


Figure 2. HHN Components (Front)

COMPONENTS

20. **EZ- Mover Boss** — Front -side insertion point for EZ Mover. Used when the transporting of the trowel is required.
21. **Radiator/Filler Cap** — Holds coolant or water necessary to keep engine at a safe operating temperature. Remove this cap to add water or antifreeze. DO NOT remove this cap when the engine is warm.
22. **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.
23. **Lights** — Four 12 volt halogen lights are provided with this unit.
24. **Right-Side Spider** — Consists (basic) of trowel arms, blades, wear plate, and thrust collar etc.
25. **Left-Side Spider** — Consists (basic) of trowel arms, blades, wear plate, and thrust collar etc.
26. **Safety Kill Switch** — Shuts down engine when operator is not sitting in seat.
27. **Engine Oil Filler Cap** — Remove this cap to add engine oil.
28. **Overflow Bottle** — Supplies coolant to the radiator when radiator coolant level is low. Fill to indicated level as shown on bottle.
29. **Engine Air Filter** — Prevents dirt and other debris from entering the fuel system. Lift locking latch on air filter canister to gain access to filter element.
30. **Engine Dip Stick** — Indicates engine oil level. Add oil as required.
31. **Oil Filter** — Provides oil filtering for the engine.
32. **Battery** — Provides +12V DC power to the electrical system
33. **Retardant Spray Motors** — Used in conjunction with the left and right spray control buttons.
34. **Retardant Spray Tank** — Holds 5 gallons of retardant.
35. **Belt Guard** — Encloses drive belt used in conjunction with clutch.
36. **EZ- Mover Boss** — Back- side insertion point for EZ Mover. Used when the transporting of the trowel is required.
37. **Oil Sight Glass** — Indicates the level of the hydraulic oil in the gear box.

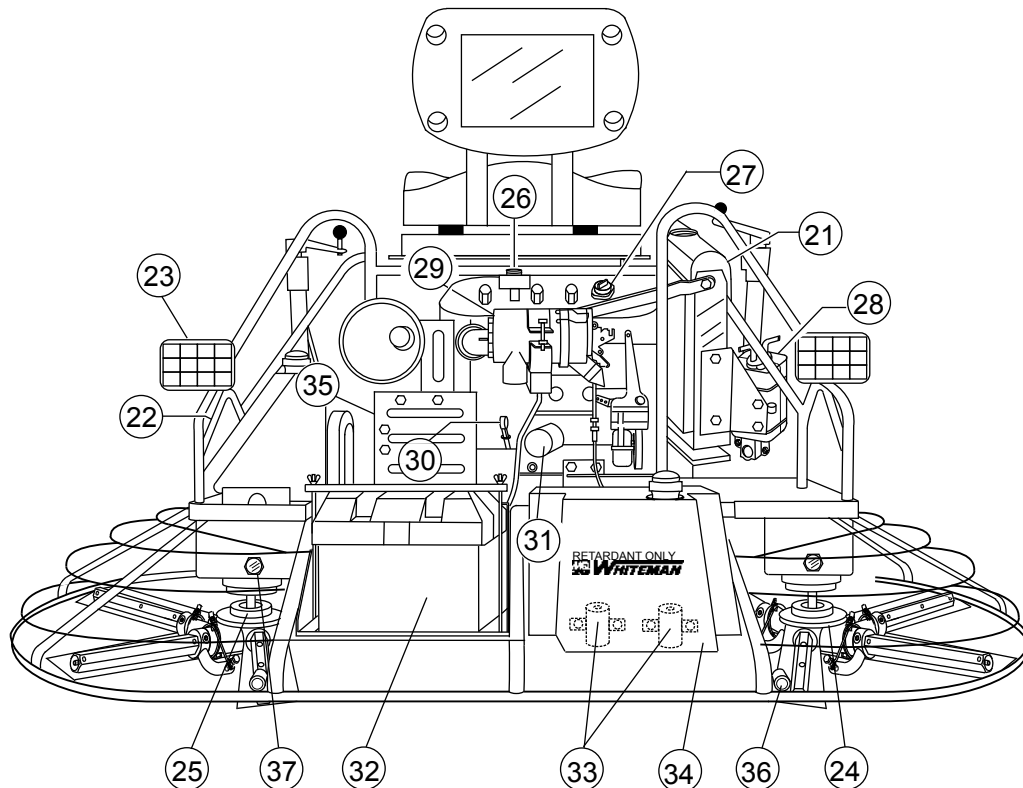


Figure 3. HHN Components (Rear)

NEW MACHINE SETUP

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

NOTICE

A new ride-on trowel cannot be put into service until the following installation instructions are completed. These instructions only need to be performed at the time of unpacking a **NEW** trowel.

Before packaging and shipping, this ride-on power 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 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) control handle 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

Models equipped with adjustable height handles are adjusted by placing the bolt through the set of holes that bring the handles to a height most comfortable for the operator.

5. Pay close attention to any wires that may be inside the control handles. **DO NOT** pinch or cut any wires during installation.
6. Remove the two knobs from the plastic bag for the pitch control tower cranks and install the 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:

NOTICE

H-series trowels have a seat that is mounted on tracks, similar to an automobile seat. This seat can be adjusted fore and aft via the control lever under the front of the seat.

1. Remove the seat from the protective wrapping.
2. Remove the bolts on the bottom of the seat, and place seat on the seat mounting plate, then insert the bolts through the holes or slots on the seat mounting plate and tighten.

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.

To install the battery on the trowel, make sure that the battery is well seated in the battery box. The positive cable, normally red, is associated with the "+" symbol on the battery. The negative cable, normally black, is associated with the "-" symbol on the battery. See Figure 4. Connect the positive cable to the positive terminal on the battery first, then connect the negative cable to the negative terminal. Close the plastic battery box cover and secure the battery box.

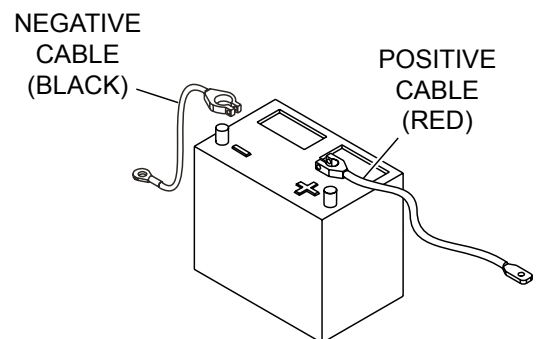


Figure 4. Battery Cable Orientation

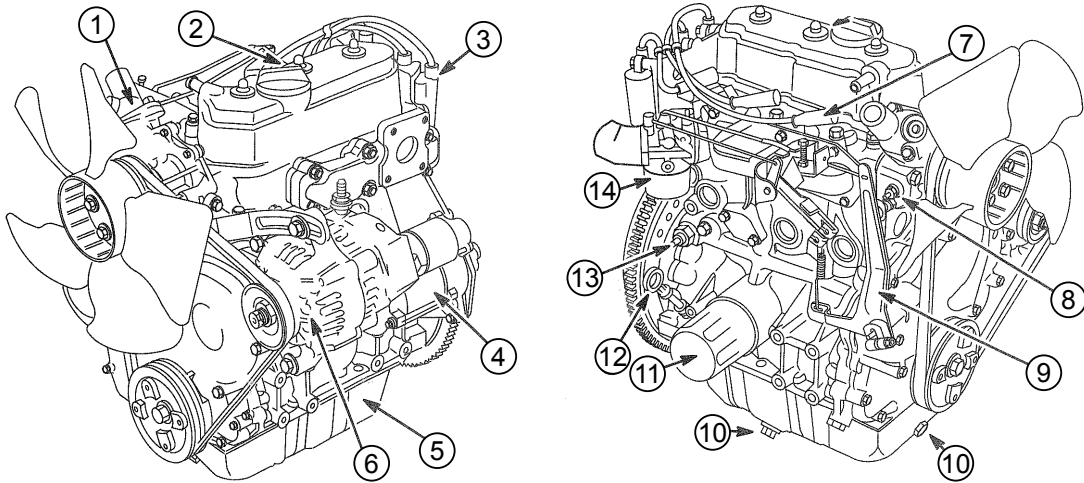


Figure 5. Engine Components

INITIAL SERVICING

The engine (Figure 5) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the manufacturer's engine manual for instructions and details of operation and servicing. The engine shown above is a Briggs & Stratton Vanguard Gasoline engine. Operation for other types of engines may vary somewhat.

1. **Thermostat** — Regulates the temperature of the engine coolant.
2. **Oil Filler Cap** — Remove to add engine oil.
3. **Ignition Coil** — Regulates coolant temperature
4. **Electric Starter** — Starts engine when ignition key is rotated to the "ON" position.
5. **Oil Pan** — Holds a maximum of 3.5 quarts (3.3 liters) of motor oil.
6. **Alternator** — Provides charge for battery and voltage for the +12 VDC electrical system.
7. **Spark Plug** — Provides spark to the ignition system. Set spark plug gap to 0.028 ~ 0.031 inch (0.6~0.7 mm). Clean spark plug once a week.
8. **Coolant Temperature Sending Unit** — Device that measures coolant temperature.
9. **Governor Lever** — This lever restricts engine speed (high idle or low idle) through a speed control device linked to the accelerator system.
10. **Oil Drain Plugs (2)** — Remove 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.
11. **Oil Filter** — Spin-on type, filters oil for contaminants.
12. **Oil Dip Stick** — Remove to check amount and condition of oil in crankcase.
13. **Oil Pressure Sending Unit** — Device that measures engine oil pressure.
14. **Carburetor** — Low-emission carburetor equipped with an idle mixture valve with a limiter which allows adjustment.

INSPECTION

This section is intended to assist the operator with the initial inspection of the HHN trowel. It is extremely important that this section be read carefully before attempting to use the trowel in the field.

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

CAUTION

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

See Figure 2 and Figure 3 for the location of any control or indicator referenced in this manual.

ENGINE OIL LEVEL

1. Pull the engine oil dipstick from its holder.
2. Determine if engine oil is low (Figure 6), add correct amount of engine oil to bring oil level to a normal safe level. (See Table 5).

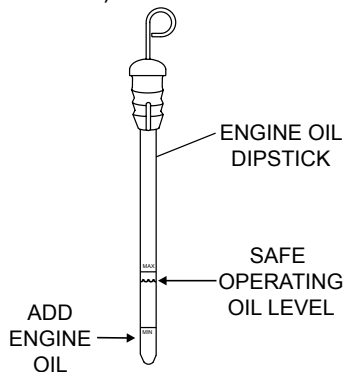


Figure 6. Engine Oil Dipstick

GEARBOX OIL LEVEL

1. Check the gearbox oil level in both gearboxes by viewing the sight glass at the rear of the gearbox. See Figure 7.
2. The oil level of the gear box should be at the half-way point of the sight glass (Figure 7). The gear box oil capacity is 1 U.S. Gallon, (3.79 liters). If additional oil is required, unscrew the oil fill plug located on top of the gearbox, and refill with ISO 220 A GMA GR 5 EP oil.

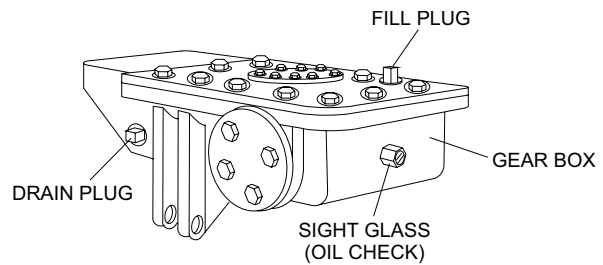


Figure 7. Gearbox Oil Plugs/Sight Glass

FUEL

Determine if the engine fuel is low (Figure 8). If fuel level is low, remove the fuel filler cap and fill with appropriate engine fuel. The HHN31V uses diesel fuel.

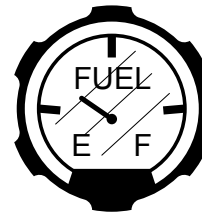


Figure 8. Fuel Gauge

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 ride-on trowel if the engine is hot or running.

CAUTION

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

STARTING THE ENGINE

1. Place one foot on the trowel's platform, grab ahold of any part of the frame, lift yourself onto the trowel, then sit down in the operator's seat.

NOTICE

The HHN31V trowel is equipped with a safety stop switch that will not allow the engine to start unless an operator is sitting in the operator's seat. The weight of an operator depresses an 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 may result if it is disabled, disconnected or improperly maintained.

NOTICE

Using the safety stop switch to stop the engine after every use will verify that the switch is working properly. Remember to turn the key to the "OFF" position after stopping the machine. Not doing so may drain the battery.

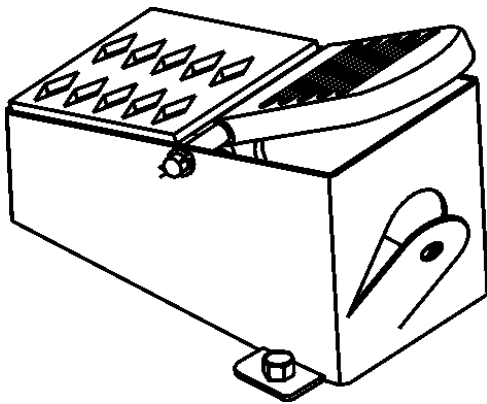


Figure 9. Blade Speed Control Foot Pedal

2. The right foot pedal (Figure 9) controls blade and engine 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.
3. Keep your foot OFF the pedal (right foot pedal). Start the engine at idle (without touching the foot pedal).
4. Insert the ignition key into the ignition switch.

5. Turn the ignition key clockwise to the (start) position. The oil, charge, and preheat indicator lights (Figure 10) should be ON.

NOTICE

OIL, CHARGE, and PREHEAT indicator lights come on when ignition switch is in the ON position, and the engine is **NOT** running.

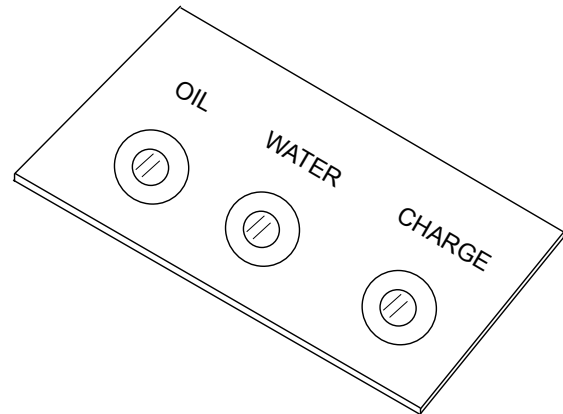


Figure 10. Oil and Charge Indicator Lights

6. Turn ignition key fully clockwise and listen for engine to start. Once engine has started release ignition key.
7. If the engine fails to start in this manner, consult the engine owner's manual supplied with the trowel.
8. 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 fix the safety stop switch. See Troubleshooting tables for possible problems.

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

STEERING

Two control levers located in front of the operator's seat provide directional control for the HHN trowel. Table 4 illustrates the various directional positions of the joysticks and their effect on the ride-on trowel.

NOTICE

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

1. Push both the left and right control levers forward. See Figure 11.

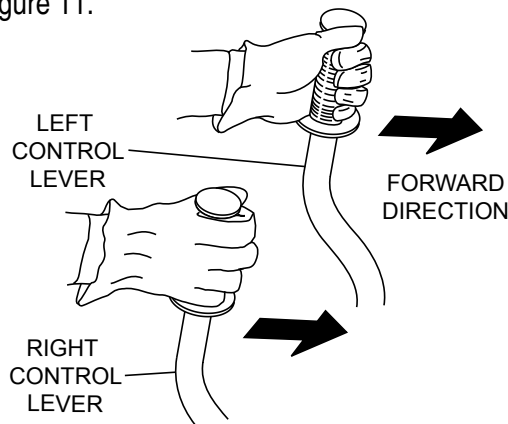


Figure 11. Left and Right Control Levers

2. With your right foot, quickly depress the right foot pedal halfway. Notice that the ride-on power 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 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 a good practice for operation.

4. Practice maneuvering the ride-on trowel using the information listed in Table 4. 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 with the ride-on trowel stopped or while the trowel is moving, whatever feels comfortable. Test the operation of optional equipment like retardant spray and lights if equipped.
6. Push both the left and right joysticks backward and repeat steps 3 through 6 while substituting the word reverse for forward.

Table 4. Control Lever Directional Positioning

Control Lever	Direction	Results
Left	Move Control Lever Forward	Causes the ride-on trowel to move forward and to the right.
Left	Move Control Lever Backward	Causes the ride-on trowel to move backward and to the left.
Right	Move Control Lever Forward	Causes the ride-on trowel to move forward and to the left.
Right	Move Control Lever Backward	Causes the ride-on trowel to move backward and to the right.
Left and Right	Move Both Control Levers Forward	Causes the ride-on trowel to move forward in a straight line.
Left and Right	Move Both Control Levers Backward	Causes the ride-on trowel to move backward in a straight line.
Left and Right	Move Both Control Levers to the Right	Causes the ride-on trowel to move to the right.
Left and Right	Move Both Control Levers 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.


When performing maintenance on the trowel or engine, follow all safety messages and rules for safe operation stated at the beginning of this manual.

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


WARNING

 Accidental starts can cause severe injury or death.

ALWAYS place the ON/OFF switch in the OFF position before performing maintenance.

 Disconnect negative battery cable from battery before servicing.

ALWAYS allow the engine to cool before servicing. **NEVER** attempt any maintenance work on a hot (muffler, radiator, etc.) trowel.



3. Replace gearbox lubricant.
4. Check and adjust blade speed.

WARNING

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

AIR CLEANER (DAILY)

The Vanguard engine is equipped with a replaceable, high-density paper air cleaner element. Check the air cleaner daily or before starting the engine. Check for and correct heavy buildup of dirt and debris along with loose or damaged components (Figure 12).

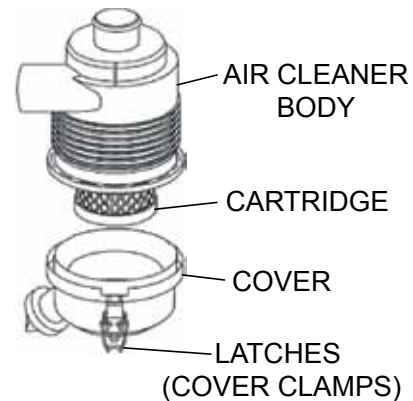


Figure 12. Air Cleaner Components

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

NOTICE

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

MAINTENANCE SCHEDULE

Daily (8-10 Hours)

1. Check the fluid levels in the engine and gearboxes, fill as necessary.
2. Check V-belt.

Weekly (30-40 Hours)

1. Relube arms, thrust collar and steering links.
2. Replace blades if necessary.
3. Check the engine air filter and change as necessary.
4. Replace engine oil and filter as necessary, see engine manual.

Monthly (100-150 Hours)

1. Remove, clean, reinstall and relube the arms and thrust collar. Adjust the blade arms.
2. Replace gearbox lubricant after the first 100 hours of operation. Replace every 500-600 hours.
3. Check drive belt for excessive wear.

Yearly (500-600 Hours)

1. Check the arm bushings, thrust collar bushings, shaft seals and belts. Replace if necessary
2. Check pitch control cables for wear.

ENGINE OIL AND FILTER

1. Change the engine oil and filter after the first 5 hours of use, then change oil every 6 months or 150 hours.
2. Remove the oil filler cap (Figure 5), and fill engine crankcase with recommended type oil as listed in Table 5. Fill to the upper limit of dipstick.
3. Crankcase oil capacity with oil filter replacement is 6.72 qts. (7.4 liters).

Oil Filter (300 Hours)

1. Replace the engine oil filter (Figure 13) every other oil change or 300 hours. Refer to your engine manual for specific details to perform this operation.

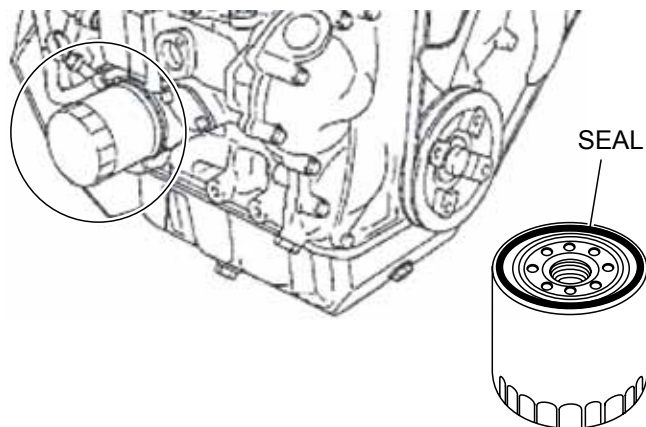


Figure 13. Oil Filter

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

Table 5. Recommended Viscosity Grades	
°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	

FUEL FILTER

Replace the engine fuel filter (Figure 14) every 800 hours. Refer to your engine manual for specific details to perform this operation.

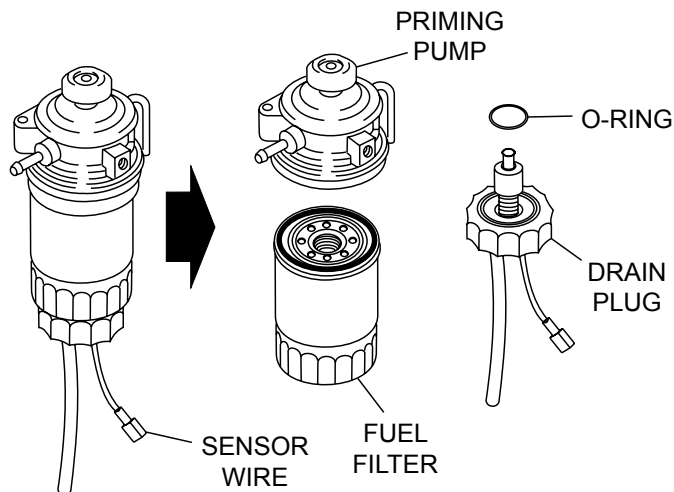


Figure 14. Fuel Filter

OIL AND FUEL LINES

- Check the oil and fuel lines and connections regularly for leaks or damage. Repair or replace as necessary.
- Replace the oil and fuel lines every two years to maintain the line's performance and flexibility.

RADIATOR/COOLING SYSTEM

WARNING




Hot coolant can cause severe burns. **DO NOT** remove cap if radiator is **HOT**.


1. Check and clean radiator fins.
2. Check cooling water.
3. Check radiator hoses for fatigue or cracking.
4. Check radiator cap seal.


Refer to your engine manual for additional information.

BATTERY/CHARGING SYSTEM

! DANGER

 Flammable, explosive gas. (produces hydrogen gas while charging or during operation). Keep area around battery well ventilated and keep from any fire source.

 Battery electrolyte contains corrosive, toxic chemical. (dilute sulfuric acid). Avoid contact with eyes and skin.

 Shock or fire due to electric short-circuit. Disconnect battery cables before inspecting electrical system and never “spark” battery terminals to test for charge.

1. Check and clean battery terminals for corrosion.
2. Check and keep battery electrolyte between upper and lower limits indicated on the battery. Never operate or recharge without sufficient fluid in the battery.
3. Never attempt to charge a battery that is frozen. The battery can explode unless first allowed to thaw.
4. Disconnect the negative terminal (-) of the battery during storage. If unit will be stored where ambient temperature will drop to -15°C or less, remove and store battery in a warm, dry place.

LONG TERM STORAGE

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

! CAUTION

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

ENGINE TUNE-UP

See the engine manual supplied with your machine for specific information on tuning up your engine as well as appropriate maintenance schedule and troubleshooting guide for problems.

MAINTENANCE (OLD STYLE CLUTCH)

NOTICE

This section is intended to aid users in the maintenance of drive assemblies with an old style Comet clutch.

CHECKING THE DRIVE BELT

The drive belt needs to be changed as soon as it begins to show signs of wear. **DO NOT** reuse a belt under any circumstances. Indications of excessive belt wear are fraying, squealing when in use, belts that emit smoke or a burning rubber smell when in use.

Under normal operating conditions, a drive belt may last approximately 150 hours. If your trowel is not reaching this kind of life span for drive belt wear, check the drive belt for proper pulley alignment and spacing .

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

WARNING



DO NOT attempt to insert hands or tools into the belt area while the engine is running and the safety guard has been removed. Keep fingers, hands, hair and clothing away from all moving parts to prevent bodily injury.

WARNING



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

REMOVING THE DRIVE BELT

- Leave the existing drive belt intact until instructed to cut it.
- Leave the engine in place for this procedure. It is not necessary to slide the engine to replace the drive belt.
- Have a 3/4 x 1 x 3-1/4 inch wooden block available.

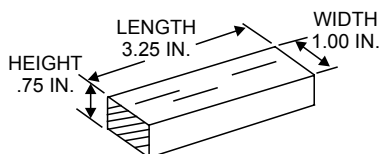


Figure 15. Wooden Block for Spacer

1. Remove Drive Belt Guard Cover. See Figure 16.

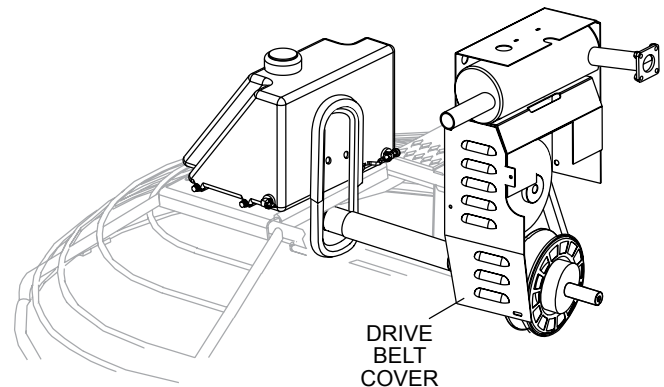


Figure 16. Drive Belt Cover

2. Squeeze the drive belt as shown in Figure 17, and pull the belt upwards. This will spread open the faces of the lower drive pulley.

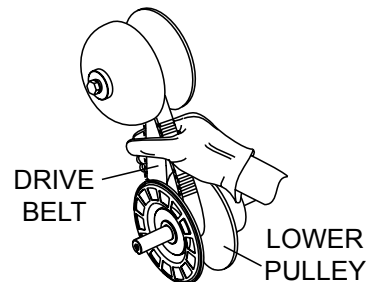


Figure 17. Expanding Lower Drive Pulley

3. Insert the wooden block (Figure 17) between the moveable face and the fixed face of the lower drive pulley. See Figure 20. This block will help keep the lower drive pulley faces open while installing the new drive belt.

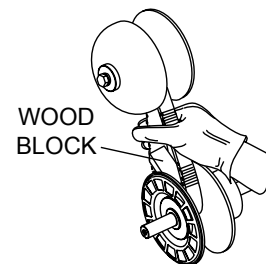


Figure 18. Wood Block

4. If the belt is not being reused (recommended), CUT the drive belt. Ensure all belt remnants are removed from the pulleys.

MAINTENANCE (OLD STYLE CLUTCH)

INSTALLING DRIVE BELT (USING REPLACEMENT DRIVE BELT)

The HHN31V Ride-On Power Trowel is equipped with a replacement drive belt (spare) carrier, which is mounted on the inboard side of the fuel tank near the clutch. Make sure that there is **ALWAYS** a spare drive belt in the drive belt carrier before the trowel is placed on a slab to finish concrete.

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

1. If necessary, refer to the "Removing the Drive Belt" section. Ensure all remnants of old belt have been removed from pulleys.
2. To replace the drive belt with the spare drive belt, remove the 2 bolts that secure the drive belt carrier. (Figure 19) This will allow free movement of the belt for installation. Take care with to not contaminate the replacement belt with grease or dirt.
3. With the wood block holding the lower pulley open, place the replacement belt into the lower pulley first. Work the belt over the upper drive pulley into the pulley groove.
4. Squeeze the belt enough to remove the wood block. With the block removed, release the tension on the belt.
5. Reinstall the spare belt carrier and the drive belt guard.
6. Replace the spare belt before the next trowel use. See "Spare Drive Belt Replacement" procedure.

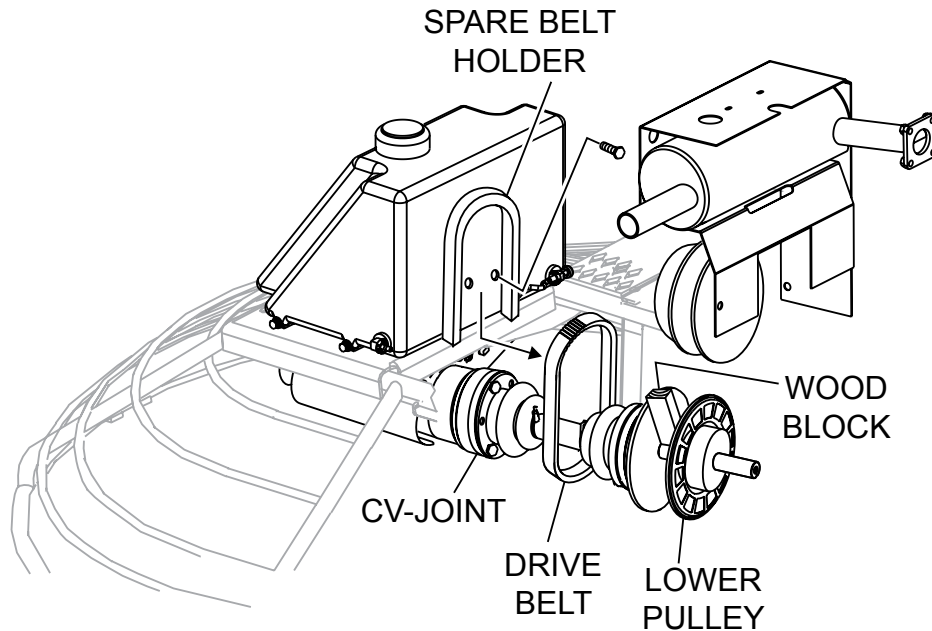


Figure 19. Installing Drive Belt

MAINTENANCE (OLD STYLE CLUTCH)

SPARE DRIVE BELT REPLACEMENT

To replace a spare drive belt, be prepared to disconnect the CV-joint from the left-side gearbox. See Figure 20.

1. Place the trowel on suitable supports and observe all safety precautions.
2. Remove the three screws that secure the CV-joint to the left-side gearbox coupler.
3. Once the CV-joint has been separated from the left-side gearbox, push the CV-joint inward so that a gap exists between the gearbox and the CV-joint. Slide the spare V-belt between the gearbox coupler and the CV-joint. Avoid contaminating the replacement belt with grease or oil when sliding it between the CV-Joint and gearbox coupler.
4. Place the spare drive belt inside the drive belt carrier, and secure the spare belt carrier to the inboard side of the left gearbox.
5. Install the three screws that secure the CV-joint to the left-side gearbox coupler.

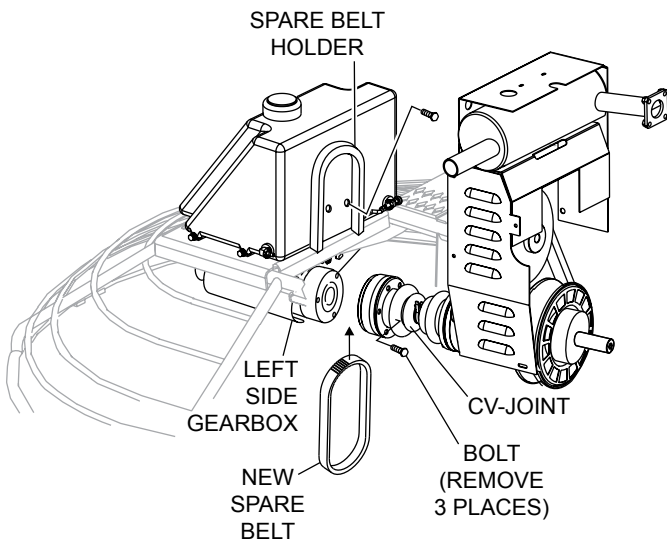


Figure 20. Replace Spare Belt

TORQUE CONVERTER

The HHN31V trowel is equipped with a Torque Converter which supplies torque to both the left and right gear boxes.

The function of the a torque converter is to automatically deliver the correct amount of torque required by the trowel under all load conditions. This enables the trowel to deliver the necessary torque for float pan applications and the high rotor speeds required for burnishing concrete.

The torque converter is of the variable pitch pulley type, (Figure 21) connected by a drive belt.

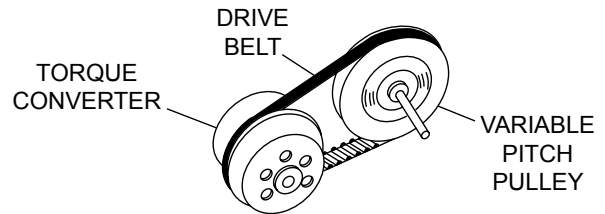


Figure 21. Torque Converter/Variable Pitch Pulley

DRIVE PULLEY

The drive pulley uses centrifugal force (Figure 22 and Figure 23) to create a belt squeeze force transmitted at the pulley faces. This condition functions as an automatic clutch.

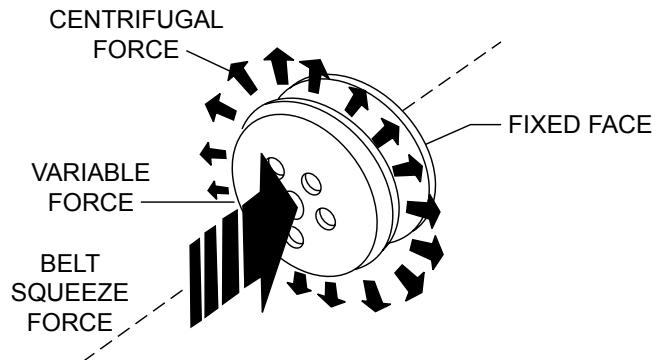


Figure 22. Torque Converter (Centrifugal Force)

MAINTENANCE (OLD STYLE CLUTCH)

As shown in Figure 22, centrifugal force pushes the roller arms (Figure 23) against the ramp plate, forcing the moveable face toward the fixed face and squeezing the belt

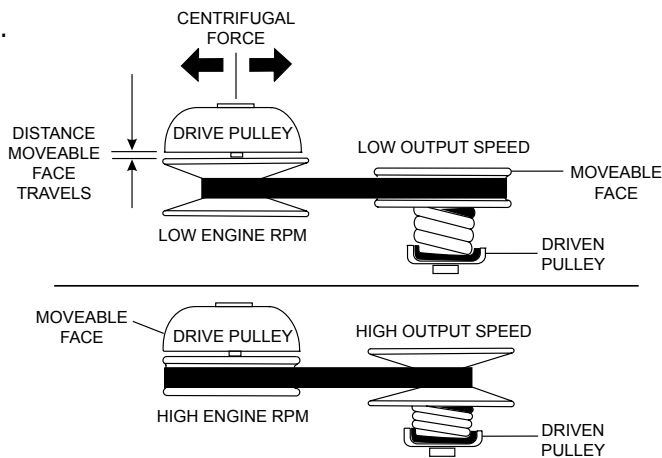


Figure 23. Pulley Interaction

The “Variable Pitch Pulleys” have one fixed face, and one moveable face. The drive pulley (Figure 24) moveable face is controlled by roller weight arms and springs, which change position according to engine speed. The driven pulley moveable face is controlled by a spring and belt tension.

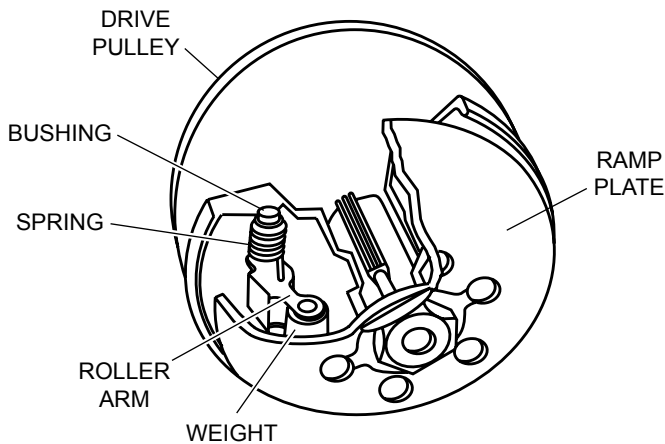


Figure 24. Variable Pitch Pulley

HOW IT WORKS

Refer to Figure 25.

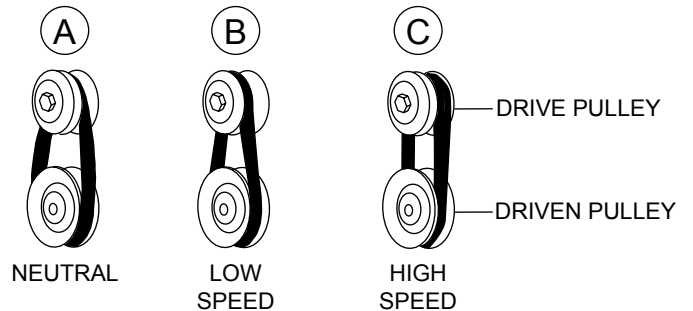


Figure 25. Pulley Conditions

Condition A:

- Engine Idling
- Drive Pulley: Small
- Belt: Loose and Stationary

Condition B:

- Engine Accelerating
- Drive Pulley: Small But Increasing
- Driven Pulley: Large But Decreasing
- Belt: Approaching Tightness

Condition C:

- Engine At High Speed
- Drive Pulley: Large
- Driven Pulley: Small
- Belt: Tight

MAINTENANCE (OLD STYLE CLUTCH)

CLUTCH

This clutch system provides a high pulley ratio (a low gear- so to speak) to start out and a low pulley ratio (a high gear- so to speak) for a high speed operation, with infinite variation between the two.

This means that it will not be necessary to give full throttle in order to “break the blades/pans loose”. The machine can slowly be brought up to speed.

The torque sensitive pulley (Figure 26) utilizes a spring and cam bracket. Peak performance results from proper interaction between the driven pulley spring and the ramp angle of the cam bracket.

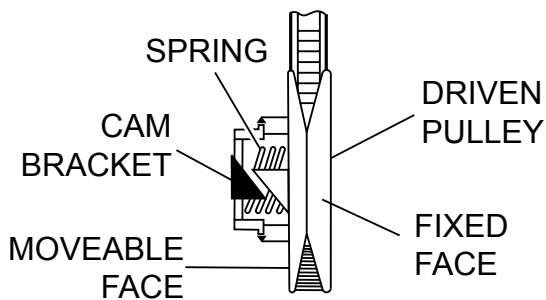


Figure 26. Pulley Spring and Cam Bracket

NOTICE

If replacement of the clutch is required, use clutch replacement kit, P/N 22581, to upgrade to Multi-Clutch system. New style drive assembly must be installed per instruction sheet, P/N 23444, included with clutch replacement kit.

Old style Comet clutch is no longer available. Multi-Clutch components are not interchangeable with the prior Hoffco Comet drive system. The Hoffco Comet CVT system must be replaced for compatibility with the new equipment.

MAINTENANCE (NEW STYLE CLUTCH)

NOTICE

This section is intended to aid users in the maintenance of drive assemblies with a new style Multi-Clutch.

CHECKING THE DRIVE BELT

The drive belt needs to be changed as soon as it begins to show signs of wear. **DO NOT** reuse a belt under any circumstances. Indications of excessive belt wear are fraying, squealing when in use, belts that emit smoke or a burning rubber smell when in use.

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

WARNING



DO NOT attempt to insert hands or tools into the belt area while the engine is running and the safety guard has been removed. Keep fingers, hands, hair and clothing away from all moving parts to prevent bodily injury.

WARNING



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

BELT MEASUREMENT

Long life can be expected with this new drive assembly as long as the belt is kept properly aligned.

The clutch will not shift correctly if the belt width is below 1.14". Measure the CVT belt every 100 hours of use to make sure it is within the specified tolerance. See Figure 27.

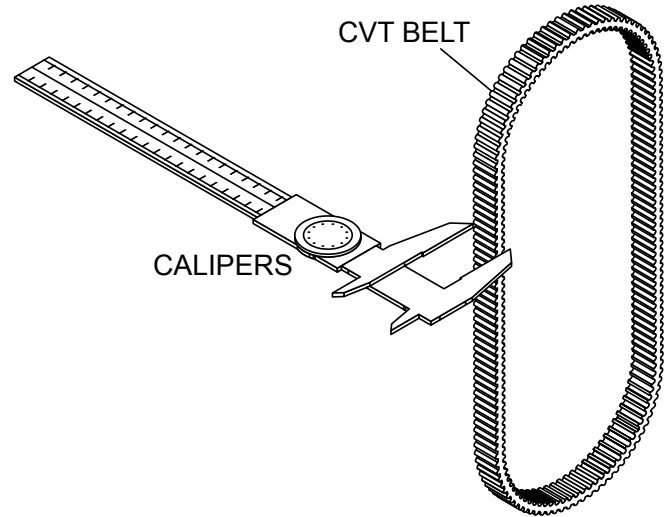


Figure 27. Belt Measurement

MAINTENANCE (NEW STYLE CLUTCH)

REMOVING THE DRIVE BELT

1. Remove Drive Belt Cover. See Figure 16.
2. Disconnect the left-side CV Axle from the left-side gearbox and the lower drive pulley coupler. See Figure 28.

NOTICE

Note that the 3 bolts securing the CV axle to the coupler are shorter than those securing the CV axle to the gearbox. Remember bolt orientation for reassembly.

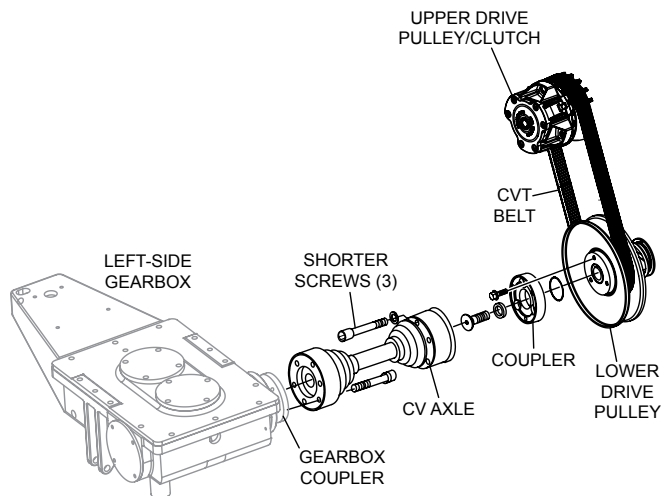


Figure 28. Remove Left-Side CV Axle

3. If the belt is not being reused (recommended), CUT the drive belt. Ensure all belt remnants are removed from the pulleys.

INSTALLING DRIVE BELT

1. Place new CVT belt over the lower pulley. Squeeze the belt (Figure 29) and pull the belt upwards and towards the rear of the trowel. This will spread open the faces of the lower drive pulley.

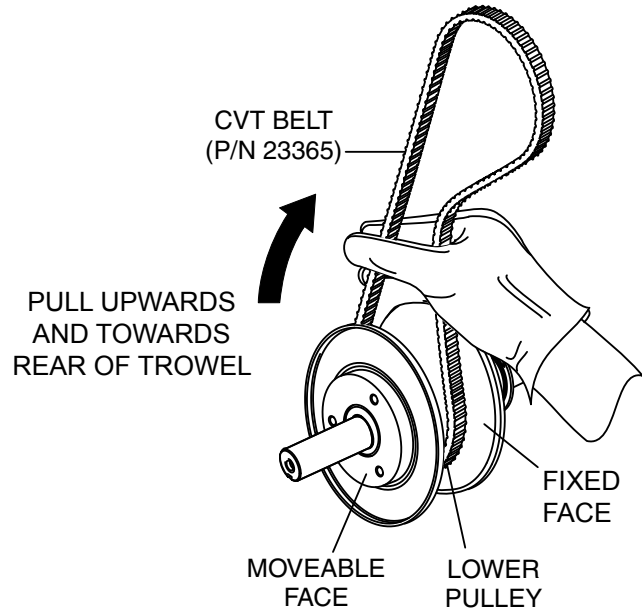


Figure 29. Holding Lower Pulley Open

2. Place free end of CVT belt into upper pulley grooves.

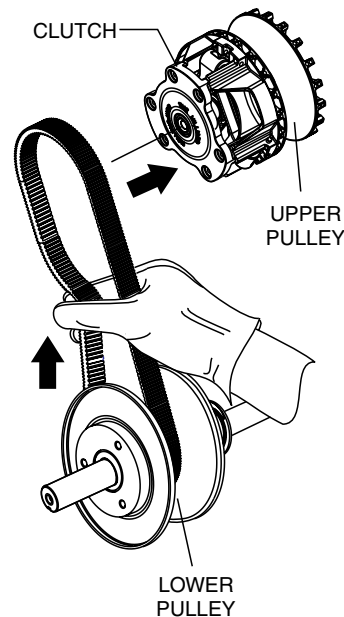


Figure 30. Upper Pulley Belt Installation

3. Reconnect left-side CV Axle Assembly. to the left side gearbox and lower drive pulley coupler. See Figure 28.

MAINTENANCE (NEW STYLE CLUTCH)

HOW IT WORKS

The Multi-Clutch functions much like a standard CVT system. As the engine RPM's increase, the drive or primary clutch closes, forcing the belt to ride outwards on the drive sheaves. The closing of the drive clutch also forces the belt to open the driven or secondary sheaves. The opening and closing of these sheaves creates a ratio variation... hence CVT or Continuously Variable Transmission.

Belt protection is achieved within the Multi-Clutch through the use of a series of centrifugal clutches. While most CVT systems have a loose or slack belt while the engine idles, the sheaves of those systems are constantly rotating and wearing on the belt.

Those systems also require the stationary belt to be pinched by the constantly rotating sheaves during startup. The relative rotation of the sheaves to the belt causes unnecessary wear on the belt. With traditional CVT systems, wear on the belt happens any time the engine is idling and at every start up of the driven equipment. This is where the Multi-Clutch differs from the other CVT's.

The Multi-Clutch utilizes two centrifugal clutches (the starter clutch system) to drive the sheaves of the drive (primary) clutch. What that means is that the belt can remain tight in the sheaves, and that both the sheaves and the belt are stationary while the vehicle is idling. This eliminates the belt wear at an idle, and during start up, while also providing one additional form of belt protection.

The centrifugal clutches (starter clutch) can act as overload protection as well. In cases where too much torque is trying to be transmitted to the belt, the centrifugals can slip before the maximum load on the belt is achieved. What this means is that instead of the belt slipping on the sheaves during an overload, the centrifugals will first slip further protecting the belt from damage.

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

Single Pitch™

On a Single Pitch™ trowel each spider assembly can be pitched individually, forcing the operator to constantly make adjustments on each pitch tower.

Twin Pitch™

Trowels equipped with Twin Pitch™ controls may need to have blade pitch between the two sets of blades “synchronized”. If the blades need to be synchronized this is easily accomplished by performing the following procedure. Refer to Figure 31.

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

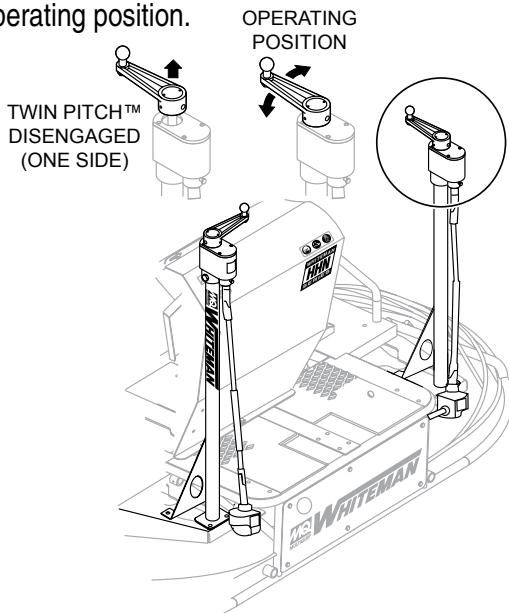


Figure 31. Pitch Towers

Blade Pitch Adjustment Procedure

Maintenance adjustment of blade pitch is made by adjusting a bolt (Figure 32) on the arm of the trowel blade finger. 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.

Look for the following indications if blades are wearing unevenly. If so, adjustment may be necessary.

- Is one blade completely worn out while the others look new?
- Does the machine have a perceptible rolling or bouncing motion when in use?
- Look at the machine while it is running, do the guard rings “rock up and down” relative to the ground?
- Do the pitch control towers rock back and forth?

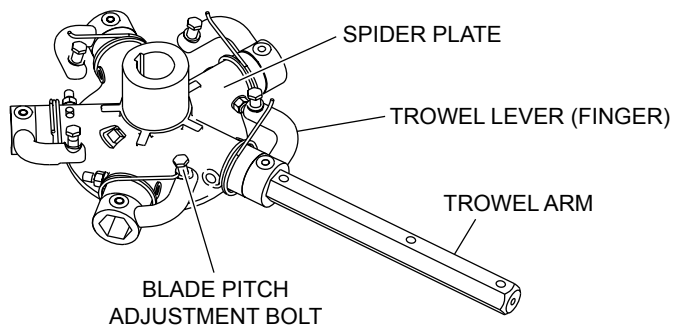


Figure 32. Blade Pitch Adjustment Bolt

The easiest and most consistent way to make adjustments on the trowel arm fingers is to use the Trowel Arm Adjustment Fixture (P/N 9177). It comes with all the hardware necessary to properly accomplish this maintenance and instructions on how to utilize this tool.

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

A better way to determine which blades need adjustment is to place the machine on a known FLAT surface (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 you can see that one of them is not making contact, some adjustment will be necessary.

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

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

If, after making Blade Pitch adjustments, the machine is still finishing poorly, blades, trowel arms, and trowel arm bushings may be suspect and should be looked at for adjustment, wear, or damage. See the following sections.

CHANGING BLADES

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

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

STEERING ADJUSTMENT

The steering assist adjustment should be performed only by qualified service technicians. For HHN34TVD steering adjustment instructions, reference MQ Whiteman service bulletin 200925.

CLEAN-UP

Never allow concrete to harden on the power trowel. Immediately after use wash any concrete off the trowel with water, be 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

Use the following procedure to check and adjust trowel arms, and check for worn or damaged components when it becomes apparent that the trowel is finishing poorly or in need of routine maintenance.

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

- Are blades wearing unevenly? Is one blade completely worn out while the others look new?
- Does the machine have a perceptible rolling or bouncing motion when in use?
- Look at the machine while it is running. Do the guard rings “rock up and down” relative to the ground?

1. Place the trowel in a FLAT, LEVEL area.

NOTICE

A level, clean area to test the trowel prior to and after is essential. Any unlevel spots in the floor or debris under the trowel blades will give an incorrect perception of adjustment. Ideally, a 5 x 5 Ft. (1.5 x 1.5 Meter) three-quarter inch (19 mm) thick FLAT steel plate should be used for testing.

2. Pitch the blades as flat as possible. The adjustment bolts should all barely make contact with the lower wear plate on the spider. If one is not making contact, adjustment will be necessary (Figure 34).

Figure 33 illustrates “incorrect alignment,” worn spider bushings or bent trowel arms. Check that the adjustment bolt is barely touching (0.10" max. clearance) lower wear plate. All alignment bolts should be spaced the same distance from the lower wear plate.

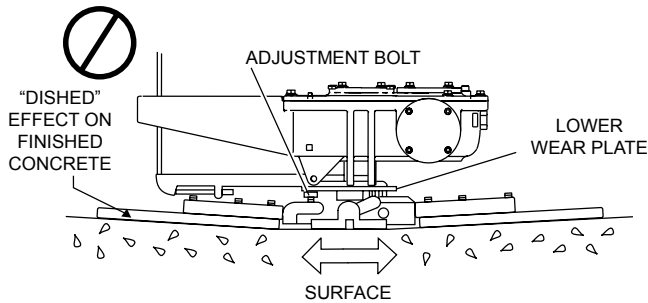


Figure 33. Incorrect Spider Plate Alignment

Figure 34 illustrates the “correct alignment” for a spider plate (as shipped from the factory).

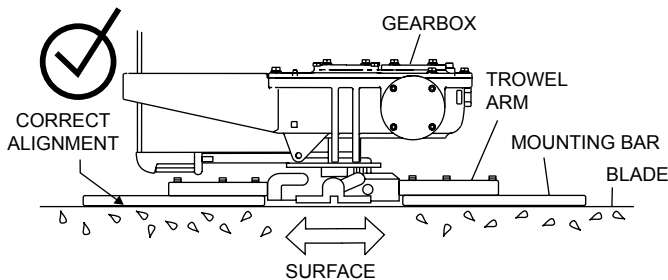


Figure 34. Correct Spider Plate Alignment

SPIDER REMOVAL

Remove the spider assembly from the gearbox shaft as follows:

1. Locate the cone point square head set screw (Figure 35) and attached jam nut found on the side of the spider assembly.
2. Loosen the jam nut and cone point square head set screw.
3. Carefully lift the upper trowel assembly off of the spider assembly. A slight tap with a rubber mallet may be necessary to dislodge the spider from the main shaft of the gearbox.

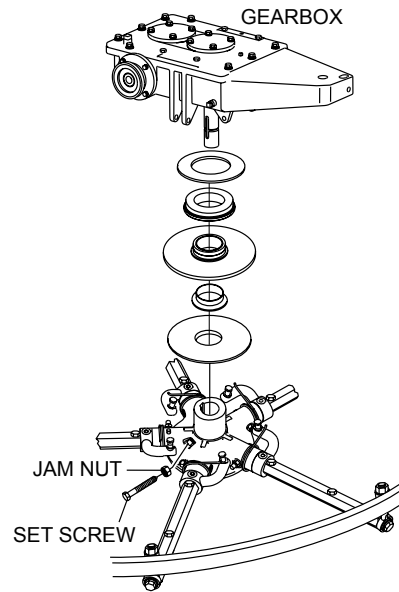


Figure 35. Spider Removal

TROWEL BLADE REMOVAL

Remove the trowel blades by removing the three hex head bolts (Figure 36) from the trowel arm. Set blades aside.

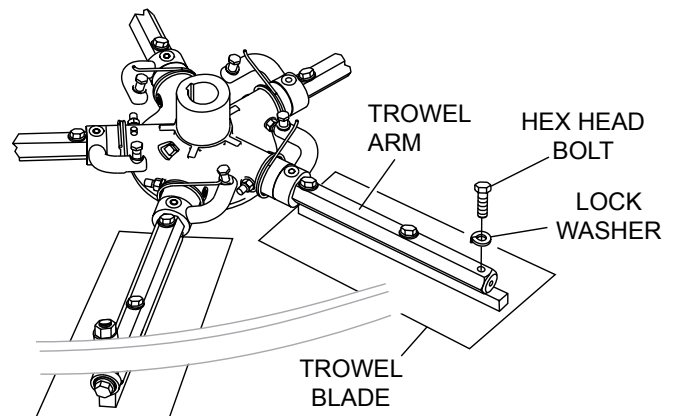


Figure 36. Trowel Blade Removal

TROWEL ARM REMOVAL

1. Remove the hardware securing the stabilizer ring to the trowel arm. (Figure 37)

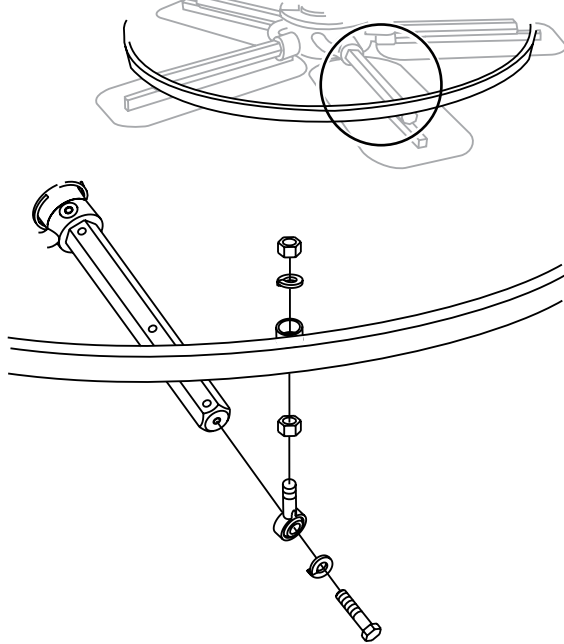


Figure 37. Stabilizer Ring

2. Each trowel arm is held in place at the spider plate by a hex head bolt (zerk grease fitting) and a roll pin. Remove both the hex head bolt and the roll pin (Figure 38) from the spider plate.
3. Remove the trowel arm from the spider plate.

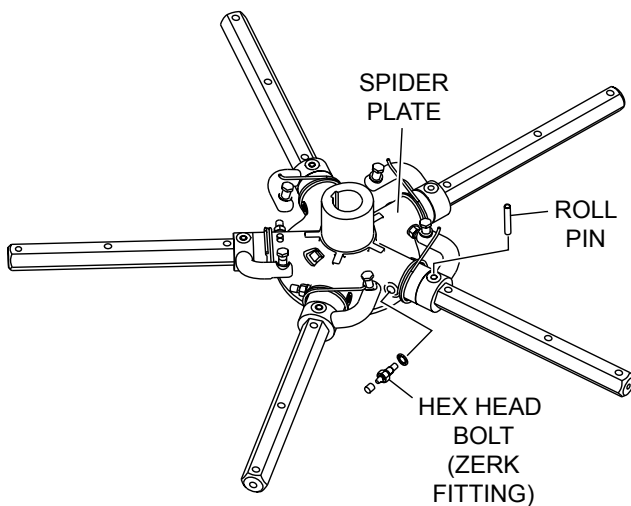


Figure 38. Remove Roll Pin and Zerk Fitting

4. Should the trowel arm inserts (bronze bushing) come

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.

5. Examine the bronze trowel arm bushing (Figure 39), and clean if necessary. Replace bushing if out-of-round or worn.

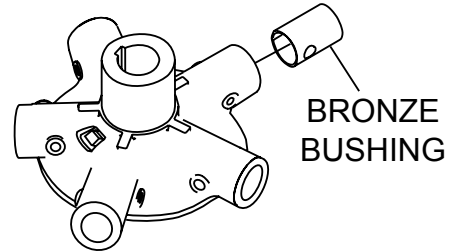


Figure 39. Bronze Bushings

6. Wire brush any build-up of concrete from all six sides of the trowel arm. Repeat this for the remaining arms.

CHECKING TROWEL ARM STRAIGHTNESS

Trowel arms can be damaged by rough handling, (such as dropping the trowel on the pad), or by striking exposed plumbing, forms, or rebar while in operation. A bent trowel arm will not allow the trowel to operate in a smooth fluid rotation. If bent trowel arms are suspect, check for flatness as follows, refer to Figures 38 and 39:

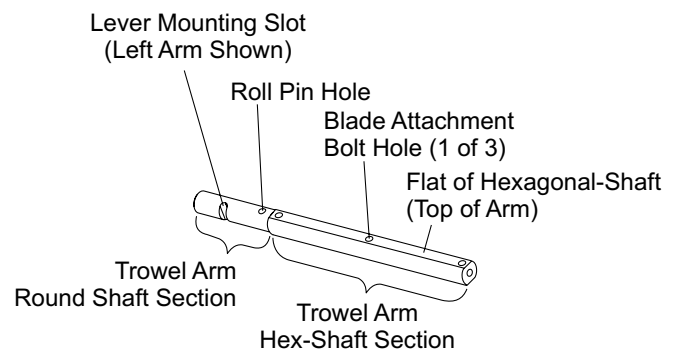


Figure 40. Trowel Arm

1. Use a thick steel plate, granite slab or any surface which is true and flat, to check all six sides of each trowel arm for flatness.
2. Check each of the six sides of the trowel arm (hex section). A feeler gauge of .004" (0.10 mm) should not pass between the flat of the trowel arm and the test surface along its length on the test surface. (Figure 41).

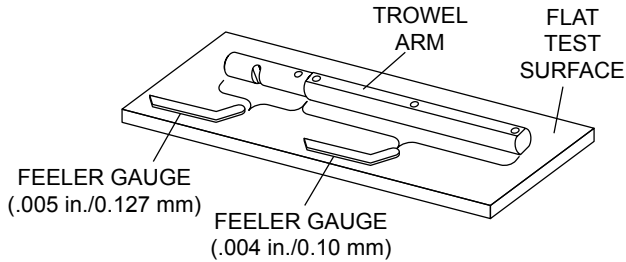


Figure 41. Checking Trowel Arm Flatness

- Next, check the clearance between the round shaft and the test surface as one of the flat hex sections of the arm rests on the test surface. Rotate the arm to each of the flat hex sections and check the clearance of the round shaft. Use a feeler gauge of .005" (0.127 mm). Each section should have the same clearance between the round of the trowel arm shaft and the test surface.
- If the trowel arm is found to be uneven or bent, replace the trowel arm.

TROWEL ARM ADJUSTMENT

Shown in (Figure 42) is the adjustment fixture with a trowel arm inserted. As each trowel arm is locked into the fixture, the arm bolt is adjusted to where it contacts a stop on the fixture. This will consistently adjust all of the trowel arms, keeping the finisher as flat and evenly pitched as possible.

- Locate the trowel arm adjustment tool P/N 9177.

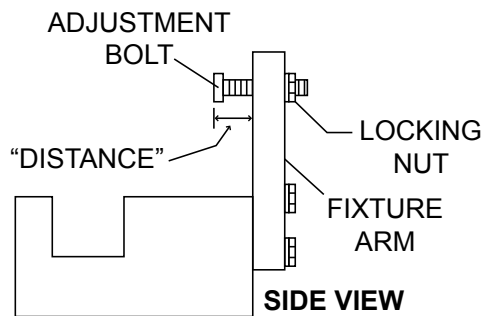


Figure 42. Trowel Arm Adjustment Tool Side View

- Ensure the fixture arm is in the proper setting (up or down) for your trowel arm rotation as shown in Figure 43.

NOTICE

Arms with CLOCK-WISE blade rotation use the fixture arm in the UP position (Figure 43, A). Arms with COUNTER CLOCK-WISE blade rotation use the fixture with the fixture arm in the DOWN position (Figure 43, B).

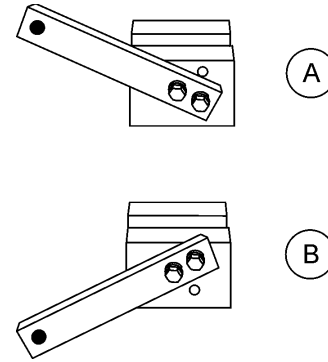


Figure 43. Trowel Arm Adjustment Setup

- Unscrew the locking bolts on the adjustment tool and place the trowel arm into the fixture channel as shown in Figure 44. A thin shim may be required to cover the blade holes on the trowel arm. Make sure to align the trowel adjustment bolt with the fixture adjustment bolt.

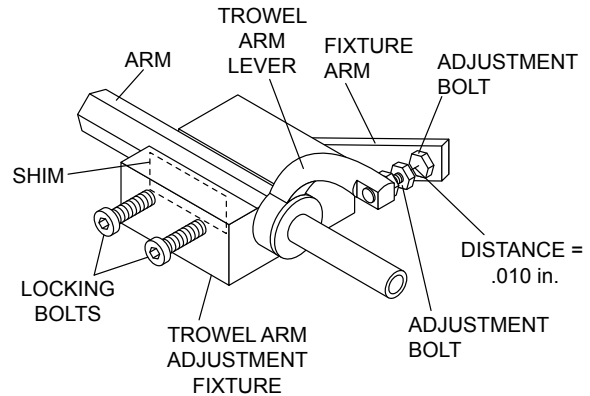


Figure 44. Trowel Arm Adjustment Fixture Components



- Use an allen wrench to tighten the locking bolts securing the trowel arm in place.
- Adjust the bolt "distance" shown in Figure 44 to match one of the arms. The other arms will be adjusted to match this distance.
- 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.
- Once the correct adjustment is made, tighten the lock nut on the trowel arm to lock in place.
- Loosen locking nuts on the adjustment fixture, and remove trowel arm.
- Repeat steps for the remaining trowel arms.

REASSEMBLY

1. Clean and examine the upper/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 found to be 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. Re-install 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

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 in embedding large aggregates and surface hardeners.

 WARNING	
	DO NOT lift the trowel when the pans are attached.
	ALWAYS install pans either on the work area or on an area that is next to and level with the work area.

Refer to Figure 43 when installing pans onto finisher blades.

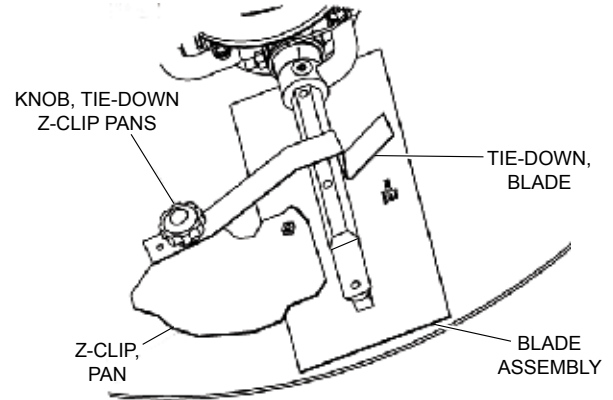


Figure 45. Z-Clip Finisher Pan Installation

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 as shown in Figure 45.
4. Check to make certain that 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.

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 take place:

1. Drain all fluids completely. These may include oil, gasoline, hydraulic oil and antifreeze. Dispose of 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 that contain sulfuric acid.
3. The remainder can be brought to a salvage yard or metal reclamation facility for further dismantling.

TROUBLESHOOTING

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 than 3.5 inches (89mm). Trailing edge of blade should be straight and parallel to the blade bar.
	Pitch Adjustment?	Check that all blades are set at the same pitch angle as measured at the spider. A field adjustment tool is available for height adjustment of the trowel arms (contact 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

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

TROUBLESHOOTING

Troubleshooting (Engine)		
Symptom	Possible Problem	Solution
Difficult to start, fuel is available, but no spark at spark plug.	Spark plug bridging?	Check gap, insulation or replace spark plug.
	Carbon deposit on spark plug?	Clean or replace spark plug.
	Short circuit due to deficient spark plug insulation?	Check spark plug insulation, replace if worn.
	Improper spark plug gap?	Set to proper gap.
	Fuel reaching carburetor?	Check fuel line.
	Water in fuel tank?	Flush or replace fuel tank.
	Fuel filter clogged?	Replace fuel filter.
	Stuck carburetor?	Check float mechanism.
	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, and replace with correct type of fuel.
	Water or dust in fuel system?	Flush fuel system.
	Air cleaner dirty?	Clean or replace air cleaner.
	Choke open?	Close choke.
Difficult to start, fuel is available, spark is present and compression is low.	Suction/exhaust valve stuck or protruded?	Reseat valves.
	Piston ring and/or cylinder worn?	Replace piston rings and/or piston.
	Cylinder head and/or spark plug not tightened properly?	Torque cylinder head bolts and spark plug.
	Head gasket and/or spark plug gasket damaged?	Replace head and spark plug gaskets.
No fuel present at carburetor.	No fuel in fuel tank?	Fill with correct type of fuel.
	Fuel cock does not open properly?	Apply lubricant to loosen fuel cock lever, replace if necessary.
	Fuel filter/lines clogged?	Replace fuel filter.
	Fuel tank cap breather hole clogged?	Clean or replace fuel tank cap.
	Air in fuel line?	Bleed fuel line.

TROUBLESHOOTING

Troubleshooting (Engine) - continued		
Symptom	Possible Problem	Solution
Weak in power, compression is proper and does not misfire.	Air cleaner dirty?	Clean or replace air cleaner.
	Improper level in carburetor?	Check float adjustment, rebuild carburetor.
	Defective spark plug?	Clean or replace spark plug.
	Improper spark plug?	Set to proper gap.
Weak in power, compression is proper but misfires.	Water in fuel system?	Flush fuel system and replace with correct type of fuel.
	Dirty spark plug?	Clean or replace spark plug.
	Ignition coil defective?	Replace ignition coil.
Engine overheats.	Spark plug heat value incorrect?	Replace with correct type of spark plug.
	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.

EXPLANATION OF CODE IN REMARKS COLUMN

The following section explains the different symbols and remarks used in the Parts section of this manual. Use the help numbers found on the back page of the manual if there are any questions.

NOTICE

The contents and part numbers listed in the parts section are subject to change **without notice**. Multiquip does not guarantee the availability of the parts listed.

SAMPLE PARTS LIST

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	12345	BOLT	1	INCLUDES ITEMS W/%
2%		WASHER, 1/4 IN.		NOT SOLD SEPARATELY
2%	12347	WASHER, 3/8 IN. ...	1	MQ-45T ONLY
3	12348	HOSE	A/R	MAKE LOCALLY
4	12349	BEARING	1	S/N 2345B AND ABOVE

NO. Column

Unique Symbols — All items with same unique symbol

(@, #, +, %, or >) in the number column belong to the same assembly or kit, which is indicated by a note in the “Remarks” column.

Duplicate Item Numbers — Duplicate numbers indicate multiple part numbers, which are in effect for the same general item, such as different size saw blade guards in use or a part that has been updated on newer versions of the same machine.

NOTICE

When ordering a part that has more than one item number listed, check the remarks column for help in determining the proper part to order.

PART NO. Column

Numbers Used — Part numbers can be indicated by a number, a blank entry, or TBD.

TBD (To Be Determined) is generally used to show a part that has not been assigned a formal part number at the time of publication.

A blank entry generally indicates that the item is not sold separately or is not sold by Multiquip. Other entries will be clarified in the “Remarks” Column.

QTY. Column

Numbers Used — Item quantity can be indicated by a number, a blank entry, or A/R.

A/R (As Required) is generally used for hoses or other parts that are sold in bulk and cut to length.

A blank entry generally indicates that the item is not sold separately. Other entries will be clarified in the “Remarks” Column.

REMARKS Column

Some of the most common notes found in the “Remarks” Column are listed below. Other additional notes needed to describe the item can also be shown.

Assembly/Kit — All items on the parts list with the same unique symbol will be included when this item is purchased.

Indicated by:

“INCLUDES ITEMS W/(unique symbol)”

Serial Number Break — Used to list an effective serial number range where a particular part is used.

Indicated by:

“S/N XXXXX AND BELOW”

“S/N XXXX AND ABOVE”

“S/N XXXX TO S/N XXX”

Specific Model Number Use — Indicates that the part is used only with the specific model number or model number variant listed. It can also be used to show a part is NOT used on a specific model or model number variant.

Indicated by:

“XXXXX ONLY”

“NOT USED ON XXXX”

“Make/Obtain Locally” — Indicates that the part can be purchased at any hardware shop or made out of available items. Examples include battery cables, shims, and certain washers and nuts.

“Not Sold Separately” — Indicates that an item cannot be purchased as a separate item and is either part of an assembly/kit that can be purchased, or is not available for sale through Multiquip.

SUGGESTED SPARE PARTS

HHN31V RIDE-ON POWER TROWEL WITH VANGUARD DM950 ENGINE

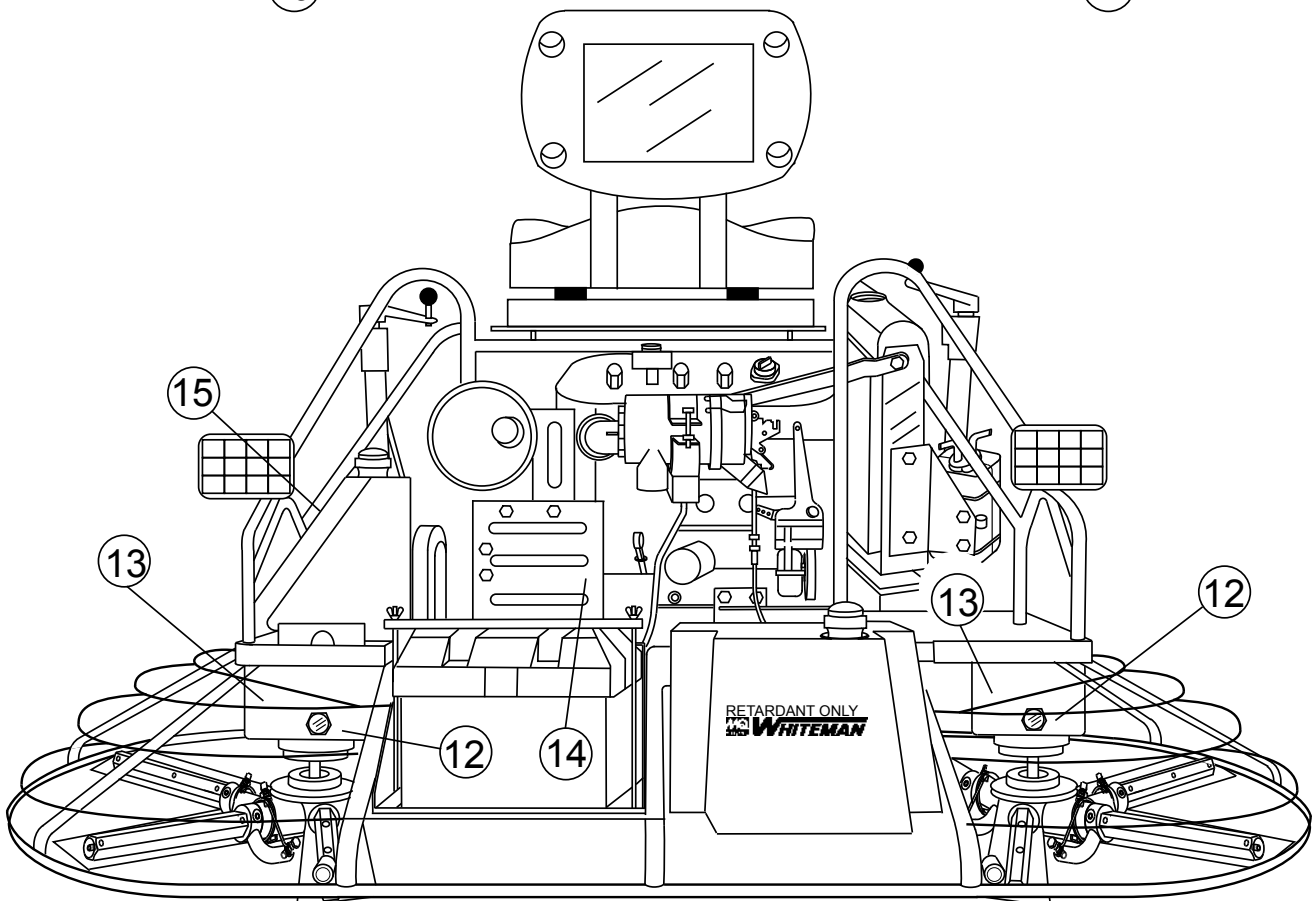
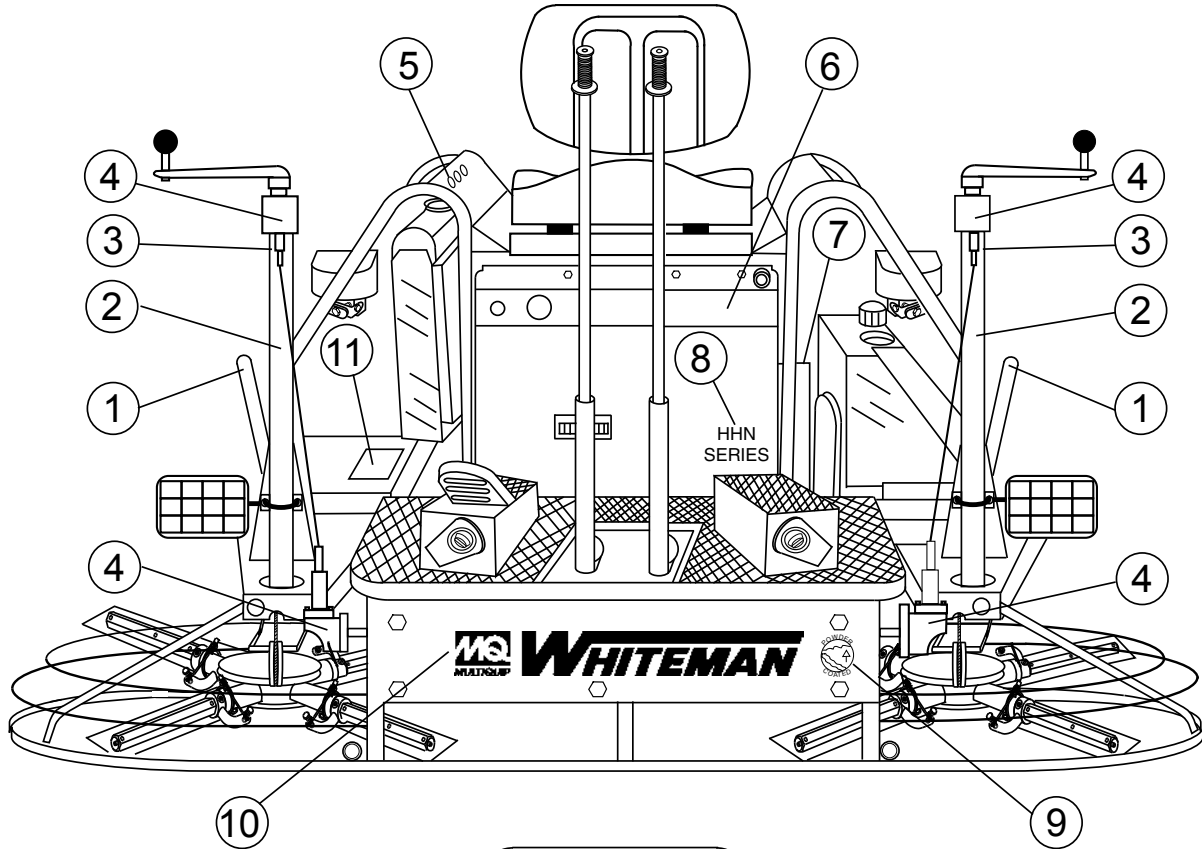
1 to 3 units

Qty.	P/N	Description	Qty.	P/N	Description
4.....	0189	HANDLE GRIP	1.....	2673	CIRCUIT BREAKER 30 AMP, 12V
4.....	2267	HANDLE GRIP (RIGHT SIDE)	2.....	4682	TOGGLE SWITCH
1.....	11430	SWITCH	2.....	8381	BOOT, TOGGLE SWITCH
2.....	12460	CABLE, PITCH	1.....	11792	ACCESSORY SOLENOID
1.....	1617	LEVER ASSY. TROWEL	4.....	11078	KEYS, IGNITION (SWITCH)
.....	.....	ADJUSTMENT	2.....	2655	HOUR METER
2.....	2737	KNOB ASSY.	2.....	9005	LEVER TROWEL ARM (L.S.)
1.....	10208	MUFFLER W/CLAMP	20.....	0166A.....	WASHER
1.....	10434	CLAMP	20.....	1876	JAM NUT
1.....	10463	CLAMP	20.....	0164B.....	SCREW
4.....	10937	BELT (B-37)	5.....	11039	BUSHING
1.....	11771	BRACKET ENGINE THROTTLE	2.....	9111	SPRING (L.S.)
.....	.....	CABLE	20.....	1875	WASHER
1.....	12168	HEADER PIPE	20.....	1322	SCREW ASSY., ARM RETAINING
1.....	2124	THROTTLE CABLE	2.....	12611	SPIDER PLATE
5.....	2829	ARMS	20.....	1162A.....	CAP GREASE FITTING
2.....	2124	CABLE THROTTLE (RT)	20.....	16602	SCREW (HHC 3/8 -16 X 3/8)
10.....	10031	WASHER 1/4 IN.	20.....	1456	NUT (3/8 -16)
2.....	11692	BRACKET BATTERY	20.....	12097	SCREW (SQH 3/8-16 X 1 3/4
2.....	11693	BOLT BATTERY	.....	.....	CONE)
6.....	2509	WING NUT	2.....	2143	SPRING (R.S.)
2.....	12548	SPRAY PUMP	2.....	1986	LEVER TROWEL ARM (R.S.)
2.....	2108	CAP SPRAY TANK	2.....	12005	SAFETY KILL SWITCH
2.....	10958	SWITCH, IGNITION	20.....	0181B.....	WASHER 1/4 IN
1.....	19301	TERMINAL STRIP (10-POLE)	2.....	11418	FUEL CAP/GUAGE
1.....	2580	CHOKE CABLE	20.....	4514	SCREW (HHC 1/4-20 X 5/8)

NOTICE

Part numbers on this Suggested Spare Parts list may supersede/replace the part numbers shown in the following parts lists.

NAMEPLATES AND DECALS

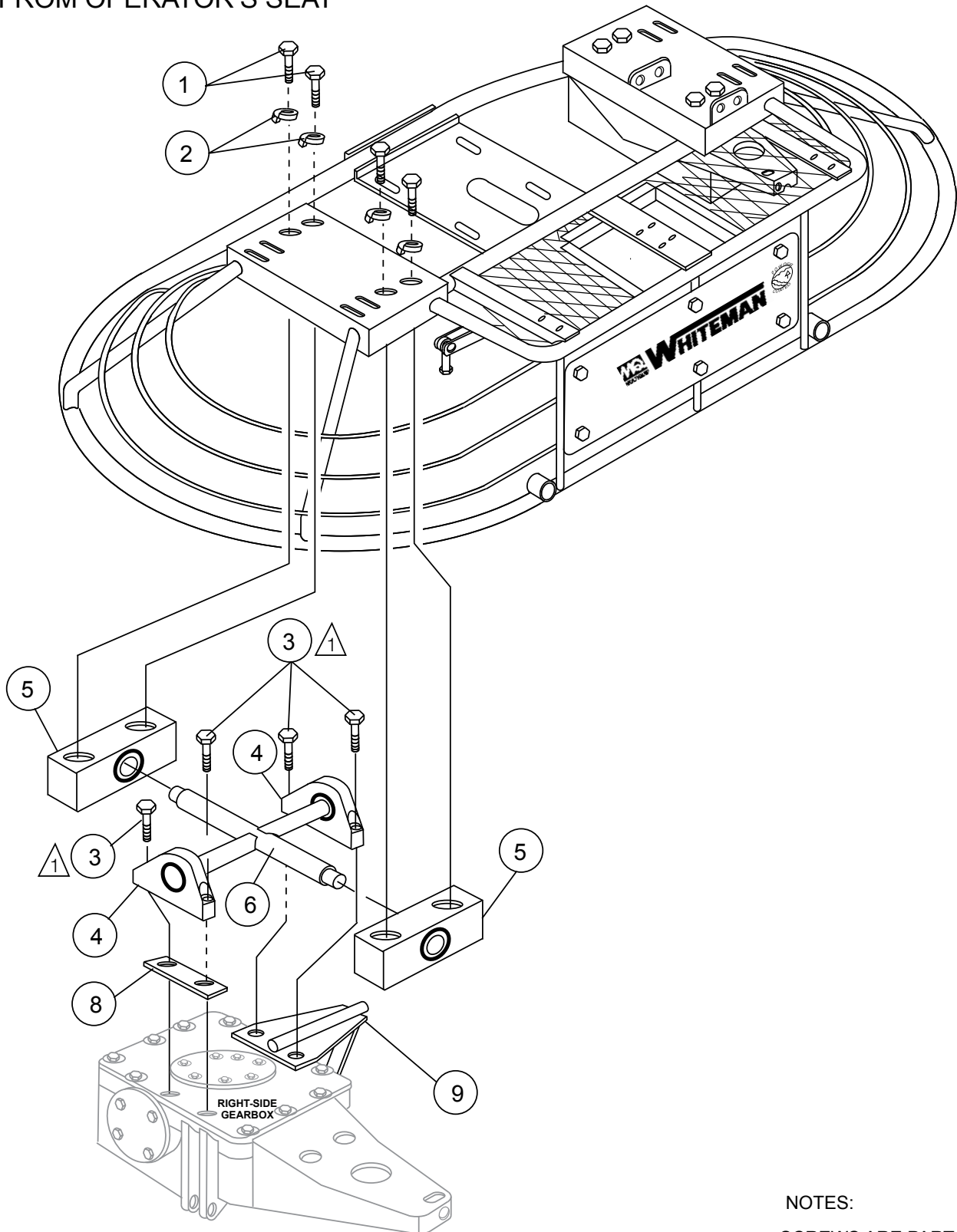


NAMEPLATES AND DECALS

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	11246	DECAL: LIFT.....	2.....	PART OF DECAL KIT12620
2	1499	DECAL: MQ WHITEMAN (RED/TOWER)	2	
3	2634	DECAL: DANGER (COMPRESSION)	2	
4	11246	DECAL: LUBRICATION	4.....	PART OF DECAL KIT12620
5	12571	DECAL: OPERATING LIGHTS	1	
6	11247	DECAL: HELMET, HAND AND FOOT	1.....	PART OF DECAL KIT12620
7	11246	DECAL: RADIATING HEAT	1.....	PART OF DECAL KIT12620
8	20198	DECAL: HHN SERIES	1	
9	13118	DECAL: POWDER COATED	1	
10	10818	DECAL: MQ WHITEMAN (WHITE/PANEL)	1	
11		DECAL: NAME PLATE.....	1.....	CONTACT MQ SERVICE DEPT W/ MODEL & S/N
12	11246	DECAL: CHECK HYDRAULIC OIL	2.....	PART OF DECAL KIT12620
13	11246	DECAL: GEAR DRIVE	2.....	PART OF DECAL KIT12620
14	11246	DECAL: BELT DRIVE.....	1.....	PART OF DECAL KIT12620
15	22088	DECAL, "ENGINE FUEL ONLY"	1	

PIVOT/GEARBOX (RIGHT SIDE) ASSY.

VIEW FROM OPERATOR'S SEAT



NOTES:

SCREWS ARE PART OF
RIGHT-SIDE GEARBOX
ASSEMBLY. TO ORDER
SCREWS USE P/N 9154

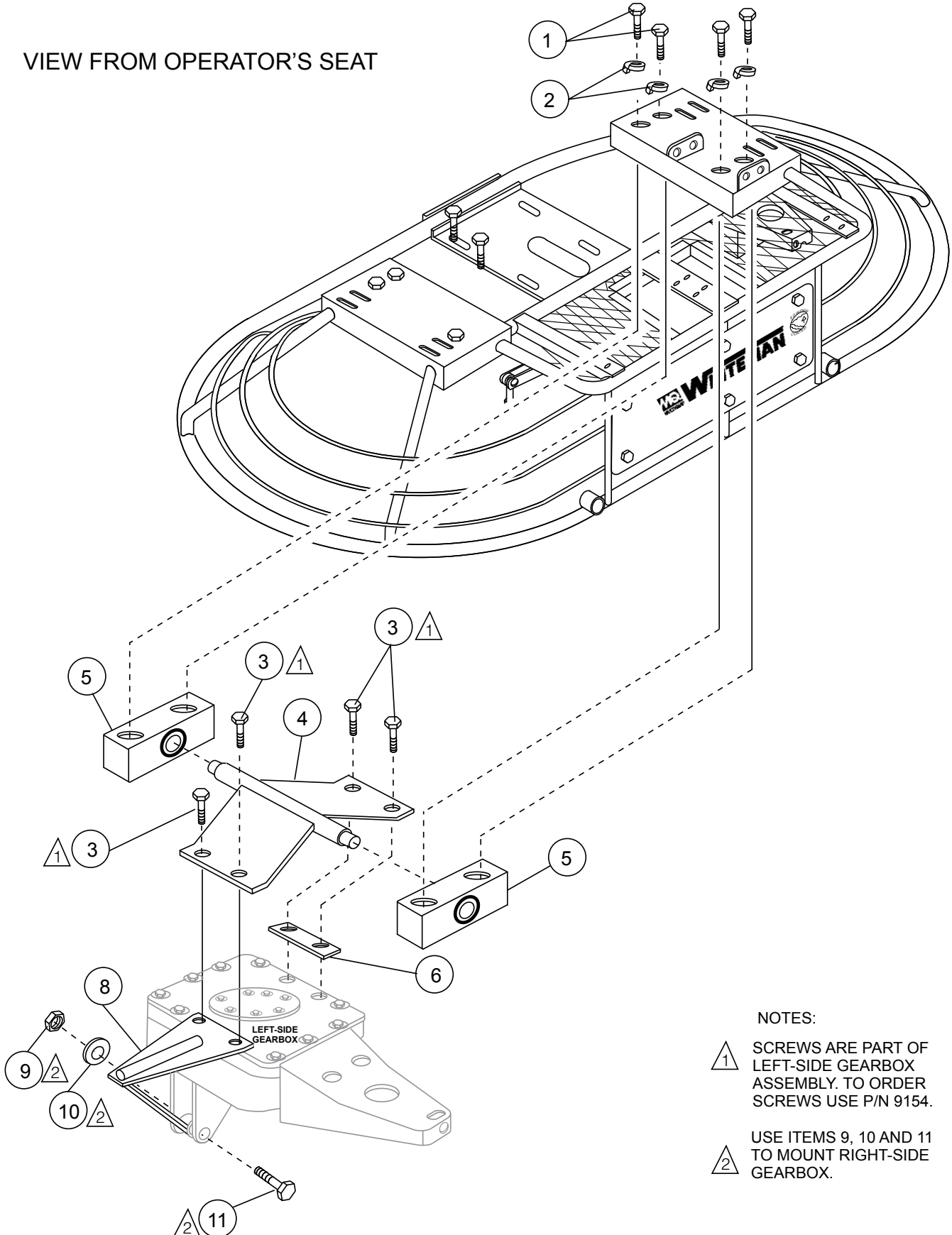


PIVOT/GEARBOX (RIGHT SIDE) ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	1023	SCREW, HHC 3/8 -16 X 1-1/4	8	
2	0166A	WASHER, LOCK 3/8 MED	8	
3	9154	SCREW.....	4.....	PART OF GEARBOX
4	12713	ROCKER BLOCK	2	
5	12725	BLOCK, ROCKER	2	
6	12716	TRUNNION W/A	1	
7	12704	GEARBOX, COMPLETE	1	
8	12859	PLATE G.B. SPACER	1	
9	12856	BRACKET, DIRECTION CONTROL	1	

PIVOT/GEARBOX (LEFT SIDE) ASSY.

VIEW FROM OPERATOR'S SEAT



NOTES:

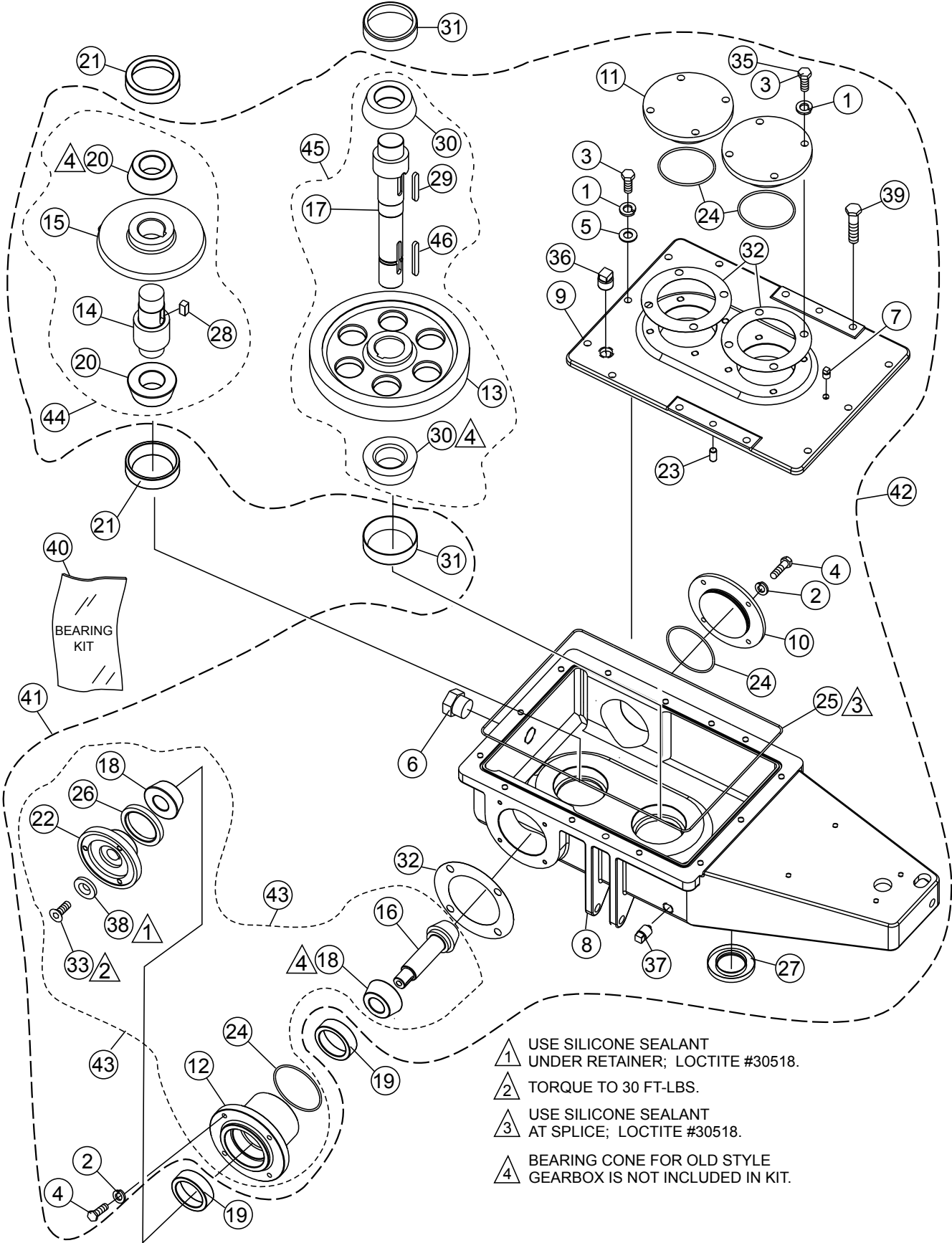
▲1 SCREWS ARE PART OF LEFT-SIDE GEARBOX ASSEMBLY. TO ORDER SCREWS USE P/N 9154.

▲2 USE ITEMS 9, 10 AND 11 TO MOUNT RIGHT-SIDE GEARBOX.

PIVOT/GEARBOX (LEFT SIDE) ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	1023	SCREW, HHC 3/8 -16 X 1-1/4	8	
2	0166A	WASHER, LOCK 3/8 MED	8	
3	9154	SCREW.....	4.....	PART OF GEARBOX
4	12719	PIVOT, GEAR BOX W/A	1	
5	12725	BLOCK, ROCKER	2	
6	12859	PLATE G.B. SPACER	1	
7	12703	GEARBOX, COMPLETE	1	
8	12856	BRACKET, DIRECTION CONTROL	1	
9	0176	NUT, NYLOC 1/2-13	2.....	USE ON RS GEARBOX
10	0447	WASHER, FLAT 1/2 SAE.....	2.....	USE ON RS GEARBOX
11	2549	SCREW, HHC 1/2-13 X3	2.....	USE ON RS GEARBOX

GEARBOX ASSY.



GEARBOX ASSY.

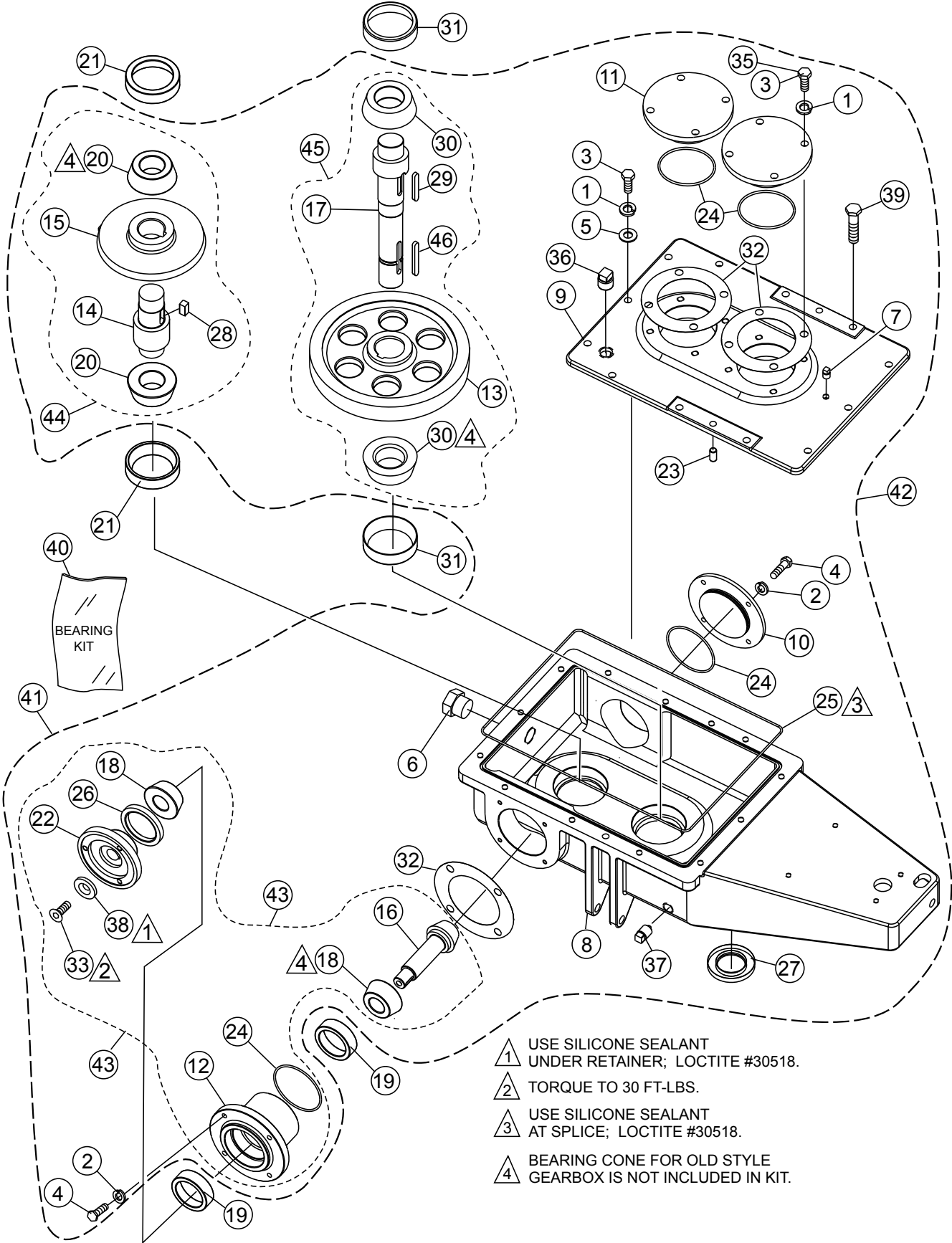
<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1◆\$	0166 A	WASHER, LOCK 3/8 MED	16	
1◇\$	10136	WASHER, FLAT SAE 3/8	16	
2◆\$	0181 B	WASHER, LOCK 1/4 MED	8	
2◇\$	0948	WASHER, FLAT SAE 1/4	8	
3◆\$	0205	SCREW, HHC 3/8-16 X 1	8	
3◇\$	0205	SCREW, HHC 3/8-16 X 1	16	
4◆\$	0730	SCREW, HHC 1/4-20 X 1	8	
4◇\$	2295	SCREW, HHC 1/4-20 X 7/8	8	
5◆\$	10136	WASHER, FLAT, 3/8 SAE	8	
6\$	11584	SIGHT GLASS, 3/4 MALE PIPE	1	
7\$	11682	FITTING, PLUG, 1/8 MP SQ HEAD	1	
8◆\$	12599	GEARBOX HOUSING	1	
8◇\$	21812	GEARBOX HOUSING	1	
9◆\$	12600	COVER, GEAR BOX	1	
9◇\$	21811	COVER, GEAR BOX	1	
10◆\$	12601	CAP, GEARBOX INPUT	1	
10◇\$	21813	CAP, HELICAL GEARBOX INPUT	1	
11◆\$	12602	CAP, GEARBOX IDLER	2	
11◇\$	21810	CAP, HELICAL GEARBOX IDLER	2	
12\$%	21809	HUB, INPUT SHAFT	1	
13\$+	21808	GEAR, 85T HELICAL	1	
14\$@	21807	PINION, 17T HELICAL	1	
15\$@	21806	GEAR, 60T HELICAL	1	
16\$%	21805	PINION, 15T BEVEL	1	
17\$+	21804	SHAFT, OUTPUT	1	
18◆	12691	BEARING, CONE TIMKEN #M84249	2	
18◇\$%	21803	BEARING, CONE SKF 32305 J2	2	
19◆	12692	BEARING, CUP TIMKEN #M84210	2	
20◆	12693	BEARING, CONE TIMKEN #2793	2	
20◇\$@	21802	BEARING, CONE SKF 32307 J2	2	
21◆	12694	BEARING, CUP TIMKEN #2729	2	
22\$%	12696	COUPLER, GEARBOX	1	
23\$	12697	PIN, DOWEL 0.375/.3752 X 3/4	2	
24\$%#	12698	O RING, SIZE - 151 BUNA N	4	

NOTICE

◆ S/N BI0203468 AND BELOW

◇ BI0203469 AND ABOVE, AND S/N BH0203412

GEARBOX ASSY.



GEARBOX ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
25\$#	12700	SEAL, CASE O-RING HHN 0.103 X 46.38	1	
26\$%#	12701	SEAL, NATIONAL #471424	1	
27\$#	12702	SEAL, NATIONAL #470682	1	
28\$@	12735	KEY, 3/8 X 3/4	1	
29\$+	12736	KEY, HARDENED 3/8 X 1-1/2	1	
30◆	12796	BEARING, CONE TIMKEN #26882	2	
30◇\$+	21801	BEARING, CONE SKF 33109 Q	2	
31◆	12797	BEARING, CUP TIMKEN #26823	2	
32◆\$	20932	SHIM, INPUT. 0.002 THICK	3	
32◇\$	21800	SHIM, INPUT. 0.002 THICK	3	
33\$%	1313	SCREW, FHSC 3/8 - 24 X 3/4 PLAIN	1	
34\$%	26034	KEY, 3/16 X 17/32	1	
35◆\$	4196	SCREW, HHC 3/8 - 16 X 3/4	8	
36\$	911064	FITTING, PLUG 1/2 MP SQ HEAD	1	
37\$	911329	FITTING, PLUG 3/8 MP MAGNETIC	2	
38\$%	9120	RETAINER, DRIVEN PULLEY	1	
39\$	9154	SCREW, HHC 3/8 - 16 X 1-3/4	4	
40◆	20933	KIT, BEARING/SEAL HHN HELICAL.....	1	INCLUDES ITEMS W/ #
41	21854	GEARBOX ASSY., RIGHT	1	INCLUDES ITEMS W/ \$
42	21853	GEARBOX ASSY., LEFT.....	1	INCLUDES ITEMS W/ \$
43	21853854INPUT	KIT, INPUT PINION/HUB/COUPLER.....	1	INCLUDES ITEMS W/ %
44	21853854INTER	KIT, INTER PINION/GEAR	1	INCLUDES ITEMS W/@
45	21853854OUTER	KIT, OUTPUT SHAFT/GEAR.....	1	INCLUDES ITEMS W/ +
46◇\$	12687	KEY, 3/8 SQ X 2	1	

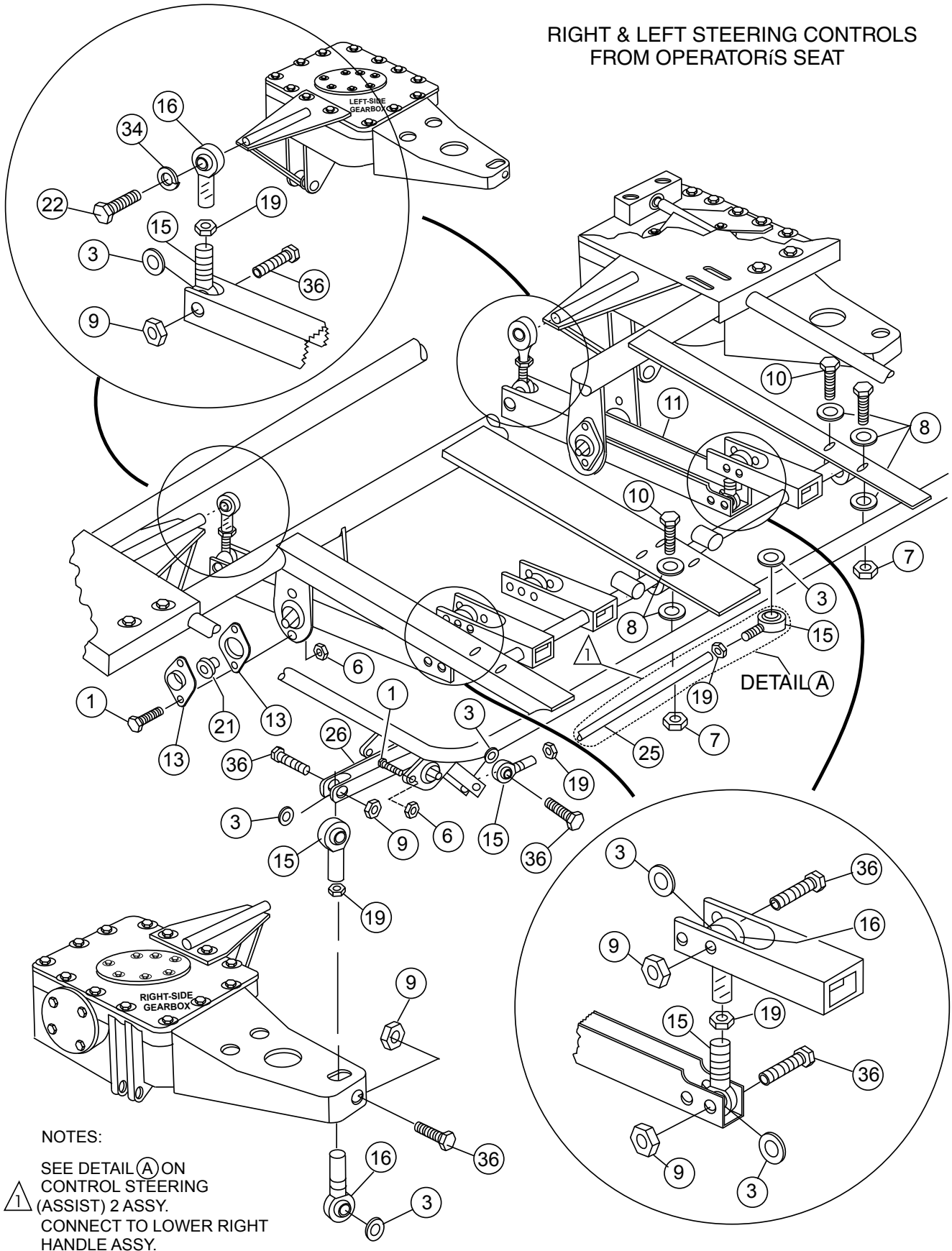
NOTICE

◆ S/N BI0203468 AND BELOW

◇ BI0203469 AND ABOVE, AND S/N BH0203412

CONTROL STEERING (ASSIST) 1 ASSY.

RIGHT & LEFT STEERING CONTROLS
FROM OPERATOR'S SEAT



NOTES:

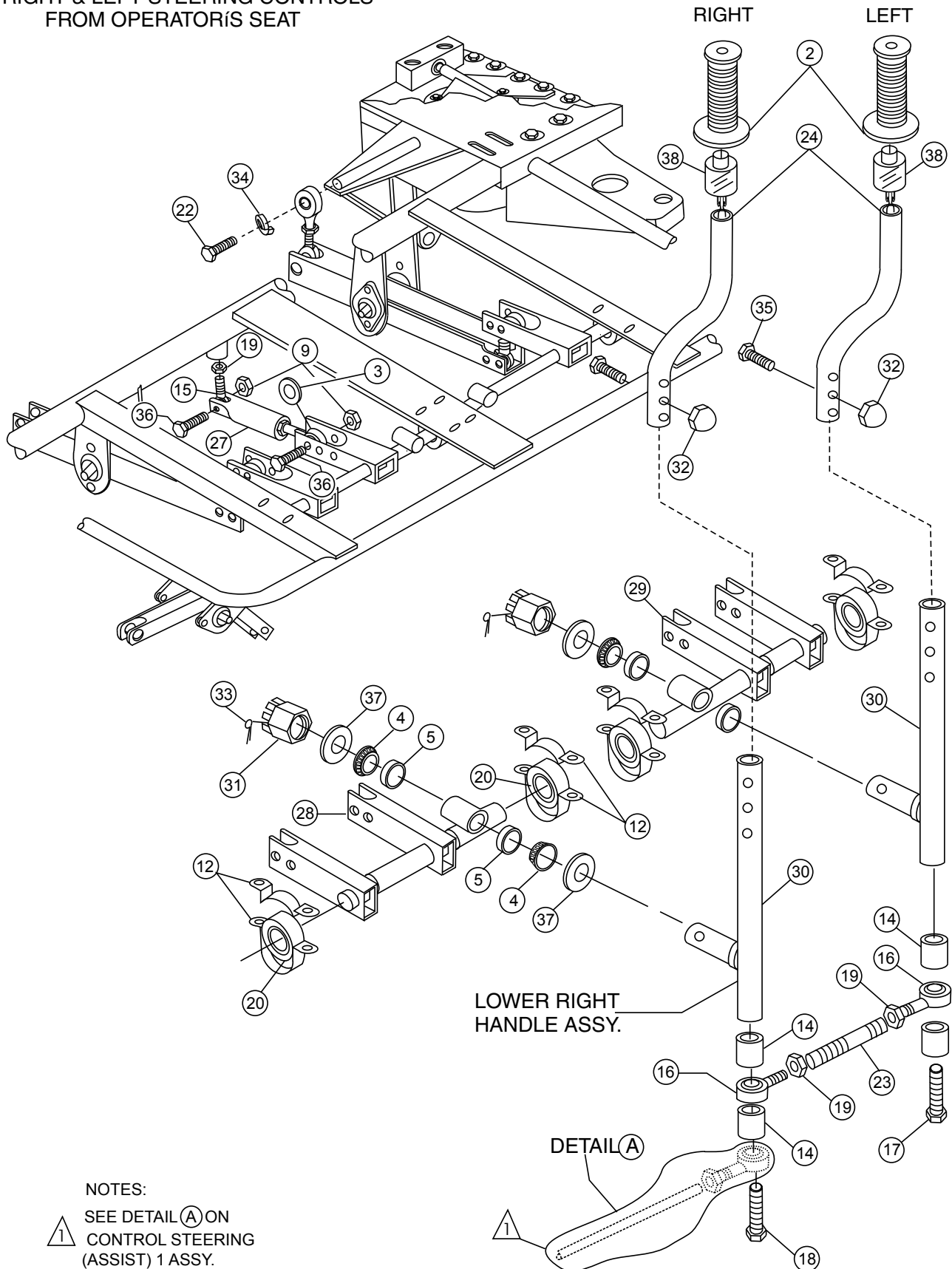
- SEE DETAIL (A) ON CONTROL STEERING (ASSIST) 2 ASSY.
- CONNECT TO LOWER RIGHT HANDLE ASSY.

CONTROL STEERING (ASSIST) 1 ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0131 A	SCREW, HHC 1/4-20 X 3/4	12	
3	0447	WASHER, FLAT, 1/2 SAE	12	
6	10024	NUT, NYLOC 1/4-20	16	
7	10133	NUT, NYLOC 3/8-16	8	
8	10136	WASHER, FLAT, 3/8 SAE	16	
9	10176	NUT, NYLOC 1/2-13	13	
10	1023	SCREW, HHC 3/8-16 X 1 1/4	8	
11	11127	LEVER, STEERING CONTROL W/A	2	
13	11139	BEARING, FLANGE HOUSING 40M-2	6	
14	11141	SPACER, ROD END	5	
15	11142	ROD END, 1/2-20 MALE RH	9	
16	11143	ROD END, 1/2-20 FEMALE RH	7	
19	11146	NUT, HEX JAM 1/2-20	11	
21	11150	BEARING, SB-201-8	6	
22	11170	SCREW, HHC 1/2-20 X 1.1/2"	2	
25	11205	ROD, L/R MOTION	1	
26	12193	LEVER, L/R CONTROL W/A	1	
34	5054 A	WASHER, LOCK, 1/2 MED.	2	
36	6159 A	SCREW, HHC 1/2-13 X 2	13	

CONTROL STEERING (ASSIST) 2 ASSY.

RIGHT & LEFT STEERING CONTROLS
FROM OPERATOR'S SEAT



NOTES:

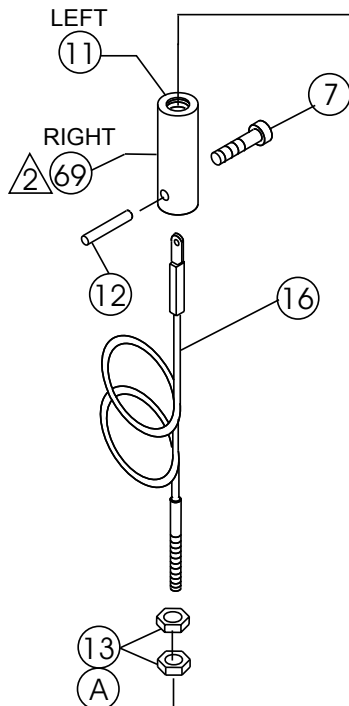
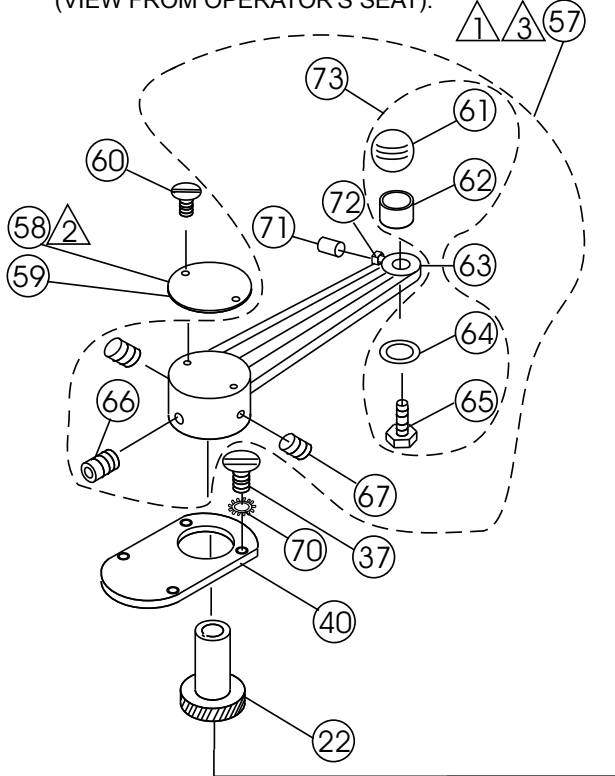
1 SEE DETAIL (A) ON
CONTROL STEERING
(ASSIST) 1 ASSY.

CONTROL STEERING (ASSIST) 2 ASSY.

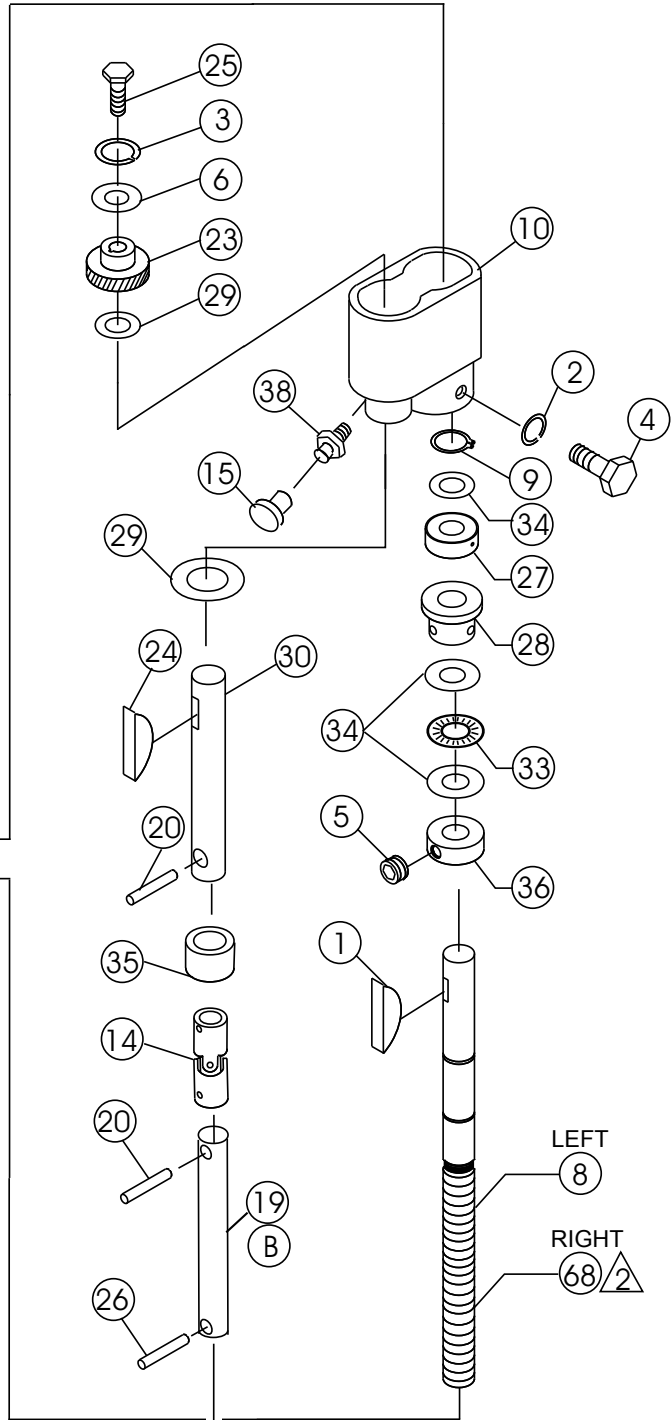
<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
2	2267	GRIP HANDLE, LEFT-RIGHT	2	
3	0447	WASHER, FLAT, 1/2 SAE	12	
4	0735	BEARING, CONE, TIMKEN #A6075	4	
5	0735 A	BEARING, CUP, TIMKEN #A6157	4	
8	10136	WASHER, FLAT,3/8 SAE	16	
9	10176	NUT, NYLOC 1/2-13	13	
12	11138	BEARING, P-BLOCK HOUSING 47MPB	4	
14	11141	SPACER, ROD END	5	
15	11142	ROD END, 1/2-20 MALE RH	9	
16	11143	ROD END, 1/2-20 FEMALE RH	7	
17	11144	SCREW, SHC 1/2-20 X 2 PLTD	1	
18	11145	SCREW. SHC 1/2-20 X 3 PLTD	1	
19	11146	NUT, HEX JAM 1/2-20	11	
20	11149	BEARING, SB-204-12	4	
22	11170	SCREW, HHC 1/2-20 X 1.1/2"	2	
23	11173	THREADPIECE, 1/2-20 X 2 PLTD	1	
24	11177	HANDLE TUBE, UPPER	2	
27	12200	ASSIST ASM, STEERING SPRING	2	
28	12904	STEERING CONTROL W/A RS ASSIST	1	
29	12903	STEERING CONTROL W/A LS ASSIST	1	
30	12425	HANDLE , LOWER W/A	2	
31	12426	NUT, SLOTTED 3/4-16 PLATED	2	
32	2197	NUT, ACORN 1/4-20	2	
33	2219	PIN, COTTER 1/8 X 1 1/2	2	
34	5054 A	WASHER, LOCK, 1/2 MED.	2	
35	5277	SCREW, HHC 1/4-20 X 1 1/2	2	
36	6159 A	SCREW, HHC 1/2-13 X 2	13	
37	8151	WASHER, FLAT, 3/4 SAE	4	
38	11430	SWITCH, PUSHBUTTON	1	

TWIN PITCH ASSY. 1 (LEFT/RIGHT)

LEFT SIDE TWIN PITCH TOWER
ASSEMBLY P/N 12386 ITEM 55
(VIEW FROM OPERATOR'S SEAT).



CONTINUED ON
TWIN PITCH ASSY. 2
SEE (A), ITEM 32.



CONTINUED ON
TWIN PITCH ASSY. 2
SEE (B), ITEM 31.

- NOTES:
- ① LEVER ASSEMBLY, ITEM 57
INCLUDES ITEMS WITHIN OUTLINE.
 - ② RIGHT SIDE TWIN PITCH
ASSEMBLY P/N 12385 ITEM 54
IS IDENTICAL TO LEFT SIDE
TWIN PITCH ASSEMBLY UNLESS
OTHERWISE NOTED.
 - ③ KNOB KIT P/N 2737 (ITEM 73)
INCLUDES ITEMS 61, 62, 64 AND 65.

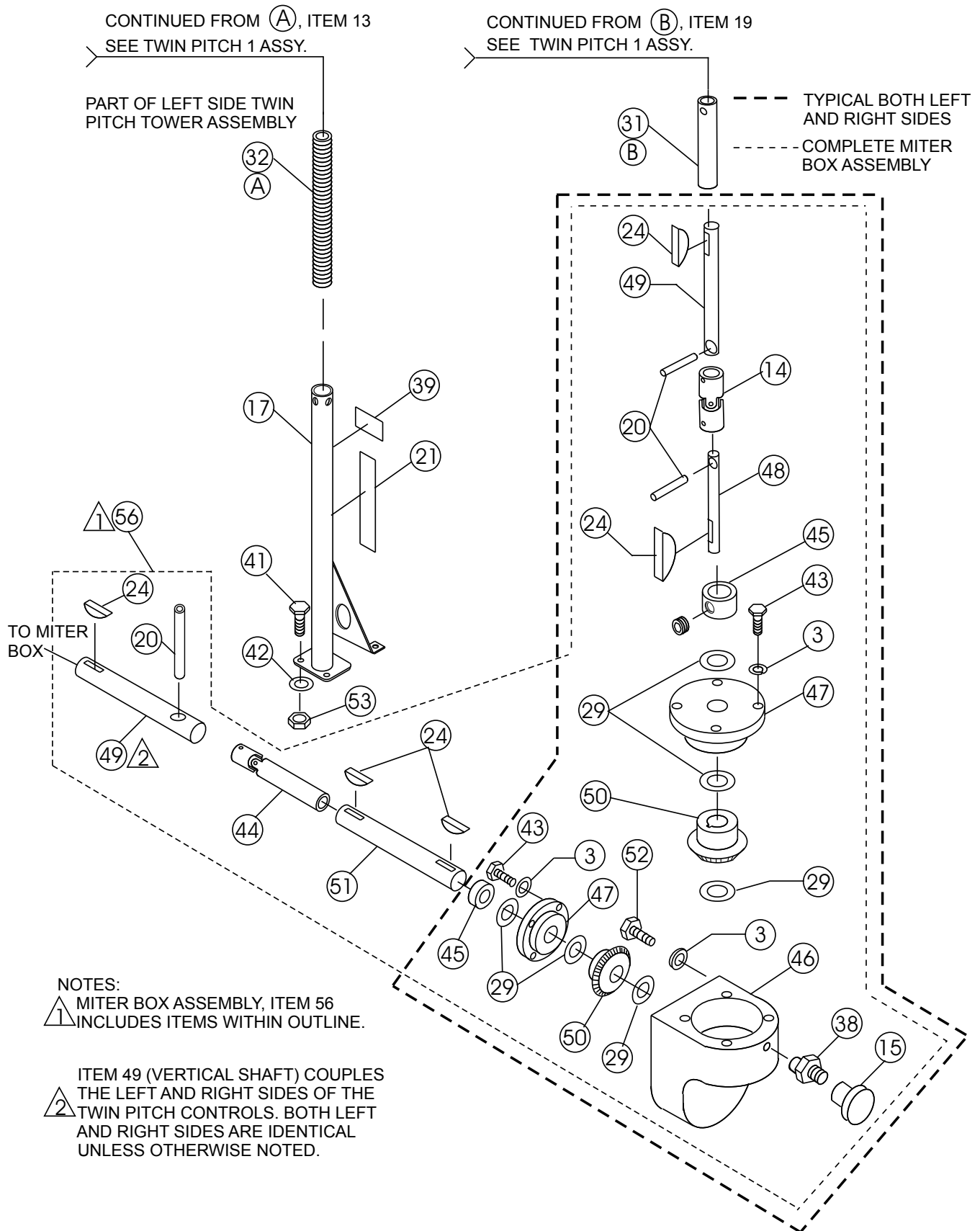
TWIN PITCH ASSY. 1 (LEFT/RIGHT)

NO.	PART NO.	PART NAME	QTY.	REMARKS
1+%	0126 B	KEY, WOODRUFF #9	1	
2+%	0161C	WASHER, LOCK 5/16 MED	1	
3@+%	0181 B	WASHER, LOCK, 1/4 MED	4	
4+%	0655	SCREW, HHC 5/16 – 18 X 3/4	1	
5+%	0685	SCREW, SHS 5/16 – 18 X 5/16	1	
6+%	0948	WASHER, FLAT, 1/4 SAE	1	
7+%	10382	BOLT, SHOULDER, 3/8 X 3/8 LONG	1	
8+	10511	SHAFT, PITCH CONTROL, LH TPC	1	LEFT SIDE ONLY
9+%	10512	RING, SNAP, TRUARC 5160 – 75	1	
10+%	10546	HOUSING, PITCH CONTROL, 1-3/4	1	
11+	10722	SLIDE BLOCK, LH PITCH CON.....	1	LEFT SIDE ONLY
12+%	10723	PIN, SPIROL 3/16 X 1 3/8 HD	1	
13+%	1116	NUT, BRASS JAM 5/16 – 18	2	
14@+%	11583	U-JOINT, PITCH CONTROL	2	
15@+%	1162 A	CAP, GREASE ZERK	2	
16+%	12460	CABLE, PITCH ASM	1	
19+%	20005	SHAFT, TWIN PITCH	1	
20@+%	11654	PIN, ROLL 1/8 X 1 PLATED	5	QTY. INCLUDES USAGE ON BOTH TWIN PITCH ASSEMBLIES, AND MITER BOX SHAFTS
22+%	1529	GEAR, MASTER, TPC	1	
23+%	1530	GEAR, SLAVE, TPC	1	
24@+%	1578	KEY, WOODRUFF, #3.....	9	QTY. INCLUDES USAGE ON BOTH TWIN PITCH ASSEMBLIES, AND MITER BOX SHAFTS
25+%	1579	SCREW, HHC 1/4 – 20 X 1/2	1	
26+%	1586	PIN, ROLL 1/8 X 3/4	1	
27+%	1604	BEARING, BALL	1	
28+%	1612	BEARING, ALUM – PITCH CONTR	1	
29@+%	1733	WASHER, 1/32 X 1/2 HARDENED	8	
30+%	2007	SHAFT	1	
33+%	2169	BEARING, THRUST, TORR #NTA 1220	1	
34+%	2170	BEARING, RACE, TORR #TRA 1220	3	
35+%	2311	SPACER, 3/4 X 1/2 X 0.8L	1	
36+%	2367	SET COLLAR.NCLUDES ITEM 5		
37+%	2620	SCREW, BHC 10 – 24 X 5/8	4	
38@+%	2621	ZERK, GREASE STR 1/4 – 28	2	
40+%	2649	COVER, PITCH CONT HOUSING	1	
57	1617	LEVER ASSY, TROWEL ADJUSTMENT.....	1	INCLUDES ITEMS W/#
58	2300	DECAL, AL PITCH, RH	1	
59	2332	DECAL, AL PITCH, LH	1	
60#	4014	SCREW, 2-3/16 P-K TYPE U DRIVE	2	
61#\$	4403	CRANK KNOB	1	
62#\$	3231	SPACER	1	
63#	1615	CRANK LEVER	1	
64#\$	1733	HARDENED WASHER	1	
65#\$	1616	SHOULDER BOLT	1	
66#	0185	SCREW, SHSS 3/8 – 16 X 3/8"	1	
67#	1528	SCREW, SHSS 1/4 – 20 X 5/16"	1	
68%	10510	SHAFT, PITCH CONTROL, RH TPC.....	1	RIGHT SIDE ONLY
69%	10721	SLIDE BLOCK, RH PITCH CONTROL.....	1	RIGHT SIDE ONLY
70	10114	WASHER, EXT. SHKP, #8	4	
71	1162A	CAP, GREASE ZERK/2	1	
72	2621	FITTING GREASE	1	
73	2737	KNOB, KIT	1	INCLUDES ITEMS W/\$

NOTICE

Indicated quantities are for one pitch tower. If ordering for two pitch towers double the quantity.

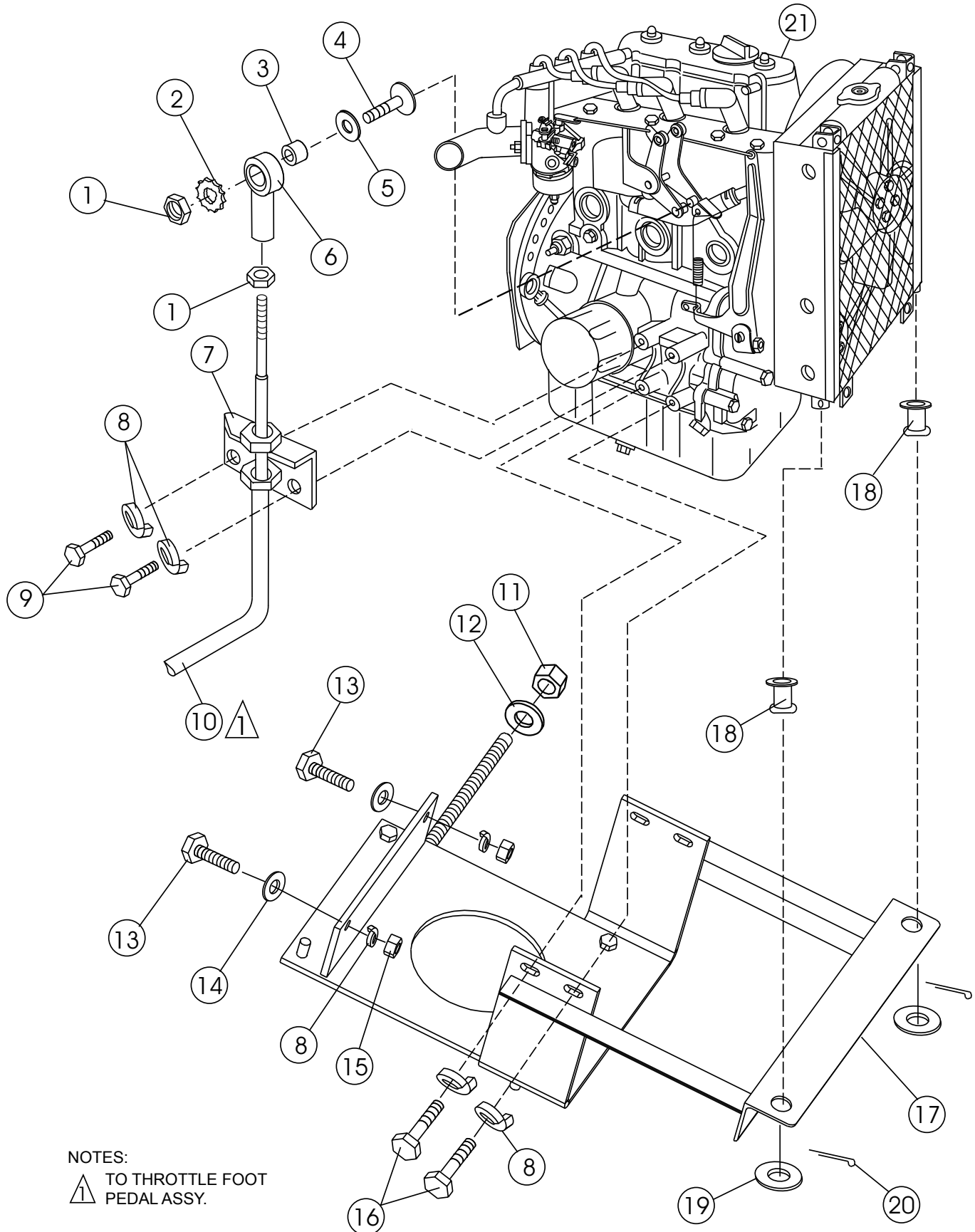
TWIN PITCH ASSY. 2 (LEFT/RIGHT)



TWIN PITCH ASSY. 2 (LEFT/RIGHT)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
3@+%	0181 B	WASHER, LOCK, 1/4 MED	4	
14@+%	11583	U-JOINT, PITCH CONTROL	2	
15@+%	1162 A	CAP, GREASE ZERK	2	
16+%	12460	CABLE, PITCH ASM	1	
17	10548	TUBE, PITCH CONTROL W/A	1	
20@+%	11654	PIN, ROLL 1/8 X 1 PLATED.....	5.....	QTY. INCLUDES USAGE ON BOTH TWIN PITCH ASSEMBLIES, AND MITER BOX SHAFTS
21	1499	DECAL, WHITEMAN	1	
22+%	1529	GEAR, MASTER, TPC	1	
23+%	1530	GEAR, SLAVE, TPC	1	
24@+%	1578	KEY, WOODRUFF, #3.....	9.....	QTY. INCLUDES USAGE ON BOTH TWIN PITCHASSEMBLIES, AND MITER BOX SHAFTS
29@+%	1733	WASHER, 1/32 X 1/2 HARDENED	8	
31	2012	SLEEVE, ADJ – LONG, RIDER	1	
32	2156	SPRING, COIL	1	
38@+%	2621	ZERK, GREASE STR 1/4 – 28	2	
39	2634	DECAL, PITCH TOWER	1	
41	0202	SCREW, HHC 5/16 – 18 X 1	4	
42	0300 B	WASHER, FLAT, 5/16 SAE	4	
43@	0730	SCREW, HHC 1/4 – 20 X 1	8	
44@	11653	SLEEVE W/U JOINT	1	
45@	1577	SET COLLAR, 1/2	2	
46@	1987	MITER BOX, PITCH CONTROL	1	
47@	1988	MITER BOX, BEARING CAP RIDERS	2	
48@	2021	SHAFT, MITER VERT	1	
49@	2022	SHAFT, MITER VERTICAL.....	3.....	QTY. INCLUDES USAGE ON BOTH TWIN PITCH ASSEMBLIES, AND MITER BOX SHAFTS
51@	2845	SHAFT, MITER BOX HORIZ (HNN)	1	
52@	4514	SCREW, HHC 1/4 – 20 X 5/8	4	
53	5283	NUT, NYLOC 5/16 – 18	4	
56	11655	MITER BOX ASSY (HHN)	1.....	INCLUDES ITEMS W/@

ENGINE MOUNTING & THROTTLE ASSY.

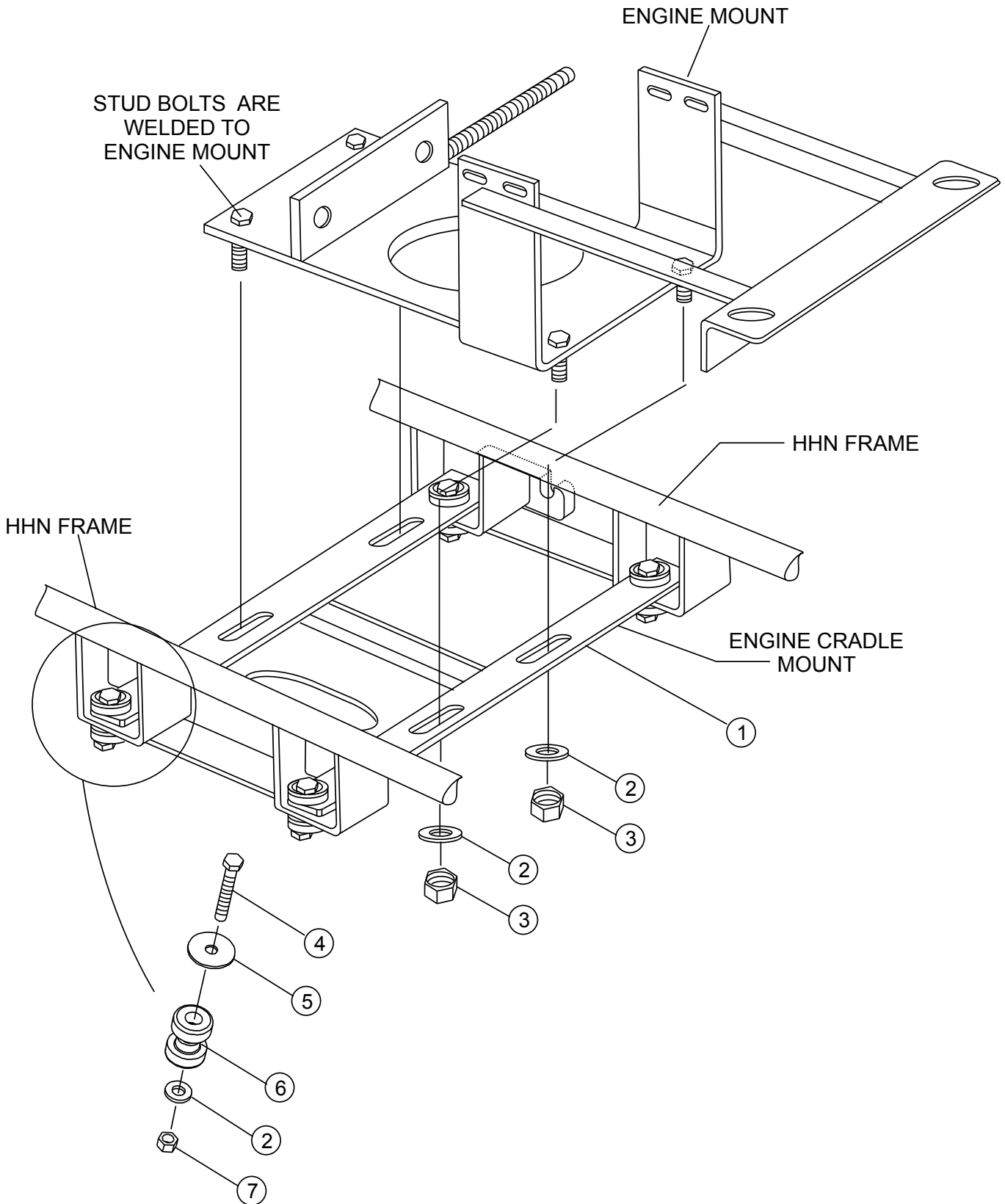


NOTES:
▲ TO THROTTLE FOOT
PEDAL ASSY.

ENGINE MOUNTING & THROTTLE ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0937	NUT, HEX 10-32	2	
2	10237	WASHER, EXT. SHKP. #10	1	
3	11710	SPACER, ENG THROTTLE	1	
4	8133	SCREW, RHM 10-32 X 3/4	1	
5	2203	WASHER, FLAT #10	1	
6	2153	ROD END, 10-32 FEMALE RH	1	
7	11771	BRACKET, ENGINE THROTTLE CABLE	1	
8	0161 C	WASHER, LOCK, 5/16 MED.	8	
9	2299	SCREW, HHC M8-1.25 X 16mm	3	
10	2124	CABLE, THROTTLE (RT)	1	
11	10087	NUT, NYLOC 1/2-20 THIN	1	
12	0447	WASHER, FLAT 1/2 SAE	1	
13	0202	SCREW, HHC 5/16-18 X 1	3	
14	0300 B	WASHER, FLAT, 5/16 SAE	2	
15	5283	NUT, NYLOC 5/16-18	3	
16	2866	SCREW, HHC M8-1.25 X 20mm	4	
17	12844	MOUNT, 31V ENGINE W/A	1	
18	19468	GROMMET, MINOR PN Z-4004	2	
19	12199	WASHER, FLAT	2	
20	0183	COTTER OIN	2	
21	11292	ENGINE, BRIGGS 31 HP DM950G	1	

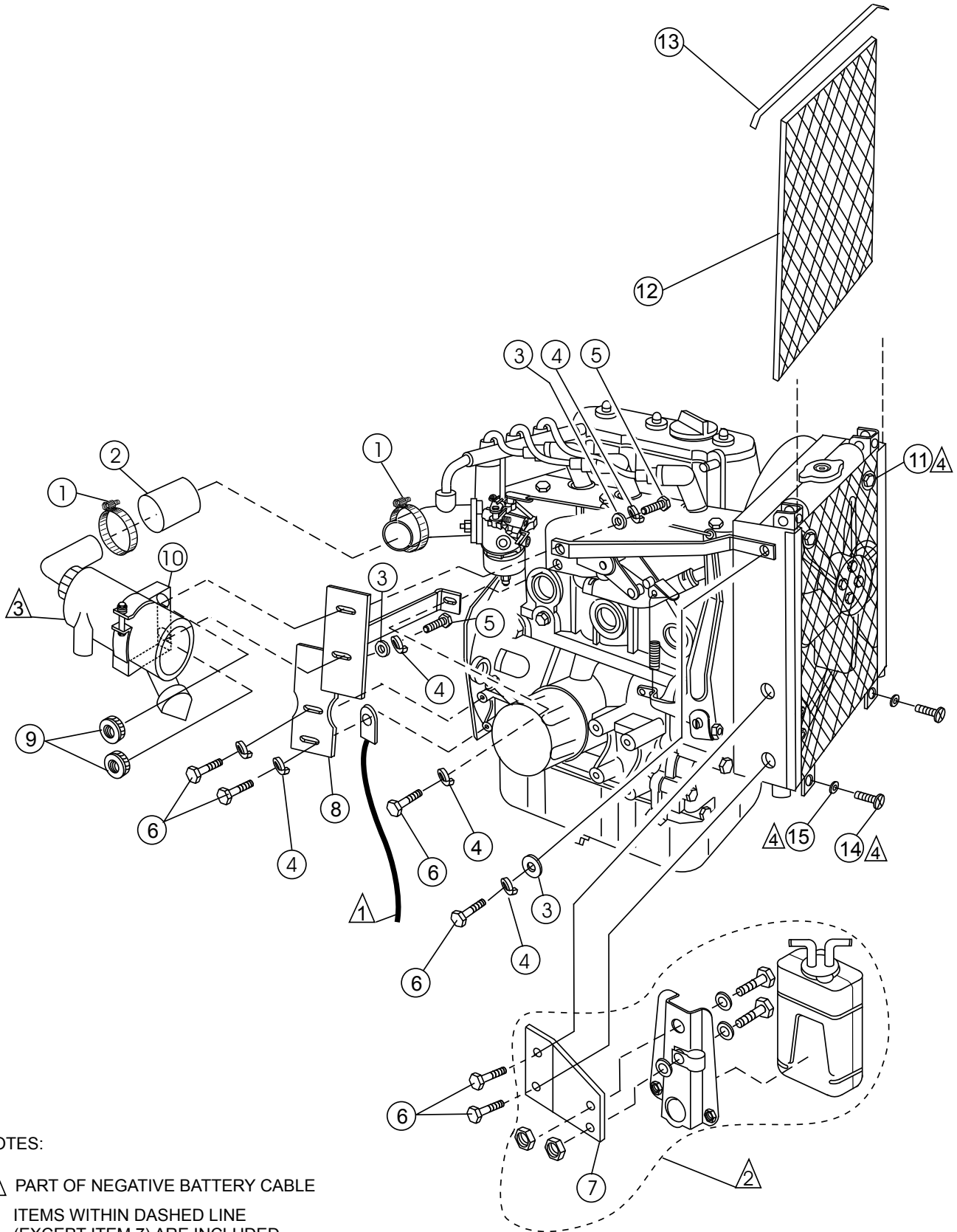
ENGINE CRADLE MOUNTING ASSY.



ENGINE CRADLE MOUNTING ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	20051	CRADLE, ENGINE W/A	1	
2	10136	WASHER, FLAT, 3/8 SAE	8	
3	1063	NUT NYLOC 3/8-24	4	
4	8156	SCREW, HHC 3/8-16 X 2-1/2	4	
5	12832	WASHER, VIBRATION SNUB	4	
6	12831	MOUNT, ENGINE VIBRATION	4	
7	10133	NUT, NYLOC 3/8-18	4	

ENGINE AIR CLEANER/RADIATOR ASSY.



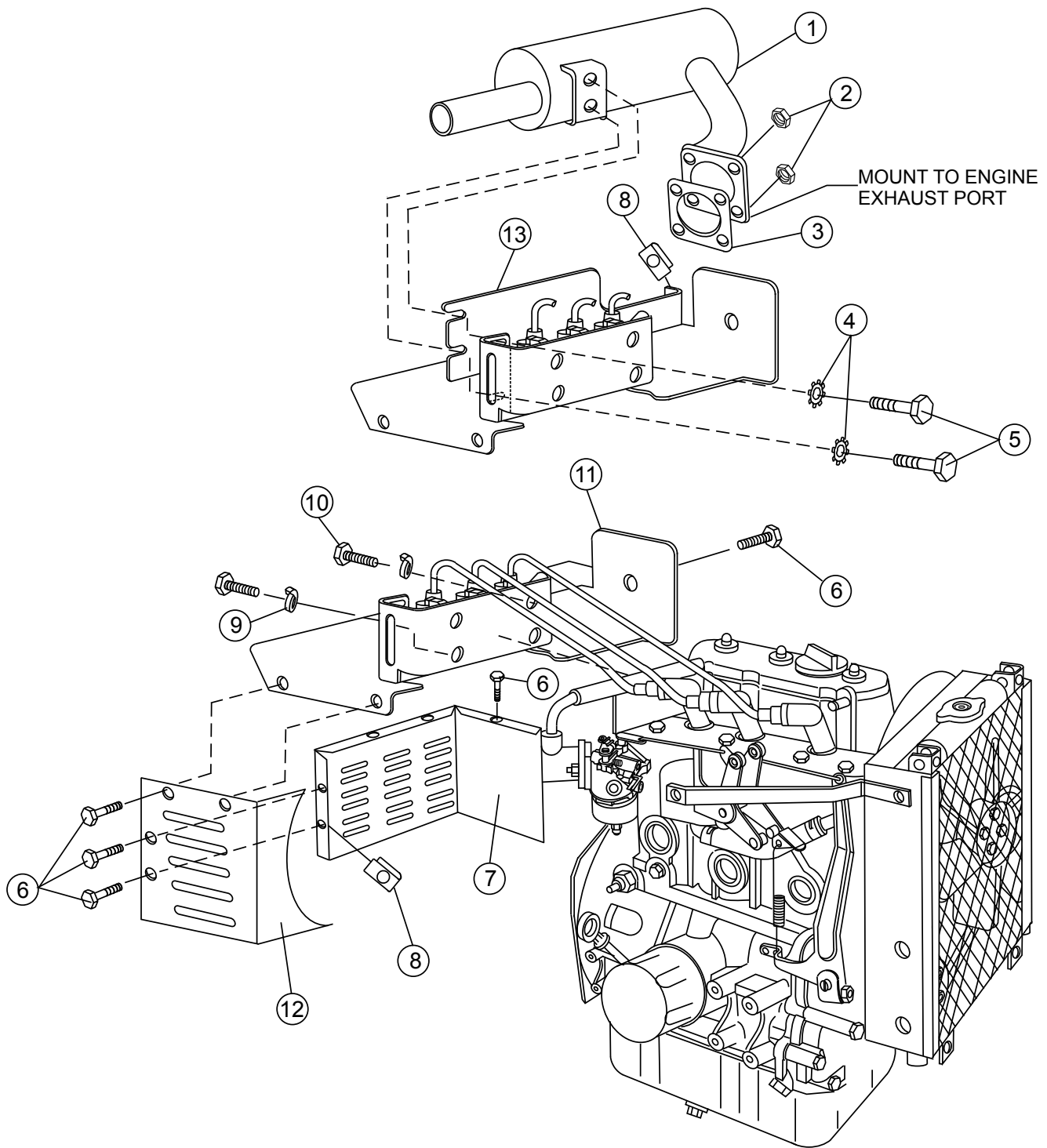
NOTES:

- ▲ PART OF NEGATIVE BATTERY CABLE
- ▲ ITEMS WITHIN DASHED LINE (EXCEPT ITEM 7) ARE INCLUDED WITH ENGINE. REFER TO ENGINE PARTS MANUAL.

ENGINE AIR CLEANER/RADIATOR ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	10434	CLAMP, 2" HOSE	2	
2	12225	HOSE , AIR CLEANER MT	1	
3	0948	WASHER, FLAT, 1/4 SAE	8	
4	0161 C	WASHER, LOCK, 5/16 MED.	6	
5	0730	SCREW, HHC 1/4-20 X 1	2	
6	12464	SCREW, HHC M6-1.0 X 16mm	3	
7	11900	MOUNT, RADIATOR OVERFLOW	1	
8	12102	MOUNT, AIR CLEANER W/A	1	
9	19266	BLIND NUT	2	
10	12103	CLAMP, 31V AIR CLEANER ASM	1	
11		SCREW.....	2.....	INCLUDED W/RADIATOR
12	12450	GUARD, RADIATOR	1	
13	60049	TRIM EDGE 1/32 (62B3-1/32)	1.5FT	
14		SCREW.....	2.....	INCLUDED W/RADIATOR
15		WASHER	2.....	INCLUDED W/RADIATOR

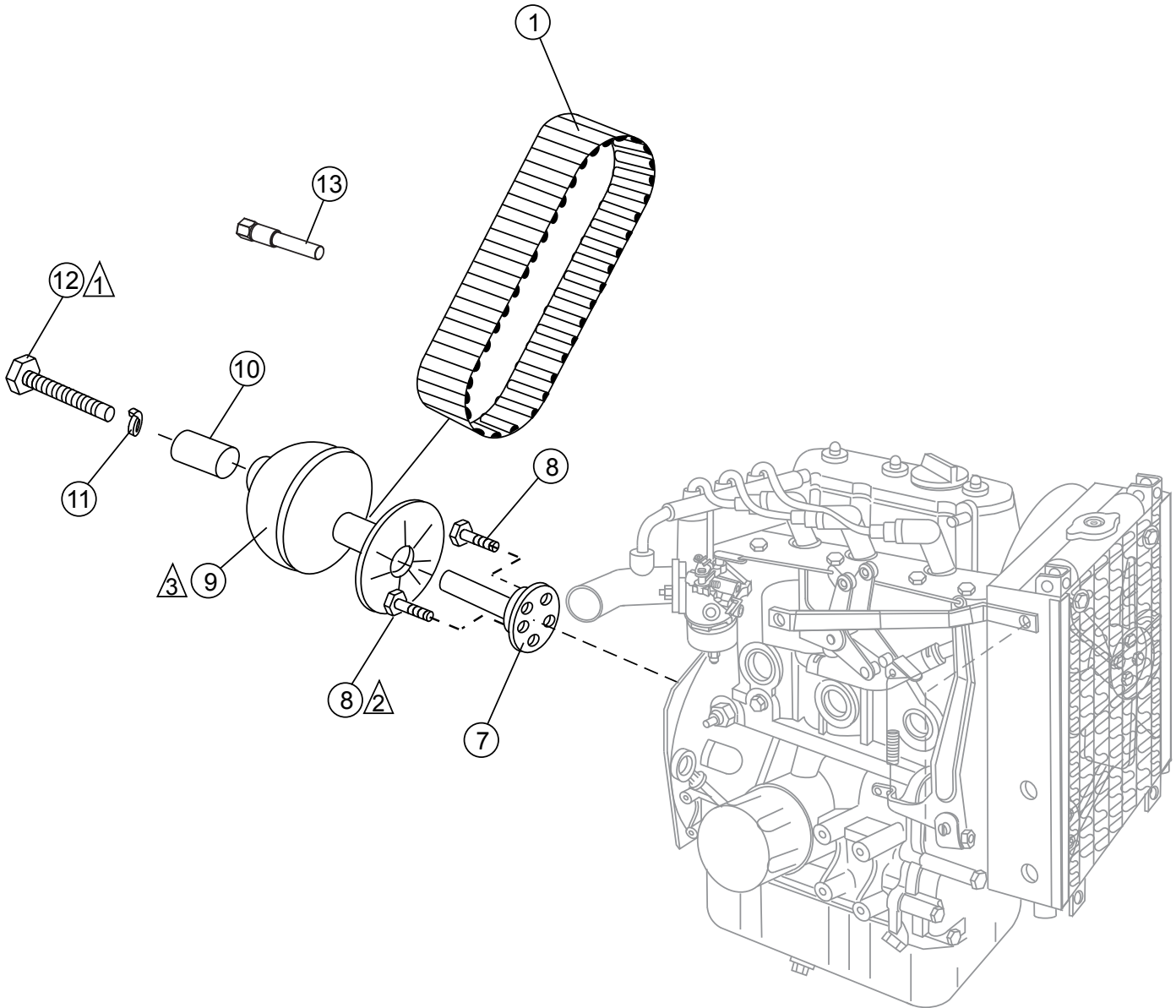
ENGINE MUFFLER ASSY.




ENGINE MUFFLER ASSY.


<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	20089	MUFFLER, 31V	1	
2	12848	EXHAUST FLANGE NUT	4	
3	12847	EXHAUST GASKET	1	
4	10114	WASHER, EXT. SHKP, #8	2	
5	0655	SCREW, HHC 5/16-18 X 3/4	2	
6	11819	SCREW, HHC 1/4-20 X 3/4 W/WASH	7	
7	12545	PLATE, BELT GUARD SIDE.....	1.....	COMET CLUTCH
7	22579	PLATE, BELT GUARD SIDE.....	1.....	MULTI-CLUTCH
8	11534	NUT, "U" TYPE, 1/4-20	8	
9	0161 C	WASHER, LOCK, 5/16 MED.	4	
10	1605	SCREW, HHC M8-1.25 X 25mm	4	
11	20082	BELT GUARD/MUFFLER SUPPORT W/COMET	1	
12	20098	PLATE, BELT GUARD REAR	1	
13	20178	HEAT SHIELD, MUFFLER	1	

ENGINE CLUTCH ASSY. (OLD STYLE)



NOTES:

 TORQUE TO 150 FT. LBS

 TORQUE TO 15 FT. LBS.
BOLT IS INCLUDED WITH
ENGINE.

 COMET CLUTCH
NO LONGER AVAILABLE

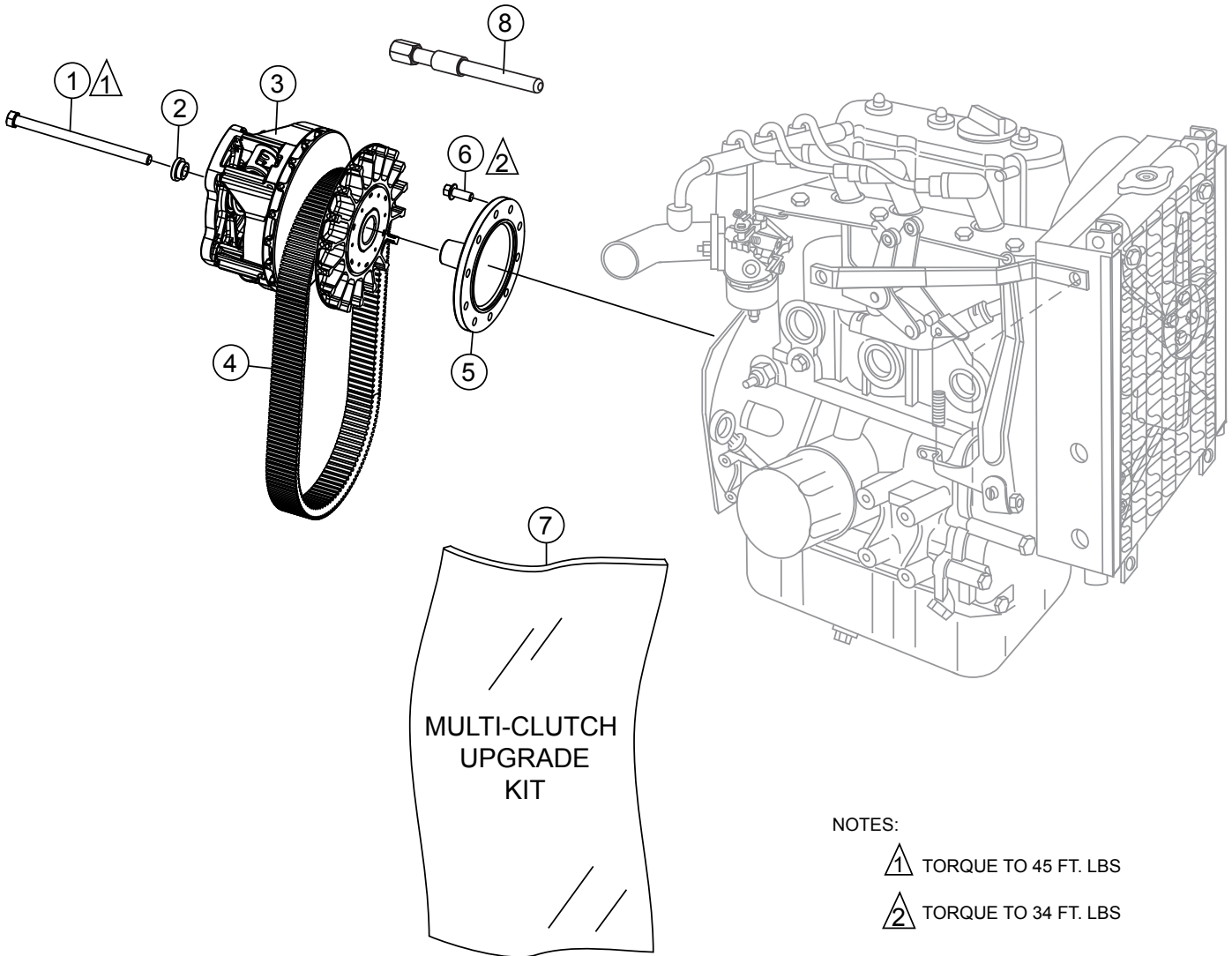
ENGINE CLUTCH ASSY. (OLD STYLE)

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	20138	BELT, CVT-VANGUARD COMET	2.....	ORDER 2 BELTS FOR SPARES
7	3911758	ADAPTOR, CLUTCH 31 HP VANGUARD	1	
8	20046	SCREW, HHC M8 125 X 25 MM GRADE 10.9	5	
9	12878	CLUTCH, CVT 1-7/16 COMET	1.....	NO LONGER AVAILABLE
		.....		USE CLUTCH KIT P/N 22581
		.....		TO UPGRADE TO
		.....		MULTI-CLUTCH SYSTEM
10	20215	.415 OD X 21/32 ID X 2-1/16L	1	
11	4703	WASHER, LOCK, 5/8 MED	1	
12	20057	SCREW, HHC 5/8-18 X4	1	
13	23291	TOOL, CLUTCH REMOVAL	1	

NOTICE

Multi-Clutch components are not interchangeable with the prior Hoffco Comet drive system. The Hoffco Comet CVT system must be replaced with Multi-Clutch components in the event of a Hoffco Comet clutch failure.

ENGINE CLUTCH ASSY. (NEW STYLE)



NOTES:

 TORQUE TO 45 FT. LBS

 TORQUE TO 34 FT. LBS

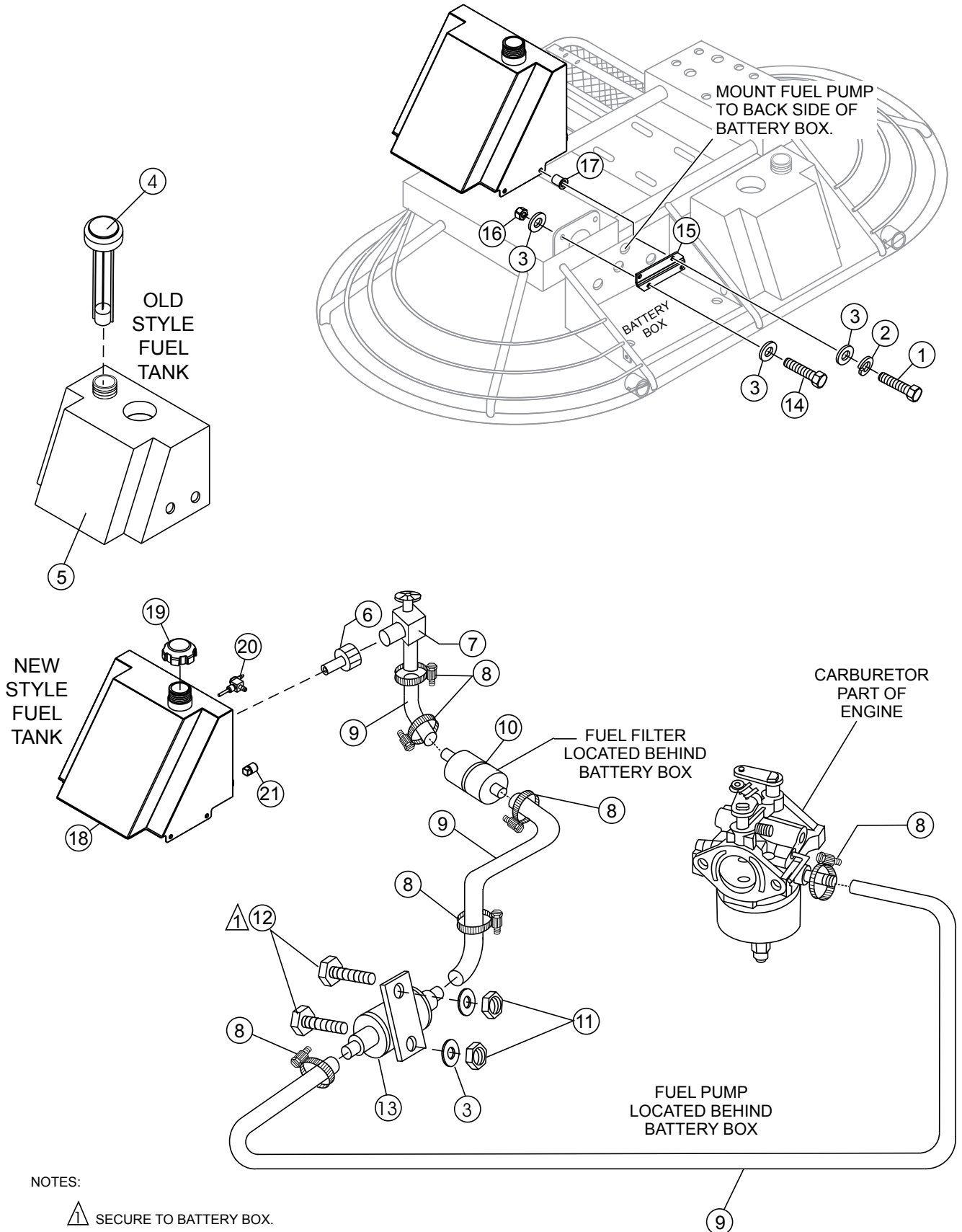
ENGINE CLUTCH ASSY. (NEW STYLE)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	23377	SCREW, HHC 7/16-20 X 6.5	1	
2	23369	WASHER, STEP 7/16	1	
3	23363-1	CLUTCH, UPPER, MULTI-CLUTCH	1	
4	23365	BELT, CVT CLUTCH	2	
5	23368	STUB SHAFT	1	
6	22021	SCREW, HEX FLANGE M8	5	
7	22581	KIT, HHN CVT REPLACEMENT	1	
8	23371	PULLER, MULTI-CLUTCH	1	

NOTICE

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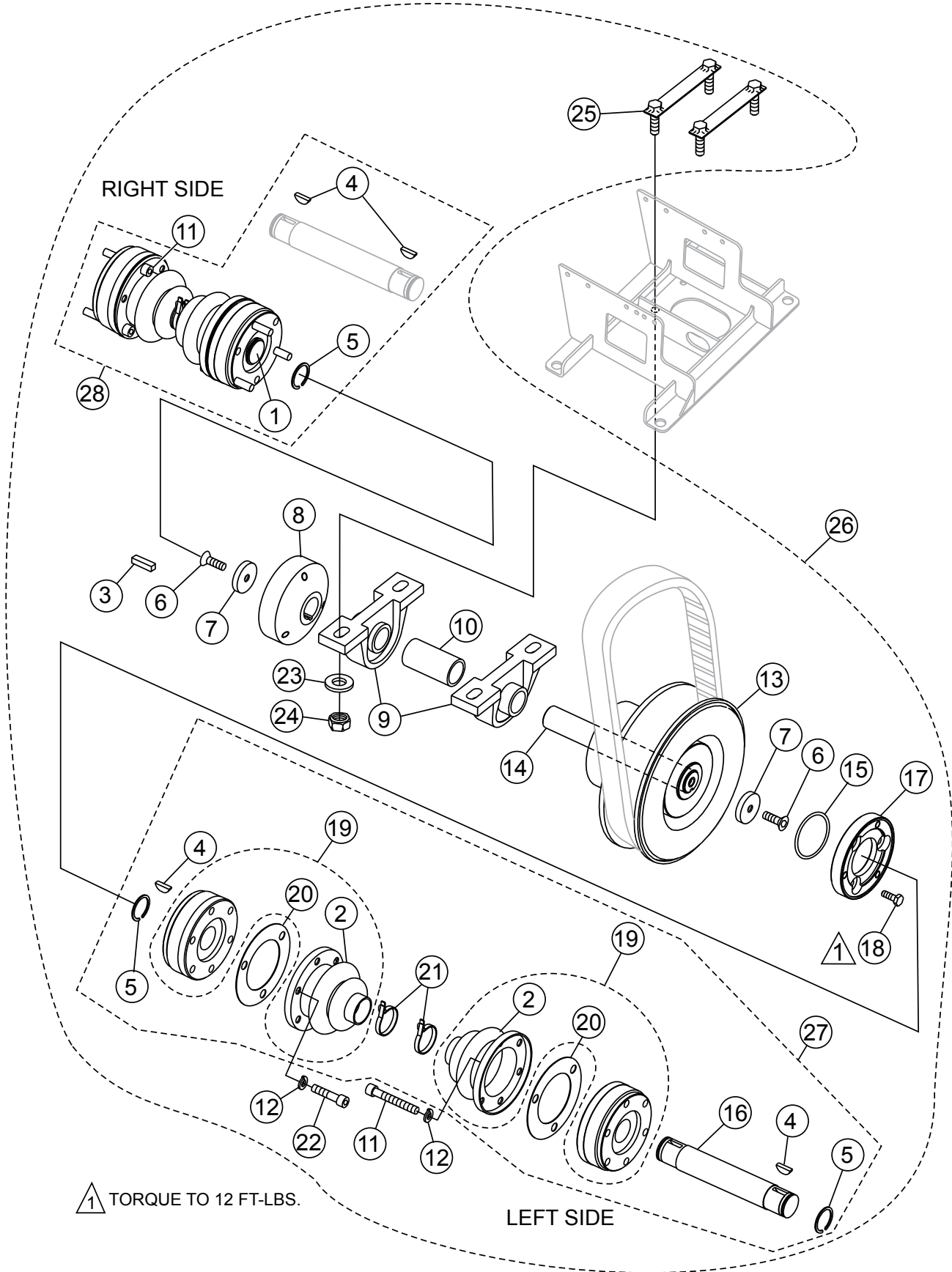
ENGINE FUEL ASSY.



ENGINE FUEL ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	4514	SCREW, HHC 1/4-20 X 5/8.....	4OLD STYLE COMET CLUTCH
1	1579	SCREW, HHC 1/4-20 X .5.....	4	.....NEW STYLE MULTI-CLUTCH
2	0161 C	WASHER, LOCK, 5/16 MED.....	4	.....OLD STYLE COMET CLUTCH
3	0948	WASHER, FLAT, 1/4 SAE	4	.....OLD STYLE COMET CLUTCH
3	0948	WASHER, FLAT 1/4 SAE	12	.....NEW STYLE MULTI-CLUTCH
4	11418	FUEL CAP/GAUGE (10.5")	1	.....S/N ZA020476761013007 AND BELOW
5	12404	TANK, HNN 5GAL	1	.....S/N ZA020476761013007 AND BELOW
6	19633	BUSHING, RUBBER FUEL DAPCO10672	1	
7	19661	VALVE , FUEL DRAIN DAPCO 11478	1	
8	19473	CLAMP, WORM HOSE, #4 (1/4-5/8)	6	
9	60013	HOSE, .25ID RUBBER FUEL LINE	3	
10	11984	IN-LINE FUEL FILTER 5/16	1	
11	10024	NUT, NYLOC 1/4-20	2	
12	0131 A	SCREW, HHC 1/4-20 X 3/4	2	
13	12497	FUEL PUMP	1	
14	0131 A	SCREW, HHC 1/4-20 X 3/4.....	4	.....NEW STYLE MULTI-CLUTCH
15	22588	MOUNT, FUEL TANK	1	.....NEW STYLE MULTI-CLUTCH
16	10024	NUT, NYLOC 1/4-20.....	4	.....NEW STYLE MULTI-CLUTCH
17	19266	NUT, BLIND 1/4-20 X 10GA	4	
18	22077	TANK,FUEL W/A-5 GAL EPA/CARB	1	.....S/N ZA020476761013008 AND ABOVE
19	22205	RACHET CAP, TOP VENT	1	.....S/N ZA020476761013008 AND ABOVE
20	22081	SHUTOFF VALVE, 1/4 NPT, 1/4 HOSE.....	1	.....S/N ZA020476761013008 AND ABOVE
21	16185	FITTING, PLUG 1/4MP SQ HD.....	1	.....S/N ZA020476761013008 AND ABOVE

DRIVE ASSY. (OLD STYLE)



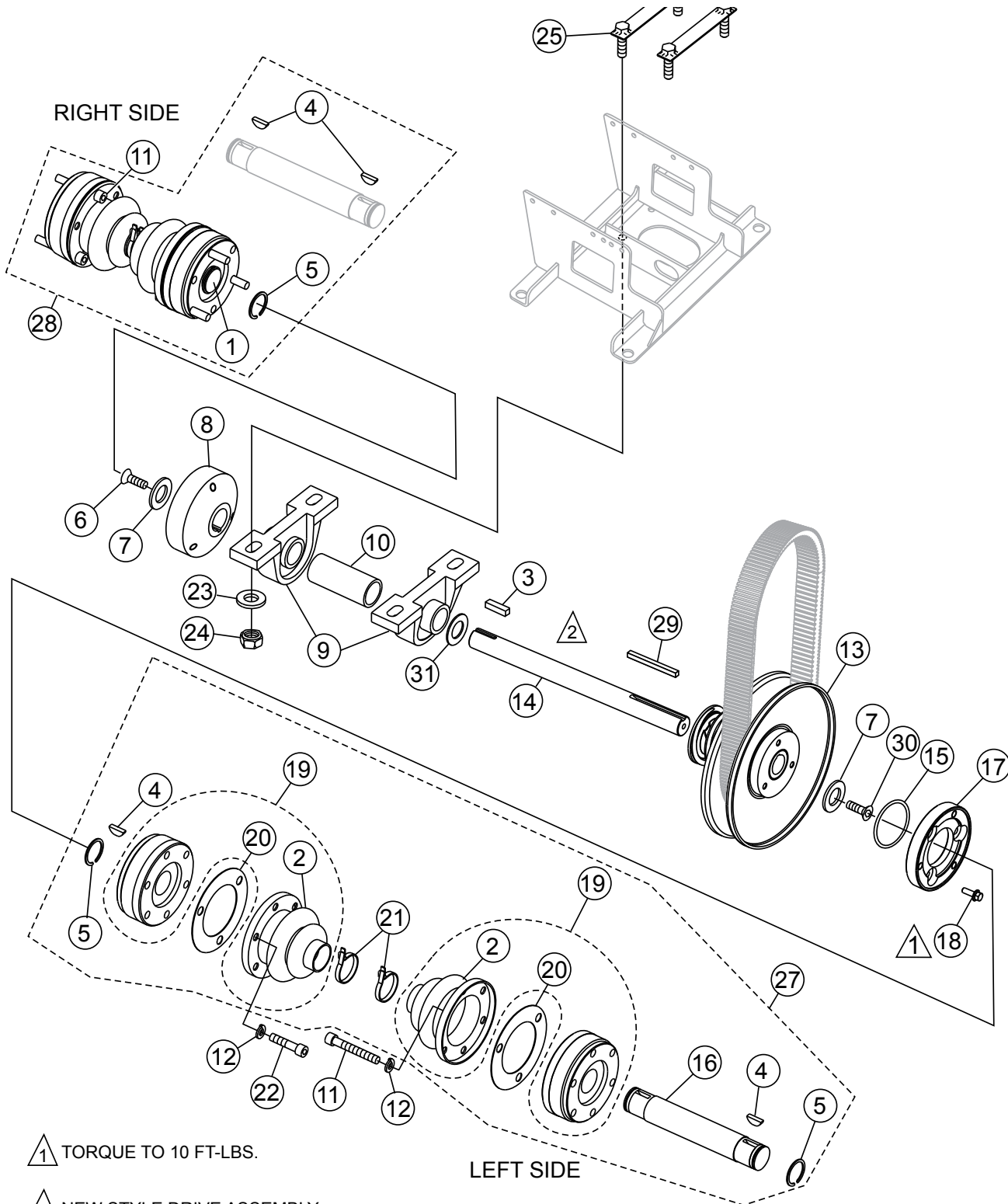
DRIVE ASSY. (OLD STYLE)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1 #@\$	2043	SHAFT, CV JOINT BRT, 9-5/8 LONG	1	
2%#@\$	2259	BOOT, C.V. JOINT	4	
3 #	10909	KEY, 3/16 X 11/16	1	
4 #@\$	0126	KEY, WOODRUFF #9	4	
5 #@\$	2090	RING, SNAP TRUARC #5100- 106	4	
6 #	1146	SCREW, FHSC 5/16- 18 X 1 NYLOC	2	
7 #	2037	WASHER, RETAINING	2	
8 #	2029	COUPLER, 1 ID. RIDER	1	
9 #	10337	BEARING, PILLOW BLOCK FAF YAK- 1	2	
10 #	20044	SPACER, BEARING SHAFT	1	
11 #	2186	SCREW, SHC 5/16-18 X 2-1/4 PLTD	9	
12 #	0161 C	WASHER, LOCK, 5/16 MEDIUM	12	
13 #	20350	PULLEY, CVT LOWER	1	
14 #	20043	SHAFT, DRIVE BEARING	1	
15 #	20116	O-RING, SIZE- 031 BUNA N	1	
16 #	20184	SHAFT, CV JOINT, HHN 7-13/16 LONG	1	
17 #	12590	COUPLER, CV JOINT COMET CLUTCH	1	
18 #	20056	SCREW, HHC 1/4- 28 X 3/4 GRD. 8	3	
19 #@\$	2052	JOINT, CV W/BOOT.....	4.....	INCLUDES ITEM W/%
20 #@\$	11108	GASKET, CV JOINT BOOT	4	
21 #@\$	60103	TIE WRAP, .312 X 8L X .082 THICK	4	
22 #	0243	SCREW, SHC 5/16- 18 X 1-3/4	3	
23 #	10136	WASHER, FLAT 3/8 SAE	4	
24 #	10133	NUT, NYLOC 3/8 - 16	4	
25 #	20186	PLATE, BEARING MOUNT	2	
26	23449	DRIVE ASSY., W/ COMET TD	1.....	INCLUDES ITEMS W/#
27#	23450	CV JOINT ASSY, RH	1.....	INCLUDES ITEMS W/@
28#	23451	CV JOINT ASSY, LH.....	1.....	INCLUDES ITEMS W/\$

NOTICE

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DRIVE ASSY. (NEW STYLE)



1 TORQUE TO 10 FT-LBS.

2 NEW STYLE DRIVE ASSEMBLY
MUST BE INSTALLED PER
INSTRUCTION SHEET, P/N 23444,
INCLUDED WITH MULTI-CLUTCH
UPGRADE KIT

DRIVE ASSY. (NEW STYLE)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1@\$	2043	SHAFT, CV JOINT BRT, 9-5/8 LONG	1	
2+@\$	2259	BOOT, C.V. JOINT	4	
3	10909	KEY, 3/16 X 11/16	1	
4@\$	0126	KEY, WOODRUFF #9	4	
5@\$	2090	RING, SNAP TRUARC #5100- 106	4	
6	1146	SCREW, FHSC 5/16- 18 X 1 NYLOC	1	
7	2037	WASHER, RETAINING	2	
8	2029	COUPLER, 1 ID. RIDER	1	
9	10337	BEARING, PILLOW BLOCK FAF YAK- 1	2	
10	23431	SPACER, 1.25DIA X 1.01ID X 4.81	1	
11	2186	SCREW, SHC 5/16-18 X 2-1/4 PLTD	9	
12	0161 C	WASHER, LOCK, 5/16 MEDIUM	12	
13	23363-2	PULLEY, CVT DRIVEN LOWER	1	
14	23430	SHAFT, DRIVE BEARING 1.00 x 12.5	1	
15	20116	O-RING, SIZE- 031 BUNA N	1	
16	20184	SHAFT, CV JOINT, HHN 7-13/16 LONG	1	
17	23433	COUPLER, CV JOINT CCVT	1	
18	9165	SCREW, HHFS 1/4-28 X 3/4 GR5 PATCH	3	
19@\$	2052	JOINT, CV W/BOOT.....	4	INCLUDES ITEM W/+
20@\$	11108	GASKET, CV JOINT BOOT	4	
21@\$	1662	TIE, CABLE TY-RAP	4	
22	0243	SCREW, SHC 5/16- 18 X 1-3/4	3	
23	10136	WASHER, FLAT 3/8 SAE	4	
24	10133	NUT, NYLOC 3/8 - 16	4	
25	20186	PLATE, BEARING MOUNT	2	
27	23450	CV JOINT ASSY, RH.....	1	INCLUDES ITEMS W/@
28	23451	CV JOINT ASSY, LH.....	1	INCLUDES ITEMS W/\$
29	20363	KEY, REC .188 X .25 X 2.5	1	
30	9092	SCREW, FHSC 5/8-18X1.25 NYLON	1	
31	11773	SHIM, .031"	A/R	

NOTICE

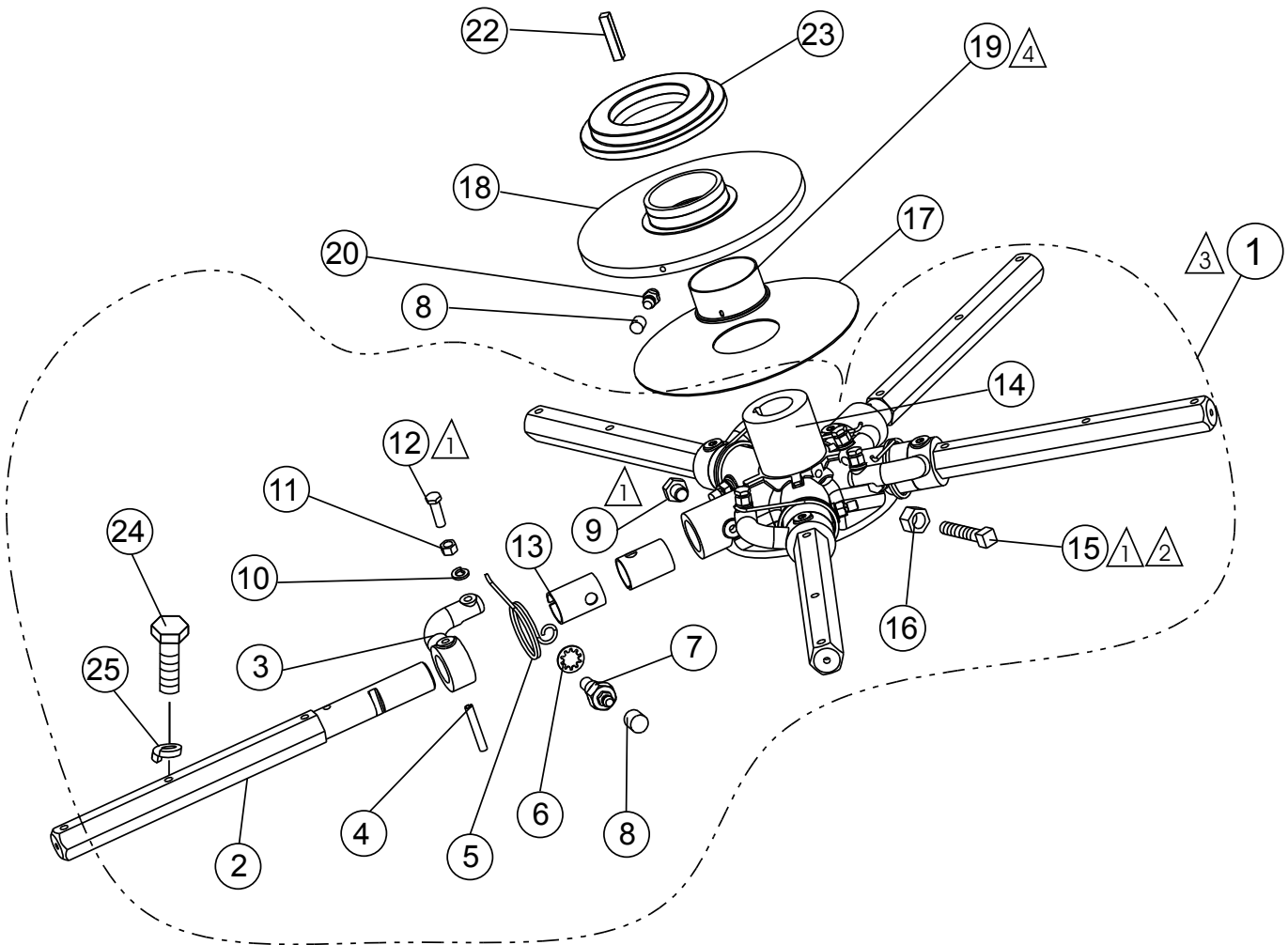
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SPIDER ASSY. (LEFT)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	12932	SPIDER ASM, LEFT SIDE (1-1/2)	1	
2	2829	ARM, TROWEL EXTENDED	5	
3	11903	LEVER, TROWEL ARM LEFT SIDE	5	
4	0166 A	WASHER, LOCK, 3/8 MED	5	
5	1876	NUT, HEX JAM 3/8	5	
6	0164 B	SCREW, HHC	5	
7	9006	PIN, ROLL 5/16 X 2	5	
8	11039	BUSHING, ARM 2 PIECE	10	
9	9111	SPRING, LEFT TROWEL	5	
10	1875	WASHER, INT SHKP 3/8	5	
11	1322	SCREW ASSY, ARM RETAINING	5	
12	21208	PLATE, SPIDER 5 BLADE (1-1/2 SHAFT)	1	
13	1162 A	CAP, GREASE ZERK #2	5	
14	11602	SCREW, HHC 3/8-16 X 3/8	5	
15	1456	NUT, HEX FINISH 3/8 -16	2	
16	12097	SCREW, SQHS 3/8-16 X 1-3/4 CONE 8	2	
17	11419	PLATE, WEAR	1	
18	11431	THRUST COLLAR	1	INCLUDES ITEM W/+
19+	20426	BUSHING, THRUST COLLAR	1	
20	2621	FITTING, GREASE	1	
22	12687	KEY, 3/8 X 2	1	
23	12779	BEARING, THRUST 6017 2RS W/FLANGE	1	
24	0105	SCREW, HHCS 5/16-18 X 11/2"	15	
25	0161C	LOCK WASHER 5/16"	15	

SPIDER ASSY. (RIGHT)

RIGHT-SIDE SPIDER ASSEMBLY (5-BLADE).
VIEW FROM OPERATORS SEAT.



NOTES:

① APPLY LOCTITE P/N 1477 TO ITEMS 9, 12, AND 15.

② TORQUE TO 90 FT. LBS.

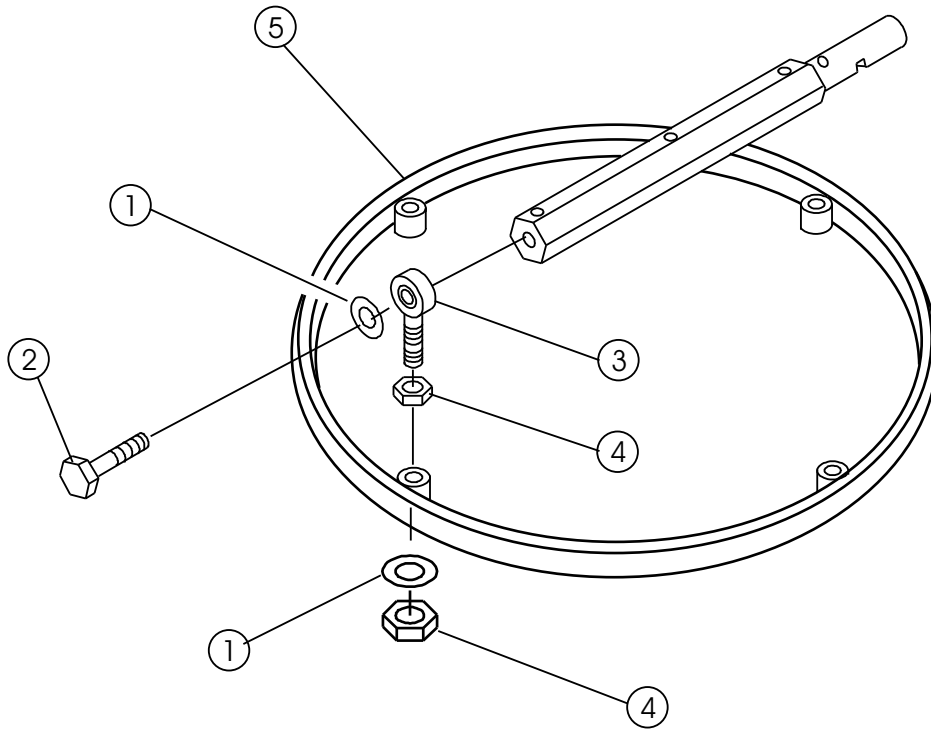
③ RIGHT-SIDE SPIDER ASSEMBLY P/N 12933 INCLUDES ALL ITEMS WITHIN OUTLINE.

④ PART OF ITEM 18 (P/N11431).

SPIDER ASSY. (RIGHT)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	12933	SPIDER ASM, RIGHT SIDE (1-1/2)	1	
2	2829	ARM, TROWEL EXTENDED	5	
3	11904	LEVER, TROWEL ARM RIGHT SIDE	5	
4	9006	PIN, ROLL 5/16 X 2	5	
5	2143	SPRING, RIGHT TROWEL	5	
6	1875	WASHER, INT SHKP 3/8	5	
7	1322	SCREW ASSY, ARM RETAINING	5	
8	1162 A	CAP, GREASE ZERK #2	5	
9	11602	SCREW, HHC 3/8-16 X 3/8	5	
10	0166 A	WASHER, LOCK, 3/8 MED	5	
11	1876	NUT, HEX JAM 3/8	5	
12	0164 B	SCREW, HHC	5	
13	11039	BUSHING, ARM 2 PIECE	10	
14	21208	PLATE, SPIDER 5 BLADE (1-1/2 SHAFT)	1	
15	12097	SCREW, SQHS 3/8-16 X 1-3/4 CONE 8	2	
16	1456	NUT, HEX FINISH 3/8 -16	2	
17	11419	PLATE, WEAR	1	
18	11431	THRUST COLLAR	1	INCLUDES ITEM W/+
19+	20426	BUSHING, THRUST COLLAR	1	
20	2621	FITTING, GREASE	1	
22	12687	KEY, 3/8 X 2	1	
23	12779	BEARING, THRUST 6017 2RS W/FLANGE	1	
24	0105	SCREW, HHCS 5/16-18 X 11/2"	15	
25	0161C	LOCK WASHER 5/16"	15	

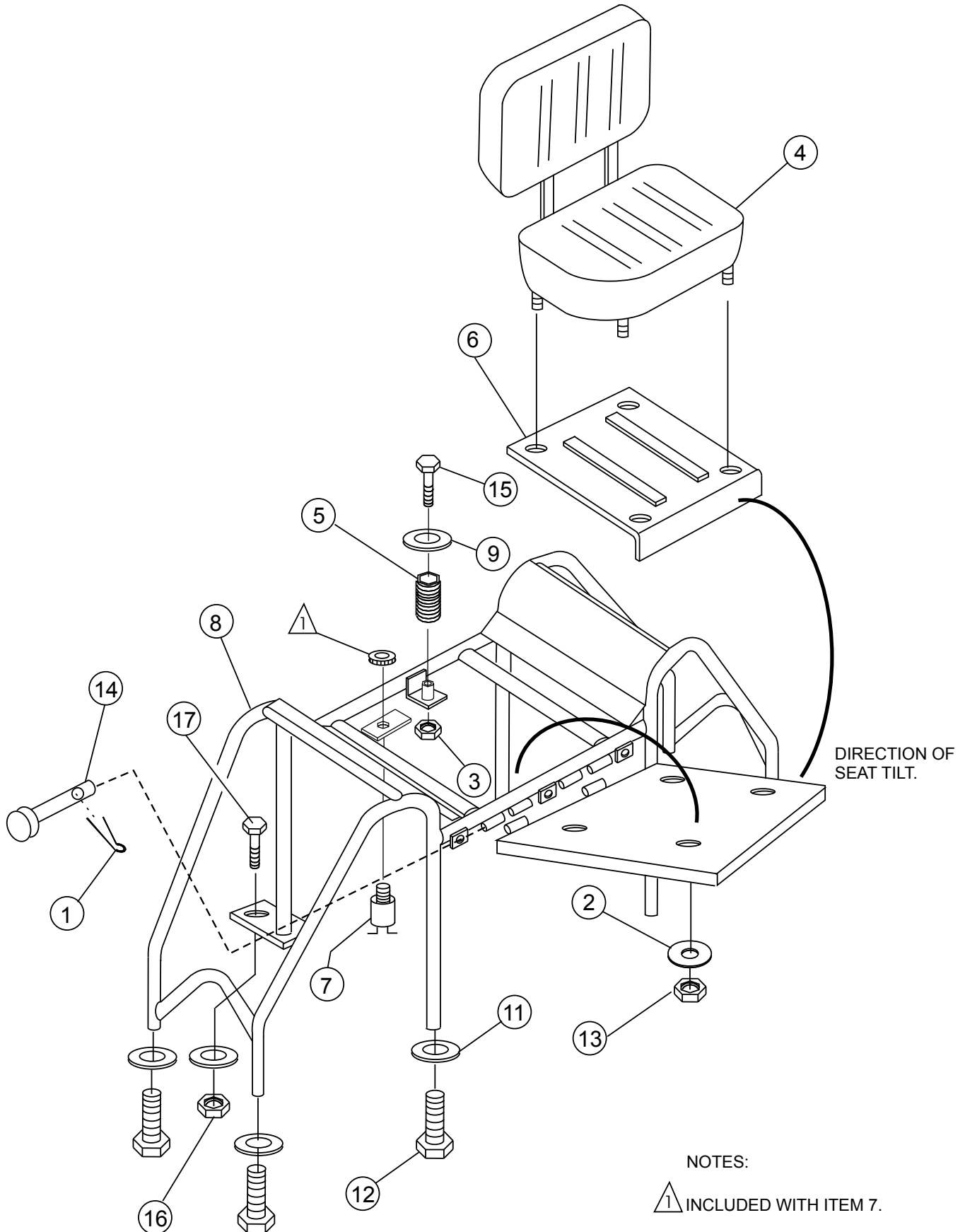
STABILIZER RING ASSY.



STABILIZER RING ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0161C	LOCK WASHER 5/16"	5	
2	1237	SCREW, SCH 5/16-18 X 7/8	5	
3	1723	ROD END, 5/16-24 MALE	4	
4	6014C	NUT, HEX FINISH 5/16-24	8	
5	12095	RING, STABILIZER, EXT ARM, HD	1	

SEAT AND FRAME ASSY.

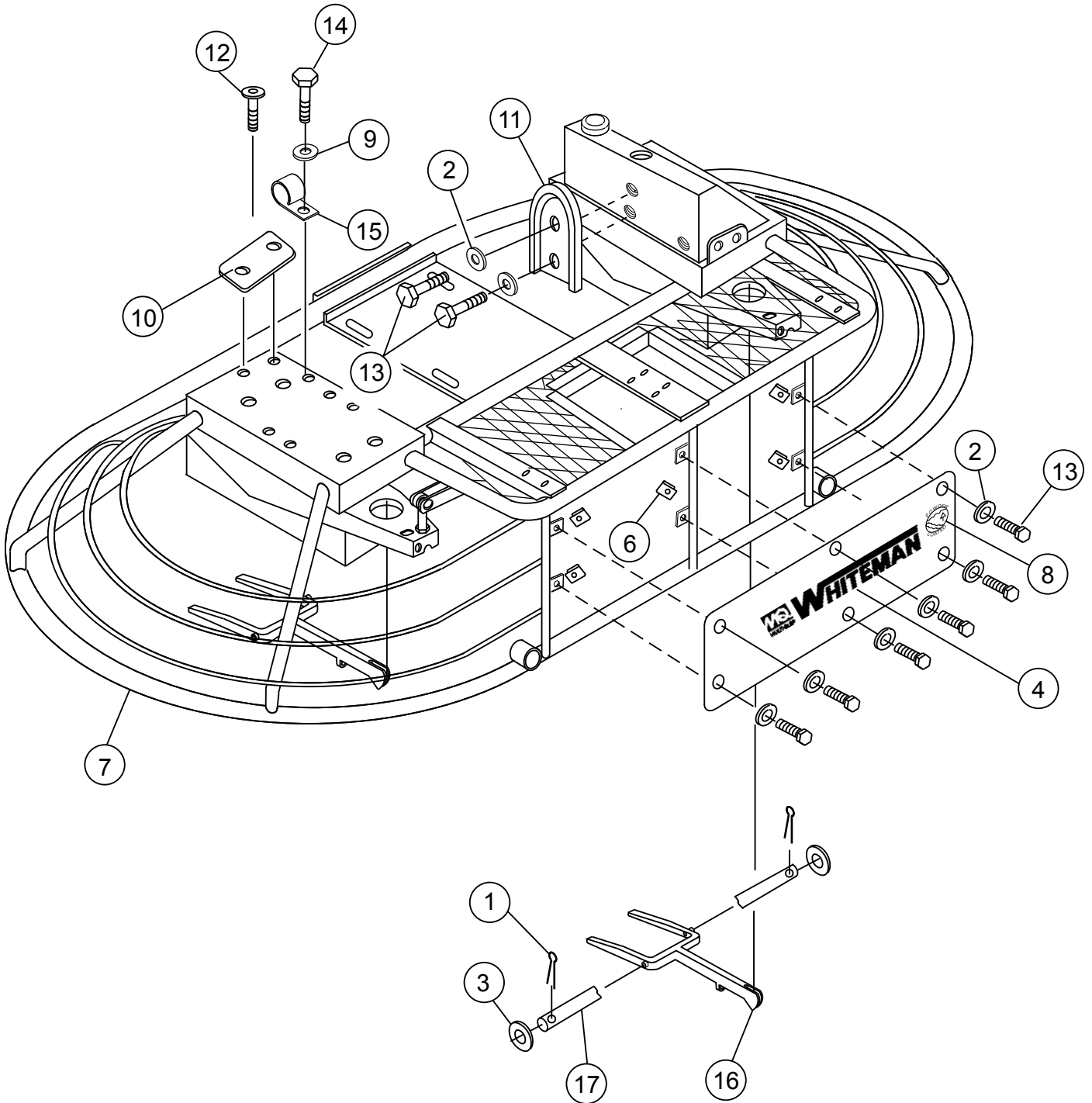


SEAT AND FRAME ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0183	PIN, COTTER 1/8X1 1/4	2	
2	0300	WASHER, FLAT, 5/16 SAE	4	
3	10133	NUT, NYLOC 3/8-16	1	
4	11286	SEAT, ADJUSTABLE	1	
5	11593	SPRING, SEAT	1	
6	11660	PLATE, SEAT W/A HHN	1	
7	12005	SWITCH, KILL	1	
8	12987	FRAME, HNN SEAT W/A VAN	1	
9	4001	WASHER, FLAT, 3/8 USS PLD	1	
11	5054A	WASHER, LOCK, 1/2 MED.	6	
12	5218	SCREW, HHC 1/2-13X1 1/2	6	
13	5283	NUT, NYLOC 5/16-18	4	
14	8081	PIN, CLEVIS 1/2X2 3/4	2	
15	8156	SCREW, HHC 3/8-16X2 1/2	1	
16	10176	NUT, NYLOC 1/2-13	2	
17	3214	SCREW	2	

FRAME AND COMPONENTS

VIEW FROM OPERATOR'S SEAT

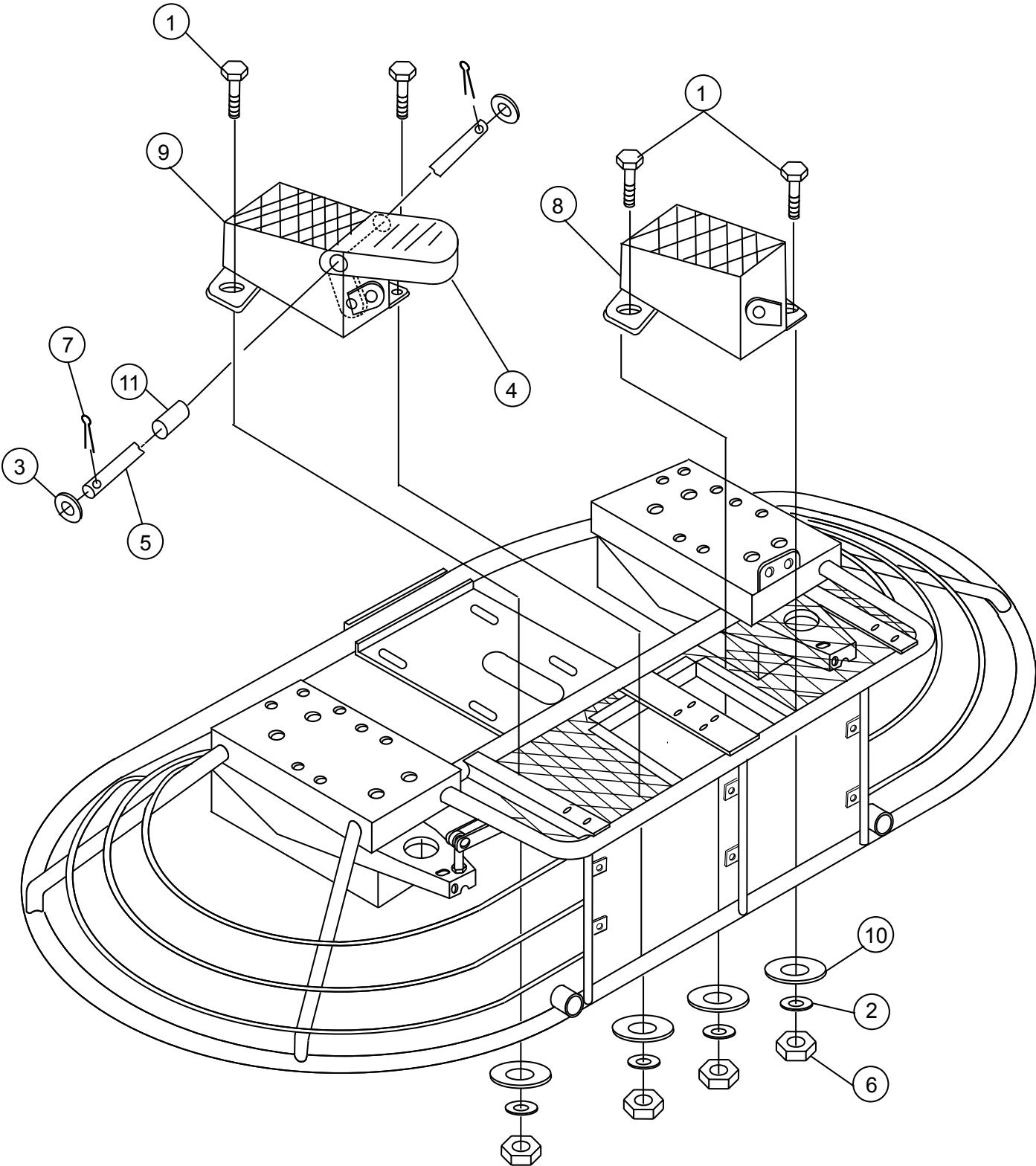


FRAME AND COMPONENTS

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0183	PIN COTTER 3/32X3/4	4	
2	0948	WASHER, FLAT, 1/4 SAE	8	
3	0448	WASHER, FLAT, 3/8 SAE	4	
4	10818	DECAL, MQ WHITEMAN, 23-1/2"	1	
5	11223	PANEL, FRONT (HHN)	1	
6	11534	NUT "U" TYPE, 1/4-20	6	
7	12896	FRAME (HNN-V)	1	
8	13118	DECAL, "POWDER COATED"	1	
9	2203	WASHER, FLAT, #10	3	
10	2411	PLATE, SERIAL, RIDER	1	
11	2429	HOLDER, SPARE BELT ALL	1	
12	4014	SCREW, 2-3/16 P-K TYPE U DRIVE	2	
13	4514	SCREW, HHC 1/4-20X5/8	8	
14	5065B	SCREW, RHM 10-32X1/2	1	
15	8126	CLAMP, HOSE SUPPORT 1/2" SMALL	2	
16	11499	YOKE, HTO/HTN-V	2	
17	11648	PIN, YOKE	2	

FOOT PEDALS ASSY.

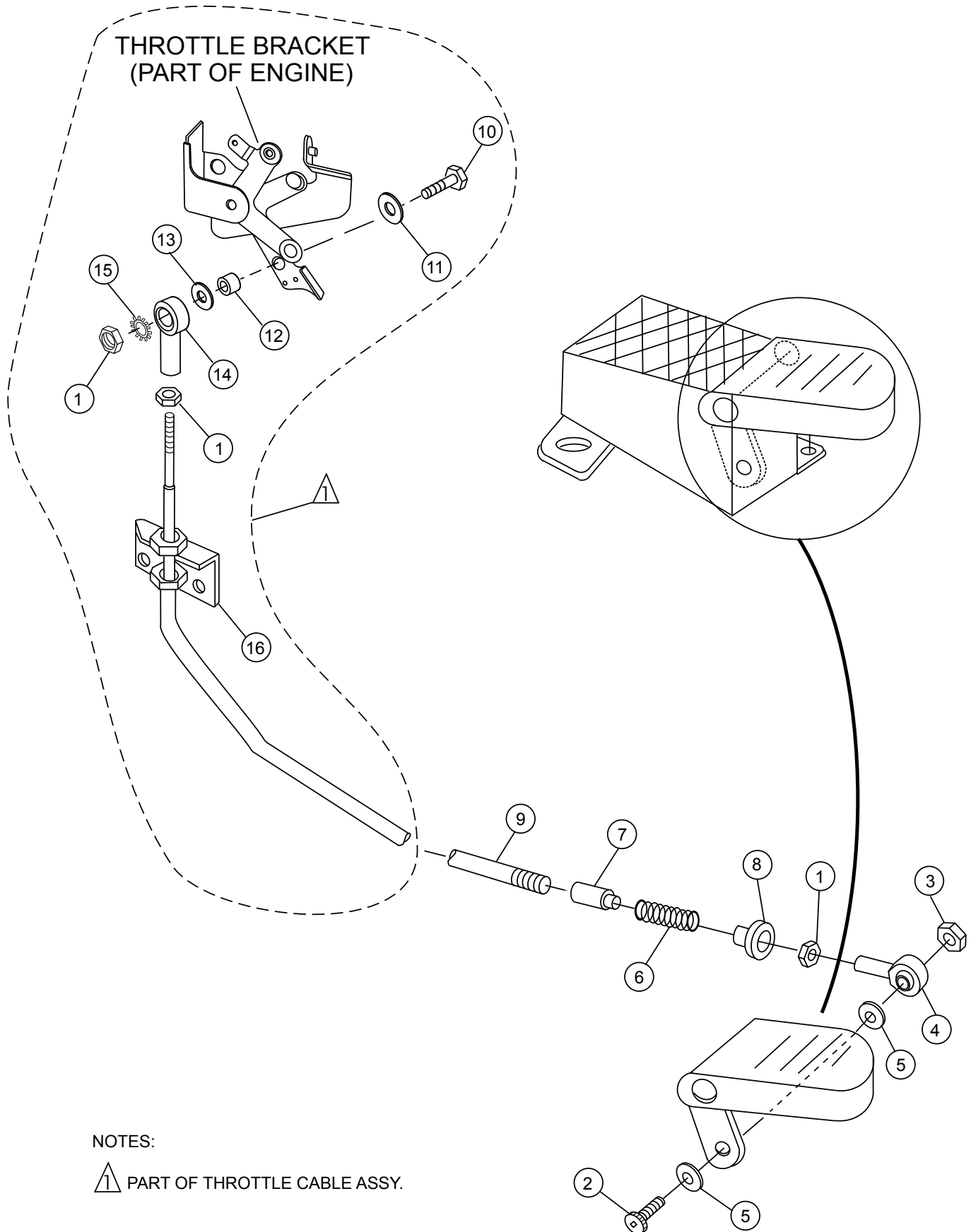
VIEW FROM OPERATOR'S SEAT



FOOT PEDALS ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0202	SCREW, HHC 5/16-18X1	4	
2	0300B	WASHER, FLAT, 5/16 SAE	4	
3	10136	WASHER, FLAT, 3/8 SAE	2	
4	2086	PEDAL, ACCELERATOR	1	
5	2772	PIN, ACC MOUNT	1	
6	5283	NUT, NYLOC 5/16-18	4	
7	6014B	PIN, COTTER 3/32X1	2	
8	12985	LEFT SIDE FOOT REST	1	
9	12986	RIGHT SIDE FOOT REST	1	
10	3233	WASHER, FENDER, 1.5ODX3/8ID	4	
11	3083	SPACER	1	

THROTTLE FOOT PEDAL ASSY.



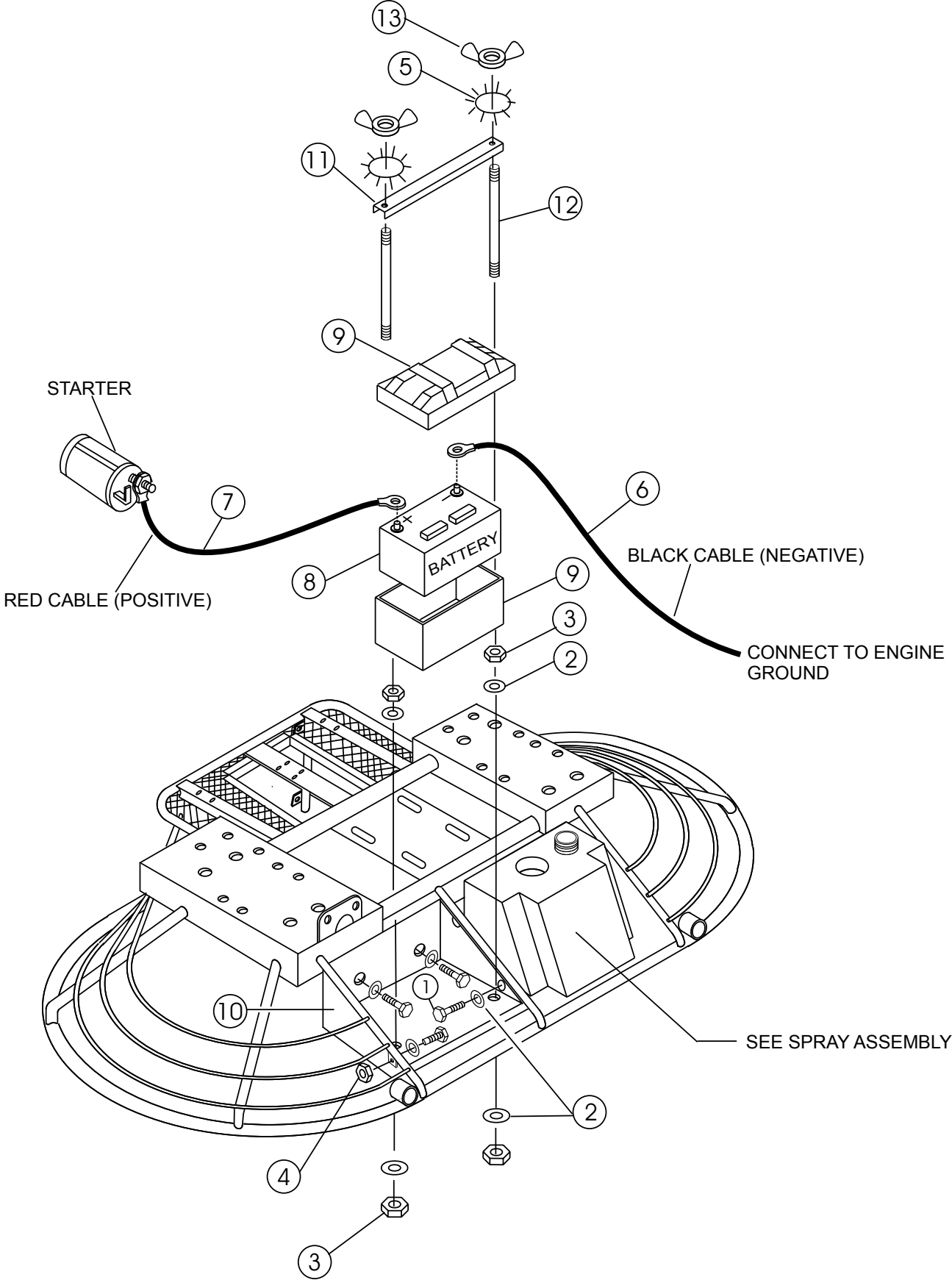
NOTES:

△ PART OF THROTTLE CABLE ASSY.

THROTTLE FOOT PEDAL ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0937	NUT, HEX 10-32	3	
2	10018	SCREW, SHC 10-32X1 NO PLATE	1	
3	10019	NUT, NYLOC 10-32	1	
4	2153	ROD END, 10-32 FEMALE RH	1	
5	2203	WASHER, FLAT, #10	2	
6	2753	SPRING, THROTTLE RETURN, LOWER	1	
7	2754	ADAPTOR, THROTTLE RET. SPRING LG.	1	
8	2755	ADAPTOR, THROTTLE RET. SPRING SHOR	1	
9	2124	CABLE, THROTTLE (RT)	1	
10	8133	SCREW, RHM 10-32 X 3/4	1	
11	2203	WASHER, FLAT #10	1	
12	11710	SPACER, ENGINE THROTTLE	1	
13	0300 B	WASHER, FLAT, 5/16 SAE	1	
14	2153	ROD END, 10-32 FEMALE RH	1	
15	10237	WASHER, EXT. SHKP, 5/16?	4	
16	11771	BRACKET, ENGINE THROTTLE CABLE	1	

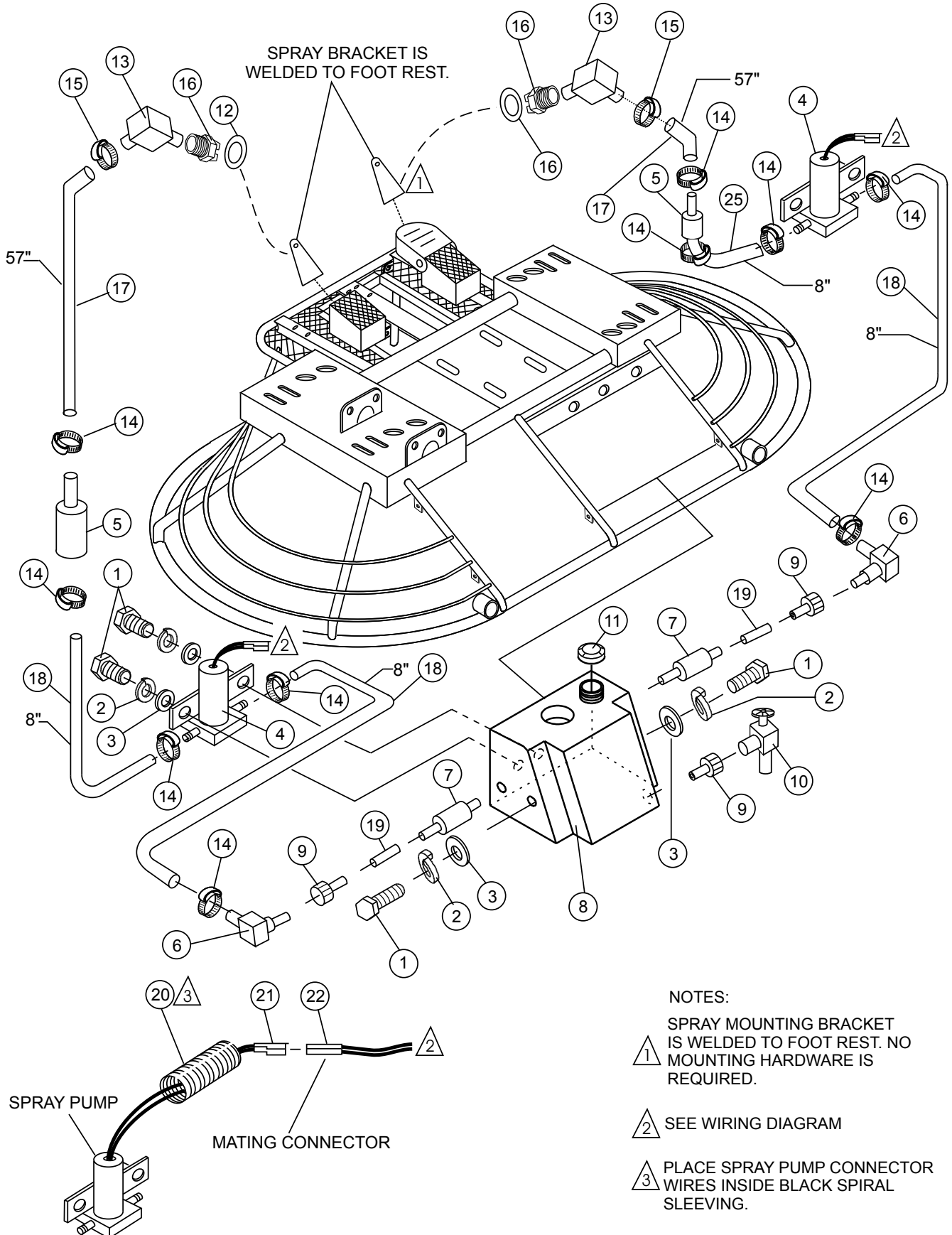
BATTERY ASSY.



BATTERY ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0730	SCREW, HHC 1/4-20X1	4	
2	0948	WASHER, FLAT, 1/4SAE	8	
3	0949	NUT, HEX FINISH 1/4-20	4	
4	10024	NUT, NYLOC 1/4-20	4	
5	10031	WASHER, EXT SHKP, 1/4	2	
6	10313	CABLE, NEG BATTERY BLACK 20"	1	
7	19303	CABLE, POS BATTERY RED 48"	1	
8	10315	BATTERY, 12V WET GROUP 22	1	
9	10318	BATTERY BOX, GROUP 24, W/LID	1	
10	11362	BATTERY FRAME BOX	1	
11	11692	BRACKET, BATTERY BOX HOLD DOWN	1	
12	11693	BOLT, BATTERY BRKT	2	
13	2509	NUT, WING 1/4-20 PLATED	2	

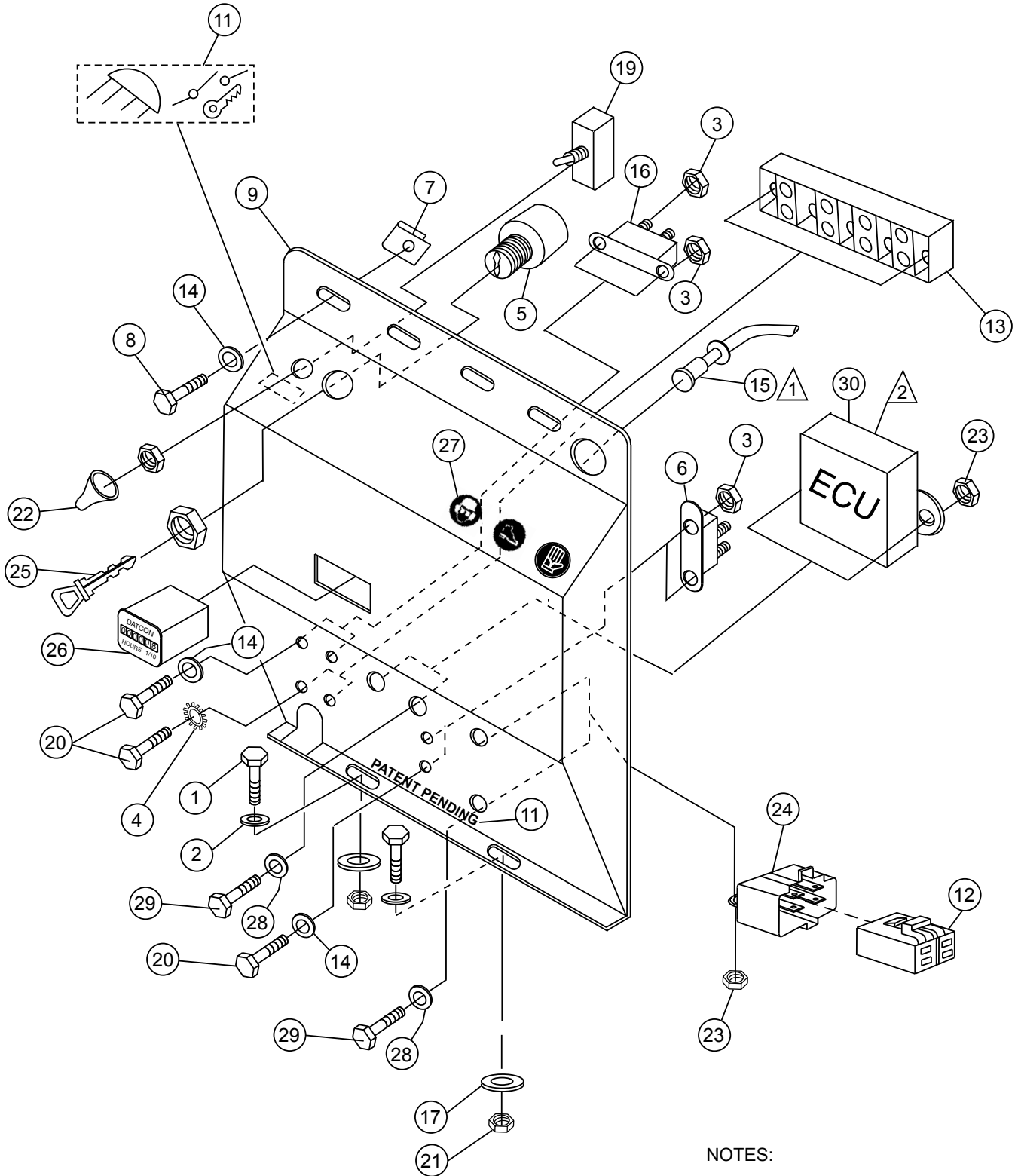
SPRAY ASSY.



SPRAY ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0131 A	SCREW, HHC 1/4-20 X 3/4	6	
2	0181 B	WASHER, LOCK, 1/4 MED	6	
3	0948	WASHER, FLAT, 1/4 SAE	6	
4	12548	PUMP, SPRAY	2	
5	10022	FITTING, PLASTIC 6 BARB – 4 BARB	2	
6	12008	FITTING, 90 6 BARB – 4 BARB FUEL	2	
7	12009	SCREEN, FILTER	2	
8	12403	TANK, RETARDANT 5 GALLON	1	
9	19633	BUSHING, RUBBER FUEL	3	
10	19661	VALVE, FUEL DRAIN	1	
11	2108	CAP, SPRAY TANK	1	
12	2898	WASHER, BONDED NEOPRENE 1 X 1/2	2	
13	2912	FITTING, 90 4 BARB –1/4 FP	2	
14	2918	CLAMP, HOSE, 475 - 536 ID	8	
15	2930	CLAMP, HOSE, 360 - 410 ID	4	
16	392292	NOZZLE, SPRAY	1	
17	60001	HOSE, 25 ID X 375 OD	10 FT.	
18	60002	HOSE, 375 ID X 5 OD	32"	
19	60058	HOSE, 1/4 X 3/8 PVC FUEL YELLOW	4"	
20	60221	CABLE, SLEEVING BLACK SPRIAL	1 FT.	
21	2687	TBD		
22	2680	TBD		

FRONT PANEL ASSY.



NOTES:

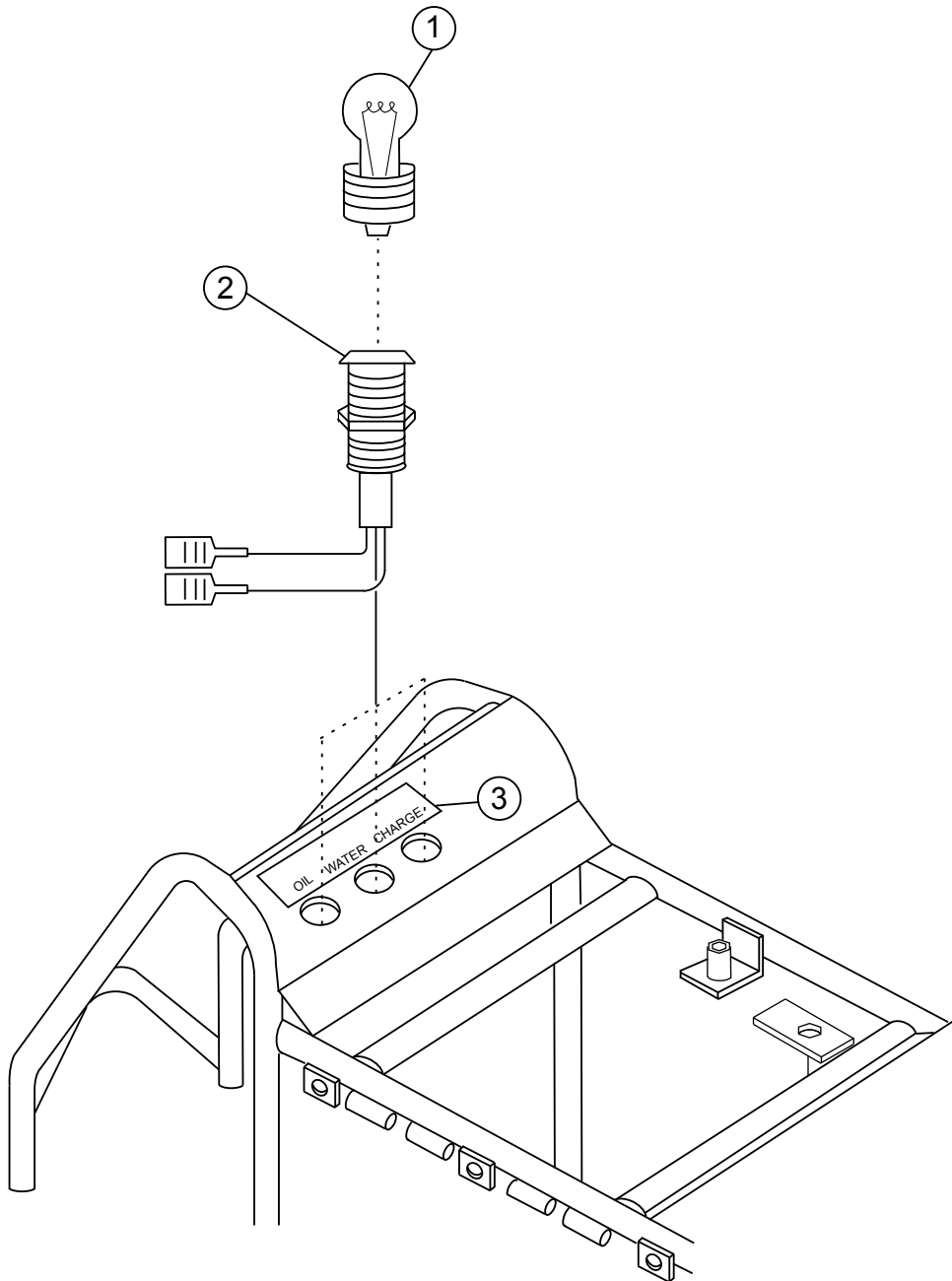
▲ **1** CHOKE CABLE ASSY. CONNECT TO CARBURETOR LINKAGE

▲ **2** ELECTRONIC CONTROL UNIT (ECU) IS INCLUDED WITH ENGINE, SEE VANGUARD ENGINE OWNER'S MANUAL.

FRONT PANEL ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0202	SCREW, HHC 5/16-18 X 1	2	
2	0300B	WASHER, FLAT, 5/16 SAE	2	
3	10019	NUT, NYLOC 10-32	8	
4	10114	WASHER, EXT. SHKP, #8	2	
5	10958	SWITCH, IGNITION VAN W/KEYS	1	
6	11098	CIRCUIT BREAKER, 40A, 12V	1	
7	11534	NUT, "U" TYPE, -20	4	
8	11819	SCREW, HHC -20 X 3/4 W/WASH	4	
9	11861	PANEL, HTO/N VANGUARD CONTROL	1	
10	11912	DECAL, "PATENT PENDING"	1	
11	12571	DECAL, INSTRUMENT LITES (31V)	1	
12	12018	CONNECTOR, RELAY	1	
13	19301	TERMINAL STRIP	.5	
14	2203	WASHER, FLAT, #10	4	
15	2580	CABLE, CHOKE	1	
16	2673	CIRCUIT BREAKER, 30A, 12V	1	
17	3233	WASHER, FENDER, 1.5OD X 3/8ID	2	
19	4682	SWITCH, TOGGLE	1	
20	5065B	SCREW, RHM 10-32 X 1/2	4	
21	5283	NUT, NYLOC 5/16-18	2	
22	8381	BOOT, TOGGLE SWITCH	1	
23	10024	NUT, NYLOC 1/4 20	4	
24	12017	ACCESSORY RELAY	1	S/N 61131 AND ABOVE
24	11792	SOLENOID	1	S/N 61130 AND BELOW
25	11078	KEY, IGNITION SWITCH	1	
26	11694	HOUR METER, DATCON	1	
27	11247	DECAL (HELMET, FOOT, HAND)	1	
28	0948	FLAT WASHER 1/4 "	4	
29	12287	SCREW, THP 1/4-20 X 3/4-SS	4	
30	825572	ECU IGNITION MODULE	1	

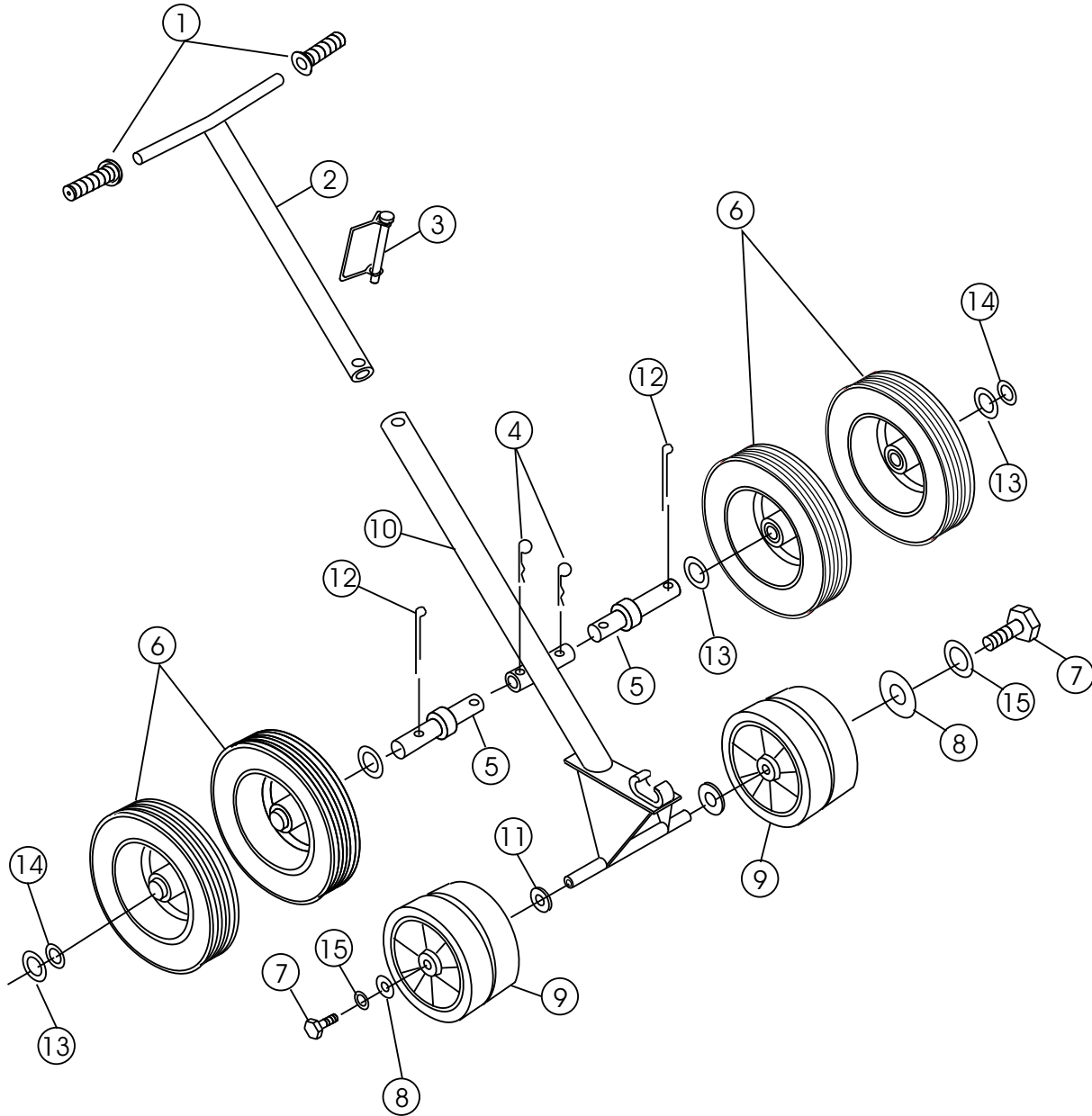
TOP RIGHT PANEL ASSY.



TOP RIGHT PANEL ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	12307	BULB, INDICATOR LIGHT	3	
2	12305	PLUG INDICATOR LIGHT	3	
3	12571	DECAL, OPERATING LIGHTS	1	

E-Z MOVER AND LIFT HANDLE ASSY.



E-Z MOVER AND LIFT HANDLE ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	0189	HAND GRIP	2	
2	2336	UPPER HANDLE	1	
3	1869	SNAP PIN	1	
4	7170	CLIP	4	
5	11684	DOLLY AXLE	4	
6	10440	WHEEL & TIRE	4	
7	0655	SCREW, HHCS 5/16-18 X 3/4"	2	
8	0300B	FLAT WASHER 5/16"	2	
9	2364	WHEEL	2	
10	10445	FRAME	1	
11	4684	FLAT WASHER 5/8"	2	
12	0183	COTTER PIN	4	
13	10446	FLAT WASHER 3/4"	8	
14	8151	FLAT WASHER 3/4" SAE	8	
15	0161C	LOCK WASHER 5/16"	2	

EMR-2 E-Z MOVER ASSY — PURCHASE THROUGH MQ UNIT SALES DEPT.

TERMS AND CONDITIONS OF SALE — PARTS

PAYMENT TERMS

Terms of payment for parts are net 30 days.

FREIGHT POLICY

All parts orders will be shipped collect or prepaid with the charges added to the invoice. All shipments are F.O.B. point of origin. Multiquip's responsibility ceases when a signed manifest has been obtained from the carrier, and any claim for shortage or damage must be settled between the consignee and the carrier.

MINIMUM ORDER

The minimum charge for orders from Multiquip is \$15.00 net. Customers will be asked for instructions regarding handling of orders not meeting this requirement.

RETURNED GOODS POLICY

Return shipments will be accepted and credit will be allowed, subject to the following provisions:

1. A Returned Material Authorization must be approved by Multiquip prior to shipment.
2. To obtain a Return Material Authorization, a list must be provided to Multiquip Parts Sales that defines item numbers, quantities, and descriptions of the items to be returned.
 - a. The parts numbers and descriptions must match the current parts price list.
 - b. The list must be typed or computer generated.
 - c. The list must state the reason(s) for the return.
 - d. The list must reference the sales order(s) or invoice(s) under which the items were originally purchased.
 - e. The list must include the name and phone number of the person requesting the RMA.
3. A copy of the Return Material Authorization must accompany the return shipment.
4. Freight is at the sender's expense. All parts must be returned freight prepaid to Multiquip's designated receiving point.

5. Parts must be in new and resalable condition, in the original Multiquip package (if any), and with Multiquip part numbers clearly marked.
6. The following items are not returnable:
 - a. Obsolete parts. (If an item is in the price book and shows as being replaced by another item, it is obsolete.)
 - b. Any parts with a limited shelf life (such as gaskets, seals, "O" rings, and other rubber parts) that were purchased more than six months prior to the return date.
 - c. Any line item with an extended dealer net price of less than \$5.00.
 - d. Special order items.
 - e. Electrical components.
 - f. Paint, chemicals, and lubricants.
 - g. Decals and paper products.
 - h. Items purchased in kits.
7. The sender will be notified of any material received that is not acceptable.
8. Such material will be held for five working days from notification, pending instructions. If a reply is not received within five days, the material will be returned to the sender at his expense.
9. Credit on returned parts will be issued at dealer net price at time of the original purchase, less a 15% restocking charge.
10. In cases where an item is accepted, for which the original purchase document can not be determined, the price will be based on the list price that was effective twelve months prior to the RMA date.
11. Credit issued will be applied to future purchases only.

PRICING AND REBATES

Prices are subject to change without prior notice. Price changes are effective on a specific date and all orders received on or after that date will be billed at the revised price. Rebates for price declines and added charges for price increases will not be made for stock on hand at the time of any price change.

Multiquip reserves the right to quote and sell direct to Government agencies, and to Original Equipment Manufacturer accounts who use our products as integral parts of their own products.

SPECIAL EXPEDITING SERVICE

A \$35.00 surcharge will be added to the invoice for special handling including bus shipments, insured parcel post or in cases where Multiquip must personally deliver the parts to the carrier.

LIMITATIONS OF SELLER'S LIABILITY

Multiquip shall not be liable hereunder for damages in excess of the purchase price of the item with respect to which damages are claimed, and in no event shall Multiquip be liable for loss of profit or good will or for any other special, consequential or incidental damages.

LIMITATION OF WARRANTIES

No warranties, express or implied, are made in connection with the sale of parts or trade accessories nor as to any engine not manufactured by Multiquip. Such warranties made in connection with the sale of new, complete units are made exclusively by a statement of warranty packaged with such units, and Multiquip neither assumes nor authorizes any person to assume for it any other obligation or liability whatever in connection with the sale of its products. Apart from such written statement of warranty, there are no warranties, express, implied or statutory, which extend beyond the description of the products on the face hereof.

Effective: February 22, 2006

OPERATION AND PARTS MANUAL

HERE'S HOW TO GET HELP

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

UNITED STATES

Multiquip Corporate Office

18910 Wilmington Ave.
Carson, CA 90746
Contact: mq@multiquip.com

Tel: (800) 421-1244
Fax (800) 537-3927

MQ Parts Department

800-427-1244 Fax: 800-672-7877
310-537-3700 Fax: 310-637-3284

Service Department

800-421-1244 Fax: 310-537-4259
310-537-3700

Warranty Department

800-421-1244 Fax: 310-943-2249
310-537-3700

Technical Assistance

800-478-1244 Fax: 310-943-2238

MEXICO

MQ Cipsa

Carr. Fed. Mexico-Puebla KM 126.5
Momoxpan, Cholula, Puebla 72760 Mexico
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