

# OPERATION MANUAL



## MODELS

**QP4TZT10P**

**QP4TZTMP16F**

**QP4TZTMPXF**

**TRASH PUMP**

**(Hatz 1B40U-2203A Diesel Engine)**

Revision #2 (12/02/22)



THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

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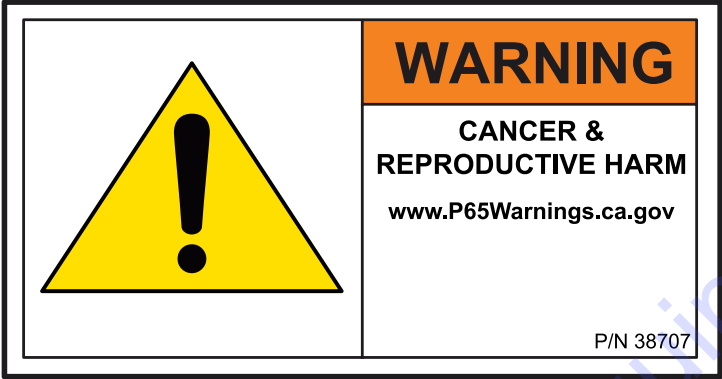
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**PROPOSITION 65 WARNING**

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**QP4TZT10P/TMP16F/TMPXF**

**Trash Pump**

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**NOTICE**

Specifications and part numbers are subject to change without notice.

# 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
	Respiratory hazards
	Accidental starting hazards
	Eye and hearing 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.



- **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.



### NOTICE

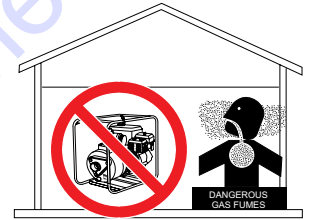
- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized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



## PUMP SAFETY

### DANGER

- **NEVER** pump volatile, explosive, flammable or low flash point fluids. These fluids could ignite or explode.
- The 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

- **NEVER** pump corrosive chemicals or water containing toxic substances. These fluids could create serious health and environmental hazards. Contact local authorities for assistance.
- **NEVER** open the priming plug when pump is hot. Hot water inside could be pressurized much like the radiator of an automobile. Allow pump to cool to the touch before loosening plug. The possibility exists of scalding, resulting in severe bodily harm.
- **NEVER** operate the pump with closed discharge hose. The liquid could reach boiling temperatures, build pressure, and cause the casing to rupture or explode.
- **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.



# SAFETY INFORMATION

## CAUTION

- **NEVER** lubricate components or attempt service on a running machine.
- **NEVER** block or restrict flow from discharge hose. Remove kinks from discharge line before starting pump. Operation with a blocked discharge line can cause water inside pump to overheat.

## NOTICE

- **ALWAYS** fill the pump casing with water before starting the engine. Failure to maintain water inside the pump housing will cause severe damage to the pump and mechanical seal.
- In winter drain water from pump housing to prevent freezing.
- **NEVER** start the pump with the clean-out cover removed. The rotating impeller inside the pump can cut or sever objects caught in it. Before starting the pump, check that the clean-out cover is securely fastened.
- **ALWAYS** keep the machine in proper running condition.
- **ALWAYS** ensure pump is on level ground before use.
- 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.

## 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.
- **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 pump.



## CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing equipment.



## NOTICE

- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.



## FUEL SAFETY

### DANGER

- **DO NOT** start the engine near spilled fuel or combustible fluids. Fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with flammable liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.



# SAFETY INFORMATION

## BATTERY SAFETY (ELECTRIC START ONLY)

### DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.



### WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.
- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **DO NOT** charge battery if frozen. Battery can explode. When frozen, warm the battery to at least 61°F (16°C).
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gases.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.
- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.



### CAUTION

- **ALWAYS** disconnect the **NEGATIVE** battery terminal before performing service on the equipment.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.

## TRANSPORTING SAFETY

### CAUTION

- **NEVER** allow any person or animal to stand underneath the equipment while lifting.

### NOTICE

- Before lifting, make sure that the equipment parts are not damaged and screws are not loose or missing.
- **ALWAYS** make sure forklift forks are inserted into pockets (if applicable) as far as possible when lifting the pump.
- **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 one point suspension hook and lift straight upwards.
- **DO NOT** lift machine to unnecessary heights.
- **ALWAYS** tie down equipment during transport by securing the equipment with rope.
- Never allow any person or animal to stand underneath the equipment while lifting.



# SAFETY INFORMATION

## TOWING SAFETY


### CAUTION

- Check with your local county or state safety towing regulations, in addition to meeting **Department of Transportation (DOT) Safety Towing Regulations**, before towing your generator. 
- Refer to MQ Power trailer manual for additional safety information.
- In order to reduce the possibility of an accident while transporting the generator on public roads, **ALWAYS** make sure the trailer that supports the generator 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 (if applicable) 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

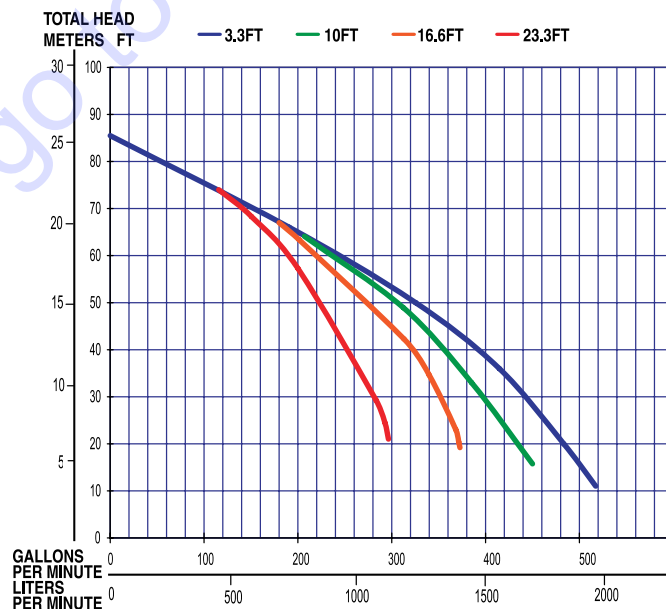
### NOTICE

- 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

Table 1. Pump Specifications			
Model	QP4TZT10P	QP4TZTMP16F	QP4TZTMPXF
Type	Trash Pump		
Suction x Discharge Size	4 x 4 in. (100 x 100 mm)		
Maximum Pumping Capacity	526 gal/minute (2000 liters/minute)		
Maximum Solids Diameter	1.50 in. (38 mm)		
Maximum Lift	25 ft. (7.62 m)		
Maximum Head	85 ft. (26 m)		
Dry Net Weight (Pump)	265 lb (120 kg)		
Dry Net Weight (Pump and Trailer)	550 lb (250 kg)	665 lb (302 kg)	735 lb (334 kg)
Fuel Tank Capacity	5.2 quarts (5 liters)	16 gal (60.6 liters)	28 gal (106 liters)

Table 2. Engine Specifications	
Engine Make	HATZ 1B40U-2203A
Engine Type	Air-Cooled, 4-Stroke, Single Cylinder, Diesel Engine
Cylinder Bore x Stroke	3.5 x 3in (88 x 76 mm)
Displacement	29 in. <sup>3</sup> (462 cm <sup>3</sup> )
Maximum Output	9.9 HP @3600 RPM (7.4 kW)
Fuel Tank Capacity	5.2 quarts (5 liters)
Oil Capacity	1.6 quarts (1.5 liters)
Starting Method	Electric/Recoil Start
Dry Net Weight	121.25 lbs (55 kg)



**Figure 1. Performance Curve**

# DIMENSIONS

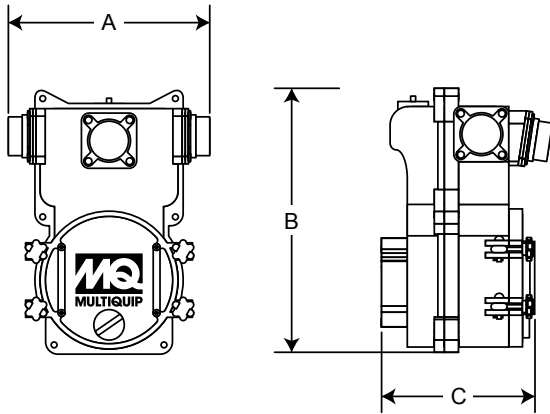


Table 3. Dimensions		
Reference Letter	QP4TZTMP16F/ QP4TZTMPXF in. (mm)	QP4TZT10P in. (mm)
A	19 (485)	
B	24.2 (615)	
C	13.5 (343)	
D	49 (1,245)	
E	56.5 (1,435)	52.4 (1,331)
F	44.5 (1,130)	
G	23.5 (597)	
H	102 (2,591)	91.6 (2,327)
J	25 (635)	
K	67 (1,702)	
L	28.4 (721)	

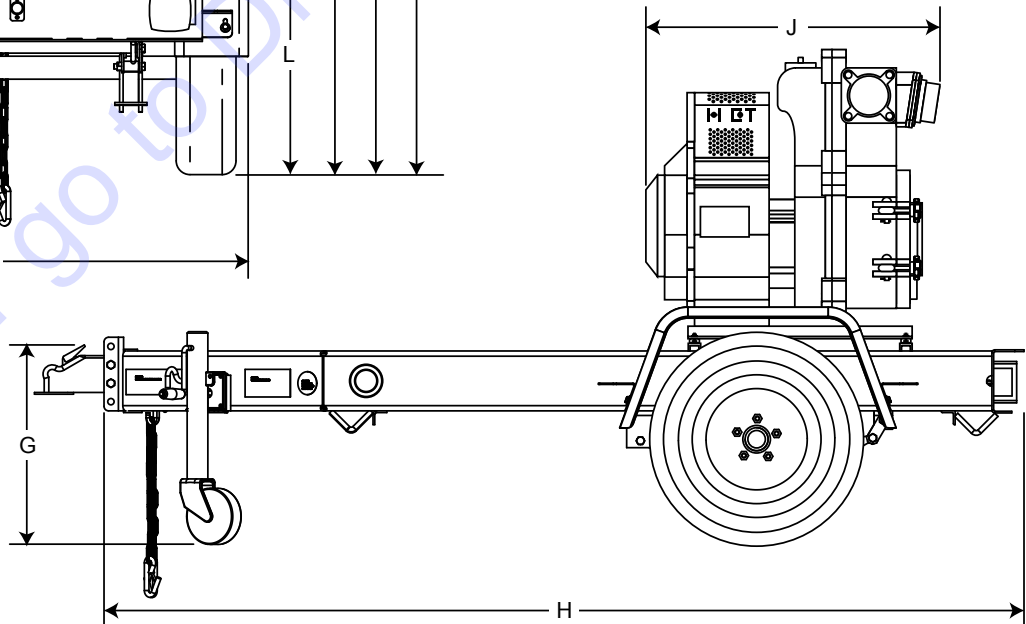
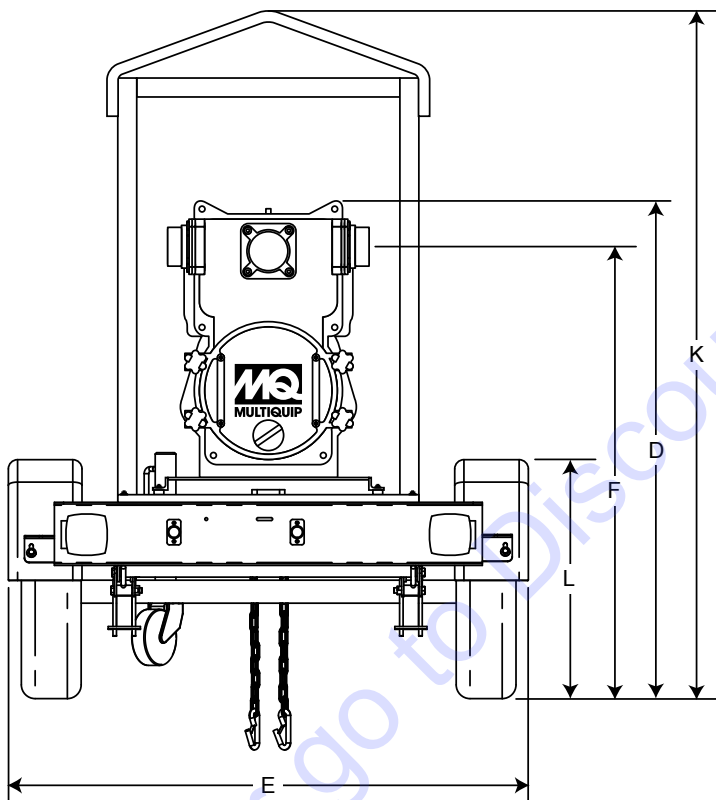


Figure 2. Dimensions

# GENERAL INFORMATION

## APPLICATION

The QP4TZ Trash Pump is designed to be used for dewatering applications. Both the suction and discharge ports on the trash pump use a 4-inch diameter opening, which allows it to pump at a rate of approximately 526 gallons/minute (gpm) or 2,000 liters/minute (lpm).

Trash or self-priming pumps are designed to purge air from the suction line and create a partial vacuum in the pump body. The reduced atmospheric pressure inside the pump allows water to flow through the suction line and into the pump body. The centrifugal force created by the rotating impeller pressurizes the water and expels it from the pump.

## ENGINE

This trash pump is powered by a 9.9 horsepower, air-cooled, HATZ 1B40 diesel engine.

## TRASH PUMP

Trash pumps derive their name from their ability to handle a greater amount of debris and solids than standard centrifugal pumps. This pump generally handles solids up to 1/2 the size of the discharge opening making them less likely to clog. Also trash pumps are capable of handling water with 25% solids by weight.

The advantage of using a trash pump is that it can be quickly and easily disassembled in the field "without tools" and easily cleaned when clogged.

## SUCTION LIFT

This pump is intended to be used for dewatering applications and is capable of suction lifts up to 25 feet at sea level. For optimal suction lift performance, keep the suction hose or line as short as possible. In general, always place the pump as close to the water as possible.

## TRAILER

The QP4TZT10P is equipped with the TRLR10P trailer (without fuel cell) for basic trailer application.

The QP4TZTMP16F is equipped with the 16-gallon Multi-Purpose TRLRMP16FP trailer.

The QP4TZTMPXF is equipped with the 28-gallon Multi-Purpose TRLRMPXFP trailer.

## ELEVATION

Higher elevations will effect the performance of the pump. Due to less atmospheric pressure at higher altitudes, pumps **DO NOT** have the priming ability that they have at sea level. This is due to the "thinner air" or lack of oxygen at higher altitudes.

A general rule of thumb is that for every 1,000 feet of elevation above sea level a pump will lose one foot of priming ability.

For example, in Flagstaff, Arizona where the elevation is approximately 7,000 feet, the pump would have a suction lift of 25 feet rather than the 18 feet at sea level. Table 4 shows suction lift at various elevations.

**Table 4. Suction Lift at Various Elevations**

Altitude Feet (Meters)	Suction Lift in Feet (Meters)			
Sea Level	10.0 (3.048)	15.0 (4.572)	20.0 (6.096)	25.0 (7.620)
2,000 (610)	8.80 (2.680)	13.2 (4.023)	17.6 (5.364)	22.0 (6.705)
4,000 (1,219)	7.80 (2.377)	11.7 (3.566)	15.6 (4.754)	19.5 (5.943)
6,000 (1,829)	6.90 (2.103)	10.4 (3.169)	13.8 (4.206)	17.3 (5.273)
8,000 (2,438)	6.20 (1.889)	9.30 (2.834)	12.4 (3.779)	15.5 (4.724)
10,000 (3,048)	5.70 (1.737)	8.60 (2.621)	11.4 (3.474)	14.3 (4.358)

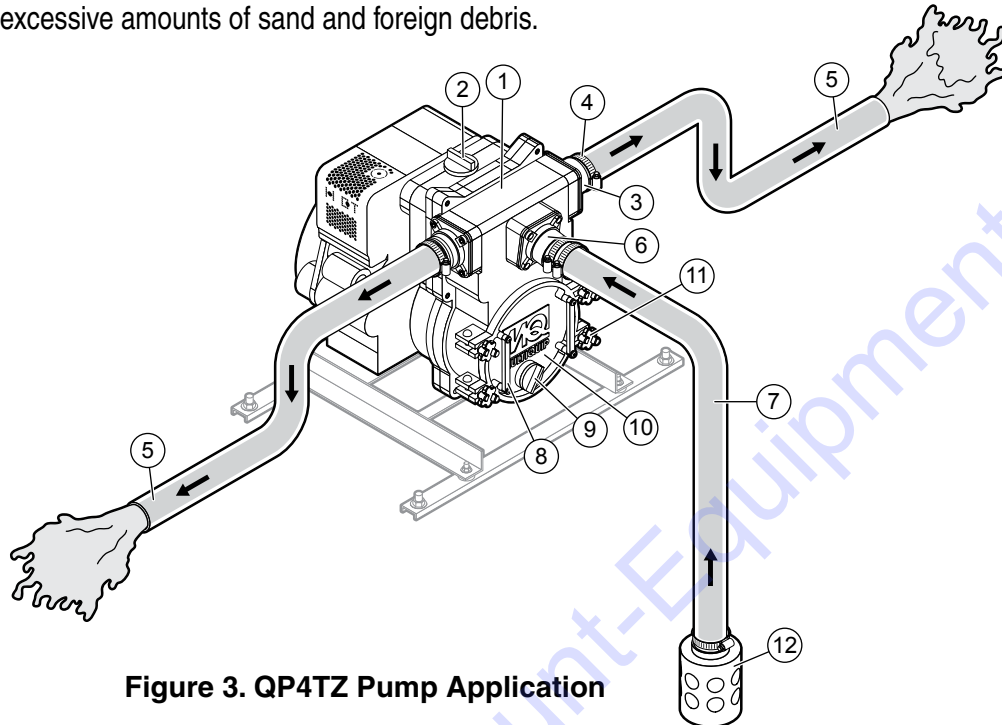
Table 5 shows percentage drops in performance as elevation increases.

**Table 5. Performance Loss at Various Elevations**

Altitude Feet (Meters)	Discharge Flow	Discharge Head
Sea Level	100%	100%
2,000 (610)	97%	95%
4,000 (1,219)	95%	91%
6,000 (1,829)	93%	87%
8,000 (2,438)	91%	83%
10,000 (3,048)	88%	78%

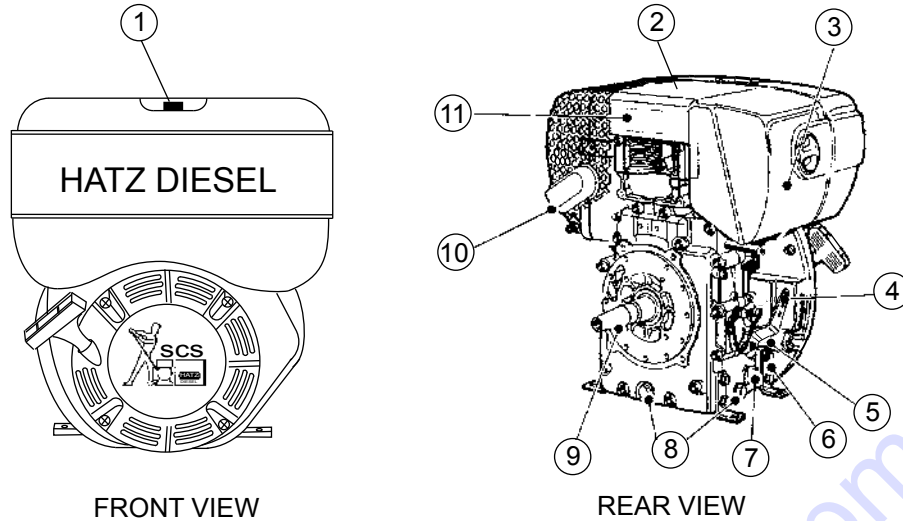
## COMPONENTS (PUMP)

Figure 3 shows a typical application using the QP4TZ trash pump. Please note that this pump is intended for the removal of clean water and water containing some debris and solids. Maximum size of solids should not exceed 1.5 inch (30 mm) in diameter. **DO NOT** set strainer on bottom of water bed. Placing the strainer above the water bed will prevent the pump from drawing in excessive amounts of sand and foreign debris.



**Figure 3. QP4TZ Pump Application**

- 1. Pump** — The model QP4TZ is a 4-inch trash pump used in general dewatering applications. Typical dewatering applications consist of manholes, septic tanks, fast and slow seepage ditch water, silt water, mud water, and muck water.
- 2. Fill Cap** — Prior to operation, the pump casing should be filled with water. Remove this cap to add water to the pump. After the initial prime, a sufficient amount of water will be retained in the casing so that the operator will not need to re-prime later.  
If the casing is dry or has insufficient water, the pump will have difficulty in priming which could lead to premature mechanical seal wear thus causing damage to the pump.
- 3. Discharge Port** — Connect a 4-inch discharge hose to either port (one of two ports).
- 4. Worm Clamp** — Used to secure the hose to the inlet and outlet ports on the pump. Use two clamps to secure the hose on the inlet side of the pump.
- 5. Discharge Hose** — Connect this flexible rubber hose to the discharge port on the pump. Make sure that the hose lays flat and is not kinked. Use only recommended type discharge hose. Contact Discount-equipment for ordering information.
- 6. Suction Port** — Connect a 4-inch inlet hose to this port. Use two worm clamps to secure the hose.
- 7. Suction Hose** — Connect this flexible rubber hose to the suction portion the pump. Make sure that the hose lays flat and is not kinked. Use only recommended type suction hose. Contact Discount-equipment for ordering information.
- 8. Clean-out Cover Handles** — To gain access to the pump's clean-out area, grip both handles, then pull to remove cover. Make sure both locking knobs have been released before attempting to remove clean-out cover.
- 9. Drain Plug** — Remove this plug to drain water from the pump.
- 10. Clean-out Cover** — Remove cover to gain access to the clean-out area.
- 11. Locking Knobs** — Turn both knobs clockwise to secure clean-out cover, turn counterclockwise to release cover.
- 12. Strainer** — Always attach a strainer to the bottom side of the suction hose to prevent large objects and debris from entering the pump. Strainer should be positioned so that it will remain completely under water. Running the pump with the strainer above water for long periods can damage pump.



**Figure 4. Engine Controls and Components**

## INITIAL SERVICING

The engine (Figure 4) 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.

1. **Fuel Filler Cap/Fuel Tank** — Pull this latch to add diesel fuel to the tank. After refueling, always make sure the fuel cap is latched properly. **DO NOT** over fill. For additional information refer to engine owner's manual.

### DANGER



Adding fuel to the tank should be accomplished only when the engine is stopped and has had an opportunity to cool down. In the event of a fuel spill, **DO NOT** attempt to start the engine until the fuel residue has been completely wiped up, and the area surrounding the engine is dry.

2. **Engine Lifting Straps/Cover** — Remove the air cleaner cover, then lift this cover (the one with decals on it) to gain access to the engine lifting straps.
3. **Air Cleaner/Cover** — Prevents dirt and other debris from entering the fuel system. Remove wing-nut on side of air filter cover to gain access to filter element.
4. **Speed Control Lever** — This lever is connected to the throttle control which is located on the side of the engine compartment cover. Use this lever to control engine speed.

5. **Dip Stick** — Remove dipstick to determine if the engine oil level is low. If low, add oil as specified.
6. **Engine Motor Mounts** — Attach these engine mounts to the pump frame. Tighten securely.
7. **Oil Filter** — Remove this bolt to gain access (internal) to the engine oil filter. Service the oil filter as recommended in the maintenance section of this manual.
8. **Oil Drain Plugs** — There are two oil drain plugs, one is underneath the flywheel, the other on the side of the engine. Remove these plugs to drain engine oil from the engine crankcase.
9. **Crankshaft** — Connect this shaft to the input of the transmission.
10. **Muffler** — Used to reduce noise and emissions.
11. **Nameplate** — Contains information about the engine.

### WARNING



Engine components can generate extreme heat. To prevent burns, **DO NOT** touch these areas while the engine is running or immediately after operating. **NEVER** operate the engine with the muffler removed.


### NOTICE

Operating the engine without an air filter, with a damaged air filter, or a filter in need of replacement will allow dirt to enter the engine, causing rapid engine wear.




# INSPECTION (ENGINE)

**DANGER**



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

**CAUTION**



**ALWAYS** wear approved eye and hearing protection before operating the pump.

## BEFORE STARTING

1. Read safety instructions at the beginning of manual.
2. Clean the pump, removing dirt and dust, particularly the engine cooling air inlet, carburetor and air cleaner.
3. Check the air filter for dirt and dust. If air filter is dirty, replace air filter with a new one as required.
4. Check carburetor for external dirt and dust. Clean with dry compressed air.
5. Check fastening nuts and bolts for tightness.

## Engine Oil Check

1. To check the engine oil level, place the pump on secure level ground with the engine stopped.
2. Remove the filler dipstick from the engine oil filler hole (Figure 5) and wipe clean.

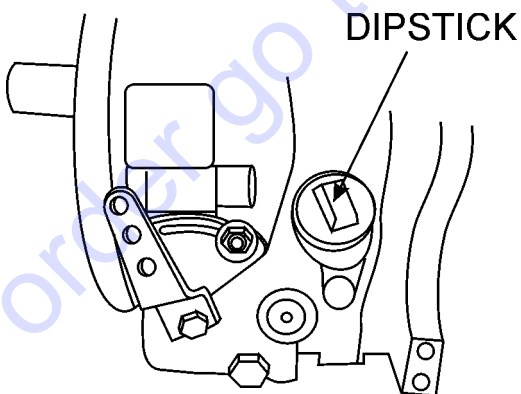


Figure 5. Engine Oil Dipstick (Removal)

3. Insert and remove the dipstick without screwing it into the filler neck. Check the oil level shown on the dipstick.
4. If the oil level is low (Figure 6), fill to the edge of the oil filler hole with the recommended oil type (Table 6). Maximum oil capacity is 1.6 quarts (1.5 liters).

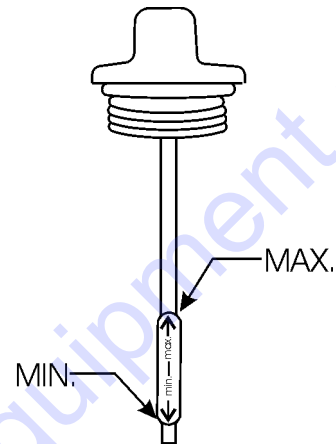



Figure 6. Engine Oil Dipstick (Oil Level)

Table 6. Oil Type		
Season	Temperature	Oil Type
Summer	25°C or Higher	SAE 10W-30
Spring/Fall	25°C ~ 10°C	SAE 10W-30/20
Winter	0°C or Lower	SAE 10W-10

**DANGER**



Motor fuels are highly flammable and can be dangerous if mishandled. **DO NOT** smoke while refueling. **DO NOT** attempt to refuel the pump if the engine is hot! or running.

## Fuel Check

1. Remove the fuel cap located on top of fuel tank.
2. Visually inspect to see if the fuel level is low. If fuel is low, replenish with diesel fuel.
3. When refueling, be sure to use a strainer for filtration. **DO NOT** top-off fuel. Wipe up any spilled fuel immediately!

## BEFORE STARTING

1. Read safety instructions at the beginning of manual.
2. Move the trailer as near to the water as possible.
3. To prime pump, remove fill cap (Figure 3) and fill pump casing with water. If the pump casing is not filled with water before starting, it will not begin pumping.

### NOTICE

Pump casing must be filled with water before using pump. Otherwise pump will not be able to begin pumping.

### WARNING

DO NOT open fill cap if pump is hot! Water inside may be under pressure.

4. Check for leaks between pump and engine. If water is leaking between the pump and engine housing, the seal inside the pump may be worn or damaged. Continued operation of the pump is not recommended. Further usage of the pump under these conditions may cause severe water damage to engine.

## HOSES AND CLAMPS

1. Check that all hoses are securely attached to the pump. Make certain suction hose (Figure 3) does not have any air leakage. Tighten hose clamps and couplings as required.
2. It is recommended that 2 clamps be used when securing the suction hose to the inlet side (suction) of the pump.
3. Remember suction hoses must be rigid enough not to collapse when the pump is in operation.
4. Check that the discharge hose (Figure 3) is not restricted. Place hose so that it lays as straight as it is possible on the ground. Remove any twists or sharp bends from hose which may block the flow of water.

### NOTICE

Suction and discharge hoses are available. Contact Discount-equipment for more information.

6. The discharge hose is usually a collapsible (thin-walled) hose, however if a thin-walled discharge hose is not available, a rigid suction hose can be substituted in its place.
7. Make sure the suction strainer (Figure 3) is clean and securely attached to the water end of the suction hose. The strainer is designed to protect the pump by preventing large objects from being pulled into the pump.

### CAUTION

The strainer should be positioned so it will remain completely under water. Running the pump with the strainer above water for long periods can damage the pump.

### CAUTION

DO NOT pump flammable fluids, corrosive chemicals or fluids containing toxic substances. These fluids can create potentially dangerous health and environmental hazards. Contact local authorities for assistance.

### CAUTION

This pump uses a water-cooled mechanical seal to prevent water from seeping into the engine. The passage of water through the pump casing lubricates the seal and prevents it from overheating. NEVER operate the pump without water in the casing as this will cause damage to the mechanical seal.



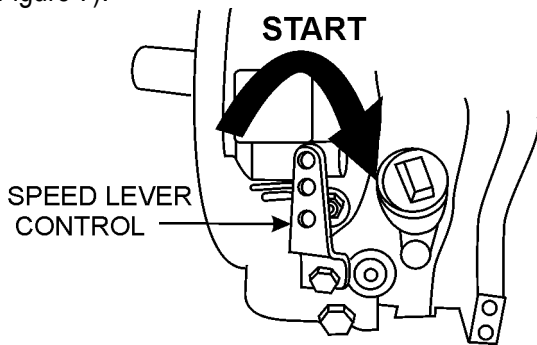
**CAUTION**



DO NOT attempt to operate the pump until the Safety, General Information and Inspection sections of this manual have been read and thoroughly understood.

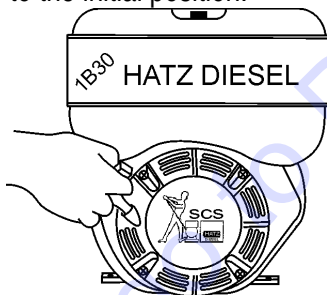
## STARTING THE ENGINE - RECOIL START

1. Move the speed lever control to the START position (Figure 7).



**Figure 7. Engine Speed Lever Control (START)**

2. Grasp the starter grip (Figure 8) and slowly pull it out until you feel the strongest resistance then return the starter grip to the initial position.



**Figure 8. Starter Grip**

**CAUTION**

Do not allow the starter grip to snap back against the engine. Return it gently to prevent damage to the starter.

3. Pull the starter grip again, hard and fast, pulling it all the way out to start engine.
4. If the engine does not start, repeat steps 2 and 3.

**CAUTION**

ALWAYS run engine at full speed while pumping.

## Engine Indicators

**Engine Running (Happy Face)** — indicates that the engine and associated components are functioning correctly.

**Battery Charge** — indicates that the battery charging system is not working correctly. If this LED remains on, stop the engine and correct the problem.

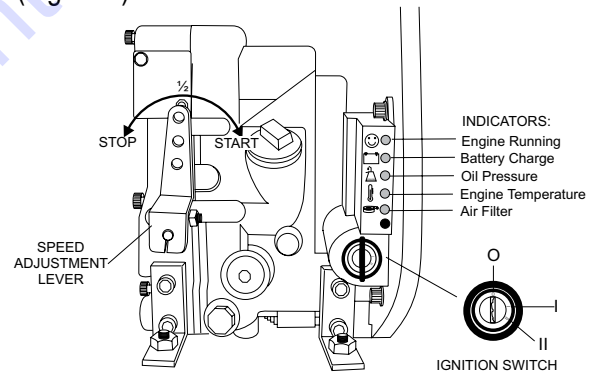
**Oil Pressure** — indicates that the oil pressure is low. If this LED remains on, stop the engine and correct the problem.

**Water Temperature** — indicates that the water temperature is too high. If this LED remains on, stop the engine and correct the problem.

**Air Filter** — indicates that the filter is dirty and is not functioning correctly. If this LED remains on, stop the engine and correct the problem.

## STARTING THE ENGINE — ELECTRIC START

1. Move the speed lever control to the START position (Figure 9).



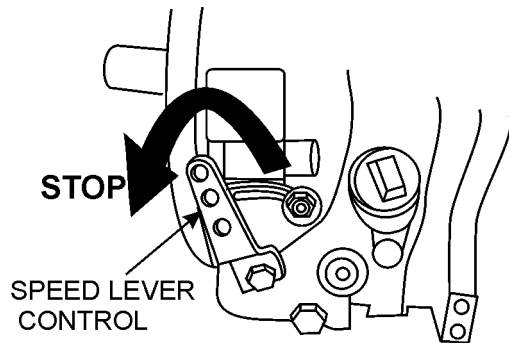
**Figure 9. Engine Electric Start**

2. Turn the key in the ignition switch to position I and verify that the BATTERY CHARGE indicator comes on (Figure 9).
3. Continue turning the ignition key to position II. Verify that the BATTERY CHARGE indicator and the OIL PRESSURE indicator goes off and the ENGINE RUNNING indicator comes on immediately as soon as the engine starts.
4. Release the key as soon as the engine runs. The key should spring back to position I and remain there during operation.
5. If the engine does not start, return the key to position I before starting the engine again.

## STOPPING THE ENGINE

### Normal Shutdown

1. Move the engine speed lever to the low speed and run the engine for about three minutes with no load.
2. After the engine cools, move the engine speed lever to the STOP position (Figure 10).



**Figure 10. Engine Speed Lever Control (STOP)**

3. Slowly pull the starter grip (Figure 8) until strong resistance is felt and leave it in this position. This prevents rust from forming while the engine is not in use.

### **CAUTION**

When stopping the engine, reduce the load slowly. Do not stop engine suddenly since it may cause the temperature to rise abnormally.

### Emergency Shutdown

1. To stop engine immediately, quickly place the engine speed lever to the STOP position.

## PUMP VACUUM TEST

To perform the pump vacuum test do the following:

### NOTICE

DO NOT attempt to start the engine unless the pump has previously been primed with water. Severe pump damage will occur if pump has not been primed.

1. Remove the pump fill cap (Figure 3), and fill the pump with water.
2. Start the engine as outlined in the initial start-up section, and wait for the pump to begin pumping.
3. As shown in Figure 11, place a water hose inside the discharge opening of the pump, and turn on the water. This flow of water into the discharge opening will prevent the pump from running dry.
4. Place the Pump Vacuum Tester (P/N 7000030) over the pump suction (inlet) opening (Figure 11) with the vacuum gauge facing upwards. It may be necessary to apply a small amount of water around the rubber seal of the vacuum tester to make a good suction fit.
5. Check and make sure that there are no air leaks between the vacuum tester and the inlet port on the pump. If air leaks are present, reset vacuum tester.
6. Run the pump for a few minutes while monitoring the vacuum gauge. If the gauge indicates a reading between -25 and -20 in. Hg. (inches of mercury), then it can be assumed that the pump is working correctly.

### NOTICE

25 in. Hg. (inches of mercury) translates into 25 feet of lift at sea level.

7. If the vacuum tester gauge indicates a reading below -20 in. Hg, it can then be assumed that the pump is not functioning
8. To test the flapper valve, shut down the engine. The vacuum tester should remain attached to the pump suction inlet port by vacuum. This indicates the pump's flapper valve is seating properly to hold water in the suction hose when the engine is stopped. This prevents backflow and allows for faster priming when the engine is restarted.

## ADJUSTING IMPELLER CLEARANCE

1. If it is necessary to replace impeller or volute, be sure clearance between impeller and volute is adjusted correctly.
2. The impeller should be as close to the volute as possible without rubbing against it. Clearance is adjusted by adding or removing shims from behind the impeller.
3. Check clearance between impeller and insert by slowly pulling starter rope to turn impeller. Remove spark plug to make it easier to turn impeller.

### NOTICE

It is important not to remove too many shims or the clearance between the impeller and volute will become too wide and pump performance will be reduced. Remember as the impeller wears down, additional shims may be required to maintain the clearance between the impeller and insert.

4. Check the impeller every six months for wear, and for clearance between the impeller face and the volute. Also check the shaft seal for wear, as well as the shaft sleeve.

## PUMP CLEANING

After pumping water containing large amounts of dirt and debris, perform the following:

1. Remove the drain plug from the pump housing (Figure 3) and drain any water left in the pump.
2. Loosen the two locking hand knobs (turn counterclockwise) and remove clean-out cover.
3. Clean and remove dirt, debris from pump casing. Inspect impeller and volute for wear. Replace any damaged or worn parts.

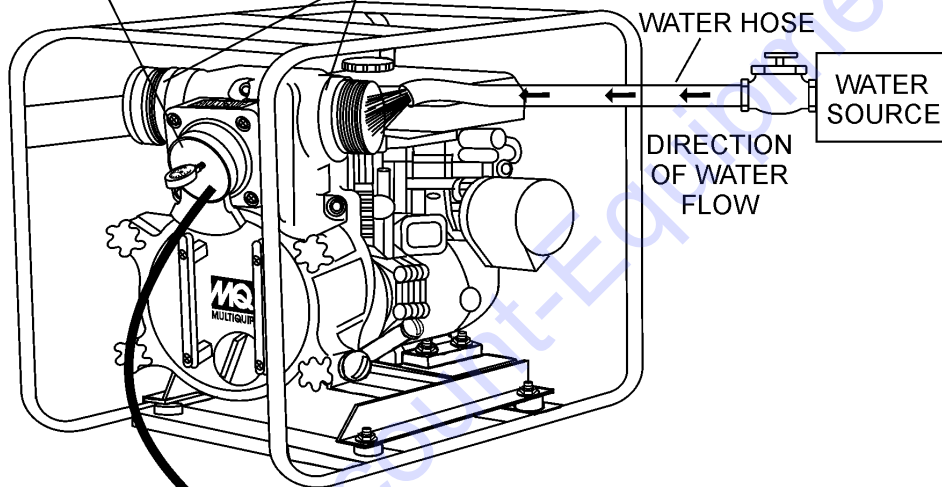
### CAUTION

The impeller may develop sharp edges. Use extreme care when cleaning around the impeller to prevent being cut.

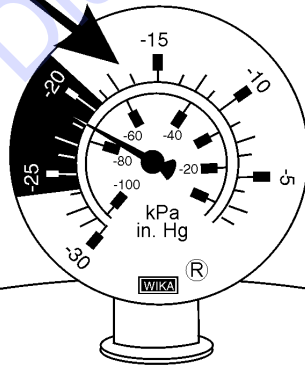
**CAUTION**  
DO NOT RUN PUMP  
WITHOUT WATER.

PLACE VACUUM TESTER  
OVER PUMP SUCTION PORT

DISCHARGE  
PORT



ACCEPTABLE READING  
SHOULD BE BETWEEN  
-25 AND -20 IN. HG.



25 IN. HG. TRANSLATES  
INTO 25 FEET OF LIFT  
AT SEA LEVEL.

PUMP VACUUM  
TESTER

**Figure 11. Pump Vacuum Tester**

# MAINTENANCE

## ENGINE MAINTENANCE

Perform engine maintenance procedures as referenced by Table 7 below:

Table 7. Engine Maintenance Schedule							
DESCRIPTION (3)	OPERATION	BEFORE USE	FIRST MONTH OR 10 HRS.	EVERY 3 MONTHS OR 25 HRS.	EVERY 6 MONTHS OR 50 HRS.	EVERY YEAR OR 100 HRS	EVERY 2 YEARS OR 200 HRS
Engine Oil	CHECK	X					
	CHANGE		X				
Air Cleaner	CHECK	X					
	CHANGE			X (1)			
All Nuts and Bolts	Retighten if necessary	X					
Cooling Fins	CHECK				X		
Spark Arrester	CLEAN					X	
Fuel Tank	CLEAN					X	
Fuel Filter	CHECK					X	
Idle Speed	CHECK-ADJUST					X (2)	
Valve Clearance	CHECK-ADJUST						X (2)
Fuel Lines	CHECK	Every 2 years - replace if necessary (2)					
<i>(1) Service more frequently when used in dusty areas.</i>							
<i>(2) These items should be serviced by your service dealer, unless you have the proper tools and are mechanically proficient. Refer to the Hatz shop manual for service procedures.</i>							
<i>(3) For commercial use, log hours of operation to determine proper maintenance intervals.</i>							

### NOTICE

Refer to engine manual for specific servicing instructions.

Perform the engine maintenance procedures as indicated below:

## DAILY

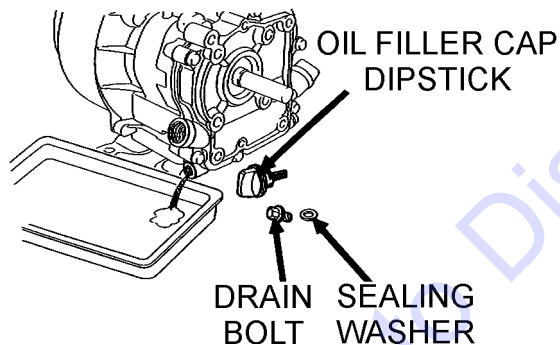
1. Thoroughly remove dirt and oil from the engine and control area.
2. Clean or replace the air cleaner elements as necessary. Check and retighten all fasteners as necessary.
3. Check the spring box and bellows for oil leaks. Repair or replace as needed.

## WEEKLY

1. Remove the fuel filter cap and clean the inside of the fuel tank.
2. Remove or clean the filter at the bottom of the tank.

## ENGINE OIL

1. Drain the engine oil when the oil is warm as shown in Figure 12.

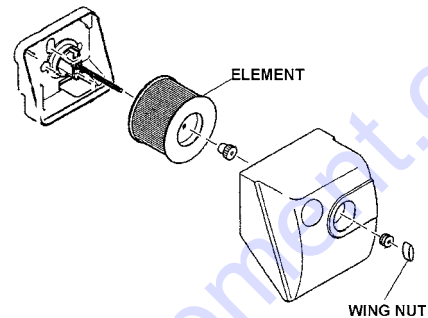


**Figure 12. Engine Oil (Draining)**

2. Remove the oil drain bolt and sealing washer and allow the oil to drain into a suitable container.
3. Replace engine oil with recommended type oil as listed in Table 6. Engine oil capacity is 1.6 quarts (1.5 liters). DO NOT overfill.
4. Install drain bolt with sealing washer and tighten securely.

## ENGINE AIR CLEANER

1. Loosen the wing nut and detach the cover of the air cleaner shown in Figure 13.



**Figure 13. Engine Air Cleaner**

2. Tap the element (Figure 13) several times on a hard surface to remove dirt, or blow compressed air, not exceeding 30 psi (207 kPa, 2.1 kgf/cm<sup>2</sup>), through the element side. NEVER wash the element with detergent because the element is oil-soaked type. Replace the element when the output decreases or bad exhaust color is noticed.

## TRAILER MAINTENANCE

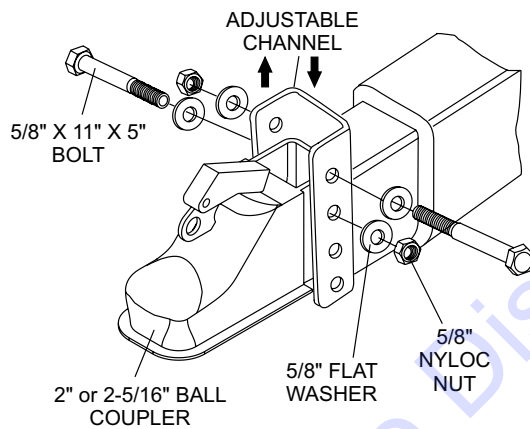
The following trailer maintenance guidelines are intended to assist the operator in preventive maintenance.

### Adjustable Channel

Your trailer may be equipped with an adjustable channel (Figure I) that allows the coupler to be raised or lowered to a desired height. Periodically check the channel bolts for damage or loosening.

#### NOTICE

When replacing channel mounting hardware (nuts, bolts and washers), **NEVER** substitute substandard hardware. Pay close attention to **bolt length** and **grade**. **ALWAYS** use manufacturer's recommended parts when replacing channel mounting hardware.



**Figure I. Adjustable Channel**

### Wheel Bearings

Wheel bearings (Figure II) must be inspected and lubricated once a year or 12,000 miles to insure safe operation of your trailer.

If trailer wheel bearings are immersed in water, they must be replaced.

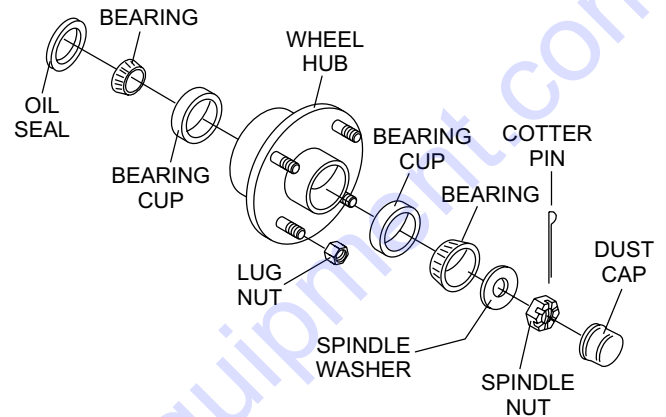
#### **! DANGER**

If trailer wheels are under water for a long period of time, wheel bearings may fail. If this is the case, service wheel bearings immediately.

The possibility exists of the wheels falling off causing equipment damage and severe bodily harm even death!

If the trailer has not been used for an extended amount of time, have the bearings inspected and packed more frequently, at least every six months and prior to use.

Follow the steps below to disassemble the wheel hub and service the wheel bearings. See Figure II.



**Figure II. Wheel Hub Components**

- After removing the dust cap, cotter pin, spindle nut and spindle washer, remove the hub to inspect the bearings for wear and damage.
- Replace bearings that have flat spots on rollers, broken roller cages, rust or pitting. Always replace bearings and cups in sets. The inner and outer bearings are to be replaced at the same time.
- Replace seals that have nicks, tears or wear.
- Lubricate the bearings with a high quality EP-2 automotive wheel bearing grease.

### Wheel Hub Adjustment

Every time the wheel hub is removed and the bearings are reassembled, follow the steps below to check the wheel bearings for free running and adjust.

- Turn the hub slowly, by hand, while tightening the spindle nut until you can no longer turn the hub by hand.
- Loosen the spindle nut just until you are able to turn it (the spindle nut) by hand. Do not turn the hub while the spindle nut is loose.
- Install a new cotter pin through the spindle nut and axle.
- Check the adjustments. Both the hub and the spindle nut should be able to move freely (the spindle nut motion will be limited by the cotter pin).



## **! DANGER**

**NEVER** crawl under the trailer unless it is on firm and level ground and resting on properly placed and secured jackstands.

The possibility exists of the trailer falling thus causing equipment damage and severe bodily harm even death!

## **! DANGER**

When performing trailer inspection and maintenance activities, you must jack up the trailer using jacks and jackstands.

When jacking and using jackstands, place them so as to clear wiring, brake lines, and suspension parts (i.e., springs, torsion bars). Place jacks and jackstands inside of the perimeter strip on the supporting structure to which the axles are attached.

## **! DANGER**

Improper weld repair will lead to early failure of the trailer structure and can cause serious injury or death.

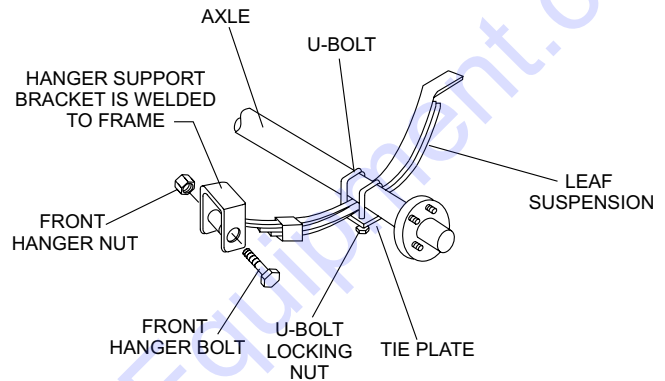
**DO NOT** repair cracked or broken welds unless you have a certified welder perform the repair. If not, have the welds repaired by your dealer.

## **! WARNING**

If the trailer is involved in an accident, have it inspected immediately by qualified personnel. In addition, the trailer should be inspected annually for signs of wear or deformations.

## Leaf Suspension

The leaf suspension springs and associated components (Figure III) should be visually inspected every 6,000 miles for signs of excessive wear, elongation of bolt holes, and loosening of fasteners. Replace all damaged parts (suspension) immediately.



**Figure III. Leaf Suspension Components**

## **! DANGER**

Worn or broken suspension parts can cause loss of control, damage to equipment and severe bodily injury, even death!

Check suspension regularly.



# TRAILER SAFETY GUIDELINES

The following guidelines are intended to assist the operator in the operation and handling of a trailer.

Safety precautions should be followed at all times when operating a trailer. Failure to read, understand and follow the safety guidelines could result in injury to yourself and others. Loss of control of the trailer or tow vehicle can result in death or serious injury.

## COMMON CAUSES FOR LOSS OF TRAILER

- Driving too fast for the conditions (maximum speed when towing a trailer is 55 mph).
- Overloading the trailer or loading the trailer unevenly.
- Trailer improperly coupled to the hitch.
- No braking on trailer.
- Not maintaining proper tire pressure.
- Not keeping lug nuts tight.
- Not properly maintaining the trailer structure.
- Ensure machine is towed level to tow vehicle.

## TRAILER TOWING GUIDELINES

- Recheck the load tiedowns to make sure the load will not shift during towing.
- Before towing, check coupling, safety chain, safety brake, tires, wheels and lights.
- Check the lug nuts or bolts for tightness.
- Check coupler tightness after towing 50 miles.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance. Allow plenty of stopping space for your trailer and tow vehicle.
- Allow plenty of stopping space for your trailer and tow vehicle.
- **DO NOT** drive so fast that the trailer begins to sway due to speed.
- Allow plenty of room for passing. A rule of thumb is that the passing distance with a trailer is 4 times the passing distance without the trailer.

- Shift your automatic transmission into a lower gear for city driving.
- **ALWAYS** use lower gears for climbing and descending grades.
- **DO NOT** ride the brakes while descending grades, they may get so hot that they stop working. Then you will potentially have a runaway tow vehicle and trailer.
- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- **DO NOT** brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve and power through the curve. This way, the towing vehicle remains in charge.
- **DO NOT** apply the brakes to correct extreme trailer swaying. Continued pulling of the trailer, and even slight acceleration, will provide a stabilizing force.
- Anticipate the trailer "swaying." Swaying is the trailer reaction to the air pressure wave caused by passing trucks and buses. Continued pulling of the trailer provides a stabilizing force to correct swaying. **DO NOT** apply the brakes to correct trailer swaying.
- Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective.
- Be aware of your trailer height, especially when approaching roofed areas and around trees.
- Make regular stops, about once each hour. Confirm that:
  - Coupler is secure to the hitch and is locked.
  - Electrical connectors are secure.
  - There is appropriate slack in the safety chains.
  - There is appropriate slack in the breakaway switch pullpin cable.
  - Tires are not visibly low on pressure.

# TRAILER SAFETY GUIDELINES

## DRIVING CONDITIONS

When towing a trailer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). In addition, you will need a longer distance to pass, due to slower acceleration and increased length.

- Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a trailer, than driving a tow vehicle without a trailer.
- Check rearview mirrors frequently to observe the trailer and traffic.
- **NEVER** drive faster than what is safe.

### WARNING

Driving too fast for severe road conditions can result in loss of control and cause death or serious injury.

Decrease your speed as road, weather, and lighting conditions deteriorate.

Always check for local trailer tow speed limits in your area.

### WARNING

Do not transport people on the trailer. The transport of people puts their lives at risk and may be illegal.

## COUPLING TO THE TOW VEHICLE

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, equipment, and satisfactory life of the trailer. Always use an adequate tow vehicle and hitch. If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury.

If you already have a tow vehicle, know your vehicle tow rating and make certain the trailer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. If you already have (or plan to buy) a trailer, make certain that the tow rating of the tow vehicle is equal to or greater than that of the trailer.

The trailer VIN tag contains the critical safety information

for the use of your trailer. Again, be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

### WARNING

Proper selection and condition of the coupler and hitch are essential to safely towing your trailer. A loss of coupling may result in death or serious injury.

- Be sure the hitch load rating is equal to or greater than the load rating of the coupler.
- Be sure the hitch size matches the coupler size.
- Observe the hitch for wear, corrosion and cracks before coupling. Replace worn, corroded or cracked hitch components before coupling the trailer to the tow vehicle.
- Be sure the hitch components are tight before coupling the trailer to the tow vehicle.

### WARNING

An improperly coupled trailer can result in death or serious injury.

**DO NOT** move the trailer until:

- The coupler is secured and locked to hitch.
- The safety chains are secured to the tow vehicle.
- The trailer jack(s) are fully retracted.

**DO NOT** tow the trailer on the road until:

- Tires and wheels are checked.
- The trailer brakes are checked.
- The breakaway switch is connected to the tow vehicle.
- The load is secured to the trailer.
- The trailer lights are connected and checked.

### WARNING

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

# TRAILER SAFETY GUIDELINES

## INOPERABLE BRAKES, LIGHTS OR MIRRORS

Be sure that the brakes and all of the lights on your trailer are functioning properly before towing your trailer. Check the trailer taillights by turning on your tow vehicle headlights. Check the trailer brake lights by having someone step on the tow vehicle brake pedal while you look at trailer lights. Do the same thing to check the turn signal lights. See Trailer Wiring Diagram section in this manual.

Standard mirrors usually do not provide adequate visibility for viewing traffic to the sides and rear of a towed trailer. You must provide mirrors that allow you to safely observe approaching traffic.

### WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and can lead to collision.

Before each tow, check that the tail lights, brake lights and turn signals work.

## TRAILER TOWING TIPS

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. Acceleration, maneuverability and braking are all diminished with a trailer in tow.

It takes longer to get up to speed, you need more room to turn and pass, and more distance to stop when towing a trailer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded trailer.

Because of the significant differences in all aspects of maneuverability when towing a trailer, the hazards and risks of injury are also much greater than when driving without a trailer. You are responsible for keeping your vehicle and trailer in control, and for all the damage that is caused if you lose control of your vehicle and trailer.

As you did when learning to drive an automobile, find an open area with little or no traffic for your first practice trailering. Of course, before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Also, before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and trailer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

Stop the rig a few times from speeds no greater than 10 mph. If your trailer is equipped with brakes, try using different combinations of trailer brake and tow vehicle brake. Note the effect that the trailer brakes have when they are the only brakes used. When properly adjusted, the trailer brakes will come on just before the tow vehicle brakes.

It will take practice to learn how to back up a tow vehicle with a trailer attached. Take it slow. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles.

Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, “think” of the hands as being on the top of the wheel. When the hands move to the right (counterclockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left while backing up.

If you are towing a bumper hitch rig, be careful not to allow the trailer to turn too much because it will hit the rear of the tow vehicle. To straighten the rig, either pull forward or turn the steering wheel in the opposite direction.

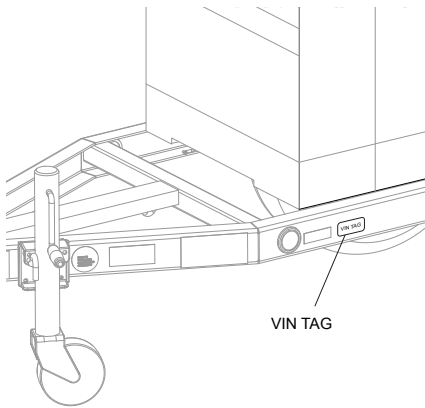
## TRAILER VIN TAG

Figure A below is a sample of the Vehicle Identification Number (VIN) Tag which is typically located on the left front of the trailer. See Figure B for location.

UFACTURED BY / FABRIQUE PAR:		DATE	
R / PNRV	KG ( LB)		
R (EACH AXLE) / PNRB (CHAQUE ESSIEU)	KG ( LB)	TIRES / PNEU	
/ JANTB			
/ INFL. PRESS. / PRESS. DE GONFL. A FROID	KPA (	PSI / LPO	<input type="checkbox"/> SINGLE <input type="checkbox"/> DUAL
VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. VEHICLE CONFORMS TO ALL APPLICABLE STANDARDS PRESCRIBED UNDER THE CANADIAN MOTOR VEHICLE SAFETY REGULATIONS IN EFFECT ON THE DATE OF MANUFACTURE. - LE VEHICULE EST JONNE A TOUTES LES NORMES QUI LIJ SONT APPLICABLES EN VERTU DU REGLEMENT SUR LA SECURITE DES VEHICULES AUTOMOBILES DU CANADA EN VALEUR A LA DATE DE SA FABRICATION.			
/ N.I.N.:	TYPE / TYPE: TRAILER TRA / REM		FD-306 REV A

Figure A. Vehicle VIN Tag

# TRAILER SAFETY GUIDELINES



**Figure B. VIN Tag Location**

The trailer VIN Tag contains the following critical safety information for the use of your trailer.

**GAWR:** The maximum gross weight that an axle can support. It is the lowest of axle, wheel, or tire rating.

Usually, the tire or wheel rating is lower than the axle rating, and determines GAWR.

**GVWR:** The maximum allowable gross weight of the trailer and its contents. The gross weight of the trailer includes the weight of the trailer and all of the items within it. GVWR is sometimes referred to as GTWR (Gross Trailer Weight Rating), or MGTW (Maximum Gross Trailer Weight). GVWR, GTWR and MGTW are all the same rating.

The sum total of the GAWR for all trailer axles may be less than the GVWR for the trailer, because some of the trailer load is to be carried by the tow vehicle, rather than by the trailer axle(s). The total weight of the cargo and trailer must not exceed the GVWR, and the load on an axle must not exceed its GAWR.

**PSIC:** The tire pressure (psi) measured when cold.

**VIN:** The Vehicle Identification Number.

**EMPTY WEIGHT:** Some information that comes with the trailer (such as the Manufacturer's Statement of Origin) is not a reliable source for "empty" or "net" weight. The shipping documents list average or standard weights and your trailer may be equipped with options.

To determine the "empty" or "net" weight of your trailer, weigh it on an axle scale. To find the weight of the trailer using an axle scale, you must know the axle weights of your tow vehicle without the trailer coupled. Some of the trailer weight will be transferred from the trailer to the tow vehicle axles, and an axle scale weighs all axles, including the tow vehicle axles.

## TOW VEHICLE

The towing hitch attached to your tow vehicle must have a capacity equal to or greater than the load rating of the trailer you intend to tow. The hitch capacity must also be matched to the tow vehicle capacity. Your vehicle dealer can provide and install the proper hitch on your tow vehicle.

## SUSPENSION SYSTEM

Sway bars, shock absorbers, heavy duty springs, heavy duty tires and other suspension components may be required to sufficiently tow the trailer and pump.

## SIDE VIEW MIRRORS

The size of the trailer that is being towed and your state law regulations determine the size of the mirrors. However, some states prohibit extended mirrors on a tow vehicle, except while a trailer is actually being towed. In this situation, detachable extended mirrors are necessary. Check with your dealer or the appropriate state agency for mirror requirements.

## HEAVY DUTY FLASHER

A Heavy Duty Flasher is an electrical component that may be required when your trailer turn signal lights are attached to the tow vehicle flasher circuit.

## ELECTRICAL CONNECTOR

An Electrical Connector connects the lights on the trailer to the lights on the towing vehicle.

## EMERGENCY FLARES AND TRIANGLE REFLECTORS

It is wise to carry these warning devices even if you are not towing a trailer. It is particularly important to have these when towing a trailer because the hazard flashers of your towing vehicle will not operate for as long a period of time when the battery is running both the trailer lights and tow vehicle lights.



# TRAILER SAFETY GUIDELINES

## SAFETY CHAINS

If the coupler connection comes loose, the safety chains can keep the trailer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the trailer from digging into the road pavement, even if the coupler-to-hitch connection comes apart.

## JACKSTAND

A device on the trailer that is used to raise and lower the coupler. The jack is sometimes called the “landing gear” or the “tongue jack”.

## COUPLER TYPES

Two types of coupler used with the trailer are discussed below.

- Ball Hitch Coupler
- Pintel Eye Coupler

## BALL HITCH COUPLER

A ball hitch coupler (Figure C) connects to a ball that is located on or under the rear bumper of tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as “bumper pull.”

A ball hitch trailer may be fitted with a tongue jack that can raise and lower the coupler. The tongue jack is mounted to the A-frame (front or tongue) part of the trailer. By rotating the jack handle clockwise, the jack will extend and raise the tongue of the trailer.

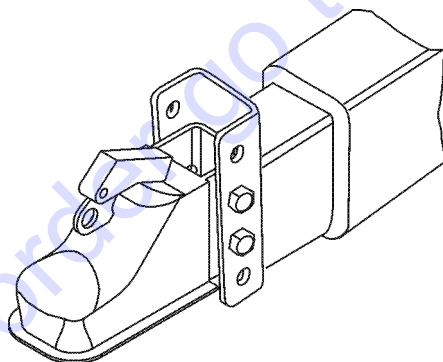


Figure C. Ball Hitch Coupler

Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation. Check the locking device that secures the coupler to the ball for proper operation.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ball or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

The coupler handle lever must be able to rotate freely and automatically snap into the latched position. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the ball socket and latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

The load rating of the coupler and the necessary ball size are listed on the trailer tongue. You must provide a hitch and ball for your tow vehicle where the load rating of the hitch and ball is equal to or greater than that of your trailer.

Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose or is worn, the trailer can come loose from the tow vehicle and may cause death or serious injury.

THE TOW VEHICLE, HITCH AND BALL MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER **Gross Vehicle Weight Rating (GVWR)**. IT IS ESSENTIAL THAT THE HITCH BALL BE OF THE SAME SIZE AS THE COUPLER.

The ball size and load rating (capacity) are marked on the ball. Hitch capacity is marked on the hitch.

### **WARNING**

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the **LOAD RATING** of the hitch ball is equal or greater than the load rating of the coupler.

Be sure the **SIZE** of the hitch ball matches the size of the ball coupler.

# TRAILER SAFETY GUIDELINES

## **WARNING**

A worn, cracked or corroded hitch ball can fail while towing and may result in death or serious injury.

Before coupling trailer, inspect the hitch ball for wear, corrosion and cracks.

Replace worn or damaged hitch ball.

## **WARNING**

A loose hitchball nut can result in uncoupling, leading to death or serious injury.

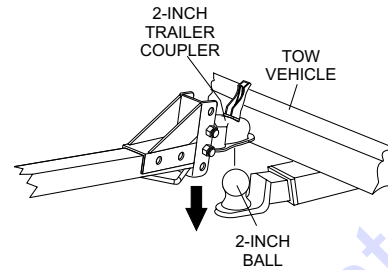
Be sure the hitch ball is tight to the hitch before coupling the trailer.

- Rock the ball to make sure it is tightened to the hitch, and visually check that the hitch ball nut is solid against the lock washer and hitch frame.
- Wipe the inside and outside of the coupler. Clean and visually inspect it for cracks and deformations. Feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is secured tightly to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.
- The bottom surface of the coupler must be above the top of the hitch ball. Use the tongue jackstand to support the trailer tongue. Wood or concrete blocks may also be used.

## **Coupling the Trailer to the Tow Vehicle (Ball Coupler)**

- Lubricate the hitch ball and the inside of the coupler with a thin layer of automotive bearing grease.
- Slowly back up the tow vehicle so that the hitch ball is near or aligned under the coupler.
- Using the jackstand at the front of trailer (tongue), turn the jackstand crank handle to raise the trailer. If the ball coupler does not line up with the hitch ball, adjust the position of the tow vehicle.
- Open the coupler locking mechanism. Ball couplers have a locking mechanism with an internal moving piece and an outside handle. In the open position, the coupler is able to drop fully onto the hitch ball.

- Lower the trailer (Figure D) until the coupler fully engages the hitch ball.



**Figure D. Ball Hitch Coupling Mechanism**

- Engage the coupler locking mechanism. In the engaged position, the locking mechanism securely holds the coupler to the hitch ball.
- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the coupler is all the way on the hitch ball and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jackstand, verify that you can raise the rear of the tow vehicle by 1 inch after the coupler is locked to the hitch.
- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.

## **NOTICE**

Overloading can damage the tongue jack. **DO NOT** use the tongue jack to raise the tow vehicle more than one inch.

If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call your dealer for assistance. Lower the trailer so that its entire tongue weight is held by the hitch and continue retracting the jack to its fully retracted position.

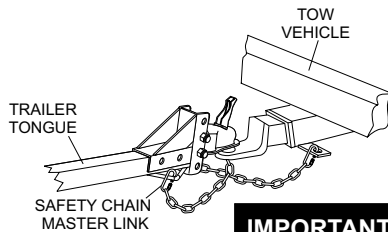
# TRAILER SAFETY GUIDELINES

## Attaching Safety Chain

Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.

Attach the safety chains so that they:

- Cross underneath the coupler. See Figure E.



**IMPORTANT!**  
CROSS BOTH  
SAFETY CHAINS

**Figure E. Attaching Safety Chain (Ball Hitch)**

- Loop around a frame member of the tow vehicle or holes provided in the hitch system (DO NOT attach them to an interchangeable part of the hitch assembly).
- Have enough slack to permit tight turns, but not be close to the road surface, so if the trailer uncouples, the safety chains can hold the tongue up above the road

### **WARNING**

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

- Fasten chains to frame of tow vehicle. DO NOT fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.
- Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.

## Connecting Trailer Lights

Connect the trailer lights to the tow vehicle's electrical system using the electric connectors at the front of the trailer (tongue). Refer to the wiring diagram shown in the trailer wiring diagram section of this manual. Before towing the trailer check for the following:

- Running lights (turn on tow vehicle headlights).
- Brake Lights (step on tow vehicle brake pedal).
- Backup Lights (place tow vehicle gear shift in reverse).
- Turn Signals (activate tow vehicle directional signal lever).

### **WARNING**

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.

Before each tow:

- Check that the taillights, brake lights and turn signals work.
- Check that the electric brakes work by operating the brake controller inside the tow vehicle.

## Uncoupling the Ball Hitch

Follow these steps to uncouple ball hitch from tow vehicle:

- Block trailer tires to prevent the trailer from rolling, before jacking the trailer up.
- Disconnect the electrical connector.
- Disconnect the breakaway brake switch cable. Promptly replace the pullpin in the switchbox.
- Before extending jackstand, make certain the ground surface below the jackstand foot will support the tongue load.
- Rotate the jackstand handle (or crank) clockwise. This will slowly extend the jack and transfer the weight of the trailer tongue to the jack.

# TRAILER SAFETY GUIDELINES

## PINTLE HITCH COUPLER

A pintle eye coupler (Figure F) connects to a pintle-hook hitch that is located on or under the rear bumper of the tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as a “lunette eye, tow ring or G.I. hitch.”

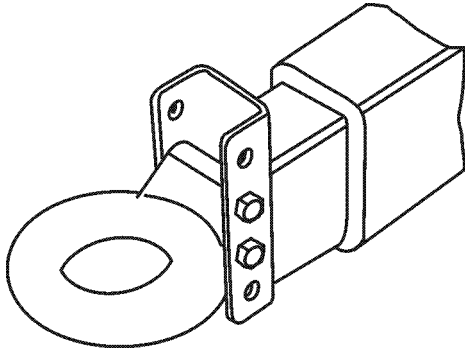


Figure F. Pintle Hitch Coupler

A pintle hitch trailer may be fitted with a tongue jackstand that can raise and lower the coupler. The tongue jack is mounted to the A-frame (front or tongue) part of the trailer. By rotating the jack handle clockwise, the jack will extend and raise the tongue of the trailer.

The load rating of the coupler and the necessary pintle hitch size are listed on the trailer tongue. You must provide a pintle hitch and pintle coupler for your tow vehicle, where the load rating of the pintle hitch and pintle coupler is equal to or greater than that of your trailer.

Also, the pintle hitch size must be the same as the pintle coupler size. If the hitch is too small, too large, underrated, loose or worn, the trailer can come loose from the tow vehicle, and may cause death or serious injury.

### Pintle Coupler and Pintle Hook

Before each tow, check the locking device that secures the coupler to the pintle hook assembly.

The pintle hook lever must be able to operate freely and automatically snap into place into the latched position. Lightly oil the pivot points and sliding surfaces with SAE30W motor oil to prevent rust and help ensure proper operation of the latching mechanism.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the pintle hook or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

THE TOW VEHICLE, PINTLE HITCH AND PINTLE COUPLER MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER **Gross Vehicle Weight Rating (GVWR)**.

IT IS ESSENTIAL THAT THE PINTLE HITCH BE OF THE SAME SIZE AS THE PINTLE COUPLER.

The coupler size and load rating (capacity) are marked on the coupler. Hitch capacity is marked on the hitch.

### **WARNING**

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the **LOAD RATING** of the pintle hitch hook is equal or greater than the load rating of the pintle eye coupler.

Be sure the **SIZE** of the pintle hitch hook matches the size of the pintle eye coupler.

### **WARNING**

A worn, cracked or corroded pintle hitch hook can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the pintle hitch hook for wear, corrosion and cracks.

Replace worn or damaged pintle hitch hook.

- Rock the pintle eye coupler to make sure it is secured tightly to the hitch.
- Wipe the inside and outside of the pintle coupler. Clean and inspect it visually for cracks and deformations. Feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is secured tightly to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.



# TRAILER SAFETY GUIDELINES

- Raise the bottom surface of the coupler to be above the top of the pintle hitch hook. Use the tongue jackstand to support the trailer tongue. Wood or concrete blocks may also be used.

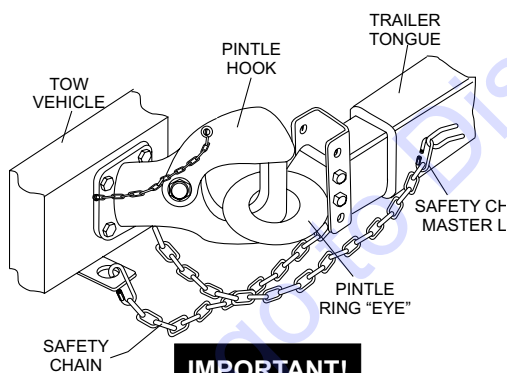
## **⚠ WARNING**

A defective pintle hitch not properly fastened can result in uncoupling, leading to death or serious injury.

Be sure the pintle hook is securely tightened to the tow vehicle before coupling the trailer.

## **Coupling Trailer to Tow Vehicle (Pintle Coupler)**

- Slowly back up the tow vehicle so that the pintle hitch hook is near or aligned under the pintle eye ring coupler.
- Using the jackstand at the front of trailer (tongue), turn the jackstand crank handle to raise the trailer. If the pintle eye coupler does not line up with the pintle hitch hook, adjust the position of the tow vehicle.
- OPEN the pintle hook locking mechanism (Figure G). Place the hook inside the eye coupler. CLOSE the pintle hook mechanism.



**IMPORTANT!**

CROSS BOTH

## **Figure G. Attaching Safety Chain (Pintle Hitch)**

- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the pintle hook is inserted completely through the eye ring and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1-inch after the coupler is locked to the hitch.

- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.

## **TIRE SAFETY**

### **Unsafe Tires, Lug Nuts or Wheels**

Trailer tires and wheels are more likely to fail than car tires and wheels because they carry a heavier load. Therefore, it is essential to inspect the trailer tires before each tow.

If a tire has a bald spot, bulge, cuts, is showing any cords, or is cracked, replace the tire before towing. If a tire has uneven tread wear, take the trailer to a dealer service center for diagnosis.

Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate tracking on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes an unstable trailer and can result in a tire blowout and loss of control. Therefore, before each tow you must also check the tire pressure. Tire pressure must be checked when tires are cold.

Allow 3 hours cool-down after driving as much as 1 mile at 40 mph before checking tire pressure. Trailer tires will be inflated to higher pressures than passenger vehicle tires.

Since trailer wheels and lug nuts (or bolts) are subjected to greater side loads than automobile wheels, they are more prone to loosen. Before each tow, check to make sure they are tight.

The proper tightness (torque) for lug nuts is listed in the lug nut tightening section of this manual. Use a torque wrench to tighten the lug nuts. If you do not have a torque wrench, use a lug wrench (from your tow vehicle) and tighten the nuts as much as you can. Then have a service garage or trailer dealer tighten the lug nuts to the proper torque.

# TRAILER SAFETY GUIDELINES

## WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

Lug nuts are also prone to loosen after first being assembled. When driving a new trailer (or after wheels have been remounted), check to make sure they are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter.

Failure to perform this check can result in a wheel parting from the trailer and a crash, leading to death or serious injury.

## WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

## WARNING

Improper lug nut torque can cause a wheel parting from the trailer, leading to death or serious injury.

Be sure lug nuts are tight before each tow.

## WARNING

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on side wall before towing trailer.

## Determining Load Limit of Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification/VIN label that is located on the forward half of the left (road) side of the unit. This certification/VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It will also provide the

Gross Axle Weight Rating (GAWR). This is the most a the axle can weigh.

There is a vehicle placard (Figure H) located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity.

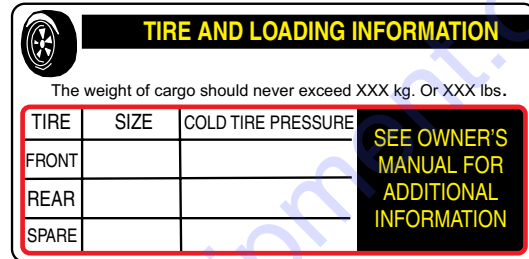


Figure H. Trailer Tire Placard

If additional work items (hoses, tools, clamps etc.) are going to be added to the trailer, be sure they are distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification/VIN label and/or on the Tire and Loading Information placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

Perform the following steps to determine the load limit of your trailer.

### Step 1.

Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's Tire and Loading Information placard (Figure I). This value equals the available amount of equipment load capacity.

# TRAILER SAFETY GUIDELINES

## Step 2.

Determine the weight of the equipment being loaded on the tow vehicle. That weight may not safely exceed the available equipment load capacity. The trailer's Tire Information Placard is attached adjacent to or near the trailer's VIN (Certification) label at the left front of the trailer (See Figure I).

## Determining Load Limit of Tow Vehicle

### Step 1.

Locate the statement, "The combined weight of occupants and cargo should never exceed XXX lbs.," on your vehicle's placard.

### Step 2.

Determine the combined weight of the driver and passengers who will be riding in your vehicle.

### Step 3.

Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.

### Step 4.

The resulting figure equals the available amount of cargo and luggage capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 650 lbs.).

### Step 5.

Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in Step 4.

If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

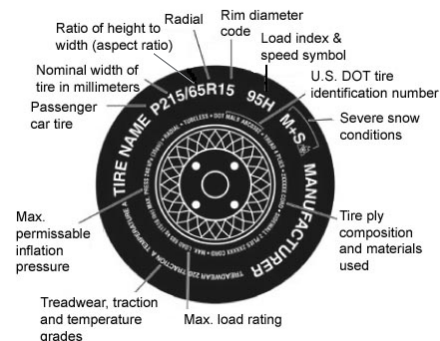
Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards and inspecting tires for cuts, slashes and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling.
- Help protect you and others from avoidable breakdowns and accidents.
- Improve fuel economy.
- Increase the tire life.

Use the information contained in this section to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

## TIRE FUNDAMENTALS

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires (Figure I). This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.



**Figure I. Standard Tire Sidewall Information**

- P:** The "P" indicates the tire is for passenger vehicles.
- Next number:** This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.
- Next number:** This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.
- P:** The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

# TRAILER SAFETY GUIDELINES

**Next number:** This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

**Next number:** This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. *Note:* You may not find this information on all tires because it is not required by law.

**M+S:** The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

**Speed Rating:** The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed in Table A. *Note:* You may not find this information on all tires because it is not required by law.

Letter Rating	Speed Rating
Q	99 mph
R	106 mph
S	112 mph
T	118 mph
U	124 mph
H	130 mph
V	149 mph
W	168* mph
Y	186* mph

**U.S. DOT Tire Identification Number:** This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

**Tire Ply Composition and Materials Used:** The number of plies indicates the number of layers of rubber-coated fabric

in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

**Maximum Load Rating:** This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

**Maximum Permissible Inflation Pressure:** This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

## Uniform Tire Quality Grading Standards (UTQGS)

**Treadwear Number:** This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

**Traction Letter:** This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA", "A", "B", and "C".

**Temperature Letter:** This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

Refer to Figure J for additional tire information for light trucks.

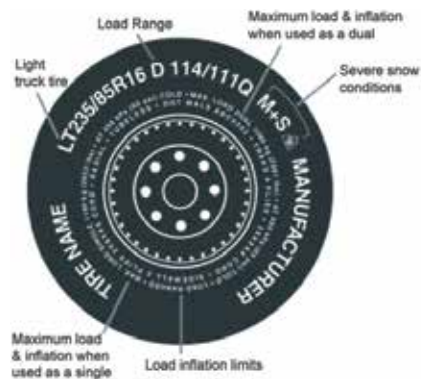


Figure J. UTQGS Tire Information



# TRAILER SAFETY GUIDELINES

Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

**LT:** The “LT” indicates the tire is for light trucks or trailers.

**ST:** An “ST” is an indication the tire is for trailer use only.

**Max. Load Dual** kg (lbs) at kPa (psi) Cold: This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

**Max. Load Single** kg (lbs) at kPa (psi) Cold: This information indicates the maximum load and tire pressure when the tire is used as a single.

**Load Range:** This information identifies the tire’s load-carrying capabilities and its inflation limits.

## Tire Safety Tips

- Slow down if you have to go over a pothole or other object in the road.
- **DO NOT** run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.
- Check tire inflation pressure weekly during use to insure the maximum tire life and tread wear.
- **DO NOT** bleed air from tires when they are hot.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- **ALWAYS** check tire pressure on tow vehicle and trailer before towing. Check tire pressure at least once a month.-
- **DO NOT** overload tow vehicle. Check the tire information and loading placard for safe allowable tire loading conditions.







## Tire Repair

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

## Replacing Worn or Damaged Tires

Replace the tire before towing the trailer if the tire treads have less than 1/16 inch depth or the telltale bands are visible. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. A bubble, cut or bulge in a side wall can result in a tire blowout. Inspect both side walls of each tire for any bubble, cut or bulge; and replace a damaged tire before towing the trailer.

Table B below will help pinpoint the causes and solutions of tire wear problems.

Table B. Tire Wear Troubleshooting			
Wear Pattern		Cause	Solution
	Center Wear	Over inflation.	Adjust pressure to particular load per tire manufacturer.
	Edge Wear	Under inflation.	Adjust pressure to particular load per tire manufacturer.
	Side Wear	Loss of camber or overloading.	Make sure load does not exceed axle rating. Align wheels.
	Toe Wear	Incorrect toe-in.	Align wheels.
	Cupping	Out-of-balance.	Check bearing adjustment and balance tires.
	Flat Spots	Wheel lockup and tire skidding.	Avoid sudden stops when possible and adjust brakes.

## WARNING



**ALWAYS** wear safety glasses when removing or installing force fitted parts. **DO NOT** attempt to repair or modify a wheel. **DO NOT** install an inner-tube to correct a leak through through the rim. If the rim is cracked, the air pressure in the inner tube may cause pieces of the rim to explode (break off) with great force and cause serious eye or bodily injury.

# TRAILER SAFETY GUIDELINES

## Wheel Rims

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

## Wheels, Bearings and Lug Nuts

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check wheel bearings, jack trailer and check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced. Check inflation pressure weekly during use to insure the maximum tire life and tread wear. Most trailer axles are built with sealed bearings that are not serviceable. Sealed bearings must be replaced as complete units.

- Check to see if the lug nuts are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter

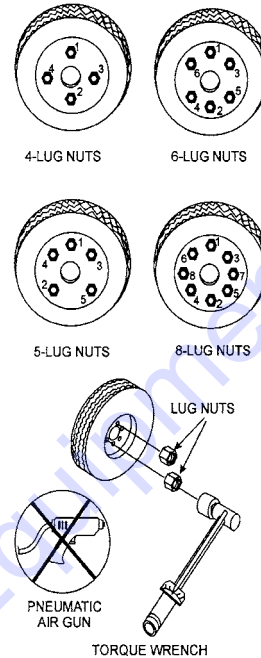


Figure K. Wheel Lug Nuts Tightening Sequence

Table C. Tire Torque Requirements

Wheel Size	First Pass FT-LBS	Second Pass FT-LBS	Third Pass FT-LBS
12"	20-25	35-40	50-65
13"	20-25	35-40	50-65
14"	20-25	50-60	90-120
15"	20-25	50-60	90-120
16"	20-25	50-60	90-120

### WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury. Check all wheel lug nuts periodically.

## Lug Nut Torque Requirements

It is extremely important to apply and maintain proper wheel mounting torque on the trailer. Be sure to use only the fasteners matched to the cone angle of the wheel. Proper procedure for attachment of the wheels is as follows:

- Start all wheel lug nuts by hand.
- Torque all lug nuts in sequence. See Figure K. DO NOT torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table C.

### NOTICE

**NEVER** use an pneumatic air gun to tighten wheel lug nuts.

Over-tightening lug nuts will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

## Lights and Signals

Before each tow, check the trailer taillights, stoplights, turn signals and any clearance lights for proper operation.

Replace any broken or burned-out lamps as necessary. Check the wire harness for cuts, fraying or other damage. If it needs replacing, contact Discount-equipment.

### WARNING

Improper operating taillights, stoplights and turn signals can cause collisions.

Check all lights before each tow.

# TRAILER SAFETY GUIDELINES

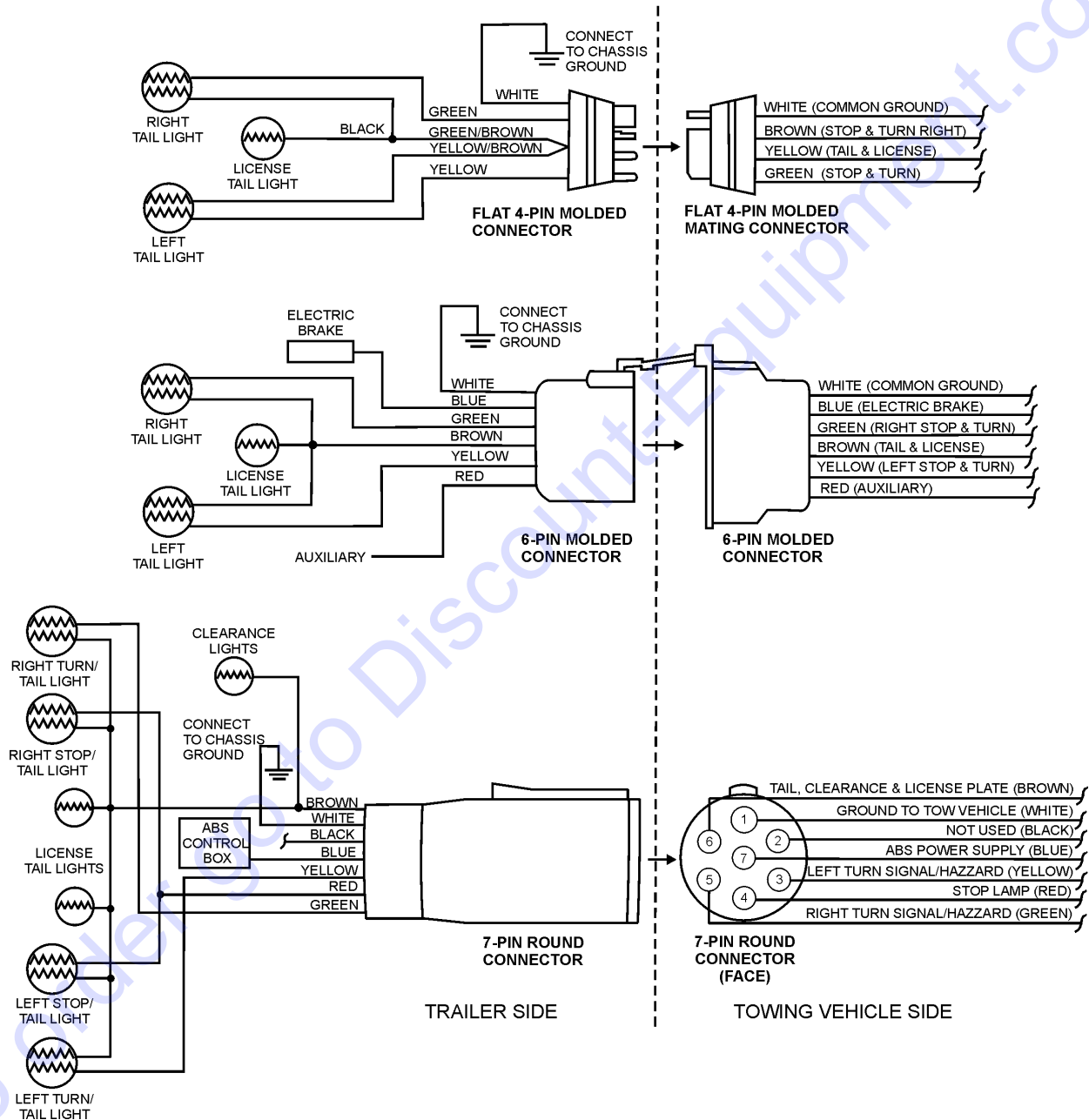


Figure L. Trailer to Tow Vehicle Wiring Diagram

# TROUBLESHOOTING

<b>Troubleshooting (Trash Pump)</b>		
<b>Symptom</b>	<b>Possible Problem</b>	<b>Solution</b>
Pump does not take on water.	Not enough priming water in the housing?	Add water.
	Engine speed too low?	Increase throttle.
	Strainer plugged?	Clean strainer.
	Suction hose damaged?	Replace or repair hose, and clamps.
	Air leak at suction port?	Check that fittings are tight and properly sealed.
	Pump is located too high above water line?	Move pump closer to water.
	Debris collecting in pump housing?	Clean pump housing.
	Too much distance between impeller and volute?	Adjust clearance by adding shims or replace impeller. Min. .006 inch - Max. .020 inch
	Water leaking out weep hole between pump and engine?	Check condition of mechanical seal and gaskets, between pump end and engine housing.
Pump takes in water, little or no discharge.	Engine speed too low?	Increase throttle speed.
	Suction strainer partially plugged?	Clean strainer.
	Impeller/Volute worn?	Adjust clearance by adding shims or replace impeller/volute.
Suction hose leaks at inlet.	Fittings/clamps are not sealed properly?	Tighten, replace or add clamp. (Keep extra seals on pump).
	Hose diameter is too large?	Use smaller diameter hose or replace hose.
Discharge does not stay on coupling.	Pressure too high?	Check pressure, add additional clamp.
	Hose kinked or end blocked?	Check hose.
Impeller does not turn, pump is hard to start.	Impeller jammed or blocked?	Open pump cover and clean dirt and debris from inside housing.
	Impeller and volute binding?	Adjust clearance by removing shim from behind impeller.
	Defective engine?	See Engine Owner's Manual.



# TROUBLESHOOTING

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

# TROUBLESHOOTING

<b>Troubleshooting (Engine) - continued</b>		
<b>Symptom</b>	<b>Possible Problem</b>	<b>Solution</b>
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.
Engine overheats.	Too much oil in engine crankcase?	Drain off engine oil down to upper mark on dipstick.
	Entire cooling air system contaminated or blocked?	Clean cooling air system and cooling fin areas.
	Fan belt broken or elongated?	Change belt or adjust belt tension.
	Coolant insufficient?	Replenish coolant.
	Radiator net or radiator fin clogged with dust?	Clean net or fin carefully.
	Fan, radiator, or radiator cap defective?	Replace defective part.
	Thermostat defective?	Check thermostat and replace if necessary.
	Head gasket defective or water leakage?	Replace parts.

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