

OPERATION MANUAL



MODEL MQ62TDD TRASH PUMP (DEUTZ F2L2011/D2011LO2 DIESEL ENGINES)

Revision #1 (07/08/20)

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THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PROPOSITION 65 WARNING



REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Multiquip at 1-800-421-1244.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Multiquip.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go to <http://www.nhtsa.dot.gov>; or write to:

Administrator
NHTSA
1200 New Jersey Avenue S.E.
Washington, DC 20590

You can also obtain information about motor vehicle safety from <http://www.safecar.gov>.

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MQ62TDD TRASH PUMP

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NOTICE

Specification and part number are subject to change without notice.

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TRAINING CHECKLIST

TRAINING CHECKLIST

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

TRAINING CHECKLIST			
NO.	DESCRIPTION	OK?	DATE
1	Read Operator's Manual completely.		
2	Machine layout, location of components, checking of engine and oil levels.		
3	Fuel system, refueling procedure.		
4	Pump priming procedure.		
5	Emergency stop procedures.		
6	Engine start-up procedure.		
7	Lifting of machine (lifting bail)		
8	Pump applications (lift, uses etc.)		
9	Suction strainer placement.		
10	Hose connections.		
11	Pump placement.		
12	Trailer safety guidelines.		
13	Protective clothing guidelines.		
14	Vacuum test procedure.		
15	Machine transport and storage.		
16	Clean out pump cavity procedure.		

DAILY PRE-OPERATION CHECKLIST

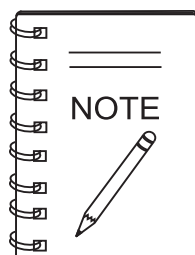
DAILY PRE-OPERATION CHECKLIST

DAILY PRE-OPERATION CHECKLIST	
1	Check engine oil level.
2	Check fuel level (and for clean fuel).
3	Check cooling fins and cooling air flow.
4	Check engine air cleaner.
5	Check engine battery and cable connections.
6	Check pump interior (impeller and volute).
7	Check vacuum pump seal oil.
8	Check bearing housing oil.
9	Check pump seal.
10	Check pump casing for cracks.
11	Check trailer wheel lug nuts for tightness.
12	Check trailer wheel bearings.
13	Check trailer hitch and ball.
14	Check trailer springs and hardware (jack stand).
15	Check trailer tire pressure.
16	Check trailer lights.

COMMENTS:

FOR YOUR SAFETY AND SAFETY OF OTHERS!

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.



This manual has been developed to provide complete instructions for the safe and efficient operation of this equipment. Refer to the engine manufacturer's instructions for data relative to its safe operation.

Before using this equipment ensure that the operating individual has read and understood all instructions in this manual.

SAFETY MESSAGE ALERT SYMBOLS

The three 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 three words: **DANGER**, **WARNING**, or **CAUTION**.

DANGER

You **WILL** be **KILLED** or **SERIOUSLY INJURED** if you **DO NOT** follow these directions.

WARNING

You **CAN** be **KILLED** or **SERIOUSLY INJURED** if you **DO NOT** follow these directions.

CAUTION

You **CAN** be **INJURED** if you **DO NOT** follow these directions.

HAZARD SYMBOLS

Potential hazards associated with the operation of this equipment will be referenced with Hazard Symbols which appear throughout this manual, and will be referenced in conjunction with Safety Message Alert Symbols.

WARNING — Lethal Exhaust Gas Hazards



Engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled. **NEVER** operate this equipment in a confined area or enclosed structure that does not provide ample free flow air.

WARNING — Explosive Fuel Hazards



Fuel is extremely flammable and its vapors can cause an explosion if ignited. **DO NOT** start the engine near spilled fuel or combustible fluids.

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 approved containers, in well-ventilated areas and away from sparks and flames.

WARNING — Burn Hazards



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

WARNING — Respiratory Hazards



ALWAYS wear approved respiratory protection when required.

CAUTION — Rotating Parts Hazards



NEVER operate equipment with covers or guards removed. Keep fingers, hands, hair and clothing away from all moving parts to prevent injury.

CAUTION — Overspeed Conditions



NEVER tamper with the factory setting of the engine governor. Personal injury and equipment damage can result if operating in speed ranges above the maximum allowable.

CAUTION — Accidental Starting Hazards



ALWAYS place the equipment ON/OFF switch in the OFF position when the equipment is not in use.

CAUTION — Equipment Damage Hazards

Other important messages are provided throughout this manual to help prevent damage to your equipment, other property, or the surrounding environment.

CAUTION — Eye and Hearing Hazards




ALWAYS wear approved eye and hearing protection when required.

RULES AND REGULATIONS


WARNING — Read This Manual

Failure to follow instructions in this manual may lead to serious injury or even **DEATH!** This equipment is to be operated by trained and qualified personnel only! This equipment is for industrial use only.

GENERAL SAFETY

- **DO NOT** operate or service this equipment before reading this entire manual. 
- This equipment should not be operated by persons under 18 years of age.
- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, steel-toed boots and other protective devices required by the job.



- **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.



- **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.
- **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.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- **ALWAYS** check the equipment for loosened threads or bolts before starting.

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



- **ALWAYS** allow the engine to cool before adding fuel or performing service and maintenance functions. Contact with *hot* components can cause serious burns.

- **NEVER** operate this equipment in any enclosed or narrow area where free flow of the air is restricted. The engine of this equipment requires an adequate free flow of cooling air. If the air flow is restricted it will cause serious damage to the equipment or engine and may cause injury to people and property. Remember the engine gives off **DEADLY** gases.



- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.

- **ALWAYS** use extreme caution when working with **flammable** liquids. When refueling, **stop** the engine and allow it to cool.

- **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.



- **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**.



- **DO NOT** top-off fuel tank. Topping-off is dangerous as it causes fuel to spill.

- **ALWAYS** store the equipment in a clean, dry location out of the reach of children.

- **NEVER** run engine without air cleaner. Severe engine damage may occur.

- **NEVER** leave the equipment unattended with the engine running. Turn off engine when unattended.

- **CAUTION** must always be observed while servicing this equipment. Rotating parts can cause injury if contacted.

RULES AND REGULATIONS

- **ALWAYS** read, understand, and follow procedures in Operator's Manual before attempting to operate equipment.
- **ALWAYS** be sure the operator is familiar with proper safety precautions and operation techniques before using pump.
- **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.
- **NEVER** pump volatile, explosive, flammable or low flash point fluids. These fluids could ignite or explode.
- **NEVER** operate the pump in an **explosive** atmosphere.
- **ALWAYS** ensure pump is on level ground before use.
- Become familiar with the components of the pump before operating.
- **ALWAYS** replace any worn or damaged warning decals.
- **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** 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.
- **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.
- In winter drain water from pump housing to prevent freezing.



- **ALWAYS** make sure that the pump's trailer is placed on solid level ground so that it cannot slide or shift around, endangering workers. Deploy jack stands for stabilization. Place blocks under the trailer's bumper to make it level (prevents tipping), and use a chocked block underneath the wheels to prevent rolling. Also keep the immediate area free of bystanders.
- Before starting the pump, check that the clean-out cover is securely fastened.
- **NEVER** start the pump with the clean-out cover removed. The rotating impeller inside the pump can cut or sever objects caught in it.

WARNING — Do Not Run the Pump Dry

If the pump loses prime while operating, the remaining water in the casing will reach near-boiling temperatures within approximately 15 minutes. **NEVER** operate the pump without water flowing through the pump. Allow pump casing to cool to the touch before opening the fill or drain caps or before removing any hoses to avoid serious burns and bodily injury to the operator.

RULES AND REGULATIONS

TRANSPORTING

- **ALWAYS** shutdown engine before transporting.
- Tighten fuel tank cap securely and close fuel cock to prevent fuel from spilling.
- **ALWAYS** make sure pump is correctly secured to the trailer. Check all connections attaching the pump to the trailer and make sure they are tight. See Towing section of this manual.

MAINTENANCE SAFETY

- **NEVER** lubricate components or attempt service on a running machine.
- **ALWAYS** allow the machine a proper amount of time to cool before servicing.
- Keep the equipment in proper running condition.
- Fix damage to the equipment immediately and always replace broken parts.
- 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.

EMERGENCIES

- **ALWAYS** know the location of the nearest **fire extinguisher**.
- **ALWAYS** know the location of the nearest **first aid kit**.
- In emergencies, **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 case of emergency.



BATTERY SAFETY (FOR ELECTRIC START)

- The battery contains acids that can cause injury to the eyes and skin. **ALWAYS** wear safety glasses to avoid eye irritation.
- **ALWAYS** wear well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, a buildup of combustible gas will occur.
- **DO NOT** charge battery if frozen. Battery can explode. When frozen, warm the battery to at least 61° F (16° C).
- **ALWAYS** make sure battery terminals are properly connected. Inadequate battery connections may cause poor starting of the equipment and create other malfunctions.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.
- **ALWAYS** recharge the battery in an vented air environment, to avoid risk of a dangerous concentration of combustible gases.
- **ALWAYS** disconnect the negative battery terminal before performing service on the equipment.
- If the battery liquid (dilute sulfuric acid) comes in contact with clothing or skin, rinse skin or clothing immediately with plenty of water.
- If the battery liquid (dilute sulfuric acid) comes in contact with your EYES, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.



DANGER — Explosion Hazards

The risk of an explosion exists when performing service on the battery. To avoid **severe injury** or **DEATH**:



DO NOT drop the battery. There is the possibility of risk that the battery may 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 in contact with a flame or spark, an explosion could occur.

Table 1. Pump Specifications

Maximum Pumping Capacity	1083 gpm (4,100 lpm)
Maximum Suction Lift*	25 FT. (7.6 meters)
Maximum Total Head	100 FT. (30.4 meters)
Maximum Pressure	43.2 psi
Maximum Solids	2 in. (30.5 mm)
Suction and Discharge Diameter	6 in. (152 mm)
Weight (No Fuel)	1,560 lbs. (707 kg.)
* Based on pump operating at sea level. Maximum suction lift will be less at higher altitudes.	

Table 2. Engine Specifications

Engine Make	Deutz	
Engine Model	F2L2011/D2011L02	
Engine Type	Air Cooled 4-Stroke Diesel	
Number Of Cylinders	2	
Bore/Stroke	94/112 mm	
Continuous Engine HP	29.2 HP @1,800 RPM	
Combustion Method	Direct Fuel Injection	
Oil Grade	See Table 5	
Oil Capacity with Cooler	2.3 gal/8.5 liters	
Fuel Type	Diesel	
Fuel Capacity	TRLRMP	16 gal/60.6 liters
	TRLRMP	28 gal/106 liters
	TRLR50WLT	41 gal/155.2 liters
	Skid Mount	16 gal/60.6 liters
Starting Method	12 VAC Electric Start	

DIMENSIONS (PUMP/TRAILER)

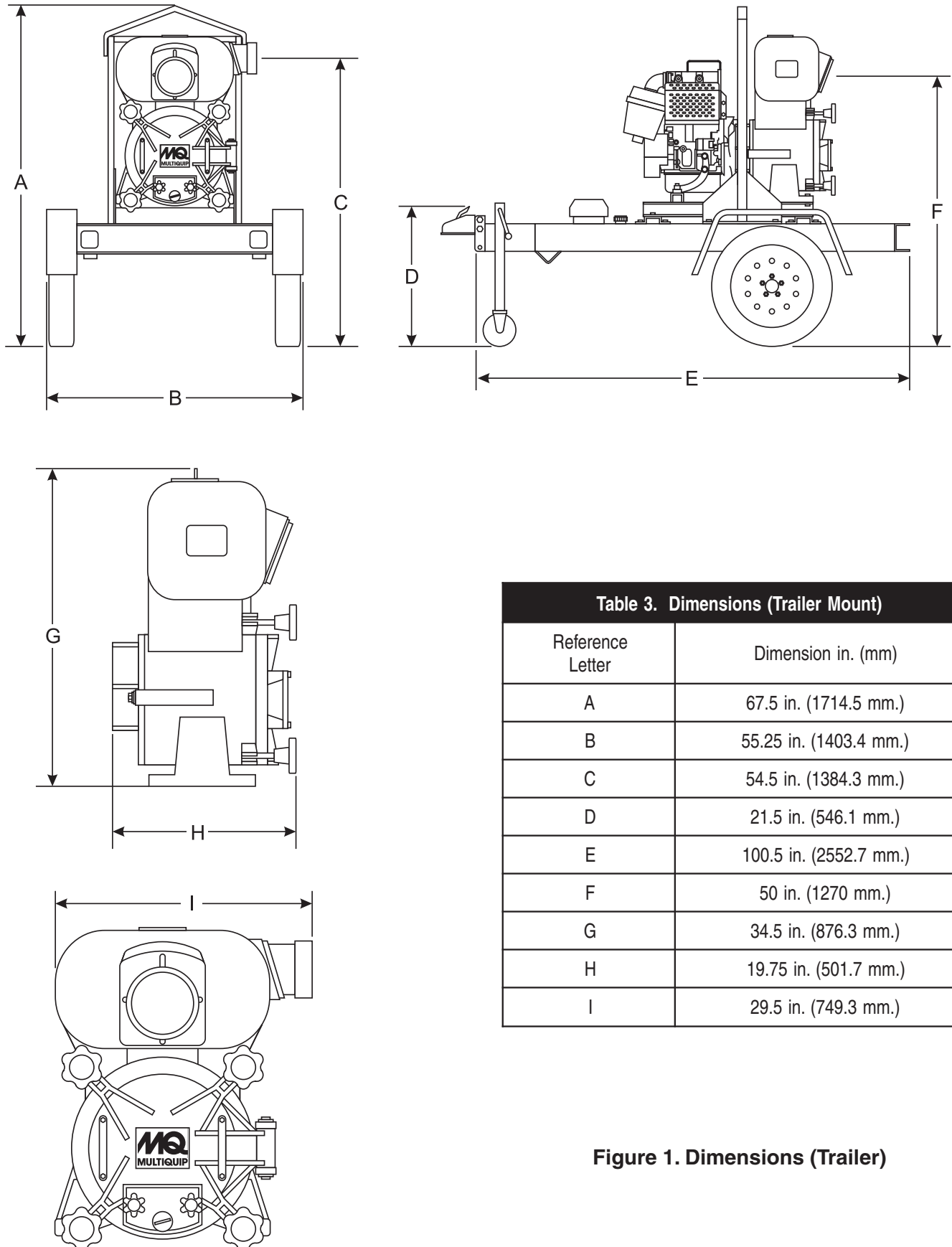


Table 3. Dimensions (Trailer Mount)

Reference Letter	Dimension in. (mm)
A	67.5 in. (1714.5 mm.)
B	55.25 in. (1403.4 mm.)
C	54.5 in. (1384.3 mm.)
D	21.5 in. (546.1 mm.)
E	100.5 in. (2552.7 mm.)
F	50 in. (1270 mm.)
G	34.5 in. (876.3 mm.)
H	19.75 in. (501.7 mm.)
I	29.5 in. (749.3 mm.)

Figure 1. Dimensions (Trailer)

DIMENSIONS(SKID MOUNT)

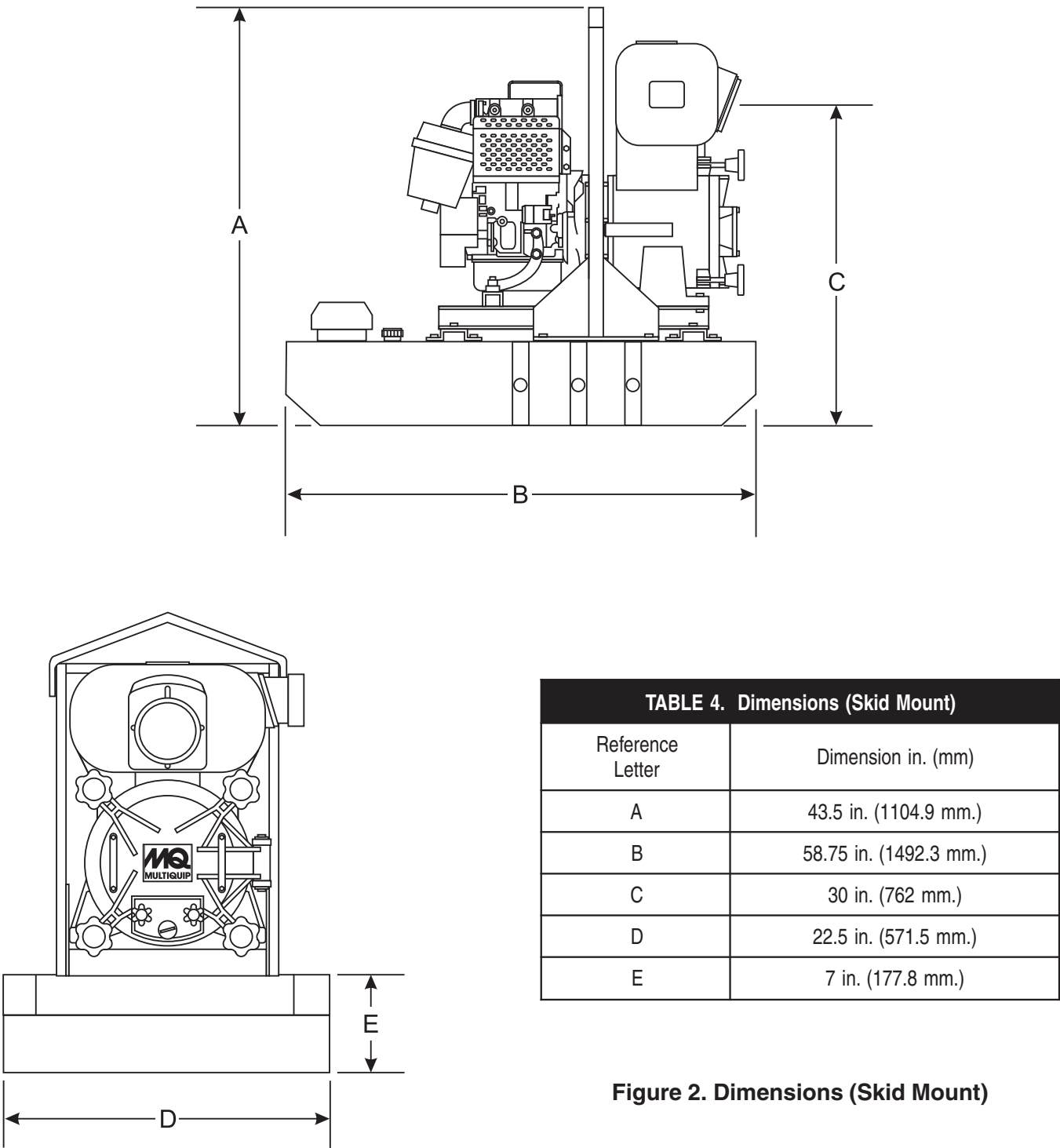


Figure 2. Dimensions (Skid Mount)

GENERAL INFORMATION

The MQ62TDD trash pump is a self-priming trash pump powered by a 29 horsepower air-cooled, 2-cylinder, four stroke Deutz diesel engine. Both the intake (suction) and discharge ports on the pump incorporate a 6-inch diameter opening, which allows the pump to discharge at a rate of approximately 1,083 gpm or 4,100 lpm.

This is a self-priming pump design, the pump casing must be filled with water before the pump can be used. The engine drives a rotating disc with two (or more vanes) called an impeller that creates an area of low pressure inside the pump. Priming is accomplished when all air is purged from the pump and suction line allowing water to flow continuously into the pump.

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 can handle solids up to 2-inches (51 mm). 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 to remove debris in the event the pump becomes clogged.

SUCTION LIFT

This pump has a maximum suction lifts up to 25 feet (7.6 meters) at sea level. ***At elevations above sea level suction lift decreases at a rate of 1 foot of suction lift per 1,000 feet of elevation.*** Therefore, when this pump is being used at an elevation of 5,000 feet the maximum suction lift is reduced to 20 feet. It is recommended that the pump be located as close to the source as possible to minimize suction lift.

PUMP SUPPORT

NEVER place the pump on ***soft soil***. The pump should always be placed on solid stationary ground in a level position. To prevent the trailer from tipping, place blocks under the trailer's bumper. In addition, place chock blocks behind each wheel to prevent the trailer from rolling.

ELEVATION

Elevations over 3,000 feet 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.

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 only 18 feet rather than the 25 feet at sea level.

PUMP CLEAN-OUT

The clean-out cover on the pump has been design for easy removal that allows for easy access to the wear plate and impeller for cleaning and servicing.

HOSES

Suction and discharges hoses or pipe connection should always be checked for tightness and leaks. A small suction leak in the hose or fittings could prevent the pump from priming.

MECHANICAL SEAL LUBRICATION

The pump uses a oil lubricated mechanical seal to prevent water from seeping into the engine. The oil in the seal chamber lubricates the seal and prevents it from overheating. Never operate the pump without water in the casing as this may cause the seal to fail. (See section on seal maintenance).

ENGINE SAFETY

Internal combustion engines present special hazards during operation and fueling! Failure to follow the safety guidelines described in the Rules for Safe Operation section of this manual and the Deutz Engine Operator's Manual could result in severe injury or death.

ACCESSORIES

Multiquip offers a complete line of fittings, hoses, and clamps to properly connect the pump to match various job conditions. Refer to the part list in section 2 of this manual for a complete list of accessories

APPLICATIONS

Figure 3 below shows a typical application using the 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 2 inches (51 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.

TERMS TO KNOW

The following terms are usually used when referring to *lift* or *head*:

1. **Static Suction Lift** – The vertical distance from the water line to the center of the impeller.
2. **Static Discharge Head** – The vertical distance from the discharge outlet to the point of discharge or liquid level when discharging into the bottom of a water tank.
3. **Dynamic Suction Head** – The static suction lift plus the friction in the suction line. Also referred to as **total suction head**.
4. **Dynamic Discharge Head** – The static discharge head plus the friction in the discharge line. Also referred to as **total discharge head**.
5. **Total Dynamic Head** – The Dynamic Head Suction Head plus the Dynamic Discharge Head. Also referred to as **total head**.

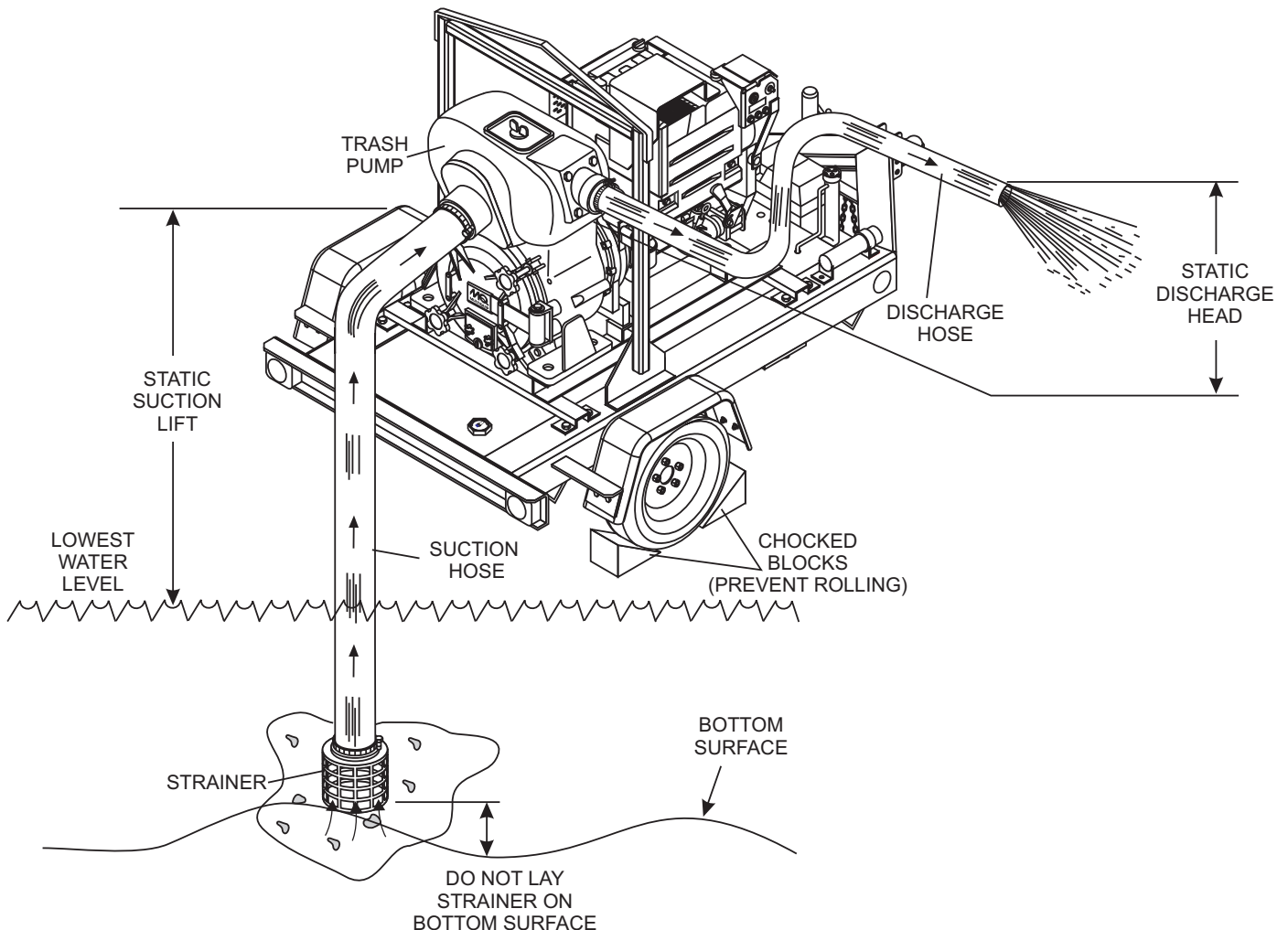


Figure 3. Pump Application

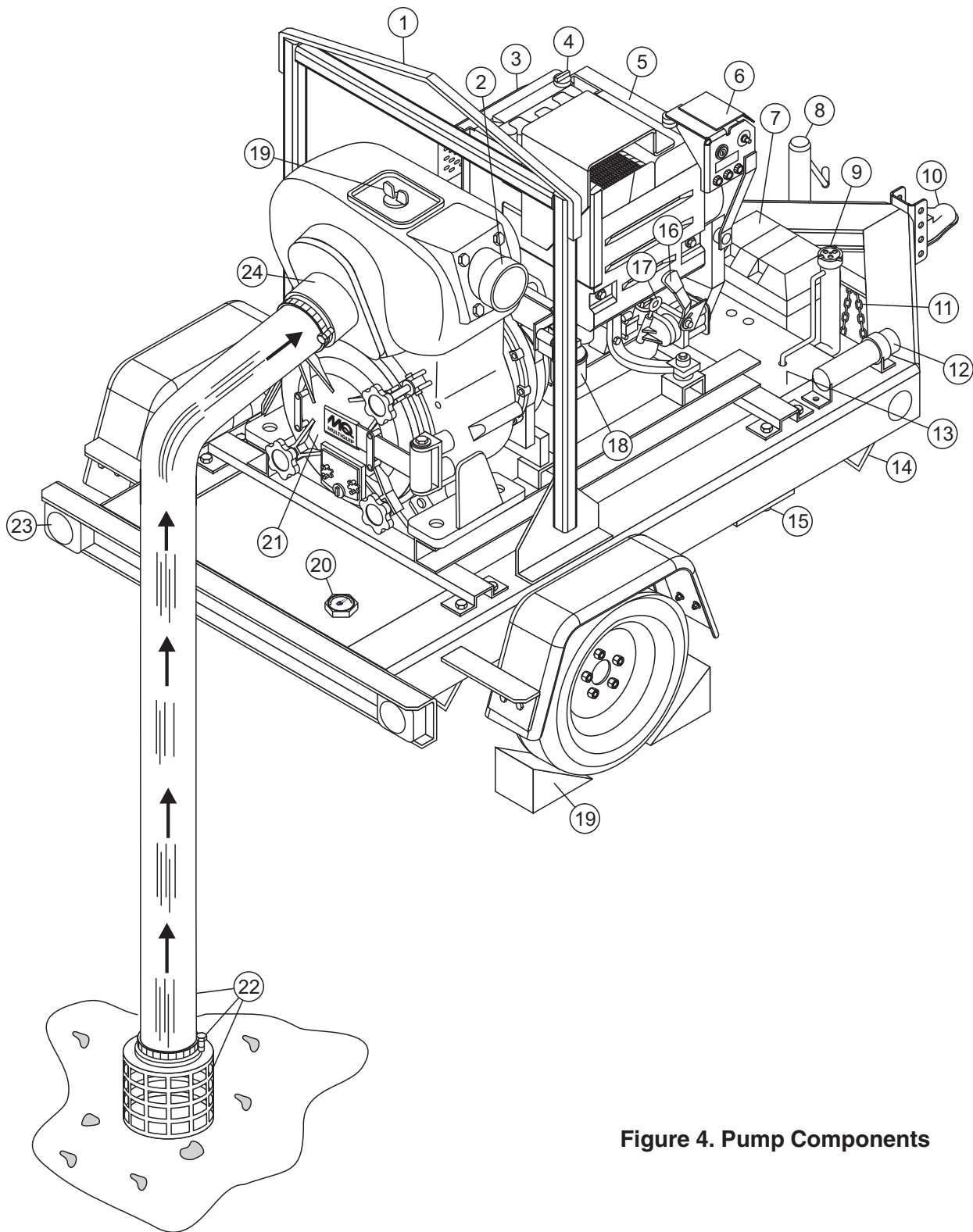


Figure 4. Pump Components

PUMP COMPONENTS

Figure 4 shows the location of the components and basic components for the MQ62TDD trash pump. The function of each component or control is described below:

1. **Lifting Bail** – When lifting of the trash pump by crane is required, use this lifting bail. Note: this lifting bail is balanced for a fully configured trash pump; removal of any trash pump components will un-balance the lifting bail.
2. **Pump Discharge Port** – Discharges water and debris from the pump.
3. **Muffler/Guard** – **DO NOT** touch the muffler when engine is running. The muffler can become extremely hot, causing severe burns. **NEVER** run the pump with the muffler guard removed.
4. **Oil Filler** – Fill as recommended in the maintenance section of this manual.
5. **Engine (Diesel)** – This pump uses a Deutz F2L2011/D2011L02 air-cooled, 4-stroke diesel engine. See the Deutz Operation manual supplied with the trash pump for additional engine information.
6. **Control Box Panel** – Monitors engine functions and will shut down the engine for low oil pressure, high coolant temperature, alternator charge and V-belt failure.
7. **Battery** – +12 VDC battery compartment.
8. **Tow End Jack Stand** – When connecting the pump to a ball type towing hitch, use this jack stand to raise and lower the pump.
9. **Fuel Filler Port** – When the adding of fuel is required, remove fuel cap and add fuel through this port. Re-fuel using only recommended types of diesel fuels (see Deutz Operation Manual). **DO NOT** top off fuel, wipe up any spilled fuel immediately.
10. **Tow Hitch Coupler** – Requires a 2-inch ball hitch.
11. **Safety Chain** – **ALWAYS** attach safety chain to the towing vehicle. **NEVER!** tow the trash pump with the safety chain unattached.
12. **Documentation Box** – Contains documentation for the pump and engine.
13. **Fuel Cell** – This pump can be configured to operate with either a 16, 23 or 41 gallon fuel cell.
14. **Tie-Downs** – When the pump is placed on a flatbed truck for transport, use these tie-down points (4) to secure the trailer frame to the flatbed.
15. **Fuel Cell Drain Plug** – Located underneath the fuel cell, remove this drain plug to drain the fuel tank.
16. **Engine Throttle Lever** – Controls the speed of the engine. For load conditions (pumping water) **ALWAYS** run the engine at **full speed**.
17. **Dipstick** – Read this gauge to determine the oil level in the engine crankcase. Fill with only recommended type oil as referenced in the maintenance section of this manual.
18. **Fuel Filter** – Replace or clean the fuel filter as specified in the maintenance section of this manual.
19. **Chock Blocks** – Place these blocks (not included as part of the trash pump package) under each trailer wheel to prevent rolling.
20. **Fuel Gauge** – Read this gauge to determine if the fuel level is low. If fuel level is low, replenish with only recommended type diesel fuel.
21. **Clean-Out Cover** – Remove this cover to clean and remove foreign debris from the trash pump.
22. **Accessories** – Hoses, strainers and clamps are the required accessory components for normal operation of this trash pump. **Contact** your nearest Multiquip dealer for information on the components.
23. **Trailer Lights** – Before towing trash pump, make sure that both trailer lights are functioning correctly. **NEVER** tow the trash pump if these lights are not working.
24. **Pump Intake Port** – Intakes water and debris from the source.
25. **Fill Cap** – Remove this cap to prime the pump with water.

ENGINE COMPONENTS

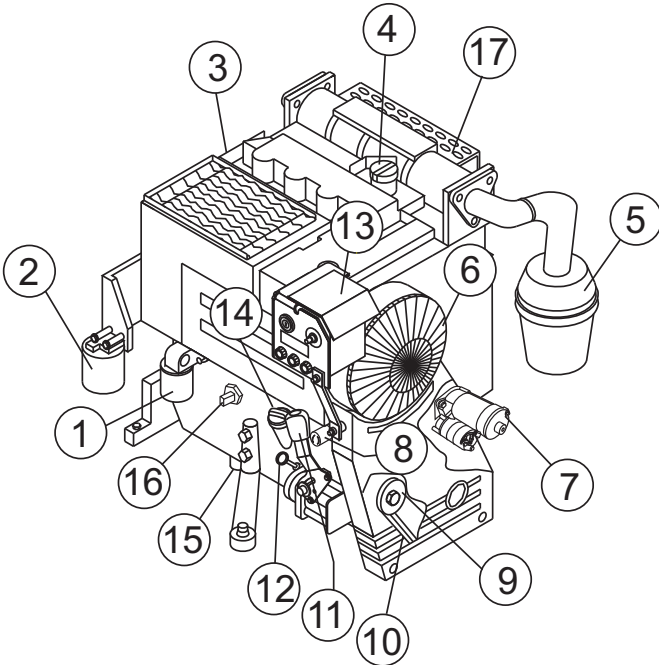


Figure 5. Deutz Engine Basic Components

Figure 5 illustrates the location of the basic components for the Deutz engine. The function of each component is described below:

1. **Oil Filter** – Replace this filter as recommended in the maintenance section of this manual
2. **Fuel Filter** – Replace or clean the fuel pump or fuel filter as specified in the maintenance section of this manual.
3. **Engine** – This pump uses a 29 horsepower air-cooled, 2-cylinder, four stroke Deutz diesel engine. See Deutz engine owners manual for more detailed information.
4. **Oil Filler Port Cap Upper** – Remove this cap to add engine oil to the crankcase. Fill with recommended type oil as specified in the maintenance section of this manual.
5. **Air Cleaner** – Prevents dirt and other debris from entering the fuel system. Remove wing-nut on top of air filter canister to gain access to filter element. Replace with only manufacturer's recommended type air cleaner.
6. **Cooling Fan Blades** – Make sure that the blades of the cooling fan are not **bent or broken**. A damaged fan blade can cause the engine to run hot and overheat.
7. **Starter Motor/Solenoid** – +12 VDC electrical device used to engage the flywheel when starting the engine.
8. **Fuel Solenoid** – Stops the flow of fuel into the injection system when the ignition key is in the OFF position. When ignition key is in the ON position fuel will flow into the injection system.
9. **Alternator** – Provides power to the electrical system. Replace with only manufacturer's recommended type alternator. A switch will shutdown the engine
10. **Fan V-Belt** – **ALWAYS** make sure V-belt is properly tensioned. A loose or defective V-belt can adversely affect the performance of the pump.
11. **Speed Control Lever** – Regulates engine speed. When pumping always place this lever in the high engine speed position.
12. **Dipstick** – Remove dipstick to determine if engine oil is low. Maintain oil level at the "H" marking on the dipstick. **NEVER** run engine with low oil.
13. **Control Box** – Includes ignition switch, reset switch and engine warning status indicators.
14. **Oil Filler Port Cap Lower** – Remove this cap to add engine oil to the crankcase. Fill with recommended type oil as specified in the maintenance section of this manual.
15. **Crankcase Drain Plug** – Remove this plug to drain engine oil from the crankcase. Replace with recommended engine oil as specified in the maintenance section of this manual.
16. **Oil Sending Unit** – In the event of low oil in the engine crankcase or low oil pressure, the indicator lamp will illuminate. **STOP** the engine immediately if this occurs. **NEVER** run the engine when this lamp is lit.
17. **Muffler/Guard** – **DO NOT** touch the muffler when engine is running. The muffler can become extremely hot, causing severe burns. **NEVER** run the pump with the muffler guard removed.

CONTROL BOX COMPONENTS

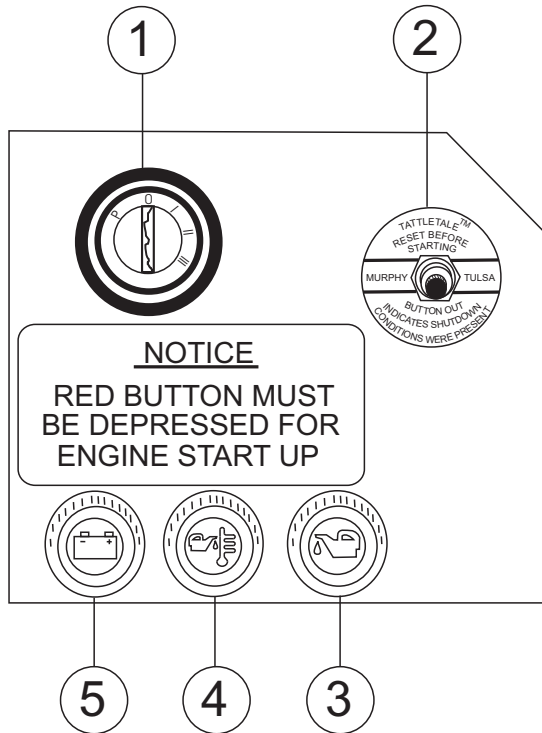


Figure 6. Control Box Components (Old Style)

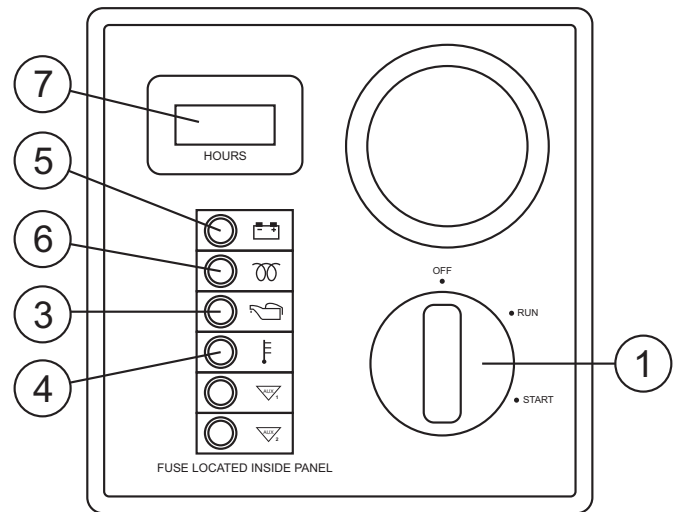


Figure 6A. Control Box Components (New Style)

Figures 6 and 6A illustrate the location of the basic components for the control box. The function of each component is described below:

1. **Ignition Switch** – Used to start and stop the engine
2. **Reset Switch** – When the engine has been shut-down due to a malfunction, the **RED** reset pushbutton must be pressed prior to starting the engine again. In addition, the fault that caused the engine to shut-down must be corrected before starting.
3. **Oil Pressure Status Indicator** – When lit indicates that the oil pressure is not within specified limits. This condition will cause the engine to shutdown.
4. **Oil Temperature Status Indicator** – When lit indicates that the oil temperature has exceeded its limit. This condition will cause the engine to shutdown.
5. **Charge Indicator** – When lit indicates that the charging system is not working properly. This condition will cause the engine to shutdown.
6. **Preheat Status Indicator** – When lit indicates the preheat system is in process. When light extinguishes, the preheat period is complete and the engine may be cranked.
7. **Hour meter** – Indicates the number of hours the machine has been in use.

Engine Oil

1. Make sure pump/engine is on level ground.
2. Pull the engine oil dipstick from its holder.
3. Verify that oil level (Figure 7) is maintained between the two notches on the dipstick.

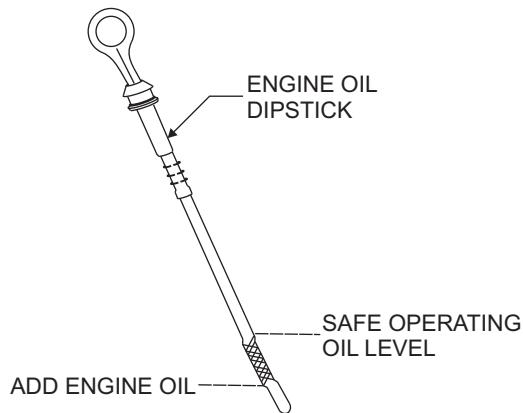


Figure 7. Engine Oil Dipstick

4. If engine oil is low, fill engine crankcase with lubricating oil through filler hole (Figure 8), but do not overfill.
5. The oil listed in Table 5 is recommended to ensure better engine performance. Use class CD or higher grade motor oil.

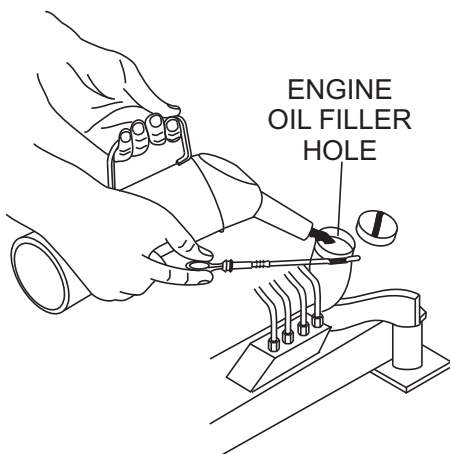


Figure 8. Engine Oil Dipstick

Table 5. Oil Selection Chart		
OIL: SAE		
°F	°C	
122	50	
104	40	
86	30	
68	20	
50	10	
32	0	
-14	-10	
-4	-20	
-22	-30	
-40	-40	
		5W/30
		5W/40
		10W
		10W/30
		10W/40
		15W/40
		20W/20
		30
		40

Battery

This unit is of negative ground. **DO NOT** connect in reverse. Always maintain battery fluid level between the specified marks. Battery life will be shortened, if the fluid level are not properly maintained. Add only distilled water when replenishment is necessary.

DO NOT over fill. Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. *Always* keep the terminals firmly tightened. Coating the terminals with an approved battery terminal treatment compound. Replace battery with only recommended type battery.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 68° F). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

Before charging the battery with an external electric source, be sure to disconnect the battery cables.

Battery Cable Installation

ALWAYS be sure the battery cables are properly connected to the battery terminals as shown in Figure 9. The **RED** cable is connected to the positive terminal of the battery, and the **BLACK** cable is connected to the negative terminal of the battery.

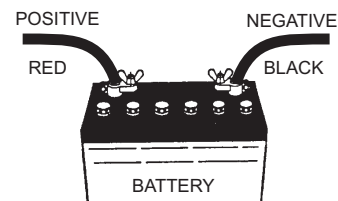


Figure 9. Battery

Fuel

1. Determine if engine fuel is low by reading fuel gauge (Figure 10) located either front or rear of the trailer depending on type of trailer. If the fuel level is low, remove the fuel cap from the trailer filler neck and fill with recommended type diesel fuel. **DO NOT** fill the tank beyond capacity.

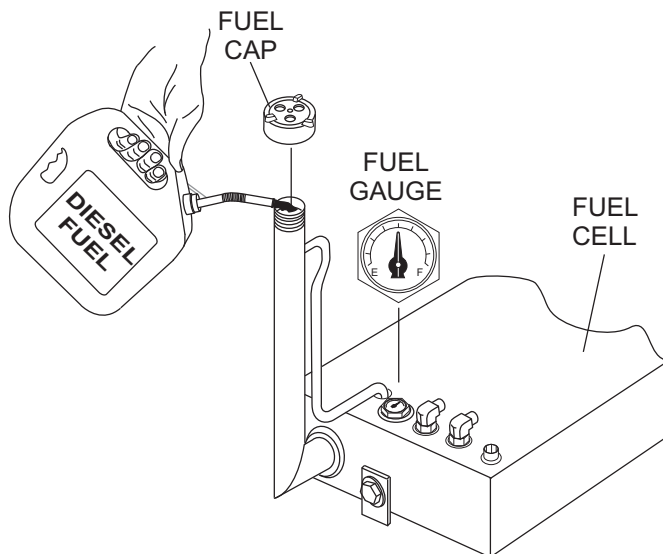


Figure 10. Refueling (Fuel Cell)

2. Handle fuel in a safety container. If the container does not have a spout use a funnel.
3. Pay attention to the fuel tank capacity when replenishing fuel. Refer to the fuel tank capacity listed in Engine Specification Table 2.
4. Tighten fuel cap securely after filling.
5. If using a skid mounted pump (Figure 11), read the fuel gauge located at the front of the fuel tank. If fuel level is low, remove the fuel cap and fill with recommended type diesel fuel. **DO NOT** fill the tank beyond capacity

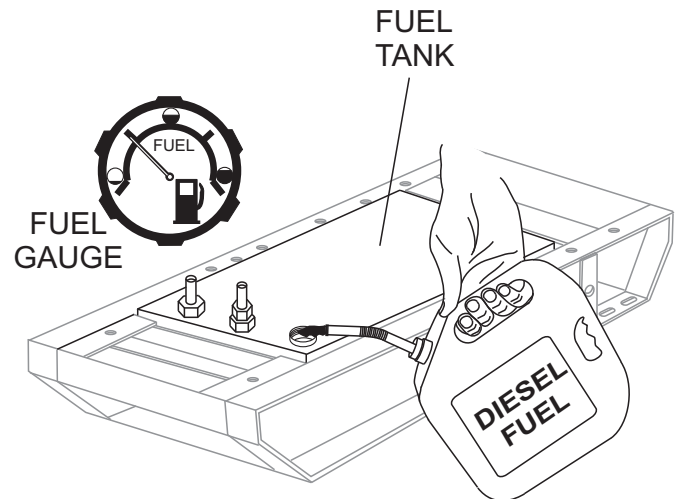


Figure 11. Refueling (Skid)



DANGER — No Smoking



DO NOT smoke while refueling, motor fuels are highly flammable and can be dangerous if mishandled.



DANGER — Fire/Explosion



NEVER fill the fuel tank while the engine is running or in the dark. Fuel spillage on a hot engine can cause a fire or explosion. If fuel spillage occurs, wipe up the spilled fuel completely to prevent fire hazards.

Before Starting

1. Read safety instructions at beginning of manual.
2. Place pump as near to water as possible, on a firm flat, level surface.
3. To prime pump, remove fill cap (Figure 4) and fill pump case with water. If the pump case is not filled with water before starting, it will not begin pumping.



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

4. Check for **leaks** between pump and engine. If water is leaking between the pump and bearing 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 bearing housing assembly.

Hoses, Clamps and Strainer

1. Check that all hoses are **securely** attached to the pump. Make certain suction hose (Figure 4) 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 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 4) 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.
5. Make sure the **suction strainer** (Figure 4) 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. Failure to use a strainer could cause damage to the pump, impeller, pump shaft, pump bearings, or wear plate.

6. Shorter suction lift and suction hose length will produce better performance.
7. 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.



DANGER — High Pressure

PVC discharge hoses and thin-walled rubber hoses can easily fail at the end of the hose fittings. Leaks from the hoses can cause high-pressure liquid to be discharged, causing dangerous conditions. Make sure pressure rating of hoses exceeds the pump maximum pressure to prevent hose failure.

8. Pipes, hoses, fittings and elbows all produce friction that can significantly reduce the flow of water. Keep hose length to a minimum and minimize the use of elbows and other fittings to reduce friction.
9. Always use a suction hose or pipe that matches the size of the pump inlet to insure optimum performance and reduce the risk of damage to the pump.
10. It is recommended that the discharge hose or pipe match the size of the pump outlet to reduce friction as much as possible. Using a discharge line that is larger than the pump outlet will reduce friction and improve water flow. Similarly, a smaller line will reduce water flow by increasing friction.



CAUTION — Strainer Placement

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 — Equipment Damage Hazards

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.

ENGINE STARTUP

CAUTION — Equipment Damage Hazards

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

1. Set the *Engine Speed Control Lever* (Figure 12) to a position half way between start and stop.

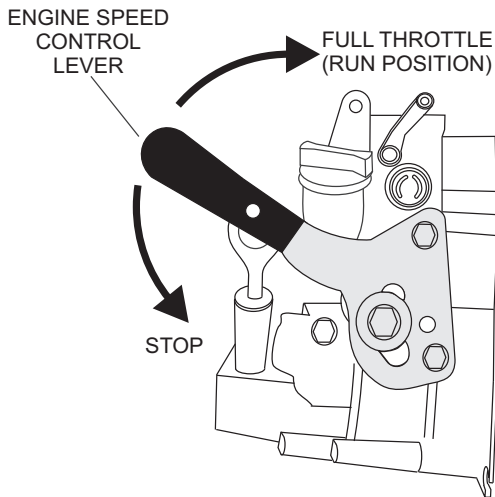


Figure 12. Engine Speed Control Lever

2. Insert ignition key into ignition switch (Figure 13), turn ignition key clockwise to position I, and verify that all three status indicator lights (Figure 14) are **ON**.

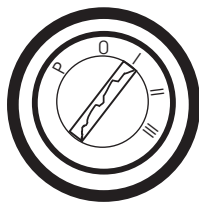


Figure 13. Ignition Switch

3. Continue turning ignition key through positions II and III while pushing the red button at the same time.
4. Release ignition key and red button as soon as engine fully starts, and verify that ignition key automatically returns back to position I. Verify that all three lamp/LED status indicator lights are **OFF** when the engine is started.

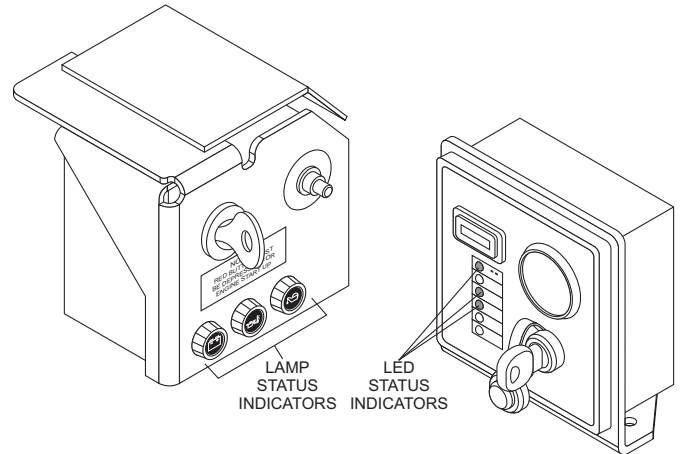
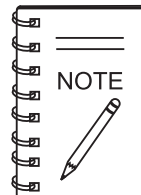


Figure 14. Engine Status Indicators Lamps

8. If charge lamp or LED remains lit, increase engine speed until lamp/LED goes off. When the charge indicator lamp/LED goes off, it can then be assumed that the charging system is working correctly.
9. If the charge lamp or LED remains on while the engine is running, refer to Table 12 (Engine Troubleshooting) or the Deutz Engine Repair Manual.
10. Move *speed control lever* to full speed position for maximum engine speed. (See Figure 12)

OPERATION

1. The pump should begin pumping water within a minute depending on the length of suction hose and height the pump is above water.
2. If pump does not begin to pump water after a few minutes, check for loose connections or air leaks in suction hose. Make sure there is water in the pump end and strainer is not clogged with debris, reference Table 11 (Pump Troubleshooting).



Longer suction hoses will require more time for the pump to begin pumping water.

ENGINE SHUT-DOWN

1. Place **engine speed control lever** in the idle position and let the engine run at this speed for at least 2 minutes. This will allow the engine to cool-down.
2. Turn ignition key counter clockwise to position **0** (OFF).

CAUTION — Engine Shutdown

NEVER attempt to stop the engine by manually activating the engine shutdown lever. **ALWAYS** use the ignition key to turn off the engine.

3. Remove ignition key and place key in safe location where it will not get lost.

CAUTION — Ignition Key Safeguarding

When pump is not in use, keep ignition key in a safe place, out of the reach of unauthorized persons.

PUMP INSPECTION AFTER USE

It is recommended that the pump be inspected after each use for damage or wear.

1. Visually inspect the pump for any signs of wear or damage. Replace any worn or defective components as specified in the maintenance section of this manual.
2. Open pump clean-out cover and remove any foreign debris that may have accumulated.
3. Inspect all hoses, fittings and clamps. If defective replace immediately.
4. Inspect impeller for wear or damage and measure impeller clearance if it appears worn. Inspect interval should be about every 1000 hours. This inspection should be done when the pump is scheduled for maintenance inspection.

PUMP STORAGE

For storage of the pump for over 30 days, the following is required:

- Drain the fuel tank completely.
- Run the engine until the fuel in the injection system is completely consumed.
- Completely drain used oil from the engine crankcase and fill with fresh clean oil, then follow the procedures described in the engine manual for engine storage.
- Remove the drain plug from the pump and drain out any water from left in the housing.
- Remove the pump cover and clean inside of pump housing. Coat inside of pump housing with a light film of oil to reduce corrosion. A spray can of oil works well for this application.
- Cover suction and discharge ports with duct tape to prevent any foreign matter from falling into pump.
- Cover pump and engine with plastic covering or equivalent and store in a clean, dry place.

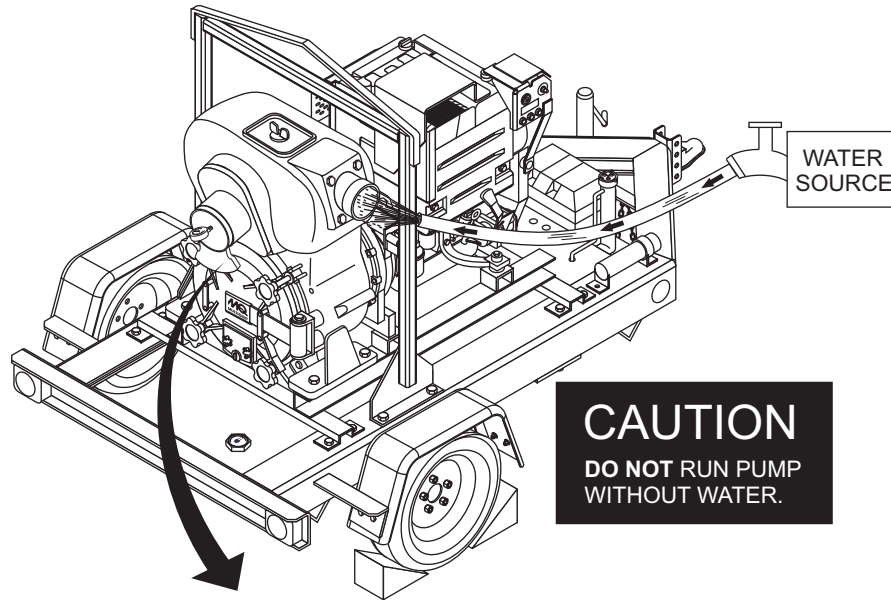
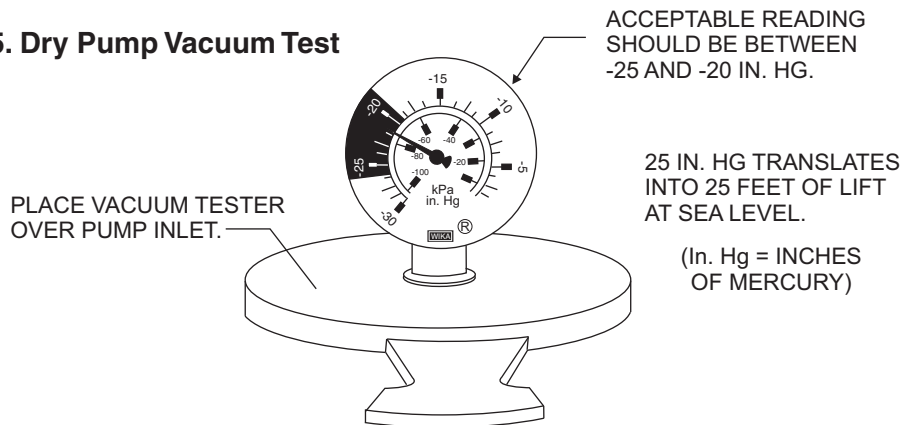


Figure 15. Dry Pump Vacuum Test



PUMP VACUUM TEST

To perform the pump vacuum test do the following:

1. Remove the pump fill cap, 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. Confirm engine is operating at 3,000 RPM's
3. As shown in Figure 15, 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** over the pump inlet opening (Figure 15) 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 re-seat vacuum tester.
6. Run the pump for a few minutes while monitoring the vacuum gauge. A pump will lose approximately one foot of suction lift for every 1,000 feet of elevation. Depending on the elevation, the gauge should read between 20-29 in. Hg. (inches of mercury). This is an indication that the pump is working correctly.
7. If the vacuum tester gauge indicates a reading *below* -20 in. Hg, it can then be assumed that the pump is not functioning correctly, and corrective action needs to be taken.

TABLE 6. INSPECTION/MAINTENANCE		10 Hrs DAILY	250 Hrs	500 Hrs	1000 Hrs
ENGINE	Check Engine Fluid Levels	X			
	Check Air Cleaner	X			
	Check Battery Acid Level	X			
	Check Fan Belt Condition	X			
	Check for Leaks	X			
	Check for Loosening of Parts	X			
	Replace Engine Oil and Filter ^{*1}		X		
	Clean Air Filter		X		
	Check Fuel Filter	X			
	Clean Unit, Inside and Outside		X		
	Change Fuel Filter			X	
	Replace Air Filter Element ^{*2}			X	
	Check all Hoses and Clamps				X

*1 Replace engine oil and oil filter at 100 hours, first time only.

*2 Replace primary air filter element when restriction indicator show RED

General Inspection

Prior to each use, the pump should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts or other fasteners. Also check for fuel, and oil. Use Table 6 as a general maintenance guideline **Engine Side** (Refer to the Engine Instruction Manual)

Air Cleaner

Every 250 hours: Remove air cleaner element (Figure 16) and clean the heavy duty paper element with light spray of compressed air. Replace the air cleaner as needed.

Air Cleaner with Dust Indicator

This indicator (Figure 16) is attached to the air cleaner. When the air cleaner element is clogged, air intake restriction becomes greater and the dust indicator signal shows **RED** meaning the element needs changing or service. After changing the air element, press the dust indicator button to reset the indicator.

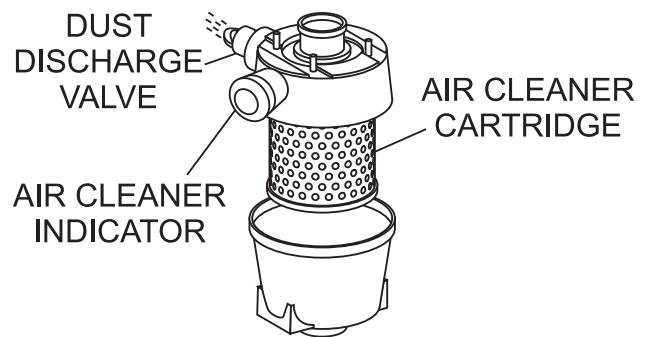
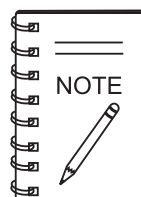


Figure 16. Air Cleaner



The air filter should not be changed until the indicator reads "**RED**". Dispose of old air filter it may not be cleaned or reused.

MAINTENANCE (ENGINE)

Check Oil Level

Check the engine crankcase oil level prior to each use, or when the fuel tank is filled. Make sure the pump is level. The oil level must be between the two notches on the dipstick as shown in Figure 17.

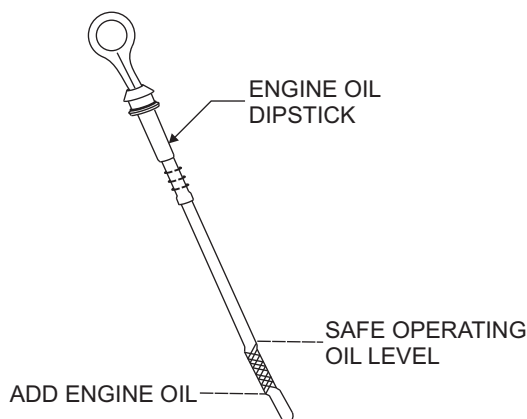


Figure 17. Dipstick

Changing Engine Oil

1. Change engine oil after first 20 hours of operation. Drain and refill engine crankcase with the correct type and amount of oil (reference Table 5) after 250 hours of operation hours or once a week thereafter.

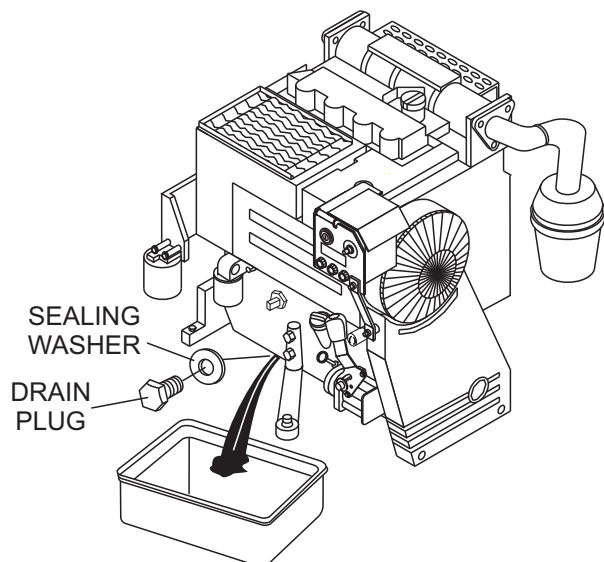


Figure 18. Oil Drain

2. Remove drain plug (Figure 18) and sealing washer let engine flow into a suitable container while engine oil is still warm.

3. Reinstall drain plug and seal washer. Tighten drain plug securely. Add engine oil through the filler hole.

Changing Oil Filter

1. Replace engine oil filter (Figure 19) after 250 hours of operation.
2. Remove oil filter cannister from engine by turning cannister counterclockwise.

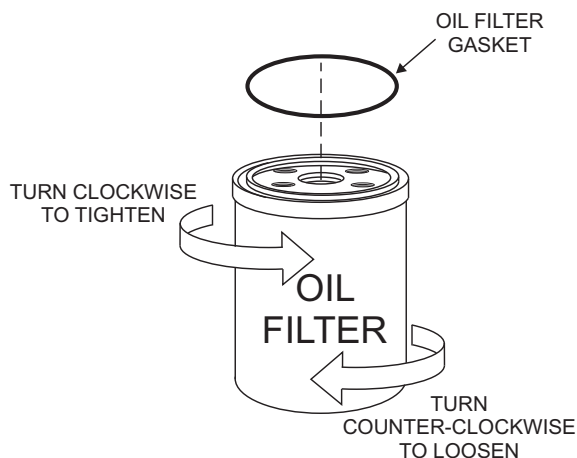


Figure 19. Oil Filter

3. Lubricate oil filter gasket with a small amount of oil. Reinstall oil filter by rotating cannister clockwise. **DO NOT** over-tighten.

Changing Fuel Filter

1. Replace fuel filter (Figure 20) every 500 hours.

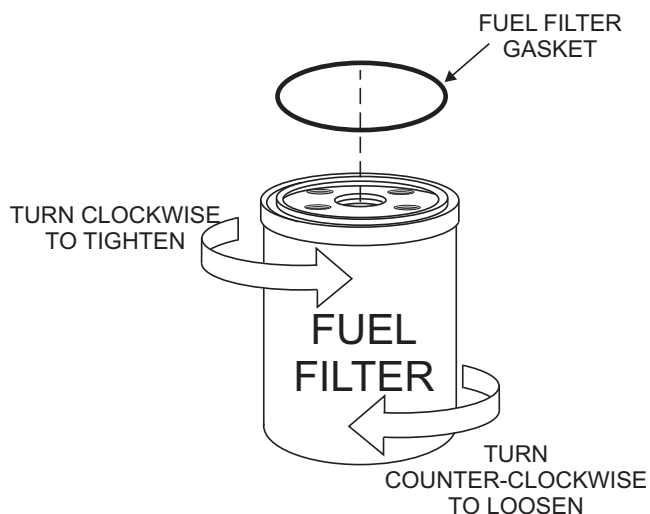


Figure 20. Fuel Filter


MAINTENANCE (ENGINE)

2. Remove oil filter cannister from engine by turning cannister counterclockwise.
3. Lubricate oil filter gasket with a small amount of oil. Reinstall oil filter by rotating cannister clockwise. **DO NOT** over-tighten.

Battery Maintenance

⚠ CAUTION — Battery Hazards

Wear **safety glasses** or **face mask**, **protective clothes**, and **rubber gloves** when working with battery.



Mishandling of the battery shortens the service life of the battery and adds to maintenance cost. When handling the battery do the following:

- Be careful not to let the battery electrolyte come in contact with your body or clothing.
- **ALWAYS** wear **eye protection** and **rubber gloves**, since the battery contains sulfuric acid which burns skin and eats through clothing.
- **ALWAYS** check the battery terminals periodically to ensure that they are in good condition.
- Use wire brush or sand paper to clean the battery terminals.
- **ALWAYS** check battery for cracks or any other damage. If white pattern appears inside the battery or paste has accumulated at the bottom, replace the battery.
- If the pump will not be in operation for a long period of time, store in cool dry place and check the battery charge level every month to maintain the performance of the battery.

- Check the battery regularly and make sure that each electrolyte level is to the bottom of the vent well (Figure 21). If necessary add only distilled water in a well-ventilated area.

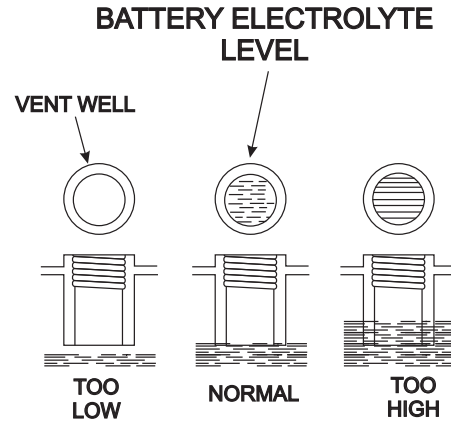


Figure 21. Battery Electrolyte Levels

- **ALWAYS** place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.
- Inadequate battery connections may cause poor starting of the generator, and create other malfunctions.

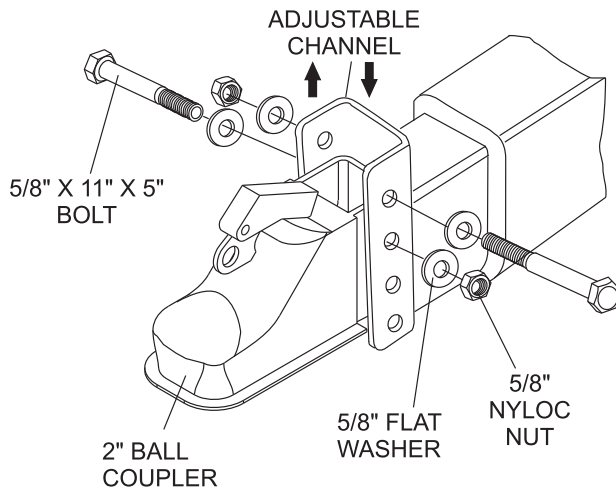


If the battery cables are connected incorrectly, electrical damage to the alternator, engine control box and other electrical components may result. Pay close attention to the polarity of the battery when connecting the battery cables.

MAINTENANCE (TRAILER)

Adjustable Channel

Your trailer may be equipped with an adjustable channel (Figure 22) that allows the coupler to be raised or lowered to a desired height. Periodically check the channel bolts for damage or loosening.



**Figure 22. Adjustable Channel
With Pintle Eye Coupler**

Wheel Bearings (Hubs)

Wheel bearings (Figure 23) must be inspected and lubricated once a year or 12,000 miles to ensure safe operation of your trailer.

If a trailer wheel bearing is immersed in water, it must be replaced.

If the pump/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 and service the wheel bearings.

- After removing the dust cap, cotter pin, spindle nut and spindle washer, remove the hub and drum to inspect the bearings for wear and damage.



DANGER — Wheel Bearings

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!

- 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.

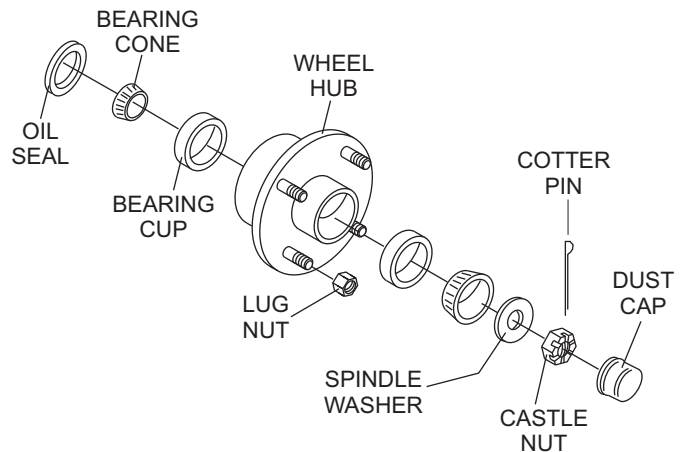


Figure 23. Wheel Hub Components

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).

MAINTENANCE (TRAILER)

⚠ DANGER — Raising the Trailer

NEVER! crawl under the trailer unless it is on firm and level ground and resting on properly placed and secured jack stands.

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

⚠ DANGER — Trailer Inspection

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

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

⚠ WARNING — Trailer Impact

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.

⚠ WARNING — Cracked or Broken Welds

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 — Trailer Welds

Broken or damaged welds can cause injury or severe damage to your trailer and contents. Inspect all of the welds for cracks or failure at least twice a year.

Leaf Suspension

The **leaf suspension** springs and associated components (Figure 24) 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. Torqued suspension components as detailed in Table 7.

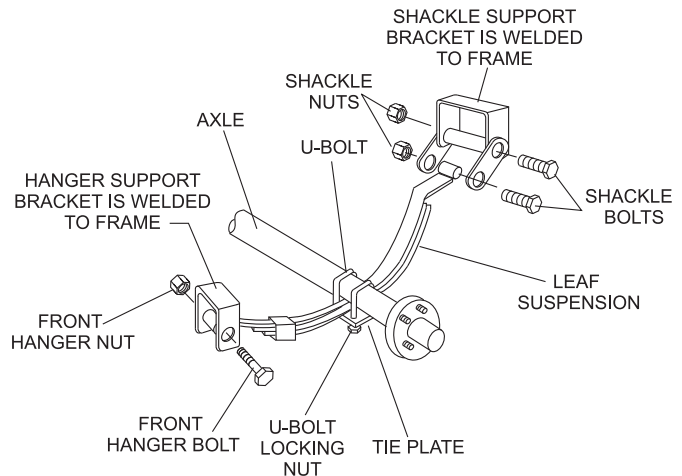


Figure 24. Torsion Suspension

⚠ DANGER — Worn or Defective Suspension

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

Check suspension regularly.

Table 7. Suspension Torque Requirements

Item	Torque (Ft.-Lbs.)
3/8" U-BOLT	MIN-30 MAX-35
7/16" U-BOLT	MIN-45 MAX-60
1/2" U-BOLT	MIN-45 MAX-60
SHACKLE BOLT SPRING EYE BOLT	SNUG FIT ONLY. PARTS MUST ROTATE FREELY. LOCKING NUTS OR COTTER PINS ARE PROVIDED TO RETAIN NUT-BOLT ASSEMBLY.
SHOULDER TYPE SHACKLE BOLT	MIN-30 MAX-50

TRAILER SAFETY GUIDELINES

TRAILER SAFETY INFORMATION

Safety precautions should be followed at all times when operating this equipment. Failure to read, understand and follow the Operating Instructions 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 60 m.p.h.).
- 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.

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.
- Adjust the brake controller to engage the trailer brakes before the tow vehicle brakes. Your dealer can assist you by making this adjustment.
- 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 busses. 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:
 - A. Coupler is secure to the hitch and is locked.
 - B. Electrical connectors are made.
 - C. There is appropriate slack in the safety chains.
 - D. There is appropriate slack in the breakaway switch pullpin cable.
 - E. Tires are not visibly low on pressure



WARNING — Drive Safely

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.

TRAILER SAFETY GUIDELINES

CAUTION — Local Towing Regulations

Check with your county or state safety towing regulations department before towing your *pump*.

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 — Transporting Personnel

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 — Coupler Selection/Condition

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 — Coupler Connection

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

DANGER — Hitch/Tow Vehicle Load Rating

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

Reporting Safety Defects

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying us.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or us.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in the Washington D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, DC 20590. You can also obtain other information about motor vehicle safety from the Hotline.

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 a towed trailer. You must provide mirrors that allow you to safely observe approaching traffic.



WARNING — Checking Taillights/Brakelights

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

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 m.p.h. 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 m.p.h. If your trailer is equipped with brakes, try using different combinations of trailer/electric 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.

TRAILER SAFETY GUIDELINES

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 (counter-clockwise, 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 25 below is a sample of the Vehicle Identification Number (VIN) Tag which is located on the left front of the trailer. See Figure 26.

MANUFACTURED BY / FABRIQUE PAR:		DATE	
GVWR / PWBV	KG (LB)		
GAWR (EACH AXLE) / PWB (CHAQUE ESSIEU)	KG (LB)	TIRES / PNEU	
RIMS / JANTS			
COLD INFL. PRESS. / PRESS. DE GONFL. A FROID	KPA (PSI / LPSI)	<input type="checkbox"/> SINGLE	<input type="checkbox"/> DUAL
<small>THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. CE VEHICULE EST CONFORME A TOUTES LES NORMES QUI LUI SONT APPLICABLES EN VERTU DU REGLEMENT SUR LA SECURITE DES VEHICULES AUTOMOBILES DU CANADA EN VIGUEUR A LA DATE DE SA FABRICATION.</small>			
V.I.N. / N.I.V.:		TYPE / TYPE: TRAILER TRA / REM	FD-306 REV A

Figure 25. Vehicle VIN Tag

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 (such as the pump with water, engine, and other ITEMS). 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.

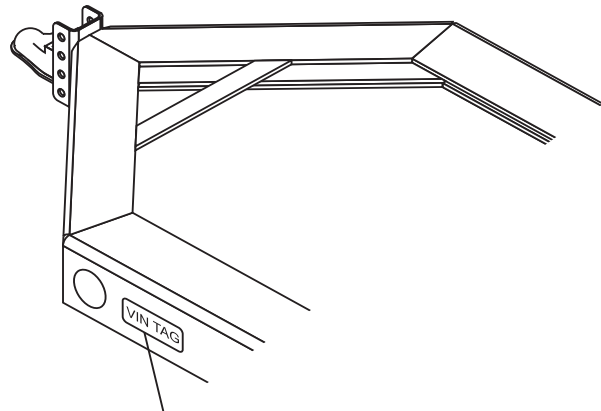
The sum total of the GAWR for all trailer axles may be less than the GVWR for the trailer, because some of the trailer load is to be carried by the tow vehicle, rather than by the trailer axle(s). The total weight of the cargo and trailer must not exceed the GVWR, and the load on an axle must not exceed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

PSIC: The tire pressure (Pounds per Square Inch) 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.



VIN TAG

Figure 26. VIN Tag Location

TRAILER SAFETY GUIDELINES

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 InstaPrime 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 light and brake systems on the trailer to the light and brake controls on the towing vehicle.

Emergency Flares and Emergency 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.

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.

Trailer Lighting (and Braking) Connector

A device that connects electrical power from the tow vehicle to the trailer. Electricity is used to turn on brake lights, running lights, and turn signals as required. In addition, if your trailer has a separate braking system, the electrical connector will also supply power to the brakes from the tow vehicle.

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”.



WARNING — Improperly Coupled Trailer

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

TRAILER SAFETY GUIDELINES

Coupler Types

The InstaPrime pump is shipped from the factory with a 2-5/16-inch ball coupler. A pintle eye coupler can be purchased as an alternative method (option) for towing. Both types of couplers will be discussed in this manual.

■ Ball Hitch Coupler

■ Pintle Eye Coupler

Ball Hitch Coupler

A ball hitch coupler (Figure 27) 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

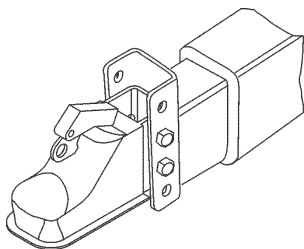


Figure 27. Ball Hitch Coupler Adjustable Tongue

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.

Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation; and 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.

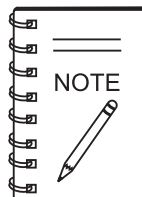
Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose or is worn, the trailer can come loose from the tow vehicle and may cause death or serious injury.

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.



When replacing a ball, the load rating must match or exceed the GVWR of the trailer.



Before coupling the tow vehicle to the trailer, be sure the size and rating of hitch ball match the size and rating of the coupler. Hitch balls and couplers are marked with their size and rating.



WARNING — Hitch Ball Load Rating

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 — Defective Hitch Ball

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 — Uncoupled Hitch Ball

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 tighten 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 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.
- The bottom surface of the coupler to 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 28) until the coupler fully

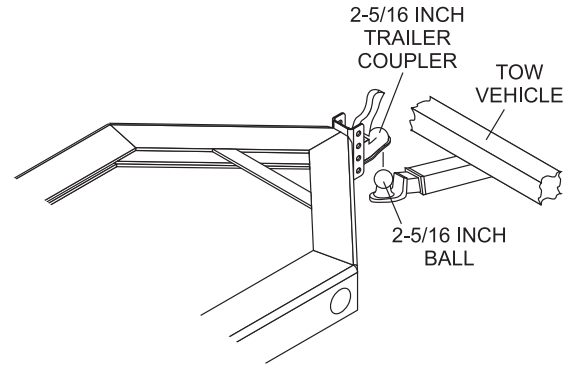


Figure 28. Ball Hitch Coupling Mechanism

engages the hitch ball.

- 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.



Overloading can damage the tongue jack. **DO NOT** use the tongue jack to raise the tow vehicle more than 1 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

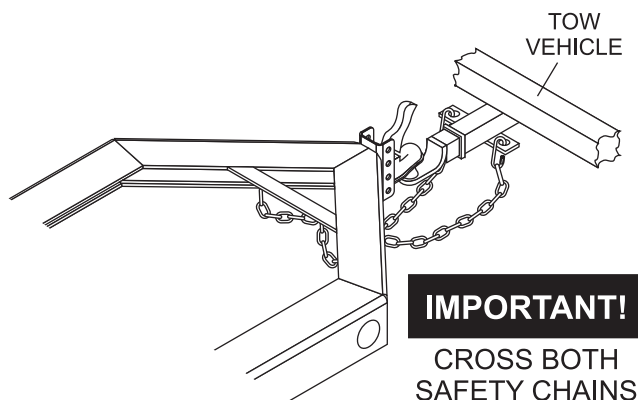


Figure 29. Safety Chain Arrangement for a Bumper Pull Trailer (Ball Hitch)

- 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:
 - A. Cross underneath the coupler. See Figure 29.
 - B. Loop around a frame member of the tow vehicle or holes provided in the hitch system (but, **DO NOT** attach them to an interchangeable part of the hitch assembly).
 - C. 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 — Safety Chains Rigging

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). Reference 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 — Electrical Connections

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.

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 m.p.h. before checking tire pressure. NOTE: 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.

WARNING — Lug Nut Tightening

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 Nut Loosening

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

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 — Tire Pressure

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 30) 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.

TIRE AND LOADING INFORMATION

The weight of cargo should never exceed XXX kg. Or XXX lbs.

TIRE	SIZE	COLD TIRE PRESSURE
FRONT		
REAR		
SPARE		

SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION

Figure 30. Tire and Loading Information 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.

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 30). This figure equals the available amount of equipment load capacity.

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.

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 31). 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.

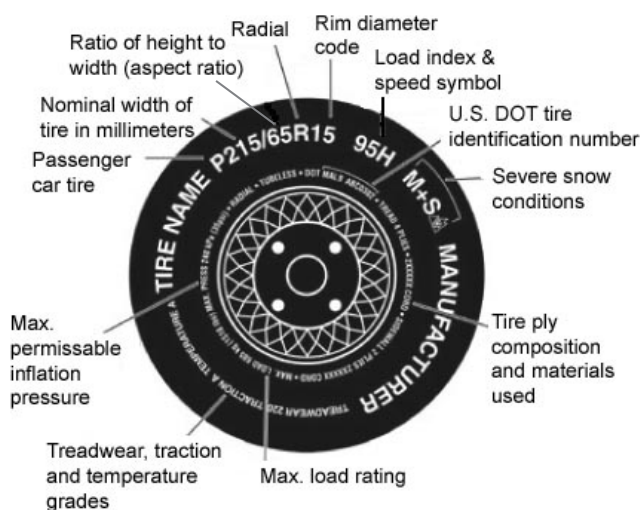


Figure 31. Standard Tire Sidewall Information

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.

R: The “R” stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

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 8. Note: You may not find this information on all tires because it is not required by law.

Table 8. Speed Rating	
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”.

Reference Figure 32 for additional tire information for light trucks.

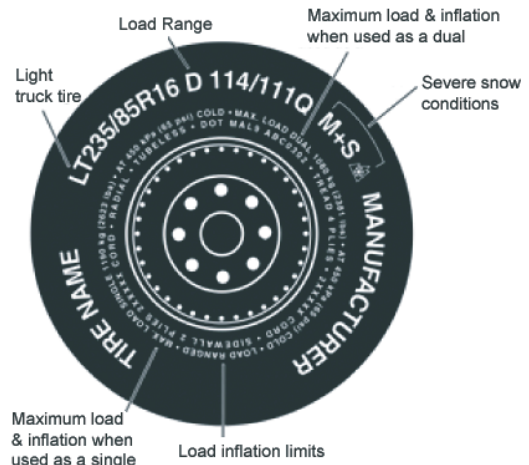


Figure 32. UTQGS Tire Information

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

TABLE 9. 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 chamber 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 & tire skidding.	Avoid sudden stops when possible and adjust brakes.



WARNING — Flying Objects



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 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.

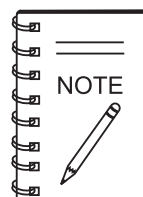
Wheel Rims

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.



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



WARNING — Lug Nut Tightening

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



WARNING — Lug Nut Inspection

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:

1. Start all wheel lug nuts by hand.
2. Torque all lug nuts in sequence. See Figure 33. **DO NOT** torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table 10.
3. Check to see if the lug nuts are tight after the first 10, 25 and 50 miles of driving and before each tow thereafter.

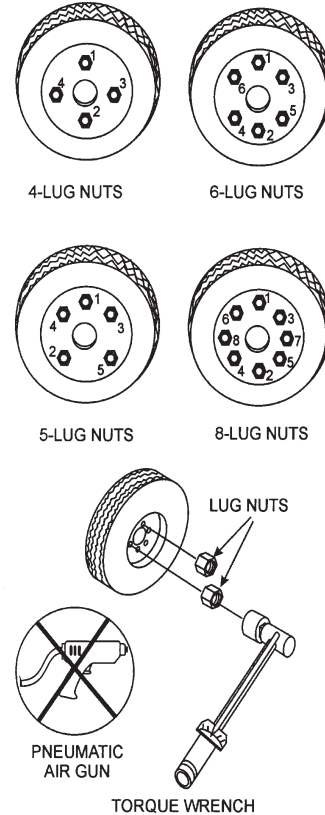


Figure 33. Wheel Lug Nuts Tightening Sequence

TABLE 10. 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

TRAILER LIGHTS WIRING DIAGRAM

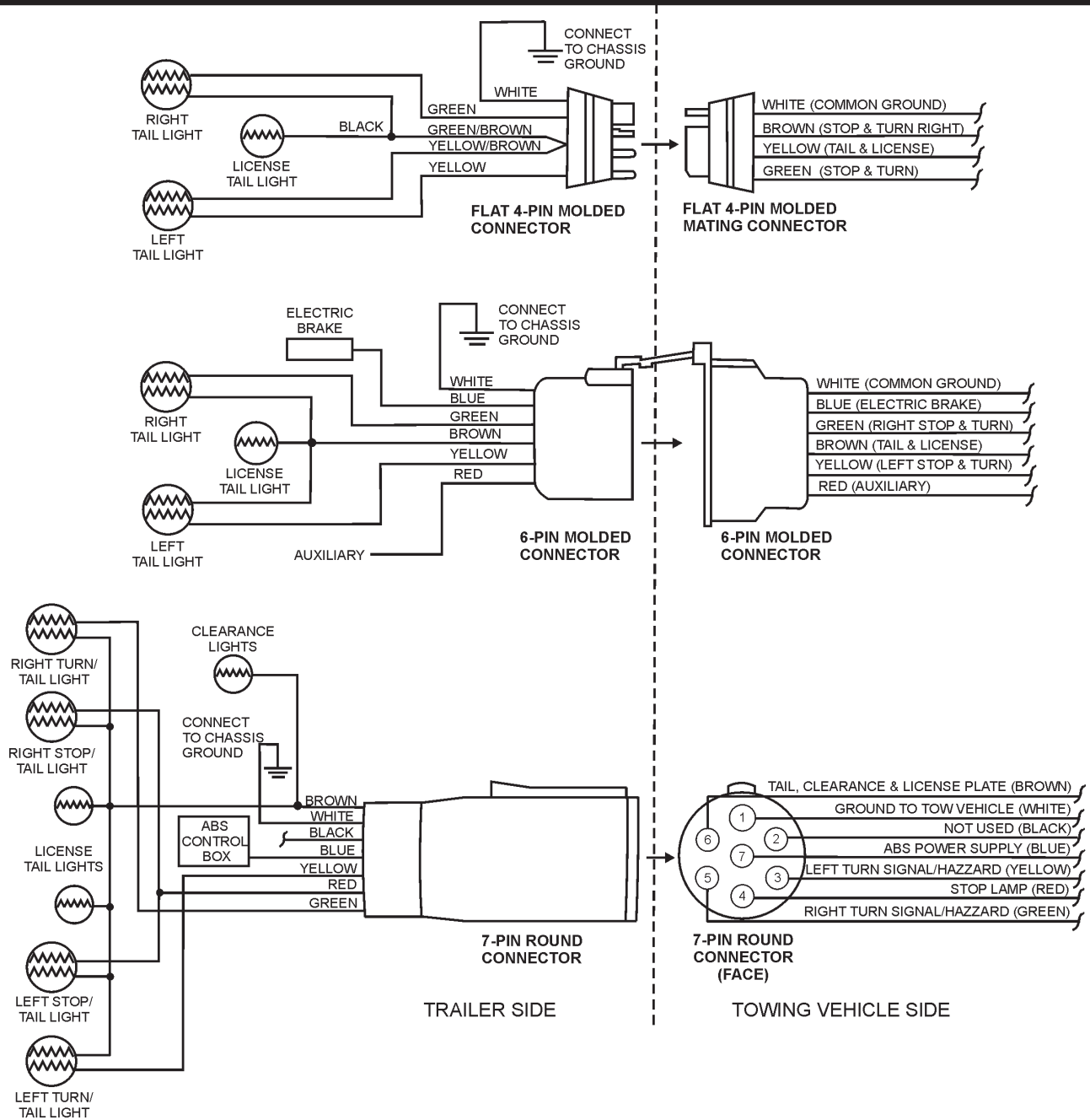


Figure 34. Trailer to Tow Vehicle Wiring Diagrams

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 your dealer.



WARNING — Trailer Lights

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

Check all lights before each tow.

TROUBLESHOOTING (PUMP)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, please take a remedial action following the diagnosis based on the Troubleshooting (Tables 11 and 12) information shown below and on the next pages. If the problem cannot be remedied, please leave the unit just as it is and consult our company's business office or service plant.

TABLE 11. PUMP TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
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 wear plate.	Adjust clearance by adding shims or replace impeller. Min. .010" - Max. .020
	Water leaking out weep hole between pump and engine?	Check condition of mechanical seal and gaskets, between pump end and engine housing.
	Suction lift or dis-charge head too high.	Check hose/pipe installation.
Pump takes in water, little or no discharge.	Engine speed too low?	Increase throttle speed.
	Suction strainer partially plugged?	Clean strainer.
	Impeller/Wear Plate worn?	Adjust clearance by adding shims or replace impeller/wear plate.
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 wear plate binding?	Adjust clearance by removing shim from behind impeller.
	Defective engine?	See Deutz Engine Owner's Manual.

TROUBLESHOOTING (ENGINE)

TABLE 12. ENGINE TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Engine will not start or start is delayed, although engine can be turned over.	Speed control lever is in "STOP" position?	Set speed control lever to "START" position.
	STOP solenoid is in the "STOP" position?	Set stop solenoid to the "START" position. Adjust and lubricate if necessary.
	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 injector not working correctly?	Repair or replace injector in accordance with engine repair manual.
	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.
At low temperatures engine will not start.	Fuel separates has inadequate resistance to low temperatures?	Check whether clear (not turbid) fuel emerges from the fuel line (detach from injection pump). If the fuel is turbid or separated either, warm up the engine or drain the complete fuel supply system. Refuel with winter grade diesel fuel.
	Engine oil too thick?	Refill engine crankcase with correct type of oil for winter environment.
	Defective battery?	Replace battery.
Engine fires but stops soon as starter is switched off.	Throttle lever in STOP position?	Reposition throttle lever to RUN position.
	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
	Electrical problem at fuel solenoid?	Repair using #7 wire.
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.

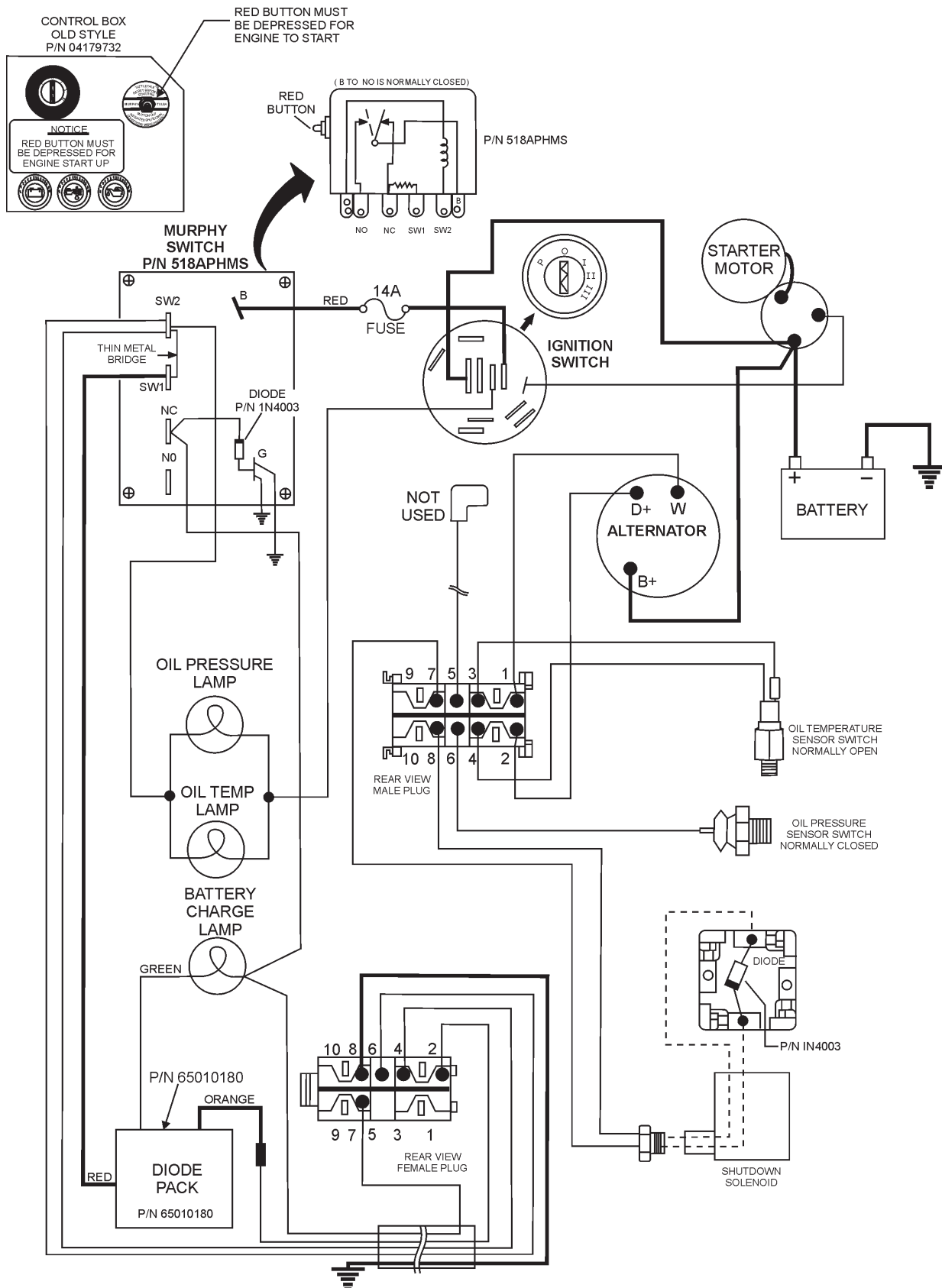
TROUBLESHOOTING (ENGINE)

TABLE 12. ENGINE TROUBLESHOOTING (CONTINUED)

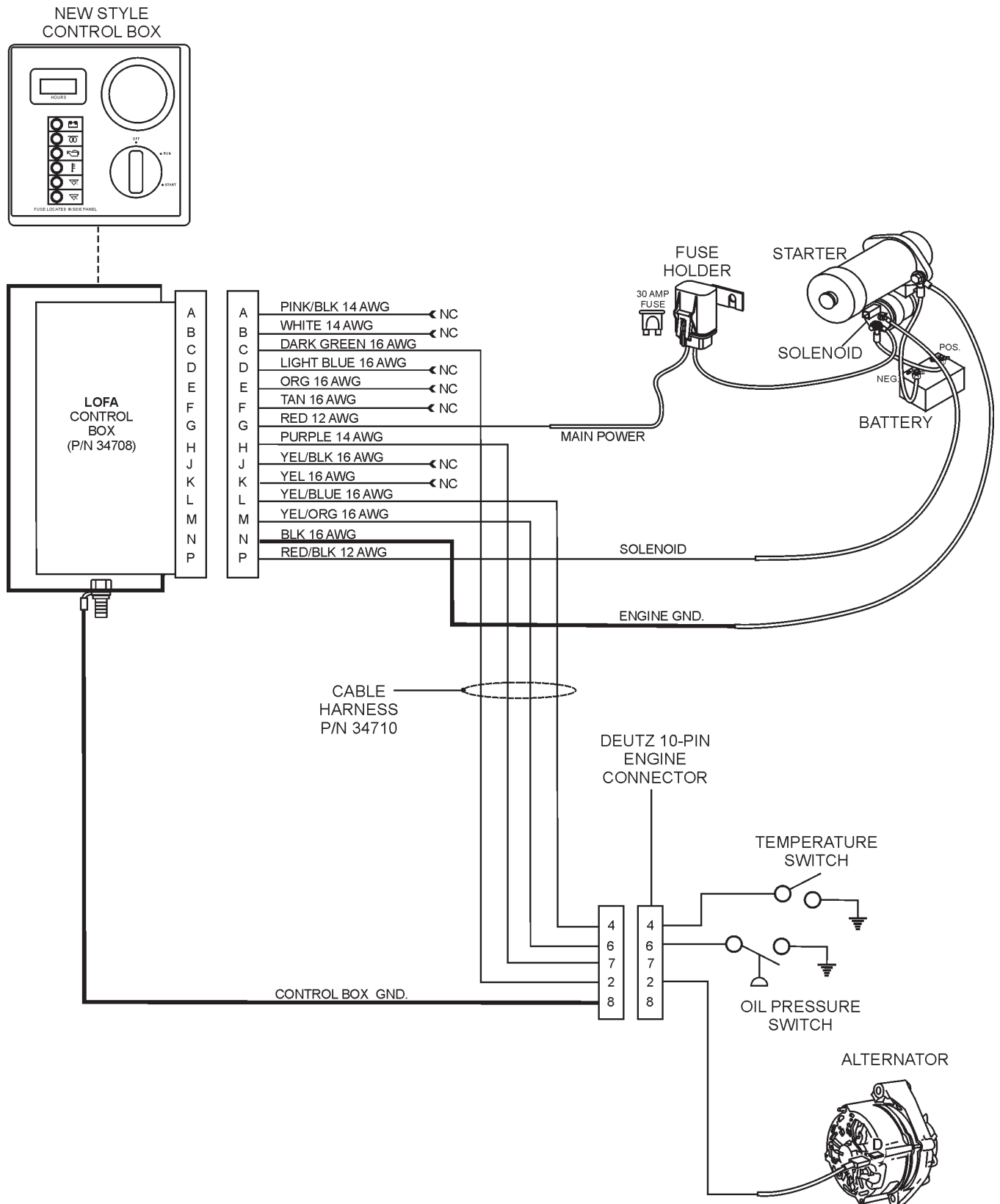
SYMPTON	POSSIBLE PROBLEM	SOLUTION
Low engine power, output and speed.	Fuel tank empty?	Replace fuel filter.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure that tank is adequately vented.
	Leaks at pipe unions?	Check threaded pipe unions tape and tighten unions as required.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level?
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.
Air-cooled diesel engine runs very "HOT". Cylinder head overheat, telltale lamp comes on (option)	Too much oil in engine crankcase?	Drain off engine oil down to uppermark on dipstick.
	Entire cooling air system contaminated blocked?	Clean cooling air system, remove shrouds and cooling fin areas.
	Inadequate sealing at air guide plates or capsule elements?	Check that air guide plates and enclosure elements are all present and make a tight seal.

[illegible]

WIRING DIAGRAM (OLD STYLE)



WIRING DIAGRAM (NEW STYLE)



OPERATION MANUAL

HERE'S HOW TO GET HELP

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

UNITED STATES

Multiquip Inc.

(310) 537- 3700
6141 Katella Avenue Suite 200
Cypress, CA 90630
E-MAIL: mq@multiquip.com
WEBSITE: www.multiquip.com

CANADA

Multiquip

(450) 625-2244
4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
E-MAIL: infocanada@multiquip.com

UNITED KINGDOM

Multiquip (UK) Limited Head Office

0161 339 2223
Unit 2, Northpoint Industrial Estate,
Globe Lane,
Dukinfield, Cheshire SK16 4UJ
E-MAIL: sales@multiquip.co.uk

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