

# OPERATION AND PARTS MANUAL



## **MODEL MQ600TD80 TRASH PUMP (DEUTZ F4L913, F4L914, D914 DIESEL ENGINE)**

Revision #11 (10/10/11)



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**THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.**

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## PROPOSITION 65 WARNING

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 <b>WARNING</b> 
<b>CALIFORNIA — Proposition 65 Warning</b>
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

## REPORTING SAFETY DEFECTS

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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.safercar.gov>.

# TABLE OF CONTENTS

## MQ600TD80 Trash Pump

Proposition 65 Warning .....	2
Reporting Safety Defects.....	3
Table Of Contents.....	4
Parts Ordering Procedures.....	5
Training Checklist .....	6
Daily Pre-Operation Checklist .....	7
Safety Information .....	8-12
Specifications .....	13
Dimensions.....	14-15
General Information.....	16
Line Configuration/Layout.....	17
Components .....	18-19
Application .....	20
Setup .....	21
Startup.....	22-23
Operation.....	24
Maintenance .....	25-30
Towing Guidelines .....	31
Trailer Guidelines.....	32-46
Troubleshooting .....	47-50

Explanation Of Code In Remarks Column.....	52
Suggested Spare Parts .....	53
Nameplates And Decals.....	54-55
Impeller, Cleanout, And Discharge Assy.....	56-57
Pump — Suction Side Assy. ....	58-59
Intermediate Plate Assy.....	60-61
Trailer Assy.....	62-63
Battery/Fuel Assy.....	64-65
Hydraulic Brake Line Assy. ....	66-67
Control Box Assy. (Deutz F4L913).....	68-69
Control Box Assy. (Deutz F4L914/D914).....	70-71
Documentation Box Assy.....	72-73
Terms And Conditions Of Sale — Parts .....	74

### NOTICE

Specifications and part numbers are subject to change without notice.

## TRAINING CHECKLIST

Training Checklist			
No,	Description	OK?	Date
1	Read operation manual completely.		
2	Machine layout, location of components, checking of engine.		
3	Fuel system, refueling procedure.		
4	Operation of controls (machine not running).		
5	Safety controls, safety stop switch operation.		
6	Emergency stop procedures.		
7	Startup of machine, pre-heat, engine choke.		
8	Shutdown of machine.		
9	Lifting of machine (lift loops).		
10	Machine transport and storage.		

## DAILY PRE-OPERATION CHECKLIST

Daily Pre-Operation Checklist		✓	✓	✓	✓	✓	✓
1	Hardware and damage check						
2	Engine oil level						
3	Braking control operation						

## SAFETY INFORMATION

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



### SAFETY MESSAGES

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

### SAFETY SYMBOLS

<b>DANGER</b>
Indicates a hazardous situation which, if not avoided, <b>WILL</b> result in <b>DEATH</b> or <b>SERIOUS INJURY</b> .
<b>WARNING</b>
Indicates a hazardous situation which, if not avoided, <b>COULD</b> result in <b>DEATH</b> or <b>SERIOUS INJURY</b> .
<b>CAUTION</b>
Indicates a hazardous situation which, if not avoided, <b>COULD</b> result in <b>MINOR</b> or <b>MODERATE INJURY</b> .
<b>NOTICE</b>
Addresses practices not related to personal injury.

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

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Respiratory hazards
	Accidental starting hazards
	Eye and hearing hazards



# SAFETY INFORMATION

## GENERAL SAFETY

### CAUTION

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.

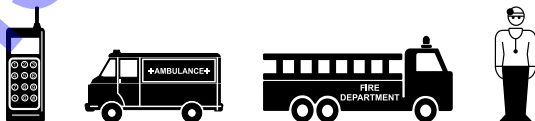


- **NEVER** operate this equipment when not feeling well due to fatigue, illness or when under medication.
- **NEVER** operate this equipment under the influence of drugs or alcohol.



### NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by Multiquip for this equipment. Damage to the equipment and/or injury to user may result.
- **ALWAYS** know the location of the nearest fire extinguisher.
- **ALWAYS** know the location of the nearest first aid kit.
- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site**. Also, know the phone numbers of the nearest ambulance, doctor and fire department. This information will be invaluable in the case of an emergency.



## PUMP SAFETY

### DANGER

- **NEVER** pump volatile, explosive, flammable or low flash point fluids. These fluids could ignite or explode.
- The engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled.
- The engine of this equipment requires an adequate free flow of cooling air. **NEVER** operate this equipment in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.
- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe **bodily harm or even death**.



### WARNING

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



# SAFETY INFORMATION

## CAUTION

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

## NOTICE

- **ALWAYS** fill the pump casing with water before starting the engine. Failure to maintain water inside the pump housing will cause severe damage to the pump and mechanical seal.
- In winter drain water from pump housing to prevent freezing.
- **NEVER** start the pump with the clean-out cover removed. The rotating impeller inside the pump can cut or sever objects caught in it. Before starting the pump, check that the clean-out cover is securely fastened.
- **ALWAYS** keep the machine in proper running condition.
- **ALWAYS** ensure pump is on level ground before use.
- Fix damage to machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.

## ENGINE SAFETY

### WARNING

- **DO NOT** place hands or fingers inside engine compartment when engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the pump.



## CAUTION

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



## NOTICE

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



## FUEL SAFETY

### DANGER

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



# SAFETY INFORMATION

## BATTERY SAFETY (ELECTRIC START ONLY)

### DANGER

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



### WARNING

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



### CAUTION

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

## TRANSPORTING SAFETY

### CAUTION

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

### NOTICE

- Before lifting, make sure that the equipment parts are not damaged and screws are not loose or missing.
- **ALWAYS** make sure forklift forks are inserted into pockets (if applicable) as far as possible when lifting the pump.
- **ALWAYS** shutdown engine before transporting.
- **NEVER** lift the equipment while the engine is running.
- Tighten fuel tank cap securely and close fuel cock to prevent fuel from spilling.
- Use one point suspension hook and lift straight upwards.
- **DO NOT** lift machine to unnecessary heights.
- **ALWAYS** tie down equipment during transport by securing the equipment with rope.
- Never allow any person or animal to stand underneath the equipment while lifting.

## SAFETY INFORMATION

### TOWING SAFETY


#### CAUTION

- Check with your local county or state safety towing regulations, in addition to meeting **Department of Transportation (DOT) Safety Towing Regulations**, before towing your generator. 
- Refer to MQ Power trailer manual for additional safety information.
- In order to reduce the possibility of an accident while transporting the generator on public roads, **ALWAYS** make sure the trailer that supports the generator and the towing vehicle are mechanically sound and in good operating condition.
- **ALWAYS** shutdown engine before transporting
- Make sure the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer “gross vehicle weight rating.”
- **ALWAYS** inspect the hitch and coupling for wear. **NEVER** tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both towing vehicle and trailer. **Trailer tires should be inflated to 50 psi cold.** Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with a **safety chain**.
- **ALWAYS** properly attach trailer’s safety chains to towing vehicle.
- **ALWAYS** make sure the vehicle and trailer directional, backup, brake and trailer lights are connected and working properly.
- DOT Requirements include the following:
  - Connect and test electric brake operation.
  - Secure portable power cables in cable tray with tie wraps.
- The maximum speed for highway towing is **55 MPH** unless posted otherwise. Recommended off-road towing is not to exceed **15 MPH** or less depending on type of terrain.

- Avoid sudden stops and starts. This can cause skidding, or jack-knifing. Smooth, gradual starts and stops will improve towing.
- Avoid sharp turns to prevent rolling.
- Trailer should be adjusted to a level position at all times when towing.
- Raise and lock trailer wheel stand in up position when towing.
- Place **chock blocks** underneath wheel to prevent **rolling** while parked.
- Place **support blocks** underneath the trailer’s bumper to prevent **tipping** while parked.
- Use the trailer’s swivel jack to adjust the trailer height to a level position while parked.

### ENVIRONMENTAL SAFETY

#### NOTICE

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

# SPECIFICATIONS

Table 1. Engine Specifications	
Engine Make	Deutz
Engine Model	D914
Engine Type	Air Cooled 4-Stroke Diesel
Number Of Cylinders	4
Bore/Stroke (F4L913)	102/125 mm
Bore/Stroke (F4L914/D914)	102/132 mm
Continuous Engine HP (F4L913)	60.0 HP @ 1,900 RPM*
Continuous Engine HP (F4L914)	68.3 HP @ 1,900 RPM*
Continuous Engine HP (D914)	63.0 HP @ 2000 RPM*
Combustion Method	Direct Fuel Injection
Oil Capacity	9.5 gal/2.5 liters
Fuel Type	Diesel
Fuel Tank Capacity	40 gal/51.0 liters
Starting Method	Electric Start
Battery	+12 VDC @ 650 amps w/reserve capacity 160 amp min.
Battery Dimensions (L x W x H)	13" x 6-3/4" x 8-3/8"
*Maximum Engine HP (intermittent) @ 2,500 RPM = 80 HP	

Table 2. Pump Specifications	
Maximum Pumping Capacity	1600 gpm (6,055 lpm)
Maximum Suction Lift*	25 FT. (7.6 meters)
Maximum Total Head	150 FT. (45.7 meters)
Maximum Pressure	64.9 psi
Maximum Solids	3 in. (76 mm)
Suction and Discharge Diameter	6 in. (152 mm)
Dimensions (LxWxH)	63.0 HP @ 2000 RPM*
Trailer Mounted	80 x 39 x 49 in.
(203 x 99 x 124 cm.)	9.5 gal/2.5 liters
Weight (No Fuel)	3,060 lbs. (1,388 kg.)
* Based on pump operating at sea level. Maximum suction lift will be less at higher altitudes.	

## SOUND MEASUREMENTS

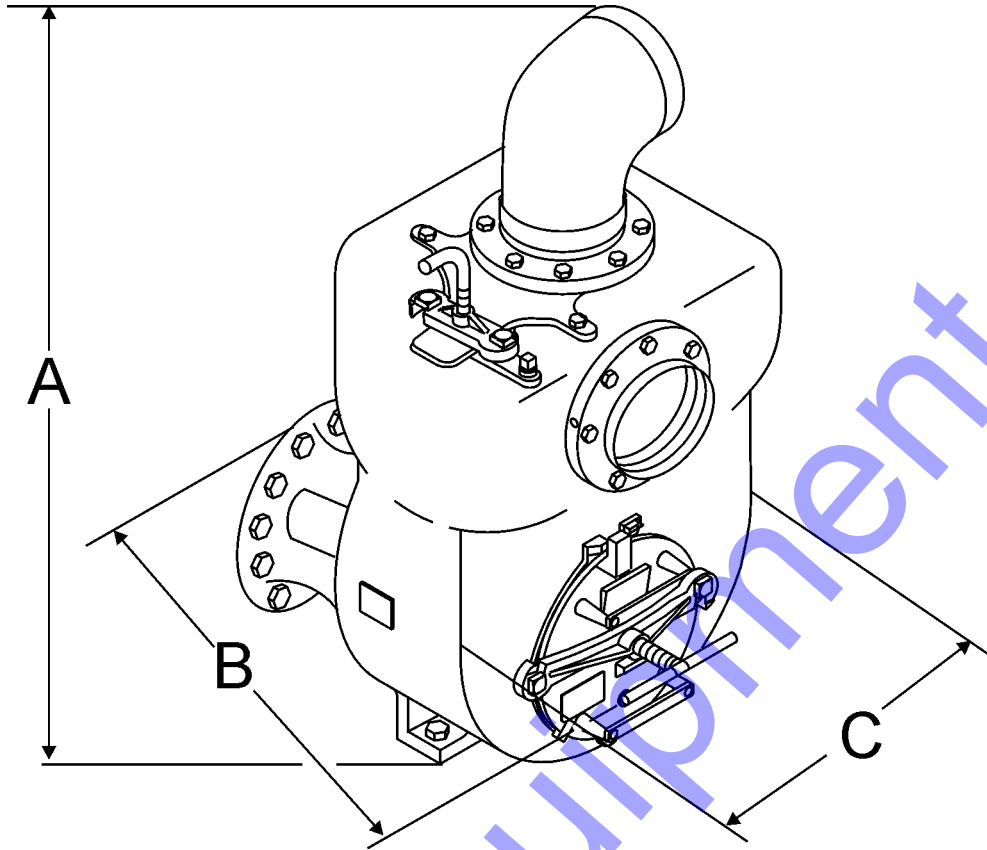
The required sound specifications, per Appendix 1, paragraph 1.7.4.f of the EC-Machine Regulations, are defined as follows:

The sound pressure level at the operator's location (L) = 87 dB (A)

The sound power level (L) = 97 dB (A)

These sound values are determine according to ISO 3744 for the sound power level (L) and ISO 6081 for the sound pressure level (L) at the operator's location.

The sound measurements were obtained with the unit operation on pavement at nominal speed.



**Figure 1. Pump End Dimensions**

<b>Table 3. Pump End Dimensions</b>		
<b>REFERENCE LETTER</b>	<b>DESCRIPTION</b>	<b>DIMENSIONS INCHES (MM)</b>
A	MEASURED FROM TOP OF 90 DEGREE ELBOW TO MOUNTING FEET (HEIGHT).	45.5 INCHES (1,156 MM)
B	MEASURED FROM TIP OF INTERMEDIATE HOUSING TO TIP OF LOCKING HANDLE (DEPTH).	32 INCHES (813 MM)
C	MEASURED FROM PUMP SIDE-WALL TO SIDE-WALL (WIDTH).	24.5 INCHES (622 MM)

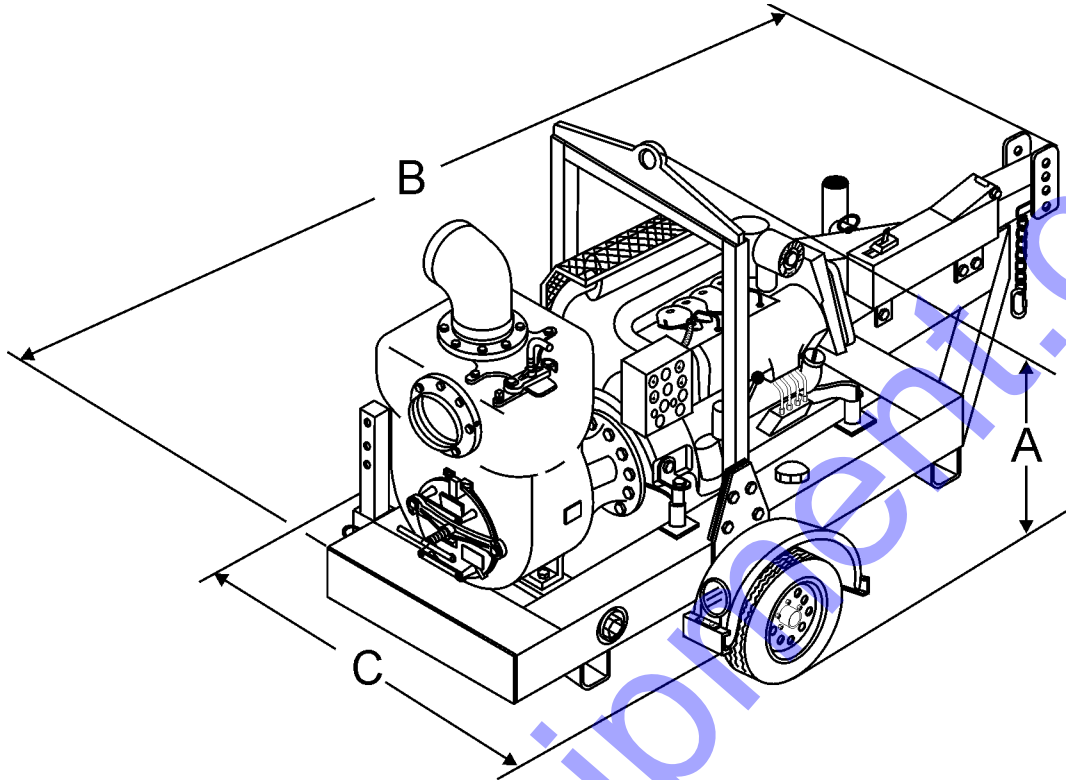


Figure 2. Trailer Dimensions

Table 4. Trailer Dimensions		
REFERENCE LETTER	DESCRIPTION	DIMENSIONS INCHES (MM)
A	MEASURED FROM TOP OF LIFTING BALE TO BOTTOM OF TIRE (HEIGHT).	65.5 INCHES (1,664 MM)
B	MEASURED FROM TIP OF TRAILER COUPLER TO REAR OF TRAILER FRAME (LENGTH).	115 INCHES (2,921 MM)
C	MEASURED FROM FENDER TO FENDER (WIDTH)	64 INCHES (1,626 MM)

## GENERAL INFORMATION

The MQ600TD80 Trash Pump is a self-priming centrifugal trash pump powered by a 63 horsepower air-cooled four stroke Deutz diesel engine. Both the intake (suction) and discharge ports on the MQ600TD80 incorporate a 6-inch diameter opening, which allows the pump to perform at a rate of approximately 1,600 gpm or 6,055 lpm.

This is a self-priming pump design and the pump casing must be filled with water before starting operation. 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. These pumps generally handle solids up to 1/2 the size of the discharge opening making them less likely to clog. Also trash pumps are capable of handling water with 25% solids by weight.

The advantage of using a trash pump is that it can be quickly and easily disassembled in the field to remove debris in the event the pump becomes clogged.

### SUCTION LIFT

This pump has a maximum suction lifts up to 25 feet 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

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.

**NEVER** place the pump on **soft soil**. The suction hose 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.

### 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 MQ600TD80 has been design for easy removal that allows for easy access to the wear plate and impeller for cleaning and servicing.

In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

### MECHANICAL SEAL LUBRICATION

The pump uses a oil lubricated mechanical seal. 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. Never pump chemicals which will attack the seals elastomers leading to premature failure (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 section this manual for a complete list of accessories.



## LINE CONFIGURATION/LAYOUT

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The pump performance is adversely affected by increased suction lift. Place the pump as close as possible to liquid being pumped. Always place pump on level ground to insure sufficient engine lubrication and fuel supply. If trailer-mounted, pump block wheels before operation. The lines near the pump must be properly supported. Never use shut-off valves.

### SUCTION LINE

Use appropriate 6-inch diameter hoses, the suction hose must be rigid, reinforced to prevent collapse under suction. To prevent air pockets, the suction hose must be straight short as possible; the line must always slope upward from the water source to the pump. The line should not slope down or air pockets may occur. If liquid being supplied to pump is under pressure, the incoming pressure must be limited to 50% of the maximum operating pressure based on the pump engineering data curve.

### DISCHARGED LINE

Maintain discharge lines straight as possible to prevent whipping and reduce friction loss. The line friction can be reduced with minimal use of fittings and elbows. If using elbows, wide radius is preferred. Always use strainer furnished with the pump.

### FITTINGS

Use properly rated 6-inch size fittings. Align fittings to pump before tightening connections. The pump connections should be sealed with pipe sealant to ensure air tight seal. A slight leak will affect priming ability and output performance

# COMPONENTS

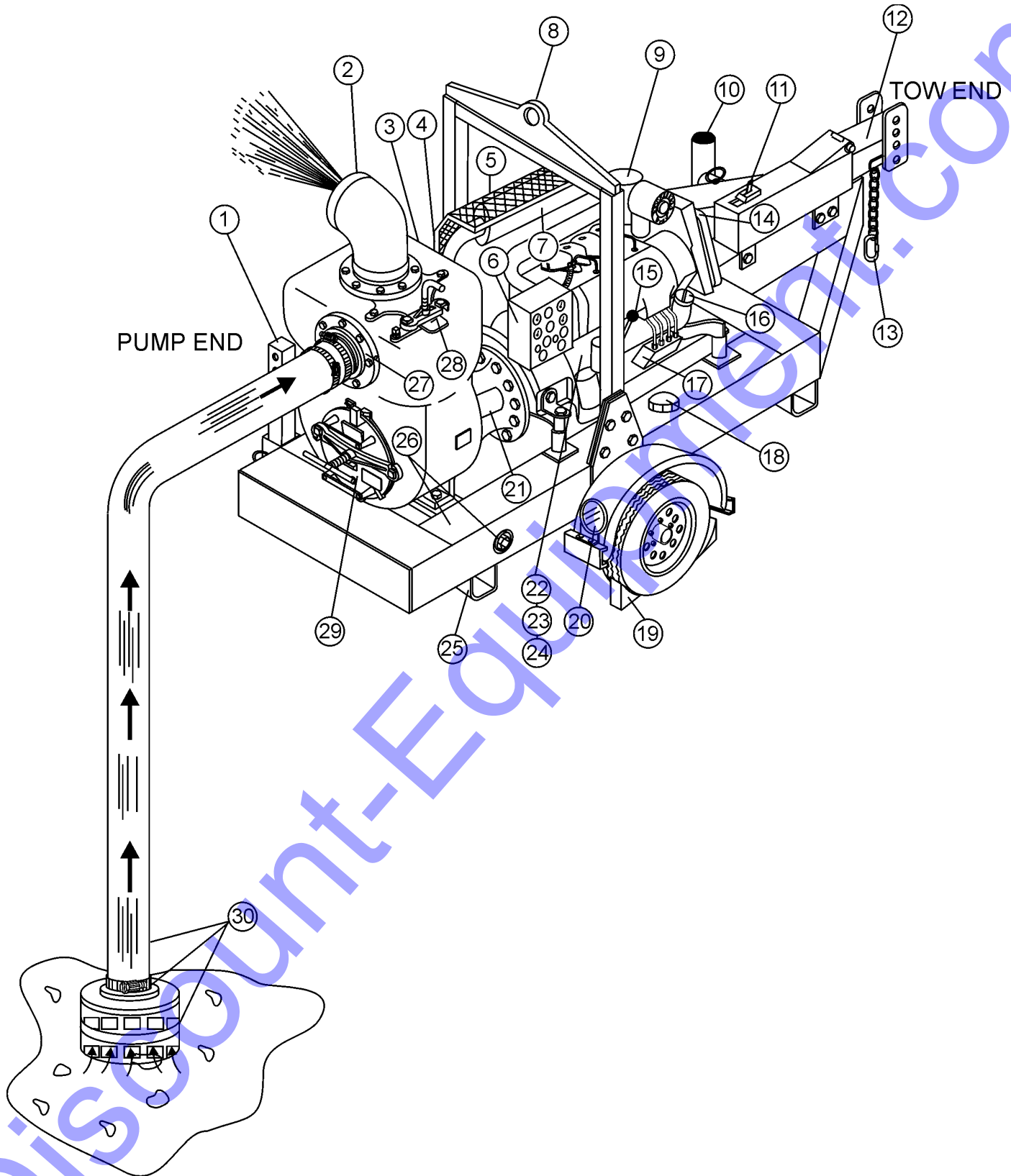


Figure 3. Pump Components

Figure 3 shows the location of the components and basic components for the MQ600TD80 trash pump. The function of each component or control is described below:

1. **Pump End Jack Stand** — Use this jack stand to level and support the trash pump.
2. **Pump Discharge Port** — Discharges water and debris from the pump.
3. **Bearing Sight Glass** — Use this sight glass to determine if oil is present. Oil must be **visible** within the sight glass at all times.
4. **Mechanical Seal Sight Glass** — Use this sight glass to determine if oil is present. Oil must be **visible** within the sight glass at all times.
5. **+12 VDC Battery** — Not provided with pump. See Table 1 for battery specifications.
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. **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.
8. **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 unbalance the lifting bail.
9. **Oil Bath Cleaner** — Prevents dirt and any foreign debris from entering the engine. Service this unit as recommended in the maintenance section of this manual.
10. **Tow End Jack Stand** — Use this jack stand to level and support the trash pump.
11. **Brake Coupler** — This device will activate the hydraulic braking system of the pump's trailer in the event the pump's trailer becomes detached from the towing vehicle.
12. **Tow Hitch Coupler** — Requires a 2.0-inch ball hitch or a 3-inch pintle.
13. **Safety Chain** — Always attach safety chain to the towing vehicle. NEVER! tow the trash pump with the safety chain unattached.
14. **Documentation Box** — Contains documentation for the pump and engine.
15. **Engine Throttle Lever** — Controls the speed of the engine. For load conditions (pumping water) ALWAYS run the engine at **full speed**.
16. **Oil Filler** — Fill as recommended in the maintenance section of this manual.
17. **Engine (Diesel)** — This pump uses a Deutz D914 air-cooled, 4-stroke diesel engine. See the Deutz Operation manual supplied with the trash pump for additional engine information.
18. **Fuel Gauge/Filler Port** — Read top of gauge to determine fuel level. Re-fuel using only recommended types of diesel fuels (see Deutz Operation Manual). DO NOT top off fuel, wipe up any spilled fuel immediately.
19. **Chock Blocks** — Place these blocks (not included as part of the trash pump package) under each trailer wheel to prevent rolling.
20. **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.
21. **Pump Shaft Guards** — To prevent injury to hands and fingers these two guard covers (one each side of pump housing) are to remain in place at all times when the pump is in use.
22. **Dipstick** — Read this gauge to determine the level oil in the engine crankcase. Fill with only recommended type oil as referenced in the maintenance section of this manual.
23. **Fuel Filters** — This pump design incorporates the use of four fuel filters, maintain these filters as recommended in the maintenance section of this manual.
24. **Fuel Water Separator** — Removes water from the fuel system. Inspect and clean as recommended in the maintenance section of this manual.
25. **Support Tubes** — These tubes protect the fuel tank from being damaged when the pump frame is lying on a flat surface.
26. **Fuel Tank/Drain Plug** — The fuel tank is part of the frame (sides). It holds 40 gallons (51 liters) of diesel fuel. Remove this drain plug to drain the fuel tank.
27. **Pump Intake Port** — Intakes water and debris from the source.
28. **Fill Cap** — Remove this cap to prime the pump with water.
29. **Clean-Out Cover** — Remove this cover to clean and remove foreign debris from the trash pump.
30. **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 component.

## APPLICATION

Figure 4 shows a typical application using the MQ600TD80 diesel powered 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 3 inches (76 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.

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**.

**Total Dynamic Head** — The Dynamic Head Suction Head plus the Dynamic Discharge Head. Also referred to as **total head**.

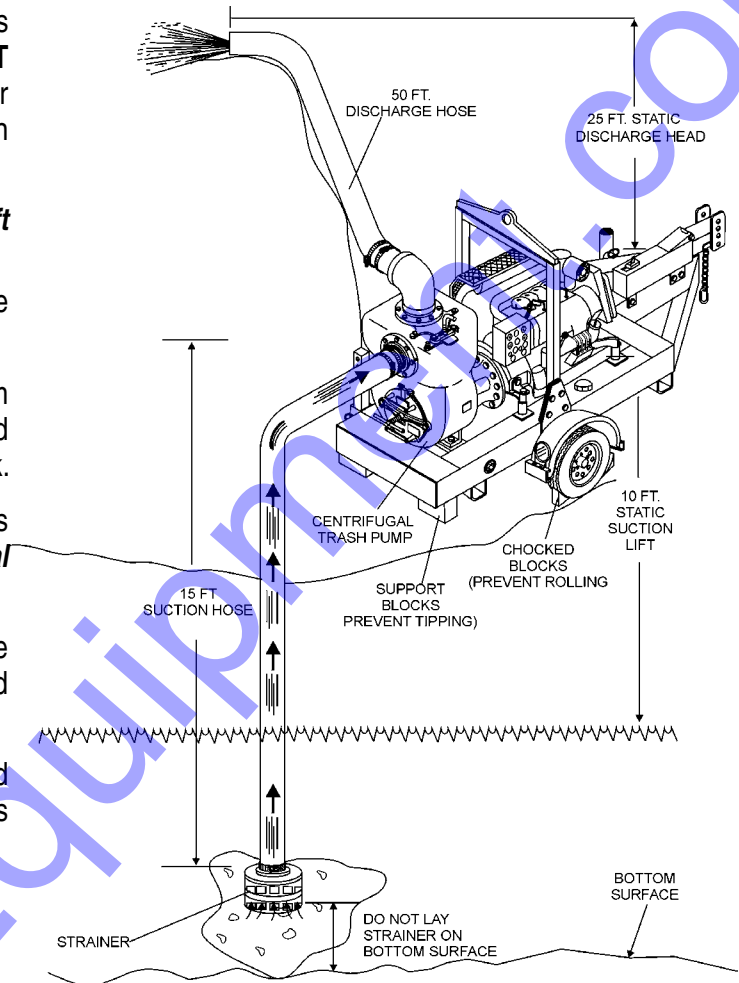


Figure 4. Pump Application

## BATTERY CABLE INSTALLATION

**ALWAYS** be sure the battery cables are properly connected to the battery terminals (Figure 5). The **RED** cable is connected to the positive terminal of the battery, and the **BLACK** cable is connected to the negative terminal.

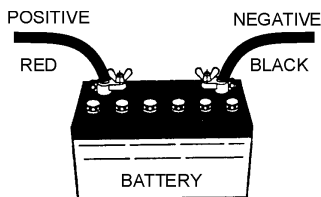


Figure 5. Battery Cable Connections

## BEFORE STARTING

1. Read safety instructions at the 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 3) and fill pump case with water. If the pump case is not filled with water before starting, it will not begin pumping.

### NOTICE

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

### WARNING

Do not open fill cap if pump is hot! Water inside may be under pressure.

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

## HOSES AND CLAMPS

1. Check that all hoses are **securely** attached to the pump. Make certain suction hose (Figure 3) does not have any air leakage. Tighten hose clamps and couplings as required.
2. It is recommended that 2 clamps be used when securing the suction hose to the inlet side of the pump.

3. Remember suction hoses must be **rigid** enough not to collapse when the pump is in operation.
4. Check that the **discharge** hose (Figure 3) is not restricted. Place hose so that it lays as straight as it is possible on the ground. Remove any twists or sharp bends from hose which may block the flow of water.

### NOTICE

Suction and discharge hoses are available from Multiquip. Contact your nearest dealer for more information.

5. 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.
6. Make sure the **suction strainer** (Figure 3) is clean and securely attached to the water end of the suction hose. The strainer is designed to protect the pump by preventing large objects from being pulled into the pump.

### CAUTION

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

### CAUTION

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

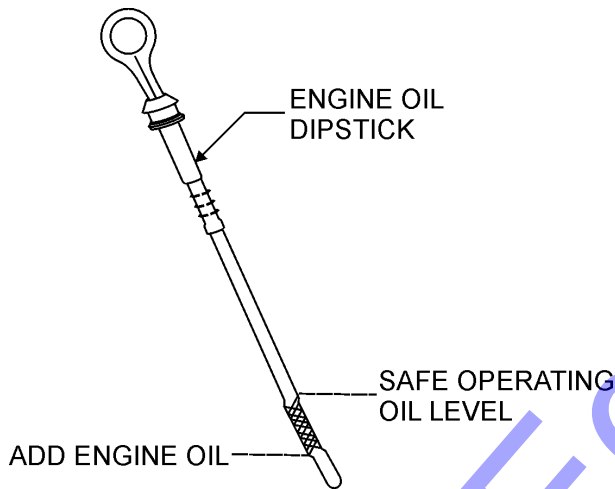
7. Pipes, hoses, fittings and elbows all produce friction that can significantly reduce the flow of water. Keep hose length to a minimum and minimize the use of elbows and other fittings to reduce friction.
8. Always use a suction hose or pipe that matches the size of the pump inlet to insure optimum performance and reduce the risk of damage to the pump.
9. 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

**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.

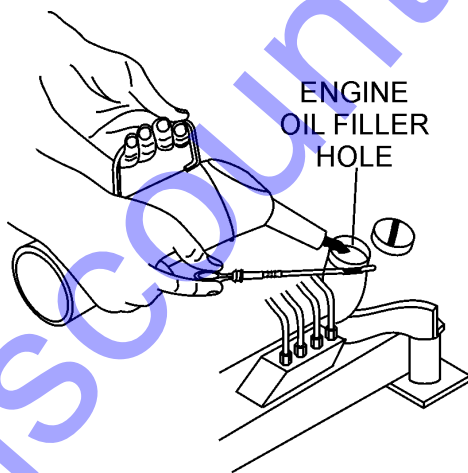
## ENGINE OIL

1. Make sure pump/engine is on level ground.
2. Pull the engine oil dipstick from its holder.
3. Verify that oil level (Figure 6) is maintained between the two notches on the dipstick.



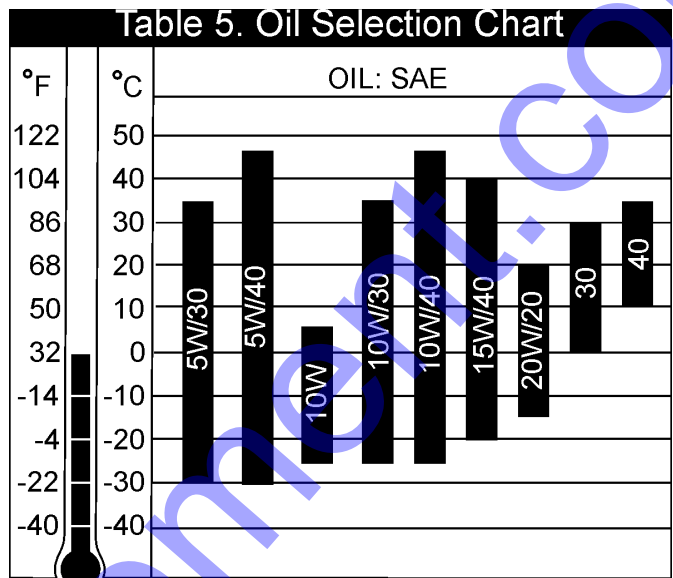
**Figure 6. Engine Oil Dipstick**

4. If engine oil is low, fill engine crankcase with lubricating oil through filler hole (Figure 7), but do not overfill.



**Figure 7. Engine Oil Filler Hole**

5. The oil listed in Table 5 is recommended to ensure better engine performance. Use class CD or higher grade motor oil.



## FUEL

### DANGER



**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.

1. Determine if engine fuel is low by reading fuel indicator gauge on top fuel cap. Fill with recommended type diesel fuel. **DO NOT** fill the tank beyond capacity.

### DANGER



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

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 Specifications Table.
4. Tighten fuel tank cap securely after filling.

## SPEED CONTROL LEVER

1. Set the **Speed Control Lever** (Figure 8) to a position half way between start and stop.

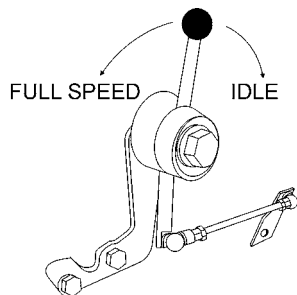


Figure 8. Speed Control Lever

## CONTROL BOX (F4L913 OLD STYLE)

1. Insert ignition key into the ignition switch located on the control box (Figure 9).

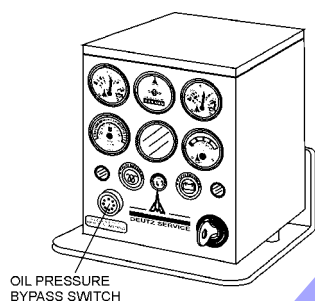


Figure 9. Control Box (Old Style)

2. Turn ignition key to position I and verify that charge indicator light comes ON.
3. Press and hold the "oil pressure bypass switch".
4. Continue turning the ignition key through positions II and III.
5. Release ignition key as soon as engine starts, and verify that ignition key automatically returns back to position I.
6. Release the "oil pressure bypass switch".
7. Verify charge indicator light goes **OFF** immediately when engine is started.
8. If charge indicator remains lit, increase engine speed until light goes off. When the charge indicator light goes off, it can then be assumed that the charging system is working correctly.

9. If the charge light remains on while the engine is running, refer to Engine Troubleshooting Table or the Deutz Engine Repair Manual.
10. Move **speed control lever** to full speed position for maximum engine speed (See Fig. 8).

## CONTROL BOX (F4L914 AND D914 NEW STYLE)

1. Insert ignition key into the ignition switch located on the control box (Figure 10).

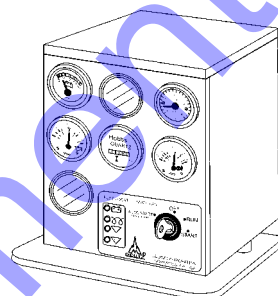


Figure 10. Control Box (New Style)

2. Turn ignition key to the RUN position and verify that voltmeter gauge indicates 12 VDC.
3. Verify that the battery and glow plug status LED indicator lamps are ON.
4. Continue turning the ignition key from the RUN position to the START position.
5. Release ignition key as soon as engine starts, and verify that ignition key automatically returns back to the RUN position.
6. Verify that the battery charge and glow plug status LED indicator lamps are OFF.
7. If battery charge indicator lamp remains lit, increase engine speed until light goes off. When the charge indicator light goes off, it can then be assumed that the charging system is working correctly.
8. If the charge light remains on while the engine is running, refer to Engine Troubleshooting Table or the Deutz Engine Repair Manual.
9. If the AUX 1 status LED lamp is ON, stop engine and check for broken or defective V-belt.
10. Move **speed control lever** to full speed position for maximum engine speed (See Fig. 8).

## OPERATION

1. The MQ600TD80 trash pump should begin pumping water within a minute depending on the length of suction hose and height the pump is above water.

### NOTICE

Longer suction hoses will require more time for the pump to begin pumping 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. Refer to Pump Troubleshooting Table.
3. Slow down the engine and allow to cool for at least 2 minutes. Place **speed control lever** in the stop position and listen for the engine to stop running.

## ENGINE SHUT-DOWN

1. Slow down the engine and allow to cool for at least 2 minutes. Place **speed control lever** in the idle position and turn the ignition key to the **OFF** position.

### CAUTION

**NEVER** attempt to stop the engine by moving the decompression lever. Always use the speed control lever to stop engine.

2. Turn the ignition key to the **0** position and remove the key from the ignition switch.

### CAUTION

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



## GENERAL INSPECTION

The following maintenance guidelines are intended to assist the operator in preventative maintenance. For a more detailed maintenance schedule refer to the **Deutz Engine Manual** supplied with the pump.

At least **daily** or prior to each use, the MQ600TD80 trash pump cover should be removed, and the pump should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts or other fasteners. Also check for fuel or oil leaks, and remove any debris stuck in the impeller or volute.

## 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 11.

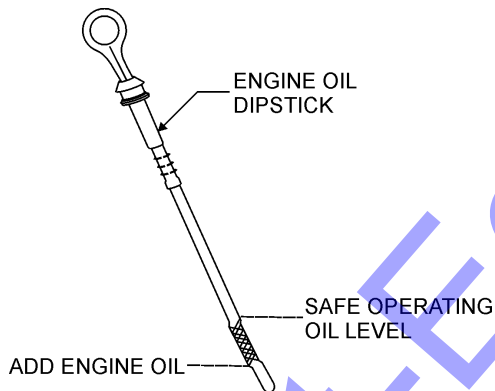


Figure 11. Engine Oil Dipstick

## CHANGING ENGINE OIL

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

When draining engine crankcase oil, place oil into a suitable container while engine is still warm. Replace the drain plug tightly. Add oil through the filler hole.

## CHANGING OIL FILTER

Change the Deutz engine oil filter (Figure 12) after 250 hours of operation.



Figure 12. Engine Oil Filter

## FUEL FILTER SYSTEM

The Deutz engine fuel system incorporates four different types of fuel filters, in-line, easy change, IMSA, and a fuel water separator.

## IN-LINE FUEL FILTER

Replace the in-line fuel filter (Figure 13) every 500 hours. If the purity of the fuel being used is of lesser quality replace the in-line fuel filter more often as needed.

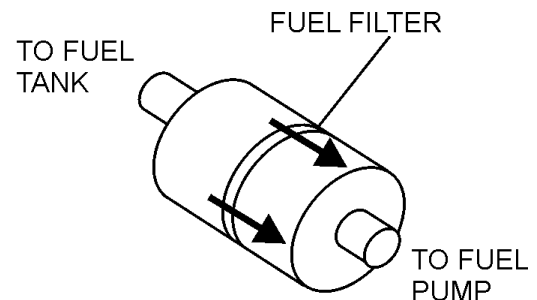


Figure 13. In-Line Fuel Filter

### NOTICE

When reinstalling fuel filters, please note the arrows indicating the **direction of fuel flow**.

## EASY-CHANGE FUEL FILTER

Replace the easy change fuel filter (Figure 14) every 500 hours.



Figure 14. Easy-Change Fuel Filter

## IMSA FUEL FILTER

Inspect and clean (replace if necessary) the IMSA fuel filter (Figure 15) every 500 hours. This filter is part of the fuel pump.

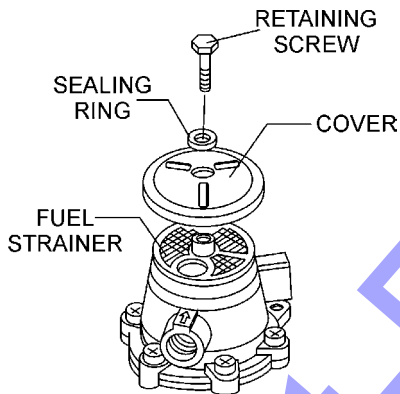


Figure 15. IMSA Fuel Filter

## CLEANING THE IMSA FUEL FILTER

1. Close the fuel shut-off valve and loosen the retaining on the IMSA fuel filter (Figure 15).
2. Remove the cover and the fuel strainer.
3. Clean the fuel strainer with diesel fuel. Replace fuel strainer if necessary.
4. Re-assemble IMSA fuel filter.
5. Bleed fuel system and check for fuel leaks.

## FUEL WATER SEPARATOR FILTER

1. Inspect the fuel water separator (Figure 16) every 40 hours. If the fuel water separator requires maintenance follow steps 2 and 3 below.

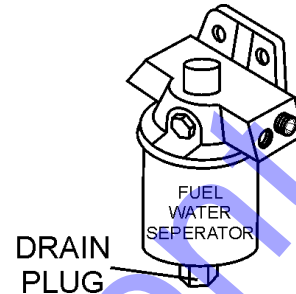


Figure 16. Fuel Water Separator Filter

2. Open the drain plug on the fuel water separator (Figure 16) to remove any sediment or water that may have accumulated in the fuel water separator reservoir.
3. After water and sediment and foreign debris has been drained from the fuel water separator, reinstall the drain plug on fuel water separator.

## FUEL TANK

Unscrew the fuel drain plug on the fuel tank (Figure 17) to remove water and sediment every 500 hours. If the purity of the fuel being used is of lesser quality drain the fuel tank more frequently.

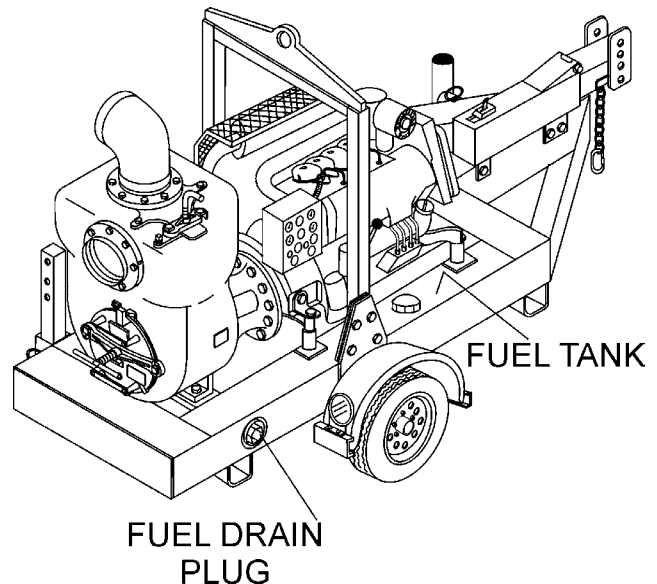


Figure 17. Fuel Tank/Drain Plug

## PUMP VACUUM TEST

### CAUTION

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

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 1,900 RPMs
3. As shown in Figure 18, 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 18) 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
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.

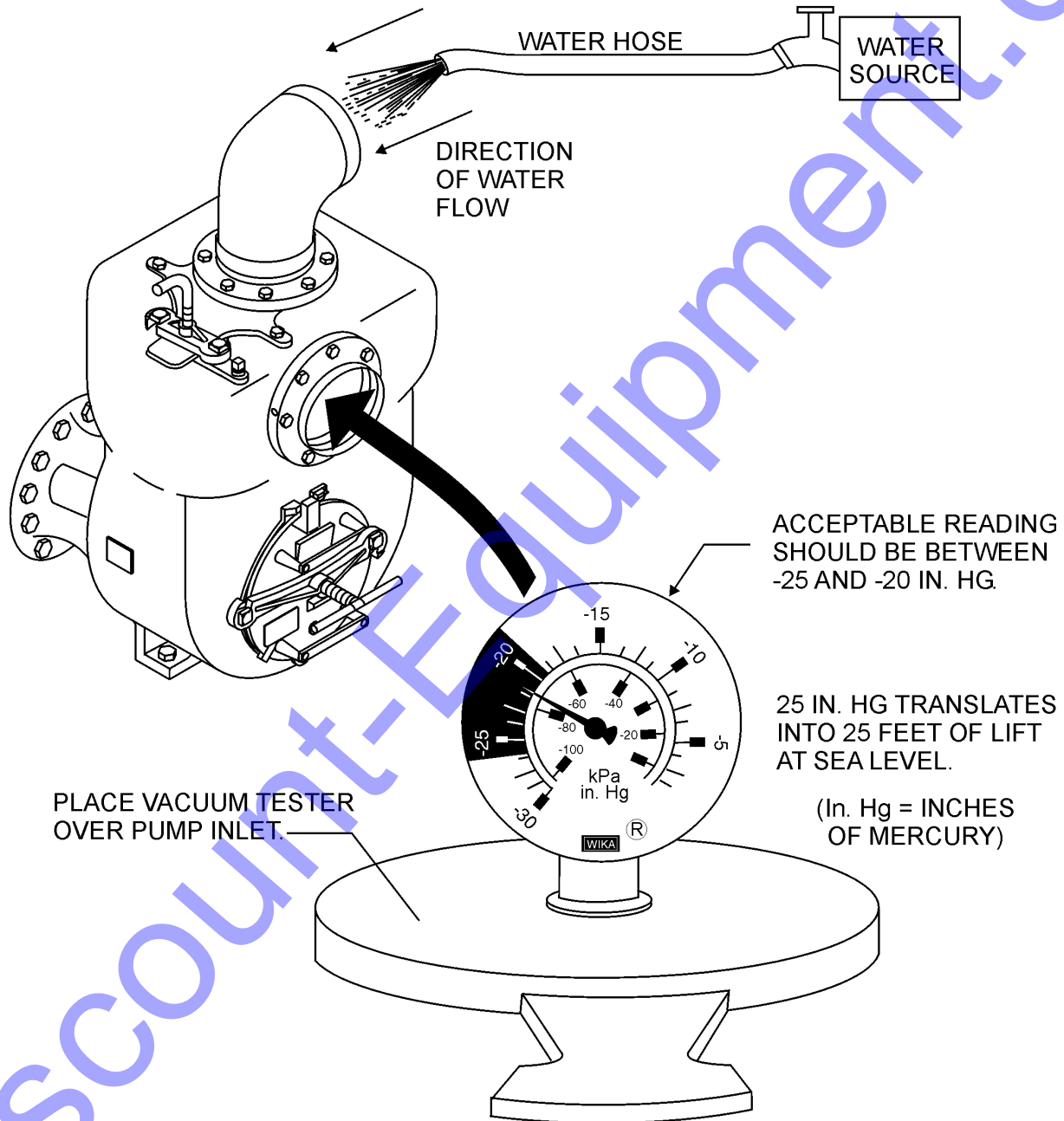
6. Run the pump for a few minutes while monitoring the vacuum gauge. A pump will lose approximately one foot of suction lift for every 1,000 feet of elevation. Depending on the elevation, the gauge should read between 20-29 in. Hg. (inches of mercury). This is an indication that the pump is working correctly.
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.

### NOTICE

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

**CAUTION**

**DO NOT RUN PUMP  
WITHOUT WATER.**



**PUMP VACUUM TESTER**

**Figure 18. Pump Vacuum Tester**

## PUMP MAINTENANCE

This section is intended for the experienced, qualified technician as a guideline to service the pump. All service precautions must be observed to avoid injury. Read and understand all safety information and the operation section. Before servicing this equipment be sure to do the following:

1. Turn off the engine
2. Follow lock out procedures.
3. Vent the pump cautiously.
4. Drain the pump.
5. Allow the pump to cool if overheated.
6. Use appropriate lifting devices.

### Mechanical Seal Replacement Instructions

#### *Disassembly*

1. It is recommended to remove the main casing body.
2. Remove the impeller by first locking (using a wrench) the front engine crankshaft pulley.
3. Using a soft-faced mallet, remove impeller by tapping vane in counterclockwise direction.
4. Remove mechanical seal components.
5. Remove the rear adaptor cover, sight glass, and vent tubes.
6. Using a punch, remove adaptor plate mechanical seal stationary seal plate.
7. Remove stationary oil seal.

#### *Installation*

1. Install new stationary oil seal into adaptor case housing. The seal should face inward towards the impeller.
2. Lightly lubricate the mechanical seal stationary seal plate O-ring and gently tap into adaptor plate making sure it is level with the O-ring groove facing the impeller.
3. Install the adaptor plate bolting onto the intermediate bearing housing.
4. Inside the adaptor plate cavity, assemble the stationary

plate by installing the O-ring then the tungsten carbide stationary element squarely onto the stationary seal plate. (Note: Tungsten element chamfer side towards pump end). A slight amount of grease can be used to allow retention. Double check that the Tungsten carbide element surface is free of dirt contamination including fingerprints.

5. Coat the mechanical seal bellows with a light drop of lubricating oil. Slide the seal bellows onto the shaft sleeve until flush with the sleeves chamfered end. Place the Tungsten carbide rotating element onto seal cage, the chamfered side towards engine. Inspect the rotating Tungsten for cleanliness. Use a slight amount of grease for retention. Carefully push and rotate the sleeve assembly onto the shaft until the Tungsten element faces are mated. The sleeve should firmly rest against the shaft shoulder. Use extreme care not to damage or roll over the oil seal lip.
6. **Alternative mechanical seal installation method**— After installation of adaptor plate assembly, slide the sleeve chamfered side toward engine. Use extreme care not to damage the oil seal. Utilize secondary sleeve as installation tool, installing over shaft butting against primary sleeve. Lubricate seal bellows slowly sliding seal assembly onto primary sleeve until the Tungsten carbide faces are squarely mated. Remove installation tool.
7. Assemble the spring then add the necessary adjustment shims.
8. Inspect the impeller and shaft threads and make sure they are clean before installation. Apply "Anti-Seize" compound. Even the slightest amount of dirt on the thread can cause the impeller to seize or make future removal difficult. At the slightest sign of binding, immediately back impeller off inspecting threads. Do not force the impeller onto the shaft. The impeller rear to adaptor plate clearance is 0.25 - 0.40 inches (0.64 - 1.02 mm). Make positively sure that the impeller is fully tightened utilizing all the threads. If not properly tightened, the impeller could further tighten jamming into the adaptor plate during pump operation, seizing the engine.
9. Reinstall the main pump body, checking for proper wear plate to impeller clearance.

## Oil Lubrication

### *Mechanical Seal*

1. Place the pump on level ground.
2. Fill the sight glass with SAE #30 non-detergent oil through the sight glass vent cap.
3. Check the oil level regularly.
4. Inspect for discoloration which may indicate that the mechanical seal is beginning to leak, passing water into the lubrication cavity.
5. The reservoir capacity is 3.3 oz. (0.1 liter).

### **NOTICE**

If lubricating after mechanical seal replacement, it is recommended to purge seal cavity of air by removing the weep hole plug found opposite to the sight glass. Fill sight glass with oil until visible from the weep hole. Reinstall plug, filling sight glass to proper level.

### *Main Bearings*

1. Place pump on level ground.
2. Fill sight glass with SAE #30 non-detergent oil through the top access port until visible.
3. Monitor the lubrication for evidence of moisture condensation particularly in areas with unusual temperature variations.
4. Do not over-lubricate. Excess oil can cause the bearings to overheat resulting in premature failure.
5. Under normal conditions, drain and refill each year.
6. The oil reservoir oil capacity is 8.45 oz. (0.259 liter).

### **Impeller/Wear-Plate Clearance**

1. For optimal performance, the recommended clearance between the impeller and the wear plate is 0.10 - 0.20 inches (0.25 - 0.51 mm). The clearance can be inspected by reaching with feeler gauge inside the discharge or fill ports.
2. Adjustment is made by removing the main pump housing, adding or subtracting gaskets located between the adaptor plate and the main housing. Typically only one or two gaskets are used.

## PREPARATION FOR LONG TERM 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.

# TOWING GUIDELINES

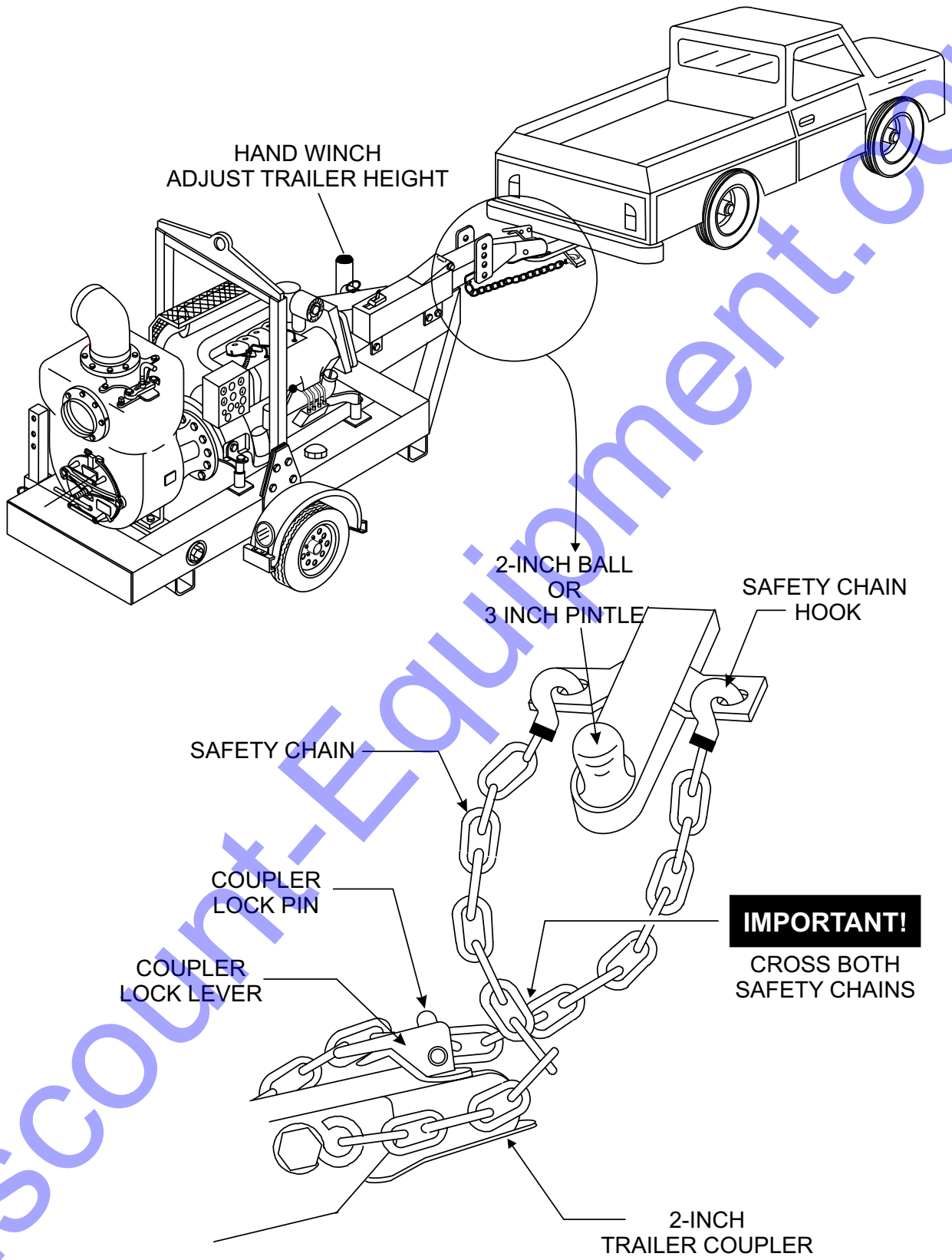


Figure 19. Safety Chains/Trailer Coupler Hookup

# TRAILER GUIDELINES

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

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

## COMMON CAUSES FOR LOSS OF TRAILER

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

## TRAILER TOWING GUIDELINES

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

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



# TRAILER GUIDELINES

## DRIVING CONDITIONS

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

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

### **WARNING**

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

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

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

### **WARNING**

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

## COUPLING TO THE TOW VEHICLE

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

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

The trailer VIN tag contains the critical safety information

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

### **WARNING**

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

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

### **WARNING**

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

**DO NOT** move the trailer until:

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

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

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

### **WARNING**

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

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

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

# TRAILER GUIDELINES

## INOPERABLE BRAKES, LIGHTS OR MIRRORS

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

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

### WARNING

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

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

## TRAILER TOWING TIPS

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

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

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

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

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

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

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

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

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

## TRAILER VIN TAG

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

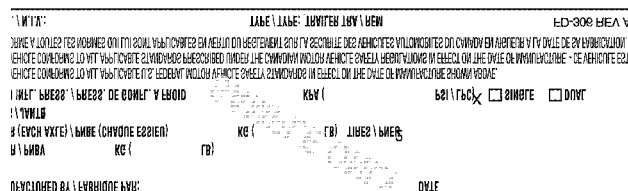
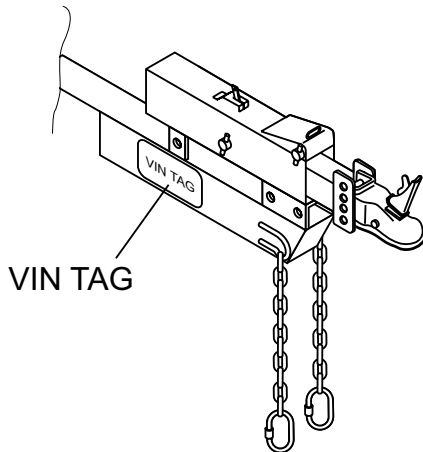


Figure A. Vehicle VIN Tag

## TRAILER GUIDELINES



**Figure B. VIN Tag Location**

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

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

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

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

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

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

**VIN:** The Vehicle Identification Number.

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

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

### TOW VEHICLE

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

### SUSPENSION SYSTEM

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

### BRAKE CONTROLLER

For trailers equipped with electric brakes, the electric brake controller is part of the tow vehicle and is essential in the operation of the electric brakes on the trailer. The brake controller is not the same as the safety breakaway brake system that may be equipped on the trailer.

### 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.

# TRAILER GUIDELINES

## EMERGENCY FLARES AND TRIANGLE REFLECTORS

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

## 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.

## BREAKAWAY SYSTEM

If the trailer coupler connection comes loose, the breakaway system can actuate emergency hydraulic brakes depending on the type of actuator on the trailer. The breakaway cable must be rigged to the tow vehicle with appropriate slack that will activate the system if the coupler connection comes loose.

## JACKSTAND

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

## COUPLER TYPES

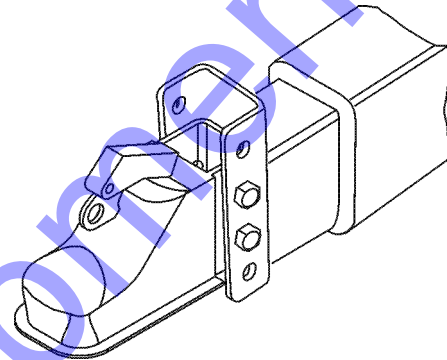
Two types of coupler used with the trailer are discussed below.

- Ball Hitch Coupler
- Pintel Eye Coupler

## BALL HITCH COUPLER

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

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



**Figure C. Ball Hitch Coupler**

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

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

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

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

Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose

## TRAILER GUIDELINES

or is worn, the trailer can come loose from the tow vehicle and may cause death or serious injury.

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

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

### **WARNING**

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

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

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

### **WARNING**

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

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

Replace worn or damaged hitch ball.

### **WARNING**

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

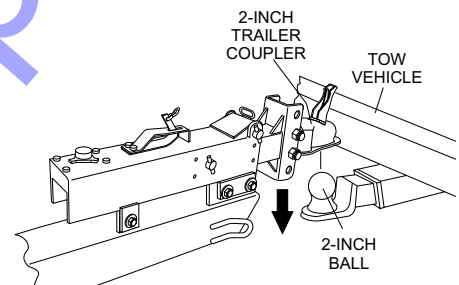
Be sure the hitch ball is tight to the hitch before coupling the trailer.

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

the trailer tongue. Wood or concrete blocks may also be used.

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

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



**Figure D. Ball Hitch Coupling Mechanism**

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

# TRAILER GUIDELINES

## NOTICE

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

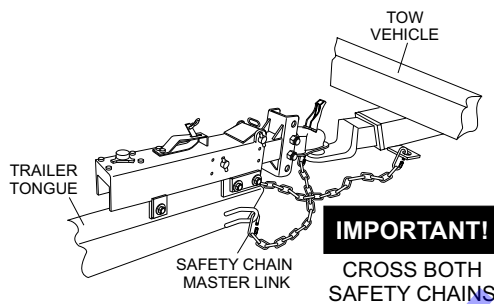
If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call your dealer for assistance. Lower the trailer so that its entire tongue weight is held by the hitch and continue retracting the jack to its fully retracted position.

## Attaching Safety Chain

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

Attach the safety chains so that they:

- Cross underneath the coupler. See Figure E.



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

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

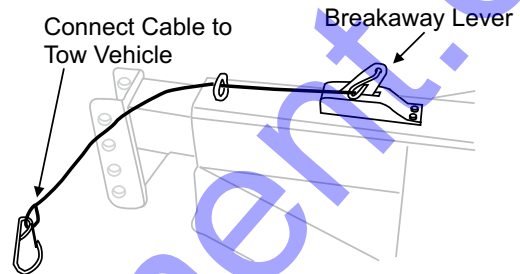
## WARNING

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

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

## Breakaway Brake System

If the coupler or hitch fails, a properly connected and working breakaway brake system (Figure F) will apply the hydraulic brakes on the trailer. The safety chains will keep the tow vehicle attached and as the brakes are applied at the trailer's axles, the trailer/tow vehicle combination will come to a controlled stop.



## Hydraulic Actuator

**Figure F. Breakaway Brake System**

## Breakaway Cable Surge Brake System

The breakaway brake system includes a brake cable connected to the tow vehicle on one end and to the emergency brake lever located on the hydraulic actuator on the other end.

## WARNING

- An ineffective breakaway brake system can result in a runaway trailer, leading to death or serious injury, if the coupler or ball hitch fails.
- Connect the breakaway cable to the tow vehicle and **NOT** to the hitch, ball or support.
- Before towing the trailer, test the function of the breakaway brake system. If the breakaway brake system is not working, **DO NOT** tow the trailer. Have it serviced or repaired.

## NOTICE

**DO NOT** tow the trailer with the breakaway brake system **ON** because the brakes will overheat which can result in permanent brake failure.

## NOTICE

Replace the breakaway brake battery (if equipped) at intervals specified by manufacturer.

# TRAILER GUIDELINES

## Connecting Trailer Lights

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

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

### **⚠ WARNING**

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

Before each tow:

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

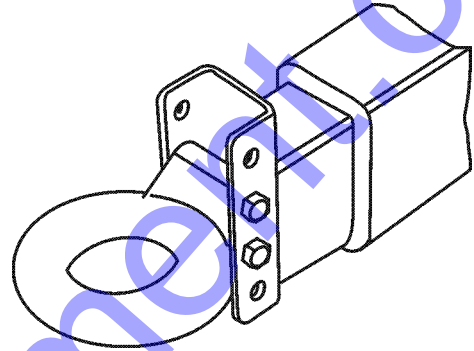
## Uncoupling the Ball Hitch

Follow these steps to uncouple ball hitch from tow vehicle:

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

## PINTLE HITCH COUPLER

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



**Figure G. Pintle Hitch Coupler**

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

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

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

## Pintle Coupler and Pintle Hook

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

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

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the pintle hook or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of

## TRAILER GUIDELINES

the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

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

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

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

### ⚠ WARNING

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

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

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

### ⚠ WARNING

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

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

Replace worn or damaged pintle hitch hook.

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

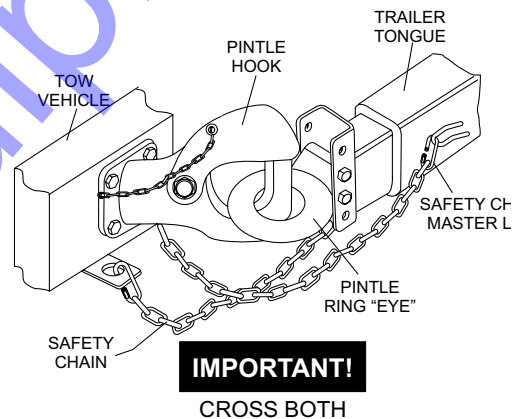
### ⚠ WARNING

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

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

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

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



**Figure H. Attaching Safety Chain (Pintle Hitch)**

- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the pintle hook is inserted completely through the eye ring and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1-inch after the coupler is locked to the hitch.
- Lower the trailer so that its entire tongue weight is held by the hitch.
- Raise the jackstand to a height where it will not interfere with the road.



# TRAILER GUIDELINES

## TIRE SAFETY

### Unsafe Tires, Lug Nuts or Wheels

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

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

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

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

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

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

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

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

#### WARNING

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

Tighten lug nuts before each tow.

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

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

#### WARNING

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

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

#### WARNING

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

Be sure lug nuts are tight before each tow.

#### WARNING

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

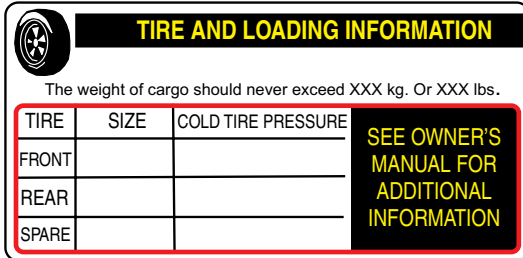
Be sure tires are inflated to pressure indicated on side wall before towing trailer.

### Determining Load Limit of Trailer

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

# TRAILER GUIDELINES

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



**Figure I. Trailer Tire Placard**

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

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

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

## Step 1.

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

## Step 2.

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

## Determining Load Limit of Tow Vehicle

### Step 1.

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

### Step 2.

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

### Step 3.

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

### Step 4.

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

### Step 5.

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

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

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

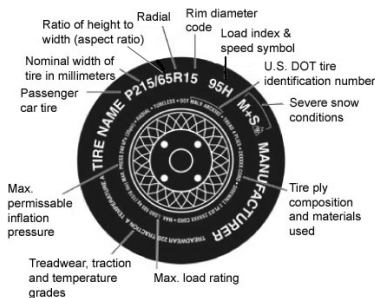
- Improve vehicle handling.
- Help protect you and others from avoidable breakdowns and accidents.
- Improve fuel economy.
- Increase the tire life.

# TRAILER GUIDELINES

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 J). 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 J. Standard Tire Sidewall Information**

**P:** The “P” indicates the tire is for passenger vehicles.

**Next number:** This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

**Next number:** This two-digit number, known as the aspect ratio, gives the tire’s ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

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

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

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

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

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

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

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

**Tire Ply Composition and Materials Used:** The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

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

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

# TRAILER GUIDELINES

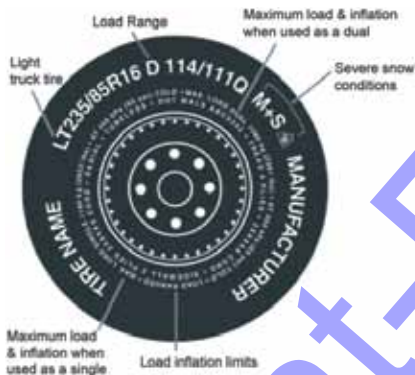
## Uniform Tire Quality Grading Standards (UTQGS)

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

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

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

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



**Figure K. 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.

# TRAILER GUIDELINES

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

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

**WARNING**



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

## 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.

### NOTICE

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

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

### WARNING

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

## Lug Nut Torque Requirements

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

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

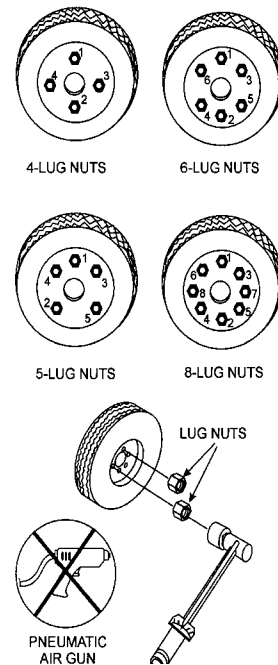


Figure L. Wheel Lug Nuts Tightening Sequence

# TRAILER GUIDELINES

**Table C. Tire Torque Requirements**

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

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.

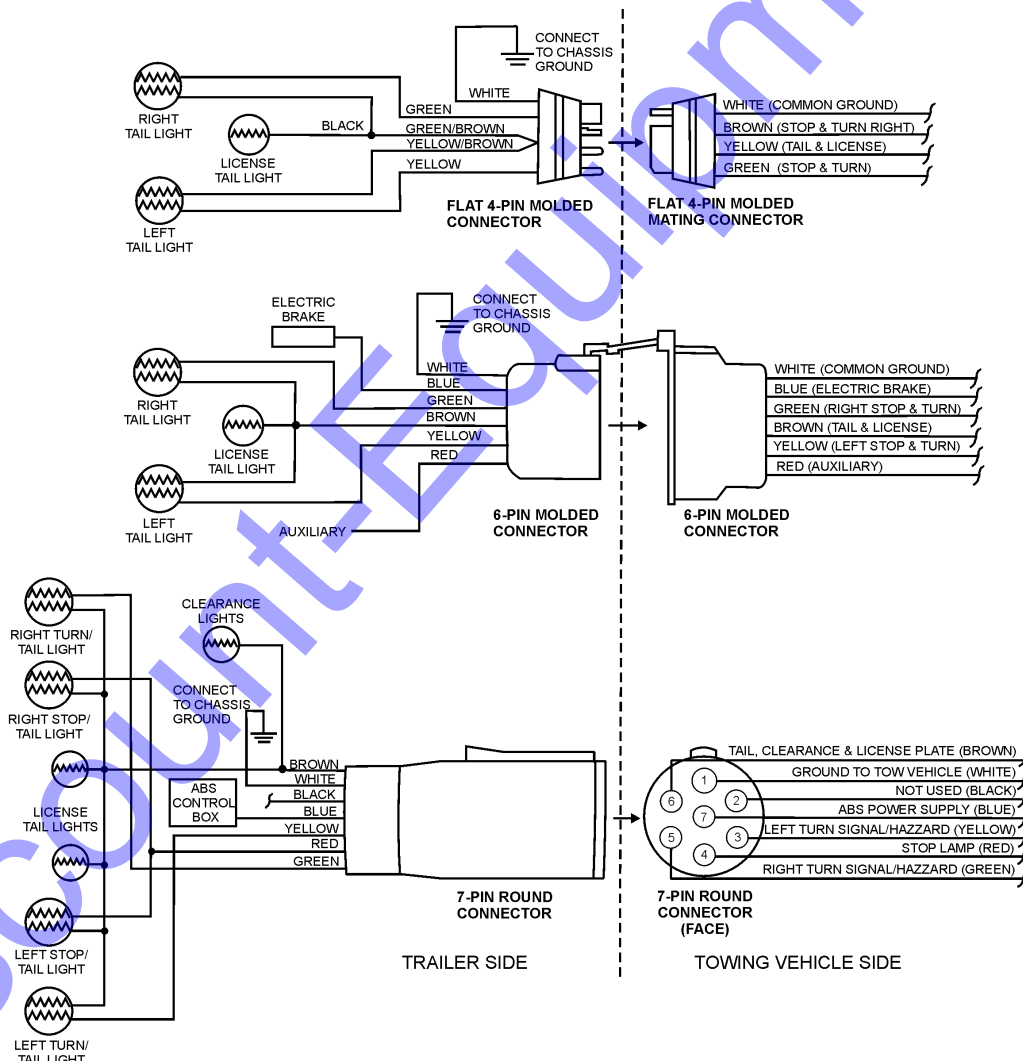
**WARNING**

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

Check all lights before each tow.

## Lights and Signals

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



**Figure M. Trailer to Tow Vehicle Wiring Diagram**

# TROUBLESHOOTING

Troubleshooting (Trash Pump)		
Symptom	Possible Problem	Solution
Pump does not prime.	Not enough priming water in the housing?	Add water.
	Engine speed too low?	Increase throttle.
	Strainer plugged?	Clean strainer.
	Suction hose damaged?	Replace or repair hose, and clamps.
	Air leak at suction port?	Check that fittings are tight and properly sealed.
	Pump is located too high above water line?	Move pump closer to water.
	Debris collecting in pump housing?	Clean pump housing.
	Too much distance between impeller and volute?	Adjust clearance by adding gaskets or replace impeller. .010 - .020 inch (0.25 - 0.51 mm)
	Water leaking out sight glass?	Check condition of mechanical seal.
Pump takes in water, little or no discharge.	Engine speed too low?	Increase throttle speed.
	Suction strainer partially plugged?	Clean strainer.
	Impeller/Volute worn?	Adjust clearance or replace impeller/volute.
Suction hose leaks at inlet.	Fittings/clamps are not sealed properly?	Tighten, replace or add clamp. (Keep extra seals on pump).
	Hose diameter is too large?	Use smaller diameter hose or replace hose.
Discharge does not stay on coupling.	Pressure too high?	Check pressure, add additional clamp.
	Hose kinked or end blocked?	Check hose.
Engine is locked or slow to start.	Impeller jammed or blocked?	Open pump cover and clean dirt and debris from inside housing.
	Impeller and wear plate binding?	Inspect for clearance .010 - .020 inch (0.25 - 0.51 mm) . Add or delete gaskets.
	Defective engine?	See Engine Owner's Manual.
	Impeller binding to rear adaptor plate?	Adjust clearance by adding or removing shims 0.25 - 0.40 inch (0.64 - 1.02 mm)

# TROUBLESHOOTING

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



## TROUBLESHOOTING

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

## TROUBLESHOOTING

<b>Troubleshooting (Hydraulic Brakes - Trailers)</b>		
<b>Symptom</b>	<b>Possible Problem</b>	<b>Solution</b>
No brakes	Is the brake line broken or kinked?	Repair or replace.
Weak brakes or brakes pull to one side.	Is the brake lining glazed?	Reburnish or replace
	Is the trailer overloaded?	Correct weight.
	Are the brake drums scored or grooved?	Check machine or replace.
	Is the tire pressure correct?	Inflate all tires equally per manufacturer guidelines.
	Are the tires unmatched on the same axle?	Match tires.
Locking brakes?	Are the brake components loose, bent or broken?	Replace components.
	Are the brake drums out-of-round?	Replace.
Noisy brakes?	Is the brake system lubricated?	Lubricate.
	Are the correct brake components installed?	Replace and correct.
Dragging brakes?	Is the brake lining thickness correct or innstalled incorrectly?	Install new shoes and linings.
	Is there enough brake fluid or correct fluid?	Fill with dot 4 fluid.

# EXPLANATION OF CODE IN REMARKS COLUMN

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

## NOTICE

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

## SAMPLE PARTS LIST

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

## NO. Column

**Unique Symbols** — All items with same unique symbol

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

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

## NOTICE

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

## PART NO. Column

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

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

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

## QTY. Column

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

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

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

## REMARKS Column

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

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

Indicated by:

“INCLUDES ITEMS W/(unique symbol)”

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

Indicated by:

“S/N XXXXX AND BELOW”

“S/N XXXX AND ABOVE”

“S/N XXXX TO S/N XXX”

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

Indicated by:

“XXXXX ONLY”

“NOT USED ON XXXX”

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

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

## SUGGESTED SPARE PARTS

### MQ600TD80 TRASH PUMP WITH DEUTZ D914 ENGINE

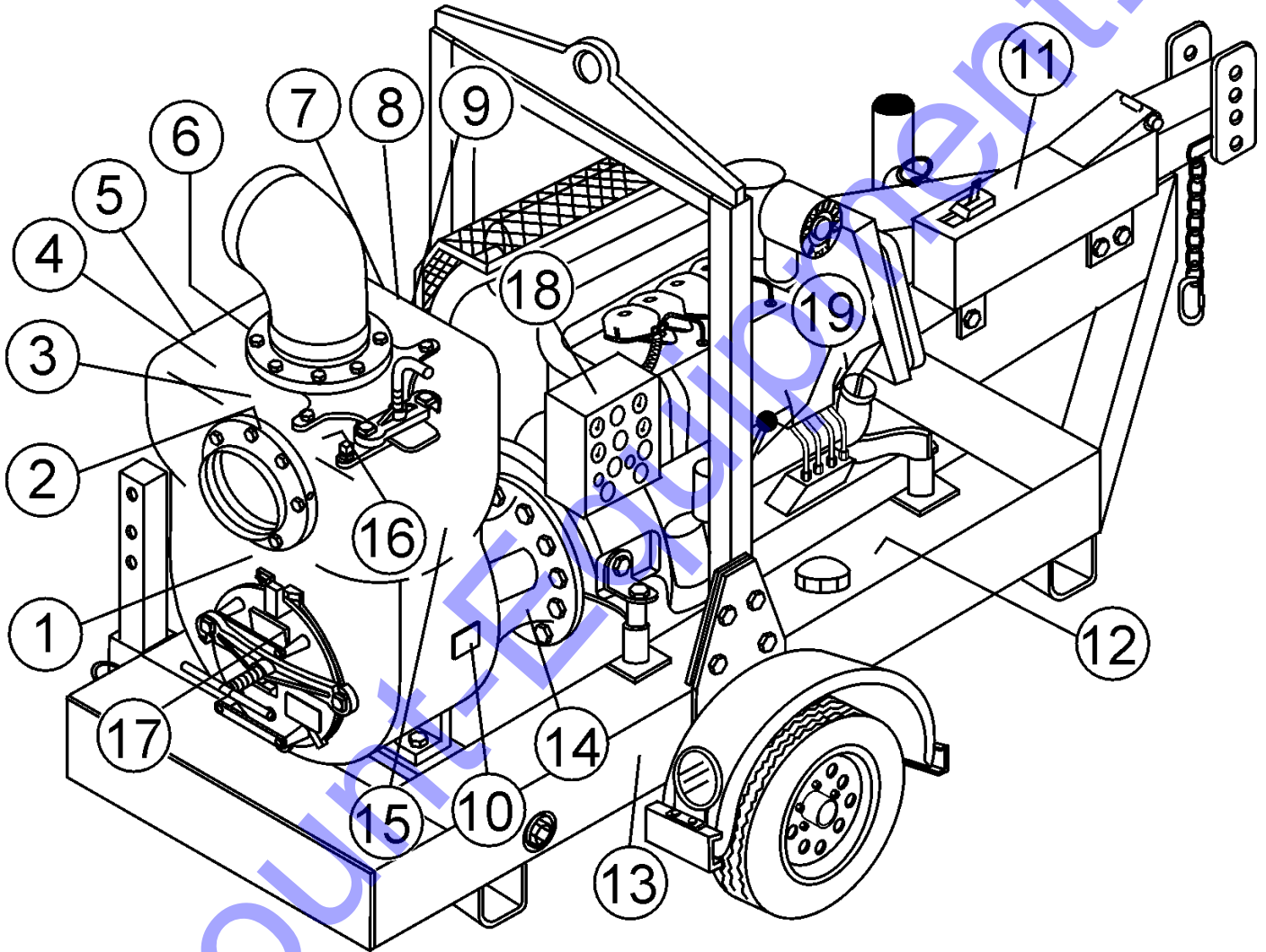
#### 1 to 3 units

Qty.	P/N	Description
3	34488	MECHANICAL SEAL
3	511245	SLEEVE, SEAL (SHAFT)
3	34491	GASKET, FRONT COVER
1	511219	IMPELLER
1	511268	WEAR PLATE
1	34489	FLAP VALVE
1	34493	GASKET
1	511259	OIL SEAL
1	34495	GASKET
1	511261	BEARING
1	511262	BEARING
1	511258	SHAFT
1	511236	OIL SEAL
1	34492	GASKET
3	EM20763	FILTER, FUEL

#### NOTICE

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

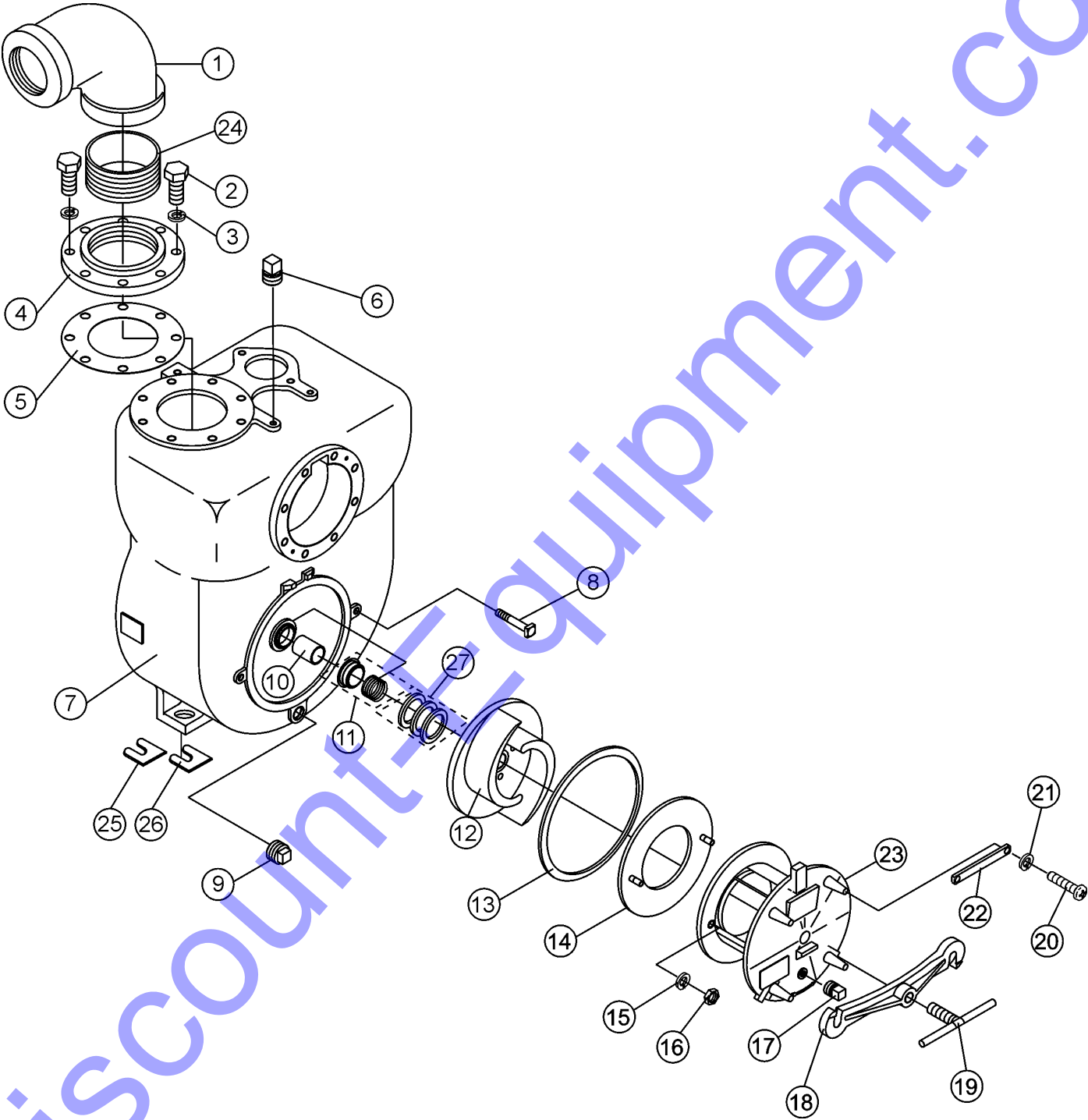
# NAMEPLATES AND DECALS



## NAMEPLATES AND DECALS

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	511782	DECAL: MQ (LONG-WHITE)	1	
2*		DECAL: SUCTION.....	1.....	DCL130
3*		DECAL: WARNING (DO NOT RUN DRY).....	1.....	DCL129
4*		DECAL: WARNING (OPERATION).....	1.....	DCL125
5*		DECAL: CAUTION (BEARING/MEC. SEAL).....	1.....	DCL133
6*		DECAL: DISCHARGE.....	1.....	DCL131
7*		DECAL: WARNING (MOVING PARTS).....	1.....	DCL135
8*		DECAL: BEARING SIGHT GLASS.....	1.....	DCL137
9*		DECAL: MEC. SEAL SIGHT GLASS.....	1.....	DCL138
10		PLATE SERIAL NO.....	1.....	CONTACT MQ PARTS DEPT. W/ MODEL AND S/N
11	EM969	DECAL: TOWING	1	
12	520616	DECAL: DIESEL FUEL	1	
13*		DECAL: TIRE.....	1.....	DCL151
14*		DECAL: WARNING (ROTATING IMPELLER) ...	2.....	DCL128
15	511783	DECAL: MQ (STACKED WHITE).....	1.....	
16*		DECAL: WARNING (FILL CAP).....	1.....	DCL126
17*		DECAL: WARNING (SERVICE).....	1.....	DCL127
18*		DECAL: WARNING (READ INSTRUCTIONS)...	1.....	DCL134
19*		DECAL: RUN FULL THROTTLE.....	1.....	DCL136
20	34517	KIT, DECAL.....	1.....	INCLUDES ITEMS W/ * DECALS AVAILABLE ONLY AS KIT

# IMPELLER, CLEANOUT, AND DISCHARGE ASSY.



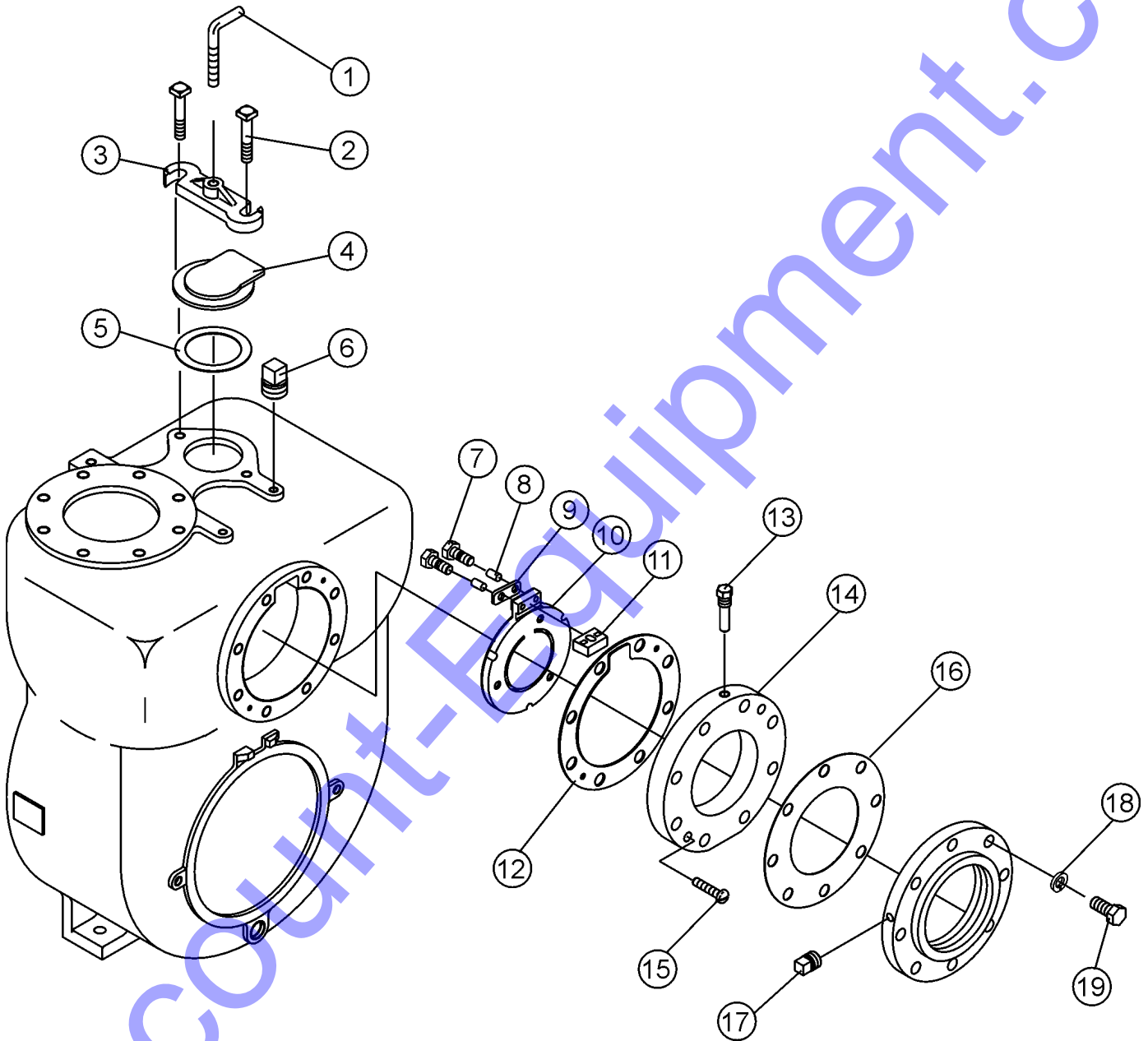
## IMPELLER, CLEANOUT, AND DISCHARGE ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	511223	90 DEGREE ELBOW	1	
2	509078	HHCS 3/4 X 2 G5	8	
3	492628	LOCK WASHER 3/4	8	
4	511225	RETAINER	1	
5	34496	GASKET	1	
6	511220	PIPE NIPPLE	1	
7	511217	MAIN HOUSING	1	
8	511832	MACHINE BOLT	2	
9	505988	DRAIN PLUG	1	
10	511245	SLEEVE, SEAL (SHAFT)	1	
11	34488	MECHANICAL SEAL ASSY.	1	
12	511219	IMPELLER	1	
13	34491	GASKET	1	
14	511268	WEAR PLATE	1	
15	511302	LOCK WASHER	2	
16	508704	NUT	2	
17	491210	DRAIN PLUG NPT1/4	1	
18	511276	RETAINING BAR	1	
19	511837	LOCK BOLT, FRONT COVER	1	
20	506596	HEX HEAD BOLT M8 X 25	4	
21	506597	LOCK WASHER M8	4	
22	506308	HANDLE	2	
23	511272	FRONT COVER	1	
24	511221	6-INCH NPT NIPPLE	1	
25	511838	SHIM, BASE 0.5 MM	AR	
26	511839	SHIM, BASE 1.0 MM	AR	
27*	511244	SHIM, KIT, IMPELLER	AR	

\* - Adjust rear of impeller to adaptor cover 0.25 - 0.40 inch (0.64 - 1.02 mm)



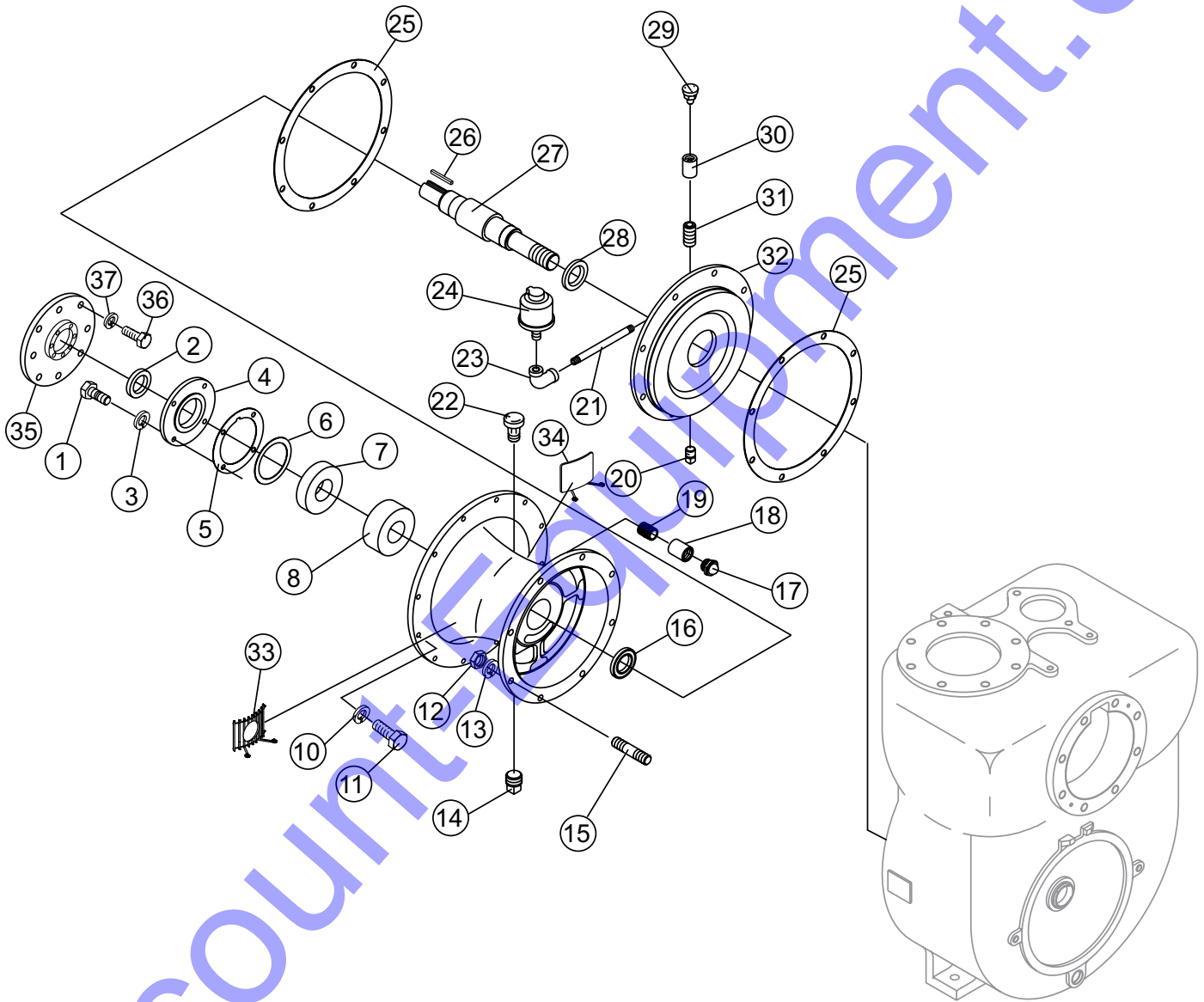
# PUMP — SUCTION SIDE ASSY.



## PUMP — SUCTION SIDE ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	511836	LOCK BOLT, FILL	1	
2	511832	MACHINE BOLT	2	
3	511243	RETAINER, FILL	1	
4	511238	COVER, FILL	1	
5	34494	GASKET	1	
6	511220	PIPE NIPPLE	1	
7	511303	HHCS 5/16 X 1-1/4 SS	2	
8	511304	SPACER	2	
9	511305	RETAINER PLATE	1	
10	34489	FLAP VALVE	1	
11	511306	ADAPTER, CHECK VALVE	1	
12	34493	GASKET	1	
13	511307	PIN, CHECK VALVE	1	
14	511278	SEAT, CHECK VALVE	1	
15	511279	SLOT HEAD BOLT 5/16 X 1-1/2	2	
16	34496	GASKET	1	
17	491210	PIPE PLUG NPT 1/4	1	
18	492628	LOCK WASHER 3/4	8	
19	492421	HHCS 3/4 NC X 3-1/2 X G5	8	

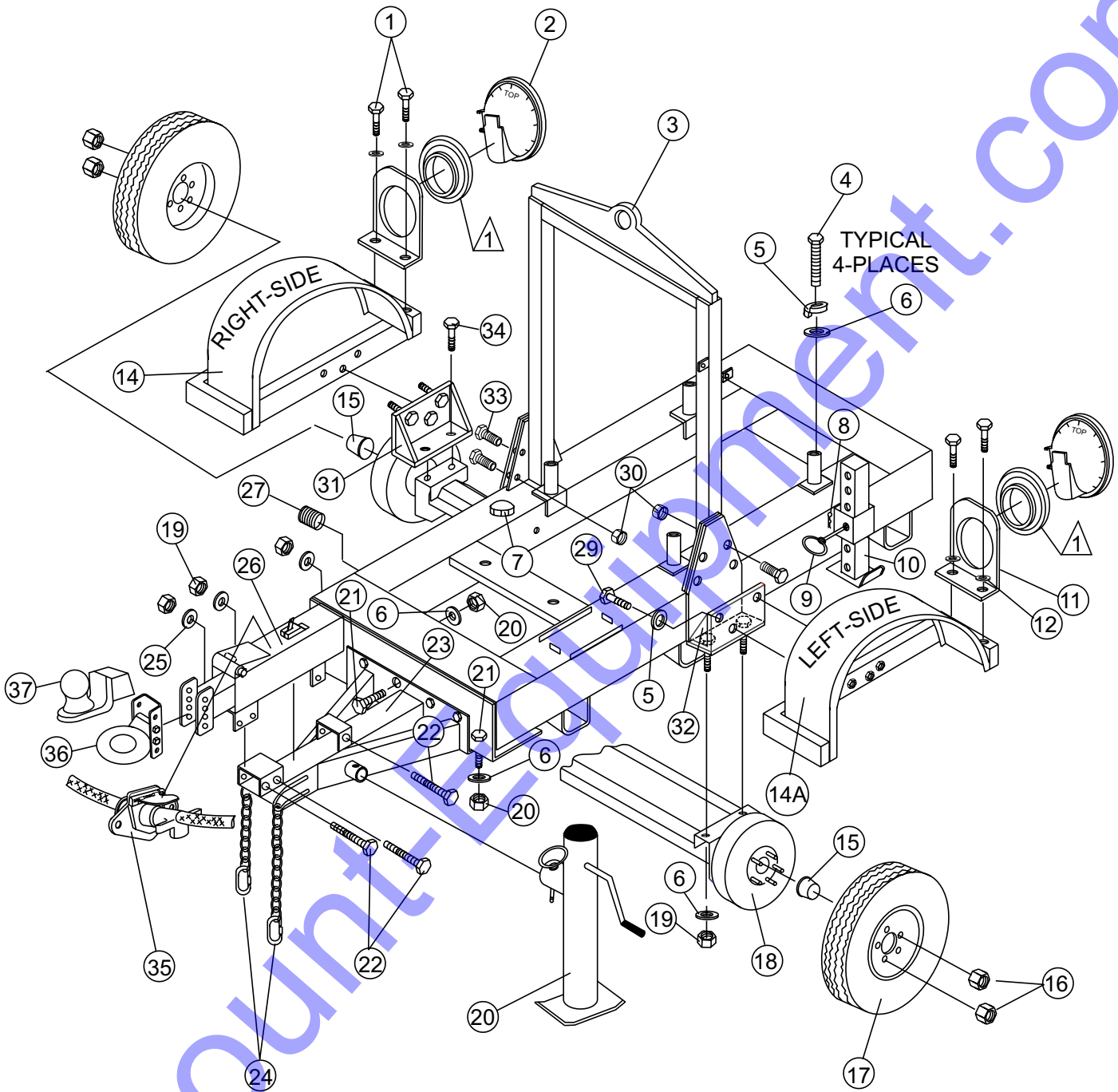
# INTERMEDIATE PLATE ASSY.



## INTERMEDIATE PLATE ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	492315	SCREW HHCS 3/8 X2 G2	4	
2	511259	SEAL, OIL	1	
3	0166 A	LOCK WASHER 3/8	4	
4	511256	RETAINER PLATE	1	
5	34495	GASKET	1	
6	34490	WAVE WASHER	1	
7	511261	BEARING	1	
8	511262	BEARING	1	
9	511235	INTERMEDIATE HOUSING	1	
10	EM269	LOCK WASHER	12	
11	EM162	ALLEN HEAD M10 X 25	12	
12	508704	HEX NUT 1/2 SS	8	
13	511302	LOCK WASHER 1/2 SS	8	
14	507657	DRAIN PLUG	1	
15	511229	STUD	8	
16	511259	SEAL, OIL	1	
17	34502	OIL SIGHT GAUGE	1	
18	506214	PIPE COUPLER	1	
19	511249	PIPE NIPPLE	1	
20	511263	PLUG	1	
21	511248	PIPE NIPPLE	1	
22	511233	BREATHER	1	
23	511833	90 DEGREE ELBOW	1	
24	34501	RESERVOIR OIL, SIGHT GLASS	1	
25	34492	GASKET	1	
26	511257	KEY	1	
27	511258	SHAFT, IMPELLER	1	
28	511236	OIL SEAL	1	
29	511230	BREATHER	1	
30	TBD	PIPE COUPLING NPT 1/8	1	
31	512787	COUPLING, PIPE 1/8	1	
32	511265	ADAPTOR COVER	1	
33	511253	GUARD (BEARING SIGHT GLASS)	1	
34	511252	GUARD	1	
35	34514	ENGINE/PUMP COUPLER ASSY	1	
36	162	SCREW M10 X 25	8	
37	492623	LOCK WASHER, 7/16"	8	

# TRAILER ASSY.

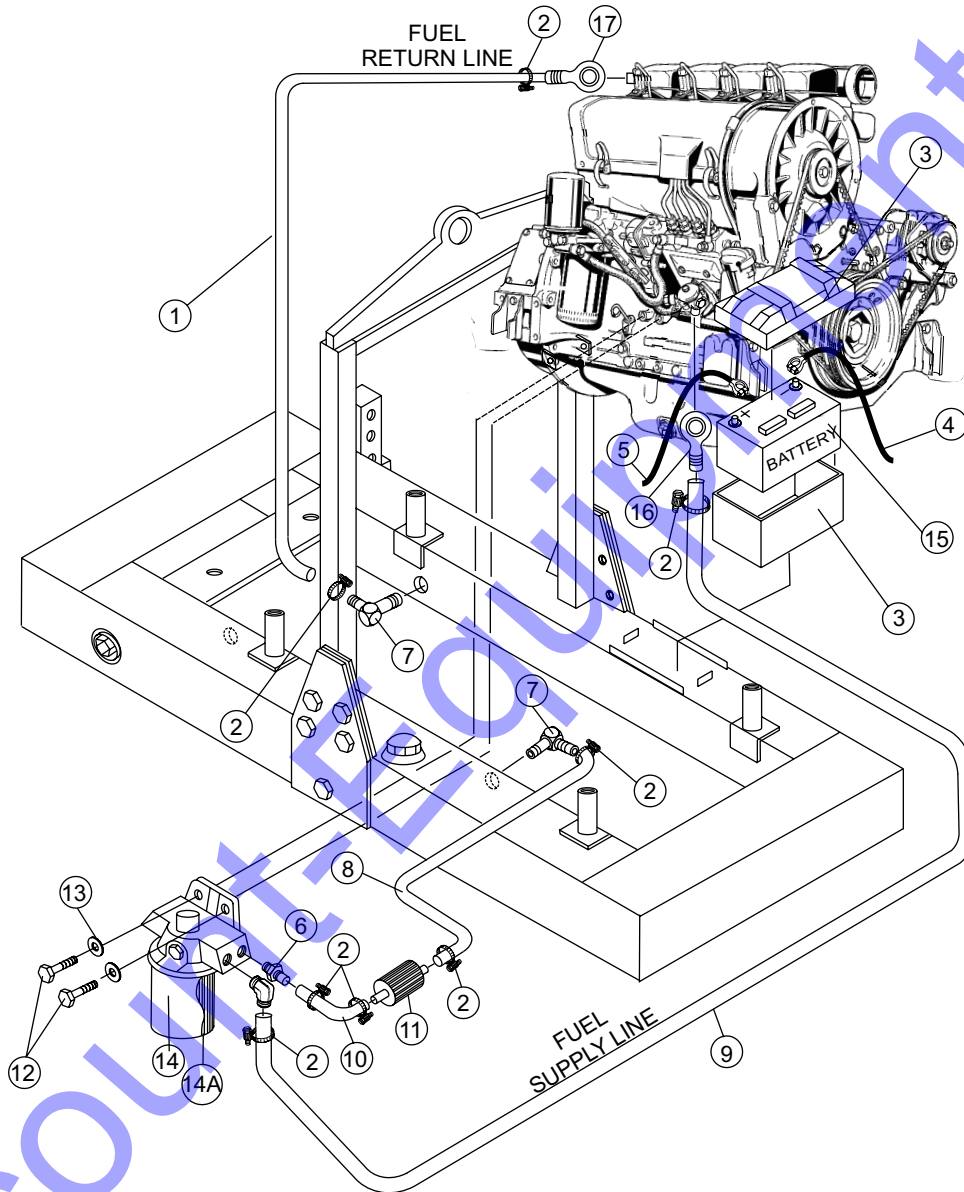


NOTES:  
△ RUBBER LIGHT SEAL IS INCLUDED WITH ITEM 2.

**TRAILER ASSY.**

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	492363	SCREW, HHC 5/16-18 X 3/4	4	
2	EM26536	LIGHT, TAIL	2	
3	511399	LIFTING BALE	1	
4	492401	SCREW, HHC 1/2-13 X 4	4	
5	6109180	WASHER, LOCK 1/2	10	
6	EM621	WASHER, FLAT 1/2	4	
7	34507	CAP, FUEL LEVEL INDICATOR	1	
8	745	PIN, COTTER	1	
9	EM744	PIN, JACK STAND	1	
10	EM70186	STAND, TRAILER JACK	1	
11	265361	BRACKET, TAIL LIGHT	2	
12	EM923343	WASHER, LOCK 5/16	4	
13	492363	SCREW, HHC 5/16 X 3/4	4	
14	512356	FENDER, TRAILER, RIGHT	1	
14A	512832	FENDER, TRAILER, LEFT	1	
15	26518	CAP, DUST	2	
16	EM26519	LUG NUT	10	
17	EM26615A	WHEEL ASSY.	2	
18	34564	AXLE ASSY.	1	
19	492584	NUT, NYLOC 1/2-13	6	
20	EM25610	JACK, TRAILER	1	
21	981635	SCREW, HHC 1/2-13 X 1	9	
22	503111	SCREW, HHC 1/2-13 X 4-1/2	3	
23	512340	TONGUE, TRAILER	1	
24	1005	LINK, CHAIN CONNECTOR	2	
25	492600	WASHER, FLAT 1/2	2	
26	19067	COUPLER, BRAKE	1	
27	505988	PLUG, ALLEN 11-1/2 NPT	2	
29	492394	SCREW, HHC 1/2-13 X 1-1/2	6	
30	492584	NUT, NYLOC 1/2-13	8	
31	512443	BRACKET, RH FENDER MOUNTING	1	
32	512444	BRACKET, LH FENDER MOUNTING	1	
33	492394	SCREW, HHC 1/2 X 1-1/2	8	
34	492396	SCREW, HHC 1/2 X 2	4	
35	512405	LIGHT CABLE HARNESS	1	
36	EE36264	PINTLE EYE 3"	1	
37	EE29228	BALL COUPLER 2"	1	

# BATTERY/FUEL ASSY.



## BATTERY/FUEL ASSY.

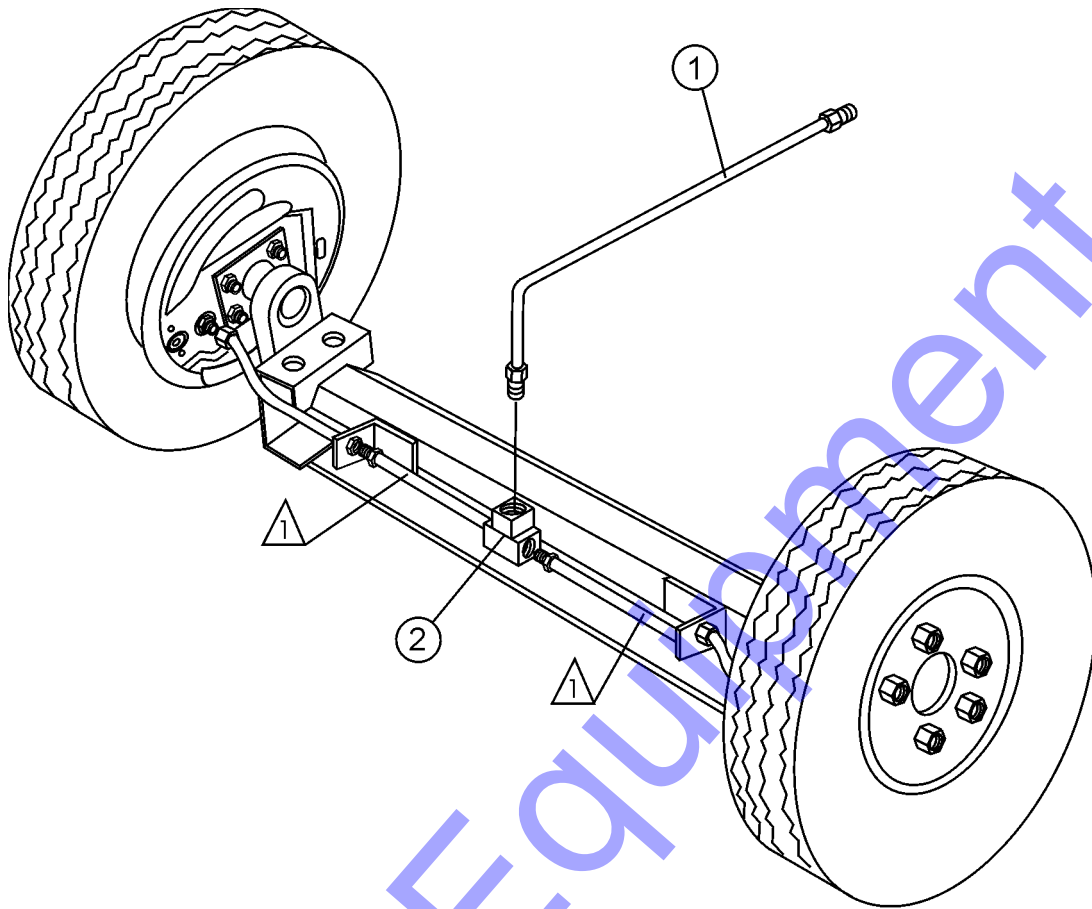
<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	511383	HOSE, FUEL RETURN, 1/4"-88"	1	
2	716	CLAMP, HOSE	8	
3	34506	BOX, BATTERY	1	
4	EM509105	CABLE, BATTERY GROUND	1	
5	EM16707	CABLE, BATTERY POSITIVE	1	
6	514561	ADAPTER, STRAIGHT	2	
7	514860	ADAPTER, ELBOW	2	
8	6636A	HOSE, SUPPLY FUEL (5/16 - 6").....	AR	SOLD BY THE FOOT
9	6636A	HOSE, SUPPLY FUEL (5/16" - 10".....	AR	SOLD BY THE FOOT
10	6636A	HOSE, SUPPLY FUEL (5/16"-6").....	AR	SOLD BY THE FOOT
11	EM20763	FILTER, FUEL	1	
12	506596	SCREW, HHC METRIC 8 X 25 P-1.25	2	
13	EM923343	WASHER, LOCK 5/16	2	
14	34505	SEPARATOR, WATER - FUEL	1	
14A	34505E	ELEMENT, FILTER	1	
15		BATTERY, 12 VOLT.....	1	NOT PROVIDED W/PUMP SEE NOTE
16	515402	FITTING, 5/16" BANJO	1	
17	515401	FITTING, 1/4" BANJO	1	

**NOTE:**

BATTERY DIMENSIONS — 6-3/4" (WIDTH) X 8-3/8" (HEIGHT) X 13" (LENGTH)  
 CAPACITY — 650 AMPS  
 RESERVE CAPACITY — 160 MIN



## HYDRAULIC BRAKE LINE ASSY.



NOTES:  
△ 1 HYDRAULIC BRAKE LINE AND FITTINGS ARE INCLUDED WITH ITEM 2.

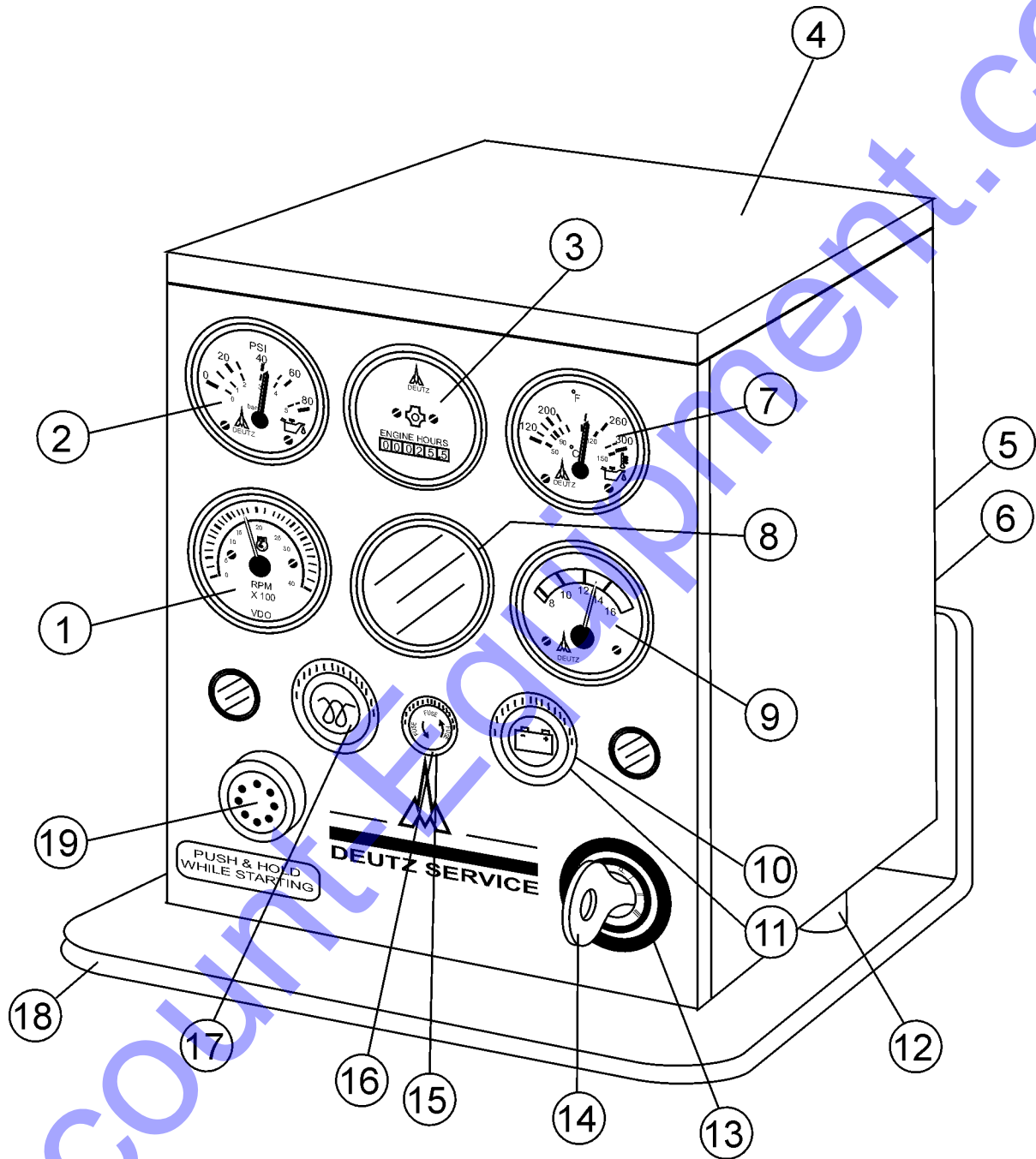
## HYDRAULIC BRAKE LINE ASSY.

---

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	34565	HYDRAULIC BRAKE LINE (SURGE)	1	
2	34566	KIT, TORSION LINES	1	

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# CONTROL BOX ASSY. (DEUTZ F4L913)



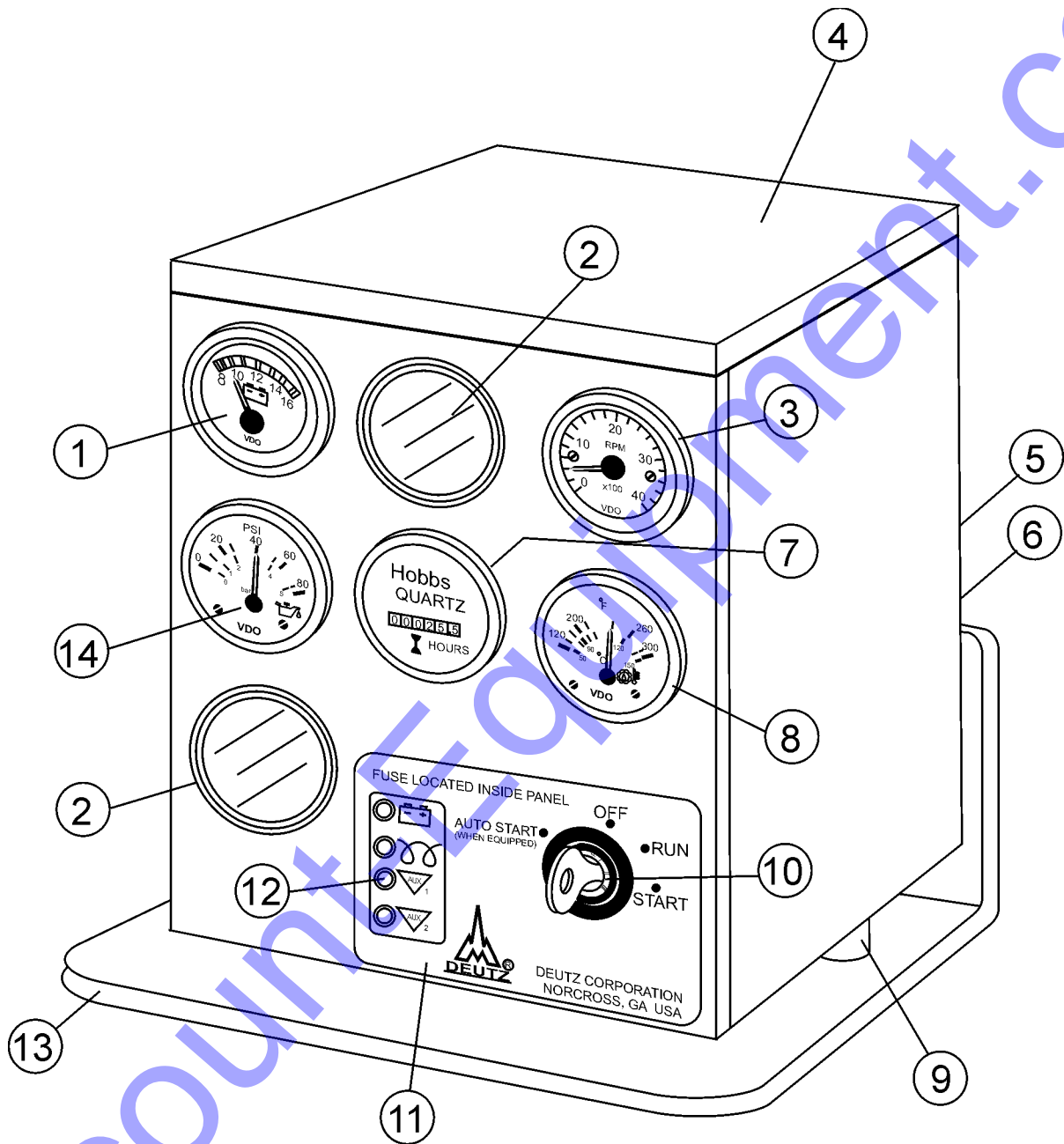
## CONTROL BOX ASSY. (DEUTZ F4L913)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1*	0302704	TACHOMETER GAUGE	1	
2*	0302700	OIL PRESSURE GAUGE	1	
3*	0302702	HOUR METER	1	
4		CONTROL BOX ASSY. (COMPLETE).....	1.....	INCLUDES ITEMS W/ * DISCONTINUED - SEE NOTE
5*	0302720	RECEPTACLE WHITE	1	
6*	0302721	RECEPTACLE YELLOW	1	
7*	0302701	TEMPERATURE GAUGE	1	
8*	0302705	BLIND COVER (LARGE)	1	
9*	0302703	AMMETER	1	
10*	0302710	BATTERY CHARGE LAMP	1	
11*	0302711	12 VOLT 2 WATT BULB	1	
12*	0302729	ISOLATION SHOCKS 5/16	3	
13*	0302735	IGNITION SWITCH	1	
14*	0302736	IGNITION SWITCH KEY	1	
15*	0302708	FUSE HOLDER	1	
16*	0302709	FUSE, 15 AMP	1	
17*	0302707	PREHEAT LIGHT HOLDER.....	1.....	FUNCTION NOT USED
18*	0303053	CONTROL PANEL MOUNTING BRACKET	1	
19*	0302712	OIL SHUT-DOWN BYPASS SWITCH.....	1.....	INCLUDES RUBBER BOOT

**NOTE:**

Replace with newer style box and wiring harness.

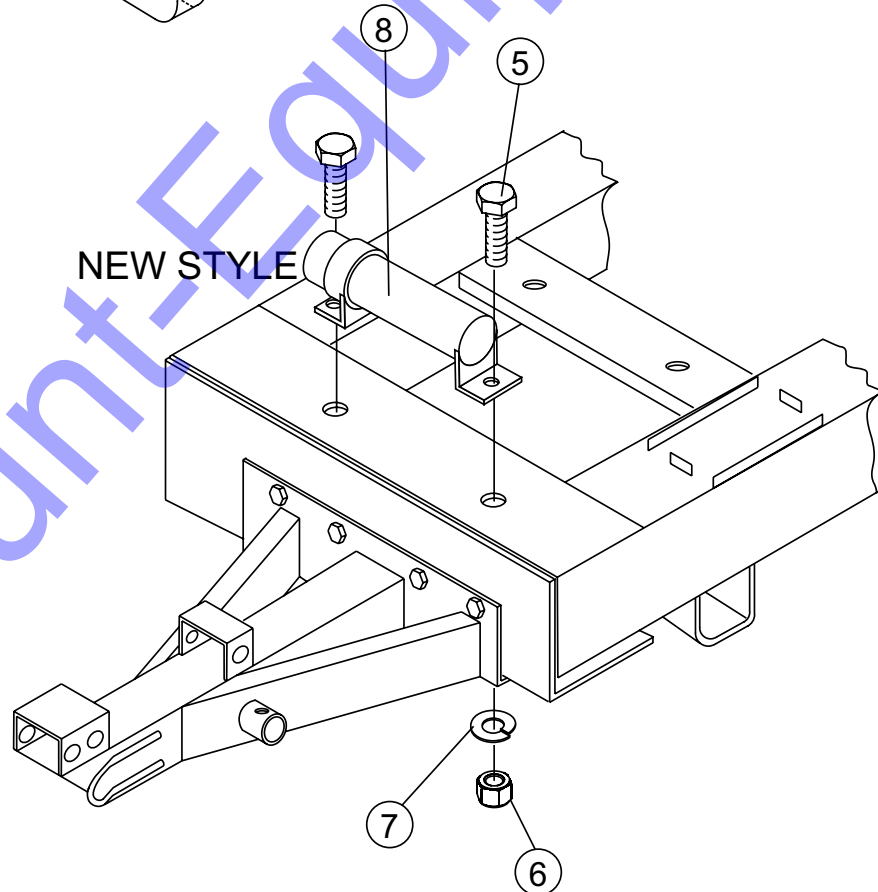
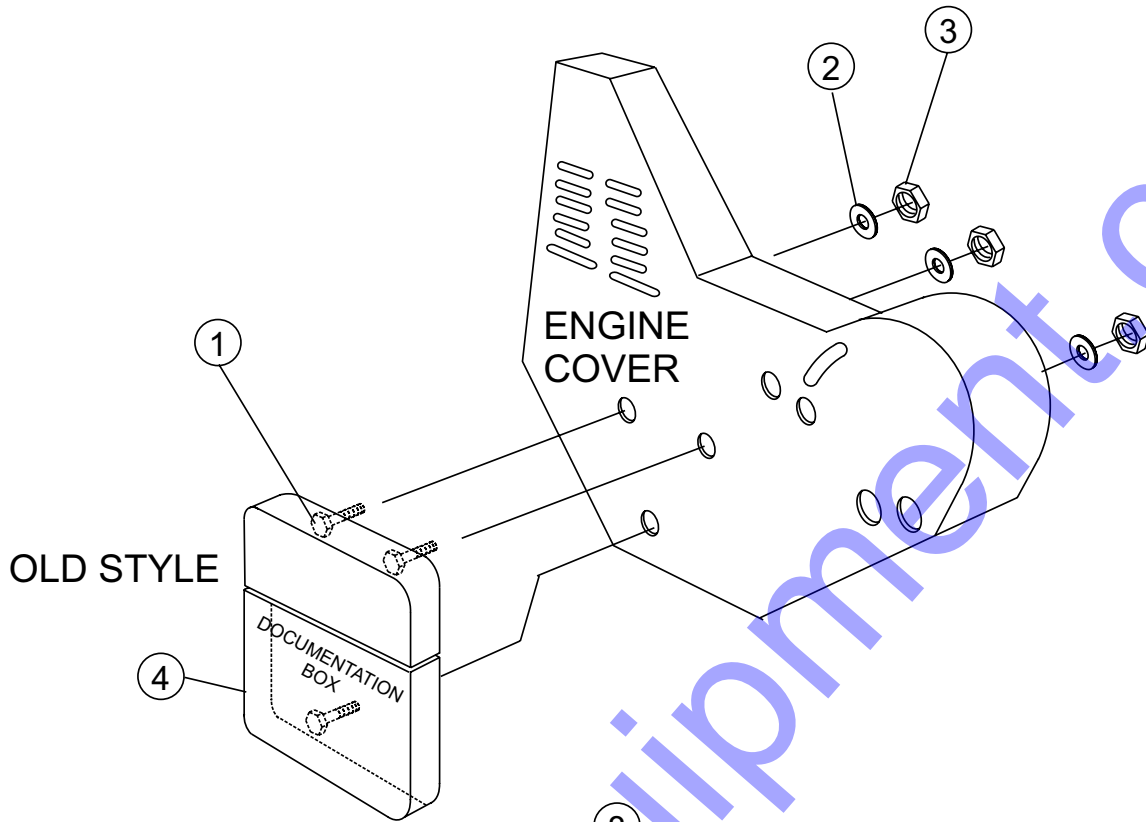
# CONTROL BOX ASSY. (DEUTZ F4L914/D914)



## CONTROL BOX ASSY. (DEUTZ F4L914/D914)

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1*	550-4012-01	GAUGE, VOLTMETER 12V	1	
2*	550-0002-00	BLIND COVER, BLACK 2-1/16"	2	
3*	550-1000-01	GAUGE, TACHOMETER 12V 4000 RPM	1	
4	999-0501-00	CONTROL BOX ASSY. (COMPLETE) .....	1.....	INCLUDES ITEMS W/ * REPLACED BY ITEM W/ #
4#	517159	CONTROL BOX ASSY (NEW STYLE)	1	
5*	043-1008-02	RECEPTACLE WHITE	1	
6*	043-1008-01	RECEPTACLE YELLOW	1	
7*	550-0000-03	GAUGE, HOURMETER, 12-60VDC	1	
8*	550-6300-01	GAUGE, TEMP. OIL 300 12V	1	
9*	180-0516-00	ISOLATION SHOCKS 5/16-18 STUD	3	
10*	EM98206	IGNITION SWITCH IP63 W/KEYS	1	
11*	610-1039-06	OVERLAY 4 LED W/DEUTZ	1	
12*	070-0010-00	LENS, LED RED	4	
13*	115-0810-00	CONTROL PANEL MOUNTING BRACKET	1	
14*	550-3080-01	GAUGE OIL 80 PSI 12VDC	1	

# DOCUMENTATION BOX ASSY.



## DOCUMENTATION BOX ASSY.

<u>NO.</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY.</u>	<u>REMARKS</u>
1	EM963003	SCREW, HHC 1/4-20 X 3/4	3	
2	EM923057	WASHER, FLAT 1/4	3	
3	EM969079	NUT, NYLOC 1/4-20	3	
4	29057	MANUAL HOLDER (OLD STYLE).....	1.....	NO LONGER AVAILABLE
5	492356	BOLT, 1/4" NC X 3/4" G5	2	
6	492541	NUT, 1/4"	2	
7	EM923057	LOCK WASHER, 1/4"	2	
8	23297	MANUAL HOLDER (NEW STYLE)	1	



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