

HARRIS RESEARCH, INC.

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CTS 450 Hot Carbonating Truckmount System™

Manufactured Exclusively for **ChemDry**

By



Mukilteo, Washington

Machine Serial Number _____

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Revised October 04, 2005
Revision 6

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Introduction

This manual contains installation and operation instructions as well as information required for proper maintenance.

Unlike a garden tractor, lawn mower or cement mixer, all having one or two functions to perform, the Truckmounted carpet cleaning machine has many functions to perform simultaneously.

- The engine has to run at a consistent RPM.
- The vacuum has to pull air and dirty water back from cleaning site.
- The air compressor pressurizes the chemical tanks, this provides stable pressure and proper solution flow for cleaning.
- The heating system must maintain proper heat.
- The vacuum tank must store dirty water until drained.

As you can see, it is not just a turn-key operation with one thing to worry about, **Does it start?**

◆Warning◆

The manufacturer uses this symbol throughout the manual to warn of possible injury or death.

◆Caution◆

The manufacturer uses this symbol to warn of possible equipment damage.

Precautions

◆ Caution ◆

1. Engine Cooling

Units employing internal combustion engines must not be enclosed within a van with doors and windows closed. Excessive temperatures within the engine will result in premature engine failure and a compromise of applicable warranty.

◆ Caution ◆

2. Level Operation

During operation, van or trailer must be parked on level ground not to exceed + or – 10 degrees. Failure to ensure proper leveling may prevent proper internal lubrication of engine, vacuum and/or high pressure components.

◆ Warning ◆

3. Moving Parts

Never touch any part of the machine that is in motion. Severe bodily injury may result.

◆ Caution ◆

4. Freeze Protection

There is often little warning before a cold spell. Failure to protect this equipment from freezing will result in costly down time. Placing an electric heater in the truck or parking the truck indoors will help to insure against freezing, but should not be the primary method of freeze protection.

◆ Warning ◆

5. Exhaust System

Do not allow flammable material (i.e. oil, fuel, plastic, or wood products) to come in contact with the exhaust system.

◆ Warning ◆

6. Hot Surfaces

During the operation of this equipment, many surfaces on the machine will become very hot. When standing in the proximity of the van, care must be taken not to touch any hot surface such as the heater, engine, exhaust, and etc.

◆ Warning ◆

7. Hearing Protection

The Occupational Safety and Health Administration (OSHA) recommends the use of hearing protection when a technician is exposed to an average of 85

decibels. This is an average of exposure over an 8 hour period. This equipment can produce 85 decibels to a distance of 10 feet. Please check with your local state agencies to see if OSHA standards apply to your machine use.

◆ Warning ◆

8. Carbon Monoxide

This unit generates toxic fumes. Position the vehicle so that the fumes will be directed away from the job site. Do not park where exhaust fumes can enter a building through open doors, windows, air conditioning units, or kitchen fans.

◆ Warning ◆

9. Toxic Fumes

Do not occupy the vehicle when the cleaning equipment is operating. Toxic fumes may accumulate inside a stationary vehicle.

◆ Warning ◆

10. Engine Exhaust

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

◆ Warning ◆

11. Carburetor Drain

Under no circumstances should the drain in the carburetor bowl be used when the machine is hot.

◆ Warning ◆

12. Portable Gas Tank

Never operate this machine with a portable gas can inside the truck. Doing so increases the risk of a fire or explosion.

◆ Warning ◆

13. Transportation of Fuel Containers

Transportation in a vehicle of any vented fuel container that presently has or has ever contained a flammable liquid is strictly forbidden by Harris Research Inc. and by federal and state regulations.

◆ Warning ◆

14. Vacuum System

When machine is being run for test purposes and the vacuum inlet on top of the machine is open, caution should be used.

To protect the vacuum blower from over loading and damaging itself, there is a vacuum relief system installed on the vacuum tank. When the vacuum tank inlet

is completely sealed off, a maximum of 14 inches Hg will be attained. At the end of each day, an oil based lubricant should be sprayed into the blower lubrication port before shutting down the machine. If this operation is not performed daily the vacuum blower will develop rust deposits from moisture and will decrease the life of the vacuum blower.

◆Caution◆

15. Vacuum Tank

Foam passing through the blower could lead to equipment malfunction. Therefore, it is important to keep the vacuum tank foam free.

◆Warning◆

16. Vacuum Hose

Do not leave the vacuum hose unattended during operation. This could cause bodily injury.

Responsibilities

The **Purchaser's** responsibilities are:

Reading of Owner's Manual: It is the purchaser's responsibility to read the unit operation manual and to familiarize himself with the information contained therein. *Special attention should be paid to all **Cautions and Warnings.***

Prior to arrival of unit, install exterior plywood flooring in the vehicle and we suggest sealing with a sealer.

Purchase a heavy duty 42 - 60 amp hour battery and have the battery 'slow' charge if new. If the battery is not fully charged, damage can occur to the engine charging regulator.

The **Equipment Installer** responsibilities are:

ACCEPTANCE OF SHIPMENT:

1. If the unit shows any outward signs of damage, do not sign the delivery receipt until you have closely inspected the unit and noted any damage on the delivery receipt.
2. The equipment installer is responsible for the correct installation of the unit in your vehicle and thoroughly training you in its operation, maintenance and precautions.

Correct Installation Includes:

- Installation of through-floor fittings for gasoline fuel lines.
- Placing the unit and recovery tank in your vehicle and securing them with bolts or tie down cleats.
- Install and connect the fuel pump.
- Connecting gasoline lines.
- Connecting the battery.
- Checking the vacuum blower and engine oil levels prior to starting the unit.
- Starting the unit to check engine and see that all systems function normally.
- Checking all hoses, wands, etc. for correct operation.

NOTE: Under certain circumstances, machines may require modification for optimal performance. Certain environmental conditions may require engine modification or control function calibration.

Training Shall Include:

- A thorough review of the operation manual with purchaser.
- A thorough review of the unit warranty and warranty procedures.
- Instruction and familiarization in:
 1. How to correctly start up and shut down the unit.
 2. How to correctly clean with the unit.
 3. Where and how often to check and change component oil levels.
 4. How the unit's systems work.
 5. How to troubleshoot the unit.
 6. How to do basic repairs.
 7. Safety precautions and their importance.
 8. Freezing damage and how to avoid it.
 9. Cleaning the orifices and how they function in the system.

Vehicle Preparation

The preferable vehicle for the CTS 450 Truckmount installation is a cargo van with a heavy-duty suspension package. The van should have a minimum ¾ ton capacity.

Be cautious when drilling any holes through the van floor. Many vans have critical components mounted directly below the van floor that could be damaged by a misplaced drill bit. (See Product Support Bulletins 92102, 94062 and 94063 at the end of this manual.)

TRUCK PREPARATION

The manufacturer recommends the installation of plywood flooring, in the vehicle prior to installation of machine.

This provides a metal-to-cushion mounting rather than metal-to-metal, insulation and makes an attractive van interior.

Materials Needed:

1. 2 sheets 4 x 8 x 5/8" exterior plywood
2. 1 Gallon Polyurethane Wood Sealer
3. 16 - 1½" sheet metal screws

(See illustration for correct placement of plywood flooring)

Roof Vents

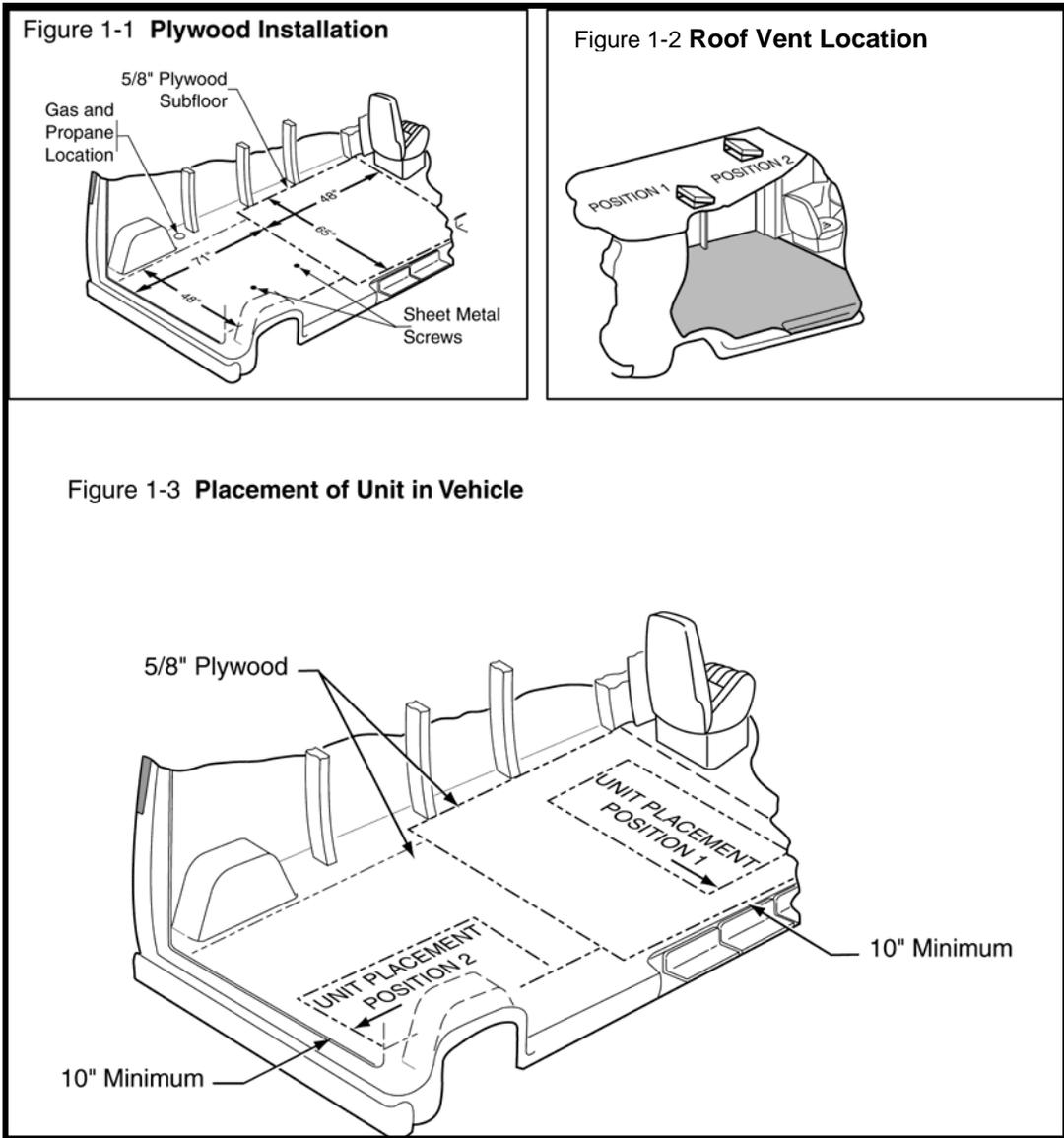
Harris Research strongly recommends installing roof vents in vehicles operated in hot weather locations.

PLACEMENT OF UNIT IN VEHICLE

There are two recommended unit placements described below and illustrated in Figure 1-3.

1. SIDE DOOR:

Most installations are side door. This provides rear access for accessories and hoses as well as unobstructed access to the component/working side of the machine, thus making it a bit easier to perform maintenance and/or repair without removing the unit from the truck.



2. REAR DOOR:

Although this location partly limits working access, it does direct the noise away from the cleaning site. Some cleaners in the colder areas prefer this location

because it puts the weight over the rear wheels for better traction in ice and snow. Rear mounting requires the unit to be slid to the right side as far as possible. This not only provides adequate working space on the component side of the unit but also improves weight distribution inside the van (engine and component weight line up over drive shaft). Also, it is physically easier to load the unit into the rear door due to the height of the van bed.

◆ Warning ◆

Ensure that the machine is well secured to the floor of the van with the hardware supplied. A sudden or crash stop will cause the machine to rocket forward, all 600 lbs. worth! Protect yourself and the machine. **SECURE IT!**

◆ Warning ◆

It is recommended by the manufacturer that the exhaust from the front of the machine be directed in such a way as to prevent carbon monoxide from entering the job site. **Always park the truck so the exhaust is blowing away from the job site.**

The manufacturer also recommends the installation of vents in the truck roof to allow heat to escape for hot weather applications.

Mount a fire extinguisher just inside the rear or side door for emergencies.

◆ Warning ◆

Never operate this machine with a portable gas can inside the truck. Doing so increases the risk of a fire or explosion.

◆ Warning ◆

Transportation in a vehicle of any vented fuel container that presently holds or has ever held a flammable liquid is strictly forbidden by Harris Research Inc. and by federal and state regulation.

◆ Warning ◆

Do not use a portable propane tank inside of the truck or van. It is dangerous and illegal in most states.

◆ Warning ◆

If the battery location is at your option, first make sure it is in an approved battery container and that it is covered and secured to the floor of the vehicle. Make sure the battery is isolated from hot machine components. This will cause the battery to last longer and also prevent the possibility of fire or explosion.

General Information

Primary System Components

Frame: 24.5"W x 47.75"L x 37.375"H

Weight: 600 lbs.

Engine

Gasoline: Daihatsu Liquid Cooled 3 Cylinder, Cast Iron Block
Displacement: 697cc/23.5 HP
Ignition: Electronically Triggered Coils (1 per cyl.)
12 v Electric Starter Motor
12 v, 40 amp Alternator, Regulated
Electronic Governor
Pressurized Oil System with Filter
Pressurized Cooling System
Triple Row Radiator

Engine

Diesel: Daihatsu Liquid Cooled 3 Cylinder, Cast Iron Block
Displacement: 697cc/23.6 HP
12 v Electric Starter Motor
12 v, 40 amp Alternator, Regulated
Electronic Governor
Pressurized Oil System with Filter
Pressurized Cooling System
Triple Row Radiator

Air Compressor: Gast, PCA-10 Oil-less Piston

Vacuum Blower: Proprietary Tuthill, 4005 Dominator Tri Lobe

Solution System: Dual High Pressure Tank compressed air fed

Heating System: 1 Stainless Steel Coil Blower Exhaust Heat Exchanger
1 Stainless Steel Coil Coolant Heat Exchanger

Drive System: Proprietary Engine to Blower Drive Bell Housing (Patent Pending)

Instruments and Controls: Solution Temperature Gauge, 0-250°F
Engine Coolant Temperature Gauge, 0-250°F
Vacuum Level Gauge, 0-30" Hg

Hour Meter, Machine Run Time
Overheat Shutdown Lamp
Overheat Engine Lamp
Glow Plug Lamp (Diesel Only)
Engine Oil Pressure Lamp
Pump Out Operating Lamp
Vacuum Tank Full Lamp
Keyed Ignition
Circuit Breakers Panel
Electronic Three Speed Engine Throttle
Recovery Tank Drain Valve
Manual Engine Choke

Instruments and Controls (Cont.): Blower Lubrication Port
Auto Pump Out Switch

Recovery Tank: 50 gallon Aluminum, Epoxy Finish (Optional)
100 gallon Aluminum, Epoxy Finish

High Pressure Hose: 3/16" High Temperature, Lined, Vinyl Covered
Hose rated to 2200 PSI, 250° F.

Vacuum Hose: 2" Reinforced

Standard Equipment: Machine Power Console
Full Instrumentation
Gast Air Compressor
Tuthill Dominator Tri-Lobe™ Vacuum Blower
Stainless Steel Water Heating Package
Vacuum Recovery Tank
2 Five Gallon Stainless Steel Solution Tanks with holder
1 2 ½ Gallon Stainless Steel Air Tank
150 ft, 2" Vacuum Hose
150 ft, 3/16" Solution Line
10 ft, 1½" Recovery Drain Line
Battery Box
Van Installation Kit
Operation Manual

Machine Layout, Gasoline Version

Recovery Tank – Holding tank for solution recovered from the carpet

Engine Mode Switch – Controls the speeds of the engine.

Choke – Pull style cable for cold starts.

Compressor Valve – Allow compressed air to be purged from the system

Solution Valve – Allows priming of the high temperature solution to be purged from the system.

Solution Outlet – Hook up for the 3/16" solution hose

Lube Port – Allows the blower to be lubricated.

Vac. Hose Hook Up – Hook up for the 2" vacuum hose.

Dump Valve – Allows the recovery tank to be dumped manually into a treated sanitary system (i.e. Toilet).

Ignition Switch – Main power control to the machine.

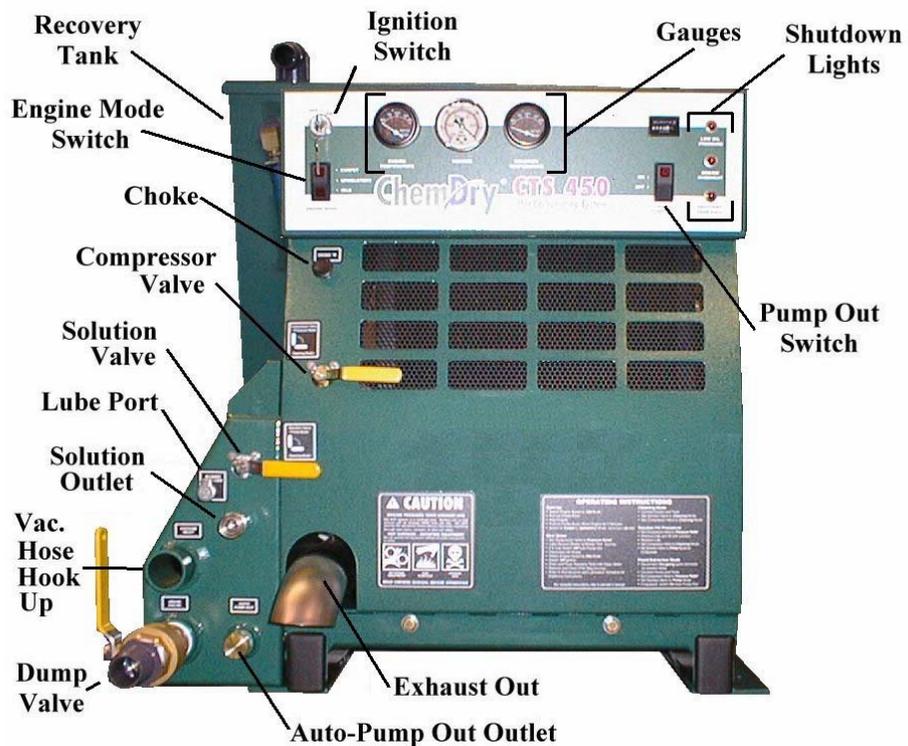
Gauges – Instruments that display engine temp, solution temp (older versions), and vacuum.

Shutdown Lights – Shows what safety switch has activated.

Pump Out Switch – Electrical switch to activate Automatic Pump Out.

Exhaust Out – Engine and Blower exhaust outlet.

Auto-Pump Out Outlet – Hook up for the pump out garden hose.



Machine Layout, Diesel Version

Engine Mode Switch – Controls the speeds of the engine.

Hour Meter – Keeps track of machine usage.

Water Separator – Removes moisture from the fuel.

Glow Plug Light – Indicates that they are pre-heating the combustion chamber.

Compressor Valve – Allow compressed air to be purged from the system

Solution Valve – Allows priming of the high temperature solution to be purged from the system.

Solution Outlet – Hook up for the 3/16" solution hose

Lube Port – Allows the blower to be lubricated.

Vac. Hose Hook Up – Hook up for the 2" vacuum hose.

Dump Valve – Allows the recovery tank to be dumped manually into a treated sanitary system (i.e. Toilet).

Ignition Switch – Main power control to the machine.

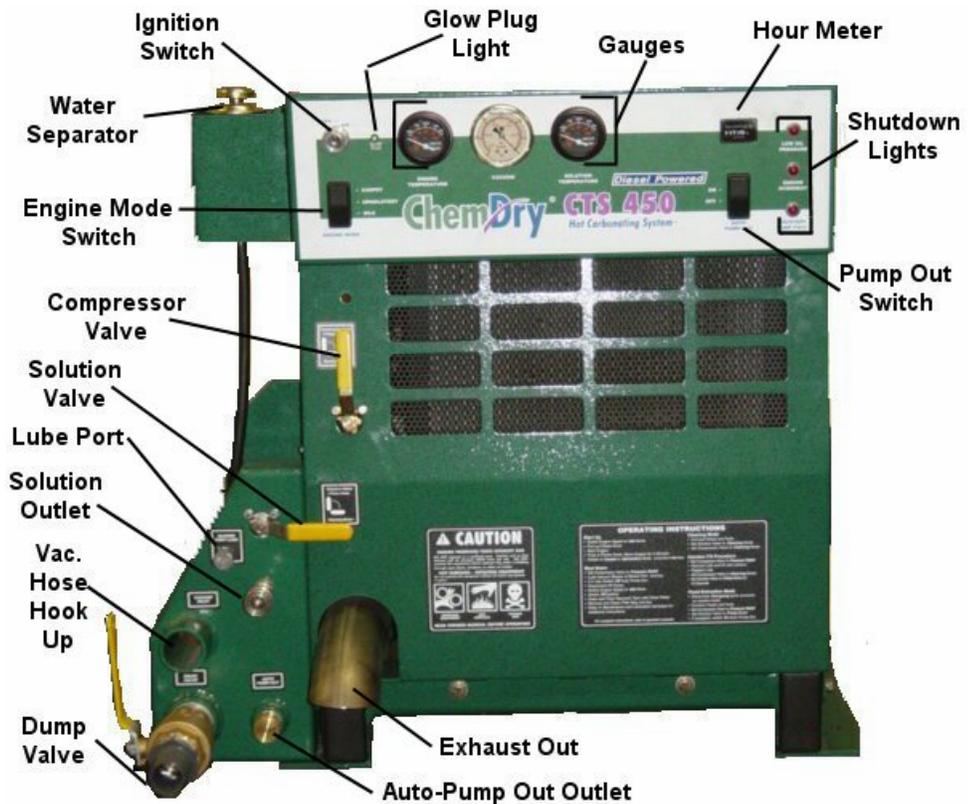
Gauges – Instruments that display engine temp, solution temp (older versions), and vacuum.

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Pump Out Switch – Electrical switch to activate Automatic Pump Out.

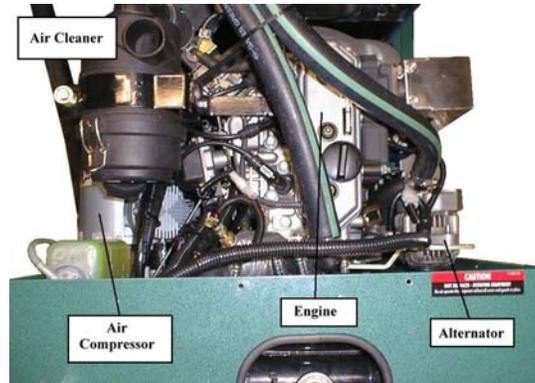
Exhaust Out – Engine and Blower exhaust outlet.

Auto-Pump Out Outlet – Hook up for the pump out garden hose.

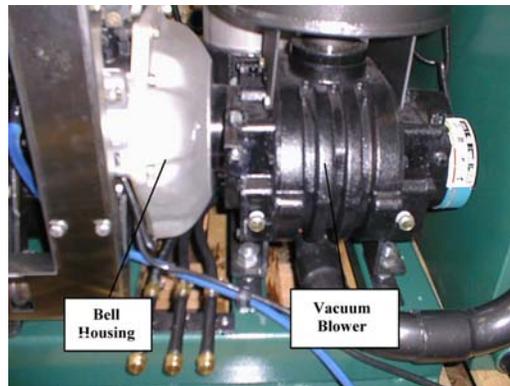


System Description

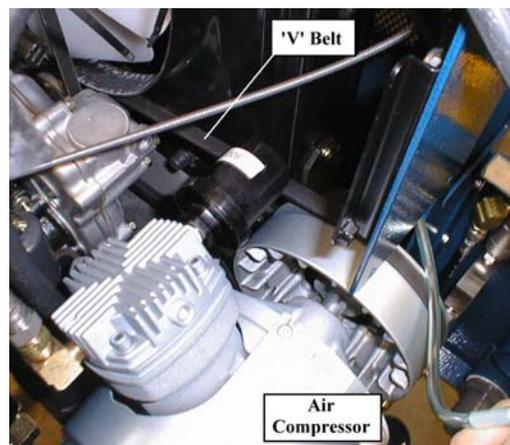
The engine produces the power required to operate the vacuum pump and air compressor.



The vacuum pump is driven through the drive bell housing by the engine.



The air compressor is driven by a v-belt located at the front of the engine.



The engine, vacuum pump, air compressor, drive system, and heat exchangers are the primary components of the cleaning system. The objective of this system is to move cleaning solution from the solution tanks to the surface in need of cleaning, and eventually back to the recovery tank. The first part of this process is to move the cleaning solution out of the solution tanks. This is accomplished by pressurizing the solution tanks with the air compressor. The compressed air pushes the solution out of the tanks and through hoses to the mixing manifold.

The mixing manifold regulates the flow of A and B cleaning solutions; with a series of filters, check valves, and orifices. The solution then flows through the heat exchange system, and into the outlet manifold. The outlet manifold contains a temperature sender, solution valve, pop off valve, and solution outlet. If the wand trigger is in use and the solution is at the desired temperature, the chemical solution will flow through the solution outlet. The solution valve and the pop off valve send the solution to the recovery tank.

The heat exchange system elevates the cleaning solution to the desired temperature. This system is comprised of two main components. The first component is the engine coolant heat exchanger, and the second is the blower exhaust heat exchanger. The engine coolant heat exchanger has two primary parts. These parts are the stainless steel coil that the cleaning solution flows through and the outer shell that contains the engine coolant. The blower exhaust heat exchanger is the same as the coolant heat exchanger with the exception of the outer shell that contains the exhaust from the blower.

The heating process begins when the engine coolant flows through the outer shell of the engine coolant heat exchanger. The cleaning solution is preheated as it flows through the inner coil of the engine coolant heat exchanger. The solution then flows into the blower heat exchanger coil, which is heated by the blower exhaust. Once the cleaning solution has passed through the heat exchangers the flow is directed to the outlet manifold then to the cleaning tool.



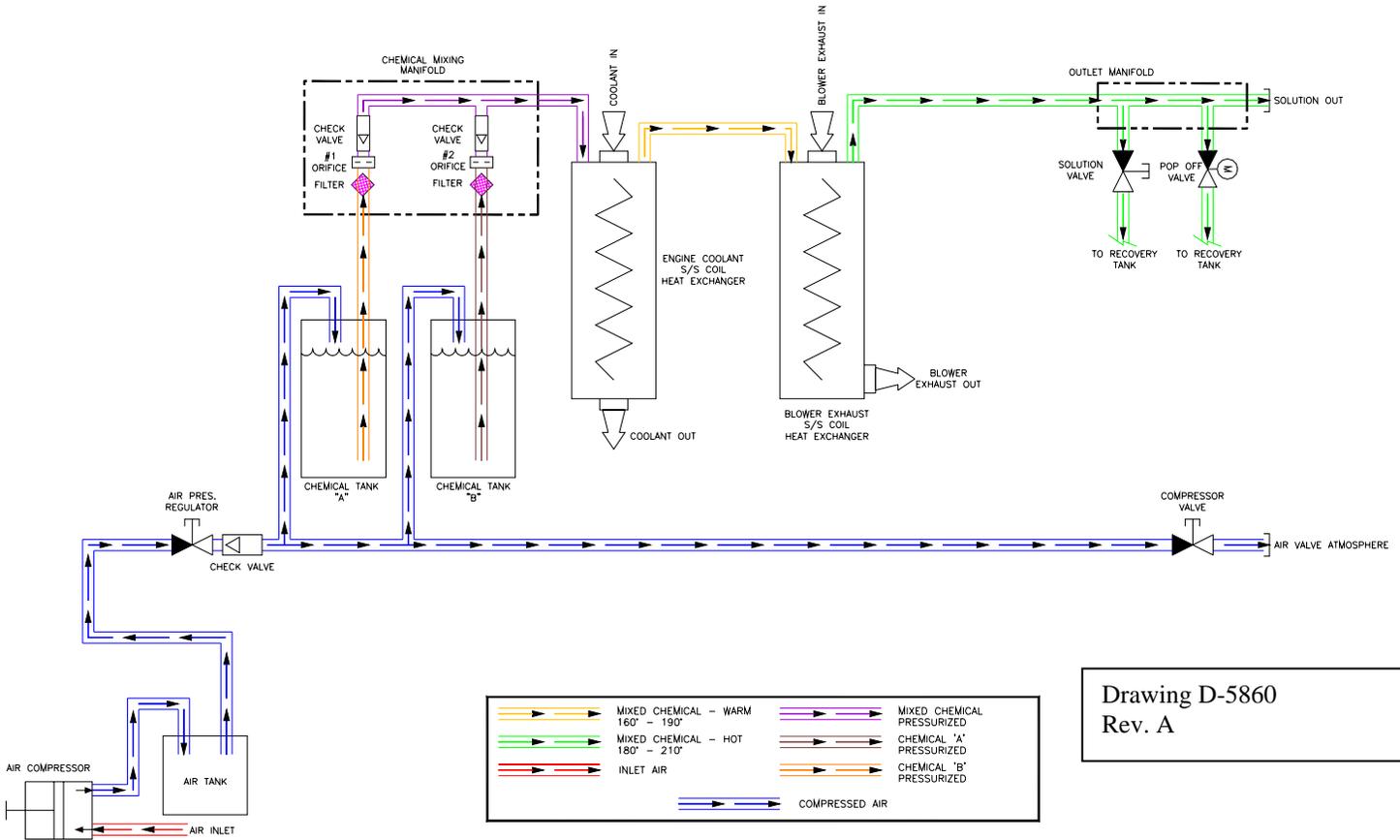
Compressor Valve

The purpose of this valve is to manually relieve the system of compressed air. This is done in situations such as removing the lids on the solution tanks.

Solution Valve

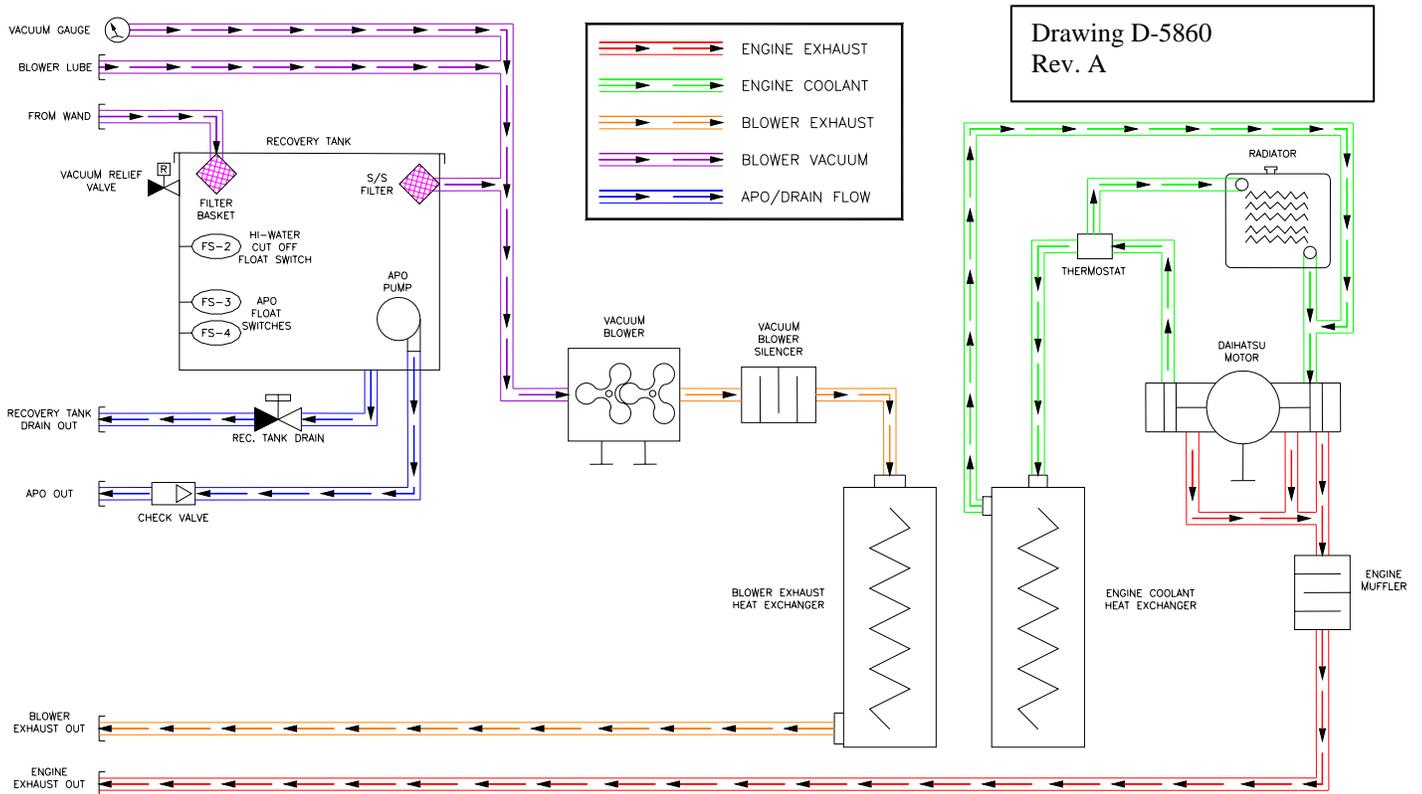
The purpose this valve is to relieve the system of excessive pressure on the solution side. This is done in situations such as “Flood Damage Mode” or in a case of the machine running for an extended period of time with no solution hoses hooked up. The pressure build up in the heat exchangers and hoses can be too high for the solution hose to be hooked up. By turning this valve to prime, it will relieve the pressure and allow the solution hose to be connected. The valve can also be used for priming the solution.

Solution Flow Diagram:



Drawing D-5860
Rev. A

Exhaust Flow Diagram:



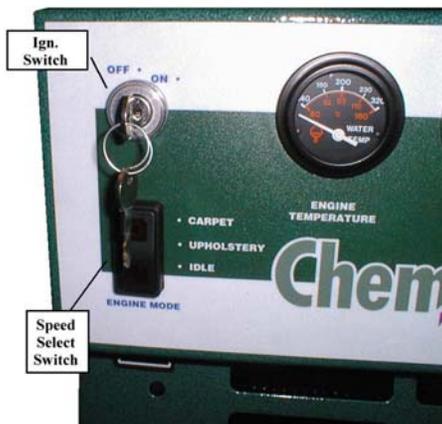
Operating Instructions

◆ Warning ◆

**Do not jump start machine!
Damage may occur to Electrical
System!**

Start Up, Gasoline Engine

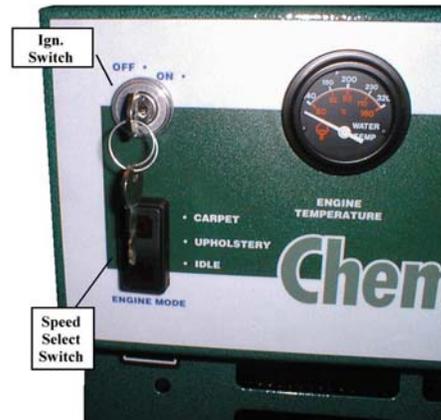
1. Perform daily and periodic maintenance as specified in this Owner's Manual.
2. Pull out Choke knob.
3. Switch engine speed to IDLE position.
4. Start engine.
5. Push in Choke knob.
6. Allow engine to warm up in the idle position for 3-5 minutes.
7. Switch engine speed to CARPET or UPHOLSTERY.



Start Up, Diesel Engine

1. Perform daily and periodic maintenance as specified in this Owner's Manual.
2. Switch engine speed to IDLE position.
3. Turn the ignition switch to the "ON" position. Wait for the "Glow Plug Light" to turn off.

4. Start engine.
5. Allow engine to warm up in the idle position for 3-5 minutes.
6. Switch engine speed to CARPET or UPHOLSTERY.



Notes

- ⇒ The engine throttle has three settings: IDLE, UPHOLSTERY, and CARPET.

◆ Warning ◆

The machine cannot be run in the IDLE position for cleaning upholstery, carpet or flood extraction. This will void the warranty.

- ⇒ The machine operates at a pressure of 100 - 120 psi.

Carpet or Upholstery Cleaning

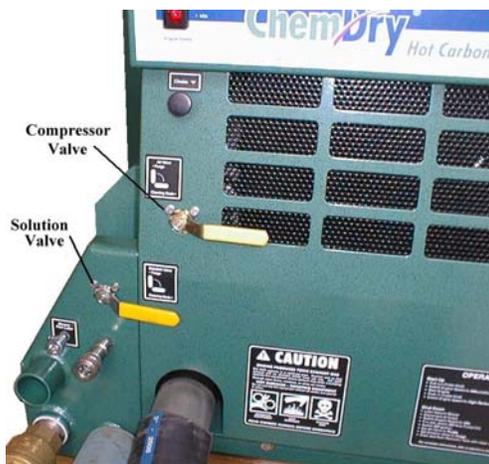
1. Fill solution tanks with A and B solution.
2. Position the Compressor Valve to CLEANING MODE.
3. Position the Solution Valve to CLEANING MODE.
4. Connect the solution and vacuum hoses to the tool.
5. Commence cleaning.

Notes

- ⇒ If the Solution Valve is left in the PRIME position, the solution will evacuate from the chemical tanks into the recovery tank.
- ⇒ If the solution tanks run dry, air will fill the system. After the solution tanks have been filled, with solution, purging the air from the system may require several minutes. This can be expedited by turning the solution valve to prime for 15 seconds, then returning the valve to cleaning mode.

Flood Extraction

1. Position Solution Valve to PRIME mode.
2. Position Compressor Valve to PRESSURE RELIEF.
3. Connect vacuum hoses and tool.
4. If equipped, switch Auto Pump Out to ON.
5. Disconnect out-going quick connects on chemical tanks.



Notes:

- ⇒ The Compressor Valve **must be** positioned in the PRESSURE RELIEF during flood extraction. If the valve is left in the CLEANING MODE, this may cause damage to the air compressor and related components.
- ⇒ The Solution Valve **must be** positioned in the PRIME mode during flood extraction. If the valve is left in the CLEANING MODE, the system may build up excessive pressure, which could cause damage to the machine.

Solution Fill Procedure

1. Position Compressor Valve to PRESSURE RELIEF.
2. Remove the lids from the solution tanks.
3. Disconnect hoses if necessary.



4. Fill solution tank A with Natural III-A solution.
5. Fill solution tank B with Natural III-B solution.
6. Replace the lids on the chemical tanks.
7. Reconnect hoses if necessary.

8. Position the Compressor Valve to CLEANING MODE.

Air Tank

The system is supplied with a 2-½ gallon air tank to help deliver a steady supply of air to the solution tanks. The air tank will slowly fill with water due to condensation. This tank should be removed and emptied daily. Water dripping from the regulator is a sign that the air tank is full of water.

1. Position Compressor Valve to PRESSURE RELIEF.
2. Disconnect the two hoses and remove the tank from the van.
3. Remove the tank lid and dispose of the water.
4. Reattach the lid and connect the hoses.
5. Position the Compressor Valve to CLEANING MODE.

Shut Down

1. Set Compressor Valve to PRESSURE RELIEF.
2. Lube vacuum blower at blower port. (End of Day)
3. If in use, switch OFF Auto Pump –Out.
4. Disconnect all hoses.
5. Switch engine speed to IDLE mode.
6. Switch OFF ignition.
7. Drain and Flush recovery tank with clean water.
8. Remove and clean filter bag. (End of Day)

Safety Shut Down

This machine is equipped with three safety shutdowns. This will alert you

by shutting down the machine and activating one of the lights.

The three machine shutdowns are:

Low Oil Pressure – This will activate when the engine loses oil pressure.

Engine Overheat – This will activate when the engine coolant temperature reaches 245° F.

Recovery Tank Full – This will activate once the recovery tank has reached its full capacity.



General Operating Information

1. In accordance with state and local EPA laws, do not dispose of wastewater into gutters, storm drains, streams, reservoirs, etc. Dispose wastewater into a treated sanitary system.
2. Perform daily maintenance as prescribed in this manual.

Maintenance

Engine

Quick Reference List

- ❑ Check air filter
- ❑ Drain oil.
- ❑ Change oil filter.
- ❑ Fill oil.
- ❑ Remove and replace spark plugs.(Gasoline Engine Only)
- ❑ Set spark plug gap.(Gasoline Engine Only)
- ❑ Check coolant overflow bottle.
- ❑ Check radiator coolant level.
- ❑ Change fuel filter
- ❑ Visually check alternator belt.
- ❑ Visually check compressor belt.
- ❑ Tighten belts.
- ❑ Loosen belts.
- ❑ Check exhaust system (doughnut gaskets).

Engine Air Filter

1. Unlock the two clamps and remove cover.

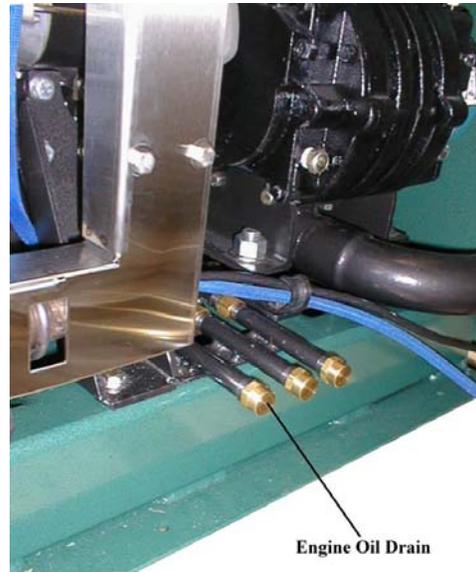


2. Remove air filter cartridge.
3. Carefully clean out cartridge.
4. Reinstall air filter cartridge.
5. Install cover and lock clamps.

Note: Do not use pressurized air or solvents to clean cartridge.

Engine Oil and Filter Change

1. Remove oil drain cap located on right center bottom side of machine. Do not reinstall cap until you begin filling the engine with oil (refer to step 4)



2. Remove oil filter located on the left side of the engine.





3. Apply oil to the new oil filter gasket. Install oil filter.
4. Remove the oil fill cap located on top of the valve cover.
5. Begin filling engine with 30W. After the oil begins to flow out of the oil drain fitting, re-install the cap. This will allow air to evacuate from the system and give accurate oil level readings. **Failure to do this step will result in an insufficient amount of oil in the engine!** Engine oil capacity is 3.5 quarts.
6. Check oil dipstick for proper level.
7. Re-install the oil fill cap.

Tools

- ⇒ 11/16 inch wrench,
- ⇒ Oil filter wrench

Engine Coolant

1. **Daily**, check the coolant overflow jug for the proper amount of coolant. The fluid level should reach the top line.



2. **Weekly**, remove the radiator cap and check the coolant for proper level. This level should be approximately 1/2 inch from the top.



3. When adding coolant to the system, use a mixture of 50% antifreeze and 50% distilled water.

Spark Plug Replacement. Gas Engine Only

The spark plugs are located at the center of the left side of the engine.

1. Unplug the wires from the spark plugs.
2. Remove the spark plugs with a 5/8" Socket.

3. Install the new plugs with a gap of 0.030".
Champion Part # RC12YC
HRI Part # 000-106-016
4. Re-install the spark plug wires.



Tools

- ⇒ 5/8 inch spark plug socket,
- ⇒ 0.030" feeler gauge

Fuel Filter, Gas Engine Only

The fuel filter is located underneath the van. It is between the fuel filler neck and the fuel through floor assembly.



1. Loosen the hose clamps on either side of the filter.
2. Pull the hoses off of the filter.
3. Install the new filter. The filter has an arrow on it. The arrow

should point towards the floor of the van.

HRI Part # 049-049

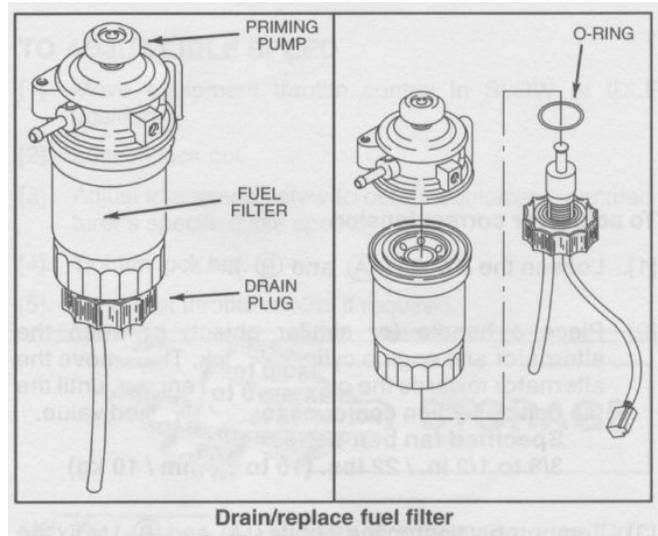
4. Tighten the hose clamps.

Tools

- ⇒ ¼ inch nut driver

Fuel Separator, Diesel Engine

Water should be drained from the fuel separator **weekly**. The fuel filter should be replaced every **800 hours**.



To drain water:

1. Stop engine
2. Place a drain pan under fuel filter and loosen the drain plug approximately 1 turn.
3. Water should drain. If necessary, operate priming pump to drain water, but only until fuel flows from filter.
4. Tighten drain plug. Bleed air from fuel line.
5. Start engine and check for leaks.

To replace fuel filter:

1. Remove drain plug and discard O-Ring.
2. Remove fuel filter with filter wrench.

3. Screw new filter on by hand until gasket contacts housing. Then tighten 1/3 turn more.
4. Install drain plug with new O-Ring.
5. Bleed air from fuel line. Start engine and check for leaks.

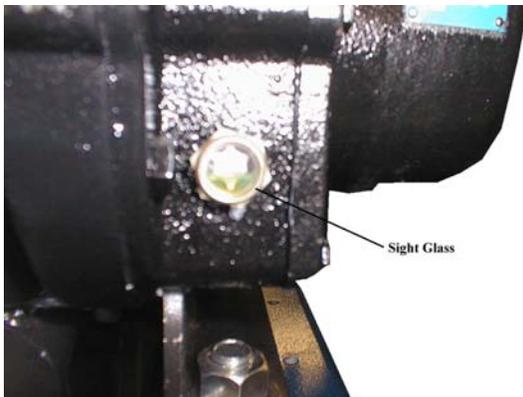
Blower

Quick Reference List

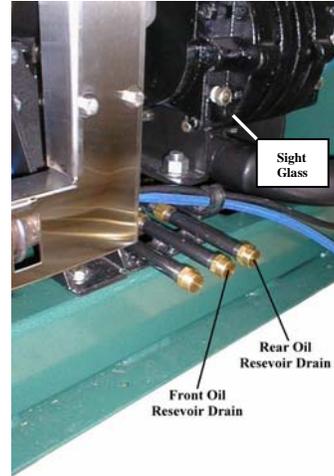
- Check blower level.
- Drain oil.
- Fill oil.
- Lube blower.

Blower Oil Change

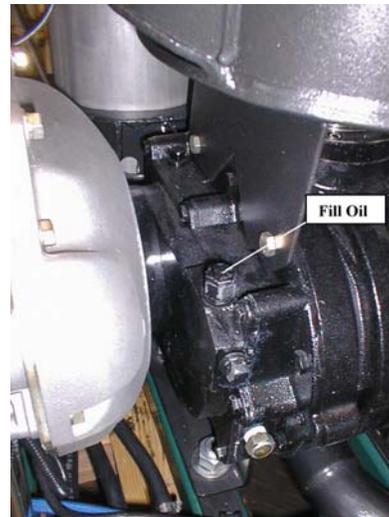
The vacuum blower has **two sight glasses** for checking the oil level. One is located in the rear of the blower and the other is towards the front near the bell housing. The oil level should be checked **daily** to ensure that it reaches over half the sight glass.



1. Remove the two oil drain caps, which are located on right center bottom side of the machine.



2. Remove oil fill caps.
3. Fill the blower with 40W non-detergent oil. After oil begins to flow out of the oil drain fitting, re-install the caps. This will allow air to evacuate from the system and give accurate oil level reading. **Failure to do this step will result in an insufficient amount of oil in the blower will lead to damage or failure!**



4. Re-install the oil fill plugs.

Tools

⇒ 11/16 wrench

Recovery Tank

Quick Reference List

- ❑ Remove and Clean Filter Bag
- ❑ Remove and Clean S/S Filter
- ❑ Remove and Clean APO Filters
- ❑ Clean APO Pump
- ❑ Remove and Clean S/S Floats
- ❑ Clean Vac Relief Box

1. Remove the filter bag and clean. **Perform this operation after every cleaning job.**



2. Remove stainless steel filter.



3. Clean the stainless steel filter of debris **daily**. This filter is

connected to the vacuum blower. Failure to clean the filter daily will result in a loss of vacuum. This loss of vacuum will cause the blower to over heat.

4. Remove automatic pump out.



5. Remove automatic pump out filter screens and clean.



6. Clean automatic pump out.



- Remove stainless steel floats and clean.



- Rinse out the recovery tank thoroughly. **Perform this operation daily.**
- Clean vacuum relief box as necessary.



- Replace all parts before starting up machine.

Solution System

Quick Reference List

- Remove filters.
- Clean filters.
- Remove orifice.
- Clean orifice.
- Inspect manifold.
- Rinse tanks.

Orifice Manifold

The orifice manifold is located on the side of the solution tank bracket. The purpose of the orifice manifold is to control the amount of solution being used, to meter solution A and B at equal levels, and to filter any debris from entering the system. The manifold also contains two check valves to ensure proper mixing of the two chemicals.

Orifice and Filter Maintenance

- Position Compressor Valve to PRESSURE RELIEF.
- Remove the filters (Stainless Steel plugs) and orifices.



- Clean the filters and orifices with fresh water or compressed air. **Perform this operation daily.**





4. Re-install filters and orifices.

Tools

- ⇒ 3/4" socket
- ⇒ 3/32 Allen wrench

Check Valve Maintenance

1. Remove the white plastic plugs with a 1 1/8" Wrench.
2. Remove the check-valves with a 9/16" socket.



3. Clean the check-valve with fresh water or compressed air. You should be able to blow through one end of the check-valve but not the other. **Perform this operation weekly.**

Tools

- ⇒ 1-1/8" wrench
- ⇒ 9/16" socket

General Maintenance

1. Inspect hoses.
2. Inspect wire connections.

3. Check nuts, belts, and hose clamps.

Freeze Guard Information

Your machine should be protected from freezing for any temperature below 35° F.

◆ Warning ◆

Water freezes at 32° F

Freeze Guard Procedure

4. Empty both chemical jugs. Once they have been emptied reinstall the lid and all the hoses.
5. Turn the Solution Valve to the "Purge" position.
6. Turn the Air Valve to the "Cleaning Mode" position.
7. Run the machine for approximately 3 to 5 minutes.
8. Empty the recovery tank.

Warranty Information

To avoid misunderstandings which might occur between machine owners and manufacturer, we are listing causes of component failure that specifically voids warranty coverage. Such causes as listed below shall constitute **abuse** or **neglect**.

Blower:

- ⇒ Failure to lubricate impellers daily with an oil based lubricant.
- ⇒ Failure to properly maintain oil levels in the blower.
- ⇒ Failure to use the correct oil grade and viscosity as recommended in the blower manual.
- ⇒ Failure to properly maintain blower safe guard systems such as waste tank filter screen, vacuum safety relief valve and waste tank automatic shut-off system.
- ⇒ Allowing foam to pass through blower.

Vacuum Tank:

- ⇒ Failure to properly maintain filtering devices.
- ⇒ Failure to clean tank as recommended by manufacturer.
- ⇒ Failure to maintain vacuum safety release in tank.
- ⇒ Use of improper chemicals.

Solution System:

- ⇒ Use of improper chemical
- ⇒ Operating machine without proper solution filter screen.
- ⇒ Failure to protect against freezing.

Vacuum and Solution Hose:

- ⇒ Failure to protect hoses against freezing.
- ⇒ Failure to protect hoses against burns from engine and blower exhaust.
- ⇒ Damage to hoses from being run over by vehicles.
- ⇒ Kinking or cracking from failure to store or unroll hoses correctly.
- ⇒ Normal wear and tear from everyday use.

Water Heating System:

- ⇒ Failure to protect against freezing.

Limited Warranty Plan

Harris Research warrants all machines of its manufacture to be free from defects in material and workmanship if properly installed, maintained, and operated under normal conditions with competent supervision. No person, agent, representative or dealer is authorized to give any warranties on behalf of Harris Research, nor to assume for Harris Research any other liability in connection with any Harris Research products. This warranty shall extend to the original purchaser of said equipment for the periods listed below from date of installation. If repairs or replacements are made by the Purchaser without Harris Research written consent, Harris Research warranty shall cease to be in effect.

Machinery, equipment and accessories furnished by Harris Research, but manufactured by others, are warranted only to the extent of the original manufacturer's warranty to Harris Research. Warranties on equipment purchased or used outside of the United States may not carry the same warranty, as per the policy of the individual component manufacturers.

Harris Research agrees, at its option, to repair at the point of shipment, or to replace without charge, any parts or parts of products of Harris Research's manufacture, which within the specified warranty period shall be proved to Harris Research's satisfaction to have been

defective when shipped, provided the purchaser promptly notifies Harris Research, in writing, of such alleged defect. Harris Research will pay all freight and transportation charges within the United States, via normal ground shipping means, for replacement of parts covered under this warranty.

This warranty covers parts, as specified, and does not cover labor which may be necessary in completing repairs. Harris Research's liability to Purchaser, whether in contract or in tort arising out of warranties, representation, instructions, or defects from any cause shall be limited to repairing or replacing the defective part or parts. To qualify for warranty coverage, defective parts must be returned to Harris Research within 30 days. No warranty liability whatsoever shall attach to Harris Research unless and until Harris Research has received payment in full for the warranted machine or part.

Except as stated in this section and in the proceeding section and except as to title, there are no guarantees or warranties of merchantability, fitness, performance or otherwise, express, implied or statutory, and Harris Research shall have no liability for consequential, incidental or other damages howsoever caused.

All components not specifically referenced in the schedule below are covered under this warranty for a period of one (1) year, excepting those parts which are considered, by Harris Research, to be expendable in normal use, including but not limited to paint, labels and other cosmetic parts or features.



**CTS 450
GENERAL MAINTENANCE LOG**

MAX HRS	DAILY SERVICE	OIL RECOMMENDATIONS					
		BLOWER					
8	ENGINE OIL check	BLOWER	40 weight non-detergent				
8	MACHINE general inspection	PUMP	30 weight non-detergent				
8	RECOVERY TANK FILTER BAG clean	ENGINE	30 weight motor oil				
8	RECOVERY TANK STAINLESS STEEL FILTER Clean						
8	BLOWER INLET spray with lubricant		NOTE: Overhead valve engines can use multi-viscosity oil, but will experience increased oil consumption.				
8	Empty Air Tank						
8	Clean ORIFICE FILTER						
8	ORIFICE inspect/clean						
	WEEKLY SERVICE	DATE & HOURS					
20	COOLANT check						
See Note	OIL change with filter	Note: Break-in period determined by manufacturer. Reference engine manual.					
25	BLOWER check oil level						
25	Drain Fuel Separator (Diesel Only)						
25	DRIVE SYSTEM tighten screws						
25	COMPRESSOR BELTS & PULLEYS check for wear HRI Part # 000-010-063 Gates Belt # A39						
25	HIGH PRESSURE LINES check for chafing						
25	NUTS & BOLTS check tightness						
25	ORIPHICE MANIFOLD CHECK VALVES inspect/clean						
25	Check the coolant level.						
25	VACUUM RELIEF VALVE inspect, clean, lube						
25	VACUUM TANK clean & flush						
25	WIRING check for chafing						
25	FLOAT SWITCHES check for debris						
	MONTHLY SERVICE						
100	ENGINE OIL change						
100	ENGINE AIR CLEANER clean HRI Part # 000-049-071						
100	BATTERY WATER LEVELS check						
200	OIL FILTER change						
200	COMPRESSOR BELT check tension						
	QUARTERLY SERVICE (3 MONTHS)						
300	FUEL LINES check for wear						
300	SPARK PLUGS clean and gap (Gas Only) HRI Part # 000-106-016 Champion Part # RC12YC						
300	SOLUTION TANKS clean & flush						
400	BLOWER OIL change						

Reference Information

Include with this manual are the following:

- ⇒ Blower Owners Manual
- ⇒ Engine Owners Manual
- ⇒ Compressor Owners Manual

⇒ Warranty Golden Guarantee Information

Revision Block

Date	Rev.	Page	Description
09/14/04	3	12	Added battery placement warning.
		14	Added 2-½ gallon air tank to standard equipment list.
		20	Revised solution control diagram to include the air tank and check valve.
		24	Added air tank procedure.
		30	Added step to orifice maintenance procedure.
		33	Added air tank maintenance to the daily maintenance list.
		Appendix	Replaced drawing D-5638, Rev. A with Rev. B.
03/23/05	4	28	Revised blower oil level text.
		30,31	Added check valve information and maintenance information to the manifold block section.
		34	Added recovery tank stainless steel filter cleaning to daily maintenance section. Added oriphices inspection and cleaning to daily maintenance section. Added coolant check to the weekly maintenance section. Added oriphice check valves inspection and cleaning to the weekly maintenance section.
		14	Added 100 recovery tank information.
		15,16	Solution temperature gauge has been removed, noted that in the layout.
		20,21	New Flow diagram shows removal of solution temp sender.

CTS 450 Assemblies & Parts

Figure 1 Machine Assembly - Front View
D-5256 Rev B

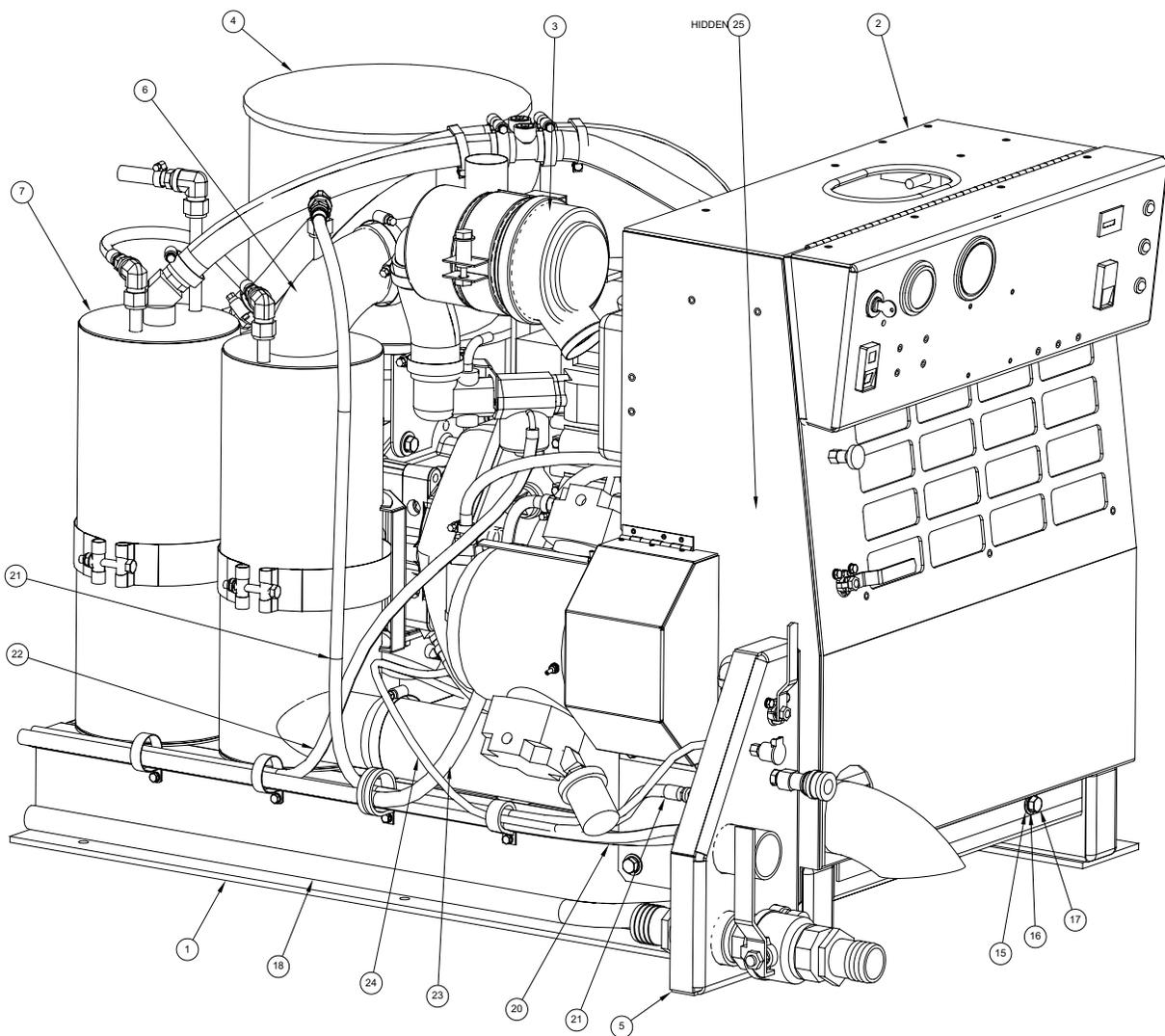


Figure 2 Machine Assembly - Rear View
D-5256 Rev B

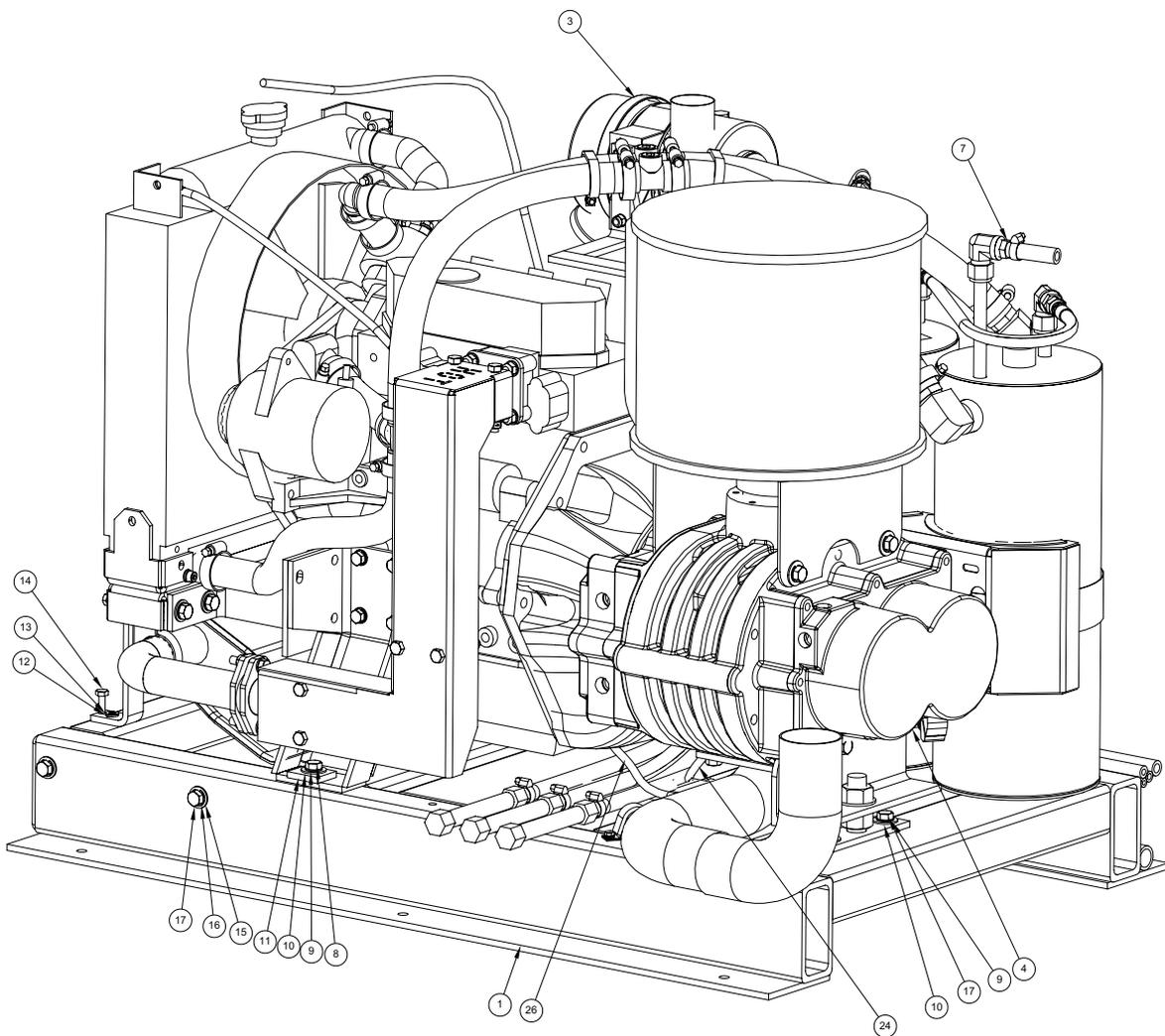
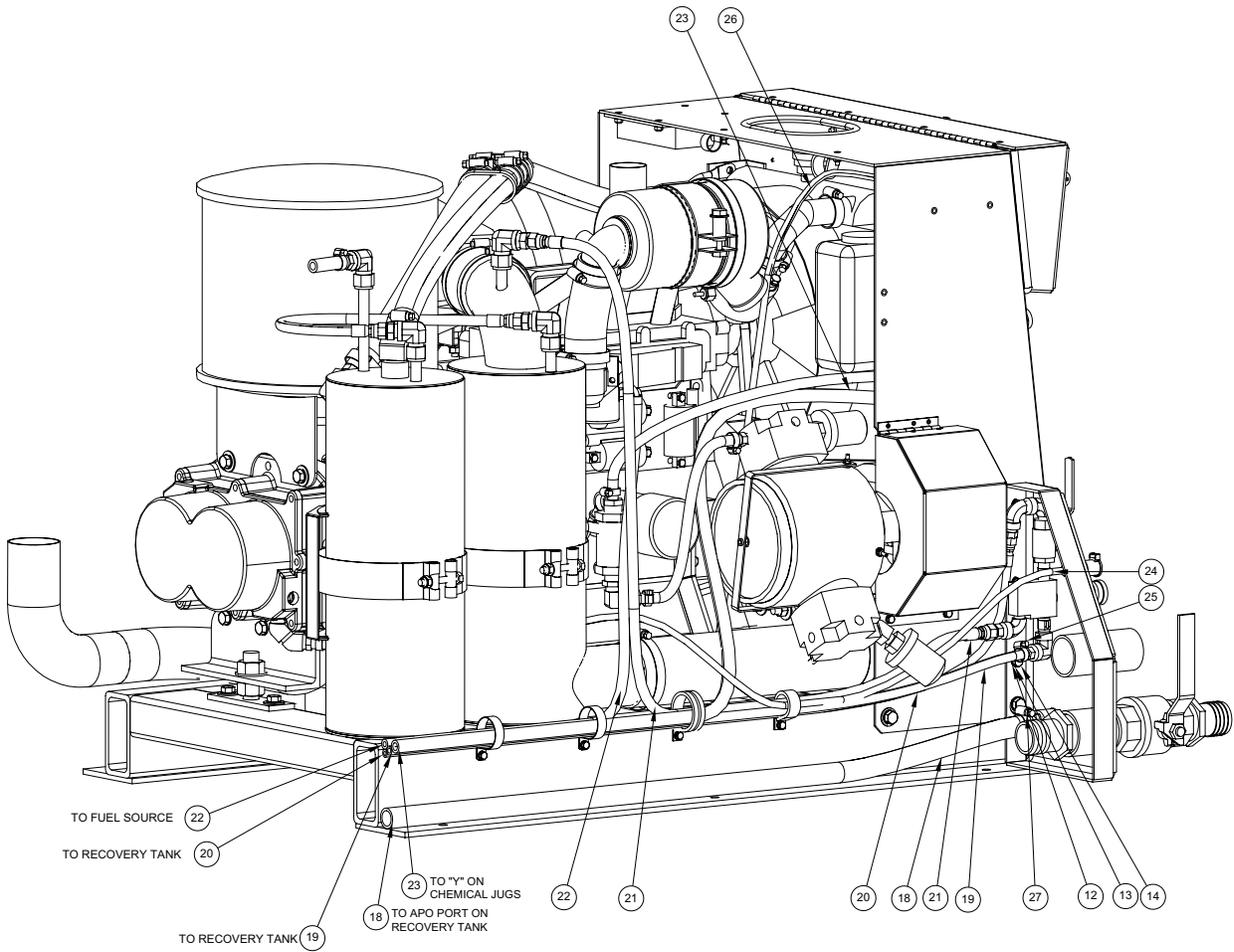


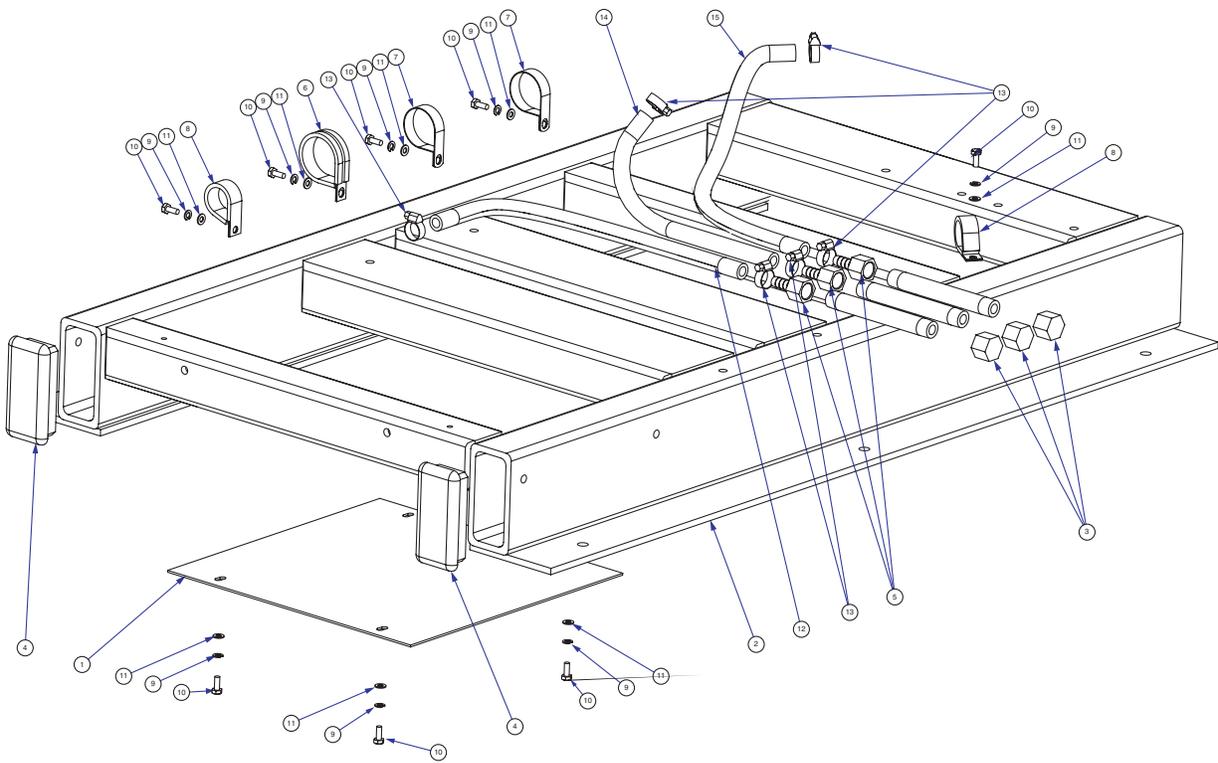
Figure 3 Machine Assembly - Side View
D-5256 Rev B



Machine Assembly Parts List

Item	Part Number	Description	Qty
1	610-001-029	Assembly, Frame - CTS 450 (Fig. 4)	1
2	610-020-029	Assembly, Dash - CTS 450 (Fig. 5-6)	1
3	610-003-029	Assembly, Engine - CTS 450 (Fig. 10-11)	1
4	610-002-029	Assembly, Blower - CTS 450 (Fig. 16)	1
5	610-019-029	Assembly, Dump & Vacuum Bracket (Fig. 17)	1
6	610-005-029	Assembly, Blower Exhaust Heat Exchanger (Fig. 19)	1
7	610-006-029	Assembly, Coolant Heat Exchanger (Fig. 18)	1
8	000-143-025	Screw, 3/8"-16UNC x 1.25" Lg. Hex Head Grd 8	2
9	000-174-021	Washer, 3/8" Lock	4
10	000-174-005	Washer, 3/8" Flat	4
11	000-174-068	Washer, Blower Feet	2
12	000-174-003	Washer, 1/4" Flat	5
13	000-174-019	Washer, 1/4" Lock	5
14	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	5
15	000-174-032	Washer, 3/8" Flat	6
16	000-174-057	Washer, 3/8" Lock	6
17	000-143-017	Screw, 3/8"-16UNC x 0.75" Lg. Hex Head Grd. 8	8
18	000-068-004	Hose, 3/4" I.D. Steam	1
19	000-068-015	Hose, 1/4" I.D. Bulk	1
20	000-068-723	Hose, 3/16" x 75" Lg. Teflon w/ JIC Ends	1
21	000-068-722	Hose, 3/8" x 46" Lg. Teflon w/ JIC Ends	1
22	000-068-660	Hose, 1/4" Fuel - Trident	1
23	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
24	000-068-030	Hose, 5/32" I.D. Vacuum	1
25	000-033-003	Clamp, Size #4 Mini	2
26	000-068-030	Hose, 5/32" I.D. Vacuum	1
27	000-033-026	Clamp, Size #10 Hose	1

Figure 4 Frame Assembly
D-5258 Rev -



Frame Assembly Parts List

Item	Part Number	Description	Qty
1	000-108-124	Protector, Muffler Heat Shield - CTS 450	1
2	000-055-159	Frame, Weldment - CTS 450	1
3	000-027-008	Cap, 3/8" FPT	3
4	000-027-034	Cap, Frame End - Modified - Maxx/CTS 450	2
5	000-052-488	Insert, #F66 (3/8" NPT x 3/8" Hose Barb)	3
6	000-033-050	Clamp, 1-3/4" Cushion Loop	1
7	000-033-053	Clamp, 1-1/2" Cushion Loop	2
8	000-033-057	Clamp, 1" Cushion Loop	2
9	000-174-014	Washer, #10 Lock	9
10	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	9
11	000-174-001	Washer, #10 Flat	9
12	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
13	000-033-005	Clamp, Size #5 Hose	6
14	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
15	000-068-085	Hose, 3/8" I.D. Hi-Temp	1

Figure 5 Dash Assembly - Front View
D-5257 Rev D

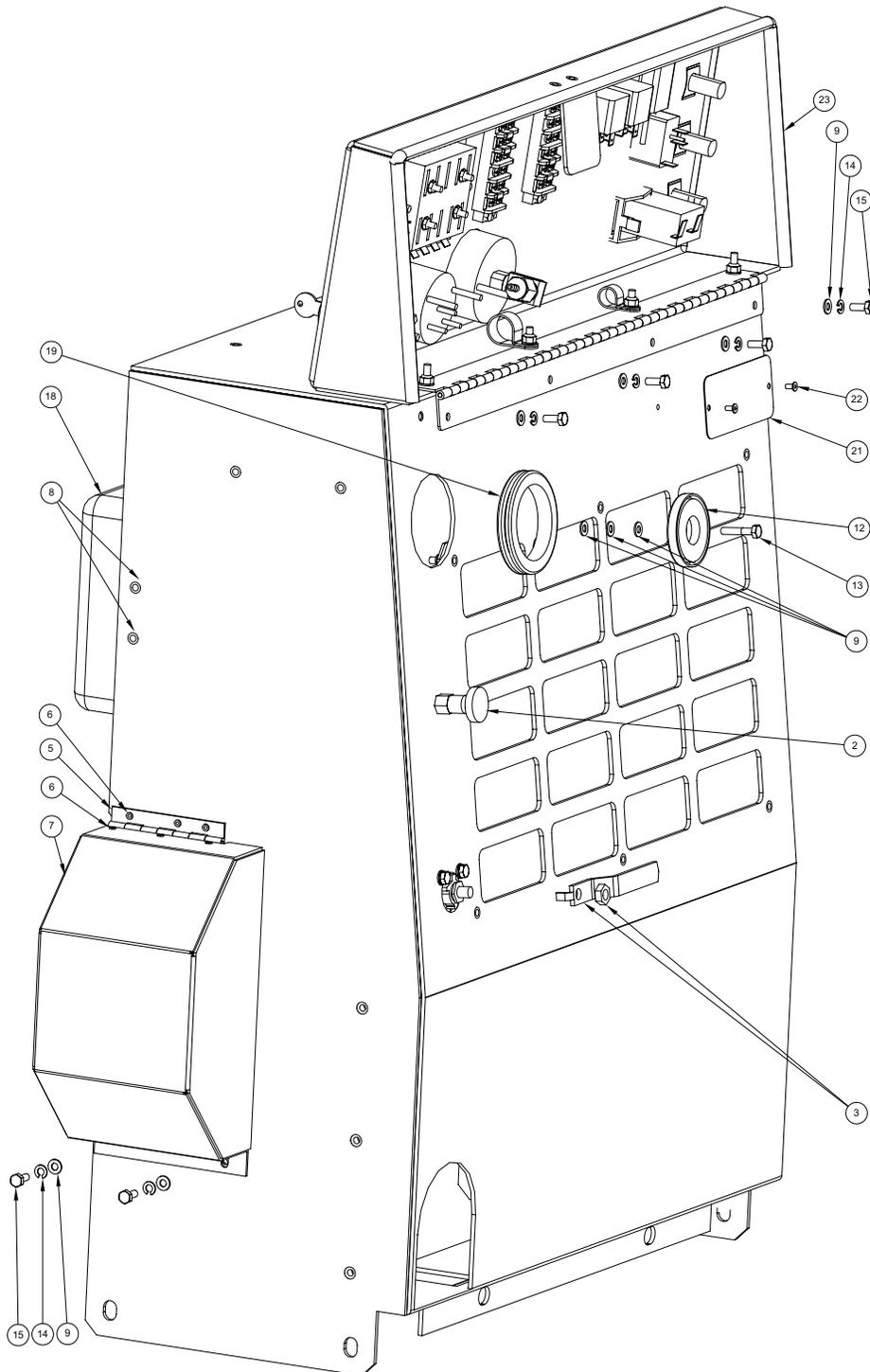
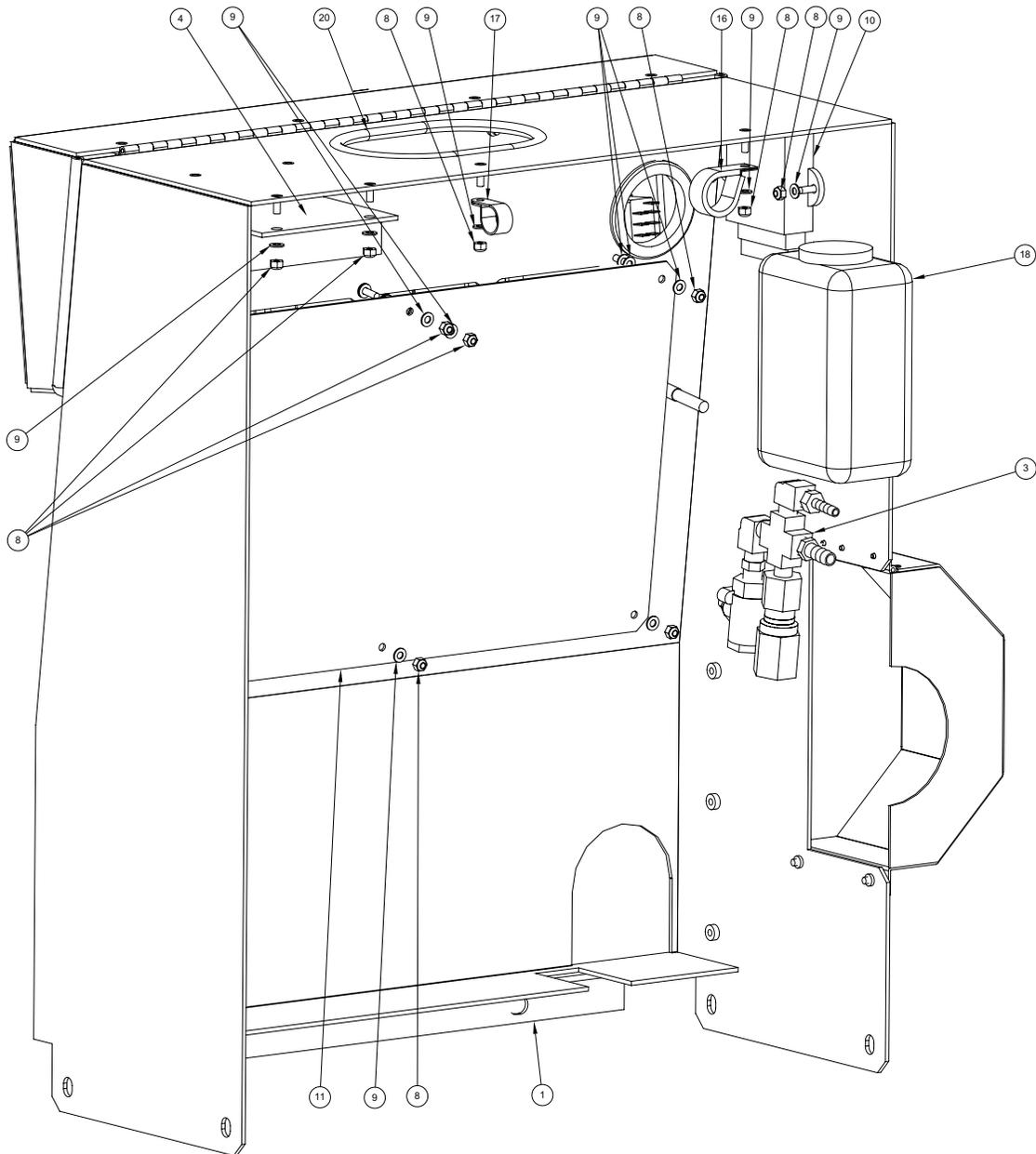


Figure 6 Dash Assembly - Rear View
D-5257 Rev D



Dash Assembly Parts List

Item	Part Number	Description	Qty
1	000-100-135	Panel, Dash - Weldment - CTS 450	1
2	000-025-011	Cable, Choke (5 Foot)	1
3	610-018-029	Assembly, Compressor Regulator - CTS 450 (Fig. 9)	1
4	000-029-016	Governor, Hall Affects Maxx 450D/470D	1
5	000-067-034	Hinge, Compressor Cover - CTS 450	1
6	000-140-001	Rivet, 1/8" x 1/4" Aluminum	6
7	000-108-123	Protector, Compressor Pulley - Weldment - CTS 450	1
8	000-094-034	Nut, #10-24UNC Nylock	17
9	000-174-001	Washer, #10 Flat	36
10	000-072-010	Ignition Processor, 700G Daihatsu	1
11	000-100-102	Panel, Perforated Grill	1
12	000-089-003	Magnet, Treadmaster	1
13	000-143-134	Screw, #10-24UNC x 1.00" Lg Hex Head	1
14	000-174-014	Washer, #10 Lock	6
15	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	6
16	000-033-057	Clamp, 1" Cushion Loop	1
17	000-033-023	Clamp, 3/4" Nylon Hose	1
18	000-047-016	Tank, Coolant Overflow - Daihatsu Engine	1
19	000-060-003	Grommet, 2.50"	1
20	000-131-131	Trimlok, 3/8" x 1/8" Edge Trim	1
21	000-105-012	Plate, Machine Serial I.D.	1
22	000-140-015	Rivet, 1/8" x 1/4" Lg. Pop	2
23	Fig. 7-8	Assembly, Brow - Dash - CTS 450	1

Figure 7 Brow Assembly - Front View
D-5521 Rev C

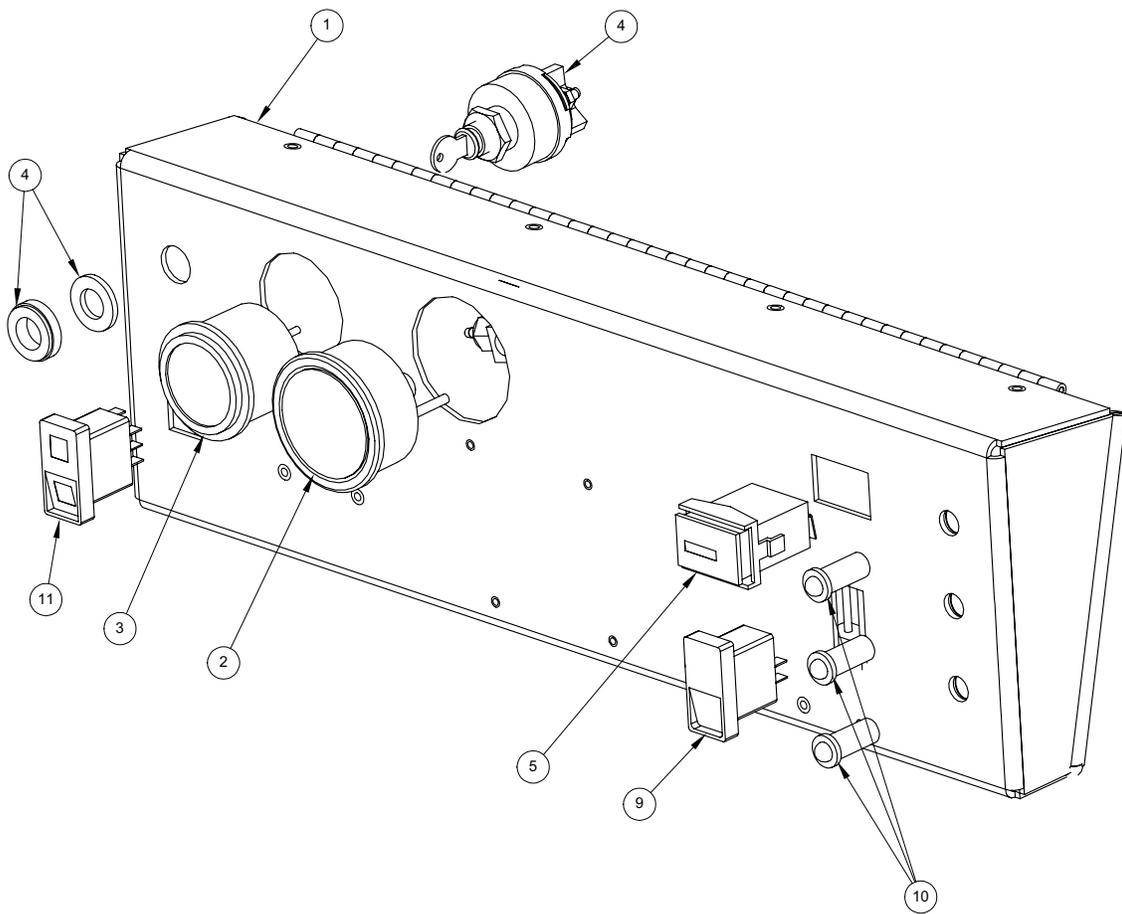
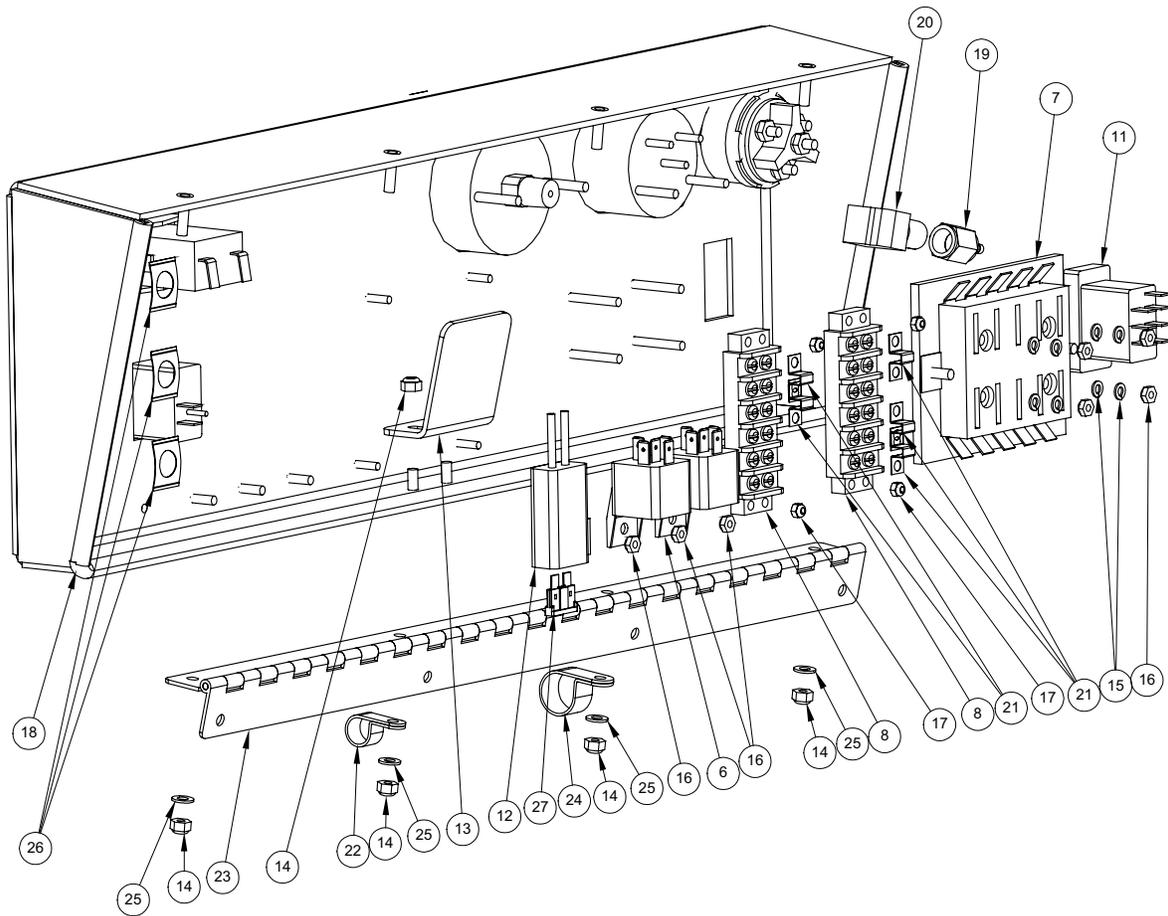


Figure 8 Brow Assembly - Rear View
D-5521 Rev C

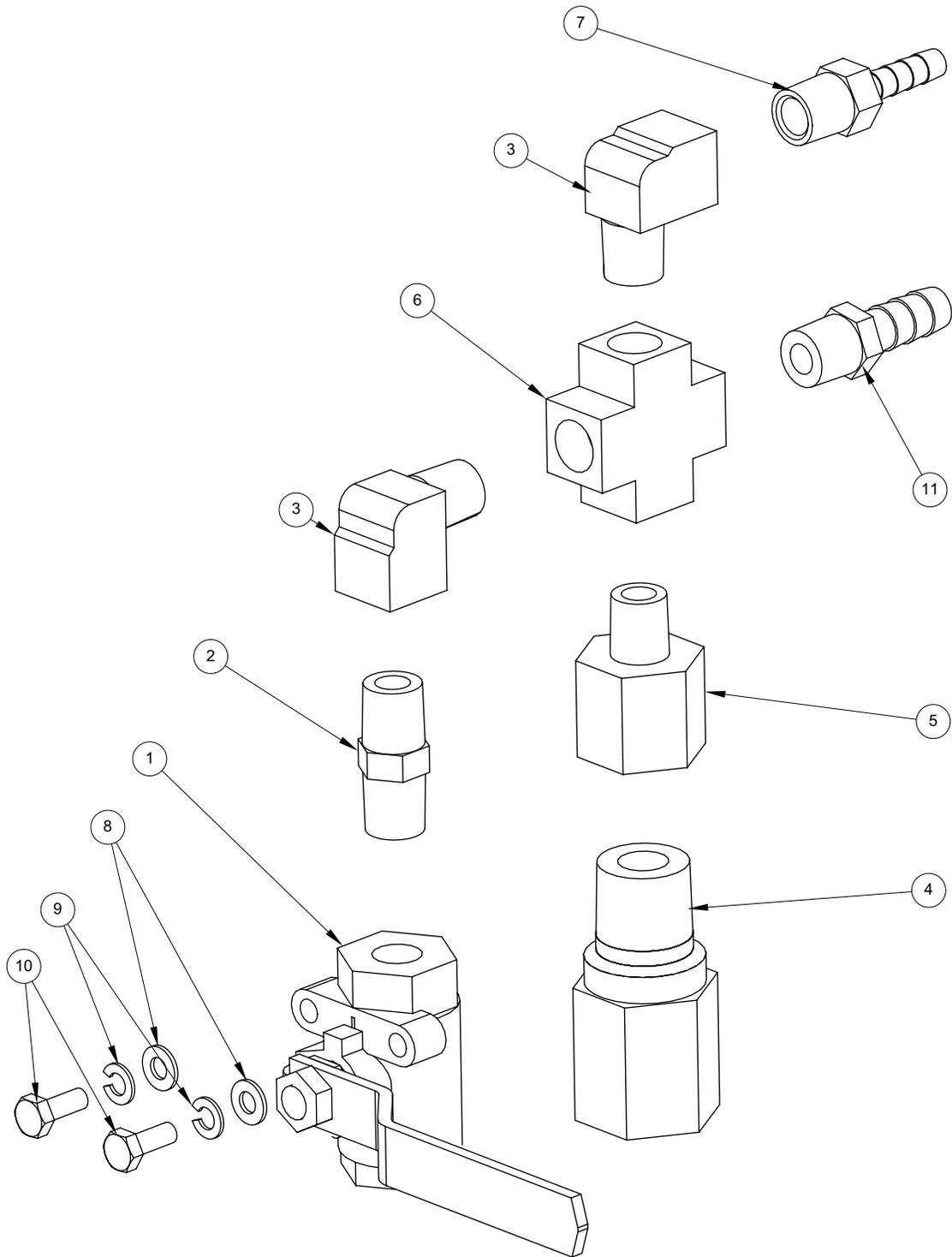


Brow Assembly Parts List

Item	Part Number	Description	Qty
1	000-100-136	Panel, Dash Brow - Weldment - CTS 450	1
2	000-074-025	Gauge, 0-30" Hg Vac. 2 1/2"	1
3	000-074-024	Gauge, Temperature	1
4	000-157-008	Switch, Ignition	1
5	000-074-018	Meter, Rectangular w/o Bezel	1
6	000-157-022	Switch, Relay	2
7	000-056-030	Diode Panel	1
8	000-012-002	Block, 6 Post Terminal	2
9	000-157-040	Switch, 20 AMP Rocker	1
10	000-084-015	Lamp, 12V 2W Round Red Indicator	3
11	000-157-131	Switch, 3 Way Speed Control	1
12	000-056-006	Fuse Holder, Inline Weather Proof	1
13	000-015-839	Bracket, Magnet - Painted - CTS 450	1
14	000-094-034	Nut, #10-24UNC Nylock	6
15	000-174-025	Washer, #8 Lock	8
16	000-094-059	Nut, #8-32UNF Nylock	7
17	000-094-063	Nut, #6-32UNC Nylock	4
18	000-131-131	Trimlok, 3/8" x 1/8" Edge Trim	1
19	000-052-652	Insert, #F42 (1/4" FPT x 1/8" Barb)	1
20	000-052-085	Elbow, 1/4" NPT Street	1
21	000-037-011	Connector, "Jumper" Terminal Block	5
22	000-033-022	Clamp, 1/2" Nylon Hose	1
23	000-067-014	Hinge, Dash - CF 3.7/CTS 450	1
24	000-033-023	Clamp, 3/4" Nylon Hose	1
25	000-174-001	Washer, #10 Flat	4
26	000-033-049	Clamp, Indicator Lamp	3
27	000-056-011	Fuse, 30 AMP Plug In	1

Figure 9 Compressor Regulator Assembly

C-6249 Rev -



Compressor Regulator Assembly Parts List

Item	Part Number	Description	Qty
1	000-169-090	Valve, 1/4" NPT Panel Mount - Full Port Ball	1
2	000-052-071	Nipple, 1/4" NPT Hex	1
3	000-052-085	Elbow, 1/4" NPT Street	2
4	000-169-208	Valve, Compressor Pop Off (1/2" MPT x 1/2" FPT)	1
5	000-052-738	Adapter, 1/4" NPT x 1/2" FPT	1
6	000-052-736	Cross, 1/4" FPT	1
7	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
8	000-174-001	Washer, #10 Flat	2
9	000-174-014	Washer, #10 Lock	2
10	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
11	000-052-102	Insert, #46 (1/4" NPT x 3/8" Barb)	1

Figure 10 Engine Assembly - Right View
D-5259 Rev D

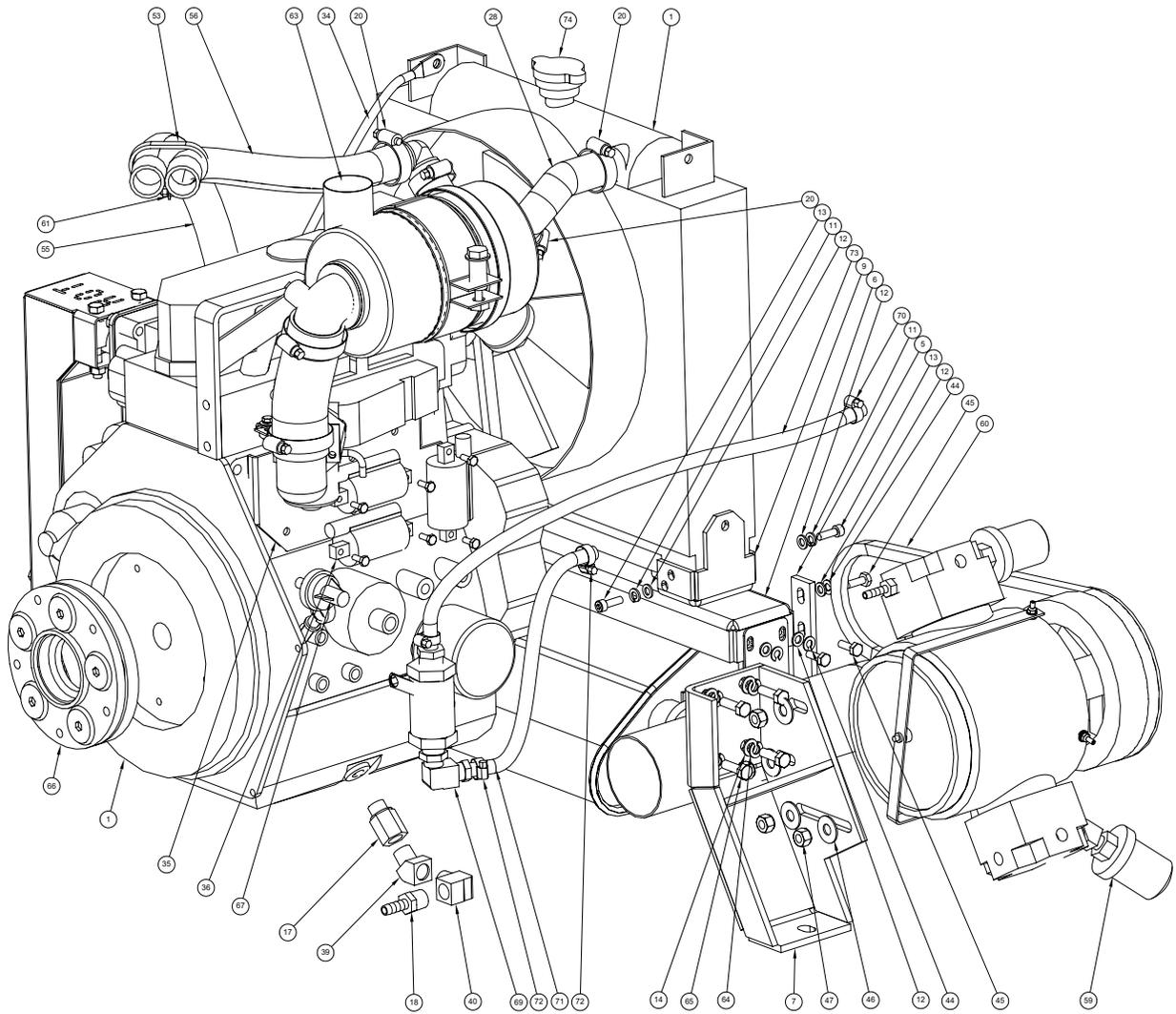
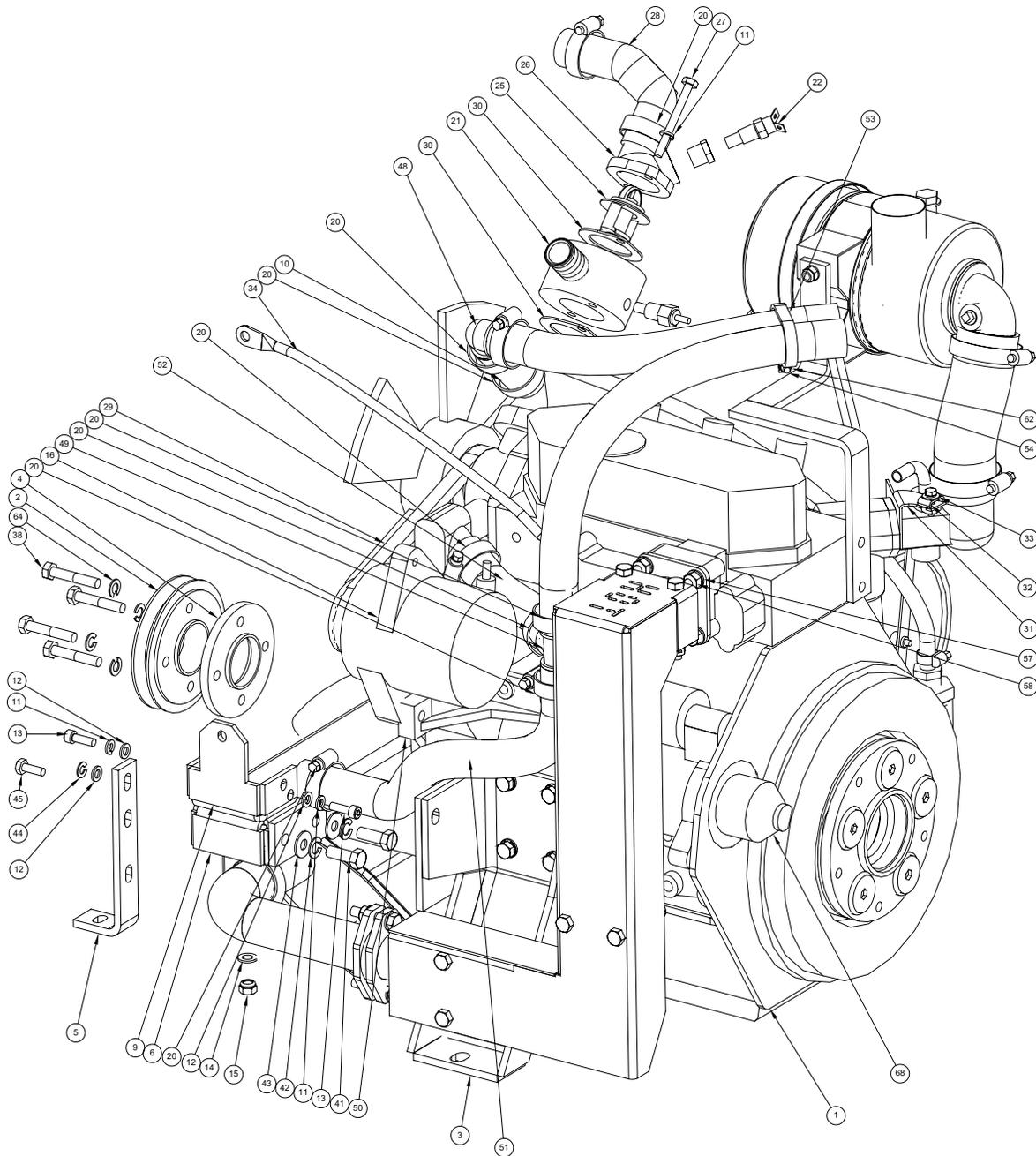


Figure 11 Engine Assembly - Left View
D-5259 Rev D



Engine Assembly Parts List

Item	Part Number	Description	Qty
1	000-047-016	Engine, Daihatsu 700G	1
2	000-109-078	Pulley, CAT Pump Drive	1
3	000-015-731	Bracket, Right Front Foot - Daihatsu	1
4	000-154-126	Spacer, Daihatsu Crank Shaft - CTS 450	1
5	000-015-872	Bracket, Radiator Mounting - CTS 450	2
6	000-015-831	Bracket, Radiator Channel	1
7	000-015-858	Bracket, Left Front Engine Mounting	1
8	610-003-029	Assembly, Exhaust - CTS 450 (Fig. 12)	1
9	000-015-737	Bracket, Radiator Mounting	2
10	000-068-250	Hose, 1" Green Stripe	1
11	000-174-017	Washer, 1/4" Lock	6
12	000-174-003	Washer, 1/4" Flat	8
13	000-143-077	Screw, 6mm x 20mm Lg. Socket Head	4
14	000-174-049	Washer, 5/16" Flat	10
15	000-094-038	Nut, 5/16"-18UNC Nylock	2
16	000-047-016	Alternator, Daihatsu 700G & 950G	1
17	000-052-058	Adapter, 3/8" FPT x 16mm Male Engine Oil Drain	1
18	000-052-104	Insert, #66 (3/8" NPT x 3/8" Barb)	1
19	000-049-014	Filter, 16HP Oil - All B & S	1
20	000-033-020	Clamp, Size #16 Hose	10
21	000-001-033	Adapter, Thermostat Housing	1
22	000-149-505	Sensor, 240°F Daihatsu Engine	1
23	000-149-039	Sender, Temperature	1
24	000-052-061	Bushing, 3/8" NPT x 1/4" FPT	1
25	000-149-023	Thermostat, 195°F Engine	1
26	000-047-016	Thermostat Housing - Daihatsu Engine	1
27	000-143-220	Screw, 6mm x 65mm Lg. Hex Head	2
28	000-068-500	Hose, Upper Radiator Daihatsu Engine	1
29	000-010-027	Belt, CTS 450 Alternator Replacement	1
30	000-057-050	Gasket, Thermostat Housing Daihatsu Engine	2

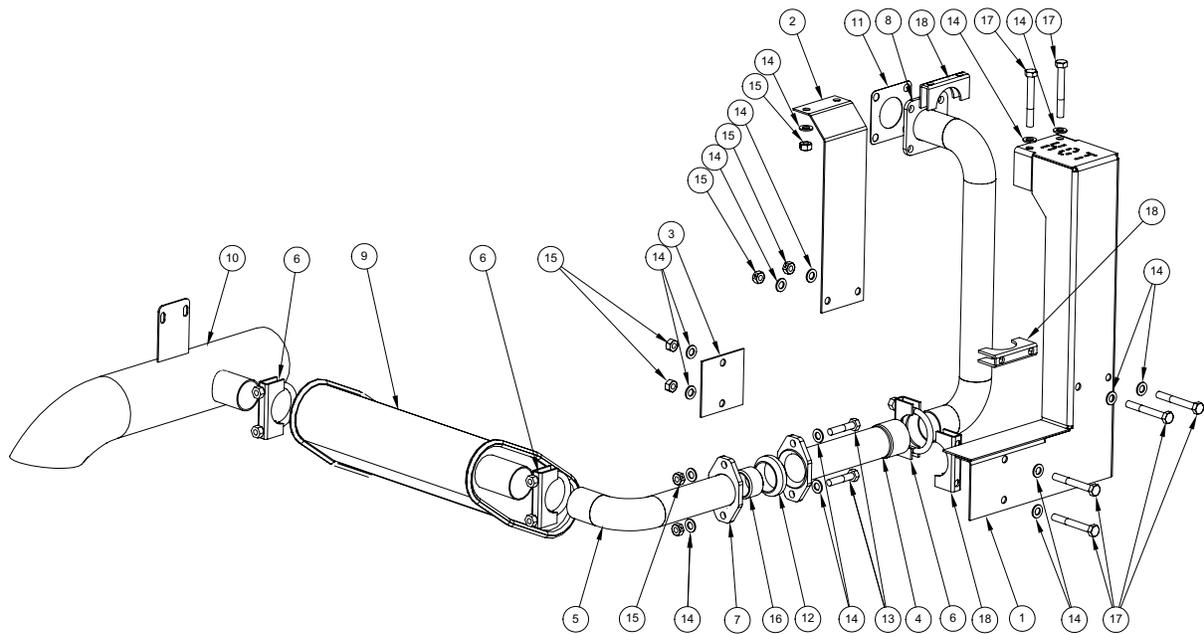
Engine Assembly Parts List

Item	Part Number	Description	Qty
31	000-015-782	Bracket, Choke Daihatsu (Manual)	1
32	000-033-124	Clamp, Daihatsu Choke (Manual)	1
33	000-143-551	Screw, Daihatsu Choke (Manual)	1
34	000-047-016	Bracket, Radiator Upper Support - Right - Raw	1
35	000-015-836	Bracket, Ignition Coil Mounting - CTS 450	1
36	000-047-016	Coil, Daihatsu 700G Engine	3
37	000-143-327	Screw, #10-32UNF x 0.50" Lg. Hex Head	6
38	000-143-184	Screw, 8mm x 45mm Lg. Hex Head Grd. 10.9	4
39	000-052-083	Elbow, 3/8" NPT Street x 45°	1
40	000-052-086	Elbow, 3/8" NPT Street	1
41	000-143-018	Screw, 3/8"-16UNC x 1.00" Lg. Grade 8	2
42	000-174-057	Washer, 3/8" Lock	2
43	000-174-032	Washer, 3/8" Flat	2
44	000-174-019	Washer, 1/4" Lock	4
45	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	4
46	000-174-005	Washer, 3/8" Flat	4
47	000-094-100	Nut, 3/8"-16UNC Hex Nylock	4
48	000-052-091	Elbow, 1" Barb x 1" Barb (For Radiator Hose)	1
49	000-052-648	Tee, 1" Barb x 1" Barb x 1" Barb	1
50	000-047-016	Bracket, Alternator Mounting - Lower - Daihatsu 700G/	1
51	000-068-032	Hose, 1" I.D. w/90° Preform Lower Rad.	1
52	000-068-500	Hose, Upper Radiator - Daihatsu Engine	1
53	000-033-067	Clamp, 2" Cushion Loop	1
54	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	1
55	000-068-250	Hose, 1" I.D. Green Stripe	1
56	000-068-250	Hose, 1" I.D. Green Stripe	1
57	000-174-069	Washer, 5/16" Inconel Belleville, Diverter Valve	4
58	000-094-043	Nut, 8mm Hex	4
59	610-007-029	Assembly, Air Compressor - CTS 450 (Fig. 14)	1
60	000-010-063	Belt, A39 - (Air Compressor)	1

Engine Assembly Parts List

Item	Part Number	Description	Qty
61	000-174-001	Washer, #10 Flat	1
62	000-094-034	Nut, #10-24UNC Nylock	1
63	610-003-029	Assembly, Air Cleaner - CTS 450 (Fig. 13)	1
64	000-174-018	Washer, 5/16" Lock	12
65	000-143-187	Screw, 8mm x 25mm Lg. Grade. 10.9 Hex Head	8
66	000-039-020	Coupler, C-Face Daihatsu - CTS 450	1
67	000-157-130	Switch, Oil Pressure	1
68	000-091-021	Starter, Daihatsu 700G Engine	1
69	610-003-029	Assembly, Compressor Check Valve (Fig. 15)	1
70	000-033-003	Clamp, Size #4 Mini	2
71	000-068-131	Hose, 1/4" I.D. Silicone - Bulk	1
72	000-033-005	Clamp, Size #5 Hose	2
73	000-068-131	Hose, 1/4" I.D. Silicone - Bulk	1
74	000-027-114	Cap, Radiator 3Lc Engine - Daihatsue	1

Figure 12 Exhaust Assembly
C-5332 Rev B

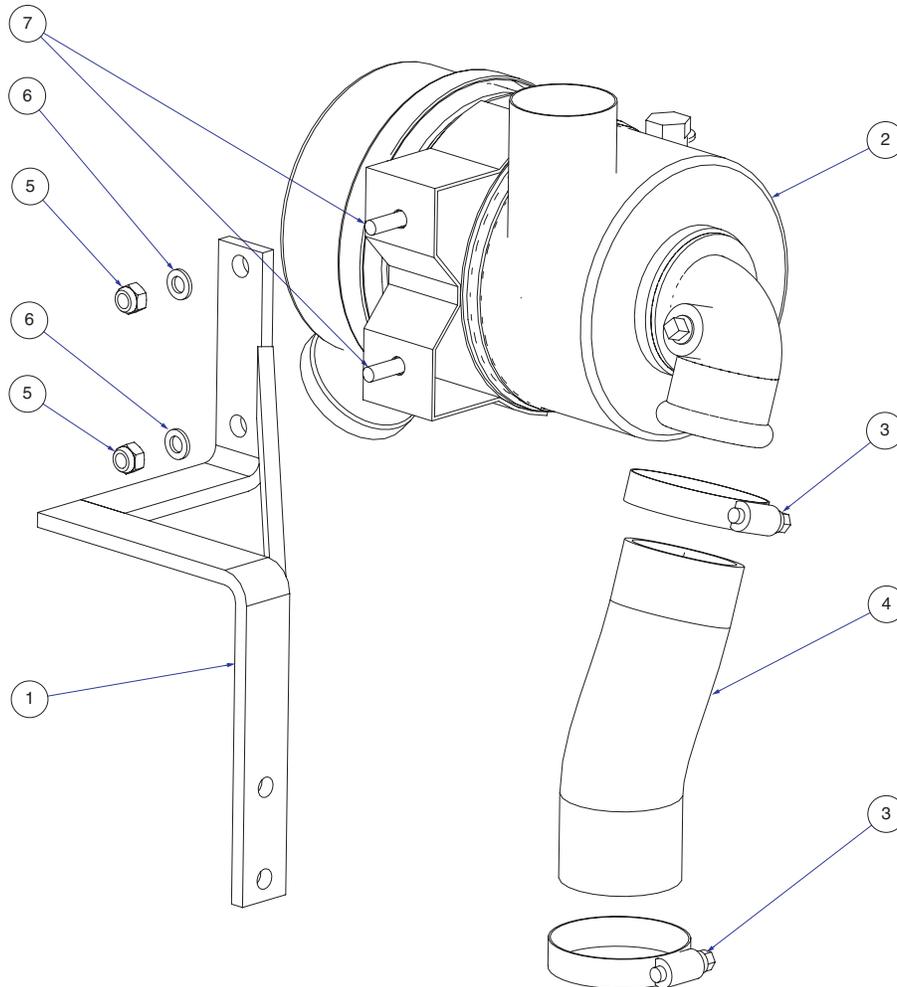


Exhaust Assembly Parts List

Item	Part Number	Description	Qty
1	000-041-400	Cover, Outer Exhaust - CTS 450	1
2	000-041-401	Cover, Inner Exhaust - CTS 450	1
3	000-015-822	Bracket, Exhaust Cover Securing - CTS 450	1
4	000-125-168	Tube, Exhaust Adjustment - CTS 450	1
5	000-125-169	Tube, Muffler Inlet - CTS 450	1
6	000-033-068	Clamp, 1-1/2" Muffler	3
7	000-105-181	Flange, Exhaust Donut	1
8	000-125-174	Tube, Exhaust Manifold Outlet - Weldment	1
9	000-093-091	Muffler, Daihatsu - Modified - CTS 450	1
10	000-001-112	Adapter, Final Exhaust - Weldment - CTS 450	1
11	000-057-070	Gasket, Manifold Daihatsu 700G & 950G	1
12	000-057-177	Gasket, Exhaust Donut 1.50"	1
13	000-143-015	Screw, 5/16" 18UNC x 1.50" Lg. Hex Head	2
14	000-174-049	Washer, 5/16" Flat	16
15	000-094-081	Nut, 5/16"-18UNC Hex 2-Way Locking	8
16	000-125-128	Tube, 1-3/8" Od x 1/8" Wall x 7/8" Long	1
17	000-143-106	Screw, 5/16"-18UNC x 2.5" Lg. Hex Head	6
18	000-033-068	Clamp, 1-1/2" Muffler (Base Only)	3

Figure 13 Air Cleaner Assembly

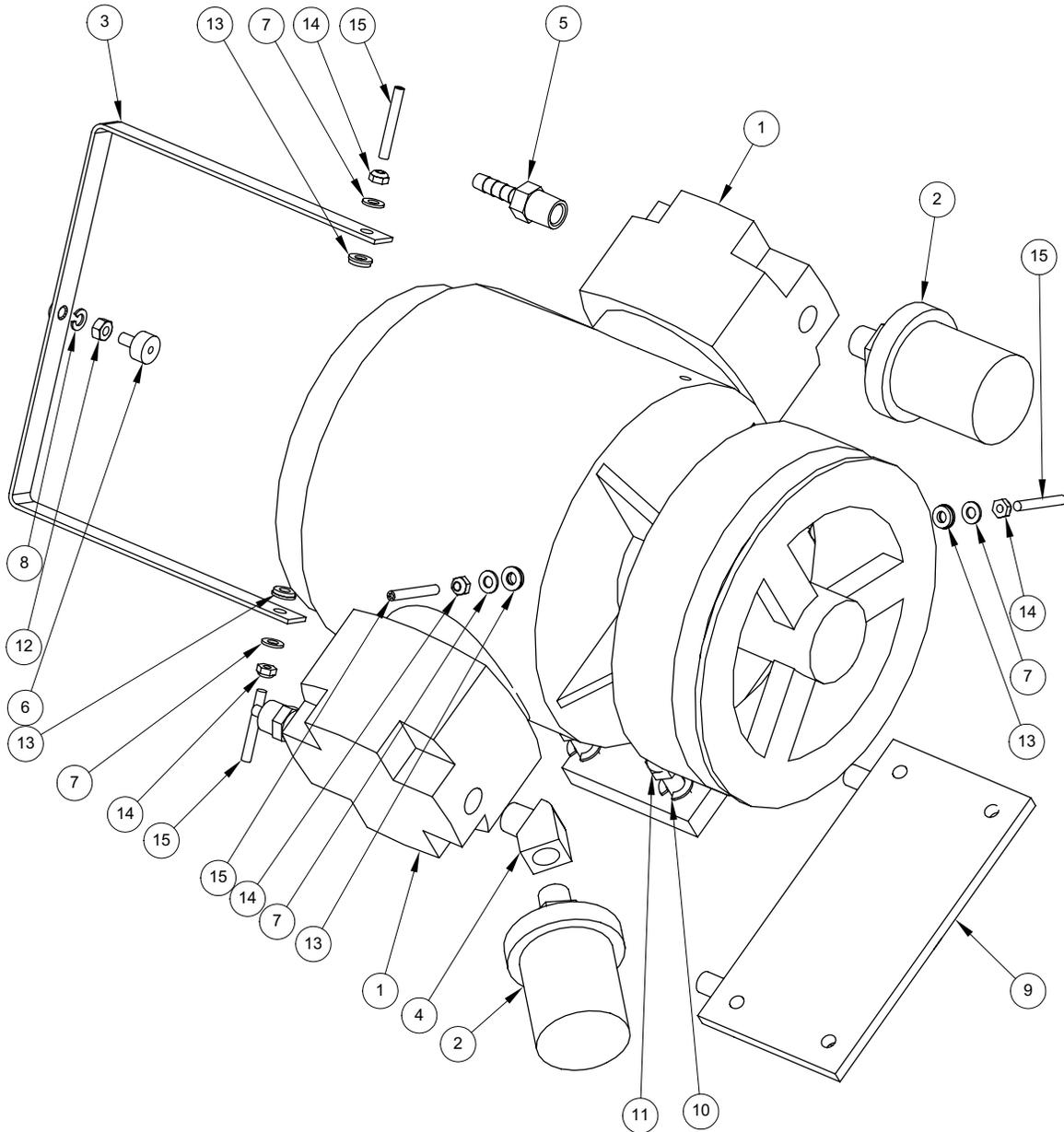
C-5526 Rev -



Air Cleaner Assembly Parts List

Item	Part Number	Description	Qty
1	000-015-844	Bracket, Air Cleaner Mounting - CTS 450	1
2	000-047-016	Air Cleaner - Daihatsu Engine	1
3	000-033-007	Clamp, #28 Hose	2
4	000-068-733	Hose, Air Cleaner To Carb.	1
5	000-094-009	Nut, 1/4"-20UNC Hex Nylock	2
6	000-174-003	Washer, 1/4" Flat	2
7	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	2

Figure 14 Air Compressor Assembly
C-5525 Rev B

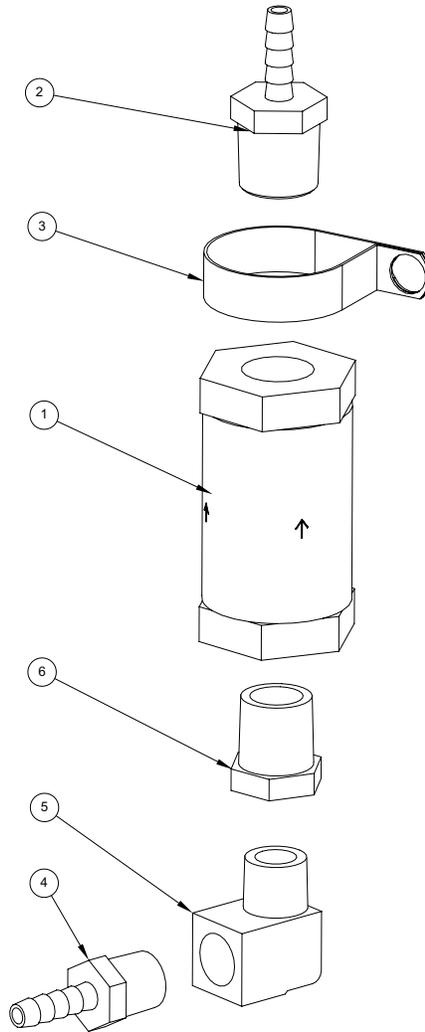


Air Compressor Assembly Parts List

Item	Part Number	Description	Qty
1	000-111-150	Pump, Air Compressor PCA 10	1
2	000-111-150	Filter, Air Compressor - CTS 450	2
3	000-108-128	Protector, Compressor Cover - CTS 450	1
4	000-052-082	Elbow, 1/4" NPT Street x 45°	1
5	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
6	000-108-115	Protector, 5/8" Bumper	1
7	000-174-047	Washer, #8 Flat	4
8	000-174-014	Washer, #10 Lock	1
9	000-015-825	Bracket, Air Compressor Mounting - CTS	1
10	000-174-018	Washer, 5/16" Lock	4
11	000-143-013	Screw, 5/16"-18UNC x 1.00" Lg. Grade 8	4
12	000-094-003	Nut, #10-32UNF Hex	1
13	000-174-036	Washer, #10 Flat Rubber Backed	4
14	000-094-059	Nut, #8-32UNF Nylock	4
15	000-143-297	Set Screw, #8-32UNF x 1.25" Lg.	4

Figure 15 Compressor Check Valve Assembly

C-6246 Rev -

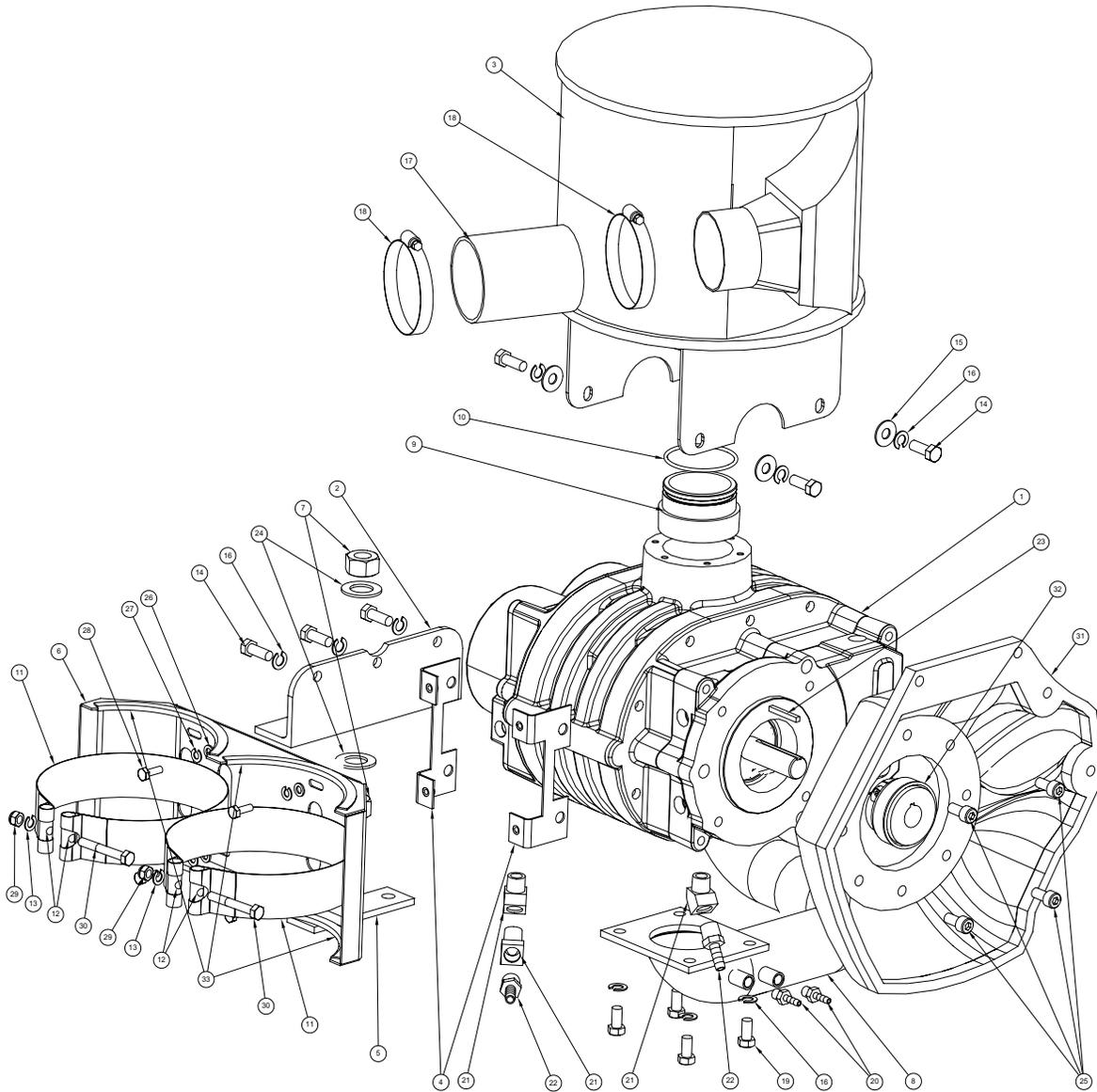


Compressor Check Valve Assembly Parts List

Item	Part Number	Description	Qty
1	000-169-208	Valve, Compressor Check 1/2" FPT x FPT	1
2	000-052-742	Insert, #84 (1/2" NPT x 1/4" Barb)	1
3	000-033-116	Clamp, 1-1/2" Cushion Loop w/ 7/16" Mounting Hole	1
4	000-052-103	Insert, #64 (3/8" NPT x 1/4" Barb)	1
5	000-052-086	Elbow, 3/8" NPT Street	1
6	000-052-064	Bushing, 1/2" NPT x 3/8" FPT	1

Figure 16 Blower Assembly

D-5371 Rev D



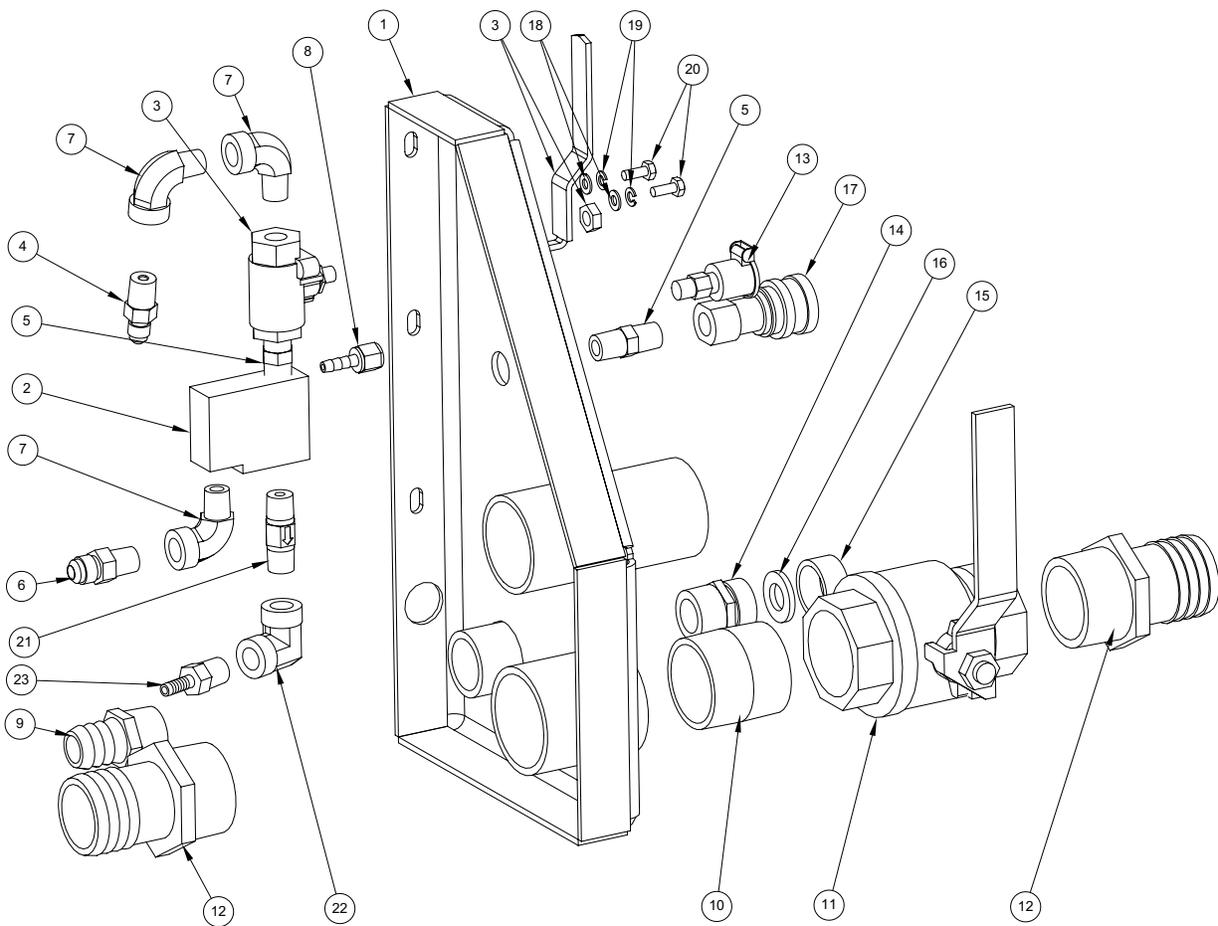
Blower Assembly Parts List

Item	Part Number	Description	Qty
1	000-111-165	Blower, 4005 C-Face	1
2	000-015-827	Bracket, Blower Foot - CTS 450	1
3	000-093-084	Silencer, 3" Blower - CTS 450	1

Blower Assembly Parts List

Item	Part Number	Description	Qty
4	000-015-840	Plate, Saddle Mounting - After Burner - CTS 450	2
5	000-015-829	Bracket, Blower Foot Adjustment - CTS 450	1
6	000-015-830	Bracket, Dual After Burner Saddle - Weldment	1
7	000-094-080	Nut, 3/4"-10UNC Hex	2
8	000-001-113	Adapter, Blower Inlet - CTS 450	1
9	000-001-024	Adapter, Blower To Silencer	1
10	000-097-029	O-Ring, Blower To Silencer (2 3/4" ID x 2 1/2" OD x 1/8	1
11	000-033-123	Clamp, After Burner Mount - Boxxer 421	2
12	000-141-033	Rod, Heat Exchanger Strap - Retainer	4
13	000-174-018	Washer, 5/16" Lock	2
14	000-143-018	Screw, 3/8"-16UNC x 1.00" Lg. Grade 8	7
15	000-174-005	Washer, 3/8" Flat	4
16	000-174-021	Washer, 3/8" Lock	11
17	000-068-398	Hose, 3" Blue Silicone x 3 Ply	1
18	000-033-013	Clamp, Size #48 Hose	2
19	000-143-017	Screw, 3/8"-16UNC x 0.75" Lg. Hex Head Grd. 8	4
20	000-052-293	Insert, #23 (1/8" NPT x 3/16" Barb)	2
21	000-052-083	Elbow, 3/8" NPT Street x 45°	3
22	000-052-104	Insert, #66 (3/8" NPT x 3/8" Barb)	2
23	000-077-011	Key, 3/16" x 1.50" Lg. Class 2 Fit	1
24	000-174-028	Washer, 7/8" I.D. x 1.50" O.D. x 0.090" Thk.	2
25	00-143-094-	Screw, 3/8"-16UNC x 0.75" Lg. Socket Head	4
26	000-174-003	Washer, 1/4" Flat	4
27	000-174-019	Washer, 1/4" Lock	4
28	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	4
29	000-094-038	Nut, 5/16"-18UNC Nylock	2
30	000-143-092	Screw, 5/16"-18UNC x 2.25" Lg. Hex Head	2
31	000-042-008	Housing, Bell - CTS 450	1
32	000-039-020	Coupler, C-Face Daihatsu - CTS 450	1
33	000-131-027	Trimlok, Crossfire Brow	4

Figure 17 Dump & Vacuum Bracket Assembly
D-5520 Rev C

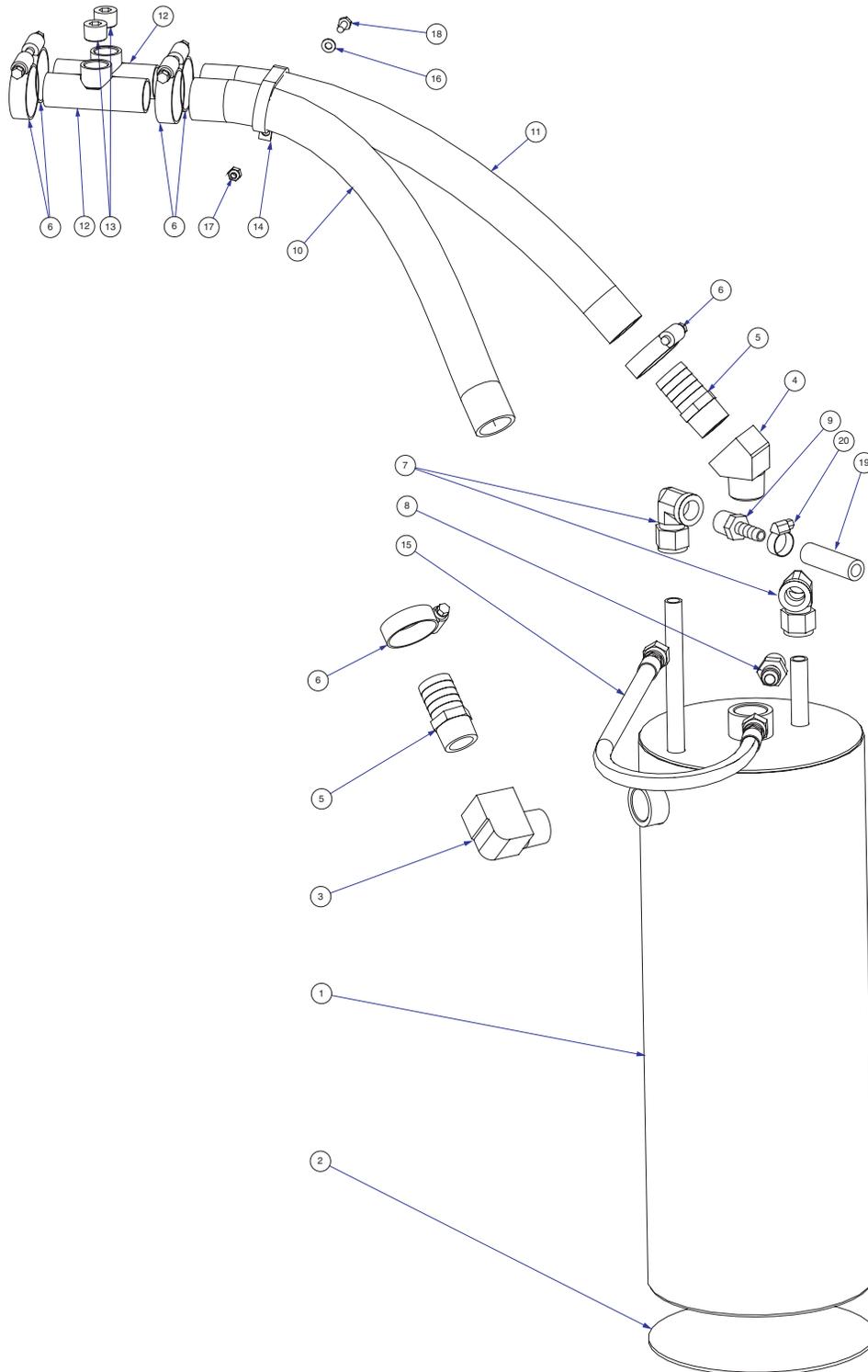


Dump & Vacuum Bracket Assembly Parts List

Item	Part Number	Description	Qty
1	000-015-821	Bracket, Dump & Vacuum Hose - Weldment - CTS 450	1
2	000-090-018	Manifold, Hi PSI s/s	1
3	000-169-095	Valve, 1/4" NPT Panel Mount - Full Port Ball	1
4	000-052-526	Nipple, 1/4" NPT x 1/4" JIC	1
5	000-052-095	Nipple, 1/4" NPT Hex	2
6	000-052-506	Nipple, 1/4" NPT x 9/16"-18UNF x 37° JIC	1
7	000-052-691	Elbow, 1/4" Street s/s	3
8	000-052-096	Insert, #F23 (1/8" FPT x 3/16" Barb)	1
9	000-052-338	Insert, #1212 (3/4" NPT x 3/4" Barb)	1
10	000-052-182	Nipple, 1-1/2" NPT Close Galvanized	1
11	000-169-022	Valve, 1-1/2" Full Port Ball	1
12	000-052-226	Insert, 1-1/2" NPT x 1-1/2" Barb (Grey)	2
13	000-052-272	Cup, Gravity Feed Oil Blower Lubrication Port	1
14	000-052-281	Nipple, 3/4" NPT x 3/4" Male Garden Hose	1
15	000-027-014	Cap, Garden Hose	1
16	000-057-055	Gasket, Garden Hose	1
17	000-052-690	Quick Connect, Female - CTS 450	1
18	000-174-001	Washer, #10 Flat	2
19	000-174-014	Washer, #10 Lock	2
20	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
21	000-169-195	Valve, 200 PSI Pop Off	1
22	000-052-734	Elbow, 1/4" FPT x 1/4" FPT s/s	1
23	000-052-696	Insert, #44 (1/4" NPT x 1/4" Barb) s/s	1

Figure 18 Coolant Heat Exchanger Assembly

D-5523 Rev -

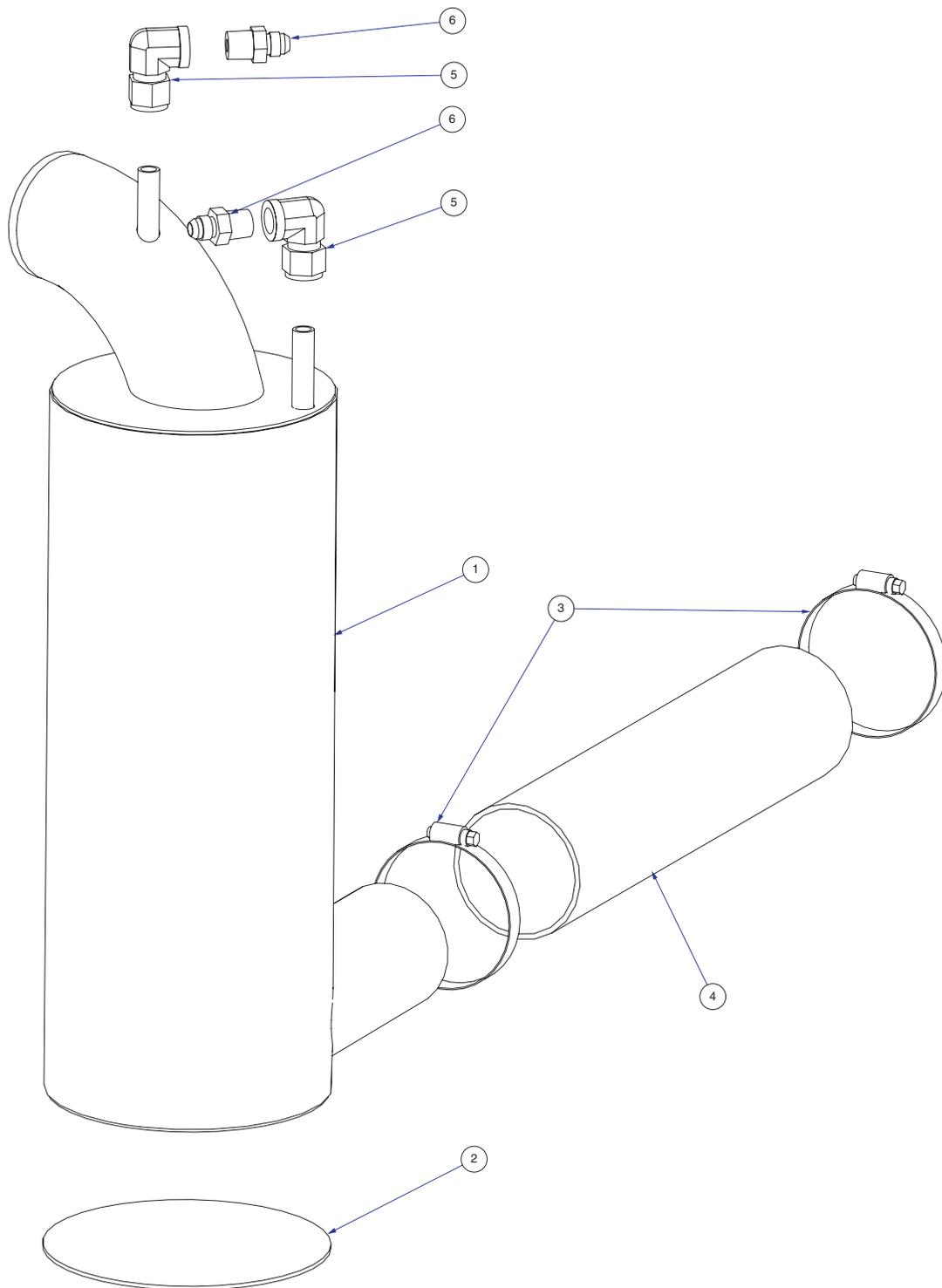


Coolant Heat Exchanger Assembly Parts List

Item	Part Number	Description	Qty
1	000-038-065	Core, Coolant Heat Exchanger - Weldment - CTS 450	1
2	000-108-131	Protector, HX Pad 6.63" O.D.	1
3	000-052-340	Elbow, 3/4" NPT Street	1
4	000-052-384	Elbow, 3/4" NPT x 45°	1
5	000-052-125	Insert, #1216	2
6	000-033-020	Clamp, Size #16	6
7	000-052-600	Elbow, 1/2" Tube x 3/8" FPT	2
8	000-052-507	Nipple, 3/8" NPT x 9/16"-18 37° JIC	1
9	000-052-694	Insert, #66 (3/8" NPT x 3/8" Barb)	1
10	000-068-250	Hose, 1" I.D. Green Stripe	1
11	000-068-250	Hose, 1" I.D. Green Stripe	1
12	000-001-019	Adapter, Lower Radiator Tee (1" Barb x 1" Barb x 3/8"	2
13	000-106-008	Plug, 3/8" NPT Allen Head	2
14	000-033-067	Clamp, 2" Cushion Loop	1
15	000-068-724	Hose, 3/8" x 18" Lg. Teflon w/ JIC Ends	1
16	000-174-001	Washer, #10 Flat	1
17	000-094-034	Nut, #10-24UNC Nylock	1
18	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	1
19	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
20	000-033-005	Clamp, Size #5 Hose	1

Figure 19 Blower Exhaust Heat Exchanger Assembly

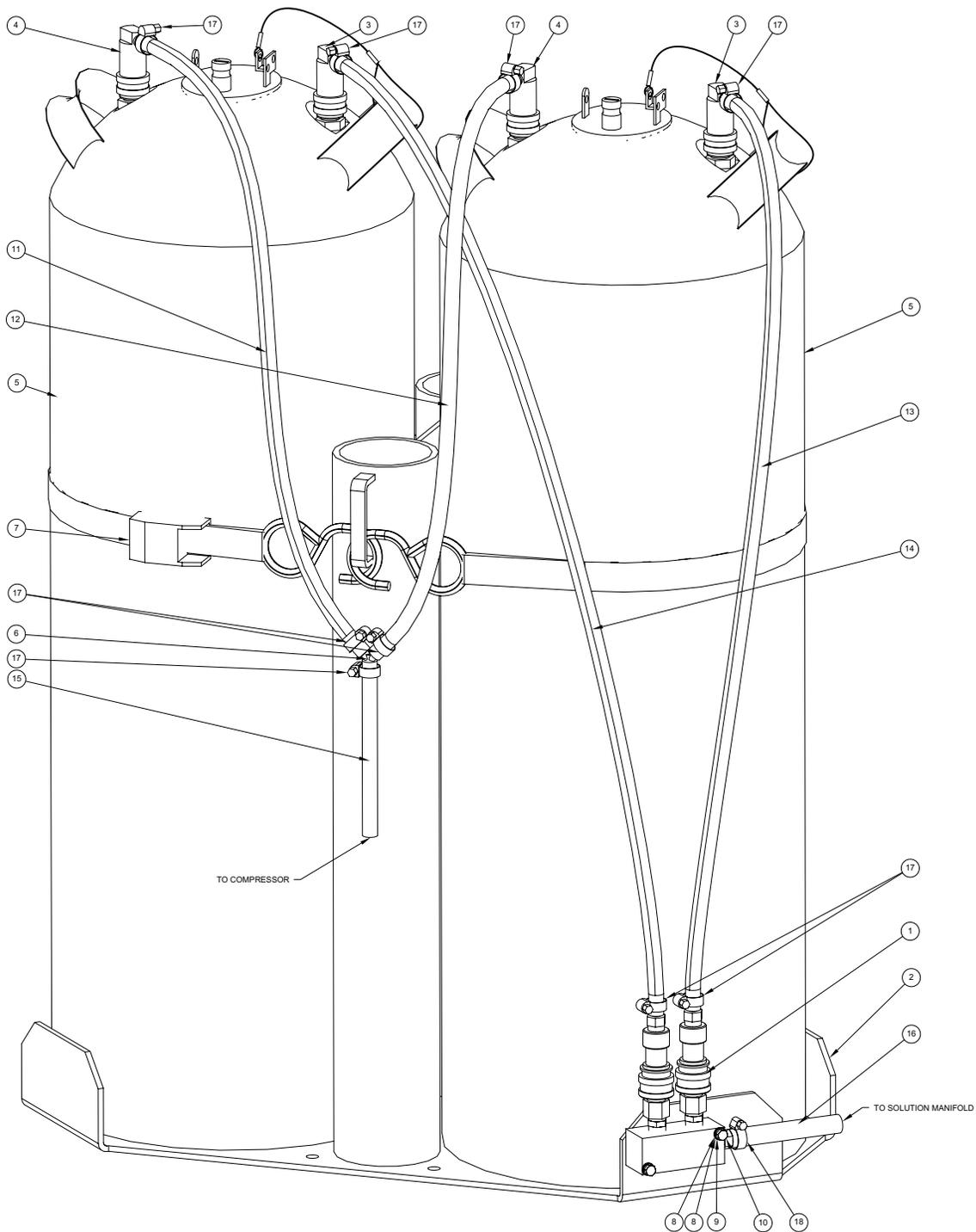
D-5522 Rev -



Blower Exhaust Heat Exchanger Assembly Parts List

Item	Part Number	Description	Qty
1	000-038-070	Core, Blower Exhaust HX - Weldment - CTS 450	1
2	000-108-131	Protector, HX Pad 6.63" O.D.	1
3	000-033-013	Clamp, Size #48 Hose	2
4	000-068-398	Hose, 3" I.D. 3 Ply Silicone	1
5	000-052-600	Elbow, 1/2" Tube x 3/8" FPT	2
6	000-052-507	Nipple, 3/8" NPT x 9/16"-18 37° JIC	2

Figure 20 15 Gallon Chemical Jugs Assembly
D-6117 Rev A

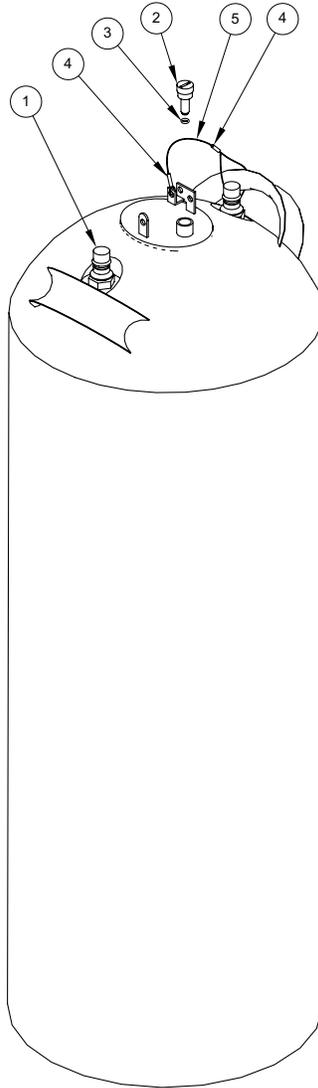


15 Gallon Chemical Jugs Assembly Parts List

Item	Part Number	Description	Qty
1	Fig. 22	Assembly, Chemical Mixing Manifold	1
2	000-015-869	Bracket, 15 Gallon Tank	1
3	000-052-697	Socket, In s/s 90° Barb	2
4	000-052-698	Socket, Out s/s 90° Barb	2
5	000-159-127	Tank, 15 Gallon Chemical - CTS 450 (Fig. 21)	2
6	000-052-700	Insert, Y (1/4" I.D. x 1/4" I.D. x 5/16" I.D. Acetal)	1
7	000-108-141	Tie Down Strap	1
8	000-174-001	Washer, #10 Flat	4
9	000-155-054	Spring, #10 Belleville Washer	2
10	000-143-065	Screw, #10-24UNC x 1.75" Lg. Hex Head	2
11	000-068-015	Hose, 1/4" I.D. - Bulk	1
12	000-068-015	Hose, 1/4" I.D. - Bulk	1
13	000-068-015	Hose, 1/4" I.D. - Bulk	1
14	000-068-015	Hose, 1/4" I.D. - Bulk	1
15	000-068-131	Hose, 1/4" I.D. - Silicone - Bulk	1
16	000-068-085	Hose, 3/8" I.D. Hi-Temp - Bulk	1
17	000-033-003	Clamp, Size #4 Mini	9
18	000-033-005	Clamp, Size #5 Hose	1

Figure 21 **15 Gallon Chemical Tank Assembly**

C-6109 Rev -

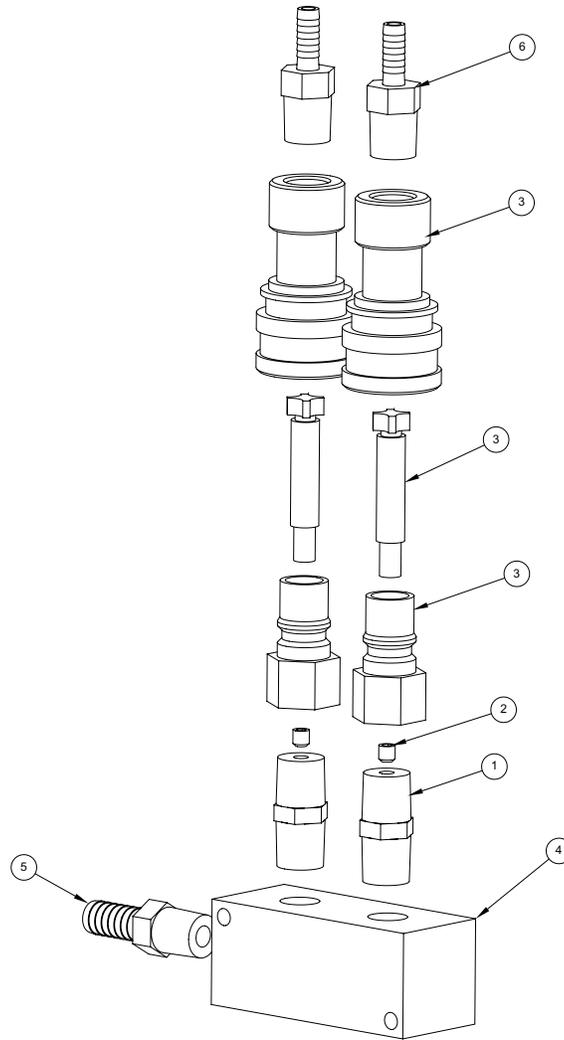


15 Gallon Chemical Tank Assembly Parts List

Item	Part Number	Description	Qty
1	000-159-126	Tank, 15 Gallon Chemical - CTS 450	1
2	000-106-055	Plug, 1/4 Ss Chemical Container - CTS 450	1
3	000-097-006	O-Ring, #8 Buna - New Rx Skid	1
4	000-033-032	Clamp, CDS Throttle Cable	2
5	000-025-008	Cable, 150 Lb Test	1

Figure 22 Chemical Mixing Manifold Assembly

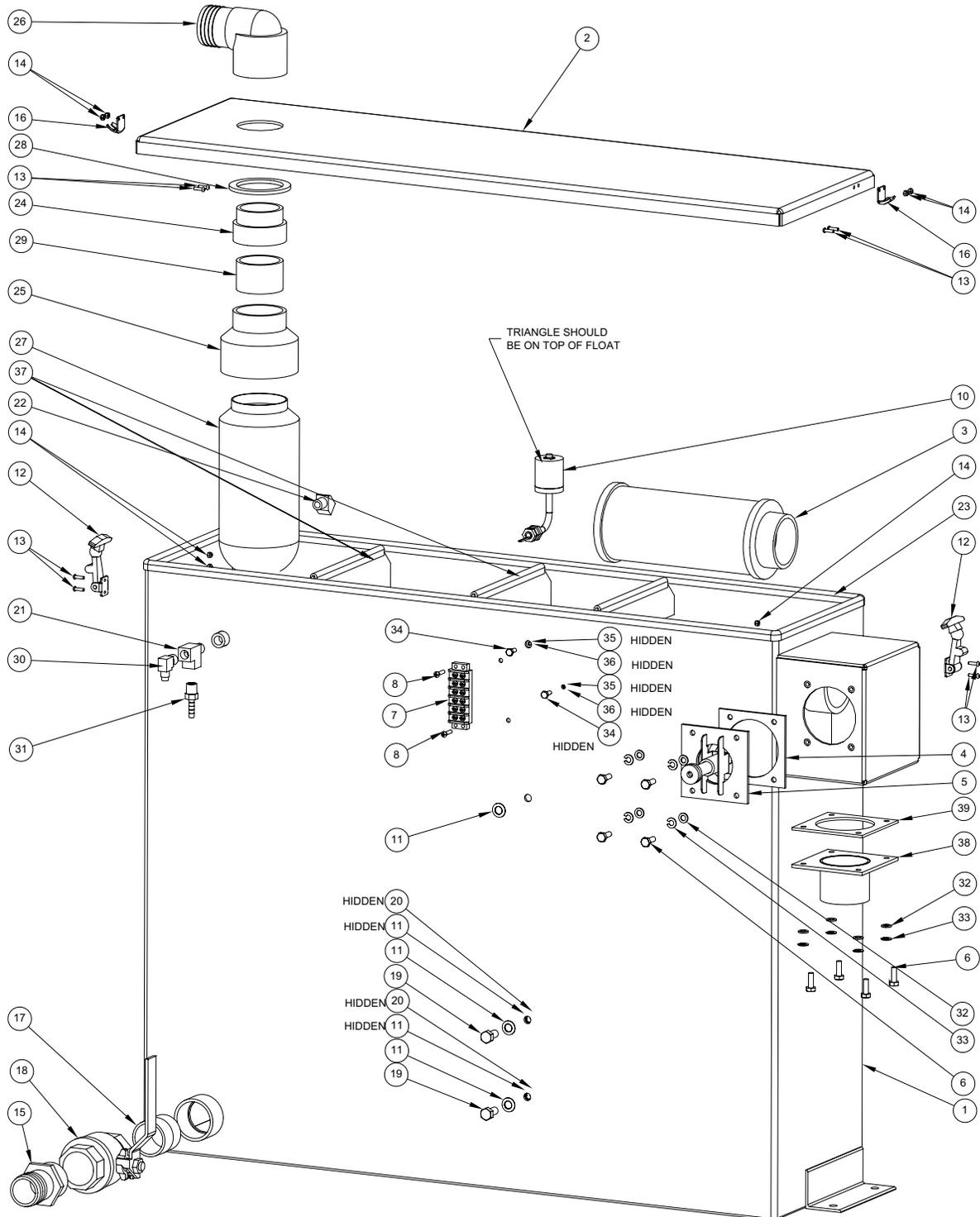
C-6107 Rev -



Chemical Mixing Manifold Assembly Parts List

Item	Part Number	Description	Qty
1	000-169-157	Valve, 1/4" NPT Check w/ Orifice	2
2	000-180-020	Orifice, Set Screw #10-32UNF x Ø0.039"	2
3	000-049-137	Filter, In-Line - Quick Connect	2
4	000-090-065	Manifold, Solution - s/s	1
5	000-052-693	Insert, #46 (1/4" NPT x 3/8" Barb) s/s	1
6	000-052-696	Insert, #44 (1/4" NPT x 1/4" Barb) s/s	2

Figure 23 Recovery Tank w/o APO Assembly
D-5269 Rev B



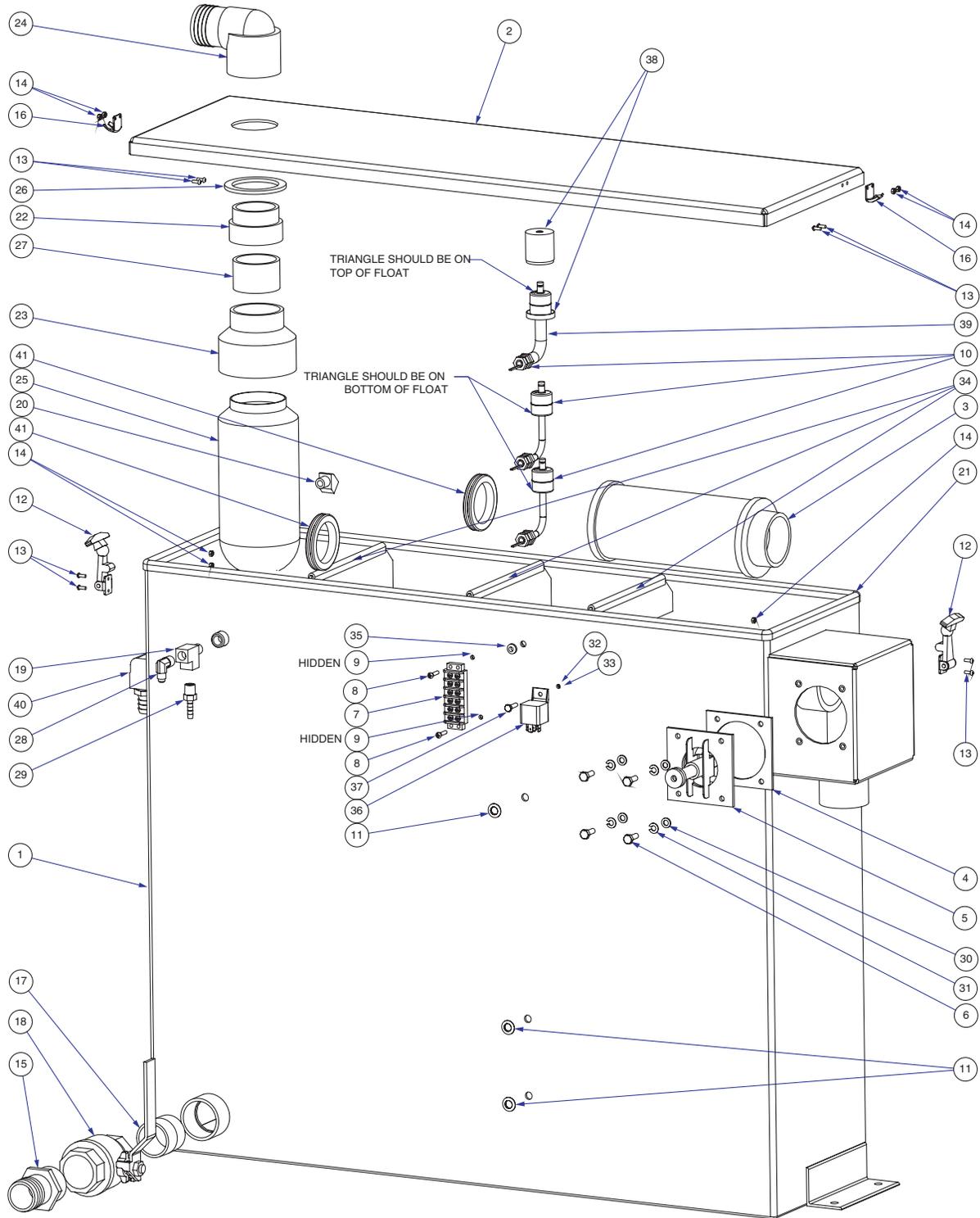
Recovery Tank w/o APO Assembly Parts List

Item	Part Number	Description	Qty
1	000-159-112	Tank, Recovery - Weldment - CTS 450	1
2	000-041-409	Cover, Recovery Tank - Weldment - CTS 450	1
3	000-049-008	Filter, 2-1/2" Recovery Tank - CDS 4.6/Boxxer 421	1
4	000-057-178	Gasket, Vacuum Relief Plate	1
5	Fig. 28	Assembly, Vacuum Relief Valve	1
6	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	8
7	000-012-002	Block, 6 Post Terminal	1
8	000-143-051	Screw, #8-32UNC x 0.75" Lg. Binder Head Phillips	2
9	000-094-059	Nut, #8-32UNF Nylock	2
10	Fig. 29	Assembly, Float Switch s/s - Recovery Tank	1
11	000-174-029	Washer, 3/8" Rubber Back	5
12	000-086-008	Latch, Bungie	2
13	000-143-539	Screw, #6-32UNC x 0.50" Lg. Button Head Allen	8
14	000-094-063	Nut, #6-32UNC Nylock	8
15	000-052-226	Insert, 1-1/2" NPT x 1-1/2" Barb (Grey)	1
16	000-086-008	Latch, Bungie - Strike	2
17	000-052-182	Nipple, 1-1/2" NPT Close Galvanized	1
18	000-169-022	Valve, 1-1/2" Full Port Ball	1
19	00-143-017-	Screw, 3/8"-16UNC x 3/4" Lg. Hex Head	2
20	000-094-100	Nut, 3/8"-16UNC Hex Nylock	2
21	000-052-090	Tee, 1/4" NPT Branch M-F-F	1
22	000-052-082	Elbow, 1/4" NPT Street x 45°	1
23	000-131-021	Trimlok, 5/8" x 1/8"	1
24	000-052-219	Adapter, 2" NPT x 2" F Slip	1
25	000-052-404	Adapter, 3" F Slip x 2" F Slip	1
26	000-052-222	Elbow, 2" Barb x 2" FPT	1
27	000-049-030	Filter Bag, 92 + Truck Mount	1
28	000-057-015	Gasket, 1-1/2" Bulkhead Fitting	1
29	000-125-052	Tube, 2" Pvc x 1.50" Lg. Filter Bag Adapter Sleeve	1
30	000-052-532	Elbow, 1/4" SAE x 1/4" JIC x 90°	1

Recovery Tank w/o APO Assembly Parts List

Item	Part Number	Description	Qty
31	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
32	000-174-003	Washer, 1/4" Flat	8
33	000-174-019	Washer, 1/4" Lock	8
34	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
35	000-174-036	Washer, #10 Flat Rubber Backed	2
36	000-094-034	Nut, #10-24UNC Nylock	2
37	000-131-021	Trimlok, 5/8" x 1/8"	3
38	000-001-119	Adapter, Recovery Tank Outlet - Boxxer 421	1
39	000-057-193	Gasket, Recovery Tank Outlet - Boxxer 427	1

Figure 24 Recovery Tank w/ APO Assembly
D-5530 Rev -



Recovery Tank w/ APO Assembly Parts List

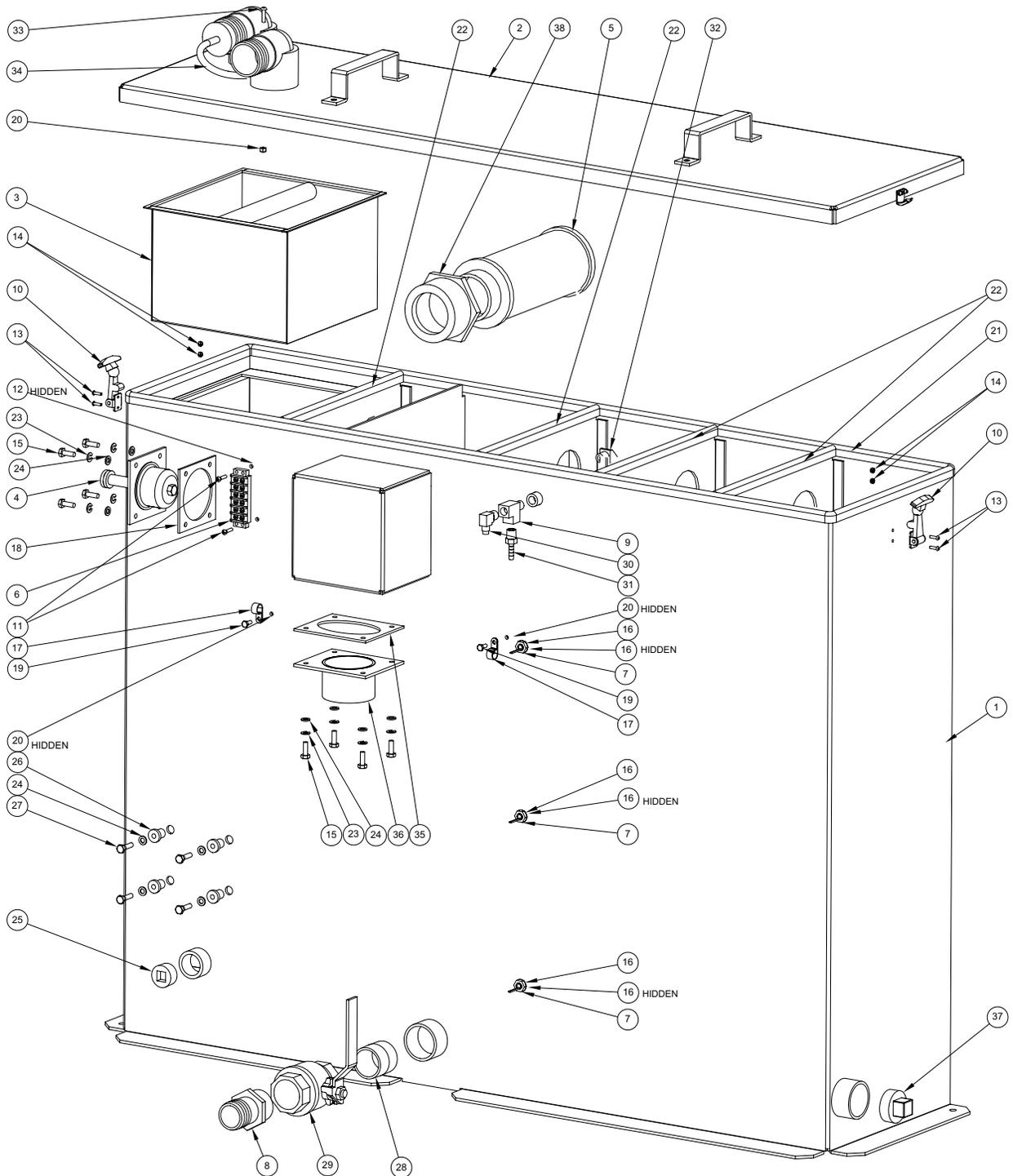
Item	Part Number	Description	Qty
1	000-159-112	Tank, Recovery - Weldment - CTS 450	1
2	000-041-409	Cover, Recovery Tank - Weldment - CTS 450	1
3	000-049-008	Filter, 2-1/2" Recovery Tank - CDS 4.6/Boxxer 421	1
4	000-057-178	Gasket, Vacuum Relief Plate	1
5	Fig. 28	Vacuum Relief Valve Assembly	1
6	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	4
7	000-012-002	Block, 6 Post Terminal	1
8	000-143-051	Screw, #8-32UNC x 0.75" Lg. Binder Head Phillips	2
9	000-094-059	Nut, #8-32UNC Nylock	2
10	000-157-080	Switch, Float	3
11	000-174-029	Washer, 3/8" Rubber Back	3
12	000-086-008	Latch, Bungie	2
13	000-143-165	Screw, #6-32UNC x 3/8" Lg. Pan Head	8
14	000-094-063	Nut, #6-32UNC Nylock	8
15	000-052-226	Insert, 1-1/2" NPT x 1-1/2" Barb	1
16	000-086-008	Latch, Bungie - Strike	2
17	000-052-182	Nipple, 1-1/2" NPT Close Galvanized	1
18	000-169-022	Valve, 1-1/2" Full Port Ball	1
19	000-052-090	Tee, 1/4" NPT Branch M-F-F	1
20	000-052-082	Elbow, 1/4" NPT Street x 45°	1
21	000-131-021	Trimlok, 5/8" x 1/8"	1
22	000-052-219	Adapter, 2" NPT x 2" F Slip	1
23	000-052-404	Adapter, 3" F Slip x 2" F Slip	1
24	000-052-222	Elbow, 2" Barb x 2" FPT	1
25	000-049-030	Filter Bag, 92 + Truck Mount	1
26	000-057-015	Gasket, 1-1/2" Bulkhead Fitting	1
27	000-125-052	Tube, 2" PVC x 1.50" Lg. Filter Bag Adapter Sleeve	1
28	000-052-532	Elbow, 1/4" SAE x 1/4" JIC x 90°	1
29	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
30	000-174-003	Washer, 1/4" Flat	4

Recovery Tank w/ APO Assembly Parts List

Item	Part Number	Description	Qty
31	000-174-019	Washer, 1/4" Lock	4
32	000-174-036	Washer, #10 Flat Rubber Backed	1
33	000-094-034	Nut, #10-24UNC Nylock	1
34	000-131-021	Trimlok, 5/8" x 1/8"	3
35	000-060-001	Grommet, Small Wiring	1
36	000-157-022	Switch, Relay	1
37	000-143-132	Screw, #10-24UNC x 0.75" Lg. Hex Head	1
38	000-108-110	Shield, Poly Float Splash	1
39	000-068-016	Hose, 5/16" I.D. - Bulk	1
40	000-079-025	Kit, APO - CTS 450 (Fig. 27)	1
41	000-060-003	Grommet, 2.50"	2

Figure 25 100 Gallon Recovery Tank Assembly

D-5859 Rev B



100 Gallon Recovery Tank Assembly Parts List

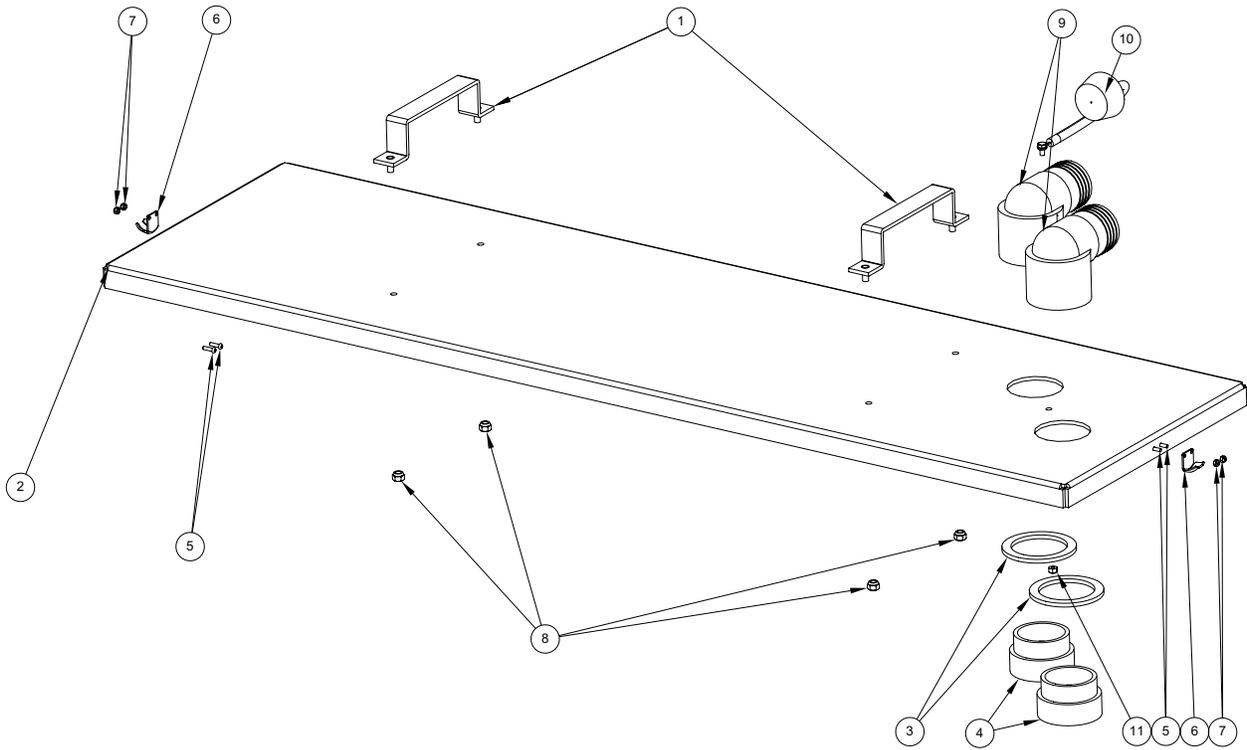
Item	Part Number	Description	Qty
1	000-159-066	Recovery Tank - Weldment - Maxx 450D/470D	1
2	Fig. 26	Assembly, Recovery Tank Cover	1
3	000-049-057	Filter Basket, Recovery Tank	1
4	Fig. 28	Assembly, Vacuum Relief Valve	1
5	000-049-008	Filter, 2-1/2" Recovery Tank - CDS 4.6/Boxxer 421	1
6	000-012-002	Block, 6 Post Terminal	1
7	Fig. 29	Assembly, Float Switch s/s - Recovery Tank	3
8	000-052-226	Insert, 1-1/2" NPT x 1-1/2" Barb (Grey)	1
9	000-052-090	Tee, 1/4" NPT Branch M-F-F	1
10	000-086-008	Latch, Bungie	2
11	000-143-051	Screw, #8-32UNC x 0.75" Lg. Binder Head Phillips	2
12	000-094-059	Nut, #8-32UNF Nylock	2
13	000-143-539	Screw, #6-32UNC x 0.50" Lg. Button Head Allen	4
14	000-094-063	Nut, #6-32UNC Nylock	4
15	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	8
16	000-174-029	Washer, 3/8" Rubber Back	6
17	000-033-022	Clamp, 1/2" Nylon Hose	2
18	000-057-178	Gasket, Vacuum Relief Plate	1
19	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
20	000-094-034	Nut, #10-24UNC Nylock	3
21	000-131-021	Trimlok, 5/8" x 1/8" Waste Tank	1
22	000-131-021	Trimlok, 5/8" x 1/8" Waste Tank	4
23	000-174-019	Washer, 1/4" Lock	8
24	000-174-003	Washer, 1/4" Flat	12
25	000-106-049	Plug, 1" NPT Allen Head	1
26	000-094-113	Nut, 1/4"-20UNC Neoprene Wellnut	4
27	000-143-002	Screw, 1/4"-20UNC x 1.00" Lg. Hex Head	4
28	000-052-182	Nipple, 1-1/2" NPT Close Galvanized	1
29	000-169-022	Valve, 1-1/2" Full Port Ball	1
30	000-052-532	Elbow, 1/4" SAE x 1/4" JIC x 90°	1

100 Gallon Recovery Tank Assembly Parts List

Item	Part Number	Description	Qty
31	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
32	000-052-082	Elbow, 1/4" NPT Street x 45°	1
33	000-143-168	Screw, #10-24UNC x 0.75" Lg.	1
34	000-078-039	Vacuum Inlet Stopper Assembly - Recovery Tank	1
35	000-057-195	Gasket, Blower Inlet Adapter - Maxx	1
36	000-001-121	Adapter, Recovery Tank Outlet - Maxx - 100 Gal.	1
37	000-106-019	Plug, 1-1/2" NPT	1
38	000-052-731	Bushing, 3" NPT x 2-1/2" FPT PVC SCH 40	1

Figure 26 100 Gallon Recovery Tank Cover Assembly

C-5960 Rev A

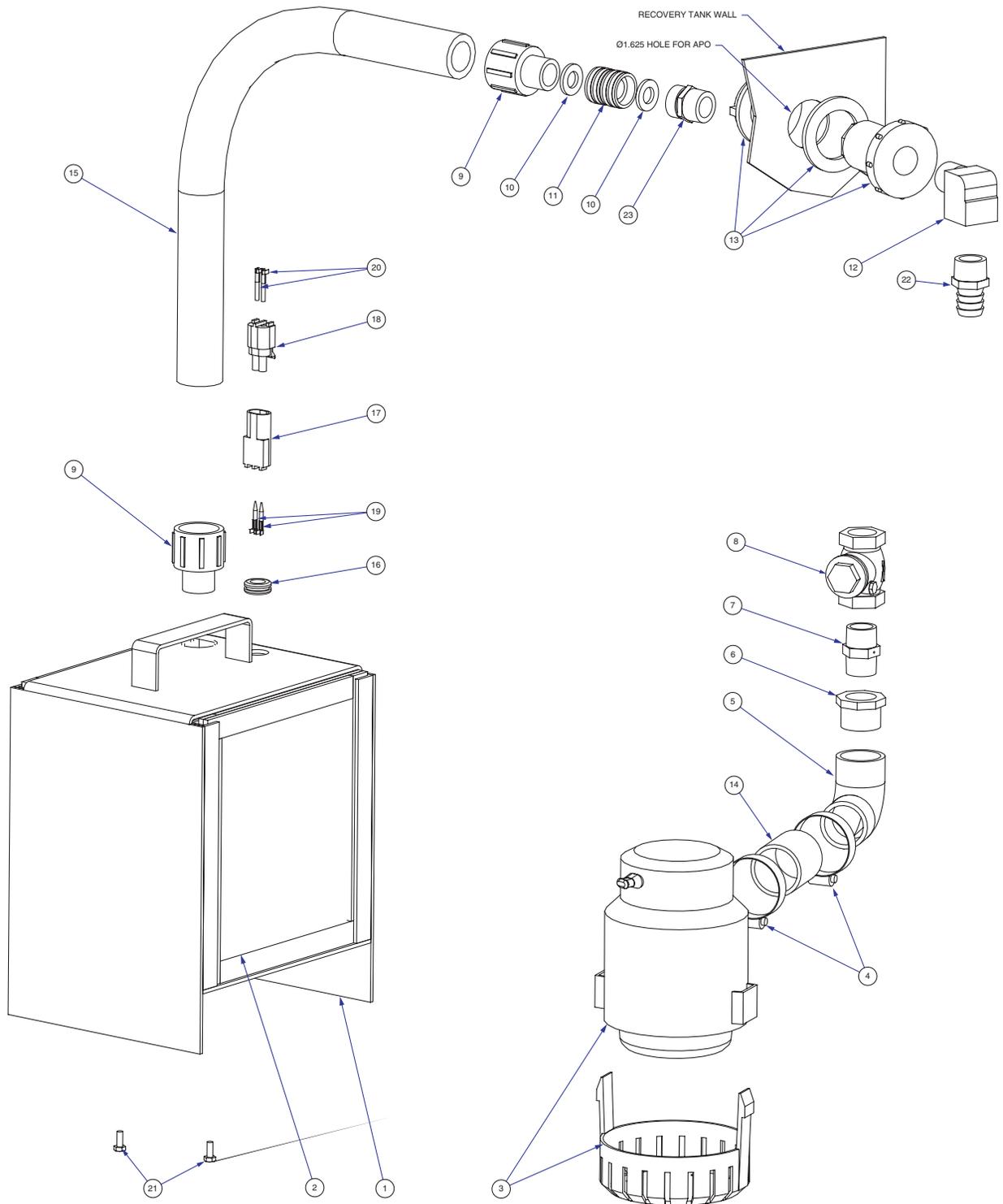


100 Gallon Recovery Tank Cover Assembly Parts List

Item	Part Number	Description	Qty
1	000-061-059	Handle, Recovery Tank Cover - Maxx	2
2	000-041-240	Cover, Recovery Tank - Weldment	1
3	000-057-015	Gasket, 1-1/2" Bulkhead Fitting	2
4	000-052-219	Adapter, 2" NPT x 2" F Slip	2
5	000-143-539	Screw, #6-32UNC x 0.50" Lg. Button Head Allen	4
6	000-086-008	Latch, Bungie - Strike	2
7	000-094-063	Nut, #6-32UNC Nylock	4
8	000-094-009	Nut, 1/4"-20UNC Hex Nylock	4
9	000-052-222	Elbow, 2" Barb x 2" FPT	2
10	000-078-039	Vacuum Inlet Stopper Assembly - Recovery Tank	1
11	000-094-034	Nut, #10-24UNC Nylock	1

Figure 27 APO Assembly

D-5531 Rev -

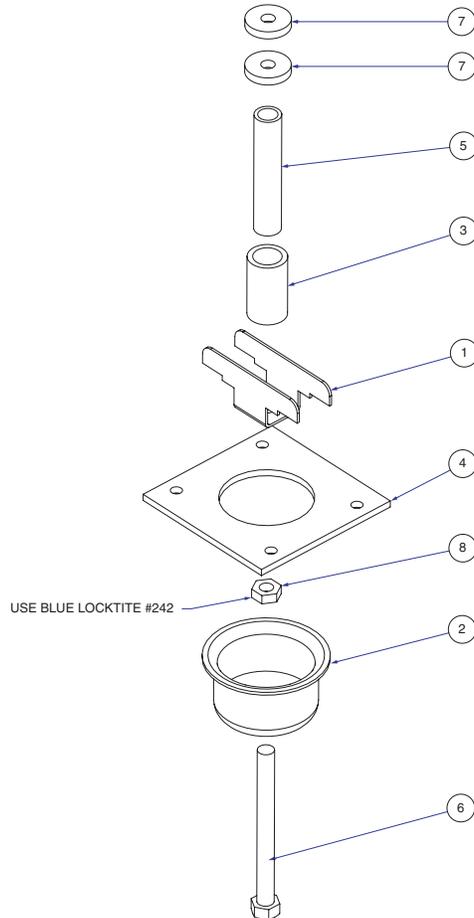


APO Assembly Parts List

Item	Part Number	Description	Qty
1	000-055-041	Frame, APO - Top Exit Style - Weldment	1
2	000-049-058	Screen, APO Filter - Boxxer	2
3	000-111-012	Pump, Truck Mount Waste Pump Out	1
4	000-033-009	Clamp, Size #24 Hose	2
5	000-052-234	Elbow, 1" F Slip x 1" F Slip	1
6	000-052-235	Bushing, 3/4" FPT x 1" M Slip	1
7	000-052-329	Nipple, 3/4" Hex - Modified	1
8	000-169-009	Valve, 3/4" FPT Swing Check	1
9	000-052-236	Adapter, 3/4" NPT x 1" F Slip	2
10	000-057-055	Gasket, Garden Hose	2
11	000-052-244	Swivel, 3/4" Female Garden x 3/4" Female Garden	1
12	000-052-340	Elbow, 3/4" NPT Street	1
13	000-052-339	Coupler, 3/4" FPT x 3/4" FPT Bulkhead Fitting	1
14	000-052-163	Cuff, 1.50" Vacuum Hose	1
15	000-068-204	Hose, Ø1" I.D. Kana Flex	1
16	000-060-009	Grommet, 1/2" I.D. w/ 3/32" Groove	1
17	000-037-047	Connector, 2 Pole - Male Water Tight	1
18	000-037-048	Connector, 2 Pole - Female Water Tight	1
19	000-037-050	Terminal, Male Pin- 4 Pole Water Tight	2
20	000-037-102	Pin Terminal, #18 w/o Insulation - Female	2
21	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
22	000-052-338	Insert, #1212 (3/4" NPT x 3/4" Barb)	1
23	000-052-281	Nipple, 3/4" NPT x 3/4" Male Garden Hose	1

Figure 28 Vacuum Relief Valve Assembly

C-4237 Rev A

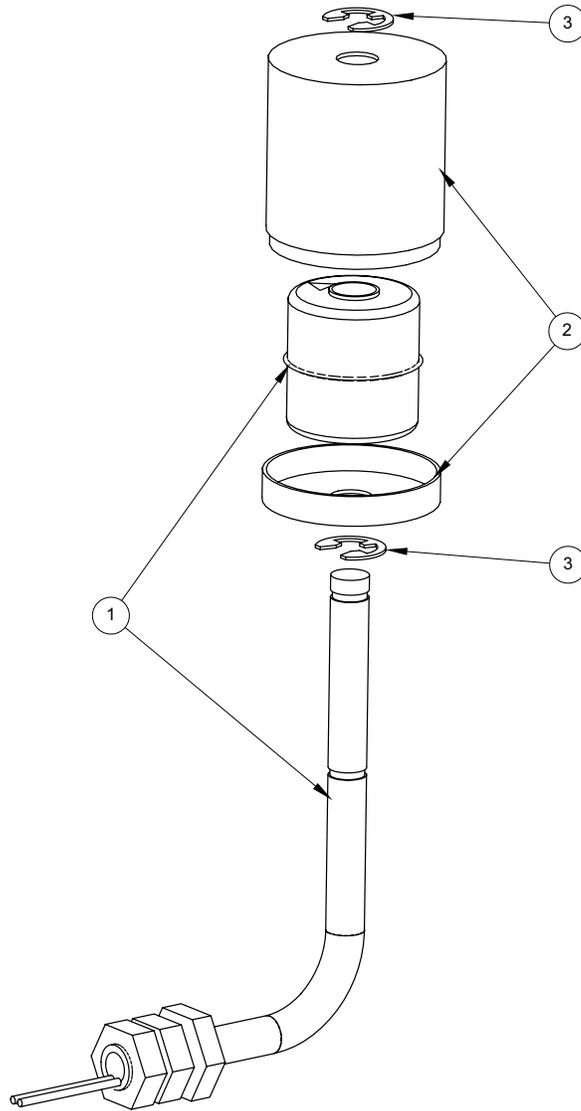


Vacuum Relief Valve Assembly Parts List

Item	Part Number	Description	Qty
1	000-015-182	Bracket, Vacuum Relief Valve	1
2	000-027-032	Cap, Vacuum Relief Valve	1
3	000-125-111	Pipe, Vacuum Relief Spring Guide	1
4	000-105-067	Plate, Vacuum Relief Valve Mounting	1
5	000-155-026	Spring, Vacuum Relief	1
6	000-143-198	Screw, 3/8"-16UNC x 4" Lg. Hex Head Full Thread	1
7	000-094-077	Nut, 3/8"-16UNC x 1.00" O.D. Knurled	2
8	000-094-101	Nut, 3/8"-16UNC Hex Jam	1

Figure 29 Float Switch s/s Recovery Tank Assembly

B-6092 Rev -



Float Switch s/s Recovery Tank Assembly Parts List

Item	Part Number	Description	Qty
1	000-157-080	Switch, Recovery Tank Float	1
2	000-108-110	Shield, Poly Float Splash	1
3	000-139-010	Ring, Snap Ring (E-Clip) x 5/16"	2

CTS 450 Diesel Assemblies & Parts

Figure 30 Machine Assembly CTS 450 Diesel - Front View
D-5865 Rev B

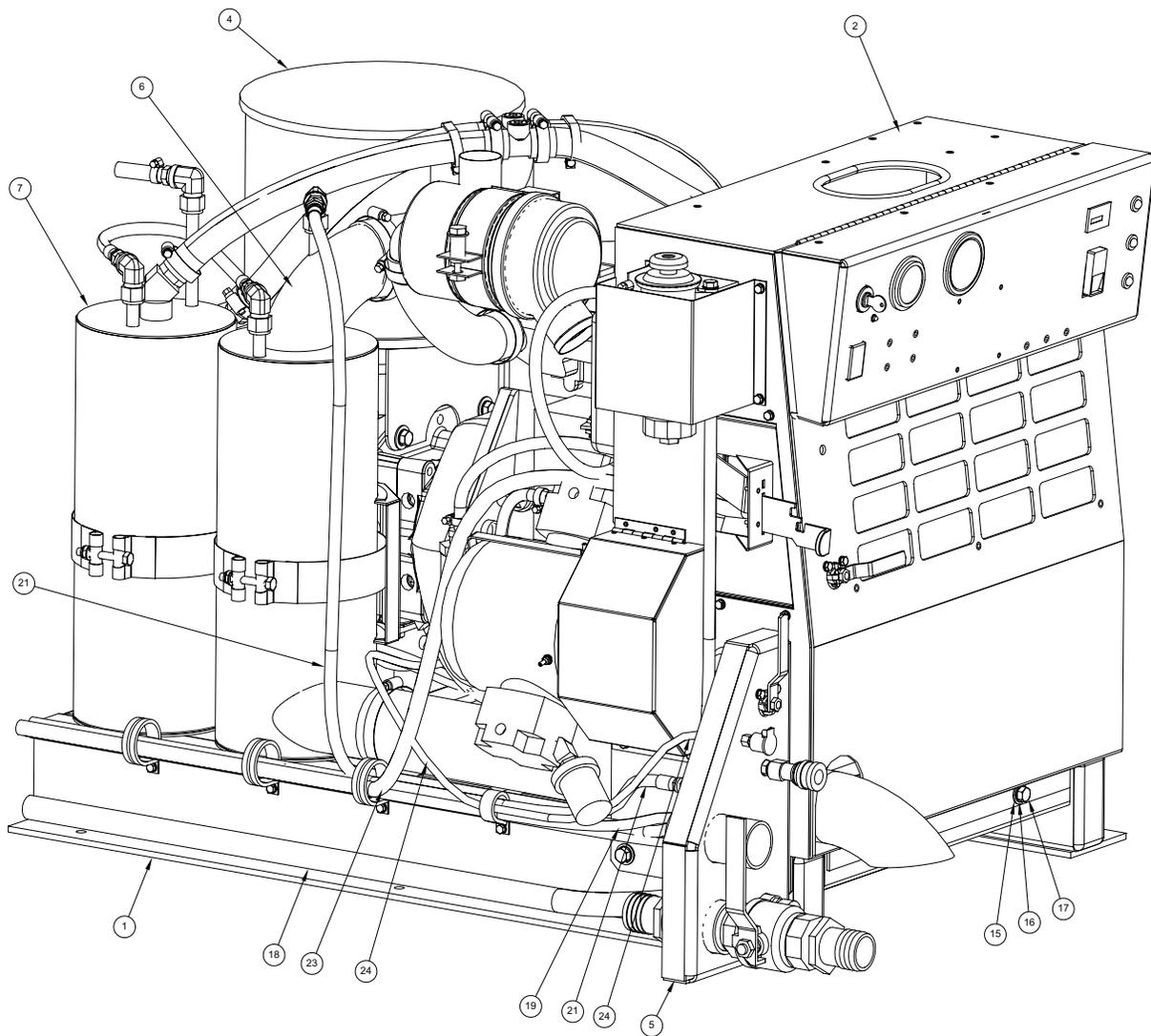


Figure 31 Machine Assembly CTS 450 Diesel - Rear View
D-5865 Rev B

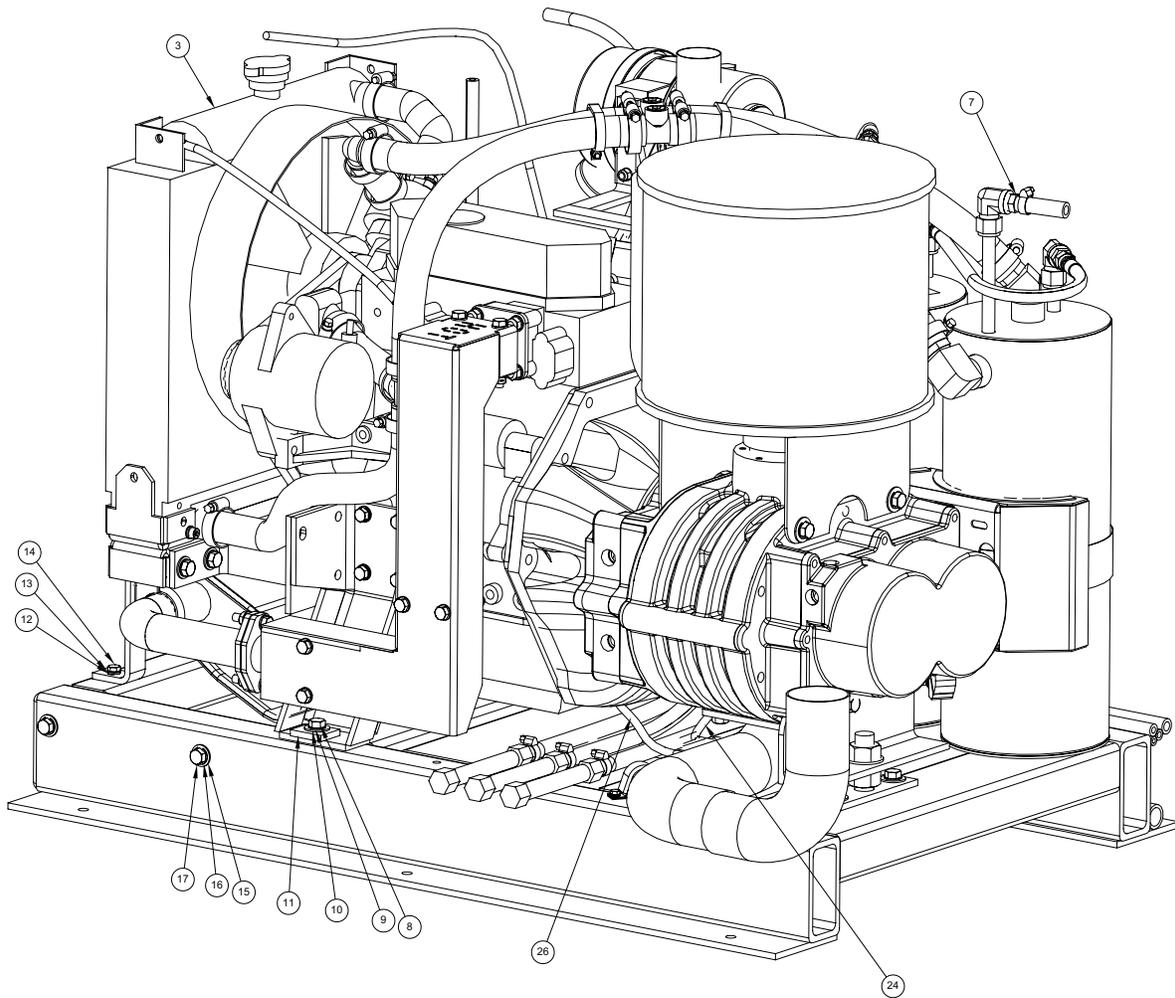
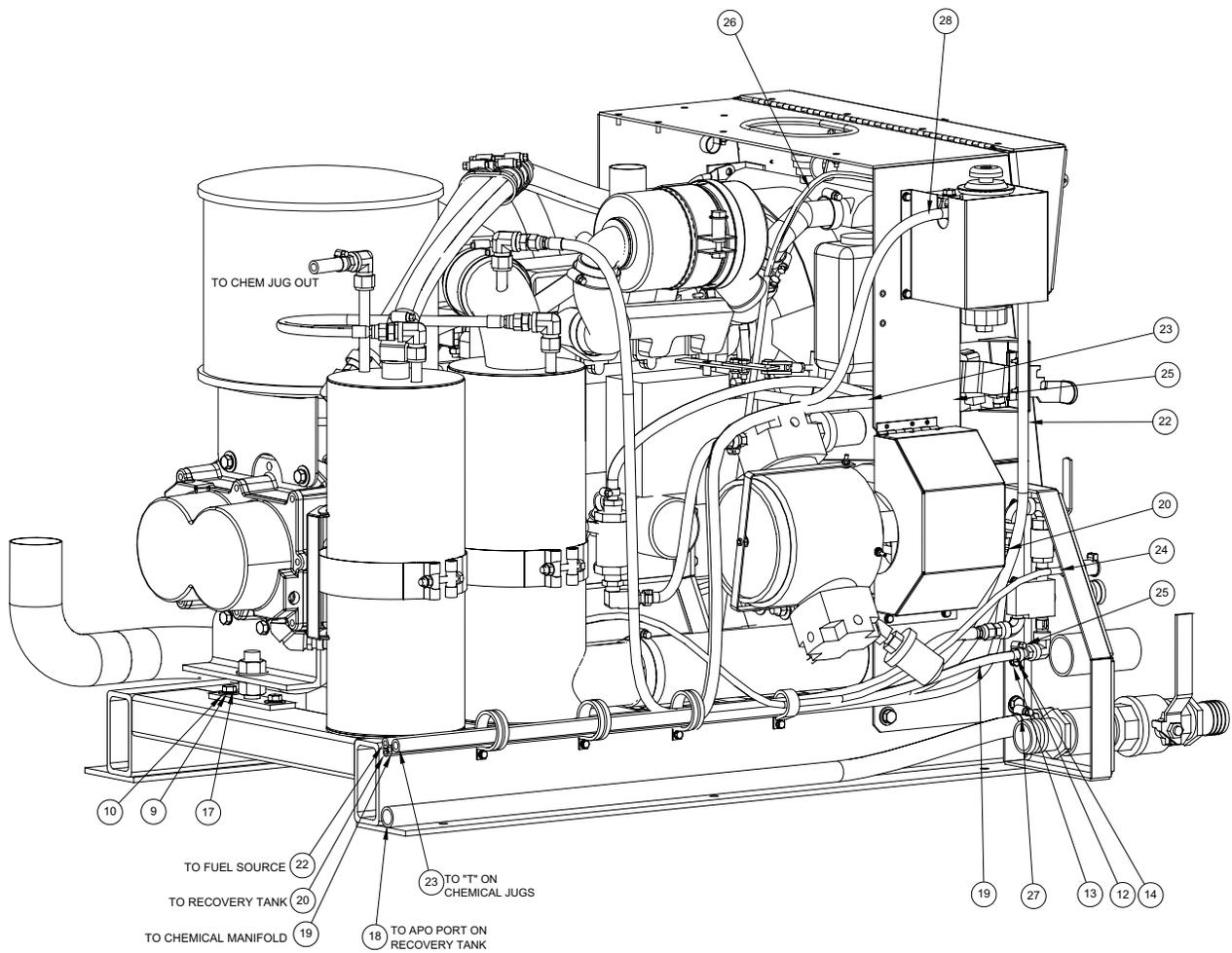


Figure 32 Machine Assembly CTS 450 Diesel - Side View
D-5865 Rev B



Machine Assembly Parts List

Item	Part Number	Description	Qty
1	610-001-031	Assembly, Frame - CTS 450 Diesel (Fig. 37)	1
2	610-020-031	Assembly, Dash - CTS 450D (Fig. 33-34)	1
3	610-003-031	Assembly, Engine - CTS 450 Diesel (Fig. 38-39)	1
4	610-002-029	Assembly, Blower - CTS 450 (Fig. 16)	1
5	610-019-029	Assembly, Dump & Vacuum Bracket - CTS 450 (Fig. 17)	1
6	610-005-029	Assembly, Blower Exhaust Heat Exchanger (Fig. 19)	1
7	610-006-029	Assembly, Coolant Heat Exchanger - CTS 450 (Fig. 18)	1
8	000-143-025	Screw, 3/8"-16UNC x 1.25" Lg. Hex Head Grd 8	2
9	000-174-021	Washer, 3/8" Lock	4
10	000-174-005	Washer, 3/8" Flat	4
11	000-174-068	Washer, Blower Feet	2
12	000-174-003	Washer, 1/4" Flat	5
13	000-174-019	Washer, 1/4" Lock	5
14	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	5
15	000-174-032	Washer, 3/8" Flat	6
16	000-174-057	Washer, 3/8" Lock	6
17	000-143-017	Screw, 3/8"-16UNC x 0.75" Lg. Hex Head Grd. 8	8
18	000-068-004	Hose, 3/4" I.D. Steam	1
19	000-068-015	Hose, 1/4" I.D. Bulk	1
20	000-068-723	Hose, 3/16" x 75" Lg. Teflon w/ JIC Ends	1
21	000-068-722	Hose, 3/8" x 46" Lg. Teflon w/ JIC Ends	1
22	000-068-660	Hose, 1/4" Fuel - Trident	1
23	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
24	000-068-030	Hose, 5/32" I.D. Vacuum	1
25	000-033-003	Clamp, Size #4 Mini	2
26	000-068-030	Hose, 5/32" I.D. Vacuum	1
27	000-033-026	Clamp, Size #10 Hose	1
28	000-068-005	Hose, 5/16" I.D. Fuel Line - Bulk	1

Figure 33 Dash Assembly CTS 450 Diesel - Front View
D-5867 Rev B

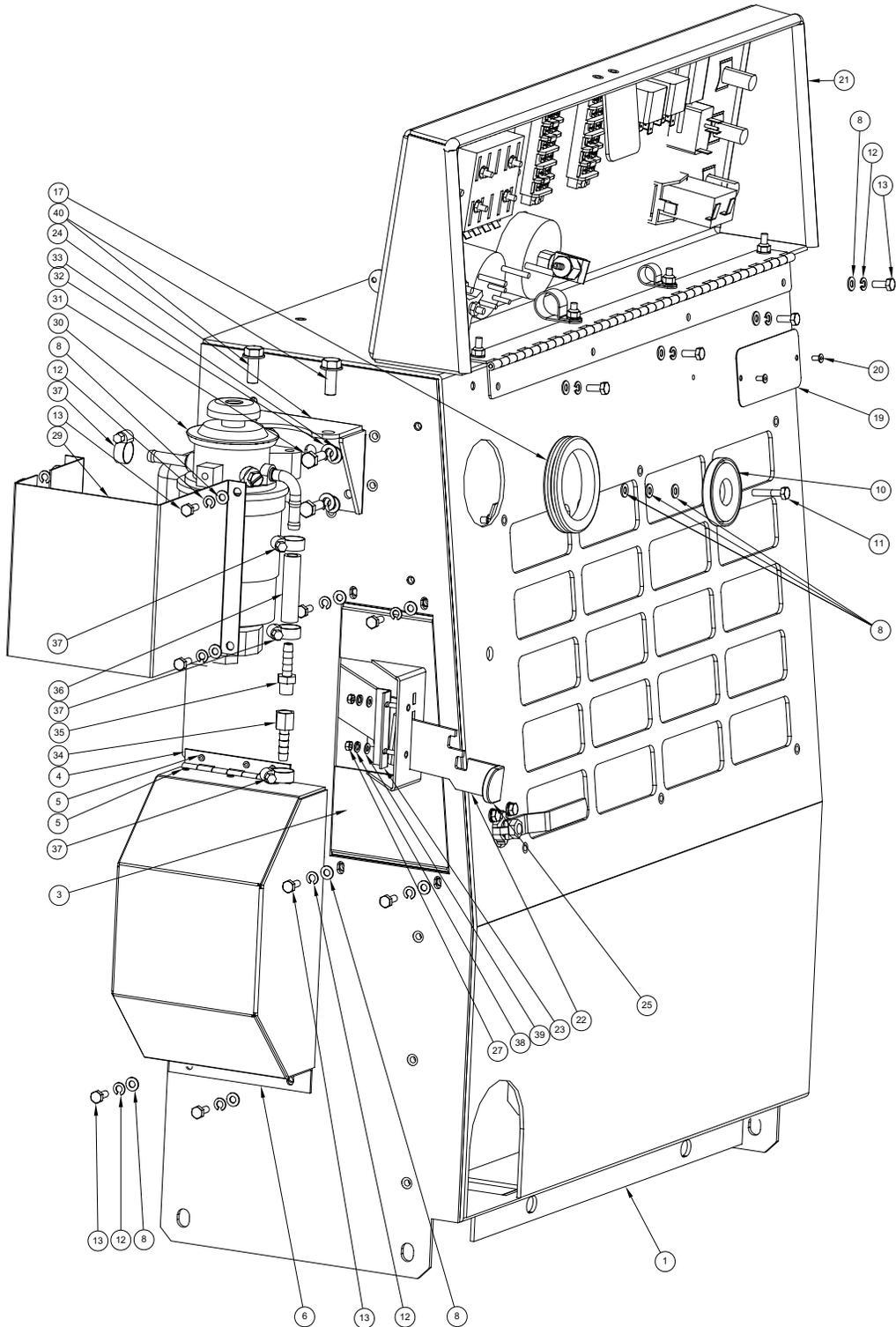
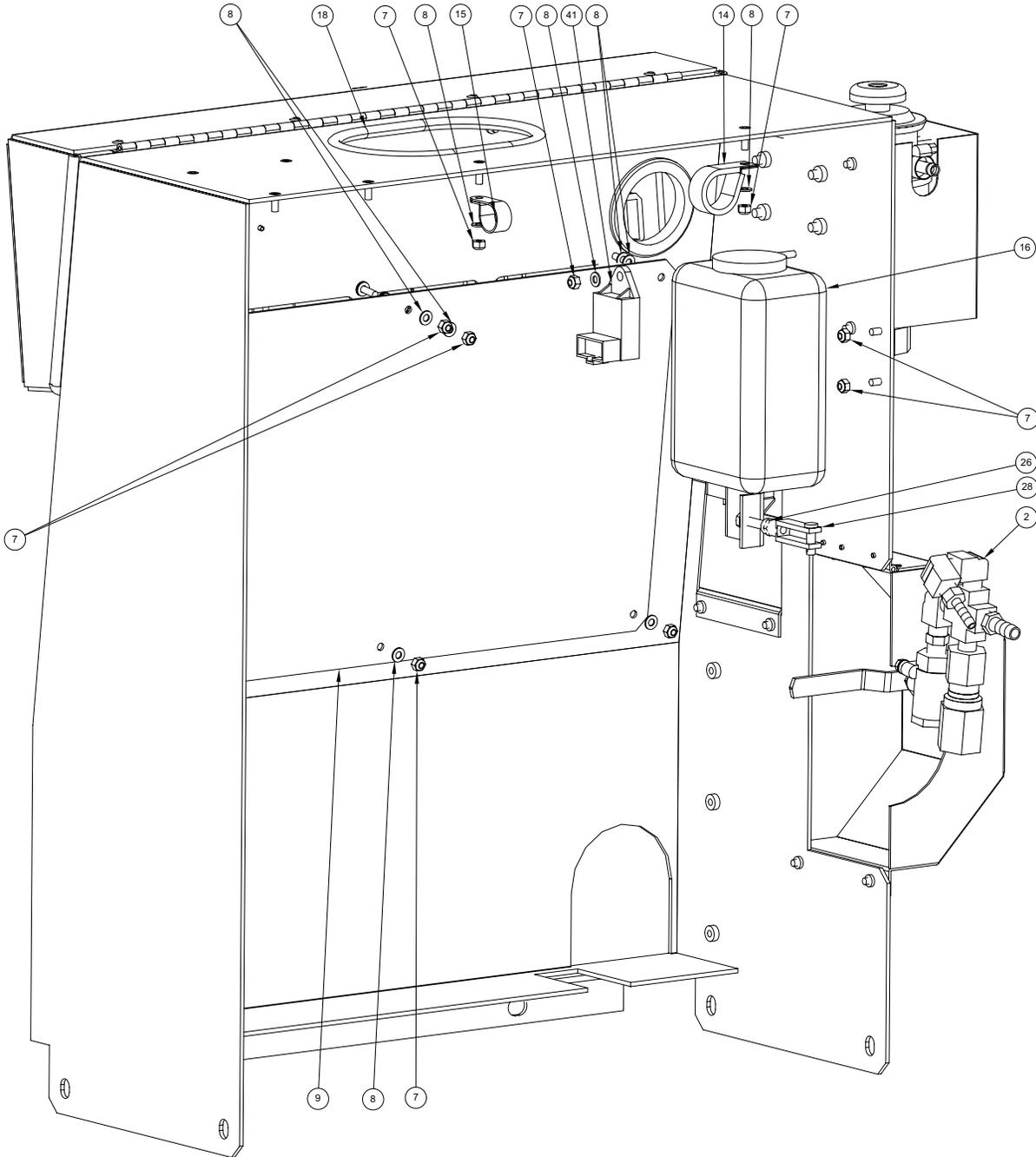


Figure 34 Dash Assembly CTS 450 Diesel - Rear View
D-5867 Rev B



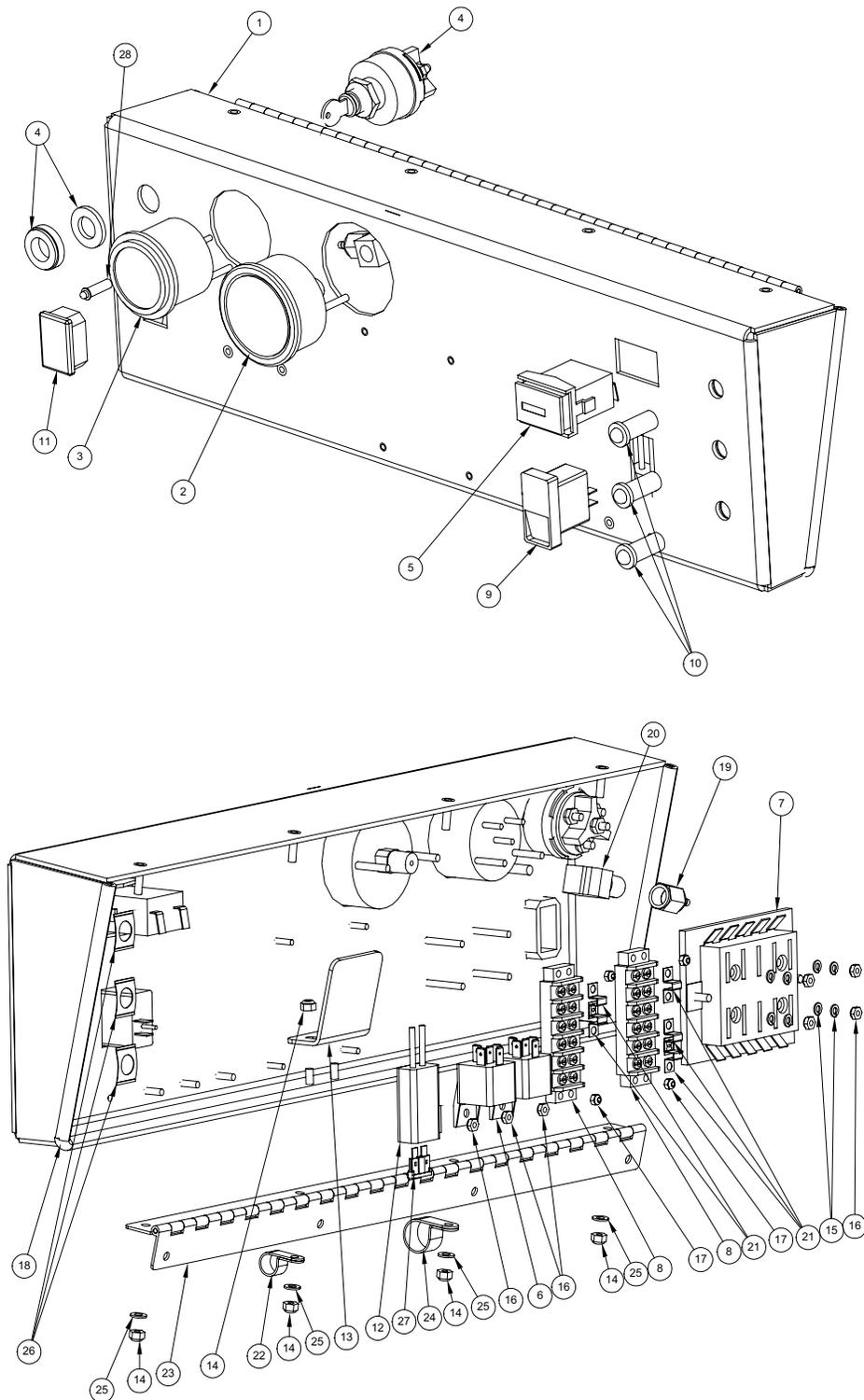
Dash Assembly Parts List

Item	Part Number	Description	Qty
1	000-100-140	Panel, Dash - Weldment - CTS 450D	1
2	610-020-031	Assembly, Compressor Regulator - CTS 450D (Fig. 36)	1
3	000-015-220	Panel, Side - CTS 450 Diesel - Weldment	1
4	000-067-034	Hinge, Compressor Cover - CTS 450	1
5	000-140-001	Rivet, 1/8" x 1/4" Aluminum	6
6	000-108-123	Protector, Compressor Pulley - Weldment - CTS 450	1
7	000-094-034	Nut, #10-24UNC Nylock	12
8	000-174-001	Washer, #10 Flat	39
9	000-100-102	Panel, Perforated Grill	1
10	000-089-003	Magnet, Treadmaster	1
11	000-143-134	Screw, #10-24UNC x 1.00" Lg Hex Head	1
12	000-174-014	Washer, #10 Lock	14
13	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	14
14	000-033-057	Clamp, 1" Cushion Loop	1
15	000-033-023	Clamp, 3/4" Nylon Hose	1
16	000-047-016	Tank, Coolant Overflow - Daihatsu Engine	1
17	000-060-003	Grommet, 2.50"	1
18	000-131-131	Trimlok, 3/8" x 1/8" Edge Trim	1
19	000-105-012	Plate, Machine Serial I.D.	1
20	000-140-015	Rivet, 1/8" x 1/4" Lg. Pop	2
21	610-020-031	Assembly, Brow - Dash - CTS 450D (Fig. 35)	1
22	000-015-222	Bracket, Throttle Handle	1
23	000-015-221	Bracket, Throttle Guide - CTS 450 Diesel	1
24	000-015-198	Weldment, Water Separator	1
25	000-041-082	Cover, Throttle Handle	1
26	000-094-112	Nut, 1/4"-28UNF Jam Hex Z/P	1
27	000-094-001	Nut, #6-32UNC Hex	2
28	000-085-010	Linkage, Clevis	1
29	000-108-049	Bracket, Water Separator Protector - CTS 450D	1
30	000-049-068	Fuel Separator	1

Dash Assembly Parts List

Item	Part Number	Description	Qty
31	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	4
32	000-174-019	Washer, 1/4" Lock	4
33	000-174-003	Washer, 1/4" Flat	4
34	000-052-109	Insert, #F24 (1/8" NPT x 1/4" Barb)	1
35	000-052-098	Insert, #25	1
36	000-068-005	Hose, 5/16" I.D. Fuel Line	1
37	000-033-003	Clamp, Size #4 Mini	4
38	000-174-043	Washer, #6 Lock	2
39	000-174-045	Washer, #6 Flat	2
40	- - -	Screw, 8.0mm x 20.0mm Lg. (Comes w/ Engine)	2
41	- - -	Timer, Glow Plug - Daihatsu 850D (Comes w/ Engine)	1

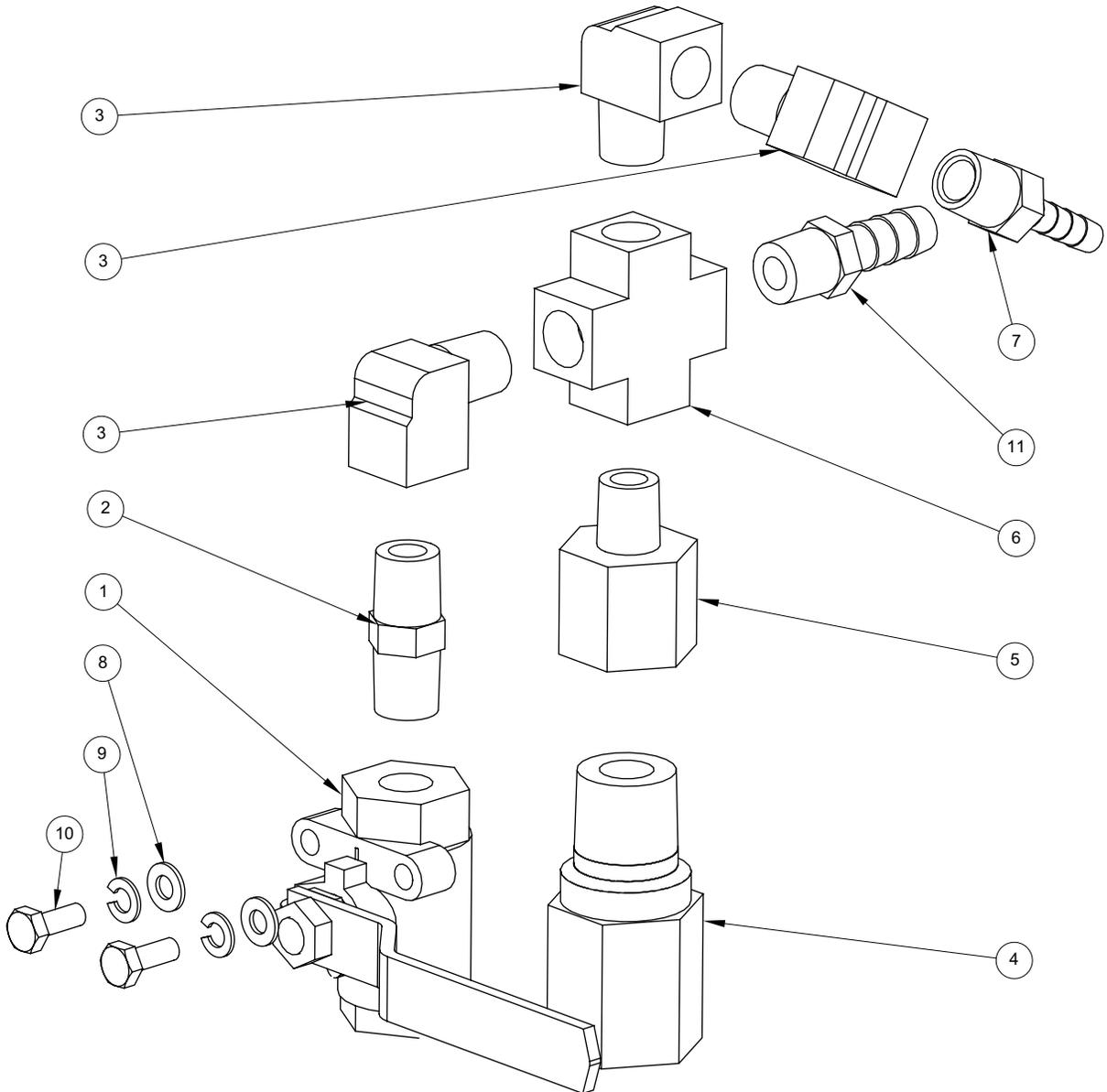
Figure 35 Brow Assembly CTS 450 Diesel
D-5868 Rev A



Brow Assembly Parts List

Item	Part Number	Description	Qty
1	000-100-136	Panel, Dash Brow - Weldment - CTS 450	1
2	000-074-025	Gauge, 0-30"Hg Vac. 2 1/2"	1
3	000-074-024	Gauge, Temperature	1
4	000-157-008	Switch, Ignition	1
5	000-074-018	Meter, Rectangular w/o Bezel	1
6	000-157-022	Switch, Relay	2
7	000-056-030	Diode Panel	1
8	000-012-002	Block, 6 Post Terminal	2
9	000-157-040	Switch, 20 AMP Rocker	1
10	000-084-015	Lamp, 12V 2W Round Red Indicator	3
11	000-106-065	Plug, 1" x 1-1/2" Plastic	1
12	000-056-006	Fuse Holder, Inline Weather Proof	1
13	000-015-839	Bracket, Magnet - Painted - CTS 450	1
14	000-094-034	Nut, #10-24UNC Nylock	6
15	000-174-025	Washer, #8 Lock	8
16	000-094-059	Nut, #8-32UNF Nylock	7
17	000-094-063	Nut, #6-32UNC Nylock	4
18	000-131-131	Trimlok, 3/8" x 1/8" Edge Trim	1
19	000-052-652	Insert, #F42 (1/4" FPT x 1/8" Barb)	1
20	000-052-085	Elbow, 1/4" NPT Street	1
21	000-037-011	Connector, "Jumper" Terminal Block	5
22	000-033-022	Clamp, 1/2" Nylon Hose	1
23	000-067-014	Hinge, Dash - CF 3.7/CTS 450	1
24	000-033-023	Clamp, 3/4" Nylon Hose	1
25	000-174-001	Washer, #10 Flat	4
26	000-033-049	Clamp, Indicator Lamp	3
27	000-056-011	Fuse, 30 AMP Plug In	1
28	000-084-011	Light, Red Led Indicator Mini	1

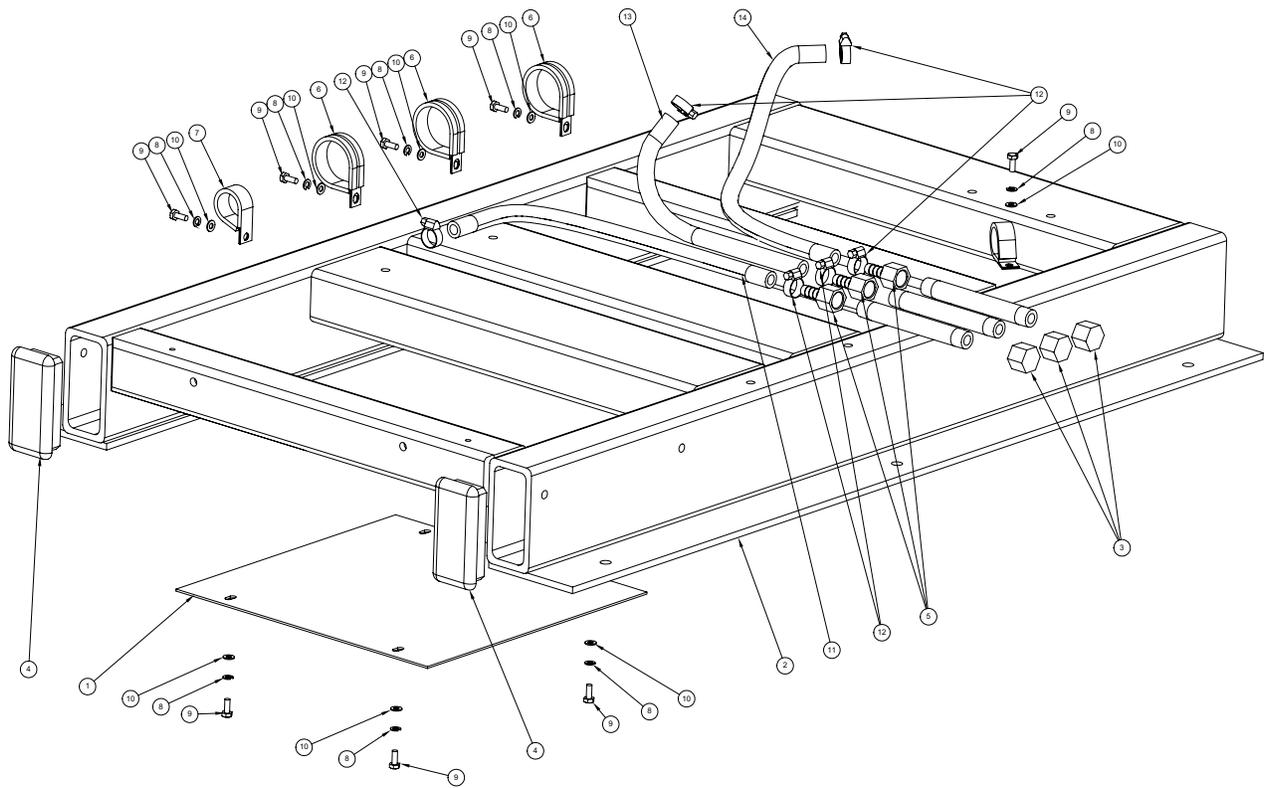
Figure 36 **Compressor Regulator Assembly CTS 450 Diesel**
C-6245 Rev -



Compressor Regulator Assembly Parts List

Item	Part Number	Description	Qty
1	000-169-090	Valve, 1/4" NPT Panel Mount - Full Port Ball	1
2	000-052-071	Nipple, 1/4" NPT Hex	1
3	000-052-085	Elbow, 1/4" NPT Street	3
4	000-169-208	Valve, Compressor Pop Off (1/2" MPT x 1/2" Fpt)	1
5	000-052-738	Adapter, 1/4" NPT x 1/2" FPT	1
6	000-052-736	Cross, 1/4" FPT	1
7	000-052-100	Insert, #44 (1/4" NPT x 1/4" Barb)	1
8	000-174-001	Washer, #10 Flat	2
9	000-174-014	Washer, #10 Lock	2
10	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	2
11	000-052-102	Insert, #46 (1/4" NPT x 3/8" Barb)	1

Figure 37 Frame Assembly CTS 450 Diesel
D-5878 Rev -



Frame Assembly Parts List

Item	Part Number	Description	Qty
1	000-108-124	Protector, Muffler Heat Shield - CTS 450	1
2	000-055-159	Frame, Weldment - CTS 450	1
3	000-027-008	Cap, 3/8" FPT	3
4	000-027-034	Cap, Frame End - Modified - Maxx/CTS 450	2
5	000-052-488	Insert, #F66 (3/8" NPT x 3/8" Hose Barb)	3
6	000-033-050	Clamp, 1-3/4" Cushion Loop	3
7	000-033-057	Clamp, 1" Cushion Loop	2
8	000-174-014	Washer, #10 Lock	9
9	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	9
10	000-174-001	Washer, #10 Flat	9
11	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
12	000-033-005	Clamp, Size #5 Hose	6
13	000-068-085	Hose, 3/8" I.D. Hi-Temp	1
14	000-068-085	Hose, 3/8" I.D. Hi-Temp	1

Figure 38 Engine Assembly CTS 450 Diesel - Right View
D-5866 Rev A

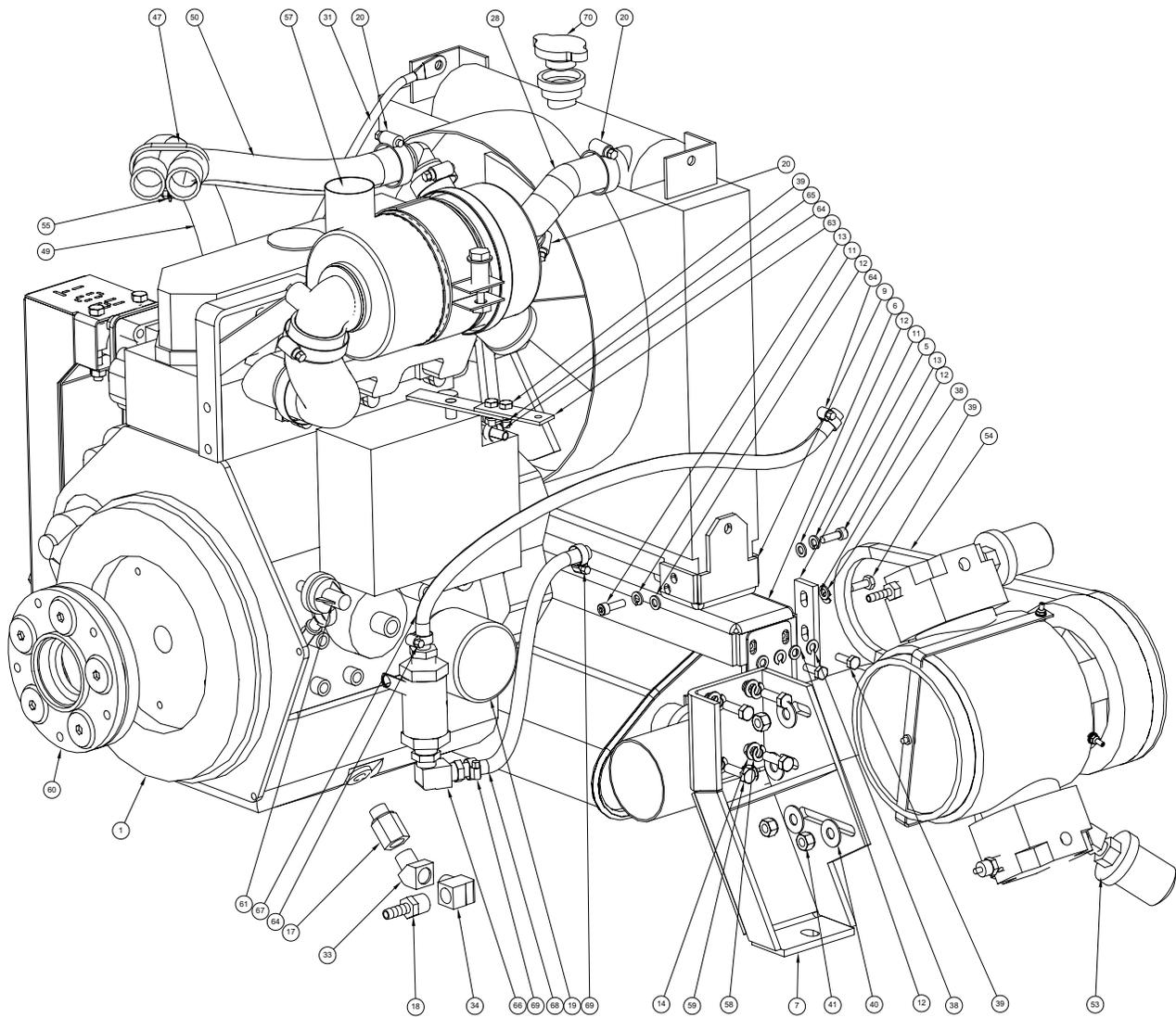
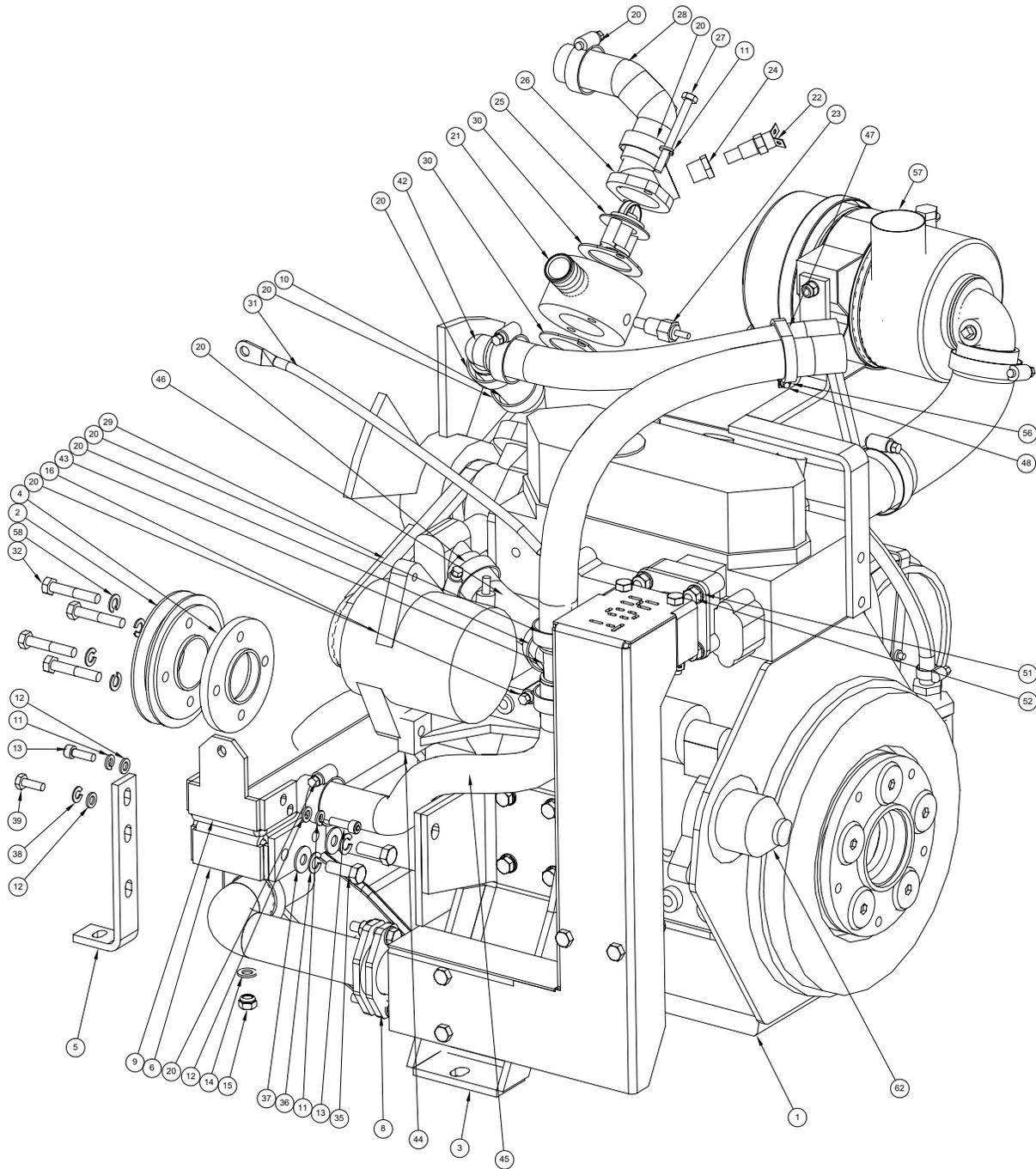


Figure 39 Engine Assembly CTS 450 Diesel - Left View
D-5866 Rev A



Engine Assembly CTS 450 Diesel Parts List

Item	Part Number	Description	Qty
1	000-047-017	Engine, Daihatsu 850 Diesel	1
2	000-109-078	Pulley, CAT Pump Drive	1
3	000-015-731	Bracket, Right Front Foot - Daihatsu	1
4	000-154-126	Spacer, Daihatsu Crank Shaft - CTS 450	1
5	000-015-872	Bracket, Radiator Mounting - CTS 450	2
6	000-015-831	Bracket, Radiator Channel	1
7	000-015-858	Bracket, Left Front Engine Mounting	1
8	610-003-029	Assembly, Exhaust - CTS 450 (Fig. 12)	1
9	000-015-737	Bracket, Radiator Mounting	2
10	000-068-250	Hose, 1" Green Stripe	1
11	000-174-017	Washer, 1/4" Lock	6
12	000-174-003	Washer, 1/4" Flat	8
13	000-143-077	Screw, 6mm x 20mm Lg. Socket Head	4
14	000-174-049	Washer, 5/16" Flat	10
15	000-094-038	Nut, 5/16"-18UNC Nylock	2
16	000-047-016	Alternator, Daihatsu 700G & 950G	1
17	000-052-058	Adapter, 3/8" FPT x 16mm Male Engine Oil Drain	1
18	000-052-104	Insert, #66 (3/8" NPT x 3/8" Barb)	1
19	000-049-014	Filter, 16HP Oil - All B & S	1
20	000-033-020	Clamp, Size #16 Hose	10
21	000-001-033	Adapter, Thermostat Housing	1
22	000-149-505	Sensor, 240F Daihatsu Engine	1
23	000-149-039	Sender, Temperature	1
24	000-052-061	Bushing, 3/8" NPT x 1/4" FPT	1
25	000-149-023	Thermostat, 195°F Engine	1
26	000-047-016	Thermostat Housing - Daihatsu Engine	1
27	000-143-220	Screw, 6mm x 65mm Lg. Hex Head	2
28	000-068-500	Hose, Upper Radiator Daihatsu Engine	1
29	000-010-027	Belt, CTS 450 Alternator Replacement	1
30	000-057-050	Gasket, Thermostat Housing Daihatsu Engine	2

Engine Assembly CTS 450 Diesel Parts List

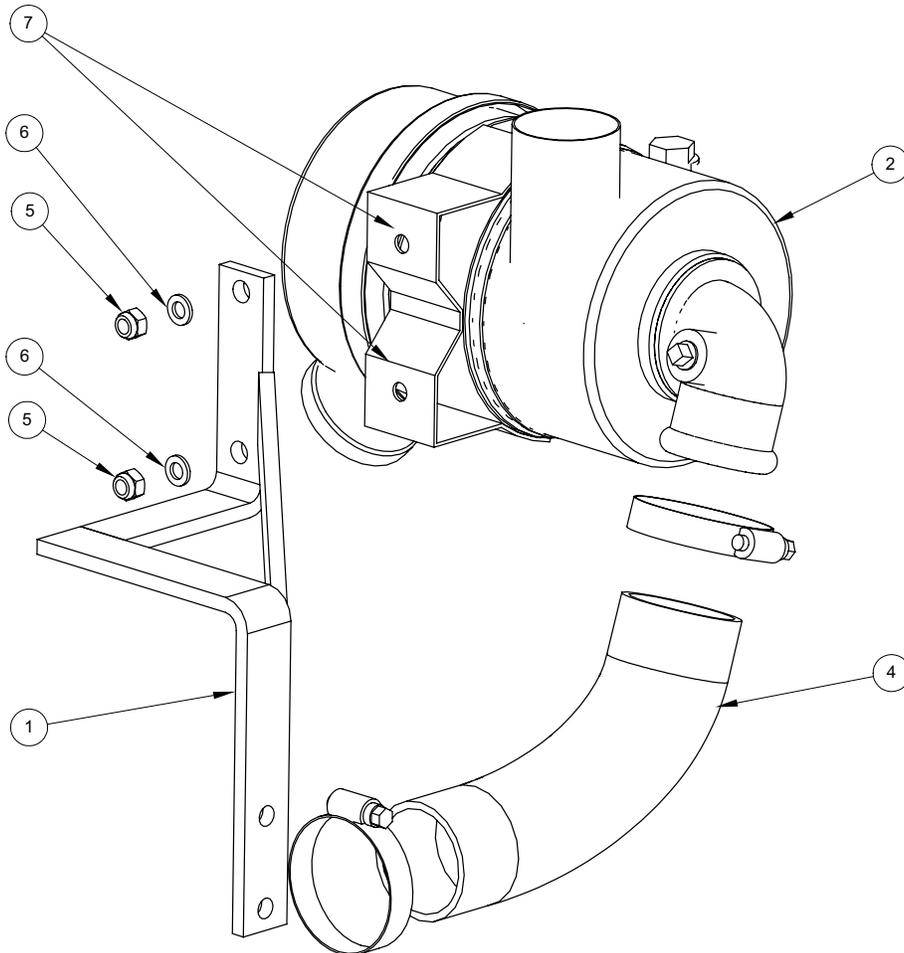
Item	Part Number	Description	Qty
31	000-047-016	Bracket, Radiator Upper Support - Right - Raw	1
32	000-143-184	Screw, 8mm x 45mm Lg. Hex Head Grd. 10.9	4
33	000-052-083	Elbow, 3/8" NPT Street x 45°	1
34	000-052-086	Elbow, 3/8" NPT Street	1
35	000-143-018	Screw, 3/8"-16UNC x 1.00" Lg. Grade 8	2
36	000-174-057	Washer, 3/8" Lock	2
37	000-174-032	Washer, 3/8" Flat	2
38	000-174-019	Washer, 1/4" Lock	4
39	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	6
40	000-174-005	Washer, 3/8" Flat	4
41	000-094-100	Nut, 3/8"-16UNC Hex Nylock	4
42	000-052-091	Elbow, 1" Barb x 1" Barb (For Radiator Hose)	1
43	000-052-648	Tee, 1" Barb x 1" Barb x 1" Barb	1
44	000-047-016	Bracket, Alternator Mounting - Lower - Daihatsu 700G/	1
45	000-068-032	Hose, 1" I.D. w/90° Preform Lower Rad.	1
46	000-068-500	Hose, Upper Radiator - Daihatsu Engine	1
47	000-033-067	Clamp, 2" Cushion Loop	1
48	000-143-126	Screw, #10-24UNC x 0.50" Lg. Hex Head	1
49	000-068-250	Hose, 1" I.D. Green Stripe	1
50	000-068-250	Hose, 1" I.D. Green Stripe	1
51	000-174-069	Washer, 5/16" Inconel Belleville, Diverter Valve	4
52	000-094-043	Nut, 8mm Hex	4
53	610-007-029	Assembly, Air Compressor - CTS 450 (Fig. 14)	1
54	000-010-063	Belt, A39 - (Air Compressor)	1
55	000-174-001	Washer, #10 Flat	1
56	000-094-034	Nut, #10-24UNC Nylock	1
57	610-003-031	Assembly, Air Cleaner - CTS 450 Diesel (Fig. 40)	1
58	000-174-018	Washer, 5/16" Lock	12
59	000-143-187	Screw, 8mm x 25mm Lg. Grade. 10.9 Hex Head	8
60	000-039-020	Coupler, C-Face Daihatsu - CTS 450	1

Engine Assembly CTS 450 Diesel Parts List

Item	Part Number	Description	Qty
61	000-157-130	Switch, Oil Pressure	1
62	000-091-021	Starter, Daihatsu 700G Engine	1
63	000-015-223	Bracket, Throttle Lever	1
64	000-033-003	Clamp, Size #4 Mini	3
65	000-094-009	Nut, 1/4"-20UNC Hex Nylock	2
66	610-003-029	Assembly, Compressor Check Valve - CTS 450 (Fig. 15	1
67	000-068-131	Hose, 1/4" I.D. Silicone - Bulk	1
68	000-068-131	Hose, 1/4" I.D. Silicone - Bulk	1
69	000-033-005	Clamp, Size #5 Hose	2
70	000-027-114	Cap, Radiator 3LC Engine - Daihatsue	1

Figure 40 Air Cleaner Assembly CTS 450 Diesel

C-5879 Rev -

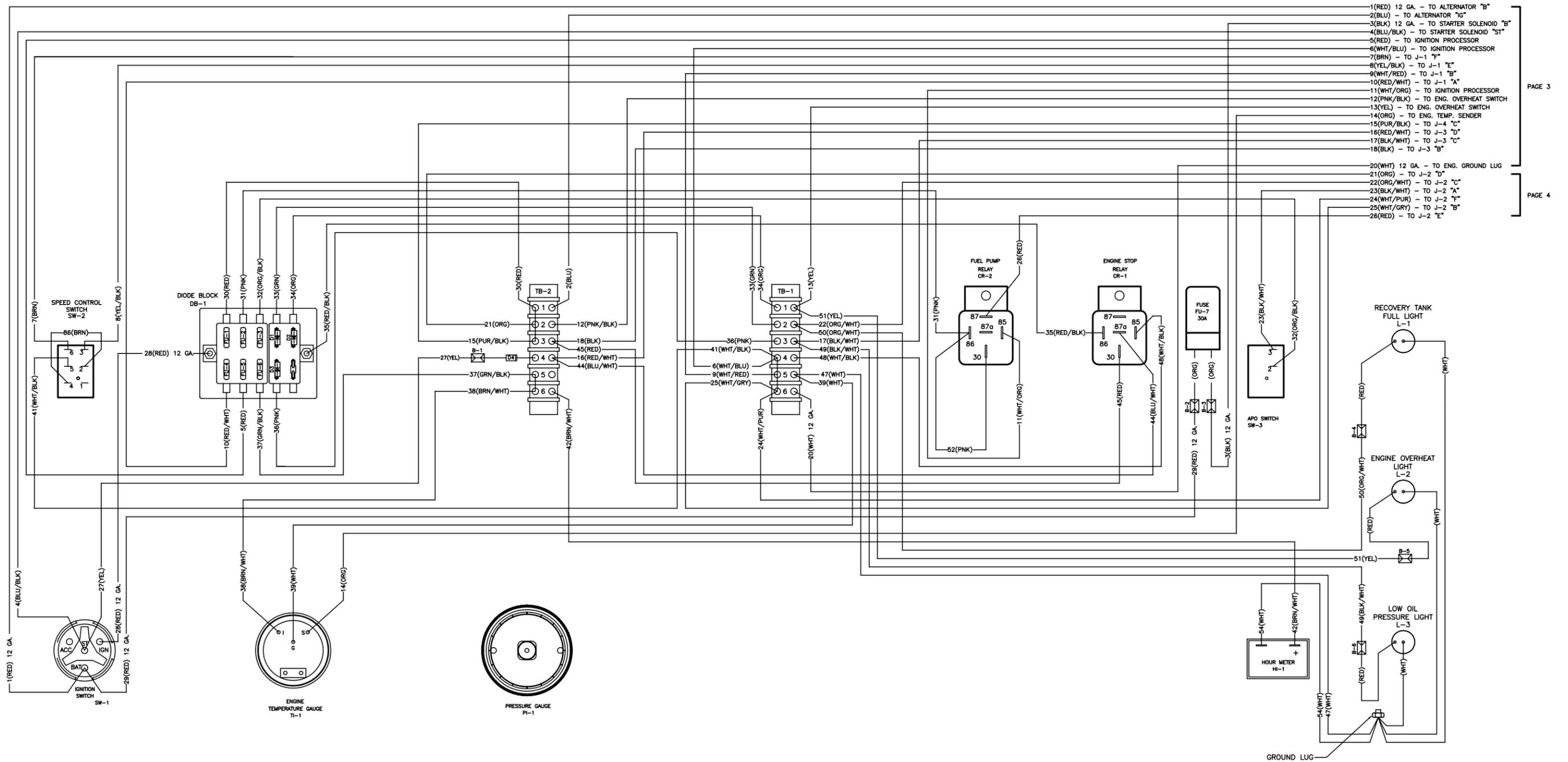


Air Cleaner CTS 450 Diesel Assembly Parts List

Item	Part Number	Description	Qty
1	000-015-844	Bracket, Air Cleaner Mounting - CTS 450	1
2	000-047-016	Air Cleaner - Daihatsu Engine	1
3	000-033-007	Clamp, #28 Hose	2
4	000-068-733	Hose, Air Cleaner To Carb.	1
5	000-094-009	Nut, 1/4"-20UNC Hex Nylock	2
6	000-174-003	Washer, 1/4" Flat	2
7	000-143-001	Screw, 1/4"-20UNC x 0.75" Lg. Hex Head	2

WD-1 Wiring Diagram - CTS 450 Gas Engine

D-5503 Sht 1, Rev F



PAGE 3

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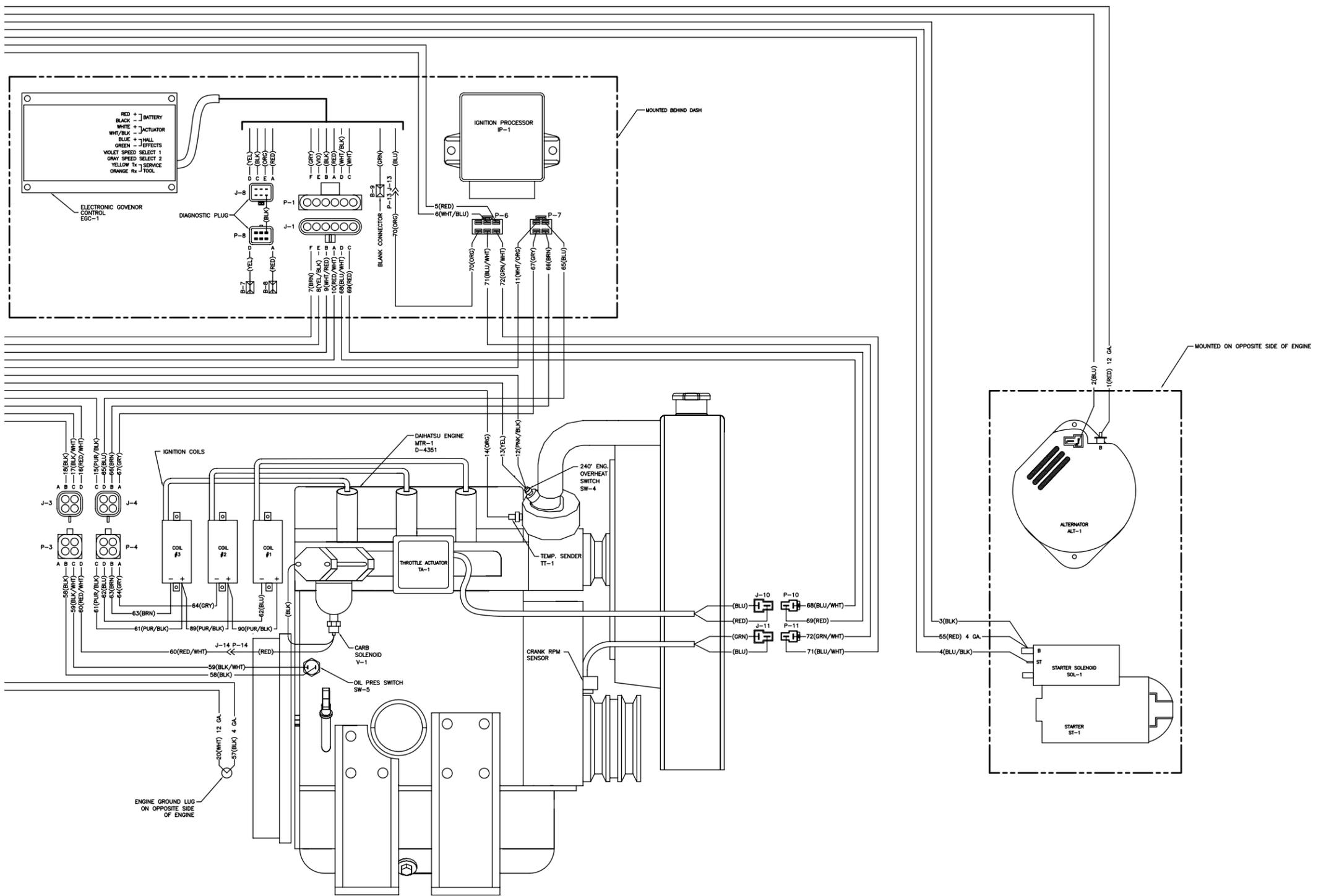
WD-2 Wiring Diagram - CTS 450 Gas Engine

D-5503 Sht 2, Rev F

- PAGE 2 [1(RED) 12 GA. - TO IGN. SWITCH "BAT"
 2(BLU) - TO TB-2 "1"
 3(BLK) 12 GA. - TO MAIN FUSE
 55(RED) 4 GA. - TO BATTERY "+"
 4(BLU/BLK) - TO IGN. SWITCH "ST"
 5(RED) - TO FU-5
 6(WHT/BLU) - TO TB-1 "4"

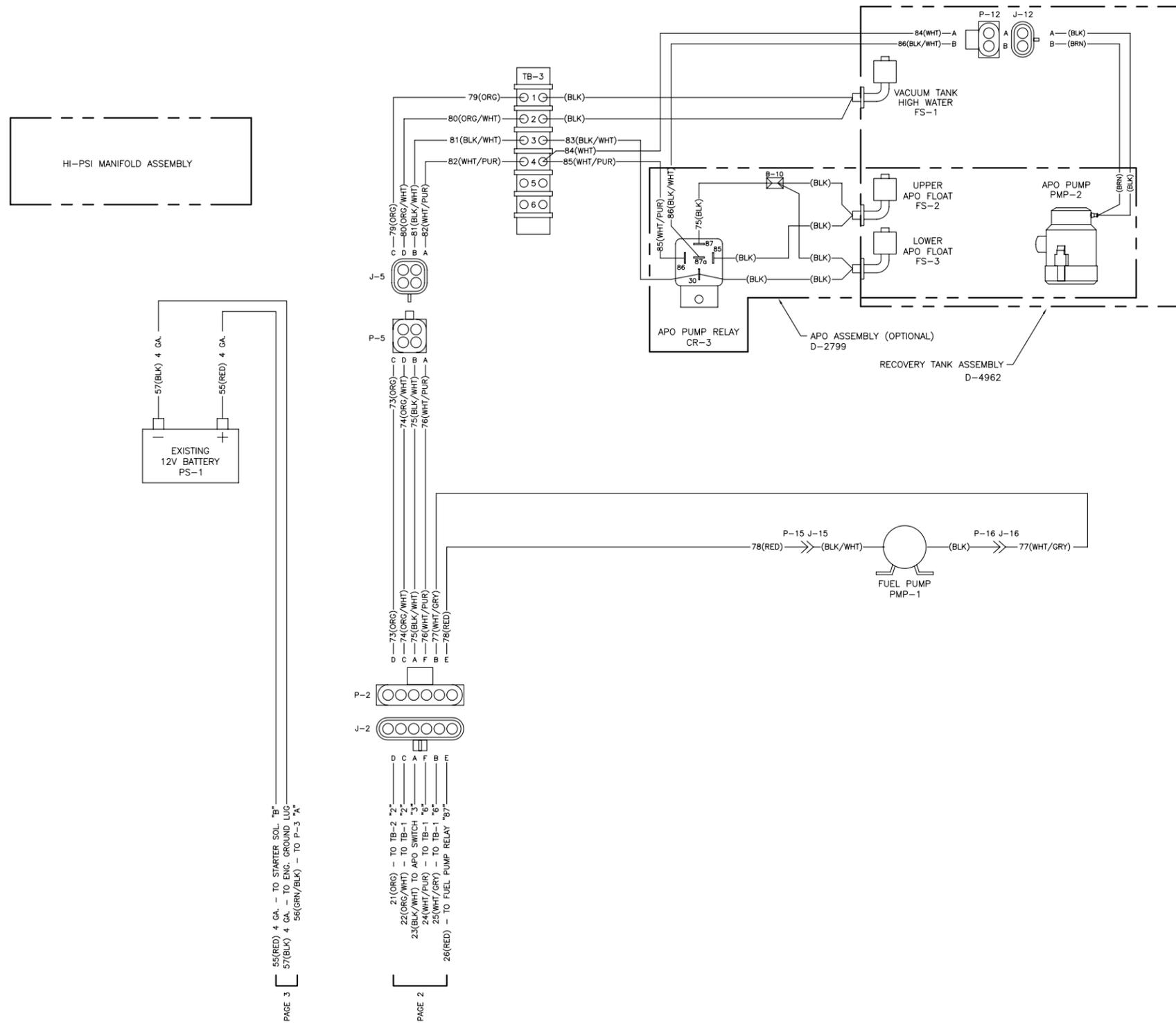
- PAGE 2 [7(BRN) - TO SPEED CONTROL SWITCH "6"
 8(YEL/BLK) - TO SPEED CONTROL SWITCH "3"
 9(WHT/RED) - TO TB-1 "3"
 10(RED/WHT) - TO FU-4
 11(WHT/ORG) - TO FUEL PUMP RELAY "B5"
 12(PNK/BLK) - TO TB-2 "2"
 13(YEL) - TO TB-1 "1"
 14(ORG) - TO ENG. TEMP. GAUGE "3"
 15(PUR/BLK) - TO TB-2 "3"
 16(RED/WHT) - TO TB-2 "4"
 17(BLK/WHT) - TO TB-1 "3"
 18(BLK) - TO TB-2 "3"

- PAGE 4 [57(BLK) 4 GA. TO BATTERY "-"
 PAGE 2 [20(WHT) 12 GA. - TO TB-1 "6"



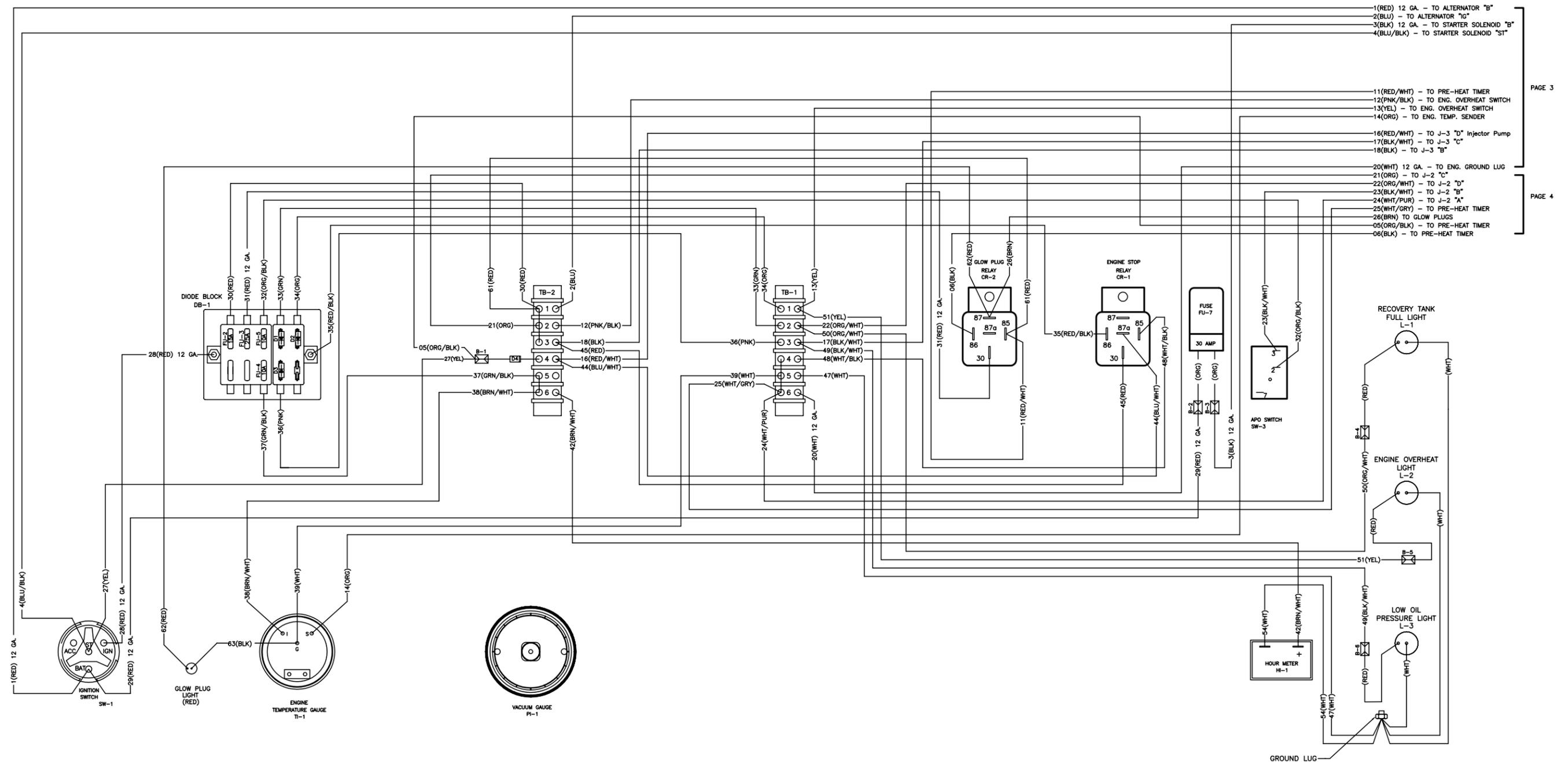
WD-3 Wiring Diagram - CTS 450 Gas Engine

D-5503 Sht 3, Rev F



WD-4 Wiring Diagram - CTS 450 Diesel Engine

D-5638 Sht 1, Rev C

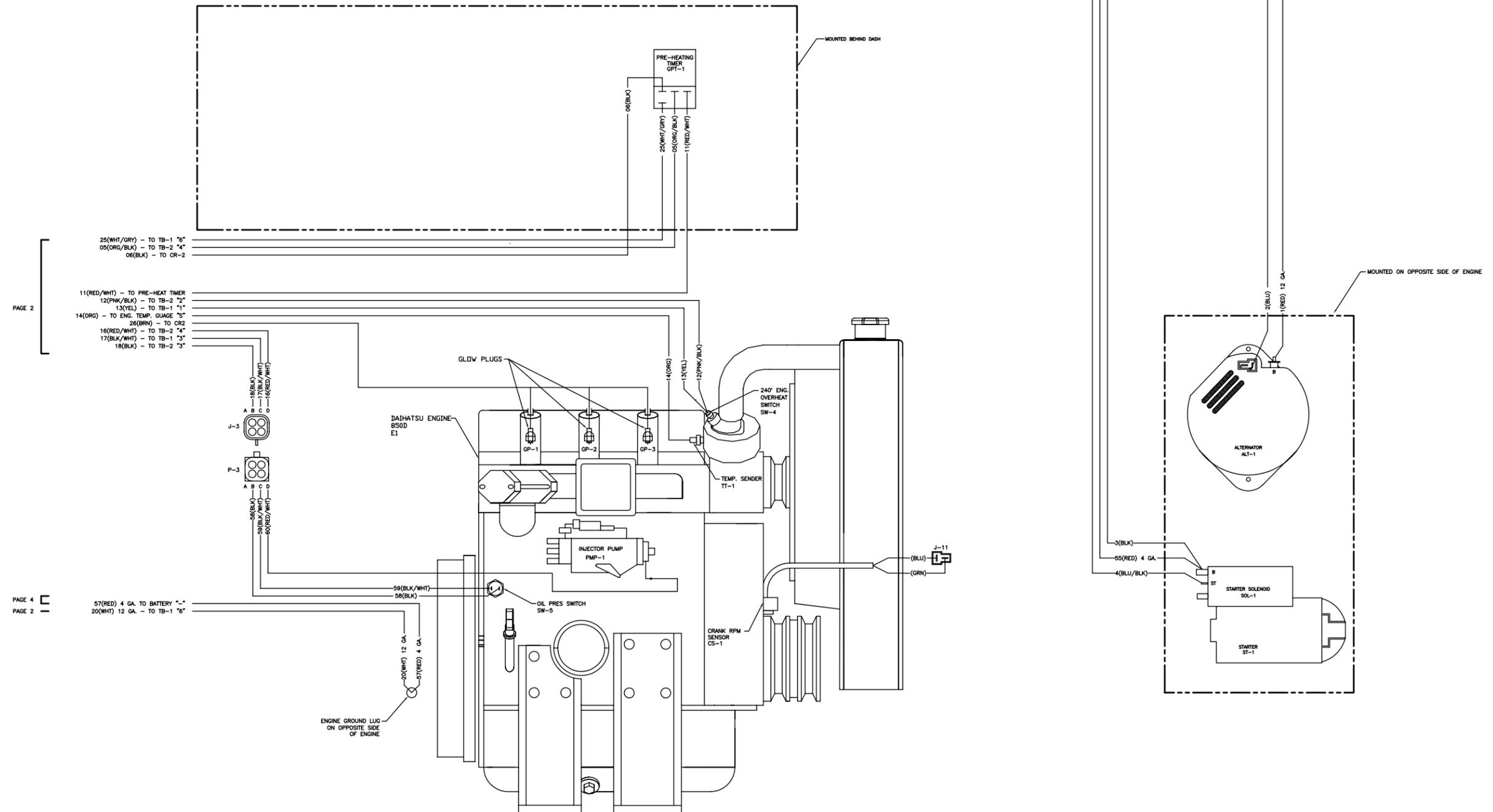


PAGE 3
PAGE 4

WD-5 Wiring Diagram - CTS 450 Diesel Engine

D-5638 Sht 2, Rev C

- PAGE 2 [1(RED) 12 GA. - TO IGN. SWITCH "BAT"
 2(BLU) - TO TB-2 "1"
 3(BLK) 12 GA. - TO MAIN FUSE
 PAGE 4 [55(RED) 4 GA. - TO BATTERY "+"
 PAGE 2 [4(BLU/BLK) - TO IGN. SWITCH "ST"

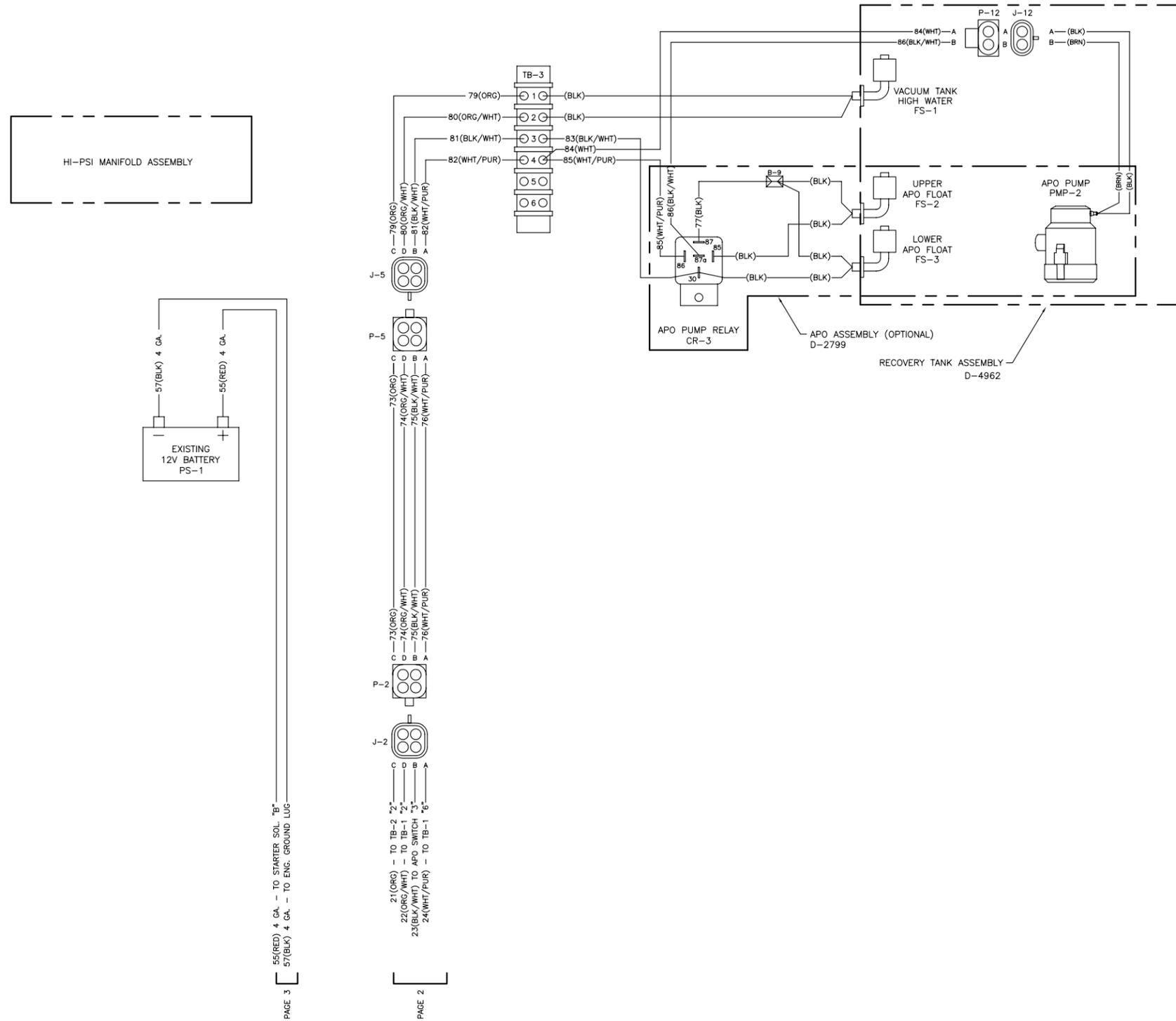


- PAGE 2 [25(WHT/GRY) - TO TB-1 "6"
 05(ORG/BLK) - TO TB-2 "4"
 06(BLK) - TO CR-2
 11(RED/WHT) - TO PRE-HEAT TIMER
 12(PNK/BLK) - TO TB-2 "2"
 13(YEL) - TO TB-1 "1"
 14(ORG) - TO ENG. TEMP. GAUGE "S"
 26(BRN) - TO CR2
 16(RED/WHT) - TO TB-2 "4"
 17(BLK/WHT) - TO TB-1 "3"
 18(BLK) - TO TB-2 "3"

- PAGE 4 [57(RED) 4 GA. TO BATTERY "+"
 PAGE 2 [20(WHT) 12 GA. - TO TB-1 "6"
 59(BLK/WHT) -
 58(BLK) -
 20(WHT) 12 GA. - TO TB-1 "6"
 57(RED) 4 GA.

WD-6 Wiring Diagram - CTS 450 Diesel Engine

D-5638 Sht 3, Rev C



PAGE 3
55(RED) 4 GA. - TO STARTER SOL. "B"
57(BLK) 4 GA. - TO ENG. GROUND LUG

PAGE 2
21(ORG) - TO TB-2 "2"
22(ORG/WHT) - TO TB-1 "2"
23(BLK/WHT) TO APO SWITCH "3"
24(WHT/PUR) - TO TB-1 "6"