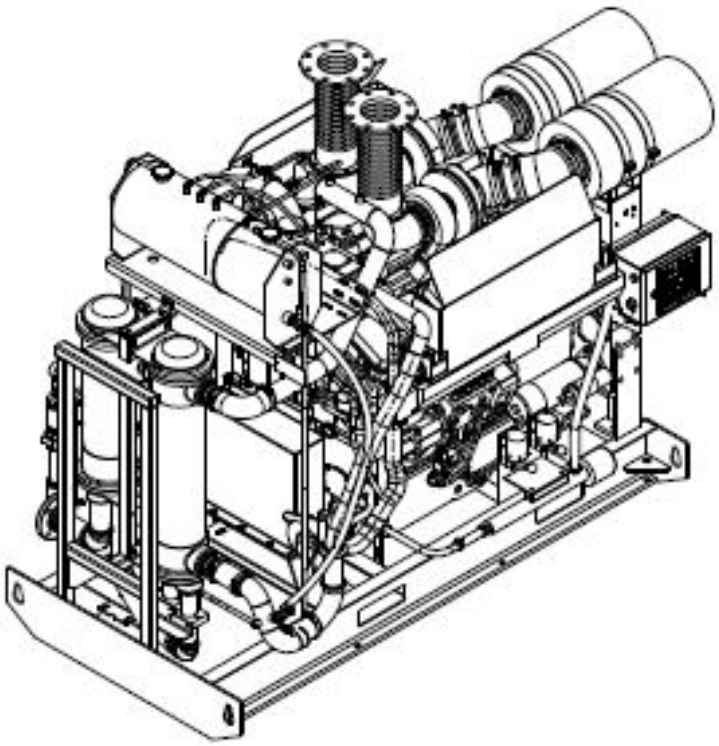
CFP30E SERIES

Fire Power

Operation & Maintenance Manual

Fire Pump Drive Engines



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English Version

This manual contains proprietary information to equipment produced by Cummins Fire Power or Cummins Inc. and is being supplied solely for the purpose of operating, maintaining, and servicing the fire pump drive engine purchased from Cummins Fire Power.

Cummins Fire Power
Limited Warranty

Fire Pump Package
This limited warranty applies to all Cummins Fire Power (hereinafter referred to as “Cummins Fire Power” branded fire pump driver and associated accessories (hereinafter referred to as "Product"). This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:
The warranty start date for stationary Product is the date of initial start up, demonstration or 18 months after factory ship date, whichever is sooner.

Base Warranty Duration (whichever occurs first): 2 years/2000 hours.

Cummins Fire Power Responsibilities:
In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Fire Power will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:
The owner will be responsible for the following:

- Notifying Cummins Fire Power distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Fire Power’s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from difficult or non-standard installations.
- Costs associated with Fire Watch Protection during Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:
This limited warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating or application guidelines.
- Normal wear and tear, negligence, accidents or misuse.
- Improper and/or unauthorized installation.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Fire Power published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner’s delay in making Product available after notification of potential Product problem.
- Replacement parts and accessories not authorized by Cummins Fire Power.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; over-fueling; over-speeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the fire pump package.

Limitations (cont.):

This limited warranty does not apply to:

- Costs of maintenance, adjustments, installation, commissioning or start-up.
- Starting batteries and enclosures.
- Components added to the Product after shipment from Cummins Fire Power.
- Block heaters are warranted for 1 year from date in service

Please contact your local Cummins NPower Distributor for clarification concerning these limitations.

Extended Warranty

Cummins Inc offers several levels of Extended Warranty Coverage (**Base Engine Only**). Please contact your local Cummins Distributor for details.

Cummins Fire Power Right to Failed Components:

Failed components claimed under warranty remain the property of Cummins Fire Power. Cummins Fire Power has the right to reclaim any failed component that has been replaced under warranty.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS FIRE POWER IN REGARD TO THE PRODUCT. CUMMINS FIRE POWER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT IS CUMMINS FIRE POWER LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

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Section 1 - Safety

1.1 Introduction

Cummins Fire Power engine manuals should be considered part of the equipment. Keep the manuals with the equipment. If the equipment is traded or sold, give the manuals to the new owner.

All personnel responsible for operation and maintenance of the equipment should read and thoroughly understand this manual.

1.2 General Safety Precautions

Read and understand all of the safety precautions and warnings before performing any repair. Special safety precautions are included in the procedures when they apply. This list contains the general safety precautions that **must** be followed to provide personal safety:

- Perform a walk around inspection and alert all area personnel that the equipment will be starting before manual operation.
- Do not operate faulty or damaged equipment. Ensure that all hoses, pipe connections, clamps and guards are in place and securely fastened. Electrical components should be kept in good working condition and repaired immediately by qualified personnel.
- After performing maintenance, remove all tools and foreign materials and reinstall and securely fasten ALL guards, covers and protective devices.
- Exposed in-running belt nips can cause severe personal injury or dismemberment. Ensure that guards are in place and securely fastened before operation.
- Rotating drive shafts can lacerate, dismember or cause strangulation. Keep hands, body parts, long hair, or loose-fitting clothing clear at all times.
- Never attempt to manually clean a machine while it is operating or in standby mode.
- Never open ports on tanks or piping while the engine is operating. Contact with pressurized agents can cause severe personal injury.
- Relieve all pressure in the air, oil, and the cooling systems before any lines, fittings, or related items are removed or disconnected.
- Engine fuel is flammable when in contact with electrical spark or flame sources. Remove all sources of spark or flame from the work area.
- Always use the same fastener part number (or equivalent) when replacing fasteners.
- Some state and federal agencies in the United States have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Dispose of waste oil in accordance with applicable requirements.

1.3 Use of Advisory and Cautionary Statements

1.3.1 Advisory Statements

Advisory statements are used throughout this manual call attention to special information and correct operating procedures. Throughout this manual, these Advisory Statements are delineated by the terms “NOTE” and “IMPORTANT” in uppercase letters:

NOTE: *A general advisory statement relating to equipment operation and maintenance procedures*

IMPORTANT: *A specific advisory statement intended to prevent damage to the equipment or associated components.*

1.3.2 Cautionary Statements

Cautionary Statements highlight particular safety precautions pertaining to personal injury and/or damage to the equipment. Cautionary Statements are always preceded by the following symbols:

WARNING

Indicates the presence of a hazard which CAN cause severe personal injury.

CAUTION

Indicates the presence of a hazard which CAN cause personal injury, or cause equipment damage.

Section 2 - Description

2.1 Introduction

This manual contains information for the correct operation and maintenance of a Cummins fire pump drive engine. Read and follow all safety instructions in Section 1 - Safety. Keep this manual with the equipment. If the equipment is traded or sold, give the manual to the new owner.

Cummins fire pump drive engines have been designed and tested in accordance with National Fire Protection Association (NFPA) 20 guidelines.

No deviations are permitted without prior written approval. These engines are to be used only for fire protection applications. Figure 2-1 and Figure 2-2 provide visual descriptions of the engine components for this fire pump drive engine.

NOTE: *Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for emission levels.*

Cummins Fire Power, Cummins NPower, and Cummins Inc. reserve the right to make changes at any time. If any differences are found between an engine and the information in this manual, contact the local Cummins Authorized Repair Location.

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts.

WARNING

Injury may result and warranty is voided if fuel rate, revolutions per minute (RPM), or altitudes exceed published maximum values for this model and application.

2.2 Fire Pump Digital Panel (FPDP)

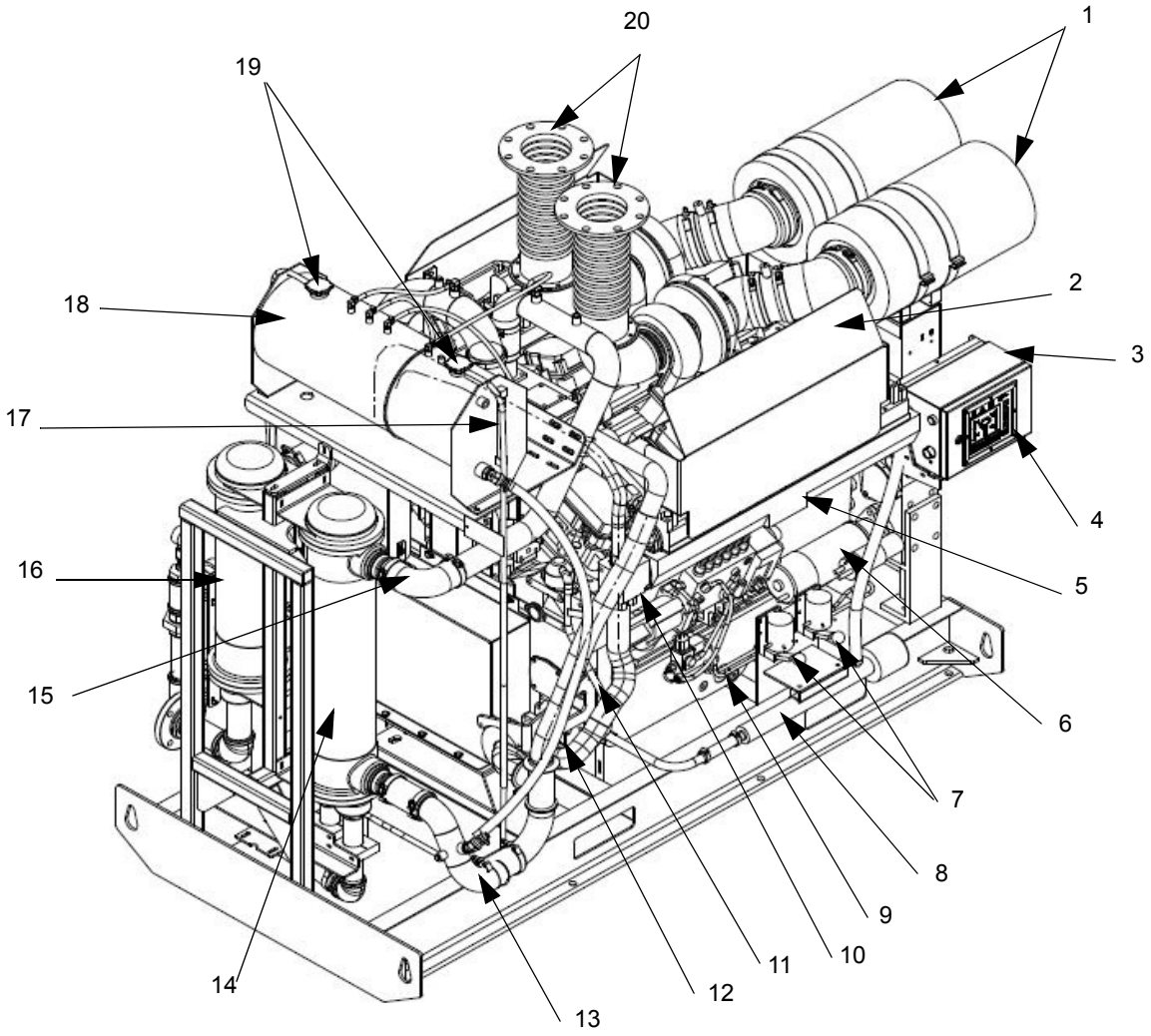
The Fire Pump Digital Panel (FPDP) is mounted on the left hand side (or right hand side - optional) on the flywheel end of the engine and contains controls for starting the engine, monitoring engine performance, and controlling fire pump drive engine operation. Section 4 - Controls illustrates the FPDP in detail.

Each engine is equipped with an electronic overspeed control which activates the fuel pump solenoid valve or the Engine Control Module (ECM) ignition to shut off the engine when the RPM exceeds a preset limit of 115% of rated speed. The overspeed control senses engine speed during the start cycle and stops the starting motor cranking cycle.

All Cummins fire pump drive engines are shipped from the factory adjusted to the requested operating speed (in RPM). Final operating speed adjustment must be made during the in-service inspection to obtain the required operating speed specified by the pump manufacturer.

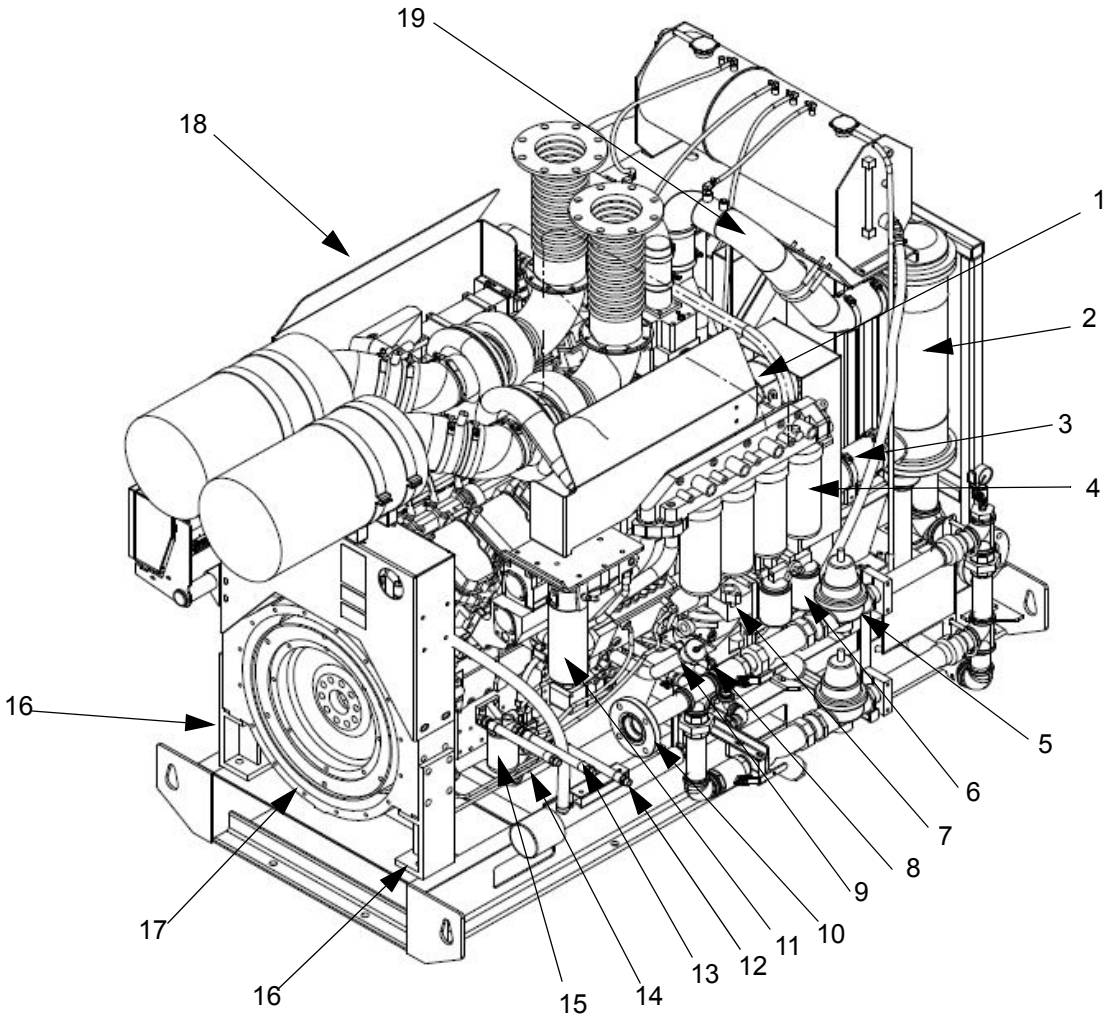
2.3 Fire Pump Controller

The fire pump controller starts the engine automatically when a remote fire demand signal is initiated and automatically shuts down the engine when the fire demand signal is discontinued. The engine may also be started locally in the **MANUAL** mode and shut down using the FPDP **STOP** button. The fire pump controller is not supplied by Cummins Fire Power or Cummins Inc.



1. Air Cleaner (2)
2. Manifold Heat Shield (2)
3. Terminal Box (customer connection inside)
4. Fire Pump Digital Panel (FPDP)
5. Engine Low Temperature Aftercooler (LTA)
6. Starter Motor
7. A/B Battery Starter Contactors
8. Engine Coolant Heater (2)
9. Oil Pan Drain
10. Electronic Control Module (ECM) (master)
11. Engine Breather Hose
12. LTA Coolant Pump
13. LTA Lower Coolant Hose
14. LTA Coolant Heat Exchanger
15. LTA Upper Coolant Hose
16. Jacket Water (JW) Coolant Heat Exchanger
17. Expansion Tank Level Sight Gauge (2)
18. Coolant Expansion Tank
19. Coolant Pressure/Fill Cap (2)
20. Exhaust Connection (2)

Figure 2-1 Engine Components - Fire Pump Digital Panel (FPDP) Side (typical)

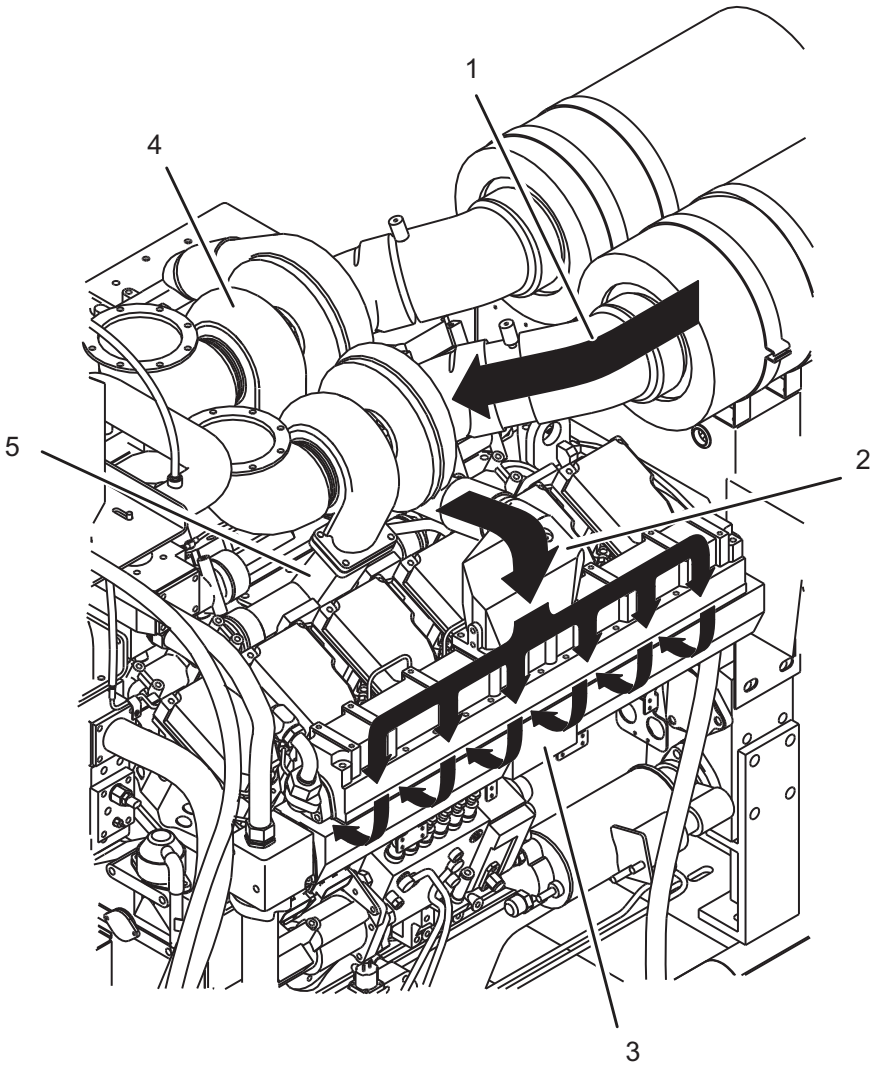


1. Alternator
2. Coolant Heat Exchanger (JW)
3. Lower Coolant Hose (JW)
4. Oil Filter (4)
5. Cooling Water Manifold
6. Coolant Filter (2)
7. Coolant Pump (JW)
8. Oil Level Dip Stick
9. Oil Fill Port
10. Cooling Water Inlet
11. Fuel Filter/Water Separator
12. Fuel Return Line
13. Fuel Supply Line
14. Oil Pan Drain (one each side)
15. Fuel Pre-Filter
16. Engine Supports
17. Flywheel Housing
18. Manifold Heat Shield (2)
19. Upper Coolant Hose (JW)

Figure 2-2 Engine Components - Raw Water Manifold Side (typical)

2.4 Air Intake

The air intake system supplies combustion air to the fire pump engine cylinders. The air filters prevent particulate matter from entering the air intake. As shown in Figure 2-3, the turbocharger directs the air through the LTA heat exchanger for cooling before entering the cylinders.



1. Filtered Intake Air from Air Cleaner (2)
2. Turbocharger Outlet (2)
3. Low Temperature Aftercooler (LTA)
4. Turbocharger (2)
5. Exhaust Manifold (2)

Figure 2-3 Engine Air Intake and Low Temperature Aftercooler Flow Diagram (typical)

2.5 Cooling Water System

The fire pump cooling water supply provides cooling water for the LTA heat exchanger and the JW coolant heat exchanger.

As shown in Figure 2-4 and Figure 2-5, cooling water entering the cooling system through the cooling water inlet circulates through the heat exchanger for the LTA system, cooling the compressed air from the turbocharger before it enters the combustion chamber. The cooling water from the LTA heat exchanger then enters the JW heat exchanger for the engine cooling system. The cooling water exits the JW heat exchanger (engine) through the drain line. Figure 2-5 shows the path of water through the engine cooling system.

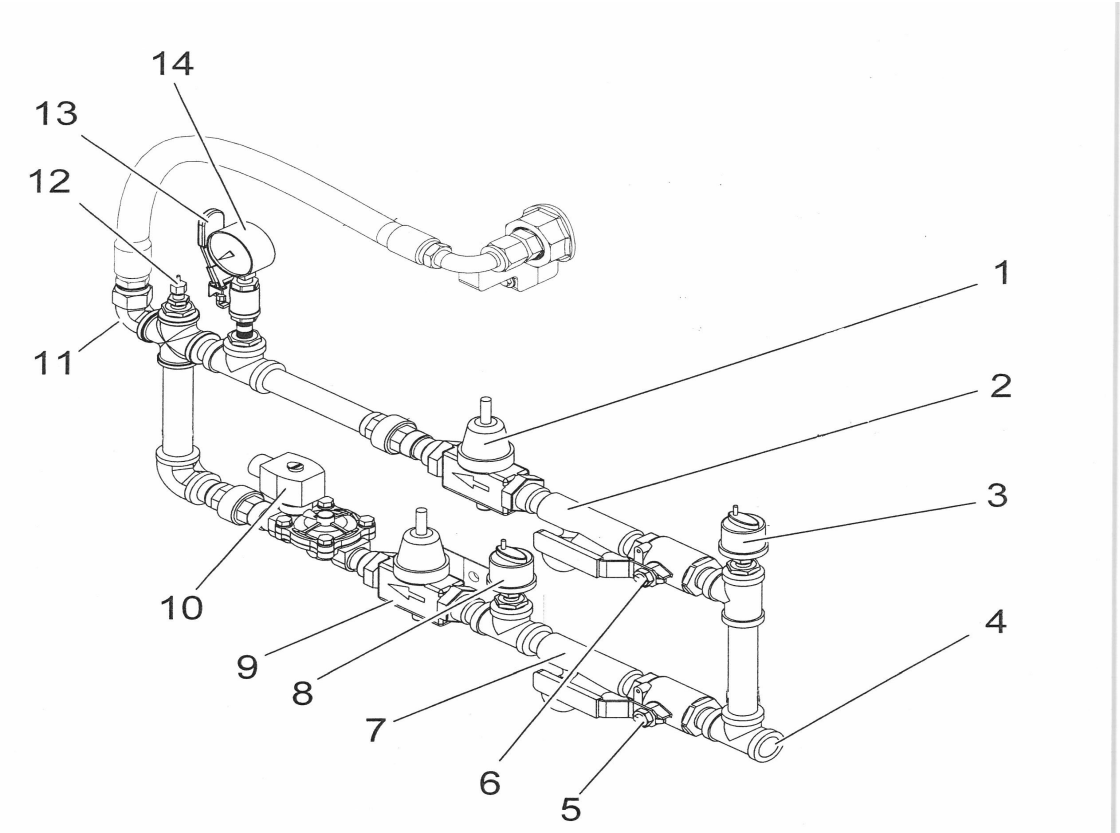
NOTE: *The cooling water supply must be immediately available when the engine is started.*

IMPORTANT: *Cooling water piping will be supplied by Cummins Fire Power as shown in the drawings in Section 8 - Component Parts and Assemblies. Refer to NFPA 20 for installation requirements.*

When the cooling water piping is installed:

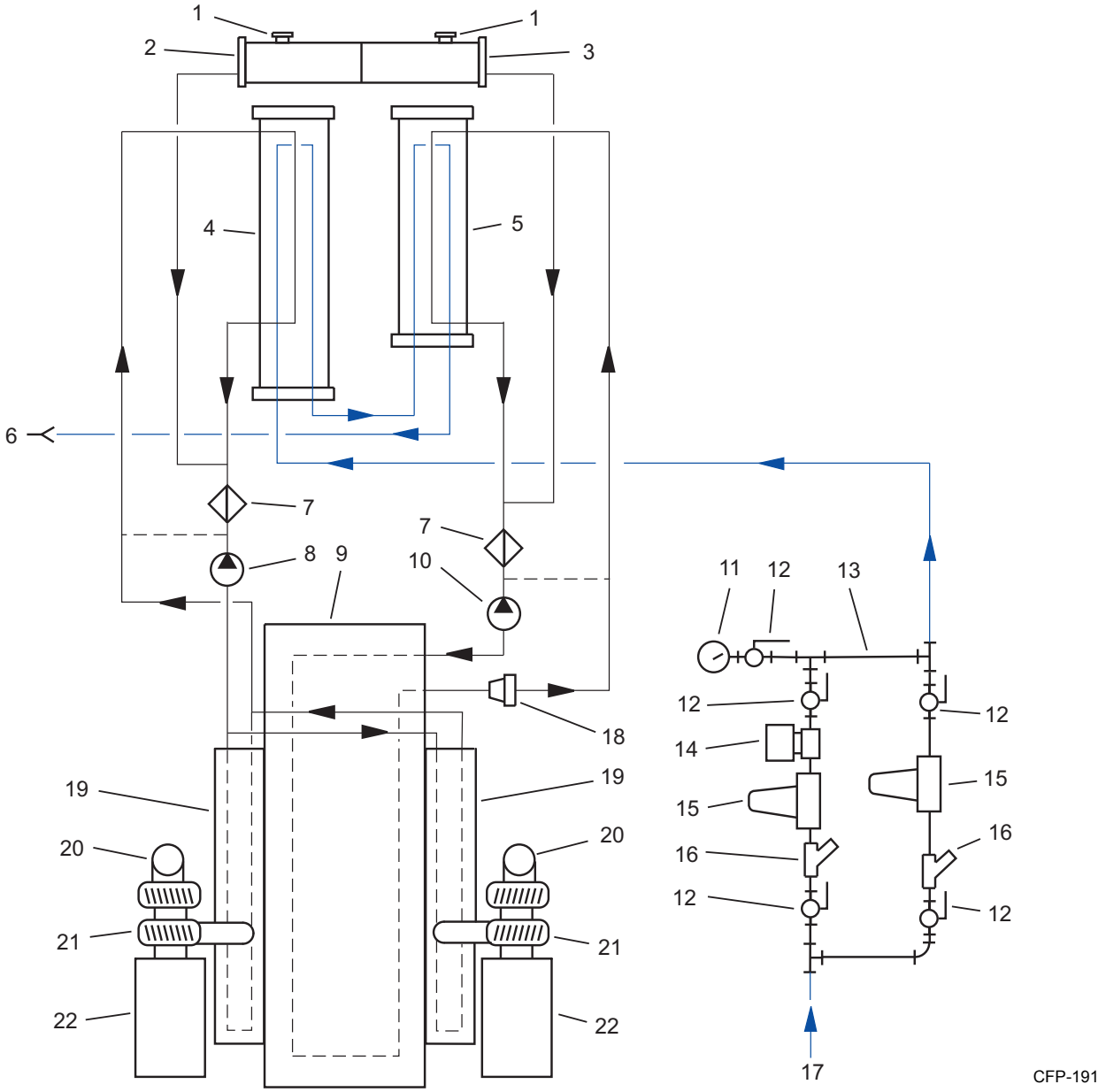
1. Adjust both pressure regulator set points of the cooling water manifold before operating the pump.

2. Ensure that the cooling water bypass line valve is closed.



1. Bypass Water Pressure Regulator
2. Bypass Water Strainer
3. Pre Strainer Pressure Sensor
4. Cooling Water Inlet
5. Normal Water Inlet Valve
6. Bypass Water Inlet Valve
7. Normal Water Strainer
8. Post Strainer Pressure Sensor
9. Normal Water Pressure Regulator
10. Normal Water Solenoid Valve
11. Outlet to Heat Exchanger
12. Temperature Sensor
13. Pressure Gauge Isolation Valve
14. Water Supply Pressure Gauge

Figure 2-4 Cooling Water Manifold (typical)



1. Coolant Pressure/Fill Cap (2)
2. LTA Coolant Expansion Tank
3. JW Coolant Expansion Tank
4. LTA Coolant Heat Exchanger
5. JW Coolant Heat Exchanger
6. Cooling Water Discharge Connection
7. Coolant Filter (2)
8. LTA Coolant Pump
9. Engine Block
10. JW Coolant Pump
11. Cooling Water Pressure Gauge
12. Manual Shut-off Valve
13. Bypass Piping
14. Cooling Water Solenoid Valve
15. Cooling Water Pressure Regulator
16. Cooling Water Wye Strainer
17. Cooling Water Inlet Connection
18. Engine Thermostat
19. Low Temperature Aftercooler (LTA)
20. Exhaust Connections
21. Turbochargers
22. Air Filters

Figure 2-5 Engine Cooling System Flow Diagram (typical)

3. Ensure that the normal water inlet line valve is open.The line with the solenoid valve is the normal inlet line.

4. Ensure that the pressure gauge isolation valve is open.

IMPORTANT: *Monitor the oil pressure and coolant temperature gauges frequently. Refer to Lubricating Oil System Specifications or Cooling System Specifications in the Engine Data Sheet in Section 8 - Component Parts and Assemblies for recommended operating pressures and temperatures. Shut off the engine if any pressure or temperature does not meet the specifications.*

NOTE: *Maximum engine coolant temperature should not exceed the temperature listed on the Engine Data Sheet found in Section 8 - Component Parts and Assemblies. The coolant expansion pressure/fill cap must meet the minimum pressure of 10 kPa (15 psi).*

The engine coolant system contains a mixture of at least 50% antifreeze and 50% water. The coolant level should be maintained so it is visible in the coolant level sight gauge.

CAUTION

Continuous operation with low coolant temperature (below 71° C [160° F]) or high coolant temperature (above 100° C [212° F]) can damage the engine. Verify cooling water pressure and flow to maintain a consistent operating temperature.

2.6 Fuel Supply and Drain

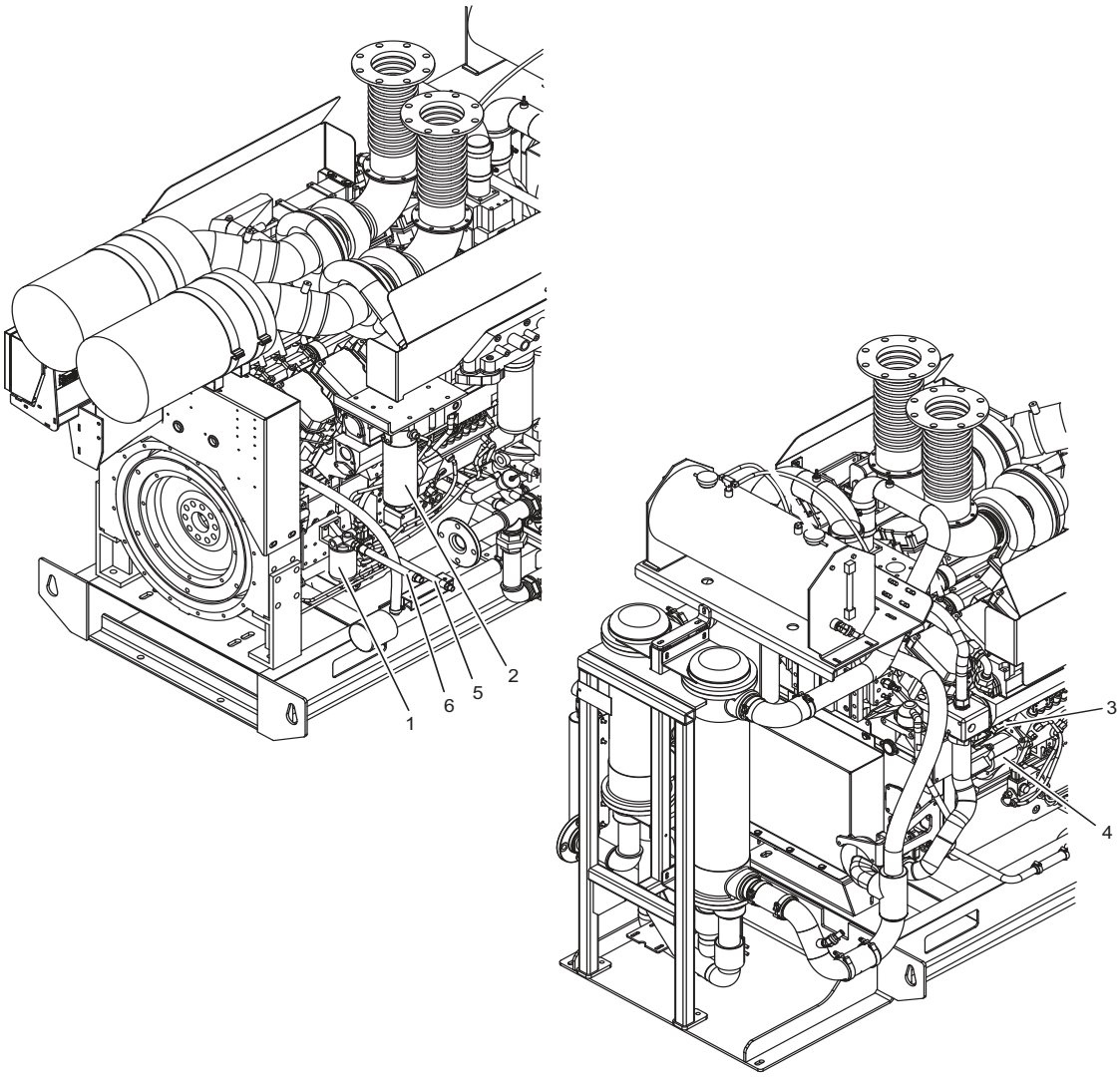
The fuel supply and return connections are centrally located on the FPDP side. Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for the maximum allowable fuel tank supply locations above the fuel pump.

2.7 High Pressure Injector (HPI) Fuel System

The CFP30E comes with a gear type fuel pump driven by the engine.

As shown in Figure 2-6, the fire pump drive engine is equipped with an electronic fuel system that delivers precise fuel quantities with precise injection timing at high injection pressures. The system consists of six (6) high-pressure unit injectors and the fuel supply system uses various system monitoring sensors. The system is controlled by engine control modules (ECMs) for fueling and timing based on temperature, altitude, pressure, and throttle position.

With the HPI fuel system, fuel priming is required for conditions such as: initial start-up, running out of fuel, and maintenance of fuel system components (i.e., filter change).



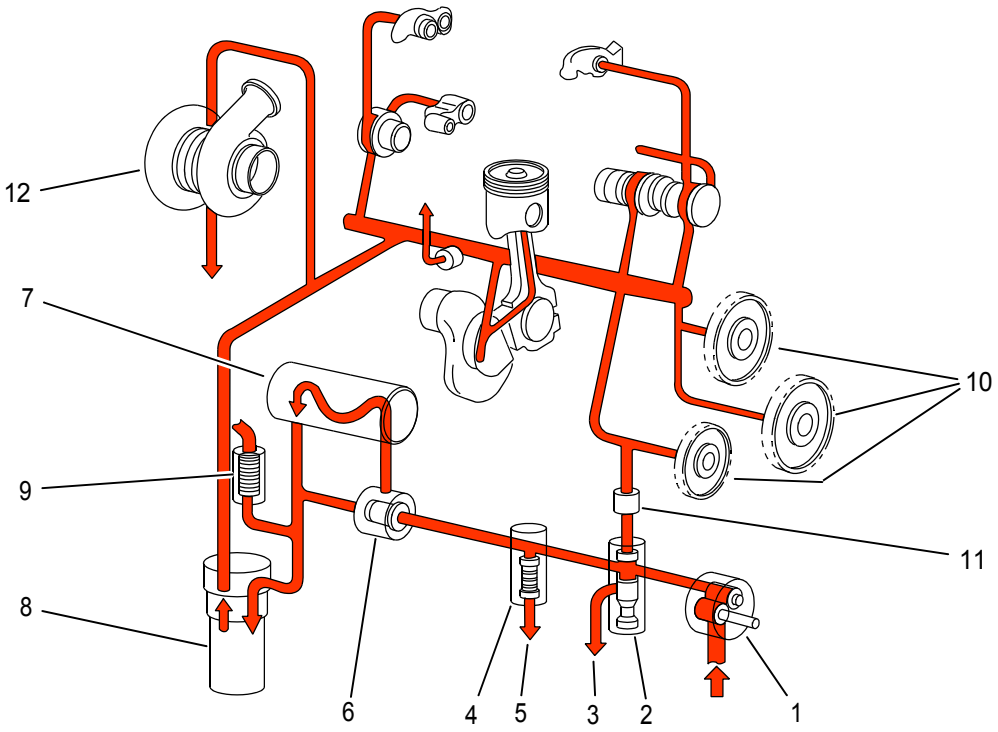
1. Fuel Pre-Filter
2. Fuel Filter/Water Separator
3. Engine Control Module (ECM)
4. Fuel Injection Pump (2)
5. Fuel Return Line
6. Fuel Supply Line

Figure 2-6 Fuel System Components (typical)

2.8 Engine Oil System

Figure 2-7 illustrates how the engine oil system lubricates moving internal engine parts (pistons, piston arms, valves, cam shafts, shafts, and bearings). The oil pump circulates oil from the oil pan, through the oil filter, and into engine areas where friction may develop. Refer to the Cummins Engine Operation and Maintenance Manual for additional information.

NOTE: *Typically engine oil has been added during manufacture and testing procedures; however, shipping restrictions can affect whether the oil is maintained in the engine or drained for shipping. Check the oil level at the dipstick. Add oil as necessary to bring the oil level to the H (high) mark on the dipstick.*

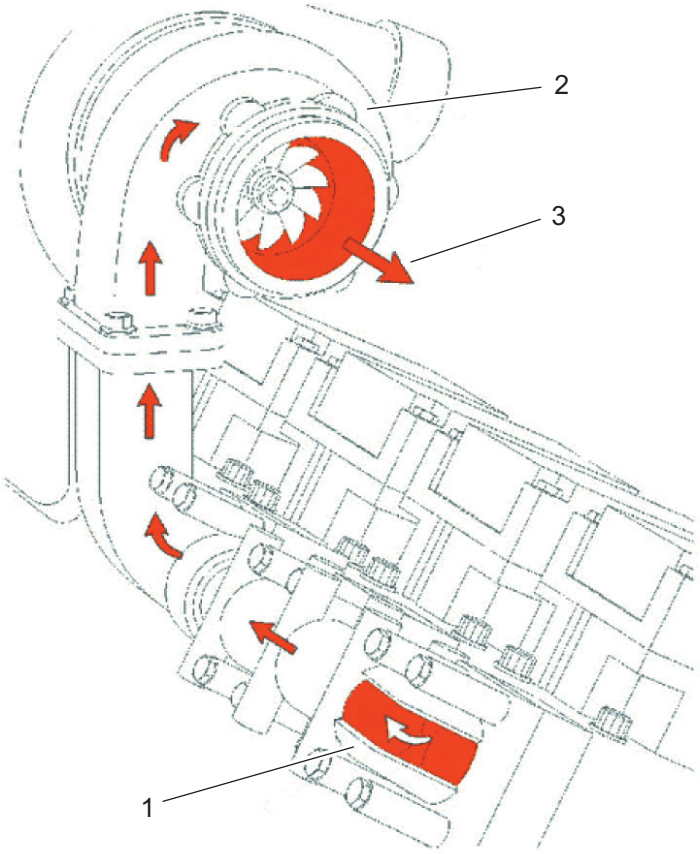


1. Oil Pump
2. Pressure Regulator Valve
3. Oil Return to Pan
4. High Pressure Relief Valve
5. Oil Return to Pan
6. Oil Thermostat
7. Oil Cooler
8. Combination Oil Filter
9. Filter Bypass Gears
10. Idler Gears
11. Viscosity Sensor
12. Turbocharger

Figure 2-7 Engine Lubricating Oil System Flow Diagram (typical)

2.9 Exhaust System

Figure 2-8 shows how the exhaust system removes engine exhaust from the cylinders after the combustion process. The exhaust discharges from the exhaust manifold, passes through (drives) the turbocharger, and exits through the exhaust connection.



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1. Exhaust Manifold
2. Turbocharger Turbine Housing
3. To Exhaust Connection

Figure 2-8 Flow Diagram - Exhaust System (typical)

Section 3 - Installation

3.1 Introduction

This section provides instructions for the initial installation, adjustment, and testing of the Cummins fire pump drive engine. Appropriate portions of this section should be used when returning the engine to operation after overhaul or major maintenance.

3.2 Receiving and Handling

Cummins Fire Power fire pump drive engines are pre-assembled and tested before shipment. Parts not shipped attached to the engine are sometimes shipped individually. The equipment was thoroughly inspected and prepared for shipping before it was turned over to the carrier. Upon receipt of the fire pump drive engine from the shipper:

1. Inspect the equipment for damage that may have occurred in shipping; and
2. Check each item carefully against the shipping manifest or bill of lading.

3.3 Site Preparation

The site should be clean and relatively level. Clear the proposed equipment area of overhanging obstructions and obstacles protruding from the floor.

CAUTION

Avoid installation in a dusty or dirty environment. Provide adequate physical protection from other physical damage as may be present in the specific location.

3.4 Drive Shaft Installation

Drive shaft installation should be done by trained technicians familiar with local, state, and federal codes and regulations.

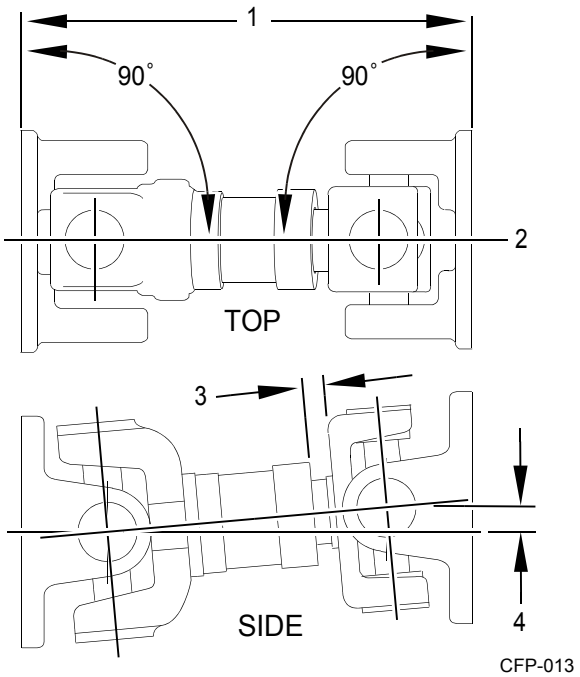
Refer to National Fire Protection Association (NFPA) 20 for installation and applicable local code requirements and NFPA 25 for inspection, testing, and maintenance requirements.

Follow these steps to install the drive shaft:

CAUTION

Ensure that the lifting device is capable of safely lifting the weight of the engine or the combined weight of the assembled pump base, drive line, and pump. Do not use the engine lifting points for assembly!

1. Ensure that the engine and pump are correctly aligned.
   a. Ensure that the engine position is centered on the frame side to side within ± .76 mm (.03 in) by measuring outside of the frame side to the engine support leg mounting pad. (Compare the two front engine supports and two back engine supports.)
   b. As shown in Figure 3-1, align the engine center line to the pump center line within ± .76 mm (.03 in).
   c. Ensure that the pump center line to the engine crankshaft center line (in vertical plane) is 2° +/- 1°.
   d. Ensure that the drive shaft mounting flanges are parallel.
2. As illustrated in Figure 3-2, lubricate the grease fittings on the drive shaft universal joint.
3. Check that the fire pump drive engine is properly installed per the pump manufacturer's specifications.



1. Planes must be parallel
2. Align both mounting center lines to ± .76 mm (.03 in)
3. Distance to equal half of total travel
4. 2° +/- 1°

Figure 3-1 Drive Shaft Alignment

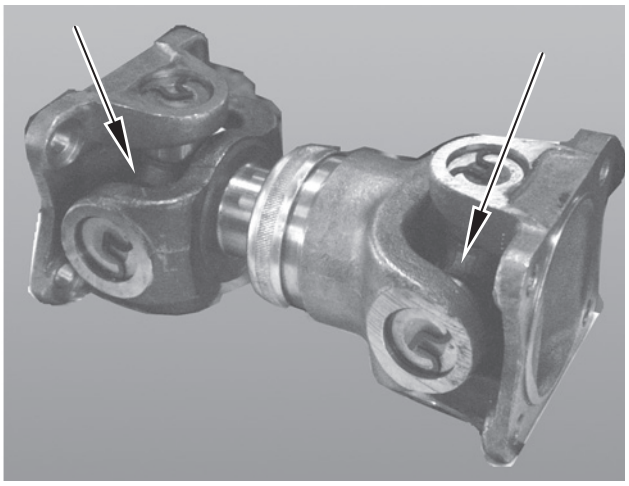


Figure 3-2 Drive Shaft Universal Joint Grease Fittings

NOTE: *Cummins Fire Power or Cummins Inc. recommends using a good quality semi-synthetic, molybdenum-fortified National Lubricating Grease Institute (NLGI) #2 lithium complex grease.*

NOTE: *Some lubrication loss may occur during transport and storage. It is recommended that the drive shaft be re-lubricated upon installation.*

3.5 Fuel Supply Installation

The following sections outline proper installation and connection of the fuel supply.

NOTE: *It is the responsibility of the customer to provide and install a properly-rated fuel tank per NFPA 20 guidelines.*

To properly install a fuel supply, follow these intstructions:

1. Install an elevated no. 2 diesel fuel tank or other fuel supply arrangement which is compatible with American Society of Testing and Materials (ASTM) no. 2 diesel fuel specifications.

NOTE: *The fuel supply line at the fuel tank must be higher than the fuel intake port on the engine fuel filter. Ensure that the fuel system is installed in a safe and effective manner.*

2. Size the fuel tank for the maximum expected full-load engine operation period with the initial fuel level at the minimum level for refueling.

3. Install a fuel return line and route this line to the bottom of the fuel tank in order to minimize the return head.

4. Install a fuel supply line to the fire pump drive engine.

NOTE: *For fuel line specifications, refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

NOTE: *DO NOT use copper or galvanized pipe for the fuel return or supply lines.*

The fire pump drive engine fuel system has been primed during manufacturing and test procedures. The engine is equipped with an engine driven (gear) fuel pump.

An optional fuel pre-filter and a fuel filter/water separator is integrated into the fuel delivery system of the fire pump drive engine. To ensure that the filter/separator is free of water, open the fuel filter/water separator drain at the bottom of the filter and drain the fuel into a container until no water is present. Dispose

of the contaminated fuel in accordance with local environmental regulations.

CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injectors.

WARNING

Do not mix gasoline, alcohol, gasohol, ethanol, or methanol with diesel fuel. This mixture will cause severe engine damage or explosion.

CAUTION

Use ONLY no. 2 diesel (ASTM no. 2D) fuel. Any adjustment to compensate for reduced performance with a fuel system using alternate fuel is not warrantable.

3.6 Cooling Water Supply Installation

IMPORTANT: *The cooling water supply must be immediately available when the engine is started. Ensure that the supply line valves are in the OPEN position.*

NOTE: *The velocity of the cooling water should be as great as possible without exceeding the maximum allowable pressure shown in the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

To install the cooling water supply:

1. Provide a cooling water discharge line at the outlet of the engine coolant heat exchanger and provide a cooling water supply line to the cooling water inlet per the Engine Data Sheet in Section 8 - Component Parts and Assemblies.

NOTE: *The cooling water outlet piping from the heat exchanger should be one pipe size larger than the supply piping.*

2. Check the pressure regulator setting on the cooling loop with water flowing through the heat exchanger. The cooling loop is supplied by Cummins Fire Power; both water pressure regulators have been set at 207 kPa (30 psi) (or slightly less) water pressure during manufacture and testing.

IMPORTANT: *The manual water valves for the automatic loop should remain OPEN at ALL times. The manual valves for the bypass loop should be CLOSED during automatic (pump controller) operation. When running, the engine should stabilize between temperatures identified on the Engine Data Sheet. The flow rate may need to be adjusted to maintain the desired engine temperature.*

NOTE: *Excessively cold (4 °C to 23 °C [40 °F to 75 °F]) cooling water flow can cause condensation inside the charge air cooler.*

IMPORTANT: *Continuous operation with low coolant temperature (below 70 °C [158 °F]) or high coolant temperature (above 107 °C [225 °F]) can damage the engine.*

3. Adjust the cooling water based on the water *flow* rather than the water *pressure*. The flow is dependent on the cooling water temperature. Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for details.

4. To measure the water flow, use an appropriate-sized container to measure the amount of water and the elapsed time of the water to flow from the discharge pipe and then formulate the calculations:

Flow rate = container size/ time to fill container.

Example:

Time to fill a 20 gallon container = 15 seconds.

20 gallons divided by 15 seconds = 1.33 gallons per second.

Multiply by 60 seconds = 80 gallons per minute (gpm) (FLOW RATE)

5. Adjust both pressure regulators to a pressure that will provide a flow rate at or above the specifications listed in the Engine Data Sheet.

CAUTION

When the cooling water piping is installed, adjust both of the pressure regulator set points before operating the pump. Damage to the heat exchanger may occur from improperly regulated cooling water supply pressure.

3.7 Battery Installation

Redundant sets of batteries must be supplied for the required operating voltage. The minimum recommended Society of Automotive Engineers (SAE) reserve capacity (RC) and SAE cold cranking ampere (CCA) values for a particular engine can be found on the Engine Data Sheet in Section 8 - Component Parts and Assemblies. RC and CCA definitions can be found in SAE Standard J537. Refer to NFPA 20 for additional battery installation information.

WARNING

Battery electrolyte (sulfuric acid) is highly caustic and can burn clothing and skin. Wear impervious neoprene gloves and safety goggles, or a full face shield, when working with the batteries.

CAUTION

DO NOT connect battery charging cables to any electronic control system component. This can damage the electronic control system.

IMPORTANT: *Batteries must meet the requirement listed in the electrical system specifications. Batteries may be supplied by Cummins Fire Power or Cummins Inc. as an option, or may be supplied by the customer.*

To properly install the batteries:

1. As shown in Figure 3-3 or Figure 3-4, install the Battery Cable Kit or equivalent customer-supplied wiring. Install battery sets in a well-ventilated or otherwise protected location.

WARNING

Batteries can emit explosive gases during charging. Always ventilate the compartment before servicing the batteries. To avoid arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

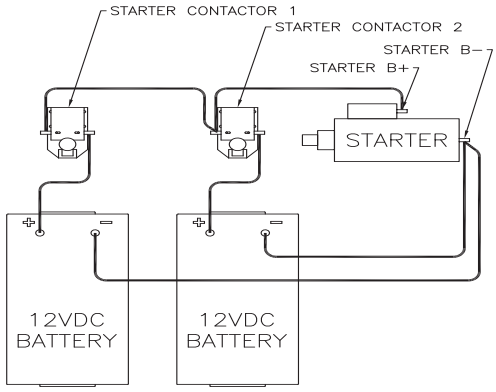


Figure 3-3 Series Battery Connection 12 VDC

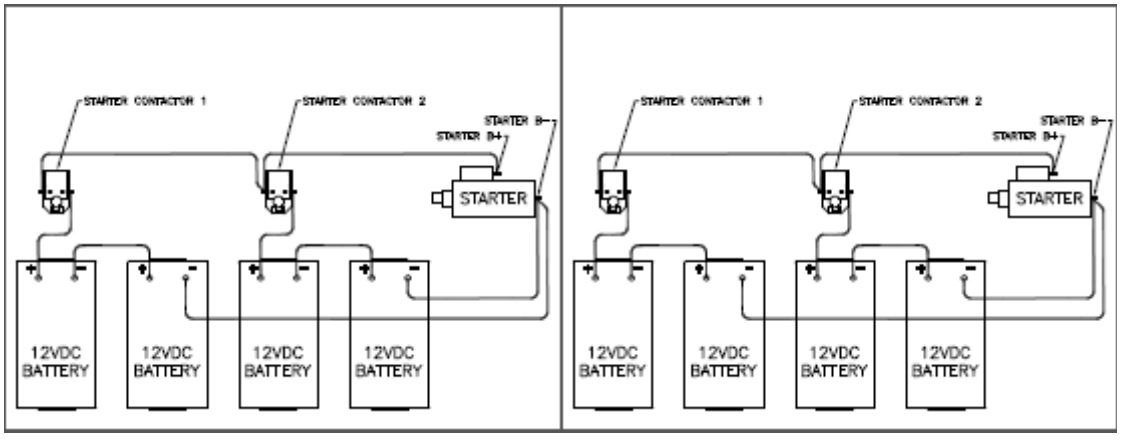


Figure 3-4 Series Battery Connection 24 VDC

2. Provide adequate room for servicing or replacing the batteries. Provide protection from extremes of temperature and weather.

3. Locate the batteries near the engine or increase the size of the conductors as required by applicable codes. Ensure that the batteries are configured properly for 12 - or 24 - VDC standard operations.

4. Check the battery cables and connections.

NOTE: *Coat the terminals with petroleum jelly to prevent corrosion. Install the cables and tighten the battery connections.*

3.8 Signal and Control Installation

The fire pump controller wires must be connected to the terminal blocks (TBs) on the FPDP Interface Terminal Strip (shown in Figure 3-5). To complete the signal and control installation:

1. Ensure that the fire pump controller is properly installed and configured per the manufacturer's instructions.

2. Complete the fire pump controller wiring (customer-supplied) per the manufacturer's instructions.

3. Ensure electrical continuity and adequate insulation resistance for the installed wiring.

4. The TBs between the fire pump controller and the FPDP Interface Strip are standard UL and FM controller terminals and follow a direct one-to-one correspondence (some TBs are optional):

   a. TB-1 [**Run Solenoid Circuit**]: This power source is necessary for fire pump operations while in the **AUTO** mode.

   b. TB-2 [**Crank Termination Switch**]: This signal is present when the engine is running. This signal indicates that the engine has started and that the crank command from the fire pump controller should stop immediately.

   c. TB-3 [**Overspeed Switch**]: This signal is present when the overspeed control module has operated. If this event occurs, the fire pump drive engine will stop.

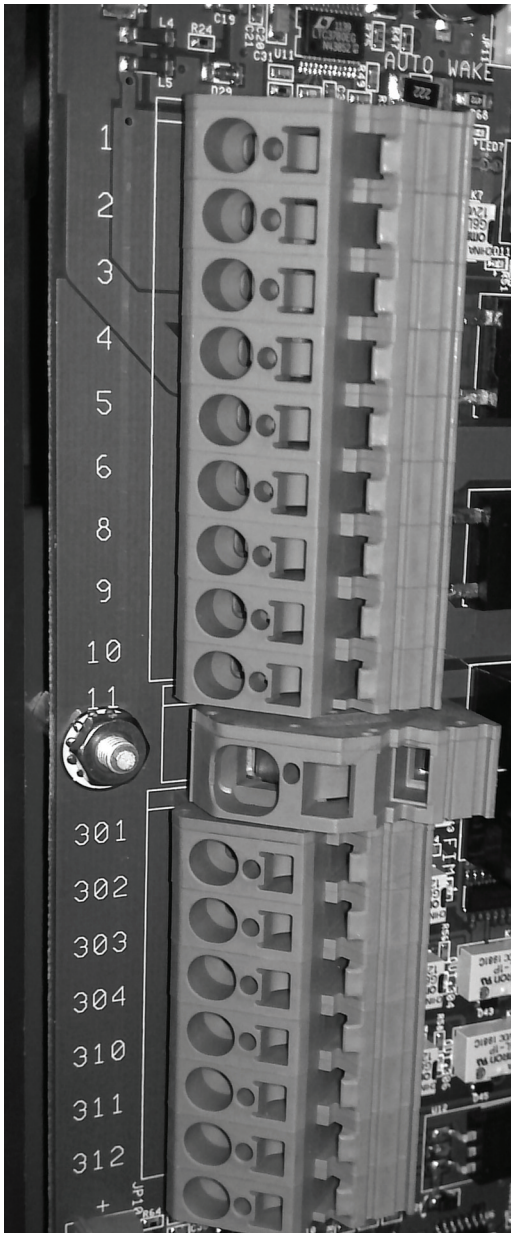


Figure 3-5 FPDP Interface Terminal Strip

   d. TB-4 [**Low Lubricant Pressure Switch**]: This zero VDC grounded signal is present when the oil pressure has dropped below the 83 ± 13 kPa (12 ± 2 psi) set point.

   e. TB-5 [**High Engine Temperature Signal**]: This zero VDC grounded signal is activated when the engine is running and the coolant temperature is at or above 93 °C (200 °F). The alarm will deactivate when the engine is

running and the coolant temperature drops below 88 °C (190 °F).

f. TB-6 [**Battery One Positive**]: The fire pump controller senses Battery A charge state and charges Battery A through this heavy gauge wire.

g. TB-8 [**Battery Two Positive**]: The fire pump controller senses Battery B charge state and charges Battery B through this heavy gauge wire.

h. TB-9 [**Main Battery Contactor One Coil or Battery Relay One Coil**]: The battery positive signal is driven from the fire pump controller to contactor A when desiring to crank from Battery A. Current in this circuit shall not exceed 10A continuous.

i. TB-10 [**Main Battery Contactor Two Coil or Battery Relay Two Coil**]: The battery positive signal is driven from the fire pump controller to contactor B when desiring to crank from Battery B. Current in this circuit shall not exceed 10A continuous.

j. TB-11: Connect the common ground and battery negative for both Battery A and Battery B from between the fire pump controller and engine. This is not intended to create a fully isolated battery negative or ground system. Current in this circuit shall not exceed 20A continuous.

NOTE: *Terminals 301 through 312 shall be electrically isolated from the ECM.*

k. TB-301 [**Electronic Control Module Switch**]: Battery negative signal driven from the FPDP when the engine is operating on Engine Control Module (ECM) B.

l. TB-302 [**Fuel Injection Malfunction**]: Battery negative signal driven from the FPDP when either of the ECMs triggers a fault code which can affect performance of the Fuel Injection System. See Section 7 - Troubleshooting for possible fault causes and solutions.

m. TB-303 [**Electronic Control Module Warning**]: Battery negative signal driven from the FPDP when a single ECM has failed.

n. TB-304 [**Electronic Control Module Failure**]: Battery negative signal driven from the FPDP when both ECMs have failed.

o. TB-310 [**Raw Water High Inlet Temperature**]: Battery negative signal driven from the FPDP when high raw water temperature is sensed.

p. TB-311 [**Clogged Raw Water Coolant Loop Strainer**] - *not applicable on radiator-cooled models:* Battery negative signal driven from the FPDP when the raw water supply restriction is sensed.

q. TB-312 [**Low Engine Temperature Signal**]: Battery negative signal driven from an engine temperature switch when engine coolant reaches or falls below 43.3 ± 2.78 °C (110 ± 5 °F). The signal will be removed when the coolant temperature reaches or exceeds 60 ± 2.78 °C (140 ± 5 °F).

5. Provide the initial charge on the redundant batteries per the battery charger's instructions.

6. Check that both voltmeters on the FPDP indicate the approximate battery voltage. Both sets of batteries can be used for starting the engine in the event that one set is low.

3.9 Coolant System Preparation

The fire pump drive engine cooling and lubrication system was initially filled during manufacture and testing. To properly prepare the coolant system:

CAUTION

Ensure that all coolant systems have been filled to the proper level before operation by checking the coolant level sight gauge on the heat exchanger.

1. Inspect the engine coolant hoses and hose clamps and ensure that all coolant hoses and clamps are properly installed and water tight.

2. Ensure that the engine coolant heater maintains an engine coolant temperature of 49 °C (120 °F) or above.

3. Ensure that coolant is present in the engine coolant heater before plugging the heater element into a dedicated circuit.

WARNING

Do not remove the pressure/fill cap from a hot engine. Wait until the coolant temperature is below 50 °C (122 °F) before removing the pressure/fill cap. Heated coolant spray or steam can cause personal injury.

3.10 Charge Air Cooler (CAC) Inspection

The charge air cooler (CAC) system reduces the temperature of the compressed combustion air from the turbocharger before entering the air intake manifold.

Inspect the CAC piping and hoses for loose/missing hose clamps, hose punctures, leaking manifold seals, or corrosion. Torque the hose clamps to the recommended torque value. Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies.

3.11 Lubricating Oil System Preparation

The fire pump drive engine and turbocharger were initially lubricated during manufacture and testing. To prepare the lubricating oil system for operation:

1. Check the oil level using the dip stick before operating the fire pump drive engine.

2. Fill the oil fill port to the “H” mark on the dipstick with lubricating oil.

NOTE: *Do not use special “break-in” lubricating oils for new or rebuilt Cummins engines. Use the same type of oil during the “break-in” as used during normal operation.*

CAUTION

Some regulatory and shipping restrictions may require that all lubricants, fuels, and coolants be drained for transport. Ensure that all cooling and lubrication systems have been filled to the proper level before operation.

NOTE: *Using multi-viscosity lubricating oil can improve oil consumption control and improve engine cranking in cold temperatures while maintaining lubrication at high operating temperatures. Cummins Inc. recommends Premium Blue® 15W-40 oil for most climates.*

CAUTION

Ensure that all cooling and lubrication systems have been filled to the proper level before operation.

3.12 Pre-Start Inspections

Prior to starting the fire pump drive engine for the first time, perform a visual inspection:

1. Check that there is no apparent damage and that all components are installed.

2. Check that the drive belt is properly installed.

3. Check that all hoses and tubes are properly installed.

4. Check that all electrical connections are properly installed.

5. Check that the fire pump drive engine is properly installed per the pump manufacturer’s instructions, is correctly aligned, and is free to rotate.

6. Lubricate the grease fittings on the auxillary drive shaft.

NOTE: *Use the same type of oil as used in normal operation. Cummins Inc. recommends Premium Blue® 15W-40 oil for most climates.*

After completing preliminary set-up procedures, perform the engine start test as outlined in detail in Section 5 - Operation.

WARNING

Before operating the equipment, complete all safety checks, remove all tools and foreign objects from the equipment, and ensure that all guards are in place and securely fastened. Alert area personnel that the equipment will be starting. Unintentional equipment start-up or contact with exposed or moving components can cause personal injury or equipment damage.

CAUTION

If the oil pressure is not displayed on the gauge or if the low oil pressure message is displayed within fifteen seconds, STOP THE ENGINE IMMEDIATELY! Continued operation without proper lubrication will cause engine damage.

3.13 Engine Monitoring

When the engine starts, it is important to monitor the displays:

1. Immediately check that water flow is established through the coolant heat exchanger. The water flow should be established immediately, but some delay may occur before the flow exits the heat exchanger drain connection.

NOTE: *Ensure that cooling water is flowing through the heat exchanger and the water pressure shown on the local pressure gauge is no more than 414 kPa (60 psi). The minimum cooling water flow rate is identified in the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

2. Ensure that the engine operating temperature stabilizes between applicable ranges as identified in the Engine Data Sheet in Section 8 - Component Parts and Assemblies.

3. Operate the engine for eight to ten minutes.

4. Inspect the engine for leaks, unusual noises, or other indications of incorrect operation.

5. Shut off the engine by pressing and holding the overspeed **RESET**/**STOP** switch.

6. Shortly after the engine stops, check that the water flow stops automatically.

7. Correct any problems found during the inspection before proceeding.

8. Check the engine lubricating oil level at the dip stick. Add oil, if necessary.

9. Check the coolant expansion tank level. Add coolant, if necessary.

10. Check the cooling water strainers. Clean the strainers according to the maintenance schedule in Section 6 - Maintenance.

11. Perform engine speed control and safety system tests per the instructions in Section 5 - Operation.

3.14 Field Acceptance Testing

The required installation tests are outlined in the NFPA 20 Standards and shall be performed to validate automatic and manual operational requirements for field acceptance testing.

Section 4 - Controls

4.1 Fire Pump Digital Panel (FPDP)

The Fire Pump Digital Panel (FPDP) shown in Figure 4-1 controls starting and monitoring engine performance, as well as the fire pump drive engine operation. In MANUAL mode, the panel remains active as long as battery power is available. In AUTO mode, the panel is active when battery power is present on Terminal Block (TB) -1, otherwise it goes into STANDBY mode after thirty minutes of no battery voltage on TB-1.

4.1.1 Warning Lamp

The Warning Lamp (**1**) illuminates (yellow) in the event that the Electronic Control Module (ECM) has sensed a non-mission disabling fault.

4.1.2 Fault Indicator Lamp

The Fault Indicator Lamp (**2**) indicates Fuel Injection Malfunction (FIM) and illuminates (red) in the event that the ECM has detected a fuel injection fault or primary sensor fault.

The FPDP also sends a ground signal to TB-302, which sends a signal to set off an alarm on the fire pump controller to indicate a FIM.

4.1.3 Scroll UP and DOWN Buttons

The scroll buttons are used to scroll UP (**4**) or DOWN (**5**) when inside the FPDP menus.

4.1.4 ENTER Button

Press the ENTER button (**6**) when making selections in the FPDP menu screen.

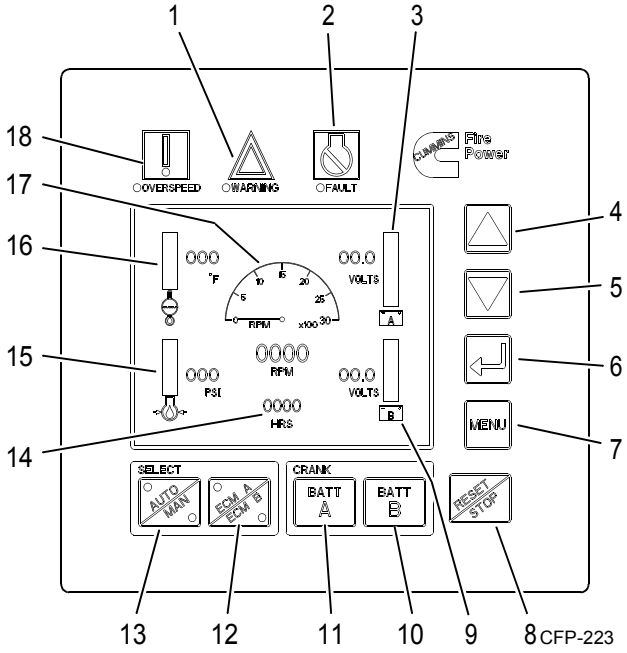
4.1.5 MENU Button

Press the MENU button (**7**) on the FPDP display to open the menu options.

4.1.6 Overspeed RESET/STOP Switch

The overspeed RESET/STOP switch (**8**) is used to shut off the engine at the FPDP. Momentarily pressing the switch removes the key switch for thirty seconds.

Pressing the Overspeed RESET/STOP Switch after correcting an engine overspeed shutdown resets the overspeed control module, allowing subsequent restarts of the fire pump drive engine.



1. Warning Lamp
2. Fault Indicator Lamp
3. Battery “A” Voltmeter
4. Scroll UP Button
5. Scroll DOWN Button
6. ENTER Button
7. MENU Button
8. Overspeed RESET/STOP Switch
9. Battery “B” Voltmeter
10. Crank Battery B Momentary Start Button
11. Crank Battery A Momentary Start Button
12. ECM A/B Selector Switch & Indicator Lamps
13. AUTO/MAN Mode Switch & Indicator Lamps
14. Hour Meter
15. Engine Oil Pressure Gauge
16. Coolant Temperature Gauge
17. Tachometer
18. Engine Overspeed Warning Lamp

Figure 4-1 Fire Pump Digital Panel (FPDP)

4.1.7 Battery "A" and "B" Voltmeters

The Battery "A" (**3**) and Battery "B" (**9**) Voltmeters display the charge status - or Voltage Direct Current (VDC) - of the relative battery connections.

4.1.8 Tachometer

The Tachometer (**17**) displays the engine speed in revolutions per minute (RPM) whenever the engine is operating.

4.1.9 Hour Meter

The Hour Meter (**14**) maintains a running total of the hours of operation (run time).

4.1.10 ECM A/B Selector Switch and Indicator Lamps - Applicable on Electronic Engines

The ECM A/B selector switch and indicator lamps (**12**) illuminate in yellow, indicating which ECM is being used to control the engine.

If ECM A (normal position) is selected, ECM A is controlling the engine.

If ECM B (alternate position) is selected, ECM B is controlling the engine, and the FPDP will send a ground signal to TB-301, which will send a signal to set off an alarm on the fire pump controller to indicate that the engine is operating on the alternate ECM.

4.1.11 Crank Battery A and B Momentary Start Buttons

The Crank Battery A (**11**) and Crank Battery B (**10**) momentary start buttons initiate an immediate engine start (momentary start) using the selected A or B crank battery.

Crank A energizes battery contactor A and Crank B energizes battery contactor B, depending on which one is selected.

Both Crank A and Crank B buttons can be energized at the same time in the event both batteries are weak.

4.1.12 Automatic or Manual Mode of Operation Indicator

The AUTO/MAN mode switch and indicator lamps (**13**) show whether the engine starts and is controlled by the operator (MANUAL) or by an automatic signal from the fire pump controller (AUTO). The lamp (yellow) is illuminated on which mode is selected.

The MANUAL mode is typically used for engine setup, testing, and emergency and maintenance procedures.

The AUTO mode is used to start the engine by the fire pump controller. In the AUTO mode, the fire pump drive engine shuts down upon loss of signal power from the fire pump controller.

4.1.13 Coolant Temperature Gauge

The Coolant Temperature Gauge (**16**) displays the engine coolant temperature in degrees Fahrenheit.

4.1.14 Engine Oil Pressure Gauge

The Engine Oil Pressure Gauge (**15**) displays the engine oil pressure in pounds per square inch (PSI). This gauge is independent of the low oil pressure alarm.

4.1.15 Engine Overspeed Warning Lamp

The overspeed control module monitors engine speed. If the engine RPM exceed 115% rated speed, the Engine Overspeed Warning Lamp (**18**) is illuminated (yellow).

The FPDP will send a power signal to TB-3, which will send a signal to set off an alarm on the fire pump controller, indicating that an overspeed condition has occurred.

The FPDP will automatically switch to MANUAL mode and will shut the engine down. After the overspeed has been reset by using the RESET/STOP switch on the FPDP, the engine operation will revert to the original AUTO mode position.

NOTE: *The engine will not be allowed to restart automatically from the fire pump controller until the FPDP is reset.*

4.1.16 ECM Fault Code Lamps - Applicable on Electronic Engines

The amber engine warning lamp and the red engine shutdown lamp alert the operator of an engine malfunction:

- An illuminated amber lamp indicates an engine malfunction that requires timely operator attention.
- An illuminated red lamp indicates an engine malfunction that requires immediate and decisive operator response.

A three- or four-digit diagnostic fault code will display on the FPDP which can then be used to help describe the engine malfunction. Refer to the Fault Code Chart in Section 7 - Troubleshooting.

4.1.17 Engine STOP Button

The Engine STOP Button is located on the left side of the FPDP enclosure and is used to stop the operation of the engine in either manual or automatic mode. The button must be pressed and held until the engine has shut down.

4.1.18 Engine Communications Port

The Engine Communications Port plug-in is located on the left side of the FPDP enclosure and is used for the communications connection port for Cummins Insite™.

NOTE: *Insite™ is a Cummins Inc. computer software tool used to monitor or report engine performance criteria.*

4.1.19 Contractor Access Port

The contractor access knock-out is located on the lower side of the FPDP enclosure. This is the only 25.4 cm (1 in) knock-out provided for the installing contractor to connect the fire pump controller to the FPDP.

IMPORTANT: *If this port is not used for the installation, all warranty on the fire pump drive engine will be void.*

4.1.20 Engine ECM Power Supply

The Engine ECM Power Supply plug-in is located on the lower side of the FPDP enclosure. The power supply port supplies unswitched battery power to both ECM A and ECM B.

4.1.21 Engine Harness Connection

Located on the lower side of the FPDP, the Engine Harness Connection plug-in connects the panel to the power source, start contactors, magnetic pick-up, alternator, and other engine-related functions controlled by the FPDP.

4.2 Electronic Control Module (ECM) - Applicable on Electronic Engines

The ECM is an electronically operated fuel control system that also provides many operator and vehicle or equipment features. It processes all of the inputs and sends commands to the fuel system vehicle and engine control devices. The base functions of the control system include fueling and timing control, limiting the engine speed operating range between the low- and high-idle set points, and reducing exhaust emissions while optimizing engine performance.

The ECM uses inputs from the operator and its sensors to determine the fueling and timing required to operate at the desired engine speed.

The ECM performs diagnostic tests on most of its circuits and will activate a fault code if a problem is detected in one of these circuits. Along with the fault code identifying the problem, a snapshot of the engine's operating parameters at the time of fault activation is also stored in memory. Some fault codes will cause a diagnostic lamp to activate to signal the driver.

The ECM also communicates with service tools and some other controllers.

⚠ CAUTION

Normally, Cummins engines with ECMs have derate and shutdown protection calibrated into the ECM. However, when the ECM on a Cummins engine has no derate or shutdown protection, the engine will run to destruction. Therefore, preventive maintenance is essential.

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Section 5 - Operation

5.1 Introduction

This section outlines general operating information for starting and stopping the fire pump drive engine, as well as instructions for navigating the menu screens of the Fire Pump Digital Panel (FPDP). This manual is provided for your specific equipment and should be considered a part of that equipment. All personnel responsible for the operation and maintenance of the equipment should read and thoroughly understand this manual.

WARNING

Before preparing the equipment for normal service, complete all safety checks, remove all tools and foreign objects from the equipment, ensure all guards are in place and securely fastened, and alert area personnel that the equipment will be starting.

5.2 Starting and Stopping Procedures

By default, the fire pump will turn on automatically in the event of low system water pressure. The engine will continue to operate as long as the RUN signal is present. When the RUN signal is terminated by the fire pump controller, the engine will stop.

For testing purposes, the fire pump drive engine can be turned on and off locally using the buttons on the FPDP (see Figure 4-1), If the engine fails to start automatically in the event of a fire emergency, follow the Emergency Starting/Stopping Procedure outlined in Section 5.2.2.

5.2.1 Local Starting/Stopping Procedure

To start the engine locally from the FPDP:

1. Press the AUTO/MAN mode switch on the FPDP to place the engine in MANUAL mode.
2. Press either the CRANK BATT A or CRANK BATT B button to start the engine.

The engine may be stopped locally by pressing the RESET/STOP button on the FPDP or by holding down the red ENGINE STOP button on the left side of the FPDP.

5.2.2 Emergency Starting/Stopping Procedure

The engine will start automatically in the event of a fire emergency. However, if it fails to start automatically, the engine can be started locally. The following procedure outlines an emergency manual mode electrical start:

1. As shown in Figure 5-1, open the water bypass valves in the cooling water supply piping or the emergency cooling supply.

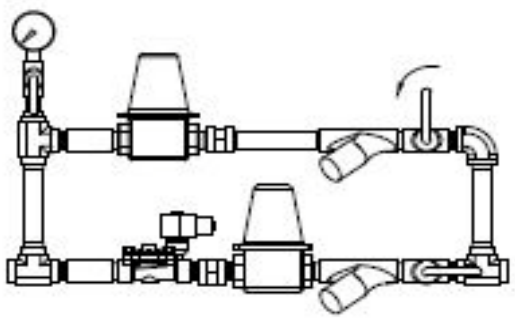

Figure 5-1 Fire Pump Drive Engine Bypass Valve

2. Verify that water is being discharged.
3. Press the AUTO/MAN mode switch on the FPDP to place the engine in MANUAL mode.
4. As shown in Figure 5-2, open the FPDP panel door and slide the keyswitch override to the “UP” position. Verify that the green LED next to the override switch is lit.

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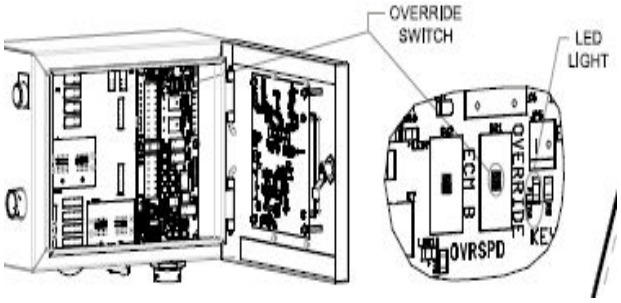


Figure 5-2 FPDP Override Switch

CAUTION

To prevent damage to the starter, do not engage the starting motor more than fifteen seconds. Wait fifteen seconds between each attempt to start, up to six attempts.

5. As shown in Figure 5-4, press downward on either the Battery A or Battery B contactor lever to start the engine.

   a. If crank contactor lever A does not engage the starter, repeat using crank contactor lever B.

   b. Release the contactor lever immediately after the engine starts.

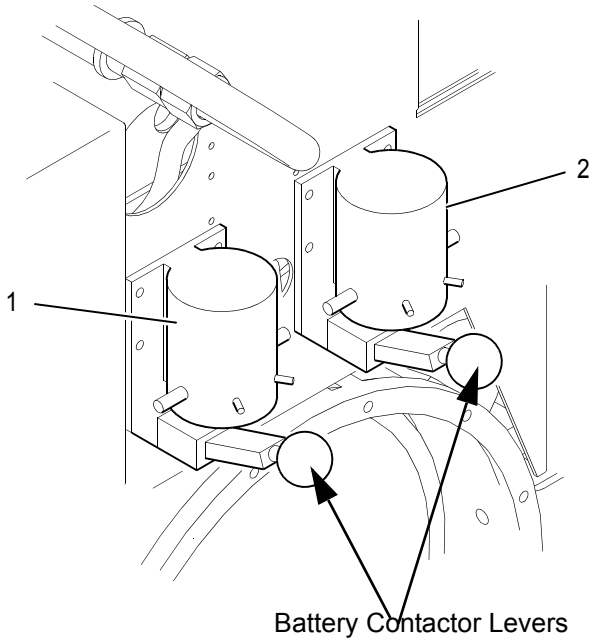
IMPORTANT: *If the engine does not start after three attempts, check the fuel supply system. Absence of blue or white exhaust smoke during cranking indicates that no fuel is being delivered.*

6. Check that the engine starts and operates at the rated speed.

NOTE: *Engine oil pressure must be indicated on the gauge within fifteen seconds after starting.*

The engine may be stopped locally by pressing the RESET/STOP button on the FPDP or by holding down the red ENGINE STOP button on the left side of the FPDP.

Figure 5-3 *Do not switch to the alternate Electronic Control Module (ECM) while the engine is running.*



1. Battery A Starter Contactor
2. Battery B Starter Contactor

Figure 5-4 Manual Starter Contactors

5.3 Fire Pump Digital Panel (FPDP) Screens and Adjustments

As shown in Figure 5-5, the FPDP User Interface Screen (main screen) shows the fire pump drive engine tachometer, coolant temperature, oil pressure, Battery A voltage, Battery B voltage, hour meter, and fault codes (when present). The “MORE /\ \/” indicator at the top right of the screen signals the user to toggle the UP or DOWN buttons to switch easily between the FPDP User Interface Screen and the Analog Values Screen (see Section 5.3.6).

NOTE: *Electronic engines display J1939 tachometer, engine temperature, and oil pressure. Mechanical engines display parameters via sensors added by Cummins Fire Power.*

NOTE: *When the key switch is not on, the coolant temperature defaults to “0 °F” (or “-18 °C”) and the oil pressure defaults to “0 PSI” (or “0 kPa”).*

.

Figure 5-5 FPDP User Interface Screen (Typical)

If the operator presses the MENU button from the FPDP User Interface Screen, the Main Menu Screen appears as shown in Figure 5-6.

```
        ENGINE SETUP
        OVERSPEED TEST
        RPM INC/DEC
        PARAMETER UNITS
        DISPLAY SETTINGS
        ANALOG VALUES
        AUTOSWITCH
        RETURN TO MAIN

Use the UP and DOWN keys to Scroll
the Menu. Press the ENTER key to
make a Selection.
```

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Figure 5-6 Main Menu Screen (Typical)

This list shows the menu options for further operator input and monitoring of engine parameters. To reach any one of these submenu screens, use the UP or DOWN buttons to highlight a desired screen and then press ENTER.

5.3.1 Engine Setup Screen

As shown in Figure 5-7, the Engine Setup screen is password protected and for Cummins Fire Power internal use only.

```
        ENGINE SETUP

        PASSWORD:
           XXX

        SUBMIT PASSWORD
        RETURN TO MAIN
```

Figure 5-7 Engine Setup Screen (Typical)

5.3.2 Overspeed Test Screen

Figure 5-8 shows the Overspeed Test Screen. To simulate an overspeed for engine speed models above 2250 RPM or for instances when over-pressurizing of sprinkler systems can cause damage:

1. Using the DOWN/UP arrow buttons, toggle down to highlight “SIMULATE OVERSPEED”.
2. Press ENTER.

```
        OVERSPEED TEST

        RATED SPEED:
             2250 RPM
        OVERSPEED SETPOINT:
             2700 RPM
        ADJUST ENGINE SPEED
      → SIMULATE OVERSPEED
        RETURN TO MAIN
              XXXX

          ENGINE SPEED in RPM
Selecting This Item allows the UP/DOWN
keys to Inc./Dec. Speed by 10 RPM.
```

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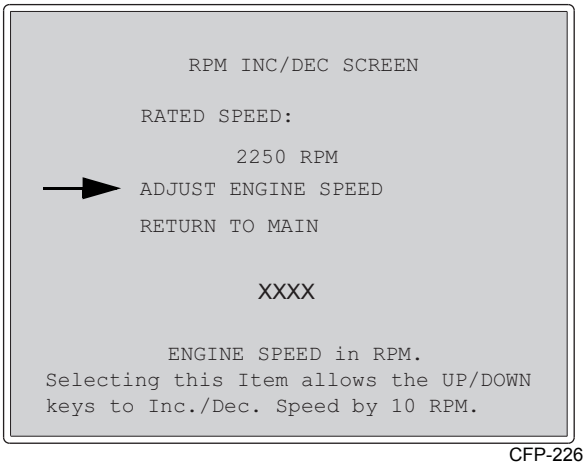
Figure 5-8 Overspeed Test Screen (Example)

3. A six-second timer will begin a countdown at the bottom of the screen and all buttons will be locked out, except for RESET/STOP.

4. The simulation test temporarily lowers the FPDP overspeed setpoint to below the engine speed. Upon completion of the overspeed simulation, the FPDP reverts back to its previous operating parameters.

The RPM INC/DEC Screen shown in Figure 5-9 allows the operator to make on-site adjustments by incrementing or decrementing the engine operating speed for electronic engines.



CFP-226

Figure 5-9 Electronic RPM INC/DEC Screen (Typical)

The engine operating speed was factory set during manufacturing and test procedures. If the speed does not match the engine RPM shown on the factory setting plate, follow these steps to adjust the speed setting:

1. Using the DOWN/UP arrow buttons, toggle down to highlight “ADJUST ENGINE SPEED”.

2. Press ENTER.

3. Press the UP or DOWN arrow to increment the engine speed to match the field setting plate. Each increment is ten RPMs.

4. Press ENTER.

5.3.3 Parameter Units Screen

The Parameter Units Screen shown in Figure 5-10 allows the operator to select Imperial or Metric units. The default units of measure are degrees in Fahrenheit and pounds per square inch (PSI).

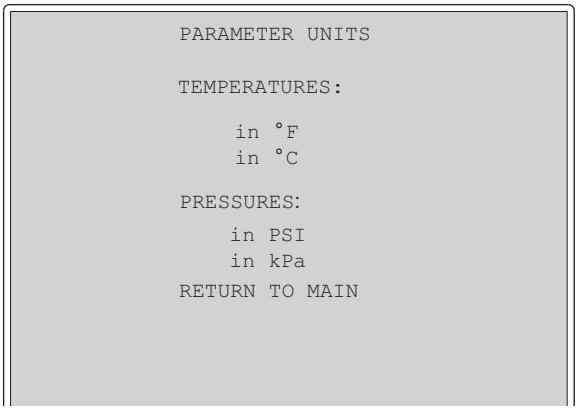
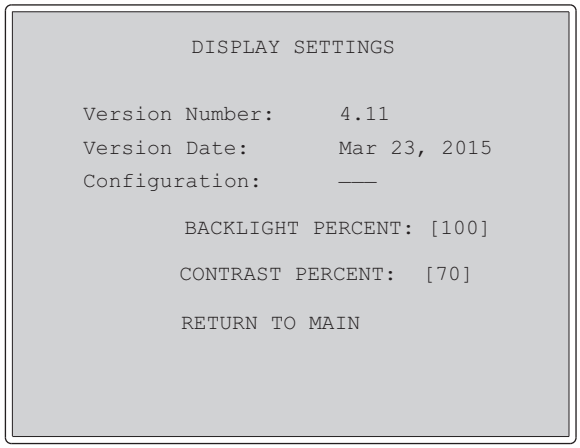


Figure 5-10 Parameter Units Screen (Typical)

5.3.4 Display Settings Screen

The Display Settings Screen (shown in Figure 5-11) enables adjustments to the backlight and contrast for optimal viewing in varying lighting environments. The version number of the FPDP software will also be indicated on this screen.



CFP-228

Figure 5-11 Display Settings Screen (Typical)

5.3.5 Analog Values Screen

The Analog Values Screen shown in Figure 5-12 provides analog output values for battery voltages, engine speed, water temperature, oil pressure, exhaust temperature, cooling loop temperature, cooling loop differential pressure, and hours of operation. The Analog Values Screen may be accessed either by toggling down and selecting ANALOG VALUES from the Main Menu Screen (Figure 5-6) or

by using the UP and DOWN buttons from the FPDP User Interface Screen (Figure 5-5).

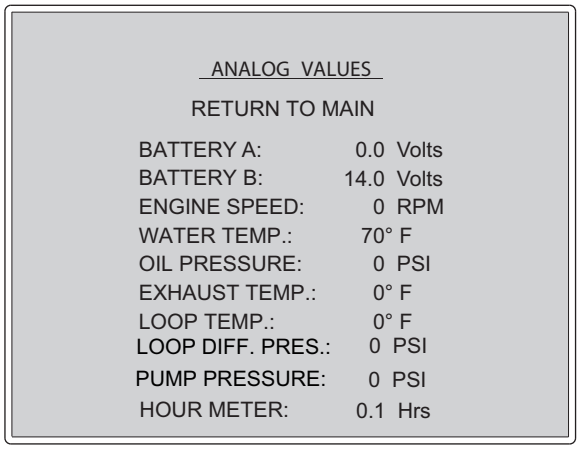


Figure 5-12 Analog Values Screen (Typical)

NOTE: *The choice of Metric or Imperial values is made using the Parameter Units screen.*

NOTE: *For exhaust temperature values less than 93 °C (200 °F) or not monitored, the value will be displayed as 0°. For oil temperature values less than 24 °C (75 °F) or not monitored, the value will be displayed as 0°.*

5.3.6 Autoswitch Screen

The National Fire Protection Association (NFPA) 20 Standard, as well as Underwriters Laboratories (UL) and Factory Mutual (FM) Standards, requires redundancy for fire safety systems. If the autoswitch is **enabled** and the selected ECM fails to start, the fire pump drive engine will automatically switch to the other ECM and restart. As shown in Figure 5-13, the Autoswitch Setting Screen allows the operator to disable or enable this autoswitch capability.

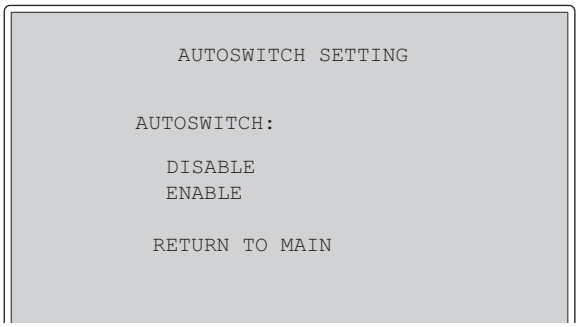


Figure 5-13 Autoswitch Screen (Typical)

5.4 Active Fault Codes Display

Operation irregularities are displayed as fault codes on the bottom of the User Interface Screen of the FPDP (see Figure 5-14). For a complete listing of Fault Codes and their meanings, see Section 7 - Troubleshooting.

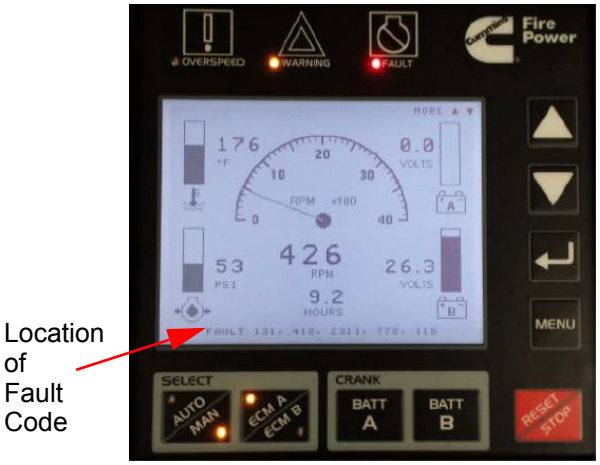


Figure 5-14 Fault Code Display

In the event that the FPDP experiences a loss of the pressure signal, the engine will default to the rated speed.

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Section 6 - Maintenance

6.1 Introduction

Before performing maintenance procedures, read and understand Section 1 - Safety of this manual. Improper performance or lack of critical information could result in personal injury or equipment damage.

Cummins encourages our customers to perform maintenance and repairs whenever necessary. However, servicing complex components within the normal warranty period may void the Cummins warranty and any specified warranty extended by the manufacturer of Original Equipment Manufacturer (OEM) products. See the Warranty Information section at the beginning of this manual.

Maintenance procedures should be performed by skilled technicians who are familiar with the equipment, local regulations, and service procedures for fire pump drive engine and pump systems. Improper maintenance can damage the engine or the fire pump drive engine, or cause severe personal injury.

The National Fire Protection Association (NFPA) 25 Standard outlines the maintenance tests to be performed to validate automatic and manual operational requirements for field acceptance testing.

Cummins recommends that the engine be maintained according to the Cummins Operation and Maintenance Manual for that engine family.

NOTE: *If your engine is equipped with a component or accessory not manufactured by Cummins Inc, refer to the component manufacturer's vendor supplied literature for specific maintenance recommendations.*

6.2 Engine Operation Reports

The engine must always be maintained in top mechanical condition. The maintenance department requires regular running reports to include the following:

- Low engine oil pressure.
- Engine surge.
- Erratic operation or frequent shutdowns.
- Any warning lamps flashing or staying illuminated.
- Abnormal coolant or oil temperature.
- Unusual engine noise or vibration.
- Excessive smoke.
- Excessive use of coolant, fuel, or engine oil.
- Any fluid leaks.
- Loose, worn, or damaged parts.

The weekly running report also helps to make provisions for more extensive maintenance, as the reports indicate the necessity.

The Fault Codes displayed on the Fire Pump Digital Panel (FPDP) assist in recording operation irregularities. See Section 7 - Troubleshooting for a listing of Fault Codes.

Maintenance Chart

NOTE: *All maintenance and inspections intervals are accumulative. When performing annual maintenance, also perform maintenance listed under daily, weekly, monthly, and three month intervals.*

Maintenance Record Form

Table 6-1.

Engine Serial Number:			Engine Model:		
Owner's Name:			Equipment Name/Number:		
Date	**Hours or Time Interval**	**Actual Hours**	**Check Performance**	**Performed By**	**Comments**

6.3 Weekly Maintenance

When the engine is running, be alert for mechanical problems that could create unsafe or hazardous conditions.

6.3.1 General

Each week, a general walk-around inspection should include the following areas:

1. Check fluid levels before starting the engine. Check oil pressure and coolant temperatures frequently. Most engine problems give an early warning.

2. Look and listen for changes in engine performance, sound, or appearance that will indicate that service or repair is needed. Be alert for misfires, vibration, excessive exhaust smoke, loss of power, or increases in oil or fuel consumption.

3. Check the engine appearance for excessive heat, wiring short circuits, excessive end-play, vibrations, excessive wear, excessive abrasion, damaged electrical wiring, or loose electrical wiring.

4. Check the engine for odors of diesel fuel, burning rubber, electrical system failure, exhaust fumes, or smoke.

WARNING

Engine fuel is highly flammable and represents an extreme hazard for fire or explosion when exposed to electrical sparks or open flame. Clean up spilled fuel immediately. Keep sources of electrical spark or open flame away from a fuel source.

6.3.2 Air Cleaner Filter and Piping

The frequency of cleaning or replacing the air cleaner filter element is determined by the conditions in which the engine operates. On a weekly basis, perform the following inspections:

1. Visually inspect the air intake filter and piping daily for blockage, damage to piping, loose clamps, or punctures that can allow debris to enter the engine. If there is a blockage, the service indicator will be activated. Refer to Figure 2-2.

NOTE: *Turbocharged engines must be operated at rated revolutions per minute (RPM) and full load to check maximum intake air restriction.*

NOTE: *Cummins recommends using an air cleaner filter element as listed on the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

CAUTION

Never operate the engine without an air cleaner. Intake air must be filtered to prevent dirt and debris from entering the engine and causing premature wear. Dirt or foreign objects could cause engine damage.

   a. If the red indicator flag is at the raised position in the window, clean or replace the air filter per the manufacturer's recommendation as required. Do not remove the felt washer from the indicator. The felt washer absorbs moisture.

   b. After the air cleaner has been serviced, push the flag in to reset the service indicator.

IMPORTANT: See the Engine Data Sheet in Section 8 - Component Parts and Assemblies for maximum intake air restriction.

2. Check for corrosion under the clamps and hoses of the intake system piping. Corrosion can allow corrosive products and dirt to enter the intake system. Disassemble and clean as required.

3. Replace any damaged air filter or hoses and tighten loose clamps, as necessary, to prevent the air system from leaking. Torque hose clamps to the recommended torque value. Refer to the torque chart in Section 8 - Component Parts and Assemblies.

6.3.3 Cooling System

CAUTION

Do not remove a coolant pressure/fill cap from a hot engine. Shut down the engine and wait until the coolant temperature is below 50 °C (120 °F) before removing the pressure cap. Heated coolant spray or steam can cause severe personal injury.

On a weekly basis, perform the following inspections on the cooling system:

1. Inspect the cooling water piping, coolant heat exchanger tanks, charge air cooling system, engine coolant hoses, and hose clamps for loose fittings, leaks, damage, and corrosion.

   a. Tighten the hose clamps as necessary.

   b. Check for cracks, holes, or other damage. Repair or replace as necessary.

CAUTION

Never use a sealing additive to stop leaks in the cooling system. This can result in cooling system plugging and inadequate coolant flow, causing the engine to overheat.

2. With the coolant expansion tank at ambient temperature, press down, unscrew, and remove the pressure cap as shown in Figure 2-1.

   a. Ensure that the coolant level is visible by checking the coolant level sight gauge.

   b. Add coolant, as required. DO NOT OVERFILL!

NOTE: *Supplemental engine coolant should be a mixture of 50% ethylene glycol antifreeze and 50% water to avoid engine damage.*

3. Check the antifreeze concentration at least six times a year or whenever coolant is added to the cooling system by using a refractometer.

4. Drain a small amount of coolant from the return line petcock and inspect the coolant for excessive rust or particulate matter. Change the coolant more frequently if particles are present.

CAUTION

Do not mix coolant brands or chemical solutions, as this could damage the cooling system. Keep a record of the coolant concentration and manufacturer with the engine maintenance records.

5. Check for soft, overly-pliant hoses, oxidation, and loose hose clamps. Torque hose clamps to the recommended torque value. Refer to the torque chart in Section 8 - Component Parts and Assemblies. Replace damaged hoses and clamps as required.

6. Check the heat exchanger for leaks, damage, and dirt buildup. Clean and repair as required.

6.3.4 Engine Oil System

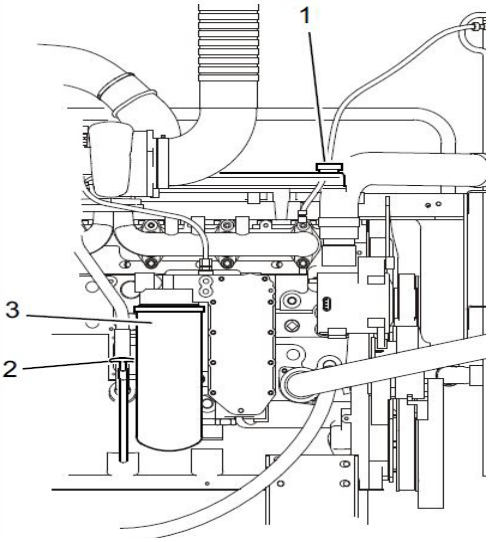
WARNING

Perform the specific checks in this section only after the engine is fully stopped. Unless tests require engine operation, disconnect the battery leads from the batteries (negative terminal first). Contact with exposed or moving components can cause severe personal injury.

Inspect the engine oil system on a weekly basis following these steps:

1. For accurate dipstick readings, shut off the engine and wait approximately ten minutes to allow the oil in the upper portions of the engine to drain back into the crankcase.

2. As shown in Figure 6-1, check the oil level at the engine dipstick.



1. Oil Fill Port (on valve cover)
2. Oil Level Dipstick
3. Engine Oil Filter

Figure 6-1 Oil Level Dipstick

   a. If the oil level is greater than the high mark (H), drain the excess oil and recheck the level.

b. If the oil level is consistently below normal after a fill, check for leaks, loose or damaged gaskets, or oil in the coolant system. If the oil level is below the low mark (L), add the equivalent type oil.

NOTE: *Cummins recommends using Premium Blue S.A.E. 15W-40 Multi-viscosity Lubricating Oil or equivalent.*

6.3.5 Fuel System

WARNING

Engine fuel is highly flammable and represents an extreme hazard for fire or explosion when exposed to electrical sparks or open flame. Clean up spilled fuel immediately. Keep sources of electrical spark or open flame away from a fuel source.

To inspect the fuel system:

1. Shut off the engine.
2. Inspect the fuel supply line, return line, filter and fittings for cracks or abrasions.
   a. Ensure the lines are not rubbing against anything that could damage the fuel system hoses. Repair any leaks or alter line routing to eliminate wear immediately.
   b. Relieve fuel line pressure by carefully loosening the fuel inlet line.

NOTE: *Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for Cummins recommended replacement components.*

6.3.6 Engine Exhaust System

With the engine operating, inspect the entire exhaust system: exhaust manifold, exhaust flex pipe, muffler, and piping. Check for leaks at all connections, welds, gaskets, and joints. Make sure that the exhaust pipes are not heating surrounding areas excessively. Repair any leaks immediately.

6.3.7 Electrical Supply and Controls

Check the terminals on the starting batteries for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Inspect the FPDP harness connections to be sure they are secure.

6.3.8 Crankcase Ventilation Hose

Inspect the crankcase ventilation hose for wear, damage, sludge, blockage, or dirt buildup (refer to Figure 2-1). Clean the ventilation hose, if obstructed or blocked. Replace a worn or damaged hose.

6.3.9 Cooling Water Strainers

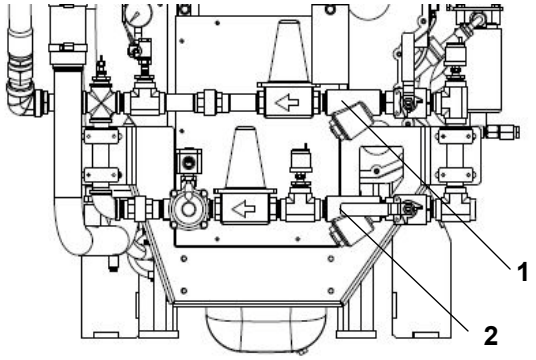
As shown in Figure 6-2, the (two) cooling water strainers should be cleaned weekly to remove sediment.

To clean the normal line strainer, ensure that the normal line valves are closed and the bypass line valves are open.

To clean the bypass line strainer, ensure that the bypass line valves are closed and the normal line valves are open.

For each cooling water strainer:

1. Remove the plug.
2. Inspect and remove any debris.
3. Install the strainer plugs.
4. When finished, open the normal line valves and close the bypass line valves for normal operation.



1. Bypass Water Line Strainer
2. Normal Water Line Strainer

Figure 6-2 Cooling Water Strainer (typical)

6.3.10 Batteries

CAUTION

Batteries can emit explosive gases during charging. To reduce the possibility of personal injury, always ventilate the battery compartment before servicing the batteries.

CAUTION

To reduce the possibility of arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

For proper weekly maintenance of the batteries:

1. Keep the batteries clean by wiping them with a damp cloth whenever dirt appears excessive.

2. Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. A fully-charged battery will have a specific gravity of 1.260. Charge the battery if the specific gravity reading is below 1.215.

3. Check the battery wiring and cable connections for loose, corroded, worn, or damaged cables. Check both connectors at the alternator, battery connections, and engine grounding lug (near the starter motor).

   a. If the battery cables are corroded, remove the battery cable clamps, starting with the negative (-) battery cable.

   b. Use a fine emery cloth or a wire brush to clean the cable clamps and battery cables. The metal should be shiny.

   c. Wash the battery terminals with a solution of baking soda and water (2 oz (1/4 cup) baking soda to 0.94 liter (1 qt) of water).

   d. Be careful to prevent the solution from entering the battery cells, and flush the batteries with clean water when done.

   e. After cleaning the connections, coat the terminals with a light application of petroleum jelly.

   f. Reinstall and tighten the cable clamps.

WARNING

Battery electrolyte (sulfuric acid) is highly caustic and can burn clothing and skin, or cause blindness. Wear protective clothing, impervious neoprene gloves, safety goggles, or full-face shield when working with the batteries.

4. Check the electrolyte level in the batteries monthly. If low, fill the battery cells to the bottom of the filler neck with distilled water.

5. Check for continuity between terminals using a digital multimeter or other test equipment. Also check the insulation resistance to ground. Correct any electrical faults.

6. Reinstall the battery cables; attach the negative (-) battery cable last.

6.3.11 Engine Test Run

Start the engine at least once a week for a minimum of thirty minutes with as much load as possible. Periods of no-load operation should be held to a minimum, because unburned fuel tends to accumulate in the exhaust system. Refer to the operating instructions in Section 5 - Operation.

Check that the engine starts and operates at the recommended fire pump drive engine speed specification and inspect the following:

1. Check that the engine oil pressure is indicated on the gauge within fifteen seconds after starting.

2. Check that the engine has attained a normal running temperature after running the engine for a minimum of thirty minutes.

3. Observe that the engine is operating at the proper operating speed. (If the engine is not operating at the proper speed, see Section 6.3.12 Engine Operation Checks.)

4. Check for unusual engine noise. Listen for any unusual engine noise which can indicate that service is required.

5. Ensure that the oil pressure is greater than 69 kPa (10 psi).

6. Check that the coolant temperature is between 70 °C (158 °F) and 107 °C (225 °F).

7. Check that both battery voltmeters indicate 12 VDC for standard or 24 VDC for optional operating systems.

8. Check that the air filter service indicator has not popped-up, indicating an air filter blockage. Replace the air filter as required.

End the test run by pressing and holding the overspeed RESET/STOP switch until the engine stops.

6.3.12 Engine Operation Checks

The following service inspections ensure that the engine starts and operates properly under normal conditions.

WARNING

Before equipment operation, ALL guards, covers, and protective devices MUST BE in place and securely fastened. Serious personal injury could result from contact with exposed or moving components.

6.3.12.1 Crank Termination Set Point

The speed switch crank termination set point is factory-set at 600 RPM and should not be changed from this value.

Engine Speed Calibration If the speed does not match the engine RPM shown on the factory settings plate, calibrate the correct speed using the controls on the FPDP:

1. Set the ECM to “ECM A”.

2. Start the engine locally from the FPDP:

   a. Press the AUTO/MAN mode switch on the FPDP to place the engine in MANUAL mode.

   b. Press either the CRANK BATT A or CRANK BATT B button to start the engine.

3. Check to verify that the engine starts and accelerates to the speed set point listed on the factory settings plate.

4. Monitor the engine speed on the tachometer. Record the observed engine speed.

5. If the speed does not match the engine RPM shown on the factory setting plate, follow these steps to adjust the speed setting:

   a. As shown in Figure 6-3, using the DOWN/UP arrow buttons, toggle down to highlight “ADJUST ENGINE SPEED”.

   b. Press ENTER.

   c. Press the UP or DOWN arrow to increment the engine speed to match the field setting plate. Each increment is ten RPMs.

   d. Press ENTER.

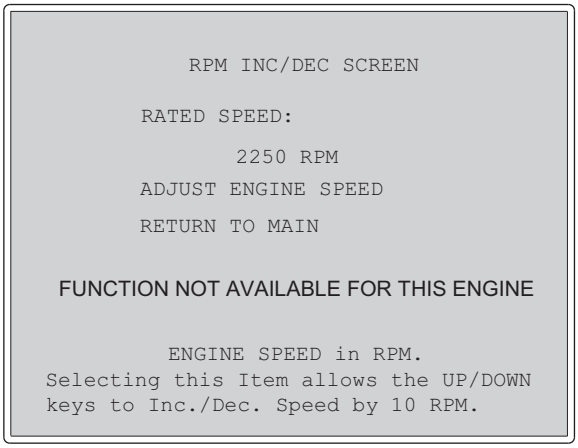


Figure 6-3 RPM INC/DEC Screen (Typical)

6. Stop the engine.
7. Start the engine.
8. Observe that the engine starts and accelerates to the rated speed set point.
9. The engine speed set point calibration is required for both the ECM A and ECM B subsystems.
10. Repeat steps 2 through 6 while the ECM selector switch is set to “ECM B”.

IMPORTANT: *Never switch from ECM A to ECM B while the engine is running.*

6.3.13 Engine Coolant Heater

NOTE: *Perform this inspection procedure twenty-four hours after shutting off the engine.*

The engine coolant heater must maintain an engine coolant temperature of 49 °C (120 °F) or above. The engine block must be warm to the touch in the water jacket areas (see Figure 2-2).

If the heater does not appear to be working correctly, contact a Cummins Authorized Repair Location.

6.4 Annual Maintenance

All checks or inspections listed under previous maintenance intervals must also be performed at the time of the annual maintenance, in addition to those listed *only* under the annual maintenance interval.

6.4.1 Electrical Components

CAUTION

AVOID SERVICING complex components such as: printed circuit boards, programmable controllers, and ECMs not specifically authorized by Cummins Inc. Contact a Cummins Authorized Repair Location before performing any extensive maintenance.

CAUTION

To reduce the possibility of arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

The electrical components of the fire pump drive engine must be thoroughly inspected on an annual basis. Remove the battery terminal cables, starting with the negative (-) cable first and check the following:

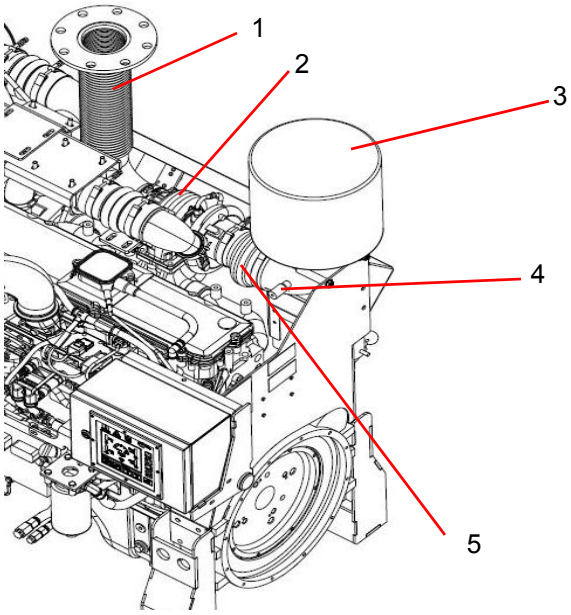
1. Inspect the electrical wiring harness, electrical terminal connections, and electrical plug-ins for secure, clean electrical contacts, worn or damaged insulation, burnt wires, broken wires, and loose connections (see Figure 2-1).
   a. Clean and tighten any loose electrical connections.
   b. Repair or replace worn, damaged, burnt, or poorly insulated wiring immediately. Refer to Section 8 - Component Parts and Assemblies.

IMPORTANT: *Refer to the vendor-supplied literature for recommended maintenance procedures.*

2. Inspect the function of all gauges, voltmeters, switches, and warning lamps on the FPDP. Replace the FPDP if any are not functioning properly.
3. Reinstall the battery cables; attach the negative (-) battery cable last.

6.4.2 Turbocharger Mounting Nuts

As shown in Figure 6-4, check the turbocharger mounting nuts and torque the mounting nuts to the recommended torque value as specified in Section 8 - Component Parts and Assemblies.



1. Exhaust Flex Connection
2. Turbocharger
3. Air Cleaner/Filter
4. Service Indicator
5. Air Cleaner Piping

Figure 6-4 Turbocharger (typical)

6.4.3 Engine Supports

CAUTION

Loose engine mount bolts or damaged brackets can cause engine misalignment or excessive vibration. These conditions can cause engine or pump damage.

Refer to Figure 2-1 for the location of the engine supports and inspect all engine supports for cracks or loose hardware. Check the torque on the engine support mounting capscrews. Torque the engine mounting cap screws to the support bracket. Refer to the torque table in Section 8 - Component Parts and Assemblies for recommended torque values.

6.4.4 Fuel Pumps and Filters

As shown in Figure 6-5, inspect the fuel injection pump mounting nuts (including the support bracket) for loose or damaged hardware. Inspect the fuel line hoses and fuel filters for wear, damage, loose fittings, and leaks. Repair or replace damaged hoses and filters as required.

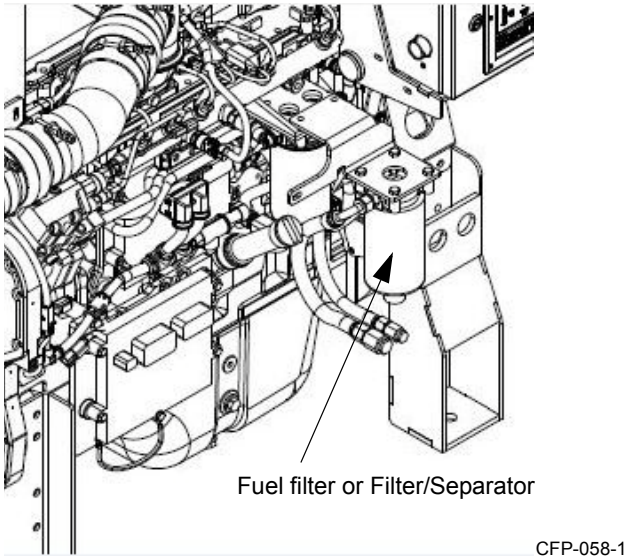


Figure 6-5 Fuel Pumps (typical)

WARNING

Engine fuel is highly flammable and represents an extreme hazard for fire or explosion when exposed to electrical sparks or open flame. Clean up spilled fuel immediately. Keep sources of electrical spark or open flame away from a fuel source.

WARNING

Do not open the fuel filter/water separator drain valve or dismantle the fuel lines on the high-pressure fuel system with the engine running. High pressure fuel spray from an operating engine can cause serious personal injury or fire hazard.

To change the fuel filters:

1. Shut off the engine.
2. Close any fuel valves (if equipped) to prevent fuel from draining or siphoning.
3. Clean the area around the fuel filter or fuel/water separator heads.

NOTE: *Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for filter replacement recommendations.*

4. Remove the spent filter canisters using a filter wrench.

5. Clean the filter mounting head surfaces of sludge buildup and foreign particles. Ensure mating gasket surfaces are clean.

6. Lubricate the gasket seals with clean SAE 15W-40 lubricating oil.

7. Center the filter ring on the threaded mounting nipple. Screw the filter canister onto the mounting flange until the gasket is snug against the mounting flange, then tighten an additional 1/4 turn.

8. Open the fuel supply valves (if equipped).

CAUTION

Mechanical over-tightening can distort the threads or damage the filter element seal.

9. Press either the CRANK BATT A or CRANK BATT B button to start the engine to allow the fuel to flow through the system.

10. Depress the contactor switch for up to fifteen seconds or until the engine starts. Repeat up to three times, if necessary.

CAUTION

To prevent damage to the starter, do not engage the starting motor more than fifteen seconds. Wait fifteen seconds between each start attempt.

IMPORTANT: *If the engine does not start after three attempts, check the fuel supply system. Absence of blue or white exhaust smoke during cranking indicates no fuel is being delivered.*

NOTE: *Engines used in fire pumps or standby service are expected to immediately accelerate from crank to full load.*

6.4.5 Engine Oil and Filter

Engine oil becomes contaminated and essential oil additives are depleted with use. The amount of contamination is related to the total amount of fuel and oil consumed. Change the oil at least once annually.

NOTE: *For composite oil pans, always use a new sealing washer on the oil drain plug. Hold the external locking nut in place while tightening the oil drain plug.*

IMPORTANT: *If the engine oil is drained from the oil pan to make an engine repair, new oil must be used.*

WARNING

To reduce the possibility of personal injury, avoid direct contact of hot oil with your skin. Some state and federal agencies have determined that used engine oil can be carcinogenic. Prolonged, repeated contact can cause skin disorders or other bodily injury. Wash thoroughly after contact. Avoid inhalation of vapors and ingestion of used engine oil. Dispose of the oil in accordance with local environmental regulations.

To change the oil and filter to remove the contaminants suspended in the oil:

1. Operate the engine until the coolant temperature reaches 70 °C (158 °F). Shut the engine off.

2. Place an appropriate container under the oil pan drain plug. Refer to the Engine Data Sheet in Section 8 - Component Parts and Assemblies for oil pan capacity.

3. Remove the oil drain plug and drain the oil immediately to make sure all the oil and suspended contaminants are removed from the engine.

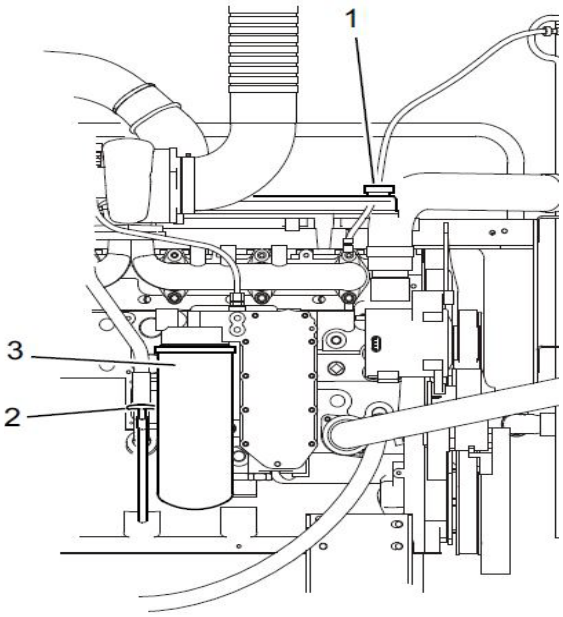
4. Remove the oil filter (see Figure 6-6) following these steps:

   a. Clean the area around the engine oil filter canister. Use a filter wrench to remove the filter.

   b. Remove and discard the O-ring seal if it has remained attached to the mounting flange. Clean the filter mounting flange with a clean lint-free cloth.

   c. Apply a light film of 15W-40 lubricating oil to the replacement filter gasket before installing the filter.

5. Fill the oil filter with a high-quality 15W-40 multi-viscosity lubricating oil, such as Premium Blue®, or its equivalent.



1. Oil Fill Port (on valve cover)
2. Oil Level Dipstick
3. Engine Oil Filter

Figure 6-6 Oil Filter and Oil Level Dipstick (Typical)

6. Center the filter ring on the threaded mounting nipple. Screw the filter canister onto the mounting flange until the gasket is snug against the mounting flange. Then tighten an additional 1/4 turn.

CAUTION

Mechanical over-tightening can distort the threads or damage the filter element seal.

NOTE: *Cummins recommends using oil filter replacement parts as outlined in the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

7. Check and clean the oil pan drain plug threads and sealing surface. Install the oil pan drain plug. Torque the plug according to the Torque Chart in Section 8 - Component Parts and Assemblies.

8. Fill the engine to the proper level with clean, high quality 15W-40 oil at the fill port.

CAUTION

If no oil pressure is noted within fifteen seconds after the engine is started, shut down the engine to reduce the possibility of internal damage.

9. Restart the engine and let it run for approximately one to two minutes.

10. Stop the engine.

11. Wait approximately fifteen minutes to let the oil drain from the upper parts of the engine.

12. Check the oil level again. Add oil as necessary to bring the oil level to the H (high) mark on the dipstick.

6.4.6 Drive Shaft

It is recommended that proper lubrication to drive shafts be completed on a regular schedule according to these steps:

1. Remove the drive shaft guards.

2. Wipe the grease fittings and grease gun nozzle with a clean cloth to avoid contamination.

3. Add grease to the drive shaft universal joint grease fittings (see Figure 3-2).

4. Wipe excess grease from the grease fittings.

NOTE: *Cummins Inc recommends using a good quality semi-synthetic, molybdenum-fortified NLGI #2 lithium complex grease which protects from -47 to 204 °C (-54 to 400 °F).*

6.4.7 Coolant Pump/Alternator Belt

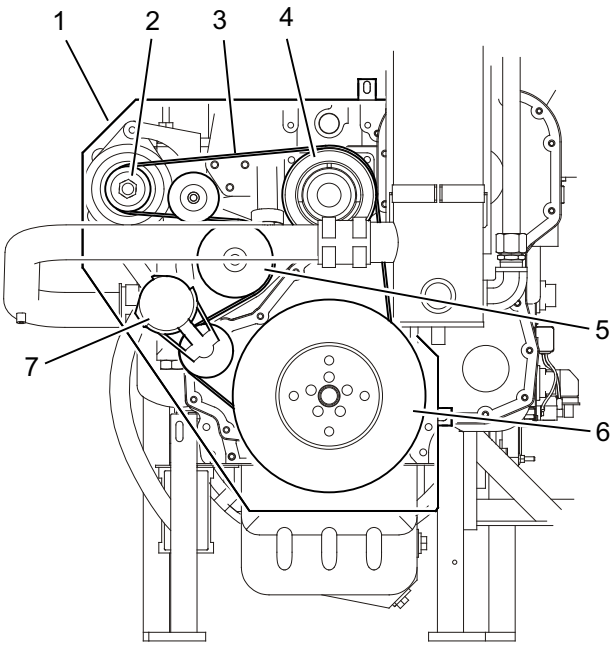
On some engine models, the pump and alternator belt drives both the pump and alternator.

To inspect the coolant pump and the alternator belt:

1. Press the AUTO/MAN button on the FPDP to place the fire pump drive engine in MANUAL operation.

2. Disconnect both batteries at their terminals. Remove the negative (-) cable first.

3. Remove the belt guard capscrews and the belt guard. Set aside for re-installation (see Figure 6-7).



1. Belt Guard
2. Alternator Pulley
3. Drive Belt
4. Idler Pulley
5. Coolant Pump Pulley
6. Balancer Pulley
7. Belt Tensioner

Figure 6-7 Coolant Pump/Alternator Belt (typical)

4. Visually inspect the belt for frayed, worn, missing pieces, or cracked belt surfaces. Check the belt for intersecting cracks.

CAUTION

Belt damage can be caused by: incorrect tension, incorrect size or length, pulley misalignment, incorrect installation, severe operating environment, and/or oil or grease on the belt or pulley.

NOTE: *Transverse cracks (across the belt width) are acceptable. Longitudinal cracks (direction of belt length) that intersect with transverse cracks are not acceptable. Replace the belt if it is cracked, frayed, or damaged.*

5. If the belt condition is acceptable, check the belt tension. There are two ways to check the belt condition:

NOTE: *Belts with glazed or shiny surfaces indicate belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear.*

CAUTION

Disconnect the batteries (negative cable first) before performing service on the fire pump drive engine or on any of its controls.

   a. Use the Cummins belt tension gauge (Part Number 3822524) to measure the drive belt tension in the center span of the belt between the idler and alternator pulleys. Ensure that the belt tension is set to the specifications outlined in the Engine Operation Manual.

   b. Use the deflection method and measure the belt tension in the center span of the belt between the alternator and idler pulleys. If the belt deflection is more than one belt thickness per foot of pulley center-to-center distance, adjust the belt tension.

6. Reinstall the battery cables; attach the negative (-) battery cable last.

6.4.8 Raw Water Zinc Anode

The zinc anode (see Figure 6-8) acts as a raw water filter and must be checked for erosion and replaced, when necessary. If the anode has eroded more than fifty percent, it must be replaced.

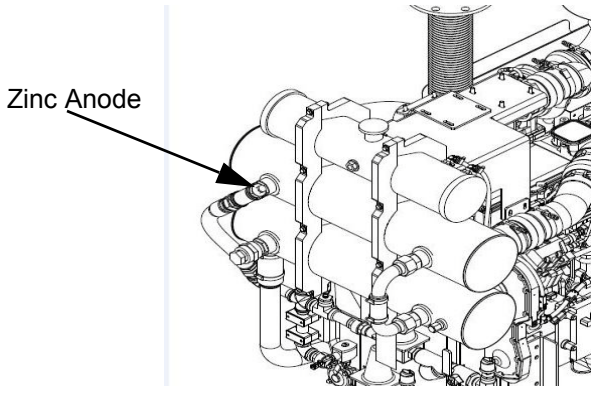


Figure 6-8 Raw Water Zinc Anode (typical)

6.4.9 Heat Exchanger

If internal leakage in the heat exchanger is suspected, a heat exchanger pressure test may be performed prior to removal from the engine.

NOTE: *Use Teflon™ tape or other pipe sealant when installing the test setup in order to prevent leaks.*

NOTE: *The size of fittings required on the water outlets and inlets are listed on the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

To test the heat exchanger pressure:

1. Install an adapter at the cooling water outlet of the heat exchanger.
2. Install a pressure test setup with 689 kPa (100 psi) pressure gauge at the cooling water inlet to the heat exchanger.
3. Apply air pressure at 414 kPa (60 psi).
    a. Isolate the pressure source and monitor the pressure gauge for five minutes.
    b. There should be no change in pressure for the duration of the test.
4. After testing, release the pressure. Remove the tubing adapters, plug, and test equipment.
5. If leakage is detected, the heat exchanger must be replaced.

6.4.10 Turbocharger

As shown in Figure 6-4, follow these steps to thoroughly inspect the turbocharger:

1. Visually inspect the air intake filter and piping according to the steps outlined in Section 6.3.2.

NOTE: *Turbocharged engines must be operated at rated revolutions per minute (RPM) and full load to check maximum intake air restriction.*

NOTE: *Cummins recommends using an air cleaner filter element as listed on the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

CAUTION

Never operate the engine without an air cleaner. Intake air must be filtered to prevent dirt and debris from entering the engine and causing premature wear. Dirt or foreign objects could cause engine damage.

2. Remove the air intake and exhaust piping from the turbocharger.
3. Inspect the turbocharger turbine wheel for cracks in the housing or turbine blades, missing blades, mechanical binding, eccentric motion, or excessive end-play.
4. Replace the turbocharger if damage, excessive end-play, binding, wear, or eccentric motion is found. Contact a Cummins Authorized Repair Location for replacement.

IMPORTANT: *The turbocharger must be removed for replacement or rebuild if the clearance is beyond the limits, the housing is cracked, or the turbine wheel is damaged.*

5. Reinstall the air intake filter and exhaust piping. Tighten the clamps. Torque loosened clamps to the recommended torque value. Refer to the torque table in Section 8 - Component Parts and Assemblies.

6.5 Every Two Years

All checks or inspections listed under daily or previous maintenance intervals must also be performed at this time, in addition to those listed under this maintenance interval.

6.5.1 Coolant Pump

Inspect the coolant pump for eccentric motion, mechanical binding, excessive end play, seal damage, and excessive grease or coolant leakage around the pump shaft.

Replace with a new or rebuilt pre-lubricated unit, as necessary. Contact a Cummins Authorized Repair Location for replacement.

6.5.2 Cooling System

Figure 6-9 illustrates the cooling system. The cooling system must be clean to work properly. If the system shows excessive mineral buildup, particulate matter, scale, oxidation, or oil contamination, drain and flush the cooling system. If the coolant is excessively dirty or is mixed with oil, contact a Cummins Authorized Repair Facility.

WARNING

Do not remove the pressure/fill cap from a hot engine. Shut down the engine and wait until the

coolant temperature is below 50 °C (120 °F) before removing the pressure cap. Heated coolant spray or steam can cause severe personal injury.

1. Press the AUTO/MAN button on the FPDP to place the fire pump drive engine in MANUAL operation.

2. Disconnect both batteries at their terminals. Remove the negative (-) cable first.

3. Press down, unscrew, and remove the coolant expansion tank pressure/fill cap. The cap must be removed to allow air to vent the cooling system during the draining process.

4. Disconnect the engine coolant heater power supply before draining the cooling system.

5. Place a container that will hold at least 57 liters (15 gal) of liquid under the coolant drain valve.

6. Ensure that the coolant filter shut-off valves are OPEN.

7. Open the drain petcock on the lower coolant tube, allowing the coolant to drain into the waste container.

8. When the system is empty, move the container under the engine coolant heater.

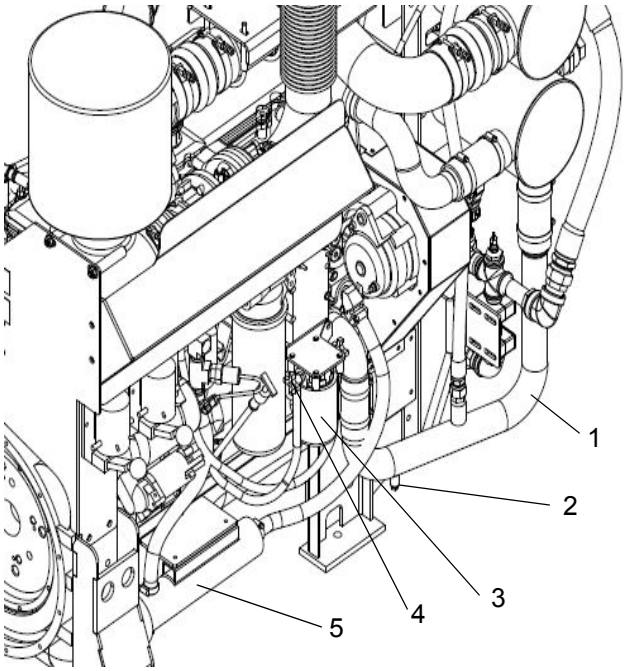
9. Disconnect either end of the engine heater coolant hose and drain the engine heater.

⚠ CAUTION

Coolant is toxic. Avoid prolonged and repeated skin contact with used antifreeze - wash thoroughly after contact. Prolonged, repeated contact can cause skin disorders. Dispose of waste antifreeze in accordance with local environmental regulations.

10. Flush with clean fresh water or heavy-duty heat exchanger cleaner. Follow the manufacturer's directions on the product container.

NOTE: *Some cooling system cleaners or commercial solvents require a soapy water rinse after use. Follow the directions on the cleaning solution or solvent.*



1. Lower Coolant Tube
2. Coolant Drain Petcock
3. Coolant Filter
4. Coolant Filter Shut-off Valve
5. Engine Coolant Heater

Figure 6-9 Engine Coolant Drain

⚠ CAUTION

Over-concentration of antifreeze or use of high-silicate antifreeze can damage the engine. Do not use more than 50% antifreeze in the mixture unless additional freeze protection is required. Antifreeze at 68% concentration provides the maximum freeze protection, and must never be exceeded under any condition. Antifreeze protection decreases above 68%.

11. When the flushing water has fully drained, use a filter wrench to remove the water coolant filter from the filter housing.

    a. Clean the filter housing gasket mount of dirt buildup, oxidation, or particulate matter with a clean cloth.

    b. Coat the replacement filter gasket with a light coating of 15W-40 lubrication oil.

12. Center the filter ring on the threaded mounting nipple. Screw the filter canister onto the mounting flange until the gasket is snug against the

mounting flange, then tighten an additional 1/4 turn. If using a soapy water solution, flush again with clear water. Allow time for the water to fully drain.

CAUTION

Mechanical over-tightening can distort the threads or damage the filter element seal.

NOTE: *Recommendations on filter replacements and fill rates can be found on the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

13. Reconnect the engine heater coolant hose and close the drain petcock on the lower coolant tube.

NOTE: *During filling, air must be vented from the engine coolant passages. The air vents through the coolant filler port. The fill rate can be found in the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

14. Fill the coolant tanks with the proper antifreeze. Use a mixture of 50% water and 50% ethylene-glycol base or propylene-glycol antifreeze (or pre-mixed solution) to protect the engine to -37 °C (-34 °F) year-around.

CAUTION

Use soft or distilled water in the coolant mixture. Contaminants in hard water neutralize the corrosion inhibitor components. Water must not exceed 300-ppm hardness or contain more than 100 ppm of either chloride or sulfate.

CAUTION

Never use a sealing additive to stop leaks in the cooling system. This can result in cooling system blockage or restricted coolant flow, causing the engine to overheat.

NOTE: *Cummins Inc. recommends using Fleetguard® ES COMPLEAT™ Ethylene-Glycol (EG) or Fleetguard® Propylene-Glycol (PG) Plus™ Antifreeze/Coolants. Both products are available in concentrated or pre-mixed formulations. Use a 50% concentration level (40% to 60% range) of ethylene-glycol or propylene-glycol and Supplemental Coolant Additive (SCA) required for wet-sleeved engines in most climates. Contact your local Cummins Authorized Repair Location for additional information.*

Table 6-2.

Ethylene-Glycol	Propylene-Glycol
40% = -23 °C (-10 °F)	40% = -21 °C (-6 °F)
50% = -37 °C (-34 °F)	50% = -33 °C (-27 °F)
60% = -54 °C (-65 °F)	60% = -54 °C (-65 °F)
68% = -71 °C (-96 °F)	68% = -63 °C (-82 °F)

CAUTION

The system must be filled properly to prevent air locks. During filling, air must be vented from the engine coolant passages.

15. Check the condition of the pressure/fill cap.

    a. If the pressure/fill cap seal is worn, damaged, missing, or the pressure spring is damaged or shows signs of sticking, replace the filler cap.

    b. Re-install the expansion tank fill cap.

16. Re-install the heater wiring.

17. Reinstall the battery cables; attach the negative (-) battery cable last.

18. Operate the engine until it reaches a temperature of 82 °C (180 °F), and check for coolant leaks.

19. Ensure that the coolant level is just below the fill neck and that the coolant heater is reconnected.

6.6 Every Four Years

All maintenance checks and inspections listed in previous maintenance intervals must also be performed at this time.

Cummins recommends performing maintenance on valve lash settings.

CAUTION

Disconnect both batteries (negative cable first) before performing service on the fire pump drive engine or on any of its controls. Wear safety glasses when disconnecting batteries!

CAUTION

Valve lash maintenance should be performed by a skilled technician. Improper maintenance can damage the engine or cause severe personal injury. Contact your local Cummins Authorized Repair Location before performing any extensive maintenance.

6.6.1 Coolant Thermostat Removal/Installation

The thermostat regulates the temperature of the engine coolant circulating through the engine cooling system. Refer to the Engine Manual for complete instructions.

CAUTION

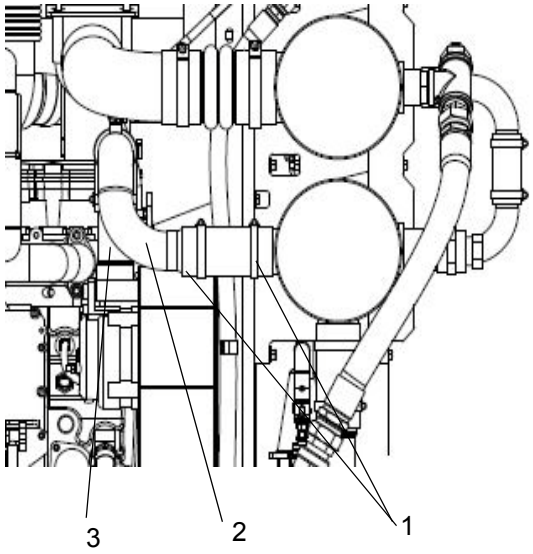
Always use the correct thermostat, and never operate the engine without a thermostat installed. The engine can overheat if operated without a thermostat because the path of least resistance for the coolant is through the bypass to the pump inlet.

1. Remove the upper coolant hose clamps and upper coolant hose at the thermostat housing.
2. Remove the (2) thermostat housing flange cap screws and the thermostat flange (see Figure 6-10).
3. Remove the thermostat and gasket from the housing.
4. Clean the housing flange faces of dirt buildup, oxidation, and sludge.
5. If still in good condition, re-install the thermostat in the housing.

IMPORTANT: *Inspect the seal on the thermostat housing flange surface and - if damaged or cracked - apply a new seal.*

NOTE: *Recommendations on thermostat replacement components can be found on the Engine Data Sheet in Section 8 - Component Parts and Assemblies.*

6. Replace the thermostat flange and cap screws.



1. Hose Clamps
2. Upper Coolant Hose
3. Thermostat Housing

Figure 6-10 Thermostat Housing (typical)

6.6.2 Coolant Pump/Alternator Belt Replacement

Referring to Figure 6-7, replace the coolant pump/alternator belt if it is cracked, frayed, or has pieces of material missing.

1. Remove the belt guard.
2. Use a 3/8” drive ratchet or breaker bar to rotate the tensioner arm away from the belt and remove the belt.
3. Check the belt tensioner cap screw torque. For recommended torque values, refer to the torque table in Section 8 - Component Parts and Assemblies.
4. Check the tensioner arm, pulley, and stops for cracks. If any cracks are noticed, the tensioner must be replaced.
5. Verify that the tensioner arm stop is not in contact with the spring casing stop. If either stop is touching, the tensioner must be replaced.
6. Inspect the tensioner for evidence of the tensioner arm contacting the tensioner cap.

   If there is evidence of the two areas making contact, the pivot tube bushing has failed and the tensioner must be replaced.

7. Check the tensioner bearing.
   a. Rotate the belt tensioner pulley. The pulley should spin freely with no mechanical binding, eccentric motion, or excessive end-play.
   b. If the arm rotates with mechanical binding, eccentric movement, or excessive end play, replace the tensioner.
8. Inspect the clearance between the tensioner spring case and the tensioner arm for uneven bearing wear.

   If the clearance exceeds 3 mm (0.12 in) at any point, the tensioner must be replaced as a complete assembly. Contact a Cummins Authorized Repair Location for replacement.

NOTE: *Experience has shown that tensioners generally will show a larger clearance gap near the lower portion of the spring case, resulting in the upper portion rubbing against the tensioner arm. Always replace the belt when a tensioner is replaced.*

9. After checking the torque, use a 3/8” drive ratchet or breaker bar to rotate the tensioner slowly away from the area of belt contact.
10. Install the replacement drive belt.

CAUTION

To prevent pulley or belt damage, do not roll a belt over the pulley or pry it on with a tool. Move the tensioner arm away from the belt area before installing the drive belt.

11. Check the location of the drive belt on the belt tensioner pulley. The belt should be centered on, or centered close to, the middle of the pulley.
12. Reinstall the belt guard.

CAUTION

Unaligned belts, either too far forward or backward, can cause belt wear, belt roll-off failures or increase uneven tensioner bushing wear.

6.6.3 Charge Air Cooler (CAC) Heat Exchanger Cleaning

The CAC heat exchanger should be removed and cleaned internally at least once every four years.

1. Press the AUTO/MAN button on the FPDP to place the fire pump drive engine in MANUAL operation.
2. Disconnect both batteries at their terminals. Remove the negative (-) cable first.
3. Shut off the manual cooling water and bypass water hand valves on the cooling loop water supply.
4. Open the coolant filter shut-off valve.
5. Drain the coolant system per the instructions in Section 6.5.2
6. When the tanks are empty, disconnect the inlet and outlet piping from the CAC tubing to the heat exchanger (see Figure 2-1).
7. Disconnect the cooling water inlet and outlet fittings from the charge air heat exchanger and the coolant heat exchanger.

WARNING

Do not use caustic cleaners to clean the CAC as these types of cleaners cause damage to the CAC. Follow the directions provided by the cleaning solution manufacturer.

WARNING

Cleaning chemicals may be caustic and cause skin irritation. Follow the instructions on cleaning containers. Wear protective clothing, eye wear, and rubber gloves when working with cleaning solutions. Dispose of solvents and cleaning solutions properly.

8. Remove the heat exchanger mounting bracket bolts from the mounting bracket and set aside for later reuse.
9. Provide support for the heat exchanger in order to avoid dropping it. Remove the charge air heat exchanger from the mounting plates.
10. Flush the CAC internally with cleaning solution in the opposite direction of normal air flow.
11. Shake the CAC and lightly tap on the tank ends with a rubber mallet to dislodge trapped debris. Continue flushing until all debris or oil is removed.

CAUTION

Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause personal injury.

12. After the CAC has been thoroughly cleaned of all oil and debris with solvent, wash the CAC internally with hot, soapy water to remove the remaining solvent.

13. Rinse thoroughly with clean water.

14. Blow compressed air into the CAC in the opposite direction of normal air flow until the CAC is dry internally.

15. Depending on the condition of the heat exchanger, perform the pressure test outlined in Section 6.4.10.

16. Reassemble the coolant heat exchangers, coolant tubing, clamps, and cooling water lines per the instructions outlined in Section 6.5.2.

17. Provide support for the coolant heat exchanger assembly in order to avoid dropping it.

18. Position the heat exchanger assembly on the engine's mounting bracket and hand-tighten the mounting bolts (see Figure 2-1 and Figure 2-2).

19. Align the cooling loop assembly with the required hose connections and hand tighten the hose clamp fasteners.

20. Reinstall all water supply and drain fittings. Use Teflon™ pipe tape to prevent leaks. Torque the hose clamp screws to the recommended torque value. Refer to the torque table in Section 8 - Component Parts and Assemblies.

21. When the heat exchanger cooling assembly is secured, re-tighten the mounting bracket fasteners, hose clamps, and cooling water lines according to the Torque Chart in Section 8 - Component Parts and Assemblies.

22. Open the cooling loop cooling water supply manual valves and check for leaks.

23. Reinstall the battery cables; attach the negative (-) battery cable last.

24. After completing and inspecting all service work, start the engine and check for air leaks, loose clamps, and blowby.

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Section 7 - Troubleshooting

7.1 Introduction

The following information is intended as a guide for some common non-technical equipment problems. The first part of this section includes troubleshooting charts that cross-reference the problem, the possible cause, and the solution. The second section includes complete Fault Code charts outlining a numerical listing of fault codes and their descriptions.

Many problems can be resolved using corrective maintenance, adjustment, or minor repair. Refer to the vendor supplied literature, electrical schematics, and mechanical prints for additional information.

For engine-related issues, refer to the engine Operation and Maintenance Manual or contact the Cummins Customer Assistance Center at 1-800-DIESELS (1-800-343-7357).

WARNING

The status checks should be performed ONLY by a qualified technician. Contact with exposed electrical components could cause extreme personal injury or death.

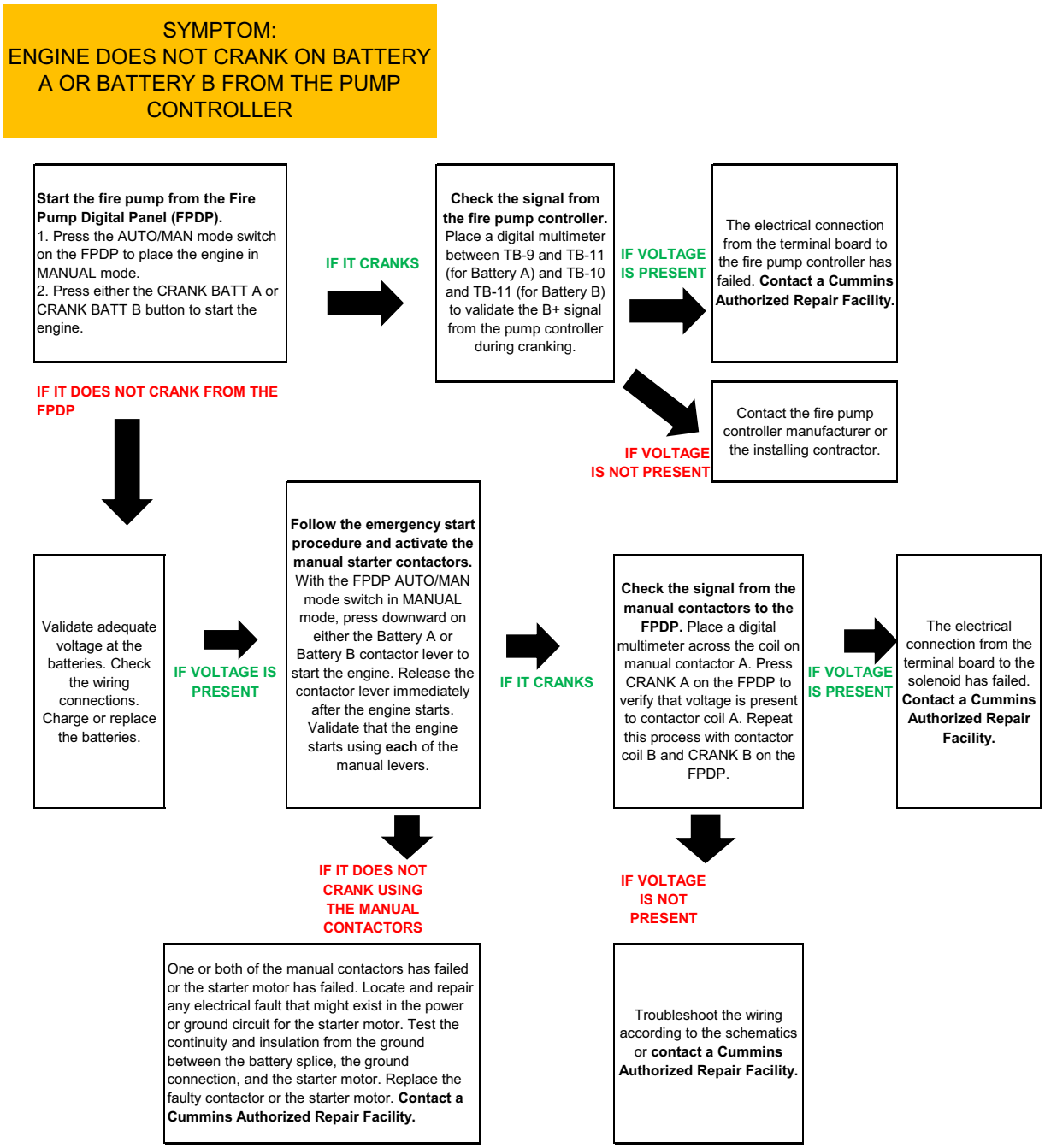
CAUTION

AVOID SERVICING complex components such as: printed circuit boards, programmable controllers, and ECMs not specifically authorized by Cummins Inc. Contact the Cummins Fire Power Customer Service Department toll free at 1-800-343-7357 before performing any extensive maintenance.

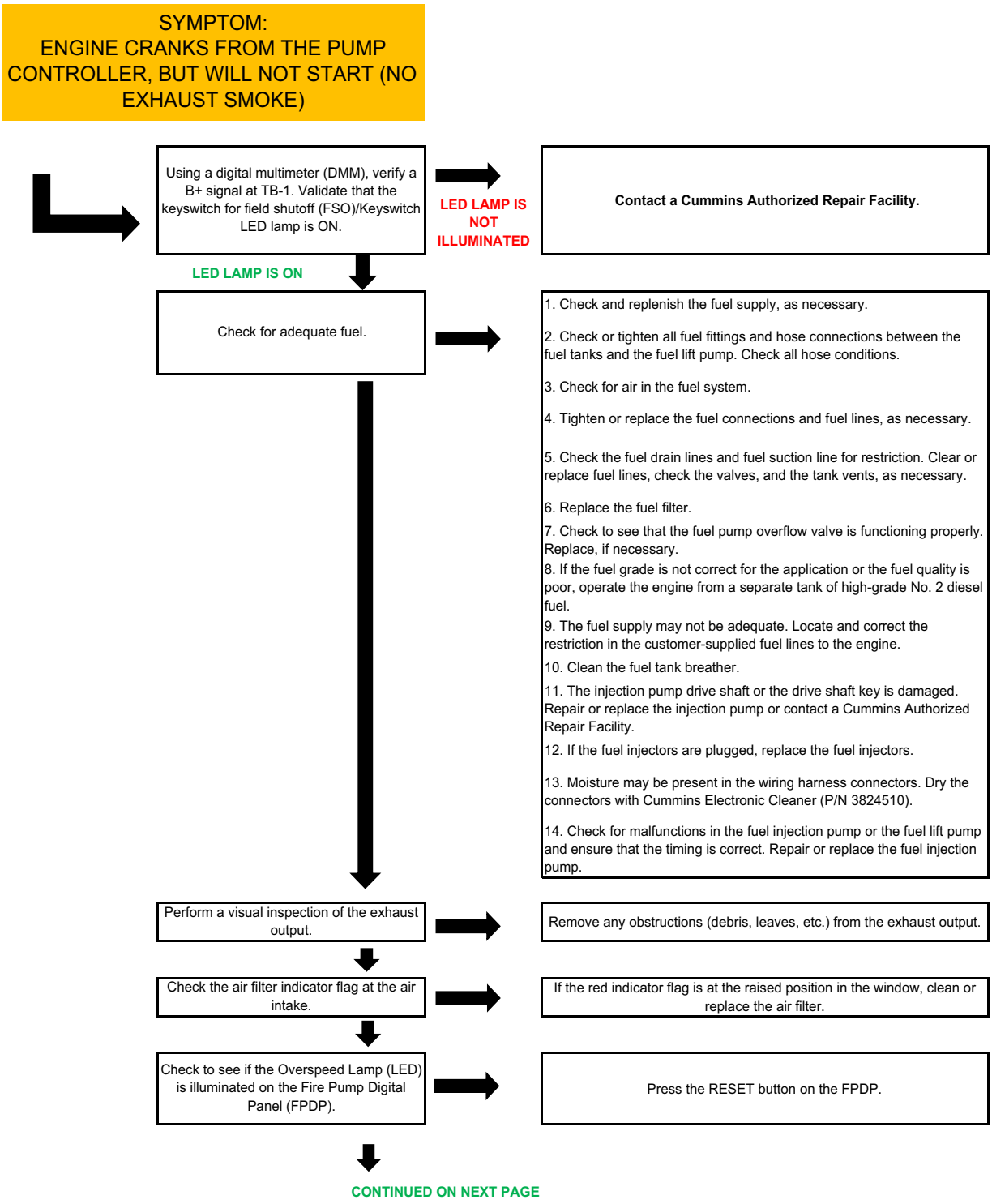
CAUTION

Never climb or stand on the equipment frame, guards, or enclosures. Contact with exposed or moving components can cause personal injury or equipment damage.

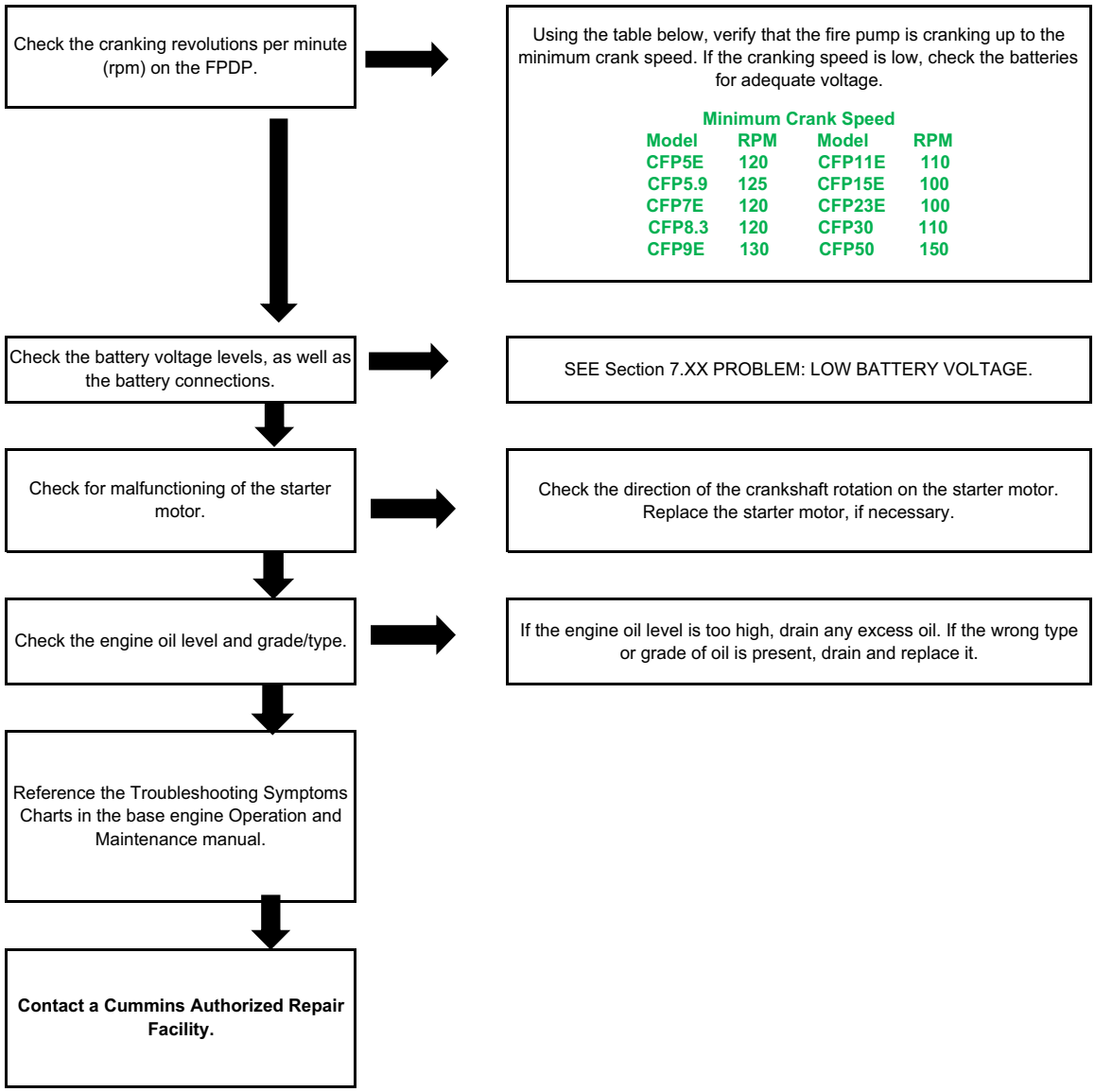
7.2 Engine Will Not Start



7.3 Engine Cranks But Will Not Start



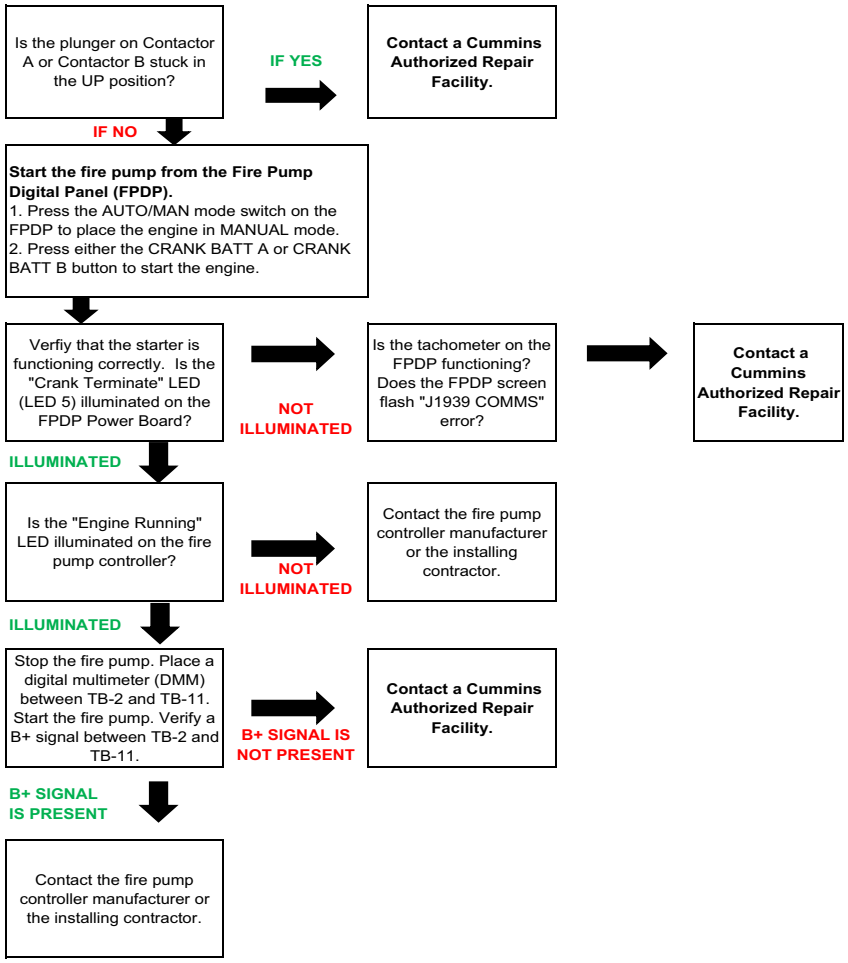
Engine Cranks But Will Not Start (continued)



7.4 Engine Starts But Continues to Crank

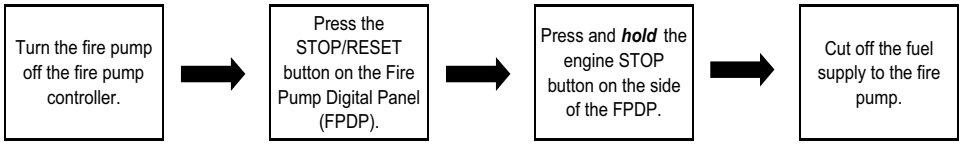
STOP THE ENGINE AT THE FIRE PUMP CONTROLLER (PLACE THE CONTROLLER IN THE OFF POSITION) AND TROUBLESHOOT FROM THE FIRE PUMP DRIVE ENGINE:

PRIOR TO MAKING A SERVICE CALL, PERFORM A VISUAL INSPECTION:

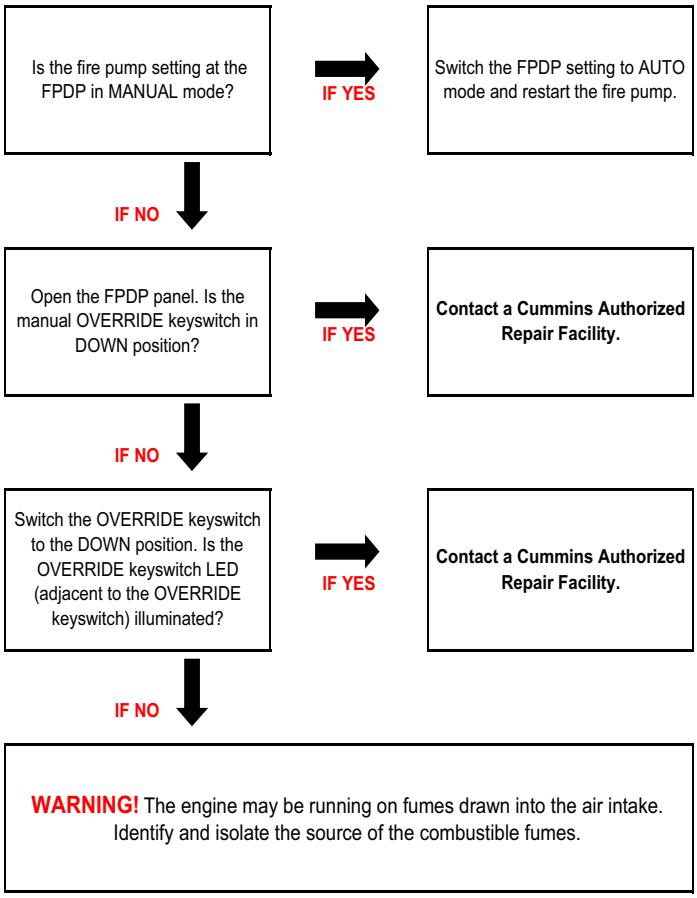


7.5 Engine Will Not Stop

TO STOP THE ENGINE:

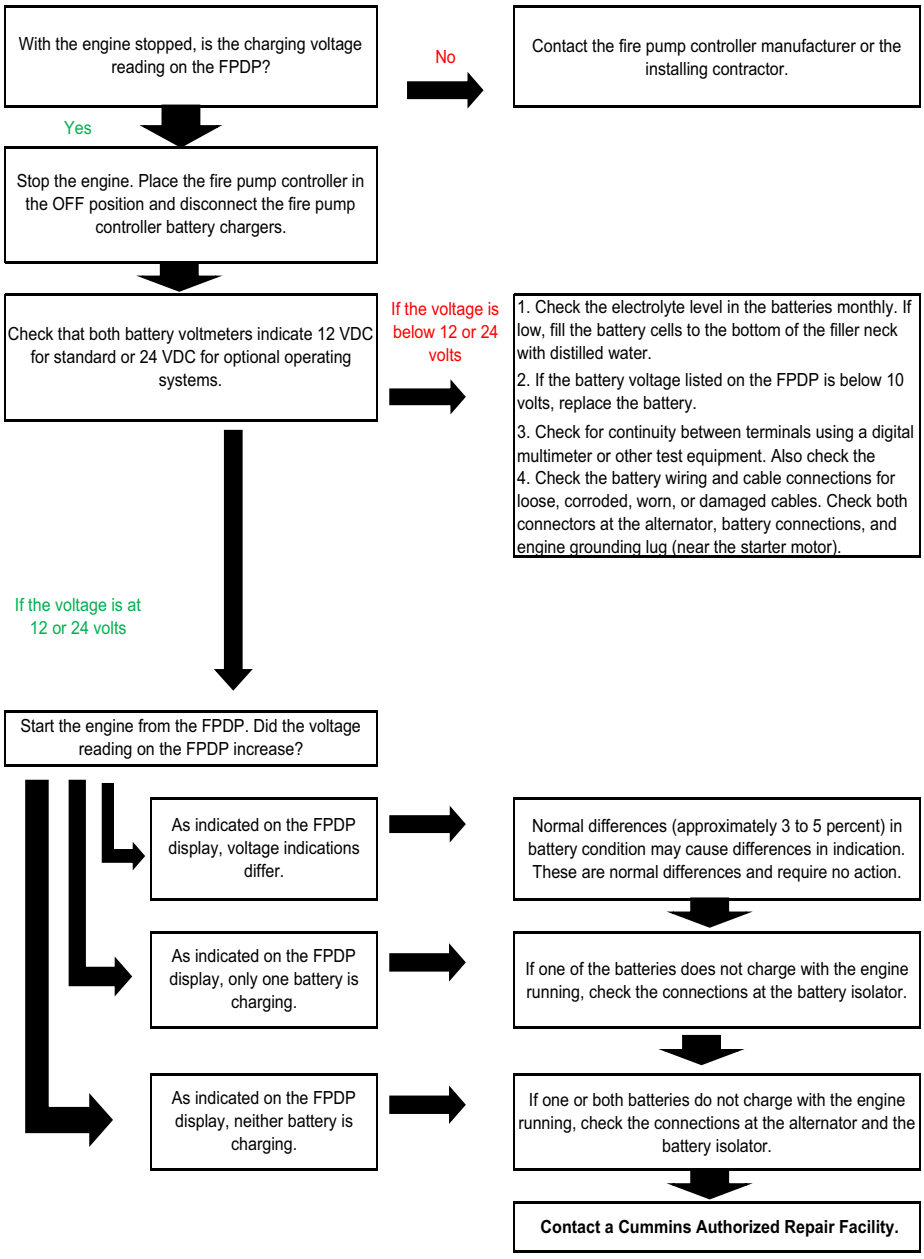


TO TROUBLESHOOT THIS PROBLEM, ONCE THE FIRE PUMP HAS STOPPED:



7.6 Low Battery Voltage

SYMPTOM: The Fire Pump Digital Panel (FPDP) will mometarily "blink" upon starting or the fire pump drive engine is slow to crank. There is a high probability that the engine will not start.



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7.7 Fault Code Charts

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
111 (Red)	629 12	Engine Control Module - Critical Internal Failure
112 (Red)	635 7	Engine Timing Actuator is not Responding to ECM Commands
113 (Yellow)	635 3	Engine Timing Actuator Circuit - Shorted High
114 (Yellow)	635 4	Engine Timing Actuator Circuit - Shorted Low
115 (Red)	190 2	Engine Speed/Position Sensor Circuit - Lost Both of Two Signals from the Magnetic Pickup Sensor
116 (Red)	156 3	Fuel Timing Pressure Sensor Circuit - Shorted High
117 (Red)	156 4	Fuel Timing Pressure Sensor Circuit - Shorted Low
118 (Yellow)	135 3	Fuel Pump Delivery Pressure Sensor Circuit - Shorted High
119 (Yellow)	135 4	Fuel Pump Delivery Pressure Sensor Circuit - Shorted Low
121 (Yellow)	190 10	Engine Speed/Position Sensor Circuit - Lost One of Two Signals from the Magnetic Pickup Sensor
122 (Yellow)	102 3	Intake Manifold Pressure Sensor #1 Circuit - Shorted High
123 (Yellow)	102 4	Intake Manifold Pressure Sensor #1 Circuit - Shorted Low
131 (Red)	91 3	Accelerator Pedal Position Sensor Circuit - Shorted High
132 (Red)	91 4	Accelerator Pedal Position Sensor Circuit - Shorted Low
133 (Red)	974 3	Remote Accelerator Pedal Position Sensor Circuit - Shorted High
133 (Red)	29 3	Remote Accelerator Pedal Position Sensor Circuit - Shorted High
134 (Red)	974 4	Remote Accelerator Pedal Position Sensor Circuit - Shorted Low
134 (Red)	29 4	Remote Accelerator Pedal Position Sensor Circuit - Shorted Low
135 (Yellow)	100 3	Engine Oil Pressure Sensor Circuit - Shorted High
141 (Yellow)	100 4	Engine Oil Pressure Sensor Circuit - Shorted Low
143 (Yellow)	100 18	Engine Oil Pressure Low - Warning
143 (White)	100 1	Engine Oil Pressure Low - Warning
144 (Yellow)	110 3	Engine Coolant Temperature Sensor Circuit - Shorted High
145 (Yellow)	110 4	Engine Coolant Temperature Sensor Circuit - Shorted Low

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
147 (Red)	91 8	Accelerator Pedal Position Sensor Circuit - Low Frequency
148 (Red)	91 8	Accelerator Pedal Position Sensor Circuit - High Frequency
151 (Red)	110 0	Engine Coolant Temperature High - Critical
151 (White)	110 0	Engine Coolant Temperature High - Critical
153 (Yellow)	105 3	Intake Manifold Temperature Sensor #1 Circuit - Shorted High
154 (Yellow)	105 4	Intake Manifold Temperature Sensor #1 Circuit - Shorted Low
155 (Red)	105 0	Intake Manifold Temperature #1 High - Critical
155 (White)	105 0	Intake Manifold Temperature #1 High - Critical
187 (Yellow)	620 4	Sensor Supply Voltage #2 Circuit - Shorted Low
211 (None)	1484 31	Additional OEM/Vehicle Diagnostic Codes have been Logged
212 (Yellow)	175 3	Engine Oil Temperature Sensor Circuit - Shorted High
213 (Yellow)	175 4	Engine Oil Temperature Sensor Circuit - Shorted Low
214 (Red)	175 0	Engine Oil Temperature High - Critical
219 (Maint.)	1380 17	Low Oil Level in the Centinel Makeup Oil Tank
219 (White)	1380 1	Low Oil Level in the Centinel Makeup Oil Tank
221 (Yellow)	108 3	Ambient Air Pressure Sensor Circuit - Shorted High
222 (Yellow)	108 4	Ambient Air Pressure Sensor Circuit - Shorted Low
223 (Yellow)	1265 4	Engine Oil Burn Valve Solenoid Circuit - Shorted Low
225 (Yellow)	1266 4	Engine Oil Replacement Valve Solenoid Circuit - Shorted Low
227 (Yellow)	620 3	Sensor Supply Voltage #2 Circuit - Shorted High
231 (Yellow)	109 3	Engine Coolant Pressure Sensor Circuit - Shorted High
232 (Yellow)	109 4	Engine Coolant Pressure Sensor Circuit - Shorted Low
233 (Red)	109 1	Engine Coolant Pressure Low - Warning
233 (Yellow)	109 18	Engine Coolant Pressure Low - Warning

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
234 (Red)	190 0	Engine Speed High - Critical
235 (Red)	111 1	Engine Coolant Level Low - Critical
235 (White)	111 1	Engine Coolant Level Low - Critical
237 (Yellow)	644 2	External Speed Input (Multiple Unit Sychronization) - Data Incorrect
241 (Yellow)	84 2	Vehicle Speed Sensor Circuit - Data Incorrect
242 (Yellow)	84 10	Vehicle Speed Sensor Circuit - Tampering has been Detected
245 (Yellow)	647 4	Fan Clutch Circuit - Shorted Low
254 (Red)	632 4	Fuel Shut-off Valve Circuit - Shorted Low
254 (None)	632 4	Fuel Shut-off Valve Circuit - Shorted Low
255 (Yellow)	632 3	Fuel Shut-off Valve Circuit - Shorted High
259 (Red)	632 7	Fuel Shut-off Valve - Stuck Open
261 (White)	174 0	Fuel Temperature High - Warning
263 (Yellow)	174 3	Fuel Temperature Sensor Circuit - Shorted High
265 (Yellow)	174 4	Fuel Temperature Sensor Circuit - Shorted Low
284 (Yellow)	1043 4	Engine Speed/Position Sensor #1 (Crankshaft) Supply Voltage Circuit - Shorted Low
285 (Yellow)	639 9	SAE J1930 Multiplexing PGN Timeout Error
286 (Yellow)	639 13	SAE J1930 Multiplexing PGN Configuration Error
287 (Red)	91 19	SAE J1930 Multiplexing Accelerator Pedal Sensor System Error
288 (Red)	974 19	SAE J1930 Multiplexing Remote Throttle Data Error
292 (White)	1083 14	Auxiliary Temperature Sensor Input #1 Engine Protection - Critical
293 (Yellow)	1083 3	Auxiliary Temperature Sensor Input #1 Circuit - Shorted High
294 (Yellow)	1083 4	Auxiliary Temperature Sensor Input #1 Circuit - Shorted Low
295 (Yellow)	108 2	Ambient Air Pressure Sensor Circuit - Data Incorrect
296 (White)	1084 14	Auxiliary Pressure Sensor Input #2 Engine Protection - Critical

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
297 (Yellow)	1084 3	Auxiliary Pressure Sensor Input #2 Circuit - Shorted High
298 (Yellow)	1084 4	Auxiliary Pressure Sensor Input #2 Circuit - Shorted Low
299 (None)	1384 31	Engine Shutdown Commanded by J1939
311 (Yellow)	651 6	Injector Solenoid Valve Cylinder #1 Circuit - Grounded Circuit
312 (Yellow)	655 6	Injector Solenoid Valve Cylinder #5 Circuit - Grounded Circuit
313 (Yellow)	653 6	Injector Solenoid Valve Cylinder #3 Circuit - Grounded Circuit
314 (Yellow)	656 6	Injector Solenoid Valve Cylinder #6 Circuit - Grounded Circuit
315 (Yellow)	652 6	Injector Solenoid Valve Cylinder #2 Circuit - Grounded Circuit
316 (Yellow)	931 3	Fuel Supply Pump Actuator Circuit - Shorted High
318 (Yellow)	931 7	Fuel Supply Pump Actuator - Mechanically Stuck
319 (None)	251 2	Real Time Clock - Power Interrupt
321 (Yellow)	654 6	Injector Solenoid Valve Cylinder #4 Circuit - Grounded Circuit
322 (Yellow)	651 5	Injector Solenoid Valve Cylinder #1 Circuit - Open Circuit
323 (Yellow)	655 5	Injector Solenoid Valve Cylinder #5 Circuit - Open Circuit
324 (Yellow)	653 5	Injector Solenoid Valve Cylinder #3 Circuit - Open Circuit
325 (Yellow)	656 5	Injector Solenoid Valve Cylinder #6 Circuit - Open Circuit
331 (Yellow)	652 5	Injector Solenoid Valve Cylinder #2 Circuit - Open Circuit
332 (Yellow)	654 5	Injector Solenoid Valve Cylinder #4 Circuit - Open Circuit
341 (Yellow)	630 2	Engine Control Module - Data Lost
343 (Yellow)	629 12	Engine Control Module - Warning Internal Hardware Failure
346 (Yellow)	630 12	Engine Control Module - Warning Software Error
349 (Yellow)	191 16	Transmission Output Shaft (Tailshaft) Speed High - Warning
349 (Yellow)	191 0	Transmission Output Shaft (Tailshaft) Speed High - Warning
352 (Yellow)	1079 4	Sensor Supply Voltage #1 Circuit - Shorted Low

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
378 (Yellow)	633 5	Fueling Actuator #1 Circuit - Open Circuit
379 (Yellow)	633 6	Fueling Actuator #1 Circuit - Grounded Circuit
384 (Yellow)	626 11	Start Assist Device Control Circuit Error (Ether Injection)
386 (Yellow)	1079 3	Sensor Supply Voltage #1 Circuit - Shorted High
387 (Yellow)	1043 3	Accelerator Pedal Position Sensor Supply Voltage Circuit - Shorted High
394 (Yellow)	635 5	Tiiming Actuator #1 Circuit - Open Circuit
395 (Yellow)	635 6	Tiiming Actuator #1 Circuit - Grounded Circuit
396 (Yellow)	1244 5	Fueling Actuator #2 Circuit - Open Circuit
397 (Yellow)	1244 6	Fueling Actuator #2 Circuit - Grounded Circuit
398 (Yellow)	1245 5	Timing Actuator #2 Circuit - Open Circuit
399 (Yellow)	1245 6	Timing Actuator #2 Circuit - Grounded Circuit
415 (Red)	100 1	Engine Oil Pressure Low - Critical
418 (None)	97 15	Water in Fuel Indicator High - Maintenance
422 (Yellow)	111 2	Engine Coolant Level Sensor Circuit - Data Incorrect
423 (Yellow)	156 2	Fuel Timing Pressure or Timing Actuator Stuck
426 (None)	639 2	SAE J1939 Datalink - Cannot Transmit
426 (Yellow)	639 2	SAE J1939 Datalink - Cannot Transmit
427 (None)	639 9	SAE J1939 Not Fast Enough
428 (Yellow)	97 3	Water in Fuel Sensor Circuit - Shorted High
429 (Yellow)	97 4	Water in Fuel Sensor Circuit - Shorted Low
431 (Yellow)	558 2	Accelerator Pedal Idle Validation Circuit - Data Incorrect
431 (Yellow)	91 2	Accelerator Pedal Idle Validation Circuit - Data Incorrect
432 (Red)	558 13	Accelerator Pedal Idle Validation Circuit - Out of Calibration
432 (Red)	91 13	Accelerator Pedal Idle Validation Circuit - Out of Calibration

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
433 (Yellow)	102 2	Intake Manifold Pressure Sensor Circuit - Data Incorrect
434 (Yellow)	627 2	Power Lost without Ignition Off
435 (Yellow)	100 2	Engine Oil Pressure Sensor Circuit - Data Incorrect
441 (Yellow)	168 18	Battery #1 Voltage Low - Warning
441 (None)	168 1	Battery #1 Voltage Low - Warning
442 (Yellow)	168 16	Battery #1 Voltage High- Warning
442 (Yellow)	168 0	Battery #1 Voltage High- Warning
443 (Yellow)	1043 4	Accelerator Pedal Position Sensor Supply Voltage Circuit - Shorted Low
449 (Yellow)	94 16	Fuel Pressure High - Warning
451 (Yellow)	157 3	Injector Metering Rail #1 Pressure Sensor Circuit - Shorted High
452 (Yellow)	157 4	Injector Metering Rail #1 Pressure Sensor Circuit - Shorted Low
455 (Red)	633 3	Fuel Control Valve Circuit - Shorted High
466 (Yellow)	1188 4	Turbocharger #1 Wastegate Control Circuit - Shorted Low
467 (Yellow)	635 2	Timing Rail Actuator Circuit - Data Incorrect
468 (Yellow)	633 2	Fuel Rail Actuator Circuit - Data Incorrect
482 (Yellow)	94 18	Fuel Pressure Low - Warning
483 (Yellow)	1349 3	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted High
484 (Yellow)	1349 4	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted Low
485 (Yellow)	1349 16	Injector Metering Rail #2 Pressure High - Warning
486 (Yellow)	1349 18	Injector Metering Rail #2 Pressure Low - Warning
487 (None)	626 1	Start Assist Device - Canister Empty (Ether Injection)
489 (Yellow)	191 18	Transmission Output Shaft (Tailshaft) Speed Low - Warning
489 (Yellow)	191 1	Transmission Output Shaft (Aux Gov) Speed Low - Warning
496 (Yellow)	1043 11	Engine Speed/Position Sensor #2 (Camshaft) Supply Voltage

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
497 (Yellow)	1377 2	Multiple Unit Sychronization Switch Circuit - Data Incorrect
514 (Red)	633 7	Fuel Control Valve - Mechanically Stuck
527 (Yellow)	702 3	Auxiliary Input/Output #2 Circuit - Shorted High
528 (Yellow)	93 2	OEM Alternate Torque Validation Switch - Data Incorrect
529 (Yellow)	703 3	Auxiliary Input/Output #3 Circuit - Shorted High
546 (Yellow)	94 3	Fuel Delivery Pressure Sensor Circuit - Shorted High
547 (Yellow)	94 4	Fuel Delivery Pressure Sensor Circuit - Shorted Low
551 (Yellow)	558 4	Accelerator Pedal Idle Validation Circuit - Shorted Low
551 (Red)	91 4	Accelerator Pedal Idle Validation Circuit - Shorted Low
553 (Yellow)	157 16	Injector Metering Rail #1 Pressure High - Warning Level
553 (Red)	157 0	Injector Metering Rail #1 Pressure High - Warning Level
554 (Yellow)	157 2	Fuel Pressure Sensor Error
555 (Yellow)	1264 16	Engine Blowby - Warning Level
555 (White)	1264 0	Engine Blowby - Warning Level
581 (Yellow)	1381 3	Fuel Supply Pump Inlet Pressure Sensor Circuit - Shorted High
582 (Yellow)	1381 4	Fuel Supply Pump Inlet Pressure Sensor Circuit - Shorted Low
583 (Yellow)	1381 18	Fuel Supply Pump Inlet Pressure Sensor Low - Warning Level
595 (Yellow)	103 16	Turbocharger #1 Speed High - Warning Level
596 (Yellow)	167 16	Electrical Charging System Voltage High - Warning Level
597 (Yellow)	167 18	Electrical Charging System Voltage Low - Warning Level
598 (Red)	167 1	Electrical Charging System Voltage Low - Critical Level
611 (None)	1383 31	Engine Hot Shutdown
649 (None)	1378 0	Change Lubricating Oil and Filter
719 (Yellow)	1264 3	Crankcase Blowby Pressure Sensor Circuit - Shorted High

FAULT CODE (LAMP)	SPN FMI	Cummins DESCRIPTION
729 (Yellow)	1264 4	Crankcase Blowby Pressure Sensor Circuit - Shorted Low
753 (None)	723 2	Engine Speed/Position #2 - Cam Sync Error
755 (Yellow)	157 7	Injector Metering Rail #1 Pressure Malfunction
758 (Yellow)	1349 7	Injector Metering Rail #2 Pressure Malfunction
951 (None)	166 2	Cylinder Power Imbalance Between Cylinders

Section 8 - Component Parts and Assemblies

8.1 Ordering Parts

Replacement parts for the Cummins Inc. equipment are manufactured to the same quality standards and specifications as the original equipment. Unapproved substitution may result in poor performance, reduced service life, lost production, or unsafe operation.

Cummins Inc. relies on the best and most cost effective shipping methods, unless specific instructions or requirements are requested by the customer. When ordering parts, please be prepared to provide the following information:

- Model and serial number.
- Part description by name or number.
- Quantity required.
- Purchase order number.

NOTE: *A purchase order number is desirable, even if the part(s) are supplied on a Returned Goods Authorization (RGA) issue number. A purchase order number helps Cummins and its customer track the parts and necessary credits.*

8.2 Routine Service and Parts

Personnel at Cummins Authorized Repair Locations can assist you with the correct operation and service of your engine. Cummins has a worldwide service network of more than 5,000 Distributors and Dealers who have been trained to provide sound advice, expert service, and complete parts support.

Check the telephone directory yellow pages or refer to the directory in this section for the nearest Cummins Authorized Repair Location.

8.3 Emergency Repairs and Technical Service

The Cummins Customer Assistance Center provides a 24-hour, toll free telephone number to aid in technical and emergency service when a Cummins Authorized Repair Location cannot be reached or is unable to resolve an issue with a Cummins product.

If assistance is required, call Toll-Free: 1-800-DIESELS (1-800-343-7357). Includes all 50 states, Bermuda, Puerto Rico, Virgin Islands, and the Bahamas.

Outside of North America contact your Regional Office. Telephone numbers and addresses are listed in the International Directory.

Refer also to the Cummins Inc. web site at www.cummins.com.

8.4 Recommended Spare Parts Inventory

To minimize downtime and increase productivity, Cummins Inc. recommends maintaining a stock of spare parts critical to uninterrupted engine operation. Shipping costs can be lower using ground transportation rather than overnight or next day air freight. For this reason, Cummins Inc. can provide a list of recommended spare parts. Contact a Cummins Authorized Repair Location for additional information.

CFP30E Engine Data Sheet

Engine Data Sheet **Cummins Fire Power** De Pere, WI 54115 http://www.cumminsfirepower.com	Basic Engine Model **CFP30E-F10, F20, F30, F40**	
	Curve Number:	**FR - 5216**
	CPL Code:	**8372**
Configuration Number: **D573003CX03**	Engine Family:	**Industrial**
Installation Drawing: **A042D759**	Revision Date:	**May 2016**

General Engine Data

Type	4 Cycle; V; 12 Cylinder	
Aspiration	Turbocharged, Aftercooled	
Bore & Stroke - in. (mm)	5.51 x 6.50	(140 x 165)
Displacement - $in.^3$ (litre)	1860	(30.5)
Compression Ratio	14.0:1	
Valves per Cylinder - Intake	2	
- Exhaust	2	
Dry Weight - lb (kg)	8917	(4013)
Wet Weight - lb (kg)	9645	(4340)
Maximum Allowable Bending Moment @ Rear Face of Block - lb.-ft. (N-m)	2286	(3099)

Air Induction System

Max. Temperature Rise Between Ambient Air and Engine Air Inlet - °F (°C)	30	(16.7)
Maximum Inlet Restriction with Dirty Filter - in. H_2O (mm H_2O)	25	(635)
Recommended Air Cleaner Element - (Standard)	Cummins Filtration (Fleetguard)	(2) AH1135

Lubrication System

Oil Pressure Range at Rated - PSI (kPa) …(Warm)	48-55	(345-448)
Oil Capacity of Pan (High - Low) - U.S. Gal. (litre)	35-30	(132-114)
Total System Capacity - U.S. Gal. (litre)	40.7	(154)
Recommended Lube Oil Filter	Cummins Filtration (Fleetguard)	(4) LF9001

Cooling System

Raw Water Working Pressure Range at Heat Exchanger - PSI (kPa)	90	(620)	MAX
Recommended Min. Water Supply Pipe Size to Heat Exchanger - in. (mm)	2.00	(50.80)	
Recommended Min. Water Disch. Pipe Size From Heat Exchanger - in. (mm)	2.50	(63.50)	
Coolant Water Capacity (Engine Side) - U.S. gal. (litre)	30	(113.6)	
Standard Thermostat - Type	Modulating		
- Range - deg F (deg C)	170-194	(76.5-90)	
Normal Operating Temperature - °F (°C)	180-212	(82-100)	
Minimum Raw Water Flow			
with Water Temperatures to 50 °F (10 °C) - U.S. GPM (litre/s)	67	(4.23)	
with Water Temperatures to 75 °F (24 °C) - U.S. GPM (litre/s)	84	(5.30)	
with Water Temperatures to 90 °F (32 °C) - U.S. GPM (litre/s)	100	(6.31)	
Recommended Cooling Water Filter: Cummins Filtration (Fleetguard)	(2) WF2075		

A jacket water heater is mandatory on this engine. The recommended heater wattage is 6000 down to 40 °F (4 °C).

Exhaust System

Max. Back Pressure Imposed by Complete Exhaust System in in. H_2O (kPa)	40.8	(10.2)
Exhaust Pipe Size Normally Acceptable - in. (mm)	10.0	(254)

Noise Emissions

Top	106 dBa
Right Side	106 dBa
Left Side	106 dBa
Front	106 dBa
Exhaust	120.0 dBa

The noise emission values are estimated sound pressure levels at 3.3 ft. (1 m.).

Doc. 14269

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CFP30E Engine Data Sheet (Continued)

Fuel Supply / Drain System - RPM	1470		1760		1900		2100	
CFP30E-F40 Nominal Fuel Consumption - Gal./hr. (L/hr)	54.0	(204)	63.6	(241)	65.7	(249)	61.4	(232)
CFP30E-F30 Nominal Fuel Consumption - Gal./hr. (L/hr)	50.2	(190)	59.1	(224)	61.1	(231)	57.1	(216)
CFP30E-F20 Nominal Fuel Consumption - Gal./hr. (L/hr)	46.4	(176)	54.6	(207)	56.5	(214)	52.8	(200)
CFP30E-F10 Nominal Fuel Consumption - Gal./hr. (L/hr)	42.7	(162)	50.2	(190)	51.9	(196)	48.5	(184)

Fuel Type	Number 2 Diesel Only	
Minimum Supply Line Size - in. (mm)	1.0	(25.40)
Minimum Drain Line Size - in. (mm)	1.0	(25.40)
Maximum Fuel Line Length Between Supply Tank & Fuel Pump - ft. (m)	40	(12)
Maximum Fuel Height above C/L Fuel Pump ft (m)	50	(15)
Recommended Fuel Filter - Primary	Cummins Filtration (Fleetguard)	(1) FF2203
- Secondary	Cummins Filtration (Fleetguard)	(1) FS1006
Maximum Restriction @ Lift Pump-Inlet - With Clean Filter - in. Hg (mm Hg)	5.0	(127)
Maximum Restriction @ Lift Pump-Inlet - With Dirty Filter - in. Hg (mm Hg)	9.0	(229)
Maximum Return Line Restriction - Without Check Valves - in. Hg (mm Hg)	20	(508)
Minimum Fuel Tank Vent Capability - ft^3/hr (m^3/hr)	127	(3.81)
Maximum Fuel Temperature @ Lift Pump Inlet - °F (°C)	160	(71)

Starting and Electrical System	12V	24V
Min. Recommended Batt. Capacity - Cold Soak at 0°F (-18°C) or Above		
Engine Only - Cold Cranking Amperes - (CCA)	12 volt	1200
Engine Only - Reserve Capacity - Minutes	option is	640
Battery Cable Size (Maximum Cable Length Not to Exceed 5 ft. [1.5 m] AWG)	not	2/0
Maximum Resistance of Starting Circuit - Ohms	offered	0.002
Typical Cranking Speed - RPM		110
Alternator (Standard), Internally Regulated - Ampere		75
Wiring for Automatic Starting (Negative Ground)	Standard	
Reference Wiring Diagram	10423	

Performance Data

All data is based on the engine operating with fuel system, water pump, lubricating oil pump, air cleaner, and alternator; not included are compressor, fan, optional equipment, and driven components. Data is based on operation at SAE standard J1394 conditions of 300 ft. (91.4 m) altitude, 29.61 in. (752 mm) Hg dry barometer, and 77 °F (25 °C) intake air temperature, using No.2 diesel or a fuel corresponding to ASTM-D2.

Altitude Above Which Output Should be Limited - ft. (m)	300	(91.4)
Correction Factor per 1000 ft. (305 m) above Altitude Limit	3%	
Temperature Above Which Output Should be Limited - °F (°C)	77	(25)
Correction Factor per 10 °F (11 °C) Above Temperature Limit	1%	(2%)

Exhaust Emissions (EPA Tier T2 w/ABT)	g/kW-hr	g/BHP-hr
Hydrocarbons (HC/OMHCE)	0.26	0.19
Oxides of Nitrogen (NOx)	8.47	6.32
Non-Methane Hydrocarbons + NOx (NMHC+NOx)	8.80	6.56
Carbon Monoxide (CO)	0.70	0.52
Particulate	0.17	0.13

CFP30E Engine Data Sheet (Continued)

NFPA-20 Ratings for CFP30E-F10, F20, F30, F40

Engine Speed - RPM	1470	1760	1900	2100
CFP30E-F10 Output - BHP (kW)	**935 (697)**	**1064 (793)**	**1077 (803)**	**984 (734)**
Ventilation Air Required for Combustion - CFM (litre/sec)	1685 (795)	2215 (1046)	2526 (1192)	2662 (1257)
Exhaust Gas Flow - CFM (litre/sec)	4668 (2203)	5844 (2758)	6136 (2896)	6527 (3081)
Exhaust Gas Temperature - °F (°C)	1094 (590)	957 (514)	855 (457)	877 (469)
Engine Heat Rejection to Coolant- BTU/min. (kW)	19696 (346)	24328 (428)	28215 (496)	26530 (466)
Engine Heat Rejection to Ambient - BTU/min. (kW)	4151 (73)	4324 (76)	4926 (87)	3466 (61)
CFP30E-F20 Output - BHP (kW)	**1017 (758)**	**1158 (864)**	**1173 (875)**	**1071 (799)**
Ventilation Air Required for Combustion - CFM (litre/sec)	1793 (846)	2305 (1088)	2578 (1217)	2754 (1300)
Exhaust Gas Flow - CFM (litre/sec)	4957 (2340)	6126 (2891)	6651 (3139)	6916 (3264)
Exhaust Gas Temperature - °F (°C)	1050 (566)	938 (504)	892 (478)	889 (476)
Engine Heat Rejection to Coolant- BTU/min. (kW)	21060 (370)	26104 (459)	29292 (515)	30045 (528)
Engine Heat Rejection to Ambient - BTU/min. (kW)	4439 (78)	4640 (82)	5114 (90)	3925 (69)
CFP30E-F30 Output - BHP (kW)	**1100 (820)**	**1253 (934)**	**1268 (946)**	**1158 (864)**
Ventilation Air Required for Combustion - CFM (litre/sec)	1885 (890)	2413 (1139)	2624 (1239)	2809 (1326)
Exhaust Gas Flow - CFM (litre/sec)	5222 (2465)	6529 (3082)	6986 (3297)	7139 (3370)
Exhaust Gas Temperature - °F (°C)	1096 (591)	980 (527)	931 (499)	925 (496)
Engine Heat Rejection to Coolant- BTU/min. (kW)	22318 (392)	28516 (501)	32576 (572)	31471 (553)
Engine Heat Rejection to Ambient - BTU/min. (kW)	4704 (83)	5069 (89)	5687 (100)	4112 (72)
CFP30E-F40 Output - BHP (kW)	**1183 (882)**	**1347 (1004)**	**1364 (1017)**	**1245 (928)**
Ventilation Air Required for Combustion - CFM (litre/sec)	1984 (936)	2476 (1169)	2695 (1272)	2844 (1343)
Exhaust Gas Flow - CFM (litre/sec)	5496 (2594)	6751 (3186)	7311 (3451)	7334 (3461)
Exhaust Gas Temperature - °F (°C)	1102 (594)	985 (529)	936 (502)	929 (498)
Engine Heat Rejection to Coolant- BTU/min. (kW)	24006 (422)	30385 (534)	33232 (584)	35204 (619)
Engine Heat Rejection to Ambient - BTU/min. (kW)	5060 (89)	5401 (95)	5802 (102)	4599 (81)

All Data is Subject to Change Without Notice.

Mike Dawson
Engineering Manager

Torque Table

Cap Screw Markings and Torque Values

CAUTION

Always use a cap screw of the same measurement and strength as the cap screw being replaced. Using the wrong cap screws can result in engine damage.

Always use the torque values listed in the following tables when specific torque values are not available.

When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

Metric Cap Screw Identification

Sample:	**M8-1.25 x 25**		
Value:	**M8**	**1.25**	**X 25**
Meaning:	Major thread diameter in millimeters	Distance between threads in millimeters	Length in millimeters

Metric Cap Screw Head Markings

Metric cap screws and nuts are identified by the grade number stamped on the head of the cap screw or on the surface of the nuts.

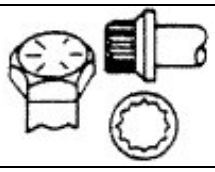
Commercial Steel Class	**8.8**	**10.9**	**12.9**
Caps Screw Head Markings			

US Customary Cap Screw Identification

Sample:	**5/16 x 18 x 1-1/2**		
Value:	**5/16**	**18**	**1-1/2**
Meaning:	Major thread diameter in inches	Number of threads per inch	Length in inches

U.S. Customary Cap Screw Head Markings

U.S. Customary cap screws are identified by radial lines stamped on the head of the cap screw.

SAE Grade 5 w/ three lines	**SAE Grade 8**
	

Metric Cap Screw Torque Values (lubricated threads)

Class:	8.8				10.9				12.9			
Diameter	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	13	10	7	4	14	9	7	4
7	14	9	11	7	18	14	11	7	23	18	11	7
8	23	17	18	14	33	25	18	14	40	29	18	14
10	45	33	30	25	65	50	30	25	70	50	30	25
12	80	60	55	40	115	85	55	40	125	95	55	40
14	125	90	90	65	180	133	90	65	195	145	90	65
16	195	140	140	100	280	200	140	100	290	210	140	100
18	280	200	180	135	390	285	180	135	400	290	180	135
20	400	290	—	—	550	400	—	—	—	—	—	—

U.S. Customary Cap Screw Torque Values (lubricated threads)

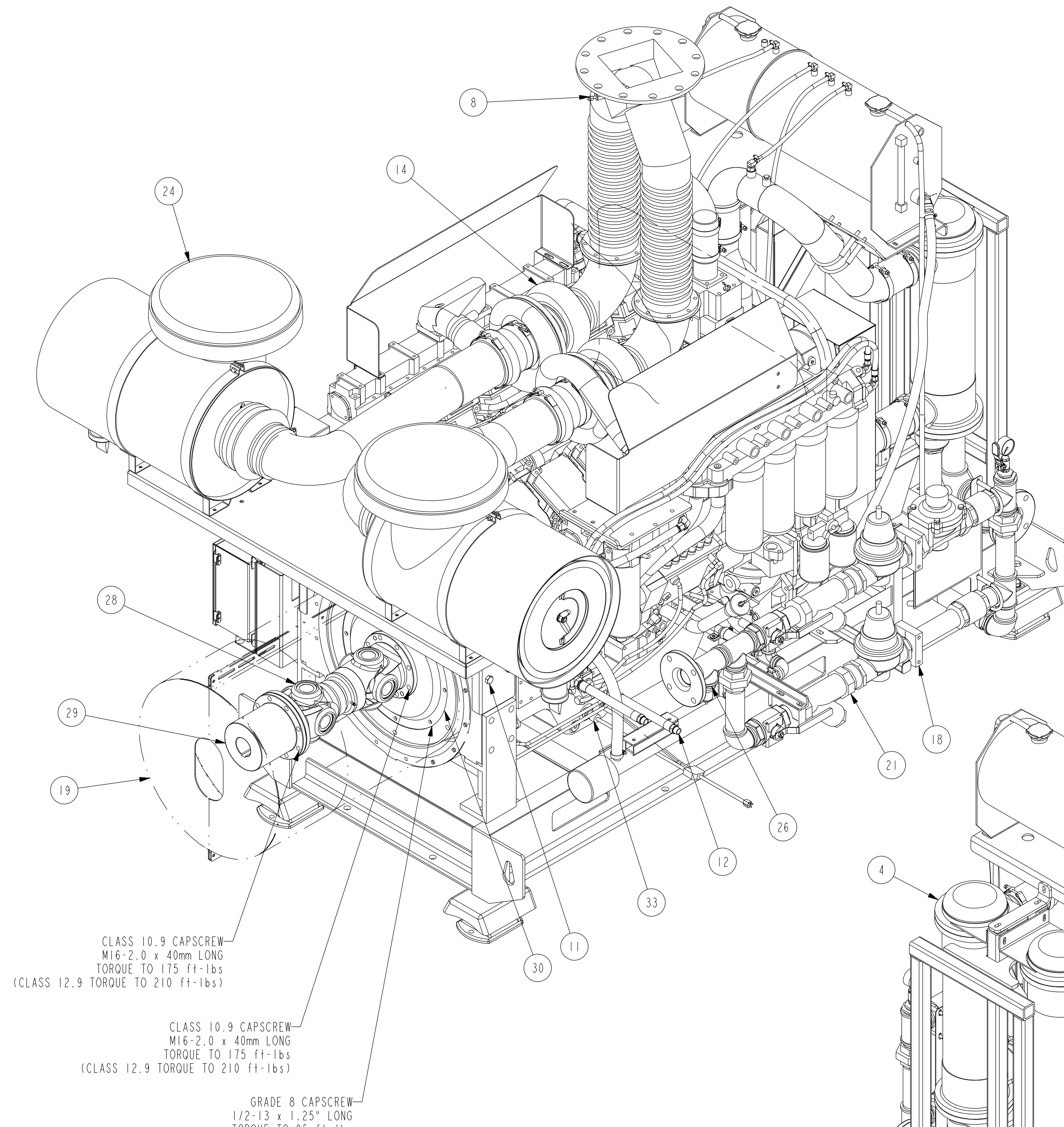
Grade:	SAE Grade 5				SAE Grade 8			
Cap Screw Body Size	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4-20	9	7	8	6	15	11	8	6
1/4-28	12	9	9	7	18	13	9	7
5/16-18	20	15	16	12	30	22	16	12
5/16-24	23	17	19	14	33	24	19	14
3/8-16	40	30	25	20	55	40	25	20
3/8-24	40	30	35	25	60	45	35	25
7/16-14	60	45	45	35	90	65	45	35
7/16-20	65	50	55	40	95	70	55	40
1/2-13	95	70	75	55	130	95	75	55
1/2-20	100	75	80	60	150	110	80	60
9/16-12	135	100	110	80	190	140	110	80
9/16-18	150	110	115	85	210	155	115	85
5/8-11	180	135	150	110	255	190	150	110
5/8-18	210	155	160	120	290	215	160	120
3/4-10	325	240	255	190	460	340	255	190
3/4-16	365	270	285	210	515	380	285	210
7/8-9	490	360	380	280	745	550	380	280
7/8-14	530	390	420	310	825	610	420	310
1-8	720	530	570	420	1100	820	570	420
1-14	800	590	650	480	1200	890	650	480

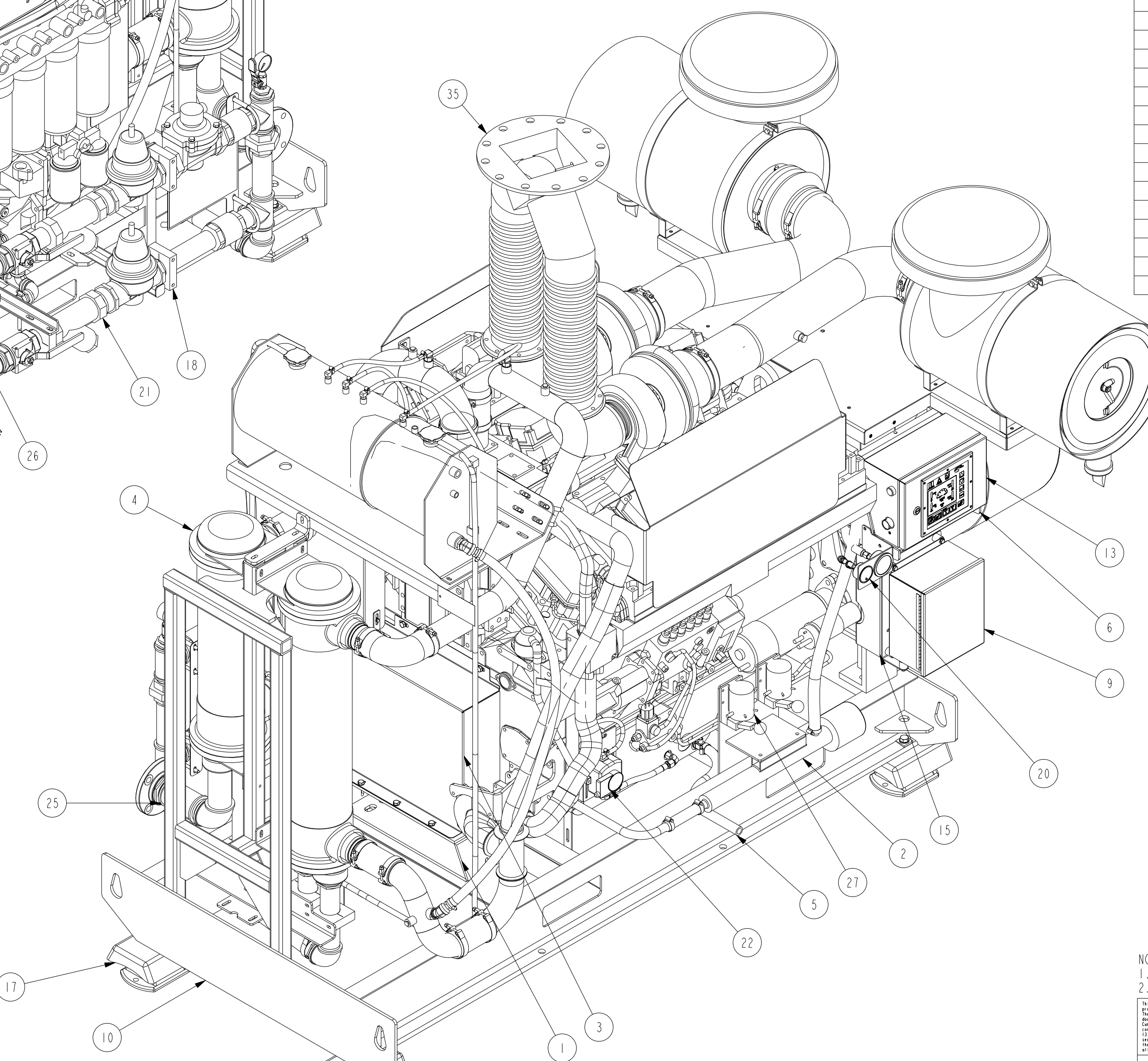
8.5 Assembly Drawings

NOTE: *The most current revisions to these drawings and related documents are accessible at: http:// www.cumminsfirepower.com/products.html.*

Description	Drawing No.	Revision Level
General Arrangement, Custom Fire Pump, CFP30E	A042G348	A
Assembly, Fire Pump, CFP30E	26783	A
Options, Engine, G-Drive, CFP30E (QST30)	13207	E
Assembly, Heat Exchanger	13760	F
Assembly, Air Intake Heavy Duty	A042G162	-
Assembly, Guarding	13638	C
Assembly, Coolant Heater	13568	D
Assembly, Sensor Package	A042A499	B
Assembly, Control Panel Mounting	21249	-
Assembly, All Component Top-level:	CFP30E-2013	
Assembly, Panel, Digital Electronic	22791	A
Assembly, Harness	22347	C
Cables, Battery Contactors	23939	A
Battery Contactors 24V	8824-24	A
Kit, Fuel Lines	22394	A
Option, Oil Drain with Valve	15338	A
Assembly, Oil/Air Temperature	21477	A
Assembly, DPEM and Mounting	21662	A
Assembly, DPEM Harness	A042G443	-
Misc. Piping, Cooling Loop	A042A568	A
Assembly, Sea Water Cooling Loop, 2" Horizontal 24V	A042D794	-
Shaft , Drive APT225 U3200 Series	13508	-
Assembly, Guard Shaft	A042A569	-
Schematic, Control Panel, Electronic	A042G984	

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SUPPORT, ENGINE, FRONT, CFP30E FIREPUMP	13535
2	1	ASSEMBLY, COOLANT HEATER, CFP30E FIREPUMP	13568
3	1	ASSEMBLY, GUARDS, CFP30E	13638
4	1	ASSEMBLY, HEAT EXCHANGER, SEA WATER, CFP30E	13760
5	1	ASSEMBLY, OIL DRAIN W/ VALVE, CFP30E (OPTIONAL)	15338
6	1	ASSEMBLY, CONTROL PANEL MOUNTING, CFP POWER UNITS	21249
7	1	ASSEMBLY, OIL/AIR TEMPERATURE	21477
8	1	THERMOCOUPLE, TYPE K, FW MURPHY	21661
9	1	ASSEMBLY, DPEM AND HARNESS	21662
10	1	FRAME, FIREPUMP, CFP30E	22173
11	1	ASSEMBLY, ACCESSORY MOUNTING, CFP30E	22203
12	1	KIT, FUEL LINES, CFP30	22394
13	1	CONTROL ASSEMBLY, FPDP ELECTRONIC CARBON STEEL	26764
14	1	ASSEMBLY, ENGINE, CFP30E	26783
15	1	ASSEMBLY, CFP30E DPEM	26845
16	1	ASSEMBLY, SENSOR, CFP30E	A042A499
17	1	ASSEMBLY, ISOLATORS, CFP30E	A042A500
18	1	MISCELLANEOUS PIPING, CFP30E	A042A568
19	1	GUARD, SHAFT, SAE 0	A042A569
20	1	ASSEMBLY, OIL DIFFERENTIAL, FUEL RESTRICTION, CFP30E	A042A679
21	1	COOLING LOOP, 2", 24V, SEA WATER COMPATABLE	A042D794
22	1	ASSEMBLY, OIL LEVEL GAUGE, CFP30E	A042D858
23	1	SKID, CFP50, 149.00" L x 92.00 W"	A042F945
24	1	ASSEMBLY, HEAVY DUTY AIR CLEANER, CFP30E	A042G162
25	1	ASSEMBLY, COOLING WATER, DISCHARGE TEMPERATURE, CFP30E	A042G349
26	1	ASSEMBLY, COOLING WATER, PRESSURE, CFP30E	A042G351
27	2	CONTACTOR, MANUAL OVERIDE, 24V, PN:535-0098, FIREPUMP	8824-24
28	1	DRIVESHAFT, APT225 SHORT COUPLED, U3200 SERIES	13508
29	1	COMPANION FLANGE, U3200 SF, 65MM x 18MM	13509-14
30	1	ADAPTER, U-JOINT, SAE #1, APT225, CFP23E	16599
31	1	KIT, WIRE HARNESS, CFP30E FIRE PUMP	22347
32	1	KIT, LOOSE WIRE, CFP23E/CFP30E	23939
33	1	AID, OIL HEATER STARTING	4009350
34	1	SILENCER, 10" SPARK ARRESTING, EIEO	49482U
35	1	FLEX, 6" WYE EXHAUST W/PORT, CFP30E	A042A472
36	1	HARNESS, DPEM	A042G443
37	1	ASSEMBLY, TURKISH DECAL, CFP30E	A042H070
38	1	PAINT, SPRAY BOMB, CUMMINS RED	A15730-A12





NOTES:
1. FINISH: COAT PER ES042, URETHANE CLEAR COAT
2. ISOLATORS SHOWN IN AN UN-COMPRESSED STATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX : ± 0.010 .XXX : ± 0.005	MACHINE TOLERANCES .X : ± 0.4 .XX : ± 0.2
		FORM TOLERANCES .XX : ± 0.030 .XXX : ± 0.015	FORM TOLERANCES .X : ± 0.8 .XX : ± 0.4
		FAB TOLERANCES .XX : ± 0.060 .XXX : ± 0.030	FAB TOLERANCES .X : ± 1.5 .XX : ± 0.8

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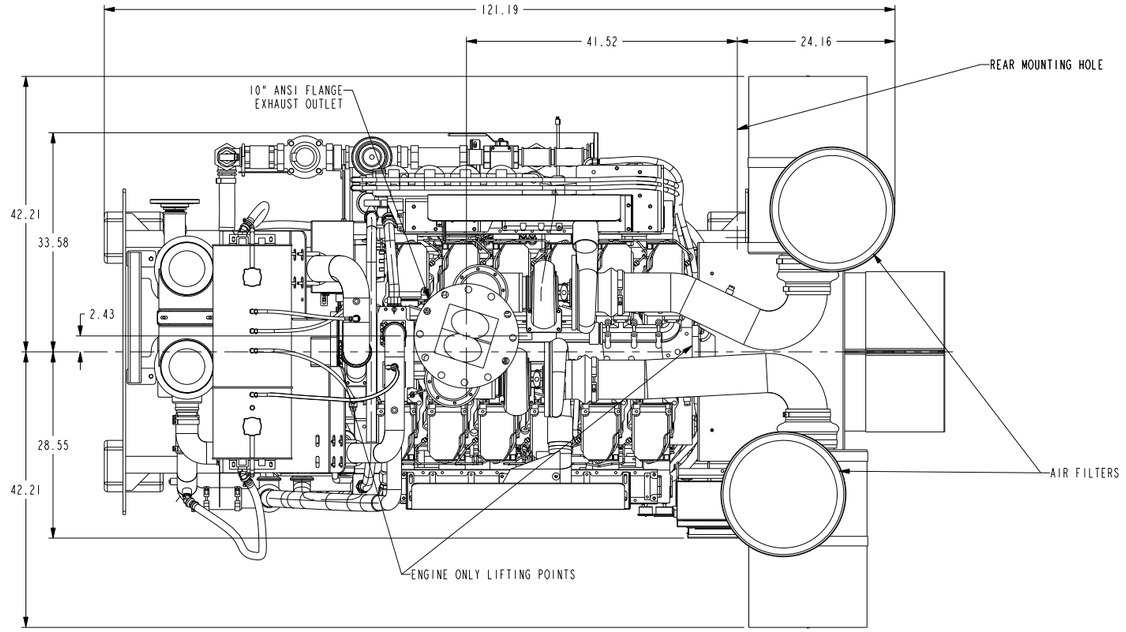
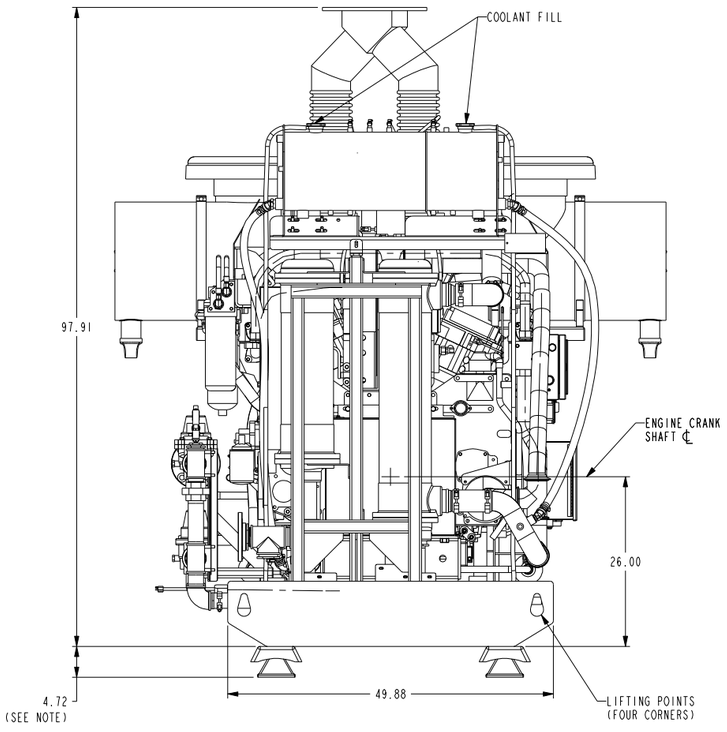
CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

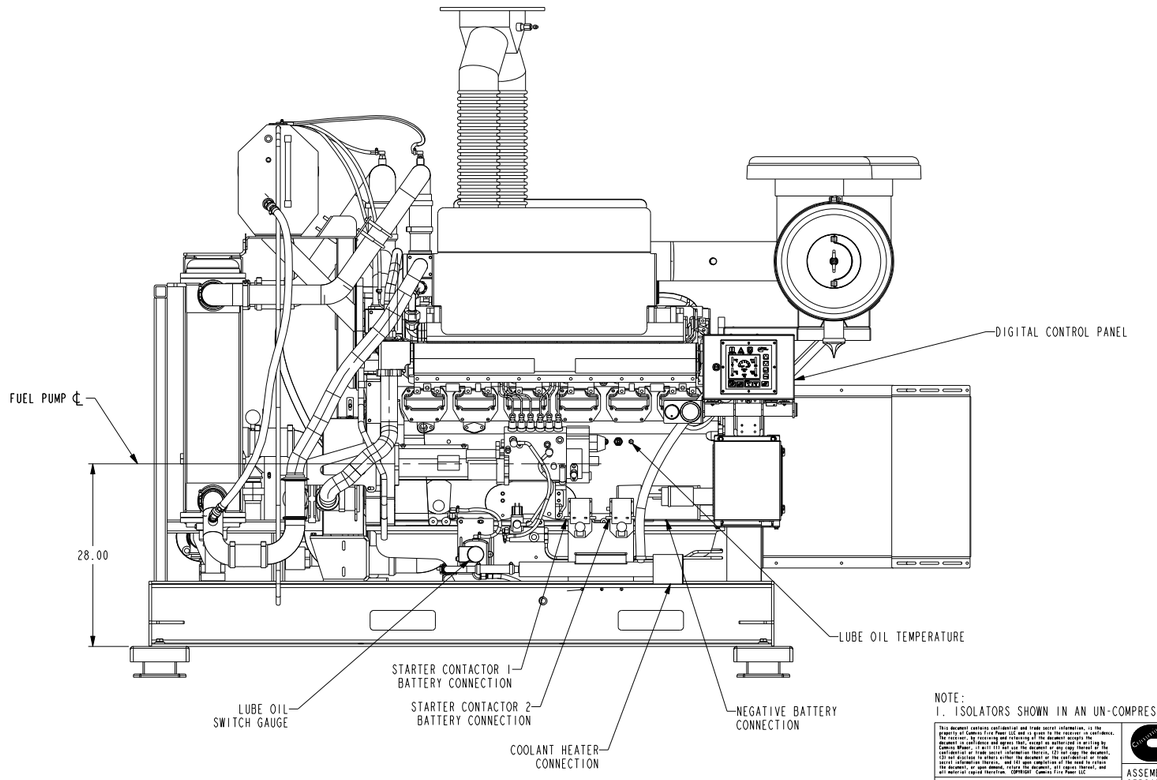
ASSEMBLY, FIRE PUMP
CFP30E-F30

DWG UNITS: IN/LB/S	DRAWN BY: PBS / PRO-ENGINEER	DATE: 29FEB2016 / INIT ECO: 2016-184
SCALE: 0.110	SHEET 1 OF 3	DRAWING NO: A042G348
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2016-441	ADDED A042H070 AND A042G443	PBS	09JUN2016







NOTE:
1. ISOLATORS SHOWN IN AN UN-COMPRESSED STATE

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2016-441	SEE SHEET 1 FOR LATEST REVISION DETAILS	PBS	09JUN2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1°
THIRD ANGLE PROJECTION
MACHINED SURFACES 125

	IMPERIAL UNITS	METRIC UNITS
DECIMAL TOLERANCE	.X ±.1 .XX ±.05 .XXX ±.025	.X ±2.5 .XX ±1.25 .XXX ±0.635
FRACTIONAL TOLERANCE	±1/64	±0.4

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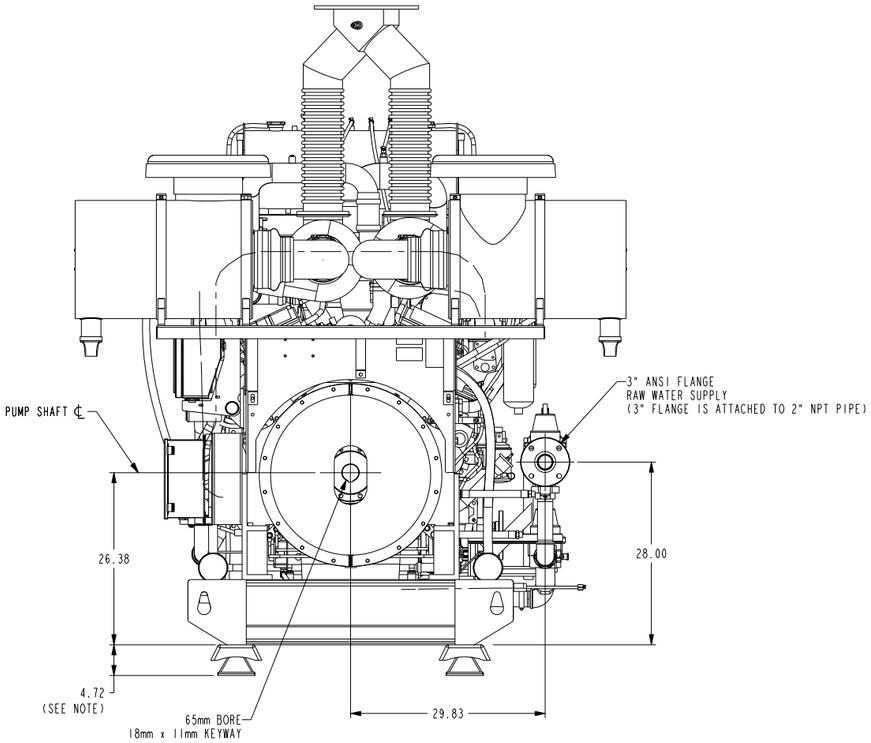
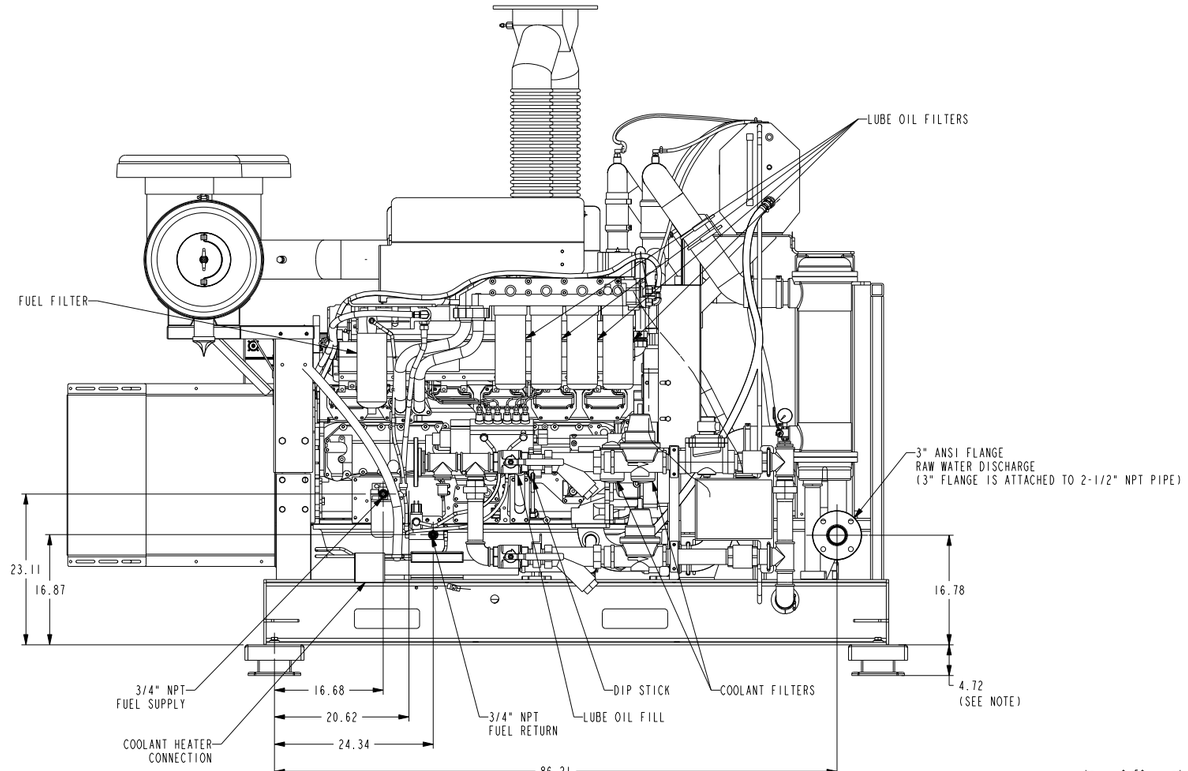
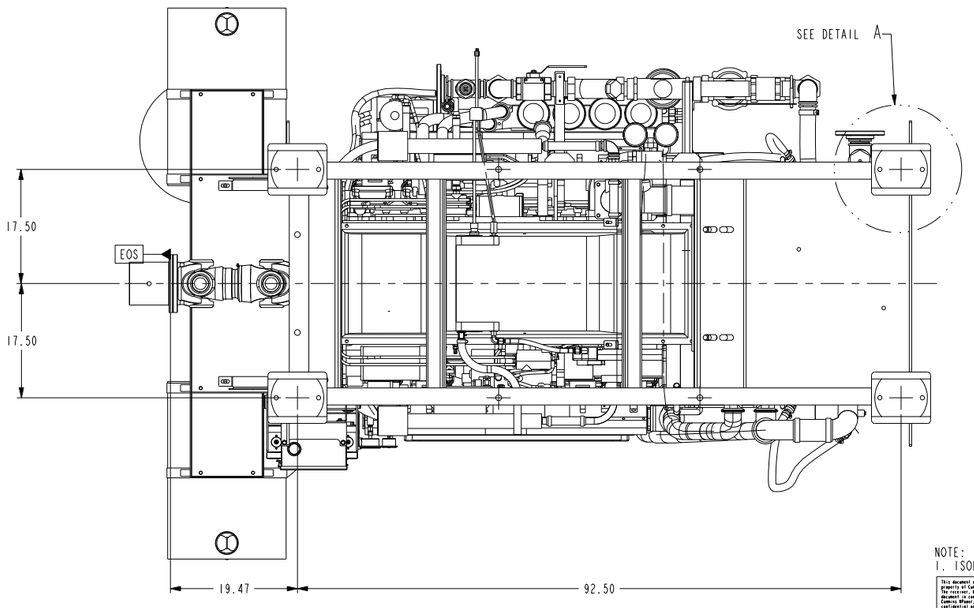
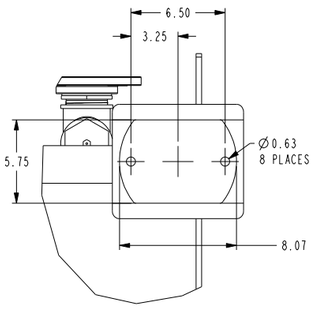
ASSEMBLY, FIRE PUMP
CFP30E-F30

DWG UNITS: IN/LB/S
DRAWN BY: PBS
PRO-ENGINEER
DATE: 29FEB2016
INIT ECO: 2016-184
SCALE: 0.090
EST WEIGHT:
SHEET 2 OF 3
DRAWING NO: A042G348









NOTE:
1. ISOLATORS SHOWN IN AN UN-COMPRESSED STATE

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2016-441	SEE SHEET 1 FOR LATEST REVISION DETAILS	PBS	09JUN2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1°
THIRD ANGLE PROJECTION

MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
	MEDIUM TOLERANCE (MEDIUM)	MEDIUM TOLERANCE (MEDIUM)
	.X ±0.030 in	.X ±0.8 mm
	.XX ±0.010 in	.XX ±0.25 mm
	.XXX ±0.005 in	.XXX ±0.127 mm
	FINE TOLERANCE (FINE)	FINE TOLERANCE (FINE)
	.X ±0.030 in	.X ±0.8 mm
	.XX ±0.005 in	.XX ±0.13 mm
	.XXX ±0.002 in	.XXX ±0.051 mm

125

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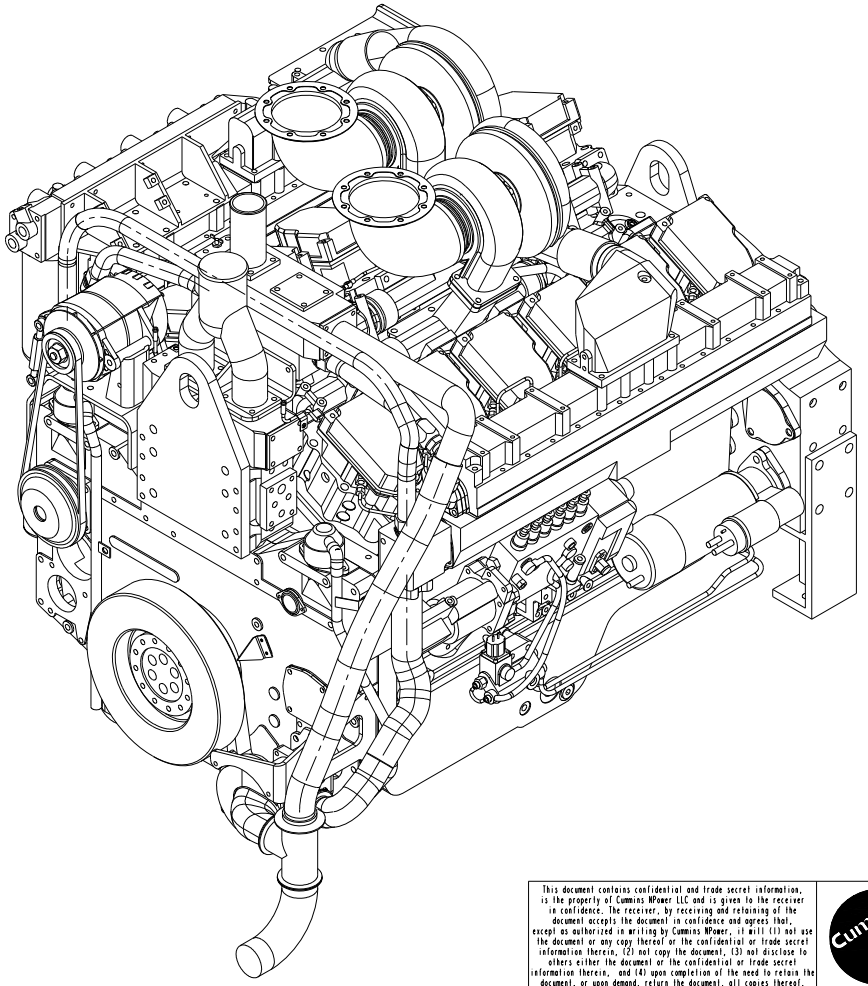
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, FIRE PUMP
CFP30E-F30

DWG UNITS: IN/LB/S
DRAWN BY: PBS
DATE: 29FEB2016
PRO-ENGINEER
INIT ECO: 2016-184
SCALE: 0.090
SHEET 3 OF 3
EST WEIGHT:
DRAWING NO: A042G348

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ENGINE, QST30, 1500HP, 1800RPM	13207
2	80	PREMIUM BLUE 15W40, (QUART)	V705290
3	1	MANUAL, FIREPUMP, CFP30E	22484
4	2	GASKET, 6" EXHAUST FLANGE	106322



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DEPERE, WISCONSIN

UNLESS OTHERWISE SPECIFIED
ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
125	MACHINE TOLERANCES .X ± 0.06 .XX ± 0.010 .XXX ± 0.001 WELD TOLERANCES .X ± 0.25 .XX ± 0.12 .XXX ± 0.06	MACHINE TOLERANCES X ± 1.5 X.X ± 0.5 X.XX ± 0.05 WELDED TOLERANCES X ± 5 X.X ± 3 X.XX ± 1.50

ASSEMBLY, ENGINE
CFP30E

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 21FEB2014

PRO-ENGINEER

INIT ECO: 2014-115

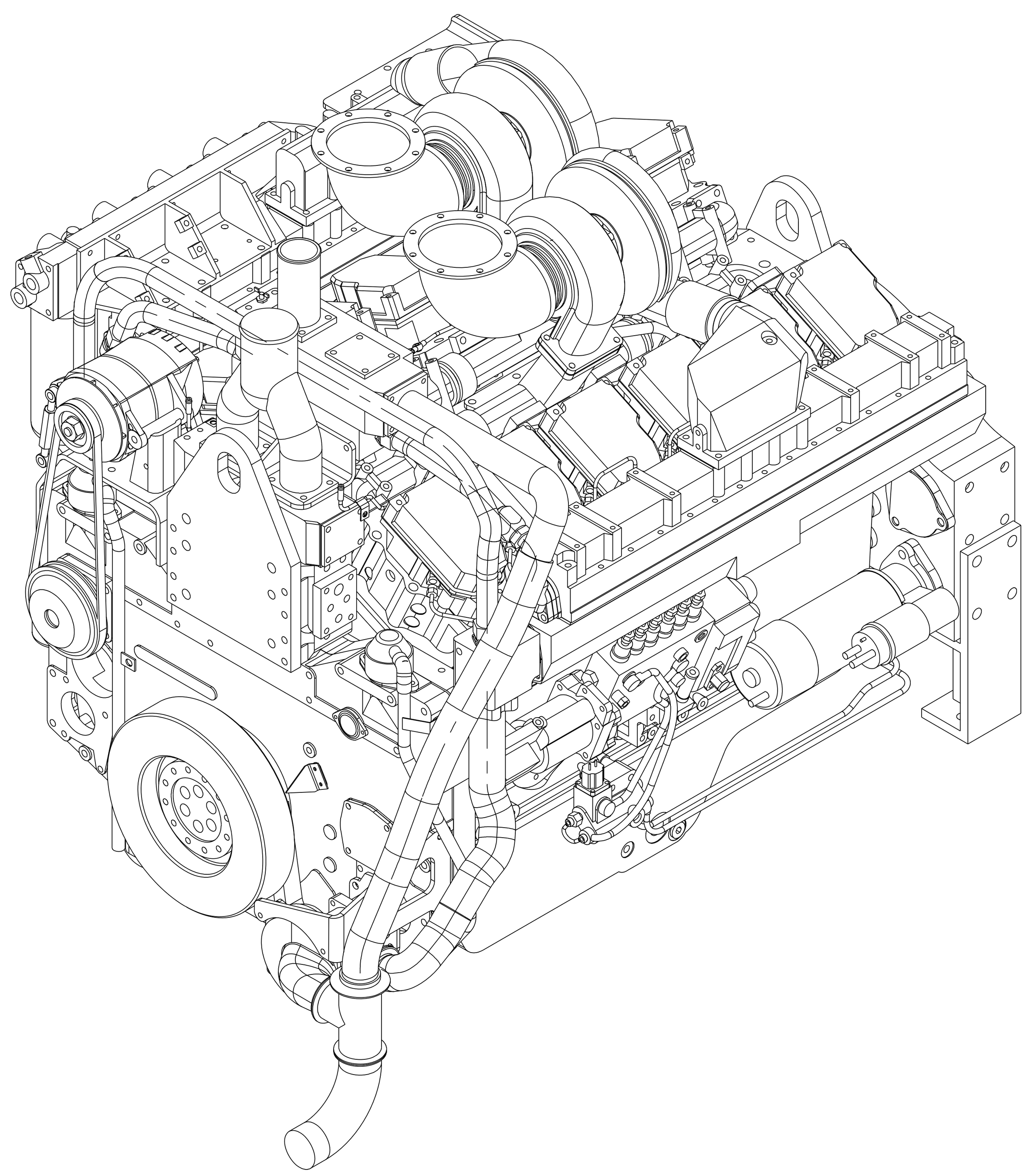
EST WEIGHT:

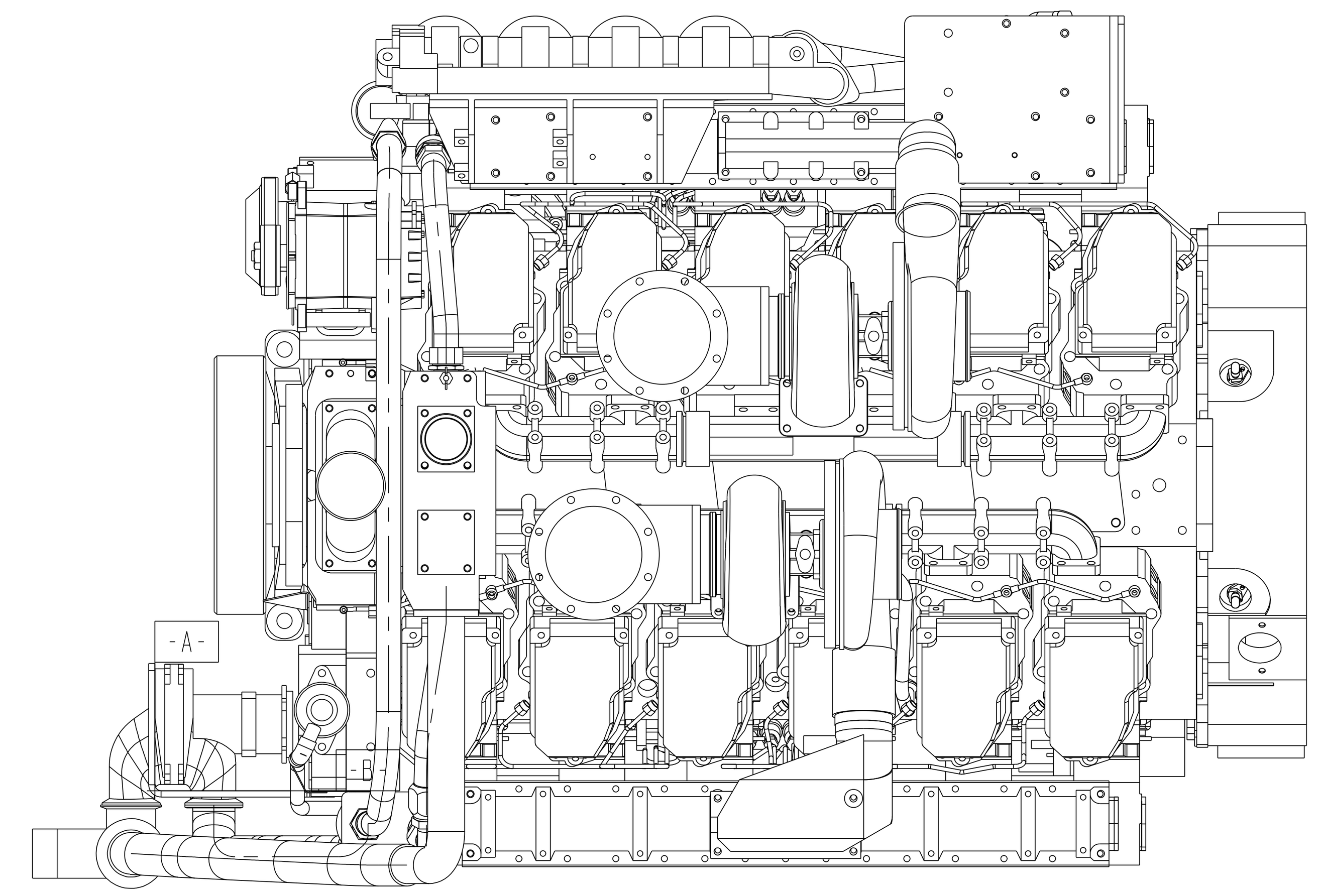
SCALE: 0.063

SHEET 1 OF 1

DRAWING NO: 26783

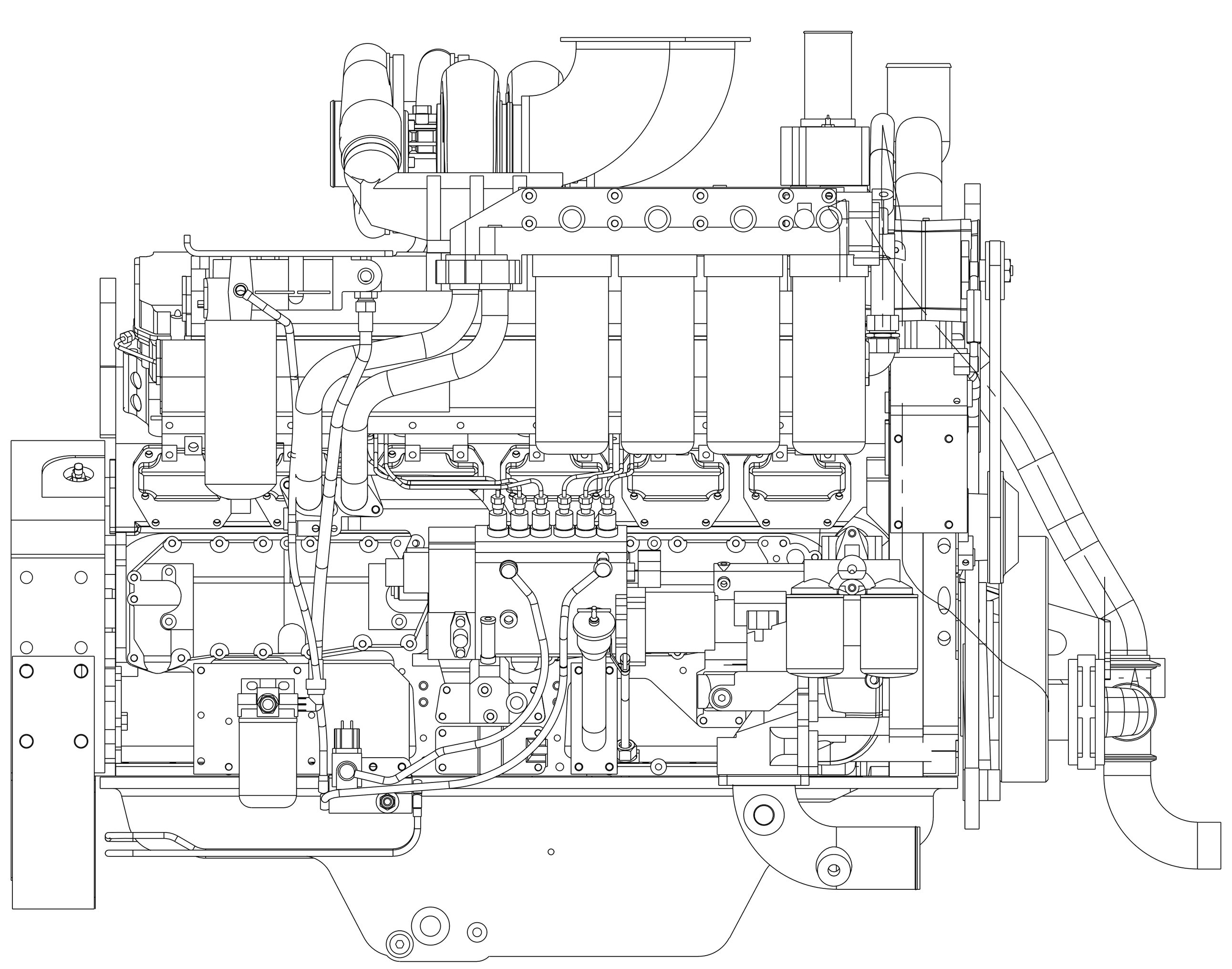
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2014-857	ADDED 106322	PBS	17DEC2014

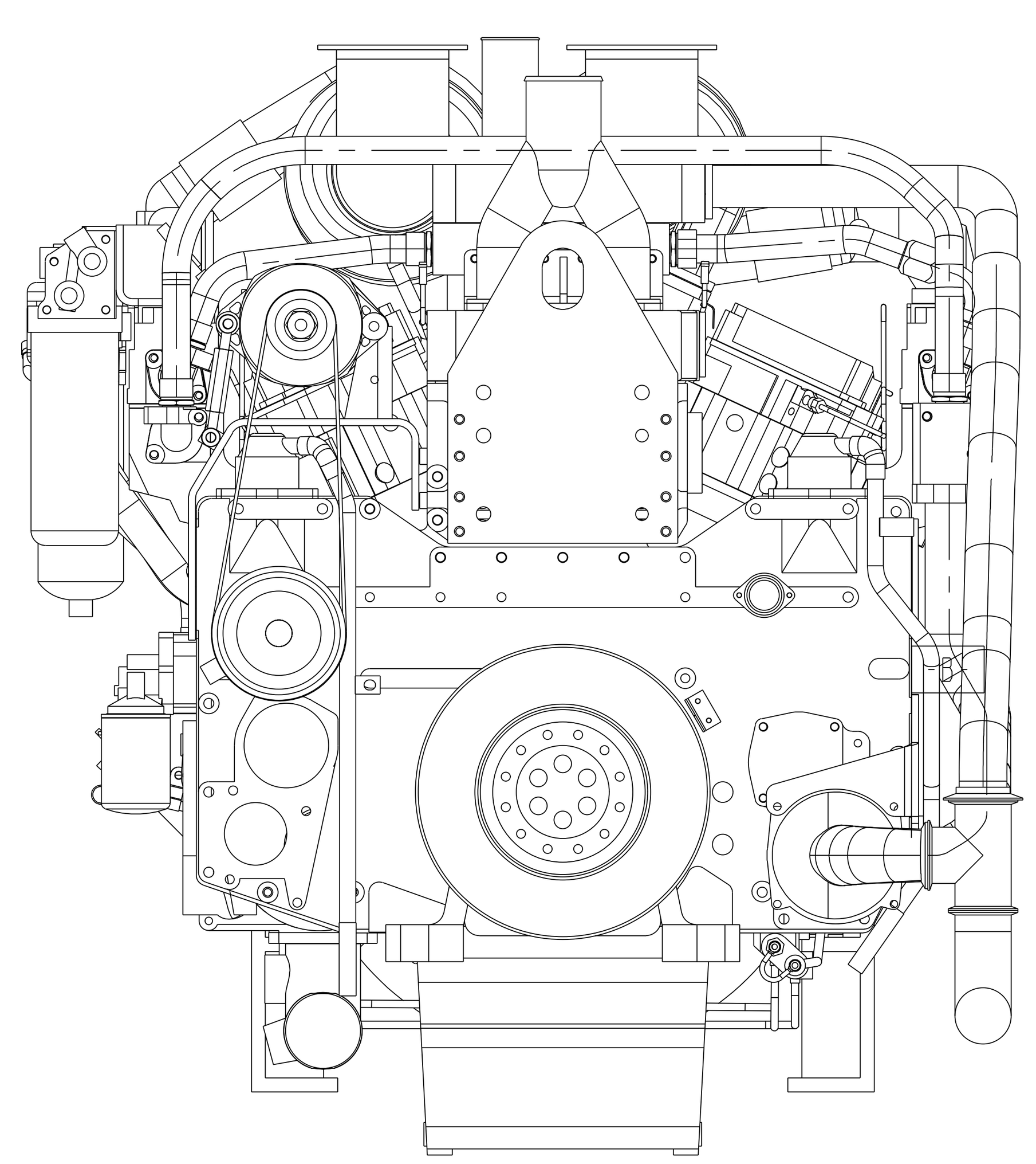


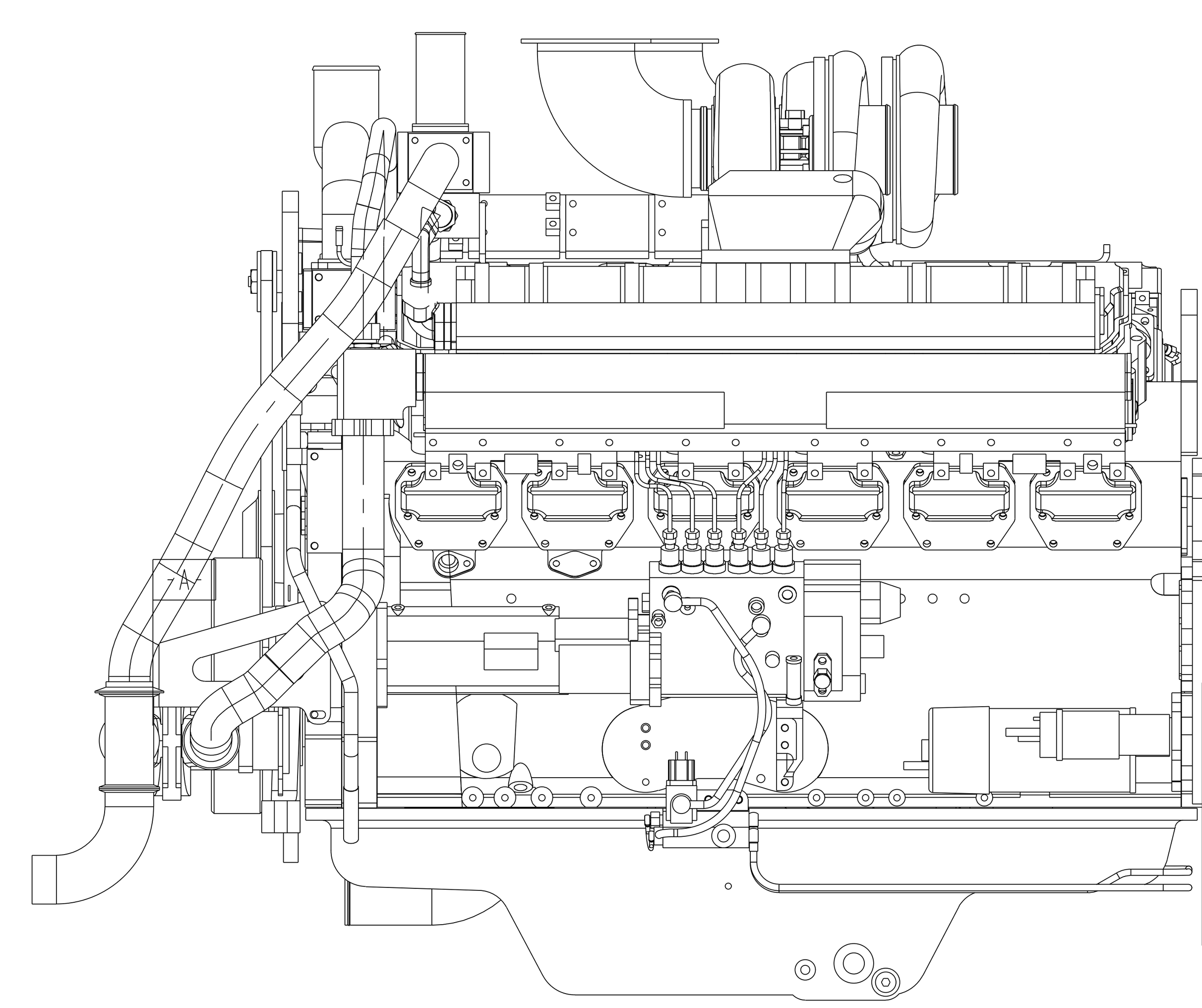


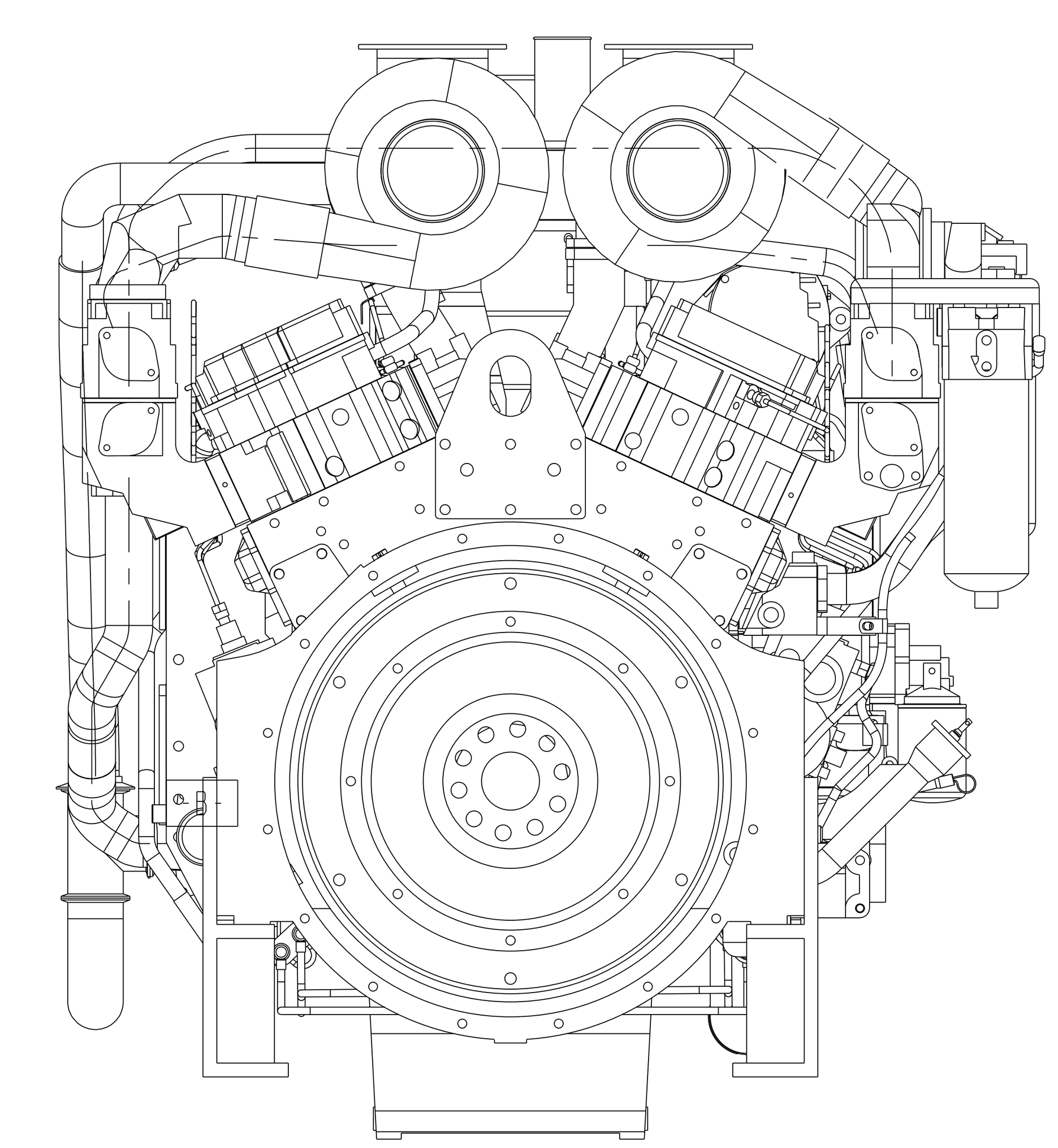
BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	TURBOCHARGER ARRANGEMENT	TB5068
2			
3	1	AGENCY APPROVAL	AP5022
4	1	BLOCK, CYLINDER	BB5702
5	1	BLOCK, CYLINDER, PLUMBING	BB5703
6	1	BREATHER, CRANKCASE	BR5705
7	1	DRIVE, ENGINE BARRING	CB5003
8	1	COVER, CAM FOLOWER	CM5702
9	1	DAMPENER, VIBRATION	DA5080
10	1	SOFTWARE, CUSTOMER INTERFACE	DO5238
11	1	DRIVE, FUEL PUMP	DP5704
12	1	ALTERNATOR	EE5067
13	1	ALTERNATOR MOUNTING	EH5009
14	1	ALTERNATOR BELT DRIVE	EH5708
15	1	SUPPORT, ENGINE FRONT	EM5075
16	1	DRIVE, FAN	FA5055
17	1	FILTER, FUEL	FF5088
18	1	FLYWHEEL HOUSING, SAE 0	FH5040
19	1	PUMP, FUEL INJECTION	FP5003B
20	1	FUEL RATING	FR5216
21	1	VALVE, CHECK	FS5034
22	1	PLUMBING, FUEL	FT5718
23	1	FLYWHEEL	FW5056
24	1	COVER, FRONT GEAR	GG5708
25	1	LIFTING ARRANGEMENT	LA5702
26	1	COOLER, ENGINE OIL	LC5704
27	1	FILTER, LUBE OIL	LF5075
28	1	GAUGE, OIL LEVEL	LG5010
29	1	PUMP, LUBE OIL	LP5701
30	1	LITERATURE	LT5009
31	1	OIL FILL ARRANGEMENT	OB5044
32	1	OIL PAN	OP5134
33	1	ENGINE MODULE SENSORS	PH5760
34	1	HEAD, CYLINDER	PP5715
35	1	TURBOCHARGERS	PP5759
36	1	PLUMBING, PERFORMANCE	PP8372
37	1	PULLEY, ACCESSORY DRIVE	PU5001
38	1	SUPPORT, ENGINE REAR	RE5701
39	1	ROCKER LEVERS	RL5701
40	1	STARTER MOUNTING COVER	SM5702
41	1	PAINT, RED	SS5025
42	1	STARTER MOTOR	ST5017
43	1	THERMOSTAT HOUSING	TH5008
44	1	COVER, VALVE	VC5701
45	1	CORROSION RESISTOR	WF5021
46	1	OIL COOLER	WH5701
47	1	WATER INLET CONNECTION	WI5056
48	1	WATER OUTLET CONNECTION	WO5016
49	1	PUMP, WATER	WP5701
50	1	EXHAUST OUTLET CONNECTION	XS5040









REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
E	2014-679	SS5025 ADDED & SS5011 REMOVED	JJW	26SEP2014
D	2012-439	ADDED SS5011 PAINT	PBS	29OCT2012
C	2012-293	UPDATE ENGINE SPEC	S DUBICK	12SEP2012

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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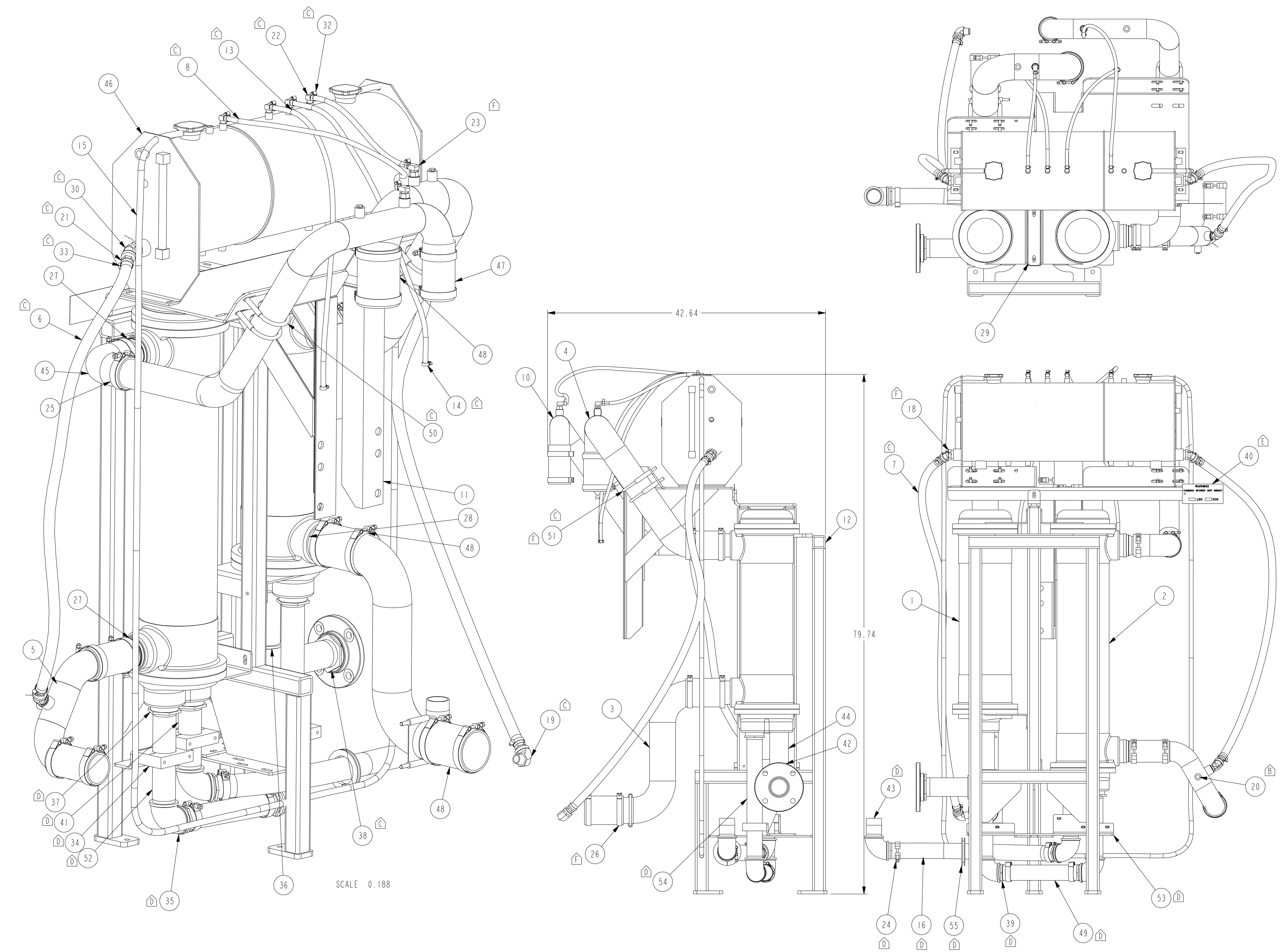
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ENGINE, QST30
1500HP, 1800RPM

DWG UNITS:
DRAWN BY: PRO-ENGINEER
DATE:
INIT ECO:
SCALE: 0.100
EST WEIGHT:
SHEET 1 OF 1
DRAWING NO: 13207



ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	HEAT EXCHANGER, SHELL AND TUBE, 2-PASS, 8" DIA. W/ 2-1/2" NPT WATER CONNECTION	13761
2	1	HEAT EXCHANGER, SHELL AND TUBE, 2-PASS, 8" DIA. W/ 2-1/2" NPT WATER CONNECTION	13762
3	1	TUBE, 2 BENDS, 4" O.D., FIREPUMP, CFP30E	13784
4	1	TUBE, 3 BENDS, 4" OD, FIREPUIMP, CFP30E	13785
5	1	TUBE, 2 BEND, 3" OD, FIREPUMP, CFP30E	13798
6	1	HOSE, HEATER, 3/4" I.D. x 68"	80242GL
7	1	HOSE, HEATER, 3/4" I.D. x 72"	80242GL
8	1	HOSE, VENT LINE, PARKER 801, 1/4" ID X 28" LG	R801-4
9	1	HOSE, VENT LINE, PARKER 801, 1/4" ID X 30" LG	R801-4
10	1	TUBE, 3 BEND, 3" OD, FIREPUMP, CFP30E	15334
11	1	BRACKET, MOUNTING, EXPANSION TANK, CFP30E FIREPUMP, LOW PROFILE	15335
12	1	STAND, HEAT EXCHANGER, FIREPUMP, CFP30E	15345
13	1	HOSE, VENT LINE, PARKER 801, 3/8" ID X 50" LG	R801-6
14	1	HOSE, VENT LINE, PARKER 801, 3/8" ID X 46" LG	R801-6
15	2	HOSE, DRAIN LINE, 5/16" x 8'	27003-001
16	1	HOSE,SILICONE,HI-TEMP, 2" ID X 27.00" LG	78200GL
17	42	COOLANT, FC EG PM, 1 GALLON	CC2743
18	2	BUSH, RED, -16 NPT X -12 FNPT	12176-16-12
19	1	ELB, 90 DEG, -12 NPT X -12 FMNPT	12195-12-12
20	3	PLUG. PIPE, -4 NPT	12210-4
21	4	FTG, STR, -12 BEAD X -12 NPT	12545-12-12
22	4	ELB, 90 DEG, -4 BARB X -4 NPT	12546-4-4
23	2	ELB, 90 DEG, -4 BARB X -6 NPT	12546-4-6
24	4	CLAMP, T-BOLT, 2.31-2.62	13164-0250
25	8	CLAMP, T-BOLT, 3.28-3.59	13164-0350
26	8	CLAMP, T-BOLT, 4.28-4.59	13164-0450
27	2	FITTING, BARBED HOSE, 3" NPT-3" HOSE	13779
28	2	FITTING, BARBED HOSE, 3" NPT X 4" HOSE	13780
29	1	BRACKET, HEAT EXCHANGER TOP, FIREPUMP, CFP30E	13820
30	3	ELBOW, 45°, 3/4"NOM, MNPTxFNPT, 150LB BLACK IRON	14204-12
31	2	BUSH, RED, -8 NPT X -6 FNPT	14783-8-6
32	8	CLAMP, WORM, .25 - .63	14992-04
33	4	CLAMP, WORM, .50 - 1.25	14992-12
34	3	CLAMP,PIPE,2",PLASTIC	15360
35	4	ELBOW, MARINE GRADE, 2" NPT	15756-32
36	1	ELBOW, MARINE GRADE, 2-1/2" NPT	15756-40
37	3	BUSHING, MARINE GRADE, 2-1/2" x 2"	15758-40-32
38	1	BUSHING, MARINE GRADE, 3" x 2-1/2"	15758-48-40
39	4	ADAPTER, NAVAL BRONZE, NPT X BARB, 2" NPT X 2" BARB	15766-32-32
40	1	TAG, ENGINE WEIGHT	16825
41	1	NIPPLE, MARINE GRADE, 2" X 8"	17574
42	1	FLANGE, NAVAL BRONZE, NPT X ANSI, 3" 150#	17578
43	1	NIPPLE, MARINE GRADE, 2" X 3-1/2"	17582
44	2	NIPPLE, MARINE GRADE, 2-1/2" X 8"	17587
45	1	ELBOW, 3" ID, 90 DEGREE	21042
46	1	TANK, EXPANSION, CFP30E	22566
47	3	HOSE, 3" x 6" LONG	77300GL-6
48	4	HOSE,DAYCO GOLD LABEL, 4.00" ID X 6" LG	77400GL-6IN
49	1	HOSE,SILICONE,HI-TEMP, 2" ID X 11.44" LG	78200GL
50	2	CLAMP, U-BOLT, GUILLOTINE, 3.00"	89545K
51	3	CLAMP, U-BOLT, GUILLOTINE, 4.00", PLATED	89548K
52	1	NIPPLE, 2" NPT x 11", SEA WATER COMPATIBLE	A042D795
53	1	BRACKET, PLUMBING SUPPORT	A042D796
54	1	NIPPLE, 2" NPT x 20", SEA WATER COMPATIBLE	A042D797
55	1	TRIM, EDGE, RUBBER x 14.00 LG, McMASTER-CARR 8507K45	A042D799

REV	ENF	DESCRIPTION OF REVISION	REV BY	DATE
F	2016-105	CHG QTY: 89548K WAS 2 DELETE: 13164-0425, 12548-4-6 ADD: 13164-0450, 12176-16-12, 12546-4-6	PBS	09FEB2016
E	2015-054	ADDED: 16825	PBS	27JAN2015
D	20155-045	DELETED: 16482, 16484-40, 16481, 17586, 17585 ADDED: A042D795, A042D796, A042D797, A042D799 15360, 78200GL, 13164-0250, 15766-32-32 15756-32, 15758-40-32, 17574, 17582	PBS	20JAN2015

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | MACHINED SURFACES 125 | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

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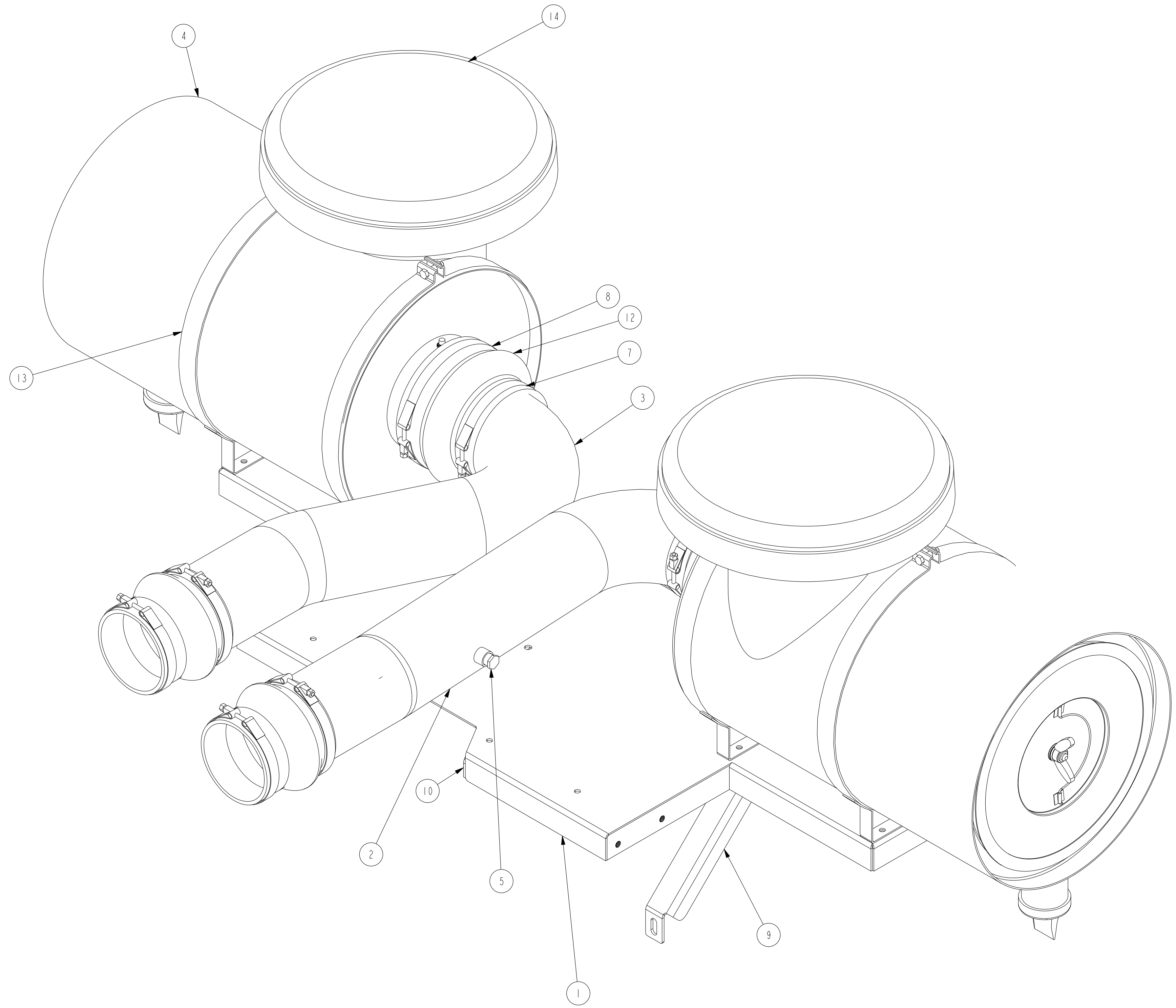
CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, HEAT EXCHANGER
SEA WATER, CFP30E

DWG UNITS: IN/LB/S	DRAWN BY: DAVE N	DATE: 18SEP2008
	PRO-ENGINEER	INIT ECO:
SCALE: 0.125	SHEET 1 OF 1	DRAWING NO: 13760
EST WEIGHT: 2858.282		

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSEMBLY, HEAVY DUTY AIR CLEANER BRACKET, CFP30E	22258
2	1	TUBE, INTAKE, CFP30E	A042G163
3	1	TUBE, INTAKE, CFP30E	A042G164
4	2	AIR HOUSING ASSEMBLY, FLEETGUARD AH19076	AH19076
5	2	PLUG, PIPE, -8 NPT	12210-8
6	2	CLAMP, T-BOLT, 5.78-6.09	13164-0600
7	4	CLAMP, T-BOLT, 6.50-6.81	13164-0675
8	2	CLAMP, T-BOLT, 8.50-8.81	13164-0875
9	2	BRACE, HD AIR CLEANER, CFP30E	22167
10	1	BRACKET, STIFFENER, OPERATOR STATION, CFP30E	22168
11	2	HUMP HOSE, 5.50" X 6.00"	3316622S
12	2	HUMP HOSE, 8" TO 6"	3316626S
13	4	BRACKET,AIR CLEANER, 18.10 INCH ID	3918237S
14	2	INTAKE BONNET, 10", FLEETGUARD 3940356S OR EQUIV	3940356S
15	2	RESTRICTION INDICATOR	D-RA00-2352



REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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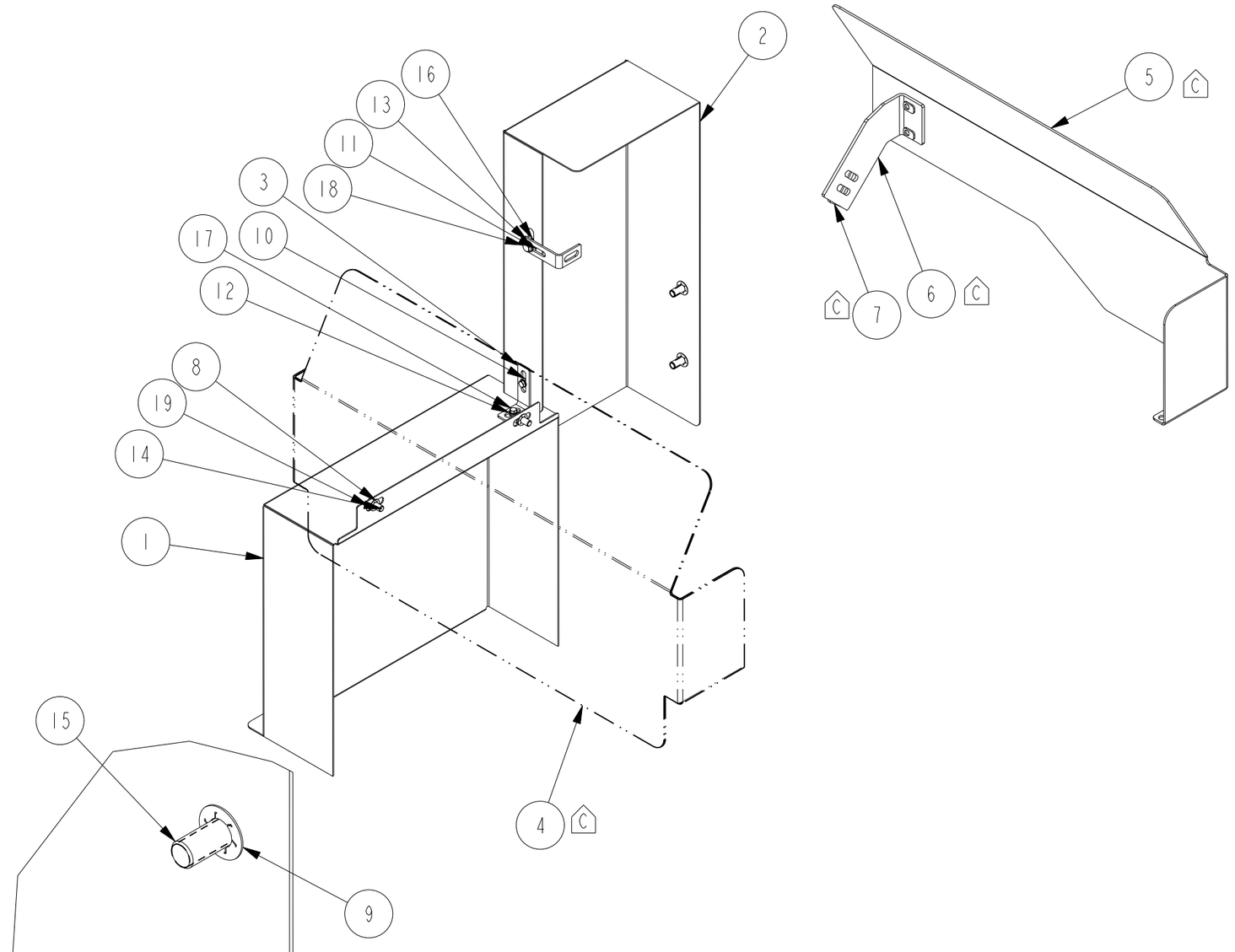
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, HEAVY DUTY AIR CLEANER
CFP30E

DWG UNITS: IN/LB/S	DRAWN BY: PBS	DATE: 09FEB2016
	PRO-ENGINEER	INIT ECO: 2016-105
SCALE: 0.250	SHEET 1 OF 1	DRAWING NO: A042G162
EST WEIGHT: 227.624		



TYPICAL GUARDING FASTENERS
SCALE 0.500

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	GUARD, HARMONIC BALANCE, CFP30E	13639
2	1	GUARD, ALTERNATOR, CFP30E	13640
3	2	BRACKET, MOUNTING, GUARD, FIREPUMP	8593
4	1	SHIELD, TURBO, LEFT, CFP30E	13546
5	1	SHIELD, TURBO, RIGHT, CFP30E	13547
6	1	BRACKET_1, TURBO SHIELD RIGHT, CFP30E	13548
7	1	BRACKET_2, TURBO SHIELD RIGHT, CFP30E	13549
8	5	WASHER, RETAINING, 3/8"	16662-06
9	2	WASHER, RETAINING, 1/2"	16662-08
10	2	WASHER, RETAINING, M6	16662-11
11	1	WASHER, RETAINING, M8	16662-12
12	2	WASHER,FLAT, M6	20020-M6
13	2	WASHER,FLAT, M8	20020-M8
14	5	SCREW, CAP, HEX HEAD, M10-1.5	HHCS_M10
15	2	HHCS m12 -1.75 X 25, COMMON HARDWARE	HHCS_M12_25
16	1	NUT,HEX, M8-1.25	20120-M8
17	2	SCREW,HH, M6-1.00x16MM	20306-016
18	1	SCREW,HH, M8-1.25x20	20308-020
19	5	WASHER, M10	WASHER_M10

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
C	2014-115	ADDED 13546, 13547, 13548, 13549	PBS	21FEB2014
B	2012-293	ADDED ITEM 8593 AND HARDWARE	PBS	16NOV2012
A	2010-098	CREATED DRAWING. ADDED RETAINING WASHERS	DAN	09-MAR-10

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES 125

	IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES	.XX : ± 0.010 .XXX : ± 0.005	.X : ± 0.4 .XX : ± 0.2
FORM TOLERANCES	.XX : ± 0.030 .XXX : ± 0.015	.X : ± 0.8 .XX : ± 0.4
FAB TOLERANCES	.XX : ± 0.060 .XXX : ± 0.030	.X : ± 1.5 .XX : ± 0.8

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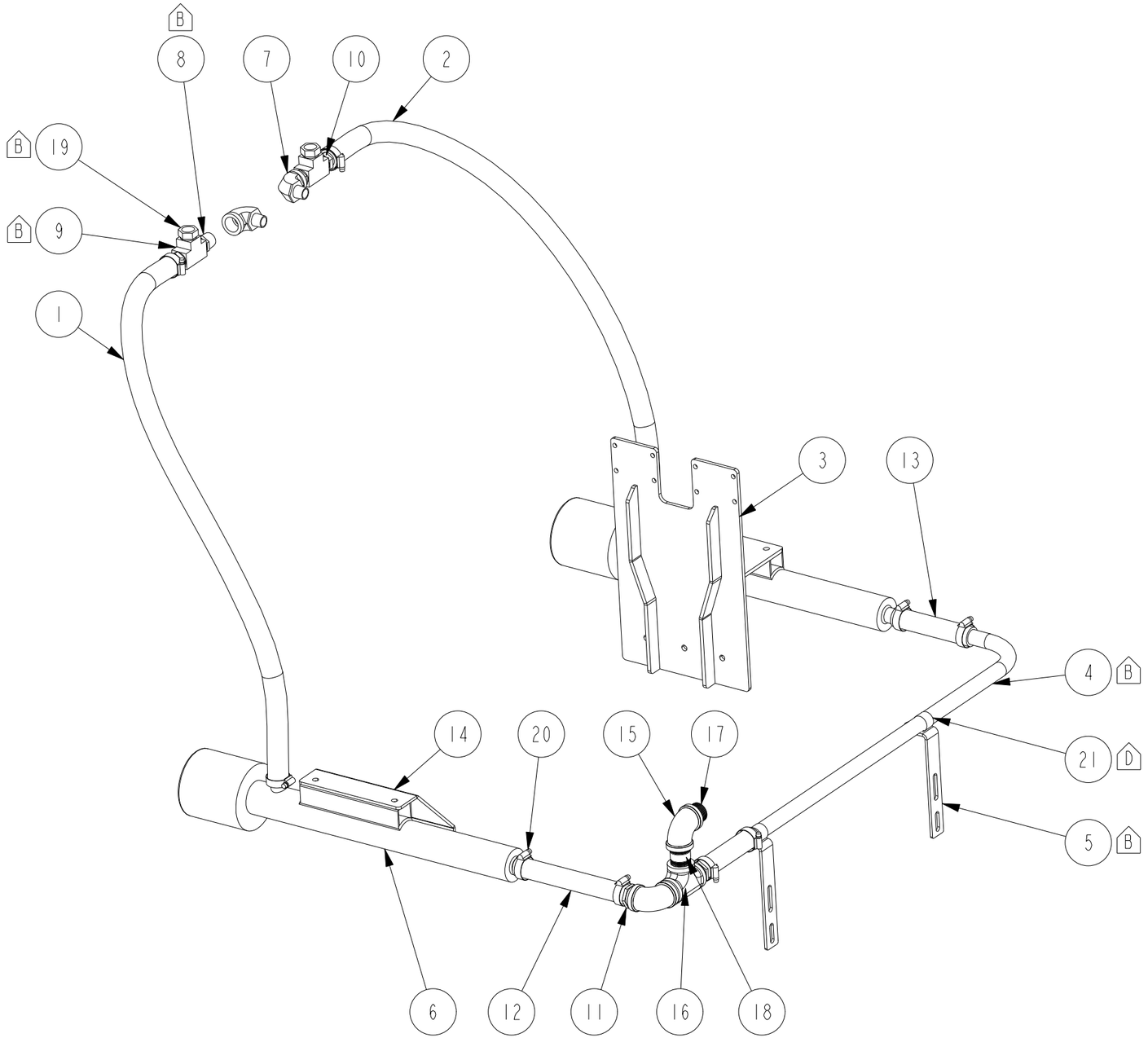
DEPERE, WISCONSIN

ASSEMBLY, GUARDS, CFP30E

DWG UNITS: IN/LB/S	DRAWN BY: DAVE N	DATE: 03OCT2008
	PRO-ENGINEER	INIT ECO:
SCALE: 0.125	SHEET 1 OF 1	DRAWING NO: 13638
EST WEIGHT: 28.499		



BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	HOSE, 1" 80244GL X 42" LG	80244GL
2	1	HOSE, 1" 80244GL X 42" LG	80244GL
3	1	ASSEMBLY, CONTACTOR BRACKET, CFP30E	22211
4	1	TUBE,CROSSOVER,HEATER, CFP9E	23494
5	2	BRACKET, MOUNTING, TUBE SUPPORT, FIREPUMP	9834
6	2	HEATER, COOLANT, 3KW, ADJ. VOLT, WATLOW 3-10-42-5PA	11577
7	2	ELB, 90 DEG, -8 NPT X -12 FMNPT	12195-8-12
8	2	NIPPLE, PIPE HEX, -12 NPT X -12 NPT	12529-12-12
9	2	TEE, UNION, -12 NPT	12531-12
10	2	FTG, STR, -16 BEAD X -12 NPT	12545-16-12
11	2	FTG, STR, -16 BARB X -16 NPT	12548-16-16
12	1	HOSE, 1" 80244GL X 9" LG	80244GL
13	2	HOSE, 1" 80244GL X 6" LG	80244GL
14	1	BRACKET, COOLANT HEATER	13645
15	2	ELBOW, 90°, 1" NPTF, BLK IRON	LTL-E190
16	1	TEE, 1" NPT, BLK IRON	LTL-ST1
17	2	NIPPLE, 1" NPT x CLOSE, BLK IRON	LTL-CPN1
18	1	NIPPLE, 1" NPT x 2-1/2", BLK IRON	BNGL
19	2	BUSH, RED, -12 NPT X -8 FNPT	14783-12-8
20	10	CLAMP, WORM, 1.00 - 1.50	14990-16
21	2	CLAMP, LOOM, 1.00 ID	26963-16

REV	ENF	DESCRIPTION OF REVISION	REV BY	DATE
D	2016-009	REPLACED LTL-SCPV16627 W/ 26963-16	KMS	22JAN2016
C	2014-115	DELETED 8824, 075NPT_X_100H 18105. ADDED 12545-16-12	PBS	20FEB2014
B	2012-293	ADDED: 12195-8-12,8824,22211,23494, 12529-12-12,12531-12,14783-12-8,18105, 9834,13745 DELETED: M27-075F80HGS	PBS	02AUG2012
A	2009-216	ADDED HOSES AND TUBES	DAN	27-MAY-09

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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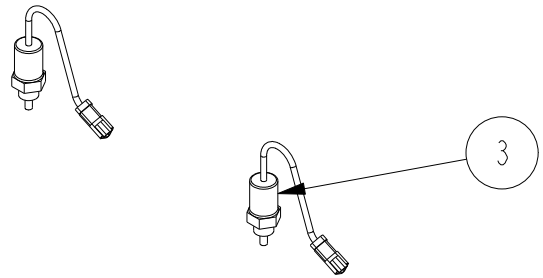
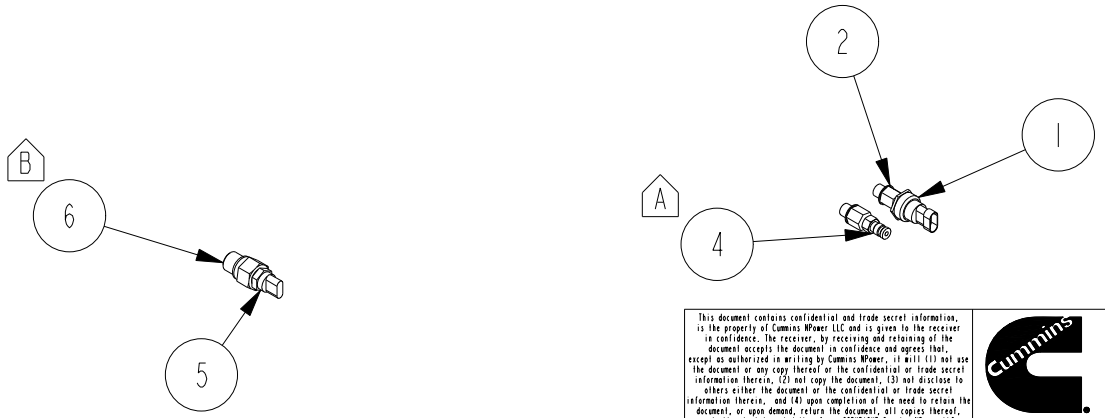
ASSEMBLY, COOLANT HEATER CFP30E FIREPUMP

DWG UNITS: IN/LB/S	DRAWN BY: DAVE N	DATE: 13OCT2008
	PRO-ENGINEER	INIT ECO:
SCALE: 0.125	SHEET 1 OF 1	DRAWING NO: 13568
EST WEIGHT: 51.323		

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SWITCH, OIL PRESSURE, 16 PSI, #3408607	8861
2	2	FTG, STR, M14 ORR X -2 FNPT	12181-M14-2
3	2	SWITCH, LOW COOLANT TEMP, 110° F SET POINT	18105
4	1	CONNECTOR, QUICK DISCONNECT	3377244
5	1	SWITCH, WATER TEMPERATURE, 200°F	3408632
6	1	FITTING, ADAPTER, M22 TO 1/2" NPT FOR CFP30E	A042E449





REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
B	2015-232	REPLACED 12181-M22-8 WITH A042E449	PBS	14APR2015
A	2014-836	ADDED 3377244, 12181-M14-2 WAS QTY 1	PBS	08DEC2014

UNLESS OTHERWISE SPECIFIED
ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

MACHINED SURFACES: 125

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES .X = ± 0.06 .XX = ± 0.010 .XXX = ± 0.001	MACHINE TOLERANCES X = ± 1.5 X.X = ± 0.5 X.XX = ± 0.05
WELD TOLERANCES .X = ± 0.25 .XX = ± 0.12 .XXX = ± 0.06	WELDED TOLERANCES X = ± 5 X.X = ± 3 X.XX = ± 1.50

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ASSEMBLY, SENSOR CFP30E

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 21FEB2014

PRO-ENGINEER

INIT ECO: 2014-115

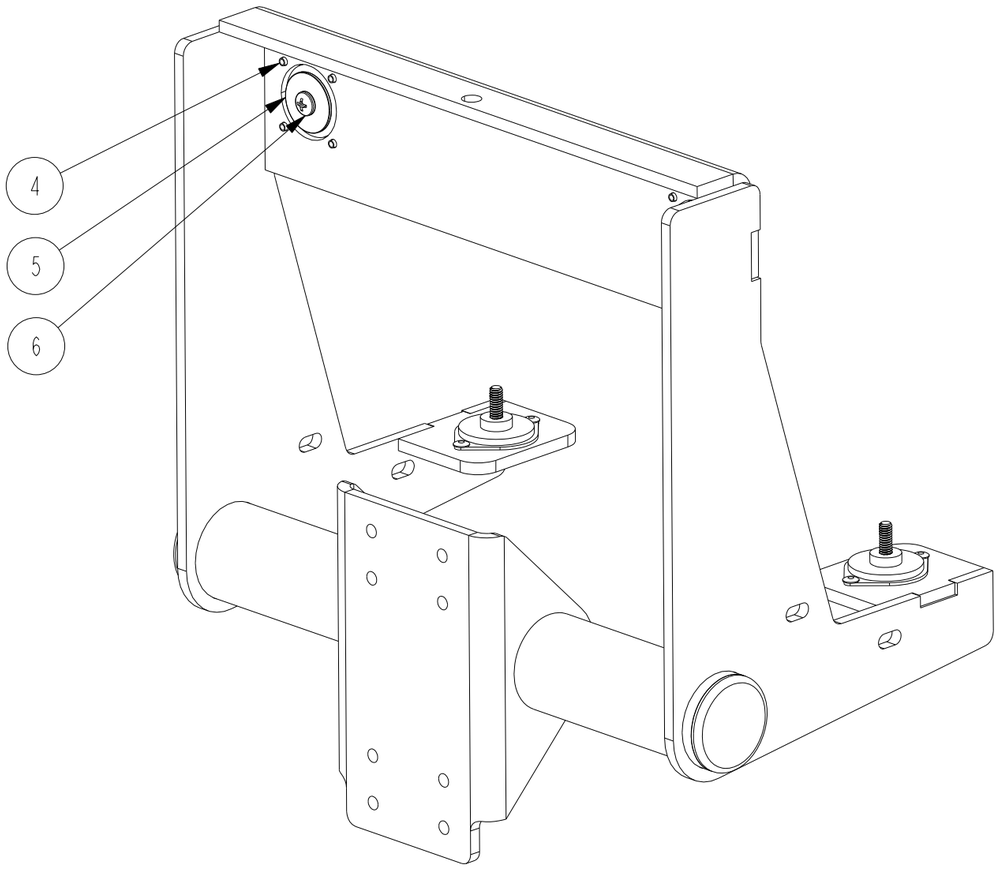
EST WEIGHT: 1.602

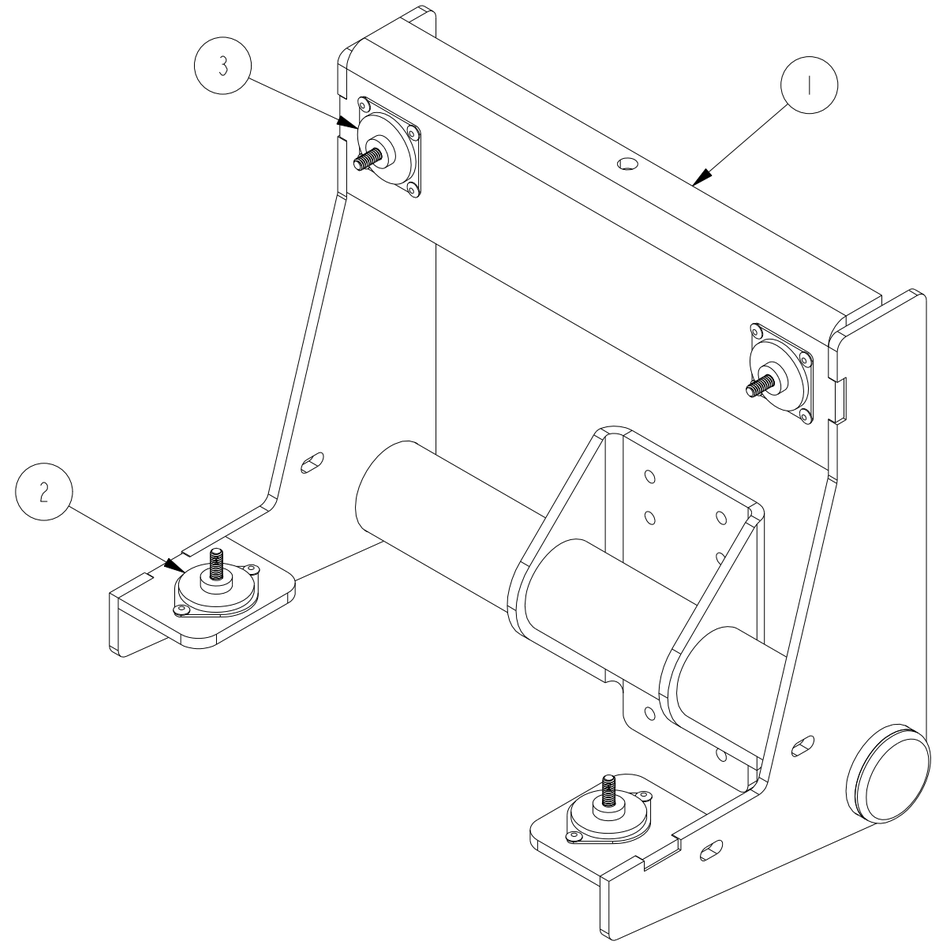
SCALE: 0.125

SHEET 1 OF 1

DRAWING NO: A042A499

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	MOUNT, OPERATOR STATION, CFP CONTROL PANEL	22318
2	2	ISOLATOR, PLATE MOUNT, 3 LB (YELLOW MARK)	15400
3	2	ISOLATOR, PLATE MOUNT, 6 LB (RED MARK)	15412
4	12	RIVET, ALUMINUM, STEEL SHANK, 0.156 DIA, 0.25-0.38 GRIP	15414
5	2	FENDER WASHER, 0.281 X 1.25	15421
6	4	SCREW, SELF LOCKING, 0.25-20 X 1.00, PH OR BH	15422





UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

	IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES	.XX = ± 0.010 .XXX = ± 0.005	.X = ± 0.4 .XX = ± 0.2
FORM TOLERANCES	.XX = ± 0.030 .XXX = ± 0.015	.X = ± 0.8 .XX = ± 0.4
FAB TOLERANCES	.XX = ± 0.060 .XXX = ± 0.030	.X = ± 1.5 .XX = ± 0.8

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

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DEPERE, WISCONSIN

ASSEMBLY, CONTROL PANEL MOUNTING CFP POWER UNITS

DWG UNITS: IN/LB/S

DRAWN BY: S DUBICK

PRO-ENGINEER

DATE: 26-SEP-12

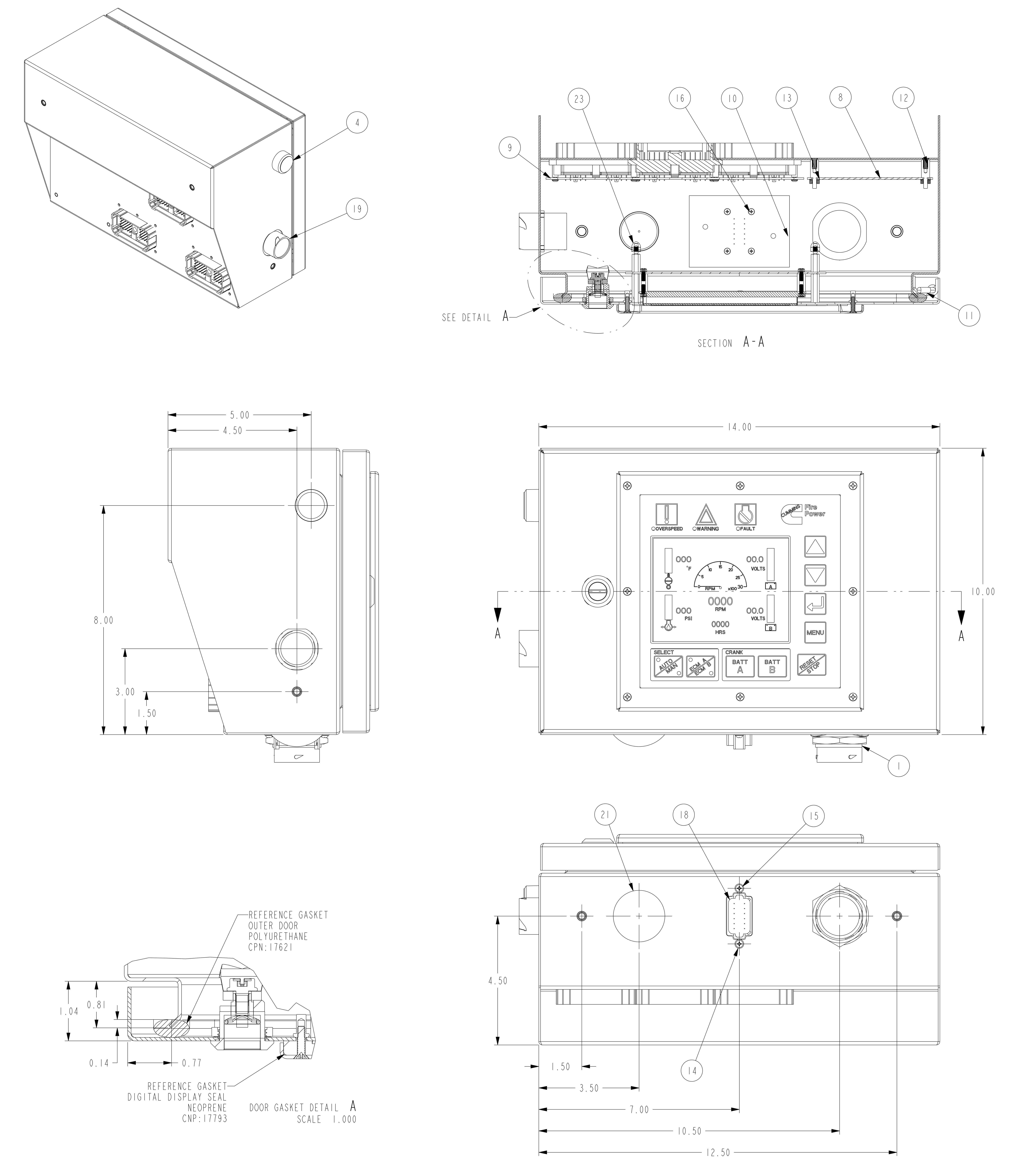
INIT ECO: 2012-392

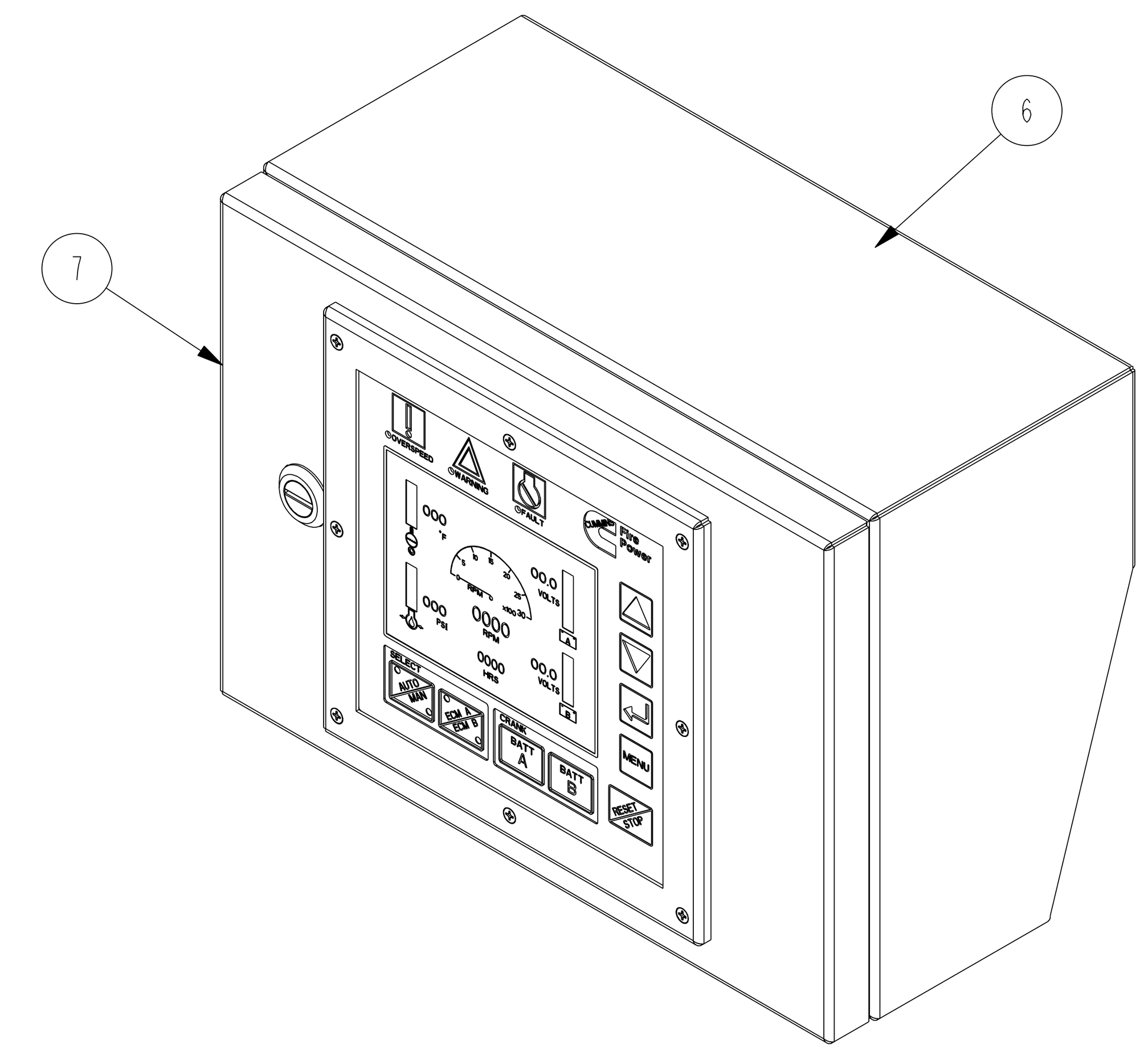
SCALE: 0.333

EST WEIGHT: 16.439

SHEET 1 OF 1

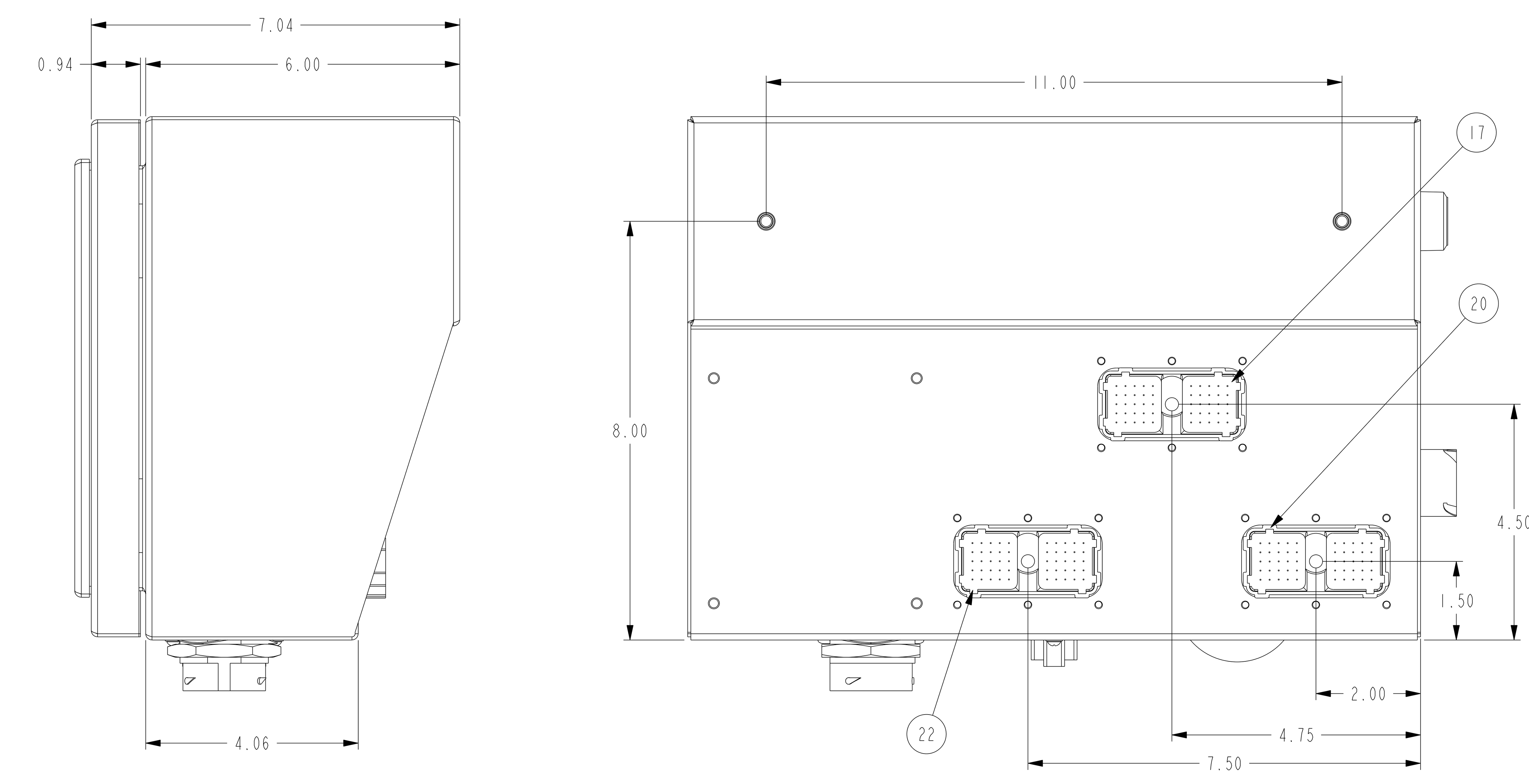
DRAWING NO: 21249





BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSY,BULKHEAD WIRING, DIGITAL PANEL, BULKHEAD TO POWER PCB	15156
2	1	CABLE, DIGITAL PANEL, POWER PCB TO DISPLAY PCB	15157
3	1	CABLE, DIGITAL PANEL, POWER PCB TO ECM SWITCH PCB	15158
4	1	ASSY, WIRING, DIGITAL PANEL, ENGINE STOP SWITCH	15160
5	1	DIAGNOSTICS, DIGITAL PANEL, RECEPTACLE AND CABLE	15161
6	1	WELDMT, DIGITAL PANEL, BOX, ELECTRONIC	15569
7	1	ASSEMBLY, DOOR, CONTROL PANEL	15575
8	1	POWER PCB, DIGITAL PANEL, ELECTRONIC	15153
9	1	SWITCH PCB, DIGITAL PANEL, MODULE, ECM	15154
10	1	POWER MODULE ECM , DIGITAL PANEL, ELECTRONIC	15155
11	2	HINGE, ASSEMBLY W/PIN, MILD STEEL, EMKA 1069-U2	15573_02
12	9	STANDOFF HEX M/F,8-32, ALUM. .63"L	15579
13	9	NUT, 8-32, W/TOOTH WASHER, ZNC -PLTD	15582
14	2	WASHER, 5/32"I.D x 5/16"O.D. x .02TK, STNL STL	15588
15	2	SCREW, 6-19 x 3/8"L, FH PHILIPS HD, STNL STL	15590
16	16	SCREW, 1/4"-20 SELF TAPPING, STNL STL	15591
17	1	RECEPTACLE, W/FLANGE 50 PIN,BLACK, CRC SERIES, DEUTSCH, DRC22-50P01	15593
18	1	RECEPTACLE, PCB MOUNT, 12 PINS STRAIGHT DT-SERIES, DEUTSCH, DT15-12P	15594
19	1	CONNECTOR, RECEPTACLE SQ. FLANGE HD10 SERIES, DEUTSCH, HD10-9-1939P	15596
20	1	RECEPTACLE, W/FLANGE 50 PIN,BLACK, CRC SERIES, DEUTSCH, DRC22-50P03	15599
21	1	PLUG, LIQUID TIGHT, HEYCO, 3837	15645
22	1	RECEPTACLE, W/FLANGE 50 PIN,BLACK, CRC SERIES, DEUTSCH, DRC22-50P02	15657
23	4	NUT, ACORN,SELF-LOCKING, 8-32, 18-8 STNL STL	17149

*** BOM IS FOR REFERENCE ONLY ***



NOTES:
1. TYPE 4X INDOOR USE CONSTRUCTION
2. UPDATED SOFTWARE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
		FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
		FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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ASSEMBLY, DIGITAL CONTROL PANEL
ELECTRONIC CFP ENGINES

DWG UNITS: IN/LB/S	DRAWN BY: S DUBICK		DATE: 21-SEP-12
	PRO-ENGINEER		INIT ECO: 2012-348
SCALE: 0.500		SHEET 1 OF 1	DRAWING NO: 22791
EST WEIGHT: 28.994			

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2015-001	UPDATED PER DETAILS	PBS	02JAN2014

KIT INCLUDES

△A 1. 22348 - HARNESS, POWER WIRES
△B△A 2. 22349 - HARNESS, INTERFACE
△C△A 3. 22350 - HARNESS, ECM A
4. 22324 - HARNESS, J1587 INTERCONNECT

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
C	2016-015	UPDATE 22350	KAK	22JAN2016
B	2014-333	UPDATE 22348,22349,22350	RMJ	14MAY2014
A	2012-532	ITEM 2 - REV A - ADDED 2ND LCL SWITCH.	BG	12 NOV 2012

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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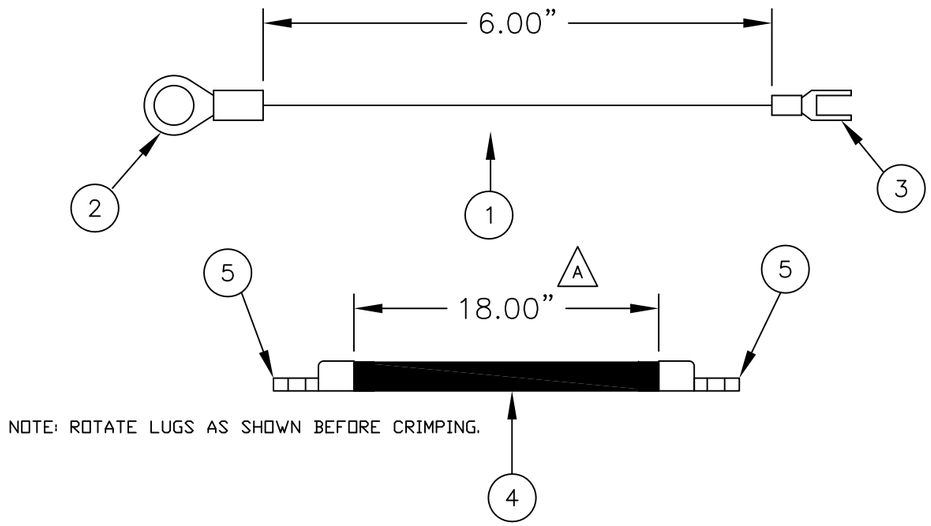
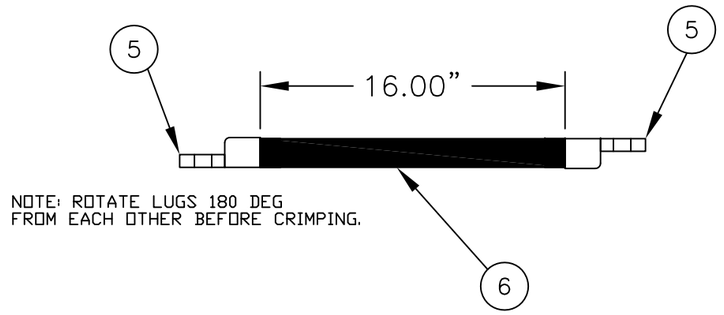
KIT, WIRE HARNESSES
CFP30E FIRE PUMP

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 18JUN2012
INIT ECO: 2012-233
SCALE:
EST WEIGHT:
SHEET 1OF1
DRAWING NO: 22347

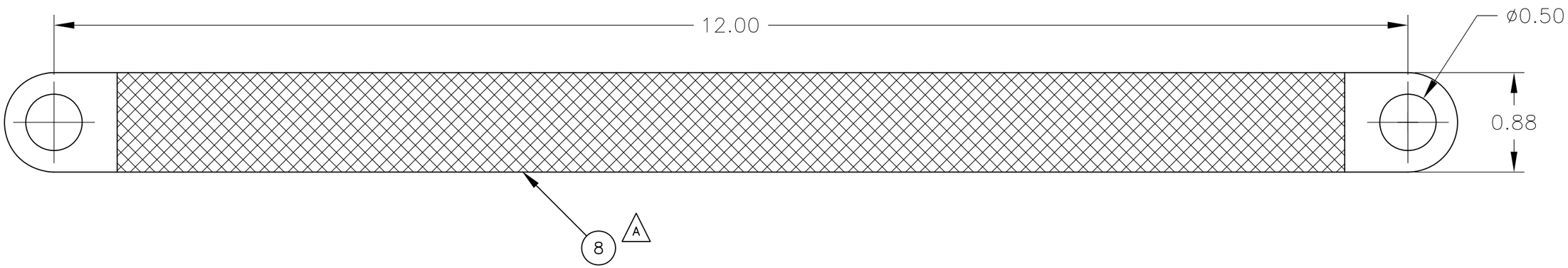
TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
1	1	6"	WL10-9	WAYTEK	WIRE, GXL, WHITE, 10 AWG
2	1	1	32706	WAYTEK	TERMINAL, RING, 1/2", 10 AWG, INSULATED
3	1	1	52717-2	AMP	TERMINAL, SPADE, #10
4	1	15"	WC00-0	WAYTEK	CABLE, WELDING, 2/0 AWG, BLACK
5	4	1	36534	WAYTEK	TERMINAL, EYELET, HEAVY DUTY, 3/8", 2/0 AWG, NON-INSULATED
6	1	16"	WC00-0	WAYTEK	CABLE, WELDING, 2/0 AWG, BLACK
7	1	1	WC90397-1	LTL	4GA, GROUND STRAP (CNP PART NUMBER 9757)



NOTE: ROTATE LUGS AS SHOWN BEFORE CRIMPING.



NOTE: ROTATE LUGS 180 DEG
FROM EACH OTHER BEFORE CRIMPING.



NOTES:

1) USE RED HEAT SHRINK ON ALL BATTERY CABLE TERMINALS.
2) COMPONENTS MAY BE SUBSTITUTED AS LONG AS FIT, FORM, FUNCTION AND REGULATORY STANDARDS ARE MET OR EXCEEDED.

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES XX = ± 0.010 XXX = ± 0.005	MACHINE TOLERANCES X = ± 0.4 XX = ± 0.2
FORM TOLERANCES XX = ± 0.030 XXX = ± 0.015	FORM TOLERANCES X = ± 0.8 XX = ± 0.4
FAB TOLERANCES XX = ± 0.060 XXX = ± 0.030	FAB TOLERANCES X = ± 1.5 XX = ± 0.8

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875 LAWRENCE DRIVE
DEPERE, WISCONSIN

CABLES, BATTERY
CFP23E

DWG UNITS: INCH/LB/S

DRAWN BY: BG

AUTO CAD

DATE: 11 APR 2013

INIT ECO: 2013-207

SCALE:

EST WEIGHT:

SHEET 1OF1

DRAWING NO: 23939

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2014-071	18” WAS 15”. ADDED 9757	PBS	14FEB2014

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	CONTACTOR, MANUAL OVERIDE, 12V, PN:535-0127, FIREPUMP	8824-12
2	1	CONTACTOR, MANUAL OVERIDE, 24V, PN:535-0098, FIREPUMP	8824-24

PR00010

THE 535-0127 SOLENOID ASSEMBLY MUST
BE INSTALLED IN A NEMA 2 ENVIRDMENT

ELECTRICAL SPECIFICATIONS
VOLTS: 12 VDC
CONTACT RATING: 400 AMPS (ROLLING CURRENT)
800 AMPS (BREAKAWAY CURRENT)
DUTY TYPE: INTERMITTENT
CONTACT POSITION: NORMALLY OPEN

DESIGN APPROVAL	DATE
DES.ENG.	
MFG.ENG.	
Q.C.	
SALES	

UNSPECIFIED TOLERANCES
.xxx ±.005
.xx ±.015
.x ±.060
Machine Finish √125 Max.
Angles ±1°
Concentricity .005 TIR
Squareness .001 per in.

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PART NO. 535-0127

DUMORE CORPORATION
1030 VETERANS ST. MAUSTON, WI 53948

DO NOT SCALE DRAWING

REMOVE ALL BURRS
BREAK SHARP CORNERS

TITLE: ASSEMBLY, SOLENOID

MATERIAL SPEC:

Req. per Piece
Pattern No.

RECEIVED AS

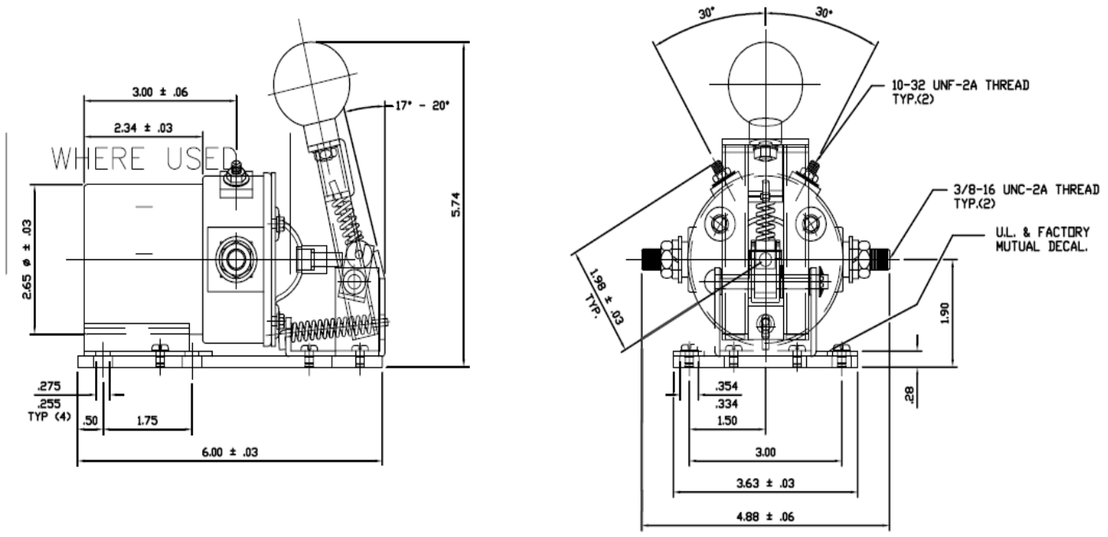
DWG. BY: CTH DATE: 7/19/01

CKD. BY: DATE:

SCALE: 1:2

REVISIONS

RELEASED
ECN # 25159
7/19/01 CTH



ITEM: 1 - 8824-12

SP4847

THE 535-0098 SOLENOID ASSEMBLY MUST
BE INSTALLED IN A NEMA 2 ENVIRDMENT

ELECTRICAL SPECIFICATIONS
VOLTS: 24 VDC
CONTACT RATING: 400 AMPS (ROLLING CURRENT)
800 AMPS (BREAKAWAY CURRENT)
DUTY TYPE: INTERMITTENT
CONTACT POSITION: NORMALLY OPEN

DESIGN APPROVAL	DATE
DES.ENG.	
MFG.ENG.	
Q.C.	
SALES	SEE ECN # 19248 FOR SIGNATURES

UNSPECIFIED TOLERANCES
.xxx ±.005
.xx ±.015
.x ±.059
Machine Finish √125 Max.
Angles ±1°
Concentricity .005 TIR
Squareness .001 per in.

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PART NO. 535-0098

DUMORE CORPORATION
1030 VETERANS ST. MAUSTON, WI 53948

DO NOT SCALE DRAWING

REMOVE ALL BURRS
BREAK SHARP CORNERS

TITLE: ASSEMBLY, SOLENOID

MATERIAL SPEC:

Req. per Piece
Pattern No.

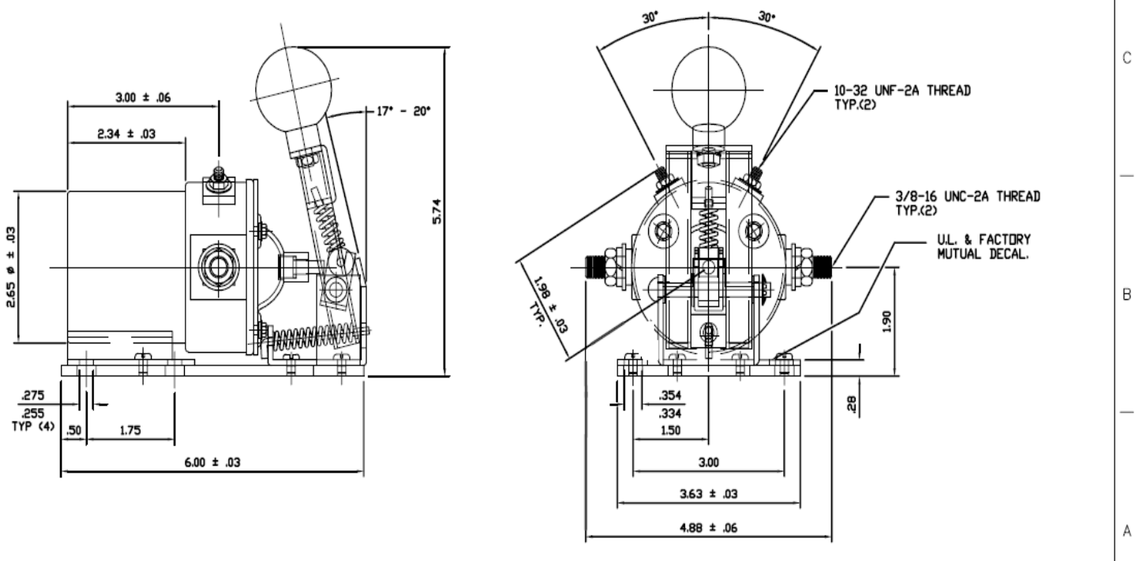
RECEIVED AS

DWG. BY: MEB DATE: 2/16/89

CKD. BY: RS DATE: 8/13/91

SCALE: 1:2

REVISIONS



ITEM: 2 - 8824-24

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2011-068	UPDATED DRAWING FORMAT ADDED CNP LABEL TO PDF DRAWING	MAC	18FEB2011

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

Cummins Fire Power

CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

MANUAL SOLENOID
-

DWG UNITS: IN/LB/S

DRAWN BY: CMC

DATE: 12JUNE2004

PRO-ENGINEER

INIT ECO: -

SCALE: 1.000

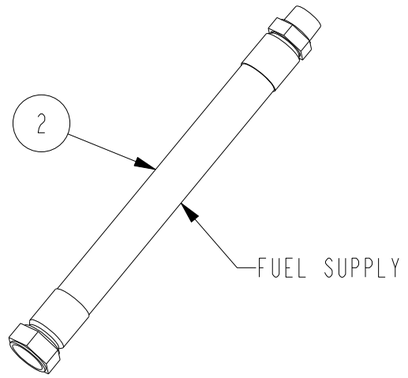
EST WEIGHT: 42238.628

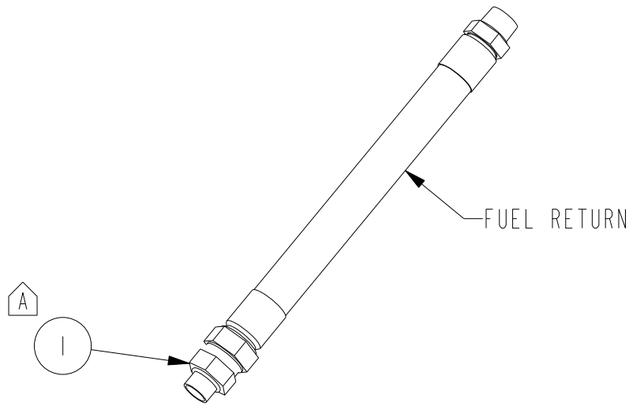
SHEET 1 OF 1

DRAWING NO: 8824

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	FTG, STR, -12 JIC X -8 ORB	12235-12-8
2	2	FUEL LINE, 12" EXTENSION, #12 FEM JIC X #12 22IFR X 3/4" NPT	14400-013





REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2012-293	ADDED ITEM 12235-12-8	PBS	03AUG2012

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

	IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES	.XX : ± 0.010 .XXX : ± 0.005	.X : ± 0.4 .XX : ± 0.2
FORM TOLERANCES	.XX : ± 0.030 .XXX : ± 0.015	.X : ± 0.8 .XX : ± 0.4
FAB TOLERANCES	.XX : ± 0.060 .XXX : ± 0.030	.X : ± 1.5 .XX : ± 0.8

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

KIT, FUEL LINES, CFP30

DWG UNITS: IN/LB/S

DRAWN BY: PBS

PRO-ENGINEER

DATE: 22JUN2012

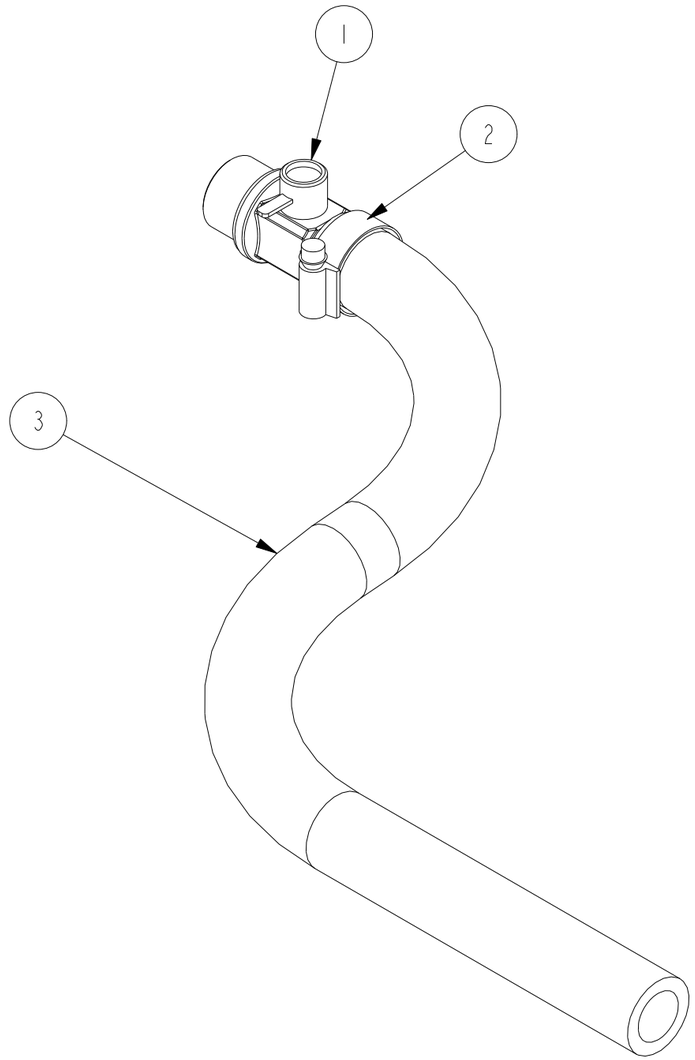
INIT ECO: 2012-177

SCALE: 0.250

EST WEIGHT: 3.679

SHEET 1 OF 1

DRAWING NO: 22394



BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	VALVE, OIL DRAIN, M27-2.0 WITH NIPPLE	13215
2	1	CLAMP, WORM, .88 - 1.25	14990-12
3	1	HOSE,.75IN IDx25FT, CUT TO 24IN LONG	A042F382

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2015-678	REPLACED A042F382 WAS 80232GL	MRH	28DEC2015

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, OIL DRAIN W/ VALVE CFP30E (OPTIONAL)

DWG UNITS: IN/LB/S

DRAWN BY: DAN

PRO-ENGINEER

DATE: 30-JUL-09

INIT ECO: -

SCALE: 0.500

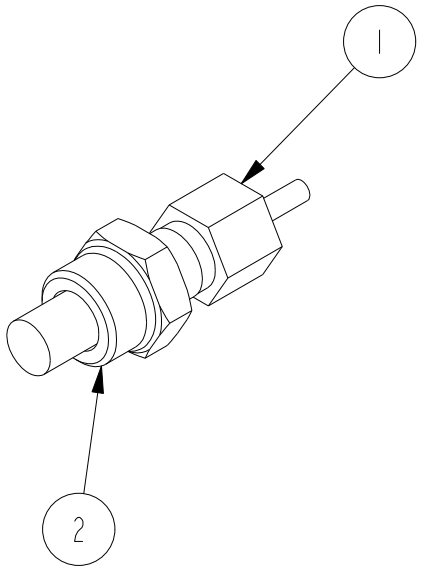
EST WEIGHT: 3.798

SHEET 1 OF 1

DRAWING NO: 15338

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SENDER, TEMPERATURE, DATCON #02022-00	8862
2	1	ADAPTER, M14 x 1.5 TO 1/8" NPT, ISSPRO, R7963	21977



UNLESS OTHERWISE SPECIFIED
ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
125	MACHINE TOLERANCES .X ± 0.06 .XX ± 0.010 .XXX ± 0.001 WELD TOLERANCES .X ± 0.25 .XX ± 0.12 .XXX ± 0.06	MACHINE TOLERANCES X ± 1.5 X.X ± 0.5 X.XX ± 0.05 WELDED TOLERANCES X ± 5 X.X ± 3 X.XX ± 1.50

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

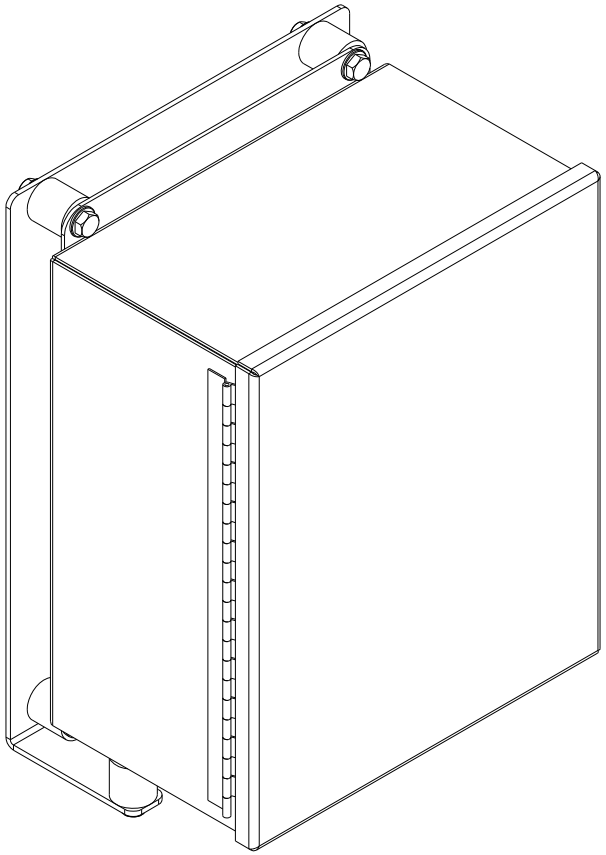
ASSEMBLY, LUBE OIL TEMPERATURE
CFP15E

DWG UNITS: IN/LB/S
DRAWN BY: PBS
DATE: 29FEB2012
PRO-ENGINEER
INIT ECO: 2012-077
EST WEIGHT: 42238.628
SCALE: 1.000
SHEET 1 OF 1
DRAWING NO: 21477

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2012-164	21977 WAS 12181-M14-2	PBS	27APR2012

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	MODULE, DIGITAL PANEL EXPANSION, AUTO CAD CONTROLLED	18485
2	6	ISOLATOR, PLATE MOUNT, 5/16-18x1x1 NEOPRENE, TECH PRODUCTS #51272	13011
3	8	SCREW,HH, 0.31-18x0.50	20231-050
4	4	SCREW,HH, 0.31-18x0.75	20231-075
5	1	WIRING, JUMPER, MODBUS, DPEM OPTION, AUTO CAD CONTROLLED	21573
6	1	BRACKET, DPEM PANEL ISOLATOR, CFP15E	21693
7	12	WASHER,FLAT,SMALL, 0.31	WASHER_FLAT_SAE_031



UNLESS OTHERWISE SPECIFIED
ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
125	MACHINE TOLERANCES .X = ± 0.06 .XX = ± 0.010 .XXX = ± 0.001 WELD TOLERANCES .X = ± 0.25 .XX = ± 0.12 .XXX = ± 0.06	MACHINE TOLERANCES X = ± 1.5 X.X = ± 0.5 X.XX = ± 0.05 WELDED TOLERANCES X = ± 5 X.X = ± 3 X.XX = ± 1.50

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, DPEM AND HARNESS

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 22MAR2012

PRO-ENGINEER

INIT ECO: 2012-089

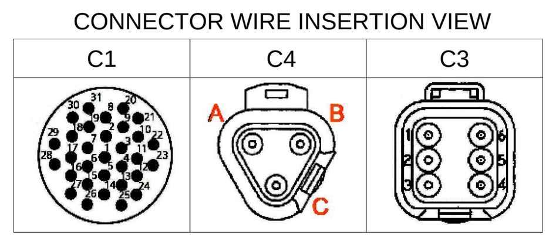
EST WEIGHT: 42238.628

SCALE: 0.250

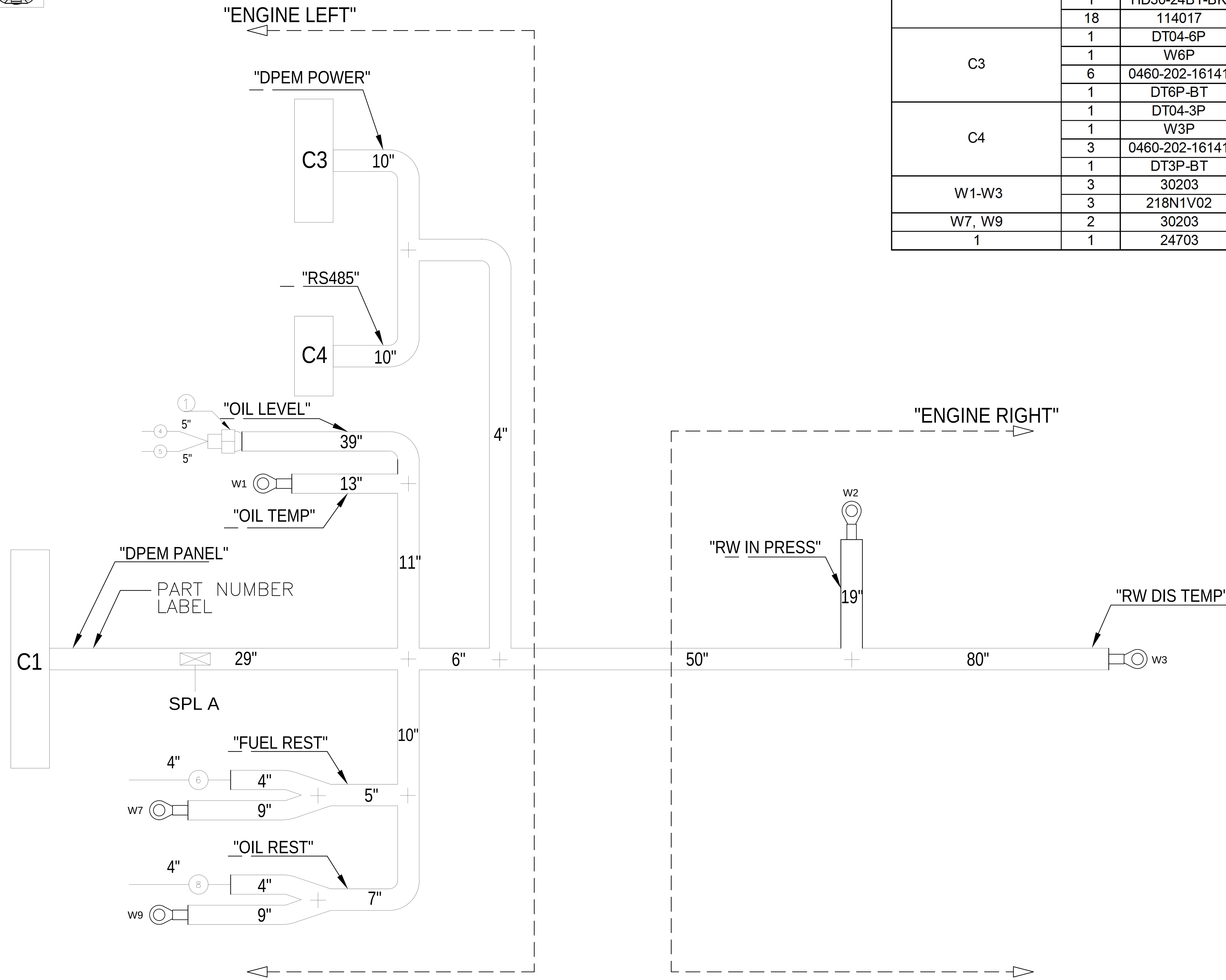
SHEET 1 OF 1

DRAWING NO: 21662

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2012-120	ADDED BRACKET, ISOLATORS AND HARDWARE	PBS	28MAR2012



TAGS	QTY	CATALOG	MFG	DESCRIPTION
C1	1	HDP26-24-31-SE	DEUTSCH	CONNECTOR, PLUG, 31 POSITION
	13	0462-201-16141	DEUTSCH	TERMINAL, SOCKET, NICKEL, 16-20 AWG
	1	HD30-24BT-BK	DEUTSCH	BOOT, BLACK
	18	114017	DEUTSCH	PLUG, SEALING
C3	1	DT04-6P	DEUTSCH	CONNECTOR, RECEPTACLE, 6-WAY DT SERIES
	1	W6P	DEUTSCH	WEDGELOCK, GREEN, DT SERIES
	6	0460-202-16141	DEUTSCH	CONTACT, SIZE 16, NICKEL, PIN
	1	DT6P-BT	DEUTSCH	BOOT, GRAY
C4	1	DT04-3P	DEUTSCH	CONNECTOR, RECEPTACLE, 3-WAY DT SERIES
	1	W3P	DEUTSCH	WEDGELOCK, GREEN, DT SERIES
	3	0460-202-16141	DEUTSCH	CONTACT, SIZE 16, NICKEL, PIN
	1	DT3P-BT	DEUTSCH	BOOT, GRAY
W1-W3	3	30203	WAYTEK	TERMINAL, RING, #10, 18-22 AWG, NON-INSULATED
	3	218N1V02	VTE	CAP, LUG AND RING TERMINAL, 200 SERIES
W7, W9	2	30203	WAYTEK	TERMINAL, RING, #10, 18-22 AWG, NON-INSULATED
1	1	24703	WAYTEK	STRAIN RELIEF, DOME NUT, BRASS, 1/2" NPT



VENDOR NOTES:
1. LOOM WITH BLACK NYLON BRAID W/ RED TRACERS, 28 MIL MINIMUM.
2. PROMINENTLY LABEL ALL CONNECTORS AS "INDICATED".
3. ALL SPLICES TO BE FITTED WITH GLUED HEAT SHRINK.
4. ALL DIMENSIONS SHOWN ARE MEASURED FROM THE REAR OF THE CONNECTOR (WIRE ENTRY VIEW).
5. RUN BRAID OVER THE BOOT AT LEAST 1" ON ALL CONNECTORS WITH BOOTS TO PREVENT THE BRAID FROM SLIPPING BACK.
6. USE A 3" LONG GLUED HEAT SHRINK ON ALL RING TERMINALS AND RUN THE BRAID 1" OVER THE HEAT SHRINK. WRAP A WIRE LABEL AROUND THE HEAT SHRINK

MANUFACTURING NOTES:
1. OIL LEVEL SWITCHGAGE: WIRE 8 (BLACK) TO COMMON; WIRE 7 (WHITE TO N.O. CONTACT (LOW LEVEL).
2. FUEL FILTER GAUGE: WIRE 6 (RED) TO THE RED WIRE (LEFT/LOW ADJUSTMENT POINT).
   RING TERMINAL TO THE BACK OF THE GAUGE (GROUND THE GAUGE CASE).
   8 IN-HG (STANDARD SETTING IS 10 IN-HG)
3. OIL FILTER GAUGE: WIRE 8 (BLACK) TO THE BLACK WIRE (RIGHT/HIGH ADJUSTMENT POINT).
   RING TERMINAL TO THE BACK OF THE GAUGE (GROUND THE GAUGE CASE).
   20 PSI

REV	ECO	DESCRIPTION OF REVISION	BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

Cummins Fire Power

CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
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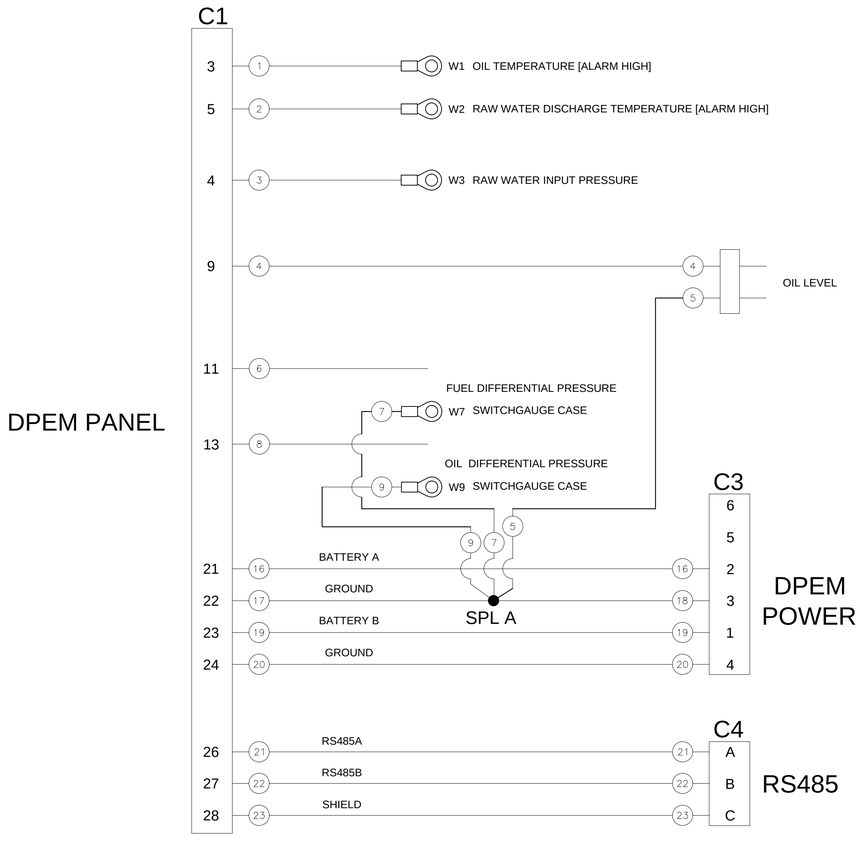
CUSTOM DESIGN AND
UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

HARNESS, DPEM, LH OP
QST30

DWG UNITS: INCH/LB/S	DRAWN BY: BG	DATE: 16MAR2016
	AUTO CAD	INIT ECO: 2016–226
SCALE:	SHEET 1OF2	DRAWING NO: A042G443
EST WEIGHT:		

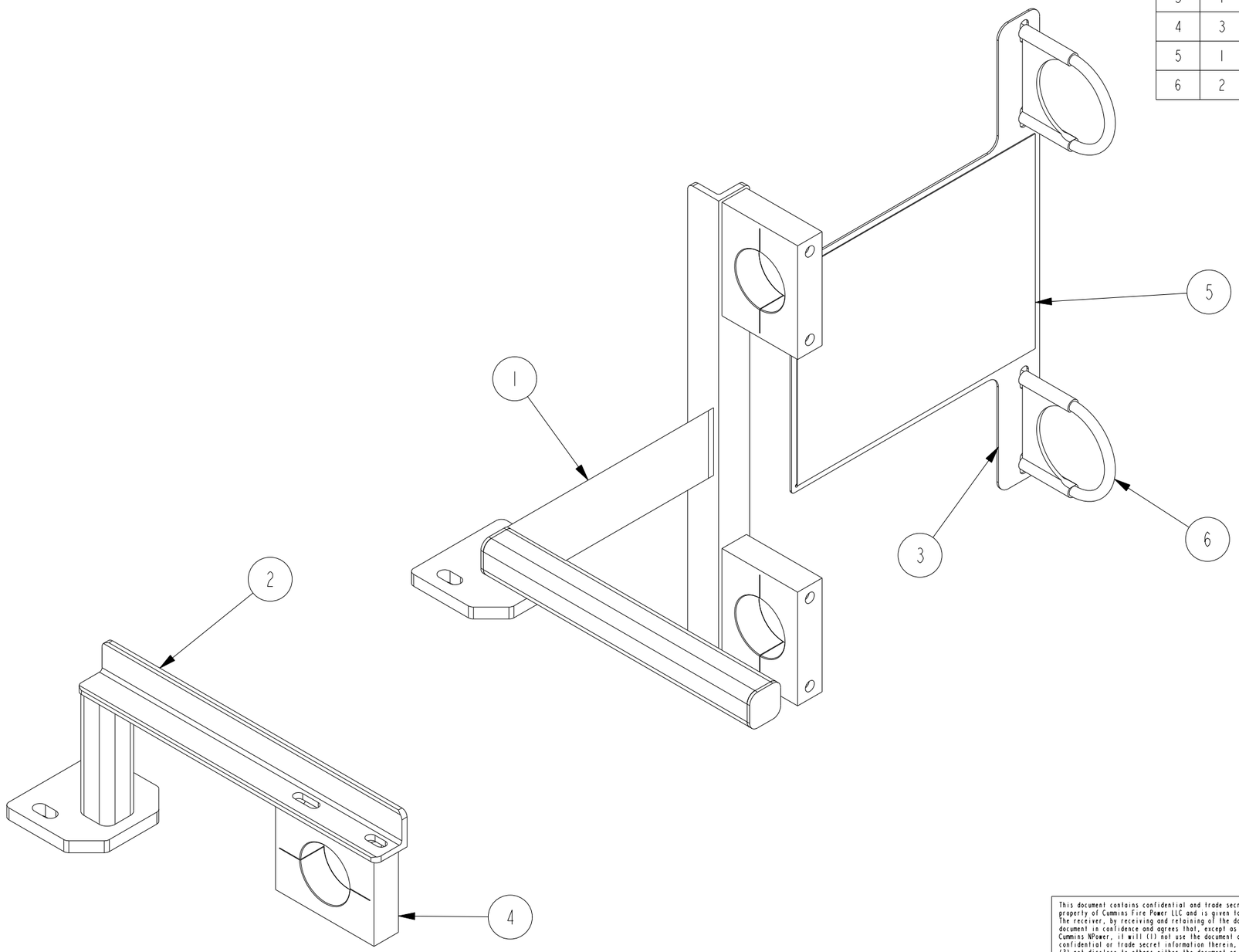


CIRCUIT DATA												
CIRCUIT #	FROM		TO		WIRE COLOR	WIRE SIZE	WIRE TYPE	FROM		TO		STAMP
	CONNECTOR	POSITION	CONNECTOR	POSITION				TERMINAL	SEAL	TERMINAL	SEAL	
1	C1	3	W1	-	WHT	18	GXL	0462-201-16141	-	30203	-	1_OIL_TEMP
2	C1	5	W2	-	WHT	18	GXL	0462-201-16141	-	30203	-	2_RW DIS_TEMP
3	C1	4	W3	-	WHT	18	GXL	0462-201-16141	-	30203	-	3_RW_IN_PRESS
4	C1	9	-	-	WHT	18	GXL	0462-201-16141	-	-	-	4_OIL_LEVEL
5	SPL A	<	-	-	BLK	18	GXL	-	-	-	-	5_OL_COM
6	C1	11	-	-	RED	18	GXL	-	-	-	-	6_FF_REST
7	SPL A	<	W7	-	BLK	18	GXL	-	-	30203	-	7_FF_REST_COM
8	C1	13	-	-	BLK	18	GXL	-	-	-	-	8_OIL_REST
9	C1	11	W9	-	BLK	18	GXL	0462-201-16141	-	30203	-	9_OIL_REST_COM
*												
16	C1	21	C3	2	RED	16	GXL	0462-201-16141	-	0460-202-16141	-	16_BATT_A
17	C1	22	SPL A	>	BLK	16	GXL	0462-201-16141	-	-	-	17_GND
18	SPL A	<	C3	3	BLK	16	GXL	-	-	0460-202-16141	-	18_GND
19	C1	23	C3	1	RED	16	GXL	0462-201-16141	-	0460-202-16141	-	19_BATT_B
20	C1	24	C3	4	BLK	16	GXL	0462-201-16141	-	0460-202-16141	-	20_GND
21	C1	26	C4	A	WHT	24	BELDEN 3105A	0462-201-16141	-	0460-202-16141	-	21_RS485A
22	C1	27	C4	B	BLU	24		0462-201-16141	-	0460-202-16141	-	22_RS485B
23	C1	28	C4	C	SHLD	24		0462-201-16141	-	0460-202-16141	-	23_SHIELD

Fire Power	CUMMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.COM	CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN	
HARNESS, DPEM, LH OP QST30			
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE			
ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS	
THIRD ANGLE PROJECTION	.XX ±.030 .XXX ±.010 .XXXX ±.005 .XXXXX ±.0025	X ±0.8 X.X ±0.25 X.XX ±0.10 X.XXX ±0.05	
DWG UNITS: INCH/LB/S	DRAWN BY: BG	DATE: 16MAR2016	
	AUTO CAD	INIT ECO: 2016-226	
SCALE:	SHEET 2OF2	DRAWING NO: A042G443	
EST WEIGHT:			

REV	ECO	DESCRIPTION OF REVISION	BY	DATE

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	BRACKET, COOLING LOOP, CFP30E	14401
2	1	BRACKET, COOLING LOOP, CFP30E	15120
3	1	PLATE, MOUNTING, COOLANT LOOP TAG, CFP30	14474
4	3	CLAMP,PIPE,2",PLASTIC	15360
5	1	DECAL, VALVE POSITION, CFP30E	23484
6	2	CLAMP, U-BOLT, GUILLOTINE, 3.00"	89545K



REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2015-045	ADDED 14474, 23484, 89545K	PBS	19JAN2015

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

	IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES	.XX = ± 0.010 .XXX = ± 0.005	.X = ± 0.4 .XX = ± 0.2
FORM TOLERANCES	.XX = ± 0.030 .XXX = ± 0.015	.X = ± 0.8 .XX = ± 0.4
FAB TOLERANCES	.XX = ± 0.060 .XXX = ± 0.030	.X = ± 1.5 .XX = ± 0.8

Cummins Fire Power

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WHITE BEAR LAKE, MN
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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

MISCELLANEOUS PIPING
CFP30E

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 06MAR2014

PRO-ENGINEER

INIT ECO: 2014-115

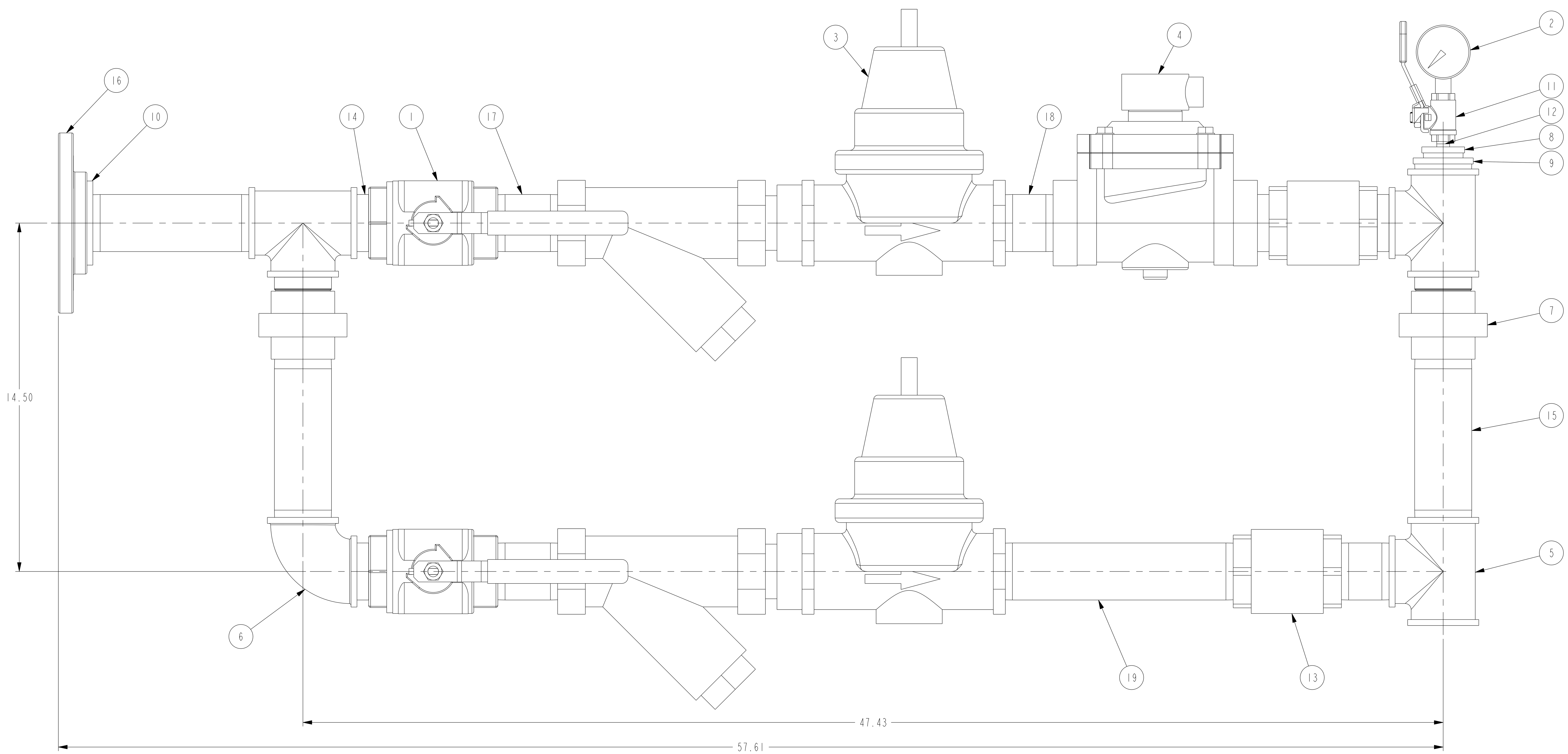
SCALE: 0.250

EST WEIGHT: 42238.628

SHEET 1 OF 1

DRAWING NO: A042A568

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	VALVE, MARINE GRADE, 1-1/4" NPT	15759-32
2	1	GUAGE, 0-100 PSI, 1/4" NPT STN STL	13113
3	2	REGULATOR/STRAINER, 2" NPT, SEA WATER COMPATIBLE	13684
4	1	VALVE, SOLENOID, 2" NPT, 24VDC, 5-150 PSI	13904
5	3	TEE, MARINE GRADE, 2" NPT	15755-32
6	1	ELBOW, MARINE GRADE, 2" NPT	15756-32
7	2	UNION, NAVAL BRONZE, 2" NPT	15757-32
8	1	BUSHING, MARINE GRADE, 1-1/4" x 1/4"	15758-20-4
9	1	BUSHING, MARINE GRADE, 2" x 1-1/4"	15758-32-20
10	1	BUSHING, MARINE GRADE, 3" x 2"	15758-48-32
11	1	VALVE, BALL, 1/4" NPT,, APOLLO 77-100 (MARINE)	15759-04
12	1	NIPPLE, NAVAL BRONZE, 1/4" X CLOSE	15760
13	2	CHECK VALVE, MARINE GRADE, 2" NPT	15768-32
14	6	NIPPLE, 2" X 2", COPPER NICKEL	16490
15	3	NIPPLE, MARINE GRADE, 2" X 8"	17574
16	1	FLANGE, NAVAL BRONZE, NPT X ANSI, 3" 150#	17578
17	2	NIPPLE, MARINE GRADE, 2" X 4"	17580
18	2	NIPPLE, MARINE GRADE, 2" X 3-1/2"	17582
19	1	NIPPLE, 2" NPT x 11", SEA WATER COMPATIBLE	A042D795



NOTES:
1. PRESSURE REGULATORS TO BE SET AT 75 PSI
2. TEST FINAL ASSEMBLY AT 113 PSI

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005; FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015; FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2; FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4; FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

Cummins Fire Power

CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

COOLING LOOP, 2", 24V
SEA WATER COMPATABLE

DWG UNITS: IN/LB/S	DRAWN BY: PBS	DATE: 20JAN2015
	PRO-ENGINEER	INIT ECO: 2015-045
SCALE: 0.375	SHEET 1 OF 2	DRAWING NO: A042D794
EST WEIGHT: 157.774		

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
17576			2" 24VDC, Sea Water			
	15759-32	Apollo, 77-108-01	2" ball valve			
				lever and grip	steel, zinc plated w/vinyl	
				stem packing	MPTFE	
				stem bearing	RPTFE	
				ball	chrome plated	ASTM B16
				seat	RPTFE	
				retainer		ASTM B524-C84400
				gland nut		ASTM B16
				stem		ASTM B16
				lever nut	steel, zinc plated	
				body seal	PTFE	
				body		ASTM B524-C84400
	13113	Grainger, 4RY95	pressure gauge			
				case	stainless steel	
				socket	316 stainless steel	
				tube	316 stainless steel	
				lens	polycarbonate	
				ring	316 stainless steel	
	13684	Wilkins, 500SBRHLRSW	2" regulator/strainer			
				body	cast bronze	ASTM B584
				access covers	cast bronze	ASTM B584
					brass	ASTM B16
				fasteners	300 series stainless steel	
				stem & plunger	cast bronze	ASTM B584
					brass	ASTM B16
				elasttomers	Buna Nitrile	FDA approved
					EPDM	FDA approved
				cap gaskets	natural vulcanized fibre	
					Acetal (Delrin 500)	NSF Listed
				springs	oil tempered wire	ASTM A229
				strainer screen	300 series stainless steel	
				seat	300 series stainless steel	
	13904	GC Valves, S211GF16J7JJ2	2" NPT 24V solenoid valve			
				valve boby/bonnet	316 stainless steel	ASTM A351 CF8M
				plunger tube -tub head	430FR	ASTM A838 alloy 2
				tube head shading ring	commercial grade silver	ASTM B742-90
				plunger tube	304 stainless steel	ASTM A269
				valve plunger	430FR	ASTM A838 alloy 2
				plunger spring	302 stainless steel	ASTM 313-08
				diaphragm spring	302 stainless steel	ASTM 313-08
				diaphragm dish plate	304 stainless steel	ASTM A276-13
				pilot orifice insert	304 stainless steel	ASTM A240
				diaphragm hardware - M6 screw	18-8 stainless steel	ASTM F837M
				diaphragm hardware - lock washer	18-8 stainless steel	ASTM B18.21.1
				diaphragm hardware - nut	18-8 stainless steel	ASTM F593-85
	15755-32		2" tee		Copper Alloy	ASTM B62-09
	15756-32		2" elbow		Copper Alloy	ASTM B62-09
	15757-32		2" union		Copper Alloy	ASTM B62-09
	15758-48-32		3" x 2" bushing		Copper Alloy	ASTM B62-09
	15759-04	Apollo, 77-101-01	1/4" ball valve			
				lever and grip	steel, zinc plated w/vinyl	
				stem packing	MPTFE	
				stem bearing	RPTFE	
				ball	chrome plated	ASTM B16
				seat	RPTFE	
				retainer		ASTM B16
				gland nut		ASTM B16
				stem		ASTM B16
				lever nut	steel, zinc plated	
				body seal	PTFE	
				body		ASTM B524-C84400
	15760		1/4" close nipple		Copper Alloy	ASTM B62-09
	15768-32	Watts, series 600	2" check valve			
				body	bronze	
				guide bushing	stainless steel	
				spring	stainless steel	
				check	brass	
				seat	PTFE	
				O-ring	Nitrile	
				adapter	bronze	
	16490		2" x 2" nipple		Copper Alloy	ASTM B62-09
	17574		2" x 8" nipple		Copper Alloy	ASTM B62-09
	17578		3" ansi flange		Copper Alloy	ASTM B62-09
	17580		2" x 4" nipple		Copper Alloy	ASTM B62-09
	17582		2" x 3-1/2" nipple		Copper Alloy	ASTM B62-09
	15758-20-4		1-1/4" x 1/4" bushing		Copper Alloy	ASTM B62-09
	15758-32-20		2" x 1-1/4" bushing		Copper Alloy	ASTM B62-09
	A042D795		2" x 11" nipple		Copper Alloy	ASTM B62-09

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES 125

IMPERIAL UNITS	METRIC UNITS
MACHINE TOLERANCES .XX ± 0.010	MACHINE TOLERANCES .XX ± 0.25
FOR TOLERANCES .XXX ± 0.005	FOR TOLERANCES .XXX ± 0.127
FOR TOLERANCES .XXXX ± 0.0005	FOR TOLERANCES .XXXX ± 0.013

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

Fire Power

CUMMINS FIRE POWER LLC
CORPORATE OFFICE:
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

COOLING LOOP, 2", 24V
SEA WATER COMPATABLE

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 20JAN2015

PRO-ENGINEER

INIT ECO: 2015-045

SCALE: 0.375

EST WEIGHT: 157.774

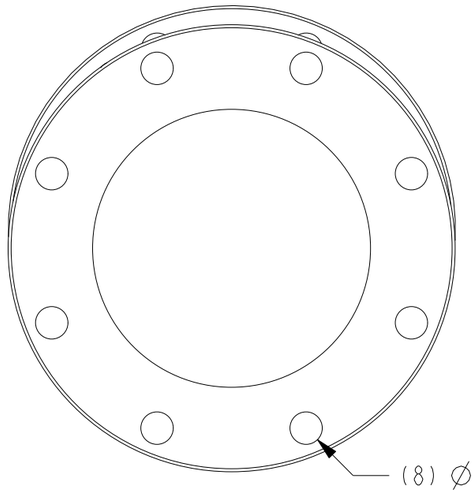
SHEET 2 OF 2

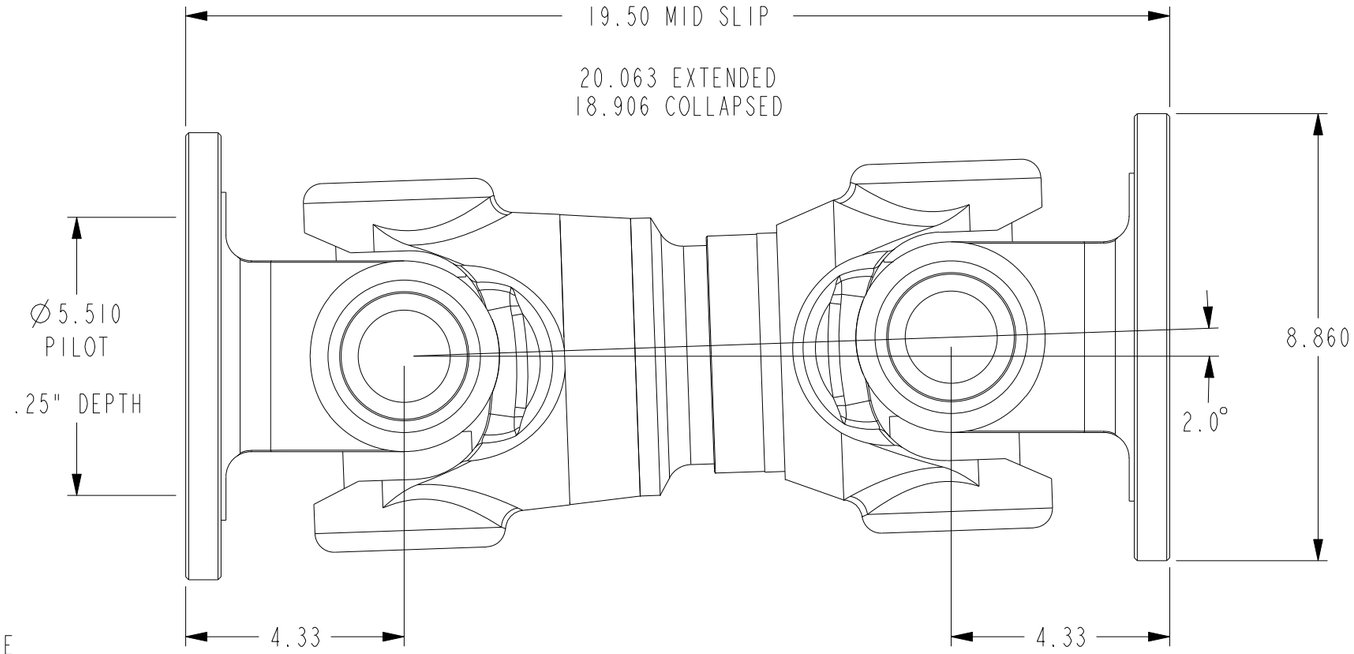
DRAWING NO: A042D794

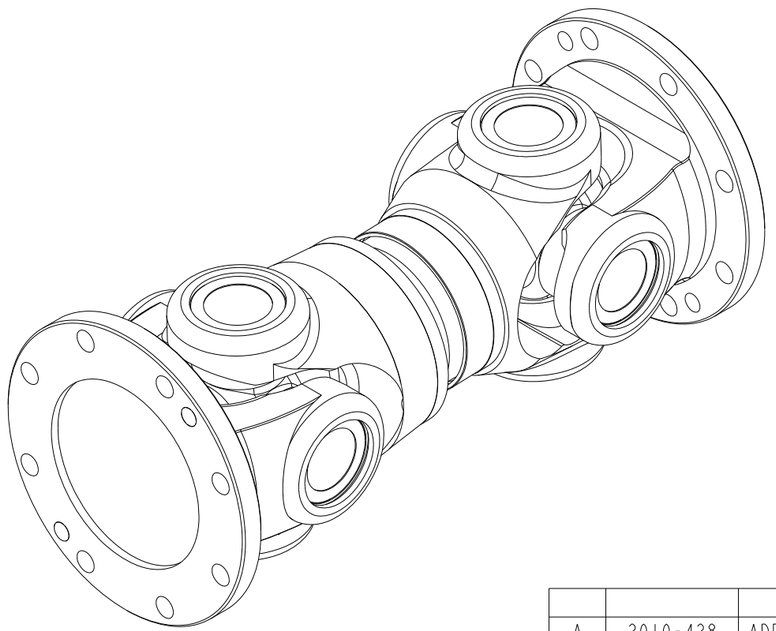
A

MASS ELASTIC DATA

STIFFNESS: 1.012x10^-4 deg/Nm
INTERTIA: .1565 Kg/m^2
WEIGHT : 125 LBS







UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

MACHINE TOLERANCES
.XX = ± 0.010
.XXX = ± 0.005
FORM TOLERANCES
.XX = ± 0.030
.XXX = ± 0.015
FAB TOLERANCES
.XX = ± 0.060
.XXX = ± 0.030

MACHINE TOLERANCES
.X = ± 0.4
.XX = ± 0.2
FORM TOLERANCES
.X = ± 0.8
.XX = ± 0.4
FAB TOLERANCES
.X = ± 1.5
.XX = ± 0.8

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2010-428	ADD MASS ELASTIC DATA	S DUBICK	09-20-10

Cummins Fire Power

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1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
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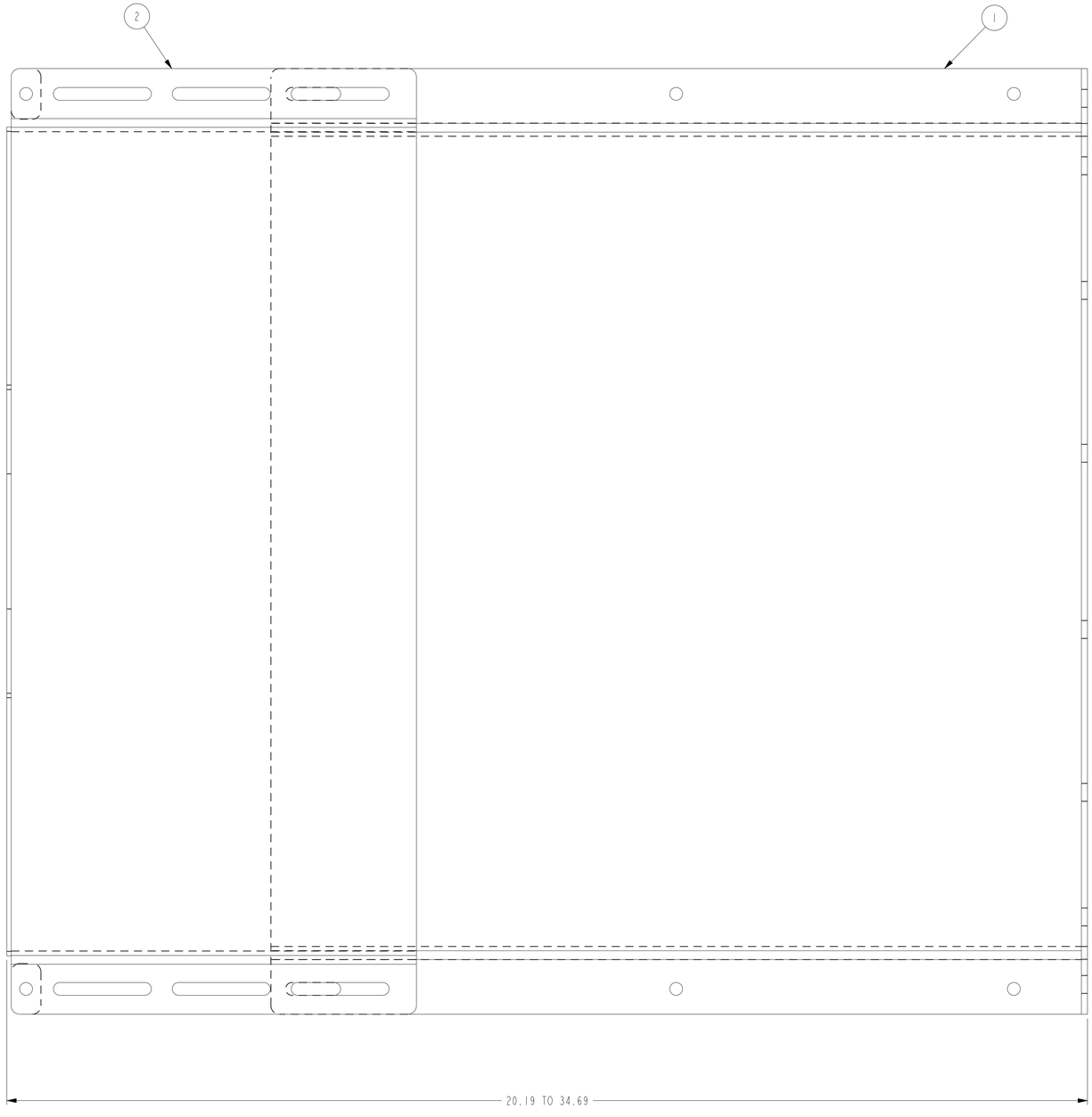
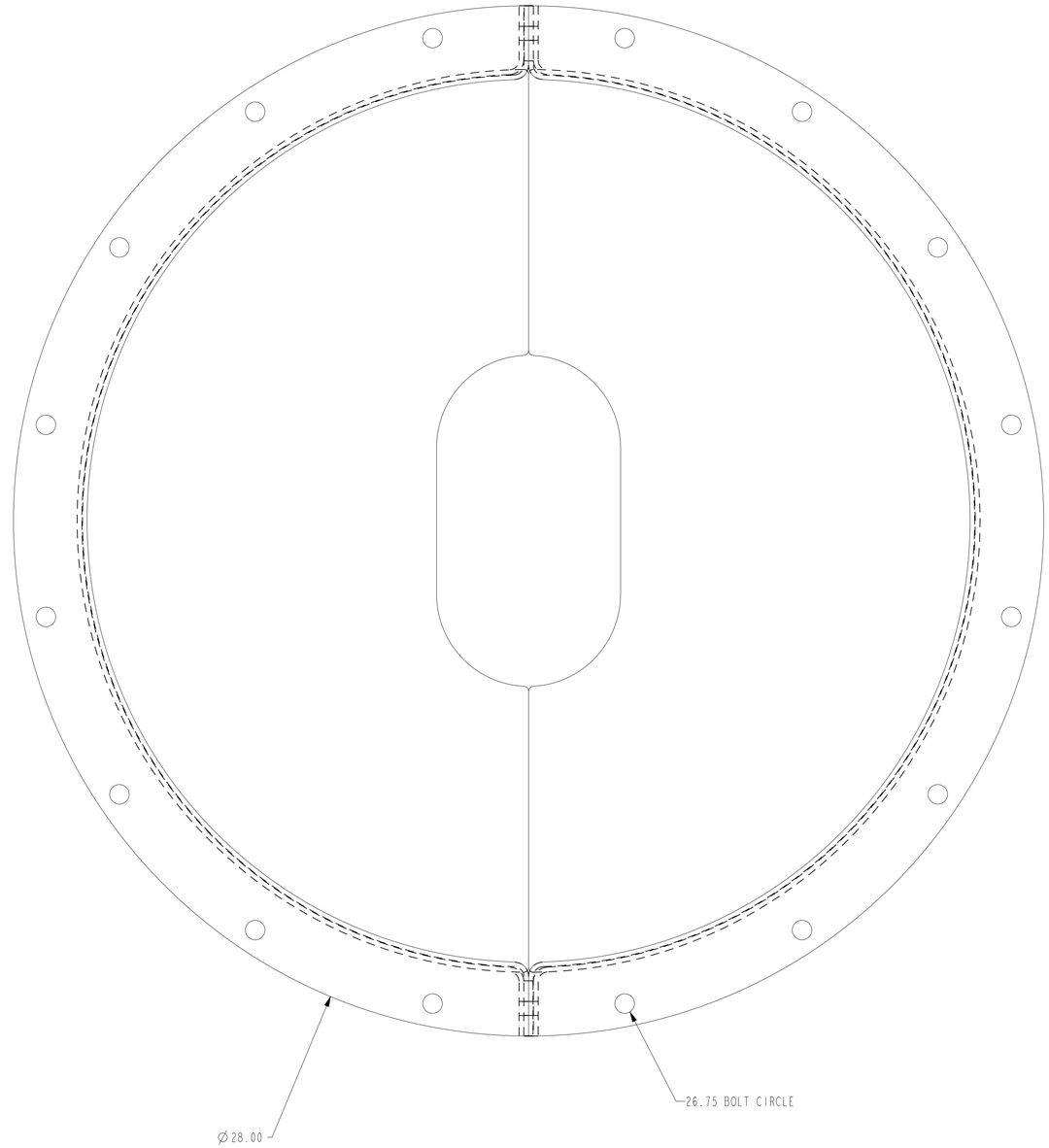
CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

DRIVESHAFT, APT225 SHORT COUPLED
U3200 SERIES

DWG UNITS:
DRAWN BY: S DUBICK
DATE: 11-11-09
PRO-ENGINEER
INIT ECO:
SCALE: 0.333
EST WEIGHT:
SHEET 1 OF 1
DRAWING NO: 13508

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	GUARD SECTION, SAE 0	A042A572
2	2	GUARD, END, SAE 0	A042A576





Cummins Fire Power

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1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

GUARD, SHAFT
SAE 0

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

	IMPERIAL UNITS	METRIC UNITS
MACHD TOLERANCES	.XX ± 0.02	X ± 0.5
FORM TOLERANCES	.XX ± 0.05	X ± 0.1
FAB TOLERANCES	.XX ± 0.06	X ± 0.2

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 28FEB2014

PRO-ENGINEER

INIT ECO: 2014-115

SCALE: 0.500

SHEET 1 OF 1

DRAWING NO: A042A569

EST WEIGHT: 42238.628

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

LEGEND:
OSS = OVER SPEED SWITCH
CTS = CRANK TERMINATION SWITCH
MBC1 = MAIN BATTERY CONTACTOR 1
MBC2 = MAIN BATTERY CONTACTOR 2
LCT = LOW COOLANT TEMPERATURE
HCT = HIGH COOLANT TEMPERATURE
LOP = LOW OIL PRESSURE
RWS = RAW WATER SOLENOID
RWHIT = RAW WATER HIGH INLET TEMP
CRWCLS= CLOGGED RAW WATER COOLING LOOP STRAINER
ECMW = ELECTRONIC CONTROL MODULE WARNING
ECMF = ELECTRONIC CONTROL MODULE FAILURE

CONTROL PANEL ENCLOSURE

CONNECTOR C1
RS485+ 21
RS485- 22
GROUND 16
TO OPTIONAL DIGITAL PANEL EXPANSION MODULE

POWER BOARD 15153

PUMP CONTROLLER CONNECTIONS
1 AUTO
2 CTS
3 OSS
4 LOP
5 HCT
6 BATT A
8 BATT B
9 MBC1
10 MBC2
11 GND
301 ECM B
302 FIM
303 ECMW
304 ECMF
310 RWHIT
311 CRWCLS
312 LCT

I2C ECM B
I/O XPDR
FIM
ECMW
ECMF
RWHIT
CRWCLS
OSS
CTS
MBC1
MBC2
MANUAL
KEYSWITCH
AUTO
LCT
LOP
HCT
INC
DEC
I2C
Vr
B+

CHARGE GND 4
EXCITE 14
MCB1 12
MCB2 13
BATT B 2
BATT A 1
LCT 19
LOP 10
HCT 11
SYS GND 3
RWS 15
J1587+ 18
J1587- 20
J1587S 23

ENGINE CONNECTIONS
BATTERY ISOLATOR
B+
ALT
D+
STARTER
S
B
XFR
CR A
CR B
POS
NEG
BAT A
BAT B
LCT
SHOWN IN "LOW OIL PRESS" STATE (OR ENGINE NOT RUNNING)
SHOWN IN "NORMAL TEMP" STATE (OR ENGINE NOT RUNNING)
NC (ENERGIZE TO RUN)

Control Panel

DISPLAY BOARD 15152
RS485
I2C
J1939

NON-ISOLATED CPU
CTS
OSS
I2C

ECM SWITCH BOARD 15154
ECM SWITCH
KEYSWITCH
ECM SELECT
ECM RETURN
INC
DEC

ECM A

ECM POWER BOARD 15155
BATT A
BATT B

NOTES: 1) SEE SHEET 2 FOR CFP30E ECM SWITCH SCHEMATIC

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION
WHOLE TOLERANCES .XX = ± 0.03 | WHOLE TOLERANCES X = ± 1
DEC TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 | DEC TOLERANCES X.X = ± 0.25 X.XX = ± 0.13
FRN TOLERANCES .XX = ± 0.005 .XXX = ± 0.000 | FRN TOLERANCES X.X = ± 0.13 X.XX = ± 0.00

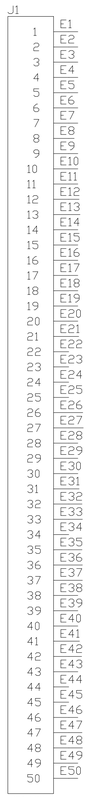
REV	ENF	DESCRIPTION OF REVISION	BY	DATE

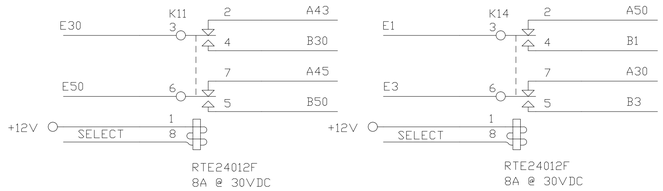
Fire Power
CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

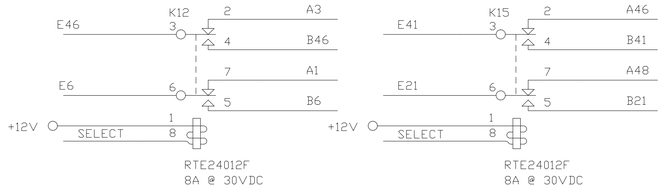
CUSTOM DESIGN AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

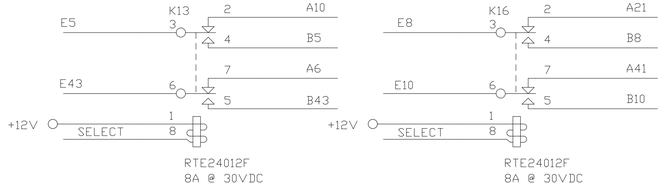
SCHEMATIC, FIRE PUMP DRIVERS
CFP MODELS: 30E

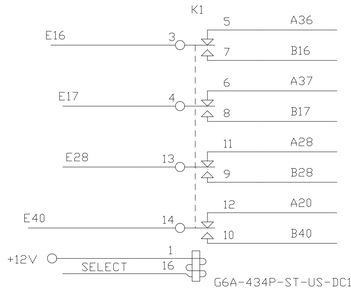
DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 1JUN2016
AUTO CAD
INIT ECO: 2016-413
SCALE:
EST WEIGHT:
SHEET 10F2
DRAWING NO: A042G984

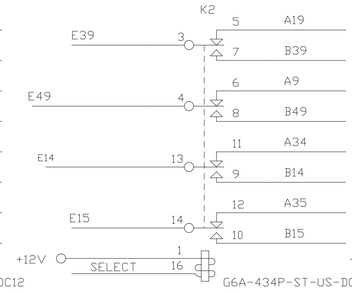


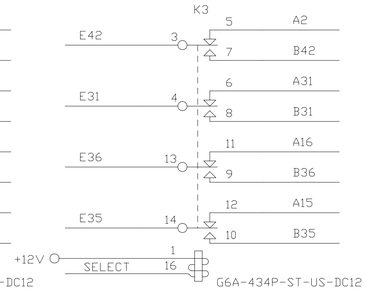


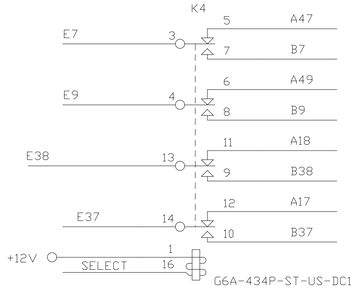


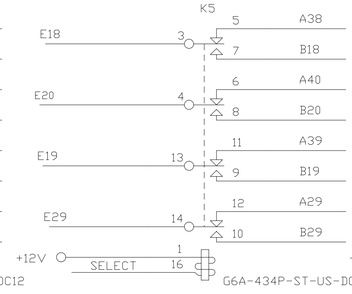


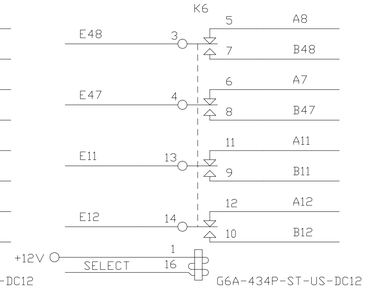


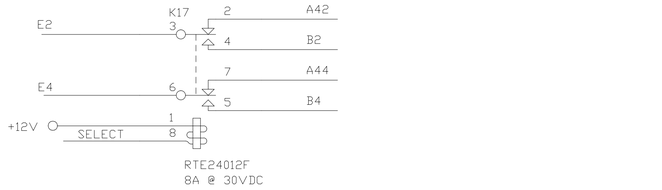


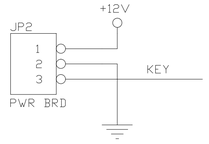


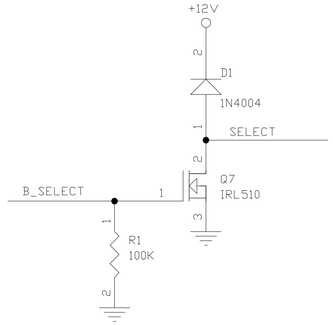


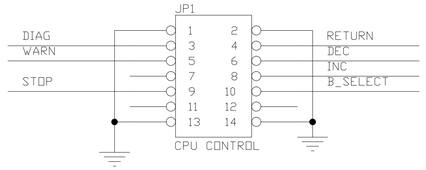


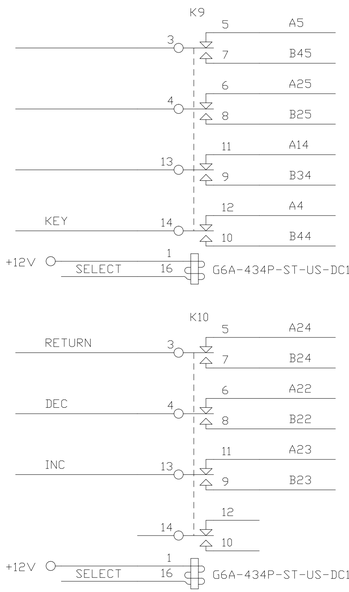


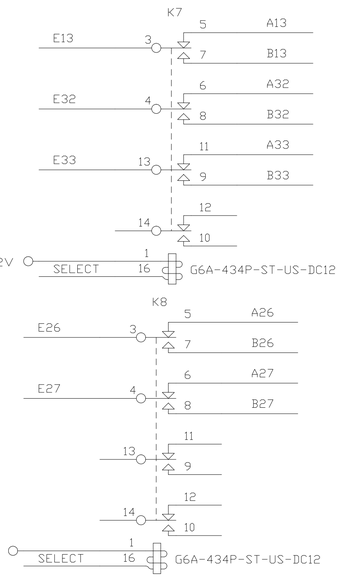


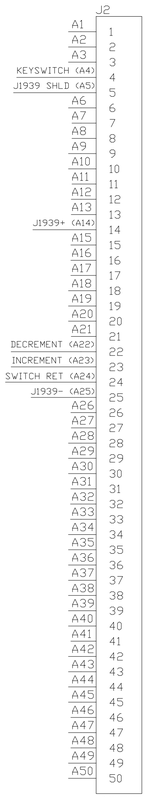


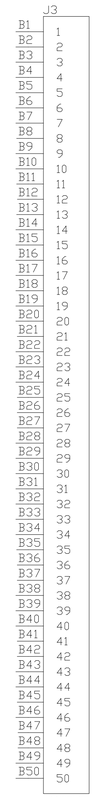












UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

IMPERIAL UNITS

MACHINE TOLERANCES
.XX = ± 0.010
.XXX = ± 0.005

FORM TOLERANCES
.XX = ± 0.030
.XXX = ± 0.015

PAR TOLERANCES
.XX = ± 0.060
.XXX = ± 0.030

METRIC UNITS

MACHINE TOLERANCES
X = ± 0.4
.XX = ± 0.2

FORM TOLERANCES
X = ± 0.8
.XX = ± 0.4

PAR TOLERANCES
X = ± 1.5
.XX = ± 0.8

THIRD ANGLE PROJECTION

REV	ENF	DESCRIPTION OF REVISION	BY	DATE

Cummins Fire Power

CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SCHEMATIC, ECM SWITCH CFP30E FIRE PUMP DRIVER

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

AUTO CAD

DATE: 1JUN2016

INT ECO: 2016-413

SCALE:

EST WEIGHT:

SHEET 20F2

DRAWING NO: A042G984