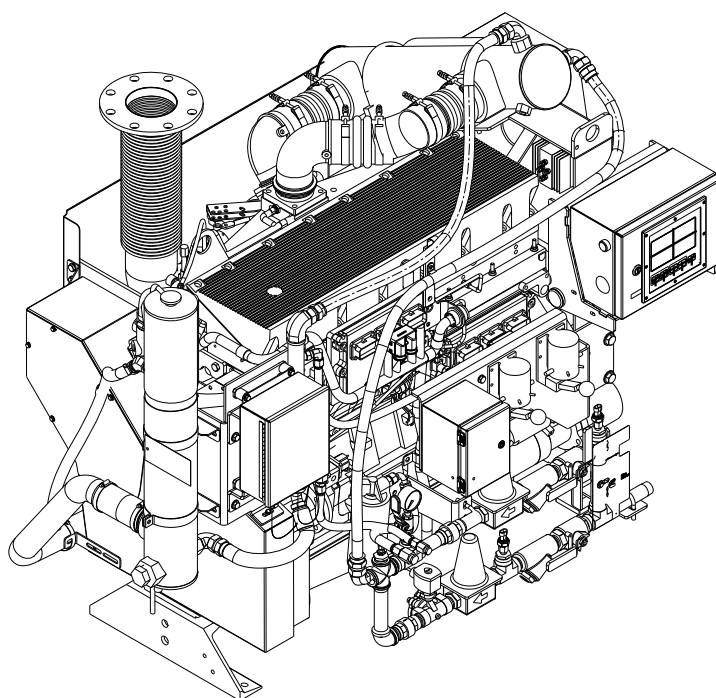




Fire Pump Drive Engines CFP11E Series

Operation and Maintenance Manual





This manual contains proprietary information to equipment produced by Cummins Sales and Service and Cummins Inc. and is being supplied solely for the purpose of operating, maintaining, and servicing the fire pump drive engine purchased from Cummins Sales and Service in De Pere, Wisconsin.

Please visit us at power.cummins.com/fire-power to view the English version of this manual in color, as well as experience a wealth of information about Cummins fire pump drive engines.



This product has been manufactured under the controls established by a Bureau Veritas Certification approved management system that conforms with ISO 9001:2015.



Fire Pump Drive Engine

Limited Warranty

Description

This limited warranty applies to all Cummins fire pump drive engines (hereinafter referred to as "Cummins" branded fire pump drive engines 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 eighteen (18) months after factory ship date, whichever is sooner.

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

Cummins Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins 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 a Cummins distributor or dealer within thirty (30) days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins 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 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.
- 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.

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.
- Block heaters are warranted for one (1) year from date in service

Please contact your local Cummins Sales and Service 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 Right to Failed Components:

Failed components claimed under warranty remain the property of Cummins. Cummins 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 INC. IN REGARD TO THE PRODUCT. CUMMINS INC. MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT IS CUMMINS INC. 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.

See the Cummins Inc. warranty bulletins for additional base engine warranty details: [US & Canada: 3381321](#)
[International: 3381322](#).



Cummins fire pump drive engines have been manufactured under the controls established by a Bureau Veritas Certification approved management system that conforms with ISO 9001:2015.



Cummins Sales and Service
875 Lawrence Drive
DePere, Wisconsin 54115

www.cumminsfirepower.com

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Section 1 - Safety

1.1 Introduction

Cummins 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 used throughout this manual call attention to special information and correct operating procedures. 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 2-2](#) and [Figure 2-3](#) provide visual descriptions of the engine components for this fire pump drive engine.

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

The latest technology and the highest quality components were used to produce this engine. Cummins fire pump drive engines as packaged units (engine and accessories) have been approved by Factory Mutual (FM) Approvals and listed by Underwriters Laboratories (UL), Inc. and Underwriters Laboratories of Canada (ULC). When replacement parts are needed, we recommend using only genuine Cummins parts.



CAUTION

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.

Description

2.2 Fire Pump Drive Engine Nameplate

Each fire pump drive engine is labeled with a nameplate that provides its unique information. A typical fire pump drive engine nameplate is shown in [Figure 2-1](#).




		FIRE PUMP DRIVER ENGINE DATATAG	
MODEL: CFP15E-F40		MFG. YEAR: 2018	
PSN: 99010000		S/O#: SOF7- 210210	
ESN: 79353535			
HP OUTPUT: 575		RATED SPEED: 1760	
SPEED RANGE, IF APPLICABLE MIN HP @ SPEED: N/A MAX HP @ SPEED: N/A HORSEPOWER RATINGS WITHIN THE SPECIFIED SPEED RANGE ARE TO BE DETERMINED BY THE USE OF LINEAR INTERPOLATION BETWEEN THE HORSEPOWER DEVELOPED AT MINIMUM AND MAXIMUM SPEEDS			
INTERNAL COMBUSTION ENGINE FOR DRIVING CENTRIFUGAL FIRE PUMP 19ZG CERTIFIED FOR USE OF SAE DF2 FUEL ONLY AS TESTED PER ANSI/ASTM D975			
			
CONTACT:		CUMMINS SALES & SERVICE DE PERE, WI	
CONTACT PHONE NUMBER:		1 800 236 9750	
POWER.CUMMINS.COM/FIRE-POWER		2534	

Figure 2-1 Fire Pump Drive Engine Nameplate
(Typical)

2.3 Fire Pump Controller

The fire pump controller starts the engine automatically when the Fire Pump Digital Panel (FPDP) is in automatic mode and a remote fire demand signal is received. The fire pump controller automatically shuts down the engine when the fire demand signal is discontinued. The fire pump controller is optionally supplied by Cummins or Cummins Sales and Service.

NOTE: With the fire pump controller in **manual** mode, starting and stopping the fire pump drive engine can be controlled by the FPDP, located on the fire pump drive engine itself.



CAUTION

Upon turning the fire pump controller to OFF, the fire pump drive engine may continue to run at a reduced speed to cool the engine down. To stop the fire pump drive engine at this point - in the case of an emergency - press the Engine STOP button on the FPDP rather than on the pump controller.



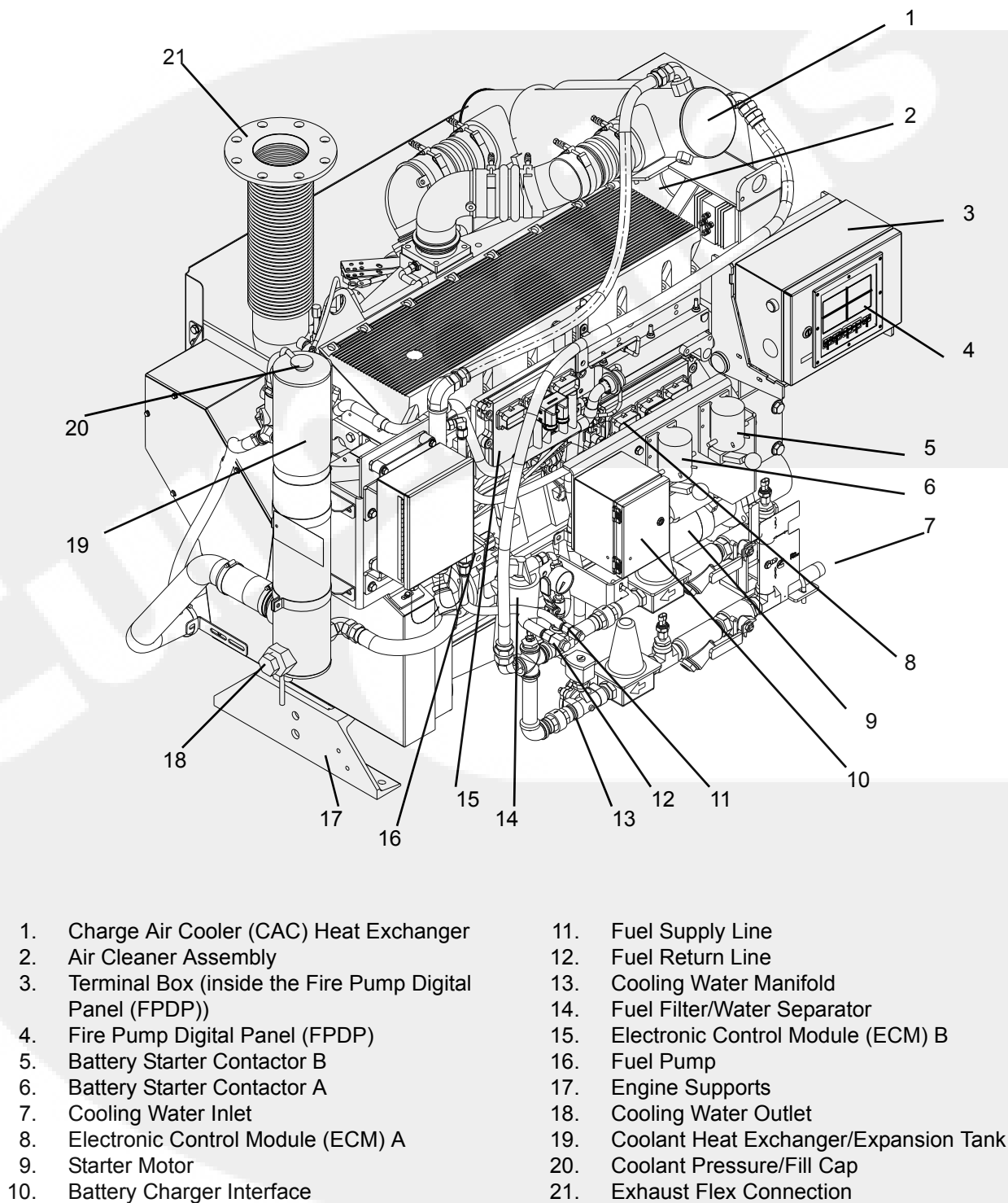
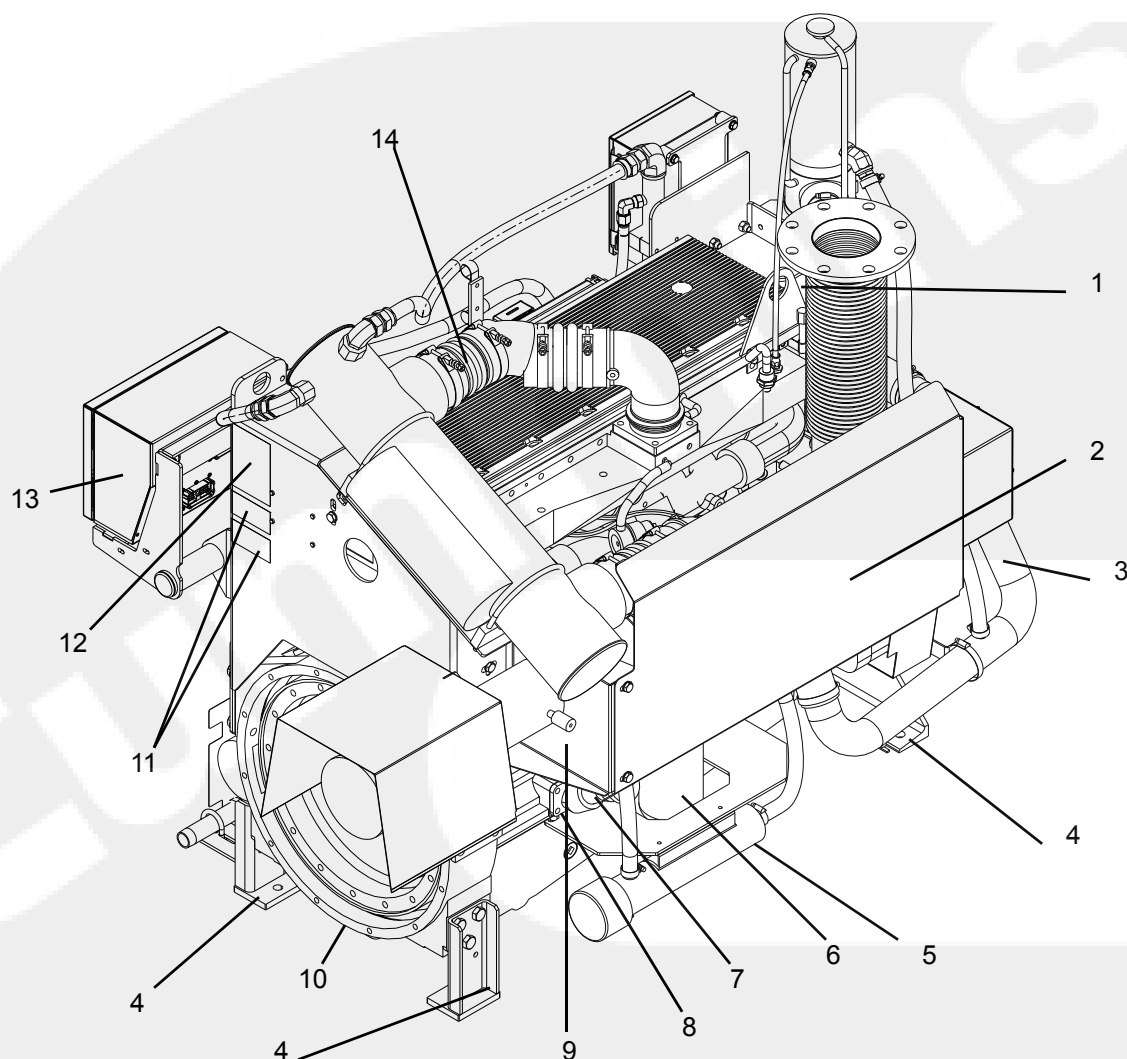


Figure 2-2 Engine Components - Fire Pump Digital Panel (FPDP) Side

Description



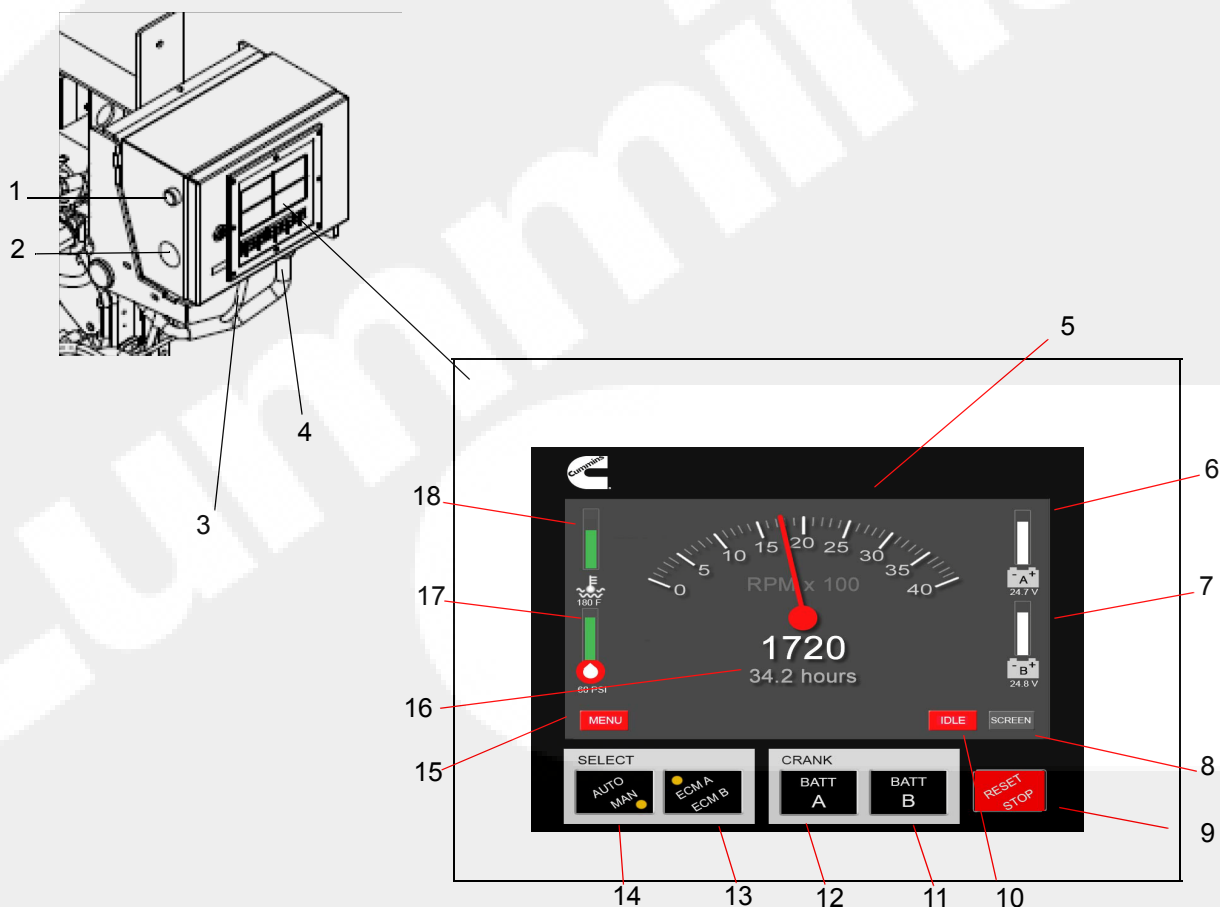
- | | |
|----------------------------|------------------------------------|
| 1. Upper Coolant Hose | 8. Engine Oil Fill Port |
| 2. Manifold Heat Shield | 9. Air Cleaner Service Indicator |
| 3. Lower Coolant Hose/Tube | 10. Flywheel Housing |
| 4. Engine Supports | 11. Engine Speed Setting Decals |
| 5. Engine Coolant Heater | 12. Engine Serial Number Decal |
| 6. Engine Oil Filter | 13. Manual Start Instruction Decal |
| 7. Engine Oil Dipstick | 14. Charge Air Cooler (CAC) Hose |

Figure 2-3 Engine Components - Turbocharger Side

2.4 Fire Pump Digital Panel (FPDP)

The FPDP control panel (shown in Figure 2-4) is mounted on the left-hand side (or right-hand side - optional) of the flywheel end of the engine and contains controls for starting the engine, monitoring engine performance, and controlling fire pump drive engine operation.

In **manual** mode, the FPDP and the Electronic Control Module (ECM) remain active as long as battery power is available. In **automatic** mode, starting and stopping of the engine is controlled by the fire pump controller.



- | | |
|----------------------------|---|
| 1. Engine STOP Button | 11. Crank Battery B Momentary Start Switch |
| 2. Customer Access Port | 12. Crank Battery A Momentary Start Switch |
| 3. Diagnostics Connector | 13. ECM A/ECM B Selector Switch and Indicator Lamps |
| 4. Engine ECM Power Supply | 14. AUTO/MAN Mode Selector Switch and Indicator Lamps |
| 5. Tachometer | 15. MENU Soft Key |
| 6. Battery "A" Voltmeter | 16. Hour Meter |
| 7. Battery "B" Voltmeter | 17. Engine Oil Pressure Gauge |
| 8. SCREEN Soft Key | 18. Coolant Temperature Gauge |
| 9. RESET/STOP Switch | |
| 10. IDLE Soft Key | |

Figure 2-4 FPDP Control Panel

Description

2.4.1 Engine STOP Button

The Engine STOP Button (1) 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.

NOTE: Upon release of the Engine STOP Button, the fire pump drive engine will attempt to restart. If there is still a "pump on demand" signal present from the fire pump controller. The engine must also be stopped at the fire pump controller.

2.4.2 Customer Access Port

The customer access knock-out (2) is located on the left side of the FPDP for ease of access. This is the only 1 in. (25.4 cm) knock-out provided for the pump controller interconnect.

IMPORTANT: If additional holes are placed in the FPDP, all warranty on the fire pump drive engine will be void.

2.4.3 Diagnostics Connector

The Diagnostics Connector (3) is located on the bottom of the FPDP enclosure and is strictly used for Cummins service personnel.

2.4.4 Engine ECM Power Supply

The Engine ECM Power Supply plug-in (4) is located on the lower side of the FPDP to provide unswitched battery power to both ECM A and ECM B.

2.4.5 Tachometer

The Tachometer (5) displays the engine speed in revolutions per minute (RPM) whenever the engine is operating.

2.4.6 Battery "A" and "B" Voltmeters

The Battery "A" (6) and Battery "B" (7) Voltmeters display the charge status - or Voltage Direct Current (VDC) - of the relative battery connections.

2.4.7 SCREEN Soft Key

The SCREEN soft key (8) allows the user to switch to a detailed pop up list of additional analog values (when available): exhaust temperature; cooling loop temperature; cooling loop differential pressure; and J1939 values including: oil temperature; intake manifold temperature; and intake manifold pressure.

2.4.8 RESET/STOP Switch

The RESET/STOP Switch (9) serves multiple purposes:

- To shut off the engine by removing the ECM key-switch/Fuel Shutoff (FSO) valve until the engine speed decelerates to 0 RPM.
- To reset the fire pump drive engine after an over-speed fault has been activated, allowing subsequent restarts of the fire pump drive engine.

2.4.9 IDLE Soft Key

The IDLE soft key (10) allows the user to run an electronic engine at a reduced speed while the FPDP is in manual mode (See [Operation: FPDP Screens and Adjustments in Manual Mode - IDLE Soft Key](#)). When the FPDP AUTO/MAN selector switch is in the MAN position (manual mode), the IDLE soft key will appear and display in red. When the engine idle command is active, the IDLE soft key will display in green.

NOTE: The IDLE soft key is only intended to be used for commissioning or service events.

2.4.10 Crank Battery A and B Momentary Start Switches

The CRANK BATT A (12) and CRANK BATT B (11) momentary start switches engage the starter when the FPDP is in MANUAL mode.

CRANK BATT A energizes battery contactor A and CRANK BATT B energizes battery contactor B. Both CRANK BATT A and CRANK BATT B buttons can be energized at the same time in the event both batteries are weak.

2.4.11 ECM A/ECM B Selector Switch and Indicator Lamps

The ECM A / ECM B selector switch and indicator lamps (13) illuminate in yellow, indicating which ECM is being used to control the engine.

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

If ECM B (alternate position) is selected, ECM B is monitoring and controlling the engine, and the FPDP will indicate that the engine is operating on the alternate ECM.



2.4.12 Automatic or Manual Mode of Operation Selector Switch and Indicator Lamps

The AUTO/MAN selector switch and indicator lamps (14) illuminate in yellow, indicating the operational state of the FPDP.

The MAN selector switch (for manual operation) is only to be selected for engine setup, testing, and emergency and maintenance procedures. When the FPDP is in manual mode, the ECM keyswitch/FSO and raw water solenoids are always activated, except under an overspeed condition.

The AUTO selector switch (for automatic operation) is the normal state of the FPDP, in which the fire pump controller starts and stops the engine. In automatic mode, the fire pump drive engine shuts down or enters engine cool down upon loss of a signal from the fire pump controller.

2.4.13 MENU Soft Key

The MENU soft key (15) on the FPDP display allows the user to open the menu options. A complete list of FPDP screens and their functionality is outlined in the [Operation Section](#) of this manual.

2.4.14 Hour Meter

The Hour Meter (16) maintains a running total of the hours of engine operation (run time).

2.4.15 Engine Oil Pressure Gauge

Based on user parameter screen display selection, the Engine Oil Pressure Gauge (17) displays the engine oil pressure in pounds per square inch (PSI) or kPa. The Engine Oil Pressure Gauge displays by default in three different colors:

- green - when the engine oil pressure is greater than 25 PSI (172 kPa);
- yellow - when the engine oil pressure is between 17 PSI (117 kPa) and 25 PSI (172 kPa); and
- red - when the engine oil pressure is below 16 PSI (110 kPa). *NOTE: Engine oil pressure displayed in red will also be accompanied by a low oil pressure fault. Refer to TB-4.*

2.4.16 Coolant Temperature Gauge

Based on user parameter screen display selection, the Coolant Temperature Gauge (18) displays the engine coolant temperature in degrees Fahrenheit or

degrees Celsius. The Coolant Temperature Gauge displays in three different colors:

- green - when the coolant temperature is between 100-199 °F (38-93 °C);
- yellow - when the coolant temperature is between 200-211 °F (93-100 °C) OR below 100 °F (38 °C). *NOTE: when the coolant temperature is below 100 °F (38 °C), the yellow gauge will also be accompanied by a low coolant temperature fault. Refer to TB-312.; and*
- red - when the coolant temperature is greater than 212 °F (100 °C). *NOTE: the red gauge will also be accompanied by a high coolant temperature fault. Refer to TB-5.*

2.5 FPDP Informational Displays

2.5.1 Fault Code Warning Displays

Fault codes diagnosed by the ECM are displayed in a yellow or red International Organization for Standardization (ISO) symbol and/or overlay box which lies atop the tachometer signal (the engine speed is still digitally displayed) to alert the operator to service the engine as soon as possible. Only the first seven active ECM faults will be displayed in the overlay.

NOTE: To remove the overlay box from atop the tachometer, press the SCREEN Soft Key.

2.5.1.1 Yellow Warning Indicators

The yellow ISO symbol (shown in [Figure 2-5](#)) or the yellow ISO symbol AND a large yellow box covering the tachometer (shown in [Figure 2-6](#)) indicate an engine malfunction that requires timely operator attention.

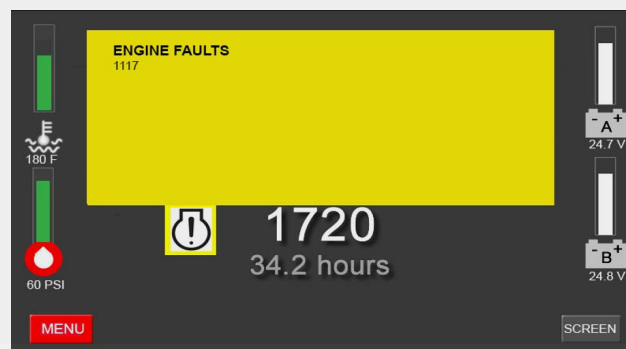


Figure 2-5 Yellow Warning Indicator ISO Symbol Only

Description

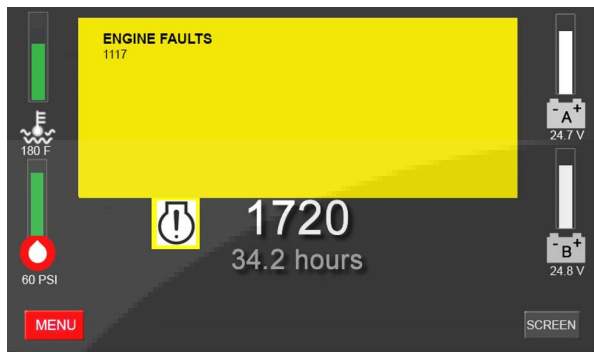


Figure 2-6 Yellow Warning Indicator Symbol and Overlay Box ISO

When applicable, the FPDP may display the Yellow Warning Indicator for any one of the following operational issues:

- The ECM has sensed a **non-mission disabling fault**. A three- or four-digit diagnostic fault code will display on the FPDP which can then be used to help diagnose the engine malfunction. Refer to the Fault Code Chart in the [Fault Codes Section](#) or contact your local Cummins Distributor.
- **Communications have been lost with the ECM**. The FPDP communicates with electronically-controlled engines via J1939. As shown in [Figure 2-7](#), if communications are lost, "J1939 Lost" will appear on the top left of the screen. The warning lamp will also illuminate and the text "NWF" (which stands for "Network Failure") will replace all digital J1939 values, except the tachometer, which will revert to using a mechanical speed sensor for engine speed detection.

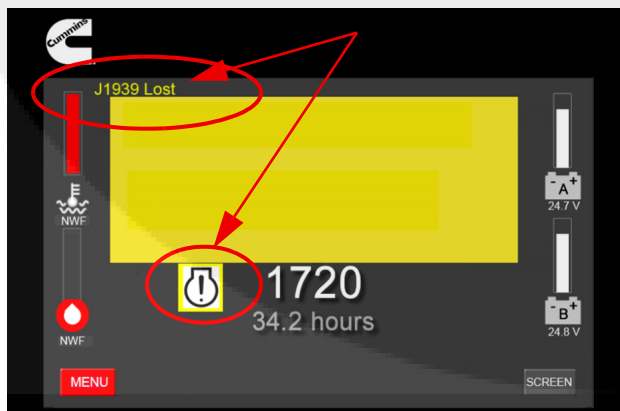


Figure 2-7 Loss of J1939 Communications

- **Communications have been lost with the Digital Panel Expansion Module (DPEM)**. As shown in [Figure 2-8](#), "DPEM Lost" will appear on the FPDP User Interface Screen if communications between the FPDP and DPEM are compromised.

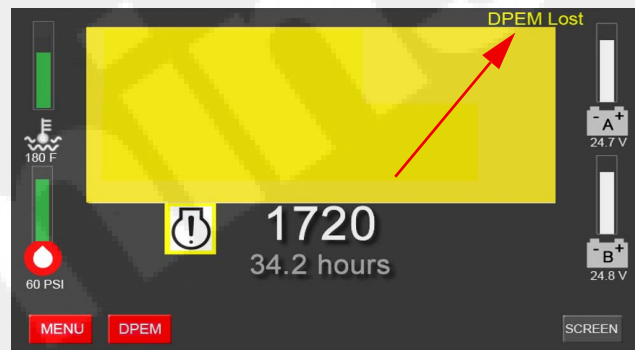


Figure 2-8 DPEM Lost Fault Screen

- A DPEM alarm has been activated.

2.5.1.2 Red Warning Indicators

The red ISO symbol (shown in [Figure 2-9](#)) or the red ISO symbol AND a large red box covering the tachometer (shown in [Figure 2-10](#)) indicate an engine malfunction that requires immediate and decisive operator response. The FPDP will display the Red Warning Indicator when the ECM has sensed a fuel system or ECM-specific diagnostic fault. Refer to the Fault Code Chart in the [Fault Codes Section](#) or contact your local Cummins Distributor.

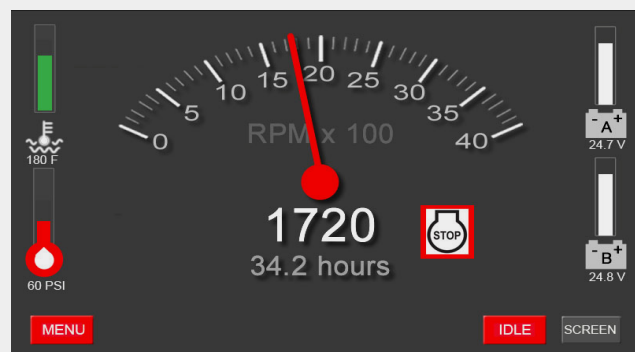


Figure 2-9 Red Warning Indicator ISO Symbol Only

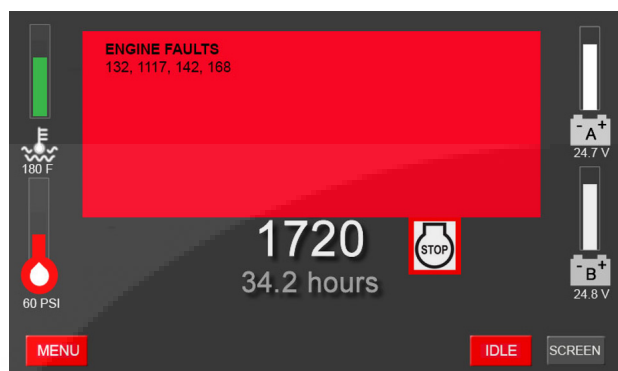


Figure 2-10 Red Warning Indicator ISO Symbol and Overlay Box

2.5.2 Overspeed Warning Indicator

As shown in [Figure 2-11](#), “ENGINE OVERSPEED” flashing in red at the top of the FPDP screen indicates that the engine has exceeded its rated RPM and that possible damage to the sprinkler system may occur. This malfunction 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 diagnose the engine malfunction. Refer to the Fault Code Chart in the [Fault Codes Section](#) or contact your local Cummins Distributor.

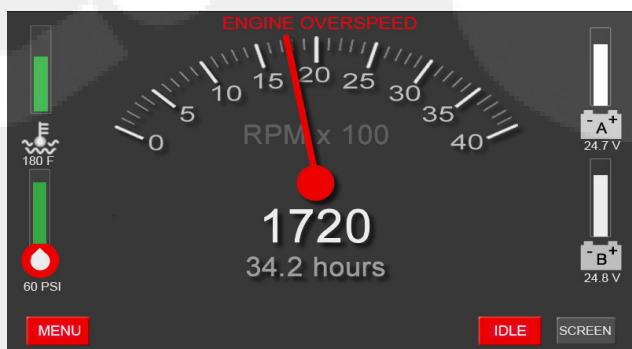


Figure 2-11 Overspeed Warning Indicator

2.5.3 DPEM Fault Screens

When an analog input parameter crosses the alarm setpoint or a switched input is active, the FPDP may display the DPEM fault one of two ways:

- **From the FPDP** - As shown in [Figure 2-12](#), the warning symbol will illuminate and the overlay will activate in yellow with the text of the active fault.

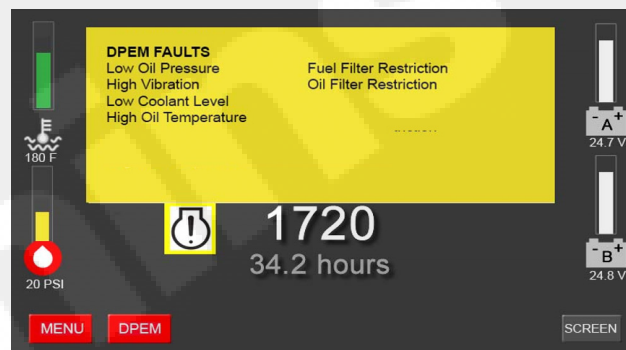


Figure 2-12 DPEM Fault Screen (Sample)

- **From the DPEM/remote location** - The terminal block interface inside of the DPEM has been created for connection to monitor alarms remotely. There is an LED next to each terminal block that will also illuminate if the relay is commanded closed.

Each set of four relays has a common dry contact associated for integration flexibility:

- Terminal Blocks 13-16 (R1-R4) are dedicated to switched inputs, with TB-17 being the common contact
- Terminal Blocks 18-21 (R5-R8) are dedicated to temperature inputs, with TB-22 being the common contact
- Terminal Blocks 23-26 (R9-R12) are dedicated to pressure inputs, with TB-27 being the common contact
- Terminal Blocks 28-31 (R13-R16) are dedicated to additional pressure inputs or J1939 setpoints, with TB-32 being the common contact

As shown in [Figure 2-13](#), “DPEM Lost” will appear on the FPDP screen if communications between the FPDP and DPEM are compromised.

Description

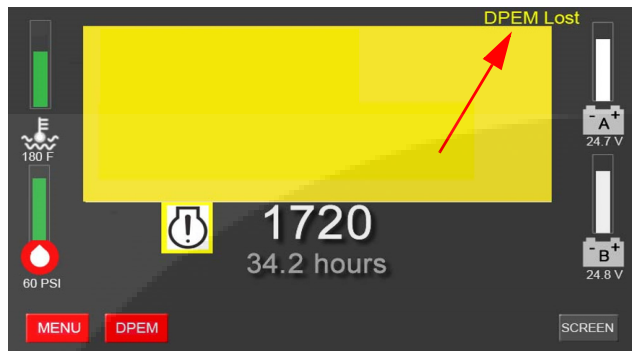


Figure 2-13 DPEM Lost Fault Screen (Sample)

2.6 Electronic Control Module (ECM)

The engine Operation and Maintenance manual provides detailed information about the ECM(s) (Electronic Control Modules).

A second ECM is installed on electronic engines to satisfy the NFPA 20 requirement for a redundant means of electronic fuel injection. Switching of the sensor inputs and outputs to the respective ECM is controlled through the FPDP either manually (by means of the ECM A/B Selector Switch on the panel) or through an automated process called Autoswitching (refer to the Operation section of this manual for more information on Autoswitching).

NOTE: Cummins electronically-controlled “engines” normally enable ECMs with derate and shutdown protection. Fire pump drive engines have the derates and shutdowns disabled. Fire pump drive engines will run to destruction, making preventive maintenance even more essential for a fire pump drive engine.

2.7 Digital Panel Expansion Module (DPEM) (Optional)

The Digital Panel Expansion Module (DPEM) is an optional electronic device that works in conjunction with the FPDP to provide options for monitoring and alarming custom inputs. As shown in Figure 2-14, the DPEM is housed in a 316 stainless steel enclosure and contains a series of terminal blocks for customer connection to specified alarm points. One DPEM can be configured for any or all of the following:

- Four switched inputs;
- Three temperature inputs;

- One exhaust temperature input;
- Six pressure inputs; and/or
- J1939 parameters (when applicable).

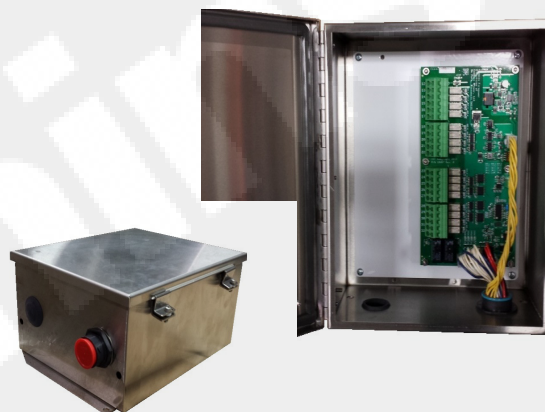


Figure 2-14 Digital Programming Expansion Module (DPEM)

2.8 Fuel Supply and Drain

As shown in Figure 2-1, the fuel supply and return connections are centrally located on the FPDP side. Refer to the [Engine Data Sheet](#) for the maximum allowable fuel tank supply locations above the fuel pump.

2.9 High Pressure Injection (HPI) Fuel System

The fire pump drive engine has an HPI electronic fuel system that uses a high-pressure pump and electronic-controlled injectors for precise fuel metering and timing. The system is controlled by the ECM for fueling and timing based on temperature, altitude, pressure, and throttle position.



CAUTION

Manually priming the fuel system is not required and should not be performed.

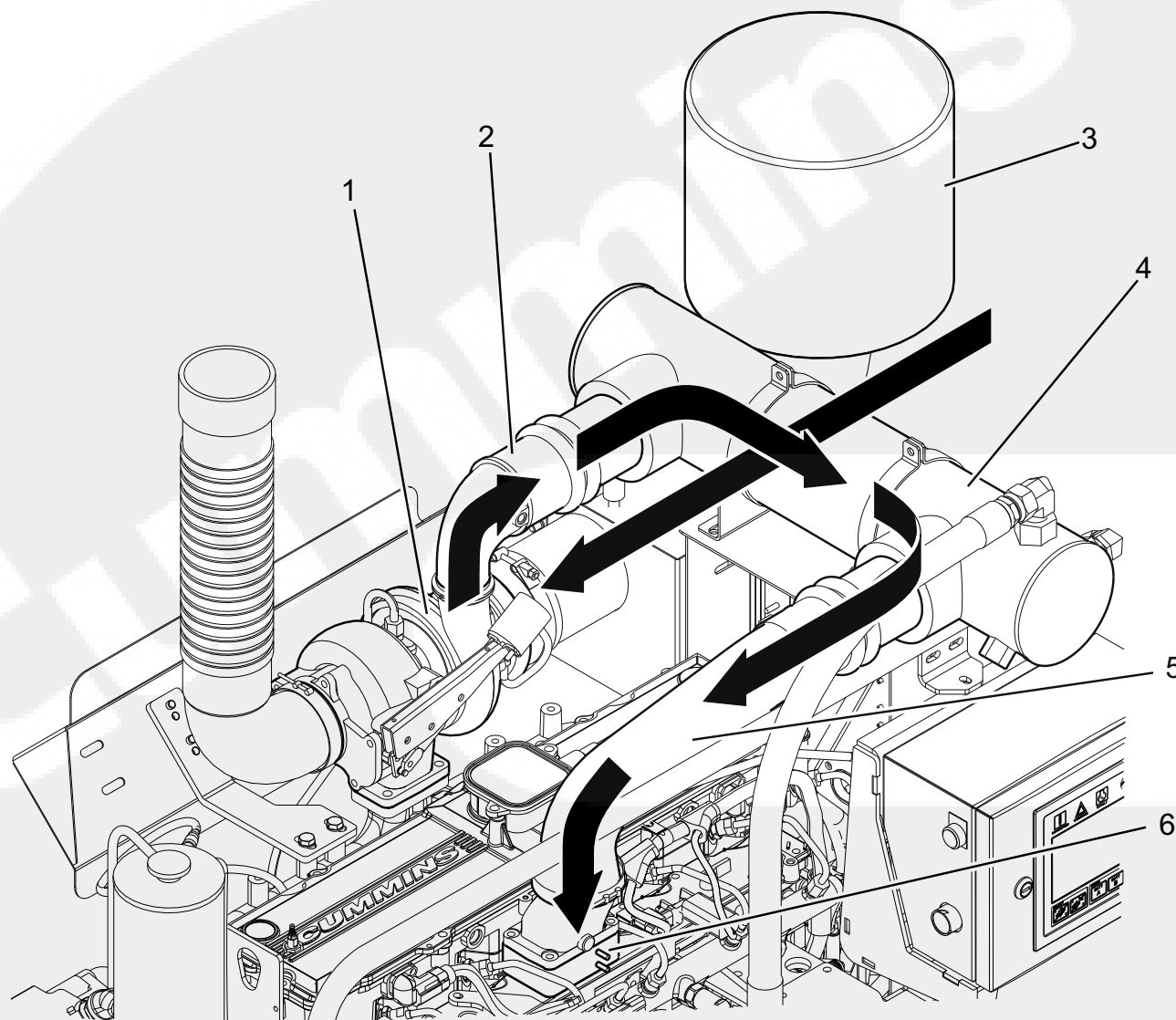
2.10 Fuel Cooling System

A fuel cooling heat exchanger maintains a fuel temperature to meet the maximum allowable fuel inlet temperature (160 °F [71 °C]). Performance of the fuel cooling system is critical to engine durability, performance, and emissions compliance.

2.11 Air Intake System

The air intake system supplies combustion air to the fire pump drive engine cylinders. The air filters prevent particulate matter from entering the air intake.

Figure 2-15 shows how the combustion air is drawn into the system. The turbocharger directs the air through the Charge Air Cooler (CAC) heat exchanger for cooling before entering the cylinders.



CFP-006-1

- | | |
|--|---|
| 1. Turbocharger | 4. Charge Air Cooler (CAC) Heat Exchanger |
| 2. Air Hose to Charge Air Cooler (CAC) | 5. Charge Air Cooler (CAC) Hose |
| 3. Air Cleaner Assembly | 6. Combustion Air Intake Manifold |

Figure 2-15 Engine Air Intake and Charge Air Cooling Flow Diagram (typical)

Description

2.12 Cooling Water System

Figure 2-16 illustrates a typical cooling water manifold and Figure 2-17 shows the path of water through the engine cooling system. Water entering the cooling system through the cooling water inlet first circulates through the CAC heat exchanger, cooling the compressed air from the turbocharger outlet ducting. The

cooled combustion air exits the CAC outlet duct to the engine air intake manifold.

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

The cooling water from the CAC heat exchanger then passes through the engine coolant heat exchanger. The cooling water exits the coolant heat exchanger through a discharge connection.

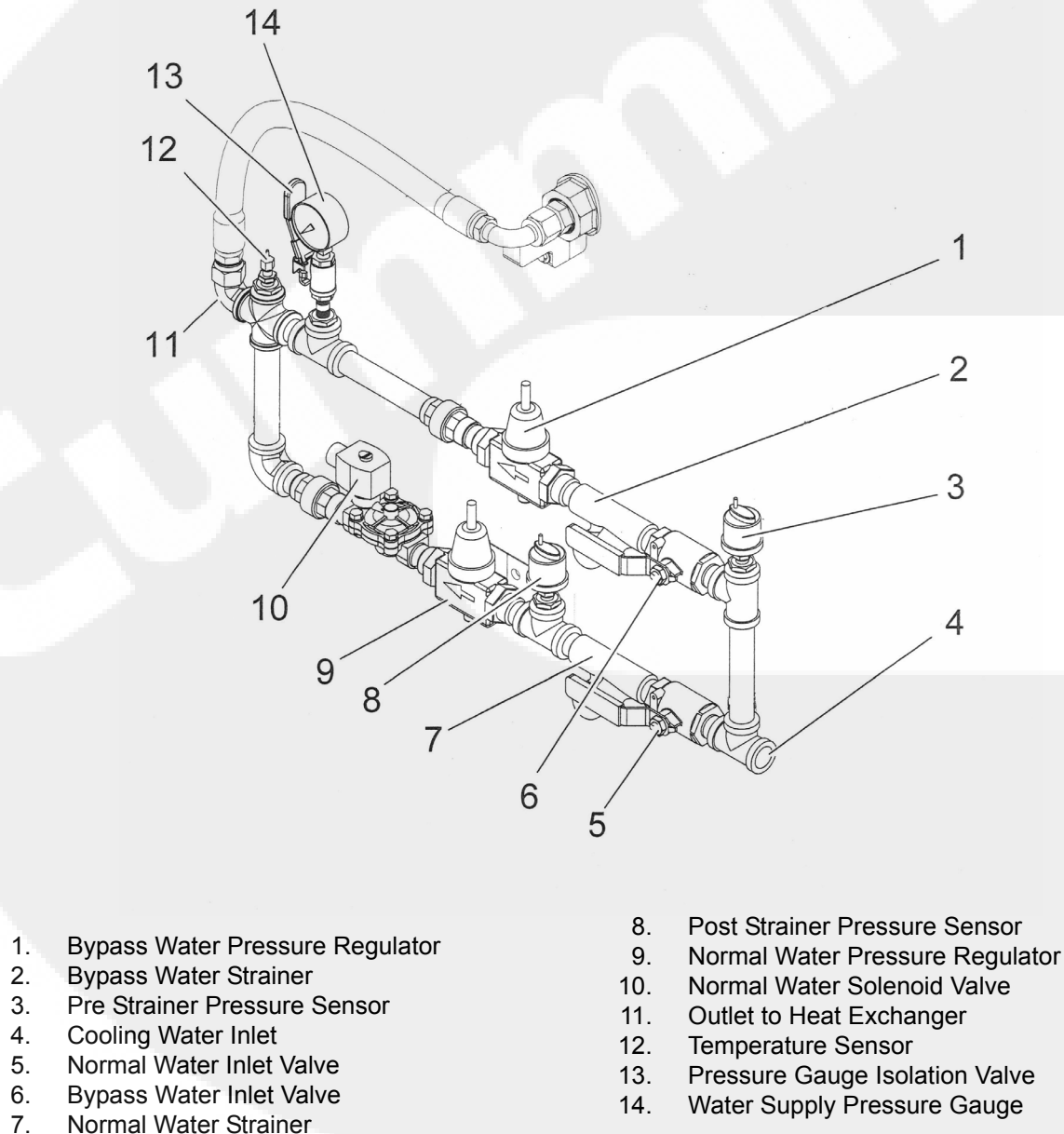


Figure 2-16 Cooling Water Manifold (typical)

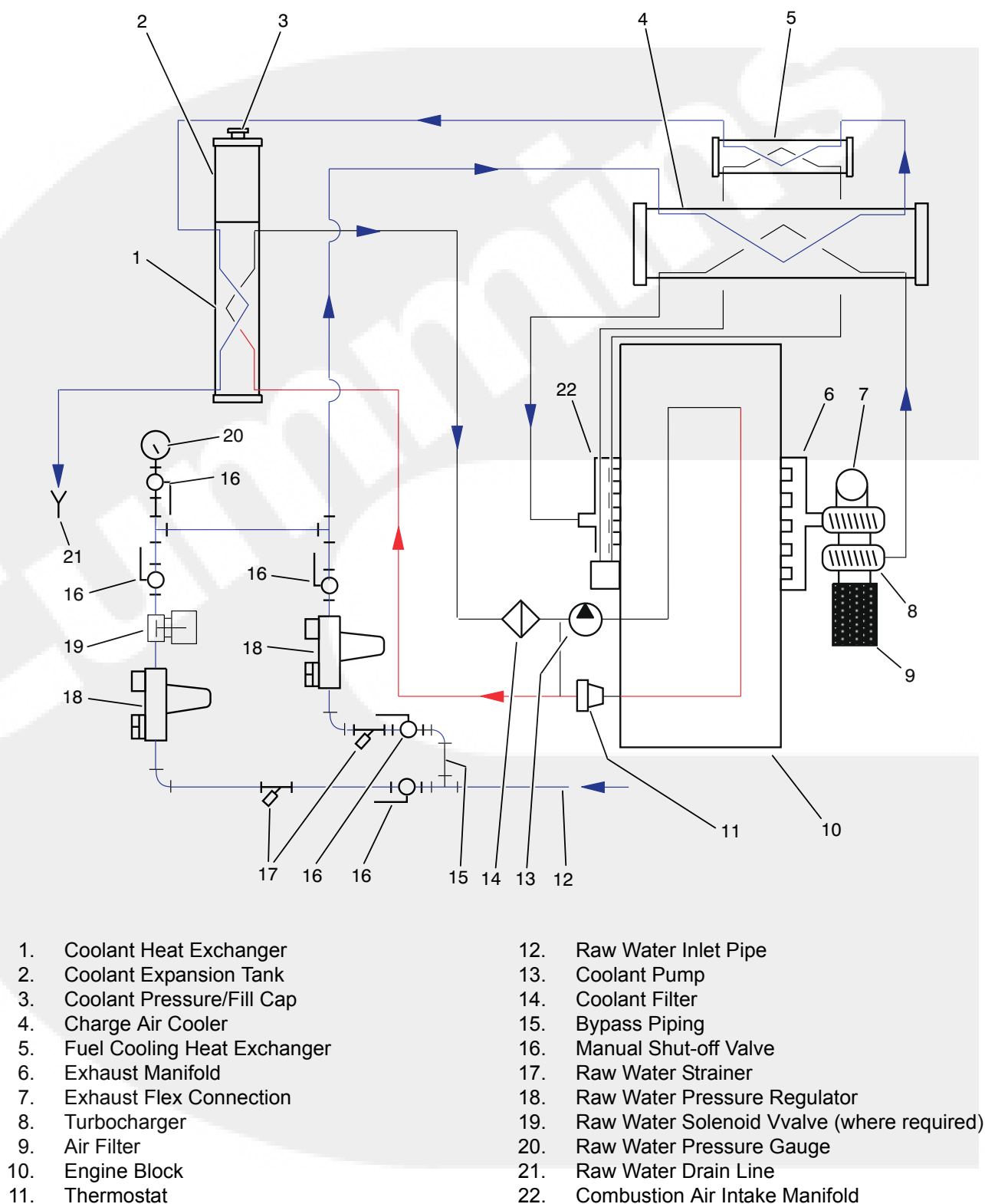


Figure 2-17 Engine Cooling System Flow Diagram (Typical)

Description

2.13 Engine Oil System

Figure 2-18 illustrates how the engine oil system lubricates moving internal engine parts (pistons, connecting rods, 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.

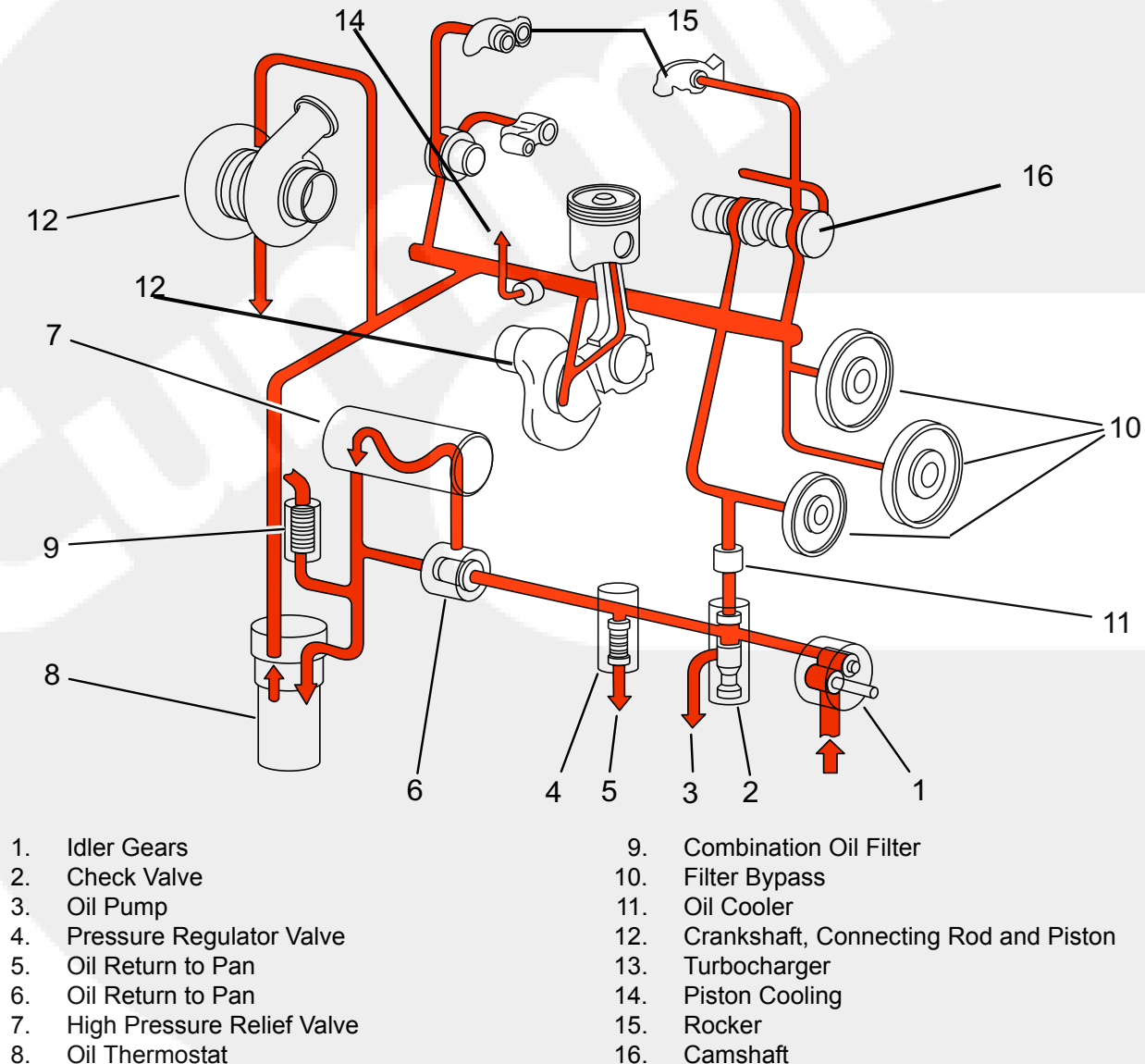


Figure 2-18 Engine Lubricating Oil System Flow Diagram (Typical)

2.14 Exhaust System

Figure 2-19 shows how the exhaust system removes engine exhaust from the cylinders after the combustion process and Figure 2-20 shows the turbocharger

exhaust flow for a wastegated engine. The exhaust discharges from the exhaust manifold, passes through (drives) the turbocharger, and exits through the exhaust connection.

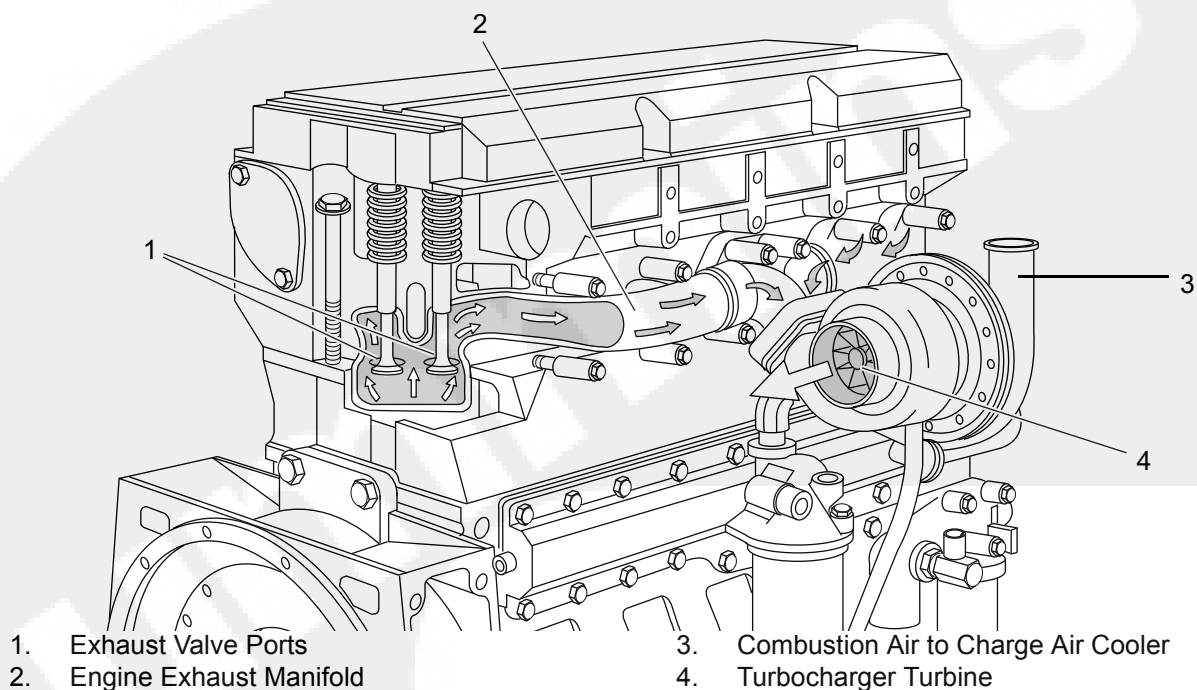


Figure 2-19 Exhaust System Flow Diagram (typical)

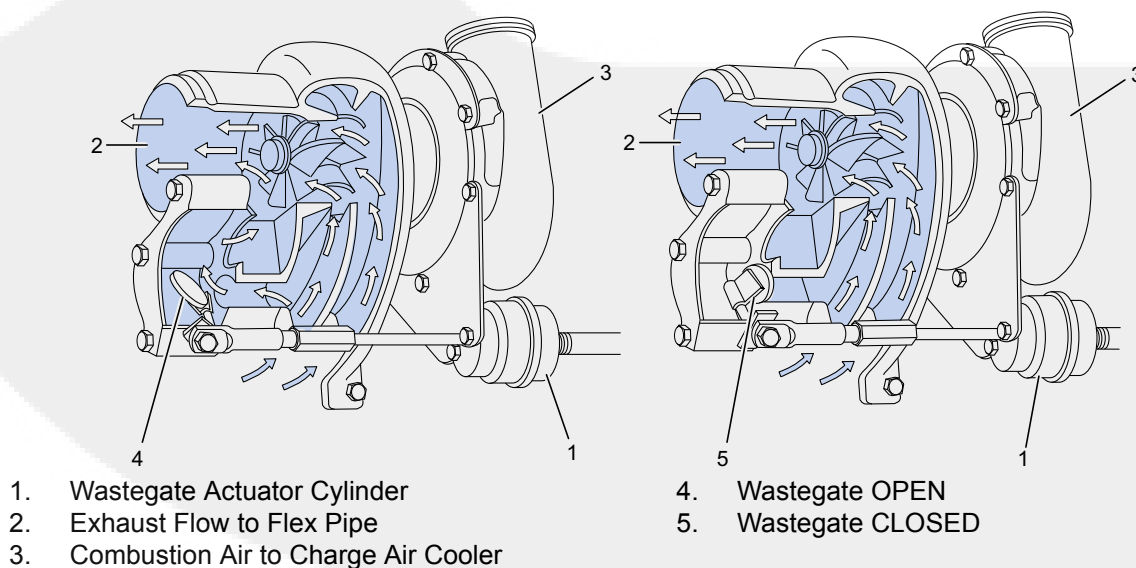


Figure 2-20 Turbocharger Exhaust Flow Diagram (typical)

Description

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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 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:

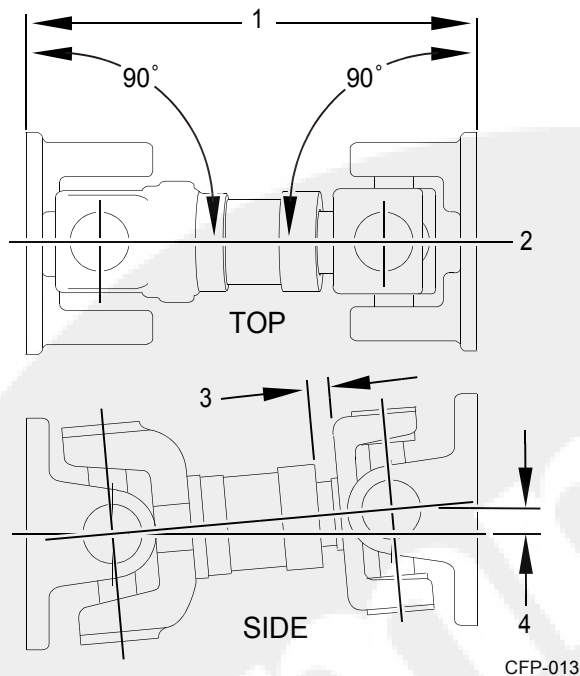


CAUTION

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 $\pm .76$ 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 $\pm .76$ mm (.03 in).
 - c. Ensure that the pump center line to the engine crankshaft center line (in vertical plane) is $2^{\circ} \pm 1^{\circ}$.
 - 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.

Installation



1. Planes must be parallel
2. Align both mounting center lines to $\pm .76$ mm (.03 in)
3. Distance to equal half of total travel
4. $2^\circ \pm 1^\circ$

Figure 3-1 Drive Shaft Alignment

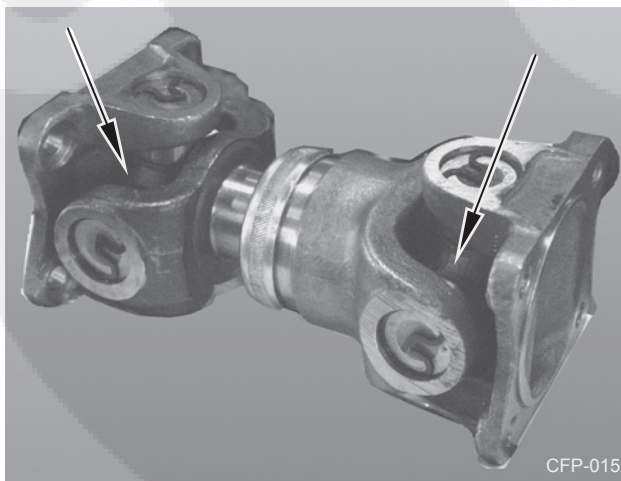


Figure 3-2 Drive Shaft Universal Joint Grease Fittings

NOTE: Cummins 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

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 instructions:

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](#).

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 fuel other than no. 2 diesel fuel may affect emission levels. 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 flow rate of the cooling water should be as great as possible without exceeding the maximum allowable pressure shown in the [Engine Data Sheet](#).

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](#).

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; both water pressure regulators have been set at 276 kPa (40 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](#).
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 setpoints before operating the pump. Damage to the heat exchanger may occur from improperly regulated cooling water supply pressure.

Installation

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](#) 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](#). 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.

3.7 Battery Installation

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](#). RC and CCA definitions can be found in SAE Standard J537. Refer to NFPA 20 and FM 1333 standards 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.

IMPORTANT: Batteries must meet the requirement listed in the electrical system specifications. Batteries may be supplied by Cummins 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.

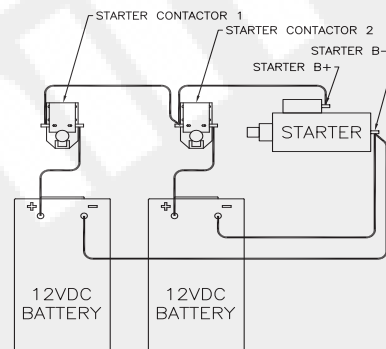


Figure 3-3 Series Battery Connection 12 VDC

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.



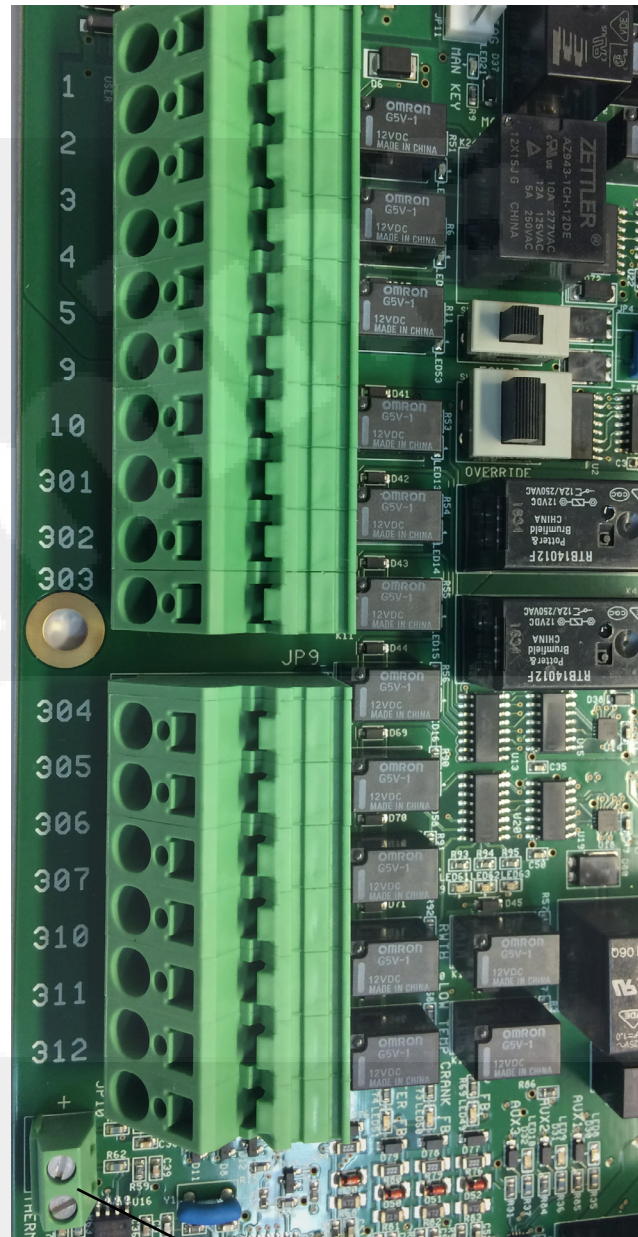
The fire pump controller wires must be connected to the terminal blocks (TBs) on the FPDP Interface Terminal Strip and on the Battery Charger Interface. To complete the signal and control installation:

Installation

- **TB-10 [Main Battery Contactor Two Coil or Battery Relay Two Coil]:** This B+ signal is driven from the fire pump controller to contactor B when desiring to crank the engine from Battery B. Current in this circuit shall not exceed 10A continuous.
- **TB-301 [ECM Switch]:** A ground path is provided by the FPDP when the engine is operating on ECM B.
- **TB-302 [Fuel Injection Malfunction (FIM)]:** A ground path is provided by the FPDP when either of the ECMs triggers a fault code which can affect the performance of the Fuel Injection System. See the Troubleshooting section for possible fault causes and solutions.
- **TB-303 [ECM Warning]:** A ground path is provided by the FPDP when a single ECM has been diagnosed as failed.
- **TB-304 [ECM Failure]:** A ground path is provided by the FPDP when both ECMs have been diagnosed as failed.
- **TB-305 [Custom Output 1]:** A ground path is provided by the FPDP when the custom alarm is configured and activated.

NOTE: If an Air Shutoff Valve is purchased, TB-305 is reserved for valve position feedback.

- **Type K Thermocouple Input - optional:** The screws to the Type K thermal couple input may be loosened for installation of an exhaust temperature.
- **TB-306 [Custom Output 2]:** A ground path is provided by the FPDP when the custom alarm is configured and activated.
- **TB-307 [Custom Output 3]:** A ground path is provided by the FPDP when the custom alarm is configured and activated.
- **TB-310 [Raw Water High Inlet Temperature] - not applicable on radiator-cooled models -** A ground path is provided by the FPDP when high raw water temperature is sensed.



Thermocouple Input

Figure 3-5 FPDP Interface Terminal Strip

- **TB-311 [Clogged Raw Water Coolant Loop Strainer] - not applicable on radiator-cooled models -** A ground path is provided by the FPDP when the raw water supply restriction is sensed.
- **TB-312 [Low Engine Temperature Signal]:** A ground path is provided by the FPDP when the engine coolant falls below 100 °F (37.8 °C).

3.8.2 Battery Charger Interface

As shown in [Figure 3-6](#), the Battery Charger Interface provides power to the fire pump controller, as well as provides charging current to the fire pump drive engine batteries. The Battery Charger Interface includes:

- TB-6 [**Battery A Positive**]: The fire pump controller senses Battery A charge state and charges Battery A through TB-6.
- TB-8 [**Battery B Positive**]: The fire pump controller senses Battery B charge state and charges Battery B through TB-8.
- TB-11 [**Battery A and Battery B Negative**]: The fire pump controller uses TB-11 as a ground reference for incoming power, as well as to charge the fire pump drive engine batteries.

NOTE: *This is not intended to create a fully isolated battery negative or ground system. Current in each terminal block shall not exceed 30 amperes continuous.*

To complete the battery signal connections:

1. Provide the initial charge on the redundant batteries per the battery charger's instructions.
2. Check that both voltmeters on the FPDP indicate the approximate battery voltage.

NOTE: *Both sets of batteries can be used for starting the engine in the event that one set is low.*

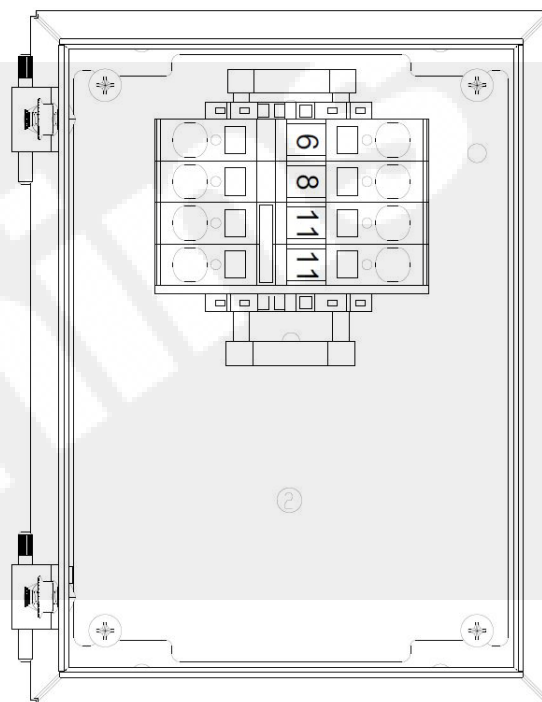


Figure 3-6 Battery Charger Interface

Installation

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 surge tank.

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. Add coolant, if necessary.
4. Inspect the heat exchanger weekly for external damage and contamination.

NOTE: Contamination of the heat exchanger will affect the ability of the cooling system to transfer heat and properly cool the engine and intake manifold.

5. Add coolant, if necessary:

NOTE: Supplemental engine coolant should be a mixture of 50% ethylene glycol antifreeze and 50% water to avoid engine damage. For additional information, refer to the antifreeze information found in the Maintenance section.

- If the engine *IS* equipped with a sight level gauge, ensure that the engine coolant level is visible at the center of the sight level gauge. Add coolant as required. DO NOT OVERFILL!
- If the engine *IS NOT* equipped with a sight level gauge, fill the cooling system with coolant to the bottom of the fill neck. Do not fill above the bottom of the fill neck.

6. Re-install the pressure/fill cap.

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 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 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.

3.11 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 axillary drive shaft.

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

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.

3.12 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 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](#).

2. Ensure that the engine operating temperature stabilizes between applicable ranges as identified in the [Engine Data Sheet](#).
3. Operate the engine for eight to ten minutes.
4. Inspect the engine for leaks, unusual noises, or other indications of incorrect operation.
5. While running the engine, look for the following signals during operation and field testing:
 - Low engine lubricant pressure

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.

- High engine coolant temperature
 - Low engine temperature
 - High raw water temperature
6. Shut off the engine by pressing and holding the overspeed **RESET/STOP** switch.
 7. Shortly after the engine stops, check that the water flow stops automatically.
 8. Correct any problems found during the inspection before proceeding.
 9. Check the engine lubricating oil level at the dip stick. Add oil, if necessary.
 10. Check the coolant expansion tank level. Add coolant, if necessary.

Installation

11. Check the cooling water strainers. Clean the strainers according to the maintenance schedule in [Section 5 - Maintenance](#).
12. Perform engine speed control and safety system tests per the instructions in [Section 4 - Operation](#).

1. Place the FPDP in MANUAL mode.
2. Start the fire pump drive engine and run a fixed speed test.

NOTE: *The maximum engine speed should only be altered by a Cummins technician.*

3.13 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 - Operation

4.1 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 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.

4.2 Starting and Stopping Procedures

By default, the fire pump drive engine will turn on automatically when low system water pressure is sensed by the pump controller. The engine will continue to operate as long as TB-1 is active. When the TB-1 signal is terminated by the fire pump controller, the engine will stop or enter a cool down procedure by lowering the engine speed.

For testing purposes, the fire pump drive engine can be turned on and off locally using the buttons on the FPDP (see the FPDP Description section). If the engine fails to start automatically in the event of a fire emergency, follow the Emergency Starting/Stopping Procedure outlined in Section 4.2.2.

4.2.1 Local Starting/Stopping Procedure

To start the engine locally from the FPDP:

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

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

NOTE: Upon release of the Engine STOP Button, the fire pump drive engine will attempt to restart. If there is still a "pump on demand" signal present from the fire pump controller. The engine must also be stopped at the fire pump controller.

4.2.2 Emergency Starting 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:

3. Press the AUTO/MAN selector switch on the FPDP to place the engine in MANUAL mode.
4. As shown in [Figure 4-1](#), open the FPDP panel door and slide the key switch override to the "RIGHT" position. Verify that LED 49 - KEY FB (key feedback) switch is lit.

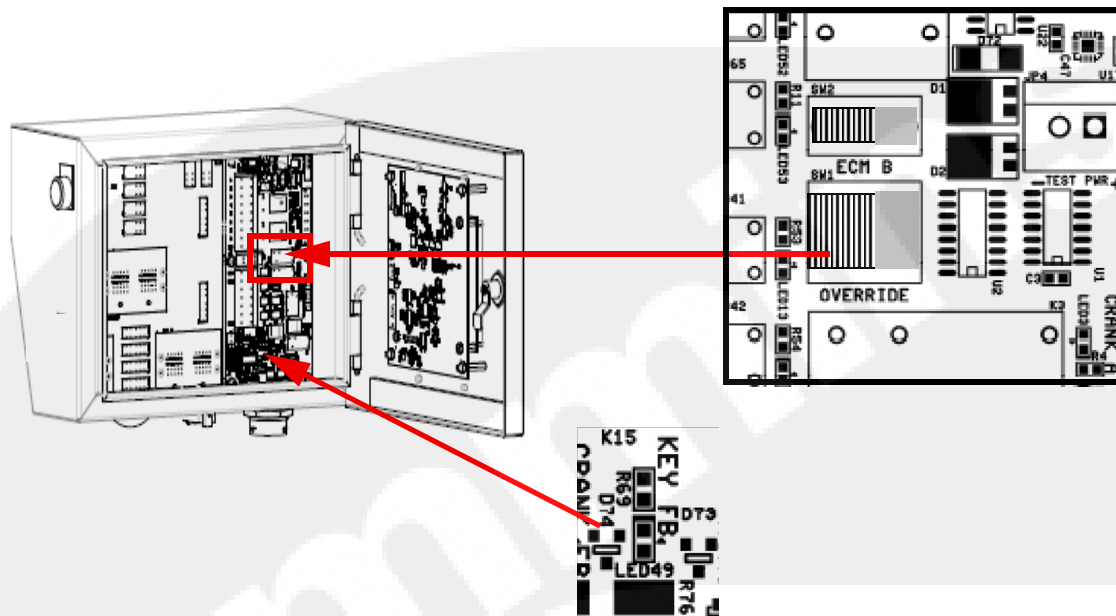


Figure 4-1 FPDP Override Switch

CAUTION

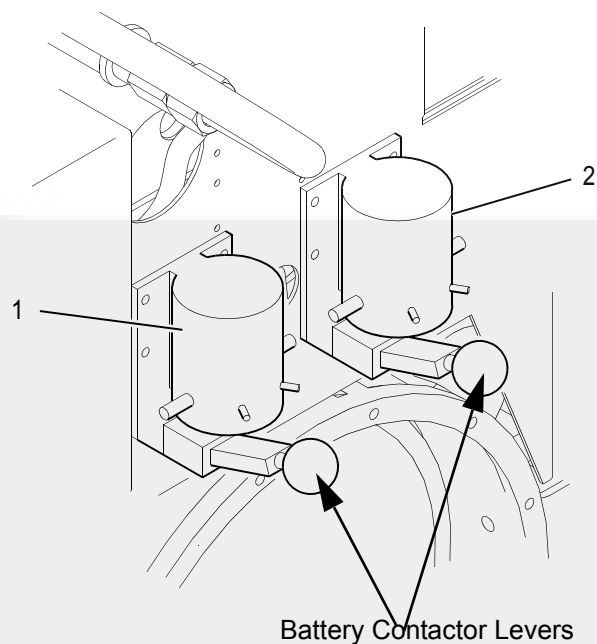
To prevent damage to the starter, do not engage the starting motor more than fifteen seconds. Wait fifteen seconds between each attempt to start, up to six attempts.

5. As shown in Figure 4-2, press downward on either the Battery A or Battery B contactor lever to start the engine. If crank contactor lever A does not engage the starter, repeat using crank contactor lever B. If the battery charge is low, press downward on both battery contactor levers at the same time. 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.

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



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

Figure 4-2 Manual Starter Contactors

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.

IMPORTANT: Upon release of the Engine STOP Button, the fire pump drive engine will attempt to restart, if there is still a “pump on demand” signal present from the FPDP. The engine must also be stopped at the fire pump controller.

4.3 Fire Pump Digital Panel (FPDP) Screens and Adjustments in Automatic Mode

The FPDP consists of an LCD touchpad that displays the fire pump drive engine tachometer, coolant temperature, oil pressure, Battery A voltage, Battery B voltage and hour meter, as well as includes three soft keys:

- SCREEN Soft Key
- MENU Soft Key
- IDLE Soft Key (electronic engines in MAN mode, only)

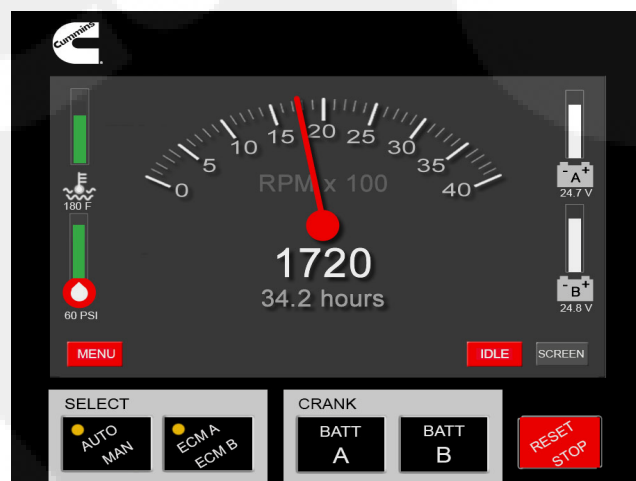


Figure 4-3 FPDP User Interface Screen (Electronic Engine)

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

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

The FPDP LCD will go into SLEEP MODE after fifteen minutes of inactivity by the user. The FPDP LCD will resume normal display features when the user presses a hard button or touches the LCD screen.

4.3.1 The SCREEN Soft Key

The SCREEN Soft Key, on the bottom right of the LCD, deactivates and activates an overlay box which lies atop the tachometer signal (the engine speed is still digitally displayed). The overlay is used to:

- Automatically - Warn the operator of ECM and/or DPEM faults, when applicable (see Section 4.3.2.6 FAULT CODES Screen); and/or
- Operator-selected - Display additional analog values not required by NFPA 20.

The overlay background color will display in gray, unless there is an active fault present. Fault overlays will display in the color of the most severe fault. To deactivate the Fault overlay, press the SCREEN Soft Key to make the overlay disappear from the LCD.

As shown below, the Analog Values overlay background color displays in gray.

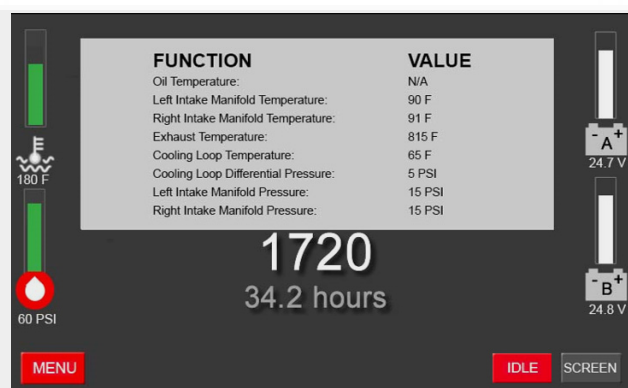


Figure 4-4 Analog Values Overlay (Electronic Engine)

Additional values that may be displayed include:

Operation

- Exhaust temperature (when a pyrometer is installed and terminated to the Power Board).
- Cooling loop raw water temperature and strainer status on FM-approved and UL-listed fire pump drivers. The Analog Values Overlay can assist in troubleshooting the cooling loop by identifying issues with the pressure sensors.
- J1939 parameters.

NOTE: The Oil Temperature value (from J1939) will only be shown on CFP11E and CFP15E.

NOTE: The Intake Manifold Pressure (from J1939) will be showing 0 PSI at no load.

NOTE: A thermocouple must be purchased and installed from Cummins in order for exhaust temperature values to display. If a thermocouple is not connected to the Power Board or the thermocouple input temperature is less than 200 °F, the Exhaust Temperature will display 0 °F.

To deactivate the Analog Values overlay, press the SCREEN Soft Key to make the overlay disappear from the LCD.

4.3.2 The MENU Soft Key - Settings Menu

If the operator presses the MENU Soft Key from the FPDP User Interface Screen, the Settings Menu Screen appears as shown below.

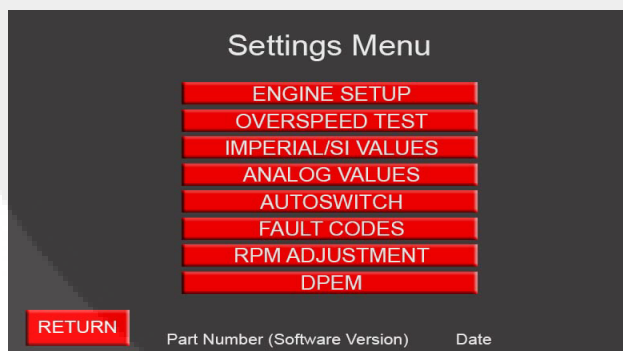


Figure 4-5 Settings Menu Screen (Electronic Engine)

The Settings Menu provides options for further operator input and monitoring of fire pump drive engine parameters. Press the corresponding soft key to access a sub-menu.

4.3.2.1 ENGINE SETUP Screen

The fire pump drive engine was preconfigured with custom options (if applicable) at the factory prior to shipping to the customer. The System Options screen provides a view of the custom configuration that has been set up for your fire pump drive engine. The Cummins Service Department must be notified if any of these parameters are adjusted in the field.

1. Starting at the User Interface Screen (Main Menu), press the MENU Soft Key.
2. As shown in [Figure 4-6](#), press the soft number keys to enter password "806" in the Engine Setup Login screen.

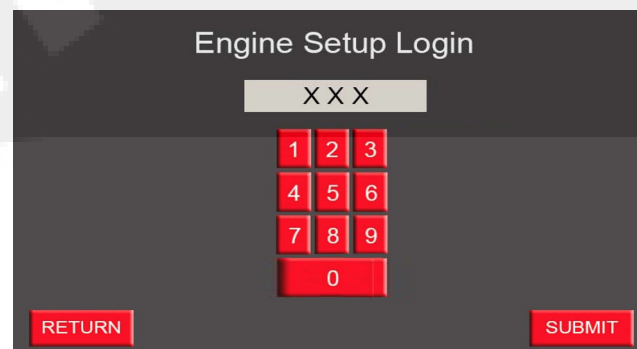


Figure 4-6 Engine Setup Login Screen (Typical)

3. Press SUBMIT to access the Engine Setup screen.

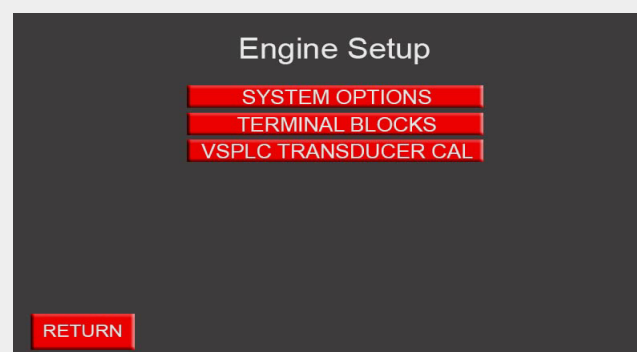


Figure 4-7 Engine Setup Screen (Electronic Engine)

Engine Setup Screen - SYSTEM OPTIONS

The System Options sub-menu displays the custom configurations of the fire pump drive engine. When

active, the soft buttons turn green in color and display “ON”. Conversely, the soft button will turn red in color and display “OFF”, if the feature is disabled. To change a numeric data field, tap the data field to access the popup keyboard and enter different data.

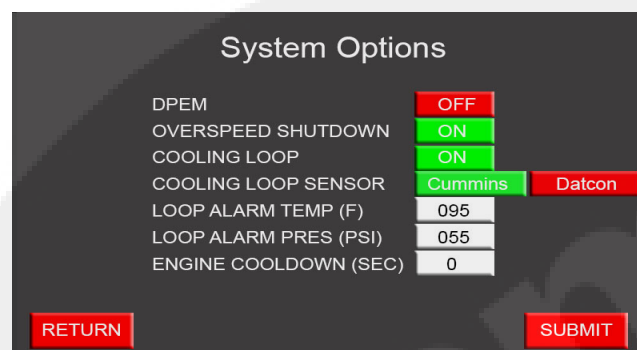


Figure 4-8 System Options Screen (Electronic Engine)

The custom options of the System Options sub-menu include:

DPEM – When active, the FPDP initiates communications with the Digital Panel Expansion Module (DPEM).

OVERSPEED SHUTDOWN – When active, the FPDP shuts the engine fueling off when the engine speed reaches or exceeds 115% of the configured rated speed.

COOLING LOOP – When active, the FPDP will monitor and diagnose the cooling loop parameters.

IMPORTANT: *The COOLING LOOP System Option shall be enabled for FM-approved fire pump drive engines.*

COOLING LOOP SENSOR– The FPDP is configured for two different sensors, a three-terminal 0-5V sensor labeled “Cummins” and a single post-resistive sensor labeled “Datcon”. When active, the applicable soft key will display in green.

IMPORTANT: *The COOLING LOOP SENSOR System Option must match the cooling loop sensor installed on the engine for proper decoding and alarming of cooling loop parameters. Ensure that the toggle switch on the FPDP Interface Terminal Strip also matches the cooling loop sensor System Option.*

LOOP ALARM TEMP (F)– When active, the display shows the alarm setpoint for the raw water temperature entering the cooling loop. When the cooling loop is disabled, the alarm will show “XXX”.

LOOP ALARM PRES (PSI)– When active, the display shows the alarm setpoint for diagnosing a clogged raw water strainer in the cooling loop. When the cooling loop is disabled, the alarm will show “XXX”.

ENGINE COOLDOWN (SEC) (on electronic engines only) - When active, the operator shall denote a specific amount of seconds to idle the fire pump drive engine. When the engine cool down is disabled, the seconds shall be set to “0” (see [4.5 Engine/Turbocharger Cool Down](#)).

Press either RETURN or SUBMIT to return to the Engine Setup menu.

Engine Setup Screen - TERMINAL BLOCK TEST

The TERMINAL BLOCKS sub-menu provides a convenient means of checking the signal integrity between the fire pump controller and the terminal block interface inside the FPDP.

As shown in [Figure 4-9](#), any of the signals on the terminal block interface can be manually activated by pressing the respective red soft key. When the button turns green, the signal is active.

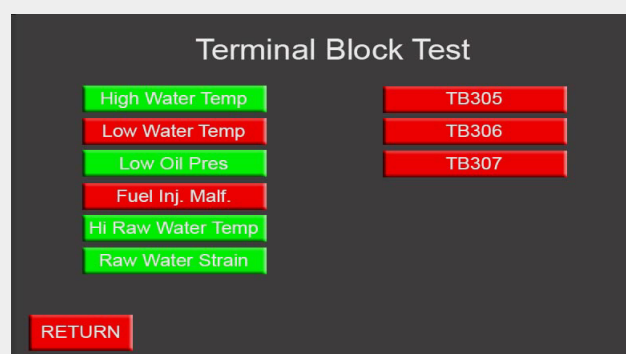


Figure 4-9 Terminal Block Test Screen (Sample)

To perform a Terminal Block Test:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key;

Operation

2. Press the ENGINE SETUP soft key from the Settings menu;
3. As shown in [Figure 4-6](#), press the soft number keys to enter password “806” in the Engine Setup Login screen.
4. Press the TERMINAL BLOCKS soft key from the Engine Setup menu;
5. Press the soft key corresponding to the terminal block requiring verification;

NOTE: If the selected terminal block soft key turns green, but the pump controller alarm does not activate, troubleshoot the terminal block connection for a B+ or ground signal (see the Section [FPDP Signal and Control Connections](#) or contact your local Cummins Sales and Service representative).

NOTE: For electronic engines, the Fuel Inj. Malf. (fuel injection malfunction) can only momentarily be set.

6. To exit the Terminal Block Test menu, press the RETURN soft key to return to the Engine Setup menu.

NOTE: Oil pressure and coolant temperature alarms will not latch upon backing out of the menu, but instead will be driven directly from datalink values.

Engine Setup Screen -VSPLC TRANSDUCER CAL

NOTE: The VSPLC TRANSDUCER CAL screen **only** applies to VSPLC fire pump drive engines. The settings in this menu are meaningless unless VSPLC is enabled.

To account for a system pressure differential, the operator may enter a pressure offset. This same pressure offset is used throughout the entire incoming pressure range. To access the VSPLC Transducer Configuration screen:

1. Starting at the User Interface Screen, press the MENU soft key.
2. Press the ENGINE SETUP soft key from the Settings menu.

3. As shown in [Figure 4-6](#), press the soft number keys to enter password “806” in the Engine Setup Login screen.
4. Press the VSPLC TRANSDUCER CAL soft key from the Engine Setup menu.
5. As shown in [Figure 4-10](#), press the VSPLC Offset (PSI) data field to activate the popup keyboard and enter the desired pressure offset.

NOTE: The software limits the pressure offset to +/- 10 PSI with a resolution of 0.1 PSI.



Figure 4-10 VSPLC Transducer Configuration

6. Press SUBMIT.
7. Press RETURN to return to the Engine Setup menu.

4.3.2.2 OVERSPEED TEST Screen

The Overspeed Test Screen allows the operator to simulate an overspeed shutdown for all engine models:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key.
2. Press the OVERSPEED TEST soft key from the Settings Menu.
3. If necessary, press Adjust Engine Speed (shown in [Figure 4-11](#)) and then use the INC and DEC buttons to increase or decrease the engine speed by increments of ten RPM.

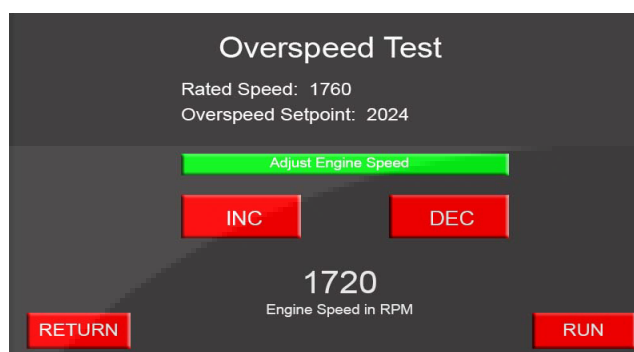


Figure 4-11 Overspeed Test - Adjust Engine Speed

4. Press the RUN soft button.

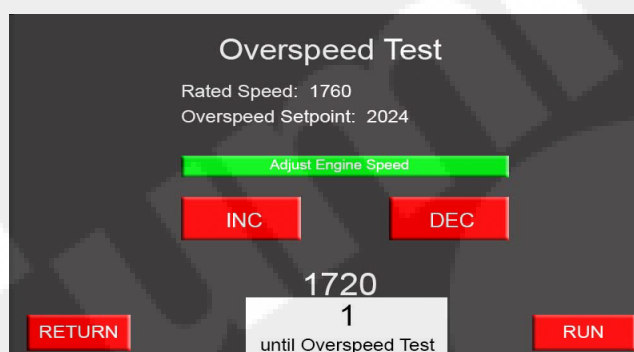


Figure 4-12 Overspeed Timer

5. When the timer expires (shown in Figure 4-12), “ENGINE OVERSPEED” written in red will flash at the top of the FPDP screen (shown in Figure 4-13).

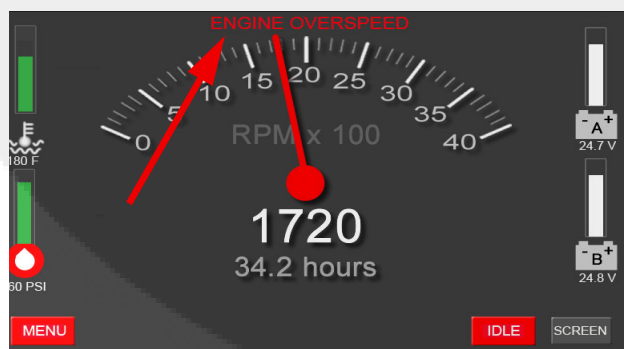


Figure 4-13 Overspeed Test Timer Expired (Sample)

6. The fire pump drive engine will enter MANUAL mode until reset.

7. Press the RESET/STOP Switch on the FPDP to reset the fire pump drive engine.

4.3.2.3 IMPERIAL/SI VALUES Screen

The Imperial/SI Values Screen, shown in Figure 4-14, allows the operator to select Imperial or *Système Internationale* (SI) (also known as metric) units of measurement. The default units of measure are Imperial units of degrees in Fahrenheit and pounds per square inch (PSI), but the user may elect degrees in Celsius or kilo Pascal (kPa).

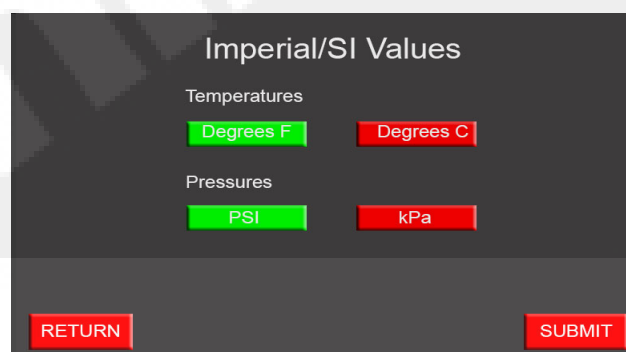


Figure 4-14 Parameter Units Screen (Typical)

To change the displayed units of measurement:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key.
2. Press the IMPERIAL/SI VALUES soft key from the Settings Menu.
3. Press the soft key for the desired unit of measure.
4. Press the SUBMIT soft key.
5. To exit the Imperial/SI Values menu, press the RETURN soft key.

4.3.2.4 ANALOG VALUES Screen

To view the information about the fire pump drive engine in digital format:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key.
2. Press the ANALOG VALUES soft key from the Settings Menu.

Operation

3. To exit the Analog Values screen (shown in [Figure 4-15](#)), press the RETURN soft key.

NOTE: The display choice of Imperial or SI values is made using the Imperial/SI Values Screen.

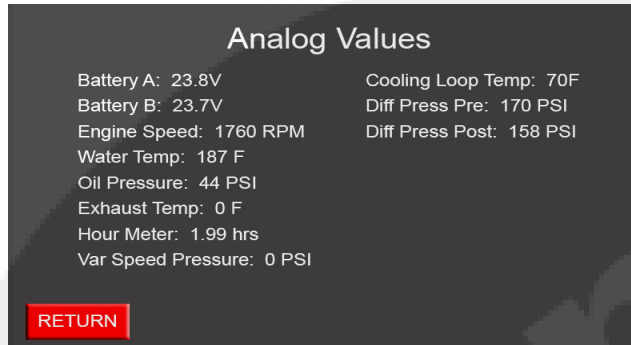


Figure 4-15 Analog Values Screen (Sample)

4.3.2.5 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 fuel system is electronically-controlled, switching of ECMs must be controlled automatically. Cummins refers to this process as “ECM Autoswitching.” When the FPDP switches ECMs automatically, the fault code responsible for the last switch can be found on the Autoswitch Screen. The FPDP will activate the ECM keyswitch for fifteen seconds every thirty minutes to validate communications with the ECM.

IMPORTANT: In order to maintain NFPA 20 compliance, autoswitching must be **enabled**.

As shown in [Figure 4-16](#), the Autoswitch Settings screen allows the operator to disable or enable this autoswitch capability.

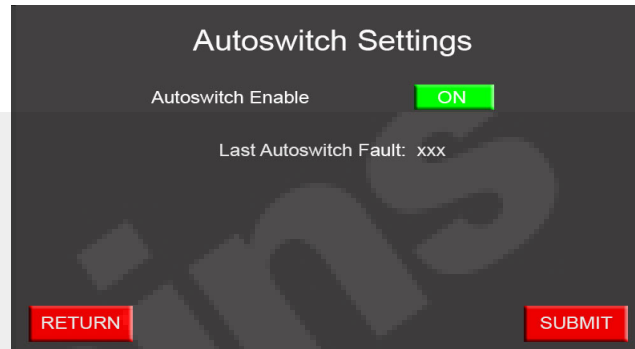


Figure 4-16 Autoswitch Settings Screen (Typical)

To change the autoswitch setting:

1. Starting at the User Interface Screen (Main Menu), press the MENUsoft key.
2. Press the AUTOSWITCH soft key from the Settings Menu.
3. Press the ON/OFF soft key - the soft key displayed (in green) indicates which mode has been selected.
4. Press the SUBMIT soft key.
5. To exit the Autoswitch Settings screen, press the RETURN soft key.

4.3.2.6 FAULT CODES Screen

As shown in the Description Section, fault codes diagnosed by the ECM are displayed in a yellow or red overlay box which lies atop the tachometer signal (the engine speed is still digitally displayed) to alert the operator to service the engine as soon as possible. Only the first seven active ECM faults will be displayed in the overlay.

As shown in [Figure 4-17](#), the Fault Codes Screen displays the full list of active faults. To view the information about the fire pump drive engine active faults:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key.
2. Press the FAULT CODES soft key from the Settings Menu.
3. To exit the FAULT CODES menu, press the RETURN soft key.

For more information about fault codes and their meanings, see the Fault Code Section of this manual or contact your local Cummins Distributor.



Figure 4-17 Fault Codes Screen (Sample)

4.3.2.7 RPM ADJUSTMENT Screen

As shown in Figure 4-18, the RPM Adjustment Screen allows the operator to make on-site adjustments to **FIXED SPEED** fire pump drive engines. Each press of the INC soft key or the DEC soft key will increase or decrease the engine speed setpoint by 10 RPM (not to exceed +/-50 RPM) for electronic engines.

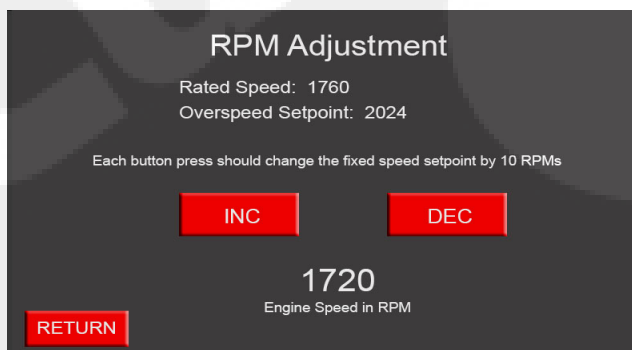


Figure 4-18 RPM Adjustment Screen (Typical)

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. Starting at the User Interface Screen (Main Menu), press the ECM A Selector Switch.
2. Press the MENU soft key.
3. Press the RPM ADJUSTMENT soft key from the Settings Menu.

4. Press either the INC soft key or the DEC soft key to change the ECM RPM setpoint.
5. Press the RETURN soft key.
6. Press the RESET/STOP Switch on the FPDP and wait for thirty seconds.
7. Repeat Steps 1 through 5 for ECM B.

NOTE: The speed setpoint adjustments must be made on each ECM to experience the same system level of performance on the alternate ECM.

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

4.3.2.8 DPEM (Optional)

As shown in Figure 4-19, the DPEM Screen displays the function name, status, alarm setpoint, and relay associated with the alarm (if applicable) of any custom inputs that are configured on the fire pump drive engine. When an analog input parameter crosses the alarm setpoint or a switched input is active, all information associated with that parameter will turn red in color. To access the DPEM Screen:

1. Starting at the User Interface Screen (Main Menu), press the MENU soft key.
2. Press the DPEM soft key from the Settings Menu.
3. To exit the DPEM Screen, press the RETURN soft key.

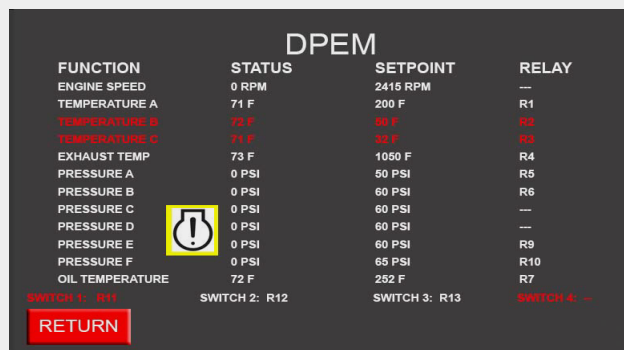


Figure 4-19 DPEM Screen (Sample)

Operation

If communications between the FPDP and DPEM are compromised, the DPEM screen may be accessed by pressing the DPEM soft key that appears on the User Interface Screen (Main Menu) (shown below).

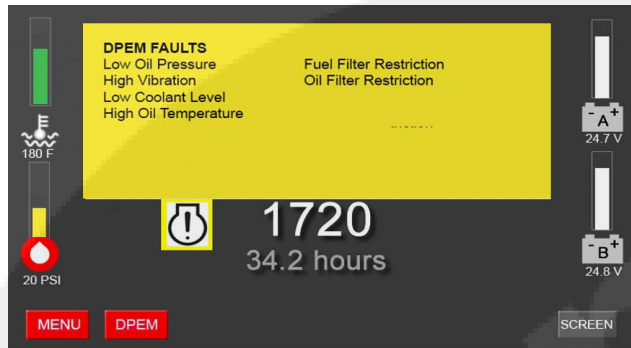


Figure 4-20 DPEM Fault Screen (Sample)

4.4 FPDP Screens and Adjustments in Manual Mode - IDLE Soft Key

NOTE: The IDLE soft key shown in Figure 4-21 displays in red while the engine idle command is inactive. The IDLE soft key will display in green when the engine idle command is active.

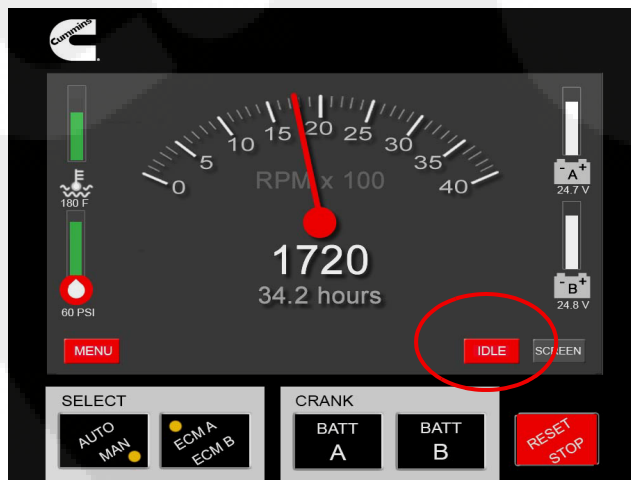


Figure 4-21 IDLE Soft Key (Typical)

With the FPDP in manual mode and using the IDLE soft key, the FPDP can now command electronic engines to idle. The operator can choose to idle the fire pump drive engine to warm up the engine for weekly testing and/or to evaluate water leaks during commissioning. To manually place the fire pump drive engine in idle:

1. Select MAN on the AUTO/MAN Mode Switch on the FPDP to place the fire pump drive engine in manual mode.

2. Press the IDLE soft key on the screen.

NOTE: Engaging the IDLE soft key will turn the IDLE soft key display from red to green, engaging the engine idle command.

3. Press the BATT A or the BATT B Momentary Start Switch to start the engine.

4. To disengage manual engine idle, press the IDLE soft key on the screen. The IDLE soft key will return to red in color.

The engine will ramp to rated speed. The engine will also ramp to rated speed (for fixed speed applications) or enter a closed loop VSPLC mode, if enabled, when TB-1 becomes active while the engine is idling.

4.5 Engine/Turbocharger Cool Down

The FPDP has the ability to idle an electronic engine for up to three minutes when a shutdown has been commanded from the fire pump controller. The cool down feature promotes engine turbocharger longevity. During engine cool down, the FPDP will display "Engine Cooldown Active" (shown in Figure 4-22).

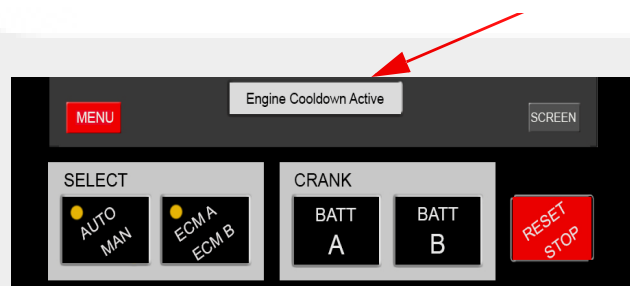


Figure 4-22 Engine/Turbocharger Cool Down (Typical)

During engine cool down, the fire pump drive engine may shutdown automatically - prior to the timer expiring - to protect the engine. The operator also has the option to shut down the engine manually from the fire pump controller or the FPDP during cool down, if necessary.

IMPORTANT: All fire pump drive engines are shipped from the factory with the cool down feature disabled. This feature must be manually enabled by the customer. Prior to enabling the cool down feature, ensure all operators are trained on the operation of this engine cool down feature.

4.5.1 Automatic Shutdown - Cool Down Timer

The fire pump drive engine will automatically shut down when the Engine Cooldown timer expires.

4.5.2 Automatic Shutdown - Engine Protection

The FPDP will automatically shut the engine off and during engine cool down if:

- Low oil pressure is sensed;
- High coolant temperature is sensed; and/or
- Communications with the ECM are lost.

4.5.3 Manual Shutdown - From the Fire Pump Controller

During cool down, the fire pump drive engine can be shut down manually from the fire pump controller by:

1. Turning the fire pump controller switch to OFF (deactivating TB-1). NOTE: *The FPDP will keep the fire pump drive engine running to idle; AND*
2. Turning the fire pump controller from OFF to MAN (manual) and back to OFF (reactivating and deactivating TB-1). The fire pump drive engine will shut down.

4.5.4 Manual Shutdown - From the FPDP

The engine can also be shutdown manually by pressing the RESET/STOP Switch on the FPDP two times in succession.



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Section 5 - Maintenance

5.1 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 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, refer to the component manufacturer's vendor supplied literature for specific maintenance recommendations.*

5.2 Engine Operation Reports

The engine must always be maintained in top mechanical condition. Proper maintenance of the fire pump drive engine requires documenting 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 assist in recording operation irregularities. See [Section 6 - Troubleshooting](#) of the model-specific English manual for a listing of Fault Codes.

Maintenance Record Form

Table 5-1.

[illegible]

5.3 Weekly Maintenance

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

5.3.1 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.

5.3.2 Air Cleaner Filter and Piping

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](#).



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](#) 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 the hose clamps to the recommended torque value. Refer to the [Torque Tables](#).

5.3.3 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.



Maintenance

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 (if applicable), 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 OVER-FILL!

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 the hose clamps to the recommended torque value. Refer to the

[Torque Tables](#). Replace damaged hoses and clamps as required.

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

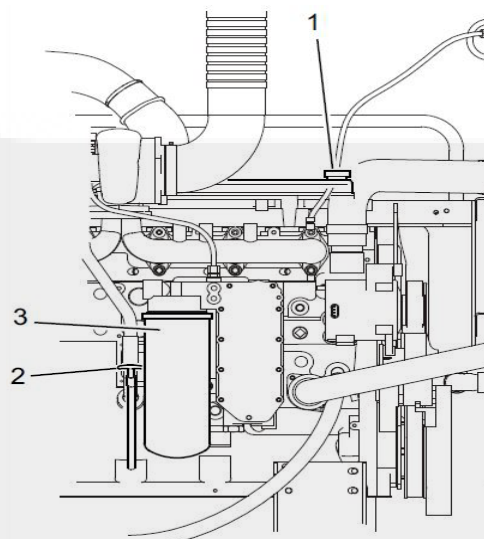
5.3.4 Engine Oil System

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 5-1](#), check the oil level at the engine dipstick.



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

Figure 5-1 Oil Level Dipstick

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

- 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® 15W-40 Multi-viscosity Lubricating Oil or equivalent.

5.3.5 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](#) for Cummins recommended replacement components.

5.3.6 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.

5.3.7 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.

5.3.8 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.

5.3.9 Heat Exchanger - Cooling Water Strainers

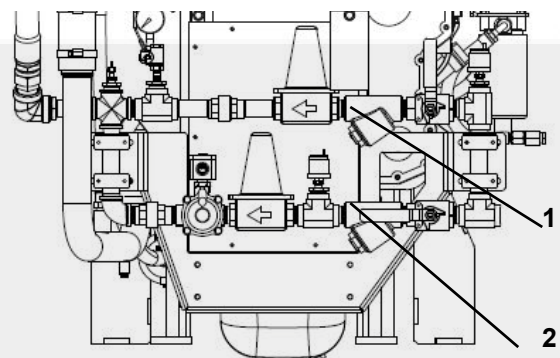
As shown in [Figure 5-2](#), the (two) cooling water strainers should be cleaned weekly to remove sediment.

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 5-2 Cooling Water Strainer (typical)

Maintenance

5.3.10 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. Replace 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.

5.3.11 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 4 - 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 5.3.12 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 over-speed RESET/STOP switch until the engine stops.

5.3.12 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.

5.3.12.1 Crank Termination Setpoint

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

5.3.12.2 Engine Speed Adjustment

The electronic engine operating speed was factory set during manufacturing and test procedures. If the speed unintentionally does not match the engine RPM shown on the factory setting plate, refer to [Section 4 - Operation: RPM Adjustment Screen](#).

5.3.13 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 (38 °C (100 °F)) 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.

5.4 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.

5.4.1 Electrical Components



CAUTION

AVOID SERVICING complex components such as: printed circuit boards, programmable controllers, and ECMs not specifically authorized by Cummins. 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:

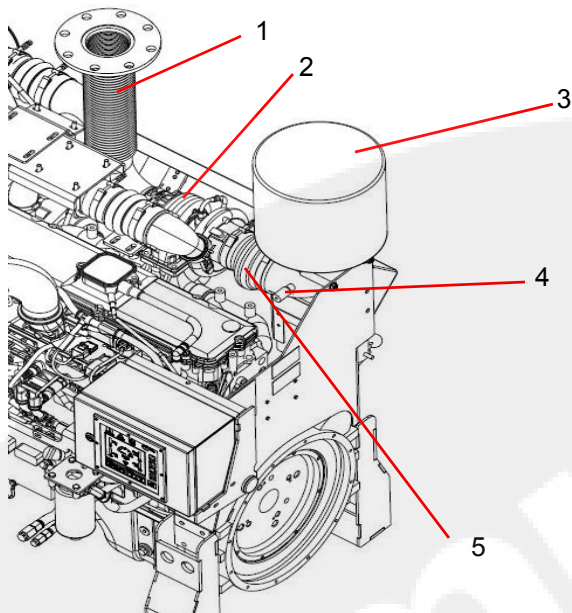
1. Inspect the electrical wiring harness, electrical terminal connections, and electrical plug-ins for secure, clean electrical contacts, worn or damaged insulation, burnt wires, broken wires, and loose connections (see [Figure 2-2](#)).
- Clean and tighten any loose electrical connections.
- Repair or replace worn, damaged, burnt, or poorly insulated wiring immediately.

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.

5.4.2 Turbocharger Mounting Nuts

As shown in [Figure 5-3](#), check the turbocharger mounting nuts and torque the mounting nuts to the recommended torque value. Refer to the [Torque Tables](#).



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

Figure 5-3 Turbocharger (typical)

5.4.3 Engine Supports

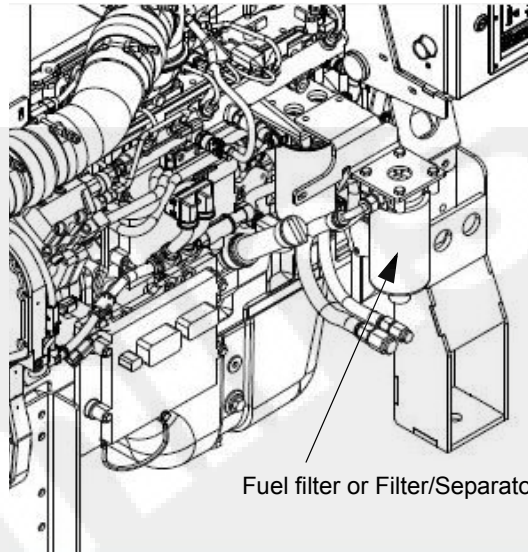
CAUTION

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 2-2](#) 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 Tables](#) for recommended torque values.

5.4.4 Fuel Pumps and Filters

As shown in [Figure 5-4](#), 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.



CFP-058-1

Figure 5-4 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](#) 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.*

5.4.5 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.*

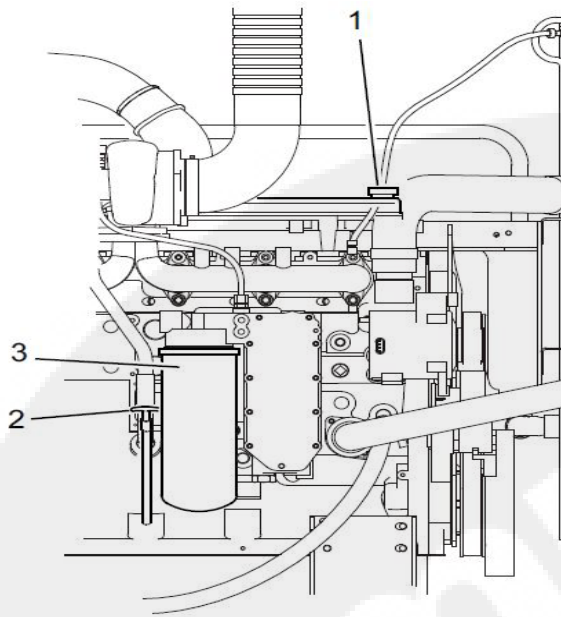
WARNING

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](#) 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 5-5](#)) 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 5-5 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](#).

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 Tables](#).
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.

5.4.6 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 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).

5.4.7 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 5-6](#)).

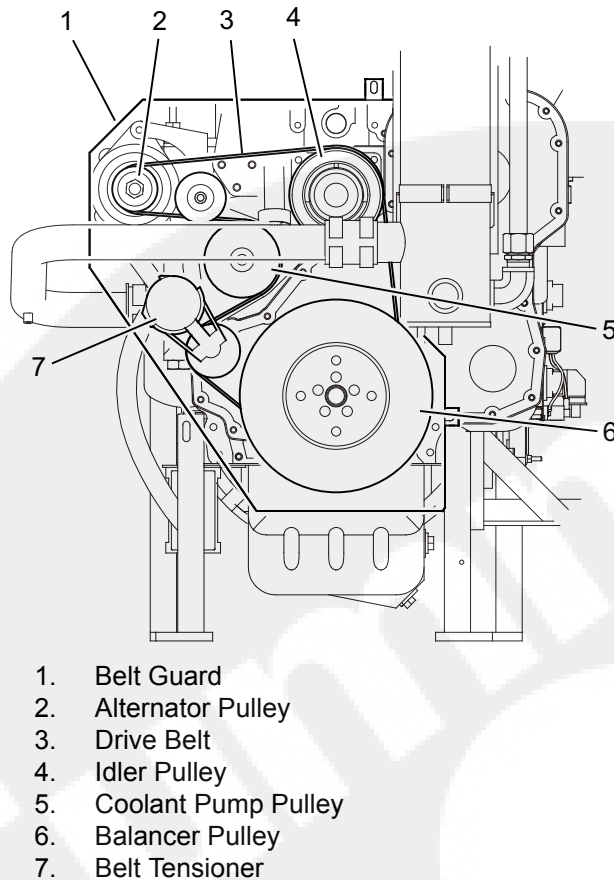


Figure 5-6 Coolant Pump/Alternator Belt (typical)

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.

- 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.
 - 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.

5.4.8 Raw Water Zinc Anode

The zinc anode (see [Figure 5-7](#)) 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.

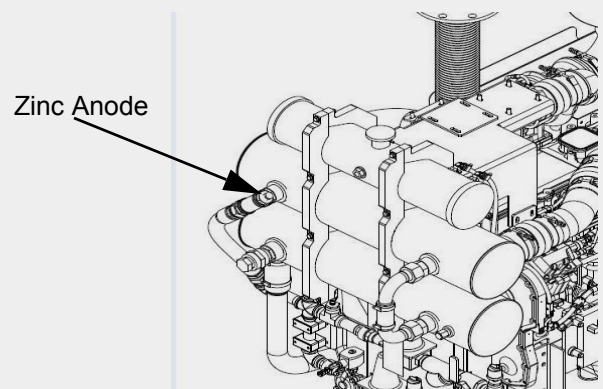


Figure 5-7 Raw Water Zinc Anode (typical)

Maintenance

5.4.9 Heat Exchanger Pressure Test

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](#).

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.

5.4.10 Turbocharger

As shown in [Figure 5-3](#), follow these steps to thoroughly inspect the turbocharger:

1. Visually inspect the air intake filter and piping according to the steps outlined in [Section 5.3.2](#).

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](#).



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 the loosened clamps to the recommended torque value. Refer to the [Torque Tables](#).

5.5 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.

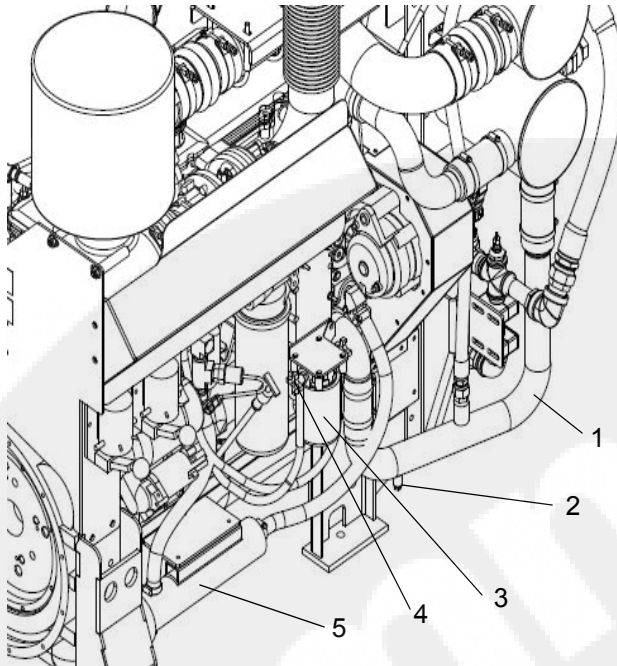
5.5.1 Coolant Pump

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.

5.5.2 Cooling System - Heat Exchanger

[Figure 5-8](#) illustrates the heat exchanger 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.



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

Figure 5-8 Engine Coolant Drain - Heat Exchanger

⚠ 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. Disconnect both batteries at their terminals. Remove the negative (-) cable first.
2. 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.
3. Disconnect the engine coolant heater power supply before draining the cooling system.
4. Place a container that will hold at least 57 liters (15 gallons) of liquid under the coolant drain valve.

5. Ensure that the coolant filter shut-off valves are OPEN.
6. Open the drain petcock on the lower coolant tube, allowing the coolant to drain into the waste container.
7. When the system is empty, move the container under the engine coolant heater.
8. 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.

9. 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.

⚠ 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%.

10. 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.
11. Center the filter ring on the threaded mounting nipple. Screw the filter canister onto the mount-

Maintenance

ing 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](#).

12. 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](#).

13. 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 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.

Ethylene-Glycol

40% = -23° C (-10° F)

50% = -37° C (-34° F)

60% = -54° C (-65° F)

68% = -71° C (-96° F)

Propylene-Glycol

40% = -21° C (-6° F)

50% = -33° C (-27° F)

60% = -54° C (-65° 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.

14. 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.
15. Re-install the heater wiring.
16. Reinstall the battery cables; attach the negative (-) battery cable last.
17. Operate the engine until it reaches a temperature of 82 °C (180 °F), and check for coolant leaks.
18. Ensure that the coolant level is just below the fill neck and that the coolant heater is reconnected.

5.6 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.

5.6.1 Coolant Thermostat Removal/Installation

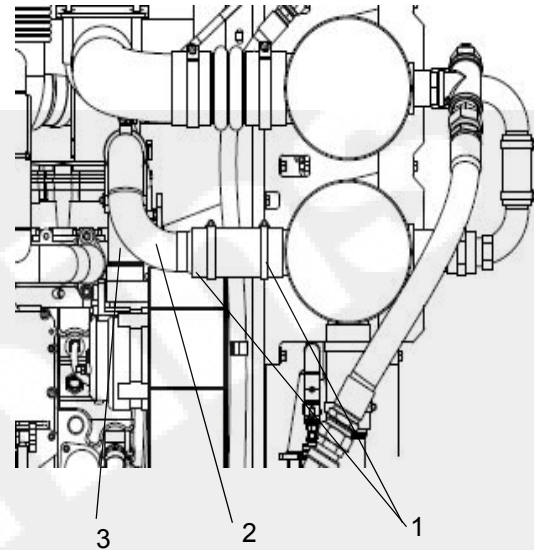
The thermostat regulates the temperature of the engine coolant circulating through the engine cooling system. Refer to the engine manual for complete instructions.

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. As shown in [Figure 5-9](#), 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.
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.



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

Figure 5-9 Thermostat Housing (typical)

NOTE: Recommendations on thermostat replacement components can be found on the [Engine Data Sheet](#).

6. Replace the thermostat flange and cap screws.

5.6.2 Coolant Pump/Alternator Belt Replacement

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 Tables](#).
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.

Maintenance

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.

Section 6 - Troubleshooting

6.1 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-CUMMINS™ (1-800-286-6467).



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. Contact the Cummins Customer Service Department toll free at 1-800-343-7357 before performing any extensive maintenance.

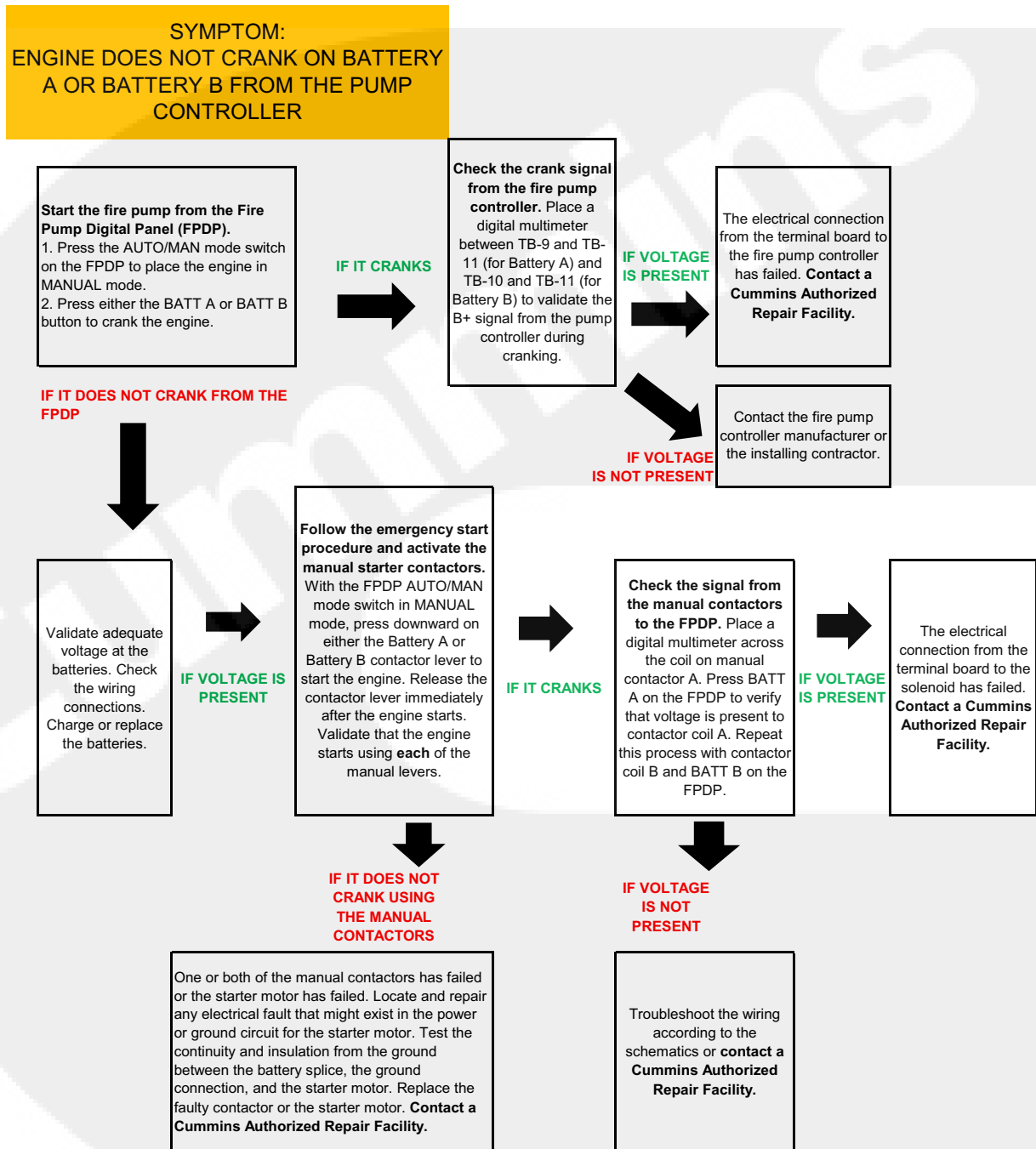


CAUTION

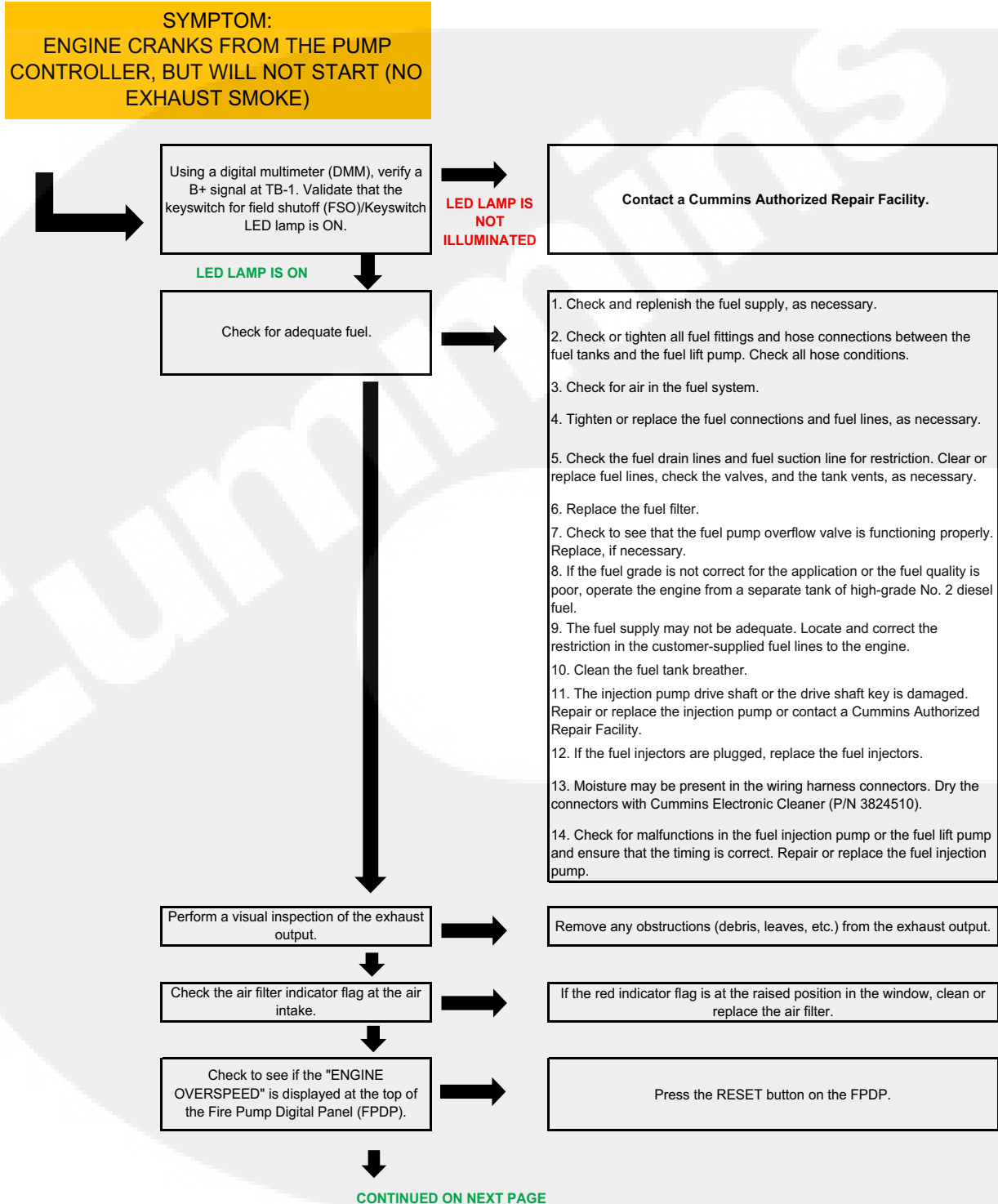
Never climb or stand on the equipment frame, guards, or enclosures. Contact with exposed or moving components can cause personal injury or equipment damage.



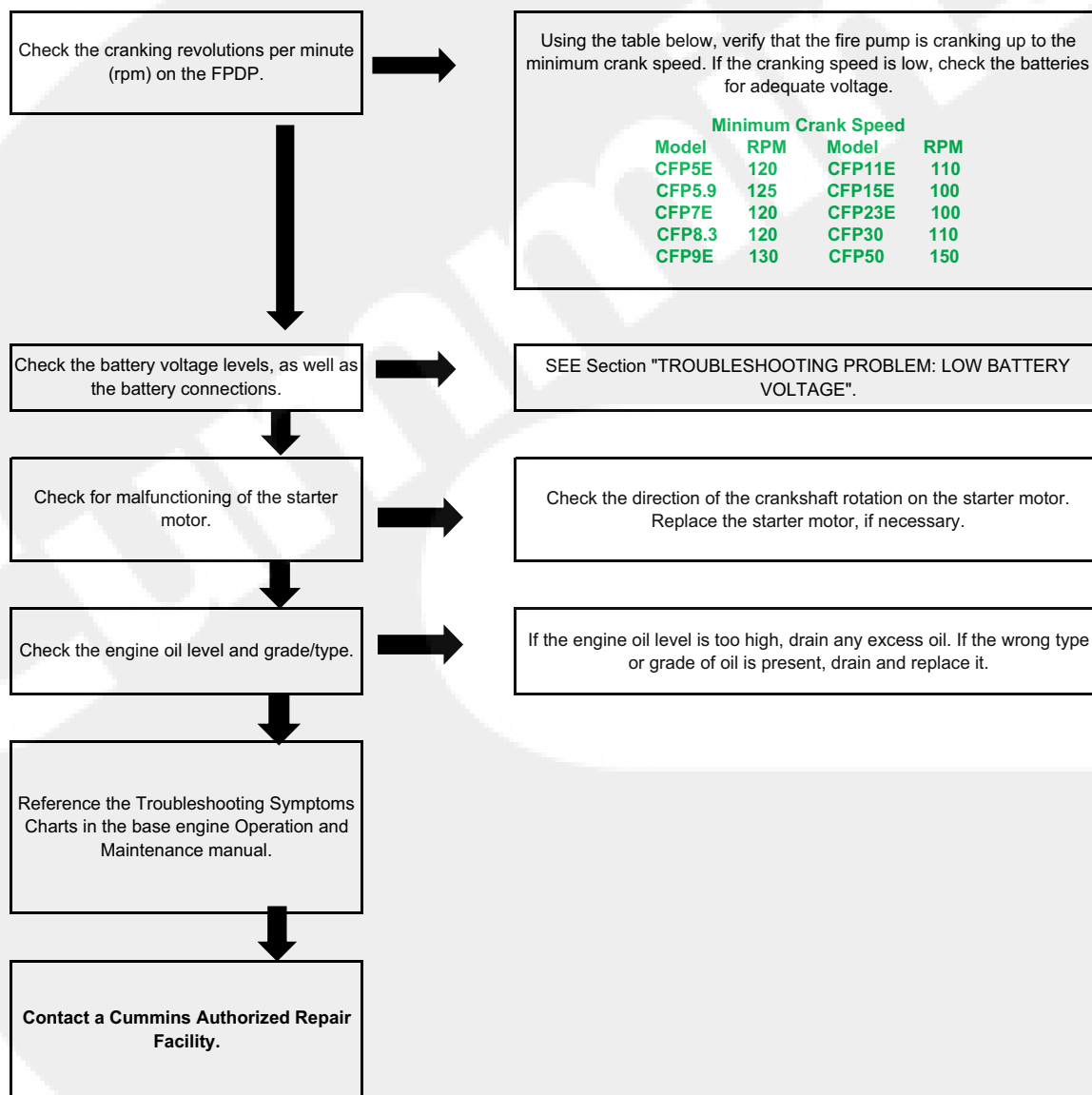
6.2 Engine Will Not Start



6.3 Engine Cranks But Will Not Start



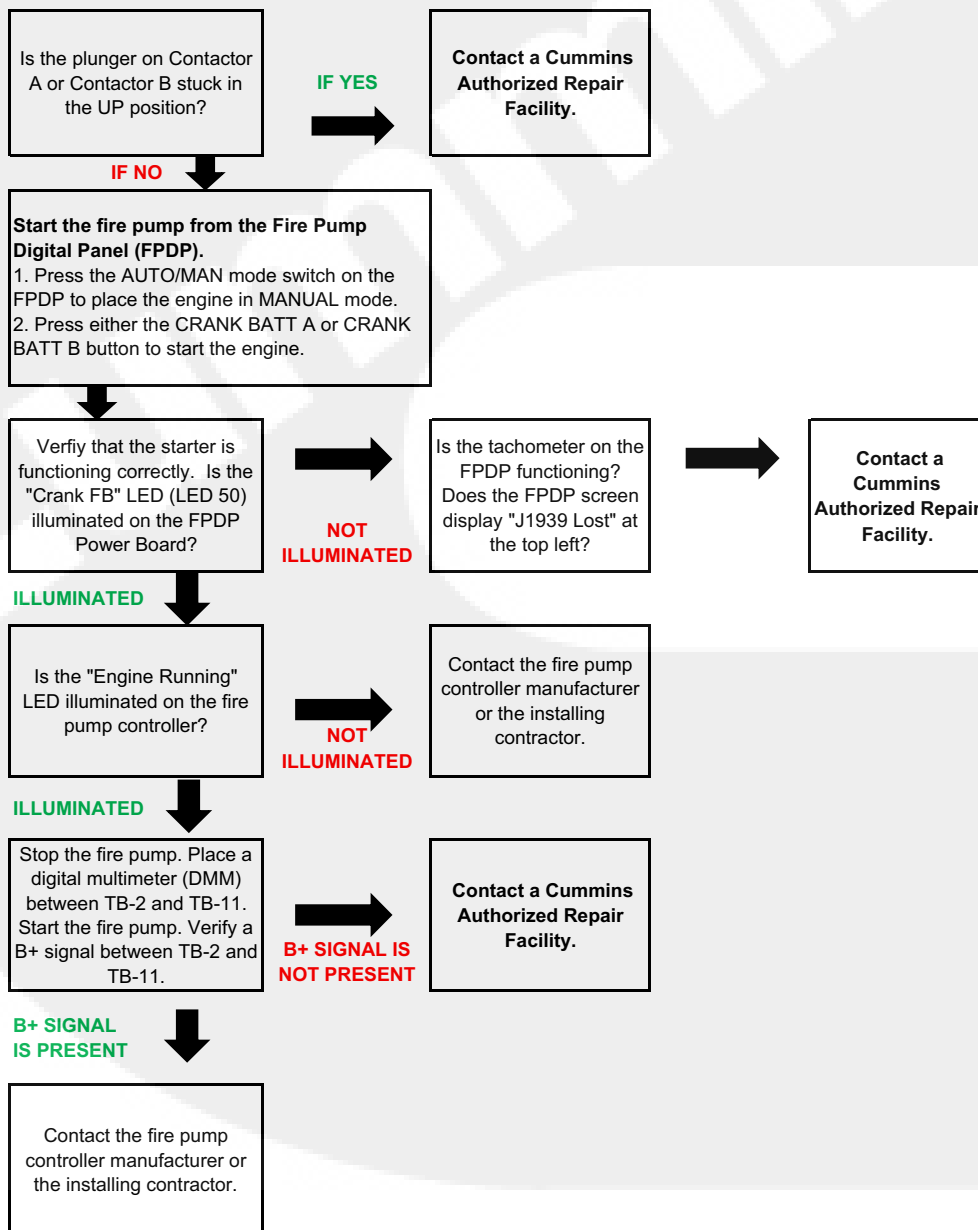
Engine Cranks But Will Not Start (cont.)



6.4 Engine Starts But Continues to Crank

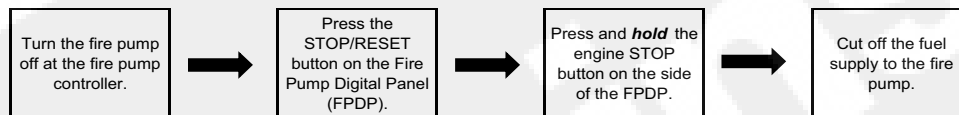
STOP THE ENGINE AT THE FIRE PUMP CONTROLLER (PLACE THE CONTROLLER IN THE OFF POSITION) AND TROUBLESHOOT FROM THE FIRE PUMP DRIVE ENGINE:

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

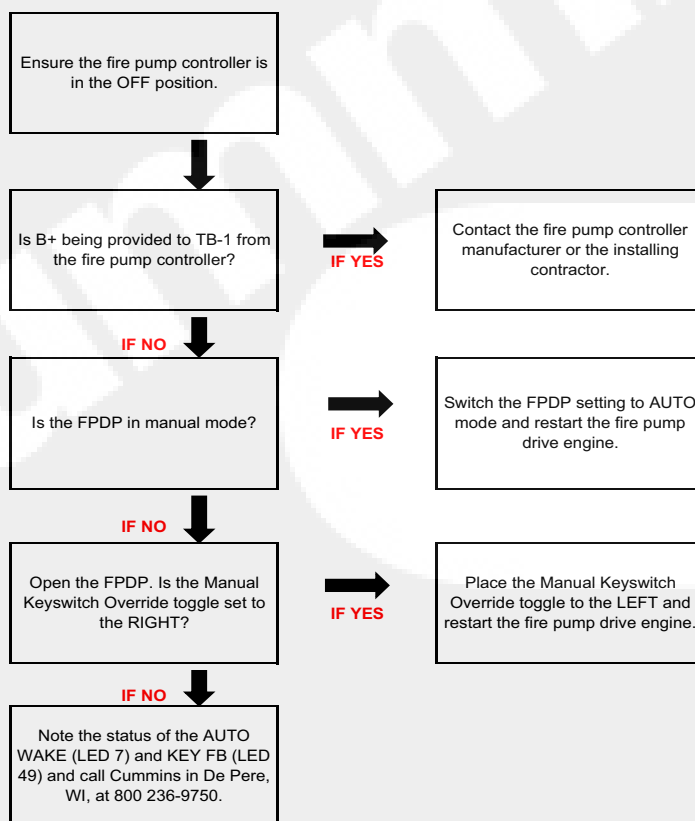


6.5 Engine Will Not Stop

TO STOP THE ENGINE:



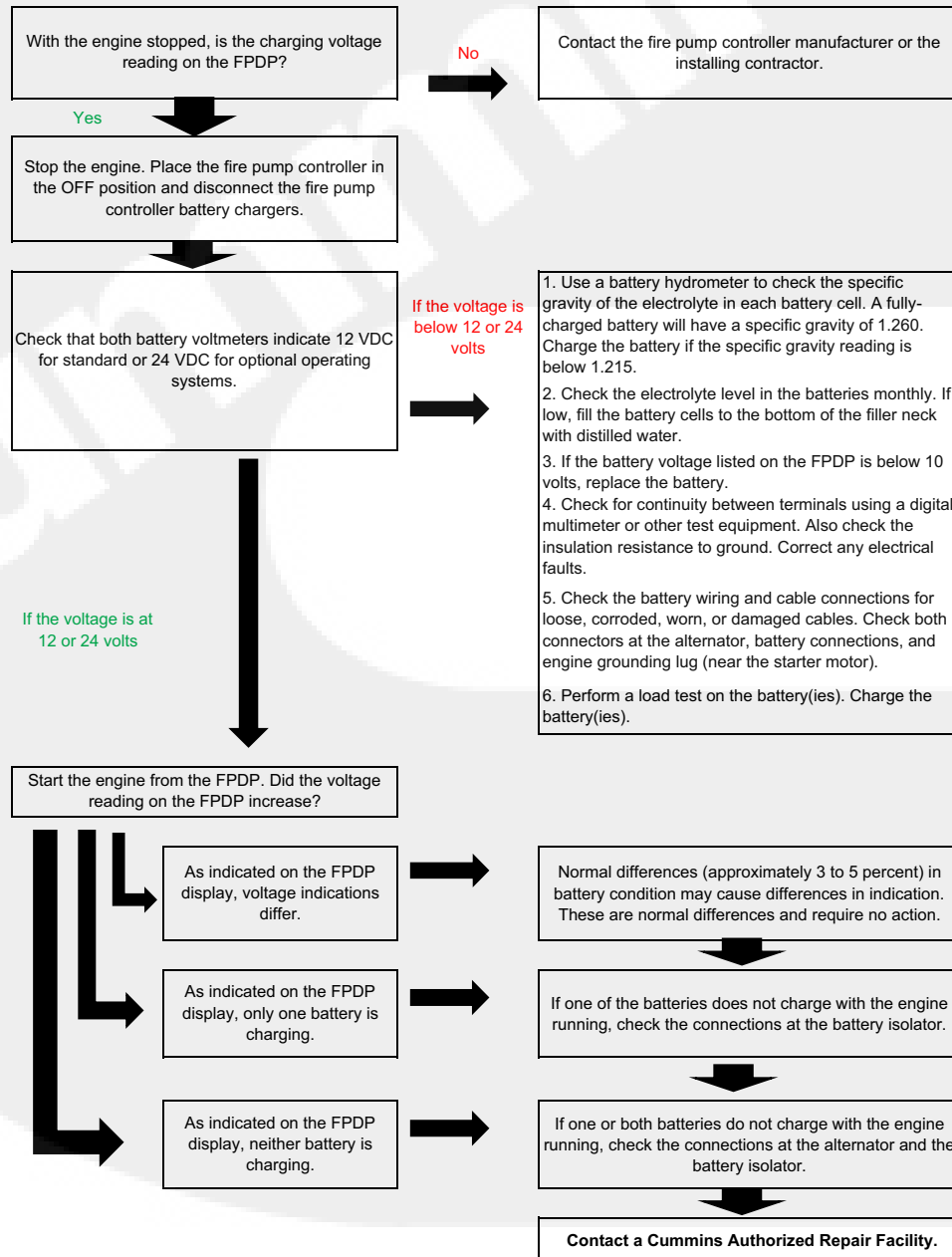
TO TROUBLESHOOT THIS PROBLEM, ONCE THE FIRE PUMP HAS STOPPED:



6.6 Low Battery Voltage

PROBLEM: LOW BATTERY VOLTAGE

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



6.7 Fault Code Charts - CFP11E, CFP15E/EVS, CFP23E/EVS, CFP30E/EVS, CFP60E

The following tables specify the fault codes and their meanings for the CFP11E, CFP15E/EVS, CFP23E/EVS, and CFP30E model fire pump drive engines:



Table 6-1. CFP11E, CFP15E, CFP23E, CFP30E, CFP60E FAULT CODES

FAULT CODE (LAMP)	SPN	FMI	LAMP COLOR	CUMMINS DESCRIPTION	FIM FAULT	ECM AUTO SWITCH
111	629	12	RED	Engine Control Module - Critical internal failure		X
112	635	7	RED	Engine Timing Actuator is not responding to ECM commands		
113	635	3	YELLOW	Engine Timing Actuator Circuit - shorted high		
114	635	4	YELLOW	Engine Timing Actuator Circuit - shorted low		
115	190	2	RED	Engine Speed/Position Sensor Circuit - lost both of two signals from the magnetic pickup sensor	X	
116	156	3	RED	Fuel Timing Pressure Sensor Circuit - shorted high	X	
117	156	4	RED	Fuel Timing Pressure Sensor Circuit - shorted low	X	
118	135	3	YELLOW	Fuel Pump Delivery Pressure Sensor Circuit - shorted high	X	
119	135	4	YELLOW	Fuel Pump Delivery Pressure Sensor Circuit - shorted low	X	
121	190	10	YELLOW	Engine Speed/Position Sensor Circuit - lost one of two signals from the magnetic pickup sensor	X	
122	102	3	YELLOW	Intake Manifold Pressure Sensor #1 Circuit - shorted high		
123	102	4	YELLOW	Intake Manifold Pressure Sensor #1 Circuit - shorted low		
124	102	16	YELLOW	High Intake Manifold Pressure Left Bank		
125	102	18		Low Intake Manifold Pressure Left Bank		
126	1129	16	YELLOW	High Intake Manifold Pressure Right Bank		
127	1129	18		Low Intake Manifold Pressure Left Bank		
128	1129	3		Right Bank Intake Manifold Pressure Sensor Circuit Failed High		
129	1129	4		Right Bank Intake Manifold Pressure Sensor Circuit Failed Low		
131	91	3	RED	Accelerator Pedal Position Sensor Circuit - shorted high		
132	91	4	RED	Accelerator Pedal Position Sensor Circuit - shorted low		
133	974	3	RED	Remote Accelerator Pedal Position Sensor Circuit - shorted high		
133	29	3	RED	Remote Accelerator Pedal Position Sensor Circuit - shorted high		
134	974	4	RED	Remote Accelerator Pedal Position Sensor Circuit - shorted low		
134	29	4	RED	Remote Accelerator Pedal Position Sensor Circuit - shorted low		
135	100	3	YELLOW	Engine Oil Pressure Sensor Circuit - shorted high		

Troubleshooting

136	1208	3		Pre Filter Oil Pressure Sensor Circuit Failed High		
137	1208	4		Pre Filter Oil Pressure Sensor Circuit Failed Low		
141	100	4	YELLOW	Engine Oil Pressure Sensor Circuit - shorted low		
143	100	18	YELLOW	Engine Oil Pressure Low - Warning		
143	100	1	RED	Engine Oil Pressure Low - Warning		
144	110	3	YELLOW	Engine Coolant Temperature Sensor Circuit - shorted high		
145	110	4	YELLOW	Engine Coolant Temperature Sensor Circuit - shorted low		
147	91	8	RED	Accelerator Pedal Position Sensor Circuit - low frequency		
148	91	8	RED	Accelerator Pedal Position Sensor Circuit - high frequency		
151	110	0	RED	Engine Coolant Temperature High - Critical		
153	105	3	YELLOW	Intake Manifold Temperature Sensor #1 Circuit - shorted high		
154	105	4	YELLOW	Intake Manifold Temperature Sensor #1 Circuit - shorted low		
155	105	0	RED	Intake Manifold Temperature #1 High - Critical		
166	733	3	YELLOW	Rack Position Sensor #1 Circuit - shorted high		
172	638	6	RED	Rack Actuator Position #1 Circuit - grounded circuit		
173	638	7	YELLOW	Rack Actuator - mechanically stuck open		
184	609	2	YELLOW	Engine Control Module Identification Input State Error		X
185	639	2	YELLOW	Engine Control Module Network Communication Error		X
187	620	4	YELLOW	Sensor Supply Voltage #2 Circuit - shorted low		
211	1484	31		Additional OEM/Vehicle Diagnostic Codes have been logged.		
212	175	3	YELLOW	Engine Oil Temperature Sensor Circuit - shorted high		
213	175	4	YELLOW	Engine Oil Temperature Sensor Circuit - shorted low		
214	175	0	RED	Engine Oil Temperature High - Critical		
221	108	3	YELLOW	Ambient Air Pressure Sensor circuit - shorted high		
222	108	4	YELLOW	Ambient Air Pressure Sensor circuit - shorted low		
223	1265	4	YELLOW	Engine Oil Burn Valve Solenoid Circuit - shorted low		
225	1266	4	YELLOW	Engine Oil Replacement Valve Solenoid Circuit - shorted low		
227	620	3	YELLOW	Sensor Supply Voltage #2 Circuit - shorted high		

Troubleshooting

231	109	3	YELLOW	Engine Coolant Pressure Sensor Circuit - shorted high		
232	109	4	YELLOW	Engine Coolant Pressure Sensor Circuit - shorted low		
233	109	1	RED	Engine Coolant Pressure Low - Warning		
233	109	18	YELLOW	Engine Coolant Pressure Low - Warning		
234	190	0	RED	Engine Speed High - Critical	X	
235	111	1	RED	Engine Coolant Level Low - Critical		
237	644	2	YELLOW	External Speed Input (Multiple Unit Synchronization) - data incorrect		
241	84	2	YELLOW	Vehicle Speed Sensor Circuit - data incorrect	X	
242	84	10	YELLOW	Vehicle Speed Sensor Circuit - tampering has been detected	X	
245	647	4	YELLOW	Fan Clutch Circuit - shorted low		
254	632	4	RED	Fuel Shutoff Valve Circuit - shorted low	X	
255	632	3	YELLOW	Fuel Shutoff Valve Circuit - shorted high	X	
259	632	7	RED	Fuel Shutoff Valve - Stuck Open	X	
261	174	0	RED	Fuel Temperature High - Warning	X	
263	174	3	YELLOW	Fuel Temperature Sensor Circuit - shorted high	X	
265	174	4	YELLOW	Fuel Temperature Sensor Circuit - shorted low	X	
284	1043	4	YELLOW	Engine Speed / Position Sensor #1 (Crankshaft) Supply Voltage Circuit - shorted low	X	
285	639	9	YELLOW	SAE J1939 Multiplexing PGN Timeout Error		
286	639	13	YELLOW	SAE J1939 Multiplexing Configuration Error		
287	91	19	RED	SAE J1939 Multiplexing Accelerator Pedal Sensor System Error		
288	974	19	RED	SAE J1939 Multiplexing Remote Throttle Data Error		
292	1083	14	RED	Auxiliary Temperature Sensor Input #1 Engine Protection - Critical		
293	1083	3	YELLOW	Auxiliary Temperature Sensor Input #1 Circuit - shorted high		
294	1083	4	YELLOW	Auxiliary Temperature Sensor Input #1 Circuit - shorted low		
295	108	2	YELLOW	Ambient Air Pressure Sensor Circuit - data incorrect		
296	1084	14	RED	Auxiliary Pressure Sensor Input #2 Engine Protection - Critical		
297	1084	3	YELLOW	Auxiliary Pressure Sensor Input #2 Circuit - shorted high		
298	1084	4	YELLOW	Auxiliary Pressure Sensor Input #2 Circuit - shorted low		

Troubleshooting

299	1384	31		Engine Shutdown Commanded by J1939		
311	651	6	YELLOW	Injector Solenoid Valve Cylinder #1 Circuit - grounded circuit	X	
312	655	6	YELLOW	Injector Solenoid Valve Cylinder #5 Circuit - grounded circuit	X	
313	653	6	YELLOW	Injector Solenoid Valve Cylinder #3 Circuit - grounded circuit	X	
314	656	6	YELLOW	Injector Solenoid Valve Cylinder #6 Circuit - grounded circuit	X	
315	652	6	YELLOW	Injector Solenoid Valve Cylinder #2 Circuit - grounded circuit	X	
316	931	3	YELLOW	Fuel Supply Pump Actuator Circuit - shorted high	X	
318	931	7	YELLOW	Fuel Supply Pump Actuator - mechanically stuck	X	
319	251	2		Real Time Clock - Power Interrupt		
321	654	6	YELLOW	Injector Solenoid Valve Cylinder #4 Circuit - grounded circuit	X	
322	651	5	YELLOW	Injector Solenoid Valve Cylinder #1 Circuit - open circuit	X	
323	655	5	YELLOW	Injector Solenoid Valve Cylinder #5 Circuit - open circuit	X	
324	653	5	YELLOW	Injector Solenoid Valve Cylinder #3 Circuit - open circuit	X	
325	656	5	YELLOW	Injector Solenoid Valve Cylinder #6 Circuit - open circuit	X	
331	652	5	YELLOW	Injector Solenoid Valve Cylinder #2 Circuit - open circuit	X	
332	654	5	YELLOW	Injector Solenoid Valve Cylinder #4 Circuit - open circuit	X	
341	630	2	YELLOW	Engine Control Module - data lost		X
342	630	13	RED	Engine Control Module - Out of Calibration		X
343	629	12	YELLOW	Engine Control Module - Warning Internal Hardware Failure		X
346	630	12	YELLOW	Engine Control Module - Warning Software error		
349	191	16	YELLOW	Transmission Output Shaft (Tailshaft) Speed High - Warning		
349	191	0	YELLOW	Transmission Output Shaft (Tailshaft) Speed High - Warning		
352	1079	4	YELLOW	Sensor Supply Voltage #1 Circuit - shorted low		
378	633	5	YELLOW	Fueling Actuator #1 Circuit - Open Circuit	X	
379	633	6	YELLOW	Fueling Actuator #1 Circuit - Grounded Circuit	X	
384	626	11	YELLOW	Start Assist Device Control Circuit Error (Ether Injection)		
386	1079	3	YELLOW	Sensor Supply Voltage #1 Circuit - shorted high		

Troubleshooting

387	1043	3	YELLOW	Accelerator Pedal Position Sensor Supply Voltage Circuit - shorted high		
394	635	5	YELLOW	Timing Actuator #1 Circuit - Open Circuit		
395	635	6	YELLOW	Timing Actuator #1 Circuit - grounded circuit		
396	1244	5	YELLOW	Fueling Actuator #2 Circuit - open circuit	X	
397	1244	6	YELLOW	Fueling Actuator #2 Circuit - grounded circuit	X	
398	1245	5	YELLOW	Timing Actuator #2 Circuit - open circuit		
399	1245	6	YELLOW	Timing Actuator #2 Circuit - Grounded Circuit		
414	608	9	YELLOW	Data Communication error over the J1587 data link circuit		
415	100	1	RED	Engine Oil Pressure Low - Critical		
418	97	15		Water in Fuel Indicator High - Maintenance		
419	1319	2	YELLOW	Intake Manifold Boost Pressure Imbalance		
422	111	2	YELLOW	Engine Coolant Level Sensor Circuit - data incorrect		
423	156	2	YELLOW	Fuel Timing Pressure or Timing Actuator stuck	X	
426	639	2		SAE J1939 datalink - cannot transmit		X
427	639	9		SAE J1939 not fast enough		X
428	97	3	YELLOW	Water in Fuel Sensor Circuit - shorted high		
429	97	4	YELLOW	Water in Fuel Sensor Circuit - shorted low		
431	558	2	YELLOW	Accelerator Pedal Idle Validation Circuit - data incorrect		
431	91	2	YELLOW	Accelerator Pedal Idle Validation Circuit - data incorrect		
432	558	13	RED	Accelerator Pedal Idle Validation Circuit - Our of Calibration		
432	91	13	RED	Accelerator Pedal Idle Validation Circuit - Our of Calibration		
433	102	2	YELLOW	Intake Manifold Pressure Sensor Circuit - data incorrect		
434	627	2	YELLOW	Power Lost without Ignition Off		
435	100	2	YELLOW	Engine Oil Pressure Sensor Circuit - data incorrect		
441	168	18	YELLOW	Battery #1 Voltage Low - Warning		
441	168	1		Battery #1 Voltage Low - Warning		
442	168	16	YELLOW	Battery #1 Voltage High- Warning		
443	1043	4	YELLOW	Accelerator Pedal Position Sensor Supply Voltage Circuit - shorted low		
449	94	16	YELLOW	Fuel Pressure High - Warning	X	

Troubleshooting

451	157	3	YELLOW	Injector Metering Rail #1 Pressure Sensor Circuit - Shorted High	X	
452	157	4	YELLOW	Injector Metering Rail #1 Pressure Sensor Circuit - Shorted Low	X	
455	633	3	RED	Fuel Control Valve Circuit - shorted high	X	
466	1188	4	YELLOW	Turbocharger #1 Wastegate Control Circuit - shorted low		
467	635	2	YELLOW	Timing Rail Actuator Circuit - data incorrect		
468	633	2	YELLOW	Fuel Rail Actuator Circuit - data incorrect	X	
479	1318	9		Exhaust Port Temperature Bank Imbalance		
482	94	18	YELLOW	Fuel Pressure Low - Warning	X	
483	1349	3	YELLOW	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted High	X	
484	1349	4	YELLOW	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted Low	X	
485	1349	16	YELLOW	Injector Metering Rail #2 Pressure High - Warning	X	
486	1349	18	YELLOW	Injector Metering Rail #2 Pressure Low - Warning	X	
487	626	1		Start Assist Device - Canister Empty (Ether Injection)		
489	191	18	YELLOW	Transmission Output Shaft (Tailshaft) Speed Low - Warning		
489	191	1	YELLOW	Transmission Output Shaft (Tailshaft) Speed Low - Warning		
496	1043	11	YELLOW	Engine Speed/Position Sensor #2 (Camshaft) Supply Voltage	X	
497	1377	2	YELLOW	Multiple Unit Synchronization Switch Circuit - data incorrect		
514	633	7	RED	Fuel Control Valve - mechanically stuck	X	
524	113	2	YELLOW	OEM Alternate Droop Switch Validation - data incorrect		
527	702	3	YELLOW	Auxiliary Input/Output #2 Circuit - shorted high		
528	93	2	YELLOW	OEM Alternate torque validation switch - data incorrect		
529	703	3	YELLOW	Auxiliary Input/Output #3 Circuit - shorted high		
546	94	3	YELLOW	Fuel Delivery Pressure Sensor Circuit - shorted high	X	
547	94	4	YELLOW	Fuel Delivery Pressure Sensor Circuit - shorted low	X	
551	558	4	YELLOW	Accelerator Pedal Idle Validation Circuit - shorted low		
551	91	4	RED	Accelerator Pedal Idle Validation Circuit - shorted low		
553	157	16	YELLOW	Injector Metering Rail #1 Pressure High - Warning Level	X	

Troubleshooting

554	157	2	YELLOW	Fuel Pressure Sensor Error	X	
555	1264	16	YELLOW	Engine Blowby - Warning Level		
555	1264	0	RED	Engine Blowby - Warning Level		
581	1381	3	YELLOW	Fuel Supply Pump Inlet Pressure Sensor Circuit - shorted high	X	
582	1381	4	YELLOW	Fuel Supply Pump Inlet Pressure Sensor Circuit - shorted low	X	
583	1381	18	YELLOW	Fuel Supply Pump Inlet Pressure Low - warning level	X	
595	103	16	YELLOW	Turbocharger #1 Speed High - warning level		
596	167	16	YELLOW	Electrical Charging System Voltage High - warning level		
597	167	18	YELLOW	Electrical Charging System Voltage Low - warning level		
598	167	1	RED	Electrical Charging System Voltage Low - critical level		
611	1383	31		Engine Hot Shutdown		
612	99	1	RED	High Lubricating Oil Filter Restriction		
617	1172	0		High Turbo Compressor Inlet Temperature LB		
621	1137	18	YELLOW	Low #1 LB Cylinder Power		
622	1138	18	YELLOW	Low #2 LB Cylinder Power		
623	1139	18	YELLOW	Low #3 LB Cylinder Power		
624	1140	18	YELLOW	Low #4 LB Cylinder Power		
625	1141	18	YELLOW	Low #5 LB Cylinder Power		
626	1142	18	YELLOW	Low #6 LB Cylinder Power		
631	1329	1	YELLOW	Low #1 RB Cylinder Power		
632	1329	1	YELLOW	Low #2 RB Cylinder Power		
633	1329	1	YELLOW	Low #3 RB Cylinder Power		
634	1329	1	YELLOW	Low #4 RB Cylinder Power		
635	1329	1	YELLOW	Low #5 RB Cylinder Power		
636	1329	1	YELLOW	Low #6 RB Cylinder Power		
641	1137	0	RED	High #1 LB Cylinder Exhaust Temperature		
642	1138	0	RED	High #2 LB Cylinder Exhaust Temperature		
643	1139	0	RED	High #3 LB Cylinder Exhaust Temperature		
644	1140	0	RED	High #4 LB Cylinder Exhaust Temperature		
645	1141	0	RED	High #5 LB Cylinder Exhaust Temperature		
646	1142	0	RED	High #6 LB Cylinder Exhaust Temperature		

Troubleshooting

649	1378	0		Change Lubricating Oil and Filter		
651	1143	0	RED	High #1 RB Cylinder Exhaust Temperature		
	1145	0	RED			
652	1144	0	RED	High #2 RB Cylinder Exhaust Temperature		
	1146	0	RED			
653	1145	0	RED	High #3 RB Cylinder Exhaust Temperature		
	1147	0	RED			
654	1146	0	RED	High #4 RB Cylinder Exhaust Temperature		
	1148	0	RED			
655	1147	0	RED	High #5 RB Cylinder Exhaust Temperature		
	1149	0	RED			
656	1148	0	RED	High #6 RB Cylinder Exhaust Temperature		
	1149	0	RED			
661	1323	0	YELLOW	High #1 LB Cylinder Power		
662	1324	0	YELLOW	High #2 LB Cylinder Power		
663	1325	0	YELLOW	High #3 LB Cylinder Power		
664	1326	0	YELLOW	High #4 LB Cylinder Power		
665	1327	0	YELLOW	High #5 LB Cylinder Power		
666	1328	0	YELLOW	High #6 LB Cylinder Power		
671	1137	4		Cylinder #1 LB Exhaust Temperature Sensor Failed Low		
672	1138	4		Cylinder #2 LB Exhaust Temperature Sensor Failed Low		
673	1139	4		Cylinder #3 LB Exhaust Temperature Sensor Failed Low		
674	1140	4		Cylinder #4 LB Exhaust Temperature Sensor Failed Low		
675	1141	4		Cylinder #5 LB Exhaust Temperature Sensor Failed Low		
676	1142	4		Cylinder #6 LB Exhaust Temperature Sensor Failed Low		
691	1172	3		LBF Turbo Comp Inlet Temperature Sensor Failed High		
692	1172	4		LBF Turbo Comp Inlet Temperature Sensor Failed Low		
711	1329	0	YELLOW	High #1 RB Cylinder Power		
712	1330	0	YELLOW	High #2 RB Cylinder Power		
713	1331	0	YELLOW	High #3 RB Cylinder Power		

Troubleshooting

714	1332	0	YELLOW	High #4 RB Cylinder Power		
715	1333	0	YELLOW	High #5 RB Cylinder Power		
716	1334	0	YELLOW	High #6 RB Cylinder Power		
719	1264	3	YELLOW	Crankcase Blowby Pressure Sensor Circuit - shorted high		
721	1143	4		Cylinder #1 RB Exhaust Temperature Sensor Failed Low		
	1145	4				
722	1144	4		Cylinder #2 RB Exhaust Temperature Sensor Failed Low		
	1146	4				
723	1145	4		Cylinder #3 RB Exhaust Temperature Sensor Failed Low		
	1147	4				
724	1146	4		Cylinder #4 RB Exhaust Temperature Sensor Failed Low		
	1148	4				
725	1147	4		Cylinder #5 RB Exhaust Temperature Sensor Failed Low		
	1149	4				
726	1148	4		Cylinder #6 RB Exhaust Temperature Sensor Failed Low		
	1149	4				
729	1264	4	YELLOW	Crankcase Blowby Pressure Sensor Circuit - shorted low		
753	723	2		Engine Speed/Position #2 - Cam sync error	X	
758	1349	7	YELLOW	Injector Metering Rail #2 Pressure Malfunction	X	
951	166	2		Cylinder Power Imbalance between cylinders		
2155	611	4		Post-Filter Oil Pressure Sensor Circuit - shorted low		

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Section 7 - Component Parts and Assemblies

7.1 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.*

7.2 Repairs and Technical Service

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.

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 cummins.com.

7.3 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.

7.4 Engine Data Sheet and Torque Values

The following pages outline applicable reference material for the CFP11E fire pump drive engine. [Table 7-1. CFP11E Engine Data](#) represents the engine data for the CFP11E and all its ratings at the time of this printing. For a complete, up-to-date, Model Specification Sheet, refer to power.cummins.com/fire-power. [Table 7-2. Cap Screw Markings and Torque Tables](#) outlines the recommended cap screw markings and torque values for fire pump drive engines.

Component Parts and Assemblies

Table 7-1. CFP11E Engine Data

Air Induction System

Maximum Temperature Rise Between Ambient Air and Engine Air Inlet	30 °F (16.7 °C)
Maximum Inlet Restriction with Dirty Filter	25 in. H ₂ O (635 mm H ₂ O)
Recommended Air Cleaner Element - (Standard)	K&N RU-3220

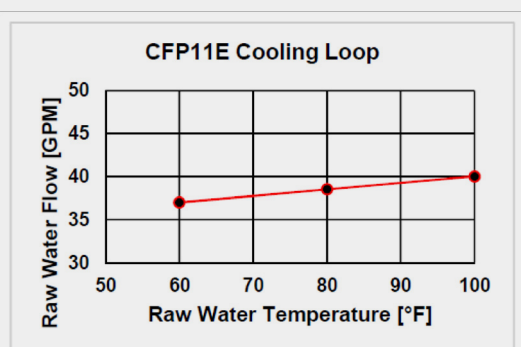
Lubrication System

Oil Pressure Range at Rated	35 PSI (241 kPa) Nominal
Oil Capacity of Pan (High - Low)	36-32 qt. (45-38 L)
Total System Capacity	7 gal. (26.5 L)
Recommended Lube Oil Filter	Cummins Filtration LF9001

Cooling System

Raw Water Working Pressure Range at Heat Exchanger	60 PSI (413 kPa) MAX
Recommended Minimum Water Supply Pipe Size to Heat Exchanger	1 in. (25.4 mm)
Recommended Minimum Water Discharge Pipe Size From Heat Exchanger	1.25 in. (31.75 mm)
Coolant Water Capacity (Engine Only)	2.5 gal. (9.5 L)
Standard Thermostat - Type	Modulating
Standard Thermostat - Range	180-200 °F (82-93 °C)
Minimum Raw Water Flow:	
- with Water Temperatures to 60 °F (16 °C)	37 GPM (2.33 L/sec)
- with Water Temperatures to 80 °F (27 °C)	38.5 GPM (2.43 L/sec)
- with Water Temperatures to 100 °F (38 °C)	40 GPM (2.52 L/sec)

* A jacket water heater is mandatory on this engine. The recommended heater wattage is 2250 down to 40 °F (4 °C)



Exhaust System

Maximum Allowable Back Pressure by Complete Exhaust System	40.8 in. H ₂ O (10.2 kPa)
Exhaust Pipe Size Normally Acceptable	5 in. (127 mm)

Component Parts and Assemblies

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

Top	101.4 dBa
Right Side	104.1 dBa
Left Side	104.2 dBa
Front	104.6 dBa
Exhaust	121.0 dBa

Fuel Supply/Drain System

Operating Speed in RPM	1470		1760		2100	
Fuel Rate - Gal/hr (L/hr)	16.3	(61.8)	19.1	(72.3)	16.7	(63.1)

Fuel Type	No. 2 diesel only
Minimum Supply Line Size	0.5 in. (12.7 mm)
Minimum Drain Line Size	0.375 in. (9.53 mm)
Maximum Fuel Height above C/L Fuel Pump	237 in. (6 m)
Recommended Fuel Filter - Primary	Cummins Filtration FS1000
Recommended Fuel Filter - Secondary	None
Maximum Restriction @ Lift Pump-Inlet - With Clean Filter	4.0 in. Hg (102 mm Hg)
Maximum Restriction @ Lift Pump-Inlet - With Dirty Filter	8.0 in. Hg (203 mm Hg)
Maximum Return Line Restriction - Without Check Valves	2.5 in. Hg (64 mm Hg)
Minimum Fuel Tank Vent Capability	30 ft ³ /hr (0.9 m ³ /hr)
Maximum Fuel Temperature @ Lift Pump Inlet	160 °F (71 °C)

Starting and Electrical System

Min. Recommended Battery Capacity - Cold Soak at 0 °F (-18 °C) or Above	24V
Engine Only - Cold Cranking Amperes	1400 CCA*
Engine Only - Reserve Capacity	430 minutes*

*Based on FM requirement for a minimum of 900 CCA and 430 Reserve Capacity Minutes

Battery Cable Size - Minimum of 2/0 AWG and Maximum Cable Length Not to Exceed 6 ft. (1.5 m)	24V
Maximum Resistance of Starting Circuit	0.0017 Ohms
Typical Cranking Speed	120 RPM
Alternator (Standard), Internally Regulated	70 amps

Operating Conditions

Operating Speed in RPM	1470		1760		2100	
Output - BHP (kW)	347	(259)	401	(299)	345	(257)
Ventilation Air Required - CFM (litre/sec)	740	(349)	875	(413)	854	(403)
Exhaust Gas Flow - CFM (litre/sec)	1890	(892)	2180	(1029)	2009	(948)
Exhaust Gas Temperature - °F (°C)	977	(525)	954	(512)	844	(451)
Heat Rejection to Coolant - BTU/min. (kW)	4750	(83)	5600	(98)	5265	(93)
Heat Rejection to Ambient - BTU/min. (kW)	1500	(26)	1580	(28)	1435	(25)

Table 7-2. Cap Screw Markings and Torque Tables

Cap Screw Markings and Torque Values



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

Component Parts and Assemblies

7.5 CFP11E Assembly Drawings

Please refer to our website at power.cummins.com/fire-power for the most up-to-date information.

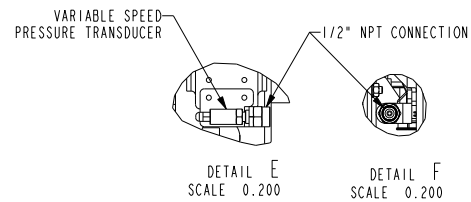
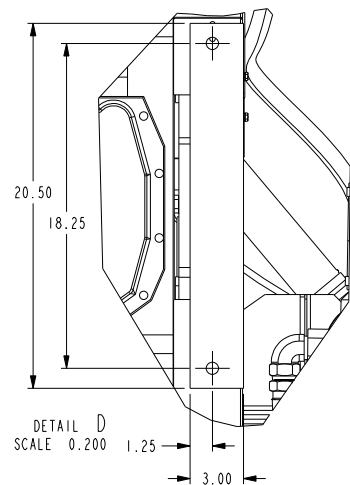
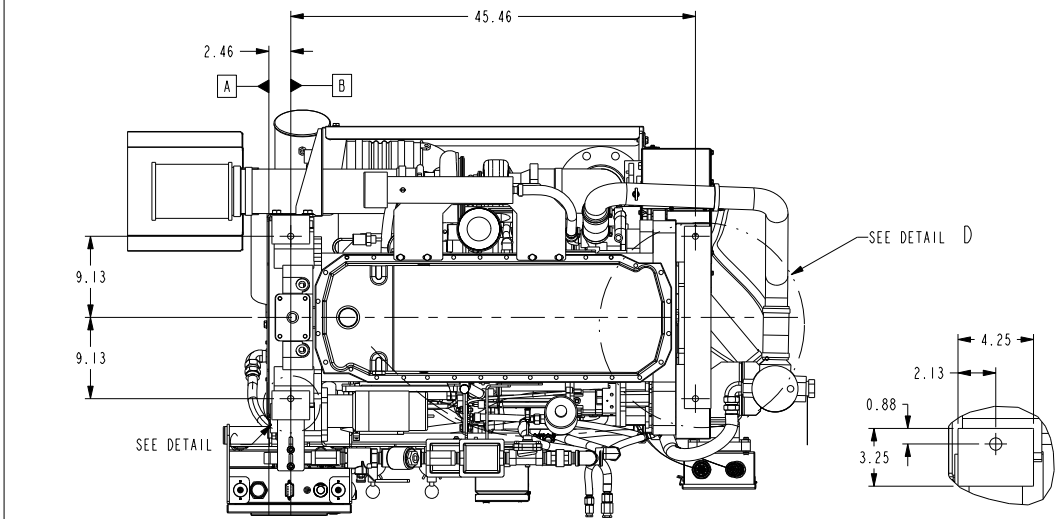
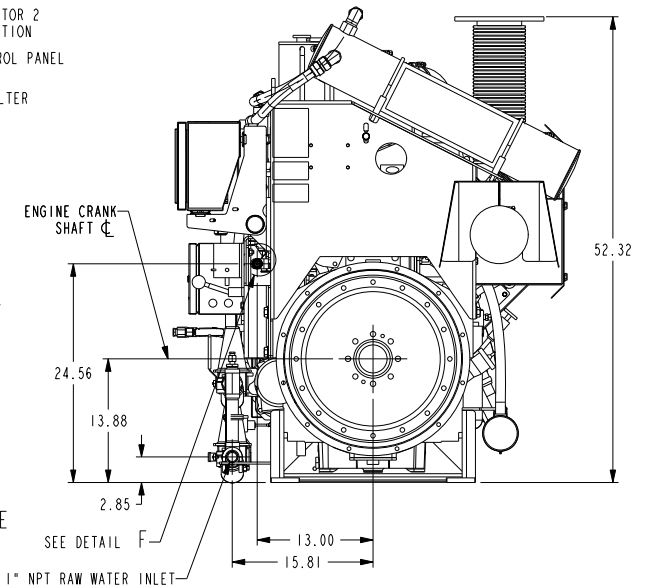
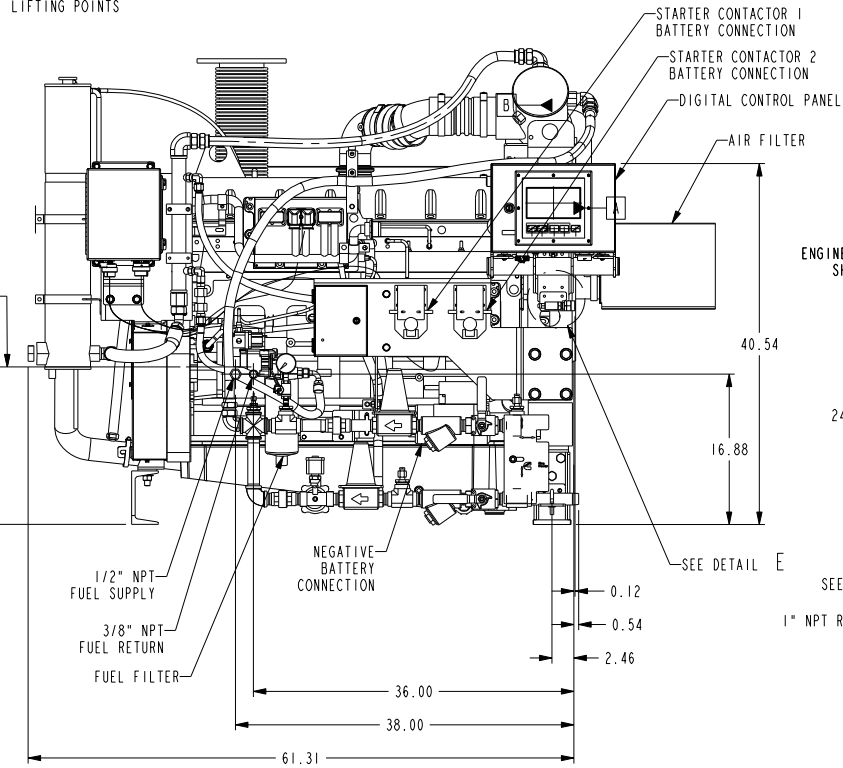
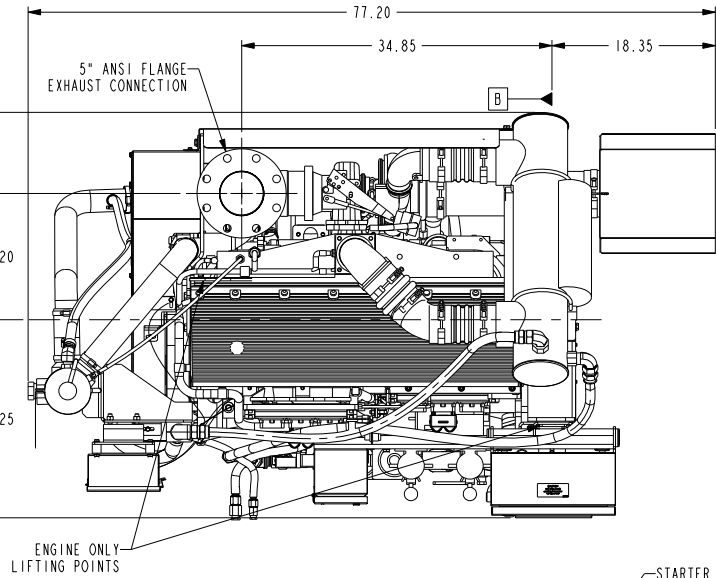
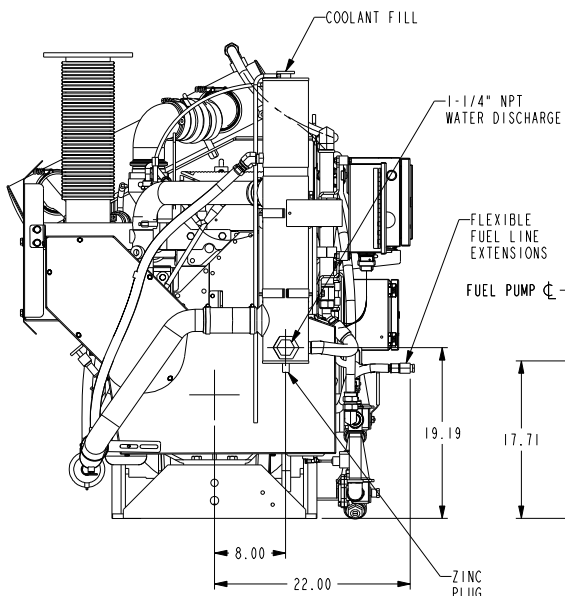
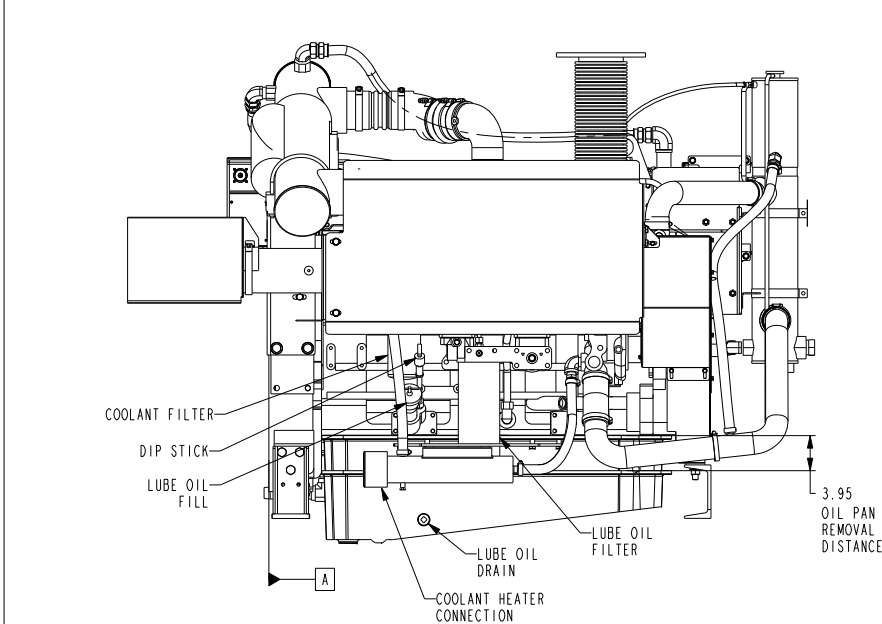
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A042H684	Assembly, Fire Pump, CFP11E F20
8740	Options, Engine, CFP11E
A042B827	Assembly, Heat Exchanger CFP11E
A042B161	Assembly, Air Intake CFP11E
A042B961	Assembly, Guarding CFP11E
A042J796	Assembly, Coolant Heater CFP11E
A042J829	Assembly, Sensors and Harnessing CFP11E
21249	Assembly, Control Panel Mounting
Assembly, All Components Top-level:	
A042G185	Assembly, Panel, Digital Electronic
8824-24	Battery Contactors 24V
15209	Kit, Fuel Lines CFP11E
A042B166	Misc. Piping, Cooling Loop, Raw Water CFP11E
A042H730	Assembly, Raw Water Cooling Loop, 1" Vertical CFP11E
A042H732	Assembly, Raw Water Cooling Loop, 1" Horizontal 24V CFP11E
A042D200	Misc. Piping, Cooling Loop, Sea Water CFP11E
A042H733	Assembly, Sea Water Cooling Loop, 1" Vertical CFP11E
A042H735	Assembly, Sea Water Cooling Loop, 1" Horizontal 24V CFP11E
9679	Assembly, Stub-Shaft and Guarding CFP11E
A042J124	Schematic, Overall CFP11E, GEN II FPDP



CFPIIE CONNECTION INFORMATION	
SAE #1	FLYWHEEL HOUSING
1/2" NPT	FUEL INLET
3/8" NPT	FUEL OUTLET
1" NPT	RAW WATER INLET
1 1/4" NPT	RAW WATER DISCHARGE
120 / 240 VAC	COOLANT HEATER (2250 WATTS)
5" DIA NPT, CUFF, OR FLANGE	EXHAUST CONNECTION

- NOTES:
1. ALL PLUMBING MUST BE SUPPORTED AND/OR ISOLATED SO THAT NO WEIGHT OR STRESS IS APPLIED TO ANY ENGINE COMPONENT.
 2. REFER TO ENGINE DATA SHEET FOR CUSTOMER CONNECTION RECOMMENDATIONS.
 3. DO NOT SCALE DRAWING.
 4. DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.

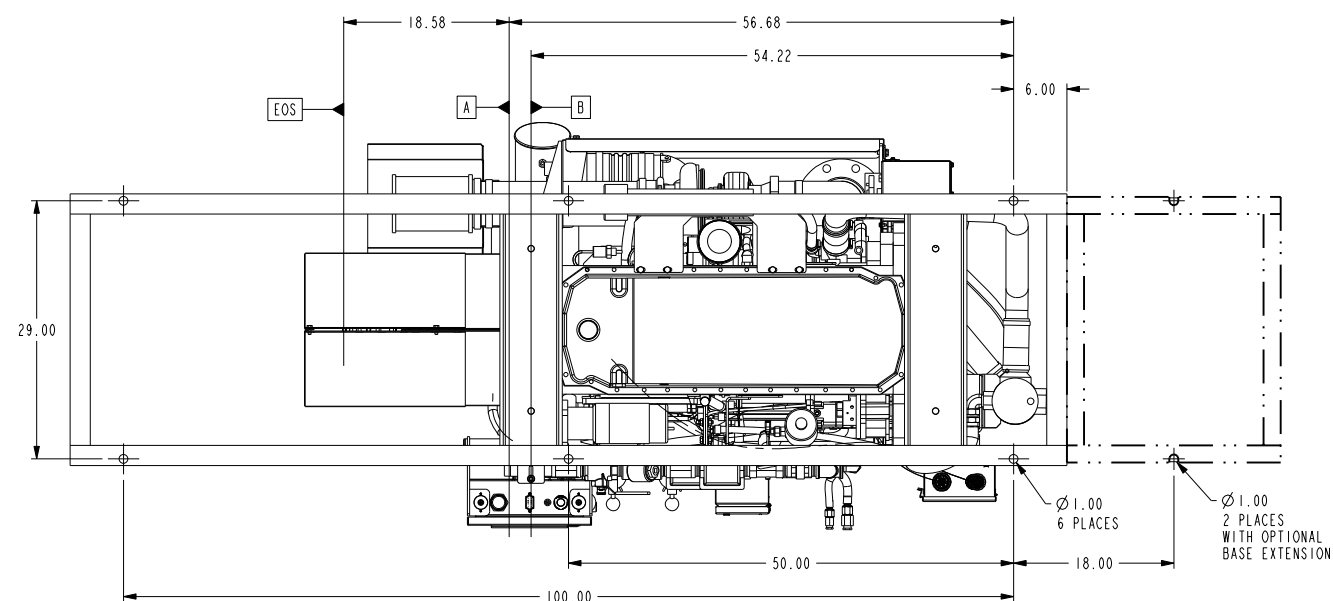
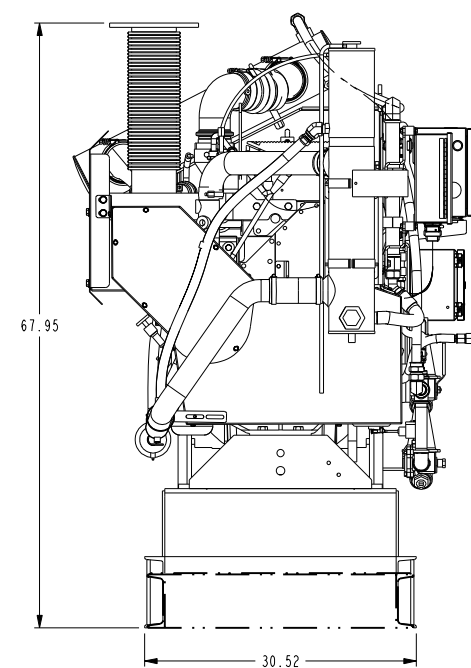
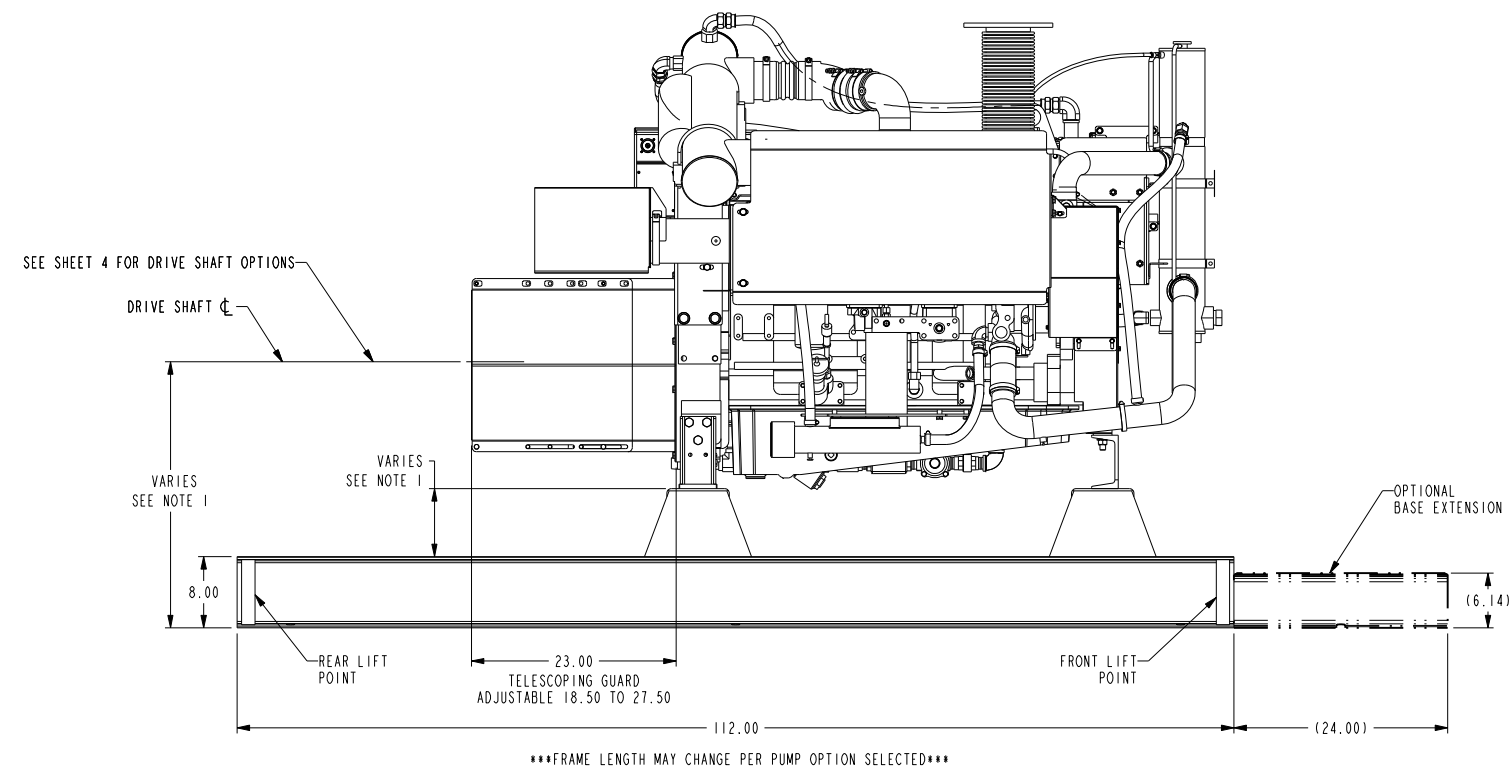
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SHEET #2	GENERAL ARRANGEMENT - HORIZONTAL SPLIT CASE PUMP BASE OPTION
SHEET #3	GENERAL ARRANGEMENT - VERTICAL TURBINE PUMP BASE OPTION
SHEET #4	DRIVE LINE OPTIONS
DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL MOUNTING SURFACE
DATUM "D"	UJOINT ADAPTER MOUNTING SURFACE
DATUM "EOS"	END OF PUMP SHAFT



DETAIL C
SCALE 0.200


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REV		ECO		DATE	

LEGEND AND DATUM IDENTIFIER	
SHEET #1	INSTALLATION DRAWING
SHEET #2	GENERAL ARRANGEMENT - HORIZONTAL SPLIT CASE PUMP BASE OPTION
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DATUM "D"	UJOINT ADAPTER MOUNTING SURFACE
DATUM "EOS"	END OF PUMP SHAFT



- NOTES:
1. RISER HIEGHT VARIES TO ACCOMDATE CUSTOMER SUPPLIED PUMPS
 2. REFERENCE OWNERS MANUAL FOR DRIVE SHAFT ALIGNMENT SPECS
 3. DO NOT SCALE DRAWING.
 4. DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.
 5. REFERENCE SHEET #1 FOR BASE FIRE PUMP INTERFACE

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

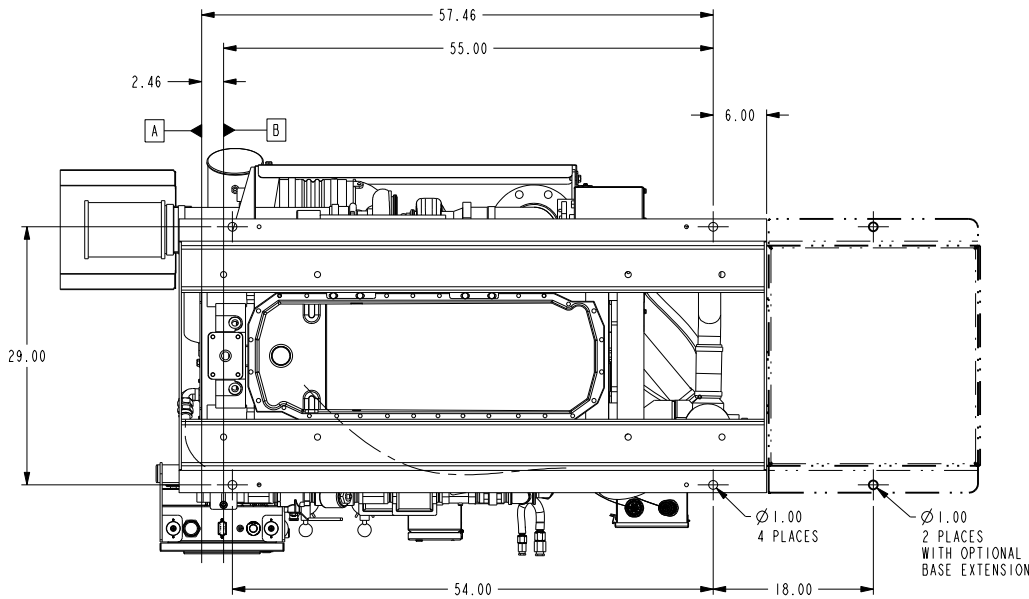
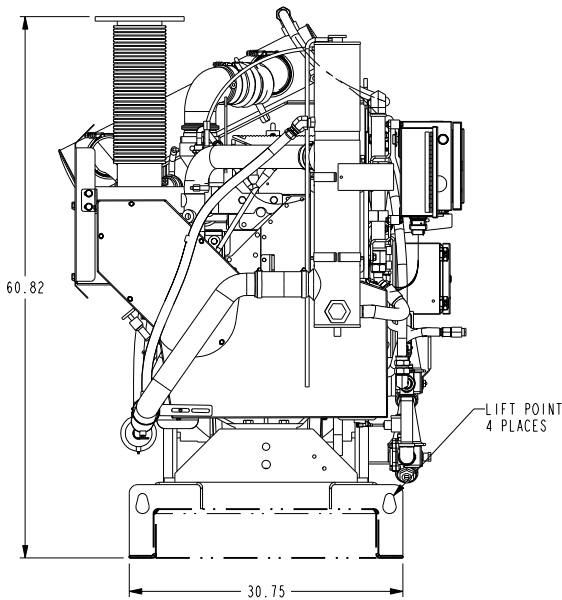
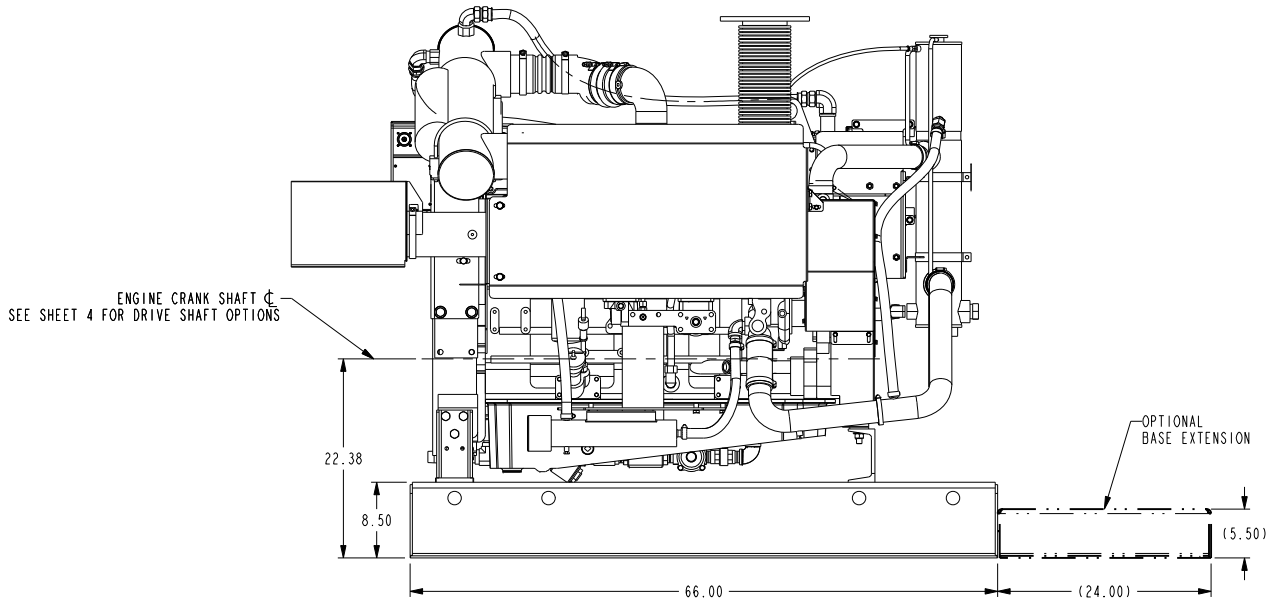
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ANGULAR DIMENSIONS $\pm 1^\circ$	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION		FINISH TOLERANCES F1 = ± 0.005 F2 = ± 0.010 F3 = ± 0.015 F4 = ± 0.020 F5 = ± 0.030 F6 = ± 0.040 F7 = ± 0.050 F8 = ± 0.060 F9 = ± 0.070 F10 = ± 0.080 F11 = ± 0.090 F12 = ± 0.100 F13 = ± 0.120 F14 = ± 0.150 F15 = ± 0.200 F16 = ± 0.250 F17 = ± 0.300 F18 = ± 0.375 F19 = ± 0.450 F20 = ± 0.500 F21 = ± 0.625 F22 = ± 0.750 F23 = ± 0.875 F24 = ± 1.000 F25 = ± 1.250 F26 = ± 1.500 F27 = ± 1.750 F28 = ± 2.000 F29 = ± 2.500 F30 = ± 3.000 F31 = ± 3.750 F32 = ± 4.500 F33 = ± 5.000 F34 = ± 6.250 F35 = ± 7.500 F36 = ± 8.750 F37 = ± 10.000 F38 = ± 12.500 F39 = ± 15.000 F40 = ± 17.500 F41 = ± 20.000 F42 = ± 25.000 F43 = ± 30.000 F44 = ± 37.500 F45 = ± 45.000 F46 = ± 50.000 F47 = ± 62.500 F48 = ± 75.000 F49 = ± 87.500 F50 = ± 100.000	FINISH TOLERANCES F1 = ± 0.127 F2 = ± 0.254 F3 = ± 0.381 F4 = ± 0.508 F5 = ± 0.762 F6 = ± 1.016 F7 = ± 1.270 F8 = ± 1.524 F9 = ± 1.778 F10 = ± 2.032 F11 = ± 2.286 F12 = ± 2.540 F13 = ± 2.794 F14 = ± 3.048 F15 = ± 3.302 F16 = ± 3.556 F17 = ± 3.810 F18 = ± 4.064 F19 = ± 4.318 F20 = ± 4.572 F21 = ± 4.826 F22 = ± 5.080 F23 = ± 5.334 F24 = ± 5.588 F25 = ± 5.842 F26 = ± 6.096 F27 = ± 6.350 F28 = ± 6.604 F29 = ± 6.858 F30 = ± 7.112 F31 = ± 7.366 F32 = ± 7.620 F33 = ± 7.874 F34 = ± 8.128 F35 = ± 8.382 F36 = ± 8.636 F37 = ± 8.890 F38 = ± 9.144 F39 = ± 9.398 F40 = ± 9.652 F41 = ± 9.906 F42 = ± 10.160 F43 = ± 10.414 F44 = ± 10.668 F45 = ± 10.922 F46 = ± 11.176 F47 = ± 11.430 F48 = ± 11.684 F49 = ± 11.938 F50 = ± 12.192

CFPIIE-F10/20		
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EST WEIGHT:		


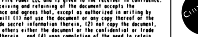
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CFPIIE CONNECTION INFORMATION	
SAE #1	FLYWHEEL HOUSING
1/2" NPT	FUEL INLET
3/8" NPT	FUEL OUTLET
1" NPT	RAW WATER INLET
1-1/4" NPT	RAW WATER DISCHARGE
120 / 240 VAC	COOLANT HEATER (2250 WATTS)
5" DIA NPT, CUFF, OR FLANGE	EXHAUST CONNECTION

LEGEND AND DATUM IDENTIFIER	
SHEET #1	INSTALLATION DRAWING
SHEET #2	GENERAL ARRANGEMENT - HORIZONTAL SPLIT CASE PUMP BASE OPTION
SHEET #3	GENERAL ARRANGEMENT - VERTICAL TURBINE PUMP BASE OPTION
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DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL MOUNTING SURFACE
DATUM "D"	UJOINT ADAPTER MOUNTING SURFACE
DATUM "EOS"	END OF PUMP SHAFT

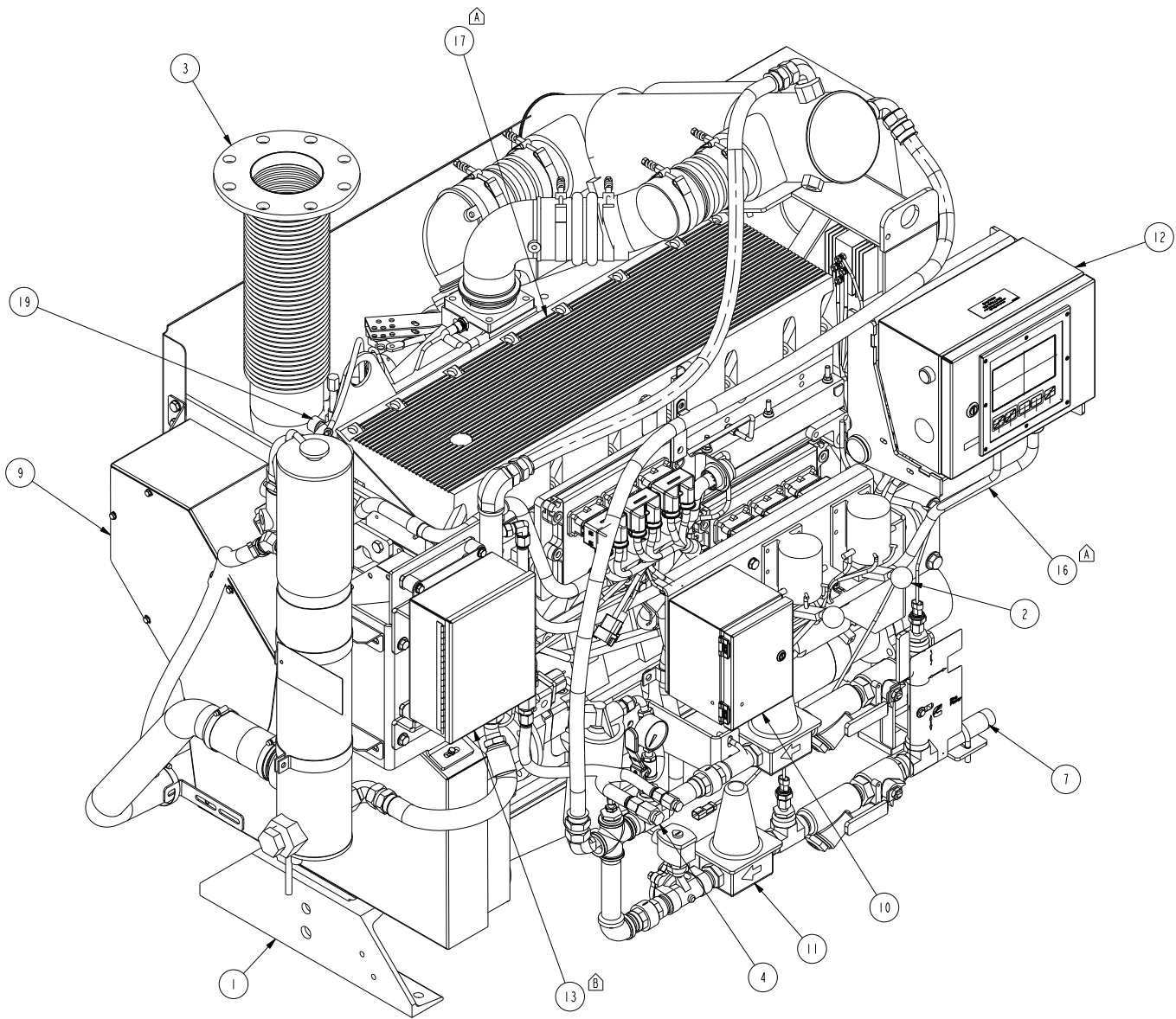
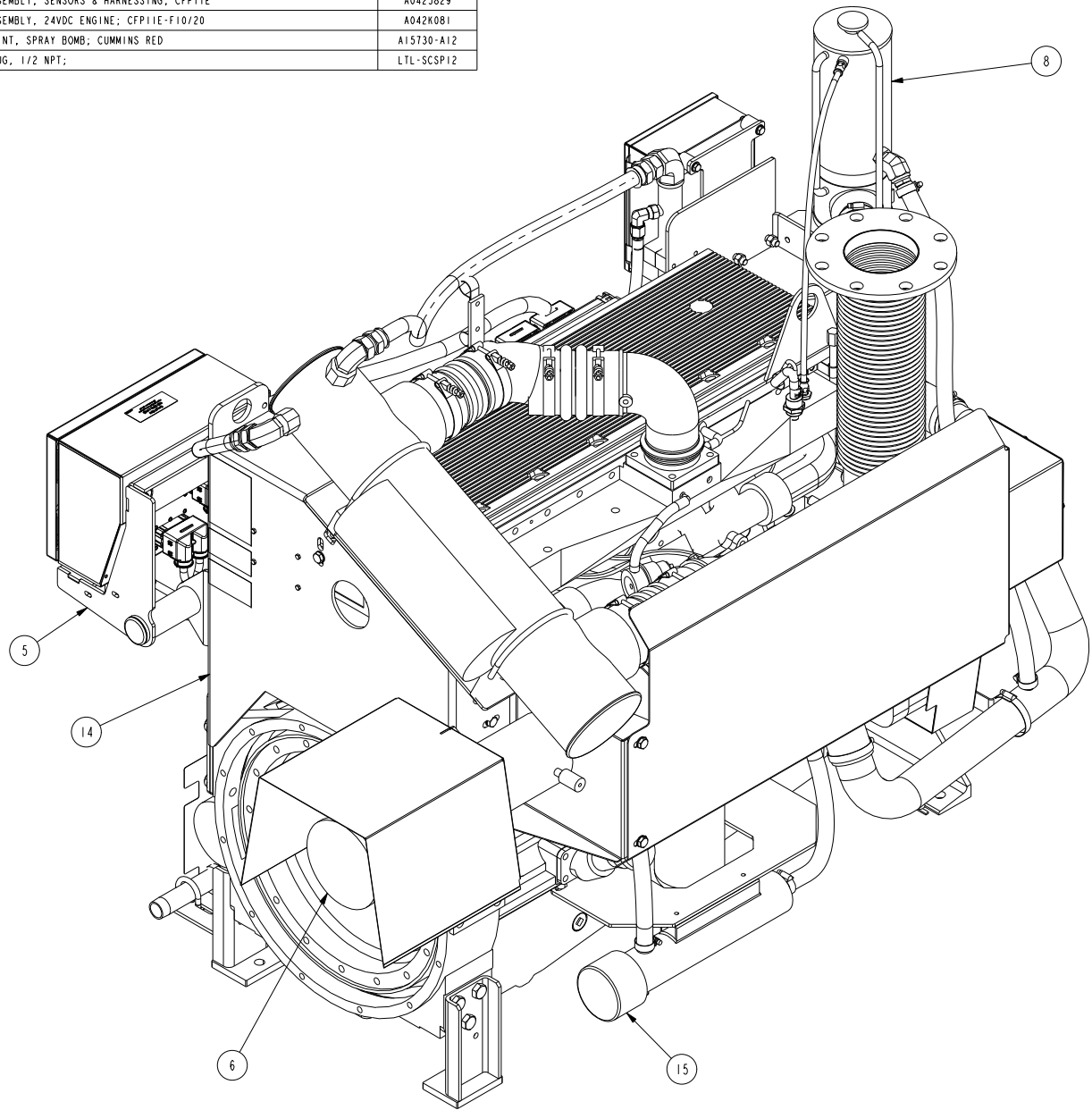




- NOTE:
1. TORSIONAL ANALYSIS REQUIRED FOR VERTICAL TURBINE INSTALLATION
 2. REFERENCE OWNERS MANUAL FOR DRIVE SHAFT ALIGNMENT SPECS
 3. DO NOT SCALE DRAWING.
 4. DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.
 5. REFERENCE SHEET #1 FOR BASE FIREPUMP INTERFACE

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UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE: ANGULAR DIMENSIONS: \pm .1° THIRD ANGLE PROJECTION							
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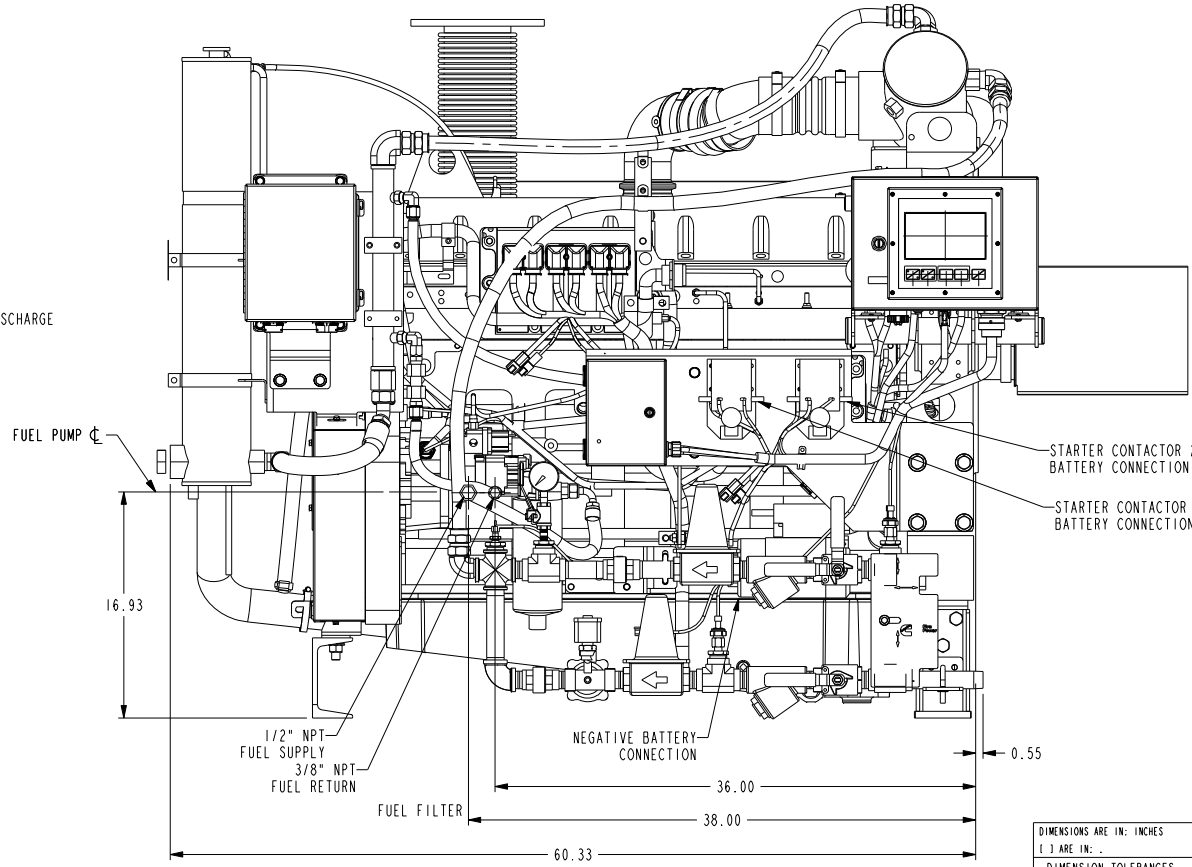
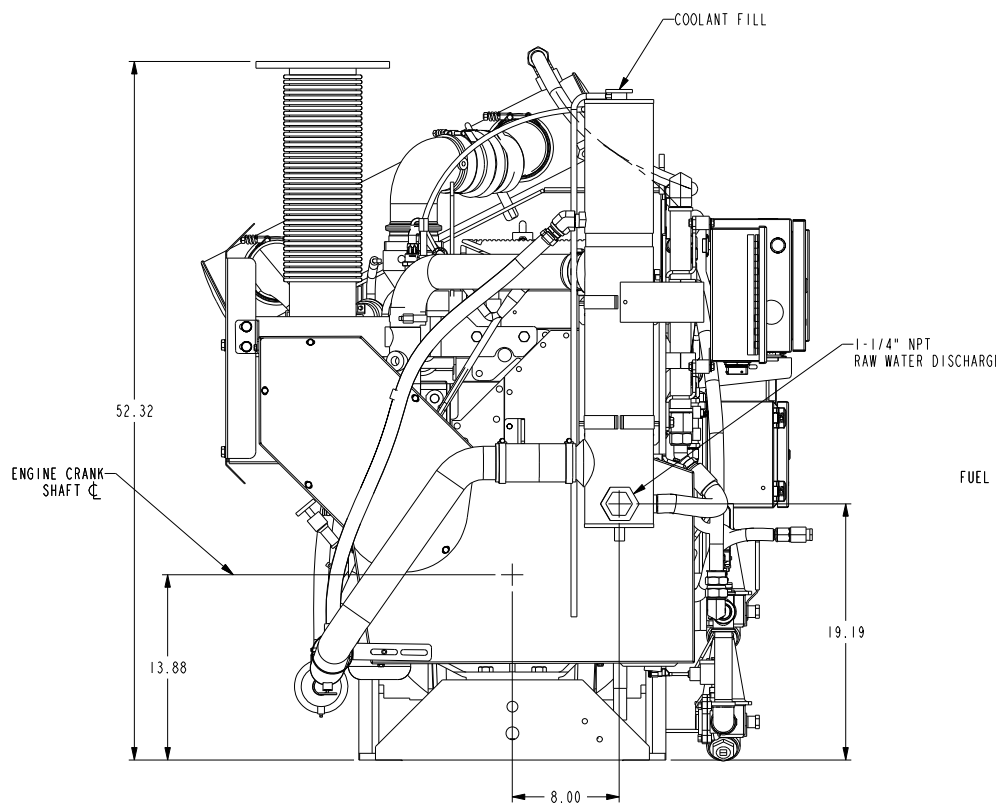
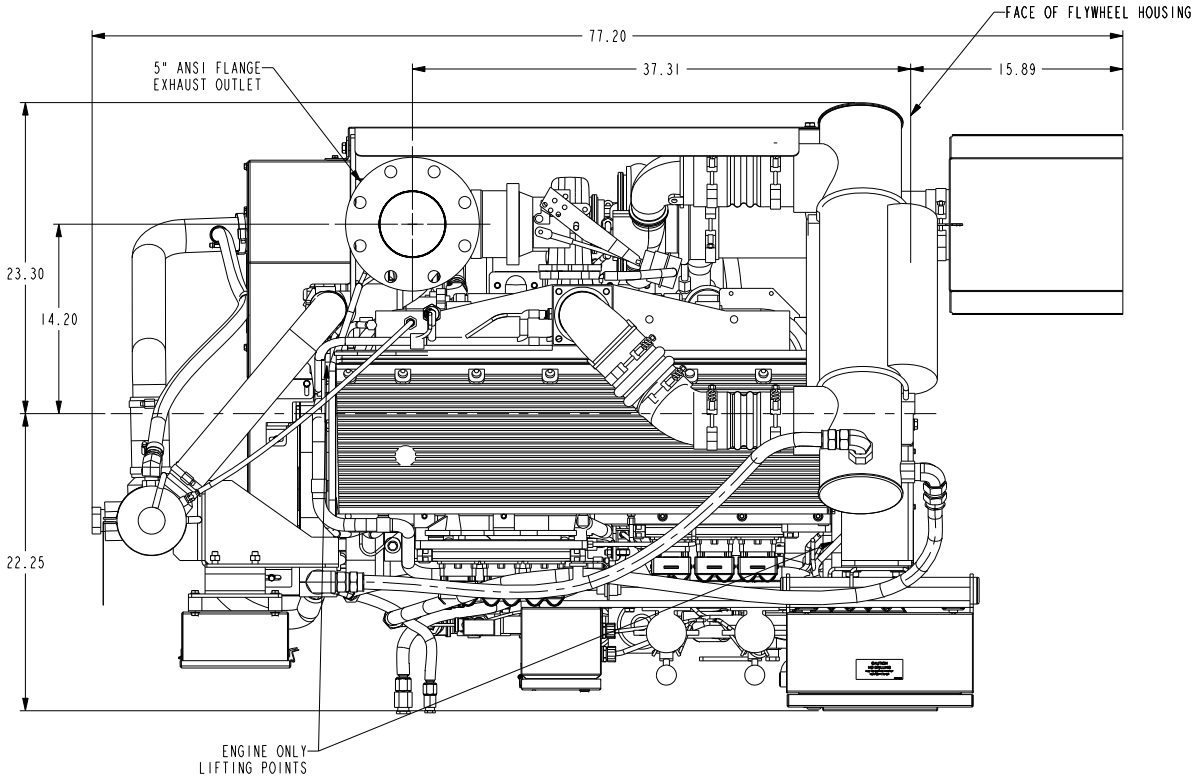
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ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSEMBLY, MOUNTING, ENGINE; CFPIIE	8773
2	2	CONTACTOR, MANUAL OVERRIDE, 24V; PN:535-0098, FIREPUMP	8824-24
3	1	EXHAUST, L 90 HALF MARMON; 5" 125# ANSI FLANGE	9514-03
4	1	KIT, FUEL LINES, CFPIIE; F10/20 - EXT ONLY	15209
5	1	ASSEMBLY, CONTROL PANEL MOUNTING; CFP POWER UNITS	21249
6	1	ASSEMBLY, AIR CLEANER; CFPIIE	A042B161
7	1	MISCELLANEOUS PIPING; CFPIIE	A042B166
8	1	ASSEMBLY, HEAT EXCHANGER; CFPIIE	A042B827
9	1	ASSEMBLY, GUARDING; CFPIIE	A042B961
10	1	ENCLOSURE, INTERFACE; BATTERY CHARGER FIRE PUMP	A042C868
11	1	COOLING LOOP, 1", 24V; RAW WATER	A042H732
12	1	CONTROL ASSEMBLY; FPDP ELECTRONIC CARBON STEEL	A042H780
13	1	KIT, RELAY; CFPIIE	A042H812
14	1	ASSEMBLY, ACCESSORY PANEL; CFPIIE	A042J791
15	1	ASSEMBLY, COOLANT HEATER; CFPIIE	A042J796
16	1	ASSEMBLY, SENSORS & HARNESSING; CFPIIE	A042J829
17	1	ASSEMBLY, 24VDC ENGINE; CFPIIE-F10/20	A042K081
18	1	PAINT, SPRAY BOMB; CUMMINS RED	A15730-A12
19	1	PLUG, 1/2 NPT;	LTL-SCSP12

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
A	2017-137	DELETE A042B153, A042J801. ADD A042K081, A042J829	HE392		NE627	09MAR2017
B	2017-337	DELETE A042G904, ADD A042H812	HE392		NE627	24MAY2017



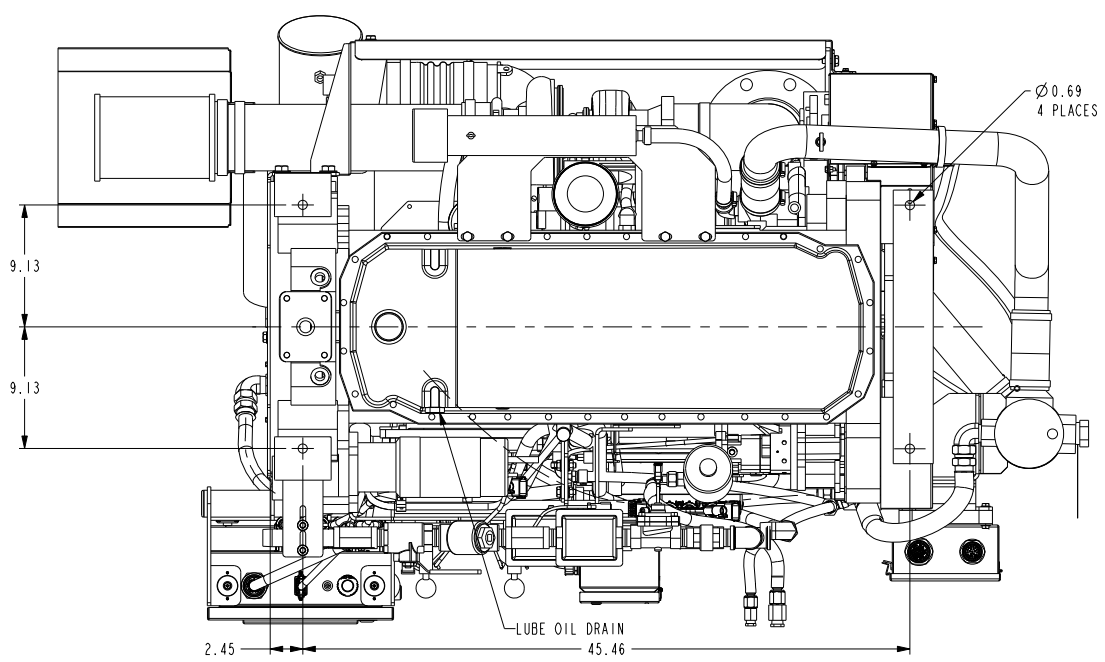
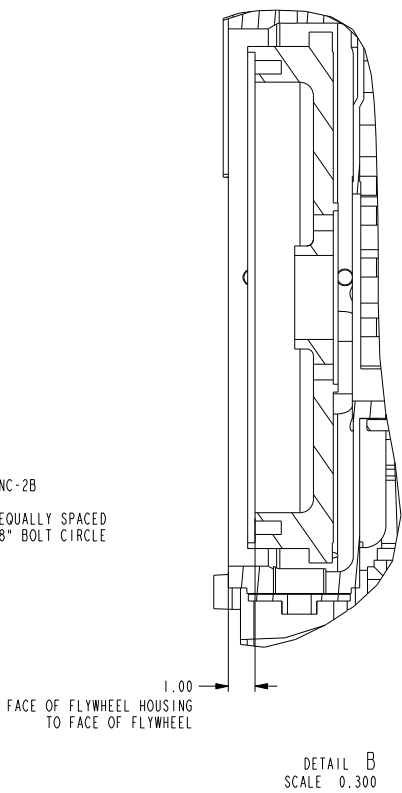
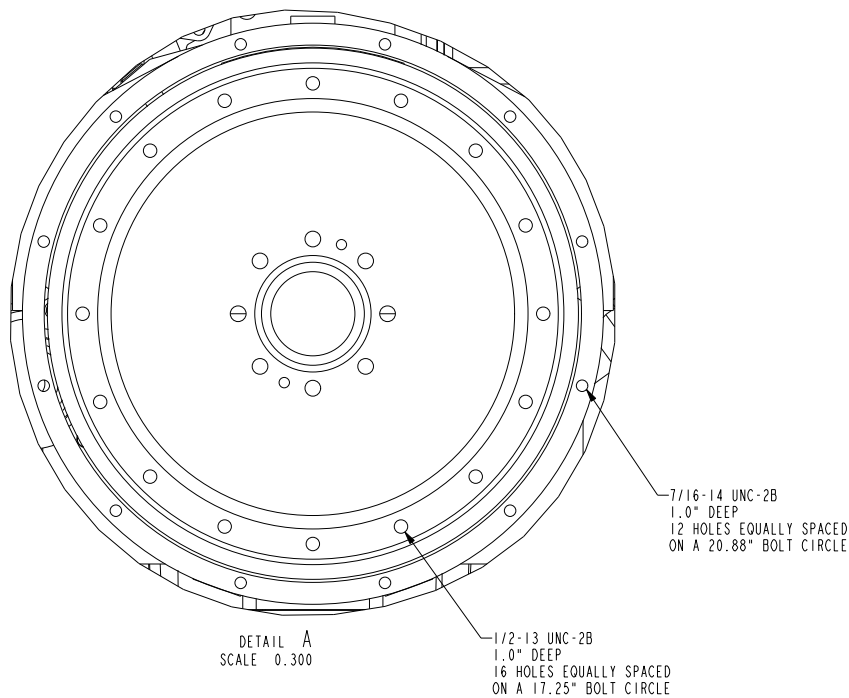
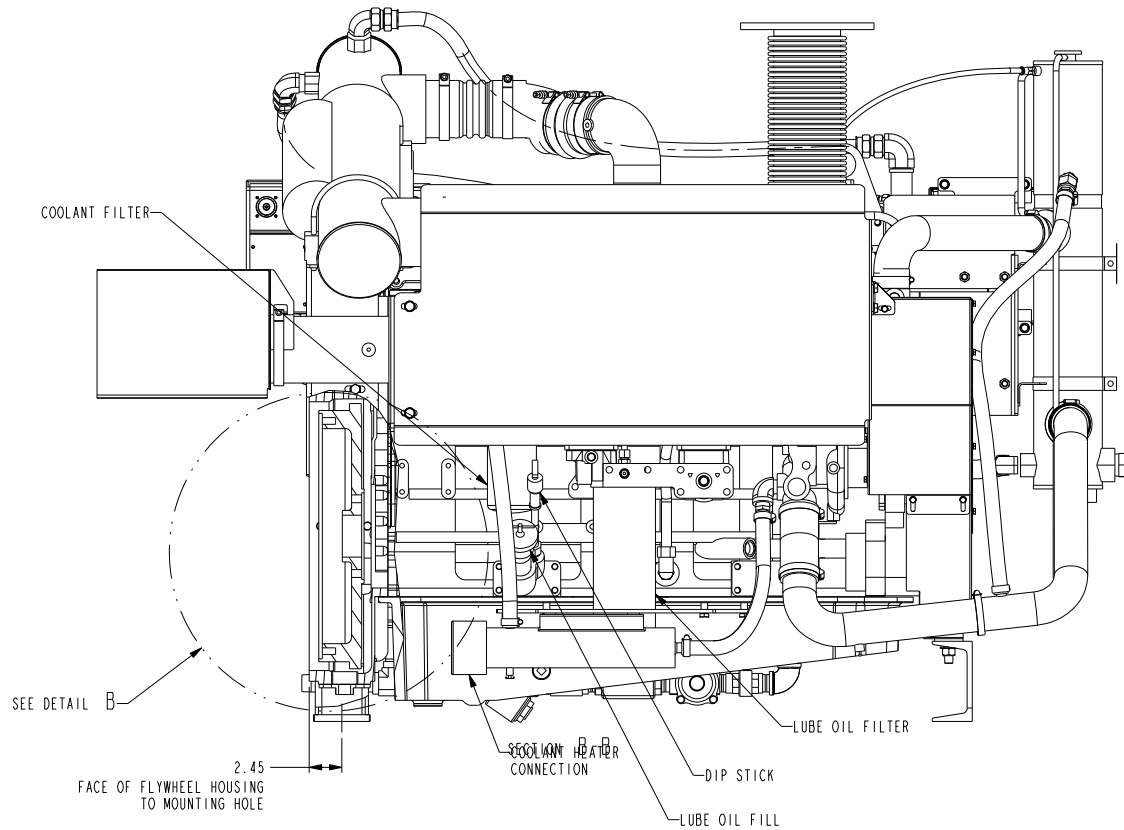
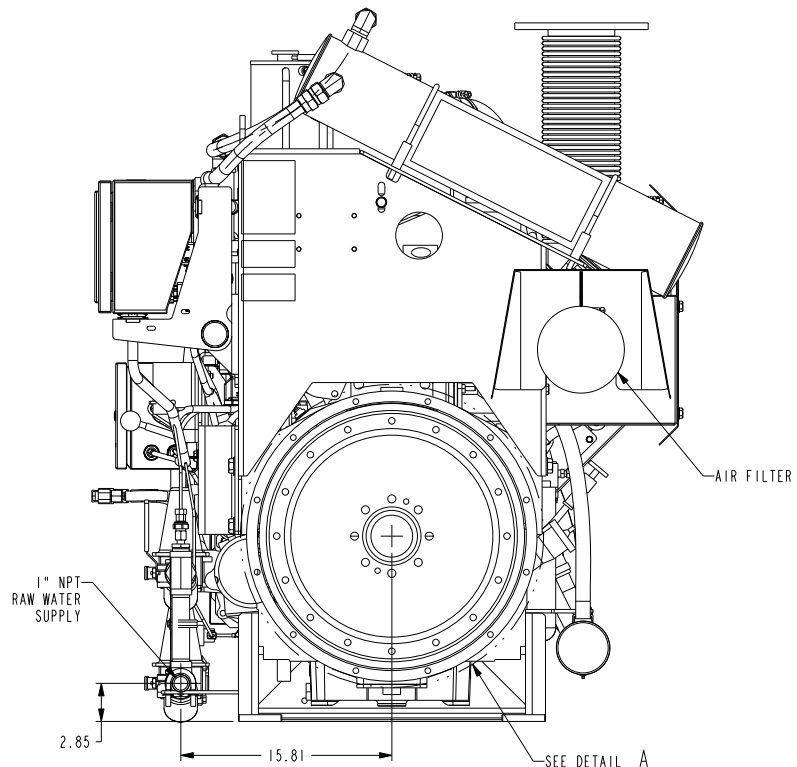
DIMENSIONS ARE IN: INCHES 1 3 ARE 1M:		DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential		Cummins Sales and Service		
DIMENSION TOLERANCES		SCALE 0.190	DWN HE392		ITEM NAME		
X.X: ±0.030IN OR 2.3mm			CKD		ASSEMBLY, FIRE PUMP		
X.XX: ±0.030IN OR 0.76mm			APVD NE627		CFPIIE-F10/20		
X.XXX: ±0.015IN OR 0.381mm			DATE 25JAN2017		ITEM NUMBER		
ANGULAR TOLERANCE: ±1°		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009			D A042H684		
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM, REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE, WITHOUT WRITTEN CONSENT OF CUMMINS, INC.		MUST CONFORM TO CES 10903			CAD SHEET 1 OF 3		

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
B	2017-337	SEE SHEET 1 FOR LATEST REVISION DETAILS	HE392		NE627	4MAY2017



DIMENSIONS ARE IN: INCHES 1:3 ARE 1IN: .		DO NOT SCALE PRINT	CM1 DATA CLASSIFICATION Cummins Confidential		Cummins Sales and Service	
DIMENSION TOLERANCES X.X: ±0.030IN OR 2.3mm X.XX: ±0.020IN OR 0.76mm X.XXX: ±0.015IN OR 0.381mm ANGULAR TOLERANCE: ±1°		SCALE 0.150	DWN HE392		ITEM NAME ASSEMBLY, FIRE PUMP CFPIIE-F10/20	
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM. REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE, WITHOUT WRITTEN CONSENT OF CUMMINS, INC.			CKD		ITEM NUMBER A042H684	
			APVD NE627		CAD SHEET 2 OF 3	
			DATE 25JAN2017	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009		
			MUST CONFORM TO CES 10903			

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
B	2017-337	SEE SHEET 1 FOR LATEST REVISION DETAILS	HE392		NE627	4MAY2017



DIMENSIONS ARE IN: INCHES 1 3 ARE 1M:		DO NOT SCALE PRINT	CM1 DATA CLASSIFICATION Cummins Confidential		Cummins Sales and Service	
DIMENSION TOLERANCES		SCALE 0.150	DWN HE392		ITEM NAME	
X.X: ±0.000IN OR 2.3mm			CKD		ASSEMBLY, FIRE PUMP	
X.XX: ±0.000IN OR 0.76mm			APVD NE627		CFPIIE-F10/20	
X.XXX: ±0.015IN OR 0.381mm			DATE 25JAN2017		ITEM NUMBER	
ANGULAR TOLERANCE: ±1°		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009		MUST CONFORM TO CES 10903		
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM, REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS, INC.				D ITEM NUMBER		CAD SHEET
				A042H684		3 OF 3

PN8740
SO35246
ModelQSM11
ConfigD353014CX03

Option	Desc	Option	Desc
FIRE 24	QSM11	LA 2053	ARRANGEMENT,LIFT
AD 2061	PULLEY,ACCESSORY	LC 2766	HEAD,OIL FILTER
AP 2077	APPROVAL,AGENCY	LF 2054	FILTER,FULL FLOW
BB 2712	BLOCK,CYLINDER	LG 2066	GAUGE,OIL LEVEL
BB 2737	PLUMBING,CYLINDE	LP 2711	PUMP,LUBRICATING
BR 2033	BREATHER,CRANKCA	LT 2025	LITERATURE
BR 2722	PLUMBING,CRC BRE	NN 2713	NAMEPLATE
CH 2021	AID,COO HEATER S	OB 2430	ARRANGEMENT,OIL
CI 2705	PLUMBING,CPR AIR	OB 2701	COVER,HAND HOLE
CP 2063	COMPRESSOR,AIR	OP 2103	PAN,OIL
CP 2709	MOUNTING,AIR COM	PH 2017	LOCATION,ENG CNT
DA 2078	DAMPER,VIBRATION	PH 2810	MODULE,ENGINE CO
DF 2036	DRIVE,FRO GER TR	PP 2829	PARTS,PERFORMANC
DL 2031	LOCATION,DRAIN	PP20007	TURBOCHARGER
DO 2422	SOFTWARE,CUS INT	PU 2002	PULLEY,ACCESSORY
DP 2701	DRIVE,FUEL PUMP	PW 2079	POWER,PROGRAMMAB
EA 2036	ACCESSORIES,ELEC	RL 2711	LEVER,ROCKER
EB 2047	BRAKE,ENGINE	RP 2708	PLUMBING,RADIATO
EC 2701	THERMOSTAT	SC20698	SOFTWARE,CALIBRA
EE2069	Alternator, 12V, 100A, Delco 24SI	SK 2003	ARRANGEMENT,SHIP
EH 2154	MOUNTING,ALTERNA	SK 2705	BRACKET,SHIPPING
EH 2735	DRIVE,ALTERNATOR	SM 2704	MOUNTING,STARTIN
EM 2038	SUPPORT,FRONT EN	SS 1097	PAINT
FA 2118	DRIVE,FAN	ST 2025	MOTOR,STARTING
FCXJ 2	CALIBRATION,FUEL	TB 2287	ARRANGEMENT,TURB
FCZ 3	CALIBRATION,FUEL	TB 2723	MOUNTING,EXHAUST
FF 2241	FILTER,FUEL	TB 2731	MOUNTING,INTAKE
FF 2743	FITTING,FUEL PUM	TH 2086	HOUSING,THERMOST
FH 2158	HOUSING,FLYWHEEL	TH 2762	PLUMBING,THM HOU
FP 2954	PUMP,FUEL	TP 2810	PLUMBING,TURBOCH
FP 2957	COUPLING,FUEL PU	VC 2086	COVER,VALVE
FR20091	RATING,FUEL	WF 2031	RESISTOR,CORROSI
FT20072	PLUMBING,FUEL	WH 2702	PLUMBING,OIL COO
FW 2141	FLYWHEEL	WP 2020	PUMP,WATER
GG 2701	COVER,FRONT GEAR	WP 2703	ARRANGEMENT,WATE
HC 2001	PLUMBING,CABIN H	WR 2045	HARNESS,ENG CNT
IC 2068	CONNECTION, AIR I	WR 2732	HARNESS,ETR CNT
IT 2002	CONNECTION, AIR T	XS 2017	CONNECTION,EXHAU

PN8740
SO35246
ModelQSM11
ConfigD353014CX03

Option	Desc	Option	Desc
FIRE 24	QSM11	IC 2068	CONNECTION,AIR I
AD 2061	PULLEY,ACCESSORY	△ IT 2005	CONNECTION,AIR T
△ AP 2117	APPROVAL,AGENCY	LA 2053	ARRANGEMENT,LIFT
BB 2712	BLOCK,CYLINDER	LC 2766	HEAD,OIL FILTER
BB 2816	PLUMBING,CYLINDE	LF 2054	FILTER,FULL FLOW
BR 2033	BREATHER,CRANKCA	LG 2141	GAUGE,OIL LEVEL(LG2068 OPTIONAL)
BR 2722	PLUMBING,CRC BRE	LP 2711	PUMP,LUBRICATING
CH 2021	AID,COO HEATER S	△ LT 2025	LITERATURE
CI 2705	PLUMBING,CPR AIR	NN 2713	NAMEPLATE
CP 2063	COMPRESSOR,AIR	OB 2430	ARRANGEMENT,OIL
CP 2709	MOUNTING,AIR COM	OB 2701	COVER,HAND HOLE
DA 2078	DAMPER,VIBRATION	OP 2103	PAN,OIL (OP2149 OPTIONAL)
DF 2036	DRIVE,FRO GER TR	PH 2028	LOCATION,ENG CNT
DL 2031	LOCATION,DRAIN	PH 2856	MODULE,ENGINE CO
DO 2422	SOFTWARE,CUS INT	PP 2829	PARTS,PERFORMANC
DP 2701	DRIVE,FUEL PUMP	PP20007	TURBOCHARGER
EA 2043	ACCESSORIES,ELEC	PP20056	MOUNTING,CYLINDE
EB 2047	BRAKE,ENGINE	PU 2002	PULLEY,ACCESSORY
EC 2701	THERMOSTAT	PW 2180	POWER,PROGRAMMAB
△ EE2072	Alternator	RL 2711	LEVER,ROCKER
EG 2706	PANEL,ENGINE INS	RP 2708	PLUMBING,RADIATO
EH 2154	MOUNTING,ALTERNA	SC20751	SOFTWARE,CALIBRA
EH 2735	DRIVE,ALTERNATOR	SD 2707	SWITCH,OIL PRESS
EM 2038	SUPPORT,FRONT EN	SK 2003	ARRANGEMENT,SHIP
FA 2118	DRIVE,FAN	SK 2705	BRACKET,SHIPPING
FCXL 90	CALIBRATION,FUEL	SM 2704	MOUNTING,STARTIN
FCZ 3	CALIBRATION,FUEL	SS 2083	PAINT
FF 2241	FILTER,FUEL	△ ST 2026	MOTOR,STARTING
FF 2743	FITTING,FUEL PUM	TB 2287	ARRANGEMENT,TURB
FH 2158	HOUSING,FLYWHEEL	TB 2723	MOUNTING,EXHAUST
FP 2954	PUMP,FUEL	TB 2731	MOUNTING,INTAKE
FP 2957	COUPLING,FUEL PU	TH 2086	HOUSING,THERMOST
FR20091	RATING,FUEL	TH 2762	PLUMBING,THM HOU
FT20097	PLUMBING,FUEL	TP 2810	PLUMBING,TURBOCH
FW 2141	FLYWHEEL	VC 2086	COVER,VALVE
GG 2701	COVER,FRONT GEAR	WF 2031	RESISTOR,CORROSI
HC 2001	PLUMBING,CABIN H	WH 2702	PLUMBING,OIL COO
		WP 2020	PUMP,WATER
		WP 2703	ARRANGEMENT,WATE
		WR 2045	HARNESS,ENG CNT
		XS 2017	CONNECTION,EXHAU

BUILT BEFORE JANUARY 1, 2007

NOTES:

GENERIC CALIBRATION (D02374) REPLACED
WITH X-CAL REV F DATED 11/08/2004 BY
CUMMINS FIREPOWER / CUMMINS NPOWER
ON ASSEMBLY LINE

X-CAL REV F REPLACED BY X-CAL REV L
DATED 08/23/2005 TO SOLVE MISFIRE SITUATION


PIR (PRODUCT INCIDENT REPORT) # RGJ051019-01
FILED BY BOB JANQUART

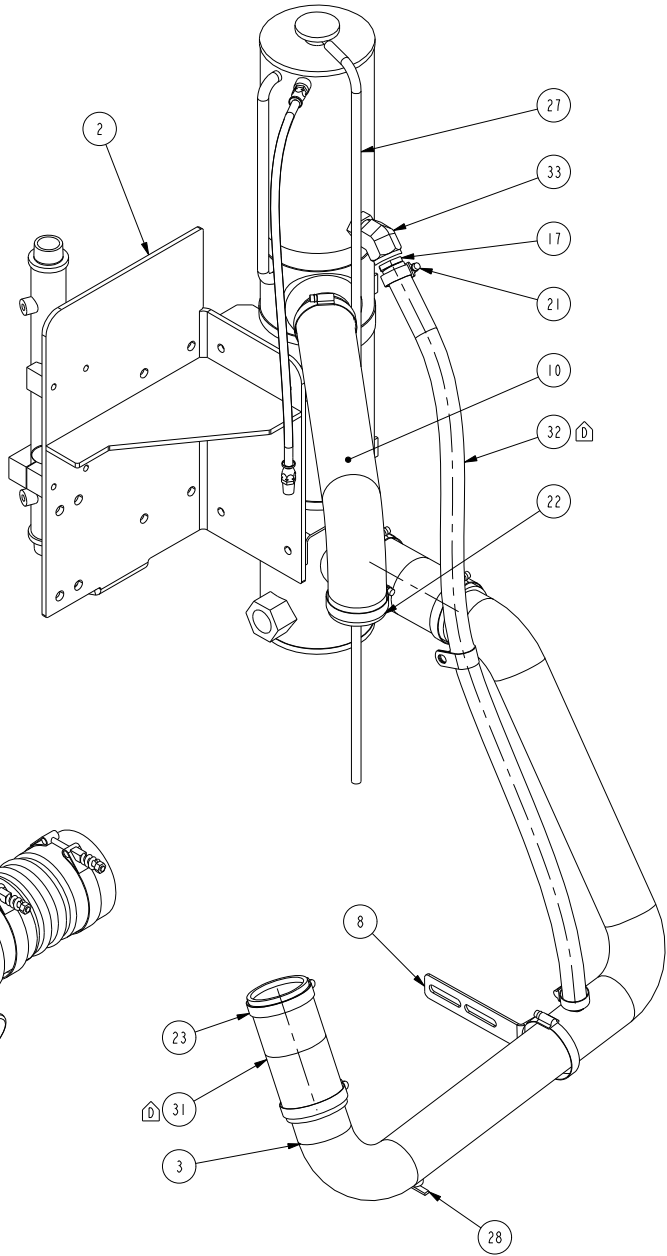
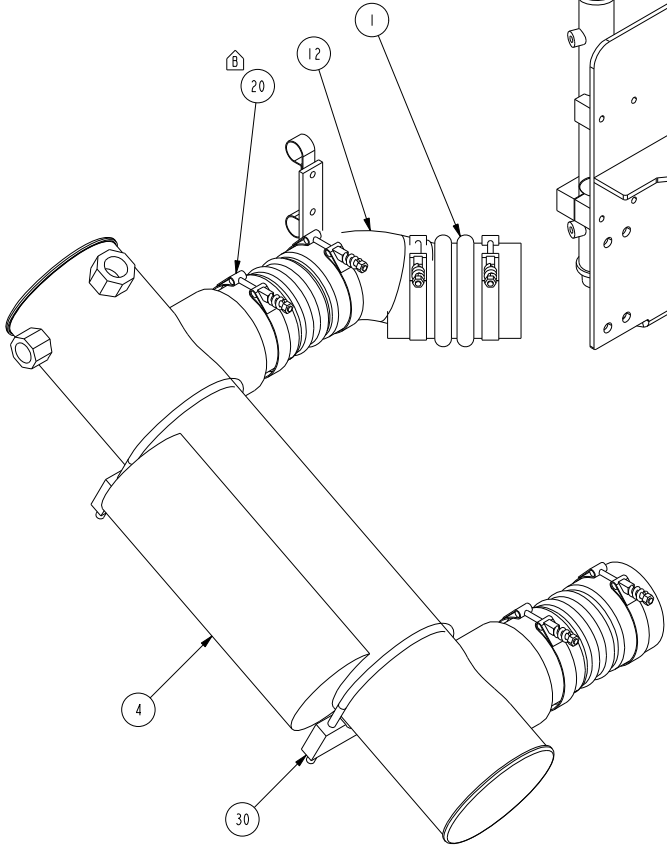
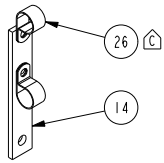
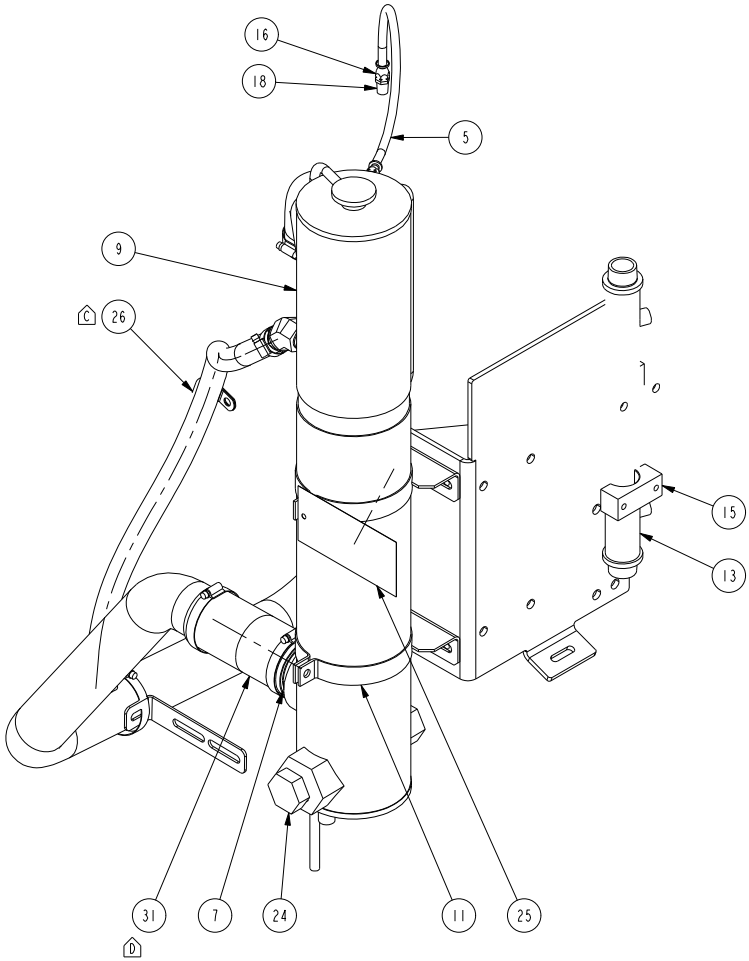
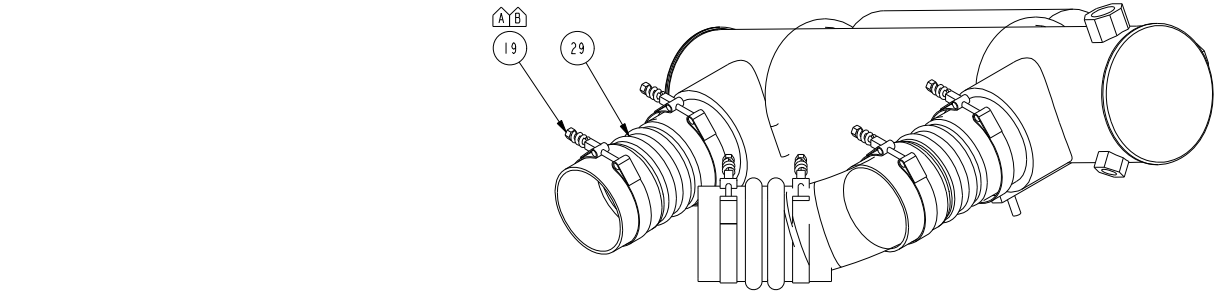
X-CAL REV F REPLACED BY RELEASED INCAL
D02422 IN SEPTEMBER 2005 INCAL RELEASE

D02422 REPLACED BY X-CAL REV S DATED 12/20/2005
BY CUMMINS NPOWER / CUMMINS FIREPOWER.
X-CAL REVISION S (FINAL REVISION TO CORRECT
SENSOR GLOBAL DEFAULT ISSUE). X-CAL REV S
SCHEDULED TO BE RELEASED AS DO 2422 REV B
FEBRUARY 2006

J	UPDATED SPEC	JJW	29SEP2014
H	ADDED LITERATURE	S DUBICK	04AUG2010
G	UPDATE ENGINE SPEC	S DUBICK	18MAR2010
REV	DESCRIPTION OF REVISION	BY	DATE

BUILT AFTER JANUARY 1, 2010

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UNLESS OTHERWISE NOTED - ALL DIMENSIONS ARE IN INCHES - APPLY MACHINE TOLERANCES .X = ± 0.06 .XX = ± 0.010 .XXX = ± 0.001 - APPLY WELDED TOLERANCES .X = ± 0.25 .XX = ± 0.12 .XXX = ± 0.06	DWG SCALE: NTS	DRAWN BY: DAVE N	DATE: 23SEP2004
	PLOT SCALE:	APPD BY:	DATE:
	DESCRIPTION ASSEMBLY, ENGINE, QSM11		
	REFERENCE: CFP11E-F10/20		DRAWING NUMBER: 8740



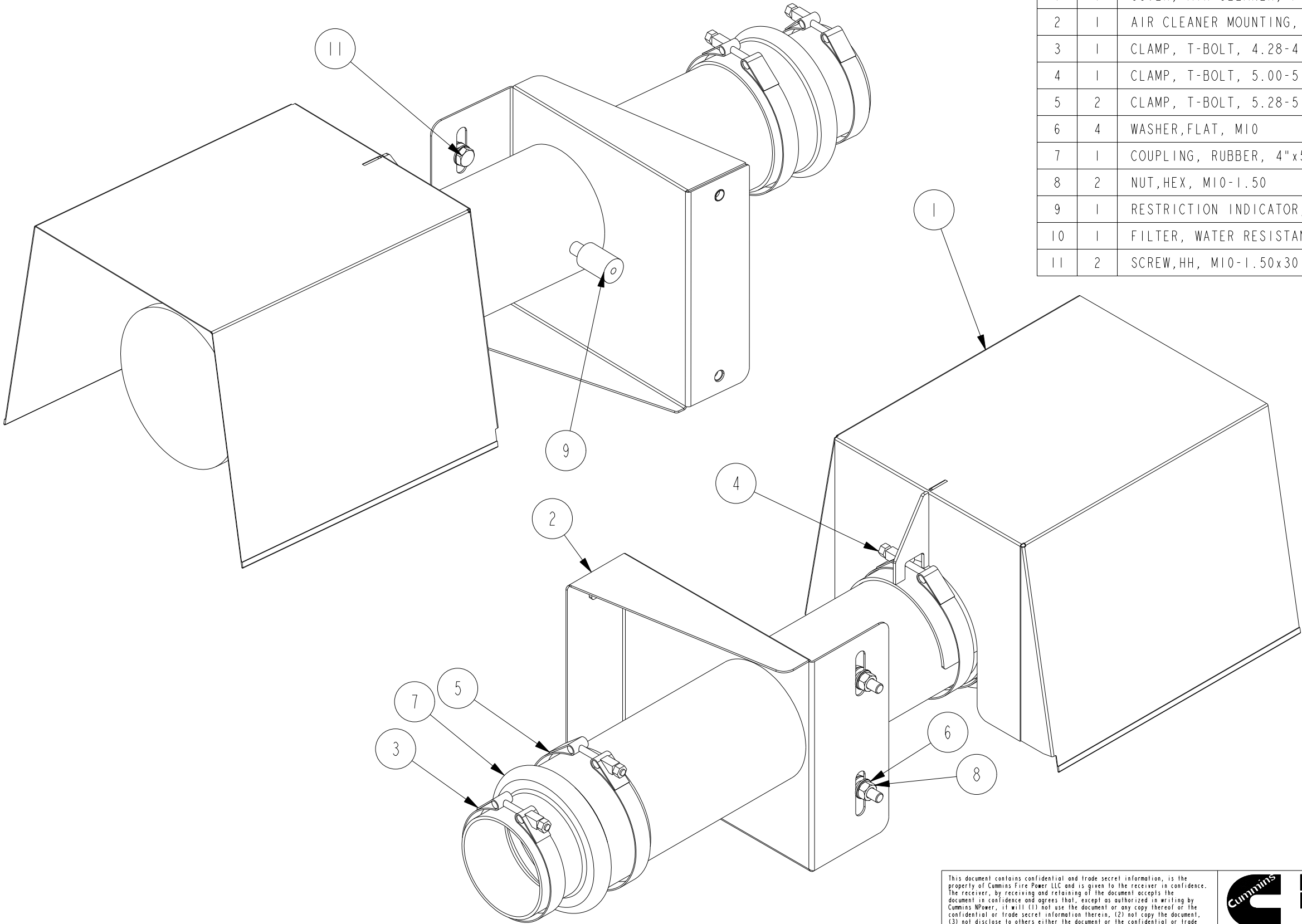
E D C A

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	COUPLING, RUBBER, MODIFIED CUMMIN NO. 4330737, FIREPUMP	8573
2	1	BRACKET, SUPT, HEAT EXCHANGER, CFP11	8789
3	1	TUBE, WATER OUTLET, QSM11, FIREPUMP	8793
4	1	COOLER, CHARGE AIR 6" DIAMETER, 4-PASS W/ RAW WATER DRAIN	8968
5	1	HOSE, VENT LINE, #801-4 X 32" LG, FIREPUMP	9543_HOSE
6	10	COOLANT, FC EG PW, 1 GALLON	CC2743
7	1	BUSHING, 2.25" X 2.50"	904
8	1	BRACKET, MOUNTING, TUBE SUPPORT, FIREPUMP	8657
9	1	HEAT EXCHANGER, 5" DIA., 2-PASS, INTEGRAL TOP TANK	8687
10	1	HOSE, WATER OUTLET, FIREPUMP, CFP11E	8794
11	2	CLAMP, SUPPORT, HEAT EXCHANGER, 5" DIAMETER BODY	8819
12	1	ELBOW, CAC, 4" DIA, 4-1/2" R., CFP11E	8949
13	1	FUEL COOLER, 1" NPT, VENDOR #CM090204-1	9586
14	1	BRACKET,HOSE,SUPPORT,CFP11E, FIREPUMP	11524
15	2	CLAMP,HOSE,1.50 DIA,PLASTIC	11530
16	2	HOSE END, STR, -4 FLR X -4 HS	12543-4-4
17	1	FTG, STR, -12 BARB X -12 NPT	12548-12-12
18	2	FTG, STR, -4 FLR X -4 NPT	12553-4-4
19	4	CLAMP, SPRING LOADED T-BOLT, 4.03-4.33	12975-0425
20	2	CLAMP, SPRING LOADED T-BOLT, 4.28-4.58	12975-0450
21	2	CLAMP, WORM, .69-1.25	14990-12
22	2	CLAMP, WORM, 1.81 - 2.75	14990-36
23	5	CLAMP, WORM, 2.06 - 3.00	14990-40
24	1	PLUG, NPT, PLASTIC, -20 (1-1/4") NPT	15255-20
25	1	TAG, ENGINE WEIGHT	16825
26	3	CLAMP, LOOM, 1.00 ID	26963-16
27	1	TUBE, OVERFLOW, 5/16" ID x 36" LG, #27003	27003_8792
28	1	DRAIN VALVE, 1/4" NPT	80511
29	2	HOSE, HUMP	4330737
30	2	U-BOLT CLAMP, 6.0"	89560K
31	2	HOSE,EPDM, 2.50IN IDx6.00IN LONG	A042F057
32	1	HOSE,SILICONE, 3/4IN ID x 24.00IN LONG	A042F073
33	1	ELBOW, STREET, 45 DEG, STEEL, PARKER OR EQUIV.	LTL-SE3445

E	2018-380	DELETE LTL-SRB-1214	HE392	16JUL18
D	2016-102	REPLACED A042F057 WAS 772506L & A042F073 WAS 802426L	MRH	18MAR2016
C	2016-232	REPLACED 13745 W/ 26963-16	KMS	17MAR2016
B	2014-799	12975-0425 WAS 071 6, ADDED 12975-0450	PBS	17NOV2014
A	2014-736	REPLACED 12975-0425, WAS 13164-0425	MRH	20OCT2014
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE:
ANGULAR DIMENSIONS: IN: ° FRACTIONS; T: DECIMALS; SURFACES: IN: INCHES; SURFACES: IN: INCHES
THIRD ANGLE PROJECTION
125
IN: INCHES; T: DECIMALS; SURFACES: IN: INCHES; SURFACES: IN: INCHES

Fire Power		CUMMINS FIRE POWER LLC CORPORATE OFFICE 1800 BUREAU ROAD WHITE BEAR LAKE, WI WWW.CUMMINSFIREPOWER.COM	CUSTOM DESIGN AND UPTIT CENTER 875 LAWRENCE DRIVE DEPUSE, WISCONSIN
ASSEMBLY, HEAT EXCHANGER CFP11E			
DWG UNITS: IN/LB/S	DRAWN BY: PBS	DATE: 25JUN2014	
SCALE: 0.250	SHEET 1 OF 1	INIT ECO: 2014-268	A042B827
EST WEIGHT:			



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	COVER, AIR CLEANER, FITS 5" O.D. TUBING	14799
2	1	AIR CLEANER MOUNTING, CFPIIE	16692
3	1	CLAMP, T-BOLT, 4.28-4.59	13164-0450
4	1	CLAMP, T-BOLT, 5.00-5.31	13164-0525
5	2	CLAMP, T-BOLT, 5.28-5.59	13164-0550
6	4	WASHER,FLAT, M10	20020-M10
7	1	COUPLING, RUBBER, 4"x5", NELSON #89845K	89845K
8	2	NUT,HEX, M10-1.50	20120-M10
9	1	RESTRICTION INDICATOR, 1/8" NPT	RAX00-2352
10	1	FILTER, WATER RESISTANT, 5" INLET	RU3220
11	2	SCREW,HH, M10-1.50x30	20310-030

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

ASSEMBLY, AIR CLEANER
CFPIIE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS $\pm 1^\circ$

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

DWG UNITS:

DRAWN BY: PBS

DATE: 23APR2014

IN/LB/S

PRO-ENGINEER

INIT ECO: 2014-268

SCALE: 0.250

EST WEIGHT: 13.530

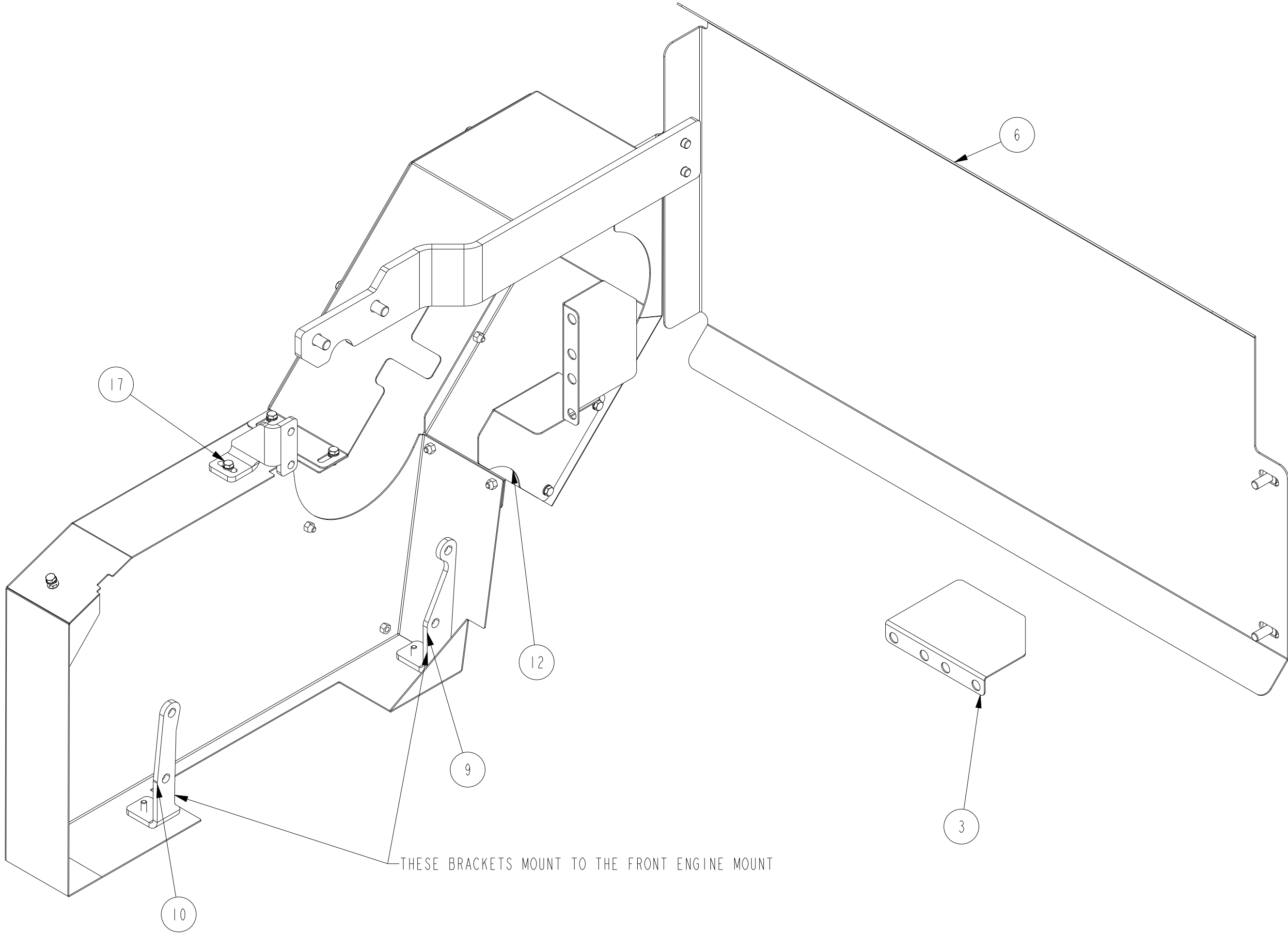
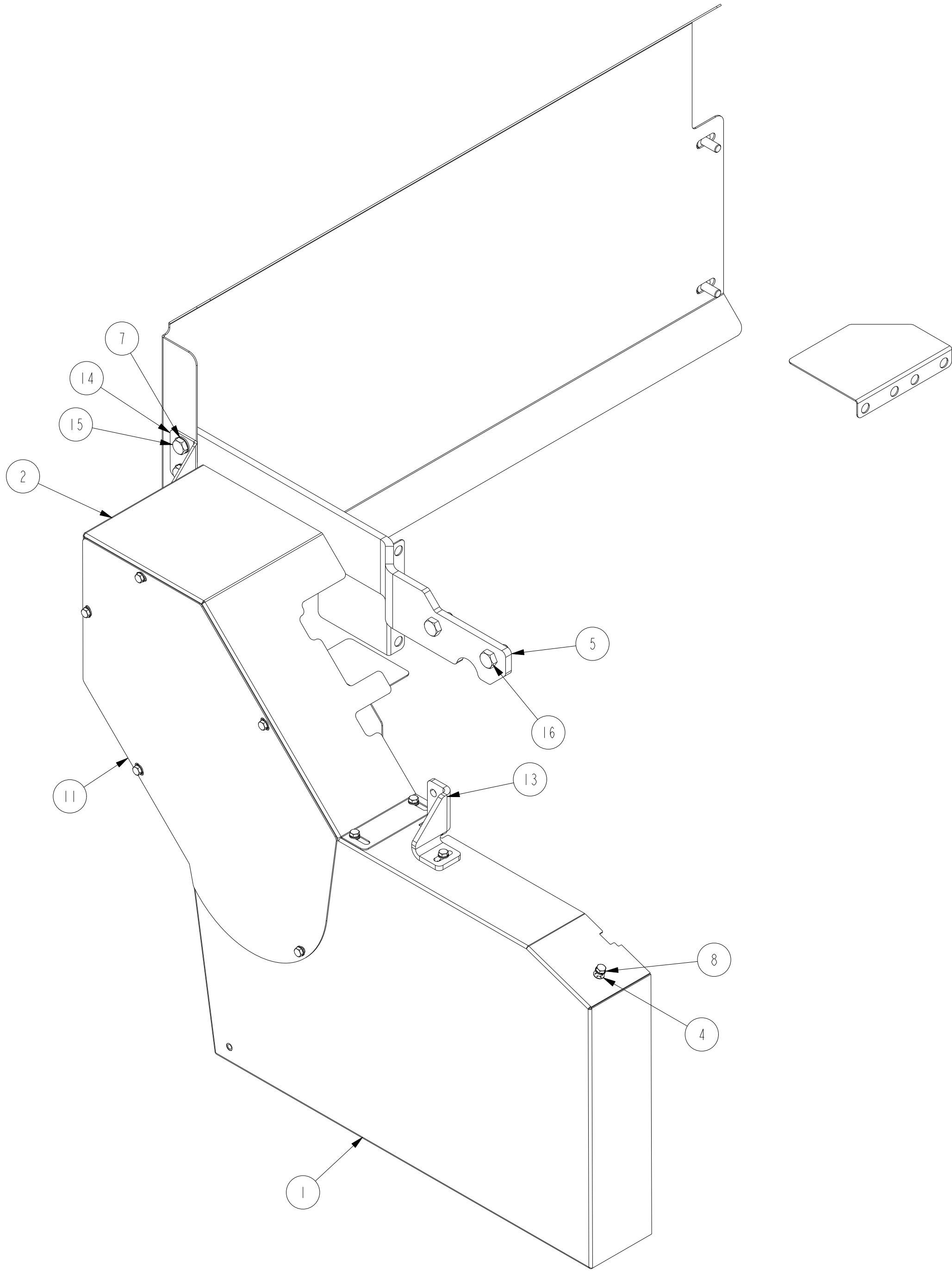
SHEET

1 OF 1

DRAWING NO:

A042B161

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	GUARD, FRONT, CFPIIE	A042B942
2	1	GUARD, BELT, CFPIIE	A042B960
3	2	HEAT SHIELD, SENSOR, CFPIIE	15625
4	16	WASHER, RETAINING, M6	16662-11
5	1	BRACKET, HEAT SHIELD MOUNTING, CFPIIE	16691
6	1	HEAT SHIELD, CFPIIE	16693
7	4	WASHER,FLAT, M10	20020-M10
8	16	WASHER,FLAT, M6	20020-M6
9	1	BRACKET, RH GUARD, CFPIIE	A042B946
10	1	BRACKET, LH GUARD, CFPIIE	A042B947
11	1	COVER, FRONT GUARD, CFPIIE	A042B948
12	1	COVER, REAR GUARD, CFPIIE	A042B949
13	1	BRACKET, UPPER GUARD, CFPIIE	A042B951
14	1	BRACKET, GUARD, CFPIIE	A042B952
15	4	SCREW,HH, M10-1.50x25	20310-025
16	2	SCREW,HH, M12-1.75x25	20312-025
17	16	SCREW,HH, M6-1.00x16MM	20306-016

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CORPORATE OFFICE
1600 BUEKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN
AND UPGRADE CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ANGULAR DIMENSIONS ± °

THIRD ANGLE PROJECTION

125

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

IMPERIAL UNITS: ± .005

METRIC UNITS: ± .13

DWG UNITS: IN/LB/S

SCALE: 0.250

EST WEIGHT: 13.983

DRAWN BY: PBS

PRO-ENGINEER

SHEET 1 OF 1

DATE: 16JUL2014

INIT ECO: 2014-494

DRAWING NO: A042B961

Exploded view diagram of a Coolant Heater Assembly, CFPIIE. The diagram shows a central heater unit (6) connected to two hoses (1 and 10) via elbows (2) and fittings (3, 4). The assembly is mounted on a bracket (8) with washers (7) and spacers (9). Screws (11) are used for mounting. Callouts 1 through 11 identify the components.

BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	PART NUMBER	
1	1	HOSE, SILICONE, 3/4IN ID x 26.00IN LONG	A042F073-J796	
2	1	ELB, 90 DEG, -12 NPT X -12 FMNPT	12195-12-12	
3	1	FTG, STR, -12 BEAD X -12 NPT	12545-12-12	
4	1	FTG, STR, -12 BEAD X -8 NPT	12545-12-8	
5	4	CLAMP, WORM, .69-1.25	14990-12	
6	1	HEATER,COOLANT,2250W,120/240 VOLT, 150 DEGREE THERMOSTAT	15167	
7	4	WASHER,FLAT, M8	20020-M8	
8	1	BRACKET, COOLANT HEATER, CFPIIE	A042B164	
9	4	SPACER, 0.5 OD X 0.43 ID X 0.50 LG	A042C901	
10	1	HOSE,SILICONE, 3/4IN ID x 24.00IN LONG	A042F073	
11	4	SCREW,HH, M10-1.50x45	20310-045	

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AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, COOLANT HEATER
CFPIIE

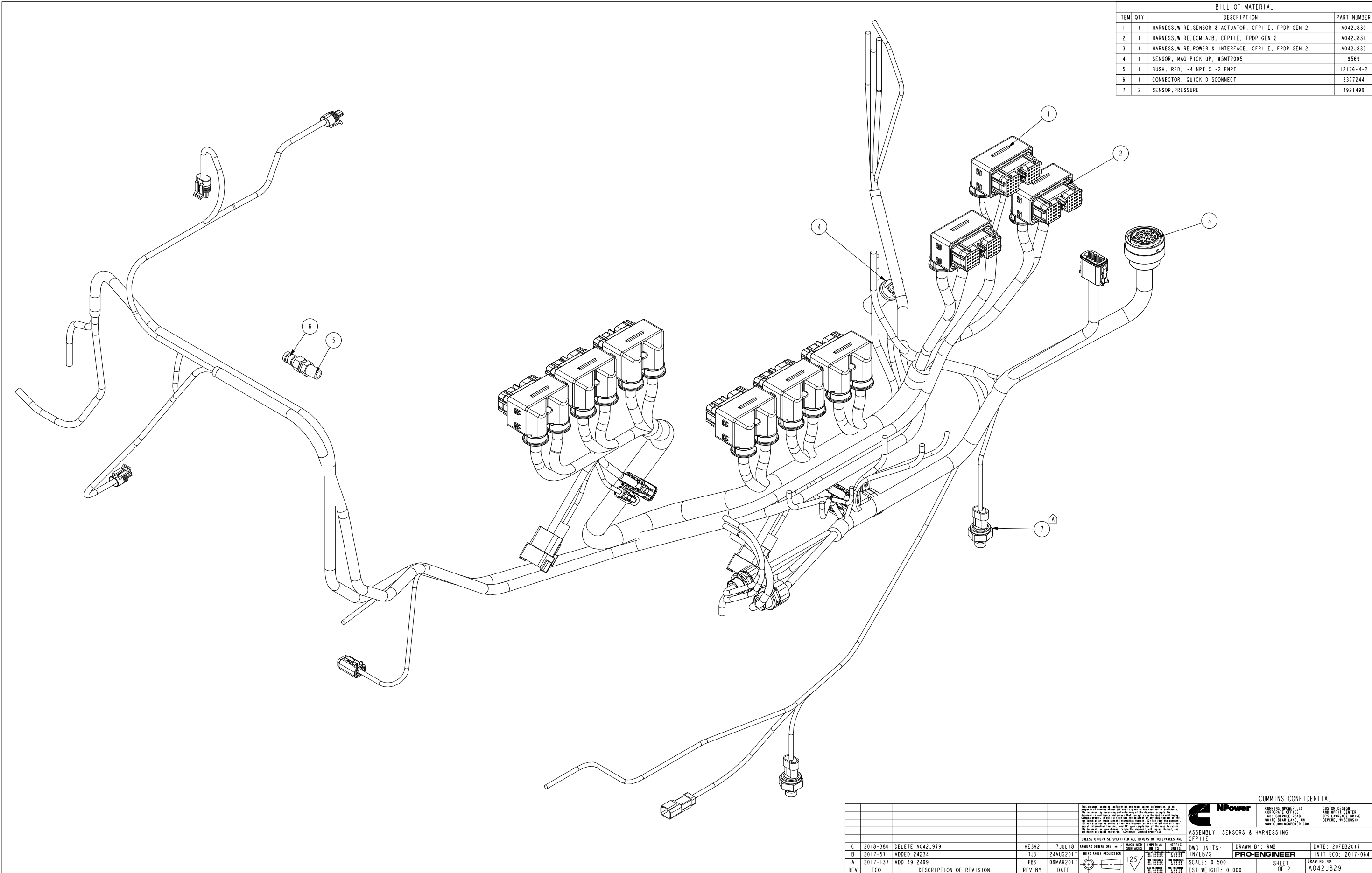
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

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

DWG UNITS: IN/LB/S	DRAWN BY: PBS PRO-ENGINEER	DATE: 25JAN2017 INIT ECO: 2016-668
SCALE: 0.190 EST WEIGHT: 31.150		SHEET 1 OF 1

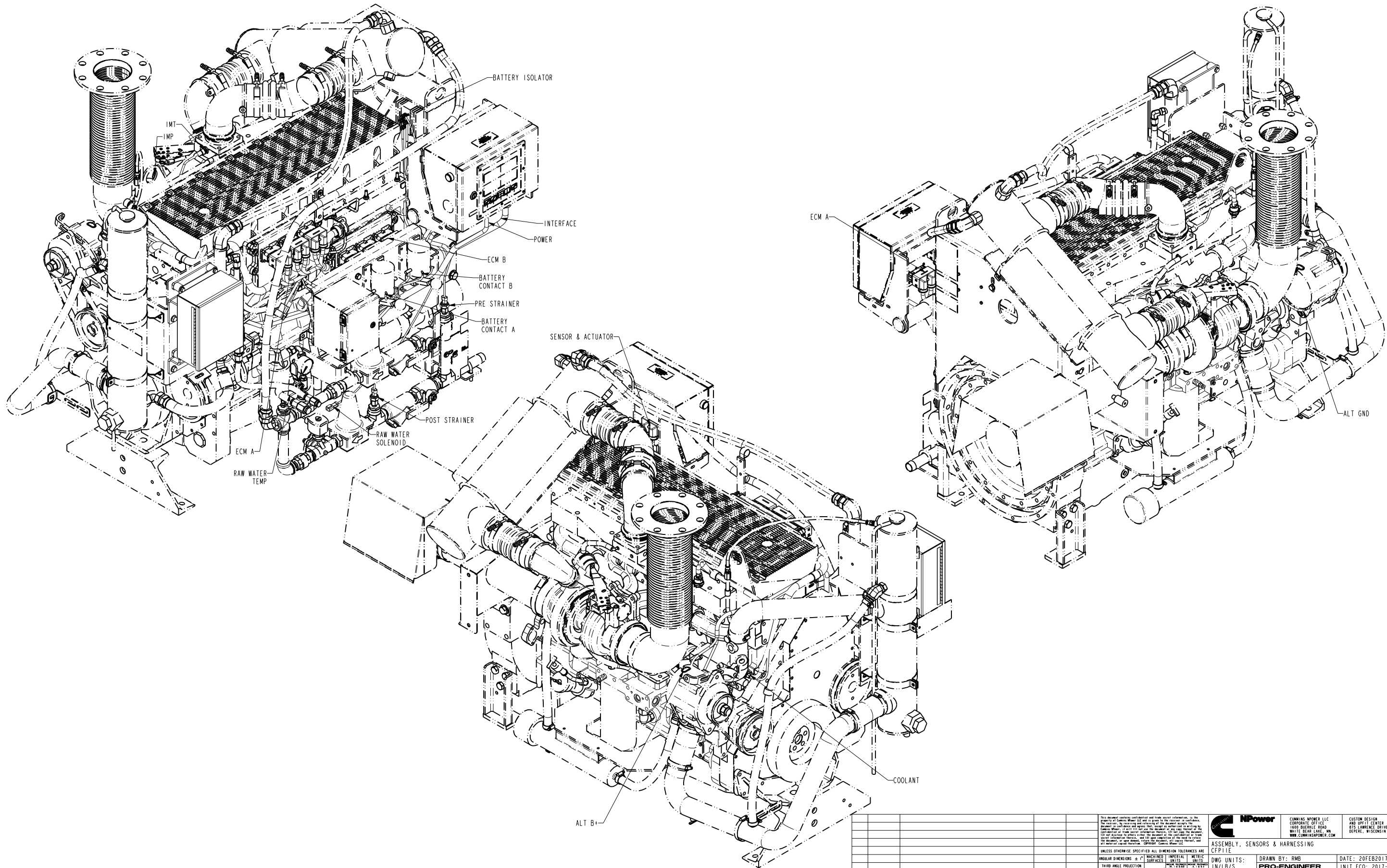
DRAWING NO:
A042J796

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	HARNESS,WIRE,SENSOR & ACTUATOR, CFPIIE, FPDG GEN 2	A042J830
2	1	HARNESS,WIRE,ECM A/B, CFPIIE, FPDG GEN 2	A042J831
3	1	HARNESS,WIRE,POWER & INTERFACE, CFPIIE, FPDG GEN 2	A042J832
4	1	SENSOR, MAG PICK UP, #5MT2005	9569
5	1	BUSH, RED, -4 NPT X -2 FNPT	12176-4-2
6	1	CONNECTOR, QUICK DISCONNECT	3377244
7	2	SENSOR,PRESSURE	4921499

				<div><div><div></div><div>Cummins NPPOWER</div></div><div>Cummins NPPOWER LLC CORPORATE OFFICE 1600 BURNELL ROAD WHITE BEAR LAKE, MN WWW.CUMMINSNPPOWER.COM</div></div>				<div>CUSTOM DESIGN AND UPTIT CENTER 875 LAWRENCE DRIVE DEPUCE, WISCONSIN</div>			
				ASSEMBLY, SENSORS & HARNESSING				CFPIIE			
				DWG UNITS:		DRAWN BY: RMD		DATE: 20FEB2017		SHEET	
				SCALE: 0.500		PRO-ENGINEER		INIT ECO: 2017-064		DRAWING NO:	
				EST WEIGHT: 0.000						A042J829	

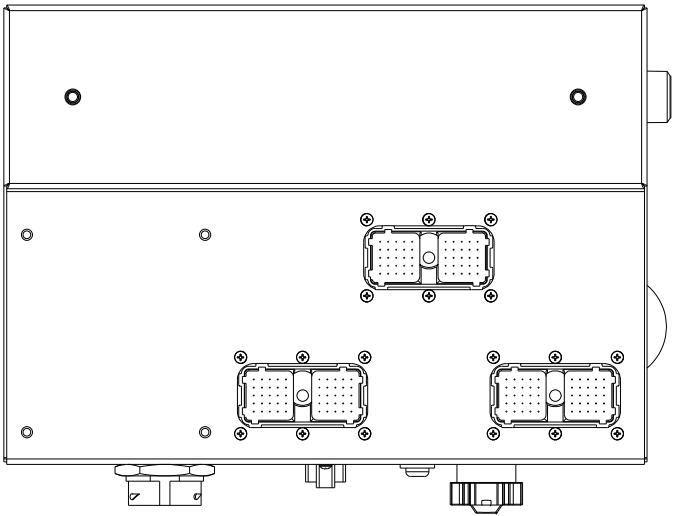
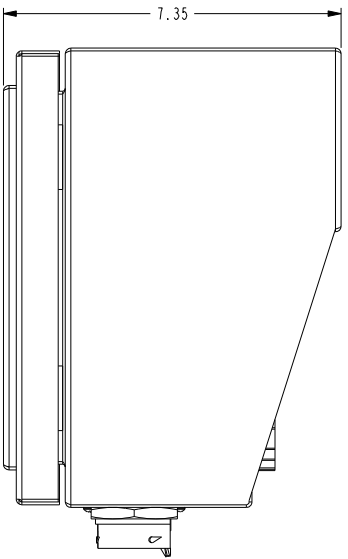
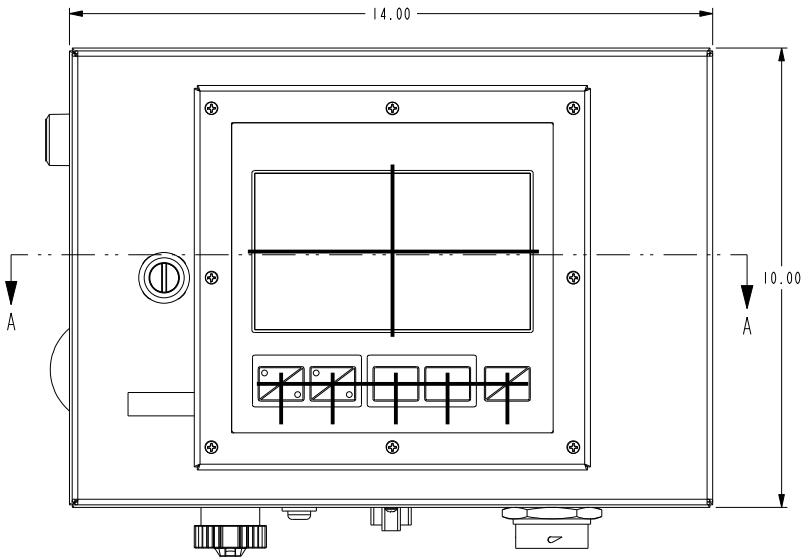
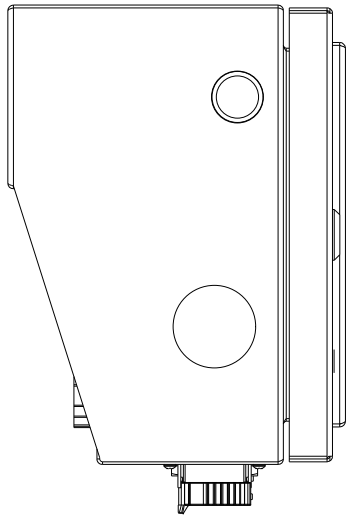
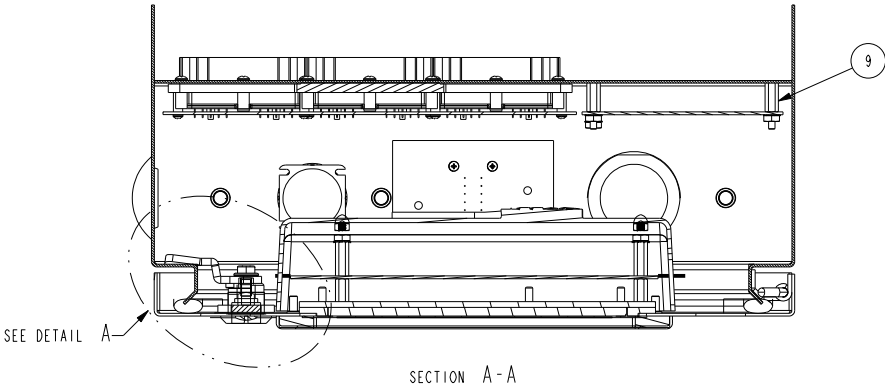


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ANGULAR DIMENSIONS: IN: ° DECIMALS T: ° IMPERIAL: ° METRIC: °				CUMMINS NPower			
THIRD ANGLE PROJECTION				CUMMINS NPOWER LLC CORPORATE OFFICE 1600 BUEKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSNPOWER.COM			
125				CUSTOM DESIGN AND UPPIT CENTER 875 LAWRENCE DRIVE DEPUSE, WISCONSIN			
C 2018-380 SEE SHEET 1 FOR LATEST REVISION DETAILS				ASSEMBLY, SENSORS & HARNESSING			
REV ECO				CFPI1E			
DESCRIPTION OF REVISION				DWG UNITS: IN/LB/S			
REV BY DATE				DRAWN BY: RMD			
				SCALE: 0.500			
				EST WEIGHT: 0.000			
				SHEET 2 OF 2			
				DRAWING NO: A042J829			
				DATE: 20FEB2017			
				UNIT ECO: 2017-064			

REFERENCE GASKET
OUTER DOOR
POLYURETHANE
CPN:17621

REFERENCE GASKET
DIGITAL DISPLAY SEAL
NEOPRENE
CNP:17793

DOOR GASKET DETAIL A
SCALE 1.000



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

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AND OPTIC CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, DIGITAL CONTROL PANEL
ELECTRONIC CFP ENGINES

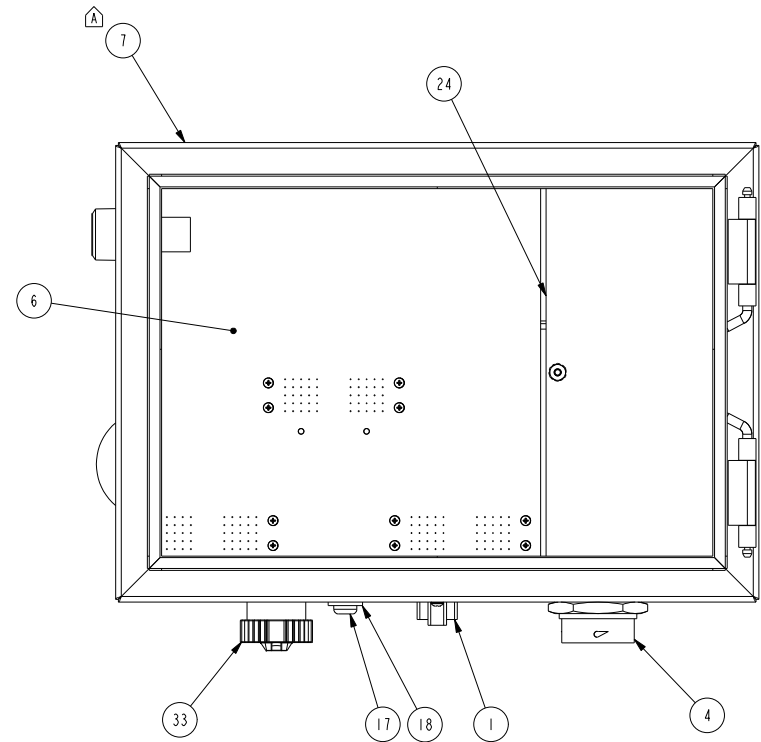
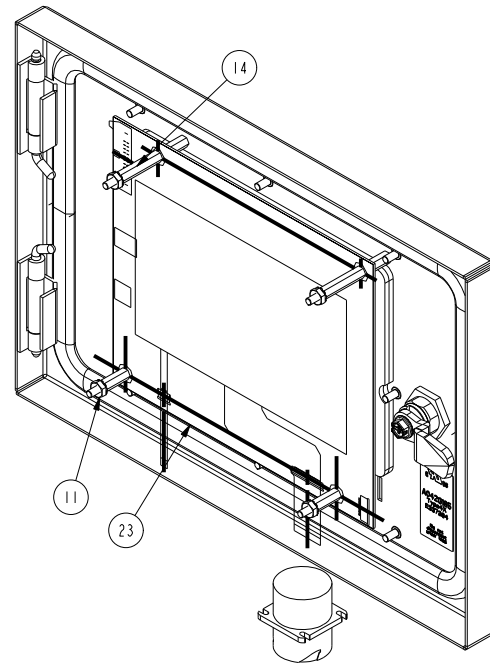
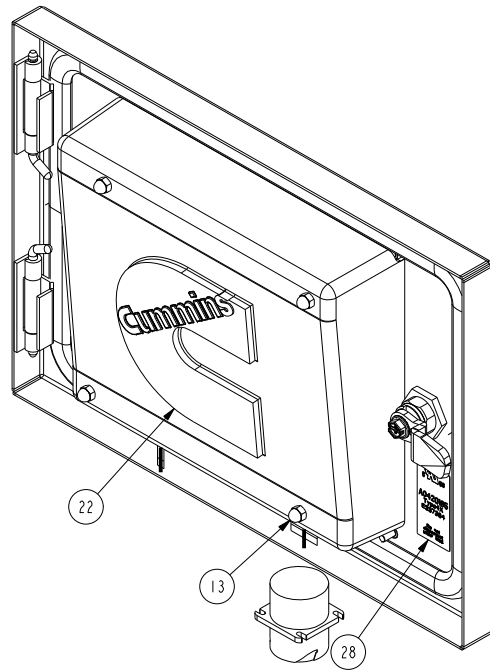
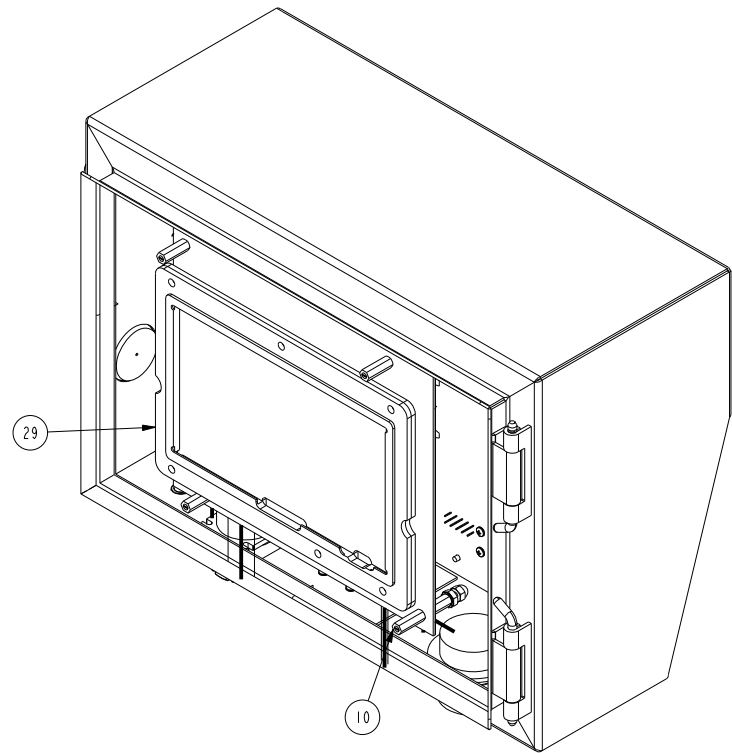
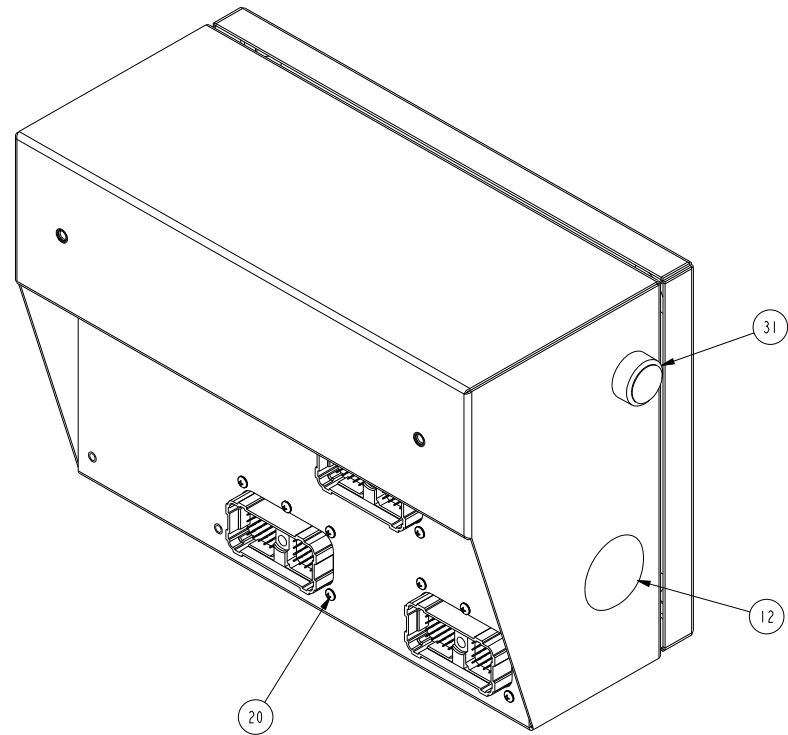
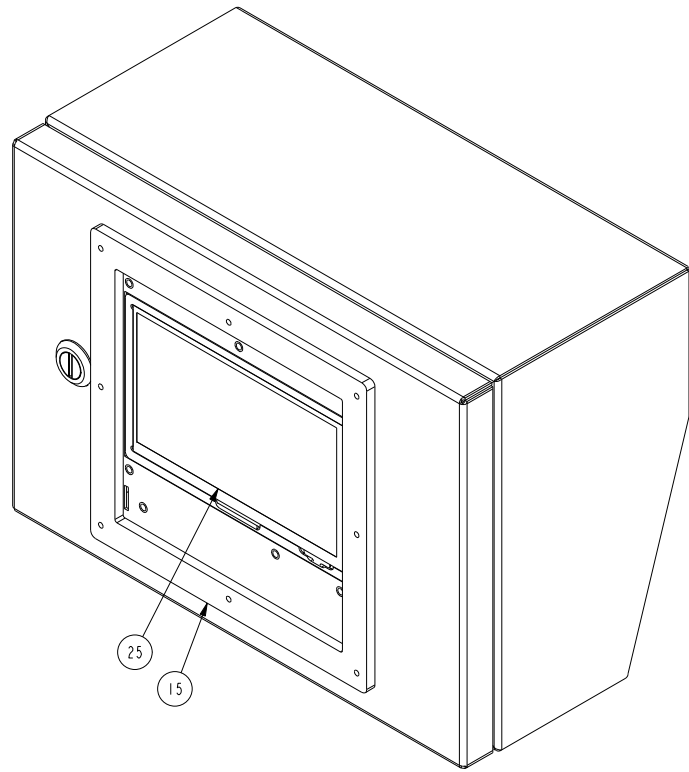
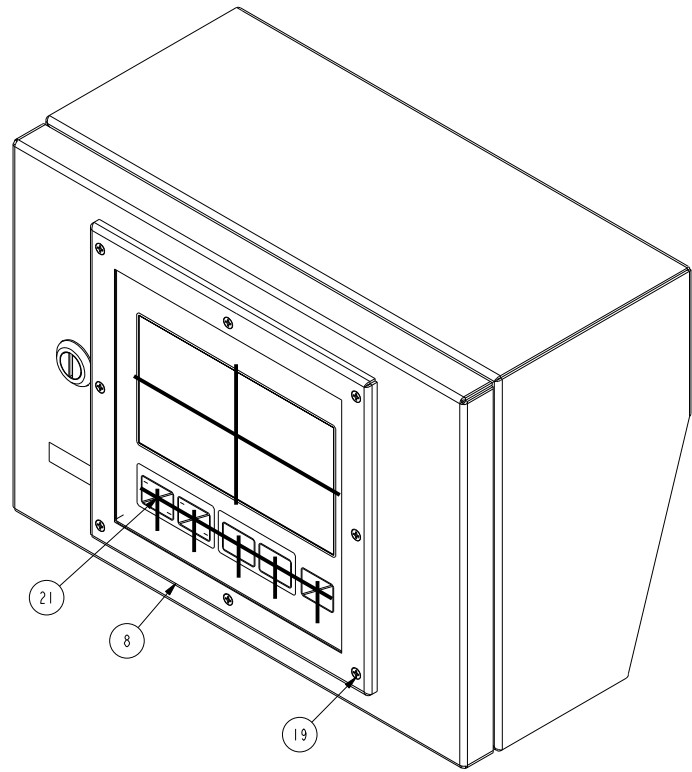
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DRAWN BY: PBS
DATE: 14SEP2016

SCALE: 0.500
SHEET 1 OF 2
DRAWING NO: A042G185

REV	DATE	DESCRIPTION OF REVISION	REV BY	DATE
A	2017-057	UPDATED PER A042H232	PBS	01FEB2017
ECO		DESCRIPTION OF REVISION		

THIRD ANGLE PROJECTION	125
------------------------	-----

ANGULAR DIMENSIONS ± 1°	MACHINE SURFACES	IMPERIAL UNITS	METRIC UNITS
125	125	125	125



A		2017-057	SEE SHEET 1 FOR LATEST REVISION DETAILS	PBS	01FEB2017	125		SCALE: 0.500		SHEET 2 OF 2		DRAWING NO: A042G185	
REV		ECO	DESCRIPTION OF REVISION	REV BY	DATE	EST WEIGHT: 28.994		DWG UNITS: IN/LB/S		DATE: 14SEP2016		INIT ECO: 2016-376	

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ANGULAR DIMENSIONS: $\pm 1^\circ$
MACHINED SURFACES: ± 0.005
THIRD ANGLE PROJECTION

Fire Power

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ASSEMBLY, DIGITAL CONTROL PANEL
ELECTRONIC CFP ENGINES

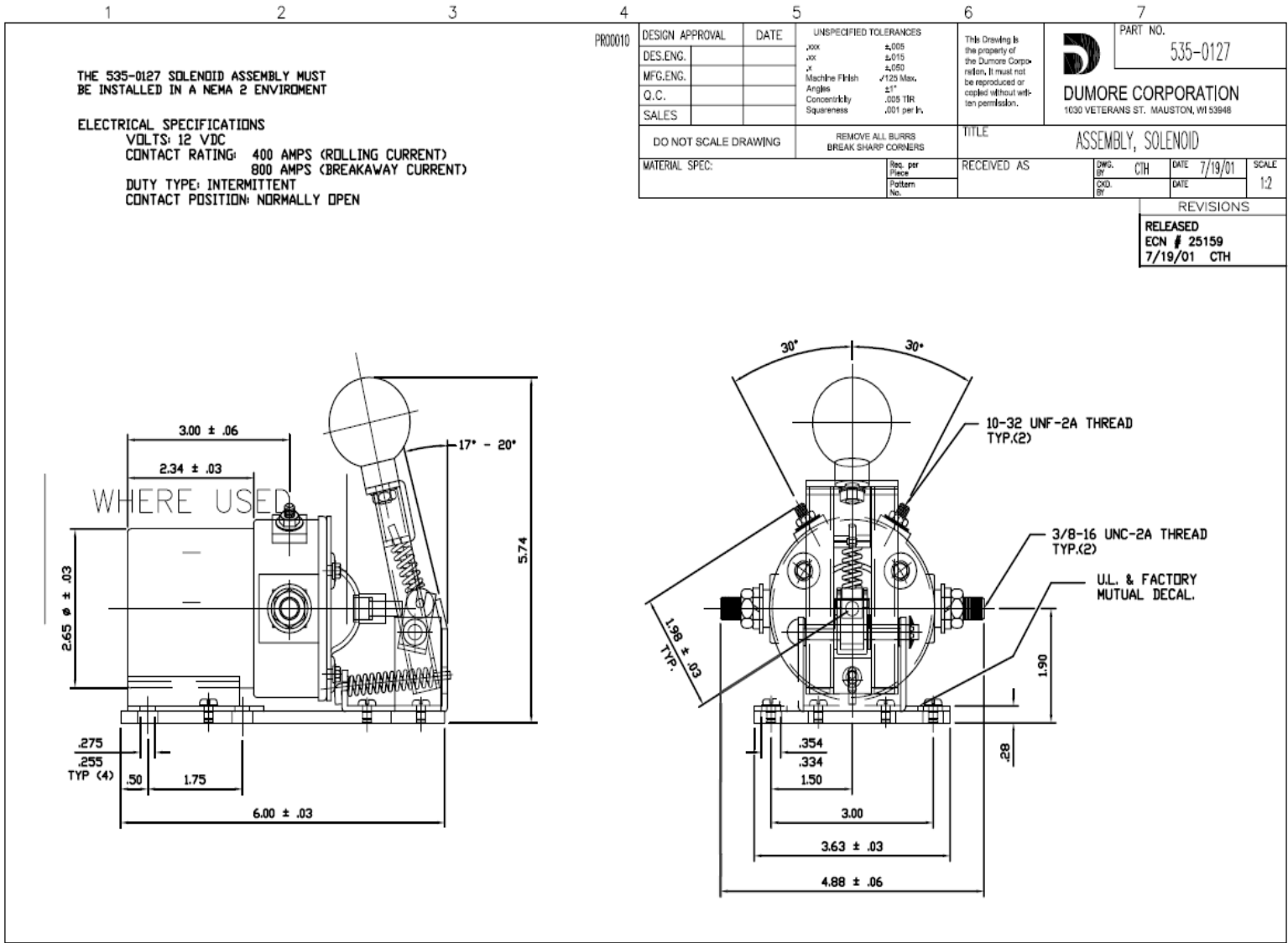
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PRO-ENGINEER

EST WEIGHT: 28.994

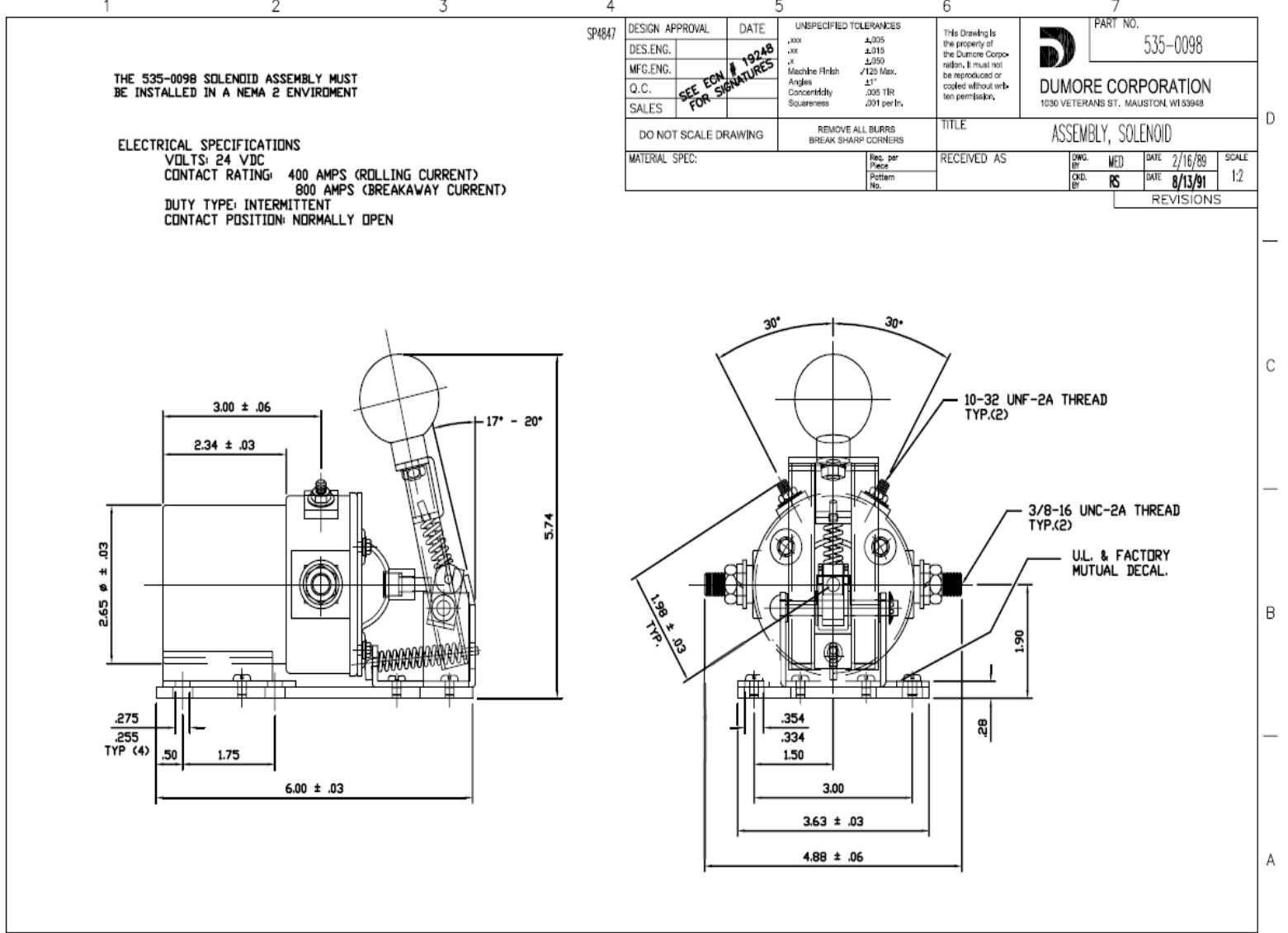
DATE: 14SEP2016
INIT ECO: 2016-376

DRAWING NO: A042G185

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



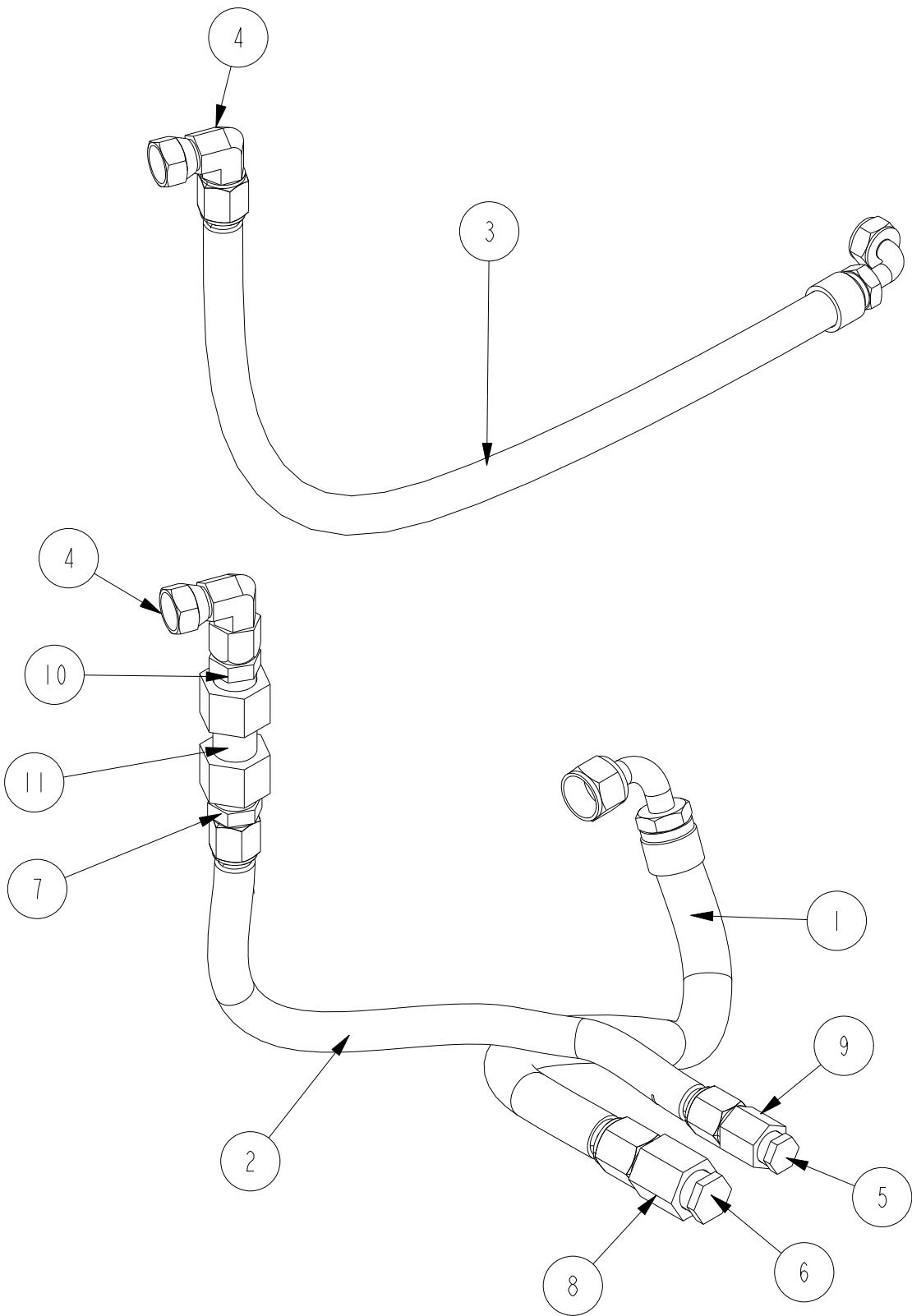
ITEM:1 - 8824-12



ITEM:2 - 8824-24

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

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ANGULAR DIMENSIONS ± 1°				DWG UNITS: IN/LB/S		DRAWN BY: CMC PRO-ENGINEER	
THIRD ANGLE PROJECTION				SCALE: 1.000		SHEET 1 OF 1	
				EST WEIGHT: 42238.628		DRAWING NO: 8824	



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSEMBLY, HOSE, FUEL LINE, CFPIIE SUPPLY	15278
2	1	ASSEMBLY, HOSE, FUEL LINE, CFPIIE RETURN	15279
3	1	ASSEMBLY, HOSE, FUEL LINE, CFPIIE JUMPER	15282
4	2	ELBOW, #8 FLARE X FLARE SWIVEL	8_C6X-S
5	1	PLUG. PIPE, -6 NPT	12210-6
6	1	PLUG. PIPE, -8 NPT	12210-8
7	1	FTG, STR, -8 JIC X -8 NPT	12238-8-8
8	1	FTG, STR, -10 JIC X -8 FMNPT	12240-10-8
9	1	FTG, STR, -8 JIC X -6 FMNPT	12240-8-6
10	1	FTG,STR, -8 FMJIC X -8 NPT	12250-8-8
11	1	VALVE,CHECK,BRASS, 1/2" FNPT X FNPT	14412

C NOTE: APPLY THREAD SEALANT ON ALL NPT THREADS.

C	0211-057	ADD NOTE	S DUBICK	11-MAY-11
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

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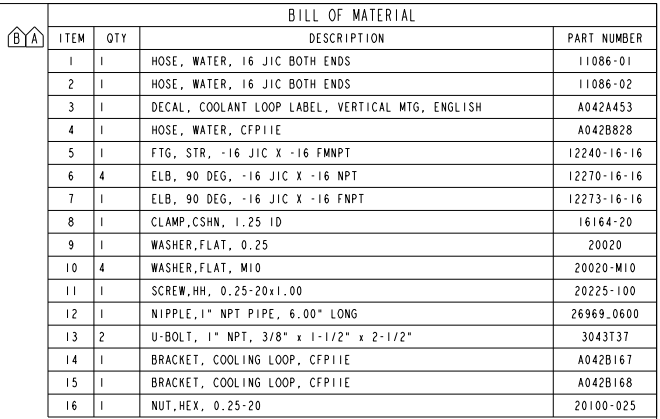
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AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

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 ± 1.0 .XX ± 0.8

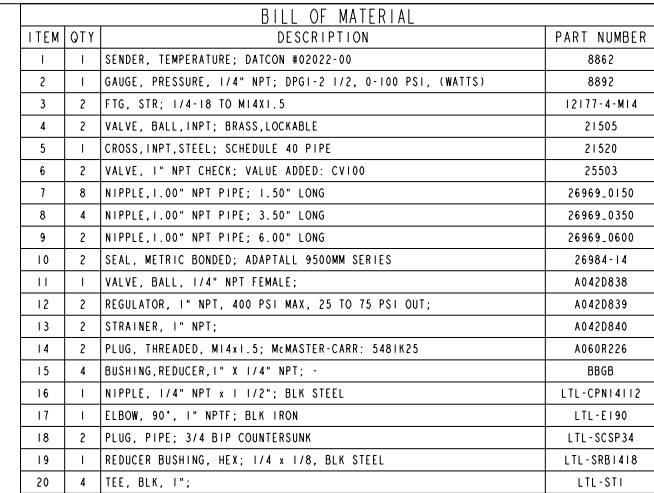
KIT, FUEL LINES, CFPIIE
F10/20 - EXT ONLY



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SCALE: 0.333 EST WEIGHT: 10.480	SHEET 1 OF 1	DRAWING NO: 15209



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	HOSE, WATER, 16 JIC BOTH ENDS	11086-01
2	1	HOSE, WATER, 16 JIC BOTH ENDS	11086-02
3	1	DECAL, COOLANT LOOP LABEL, VERTICAL MTG, ENGLISH	A042A453
4	1	HOSE, WATER, CFP11E	A042B828
5	1	FTG, STR, -16 JIC X -16 FWNPT	12240-16-16
6	4	ELB, 90 DEG, -16 JIC X -16 NPT	12270-16-16
7	1	ELB, 90 DEG, -16 JIC X -16 FNPT	12273-16-16
8	1	CLAMP, CSHN, 1.25 ID	16164-20
9	1	WASHER, FLAT, 0.25	20020
10	4	WASHER, FLAT, M10	20020-M10
11	1	SCREW, HH, 0.25-20x1.00	20225-100
12	1	NIPPLE, 1" NPT PIPE, 6.00" LONG	26969.0600
13	2	U-BOLT, 1" NPT, 3/8" x 1-1/2" x 2-1/2"	3043T37
14	1	BRACKET, COOLING LOOP, CFP11E	A042B167
15	1	BRACKET, COOLING LOOP, CFP11E	A042B168
16	1	NUT, HEX, 0.25-20	20100-025

B	2016-373	REPLACED BNGU W/ 26969.0600	KWS	07JUL2016	ANGULAR DIMENSIONS ± 1°	MACHINE SURFACES	TEMPERATURE UNITS	METRIC UNITS	DWG UNITS: IN/LB/S	DRAWN BY: PBS	DATE: 23APR2014
A	2014-806	ADDED 16164-20, A042A453, 20000-025, 20225-100 & 20100-025.	JJW	20NOV2014	THIRD ANGLE PROJECTION	125	FOR TOLERANCES SEE DRAWING FOR FINISHES SEE DRAWING FOR MATERIALS SEE DRAWING FOR TOLERANCES SEE DRAWING FOR FINISHES SEE DRAWING FOR MATERIALS SEE DRAWING	FOR TOLERANCES SEE DRAWING FOR FINISHES SEE DRAWING FOR MATERIALS SEE DRAWING FOR TOLERANCES SEE DRAWING FOR FINISHES SEE DRAWING FOR MATERIALS SEE DRAWING	SCALE: 0.300	PRO-ENGINEER	INIT ECO: 2014-268
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE					SCALE: 0.300	DRAWING NO: A042B166	
									EST WEIGHT: 672.848	SHEET 1 OF 1	

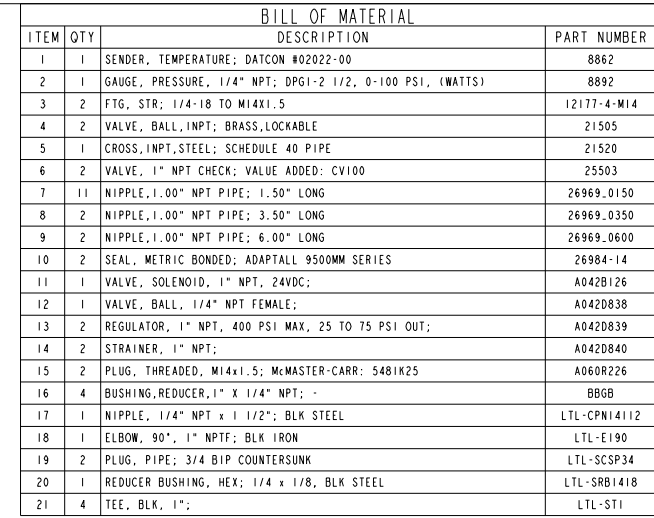



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|---|--|--|
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 AND OFFICE CENTER
 825 LAMAR AVENUE
 DELPHE, WISCONSIN</p> |
| <p>COOLING LOOP, 1", VERT
 RAW WATER</p> | | |
| <p>UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE:
 FINISH SURFACES: ± .005
 UNFINISHED SURFACES: ± .010</p> | <p>DWG UNITS: INCHES
 SCALE: 0.700
 EST WEIGHT: NA</p> | <p>DRAWN BY: PBS
 DATE: 12SEP2016
 UNIT CODE: 2016-376</p> |
|  | <p>PRO-ENGINEER</p> | <p>SHEET
 1 OF 2
 A042HT30</p> |

C	2018-360	DELETE: 12210-4. ADD: A060R226, 26984-14 AND NOTE	HE392	03JUL
B	2017-713	ADDED TOLERANCE TO DIMENSION	L0629	26OCT
A	2017-137	DELETE: 4921499. ADD: 12210-4	PBS	06MAR
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H730			1" Vertical, Raw Water			
	21505	RUB, S95F445	1" ball valve			
				body	CW617N	EN12165
				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW617N	EN12164
				nut	CB4FF	EN10263-2
				O-ring	FPM	
				handle	DD11	EN10111
				handle coating	PVC	
				washer	PTFE	
	A042D839	Watts, N45BU-M1-1"	regulator			
				body	bronze	
				seat	thermoplastic	
				cage	thermoplastic	
				integral strainer	stainless steel	
				diaphragm	reinforced EPDM	
				valve disc	elastomer	
	A042D840	Watts, 77S-M1-1"	strainer			
				body	cast iron	
				retainer cap	cast iron	ASTM A-126 Class B
				screen	304 stainless steel	
	8862	Datcon 02022-00	temperature sender	Body	brass	
	8892	Watts, DPG1-2	pressure gauge			
				case	ABS polymer	
				window	Kostil polymer	
				sensing element	copper alloy Bourdon tube	
				welding	tin alloy	
				connection	brass	
	A042D838	RUB, S95B45	1/4" ball valve			
				body	CW617N	EN12165
				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW617N	EN12164
				nut	CB4FF	EN10263-2
				O-ring	FPM	
				handle	DD11	EN10111
				handle coating	PVC	
				washer	PTFE	
	LTL-E190		1" elbow		black steel	ASTM A53/A733
	21520		1" cross		black steel	ASTM A53/A733
	25503	Euroblock, 100002	1" check valve			
				body	brass CW617N	EN12165
				end connection	brass CW617N	EN12165
				disc	polyetherimide	
				seat	NBP	
				spring	stainless steel	
	BBGB		1" X 1/4" reducing bushing		black steel	ASTM A53/A733
	26969_0350		1" x 3-1/2" nipple		black steel	ASTM A53/A733
	26969_0600		1" x 6" nipple		black steel	ASTM A53/A733
	26969_0150		1" close nipple		black steel	ASTM A53/A733
	LTL-CPN14112		1/4" x 1-1/2" nipple		black steel	ASTM A53/A733
	LTL-SCSP34		3/4" NPT plug		black steel	ASTM A53/A733
	LTL-SRB1418		1/4" x 1/8" reducing bushing		black steel	ASTM A53/A733
	LTL-ST1		1" TEE		black steel	ASTM A53/A733
	12177-4-M14		ftg. str, 1/4-18 to M14x1.5		steel, zink plated	

C	2018-360	SEE SHEET 1 FOR LATEST REVISION DETAILS	HE392	03JUL18				UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE: ANGULAR DIMENSIONS: ± 1° DIMENSIONS: ± 0.005 IN / ± 0.127 MM SURFACES: ± 0.005 IN / ± 0.127 MM	RAW WATER	DWG UNITS:	IN/LB/S	SCALE: 0.700	SHEET	2 OF 2	DRAWING NO:	A042H730
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE						EST WEIGHT:	PRO-ENGINEER	INIT ECO: 2016-376				

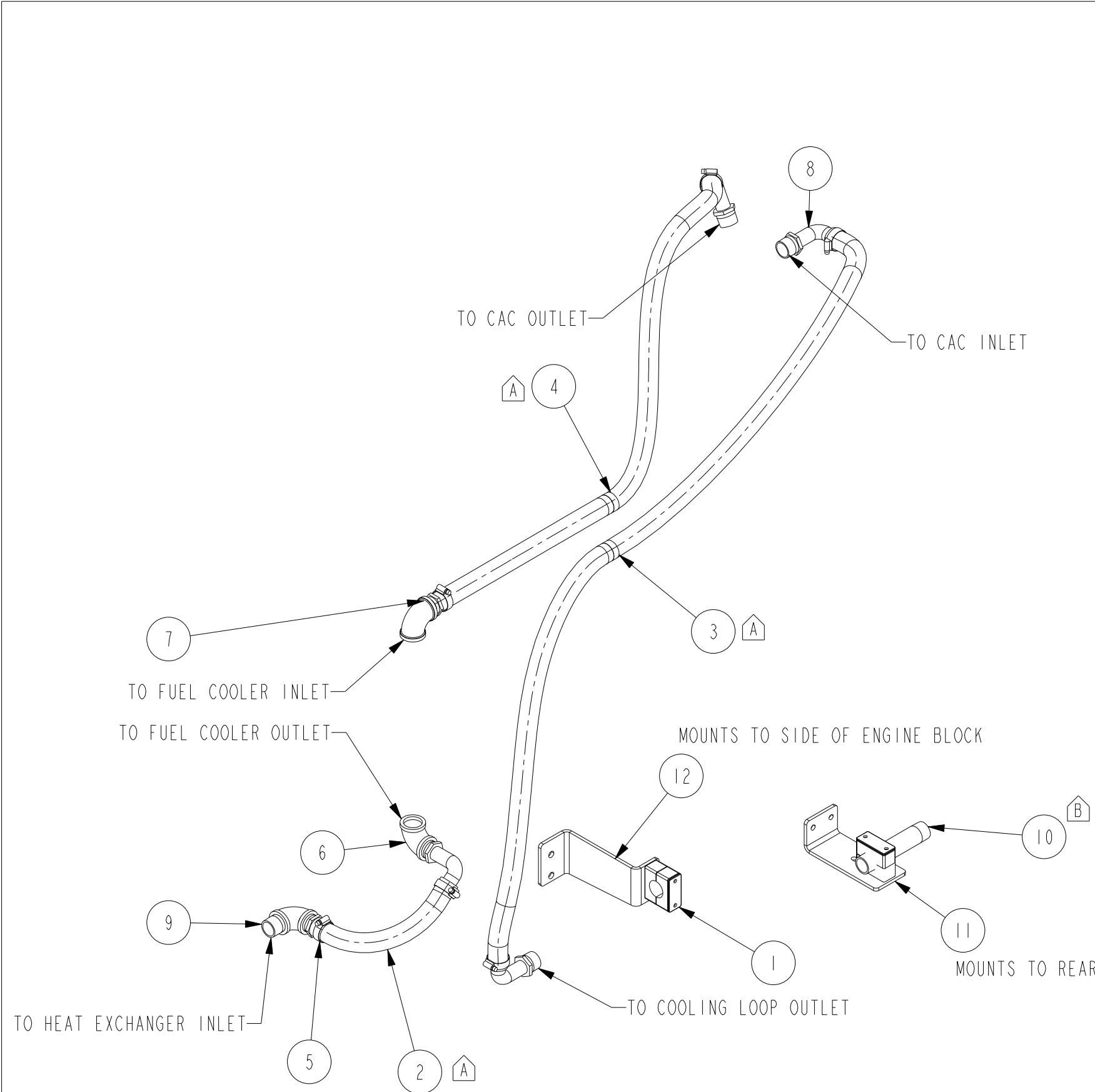


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CORPORATE OFFICE
855 LAMAR BLVD
WHITE BEAR LAKE, MN
WWW.COMPASSFIREPOWER.COM</p> | <p>CUSTOM DESIGN
AND OFFER CENTER
1875 LAMAR BLVD
DEPERE, WISCONSIN</p> |
| <p>UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE: ±.005</p> | | | |
| <p>ANGULAR DIMENSIONS ±.01
SURFACES</p> | <p>MAXIMUM TOLERANCE
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[illegible]

Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H732			1" 24VDC, Raw Water			
	21505	RUB, S95F45	1" ball valve			
				body	CW617N	EN12165
				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW617N	EN12164
				nut	CB4FF	EN10263-2
				O-ring	FPM	
				handle	DD11	EN10111
A042B126				handle coating	PVC	
				washer	PTFE	
	A042B126	Asco, 8210G004-24V	1" NPT 24V solenoid valve			
				body	brass	
				seals and discs	NBR or PTFE	
				disc holder	PA	
				core tube	305 stainless steel	
				core and plugnut	430F stainless steel	
				springs	302 stainless steel	
				shading coil	copper	
A042D839		Watts, N45BU-M1-1"	regulator			
				body	bronze	
				seat	thermoplastic	
				cage	thermoplastic	
				integral strainer	stainless steel	
				diaphragm	reinforced EPDM	
				valve disc	elastomer	
	A042D840	Watts, 77S-M1-1"	strainer			
				body	cast iron	
				retainer cap	cast iron	ASTM A-126 Class B
8862				screen	304 stainless steel	
	8862	Datcon 02022-00	temperature sender	Body	brass	
	8892	Watts, DPG1-2	pressure gauge			
				case	ABS polymer	
				window	Kostil polymer	
				sensing element	copper alloy Bourdon tube	
				welding	tin alloy	
				connection	brass	
	A042D838	RUB, S95B45	1/4" ball valve			
				body	CW617N	EN12165
LTL-E190				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW617N	EN12164
				nut	CB4FF	EN10263-2
				O-ring	FPM	
				handle	DD11	EN10111
				handle coating	PVC	
				washer	PTFE	
	LTL-E190		1" elbow		black steel	ASTM A53/A733
21520					black steel	ASTM A53/A733
	21520		1" cross			
	25503	Euroblock, 100002	1" check valve			
				body	brass CW617N	EN12165
				end connection	brass CW617N	EN12165
				disc	polyetherimide	
				seat	NBP	
				spring	stainless steel	
	BBGB		1" X 1/4" reducing bushing		black steel	ASTM A53/A733
	26969_0350		1" x 3-1/2" nipple		black steel	ASTM A53/A733
26969_0600					black steel	ASTM A53/A733
	26969_0600		1" x 6" nipple		black steel	ASTM A53/A733
	26969_0150		1" close nipple		black steel	ASTM A53/A733
	LTL-CPN14112		1/4" x 1-1/2" nipple		black steel	ASTM A53/A733
	LTL-SCSP34		3/4" NPT plug		black steel	ASTM A53/A733
	LTL-SRB1418		1/4" x 1/8" reducing bushing		black steel	ASTM A53/A733
	LTL-ST1		1" TEE		black steel	ASTM A53/A733
	12177-4-M14		flg, str, 1/4-18 to M14x1.5		steel, zink plated	

C	2018-360	SEE SHEET 1 FOR LATEST REVISION DETAILS	HE392	03JUL18				UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE: ANGULAR DIMENSIONS: ± .1° THIRD ANGLE PROJECTION	INCHES: 1/16, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/4, 2 3/4, 3, 3 1/4, 3 1/2, 3 3/4, 4, 4 1/4, 4 1/2, 4 3/4, 5, 5 1/4, 5 1/2, 5 3/4, 6, 6 1/4, 6 1/2, 6 3/4, 7, 7 1/4, 7 1/2, 7 3/4, 8, 8 1/4, 8 1/2, 8 3/4, 9, 9 1/4, 9 1/2, 9 3/4, 10, 10 1/4, 10 1/2, 10 3/4, 11, 11 1/4, 11 1/2, 11 3/4, 12, 12 1/4, 12 1/2, 12 3/4, 13, 13 1/4, 13 1/2, 13 3/4, 14, 14 1/4, 14 1/2, 14 3/4, 15, 15 1/4, 15 1/2, 15 3/4, 16, 16 1/4, 16 1/2, 16 3/4, 17, 17 1/4, 17 1/2, 17 3/4, 18, 18 1/4, 18 1/2, 18 3/4, 19, 19 1/4, 19 1/2, 19 3/4, 20, 20 1/4, 20 1/2, 20 3/4, 21, 21 1/4, 21 1/2, 21 3/4, 22, 22 1/4, 22 1/2, 22 3/4, 23, 23 1/4, 23 1/2, 23 3/4, 24, 24 1/4, 24 1/2, 24 3/4, 25, 25 1/4, 25 1/2, 25 3/4, 26, 26 1/4, 26 1/2, 26 3/4, 27, 27 1/4, 27 1/2, 27 3/4, 28, 28 1/4, 28 1/2, 28 3/4, 29, 29 1/4, 29 1/2, 29 3/4, 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A

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	CLAMP,PIPE,1",PLASTIC, W/COVER PLATE	14925-01
2	1	HOSE,1 INCH ID SILICONE, 1.00" x 12.00" LONG	A042F061
3	1	HOSE,1 IN SILICONE, 1.00" x 66.00" LONG	A042F074
4	1	HOSE,1 IN SILICONE, 1.00" x 46.00" LONG	A042F074
5	6	CLAMP, WORM, .81 - 1.50	14990-16
6	3	ELBOW, MARINE GRADE, 1" NPT	15756-16
7	2	ADAPTER, NAVAL BRONZE, NPT X BARB, 1" NPT X 1" BARB	15766-16-16
8	4	ELBOW, NAVAL BRONZE, NPT X BARB, 1" NPT X 1" BARB	15767-16-16
9	1	NIPPLE, MARINE GRADE, 1" X 1-1/2"	15789
10	1	NIPPLE, 1" X 6", SEA WATER COMPATIBLE	A042A430
11	1	BRACKET, COOLING LOOP, CFPIIE	A042B167
12	1	BRACKET, COOLING LOOP, CFPIIE	A042B168

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UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

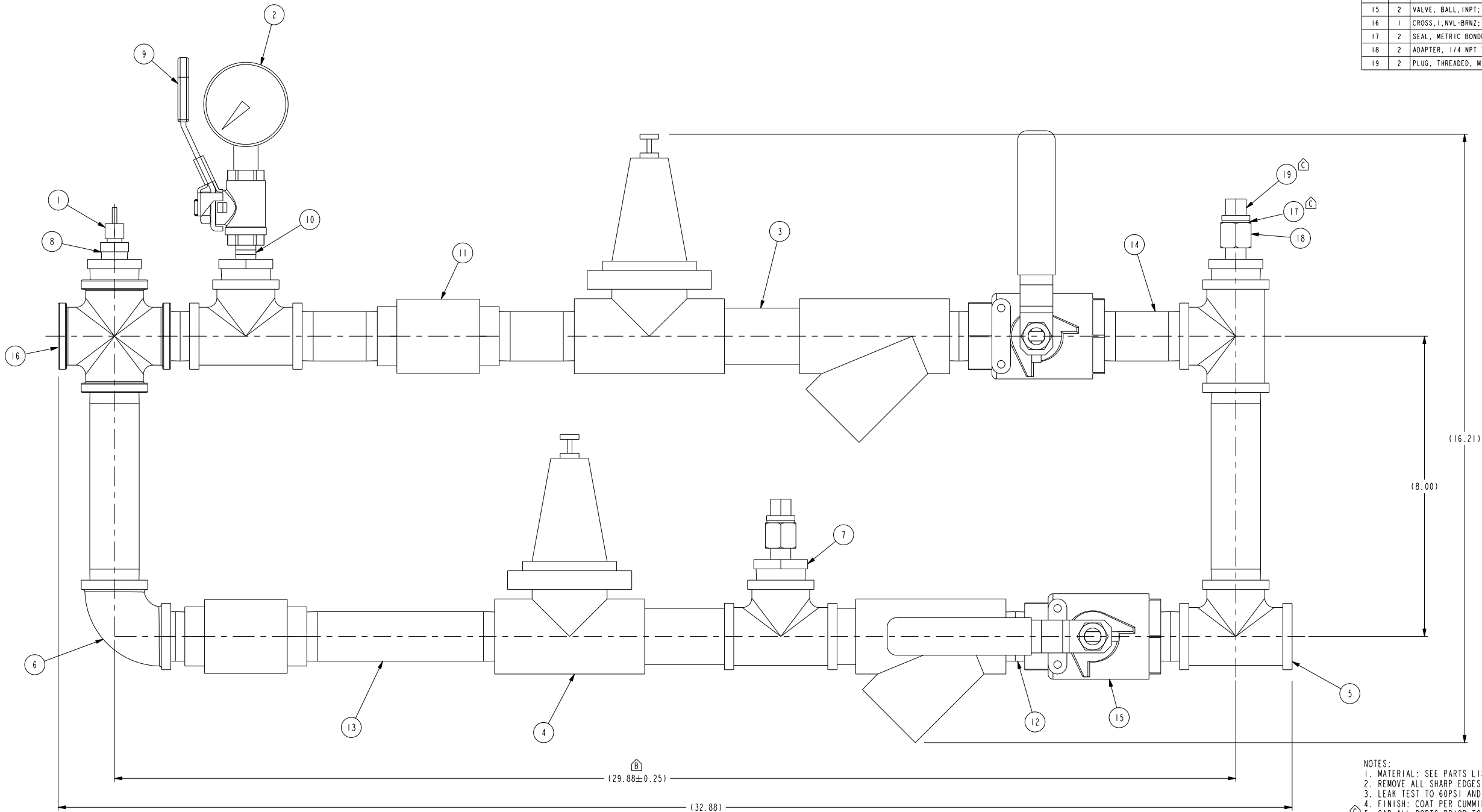
ANGULAR DIMENSIONS ± °	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX : ± 0.010 .XXX : ± 0.005 FORM TOLERANCES .XX : ± 0.030 .XXX : ± 0.015 FAB TOLERANCES .XX : ± 0.060 .XXX : ± 0.030	MACHINE TOLERANCES .XX : ± 0.2 FORM TOLERANCES .XX : ± 0.8 .XXX : ±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

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

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

MISCELLANEOUS PIPING
SEA WATER, CFPIIE

DWG UNITS: IN/LB/S	DRAWN BY: PBS PRO-ENGINEER	DATE: 11NOV2014 INIT ECO: 2014-782
SCALE: 0.125 EST WEIGHT: 17.730	SHEET 1 OF 1	DRAWING NO: A042D200



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SENDER, TEMPERATURE; DATCON #02022-00	8862
2	1	GUAGE, 0-100 PSI, 1/4" NPT STN STL;	13113
3	1	REGULATOR/STRAINER, 1" NPT, SEA WATER COMPATIBLE;	14684
4	1	REGULATOR/STRAINER, 1" NPT, SEA WATER COMPATIBLE;	14684-01
5	4	TEE, MARINE GRADE; 1" NPT	15755-16
6	1	ELBOW, MARINE GRADE; 1" NPT	15756-16
7	4	BUSHING, MARINE GRADE; 1" x 1/4"	15758-16-4
8	1	BUSHING, MARINE GRADE; 1/4" x 1/8"	15758-4-2
9	1	VALVE, BALL, 1/4" NPT.; APOLLO 77-100 (MARINE)	15759-04
10	1	NIPPLE, NAVAL BRONZE, 1/4" X CLOSE;	15760
11	2	CHECK VALVE, MARINE GRADE, 1" NPT;	15768-16
12	6	NIPPLE, MARINE GRADE, 1" X 1-1/2";	15789
13	3	NIPPLE, MARINE GRADE, 1" X 6";	15792
14	3	NIPPLE, MARINE GRADE, 1" X 3";	15794
15	2	VALVE, BALL, INPT; SEA WATER COMPATIBLE, LOCKABLE	21435
16	1	CROSS, 1, NVL-BRNZ; SCHEDULE 40 PIPE	21437
17	2	SEAL, METRIC BONDED; ADAPTALL 9500MM SERIES	26984-14
18	2	ADAPTER, 1/4 NPT TO M14-1.5; SEA WATER COMPATIBLE	A042H751
19	2	PLUG, THREADED, M14x1.5; McMASTER-CARR: 5481K25	A060R226

- NOTES:
1. MATERIAL: SEE PARTS LIST
2. REMOVE ALL SHARP EDGES PRIOR TO COATING
3. LEAK TEST TO 60PSI AND PRESET REGULATORS TO 60PSI
4. FINISH: COAT PER CUMMINS SPEC ES044 RAL 3001
5. CAP ALL PORTS PRIOR TO SHIPPING

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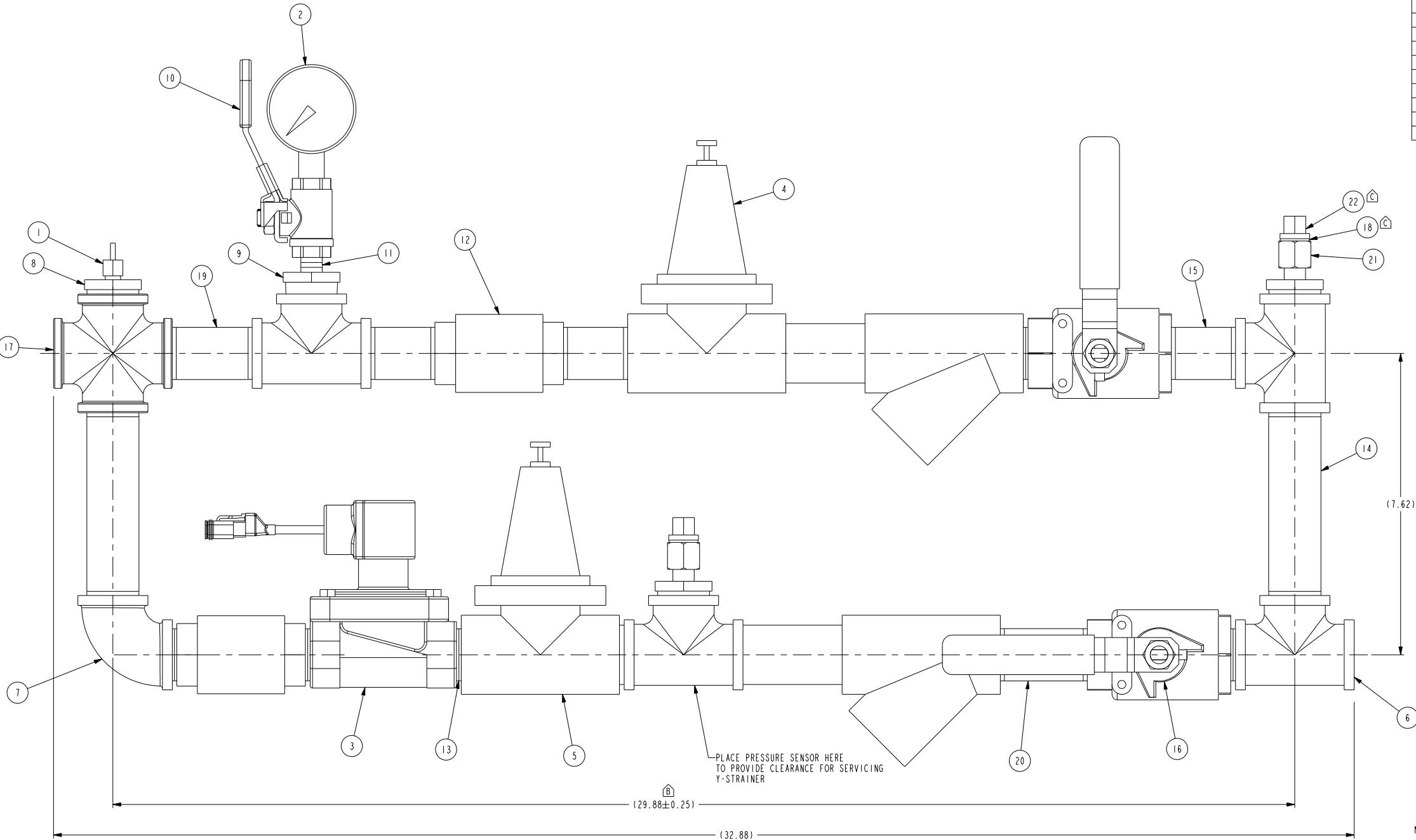
CUMMINS FIRE POWER LLC
CORPORATE OFFICE
1600 BUREAU ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN
AND UPTIT CENTER
875 LAWRENCE DRIVE
DEPUIS, WISCONSIN

COOLING LOOP, 1" VERT
SEA WATER COMPATIBLE

DWG UNITS: IN/LB/S	SCALE: 0.700	EST WEIGHT: NA
DRAWN BY: PBS	SHEET 1 OF 2	DATE: 12SEP2016
PRO-ENGINEER	DRAWING NO: A042H733	INIT ECO: 2016-376

C	2018-360	DELETE: 12210-4, ADD: A060R226, 26984-14 AND NOTE	HE392	03JUL18
B	2017-713	ADDED TOLERANCE TO DIMENSION	LO629	26OCT2017
A	2017-137	DELETE: 4921499, ADD: 12210-4	PBS	06MAR2017
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	SENDER, TEMPERATURE; DATCON #02022-00	8862
2	1	GUAGE, 0-100 PSI, 1/4" NPT STN STL;	13113
3	1	VALVE, SOLENOID, 1" NPT, 24VDC; SEA WATER COMPATIBLE	14681
4	1	REGULATOR/STRAINER, 1" NPT, SEA WATER COMPATIBLE;	14684
5	1	REGULATOR/STRAINER, 1" NPT, SEA WATER COMPATIBLE;	14684-01
6	4	TEE, MARINE GRADE; 1" NPT	15755-16
7	1	ELBOW, MARINE GRADE; 1" NPT	15756-16
8	1	BUSHING, MARINE GRADE; 1" x 1/8"	15758-16-2
9	3	BUSHING, MARINE GRADE; 1" x 1/4"	15758-16-4
10	1	VALVE, BALL, 1/4" NPT.; APOLLO 77-100 (MARINE)	15759-04
11	1	NIPPLE, NAVAL BRONZE, 1/4" X CLOSE;	15760
12	2	CHECK VALVE, MARINE GRADE, 1" NPT;	15768-16
13	6	NIPPLE, MARINE GRADE, 1" X 1-1/2";	15789
14	2	NIPPLE, MARINE GRADE, 1" X 6";	15792
15	3	NIPPLE, MARINE GRADE, 1" X 3";	15794
16	2	VALVE, BALL, INPT; SEA WATER COMPATIBLE, LOCKABLE	21435
17	1	CROSS, 1, NVL-BRNZ; SCHEDULE 40 PIPE	21437
18	2	SEAL, METRIC BONDED; ADAPTALL 9500MM SERIES	26984-14
19	1	NIPPLE, 1" PIPE, 3.40" L; SEA WATER COMPATIBLE	A042H250
20	1	NIPPLE, 1" PIPE, 3.58" L; SEA WATER COMPATIBLE	A042H251
21	2	ADAPTER, 1/4 NPT TO M14-1.5; SEA WATER COMPATIBLE	A042H751
22	2	PLUG, THREADED, M14x1.5; McMASTER-CARR: 5481K25	A060R226

- NOTES:
1. MATERIAL: SEE PARTS LIST
2. REMOVE ALL SHARP EDGES PRIOR TO COATING
3. LEAK TEST TO 60PSI AND PRESET REGULATORS TO 60PSI
4. FINISH: COAT PER CUMMINS SPEC ES044 RAL 3001
5. CAP ALL PORTS PRIOR TO SHIPPING

C	2018-360	DELETE: 12210-4. ADD: A060R226, 26984-14 AND NOTE	HE392	03JUL18
B	2017-713	ADDED TOLERANCE TO DIMENSION	LO629	26OCT2017
A	2017-137	DELETE: 4921499. ADD: 12210-4	PBS	06MAR2017
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE:
ANGULAR DIMENSIONS: ± 1°
DIMENSIONS: ± 0.005 INCHES / ± 0.127 MM
THIRD ANGLE PROJECTION
125

INCHES: 1/16, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, 2 3/4, 3, 3 1/4, 3 1/2, 3 3/4, 4, 4 1/4, 4 1/2, 4 3/4, 5, 5 1/4, 5 1/2, 5 3/4, 6, 6 1/4, 6 1/2, 6 3/4, 7, 7 1/4, 7 1/2, 7 3/4, 8, 8 1/4, 8 1/2, 8 3/4, 9, 9 1/4, 9 1/2, 9 3/4, 10
MILLIMETERS: 0.2, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000

COOLING LOOP, 1", 24V
SEA WATER COMPATIBLE

DWG UNITS: IN/LB/S
SCALE: 0.700
EST WEIGHT: NA

DRAWN BY: PBE
PRO-ENGINEER
SHEET 1 OF 2

DATE: 12SEP2016
UNIT ECO: 2016-376
DRAWING NO: A042H735

Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H735			1" 24VDC, Sea Water			
	14681	GC Valves, S211GF16J7FG9	1" NPT 24V solenoid valve			
				valve body/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
	21435	Apollo, 75-105-01	1" 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
	8862	Daicon 02022-00	temperature sender	Body	brass	
	13113	Groinger, 4RY95	pressure gauge			
				case	stainless steel	
				socket	316 stainless steel	
				tube	316 stainless steel	
				lens	polycarbonate	
				ring	316 stainless steel	
	14684	Wilkins, 500YSBRHLRSW	1" 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
				elastomers	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	
	15755-16		1" tee		Copper Alloy	ASTM B62-09
	15756-16		1" elbow		Copper Alloy	ASTM B62-09
	15758-16-4		1" X 1/4" reducing bushing		Copper Alloy	ASTM B62-09
	15758-16-2		1" x 1/8" reducing 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
	15768-16	Watts, series 600	1" check valve			
				body	bronze	
				guide bushing	stainless steel	
				spring	stainless steel	
				check	brass	
				seat	PTFE	
				O-ring	Nitrile	
				adapler	brass	
	15789		1" x 1-1/2" nipple		Copper Alloy	ASTM B62-09
	15794		1" x 4" nipple		Copper Alloy	ASTM B62-09
	A042H250		1" x 3.4" nipple		Copper Alloy	ASTM B62-09
	A042H251		1" x 3.58" nipple		Copper Alloy	ASTM B62-09
	21437		1" cross		Copper Alloy	ASTM B62-09
	A072H751		adapter 1/4 NPT to M14-1.5		Copper Alloy	ASTM B62-09

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

INCHES
SURFACES

INCHES
SURFACES

125

125

125

125

125

125

125

125

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Cummins Fire Power LLC
CORPORATE OFFICE
1600 BUREAU ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSFIREPOWER.COM

CUSTOM DESIGN
AND UPGIT CENTER
875 LAWRENCE DRIVE
DEPUSE, WISCONSIN

COOLING LOOP, 1" , 24V
SEA WATER COMPATIBLE

DWG UNITS:
IN/LB/S

SCALE: 0.700

EST WEIGHT:

DRAWN BY: PBE

PRO-ENGINEER

SHEET
2 OF 2

DATE: 12SEP2016

UNIT ECO: 2016-376

A042H735

C

2018-360

SEE SHEET 1 FOR LATEST REVISION DETAILS

HE392

03JUL18

125

REV

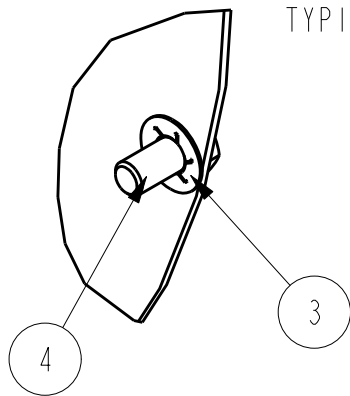
ECO

DESCRIPTION OF REVISION

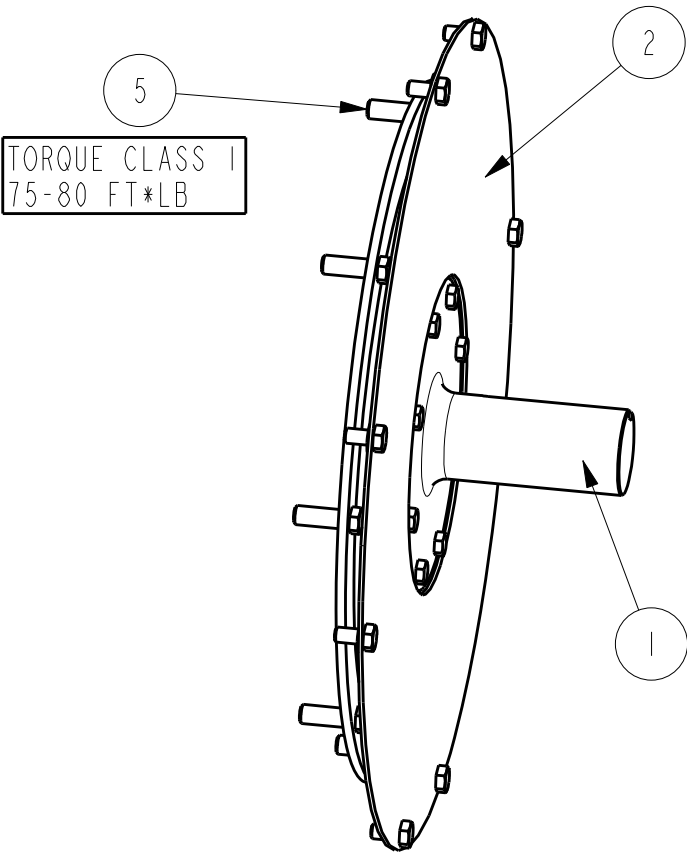
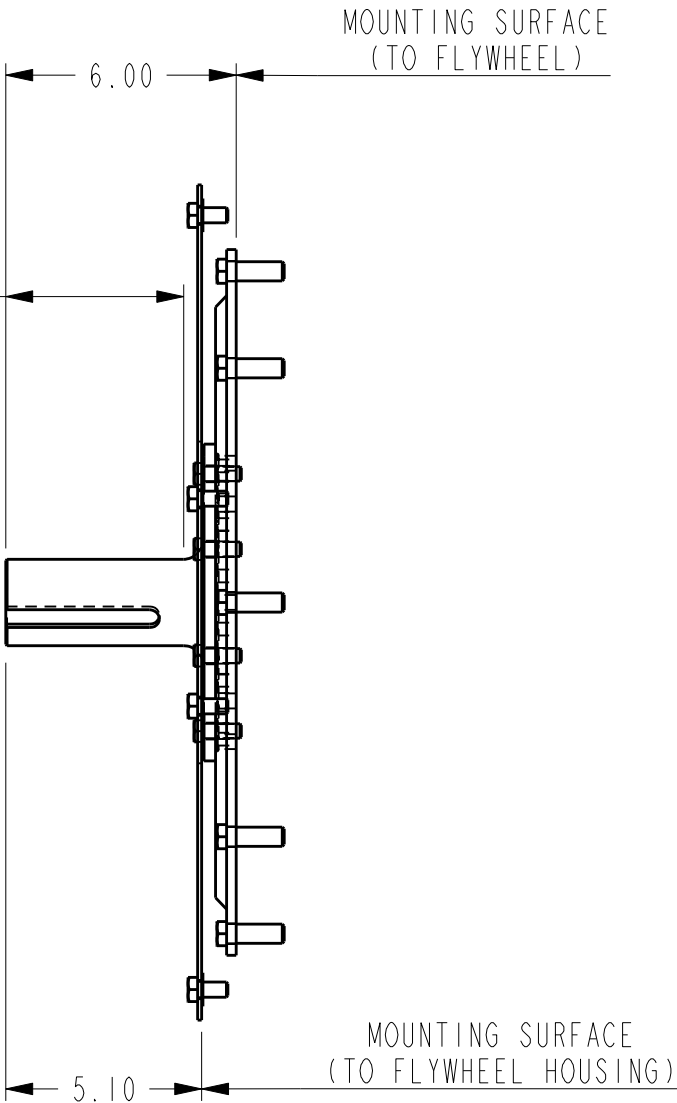
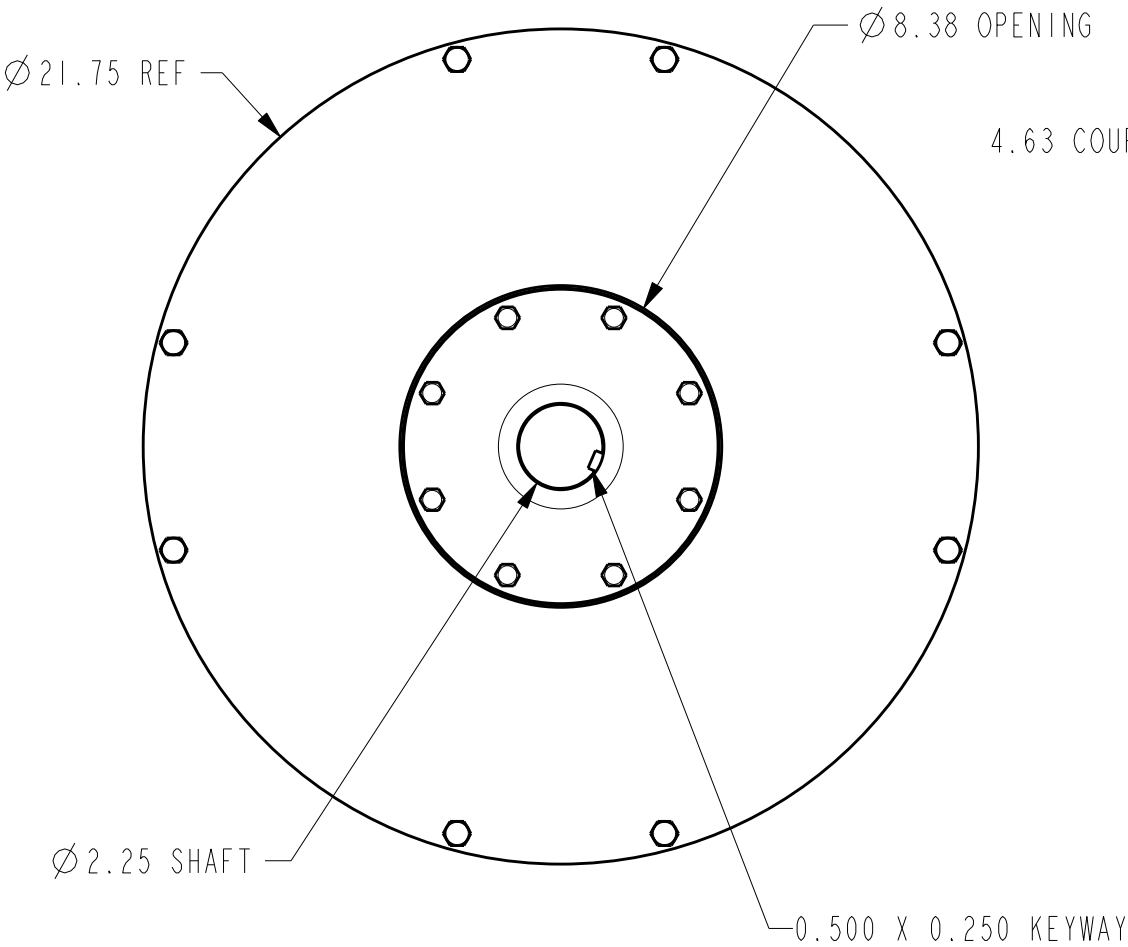
REV BY

DATE

125



TYPICAL GUARDING FASTENERS
SCALE 0.500



BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSEMBLY, SAE 14, 2.25" DIA STUB SHAFT, CFPIIE SERIES	14956
2	1	PLATE, STUB SHAFT GUARD, SAE #1, HAYES #127807, FIREPUMP	9557
3	8	RETAINING WASHER, PUSHNUT, 7/16" BOLT	16662-07
4	8	SCREW, CAP, HEX HEAD, 7/16-14 UNC	HHCS_0437_0075
5	8	SCREW, CAP, HEX HEAD, 1/2-13 UNC X 1.50"	HHCS_0500_0150

NOTES:
1. MASS: 47.9 LBS, INERTIA: 113.46 LB.IN^2

D	2010-098	ADDED RETAINING FASTENERS	DAN	04-MAR-10
C	2009-620	ADDED MASS & INERTIA DATA	S DUBICK	12/28/09
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

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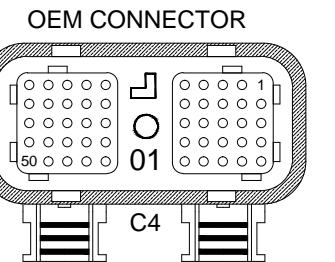
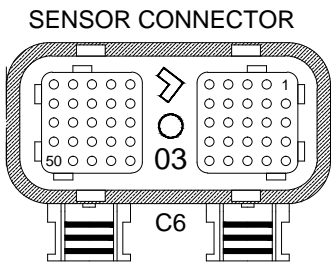
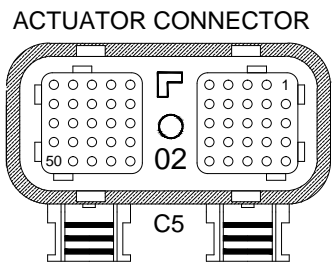
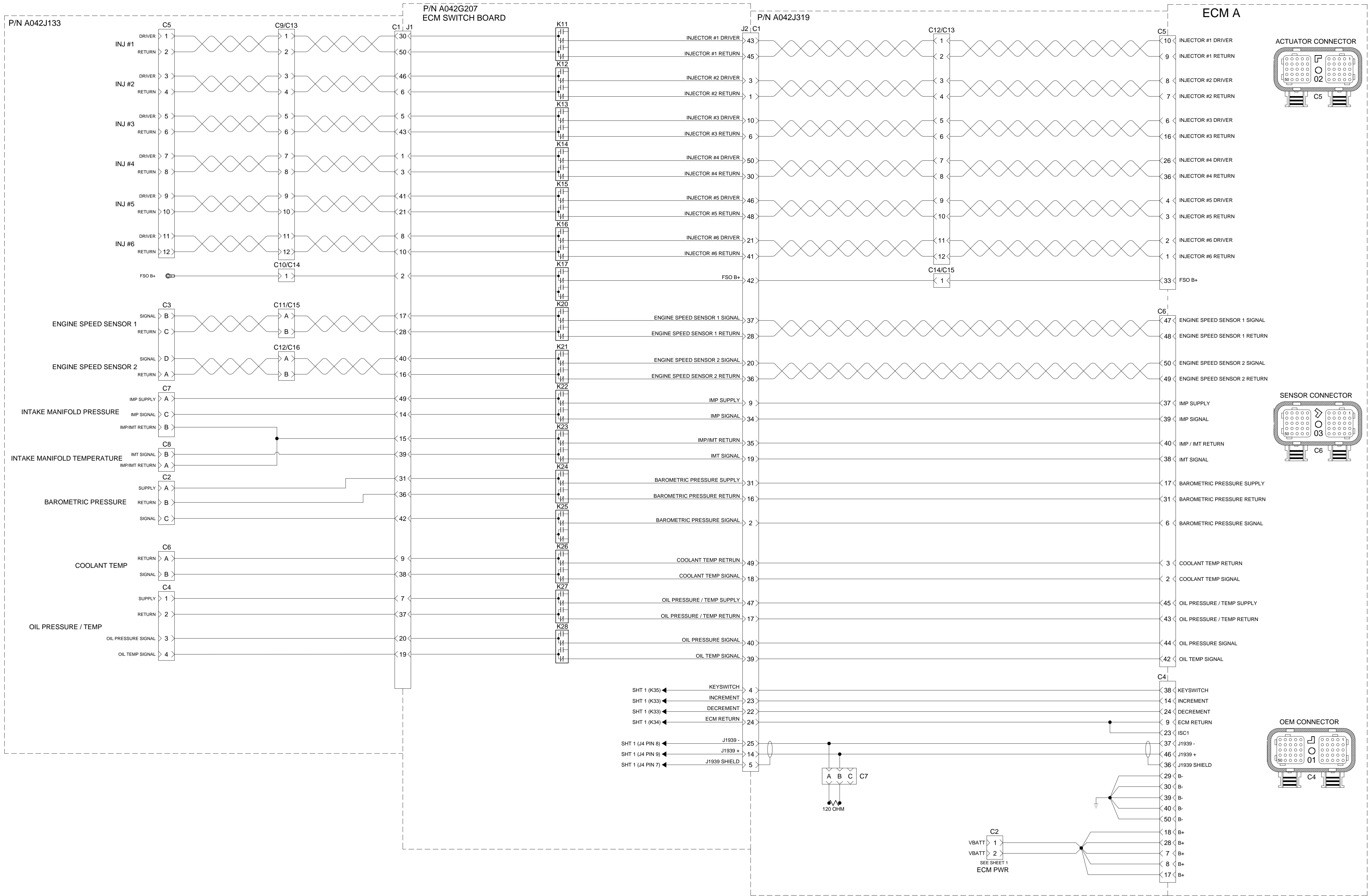
ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX ± 0.010 .XXX ± 0.005	MACHINE TOLERANCES .XX ± 0.4 .XXX ± 0.2
	FORM TOLERANCES .XX ± 0.030 .XXX ± 0.015	FORM TOLERANCES .XX ± 0.8 .XXX ± 0.4
	FAB TOLERANCES .XX ± 0.060 .XXX ± 0.030	FAB TOLERANCES .XX ± 1.6 .XXX ± 0.8

CUMMINS FIRE POWER LLC
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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, STUB SHAFT, SAE#1
FIREPUMP, CFPIIE

DWG UNITS: IN/LB/S	DRAWN BY: DAVE N PRO-ENGINEER	DATE: 20JUN2005 INIT ECO:
SCALE: 0.200 EST WEIGHT: 60.031	SHEET 1 OF 1	DRAWING NO: 9679



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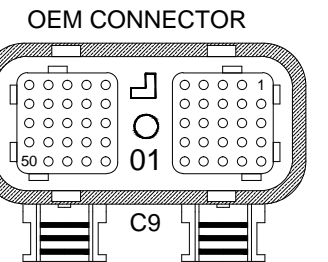
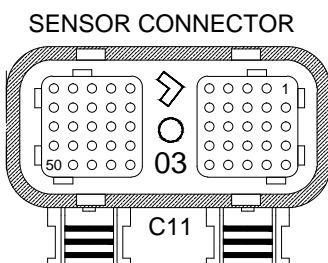
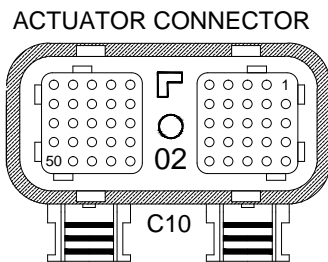
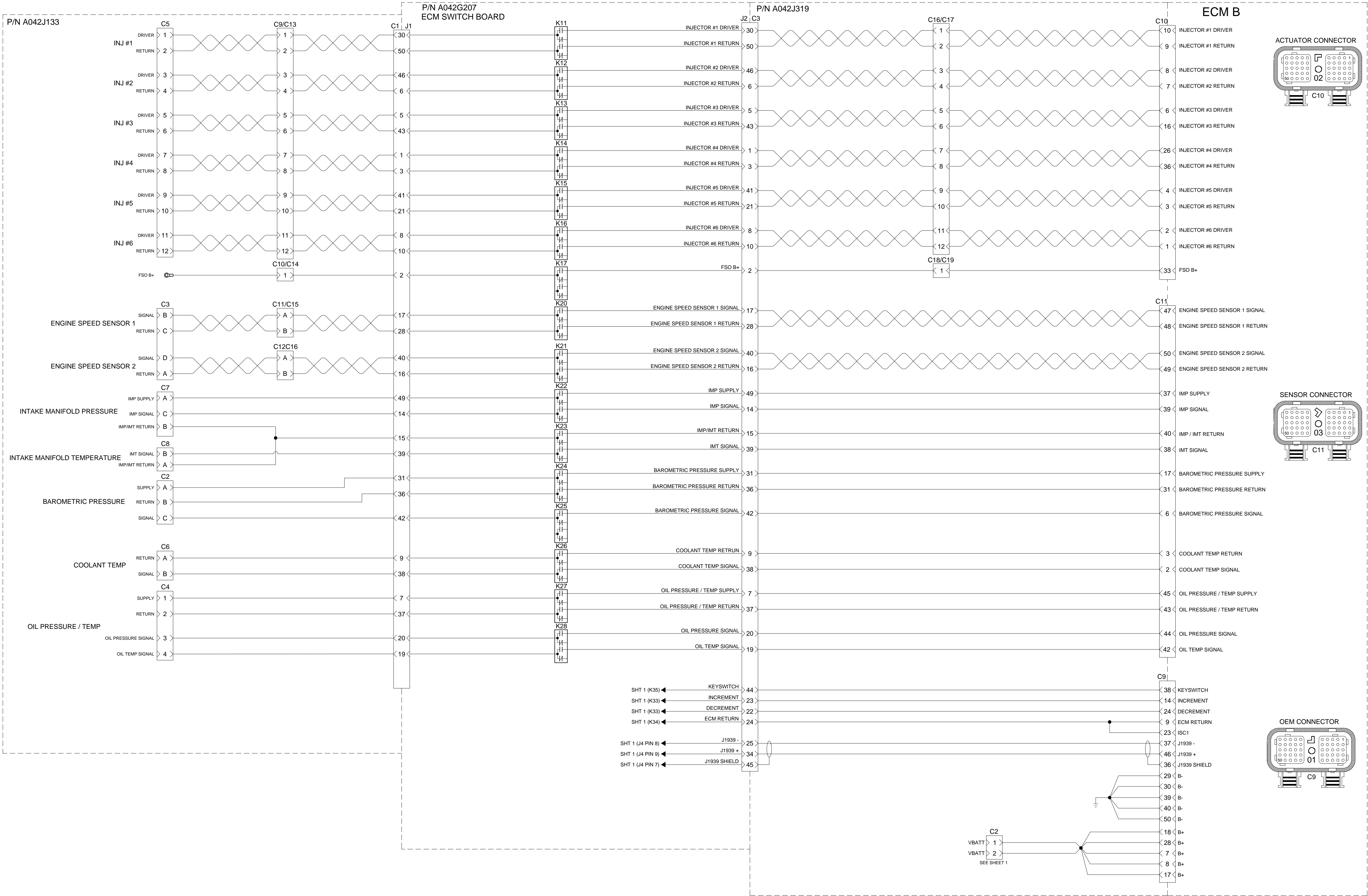
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CUSTOM DESIGN AND
UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SHEETS, OVERALL, CFP11E
FPDP GEN II

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE:
ANGULAR DIMENSIONS ± 1°
THIRD ANGLE PROJECTION
IMPERIAL UNITS: INCH/LB/S
METRIC UNITS: MM/KG

DWG UNITS: INCH/LB/S
SCALE: EST WEIGHT:
DRAWN BY: KAK
INIT ECO: 2016-694
SHEET 2 OF 6
DRAWING NO: A042J124



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875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SHEETS, OVERALL, CFP11E
FPDP GEN II

DWG UNITS: INCH/LB/S
SCALE: EST. WEIGHT:

DRAWN BY: KAK
INIT ECO: 2016-694

DATE: 1 FEB 2017

SHEET 3 OF 6
DRAWING NO: A042J124

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
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NO ASO OPTION WITH UP TO 3 SWITCHED INPUTS

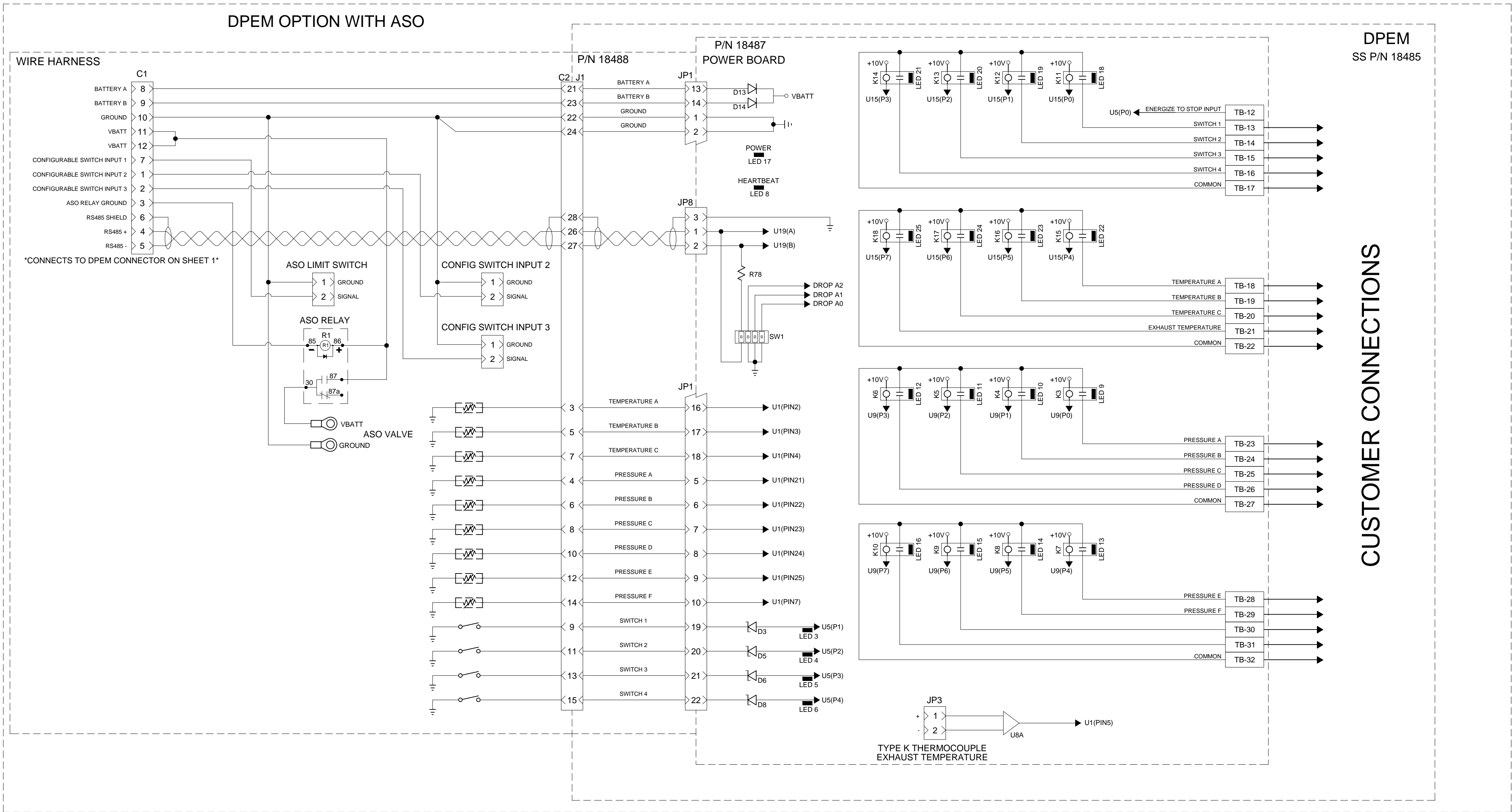
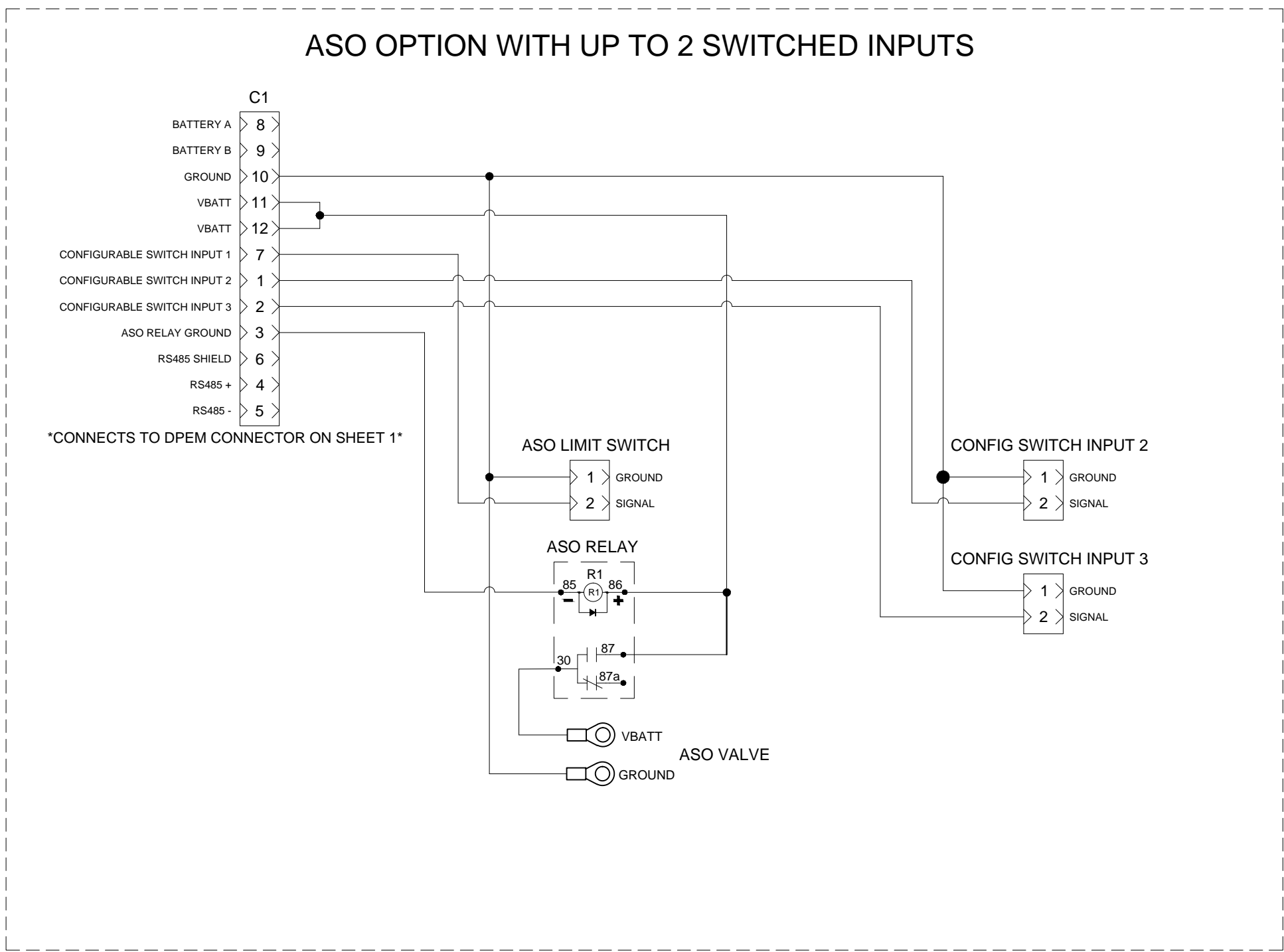
The diagram illustrates the wiring for a circuit with up to 3 switched inputs. It shows the following components and connections:

- Power Source:** BATTERY A (pin 8) and BATTERY B (pin 9) are connected to the circuit. GROUND is connected to pin 10.
- Switch Inputs:** CONFIGURABLE SWITCH INPUT 1 (pin 7), CONFIGURABLE SWITCH INPUT 2 (pin 1), and CONFIGURABLE SWITCH INPUT 3 (pin 2) are connected to the circuit.
- Connections:** The circuit is connected to a DPPEM connector on sheet 1. The connections are as follows:
 - CONFIGURABLE SWITCH INPUT 1 (pin 7) connects to CONFIG SWITCH INPUT 1 (pin 1).
 - CONFIGURABLE SWITCH INPUT 2 (pin 1) connects to CONFIG SWITCH INPUT 1 (pin 2).
 - CONFIGURABLE SWITCH INPUT 3 (pin 2) connects to CONFIG SWITCH INPUT 2 (pin 1).
 - CONFIG SWITCH INPUT 1 (pin 1) connects to GROUND.
 - CONFIG SWITCH INPUT 1 (pin 2) connects to GROUND.
 - CONFIG SWITCH INPUT 2 (pin 1) connects to GROUND.
 - CONFIG SWITCH INPUT 2 (pin 2) connects to GROUND.
 - CONFIG SWITCH INPUT 3 (pin 1) connects to GROUND.
 - CONFIG SWITCH INPUT 3 (pin 2) connects to GROUND.

CONNECTS TO DPPEM CONNECTOR ON SHEET 1

[illegible]

IF AIR SHUT-OFF (ASO) IS SELECTED, THE UL/FM LISTING IS REMOVED AS THIS OPTION IS NOT ALLOWED PER THE STANDARDS.



P/N A042J117

CRANK A > 12

BATTERY A > 1

ALTERNATOR EXCITE > 14

CRANK B > 13

BATTERY B > 2

GROUND > 3

GROUND > 4

P/N 15155
ECM POWER BOARD

BATTERY A > 1

BATTERY A > 2

BATTERY A > 3

GROUND > 7

GROUND > 8

GROUND > 9

BATTERY B > 10

BATTERY B > 11

BATTERY B > 12

DPEM

GROUND > 10

BATTERY A > 8

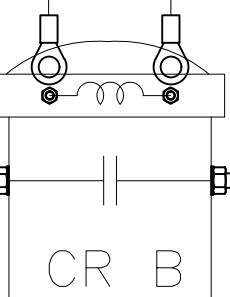
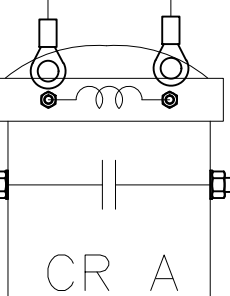
BATTERY B > 9

P/N A042C868

TB-6

TB-8

TB-11



BATTERY ISOLATOR

ALTERNATOR

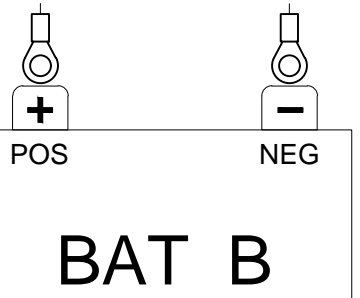
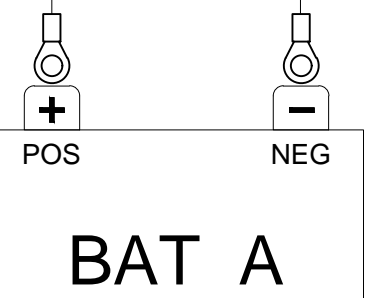
B+

GND

STARTER

B+

GND



ENGINE BLOCK

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ANGULAR DIMENSIONS ± 1°	THIRD ANGLE PROJECTION	IMPERIAL UNITS FRACTIONS DECIMALS INCHES FEET	METRIC UNITS FRACTIONS DECIMALS MILLIMETERS CENTIMETERS	DRAWN BY: KAK AUTO CAD SHEET 6 OF 6 DRAWING NO: A042J124
REV	ECO	DESCRIPTION OF REVISION	BY	DATE