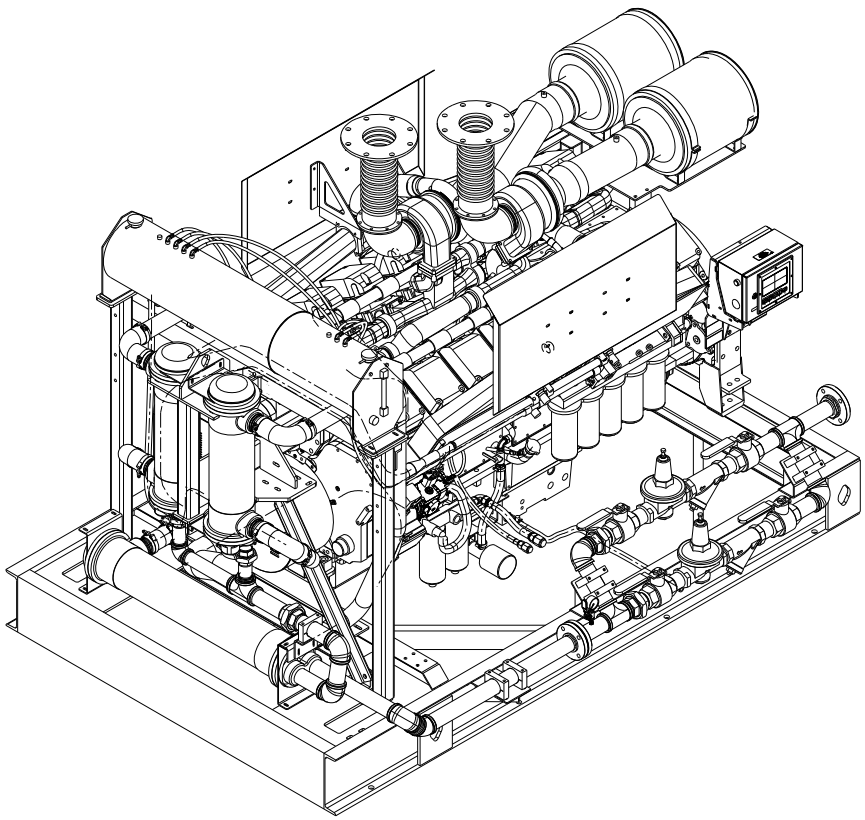
Fire pump drive engines
CFP50 series

Operation and maintenance manual



Doc. A042J566
October 2019

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 installing, operating, maintaining and servicing the fire pump drive engine purchased from Cummins Sales and Service in De Pere, Wisconsin.

Please visit us at https://www.cummins.com/engines/fire-pump-drives/maintenance-current-models 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.
- 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.

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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.

ISO 9001
BUREAU VERITAS
Certification

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.

Sales and Service

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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 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. 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.

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.

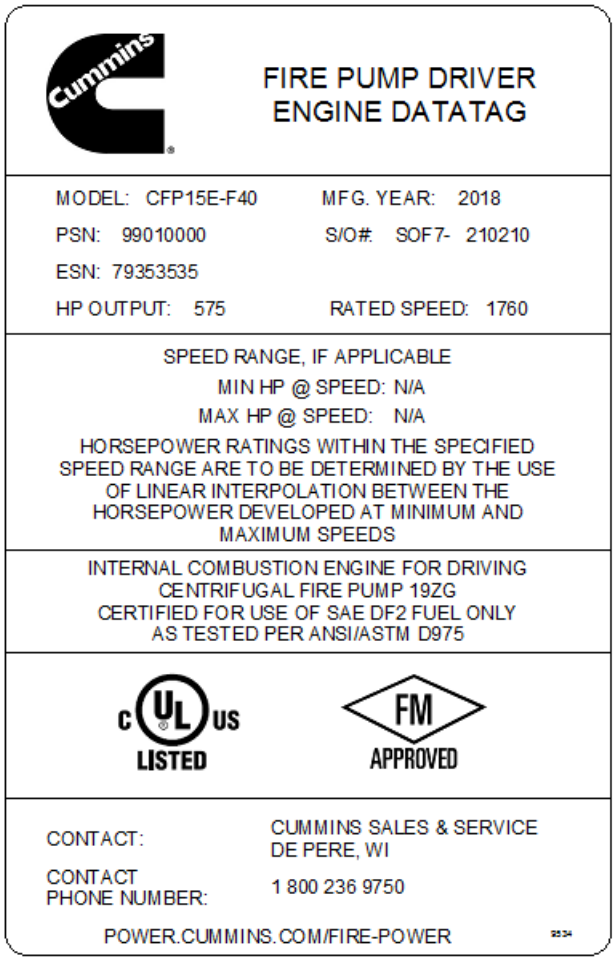
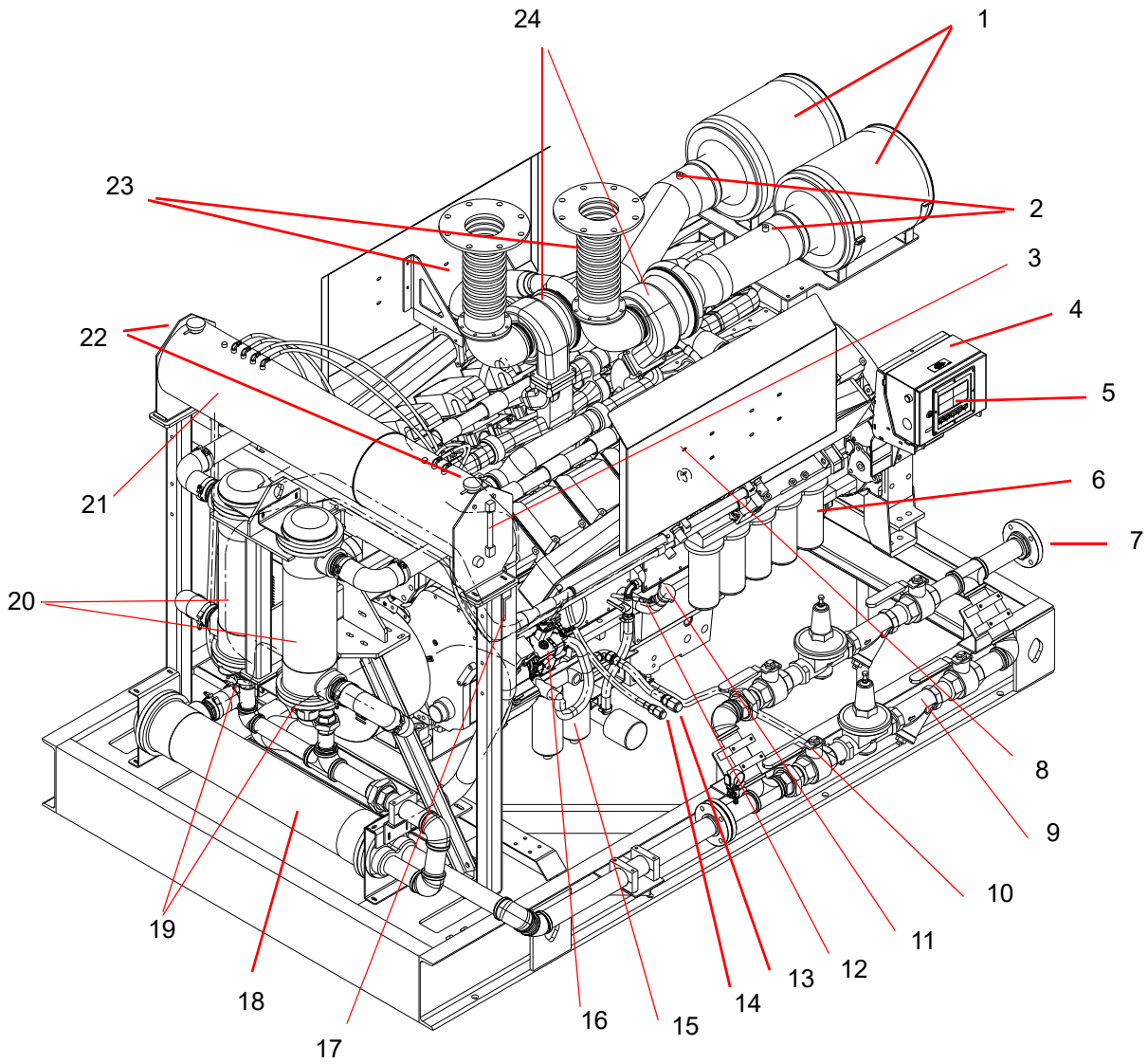


Figure 2-1 Fire pump drive engine nameplate (typical)

2.3 Fire pump controller

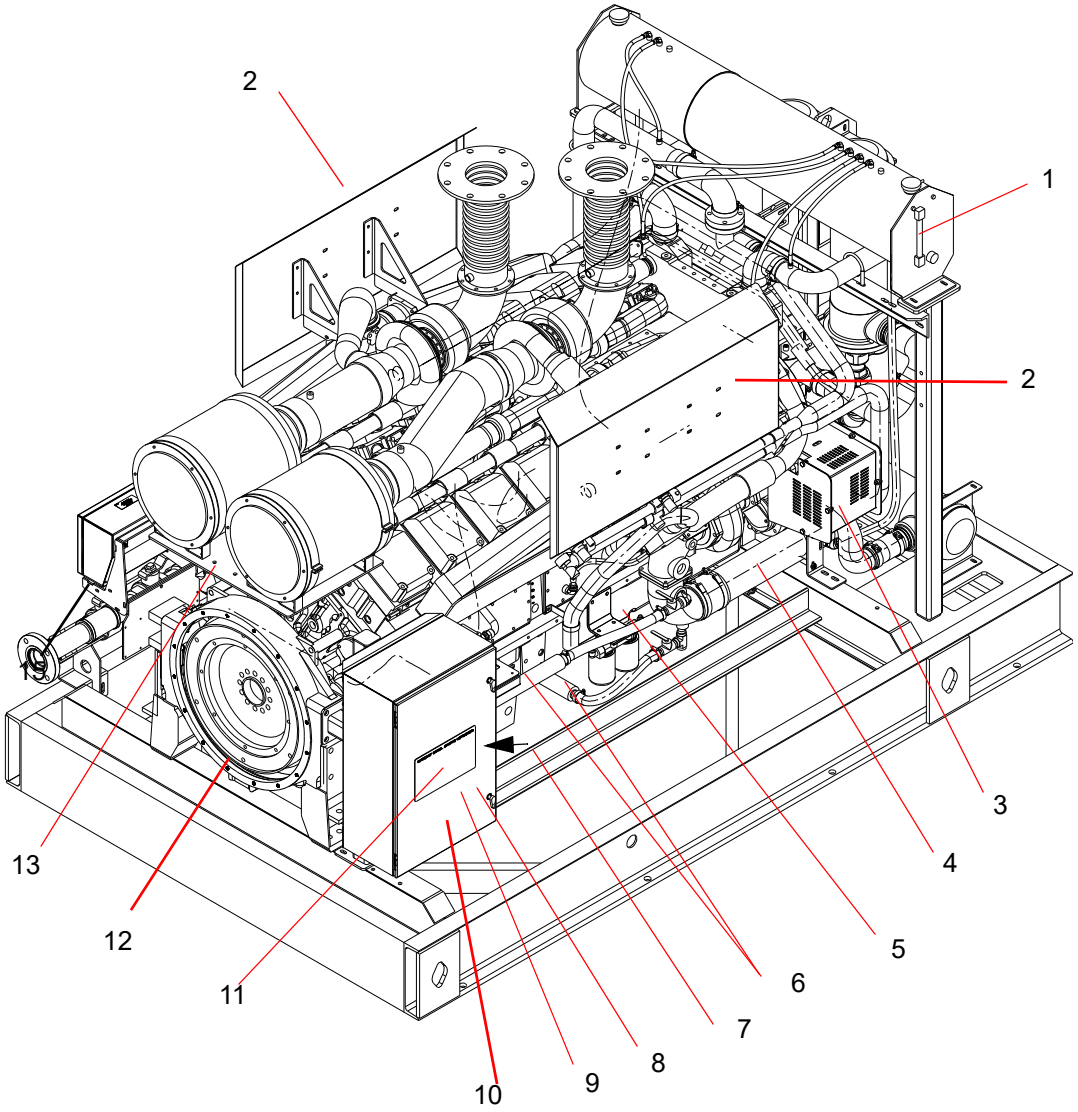
The fire pump controller starts the engine automatically when the Fire Pump Digital Panel (FPDP) is in automatic mode and a remote fire demand signal is received. The fire pump controller automatically shuts down the engine when the fire demand signal is discontinued. The fire pump controller is optionally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

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.*



1. Air cleaner assembly (2)
2. Air cleaner service indicator (2)
3. Expansion tank level sight gauge (1 of 2)
4. Contactor/terminal box (inside the FPDP)
5. Fire pump digital panel (FPDP)
6. Oil filters (5)
7. Cooling water inlet
8. Engine aftercooler (behind heat shield)
9. Cooling water manifold
10. Oil pan and drain
11. Engine oil fill port
12. Engine oil dipstick
13. Fuel supply line
14. Fuel return line
15. Fuel filters (2)
16. Fuel pump
17. Engine serial number decal
18. Low temperature aftercooler (LTA) coolant heat exchanger
19. Heat exchanger cooling water discharge
20. Jacket water (JW) coolant heat exchanger
21. Cooling expansion tank
22. Coolant pressure/fill cap (2)
23. Exhaust elbow connection
24. Turbocharger (2)

Figure 2-2 Engine components - fire pump digital panel (FPDP) side



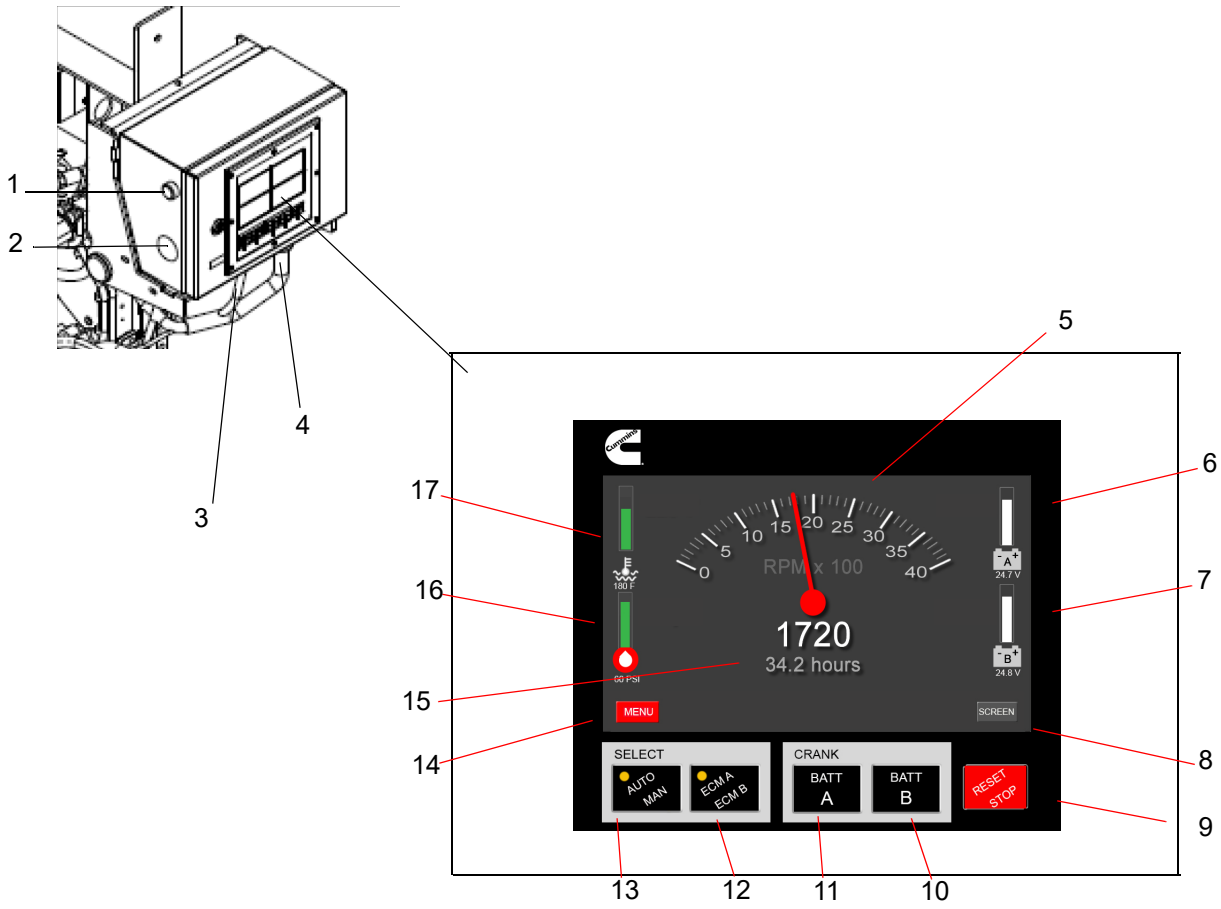
1. Expansion tank level sight gauge (1 of 2)
2. Manifold heat shield (2)
3. Alternator
4. Lower coolant hose/tube
5. Engine coolant filters (2)
6. Engine coolant heater (2)
7. Starter motor (behind contactor panel)
8. Battery starter contactor B (inside contactor panel)
9. Battery starter contactor A (inside contactor panel)
10. Battery charger interface (inside contactor panel)
11. Manual start instruction decal
12. Flywheel housing
13. Engine speed setting decals

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
2. Customer access port
3. Diagnostics connector
4. Engine ECM power supply
5. Tachometer
6. Battery “A” voltmeter
7. Battery “B” voltmeter
8. SCREEN soft key
9. RESET/STOP switch
10. Crank battery B momentary start switch
11. Crank battery A momentary start switch
12. ECM A/ECM B selector switch and indicator lamps (not applicable to mechanical engines)
13. AUTO/MAN mode selector switch and indicator lamps
14. MENU soft key
15. Hour meter
16. Engine oil pressure gauge
17. Coolant temperature gauge

Figure 2-4 FPDP control panel

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 keyswitch/Fuel Shutoff (FSO) valve until the engine speed decelerates to 0 RPM.
- To reset the fire pump drive engine after an overspeed fault has been activated, allowing subsequent restarts of the fire pump drive engine.

2.4.9 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.

2.4.10 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.

2.4.11 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.

2.4.12 Hour meter

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

2.4.13 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.*

2.4.14 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 Overspeed warning indicator

As shown in Figure 2-5, “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.

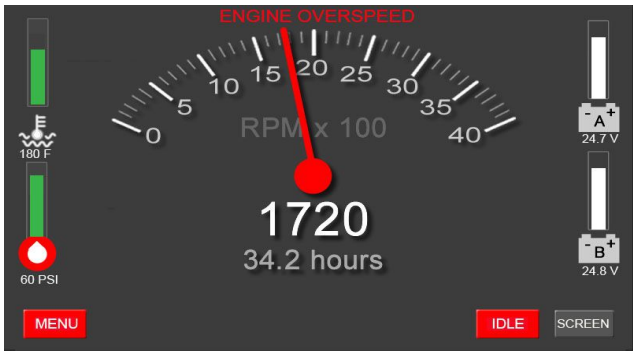


Figure 2-5 Overspeed warning indicator

2.5.2 DPEM fault screens (if applicable)

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 2-6, the warning symbol will illuminate and the overlay will activate in yellow with the text of the active fault.

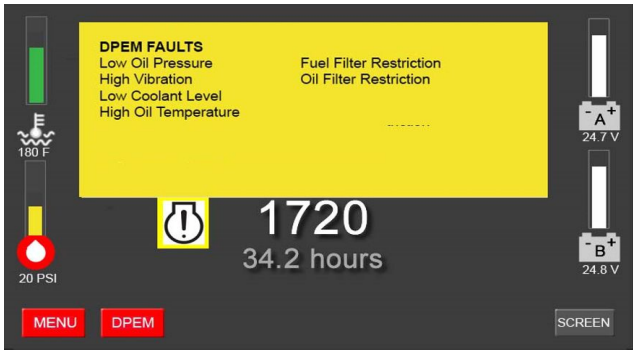


Figure 2-6 DPEM fault screen (sample)

- **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 2-7, “DPEM Lost” will appear on the FPDP screen if communications between the FPDP and DPEM are compromised.

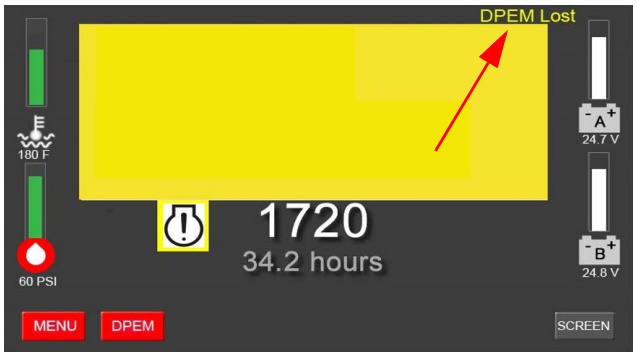


Figure 2-7 DPEM lost fault screen (sample)

2.6 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 2-8, 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).

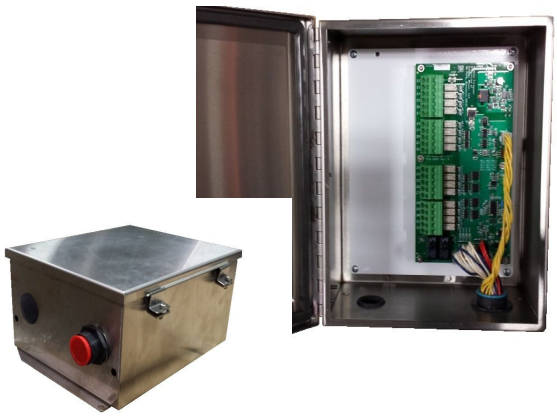


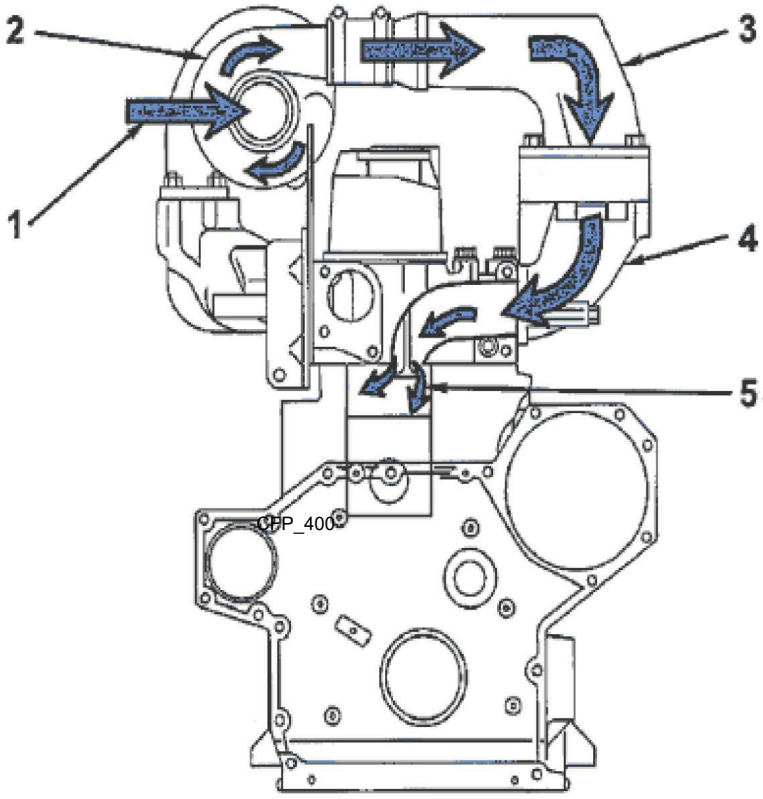
Figure 2-8 Digital programming expansion module (DPEM)

2.7 Fuel supply and drain

As shown in Figure 2-2, 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.

2.8 Air intake system

The air intake system supplies combustion air to the mechanical fire pump drive engine cylinders. The air filter prevents particulate matter from entering the air intake. Figure 2-9 shows how the combustion air is drawn into the system. Combustion air drawn into the system by the turbocharger is directed through the engine aftercooler before entering the cylinders.



1. Filtered air
2. Turbocharger compressor
3. Air crossover tube
4. Engine aftercooler
5. Intake valve port

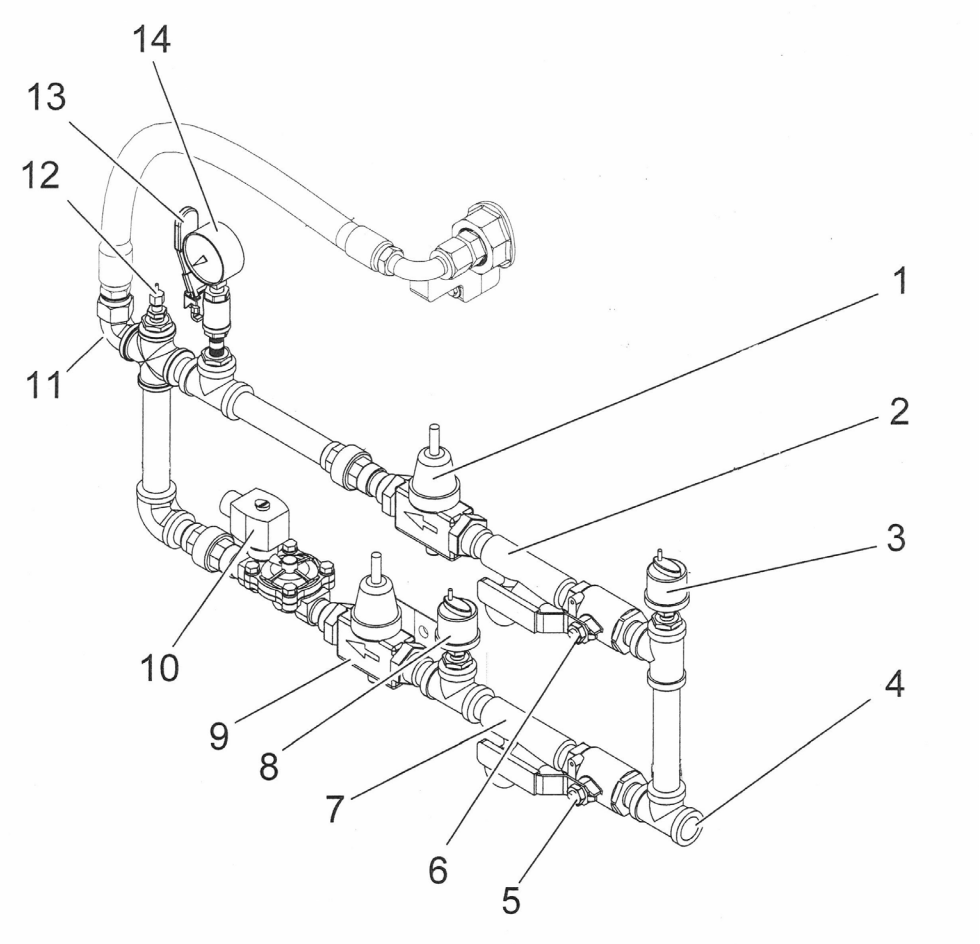
Figure 2-9 Mechanical engine with heat exchanger - air intake flow diagram (typical)

2.9 Cooling water system

Figure 2-10 illustrates a typical cooling water manifold and Figure 2-11 shows the path of water through the engine cooling system. Water entering the cooling system through the cooling water inlet first circulates through the heat exchanger, cooling the compressed air from the turbocharger outlet ducting. Note that the charge air cooler (CAC) and fuel heat exchanger are not included in this engine model.

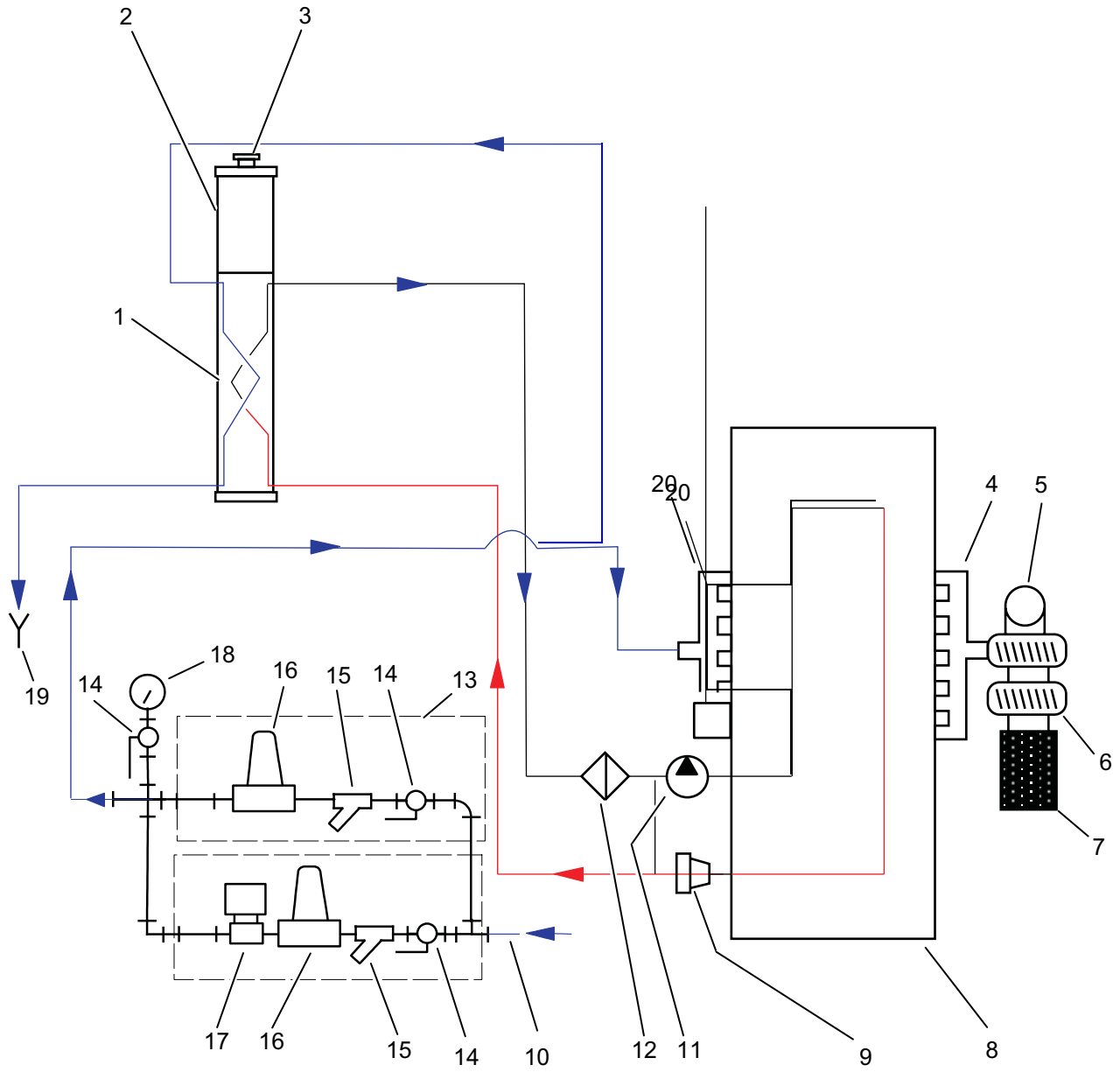
NOTE: *The cooling water supply must be immediately available when the engine is started.*

Engine coolant is circulated through the integral aftercooler on the engine.



1. Bypass water pressure regulator
2. Bypass water strainer
3. Pre-strainer pressure sensor
4. Cooling water inlet
5. Normal water inlet valve
6. Bypass water inlet valve
7. Normal water strainer
8. Post strainer pressure sensor
9. Normal water pressure regulator
10. Normal water solenoid valve (where required)
11. Outlet to heat exchanger
12. Temperature sensor
13. Pressure gauge isolation valve
14. Water supply pressure gauge

Figure 2-10 Cooling water manifold (typical)



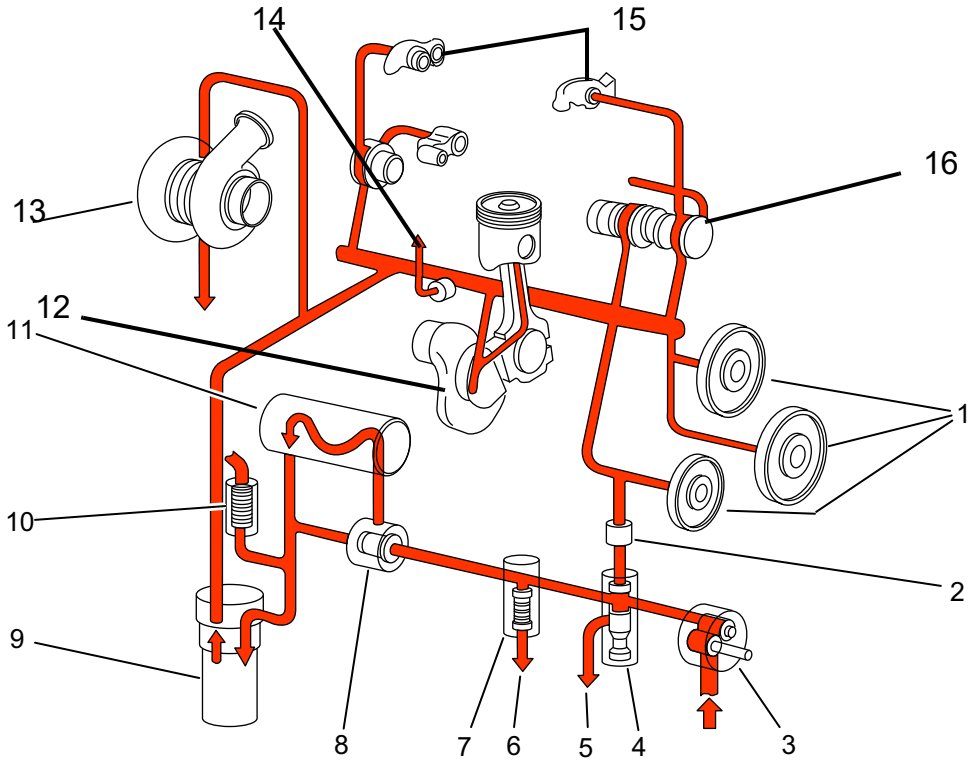
1. Coolant heat exchanger
2. Coolant expansion tank/line
3. Coolant pressure cap
4. Exhaust manifold
5. Exhaust flex connection
6. Turbocharger
7. Air filter
8. Engine block
9. Thermostat
10. Cooling water inlet pipe
11. Coolant pump
12. Coolant filter
13. Bypass piping
14. Manual shut-off valve
15. Cooling water strainer
16. Cooling water pressure regulator
17. Cooling water solenoid valve
18. Cooling water pressure gauge
19. Cooling water drain line
20. Intake manifold

Figure 2-11 Engine cooling system flow diagram (typical)

2.10 Engine oil system

Figure 2-12 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.*

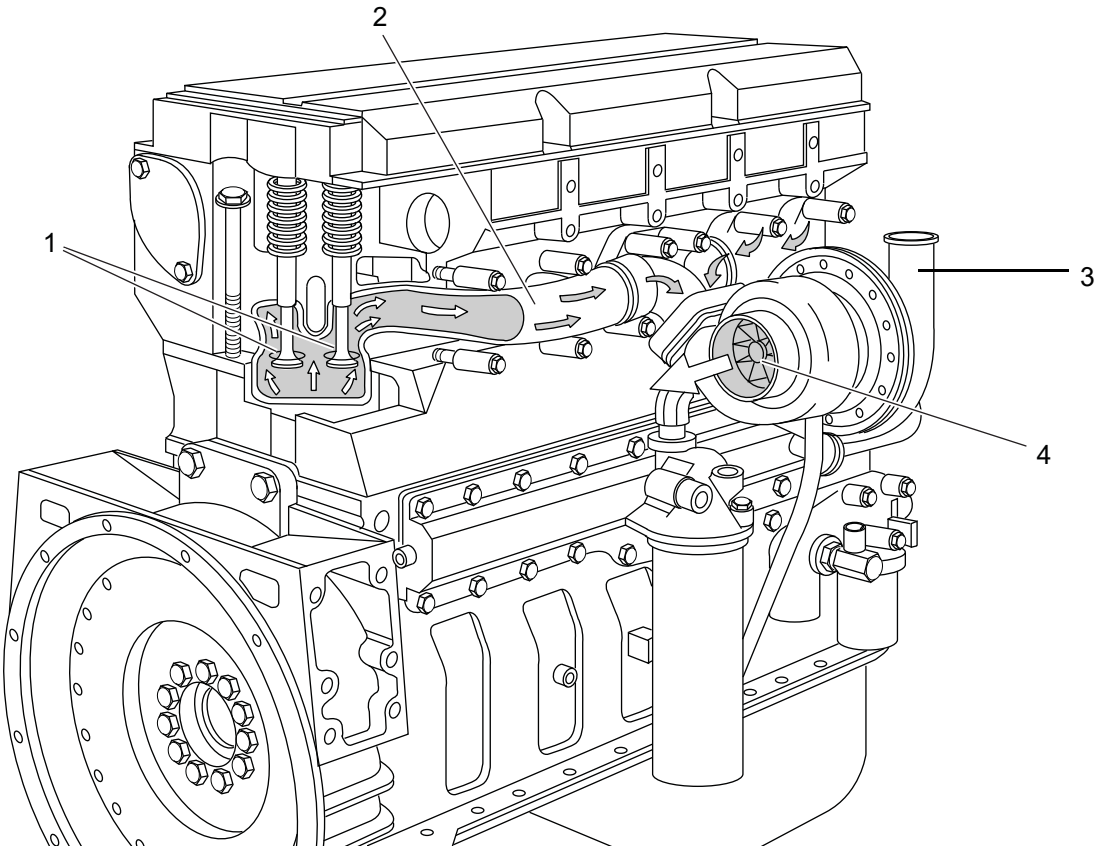


1. Idler gears
2. Check valve
3. Oil pump
4. Pressure regulator valve
5. Oil return to pan
6. Oil return to pan
7. High pressure relief valve
8. Oil thermostat
9. Combination oil filter
10. Filter bypass
11. Oil cooler
12. Crankshaft, connecting rod and piston
13. Turbocharger
14. Piston cooling
15. Rocker
16. Camshaft

Figure 2-12 Typical engine lubricating oil system flow

2.11 Exhaust system

Figure 2-13 shows how the exhaust system removes engine exhaust from the cylinders after the combustion process. The exhaust discharges from the exhaust manifold, passes through (drives) the turbocharger, and exits through the exhaust connection.



1. Exhaust valve ports
2. Engine exhaust manifold
3. Combustion air to charge air cooler
4. Turbocharger turbine

Figure 2-13 Typical exhaust system flow

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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 ± .76 mm (.03 in) by measuring outside of the frame side to the engine support leg mounting pad. (Compare the two front engine supports and two back engine supports.)

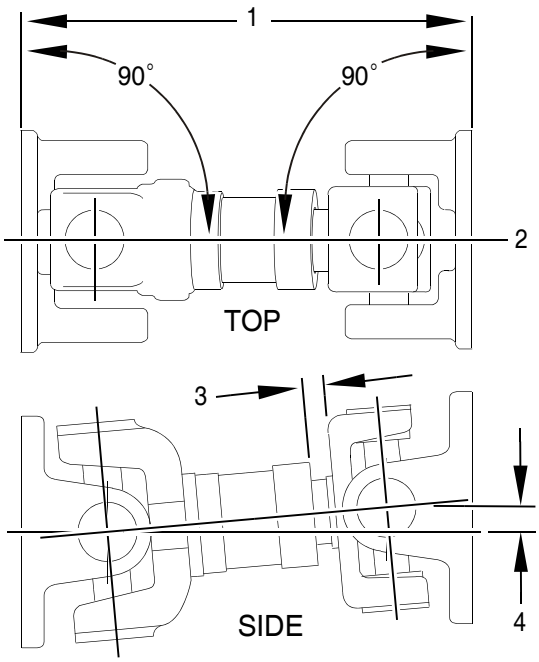
   b. As shown in Figure 3-1, align the engine center line to the pump center line within ± .76 mm (.03 in).

   c. Ensure that the pump center line to the engine crankshaft center line (in vertical plane) is 2° +/- 1°.

   d. Ensure that the drive shaft mounting flanges are parallel.

2. As illustrated in Figure 3-2, lubricate the grease fittings on the drive shaft universal joint.

3. Check that the fire pump drive engine is properly installed per the pump manufacturer's specifications.



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

Figure 3-1 Drive Shaft Alignment

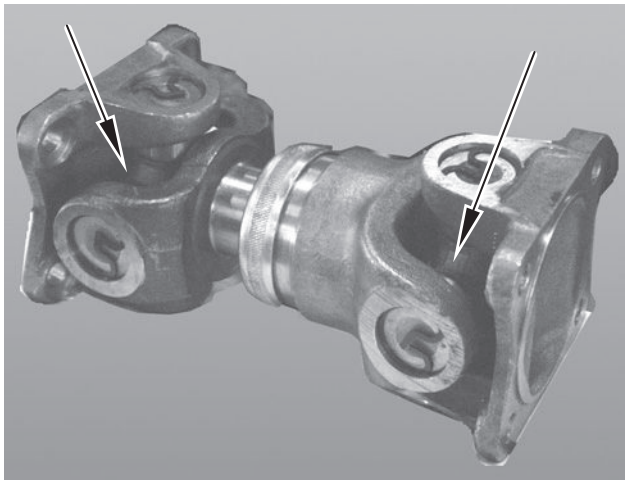


Figure 3-2 Drive shaft universal joint grease fittings

NOTE: *Cummins 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 (or slightly less) water pressure during manufacture and testing:

- For the CFP5E, CFP59, CFP7E, CFP83, CFP9E, CFP11E, CFP15E and CFP23E - 276 kPa (40 psi)
- For the CFP30E, CFP50 and CFP60E models - 345 kPa (50 psi).

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.

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.

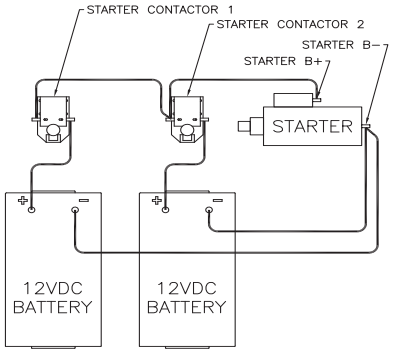


Figure 3-3 Series battery connection 12 VDC

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.*

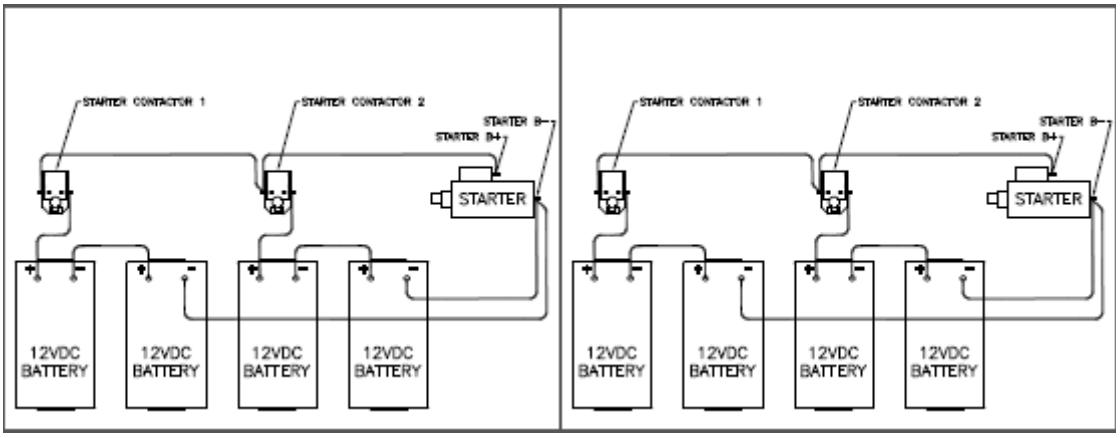


Figure 3-4 Series battery connection 24 VDC

3.8 Signal and control installation

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

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

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

3. Ensure electrical continuity and adequate insulation resistance for the installed wiring. Refer to the Operation - Engine Setup Screen section to conduct a Terminal Block Test from the FPDP.

3.8.1 FPDP interface terminal strip

As shown in Figure 3-5, the TBs between the fire pump controller and the fire pump driver are standard UL and FM controller terminals and follow a direct one-to-one correspondence (some TBs are optional):

- TB-1 [**Run Solenoid Circuit**]: This B+ signal is necessary for fire pump operations while in the FPDP is in AUTO mode. The Electronic Control Module (ECM) keyswitch/Fuel Shutoff (FSO) and raw water solenoid are activated when voltage is present at TB-1. When TB-1 is removed while the engine is running, the FPDP will command electronic engines to idle for up to three minutes.

- TB-2 [**Crank Termination Switch**]: This B+ signal is provided by the FPDP to inform the pump controller that the engine is running. Crank Termination indicates that the engine has started and that the crank command from the fire pump controller should stop immediately.

- TB-3 [**Overspeed Switch**]: This B+ signal is provided by the FPDP when the engine speed has exceeded 115% of the rated engine speed. When overspeed occurs, the ECM keyswitch or FSO outputs and the raw water cooling loop solenoid are immediately deactivated in an attempt to stop the fire pump drive engine. The FPDP will not allow the engine to be restarted until after the overspeed alarm has been reset.

- TB-4 [**Low Lubricant Pressure Switch**]: A ground path is provided by the FPDP when the oil pressure has dropped below the 16 psi (110 kPa) setpoint when the engine is running. A ground path is also provided to indicate low oil pressure when the engine is NOT running.

- TB-5 [**High Engine Temperature Signal**]: A ground path is present when the engine is running and the coolant temperature is at or above 212 °F (100 °C).

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

- 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**]: Not applicable to mechanical engines.

- TB-302 [**Fuel Injection Malfunction (FIM)**]: Not applicable to mechanical engines.

- TB-303 [**ECM Warning**]: Not applicable to mechanical engines.

- TB-304 [**ECM Failure**]: Not applicable to mechanical engines.

- 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.

- TB-311 [**Clogged Raw Water Cooling 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).

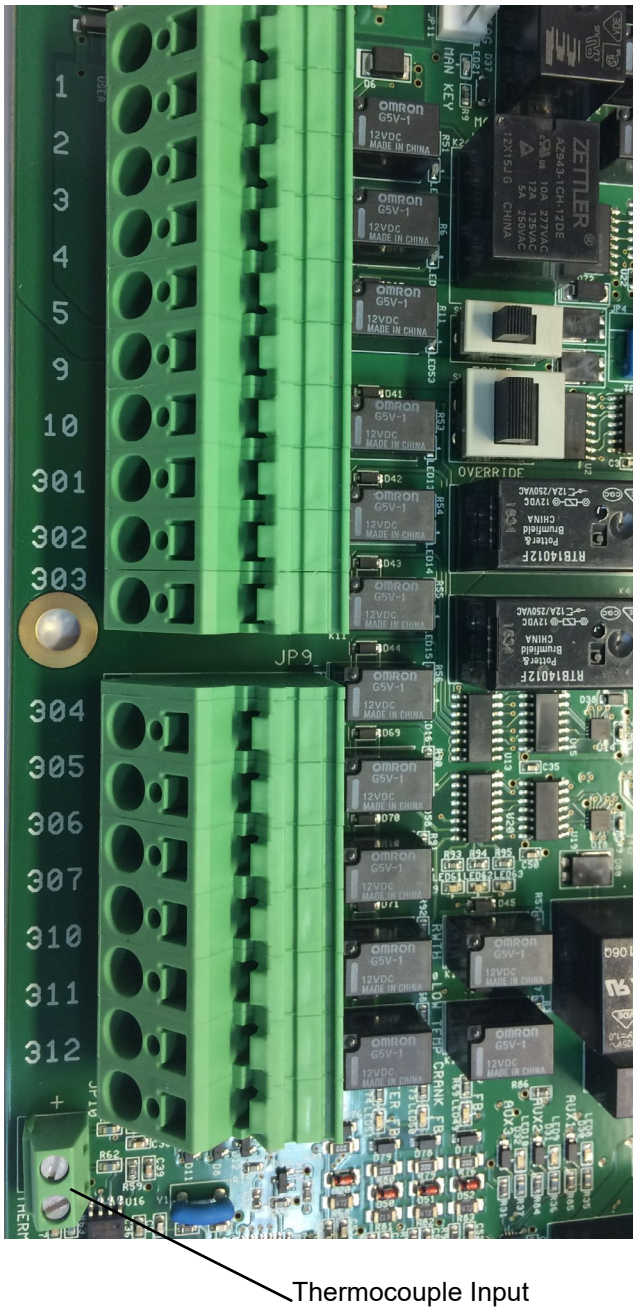


Figure 3-5 FPDP interface terminal strip

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.*

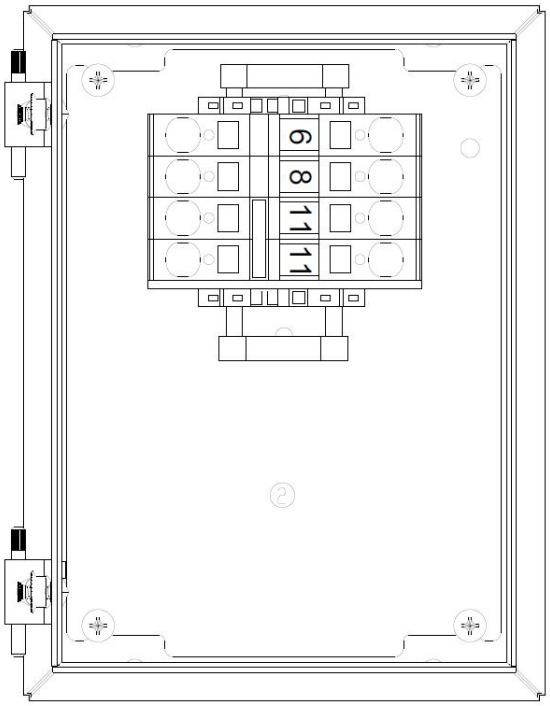


Figure 3-6 Battery charger interface

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 or 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 or weekly for external damage and contamination.

NOTE: *Contamination of the heat exchanger or 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 or coolant heat exchanger. The water flow should be established immediately, but some delay may occur before the flow exits the or 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.

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.

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.

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

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:

1. As shown in Figure 4-1, open the water bypass valves in the cooling water supply piping or the emergency cooling supply.

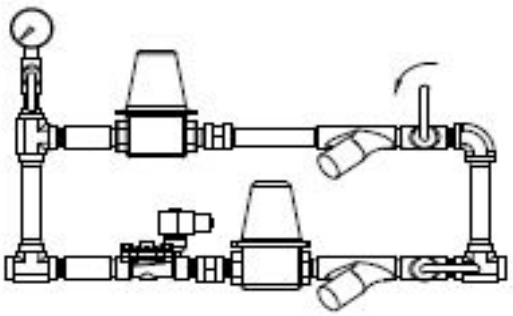


Figure 4-1 Fire pump drive engine bypass valve

1. Press the AUTO/MAN selector switch on the FPDP to place the engine in MANUAL mode.
2. As shown in Figure 4-2, 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.

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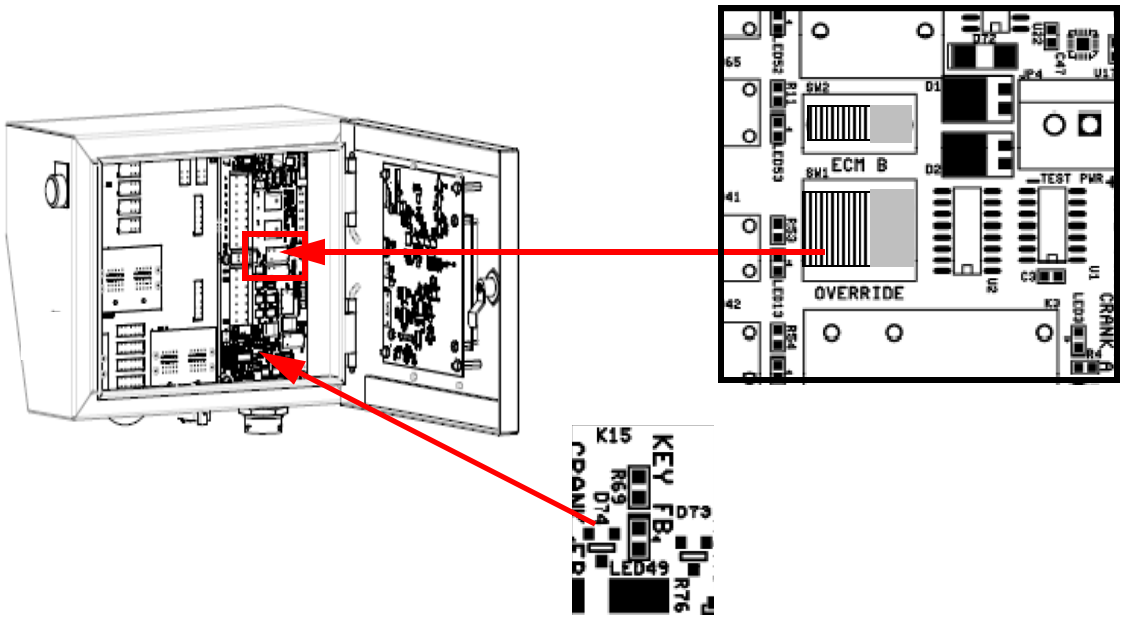


Figure 4-2 FPDP override switch

CAUTION

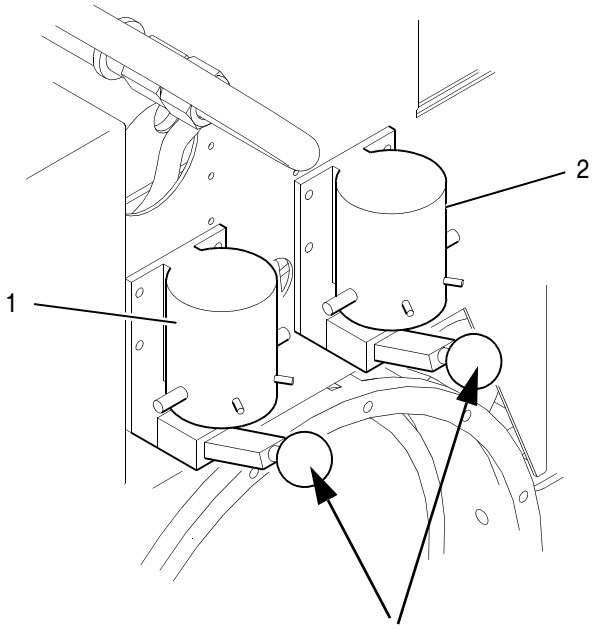
To prevent damage to the starter, do not engage the starting motor more than fifteen seconds. Wait fifteen seconds between each attempt to start, up to six attempts.

3. As shown in Figure 4-3, 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.*

4. 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.*



Battery contactor levers

1. Battery A starter contactor
2. Battery B starter contactor

Figure 4-3 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 two or soft keys:

- **SCREEN** soft key
- **MENU** soft key

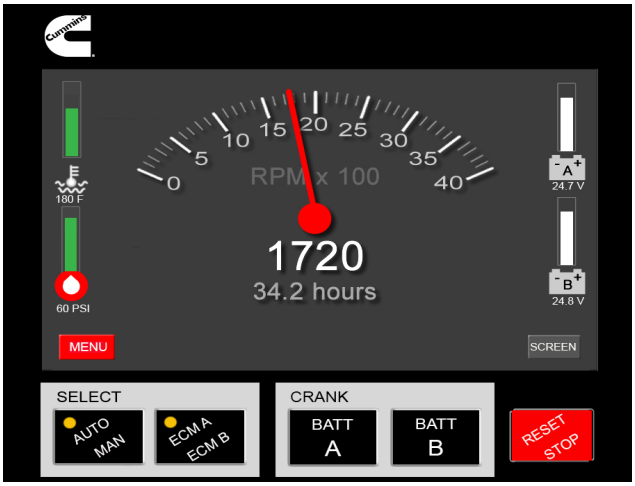


Figure 4-4 FPDP User Interface screen (mechanical engine)

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; 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.

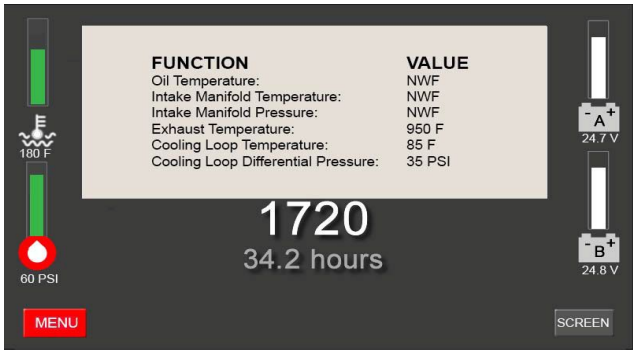


Figure 4-5 Analog Values overlay (mechanical engine)

Additional values that may be displayed include:

- Exhaust temperature (when a pyrometer is installed and terminated to the Power Board).
- J1939 parameters.

NOTE: *J1939 parameters are not available on mechanical engines. The oil temperature, intake manifold temperature, and intake manifold pressure*

values display as "NWF" (which stands for "Network Failure").

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.

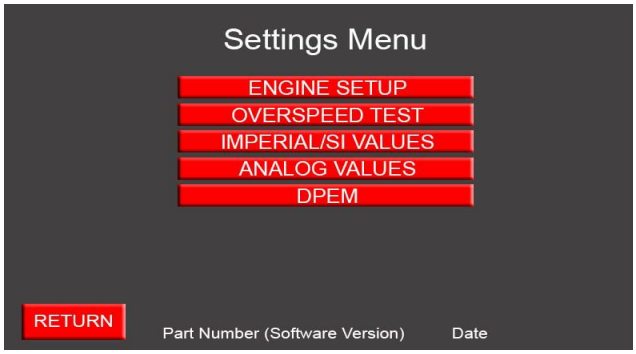


Figure 4-6 Settings Menu screen (mechanical engine)

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. Press the soft number keys to enter password "806" in the Engine Setup Login screen.

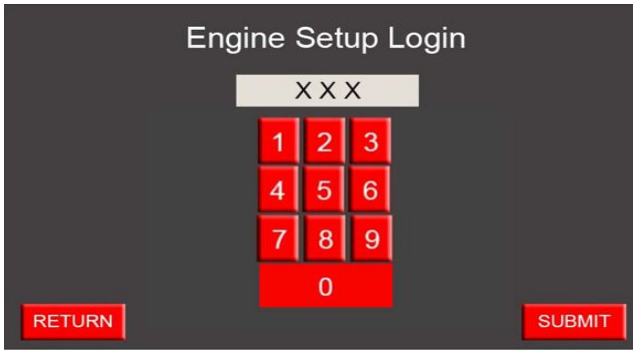


Figure 4-7 Typical Engine Setup Login screen

3. Press **SUBMIT** to access the Engine Setup screen.

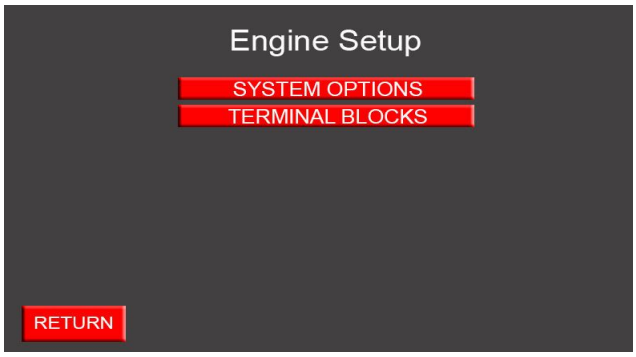


Figure 4-8 Engine Setup screen (mechanical engine)

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.

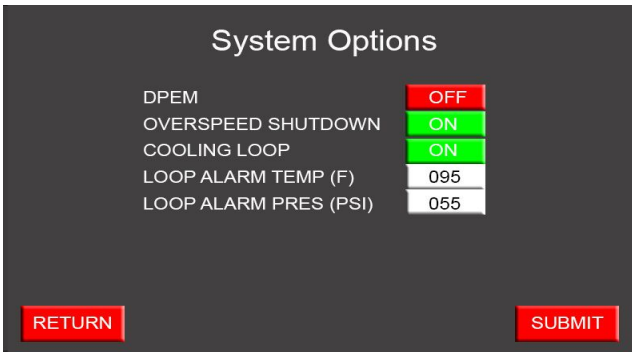


Figure 4-9 System Options screen (mechanical engine)

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 (COOLING LOOP) System Option shall be enabled for FM-approved fire pump drive engines.*

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”.

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 4-10, 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.

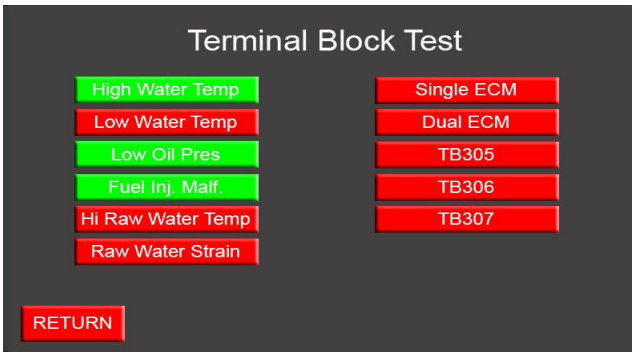


Figure 4-10 Typical Terminal Block Test screen

To perform a Terminal Block Test:

1. Starting at the User Interface screen (Main Menu), press the **MENU** soft key;
2. Press the **ENGINE SETUP** soft key from the Settings menu;
3. 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).*

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.*

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. As shown in Figure 4-11, press the **RUN** soft button.

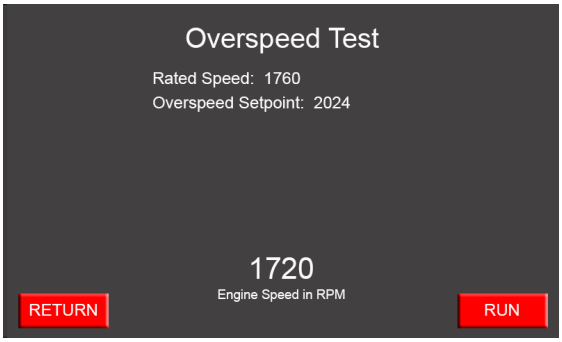


Figure 4-11 Overspeed test

4. 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).

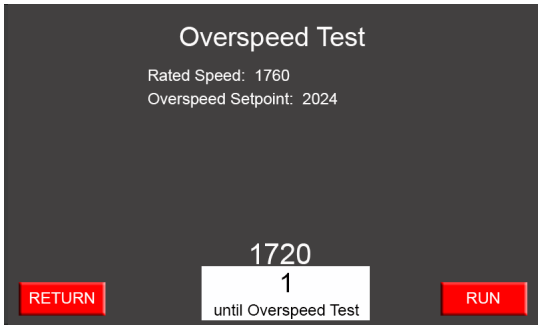


Figure 4-12 Overspeed Test timer

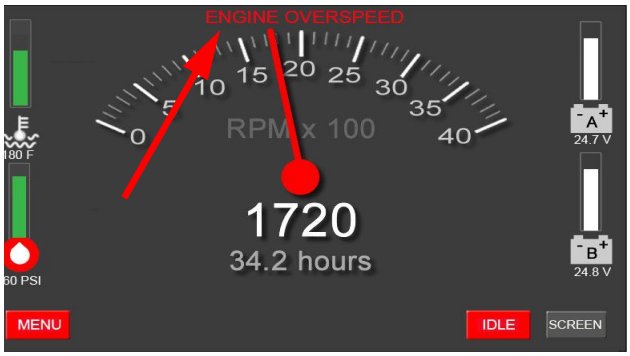


Figure 4-13 Overspeed Test timer expired

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

6. 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).

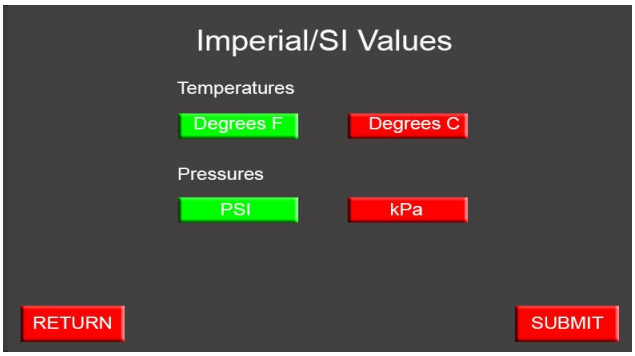


Figure 4-14 Typical Parameter Units screen

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.
3. To exit the Analog Values screen (shown below), press the **RETURN** soft key.

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

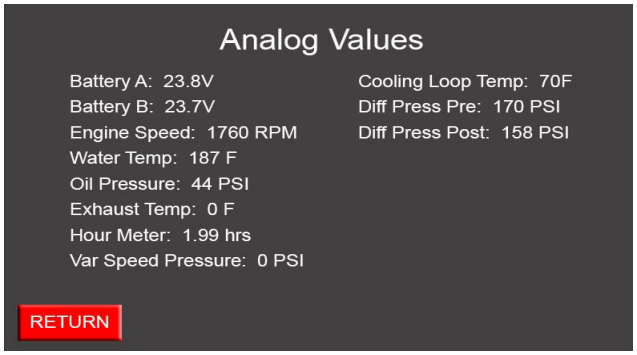


Figure 4-15 Sample Analog Values screen

4.3.2.5 DPEM (optional)

As shown in Figure 4-16, 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.

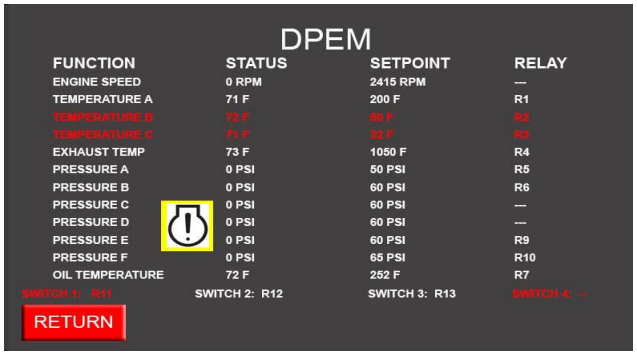


Figure 4-16 Sample DPEM screen

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).

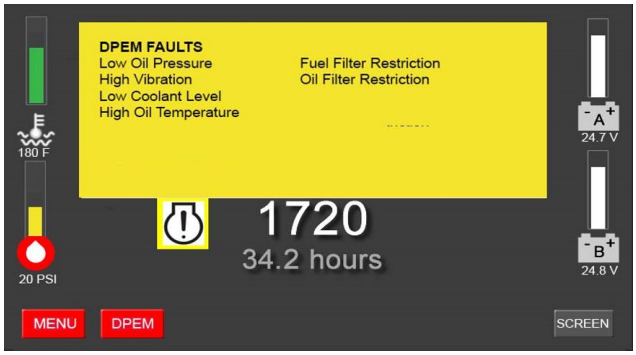


Figure 4-17 Sample DPEM Fault screen

NOTE: *The **IDLE** (IDLE) soft key is on electronic engines, only. This section is not applicable to mechanical engines.*

NOTE: *The Engine/Turbocharger Cool Down feature is on electronic engines, only. This section is not applicable to mechanical engines.*

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.

Maintenance record form

Table 5-1.

Engine serial number:			Engine model:		
Owner’s name:			Equipment name/number:		
Date	**Hours or time interval**	**Actual hours**	**Check performance**	**Performed by**	**Comments**
NOTE: All maintenance and inspections intervals are accumulative. When performing annual maintenance, also perform maintenance listed under daily, weekly, monthly, and three month intervals.					

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.

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 OVERFILL!

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

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

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

CAUTION

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

5. Check for soft, overly-pliant hoses, oxidation, and loose hose clamps. Torque 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

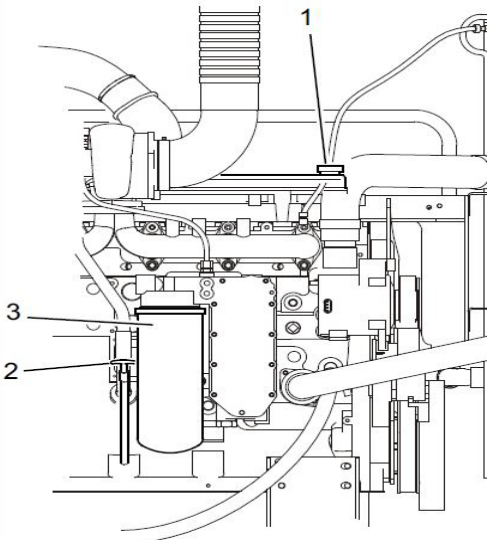
WARNING

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.



1. Oil fill port (on valve cover)
2. Oil level dipstick
3. Engine oil filter

Figure 5-1 Oil level dipstick (typical)

- 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 elbow 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

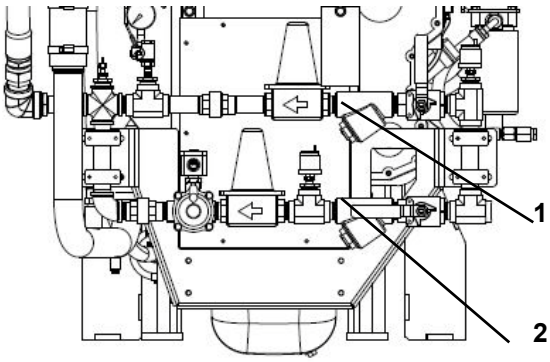
As shown in Figure 5-2, the (two) cooling water strainers should be cleaned weekly to remove sediment.

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)

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 overspeed 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 engine speed for the CFP50 is factory-set and can only be changed by a Cummins technician.

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.

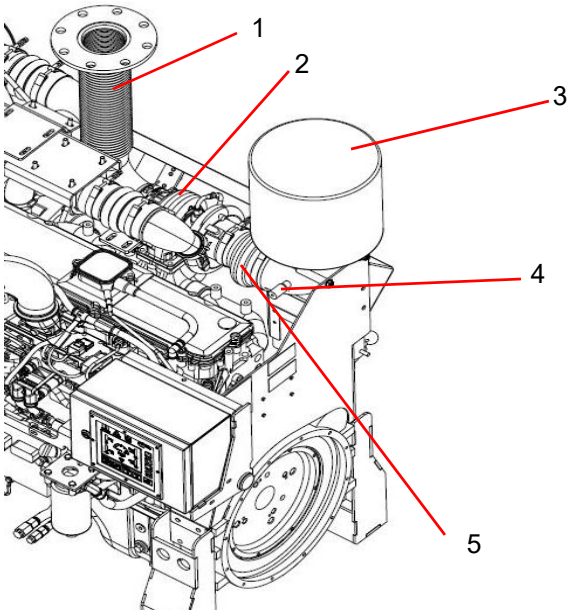
IMPORTANT: *Refer to the vendor-supplied literature for recommended maintenance procedures.*

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 elbow connection
2. Turbocharger
3. Air cleaner/filter
4. Service indicator
5. Air cleaner piping

Figure 5-3 Typical turbocharger

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.

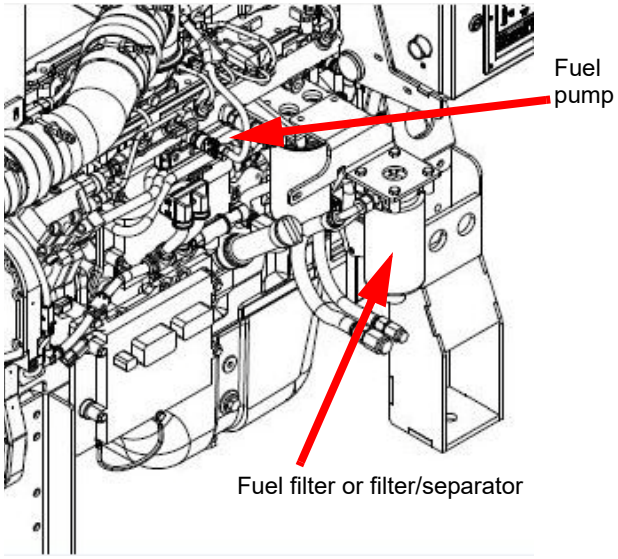


Figure 5-4 Typical fuel pumps and filters

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.

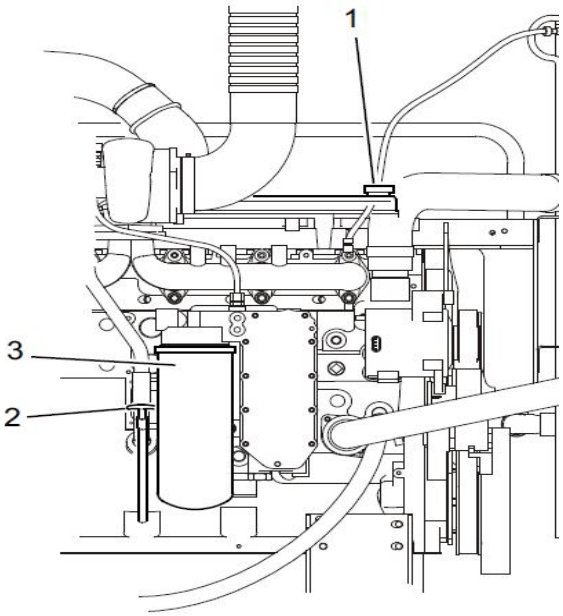
4. Remove the oil filter (see Figure 5-5) following these steps:

   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 Typical oil filter and oil level dipstick

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

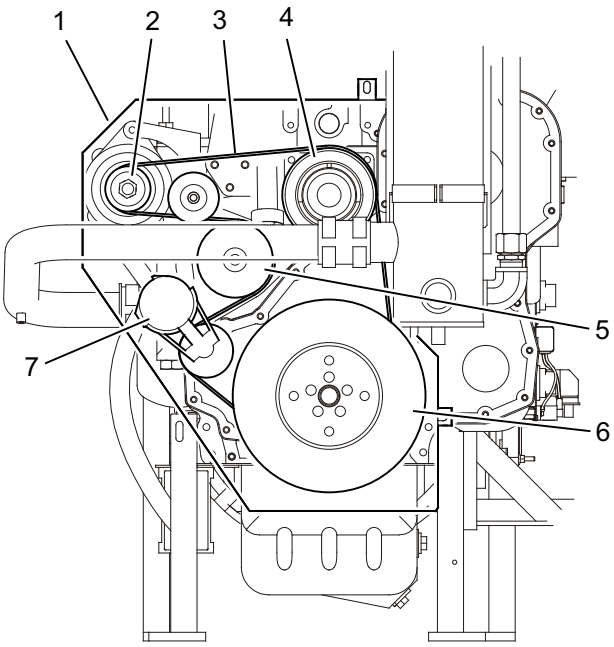
On some engine models, the pump and alternator belt drives both the pump and alternator.

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).



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

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.

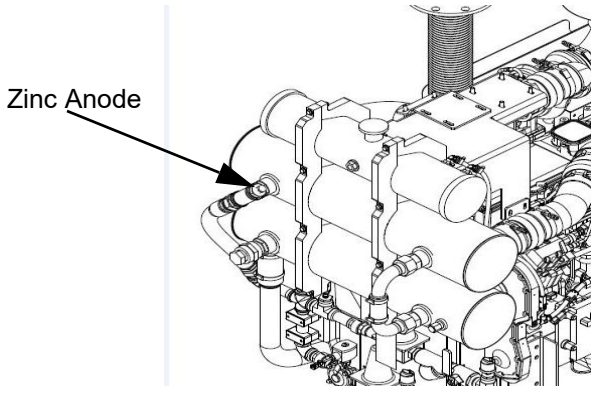


Figure 5-7 Raw Water Zinc Anode (typical)

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 276 kPa (40 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.

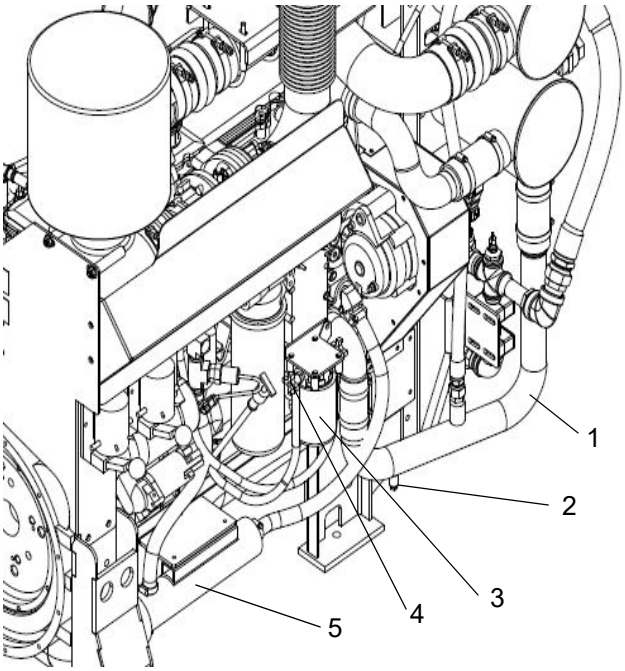
5.5.1 Coolant pump

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 (typical)

⚠ 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-

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

CAUTION

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

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

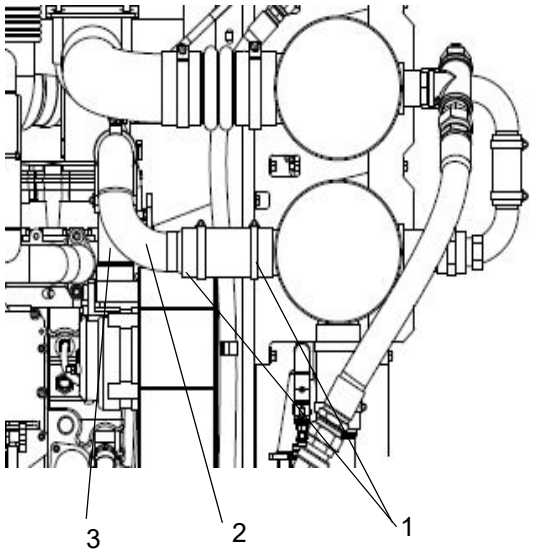
Always use the correct thermostat, and never operate the engine without a thermostat installed. The engine can overheat if operated without a thermostat because the path of least resistance for the coolant is through the bypass to the pump inlet.

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.*

NOTE: *Recommendations on thermostat replacement components can be found on the engine data sheet.*

6. Replace the thermostat flange and cap screws.



1. Hose clamps
2. Upper coolant hose
3. Thermostat housing

Figure 5-9 Typical thermostat housing

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.

   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.

⚠ 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.

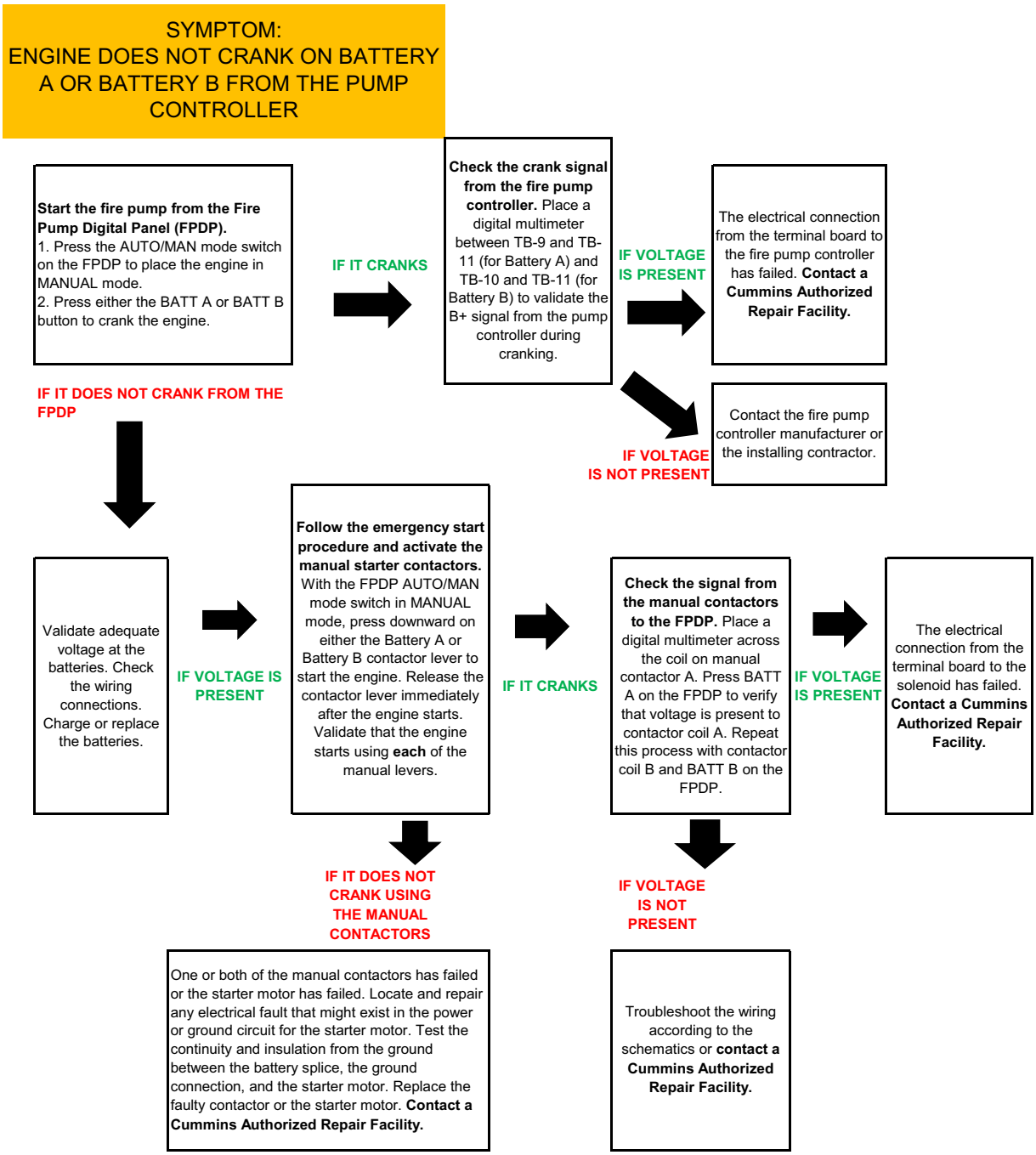
⚠ CAUTION

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.

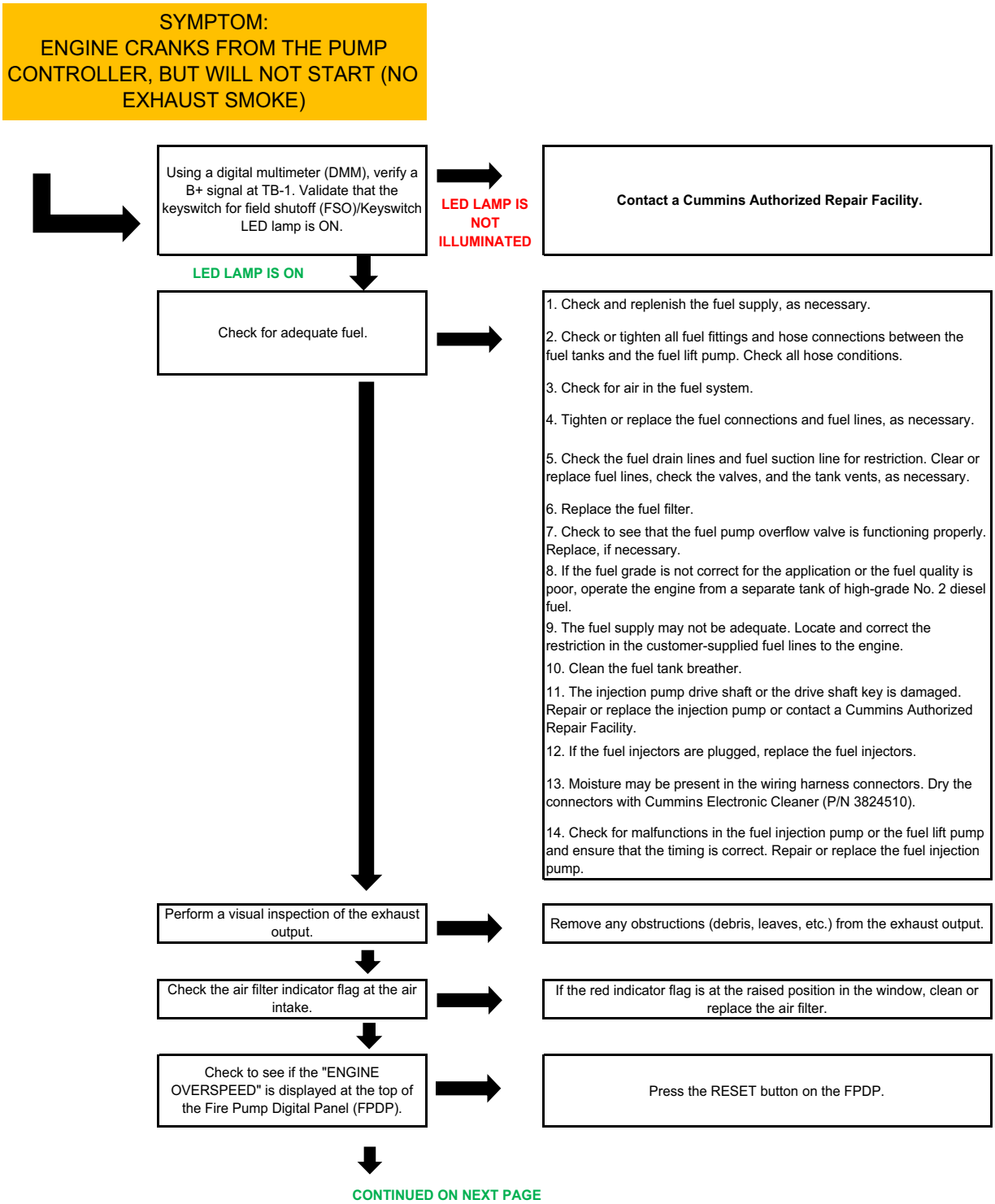
⚠ CAUTION

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



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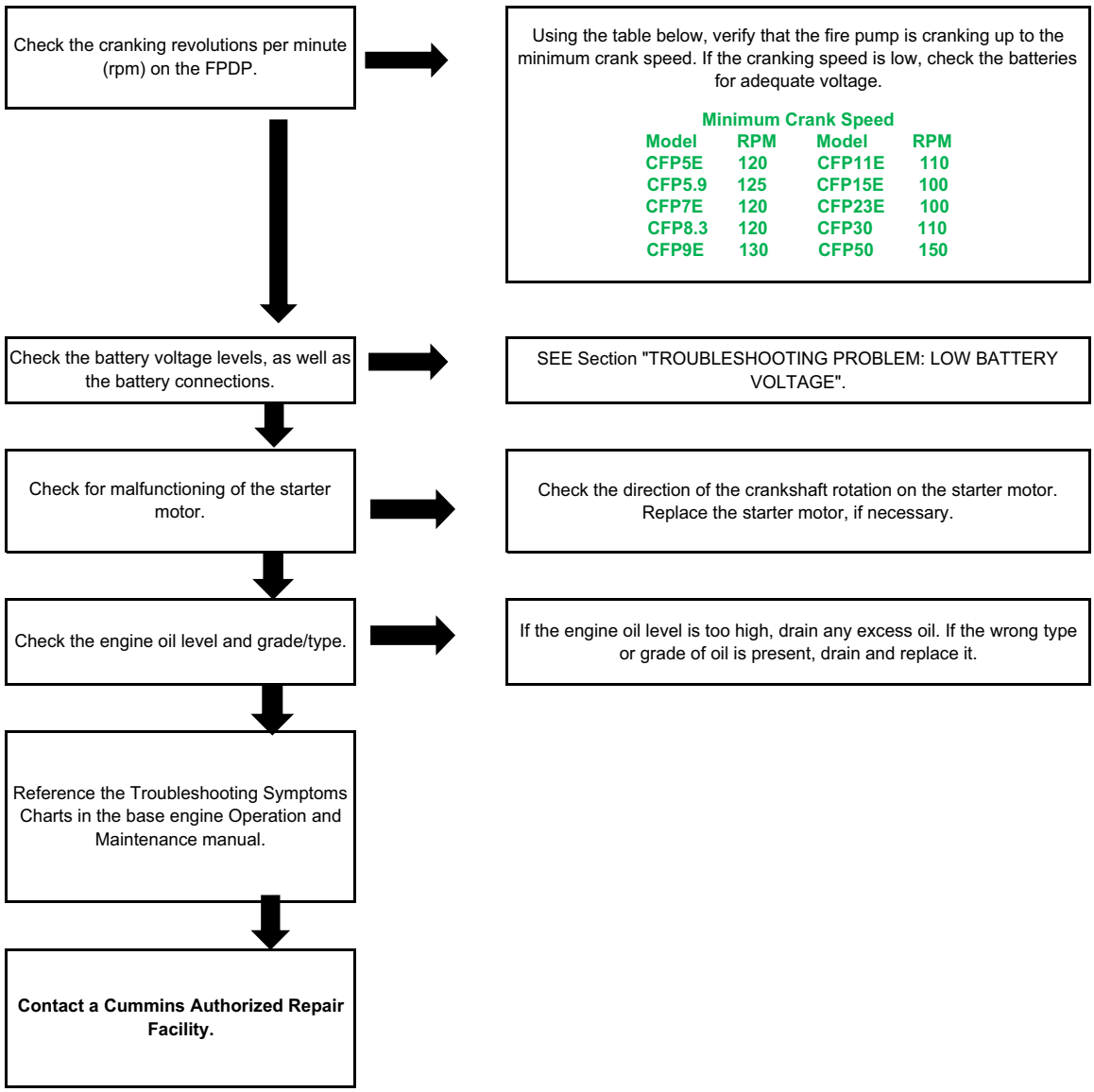
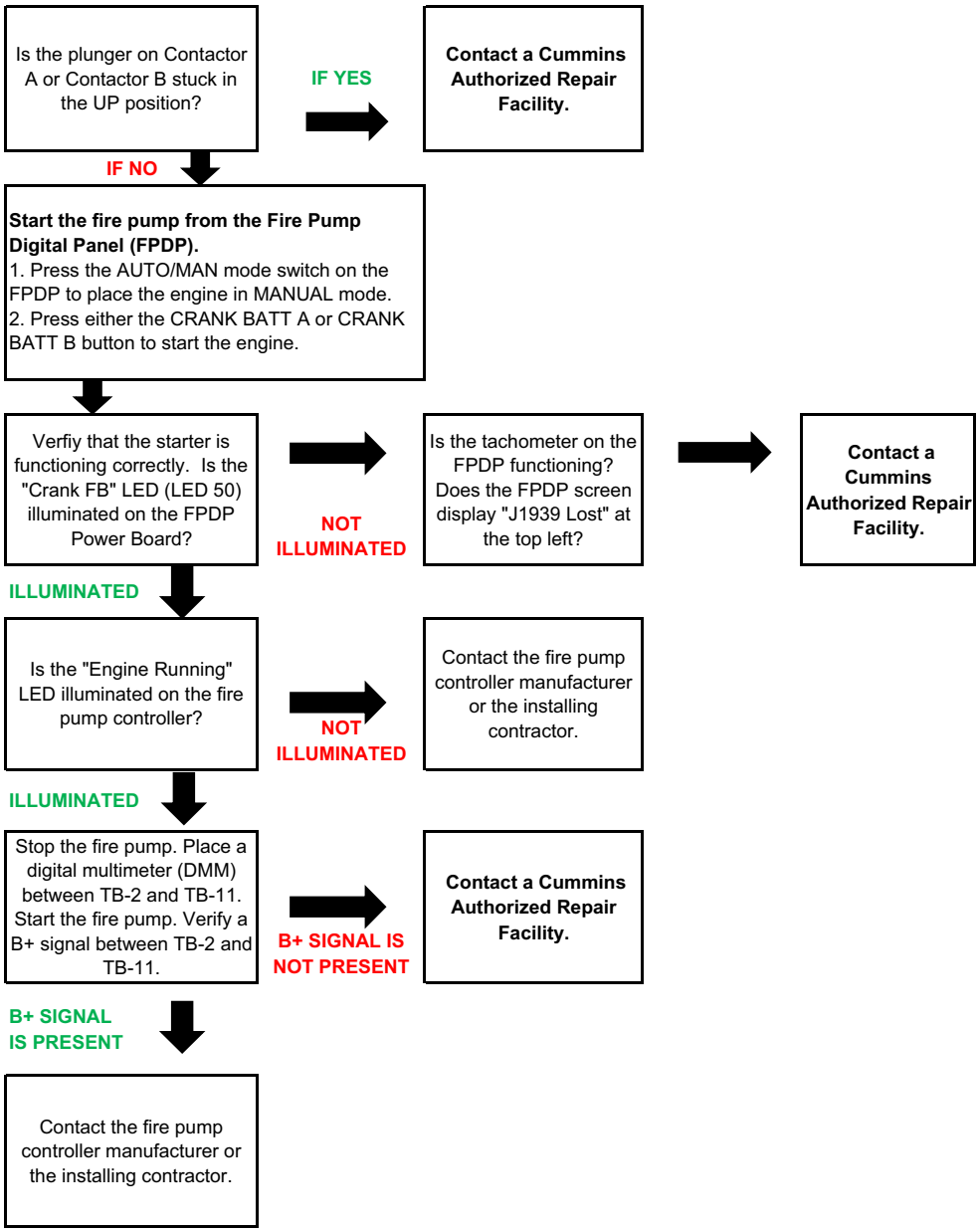
Engine cranks but will not start (cont.)



6.4 Engine starts but continues to crank

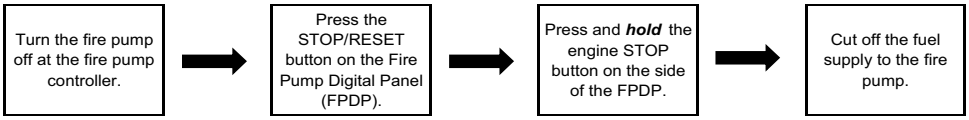
STOP THE ENGINE AT THE FIRE PUMP CONTROLLER (PLACE THE CONTROLLER IN THE OFF POSITION) AND TROUBLESHOOT FROM THE FIRE PUMP DRIVE ENGINE:

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

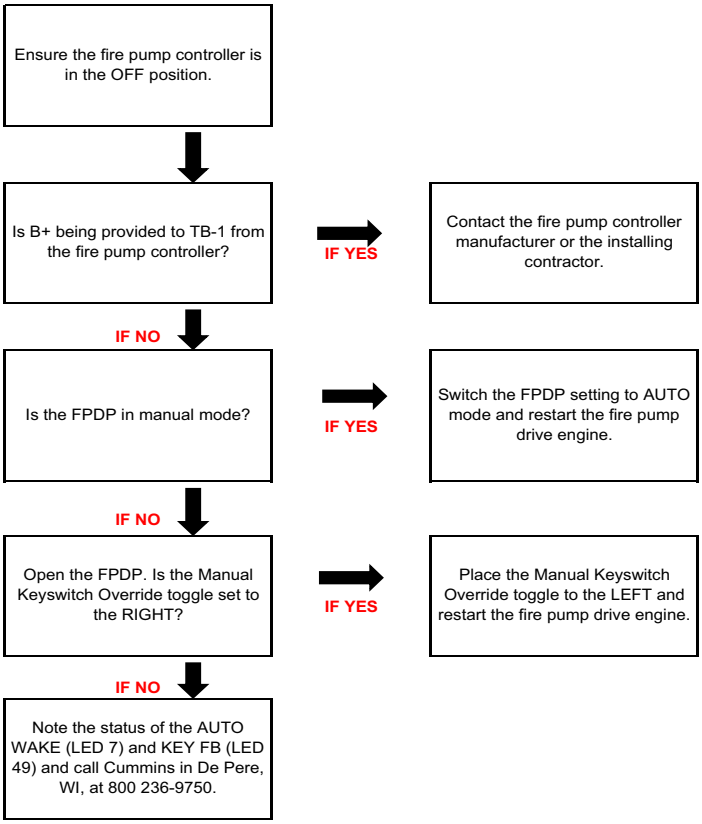


6.5 Engine will not stop

TO STOP THE ENGINE:



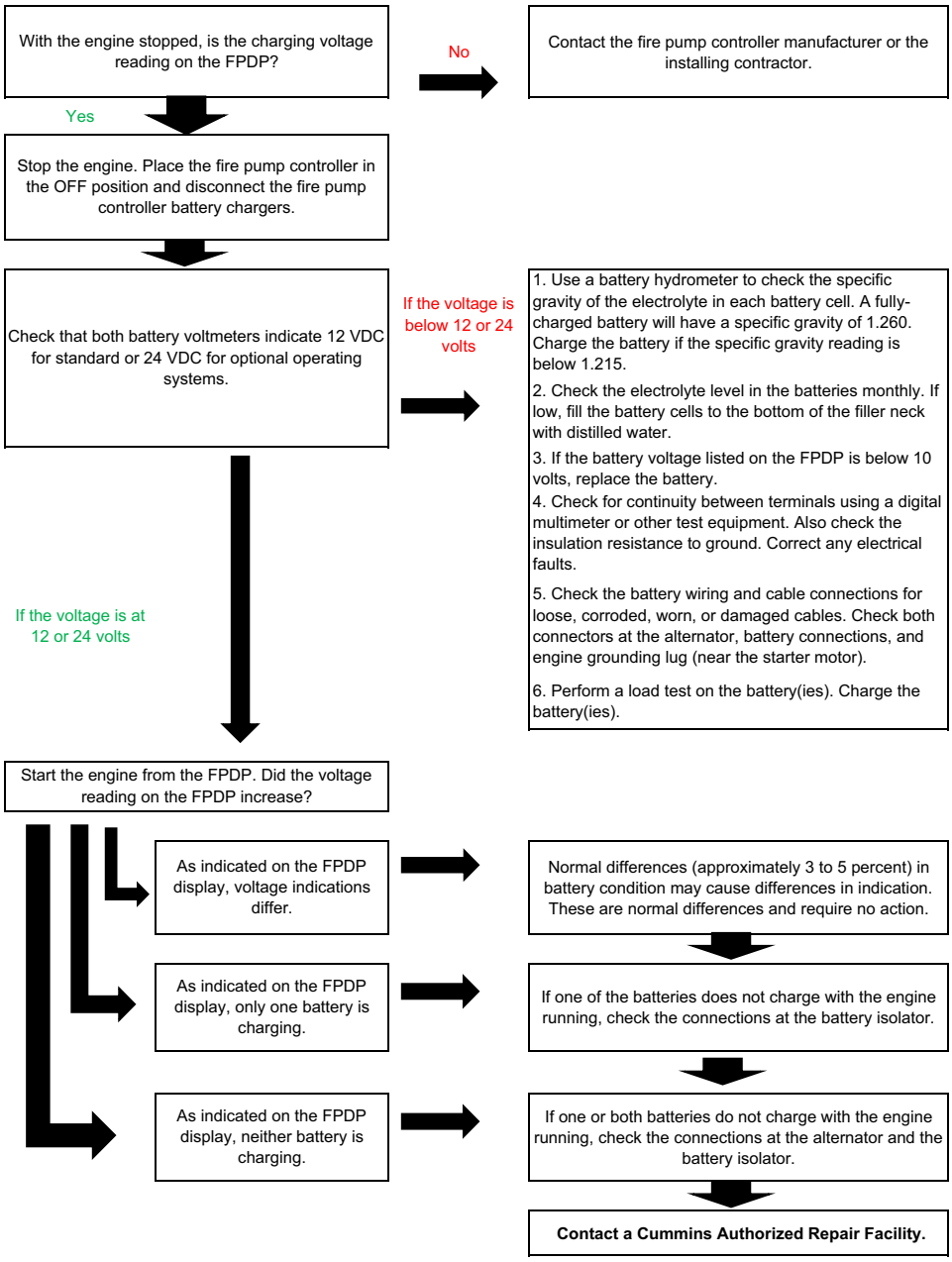
TO TROUBLESHOOT THIS PROBLEM, ONCE THE FIRE PUMP HAS STOPPED:



6.6 Low battery voltage

PROBLEM: LOW BATTERY VOLTAGE

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



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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 CFP50 fire pump drive engine. Table 7-1. represents the engine data for the CFP50 and all its ratings at the time of this printing. For a complete, up-to-date, Model Specification Sheet, refer to cummins.com. Table 7-2. Cap screw markings and torque tables outlines the recommended cap screw markings and torque values for fire pump drive engines.

Table 7-1. CFP50 F10-F80 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_2O (635 mm H_2O)
Recommended air cleaner element - (standard)	(2) Cummins Filtration AH19076

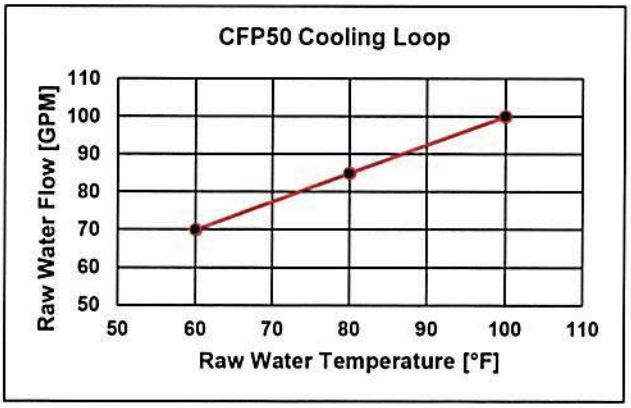
Lubrication system

Oil pressure range at rated	50-70 PSI (345-483 kPa)
Oil capacity of pan (high - low)	40-32 gal. (152-122 L)
Total system capacity (including bypass filter)	54 gal. (204 L)
Recommended lube oil filter	(5) Cummins Filtration LF3325

Cooling system*

Raw water working pressure range at heat exchanger	60 PSI (413 kPa) MAX
Recommended minimum water supply pipe size to heat exchanger	2.50 in. (63.50 mm)
Recommended minimum water discharge pipe size from heat exchanger	3.00 in. (76.20 mm)
Coolant water capacity (total system)	76.5 gal. (289.6 L)
Standard thermostat - type	Modulating
Standard thermostat - range	180-200 °F (82-93 °C)
Normal operating temperature	180-212 °F (82-100 °C)
Minimum raw water flow:	
- with water temperatures to 60 °F (16 °C)	70 GPM (4.42 L/sec)
- with water temperatures to 80 °F (27 °C)	85 GPM (5.36 L/sec)
- with water temperatures to 100 °F (38 °C)	100 GPM (6.31 L/sec)
Recommended cooling water filter	(2) Cummins Filtration WF2076

* A jacket water heater is mandatory on this engine. The recommended heater wattage is (2) 4000 down to 40 °F (4 °C)



Exhaust system

Maximum allowable back pressure by complete exhaust system	27.2 in. H_2O (6.8 kPa)
Exhaust pipe size normally acceptable	12 in. (305 mm)

Table 7-1. CFP50 F10-F80 Engine Data (Cont'd.)

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

Top	105 dBa
Right side	103 dBa
Left side	104 dBa
Front	101 dBa
Exhaust	127 dBa

Fuel supply/drain system

Operating speed in RPM	1470		1500		1760		1800	
CFP50-F10 Fuel rate - gal/hr (L/hr)	65.9	(249.4)	67	(253.6)				
CFP50-F20 Fuel rate - gal/hr (L/hr)	70.5	(267)	71.7	(271.4)				
CFP50-F30 Fuel rate - gal/hr (L/hr)	75.6	(286.2)	71.7	(271.4)				
CFP50-F40 Fuel rate - gal/hr (L/hr)	81.5	(308.7)	82.9	(313.7)				
CFP50-F50 Fuel rate - gal/hr (L/hr)					75.7	(286.4)	77.0	(291.5)
CFP50-F60 Fuel rate - gal/hr (L/hr)					81.6	(309.1)	83.1	(314.7)
CFP50-F70 Fuel rate - gal/hr (L/hr)					86.7	(328.2)	88.3	(334.2)
CFP50-F80 Fuel rate - gal/hr (L/hr)					93.2	(352.9)	94.9	(359.4)

Fuel type	No. 2 diesel only
Minimum supply line size	1.5 in. (38.10 mm)
Minimum drain line size	1 in. (25.40 mm)
Maximum fuel line length between supply tank & fuel pump	40 ft. (12 m)
Maximum fuel height above C/L fuel pump	84 in. (2134 mm)
Recommended fuel filter - primary	(2) Cummins Filtration FS1006
Recommended fuel filter - secondary	None
Maximum restriction @ lift pump-inlet - with clean filter	4 in. Hg (102 mm Hg)
Maximum restriction @ lift pump-inlet - with dirty filter	8 in. Hg (203 mm Hg)
Maximum return line restriction - without check valves	6.5 in. Hg (165 mm Hg)
Minimum fuel tank vent capability	15 ft^3/hr (.45 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	1800 CCA*
Engine only - reserve capacity	460 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	0.002 Ohms
Typical cranking speed	150 RPM
Alternator (standard), internally regulated	35 amps

Operating conditions

Operating Speed in RPM	1470		1500		1760		1800	
CFP50-F10								
Output - BHP (kW)	1352	(1009)	1375	(1026)				
Ventilation air required - CFM (litre/sec)	2433	(1148)	2493	(1177)				
Exhaust gas flow - CFM (litre/sec)	6309	(2978)	6460	(3049)				
Exhaust gas temperature - °F (°C)	680	(360)	680	(360)				
Heat rejection to coolant - BTU/min. (kW)	35433	(623)	36265	(637)				
Heat rejection to ambient - BTU/min. (kW)	8122	(143)	8311	(146)				
CFP50-F20								
Output - BHP (kW)	1473	(1099)	1497	(1117)				
Ventilation air required - CFM (litre/sec)	2735	(1291	2803	(1323)				
Exhaust gas flow - CFM (litre/sec)	7092	(3347)	7261	(3427)				
Exhaust gas temperature - °F (°C)	764	(407)	764	(407)				
Heat rejection to coolant - BTU/min. (kW)	39832	(700)	40766	(716)				
Heat rejection to ambient - BTU/min. (kW)	9130	(160)	9342	(164)				
CFP50-F30								
Output - BHP (kW)	1593	(1188)	1619	(1208)				
Ventilation air required - CFM (litre/sec)	2994	(1413)	3069	(1448)				
Exhaust gas flow - CFM (litre/sec)	7765	(3665)	7951	(3753)				
Exhaust gas temperature - °F (°C)	837	4470)	837	4470)				
Heat rejection to coolant - BTU/min. (kW)	43613	(766)	44636	(784)				
Heat rejection to ambient - BTU/min. (kW)	9997	(176)	10229	(180)				
CFP50-F40								
Output - BHP (kW)	1713	(1278	1741	(1299)				
Ventilation air required - CFM (litre/sec)	3220	(1520)	3300	(1558)				
Exhaust gas flow - CFM (litre/sec)	8350	(3941)	8550	(4036)				
Exhaust gas temperature - °F (°C)	900	(482)	900	(482)				
Heat rejection to coolant - BTU/min. (kW)	46900	(824)	48000	(844)				
Heat rejection to ambient - BTU/min. (kW)	10750	(189)	11000	(193)				
CFP50-F50								
Output - BHP (kW)					1566	(1168)	1594	(1189)
Ventilation air required - CFM (litre/sec)					3099	(1463)	3325	(1570)
Exhaust gas flow - CFM (litre/sec)					7255	(3425)	8049	(3799)
Exhaust gas temperature - °F (°C)					695	(368)	726	(385)
Heat rejection to coolant - BTU/min. (kW)					44968	(790)	45421	(798)
Heat rejection to ambient - BTU/min. (kW)					8276	(145)	8480	(149)

CFP50-F60								
Output - BHP (kW)					1705	(1271)	1736	(1295)
Ventilation air required - CFM (litre/sec)					3484	(1644)	3739	(1765)
Exhaust gas flow - CFM (litre/sec)					8158	(3850)	9050	(4272)
Exhaust gas temperature - °F (°C)					816	(435)	816	(435)
Heat rejection to coolant - BTU/min. (kW)					50561	(889)	51071	(897)
Heat rejection to ambient - BTU/min. (kW)					9305	(164)	9534	(168)
CFP50-F70								
Output - BHP (kW)					1843	(1375)	1877	(1400)
Ventilation air required - CFM (litre/sec)					3814	(1800)	4093	(1932)
Exhaust gas flow - CFM (litre/sec)					8929	(4215)	9906	(4676)
Exhaust gas temperature - °F (°C)					893	(478)	893	(478)
Heat rejection to coolant - BTU/min. (kW)					55343	(973)	55901	(982)
Heat rejection to ambient - BTU/min. (kW)					10185	(179)	10436	(183)
CFP50-F80								
Output - BHP (kW)					1982	(1479)	2018	(1505)
Ventilation air required - CFM (litre/sec)					4100	(1935)	4400	(2077)
Exhaust gas flow - CFM (litre/sec)					9600	(4531)	10650	(5027)
Exhaust gas temperature - °F (°C)					960	(516)	960	(516)
Heat rejection to coolant - BTU/min. (kW)					59500	(1046)	60100	(1056)
Heat rejection to ambient - BTU/min. (kW)					10950	(192)	11220	(197)

Table 7-2. Cap screw markings and torque tables

Cap Screw Markings and Torque Values

CAUTION

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

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

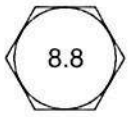
When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

Metric Cap Screw Identification

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

Metric Cap Screw Head Markings

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

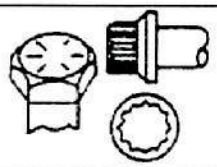
Commercial Steel Class	8.8	10.9	12.9
Caps Screw Head Markings			

US Customary Cap Screw Identification

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

U.S. Customary Cap Screw Head Markings

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

SAE Grade 5 w/ three lines	SAE Grade 8
	

Metric Cap Screw Torque Values (lubricated threads)

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

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

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

7.5 CFP50 assembly drawings

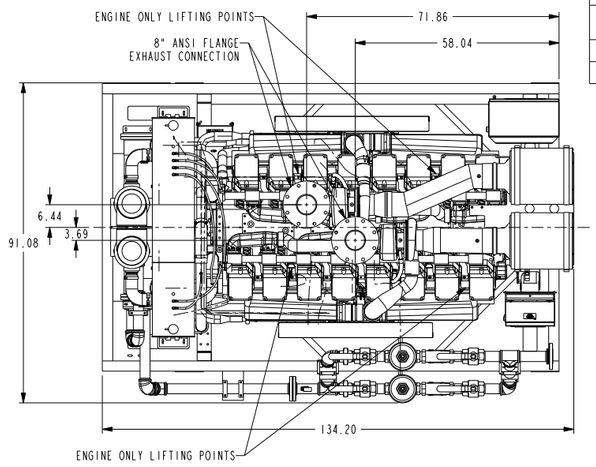
Please refer to our website at cummins.com for the most up-to-date information.

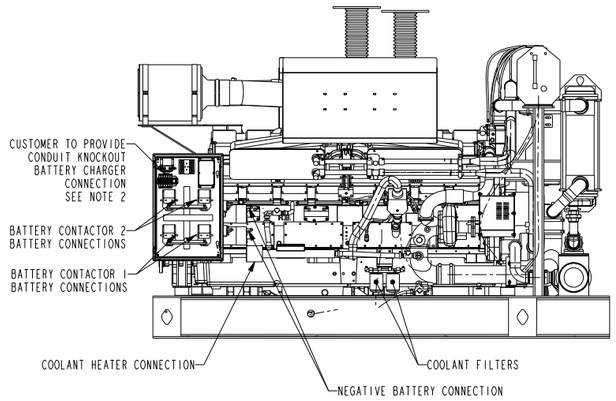
Drawing No.	Description
A042J665	General Arrangement, Installation, Fire Pump, CFP50 F50-F80
A042H690	Assembly, Fire Pump, CFP50 F50-F80
A059J632	Assembly, Engine, CFP50 F50-F80
17906	Assembly, Cooling Package, CFP50
17907	Assembly, Expansion Tank, CFP50
17895	Assembly, Front Guards, CFP50
A042J921	Assembly, Coolant Heater, CFP50
A059J726	Harness, Engine Interface, CFP50
A042J920	Assembly, Operator Station, CFP50
Assembly, All Components Top-level:	
A042H778	Assembly, Panel, Digital Mechanical
A059J635	Assembly, Fuel System, CFP50
A042J936	Assembly, Raw Water Misc. Piping, CFP50
A042G835	Assembly, Raw Water Cooling Loop, 2-1/2" Vertical, CFP50
A042G142	Assembly, Sea Water Cooling Loop, 2-1/2" Vertical, CFP50
A042J128	Schematic, Overall CFP50, GEN II FPDP
A063M269	Assembly, Oil Drain, CFP50

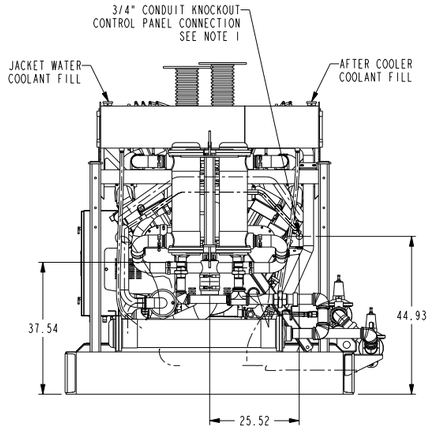
LEGEND AND DATUM IDENTIFIER	
SHEET 1	INSTALLATION DRAWING
SHEET 2	DRIVE LINE OPTIONS
SHEET 3	FLYWHEEL DETAIL
DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL MOUNTING SURFACE
DATUM "D"	UJOINT ADAPTER MOUNTING SURFACE
DATUM "EOS"	END OF PUMP SHAFT

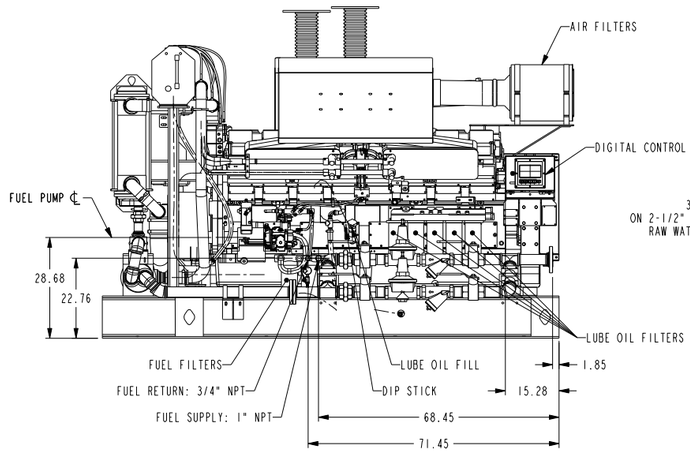
CFP50 CONNECTION INFORMATION	
SAE #0	FLYWHEEL HOUSING
1" NPT	FUEL INLET
3" FLANGE	RAW WATER INLET
2-1/2" NPT	RAW WATER DISCHARGE
120 / 240 VAC	COOLANT HEATER (8000 WATTS)
8" DIA FLANGE	EXHAUST CONNECTION
OPTIONAL DRIVESHAFT	587.55, 250mm ENDS

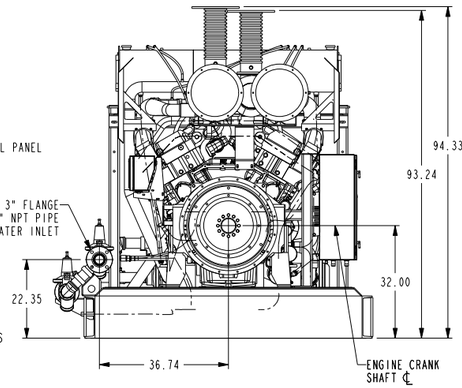
REV	REL NO	REVISION	DWN	CKD	APVD	DATE
1	2019-453	REMOVED ENGINE FUEL TANK; ADDED TURBOCHARGER HEAT SHIELDS	NOI34	MS707	MS707	18SEP19

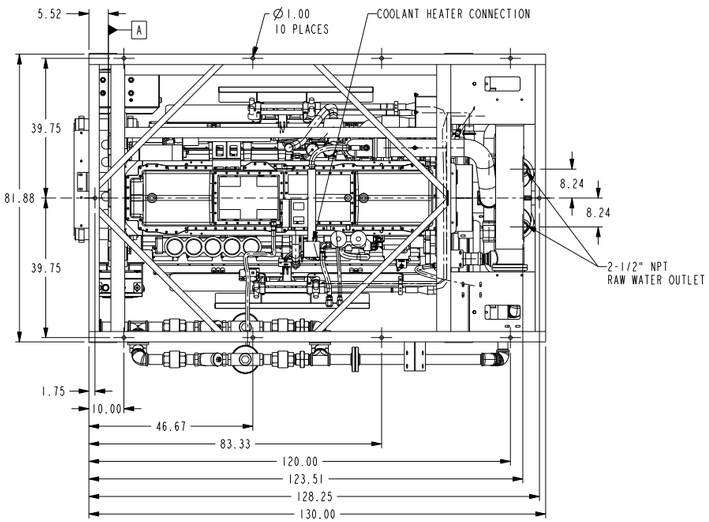












NOTES:
1. ALL PLUMBING MUST BE SUPPORTED AND/OR ISOLATED SO THAT NO WEIGHT OR STRESS IS APPLIED TO ANY ENGINE COMPONENT.
2. REFER TO ENGINE DATA SHEET FOR CUSTOMER CONNECTION RECOMMENDATIONS.
3. DRAWING SUBJECT TO CHANGE WITH OUT NOTICE.
4. CONTROL PANEL TERMINAL BLOCKS: 1, 2, 3, 4, 5, 9, 10
   301, 302, 303, 304, 310, 311, 312
5. BATTERY CHARGER CONNECTION TERMINAL BLOCKS: 6, 8, 11
   (LOCATED IN CONTACTOR BOX)

DIMENSIONS ARE IN: INCHES
[ ] ARE IN: .
DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED
X: ± 1 IN OR 4 mm
X.X: ± .1 IN OR 0.1 mm
X.XX: ± .030 IN OR 0.25 mm
X.XXX: ± .010 IN OR 0.025 mm
ANGULAR TOLERANCE: ± 2°

DO NOT SCALE PRINT

SCALE 0.050

CMI DATA CLASSIFICATION
Cummins Confidential

DWN HE392
CKD -
APVD -
DATE 07JUL2017

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009

MUST CONFORM TO CES 10903

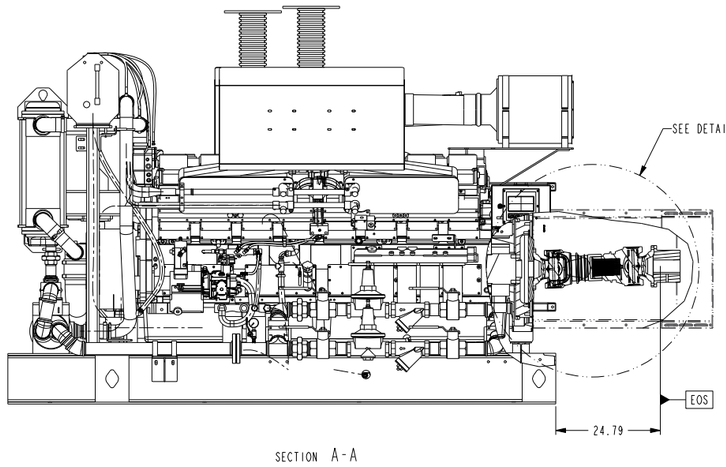
Cummins Inc.

ITEM NAME
GENERAL ARRANGEMENT
CFP50-F50/60/70/80

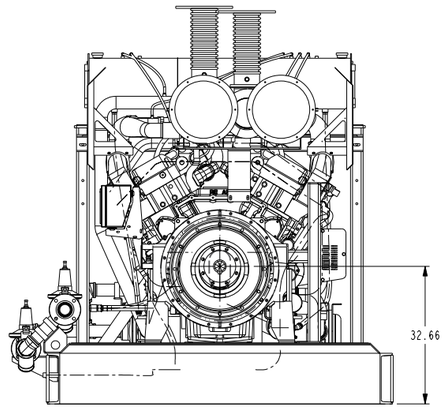
DWG SIZE D | CAD SHEET 1 OF 3 | ITEM NUMBER A042J665 | REV 1

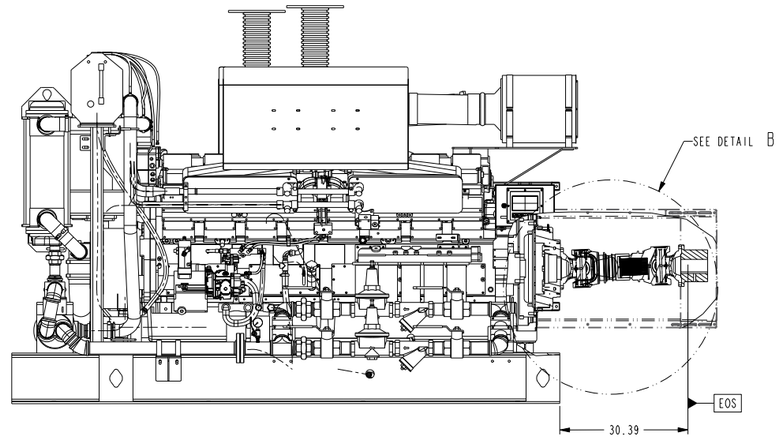
LEGEND AND DATUM IDENTIFIER	
SHEET 1	INSTALLATION DRAWING
SHEET 2	DRIVE LINE OPTIONS
SHEET 3	FLYWHEEL DETAIL
DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL MOUNTING SURFACE
DATUM "D"	UJOINT ADAPTER MOUNTING SURFACE
DATUM "EOS"	END OF PUMP SHAFT

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
1	2019-453	SEE SHEET 1 FOR REVISION DETAILS	NOI34	MS707	MS707	18SEP19

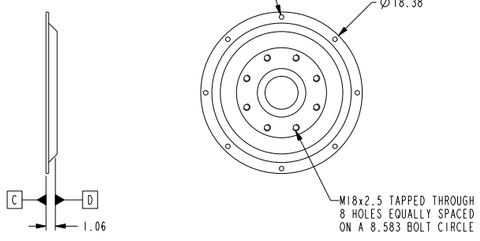


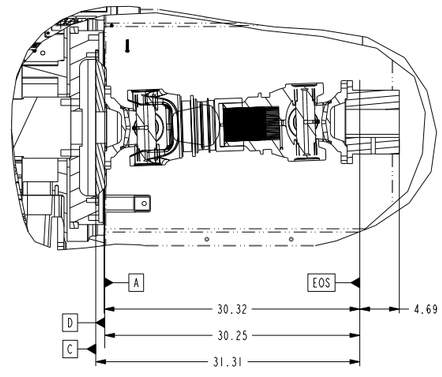
SECTION A-A



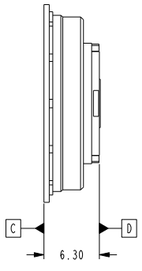


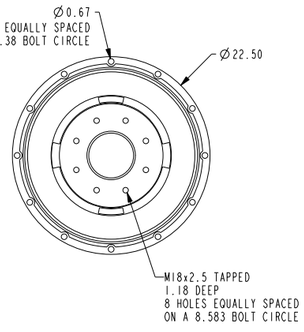
SECTION A-A

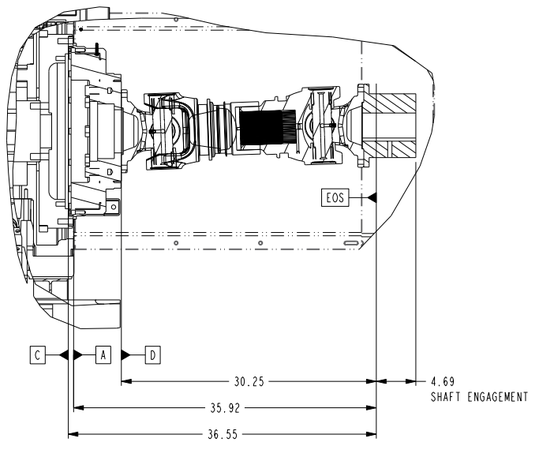




U-JOINT ADAPTER & DRIVE SHAFT DETAIL
DETAIL A
SCALE 0.120







TORSIONAL COUPLING & DRIVE SHAFT DETAIL
DETAIL B
SCALE 0.120

NOTE:
1. TORSIONAL ANALYSIS REQUIRED FOR VERTICAL TURBINE INSTALLATION
2. REFERENCE OWNERS MANUAL FOR DRIVE SHAFT ALIGNMENT SPECS
3. DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.
4. REFERENCE SHEET 1 FOR BASE FIRE PUMP INTERFACE

DIMENSIONS ARE IN: INCHES [ ] ARE IN: MM DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm X.X: ± .10 IN OR 2.5 mm X.XX: ± .010 IN OR 0.25 mm X.XXX: ± .005 IN OR 0.125 mm ANGULAR TOLERANCE ± 2° 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.	DO NOT SCALE PRINT SCALE 0.060	CMI DATA CLASSIFICATION Cummins Confidential DWN HE392 CKD - APVD - DATE 07JUL2017 FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	Cummins Inc. ITEM NAME GENERAL ARRANGEMENT CFP50-F50/60/70/80 MUST CONFORM TO CES 10903 DWG SIZE D | CAD SHEET 2 OF 3 | ITEM NUMBER A042J665 | REV 1

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
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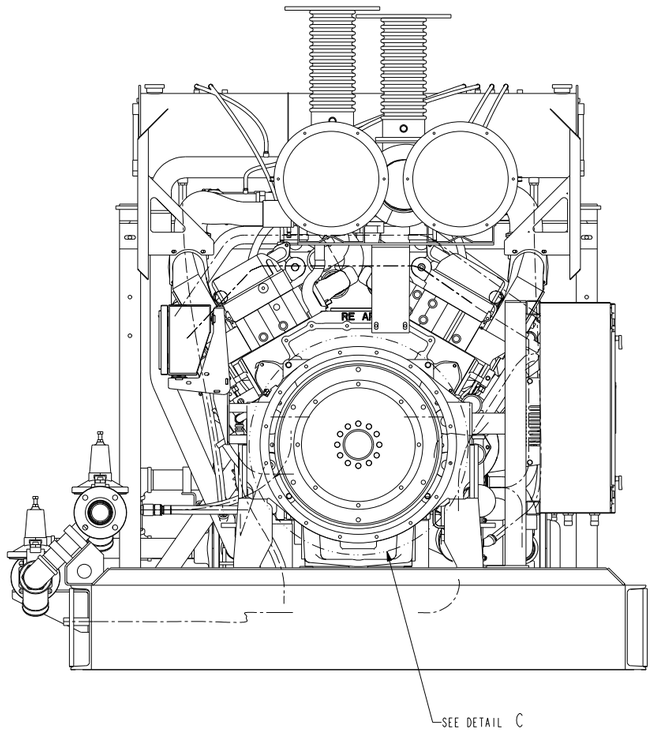

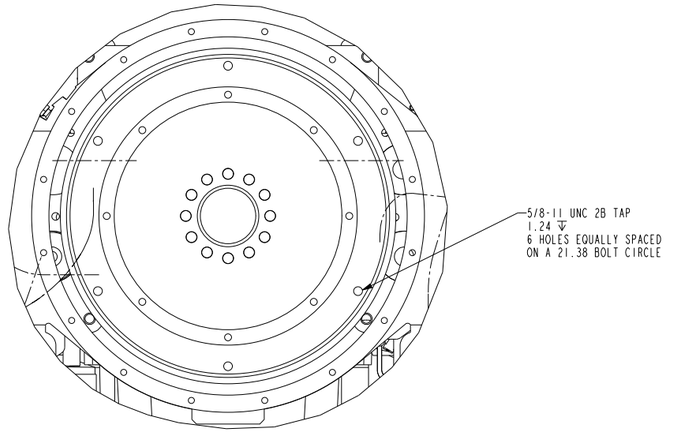

DETAIL C
SCALE 0.200

DIMENSIONS ARE IN: INCHES [ ] ARE IN: - DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm X.X: ± .1 IN OR 0.7 mm X.XX: ± .030 IN OR 0.25 mm X.XXX: ± .010 IN OR 0.025 mm ANGULAR TOLERANCE: ± 1°	DO NOT SCALE PRINT SCALE 0.100	CMI DATA CLASSIFICATION Cummins Confidential DWN HE392 CKD - APVD - DATE 07JUL2017	Cummins Inc. ITEM NAME GENERAL ARRANGEMENT CFP50-F50/60/70/80
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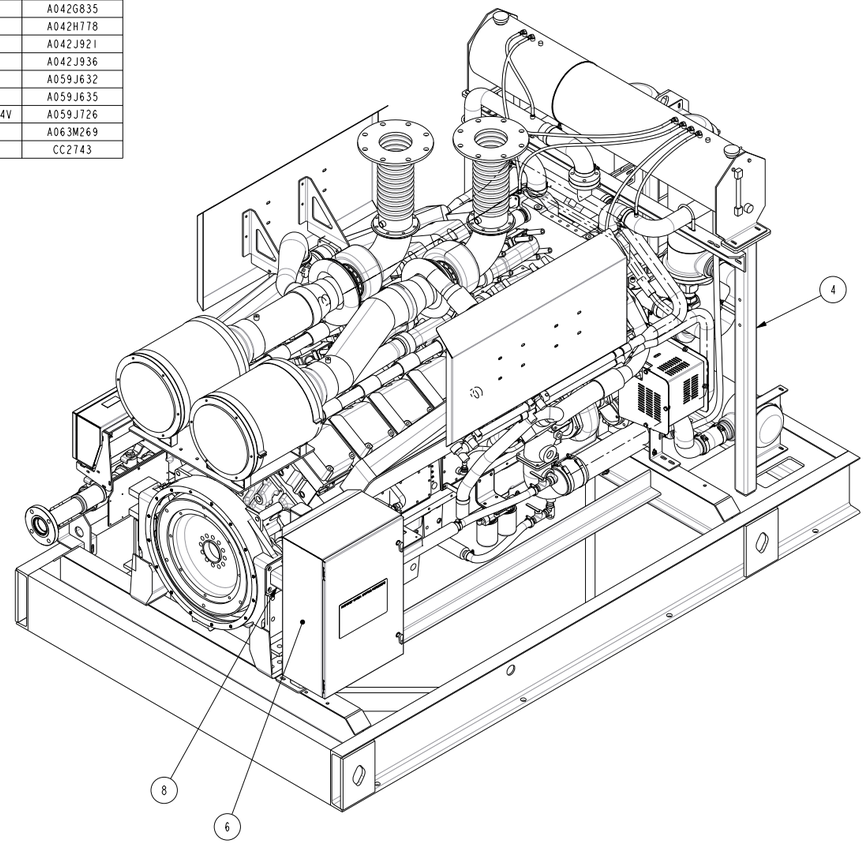
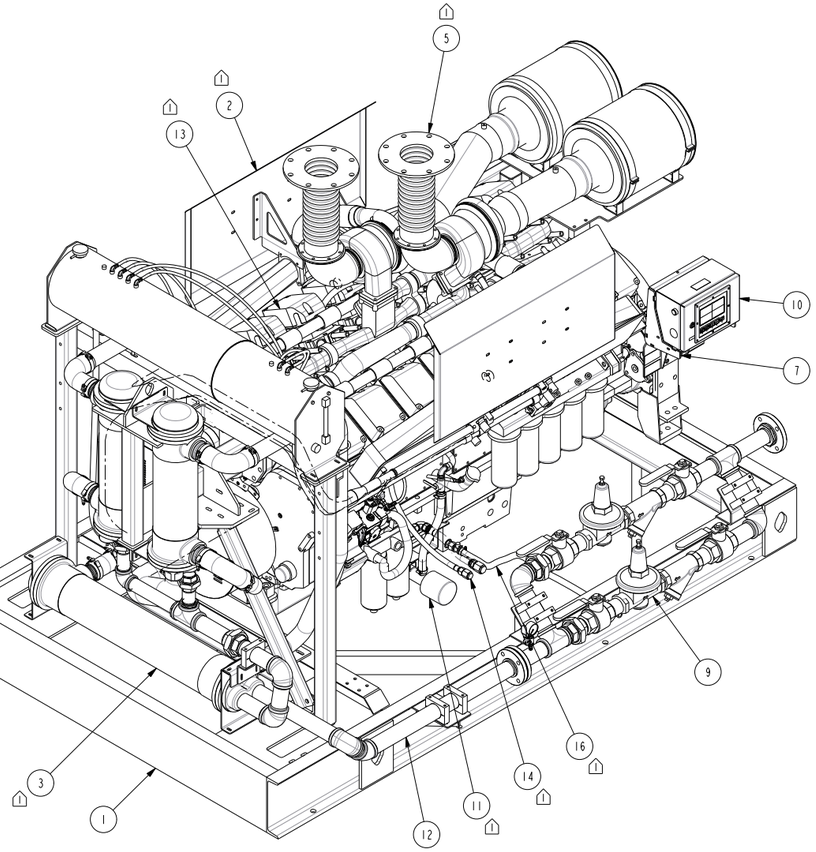
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	BASE, FIREPUMP; CFP50	17894
2	1	ASSEMBLY, FRONT GUARDS; CFP50	17895
3	1	ASSEMBLY, COOLING PACKAGE; CFP50	17906
4	1	TANK, EXPANSION ASSEMBLY; CFP50	17907
5	2	FLEX, EXHAUST, 8" FLANGE; CFP23E/CFP50	A042A875
6	1	CONTACTORS, MANUAL START; FIRE PUMP, RIGHT	A042B041
7	1	ASSEMBLY, OPERATOR STATION; CFP50	A042F920
8	1	BRACKET, CONTACTOR ENCLOSURE; CFP50	A042F922
9	1	COOLING LOOP, 2-1/2", VERT; RAW WATER	A042G835
10	1	CONTROL ASSEMBLY; FPDP, MECHANICAL CARBON STEEL	A042H778
11	1	ASSEMBLY, COOLANT HEATER; CFP50	A042J921
12	1	MISCELLANEOUS PIPING, CFP50; WITH FRAME, RAW WATER	A042J936
13	1	ASM, ENGINE, G9; CFP50-F50/60/70/80, W/O FUEL TANK	A059J632
14	1	ASM, FUEL SYSTEM; CFP50, W/O FUEL TANK	A059J635
15	1	HARNESS, ELECTRICAL WIRING; CFP50-80, LH CONTROL, 24V	A059J726
16	1	ASM, OIL DRAIN; CFP50	A063M269
17	65	COOLANT, FC EG PM, 1 GALLON	CC2743

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
1	2019-453	UPDATED PER 17895,17906 & A042J921: REMOVED 18361,67946,123824,12526-12-8, A042D567 & A042F382; ADDED A059J726 & A063M269; REPLACED A042K093,17897 & 21839 W/ A059J632,A059J635 & A042A875	NOI34	MS707	MS707	17SEP19





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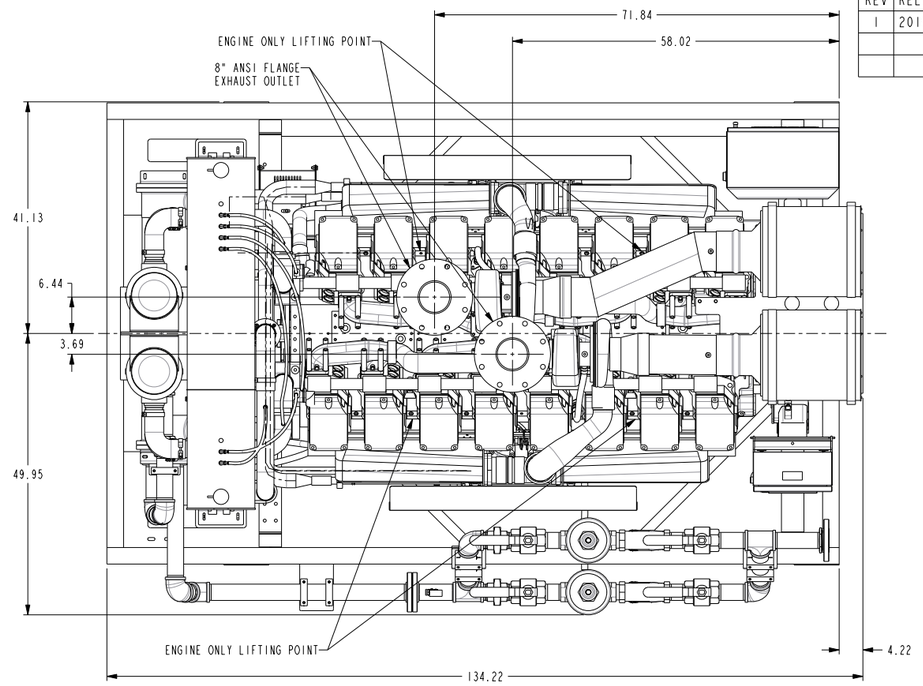
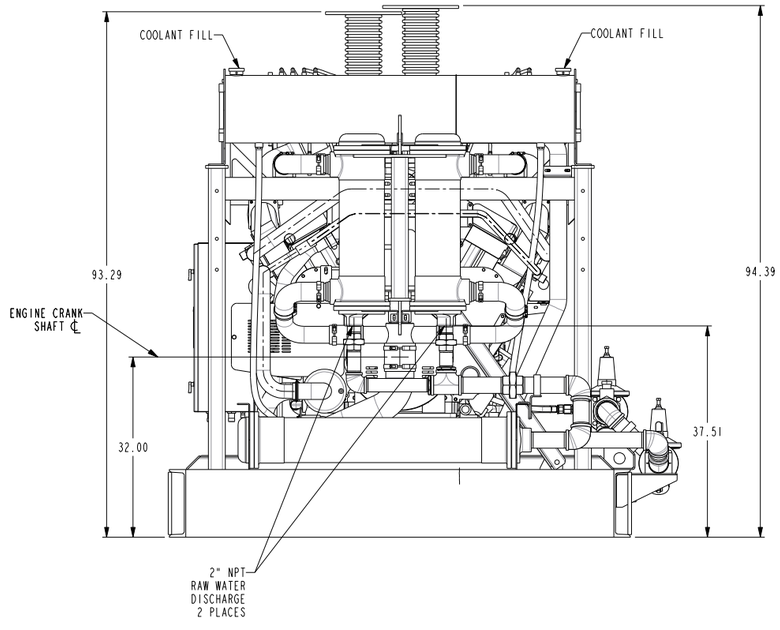
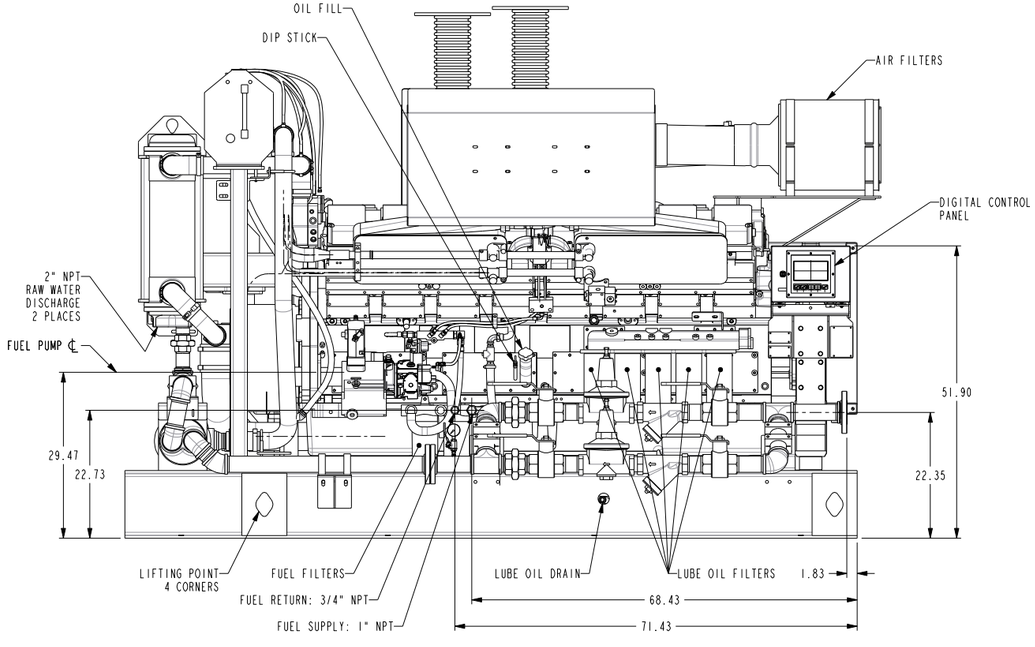
REV	REL NO	REVISION	DWN	CKD	APVD	DATE
1	2019-453	SEE SHEET 1 FOR REVISION DETAILS	NO134	MS707	MS707	17SEP19







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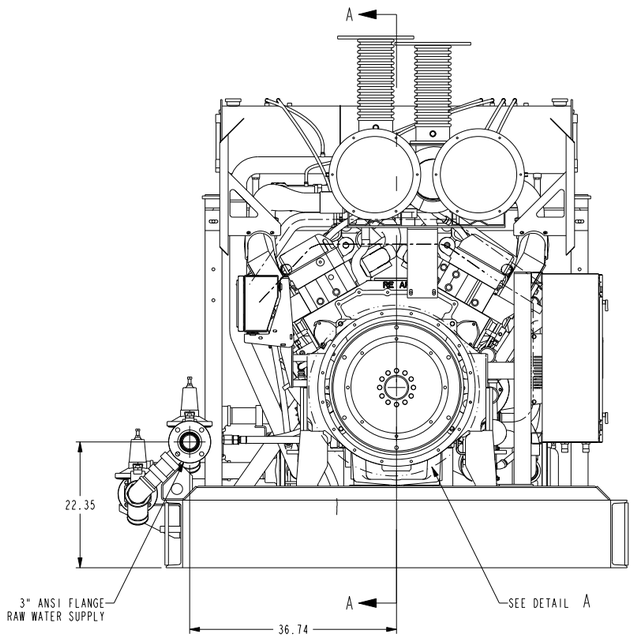
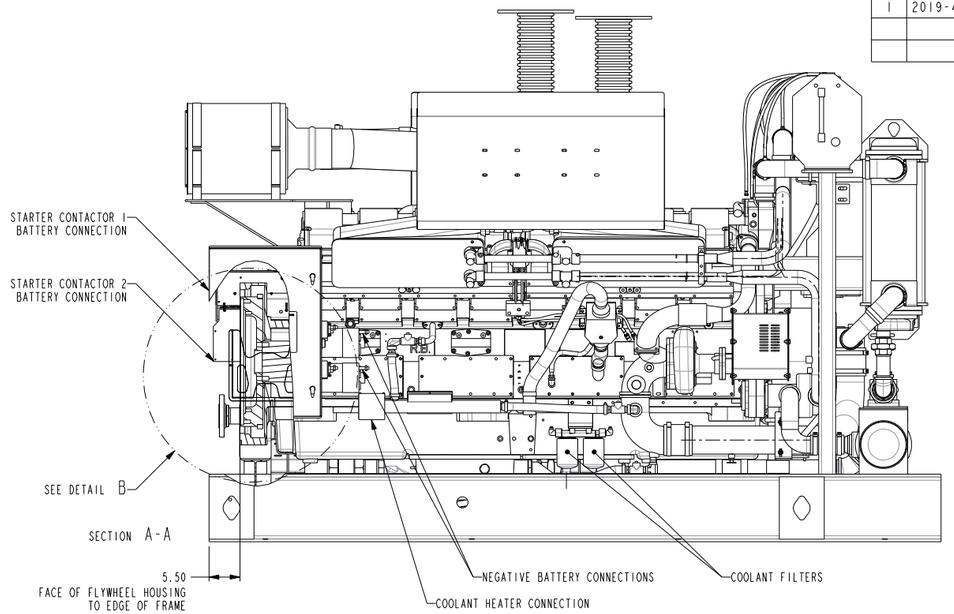
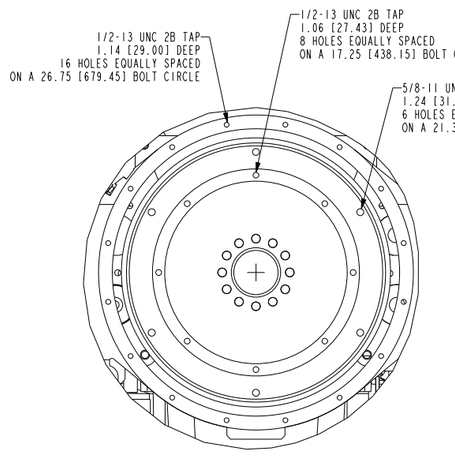
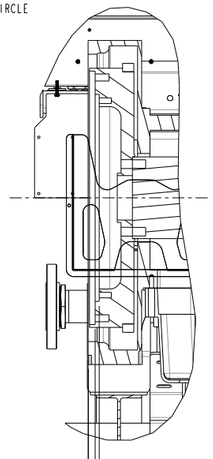
REV	REL NO	REVISION	DWN	CKD	APVD	DATE
1	2019-453	SEE SHEET 1 FOR REVISION DETAILS	NO134	MS707	MS707	17SEP19



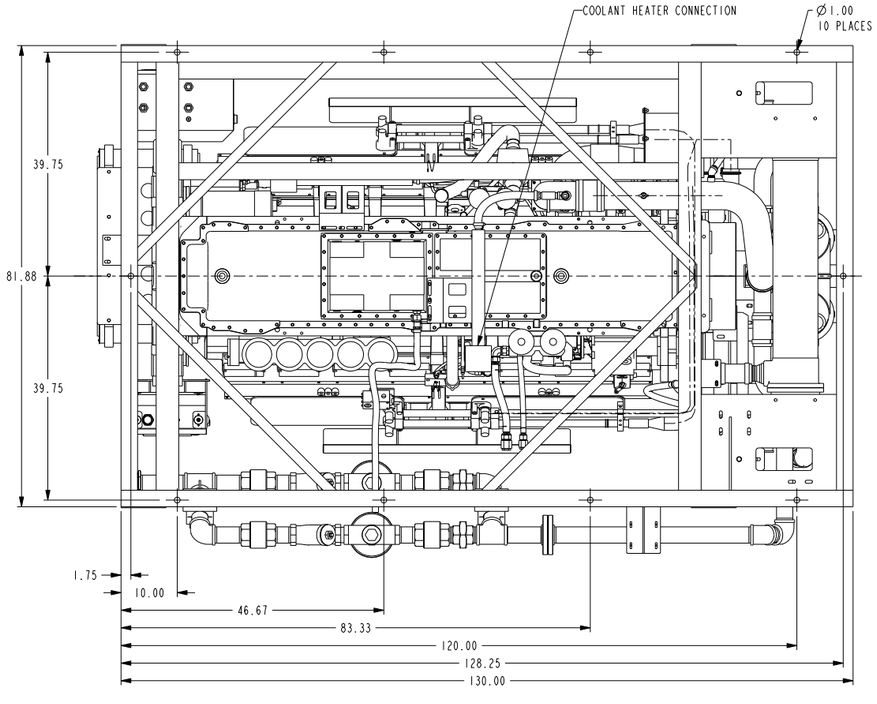




DETAIL A
SCALE 0.160



DETAIL B
SCALE 0.160



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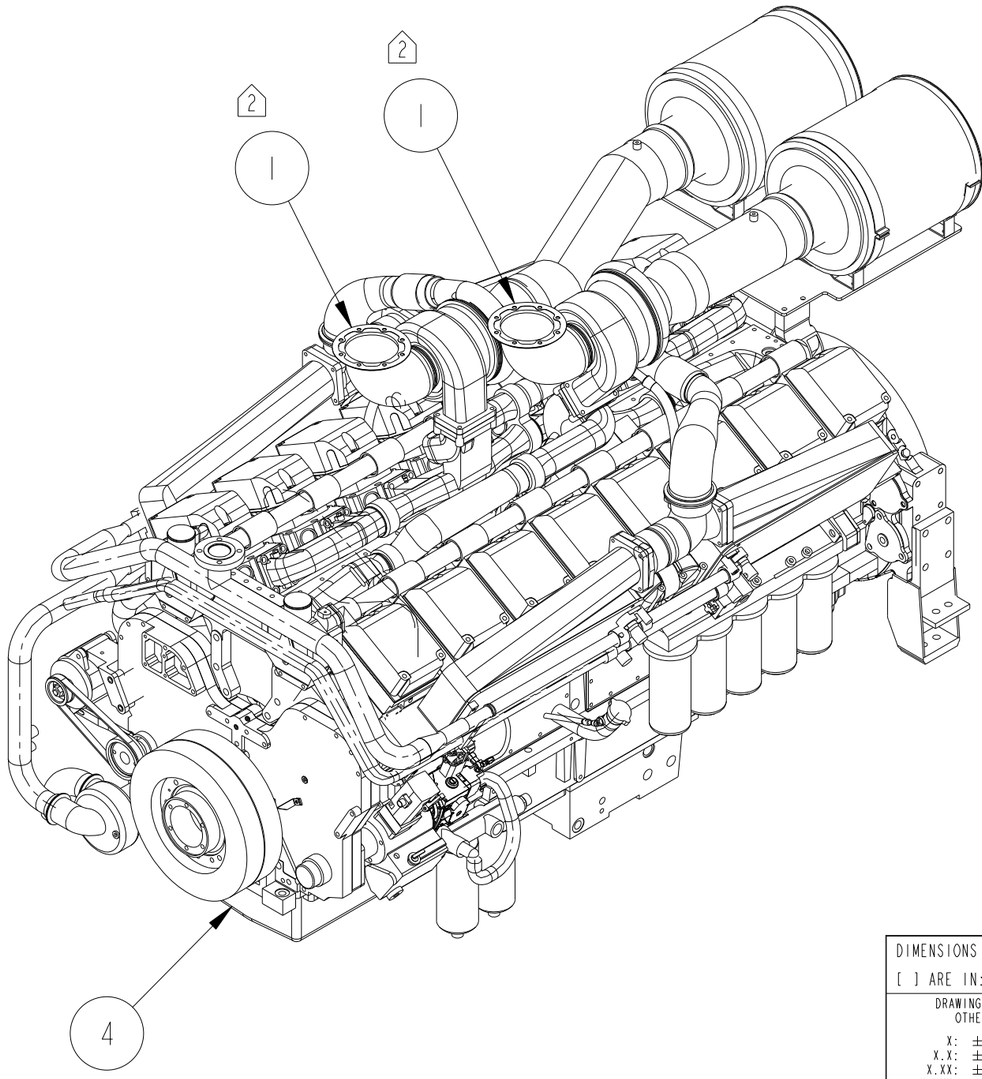
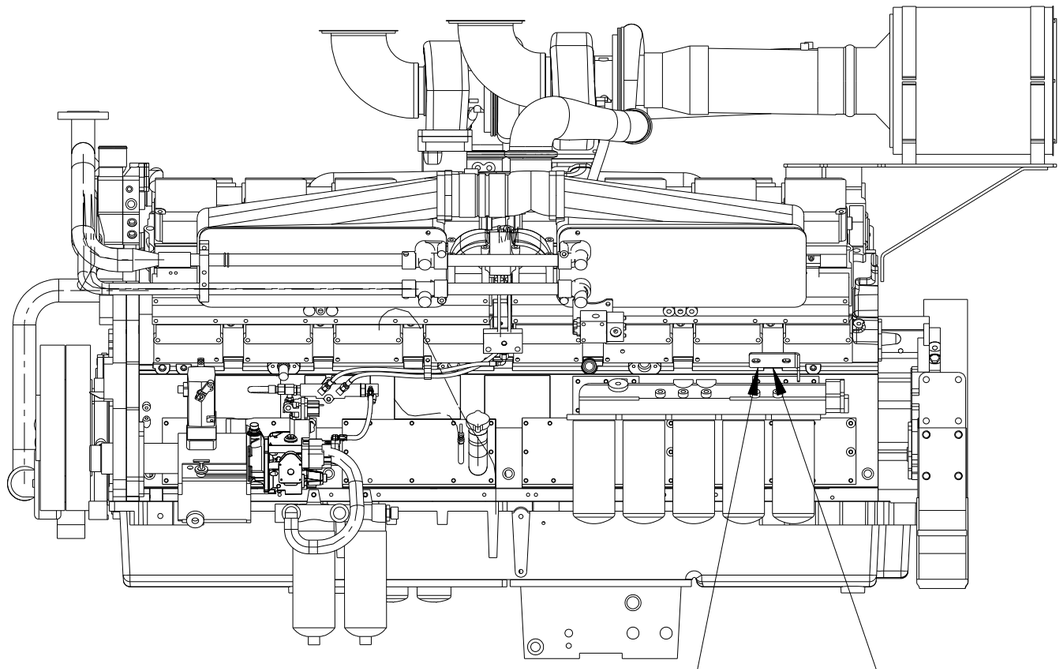
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	GASKET, 6" EXHAUST FLANGE	106322
2	1	MANUAL, CFP50	A042J566
3	1	BRACKET, THROTTLE CONTROL; CFP50	A062Z709
4	1	ASM, ENGINE, CFP50-F50/60/70/80; KTA50-G9, 1800RPM - 2220HP	CFP50F50-F800GRB_DAV
5	188	PREMIUM BLUE 15W40; (QUART)	V705290

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
-	2019-064	RELEASED TO PRODUCTION	NO134	MS707	MS707	14MAR19
A	2019-310	ADDED A062Z709 BRACKET & NOTE	NO134	MS707	MS707	17JUL19
2	2019-453	ADDED 106322 QTY(2)	NO134	MS707	MS707	07OCT19





(A) RE-LOCATE FUEL THROTTLE VALVE (COMES ON ENGINE) TO A062Z709 BRACKET & SHORTEN CABLE

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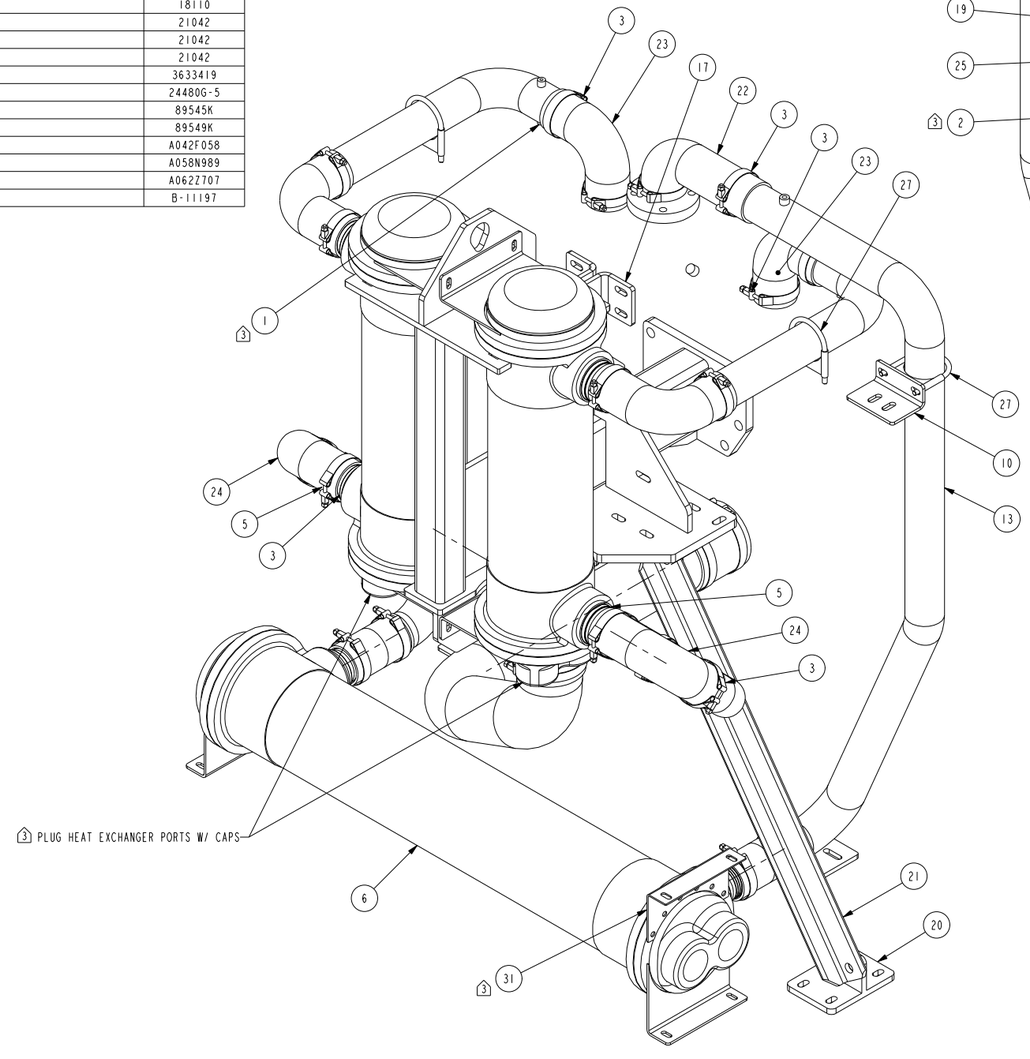
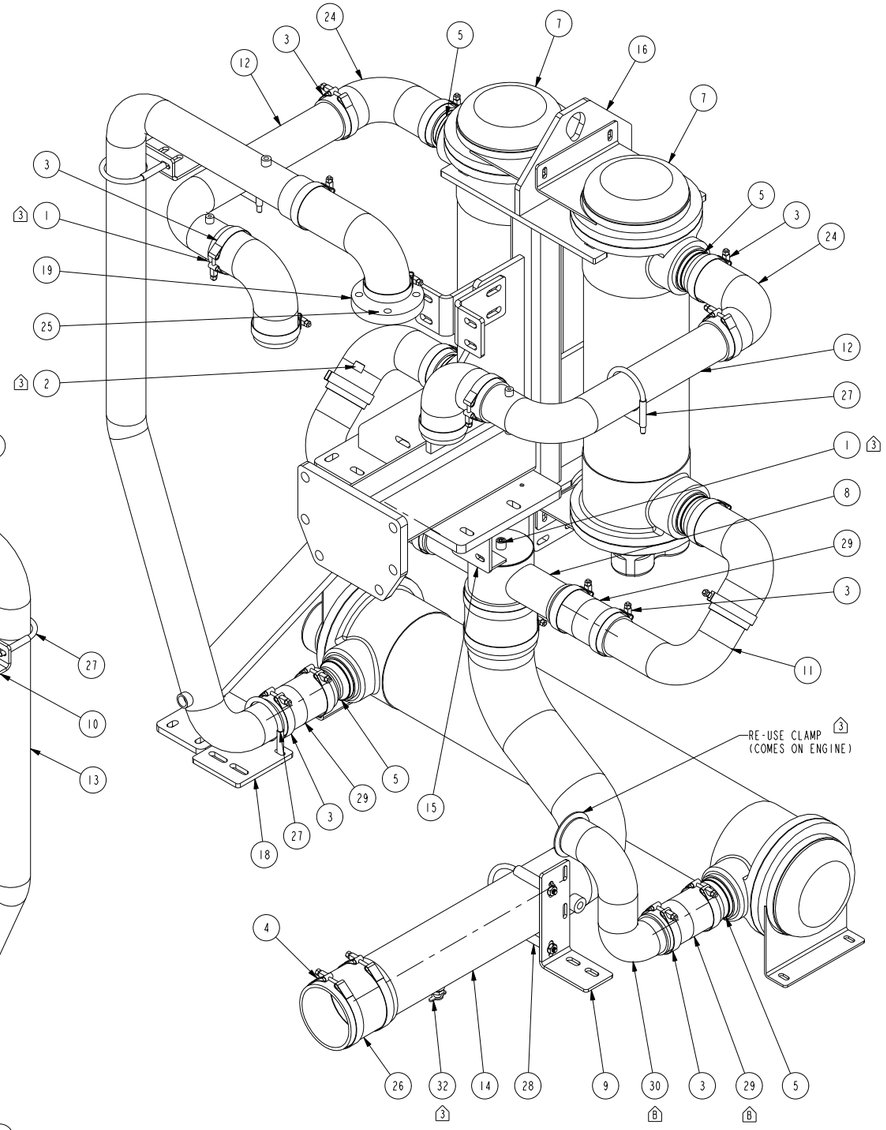
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	3	PLUG,PIPE; INT HEX -4 NPT,STEEL	12212-4
2	1	PLUG,PIPE; INT HEX -8 NPT,STEEL	12212-8
3	22	CLAMP, T-BOLT; 3.28-3.59	13164-0350
4	4	CLAMP, T-BOLT; 5.28-5.59	13164-0550
5	6	FITTING, BARBED HOSE; 3" NPT-3" HOSE	13779
6	1	HEAT EXCHANGER, SHELL AND TUBE, 2-PASS; 8" DIA. W/ 2-1/2" NPT WATER CONNECTION	16229
7	2	HEAT EXCHANGER, SHELL AND TUBE, 4-PASS; 8" DIA. W/ 2" NPT WATER CONNECTION	16230
8	1	TUBE, JW SUCTION SPLITTER; CFP50	16409
9	1	BRACKET,JW TUBE MIOUNTING; CFP50	16493
10	1	BRACKET, TUBE BRACE; FITS 3" U-BOLT	16503
11	2	TUBE, RADIATOR, 3" DIA. 90 DEGREE, 10" X 8"	17059
12	2	TUBE, RADIATOR, 3" DIA. 90 DEGREE, 8" X 20"	17060
13	1	TUBE, LTA DISCHARGE; CFP50	17061
14	1	TUBE, JW SUCTION; CFP50	17062
15	1	BRACKET, JW TUBE BRACE	17115
16	1	BRACKET, HEAT EXCHANGER MOUNTING; CFP50	17908
17	2	BRACE, FORMED	17910
18	1	BRACKET, TUBE BRACE; FITS 3" U-BOLT	17919
19	1	FLANGE ADAPTER, 3" STRAIGHT; LTA CIRCUIT DISCHARGE, CFP50	17962
20	2	BRACKET, FRONT SUPPORT BRACE; CFP50D	18034
21	1	BRACE, FRONT SUPPORT; CFP50	18110
22	1	ELBOW; 3" ID, 90 DEGREE	21042
23	2	ELBOW; 3" ID, 90 DEGREE	21042
24	4	ELBOW; 3" ID, 90 DEGREE	21042
25	1	GASKET, WATER HEADER	3633419
26	2	HOSE, 5" x 6" LONG	24480G-5
27	4	CLAMP, U-BOLT, GUILLOTINE; 3.00"	89545K
28	1	CLAMP, U BOLT; 5" GUILLOTINE	89549K
29	4	HOSE,EPDM; 3.00IN IDx6.00IN LONG	A042F058
30	1	ELBOW, WATER INLET; CFP50	A058N989
31	1	BRACKET, HEAT EXCHANGER; 8" DIA	A062Z707
32	1	PETCOCK. 1/2" NPT MALE; -	B-11197

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
-	2010-494	RELEASED TO PRODUCTION	DAN	-	-	14DEC10
B	2017-760	ADDED A042F058 & A058N989; DELETED 21042,21891 & 77300GL-6	HE392	-	-	15FEB17
3	2019-453	ADDED 12212-4 QTY(3),12212-8,B-11197, A062Z707 & NOTES	NO134	MS707	MS707	17SEP19





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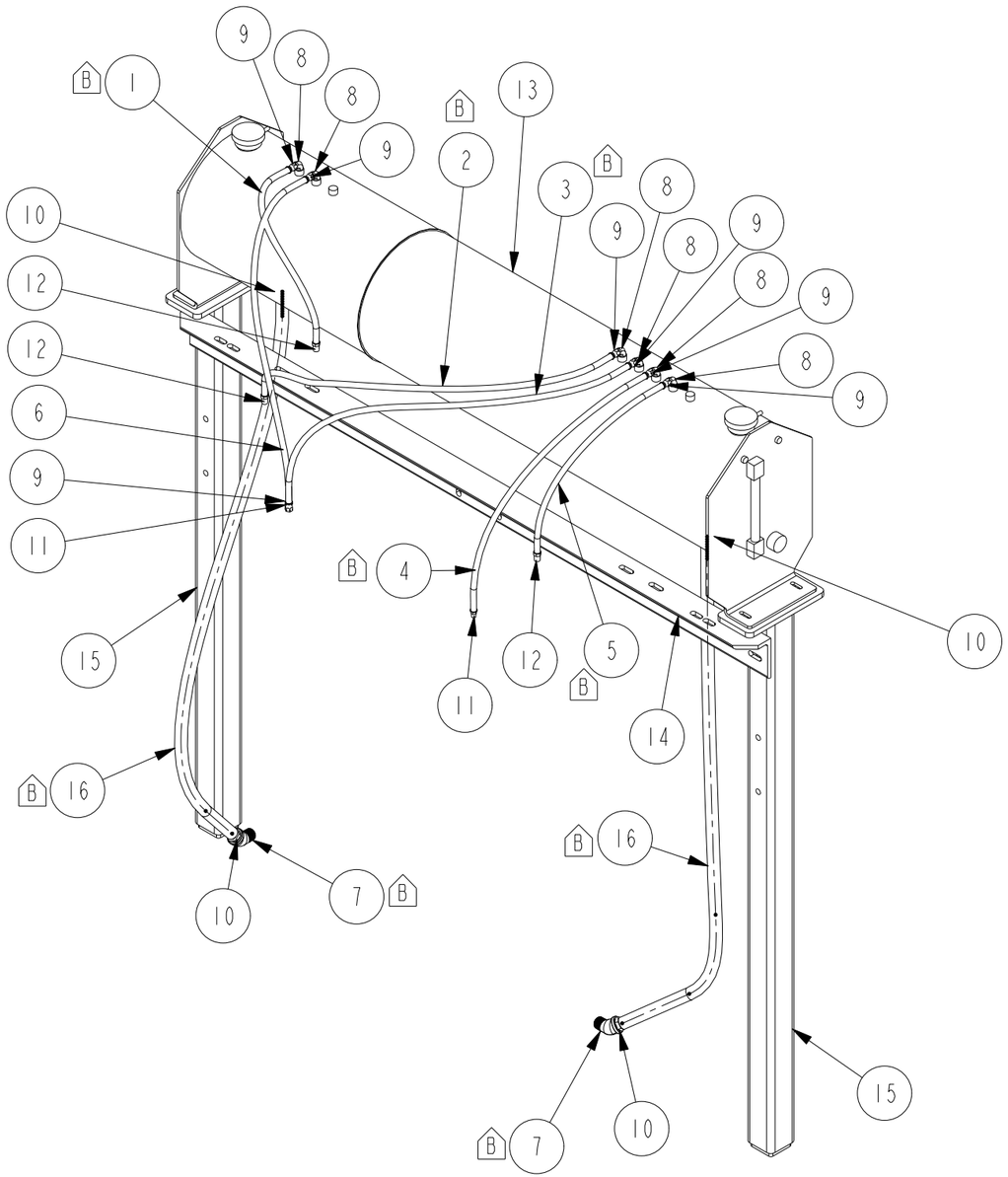


BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	HOSE, VENT LINE, 1/4" ID X 18" LG	801-04
2	1	HOSE, VENT LINE, 1/4" ID X 46" LG	801-04
3	1	HOSE, VENT LINE, 1/4" ID X 42" LG	801-04
4	1	HOSE, VENT LINE, 1/4" ID X 30" LG	801-04
5	1	HOSE, VENT LINE, 1/4" ID X 18" LG	801-04
6	1	HOSE, VENT LINE, 1/4" ID X 18" LG	801-04
7	2	ELBOW,3/4 FNPT X 3/4 MNPT, -	LTL-SE3445
8	6	ELB, 90 DEG, -4 JIC X -4 NPT	12270-4-4
9	7	HOSE END, STR, -4 FLR X -4 HS	12543-4-4
10	4	FTG, STR, -12 BEAD X -12 NPT	12545-12-12
11	2	HOSE END, STR, -2 NPT X -4 HS	14590-2-4
12	3	HOSE END, STR, -4 NPT X -4 HS	14590-4-4
13	1	TANK, SURGE, DUAL CHAMBER - 20 GAL - 10 GAL	16390
14	1	ANGLE, TUBE SUPPORT	17106
15	2	BRACKET, EXPANSION TANK, CFP50	17909
16	2	HOSE,SILICONE, 3/4IN ID x 60.00IN LONG	A042F073

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
B	2018-248	REPLACED A042F073 WAS 80242GL, 801-04 WAS 15130,LTL-SE3445 WAS 14204-12	LQ629	02MAY18
A	2014-057	80242GL WAS 14194	S DUBICK	12-FEB-14

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

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

Cummins Fire Power

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

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

TANK, EXPANSION ASSEMBLY
CFP50

DWG UNITS: IN/LB/S

DRAWN BY: DAN

PRO-ENGINEER

DATE: 01-NOV-10

INIT ECO: 2010-494

SCALE: 0.083

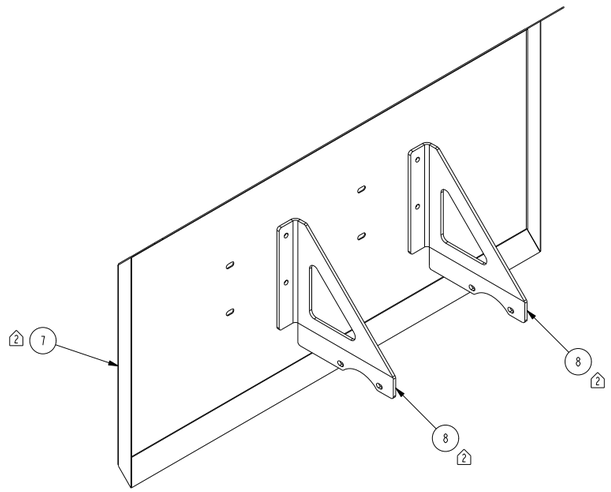
EST WEIGHT: 250.072

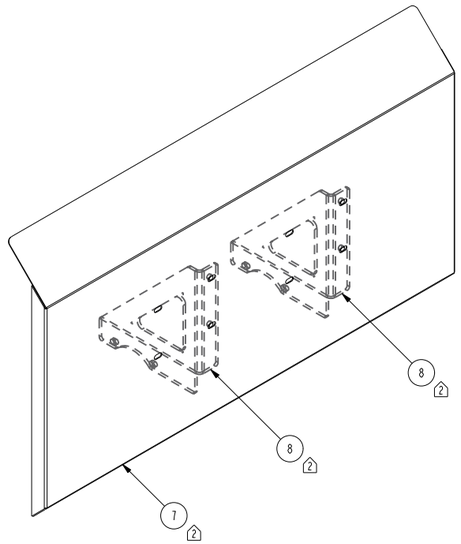
SHEET 1 OF 1

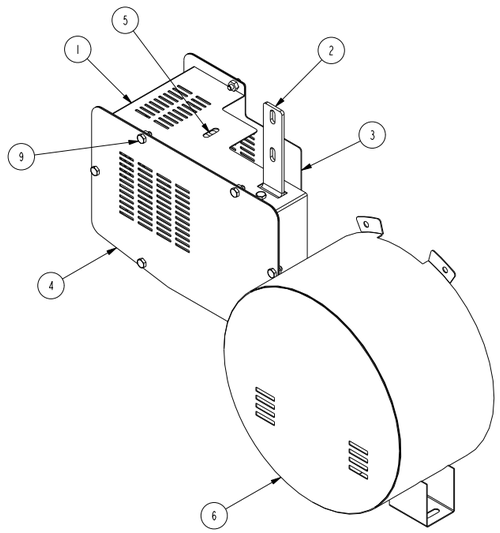
DRAWING NO: 17907

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	GUARD BODY, ALTERNATOR; CFP50	17101
2	1	BRACKET, ALTERNATOR GUARD; CFP50	17102
3	1	COVER, ALTERNATOR; CFP50	17103
4	1	COVER, ALTERNATOR GUARD; CFP50	17104
5	1	SPACER, ALTERNATOR GUARD; CFP50	17186
6	1	GUARD, DAMPENER; CFP50	17896
7	2	SHIELD, TURBOCHARGER HEAT; CFP50	A062Z676
8	4	BRACKET, HEAT SHIELD; CFP50	A062Z677
9	9	SCREW, CAP, HEX HEAD, M10-1.5	HHCS_M10-20

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
-	2010-496	RELEASED TO PRODUCTION	DAN	-	-	01NOV10
2	2019-453	ADDED A062Z676 (2) & A062Z677 (4)	NO134	MS707	MS707	17SEP19







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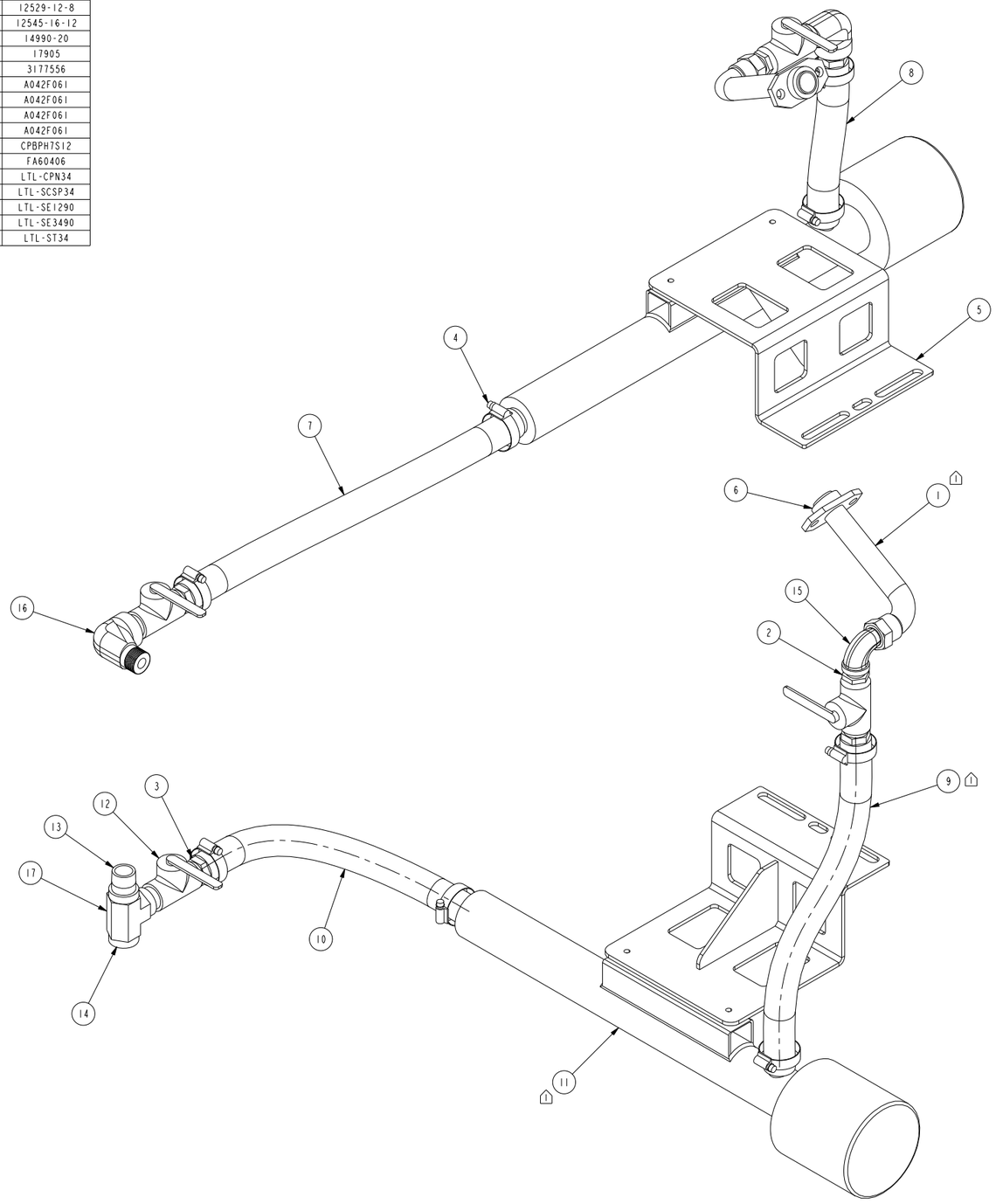
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	2	TUBE,WATER HEATER; CUMMINS POWER GENERATION	130-5607-02
2	2	NIPPLE,REDUCING HEXAGON; -12 NPT X -8 NPT,BRASS	12529-12-8
3	4	COUPLING,PLAIN HOSE; -16 BEAD X -12 NPT,BRASS	12545-16-12
4	8	CLAMP,HOSE; .81 - 1.75 WORM	14990-20
5	2	BRACKET, COOLANT HEATER; CFP50	17905
6	2	SEAL, RECTANGULAR RING	3177556
7	1	HOSE,1.00IN IDX36IN,SILICONE; CUT TO 20.00 INCHES LONG	A042F061
8	1	HOSE,1.00IN IDX36IN,SILICONE; CUT TO 20.00 INCHES LONG	A042F061
9	1	HOSE,1.00IN IDX36IN,SILICONE; CUT TO 24.00 INCHES LONG	A042F061
10	1	HOSE,1.00IN IDX36IN,SILICONE; CUT TO 18.00 INCHES LONG	A042F061
11	2	HEATER, COOLANT, 4000W, ADJ. VOLTAGE; WATLOW CPBPH7S12	CPBPH7S12
12	4	VALVE, BALL, 3/4" NPT	FA60406
13	3	NIPPLE, BLK, 3/4x1-1/2	LTL-CPN34
14	1	PLUG, PIPE; 3/4 BIP COUNTERSUNK	LTL-SCSP34
15	1	STREET ELBOW,BLK,1/2" NPT	LTL-SE1290
16	2	ELBOW, STREET, 90 DEG 3/4NPT; PER SAE NO. 130239	LTL-SE3490
17	1	TEE, BLK, 3/4" NPT	LTL-ST34

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
0	2017-070	INITIAL RELEASE	HE392	-	-	10FEB17
1	2019-453	MOVED COOLANT HEATER; RE-ORIENTATED FITTINGS; UPDATED A042F061 HOSE LENGTH	NO134	MS707	MS707	07OCT19

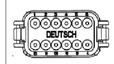
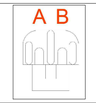


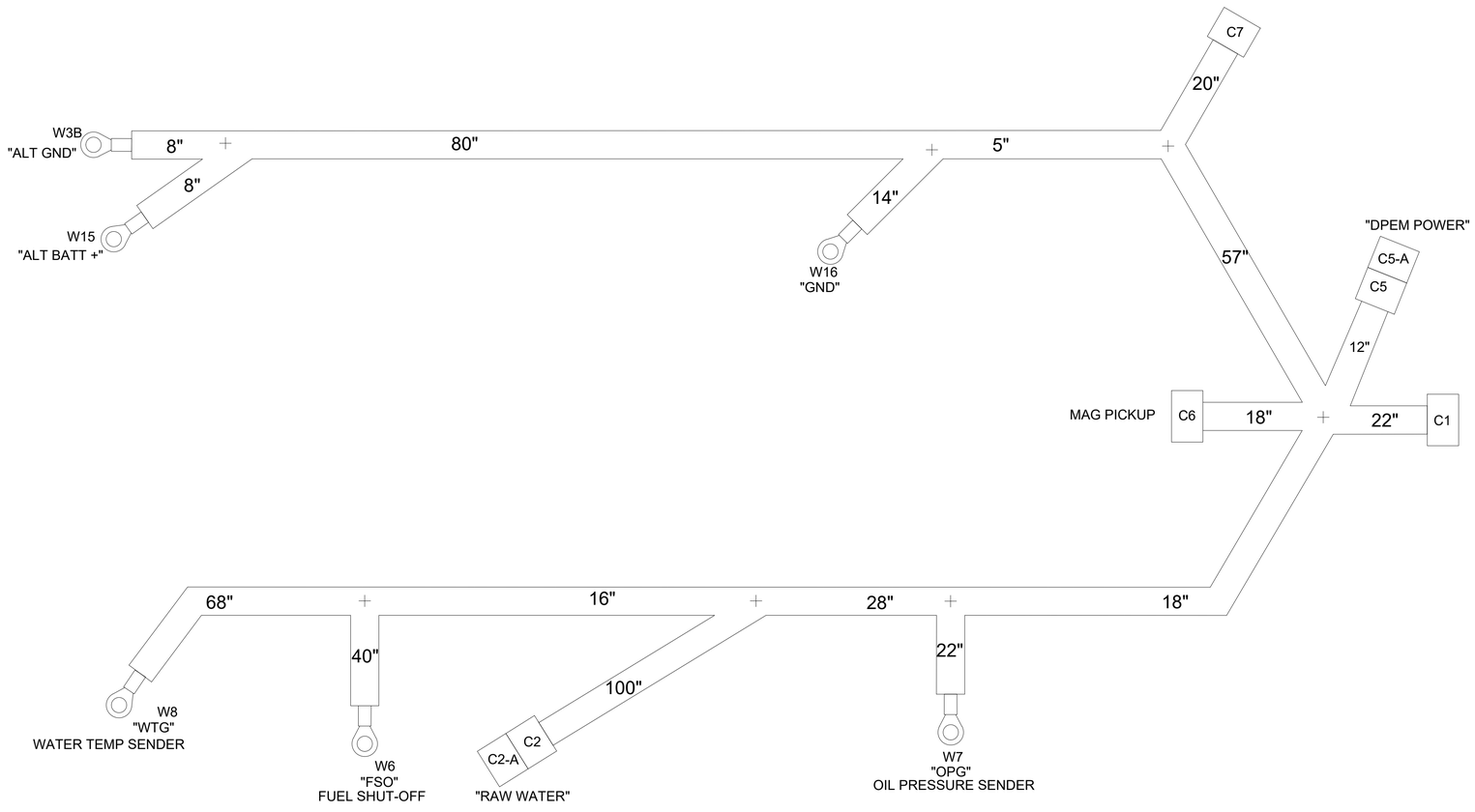
NOTE:
1. USE THREAD SEALANT ON ALL THREADED CONNECTIONS.

DIMENSIONS ARE IN: INCHES [ ] ARE IN: ..	DO NOT SCALE PRINT	CMI DATA CLASSIFICATION CUMMINS CONFIDENTIAL		Cummins Inc.
DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm X.X: ± .1 IN OR 0.1 mm X.XX: ± .030 IN OR 0.25 mm X.XXX: ± .010 IN OR 0.015 mm ANGULAR TOLERANCE: ± 1°	SCALE 0.375	DWN HE392 CKD - APVD - DATE 10FEB2017		ITEM NAME ASSEMBLY, COOLANT HEATER CFP50
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.		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	MUST CONFORM TO CES 10903	DWG SIZE D | CAD SHEET 1 OF 1 | ITEM NUMBER A042J921 | REV 1

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
–	2019-097	RELEASED TO PRODUCTION	LA522	HV937	HV937	28FEB19
–	–	–	–	–	–	–

CONNECTOR WIRE INSERTION VIEW

C1	C2	C2-A	C5	C5-A	C6	C7
						



NOTES:

1) LOOM WITH BLACK NYLON BRAID W/ RED TRACERS, 28 MIL MINIMUM.
2) PROMINENTLY LABEL ALL CONNECTORS AS "INDICATED".
3) ALL SPLICES TO BE FITTED WITH GLUED HEATSHRINK.
4) ALL DIMENSIONS SHOWN ARE MEASURED FROM THE REAR OF THE CONNECTOR (WIRE ENTRY VIEW).
5) SEE SHEET 2 FOR THE WIRE TO/FROM LIST.
6) RUN BRAID OVER THE BOOT AT LEAST 1" ON ALL CONNECTORS WITH BOOTS TO PREVENT THE BRAID FROM SLIPPING BACK.
7) USE A 3" LONG GLUED HEATSHRINK ON ALL RING TERMINALS AND RUN THE BRAID $\frac{1}{2}$ WAY UP THE HEATSHRINK.
8) USE GLUED HEAT SHRINK ON CONNECTORS C5 TO ACT AS A BOOT. MAKE SURE HEAT SHRINK COVERS BACK OF CONNECTOR AND BRAID RUNS $\frac{1}{2}$ WAY UP THE HEATSHRINK.
9) COMPONENTS MAY BE SUBSTITUTED AS LONG AS FIT, FORM, FUNCTION AND REGULATORY STANDARDS ARE MET OR EXCEEDED.

DIMENSIONS ARE IN: INCHES
[ ] ARE IN: .
DIMENSION TOLERANCES
X.X: ±0.090IN OR 2.3mm
X.XX: ±0.030IN OR 0.76mm
X.XXX: ±0.015IN OR 0.381mm
ANGULAR TOLERANCE: ±1°

DO NOT SCALE PRINT

SCALE 1.00

CMI DATA CLASSIFICATION
Cummins Confidential

DWN LA522
CKD HV937
APVD HV937
DATE 29FEB19

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009

MUST CONFORM TO CES 10903

Cummins Inc.

ITEM NAME
HARNESS,ENGINE INTERFACE
QSK50 FPDP LEFT CONN'S

DWG SIZE D | ITEM NUMBER A059J726 | ACAD SHEET 1 OF 3

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
–	2019-097	RELEASED TO PRODUCTION	LA522	HV937	HV937	28FEB19
–	–	–	–	–	–	–

TAGS	SUB	QTY	CATALOG	MFG	DESC
C1	1	1	HDP26-24-29SN	DEUTSCH	CONNECTOR, PLUG, 29 POSITION, CIRCULAR
		2	1062-12-0222	DEUTSCH	TERMINAL, SOCKET, NICKEL, SIZE 12,10 AWG
		2	0462-203-12141	DEUTSCH	TERMINAL,SOCKET,NICKEL,SIZE 12, 12-14 AWG
		3	0462-209-16141	DEUTSCH	TERMINAL, SOCKET, NICKEL, SIZE 16
		12	0462-201-16141	DEUTSCH	TERMINAL, SOCKET, NICKEL, SIZE 16,16-20 AWG
		4	114017	DEUTSCH	PLUG, SEALING, SIZE 12-16
		6	0413-204-2005	DEUTSCH	PLUG, SEALING, SIZE 20
		1	HD30-24BT-BK	DEUTSCH	BOOT, 24 SHELL SIZE, BLACK
C2	1	1	DT04-2P	DEUTSCH	CONNECTOR, RECEPTACLE, 2 POSITION
		2	0460-215-16141	DEUTSCH	TERMINAL, PIN, NICKEL, SIZE 16, 14 AWG
		1	W2P	DEUTSCH	WEDGELOCK
		1	DT2P-BT	DEUTSCH	BOOT, 2 WAY RECEPTACLE, GRAY
C2-A	1	1	DT06-2S	DEUTSCH	CONNECTOR, PLUG, 2-POSITION
		1	W2S	DEUTSCH	WEDGELOCK PLUG
C5	1	1	DT06-12B	DEUTSCH	CONNECTOR, PLUG, 12-POSITION
		9	0462-201-16141	DEUTSCH	TERMINAL, SOCKET, NICKEL, SIZE 16-20 AWG
		3	114017	DEUTSCH	PLUG, SEALING, SIZE 12-16
		1	W12S	DEUTSCH	WEDGELOCK
		1	DT12S-BT-BK	DEUTSCH	BOOT, BLACK
C5-A	1	1	1011-349-1205	DEUTSCH	DUST CAP, THERMOPLASTIC, 12-POS
C6	1	1	12010973	DELPHI	CONNECTOR,MALE, WEATHER PACK,2 WAY
		2	12124582	DELPHI	TERMINAL,MALE, TIN PLATED,1.00-2.00MM^2
		2	15324983	DELPHI	PLUG,CABLE CAVITY,RED-BROWN
C7	1	1	HD36-24-18SN	DEUTSCH	CONNECTOR,PLUG,18 POSITION,CIRCULAR
		1	0462-203-08141	DEUTSCH	TERMINAL,SOCKET,NICKEL, SIZE 8
		2	1062-12-0222	DEUTSCH	TERMINAL,SOCKET,NICKEL, SIZE 12
		9	0462-201-16141	DEUTSCH	TERMINAL,SOCKET,NICKEL, SIZE 16
		6	114017	DEUTSCH	PLUG,SEALING SIZE 12-16
		1	HD30-24BT-BK	DEUTSCH	BOOT,24 SIZE SHELL,BLACK
W8,W7	2	1	31203	WAYTEK	TERMINAL, RING, #10, 16-14AWG, NON-INSULATED
W6	1	1	31203	WAYTEK	TERMINAL, RING, #10, 16-14AWG, NON-INSULATED
	1	1	218N1V02	WAYTEK	CAP, LUG AND RING TERMINAL, 200 SERIES
W16	1	1	34004	WAYTEK	TERMINAL, RING, 1/2", 6AWG, NON-INSULATED
W3B	1	1	33002	WAYTEK	TERMINAL, RING, 1/4" 8AWG, NON-INSULATED
W15	1	1	33002	WAYTEK	TERMINAL, RING, 1/4", 8AWG, NON-INSULATED

CIRCUIT #	FROM	PIN1	TO	PIN2	WIRECOLOR	WIRESIZE	WIRE TYPE	TERM 1	TERM 2	STAMP	FUNCTION	NOTES
1	C1	1	SPL C	-	RED	12	GXL	0462-203-12141	-	C1-1/SPL C	BATT A	
2	C1	2	SPL D	-	RED	12	GXL	0462-203-12141	-	C1-2/SPL D	BATT B	
3	C1	4	SPL B	-	BLACK	10	GXL	1062-12-0222	-	C1-4/SPL B	CHARGE GND	
3A	C1	3	SPL B	-	BLACK	10	GXL	1062-12-0222	-	C1-3/SPL B	SYS GND	
3B	W3B	-	SPL B	-	BLACK	8	GXL	33002	-	W18/SPL B	ALT GND	
4	C1	5	C6	A	WHITE	16	GXL	0462-201-16141	12124582	C1-5/C6-A	MPU +	TWIST
5	C1	6	C6	B	WHITE	16	GXL	0462-201-16141	12124582	C1-6/C6-B	MPU -	
6	C1	7	W6	-	WHITE	16	GXL	0462-201-16141	31203	C1-7/FSO	FSO	
7	C1	8	W7	-	WHITE	16	GXL	0462-201-16141	31203	C1-8/OPS	OPG	
8	C1	9	W8	-	WHITE	16	GXL	0462-201-16141	31203	C1-9/WTS	WTG	
9	C1	19	C5	2	WHITE	18	GXL	0462-201-16141	0462-201-16141	C1-19/C5-2	SW3	
10	C1	11	C5	1	WHITE	18	GXL	0462-201-16141	0462-201-16141	C1-11/C5-1	SW2	
11	C1	13	SPL F	-	RED	14	GXL	0462-209-16141	-	C1-13/SPL F	CRANK 1	
11A	C7	13	SPL F	-	RED	16	GXL	0462-201-16141	-	C7-13/SPL F	CRANK 1A	
11B	C7	11	SPL F	-	RED	16	GXL	0462-201-16141	-	C7-11/SPL F	CRANK 1B	
12	C1	12	SPL G	-	RED	14	GXL	0462-209-16141	-	C1-12/SPL G	CRANK 2	
12A	C7	4	SPL G	-	RED	16	GXL	0462-201-16141	-	C7-4/SPL G	CRANK 2B	
12B	C7	9	SPL G	-	RED	16	GXL	0462-201-16141	-	C7-9/SPL G	CRANK 2A	
13	C1	15	C2	1	RED	14	GXL	0462-209-16141	0460-215-16141	C1-15/C2-2	RW SOL +	
15	W15	-	C7	1	RED	8	GXL	33002	0462-203-08141	W19/C7-1	ALT B+	
16	W6	-	SPL A	-	BLACK	6	GXL	34004	-	W4/SPL A	GND	
18	SPL A	-	SPL E	-	BLACK	14	GXL	-	-	SPL A/SPL E	CRANK GND	
18A	C7	3	SPL E	-	BLACK	16	GXL	0462-201-16141	-	C7-3/SPL E	CRANK 2B GND	
18B	C7	5	SPL E	-	BLACK	16	GXL	0462-201-16141	-	C7-5/SPL E	CRANK 2A GND	
18C	C7	10	SPL E	-	BLACK	16	GXL	0462-201-16141	-	C7-10/SPL E	CRANK 1B GND	
18D	C7	12	SPL E	-	BLACK	16	GXL	0462-201-16141	-	C7-12/SPL E	CRANK 1A GND	
19	C1	10	C5	7	WHITE	18	GXL	0462-201-16141	0462-201-16141	C1-10/C5-7	SW1	
20	C2	2	SPL A	-	BLACK	14	GXL	0460-215-16141	-	C2-2/SPL A	RW SOL-	
21	C1	14	C7	2	WHITE	16	GXL	0462-201-16141	0462-201-16141	C1-14/C7-2	EXCITE	
22	C1	21	C5	4	WHITE/BLUE	22	BELDEN 3105A	0462-201-16141	0462-201-16141	C1-21/C5-4	RS485 A	
23	C1	22	C5	5	BLUE/WHITE	22		0462-201-16141	0462-201-16141	C1-22/C5-5	RS485 B	
24	C1	16	C5	6	SHIELD	22		0462-201-16141	0462-201-16141	C1-16/C5-6	RS485 SHLD	
29	SPL C	-	C7	6	RED	12	GXL	-	1062-12-0222	SPL C/C7-6	BATT A	
30	SPL D	-	C7	7	RED	12	GXL	-	1062-12-0222	SPL D/C7-7	BATT B	
31	SPL C	-	C5	8	RED	16	GXL	-	0462-201-16141	SPL C/C5-8	DPEM BA+	
34	SPL A	-	C5	10	BLACK	16	GXL	-	0462-201-16141	SPL A/C5-10	DPEM GROUND	
36	SPL D	-	C5	9	RED	16	GXL	-	0462-201-16141	SPL D/C5-9	DPEM BB+	
37	SPL A	-	SPL B	-	BLACK	14	GXL	-	-	SPL A/SPL B	GND	

DIMENSIONS ARE IN: INCHES
[ ] ARE IN:
DIMENSION TOLERANCES
X.X: ±0.090IN OR 2.3mm
X.XX: ±0.030IN OR 0.76mm
X.XXX: ±0.015IN OR 0.381mm
ANGULAR TOLERANCE: ±1°

DO NOT SCALE PRINT

SCALE 1.00

CMI DATA CLASSIFICATION
Cummins Confidential
DWN LA522
CKD HV937
APVD HV937
DATE 29FEB19

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009

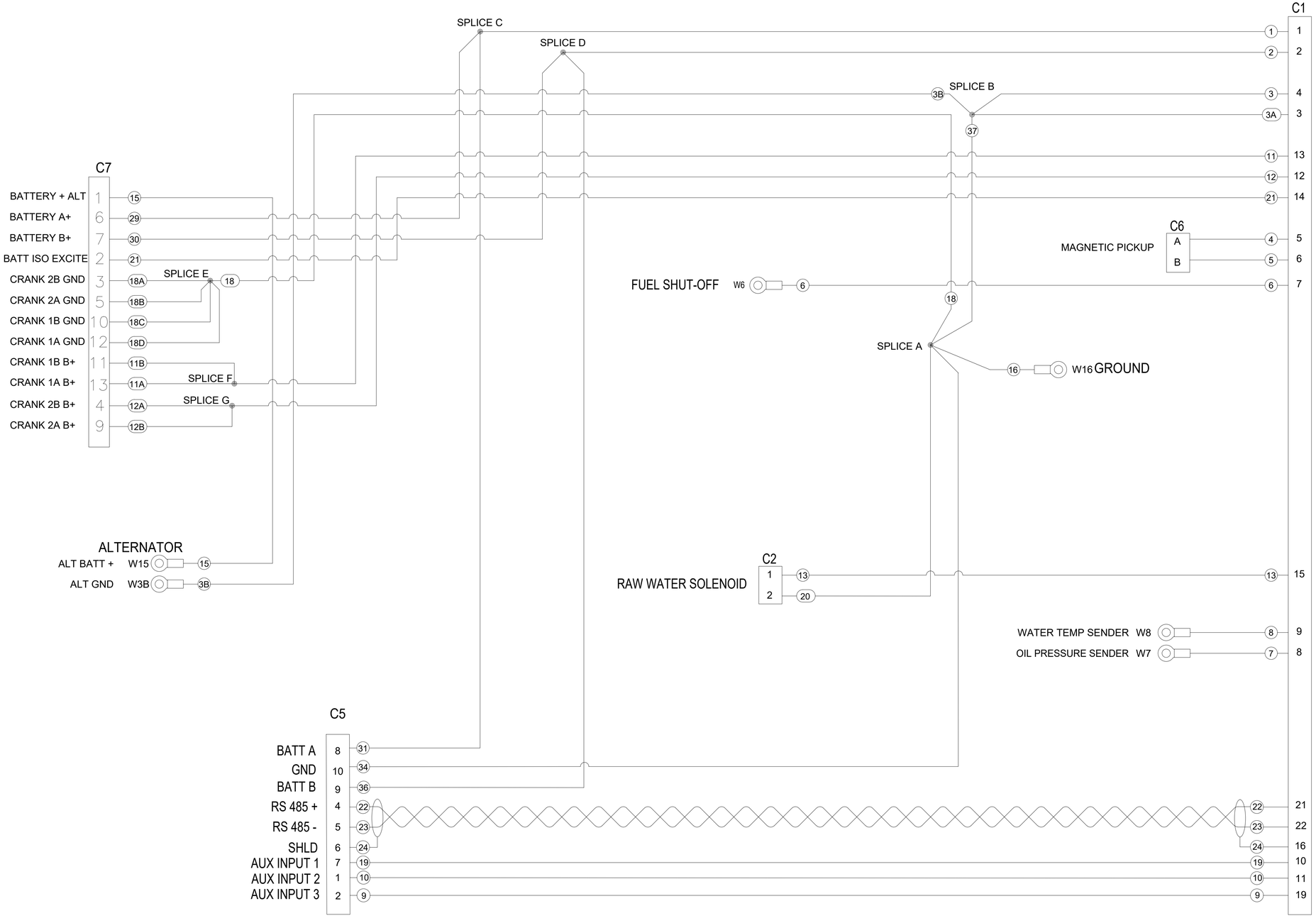
MUST CONFORM TO CES 10903

Cummins Inc.

ITEM NAME
HARNESS,ENGINE INTERFACE
QSK50 FPDP LEFT CONN'S

DWG SIZE D
ITEM NUMBER A059J726
ACAD SHEET 2 OF 3

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
–	2019-097	RELEASED TO PRODUCTION	LA522	HV937	HV937	28FEB19
–	–	–	–	–	–	–



DIMENSIONS ARE IN: INCHES [ ] ARE IN: .	DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential	**Cummins Inc.**
DIMENSION TOLERANCES X.X: ±0.090IN OR 2.3mm X.XX: ±0.030IN OR 0.76mm X.XXX: ±0.015IN OR 0.381mm ANGULAR TOLERANCE: ±1°	SCALE 1.00	DWN LA522 CKD HV937 APVD HV937 DATE 29FEB19	ITEM NAME HARNESS,ENGINE INTERFACE QSK50 FPDP LEFT CONN'S
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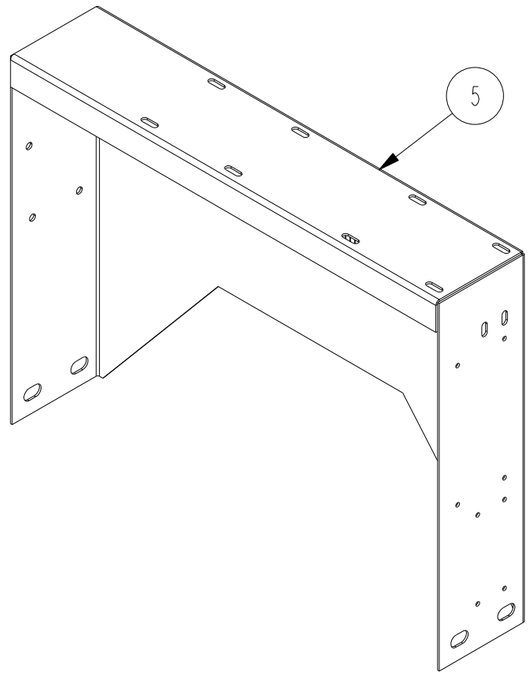
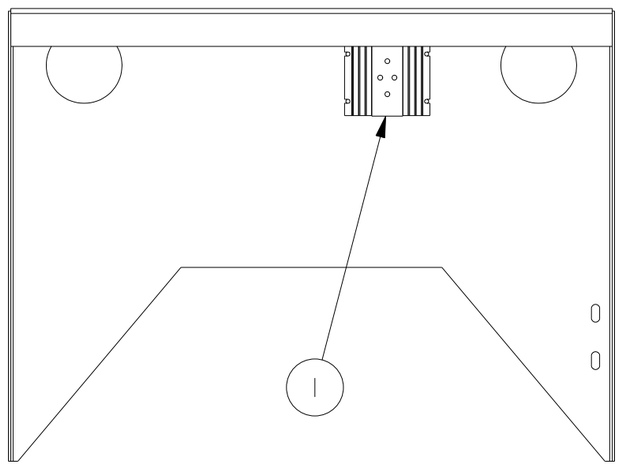
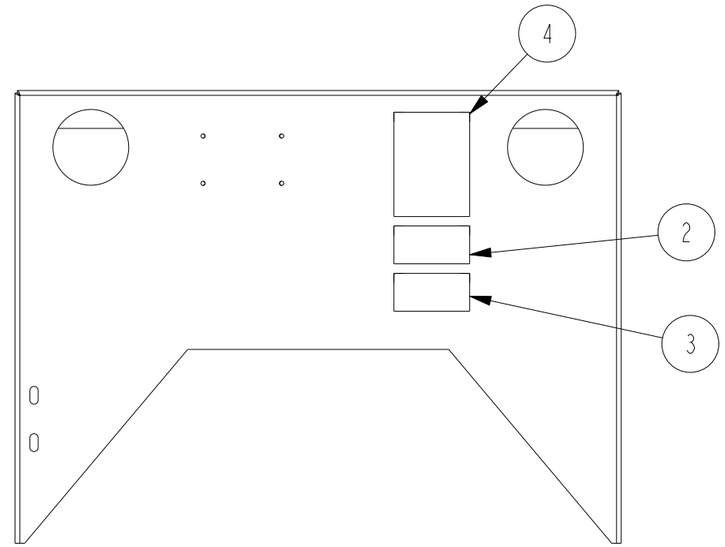
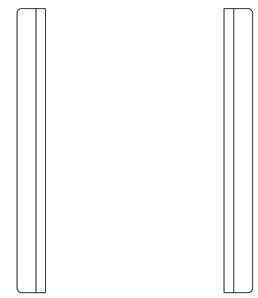
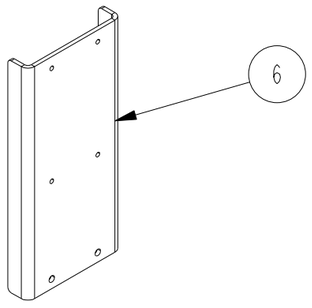
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	BATTERY ISOLATOR, FIRE PUMP	8838
2	1	FACTORY SETTINGS TAG, FIREPUMP	9526-02
3	1	FIELD SETTINGS TAG, FIREPUMP	9526-03
4	1	DATA TAG, FIREPUMP	9534
5	1	BRACKET, MOUNTING, OPERATORS STATION, CFP30E FIREPUMP	13543
6	1	BRACKET, ENCLOSURE	A042J919











REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES: 125

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

Cummins Fire Power

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

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

ASSEMBLY, ACCESSORY MOUNTING CFP30E

DWG UNITS: IN/LB/S

DRAWN BY: PBS

DATE: 09FEB2017

PRO-ENGINEER

INIT ECO: 2017-333

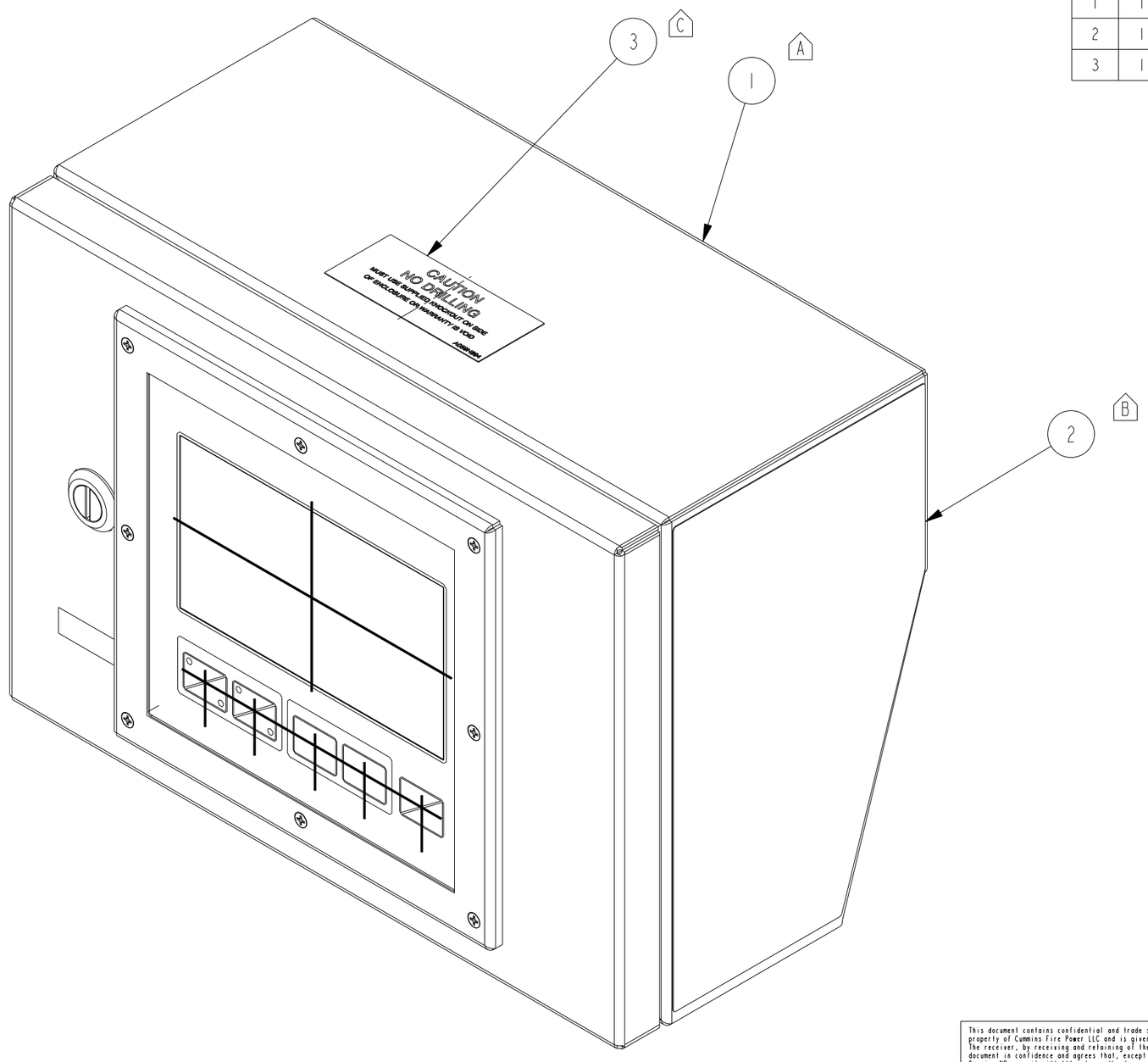
SCALE: 0.125

EST WEIGHT: 55.639

SHEET 1 OF 1

DRAWING NO: A042J920

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ASSEMBLY, DIGITAL CONTROL PANEL, MECHANICAL CFP ENGINES	A042G184
2	1	DECAL, MANUAL START/STOP, MECHANICAL (AUTOCAD CONTROLLED)	A042K215
3	1	DECAL, NO DRILL	A059H894



UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

MACHINED SURFACES 125

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

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
C	2018-282	ADD A059H894	HE392	14MAY18
B	2017-245	DELETE A042A317, ADD A042K215	PBS	21APR2017
A	2017-057	UPDATE PER A042G184	PBS	01FEB2017

Cummins Fire Power

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

CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

CONTROL ASSEMBLY
FPDP, MECHANICAL CARBON STEEL

DWG UNITS: IN/LB/S

DRAWN BY: PBS

PRO-ENGINEER

DATE: 27SEP2016

INIT ECO: 2016-668

SCALE: 0.500

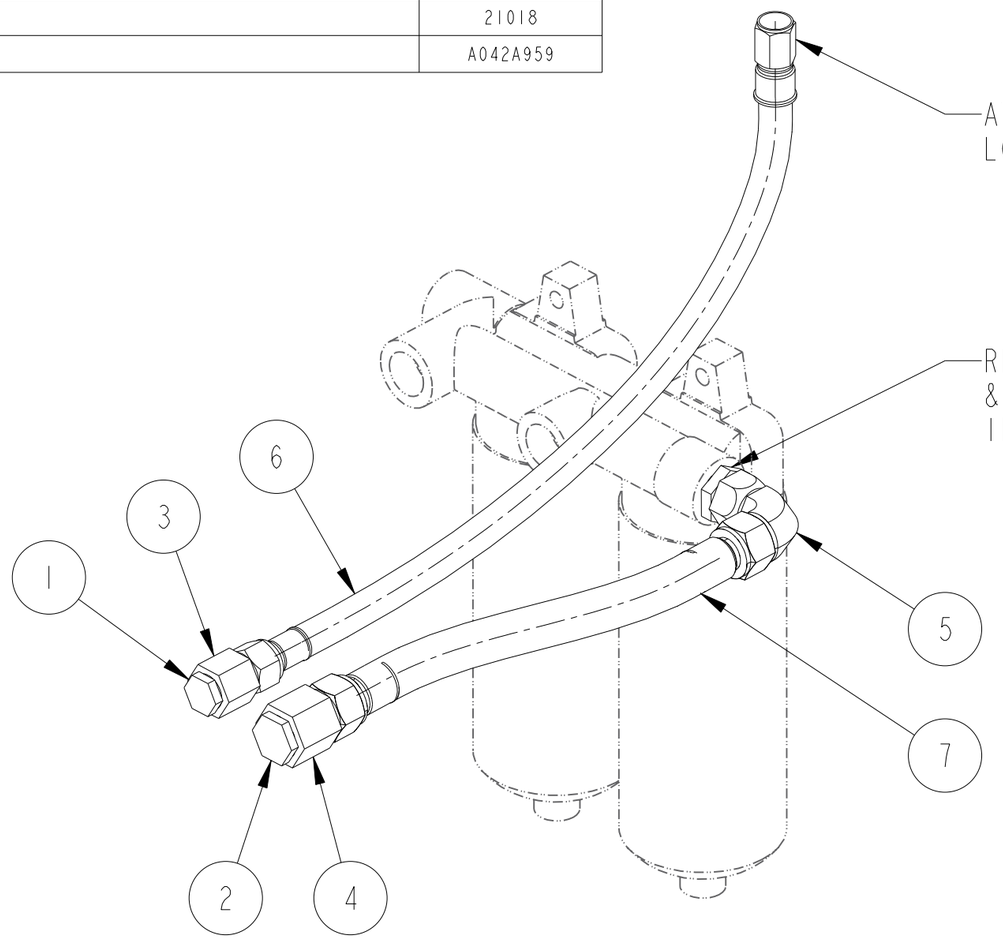
EST WEIGHT: 0.000

SHEET 1 OF 1

DRAWING NO: A042H778

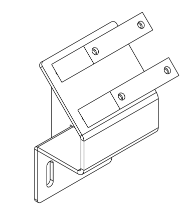
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	PLUG,PIPE; EXT HEX -12 NPT,STEEL	12210-12
2	1	PLUG,PIPE; EXT HEX -16 NPT,STEEL	12210-16
3	1	CONNECTOR,FEMALE; -12 JIC X -12 FNPT,STEEL	12240-12-12
4	1	CONNECTOR,FEMALE; -16 JIC X -16 FNPT,STEEL	12240-16-16
5	1	ELBOW,PLAIN UNION; 90DEG -16 JIC X -16 FJIC,S	12265-16-16
6	1	HOSE, FUEL; -	21018
7	1	HOSE, FUEL	A042A959

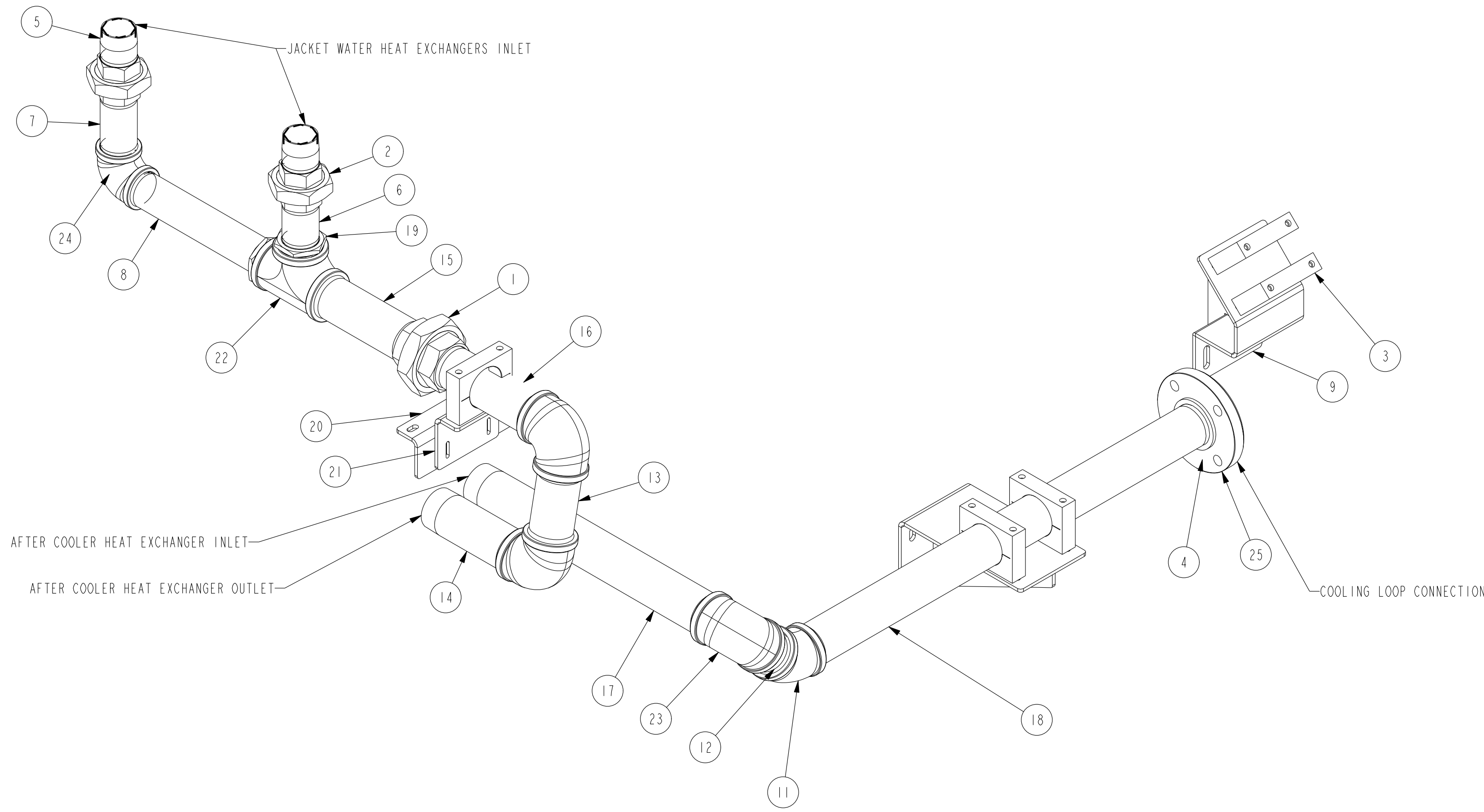
REV	REL NO	REVISION	DWN	CKD	APVD	DATE
-	2019-064	RELEASED TO PRODUCTION	NO134	MS707	MS707	15MAR19
1	2019-342	ADDED NOTE	NO134	MS707	MS707	11SEP19



DIMENSIONS ARE IN: INCHES [ ] ARE IN: .	DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential		Cummins Inc.
DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm X.X: ± .1 IN OR 0.7 mm X.XX: ± .030 IN OR 0.25 mm X.XXX: ± .010 IN OR 0.075 mm ANGULAR TOLERANCE: ± 1°	SCALE .250	DWN NO134 CKD MS707 APVD MS707 DATE 15MAR2019		ITEM NAME ASM, FUEL SYSTEM CFP50, W/O FUEL TANK
		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	MUST CONFORM TO CES 10903	DWG SIZE B | CAD SHEET 1 OF 1 | ITEM NUMBER A059J635 | REV 1

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	UNION, 2-1/2" NPT, McMASTER-CARR: 44605K910	A042G825
2	2	UNION, 2" NPT, McMASTER-CARR: 44605K199	A042G831
3	7	CLAMP, PIPE, 2-1/2", PLASTIC	16438
4	1	GASKET, 2-1/2" PIPE X 0.12 THICK, SEA WATER COMPATIBLE	16488
5	2	NIPPLE,2 INCH PIPE, 3.00 IN LONG	17853-0300
6	1	NIPPLE,2 INCH PIPE, 4.38 IN LONG	17853_0438
7	1	NIPPLE,2 INCH PIPE, 5.44 IN LONG	17853_0544
8	1	NIPPLE,2 INCH PIPE, 12.44 IN LONG	17853_1244
9	2	BRACKET, MTG, COOLING LOOP, CFP50	17924
10	1	BRACKET, JW TUBE BRACE, CFP50	17925
11	1	ELBOW,45 DEG, 2-1/2 NPT FEMALE	24925
12	1	NIPPLE,2-1/2" NPT PIPE, 3.06" LONG	26970_0306
13	1	NIPPLE,2-1/2" NPT PIPE, 6.44" LONG	26970_0644
14	1	NIPPLE,2-1/2" NPT PIPE, 8.00" LONG	26970_0800
15	1	NIPPLE,2-1/2" NPT PIPE, 9.19" LONG	26970_0919
16	1	NIPPLE,2-1/2" NPT PIPE, 9.50" LONG	26970_0950
17	1	NIPPLE,2-1/2" NPT PIPE, 21.75" LONG	26970_2175
18	1	NIPPLE,2-1/2" NPT PIPE, 36.75" LONG	26970_3675
19	2	BUSHING,REDUCER, 2-1/2" TO 2" NPT	A042C726
20	1	BRACKET, PIPING, CFP50	A042G138
21	1	BRACKET, PIPING, CFP50	A042G148
22	1	TEE, 2-1/2" NPT, STEEL, McMASTER-CARR: 44605K510	A042G832
23	3	ELBOW, 2-1/2" NPT, 90 DEGREE, McMASTER-CARR: 44605K110	A042G833
24	1	ELBOW, 2" NPT, 90 DEGREE, McMASTER-CARR: 44605K119	A042G834
25	1	FLANGE, 2-1/2" NPT, STEEL, McMASTER-CARR: 68095K126	A042G836





NOTE:
1. APPLY THREAD SEALANT TO ALL THREADED CONNECTIONS
2. COAT BLACK IRON PIPING AFTER ASSEMBLY PER ES044 RAL 3001

Cummins Fire Power

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CUSTOM DESIGN
AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

MISCELLANEOUS PIPING, CFP50
WITH FRAME, RAW WATER

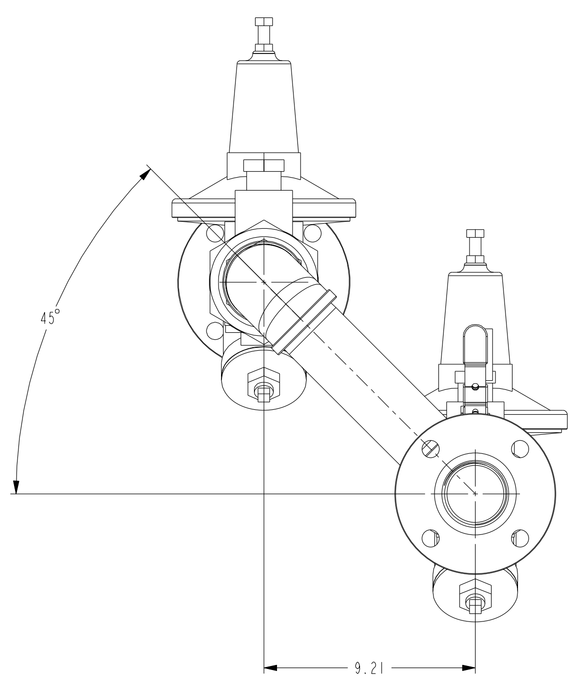
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

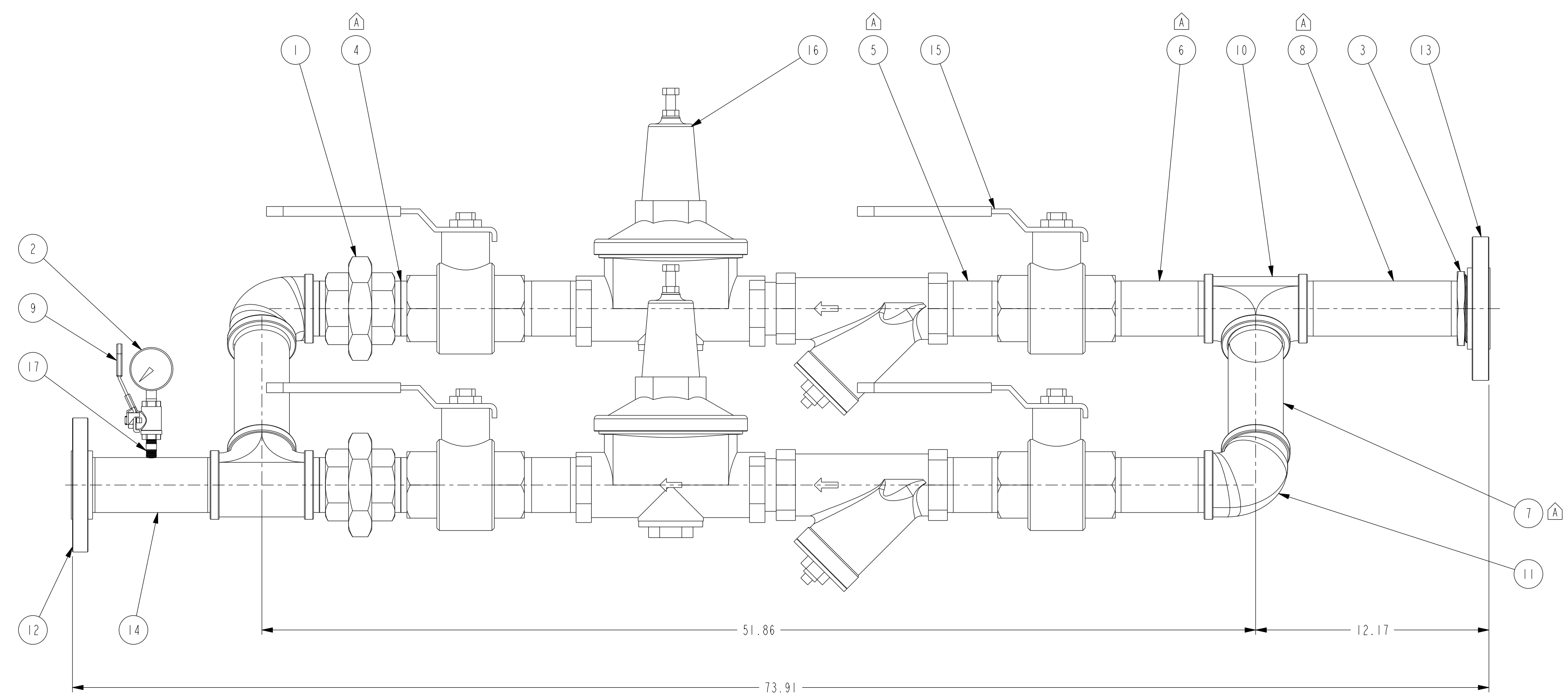
ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	125	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
		FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
		FAB TOLERANCES .XX = ± 0.060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

DWG UNITS: IN/LB/S	DRAWN BY: PBS	DATE: 15FEB2017
	PRO-ENGINEER	INIT ECO: 2017-070
SCALE: 0.190	SHEET 1 OF 1	DRAWING NO: A042J936
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

ITEM	QTY	DESCRIPTION	PART NUMBER
BILL OF MATERIAL			
1	2	UNION, 2-1/2" NPT, McMASTER-CARR: 44605K910	A042G825
2	1	GAUGE, PRESSURE, 1/4" NPT, DPG1-2 1/2, 0-100 PSI, (WATTS)	8892
3	1	BUSHING, 3" TO 2 1/2", McMASTER-CARR: 44605K413	17189
4	4	NIPPLE,2-1/2" NPT PIPE, 2.50" LONG	26970_0250
5	4	NIPPLE,2-1/2" NPT PIPE, 4.50" LONG	26970_0450
6	2	NIPPLE,2-1/2" NPT PIPE, 6.50" LONG	26970_0650
7	2	NIPPLE,2-1/2" NPT PIPE, 9.50" LONG	26970_0950
8	1	NIPPLE,2-1/2" NPT PIPE, 9.69" LONG	26970_0969
9	1	VALVE, BALL, 1/4" NPT FEMALE	A042D838
10	2	TEE, 2-1/2" NPT, STEEL, McMASTER-CARR: 44605K510	A042G832
11	2	ELBOW, 2-1/2" NPT, 90 DEGREE, McMASTER-CARR: 44605K110	A042G833
12	1	FLANGE, 2-1/2" NPT, STEEL, McMASTER-CARR: 68095K126	A042G836
13	1	FLANGE, 3" NPT, STEEL, McMASTER-CARR: 68095K127	A042G837
14	1	NIPPLE, 2-1/2" X 8", BLACK IRON, WITH PORT	A042G838
15	4	VALVE, 2-1/2" NPT, BALL, RAW WATER	A042G844
16	2	PRESSURE REDUCING REGULATOR, AND STRAINER, 2-1/2" NPT	A042G866
17	1	NIPPLE, 1/4" NPT x 1 1/2", BLK STEEL	LTL-CPN14112





NOTES:
1. REMOVE ALL SHARP EDGES PRIOR TO COATING
2. LEAK TEST TO 60PSI AND PRESET REGULATORS TO 60PSI
3. FINISH: COAT PER CUMMINS SPEC ES044 RAL 3001

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875 LAWRENCE DRIVE
DEPERE, WISCONSIN

COOLING LOOP, 2-1/2", VERT
RAW WATER

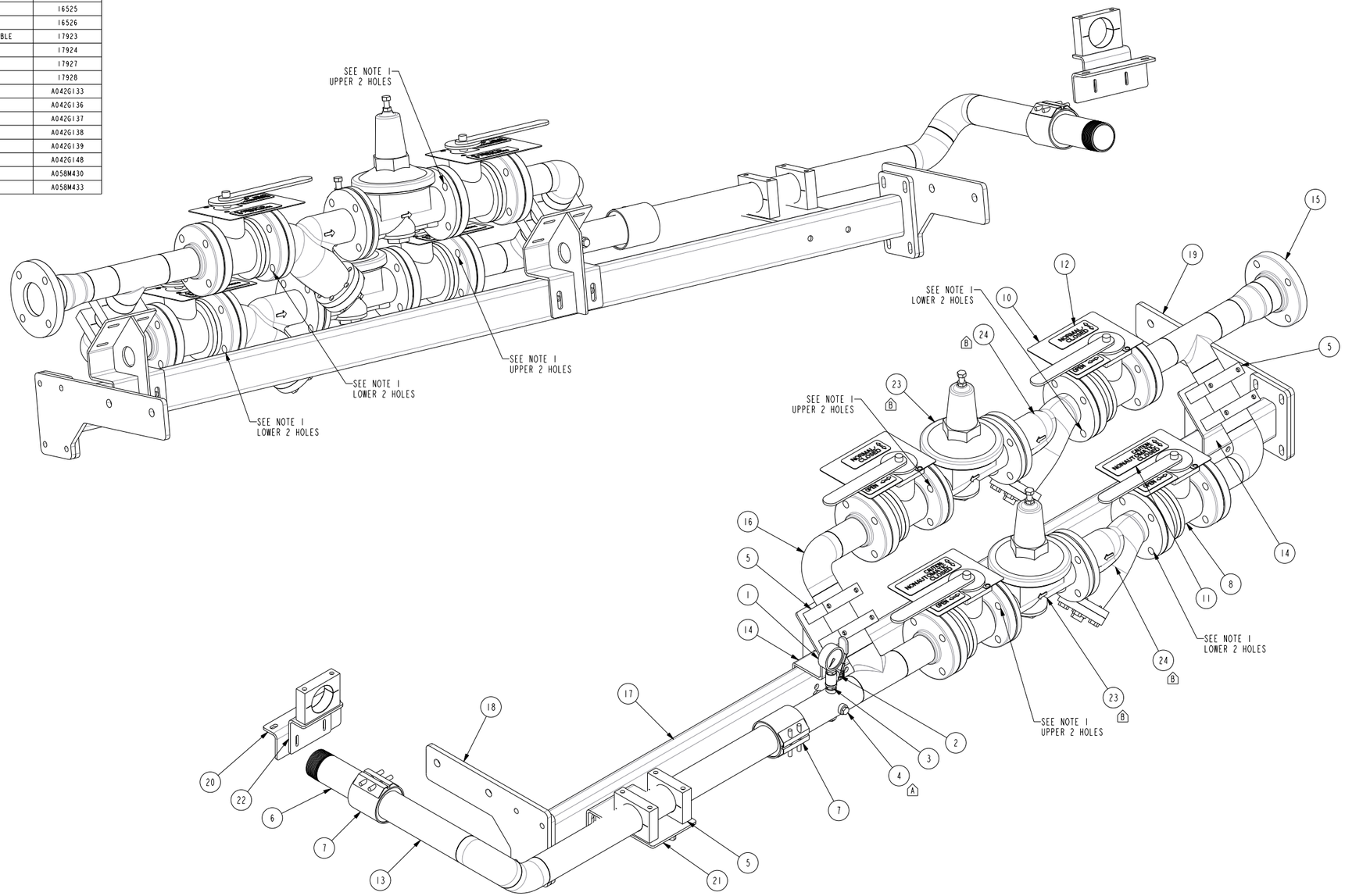
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | MACHINED SURFACES 125 | IMPERIAL UNITS: MACHINE TOLERANCES .XX = ± 0.010, .XXX = ± 0.005; FORM TOLERANCES .XX = ± 0.030, .XXX = ± 0.015; FAB TOLERANCES .XX = ± 0.060, .XXX = ± 0.030 | METRIC UNITS: MACHINE TOLERANCES .X = ± 0.4, .XX = ± 0.2; FORM TOLERANCES .X = ± 0.8, .XX = ± 0.4; FAB TOLERANCES .X = ± 1.5, .XX = ± 0.8
THIRD ANGLE PROJECTION

DWG UNITS: IN/LB/S	DRAWN BY: PBS		DATE: 04MAY2016
	PRO-ENGINEER		INIT ECO: 2016-332
SCALE: 0.250	SHEET 1 OF 1		DRAWING NO: A042G835
EST WEIGHT:			

REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE
A	2016-373	REPLACED A042E424_0250/0450/0650/0950/0969 W/ 26970_0250/0450/0650/0950/0969	KMS	20MAY2016

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER (A)(B)
1	1	GAUGE, 0-100 PSI; 1/4" NPT STN STL	13113
2	1	VALVE, BALL, 1/4" NPT,; APOLLO 77-100 (MARINE)	15759-04
3	1	NIPPLE, NAVAL BRONZE, 1/4" X CLOSE	15760
4	3	PLUG, NAVAL BRONZE, NPT; 1/4"	15793-4
5	7	CLAMP, PIPE, 2-1/2", PLASTIC	16438
6	1	HALF NIPPLE, 2-1/2" X 8", COPPER NICKEL	16482
7	2	COUPLING, CLAMP TYPE; 2-1/2" NPT	16484-40
8	4	BALL VALVE, FLANGED, 2-1/2"; SEA WATER COMPATABLE	16487
9	10	GASKET, 2-1/2" PIPE X 0.12 THICK; SEA WATER COMPATIBLE	16488
10	4	PLATE, VALVE LABEL; FLANGED BALL VALVE	16524
11	2	DECAL, VALVE LABEL; OPEN - NON-AUTOMATIC CLOSED	16525
12	2	DECAL, VALVE LABEL; EMERGENCY OPEN - NORMALY CLOSED	16526
13	1	WELDMENT, 2-1/2" PIPE, OFFSET 90 DEGREE; SEA WATER COMPATABLE	17923
14	2	BRACKET, MTG, COOLING LOOP; CFP50	17924
15	1	WELDMENT, COOLING LOOP INFEED; SEA WATER COMPATABLE	17927
16	1	WELDMENT, COOLING LOOP DISCHARGE; SEA WATER COMPATABLE	17928
17	1	BRACKET, COOLING LOOP; CFP50	A042G133
18	1	BRACKET, COOLING LOOP; CFP50	A042G136
19	1	BRACKET, COOLING LOOP; CFP50	A042G137
20	1	BRACKET, PIPING; CFP50	A042G138
21	1	BRACKET, PIPING; CFP50	A042G139
22	1	BRACKET, PIPING; CFP50	A042G148
23	2	VALVE,PRESSURE REGULATOR ; 2 1/2" FLANGED, SEA WATER	A058M430
24	2	STRAINER,WATER ; 2 1/2" FLANGED, SEA WATER	A058M433

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
-	2016-104	RELEASED TO PRODUCTION	HE392	-	-	05FEB16
A	2019-064	UPDATED DRAWING FORMAT & A042G142 ITEM NAME; ADDED 15793-4 QTY(2)	NO134	MS707	MS707	21MAR19
B	2019-243	A058M430 & A058M433 REPLACED 16489; ADDED NOTES	RE123	MS707	MS707	12JUN19



(B)
NOTE:
1. USE 3/4" STAINLESS STEEL THREADED STOCK 3 1/2" LONG IN THE FOLLOWING LOCATIONS DUE TO INTERFERENCE ISSUES. TOTAL OF 8 LOCATIONS

DIMENSIONS ARE IN: INCHES [ ] ARE IN: .	DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential	Cummins Inc.	
DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm .X: ± .1 IN OR 0.7 mm .XX: ± .030 IN OR 0.25 mm .XXX: ± .010 IN OR 0.025 mm ANGULAR TOLERANCE: ± 1°	SCALE 0.190	DWN HE392	ITEM NAME	
		CKD -	ASM, COOLING SYSTEM	
		APVD -	CFP50, COOLING LOOP, SEA WATER	
		DATE 05FEB2016		
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FPDP GEN II
CS P/N A042G184
SS P/N A042G186
TERMINAL BLOCK LEGEND
TB1 AUTO/MANUAL
TB2 CRANK TERMINATION SWITCH
TB3 OVERSPEED SWITCH
TB4 LOW LUBRICANT PRESSURE SWITCH
TB5 HIGH ENGINE TEMPERATURE SWITCH
TB6 BATTERY 1 POSITIVE
TB8 BATTERY 2 POSITIVE
TB9 MAIN BATTERY CONTACT 1 COIL
TB10 MAIN BATTERY CONTACT 2 COIL
TB11 COMMON BATTERY 1 AND 2 NEGATIVE
TB301 ELECTRONIC CONTROL MODULE SWITCH
TB302 FUEL INJECTION MALFUNCTION
TB303 ELECTRONIC CONTROL MODULE WARNING
TB304 ELECTRONIC CONTROL MODULE FAILURE
TB310 RAW WATER HIGH INLET TEMPERATURE
TB311 CLOGGED RAW WATER COOLANT LOOP STRAINER
TB312 LOW ENGINE TEMPERATURE SWITCH
TO PUMP CONTROLLER
P/N A042G196
POWER BOARD
P/N A042B041/42
TO OVERLAY
TO LCD TOUCHSCREEN
USB
TO LCD
40 PIN FLEX CABLE
P/N A042G198
P/N A042G195
DISPLAY BOARD
P/N A042G197
A059J726/A059J636
DPEM
BATTERY ISOLATOR
ALT
STARTER1
STARTER2
BAT 1A
BAT 1B
BAT 2A
BAT 2B
KEY / FSO OVERRIDE SWITCH
ENGINE STOP
ECM OVERRIDE SWITCH
COOLING LOOP RAW WATER SOLENOID
MAG PICK-UP
GROUND
FUEL SHUT-OFF
OIL PRESSURE SENDER
WATER TEMPERATURE SENDER

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
B	2019-097	CORRECTED ENGINE INTERFACE HARNESS P/N, REMOVED REMOVED COOLING LOOP SENSORS	JF	28FEB2019
A	2019-037	ADDED TB LEGEND CORRECTED OSS SWITCH TO B+	JF	24JAN2019

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

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

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CUSTOM DESIGN AND
UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SCHEMATICS, OVERALL, CFP50 FPDP GEN II

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

DATE: 22 NOV 2016

AUTO CAD

INIT ECO: 2016-694

SCALE:

EST WEIGHT:

SHEET 1 OF 2

DRAWING NO: A042J128

DPEM OPTION

WIRE HARNESS

C1

BATTERY A 8
BATTERY B 9
GROUND 10

RS485 SHIELD 6
RS485 + 4
RS485 - 5

CONNECTS TO DPEM CONNECTOR ON SHEET 1

P/N 18488

C2 J1

21 BATTERY A
23 BATTERY B
22 GROUND
24 GROUND

28
26
27

P/N 18487
POWER BOARD

JP1

13 D13 VBATT
14 D14
1
2

POWER LED 17

HEARTBEAT LED 8

JP8

3
1 U19(A)
2 U19(B)

R78

DROP A2
DROP A1
DROP A0

SW1

JP1

3 TEMPERATURE A 16 U1(PIN2)
5 TEMPERATURE B 17 U1(PIN3)
7 TEMPERATURE C 18 U1(PIN4)
4 PRESSURE A 5 U1(PIN21)
6 PRESSURE B 6 U1(PIN22)
8 PRESSURE C 7 U1(PIN23)
10 PRESSURE D 8 U1(PIN24)
12 PRESSURE E 9 U1(PIN25)
14 PRESSURE F 10 U1(PIN7)
9 SWITCH 1 19 D3 U5(P1) LED 3
11 SWITCH 2 20 D5 U5(P2) LED 4
13 SWITCH 3 21 D6 U5(P3) LED 5
15 SWITCH 4 22 D8 U5(P4) LED 6

JP3

+ 1
- 2

U8A U1(PIN5)

TYPE K THERMOCOUPLE
EXHAUST TEMPERATURE

+10V K14 LED 20 U15(P3)
+10V K13 LED 20 U15(P2)
+10V K12 LED 19 U15(P1)
+10V K11 LED 16 U15(P0)

U5(P0) ENERGIZE TO STOP INPUT
SWITCH 1 TB-13
SWITCH 2 TB-14
SWITCH 3 TB-15
SWITCH 4 TB-16
COMMON TB-17

+10V K18 LED 25 U15(P7)
+10V K17 LED 24 U15(P6)
+10V K16 LED 23 U15(P5)
+10V K15 LED 22 U15(P4)

TEMPERATURE A TB-18
TEMPERATURE B TB-19
TEMPERATURE C TB-20
EXHAUST TEMPERATURE TB-21
COMMON TB-22

+10V K6 LED 12 U9(P3)
+10V K5 LED 11 U9(P2)
+10V K4 LED 10 U9(P1)
+10V K3 LED 9 U9(P0)

PRESSURE A TB-23
PRESSURE B TB-24
PRESSURE C TB-25
PRESSURE D TB-26
COMMON TB-27

+10V K10 LED 16 U9(P7)
+10V K9 LED 15 U9(P6)
+10V K8 LED 14 U9(P5)
+10V K7 LED 13 U9(P4)

PRESSURE E TB-28
PRESSURE F TB-29
TB-30
TB-31
COMMON TB-32

DPEM
SS P/N 18485

CUSTOMER CONNECTIONS

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
B	2019-097	CORRECTED ENGINE INTERFACE HARNESS P/N, REMOVED REMOVED COOLING LOOP SENSORS	JF	28FEB2019
A	2019-037	ADDED TB LEGEND CORRECTED OSS SWITCH TO B+	JF	24JAN2019

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°
THIRD ANGLE PROJECTION

IMPERIAL UNITS
METRIC UNITS

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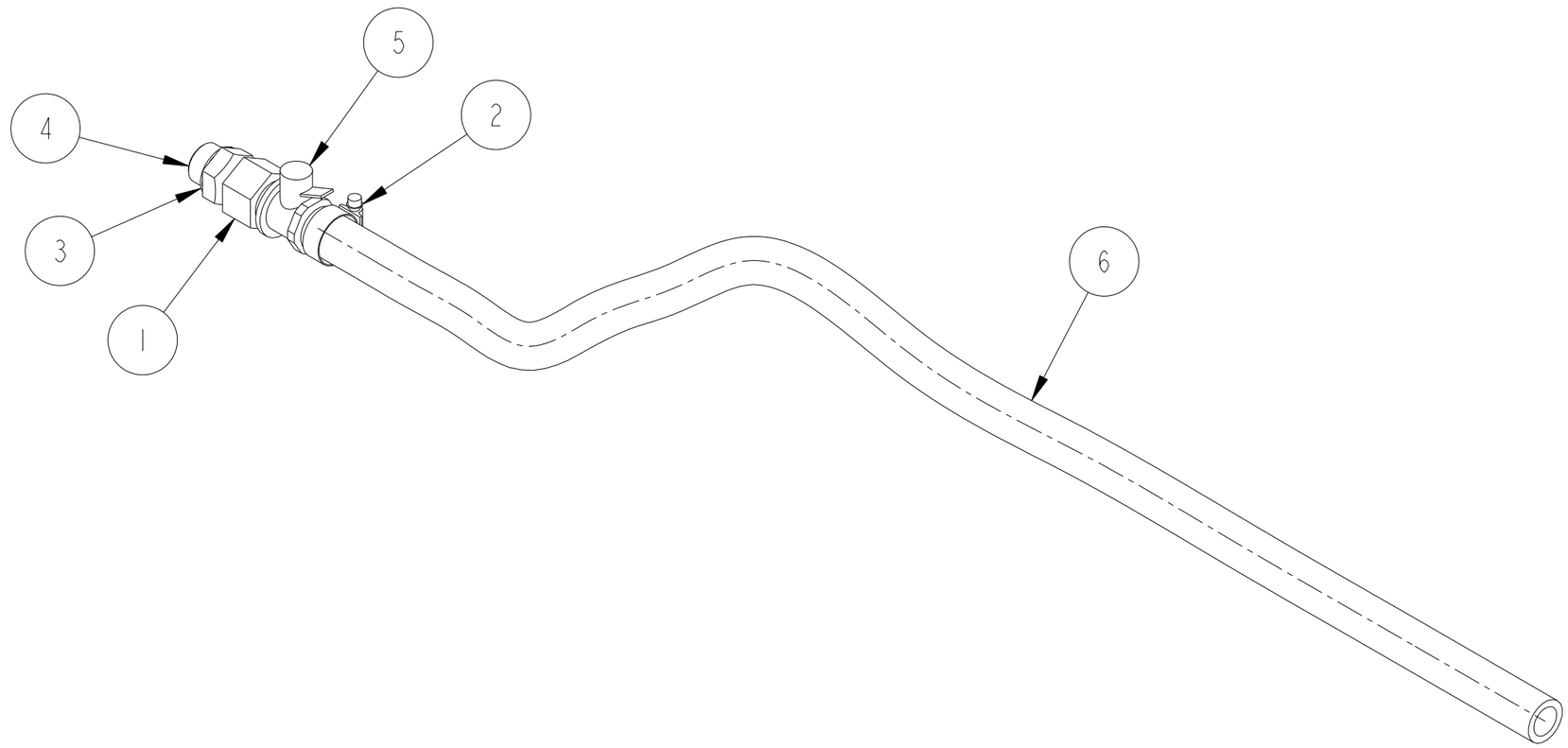
SCHEMATICS, OVERALL, CFP50
FPDP GEN II

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 22 NOV 2016
AUTO CAD
INIT ECO: 2016-694
SCALE:
EST WEIGHT:
SHEET 2 OF 2
DRAWING NO: A042J128

BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	ADAPTER,REDUCING PIPE; -12 FNPT X -8 NPT,BRASS	12526-12-8
2	1	CLAMP,HOSE; .69-1.25 WORM	14990-12
3	1	WASHER,PLAIN	67946
4	1	FTG,ST,ADAPTER 1.00-18 X 1/2 NPTF; _	123824
5	1	VALVE, OIL DRAIN; 3/4-14 NPT WITH NIPPLE	A042D567
6	1	HOSE,HEATER EPDM; 3/4"IDX36.00" LONG	A042F382

REV	REL NO	REVISION	DWN	CKD	APVD	DATE
0	2019-453	INITIAL RELEASE	NO134	MS707	MS707	15OCT19



DIMENSIONS ARE IN: INCHES [ ] ARE IN: .	DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential		Cummins Inc.	
DRAWING TOLERANCES UNLESS OTHERWISE SPECIFIED X: ± 1 IN OR 4 mm X.X: ± .1 IN OR 0.7 mm X.XX: ± .030 IN OR 0.25 mm X.XXX: ± .010 IN OR 0.075 mm ANGULAR TOLERANCE: ± 1°	SCALE .313	DWN NO134 CKD MS707 APVD MS707 DATE 15OCT2019		ITEM NAME ASM, OIL DRAIN CFP50	
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