

Installation, operation, and maintenance manual

Fire pump drive engine CFP59 series

Doc. A042J557 Rev. 1



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

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

Doc. A042G861 Rev. 2

www.cummins.com

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: <u>US & Canada: 3381321</u> International: 3381322.



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



Cummins Sales and Service 875 Lawrence Drive DePere, Wisconsin 54115

www.cummins.com

Doc. A042G861 Rev. 2

This page is intentionally left blank.

Table of Contents

1 - Safety

.1 Introduction	1
.2 Use of advisory and cautionary statements	1
1.2.1 Advisory statements	1
1.2.2 Cautionary statements	
3 General safety precautions	2

2 - Description

2.1 Introduction
2.2 Fire pump drive engine nameplate
2.3 Fire pump controller
2.4 CFP59 components
2.5 Fire Pump Digital Panel (FPDP)
2.5.1 Engine STOP button
2.5.2 Customer access port
2.5.3 Diagnostics connector
2.5.4 Engine ECM power supply
2.5.5 Tachometer
2.5.6 Battery "A" and "B" voltmeters
2.5.7 SCREEN soft key
2.5.8 RESET/STOP switch
2.5.9 Crank battery A and B momentary start switches
2.5.10 Automatic or manual mode of operation selector switch and indicator lamps
2.5.11 MENU soft key
2.5.12 Hour meter
2.5.13 Engine oil pressure gauge
2.5.14 Coolant temperature gauge
2.6 FPDP informational displays
2.6.1 Overspeed warning indicator
2.6.2 DPEM fault screens (if applicable) 10
2.7 Digital panel expansion module (DPEM) (optional)
2.8 Fuel supply and drain
2.9 Air intake system
2.10 Cooling system
2.11 Engine oil system
2.12 Engine exhaust system
3 - Installation
3.1 Introduction

Introduction	1
Receiving and handling	7
Site preparation	7
Drive shaft installation	
Fuel supply installation	9
Cooling water supply installation	0
Battery installation	1
	Receiving and handling. 1 Site preparation. 1 Drive shaft installation. 1 Fuel supply installation 1 Cooling water supply installation. 2

3.8 Signal and control installation.	23
3.8.1 FPDP interface terminal strip	
3.8.2 Battery charger interface.	
3.9 Coolant system preparation	
3.10 Lubricating oil system preparation	
3.11 Pre-start inspections.	
3.12 Engine monitoring.	
3.13 Start-up validation.	
4 - Operation	
4.1 Introduction	31
4.2 Starting and stopping procedures.	
4.2.1 Local starting/stopping procedure.	
4.2.2 Emergency starting procedure	
4.3 Fire Pump Digital Panel (FPDP) screens and adjustments in automatic mode	
4.3.1 The SCREEN soft key	
4.3.2 The MENU soft key - Settings Menu.	
4.3.2.1 ENGINE SETUP screen	
4.3.2.2 OVERSPEED TEST screen	
4.3.2.3 IMPERIAL/SI VALUES screen	
4.3.2.4 ANALOG VALUES screen	
4.3.2.5 DPEM (optional)	
	43
5 - Maintenance	
5 - Maintenance	45
5.1 Introduction	
5.1 Introduction 5.2 Engine operation reports	45
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 	45 48
 5.1 Introduction. 5.2 Engine operation reports . 5.3 Weekly maintenance . 5.3.1 General . 	45 48 48
 5.1 Introduction. 5.2 Engine operation reports . 5.3 Weekly maintenance . 5.3.1 General . 5.3.2 Air cleaner filter and piping . 	45 48 48 48
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 	45 48 48 48 49
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 	45 48 48 49 50
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General. 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system. 	45 48 48 49 50 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system 5.3.6 Engine exhaust system 	45 48 48 49 50 51 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system 5.3.6 Engine exhaust system 5.3.7 Electrical supply and controls 	45 48 48 49 50 51 51 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system 5.3.6 Engine exhaust system 5.3.7 Electrical supply and controls 5.3.8 Crankcase ventilation hose 	45 48 48 49 50 51 51 51 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system 5.3.6 Engine exhaust system 5.3.7 Electrical supply and controls 	45 48 48 49 50 51 51 51 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system 5.3.6 Engine exhaust system 5.3.7 Electrical supply and controls 5.3.8 Crankcase ventilation hose 	45 48 48 49 50 51 51 51 51 51
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance . 5.3.1 General . 5.3.2 Air cleaner filter and piping . 5.3.3 Cooling system . 5.3.4 Engine oil system . 5.3.5 Fuel system . 5.3.6 Engine exhaust system . 5.3.7 Electrical supply and controls . 5.3.8 Crankcase ventilation hose . 5.3.9 Heat exchanger - cooling water strainers . 	45 48 48 49 50 51 51 51 51 52 52
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General. 5.3.2 Air cleaner filter and piping 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system. 5.3.6 Engine exhaust system. 5.3.7 Electrical supply and controls 5.3.8 Crankcase ventilation hose. 5.3.9 Heat exchanger - cooling water strainers 5.3.10 Batteries 	45 48 48 49 50 51 51 51 51 52 52 52 53
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General. 5.3.2 Air cleaner filter and piping. 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system. 5.3.6 Engine exhaust system. 5.3.7 Electrical supply and controls 5.3.8 Crankcase ventilation hose. 5.3.9 Heat exchanger - cooling water strainers 5.3.10 Batteries 5.3.11 Engine test run 	45 48 48 49 50 51 51 51 51 51 52 52 53 54
 5.1 Introduction. 5.2 Engine operation reports . 5.3 Weekly maintenance . 5.3.1 General . 5.3.2 Air cleaner filter and piping . 5.3.3 Cooling system . 5.3.4 Engine oil system . 5.3.5 Fuel system . 5.3.6 Engine exhaust system . 5.3.7 Electrical supply and controls . 5.3.8 Crankcase ventilation hose . 5.3.9 Heat exchanger - cooling water strainers . 5.3.10 Batteries . 5.3.12 Engine operation checks . 	45 48 48 49 50 51 51 51 51 51 52 52 52 53 54 54
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General. 5.3.2 Air cleaner filter and piping. 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system. 5.3.6 Engine exhaust system. 5.3.7 Electrical supply and controls 5.3.8 Crankcase ventilation hose. 5.3.9 Heat exchanger - cooling water strainers 5.3.10 Batteries 5.3.11 Engine test run 5.3.12 Engine operation checks. 5.3.12.1 Crank termination setpoint 	45 48 48 49 50 51 51 51 51 51 52 52 53 54 54 54
 5.1 Introduction. 5.2 Engine operation reports . 5.3 Weekly maintenance . 5.3.1 General . 5.3.2 Air cleaner filter and piping . 5.3.3 Cooling system . 5.3.4 Engine oil system . 5.3.5 Fuel system . 5.3.6 Engine exhaust system . 5.3.7 Electrical supply and controls . 5.3.8 Crankcase ventilation hose . 5.3.9 Heat exchanger - cooling water strainers . 5.3.10 Batteries . 5.3.11 Engine test run . 5.3.12 Engine operation checks . 5.3.12.1 Crank termination setpoint . 5.3.12.2 Engine speed adjustment . 	45 48 48 49 50 51 51 51 51 52 52 53 54 54 54 56
 5.1 Introduction. 5.2 Engine operation reports 5.3 Weekly maintenance 5.3.1 General. 5.3.2 Air cleaner filter and piping. 5.3.3 Cooling system 5.3.4 Engine oil system 5.3.5 Fuel system. 5.3.6 Engine exhaust system. 5.3.7 Electrical supply and controls. 5.3.8 Crankcase ventilation hose. 5.3.9 Heat exchanger - cooling water strainers. 5.3.10 Batteries. 5.3.11 Engine test run. 5.3.12 Engine operation checks. 5.3.12.1 Crank termination setpoint 5.3.12.2 Engine speed adjustment 5.3.13 Engine coolant heater. 	45 48 48 49 50 51 51 51 51 52 52 53 54 54 54 56 56

5.4.3 Engine supports575.4.4 Fuel pumps and filters585.4.5 Engine oil and filter595.4.6 Drive shaft615.4.7 Coolant pump/alternator belt625.4.8 Raw water zinc anode635.4.9 Heat exchanger pressure test635.4.10 Turbocharger64

Table of Contents

5.5 Every two years 5.5.1 Coolant pump 5.5.2 Cooling system - heat exchanger 5.6 Every four years 5.6.1 Coolant thermostat removal/installation 5.6.2 Coolant pump/alternator belt replacement	64 65 67 68
6 - Troubleshooting	
6.1 Introduction.	71
6.2 Engine Will Not Start	
6.3 Engine Cranks But Will Not Start	
6.4 Engine Starts But Continues to Crank	
6.5 Engine Will Not Stop.	76
6.6 Low Battery Voltage	77
7 - Component parts and assemblies	
7.1 Repairs and technical service.	79
7.2 Recommended spare parts inventory	
7.3 Ordering parts	
7.4 Engine data and torque values	
7.5 Cap screw markings and torque values	
7.5.1 Cap screw identification	
7.5.1.1 Metric cap screw identification and head markings.	
7.5.1.2 US customary cap screw identification and head markings	
7.5.2 Cap screw torque values	
7.6 Assembly drawings	ÖΟ

This page is intentionally left blank.

1 - Safety

1.1 Introduction

Cummins 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.

The fire pump drive engine has been carefully designed to provide safe and efficient service when properly installed, maintained, and operated. However, the overall safety and reliability of the complete system is dependent on many factors outside the control of the fire pump drive engine manufacturer. To avoid possible safety hazards, make all mechanical and electrical connections to the fire pump drive engine exactly as specified in this manual.

All systems external to the fire pump drive engine (fuel, electrical, etc.) must comply with all applicable codes. Make certain all required inspections and tests have been completed and all code requirements have been satisfied before certifying the installation is complete and ready for service. All personnel responsible for operation and maintenance of the equipment should read and thoroughly understand this manual.

SAVE THESE INSTRUCTIONS.

Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

1.2 Use of advisory and cautionary statements

1.2.1 Advisory statements

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

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

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

1.2.2 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:

This symbol warns of immediate hazards which will result in severe personal injury or death.

This symbol refers to a hazard or unsafe practice which CAN result in severe personal injury or death.

A CAUTION

Indicates the presence of a hazard or unsafe practice which can result in equipment damage OR minor or major personal injury.

1.3 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.

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.

- 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.

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 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 Authorized Repair Location.

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

A 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.

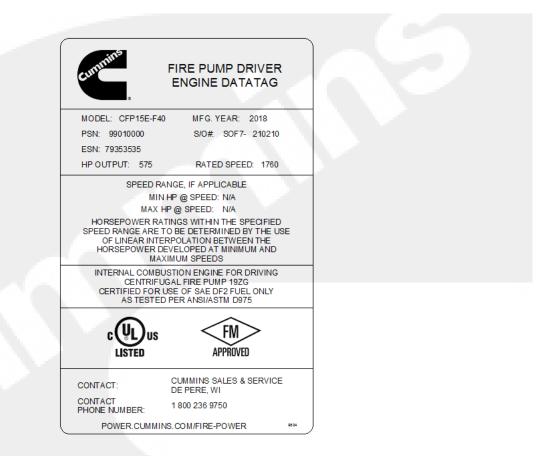


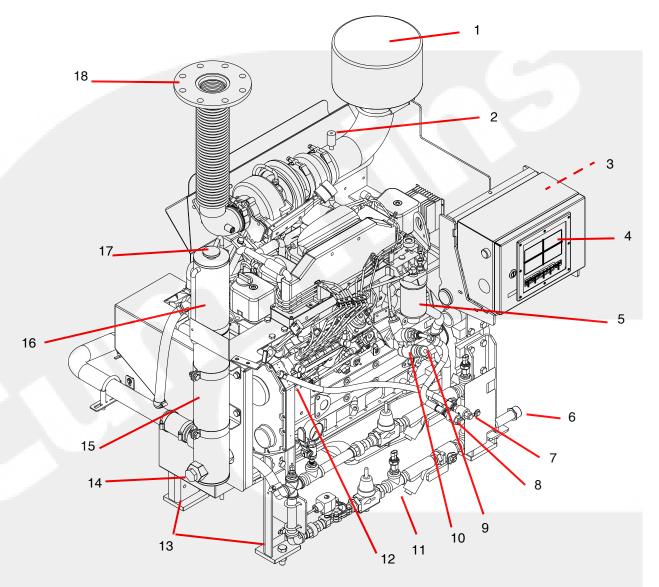
Figure 2-1 Fire pump drive engine nameplate (typical)

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.

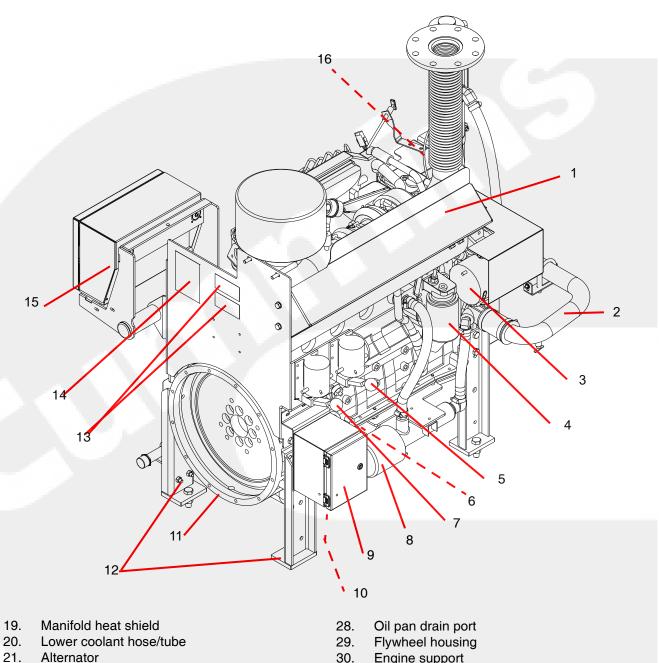
2.4 CFP59 components



- 1. Air cleaner assembly (intake)
- 2. Air cleaner service indicator
- 3. FPDP interface terminal strip terminal blocks (TBs)
- 4. FPDP
- 5. Primary fuel filter
- 6. Raw water inlet connection
- 7. Fuel return line
- 8. Fuel supply line
- 9. Engine oil fill port

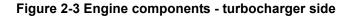
- 10. Engine oil dipstick
- 11. Cooling loop
- 12. Fuel pump
- 13. Engine support
- 14. Raw water discharge connection
- 15. Coolant heat exchanger
- 16. Coolant expansion tank
- 17. Coolant pressure/fill cap
- 18. Exhaust flex connection

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



- Alternator
- 22. Engine oil filter 23.
- Battery starter contactor B
- 24. Starter motor
- 25. Battery starter contactor A
- 26. Engine coolant heater
- 27. Battery charger interface

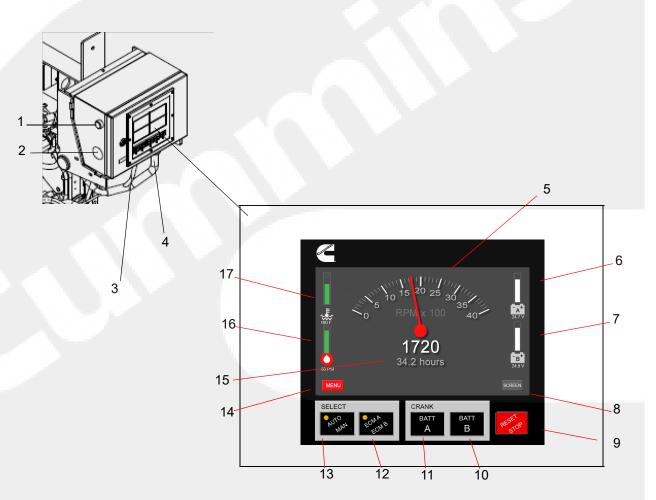
- 30. Engine support
- 31. Engine speed setting decals
- 32. Engine serial number decal
- 33. Manual start instruction decal
- 34. Upper coolant hose



2.5 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 fuel shut-off valve (FSO) 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
- 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

2.5.1 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.

2.5.2 Customer access port

The customer access knock-out (2) is located on the left side of the FPDP for ease of access. With an opening diameter of 1.38 in. (3.5 cm), this is the only 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.

2.5.3 Diagnostics connector

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

2.5.4 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.

2.5.5 Tachometer

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

2.5.6 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.

2.5.7 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.

2.5.8 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.

2.5.9 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.

2.5.10 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.

A WARNING

Manual operation of the fire pump drive engine is intended for a short run time. Leaving the FPDP in manual mode for an extended period may cause fuel dilution.

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.

2.5.11 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.

2.5.12 Hour meter

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

2.5.13 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.

2.5.14 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.

2.6 FPDP informational displays

2.6.1 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.



Figure 2-5 Overspeed warning indicator

2.6.2 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.

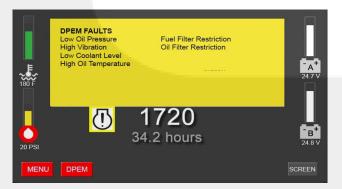


Figure 2-6 DPEM fault screen (sample)

 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.

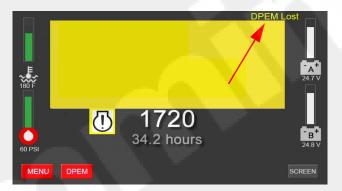


Figure 2-7 DPEM lost fault screen (sample)

2.7 Digital panel expansion module (DPEM) (optional)

The digital panel expansion module (DPEM) is an optional electronic device that works in conjunction with the FPDP to provide options for monitoring and alarming custom inputs. As shown in Figure 2-8, 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).



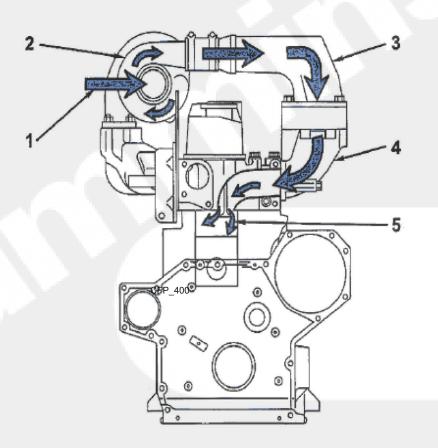
Figure 2-8 Digital programming expansion module (DPEM)

2.8 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.

2.9 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 after-cooler 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)

2.10 Cooling system

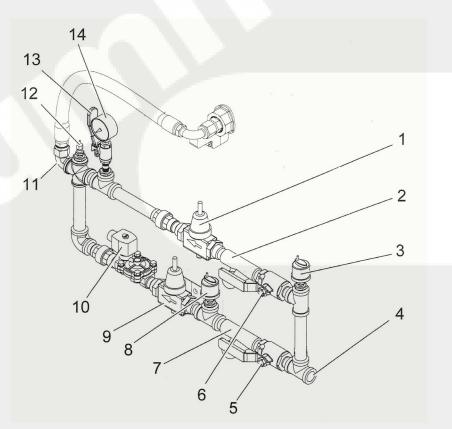
The following diagrams illustrate a typical cooling loop and the path of water through the engine cooling system. Water entering the cooling system through the cooling water inlet first circulates through the heat exchanger, cooling the compressed air from the turbocharger outlet ducting. Note that the charge air cooler (CAC) and fuel heat exchanger are not included in this engine model.

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

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

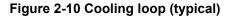
IMPORTANT: Do not operate without a pressure cap.

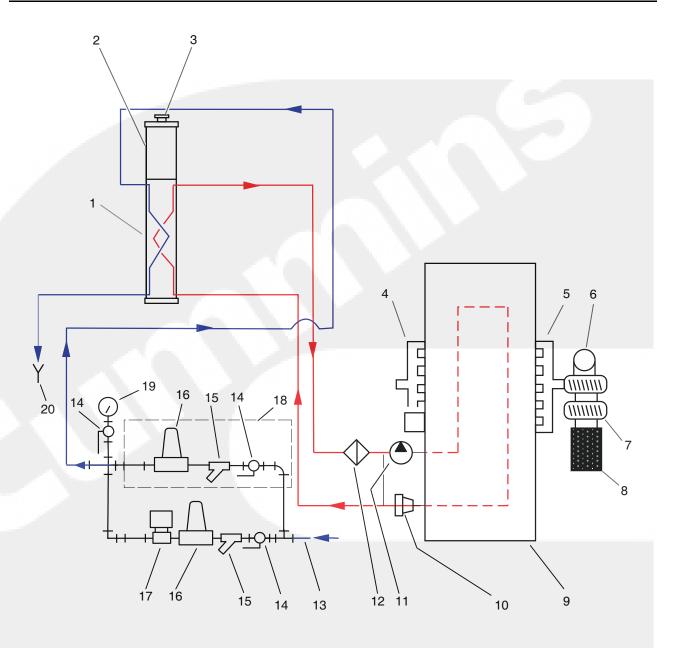
NOTE: When filling with coolant, allow air to bubble out after the initial fill and then add coolant to the maximum level again. Monitor the coolant level after running the engine to ensure that all of the air is out of the system and replace with coolant.



- 1. Bypass water pressure regulator
- 2. Bypass water strainer
- 3. Pre-strainer pressure sensor
- 4. Raw water inlet connection
- 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





- 1. Coolant heat exchanger
- 2. Coolant expansion tank
- 3. Coolant pressure/fill cap
- 4. Air intake manifold
- 5. Exhaust manifold
- 6. Exhaust flex connection
- 7. Turbocharger
- 8. Air filter
- 9. Engine block
- 10. Thermostat

- 11. Coolant pump
- 12. Coolant filter
- 13. Raw water inlet connection
- 14. Manual shut-off valve (3)
- 15. Raw water strainer (2)
- 16. Raw water pressure regulator (2)
- 17. Raw water solenoid valve (if required)
- 18. Raw water bypass piping
- 19. Raw water pressure gauge
- 20. Raw water discharge connection

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

2.11 Engine oil system

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 or Cummins QuickServe Online (QSOL) 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.

2.12 Engine exhaust system

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. Refer to the Cummins engine Operation and Maintenance Manual or Cummins QuickServe Online (QSOL) for additional information.

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.

A 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.

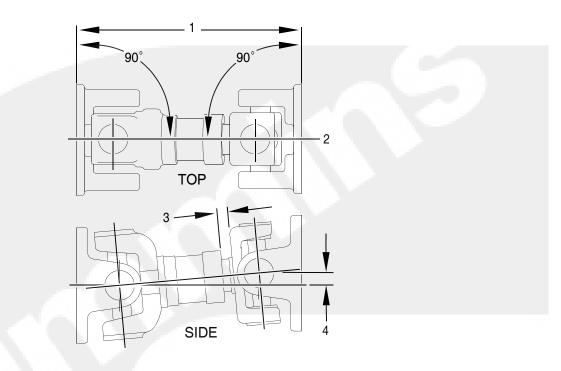
Follow these steps to install the drive shaft:

A 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 \pm .76 mm (.03 in).



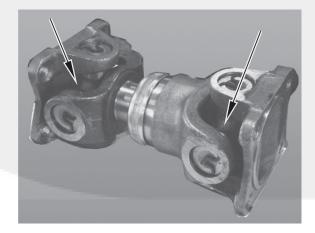
1. Planes must be parallel

2. Align both mounting center lines to \pm .76 mm (.03 in)

- 3. Distance to equal half of total travel
- 4. 2° +/- 1°

Figure 3-1 Drive shaft alignment

- 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.
- 4. 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 pump. 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.

A 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.

A WARNING

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

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 normal 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.

A 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.

A 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.

A 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. To properly install the batteries:

1. As shown in the following diagrams, install the battery cable kit or equivalent customer-supplied wiring. Install battery sets in a well-ventilated or otherwise protected location.

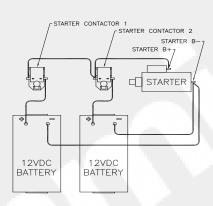
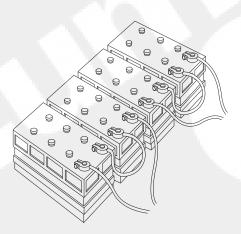


Figure 3-3 Series battery connection 12 VDC



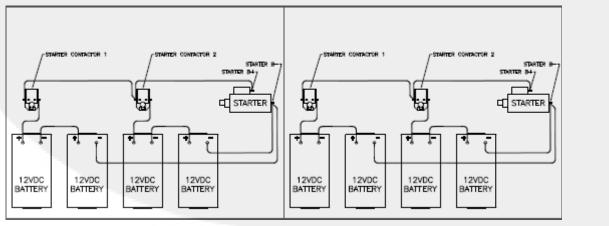


Figure 3-4 Series battery connection 24 VDC

- 2. Provide adequate room for servicing or replacing the batteries. Provide protection from extremes of temperature and weather.
- 3. Locate the batteries near the engine or increase the size of the conductors as required by applicable codes. Ensure that the batteries are configured properly for 12 or 24 (depending on the engine) VDC standard operations.
- 4. Check the battery cables and connections.

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

3.8 Signal and control installation

The fire pump controller wires must be connected to the terminal blocks (TBs) on the FPDP Interface Terminal Strip 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 (automatic) 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.



Thermocouple input



- 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).

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.

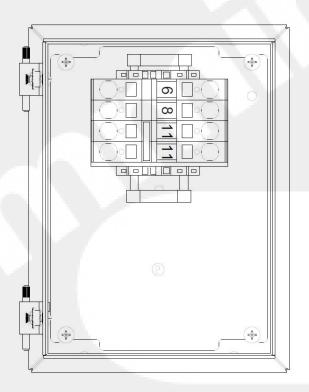


Figure 3-6 Battery charger interface

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:

A CAUTION

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

- 1. Inspect the engine coolant hoses and hose clamps and ensure that all coolant hoses and clamps are properly installed and water tight.
- 2. Ensure that the engine coolant heater maintains an engine coolant temperature of 49 °C (120 °F) or above.
- 3. Ensure that coolant is present in the engine coolant heater before plugging the heater element into a dedicated circuit. Add coolant, if necessary.

4. Inspect the heat exchanger weekly for external damage and contamination.

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

5. Add coolant, if necessary:

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

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

A 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.

For those models (CFP9E, CPFP11E, CFP15E, and CFP23E) equipped with an oil level gauge, it may be necessary to adjust the gauge:

- 1. Ensure the engine oil is at the low level of the oil dipstick.
- 2. Start the engine.
- 3. Adjust the oil level gauge until it alarms.
- 4. Stop the engine.
- 5. 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.

A 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.

A 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.

A WARNING

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

3.12 Engine monitoring

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

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

NOTE: Ensure that cooling water is flowing and the water pressure shown on the local pressure gauge is no more than 414 kPa (60 psi). The minimum cooling water flow rate is identified in the Engine Data Sheet.

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

A 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.

- Low engine lubricant pressure
- 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 4 Operation.

3.13 Start-up validation

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. Visit https://www.cummins.com/ engines/fire-pump-drives/registration-and-warranty to download the Start-up inspection checklist.

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

This page is intentionally left blank.

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.

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.

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.

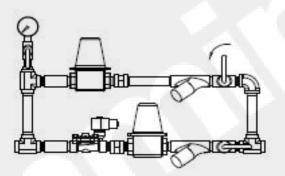


Figure 4-1 Fire Pump Drive Engine Bypass Valve

- 2. Press the AUTO/MAN selector switch on the FPDP to place the engine in MANUAL mode.
- 3. 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.

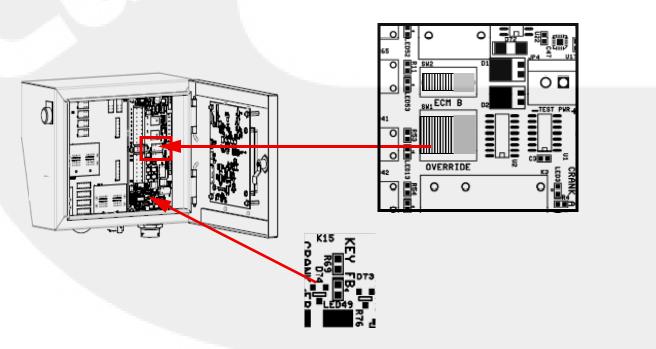


Figure 4-2 FPDP override switch

A CAUTION

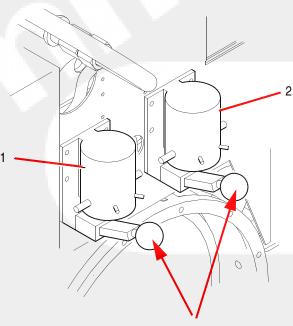
To prevent damage to the starter, do not engage the starting motor more than fifteen seconds. Wait fifteen seconds between each attempt to start, up to six attempts.

4. 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.

5. 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

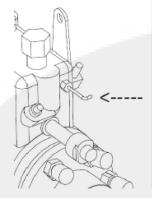
- 1. Battery A starter contactor
- 2. Battery B starter contactor

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 at the FPDP. The engine must also be stopped at the fire pump controller.

For models CFP59 F10, F20, F40, and F50, if the fuel solenoid does not open, use the fuel solenoid override located on the fuel pump. Push the plunger in to run the fire pump drive engine. Monitor the engine, as needed. To stop the fire pump drive engine, pull the plunger out.



For models CFP59 F15 and F25, use the fuel solenoid override located above the fuel pump. Turn the fuel solenoid handle counter-clockwise to unlock and then pull the handle to run the fire pump drive engine. Turn the handle clockwise to lock the fuel solenoid. To stop the fire pump drive engine, turn the fuel solenoid counter-clockwise and push the handle in.



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

NOTE: 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").

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

To deactivate the Analog Values overlay, press the **SCREEN** soft key to make the overlay disappear from the LCD.

4.3.2 The MENU soft key - Settings Menu

If the operator presses the **MENU** soft key from the FPDP User Interface screen, the Settings Menu screen appears as shown below.

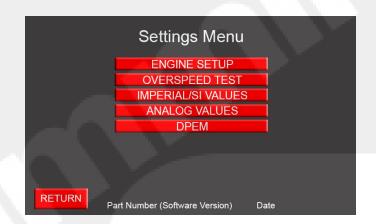


Figure 4-6 Settings Menu screen (mechanical engine)

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. As shown below, press the soft number keys to enter password "806" in the Engine Setup Login screen.
- 3. Then press **SUBMIT** to access the Engine Setup screen.

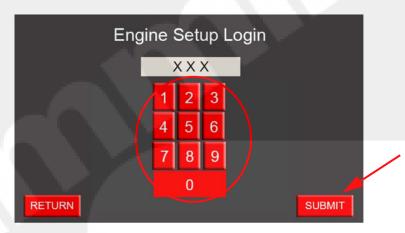
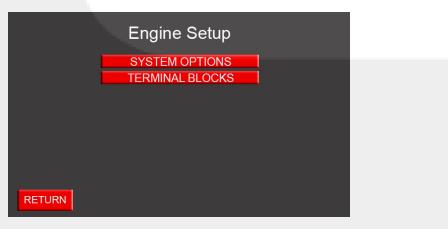


Figure 4-7 Typical Engine Setup Login screen





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.

System Options					
	DPEM OVERSPEED SHUTDOWN COOLING LOOP LOOP ALARM TEMP (F)	OFF ON ON 095			
	LOOP ALARM PRES (PSI)	055			
RETURN			SUBMIT		

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.

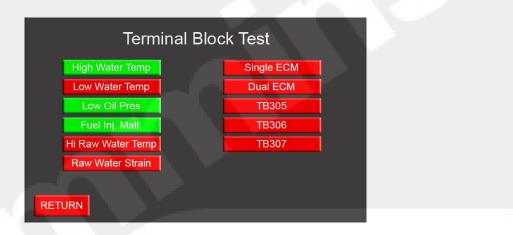


Figure 4-10 Typical Terminal Block Test screen

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. As shown in Figure 4-7, 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.

Overspeed Test
Rated Speed: 1760 Overspeed Setpoint: 2024
Adjust Engine Speed
1720
Engine Speed in RPM RETURN RUN

Figure 4-11 Overspeed Test - Adjust Engine Speed

- 3. Press the **RUN** soft button.
- 4. A dialog box will appear alerting the user that the engine will ramp to an overspeed condition. If it is safe to do so, proceed with the test and select Yes. If not, select No.

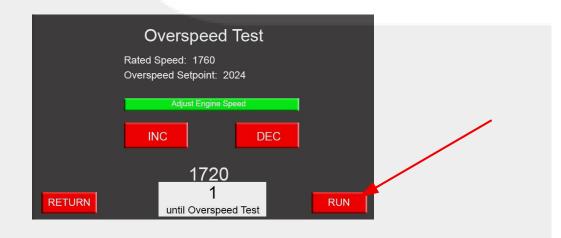


Figure 4-12 Overspeed timer

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



Figure 4-13 Overspeed Test timer expired

- 6. The fire pump drive engine will enter MANUAL mode until reset.
- 7. Press the **RESET/STOP** switch on the FPDP to reset the fire pump drive engine.

4.3.2.3 IMPERIAL/SI VALUES screen

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

Imperial/SI Values					
	Temperatures				
	Degrees F	Degrees C			
	Pressures				
	PSI	kPa			
RETURN			SUBMIT		

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.

Analog Values

 Battery A: 23.8V
 Cooling Loop Temp: 70F

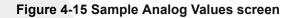
 Battery B: 23.7V
 Diff Press Pre: 170 PSI

 Engine Speed: 1760 RPM
 Diff Press Post: 158 PSI

 Water Temp: 187 F
 Oil Pressure: 44 PSI

 Exhaust Temp: 0 F
 Hour Meter: 1.99 hrs

 Var Speed Pressure: 0 PSI
 PSI



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).

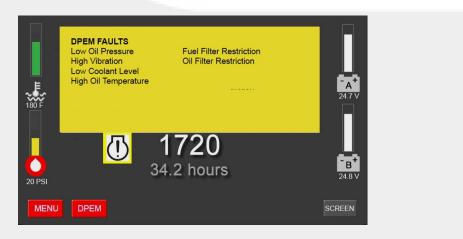


Figure 4-17 Sample DPEM Fault screen

This page is intentionally left blank.

5 - Maintenance

5.1 Introduction

Before performing maintenance procedures, read and understand 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: Equipment name/number:			
Owner's name:					
Date	Hours or time interval	Actual hours	Check performance	Performed by	Comments
		2.12	-		
		S V			
	A110	~			
<u></u>	S. 8				
A 1	1.42.2				
1					
					2

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.

A 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.

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

A 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.

A 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 2-2.
 - 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.

A 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.

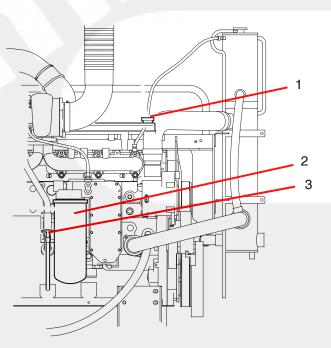
5.3.4 Engine oil system

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.

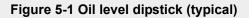
Inspect the engine oil system on a weekly basis following these steps:

- 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.
- 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.



- 1. Engine oil fill port
- 2. Engine oil filter
- 3. Engine oil dipstick



5.3.5 Fuel system

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

To inspect the fuel system:

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

NOTE: Refer to the engine data sheet for Cummins recommended replacement components.

5.3.6 Engine exhaust system

With the engine operating, inspect the entire exhaust system: exhaust manifold, exhaust flex, 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

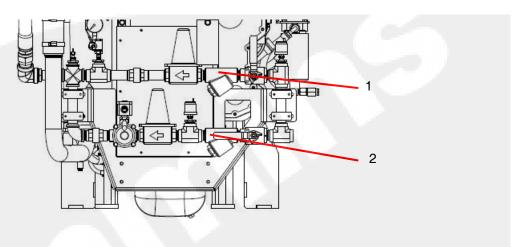
Check the terminals on the starting batteries for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Inspect the FPDP harness connections to be sure they are secure.

5.3.8 Crankcase ventilation hose

Inspect the crankcase ventilation hose for wear, damage, sludge, blockage, or dirt buildup. 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.



- 1. Bypass raw water strainer
- 2. Normal raw water strainer

Figure 5-2 Cooling water strainer (typical)

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.

5.3.10 Batteries

A CAUTION

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

A 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 fullycharged 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.

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 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.

A 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

If required, use this section to adjust the normal operating speed to the nameplate value on a mechanical fire pump drive engine.

CFP59-F10, F20, F40, and F50 speed adjustment

To adjust the speed on CFP59-F10, F20, F40, and F50 fire pump drive engines, follow these steps:

- 1. Start the engine.
- 2. Observe that the engine starts and accelerates to the currently adjusted speed setpoint.
- 3. Locate the threaded bolts on each side of the throttle bracket on the fuel pump side of the engine (see Figure 5-3). To adjust the speed setpoint to the rated speed, do the following:
- To *increase* the speed, turn the bolt on the left side of the throttle bracket *clockwise*. The adjustment of the bolt will pivot the throttle bracket clockwise and allow more fuel through the pump to speed up the engine.

NOTE: The bolt on the right side of the bracket is for maximum speed and may also need to be adjusted if the maximum speed cannot be attained. Loosen the lock nut and turn the bolt counter-clockwise to increase speed. When the rated speed is correct, tighten the lock nut against the stops.

To decrease the speed, turn the bolt on the left side of the throttle bracket counter-clockwise. The adjustment of the bolt will pivot the throttle bracket counter-clockwise and allow less fuel through the pump to slow down the engine.

When the rated speed is correct, tighten the locking nuts against the stops.

- 4. Stop the engine.
- 5. Repeat Steps 1 through 4 until the desired speed is attained.



Figure 5-3 Fire pump drive engine throttle bracket

CFP59-F15, F25, and F65 speed adjustment

To adjust the speed on CFP59-F15, F25, and F65 fire pump drive engines, follow these steps:

- 1. Start the engine.
- 2. Observe that the engine starts and accelerates to the currently adjusted speed setpoint.
- 3. Locate the threaded linkage rod on the fuel pump side of the engine (see Figure 5-4). Loosen the locking nuts against the stops on the outside of the threaded rod. To adjust the speed setpoint to the rated speed, do the following:
- To *increase* the speed, turn the rod upward toward the engine. The adjustment of the rod upward and toward the engine increases the actual length of the rod to allow more fuel through the pump to speed up the engine.
- To *decrease* the speed, turn the rod downward toward the floor. The adjustment of the rod toward the floor decreases the actual length of the rod to allow less fuel through the pump to slow down the engine.



Figure 5-4 Fire pump drive engine linkage rod

When the rated speed is correct, tighten the locking nuts against the stops.

- 4. Stop the engine.
- 5. Repeat Steps 1 through 4 until the desired speed is attained.

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.

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

A 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.

A 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.

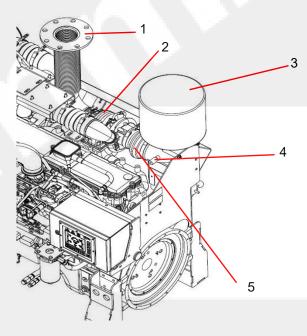
2. Clean and tighten any loose electrical connections. Repair or replace worn, damaged, burnt, or poorly insulated wiring immediately.

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

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

5.4.2 Turbocharger mounting nuts

As shown in Figure 5-5, check the turbocharger mounting nuts and torque the mounting nuts to the recommended torque value. Refer to the torque tables.



- 1. Exhaust flex connection
- 2. Turbocharger
- 3. Air cleaner assembly (intake)
- 4. Air cleaner service indicator
- 5. Air cleaner piping

Figure 5-5 Typical turbocharger

5.4.3 Engine supports

A 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 and Figure 2-3 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 5-6, 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.

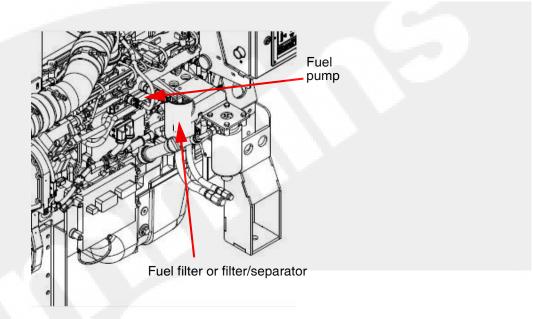


Figure 5-6 Typical fuel pumps and filters

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.

A 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).

A 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.

A 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.

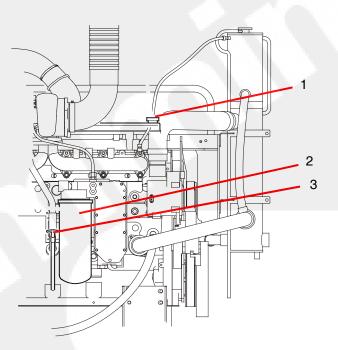
IMPORTANT: If the engine oil is drained from the oil pan to make an engine repair, new oil must be used.

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 5-7) 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. Engine oil fill port
- 2. Engine oil filter
- 3. Engine oil dipstick

Figure 5-7 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.

A 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.

A 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).

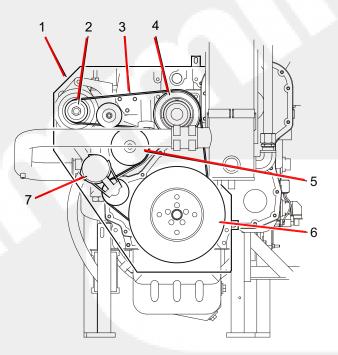
Maintenance

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 5-8).



- 1. Belt guard
- 2. Alternator pulley
- 3. Drive belt
- 4. Idler pulley
- 5. Coolant pump pulley
- 6. Balancer pulley
- 7. Belt tensioner

Figure 5-8 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.

A 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. 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.

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

A CAUTION

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

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

5.4.8 Raw water zinc anode

The zinc anode - part number 9750 - (see Figure 5-9) 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.

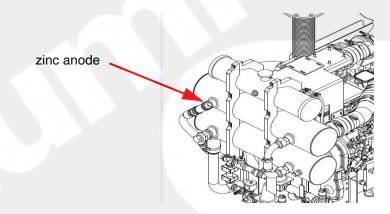


Figure 5-9 Raw water zinc anode (typical)

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 5-5, 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.

A 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.

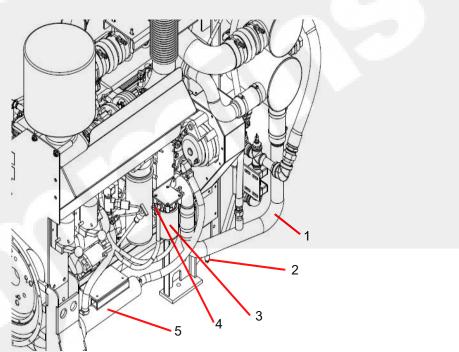
5.5.1 Coolant pump

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 5-10 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 hose/tube
- 2. Coolant drain petcock
- 3. Coolant filter
- 4. Coolant filter shut-off valve
- 5. Engine coolant heater

Figure 5-10 Engine coolant drain - heat exchanger (typical)

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.

A 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.

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

A 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.

A 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.

A 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)
$60\% = -54^{\circ} \text{ C} (-65^{\circ} \text{ F})$	60% = -54° C (-65° F)
68% = -71° C (-96° F)	68% = -63° C (-82° F)

A 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.

A 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!

A 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.

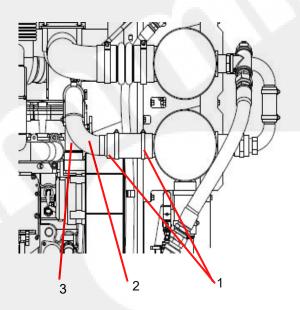
5.6.1 Coolant thermostat removal/installation

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

A 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 5-11, remove the upper coolant hose clamps and upper coolant hose at the thermostat housing.



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

Figure 5-11 Typical 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.

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.
- 7. If there is evidence of the two areas making contact, the pivot tube bushing has failed and the tensioner must be replaced.
- 8. Check the tensioner bearing.
- 9. Rotate the belt tensioner pulley. The pulley should spin freely with no mechanical binding, eccentric motion, or excessive end-play.
- 10. If the arm rotates with mechanical binding, eccentric movement, or excessive end play, replace the tensioner.
- 11. Inspect the clearance between the tensioner spring case and the tensioner arm for uneven bearing wear.
- 12. 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.

- 13. 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.
- 14. Install the replacement drive belt.

A 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.

- 15. 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.
- 16. Reinstall the belt guard.

A CAUTION

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

This page is intentionally left blank.

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).

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

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.

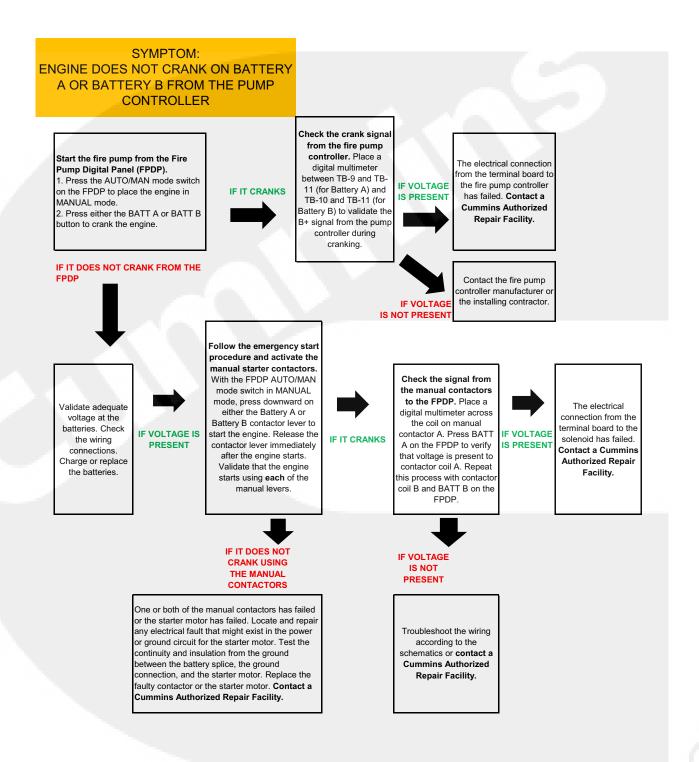
A CAUTION

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.

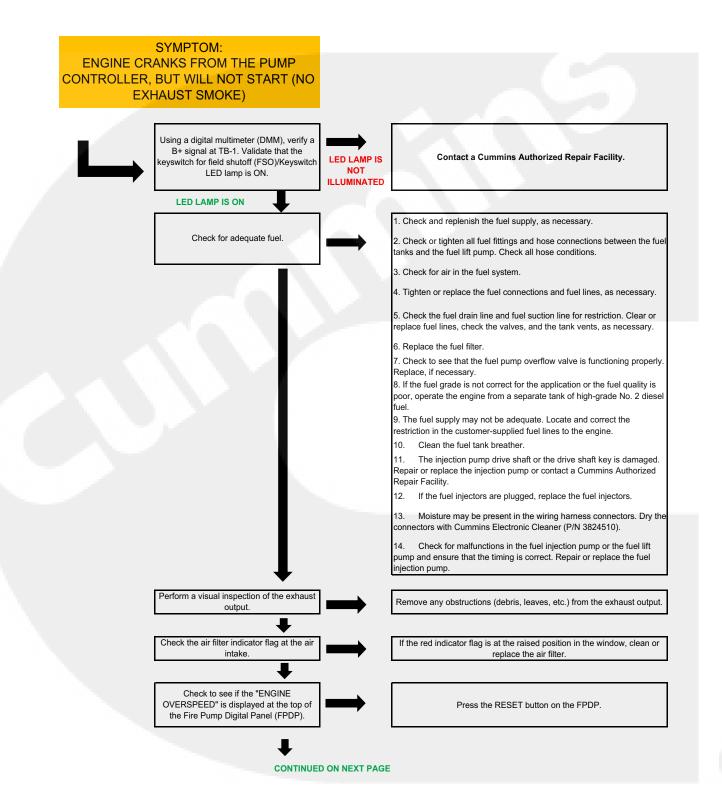
A CAUTION

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

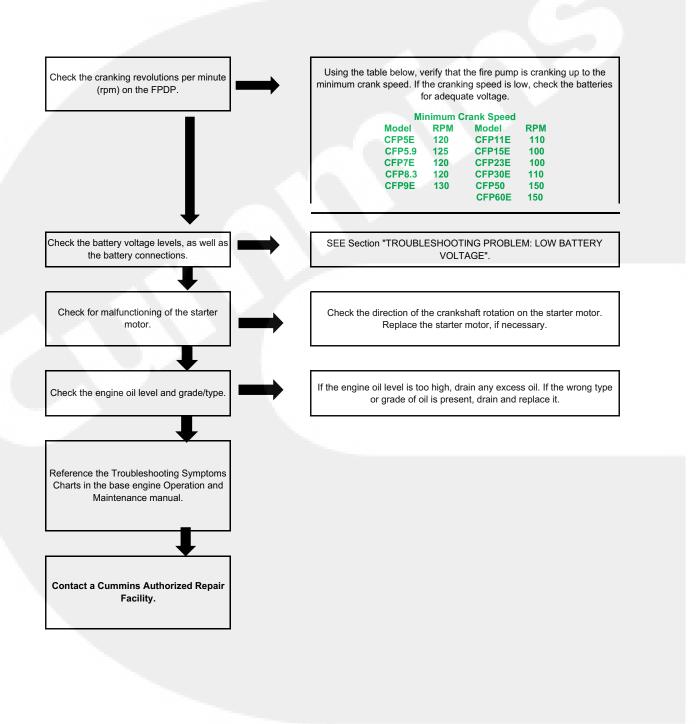
6.2 Engine Will Not Start



6.3 Engine Cranks But Will Not Start



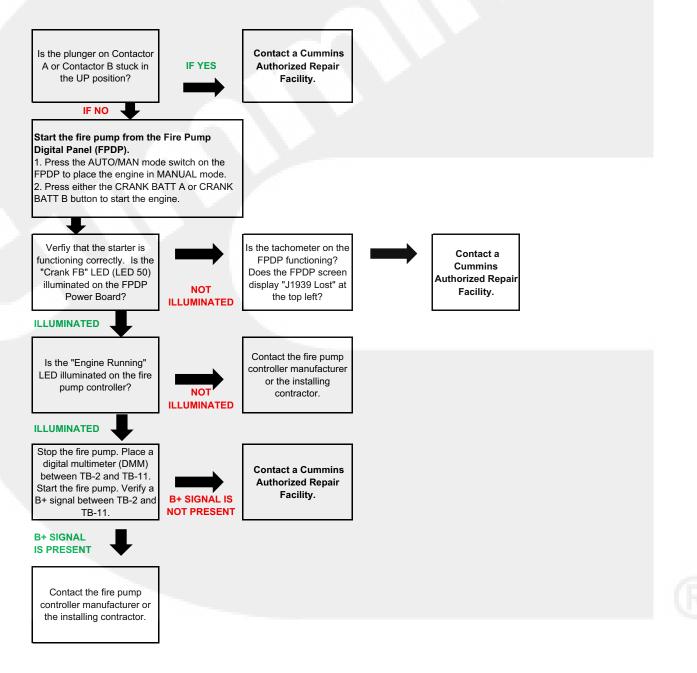
Engine Cranks But Will Not Start (cont.)



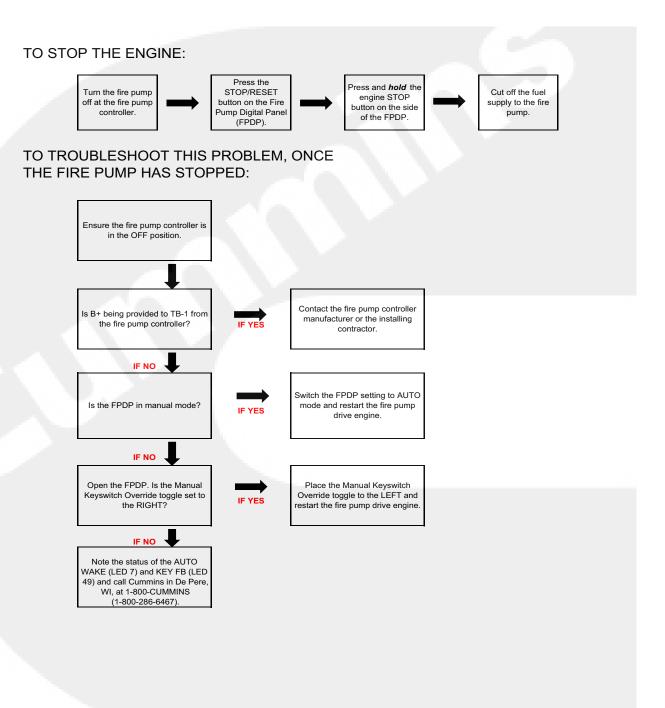
6.4 Engine Starts But Continues to Crank

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

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



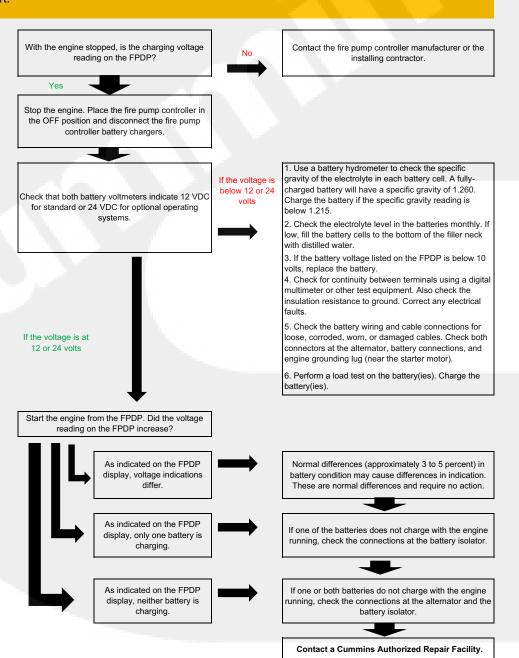
6.5 Engine Will Not Stop



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.



This page is intentionally left blank.

7 - Component parts and assemblies

7.1 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. Outside of North America, contact your regional office. Telephone numbers and addresses are listed in the International Directory.

If assistance is required, call toll-free: 1-800-CUMMINS. Includes all 50 states, Bermuda, Puerto Rico, Virgin Islands, and the Bahamas. The Cummins Customer Assistance Center provides 24-hour assistance 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.

Refer also to the Cummins Inc. website at cummins.com.

7.2 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.

7.3 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.

7.4 Engine data and torque values

The following pages outline applicable reference material that represents the engine data for the CFP59 and all its ratings at the time of this printing. For a complete, up-to-date, Model Specification Sheet, refer to cummins.com.

Air induction system CFP59-F10/20/40/50

Maximum temperature rise between ambient air and engine air inlet	30 °F (16.7 °C)
Maximum inlet restriction with dirty filter	25 in. H ₂ O (635 mm H ₂ O)
Recommended air cleaner element - (standard)	Cummins FIltration AH1140
Recommended air cleaner element - (heavy duty)	Optional: primary element AF26124; secondary element AF26125

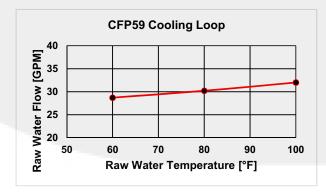
Lubrication system CFP59-F10/20/40/50

Oil pressure range at rated	40-60 PSI (276-414 kPa)
Oil capacity of pan (high - low)	15-13 qt. (14.2-12.3 L)
Total system capacity	4.3 gal. (16.3 L)
Recommended lube oil filter	Cummins Filtration LF3959

Cooling system CFP59-F10/20/40/50*

60 PSI (413 kPa) MAX
.75 in. (19.05 mm)
1.00 in. (25.40 mm)
4 gal. (15.1 L)
Modulating
180-203 °F (82-95 °C)
180-212 °F (82-100 °C)
28.7 GPM (1.81 L/sec)
30.2 GPM (1.91 L/sec)
32 GPM (2.02 L/sec)

* A jacket water heater is mandatory on this engine. The recommended heater wattage is 1500 down to 40 °F (4 °C)



Exhaust system CFP59-F10/20/40/50

Maximum allowable back pressure by complete exhaust system	40.8 in. H ₂ O (10.2 kPa)
Exhaust pipe size normally acceptable	4 in. (102 mm)

Noise emissions CFP59-F10/20/40/50 -

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

Тор	99.0 dBa
Right side	96.3 dBa
Left side	98.9 dBa
Front	96.3 dBa
Exhaust	116.0 dBa

Fuel supply/drain system CFP59-F10/20/40/50

Operating Speed in RPM	14	70	1760			
CFP59 F-10 Fuel Rate - Gal/hr (L/hr)	4.8	(18.3)	5.6	(21.3)		
CFP59 F-20 Fuel Rate - Gal/hr (L/hr)	6.3	(23.8)	7.3	(27.6)		
CFP59 F-40 Fuel Rate - Gal/hr (L/hr)	7.2	(27.4)	8.4	(31.7)		
CFP59 F-50 Fuel Rate - Gal/hr (L/hr)	7.9	(30)	9.2	(34.9)		

Fuel type	No. 2 diesel only
Minimum supply line size	0.25 in. (6.35 mm)
Minimum drain line size	0.125 in. (3.18 mm)
Maximum fuel height above C/L fuel pump	71 in. (1.8 m)
Recommended fuel filter - primary	Cummins Filtration FS1251
Recommended fuel filter - secondary	None
Maximum restriction @ lift pump-inlet - with clean filter	4.0 in. Hg (102 mm Hg)
Maximum restriction @ lift pump-inlet - with dirty filter	8.0 in. Hg (203 mm Hg)
Maximum return line restriction - without check valves	20 in. Hg (508 mm Hg)
Minimum fuel tank vent capability	12 ft ³ /hr (0.36 m ³ /hr)
Maximum fuel temperature @ lift pump inlet	160 °F (71 °C)

Starting and electrical system CFP59-F10/20/40/50

Minimum recommended battery capacity - cold soak at 0 °F (-18 °C) or above	12V	24V
Engine only - cold cranking amperes	900 CCA*	900 CCA*
Engine only - reserve capacity	430 minutes*	430 minutes*
*Based on FM requirement for a minimum of 900 CCA and 430 reser Battery cable size - minimum of 2/0 AWG and maximum cable length not to exceed 6 ft. (1.5 m)	12V	24V
Maximum resistance of starting circuit	0.002 Ohms	0.002 Ohms
Typical cranking speed	120 RPM	120 RPM
Alternator (standard), internally regulated	95 amps	45 amps

Operating conditions - CFP59 - F10/20/40/50

Operating Speed in RPM	1470		1760	
CFP59 F-10				
Output - BHP (kW)	100	(75)	115	(86)
Ventilation air required - CFM (litre/sec)	189	(89)	260	(123)
Exhaust gas flow - CFM (litre/sec)	489	(231)	626	(295)
Exhaust gas temperature - °F (°C)	924	(496)	924	(496)
Heat rejection to coolant - BTU/min. (kW)	2673	(47)	3078	(54)
Heat rejection to ambient - BTU/min. (kW)	1240	(22)	1276	(22)
CFP59 F-20				
Output - BHP (kW)	130	(97)	149	(111)
Ventilation air required - CFM (litre/sec)	226	(107)	309	(146)
Exhaust gas flow - CFM (litre/sec)	617	(291)	773	(365)
Exhaust gas temperature - °F (°C)	1016	(547)	1016	(547)
Heat rejection to coolant - BTU/min. (kW)	3334	(59)	3771	(66)
Heat rejection to ambient - BTU/min. (kW)	1291	(23)	1329	(23)
CFP59 F-40				
Output - BHP (kW)	150	(112)	171	(128)
Ventilation air required - CFM (litre/sec)	252	(119)	347	(164)
Exhaust gas flow - CFM (litre/sec)	706	(333)	882	(416)
Exhaust gas temperature - °F (°C)	1054	(568)	1054	(568)
Heat rejection to coolant - BTU/min. (kW)	3809	(67)	4209	(74)
Heat rejection to ambient - BTU/min. (kW)	1345	(24)	1384	(24)
CFP59 F-50				
Output - BHP (kW)	164	(122)	188	(140)
Ventilation air required - CFM (litre/sec)	284	(134)	391	(185)
Exhaust gas flow - CFM (litre/sec)	757	(357)	972	(459)
Exhaust gas temperature - °F (°C)	1041	(561)	1041	(561)
Heat rejection to coolant - BTU/min. (kW)	3587	(63)	4205	(74)
Heat rejection to ambient - BTU/min. (kW)	1401	(25)	1442	(25)

Air induction system CFP59-F15/F25

Maximum temperature rise between ambient air and engine air inlet	30 °F (16.7 °C)
Maximum inlet restriction with dirty filter	25 in. H ₂ O (635 mm H ₂ O)
Recommended air cleaner element - (standard)	Cummins FIltration AH1140
Recommended air cleaner element - (heavy duty)	Optional: primary element AF26124; secondary element AF26125

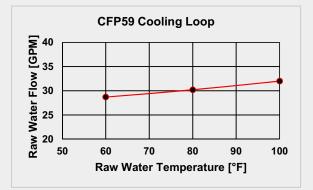
Lubrication system CFP59-F15/F25

Oil pressure range at rated	10-50 PSI (69-345 kPa)
Oil capacity of pan (high - low)	15-13 qt. (14.2-12.3 L)
Total system capacity	4.3 gal. (16.3 L)
Recommended lube oil filter	Cummins Filtration LF3959

Cooling system CFP59-F15/F25*

Raw water working pressure range at heat exchanger	60 PSI (413 kPa) MAX
Recommended minimum water supply pipe size to heat exchanger	.75 in. (19.05 mm)
Recommended minimum water discharge pipe size from heat exchanger	1.00 in. (25.40 mm)
Coolant water capacity (engine only)	4 gal. (15.1 L)
Standard thermostat - type	Modulating
Standard thermostat - range	180-203 °F (82-95 °C)
Normal Operating Temperature	180-212 °F (82-100 °C)
Minimum raw water flow:	
- with water temperatures to 60 °F (16 °C)	28.7 GPM (1.81 L/sec)
- with water temperatures to 80 °F (27 °C)	30.2 GPM (1.91 L/sec)
- with water temperatures to 100 °F (38 °C)	32 GPM (2.02 L/sec)

* A jacket water heater is mandatory on this engine. The recommended heater wattage is 1500 down to 40 °F (4 °C)



Exhaust system CFP59-F15/F25

Maximum allowable back pressure by complete exhaust system	40.8 in. H ₂ O (10.2 kPa)
Exhaust pipe size normally acceptable	4 in. (102 mm)

Noise emissions CFP59-F15/F25 - The noise emission values are estimated sound pressure levels at 3.3 ft. (1 m).

Тор	96.3 dBa
Right side	96.3 dBa
Left side	99.0 dBa
Front	98.9 dBa
Exhaust	114.0 dBa

Fuel supply/drain system CFP59-F15/F25

Operating Speed in RPM	2	100	23	350	2600				
CFP59 F-15 Fuel Rate - Gal/hr (L/hr)	6.5	(24.8)	7.1	(26.8)	7.4	(27.9			
CFP59 F-25 Fuel Rate - Gal/hr (L/hr)	7.5	(28.4)	7.9	(29.8)	8.2	(31.0)			
Fuel type		No.	2 diesel o	only					
Minimum supply line size			0.25	in. (6.35	mm)				
Minimum drain line size			0.125 in. (3.18 mm)						
Maximum fuel height above C/L fuel pump			50.5 in. (1.3 m)						
Recommended fuel filter - primary			Cummins Filtration FS5052						
Recommended fuel filter - secondary		- A.	None						
Maximum restriction @ lift pump-inlet - with cle	an filter		4.0 in. Hg (102 mm Hg)						
Maximum restriction @ lift pump-inlet - with dir	8.0 in. Hg (203 mm Hg)								
Maximum return line restriction - without check	20 in. Hg (508 mm Hg)								
Minimum fuel tank vent capability			12 ft ³ /hr (0.36 m ³ /hr)						
Maximum fuel temperature @ lift pump inlet	160 °F (71 °C)								

Starting and electrical system CFP59-F15/F25

Minimum recommended battery capacity - cold soak at 0 $^\circ\text{F}$ (-18 $^\circ\text{C})$ or above	12V	24V
Engine only - cold cranking amperes	900 CCA*	900 CCA*
Engine only - reserve capacity	430 minutes*	430 minutes*

*Based on FM requirement for a minimum of 900 CCA and 430 reserve capacity minutes

Battery cable size - minimum of 2/0 AWG and maximum cable length not to exceed 6 ft. (1.5 m)	12V	24V
Maximum resistance of starting circuit	0.002 Ohms	0.002 Ohms
Typical cranking speed	120 RPM	120 RPM
Alternator (standard), internally regulated	95 amps	45 amps

Operating conditions CFP59-F15/F25

Operating speed in RPM	2100		2350		2600	
CFP59 F-15					1.0	1
Output - BHP (kW)	122	(91)	126	(94)	126	(94)
Ventilation air required - CFM (litre/sec)	329	(155)	383	(181)	415	(196)
Exhaust gas flow - CFM (litre/sec)	762	(360)	865	(408)	975	(460)
Exhaust gas temperature - °F (°C)	785	(418)	785	(418)	785	(418)
Heat rejection to coolant - BTU/min. (kW)	2636	(46)	3262	(57)	3520	(62)
Heat rejection to ambient - BTU/min. (kW)	683	(12)	739	(13)	810	(14)
CFP59 F-25				•		
Output - BHP (kW)	140	(104)	140	(104)	140	(104)
Ventilation air required - CFM (litre/sec)	346	(163)	398	(188)	430	(203)
Exhaust gas flow - CFM (litre/sec)		(410)	968	(457)	1035	(489)
Exhaust gas temperature - °F (°C)	893	(478)	893	(478)	893	(478)
Heat rejection to coolant - BTU/min. (kW)	3021	(53)	3656	(64)	3810	(67)
Heat rejection to ambient - BTU/min. (kW)	811	(14)	864	(15)	910	(16)

7.5 Cap screw markings and torque values

A 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. 7.5.1 Cap screw identification 7.5.1.1 Metric cap screw identification and head markings Sample: M8-1.25 x 25 Value: 1.25 X 25 M8 Major thread diameter in milli-Distance between threads in Meaning: Length in millimeters millimeters meters 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** 10.9 8.8 12.9 7.5.1.2 US customary cap screw identification and head markings 5/16 x 18 x 1-1/2 Sample: Value: 18 1 - 1/25/16 Meaning: Major thread diameter in inches Number of threads per inch Length in inches 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

7.5.2 Cap screw torque values

Class:	8.8 10.9					10.9				12	2.9	
Diameter	Cast	Iron	Alum	inum	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			—	—	—	_

Table 7-1. Metric Cap Screw Torque Values (lubricated threads)

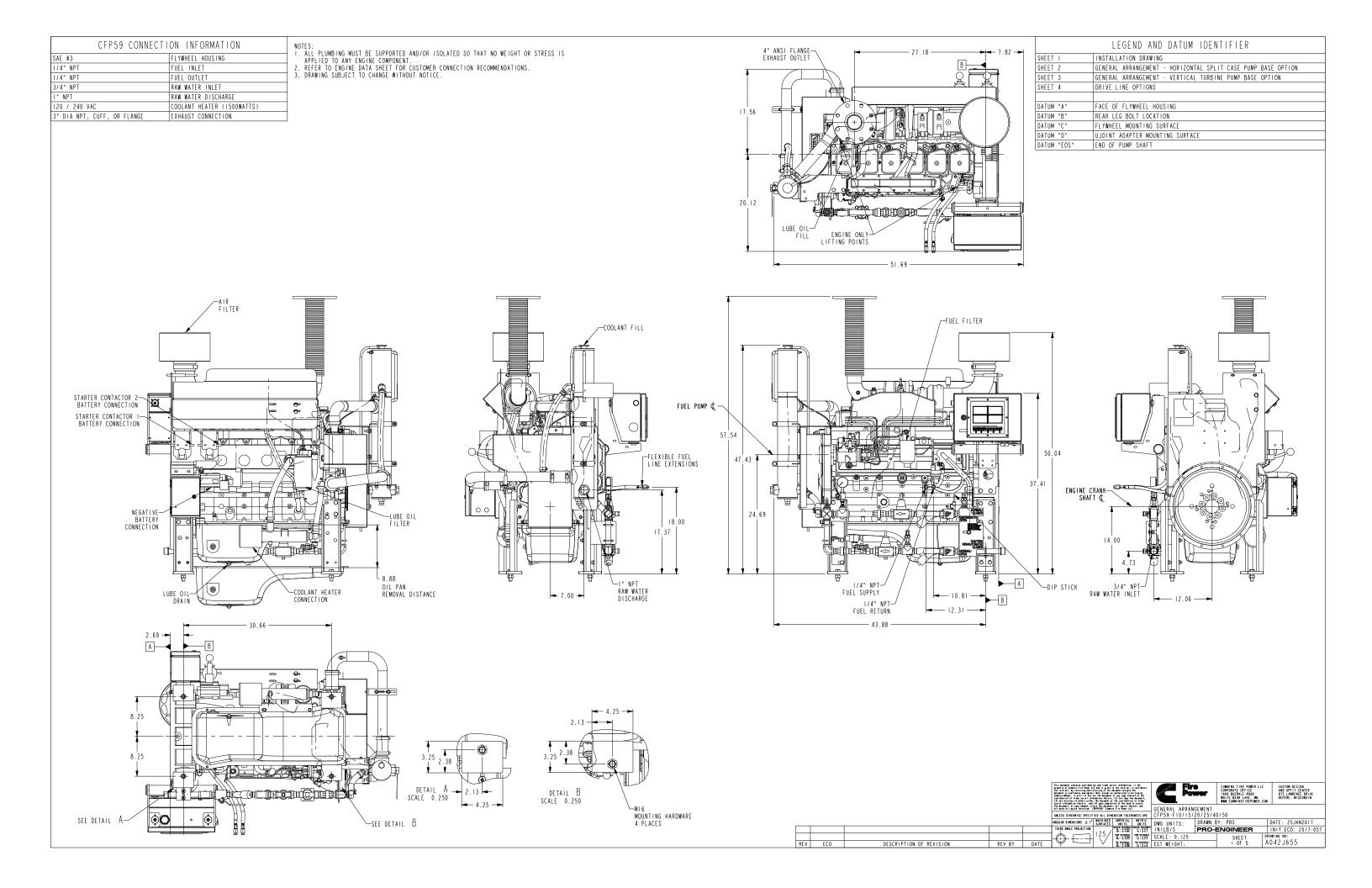
 Table 7-2. U.S. Customary Cap Screw Torque Values (lubricated threads)

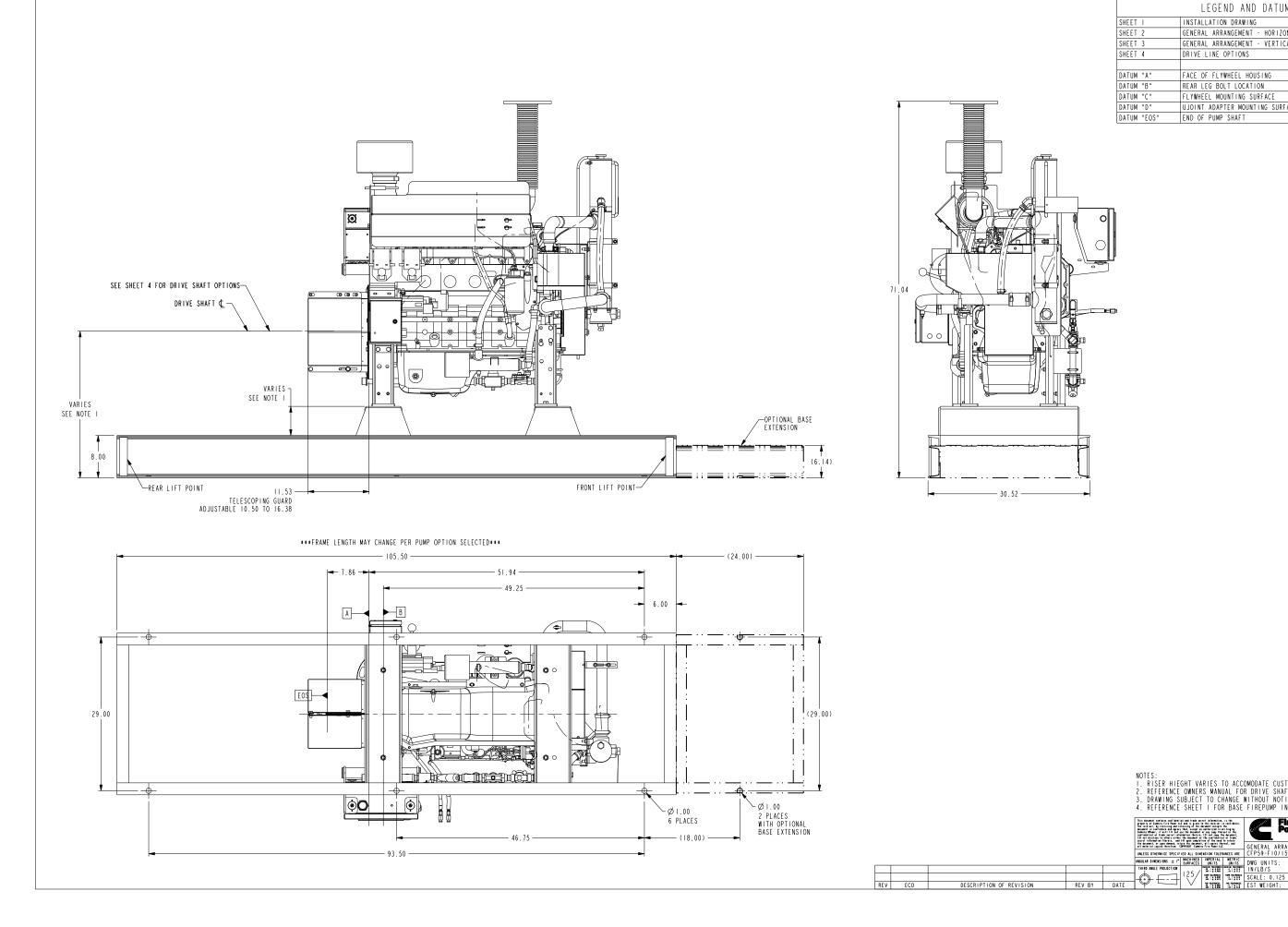
Grade:		SAE G	arade 5		SAE Grade 8				
Cap Screw Body Size	Cas	t Iron	Alu	minum	Cast	Iron	Aluminum		
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	
1/4-20	9	7	8	6	15	11	8	6	
1/4-28	12	9	9	7	18	13	9	7	
5/16-18	20	15	16	12	30	22	16	12	
5/16-24	23	17	19	14	33	24	19	14	
3/8-16	40	30	25	20	55	40	25	20	
3/8-24	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	

7.6 Assembly drawings

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

Drawing No.	Description							
A042J655	General Arrangement, Installation, Fire Pump, CFP59 F15-25, F10/20/40/50							
A042H677	Assembly, Fire Pump, CFP59 F10/20/40/50							
A042H678	Assembly, Fire Pump, CFP59 F15-25							
8724	Assembly, Engine, CFP59 F10/20/40/50, 12V							
A042K061	Assembly, Engine, CFP59 F10/20/40, 24V							
A042K134	Assembly, Engine, CFP59 F50, 24V							
8725	Assembly, Engine, CFP59 F15-25, 12V							
8650	Assembly, Heat Exchanger CFP59 F15-25, F10/20/40/50, Raw Water							
A042J147	Assembly, Air Intake CFP59 F10/20/40/50							
A042J156	Assembly, Air Intake CFP59 F15/F25							
A042J846	Assembly, Coolant Heater CFP59 F15-25, F10/20/40/50							
A042J820	Assembly, Sensors and Harnessing CFP59 F15-25, F10/20/40/50							
8585	Assembly, Throttle Positioning CFP59 F15-25							
9839	Assembly, Solenoid Override CFP59 F15-25							
9699	Assembly, Solenoid Override CFP59 F10/20/40/50							
21249	Assembly, Control Panel Mounting							
Assembly, All Compor	nents Top-level:							
A042G184	Assembly, Panel, Digital Mechanical							
8824-12	Battery Contactors 12V							
8824-24	Battery Contactors 24V							
15204	Kit, Fuel Lines CFP59 F10/20/40/50							
A042B473	Kit, Fuel Lines CFP59 F15-25 and CFP83							
25983	Misc. Piping, Cooling Loop, Raw Water CFP59							
A042H724	Assembly, Raw Water Cooling Loop, 3/4" Vertical							
A042H725	Assembly, Raw Water Cooling Loop, 3/4" Horizontal 12V							
A042H726	Assembly, Raw Water Cooling Loop, 3/4" Horizontal 24V							
A042E017	Misc. Piping, Cooling Loop, Sea Water CFP59							
A042H727	Assembly, Sea Water Cooling Loop, 3/4" Vertical							
A042H728	Assembly, Sea Water Cooling Loop, 3/4" Horizontal 12V							
A042H729	Assembly, Sea Water Cooling Loop, 3/4" Horizontal 24V							
8618	Assembly, Stub-Shaft and Guarding CFP59							
8619	Assembly, Stub-Shaft and Guarding							
A042J119	Schematic, Overall CFP59, GEN II FPDP							



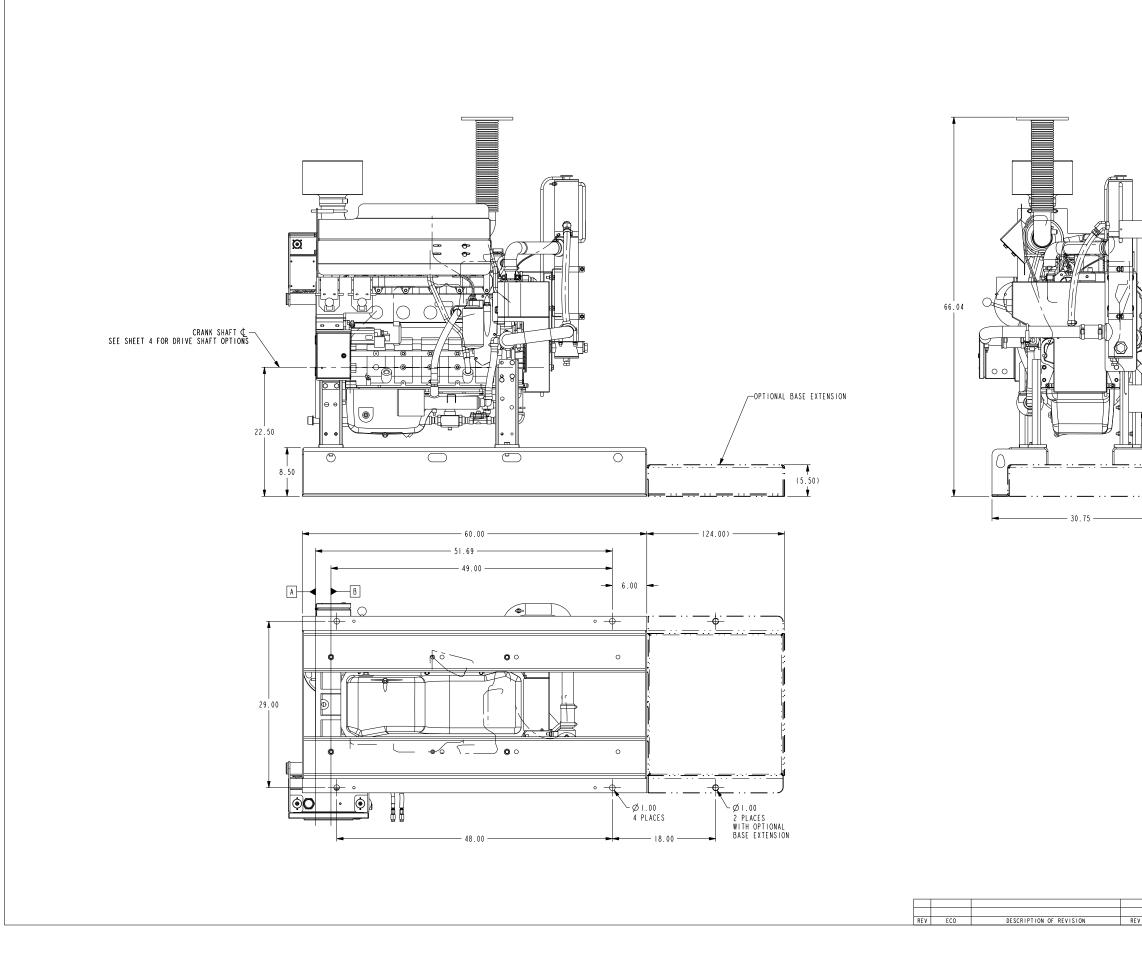


	LEGEND AND DATUM IDENTIFIER
SHEET I	INSTALLATION DRAWING
SHEET 2	GENERAL ARRANGEMENT - HORIZONTAL SPLIT CASE PUMP BASE OPTION
SHEET 3	GENERAL ARRANGEMENT - VERTICAL TURBINE PUMP BASE OPTION
SHEET 4	DRIVE LINE OPTIONS
DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL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

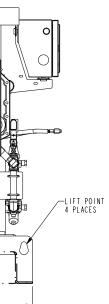


ЪE

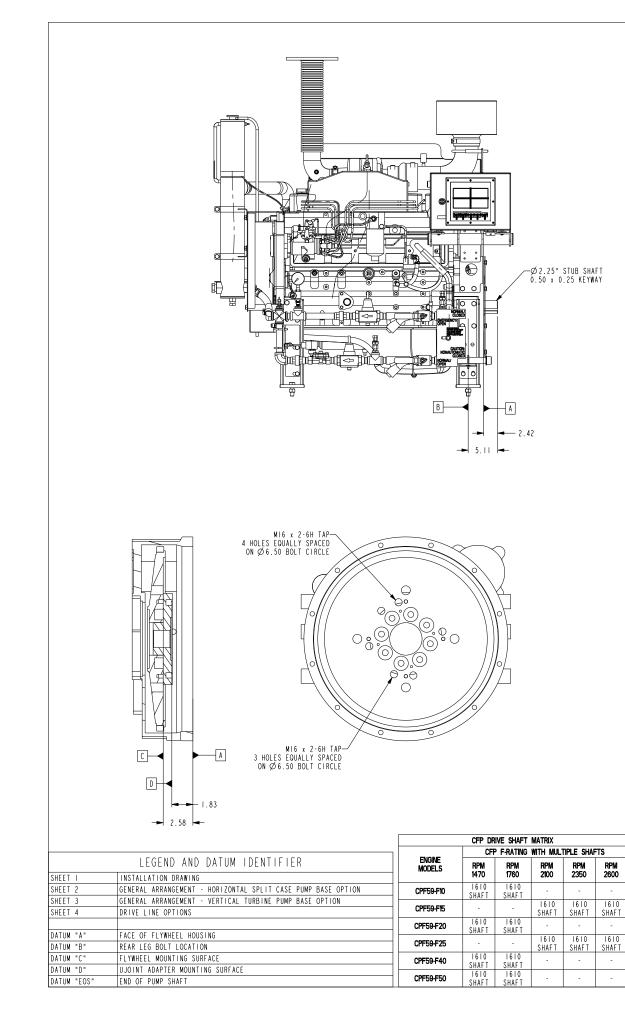
	REFERENCE DRAWING SI	OWNERS N Ubject to	MANUAL FO D CHANGE	OMODATE CUSTO R DRIVE SHAFT WITHOUT NOTIC FIREPUMP INT	ALIGNM E.		
propo The m deam Cantin C3 m 37 m	decument contains confidenti rity of Commus Fire Power LLE receiver, by freecing and re- ment in confidence and opress in Maner, it will the fire identical or frade secret info- not disclose to others either information therein, and	C and is given to the re toining of the decument that, except as author in the decument ar any o motion therein, (2) not the decument or the co	eceiver in confidence, accepts the ized is mriting by copy thereof ar the I copy the decument, afidential or trade the each do relate	Fire For		CUMMINS FIRE POWER LLI CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.	AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN
	document, er upon demond, reti molerial capied likerefram. Cl ESS OTHERWISE SPECIFI			GENERAL ARRAN CFP59-FI0/I5/		0/50	
ANGUL	LAR DIMENSIONS ± 1°		ITS UNITS	DWG UNITS:	DRAWN E	BY: PBS	DATE: 25JAN2017
THI	RD ANGLE PROJECTION		LAND CONTRACTS	IN/LB/S	PRO-B	ENGINEER	INIT ECO: 2017-05
	÷>		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SCALE: 0.125		SHEET	DRAWING NO:
BY DATE	¥	V 11	itemas na tautonas	EST WEIGHT:		2 OF 5	A042J655

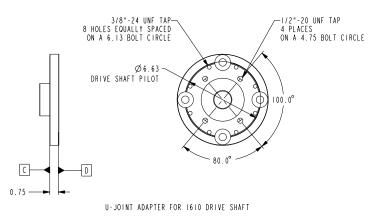


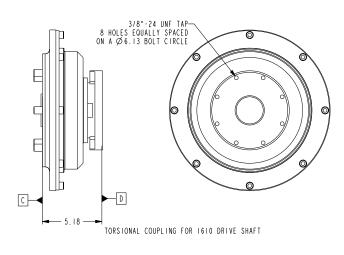
	LEGEND AND DATUM IDENTIFIER
SHEET I	INSTALLATION DRAWING
SHEET 2	GENERAL ARRANGEMENT - HORIZONTAL SPLIT CASE PUMP BASE OPTION
SHEET 3	GENERAL ARRANGEMENT - VERTICAL TURBINE PUMP BASE OPTION
SHEET 4	DRIVE LINE OPTIONS
DATUM "A"	FACE OF FLYWHEEL HOUSING
DATUM "B"	REAR LEG BOLT LOCATION
DATUM "C"	FLYWHEEL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



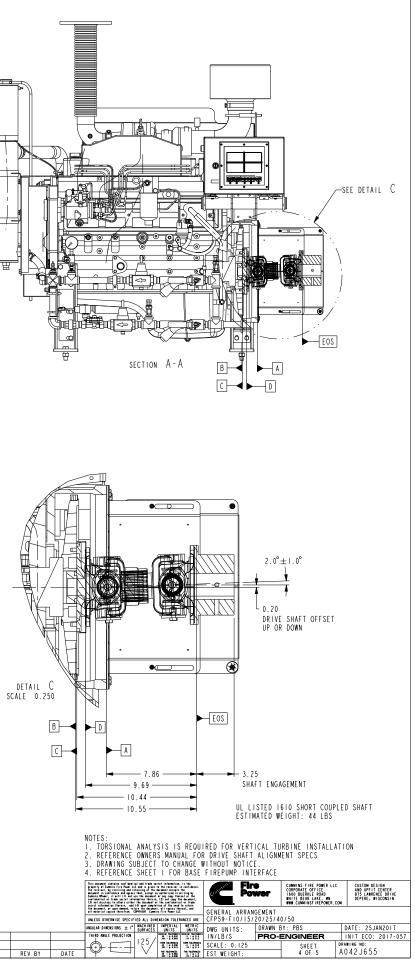
			NOTES:										
			. TORSIONAL ANALYSIS IS REQUIRED FOR VERTICAL TURBINE INSTALLATION										
			2. REFERENCE OWNERS MANUAL FOR DRIVE SHAFT ALIGNMENT SPECS										
			3. DRAWING SUBJECT TO CHANGE WITHOUT NOTICE.										
4. REFERENCE SHEET I FOR BASE FIREPUMP INTERFACE													
			This decuted calains confident property of Commis Fire Power U The receiver, by receiving odd re decuted is confidence and ogree Confidential or frods secret inf (3) not disclose to others either secret information therein, and	C and is given righting of the that, except o use the document implies therein the document of	to the receiver document occepts is callerized in ar any copy the b. (2) not copy to r the confident	in coefidence. The miling by real of the be decument. al of trade	Fire Power		CUMMINS FIRE POWER LL CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.	CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN			
			the document, or upon demand, re all material capied therefrom.	OPTRIGHT Cum	n, all capies In as fire Paser LL	greet, and	GENERAL ARRANGEMENT						
			UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE CFP59-F10/15/20/25/40/50										
			ANGULAR DIMENSIONS ± 1°	MACHINED SURFACES	UNITS	UNITS	DWG UNITS:	DRAWN E	BY: PBS	D	ATE: 25JAN2017		
			THIRD ANGLE PROJECTION	125/		In the second	IN/LB/S	PRO-I	ENGINEER	1	NIT ECO: 2017-057		
				⁰ / 100 SACHARCS 100 SACHARCS :11:11113 11:111	100 SALIMATS	SCALE: 0.125		SHEET		NING NO:			
	REV BY	DATE		\sim	THE SECTION	The factoments	EST WEIGHT:		3 OF 5	A U	142J655		

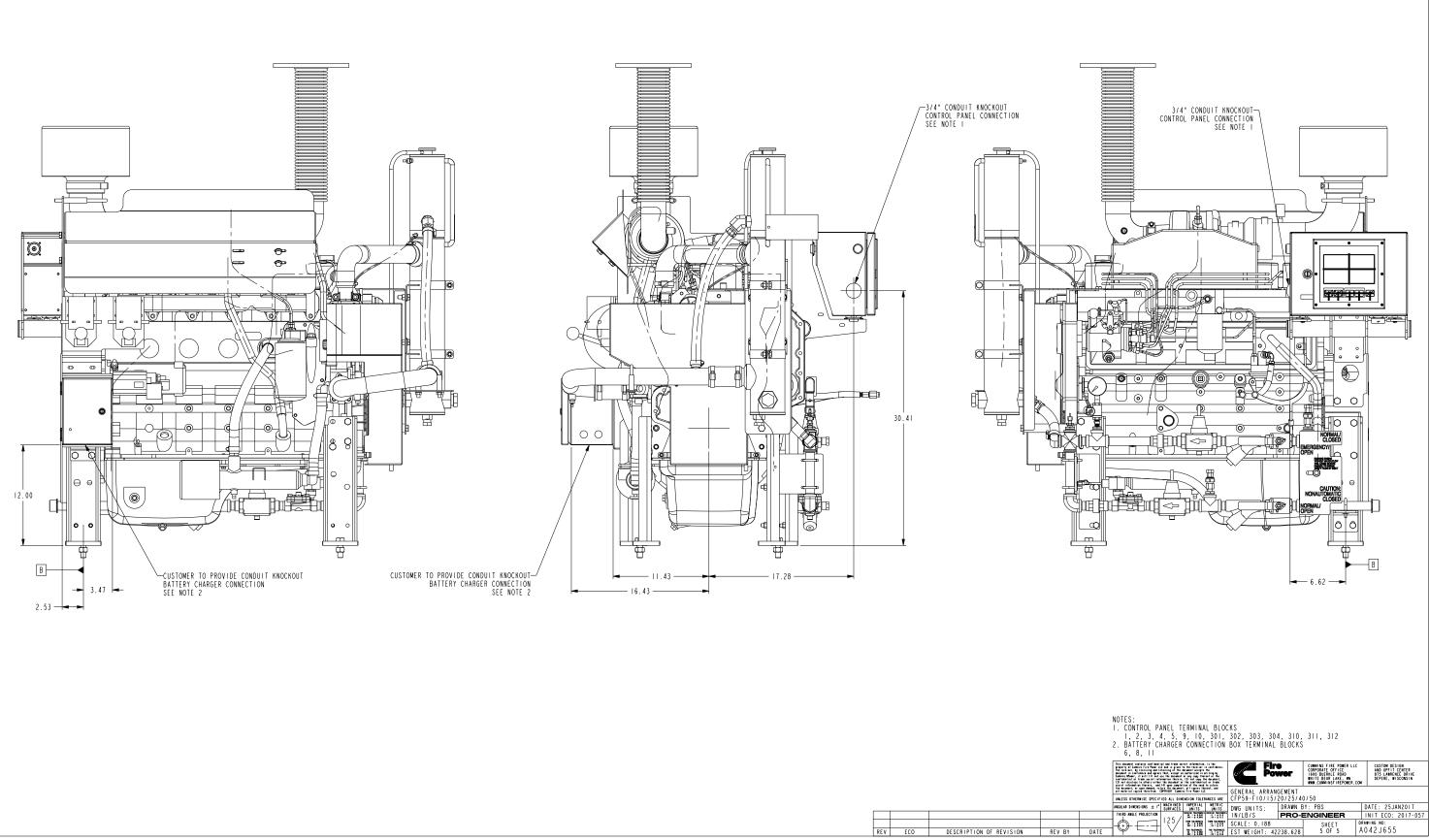




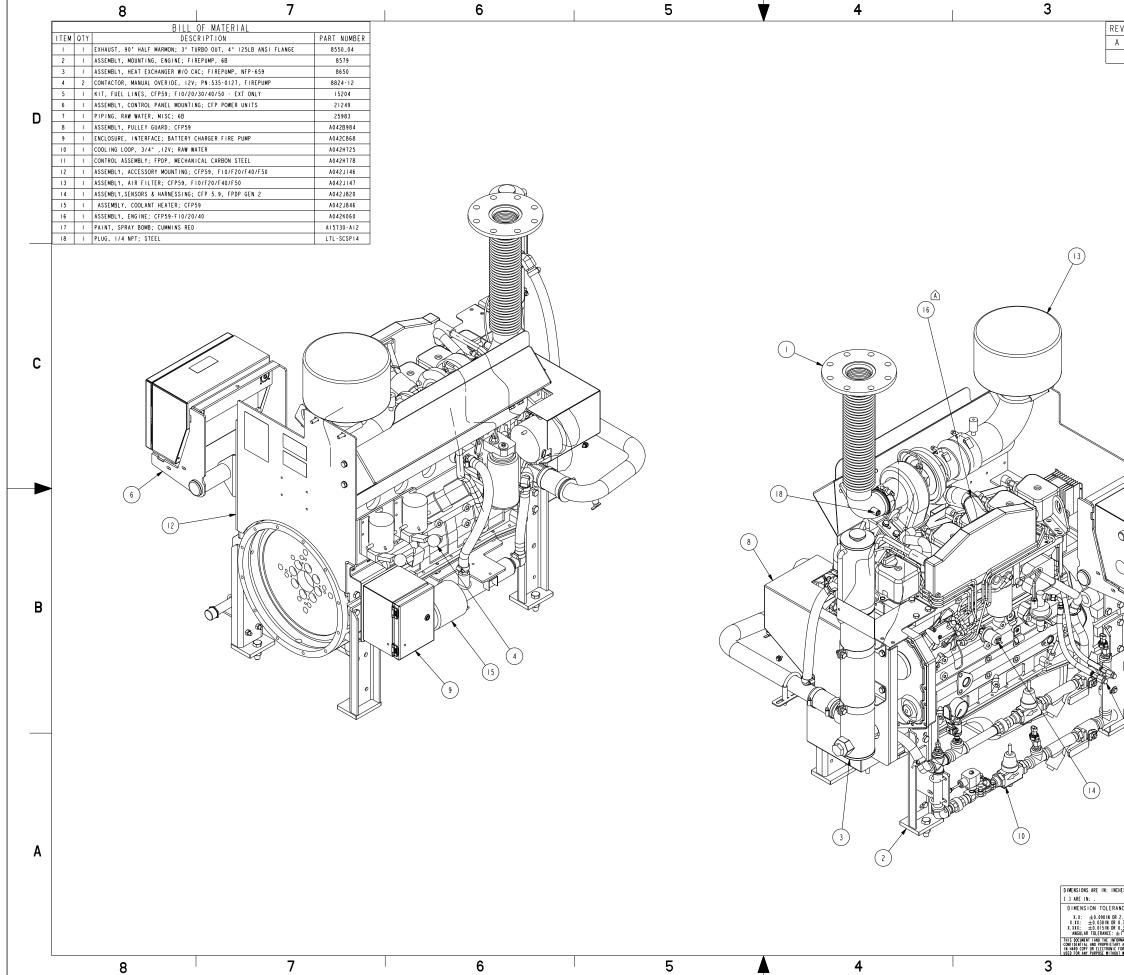


REV ECO DESCRIPTION OF REVISION REV

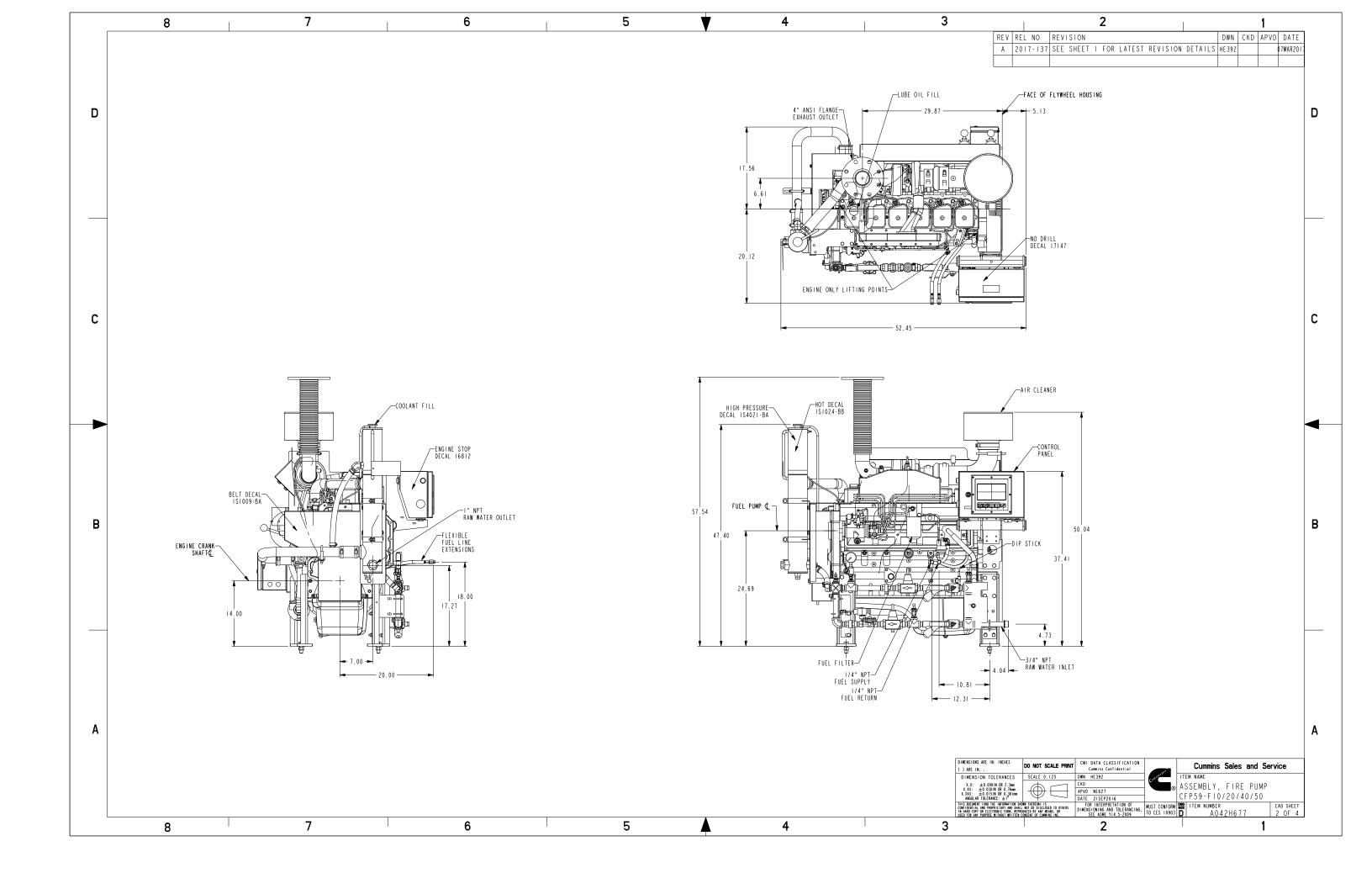


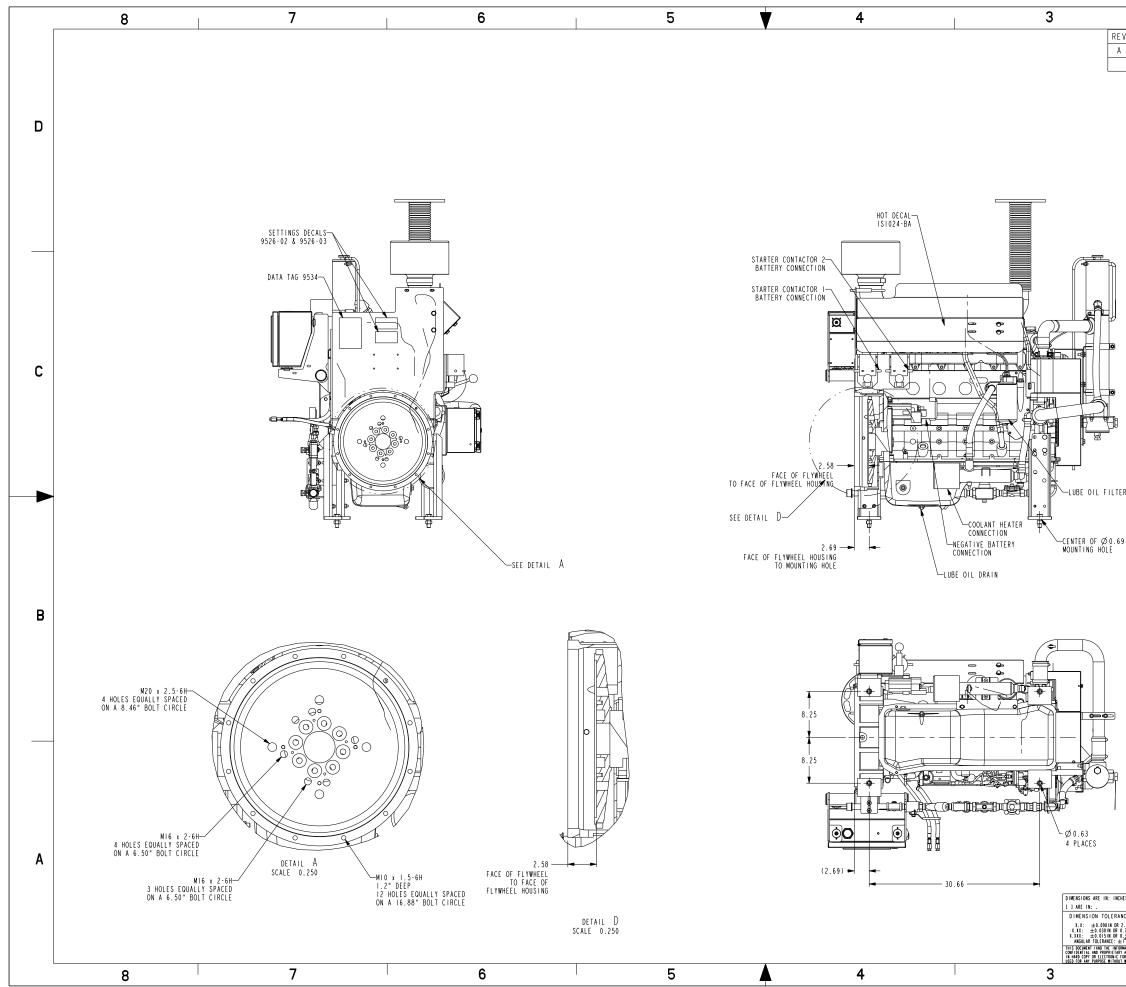


REV ECO

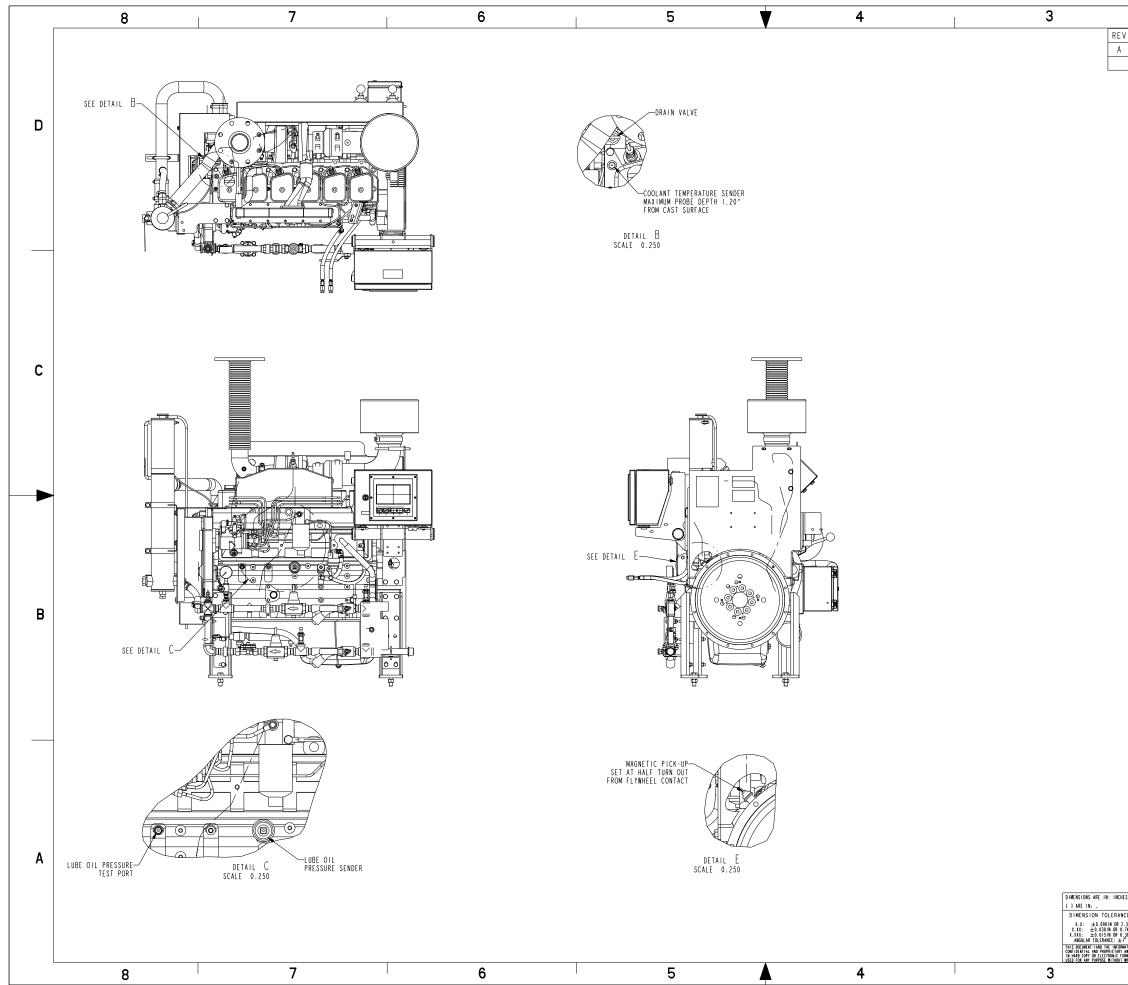


			2	2					1		
		E V I S I E L E T E		. ADD A042	2K060		DWN HE 392	CKD	APVD NE627	DATE 07MAR2011	
											D
											с
	×										
			\geq								
	Ĭ										
o T			Ē.								
0	0.		\checkmark								
											В
Ø											
, F	~										
ð	Z										
	(1)									
Ś	5)									
											A
NCHES	DO NOT SCAL		Cummin: DWN HE392	CLASSIFICATION Confidential	Curpone	Cummins				ce	
R 2.3mm R 0.76mm R 0.381mm ±1° FORMATION S™	MIN THERECONI IS L NOT BE DISCLOSED TO DOUCED BY ANY MEANS, CONSENT OF CUMMINS IN	\exists	CKD APVD NE62 DATE 21SE FOR INTE	P2016	-	ASSEMBLY CFP59-FI	0/20/	RE PU 40/5	0	AD OUTST	
ARY AND SHALL C FORM, REPRO	L NOT BE DISCLOSED TO DUCED BY ANY MEANS, DONSENT OF CUMMINS IN	O OTHERS OR WC.		RPRETATION OF 6 AND TOLERANCING, 4E YI4.5-2009 2	MUST CONFORM To CES 10903	D AC	к) <u>42Н6</u>	77		AD SHEET OF 4	
				-					•		



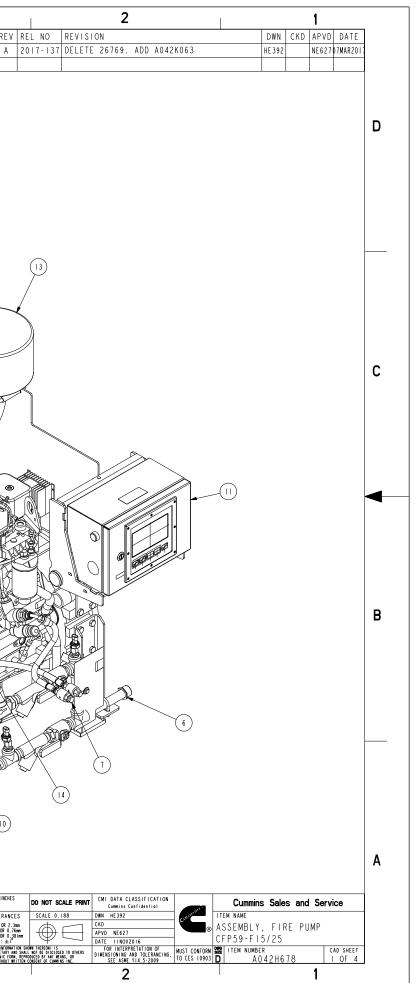


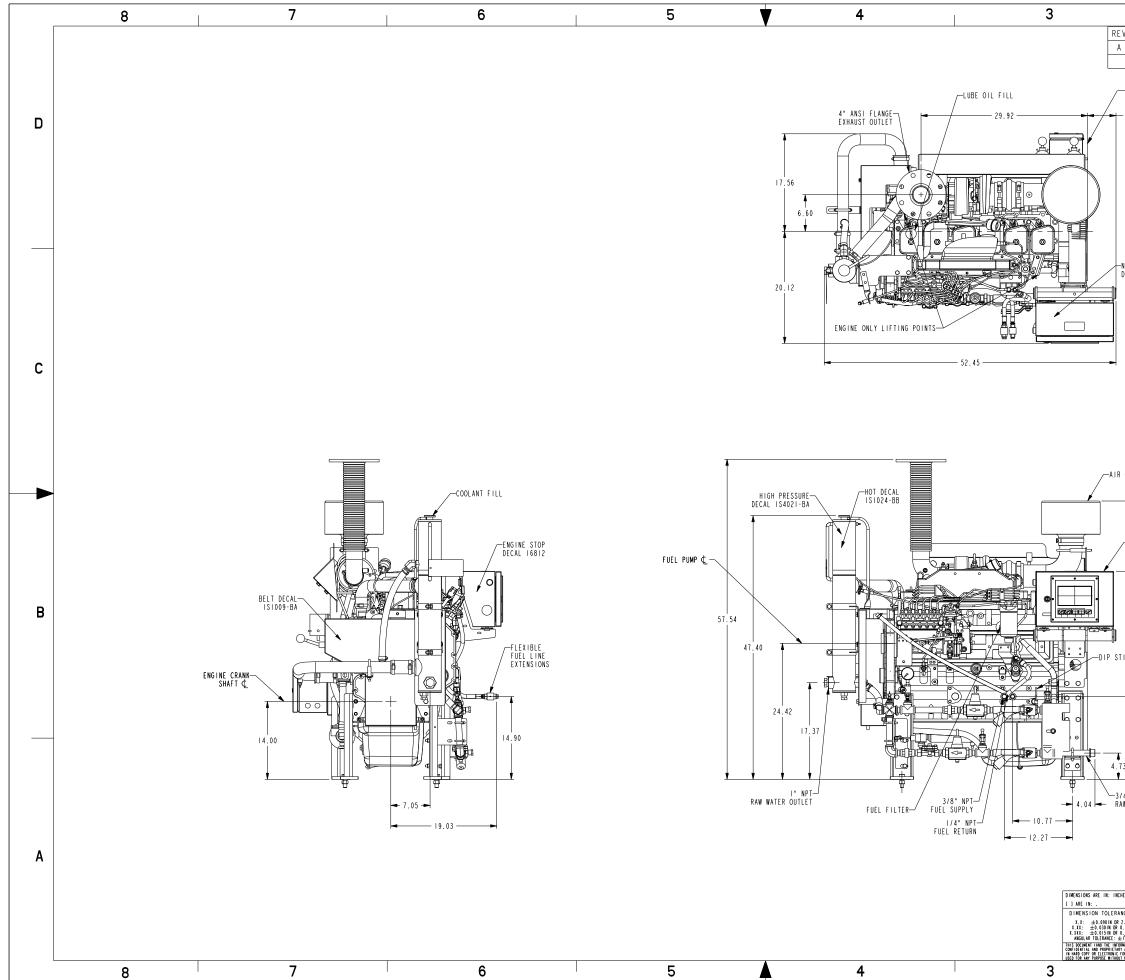
				2						1		
	EL NO 017-137	REVIS SEE SH		FOR	LATEST	REVISIO	N DETAILS	DWN HE 392	CKD	APVD	DATE D7MAR2011	
												_
												D
ļ												
												С
												•
1												
TER												◀—
69												
												в
Ð												
												Α
NCHES	do not so		Cumni	ins Confid	FICATION ential			ns Sale	s and	Servi	ce	
RANCES DR 2.3mm R 0.76mm R 0.381mm ±1°		\square	DWN HE3 CKD APVD NE DATE 21	627		Curpert 0	ITEM NAME ASSEMBLY CFP59-FI	(, FIF	RE PU	MP 0		
FORMATION S TARY AND SHA IC FORM, REP HOUT WRITTEN	HOWIN THEREON) IS ILL NOT BE DISCLOSI RODUCED BY ANY MEI I CONSENT OF CUMMIT	ED TO OTHERS ANS, OR NS INC,	FOR IN DIMENSION SEE		ION OF DLERANCING, 5-2009	MUST CONFORM TO CES 10903	DWG ITEM NUMB			C.	AD SHEET S OF 4	
	•			2						I		



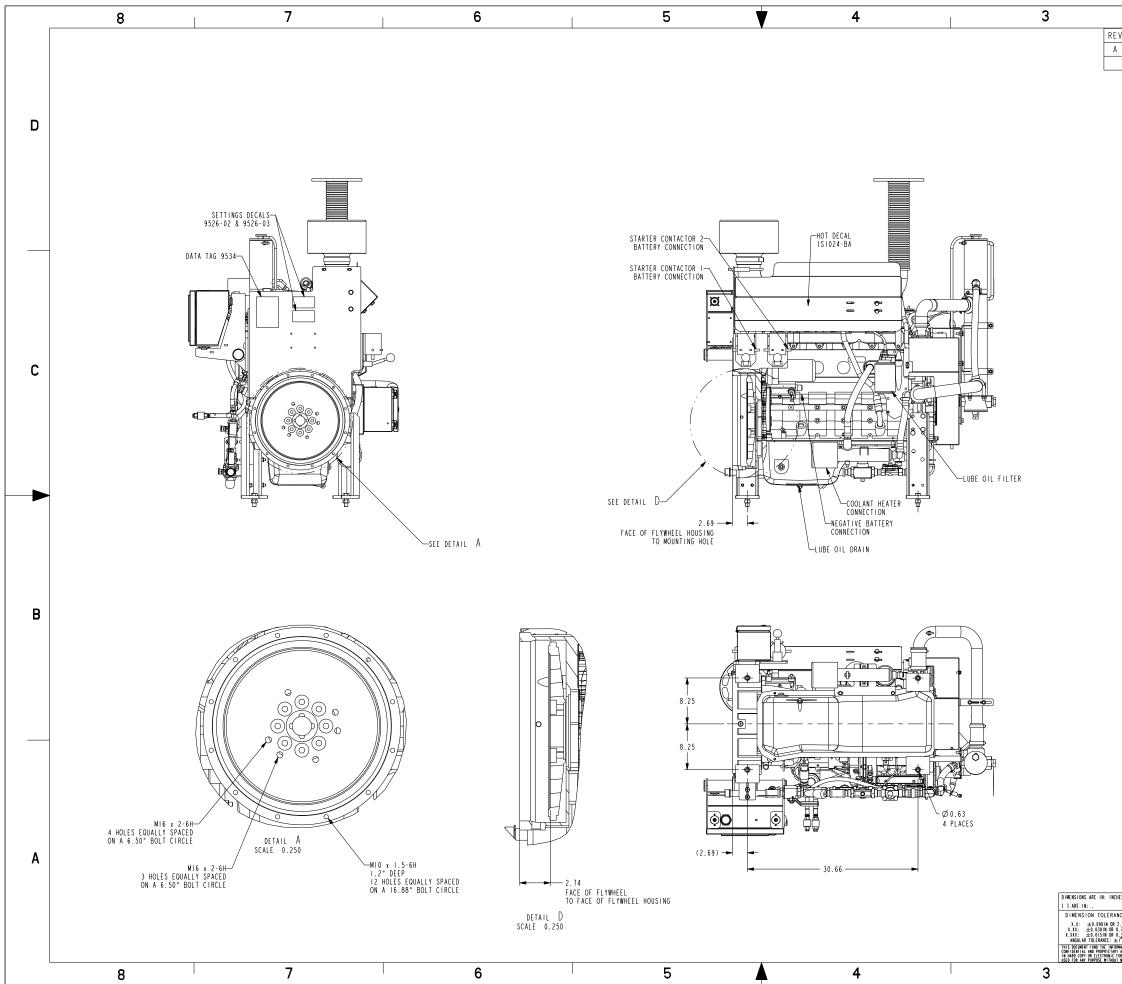
	1			2						1		
	L NO	REVIS				DEVICE		DWN	CKD	APVD	DATE	
A 20) 7- 37	SEE SI	1ttll	FOK	LATEST	KEVISIC	N DETAILS	HE 392)7MAR2011	
												-
												D
												•
												С
												в
												В
												Α
NCHES	do not so			TA CLASSI			Cummins	Cala	م مح	Sand	Ce	
RANCES	SCALE 0.			ins Confid		Curanian	ASSEMBLY				60	
R 2.3mm R 0.76mm R 0.381mm ±1° FORMATION SHO			APVD NE	627 ISEP2016 NTERPRFTAT	ION OF		CFP59-FI	0/20/	40/5	0	AD SHEET	
ARY AND SHALL C FORM, REPRO OUT WRITTEN C	OWN THEREON) IS NOT BE DISCLOSE DOUCED BY ANY MEY CONSENT OF CUMMIN	ED TO OTHERS NNS, OR NS INC,	DIMENSION		ION OF DLERANCING, 5-2009	MUST CONFORM TO CES 10903	D AO	42H6	77		OF 4	
	•			2			1			1		

[
	8	7		6	5		' 4	1	3	
		OF MATERIAL								REV
		CRIPTION	PART NUMBER							
	I I EXHAUST, 90" HALF MARMON; 3" T		8550_04							A
	2 I ASSEMBLY, MOUNTING, ENGINE; FI	REPUMP, 6B	8579							
	3 I ASSEMBLY, HEAT EXCHANGER W/O C		8650							
	4 2 CONTACTOR, MANUAL OVERIDE, 12V		8824-12							
	5 I ASSEMBLY, CONTROL PANEL MOUNTI	NG; CFP POWER UNITS	21249 25983							
D	6 I PIPING, RAW WATER, MISC; 6B 7 I KIT, FUEL LINES, CFP83; FI0/20	/30/40 - EXT ONLY	A042B473							
	8 I ASSEMBLY, PULLEY GUARD; CFP59		A042B984							
	9 I ENCLOSURE, INTERFACE; BATTERY		A042C868							
	10 I COOLING LOOP, 3/4", 12V; RAW W		A042H725							
	II I CONTROL ASSEMBLY; FPDP, MECHAN I2 I ASSEMBLY, ACCESSORY MOUNTING;		A042H778 A042J146							
	13 I ASSEMBLY, AIR FILTER; CFP59, F		A042J146							
	14 I ASSEMBLY, SENSORS & HARNESSING;		A042J820							
	15 I ASSEMBLY, COOLANT HEATER; CFP		A042J846							
	16 I ASSEMBLY, 12VDC ENGINE; CFP59-F		A042K063							
	17 I PAINT, SPRAY BOMB; CUMMINS RED		A15730-A12							
	18 I PLUG, 1/4 NPT; STEEL		LTL-SCSP14							
				S S S						
									\frown	<hr/>
							<i>(</i>	~	(16)	
							(」 し		~
								\sim		
C								7°)°)	
								6		<
			RD							These
										y
			1							\prec /
					<					
					\geq					
										·
			\sim							
			\gg		\downarrow		_			
			·		a		(18)			
			0		2)		\bigcirc			
							\frown			
			0		\sim		(8)			
					5					
		•	2ª		0		X			
В	(12)							$\mathbb{A} \mathbb{A} \mathbb{A}$		
		0					$\langle \rangle$		<u> </u>	
			0							
		6 N N N 8000	° \\\ 4 @ \\				a a			
)					
							Ċ		PIN & KOP	
			74							AD
								NAD .		
			0	(9)						Sand
				\odot						
							-	\checkmark	A CAR DA	- \
							(:	3)		\succ
								-		(10)
									¥Ú	
A										
^										
									Г	DIMENSIONS ARE IN: INCHES
										[] ARE IN: .
										DIMENSION TOLERANC X.X: ±0.0901N OR 2.3
										X.XX: ±0.0301N OR 0.7 X.XXX: ±0.0151N OR 0.3 ANGULAR TOLERANCE: ±1°
									-	X.X: ±0.0901N OR 2.3 X.XI: ±0.0301N OR 0.7 X.XII: ±0.0151N OR 0.7 ANGULAR TOLERANCE: ±1° THIS DOCUMENT TAND THE INFORMAT CONFIDENTIAL AND PROPEITARY AND IN HARD COPY OF ELECTRONIC FOR USED FOR ANY PURPOSE WITHOUT WE
		_		•		. 🔺	-			IN HARD COPT OR ELECTRONIC FORM USED FOR ANY PURPOSE WITHOUT WE
	8	7		6	5	•	. 4	I	3	
-										

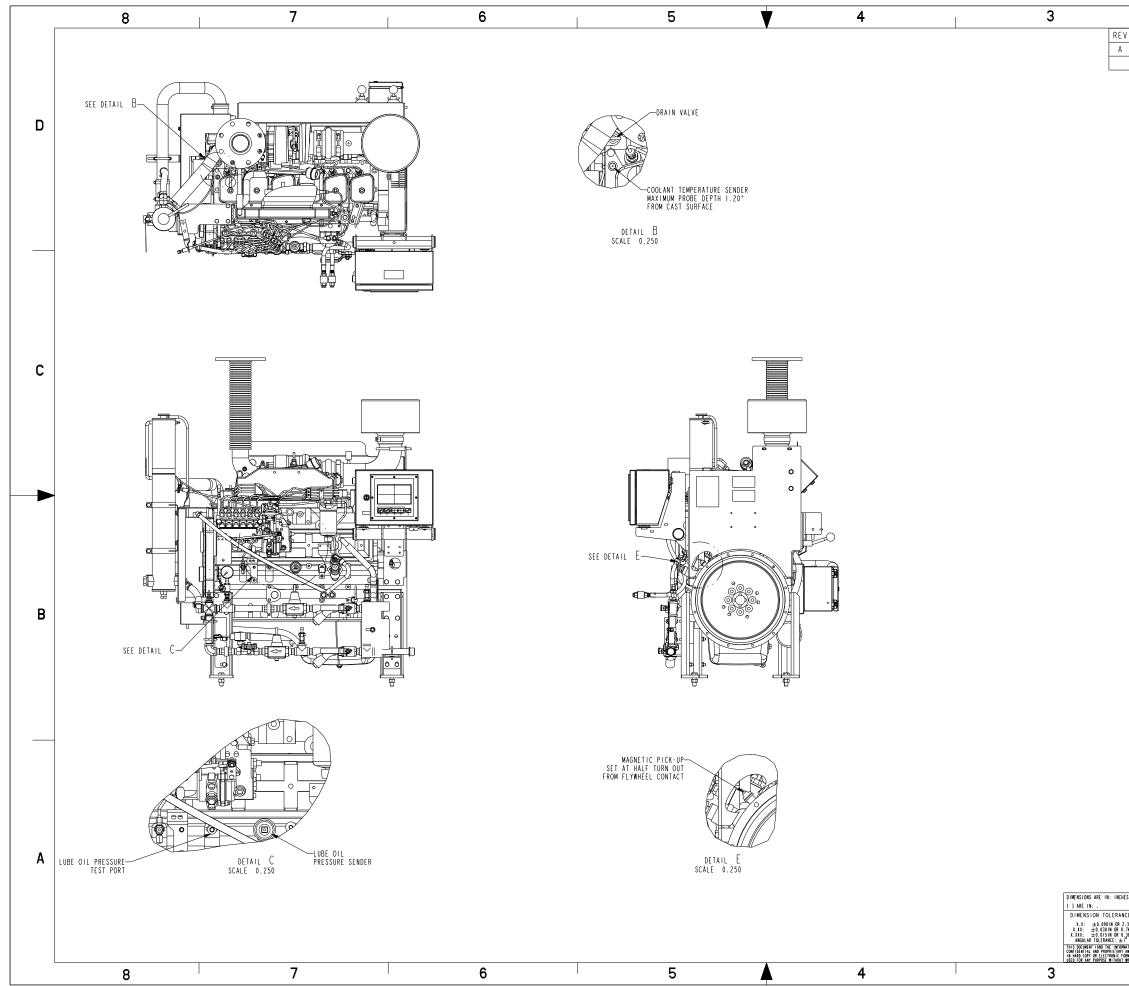




				2						1		
		REVIS				DEVICE		DWN	CKD		DATE	
A 20	17-137	SEE S	HEET	I FOR	LATEST	REVISION	DETAILS	HE 392		NE 6 2 7	07MAR2011	
—FACE	OF FLYWI	HEEL HO	USING									
- 5.13												D
-NO DRI	LL											—
DECAL	17147											
												C
												С
R CLEAN	IE R											
		_										
		Ī										
CON' PANI	TROL											
' PANI	L											
	f											
												_
												В
		 50.04										
TICK												
	37.41											
•												
 4.9	0											
73												
Ĩ	•											
/4" NP AW WAT	T ER INLET											
												Α
CHES	do not sc	ALE PRINT		DATA CLASS ummins Confi	IFICATION		Cummins	s Sale	s and	Servi	ce	
ANCES	SCALE 0.1	25	DWN H CKD	HE 392			TEM NAME SSEMBLY	E I C	F PI	MP		
2.3mm 0.76mm 0.381mm ±1°			APVD	110072016			CFP59-FI	5/25	L FU			
USHATION SHO RY AND SHALL FORM, REPRO UT WRITTEN C	UN THEREON) IS NOT BE DISCLOSED DUCED BY ANY MEAT ONSENT OF CUMMIN:	D TO OTHERS NS, OR S INC.	FOR DIMENSI SE		TION OF TOLERANCING, .5-2009	MUST CONFORM	EITEM NUMBE	r 42H6	78	2	AD SHEET COF 4	
				2						1		



				2						1		
	L NO	REVIS SEE SH		I_FOR	LATEST	REVISIO	N DETAI	DWN LS HE39	-	APVD NE627	DATE 07MAR2011	
												D
												с
												L
												-
												В
												Α
NCHES	do not sc	ALE PRINT		ATA CLASS mmins Confi			Cum	mins Sal	es and	Servi	ce	
RANCES R 2.3mm R 0.76mm R 0.381mm ±1°	SCALE 0.1		DWN HI CKD APVD	E 392		Curprint 0	ITEM NAME ASSEMB	LY, FI	RE PU			
H 0.381mm ±1° FORMATION SHO ARY AND SHALL C FORM, REPRO DUT WRITTEN O	WIN THEREONI IS NOT BE DISCLOSE DOUCED BY ANY MEA ONSENT OF CUMMIN	D TO OTHERS NS, OR S INC.	DATE FOR DIMENSIONS SF	IINOV2016 INTERPRETA DNING AND 1 E ASMF Y14	TION OF OLERANCING, 5-2009	MUST CONFORM To ces 10903	СЕР59- 1000 гтем Ni D			C.	AD SHEET 3 OF 4	
NUT BRITIER C	UNDER OF CONNER	y 186,	. 31	2					• • •	1		



				2						1		
	L NO	REVIS SEF SI			LATEST	REVISIO	N DETAILS	DWN HE392	CKD	APVD	DATE D7MAR201	
	1.1.1.51	022 01			ENTEOL		PEINILO			NEVL1	, rentice VI i	
												D
												U
												С
												U
												_
												в
												D
												Α
NCHES	.		CMI DA	1 A CI 499	IFICATION							
RANCES	DO NOT SC SCALE 0.		Cum DWN HE	nins Confid	lential		Cummin:				ce	
R 2.3mm R 0.76mm E 0.381mm ±1°		\square	CKD APVD N DATE I	10072016		Ū	ASSEMBLY CFP59-FI	5/25	E PU			
NORMATION SHO ARY AND SHALL C FORM, REPRO GUT WRITTEN C	WIN THEREONI IS NOT BE DISCLOSE NOUCED BY ANY MEA CONSENT OF CUMMIN	D TO OTHERS INS, OR IS INC.	FOR I DIMENSION SEE		TION OF OLERANCING, 5-2009	MUST CONFORM TO CES 10903	D AC	.r)42H6	78	4	AD SHEET OF 4	
	1			2			1			1		

8724 ΡN 35324 SO Model 6BTA5.9G3 **Config** D403050DX02

Option Desc FIRE 35 6BTA5.9G3 ADAPTER, FRONT DR AF 9006 HEATER, AIR INTAK AH 9000 APPROVAL, AGENCY AP 9229 BP 9042 BASE PARTS BP 9703 COVER, FRONT GEAR BP 9710 LEVER,ROCKER BP 9711 FOLLOWER,CAM BP97149 **BLOCK, ENGINE** COVER, CAM FOLLOW CM 9016 CM 9701 COVER, CAM FOLLOW DF 9051 DRIVE, FRT GR TR DL 9001 LOCATION, FUEL DR EC 9039 THERMOSTAT EH 9001 LOCATION, ALTERNA EH 9993 DRIVE, ALTERNATOR EI 9000 DRIVE, MECH TACH DRIVE, MECH TACH EI 9701 FA 9000 DRIVE, FAN FILTER, FUEL FF 9003 FF 9740 PLUMBING, FUEL FI FH 9002 HOUSING, FLYWHEEL FP 9211 COUPLING, FUEL PU FP90368 PUMP, FUEL RATING, FUEL FR91231 FS 9004 PUMP,LIFT FT97121 PLUMBING, FUEL VALVE, FUEL SHUTO FV 9001 FW 9222 FLYWHEEL

Option Desc LA 9007 BRACKET, LIFTING LC 9020 COOLER, ENGINE OI LG 9058 GAUGE, OIL LEVEL LP 9714 PUMP,LUBRICATING OB 9000 COVER, CYLINDER B OB 9704 COVER, CYLINDER B OP 9006 PAN,OIL OP 9702 MOUNTING,OIL PAN PP 8387 PERFORMANCE, PART PP97222 HEAD, CYLINDER PP97298 1 MOUNTING, CYLINDE PP97611 1 TURBOCHARGER SG 9000 1 PACKAGE, GUARD SM 9701 1 MOUNTING, STARTER SS 9005 1 PAINT SS 9075 1 SKID SS 9702 1 ENGINE, DRY ST 9368 1 MOTOR, STARTING TB 9766 1 MOUNTING, TURBOCH TB 9792 1 MANIFOLD, EXHAUS TTB90006 1 LOCATION, TURBOCH TH 9001 1 HOUSING, THERMOST TP 9703 1 PLUMBING, TURBOCH VC 9005 COVER, VALVE WA 9738 PLUMBING,AFTERCO WI 9005 CONNECTION, WATER WI 9701 CONNECTION, WATER WP 9031 PUMP,WATER XS 9009 CONNECTION, EXHAU

8724 ΡN 35324 SO Model 6BTA5.9G3 **Config** D403050DX02

	Option FIRE 35 AF 9006 AH 9000	Desc 6BTA5.9G3 ADAPTER,FRONT DR HEATER,AIR INTAK		Option LA 9007 LC 9020 LG 9058
٨	AP 9001		\$	LP 9064
	BP 9042	- ,		LT 9001
	BP 9703	COVER, FRONT GEAR		OB 9000
	BP 9710	LEVER,ROCKER		OB 9704
	BP 9711	FOLLOWER,CAM		OP 9006
	BP97149	BLOCK,ENGINE		OP 9702
	CM 9016	COVER,CAM FOLLOW		PP 8387
	CM 9701	COVER,CAM FOLLOW	$\underline{\wedge}$	PP98482
	DF 9051	DRIVE,FRT GR TR		PP97298
	DL 9001	LOCATION, FUEL DR	\mathbb{A}	PP90689
	EC 9039	THERMOSTAT		SG 9000
\land	EE 9249	ALTERNATOR		SM 9701
	EH 9001	LOCATION, ALTERNA	\mathbb{A}	SS 9615
	EH 9993	DRIVE,ALTERNATOR		SS 9024
	EI 9000	DRIVE, MECH TACH	\mathbb{A}	SS 9279
	EI 9701			SS 9702
	FA 9000	DRIVE,FAN	$\underline{\mathbb{A}}$	ST 9587
	FF 9003	FILTER,FUEL		TB 9766
	FF 9740	PLUMBING,FUEL FI		TB 9792
	FH 9002	HOUSING,FLYWHEEL		TTB90006
	FP 9211	COUPLING,FUEL PU		TH 9001
	FP90368	PUMP,FUEL		TP 9703
	FR91231	RATING,FUEL		VC 9005
	FS 9004	PUMP,LIFT		WA 9738
	FT97121	PLUMBING,FUEL		WI 9005
	FV 9001	VALVE, FUEL SHUTO		WI 9701
	FW 9828	FLYWHEEL		WP 9031
				XS 9009

BUILT BEFORE JANUARY 1, 2007

BUILT AFTER JANUARY 1, 2010

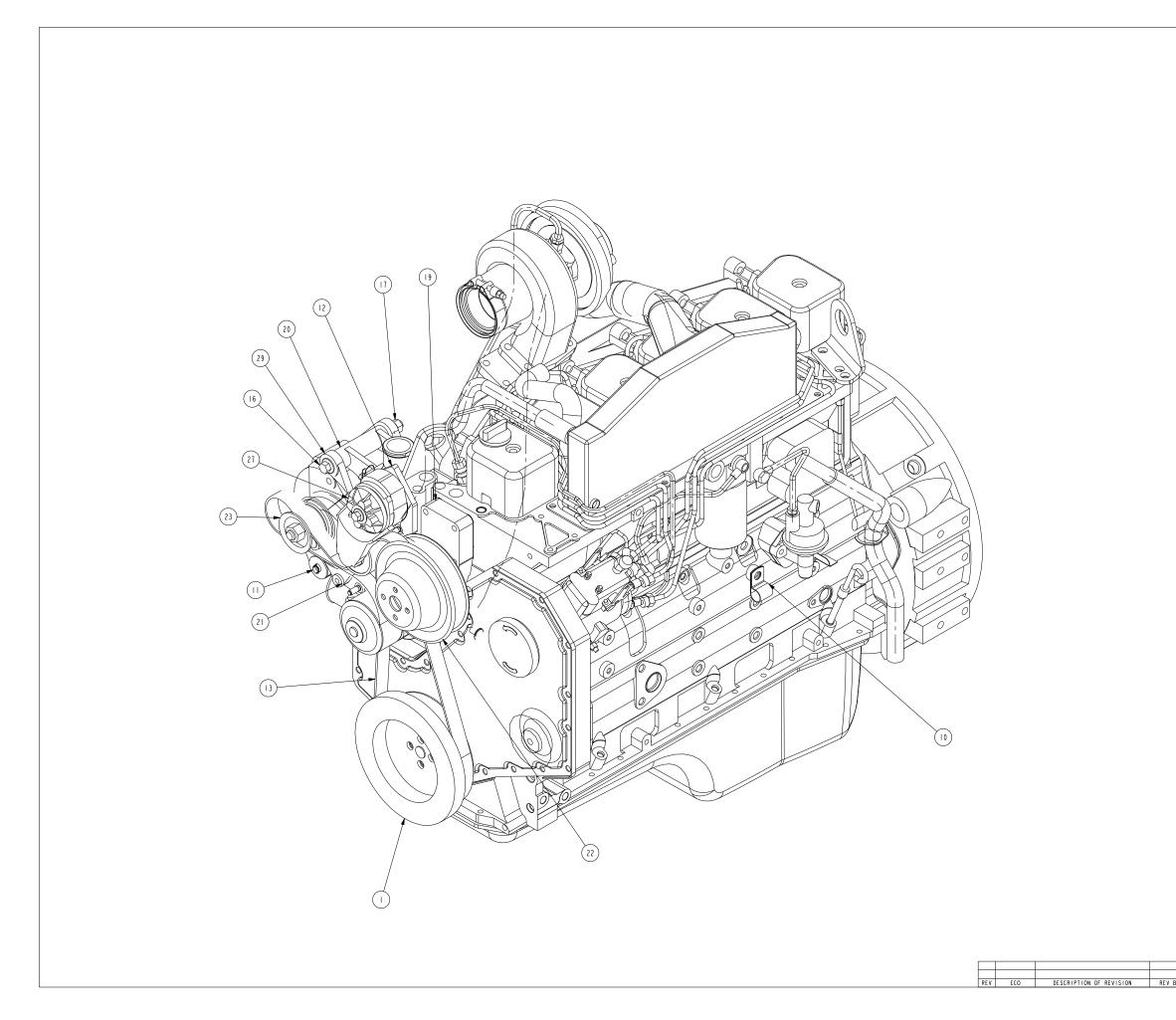
				ALL RIGHTS TO MANUFACTURE, COPY OR DISPOSE OF THIS DRAWING OR ITS CONTENTS ARE RESERVED UNLESS OTHERWISE SPECIFIED IN WRITING BY CUMMINS NPOWER, LLC	Cummins	Fire Power	CUMMINS NPOWER CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.NPOWER.CUMMINS.COM	CUMMINS FIRE POWER DESIGN CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN WWW.CUMMINSFIREPOWER.COM
				UNLESS OTHERWISE NOTED	DWG SCALE:	NTS	drawn by: DAVE N	date: 23SEP2004
				-	PLOT SCALE:		APPD BY:	DATE:
				APPLY MACHINE TOLERANCES $X = \pm 0.06$ $XX = \pm 0.010$	DESCRIPTION			
D	UPDATE ENGINE SPEC	JJW	29SEP2014	$.XXX = \pm 0.001$	ASSEM	BLY, ENG	INE, 6BTA5.9G3	
С	UPDATE ENGINE SPEC	S DUBICK	04AUG2010	APPLY WELDED TOLERANCES $X = \pm 0.25$ $XX = \pm 0.12$	REFERENCE:	,		DRAWING NUMBER:
REV	DESCRIPTION OF REVISION	BY	DATE	$.XXX = \pm 0.06$	CFP59	-F10/20	/40/50	8724D

- MOUNTING, TURBOCH MANIFOLD, EXHAUS 06 LOCATION, TURBOCH HOUSING, THERMOST PLUMBING, TURBOCH 5 COVER,VALVE 88 PLUMBING,AFTERCO CONNECTION, WATER CONNECTION, WATER 1 PUMP,WATER CONNECTION, EXHAU
- MOUNTING, STARTER PAINT **OIL, LUBRICATING** ARRANGEMENT. SHIP OIL, ENGINE MOTOR, STARTING
- MOUNTING, OIL PAN PERFORMANCE, PART HEAD, CYLINDER MOUNTING, CYLINDE TURBOCHARGER PACKAGE, GUARD
- GAUGE, OIL LEVEL PUMP,LUBRICATING LITERATURE COVER, CYLINDER B COVER, CYLINDER B PAN.OIL
- Desc BRACKET, LIFTING COOLER, ENGINE OI

REV ECO DESCRIPTION OF REVISION REV BY DATE

3 I FUEL SOLENOID 26387 4 I CLAMP, LOOM, 0.75 ID 26964-12 5 I SCREW, HEXAGON HEAD CAP, .3125-24X1.00 3052061 6 I BRACKET, BELT TENSIONER 3283868 7 I BELT, V RIBBED 3288812 8 5 SCREW, HEX FLANGE HEAD CAP, - 3900630 9 4 SCREW, HEX FLANGE HEAD CAP, - 39003105 10 I SCREW, HEX FLANGE HEAD CAP, - 3903105 11 I NUT, HEXAGON FLANGE, MI2 x 1.75 3903210 12 I SCREW, HEX FLANGE HEAD CAP, MI0X1.5-70 9.8 ZN_PHOS 39094446 13 I SUPPORT, FAN 3909888 14 I SUPPORT, ALTERNATOR 3910923 15 I BRACE, ALTERNATOR 3918275 18 I SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 I SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, FLAT HEAD CAP, M10x1.5-6g X 35mm LG 3968470 </th <th>TEM</th> <th>QTY</th> <th>DESCRIPTION</th> <th>PART NUMBE</th>	TEM	QTY	DESCRIPTION	PART NUMBE	
3 I FUEL SOLENOID 26387 4 I CLAMP, LOOW, 0.75 1D 26964-12 5 I SCREW, HEXAGON HEAD CAP, .3125-24X1.00 3052061 6 I BRACKET, BELT TENSIONER 3283868 7 I BELT, V. RIBBED 328386 8 S SCREW, HEX FLANGE HEAD CAP, 3900650 9 4 SCREW, HEX FLANGE HEAD CAP, 3930051 10 I SCREW, HEX FLANGE HEAD CAP, 3930105 11 I NUT, HEXAGON FLANCE, MI2 X 1.75 3903205 12 I SCREW, HEX FLANGE HEAD CAP, MI0XIL5-70 9.8 ZN_PHOS 3904446 13 I SUPPORT, FAN 390328 3910923 14 I SUPPORT, FAN 3910924 3910924 15 I BRACE, ALTERNATOR 3910924 16 I PULLEY, FAN 3914463 17 I PULLEY, FAN 3918275 18 I SCREW, HEX FLANGE HEAD CAP, MEX 1.25 × 25 3925186 <td>1</td> <td> </td> <td>ENGINE, 6BTA5.9G3</td> <td>8724</td>	1		ENGINE, 6BTA5.9G3	8724	
4 1 CLAMP, LOOM, D.75 ID 26964-T2 5 1 SCREW, HEXAGON HEAD CAP, .3125-24X1.00 3652061 6 1 BRACKET, BELT TENSIONER 3283868 7 1 BELT, V. RIBBED 3283868 8 5 SCREW, HEX FLANGE HEAD CAP, 3900630 9 4 SCREW, HEX FLANGE HEAD CAP, 38003105 10 1 SCREW, HEX FLANGE HEAD CAP, 38003105 11 1 NUT, HEXAGON FLANGE, MI2 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, MI0X1.5-70 9.6 ZN_PHOS 3904446 13 I SUPPORT, FAN 3903810 3904446 14 I SUPPORT, ALTERNATOR 3910924 15 I BRACE, ALTERNATOR 39138275 16 I PULLEY, FAN 39128275 3925166 19 I SCREW, FLAT HEAD CAP, MI & 1.25 × 25 3925186 19 I SCREW, TEXFER POINT CAP, MI & 1.25 × 25 392873 20 2 SCREW, TEXFER POINT CAP, MI & 1.25 × 25 3928186 14 I	2	16	PREMIUM BLUE I5W40, (QUART)	V705290	
5 1 SCREW, HEXAGON HEAD CAP,	3		FUEL SOLENOID	26387	
6 1 BRACKET, BELT TENSIONER 3283868 7 1 BELT, V RIBBED 3288812 8 5 SCREW, HEX FLANGE HEAD CAP, - 3300630 9 4 SCREW, HEX FLANGE HEAD CAP, - 3903053 10 1 SCREW, HEX FLANGE HEAD CAP, - 3903053 11 1 NUT, HEXAGON FLANGE, MI2 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, - 3903088 13 1 SUPPORT, FAN 3903088 14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3918275 18 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25 x 40 10.9 ZNLPHOS 3928873 20 2 SCREW, TEX FLANGE HEAD CAP, M8 x 1.25 x 40 10.9 ZNLPHOS 3928873 21 1 TERSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 49987071 23 1 ALTERNATOR, 24V S282841	4		CLAMP, LOOM, 0.75 ID	26964-12	
7 1 BELT, V RIBBED 3288812 8 5 SCREW, HEX FLANGE HEAD CAP, - 3900630 9 4 SCREW, HEX FLANGE HEAD CAP, - 3900631 10 1 SCREW, HEX FLANGE HEAD CAP, - 3903105 11 1 NUT, HEXAGON FLANGE, MI2 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, NUCXI.S.70 9.8 ZN_PHOS 3904446 13 1 SUPPORT, TAN 39039240 3904446 13 1 SUPPORT, ALTERNATOR 3910924 3910924 16 1 PULLEY, FAN 3913924 3910924 16 1 PULLEY, FAN 3910924 3910924 17 1 PULLEY, FAN 3913924 3910924 18 1 SCREW, FLAT HEAD CAP, N& XI.25 × 25 3925186 19 1 SCREW, THEX FLANGE HEAD CAP, M& XI.25 × 40 10.9 ZN_PHOS 3926873 20 2 SCREW, THEX FLANGE HEAD CAP, MOXI.5 - 6g X 35mm LG 3968470 3978022 21 1 TENSIONER, BELT 3978022 3978022 3978022 3978022	5	Ι	SCREW, HEXAGON HEAD CAP, .3125-24X1.00	3052061	
8 5 SCREW, HEX FLANGE HEAD CAP, - 3900630 9 4 SCREW, HEX FLANGE HEAD CAP, M8X1.25-25 9.8 ZN_PHOS 3900631 10 1 SCREW, HEX FLANGE HEAD CAP, - 3903105 11 1 NUT, HEXAGON FLANGE, M12 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, M10X1.5-70 9.8 ZN_PHOS 3904446 13 1 SUPPORT, FAN 3909888 14 1 SUPPORT, FAN 3910924 15 1 BRACE, ALTERNATOR 3919244 16 1 PULLEY, FAN 391463 17 1 PULLEY, FAN 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, TWELVE POINT CAP, MI0x1.5-69 X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V S282841 24 1 MANUAL, 0&M CFPS.9 A0421557 ASSEMELY,	6	Ι	BRACKET, BELT TENSIONER	3283868	
9 4 SCREW, HEX FLANGE HEAD CAP, M8X1.25-25 9.8 ZN_PHOS 3900631 10 1 SCREW, HEX FLANGE HEAD CAP, - 3903105 11 1 NUT, HEXAGON FLANGE, M12 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, MIOX1.5-70 9.8 ZN_PHOS 3904446 13 1 SUPPORT, FAN 3903988 14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, FAN 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, TWELVE POINT CAP, MIOX1.5-69 X 35mm L6 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V S282841 24 1 MANUAL, 0&M CFP5.9 A0421557	7		BELT, V RIBBED	3288812	
10 11 SCREW, HEX FLANGE HEAD CAP, - 3903105 11 11 NUT, HEXAGON FLANGE, MI2 x 1.75 3903210 12 11 SCREW, HEX FLANGE HEAD CAP, MI0X1.5-70 9.8 ZN_PHOS 3904446 13 11 SUPPORT, FAN 3909888 14 1 SUPPORT, ALTERNATOR 3910924 15 1 BRACE, ALTERNATOR 3914463 16 1 PULLEY, ALTERNATOR 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 39682707 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CEPS.9 A0423557 ALTERNATOR, 24V CUMMINS FIRE ROWER LLC TOPORATE DEFICE CONTREL FRAME SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG CUMMINS FIRE ROWER LLC TOPORATE DEFICE CONTREL TOPORATE DEFICE SCREWE WEEN WEEN WEEN WEEN	8	5	SCREW, HEX FLANGE HEAD CAP, -	3900630	
11 1 NUT, HEXAGON FLANGE, M12 x 1.75 3903210 12 1 SCREW, HEX FLANGE HEAD CAP, MIDX1.5-70 9.8 ZN_PHOS 390446 13 1 SUPPORT, FAN 3909888 14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, FAN 3918275 18 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, THEX FLANGE HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, TWELVE POINT CAP, MIDX1.5-6g x 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 ASSEMBLY, 24VDC ENGINE CUSTOM DESIGN AC42J557 MANUAL, 08M CFP5.9 AC42J557 AC42J557 ASSEMBLY, 24VDC ENGINE CUSTOM DESIGN AC42J557 MANUAL, 08M CFP5.9 AC42J557 <td>9</td> <td>4</td> <td>SCREW,HEX FLANGE HEAD CAP, M8XI.25-25 9.8 ZN_PHOS</td> <td>3900631</td>	9	4	SCREW,HEX FLANGE HEAD CAP, M8XI.25-25 9.8 ZN_PHOS	3900631	
12 1 SCREW, HEX FLANGE HEAD CAP, MIOXI, 5-70 9.8 ZN_PHOS 3904446 13 1 SUPPORT, FAN 3910923 14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, FAN 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, FLAT HEAD CAP, MIOXI, 5-6g X 35mm L6 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 ASSEMBLY, 24VDC ENGINE A042J557 ASSEMBLY, 24VDC ENGINE MW. COMMINSTREPORE COM SWERKER MINSTO TOREARDS ARC CP59-FIO/20/40	10		SCREW,HEX FLANGE HEAD CAP, -	3903105	
13 1 SUPPORT, FAN 3909888 14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, FAN 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25-40 10.9 ZN_PHOS 3968470 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 A042J557 A042J557 A042J557 A042J557 ASSEMBLY, 24VDC ENGINE MINISTIERFOWER LLC CORPORATE OFFICE CHINTER MINISTOR TEREAMERS ASSEMBLY, 24VDC ENGINE MAURISTIERFOWER, MAURINESTIERFOWER, MAUR		Ι	NUT, HEXAGON FLANGE, MI2 x I.75	3903210	
14 1 SUPPORT, ALTERNATOR 3910923 15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, ALTERNATOR 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, FLAT HEAD CAP, M8 x 1.25 40 10.9 ZN_PHOS 3928873 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g x 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, O&M CFP5.9 A0423557 ASSEMBLY, 24VUC ENGINE CUMMINS FIRE POWER LLC IND DUSTING THE MANUAL, O&M CFP5.9 ASSEMBLY, 24VUC ENGINE CUMMINS FIRE POWER LLC IND DUSTING THERE OF THE FORMER COM SUBMIC THE MANUAL METRIC SUBMIC THE MANUAL METRIC SEMBLY, 24VUC ENGINE SUBMIC THE MANUAL METRIC SEMBLY, 24VUC ENGINE SUBMIC THE METRIC	12		SCREW,HEX FLANGE HEAD CAP, MIOXI.5-70 9.8 ZN_PHOS	3904446	
15 1 BRACE, ALTERNATOR 3910924 16 1 PULLEY, FAN 3914463 17 1 PULLEY, ALTERNATOR 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25 + 40 10.9 ZN_PHOS 3928873 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm L6 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J551 A042J551 A042J551 A042J551 MOTOR FRAME ASSEMBLY, 24VDC ENGINE CUMMINSFIREPOWER.LCC 18 ASSEMBLY, 24VDC ENGINE CUMMINSFIREPOWER.COM 19 MANUAL, 08M CFP5.9 A042J551 10 MANUAL, 08M CFP5.9 A042J551 11 METRICAL DIMENSITY DEFENSION TOLERARCES ARE CFP59-F10/20/40 12 METRICAL METRIC METRICAL DIMENSITY DEFENSION TOLERARCES ARE CFP59-F10/20/40	13		SUPPORT, FAN	3909888	
16 1 PULLEY, FAN 3914463 17 1 PULLEY, ALTERNATOR 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, HEX FLANGE HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J551 CUMMINS FIRE POWER LLC CORPORATE OFFICE 660 BUENCE FORD FORD-ENGINEER A0422J551 A0422J551 A0422J551 A0422J551 A0422J551 <td colspan<="" td=""><td> 4</td><td> </td><td>SUPPORT, ALTERNATOR</td><td>3910923</td></td>	<td> 4</td> <td> </td> <td>SUPPORT, ALTERNATOR</td> <td>3910923</td>	4		SUPPORT, ALTERNATOR	3910923
17 1 PULLEY, ALTERNATOR 3918275 18 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 1 SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3928873 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A0423557 COPPORT OFFICE Figure CUMMINS FIRE POWER LLC COPPORT OFFICE COPPORT OFFICE COPPO	15		BRACE, ALTERNATOR	3910924	
18 I SCREW, FLAT HEAD CAP, M8 x 1.25 x 25 3925186 19 I SCREW, HEX FLANGE HEAD CAP, M8X1.25-40 10.9 ZN_PHOS 3928873 20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 3968470 21 I TENSIONER, BELT 3978022 22 I MOTOR, STARTING, - 4996707 23 I ALTERNATOR, 24V 5282841 24 I MANUAL, 08M CFP5.9 A042J557 Cummins fire power LLC COPPORT OFFICE ISD0 BUERKLE ROAD WW.CUMMINSTIREFOWER.COM CUSTOM DESIGN A042J557 ALTERNATOR 24V SESEMBLY, 24VDC ENGINE CUMMINS FIRE POWER LLC COPPORT OFFICE ISD0 BUERKLE ROAD WW.CUMMINSTIREFOWER.COM CUSTOM DESIGN A042J557 AUTOR ACCEPTION OF THE POWER LLC COPPORT OFFICE ISD0 BUERKLE ROAD WW.CUMMINSTIREFOWER.COM CUSTOM DESIGN A042J557 CUSTOM DESIGN A042J557 AUTOR ACCEPTION OF THE POWER LLC COPPORT OFFICE ISD0 BUERKLE ROAD WW.CUMMINSTIREFOWER.COM CUSTOM DESIGN A042J557 ALTERNATION OF THE POWER ISD ACCEPTION OF THE	16	Ι	PULLEY, FAN	3914463	
19 1 SCREW, HEX FLANGE HEAD CAP, M8X1.25-40 10.9 ZN_PHOS 3928873 20 2 SCREW, TWELVE POINT CAP, MI0X1.5-6g X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 MOTOR starting tring t	17		PULLEY, ALTERNATOR	3918275	
20 2 SCREW, TWELVE POINT CAP, MI0x1.5-6g X 35mm LG 3968470 21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 CUMMINS FIRE POWER LLC GROODBATE OFFICE RAD BURGED BURGED BUR	18	I	SCREW, FLAT HEAD CAP, M8 x 1.25 x 25	3925186	
21 1 TENSIONER, BELT 3978022 22 1 MOTOR, STARTING, - 4996707 23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 Cummins Fire power LLC CORDATE OFFICE	19		SCREW, HEX FLANGE HEAD CAP, M8XI.25-40 IO.9 ZN_PHOS	3928873	
22 I MOTOR, STARTING, - 4996707 23 I ALTERNATOR, 24V 5282841 24 I MANUAL, 08M CFP5.9 A042J557 24 I MANUAL, 08M CFP5.9 A042J557 Composite of the convert of th	20	2	SCREW,TWELVE POINT CAP, MIOxI.5-6g X 35mm LG	3968470	
23 1 ALTERNATOR, 24V 5282841 24 1 MANUAL, 08M CFP5.9 A042J557 24 1 MANUAL, 08M CFP5.9 A042J557 Site and site rectors is inference. CUMMINS FIRE POWER LLC CORPORATE OFFICE HOUSE LLC HOUSE HOU	21	Ι	TENSIONER, BELT	3978022	
24 1 MANUAL, 08M CFP5.9 A042J557 25 1 MANUAL, 08M CFP5.9 Cummins Fire Power LLC CORPORATE OFFICE 1600 BORNE Correct of the transmission to the receiver in confidence for the document of the central confidence for the document of the centre for the document of the c	22		MOTOR, STARTING, -	4996707	
Aniel and trade secret information, is the Licent is given to the receiver in confidence. Is a given to the receiver in confidence. Is the double of a provide a confidence. In the secret a confidence in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret a confidence in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret in the secret	23	Ι	ALTERNATOR, 24V	5282841	
Interention Inference (2) not copy the document, her The document of the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Copy the document, all copy the CFP 59 - FIO/20/40 Image: Copy the document, CFP 59 - FIO/20/40 Image: Copy the document of the colification surfaces Image: Copy the document of the colification surfaces Image: Copy the document of the colification to the document of the colification surfaces Image: Copy the document of the colification to the document of the document of the colification to the document of the document of the document of the document to the document of the document of the document of the document to the document of th	24	—	MANUAL, O&M CFP5.9	A042J557	
Interention Inference (2) not copy the document, her The document of the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Marchine To the colification of the need to retain refar the document, all copies thereof, and COPTRIGHT Cummins Fire Power LLC Image: Copy the document, Copy the document, all copy the CFP 59 - FIO/20/40 Image: Copy the document, CFP 59 - FIO/20/40 Image: Copy the document of the colification surfaces Image: Copy the document of the colification surfaces Image: Copy the document of the colification to the document of the colification surfaces Image: Copy the document of the colification to the document of the document of the colification to the document of the document of the document of the document to the document of the document of the document of the document to the document of th	nlial and	trade secre		CUSTOM DESIGN	
• MACHINED IMPERIAL METRIC DWG UNITS DRAWN BY: PBS DATE: 07MAR2017 • MACHINE TOLEBARCS INTS IN/LB/S IN/LB/S PRO-ENGINEER INIT ECO: 2017-13	LLC and retaining ees that, t use the nformation her the da nd (4) up return the COPYRIGI	is given to g of the doc except as a document or n therein, (ocument or t on completio e document, HT Cummins F	2) nof copy the document, be confidential or frade n of the need to refain 11 copies thereof, and 11 copies thereof, and ASSEMBLY, 24VDC ENGINE	AND UPFIT CENTER 875 LAWRENCE DRIVE	
MULTINE TOLEBANCES MACHINE TOLEBANCES INCLINE TOLEB	• MAC	HINED FACES	IMPERIAL METRIC DWG UNITS: DRAWN BY: PBS C	DATE: 07MAR2017	
	1	ма	RIME TO LEPARCES NCHINE TO LEPARCES NXX := ± 0.005 X := ± 0.2	NIT ECO: 2017-13	

			BILL OF MATERIAL	
	ITEM	QTY	DESCRIPTION	PART NUMBER
	1		ENGINE, 6BTA5.9G3	8724
	2	16	PREMIUM BLUE I5W40, (QUART)	V705290
	3		FUEL SOLENOID	26387
	4		CLAMP, LOOM, 0.75 ID	26964-12
	5		SCREW, HEXAGON HEAD CAP, .3125-24X1.00	3052061
	6		BRACKET, BELT TENSIONER	3283868
	7	I	BELT, V RIBBED	3288812
	8	5	SCREW, HEX FLANGE HEAD CAP, -	3900630
	9	4	SCREW,HEX FLANGE HEAD CAP, M8XI.25-25 9.8 ZN_PHOS	3900631
	10		SCREW,HEX FLANGE HEAD CAP, -	3903105
			NUT, HEXAGON FLANGE, MI2 x I.75	3903210
	12		SCREW,HEX FLANGE HEAD CAP, MIOXI.5-70 9.8 ZN_PHOS	3904446
	13		SUPPORT, FAN	3909888
	4		SUPPORT, ALTERNATOR	3910923
	15		BRACE, ALTERNATOR	3910924
	16		PULLEY, FAN	3914463
	17		PULLEY, ALTERNATOR	3918275
	18		SCREW, FLAT HEAD CAP, M8 x 1.25 x 25	3925186
	19		SCREW,HEX FLANGE HEAD CAP, M8XI.25-40 IO.9 ZN_PHOS	3928873
	20	2	SCREW,TWELVE POINT CAP, MIOxI.5-6g X 35mm LG	3968470
	21		TENSIONER, BELT	3978022
	22	I	MOTOR, STARTING, -	4996707
	23		ALTERNATOR, 24V	5282841
	24	I	MANUAL, O&M CFP5.9	A042J557
This document contains conf property of Cummins Fire Po- The receiver, by receiving document in confidence and cummins Never, it will (1) confidential or frade secter (3) not disclose to others secret information therein, the document, or upon demon all material copied thereif UNLESS OTHERWISE SP ANGULAR DIMENSIONS ± THIRD ANGLE PROJECT	wer LLC and and retainin agrees that, not use the t informatio either the d and (4) up d, return th om. COPYRIG ECIFIED A ECIFIED A SUR ION	is given to got the doc except as a document or n completio e document, HT Cummins F ALL DIMEN HINED FACES	The receiver in confidence. Impact occepts the COMPORATE OFFICE CONFORMER END withor is the document, the confidention or from Impact occepts the Comport of the State 01 copies the document, the confidention or from ASSEMBLY, 24VDC ENGINE Comport of the State 01 copies thereof, or the aced to reform ASSEMBLY, 24VDC ENGINE Comport of the State Ston tolerances are CFP 59 - F10/20/40 DRAWN BY: PBS DATE:	



		BILL OF MATERIAL	
ITEM	QTY	DESCRIPTION	PART NUMBER
T	Т	ENGINE, 6BTA5.9G3	8724
2	16	PREMIUM BLUE I5W40, (QUART)	¥705290
3	1	GOVERNOR CONTROL, COVER, STANADYNE P/N: 21681	9691
4	1	RETAINING, RING, STANADYNE P/N: 15185	9692
5	1	GUIDE, WASHER, STANADYNE P/N: 15084	9693
6	1	GUIDE, MECH.OVER-RIDE, STANADYNE P/N: 15085	9694
7	1	MECH.OVER-RIDE, ROD, STANADYNE P/N: 15081	9695
8	1	THROTTLE SHAFT, SEAL, STANADYNE P/N: 17438	9696
9	Ι	FUEL SOLENOID	26387
10	Ι	CLAMP, LOOM, 0.75 ID	26964-12
11	Ι	SCREW, HEXAGON HEAD CAP, .3125-24X1.00	3052061
12	Т	BRACKET, BELT TENSIONER	3283868
13	Ι	BELT, V RIBBED	3288812
14	5	SCREW, HEX FLANGE HEAD CAP, -	3900630
15	4	SCREW, HEX FLANGE HEAD CAP, M8X1.25-25 9.8 ZN_PHOS	3900631
16	Ι	SCREW,HEX FLANGE HEAD CAP, -	3903105
17	Ι	NUT, HEXAGON FLANGE, MI2 x 1.75	3903210
18	1	SCREW, HEX FLANGE HEAD CAP, MIOXI.5-70 9.8 ZN_PHOS	3904446
19	1	SUPPORT, FAN	3909888
20	1	SUPPORT, ALTERNATOR	3910923
21	1	BRACE, ALTERNATOR	3910924
22	1	PULLEY, FAN	3914463
23	1	PULLEY, ALTERNATOR	3918275
24	Т	SCREW, FLAT HEAD CAP, M8 x 1.25 x 25	3925186
25	Т	SCREW, HEX FLANGE HEAD CAP, M8X1.25-40 10.9 ZN_PHOS	3928873
26	2	SCREW, TWELVE POINT CAP, MIOx1.5-6g X 35mm LG	3968470
27	1	TENSIONER, BELT	3978022
28	1	MOTOR, STARTING, -	4996707
29	1	ALTERNATOR, 24V	5282841
30	1	OSP, FUEL PUMP MODIFICATION, CFP59	A0428624
31	2	FIBER, WASHER, STANADYNE P/N: 12500	A042C497
32	2	INSULATING, TUBE, STANADYNE P/N: 23190	A042C498
33	Т	COVER, GASKET, STANADYNE P/N: 27244	A042C499
34	Т	O-RING, SEAL, STANADYNE P/N: 27607	A042C500
35	Ι	MANUAL, O&M CFP5.9	A042J557

		This decument contains confident property of Commons fore Power 12 The receiver, by receiving and re- document in confidence and oppers Common Moner, it will fill not a confidential or trade secret info (3) and disclass to others either secret information thereins, and	C and is given faiting of the d that, except or the facturent mation therein, the document or (4) upon complet	a the receiver authorized is a authorized is a ar any capy ther (2) and capy th the confidention in of the need	n confidence. He riling by collar He e decument. I or trade to refain	Fire Por) Nor	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
		the decument, or upon demaid, rel off material capied therefrom. C UNLESS OTHERWISE SPECIF	OPIEIGNI Cumin	s fire Paser LLC		ASSEMBLY, 24V CFP59-F50	DC ENGII	NE	
		ANGULAR DIMENSIONS ± 1°		INPERIAL UNITS	NETRIC UNITS	DWG UNITS:	DRAWN E	IY: PBS	DATE: 07MAR2017
		THIRD ANGLE PROJECTION	105 /	HCHINE TOLEMACES	HEALTHE RELEMBERS	IN/LB/S	PRO-	ENGINEER	INIT ECO: 2017-070
		l ← − − 1 ² 5/		100 10.000001 1 11 1 0 0.000 111 1 0 0.000	1. 1.1.1	SCALE: 0.375			RAWING NO:
BY	DATE	Ψ	\vee	L 118	1.1111	EST WEIGHT:		I OF I	A042KI34

8725 ΡN 35325 SO B5.9C Model **Config** D402056DX02

Option Desc **FIRE 29** B5.9-C AH 9021 HEATER, AIR INTAK AP 9001 APPROVAL, AGENCY BP 9052 BASE PARTS BP 9710 LEVER, ROCKER BP 9711 FOLLOWER,CAM BP97101 COVER, FRONT GEAR BP97149 **BLOCK, ENGINE** CM 9016 COVER, CAM FOLLOW COVER, CAM FOLLOW CM 9701 DA 9026 DAMPER, VIBRATION DF 9051 DRIVE, FRT GR TR DL 9028 LOCATION, FUEL DR EC 9039 THERMOSTAT EE9249 Alternator, 12v, 95A, Delco 11SI EH 9001 LOCATION, ALTERNA EH 9993 DRIVE, ALTERNATOR EI 9000 DRIVE, MECH TACH EI 9701 DRIVE, MECH TACH FA 9000 DRIVE, FAN FE 9000 PLUMBING, AIR FUE FF 9104 FILTER, FUEL FF 9790 PLUMBING, FUEL FI FH 9002 HOUSING, FLYWHEEL PUMP, BASE FUEL FP97760 FP97774 COUPLING, FUEL PU FR90026 RATING, FUEL PUMP,LIFT FS 9128 FT 9960 PLUMBING, FUEL FV 9308 VALVE, FUEL SHUTO FLYWHEEL FW 9222

Option Desc LA 9007 **BRACKET, LIFTING** LC 9020 COOLER, ENGINE OI LG 9058 GAUGE, OIL LEVEL LP 9714 PUMP,LUBRICATING OB 9000 COVER, CYLINDER B OB 9704 COVER, CYLINDER B OP 9006 PAN,OIL OP 9702 MOUNTING,OIL PAN PP 1948 PERFORMANCE, PART PP97246 TURBOCHARGER PP97298 MOUNTING, CYLINDE PP97946 HEAD, CYLINDER SM 9701 MOUNTING, STARTER SS 9005 PAINT SS 9075 SKID SS 9702 ENGINE, DRY ST 9368 MOTOR, STARTING TB 9375 LOCATION, TURBOCH TB 9767 MOUNTING, TURBOCH TB 9792 MANIFOLD, EXHAUS TTB90006 LOCATION, TURBOCH TH 9001 HOUSING, THERMOST TP 9703 PLUMBING, TURBOCH VC 9005 COVER, VALVE WI 9005 CONNECTION, WATER WI 9701 CONNECTION, WATER WP 9031 PUMP,WATER XS 9009 CONNECTION, EXHAU

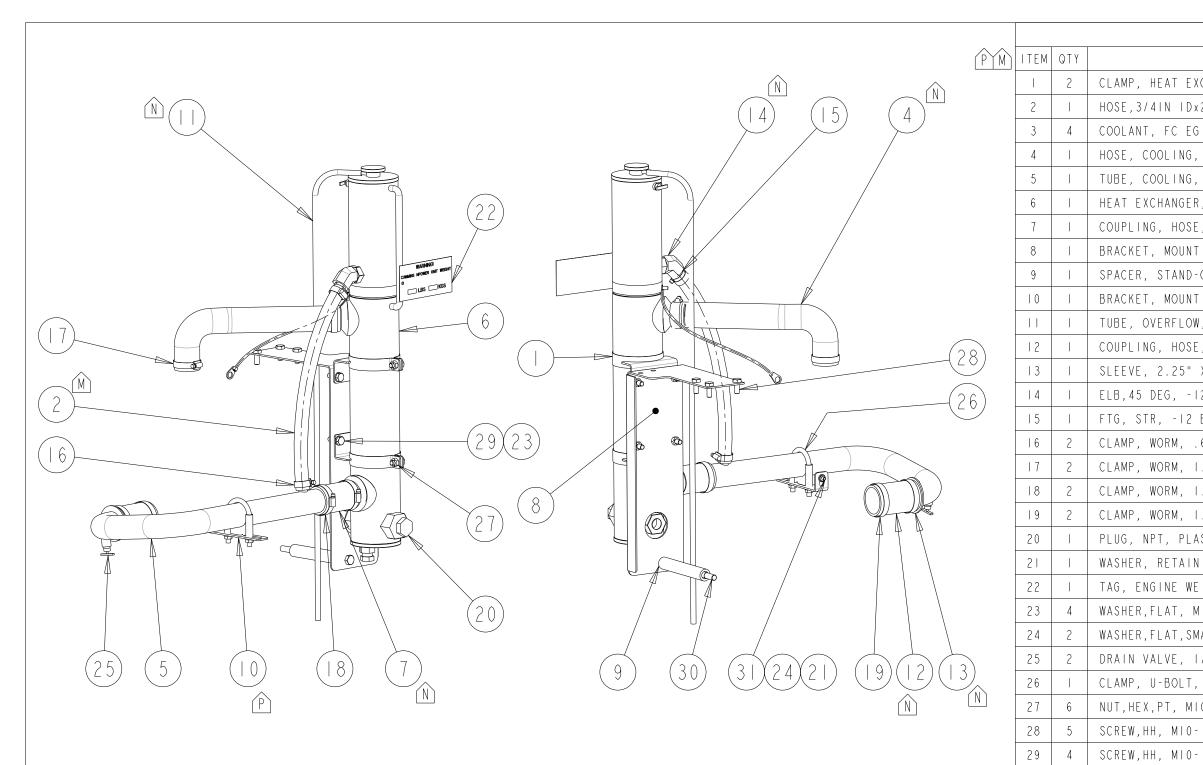
8725 ΡN SO 35325 Model B5.9C Config D402056DX02 Optic Option Desc FIRE 29 B5.9-C LA 90 AH 9021 HEATER, AIR INTAK LC 90 **AP 9536** APPROVAL, AGENCY LG 9 ▲ LP 90 BP 9052 **BASE PARTS** BP 9710 LEVER, ROCKER ▲LT 9' BP 9711 FOLLOWER,CAM **OB** 9 OB 9 BP97101 COVER, FRONT GEAR OP 9 BP97149 BLOCK, ENGINE OP 9 CM 9016 COVER, CAM FOLLOW COVER, CAM FOLLOW PP 1 CM 9701 **PP97** DA 9026 DAMPER, VIBRATION DF 9051 DRIVE, FRT GR TR **PP97** PP97 DL 9028 LOCATION, FUEL DR SM 9 EC 9039 THERMOSTAT EE9249 Alternator, 12v, 95A, Delco 11SI **SS** 9 **SS** 9 EH 9001 LOCATION, ALTERNA **SS 9** EH 9993 DRIVE, ALTERNATOR **SS** 9 EI 9000 DRIVE, MECH TACH ST 9 EI 9701 DRIVE, MECH TACH TB 9 FA 9000 DRIVE, FAN FE 9809 PLUMBING, AIR FUE TB 9 **TB 9** FF 9104 FILTER, FUEL FF 9790 TTBS PLUMBING, FUEL FI FH 9002 HOUSING, FLYWHEEL TH 9 TP 9 FP97760 PUMP, BASE FUEL FP97774 COUPLING, FUEL PU VC 9 FR90026 RATING, FUEL WI 90 FS 9128 PUMP,LIFT WI 9 FT 9960 PLUMBING, FUEL **WP 9** FV 9308 VALVE, FUEL SHUTO XS 9 FW 9828 FLYWHEEL

BUILT BEFORE JANUARY 1, 2007

BUILT AFTER JANUARY 1, 2010

				ALL RIGHTS TO MANUFACTURE, COPY OR DISPOSE OF THIS DRAWING OR ITS CONTENTS ARE RESERVED UNLESS OTHERWISE SPECIFIED IN WRITING BY CUMMINS NPOWER, LLC	Cummins	Fire Power	CUMMINS NPOWER CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.NPOWER.CUMMINS.COM	CUMMINS FIRE POWER DESIGN CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN WWW.CUMMINSFIREPOWER.COM	
				UNLESS OTHERWISE NOTED	DWG SCALE:	NTS	drawn by: DAVE N	date: 23SEP2004	
				-	PLOT SCALE:		APPD BY:	DATE:	
				APPLY MACHINE TOLERANCES $X = \pm 0.06$ $XX = \pm 0.010$	DESCRIPTION				
				$.XXX = \pm 0.001$	ASSEM	BLY, ENG			
С	UPDATE ENGINE SPEC	S DUBICK	08-04-10	APPLY WELDED TOLERANCES $X = \pm 0.25$ $XX = \pm 0.12$	REFERENCE:			DRAWING NUMBER:	
REV	DESCRIPTION OF REVISION	BY	DATE	$.XXX = \pm 0.06$	CFP59-F15/25			8725C	
	·								

on	Desc
007	BRACKET,LIFTING
020	COOLER, ENGINE OI
058	GAUGE,OIL LEVEL
064	PUMP,LUBRICATING
195	LITERATURE
000	COVER,CYLINDER B
9704	COVER,CYLINDER B
006	PAN,OIL
702	MOUNTING,OIL PAN
948	PERFORMANCE,PART
7246	TURBOCHARGER
7298	MOUNTING,CYLINDE
7946	HEAD, CYLINDER
9701	MOUNTING,STARTER
005	PAINT
024	OIL, LUBRICATING
075	ARRANGEMENT,SHIP
701	OIL,ENGINE
368	MOTOR,STARTING
375	LOCATION, TURBOCH
767	MOUNTING,TURBOCH
792	MANIFOLD,EXHAUS
90006	LOCATION, TURBOCH
001	HOUSING, THERMOST
703	PLUMBING,TURBOCH
005	COVER,VALVE
005	CONNECTION,WATER
701	CONNECTION, WATER
9031	PUMP,WATER
009	CONNECTION, EXHAU



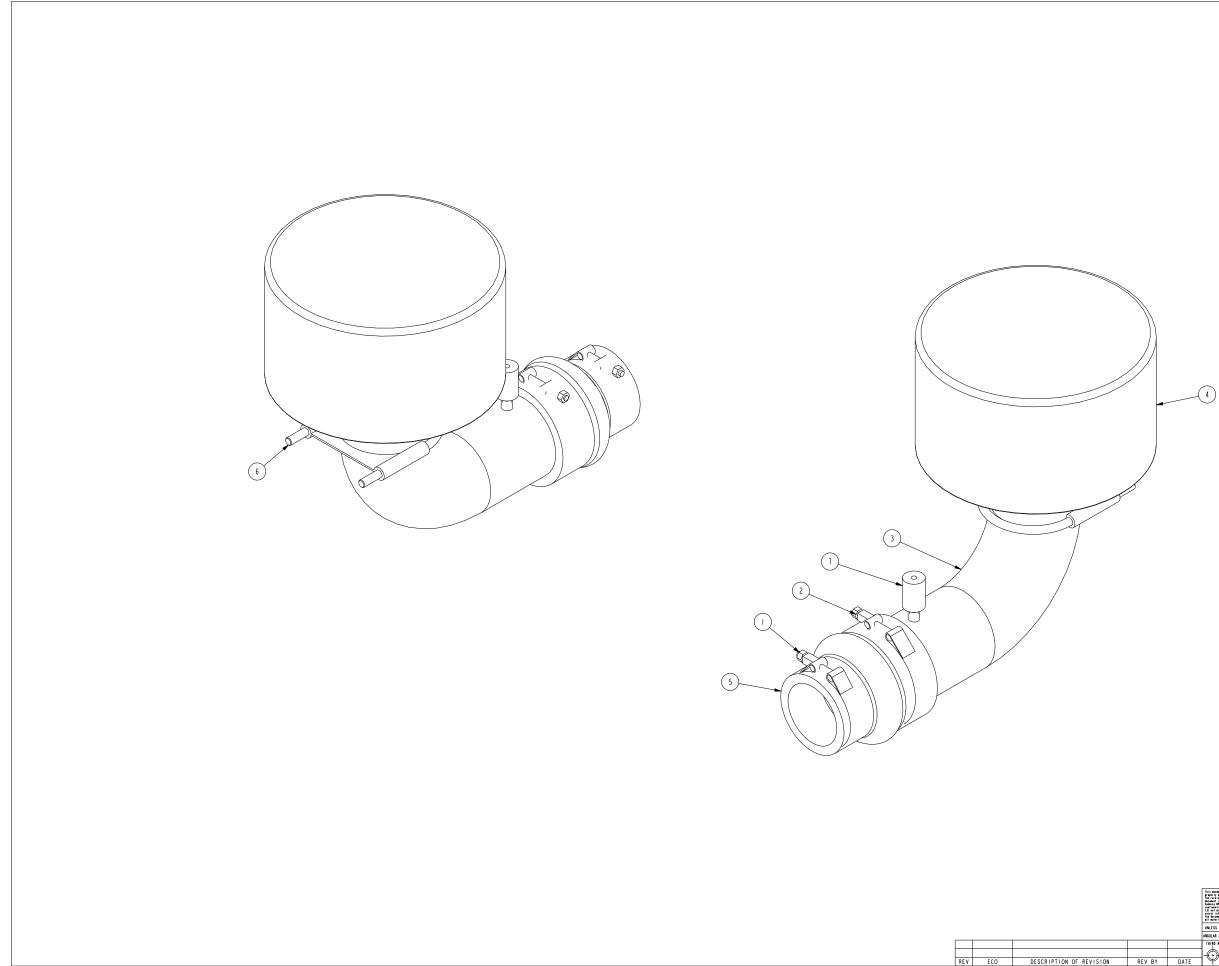
NOTE: APPLY THREAD SEALANT ON AL

30

					This document contains confident property of Cummins Fire Power LI the receiver, by receiving and re document in confidence and agreez cummins Mpwer, it will (1) not confidential or trade secret inf (3) not disclose to others either secret information therein, and the document, or upon demod, ret all material copied therefrom.	C and is given taining of the that, except a the document ormation therein the document of (4) upon comple	to the receiver i document accepts is authorized in w or any copy ther, , (2) not copy the r the confidentia tion of the need t, all copies the	in confidence. the writing by reof or the he document, al or trade to retain ereof, and	
Р	2016-689	REVISED PER 8657	TJK	070CT2016	UNLESS OTHERWISE SPECIF			RANCES ARE	L
N	2016-260	20957 WAS 8566, A042F054 WS 8653, 27003 WAS 8662 A042F055 WAS 8664 , 903 WAS 8963, I2I89-I2-I2 WAS E3445	PBS	29MAR2016	ANGULAR DIMENSIONS \pm 1° THIRD ANGLE PROJECTION	MACHINED SURFACES		UNITS	-
М	2016-048	REPLACED A042F382 WAS 80232GL	MRH	31DEC2015		125/	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4	
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE		$ $ \vee	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8	

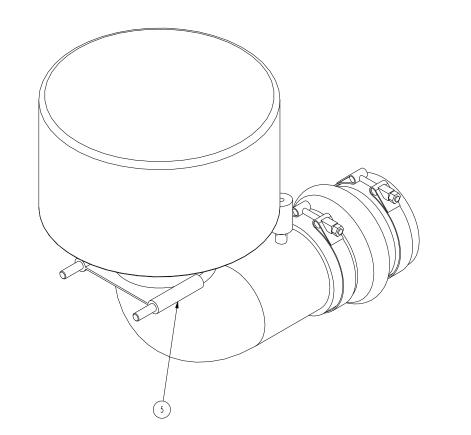
BILL	OF MATERIAL	
DES	SCRIPTION	PART NUMBER
CLAMP, HEAT EXCHANGER, 4"	, CHAMP #300377, FIREPUMP	8659
HOSE,3/4IN IDx25FT, CUT TO	O 20.00IN LONG	A042F382
COOLANT, FC EG PM, I GALLO	N	CC2743
HOSE, COOLING, I.75" I.D.	, FIRE PUMP, 6B/4B	20957
TUBE, COOLING, 2" OD, FIRE	EPUMP	8567
HEAT EXCHANGER, 4" DIAMETE	ER, 2-PASS, W/ INTEGRAL TO	PTANK 8652
COUPLING, HOSE, 2.0" I.D.	, 4.0 LONG	A042F054
BRACKET, MOUNTING, HEAT EX	XCHANGER, FIREPUMP, 6B/4B	8655
SPACER, STAND-OFF, 5/8" BG	OLT x 6.33" LENGTH	8656
BRACKET, MOUNTING, TUBE SU	UPPORT, FIREPUMP	8657
TUBE, OVERFLOW, 5/16" ID :	x 60" LG	27003
COUPLING, HOSE, 2.25" I.D	., 4.00 LONG	A042F055
SLEEVE, 2.25" X 2"		903
ELB,45 DEG, -12 NPT X -12	FMNPT	2 89- 2- 2
FTG, STR, -12 BARB X -12 1	NPT	2548- 2- 2
CLAMP, WORM, .69-1.25		4990 - 2
CLAMP, WORM, 1.31 - 2.25		4990 - 28
CLAMP, WORM, 1.56 - 2.50		4990 - 32
CLAMP, WORM, 1.81 - 2.75		4990 - 36
PLUG, NPT, PLASTIC, -16 ((") NPT	5255-16
WASHER, RETAINING, M6		6662-
TAG, ENGINE WEIGHT		16825
WASHER,FLAT, MIO		20020-MI0
WASHER,FLAT,SMALL, 0.25		20020
DRAIN VALVE, I/4" NPT		80511
CLAMP, U-BOLT, 2" OD PIPE		8954IK
NUT,HEX,PT, MIO-I.50		20 40-M 0
SCREW, HH, MIO-I.50x25		20310-025
SCREW, HH, MIO-I.50x30		20310-030
SCREW, HH, MI2-I.75x200		20312-200
SCREW, HH, M6-I.OOxI6MM		20306-016
SEALANT ON ALL NPT THR	EADS.	1
) not copy the document, e confidential or trade of the need to retain	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
	T EXCHANGER W/O CAC	
ION TOLERANCES ARE FIREPUMP, NFP MPERIAL METRIC UNITS UNITS DWG UNITS:	DRAWN BY: DAVE N	DATE: 01JUN2004
$\begin{array}{c} \text{ONTIGENTIAL STATES } \\ \text{INTERTOLERANCES } \\ INTERTOLERANCES \\ \ INTERTOLERANCES \\ \ \text{INTERTOLERAN$	PRO-ENGINEER	INIT ECO: -

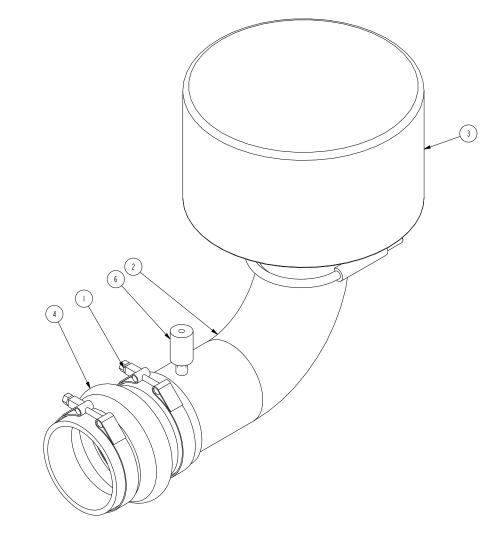
DWG UNITS:	DRAWN E	BY: DAVE N		DATE: 01JUN2004
IN/LB/S	PRO-	ENGINEER		INIT ECO: -
SCALE: 0.125		SHEET		AWING NO:
EST WEIGHT: 50	I OF I		8650	



	BILL OF MATERIAL				
ITEM	EM QTY DESCRIPTION		PART NUMBER		
1	1	CLAMP, T-BOLT, 3.28-3.59	13164-0350		
2	2	CLAMP, T-BOLT, 4.28-4.59	13164-0450		
3	1	TUBE, AIR INTAKE	15367		
4	1	AIR CLEANER, 4" CONNECTION, CF# AHII40 OR EQUAL	15608		
5	1	HUMP HOSE REDUCER, 4.0" x 3.0", -	33166175		
6	1	CLAMP, U-BOLT, GUILLOTINE, 4.00", PLATED	89548K		
7	1	RESTRICTION INDICATOR, 1/8" NPT	RAX00-2352		

This decrease contains confidential and trate second information, is the property of contens for Percentain CE and a prior to the second is confidence. The restrictions: by retermining and trading and the document accepts the General Second Second Second Second Second Second Second Second Second Control Second Second Second Second Second Second Second Second Control Second Sec		Fire Power		CUNMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.CO	CUSTOM DESIGN AND UPFIT CENTER 875 LAWBENCE DRIVE DEPERE, WISCONSIN DN				
the document, or upon demond, return the document, all capies thereof, and all motorial capied therefrom. COMMENDET Commiss Fire Paser LLC		ASSEMBLY, AIR							
		UNLESS OTHERWISE SPECIF			CFP59, FI0/F20/F40/F50				
		ANGULAR DINENSIONS ± 1°	MACHINED INPER SURFACES UNI	S UNITS	DWG UNITS:	DRAWN E	IY: PBS	DATE: 09NOV2016	
		THIRD ANGLE PROJECTION		ANACES INCOME TOLENACES	IN/LB/S	PRO-I	ENGINEER	INIT ECO: 2016-668	
			125/	inges in the subsection of the	SCALE: 0.500		SHEEL	DRAWING NO:	
BY	DATE	$ \Psi \square$		ans na mananans Sa Sa S	EST WEIGHT: 76	.013	I OF I	A042J147	





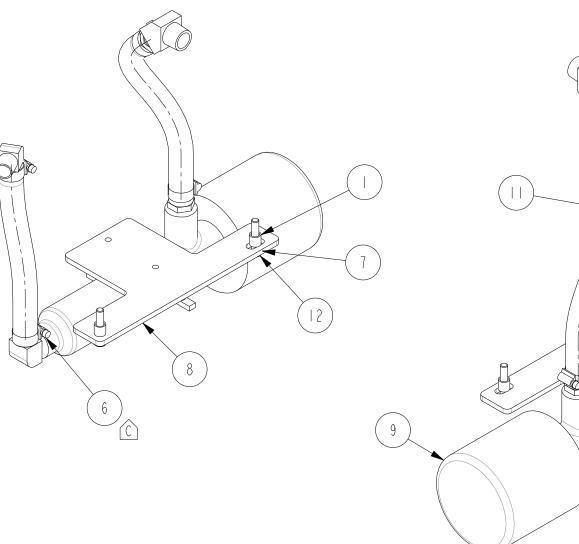
2 F V	ECO	DESCRIPTION OF REVISION	RF

	BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	PART NUMBER		
I	3	CLAMP, T-BOLT, 4.28-4.59	13164-0450		
2	I	TUBE, AIR INTAKE	15367		
3	I.	AIR CLEANER, 4" CONNECTION, CF# AHII40 OR EQUAL	15608		
4	1	HUMP HOSE, 4.0"DIA, -	33166085		
5	1	CLAMP, U-BOLT, GUILLOTINE, 4.00", PLATED	89548K		
6	1	RESTRICTION INDICATOR, 1/8" NPT	RAX00-2352		
-					

This decreast contrast configuration for the track access information, is the property of controns for the Vacce IC and a space in the track access is a confidence. The rescioner, by rescription of relations of the decreast accession has been accessed and the state of the state of the state of the state of the control tenders. In the III that is not the state of the rescions the rescion of the confidential or interactions therein. But and the state of the confidential or interactions therein. But and the state of the confidential or interactions the line the state of the confidential or interac- tions of the line tenders the state of the line tenders of the confidential or interac- tions and the line tenders of the line tenders of the confidential or interac- tions are accessed informations the line tenders of the confidential or interac- tions are accessed in the line tenders of the confidential or interac- tions are accessed in the line tenders of the confidential or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the confidencial or interac- tions are accessed in the line tenders of the lin		Fire Por) Nor	CUNMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.CC	CUSTOM DESIGN AND UPFIT CENTER 875 LANRENCE DRIVE DEPERE, WISCONSIN	
	the document, or upon demond, return the document, all all material capied therefrom. COPARIGHT Cummins fire	capies thereof, and Pamer LLC	ASSEMBLY, AIR	FILTER		
	UNLESS OTHERWISE SPECIFIED ALL DIMENSIO		CFP59, F15/25			
	ANGULAR DINENSIONS ± SURFACES U	VERIAL METRIC NITS UNITS	DWG UNITS:	DRAWN E	IY: PBS	DATE: IINOV2016
		TRUETINGETS INCOME TRUETINGETS	IN/LB/S	PRO-B	ENGINEER	INIT ECO: 2016-668
		LINE LES	SCALE: 0.500			DRAWING NO:
BY DATE		Linears in nationals	EST WEIGHT: 76	.013	I OF I	A042JI56

			4		3
			BILL OF MATERIAL		
	ITEM	QTY	DESCRIPTION	PART NUMBER	BC
		2	SPACER, 0.5 OD X 0.38 ID X 0.50 LG	9618	
	2		ELB, 45 DEG, -I2 NPT X -I2 FMNPT	12532-12-12	
п	3	2	FTG, STR, -12 BEAD X -12 NPT	2545- 2- 2	
U	4		ELB, 90 DEG, -12 BEAD X -12 NPT	2547- 2- 2	
	5		ELB, 90 DEG, -12 BEAD X -8 NPT	2547- 2-8	
	6	4	CLAMP, WORM, .56-1.06	4990- 0	
	7	2	WASHER,FLAT, M8	20020-M8	
	8		BRACKET, COOLANT HEATER MOUNTING, CFP5E/7E	24233	
	9		HEATER, COOLANT, I500W, I20/240VAC	24238	
	10		HOSE, SILICONE, 3/4IN ID x 10.00IN LONG	A042F073	
			HOSE, SILICONE, 3/4IN ID x 16.00IN LONG	A042F073	
	2	2	SCREW, HH, M8-1.25x40	20308-040	

	2	1		1
REV REL NO REVISI		DWN		
	ED TO PRODUCTION	HE 39	2	03FEBI7
B 2019-079 ADD 12 OMIT 1	532-12-12; (2) 12545-12-1 2548-10-12	2 WAS (I); OY25	6 MS707 MS707	20FEB19
	ED 4990- 2 W/ 4990- 0		4 MS707 MS707	I9APRI9 D
The increase of the increase o		3 SUPI	5 10 4	
DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential	Cumr	nins Inc.	A
LERANCES UNLESS SE SPECIFIED SCALE 0.250	Cummins Confidential DWN HE 392 CKD .	ITEM NAME	. <u>A</u> NIT LIE A T	
IN OR 0.7 mm 30 IN OR 0.25 mm 10 IN OR 0.075 mm	APVD . DATE 03FEBI7	■ ASSEMBLY,COC CFP59	LANI ALAI	
$\begin{array}{c c} \mbox{France:} \pm 1^\circ & & \\ \mbox{Ind the information shown thereon) is} \\ \mbox{Information shown thereon) is} \\ \mbox{Information shown thereon} \\ \mbox{Information constraints} \\ In$	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009 TO CES 1090	M Dwg CAD SHEET ITEM M	A 0 4 2 J 8 4 6	Rev C
	2	1	<u> </u>	



	2	1	
REV REL NO REVIS	ON	DWN CKD APVD DATE	
	SED TO PRODUCTION	HE 392 03FEBI	7
B 2019-079 ADD 12 OMIT 1	532-12-12; (2) 12545-12-12 2548-10-12	WAS (1); OY256 MS707 MS707 20FEBI	9
C 2019-188 REPLAC	CED 4990- 2 W/ 4990- 0	NOI34 MS707 MS707 I9APRI	9 D
		2 3 3 4 4 5 10 10 10 10 10 10 10 10 10 10	C
DIMENSIONS ARE IN: INCHES [] ARE IN: . DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential	Cummins Inc.	_
DRAWING TOLERANCES UNLESS SCALE 0.250	DWN HE392	ITEM NAME	_ A
X: ± I IN OR 4 mm X.X: ± . I IN OR 0.7 mm X.XX: ± .030 IN OR 0.25 mm X.XXX: ± .010 IN OR 0.075 mm	CKD . APVD . DATE 03FEB17	ASSEMBLY,COOLANT HEATER CFP59	
ANGULAR TOLERANCE: ± 1° 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.			V
	2	1	

NOTES:

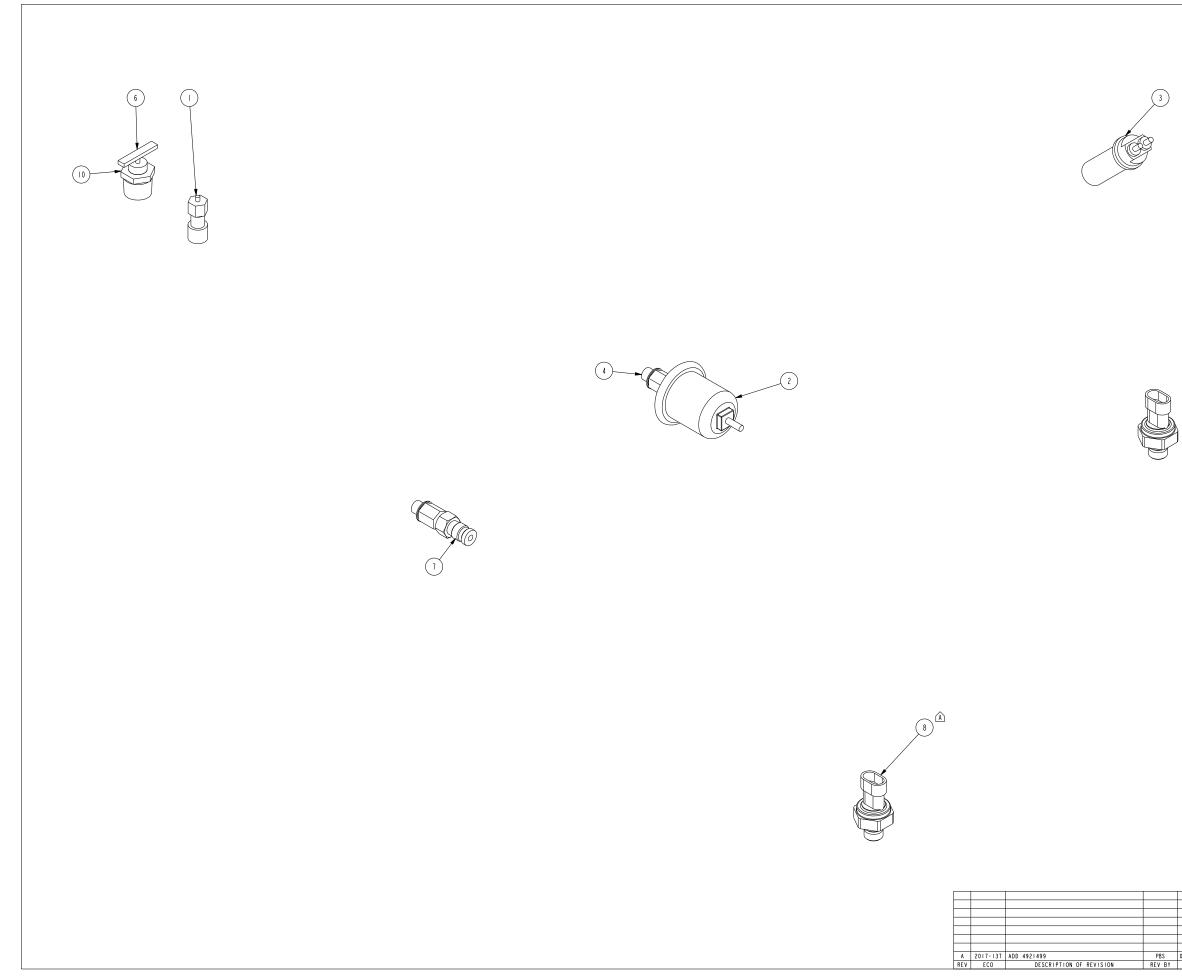
С

В

Α

1. ATTACH HOSE TO HEATER WITH OUT RADIAL TWIST 2. APPLY THREAD SEALANT ON ALL NPT THREADS

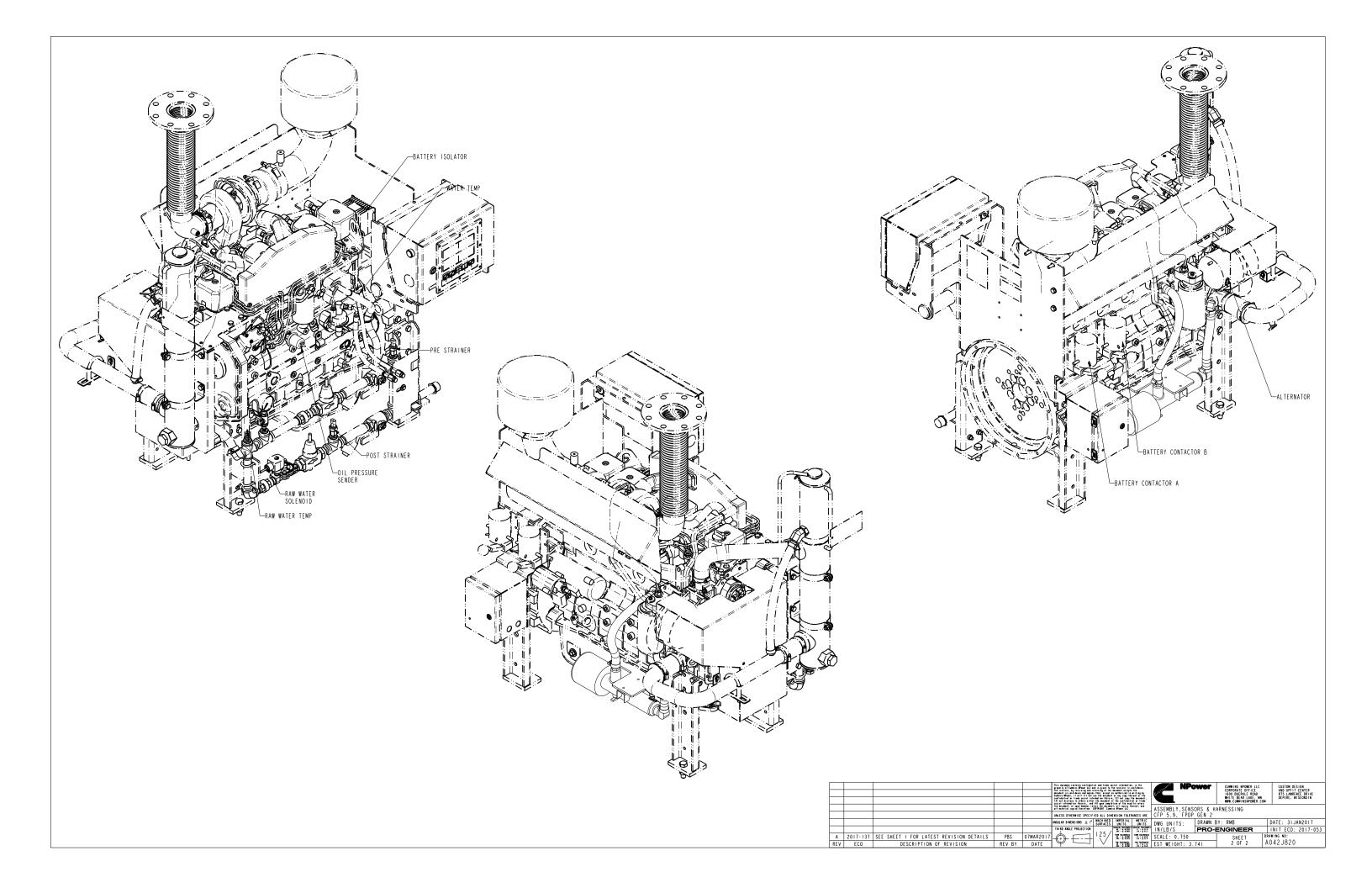
3

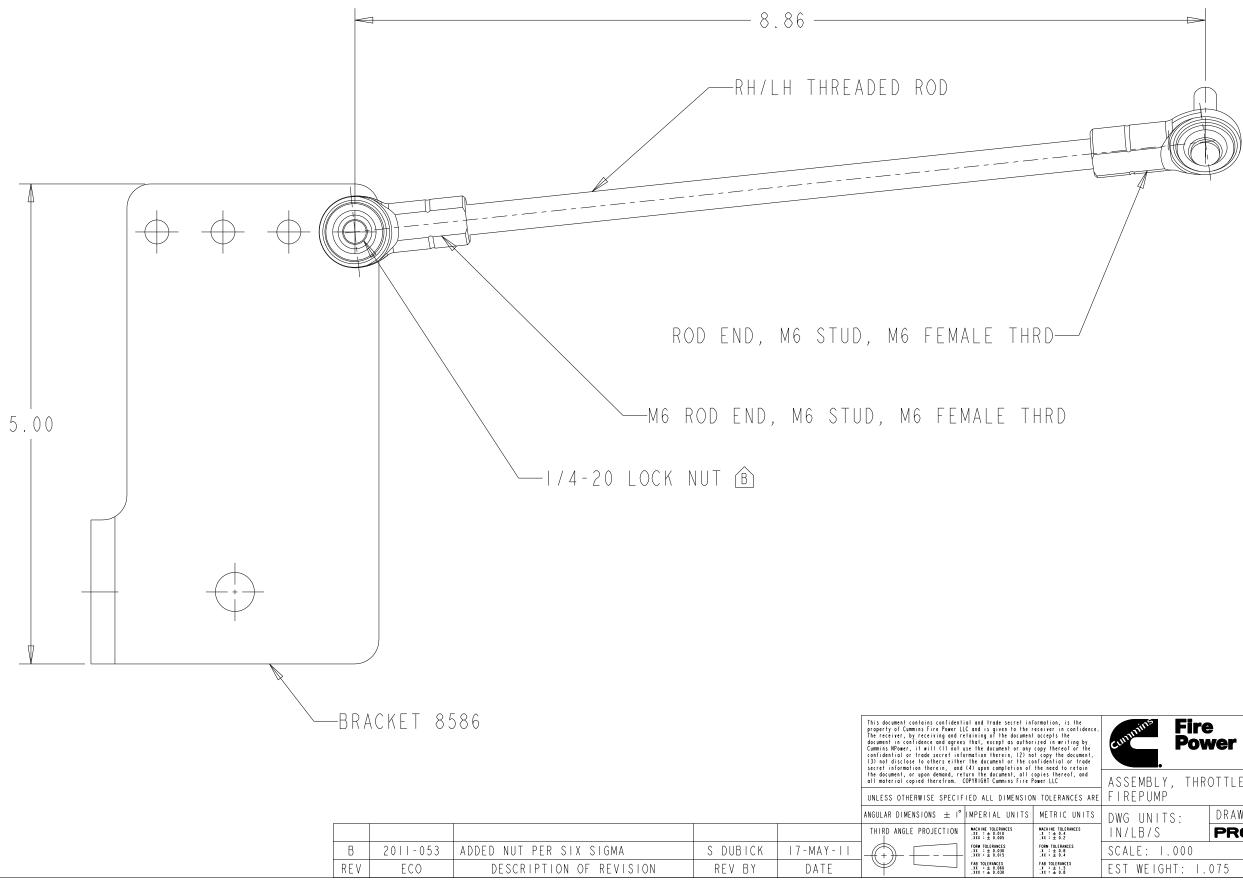


		BILL OF MATERIAL	
ITEM	QTY	DESCRIPTION	PART NUMBER
1	Т	SENDER, WATER TEMPERATURE, DATCON #02025-00	02025-00
2	1	SENDER, PRESURE, DATCON #02504-00	8863
3	1	SENSOR, MAG PICK UP, #5MT2005	9569
4	2	FTG, STR, MIO ORR X -2 FNPT	2 8 -M 0-2
5	1	CABLES, BATTERY, CFP5E, 7E, 9E, IIE	24234
6	1	DRAIN VALVE, I/4" NPT	80511
7	1	CONNECTOR, QUICK DISCONNECT	3377244
8	2	SENSOR, PRESSURE	4921499
9	1	HARNESS, WIRE, CFP5.9 & CFP8.3, FPDP GEN 2	A042H306
10	I	BUSHING, 1/4" NPT X 1/2" NPT	L T L - SRB - 1214

>	- 1	
	- 1	
	7	

								CUMMINS CONFI	DENTIAL	
		This document contains confident property of Commiss Brown LLC o the receiver, by receiving out document in confidence and opper Commiss Brown, it will the had confidential or frede secret int (3) and disclose to others earth secret information therein, and	ed is given to t claining of the s that, except o use the document ormation therein r the document o (4) uses compto	the receiver in decument accept as authorized in for any copy the s. (2) not copy or the confident rises of the nee	confidence. the artifing by recof ar the the document. ial or trade i fo refain		wer	CUMNINS NPOWER LLC Corporate Office IGOO BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSNPOWER.CC	CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN	
		the document, or upon demond, re all material capied therefrom.	furn the document	it. all cooles II	lereol, and	ASSEMBLY, SENS	ORS & H	ARNESSING		
		UNLESS OTHERWISE SPECIF				CFP 5.9, FPDP	GEN 2			L
		ANGULAR DIMENSIONS ± 1°	SURFACES		UNITS	DWG UNITS:	DRAWN E	BY: RMB	DATE: 31JAN2017	
		THIRD ANGLE PROJECTION	125 /	HICH NE TOLENHOUSE	in the second	IN/LB/S	PRO-I	ENGINEER	INIT ECO: 2017-053	
PBS	07MAR2017		125/	104 10.000000 111 1 0 0.000	100 10.000CCS	SCALE: 0.750		SHEET	DRAWING NO:	
VBY	DATE	$ \Psi \square$		THE SOLCHWALES	THE RECEIPTINGS	EST WEIGHT: 3.	741	I OF 2	A042J820	L





unnin ^s Fire Pow		CUMMINS FIRE POWER LL CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.	-	CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN
SSEMBLY, THR(IREPUMP	OTTLE PO	OSITION		
WG UNITS:	DRAWN B	BY: DAVE N	[DATE: 05AUG2004
N/LB/S	PRO-E	ENGINEER		INIT ECO:
CALE: 1.000		SHEET		WING NO:
ST WEIGHT: L.	075	I OF I	85	585

			BILL OF MATERIAL	
	ITEM	QTY	DESCRIPTION	PART NUMBER
		I	THROTTLE CABLE, TURN LOCKING	R09D3-5X06
	2		DECAL, FUEL SOLENOID OVERIDE (NOT SHOWN), FIREPUMP	9526-12
	3	I	BRACKET, HANDLE, SOLENOID OVERIDE, FIREPUMP	9835
	4	I	CHAIN, CONNECTING (NOT SHOWN) P/N 1250, FIREPUMP	CHAIN-1250
ß	5		NUT,HEX,PT, M5-0.80	20140-M5
ß	6	2	NUT,HEX, MIO-I.50	20120-M10
ß	7	2	SCREW,HH, MIO-I.50x25	20310-025
ß	8	I	SCREW,HH, M5-0.80x16	20305-016
B	9		WASHER,FLAT, M5	20020-M5

2011-053 ADD FASTENERS PER SIX SIGMA

DESCRIPTION OF REVISION

B REV

ECO

S DUBICK

REV BY

|7-MAY-||

DATE

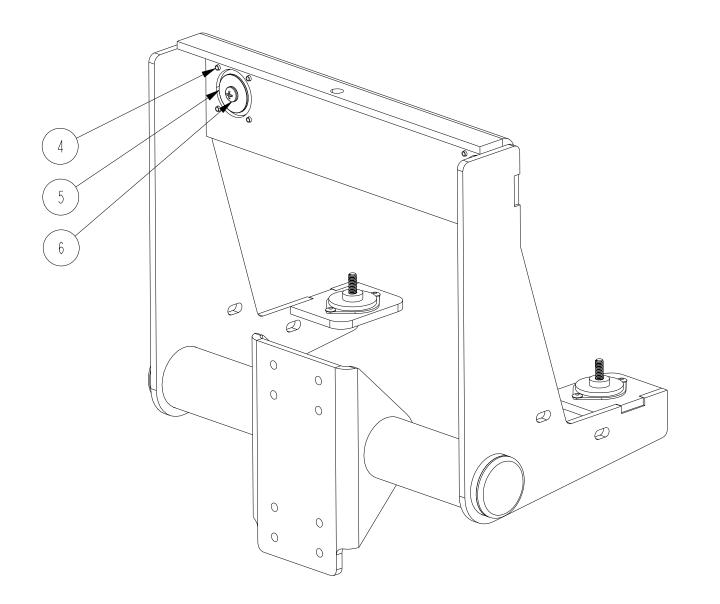
This document contains confidential and trade secret information, is the property of Cummins Fire Power LLC and is given to the receiver in confidence. The receiver, by receiving and relating of the document accepts the document in confidence and agrees that, except as outhorized in writing by Cummins NPower, it will (1) not use the document or any copy thereof or the confidential or trade secret information therein, (2) not copy the document, (3) not disclose to others either the document or the confidential or trade secret information, and (4) upon completion of the need to relation	current Fire Pov		CUMMINS FIRE POWER LLC CORPORATE OFFICE IGOO BUERKLE ROAD WHITE BAR LAKE, MN WWW.CUMMINSFIREPOWER.(AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN
the document, or upon demond, return the document, all copies thereof, and all material copied therefrom. COPYRIGHT Cummins Fire Power LLC UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARI	document, all copies thereof, and ASSEMBLY, SOLENOID OVERIDE			
ANGULAR DIMENSIONS \pm 1° IMPERIAL UNITS METRIC UNITS	DWG UNITS:	DRAWN E	BY: DAVE N	DATE: 30APR05
THIRD ANGLE PROJECTION MACHINE TOLERANCES	IN/LB/S	PRO-I	ENGINEER	INIT ECO:
FORM TOLEBANCES	SCALE: 0.500		SHEET	DRAWING NO:
FAB TOLERANCES FAB TOLERANCES XX ± 0.060 .7.8 .XX ± 0.030 .7.8 .XX ± 0.030 .7.8	EST WEIGHT: 0.	606	I OF I	9839

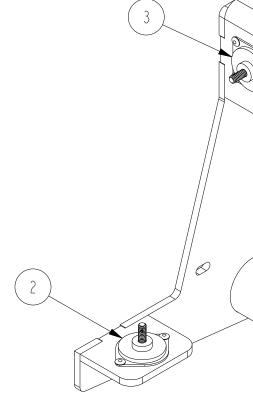
		BILL OF MATERIAL	
ITEM	QTY	DESCRIPTION	PART NUMBER
		KIT, FUEL SOLENOID OVERIDE	9699

J.

					is the property of C in confidence. The document accepts except as authorized i the document or any c information therein, o distance therein, o document, or upon de and all material co	and (4) upon completion o mand, return the document spied therefrom, COPYRIGH	given to the receiver and relaining of the ce and agrees thet, mer, it will (1) not use dential or trade secret 1, (3) not disclose to tial or trade secret 1 the need to relain the 1, all copies thereof, 17 Cummins MPower LLC	curum Fire Pow		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
						ERWISE SPECIE		KIT, FUEL SOLE	ENOID C	DVERIDE	
						MENSIONS ±		FIREPUMP			
					MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS	DWG UNITS:	DRAWN	BY: DAVE N	DATE: MAR05
						MACHINE TOLERANCES .X : ± 0.06 .XX : ± 0.010	MACHINE TOLERANCES $X = \pm 1.5$ $X.X = \pm 0.5$	IN/LB/S	PRO-	ENGINEER	INIT ECO:
А		CREATED DRAWING	DAVE N	08JUL05	2 2/	.XXX = ± 0.001 WELD TOLERANCES	x.xx : ± 0.05 WEIDED TO FRANCES EST WEIGHT: 0.005 SHEFT		DRAWING NO:		
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE		.X : ± 0.25 .XX : ± 0.12 .XXX : ± 0.06	x = ± 5 x.x = ± 3 x.xx = ± 1.50	SCALE: 1.000		I OF I	9699

ITEM QTY	DESCRIPTION	PART NUMBER
	MOUNT, OPERATOR STATION, CFP CONTROL PANEL	22318
2 2	ISOLATOR, PLATE MOUNT, 3 LB (YELLOW MARK)	15400
3 2	ISOLATOR, PLATE MOUNT, 6 LB (RED MARK)	15412
4 12	RIVET, ALUMINUM, STEEL SHANK, O.156 DIA, O.25-0.38 GRIP	15414
5 2	FENDER WASHER, 0.281 X 1.25	15421
6 4	SCREW, SELF LOCKING, 0.25-20 X I.00, PH OR BH	15422



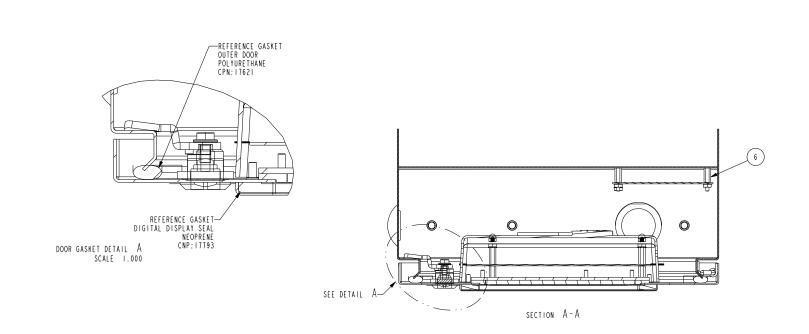


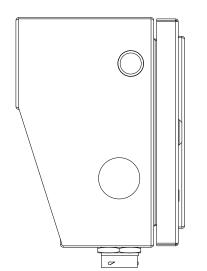
	This document contains confident property of Cummins Fire Power LL The receiver, by receiving and re document in confidence and agrees Cummins Nower, it will (11) not confidential or trade secret info (3) not disclose to others either secret information therein, and	C and is given t taining of the c that, except as use the document rmation therein, the document or	to the receiver i document accepts s authorized in w or any copy ther , (2) not copy th r the confidentio	n confidence. the writing by eof or the e document, il or trade	CU
	the document, or upon demand, ret all material copied therefrom. C	urn the document	t, all copies the		AS
	UNLESS OTHERWISE SPECIF	IED ALL DIMI	ENSION TOLER	ANCES ARE	CF
	ANGULAR DIMENSIONS \pm 1°	MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS	DW
	THIRD ANGLE PROJECTION	10F /	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2	ΙN
		125/	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4	SC
ΤE		\sim	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8	ES

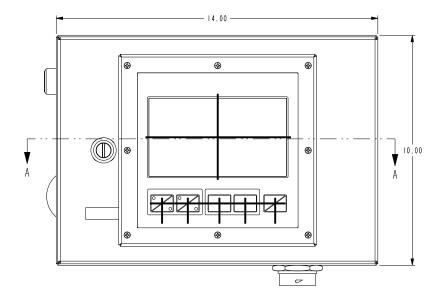
REV	ECO	DESCRIPTION OF REVISION	REV BY	DATE

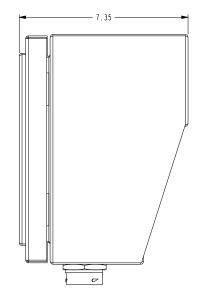
Intrin ⁵ Fire Pow		CUMMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.COM			
SSEMBLY, CON P POWER UNI		NEL MOUNTING			
VG UNITS:	DRAWN E	BY: S DUBICK	[DATE: 26-SEP-12	
N/LB/S	PRO-	ENGINEER		INIT ECO: 2012-392	
CALE: 0.333 ST WEIGHT: 16	. 439	SHEET I OF I		wing no: 2 4 9	

Ø

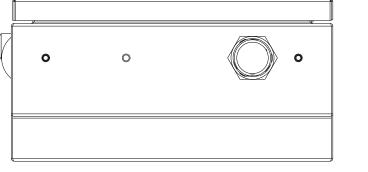












 A
 2017-057
 UPDATED
 PER
 A042G188
 PBS

 REV
 ECO
 DESCRIPTION OF REVISION
 REV BY

Image: State of the state		A042G						ET, COM		I	2		
S 0 EFCL. FORME, STL. CONTROL FARL 151 S 0 510000F HEL MIT, 6-32, BASS, 53'L 151 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 13'L 151 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 13'L 151 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 13'L 151 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 13'L 171 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 1-25'L 171 S 11 W1L, 6-32, W1001 Hell, MIT, 6-32, BASS, 1-25'L 171 S 11 W1L, 6-32, W100, STAT, AREL, SECTONIC 8424 S 11 W006MAR, K17AD 8424 S 12 152L, G. 605174, PARL, ELECTONIC 8424 S 13 9344 8424 S 14 152L, G. 005174, PARL, ELECTONIC 8424 S 14 152L, G. 005174, PARL, ELECTONIC 8424 S 15464, G. 00516 1644 8424 S 15474, G. 005174, PARL 8424 8444 S 15474, G. 00507, MEL 1647		A042G	POWER PCB										
1 NOTES: 1. TPC 41 NODER USE CONSTRUCTION 2. UPDATE NOTES: 1. TPC 41 NODER USE CONSTRUCTION 3. TIE, AND 4. USE CONSTRUCTION 4. AND 4. STANDOF HILM NO. 532, USE 3. STAL 511, 117 11. 2. STANDOF HILM NO. 532, USE 3. STAL 511, 117 13. TIE, WISE, 47, MIDRA 3. TIE, MIDRA 3.				AT PCB								-	
1 NUTES: 1. TYPE: At INDORE NUE CONSTRUCTION 2. UPDATE STANDORE NUE CONSTRUCTION 3. UPDATE												-	
8 1 HUT, 6-32, MOOD MASHER, 2NC - PLD 155 9 1 PLUD, CLOBUT TOHE, HUR, PL-322, BASS 1, L271 171 11 2 STAMOFT HIL WIT, 6-32, BASS 1, L271 172 13 1 TLE, MUSE, 47, NUTRAL 183 14 0 SCREE, A22, 1/27 CMOS, STAILESS STELL, BLACK ONDE FINISH 4422 15 1 MUSEAKE, KEY-PD 4422 16 1 CORE, OOR FARLE 111 17 10 DISTAN, GOOR FARLE, ELECTRONIC 4422 16 1 DORE PAR, OLER TONIC 4422 17 1 PCR, DIGTIAL FANEL, ELECTRONIC 4422 18 1 PORE PCR, DIGTIAL FANEL, ELECTRONIC 4422 19 DISTAN, GOOR DOW FARLE, ELECTRONIC 4422 11 LIGELU, U., WECHMARCAL CONTIOL PANEL 4422 10 DISTAN, FOR WIDTION, ABE CONTROL TONE 1 4422 21 DISTAN, FOR WIDTION, ABE CONTROL TONE 1 4422 22 DISTAN, FOR WIDTION, ABE CONTROL TONE 1 4422 23 COLUP RIBORN CALL, 23.5m FORE 1 24 DINCR, FURCHONE USE CONSTRUC	5580											-	
9 I PLUGE LOUGID TOREL, METCO, 3831 135 10 E STAMOOF HEA, MET, 6-32, 18-45 112 112 12 E STAMOOF HEA, MET, 6-32, 28-455 1.251L 117 12 E BEZEL, GASKET LICK HAR, STALLESS STEEL, BLACK ON DEF THISS 9646 14 6 SORRA, 6-32, 1/27 1005, STALLESS STEEL, BLACK ON DEF THISS 9646 11 I THE, MER, K. 1970 1005, STALL, DECETRONIC 4442 15 HORD RANK, ELECTRONIC 4442 4442 11 I PES, DIGITAL, FRALL, ELECTRONIC 4442 13 INF, GRANG RANK, ELECTRONIC 4442 14 DISTRA, GOURD TOCH SCREER 10057, INF, PUMP DIGITAL PAREL 4442 15 INF, GOURD TOCH SCREER 100513, INF, PUMP DIGITAL PAREL 4442 15 INF, COURT SCREER, LICETRONIC 4442 4442 16 INF, LORGEN LISE CONTRUCTION, ABE COMING, PAREL 4442 17 INFORMER STARP, PUMP DIGITAL PAREL 4442 18 INFORMER STARP, PUMP DIGITAL PA		1558										-	
10 4 NUT, ACORN SET (JCK NDG, 8-32, 16-3 STN, STL 171 11 2 STANDOF NEE MIT, 6-32, BASS STELL, BLACE OXIDE FINIS 9800 13 1 TLE, WIRE, 47, NATRAL 101 14 6 SEREN, ASSA STANDOF NEEL, LECETONIC 4422 15 1 MURBARM, NETPAD 4422 16 COVER, DOOF TARL LECETONIC 4422 16 ID OFSALT, IZE MURDAL, CLECTONIC 4422 16 ID OFGAL, ASSA MURBARM, NETPAD 4422 17 I. LOBEL, U. M., SCHANTICAL CONTROL 4422 4422 18 IP OPER PCB, DIGTIA, FAREL, ELECTONIC 4422 4422 19 ID OFGAL, U., MECHANICAL CONTROL 4422 4422 10 ID OFGAL, U., MECHANICAL CONTROL 4422 4422 10 L. LOBEL, U., MECHANICAL CONTROL, FILE PUBLICAL PAREL 4422 10 INTR. 600100 1010114, FAREL 4422 10 INTR. 9010114, FAREL 4422 442 4422 10 INTR. 9010114, FAREL 4420 4422 4422 4422 <td></td> <td>156</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ŀ</td> <td></td>		156										ŀ	
12 1 BEZZU, 645KET 1/47 * 3.92* 177 13 1 TEE, WISE, 4.7, MAURAL 3000 14 8 SCRW, 4-22, 1/27 (MG, STAINLESS STEEL, BLACK OVIDE FINISH 9864 15 1 MURBARAK, 4ET-MO A422 16 1 PORE RES, DIGITAL PARLE, LECETONIC A422 19 1 DISTAL, COLOR TOUCH SCREEN A422 20 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 21 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 22 1 BEZCL, DISPLA, FREE VIEL (LECTONIC A442 23 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 24 10 NOTES: TEC. ADISPLA, FREE VIEL MATURAL A422 25 1 HOUDER, TEE, ADRESIVE, MATURAL A422 26 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 27 1 BEZCL, DISPLA, FREE VIEL POISITAL PARL RESO 28 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 29 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 20 1 HOUDER		1714		. STL						4			
12 1 BEZZU, 645KET 1/47 * 3.92* 177 13 1 TEE, WISE, 4.7, MAURAL 3000 14 8 SCRW, 4-22, 1/27 (MG, STAINLESS STEEL, BLACK OVIDE FINISH 9864 15 1 MURBARAK, 4ET-MO A422 16 1 PORE RES, DIGITAL PARLE, LECETONIC A422 19 1 DISTAL, COLOR TOUCH SCREEN A422 20 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 21 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 22 1 BEZCL, DISPLA, FREE VIEL (LECTONIC A442 23 1 LAREL, U. M. XCHAMICAL CONTROL PARLE A422 24 10 NOTES: TEC. ADISPLA, FREE VIEL MATURAL A422 25 1 HOUDER, TEE, ADRESIVE, MATURAL A422 26 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 27 1 BEZCL, DISPLA, FREE VIEL POISITAL PARL RESO 28 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 29 1 HOUDER, TEE, ADRESIVE, MATURAL RESO 20 1 HOUDER		1720								2	П		
11 8 SCREW, 4-32, 1/2* CONG., STAINLESS STEEL, BLACK OXIDE FINISH 4944 15 1 CORE, NOOP PAREL A442 16 1 CORE, NOOP PAREL A442 17 1 PCD, DISTIAL PAREL, ELECTRONIC A442 16 1 CORE, DISTIAL PAREL, ELECTRONIC A442 17 1 PCD, DISTIAL PAREL, ELECTRONIC A442 19 1 DISPLAY, COLOR POLY IS SCREW A442 20 1 STRAP, GROUND A442 21 1 CORE, DISTIAL, FIRE PUMP DISTIAL PAREL A442 22 1 DECEL, DISFLAY, FIRE PUMP DISTIAL PAREL A442 23 DECER, DISFLAY, FIRE PUMP DISTIAL PAREL A442 24 1 SITLAT, PUSHBONTON, ABS CONTROL, CPTIOR-DI CPTIC 25 1 CLIP, RIBBON CABLE, 25, 6m FCM-1 26 1 MODER, TIEL, AMESIVE, MATURAL RP30 NOTES: NOTES: UPARE XI INDOOR USE CONSTRUCTION LIPE AX INDOOR USE CONSTRUCTION	793	1779								I	12		
15 I MEMBRANE, KEYRAD A442 16 I COVER, DOOR PAREL A442 18 I PORE PCB, DOITAL FAREL, ELECTRONIC A442 19 DSPARY, COUR TOURS SCREEN A442 20 I ST647, COURT DOURS SCREEN A442 21 I LABEL, UL, MEMALL CONTOUR SCREEN A442 22 I ST647, COURT DOURS SCREEN A442 23 I COVER, DISPLAY, COUR TOURS SCREEN A442 23 I COVER, DISPLAY, COURT DOURS SCREEN A442 23 I COVER, DISPLAY, COURT DOURS SCREEN A442 23 I COVER, DISPLAY, FIRE FUMP BIOTAL PAREL A442 24 I SINTCH, STREE, TUPB BIOTAL PAREL A442 25 I CUIP, RIBBON CABLE, 23.6m FCRIT 26 I MOUDER, TIE, A0HESIYE, MATURAL B730 I IYRE AX INDOOR USE CONSTRUCTION	IM-ND	3M101)					, NATU	WIRE, 4	TIE,	1	13		
16 1 COVER. DOOR PARL 4442 17 1 PCB. DIGITAL PARL LECETONIC 4442 18 PORE PRES. DIGITAL PARL LECETONIC 4442 19 1 DISPLAT. COLOR TOLEN SCREEN 4442 21 1 LABEL, UL . MECHANICAL CONTROL PAREL 4442 22 1 BTZEL, DISPLAT. TRUE PUPP DIGITAL PAREL 4442 23 1 CORE. DISPLAT. FILE PUPP DIGITAL PAREL 4442 24 1 ZATOR. PUSHBUTTON. ABS CONTROL, CPITOR-DI CPITOR 23 I CORE. DISPLAT. FILE PUPP DIGITAL PAREL 4442 24 I SWITCH. PUSHBUTTON. ABS CONTROL, CPITOR-DI CPITOR 25 I COLOR. TIEL. AMESIVE. NATURAL RP30	10A117	96640/	XIDE FINISH	, BLACK C	LESS STEE	G , STA	1/2" L	, 6-32,	SCREW	8	14		
11 PC9, D10TAL PAREL, ELECTRONIC 4492 18 1 D15PLAY, COLOR TOUR SCREEN 4492 20 1 STAF, GOUND 4492 21 1 STAF, GOUND 4492 22 1 STAF, GOUND 4492 22 1 STAF, GOUND 4492 22 1 STAF, GOUND 4492 23 1 COVER, DISFLAY, MOUNTING, FIRE PUMP DIGITAL PAREL 4492 23 1 COVER, DISFLAY, FIRE PUMP DIGITAL PAREL 4492 23 1 COVER, DISFLAY, FIRE PUMP DIGITAL PAREL 4492 23 1 COVER, DISFLAY, FIRE PUMP DIGITAL PAREL 4492 24 1 STICLEN, PUBBOTTON, ABS CONTROL, CHILL PAREL 4492 25 1 CUPE, TIE, ADHESIYE, NATURAL 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <	2G 92	A042G					PAD	ANE, KE	MEMBR	1	15		
18 1 PORER PCB, DIGITAL PAREL A442 19 1 DISPLAT, COLON TOUCH SCREEN A442 21 1 STRAF, GOUND PAREL A442 21 1 LABEL, UL, MECHANICAL CONTOL PAREL A442 21 1 LIABEL, UL, MECHANICAL CONTOL PAREL A442 23 1 COVER, DISTLAT, FIRE PUMP DIGITAL PAREL A442 23 1 COVER, DISTLAT, FIRE PUMP DIGITAL PAREL A442 24 1 SNICH, PUSBEDITON, ABG CONTOL, CPITOR-01 CPITO 25 1 CUPR, PUSBEDITON, ABG CONTOL, CPITOR-01 CPITO 26 1 HOUDER, TIE, ADHESIVE, MATURAL RP30	2G 94	A042G								1	16		
19 1 D SPLAY, COLOR TOUCH SCREEN 4.442 20 1 STRAF, GROUND 4422 21 1 CAREL 0.5812 22 1 BEZEL, DISPLAY, FIRE PUMP DIGITAL PAREL 4422 23 1 COURS, DISPLAY, FIRE PUMP DIGITAL PAREL 4422 23 1 COURS, DISPLAY, FIRE PUMP DIGITAL PAREL 4422 24 1 SNICA, USBUTON, ABS CONTOL, CPITA-01 FIRE 25 1 CUPP, REBORY CABLE, 25.566 FCMI- 26 1 MOLDER, TIE, ADRESTVE, MATURAL RP30		A042G								1			
20 I STRAP. GROUND A042 21 LABEL, UL., NECHANICAL CONTROL PAREL A042 23 COVER, DISPLAT, FIRE FUME DIGITAL PAREL A042 24 LSELL, UL., ABBO CONTROL, CPITOR-DI CPITOR 24 LSELL, SERTER PUBLICAL PAREL A042 25 LCIFA, PUBLICAL, FIRE FUME DIGITAL PAREL A042 26 HOLDER, TIE, ADHESTYE, NATURAL PP30		A042G			TRONIC								
21 I LABEL, UL, MECHANICAL CONTROL PAREL 4042 22 I DEZEL, DISPLAT, TRUE PUMP DIGITAL PAREL 4042 24 I SWITCH, PUSBBUTCH, ABE CONTROL, CPIDE-DI CPIDE 25 I CLUP, RIBBON CABLE, 23.6mm FCMI- 26 I HOLDER, TIE, ADHESIVE, NATURAL RP30						SCREEN							
22 1 BEZEL, DISPLAT MOUNTING, FIRE PUMP DIGITAL PAREL A042 23 1 COVER, DISPLAT, FIRE PUMP DIGITAL PAREL A042 24 1 SMITER, PUSSBUTION, ABE CONTROL, CP 108-01 CP 107 25 CLIP, RIBBON CABLE, 25.6m CP 107 CP 107 26 1 MOUDER, THE, ADRESTVE, NATURAL RP30													
23 I COVER, DISPLAY, FIRE PUMP DIGITAL PAREL A642 24 I SHITCH, PUSHBUTTON, ABB CONTROL, CPITOR-01 CPITO 25 I CLIP ZESSION ABE CONTROL, CPITOR-01 CPITO 26 I HOLDER, TIE, ADRESTVE, MATURAL BP30		A042G										ŀ	
NOTES: 1. SWITCH, PUSHBUTTON, ABB CONTRUCTION COPIO CPIIO CPIIO				AL PANEL								-	
NOTES: . UPDATED SOTWARE				.01								ł	
NOTES: 1. TYPE AX INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE NOTES:				01	L, UMITOR							ŀ	
NOTES: 1. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATES SOFTWARE												ŀ	
NOTES: 1. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE													
NOTES: 1. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE			•)	0
NOTES: I. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTMARE										0			
I. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE										° T			
I. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE													
I. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE													
I. TYPE 4X INDOOR USE CONSTRUCTION 2. UPDATED SOFTWARE													
						TRUCTIO	SE COM			. TYPE	1		
Contribution in true server lationaliza therein, D2 for Gay The Advanced, Contributions in therein, and the participation of the works in true In declaration, or use for the foreign of the works in th	ESIGN T CENTER ENCE DRIVE WISCONSIN	CUSTOM DESI And Upfit (875 Lawrend Depere, Wis	CUMMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.CON		E. Po		l information, i the receiver in ment accepts th any capy theree 23 net copy the the caption that the caption that the caption that a d the need to						
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE MECHANICAL CEP FINGINES			ROL PANEL	ITAL CONT P ENGINES	MBLY, DIG ANICAL C		SION TOLERA	ED ALL DIN	ISE SPECIF	INLESS OTHER	b		
		DATE: 26SE	: PBS	DRAWN BY	UNITS:	PIC .	NDCDIAL	MACHINED SURFACES	ions ± 1°	NGULAR DINENS	N		
International And Control of Cont		INIT ECO:		PRO-E	B/S	1 N /	1		ROJECTION			0.55	
PBS 01FEB2017 V BY DATE T A CONTROL 120 SHEET ORANING NO: 117170 EST WEIGHT: 28.994 I OF 2 A042G184	4			. 994		H SCA		Ň		⊕-f			

BILL OF MATERIAL DESCRIPTION

ASSY, WIRING, DIGITAL PANEL, ENGINE STOP SWITCH

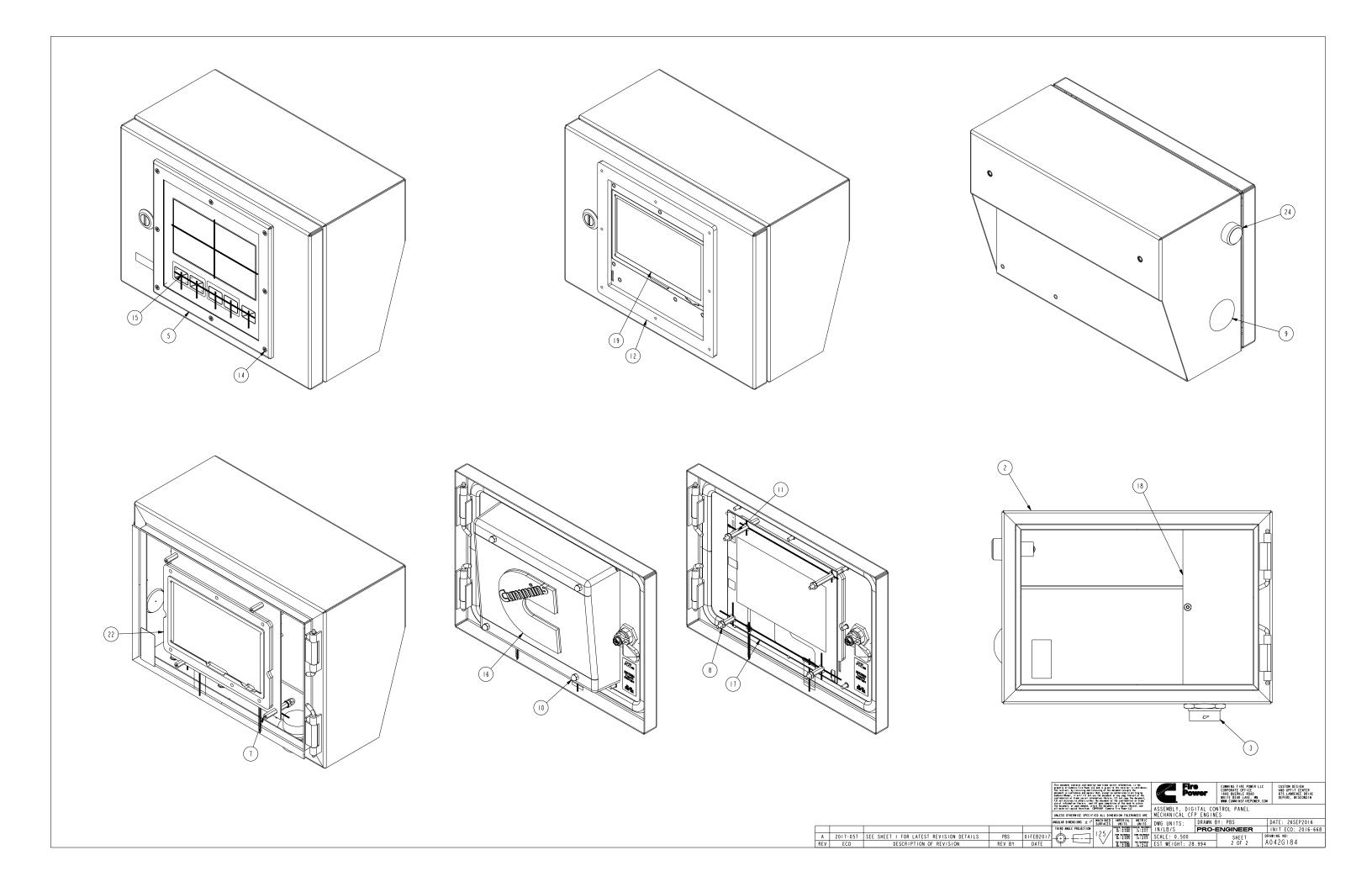
CABINET, CONTROL PANEL

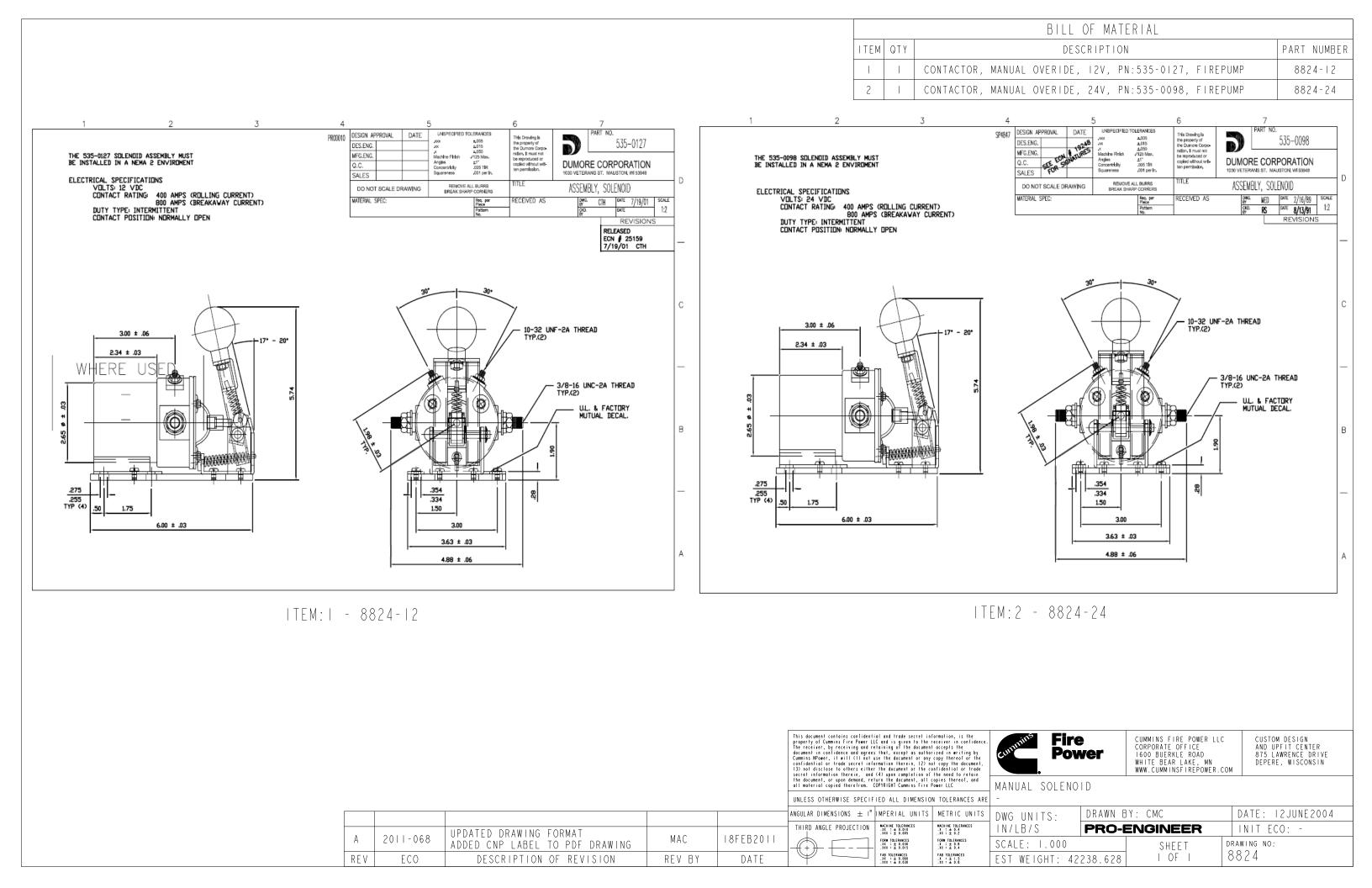
PART NUMBER

15160

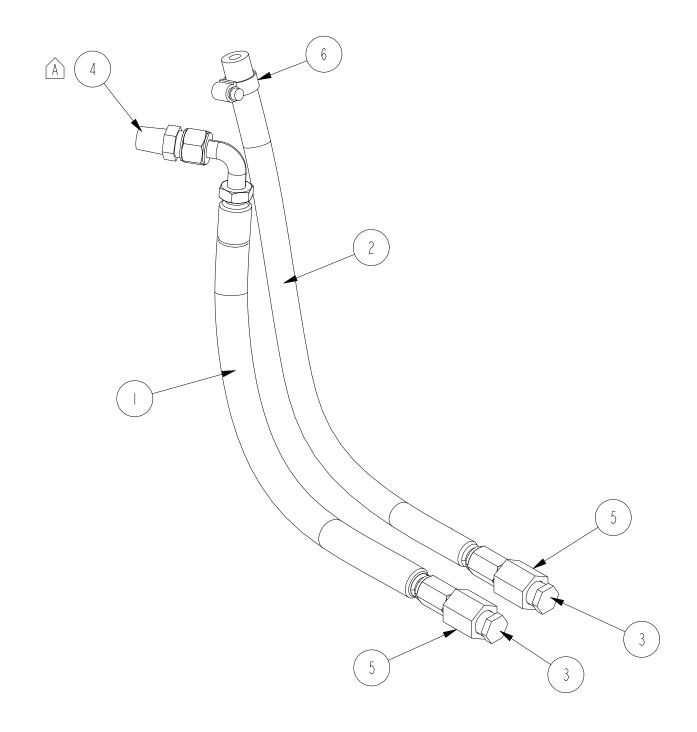
I TEM QTY

1 1





	BILL OF MATERIAL									
ITEN	4 QTY	DESCRIPTION	PART NUMBER							
1		ASSEMBLY, HOSE, FUEL LINE, CFP59 SUPPLY	15266							
2		ASSEMBLY, HOSE, FUEL LINE, CFP59 RETURN	15267							
3	2	PLUG. PIPE, -4 NPT	22 0-4							
4		FTG, STR, -6 JIC X -4 NPT	2 2 3 8 - 6 - 4							
5	2	FTG, STR, -4 JIC X -4 FMNPT	2 2 4 0 - 4 - 4							
6		CLAMP, WORM, .2563	4992-04							



2011-053 ADD NOTE

2010-390

ECO

CHG FITTING SIZE, WAS -6-6 DESCRIPTION OF REVISION

В

A REV

B NOTE: APPLY THREAD SEALANT OF

S DUBICK

S DUBICK

REV BY

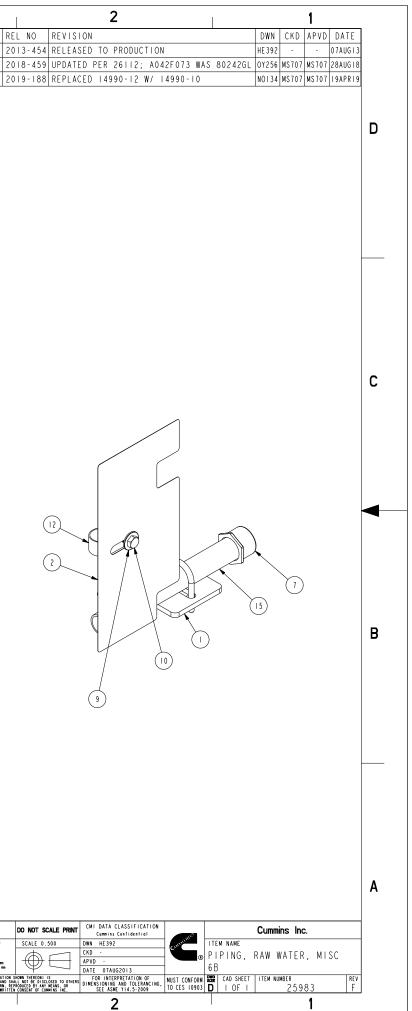
property of C The receiver, document in c Cummins WPome confidential (3) not disc() secret inform	contains confidential and trade secret mmins Fire Power LLC and is given to the by receiving and relaining of the docum afidence and agrees that, except as sult , it will (1) not use the document or a or frade secret information therein, (2) set to others either the document or the tion therein, and (41 upon completion or	receiver in confidence. nt accepts the orized in writing by y copy thereof or the not copy the document, confidential or trade if the need to retain	currents Fire Pov		CUMMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.C	AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN
the document, all material UNLESS OTI	KIT, FUEL LIN FI0/20/30/40/					
ANGULAR DIM	ENSIONS ± 1° IMPERIAL UNITS	METRIC UNITS	DWG UNITS:	DRAWN B	Y: DAN	DATE: 07-JUL-09
7-MAY- THIRD ANG	E PROJECTION	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2	IN/LB/S	PRO-E	ENGINEER	REF DRWG: 8568
24-AUG-10 +	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4	SCALE: 0.500		SHEET	DRAWING NO:
DATE	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8	EST WEIGHT: 7.	039	I OF I	15204

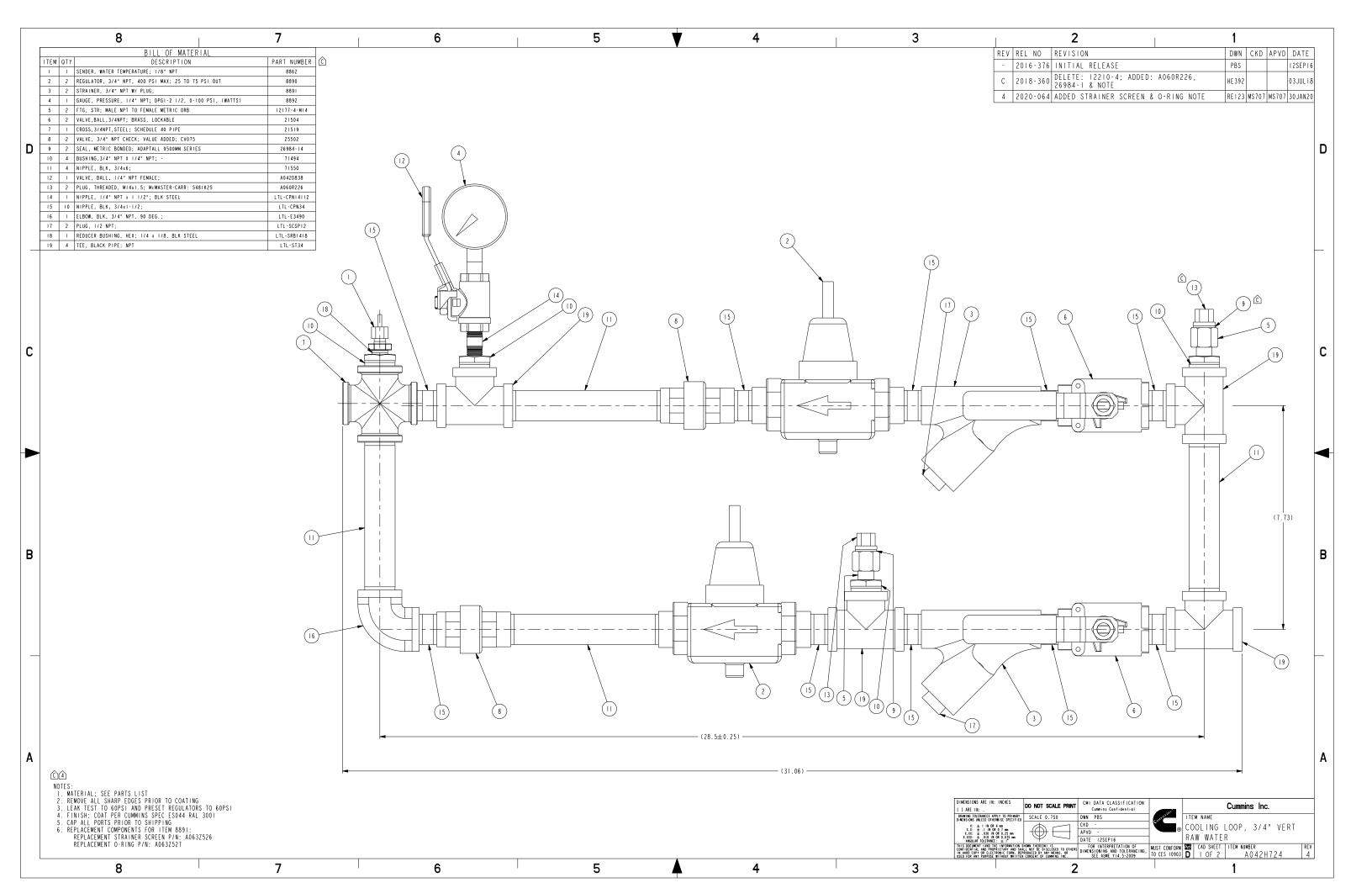
ON ALL NPT THREADS.

			BILL OF MATERIAL
			ITEM QTY DESCRIPTION PART
			I I HOSE, FUEL LINE, CFP83 SUPPLY A04
			2 I HOSE, FUEL LINE, CFP83 RETURN A04
			3 I PLUG. PIPE, -4 NPT 122
	5		4 I PLUG. PIPE, -6 NPT 122
		\backslash	5 I FTG, STR, -8 JIC X -8 NPT 1223
	· · · · · · · · · · · · · · · · · · ·		6 I CLAMP, WORM, .3188 149
			7 I CHECK VALVE, 3/8", FNPT x FNPT, 2 PSI CRACK A04
			8 I CHECK VALVE, I/4", FNPT x FNPT, O PSI CRACK A04
		\sim	
		·	
		/	
(6)			(8)
		1	
	$\left(\begin{array}{c}2\end{array}\right)$		
			NOTE, ADDLY THREAD CEALANT ON ALL NRT THREADC
		Г	NOTE: APPLY THREAD SEALANT ON ALL NPT THREADS.
			This document contains confidential and trade secret information, is the property of Cummiss Fire Power (LC and is given to the receiver in confidence. The receiver in confidence and agrees that, except as authorized in writing by Commiss Prover, it will (1) not use the document (2) not copy the document, copy the document, (2) not copy the document, (2) not copy the document.
		-	secret information therein, and (4) upon completion of the need to retain the document, or upon demand, return the document, all copies thereof, and all matrial copied therefrom. COPYRIGHT Cummins Fire Power LLC KIT, FUEL LINES, CFP83
			unless otherwise specified all dimension tolerances are FI0/20/30/40 - EXTONLY angular dimensions ± 1° Machined imperial metric units DWG UNITS: DRAWN BY: MRH DATE: 27MAY2
	UPDATED A042B474,SWITCHED		THIRD ANGLE PROJECTION
A 2014-439	A042B476 & A042B477	MRH 17JUN2014	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
REV ECO	DESCRIPTION OF REVISION	REV BY DATE	Image: Product and the second seco



	8	7		6		5		4	 3
	BILL OF MATERIAL ITEM OTY DESCRIPTION	PART NUMBER (ÊYÊ)				•		 REV RE - 20 E 20 F 20
	I I BRKT, RAW WATER COOLING, 4" LG, 3/4" OR I" PIPE 2 I DECAL, COOLING LOOP VALVES, VERTICAL MTG	9633							E 20
	3 I ELB, 45 DEG, -12 NPT X -12 FMNPT	12532-12-12							F 20
	4 I FTG, STR, -12 BEAD X -12 NPT 5 I ELB, 90 DEG, -12 BEAD X -12 NPT	2545-12-12 2547-12-12						STAT L	
D	6 2 CLAMP, WORM, .56-1.06 7 1 CAP, PVC, NPT FEMALE, 3/4" NPT	4990 - 10 6663 - 12						HH J	
	8 6 WASHER,FLAT, 0.25 9 I WASHER,FLAT, 0.31	20020 20020					5		
	10 I SCREW, HH, 0.31-18x1.00	20231-100							
	II I BRACKET, COOLING MOUNTING, CFP59 I2 I CLAMP, LOOM, I.00 ID	26122 26963-16				(8)	0		
	13 3 U-BOLT, I-1/8" OD PIPE, W/NUTS 14 1 HOSE,SILICONE, 3/4IN ID x 7.00IN LONG	3201T13 A042F073					\bigcirc		
	I5 I NIPPLE, PIPE, BLK, 3/4 NPT x 9.00	BNFY							
	16 4 NUT, HEX, PT, MIO-1.50 17 1 NUT, HEX, 0.31-18	20140-M10 20100-031				2	Dall -		
	18 4 SCREW, HH, MIO-I.50x30	20310-030							
						<u> </u>			
							Ro		
С							ULO		
		\square							
							TACE		
		λ.							
						(3)			
							×		
		\sum					·		
							A		
В							$(14)^{\overline{E}}$		
		\geq			O.	AA			
							\checkmark	5	
						\``\			
		- SCO				\backslash			
								ł	
						1		ļ	
Λ									
A							_		
						Ľ (I	B) _/		
									DIMENSIONS ARE IN: INCHES []] ARE IN: . DRAWING TOLERANCES UNLESS
									OTHERNISE SPECIFIED X: ± IN OR 4 mm X.X: ± IN OR 0.7 mm X.XI: ± 0.03 KM 0.25 mm
	NOTES: I. REFERENCE DRAWING 26106 FOR INSTALLATION ONTO TH	E POWER UNIT							L J ARL IN. DRAFT TO CLEMENTS UNLESS OVIANTSE SPECIALS VIANTSE SPECIALS L. 2. 4.18 IN G mm L. 2.1.2.19 IN G mm L. 2.2.19 IN G mm L 2.2.19 IN G mm L. 2.2.19 IN G mm L 2.2.19 IN G mm L 2.2.19 IN G mm L 2.2.19 IN G mm
	8	7		6		5	A	4	IN HARD COPY OF ELECTRONIC FORM, BEE USED FOR ANY PURPOSE WITHOUT WRITTEN
	U	•		<u> </u>		<u> </u>		•	~

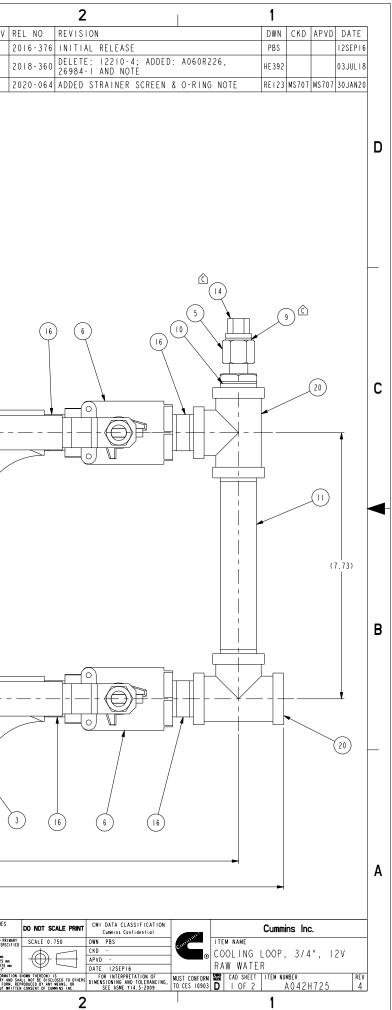




	8	3	7	1	6		5	V	4	3	
Assembly	y Component	Manufacture/pn	Description	Sub-Component	Material	Specification			-		
A042H72			3/4" Vertical, Raw Water								
	21504	RUB, \$95E45	3/4" ball valve								
				body	brass CW617N	EN12165	_				
	-			seat	PTFE	ENLOY OF	_				
				ball	brass CW617N	EN12165	_				
				end cap stem	brass CW617N brass CW617N	EN12165 EN12164	_				
				nut	CB4FF	EN12164	_				
				0-ring	FPM	ENTOZOJ-Z	_				
				handle	DDII	ENIOIII	-				
				handle coating	PVC	Entotti	_				
				washer	PTFE		-				
	8862	Datcon, 02022-00	temperature sender	body	brass						
	8890	Watts, N45BU-MI-3/4"	regulator	,							
			-	body	bronze						
				seat	thermoplastic						
				cage	thermoplastic						
				intregral strainer	stainless steel						
				diaphragm	reinforced EPDM						
				valve disc	e lastomer		_				
	8891	Watts, 775-MI-3/4"	strainer	<u>↓</u> ↓			4				
				body	cast iron		4				
				retainer cap	cast iron	ASTM A-126 Class B	-				
	8892	Watts, DPGI-2	pressure gauge	screen	304 stainless steel		-				
	0092	mails, Droi-2	pressure gauge	case	ABS polymer		_				
				window	Kostil polymer		-				
				sensing element	copper alloy Bourdon tube		_				
				welding	tin alloy		_				
				connection	brass		-				
	A042D838	RUB, \$95845	I/4" ball valve								
				body	CW617N	EN12165					
				seat	PTFE						
				ball	CW6 7N	EN12165					
				end cap	CW617N	EN12165					
				stem	CW617N	EN12164					
				nut	CB4FF	EN10263-2	_				
				O-ring	FPM	ENLALL.	_				
				handle	DDII PVC	ENIOIII	-				
				handle coating washer	PTFE		_				
>	21519		3/4" cross	washer	black steel	ASTM A53/A733	_				
	25502	Euroblock, 100002	3/4" check valve		brack steel	NOTH NOOTHTOO	-				
	20002	201001000, 100002		body	brass CW617N	EN12165	_				
				end connection	brass CW617N	EN12165					
				disc	polyetherimide						
				seat	NBP						
				spring	stainless steel						
	71494		3/4" x I/4" reducing bushing		black steel	ASTM A53/A733					
	71550		3/4" x 6" nipple		black steel	ASTM A53/A733					
L	LTL-CPN14112		1/4" x 1-1/2" nipple		black steel	ASTM A53/A733	_				
	LTL-CPN34		3/4" x 1-1/2" nipple		black steel	ASTM A53/A733	4				
	LTL-E3490		3/4", 90* elbow		black steel	ASTM A53/A733	4				
<u> </u>	LTL-SCSP12		1/2" NPT plug		black steel	ASTM A53/A733	4				
	LTL-SRB1418		1/4" x 1/8" reducing bushing		black steel	ASTM A53/A733	-				
	LTL-ST34		3/4" TEE ftg, str, 1/4-18 to M14x1.5		black steel	ASTM A53/A733	-				
(12111-4-M14		, \$11, 1/4-10 TO MI4X1.5		steel, zink plated						

2		1	
			D
			С
			в
			-
			Α
	1		
DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential	Cummins Inc.	
CES APPLY TO PRIMARY OTHERWISE SPECIFIED SCALE 0.750	Cummins Confidential DWN PBS CKD - CVD	ITEM NAME ■ COOLING LOOP, 3/4" VERT	
NONCONTRACTOR NO GALANTINO NO GALANTINO NO KO CALANTINO NA CALANTINO	APVD - DATE 12SEP16 FOR INTERPRETATION OF	RAW WATER	
PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS ELECTRONIC FORM, REPRODUCED BY ANY MEANS, OR POSE WITHOUT WRITTEN CONSENT OF CUMMINS INC.	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009 TO CES II	0903 D 2 OF 2 A 0 4 2 H 7 2 4 4]
2		1	

	8 BILL OF MATERIAL	7	6	5	▼ 4	3
D	BILL OF MATERIAL ITEM OTY DESCRIPTION I I SENDER, WATER TEMPERATURE; 1/8" NPT 2 2 REGULATOR, 3/4" NPT, 400 PSI MAX; 25 TO 75 PSI OUT 3 2 STRAINER, 3/4" NPT W/ PLUG; 4 I GAUGE, PRESSURE, 1/4" NPT; DPGI-2 1/2, 0-100 PSI, (WATTS) 5 2 FTG, STR; MALE NPT TO FEMALE METRIC ORB 6 2 VALVE, BALL.3/4NPT; BRASS, LOCKABLE 7 I CROSS, 3/4NPT, STEEL; SCHEDULE 40 PIPE 8 2 VALVE, J/4" NPT CHECK; VALUE ADDED; CV075 9 2 SEAL, METRIC BONDED; ADAPTALL 9500MM SERIES 10 4 BUSHING, 3/4" NPT X 1/4" NPT; 11 3 NIPPLE, BLK, 3/44.6; 12 I VALVE, SOLENOID, 3/4" NPT, 12VDC; 13 I VALVE, BALL, 1/4" NPT FEMALE; 14 2 PLUG, THREADED, MI4x1.5; McMASTER-CARR: 5481K25 15 I NIPPLE, I/4" NPT x I 1/2"; BLK STEEL 16 12 NIPPLE, BLK, 3/4*I-1/2; 17 I ELBOW, BLK, 3/4" NPT, 90 DEG.; 18 2 PLUG, I/2 NPT;	PART NUMBER 8862 8890 8890 12177-4-M14 21504 21504 21519 25502 26984-14 71494 71550 A042B123 A042B123 A042D838 A060R226 LTL-CPN14112 LTL-CPN34 LTL-E3490 LTL-SCP12				2 REV - C 4
C	19 1 REDUCER BUSHING. HEX; 1/4 x 1/8, BLK STEEL 20 4 TEE, BLACK PIPE; NPT	(1) (1) (1) (1)				
B		(1)				
A	CA NOTES: 1. MATERIAL: SEE PARTS LIST 2. REMOVE ALL SHARP EDGES PRIOR TO COATING 3. LEAK TEST TO GOPSI AND PRESET REGULATORS TO GOPSI 4. FINISH: COAT PER CUMMINS SPEC ESO44 RAL 3001 5. CAP ALL PORTS PRIOR TO SHIPPING 6. REPLACEMENT COMPONENTS FOR ITEM 8891: REPLACEMENT STRAINER SCREEN P/N: A0632527 8	7	6	5	(28.4±0.25)	31.0 31.0 33.0



	8	i	7	I	6	
Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H725			3/4" I2VDC, Raw Water			
	21504	RUB, \$95E45	3/4" ball valve			
				body	CW617N	EN12165
				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW6 7N	EN12164
				nut	C B 4 F F	EN10263-2
				0-ring	FPM	
				handle	DDII	ENIOIII
				handle coating	PVC	
				washer	PTFE	
	A042B123	Asco, 8210G003-12V	3/4" NPT I2V solenoid valve			
				body	brass	
				seals and discs	NBR or PTFE	
				disc holder	PA	
				core tube	305 stainless steel	
				core and plugnut	430F stainless steel	
				springs	302 stainless steel	
	0000			shading coil	copper	
	8862	Datcon, 02022-00	temperature sender	Body	brass	
	8890	Watts, N45BU-MI-3/4"	regulator	h. l	h	
				body	bronze	
				seat	thermoplastic	
				cage	thermoplastic stainless steel	
				intregral strainer		
				diaphragm	reinforced EPDM elastomer	
	8891	Watts, 775-MI-3/4"	strainer	valve disc	eldstomer	
	0091	WOITS, 773-MT-374	Strather	body	cast iron	
				retainer cap	cast iron	ASTM A-126 Class B
				screen	304 stainless steel	
	8892	Watts, DPGI-2	pressure gauge	Vereen	304 310111033 31001	
	0002		p: 0000: 0 gaugo	case	ABS polymer	
				window	Kostil polymer	
				sensing element	copper alloy Bourdon tube	
				welding	tin alloy	
				connection	brass	
	A042D838	RUB, \$95845	I/4" ball valve			
				body	CW617N	EN12165
				seat	PTFE	
				ball	CW617N	EN12165
				end cap	CW617N	EN12165
				stem	CW617N	EN12164
				nut	CB4FF	EN10263-2
				O-ring	FPM	
				handle	DDII	ENIOIII
				handle coating	PVC	
				washer	PTFE	
	21519		3/4" cross		black steel	ASTM A53/A733
	25502	Euroblock, 100002	3/4" check valve			
L				body	brass CW617N	EN12165
				end connection	brass CW617N	EN12165
				disc	polyetherimide	
L				seat	NBP	
				spring	stainless steel	
	71494		3/4" x 1/4" reducing bushing		black steel	ASTM A53/A733
	71550		3/4" x 6" nipple		black steel	ASTM A53/A733
	LTL-CPNI4112		1/4" x 1-1/2" nipple		black steel	ASTM A53/A733
	LTL-CPN34		3/4" x 1-1/2" nipple		black steel	ASTM A53/A733
	LTL-E3490		3/4", 90* elbow		black steel	ASTM A53/A733
	LTL-SCSP12		I/2" NPT plug		black steel	ASTM A53/A733
	LTL-SRB1418		I/4" x I/8" reducing bushing 3/4" TEE		black steel	ASTM A53/A733
				1	black steal	ASTM A53/A733
	LTL-ST34		5/4 IEE ftg, str, 1/4-18 to MI4x1.5		black steel steel, zink plated	A01M A007A100

6

Α

8

[] ARE IN: . ORANING TO(FRANCES APPI DINESTONS UNLESS OTREMI X.X. ± | IN OR 4 X.X. ± | IN OR 4 X.X. ± 0.00 IN OR X.X.X. ± 0.00 IN OR X.X.X. ± 0.00 IN OR ANGUAR TO(FRANCE) THIS DOCUMENT LAMD THE CONFIDENTIAL AND THE CONFIDENTIAL AND

3

DIMENSIONS ARE IN: INCHES

3

4

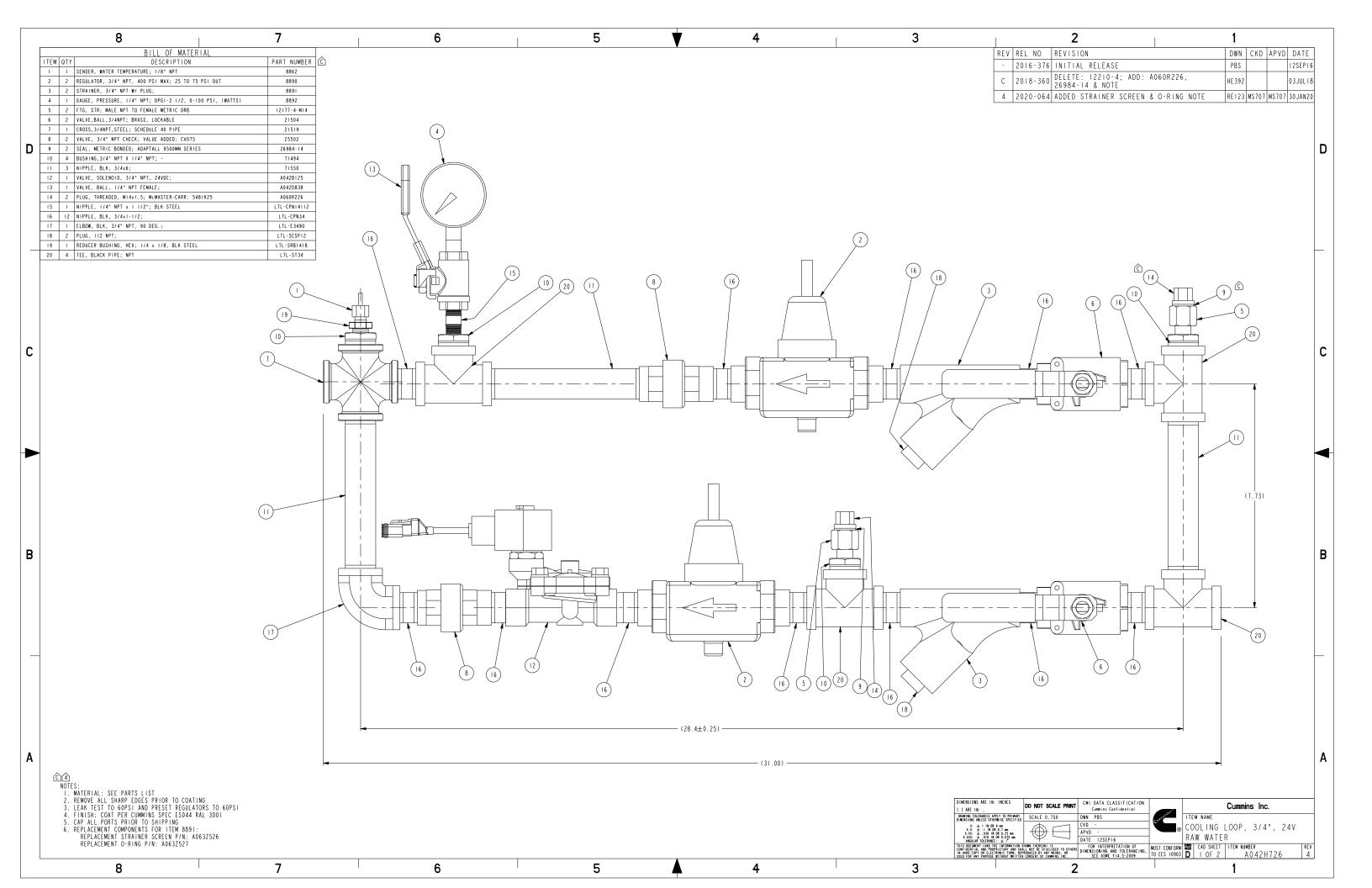
1

¥

5

4

2				1	
					D
					_
					C
					В
					_
					A
DO NOT SCALE PRINT SCALE 0.750	CMI DATA CLASSIFICATION Cummins Confidential DWN PBS CKD - APVD - DATE 12SEP16	c.ongrant @	ITEM NAME COOLING L RAW WATER	Cummins Inc. 00P, 3/4", 12	
IN THEREON) IS NOT BE DISCLOSED TO OTHERS DUCED BY ANY MEANS, OR CONSENT OF CUMMINS INC.	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	MUST CONFORM TO CES 10903		A042H725	REV 4



_		8	7		6		5	▼
Assembl	y Component	Manufacture/pn	Description	Sub-Component	Material	Specification		
A042H72			3/4° 24VDC, Raw Water					
	21504	RUB, \$95E45	3/4" ball valve				-	
				body	CW617N	EN12165	-	
-				seat ball	PTFE CW617N	ENIDICE	-	
				end cap	CW617N	EN12165 EN12165	-	
	_			stem	CW617N	EN12163	-	
				nut	CB4FF	EN10263-2	-	
				0-ring	FPM	ENT0203-2	-	
				handle	DDII	ENIOIII	-	
				handle coating	PVC	ENIVITI	-	
				washer	PTFE		1	
	A042B125	Asco, 8210G003-24V	3/4" NPT 24V solenoid valve				1	
				body	brass		1	
				seals and discs	NBR or PTFE		1	
				disc holder	PA			
				core tube	305 stainless steel		1	
				core and plugnut	430F stainless steel		1	
				springs	302 stainless steel		1	
				shading coil	copper]	
	8862	Datcon, 02022-00	temperature sender	Body	brass]	
	8890	Watts, N45BU-MI-3/4"	regulator]	
				body	bronze			
				seat	thermoplastic			
				cage	thermoplastic			
				intregral strainer	stainless steel			
				diaphragm	reinforced EPDM			
				valve disc	elastomer			
	8891	Watts, 775-MI-3/4"	strainer				-	
				body	cast iron		-	
				retainer cap	cast iron	ASTM A-126 Class B	-	
	0000	WILL DOCL 0		screen	304 stainless steel		-	
	8892	Watts, DPGI-2	pressure gauge		ABS polymer		-	
				case window	Kostil polymer		-	
	_			sensing element	copper alloy Bourdon tube		-	
				welding	tin alloy		-	
				connection	brass			
	A042D838	RUB, \$95845	/4" ball valve				1	
				body	CW617N	EN12165	1	
				seat	PTFE		1	
				ball	CW617N	EN12165	1	
				end cap	CW617N	EN12165	1	
				stem	CW617N	EN12164	1	
				nut	CB4FF	EN10263-2]	
				0-ring	FPM]	
				handle	DDII	ENIOIII]	
				handle coating	PVC			
				washer	PTFE			
	21519		3/4" cross		black steel	ASTM A53/A733	-	
	21519 25502	Euroblock, 100002	3/4" cross 3/4" check valve]	
		Euroblock, 100002		body	brass CW617N	EN12165		
		Euroblock, 100002		body end connection	brass CW617N brass CW617N			
		Euroblock, 100002		body end connection disc	brass CW617N brass CW617N polyetherimide	EN12165	-	
		Euroblock, 100002		body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP	EN12165	-	
	25502	Euroblock, 100002	3/4" check valve	body end connection disc	brass CW617N brass CW617N polyetherimide NBP stainless steel	EN12165 EN12165	-	
	25502	Euroblock, 100002	3/4" check valve	body end connection disc seat	brass CWGI7N brass CWGI7N polyetherimide NBP stainless steel black steel	EN12165 EN12165		
	25502 71494 71550		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112 LTL-CPN34		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112 LTL-CPN34 LTL-E3490		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple 3/4", 90* elbow	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112 LTL-CPN34 LTL-E3490 LTL-SCSP12		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel black steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112 LTL-CPN14112 LTL-E3490 LTL-SCSP12 LTL-SCSP12		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple 3/4", 90* elbow 1/2" NPT plug 1/4" x 1/8" reducing bushing	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel black steel black steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		
	25502 71494 71550 LTL-CPN14112 LTL-CPN34 LTL-E3490 LTL-SCSP12		3/4" check valve 3/4" x 1/4" reducing bushing 3/4" x 6" nipple 1/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple 3/4" x 1-1/2" nipple	body end connection disc seat	brass CW617N brass CW617N polyetherimide NBP stainless steel black steel black steel black steel black steel black steel black steel black steel	EN12165 EN12165 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733 ASTM A53/A733		

Α

8

DIMENSIONS ARE IN: INCHES I ARE IN: . DRAWNG TOLEBANCES APPLIT TO PR DIMENSIONS BUSIES OINTRIVISES I: ± I IN 00 4 mm X.1: ± I IN 00 4 mm X.1: ± 0.00 IN 00 4.05 I.XII: ± 0.00 IN 00 4.05 III: 0.00 IIII: 0.00 IIIIII III: 0.00 III: 0.00 IIIIII

7

6

5

4

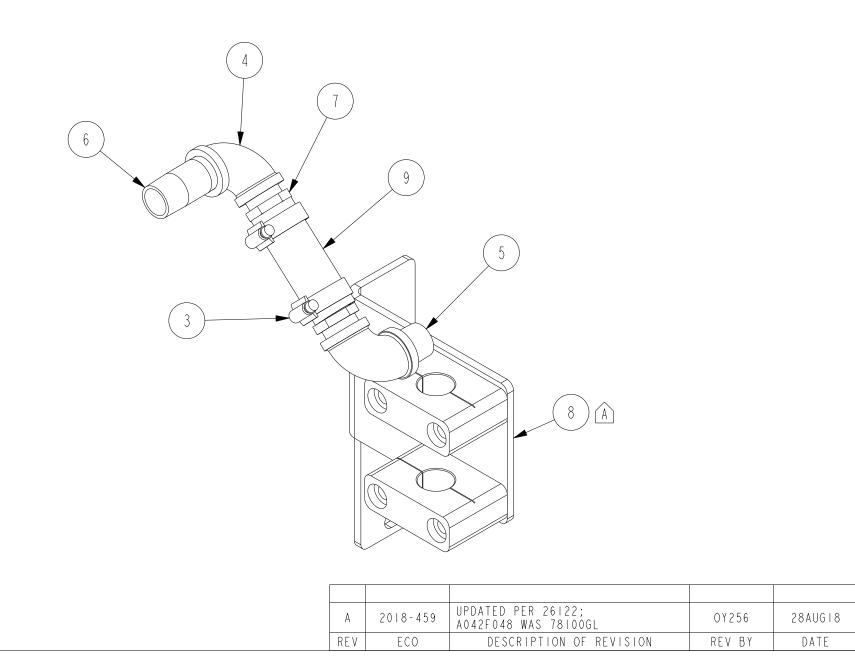
3

1

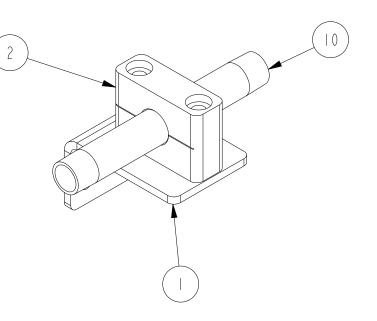
1

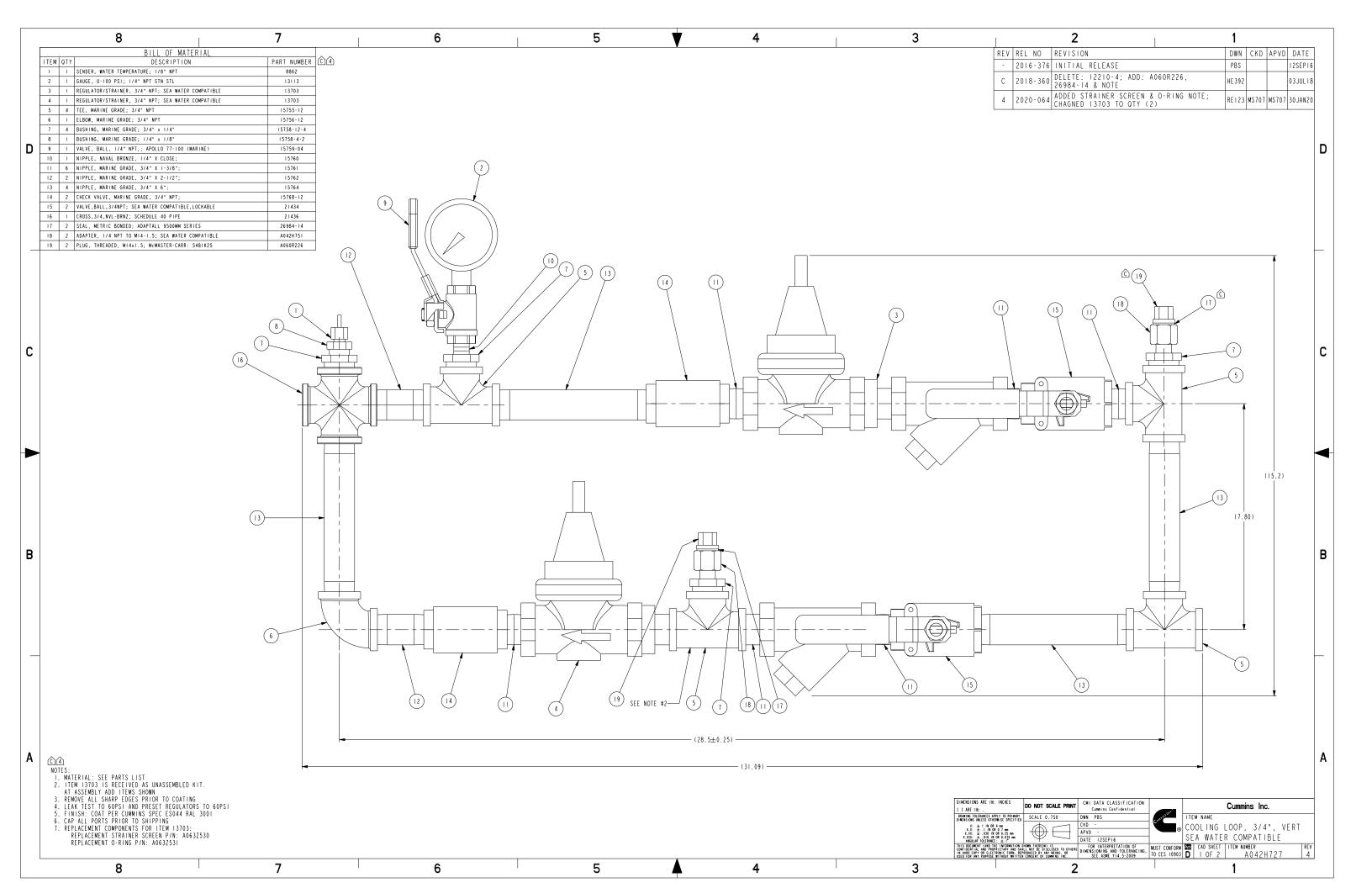
2		1	1	
				D
				С
				В
				A
DO NOT SCALE PRINT	CMI DATA CLASSIFICATION Cummins Confidential		Cummins Inc.	
SCALE 0.750	DWN PBS CKD -	Cuntum	ITEM NAME COOLING LOOP, 3/4"	, 24V
OWN THEREON) IS L NOT BE DISCLOSED TO OTHERS	APVD - DATE 12SEP16 FOR INTERPRETATION OF DIMENSIONING AND TOLEPANCING	MUST CONFORM	RAW WATER	REV
DEWN THEREON) IS L NOT BE DISCLOSED TO OTHERS DOUCED BY ANY MEANS, OR CONSENT OF CUMMINS INC.		TO CES 10903	D 2 OF 2 A042H	26 4
			I	

\sim		BILL OF MATERIAL						
(A)	ITEM	ITEM QTY DESCRIPTION						
	_	I	BRKT, RAW WATER COOLING, 4" LG, 3/4" OR I" PIPE	9633				
	2	3	CLAMP, PIPE, 3/4", PLASTIC	4926				
	3	2	CLAMP, WORM, .81 - 1.50	4990- 6				
	4	2	ELBOW, MARINE GRADE, 3/4" NPT	15756-12				
	5	I	NIPPLE, MARINE GRADE, 3/4" X I-3/8"	15761				
	6	Ι	NIPPLE, MARINE GRADE, 3/4" X 2-1/2"	15762				
	7	2	ADAPTER, NAVAL BRONZE, NPT X BARB, 3/4" NPT X I" BARB	15766-12-16				
	8	I	BRACKET, COOLING MOUNTING, CFP59	26122				
	9	I	HOSE, SILICONE, HI-TEMP, I.OO" ID X 4.00"	A042F048				
	10		NIPPLE, 3/4" x 7.5", SEA WATER COMPATIBLE	A04 Z956				



This document contains confidential and trade so property of Cummins Fire Power LLC and is given the receiver, by receiving and retaining of the document in confidence and agrees that, except a Cummins Nover, it will (1) not use the document confidential or trade secret information there in (3) not disclose to others either the document secret information therein, and (4) upon comple	e document, I or trade	currents Fire Power		CUMMINS FIRE POWER LLC CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.CO	AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN		
the document, or upon demand, return the documen all material copied therefrom. COPYRIGHT Cummin		reof, and		MISCELLANEOUS PIPING			
UNLESS OTHERWISE SPECIFIED ALL DIM	ENSION TOLEF	ANCES ARE	SEA WATER, CFP59				
ANGULAR DIMENSIONS ± 1° MACHINED SURFACES	IMPERIAL UNITS	METRIC UNITS	DWG UNITS:	DRAWN E	Y: PBS	DATE: 12FEB2015	
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2	IN/LB/S	PRO-	ENGINEER	INIT ECO: 2015-109	
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4	SCALE: 0.375			DRAWING NO:	
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8	EST WEIGHT: 7.	519	I OF I	A042E017	





		8	7		6		5	▼ 4
Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification		•
A042H727			3/4" Vertical, Sea Water					
	21434	Apollo, 75–104–01	3/4" ball valve					
				lever and grip	steel, zinc plated w/vinyl			
				stem packing	MPTFE			
				stem bearing	RPTFE			
				ball	chrome plated	ASTM BI6		
				seat	RPTFE			
				retainer		ASTM BI6		
				gland nut		ASTM BIG		
	-			stem		ASTM BIG		
				lever nut	stool zinc plated	ASTM DTO		
				body seal	steel, zinc plated PTFE			
	_					ASTM B524-C84400		
	0000	D I 02022 00		body		ASIM B524-C84400		
	8862	Datcon 02022-00	temperature sender	body	brass			
	13113	Grainger, 4RY95	pressure gauge					
				case	stainless steel			
				socket	316 stainless steel			
				tube	316 stainless steel			
				lens	polycarbonate			
				ring	316 stainless steel			
	13703	Wilkins, 500YSBRHLRSW	3/4" regulator/strainer					
				body	cast bronze	ASTM B584		
				access covers	cast bronze	ASTM B584		
					brass	ASTM BI6		
				fasteners	300 series stainless steel			
				stem & plunger	cast bronze	ASTM B584		
					brass	ASTM BIG		
				elasttomers	Buna Nitrile	FDA approved		
					EPDM	FDA approved		
				cap gaskets	natural vulcanized fibre			
				Jun gut and	Acetal (Delrin 500)	NSF Listed		
				springs	oil tempered wire	ASTM A229		
				strainer screen	300 series stainless steel	NOTH REED		
				seat	300 series stainless steel			
	15755-12		3/4" tee	3001	Copper Alloy	ASTM B62-09		
	15756-12		3/4" elbow		Copper Alloy	ASTM 862-09		
	15758-12-4		3/4" x 1/4" reducing bushing		Copper Alloy	ASTM 862-09		
	15758-4-2		1/4" x 1/8" reducing bushing			ASTM B62-09		
					Copper Alloy	A31M D02-09		
	15759-04	Apollo, 77–101–01	1/4" ball valve	Lines and sets	All and the second second second			
				lever and grip	steel, zinc plated w/vinyl			
				stem packing	MPTFE			
				stem bearing	RPTFE			
				ball	chrome plated	ASTM BI6		
				seat	RPTFE			
				retainer		ASTM BI6		
				gland nut		ASTM BI6		
				stem		ASTM BI6		
				lever nut	steel, zinc plated			
				body seal	PTFE			
				body		ASTM B524-C84400		
	15760		1/4" close nipple		Copper Alloy	ASTM B62-09		
	15761		3/4" x 1-3/8" nipple		Copper Alloy	ASTM B62-09		
	15762		3/4" x 2-1/2" nipple		Copper Alloy	ASTM B62-09		
	15764		3/4" x 6" nipple		Copper Alloy	ASTM B62-09		
			3/4" check valve		Copper Alloy	ASTM B62-09		
				body	bronze			
		1		guide bushing	stainless steel			
				spring	stainless steel			
<u> </u>	-			check	brass			
<u> </u>				seat	PTFE			
				0-ring	Nitrile			
				adapter	brass			
1	21436		3/4" cross	14444161	Copper Alloy	ASTM B62-09		
1		1	1014 (1033	1	leobhei viioà	NOIM D02-03		
	A042H751		adapter 1/4 NPT to MI4-1.5		Copper Alloy	ASTM B62-09		

5

4

Α

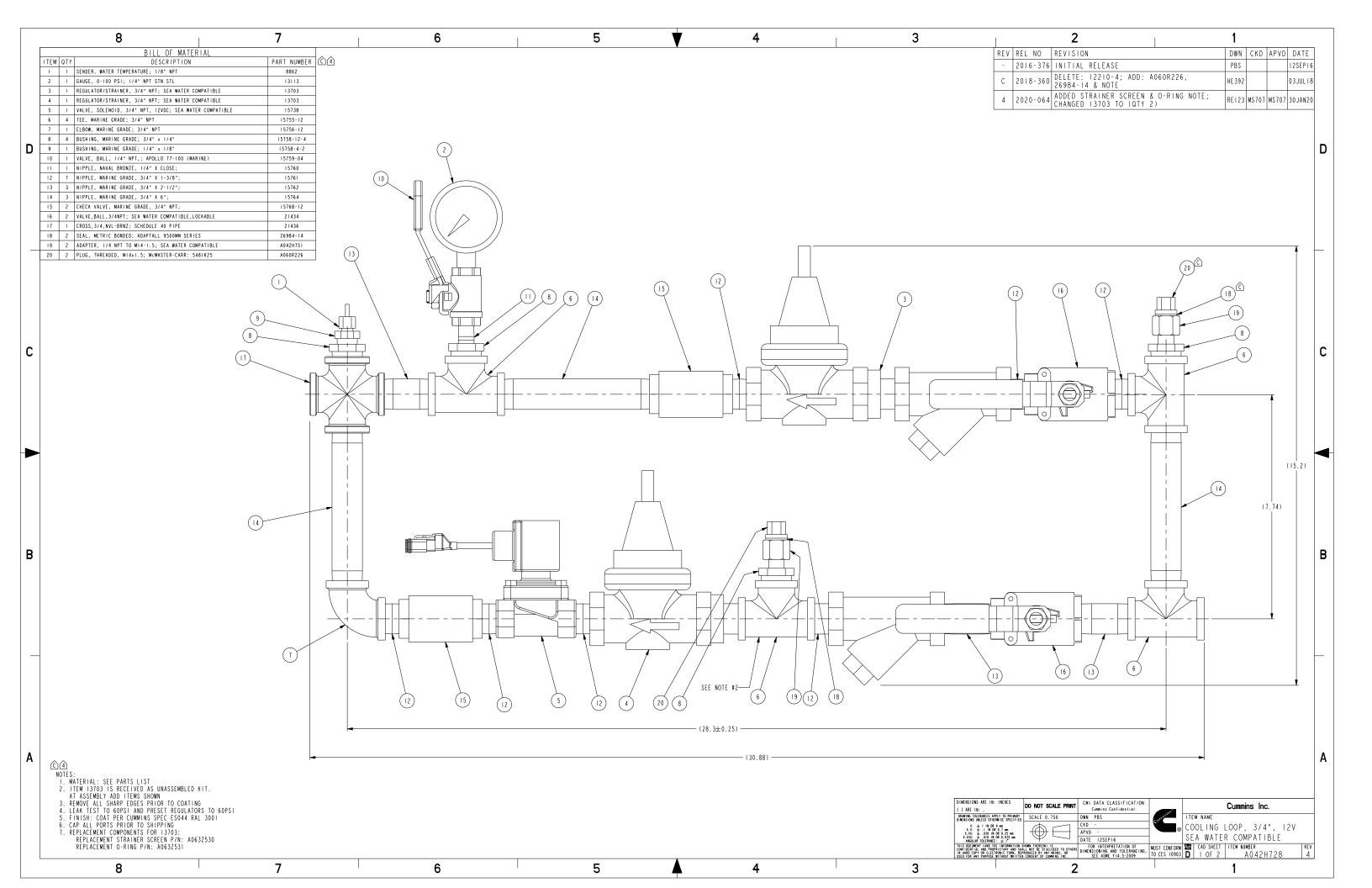
8

7

DIMENSIONS ARE IN: INCHES DI DIMENSIONS ARE IN: INCHES DI DIMENSIONS UNCERTIFICATION PRIMATE TELESTON PRIMATE DIMENSION T.: ± 110 04 a m T.: ± 100 04 a m T.: ±

3

2	,			1	
Ľ	•			1]
					D
					_
					_
					С
					_
					В
					A
o not scale print	CMI DATA CLASSIFICATION			Cummins Inc.	
SCALE 0.750	Cummins Confidential DWN PBS CKD -	Cummun	ITEM NAME		-
\bigoplus	APVD - DATE 12SEP16	•	SEA WATER	OOP, 3/4", VERT COMPATIBLE	
DWIN THEREON) IS NOT BE DISCLOSED TO OTHERS DOUCED BY ANY MEANS, OR CONSENT OF CUMMINS INC.	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	MUST CONFORM TO CES 10903	CAD SHEET D 2 OF 2	ITEM NUMBER REV A 0 4 2 H 7 2 7 4]
2				1	

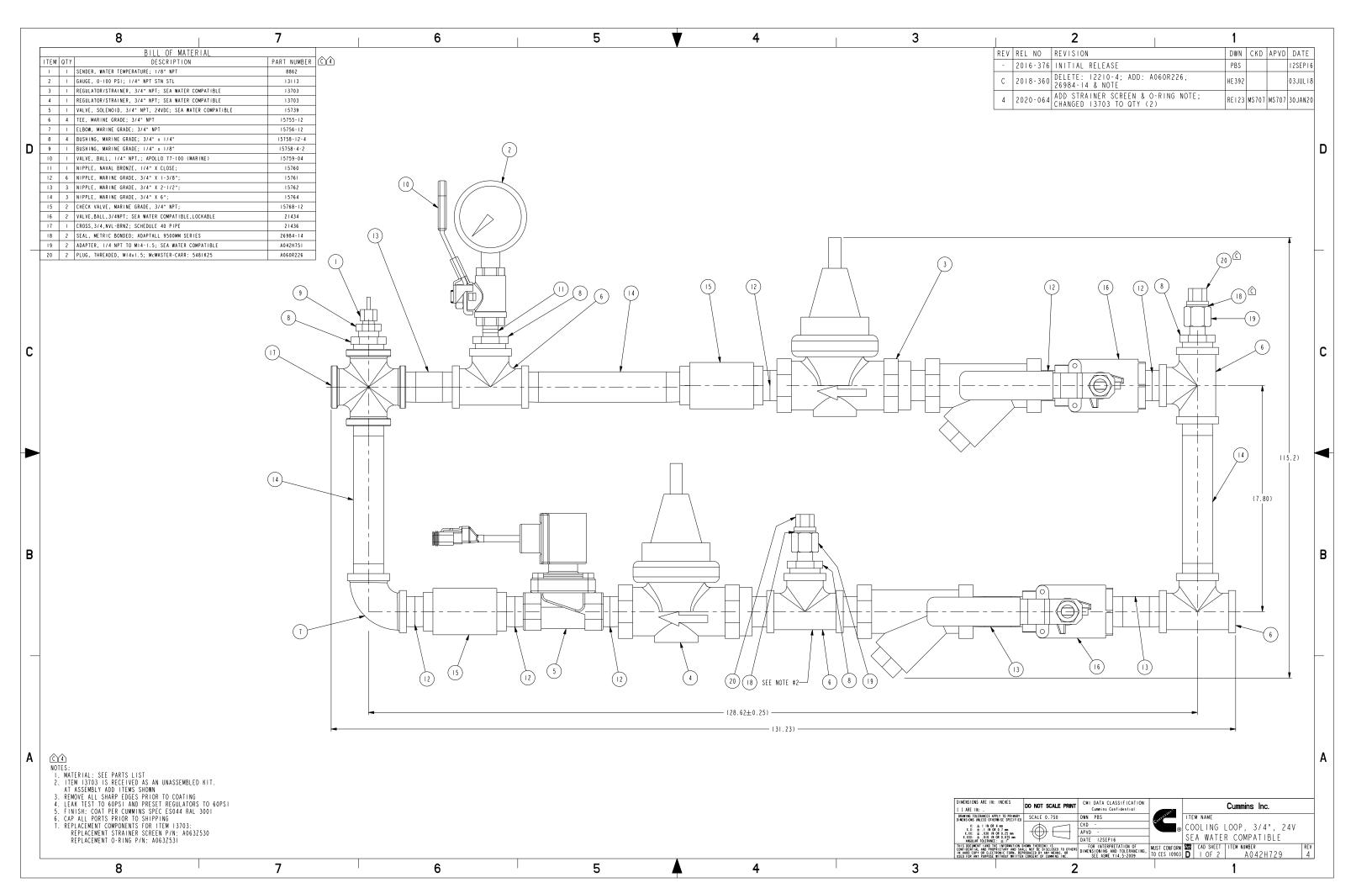


		8	7		6	5
Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H728			3/4" I2VDC, Sea Water			
	15738	GC Valves, S211GF15J7EG5	3/4" NPT I2V solenoid valve	Later half discount		
				valve boby/bonnet plunger tube -tub head	316 stainless steel 430FR	ASTM A351 CF8M ASTM A838 alloy 2
				tube head shading ring	commercial grade silver	ASTM 8742-90
				plunger tube	304 stainless steel	ASTM A269
				valve plunger	430FR	ASTM A838 alloy 2
				plunger spring	302 stainless steel	ASTM 313-08
				diaphragm pilot orifice	303 stainless steel	ASTM A8582
				diaphragm back plate/dish plate	304 stainless steel	ASTM A276-13
	21434	Apollo, 75–104–01	3/4" ball valve			
				lever and grip	steel, zinc plated w/vinyl MPTFE	
				stem packing stem bearing	RPTFE	
				ball	chrome plated	ASTM BI6
				seat	RPTFE	
				retainer		ASTM BIG
				gland nut		ASTM BI6
				stem		ASTM BI6
				lever nut	steel, zinc plated	
				body seal	PTFE	
	0000	Dates 02022 00	lamaaalua	body Rodu		ASTM B524-C84400
	8862	Datcon 02022-00 Grainger, 4RY95	temperature sender	Body	brass	
	10110	orunnyer, 48190	pressure gauge	case	stainless steel	
				socket	316 stainless steel	
				tube	316 stainless steel	
				lens	polycarbonate	
				ring	316 stainless steel	
	13703	Wilkins, 500YSBRHLRSW	3/4" regulator/strainer			
				body	cast bronze	ASTM B584
				access covers	cast bronze	ASTM B584
				(brass 300 series stainless steel	ASTM BI6
				fasteners stem & plunger	cast bronze	ASTM B584
					brass	ASTM BIG
				elasttomers	Buna Nitrile	FDA approved
					EPDM	FDA approved
				cap gaskets	natural vulcanized fibre	
					Acetal (Delrin 500)	NSF Listed
				springs	oil tempered wire	ASTM A229
				strainer screen	300 series stainless steel	
	15755-12		2/48 1	seat	300 series stainless steel	00 COD MT24
	15756-12		3/4" tee 3/4" elbow		Copper Alloy Copper Alloy	ASTM B62-09 ASTM B62-09
	15758-12-4		3/4" x 1/4" reducing bushing		Copper Alloy	ASTM 862-09
	15758-4-2		1/4" x 1/8" reducing bushing		Copper Alloy	ASTM 862-09
	15759-04	Apollo, 77–101–01	1/4" ball valve			
				lever and grip	steel, zinc plated w/vinyl	
				stem packing	MPTFE	
				stem bearing	RPTFE	
				ball	chrome plated	ASTM BI6
				seat	RPTFE	
				retainer gland nut		ASTM BI6 ASTM BI6
				glana nut stem		ASTM BI6
				lever nut	steel, zinc plated	
				body seal	PTFE	
				body		ASTM B524-C84400
	15760		1/4" close nipple		Copper Alloy	ASTM B62-09
	15761		3/4" x 1-3/8" nipple		Copper Alloy	ASTM B62-09
	15762		3/4" x 2-1/2" nipple		Copper Alloy	ASTM B62-09
	15764		3/4" x 6" nipple		Copper Alloy	ASTM B62-09
	15768-12	Watts, series 600	3/4" check valve	hadu		
				body guide bushing	bronze stainless steel	
				guide bushing spring	stainless steel stainless steel	
				check	brass	
				seat	PTFE	
				0-ring	Nitrile	
				adapter	brass	
	21436		3/4" cross		Copper Alloy	ASTM B62-09
	A042H751		adapter 1/4 NPT to MI4-1.5		Copper Alloy	ASTM B62-09



FORM, REPRO T WRITTEN C

2	1			1	
2				1	
					D
					_
					_
					С
					\blacksquare
					_
					В
					Α
o not scale print	CMI DATA CLASSIFICATION			Cummins Inc.	
	Cummins Confidential	maine		oannini is iliit.	
SCALE 0.750	DWN PBS CKD -	Curr	ITEM NAME		
\oplus \leftarrow	APVD -	•	CUULING L	OOP, 3/4", 12V	
WEN THEREON) IS	DATE 12SEP16 FOR INTERPRETATION OF	MUCT CONTORT	DIG CAD SHEET	COMPATIBLE	
WIN THEREON) IS NOT BE DISCLOSED TO OTHERS NOUCED BY ANY MEANS, OR ONSENT OF CUMMINS INC.	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME 114.5-2009	TO CES 10903	CAD SHEET D 2 OF 2	A042H728 4	
2	·			1	



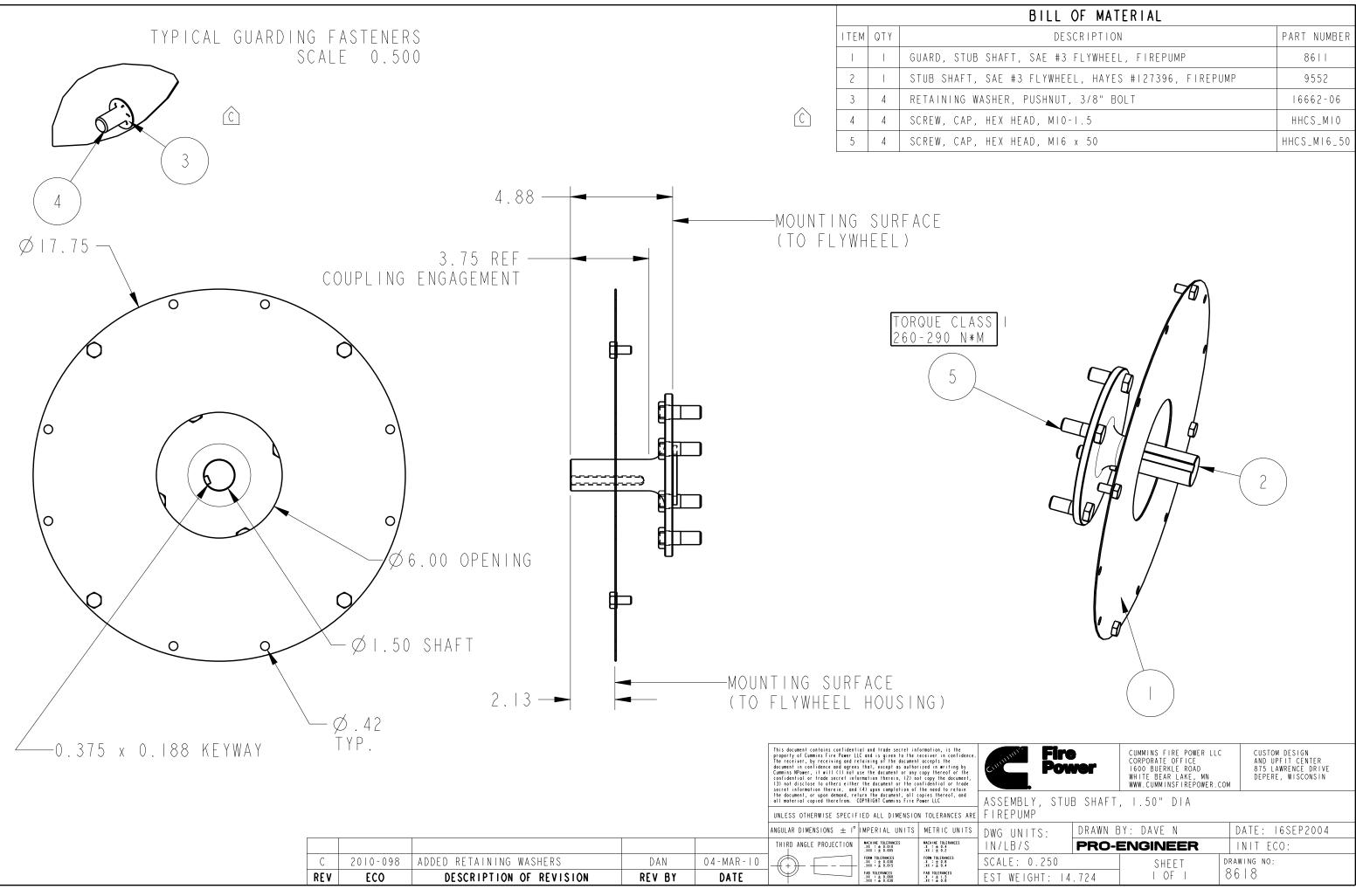
		8	7		6	5
Assembly	Component	Manufacture/pn	Description	Sub-Component	Material	Specification
A042H729			3/4" 24VDC, Sea Water			
	15739	GC Valves, S211GF16J7EG5	3/4" NPT 24V solenoid valve			
				valve boby/bonnet	316 stainless steel	ASTM A351 CF8M
				plunger tube -tub head	430FR	ASTM A838 alloy 2
				tube head shading ring	commercial grade silver 304 stainless steel	ASTM 8742-90
				plunger tube valve plunger	430FR	ASTM A269 ASTM A838 alloy 2
				plunger spring	302 stainless steel	ASTM 2030 01109 2
-				diaphragm pilot orifice	303 stainless steel	ASTM 515 00
				diaphragm back plate/dish plate	304 stainless steel	ASTM A276-13
	21434	Apollo, 75–104–01	3/4" ball valve			
				lever and grip	steel, zinc plated w/vinyl	
				stem packing	MPTFE	
				stem bearing	RPTFE	
				ball	chrome plated	ASTM BIG
				seat	RPTFE	
				retainer		ASTM BIG
				gland nut stem		ASTM BI6 ASTM BI6
				stem lever nut	steel, zinc plated	ASIM DIO
				body seal	PTFE	
				body		ASTM B524-C84400
	8862	Datcon 02022-00	temperature sender	Body	brass	
	13113	Grainger, 4RY95	pressure gauge	,		
				case	stainless steel	
				socket	316 stainless steel	
				tube	316 stainless steel	
				lens	polycarbonate	
				ring	316 stainless steel	
	13703	Wilkins, 500YSBRHLRSW	3/4" regulator/strainer			
				body	cast bronze	ASTM B584
				access covers	cast bronze	ASTM B584
				(brass	ASTM BI6
				fasteners stem & plunger	300 series stainless steel cast bronze	ASTM B584
				stem a prunger	brass	ASTM BI6
				e l a s t t omer s	Buna Nitrile	FDA approved
					EPDM	FDA approved
				cap gaskets	natural vulcanized fibre	
					Acetal (Delrin 500)	NSF Listed
_				springs	oil tempered wire	ASTM A229
				strainer screen	300 series stainless steel	
				seat	300 series stainless steel	
	15755-12		3/4" tee		Copper Alloy	ASTM B62-09
	15756-12		3/4" elbow		Copper Alloy	ASTM B62-09
	15758-12-4		3/4" x 1/4" reducing bushing		Copper Alloy	ASTM B62-09
	15758-4-2		<pre>1/4" x 1/8" reducing bushing</pre>		Copper Alloy	ASTM B62-09
	15759-04	Apollo, 77–101–01	1/4" ball valve	Luna and m	Copper Alloy	ASTM B62-09
				lever and grip	steel, zinc plated w/vinyl	
				stem packing stem bearing	MPTFE RPTFE	
				ball	chrome plated	ASTM BI6
				seat	RPTFE	
				retainer	···· ··· ···	ASTM BIG
				gland nut		ASTM BIG
				stem		ASTM BIG
				lever nut	steel, zinc plated	
				body seal	PTFE	
				body		ASTM B524-C84400
	15760		l/4" close nipple		Copper Alloy	ASTM B62-09
	15761		3/4" x l-3/8" nipple		Copper Alloy	ASTM B62-09
	15762		3/4" x 2-1/2" nipple		Copper Alloy	ASTM B62-09
	15764		3/4" x 6" nipple		Copper Alloy	ASTM B62-09
	15768-12	Watts, series 600	3/4" check valve			
				body	bronze	
				guide bushing	stainless steel	
				spring	stainless steel	
				check	brass	
				seat O-ring	PTFE Nitrile	
					brass	
	21436		3/4" cross	adapter	brass Copper Alloy	ASTM B62-09
1	A042H751		adapter I/4 NPT to MI4-1.5		Copper Alloy Copper Alloy	ASTM 862-09

Ŵ



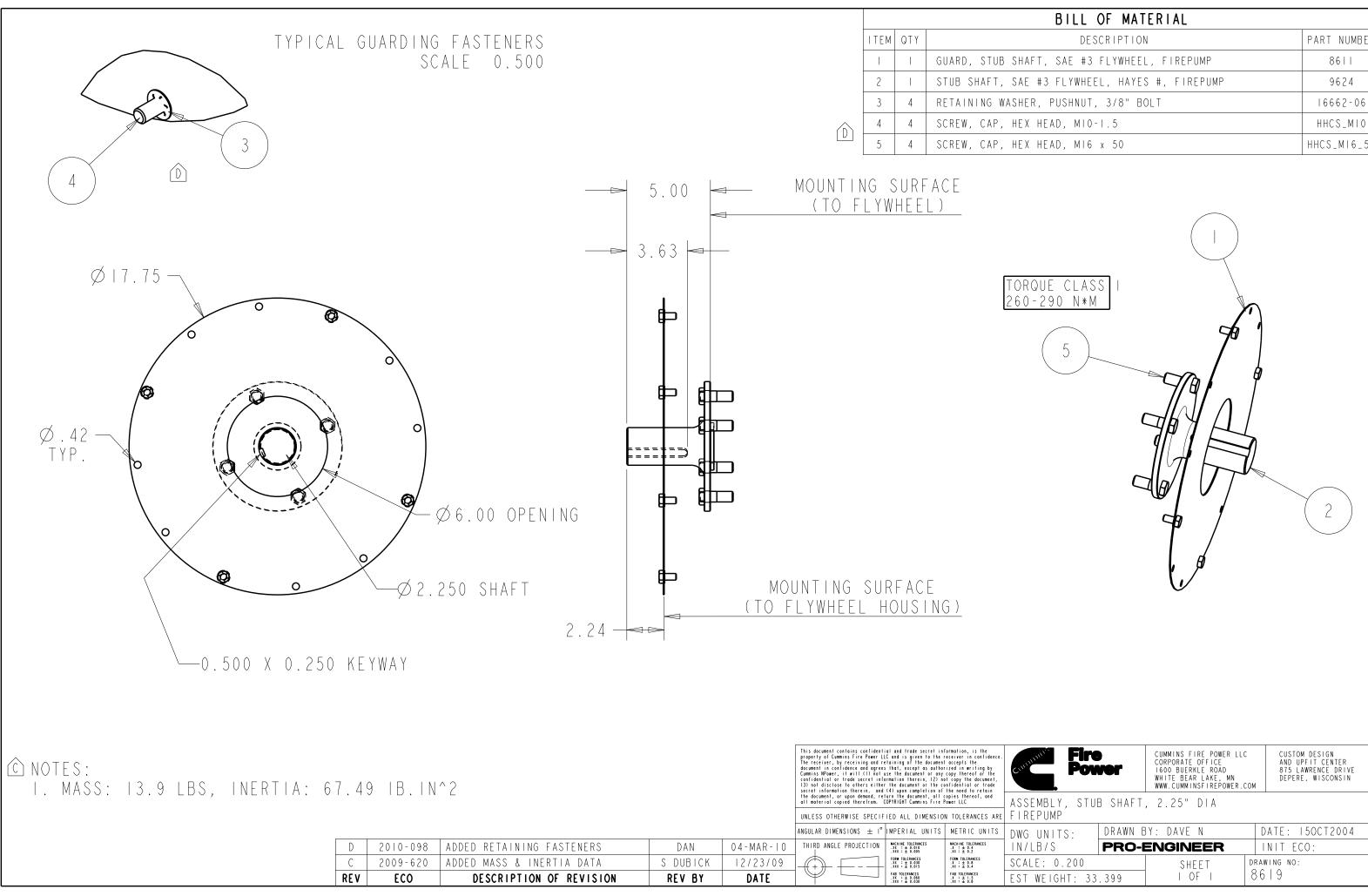
WRITTEN C

2	1	
		D
		С
		в
	-	
DO NOT SCALE PRINT CHI DATA CLASSIFICATION	Cummins Inc.	A
SCALE 0.750 DWN PBS CKD - APVD - DATE 125EP16 DATE 125EP16 DATE 125EP16 DON INFERDENTION OF	COMMINS INC. ITEM NAME COOLING LOOP, 3/4", 24V SEA WATER COMPATIBLE UST CONFORM CAD SWEET ITEM NUMBER 0 CES 10903 D 2 OF 2 A042H729 4 1	



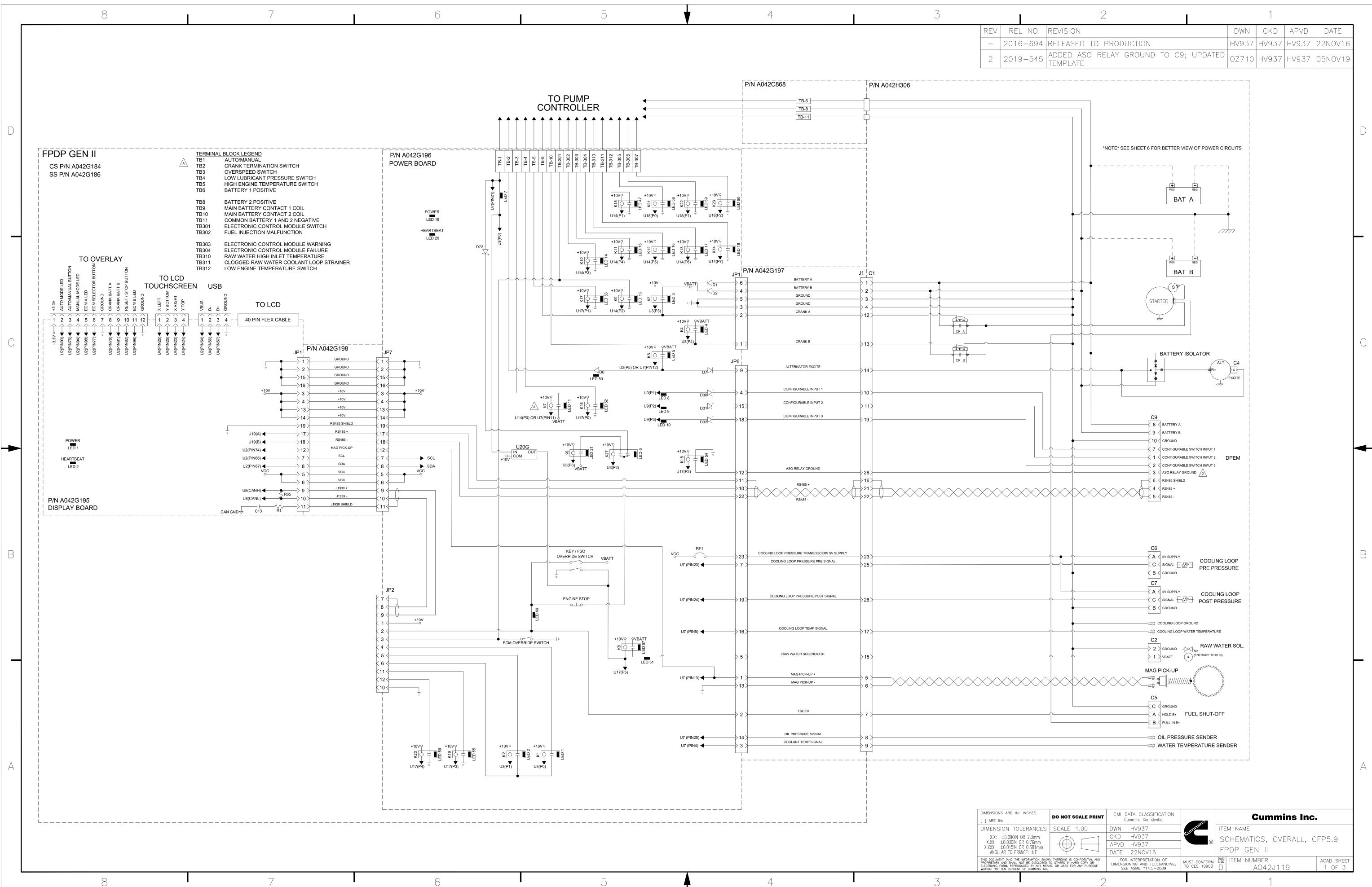
BILL OF MATERIAL	
DESCRIPTION	PART NUMBER
HAFT, SAE #3 FLYWHEEL, FIREPUMP	8611
AE #3 FLYWHEEL, HAYES #127396, FIREPUMP	9552
HER, PUSHNUT, 3/8" BOLT	6662-06
EX HEAD, MIO-I.5	HHCS_MI0
EX HEAD, MI6 x 50	HHCS_MI6_50

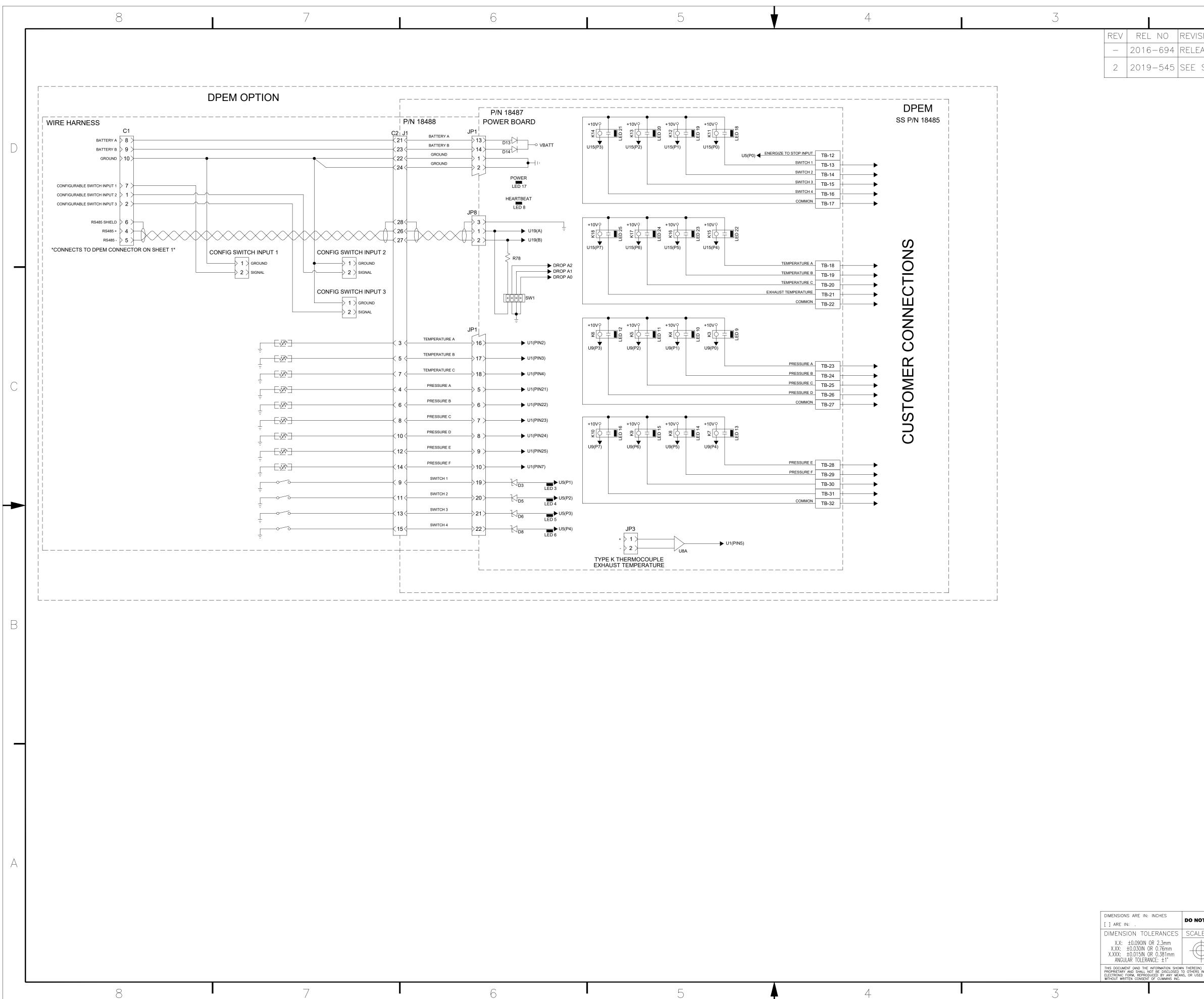
VG UNITS: DRAWN	BY: DAVE N	DATE: 16SEP2004
N/LB/S PRC	-ENGINEER	INIT ECO:
CALE: 0.250	J J J L L L	DRAWING NO:
ST WEIGHT: 14.724	I OF I	8618



BILL OF MATERIAL	
DESCRIPTION	PART NUMBER
HAFT, SAE #3 FLYWHEEL, FIREPUMP	8611
AE #3 FLYWHEEL, HAYES #, FIREPUMP	9624
HER, PUSHNUT, 3/8" BOLT	16662-06
EX HEAD, MIO-I.5	HHCS_MI0
EX HEAD, MI6 x 50	HHCS_MI6_50

		CUMMINS FIRE POWER LLG CORPORATE OFFICE 1600 BUERKLE ROAD WHITE BEAR LAKE, MN WWW.CUMMINSFIREPOWER.G		CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN				
SSEMBLY, STUI IREPUMP	SEMBLY, STUB SHAFT, 2.25" DIA REPUMP							
NG UNITS:	DRAWN E	BY: DAVE N	DA	TE: I50CT2004				
N/LB/S	PRO-	ENGINEER		IT ECO:				
CALE: 0.200		SHEET	DRAWING NO:					
ST WEIGHT: 33	. 399	I OF I	861	9				





DIMENSIONS ARE IN: INCHES [] ARE IN: .	DO NOT			
DIMENSION TOLERANCES	SCALE			
X.X: ±0.090IN OR 2.3mm X.XX: ±0.030IN OR 0.76mm X.XXX: ±0.015IN OR 0.381mm ANGULAR TOLERANCE: ±1°				
THIS DOCUMENT (AND THE INFORMATION SHOWN THEREON) I PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN ELECTRONIC FORM, REPRODUCED BY ANY MEANS, OR USED WITHOUT WRITTEN CONSENT OF CUMMINS INC.				

2			1			
SION		DWN	CKD	APVD	DATE	
ASED TO PRODUCTION		HV937	HV937	HV937	22NOV16	
SHEET 1 FOR LATEST REVISIO)N	OZ710	HV937	HV937	05NOV19	
						D
						\sim
						C
						В
						А
OT SCALE PRINT CMI DATA CLASSIFICATION Cummins Confidential	cummins		Cummi	ns Inc		
APVD HV937	Cumu	ITEM NAME SCHEMATI FPDP GEN		ERALL,	CFP5.9	
DATE 22NOV16 DATE 22NOV16 FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009	MUST CONFORM TO CES 10903	dwg size ITEM NUM		9	ACAD SHEET 2 OF 3	
2			1			

