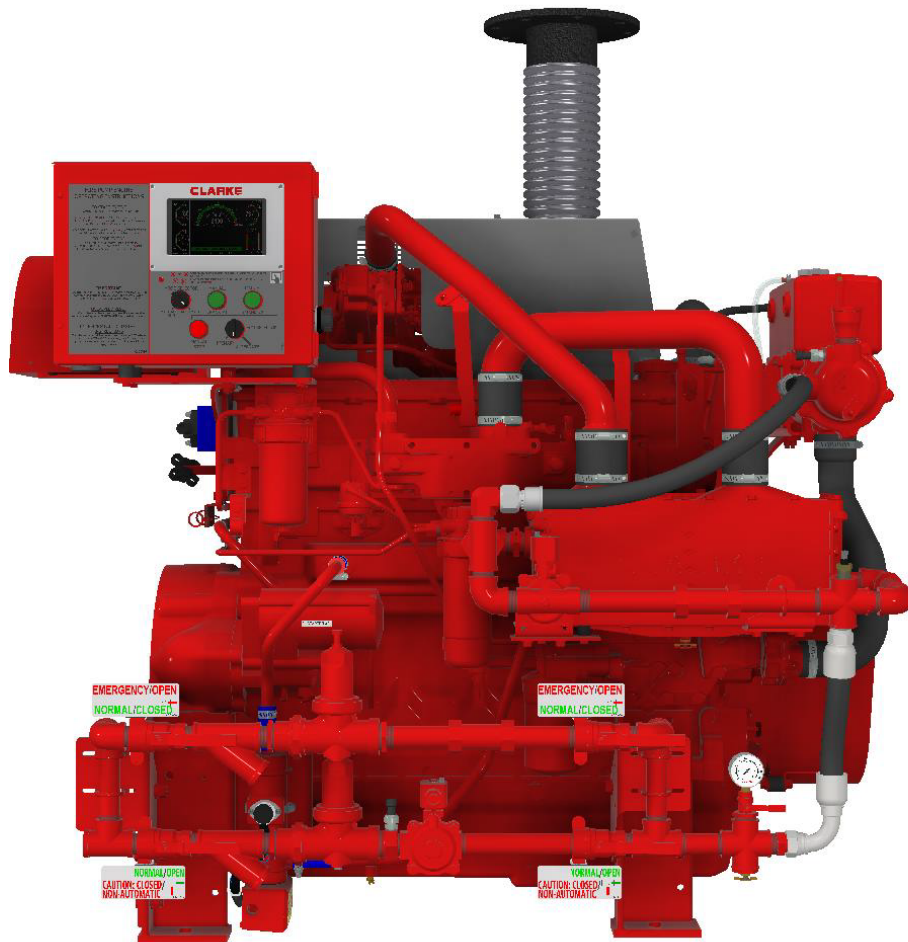


CLARKE



Operation and Maintenance Instructions Manual

JU/JW (Electronic) Model Engines

C139336 rev A
26 September 2024

For Constant and Variable Speed Engine Models, assembled with TSP-E or Powerview Instrument Panels and Brazed or NSR Heat-Exchangers.

This content is prepared by Clarke Fire Protection Products, INC.

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1. Introduction

1.1. Support Contacts

- **CLARKE FIRE PROTECTION PRODUCTS, INC.**
TEL: +1-513-475-3473
Parts@ClarkeFire.com
100 PROGRESS PLACE
CINCINNATI, OHIO 45246
UNITED STATES OF AMERICA
- **CLARKE FIRE PROTECTION PRODUCTS, LTD.**
TEL: +44-1236-429-946
CUKParts@ClarkeFire.com
UNIT 1, GRANGE WORKS LOMOND RD
COATBRIDGE, SCOTLAND ML5 2NN
UNITED KINGDOM

1.2. Scope of Supply

- **The following paragraphs summarize the “Scope of Supply” of the Engine:**
 - The CLARKE Engine supplied has been designed for the sole purpose of driving a stationary Emergency Fire Pump. It must not be used for any other purpose.
 - Shall not be subjected to Horsepower requirements greater than the certified nameplate rating (for UL/cUL/FM/ LPCB only).
 - Engines must be sized to cover fully the maximum power absorbed by any particular driven equipment together with a safety factor of no less than 10%. (For Non-listed only).
 - De-rates for elevation and temperature need to be considered for maximum pump power.
 - Fuel delivery settings are factory set within the injection pump and must not be tampered with or adjusted. Minor RPM adjustments to meet pump requirements are permissible.
 - The engine shall be installed and maintained in accordance with the guidelines stated in this manual.

1.3. Identification & Nameplate

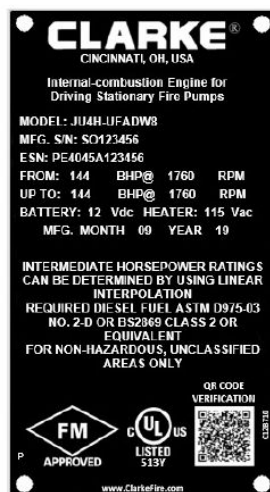
Throughout this manual, the terms “**Engine**” and “**Machine**” are used. The term “**Engine**” refers solely to the diesel engine driver as supplied by CLARKE. The term “**Machine**” refers to any piece of equipment with which the engine might interface.

This manual provides all the information necessary to operate your newly acquired engine safely and efficiently and perform routine servicing correctly. Please read it carefully.

Model Numbering & Identification : There are two identification plates attached to each engine.

- **Clarke Identification Plate:** Engine Model, Serial Number, Rating and Date of Manufacture are shown on this identification plate.
- **John Deere Identification Plate:** The second identification plate contains the John Deere Model Number and Serial Number. On the JU Series, the John Deere identification plate is located on the right side of the cylinder block behind the fuel filter. On the JW Series, the John Deere Serial identification plate is located on the left-hand side of the engine between the intake manifold and starting motor.

Clarke Identification Plate - USA Listed / Approved



The Clarke 10 digit model numbers reflects the base engine type, number of cylinders, cooling system, approval listing, manufacturing location, emissions code and a power rating code.

Table 1. Example: JU4H-UFADW8

J	John Deere base engine prepared by CLARKE
U	base engine series (4.5 liter 4 cylinder or 6.8 liter 6 cylinder)
4	number of cylinders
H	Heat Exchanger cooled (R = Radiator)
UF	Underwriters Laboratories Listed/ Factory Mutual Approved, FM = Factory Mutual Approved, LP = LPCB Loss Prevention Council Board Approved, AP = Plenary Assembly of Damage Insurance Companies, NL = Non-Listed
A	Manufacturing Location (A= Cincinnati, B= Coatbridge)
	A power rating code
D	Non-Emissioned, C=EPA Tier 2 Certified, D=EPA Tier 3 Certified, E=EPA Interim Tier 4 Certified (EPA=USA Environmental Protection Agency)
W8	A power rating code

The nameplate also contains a QR code that can be scanned with a smartphone barcode reader app. The QR code links to a Clarke webpage specific to the engine serial number where engine specific data can be verified against the nameplate. This information will safeguard against counterfeiting and provide assurance to the authenticity of the Clarke engine.

Declaration of Incorporation

CLARKE UK provides the machine manufacturer with a “Declaration of Incorporation” for the Engine, when required, a copy of which is enclosed in the manual. This document clearly states the machine manufacturers’ duties and responsibilities with respect to health and safety. Refer to [Declaration of Incorporation \[46\]](#)

1.4. Safety, Cautions, and Warnings



CAUTION

This engine has components and fluids that reach very high operating temperatures and is provided with moving pulleys and belts. Approach with caution. It is the responsibility of the builder of the machine using a Clarke engine to optimize the application in terms of maximum end user safety.

What to do in an Emergency: Any user of the Engine who follows the instructions set out in this manual and complies with the instructions on the labels affixed to the engine are working in safe conditions. If operating mistakes cause accidents call for help immediately from the EMERGENCY SERVICES. In the event of an emergency, and while awaiting the arrival of the EMERGENCY SERVICES, the following general advice is given for the provision of first aid.

- **FIRE.** Put out the fire using extinguishers recommended by the manufacturer of the machine or the installation.
- **BURNS.** Put out the flames on the clothing of the burns victim by means of drenching with water, use of powder extinguisher, making sure not to direct the jets onto the face, blankets or rolling the victim on the ground. Do not pull off strips of clothing that are sticking to the skin. In the case of scalding with liquids, remove the soaked clothing quickly but carefully. Cover the burn with a special anti-burn packet or with a sterile bandage.
- **CARBON MONOXIDE POISONING (CO).** Carbon monoxide contained in engine exhaust gases is odorless and dangerous because it is poisonous and with air, it forms an explosive mixture. Carbon monoxide is very dangerous in enclosed premises because it can reach a critical concentration in a short time. When attending a person suffering from CO poisoning in enclosed premises, ventilate the premises immediately to reduce the gas concentration. When accessing the premises, the person providing the aid must hold his breath, not light flames, turn on lights or activate electric bells or telephones so as to avoid explosions. Take the victim to a ventilated area or into the open air, placing him on his side if he is unconscious.
- **CAUSTIC BURNS.** Caustic burns to the skin are caused by acid escaping from the batteries. Remove the clothes, wash with running water, being careful not to affect injury-free areas. Caustic burns to the eyes are caused by battery acid, lubricating oil and diesel fuel. Wash the eye with running water for at least 20 minutes, keeping the eyelids open so that the water runs over the eyeball and moving the eye in all directions.
- **ELECTROCUTION.** Electrocution can be caused by the engine’s electrical system (12/24 VDC) or the electrical coolant pre-heating system (115/230 Volt AC) if supplied. In the first case, the low voltage does not involve high current flows through the human body; however, if there is a short circuit, caused by a metal tool, sparks and burns may occur. In the second case, the high voltage causes strong currents, which can be dangerous. If this happens, break the current by operating the switch before touching the injured person. If this is not possible, bear in mind that any other attempt is highly dangerous also for the person assisting; therefore, any attempt to help the victim must be carried out without fail using means that are insulating.
- **WOUNDS AND FRACTURES.** The wide range of possible injuries and the specific nature of the help needed means that the medical services must be called. If the person is bleeding, compress the wound externally until help arrives. In the case of fracture do not move the part of the body affected by the fracture. When moving

an injured person permission from that person must be received until you can help him. Unless the injury is life threatening, move the injured person with extreme care and then only if strictly necessary.

Hearing Protection. The engine produces a noise level exceeding 70 dB(a). When performing the weekly functional test, it is recommended that hearing protection be worn by operating personnel.

Warning labels, in picture form, are applied to the engine. Their meanings are given below.



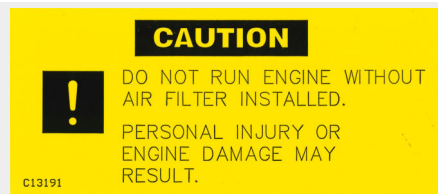
Jacket Water Heater Voltage



Coolant Mixture



Lifting Point



Air Filter Installation



Rotating Parts



Automatic Start



Heat Exchanger Maximum Working Pressure



IMPORTANT

Important Note: Labels that show an exclamation mark indicate that there is a possibility of danger.

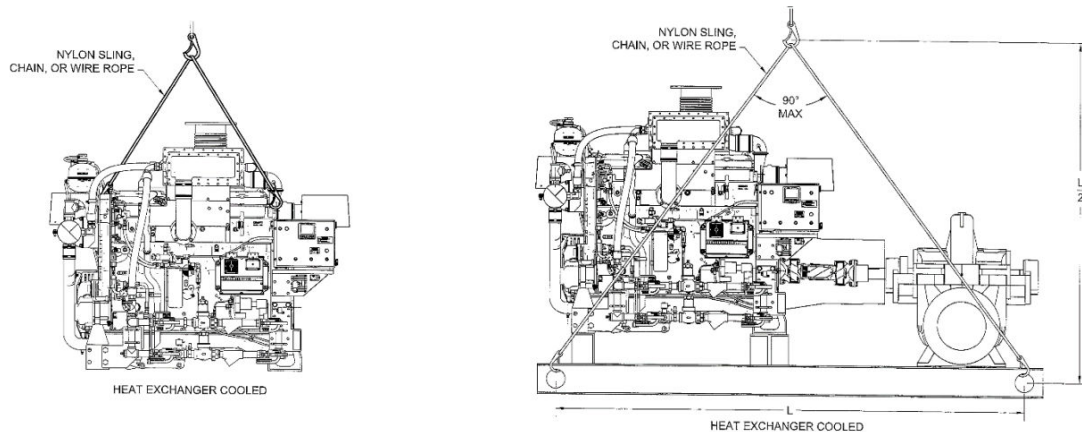
1.5. Basic Rules

The following recommendations are given to reduce the risk to persons and property when an engine is in service or out of service.

- Engines must not be used for applications other than those declared under "Scope of Supply".
- Incorrect handling, modifications and use of non-original parts may affect safety. When lifting the engine, take care to use suitable equipment to be applied to the points specially provided as shown on the appropriate Engine Installation Drawing. Engine weights are shown below.

Engine Model	Weight lbs (kg)
JU4H All Models	1490
JU6H-UFADK0, JU6H-UFADN0, JU6H-UFAD58, JU6H-UFADNG, JU6H-UFADP8, JU6H-UFAD88, JU6H-UFADM8, JU6H-UFADMG	1747
JU6H-UFADT0, JU6H-UFADP0, JU6H-UFADQ0, JU6H-UFADR0, JU6H-UFADS0, JU6H-UFAD98, JU6H-UFADR8, JU6H-UFADS8, JU6H-UFADW8, JU6H-UFADX8	1902
JW6H All Models	2094

When Clarke furnishes the base (or module) for the engine and pump set, the combined weight of the engine and base (or module) will be indicated on the unit. Caution, when lifting, lift point should always be over the equipment Center of Gravity.



The image on the left shows the typical lifting arrangement of a bare engine. Note the lifting points on the engine are for lifting the ENGINE only. Caution, when lifting, lift point should always be over the equipment Center of Gravity.

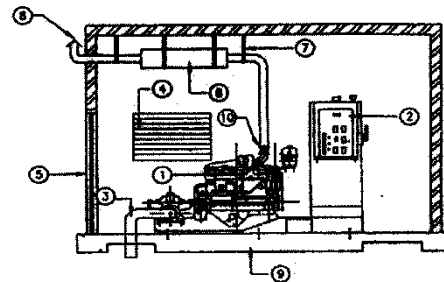
The image on the right shows the typical lifting arrangement of a base mounted engine and pump set when the base (or module) is furnished with lifting holes.

2. Installation

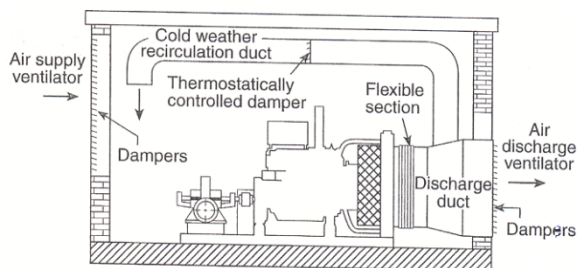
2.1. Typical Installation

1. Pump/Engine set
2. Main Pump Controller
3. Pump Discharge
4. Air Louver
5. Entrance door with air louver
6. Exhaust Silencer
7. Exhaust System
8. Exhaust Outlet Pipe
9. Concrete Base
10. Exhaust Flexible Connection Joint/Pipe

NOTE: For radiator cooled engines, the total air supply path to the pump room, which includes any louvers or dampers, shall not restrict the flow of the air more than 0.2" (5.1mm) water column. Likewise, the air discharge path, which includes any louvers, dampers, or ducting, shall not restrict the flow of air more than 0.3" (7.6mm) water column.



Typical Installation: Heat Exchanger



Typical Installation: Radiator

2.2. Engine Storage

• Storage Less than 1 Year

Storing engines requires special attention. Clarke engines, as prepared for shipment, may be stored for a minimum of one year. During this period, they should be stored indoors in a dry environment. Protective coverings are recommended provided they are arranged to allow for air circulation. The stored engine should be inspected periodically for obvious conditions such as standing water, part theft, excess dirt buildup or any other condition that may be detrimental to the engine or components. Any such conditions found must be corrected immediately. Completely fill the cooling system before storage. (It is common for Clarke to ship the engine pre-filled with coolant.)

Use Clarke Coolant (part # C12E170). The only acceptable substitute is COOL-GARD II (part # TY26575).



NOTICE

After a one-year storage period or if the engine is being taken out of service for more than 6 months, additional preservation service must be performed

• Long Term Storage: Extended Storage Maintenance Procedure

It is recommended that a Clarke Service Dealer perform the steps outlined in this section.

1. Drain the engine oil and change the oil filter.
2. Refill the engine crankcase with MIL-L-21260 preservative oil.
3. Change the fuel filters.
4. Install the coolant plugs and install coolant (Clarke Coolant C12E170).
5. Remove the protection from the intake and exhaust openings.
6. Prepare a preservative fuel container as a fuel source using a fuel conditioner mixture of C02686 or C02687 with ONLY Diesel #2 fuel or "Red" diesel fuel (ASTM D-975) or EN 590. (Refer to Section 4.1 for Fuel Specification.)
7. Disconnect the coupling or drive shaft from the pump.
8. Start and run the engine at a slow speed for 1-2 minutes being careful not to exceed the normal operating temperature.
9. Drain the oil and coolant.
10. Replace the protective plugs that were used for shipping and storage.
11. Attach to the engine a visible card, specifying "ENGINE WITHOUT OIL" DO NOT OPERATE".

**IMPORTANT**

THIS TREATMENT MUST BE REPEATED EVERY YEAR.

- **Putting Engine into service after additional preservation service.**

To restore the normal operation running conditions of the engine, carry out the following:

1. Fill the engine sump with the normal recommended oil, to the required level.
2. Remove the protective plugs used for shipping and storage.
3. Refill cooling water to proper level.
4. Remove the card "ENGINE WITHOUT OIL, DO NOT OPERATE".
5. Follow all steps of the Installation Instructions when the engine will be put into service.

2.3. Installation Instructions

The correct installation of the engine is very important to achieving optimum performance and extended engine life. In this respect, the engine has certain installation requirements, which are critical to how it performs. These requirements are generally associated with the cooling, exhaust, induction air, and fuel systems. This section of the manual should be read in conjunction with the relevant Installation and Operation Data Sheets. If there is any doubt about an installation, contact should be made with Clarke Customer Support giving exact details of the problem. All installations should be clean, free of any debris and dry. Care should be taken to ensure that there is easy access to the engine for maintenance and repair. The safety of personnel who may be in the area of the engine when it is running is of paramount importance when designing the installation layout.

2.3.1. Secure Pump Set to Foundation

Secure pump set to foundation and complete installation in accordance with pump manufacturer's instructions. Perform engine to pump coupling alignment. Lubricate driveshaft universal joints with NLGI grade #1 or #2 grease at the (3) zerk fittings.

2.3.2. Install the Heat Exchanger Discharge Pipe

The discharge pipe should be no smaller than the outlet connection on the heat exchanger. Discharge water piping should be installed in accordance with applicable codes. All plumbing connecting to the heat exchanger must be secured to minimize movement by the engine. Cooling loop water pressure to the heat exchanger must not exceed the limit that is stated on the heat exchanger supplied with the engine.

2.3.3. Install Draincocks and Plugs

Qty	Description	Location
1	1/8" draincock	Water Heater Inlet Tube
1	Plug	Oil Cooler (JU4H)
1	draincock	bottom of heat exchanger

2.3.4. Fill the Coolant

Engine is typically provided with premixed coolant installed. If engine is not provided with coolant or there is a need to top off, fill engine cooling system with Clarke Coolant C12E170. The only acceptable substitute is COOL-GARD II TY26575.

2.3.5. Fill the Oil

Engine is shipped with oil installed. For make-up oil specifications refer to Lubrication System.

2.3.6. Connect Fuel Supply

Connect fuel supply and return line to fuel supply tank plumbing. Reference the Fuel System section of the Installation and Operation Data for piping size, maximum allowable fuel pump suction, and maximum allowable fuel head requirements. Fill supply tank with ONLY #2 diesel fuel (ASTM D-975) or EN 590 diesel fuel, bleed supply system of air and check for leaks.

**WARNING**

Biodiesel fuel is not recommended or stand-by equipment that can have minimal fuel consumption (such as standby generators, fire protection, etc.)

2.3.7. Remove Protective Covering

Remove protective covering on air cleaner element.

2.3.8. Connect Jacket Water Heater

Connect jacket water heater (if supplied) to AC power source. Connect the supplied heater connection wire directly to a customer supplied electrical junction box. The electrical supply requirements are indicated on the connection box. Connect to the heater directly to the junction box at the end of the heater only. Supply wiring should never be routed through the engine gauge panel. Severe damage to critical engine control components could result. Energize heater only after coolant is filled.

2.3.9. Connect Exhaust System

Connect exhaust system to flexible connection on the engine. The exhaust system plumbing must be supported by the building structure and not the engine. The exhaust flexible connection is provided only for the purpose of thermal expansion and vibration isolation, not for misalignment or directional change.

2.3.10. Make DC Connections (Interconnect)

Make electrical DC connections between the engine instrument panel terminal strip (if supplied) and the controller per the controller manufacturer's instructions. Refer to the wiring diagram of the engine instrument panel for proper connections. [Wiring Diagram \[46\]](#)

Pump controllers are designed and assembled to be compatible for various applications. The pump controller may have more interconnect terminals than what the engine instrument panel requires for proper operation. Only connect the terminals required by the engine instrument panel. Refer to the table below for descriptions on the interconnect terminals.



IMPORTANT

Interconnect wiring connections shall be made using stranded wire.



NOTICE

Refer to pump controller manufacturer's instructions for minimum size requirements.

Pin	Description	I/O	+/-	Note
1	Fuel and Water Solenoid	I	+	Utilized by all engines.
2	Engine Run Signal	O	+	
3	Engine Overspeed	O	+	
4	Low Oil Pressure	O	-	
5	High Engine Temp	O	-	
6	Battery Charger Set #1 System Batt Voltage #1		+	
8	Battery Charger Set #2 System Batt Voltage #2		+	
9	Start Circuit Starter #1	I	+	
10	Start Circuit Starter #2	I	+	
11A	Main Engine Ground		-	
11B	Main Engine Ground		-	
12	Energized to Stop Fuel Solenoid	I	+	Utilized by mechanical ETS engines only.
301	Alternate ECM	O	-	Utilized by all electronic engines.
302	Fuel Injection Malfunction	O	-	
303	Single ECM Failure (Warning)	O	-	
304	Double ECM Failure (Failure)	O	-	
305	Low Suction Alarm	O	-	Utilized by Suction (-S) PLD engines only.
310	High Raw Water Temp	O	-	Utilized by all engines.
311	Low Raw Water Flow	O	-	
312	Low Engine Coolant Temperature Alarm	O	-	
401	Air Filter Restriction	O	-	Special Option Only.
402	Oil Filter Differential Pressure	O	-	
403	Fuel Filter Differential Pressure	O	-	
501	Oil Temperature, High	O	-	
601	Oil Level, Low	O	-	
602	Coolant Level, Low	O	-	

2.3.11. Service the Engine Batteries

1. Batteries Filled

Activation of Dry Batteries

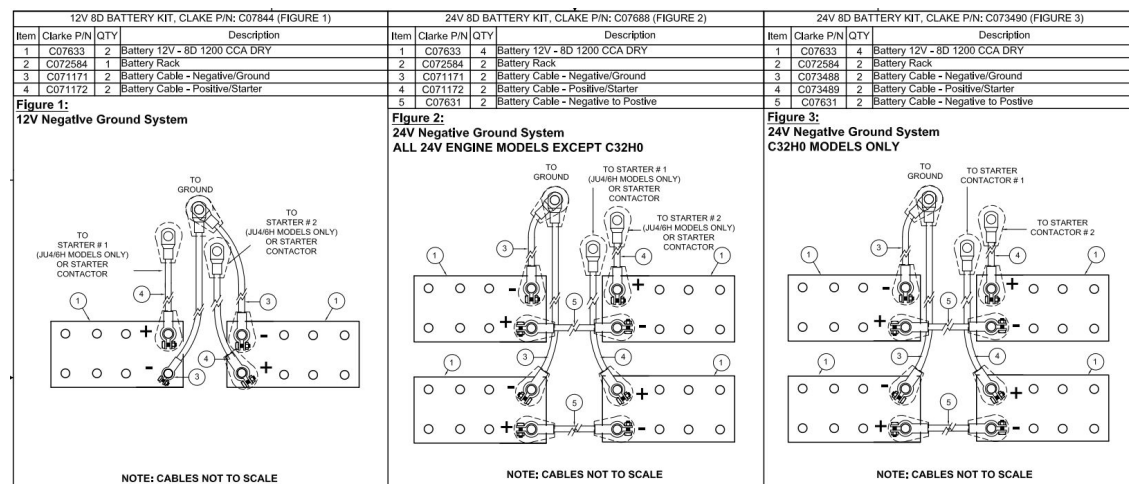
Reference Document C131885

- Use premix battery grade electrolyte (Specific Gravity: 1.265). Each 8D battery will take approximately 18 qts (16.5 L) of electrolyte.
- Remove the six vent caps for each battery.
- With proper safety gear (eye protection, gloves, etc.) carefully fill each of the six cells to cover the plates and just below the vent well. **DO NOT OVERFILL!**
- Re-install vent caps.
- New batteries must be properly activated and charged for at least 24 hours. Undercharged batteries may cause damage to the electrical system and could prevent the engine from starting.
- After initial charge, check level of electrolyte in all cells. If required, add additional electrolyte to bring all levels to the bottom of the vent wells. **DO NOT OVERFILL!** If batteries require top-off while in service, add water. **DO NOT ADD ACID.**

2. Connected to the Engine

Battery Connections

Reference Document C131885



3. Charged for 24 hours

New batteries must be properly activated and charged for at least 24 hours. Undercharged batteries may cause damage to the electrical system and could prevent the engine from starting.

2.3.12. Connect Negative Cables

Connect negative cables directly to the ground stud. Connect each positive cable to the large outer post of the manual starting contactors.



IMPORTANT

In order to obtain prompt Warranty Service and to comply with Emissions regulations, this engine must be registered to the final installation name and address.

2.4. Service Driveshaft or Coupling



WARNING

Before removing the driveshaft guard turn off the pump controller battery chargers and disconnect the negative battery cable from both batteries to prevent the engine from starting.



IMPORTANT

Before beginning driveshaft alignment checks and making any necessary corrections, retorque all driveshaft connection bolts and lubricate the driveshaft bearings.



NOTICE

When installing the driveshaft, it is recommended that a medium strength thread-locker (Loctite 243—blue) be used in the assembly and torquing of all hardware. This may be purchased as part C126758, 50ml bottle.



Retorque Connection Bolts

- Driveshaft to Flywheel Adapter Disc or Torsional Coupling
- Driveshaft to Pump Companion Flange

Models	Driveshaft	Bolt Size / Material Grade	Tightening Torque (N-m)
JU4H-UFAD4G	CDS20-SC	1/2-20 Grade 8 (Hi-Tensile)	75 - 82 (102 - 112)
JU4H-UFAD5G, JU4H-UFAD58, JU4H-UFADJG, JU4H-UFADP0, JU4H-UFADR0, JU4H-UFADW8, JU4H-UFA-DY8	CDS30-S1	3/8-24 Grade 8 (Hi-Tensile)	30 - 35 (41 - 48)
JU4H-UFAD98, JU6H-UFADP8, JU6H-UFADP0, JU6H-UFADT0, JU6H-UFADS0, JU6H-UFAD88, JU6H-UFAD98, JU6H-UFADR8, JU6H-UFADS8, JU6H-UFADS0, JU6H-UFADW8, JU6H-UFADX8, JU6H-UFADM8, JU6H-UFADMG	CDS50-SC	7/16-20 Grade 8 (Hi-Tensile)	50 - 55 (68 - 75)
JW6H-UFAD80, JW6H-UFADB0, JW6H-UFADD0, JW6H-UFADP0, JW6H-UFADJ0, JW6H-UFAD70			



NOTICE

Four of the hi-tensile bolts and/or nuts, that are used to connect the driveshaft to the drive disc and that connect the driveshaft to the pump companion flange, will require a “crow’s foot” wrench attached to a standard torque wrench in order to apply the required tightening torque. A standard socket will not work due to close proximity of the bolts and/or nuts with the driveshaft yoke. The tightening torque values listed for these bolts and/or nuts have been corrected for using a “crow’s foot” adapter which extends the standard torque wrench’s length.



Lubricate the Driveshaft

Cross and bearing and sliding splines contain only enough grease to provide protection during shipment. It is necessary to lubricate by zerk fittings prior to start-up to avoid premature failure.

Use a good quality lithium base E.P. grease meeting N.L.G.I. grade 2. Several greases meeting these specifications Lubriplate 1200-2, Shell Alvania EP2 or Mobil Mobilux EP2. Add lubricant to universal joint until clean lubricant appears at all four bearing seals and until lubricant appears at pressure relief hole for spline lubrication on variable length shafting. It may be necessary, while applying grease gun pressure, to move the drive shaft from side to side to allow greater thrust clearance on a seal end that is not purging.



Alignment Check

To check the alignment of the pump shaft and engine crankshaft centerline for proper Parallel Offset and Angular Tolerance, the driveshaft must be installed between the flywheel adapter disc (or torsional coupling) and the pump companion hub on the pump shaft. For proper procedure to take the pump the pump out of service refer to Pump, Engine, and Controller Maintenance and Operation Manuals. Before removing the driveshaft guard, disable the controller battery chargers and disconnect the negative battery cables from all batteries.

The following procedure outlines alignment checks for an engine installed with its crankshaft centerline elevation above the pump shaft centerline. **For an engine installed with its crankshaft centerline elevation below the pump shaft centerline, the measurement locations of Step C (Point "H") and Step D**

(Point "J") should be mirrored. Point "H" will be measured underneath the driveshaft and Point "J" will be measured above the driveshaft.



NOTICE

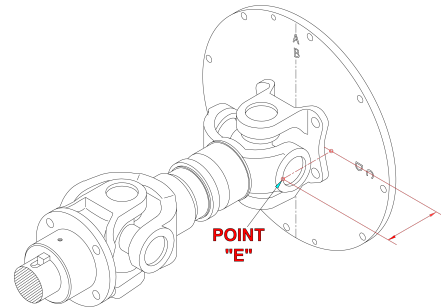
A torsional coupling does not have letters AB or CD stamped on the assembly. When performing the alignment procedure, on an engine utilizing a torsional coupling, use the images provided to ensure the driveshaft is in the proper orientation. Step A & B the driveshaft internal yoke should be in a horizontal orientation. Step C & D the driveshaft internal yoke should be in a vertical orientation.

1. Step A: Horizontal Parallel Offset

- Rotate the shaft so the reference "AB" on the flywheel adapter disc is in the 12 O'clock position.
- Measure from the face of the flywheel adapter disc to Point "E" (The furthestmost point on the bearing bore diameter). This measurement should be equal to the value in the table below.

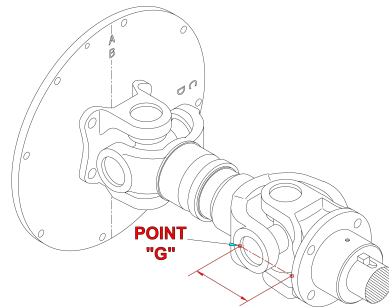
Table 2. Step A Measurement / Point "E"

Driveshaft	Measurement
CDS10-SC / SC41 / SC41A	58 ± 1.0mm
CDS20-SC / SC55 / SC55A	68 ± 1.0mm
CDS20-S1 / SC55L-A	68 ± 1.0mm
CDS30-S1 / SC61L-A	92 ± 1.0mm
CDS50-SC / SC81A	109 ± 1.0mm
SC2160A	123.5 ± 1.5mm



2. Step B: Horizontal Angular Alignment

- Measure from the mating surface of the pump companion hub to Point "G" (The furthestmost point on the bearing bore diameter). This measurement must be equal to the measurement at Point "E" ± 0.5mm.

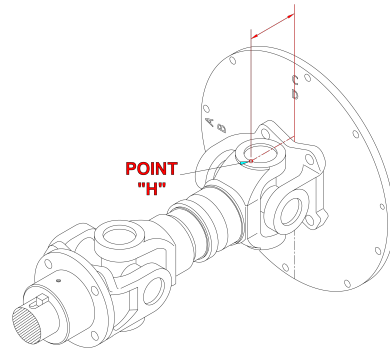


3. Step C: Vertical Parallel Offset

- a. Rotate the shaft 90° so the reference "CD" on the flywheel adapter disc is in the 12 O'clock position.
- b. Measure from the face of the flywheel adapter disc to Point "H" (The furthestmost point on the bearing bore diameter). This measurement should be equal to the value in the table below.

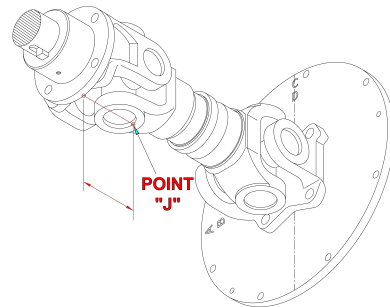
Table 3. Step C Measurement / Point "H"

Listed Driveshaft	Measurement
CDS10-SC / SC41 / SC41A	60 ± 1.0mm
CDS20-SC / SC55 / SC55A	70.5 ± 1.0mm
CDS20-S1 / SC55L-A	70.5 ± 1.0mm
CDS30-S1 / SC61L-A	86.5 ± 1.0mm
CDS50-SC / SC81A	112.5 ± 1.0mm
SC2160A	126.5 ± 1.0mm



4. Step D: Vertical Angular Alignment

- Measure from the mating surface of the pump companion hub to Point "J" (The furthestmost point on the bearing bore diameter). This measurement must be equal to the measurement at Point "H" ± 1mm.



- ☐ Reinstall all guards before reconnecting the battery cables.

Other Coupling Types: Consult Factory or Clarke website at www.clarkefire.com for additional information.

3. Operation

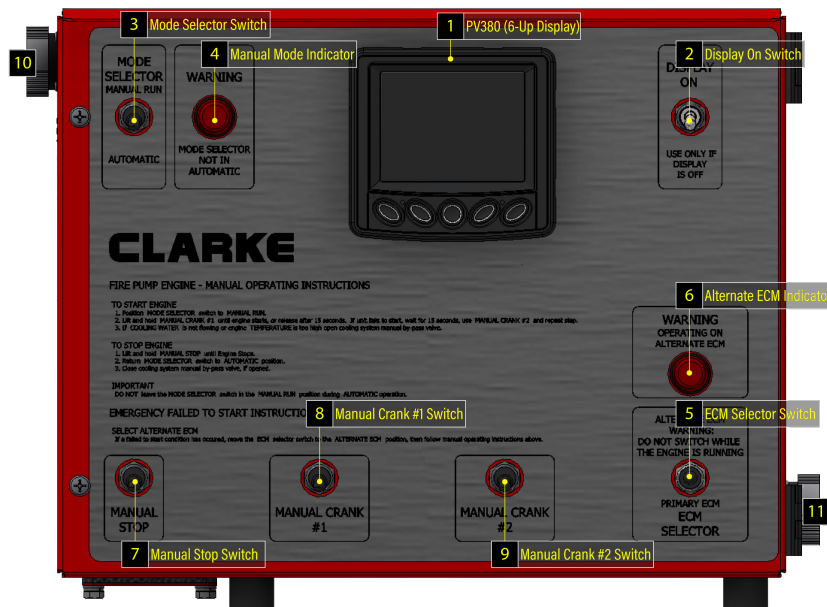
3.1. Engine Instrument Panel



JU4, JU6, and JW6 Engine Models are currently configured with the **Powerview Instrument Panel** or the **Touch Screen Panel for Electronic Engines (TSP-E)**.

3.2. Powerview Instrument Panel Operation

Figure 1. C073009 - Front



Front Components

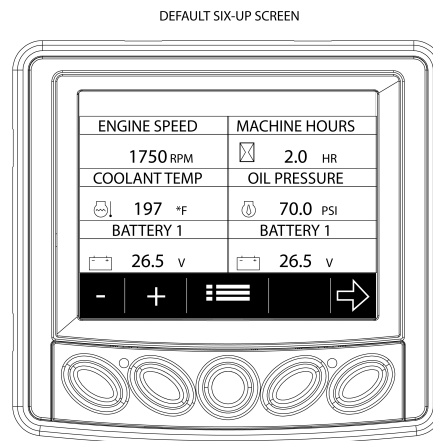
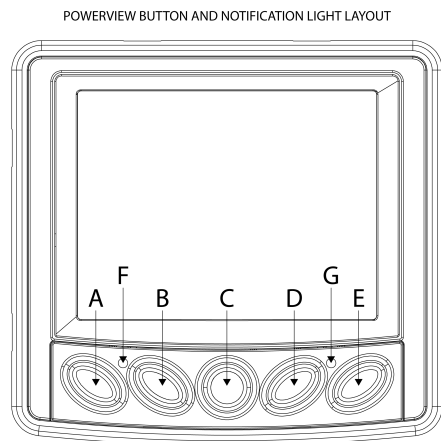
1. PV380 (6-up display)
2. Display On Switch
3. Mode Selector Switch
4. Manual Mode Indicator Warning Light
5. ECM Selector Switch
6. Alternate ECM Indicator Warning Light
7. Manual Stop Switch
8. Manual Crank Switch #1
9. Manual Crank Switch #2
10. Left 9-Pin Connector
Diagnostics Connection
11. Right 9-Pin Connector
PLD & Cooling Loop Harness Connection

The PV380 allows the operator to view operating conditions and diagnostic trouble codes (DTC's). Press the menu key to access the various engine functions in sequence. The displays can be selected as either customary English or Metric units. The following menu of engine parameters can be displayed:

- Engine RPM*
- Coolant Temperature*
- Oil Pressure*
- Machine Hours*
- System Voltage (Battery #1)*
- System Voltage (Battery #2)*
- Percent Engine Load at the current RPM
- Oil Temperature
- Intake Manifold Temperature
- Fuel Temperature
- Engine Torque
- Fuel Level
- Active Service Codes
- Stored Service Codes
- Set the Units for Display
- View the Engine Configuration Parameters

* These six parameters are fixed for the PV380 display.

The PV380 display utilizes a liquid crystal display (LCD) screen and is programmed to show six NFPA required engine parameters simultaneously.



Item	Description
A	[Home] Minus Key - used to decrease the rated speed on most engine models. [In Menu] Up Arrow Key - used for scrolling through the engine parameter list and viewing the menu list.
B	[Home] Plus Key - used to increase the rated speed on most engine models. [In Menu] Down Arrow Key - used for scrolling through the engine parameter list and viewing the menu list.
C	[Home] Menu Key - used to access the main menu screen. [In Menu] Menu Key - used to return to the home screen.
D	[Home] - NA [In Menu] Escape Key - used to leave a menu without making a change.
E	[Home] Arrow Right Key - used to view additional system parameters. [In Menu] Enter Key - used to select the highlighted item.
F	Amber Light - indicates an abnormal condition.
G	Red Light - indicates a serious condition.



AMBER LIGHT

An amber light indicates an abnormal condition. It is not necessary to shutdown engine immediately, but problem should be corrected as soon as possible.



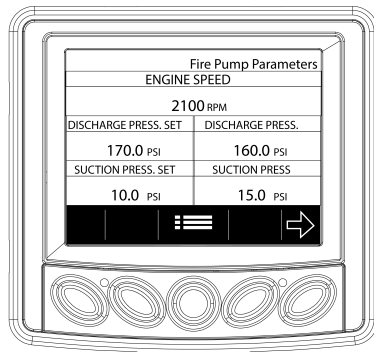
RED LIGHT

A red light indicates a serious condition. Correct problem before restarting.

Aside from the six-up default display, there are additional parameter screens that are viewable by pressing the "Arrow Right" key while on the Home Screen.

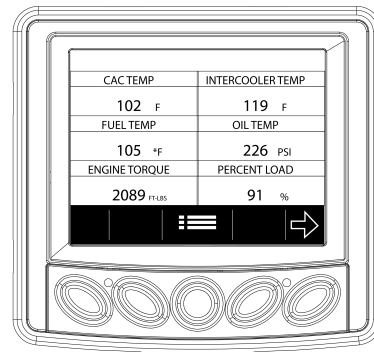
- Fire Pump Parameters
- Auxiliary Parameters

FIRE PUMP PARAMETERS SCREEN



"Fire Pump Parameters" screen will be displayed by pressing the "Arrow Right" key once while on the Home Screen. This screen will not be populated with data unless the engine is a Clarke PLD.

AUXILIARY PARAMETERS SCREEN



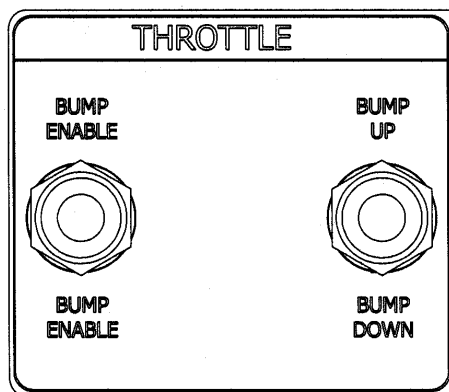
"Auxiliary Parameters" screen will be displayed by pressing the "Arrow Right" key once while on the Fire Pump Parameters Screen. This screen displays six parameters that are customizable from a list of 11 user-selectable parameters. These values are obtained from the engine ECU via CAN bus protocol. Some of these parameters may not be able to be displayed. Compatibility depends on the specific Clarke engine model you own. To return to the six-up display from the "Auxiliary Parameters" screen, press the "Arrow Right" key once or the "Menu" key twice.

3.2.1. Powerview Instrument Panel - Engine Speed Adjustment Constant Speed Configured Instrument Panels

To adjust the speed on an engine that utilizes a Constant Speed Configured Instrument Panel, assembled with internal throttle adjustment switches:

1. Start the engine.
2. Allow the engine to warm-up.
3. Open the engine instrument panel.
4. Lift and hold the "bump enable" switch and toggle the "bump up" or "bump down" switch while observing the engine tachometer.
Holding "bump up" or "bump down" will continuously increase or decrease the engine speed to a maximum of 50 RPM from rated speed. Each press of the "bump up" or "bump down" switch will change the speed by 5 RPMs.
5. Stop the engine.
6. Switch to the Alternate ECM and repeat the procedure.
7. Switch back to Primary ECM.

Constant Speed Configured Instrument Panel



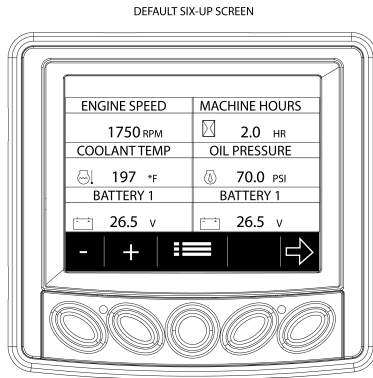
Variable Speed Configured Instrument Panel Speed Adjustment

To adjust the speed on an engine that utilizes a Variable Speed Configured Instrument Panel, assembled without internal throttle adjustment switches:

1. Start the engine.
2. Let the engine warm-up.
3. From the Home Screen (six-up), press the "Plus" or "Minus" button to increase or decrease the engine running speed.

Each press will change the engine speed by 5 RPM increments. This procedure does not have to be repeated on the opposite ECM.

Variable Speed Configured Instrument Panel



3.2.2. PV380 Menu Navigation



IMPORTANT

The display must be powered to navigate the menus. This is achieved by starting the engine, changing the engine mode selector switch to manual, or holding up on the 'display-on switch'.

Pressing the Menu Key, while on the Home Screen (default 6-up screen), will navigate to the main menu and display seven items.

- User Settings
- User Gauges
- Faults
- Engine Settings
- Soft Start
- Modbus
- OEM

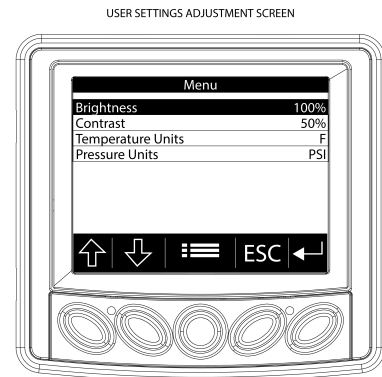
User Settings

From the "Main Menu" screen you can select "User Settings" by highlighting the text and pushing the "Enter" key.

Five (5) items will be displayed on the User Settings Screen.

- Brightness
- Contrast
- Temperature Units
- Pressure Units
- Language

Each of these parameters can be adjusted by highlighting the item with use of the "Arrow" keys and then pressing the "Enter" key to bring up the adjustment screen. Press the "Enter" key to store the adjustment once the desired parameter is highlighted.



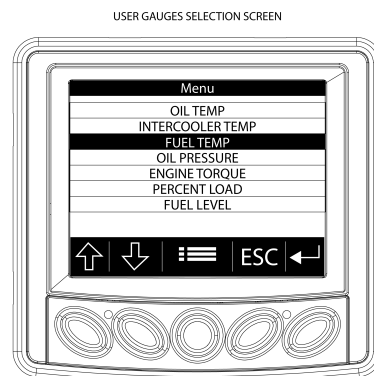
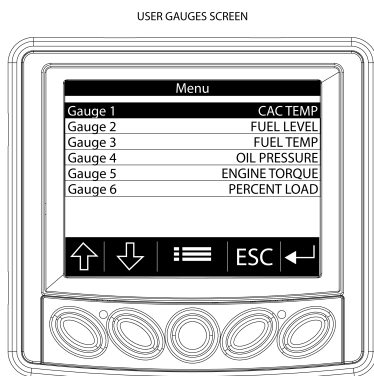
Press the "Menu" key to return to the Home Screen (6-up).

User Gauges

To program the parameters displayed on the "Auxiliary Parameters" screen, follow the procedure below.

1. While on the Home Screen, Press the "Menu Key".
2. Press the "down arrow key" to highlight "User Gauges". Press "Enter".
3. On the "User Gauges" screen, use the "Arrow" keys to highlight the gauge to replace. Press the "Enter". The "parameter selection screen" will appear.
4. Selectable parameters will be displayed on the "parameter selection screen". Pressing the "Arrow Down" key will display four more parameter selections.

- Oil Temp
- Intercooler Temp
- Fuel Temp
- Oil Pressure
- Engine Torque
- Percent Load
- Fuel Level
- Coolant Level
- Engine Speed
- Machine Hours
- CAC Temp



5. Use the "Arrow Keys" to highlight a parameter. Press "Enter" key to confirm selection and recall the "User Gauges" menu screen.
6. Press the "Menu Key" to return to the Home Screen.

PV380 Faults

Active Trouble Codes

During normal operation, the default six-up display will be visible. When the diagnostic gauge receives a trouble code from an engine control module, the six-up display will be replaced with the "Warning" message. The yellow LED will illuminate, and the SPN-FMI number will be displayed along with a description of the problem.



IMPORTANT

Ignoring active trouble codes can result in severe engine damage.

The top line of the screen will indicate if there are multiple "diagnostic messages". Use the arrow keys to scroll to the next trouble code.

To acknowledge and hide the code, press the "Enter Key" to return to the Home Screen. The yellow LED and warning icon will remain until the fault condition is corrected.

Engine Shutdown Codes



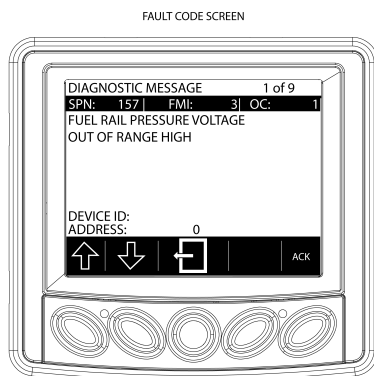
NOTICE

For Clarke Engine models, the only shutdown will be due to an overspeed condition.

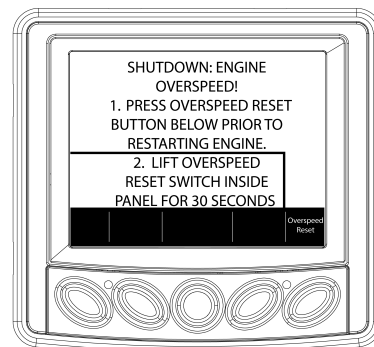
During normal operation, the default six-up display will be visible. When the diagnostic gauge receives a severe trouble code from an engine control module, the six-up display will be replaced with the "Shutdown" message.

An Overspeed event will lock the engine from restarting. To acknowledge the overspeed event and hide the trouble code, press the "Enter" key. It will be labeled as "Overspeed Reset". Once reset, hold the "overspeed reset switch (located inside the instrument panel) for 30 seconds and the engine will be ready to restart. The engine will NOT restart and run until the overspeed reset procedure is performed.

Active Trouble Code



Engine Shutdown (Overspeed)



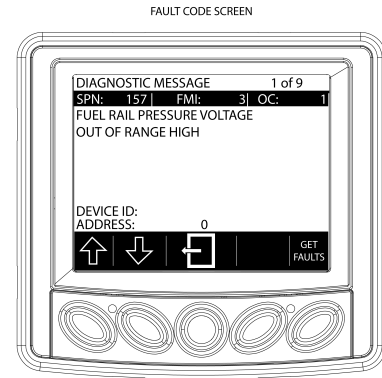
Accessing Active Trouble Codes

1. While on the Home Screen, press the "Menu Key".
2. Use the "Arrow Down Key" to highlight Faults. Press "Enter Key".
3. On the "Faults Menu Screen", use the "Arrow Keys" to highlight "Active Faults". Press "Enter Key".
4. The "Active Faults Screen" will appear.
The top line of the "Active Faults" screen informs the user of the number of active fault codes. See the Troubleshooting section of this manual for description of common codes. OC is the number of occurrences for the code displayed.

Accessing Stored Trouble Codes

1. While on the Home Screen, press the "Menu Key".
2. Use the "Arrow Down Key" to highlight Faults. Press "Enter Key".
3. On the "Faults Menu Screen", use the "Arrow Keys" to highlight "Stored Faults". Press "Enter Key".
4. The "Stored Faults Screen" will appear.
The top line of the "Stored Faults" screen informs the user of the number of stored fault codes. If there are two stored faults, beside the text "Diagnostic Message", the text will read 1 of 2. SPN and FMI make up the code for the fault. See the Troubleshooting section of this manual for description of common codes. OC is the number of occurrences for the code displayed.

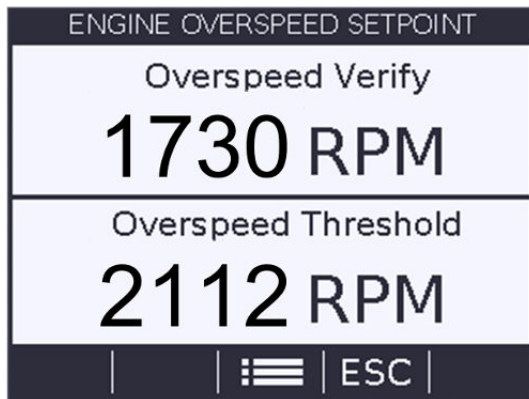
Example of a "Stored Faults" screen when there are stored faults. Press the "Arrow" keys to scroll through all of the stored fault codes.



PV380 Engine Settings

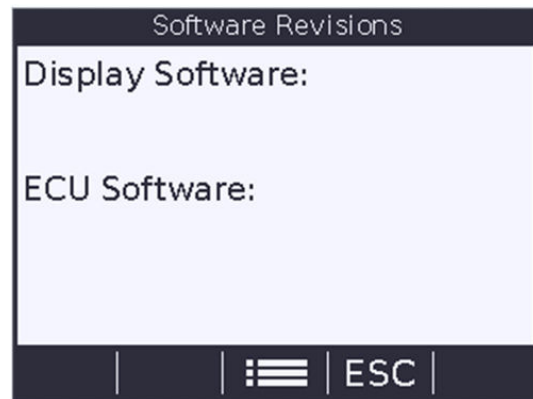
The engine settings data is a read only function. All engine settings parameters are pre-set by Clarke. This menu is primarily used for trouble shooting activities.

1. While on the Home Screen, Press the "Menu Key".
2. Press the "down arrow key" to highlight "Engine Settings". Press "Enter".
3. On the "Engine Settings" screen, two items will be displayed.



Engine Overspeed

- Overspeed Verify - the engine speed (RPM) required to trip the overspeed alarm during a verification of that alarm circuit.
- Overspeed Threshold - is the engine speed (RPM) required to activate the overspeed alarm during normal operation.



Software Revision

- Display Software
- ECU Software

4. Press the "Menu Key" to return to the main menu.

PV380 Soft Start

Soft Start Operation

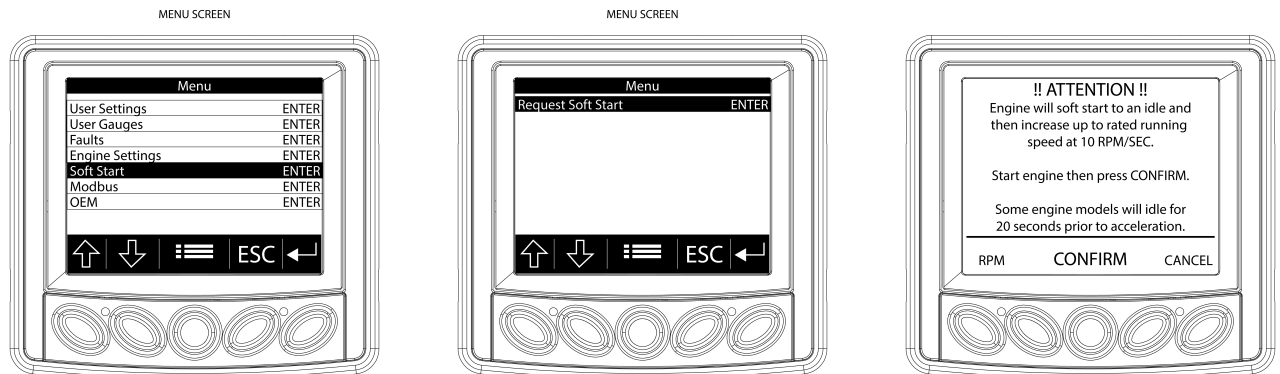
During installation of the sprinkler system or initial commissioning, it may be desirable to start the engine at a reduced speed. Reducing the speed reduces the pressure of the pump discharge. This allows leak detection to be performed at reduced system pressure and reduces the likelihood of water hammer at start.

Most engine models from Clarke Fire, that are assembled with a PV380 instrument panel, are equipped with a "Soft Start" feature to allow operation at a reduced speed. *(Note: Most Constant Speed John Deere engine models do not have the ability to perform a soft start. All Constant Speed C18 engine models have a different soft start procedure, utilizing the dedicated soft start switch inside the instrument panel.)*

To use the feature, the engine should be started manually from the engine gauge panel. To use the feature:

1. Switch the main fire pump controller to the OFF position.
2. Switch the MODE SELECTOR to MANUAL RUN.
3. Press the "menu key" on the PV380.
4. Toggle down the list of menu options and highlight "Soft Start", then press the "Enter" key.
5. The next screen will display one choice, "Request Soft Start". Press the "Enter" key.
6. The next screen will allow initiation of Soft Start or the choice to cancel the process. To proceed with the Soft Start, crank and start the engine with one of the Manual Crank switches on the front of the panel.

The engine will start and run at the minimum operating speed until the “Confirm” key is pressed. Once the “Confirm” key is pressed, the engine will increase speed at the rate of 10 rpms per second until it reaches rated speed. [minimum operating speed: (CAT: 1100 RPM)(John Deere: 1300 RPM)]



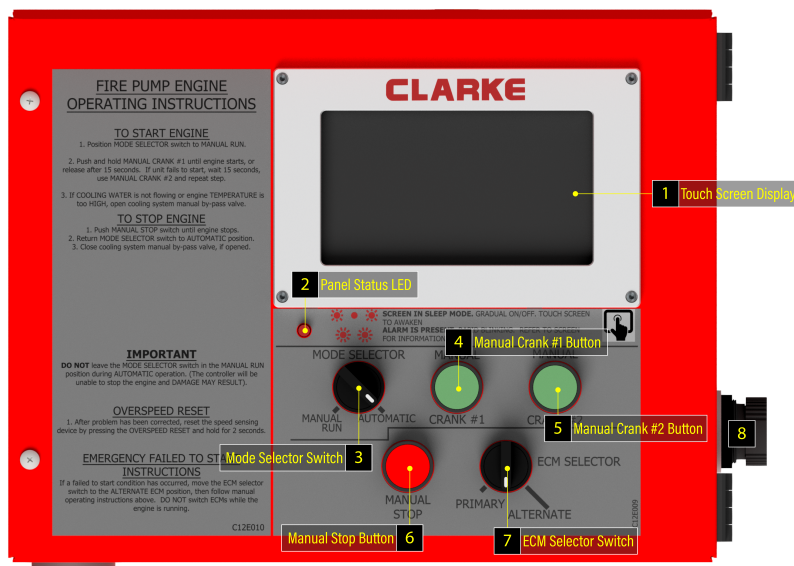
PV380 Modbus

Not Utilized.

PV380 OEM

Password Protected Menu for Factory Use Only.

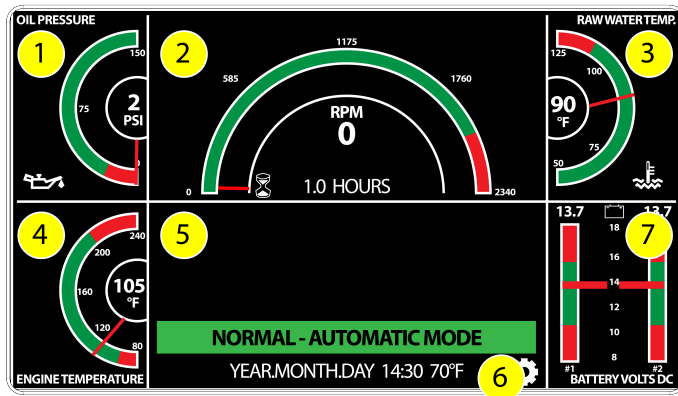
3.3. TSP-E Operation



1. Touch Screen Display
2. Panel Status LED
3. Mode Selector Switch
4. Manual Crank #1 Button
5. Manual Crank #2 Button
6. Manual Stop Button
7. ECM Selector Switch
8. Diagnostic Connector

The TSP-E allows the operator to view operating conditions and diagnostic trouble codes (DTC's). The display can be selected as either customary English or Metric units. The following menu of engine parameters can be displayed:

- Engine RPM
- Coolant Temperature
- Oil Pressure
- Machine Hours
- System Voltage (Battery #1)
- System Voltage (Battery #2)
- Percent Engine Load at the current RPM
- Oil Temperature
- Intake Manifold Temperature
- Fuel Temperature
- Engine Torque
- Fuel Level
- Active Service Codes
- Stored Service Codes
- Set the Units for Display
- View the Engine Configuration Parameters



1. Oil Pressure Gauge
2. Tachometer
3. Raw Water Temperature Gauge
4. Engine Temperature Gauge
5. Engine Status
6. Settings Gear Icon
7. Battery Voltage Gauge

For TSP-E menu navigation details, refer to TSP-E Operation Manual C139228.

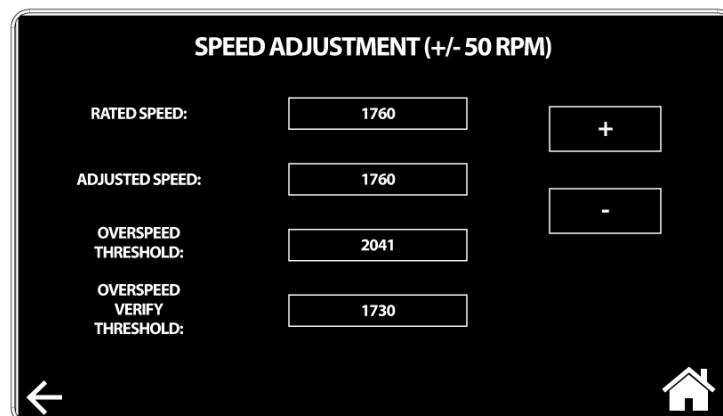
3.3.1. TSP-E Engine Speed Adjustment

TSP-E Speed Adjustment

To adjust the speed on a TSP-E:

1. Start the engine.
 2. Allow the engine to warm-up.
 3. Press the Settings Gear Icon on the TSPE Home Screen.
 4. Press the Speed Adjustment Button on the Settings Menu Screen.
- The Speed Adjustment Screen allows the operator to adjust the engine running speed within a 50 RPM variance from rated speed. The engine rated speed is shown at the top center of the display, below the screen title. The adjusted speed is shown just below the rated speed.

Figure 2. Speed Adjustment Screen



5. To adjust the speed, press the plus or minus button to increase or decrease the RPM. Each press of the plus or minus button will adjust the speed by 1 RPM. Holding the button will cause greater speed adjustment.

3.4. Starting and Stopping the Engine



IMPORTANT

Before starting the engine for the first time ensure there is an adequate Raw Water Supply to the Engine Heat Exchanger.

• Starting from the Pump Controller

1. Ensure the Engine Instrument Panel mode selector switch is in Automatic.
2. On UL/FM engines, use main pump controller for starting and stopping the engine. Should the main pump controller become inoperable, the engine can be manually started and stopped from the engine gauge panel.

• Starting from the Engine Instrument Panel

1. Ensure the Pump Controller is in the OFF position. Be sure to return mode selector back to Automatic after completing manual run.

2. Position Engine Instrument Panel mode selector switch to Manual Run.
3. Hold the Manual Crank #1 or #2 until the engine starts, or release after 15 seconds. If the engine fails to start, wait 15 seconds. Hold the opposite manual crank switch until the engine starts, or release after 15 seconds.



NOTICE

If the raw water is not flowing or the engine temperature is too high, open the cooling loop bypass manual valves. (applies to heat exchanger cooled engines only).

• **Stopping the Engine**

1. If the engine is started from pump controller use pump controller to stop the engine.
2. If engine is started from engine instrument panel, Hold the Manual Stop.
Ensure the Manual Stop is held until the engine comes to a complete stop.



IMPORTANT

DO NOT leave the MODE SELECTOR switch in the MANUAL RUN position during AUTOMATIC operation.

3.5. Weekly Test

Clarke recommends exercising the engine in accordance with NFPA 25's recommendation of 30 minutes per week at a no-flow condition. 30 Minutes is enough time to ensure everything is working correctly. Clarke Fire Protection Products are designed and capable of running for long durations and high flow conditions in the event of a fire. However, there is no benefit in running the engine longer than 30 Minutes at no-flow conditions during the weekly exercise. In addition to the weekly exercise, it is expected that the engine will be run under loads in accordance with the authority having jurisdiction for initial acceptance and annual flow tests. Operating the engine in excess of these requirements may result in a non-warrantable incident.

Before starting the engine make sure of the following:

- The operator has free access to stop the engine in an emergency.
- The pump room ventilation ducts are open, and the engine has good access for air.
- All the guards are in position. If the guards are removed for maintenance or troubleshooting, ensure any rotating parts will be free and clear without restriction.
- Battery covers are in place and there is nothing on top of or touching the engine which is not part of the original supply specification.
- The raw water supply for cooling is available without restriction.
- When the engine is running make sure that the coolant temperature, oil pressure and raw water flow and raw water temperature are within limits specified on the relevant **Installation & Operation Data Sheet**.

When the engine is running make sure of the following are within the limits specified on the relevant Installation & Operation Data Sheet.

- Coolant Temperature
- Oil Pressure
- Cooling Loop Raw Water Flow

4. Fuel System

4.1. Diesel Fuel Specification

All diesel fire pump drivers manufactured by Clarke are designed, tested and warranted for use only with No. 2-D Diesel Fuel conforming to ASTM International D-975 or European Standard EN 590. Although the above referenced fuel specifications allow limited amounts of Biodiesel, 100% petroleum fuel is preferred and should be used whenever possible.

Biodiesel in any amount greater than that allowed by the above referenced specifications should not be used. The use of fuels not referenced above, or Biodiesel in amounts greater than allowed in the above referenced specifications, may affect performance and reliability, and may result in a non-warrantable engine condition.

To ensure engine reliability and performance, the fuel provided for Clarke fire pump drivers must be maintained in a quality condition. Refer to NFPA 25, reprint provided below, for guidance to the minimum requirements for fuel maintenance for all Clarke fire pump engine installations.

8.3.4 Diesel Fuel Testing and Maintenance

8.3.4.1 Diesel fuel shall be tested for degradation no less than annually.

8.3.4.1.1* Fuel degradation testing shall comply with ASTM D975-11b Standard Specification for Diesel Fuel Oils, or ASTM D6751 -11b Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels as approved by the engine manufacturer, using ASTM D 7462 -11 Standard Test Method for Oxidation Stability of Biodiesel (B100) and Blends of Biodiesel with Middle Distillate Petroleum Fuel (Accelerated Method).

8.3.4.2* If diesel fuel is found to be deficient in the testing required in 8.3.4.1.1, the fuel shall be reconditioned or replaced, the supply tank shall be cleaned internally, and the engine fuel filter(s) shall be changed.

8.3.4.2.1 After the restoration of the fuel and tank in 8.3.4.2, the fuel shall be retested each 6 months until experience indicates the fuel can be stored for a minimum of one year without degradation beyond that allowed in 8.3.4.1.1

8.3.4.3 When provided, active fuel maintenance systems shall be listed for fire pump service.

8.3.4.3.1 Maintenance of active fuel maintenance systems shall be in accordance with the manufacturer's recommendations.

8.3.4.3.2 Maintenance of active fuel maintenance systems shall be performed at a minimum annual frequency for any portion of the system that the manufacturer does not provide a recommended maintenance frequency.

8.3.4.3.3 Fuel additives shall be used and maintained in accordance with the active fuel maintenance system manufacturer's recommendations.

A.8.3.4.1.1 Commercial distillate fuel oils used in modern diesel engines are subject to various detrimental effects from storage. The origin of the crude oil, refinement processing techniques, time of year, and geographical consumption location all influence the determination of fuel blend formulas. Naturally occurring gums, waxes, soluble metallic soaps, water, dirt, blends and temperature all contribute to the degradation of the fuel as it is handled and stored. These effects begin at the time of fuel refinement and continue until consumption. Proper maintenance of stored distillate fuel is critical for engine operation, efficiency, and longevity. Storage tanks should be kept water-free. Water contributes to steel tank corrosion and the development of microbiological growth where fuel and water interface. This and the metals of the system provide elements that react with fuel to form certain gels or organic acids, resulting in clogging of filters and system corrosion. Scheduled fuel maintenance helps to reduce fuel degradation. Fuel maintenance filtration can remove contaminants and water and maintain fuel conditions to provide reliability and efficiency for standby fire pump engines. Fuel maintenance and testing should begin the day of installation and first fill.

A.8.3.4.2 Where environmental or fuel quality conditions result in degradation of the fuel while stored in the supply tank, from items such as water, micro-organisms and particulates, or destabilization, active fuel maintenance systems permanently installed on the fuel storage tanks have proven to be successful at maintaining fuel quality. An active fuel maintenance system will maintain the fuel quality in the tank, therefore preventing the fuel from going through possible cycles of degradation, risking engine reliability, and then requiring reconditioning.

Whenever the fuel system has been opened up for service (lines disconnected, or filters removed), it will be necessary to bleed air from the system.



CAUTION

Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles, which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand. If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result.

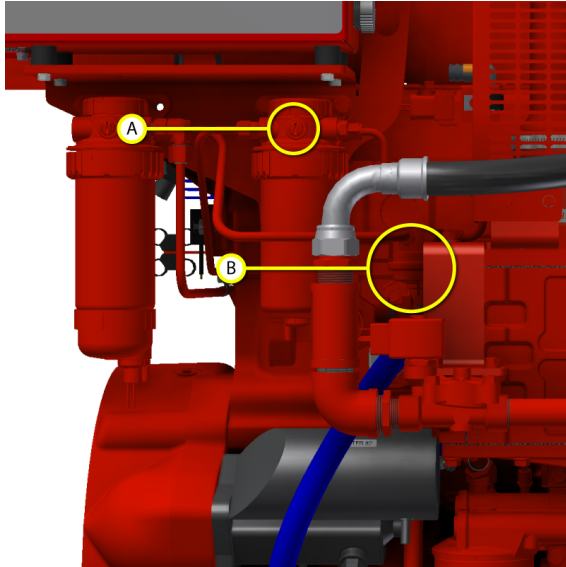


4.2. Bleeding the Fuel System

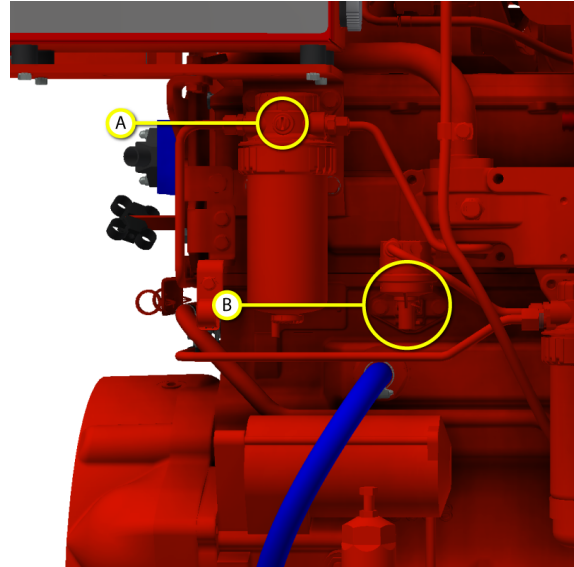
JU4H & JU6H Engine Models:

- **At Fuel Filter:**

1. Loosen the air bleed vent screw (A) two full turns by hand on fuel filter base.
2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles.
3. Tighten bleed plug securely; continue operating hand primer until pump action is not felt. Push hand primer inward (toward engine) as far as it will go.
4. Start engine and check for leaks.



JU4H - (A) Vent Screw, (B) Hand Primer Pump



JU6H - (A) Vent Screw, (B) Hand Primer Pump

JW6H Engine Models:

Under normal conditions, fuel system bleeding is not required. The JW6H engines have an electric fuel pump. To prime or bleed the fuel system, the electric pump will automatically turn on to maintain a correct downstream pressure.

4.3. Changing Fuel Filters

Changing the cartridges and bleed any air from the fuel system as per instructions. Fuel filter changes should take place as per recommendations and only using approved filters. It may also be necessary to change filters out with the recommendations in the event of:

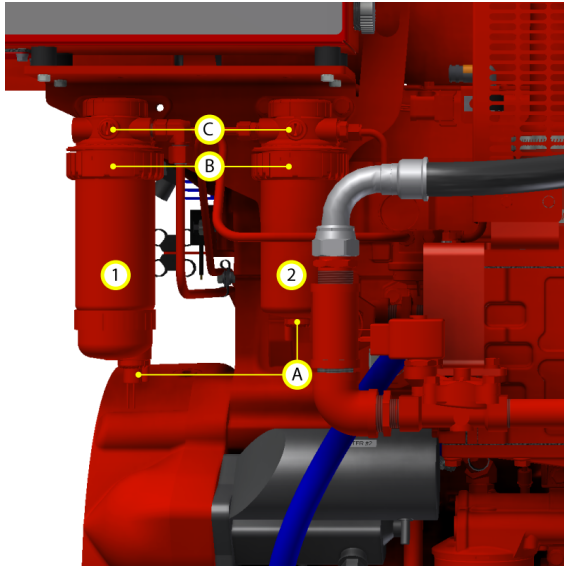
- The engine has had an overhaul.
- The quality of the fuel is questionable.
- The engine has been subjected to temporary adverse conditions outside its normal operating parameters.
- The fuel tank condensation trap has not been drained in line with manufacturer's recommendations.

JU4H & JU6H Engine Models:

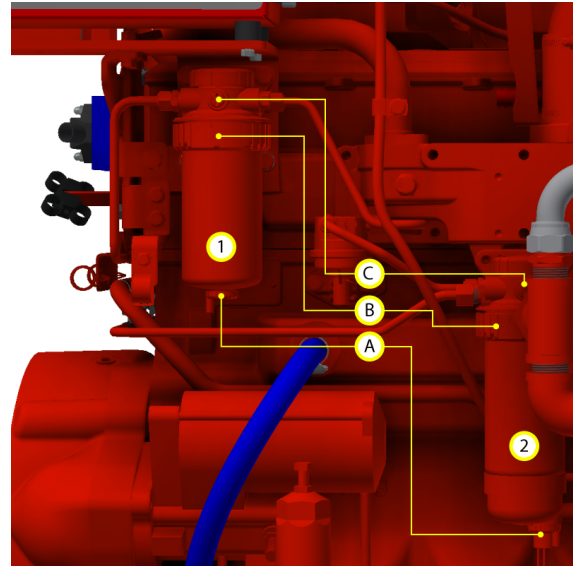
Each engine has two fuel filters, a primary filter (1) and a secondary filter (2). For the purpose of identity, the primary filter incorporates the transparent water separator.

1. Close fuel shut-off valve, if equipped.
2. Thoroughly clean fuel filter assembly and surrounded area.
3. Disconnect water-in-fuel sensor
4. Loosen drain plug (A) from both filters and drain fuel into a suitable container.
5. Firmly grasp the retaining rings (B) and rotate it counterclockwise ¼ turn. Remove ring with filter element.
Note: *Lifting up on retaining ring and rotate it helps to get past raised locators.*
6. Inspect filter mounting bases for cleanliness. Clean as required. **Note:** Raised locators on fuel filter canister must be indexed properly with slots in mounting base for correct installation.
7. Install new filter elements onto mounting base. Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment. If equipped with water separator, remove filter element from water separator bowl. Drain and clean separator bowl. Dry with compressed air. Install water separator bowl onto new element. Tighten securely.

8. Align keys on filter element with slots in filter base.
9. Install retaining ring onto mounting base making certain dust seal is in place on filter base. Hand tighten ring (about 1/3 turn) until it "snaps" into the detent. **DO NOT** over tighten retaining ring. **Note:** The proper installation is indicated when a "click" is heard and a release of the retaining ring is felt. A plug is provided with the new element for plugging the used element.
10. Open fuel shut-off valve and bleed the fuel system. Tighten bleed plug (C).



JW4H - (1) Primary Fuel Filter, (2) Secondary Fuel Filter, (A) Drain Plug, (B) Retaining Ring, (C) Vent Screw



JW6H - (1) Primary Fuel Filter, (2) Secondary Fuel Filter, (A) Drain Plug, (B) Retaining Ring, (C) Vent Screw

JW6H Engine Models:

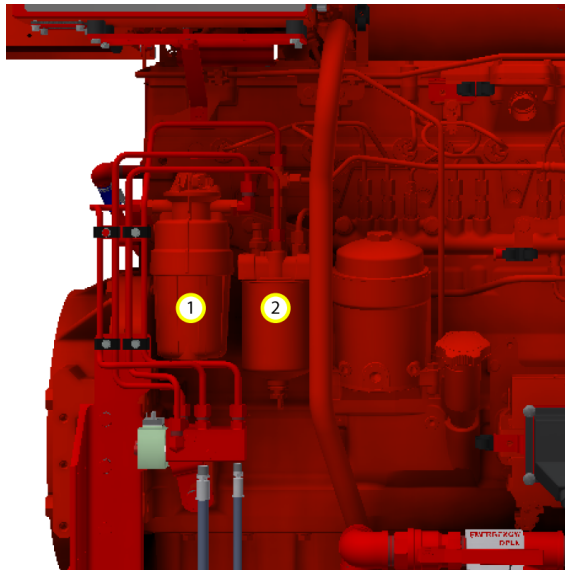
Each engine has two fuel filters, a primary filter (1) and a secondary filter (2). For the purpose of identity, the primary filter incorporates the transparent water separator.

Replacing Primary Fuel Filter:

1. Close fuel shut-off valve at bottom of fuel tank, if equipped.
2. Thoroughly clean filter header (A) and surrounding area to keep from getting dirt and debris into fuel system. Ref to *figure#22*.
3. Loosen drain plug (B) and drain fuel into a suitable container. Ref [Figure 3, "JW6H Fuel Filters" \[25\]](#)
4. Disconnect water-in-fuel sensor
5. Turn filter canister (D) counter-clockwise (CCW) to remove.
6. Once filter canister is removed, pull filter element (E) down to remove from filter header (A).
7. Inspect filter header and filter canister sealing surfaces. Clean as required.
8. Place new packing on filter canister.
9. Place thin film of fuel on filter packing.
10. Place filter in canister with tangs on bottom going into canister.
11. Install fuel filter onto fuel filter header. Tighten until fuel filter snugly mates with fuel filter header.
12. Turn filter additional $\frac{3}{4}$ turn after seal contact with header.
13. Connect water-in-fuel sensor connector.

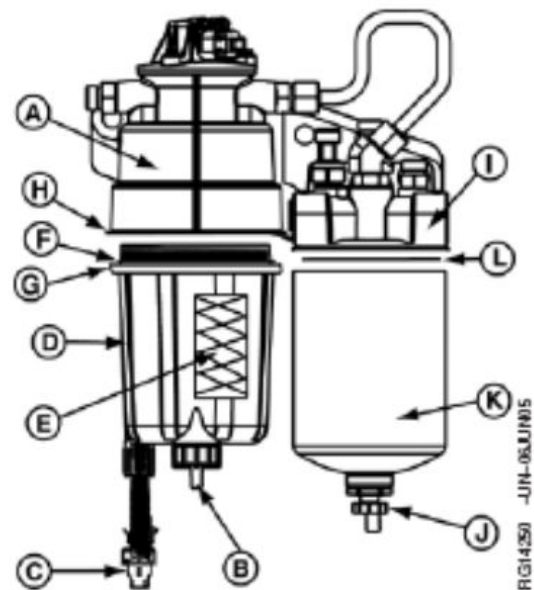
Replacing Secondary Fuel Filter:

1. Close fuel shut-off valve at bottom of fuel tank, if equipped.
2. Loosen drain plug (J) and drain fuel into a suitable container. Ref [Figure 3, "JW6H Fuel Filters" \[25\]](#)
3. Turn filter (K) counter-clockwise (CCW) to remove.
4. Inspect filter header surface. Clean as required.
5. Install new filter drain valve and tighten to 30-35 lb-in (3.4-4 Nm)
6. Place new filter packing (L) on filter
7. Place thin film of fuel on packing.
8. Install fuel filter onto fuel filter header. Tighten until fuel filter snugly mates with fuel filter header (I).
9. Turn filter additional $\frac{3}{4}$ turn after seal contact with header.



JW6H - (1) Primary Fuel Filter, (2) Secondary Fuel Filter

Figure 3. JW6H Fuel Filters



Primary and Secondary Filter Parts Kit

- A—Primary Filter Header
- B—Primary Filter Canister Drain Valve
- C—Water In Fuel Sensor Connector
- D—Primary Filter Canister
- E—Primary Filter Element
- F—Primary Filter Packing
- G—Primary Filter Canister Lip
- H—Primary Filter Header Lip
- I—Secondary Fuel Filter Header
- J—Secondary Filter Drain Valve
- K—Secondary Fuel Filter
- L—Secondary Filter Packing

4.4. Fuel Tanks

Keep the fuel tank filled to reduce condensation to a minimum. Open drain at the bottom of the fuel tank once a week to drain off any possible water and/or sediment. Fill tank after each test run.

Note: Per NFPA 25 standards, the fuel tank level must never be less than 67% of its capacity.

Maximum Allowable Fuel Head above Fuel pump, Supply or Return.		
Engine Model	Feet	Meters
JU4, JU6, JW6	6.6	2.0

5. Air/Exhaust System

5.1. Air System

Ambient Conditions

Clarke engines are tested in accordance with SAE J1349 (Clarke USA) or ISO 3046 (Clarke UK). In this capacity they may be derated to meet certain site conditions, failure to do so can seriously impede the performance of the engine and could lead to premature failure.

Ventilation

The engine must be provided with adequate ventilation to satisfy the requirements of the combustion system, radiator cooling systems where fitted, and allow adequate dissipation of radiated heat and crankcase emissions. For all this data refer to Installation & Operation Data. This data can be used for proper sizing of inlet and outlet louvers.

5.2. Standard Air Filter

The standard air filter is a reusable type. Should a situation occur where the air filter becomes plugged with dirt (starving the engine of air), loss of power and heavy black smoke will result; the air filter should be serviced immediately.

Table 4. Air Filter Restriction

Engine Model	Air Filter Restriction (Inches of Water)
JU4H-UFAD4G, JU4H-UFAD5G, JU4H-UFAD58, JU4H-UFADJG, JU4H-UFADP0, JU4H-UFADR0, JU4H-UFADW8, JU4H-UFADY8, JU4H-UFAD98	12
JU6H-UFADK0, JU6H-UFADN0, JU6H-UFAD58, JU6H-UFADNG, JU6H-UFADP8, JU6H-UFAD88, JU6H-UFADM8, JU6H-UFADMG	10
JU6H-UFADT0, JU6H-UFADP0, JU6H-UFADQ0, JU6H-UFADR0, JU6H-UFADS0, JU6H-UFAD98, JU6H-UFADR8, JU6H-UFADS8, JU6H-UFADW8, JU6H-UFADX8	14
JW6H-UFAD80, JW6H-UFADB0, JW6H-UFADF0, JW6H-UFADJ0, JW6H-UFAD70, JW6H-UFAA60, JW6H-UFAAM8, JW6H-UFAA80, JW6H-UFADD0	



CAUTION

Do not attempt to remove the air cleaner while an engine is running nor run the engine while the air cleaner is off. Exposed components could cause severe injury to personnel and major internal engine damage could occur should any foreign matter be drawn into the engine.

The air cleaner manufacturer recommends the following:

- The pre-oiled reusable elements are serviced with a special oil. The elements can be serviced or replaced.
- [Figure 4, “Air Filter Cleaning Procedure” \[27\]](#) shows the air filter service instructions.
- When servicing the element is not practical, you can improve filter efficiency by re-spraying with oil.

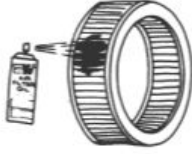


IMPORTANT

Do not attempt this while engine is running.

Do not over oil the reusable element.

Figure 4. Air Filter Cleaning Procedure

1. PRE-CLEANING Tap the element to dislodge any large embedded dirt, then gently brush with a soft bristle brush. (Note: If complete cleaning is not practical at this time, re-oil the element and re-install in your vehicle.) 	2. SPRAY ON CLEANER Spray K&N air filter cleaner liberally onto the entire element and let soak for 10 minutes. 	3. PAN CLEANING Large K&N elements can be rolled or soaked in a shallow pan of K&N air filter cleaner. Remove immediately and let soak for approximately 10 minutes. 	4. CLEANING HINTS Use only K&N air filter cleaner. NO gasoline cleaning. NO steam cleaning. NO caustic cleaning solutions. NO strong detergents. NO high pressure car wash. NO parts cleaning solvents. Any of these NO's can cause harm to the cotton filter media, plus shrink and harden the rubber end caps.
5. RINSE OFF Rinse off the element with low pressure water. Tap water is OK. Always flush from the clean side to dirty side. This removes the dirt and does not drive it into the filter. 	6. DRYING HINTS Always dry naturally. After rinsing, shake off all excess water and let the element dry naturally. DO NOT USE COMPRESSED AIR DO NOT USE OPEN FLAME DO NOT USE HEAT DRYERS EXCESS HEAT WILL SHRINK THE COTTON FILTER MEDIA. COMPRESSED AIR WILL BLOW HOLES IN THE ELEMENT.	7. AEROSOL OILING After cleaning air filter always re-oil before using. Spray K&N air filter oil down into each pleat with one pass per pleat. Wait 10 minutes and reoil any white spots still showing. 	8. SQUEEZE BOTTLE OILING After cleaning air filter always re-oil before using. Squeeze K&N air filter oil down into the bottom and along each pleat — only one pass per pleat. Let oil wick into cotton for 20 minutes. Re-oil any white spots still showing. 
9. OILING HINTS Never use a K&N air filter without oil. (The filter will not stop the dirt without the oil.) Use only K&N formulated air filter oil. K&N air filter oil is a compound of mineral and animal oil blended with special polymers to form a very efficient tack barrier. Red dye is added to show just where you have applied the oil. Eventually the red color will fade but the oil will remain and filter the air. NEVER USE Automatic Transmission Fluid. NEVER USE Motor Oil. NEVER USE Diesel Fuel. NEVER USE WD-40, LPS, or other light weight oils.			

Note: Intake Air Shutoff Valve - Engine may include an intake air shutoff valve as an optional feature that is activated by an overspeed event and provides a positive shutoff of combustion air to the engine. The optional air intake shutoff valve has not been evaluated by UL as part of a UL Listed fire pump driver.

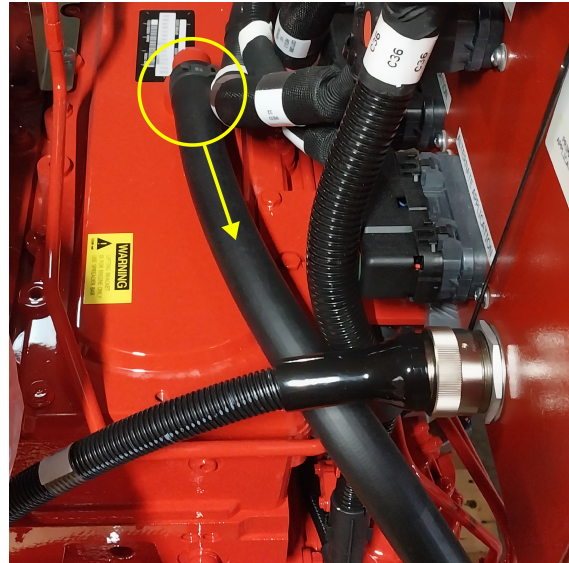
5.3. Crankcase Ventilation

Vapors which may form within the engine are removed from the crankcase and gear train compartment by a continuous, pressurized ventilation system. A slight pressure is maintained within the engine crankcase compartment. Vapors are expelled through a vent pipe attached to the rocker cover breather element.

Figure 5. JU4/6 Crankcase Ventilation



Figure 6. JW6 Crankcase Ventilation



5.4. Exhaust System

Excessive back pressures to the engine exhaust can considerably reduce both engine performance and life. It is therefore important that exhaust systems should be the proper diameter and be as short as possible within the minimum amount of bends. Refer to Installation & Operating Data for exhaust data. Also refer to table below for maximum exhaust restriction.

Base Engine	Exhaust Backpressure Limit
All Models	30

Installation of Exhaust System should consist of the following:

- Personnel protection from hot surfaces
- Adequate supports to prevent strain on the engine exhaust outlet and minimize vibration.
- Protection against entry of water and other foreign matter.

While the engine is running inspect exhaust pipe outlet outside of the pump room itself for environmental hazards such as excessive smoke conditions. The following could be used as a guide for general engine operating conditions.

- Blue Smoke – Possible engine oil consumption.
- White Smoke – Possibility of water in cylinders, water in fuel or internal engine problem.

6. Lubrication System

6.1. Checking Oil Level

Check the sump oil level using the dipstick on the engine as shown in image below. This level must always be between the dipstick marks Min. and Max. with the engine not running.

Figure 7. JU4 dipstick

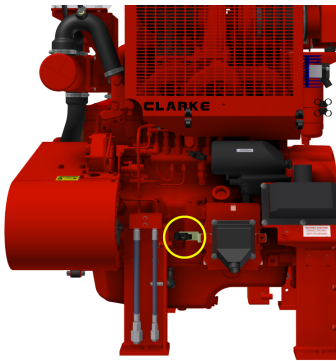


Figure 8. JU6 dipstick

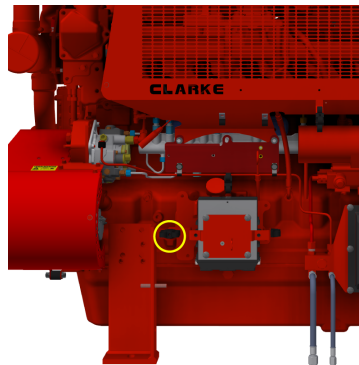
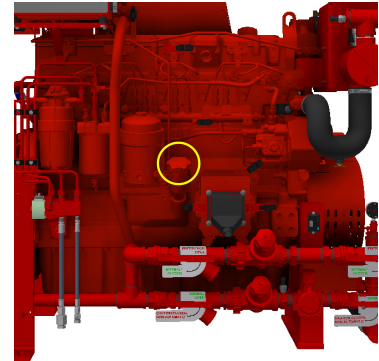


Figure 9. JW6 dipstick



6.2. Changing Engine Oil

1. Operate the engine until it is warm.
2. Stop the engine. Remove the sump drain plug and drain the lubricating oil from the sump.
3. Install the drain plug.
 - Tighten the plug to 34 Nm (25lbf-ft) / 3.5 kgf-m.
4. Fill the sump to the 'FULL' mark on the dipstick with new and clean lubricating oil of an approved grade.
5. Return the unit back into service by returning the AEC selector to "automatic" position and the manual operating lever to manual stop position.
6. Dispose used oil properly.

6.3. Changing Oil Filter Cartridge

1. Turn engine off.
2. Put a tray under the filter to retain spilt lubricating oil.
3. Remove the filter with a strap wrench or similar tool. Then dispose of the filter properly.
4. Clean the filter head.
5. Add clean engine lubricating oil to the new filter. Allow the oil enough time to pass through the filter element.
6. Lubricate the top of the filter seal with clean engine lubricating oil.
7. Fit the new filter and tighten it by hand only. Do not use a strap wrench.
8. Ensure that there is lubricating oil in the sump. On turbocharged engines, ensure that the engine will not start and operate the starter motor until oil pressure is obtained.
9. Operate the engine and check for leakage from the filter. When the engine has cooled, check the oil level on the dipstick and put more oil into the sump, if necessary.
10. Return the unit back into service by returning the main pump controller selector to "automatic" position and the manual operating lever to AUTO-OFF position.

6.4. Oil Specification

This engine is factory-filled with John Deere Engine Break-in Oil.

Do not add makeup oil until the oil level is **BELOW** the add mark on the dipstick.

Break-in period is 1 year from engine start-up.

Low Speed engine models (Nameplate RPM is less than or equal to 2600 RPM) are shipped from Clarke with John Deere Break-in oil installed. Break-In Oil (TY22041, 10W30) should be used to make up any oil consumed during the break-in period.

High speed engine models (Nameplate RPM is greater than 2600 RPM) are shipped with CI-4, 15W40 oil. On these models any make up oil should meet the requirements of CF-4, CG-4, CH-4, or CI-4, Viscosity Grade 15W40.

Oil spec to be used after break-in period, all engine models:

Oil spec to be used for all engine models

API Symbol:



Note: CF-4, CG-4, CH-4 and CI-4 are also acceptable

6.5. Oil Capacities

Oil Capacities (Including Filter)

Engine Model	Oil Capacity – Quarts (Liters)
JU4H – All Models	15.0 (14.2)
JU6 – All Models (<i>except JU6H-PTP models below</i>)	20.1 (19)
JU6H-PTP: (JU6H-UFAD98, ADP0, ADQ0, ADR0, ADR8, ADS0, ADS8, ADT0, ADW8, ADX8)	31.7 (30.0)
JW6H - All Models	30.1 (28.5)

7. Cooling System

7.1. Intended Engine Operating Temperature

The engine is provided with either a heat exchanger or radiator to maintain the engine coolant temperature within recommended operating guidelines.

- **Operating Temperature**

The JU4H, JU6H, and JW6H have an intended engine operating temperature of 175° F (79°C) to 195° F (91° C).

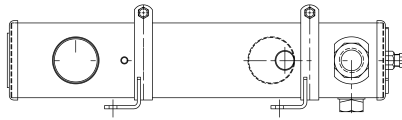
- **High Coolant Temperature Alarm**

A high coolant temperature sensor monitors coolant temperature and will indicate a high coolant temperature alarm at 230° F (110° C).

7.2. Heat Exchanger

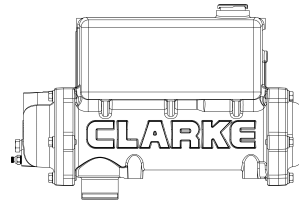
- JU4H and JU6H Heat Exchangers

JU4H & JU6H Brazed Heat Exchanger



The brazed heat exchanger is non-serviceable.

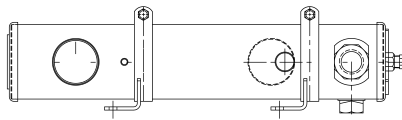
JU4H & JU6H NSR Heat Exchanger



Reference [Maintenance \[40\]](#) for NSR maintenance procedures.

- JW6H Heat Exchanger

JW6H Brazed Heat Exchanger



The brazed heat exchanger is non-serviceable.

7.3. Coolant Specification

Coolant Part # C12E170 or Clarke Coolant (C054129)

Per recommendations from the engine manufacturers, it has become necessary that engine coolants be changed every 12 months.

The only acceptable substitute is COOL-GARD II part # TY26575.

Warranty is contingent on utilizing the indicated coolant.



WARNING

A water and anti-freeze solution is required for pump installations. Premixing this solution prior to installing is required. This prevents possible pure anti-freeze chemical reactions to block heater elements which can burnout the element. Please see the I&O section for proper cooling system capacities of each model.

7.4. Coolant Capacities

Engine coolant capacity table.

Engine Model	Coolant Capacity – Quarts (Liters)
JU4H	14.9 (14.1)
JU6H - (Except PTP models listed below)	19 (18)
JU6H – PTP (JU6H-UFAD98, ADP0, ADQ0, ADR0, ADR8, ADS0, ADS8, ADT0, ADW8, ADX8)	21.6 (20.4)

Engine Model	Coolant Capacity – Quarts (Liters)
JW6H	25.9 (24.5)

7.5. Procedure for Filling Engine Coolant



IMPORTANT

Do not overfill cooling system. A pressurized system needs space for heat expansion without overflowing.

Clarke engines ship from the factory filled with coolant unless otherwise requested. Prior to running engine always check for proper coolant level. Checking coolant level and replacing coolant are parts of the standard maintenance routine. For more information on maintenance please review Maintenance Schedule.

During filling of the cooling system, air pockets may form. The system must be purged of air prior to being put in service. This is best accomplished by filling with a pre-mix solution.

1. Install the pressure cap, start and run engine for approximately 5 minutes in order to purge the air from the engine cavities.
When verifying that the coolant is at a safe operating level, it is best to wait until the engine temperature drops to approximately 120°F (49°C), or lower, before removing the pressure cap.
2. Remove the pressure cap and refill to the proper fill level. To continue the deaeration process start and run engine until the temperature stabilizes at approximately 160°-200° (71°-93° C) or run engine for 25 minutes, whichever is longer. During this warming process, you may see coolant coming from the overflow tube attached at the pressure cap location. Allow engine to cool, then remove the pressure cap and refill to the proper fill level.
Caution: Do not remove pressure cap while coolant is at normal operating temperatures. Possible personal injury could result from the expulsion of hot coolant.

7.6. Water

Water can produce a corrosive environment in the cooling system, and the mineral content may permit scale deposits to form on internal cooling surfaces. Therefore, inhibitors must be added to control corrosion, cavitation, and scale deposits.

Chlorides, sulfates, magnesium and calcium are among the materials which make up dissolved solids that may cause scale deposits, sludge deposits, corrosion or a combination of these. Chlorides and/or sulfates tend to accelerate corrosion, while hardness (percentage of magnesium and calcium salts broadly classified as carbonates) causes deposits of scale. Water within the limits specified in the table below is satisfactory with an engine coolant when properly inhibited. Use of deionized or red distilled water is preferred.

Materials	Parts Per Million	Grains Per Gallon
Chloride (max.)	40	2.5
Sulfates (max.)	100	5.8
Total Dissolved Solids (max.)	340	20
Total Hardness (max.)	170	10

7.7. Raw Water Supply

• Providing Adequate Raw Water Supply to the Engine Heat Exchanger

Most Clarke diesel engine fire pump drivers are heat exchanger cooled and some engines also have a charge air cooler (CAC) that uses raw water to cool the air before entering the intake manifold. If you have a radiator cooled Clarke engine, you can disregard this section. Heat exchanger cooled diesel engine drivers require a clean source of pressurized water from the discharge side of the fire pump in order to keep the engine from overheating by providing a specified minimum amount of raw water flow.

• Cooling Loop



NOTE

Engine may include a cooling loop as an optional feature and has not been evaluated by UL as part of a UL Listed fire pump driver.

Figure below shows the standard NFPA 20 cooling loop piping arrangement. The cooling loop consists of an Automatic flow line with a 12V or 24V solenoid valve (HSC and ES pump applications only) that is energized to open anytime the engine is called upon to run from either the fire pump controller or from the engine instrument panel.

The second flow line is called the Manual by-pass line, and it can be opened at any time if for any reason the engine shows signs of overheating. Each line has two (quarter turn) shutoff values installed and the normal position of the shutoff valve is to remain open in the Automatic flow line and remain closed in the Manual by-pass flow line.

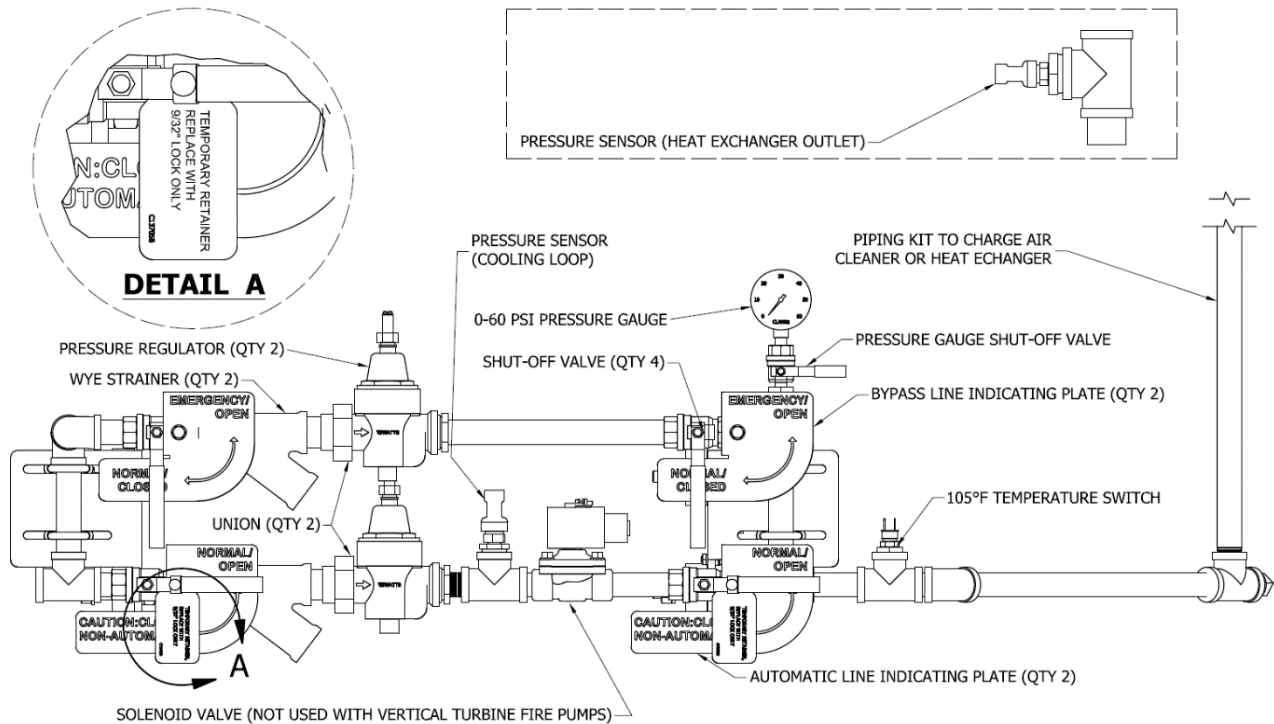
NOTE: Opening up both lines to flow is never a problem should there be some concern of engine overheat, especially if there is an emergency situation. The Manual by-pass line can only be opened by an operator in the pump room.

The shutoff valves are all identified to show which are Normally Open (Automatic flow line) and which are Normally Closed (Manual by-pass flow line). The shutoff valves are also used to isolate water pressure in the event of maintenance to pressure regulators, strainers and solenoid valve. Shutoff valves in the automatic flow line are provided with lockable handles for cooling loops that have been tested to FM requirements. These valves have been provided with a temporary locking pin to keep them in the open position, see detail A in figure below. This temporary retainer needs to be replaced with a 9/32" lock.

In each flow line there is also a pressure regulator.

Each pressure regulator protects the downstream piping from over-pressurization which includes the tube side of the engine shell & tube heat exchanger (or CAC) and to control raw water flow rate. Typically the pressure regulators are set to limit downstream pressure to 60 psi (4 bar). There is a pressure gauge installed just upstream of the engine heat exchanger (or CAC) and downstream of the pressure regulator. Under normal engine operating conditions with adequate cooling water flowing thru the heat exchanger (or CAC) this gauge should typically read below 20 psi (1.4 Bar).

Wye strainers are used to remove debris from the raw water supply. One strainer is in the Automatic flow line and the other is in the Manual by-pass flow line.



• Setting Raw Water Flow Rate

The proper amount of raw water flow thru the engine is of the utmost importance, and the pressure gauge value does little to indicate if there is sufficient flow. When the engine is exercised weekly, the amount of raw water flow exiting the engine should always be checked to verify it does not appear to have diminished.

During initial commissioning of the engine, it is important to correctly set the raw flow rate going thru the cooling loop. Each Clarke engine model has an Installation and Operation (I&O) Datasheet that provides basic operating conditions of the engine and most values are given based upon engine speed. You will find this datasheet in the documentation bag that is shipped with the engine for your specific Clarke model. This datasheet must be available during commissioning in order to set the proper minimum raw water flow. With the fire pump flowing 150% of rated flow, and the Automatic flow line open; verify sufficient raw water flow rate is achieved and that the reading of the cooling loop pressure gauge does not exceed 60 psi (4 bar). You will need to capture the flow for a specific amount of time coming out of the heat exchanger and going to a floor drain in order to establish a reasonably accurate flow rate value. Using a container or bucket of known volume, record the time required to fill the container and compare to the gpm or L/min value provided on the I&O datasheet. **THIS IS CRITICAL FOR PROPER ENGINE COOLING AT MAXIMUM PUMP LOAD!!**

If proper cooling water flow rate is established then no fire pump controller alarm will be triggered to indicate clogged raw water strainer (low raw water flow).

After verifying raw water flow rate in the Automatic flowline, open the Manual by-pass line shut-off valves, and then close the Automatic flowline shut-off valves and repeat the above process in order to verify the flowrate going thru the Manual by-pass line. Note, with Automatic flowline closed the controller low raw water flow alarm may be present, this is normal. Once this is completed; close the Manual by-pass shut-off valves and open the Automatic flowline shut-off valves to restore conditions back to normal.

- **Raw Water Outlet**

NOTE: NFPA 20 does allow for the heat exchanger outlet flow to be returned to a suction reservoir. This makes it very difficult to measure the flowrate. When discharging to a suction reservoir, NFPA provides additional requirements:

A visual flow indicator and temperature indicator are installed in the discharge (waste outlet) piping.

When waste outlet piping is longer than 15ft (4.6m) and / or the outlet discharges are more than 4ft (1.2M) higher than the heat exchanger, the pipe size increased by at least one size.

Verify that when the correct flow rate is achieved that the inlet pressure to the heat exchanger (or CAC) does not exceed 60psi (4bar)

If you have such an installation, it is recommended that you run the engine for a period of time at firepump 150% flow and confirm the visual flow indicator is showing water flow, the temperature rise is not excessive (usually no more than 40F (4.5C) over ambient raw water temperature) and the engine is showing no signs of overheating.

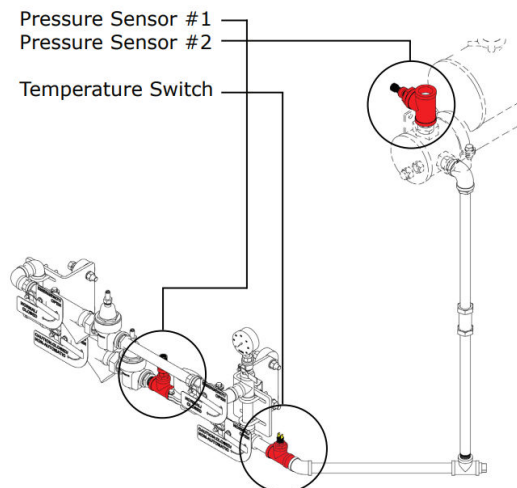
- **Raw Water Quality, Strainers and Deterioration of Heat Exchanger (or CAC)**

Over time, as the heat exchanger (or CAC) begins to plug and foul, this pressure will rise and the flow will diminish which could mean that the heat exchanger (or CAC) may have to be replaced.

It can be not stressed enough how important it is to keep the wye strainers within the cooling loop clean: Most engine failures occur due to plugged cooling loop strainers! If the raw water supply has debris in it (leaves, stones, etc) as the strainer accumulates more debris (that will not pass thru it), the flowrate will continue to diminish which will eventually starve the engine of adequate cooling water flow which will lead to engine overheat and catastrophic engine failure. When this occurs you have no fire protection! Clarke recommends that after the initial engine commissioning and also prior to each weekly exercise of the engine / fire pump set, both strainers be removed and cleaned and then re-installed before starting the engine.

Clarke engines are equipped with an alarm that is meant to signal diminished raw water flow rate (terminal 311), possibly due to clogged raw water strainers in the cooling loop. A circuit board located near the front of the cooling loop monitors differential pressure between the two sensors and will send an alarm to the controller if a low water flow condition exists.

Additionally, a raw water temperature switch will send an alarm (terminal 310) when temperature of the water exceeds 105°F (41° C). Refer to cooling loop illustrations for location of switch. If either of these alarms are active, it indicates that the cooling system's capability may be compromised.



- **Backflow Preventers**

NFPA20 allows for the use of backflow preventers in the Automatic and Manual flow line of the cooling loop as required by local code. For specific application information contact factory.

- **Raw Water Outlet Temperature**

Certain local codes may not allow you to discharge the waste water outlet from the engine heat exchanger either due to its temperature or it now being considered hazardous waste. It is recommended you always check local codes regarding waste water discharge.

- **Flow Paths of Engine Cooling System**

The engine coolant flows through the shell side of the heat exchanger (or radiator), engine coolant pump, oil cooler, engine block and cylinder head, jacket water heater, thermostat, expansion tank, and coolant recovery tank (if equipped).

On heat exchanger equipped engines raw cooling water flows through the tube side of the charge air cooler, if equipped, and the tube side of the heat exchanger.

Refer to Figure 10, "Heat Exchanger Cooled Engines" [35] for heat exchanger cooled engines and Figure 11, "Radiator Cooled Engines" [35] for radiator cooled engines for flow path diagrams.

Figure 10. Heat Exchanger Cooled Engines

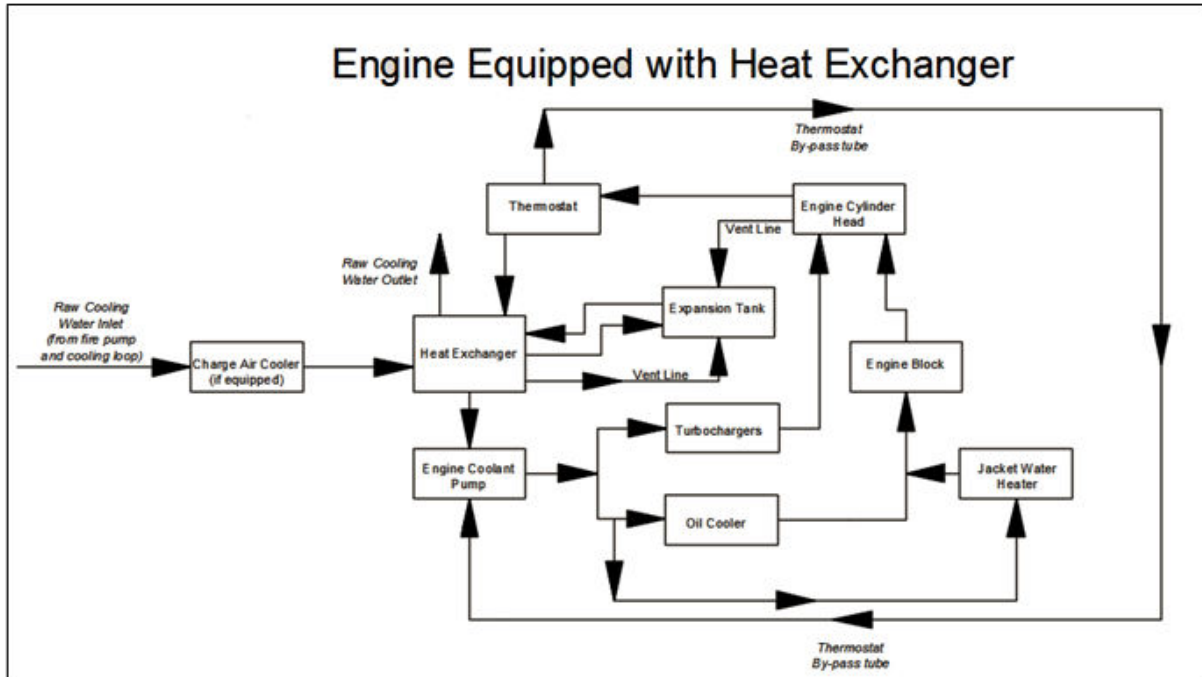
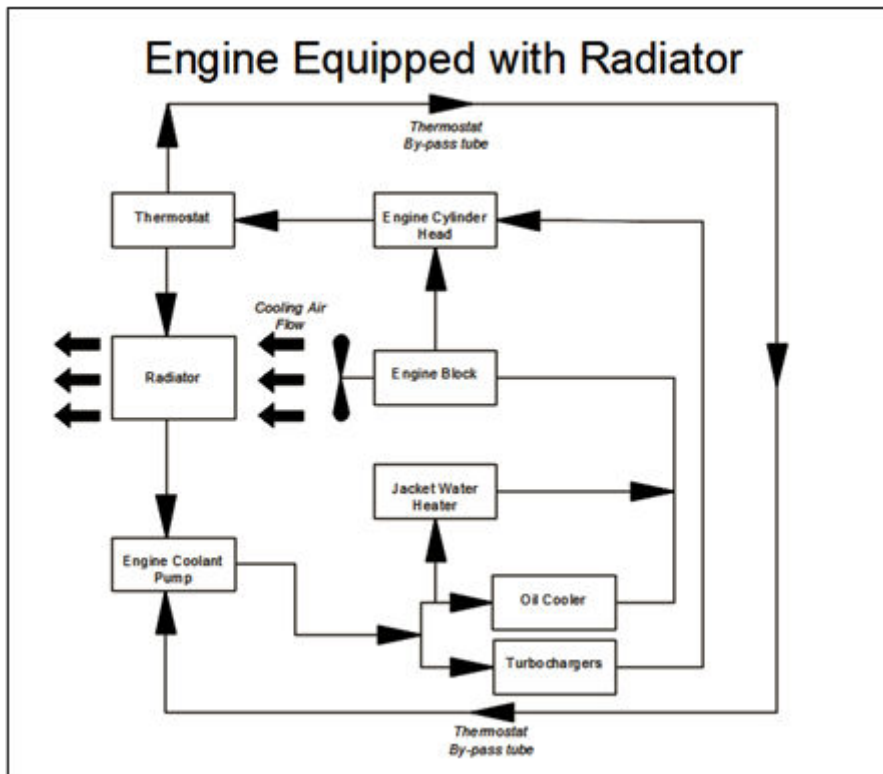


Figure 11. Radiator Cooled Engines



- **Important Service Notice**

Any time an engine experiences a high coolant temperature alarm condition the primary cause of the overheat must be determined and the cause corrected to prevent a recurring overheat event. Additionally, if an event of a restricted flow, collapsed hose, insufficient coolant level or failed pressure cap is experienced, further investigation of the cooling system is required.

1. The coolant should be drained (after de-energizing the coolant heater).

2. Replace the engine thermostat(s)
3. Remove the engine water pump and inspect the impeller and seal for damage, replace as necessary. Reassemble and refill coolant according to the Installation and Operations Instruction Manual.
4. Run the engine to verify normal operating temperature.

- **Cavitation**

Cavitation is a condition that occurs when bubbles form in the coolant flow in the low pressure areas of the cooling system and implode as they pass to the higher pressure areas of the system. This can result in damage to cooling system components, particularly the water pump impeller and cylinder liners. Cavitation in an engine can be caused by:

- Improper coolant
- Restricted coolant flow caused by collapsed hose or plugged system
- Coolant fill cap is loose or unable to retain the required pressure
- Insufficient fluid level
- Failure to de-aerate
- Overheat

8. Electrical System

8.1. Instrument Panel

8.1.1. Instrument Panel Wiring Diagram

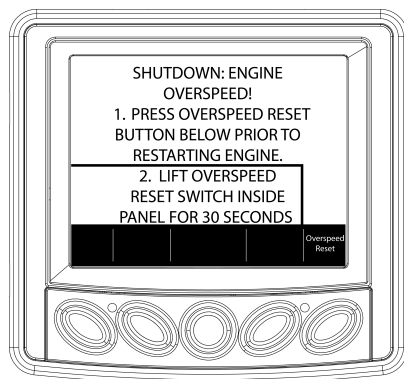
Engine Model Configuration	Instrument Panel Part Number	Wiring Diagram Part Number
JU4, JU6, JW6 - PLD (Variable Speed) with Powerview Instrument Panel	C073009 or C073010	C073101 A
JU4, JU6, JW6 - (Constant Speed) with Powerview Instrument Panel	C073560 or C072958	C072996 A
JU4, JU6, JW6 - with TSP-E	C073133	C073809 A

8.1.2. Engine Over Speed

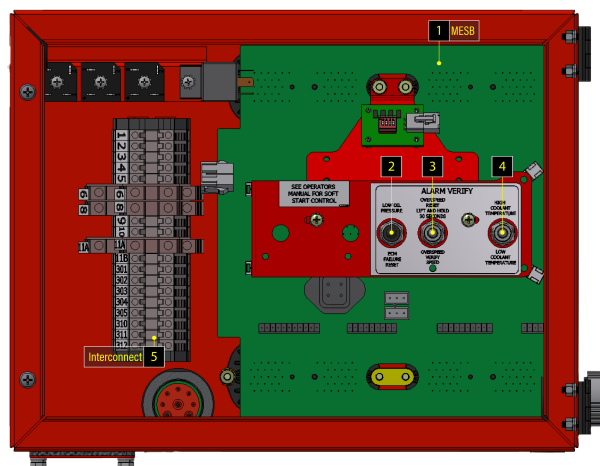
In the event of an engine over speed, the ECM signals the main pump controller and initiates an engine shutdown. Should an overspeed condition occur, investigate the cause and make necessary corrections before placing engine back in service. The engine will be locked out from restarting and the instrument panel will indicate an overspeed shutdown.

- Powerview Instrument Panel Over Speed Verification

On Variable Speed Electronic engines **disable the PLD** by unplugging the PLD wiring from the instrument panel. Locate the Overspeed Verification Switch inside the engine instrument panel. **Hold the Overspeed Verification Switch** the down position, start the Engine from the Fire Pump Controller. The engine will shut down automatically at 30 rpm below rated speed and indicate an alarm on the fire pump controller. **Press the Overspeed reset button** on the display, **then Lift the Overspeed Reset Switch** in the up position for 30 seconds and reset the fire pump controller.



Powerview display - Overspeed Reset



(3) Over Speed Reset / Over Speed Verify Switch

- TSP-E Over Speed Verification

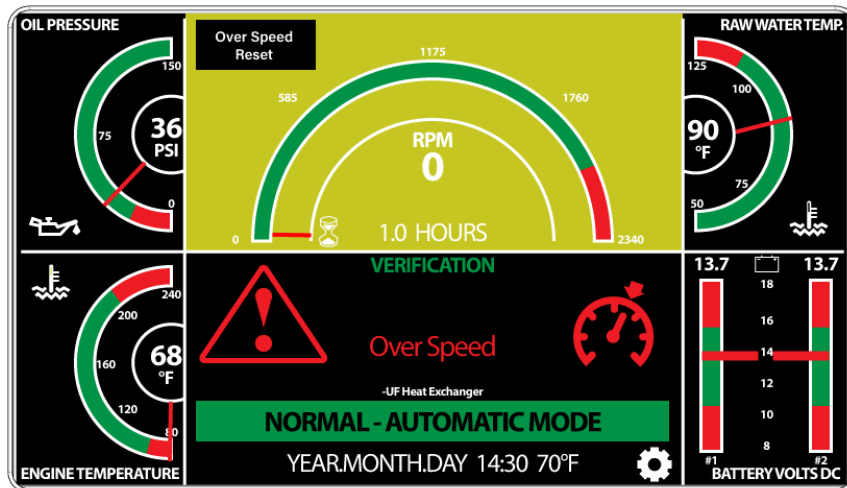
With the engine running, navigating to the verification tests screen and selecting “Run Test” for Engine Over Speed the display will go to the Home Screen, shut the engine down and generate an engine over speed alarm. The screen will highlight the tachometer gauge and generate a verification warning message.



IMPORTANT

The engine will be locked-out from restarting until the **Over Speed Reset button** is pressed and the pump controller is reset to normal operation. Follow the pump manufacturer's instructions to reset the fire pump controller to re-instate normal operation. (This typically involves cycling to the off position.)

Figure 12. TSP-E Engine Overspeed



8.1.3. Field Simulation of Pump Controller Alarms

Engine Instrument Panel	Supplemental Alarm Verification Document
Powerview Instrument Panel	C134335
TSP-E	C139327

Powerview Instrument Panel - Alarm Verifications

- Overspeed Shutdown**
 On Variable Speed Electronic engines **disable the PLD** by unplugging the PLD wiring from the instrument panel. Locate the Overspeed Verification Switch inside the engine instrument panel. **Hold the Overspeed Verification Switch** the down position, start the Engine from the Fire Pump Controller. The engine will shut down automatically at 30 rpm below rated speed and indicate an alarm on the fire pump controller. **Press the Overspeed reset button** on the display, **then Lift the Overspeed Reset Switch** in the up position for 30 seconds and reset the fire pump controller.
- Low Oil Pressure Alarm**
 Start the Engine from the Fire Pump Controller. **Lift the Low Oil Pressure Verify Switch** in the up position for 20 seconds. Release the switch, turn the engine off and reset the fire pump controller. **Note:** If the Low Oil Pressure alarm does not activate on a PLD engine, it may be necessary to disable the PLD.
- High Engine Temperature Alarm**
 Start the Engine from the Fire Pump Controller. Lift the **High Engine Coolant Temperature Verify Switch** in the up position (located inside the engine instrument panel) and wait up to **5 minutes** until an alarm is indicated on the fire pump controller via interconnect wire 5. Release the switch and reset the fire pump controller.
- Low Engine Temperature Alarm**
 On an Electronic engine locate the **Low Engine Coolant Temperature Verify Switch** inside the instrument panel. Press the switch in the down position and wait until an alarm is indicated on the fire pump controller via interconnect wire 312. Release the switch and reset the fire pump controller.
- High Raw Water Temperature Alarm**
 Locate the High Raw Water Temperature Switch between the cooling loop and heat exchanger. Remove the harness boot. Start the Engine from the Fire Pump Controller. **Jumper the two terminals on the switch** and wait up to 30 seconds until an alarm is indicated on the fire pump controller via interconnect wire 310. Stop the engine, correct the harness connector, place the harness boot back on the switch and reset the fire pump controller.
- Low Raw Water Flow Alarm**
 Start the engine from the Fire Pump Controller, Locate the Ball Valve on the automatic side of the cooling loop, to the left of the Y-strainer. **Slowly rotate the valve handle clockwise** until the alarm is indicated at the pump controller via interconnect wire 311. Stop the engine and return the ball valve handle to the Normal/Open position and reset the fire pump controller.
 The alarm will be instant once flow is restricted. If the alarm does not activate immediately return the ball valve to the normally open position and troubleshoot the alarm.
- Over-crank (Fail to Start)**
 Lift and **hold the Overspeed Reset Switch** on the engine instrument panel. Ensure that the Switch is held for the entire duration of each of the 6 crank attempts. Each time while the engine is resting for 15 seconds in between crank attempts, release the SWITCH for 3 seconds. Before the engine cranks again, activate the SWITCH and continue holding throughout the crank attempt, releasing in between each time.
- ECM Warning & Failure Alarm**
 The Pump Controller in the automatic mode and with the engine not running **lift the Overspeed Reset Switch for 2 minutes** until the engine automatically switches ECM and the ECM Warning alarm is indicated on the fire pump controller. Continue to **hold the Overspeed Reset Switch for an additional 2 minutes** until the ECM Failure alarm is indicated on the fire pump controller. After activation of the alarms, reset the instrument panel by holding the **ECM Failure Reset Switch**. Release the switch and reset the fire pump controller.

TSP-E Alarm Verifications

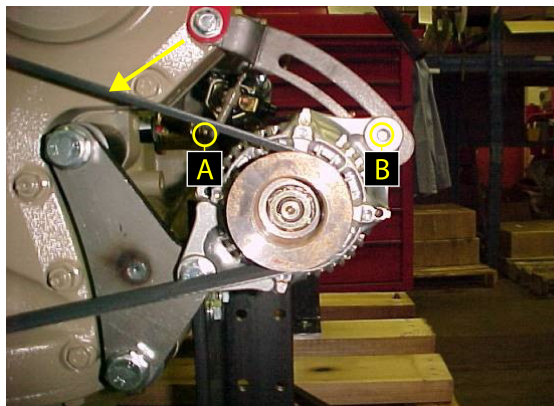
Reference the TSP-E Operations Manual C139228 for alarm verification instructions.

- Low Oil Pressure Alarm
- Low Engine Temperature Alarm
- High Engine Temperature Alarm
- Engine Over Speed Alarm
- Low Raw Water Flow Alarm
- High Raw Water Temperature Alarm
- Fuel Injection Alarm
- Low Suction Pressure Alarm (-S PLD Only)
- ECM Warning & Failure Alarm
- Fail to Start

8.2. Drive Belt Tension and Adjustment

All drive belts must be adequately tightened to secure that both the engine water pump and battery charging alternator (when fitted) are operating efficiently.

- To adjust belt tension:
 - Check belt tension: Give at arrow must be 0.4" - 0.6" (10-15mm).
- To Increase tension of the water pump driving belts:
 1. Loosen alternator or belt tensioner mounting bolts A & B.
 2. Adjust to proper belt tension.
 3. Tighten mounting bolts A and B.



8.3. Battery Requirements

All Clarke engine models require 8D batteries, as sized per SAE J537 and NFPA20. The battery should meet the following criteria:

- Cold Cranking Amps (CCA @ 0°F): 1200
- Reserve Capacity (minutes): 430

9. Maintenance

9.1. Weekly Maintenance

Weekly Maintenance Items are routine tasks based on an engine usage rate of 2 hours per month. For UL/FM engine models, also refer to NFPA 25.

Static Checks:

- ☐ Check the **Air Filter** for rips, crushed elements or extreme dirt.
- ☐ Check the **Battery** electrolyte level and cable connections.
- ☐ Check the **Coolant Hoses** for rips, splitting, collapses or bulges.
- ☐ Check the **Coolant Level**.
- ☐ Check the **Fuel Tank** for leaks and minimum two-thirds full.
- ☐ Check the **Governor Run-Stop Solenoid**.
 - On mechanical engines make sure the speed adjustment jam nuts are tight and the Manual Stop is in the Automatic Run position, if equipped.
- ☐ Check the **Jacket Water Heater**.
- ☐ Check the **Lubrication Oil Level**.
 - The level must always be between the dipstick marks Min. and Max. with the engine not running.
- ☐ Remove Water from Fuel Filter
 - Remove **water** from the **fuel filter** by opening the valve under the filter and let water and sediment flow until fuel comes out.
- ☐ Check the Mode Selector **Not In Auto Warning Light**.
- ☐ Check the Manual Cooling Loop Valves.
 - Check the **Manual Valves** on the cooling loop. The bypass line manual valves should be normally closed, and the automatic line manual valves should be open normally open.
- ☐ Check and Clean the **Y-strainer** screens.

Running Checks:

- ☐ **Run the Engine**

Clarke recommends exercising the engine in accordance with NFPA 25's recommendation of 30 minutes per week at a no-flow condition. 30 Minutes is enough time to ensure everything is working correctly. Clarke Fire Protection Products are designed and capable of running for long durations and high flow conditions in the event of a fire. However, there is no benefit in running the engine longer than 30 Minutes at no-flow conditions during the weekly exercise. In addition to the weekly exercise, it is expected that the engine will be run under loads in accordance with the authority having jurisdiction for initial acceptance and annual flow tests. Operating the engine in excess of these requirements may result in a non-warrantable incident.

 - Starting Method: From the Fire Pump Controller using test feature or actual pressure drop
 - Run the engine for **30 minutes per week**
 - NFPA 25.8.3.2
 - NFPA 11.6.1.1
- ☐ Check the Operating **Gauges**
- ☐ Check the Cooling **Water Solenoid** (N/A for vertical turbine)
- ☐ Check the **Heat Exchanger Discharge** for free flow of water.
- ☐ Check the **Exhaust System** for leaks, support and rain cap.
- ☐ General Inspection for excessive noise, adequate ventilation, missing items or fluid leaks.

9.2. 6-Month Maintenance

6 MONTH Maintenance Items are routine tasks to be completed twice a year in addition to the Weekly Maintenance items.

- ☐ Clean the Batteries

- Clean the **Battery** posts and cable connectors.
- ☐ Check the **Exhaust System** for leaks, support and rain cap.
- ☐ Check the **Battery Charging Alternator** for proper operation.
- ☐ Check the **Belt** for proper alignment, signs of fraying or cracks.
 - Refer to operations manual for proper adjustment procedures.
- ☐ Clean the **Cooling Water Strainers**
- ☐ Check the Driveshaft U-joints or Coupling Set Screws
 - Check the **Driveshaft U-joints** or **Coupling**. Visual inspection to ensure they are not loose and check the set screws.
- ☐ Check the **Fuel Lines** for leaks, breaks, bends or inconsistencies.

9.3. 1-Year Maintenance

1 YEAR Maintenance Items are routine tasks to be completed once a year in addition to the Weekly and 6 Month Maintenance items.

- ☐ Clean or Replace the **Air Filter**.
- ☐ Check the **Crank Case Vent System** to make sure it is open and not kinked.
- ☐ Lubricate the **Driveshaft U-Joints** and **check alignment** according to the operation manual instructions.
- ☐ Replace the **Fuel and Oil Filters**
- ☐ Check the **Heat Exchanger Electrode**.
 - If the length is less than one inch, replace the electrode.
- ☐ Test the **Fuel** for degradation.
 - Testing shall comply with ASTM D975 or ASTM D 6751.
 - If diesel fuel is found to be deficient the fuel shall be reconditioned or replaced.
- ☐ Replace the **Coolant**. Use part number C12E170 or C054129 Clarke Coolant. The only acceptable replacement is COOL-GARD II, part number TY26575.
- ☐ Replace the **Lubricating Oil**.
 - Refer to the Operations Manual for oil weight and capacity.
- ☐ Check the **Mounting Isolators** and foundation nuts. (If applicable.)
- ☐ Check the **Wiring System** connections, tighten if necessary.

9.4. 2-Year Maintenance

2 YEAR Maintenance Items are routine tasks to be completed once every two years in addition to the Weekly, 6 Month and 1 Year Maintenance items.

- ☐ Replace the **Air Filter**.
- ☐ Replace the **Batteries**.
- ☐ Replace the **Belts**.
- ☐ Replace the **Coolant Hoses**.
- ☐ Replace the engine **Thermostat**.

9.5. 5-Year Maintenance

5 YEAR Maintenance Item

- ☐ Replace Torsional Coupling. (If applicable.)

9.6. As-Needed Maintenance

As Needed

- ☐ NSR Heat Exchanger Cleaning Procedure. Reference C139149

10. Troubleshooting

Consult Clarke Service Dealer or Factory.

Service dealers can be located by going to our website: www.clarkefire.com

• Diagnostic Trouble Codes (DTC's)



NOTICE

Refer to wiring diagnostic earlier in this section as a guide to connections and wires. [Engine Instrument Panel](#)

1. **Active DTCs indicate that the failure is occurring.** These types of failures are sometimes called “hard” failures. They can be accessed on the diagnostic gauge (A) on the instrument panel.
2. **Inactive DTCs indicate that a failure has occurred in the past but is not currently occurring.** This type of “stored” DTC can be caused by an “intermittent” failure.

These could be problems such as a bad connection or a wire intermittently shorting out. If a sensor or wiring fails and a DTC is active for the sensor, the ECM will use a substitute “limp home” value in its calculation to continue engine operation. Displaying of Diagnostic Trouble Codes (DTCs) SPN/FMI CODES Stored and active diagnostic trouble codes are output on the PowerView Gauge according to the J1939 standard as a two-part code as shown on the table on the following pages. The first part is a Suspect Parameter Number (SPN) followed by a Failure Mode Identifier (FMI) code. To determine the exact failure, both (SPN and FMI) of the code are needed. The SPN identifies the system or the component that has the failure; for example, SPN 000110 indicates a failure in the engine coolant temperature circuit. The FMI identifies the type of failure that has occurred; for example, FMI03 indicates value above normal. Combining the SPN 000110 with FMI 03 yields engine coolant temperature input voltage too high. Always contact your Clarke service dealer for help in correcting diagnostic trouble codes which are displayed for your engine.

Refer to [PV380 Faults \[16\]](#) for more information.

• Listing of Diagnostic Trouble Codes

The Diagnostic Trouble Codes (DTCs) are output on the diagnostic gauge according to J1939 standard as a two-part code. The first part is a two to four-digit Suspect Parameter Number (SPN) followed by a one or two-digit Failure Mode Identifier (FMI) code. Following is a list of SPN's, FMI's and a description of the diagnostic trouble codes that can occur in the various engine systems. Not all the codes will be present in all engine applications. When trouble codes appear on the PowerView diagnostic gauge, see your engine dealer for repairs as soon as possible.

SPN	FMI	Description
28	3	Throttle #3 Input High
28	4	Throttle #3 Input Low
29	3	Throttle #2 Input High
29	4	Throttle #2 Input Low
91	3	Throttle #1 Input High
91	4	Throttle #1 Input Low
91	8	PWM Throttle Abnormal Pulse Width
91	9	Throttle Invalid
91	14	Throttle Voltage Out of Range
94	1	Fuel Supply Pressure Extremely Low
94	3	Fuel Supply Pressure Input Voltage High
94	4	Fuel Supply Pressure Input Voltage Low
94	16/31	Fuel Supply Pressure Moderately High
94	18	Fuel Supply Pressure Moderately Low
97	0	Water in Fuel – Continuously Detected
97	3	Water in Fuel Signal – Voltage High
97	4	Water in Fuel Signal – Voltage Low
97	16	Water in Fuel Detected
100	1	Engine Oil Pressure Extremely Low
100	3	Engine Oil Pressure Input Voltage High
100	4	Engine Oil Pressure Input Voltage Low
100	18	Engine Oil Pressure Moderately Low
102	3	Manifold Air Pressure Input Voltage High
102	4	Manifold Air Temperature Input Voltage Low
105	3	Manifold Air Temperature Input Voltage High

SPN	FMI	Description
105	4	Manifold Air Temperature Input Voltage Low
105	16	Manifold Air Temperature Input Voltage High
110	0	Engine Coolant Temperature Extremely High
110	3	Engine Coolant Temperature Input Voltage High
110	4	Engine Coolant Temperature Input Voltage Low
110	16	Engine Coolant Temperature Moderately High
111	1	Engine Coolant Level Low
158	17	ECM Power Down Error
174	3	Fuel Temperature Input Voltage High
174	4	Fuel Temperature Input Voltage Low
611	3	Injector Shorted to Power Source
611	4	Injector Wiring Shorted to Ground
620	3	Sensor Supply Voltage High
620	4	Sensor Supply Voltage Low
627	1	Injector Supply Voltage Problem
629	12/13	ECM Error
636	2	Cam Position Input Noise
636	8	Cam Position Input Missing
636	10	Cam Position Input Pattern Error
637	2	Cam Position Input Noise
637	8	Cam Position Input Missing
637	7	Crank Position/Cam Position Out of Sync
637	10	Crank Position Input Pattern Error
651	5	Cylinder #1 EUI Circuit Open
651	6	Cylinder #1 EUI Circuit Shorted
652	5	Cylinder #2 EUI Circuit Open
652	6	Cylinder #2 EUI Circuit Shorted
653	6	Cylinder #3 EUI Circuit Open
653	5	Cylinder #3 EUI Circuit Shorted
654	6	Cylinder #4 EUI Circuit Open
654	5	Cylinder #4 EUI Circuit Shorted
655	6	Cylinder #5 EUI Circuit Open
655	5	Cylinder #5 EUI Circuit Shorted
656	5	Cylinder #6 EUI Circuit Open
656	6	Cylinder #6 EUI Circuit Shorted
970	2	Auxiliary Engine Shutdown Switch Signal Invalid
970	31	Auxiliary Engine Shutdown Switch Active
971	31	External Fuel De-Rate Switch Active
1109	31	Engine Shutdown Warning
1110	31	Engine Shutdown
1569	31	Fuel De-rate
2000	13	Security Violation
3133	4	PLD Transducer – under 13 psi

- The PowerView diagnostic gauge can have communication problems that result in Error Codes being shown on its LCD display window. The following Error Codes all indicate that there is a Diagnostic Gauge communication error with the ECM. Contact your servicing dealer for help in correcting these codes:
 - EE – Error XXXXX – EP No Data
 - ACP – Err XXXXX - BO No Addr No Data
 - ACP – Err XXXXX - BR BUS – EP No Data

11. Additional Information

11.1. Parts Information

11.1.1. Spare Parts

To ensure best operation and efficiency of all engine components, always use genuine Clarke spare parts.

Contact a local Clarke Service Dealer for parts pricing and availability.

- **Service Dealer Locator:** Clarkefire.com/home/service/service-providers/service-dealer-locator
 - Parts Requests should specify the Clarke Engine Serial number.

Support Contacts

• **CLARKE FIRE PROTECTION PRODUCTS, INC.**
TEL: +1-513-475-3473
Parts@ClarkeFire.com
100 PROGRESS PLACE
CINCINNATI, OHIO 45246
UNITED STATES OF AMERICA

• **CLARKE FIRE PROTECTION PRODUCTS, LTD.**
TEL: +44-1236-429-946
CUKParts@ClarkeFire.com
UNIT 1, GRANGE WORKS LOMOND RD
COATBRIDGE, SCOTLAND ML5 2NN
UNITED KINGDOM

11.1.2. Engine Maintenance Parts List

- Contact Clarke Fire Customer Support for maintenance parts.
Parts Requests should specify the Clarke Engine Serial number.
- More information on genuine Clarke spare parts can be view on: <https://clarkefire.com/home/parts/parts>

11.1.3. Parts Illustration Drawing

The Parts Illustration Drawing is engine serial number specific and can be located inside the document bag shipped with the engine.

11.2. Owner Assistance

Consult Clarke Service Dealer or Factory. Service Dealers can be located by going to our website.

Service Dealer Locator: Clarkefire.com/home/service/service-providers/service-dealer-locator

11.3. Warranty

11.3.1. General Warranty Statement

The satisfactory performance of Clarke engines and the goodwill of owners / operators of Clarke engines are of primary concern to the Engine Manufacturer, the Engine Service Dealer and Clarke. All provide support of these products after final installation of the complete fire pump and sprinkler system. Warranty responsibility involves both Clarke and the Doosan(Hyundai) service organizations worldwide. The Engine Manufacturer (Doosan(Hyundai)) provides Warranty for the basic engine components and Clarke provides warranty on the accessories added to meet the NFPA-20 specifications and FM/UL certification requirements.

11.3.2. Clarke Warranty

All Clarke warranted components have warranty Duration of 24 months beginning at the Start-up date of the fire pump system. The warranty coverage includes replacement of the part and reasonable cost of labor for installation. Components failed due to improper engine installation, transportation damage, or misuse is not covered under this warranty. For additional warranty details, see the specific warranty statement "Doosan(Hyundai) New Engine Warranty" on the following page. Also contact Clarke direct if you have any questions or require additional information. Clarke is not responsible for incidental or consequential costs, damage or expenses which the owner may incur as a result of a malfunction or failure covered by this warranty.

11.3.3. John Deere Warranty

Warranty Duration

Unless otherwise provided in writing, John Deere* makes the following warranty to the first retail purchaser and each subsequent purchaser (if purchase is made prior to expiration of applicable warranty) of each John Deere new off-highway engine marketed as part of a product manufactured by a company other than John Deere or its affiliates:

- 12 months, unlimited hours of use, or
- 24 months and prior to the accumulation of 2000 hours of use; and on each John Deere engine used in an off-highway repower application:

- 12 months, unlimited hours of use.

Note: In the absence of a functional hour meter, hours of use will be determined on the basis of 12 hours of use per calendar day.

(*John Deere" means Deere Power Systems Group with respect to users in the United States, John Deere Limited with respect to users in Canada, and Deere & Company or its subsidiary responsible for marketing John Deere equipment in other countries where the user is located)

Warranty Coverage

This warranty applies to the engine and to integral components and accessories sold by John Deere.

All John Deere-warranted parts and components of John Deere engines which, as delivered to the purchaser, are defective in materials and/or workmanship will be repaired or replaced, as John Deere elects, without charge for parts or engine repair labor, including reasonable costs of labor to remove and reinstall non engine parts or components of the equipment in which the engine is installed, and, when required, reasonable costs of labor for engine removal and reinstallation, if such defect appears within the warranty period as measured from the date of delivery to the first retail purchaser, if the delivery is reported to John Deere within 30 days of the delivery.

Emissions System Warranty (Non-Road Diesel)

Refer to the corresponding Engine Manufacturers' Operation and Maintenance manual (applicable only for Emissions Certified Engines).

Obtaining Warranty Service

Warranty service must be requested of the nearest authorized John Deere engine service outlet before the expiration of the warranty. An authorized service outlet is a John Deere engine distributor, a John Deere engine service dealer, or a John Deere equipment dealer selling and servicing equipment with an engine of the type covered by this warranty. Authorized service outlets will use only new or remanufactured parts or components furnished or approved by John Deere. Authorized service locations and the name of the John Deere division or subsidiary making this warranty are listed in the Parts and Service Directory for John Deere Engines. At the time of requesting warranty service, the purchaser must be prepared to present evidence of the date of delivery of the engine. John Deere reimburses authorized service outlets for limited travel expenses incurred in making warranty service repairs in non-John Deere applications when travel is actually performed. The limit, as of the date of publication of this statement, is US \$300.00 or equivalent. If distances and travel times are greater than reimbursed by John Deere, the service outlet may charge the purchaser for the difference.

Warranty Exclusions

John Deere's obligations shall not apply to fuel injection pump and nozzles during the pump and nozzle manufacturer's warranty period on the pump and nozzles, components and accessories which are not furnished or installed by John Deere, nor to failures caused by such items. When the pump manufacturer's warranty is less than the engine warranty, John Deere will reimburse pump repair costs for warrantable-type failures during the remainder of the original engine warranty period, when so documented by the pump manufacturer's approved service outlet.

Purchaser's Responsibilities

The cost of normal maintenance and depreciation. Consequences of negligence, misuse, or accident involving the engine, or improper application, installation, or storage of the engine, or improper application, installation, or storage of the engine. Consequences of service performed by someone other than a party authorized to perform warranty service, if such service, in John Deere's judgment, has adversely affected the performance or reliability of the engine. Consequences of any modification or alteration of the engine not approved by John Deere, including, but not limited to, tampering with fuel and air delivery systems. The effects of cooling system neglect as manifested in cylinder liner or block cavitation ("pitting", "erosion", "electrolysis"). Any premium for overtime labor requested by the purchaser. Costs of transporting the engine or the equipment in which it is installed to and from the location at which the warranty service is performed, if such costs are in excess of the maximum amount payable to the service location where the warranty service performed at the engine's location. Costs incurred in gaining access to the engine, i.e., overcoming physical barriers such as walls, fences, floors, decks or similar structures impeding access to the engine, rental of cranes or similar, or construction of ramps or lifts or protective structures for engine removal and reinstallation. Incidental travel costs including tolls, meals, lodging, and similar. Service outlet costs incurred in solving or attempting to solve non-warrantable problems. Services performed by a party other than an authorized John Deere engine service dealer, unless required by law. Charges by dealers for initial engine start-up and inspection, deemed unnecessary by John Deere when operation and maintenance instructions supplied with the engine are followed. Costs of interpreting or translating services.

No Representations or Implied Warranty

Where permitted by law, neither John Deere nor any company affiliated with it makes any guaranties, warranties, conditions, representations or promises, express or implied, oral or written, as to the nonoccurrence of any defect or the quality or performance of its engines other than those set forth herein, and DOES NOT MAKE ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY OR FITNESS otherwise provided for in the Uniform Commercial Code or required by any Sale of Goods Act or any other statute. This exclusion includes fundamental terms. In no event will a John Deere engine distributor or engine service dealer, John Deere equipment dealer, or John Deere or any company affiliated with John Deere be liable for incidental or consequential damages or injuries including, but not limited to, loss of profits, loss of crops, rental of substitute equipment or other commercial loss, damage to the equipment in which the engine is installed or for damage suffered by purchaser as a result of fundamental breaches of contract or breach of fundamental terms, unless such damages or injuries are caused by the gross negligence or intentional acts of the foregoing parties.

Remedy Limitation

The remedies set forth in this warranty are the purchaser's exclusive remedies in connection with the performance of, or any breach of guaranty, condition, or warranty in respect of new John Deere engines. In the event the above warranty fails to correct purchaser's performance problems caused by defects in workmanship and/or materials, purchaser's exclusive remedy shall be limited to payment by John Deere of actual damages in an amount not to exceed the cost of the engine.

No Seller's Warranty

No person or entity, other than John Deere, who sells the engine or product in which the engine has been installed makes any guaranty or warranty of its own on any engine warranted by John Deere unless it delivers to the purchaser a separate written guaranty certificate specifically guaranteeing the engine, in which case John Deere shall have no obligation to the purchaser. Neither original equipment manufacturers, engine or equipment distributors, engine or equipment dealers, nor any other person or entity, has any authority to make any representation or promise on behalf of John Deere or to modify the terms or limitations of this warranty in any way.

11.4. Installation & Operations Data

The I&O (Installation & Operations) Data Sheet is provided inside the engine document bag shipped with the engine. The I&O Data Sheet can be downloaded on ClarkeFire.com.

11.5. Wiring Diagram

11.6. Declaration of Incorporation

This content is prepared by Clarke Fire Protection Products, INC.

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