Operation and Maintenance
Instructions Manual

JU MODEL ENGINES
With TSP-M Instrument Panel
FOR FIRE PUMP APPLICATIONS

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Check factory availability for a manual in another language.

NOTE
The information contained in this book is intended to assist operating personnel by providing information on the characteristics of the purchased equipment.

It does not relieve the user of their responsibility of using accepted practices in the installation, operation, and maintenance of the equipment.

NOTE: CLARKE FPPG Reserves the right to update the contents of this publication without notice.
1. Introduction

1.1 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).
- Engine must be sized to cover fully the maximum power absorbed by any particular driven equipment together with a safety factor on 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 with-in 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.
- Periodic running checks to ensure functionality should be kept to a maximum of ½ hour per week.

1.2 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. The JU Series identification plate is mounted on the stiffening plate that connects the two mounting feet at the rear of the engine. The JW and JX Series identification plate is mounted on right rear engine mount.

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 and JX Series, the John Deere Serial identification plate is located on the left-hand side of the engine between the intake manifold and starting motor.

Note that there are four types of identification plates, dependent on whether the engine is a “Listed/Approved” or “Non-Listed” Model. These are typical examples. (See Figure #1-1).
The Clarke eight digit model numbers reflects the base engine type, number of cylinders, cooling system, approval listing and a power rating code.

Example: JU6H-UF60
- J = John Deere base engine prepared by CLARKE
- U = base engine series (4.5 liter 4 cylinder or 6.8 liter 6 cylinder)
- 6 = 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
- 60 = A power rating code
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.

Example: JU6H-UFAARG
- **J** = John Deere base engine prepared by CLARKE
- **U** = base engine series (4.5 liter 4 cylinder or 6.8 liter 6 cylinder)
- **6** = number of cylinders
- **H** = Heat Exchanger cooled (R = Radiator)
- **U** = 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** = Non-Emissioned, C=EPA Tier 2 Certified, D=EPA Tier 3 Certified, E=EPA Interim Tier 4 Certified (EPA=USA Environmental Protection Agency)
- **54** = 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.

1.3. **Safety, Caution and Warnings**

**ATTENTION:** 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.

1.3.1. **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.

1.3.1.1. Engines must not be used for applications other than those declared under “Scope of Supply”.

1.3.1.2. 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 in Figure #1-2

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Weight lbs (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4H-UF10,12,14,20,22,24, UFAB26, NL14,20,22,24, LP20,24, JU4H-AP50,54</td>
<td>910 (413)</td>
</tr>
<tr>
<td>JU4H-UF28,30,32,34,40,42,44,50, 52,54, H8,H0,H2,J4,58, NL30,32, 34,30,42,44,50,52,54,K4,LP50,54, L4, JU6H-AP30, 34, 50, 54, 60, 84</td>
<td>935 (424)</td>
</tr>
<tr>
<td>JU4H-UF84, JU4H-LP84</td>
<td>1085 (492)</td>
</tr>
<tr>
<td>JU4H-UFAJD8, UFAJD2, UFAHDG</td>
<td>873 (396)</td>
</tr>
<tr>
<td>JU4H-UFAE0A, UFAEE8, UFADF2</td>
<td>956 (434)</td>
</tr>
<tr>
<td>JU4R-UFO9, UF11,13,19,21,23</td>
<td>982 (445)</td>
</tr>
<tr>
<td>JU4R-NL09, UF11,13,19,21,23</td>
<td>1657 (750)</td>
</tr>
<tr>
<td>JU4R-UF40,49,51,53, NL40,49,51,53, UFAEA9, E7, F1</td>
<td>1693 (766)</td>
</tr>
<tr>
<td>JU6H-UF30,32,34,40,42,44,50, 52,54, 54, 60, D2, G8,M8,M0,M2,58, KAL2, UFABLO2, L2, L8, JU6H- NL30,32,34,50,52,54,M4, LP50,54</td>
<td>1744 (791)</td>
</tr>
<tr>
<td>JU6H-UF60,62, 68,74,84,94, AAT2, ATA0, AAT8, KAS2, KAT2, KAT0, KAT8, AB76, AARG, Q8, PG, 50, KARG, Q8 PG, 50, NL60, 62,74,84,94,84, JU6H-NL94,NLARG, Q8 PG, 50, T8,T0,T2, LP60, 84</td>
<td>1844 (836)</td>
</tr>
</tbody>
</table>

**Figure #1-2**
Figure #1-3 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.

Figure #1-4 & 1-5 show the typical lifting arrangement of a base mounted engine and pump set when the base (or module) is furnished with lifting holes.

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.

1.3.2. 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.

1.3.3. 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 section 18.

1.3.4. 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.

1.3.4.1. FIRE. Put out the fire using extinguishers recommended by the manufacturer of the machine or the installation.

1.3.4.2. 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.

1.3.4.3. 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.

1.3.4.4. 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.

1.3.4.5. 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.

1.3.4.6. 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.

1.3.5. Warning Labels
Warning labels, in picture form, are applied to the engine. Their meanings are given below.
Important Note: Labels that show an exclamation mark indicate that there is a possibility of danger.

- **WARNING**
  - 60 P.S.I. MAX.
  - Heat Exchanger Maximum Working Pressure

- **WARNING**
  - PREMIXING 50% TREATED WATER AND 50% ANTI-FREEZE COOLANT SOLUTION PRIOR TO INSTALLING IS REQUIRED
  - Coolant Mixture

- **WARNING**
  - LIFTING BRACKET IS FOR ENGINE ONLY
  - Lifting Point

- **WARNING**
  - THIS EQUIPMENT STARTS AUTOMATICALLY
  - USE EAR PROTECTION
  - Automatic Start

- **WARNING**
  - KEEP GUARDS IN PLACE
  - Rotating Parts

- **CAUTION**
  - DO NOT RUN ENGINE WITHOUT AIR FILTER INSTALLED. PERSONAL INJURY OR ENGINE DAMAGE MAY RESULT.
  - Air Filter Installation

- **WARNING**
  - TO PREVENT HEATER DAMAGE, INSTALL ENGINE COOLANT BEFORE HEATER IS ENERGIZED
  - 230 VAC
    - +5% -10% SINGLE PHASE
    - 2500 W @ 10.9 A\mps
    - P/N: C122194 (JX6 Models)
    - or C122195 (JW6 Models)
  - Jacket Water Heater Voltage
2. **Installation & Operation**

2.1. **Typical Installation**

A typical Fire Pump installation is shown in Figures #2-1 & 2-2.

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 supports
8. Exhaust outlet pipe
9. Concrete base
10. Exhaust flexible connection joint/pipe
11. Air Discharge Duct from Radiator

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.

2.2. **Engine Storage**

2.2.1. **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.

2.2.2. **Extended Storage Maintenance Procedure**

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 as follows:

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 C054129).
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 BS2869 Class A2.
   (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** and complete installation in accordance with pump manufacturer’s instructions. Perform engine to pump coupling alignment. Lubricate Falk coupling with supplied grease or driveshaft universal joints with NLGI grade #1 or #2 grease at the (3) zerk fittings. (Refer to section 2.4.3 for specific alignment instructions).

2.3.2. **(Engine with Heat Exchanger Cooling) 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. **(Engine with Radiator Cooling) Connect radiator air discharge ducting** to radiator duct flange. Discharge ducting should be installed in accordance with applicable codes. A flexible duct section should be provided to isolate engine from building.

2.3.3. **Install all engine cooling system draincocks and plugs.**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/8” draincock</td>
<td>Water Heater inlet tube JU4/6H, JU4/6R</td>
</tr>
<tr>
<td>1</td>
<td>Plug RE46686</td>
<td>Oil Cooler             JU4/6H, JU4/6R</td>
</tr>
<tr>
<td>1</td>
<td>Electrode plug</td>
<td>Bottom of heat exchanger JU4/6H</td>
</tr>
</tbody>
</table>

2.3.4. Engine is typically provided with premixed coolant installed. If the engine is not provided with coolant or there is a need to top off, fill engine cooling system with coolant part # C12E170 or Clarke Coolant part # OC054129. The only acceptable substitute is COOL-GARD II TY26575. Refer to section 7.2.4 for cooling system capacity. Refer to section 7.2.5 filling procedure.

2.3.5. Engine is shipped with oil installed. For make-up oil specifications refer to section 6 Lubrication System.

2.3.6. **Connect fuel supply** and return line to fuel supply tank plumbing. Reference the Fuel System section of the Installation and Operation Data (see Page 5), 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. **CAUTION:** All diesel fire pump drivers manufactured by Clarke are designed and tested for use with only No. 2-D diesel fuel conforming to ASTM D-975. Additionally, in European countries an acceptable alternative fuel is diesel fuel conforming to EN 590. Both of these fuel specifications must contain NO (0%) bio-fuel whenever possible. Fuel supply level must meet applicable code requirements. Do not use a copper based or galvanized material for any component of a diesel fuel system. The fuel will chemically react with the zinc resulting in clogged fuel filters and injector systems.

2.3.7. **Remove protective covering** on air cleaner element.
2.3.8. **Connect jacket water heater** (if supplied) to AC power source. For JU4/6 Series the electrical supply requirements are indicated on the heater body. Connect the supplied heater connection wire directly to a customer supplied electrical junction 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 step 2.3.4 is completed.

2.3.9. **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 electrical DC connections** between the engine gauge panel terminal strip (if supplied) and the controller per the controller manufacturer’s instructions. Refer to the wiring diagram sticker located on the inside door of the engine gauge panel for proper connection of the water solenoid.

2.3.11. **Fill batteries** with electrolyte per battery manufacturer’s instructions. Connect cables between engine and batteries only after electrolyte is installed. Refer to the wiring diagram inside the engine gauge panel cover (if supplied), or appropriate wiring diagram (see Page 5), for correct positive and negative connections. Connect negative cables directly to the brass ground bolt, as indicated with tag C133445. On JU4/6 Series connect each positive cable to the large electrical post of the starter motor as indicated with tag C133443. Note: the JU4/6 Series have a separate starter motor for each battery set. On the JDFP/JW6 Series connect each positive cable to the large outer post of the manual starting contactors as indicated with tag C133443.

Always follow fire pump controller operating instructions when switching on/off battery chargers and disconnecting/reconnecting batteries from engine.

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

2.3.13. **Note:** Clarke Operation and Maintenance Instructions Manual and Clarke parts illustration pages are located inside the engine gauge panel.

2.3.14. **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. To register this engine, go to www.clarkefire.com and select Warranty Registration.
Specific Flywheel Coupling Alignment Instructions

2.4.1. Listed Driveshafts. Refer to Listed Driveshaft Installation, Operation and Maintenance Manual C132355

2.4.2. Driveshaft Installation. To check the alignment of the pump shaft and engine crankshaft centerlines for proper Parallel Offset and Angular tolerance, the driveshaft must be installed between the flywheel drive disc and the flanged hub on the pump shaft. Before removing the driveshaft guard, disconnect the negative battery cable from both batteries. Before beginning the alignment, checks and making any necessary corrections, install the driveshaft and re-torque all driveshaft connection bolts to the values given in the following table:

<table>
<thead>
<tr>
<th>MODELS</th>
<th>DRIVE SHAFT</th>
<th>BOLT SIZE / MATERIAL GRADE</th>
<th>TIGHTENING TORQUE ft-lbs (N-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4H-10,12, 14,20,22,24 AB26, AEA0, JU4R-09, 11,13,19,21,23, AEA9</td>
<td>CDS10-SC SC41 SC41A</td>
<td>7/16-20 Grade 8 (Hi-Tensile)</td>
<td>50 - 55 (68 - 75)</td>
</tr>
<tr>
<td>JU4H+28,30,32,34, 40,42,44,J4,H8, H0, H2, AEE8, AEF2, ADJ8, ADJ2, JU4R-40, AEE7, AEF1</td>
<td>CDS20-SC SC55 SC55A</td>
<td>1/2-20 Grade 8 (Hi-Tensile)</td>
<td>75 - 82 (102 - 112)</td>
</tr>
<tr>
<td>JU6H- D9, D2,30, 32, 34,KAL2</td>
<td>CDS20-S1 SC55L-A</td>
<td>1/2-20 Grade 8 (Hi-Tensile)</td>
<td>75 - 82 (102 - 112)</td>
</tr>
<tr>
<td>JU4R-50,52,54,58, JU4R- 49,51,53</td>
<td>CDS30-S1</td>
<td>3/8-24 Grade 8 (Hi-Tensile)</td>
<td>30-35 (41-48) (See Note 2)</td>
</tr>
<tr>
<td>JU6H- G8, M8, M2, M0,44,58,50,52, S4, ABL8, ABL0, ABL2, AB76, 68,60,62, 74,84,94</td>
<td>CDS30-SC SC61L-A</td>
<td>3/8-24 Grade 8 (Hi-Tensile)</td>
<td>30-35 (41-48) (See Note 2)</td>
</tr>
<tr>
<td>JU6H-AAQ8, KAQ8, AARG, KARG, AAPG, KAPG, AAS0, KAS0,KAS</td>
<td>CDS50-SC SC81A</td>
<td>7/16-20 Grade 8 (Hi-Tensile)</td>
<td>50 - 55 (68 - 75) (See Note 2)</td>
</tr>
</tbody>
</table>

2.4.2.1. Note 1: 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 number C126758, 50ml bottle.

2.4.2.2. Note 2: 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.
2.4.3. **Driveshaft Alignment.**
The following steps describe the proper way to check alignment. A small pocket scale or ruler with millimeter markings is recommended to make all measurements. (Clarke Pocket Scale part number C125781)

2.4.3.1. **(Step A)** To check the **Horizontal Parallel Offset**, the driveshaft must be in the proper orientation.

2.4.3.1.1. Rotate the shaft so the reference "AB" on the flywheel adapter disc or the circumference of the drive shaft flange (against the flywheel adapter disc) is in the 12 o’clock position shown on figure #2-3.

2.4.3.1.2. Measure from the face of the flywheel adapter disc to point E. (Point E is on the bearing bore as shown in Figure #2-3). This measurement must:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Driveshaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>58 ± 1mm.</td>
<td>CDS10-SC / SC41 / SC41A</td>
</tr>
<tr>
<td>68 ± 1.5mm.</td>
<td>CDS20-SC / SC55 / SC55A</td>
</tr>
<tr>
<td>68 ± 1.5mm.</td>
<td>CDS20-S1 / SC55L-A</td>
</tr>
<tr>
<td>92 ± 1.5mm.</td>
<td>CDS30-S1 / SC61L-A</td>
</tr>
<tr>
<td>109 ± 2mm.</td>
<td>CDS50-SC / SC81A</td>
</tr>
</tbody>
</table>

![Figure 2-3](image)

2.4.3.2. **(Step B)** With the driveshaft in the same orientation as the previous step (Step A), check the **Horizontal Angular alignment** of the shafts.

2.4.3.2.1. Measure from the mating surface of the companion hub to point G shown on figure #2-4. (Point G is the furthermost point on the bearing bore). This measurement must be equal to the measurement at point E + 0.5 mm.

![Figure 2-4](image)
2.4.3.3.  (Step C) To check the **Vertical Parallel Offset**, the driveshaft must be re-orientated.

2.4.3.3.1. Rotate the shaft 90° so the reference “CD” on the flywheel adapter disc or the circumference of the drive shaft flange (against the flywheel) is in the position shown on Figure 2-5.

2.4.3.3.2. Measure from the face of the flywheel adapter disc to point H. (Point H is the furthermost point on the bearing bore diameter). The measurement must be:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Driveshaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 ± 1mm.</td>
<td>CDS10-SC / SC41 / SC41A</td>
</tr>
<tr>
<td>70.5 ± 1mm.</td>
<td>CDS20-SC / SC55 / SC55A</td>
</tr>
<tr>
<td>70.5 ± 1mm.</td>
<td>CDS20-S1 / SC55L-A</td>
</tr>
<tr>
<td>94.5 ± 1mm.</td>
<td>CDS30-S1 / SC61L-A</td>
</tr>
<tr>
<td>112.5 ± 1mm.</td>
<td>CDS50-SC / SC81A</td>
</tr>
</tbody>
</table>

**Figure 2-5**

2.4.3.4.  (Step D) With the driveshaft in the same orientation as the previous step (Step C), check the **Vertical alignment** of the shafts.

2.4.3.4.1. Measure from the mating surface of the pump companion hub of the drive shaft to point J as shown in figure 2-6. (Point J is the same as point G, with the driveshaft rotated 90°). This measurement must be equal to the measurement at point H ± 1.

**Figure 2-6**

Note: Reinstall all guards and grease fittings before reconnecting the battery cables.
2.4.4. **Driveshaft Maintenance**
2.4.4.1. To service the driveshaft disconnect the negative battery cables, remove the top of guard and set aside.
2.4.4.2. Rotate engine shaft manually so the u-joint grease fittings are accessible.
2.4.4.3. Using a hand-held grease gun with N.L.G.I. grade 1 or 2 grease position on grease fitting. Pump with grease until grease is visible at all four cap seals.
2.4.4.4. Verify all driveshaft connecting bolts remain tight. Re-torque per 2.4.2 if necessary.
2.4.4.5. Reinstall top of guard and connect negative battery cables.
2.4.5. **Other Coupling Types**
   Consult Factory or Clarke website at www.clarkefire.com for additional information.
3. Operation

3.1. Starting and Stopping the Engine

Before starting the engine for the first time, review section 7.3.1 to ensure there is an adequate Raw Water Supply to the Engine Heat Exchanger.

3.1.1. Starting from the Pump Controller

On UL/FM engines, use the 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.

3.1.2. Manual Start from the Engine Instrument Panel

IMPORTANT: Main pump controller selector should be in the OFF position when starting from engine gauge panel. Be sure to return the selector on the main pump controller and engine gauge panel to AUTOMATIC after completing manual run.

3.1.2.1. To manually start the engine with the TSP controls, position the mode selector switch to manual run (Figure 3-1 item 1).

3.1.2.2. Press and hold the manual crank #1 button (Figure 3-1 item 2) until the engine starts, or release after 15 seconds. If the engine fails to start, wait 15 seconds. Press and hold the manual crank #2 button (Figure 8 item 3) until the engine starts, or release after 15 seconds. Repeat.

NOTE: 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).

3.1.3. Emergency Operation - (ETR Engines Only)

The Emergency Run Override (Figure 3-2 item 1), utilized only on energized to run engines, will manually switch battery voltage to the fuel run solenoid. (Positioning the switch to the right is ON.) IMPORTANT: This override should ONLY be used if the engine is configured as ETR (energized to run) AND the control board is nonfunctional.
3.1.4. **To Stop the Engine**
3.1.4.1. If engine is started from pump controller use pump controller to stop the engine.
3.1.4.2. If engine is started from engine TSP, return mode selector switch run (Figure 3-1 item 1) to AUTOMATIC/MANUAL STOP position. Close cooling system manual by-pass valve if opened. IMPORTANT: DO NOT leave the MODE SELECTOR switch in the MANUAL RUN position during AUTOMATIC operation. (The controller will be unable to stop the engine and DAMAGE MAY RESULT).

3.1.5. **Emergency Stop Instructions**
If energized to stop solenoid fails, you will NOT be able to stop the engine from the instrument control panel or fire pump controller. Use the emergency stop knob to choke off fuel supply and shut the engine down. Reference Figure 3-3. The emergency stop knob is located on the opposite side of the engine of the instrument panel.

3.2. **Weekly Test**
An experienced operator should always be present during the weekly test.

NOTE: This engine is designed to operate at rated load conditions. For testing purposes, the engine can be run at lower load (lower flow) conditions. Running times in any one period should not exceed 30 minutes maximum.

3.2.1. **Before starting the engine** make sure of the following:
3.2.1.1. The operator has free access to stop the engine in an emergency.
3.2.1.2. The plant room ventilation ducts are open and the engine has good access for air.
3.2.1.3. All the guards are in position and, if not, for whatever reason, any rotating parts will be free and clear without restriction.
3.2.1.4. 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.
3.2.1.5. Heat Exchanger Cooling: The water supply for coolant is available again without restriction.
3.2.1.6. Radiator Cooling: The air supply for cooling is available again without restriction.

3.2.2. **When engine is running** make sure of the following are within the limits specified on the relevant Installation & Operation Data Sheet in the Technical Catalog, C133295(see Page 5):
3.2.2.1. **Coolant temperature.**
If the coolant temperature is excessive, check cooling loop strainers, functioning thermostat and condition of heat exchanger tube bundle.
3.2.2.2. **Oil pressure**
3.2.2.3. **Raw cooling water flow**
4. **Fuel System**

4.1. **Diesel Fuel Specification**

4.1.1. 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.

4.1.2. 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.

4.1.3. To insure engine reliability and performance, the fuel provided for Clarke fire pump drivers must be maintained in a quality condition. Refer to NFPA 25 2014, 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.

4.2. **Bleeding the Fuel System**

CAUTION: Escaping fluid under pressure can penetrate the skin causing series 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. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source. Ref Figure 4-1

![Figure 4-1](image1)

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.

4.3. **Bleeding JU4/6-UF, NL Engine Series:**

4.3.1. At Fuel Filter / Supply Pump (JU4/6-UF, NL Engine Series)

4.3.1.1. Loosen the air bleed vent screw (A) two full turns by hand on fuel filter base. Ref. Figure 4-2

4.3.1.2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles. Ref. Figure 4-3.

4.3.1.3. 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.

4.3.1.4. Start engine and check for leaks.

![Figure 4-2](image2)  ![Figure 4-3](image3)

If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.

4.3.2. At Fuel Injection Pump (JU4/6-UF, NL Engine Series)

4.3.2.1. Slightly loosen fuel return line connector (A) at fuel injection pump. Ref figure 4-4
4.3.2.2. Operate fuel supply pump primer lever until fuel, without air bubbles, flows from fuel return line connection.
4.3.2.3. Tighten return line connector at 16N-m (12 lb-ft).
4.3.2.4. Leave hand primer in the inward position toward cylinder block. Ref. Figure 4-5.

4.4. Changing the Fuel Filter Cartridges
Change the cartridges and bleed any air from the fuel system as per instructions given in section 4.2. 
Fuel filter changes should take place as per recommendations and only use 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 out with it normal operating parameters.
- The fuel tank condensation trap has not been drained in line with manufacturer’s recommendations.

4.4.1. JU4/6-UF, NL Engine Series
4.4.1.1. Close fuel shut-off valve, if equipped
4.4.1.2. Thoroughly clean fuel filter assembly and surrounded area.
4.4.1.3. Loosen drain plug (C) and drain fuel into a suitable container. Ref figure 4-13
Note: Lifting up on retaining ring and rotate it helps to get past raised locators.
4.4.1.4. Firmly grasp the retaining ring (A) and rotate it counterclockwise ¼ turn. Remove ring with filter element (B). Ref figure 4-13
4.4.1.5. Inspect filter mounting base for cleanliness. Clean as required.
Note: Raised locators on fuel filter canister must be indexed properly with slots in mounting base for correct installation.
4.4.1.6. Install new filter element onto mounting base. Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.
4.4.1.7. 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.
4.4.1.8. Align keys on filter element with slots in filter base.
4.4.1.9. 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.
4.4.1.10. Open fuel shut-off valve and bleed the fuel system. Tighten bleed plug (D). Reference Figure 4-13
4.5. **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.

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Feet</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4 / JU6</td>
<td>4.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

### Maximum Allowable Fuel Head above Fuel pump, Supply or Return.

4.6. **JU4/6 Fuel Injection Pump Components**

4.6.1. **Injection Pump Tag**

**THIS TAG IS SUPPLIED ON ALL JU4 AND JU6 ENGINES**

The above tag is stamped to identify the “As Built” Components. Refer to the next two tables to identify: Table 1) Droop Spring Part Number by Engine Model and Speed. Table 2) Run-Stop Solenoid (Internal to Injection Pump) Part Number by engine voltage.
### 4.6.2. Injection Pump “Droop Spring” Part Number

<table>
<thead>
<tr>
<th>Model</th>
<th>RPM</th>
<th>1760 / 2100 / 2350</th>
<th>2350 / 2600</th>
<th>2800 / 2960 / 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4H-UF10, JU4R-UF09, JU4R-UF11, JU4H-UF20, JU4R-UF19, JU4R-UF21, JU4H-LP20, JU4R-UF23, JU4H-UFADJ8, JU4H-UFADJ2, JU4H-UFAEA0, JU4H-UFAEA8, JU4H-UFAEF2, JU4R-UFAEA9, JU4R-UFASE7, JU4R-UFAF1</td>
<td>13563 or C02353</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JU4R-UF13, JU4H-UF14, JU4H-UF24, JU4H-UFAB26</td>
<td>24339</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JU4H-UF12, JU4H-UF22, JU4H-UF32, JU4R-UF42, JU4R-UF51, JU4H-UF52, JU4H-UFH2</td>
<td>13563 or C02353</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JU4H-UF30, JU4H-UF40, JU4R-UF40, JU4H-UF50, JU4H-UFH8, JU4H-UFH0, JU4R-UF49</td>
<td>20357</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 4.6.2.1. Run-Stop Solenoid Part Number

<table>
<thead>
<tr>
<th>ETR</th>
<th>ETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Volt</td>
<td>SD26214 or C07853</td>
</tr>
<tr>
<td>24 Volt</td>
<td>SD26387 or C07826</td>
</tr>
</tbody>
</table>

Legend: (ETR- Energized to Run) (ETS- Energized to Stop) (SD#- Stanadyne Part) (C#- Clarke Part#)
5. **Air/Exhaust System**

5.1. **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.

5.2. **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 in Technical Catalog (see Page 5). This data can be used for proper sizing of inlet and outlet louvers.

5.3. **Standard Air Cleaner**

The standard air cleaner is a reusable type. Should a situation occur where the air cleaner becomes plugged with dirt (starving the engine of air), loss of power and heavy black smoke will result; the air cleaner should be serviced immediately. See section 17 for air cleaner part numbers by Clarke Engine Model.

<table>
<thead>
<tr>
<th>Base Engine</th>
<th>Speed</th>
<th>Air Filter Restriction (Inches of Water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All JU4</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>All JU6 except for below</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>UF30, UFABL8, UFM8, UF58, UF68, UFAAPG</td>
<td>1470</td>
<td>10</td>
</tr>
<tr>
<td>UFD0, UFD2, UF30, UF32, UFABL0, UFABL2, UFM0, UFM2, UF50, UF52, UF60, UF62</td>
<td>2350</td>
<td>13</td>
</tr>
<tr>
<td>UFD2, UF32, UFABL2, UFM2, UF52, UF62</td>
<td>2600</td>
<td>13</td>
</tr>
<tr>
<td>JU6H-UF94, UFKAS2, UFAAT8, UFKAT8, UFAAT0, UFKAT0, UFAAT2, UFKAT2</td>
<td>ALL</td>
<td>13</td>
</tr>
</tbody>
</table>

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:

1. The pre-oiled reusable elements are serviced with a special oil. The elements can be serviced or replaced.
2. Figure 5-1 shows the air filter service instructions.
3. When servicing the element is not practical, you can improve filter efficiency by re-spraying with oil.

NOTE: Do not attempt this while engine is running

NOTE: Do not over oil the reusable element
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.
5.4. **Crankcase Ventilation**

5.4.1. **Open Crankcase Ventilation** (Refer to Figure 5-6)

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 expelled through a vent pipe attached to the rocker cover breather element. (Ref. Figures 5-2 & 5-3).

5.4.2. **Crankcase Ventilation System**

A crankcase ventilation system allows for the recirculation of vapors (expelled through a vent pipe attached to the rocker cover breather element) to the combustion air inlet. Refer to figure 5-4.

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Open Crankcase Ventilation</th>
<th>Crankcase Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models</td>
<td>Standard</td>
<td>Optional</td>
</tr>
</tbody>
</table>

**Figure 5-2**

JU4H-UF10, 12, 20, 22, UFADA0, JU4-LP20, 24

**Figure 5-3**

JU4H-UF30, 32, 40, 42, 50, 52, H8, H0, H2, 58, UFADJ8, ADJ2, ADE8, ADF2, ADHG, LP50, 54, & all JU6H

**Figure 5-4**

**Figure 5-6**
5.5. **Exhaust System**

5.5.1. 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 (see Page 5) for exhaust data. Also refer to table below for maximum exhaust restriction.

<table>
<thead>
<tr>
<th>Base Engine</th>
<th>Speed</th>
<th>Exhaust Backpressure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>All JU4</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>All JU6 except for models below</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>UF34, UF54, UFAB76, UF84</td>
<td>2800</td>
<td>25</td>
</tr>
<tr>
<td>UF34, UF54, UF84</td>
<td>3000</td>
<td>25</td>
</tr>
<tr>
<td>UF30, UFG8, UFABL8, UFM8, UF58, UF68, UFAAPG</td>
<td>1470</td>
<td>20</td>
</tr>
</tbody>
</table>

5.5.2. Installation of Exhaust System should consist of the following:

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

5.5.3. 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.

5.5.3.1. Blue Smoke – Possible engine oil consumption.
5.5.3.2. White Smoke – Possibility of water in cylinders, water in fuel or internal engine problem.
6. **Lubrication System**

6.1. **Checking Sump Oil**

Check the sump oil level using the dipstick on the engine as shown in Figure 6-1.
This level must always be between the dipstick marks Min. and Max. with the engine not running.

![Figure 6-1](image1)

6.2. **Changing Engine Oil**

6.2.1. Operate the engine until it is warm.
6.2.2. Stop the engine. Remove the sump drain plug and drain the lubricating oil from the sump. Fit the drain plug tighten the plug to 34 Nm (25lbf-ft) / 3.5 kgf-m.
6.2.3. Fill the sump to the “FULL” mark on the dipstick with new and clean lubricating oil of an approved grade.
6.2.4. Return the unit back into service by returning the AEC selector to “automatic” position and the manual operating lever to manual stop position.
6.2.5. Dispose used oil properly.

6.3. **Changing Oil Filter Cartridge**

6.3.1. Turn engine off.
6.3.2. Put a tray under the filter to retain spilt lubricating oil.
6.3.3. Remove the filter with a strap wrench or similar tool. Then dispose of the filter properly (Ref Figure 6-3).
6.3.4. Clean the filter head.
6.3.5. Add clean engine lubricating oil to the new filter. Allow the oil enough time to pass through the filter element.
6.3.6. Lubricate the top of the filter seal with clean engine lubricating oil.
6.3.7. Fit the new filter and tighten it by hand only. Do not use a strap wrench.
6.3.8. 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.
6.3.9. 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.
6.3.10. 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.

![Figure 6-3](image2)
6.4. **Oil Specification**
   This engine is factory-filled with John Deere Engine Break-in Oil.
   Important: 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.

6.4.1. 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.

6.4.2. 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.

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

<table>
<thead>
<tr>
<th>Oil spec to be used for all engine models</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="API Symbol" /></td>
</tr>
</tbody>
</table>

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

### 6.5. Oil Capacities (Including Filter)

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Oil Capacity - Quarts (Liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4 – All Models (except JU4H-UF14, UF24, UF34, UF54, JU4R-UF13, UF23, UF53)</td>
<td>15.0 (14.2)</td>
</tr>
<tr>
<td>JU4H-UF14, UF24, UF34, UFJ4, UF54, JU4R-UF13, UF23, UF53</td>
<td>16.0 (15.1)</td>
</tr>
<tr>
<td>JU6 – All Models (except JU6H-UFAARG, KARG, AAPG, KAPG, AAS0, KAS0, AAQ8, KAQ8, JU6R-UFAARF, KARF, AAPF, KAPF, AAS9, KAS9, AAQ7, KAQ7)</td>
<td>19.7 (18.6)</td>
</tr>
<tr>
<td>JU6H-UFAARG, KARG, AAPG, KAPG, AAS0, KAS0, AAQ8, KAQ8, JU6R-UFAARF, KARF, AAPF, KAPF, AAS9, KAS9, AAQ7, KAQ7</td>
<td>32.3 (30.6)</td>
</tr>
</tbody>
</table>
7. Cooling System

7.1. Intended Engine Operating Temperature
The JU engines are provided with either a heat exchanger or radiator to maintain the engine coolant temperature within recommended operating guidelines.

7.1.1. Operating Temperature
The JU4H and JU6H have an intended engine operating temperature of 160º F (71ºC) to 185º F (85º C).

7.1.2. High Coolant Temperature Alarm
A high coolant temperature switch is provided to indicate a high coolant temperature alarm at 205º F (96º C) for heat exchanger cooled models and 215ºF (102° C) for radiator cooled models.

7.2. Engine Coolant
The following information is provided as a guide for Clarke Engine users in the selection of a suitable coolant.

7.2.1. Per recommendations from the engine manufacturers, it has become necessary that engine coolants be changed every 12 months using coolant part # C12E170 or Clarke Coolant (part # C054129).

7.2.2. The only acceptable substitute is COOL-GARD II part number 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 (see Page 5) technical data section for proper cooling system capacities of each model.

7.2.3. 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.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Parts Per Million</th>
<th>Grains Per Gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride (max.)</td>
<td>40</td>
<td>2.5</td>
</tr>
<tr>
<td>Sulfates (max.)</td>
<td>100</td>
<td>5.8</td>
</tr>
<tr>
<td>Total Dissolves Solids (max.)</td>
<td>340</td>
<td>20</td>
</tr>
<tr>
<td>Total Hardness (max.)</td>
<td>170</td>
<td>10</td>
</tr>
</tbody>
</table>

7.2.4. Coolant Capacities
Use coolant part # C12E170 or Clarke Coolant (part # C054129).
The only acceptable substitute is COOL-GARD II (part # TY26575).

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Coolant Capacity - Quarts (Liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JU4H</td>
<td>13.2 (12.5)</td>
</tr>
<tr>
<td>JU6H</td>
<td>19.5 (18.5)</td>
</tr>
<tr>
<td>JU4R-UF09, 11, 13, 19, 21, 23, UFAEA9, AEE7, AEF1</td>
<td></td>
</tr>
<tr>
<td>JU4R-UF40, 49, 51, 53</td>
<td>18.0 (17.0)</td>
</tr>
<tr>
<td>JU6R-UFAAD9, D1, 29, 31, M7, M9, M1, 57, 49, 51, 33, 53</td>
<td>20.0 (19.0)</td>
</tr>
<tr>
<td>JU6R-UFAAPF, Q7, RF, 83, 59, 61, 59</td>
<td>43 (40.7)</td>
</tr>
</tbody>
</table>
7.2.5. **Procedure for Filling Engine Coolant**

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 see section 9.0 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.

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

7.2.5.1. Engines without Coolant Recovery Tank  (Figure 7-1)

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.

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.

![Figure 7-1](image-url)
7.2.5.2. Engines with Coolant Recovery Tank (Figure 7-2)
Remove pressure cap from heat exchanger and fill the cooling system with a 50/50 coolant mixture to pressure cap sealing surface. Note: Use a fill rate of no more than 10 liters/min (3 gpm). Replace heat exchanger pressure cap.

Remove cap from coolant recovery tank and fill the coolant recovery tank with a 50/50 coolant mixture to a level of 100mm (4”) from bottom of the tank. Replace cap.

Start and run engine with fire pump in a no flow or low flow condition. Run engine for approximately 1 minute. Carefully remove heat exchanger pressure cap while engine is running.

Note: Caution should always be taken when removing a cap from a system under pressure.

Refill cooling system to the pressure cap sealing surface. Replace heat exchanger pressure cap.

Complete deaeration will take several warm up/cool down cycles. Always check appropriate coolant level in coolant recovery bottle.

Figure 7-2

7.3. Providing Adequate Raw Water Supply to the Engine Heat Exchanger
7.3.1. Raw Water Supply
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.

7.3.2. 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 7-3 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.

NOTE: VT type pumps applications do not require a solenoid valve in the Automatic flow line.
NOTE: With the Touch Screen Panel for Mechanical Engines, the raw water solenoid will remain energized for 60 seconds [standard factory setting] to allow raw water to flow through the heat exchanger and reduce the heat soak rise caused in the engine.

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 7-3. 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.

Note: See section 7.3.2.3 regarding strainer maintenance.

7.3.2.1. 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.

7.3.2. 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:

7.3.2.1. A visual flow indicator and temperature indicator are installed in the discharge (waste outlet) piping.
7.3.2.2. 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.
7.3.2.3. 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.

7.3.2.3. 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. Refer to Figures 7-3 and 7-4 for location of sensors. 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 Figures 7-3 and 7-4 for location of switch. If either of these alarms are active, it indicates that the cooling system’s capability may be compromised.
7.3.2.4. **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.

7.3.2.5. **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.

7.3.3. **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 7-5 for heat exchanger cooled engines and 7-6 for radiator cooled engines for flow path diagrams.

---

**Figure 7-5**

*Heat Exchanger cooled engines*
7.3.4. **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.

- The coolant should be drained (after de-energizing the coolant heater)
- Replace the engine thermostat(s)
- 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.
- Run the engine to verify normal operating temperature.

7.3.4.1. 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

8.1.1. Wiring Diagram [TSP-M]
C073082 - Refer to TSP-M Operators Manual for more information (document C138534)

8.1.2. Checking 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. Refer to Figure 8-1.

8.1.2.1. To adjust Belt Tension:
- 8.1.2.1.1. Check belt tension: Give at arrow must be 0.4'' - 0.6'' (10-15mm).

8.1.2.2. To increase tension of the water pump driving belts:
- 8.1.2.2.1. Loosen alternator or belt tensioner mounting bolts A and B.
- 8.1.2.2.2. Adjust to proper belt tension.
- 8.1.2.2.3. Tighten mounting bolts A and B.

Figure 8-1

8.1.3. Overspeed
Overspeed is defined as 120% of rated speed for engines rated from 1470 through 2600 rpm, and 110% of rated speed for engines rated from 2800 through 3000 rpm. In the event of an engine overspeed, the TSP-M signals the main pump controller and initiates an engine shutdown. A visual overspeed notification will appear on the TSP-M touch screen display (figure #8-2). The OVERSPEED RESET BUTTON is located on the touch screen display. Should an overspeed condition occur, investigate the cause and make necessary corrections before placing engine back in service. The OVERSPEED RESET BUTTON must be pressed to reset.

NOTE: This reset operation must be completed to allow a restart. If not, the engine will not start through the main pump controller or manually.

8.1.3.1. Overspeed Verification
- 8.1.3.1.1. With the TSP in the Automatic Mode, start the engine from the fire pump controller.
- 8.1.3.1.2. Press the gear icon on the Home Screen.
- 8.1.3.1.3. Press the Verification Tests button on the Settings Menu Screen.
- 8.1.3.1.4. Enter 8705 on the Password Screen. Press OK.
- 8.1.3.1.5. Press "Run Test" for Engine Over Speed.

The display will go to the Home Screen, highlight the tachometer and display a verification warning message for Over Speed Alarm. The engine will shut down and remain locked out from re-starting. An alarm signal will be sent to the fire pump controller on interconnect terminal #3.

8.1.3.1.6. Press the Over Speed Reset Button (Figure 8-2) on the home screen to return the engine to normal function. 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.)

8.1.4. **Magnetic Pick-Up**
A magnetic pick-up, mounted in the flywheel housing, provides the input signal for the TSP-M control board. There should be a 0.03” air gap between the top of the ring gear and the center of the magnetic pick-up. With one tooth centered in the magnetic pick-up hole, thread the pickup in until it touches the gear tooth and then back it out 1 turn. Tighten jam nut while holding the pickup in position. Reconnect to wiring harness.

8.1.5. **TSP-M Troubleshooting**
The TSP-M is capable of generating alarms for specific engine conditions.
- Overspeed
- Low Oil Pressure
- High Engine Temperature
- Low Engine Temperature
- Low Raw Water Flow
- High Raw Water Temperature
- PLD Failure


8.1.6. **Field Simulation of Pump Controller Alarms**
Pump controller alarms can be simulated by the TSP-M by accessing the Verification Tests screen via the Settings Gear Icon on the Home Screen.


8.1.7. **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

Refer to Clarke drawing (see Page 5) for additional information on Clarke supplied batteries.

8.2. **Engine Speed Adjustment**
A mechanical governor controls the engine speed. The governor is built into the fuel injection pump. All governors are adjusted to the rated speed at nameplate power or maximum allowed pump load before leaving Clarke. During Start-Up Inspection or when placing reconditioned units into service, some minor speed adjustment may be required. It is recommended that this adjustment be performed by the authorized Service Dealer representative.

8.2.1.1. **To adjust the speed of the engine:**
8.2.1.1.1. Start the engine by following the “To Start Engine” Procedure in this manual.
8.2.1.1.2. Let the engine warm-up. Loosen the jam nut(s) (Figure 8-3)
8.2.1.1.3. While observing the instrument panel tach rotate the long adjustor clockwise to lower the RPM and counter clockwise to raise the RPM’s until desired speed is obtained. Ref. Figure 8-3.
8.2.1.1.4. Holding secure the long adjustor with a wrench tighten the jam nut.
8.2.1.1.5. Stop engine by following “To Stop Engine” Procedure in this manual.

If the engine has been designed and tested for range rating, stamp the metal tag titled “FIELD SETTING” with the final adjusted speed, horsepower, and 67% overspeed verify shutdown setting and keep with the engine. Refer to Figure 8-4.
9. Maintenance Schedule

NOTE: The following Routine Maintenance schedule is based on an engine usage rate not exceeding 2 hours per month. For UL/FM engine models, also refer to NFPA25.
The Maintenance Schedule Checklist is an optional document to record Clarke Fire specific maintenance items.
Based on NFPA 25 and Clarke Fire maintenance requirements, document C13768 was created for customer and technician record keeping purposes. The PDF can be downloaded from ClarkeFire.com

9.1. Weekly Maintenance Items

9.1.1. Check the Air Filter for rips, crushed elements or extreme dirt. A dirty filter can make it more difficult for the engine to draw in air and effect the power output.

9.1.2. Check the Battery electrolyte level and cable connections.

9.1.3. Check the Coolant Hoses for rips, splitting, collapses or bulges.
The heater system typically contains two to four hoses.
The heat exchanger assembly typically contains three to six hoses.

9.1.4. Check the Coolant Level.

9.1.5. Check the Fuel Tank. Inspect the outside of the container for signs of deterioration or leaks. This visual inspection is intended to be a routine walk-around and includes the tank's piped connections, supports and foundations.

9.1.6. Check the Jacket Water Heater. The heater should be warm to the touch. Confirm there is no discoloration to the outside of the heater assembly. Discoloration could indicate an overheating heater assembly.

9.1.7. Check the Lubrication Oil Level. The level must always be between the dipstick marks Min. and Max. with the engine not running.

9.1.8. Remove water from the fuel filter by opening the valve under the filter and let water and sediment flow until fuel comes out.

9.1.9. Check the Not In Auto Warning Light. Ensure the warning bulb is functional by changing the mode selector switch to the manual mode position.

9.1.10. 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 normally open.

9.1.11. Check and Clean the Y-strainer screens. With the engine off, close the manual valves to restrict flow to the cooling loop. Remove the endcaps on the y-strainer assembly and pull the screens. Clean the screens and ensure there is no containments or restrictions inside the y-strainer. Replace the screens, install the endcaps and return the manual valves to the normal position.

9.1.12. Run the engine.
Starting Method: From the Fire Pump Controller using test feature or actual pressure drop.
With the engine instrument panel in the automatic mode, start the engine from the pump controller using a test feature or pressure drop.

9.1.12.1. The engine is designed to operate at rated load conditions. For testing purposes, the engine can run at lower load (lower flow) conditions. Running times in any one period should not exceed 30 minutes maximum.

9.1.12.2. When the engine is running make sure that the coolant temperature, oil pressure and raw water flow are within limits specified on the relevant Installation & Operation Data Sheet.

9.1.13. Check the Operating Gauges on the engine instrument panel.

9.1.14. Check the Cooling Loop Raw Water Solenoid for operation while the engine is running.

9.1.15. Check the Heat Exchanger Discharge for free flow of water.

9.1.16. Check the Exhaust System for leaks, proper support and operational rain cap.

9.1.17. General Inspection for excessive noise, adequate ventilation, missing items, fluid leaks or anything broken.

9.2. 6 Month Maintenance Items

9.2.1. Clean the Battery posts and cable connectors. Use baking soda and water or battery cleaner to clean the terminals and battery surfaces. Use terminal spray or Vaseline on the terminals to minimize corrosion.

9.2.2. Check the Battery Charging Alternator for proper operation.

9.2.2.1. Disable the pump controller battery chargers.

9.2.2.2. Read the battery voltage with the engine off. (ex: 12 or 24 vdc)

9.2.2.3. Read the battery voltage with the engine running. (ex: 14-15 or 27-29 vdc)

9.2.2.4. Compare the readings to determine if the alternator is charging.

9.2.2.5. Enable the pump controller battery chargers
9.2.3. **Check the Belt** for proper tension, alignment, signs of fraying or cracks.

9.2.4. **Check and Clean the Y-strainer screens.**

9.2.5. **Check the Driveshaft U-joints or Coupling.** Visual inspection to ensure they are not loose and check the set screws. Disable the pump controller battery charger and disconnect negative battery cable before removing the driveshaft guard and inspecting the driveshaft. **IMPORTANT:** Return engine and pump controller to normal / automatic mode once check is complete.

9.2.6. **Check the Fuel Lines** for leaks, breaks, bends or inconsistencies.

9.3. **1 Year Maintenance Items**

9.3.1. **Clean or Replace the Air Filter.**

9.3.2. **Clean the Fuel Lift Pump Strainer.** DP and DQ engines only.

9.3.3. **Check the Crank Case Vent System** to make sure it is open and not kinked.

9.3.4. **Lubricate the Driveshaft U-joints and check alignment.**

9.3.5. **Replace the Fuel and Oil Filters** with OEM or Clarke branded filters.

9.3.6. **Check the Heat Exchanger Electrode.** If the length is less than one inch, replace the electrode.

9.3.7. **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.

9.3.8. **Replace the Lubricating Oil.**

9.3.9. **Replace the Coolant.** Coolant part # C12E170 or Clarke Coolant (part # C054129). The only acceptable substitute is COOL-GARD II part number TY26575. Warranty is contingent on utilizing the indicated coolant.

9.3.10. **Check the Mounting Isolators and foundation nuts.** (If applicable.)

9.3.11. **Check the Wiring System connections,** tighten if necessary.

9.4. **2 Year Maintenance Items**

9.4.1. **Replace the Air Filter.**

9.4.2. **Replace the Batteries.**

9.4.3. **Replace the Belts.**

9.4.4. **Replace the Coolant Hoses.**

9.4.5. **Replace the engine Thermostats.**

9.5. **5 year Maintenance Items**

9.5.1. **Replace the Torsional Coupling** (if applicable)

**IMPORTANT:** Set main pump controller to “OFF” while servicing engine. Before turning the main pump controller to the "OFF" position, check with the maintenance and security supervisors to verify that all the departments concerned will be alerted of the temporary interruption of their fire protection equipment for normal maintenance or testing. Also, alert the local fire department in the event that the main pump controller is connected by silent alarm to headquarters. When servicing is complete, return main pump controller selector to “Automatic” position and the mode selector on the engine to “Automatic” position. Advise the appropriate personnel the engine has been returned to the “Automatic”.
10. Troubleshooting

Consult Clarke Service Dealer or Factory. Service dealers can be located by going to our website: www.clarkefire.com. For trouble shooting pertaining to the Touch Screen Panel for Mechanical Engines (TSP-M) refer to the TSP-M Operators Manual (document C138534).

11. Parts Information

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

Orders should specify:
• Engine Model Number - See Engine General
• Engine Serial Number - Specification
• Part Number(s) Refer to Engine Maintenance Parts List section 11 or Parts Illustration (see Page 5).

Contact numbers for spare parts:
• www.clarkefire.com
• Phone USA: (513) 771-2200 Ext. 427 (calling within USA)
• Phone UK: (44) 1236 429946 (calling outside USA)
• Fax USA: (513) 771-5375 (calling within USA)
• Fax UK: (44) 1236 427274 (calling outside USA)
• E-Mail USA: parts@clarkefire.com
• E-Mail UK: dmurray@clarkefire.com

11.2. Engine Maintenance Parts List
Refer to Appendix “A” at the end of this manual.

<table>
<thead>
<tr>
<th>Engine</th>
<th>Air Filter Service Kit</th>
<th>Air Filter Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>99-5050</td>
<td>C121157</td>
</tr>
</tbody>
</table>

12. Owner Assistance

Consult Clarke Service Dealer or Factory. Service Dealers can be located by going to our website: www.clarkefire.com/home/service/service-providers/service-dealer-locator

13. Warranty

13.1. 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 service organizations worldwide.

The Engine Manufacturer (Doosan) 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.

13.2. 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 that 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 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.

13.3. John Deere Warranty

13.3.1. 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 counties where the user is located)

13.3.2. 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.

13.3.3. Emissions System Warranty (Non-Road Diesel)

EMISSIONS CONTROL SYSTEM CERTIFICATION LABEL

WARNING: Statutes providing severe penalties for tampering with emissions controls may apply at the user’s location.

The emissions warranty described below applies only to those engines marketed by John Deere that have been certified by the United States Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB); and used in the United States in equipment. The presence of an emissions label like the one shown signifies that the engine has been certified with the EPA and/or CARB. The EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas governed by the regulation agencies.
Note: The hp/kW rating on the engine emissions certification label specifies the gross engine hp/kW, which is flywheel power without fan. In most applications this will not be the same rating as the advertised vehicle hp/kW rating.

Stationary engines under the NSPS provisions are also covered, including stationary fire pump ratings. Fire pump ratings labeled under the 40 CFR part 60 (NSPS).

**U.S. EMISSIONS CONTROL WARRANTY STATEMENT (UNITED STATES ONLY)**

Emissions control-related parts and components are warranted by John Deere for five years or 3000 hours of operation, whichever occurs first. John Deere further warrants that the engine covered by this warranty was designed, built, and equipped so as to conform at the time of sale with all U.S. emissions standards at the time of manufacture, and that it is free of defects in materials and workmanship which would cause it not to meet these standards within the period of five years or 3000 hours of operation, whichever occurs first.

Warranties stated in this manual refer only to emissions-related parts and components of your engine. For complete engine warranty, less emissions related parts and components, refer to 8.3.1.

**COVERED EMISSIONS SYSTEMS AND COMPONENTS**

<table>
<thead>
<tr>
<th>System</th>
<th>Sample Sub-Systems and Components</th>
</tr>
</thead>
</table>
| Air induction system | o Air filter housing  
|                    | o Air mass sensor assembly  
|                    | o Controlled hot air intake system  
|                    | o Heat riser  
|                    | o Intake manifold  
|                    | o Intercooler  
|                    | o Turbocharger  
|                    | o Wastegate control assembly valve  |
| Fuel metering system (fuel system) | o Aneroid  
|                                 | o Carburetor  
|                                 | o Choke mechanism  
|                                 | o Electronic injection unit  
|                                 | o Fuel injection assembly  
|                                 | o Fuel injection nozzle assembly  
|                                 | o Fuel injection injector  
|                                 | o Fuel injector nozzle  
|                                 | o Fuel injection valve assembly  
|                                 | o Fuel line  
|                                 | o Gas pressure regulator  
|                                 | o Pressure relief valve/assembly  
|                                 | o Air restriction sensor  
|                                 | o Air temperature sensor  
|                                 | o Coolant temperature sensor  
|                                 | o Fuel temperature sensor  
|                                 | o Mass flow module sensor  
|                                 | o UEGO sensor  
|                                 | o Throttle  |
| Ignition control system | o Distributor assembly  
|                         | o Engine control module  
|                         | o Glow plugs  
|                         | o Ignition coil  
|                         | o Ignition control module  
|                         | o Ignition sensor  
|                         | o Ignition wires  
|                         | o Spark plugs  |
| EGR system | o EGR cooler  
|           | o EGR valve body  |
| Advanced Oxides of Nitrogen (NOx controls) | o Lean NOx catalysts  
|                                          | o Nox absorbers  
|                                          | o Reductant (urea/fuel)  
|                                          | containers/dispensing systems  |
| Catalyst or thermal reactor system | o Catalytic converter  |
### Double wall portion of exhaust system
- Exhaust manifold
- Exhaust gas recirculation valve

### Particulate Controls
- Control device enclosure and manifolding
- Regenerators
- Oxidizers
- Traps
- Filters
- Precipitators
- Manifold absolute pressure (MAP) sensor

### PCV system
- Oil filler cap
- PCV solenoid
- PCV valve
- Crankcase ventilation filter
- Crankcase ventilation valve

### Miscellaneous items used in the above systems
- Electronic control sensors
- Electronic control units (ECUs)
- ECU software
- Pump/valve controllers
- Wiring harness
- Coolant temperature sensor
- Emissions labels
- Sealing gaskets
- Thermocouples
- Thermostats
- Vacuum-sensitive valve/switches

13.3.4. 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.

13.3.5. 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.

13.3.6. 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 were 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.

13.3.7. 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 Sales 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.

13.3.8. 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.

13.3.9. 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.
13.3.10. Additional Information

For additional information concerning the John Deere New Off-Highway Engine Warranty, see booklet Engine Owner’s Warranty - Worldwide.

13.4. ATCM CALIFORNIA EMISSIONS REGULATIONS FOR STATIONARY ENGINES

NOTICE AND DISCLAIMER
FOR STATIONARY COMPRESSION IGNITION ENGINES INSTALLED IN CALIFORNIA AFTER JANUARY 1, 2005

1. This Notice and Disclaimer is an addendum to, and made a part of, Clarke’s Fire Protection Products, Inc.’s (“Clarke”) Standard Terms and Conditions of Sale and, in all respects not inconsistent therewith, also applies to all sales of stationary compression ignition engines installed in California after January 1, 2005.

2. Stationary diesel-fueled compression ignition engines installed in California after January 1, 2005 are subject to California’s Airborne Toxic Control Measure for Stationary Compression Ignition Engines (the “ATCM”), Cal. Code Regs. Title 17, Section 93115. The California Air Resources Board (“CARB”) has reviewed the emissions estimation methodology provided by Clarke Fire Protection Products, Inc. (“Clarke”) and has concluded that Clarke has used a valid methodology for estimating the emissions from engines supplied by Clarke and that the engines presumptively comply with the ATCM’s emissions standards. Clarke’s methodology used existing emissions test data associated with similar engines to estimate the emissions produced by the emergency fire pump engines supplied by Clarke.

3. CARB’s determination is not binding on the local air districts, which have primary jurisdiction for implementing and enforcing the ATCM. Actual test data in the field or other information established by the local air districts or CARB that show actual emissions from an engine supplied by Clarke in excess of the ATCM limitations could indicate a violation of the ATCM and subject the seller, owner and operator of the engine to penalties under California law. Although Clarke believes that the engines supplied by Clarke comply with the ATCM based on the available data and methodology accepted by CARB, for the foregoing reasons, Clarke cannot, and does not, guarantee that its engines will comply with the ATCM emission regulations.

4. CLARKE MAKES NO WARRANTIES OR GUARANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, THAT THE ENGINES SUPPLIED BY CLARKE WILL COMPLY WITH THE ATCM. CLARKE ALSO EXPRESSLY DISCLAIMS THAT THE ENGINES SUPPLIED BY CLARKE WILL, IN FACT, COMPLY WITH THE ATCM. IN NO EVENT SHALL CLARKE BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS OR THE ENGINES SUPPLIED BY CLARKE OR FOR INDEMNIFICATION OF BUYER ON ACCOUNT OF ANY CLAIM ASSERTED AGAINST BUYER, OR FOR ANY OTHER DAMAGE OF ANY KIND, WHETHER DIRECT OR INDIRECT, IF THE ENGINES SUPPLIED BY CLARKE DO NOT COMPLY WITH THE ATCM.

5. If Buyer resells any of the goods sold under this Agreement, Buyer shall include language in an enforceable agreement with its buyer that makes the language in this Agreement, including Clarke’s disclaimer of warranties and remedies in paragraph 5, binding on its buyer. Buyer shall defend, indemnify and hold Clarke harmless from any claims, causes of action, damages, losses or expenses (including reasonable attorney’s fees) that Clarke incurs by reason of Buyer’s failure to comply with this paragraph.

6. Each Clarke ATCM Compliant Fire Pump Driver will be affixed with the following ATCM Tier 2 Label:

7. Each Clarke ATCM Compliant Fire Pump Driver will be stamped with new fuel injection pump timing alignment marks. Refer to figure #___. Original “factory” timing marks will be “X” out.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14.</strong></td>
<td><strong>Installation &amp; Operation Data</strong></td>
</tr>
<tr>
<td></td>
<td>(See ClarkeFire.com)</td>
</tr>
<tr>
<td><strong>15.</strong></td>
<td><strong>Wiring Diagrams</strong></td>
</tr>
<tr>
<td></td>
<td>C073082 - Refer to TSP-M Operators Manual for more information (document C138534)</td>
</tr>
<tr>
<td></td>
<td>(See ClarkeFire.com)</td>
</tr>
<tr>
<td><strong>16.</strong></td>
<td><strong>Parts Illustration Drawing</strong></td>
</tr>
<tr>
<td></td>
<td>(See ClarkeFire.com)</td>
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</tbody>
</table>
### Appendix A

#### JU4H AND JU4R MODELS

<table>
<thead>
<tr>
<th>Clarke Engine Models</th>
<th>-UF10, 12, 20, 22, -AB26</th>
<th>-UF14, 24</th>
<th>-UF28, 30, 32, 40, 42, 50, 52, 58, H0, H2, H8</th>
<th>-UF34, J4, UF44, 54</th>
<th>-UF84</th>
<th>-UFAEA0, E8,F2, JU4R, UFAEA9, E7, F1</th>
<th>-UFADHG, J8, J2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JU4R-09, 11, 19, 21</td>
<td>JU4R-UF13, 23</td>
<td>JU4R-UF40, 49, 51</td>
<td>JU4R-UF33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part Description</th>
<th>Part Number (standard items only, optional items not shown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Filter</td>
<td>C04440, C04521, C04440, C04521, C04616</td>
</tr>
<tr>
<td>Fuel Filter (Primary)</td>
<td>C02359, C02549, C02359, C02549, C02883</td>
</tr>
<tr>
<td>Fuel Filter (Secondary)</td>
<td>N/A</td>
</tr>
<tr>
<td>Air Filter</td>
<td>C03249</td>
</tr>
<tr>
<td>Alternator</td>
<td>C071047 (12V) or C071048 (24V)</td>
</tr>
<tr>
<td>Fuel Injection Pump</td>
<td>C02896, C02897, C02898, C02900, C02901</td>
</tr>
<tr>
<td>Heat Exchanger</td>
<td>C051128 or C053795 or C053900 (USA built) or C051001 (UK built)</td>
</tr>
<tr>
<td>Starter Motor (12V)</td>
<td>RIGHT SIDE-C07888 AND LEFT SIDE-C07889 or RIGHT SIDE-C071071 AND LEFT SIDE-C071072</td>
</tr>
<tr>
<td>Starter Motor (24V)</td>
<td>RIGHT SIDE-C071073 AND LEFT SIDE-C071074</td>
</tr>
<tr>
<td>Switch, Oil Pressure</td>
<td>C071273 or C071884</td>
</tr>
<tr>
<td>Switch, Speed</td>
<td>C071001 or C071571</td>
</tr>
<tr>
<td>Switch, Coolant Temperature</td>
<td>C125678 or C071881</td>
</tr>
<tr>
<td>Turbocharger</td>
<td>N/A, C061634 or C061635, C061636, C061637, C061638</td>
</tr>
<tr>
<td>Thermostat</td>
<td>C052057, C051275, C052057, C051275, C052057</td>
</tr>
<tr>
<td>Nozzle, Injector</td>
<td>C02360, C02925</td>
</tr>
</tbody>
</table>
### Clarke Engine Models

<table>
<thead>
<tr>
<th>Part Description</th>
<th>Part Number (standard items only, optional items not shown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Filter</td>
<td>C04440, C04521, C04440</td>
</tr>
<tr>
<td>Fuel Filter (Primary)</td>
<td>C02359, C02550, C02359</td>
</tr>
<tr>
<td>Fuel Filter (Secondary)</td>
<td>N/A</td>
</tr>
<tr>
<td>Air Filter</td>
<td>C03396</td>
</tr>
<tr>
<td>Alternator</td>
<td>C071047 (12V) or C071048 (24V) OR C071517</td>
</tr>
<tr>
<td>Fuel Injection Pump</td>
<td>C02902 or C02903, C02904, C02905, 0C2906, C02907</td>
</tr>
<tr>
<td>Heat Exchanger</td>
<td>C051127 or C053799 or C053889 (USA built) or C051002 (UK built)</td>
</tr>
<tr>
<td>Starter Motor (12V)</td>
<td>RIGHT SIDE-C07888 AND LEFT SIDE-C07889 or RIGHT SIDE C071071 AND LEFT SIDE C071072</td>
</tr>
<tr>
<td>Starter Motor (24V)</td>
<td>RIGHT SIDE-C071073 AND LEFT SIDE C071074</td>
</tr>
<tr>
<td>Switch, Oil Pressure</td>
<td>C071273 OR C071884 OR C072011 OR C072013</td>
</tr>
<tr>
<td>Switch, Speed</td>
<td>C071001</td>
</tr>
<tr>
<td>Switch, Coolant Temperature</td>
<td>C125678 OR C071881</td>
</tr>
<tr>
<td>Turbocharger</td>
<td>C061639 or C061640</td>
</tr>
<tr>
<td>Thermostat</td>
<td>C052057, C051275, C052057</td>
</tr>
<tr>
<td>Nozzle, Injector</td>
<td>C02360</td>
</tr>
</tbody>
</table>
DECLARATION OF INCORPORATION

Product:

Description - Diesel Engines
Manufacturer - Clarke Fire Protection Products, USA
Model Number -
Serial Number -
Year of Manufacture -
Contract Number -
Customer Order Number -

Name and address of manufacturer:

Clarke Fire Protection Products, Inc.
100 Progress Place
Cincinnati, Ohio 45246
United States of America

Declaration

We hereby declare that the engine is intended to be incorporated into other machinery and must not be put into service until the relevant machinery, into which the engine is to be incorporated, has been declared in conformity with the essential health and safety requirements of the machinery Directive 2006/42/EC and consequently the conditions required for the CE Mark.

The object of the declaration described above is manufactured in accordance with the following directives:

Machinery Directive 2006/42/EC
Low Voltage Directive 2014/35/EU
EMC Directive 2014/30/EU

References to the relevant harmonized standards used:


The engine has moving parts, areas of high temperatures and high temperature fluids under pressure. In addition, it has an electrical system, which may be under strong current.

The engine produces harmful gases, noise and vibration and it is necessary to take suitable precautionary measures when moving, installing and operating the engine to reduce risk associated with the characteristics stated above.

The engine must be installed in accordance with local laws and regulations. The engine must not be started and operated before the machinery into which it is to be incorporated and/or its overall installation has been made to comply with local laws and regulations. The engine must only be used in accordance with the scope of supply and the intended applications.

Signed: Ken Wauligman - Engineering Manager

Date: 

C13944, Rev.1 253-plt18