BLACKWOOD
FIRE COMPANY

LADDER 844

DRIVER TRAINING OUTLINE

2002 KME
95' QUINT MID-MOUNT
AERIAL APPARATUS

ORGANIZED 1893

Reviewed: 06/2010

Apparatus Specifications

- Manufacturer and year of Manufacture
  - Ladder 84 – 2002 KME 95' Quint Mid Mount Aerial Apparatus

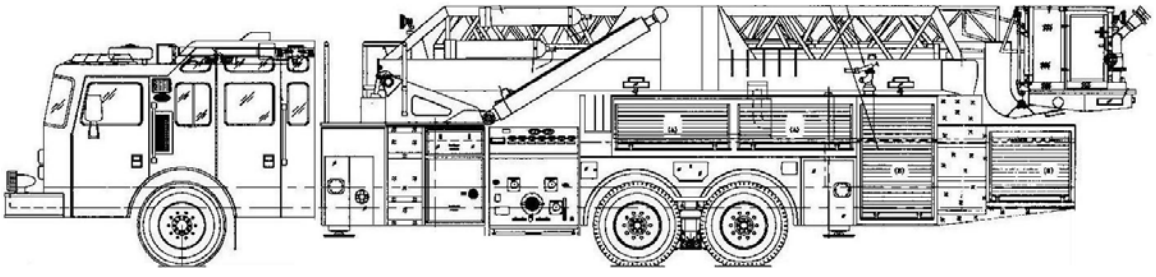
- Drive Train
  - Engine – Detroit Diesel Series 60
    - 12.7 liter, turbocharged
    - 470 hp @ 2100 rpm
  - Transmission – Allison HD4060P
    - 5 speed automatic

- Pump
  - Hale 8FG-250
    - Centrifugal Pump rated at 2500 GPM @ 150 PSI
    - Single Stage

- Water Tank
  - Capacity – 300 gallons

- Aerial Platform
  - KME 95' Mid Mount Aerialcat 5 Section Platform Ladder

- Dimensions
  - Length – 45' 8" (548 inches)
  - Width – 8' 4" (100 inches)
  - Height – 11' 0" (132 inches)
  - Wheelbase – 258"
  - Weight – 80,500 lbs. (40 ton)



Apparatus Systems

- Fuel Tank – 50 gallons
- Tow Hooks – 2 heavy duty chrome plated tow hooks bolted directly to the chassis frame with grade “8” bolts
- Air Horn Actuation
    - Steering Wheel Horn Button
    - Right Side Officer’s Push Button Switch
- Steering Column and Tilt Wheel
    - Seven (7) position tilt
    - 2.25” telescopic column with 18” steering wheel
    - Self-canceling turn signal
    - Four-way hazard switch
    - Head lamp dimmer switch
- Top Speed
    - 65 mph at governed engine RPM
- Tandem Inter-Axle Differential Lock
    - The tandem axle chassis includes and inter-axle differential lock which allows both axles to be engaged as drive axles. A flipper valve actuator and red indicator lamp are located below the instrument panel.
    - Used in slippery/inclement weather or muddy conditions to provide added traction.
- Anti-Locking Braking System (ABS) & ATC System
    - ABS provides for safer vehicle control during braking and reduced stopping distance in all skid applications.
    - Automatic traction control (ATC) is installed on the rear tandem axle and prevents wheel spin while accelerating on a slippery surface.
    - A Mud & Snow switch allows momentary wheel slip to obtain traction under mud and snow conditions.
- Brakes
    - Tandem Axle Air Brake System
        - A rapid build-up air brake system includes four (4) air reservoirs with a total of 6,204 cu. in. air capacity.
        - A parking brake on the spring actuated chambers on the rear axle brakes with a push-pull valve on the instrument panel
            - The rear axle spring brakes will automatically apply in case of air pressure drop below 60 psi.
    - Front Wheel Service Brake Lock-Up System

        - Upon application of the push-pull valve in the cab both the front air and rear spring brakes will be applied.
    - Jacobs Engine Brake
        - Jacobs engine compression brake (Jake Brake) activates upon release of the accelerator when in operation mode. (See attached manual).
    - Automatic Transmission
        - Allison HD 4060P five (5) speed automatic with electronic controls
        - Allison pressure sensitive range selector touch pad is mounted to the right of the driver within clear view and reach.
        - The transmission, upon start-up, will select four (4) speed operation. By pressing the “mode” switch on the shift pad provides five (5) speed.
- Instrumentation
    - Electronic Tachometer
    - Electronic Speedometer with digital odometer/trip odometer
    - Three function gauge:
        - Front Air Pressure
        - Rear Air Pressure
        - Fuel Level
    - Four Function Gauge
        - Oil Pressure
        - Coolant Temperature
        - Transmission Temperature
        - Volt Meter
    - Center Instrument Panel (Red Lamps)
        - Low Air System One (1) or Two (2)
        - Low Engine Oil Pressure
        - High Engine Coolant Temperature
        - High Transmission Temperature
        - Low Coolant Level
        - Air Filter Restriction
        - Low Fuel Level (activates at ¼ full)
        - Stop Engine
        - Parking Brake Set
    - Center Instrument Panel (Green Lamps)
        - Directional left and right indicators
        - Auxiliary braking device active
        - Low traction (indicates wheel slip)
        - High idle active

    - Center Instrument Panel (Yellow Lamps)
        - Check Engine
        - Check Transmission
        - ABS Brakes
        - Wait to Start
        - Water in Fuel
        - Engine Maintenance
    - Center Instrument Panel (Blue Lamp)
        - High beam headlight on
    - Audible Warning System:
        - Low Air System
        - Low Engine Oil Pressure
        - High Engine Coolant Temperature
        - High Transmission Temperature
        - Low Coolant Level
        - High and Low Voltage
        - Stop Engine
- Pump Shift Control
    - An air operated in-cab control for rapid shift is mounted in the cab and will lock in road or pump with a neutral position for use when manual override is required.
    - An emergency manual pump shift control is furnished on the left side of the pump panel which may be utilized if the air shift control does not operate.
- “Fire Commander” Pressure Governor

CAB FUNCTIONS AND INSTRUMENTATION

- Gauges
  - Air pressure
  - Both gauges should show a pressure of >80 PSI
- Volt meter
  - Gauge should show >12 volt charge
- Fuel gauge
  - Apparatus should always have >1/2 tank
- Oil pressure
  - Gauge should indicate >10 PSI at idle +>30 at 1200 RPM
- Tachometer
  - Idle speed – 500 RPM
  - Governed speed – 2000 RPM
- Transmission temperature
  - Normal operating temperature is 160-200 degrees Fahrenheit
- Water temperature
  - Normal operating temperature is 170-210 degrees Fahrenheit

EQUIPMENT OPERATING PROCEDURES

- Starting Engine
  - Insure that air and electrical shorelines have been disconnected and rewound
  - Turn master switch to “ON”
  - Turn ignition switch to “ON”
  - Depress starter button
  - Release when engine starts
- Stopping Engine
  - Shift transmission to neutral
  - Engage parking brake
  - Turn ignition switch to “OFF”
  - Turn master switch to “OFF”
  - Connect air and electrical shore lines
- Emergency Stop of Engine
  - In case of emergency or failure of engine stop control, raise red safety cover and flip toggle switch up. (switch is located right of steering column)
- Resetting emergency stop
  - Access reset lever on Turbocharger under the interior engine cover – push lever until it relocks into proper position

- Pump Operation
    - Engage pump
        - Shift transmission to neutral
        - Engage parking brake
        - Depress service (foot) brake
        - Pull up on yellow locking device and move lever to middle position then to the lowest position and release yellow locking device
        - Shift transmission to “DRIVE”
        - Observe that both green pilot lights indicating pump is engaged and listen for change in engine sound.
        - Slowly release service (foot) brake

Note: 1 pump panel light will illuminate when pump is engaged

- Review of pump panel and pump control functions
- Review of Hale pump materials
- Review of Fire Commander Governor Material

Equipment

- Hose Lines
  - Bumper Line
    - 150’ of 1 ¾” hose with 15/16” SB Nozzle
      - Flows 185 GPM @ 50 PSI
      - < 2 minutes flow on tank water
  - Pre-connected Cross Lays
    - Pre-connect 1
      - 150’ of 2 ½” hose with 1 ¼” SB Nozzle
        - Blitz Line
        - Flows 330 GPM @ 50 PSI
        - < 1 minute flow on tank water
    - Pre-connect 2
      - 300’ of 1 ¾” hose with 15/16” SB Nozzle
        - Flows 185 GPM @ 50 PSI
        - < 2 minutes flow on tank water
  - Rear Hose Bed
    - 250’ of 3” hose with 1 ½” SB Nozzle
      - Bomb Line
      - 475 GPM @ 50 PSI
      - Aprox. 40 sec. flow on tank water
    - 700’ of 5” LDH Supply Hose
      - Transverse Pack
      - Couplings align with Chute
- Body Mounted Deck Guns
  - Two body mounted Elkhart Stinger Deck Guns
    - Stacked Tips
    - Pre-Piped
    - Can be removed for portable use
    - 500 – 1,000 GPM flow Capability
- Electrical Equipment
  - Harrison 30,000-Watt Hydraulic Driven Generator
    - Harrison model MPC 30.0 rated at 30 kilowatts, 250 AMPS @ 120 VAC
    - Capable of producing the rated full-load power when driven from the vehicle PTO from high idle to maximum engine speed
    - Can be left running while truck is in motion
      - **ENGINE RPM MUST BE BELOW 900 RPM WHEN PTO IS ENGAGED.**
        - **SERIOUS DAMAGE CAN RESUT**
  - Electric Cable Reels

- One Mounted in the driver's side rear body access ladder well
  - Two hundred (200) feet of 10/4 yellow heavy duty electric cable
  - 220 volt/20 amp, electric rewind cord reels are wired to the breaker panel and reduced to 110 volt/20 amp at junction box outlets
- One mounted in the officer's side front body access ladder well
  - Two hundred (200) feet of 10/3 yellow heavy duty electrical cable
  - 120 volt/20 amp, electric rewind cord reels are wired to the breaker panel
    - Junction box located in compartment R-7

- Lighting
  - Total of 21,250 watts of scene lighting
    - Critical to firefighter safety
    - Victim Identification
    - Scene Safety
  - Light Tower
    - Will-Burt NS15-9000 "Night Scan" light tower with six (6) Fire Research 1500 watt 220 volt quartz lights is mounted on the cab roof
      - Equipped with top mounted pan and tilt device to allow light bar to achieve 360 degree lighting coverage
      - Mast extends 15' above the roof when fully extended
    - Light heads have dual tilting capabilities with each sides group of heads able to tilt independently to the front and rear of the light tower.
    - Control head located in Compartment L-4
      - On/Off Safety Switch
  - Body Mounted Lighting
    - 4 – 1,500 watt body mounted lights
      - Switched at breaker panel
      - Can be removed for portable use
        - Tripods in Transverse Compartment
  - Cab Mounted Lights
    - One 750 watt light on each side
      - Switched in cab
  - Platform Mounted Lights

        - 5 fixed mount 750 watt lights
        - 2 pole mount 500 watt lights
        - Individually switched in platform.
- Ground Ladders
    - 160’ total
        - Two 35’ 2-section extension ladders
        - One 28’ 2-section extension ladder
        - One 20’ roof ladder
        - Two 16’ roof ladder
            - One Mounted in Ladder Fly
        - One 10’ folding attic ladder

EXCERPTS FROM NJ TITLE 39
MOTOR VEHICLE CODE

39:4-91 Failure to yield to emergency vehicles, Right of way of emergency vehicles; liability of drivers. The driver of a vehicle upon a highway shall yield the right of way to any authorized emergency vehicle when it is operated on official business, or in the exercise of the driver's profession or calling, in response to an emergency call or in the pursuit of an actual or suspected violator of the law and when an audible signal by bell, siren, exhaust whistle or other means is sounded from the authorized emergency vehicle and when the authorized emergency vehicle, except a police vehicle, is equipped with at least one lighted lamp displaying a red light visible under normal atmospheric conditions from a distance of at least five hundred feet to the front of the vehicle.

This section shall not relieve the driver of any authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall it protect the driver from the consequences of his reckless disregard for the safety of others. Nothing in this section shall be construed to limit any immunity or defense otherwise provided by law.

39:4-92. Authorized emergency vehicles; clearance for; following or parking near. Upon the immediate approach of an authorized emergency vehicle giving audible signal, and equipped, as required by section 39:4-91 of this Title, and unless otherwise directed by a police or traffic officer,

(a) The driver of every vehicle shall immediately drive to a position as near as possible and parallel to the right-hand edge or curb of the highway, clear of an intersection of highways, and shall stop and remain in that position until the authorized emergency vehicle has passed and

(b) The driver or person in control of a street car shall immediately stop the car clear of an intersection of highways and keep it stationary until the authorized emergency vehicle has passed.

No driver of any vehicle other than one on official business shall follow any authorized emergency vehicle, traveling in response to an emergency call, closer than 300 feet, or drive nearer to, or park the vehicle within 200 feet of, where any fire apparatus has stopped in answer to a fire alarm.

39:4-92.1. Fire department vehicle returning to fire station; **flashing red light**. It shall be lawful for any fire department vehicle when returning to its fire station from an emergency call to display a flashing red light visible under normal atmospheric conditions from a distance of at least 500 feet to the rear of the vehicle and no driver of any vehicle other than one on official business shall follow any such vehicle displaying said light closer than 300 feet.

39:4-97. Careless driving A person who drives a vehicle carelessly, or without due caution and circumspection, in a manner so as to endanger, or be likely to endanger, a person or property, shall be guilty of careless driving.

39:4-103. Exemptions from speed regulations

Motor vehicles belonging to the military establishment, while in use for official purposes in time of riot, insurrection or invasion; all police officers, while the officers are engaged in the apprehension of violators of the law, or of persons charged with, or suspected of, a violation, are exempt from the provisions of this chapter relating to speed.

HALE MIDSHIP PUMPS

1. INTRODUCTION

A. Description

Hale single -stage and two-stage midship pumps are favorites of firefighters throughout the world. Covering a range of capacities from 750 Gallons Per Minute (GPM) (2,838 Liters Per Minute, LPM) to 2,250 GPM (8,516 LPM), Hale pumps offer the versatility, dependability, reliability, and ease of operations necessary for effective fire fighting. This section reviews the principles of operation of Hale's single -stage and two-stage midship pumps.

B. Principles of Operation

Centrifugal Force

A centrifugal pump operates on the principle that centrifugal force is created by a rapidly spinning disk. Figure 1-1 shows that an amount of water has been placed at the center of a disk. The disk is rotated at some speed, and the water is thrown from the center toward the outer circumference of the disk. The distance that the water travels from the center directly relates to the diameter of the disk and the speed of rotation. When water is confined in a closed container (such as the pump body), its pressure rises to a level that depends on the speed of rotation. There are three interrelated factors that regulate the performance of a centrifugal pump:

- SPEED (RPM). If the speed of rotation increases with flow held constant, the water pressure increases.
- PRESSURE. Pressure is usually measured in Pounds Per Square Inch (PSI) (BAR). If pressure changes with speed held constant, the flow (measured in GPM) (LPM) will change inversely, that is, if pressure increases, flow decreases.
- FLOW. Flow is usually measured in the number of gallons of water per minute (GPM) (LPM) that a pump can deliver when supplied from draft. If the pressure is held constant, the flow will increase with an increase in the speed of rotation. The centrifugal pump is preferred by the fire protection service due to its ability to fully utilize any positive suction inlet pressure, reducing the amount of work done by the pump. For example, if the required discharge pressure is 120 PSI (8 BAR), and the inlet pressure is 45 PSI (3 BAR), the pump must only produce the difference in pressures of 75 PSI (5 BAR). This contributes to low engine and pump speeds with reduced maintenance. Decreased maintenance is aided by the fact a centrifugal pump has basically only two moving parts the impeller and the shaft.

Pump Stages

The number of impellers on a common shaft determines the number of pump stages. The Hale series of single -stage pumps provides the same normal operating and rating test pressures as the Hale series of two-stage pumps. The two-stage pump provides an additional level of operating pressures if required, but adds some operating complexity.

Figure 1-1. Centrifugal Force From a Rotating Disk

Single-Stage Pump

There are three series of single -stage pumps.

- Qpak – 500 GPM to 1000 GPM

(1,892 LPM to 3,785 LPM)
- Qflo - 750 GPM to 1,250 GPM

(2,838 LPM to 4,731 LPM)
- Qmax - 1,000 GPM to 2,250 GPM

(3,785 LPM to 8,516 LPM)
(See figure 1-2)
Hale single -stage pumps are of a size and design to attach to the chassis rails of commercial and custom chassis. The pump is driven from the truck's main driveline. Generally, the pump consists of the following major components:
- Pump body
- Impeller and Shaft Components
- Gearbox
- Priming System
- Pressure Control Device
- Valves

Single-Stage Pump Operation
Hale single -stage pumps use a single impeller to develop the required volume and pressure. Figure 1-3 shows the flow of water through the Hale Qmax single-stage pump. Water enters the suction channels on both sides of the impeller, thereby maintaining axial balance. Dual cutwaters on the Qmax strip water from the rotating impeller and direct it to the discharge path. The Qflo and Qpak pumps utilize an impeller with a single suction channel where water enters. The impeller develops discharge pressure and directs the water to a single cutwater and then to the discharge valves. The impellers are radially and axially balanced. Radial hydraulic balance in the Qmax and Qtwo is maintained by the opposed discharge volute cutwaters. The cutwaters are wedge shaped and divide the water between the volute and the pump discharge.

Priming Pump
Priming pumps are used to create a vacuum: they are designed to evacuate air in the suction hose and the pump. The vacuum created allows atmospheric pressure to push water from the open source through the suction hose and into the pump. Hale centrifugal midship pumps use Rotary Vane Positive Displacement pumps for priming. A positive displacement pump moves a specified amount of air or fluid with each revolution. As shown in figure 1-14, the priming pump has a single rotor mounted off-center (eccentric) to the pump body housing. The vanes in the rotor slide in groves and are held against the body housing by centrifugal force. As a vane turns toward the discharge, it recedes into the rotor. As the rotor continues past the discharge, the vane advances outward from its groove and against the body housing. During this cycle, the space between the rotor and housing cases fills with air, and the vanes, acting as wipers, force air out of the discharge, creating a vacuum in the main pump allowing atmospheric pressure to push water into the hose and into the suction side of the main pump. A Hale priming pump has a single control that both opens the priming valve between the midship pump and the priming pump and starts the priming motor.

Priming Valves
Hale priming valves open when the primer is operated, to allow the primer to evacuate air in the pump. There are two priming valves available. The Hale Semi-Automatic Priming Valve (SPV) can be mounted directly to the priming connection on the midship pump, or can be

remotely mounted using a universal mounting adapter. When the SPV is installed, a single electric push-button on the operator's panel starts the priming pump motor. When the primer motor starts and produces a vacuum, the SPV opens. Releasing the push-button stops the priming pump and the SPV closes. The Hale PVG Priming Valve is mounted on the operator's panel. The PVG is a combination valve and switch. When the panel handle on the PVG is pulled out the valve opens and the switch energizes the primer motor. Pushing the handle de-energizes the motor and closes the valve.

B. Operating Procedures

THE PROCEDURES IN THIS SECTION ARE GENERAL OPERATING PROCEDURES. THEY DO NOT REPLACE THE PROCEDURES AND POLICIES ESTABLISHED BY YOUR FIRE DEPARTMENT, NOR DO THEY REPLACE THE RECOMMENDATIONS AND PROCEDURES PROVIDED BY THE FIRE TRUCK MANUAL.

Pumping From a Hydrant, General Operation

1. Position the truck for the best hydrant hookup and discharge hose layout.

REFER TO THE FIRE DEPARTMENT PROCEDURES ON SETTING WHEEL CHOCKS AS WELL AS LAY OUT AND CONNECTION OF SUCTION AND DISCHARGE HOSES. ALL VALVES, DRAIN COCKS, AND CAPS SHOULD BE CLOSED. NEVER ATTEMPT TO SHIFT THE PUMP TRANSMISSION WHILE THE TRUCK TRANSMISSION IS IN GEAR. ALWAYS SWITCH THE TRANSMISSION TO "N" AND VERIFY THE SPEEDOMETER IS "0" BEFORE MAKING PUMP TRANSMISSION SHIFT.

2. Bring the truck to a complete stop before you attempt to shift from road to pump.
3. Apply the truck parking brake.
4. Shift the truck transmission to the NEUTRAL position.
5. Move the in-cab pump shift control valve from the ROAD position to the PUMP position. The shift warning lights should come on in a second or two, indicating a complete shift. If the truck manufacturer has used another incab valve to achieve pump shift or has an electric switch, follow the instructions supplied with that valve.
6. After pump shift is completed, put the truck transmission in the proper pump operating range or gear. For most pumpers this will be direct drive (1:1) ratio. In addition, the speedometer should read 5 to 15 MPH after the shift has been completed. If the shift does not seem to be completed, shift truck transmission to “N” and repeat the entire procedure. Note that some vehicles drive the speedometer from the front wheel of the chassis. In this case, the speedometer will not read 5 to 15 MPH after shifting to the pump position. See the chassis manual for details.
DO NOT LEAVE THE CAB OR ATTEMPT TO PUMP UNTIL ALL THE GREEN PUMP LIGHTS IN THE CAB AND PANEL ARE ON.

7. Exit the driving compartment only after all the above steps are completed and you are sure that the shift completed lights in the cab and panel are on.

DO NOT OPEN THROTTLE UNLESS ALL GREEN PUMP INDICATOR LIGHTS ARE ON.

8. Verify that the pump panel shift indicator
green "OK TO PUMP" light is on.
9. Open the hydrant.
10. If necessary, open the suction valve.
11. If applicable, set the transfer valve to either *volume* or *pressure*, as required.
12. If necessary to eliminate air pockets open valve to let air out or prime the pump: see “Pumping From Draft” for instructions.
13. Note the intake and discharge pressures then open the engine throttle gradually until the master discharge gauge indicates the desired pressure.
14. Set the automatic relief valve according to your fire department policy. If your fire department does not have a policy to follow, see the “Relief Valve or TPM Procedures” later in this section DO NOT REDUCE THE PRESSURE ON THE INTAKE GAUGE TO ZERO; SERIOUS DAMAGE TO THE WATER MAIN COULD RESULT.
If the master intake gauge shows a vacuum before the desired discharge pressure or flow is reached, this is an indication that you are getting all the water that the hydrant will supply. To increase the pressure when this occurs, reduce the pump flow. The master intake gauge reading must be maintained at 5 PSI (.5 BAR), minimum. As the throttle is opened, the pressure gauge reading increases with the engine speed. If the engine speed increases without an increase in pressure, the pump may be cavitating. In this case, close the throttle slowly until the pressure begins to drop, and the engine returns to an idle. If this does not correct the problem you are trying to pump more capacity than is available from the hydrant.
15. Open the discharge valves.
16. If the pump overheats and is not equipped with the Hale TRV valve, open the valve to access the pump auxiliary cooling system, or slightly open the tank fill line.
17. After completion of pumping procedures, gradually reduce the pump pressure until the engine is at an idle speed. Use the “Pump to Road Shift Procedure” and “Post Operation

Procedure" provided later in this section.

Pumping From Draft, General Operation.

1. Get as close to the water source as possible. The pump can do better than its rated capacity with less than a 10-foot vertical lift. As the vertical lift increases to above 10 feet, the maximum pump capacity will be reduced.

REFER TO THE FIRE DEPARTMENTPROCEDURES IN SETTING WHEEL CHOCKS AS WELL AS LAY OUT AND CONNECTION OF SUCTION AND DISCHARGE HOSES. ALL VALVES, DRAIN COCKS, AND CAPS SHOULD BE CLOSED. NEVER ATTEMPT TO SHIFT THE PUMP
TRANSMISSION WHILE THE TRUCK TRANSMISSION IS IN GEAR. ALWAYS SWITCH THE TRANSMISSION TO "N" AND VERIFY THE SPEEDOMETER IS "0" BEFORE MAKING PUMP TRANSMISSION SHIFT.

2. Bring the truck to a complete stop before you attempt to connect suction hoses or shift from road to pump.
3. Apply the truck parking brake.
4. Shift the truck transmission to the NEUTRAL position.
5. Move the in-cab pump shift control valve from the ROAD to the PUMP position. The shift warning light should come on in a second or two, indicating a completed shift. If the truck manufacturer has used another in-cab valve to achieve pump shift, follow the instructions supplied with that valve
6. After pump shift is complete, put the truck transmission in the proper pump operating range or gear. For most pumpers this will be direct drive (1:1) ratio. In addition, the speedometer should read 5 to 15 MPH after the shift has been completed. If the shift does not seem to be completed, shift truck transmission to "N" and repeat the entire procedure. Note that some vehicles drive the speedometer from the front wheel of the chassis. In this case, the speedometer will not read 5 to 15 MPH after shifting to the pump position. See the chassis manual for details.

DO NOT LEAVE THE CAB OR ATTEMPT TO PUMP UNTIL ALL THE GREEN PUMP LIGHTS IN THE CAB AND PANEL ARE ON.

7. Exit the driving compartment only after all the above steps are completed and you are sure that the shift completed lights in the cab and panel are on.

DO NOT OPEN THROTTLE UNLESS ALL GREEN PUMP INDICATOR LIGHTS ARE ON.

8. Verify that the pump shift indicator light is on.

9. Activate the priming pump by pulling the control handle located on the pump panel or depressing the push button. The departmental manual for pumping should specify the correct RPM for priming, but in general, for priming the pump should be operated at idle with an engine speed of about 1,000 to 1,200 RPM.
10. Watch the intake and discharge master gauges. When the pump is primed, the intake indication reading falls below zero, and the discharge pressure starts to increase. You may also hear water discharging on the ground, indicating that the pump is primed.
Running the engine at speeds higher than 1,200 RPM during priming is not recommended, because it will not improve priming operation. Running the pump at higher RPM will increase wear.

IF THE DISCHARGE GAUGE READING DOES NOT INCREASE, THE INTAKE GAUGE READING DOES NOT FALL BELOW ZERO, OR THE PRIMING PUMP DOES NOT DISCHARGE WATER ON THE GROUND IN 30 SECONDS, DO NOT CONTINUE TO RUN THE PRIMING PUMP. STOP THE PUMP, AND CHECK FOR AIR LEAKS OR POSSIBLE PUMP TROUBLE.

11. After priming, select the desired transfer valve position (for two-stage pumps).
12. Gradually open the discharge valve until the water emerges as a steady stream. Then open the other discharge valves to the desired setting.
13. Open the engine throttle gradually until the desired pressure or flow is reached.

DO NOT PUMP ENOUGH WATER TO CAUSE A WHIRLPOOL AT THE STRAINER. THIS ALLOWS AIR INTO THE PUMP, RESULTING IN ROUGH OPERATION AND PULSATION. REPOSITION THE STRAINER OR REDUCE FLOW TO CORRECT THE SITUATION.

As the throttle is opened, the pressure gauge reading increases with the engine speed. If the engine speed increases without an increase in pressure, the pump may be cavitating. If the pump is cavitating, warn personnel that the pressure is being dropped. In this case, close the throttle slowly until the pressure begins to drop, and the engine returns to an idle. If this does not correct the problem, here are two possibilities that can also lead to this condition:
a. Cavitation can occur with large nozzle tips. Solve this problem by reducing flow.
b. Cavitation can also occur when you are pumping if air enters with the water. Even though the pump may be primed, air leaks can cause rough operation and an increase of engine speed without an increase in pressure or flow. If an air leak is suspected, discontinue pumping and refer to Section 4 for maintenance.
14. If a pump shutdown is desired while pumping from draft, reduce the engine speed to idle, and close the discharge valves. To resume pumping, open the throttle and discharge valves. If the pump overheats from continued churning without water flow, open the discharge valves periodically to release hot water.
15. Set the automatic relief valve according to your fire department policy. If your fire department does not have a policy to follow, see the “TPM or Relief Valve Procedures” later in this section.
16. If the pump overheats and is not equipped with the Hale TRV valve, open the valve to access the pump auxiliary cooling system, or slightly open the tank fill line.
17. After completion of pumping procedures, gradually reduce the engine RPM until it is at an idle speed. Use the “Pump to Road Shift Procedure” and “Post Operation Procedure” provided later in this section.

Pumping From the Onboard Water Tank

1. Position the truck for convenient discharge hose layout, and bring the truck to a complete stop.

REFER TO THE FIRE DEPARTMENT PROCEDURES ON SETTING WHEEL CHOCKS AS WELL AS LAY OUT AND CONNECTION OF SUCTION AND DISCHARGE HOSES.

2. Bring the truck to a complete stop before you attempt to shift from road to pump.
3. Apply the truck parking brake.
4. Shift the truck transmission to the NEUTRAL position.
5. Move the in-cab pump shift control valve from the ROAD position to the PUMP position. The shift warning light should come on in a second or two, indicating a completed shift. If the truck manufacturer has used another in-cab valve to achieve pump shift, follow the instructions supplied with that valve.
6. After pump shift is complete, put the truck transmission in the proper pump operating range or gear. For most pumpers this will be direct drive (1:1) ratio. In addition, the speedometer should read 5 to 15 MPH after the shift has been completed. If the shift does not seem to be completed, shift truck transmission to “N” and repeat the entire procedure. Note that some vehicles drive the speedometer from the front wheel of the chassis. In this case, the speedometer will not read 5 to 15 MPH after shifting to the pump position. See the chassis manual for details.

DO NOT LEAVE THE CAB OR ATTEMPT TO PUMP UNTIL ALL THE GREEN PUMP LIGHTS IN THE CAB AND PANEL ARE ON.

7. Exit the driving compartment only after all the above steps are completed and you are sure that the shift completed warning lights in the cab and panel are on.

DO NOT OPEN THROTTLE UNLESS ALL GREEN PUMP INDICATOR LIGHTS ARE ON.

8. Verify that the pump panel shift indicator light is on.
9. Open the tank suction valve.
10. For two-stage pumps, select the desired transfer valve position.
11. Check the master discharge gauge to see if priming is necessary. If necessary, start the priming pump by pulling the control handle located on the pump panel or depressing the prime push button or just crack the tank fill valve.

IF THE DISCHARGE GAUGE READING DOES NOT INCREASE, THE INTAKE GAUGE READING DOES NOT FALL BELOW ZERO, OR THE PRIMING PUMP DOES NOT DISCHARGE
WATER ON THE GROUND IN 30 SECONDS, DO NOT CONTINUE TO RUN THE PRIMING PUMP. STOP THE PUMP, AND CHECK FOR AIR LEAKS OR POSSIBLE PUMP TROUBLE.

Watch the intake and discharge pressure gauges. When the pump is primed, the compound gauge indication falls below zero, and the pressure starts to increase. You may also hear water splashing on the ground, indicating that the pump is primed.
12. Open the engine throttle gradually until the desired pressure or flow is reached. As the throttle is opened, the discharge pressure gauge reading increases with the engine speed. If the engine speed increases without an increase in pressure, the pump may be cavitating.
If the pump is cavitating, warn personnel that the pressure is being dropped. In this case, close the throttle slowly until the pressure begins to drop, and the engine returns to an idle. If this does not correct the problem, reduce flow.

DO NOT OPEN THROTTLE UNLESS ALL GREEN PUMP INDICATOR LIGHTS ARE ON.

13. Gradually open the discharge valves until the water emerges as a steady stream. Then open the discharge valves to the desired setting.
14. Set the automatic relief valve according to your fire department policy. If your fire department does not have a policy to follow, see the "TPM or Relief Valve Procedures" later in this section.
15. If the pump overheats and is not equipped with the Hale TRV valve, open the valve to access the pump auxiliary cooling system, or slightly open the tank fill line.
16. After completion of pumping procedures, gradually reduce the engine RPM until it is at an idle speed. Use the "Pump to Road Shift Procedure" and "Post Operation Procedure" provided later in this section.

Pumping In Relay

Relay operations are necessary when the water source is too far away from the fire to be pumped efficiently by one pumper. Relay pumping is the movement of water through a number of consecutive pumpers, from suction to discharge. The number of pumpers is determined by how far the water source is from the fire. In some cases, when you are on the receiving end of a relay, it may help to set the suction dump or TPM (if available) very low in order to limit the incoming pump pressure by dumping water on the ground before you have discharge hose lines connected and are flowing water. Then, as you are able to use the incoming water, the relief valve control can be moved up to the desired operating pressure and set as instructed. This technique will also help you to purge the air from the incoming hose and the pump before it can get to a dangerously high pressure.
Use this procedure after the hose is laid, the apparatus are in position, and the pumps are engaged. See the "Pumping from a Hydrant" procedure for setup and engagement instructions for apparatus receiving pressurized water.
1. Open two discharge gates on all pumps, except on the pump at the source, to get rid of air from hose lines and pumps.
2. On each pump, attach the hose lines to one of the discharges, and leave the other discharge uncapped (only for trucks without a relay valve).
3. Watch the intake gauge for a high-pressure reading. If this is reached, open the gate controlling the uncapped discharge to remove excess water.
4. Supply the pump at the water source with water; prime if necessary. The discharge pressure must not be over 150 PSI (10 BAR) or the maximum pressure rating of the relay hose to start water moving. Use either the "Pumping From Hydrant" or "Pumping From Draft" procedures that appear earlier in this section.
5. When the water reaches the second pump, close the uncapped discharge gate. Repeat this

step for all pumps until the water reaches the fire ground.
6. Adjust the throttle on the pump at the water source for the required operating pressure. Watch the gauges to avoid cavitation. (The pump operator at the fire scene will advise all other pump operators of the amount of water needed at the fire ground).
7. Adjust the discharge pressure or flow at the fire scene to supply the lines being used.
8. Observe the gauges carefully, and adjust the pressure or flow as needed.
9. Shutdown starts from the fire ground pump and works toward the water source. Gradually reduce pressure at the fire ground pump until you can disengage it. Follow this procedure for every pump in the relay until the pump at the water source is shut down.

LOCAL TRAINING PROCEDURES MAY VARY SLIGHTLY FROM ABOVE.

Tandem Pumping Operation From a Hydrant

1. Using the large intake hose, connect the first pumper to the hydrant steamer. Open the hydrant until the pump is primed, then partially close the hydrant.
2. Position the second pumper intake-to-intake with the first pumper.
3. Open a discharge to flow water.
4. With the hydrant partially closed, adjust the throttle on the first pumper until the intake gauge reads about 5 PSI (.5 BAR)
5. Remove the unused intake cap.
6. Connect the second pumper to the unused steamer intake of the first pumper, using a large intake hose.
7. Open the hydrant completely. Both pumpers pump water to the fire, (refer to the procedure on “Pumping From a Hydrant”). LOCAL TRAINING PROCEDURES MAY VARY FROM ABOVE.

Pump To Road Shift Procedures

1. Verify that the operator’s hand throttle or governor control has returned to idle speed.
2. Shift the truck transmission into the NEUTRAL position, and wait four seconds. Check to make sure the speedometer reads 0.
3. Moving pump shift control valve lever to the ROAD position. The in-cab and panel pump indicator lights should go out when the pump transmission starts to shift into the ROAD position.

REFER TO THE FIRE DEPARTMENT PROCEDURES ON REMOVING WHEEL CHOCKS AS WELL AS LAY OUT AND CONNECTION OF SUCTION AND DISCHARGE HOSES.

Emergency Pump Shift Procedures

Before implementing manual override shift procedures, repeat recommended procedures. If the shift fails to take place, follow these procedures.

1. Bring the truck to a complete stop.
2. Apply the truck parking brake, and chock the wheels.
3. Shift the truck transmission to the NEUTRAL position.
4. For Pump or Road position, put the in-cab shift control in the Neutral position. (Neutral position is exactly in the middle of the road and pump position.
5. Shut down the engine.

DO NOT ATTEMPT EMERGENCY SHIFT PROCEDURES WHILE THE ENGINE IS RUNNING.

6. Employ manual override procedure at the shift cylinder on the pump gearbox as follows: An eyebolt is provided in the shift shaft to accept a drift punch or screwdriver. By inserting this tool into the hole provided, it will enable you to pull or push the shaft manually. Pull the shift shaft Out for Pump Position (after in-cab control valve selection), or push shift shaft for Road Position (after in-cab control valve selection). If the shift stroke cannot be completed manually, turn the driveshaft slightly by hand to realign the internal gears and repeat the manual shift effort.

Post Operation Procedures

1. If you have been pumping seawater, dirty water, alkaline water, or using an around the pump proportioner, flush the pump with clean water.
2. After using the pump, drain the pump as follows (especially important in freezing weather):

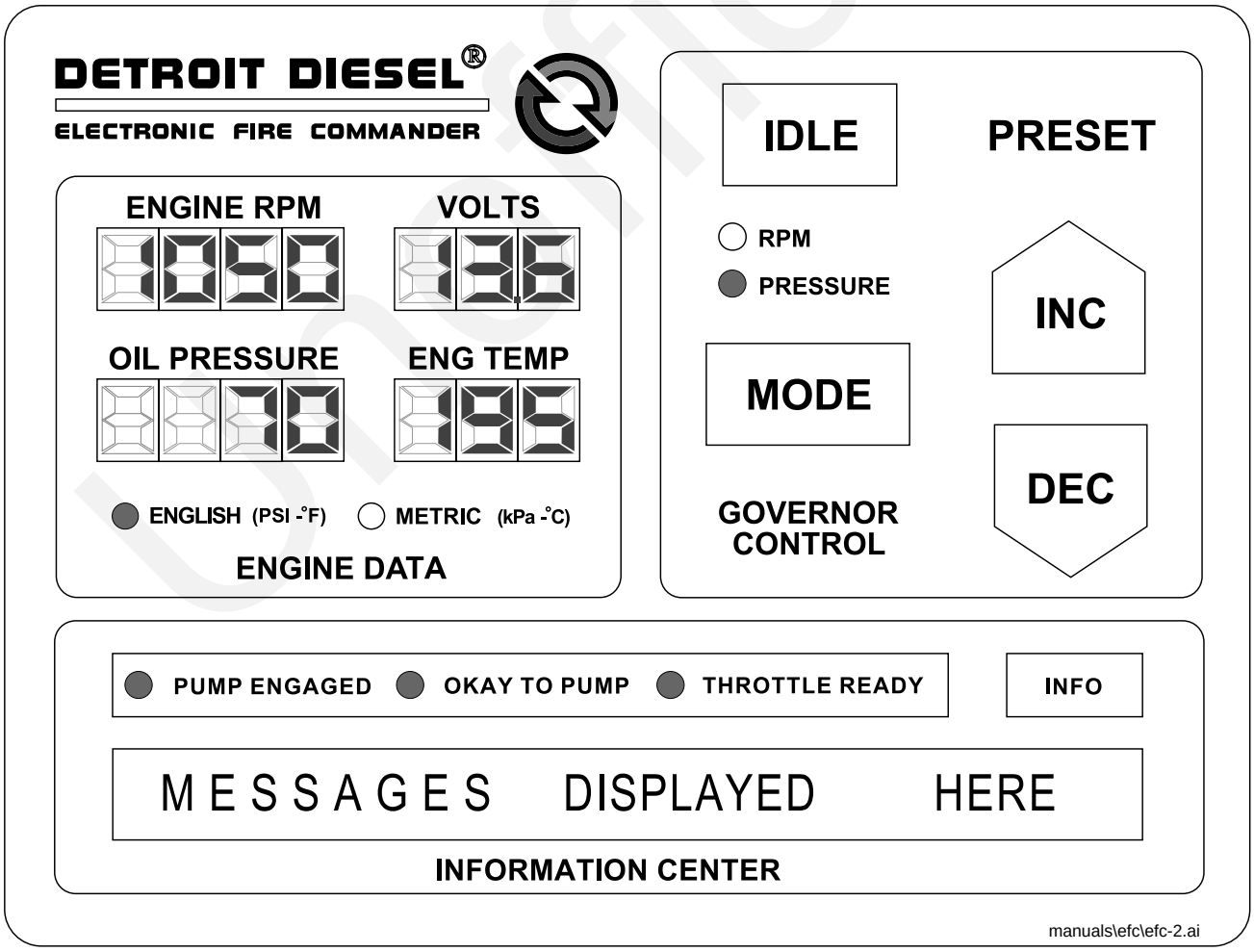
a. Open discharge valves, remove suction tube caps, and discharge valve caps.

b. Open the pump body drain cocks or Hale multiple drain valve. If a multiple drain valve is used, all pump drain lines should be connected to this valve.
c. On two-stage pumps, move the transfer valve back and fourth to both the *volume* and *pressure* positions.
d. If installed, drain the gearbox cooler.
e. After the pump is completely drained, replace all caps and close all valves.
3. Fill out the pump run log, indicating total pumping time and total out-of-station time.
4. Report all pump, vehicle equipment malfunctions, and irregularities to the proper authority.

Operating the Detroit Diesel Electronic Fire Commander (EFC):

MODES:

There are two modes of operation for the Electronic Fire Commander. The RPM Mode controls the engine speed to a desired RPM and the Pressure Mode controls the engine speed to maintain a desired pump discharge pressure. The operating mode of the Fire Commander can be changed from RPM Mode to Pressure Mode and back without the need to return to idle. When the MODE switch is pressed, the Fire Commander will change from one mode to the other and utilize the RPM or Pump Pressure that is current at the time the change is made for engine control.



Operating the Detroit Diesel Electronic Fire Commander:

RPM Mode:

The EFC must be on and the Throttle Ready LED (interlocks necessary for increased throttle operations are active) must be illuminated before any RPM adjustments can be made. The RPM LED will be on to indicate that the EFC will operate in the RPM mode.

Engine speed can be controlled to a predetermined RPM by pressing the PRESET switch. (PROGRAMMABLE FROM THE EFC MENU)
Engine speed can be increased in 25 RPM increments using the INC switch.
Engine speed can be decreased in 25 RPM increments using the DEC switch.

Pressing the IDLE switch will return the engine RPM to it's normal curb idle speed.

PSI Mode:

The EFC must be on and the PUMP ENGAGED, OKAY TO PUMP *and* the THROTTLE READY LEDs (safety interlocks for pump operation have been established) must all be illuminated before any PSI adjustments can be made. The PRESSURE LED will be on to indicate that the EFC can be operated in the PSI Mode.

Pump Pressure can be controlled to a predetermined PSI by pressing the PRESET switch.
Pump Pressure can be increased in 4 PSI increments using the INC switch.
Pump Pressure can be decreased in 4 PSI increments using the DEC switch.

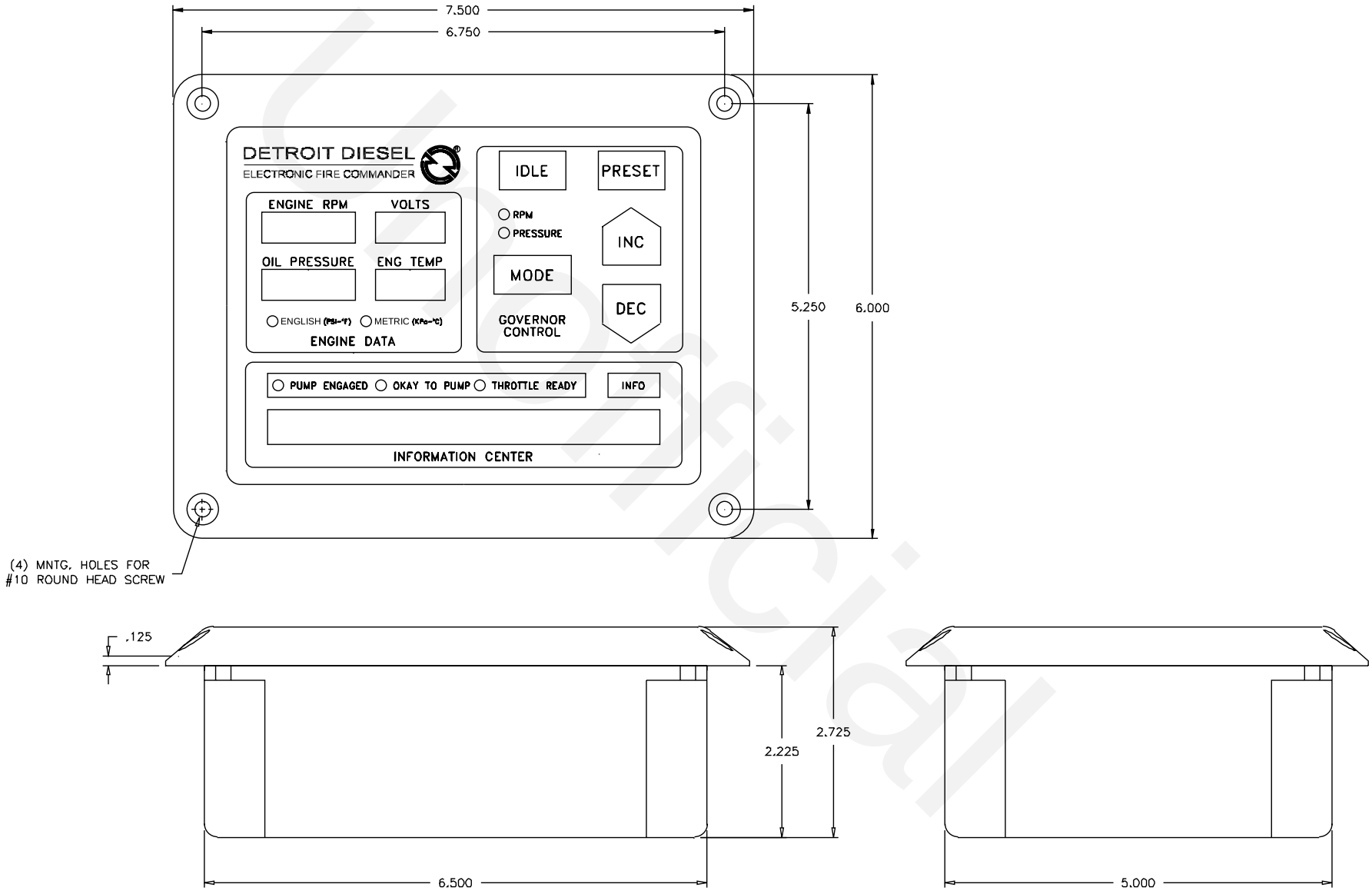
Pressing the IDLE switch will return the engine to it's normal idle speed.

Engine Parameters:

Engine RPM, Oil Pressure, Temperature, and System Voltage are displayed continuously while the EFC is in operation. In addition to this, any operating parameter that would cause a Check Engine or Stop Engine Condition will be displayed on the EFC's Information Center Message Display and an audible alarm will be activated.

Troubleshooting the Detroit Diesel Electronic Fire Commander

- The throttle won't increase in RPM Mode
  - Is the THROTTLE READY LED on? The EFC won't respond in RPM mode unless the OEM safety interlock requirements that enable the throttle are met.
- The throttle won't increase in Pressure Mode
  - Are all three LED's (PUMP ENGAGED, OKAY TO PUMP, and THROTTLE READY) on?
- The THROTTLE READY LED won't turn on
  - Is the parking brake on?
  - Is the transmission in neutral or the PTO engaged?
- The PUMP ENGAGED and OKAY TO PUMP LED's won't turn on
  - All OEM safety requirements for pump operation must be fulfilled.
  - Is the parking brake on?
  - Is the transmission in the proper range for pump operation?
  - Is the PTO engaged?
  - Is there an OK TO PUMP signal in the cab?
- The mode won't change from RPM to Pressure
  - Are the PUMP ENGAGED and OKAY TO PUMP LED's on?


7.500
6.750
DETROIT DIESEL
ELECTRONIC FIRE COMMANDER
ENGINE RPM
VOLTS
OIL PRESSURE
ENG TEMP
ENGLISH (PSI-°F)
METRIC (KPa-°C)
ENGINE DATA
IDLE
PRESET
RPM
PRESSURE
INC
MODE
DEC
GOVERNOR CONTROL
PUMP ENGAGED
OKAY TO PUMP
THROTTLE READY
INFO
INFORMATION CENTER
5.250
6.000
(4) MNTG. HOLES FOR #10 ROUND HEAD SCREW
.125
2.225
2.725
6.500
5.000