

**1. PREFACE..... 3**

**2. CAUTION..... 3**

**3. GENERAL..... 3**

**4. VOLT FREE CONTACTS..... 4**

**5. SUPPLY CONNECTIONS..... 4**

**6. OPERATOR INTERFACE DEVICE OID DISPLAY..... 5**

    SYSTEMS STATUS. (BOTH LANGUAGES)..... 8

    SYSTEM LOGS. (BOTH LANGUAGES)..... 8

    CONFIG. (BOTH LANGUAGES)..... 8

**7. ENERGISING THE CONTROL SYSTEM..... 9**

**8. LAMP TEST..... 9**

**9. RESET..... 9**

**10. MUTE..... 9**

**11. AC SUPPLY MONITORING..... 9**

    AC SUPPLY FAILURE..... 10

**12. HEATERS..... 10**

    ENGINE HEATER (OPTION)..... 10

    PANEL HEATER (OPTION)..... 10

**13. DC SUPPLY MONITORING..... 10**

    BATTERY VOLTAGE AND CURRENT..... 10

    BATTERY FAILURE..... 10

**14. BATTERY CHARGING..... 12**

**15. CHARGER MONITORING..... 13**

    CHARGER FAILURE..... 13

**16. MANUAL MODE..... 14**

    MANUAL START..... 14

    ENGINE RUNNING..... 14

    ENGINE SHUTDOWN (MANUAL)..... 14

**17. AUTOMATIC MODE..... 15**

    LOW PRESSURE AUTOSTART..... 15

    DELUGE VALVE..... 15

    REMOTE START..... 16

    ENGINE RUNNING..... 16

    ENGINE SHUTDOWN IN AUTO..... 16

**18. CRANK SEQUENCE..... 16**

    BATTERY FAILURE DURING CRANKING..... 16

    FAILED TO START..... 17

**19. OVERSPEED..... 17**

**20. ENGINE LUBE OIL PRESSURE LOW..... 17**

**21. ENGINE HIGH WATER TEMPERATURE. .... 18**

**22. ENGINE FUEL LEVEL LOW. .... 18**

**23. WEEKLY TEST START. .... 18**

**OPERATING INSTRUCTIONS FOR CONTROLLER:  
TYPE: EFP/FD4E/DVAC**

**1. PREFACE.**

This operating manual explains the operation of the complete control system.

**2. CAUTION.**

In order to avoid risk of personal INJURY or damage to the control equipment, READ THIS MANUAL VERY CAREFULLY. If after reading these instructions doubt exists, do not hesitate to contact Metron-Eledyne for further clarification.

In the interests of safety pay special attention to the CAUTION notes listed below:

If work has to be carried out on the engine or control equipment, isolate the control equipment from the A.C and D.C supplies, and remove the start solenoid supplies from control circuit terminals before work commences. If possible use a temporary label, which draws attention to this fact.

Before attempting to start the engine during commissioning, ensure that the 'Fuel Stop Solenoid' is operational. Due to the nature of the equipment, the control system may start the engine at any time when operating in automatic mode. Ensure all concerned are aware of this condition by means of an appropriate label, prominently displayed on the engine skid.

When the equipment is energised and on line, ensure all doors are closed and where applicable locked.

If during commissioning the equipment is energised with the access door to the panel interior open, make sure that any terminal cover is fitted to avoid the risk of electric shock.

**3. GENERAL.**

The controller is designed as a fully automatic engine start system based on the requirements of National Fire Codes NFPA No. 20 for Engine Driven Fire Pump Controllers.

In these instructions, the following terms used are defined as: -

- Visual           - Lamp, or meter.
- Display         - LCD display on the front door (OID).
- Audible         - Electronic sounder.
- Volt free        - Remote volt free changeover contacts.

#### 4. VOLT FREE CONTACTS.

If the volt free is named then its title is active i.e.

Volt Free.    Engine Running.

Indicates the contacts are in the engine running position.

If the volt free engine running is said to clear i.e.

Volt Free.    Engine Running clears.

Indicates the contacts have changed to the standby position (engine stopped).

#### 5. SUPPLY CONNECTIONS.

Ensure the system is correctly earthed and make interconnections referring to information contained in the interconnection drawing. Connect AC and DC supplies.

**6. OPERATOR INTERFACE DEVICE OID DISPLAY.**

The Operator Interface Device (OID) provides visual indication of the alarms, status of system parameters, and an interface to change set points to configure the FD4e to operate appropriately for various installation requirements.

**Common Tasks Performed Using The OID**

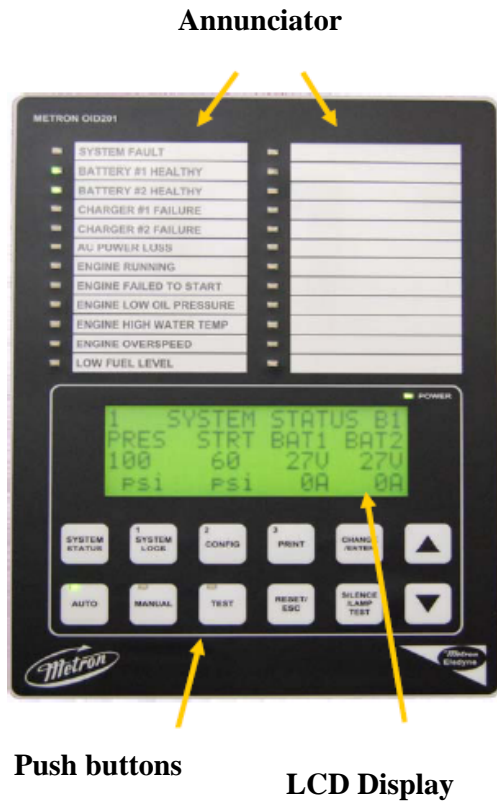
**Silencing Horn:** If a horn is sounding and the alarm is silence able, a quick press of the [SILENCE/LAMPTEST] will silence the horn (less than 1 second press).

**Resetting Alarms:** If the alarm condition has cleared, press the [RESET/ESC] button BRIEFLY to reset alarms.

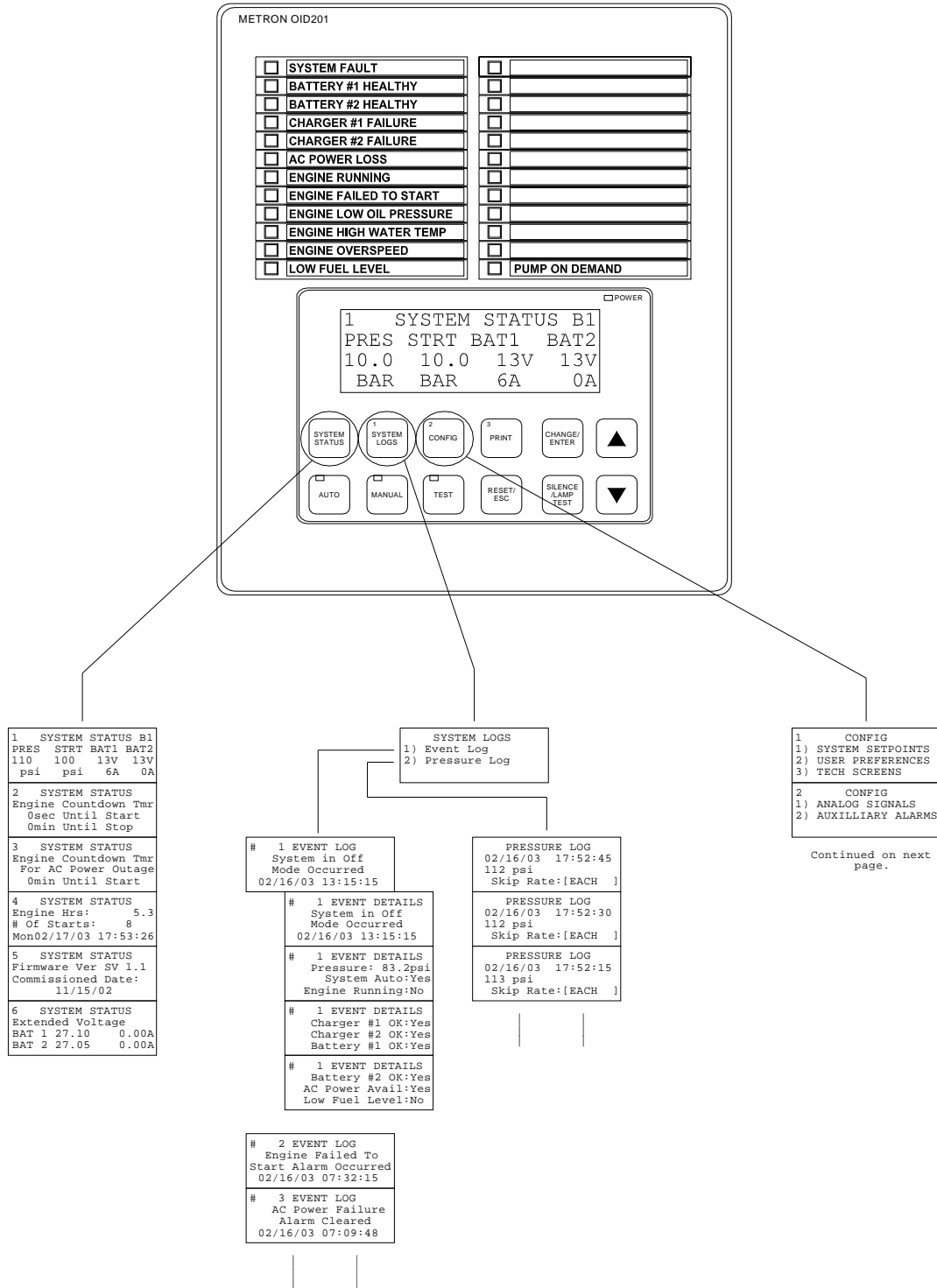
**Operating Mode Change:** The operational mode that the controller is in can be changed via the mode switch and by the OID push buttons. With the mode switch in the ‘AUTO’ (automatic) position, the ‘AUTO’ indicator will be illuminated and the controller will be in full automatic start mode. The test push button is only active while the mode switch is in the automatic position. When the mode switch is on the ‘MAN’ (manual) position, the ‘MANUAL’ indicator will be illuminated and the controller will be available for manual starting only. When the mode switch is in the off position, neither the AUTO or MAN indicator is illuminated.

**Test Mode:** When controller is in Auto Mode, pressing and holding the [TEST] button for two or more seconds will open the pressure drain solenoid thus dropping the pressure which causes the controller to start the engine. Pressing and releasing the [TEST] button in Manual Mode directly controls the opening and closing of the drain solenoid. The engine will not automatically start when in Manual Mode.

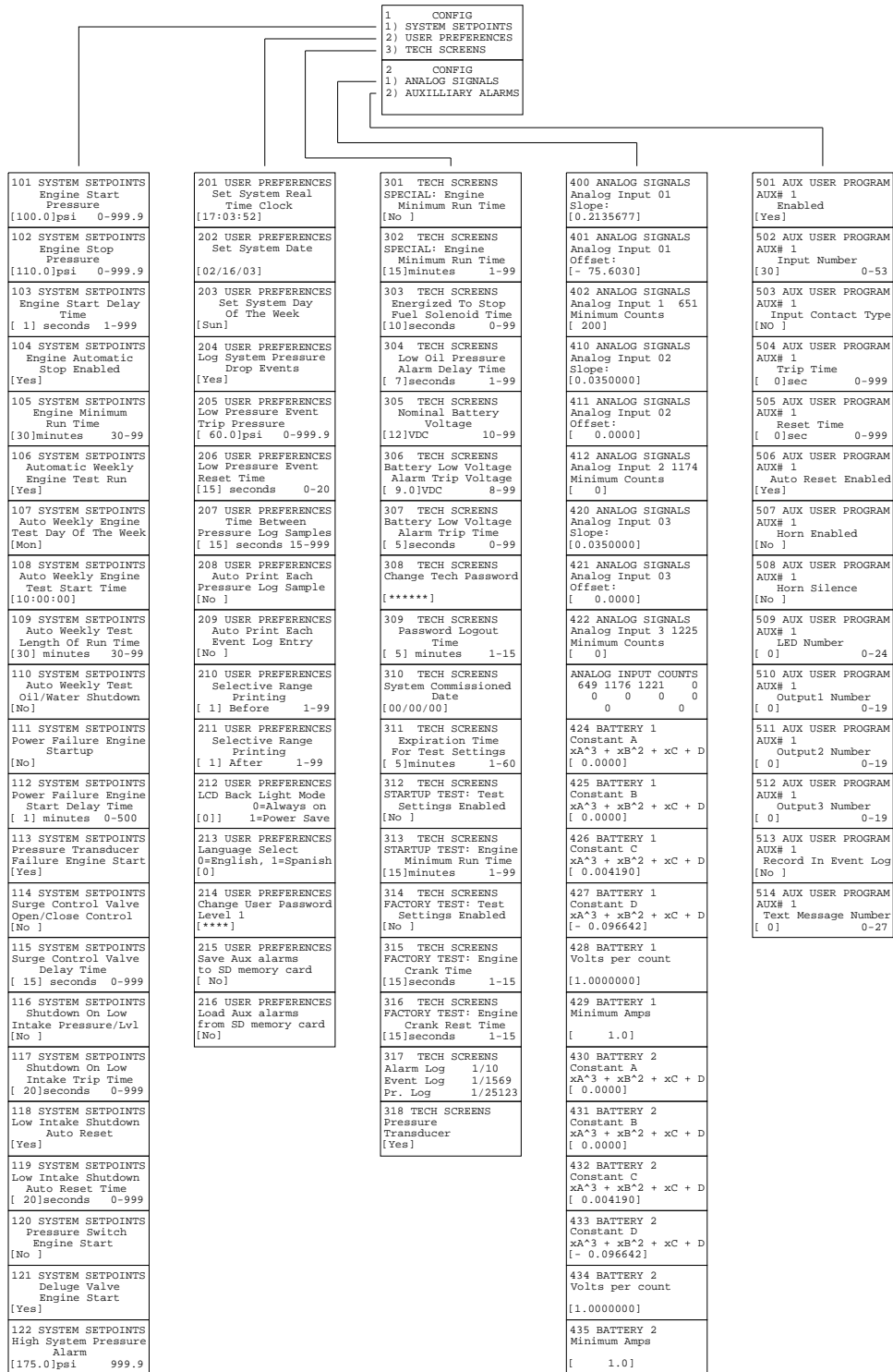
**Lamp Test:** To illuminate and check all the OID LED’s and the horn, press and hold the [SILENCE/LAMPTEST] button 5 or more seconds or until all the lights turn on.



**OID Screen Map**



### OID Screen Map



The OID can view 3 main areas.

SYSTEMS STATUS. (both languages)

When the controller is switched on the OID will default to System Status screen 1 which displays the

- Fire Main Pressure.
- The Start Pressure Setting.
- Battery 1 and 2's voltage and current.

The remaining screens in System Status are not required for normal operation of the controller, if they are required consult the Service Manual.

SYSTEM LOGS. (both languages)

In System Logs it is possible to view 2 separate logs.

- Event Logs (records alarms and system functions).
- Pressure Logs (records pressure at set times).

These Logs are not required for normal operation of the controller, if they are required consult the Service Manual.

CONFIG. (both languages)

In Config it is possible to view 5 separate areas.

- System Setpoints. (both languages)
- User Preferences. (both languages)
- Tech Screen. (both languages)
- Analog Signal. (both languages)
- Auxiliary alarms. (both languages)

It may be necessary to change the Start Pressure, this can be done in System Setpoints.

To change the Start Pressure press the following pushbuttons in order.

- Config button (2) once.
- Button 1 (System Logs) once.
- Change/Enter button once.
- Buttons 1, 2 or 3 to enter the password.
- Default value is 1111.
- Up and Down buttons to change the digit.
- Change/Enter to move to the next digit.
- When the new number is complete press
- Change/Enter to accept.
- System Status

Check that the new Start Pressure is correct.

It may be now necessary to change the Stop Pressure, to do this press the following pushbuttons in order.

- Config button (2) once.
- Button 1 (System Logs) once.
- Up and Down buttons to scroll screens, go to 102.
- Change/Enter button once.



Buttons 1, 2 or 3 to enter the password.  
 Default value is 1111.  
 Up and Down buttons to change the digit.  
 Change/Enter to move to the next digit.  
 When the new number is complete press  
 Change/Enter to accept.  
 System Status

Check that the new Stop Pressure is correct.

The remaining screens are not required for normal operation of the controller, if they are required consult the Service Manual.

## **7. ENERGISING THE CONTROL SYSTEM.**

Close all CB's and close the AC isolator.

Visual.

Power.  
 Auto Mode (see note).  
 Battery 1 Healthy  
 Battery 2 Healthy

Audible.

Silent.

Display shows.

Water Pressure.  
 Start Pressure.  
 Battery 1 Volts & Amps.  
 Battery 2 Volts & Amps.

**NOTE.** The controller will energise in the same mode it was in when turned off.

## **8. LAMP TEST.**

Press the Silence/Lamp test pushbutton for least 5 seconds.

Visual.

All lamps illuminate.

## **9. RESET.**

To reset an alarm, press the Reset/Esc pushbutton for at least 1 second.

## **10. MUTE.**

To silence an alarm the Silence/Lamp Test pushbutton must be pressed and then released.

## **11. AC SUPPLY MONITORING.**

Switching on the AC isolator will supply the Battery Charger circuit breaker CB1 and CB5 which protect the Engine Heater circuit.

**AC SUPPLY FAILURE.**

Should the AC supply fail the battery chargers will be de-energised, their internal circuit senses this and after short delay.

Visual. AC Power Loss (due to both chargers failing).

Then after a delay of 30 seconds.

Visual. Charger 1 Failure.  
Charger 2 Failure.  
System Fault.

Volt free. System Failure.

Audible. Non-Mutable.

When the AC supply is restored the AC supply alarms will clear.

**12. HEATERS.****ENGINE HEATER (Option).**

Engine Jacket Heater supply is protected by CB5 and when switched on will supply the engine heater via terminals L1 & L2.

**PANEL HEATER (Option).**

The panel heater supply is protected by fuse F. A thermostat TH controls the panel heater.

With the thermostat TH above ambient. Heater Warms.

With the thermostat TH below ambient. Heater Cools.

Set the thermostat to 30 Deg C.

**13. DC SUPPLY MONITORING.****BATTERY VOLTAGE AND CURRENT.**

Battery voltage and charge current can be view on the LDC display mounted on the door.

**BATTERY FAILURE.**

If a Battery 1 is disconnected.

Visual. Battery 1 Healthy – goes out  
System Fault.

Audible. Non-Mutable.

Volt free. System Failure.

When the battery as been reconnected, the Controller must be reset for the alarms to clear.

If a Battery 2 is disconnected.

Visual.	Battery 2 Healthy – goes out. System Fault.
Audible.	Non-Mutable.
Volt free.	System Failure.

When the battery as been reconnected, the Controller must be reset for the alarms to clear.

## **14. BATTERY CHARGING.**

This battery charger is intended for use only in Metron Eledyne control systems. Use of an attachment / connector not recommended or sold by Metron Eledyne may result in a risk of fire, electric shock, or injury to persons.

Do not in any circumstances disassemble the battery charger, there are no user serviceable parts inside. Incorrect reassembly may result in risk of electric shock or fire.

### **WARNING NOTICE**

The performance of the battery charger is entirely automatic. No operator variables are provided, the charger is factory preset to the required float voltage, at a maximum current of **10 Amps** and **NO ADJUSTMENTS MUST BE ATTEMPTED ON SITE** or damage to the batteries may result. Maintenance of batteries should be carried out in accordance with the instructions issued by the battery manufacturer.

### **RISK OF EXPLOSIVE GASSES.**

**WORKING IN THE VICINITY OF A LEAD ACID/ NI CAD BATTERY IS DANGEROUS . BATTERIES GENERATE EXPLOSIVE GASSES DURING NORMAL BATTERY OPERATION.**

To reduce the risk of battery explosion read this manual completely, and the battery manufacturers data. Equipment used in the vicinity of the batteries should also be carefully selected to reduce the risk of battery explosion.

### **PERSONAL PRECAUTIONS**

1. Someone should be within range of your voice or close enough to come to your aid when you work near a lead acid/ nicad battery.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near the battery.
4. If battery acid contacts skin or clothing , wash immediately with soap and water. If acid enters eye immediately flush with running cold water for at least 10 minutes and get medical attention immediately.
5. NEVER smoke or allow a spark flame in the vicinity of the battery or the engine.
6. Be extra cautious to reduce the risk of dropping a metal tool onto battery, it may spark or short the circuit battery or other electrical parts that may cause explosion.
7. Remove personal metal items such as rings, bracelets, necklaces and watches when working with an engine battery. Such engine batteries can produce a short circuit current high enough to weld a ring or similar, causing a severe burn.
8. NEVER charge a frozen battery.

### **PREPARING TO CHARGE**

Clean battery terminals. Be careful to prevent corrosion from coming into contact with the eyes. Study all battery manufacturers specific precautions such as removing or not removing cell caps during initial charging and verify that the maximum rate of charge is not exceeded.

**15. CHARGER MONITORING.****CHARGER FAILURE.**

Should Charger 1 stops charging, its internal circuits will sense this and after a delay of 160 seconds.

Visual.	Charger 1 Failure. System Fault.
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Volt free.	System Failure.
------------	-----------------

Audible.	Non-Mutable.
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If the charger starts to charge again the Charger Failure alarms will clear.

Should Charger 2 stops charging, its internal circuits will sense this and after a delay of 160 seconds.

Visual.	Charger 2 Failure. System Fault.
---------	-------------------------------------

Volt free.	System Failure.
------------	-----------------

Audible.	Non-Mutable.
----------	--------------

If the charger starts to charge again the Charger Failure alarms will clear.

## **16. MANUAL MODE.**

Select manual mode by using the mode selector switch.

Visual.

Manual Mode.

Auto Mode goes out.

**NOTE. MANUAL MODE SHOULD ONLY BE USED FOR COMMISSIONING OR MAINTENANCE.**

### **MANUAL START.**

To start, press either 'Crank Battery 1' or 'Crank Battery 2' pushbuttons, PB1 or PB2, their contacts will energise the start solenoids via terminals 9 or 10 cranking the engine from their respective battery.

The battery chargers will be inhibited and the via terminal 1 the 'Fuel Solenoid' will be energised

The pushbutton must be released when the 'Engine Running' lamp is illuminated which should be almost immediate.

### **ENGINE RUNNING.**

When the engine runs up to speed the speedswitch connected to the engine speed sender unit, will energise the engine running input, terminal 2.

Visual.

Engine Running.

Volt free.

Engine Running.

### **ENGINE SHUTDOWN (MANUAL).**

Pressing the Engine Stop pushbutton PB3 will result in terminal 12 the Energise To Stop solenoid output energising, and terminal 1 the 'Fuel Solenoid' output de-energising.

An **AUTOSTART SIGNAL INHIBITS** the Engine Shutdown pushbutton.

**17. AUTOMATIC MODE.**

Select automatic mode by using the mode selector switch.

Visual.	Auto Mode. Manual Mode goes out
Volt Free.	Automatic Mode.

**Controller is in now Standby.**

Manual start is inhibited.

**LOW PRESSURE AUTOSTART.**

Should the fire main water pressure fall to below the Engine Start Pressure set point, the Engine Start Delay timer will energised. When the timer times out a crank sequences will begin, the engine will be cranked alternatively from both batteries via terminals 9 or 10 for 15 seconds.

The Engine Start Pressure can be set in System Setpoints screen 101.  
The Engine Start Delay timer can be set in System Setpoints screen 103.

A crank sequences begins, the engine will be cranked alternatively from both batteries via terminals 9 or 10 for 15 seconds.

Visual.	Pump on Demand.
Volt Free.	Pump on Demand.

If the start signal be removed, the crank sequence will continue.

**DELUGE VALVE.**

Should a deluge valve signal be received at terminal 16, the Engine Start Delay timer will energised. When the timer times out a crank sequences will begin, the engine will be cranked alternatively from both batteries via terminals 9 or 10 for 15 seconds.

The Engine Start Pressure can be set in System Setpoints screen 101.  
The Engine Start Delay timer can be set in System Setpoints screen 103.

Visual.	Pump on Demand.
Volt Free.	Pump on Demand.

If the start signal be removed, the crank sequence will continue.

### REMOTE START.

Should a remote start signal be received at terminal 17, a crank sequences will begin, the engine will be cranked alternatively from both batteries via terminals 9 or 10 for 15 seconds.

Visual. Pump on Demand.

Volt Free. Pump on Demand.

If the start signal be removed, the crank sequence will continue.

### ENGINE RUNNING.

When the engine runs up to speed the speedswitch connected to the engine speed sender unit, will energise the engine running input, terminal 2, cranking will cease immediately..

Visual. Engine Running.

Volt free. Engine Running.

### ENGINE SHUTDOWN IN AUTO.

Pressing the Engine Stop pushbutton PB3 will result in terminal 12 the Energise To Stop solenoid output energising, and terminal 1 the 'Fuel Solenoid' output de-energising.

An **AUTOSTART SIGNAL INHIBITS** the Engine Shutdown pushbutton.

## **18. CRANK SEQUENCE.**

Once a sequence is initiated, crank attempts occur alternately from each battery.

If the engine fuel system is held off and cranking is allowed to proceed.

Crank solenoid A energises for 15 sec's.  
Cranking ceases for 15 sec's.  
Crank solenoid B energises for 15 sec's.  
Cranking ceases for 15 sec's.

The cycle repeats until a total of six alternate crank attempts have occurred.

### BATTERY FAILURE DURING CRANKING.

As the starter motor engages, the battery voltage dips briefly to a low value and then recovers to a higher steady value during cranking. With a poor battery, the voltage remains low. The cranking will be transferred to the other battery.



**FAILED TO START.**

When the crank sequence has completed the six attempts, a Failed to Start alarm will occur.

Visual.	Engine Failed to Start. System Fault.
---------	--

Volt free.	Failed to Start. System Failure.
------------	-------------------------------------

Audible.	Non-Mutable.
----------	--------------

If a failed to start alarm occurs and the start signal has cleared, the controller can be reset to return it to standby. If the controller is reset when a start signal remains it will **repeat the crank sequences.**

**19. OVERSPEED.**

Should an overspeed signal be received at terminal 3 the engine will be shutdown.

Then.	Engine fuel solenoid shuts off the fuel. Engine stops.
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Autostart is inhibited Manual start is available.

Visual.	Engine Overspeed. Available for Autostart goes out.
---------	--

Volt Free.	System Failure.
------------	-----------------

Audible.	Non-Mutable.
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The controller remains latched in the 'Overspeed' condition until the speed switch on the engine and the controller are reset.

**20. ENGINE LUBE OIL PRESSURE LOW.**

The Engine Running signal enables the low oil pressure alarm and it is delayed to allow the pressure to rise.

After a delay.

Visual.	Engine Lube Oil Pressure Low.
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Volt Free.	System Failure.
------------	-----------------

Audible.	Non-mutable.
----------	--------------

**21. ENGINE HIGH WATER TEMPERATURE.**

The Engine Running signal enables the high water temperature alarm.

Visual.	Engine High Water Temperature.
Volt Free.	System Failure.
Audible.	Non-mutable.

**22. ENGINE FUEL LEVEL LOW.**

Visual.	Engine Fuel Level Low.
Audible.	Non-mutable.
Volt free.	Fuel Level Low. System Failure

**23. WEEKLY TEST START.**

NFPA 20 states that the engine should be run once each week for a minimum of 30 minutes.

Set weekly start timer and stop timer can be set using screens 105 though to 109 in System Setpoints.

When the timer activates.	A crank sequence is initiated.
---------------------------	--------------------------------

The engine will now run for the allotted test time and then shutdown.

**DISPOSAL.**

Metron Eledyne Ltd are a member of a compliance scheme under the Waste Electrical and Electronic Equipment regulations which is applicable in all EEC countries. At the end of the service life of the equipment the company offers to collect and dispose of this equipment in accordance with regulations in force under the Registration Number WEE/CF0105WV.(Equipment must be suitably packed for collection by courier if outside the UK)

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