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OPERATING INSTRUCTIONS FOR CONTROLLER:  
TYPE: EFP/FD4e

## 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, IEC 62091, UL218 and to FM class number 1321/1323.

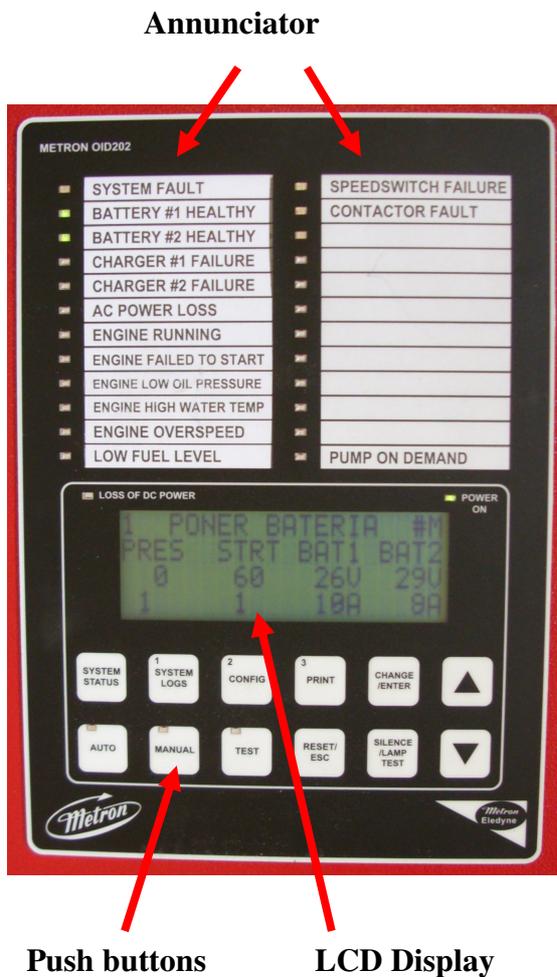
In these instructions, the following terms used are defined as: -

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



## 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.

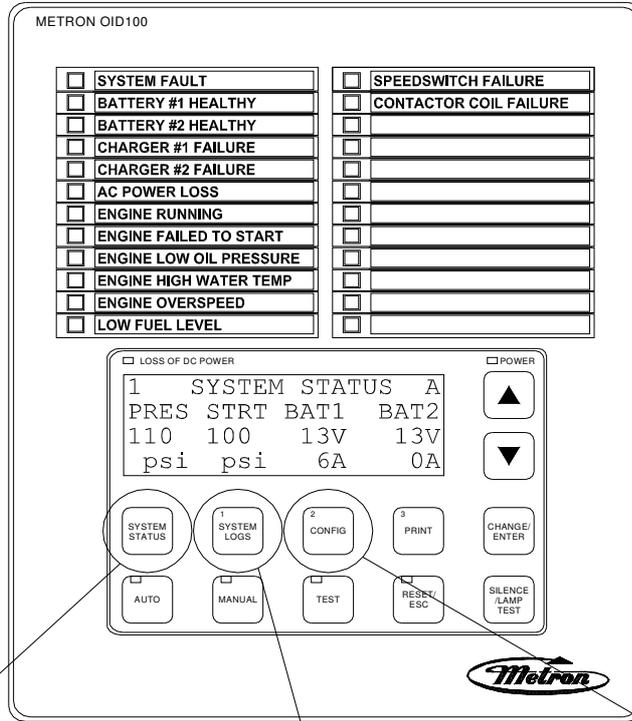
**Operating Mode Change:** The operational mode that the controller is in can be changed via the mode switch and by the OID push buttons. With the mode switch in the 'AUTO' (automatic) position, the 'AUTO' indicator will be illuminated and the controller will be in full automatic start mode. The test push button is only active while the mode switch is in the automatic position. When the mode switch is in 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.

The Controller may be configured as either "**Manual**" or "**Automatic**" stop as required (System Config Screen 104). "**Manual**" stop is set as standard. The current status of this setting is visible on the Main System Status Screen where the letter "A" will appear in the upper right hand corner of the screen when set to Automatic Stop and an "M" will appear when set for Manual stop.

**OID Screen Map**



1 SYSTEM STATUS A  
PRES STRT BAT1 BAT2  
110 100 13V 13V  
psi psi 6A 0A

2 SYSTEM STATUS  
Engine Countdown Tmr  
0sec Until Start  
0min Until Stop

3 SYSTEM STATUS  
Engine Countdown Tmr  
For AC Power Outage  
0min Until Start

4 SYSTEM STATUS  
Engine Hrs: 5.3  
# Of Starts: 8  
Mon02/17/03 17:53:26

5 SYSTEM STATUS  
Firmware Ver SV 1.1  
Commissioned Date:  
11/15/02

6 SYSTEM STATUS  
Extended Voltage  
BAT 1 27.10 0.00A  
BAT 2 27.05 0.00A

SYSTEM LOGS  
1) Event Log  
2) Pressure Log

1 CONFIG  
1) SYSTEM SETPOINTS  
2) USER PREFERENCES  
3) TECH SCREENS

2 CONFIG  
1) ANALOG SIGNALS  
2) AUXILIARY ALARMS

Continued on next page.

# 1 EVENT LOG  
System in Off  
Mode Occurred  
02/16/03 13:15:15

PRESSURE LOG  
02/16/03 17:52:45  
112 psi  
Skip Rate:[EACH ]

PRESSURE LOG  
02/16/03 17:52:30  
112 psi  
Skip Rate:[EACH ]

PRESSURE LOG  
02/16/03 17:52:15  
113 psi  
Skip Rate:[EACH ]

# 1 EVENT DETAILS  
System in Off  
Mode Occurred  
02/16/03 13:15:15

# 1 EVENT DETAILS  
Pressure: 83.2psi  
System Auto:Yes  
Engine Running:No

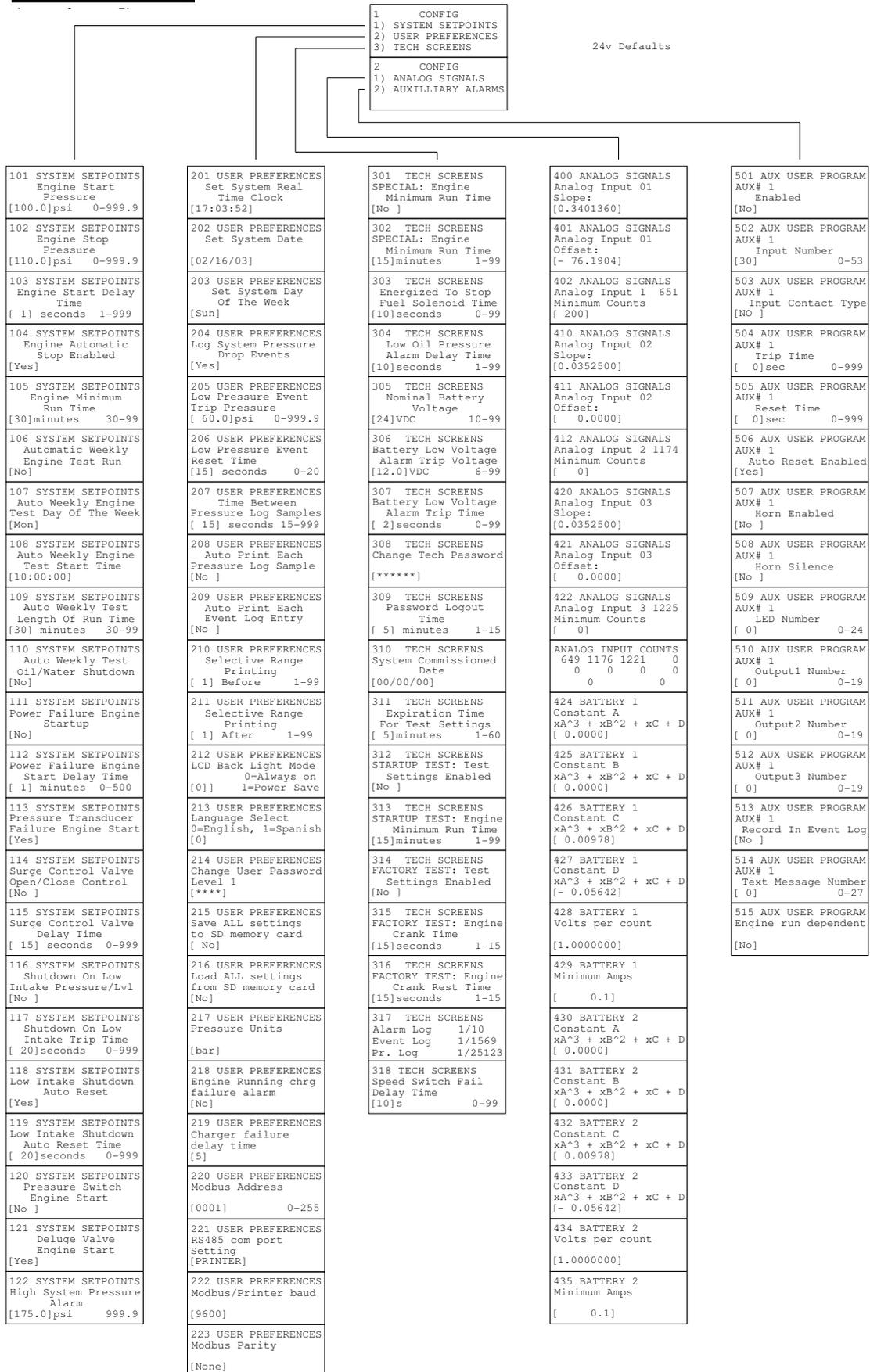
# 1 EVENT DETAILS  
Charger #1 OK:Yes  
Charger #2 OK:Yes  
Battery #1 OK:Yes

# 1 EVENT DETAILS  
Battery #2 OK:Yes  
AC Power Avail:Yes  
Low Fuel Level:No

# 2 EVENT LOG  
Engine Failed To  
Start Alarm Occurred  
02/16/03 07:32:15

# 3 EVENT LOG  
AC Power Failure  
Alarm Cleared  
02/16/03 07:09:48

### 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 mode according to the mode switch.**

## **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 protectS 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 a 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 viewed on the LCD 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.

If both batteries are disconnected:

Visual. Battery 1 Healthy – goes out.  
Battery 2 Healthy – goes out  
System Fault – on  
Loss of DC power - on.

Audible. Non-Mutable.

Volt free. System Failure  
Not in Auto

## **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.
---------	-------------------------------------

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

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

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.*
------------	------------------

\* Note:

When all power is lost to the controller then the volt free contacts will show 'Not in Auto'

**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 be 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 Stop Pressure can be set in System Set Points screen 102.

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

**NOTE: The start pressure MUST be set to a lower value than the stop pressure.**

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 is removed, the crank sequence will continue.

### **DELUGE VALVE.**

Should a deluge valve signal be received at terminal 16, the Engine Start Delay timer will be energised. When the timer times out the crank sequence 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.

**REMOTE START.**

Should a remote start signal be received at terminal 17, a crank sequence will begin (no time delay), 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.

Autostart is inhibited, but Manual start is available.

Visual. Engine Overspeed.  
Available for Autostart goes out.

Volt Free. System Failure.

Audible. Non-Mutable.

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.

Volt Free. System Failure.

Audible. Non-mutable.

**21. ENGINE HIGH WATER TEMPERATURE.**

The Engine Running signal enables the high water temperature alarm and it is delayed to enable the water temperature to stabilize.

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

**22. ENGINE FUEL LEVEL LOW.**

There is a 2 second on delay before the low fuel level alarm is activated, then:

Visual.	Engine Fuel Level Low.
Audible.	Muteable.
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 through 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.

**24. SPEEDSWITCH FAILURE**

Should the engine run, while not receiving the engine running input on terminal 2, then :

Visual.	Speedswitch failure
Audible.	Non-mutable
Volt free	System Failure

Note: This signal is derived from the oil pressure contact opening.

## **25. CONTACTOR COIL FAILURE**

Should the DC engine contactor coils loose continuity (either short circuit or open circuit) then, after a short delay:

Visual.	Contactor Fault
Audible.	Muteable
Volt free	System fault

## **26. SD MEMORY CARD**

The controller is equipped with an SD (Secure Digital) memory card on the motherboard to store the Pressure log, Event log, and Auxiliary Alarm configuration information.

The SD card is located on the right hand edge of the motherboard and is removed by pressing in on the right edge of the card to release from the card holder. When the SD card is removed, data is still being recorded on temporary flash memory on the motherboard. Once the card is replaced, the stored data will be written back to the SD Card. When the SD card is removed, the LCD display will indicate that the card is missing and that it should be replaced. If the card is not replaced within approximately 1 minute, the alarm will sound and the System Fault LED will come on. Once the SD card is replaced, the System Fault LED will go out but the Alarm Silence button must be pressed to silence the alarm horn. The data stored on the SD card is in standard ASCII text format and can be read by a computer equipped with an appropriate SD card reader. These are readily available at any electronics store, the maximum size to be used is 1 Gigabyte. The data on the SD card is in the following format:

### **PressXXX.txt file**

Data is stored in a standard comma delimited file as follows:

```
07/27/07, 11:07:52, 060
Date      Time      Pressure
```

Each file starting with "Press" contains one days worth of pressure data. XXX denotes the date day of the pressure log.

### **Events.txt file**

Data is stored in a standard comma delimited file as follows:

```
07/27/07 ,11:09:26 ,Battery2 Low Voltage, Alarm Cleared ,060 cont.....
Date      Time      Event      Action      Pressure
1,        0,        0,         0,         1,         1,         000
Auto mode, Engine running, Charger 1 Fault, Charger 2 fault, Battery 1 OK, Battery 2 OK, Event Txt
```

## **27. 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)

Contact: Tel + 44 (0)1476 516120 Fax. + 44 (0)1476 516121 .