

OPERATION AND MAINTENANCE MANUAL FOR
MICROPROCESSOR CONTROLLED DIESEL
ENGINE FIRE PUMP CONTROLLER

NOTE: The drawings and information included in this document are for controllers covered under our standard product range. Actual “AS BUILT” drawings and information may differ from the details in this document.

FOREWARD

LPCB DIESEL ENGINE CONTROLLER

This Microprocessor based Controller was introduced in 2009, having been designed specifically to meet the requirements of the Loss Prevention Certification Board (LPCB), Standard LPS 1236:- “Requirements for Control Panels for Diesel Engine Driven Pumps used in Automatic Sprinkler Installations”.

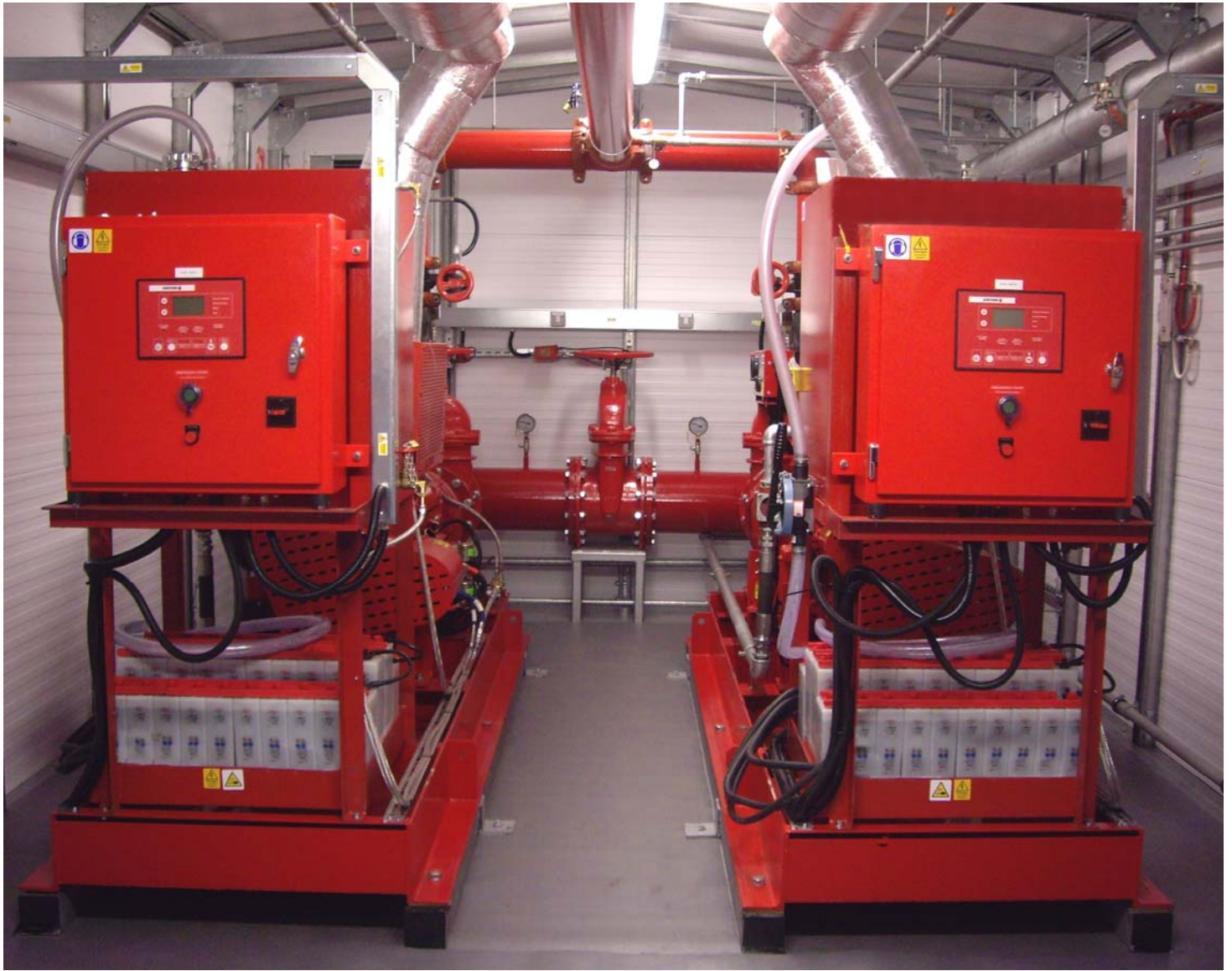
These controllers are available in both 12Volt and 24Volt versions for Ni-Cad and Plante battery systems. Controllers are manufactured and fully tested prior to dispatch by Armstrong Controls, in-house at their Halesowen, UK Works. This is done in accordance with Armstrong Controls ISO9000 Quality Assurance and ISO14000 Environmental Management Procedures.

The manufacturer’s address and contact details are:-

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Halesowen, West Midlands,
B62 8DJ, United Kingdom.

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A typical installation of Dual Diesel Fire Sets is shown below, installed in an Armstrong Fire Plant Room



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Mk VII Microprocessor Diesel Engine Fire Pump Controller



Technical Specification

•	Controller weight 28Kgs.
•	Controller dimensions, 600mm Wide x 600mm High x 180 Deep.
•	Controller protection level: IP54 rating as standard. Protection to IP55 rating is available as an optional extra
•	Controller temperature operating range 0°C to 50°C.

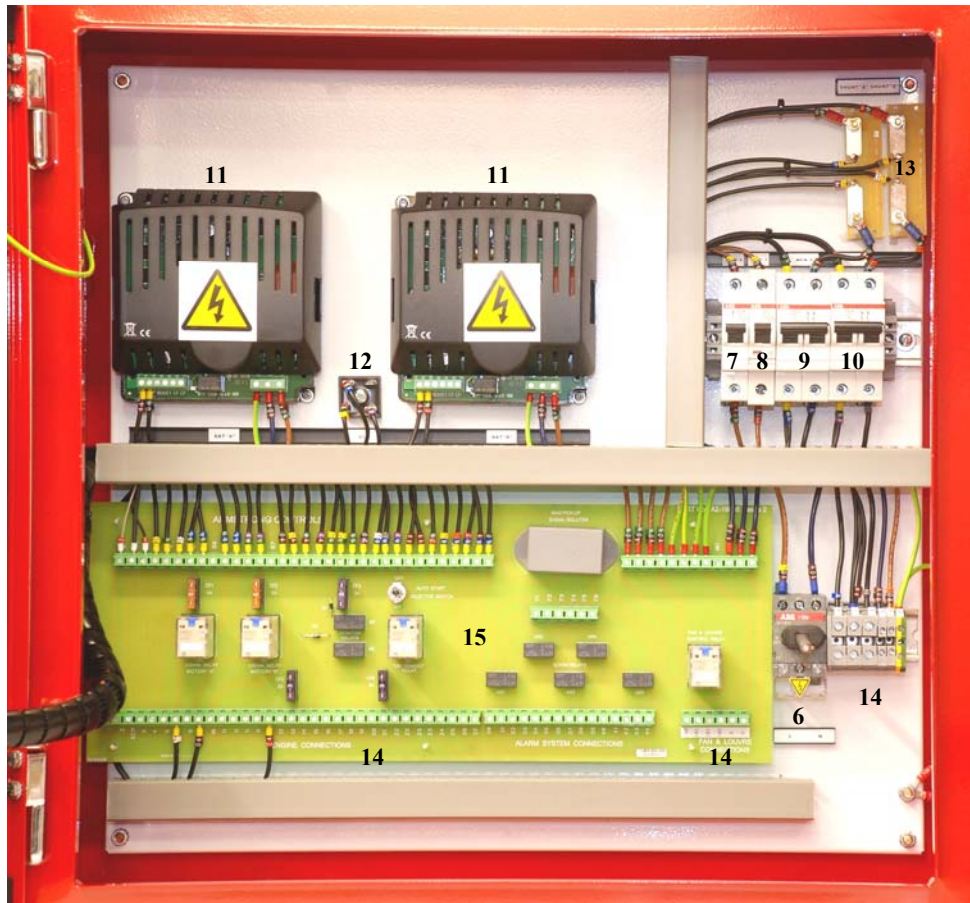
Enclosure

•	Sheet steel wall mounted or skid mounted sheet steel mounted enclosure. A locking device is fitted to the enclosure door which requires a special tool for access.
•	Painted finish to the colour Apollo Red to BS 38-1C-538.
•	Cable entry provision via a removable bolted gland plate (supplied undrilled) mounted in the enclosure base.

Door mounted equipment

•	Fig 1	Isolator operating handle, which is pad lockable in the off position.
•	Fig 2	Armstrong Integrated, LPS 1236 Engine Control Module.
•	Fig 3	Emergency Start Push Button, protected against accidental operation by a quick release lift up access cover.
•	Fig 4	Engine Shutdown Push Button.
•	Fig 5	Door Locking Device requiring special tool to open and close the door. Such a tool is supplied with each enclosure.

Controller Internally Mounted Equipment



● Fig 6	Double pole A.C isolator, fully interlocked with the enclosure door. A shroud is supplied over the incoming mains supply connection terminals.
● Fig 7	Single Pole Circuit Breaker MCB1 for isolation and protection of the battery chargers and pump house 230V Extraction Fan and Ventilation Louver.
● Fig 8	Single Pole Circuit Breaker MCB2 for isolation and protection of the Thermostatically Controlled Engine Jacket Water Heater.
● Fig 9	Double Pole Circuit Breaker MCB3 for isolation and protection of the Battery “A” control circuit.
● Fig 10	Double Pole Circuit Breaker MCB4 for isolation and protection of the Battery “B” control circuit.
● Fig 11	Two fully automatic Battery Chargers. Factory set as standard to suit Nickel Cadmium Battery’s. Chargers can be Factory set on request to suit Lead - Acid Plante Battery’s.
● Fig 12	Diode Bridge.
● Fig 13	Current Monitoring shunts.
● Fig 14	Set of fully identified terminals

● Fig 15	Operating in conjunction with the LPS 1236 module, the interface card provides a number of input signals and also converts the module output signals into relay logic. These control engine cranking, and provide Volt-free signals to alarm monitoring systems.
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Volt-Free Contacts

●	Volt-free changeover contacts are provided, for connecting to an Armstrong Integrated Remote Alarm Panel, giving the following signals:- Pump on Demand, Pump Running, Trouble at Engine or Controller, Automatic Start Unavailable, and Engine Failed to Start.
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S.M.S Interface

●	A separate set of Volt-free changeover contacts (closing on fault condition) are provided, for connecting to an Armstrong Remote Monitoring Outstation, giving the following signals:- Pump on Demand, Pump Running, Trouble at Engine or Controller, Automatic Start Unavailable, and Engine Failed to Start.
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Armstrong Integrated LPS 1236 Diesel Engine Control Module



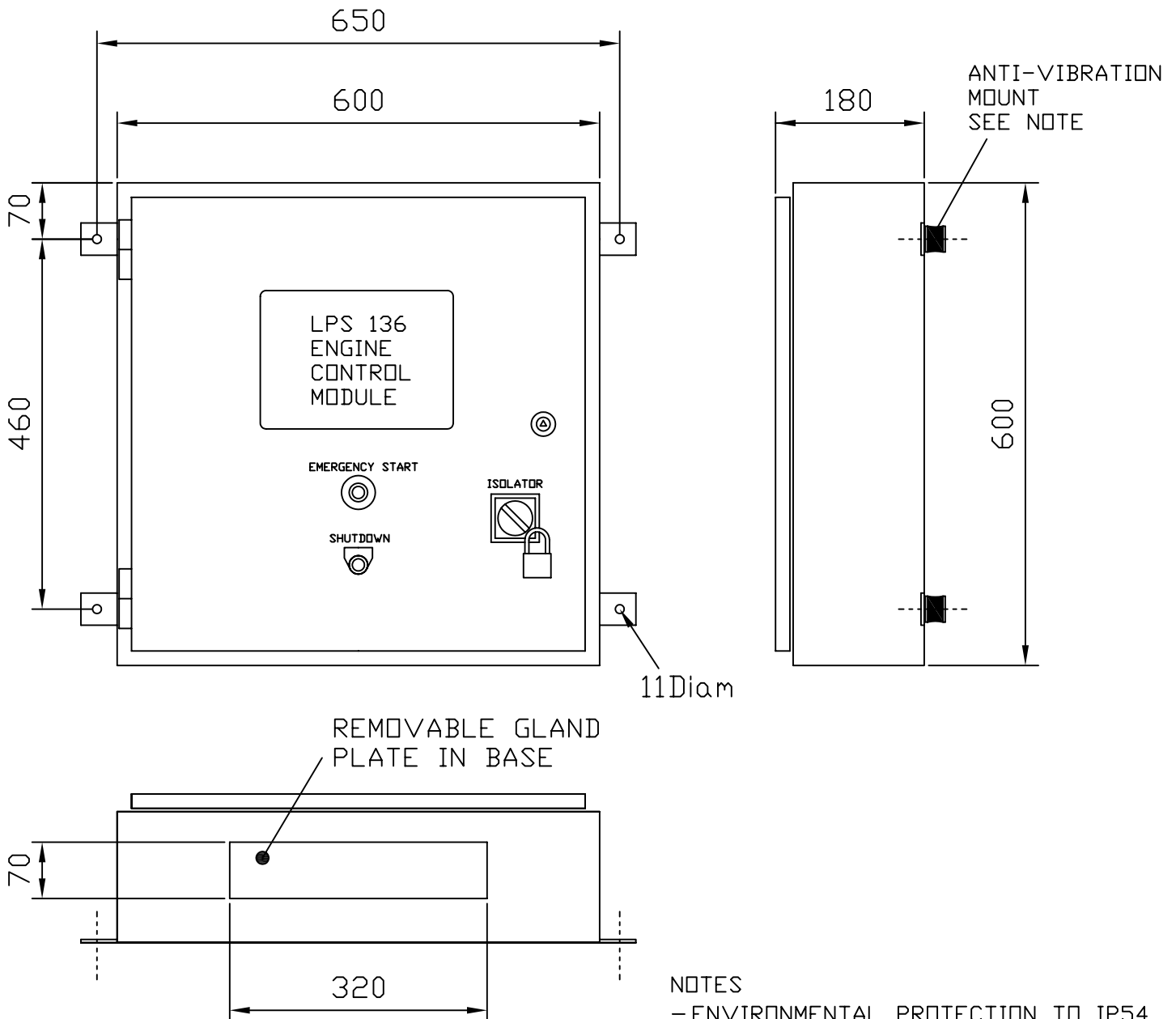
- The Module is factory programmed to provide control and monitoring of the Diesel driven Fire Pump set, as specified in Loss Prevention Standard LPS 1236.
- The module has been designed to be simple to use with clearly marked indicator lights for the main conditions
- The module message display screen details specific Alarm and Fault conditions, as required by the Loss Prevention Standard LPS 1236.
- Six tactile push buttons, eleven indicator lights and a message display screen are incorporated in the door mounted LPS 1236 Engine Control Module.

• Green light for	①	AC Supply Healthy
——— ———	②	Battery System “A” Healthy
——— ———	③	Battery System “B” Healthy
——— ———	④	Auto Start Available
——— ———	⑤	Cranking from Battery “A”
——— ———	⑥	Cranking from Battery “B”
——— ———	⑦	Pump on Demand
——— ———	⑧	Pump Running
• Amber light for	⑨	Alarm
——— ———	⑩	Test Manual Start
• Red light for	⑪	Fault

- Pressing a single push button, identified with a battery and tachometer symbol, ⑫ changes the Alarm/Fault display to a second screen ⑬ showing Battery Volts, Battery Amps, Engine Speed, Hours Run and Delay start timer setting.
- A Factory Set delayed start option is available. The start delay timer setting information is also displayed on the second screen. ⑬
- This screen is then displayed for 15 seconds before automatically reverting to the Alarm/Fault screen. “Scroll” Up and Down push buttons, ⑭ to the left of the four line display screen; enable all active information to be viewed.
- Every Alarm/Fault condition displayed also initiates an audible alarm. Which, with the exception of “Automatic Start Unavailable” ④ may be silenced by pressing the “Mute Alarm” ⑮ push button. Once the cause of the Fault/Alarm has been rectified the display can be cancelled by pressing the “Alarm Reset” ⑯ push button.
- The “Mute Alarm” ⑮ push button also doubles as “Lamp Test” initiated by keeping the button pressed for 2 seconds
- Incorporated within the Module is a “Test Manual Start” push button ⑩ and associated indicator light. This Push Button is only active when the indicator light is illuminated. It is enabled after an Automatic Start, followed by a shut down. Or after six repeated unsuccessful attempts to start automatically.

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DIESEL ENGINE FIRE PUMP CONTROLLER
12VDC or 24VDC NEGATIVE GROUND MODEL Mk VII

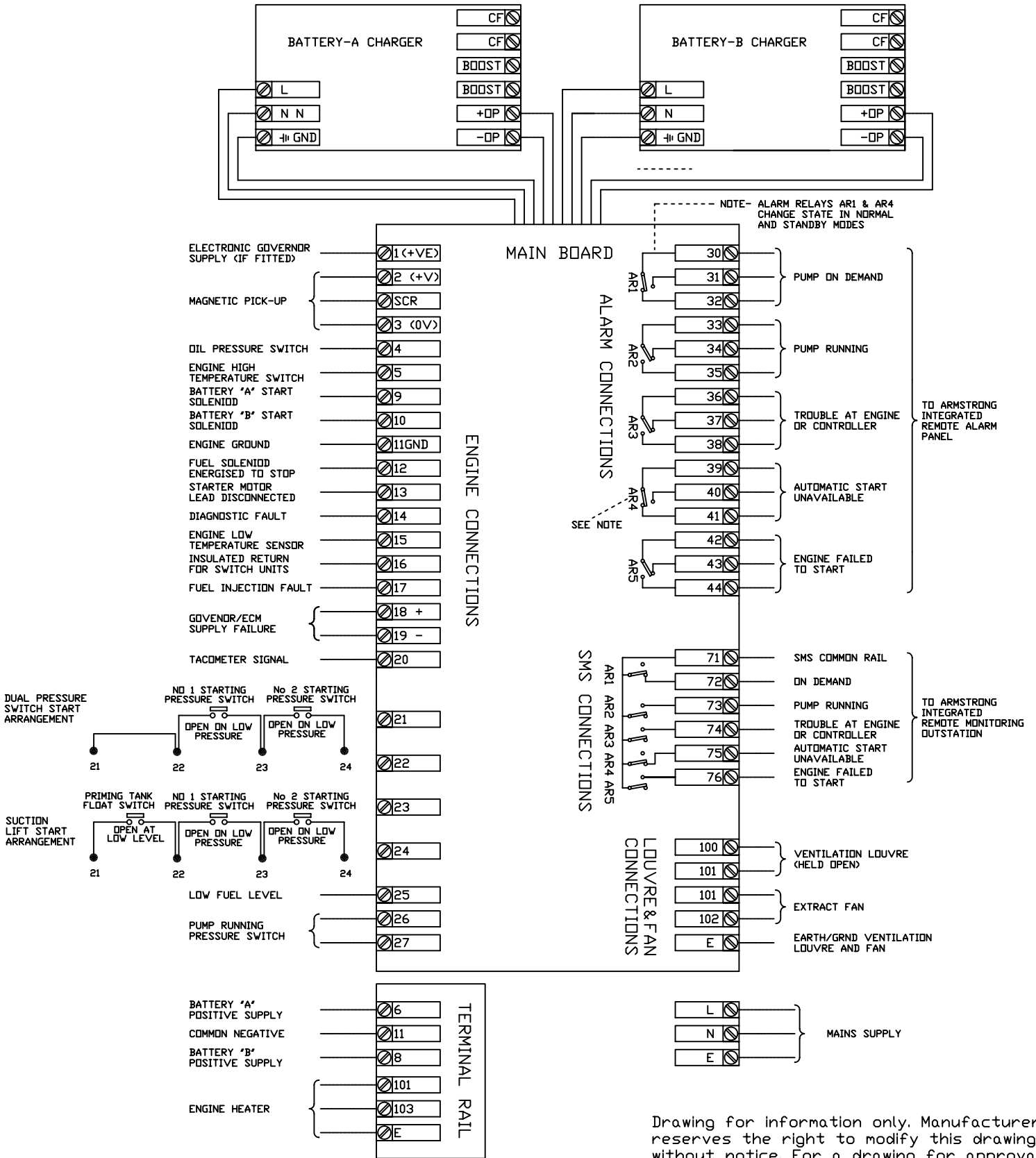


NOTES

- ENVIRONMENTAL PROTECTION TO IP54
- PAINTED FINISH TO BS 38-1C-538 COLOUR "APOLLO RED"
- ALL DIMENSIONS ARE IN MILLIMETERS
- USE WATERTIGHT GLANDS/CONDUIT
- REMOVE GLAND PLATE FOR DRILLING
- PROTECT AGAINST DRILLING SWarf
- AMBIENT TEMPERATURE 0C-50C
- SHIPPING WEIGHT APPROXIMATELY 28Kgs
- SEE RATING PLATE FOR ELECTRICAL DETAILS
- IF THE CONTROLLER IS MOUNTED ON AN ENGINE SKID ANTI-VIBRATION MOUNTS (NOT SUPPLIED) MUST BE FITTED.

Drawing for information only.
Manufactures reserves the right to modify this drawing without notice.
For a drawing for approval, please contact Armstrong Integrated Sales Department

DIESEL ENGINE FIRE PUMP CONTROLLER
12VDC or 24VDC NEGATIVE GROUND MODEL Mk VII



Drawing for information only. Manufacturer reserves the right to modify this drawing without notice. For a drawing for approval please contact Armstrong Sales Department

COMPONENTS FOR USE WITH 12 VOLT CONTROL BATTERY SYSTEMS

3289115-012 12 Volt Micro Processor Diesel Controller Components		
Part Number	Description	Qty
3284211-302	Red pushbutton	1
3284211-101	Green pushbutton	1
3284238-001	Hinged Cover	1
3282114-100	LPC Diesel Engine Control Module Type 1236	1
3284344-005	Isolator Handle	1
3284344-201	Contact block holder	2
3284344-110	Contact block	3
3282412-012	Battery charger 12v	2
3285560-001	Ammeter Shunt	2
3285541-001	Rectifier	1
3284312-106	MCB-1 Single Pole 6 amp	1
3284312-116	MCB-2 Single Pole 16 amp	1
3284312-210	MCB-3 and 4 Double Pole 10 amp	2
3284346-016	Isolator	1
3284342-032	Isolator shroud	1
3284347-618	Isolator shaft	1
3286651-102	Terminal, M10/10	3
3286651-101	Terminal, M4/6	2
3286661-006	Terminal End Plate	1
3286652-101	Earth terminal	1
3282114-012	Diesel Micro PCB 12V	1
3281213-003	Steel Enc, Micro Pro Diesel	1

COMPONENTS FOR USE WITH 24 VOLT CONTROL BATTERY SYSTEMS

3289115-024 24 Volt Micro Processor Diesel Controller Components		
Part Number	Description	Qty
3284211-302	Red pushbutton	1
3284211-101	Green pushbutton	1
3284238-001	Hinged Cover	1
3282114-100	LPC Diesel Engine Control Module Type 1236	1
3284344-005	Isolator Handle	1
3284344-201	Contact block holder	2
3284344-110	Contact block	3
3282412-024	Battery charger 24v	2
3285560-001	Ammeter Shunt	2
3285541-001	Rectifier	1
3284312-106	MCB-1 Single Pole 6 amp	1
3284312-116	MCB-2 Single Pole 16 amp	1
3284312-210	MCB-3 and 4 Double Pole 10 amp	2
3284346-016	Isolator	1
3284342-032	Isolator shroud	1
3284347-618	Isolator shaft	1
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3286651-101	Terminal, M4/6	2
3286661-006	Terminal End Plate	1
3286652-101	Earth terminal	1
3282114-024	Diesel Micro PCB 24V	1
3281213-003	Steel Enc, Micro Pro Diesel	1

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E.C. DECLARATION OF CONFORMITY

We declare under our sole responsibility that the **Mk VII Microprocessor Diesel Engine Fire Pump Controller** detailed below complies with the following harmonised standards:-

- Safety requirements for Low Voltage Switchgear & Controlgear Assemblies;
BS EN 60439-1 (1999):
- Electro Magnetic Compatibility (EMC) Part 6-3: Generic Standard;
Electro Magnetic Compatibility (EMC) Emission Standard for Residential,
Commercial & Light-Industrial Environments.
BS EN 61326 Industrial, BS EN 55022, BS EN 55011, BS EN 61000-6-3 (2007)
- Electro Magnetic Compatibility (EMC) Part 6-2: Generic Standard;
Electro Magnetic Compatibility (EMC) Immunity Standard for Industrial Environments.
BS EN 61326 Industrial, BS EN 61000-6-2 (2005)

Therefore the **Mk VII Microprocessor Diesel Engine Fire Pump Controller** conforms with the following European Directives:-

- Low Voltage Directive : 2006/95/EC
Including all current amendments thereof
- Electromagnetic Compatibility (EMC) Directive: 2004/108/EC
Including all current amendments thereof

Description: Generic Standard for the **Mk VII Microprocessor Diesel Engine Fire Pump Controller** designed and built to the requirements of the **Loss Prevention Certification Board (LPCB), Standard LPS 1236**. In accordance with this **Operation and Maintenance Manual** and the drawings included herein.

Name of Authorised Person :- David J. Halfpenny
 Status of Authorised Person :- Controls Division General Manager

Signature of Authorised Person :-

Date of Issue :- 1st August 2010

Installation and Operation

1-Introduction

Diesel engine fire pump controllers are designed to automatically start a diesel engine driven fire pump by detecting a pressure drop in the fire protection system.

A diesel engine fire pump controller provides both automatic starting and manual starting and manual stopping of the engine.

Automatic start is initiated by detecting a pressure drop in the fire protection system.

This is facilitated by means of a pair of pressure switches wired in series. Either of which may initiate the starting of the engine.

A further pressure switch is then used to provide a confirmation signal to the controller to advise that the correct pump pressure is being maintained.

If this confirmation signal is not maintained an alarm condition **PUMP FAILURE** is shown on the screen display.

When started the diesel engine will continue to run until manually stopped.

The diesel engine is stopped by pressing and continuing to press the controller Shut Down push button until the engine comes to rest.

A manual Emergency Start is provided by a push button on the controller. To prevent accidental starting this push button is protected by a quick release lift up access cover.

The diesel engine controller includes two automatic battery chargers to maintain the engine batteries at their optimum charge.

A factory programmable delay start option is available on the controller.

2-Types of Diesel Engine Fire Pump Controllers

Type	Part Number	Battery Type Plante/Ni-Cad	Number of Flywheel Teeth	Start Delay
12v	3289115-012	Customer specification	Customer specification	Customer specification
24v	3289115-024	Customer specification	Customer specification	Customer specification

3-Location

<ul style="list-style-type: none"> The controller should be located as close as practical to the diesel engine fire pump that it controls and should be within sight of the fire pump engine set. 	
<ul style="list-style-type: none"> The controller shall be located and or protected such that it cannot be damaged by water escaping from the fire pump or associated pipe work. 	
<ul style="list-style-type: none"> Appropriate and adequate working clearances shall be provided around the controller to allow operational and maintenance activities on the controller to be carried out safely. 	

<ul style="list-style-type: none"> The controller must be installed inside a building. Controllers are not designed for an outside environment. 	
<ul style="list-style-type: none"> The controller is suitable for use in pump room locations which may be subject to a moderate degree of moisture in the atmosphere. 	
<ul style="list-style-type: none"> The controller enclosure in standard form has an environmental rating to IP54. 	

4-Mounting

<ul style="list-style-type: none"> The diesel engine controller shall be mounted in a substantial manner on a single incombustible supporting structure 	<ul style="list-style-type: none"> If the controller is to be wall mounted it shall be attached to the wall or structure using all four mounting lugs. The fixings used to secure the mounting lugs to the wall or structure must be designed to support the weight of the controller.
<ul style="list-style-type: none"> If the controller is to be mounted on an diesel engine set support frame it shall be mounted using four anti-vibration mounts between the support framework and the controller. 	<ul style="list-style-type: none"> The controller shall be mounted at an appropriate working height allow operational and maintenance activities on the controller to be safely carried out

5-Electrical Wiring and Connection

<ul style="list-style-type: none"> Electrical Wiring The electrical wiring between the power source and the diesel engine controller shall be designed and installed in accordance with the IEE Wiring Regulations Seventeenth Edition (BS 7671:2008) and or any other prevailing local codes and regulations which may be applicable. 	<ul style="list-style-type: none"> Terminal Connection Description Refer to terminal connection drawing number A4-19148 (Page-8 of this document) before connecting to any terminals
<ul style="list-style-type: none"> A suitably qualified electrician must supervise the controller electrical installation. 	<ul style="list-style-type: none"> Incoming Power Connection The incoming power supply should be connected directly to the isolator located at the bottom right of the enclosure. Refer to connection drawing Number A4-19148 (Page-8 of this document) The earth (ground) terminal is located adjacent to the isolator.
<ul style="list-style-type: none"> The controller gland plate must be removed for drilling for cable glands and connection fixings. 	<ul style="list-style-type: none"> Low Fuel Float Switch One lead of the low float switch must be connected to terminal 25. The second lead of the float switch must be connected to terminal number 16, or common ground.
<ul style="list-style-type: none"> The installer is responsible for adequate protection of the diesel engine fire pump controller components against metallic debris or drilling swarf. Failure to do so may cause injury to personnel, and damage the controller and subsequently void the controller warranty. 	<ul style="list-style-type: none"> Low Engine Temperature Switch One lead of the low temperature switch must be connected to terminal 15. The second lead of the low temperature switch must be connected to terminal number 16 or common ground.
<ul style="list-style-type: none"> The fire pump controller must be powered by a dedicated power source and protected by a fuse or circuit breaker. The recommended fuse or circuit breaker rating is 16 amps. 	<ul style="list-style-type: none"> High Engine Temperature Switch The high temperature switch must be connected to terminal 5.
<ul style="list-style-type: none"> The controller incoming power supply terminals are sized for cables between 0.75 mm to 10.0 mm. 	<ul style="list-style-type: none"> Pump Running Pressure Switch One lead of the pump running pressure switch connected to terminal 26. The second lead of the pump running pressure switch must be connected to terminal number 27.
<ul style="list-style-type: none"> Power supply cabling to the controller incoming power supply terminals shall be 2.5mm minimum 	<ul style="list-style-type: none"> Oil Pressure Switch The oil pressure switch must be connected to terminal 4.
<ul style="list-style-type: none"> Wiring between controller and engine terminals 1-2-3-4-5-9-10 and 12 to 27 should be stranded and a minimum size of 1.0 mm square. 	
<ul style="list-style-type: none"> Battery wiring cables 6, 8 and 11 must be stranded 4.0 mm square, when the controller and batteries are skid mounted. For remote mounting applications refer to the engine manufacturer. 	

• **Diesel Engine Connection**

The diesel engine must be fully and correctly connected to the controller. It is recommended to use “Boot Lace Ferrules” on these terminals to ensure a secure connection.

The Controller terminals are numbered according to the LPS Standard 1236:-

1	Electronic Governor (if fitted)	17	Fuel injection fault (contact closed on fault)	
2	Magnetic pick up +VE	18	(+) Governor/ECM failure	
SCR	Magnetic pick up cable Screen	19	(-) Governor/ECM failure	
3	Magnetic pick up 0V	20	Tachometer signal	
4	Oil pressure switch (contact closed on low pressure)	21	Start pressure switch	Refer to controller wiring diagram for pressure switch starting options for dual switch start and suction lift start arrangements
5	High temperature (closed on high temp)	22	Start pressure switch	
6	Battery “A” positive supply	23	Start pressure switch	
8	Battery “B” positive supply	24	Start pressure switch	
9	Battery “A” start solenoid	25	Low fuel level (contact closed on low fuel)	
10	Battery “B” start solenoid	26	Pump running pressure switch supply	Switch opens on low pressure
11	Engine ground and common battery negative	27	Pump running pressure switch return	
12	Engine shut down	100	Extract fan 230v positive supply	
13	Starter motor lead disconnected	101	Extract fan, vent louver, engine heater negative	
14	Diagnostic fault (contact closed on fault)	102	Ventilation louver 230v positive supply	
15	Low temperature (contact closed on low temp)	103	Engine water heater 230v positive supply	
16	Insulated return for switch units			

Alarm Contacts and SMS Remote Monitoring

<ul style="list-style-type: none"> • Pump On-Demand Volt-free alarm contacts: Connection terminals 30-31-32. Active relay is AR1. Connections 30-31 are normally open, 30-32 are normally closed. Relay AR1 changes state in normal and standby modes. 	<ul style="list-style-type: none"> • Automatic Start Unavailable Volt-free alarm contacts: Connection terminals 39-40-41. Active relay is AR4. Connections 39-40 are normally open, 39-41 are normally closed. Relay AR4 changes state when the automatic start facility is available.
<ul style="list-style-type: none"> • Pump Running Volt-free alarm contacts: Connection terminals 33-34-35. Active relay is AR2. Connections 33-34 are normally closed, 33-35 are normally open. Relay AR2 changes state when the pump is running. 	<ul style="list-style-type: none"> • Fail To Start Volt-free contacts: Connection terminals 42-43-44. Active relay is AR5. Connections 42-43 are normally closed, 42-44 are normally open. Relay AR5 changes state when the engine has failed to start when called for.
<ul style="list-style-type: none"> • Engine/Controller Trouble Volt-free alarm contacts: Connection terminals 36-37-38. Active relay is AR3. Connections 36-37 are normally closed, 36-38 are normally open. Relay AR3 changes state when a problem (Trouble) is detected at engine or controller. 	<ul style="list-style-type: none"> • SMS Remote Monitoring Facility: Connection terminals 71 to 76 are provided for connecting directly to the “Armstrong Integrated” Remote Monitoring Outstation. Refer to Armstrong Integrated Sales Department for details of the SMS Remote Monitoring Outstation equipment.

Circuit Protection

Protection Device	Ref	Rating	Circuit(s) Protected
Circuit breaker	MCB-1	6 Amp	Battery charger, Extraction Fan, Ventilation Louver
Circuit breaker	MCB-2	16 Amp	Jacket Water Heater
Circuit breaker	MCB-3	10 Amp	Battery System “A” Control Circuit
Circuit breaker	MCB-4	10 Amp	Battery System “B” Control Circuit
Fuse	CF1	5 Amp	Crank Solenoid Battery “A”
Fuse	CF2	5 Amp	Crank Solenoid Battery “B”
Fuse	CF3	3 Amp	LPS 1236 Module Supply
Fuse	CF4	5 Amp	Electronic Governor Supply
Fuse	CF5	3 Amp	Starter Lead Fault Control Circuit Supply
Fuse	CF6	3 Amp	Auto Start Control Circuit

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7- Controller Operation

Alarm

Batt/Charger "A" Fault

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Batt/Charger "A" Fault (Amber Alarm light on)

Reason:- No charge current is detected going into Battery 'A'
Possible Cause:- AC supply switched off, Battery charger "A" fault, Battery "A" faulty or missing.

Alarm

Batt/Charger "B" Fault

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Battery/Charger "B" Fault (Amber Alarm light on)

Reason:- No charge current is detected going into Battery 'B'
Possible Cause:- AC supply switched off, Battery charger "B" fault, Battery "B" faulty or missing.

Alarm

Battery "A" Fault

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Battery "A" Fault (Amber Alarm light on)

Reason:- Controller detected that RPM of engine during cranking is too slow
Possible Cause:- Battery "A" faulty or missing. Magnetic pick-up faulty /wiring faulty leading to Controller not receiving correct RPM signal during cranking.

Alarm

Battery "B" Fault

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Battery "B" Fault (Amber Alarm light on)

Reason:- Controller detected RPM of engine during cranking is too slow.
Possible Cause:- Battery "B" faulty or missing. Magnetic pick-up faulty /wiring faulty leading to Controller not receiving correct RPM signal during cranking.

Alarm

Low Oil Pressure

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Low Oil Pressure (Amber Alarm light on)

Reason:- Engine Oil Pressure is below manufacturers recommended level.
Possible Cause:- Low oil level in engine, Engine overheating, Oil pump problem

Alarm

High Engine Temp

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
High Engine Temp (Amber Alarm light on)

Reason:- Engine Temperature is above manufacturers recommended level.
Possible Cause:- No water in system, low water level in heat exchanger, if fitted, or blockage in cooling system. In the case of air cooled engines obstruction of air flow.

Alarm

Low Engine Temp

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Low Engine Temperature (Amber Alarm light on)

Reason:- Engine Water Jacket temperature below manufacturers recommended level.
Possible Cause:- Engine jacket heater failure, A.C. supply failure, No water in system.

7- Controller Operation (continued)

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Low Fuel Level

Screen Display:- **Alarm**
Low Fuel Level (Amber Alarm light on)

Reason:- Fuel level below manufacturers recommended level.
Possible Cause:- Fuel level in day tank low,

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Mains Low Volts

Screen Display:- **Alarm**
Mains Low Volts (Amber Alarm light on)

Reason:- No A.C. Supply detected in the controller .
Possible Cause:- Controller A.C. isolator switched off, MCB1 tripped, failure of A.C. supply external to controller.

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Governor/ECM Supply Failed

Screen Display:- **Alarm**
Governor/ECM Supply Failed (Amber Alarm light on)

Reason:- Failure of supply to Governor/ECM.
Possible Cause:- Failure of Fuse CF4.

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Fuel Injection Fault

Screen Display:- **Alarm**
Fuel Injection Fault (Amber Alarm light on)

(Applicable to electronic engines only.)
Reason:- Fuel injection fault detected by ECM
Possible Cause:- Problem with Fuel injector pump.

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Diagnostic Fault

Screen Display:- **Alarm**
Diagnostic Fault (Amber Alarm light on)

Reason:- ECM internal monitoring programme detected a fault
Possible Cause:- ECM internal monitoring programme detected a fault within the unit or with engine timing, emissions etc.

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Pump Failure

Screen Display:- **Alarm**
Pump Failure (Amber Alarm light on)

Reason:- Pump failed to establish pressure when running.
Possible Cause:- No water in system, pump discharge pressure switch not wired in circuit.

Alarm

- Pump on Demand
- Pump Running
- Alarm
- Fault

Auto Start Unavailable

Screen Display:- **Alarm**
Auto Start Unavailable (Red Fault light on)

Reason:- Automatic Start facility unavailable.
Possible Cause:- Internal auto start selector switch in 'off' position, engine has made six unsuccessful starting attempts.



7- Controller Operation (continued)

Alarm

Engine Fail to Start

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Engine Fail to Start (Red Fault light on)

Reason:- Engine has made six unsuccessful starting attempts.
Possible Cause:- No fuel or problem with fuel delivery system.

Alarm

Starter Motor Lead Fault

- Pump on Demand
- Pump Running
- Alarm
- Fault

Screen Display:- **Alarm**
Starter Motor Lead Fault (Red Fault light on)

Reason:- Starter motor lead disconnected.
Possible Cause:- Lead disconnected by Service Engineer and not replaced.
Failure of fuse CF5.

RECOMMENDED SPARES

FOR USE WITH 12 VOLT CONTROL BATTERY SYSTEMS

3289115-012 12 Volt Micro Processor Diesel Controller Spare Parts			
Part Number	Description	Spares Qty	Order Qty
3284211-302	Red pushbutton	1	
3284211-101	Green pushbutton	1	
3284344-201	Contact block holder	1	
3284344-110	Contact block, 1n/o	2	
3282412-012	Battery charger	1	
3285541-001	Rectifier	1	
3284312-106	MCB single pole 6 amp	1	
3284312-116	MCB single pole 16 amp	1	
3284312-210	MCB double pole 10 amp	1	

The Controller identification numbers should also be included on any request for the supply of spare parts

Baan Number	-----	All this information can be found on the Controller rating label which is attached to the inside of the enclosure door
Lot Number	-----	
Part Number	-----	
Type Number	-----	

The above list are Armstrong Integrated recommendations for the spare parts that should be held on site for this Micro-processor Controller. To order or obtain a quotation for the supply of any of the spare parts as listed, fill in the Order Quantity box and Fax or E-Mail a copy of this page to:-

Sales Department by Fax on:- 0121-550-1679, or E-Mail sales department at:- controls@armlink.com

RECOMMENDED SPARES

FOR USE WITH 24 VOLT CONTROL BATTERY SYSTEMS

3289115-024 24 Volt Micro Processor Diesel Controller Spare Parts			
Part Number	Description	Spares Qty	Order Qty
3284211-302	Red pushbutton	1	
3284211-101	Green pushbutton	1	
3284344-201	Contact block holder	1	
3284344-110	Contact block, 1n/o	2	
3282412-024	Battery charger	1	
3285541-001	Rectifier	1	
3284312-106	MCB single pole 6 amp	1	
3284312-116	MCB single pole 16 amp	1	
3284312-210	MCB double pole 10 amp	1	

The Controller identification numbers should also be included on any request for the supply of spare parts

Baan Number	-----	All this information can be found on the Controller rating label which is attached to the inside of the enclosure door
Lot Number	-----	
Part Number	-----	
Type Number	-----	

The above list are Armstrong Integrated recommendations for the spare parts that should be held on site for this Micro-processor Controller. To order or obtain a quotation for the supply of any of the spare parts as listed, fill in the Order Quantity box and Fax or E-Mail a copy of this page to:-

Sales Department by Fax on:- 0121-550-1679, or E-Mail sales department at:- controls@armlink.com

HEALTH AND SAFETY INFORMATION

1. INTRODUCTION

This O & M Manual has been prepared by Armstrong Integrated. The Manual contains Health and Safety information and instructions to enable the specified equipment to be operated and maintained in a safe manner by authorised and competent persons. Where Health and Safety Regulations are quoted herein these regulations are valid at the time of issue of this manual.

Although accidents do arise due to faulty plant and equipment, often brought on by poor or lack of maintenance, equipment which is manufactured to an appropriate standard will not normally give rise to danger. It is usually people who create accident situations. The aim of this document is to highlight the legal requirements, the general safety principles, management strategies, responsibilities and requirements for working which will lead to safer installations and working practices.

Reference is made to documents and standards which provide more information in greater detail.

It is recognized that Clients will already have their own in-house policy and procedures which will provide a safe system of working. Compliance with site imposed requirements must be observed.

The requirements of this specification are based on UK practice, but the principles related to ensure satisfactory operation and to avoid damage to the equipment, the following points must be observed.

- The equipment must be correctly installed by suitably qualified and experienced personnel, in accordance with the installation information given in this manual.
- Any recommended pre-commissioning checks must be carried out before the plant is powered up.

2. LEGAL REQUIREMENTS HIGHLIGHTS

Your attention is drawn to the following requirement:- Note the following information is not intended to be a full and comprehensive description of all Health and Safety requirements but as a general guide to the principal safety information that is applicable to this Microprocessor Controller:-

- The Health and Safety at Work etc Act 1974 (Sections 2 and 3) places general duties on employers to ensure the health, safety and welfare of their employees. It also requires employers and the self-employed to conduct their activities so that other people who are not their employees are not exposed to risks to their safety.

Employers are also required to provide information, training and supervision regarding safety matters and to maintain the workplace in a safe condition. Since 1992, the European Health and Safety Framework Directive and daughter Directives have been implemented as Regulations made under the Health and Safety at Work etc Act 1974.

These Regulations are based on the same fundamental principles as the Act but they are somewhat more prescriptive. Section 6 of the Health and Safety at Work Act places duties on designers and manufacturers to ensure that any article (plant and equipment) for use at work is safe when it is being set (tested and commissioned) and maintained.

HEALTH AND SAFETY INFORMATION

2. LEGAL REQUIREMENTS HIGHLIGHTS (CONTINUED)

- Electricity at Work Regulations 1989. The Electricity at Work Regulations 1989 are the specific Regulations which apply to electrical matters. They are mostly qualified by "so far as is reasonably practicable". However an absolute duty applies to Regulation 16 which covers competence, Regulation 13 which covers working dead and Regulation 14 which deals with live working, including testing and fault finding using appropriate instruments.

"Danger" in these Regulations is defined as "the risk of injury".

"Injury" is defined and includes "death or personal injury from electric shock, electric burn, electrical explosion or arcing".

- The Personal Protective Equipment at Work Regulations 1992 apply to insulating clothing and complement the requirements regarding protective equipment in Regulation 4(4) of the Electricity at Work Regulations 1989.
- The Provision and Use of Work Equipment Regulations 1999 are applicable to all workplaces and include servicing and repair activities; designated persons who carry out this work are required to be adequately trained. Employers also have duties to make adequate information and appropriate written instructions available. The training should include the identification of any risks the work entails and the precautions which should be taken.
- The Management of Health and Safety at Work Regulations 1999, Regulation 3, requires employers to carry out formal risk assessments with a view to eliminating risks at source by design and to enable safety control measures to be identified to reduce the residual risk to a minimum

3. GENERAL EQUIPMENT SAFETY PRINCIPLES

The risk of injury is inherently high in both electrical testing and fault finding, if hazardous live conductors are exposed. Precautions should minimise electrical danger and prevent injury.

Where practicable testing and fault finding should be carried out using safe voltages, e.g. insulation/continuity testing.

Where measurements of voltage/currents/waveforms are necessary only suitable instruments should be used and, where necessary insulating and sheathed leads and fused probes.

Any component or wiring replacement must be carried out with the equipment made dead and with any adjacent live equipment sufficiently protected and insulated to present dead working conditions in the vicinity of the work.

Temporary wiring or component alteration are not acceptable. Permanent fixed wiring and components to complete the fault repair are the only acceptable course of action.

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