IS-UPS IECEx

Intrinsically Safe Uninterruptible Power Supply User Manual

Designed and Manufactured in Australia by Ampcontrol CSM Pty Limited ABN 35 000 770 141

Ampcontrol Electronics Phone: (02) 4903 4800 Fax: (02) 4903 4888

Ampcontrol User Manual Part No: 142834

AMPCONTROL®

Revision Record:

Version	Notes	Author	Checked	Approved	Date
R0-CRN 8036	First Issue	B. Pascoe			

Ampcontrol CSM Contact details:

7 Billbrooke Close, Cameron Park, NSW, 2285
P +61 2 4903 4800 | F +61 2 4903 4888

EMAIL: electronicsorders@ampcontrolgroup.com
WEB: www.ampcontrolgroup.com

Safety and other Warnings

WARNING! 	**This safety alert symbol identifies important safety messages in this manual and indicates a potential risk of injury or even death to the personnel. When you see this symbol, be alert, your safety is involved, carefully read the message that follows, and inform other operators.**

CAUTION! 	**This safety alert symbol identifies important information to be read in order to ensure the correct sequence of work and to avoid damage or even destruction of the equipment, and reduce any potential risk of injury or death to the personnel.**

	Supplementary information not directly affecting safety or damage to equipment. Carefully read the message that follows, and inform other relevant personnel.

	**Information concerning possible impact on the environment and actions required for prevention and proper response.**

Copyright Notice

Disclaimer

Ampcontrol CSM Pty Ltd will make no warranties as to the contents of this documentation and specifically disclaims any implied warranties or fitness for any particular purpose.

Ampcontrol further reserves the right to alter the specification of the system and/or manual without obligation to notify any person or organisation of these changes.

Before You Begin

We would like to take a moment to thank you for purchasing the I.S. UPS from Ampcontrol.

WARNING! 	**To become completely familiar with this equipment and to ensure correct operation, we strongly recommend that you take the time to read and thoroughly understand this user manual.**

If this document is being read via a computer the hyper links may be used (Press control and click on the blue highlighted text to go to that topic).

Table of Contents:

1 Receiving and Storage

1.1 Receiving

All possible precautions are taken to protect the equipment against damage or losses during shipment, however before accepting delivery, check all items against the packing list or Bill of Lading. If there are shortages or evidence of physical damage, notify Ampcontrol immediately.

Notify Ampcontrol within 7 days (maximum) in case of shortages or discrepancies, according to the packing list. This action will help ensure a speedy resolution to any perceived problems. Keep a record of all claims and correspondence. Photographs are recommended.

Where practicable do not remove protective covers prior to installation unless there are indications of damage. Boxes opened for inspection and inventory should be carefully repacked to ensure protection of the contents or else the parts should be packaged and stored in a safe place. Examine all packing boxes, wrappings and covers for items attached to them, especially if the wrappings are to be discarded.

1.2 Storage after Delivery

When the equipment is not to be installed immediately, proper storage is important to ensure protection of equipment and validity of warranty.

All equipment should be stored indoors, in a cool dry environment, on raised shelves, and protected from the elements. Ensure that the storage area is not an area where water will collect.

1.2.1 Battery Care and Storage

The storage period should be as short as possible. The temperature has an impact on the self-discharge rate hence it is important to store the batteries in a fully charged condition in a cool but frost-free room

The batteries will be delivered filled, charged and installed inside the enclosure.

WARNING! 	**DO NOT ATTEMPT TO REMOVE THE BATTERIES FROM THE ENCLOSURE. The UPS has no user serviceable parts. All repairs must be carried out by Ampcontrol personnel only. If a fault develops return the IS UPS to Ampcontrol for repair. It is essential that no attempt be made to repair the UPS as any attempt to dismantle or repair the UPS can seriously compromise the safety of the unit and the consequence can be fatal.**

If it is anticipated that the UPS will not be used and will remain disconnected from the mains power supply for a period of time exceeding the recommended maximum, the battery should be recharged at the end of that time. The maximum storage time at ≤ 20° C is 6 months for 65WH models and 24 months for 300WH models. Higher temperatures cause higher self-discharge and shorter storage time between recharging operations.

To recharge the battery in this situation plug the unit into an appropriate power supply and turn the power on for the "Charging Time" as listed in section 3, Specification.

1.3 Unpacking of Equipment

The method of packing used will depend on the size and quantity of the equipment. The following cautions should be interpreted as appropriate.

CAUTION! 	**Take care when unpacking crates as the contents may have shifted during transport.**

	The disposal of packaging materials, replaced parts, or components must comply with environmental restrictions without polluting the soil, air or water. Ensure that any timber and cardboard used as packaging is disposed of in a safe and environmentally responsible manner. Where possible, dispose of all waste products i.e. oils, metals, plastic and rubber products by using an approved recycling service centre.

2 Overview of Equipment

The Intrinsically Safe Uninterruptible Power Supply by Ampcontrol is designed for Group 1 applications and is part of their environmental products range.

The IS UPS converts 100VAC ~ 250VAC mains power to intrinsically safe low voltage DC power with a built in Battery Backup.

The IS-UPS can be mounted by its back or base using M6 screws. The enclosure is of robust stainless steel construction and all terminals are screw terminals located on the top of the enclosure. The keypad display is located on the front of the enclosure. All cables enter and exit the enclosure via appropriate cable glands.

Typical use of this power supply is for gas detection systems but it is also suitable for voice communication systems, Serial to Ethernet converters, and other electronic equipment requiring intrinsically safe power in a Group 1 application.

WARNING! 	**The UPS has no user serviceable parts. All repairs must be carried out by Ampcontrol personnel only. Should a fault develop, return the IS UPS to Ampcontrol for repair. It is essential that no attempt be made to repair the UPS as any attempt to dismantle or repair the UPS can seriously compromise the safety of the unit and the consequence can be fatal.**

3 Specification

IS Certified:	IECEx TSA 10.0008X, Ex ia ma e I -20<Ta<+60degC
Supply Voltage:	100VAC ~250VAC, 50/60Hz
Operating Temperature:	0-60ºC
Dimensions:	300W x220 H x 225 D - 300WH model 180W x 220H x 210 D - 65WH model
Weight:	12kg for 65WH model and 24kg for 300WH model
IP Rating:	IP66
Efficiency:	91%
Charging time:	4hrs for 65Wh model and 19hrs for 300Wh model (From fully discharged).
Parameter:	Um = 250VAC
Output Parameters:	Refer Table 8 in Section 8.

WARNING! 	**The mains input power must not be used when installed in Zone 0.** **The IS UPS must be taken to a safe area for recharging when necessary.**

4 Installation

4.1 Mechanical Installation

Install the IS-UPS in an area that complies with the relevant parts of the specifications in Section 7 'Warnings for the Safe use of the IS UPS'.

Ensure adequate space above and below the unit to allow free air movement around the unit.

CAUTION! 	**Wiring to the IS-UPS must comply with any statutory, site or local wiring codes and Intrinsically Safe standards, as appropriate.**

The IS-UPS can be mounted by its back or base using M6 screws but must be positioned the right way up, which is such that the cable glands are at the top of the box.

5 Technical Description

5.1 Features

- LCD Display with Keypad input.
- "Mains On", "Output On" and "Output Overload" indicator LED's.
- "Stop LED" and "Reset LED"
- Local start/stop
- Remote start/stop
- Auto shutdown on low battery.
- Battery state and capacity indicators.
- Configurable alarms for:
    i. Output over current.
    ii. Output under current.
    iii. Output under voltage.
    iv. Battery over temperature.
- 3-output relays voltage free NO contacts. These can be configured for multiple alarm functions. Contacts are rated at 30V/3A
- 2-external and isolated digital inputs that may be used as the driving source for the relays.
- 1 non-isolated digital input that can be configured to stop the UPS.
- Modbus over RS485 to monitor the device.
- Event and periodic logs.
- User configurable timer to shutdown UPS, while operating from battery.

6 Operation

The Intrinsically safe uninterruptible power supply is an active type and exhibits very low output impedance. The output voltage is reduced by only 0.3V at full load. Precise active current limiting provides maximum available current up to the Io parameter. The power supply output acts as a current limited voltage source. The load impedance can vary down to short circuit while the maximum output current is maintained.

6.1 LED Indication

On the front facia there are 5 status indication LEDS:

6.1.1 **RESET LED**

When the STOP button is pressed to stop/lock the UPS this LED starts flashing, and remains flashing until the UPS is unlocked by pressing the RESET button. The LED remains flashing when the UPS is in lock mode. The application of mains power while UPS is locked will not start the UPS; it will be necessary to press the RESET button to unlock and then press the START button.

6.1.2 **STOP LED**

When the UPS is unlocked (by pressing the RESET button) it forces the STOP LED to begin flashing. This means that the UPS is ready to start and pressing and holding the START button for 1-second will start the UPS. The UPS may also be started by momentarily closing the terminals 'Start+' and 'Start In' located at X7 on the terminal Board. The successful start is indicated by the OUTPUT LED becoming illuminated at which time output will be available at the output terminals. The application of mains power while the UPS is unlocked will immediately start the UPS.

6.1.3 **OUTPUT LED**

This LED illuminates when the UPS is on.

6.1.4 **OVERLOAD LED**

This LED illuminates when the UPS is operating in current limit mode, and extinguishes when operating normally.

6.1.5 **MAINS ON LED**

This LED illuminates when the mains power is applied to the UPS, and extinguishes when mains power is switched off.

When operating from the battery the back light of the LCD display turns off 30-second after the last press on any button to save battery power. It is continuously illuminated when the mains is switched on.

6.2 Battery Life

CAUTION! 	The "Reset" LED flashes continuously (<1-second intervals) to indicate that this equipment is in "Stand-by" mode and contains an operational battery pack. The battery life is 6-months for the 65WH and 24 months for the 300WH UPS when they are stored in the recommended manner.

	Lead-acid batteries are recyclable products. Recognizing the need to be involved in the whole lifecycle of a battery and to protect the environment, EXIDE Technologies' factories recycle used lead. Contact your EXIDE Technologies representative who will advise you on this matter.

7 Warnings for the Safe Use of the IS-UPS

WARNING! 	**This equipment is designed to receive 110VAC to 250VAC. It also contains Battery backup which is indicated by a flashing LED. It is essential to be careful about the installation, use and storage of the IS-UPS.** **To ensure safe operation, avoid nullifying the warranty and contravening the Certificate of Compliance, check the following:**

- The input/output parameters provided in Table 8, in Section 8 must be taken into account when installed.
- The mains power input must not be used when installed in Zone – 0.
- The IS UPS must be taken to a safe area for recharging when necessary.
- The input Voltage Range and are connected to the designated input terminals
- The load is connected to the designated output DC terminals.
- No alteration to this equipment is permitted without written consent from Ampcontrol. Do not allow any alteration to this product as this may violate the Intrinsic Safety rating and the consequences of that could be fatal.
- Do not allow the equipment operating beyond the specification. This will compromise the product-life and result in premature failure.
- Refer to Table 8 for output parameters.

CAUTION! 	**Maintain a minimum 5-minute interval between successive applications of mains to the UPS. Frequent applications of mains power at insufficient intervals will blow the input fuse. Replacing a blown fuse will necessitate returning the unit to Ampcontrol for repairs (See warning in Section 2, Overview of equipment). This repair could be time consuming & expensive.**

8 Product List with Capacity Details

There are seventeen models of IS-UPS with a range of voltage and current limits that may be selected from Table 8, following. Various output options and battery capacity that are not shown in the Table can be manufactured on request as a system special.

	System specials will require longer lead times to manufacture.

Part Number	Model	Battery Capacity WH	Co (µF)	Lo (µH)	L/R µH/Ohm
110284	15.1V/1.5A	300	1.00/2.09	200/181.5	87.17/79
110282	15.1V/1.5A	65	1.00/2.09	200/181.5	87.17/79
142542	15.1V/0.51A	300	1.00	200	87.17
142541	15.1V/0.51A	65	1.00	200	87.17
140369	15.1V/0.50A	300	1.00	200	87.17
140368	15.1V/0.50A	65	1.00	200	87.17
142540	15.1V/0.47A	300	2.01	520	87.17
142539	15.1V/0.47A	65	2.01	520	87.17
142544	14.5V/1.5A	300	1.00	200	87.17
142543	14.5V/1.5A	65	1.00	200	87.17
142546	12.6V/2.5A	300	2.0	167.2	33
142545	12.6V/2.5A	65	2.0	167.2	33
140367	12.6V/2.4A	300	2.0	167.2	33
140364	12.6V/2.4A	65	2.0	167.2	33
140366	12.6V/2.0A	300	2.0/20.54	167.2/102.1	33/39
140365	12.6V/2.0A	65	2.0/20.54	167.2/102.1	33/39
141909	15.1V/1.5A	750	T.B.A.	T.B.A	T.B.A

Table 8: Product list with battery backup capacity and output parameters

9 Output Characteristics

9.1 Typical Output Voltage VS Output Load Current Curve

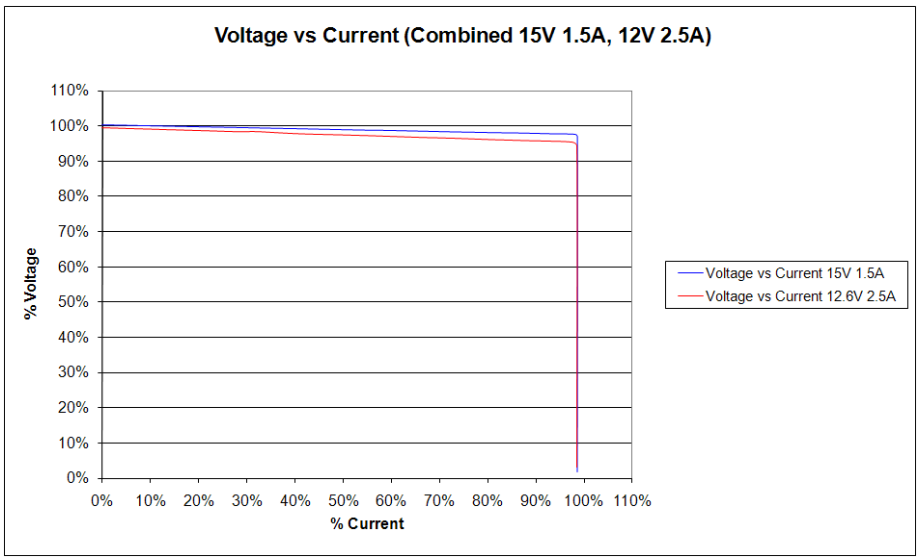


Figure 9.1: Typical Output Voltage VS Output Load Current Curve ISUPS

9.2 Efficiency Data

The overall efficiency of the ISUPS is in the order of the 91%. The efficiency is low at light load. Refer to Figure 9.2.

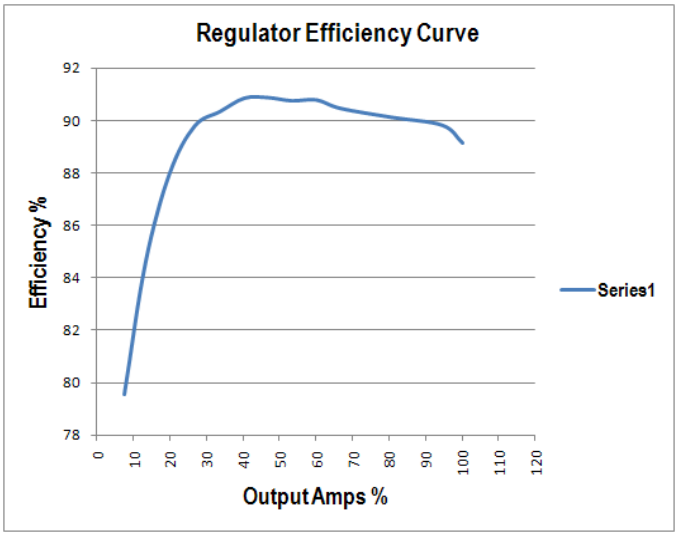


Figure 9.2: Efficiency VS load curve for IS UPS.

10 User Interface

The IS UPS is managed by using a 16 character x 2 line LCD display and a keypad.

The menus are divided into three user accessible groups as follows

10.1 Status Menu

The status menu displays information regarding the general status of the UPS such as Output ON/ OFF and Mains ON/OFF. Other information available from this menu by the use of the RIGHT button is: UPS Model, Serial Number, User Defined Label, Date and Time, Software and Hardware Version and Release Date.

10.2 Field Configurable Menus

The configuration menus coordinate and display changes to the settings that control the operation of the UPS. A password is required to gain access to the configuration menus. The factory default setting for the password is '0000' (four zeros).

It is recommended that the password be changed once the UPS has been configured after installation. Be sure to remember the password, as lost (or forgotten) passwords cannot be recovered. Creating a new password will necessitate resetting the password to the original factory '0000' prior to creating the new password.

CAUTION! 	**If the password is reset it is very likely that all previous user settings will be lost and will revert to the ex factory default. (The same as when the unit was first delivered).**

Refer to Section 13.4 for the **Password Management Menu**.

10.3 Factory Configuration

This menu coordinates and displays factory changes to the attributes of the UPS that are defined at build time, including battery size, temperature coefficient, model number and serial number. These settings are not operator variable parameters.

11 Menu Navigation

Navigation of the menu is performed by pressing the arrow keys on the keypad. The backlight will be lit for round 30 seconds whenever a key is pressed while the unit is battery powered, and lit continuously when the unit is mains powered.

UP Key (Button)

DOWN Key (Button)

LEFT Key (Button)

RIGHT Key (Button)

From the power-on-default **Status Menu** (Section 10.1) pressing the UP key will allow navigation through the major menus, and pressing the DOWN key will navigate back. Pressing the RIGHT key will select the minor menus from the sub-menus. Repeated pressing of the LEFT key will navigate back to the major menus. These key actions are typical throughout the menus.

Each menu requires different settings or responses from the user, some keys may be de-activated all together or have a different action – but this depends upon each menu. In general the keys will operate as shown in Table 11 (immediately following).

Key	Status Menus		Configuration Menu	
	Major Menu MM/a	Sub-Menu MM/(b-n)	Major Menu CM/a	Sub-Menu CM/(b-n)
UP	Next menu	-	Previous menu	Increase setting value
DOWN	Previous menu	-	Next menu	Decrease setting value
RIGHT	Sub-menu	Next sub-menu	Sub-menu	Next sub-menu
LEFT	-	Previous sub-menu	-	Previous sub-menu

Table 11 - The function of the Menu Keys

12 Field Accessible Menu Structure

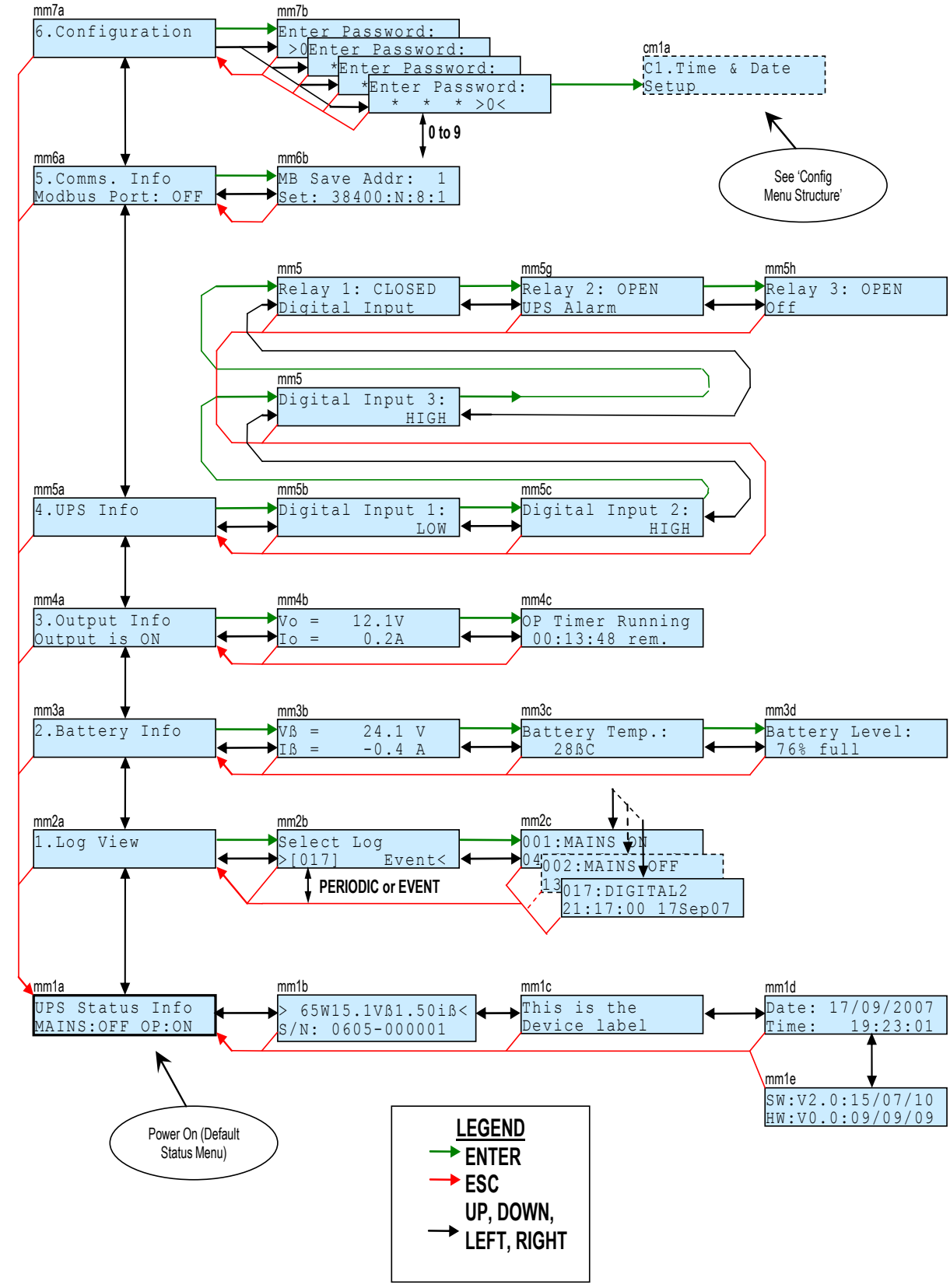


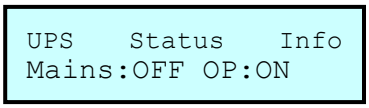
Figure 12 – Field Accessible Menu

12.1 Field Accessible Menus

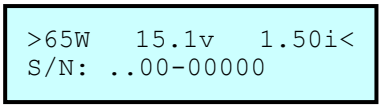
12.1.1 Default Menu

The Default Status menu is displayed at power-up of the UPS. The bottom line displays the Mains status and Output status. From here navigation to all other menus can commence. From this menu the DOWN and the LEFT button have no effect. The UP button will change the menu focus to the **Log View Menu** Section 12.1.2; while the RIGHT button changes menu focus to show the Model, Serial Number, User Defined Label, Date & Time, SW & HW version menu. While in any of these menus the UP and DOWN menu have no effect and the LEFT button changes to previous menu.

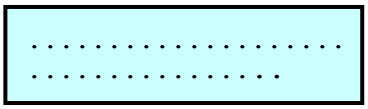
Main and Output Status menu – displays the Mains ON/OFF status and Output ON/OFF status.



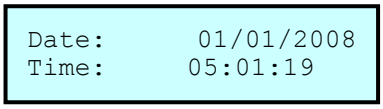
Model and Serial Number menu – displays the model and Serial Number of the UPS.



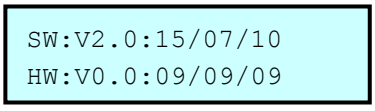
User defined Label menu – displays the blank window for user to write any identifying description etc.



Date and Time menu – displays date and time



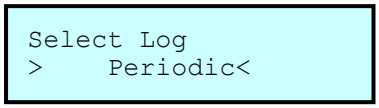
SW and HW version menu – displays Soft-Ware and Hard-Ware version. Press the LEFT or the ESC button to return to the **Default Menu**.



12.1.2 Log View Menu

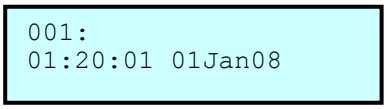
To view the log, press the UP button to select the "Log View" menu. To access the sub menus of the log view, press the right arrow to access the log selection menu. At this menu, and subsequent sub menus, Modbus reporting of the logs is suspended.

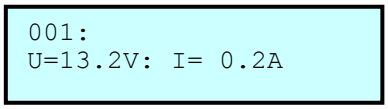
12.1.3 Select Log Menu



At this menu, either the **Periodic Log** or the **Event Log** may be selected for viewing by pressing either the UP or DOWN button respectively. Pressing the RIGHT button will select the currently active option.

12.1.4 Periodic Log menu



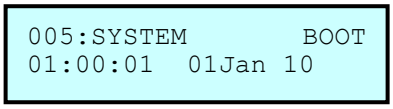


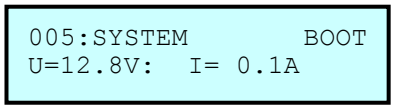
This menu will initially display 'LOG START'. Press the UP button and the periodic log entries will be displayed, with the most recent entry being displayed first. 'LOG END' will be displayed when the other end of the log is reached.

The periodic log can display the entries that have been logged every 5 minutes for up to 6 days – 1,728 entries in total. To assist with rapid navigation, by continually pressing the UP (or DOWN) button, the entries will increment (or decrement) by about 12 per second (roughly 1 hour intervals).

Once an entry has been selected, the bottom line of the display will show the time and date the entry was logged (see above left example), then, after a few seconds, will display the output voltage and output current reading that was logged (see above right example).

12.1.5 Event log Menu





This menu will initially display 'LOG START'.

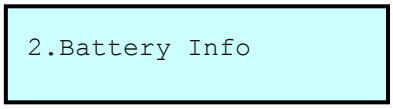
Pressing the UP button, the periodic log entries can be displayed, with the most recent entry being displayed first. 'LOG END' will be displayed when the other end of the log is reached.

The periodic log can display the event entries that have been logged whenever an event of significance occurs. Up to 100 events are logged. To assist with navigation through the log, the UP (or DOWN) button may be held closed to scroll forwards (or backwards) at about 5 per second through the events viewed.

Once an entry has been selected, the bottom line of the display will show the time and date the entry was logged (see above left example), then, after a few seconds will display the output voltage and output current reading that was logged (see see above right example).

Press the ESC to return to the "**Log View Menu**" (Section 12.1.2)

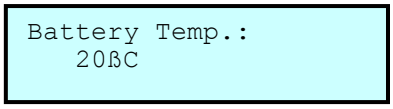
12.1.6 Battery Information Menu



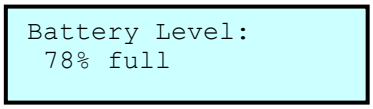
Press the UP button to select the "Battery Info" menu to view the battery status. This major menu has submenus that display the Battery Voltage and Current, Battery Temperature and estimated capacity remaining in the battery. To view these menus press the RIGHT button successively.

Battery Voltage and Current menu – displays the Battery Voltage and Battery current. Current displayed with a "–ve" sign indicates that the battery is supplying the load and "+ve" sign indicates that the battery receiving charge.

Battery Temperature menu – displays the battery temperature in degrees Celsius.



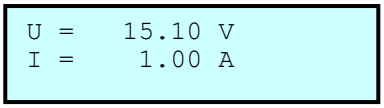
Battery capacity Remaining menu – displays the estimated battery capacity remaining. Press the ESC button to return to the "Battery Info" menu. While in any of these submenus, the UP and DOWN buttons have no effect, the LEFT button changes to the previous menu. Press the LEFT or the ESC button to return to "**Battery Info**" menu.



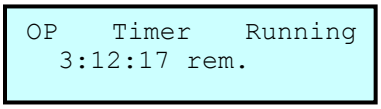
12.1.7 Output Information Menu

Press the UP button to select the "Output Info" menu to view the output status of the UPS. This major menu has submenus that display the Output Voltage and Current, Timer, and Remaining time that the UPS will run for. These submenus can be accessed by pressing the RIGHT button.

Output Voltage and current menu – displays the output voltage and current of the UPS.



Timer menu displays the remaining time that the UPS output will run for. The output will be switched off once this timer reaches 0:00:00. Press the LEFT button or ESC to return to "Output Info" menu.

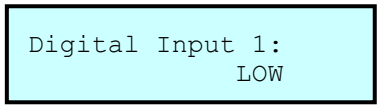


12.1.8 UPS Information Menu

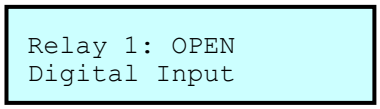
Press the UP button to select the "UPS Info" menu to view the status of the digital inputs and the relay outputs.

These menus can be viewed by pressing the RIGHT button. The first press on the RIGHT button will show the digital input-1 and its state (HIGH or LOW), and further successive presses will show the digital inputs "-2 and 3". Further successive presses on the RIGHT button will show the Relays "-1, 2 and 3" along with their state and configuration (driving source). An example of each is shown immediately following:

Digital Input-1: The top line displays the digital input number and bottom line displays its state HIGH/LOW.



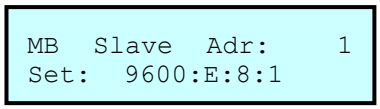
Relay 1: The top line displays Relay number and its state OPEN/CLOSE, the bottom line displays its driving source, as configured in the "Configuration menu". Press ESC button to return to "**UPS Info**" menu.



12.1.9 Communications Information Menu

Press the UP button to select the "Comms. Info" menu to view the Modbus communications port settings. This major menu also displays if the Modbus port has been switched ON (by setting the address to non-zero).

Pressing the RIGHT button progresses the display through the Modbus address and the communications settings. An example is shown immediately following. Press the ESC button to return to the "Comms. Info" menu.



13 Field Configuration Menu Structure

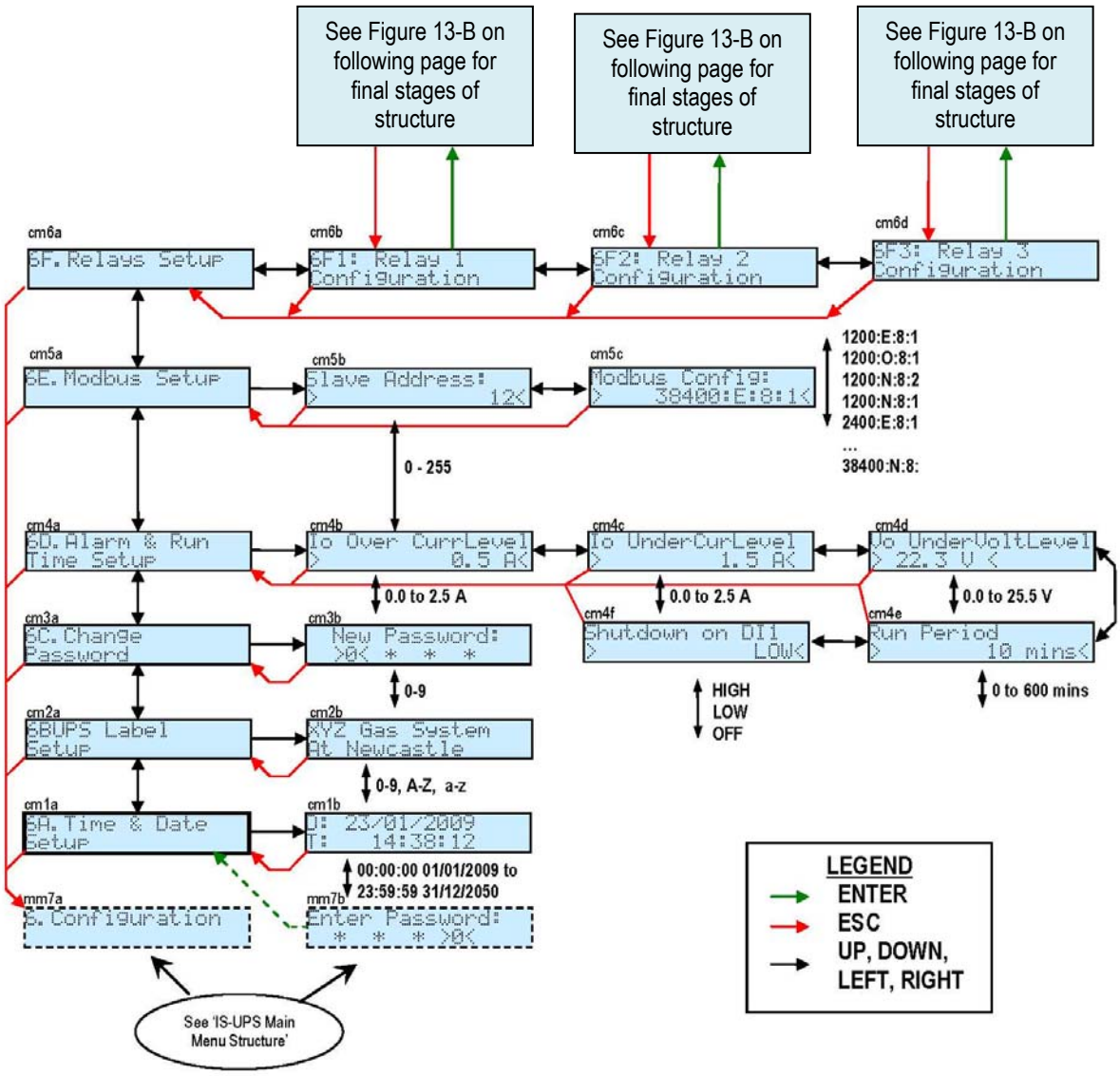


Figure 13-A – Field Configuration Menu – Initial; Stages

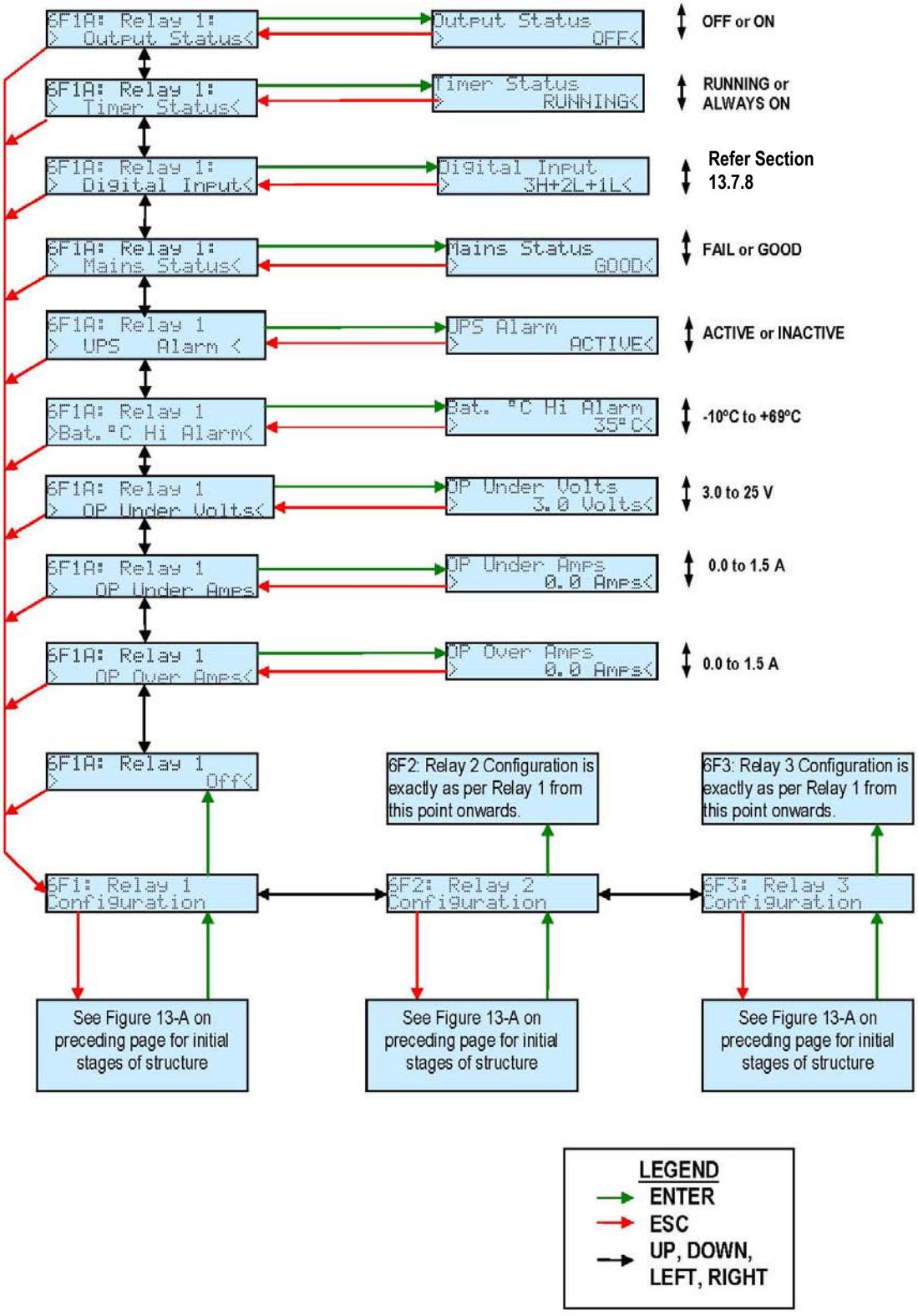


Figure 13-B – Field Configuration Menu – Final Stages

13.1 Configuration Menu

Press the UP button to select the "Configuration" menu. This menu can be used to View and Modify or change the configuration settings. To gain access to the configuration menus, a valid password must first be entered.

```
6. Configuration
```

Pressing the RIGHT or ENTER button progresses the display to show the Password entry menu. An example is shown below:

```
Enter Password:
 >0< *  *  *
```

Selection of the first digit of the password is done by progressive pressing of the UP and/or DOWN button. Pressing the RIGHT button will move to the next digit. Pressing the LEFT button will move to the preceding digit.

Once the four password digits have been entered, pressing the ENTER button will display the '6A: Time and Date Setup' if the password is correct. If the password is not correct the cursor will return to the left-most digit of the password entry display. After all the password entry digits are cleared, the password can be re-entered.

Press the LEFT button to move back to the previous digit or, if in the left-most digit, the previous menu.

	**The correct password must be entered to gain access to the configuration menus. The factory default password is set to '0000' (four zeros).**

To prevent unsolicited tampering with the configuration settings, it is recommended that the password be changed once the configuration is completed.

CAUTION! 	**Be sure to set the new password to a value that is easily remembered because access cannot be gained to the configuration settings without the password.** **A lost or forgotten password will require resetting the password to the factory setting before a new password can be set. The password can be reset by selecting the "F4.Password Reset" menu from the Factory Configuration Menu (Section 14).**

Refer to Section 13.4 for the **Password Management Menu**.

The "Configuration" menu has 6-submajor menus which allow access to change the settings belonging to these categories.

To gain access to the major sub menus, press the UP button; while in any of the major submenus, pressing the RIGHT button will open the submenu and the settings can be changed here.

13.2 Time and Date Menu – 1st Major Sub-Menu

```
6A: Time & Date
Setup
```

Press the UP button to gain access to this menu. This is the first major submenu. To change the settings in it, press the RIGHT button and it will provide the editable menu.

13.2.1 Time and Date Setup Menu

```
D: 01/01/2008
T:  14:33:18
```

This menu allows entry of the current date and time. The element (day, month, year, hour minute or second) of date/time that is active for modification is indicated with a flashing block (‘ ’). The value of the element can be increased or decreased in value using the UP or DOWN buttons. Selection of the elements can be done using the LEFT and RIGHT buttons. Press the ENTER button to save the changes. Press the ESC button to return to the **Time and Date Setup Menu** (1st Major Sub-menu).

	When the UPS is initially powered on, a default time and date is set to ensure that logging of events will occur. The default date is 1 January 2009, and time of 1:00:00 is set (See Below).

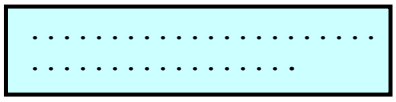
```
D: 01/01/2009
T:  01:00:00
```

13.3 User Defined Label – 2nd Major Sub-Menu

```
6B.UPS Label
Setup
```

Press the UP button to access this menu. A user definable label to be given to this UPS is entered here. Normally, information that is relevant to the user regarding the installation of the UPS is entered at this menu. This information is displayed on the Main Status sub-menu. Press the RIGHT button to access the editable menu.

13.3.1 UPS Label Setup Menu



Upon entry to this menu, a flashing block will appear in the upper left corner. The UP or DOWN button can be pressed to select the desired character for the position of this label. A single press of the UP button will select the next character/digit; conversely a single press of the DOWN button will select the previous character/digit. If either the UP or DOWN buttons are pressed, then rapid progression of the next or previous characters will be selected.

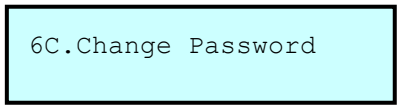
The RIGHT button will allow the next character in the label to be selected for editing. Successive presses of the RIGHT button will move the block to the last character of the bottom line, then an additional press of the RIGHT button will move focus to the top left of the menu.

The LEFT button will allow either the previous character to be selected for editing; except if the block is already in the upper-left corner of the display, the last character will be moved into focus.

The ENTER button saves the setting into memory. Press the ESC button to return to the **User Defined Label Menu** (2nd Major Sub-menu).

NOTE	This menu has no default display – it will appear as a blank screen after factory initialisation.

13.4 Password Management Menu – 3rd Major Sub-Menu



Press the UP button to access the Password Management Menu. Under this menu there is an editable menu that will allow the operator to enter the new password. To enter, press the RIGHT button.

13.4.1 Password Change Menu

The Password Change Menu allows the user to change the configuration menu entry password.

Pressing the UP or DOWN buttons will change the password digit with the focus up or down, respectively. Pressing the RIGHT button will move the focus to the next digit. The LEFT button will move the focus to the preceding digit, providing that it is not the first digit (left-most digit). If the focus is on the first digit, and the LEFT button is pressed, then it will move the focus to the last digit.

The ENTER button saves the setting into memory. Press the ESC button to return to the **Password Management Menu** (3rd Major Sub-menu).

13.5 UPS Output (Alarm & Run Time) Menu-4th Major Sub-Menu

```
6D.Alarm & Run
Time Setup
```

Press the UP button to access this menu. This major sub menu allows the viewing and setting of various UPS parameters, as follows:

- The output over-current level
- The output under-current level,
- The output under voltage level,
- Run time and
- Shutdown on DI1

13.5.1 Output Over-Current Level Menu

```
OP OverCurrLevel
>        1.0 A <
```

Press the RIGHT button to access to this menu. This menu allows entry of the level of current that will result in the Output Over-current alarm being activated. The UP/ DOWN button increments/decrements the setting in 0.1 Amp intervals. The minimum setting is 0.0 Amps, the maximum is 2.5 Amps. Default setting 0.4A; Hysteresis is 20% of the current limit from **Table 8**.

The RIGHT button progresses to the next menu.

The LEFT button returns to the previous menu.

The ENTER button saves the setting into memory.

13.5.2 Output Under-Current Level Menu

```
OP UnderCurrLevel
>        0.7 A <
```

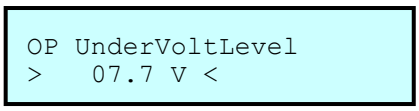
Press the RIGHT button to access to this menu. This menu allows entry of the level of current that will result in the Output Undercurrent alarm being set. The UP/DOWN button increments/decrements the setting in 0.1 Amp intervals. The minimum setting is 0.0 Amps, the maximum being 2.5 Amps. Default setting 0.0A; Hysteresis is 20% of the current limit from **Table 8**.

The RIGHT button progresses to the next menu.

The LEFT button returns to the previous menu.

The ENTER button saves the setting into memory.

13.5.3 Output Under-Volts Level Menu



Press the RIGHT button to access to this menu. This menu allows entry of the level of voltage that will result in the Output under Voltage alarm being set. The UP/DOWN button increments/decrements the setting in 0.1 Volt intervals. The minimum setting is 0.0 Volts, the maximum being 25.5 Volts. Default setting 1.8 V; Hysteresis is 20% of the voltage limit from **Table 8**.

The RIGHT button progresses to the next menu.

The LEFT button returns to the previous menu.

The ENTER button saves the setting into memory.

13.5.4 Run Period Menu

Press the RIGHT button to access this menu. This menu allows selection of how long the UPS will provide output (without mains power), in 10 minute intervals. Setting can be from 0 minutes through to a maximum of 600 minutes (10 hours) or 'ALWAYS ON' using the UP/DOWN buttons. In the 'ALWAYS ON' mode the timer is deactivated and the UPS will continue to run until the battery low voltage is reached and the UPS shutdown. The run time is only active while UPS is running from Battery. If the UPS is stopped because it has exceeded the run time or low battery voltage and the mains power is returned, the UPS will start and remain running with the run time counter disabled. The UPS cannot be started while the "RESET LED" is flashing. This means it is in lock mode and needs to be reset before any start command can be given. Default setting is 'ALWAYS ON'

The RIGHT button progresses to the next menu.

The LEFT button will return to the previous menu.

The ENTER button saves the setting into memory.

13.5.5 Shutdown on DI1 Menu

```
Shutdown on DI1
>          HIGH<
```

Press the RIGHT button to access to this menu. This menu allows selection of whether the UPS will shutdown from Digital Input-1. The available options are OFF, HIGH or LOW. For example, when set to OFF, no action will be taken when Digital Input-1 changes state. If set to HIGH, then the UPS will shut down when Digital Input-1 changes to a high state. If set to LOW, the UPS will shut down when Digital Input-1 changes to a low state.

CAUTION! 	**This feature only operates when the UPS is in Battery mode and it can only be used to shutdown the UPS.**

To enable restart; Digital Input-1 must be in a high state if set to LOW and in a low state if set to HIGH. The local start button or an external start button from the terminal board may then be used to restart the UPS.

Switching mains power on after a shutdown caused by DI1 will start the UPS but if the mains power is disconnected the UPS will shutdown again. To fully utilise the IS UPS ensure that the actual DI1 is opposite to the screen setting (in a high state if set to LOW and in a low state if set to HIGH) before the mains is applied. Default setting is OFF.

The RIGHT button has no effect.

The LEFT button will return to the previous menu.

The ENTER button saves the setting into memory.

Press the ESC button to return to **UPS Outlet Menu** (4th Major Sub-menu).

WARNING! 	**Once this setting has been saved to memory, it will be acted upon immediately and may cause the UPS to shutdown in a 'locked out' state. For example: If DI1 state is currently HIGH, and the setting is changed to HIGH and saved to memory, the UPS will shut down immediately and remain shut down until DI1 goes to the LOW state and a "Start" command is issued.**

13.6 Modbus Configuration View and Modify Menu-5th Major Sub-Menu

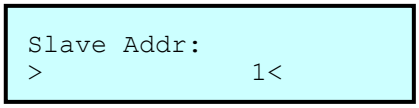
Press the UP button to access this menu. The Modbus Configuration, View and Modify major menu allows the editing of the Modbus port settings. It has two submenus which may be accessed by pressing the RIGHT button.

Pressing the RIGHT button progresses the display to show the Modbus Slave Address Menu.

Pressing the UP button returns to the Relay Configuration Modify Menu.

Pressing the DOWN or LEFT button has no effect.

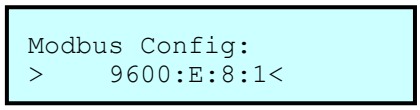
13.6.1 Modbus Slave Address Menu



Press the RIGHT button to access to this menu. This menu allows selection of the slave address of the device. The selection of address 0 will switch the Modbus communications OFF; any other address will cause the unit to respond to messages of the same address. By default, address 1 is selected.

Pressing the ENTER button saves the setting into memory.

13.6.2 Modbus Configuration Menu



Press the RIGHT button to access to this menu. This menu allows selection of the baud rate, parity and stop bits for the Modbus communications. Note that the data format is fixed to 8 bits, and therefore is not selectable.

Selection is made by multiple presses of the UP or DOWN buttons. The possible settings are as in Table 13.6.2, following.

The RIGHT button has no effect.

The LEFT button returns to the previous menu.

The ENTER button saves the setting into memory. Press the ESC button to return to **Modbus Configuration View and Modify Menu** (5th Major Sub-menu).

Baud	Parity	Bits	Stop
1200	E	8	1
1200	O	8	1
1200	N	8	2
1200	N	8	1
2400	E	8	1
2400	O	8	1
2400	N	8	2
2400	N	8	1
4800	E	8	1
4800	O	8	1
4800	N	8	2
4800	N	8	1
9600	E	8	1
9600	O	8	1
9600	N	8	2
9600	N	8	1
19200	E	8	1
19200	O	8	1
19200	N	8	2
19200	N	8	1

13.7 Relay Configuration Modify Menu-6th Major Sub-Menu

Press the UP button to access this menu. This major sub menu allows the viewing and setting of the Relay driving source and the level of the parameter at which it will activate the relay. Progressive pressing on the RIGHT button will access the configuration menu for Relay 1, 2 or 3 (See note below).

The procedures and illustrations applicable to Relay 1 are discussed in this section but the method of configuration is the same for all 3 relays once the appropriate relay configuration menu has been selected.

13.7.1 Relay Configuration menu

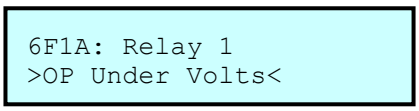
Press the RIGHT button to access this menu. When in this menu press the ENTER button to access the source selection menu to select the relay driving source. One of the ten sources in Table 13.7.2 can be selected as the relay driving source by pressing the UP or DOWN buttons. Once the driving source is selected, press the ENTER button to access the editable menu for the selected source parameter. The value may then be set by pressing the UP/DOWN (increase/decrease) buttons. Press ENTER again to save the settings. The default setting for all three relays is 'OFF'

13.7.2 Configure Relay 1 using "Output Under-Volt" Menu

The following example shows the selection of 'Output Under-Voltage' as the driving source for Relay-1 and its parameter value set to 10V, at which point it will activate the Relay-1. While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Output Under Volt' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter '10V' by pressing the UP/DOWN (increase/decrease) button, then press the ENTER button to save these settings. After these steps are completed, the Relay-1 will be activated whenever the output volts fall below 10V. The configurable minimum and maximum values are 0.0V & 25.5V respectively. Hysteresis is 20% of the voltage limit from **Table 8**.

Press the ESC button to return to the **Relay Configuration Modify Menu** (6th Major Sub-menu).

Relay Source Selection Menu



Output Under-Volts Selection Menu

SN	Available Relay driving Source
1	Off
2	Output Over Current (OP Over Amps)
3	Output Under Current (OP Under Amps)
4	Output Under Voltage (OP Under Volts)
5	Battery Temperature Alarm (Bat.°C Hi Alarm)
6	UPS Alarm (UPS Alarm)
7	Mains Status (Mains Status)
8	Digital Input (Digital Input)
9	Timer Status (Timer Status)
10	Output Status (Output Status)

Table 13.7.2 - List of Relay Driving Sources

13.7.3 Configure Relay 1 using 'Output Over-Current' Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'OP Over Amps' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter '0.40A' by pressing UP/DOWN (increase/decrease) buttons, then press the ENTER button once again, to save these settings. After these steps are completed, the Relay-1 will be activated whenever the output current rises above 0.40A. The configurable minimum and maximum values are 0.0A & 2.5A. Hysteresis is 20% of the current limit from **Table 8.**

Press the ESC button to return to the **Relay Configuration Modify Menu**.

Relay Output-Over Current Menu

```
6F1A:Relay 1
>  OP Over Amps<
```

Output Over-Current Setting menu

```
OP Over Amps
> 0.40 Amps <
```

13.7.4 Configure Relay 1 using 'Output Under-Current' Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Output Under Current' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter '0.30A' by pressing the UP/DOWN (increase/decrease) buttons, then press the ENTER button once again, to save these settings. After these steps are completed the Relay-1 will be activated whenever the output current drops under 0.30A. The configurable minimum and maximum values are 0.0A & 2.5A. Hysteresis is 20% of the current limit from **Table 8**.

Press the ESC button to return to the **Relay Configuration Modify Menu**.

Relay Output Under-Current Menu

```
6F1A:Relay 1
> OP Under Amps<
```

Output Under-Current Setting menu

```
OP Under Amps
> 0.3 Amps <
```

13.7.5 Configure Relay 1 using 'Battery Temperature Alarm' Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Bat °C Hi Alarm' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter '45 °C' by pressing the UP/DOWN (increase/decrease) buttons until the required value is displayed, then press the ENTER button once again, to save these settings. After these steps are completed, the Relay-1 will be activated whenever the Battery temperature reaches to 45degC. The minimum setting is -10°C; the maximum setting being +69°C. After the relay activates, the relay will de-energise once the Temperature has fallen 1°C below the setting.

Press the ESC button to return to the **Relay Configuration Modify Menu**.

Relay Battery Temperature Alarm Menu

```
6F1A:Relay 1
>Bat. °C Hi Alrm<
```

Battery Temperature Setting Menu

```
Bat. °C Hi Alarm:
> 45 °C <
```

13.7.6 Configure Relay 1 using 'UPS Alarm' Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'UPS Alarm' in the bottom line on the display – then press the ENTER to access the editable menu, press the UP button to select 'Active/Inactive' then press ENTER to save the settings. If the 'Active' is selected, the Relay-1 will be activated when any of the UPS alarms situation arises. These alarms settings are in the "**6D.Alarm and Run Time Setup**" menu.

Pressing the ESC button returns to the **Relay Configuration Modify Menu**.

Relay x UPS Alarm Menu

```
6F1A:Relay 1
>     UPS Alarm<
```

UPS Alarm Setting Menu

```
UPS Alarm
>      ACTIVE<
```

13.7.7 Configure Relay 1 using 'Mains Status" Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Mains Status' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter 'FAIL/GOOD' by pressing the UP/DOWN buttons, then press the ENTER button once again, to save these settings. If 'FAIL' is selected, the Relay-1 will be activated whenever the Mains fail. If 'GOOD' is selected the Relay-1 will be activated whenever the mains is ON

Press the ESC button to return to the **Relay Configuration Modify Menu**.

Relay x Mains Status Menu

```
6F1A:Relay 1
>  Mains Status<
```

Mains Supply Setting Menu

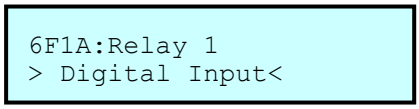
```
Mains Status
>          FAIL<
```

13.7.8 Configure Relay 1 using 'Digital Input' Menu

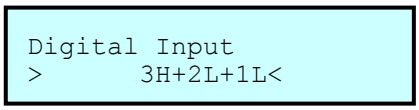
While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Digital Input' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter '3H 2L 1L' by pressing the UP/DOWN buttons, then press the ENTER button once again, to save these settings. After these steps are completed, the Relay-1 will be activated whenever the three Digital Inputs match the set up. See Table 13.7.8 '**Available Digital Input setting list**' following for various options of setting.

Pressing the ESC button returns to the **Relay Configuration Modify Menu**.

Relay Digital Input Menu



Digital Input Setting Menu



Index	Digital Input-1	Digital Input-2	Digital Input-3
1	IGNORED	IGNORED	IGNORED
2	IGNORED	IGNORED	LOW
3	IGNORED	IGNORED	HIGH
4	IGNORED	LOW	IGNORED
5	IGNORED	LOW	LOW
6	IGNORED	LOW	HIGH
7	IGNORED	HIGH	IGNORED
8	IGNORED	HIGH	LOW
9	IGNORED	HIGH	HIGH
10	LOW	IGNORED	IGNORED
11	LOW	IGNORED	LOW
12	LOW	IGNORED	HIGH
13	LOW	LOW	IGNORED
14	LOW	LOW	LOW
15	LOW	LOW	HIGH
16	LOW	HIGH	IGNORED
17	LOW	HIGH	LOW
18	LOW	HIGH	HIGH
19	HIGH	IGNORED	IGNORED
20	HIGH	IGNORED	LOW
21	HIGH	IGNORED	HIGH
22	HIGH	LOW	IGNORED
23	HIGH	LOW	LOW
24	HIGH	LOW	HIGH
25	HIGH	HIGH	IGNORED
26	HIGH	HIGH	LOW
27	HIGH	HIGH	HIGH

Table 13.7.8 - Available Digital Input setting list

13.7.9 Configure Relay 1 using 'Timer Status' Menu

While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Timer Status' in the bottom line of the display – then press the ENTER button again to open the source parameter editable menu. Here enter 'RUNNING/ALWAYS ON' by pressing the UP/DOWN buttons, then press the ENTER button once again, to save these settings. If 'RUNNING' is selected, the Relay-1 will be activated when the UPS is running from the battery ***and*** the timer is running (Refer Section 13.5.4 **Run Period Menu**). If 'ALWAYS ON' is selected, the Relay-1 will be activated if the timer is set to 'ALWAYS ON'.

Pressing the ESC button returns to the **Relay Configuration Modify Menu**.

Relay Timer Status Menu

```
6F1A:Relay 1
>  Timer Status<
```

Timer Status Setting Menu

```
Timer Status
>           ON<
```

13.7.10 Configure Relay 1 using 'Output Status' Menu

The Relay-1 Output Status Setting Menu allows selection of when the output has been enabled will activate Relay-1. While in the "6F1.Relay 1 Configuration" menu, press the ENTER button, then progressively press the UP button until it displays 'Output Status' in the bottom line on the display – then press the ENTER button again to open the source parameter editable menu. Here enter 'ON/OFF' by pressing the UP/DOWN buttons, then press the ENTER button to save these settings. If 'ON' is selected, the Relay-1 will be activated when the Output is enabled ON. If 'OFF' is selected, the Relay-1 will be activated when the Output turns off.

Pressing the ESC button returns to the **Relay Configuration Modify Menu**.

Relay Output Status Menu

```
6F1A:Relay 1
> Output Status<
```

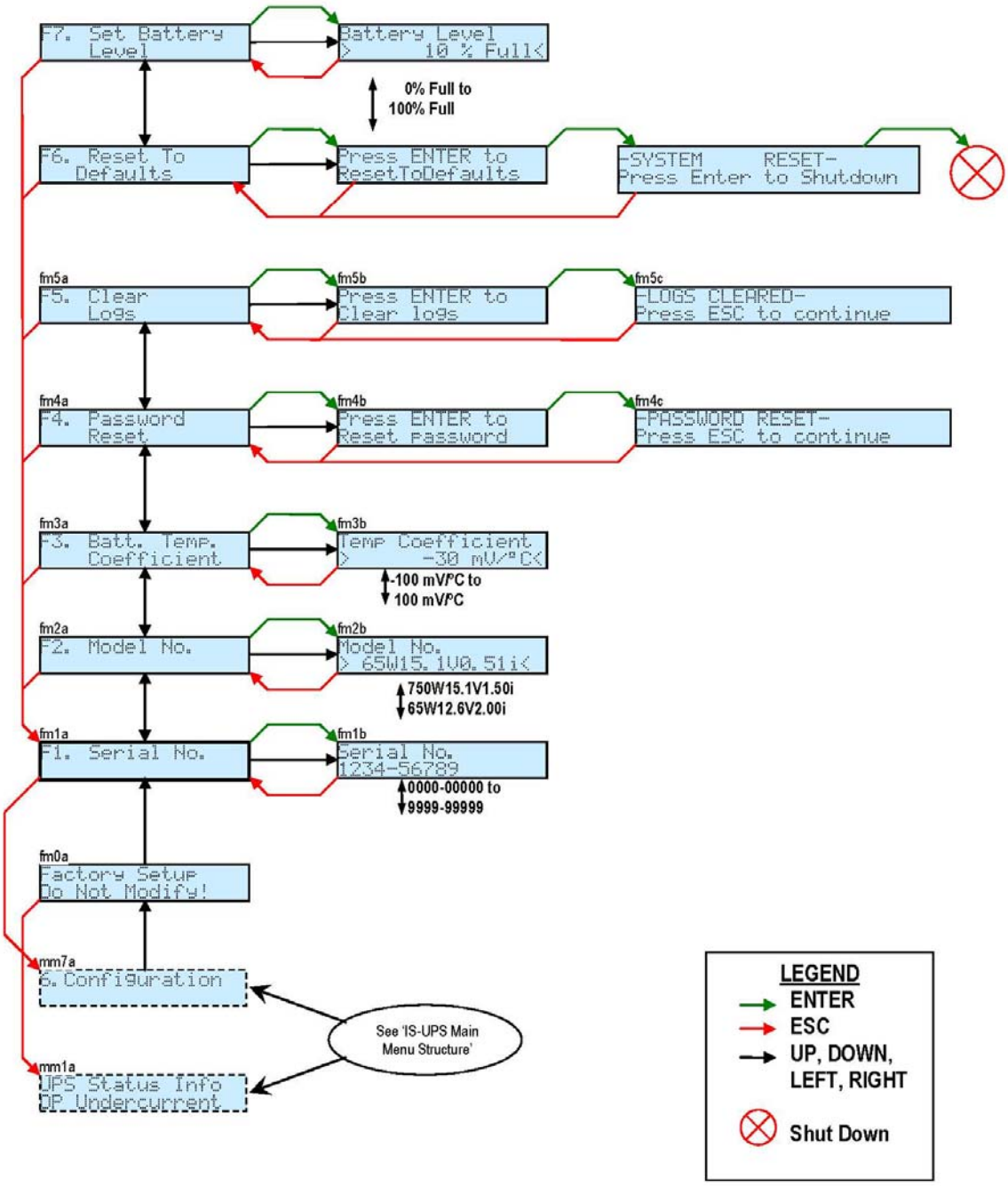
Output Status Setting Menu

```
Output Status
>           ON<
```

Relay Off Menu

```
6F1A:Relay 1
>           Off<
```

14 Factory Configuration menu



14.1 Factory Settings Access

To gain access to the Factory Settings menu a specific key sequence must be entered when the 'Configuration Menu' is displayed. The sequence needed is UP-UP-DOWN-DOWN-LEFT-RIGHT-LEFT-RIGHT-ENTER. If this key sequence is not entered in the exact order, then access shall not be granted to the factory settings. The factory settings are intended for factory configuration only and are not meant as general purpose settings.

15 Modbus and Memory Map

A two wire RS485 interface is provided to allow Modbus Master to query the UPS using RTU Modbus protocol. The various Modbus registers exposed by the device are shown in the Memory Map section following. The RS485 configuration is shown in the **Modbus Configuration Menu** in Section 13.6.2, previous. An external 12 V dc power is required to enable the RS485 communications.

15.1 Memory Map

15.1.1 **Discreet outputs (0X References)**

Bit Address	Name	Comment	Modbus Functions Supported
1	Mains Status	0 = Off, 1 = On	Read Coil Status(0X01)
2	Output Status	0 = Off, 1 = On	Read Coil Status(0X01)
3	Modbus Status	0 = Off, 1 = On	Read Coil Status(0X01)
4	Relay 1	0 = Off, 1 = On	Read Coil Status(0X01), Write Single Coil(0X05)
5	Relay 2	0 = Off, 1 = On	Read Coil Status(0X01), Write Single Coil(0X05)
6	Relay 3	0 = Off, 1 = On	Read Coil Status(0X01), Write Single Coil(0X05)
7	Reserved		
8	Reserved		
9	Up Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
10	Down Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
11	Left Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
12	Right Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
13	ESC Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
14	ENTER Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
15	START Button	0 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
16	STOP Button	1 = Pressed	Read Coil Status(0X01), Write Single Coil(0X05)
17	Reserved		
18	Reserved		
19	Reserved		
20	Reserved		
21	Digital Input 1	0 = Low, 1 = High	Read Coil Status(0X01)
22	Digital Input 2	0 = Low, 1 = High	Read Coil Status(0X01)
23	Digital Input 3	0 = Low, 1 = High	Read Coil Status(0X01)
24	Reserved		
25	Overload Current Sense 1	OLC1 Input	Read Coil Status(0X01)
26	Overload Current Sense 2	OLC2 Input	Read Coil Status(0X01)
27	Overload Current Sense 3	OLC3 Input	Read Coil Status(0X01)
28	Reserved		

15.1.1 Discreet outputs (0X References)			
Bit Address	**Name**	**Comment**	**Modbus Functions Supported**
29	Latched Overload Current Sense 1	OLC1 Latch	Read Coil Status(0X01)
30	Latched Overload Current Sense 2	OLC2 Latch	Read Coil Status(0X01)
31	Latched Overload Current Sense 3	OLC3 Latch	Read Coil Status(0X01)
32	Reserved		
33	Reserved		
34	Reserved		
35	Reserved		
36	Reserved		
37	Reserved		
38	Reserved		
39	Reserved		
40	Reserved		
41	Reserved		
42	Reserved		
43	Reserved		
44	Reserved		
45	Reserved		
46	Reserved		
47	Reserved		
48	Reserved		
49	Reserved		
50	Reserved		
51	Reserved		
52	Reserved		
53	Reserved		
54	Reserved		
55	Reserved		
56	Reserved		

15.1.2 Input Registers (3X References)			
Address	**Register Name**	**Precision**	**Modbus Functions Supported**
1	System Timer (MSW)	Seconds	Read Input Registers(0X04)
2	System Timer (LSW)		Read Input Registers(0X04)
3	Battery Temperature	ºC	Read Input Registers(0X04)
4	Battery Bus Voltage	mV	Read Input Registers(0X04)
5	Mains Input Voltage	V	Read Input Registers(0X04)
6	DC Output Voltage	mV	Read Input Registers(0X04)
7	DC Output Current	mA	Read Input Registers(0X04)
8	Battery Voltage	mV	Read Input Registers(0X04)
9	Battery Discharge Current	mA	Read Input Registers(0X04)
10	Battery Charge Current	mA	Read Input Registers(0X04)

15.1.3 Holding Registers (4X References) *[Control Registers support read/write]*			
Address	**Register Name**	**Description**	**Modbus Functions Supported**
1	Periodic Log Index	16 bit index of the **Periodic Log** to show at Holding Register starting : 101	Read Holding Registers(0X03), Preset Single Register(0X06)
2	Event Log Index	16 bit index of the **Event Log** to show at Holding Register starting : 201	Read Holding Registers(0X03), Preset Single Register(0X06)
3	Output Toggle Timer	16 Bit timer in **Seconds** to activate the output toggle operation. Setting this to a value greater than 0, immediately switches the output Off. The output would come on when this timer expires.	Read Holding Registers(0X03), Preset Single Register(0X06)
4-100	Reserved		

15.1.4 Holding Registers (4X References)			
Address	**Name**	**Comment**	**Modbus Functions Supported**
101	Periodic Log Entry Index	Register Index H	Read Holding Registers(0X03)
		Register Index L	Read Holding Registers(0X03)
102	Total Periodic Log Entries	Total Log Entries H	Read Holding Registers(0X03)
		Total Log Entries L	Read Holding Registers(0X03)
103	Time	Seconds	Read Holding Registers(0X03)
		Minutes	Read Holding Registers(0X03)
104		Hours (24 Hr Format)	Read Holding Registers(0X03)
		0 (Reserved)	Read Holding Registers(0X03)
105	Date	Day (1 – 31)	Read Holding Registers(0X03)

[Periodic Log supports read only]

15.1.4 Holding Registers (4X References)			
Address	**Name**	**Comment**	**Modbus Functions Supported**
		Month (1 -12)	Read Holding Registers(0X03)
106		Year (– 2000)	Read Holding Registers(0X03)
		0 (Reserved)	Read Holding Registers(0X03)
107	Output Current (mA)	Output Current H	Read Holding Registers(0X03)
		Output Current L	Read Holding Registers(0X03)
108	Output Voltage (mV)	Output Voltage H	Read Holding Registers(0X03)
		Output Voltage L	Read Holding Registers(0X03)
109	Battery Current (mA)	Battery Current H	Read Holding Registers(0X03)
		Battery Current L	Read Holding Registers(0X03)
110	Battery Voltage (mV)	Battery Voltage H	Read Holding Registers(0X03)
		Battery Voltage L	Read Holding Registers(0X03)
111	Battery Temperature (ºC)	Battery Temperature	Read Holding Registers(0X03)
	UPS Status	UPS Status	Read Holding Registers(0X03)
112-200	Reserved		

15.1.5 Holding Registers (4X References) *[Event Log & LCD-Data support read only]*				
Address	**Name**	**Example**		**Modbus Functions Supported**
		Hex	**ASCII**	
201	Event log entry number	0x30	0	Read Holding Registers(0X03)
		0x31	1	Read Holding Registers(0X03)
202		0x37	7	Read Holding Registers(0X03)
		0x2C	,	Read Holding Registers(0X03)
203	Total event log entries	0x30	0	Read Holding Registers(0X03)
		0x39	9	Read Holding Registers(0X03)
204		0x39	9	Read Holding Registers(0X03)
		0x2C	,	Read Holding Registers(0X03)
205	Entry description	0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
206		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
207		0x4F	O	Read Holding Registers(0X03)
		0x56	V	Read Holding Registers(0X03)
208		0x45	E	Read Holding Registers(0X03)
		0x52	R	Read Holding Registers(0X03)
209		0x20		Read Holding Registers(0X03)
		0x43	C	Read Holding Registers(0X03)
210		0x55	U	Read Holding Registers(0X03)
		0x52	R	Read Holding Registers(0X03)

15.1.5 **Holding Registers (4X References)** *[Event Log & LCD-Data support read only]*				
Address	**Name**	**Example**		**Modbus Functions Supported**
		Hex	**ASCII**	
211		0x52	R	Read Holding Registers(0X03)
		0x45	E	Read Holding Registers(0X03)
212		0x4E	N	Read Holding Registers(0X03)
		0x54	T	Read Holding Registers(0X03)
213		0x2C	,	Read Holding Registers(0X03)
	Output Current (Amps)	0x20		Read Holding Registers(0X03)
214		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
215		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
216		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
217		0x20		Read Holding Registers(0X03)
		0x30	0	Read Holding Registers(0X03)
218		0x2E	.	Read Holding Registers(0X03)
		0x32	2	Read Holding Registers(0X03)
219		0x41	A	Read Holding Registers(0X03)
		0x2C	,	Read Holding Registers(0X03)
220	Output Voltage (Volts)	0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
221		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
222		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
223		0x20		Read Holding Registers(0X03)
		0x20		Read Holding Registers(0X03)
224		0x30	0	Read Holding Registers(0X03)
		0x2E	.	Read Holding Registers(0X03)
225		0x30	0	Read Holding Registers(0X03)
		0x56	V	Read Holding Registers(0X03)
226		0x2C	,	Read Holding Registers(0X03)
	Time recorded	0x30	0	Read Holding Registers(0X03)
227		0x39	9	Read Holding Registers(0X03)
		0x3A	:	Read Holding Registers(0X03)
228		0x35	5	Read Holding Registers(0X03)
		0x37	7	Read Holding Registers(0X03)
229		0x3A	:	Read Holding Registers(0X03)
		0x32	2	Read Holding Registers(0X03)
230		0x35	5	Read Holding Registers(0X03)

15.1.5 **Holding Registers (4X References)** *[Event Log & LCD-Data support read only]*				
Address	**Name**	**Example**		**Modbus Functions Supported**
		Hex	**ASCII**	
		0x20		Read Holding Registers(0X03)
231		0x30	0	Read Holding Registers(0X03)
		0x36	6	Read Holding Registers(0X03)
232		0x44	D	Read Holding Registers(0X03)
		0x65	e	Read Holding Registers(0X03)
233		0x63	c	Read Holding Registers(0X03)
		0x30	0	Read Holding Registers(0X03)
34		0x37	7	Read Holding Registers(0X03)
		0x0a	'\n'	Read Holding Registers(0X03)
235	Current LCD Top Line		U	Read Holding Registers(0X03)
			P	Read Holding Registers(0X03)
236			S	Read Holding Registers(0X03)
				Read Holding Registers(0X03)
237			S	Read Holding Registers(0X03)
			t	Read Holding Registers(0X03)
238			a	Read Holding Registers(0X03)
			t	Read Holding Registers(0X03)
239			u	Read Holding Registers(0X03)
			s	Read Holding Registers(0X03)
240				Read Holding Registers(0X03)
			l	Read Holding Registers(0X03)
241			n	Read Holding Registers(0X03)
			f	Read Holding Registers(0X03)
242			o	Read Holding Registers(0X03)
				Read Holding Registers(0X03)
243	LCD Bottom Line		M	Read Holding Registers(0X03)
			a	Read Holding Registers(0X03)
244			i	Read Holding Registers(0X03)
			n	Read Holding Registers(0X03)
245			s	Read Holding Registers(0X03)
			:	Read Holding Registers(0X03)
246			O	Read Holding Registers(0X03)
			F	Read Holding Registers(0X03)
247			F	Read Holding Registers(0X03)
				Read Holding Registers(0X03)
248			O	Read Holding Registers(0X03)
			P	Read Holding Registers(0X03)
249			:	Read Holding Registers(0X03)
			O	Read Holding Registers(0X03)

15.1.5 **Holding Registers (4X References)** *[Event Log & LCD-Data support read only]*				
Address	**Name**	**Example**		**Modbus Functions Supported**
		Hex	**ASCII**	
250			N	Read Holding Registers(0X03)
				Read Holding Registers(0X03)
251 – 300	Reserved			

15.1.6 **Holding Registers (4X References)** *[Date & Time Registers support read/write]*			
Address	**Register Name**	**Description**	**Modbus Functions Supported**
301	Seconds In BCD format	Seconds of the Time and Date in BCD format. Valid range = 0X00 to 0X59	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
302	Minutes In BCD format	Minutes of the Time and Date in BCD format. Valid range = 0X00 to 0X59	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
303	Hours In BCD format	Hours of the Time and Date in BCD format. Valid range = 0X00 to 0X23	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
304	Date In BCD format	Date of the Time and Date in BCD format. Valid range = 0X01 to 0X31	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
305	Month In BCD format	Month of the Time and Date in BCD format. Valid range = 0X01 to 0X12	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
306	Year In BCD format	Year of the Time and Date in BCD format. Valid range = 0X00 to 0X99	Read Holding Registers(0X03), Preset Multiple Registers(0X10)
306-400	Reserved		

15.2 Log reports

There are two separate logs kept in the UPS; a periodic log and an event log. These logs are accessible through the Modbus interface using the '**Read Holding Registers**' command as per the Memory Map previous (Section 15.1).

To set the desired log entry to be reported for a Periodic or Event log, the entry number (index) needs to be set in holding registers 1 and 2 respectively.

If a log entry is requested that does not exist in the log, then a Modbus error will be returned to the Modbus master.

15.2.1 Event Log

The Event Log contains a text representation of the log entry. The entry details that are sent are (in order), the Entry code (that is, the numeric value of the cause of the log entry), the Entry description (that is, a short text summary of the cause of the log entry), the output current, the output voltage and the date and time when the entry was logged.

Each entry detail is always the same size – it will be padded with spaces to ensure the details remain the same length. This allows the Modbus master to request sections of the string, if needed.

15.2.2 Periodic Log

The Periodic Log is reported in a raw binary manner – i.e. strings do not represent the periodic log records, but absolute raw values. The Periodic Log can hold up to 1,728 records.

15.3 Output Toggle Time

This timer can be used to toggle the output of the UPS remotely through Modbus. Setting this timer immediately turns the output of the UPS off (If the output is already off it is kept off). The timer value setting would be used to determine when to turn the output on after it was turned off. It is a read/write register and the timer count-down is visible by reading this register.

15.4 Time and Date

The system Time and Date is available in the Holding registers as per the memory map shown previously. Each of the registers; for seconds, minutes, hours, date, month and year are in BCD (Binary Coded Decimal) format. Each of these registers can be read (using Read Holding Registers (0X03)) and write can be done using Preset Multiple Registers (0X10). When the write is performed the system checks for validity and the system Time and Date is updated only if all the fields are valid.

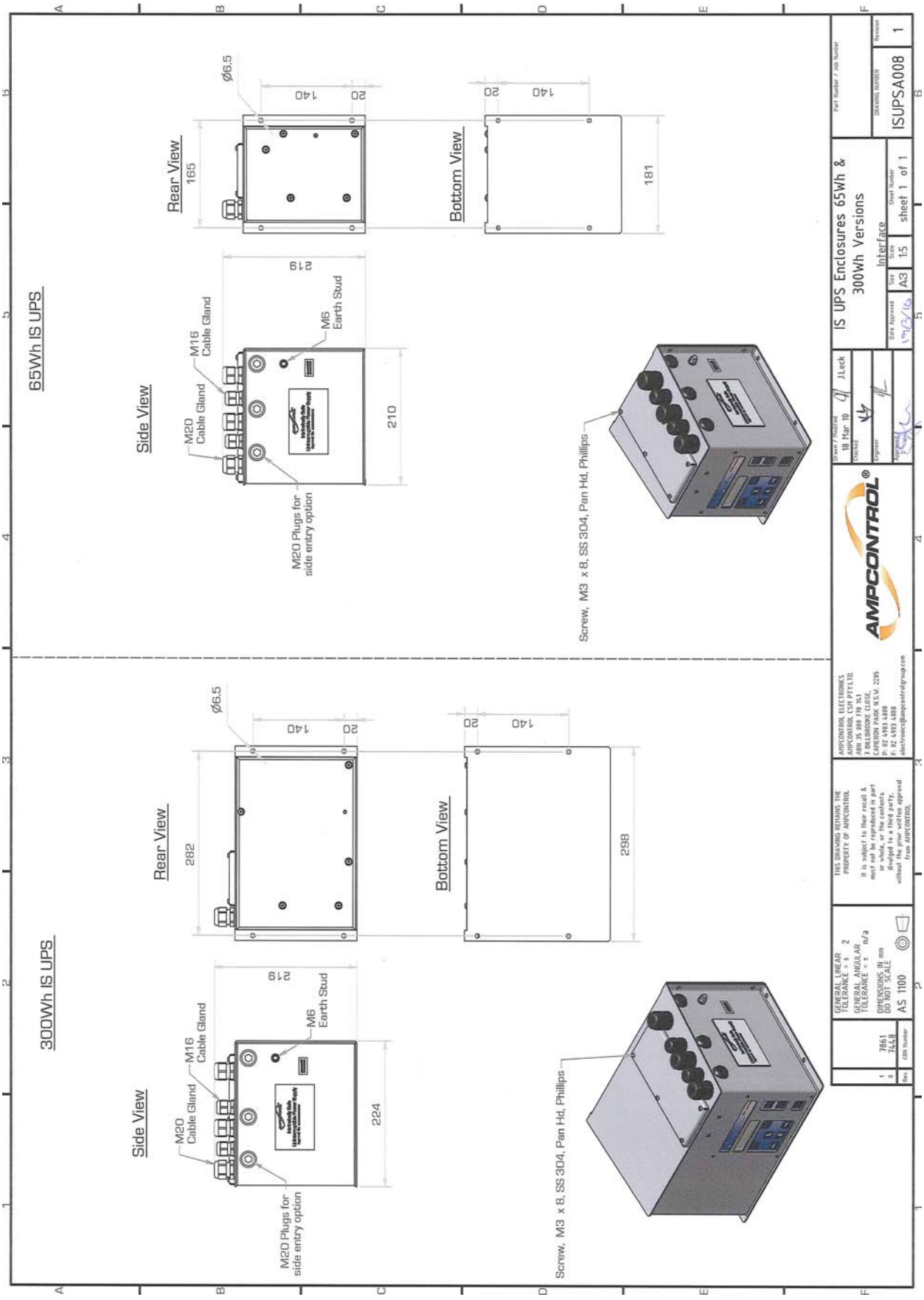
	**The system only checks for upper and lower bounds and not if the date is valid. (For example: if the external system sets the month as Feb and Date as 0X31, though the date is invalid the UPS would save it as valid since 0X31 is within the bounds of 0X1 to 0X31)**

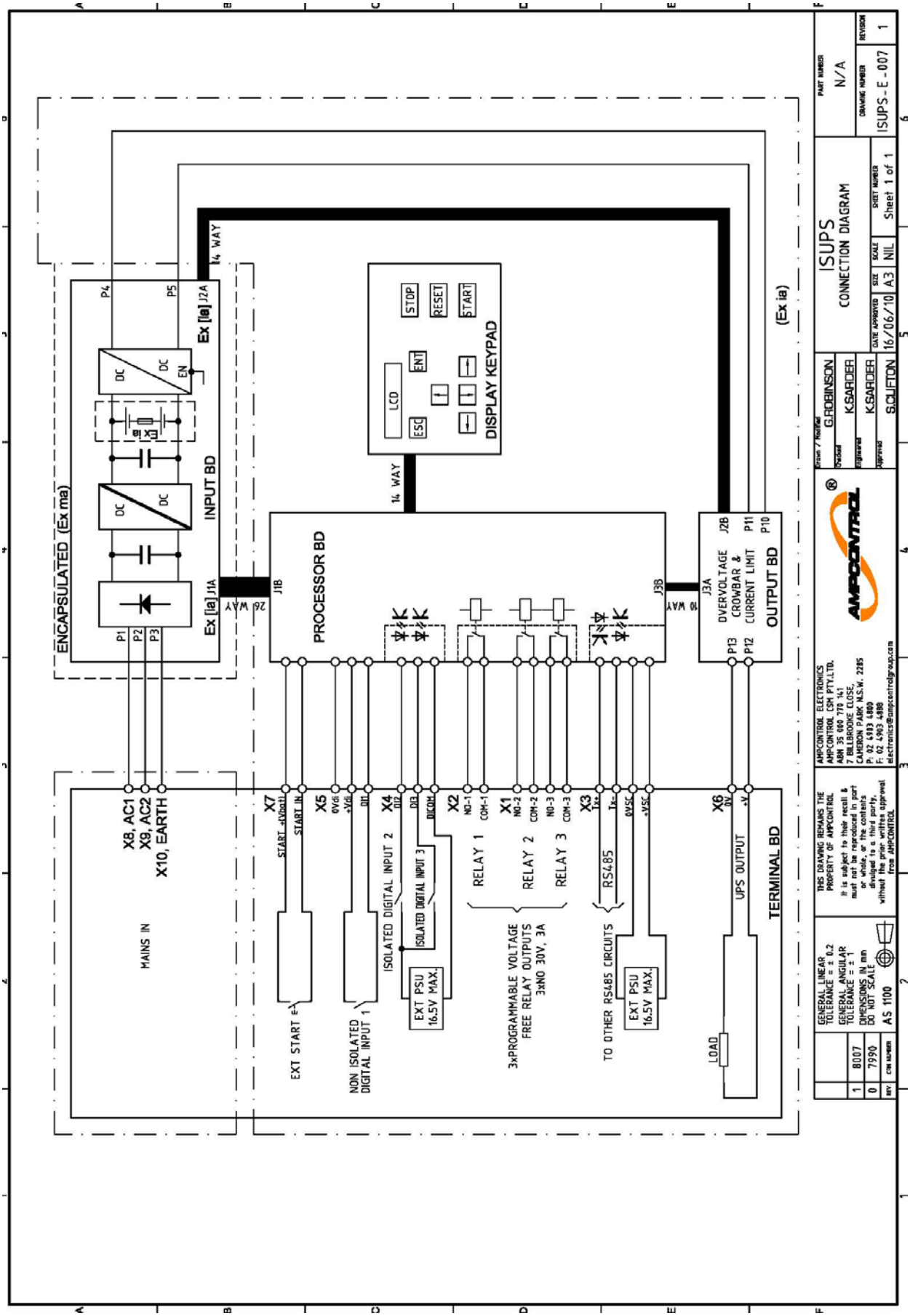
APPENDIX A - Drawings

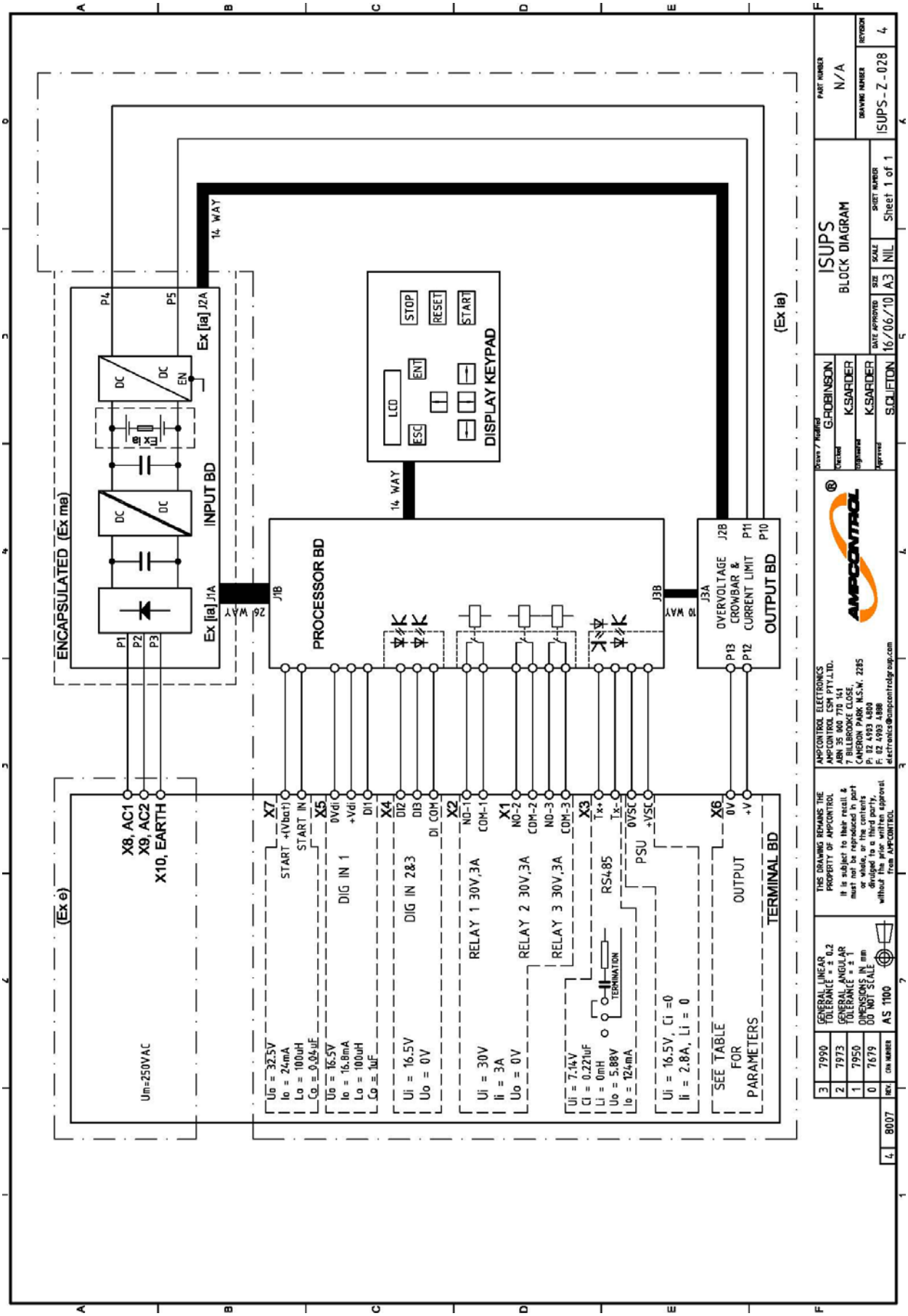
Drawing No.	Description
IS UPS A008	IS UPS Enclosures – 65Wh and 300Wh
IS UPS E007	IS UPS Connection Diagram
IS UPSZ 028	IS UPS Block Diagram

The drawings appear in the following pages in the same order in which they are listed in the table above.

This list is also hyperlinked to the drawings and if reading this via a computer: holding the curser on the required drawing number whilst pressing “Control” will take the reader to that drawing.


65Wh IS UPS
Rear View
165
Ø6.5
20
140
Bottom View
181
Side View
M16 Cable Gland
M6 Earth Stud
M20 Cable Gland
M20 Plugs for side entry option
210
Screw, M3 x 8, SS 304, Pan Hd, Phillips
300Wh IS UPS
Rear View
282
Bottom View
298
Side View
224
IS UPS Enclosures 65Wh & 300Wh Versions
Interface
ISUPSA008
sheet 1 of 1
AMPCONTROL


ISUPS
CONNECTION DIAGRAM
ISUPS-E-007
ENCAPSULATED (Ex ma)
INPUT BD
Ex [ia] J1A
Ex [ia] J2A
14 WAY
26 WAY
PROCESSOR BD
J1B
DISPLAY KEYPAD
LCD
ESC
ENT
STOP
RESET
START
OUTPUT BD
DVERVOLTAGE CROWBAR & CURRENT LIMIT
J3A
J3B
J2B
10 WAY
(Ex ia)
TERMINAL BD
MAINS IN
X8, AC1
X9, AC2
X10, EARTH
X7
X5
X4
X2
X1
X3
X6
ISOLATED DIGITAL INPUT 2
ISOLATED DIGITAL INPUT 3
RELAY 1
RELAY 2
RELAY 3
RS485
UPS OUTPUT
EXT START
NON ISOLATED DIGITAL INPUT 1
EXT PSU 16.5V MAX.
3xPROGRAMMABLE VOLTAGE FREE RELAY OUTPUTS 3xNO 30V, 3A
TO OTHER RS485 CIRCUITS
LOAD
AMPCONTROL ELECTRONICS
AMPCONTROL CSM PTY.LTD.
ABN 35 069 770 141
7 BILLBROOKE CLOSE,
CAMERON PARK N.S.W. 2285
P. 02 4903 4800
F. 02 4903 4899
electronics@ampcontrolgroup.com
G.ROBINSON
K.SARDER
K.SARDER
S.CLIFTON
16/06/10
A3
NIL
Sheet 1 of 1
N/A
1
8007
7990
AS 1100


ISUPS
BLOCK DIAGRAM
ISUPS-Z-028
N/A
ENCAPSULATED (Ex ma)
INPUT BD
Ex [ia] J1A
Ex [ia] J2A
14 WAY
PROCESSOR BD
DISPLAY KEYPAD
LCD
ESC
ENT
STOP
RESET
START
OUTPUT BD
OVERVOLTAGE CROWBAR & CURRENT LIMIT
(Ex ia)
(Ex e)
X8, AC1
X9, AC2
X10, EARTH
Um=250VAC
TERMINAL BD
START +(Vbat)
START IN
DIG IN 1
DIG IN 2&3
RELAY 1 30V,3A
RELAY 2 30V,3A
RELAY 3 30V,3A
RS485
TERMINATION
PSU
OUTPUT
SEE TABLE FOR PARAMETERS
AMPCONTROL ELECTRONICS
AMPCONTROL CSM PTY.LTD.
ABN 35 900 779 141
7 BILLBROOKE CLOSE,
CAMERON PARK N.S.W. 2285
P: 02 4903 4800
F: 02 4903 4888
electronics@ampcontrolgroup.com

APPENDIX B - APPROVALS

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx TSA 10.0008X	issue No.:0	Certificate history:
Status:	**Current**		
Date of Issue:	**2010-07-05**	Page 1 of 3	

Applicant: **Ampcontrol CSM Pty. Ltd**
7 Billbrooke Close
Cameron park NSW 2285
Australia

Electrical Apparatus: **Intrinsically Safe UPS**
Optional accessory:

Type of Protection: **Ex e ia m Group I IP66**

Marking: **Ampcontrol**
IS UPS
Ex ia ma e I (Tamb –20 °C + 60 °C) IP66
IECEX TSA 10.0008X
110-240 Vac
S/N

Approved for issue on behalf of the IECEx Certification Body: Ujen Singh

Position: Quality & Certification Manager

Signature:
(for printed version)

Date: 05 JULY 2010.

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

TestSafe Australia
919 Londonderry Road
Londonderry NSW 2753
Australia

IECEx Certificate of Conformity

Certificate No.: IECEx TSA 10.0008X

Date of Issue: **2010-07-05** Issue No.: **0**

Page 2 of 3

Manufacturer: **Ampcontrol CSM Pty Ltd**
7 Billbrooke Close
Cameron park 2285
Australia

Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2004 Edition: 4.0	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-11 : 2006 Edition: 5	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-18 : 2004 Edition: 2.0	Electrical apparatus for explosive gas atmospheres - Part 18: Construction, test and marking of type of protection encapsulation 'm' electrical apparatus
IEC 60079-7 : 2006-07 Edition: 4	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

AU/TSA/ExTR10.0015/00
AU/TSA/ExTR10.0016/00

Quality Assessment Report:
AU/TSA/QAR06.0007/03

IECEx Certificate of Conformity

Certificate No.: IECEx TSA 10.0008X

Date of Issue: **2010-07-05** Issue No.: **0**

Page 3 of 3

Schedule

EQUIPMENT:
Equipment and systems covered by this certificate are as follows:

The Intrinsically Safe UPS comprises of electronics and batteries mounted within a stainless steel enclosure, to provide a battery-backed, intrinsically safe power supply output. In addition to this output, it provides several other intrinsically safe monitoring and control connections, and a mains power input to maintain the battery. A user accessible front panel consisting of a display, keypad and indicator lamps are provided to allow interrogation and configuration of the IS UPS. The IS UPS consists of circuit boards namely - Input Board, Processor Board, Output Board and Terminal Board. The Battery Board PCB is encapsulated together with the batteries. The terminals of the batteries and the Input Board are encapsulated. The type of protection provided by the encapsulation of the Input Board is 'ma' and has been assessed in a separate test report 32120. The mains terminals are situated in a separate compartment of the stainless steel enclosure. The type of protection provided at the mains terminals is increased safety 'e' and it has been assessed in the test report 32120. The ISUPS is not to be energized when it is inside zone 0. The IS UPS is manufactured in a variety of variants, providing different battery capacities and intrinsically safe power supply output parameters. Variation of battery capacity is accommodated by separate enclosure types, while variation of output parameters is accommodated by allowing the fitment of varied components to configure the output.

CONDITIONS OF CERTIFICATION: YES as shown below:

See Annexe of this certificate for the conditions of certification.

Annexe: Annexe for IECEx TSA 10.0008X.pdf

IECEx Certificate of Conformity Annexe

Annexe for Certificate No.:	IECEx TSA 10.0008X	Issue No.:	0

Drawing list pertaining to Issue- 0 of this Certificate:

Document No.	Sheets	Document Title	Issue	Date (yyyy/mm/dd)
		IS UPS Battery Board		
IS UPS–Z-020	1	IS UPS Battery Board Schematic	3	2010/05/25
ISUPS-Z-021	5	IS UPS Battery Board PCB	3	2010/05/25
ISUPS-Z-022	1	IS UPS Battery Board BOM	3	2010/05/25
		IS UPS Input Board		
ISUPS-Z-002	2	IS UPS Input Board Schematic	4	2010/06/16
ISUPS-Z-016	7	IS UPS Input Board PCB	3	2010/05/25
ISUPS-Z-024	3	IS UPS Input Board BOM	4	2010/06/16
		IS UPS Output Board		
ISUPS-Z-015	2	IS UPS Output Board Schematic	4	2010/06/16
ISUPS-Z-019	5	IS UPS Output Board PCB	3	2010/05/25
ISUPS-Z-025	2	IS UPS Output Board BOM	4	2010/06/16
		IS UPS Processor Board		
ISUPS-Z-014	3	IS UPS Processor Board Schematic	4	2010/06/16
ISUPS-Z-018	7	IS UPS Processor Board PCB	3	2010/05/25
ISUPS-Z-023	3	IS UPS Processor Board BOM	4	2010/06/16
		IS UPS Terminal Board		
ISUPS-Z-013	1	IS UPS Terminal Board Schematic	4	2010/06/01
ISUPS-Z-017	5	IS UPS Terminal Board PCB	3	2010/05/25
ISUPS-Z-009	1	IS UPS Terminal Board BOM	3	2010/05/24
		Transformer		
ISUPS-Z-003	1	IS. UPS Transformer Construction Details	4	2010/05/07
		Assembly Drawings		
ISUPSZ004	1	Battery Module Component of Power Module S/Assy	2	2010/03/19
ISUPSZ005	1	UPS IS IECEx 110/240 300 Wh Version	4	2010/06/16
ISUPSZ006	1	UPS IS IECEx 110/240 65 Wh Version	4	2010/06/16
ISUPSZ010	1	S/Assy, Battery Pack, IS UPS, 65WH	2	2010/03/19
ISUPS-Z-011	1	S/Assy Power Module IS UPS PCB Part	1	2009/11/02
ISUPS Z012	1	ISUPS Enclosures	4	2010/05/07
ISUPS-M-018	3	IS UPS LABELS Manufacturing Details	2	2010/05/11
ISUPS-Z-027	2	IS UPS Model Creation Procedure	1	2010/04/06
ISUPS-Z-028	1	IS UPS Block Diagram	4	2010/06/16

Certificate issued by:

Test Safe AUSTRALIA

TestSafe Australia
919 Londonderry Road
Londonderry NSW 2753 Australia

IECEx Certificate of Conformity Annexe

Annexe for Certificate No.:	IECEx TSA 10.0008X	Issue No.:	0

Document No.	Sheets	Document Title	Issue	Date (yyyy/mm/dd)
ISUPS-Z-029	5	IS UPS User Manual Inclusion	0	2010/06/16

Conditions of Certification pertaining to Issue -0 of this Certificate:
The following conditions of safe use must be taken into account when installed.

1. The mains power input must not be used when installed in Zone 0.

2. The following input/output parameters must be taken in to account when installed.

Terminals X8, X9, X10; mains supply input:
Um = 250 Vac

Terminal X7; External Start Push Button:
Uo = 32.5V
Io = 24 mA
Lo = 100 µH
Co = 0.040 µF

Terminal X6; DC Output:

Configuration	Uo	Io	Co	Lo	Lo/Ro
1	15.1 V	1.50 A	1.0 µF	200 µH	87.17 µH/Ω
2	15.1 V	0.51 A	1.0 µF	200 µH	87.17 µH/Ω
3	15.1 V	0.47 A	2.01µF	520 µH	87.17 µH/Ω
4	15.1 V	0.50 A	1. 0 µF	200 µH	87.17 µH/Ω
5	14.5 V	1.50 A	1.0 µF	200 µH	87.17 µH/Ω
6	12.6 V	2.50 A	2.0 µF	167.2 µH	33 µH/Ω
7	12.6 V	2.40 A	2.0 µF	167.2 µH	33 µH/Ω
8	12.6 V	2.00 A	502 nF	164 µH	40.1 µH/Ω
9	12.6 V	2.00 A	20.54 µF	102.1µH	39 µH/Ω
10	15.1 V	1.50 A	2.09 µF	181.5 µH	79 µH/Ω

The above output parameters Co, Lo, Lo/Ro were determined based on spark testing. The same Co, Lo, Lo/Ro values are allowed to be used with models of ISUPS when configured with lesser Uo and/or Io values.

Terminal X5: Digital Input 1
Uo = 16.5 V
Io = 16.8mA
Lo = 100 µH
Co = 1 µF

Certificate issued by:

TestSafe Australia
919 Londonderry Road
Londonderry NSW 2753 Australia

IECEx Certificate of Conformity Annexe

Annexe for Certificate No.:	IECEx TSA 10.0008X	Issue No.:	0

Terminal X4: Digital Input 2 & 3
Ui = 16.5V
Uo = 0V

Terminal X3; Pins 1 & 2 (data for RS-485):
Ui = 7.14 V
Ci = 0.221µF
Li = 0 µH
Uo = 5.88V
Io= 124mA

Terminal X3 Pins 3 & 4 (Power Supply for RS-485):
Ui = 16.5 V
Ii = 2.8A
Ci = 0 µF
Li = 0 µH

Terminal X2; Relay 1:
Ui = 30Vdc
Ii = 3A
Uo = 0 V

Terminal X1; Relay 2 and Relay 3:
Ui = 30Vdc
Ii = 3A
Uo = 0 V

Certificate issued by:

TestSafe Australia
919 Londonderry Road
Londonderry NSW 2753 Australia

APPENDIX C – MSDS

FIAMM
Industrial Batteries Department
Viale Europa, 63 - 36075 Montecchio Maggiore (VI)
ITALY

MATERIAL SAFETY DATA SHEET

FIAMM BATTERIES: SLA/FAT/UMTB

PRODUCT CHARACTERISTICS

PRODUCT

Valve Regulated Lead Acid Sealed batteries with absorbed electrolyte wet (non spillable).

PRODUCT TECHNICAL COMPONENTS

Components	Description	%
Lead and Compounds	Pb, PbO2, PbSO4	70-80
Electrolyte	Sulphuric acid in max concentration of 35%	12-20
Polymer	ABS	6-9

TECHNICAL NAME OF DANGEROUS SUBSTANCE

Sealed batteries containing a solution of sulphuric acid and distilled water, completely absorbed in separators.

PROPERTIES OF CONTAINER

ABS polymer, flame retardant FV0, anti-cracking.

PROPERTIES OF DANGEROUS SUBSTANCE

Liquid, clear, colourless.

BOILING POINT OF DANGEROUS SUBSTANCE

110° C

CLASSIFICATION OF DANGEROUS SUBSTANCE

Class 8
Code page IMDG IMCO No.8121
UN No 2800

PACKAGING REQUIRED FOR TRANSPORTATION

Batteries have to be packed in strong outer packagings after insulating each cell terminals.

Packaging Group III

IMPORTANT NOTE

There is no electrolyte in liquid status inside the battery due to the fact that this electrolyte is completely absorbed by a spungy material.

This means that even if you turn upside down (ermetically closed) there will be no leakage of the electrolyte.

Conditions will not change below boiling point (110° C).

SAFETY DATA

NATURE OF HAZARD

Corrosive liquid electrolyte causes damage to eyes, skin & air passages.
Attacks many materials & clothing.
Attacks many metals with liberation of hydrogen which is flammable and forms an explosive mixture with air.
Stored electrical energy.

PROTECTIVE MEASURES

Goggles giving complete protection to eyes, acid resistant clothing and gloves, and safety footwear.
Have available an eyewash bottle with clean water.
Store in a cool dry place.
Keep all vent plugs in position.
Charge in a well ventilated area, avoid breathing mist.
Keep away from sources of ignition, do not allow smoking or any naked lights.
Keep away from children.
For safe operating practices see BS 6287:1982

FIRST AID

If substance has got into eyes, immediately wash out with plenty of water.
If ingested drink copious amounts of water and seek immediate medical attention.
Remove any contaminated clothing and wash skin with water.
Seek medical treatment.

SPILLAGE

Close off or contain leak if without risk, using plastic containers if available.
Neutralise with soda ash, sodium carbonate or sodium bicarbonate.
If undiluted substance has entered a watercourse or contaminated soil or vegetation, advise local authority.

FIRE

If circuit still made, and if safe to do so, the emergency services may sever cables with fireman's axe.
Smother with dry powder or foam.
If necessary keep containers cool by spraying with water.

DISPOSAL

This product is defined in SI 232:1994 as being for fitment to an excluded appliance.
The cells contain heavy metal and must not be put out for collection in refuse containers.
Keep all constituents enclosed and upright.
Dispose of only to authorised scrap recoverer.
Move only in accordance with local authority requirements.
Do not incinerate or throw away.

Fiamm Asia Pacific Pte Ltd
36 Tuas Crescent
Singapore
Tel 0065 8653278
Fax 0065 8626550