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24V dc 5 Amp Switch Mode Power Supply for Fire Systems.

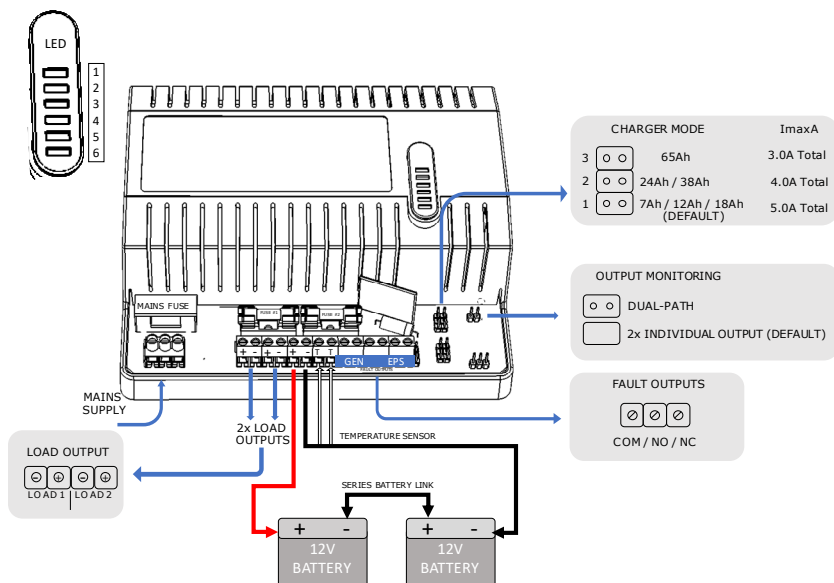
### 2405ST-MOD

*This power module is used within our certified 2405ST-x products. Please note, for full EN54-4 certification the box version must be used.*

Thank you for choosing this 2405ST Power Supply module. Please read this manual carefully as it provides information on how to safely install, commission and maintain this equipment.

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## SPECIFICATION

### Mains Input

Rated Voltage / Power (Operational voltage)	230V ac / 60W @ In = 5A nominal output current Un = 24V nominal output voltage (195V ac – 265V ac)
Frequency Input Switching frequency range	50Hz nominal 20KHz – 125KHz approximately, dependent on load.
Input current	< 2.0 Amps at full load
Inrush current	25A Max at 25 °C 230V ac for 10ms
Fuse	T3.15 A 20mm, 250V ac HRC (IEC 60127-2 type)
Earth / neutral system	TN & TT

PSU = Power Supply Unit (2405ST), PSE = Power Supply Equipment (the PSU in metal enclosure complete with batteries – 2405ST-x), CIE = Control and Indicating Equipment (e.g. a Fire Alarm System Control Panel).

### PSU Output

<b>Voltage</b> on Mains power (at full load)	21.6V dc (Umin)* – 28.8V dc (Umax)* / ** Un* = 24.0 V dc +/-3% at 25°C
<b>Voltage</b> on Battery standby (at full load)	21.6V dc – 26.0V dc
<b>Continuous Output Current</b> No charging ( <b>I<sub>max</sub> B</b> ) With Charging EN54-4 ( <b>I<sub>max</sub> A</b> )	5.7A Varies – see Section 21
<b>Ripple</b>	<100 mV pk – pk max @ Rated Voltage (HF)
<b>Current Limitation</b> Short circuit protection	From In* to In+15% for an output voltage < 50% Un*
<b>Fuse</b> Load (OP1 and OP2)	F5.0 A (IEC 60127-2 type)
<b>Battery Charging</b>	Constant current (bulk) charging to 80% capacity within 24 hours Float charging to 100% within 48 hours with monitored ECO charging
<b>Battery Voltage</b> Low battery threshold voltage Deep discharge protection	23.2 V (measured at the battery) 21.6 V (minimum, measured at PSU output)
<b>Quiescent current</b> At no load At battery cut off	< 60 mA < 180 µA

\* Umin / Umax / Un = maximum / minimum

\*\* Umax elevated by approximately +1% of Un when connecting the battery. Umax = 28.8V at all other times.

### Environmental

Temperature – Operating	-10 to +40°C (operating) 75% RH non-condensing
Temperature - Storage	-20 to +80°C (storage)
Enclosure rating	IP30

This Power Supply Unit (PSU) is only suitable for installation as permanently connected equipment (Power Supply Equipment / PSE).

The PSE is NOT SUITABLE for external installation

## INSTALLATION

This unit is only suitable for installation as permanently connected equipment. The PSU is NOT SUITABLE for external installation.

This unit must be fed from a mains power source having a separate (approved) disconnect device and fitted with a fuse or other over-current protection device rated at 5A maximum. Ensure that the disconnect device used has appropriate earth fault protection to the applicable standard.

Where the PSU is used to provide power to a fire alarm circuit, the mains isolation and disconnect device should be provided solely for this purpose and be suitably marked “FIRE ALARM – DO NOT TURN OFF”. All cabling should meet national and local fire system installation regulations, e.g. FP200 type cable for high integrity installations.

Where the PSU is used for other applications, it should be installed according to all relevant safety regulations applicable to that application.

Where the GEN PSU Fault and EPS Fault outputs are used, they should only be connected to circuits having voltages less than 60V dc.

### Cable Sizing

- 1) Mains input cable must be to the applicable standard with a 5A or greater current capacity, i.e. 0.75 mm<sup>2</sup> nominal conductor area, having a minimum operating voltage of 300/500V ac.
- 2) The low voltage output cable must be sized to carry the rated load current to the devices connected to the PSU, at full 5 Amp load this should be 1.5 mm<sup>2</sup> CSA.
- 3) All cabling should be securely fastened in position.

### Mounting the Module

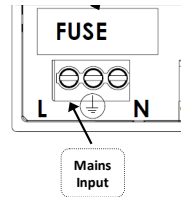
- 4) Fix the module into chosen enclosure using 3 x fixing points as per Fig 1 (All fixings must be used). Ensure sufficient space for heat dissipation and adequate ventilation to avoid overheating of the unit or associated batteries.

## COMMISSIONING

### Connecting the mains supply

1. With no external connections made to the PSE, connect the mains input wires to the terminal block, **ensuring that the mains isolator (disconnect device) is open**. Fasten wiring in place with cable tie to the fixing points provided.

**Note: This equipment MUST be earthed.**



2. Apply mains input. Confirm that all LED indicators flash on briefly proving integrity of indicators. After the power-on LED sequence confirm that the following conditions are met:

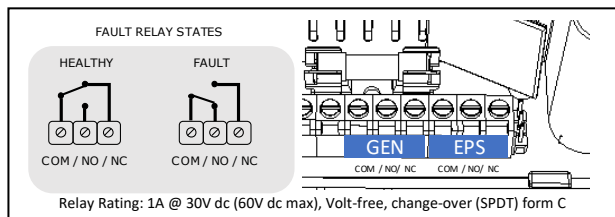
LED #	Symbol	LED Colour	Function
1	Mains	Constant Green	Indication: Mains supply = OK
2	Batt	Constant Yellow	Indication: Battery Fault = missing battery indicated
3	Fault	Yellow FLASH x1 (repeating)	Indication: Fault with PSU = due to missing battery
4	Diagnostic	Red FLASH x2 (repeating)	Indication: Fault = missing battery indicated
5	OP1*	Constant Green	Indication: Output 1 = OK
6	OP2*	Constant Green	Indication: Output 2 = OK

(See also 'Status and Fault-Diagnostic LED Indication' table for full details of LED indications.)

3. Disconnect the mains power using the disconnect device.

### Connecting the Remote Signalling

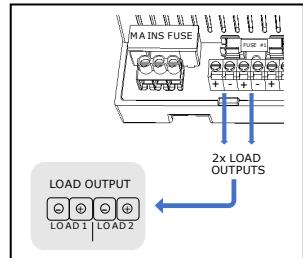
4. Connect the EPS and GEN PSU Fault outputs to the appropriate inputs of CIE



EPS Fault	GEN Fault	Condition	Possible Cause	Action
(COM TO N/C) CLOSED	(COM TO N/C) CLOSED	Normal operation.	Mains present. Battery healthy.	None.
(COM TO N/C) OPEN	(COM TO N/C) CLOSED	Standby Mode.	Mains lost (> 8 seconds) Battery driving load.	Investigate loss of mains.
(COM TO N/C) CLOSED	(COM TO N/C) OPEN	Fault Present.	Blown fuses. Battery fault Internal fault.	Investigate fault source using diagnostic LED #4. Rectify fault where possible.
(COM TO N/C) OPEN	(COM TO N/C) OPEN	PSU Shutdown.	Mains lost (> 8 seconds) Standby battery exhausted.	Restore mains as soon as possible.

#### Connecting the Load (with OUTPUT MONITOR jumper fitted)

- When monitoring the PSU outputs, the ST can either consider the outputs as 2 individual, unrelated loads or will monitor the two outputs as a single dual-power transmission path (see section 43 for DUAL-PATH monitoring). With the OUTPUT MONITOR jumper fitted, the outputs are considered as two individual loads.
- Connect the load (output) wiring as shown here. Cable tie to fixing point provided (adjacent to exit hole).
- If only one load is connected, the PSU will continue to monitor both outputs  
**Warning: do not overload the PSU, the I<sub>maxA</sub> and I<sub>maxB</sub> value is shared between both outputs**
- Re-apply mains. Verify the following



LED #	Symbol	LED Colour	Function
1	Mains	Constant Green	Indication: Mains supply = OK
2	Batt	Constant Yellow	Indication: Battery Fault = missing battery indicated
3	Fault	Yellow FLASH x1 (repeating)	Indication: Fault with PSU = due to missing battery
4	Diagnostic	Red FLASH x2 (repeating)	Indication: Fault = missing battery indicated
5	OP1*	Constant Green	Indication: Output 1 = OK
6	OP2*	Constant Green	Indication: Output 2 = OK

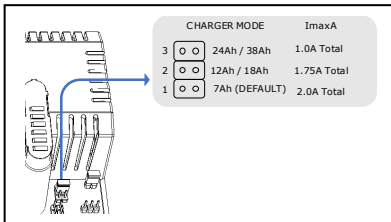
- If connected, verify that the EPS Fault monitor shows a (com to n/c) *CLOSED* contact and the GEN PSU Fault monitor shows an (com to n/c) *OPEN* contact.
- Perform a full functional test of the connected system (load) including full alarm condition, then disconnect the mains supply.

#### Battery Charger Setting

- Set the correct charger mode by fitting the jumper to the appropriate charger mode header. Use the table below to select the appropriate charger mode

Battery mode selected	Mode 1 (DEFAULT)			Mode 2		Mode 3
Battery Capacity (2x 12V)	7 Ah	12 Ah	17 Ah	24 Ah	38 Ah	65Ah
EN54-4 Continuous Output Current No charging (Imax B) With Charging (Imax A)	5.7 A (c) 5.0 A			5.7 A (b) 4.0 A		5.7 A 3.0 A
Constant current charge	0.70 A			1.50 A		2.60A
EN12101-10 (ImaxB)	5.7A					

For 180s at end of standby period							
EN12101-10 Max Standby current (Imax Standby)	4hr standby	1.10 A	1.90 A	2.66 A	3.70 A	5.00 A	5.00 A
	24hr standby	0.25 A	0.43 A	0.60 A	0.83A	1.30 A	(a) 2.25 A
	72hr standby	0.10 A	0.17 A	0.25 A	0.33 A	0.52 A	0.90 A



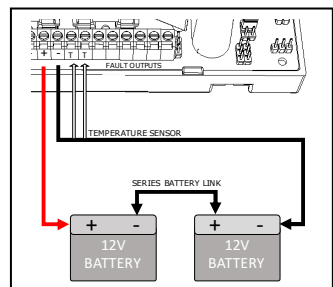
Battery Capacity (2x 12V) Type (closed) VRLA.:	7 Ah	12 Ah	17/18 Ah	24 Ah	38 Ah	65Ah
<b>PowerSonic model</b>	PS-1270	PS-12120	PS-12180S	PS-12260S	PS-12380	PS-12650
<b>Yuasa model</b>	NP7-12	NP12-12	NP17-12I	NP24-12I	NP38-12I	NP65-12I
<b>Interlogix model</b>	BS127N	BS130N	BS131N	BS129N	BS132N	BS133N
<b>Europa model</b>	EB12-7.2	EB12-12	EB12-18	EB12-26	EB12-44	

- Using the battery lead provided, connect the two white wires to the “Temp” terminals on the PSU (polarity is not important) and the RED lead to “Bat+” and the BLACK lead to “Bat-”.

**CAUTION: Connect battery leads to PSU terminals FIRST - THEN connect to the battery LAST.**

- Connect the red battery lead to the free positive battery terminal and the black battery lead to the free negative battery terminal.

**CAUTION – significant energy can be released from an SLA battery. When connecting the last battery lead, take extreme care to attach the cable ONLY to the correct terminal. Avoid shorting it to any other terminal or conducting surface.**




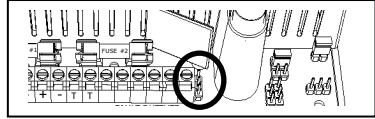
**CAUTION – the supplied battery lead contains a temperature sensor – DO NOT attempt to modify this lead in any way and do not use an alternative method of connecting the batteries.**

- Reconnect the mains supply and verify that Fault LED #3 is off and Battery LED #2 indicates flashing or constant Green. 2405ST only accepts batteries >= 22V.

*Note: Batteries as low as 19V may be connected, but this is NOT ADVISED as this could indicate damaged batteries. To connect batteries as low as 19V, carefully disconnect one white temperature sensor wire from the “TEMP” terminal block. This will induce a thermistor fault. Then wire the batteries to the terminals (follow steps 29-30). Once the batteries are charging, clear the thermistor fault by reconnecting the thermistor wire.*

- Verify GEN Fault relay n/c contact is closed, (com to n/c terminals = short circuit)
- Disconnect the mains power. Verify that the green Mains LED #1 extinguishes, and the Yellow Fault LED #3 starts to flash (indicating that the PSE is running from its standby batteries).
- If connected, verify that the EPS Fault output shows an open contact (com and n/c terminals = open circuit) and the GEN PSU Fault output shows a closed contact (com and n/c terminals = short circuit).

18. Verify that the standby batteries are now supporting the system load. Perform a full functional test of system including full alarm condition Note: ensure batteries have sufficient charge to support the system under full load.
19. To prevent battery fault indication when no battery is required, fit the “No Battery” link (  ).  
**Please note; fitting of this link invalidates EN54-4 and EN12101-10 compliance.**



#### Final Commission

20. Reconnect the mains. Verify that

LED #	Symbol	LED Colour	Function
1	Mains	Constant Green	Indication: Mains supply = OK
2	Batt	Green flash x1 (repeating)	Indication: Battery Charging (bulk phase)
3	Fault	OFF	Indication: No Fault
4	Diagnostic	OFF	Indication: No Fault
5	OP1	Constant Green	Indication: Output 1 = OK
6	OP2	Constant Green	Indication: Output 2 = OK

(See also ‘Status and Fault-Diagnostic LED Indication’ table for full details of LED indications.)

21. If connected, verify that EPS Fault output shows a (com to n/c) *closed* contact and the GEN PSU Fault output also shows a (com to n/c) *closed* contact.
22. Disconnect one of the battery leads, ensuring that no exposed section of conductor or connector is allowed to contact exposed metal-work, other PSE terminals, or other battery terminals.
23. Verify that, in less than 1 minute the following conditions are met:

LED #	Symbol	Green ON	Function
1	Batt	Constant Yellow	Indication: Battery Fault = missing battery indicated
2	Fault	Yellow flash x1 (repeating)	Indication: Fault with PSU = due to missing battery
3	Diagnostic	Red flash x2 (repeating)	Indication: Fault = missing battery indicated
4	OP1	Constant Green	Indication: Output 1 = OK
5	OP2	Constant Green	Indication: Output 2 = OK
6	Batt	Constant Yellow	Indication: Battery Fault = missing battery indicated

(See also ‘Status and Fault-Diagnostic LED Indication’ table for full details of LED indications.)

24. Reconnect the battery lead and, after approximately 3s, verify that that the Fault LED #3 does not flash. (Audible click can be heard as the battery relay closes, then a second click while the charger is tested.)  
*Note: If it is necessary to obtain confirmation of charging current; between steps 28 and 29, an ammeter can be placed in series with the battery leads. Continue to observe caution with all exposed conductors when inserting or removing the meter and when restoring normal battery wiring*
25. Close cover and secure using fastening screws provided.

## OPERATING INSTRUCTIONS

In the event of loss of mains, a battery fault or a GEN fault, the corresponding Fault relay (signal) contacts will open, and the LED indicators will display the fault condition and overall status of PSE.

If the output of the PSE fails, the cause of the failure should be investigated, also by referring to the '**Status and Fault-Diagnostic LED Indication**' table, e.g. short circuit on load terminals or connection of a deeply discharged battery. The fault should be rectified before restoring power to the PSE.





If any of the fuses require replacing, ensure the correct fuse rating and type is used – see page 2




## MAINTENANCE





This unit is intended for use by Service Personnel only. There are NO USER SERVICEABLE parts inside.



There is no regular maintenance required of the PSE other than periodic testing, and replacement of the standby battery. **Reference should be made to the battery manufacturer's documentation to determine typical/expected battery life with a view to periodic replacement of the battery.**







## TROUBLE SHOOTING



The PSU will identify a fault the PSU (LED3) Further information can be obtained by observing the flash sequence of LED 4 and using the tables below				
LED KEY	ON 	OFF 	FLASHING ON/OFF 	FLASHING GREEN/YELLOW 

Mains LED #1	Condition	Possible Cause	Action
 GREEN		Mains OK	
 YELLOW	<b>Mains lost</b> (Battery supporting load)	Mains lost / Battery supporting load.	Investigate loss of mains.
 OFF	<b>PSU off – No power</b> (Battery depleted)	Mains lost / Battery not supporting load.	Restore mains, confirm batteries are in working condition

Batt LED #2	Condition	Possible Cause	Action
 GREEN/YELLOW Fast Flash	Battery in process of connecting	Battery connecting	No action – Wait for battery connection to complete
 GREEN Flash x1	Normal operation (Battery connected)	Battery in bulk charge	No action – Battery charging normally
 GREEN	Normal operation (Battery connected)	Battery healthy.	No action – System healthy. (Battery in good state of charge)
 YELLOW	Battery fault	Battery disconnected Low Battery Volts High impedance in battery connection. Ri max 250mΩ Battery internal fault (detected during load test).	Note LED #4 Flash sequence and refer to table

Fault LED #3	Condition	Possible Cause	Action
 OFF	Normal Conditions	No faults	No action
 YELLOW Flash x1	PSU Fault	See LED #4 Flash sequence table	Note LED #4 Flash sequence and refer to table

Diagnostic LED #4	Condition	Possible Cause	Action
 RED Flash x1	No Output	Output fuse fail Output overload or short circuit.	Check and replace output fuse. Disconnect and test output load.
 RED Flash x2	No Battery Low Battery Volts.	Battery disconnected Battery heavily discharged Low Battery Volts	Check battery connections Check battery fuse. Check battery condition / replace battery.
 RED Flash x3	Battery Fault.	High impedance in battery connection. Ri max 250mΩ Battery internal fault (detected during load test).	Check battery connections for corrosion. Replace battery if aged.
 RED Flash x4	Charger Fault.	Internal failure of battery charger.	Return to manufacturer.
 RED Flash x5	Battery Temperature Probe Fault.	Battery temperature monitor disconnected or damaged. PSU running in Safe Mode.	Check temperature sensor connections and condition of sensor. Replace if suspect
 RED Flash x6	Dual Path Fault.	Fault in output connections to the load (DUAL-PATH mode active only).	Check all cables between PSU and load.

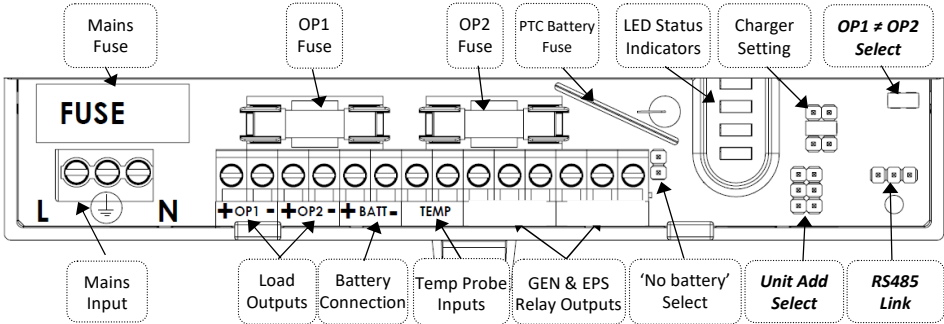
OP1 & OP2 LEDs #5 or #6	Condition	Possible Cause	Action
 GREEN	Normal operation	No faults.	No action
 YELLOW	No Output	Output fuse fail Output overload or short circuit.	Check and replace output fuse. Disconnect and test output load.

*NOTE: after applying mains power – if red LED is ON (not flashing), this indicates a failed calibration check, although a calibration fault is not indicated via the GEN fault relay. This fault should never be seen, but in the extremely rare event that it does, the PSU will operate using default values, but some functions may be compromised, and you are strongly advised to contact Elmdene Technical Support to return the product. Indication of a calibration fault will be suppressed (but not cleared) when the battery is connected.*



## DEVELOPER SECTION

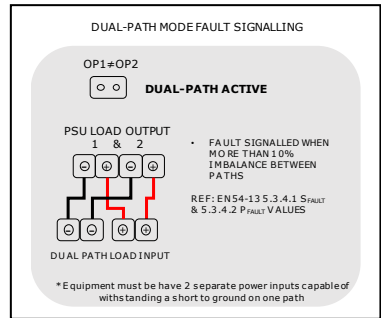
Figure 4 – Terminal layout and mode selection



### Dual-Path power transmission monitoring feature

26. The 2405ST PSU has an optional mode designed to work with systems that require dual-power transmission paths. When enabled, the PSU compares the outputs and reports a load imbalance of more than 10% as an OUTPUT FAULT (LED 4 x6 Flashes) and is enabled by removing the header marked **OP1 ≠ OP2**

This mode meets the requirements of EN54-13 Section 5.3.3.1  $S_{FAULT}$  and Section 5.3.4.2  $P_{FAULT}$  warning conditions, for loads above 200mA. It is still necessary for the connected equipment to be designed to accept two separate power inputs, such that a short to ground of either power transmission path, will not inhibit the equipment performance.



### PSU Addressable Data link communication protocol

27. The 2405ST PSU has an addressable RS485 communication port, that can be enabled to provide the internal PSU data, and includes; Mains Voltage; Output1 Voltage/Current; Output2 Voltage/Current; Battery Voltage; Charger Current; Charger setting; GEN Fault condition; EPS Fault condition; Diagnostics fault status (condition 1-6), Battery temperature, Charger status, unit address
28. To enable this feature and obtain the protocol guide, please contact Elmdene Technical Support.

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## DISPOSAL OF PRODUCT AT END OF LIFE

This product falls within the scope of EU Directives 2012/19/EU Waste Electrical and Electronic Equipment (WEEE) and 2013/56/EU (Battery). At the end of life, the product must be separated from the domestic waste stream and disposed via an appropriate approved WEEE disposal route in accordance with all national and local regulations.

Before disposal of the product, any batteries must be removed, and disposed separately via an appropriate approved battery disposal route in accordance with all national and local regulations. Package used batteries safely for onward transport to your supplier, collection point or disposal facility.

**Caution: Risk of fire or explosion if bare battery wires are allowed to touch.**

See Specification for battery type information. The battery is marked with the crossed-out wheellie bin symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg).

For more information see: [www.recyclethis.info](http://www.recyclethis.info)

*The packaging supplied with this product may be recycled. Please dispose of packaging accordingly.*

## COMPLIANCE

This power supply unit meets the essential requirements of the following EU Directives:

CPR: 305/2011/EU    EMC: 2014/30/EU    Low Voltage: 2014/35/EU    WEEE: 2012/19/EU    RoHS2: 2011/65/EU

### Explanation of symbols: (Not all may apply)



Fault Indication



Shock Risk - isolate before attempting access



Certification Level



Mains Present



Protective Earth



Do not dispose of in unsorted waste

Specifications subject to change without notice