Dycon D2435-M-MS1-PSUM Power Supply Series

Technical Description

Installation and Operating Manual

Contents

1. General 3
1.1 Product 3
1.2 Features 3
2. Electrical and Operational Specifications 3
3. Compliance 5
4. Power Supply Physical Dimensions and Features 6
4.1 Printed Circuit Board 6
5. Installation and Operation 6
5.1 Mounting 7
5.2 Step by step 7
5.3 AC Power Connection and Wiring 7
5.4 Jumper Links 7
5.5 LED Display 8
5.6 OP1 and OP2 9
5.7 SW1 and SW2 Inputs 9
5.8 DATA and LED Interfaces 9
5.9 Fault detection and Outputs 9
5.10 Batteries 11
5.10.1 Battery Protection 11
5.10.2 General Maintenance 11
6. Declared performance 12
7. PSU Monitor 13
7.1 Specification 13
7.2 Installation and Operating 14
7.3 Specifications 16

1. General

1.1 Product

Dycon D2435-M-MS1-PSUM is a high-efficiency, 5 Ampere switched-mode, dual-output, 'intelligent' 24VDC power supply (PSU) with an integral Dycon PSUMON-01 PSU monitor and display.

1.2 Features

The power supply is a 5 amp providing a nominal 27V with two 12V lead acid batteries for standby operation without AC power. The power supplies share the following features:

- Microprocessor controlled operation and protection
- On-demand battery charging and load output current sharing
- Automatic output reconnection after short circuit fault
- No user serviceable fuses, outputs protected by electronic E-fuses
- Two independent switched outputs with programmable (jumper selectable) control inputs
- On board or remote temperature sensing (jumper selectable) with optional remote sensor
- Separate AC healthy, battery fault and power supply fault outputs
- Three fault outputs, AC Power Fail, Battery Fault, PSU Fault
- Form A, normally closed floating relay fault outputs
- Four LED status display
- Over-voltage output protection
- Battery-free option selected by a jumper

The on-demand load sharing capability gives the power supply range exceptional flexibility. This allows rapid large capacity battery charging with either extended standby hold-up duration at light loads, or short high current peak loads where spare output capacity is diverted to battery charging.

2. Electrical and Operational Specifications

SPECIFICATIONS	
AC Input Voltage	230VAC ±10%, 50Hz.
Maximum Input Continuous Current	D2435, 1.5A @ 230VAC
Peak inrush current limit	20A maximum.
Recommended Switched Spur Input Fuses	D2435, 250V T3.15A
Voltage Output AC Present	Minimum 25.0Vdc, Maximum 28.5Vdc.
Voltage Output Standby	Minimum 20Vdc, 24 V Nominal

SPECIFICATIONS	
Total Continuous Output Current (Imax.b)	D2435, 5A
Current output with battery charging (Imax.a)	D2435, 4.3A
Battery Charging Current	On demand. Maximum D2435, 5A
Low Voltage detection thresholds	<22V ±2%, low voltage restore, >23V ±2%.
Battery Circuit Impedance Threshold (Ri max)	>0.18 Ohm ±5%, at a nominal test current of 5A.
Deep Discharge Disconnection Threshold	**<**21V ±2%.
Overvoltage Detection Shutdown Threshold	>30V ±2%.
Output Monitoring Threshold	Battery charging voltage <2V ±2%.
On-Board AC Power Input Fuses	2435, T3.15A
Battery Fuse	PTC, self-resetting, non-replaceable.
Fault Relays	Normally closed, 100mA at 60V. On-Resistance 16 ohms maximum, 1500VRMS Isolation voltage
PSU Standby Current	32mA.
Maximum Ripple Voltage	0.7V peak to peak.
Battery Type	Sealed Lead Acid Gel, YUASA NP7-12F/RETARD, YUASA NP17-12F/RETARD, YUASA NP7-12, YUASA NP17-12I
Operating Temperature and Humidity Range	-10^{o}C to +40^{o}C, 95% maximum humidity, non-condensing
Minimum Output Current **(I min)**	200mA

SPECIFICATIONS	
Battery current drawn by power supply without AC supply	Maximum 55mA (Depending on fault output status)

3. Compliance

The power supplies comply with the following European Directives:

Low Voltage: 2006/95/EC

EMC: 2004/108/EC

WEEE: 2012/19/EU

RoHs: 2011/65/EU

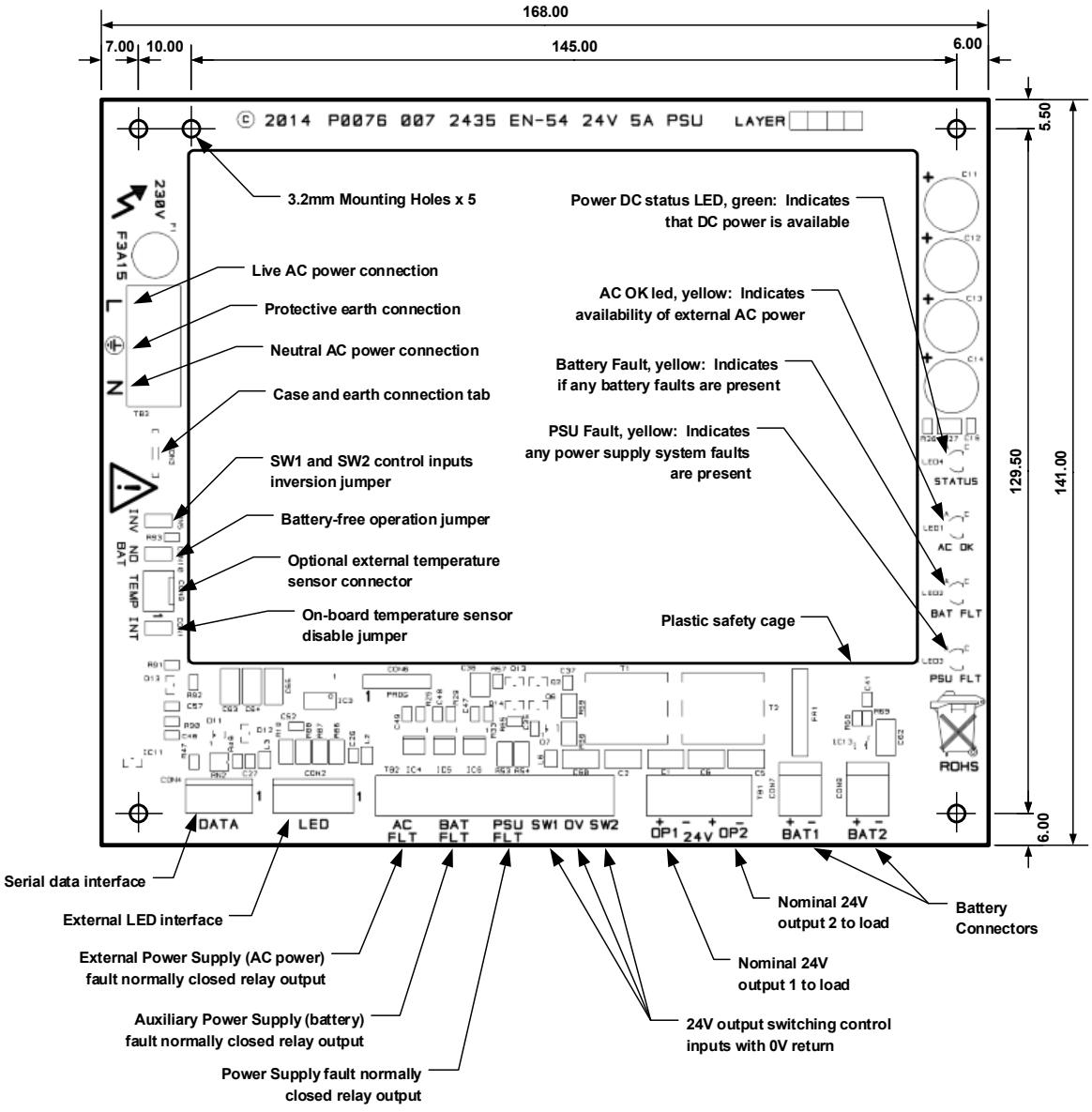
IEC61140: Protection against electric shock – Common aspects for installation and equipment:
Class 1

CE 0359

4. Power Supply Physical Dimensions and Features

4.1 Printed Circuit Board

The dimensions are identical are as below:



5. Installation and Operation

Warning: Isolate the AC power supply before working on the power supply. Only suitably qualified personnel should install these power supplies and wiring should comply with the latest edition of IEE Wiring Regulations (BS 7671) or local national electrical standards.

5.1 Mounting

The power supplies are designed for indoor use, within the specified operational temperature and humidity limits.

The metal enclosures should be mounted on a solid, flat and dry surface. The screws should have a minimum shank diameter of 5mm (No 11 gauge) and use suitable wall plugs where needed.

The power supplies should not be mounted near sources of heat or moisture and should be accessible for ease of fitting heavy batteries.

5.2 Step by step

- Isolate mains power
- 2 wiring for mains, power out, fault and batteries to be disconnected from KT Assemblies PS
- 4 x M4 nuts with washer to be removed
- Remove existing PSU plate and fit new fixing plate with D2435 (using 4 x M4 nuts)
- Fit/replace external LED in lid of the housing
- Wire up mains 3 wires AC to 20-240V (do not power up)
- Fit mains cover (if supplied) LED's are still visible on PSU
- Fit 2 x spade for earth to base and lid.
- Wire in the fault outputs, note D2435 has 3 outputs which can be connected in series if only 1 is currently used or additional wiring required to Mercury controller.
- Connect 2 x battery cables and put 4 x battery caps on battery connection terminals (use one battery cable per battery – DO NOT LINK THE BATTERIES IN SERIES)
- Power up mains
- Check status LED's. Note battery impedance test can be delayed up to 1 minute (with PSU monitor)
- Fit label to outside housing door (indicate PSU has been upgraded)

5.3 AC Power Connection and Wiring

AC power with a protective earth for Class 1 equipment is to be used with an isolating switched spur using the recommended fuse ratings or a fuse rating of not greater than 5A. The fused switched spur should be fitted as close to the power supply as practicable to allow isolation when the unit is serviced. AC power cable with conductors of a cross sectional area greater than 0.75mm should be used.

The AC power cables shall be segregated from the low voltage control wiring and outputs to load. 20mm diameter knockouts on the four sides of the box are provided for cable glands including mineral insulated copper-clad cable.

5.4 Jumper Links

Warning: The AC power supply and the batteries must be disconnected before the jumper positions can be changed. Failure to do so can cause damage to the PSU, batteries and connected equipment.

The power supply must not be used with the INT jumper in the off position without a D2430 external temperature sensor fitted, as this could result in a battery fire or explosion risk.

The NO BAT link must be in the off position.

Three jumper links are provided for configuring the PSU, the “off” position is when the jumper is “parked” on a single pin and the “on” position is when the jumper is placed across two pins:

JUMPER	DEFAULT	OPERATION
INV (Invert inputs)	Off (Not inverted)	When left in the off position the outputs associated with the SW1 and SW2 inputs will be switched on when they are at a logic high. When in the on position the outputs associated with the SW1 and SW inputs will be switched off when they are at a logic high.
NO BAT[1] (Battery free operation)	Off (Battery monitoring enabled)	With the jumper left in the off position, the PSU will operate as normal with battery standby when AC power is not available. If operation without a battery being fitted is required, then the jumper should be in the on position.
INT[2] (Internal/external temperature sensing)	ON (Internal temperature sensing)	When the jumper is fitted the PSU will use the internal on-board temperature sensor, the link must be put into the off position to use an external temperature sensor.

NOTES

1. This jumper can also be used to supress a battery fault condition until a new battery can be fitted. The jumper disables the battery monitoring only and allows the battery to be charged and provide standby power as normal.

2. The power supply must not be used with the jumper in the off position without a D2430 external temperature sensor fitted, as this could result in a battery fire or explosion risk.

5.5 LED Display

Four board mounted LEDs are used to provide a status and fault display. The DC power status display indication is brought out to the lid via a light pipe and identified with the label as shown. The other indicators are only visible when the lid is removed:

⎓ STATUS: The yellow LED indicates that DC power is available.

AC OK: The green LED is lit when AC power is available.

BAT FLT: The yellow LED is lit when any battery related faults are detected.

PSU FLT: The yellow LED is lit when any power supply related faults are detected.

5.6 OP1 and OP2

Due to high instantaneous current that can flow under fault conditions, the DC output wire is recommended to be 1mm cross sectional area or greater.

The outputs are individually protected against short circuits. The outputs can be switched using the SW1 and SW2 output control inputs. The outputs are fully protected against switching transients and are suitable for switching highly inductive loads such as door strikes and magnets.

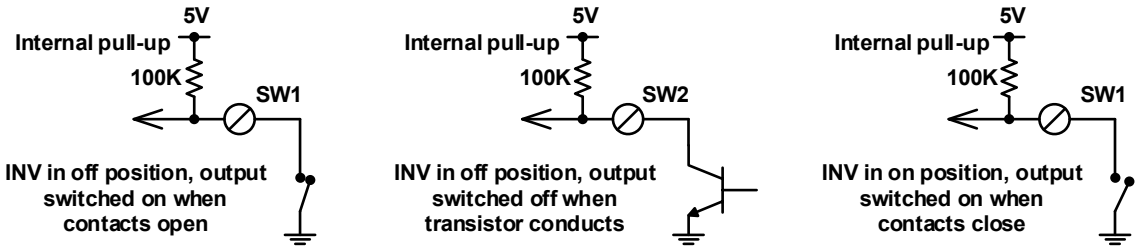
The combined output current of the two outputs must not exceed the power supply ratings.

5.7 SW1 and SW2 Inputs

These inputs can be used to switch on and off OP1 and OP2. The default of these inputs are selected by the INV (inverted) jumper, with the jumper in the off position the outputs can be switched off when the input is low and when in the on position (inverted) the output can be switched off with a positive input.

The wiring to these inputs shall not be more than 3 meters in length.

The inputs have a 100K pull-up resistor and are 30V tolerant. They are designed to be easily driven by a 5V logic output, relay contacts or open collector transistors, see drive examples below:

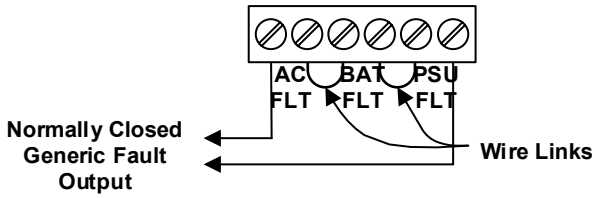


5.8 DATA and LED Interfaces

The 5 way connector block (data) is for the PSU monitor and the 6 way connector block (LED) is for the green LED cable.

5.9 Fault detection and Outputs

Three normally closed relay outputs in no-fault conditions are provided for fault signalling and will open when a fault is detected. The PSU can be fitted with two wire links as shown below. The three separate normally closed fault outputs can be connected in series, so should any one of the fault relays opens in a fault condition, a generic fault condition is signalled. It is recommended to individually wire the outputs to the controller so the detailed fault is reported.



The table below shows the relation between fault and outputs.

FAULT	OUTPUT	DISPLAY	DESCRIPTION
AC power missing	AC Fault	DC Power AC Power	The front panel DC power LED will be on to indicate that DC is available, with or without AC power, The internal AC power LED will be off.
OP1 or OP2 shorted	PSU Fault	PSU	The outputs will automatically retry to restore power every 5 seconds until the short is removed.
Over-voltage[1]	PSU Fault	PSU	If the power supply voltage exceeds 30 volts, both outputs will be switched off and a latched fault generated[2].
Battery connection fault	BAT Fault	Battery	If any of the battery connectors are disconnected a battery fault will be generated.
Battery high[2] resistance fault	BAT Fault	Battery	The batteries (and) battery connections are tested every hour and if the resistance is over 0.18ohms, a fault is generated.
PSU low voltage	PSU Fault	PSU	If the internal PSU power rail voltage is too low to charge the battery, a fault will be generated.
PSU Failure	PSU Fault	PSU	Should the switching power supply fail due to overloading, over-temperature or a component failure, a fault will be generated.
Charging[3] Failure	PSU Fault	PSU	Should the charging circuit fail, then a fault will be generated.
Battery Low Fault	APS[3] Fault	Battery	If any individual battery is left to discharge below 11.5V when the PSU is in standby mode, a fault will be generated.

NOTES

1. Over voltage protection is done at two levels, the first being where the internal power low voltage rail (nominal 24V) is monitored and the second is where the off-line, high voltage side of the switched mode power supply is monitored. Should an off-line fault be found then the high voltage switching circuit will be disabled. In both conditions the power supply should be switched off and the batteries removed for 15 minutes to reset the fault.

2. The battery and connection resistance is tested every hour, except when first powered up. On power-up the batteries are tested after 5 minutes to alert the installer to any potential battery condition fault. The fault threshold is approximately 0.18 Ohm. With the PSU monitor

connected the battery test is within 1 minute. Fully charged batteries should show less than 0.18 impedance and an empty battery will show an impedance above the threshold. Batteries showing above 0.18 should be replaced in sets. On a 17 Ampere battery set, 0.18 indicates only 50% capacity is left.

3. This fault condition is detected by comparing the internal rail voltage to the calculated temperature compensation voltage. If more than 1 volt lower, then a fault will be generated.

5.10 Batteries

Warning: There is a risk of fire and explosion if the wrong batteries or battery connection cables are fitted. Care should be taken with polarity when connecting the batteries. Used batteries should be disposed of in accordance to the WEEE directive.

Two identical batteries of the specified type shall be used, preferably from the same batch and date of manufacture. This is important to maintain a balance of charge between the two batteries. Two cable harnesses are provided for individual connection to the board, where they are connected in series. The box will house two 17Ah batteries. The battery cables are to be segregated from the incoming AC power supply wiring.

5.10.1 Battery Protection

The batteries are reverse connection protected and the battery charging output is protected from short circuits.

The battery output is overload protected by a resettable fuse, in addition to the electronic output fuses. If this fuse is tripped then the batteries should be disconnected for 1 minutes to allow the fuse to reset.

When in standby mode the battery is switched off when the battery terminal voltage reaches 20V to prevent battery deep discharge damage. This fault is normally reset by restoring the AC power supply.

5.10.2 General Maintenance

Warning: Isolate the AC power supply before removing the power supply lid. Do not touch components or heat sinks as there is risk of electric shock or burn hazard.

The power supply should be regularly inspected by qualified personnel and the following checked:

1. No faults are displayed.
2. Battery terminals checked for corrosion and the terminals are securely tightened.
3. All the connections into the power supply terminal blocks are secure.
4. The battery voltages are checked and the voltages are balanced within a volt to each other. The battery manufacturer’s specifications should be consulted when making battery voltage measurements.
5. Battery replacement is recommended after a 5-year service life.
6. Check there are no signs of water or moisture ingress and there is no mechanical damage to the enclosure.
7. Check for signs of overheating on the power supply board and battery cases.
8. Check the voltage outputs, they should be nominally between 26.5V and 28.5V depending on temperature.
9. There are no replaceable input, battery or output fuses. In the event of a fault the power supply board will have to be replaced.

6. Declared performance

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14

D2431, D2433, D2435/2014/09/19

Harmonised Technical Specification		**EN54-4:1997 + A1:2002 + A2:2006**
Essential Characteristics	**Performance**	**Clause**
Performance of power supply		
- General requirements	Pass	4
- Functions	Pass	5
- Materials, design and manufacture	Pass	6
Operational reliability		
- General requirements	Pass	4
- Functions	Pass	5
- Materials, design and manufacture	Pass	6
- Documentation	Pass	7
- Marking	Pass	8
Durability of operational reliability (temperature resistance)		
- Cold (operational)	Pass	9.5
Durability of operational reliability (vibration resistance)		
- Impact (operational)	Pass	9.7
- Vibration, sinusoidal (operational)		

- Vibration, sinusoidal (endurance)	Pass Pass	9.8 9.15
Durability of operational reliability (electrical stability) - Electrical Compatibility (EMC), - Immunity tests (operational)	 Pass	 9.9
Durability of operational reliability (humidity resistance) - Damp heat, steady state (operational) - Damp heat, steady state (endurance)	 Pass Pass	 9.6 9.14
Products covered by this standard are assumed to function during the alarm condition, in an event of fire, before the fire becomes so large as to affect their functioning. There is therefore no requirement to function when exposed to direct attack from fire.		

7. PSU Monitor

7.1 Specification

The PSU monitor provides real-time display and monitoring of voltage, current, impedance & faults on Dycon D243X Intelligent 24VDC power supply units.

PSU monitor can be attached on the fixing plate or inside door using the magnetic strips on the back of the monitor. You can remove the backing of the self-adhesive tape if you want to fit it permanently.

7.2 Installation and Operating

Page 1 – Product page

When powering up, the unit will start with the product page, then to legend, fast sampling and finally normal mode.

Page 2 – Legend

Page 2 is display legend (photo shows legend).
Note 'n' is for input, output or battery 1 or 2.

Voltage outputs

Output 1 and 2 Voltage
01V 02V
Both outputs are monitored and display the voltage. This is updated every 800 miliseconds, in fast scan every 8000 milliseconds and show the voltage ripple.
Note the outputs can show 0.00 volt if SW1 or SW2 (inputs) are activated. The PSU monitor will show this as 01 = off 02 = off

B1V B2V and BCV Battery Charge

Batteries can have different charging voltages and rate of charging. The B1V (battery 1) is measured and the voltage in series of the 2 batteries (BCV. B2V is the value of BCV – B1V. If battery 2 is discounted B1V still shows the measurement.

BCA Battery Charge in Amperes

This is shown with milliamperes. For example 0.18 is 180 milliampere. The PSU does smart charging and calculates constantly the spare amount not used by the PSU outputs and adds this to the battery charging current.

DGC Temperature monitoring

The PSU has a built in temperature sensor. To automatically vary the battery charging. At higher temperatures the charging voltage will reduce to optimise the life of the battery. The value is displayed in centigrade and will be higher than the box temperature due to electronics on the PSU.

Battery impedance (IMP)

The impedance measurements of the batteries is the best solutions to show the status and quality of the batteries.

Page 3 – Fast sampling

Page 3 is the fast sampling for 10 seconds.
This allows to see in real time data which you cannot see with an LCD multi-meter.
The fast sampling allows to see fluctuations and short changes of voltage and current.
Useful when start up in rush currents as it can cause a problem or short circuit on the outputs can cause a shutdown of a port.
High inrush currents will show the batteries assisting with the power output and dip in the output voltage.

Default page

The final page is the default page which gives provides data every 800 milli seconds instead of every 8000 of a milli second.

Functions

The top left button switches between these 3 pages.
Note: only press once and let it scroll through the pages.
The top right button puts the PSU monitor in sleep mode.
Current draw of the PSU monitor is only 10mA and in sleep mode reduces to just under 1 mA.
Press the button again to wake up the PSU monitor.
The bottom right slider allows to switch off the power completely to the unit. This does not affect the operation of the PSU, LED's and the fault outputs.
Slide it back to turn on the power.

7.3 Specifications

Model No.	D-PSU-MON-24
Description	Power Supply Unit (PSU) Monitor
Compatible Dycon Intelligent 24VDC PSU's	D2431, D2433 & D2435
Voltage Input	5 to 14 VDC
Max. Input Continuous Current	30 mA at 5 VDC
Power consumption	10 mA at 27.6 VDC
Cable	5-core included
LED 1	Red = Power on
LED 2	Green = Data
Switch 1	Display legend, product info and fast-scan mode
Switch 2	Deep sleep mode - switches off display
Display Language	English (others on request)
Output Monitoring Threshold	Battery Charging Voltage <±2%
Sleep Mode	Toggle switch
ON/OFF	Slider switch
Operating temperature Range	-10˚C to +40˚C
Humidity	95% non-condensing
Unit Size	93 x 61 x 20mm