



DYCON
power solutions

User Manual

D2330 Test Set/Service Tool for D243X-series, EN54-certified, 24VDC Switched-Mode Power Supply Units

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D2330 PSU Test Set / Service Tool Instructions

Test Set / Service Tool Overview

The Test Set / Service Tool is compatible with the Dycon range of EN54-4 24V power supplies:

- D2431-7 : 1.5A 24V power supply in medium box (2 x 7.5/8 Ah batteries)
- D2433-7 : 3.0A 24V power supply in medium box (2 x 7.5/8 Ah batteries)
- D2433-17 : 3.0A 24V power supply in large box (2 x 17.5/18 Ah batteries)
- D2435-17 : 5.0A 24V power supply in large box (2 x 17.5/18 Ah batteries)

The D2330 allows the installer to monitor the performance of the power supply, system currents and voltages, the condition of the batteries and a log of PSU events and faults. It can also be used to calibrate and test power supplies.

Test Set / Service Tool Description

The D2330 is supplied in a removable tough rubber boot with hinged stand:

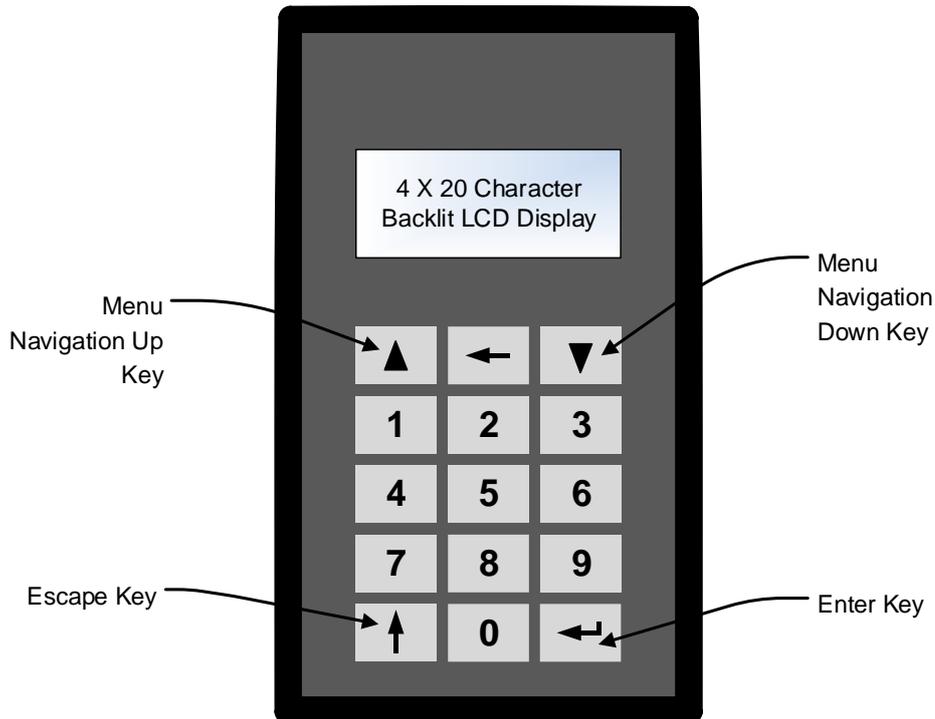


A USB charging socket and RJ45 PSU connection socket are located at the top of the test set:



Programmer Keypad

The programmer has a 15-key membrane keypad that is used to navigate through all the menus and enter and retrieve information. The up and down keys will scroll through the menus, the enter key is used to select menus and enter commands, the escape key allows the user to quit menus. *The right arrow delete key is for future use and is not used in this version.*



To Turn the Programmer On

Press any of the left-hand column keys

To Turn the Programmer Off

Press the escape key repeatedly until '**Turn Off?**' is shown and press enter. If the unit is accidentally left on continuously, the programmer will automatically power down after 15 minutes of non-use. The test set will stay on continuously when the charging adapter is plugged-in and charging.

Test Set / Service Tool Specifications

SPECIFICATIONS	
Charging	USB Micro B, 5V, 450mA Maximum
Charge Time	2 hours to full charge
Battery	Rechargeable LiPo battery, 3.7V nominal, 800mAH
Battery Life	2 days continuous operation
Test Lead	1 Metre FCC-68 (RJ45) to 5-way 2.5mm Molex KK receptacle
Display	Backlit 4 x 20 character LCS display, readable in direct sunlight
Communication interface	9600 baud, no parity, one stop bit, 5V logic, asynchronous serial
Compatibility	D2431-7, D2433-7, D2433-17, D2435-17
Accuracy	+/- 2 Least significant digits. Actual measurements are derived from PSU
Dimensions	76.5mm x 127mm x 24mm without boot, 93mm x 155mm x 36mm with boot
Weight	140gm without boot, 310gm with boot

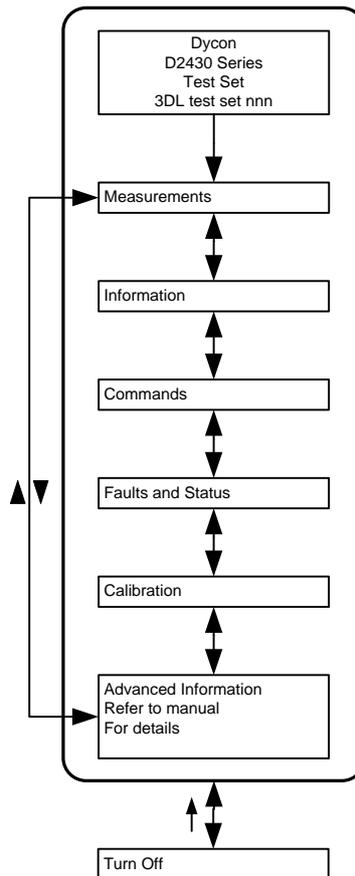
Warning

Before using the test set / service tool, ensure that the AC power supply is switched off before removing the lid and plugging in the test cable.

Programmer Menus

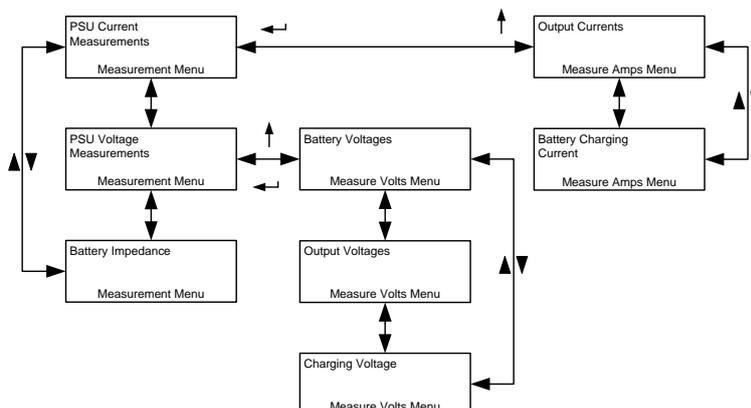
Main Menu

This menu selects the various functions of the test set. When the test set is first switched-on a screen with the software version is shown briefly in the lower right hand corner ('*nnn*' on the illustration below). Pressing the up/down arrows steps through the functions. Pressing enter will select the menu of interest.



Measurements

The measurement menu is used to select the various voltages, currents generated by the power supply and the battery impedance in ohms. The menu is accessed by pressing enter when '**Measurements**' prompt is shown:



PSU Current Measurements

Pressing '**enter**' accesses the two current measurement menus by scrolling up and down using the arrows.

Output Currents

After pressing **enter**, the display will briefly show this message, whilst connecting.... Followed by a typical display like this:

```
Waiting for Data

Output 1 = 1.20A
Output 1 = 0.30A
Outputs = 1.50A
```

The bottom '**Outputs**' display shows the total current being used by outputs 1 and 2. This does not include the battery charging current. You can quit the Output Currents display by pressing the up arrow key.

NOTE: There is a 300mA reserve of battery current, for example if a 5A PSU is already providing 5A, an extra 300mA (depending on the battery charge condition) can also be provided. In this case a total of 5.3A is being supplied.

Battery Charging Current

Selected by pressing '**enter**', the following display is shown:

```
Battery Charging
Current
0.02A
```

The current shown is typical of a fully charged battery.

NOTE: If the battery current is varying wildly, this will probably be due to a discharged battery taking significant charging current and sharing the total current capacity with the output load, where the load is varying.

PSU Voltage Measurements

Three different menus are available in this measurement mode, these can be accessed by pressing '**enter**' and using the scroll arrows.

Battery Voltages

When selected, the following display is

```
Battery 1 = 13.34V
Battery 1 = 13.65V
Batteries = 26.99V
```

shown:

The battery voltages shown is typical of a fully charged set of batteries. Battery 1 and Battery 2 voltages are shown separately, the bottom Batteries voltage display is the sum of the individual battery voltages.

NOTE: The individual battery voltages will seldom be identical, but should be balanced to at least 1V with respect to each other. Actual voltage values will depend on the charge state and temperature and are not necessarily related to the PSU charging voltage.

Output Voltages

When selected, this display is shown:

```
Output 1 = 27.01V
Output 2 = 27.03V
Voltage at load will
drop with current
```

The output voltages will vary according to temperature and load current and will not necessarily be identical.

NOTE: Voltage at the load will vary according to current causing voltage drop by the installation wiring. There will also be a small difference (a few tens of millivolts) caused by the PSUs small internal resistance needed for current monitoring. This is will be reflected by a small variations of the displayed voltage readings shown on the screens and is normal.

Charging Voltage

When selected, this display is shown:

```
Charging = 27.00V
```

The charging voltage is the internal PSU voltage used for battery charging when AC power is present and is dependent on temperature.

NOTE: The charging voltage, battery voltage and output voltages will not necessarily be the same depending on mode and conditions.

Battery Impedance

When selected the following display is shown:

```
Battery Test Results
Rbat = 0.095 Ohms
Test Passed
Limit 0.177 Ohms
```

'**Rbat**' is the combined impedance (resistance) of the battery, battery leads, connectors and PSU charging path and must not exceed 0.177Ohms.

If the test fails then a typical display might show the following:

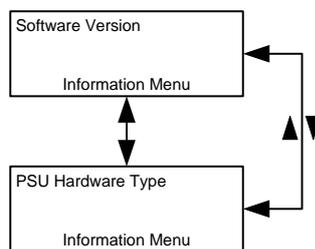
```
Battery Test Results
Rbat = 0.186 Ohms
Test Failed!
Limit 0.177 Ohms
```

If the test is attempted when the battery is not fitted or AC power is not present the following display is shown:

```
Waiting For Data
Fault Halted Test!
```

Information

The information menu is used to view the software version of the PSU firmware and the PSU type.



Software Version

When selected the following display is shown. The two characters before and adjacent to the "V" indicate the version:

```
Version Number
EN54PSU08V
```

PSU Hardware Type

The display shows the PSU hardware type:

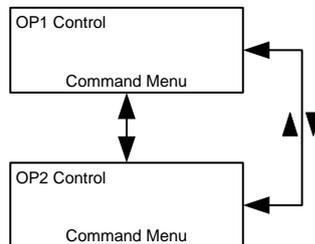
Currently there are three types:

24V 1.5A: D2431-7 (2 x 7Ah batteries)
 24V 3A: D2433-7 (2 x 7Ah batteries)
 24V 3A: D2433-17 (2 x 17Ah batteries)
 24V 5A: D2435-17 ((2 x 17Ah batteries)

```
PSU Hardware Type
24V 1.5A
```

Commands

The command menu remotely controls the switching of the two outputs in addition to the two local control inputs.



OP1 Control

The OP1 control screen is shown opposite. The first line displays the current output status, either "**On**" or "**Off**" and is updated in real time. The second line indicates if local or serial control is in operation in real time. When '**Serial**' control is selected then numeric keys can be used to control the output.

Number '**1**' switches the output on and '**2**' switches the output off. Numbers '**4**' and '**5**' select between serial and local control.

```
OP1 On
OP1 Local Control
1=On      2=Off
4=Local   5=Serial
```

NOTE: When the control function is used to switch outputs, care has to be taken to return the PSU to the local control condition, otherwise the local control inputs on the PSU will be ignored.

OP2 Control

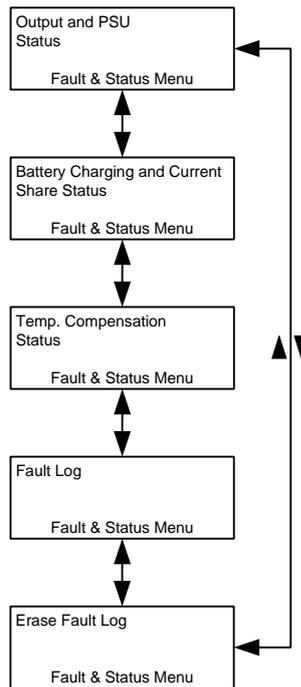
The OP2 control screen is shown opposite in serial mode with the output off:

Please see above for operation.

OP2 Off	
OP1 Serial Control	
1=On	2=Off
4=Local	5=Serial

Faults and Status

This suite of functions display overall status of the power supply with informative, multiple data type screens for 'at a glance' user information. Faults and a fault log is also displayed here with a user option of erasing the fault log so fresh history can be recorded.



Output and PSU Status

A typical PSU and Output status is displayed in the adjacent screen:

The PSU status is shown as follows:

- First line: Output switched status, either On or Off
- Second line: Output voltage
- Third line: Output current
- Fourth Line: AC On or Off, PSU fault status, OK or Fail

O/P1 = On	O/P2 = On
26.95V	26.90V
0.28A	0.79A
AC On	PSU OK

NOTE: The Fail PSU status is displayed if any of the faults other than AC power failure are pending.

Battery Charging and Current Share Status

A typical battery status is displayed in the adjacent screen:

The battery status is shown as follows:

- First line: Battery charging current and voltage
- Second line: Output 1 and 2 combined current and AC power status
- Third line: Total current provided by the PSU, i.e. battery and combined current outputs with PSU fault status
- Fourth Line: Battery 1 and 2 individual voltages

Battery = 0.65A 26.88V
OP1&2=0.86A AC ON
Total =1.51A PSU OK
B1=13.46V B2=13.42V

NOTE: With a fully discharged battery the PSU will automatically any used capacity to charge the battery. For example, if 3 amps was taken from a D2435 5A PSU, then 2A would be diverted to charging the battery; in this

way, the PSU shares capacity with the outputs having the highest priority. A fully discharged battery will always be charged at a minimum of 300mA. If a D2433 is supplying all of its 3A capacity to its outputs, then the battery would be charged with a reserve of 300mA. In this case the total current would be 3.3A.

Temperature Compensation Status

This screen shows the Temperature compensation status:

The temperature compensation data is displayed thus:-

First line: **Temperature**, this is measured by a probe located between the two standby batteries

Second and third line: **Actual charging voltage** being delivered to the battery, internally within the PSU.

Fourth line: **Ideal charging voltage**, the test set has a mathematical model of the ideal theoretical voltage that should be used to charge the batteries at any given temperature. The actual measured voltage should be between **+/- 70millivolts** of the displayed actual voltage for maximum battery performance.

Temperature = 31.0C
Charging Voltage:
Actual = 26.90V
Ideal = 26.90V+/-0.07V

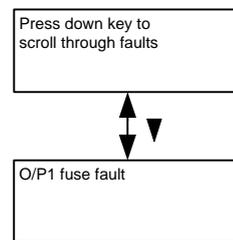
NOTE: In this way the screen display can be used for checking that the battery is being charged correctly between specified limits. The sample screen shot is an actual reading taken off a real, randomly selected PSU, the actual and ideal voltages should track between these limits with temperature and will not necessarily be identical as shown.

Fault Log

The fault log records all fault events that have occurred since the log was cleared:

A list of 11 fault events are shown below:

1. **SMPS Fault:** Switched Mode Power Supply internal low voltage fault, supply is less than 20V.
2. **PSU over 32V and PSU shutdown:** Over-voltage fault and subsequent shutdown.
3. **O/P1 fuse fault:** Output 1 fuse fault.
4. **O/P2 fuse fault:** Output 2 fuse fault.
5. **PSU under minimum battery charging voltage fault:** Inability to correctly charge the battery because voltage is too low fault.
6. **PSU not charging battery fault:** Charging circuit malfunction fault.
7. **Battery lead disconnected fault:** One or both batteries are disconnected.
8. **Battery high resistance fault:** Battery impedance greater than 177milliohm limit when being load tested.
9. **Battery 1 under 11.5V fault:** Battery 1 low voltage fault.
10. **Battery 2 under 11.5V fault:** Battery 2 low voltage fault.
11. **Battery under 22V while charging fault:** Catastrophic battery fault where total battery voltage is less than 22 volts when charging is applied.



The log is scrolled through by pressing the '**down**' key and the log events will be displayed in chronological order, most recent displayed first. When the end of the log is reached this message "**-----End of Log-----**" will be displayed.

If the log is empty, '**No faults logged**' will be displayed when attempting to view the log:

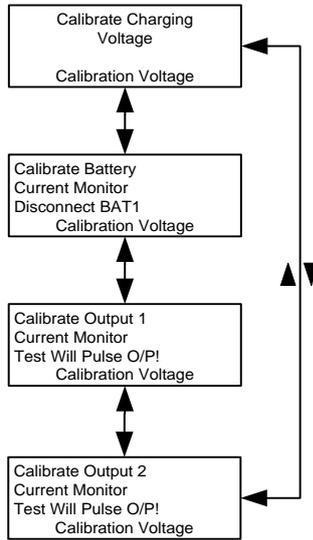
Multiple events of one type will only be appear once in the log to prevent the log from overflowing.

Erase Fault Log

This menu erases the current log enabling fresh events to be recorded. When '**enter**' is pressed the log will be erased and the display will show: '**log erased**'

Calibration

The calibration menu allows on-site calibration of the PSU. All PSUs are calibrated at the factory as a part of their automated test procedure and normally do not require calibrating for the rest of their service lifetime. However in extreme circumstances, e.g. operating in extremes of temperature, recalibration can be worthwhile.



Calibrate Charging Voltage

When 'enter' is pressed the display will show:

'Calibration Done'

After a short pause this display will be replaced with:

Temperature = 31.0C
 Charging Voltage:
 Actual = 26.90V
 Ideal = 26.90V+/-0.07V

This display is described under the Temperature Compensation status section.

Note: There is a **'hidden'** Advanced Information screen that can be accessed by pressing the **'down'** arrow. This information is useful only to trained technicians.

Calibrate Battery Current Monitor

Before calibrating, battery 1 must be disconnected as prompted. If the battery is not disconnected then **'Disconnect Battery!'** will be displayed and the procedure will have to be started all over again.

When the calibration is completed successfully the display will show:

'Calibration Done'

Note: There is a **'hidden'** Advanced Information screen that can be accessed by pressing the **'down'** arrow. This information is useful only to trained technicians.

'Calibrate Output 1'

When 'enter' is pressed the display will show:

'Calibration Done'

Note: There is a **'hidden'** Advanced Information screen that can be accessed by pressing the **'down'** arrow. This information is useful only to trained technicians.

'Calibrate Output 2'

Please see above.