AIM & THURLBY THANDAR INSTRUMENTS

MX100Q & MX100QP

Triple Output Multi-Range DC Power Supply

INSTRUCTION MANUAL

Aim-TTi

CONTENTS

1.1 Range Combinations

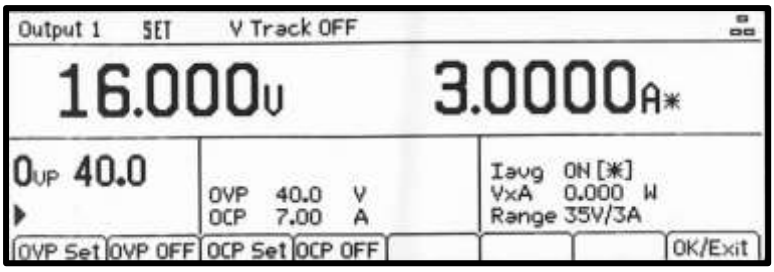
Output 1	Output 2	Output 3	Output 4
35V/3A	35V/3A	35V/3A	35V/3A
16V/6A	35V/3A	35V/3A	35V/3A
35V/3A	16V/6A	35V/3A	35V/3A
16V/6A	16V/6A	35V/3A	35V/3A
16V/6A	16V/6A	70V/1.5A	35V/3A
16V/6A	16V/6A	35V/3A	70V/1.5A
16V/6A	16V/6A	70V/1.5A	70V/1.5A
35V/3A	16V/6A	70V/1.5A	70V/1.5A
16V/6A	35V/3A	70V/1.5A	70V/1.5A
35V/3A	35V/3A	70V/1.5A	70V/1.5A
35V/3A	35V/3A	35V/3A	70V/1.5A
35V/3A	35V/3A	70V/1.5A	35V/3A
35V/3A	35V/6A	35V/3A	-
35V/3A	35V/6A	-	35V/3A
35V/3A	35V/6A	70V/1.5A	-
35V/3A	35V/6A	-	70V/1.5A
16V/6A	35V/6A	35V/3A	-
16V/6A	35V/6A	-	35V/3A
16V/6A	35V/6A	70V/1.5A	-
16V/6A	35V/6A	-	70V/1.5A
35V/6A	35V/3A	35V/3A	-
35V/6A	35V/3A	-	35V/3A
35V/6A	35V/3A	70V/1.5A	-
35V/6A	35V/3A	-	70V/1.5A
35V/6A	16V/6A	35V/3A	-
35V/6A	16V/6A	-	35V/3A
35V/6A	16V/6A	70V/1.5A	-
35V/6A	16V/6A	-	70V/1.5A
35V/6A	-	35V/3A	35V/3A
35V/6A	-	70V/1.5A	35V/3A
35V/6A	-	35V/3A	70V/1.5A
35V/6A	-	70V/1.5A	70V/1.5A
-	35V/6A	35V/3A	35V/3A
-	35V/6A	70V/1.5A	35V/3A
-	35V/6A	35V/3A	70V/1.5A
-	35V/6A	70V/1.5A	70V/1.5A
35V/3A	35V/3A	70V/3A	-
16V/6A	35V/3A	70V/3A	-
35V/3A	16V/6A	70V/3A	-
16V/6A	16V/6A	70V/3A	-
35V/3A	35V/3A	-	70V/3A
16V/6A	35V/3A	-	70V/3A
35V/3A	16V/6A	-	70V/3A
16V/6A	16V/6A	-	70V/3A
35V/3A	-	70V/3A	70V/1.5A
-	35V/3A	70V/3A	70V/1.5A
16V/6A	-	70V/3A	70V/1.5A
-	16V/6A	70V/3A	70V/1.5A
35V/3A	-	70V/3A	35V/3A
-	35V/3A	70V/3A	35V/3A
16V/6A	-	70V/3A	35V/3A
-	16V/6A	70V/3A	35V/3A
35V/6A	35V/6A	-	-
35V/6A	-	70V/3A	-
35V/6A	-	-	70V/3A
-	35V/6A	70V/3A	-
-	35V/6A	-	70V/3A
-	-	70V/3A	70V/3A

6.5 Setting Over-Voltage and Over-Current protection

OVP/OCP

The power supply offers user adjustable over-voltage protection (OVP) and over-current protection (OCP). If a voltage is detected that exceeds the OVP level, or a current is detected that exceeds the OCP level, the output is switched off and the message OVP or OCP is displayed.

OVP is adjustable between 1V and 40V for outputs 1 and 2, and between 1V and 80V for output 3 and 4. OCP is adjustable between 0.01A and 7A for outputs 1 and 2, and between 0.01A and 3.5A for output 3 and 4.



Pressing the OVP/OCP soft key creates a new set of soft keys from which OVP & OCP values can be set or turned on or off.

Pressing OVP Set causes the key to illuminate and makes the OVP value settable. A new value can be entered using the numeric keypad or by the spin wheel if enabled. OVP can be turned off by pressing OVP OFF, and turned back on by pressing OVP On. The previous OVP value is retained when OVP is off and is displayed in brackets.

Similar capabilities are provided for controlling OCP.

Note that, when set to OFF, the function is not completely disabled but is set to the maximum value for the output. Thus, if OVP was set to OFF on output 1 and an external voltage greater than 40V was applied to the terminals, an OVP trip would occur.

More information on using OVP and OCP is provided in section 10.7.

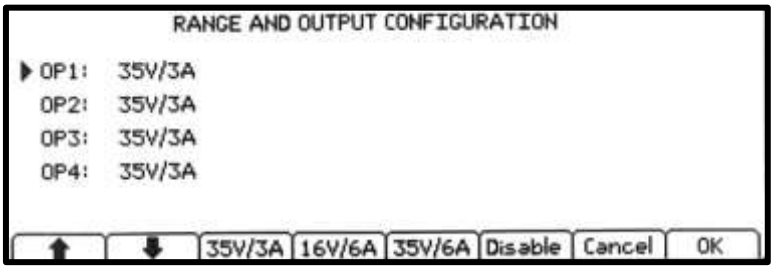
6.6 Setting the Voltage/Current Range

Range

Each output has more than one range. For outputs 1 and 2 the choice is 35V/3A, 16V/6A or 35V/6A. For outputs 3 and 4 the choice is 35V/3A, 70V/1.5A or 70V/3A.

Note that selecting a high power setting may require the disabling of other outputs, see table in section 1.

Pressing the Range soft key brings up a menu screen which indicates the currently selected range and output with a flashing arrow.



All output ranges can be amended or disabled from this screen using the soft keys, select the output with the up and down arrow soft keys and press the desired range soft key. Pressing the cancel soft key will return to the output screen and the range will remain unchanged, pressing the OK soft key will action the changes made.

Note that a change of range can only be made when the output is off. If the output is on, a message will prompt the user to turn it off.

8.6 System Preferences

Menu > System Preferences

Various aspects of the power supply operation can be changed from the System Preferences function. These are detailed in section 9.

8.7 Setting to Factory Defaults

Menu > Factory Defaults

This function can be used to return most of the instrument settings including Voltage, Current, Range, OVP, OCP, Output On/Off, Current Meter Averaging, Multi-On/Off Action and System Preferences back to the factory default values as listed in section 15-Default Values.

The Store memories for both individual outputs and All Outputs are unaffected. To clear each bank of Stores it is necessary to use the function Stores > Delete > Del All.

LCD contrast setting and remote interface settings (MX100QP only) are also unaffected.

8.8 Adjusting LCD Contrast

Menu > Adjust LCD Contrast

The LCD contrast can be adjusted over a wide range. The setting is displayed numerically as a percentage. The display can also be inverted from black on white to white on black.

8.9 Calibration

Menu > Calibration

The Calibration function enables the instrument to be re-calibrated when required.

Calibration will overwrite the existing settings and should only be carried out by qualified personnel in conjunction with the instrument Service Guide and the necessary precision equipment.

A 4-digit pass code can be set to prevent unauthorised calibration if required.

8.10 Remote Control Interfaces (MX100QP only)

Menu > Remote Control Interfaces

Settings for the GPIB and LAN interfaces can be observed using this function.

Details for the GPIB interface are within the Remote Interfaces Configuration section 11.1.1.

Details for the LAN interface are within the Remote Interfaces Configuration section 11.1.4.

10 Notes on Operation

10.1 Accuracy and Resolution

All four outputs provide good accuracy and resolution and offer remote sensing to ensure precise regulation at the load. See section 14 for accuracy specifications.

Ranges 16V and 35V offer greater resolution and accuracy than 70V range and uses 5-digit meters to give 1mV and 0.1mA resolution (as against 10mV and 0.1mA for 70V range). Consequently, ranges 16V and 35V should be chosen to power circuits where particularly high precision is required.

10.2 Remote Sense

Each output has a very low output impedance, but this is inevitably increased by the resistance of the connecting leads and the contact resistance between terminals and leads. At high currents this can result in significant differences between the indicated source voltage and the actual load voltage (two 20 milliohm connecting leads will drop 0.2V at 5 Amps, for example).

This problem can be minimised by using short, thick, connecting leads, but where necessary it can be completely overcome by using the remote sense capability.

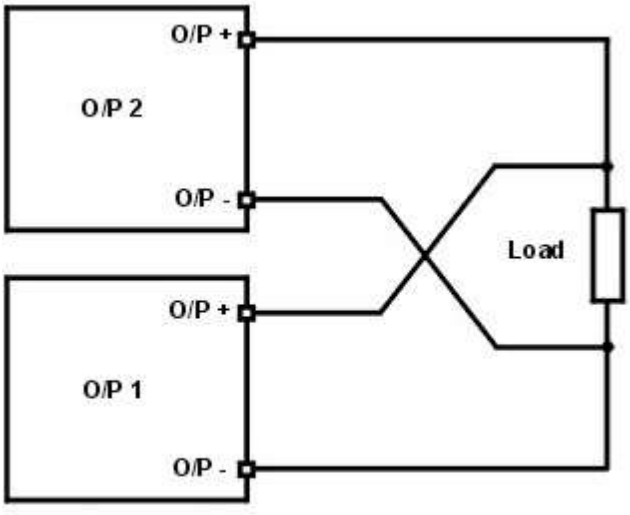
This requires the sense terminals to be connected to the output at the load instead of at the source by inserting wires into the SENSE terminals and connecting them directly to the load. The switch should then be set to REMOTE instead of LOCAL.

To avoid instability and transient response problems, care must be taken to ensure good coupling between each output and sense lead; this can best be done by twisting the leads together. An electrolytic capacitor directly across the load connection point may also be beneficial.

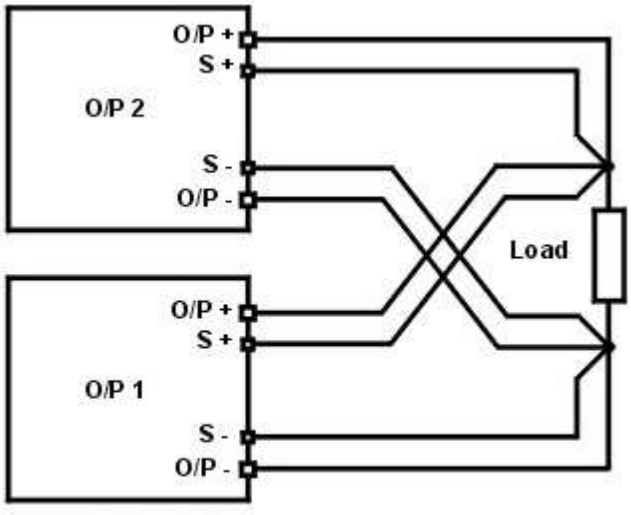
The voltage drop in each output lead should not exceed 0.5 Volts. Higher voltage drops could result in small metering errors or an inability to supply full power to the load when approaching maximum voltage and current.

10.3 Parallel Wiring of Outputs

If currents above 6 amps are required, this can be achieved by wiring two or more outputs in parallel. For example, outputs 1 and 2 could be paralleled to provide 16V/12A. In this situation it would be appropriate to use voltage tracking (Mode1 V2=V1 in this example) so that the voltage can be adjusted directly on one output. See section 8.1 .



Parallel Wiring (Local Sense)



Parallel Wiring (Remote Sense)

The drawing shows a parallel connection of two outputs using local or remote sensing.

However, this time could be increased if the current setting is very low or is very close to the current required by the load. A large external capacitance at the load could also slow down the response.

When switching off with no load, the output will normally fall back to zero within a fixed length of time (see section 14 – Specifications). If a load is connected the response may be quicker because of the additional discharge provided by the load. However, if the load includes a large capacitance the response may be slower.

Turn-on and turn-off speeds are particularly relevant to Multi-On/Multi-Off output sequencing (see section 8.4) where delays between the switching of different outputs can be set to a resolution of 10ms. These delays apply only to the initiation of an output being turned on or turned off, the actual delay will depend upon the actual turn-on or turn-off times applying as described above. In situations where the user needs to know the actual response speeds for specific conditions it will be necessary to observe this using an oscilloscope.

10.7 Using OVP and OCP

OVP (over-voltage protection) monitors the voltage on the output terminals and switches the output off if it exceeds the OVP setting. The response speed is typically 100us. Control of OVP is described in section 0.

OVP might be used to guard against accidental mis-setting of the power supply or might be used to identify a fault condition when operating in constant current mode. Unlike the voltage limit setting, exceeding the OVP will turn the output off in a situation where damage to the device under test might otherwise occur.

OCP (over-current protection) monitors the current flowing at the output and switches the output off if it exceeds the OCP setting. The response speed is <0.5s. Control of OCP is described in section 0.

OCP might be used to guard against accidental mis-setting of the power supply or might be used to identify a fault condition when operating in constant voltage mode. Unlike the current limit setting, exceeding the OCP will turn the output off in a situation where damage to the device under test might otherwise occur.

10.7.1 OCP Trip at Output On

If the OCP level is set to a very low level whilst also being below the set current level, it is possible for a trip condition to be created when the output is switched on. This is caused by the current needed to charge the output capacitance. Whether a trip occurs is a function of the OCP trip response speed, the OCP level, the set current and the set output voltage.

10.8 Over-temperature Trip (OTP)

The power supply has a sensor that monitors the internal ambient temperature. Should that exceed a safe level, as might occur if the ventilation input or output was blocked, an over-temperature protection trip (OTP) will occur. Should OTP occur, all four outputs will be turned off and an OTP message will appear on the screen. Normal operation can only be restored by turning the AC supply (Power) off, rectifying the ventilation problem and allowing the unit to cool before switching back on.

Also, each output module has a temperature sensor which can shut down only the affected output and display an OTP message. In this case it is possible to attempt to clear the trip condition without requiring a power cycle using the Reset soft-key. If the OTP message continues to be displayed after allowing the module to cool this may be an indication of a hardware fault.

In addition, there is a temperature sensor on the power device of the PFC (power factor correction) stage. If this detects an over-temperature problem, all power outputs will shut down; the auxiliary supply for the CPU and display will, however, remain active, and the ‘Hardware

15 Default Values

When supplied from the factory the power supply is set as follows:

All Outputs

Voltage	1 volt
Current	0.1 amp
Range	35V/3A
OVP	40V (O/P1 and O/P2); 80V (O/P3 and 4)
OCP	7A (O/P1 and O/P2); 3.5A (O/P3 and 4)
Current meter averaging	Off (Level = Medium)
Voltage tracking	None
Output On/Off	Off
Multi On/Off action	All Quick (synchronous on, synchronous off)

System Level Settings

Power-up state	Settings as at power-down, all outputs off
Beep sound	Enabled for key errors and trips Disabled for entry into CC mode
Spin wheel action	Normal

The default values can be restored from the “Reset to factory Defaults” function – see section 8.7

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