Product Manual
MNX10011 / REV B
MODEL PS06 110/220

&
MODEL PS12 110/220

6-Channel & 12-Channel
Rack Mountable Power Supply
Introduction

PRO models PS06 and PS12 power units are 19 inch wide by 1 3/4 high rack mountable, line powered current source power units designed to power 6 and 12 channels of regulated current style sensors and in-line charge amplifiers.

NOTE: SENSORS may refer to accelerometers, pressure sensors, hammers and force transducers, etc. The words SENSOR and TRANSDUCER are used interchangeably in this guide.

PRO model PS06 supplies power to up to 6 channels of instrumentation while model PS12 can support up to 12 channels, simultaneously. The sensor signal, riding atop an approximate +10 volt bias level is decoupled from this DC bias by use of a 10µF coupling capacitor for each channel.

Normal supply line power for these units is 115 VAC. The ‘220’ versions operate from 230 VAC.

Description

These power units contain a regulated DC power supply and constant current circuits which supply constant current DC power to 6 or 12 sensor channels. The constant current sources can be individually adjusted to provide from 2 to 20 mA of drive current per channel.

There is also provision for operation from external +24 VDC batteries or DC power pacs for use where AC power is not available.

The front panel has 6 or 12 BNC output jacks for monitoring the sensor signals from the front of the instrument. These jacks are repeated on the rear panel also. The rear panel also contains 6 or 12 sensor jacks, all BNC’s.

A rotary selector switch (6 or 12 position) on the front panel allows the monitoring of the DC bias voltage of each sensor. This is a very handy troubleshooting tool for system checks. Readout is by a front panel mounted 10 segment LED DC voltmeter. Also connected to this rotary switch is a rear panel mounted BNC ‘Monitor’ jack which allows the user to look at the signal from the sensor connected to the selected channel. In this way, with a single oscilloscope, each channel’s signal may be inspected.

A three position power switch on the front panel selects AC power or Ext DC power with an ‘off’ position included. The rear panel has a set of twin binding posts for connection to the external DC power source. The rear panel also contains the fuse holder and the AC power cord.
## RACK MOUNTED POWER UNITS

<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>VALUE</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSOR SUPPLY CURRENT (Factory set at 5 mA)</td>
<td>2.0</td>
<td>mA</td>
</tr>
<tr>
<td>NUMBER OF SENSOR CHANNELS PS06</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF SENSOR CHANNELS PS12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>SENSOR EXCITATION VOLTAGE (COMPLIANCE VOLTAGE)</td>
<td>+24</td>
<td>VDC</td>
</tr>
<tr>
<td>VOLTAGE GAIN</td>
<td>UNITY</td>
<td></td>
</tr>
<tr>
<td>FRONT PANEL LED VOLTOMETER F.S.</td>
<td>+24 VDC</td>
<td></td>
</tr>
<tr>
<td>OUTPUT COUPLING CAPACITOR</td>
<td>10</td>
<td>µF</td>
</tr>
<tr>
<td>COUPLING TIME CONSTANT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w/ 10 MEGOHM LOAD</td>
<td>100</td>
<td>SEC</td>
</tr>
<tr>
<td>w/ 1 MEGOHM LOAD</td>
<td>10</td>
<td>SEC</td>
</tr>
<tr>
<td>LOWER -3db FREQUENCY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w/ 10 MEGOHM LOAD</td>
<td>.0016</td>
<td>Hz</td>
</tr>
<tr>
<td>w/ 1 MEGOHM LOAD</td>
<td>.016</td>
<td>Hz</td>
</tr>
<tr>
<td>HIGH FREQUENCY RESPONSE</td>
<td>DETERMINED BY SENSOR, CABLE LENGTH AND SIGNAL LEVEL</td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL NOISE, WIDEBAND</td>
<td>150</td>
<td>µV, RMS</td>
</tr>
<tr>
<td>SENSOR CONNECTORS, REAR PANEL</td>
<td>BNC</td>
<td>JACK</td>
</tr>
<tr>
<td>6 ON MODEL PS06, 12 ON MODEL PS12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTPUT CONNECTORS, FRONT AND REAR PANELS</td>
<td>BNC</td>
<td>JACK</td>
</tr>
<tr>
<td>12 ON MODEL PS06, 24 ON MODEL PS12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER CORD, 3-WIRE WITH CHASSIS GROUND</td>
<td>3-WIRE PLUG</td>
<td>6 FT</td>
</tr>
<tr>
<td>POWER REQUIRED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODEL PS06/110 &amp; 220</td>
<td>6.5</td>
<td>VA</td>
</tr>
<tr>
<td>MODEL PS12/110 &amp; 220</td>
<td>13.0</td>
<td>VA</td>
</tr>
<tr>
<td>LINE VOLTAGE REQUIRED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODELS PS06/110 &amp; PS12/110</td>
<td>115</td>
<td>VAC</td>
</tr>
<tr>
<td>MODELS PS06/220 &amp; PS12/220</td>
<td>230</td>
<td>VAC</td>
</tr>
<tr>
<td>SIZE (H x W x D)</td>
<td>1.75”x 12.30”x 19.00”</td>
<td>INCHES</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>2.3</td>
<td>OUNCES</td>
</tr>
</tbody>
</table>

Table 1. Specifications
Section II
Installation

The PS06 & PS12 are rack mount units that will fit standard 19" inch racks.

Figure 1. PS06 Power Supply Layout Diagram

Figure 2. PS12 Power Supply Layout Diagram
Section III
Operation

OPERATION FROM AC POWER MAINS

Models PS06/110 and PS12/110 normally operate from 115VAC, 60 Hz mains. The PS06/220 and PS12/220 versions operate from 230VAC mains. Before plugging in your unit, check to see that the markings agree with the voltage you will be using. The units will be severely damaged by connecting to the wrong voltage source.

Plug the line cord into the appropriate AC power source and move the power switch toggle to the ‘AC POWER’ position. The red indicator lamp on the left side of the front panel will glow and the voltmeter will indicate full scale with no sensors attached to the sensor jacks.

If these indications are not present, check the fuse at the rear panel. If it is blown, replace it with a 1/4 Amp 3AG fuse only.

OPERATING THE POWER UNIT

Connect the sensor to any one of the ‘Sensor’ jacks at the rear panel of the power unit. Rotate the channel selector switch on the front panel to the number of the channel into which the sensor has been connected. The front panel 10-segment LED voltmeter should indicate near mid-scale if the sensor and cable are intact and working normally.

In like manner, connect up to the maximum number of sensors and check the bias indications of each for normal operation. If the monitor voltmeter reads full scale, this means:
1. that there is no sensor connected to that channel
2. the cable to the sensor is open or
3. the sensor amplifier is not functioning.

After ensuring that all channels are functioning normally, connect the ‘Output’ connectors to the readout instrument using either the front or rear sets of output jacks. You are now ready to proceed with the measurement task.

Remember, the rear panel BNC monitor jack allows the user to monitor the signal from any channel selected by the front panel rotary selector switch. Thus, with one oscilloscope, each channel may be monitored for normal operation, even while that channel is being monitored at the front or rear output jack for that channel.
COUPLING TIME CONSTANT

A feature of this system is that power to operate the internal IC in the sensor and the signal from the sensor both flow over the same pair of wires. The DC bias from the sensor amplifier is blocked by a 10 µF capacitor in the power unit while the AC or dynamic signal is allowed to pass through this blocking capacitor to the output jack (Figure 1).

The value of the coupling capacitor and the resistive load of the readout instrument (in parallel with the pulldown resistor) determine the discharge time constant (TC) of the power unit/readout combination and set the low frequency performance of this system.

NOTE: The discharge TC of the sensor itself must be considered also but for this guide, we will concentrate on the effect of the power unit/readout combination only. The operating guide supplied with the sensor will address the low frequency response of the sensor.

In the PS06/PS12 the value of the coupling capacitor is 10µF and the pulldown resistor is 1 megohm. This yields a coupling TC of:

\[ \text{Eq 1. } TC = RC = 1 \times 10^6 \times 10 \times 10^{-6} = 10 \text{ Seconds} \]

To determine the low frequency response, i.e., to find the frequency at which the output signal will be 3db down from the reference level, use the following equation:

\[ \text{Eq.2 } f_{\text{3db}} = \frac{0.16}{TC}, \text{ Hz} \]
For a TC of 10 Seconds, using Eq. 2,

\[
\frac{0.16}{10} = f_{-3db} = 0.016 \text{ Hz}
\]

Now, let us assume that the readout instrument has an input resistance of 1 megohm. Combining the pulldown resistor (1 megohm) and the readout resistance in parallel, we have a load of 500k Ohms on the power unit in this case. Substituting the new resistance value into equation 1, we have a new TC of 5 seconds.

Now, substituting 5 sec into equation 2 we have:

\[
\frac{0.16}{5} = f_{-3db} = 0.032 \text{ Hz}
\]

This illustration shows how the readout load can affect the low frequency response of the system, irrespective of the TC built into the sensor. As a rule of thumb, the TC of the power unit/readout combination should be an order of magnitude higher than the TC of the sensor.

**SETTING THE CONSTANT CURRENT SENSOR DRIVE CURRENT LEVEL**

*For most users, this section may be skipped over for now.*

The sensor drive current levels are factory set at 5 mA per channel. This is a high enough level for most normal applications and should only be changed when driving very long cables with sensors measuring very high frequencies. For best thermal stability and lowest noise, it is recommended that the sensors operate from 2 to 5 mA of drive current.

These power units use a clamped base transistor circuit as the constant current source. *(Figure 2).*
The constant current out of the collector is set by the current flowing through the emitter resistor. The base is clamped by the zener/resistor combination to a fixed voltage, and this in turn sets the emitter voltage via the fixed base to emitter voltage characteristic of the transistor. Thus by varying the potentiometer in the emitter circuit, we may set the constant current to any desired level.

![Figure 4. Constant Current Circuit](image)

However, if it is found that the measurement situation calls for higher drive currents, it may be necessary to increase this level. To change the level of sensor drive current, proceed as follows:

1. Remove the top cover by removing the four cover screws located at the upper end of the units.

**CAUTION: FOR THE FOLLOWING ADJUSTMENT, USE A NON-METALLIC SCREWDRIVER SINCE VOLTAGES ARE PRESENT IN THIS UNIT WHICH CAN CAUSE ELECTRIC SHOCKS WHICH COULD RESULT IN FATAL INJURY.**

2. Set the mA range of a DC milli-ammeter to 20 mA and connect the + lead to the center conductor of a sensor channel and connect the other lead to ground return (the outside shell of the same connector). Read the constant current, then adjust the sensor drive current adjust pot to obtain the desired drive current for that channel. Each channel may be individually adjusted in this manner.

**NOTE: Although it may be possible to do so, do not set the drive current above 20 mA. This could be harmful to the sensor.**
**SENSOR DRIVE VOLTAGE (COMPLIANCE VOLTAGE) SETTING**

It should not be necessary under normal conditions to ever need to adjust this setting. The output voltage of the DC power supply is regulated by a very stable 3-terminal voltage regulator. This voltage is factory set to provide +24 VDC compliance voltage at +5 mA output level.

Should it become necessary to reset this voltage, proceed as follows:

1. On one channel, set the sensor drive current level to 5.0 mA per the previous section.
2. Connect a DC voltmeter across the Sensor jack of that channel with the voltmeter set on 100 to 200 VDC full scale.
3. Referring to outline/installation drawing, find the sensor drive current adjust pot for that channel and set the voltage to precisely +24.0 volts.

**NOTE:** This voltage will change slightly as the sensor drive current level is changed. This is normal. It is not necessary to readjust the voltage each time the drive current level is changed.

**EXTERNAL POWER SOURCES**

Models PS06 and PS12 may be powered by an external DC power source such as batteries or a DC power supply. 24 VDC is recommended but voltages down to 18 volts are sufficient. (With voltages as low as +18 volts, the front panel LED voltmeter may not function normally, however the unit will work normally otherwise.)

To use an external supply, connect the leads from the power source to the twin binding post at the rear panel. Be sure to observe the proper polarity as marked at the rear panel. A protective diode is built into the PS06/PS12 to preclude damage from reverse polarity connection of the power source.

Switch the front panel toggle switch to ‘EXT PWR’. With +24 VDC as the power source, it will be noticed that the LED voltmeter may indicate one segment lower than normal when there is no sensor connected to that channel. This is normal and will not affect the operation of the units or the sensors.

When operating from batteries or an external DC power supply, the operation of the sensors and power units, aside from the minor points mentioned, will be the same as with AC power.

The center position of the power toggle switch is the “off” position and should be used when the instrument is not taking data, to prolong battery life.
Section IV
Maintenance

General
Under normal usage, no routine maintenance is necessary for these instruments. Should it be necessary to replace the fuse, unplug the unit from the AC line power source, remove the cap from the fuse holder and remove the fuse, Replace only with a 1/4 Amp 3AG fuse.

Should a problem arise with the power unit, contact the factory for help in analyzing the problem and/or for instructions on sending the unit back for evaluation.

Should the PS06 or PS12 develop a problem, contact the factory Service Department for help in trouble shooting or for instructions in returning the unit to the factory for evaluation. At this time, a Returned Material Authorization (RMA) number will be assigned to help track the unit through the repair process. should it be necessary to return the unit to the factory.

Warranty
If any PRO product should ever fail, we will repair or replace it at no charge, as long as the product was not subjected to misuse, natural disasters, improper installation or modification which caused the defect.

CONTACT INFORMATION:
Connection Technology Center, Inc (CTC)
7939 Rae Blvd.
Victor, NY 14564
1-800-999-5290 (US & Canada) 1-585-924-5900 (International)
sales@ctconline.com – www.ctconline.com