

**Addendum – Analog Output**  
**Terranova 751 Manual**  
07-10-08

Page 5 – **ANALOG OUTPUTS**  
**change to:**

Voltage 0 - 10 volts; 1 volt per 1000 volts

Current 0 - 10 volts; User Selectable

Linear: 200 microamps per volt to 2000 microamps

$$\text{Current (amp)} = 200 * 10^{(-6)} * \text{Vout}$$

Linear: 2 milliamps per volt to 20 milliamps (default)

$$\text{Current (amp)} = 2 * 10^{(-3)} * \text{Vout}$$

Logarithmic:  $\text{Vout} = \text{Log } 10 (\text{current in amps}) + 8$

$$\text{Current (amp)} = 10^{(\text{Vout} - 8)}$$

Page 19 - **F. Analog Output Range Settings**  
**change to:**

The Analog Output Range setting is controlled by Jumper JP-7 and DIP Switch S2. The Analog Output signal, 0 to 10 volts DC, is available on pin 12 of the Miscellaneous I/O Connector on the rear panel. There are three User Selectable ranges available:

1. Linear Analog Out: 0 - 10 volts, 200 microamps per volt to 2000 microamps

$$\text{Current (amp)} = 200 * 10^{(-6)} * \text{Vout}$$

2. Linear Analog Out: 0 - 10 volts, 2 milliamps per volt to 20 milliamps (default)

$$\text{Current (amp)} = 2 * 10^{(-3)} * \text{Vout}$$

NOTE: recommended lower limit for accurate readings is 1% of full scale. For example, on the 200 microamps/volt scale, this would be equivalent to a current reading of 20 microamp.

3. Log Analog Out:  $\text{Vout} = \text{log } 10 (\text{current in amps}) + 8$

$$\text{Current (amp)} = 2 * 10^{(-3)} * \text{Vout}$$

Example: Current = 800 microamps ( $8 \times 10^{-4}$  amps), Vout = 4.903 volts

See "ADD" below for a Table of Further Examples

To change the range: (after turning off the unit and removing the power cord)

1. Locate Jumper JP-7 on the right side of the main printed circuit board. JP-7 is a black rectangular component accessible from the top of the unit. The default position is forward (2 mA/volt). The jumper has 2 female sockets; the base has three male pins.
2. Pull the Jumper upward to remove it from its socket on the printed circuit board.
3. Make sure DIP switch S2-8 is in OFF position
4. Replace the jumper in its new location, toward front panel for 2 mA/volt, or toward rear panel for 200 uA /volt
5. For logarithmic output, place DIP Switch S2-8 in ON position and place JP-7 in forward position (2 mA/volt).

$$\text{Vout} = \text{log } 10 (\text{current in amps}) + 8$$

$$\text{Current in amps} = 10^{(\text{Vout} - 8)}$$

**Add this Table:**

**Vout by Current Decade**

<b><u>V-out</u></b>	<b><u>Ion Pump Current</u></b>
0.0 v	0.02 microamp or less
1.0 v	0.1 microamp (10 <sup>-7</sup> amp)
2.0 v	1.0 microamp (10 <sup>-6</sup> amp)
3.0 v	10 microamp (10 <sup>-5</sup> amp)
4.0 v	100 microamp (10 <sup>-4</sup> amp)
5.0 v	1 milliamp (10 <sup>-3</sup> amp)
6.0 v	10 milliamp (10 <sup>-2</sup> amp)
7.0 v	100 milliamp (10 <sup>-1</sup> amp)
8.0 v	1 amp (10 <sup>0</sup> amp)

**Example: Vout 200 to 900 microamp**

<b><u>V-out</u></b>	<b><u>Ion Pump Current</u></b>
4.30 v	200 microamp (2 x 10 <sup>-4</sup> amp)
4.47 v	300 microamp (3 x 10 <sup>-4</sup> amp)
4.60 v	400 microamp (4 x 10 <sup>-4</sup> amp)
4.70 v	500 microamp (5 x 10 <sup>-4</sup> amp)
4.79 v	600 microamp (6 x 10 <sup>-4</sup> amp)
4.84 v	700 microamp (7 x 10 <sup>-4</sup> amp)
4.90 v	800 microamp (8 x 10 <sup>-4</sup> amp)
4.95 v	900 microamp (9 x 10 <sup>-4</sup> amp)

**Table: Logarithmic V-out vs. Ion Pump Current**

For a convenient reference on logarithm tables:

<http://www.sosmath.com/tables/logtable/logtable.html>



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