

## Umac Description

### **Switched outputs (digital outputs)**

The so-called switched outputs are really digital outputs which are used to trigger a relay (or switch). On the back of the umac there are 16 switched outputs available. These are numbered 0-15.

There are two types of switched output connectors on the back of the umac, they are similar except one is rated for higher current than the other. The beefy looking ones (0-3) with 3 pin connectors are higher current (12 Amp) and the 12 pin connectors (4-15) are lower current (2.5-6 Amp depending on how many outputs are hooked up). All put out 120 Vac.

For the 3 pin connectors:

\*Key\*  
[return][ground][hot]

For the 12 pin connectors:

[7-Return]	[1-Return]		
[8-hot]	[2-hot]		[6] [4]
[9-ground]	[3-ground]	This corresponds to 4	
*Key* [10-Return]	[4-Return]	switched outputs, e.g.:	and so forth
[11-hot]	[5-hot]		[7] [5]
[12-ground]	[6-ground]		

For a typical system the solenoids controlling bypass flow and the Whitey electronic ball valve controlling the path of the analyzer flow (i.e., size cut) are hooked into switched outputs #0 and #1. For a system with a humidifier, the small solenoid valve allowing the water to quickly fill or drain from the humidifier is hooked into switched output#4. In cpd.ini the first two are set in the [AEROSOL] module:

Dig\_Chan\_Bypass=0

Dig\_Chan\_AnalyzerImpactor=1

And in the humidograph menu:

PumpRange\_uMAC\_ch=4

Activating the switched output connectors is controlled in the umac menu available in cpdclient by setting the value of switched output four digit hexadecimal string. There are four groups of 4 switched outputs and each of the groups is represented one of the digits in the string. Within a group, the first switched output gets value '1', the second gets value '2', the third gets value '4' and the fourth gets value '8'. To activate all switched output connectors in a group you would set that groups digit to 'F' (F=15 in hexadecimal). For example, to activate all the high current connectors (switched output #s 0-3) you would set the string to 000F. The table below shows more examples of the hex string for activating various switched output connectors.

Switched output #s	0,3,4,11	0-15	12,14	0,4,8,12	0,5,10,15	3,6,9,12
String	0819	FFFF	5000	1111	8421	1248

The 3-pin switched output connectors on the back of a PID box work the same way as those on the back of a umac.

### Analog In

#### *8-pin connectors*

There are eight 8-pin ‘Analog In’ connectors on the back of the umac (numbered 0-7).

For a typical system:

AI #	0	1	2	3	4	5	6	7
Ch	8	10	12	14	16	18	No Ch	No Ch
Ch	9	11	13	15	17	No Ch	No Ch	No Ch

Each of these connectors has 8 pins, which by default are set up the same way (from top to bottom):

- [1] positive signal (1st signal)
- [2] negative signal (or 2nd signal)
- [3] ground
- \*Key\*[4] ground
- [5] +15 V
- [6] -15 V
- [7] ground
- [8] +5 V

#### *4-20 mA connectors*

There are two 4-20 mA analog input connectors (0 and 1). Typically 0 is connected and 1 is not connected. This connector is used for the pressure transducer connected to the pitot tube in the pumpbox. The current from the transducer is dropped across a resistor and the umac gets a voltage representation of the current. If the channels are as described in the 8-pin table above, then the 4-20 mA connector labeled ‘0’ is channel 19.

#### *Pressure sensors*

There are eight pressure sensor connectors, four pairs of high/low. Typically these are all connected and assigned channel numbers 20, 21, 22 and 23. Note: if one needs additional channels for voltage measurements or something then sometimes a pressure sensor is sacrificed in order to activate one of the 8-pin analog input connectors (e.g., 6 and/or 7)

### Analog out

There is one analog out connector on the back of the umac, with 2 channels. It’s a 4-pin connector – the top two pins are channel 0 and the bottom two are channel 1. The values for this connector can be set in the umac menu or in cpd.ini. This connector is typically used to control a humidifier gear pump. One can vary the voltage out to change the pump speed.

## Example Analog In channel assignments (BRW)

AI#0

Ch8 – Sample T

Ch9 – Humidifier control T

AI#1

Ch10 – Stack T

AI#2

Ch12 – CN flow

AI#3

Ch14 – CN drier flow

AI#4

Ch16 – Wind direction

Ch17 – Wind speed

4-20 mA, # 0

Ch 19 – dp\_pitot

Pressure port#1 (low)

Ch20 – NephImp

Pressure port#2 (low)

Ch21 – Spare 2 (CN dP) – connected to pressure port#2 (low)

The picture below shows the Analog In connections.

