M200 Dual Supply Voltage Monitor

FUNCTION DESCRIPTION

The M200 Dual Supply Voltage Monitor is a dedicated tool built to efficiently 'monitor' the 3 DC voltages of each 3 power supplies used by the 3 modular cabinets. With the dynamic current supply demands involved by a big modular synth on each supply, the 3 DC voltages could easily drop in value and bring a mis-behaviour of all the connected modules inside a cabinet. The M200 module monitors the 3 voltages of both power supplies (+15vdc, −15vdc and +5vdc) for any significant voltage drop and shut OFF the according led to alarm the user. The voltage thresholds programmed in the microprocessor are as followed for each voltages:

On normal usage the 6 monitor leds will be lighted.

Whenever one of the DC voltage drops by 0.10vdc or more its corresponding led shuts OFF to show an alarm of a voltage line going too low. The programmed threshold of 0.05vdc waits for a rise to at least 0.05vdc below the normal supply voltage.

Ex: If the +15vdc line drops to +14.90vdc or less the +15V led will shut OFF. Then the microprocessor will wait for a rise of that voltage line to at least +14.95vdc or more to get the led lighted back.

Ex: If the −15vdc line drops to −14.90vdc or less the −15V led will shut OFF. Then the microprocessor will wait for a rise of that voltage line to at least −14.95vdc or more to get the led lighted back.

Ex: If the +5vdc line drops to +4.90vdc or less the +5V led will shut OFF. Then the microprocessor will wait for a rise of that voltage line to at least +4.95vdc or more to get the led lighted back.

The MAIN front panel switch is wired to the bottom cabinet's back modules M201 and M202. The main 120vac is actually applied to both supplies by the mean of this switch.

The printed circuit board

The PCB has been designed to fit behind a 1U Moog style front panel. It is a double side board 4.0" X 5.5" and is mounted using 4-40 1.5" hexa standoffs. All the parts are through hole types.
Connectors H1 and H101 are for the 2 separate power supply entries. Power entries are each connected by use of 6 pins 0.156" Molex type connectors. The PCB has 4 mounting holes, one on each corner.

The circuit description

The M200 Dual Voltage Monitor PCB supports 2 similar circuits that are
housed on the same board but don't link together. 2 distinct circuits.
Since both circuits are pretty much the same the following explanations
will apply for the TOP cabinet monitor circuit only.
The BOTTOM cabinet circuit operates the same.

For precision and lasting reliability a +5.00VDC voltage reference IC (U1) is
used for accurate and stable voltage reference for all CPU A/D readings.
The Microchip PIC16F88 controller (U5) continuously reads 3 of its analog inputs
and compute the decisions to be made following the 3 DC voltages read.
Instead of measuring between 0-5vdc, the internal analog converter is set to
measure voltages between +4.80vdc and +5.00vdc for much more accuracy around the
supply voltage high ends.
The A/D converter available 10bits will be brought at the supply voltage top
ends. U2A, a LF412 low offset opamp will derivate +4.80vdc out of the +5.00v
reference voltage. Both of these voltages will be used by the CPU for the ref
limits of the internal A/D converter. The +15vdc and -15vdc are processed by
means of some precision summing opamps to bring their respective voltages down to
a normalized +5.00vdc. Here is a table that shows the incoming supply voltage vs
the CPU final voltage to be read:

Supply Voltage	CPU final Voltage read	CPU pin#
+15.00vdc	+5.00vdc	pin#17
+14.95vdc	+4.95vdc	pin#17
+14.90vdc	+4.90vdc	pin#17
-15.00vdc	+5.00vdc	pin#18
-14.95vdc	+4.95vdc	pin#18
-14.90vdc	+4.90vdc	pin#18
+5.00vdc	+5.00vdc	pin# 3
+4.95vdc	+4.95vdc	pin# 3
+4.90vdc	+4.90vdc	pin# 3

U3A-B and U4A are used to process the +15.00vdc supply voltage
down to the needed +5.00vdc

U4B is used to process the -15.00vdc supply voltage
down to the needed +5.00vdc

The +5.00vdc supply voltage need not to be processed and
actually goes right to the CPU input.

D1, D2 and R8 act as voltage limiter to the A/D CPU inputs if for any reasons the
incoming voltage from the U4A opamp output should go beyond +5vdc or gnd, both
diodes will limit the voltage to the 5vdc digital supply levels.
D3, D4 and R6 are for the same needs. C12, C14 and C13 are for smoothing the
incoming supply voltages from any anoying and spurious peaks.
Q1, Q2 and Q3 help to keep the overall CPU output current low when the 3 leds
need to be lighted all together.

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ELECTRONIC SPECIFICATIONS

POWER CONNECTOR
PIN ASSIGNMENTS

1	−15V
2	A GND
3	A GND
4	+15V
5	D GND
6	+5V

Panel Size: Single width 2.125"w x 8.75"h.

Power:
+15V @ 13mA,
-15V @ 12mA,
 +5V @ 47mA max. (All leds lighted)

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