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national accelerator laboratory

COMPARATIVE TEST OF NANO SYSTEMS PS-500 MWPC POWER SUPPLY AND THE DETECTOR ELECTRONICS MWPC POWER SUPPLY

T. Droege

October 1974

	NANO	DETECTOR ELECTRONICS
High Voltage Drift 25-50°C	615ppm/°C	73 ppm/°C
Current Output Monitor Drift 25-50°C	15na/°C	0.5 na/°C
Load Regulation 0-200ua	<.2%	.2%
Ripple @ 4 KV	4V p-p 60 Hertz	1V p-p 20 K Hertz
Rise Time To 3.5 KV	300 ms	40 ms
Load Transient Response 20 ua step	<0.1%	0.3% Recovers to 0.1% in 10 ms
Overshoot - Turn on to 3.5 KV, no load	250 V	100V
Overshoot Duration	150 ms	10 ms
Internal Capacity	0.1 uf	0.004 uf
Output Series Resistance	5 K	10 K

The NANO systems unit is packaged in a double width NIM module and obtains power from an external power cord. The Detector Electronics unit contains two complete power supplies in a double width NIM unit and draws power from the NIM bin.

The following are considered to be positive features of the NANO systems unit:

1) A Connector is provided for remote control of the power supply voltage. A logic level signal allows reduction of output voltage by 25% for standby operation.

2) A front panel multirange meter allows monitoring of chamber current.

3) Chamber trip current is tied to meter range eliminating the problem of how to set the trip level.

4) Due to the external power cord the unit may be operated on the bench without a NIM bin.

The following are considered to be positive features of the Detector Electronics supply:

1) The trip feature is activated both by fast current spikes and slow current overloads so that the power supply turns off faster and deposits less energy in the MWPC on a spark.

2) The power supply will provide up to 8.0 KV at reduced current.

3) The power supply contains very little stored energy so that less is available to damage the MWPC.

4) The power supply can be set for automatic reset on trip.

5) Bridged Lemo connectors allow collecting the trip signals from a number of power supplies to activate a single alarm unit.

6) Power supply operates to 70°C.

NANO Systems Design Problems:

1) The supply uses the MHV connector and cannot be operated at full output voltage without a cable.

2) The "Knob Pot" used for high voltage control has a history of low reliability. It is easy to damage.

3) A transistor failure in the drive pass transistor during test may indicate a design problem.

4) With the "off" button pushed and the "H.V." light off,

cranking up the high voltage control pot causes high voltage to appear at the output. This is a serious safety problem and must be corrected before use.

5) Nonuniform capacitors in voltage multiplier string could cause diode failures in case of an internal spark.

6) Input 115 volt A. C. power is incorrectly wired. On-off switch is in white wire and does not remove power from fuse when turned off.

7) Since the DC power to the DC-DC converter is not regulated and since the response time of the regulation loop is slow, the power supply could be sensitive to line voltage variations as sometimes occur at Fermilab.

8) With the trip circuit out, the power supply is not short circuit proof.

Both power supplies were connected to a small 12.5 micron tungsten wire MWPC and the high voltage increased until the chamber sparked many times. Neither power supply damaged the chamber when operated in the trip out mode. Neither power supply caused the chamber to spark when turned on at a typical operating voltage.

Conclusion:

Either power supply is suitable for operation of MWPC's. The NANO systems supply should have the safety problems corrected before use.