Model 1449M/1449ME

GENERAL

HV Module Slots per Mainframe: 16.
Channels per Mainframe: Up to 256.
Maximum HV Output Power: 1.6 kW for Model 1449M; 800 W for Model 1449ME; for each plug-in module in excess of eight, deduct 15 W from the 800 W available.
Ramp Rates: The HV run-up and run-down rates may be selected by a jumper option and/or software on the 1445 or 1445A control units between 10-500 V/sec.

DISPLAY AND CONTROL

HV Enable Indicator Switch: Yellow lamp indicates HV is ready for turn on (i.e., HV Disable is not actuated and INTERLOCK is not asserted). Integral with front-panel HV ON indicator (red lamp) and HV Enable button. Rear-panel indicator lamp.
Input Power Status: *Model 1445A* - three LEDs indicate presence of +5 V, +15 V, and -15 V. *Model 1445* - two LEDs indicate presence of -15 V and +5 V. Active lit by +15 V.
System Active/ENB: Front-panel LED indicates modules enabled for generating HV.
Status: Lemo connector, TTL high = HV on, low = HV off.
Interlock: BNC connector, TTL high = on, low = off.
HV Limit Potentiometers: Set separate positive and negative hardware limits.

PROTECTION

System Protection: In the event of a power failure, the system will shut down in an controlled manner. A front-panel switch on the 1440 mainframe provides immediate shut down. Panic-off in the rear is accomplished by pulling out the power cord. An interlock is provided on the control unit that will disable all HV in the mainframe when driven to ground.
Thermal Protection: A temperature monitor on each of the low voltage power supplies shuts off the high voltage in the event of overheating that can result from excessive loading, clogged fan filters, or high ambient air temperatures.

MECHANICAL

Packaging: 19" rack-mount chassis, 17" wide x 22" deep x 26 1/4" high. (Add 3" to depth to include handle protrusion.)
Input Power: 180-260 V, AC 50/60 Hz, 15 A.
Humidity: 0 to 85% relative humidity.
Operating Temperature: 10°C to 40°C ambient.
Shipping Weight: 210 lbs. (95 kg).

Model 1443

Number of Channels: 16 per module; maximum of 256 channels per mainframe.
Output Voltage: 500 to 2500 V; < 500 V. Performance is not rated. Polarity indicated by N or P suffix.
Full Scale: 2500 V, 2047 V, 1500 V, 4095 V values available (limited to 2500 V max.) by mainframe jumper option.
Output Current: Up to 2.5 mA per channel. Reduced output current specification when all channels of a module are run at maximum voltage and current.
Voltage Regulation: 0.05% of full scale, line and load.
Programming Step: 0.025% of full scale.
Programming Accuracy: < ±(0.2% +2 V) for demand voltages > 500 V. Performance is not rated for < 500 V.
Programming Reproducibility: < 1 V at a constant load and temperature after 10 minute warm-up.
Voltage Monitor Accuracy: ±(0.1% +1.5 V).
Monitor Long-Term Stability: < 1.5 V/week at constant load and temperature.
Output Long-Term Stability: < 2 V/week at constant load and temperature.
Temperature Coefficient: Typically 0.005%/°C, maximum 0.01%/°C from 500 V to 2500 V (10°C to 40°C ambient).
Output Ripple: Typically < 50 mV peak-to-peak; < 250 mV peak-to-peak maximum.
Output Protection: Fully protected against arcs at load, short circuit and overload.
Output Connector Type: Multiconductor block-type connectors. SHV connectors specified by F suffix.

Model 1444

Number of Channels: 8 per module; maximum of 128 channels per mainframe.
Output Voltage: 500 V to 5600 V; < 500 V performance is not rated. Polarity indicated by N or P suffix.
Output Current: Up to 1 mA per channel.
Voltage Regulation: 0.05% of full scale, line and load.
Programming Step: Employs a 14-bit DAC with 0.5 V/LSB.
Programming Accuracy: < (0.1% +5 V).
Programming Reproducibility: < 1 V at a constant load and temperature.
Voltage Monitor Accuracy: ±(0.05% +0.5 V).
DC Current Monitor: The DC current drawn by the load is monitored via a 16-bit ADC (located in the 1445A).
Resolution: 60 nA/LSB, Accuracy: 0.2% ±4 LSB. Any DC trip value between 1 LSB and full scale (1 mA) can be programmed. A trip indicator on the 1440 front panel will light when any channel in the mainframe fails.
DC Current Trip: Programmable between 0 and 1 mA. One setting applies to all channels in module.
AC Current Trip: Programmable between approximately 200 nA and 3 mA (14-bit DAC). Same as DC current trip except for a low frequency cut off of 3 Hz ($\tau \approx 300$ msec) and a high frequency cut off of 150 Hz ($\tau \approx 6$ msec). Current spikes shorter than 6 msec are integrated and will trip the circuit only if the integrated value over 6 msec exceeds the pre-programmed trip value.
Output Long-term Stability: < 2 V/week at constant load and temperature.
Output Ripple: Typical < 5 mV RMS, maximum 10 mV RMS or 40 mV p-p.
External Monitoring Capability: 6 pins of the 10-pin header per channel are used for external monitoring; 2 pins monitor voltage (1000:1 reduction); 2 pins provide DC current measurement with 10 V/mA sensitivity; 2 pins monitor over-voltage protection (see below).
Over Voltage Protection: Adjustable by a front-panel potentiometer (one per channel) between 1 kV and 6 kV.
Inter-Channel Protection: 4 pins of the 10-pin header for each channel are available for daisy-chaining channels together such that when any channel on the daisy-chain fails, all channels on the daisy-chain will ramp down at the selected hardware rate.
Output Connector Type: SHV connectors.

SYSTEM COMPATIBILITY

The Model 1444 HV module is compatible with existing mainframes. However, if used with the older, economy 1445 Controller, the lack of a 16-bit ADC means lower accuracy and increased software effort (i.e., on the 1444, a demand of 2000 counts produces a voltage of 4000 V). In order to use all the features and the full precision of the 1444, the 1445A control unit must be used.