



The 2720GS—True DC Standards Lab Performance in One Instrument

The 2720GS Ultra-Precision Direct Voltage System is a physical representation of Valhalla Scientific's corporate philosophy, "Building New Standards for Technology". From its fully sealed multi-function membrane control panel to its ingenious on-board multi-reference monitoring system the 2720GS is the most powerful and comprehensive direct voltage system in the world.

The 2720GS offers the best accuracy of any DC calibrator on the market, but we didn't stop there; our demanding internal divider design has resulted in the lowest temperature coefficient of any DC Standard anywhere. So low in fact, that our 1.6ppm thirty day accuracy is specified for $\pm 6^{\circ}\text{C}$ from

calibration temperature. Delivering the best accuracy and lowest temperature coefficient of all DC standards is quite an accomplishment but the 2720GS leaves the others far behind when it comes to stability.

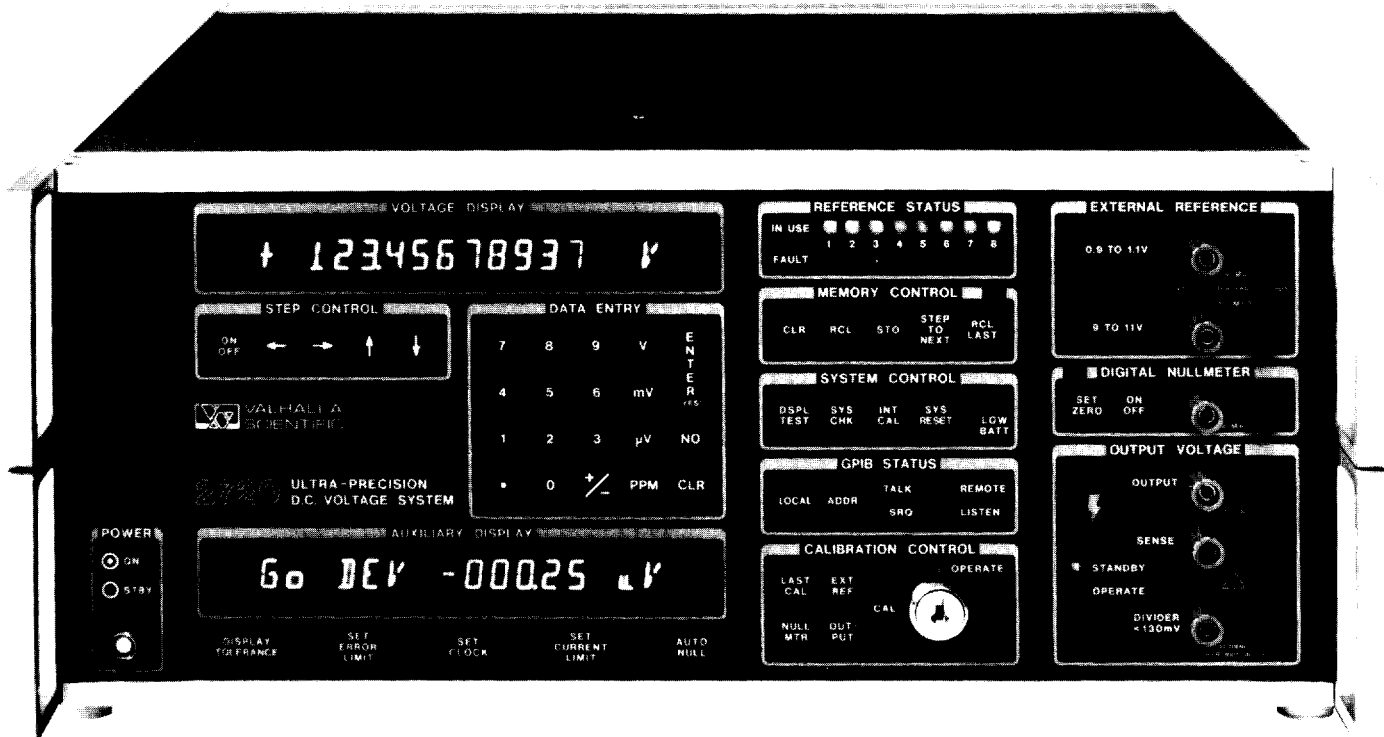
To conquer drift against time, the 2720GS utilizes an internal real time clock and an ingenious on-board multi-reference monitoring system. The system's internal 30 bit A to D converter continually monitors each of up to eight internal highly stabilized reference zeners. Each reference module contains its own non-volatile memory which stores calibration and drift rate data. Should a reference exhibit excessive noise or drift, the system has the ability to "drop it out" and pick it up again later upon stabilization to its new value. No other system can do this and no other system even comes close to matching the 2720GS uncompromising rock-solid stability.

Valhalla's 2720GS—The Calibrator's Calibrator

The 2720GS delivers the performance required to calibrate the world's most accurate $7\frac{1}{2}$ and $8\frac{1}{2}$ digit DVM's yet does even more. It also contains an on-board autoranging digital nullmeter which permits the 2720GS to directly calibrate our competitors best DC voltage calibrators. With our built-in Auto Null™ function, one touch is all that is required for the 2720GS to achieve a null with the DC source being calibrated. In the Auto-Null™ mode the 2720GS auxiliary read-out simultaneously displays the error of the unit under test (UUT) out to 0.01 PPM as well as the UUT's pass/fail status.

Direct Voltage Output 10nV to 1200V

The 2720GS Direct Voltage System displays its actual or standby output voltage down to 10 nanovolt resolution or 0.01 PPM of full scale



on all ranges. The extended resolution of the 2720GS is at least 10 times greater than that of the nearest competitive units. This resolution is made possible through the use of Valhalla's proprietary 32 bit pulse-width-modulated D to A converter technology. When it comes to extended output voltage and drive current capability the 2720GS takes a "NO BOOST NEEDED" attitude. The standard unit provides up to 100mA current sourcing capability on the 0.65V through 130V ranges and delivers a maximum output voltage of ± 1200 volts DC.

Double-Edged 2720GS Productivity Cuts Through Calibration Backlog

When it is productivity you are looking for in a Direct Voltage System, the 2720GS looks twice as nice as any other system available. That is because the 2720GS works double-time clearing out calibration workload on both DVM's and calibrators alike. Its ergonomically engineered operating format is flexible and powerful yet refreshingly simple. Direct volts entry can be accomplished in either volts, millivolts or microvolts. Editing the output is a snap utilizing the 2720GS step control mode with auto-repeat or by modifying the output directly in parts per million with the PPM key.

Entering the 2720GS step control mode automatically triggers the units auxiliary display to readout the deviation and pass/fail status of the UUT. For added user convenience and productivity, changes in output polarity are accomplished with the single touch of the bi-polar output key.

System Control

The system control section of the 2720GS provides full operational verification in four simple yet powerful keys. The display test provides a three second illumination of all display segments and indicators. The system check key prompts the unit's extensive diagnostic routine backed by over two hundred user prompting messages and fault codes. Built-in operational redundancy allows the user the option of continuing operation, utilizing back-up circuitry, in the event of a primary component fault.

The 2720GS internal calibration routine is quick and easy requiring only about 30 seconds. The routine is prompted by a single keystroke and does not require multi-level keyboard manipulation. Internal calibration automatically compensates for attenuator drift, zero offset errors caused by thermal EMFs and corrects for gain shift in amplifiers. The 2720GS requires the use of internal cal on a monthly basis, not daily, in order to achieve its long term performance specifications. Obviously, the 5 PPM one year uncertainty of the 2720GS could not be achieved without the use of internal calibration and the on-board multi-reference monitoring system.

Direct 2720GS Calibration Routine Reduces Traceability Uncertainty

The calibration of the 2720GS requires only one external instrument (a 1V/10V reference standard). This simplification of the calibration process and resulting reduction in traceability uncertainty is made possible through the use of the system's internal reference divider and on-board digital null detector. No other DC system offers this level of performance and support in one package.

The calibration integrity of the 2720GS is guarded by a front panel mounted keylock switch which prevents unauthorized access to the calibration mode. Once in the calibration mode, the system's alpha-numeric display prompts the operator through the two point calibration sequence with clear English commands. In this mode, the system's output terminals become input terminals with an input impedance greater than 100 gigohms. The system then prompts the user to connect a one volt reference ($\pm 10\%$) and enter the reference value on the 2720GS keyboard (or over the GPIB). Following a five second integrated measurement period, the derived calibration constant is loaded into non-volatile RAM and the auxiliary display scrolls out set up instructions for the 10 volt calibration. The 10 volt cal point provides full scale correction data for the unit's on-board multi-reference monitoring system as well as the final leg in the calibration on the 2720GS' internal precision 10:1 reference divider. Once the internal reference divider is calibrated the microprocessor based routine automatically verifies and stores correction data for the system's 130V and 1200V output attenuator stages.

During the entire three minute external calibration sequence of the 2720GS no manual editing of the unit's output or any other type of manual adjustment including instrument disassembly is required.

The 1.6 ppm 30 day accuracy of the 2720GS is relative to local reference standards. For total uncertainty including Valhalla's traceability to the National Bureau of Standards and all transfer uncertainties add

2720GS Options and Accessories

Option "BAT": Rear-panel mounted gel-cell battery pack provides 12 hour reference oven power when line power is removed. The rugged design and immunity to environmental conditions makes the 2720GS ideal for "on-site" calibration of precision DVMs and calibrators. The battery back-up capability allows you to begin calibration immediately upon arrival while the other guys are waiting for warm-up. The option "BAT" is fully self-contained in an aluminum enclosure with on-board charging circuitry and logic interconnect.

Option "EBU": If a longer battery back-up period is desired the "EBU" option provides logic interface and voltage conditioning circuitry for user supplied auxilliary automobile type 12V battery. The "EBU" provides full 1000 volt

isolation between back-up power source and output low.

Option "RP-20": Complete rear panel output/input low thermal EMF binding post assembly.

Options "EXR1" "EXR7" and "EXR10": Allows user to operate the 2720GS off of an external 1V, 7V or 10V reference respectively. With power applied (or battery back-up) the input impedance is greater than 100 gigohms, so direct standard cell input can be accomplished without loading. Applied reference voltage values are entered on the unit's data entry keyboard (or over the GPIB) and may vary $\pm 10\%$ from nominal. The 2720GS automatically reverts to it's internal reference system when the external reference mode is de-selected.

Option "54-4T": Where budgetary constraints or less crucial applications exist, this option provides savings by the elimination

of the 2720GS' digital nullmeter and a reduction of two zener references from the unit's reference system (to a total of four). Resolution is reduced to 0.1 ppm and a reduced 2720GS specification applies. The nullmeter and dual reference module can be easily field retrofitted at a later date for restoration to 2720GS performance level.

Option "HSR": For the absolute ultimate in Direct Voltage Performance the "HSR" option replaces the six standard 2720GS zener references with eight premium zener references. These references are selected, aged and monitored for 9 to 12 months then statistically enhanced by the 2720GS' multi-reference monitoring system. The result is an awesome performance and stability level rivaling that of external reference voltage standards.

2720GS Performance Specifications

Accuracy: (Valid for $\pm 6^\circ\text{C}$ from calibration temperature within 10-35°C). The values stated below include affects of line, load and temperature variation (within the 12°C calibration temperature window). To derive absolute accuracies relative to the National Bureau of Standards add 1.5 ppm for Valhalla Scientific's traceability and transfer uncertainty.

2720GS (PPM of Setting + μV)

Range	30 days		90 days		180 days		1 year		3 years	
650mV*	2.3ppm +	0.2 μV	2.9ppm +	0.2 μV	3.9ppm +	0.2 μV	6.0ppm +	0.2 μV	12.6ppm +	0.2 μV
1300mV*	2.7ppm +	0.3 μV	3.3ppm +	0.3 μV	4.3ppm +	0.3 μV	6.3ppm +	0.3 μV	12.9ppm +	0.3 μV
0.65V	2.3ppm +	0.3 μV	2.9ppm +	0.3 μV	3.9ppm +	0.3 μV	6.0ppm +	0.3 μV	12.6ppm +	0.3 μV
1.3V	2.7ppm +	0.4 μV	3.3ppm +	0.4 μV	4.3ppm +	0.4 μV	6.3ppm +	0.4 μV	12.9ppm +	0.4 μV
6.5V	1.6ppm +	1.2 μV	2.2ppm +	1.2 μV	3.2ppm +	1.2 μV	5.0ppm +	1.2 μV	10.6ppm +	1.2 μV
13V	2.0ppm +	2.3 μV	2.6ppm +	2.3 μV	3.5ppm +	2.3 μV	5.3ppm +	2.3 μV	10.9ppm +	2.3 μV
65V	2.7ppm +	12 μV	3.3ppm +	12 μV	4.2ppm +	12 μV	5.9ppm +	12 μV	11.5ppm +	12 μV
130V	3.0ppm +	23 μV	3.7ppm +	23 μV	4.5ppm +	23 μV	6.2ppm +	23 μV	11.8ppm +	23 μV
600V	3.4ppm +	106 μV	4.0ppm +	106 μV	4.9ppm +	106 μV	6.5ppm +	106 μV	12.1ppm +	106 μV
1200V	3.8ppm +	206 μV	4.4ppm +	206 μV	5.2ppm +	206 μV	6.9ppm +	206 μV	12.4ppm +	206 μV

2720GS/HSR

Range	30 days		90 days		180 days		1 year		3 years	
650mV*	2.1ppm +	0.2µV	2.4ppm +	0.2µV	3.0ppm +	0.2µV	4.3ppm +	0.2µV	8.5ppm +	0.2µV
1300mV*	2.5ppm +	0.3µV	2.8ppm +	0.3µV	3.4ppm +	0.3µV	4.6ppm +	0.3µV	8.9ppm +	0.3µV
0.65V	2.1ppm +	0.3µV	2.4ppm +	0.3µV	3.0ppm +	0.3µV	4.3ppm +	0.3µV	8.5ppm +	0.3µV
1.3V	2.5ppm +	0.4µV	2.8ppm +	0.4µV	3.4ppm +	0.4µV	4.6ppm +	0.4µV	8.9ppm +	0.4µV
6.5V	1.4ppm +	1.2µV	1.7ppm +	1.2µV	2.2ppm +	1.2µV	3.2ppm +	1.2µV	6.4ppm +	1.2µV
13V	1.8ppm +	2.3µV	2.1ppm +	2.3µV	2.6ppm +	2.3µV	3.5ppm +	2.3µV	6.7ppm +	2.3µV
65V	2.5ppm +	12µV	2.8ppm +	12µV	3.2ppm +	12µV	4.2ppm +	12µV	7.3ppm +	12µV
130V	2.8ppm +	23µV	3.2ppm +	23µV	3.6ppm +	23µV	4.5ppm +	23µV	7.6ppm +	23µV
600V	3.2ppm +	106µV	3.5ppm +	106µV	4.0ppm +	106µV	4.9ppm +	106µV	7.9ppm +	106µV
1200V	3.6ppm +	206µV	3.9ppm +	206µV	4.3ppm +	206µV	5.2ppm +	206µV	8.2ppm +	206µV

2720GS/54-4T

Range	30 days		90 days		180 days		1 year		3 years	
650mV*	3.5ppm +	0.2µV	5.5ppm +	0.2µV	8.4ppm +	0.2µV	13.7ppm +	0.2µV	30.7ppm +	0.2µV
1300mV*	3.8ppm +	0.3µV	5.9ppm +	0.3µV	8.7ppm +	0.3µV	14.0ppm +	0.3µV	31.0ppm +	0.3µV
0.65V	3.5ppm +	0.3µV	5.5ppm +	0.3µV	8.4ppm +	0.3µV	13.7ppm +	0.3µV	30.7ppm +	0.3µV
1.3V	3.8ppm +	0.4µV	5.9ppm +	0.4µV	8.7ppm +	0.4µV	14.0ppm +	0.4µV	31.0ppm +	0.4µV
6.5V	2.8ppm +	1.2µV	4.9ppm +	1.2µV	7.7ppm +	1.2µV	12.9ppm +	1.2µV	29.0ppm +	1.2µV
13V	3.2ppm +	2.3µV	5.3ppm +	2.3µV	8.0ppm +	2.3µV	13.1ppm +	2.3µV	29.2ppm +	2.3µV
65V	3.8ppm +	12µV	5.8ppm +	12µV	8.6ppm +	12µV	13.7ppm +	12µV	29.7ppm +	12µV
130V	4.2ppm +	23µV	6.2ppm +	23µV	8.9ppm +	23µV	14.0ppm +	23µV	30.0ppm +	23µV
600V	4.5ppm +	106µV	6.5ppm +	106µV	9.2ppm +	106µV	14.2ppm +	106µV	30.3ppm +	106µV
1200V	4.9ppm +	206µV	6.9ppm +	206µV	9.5ppm +	206µV	14.5ppm +	206µV	30.5ppm +	206µV

Stability (24hrs)

Range	2720GS	2720GS/HSR	2720GS/54-4T
650mV*	0.23ppm + .06µV	0.19ppm + .06µV	0.36ppm + .06µV
1300mV*	0.23ppm + 0.1µV	0.19ppm + 0.1µV	0.36ppm + 0.1µV
0.65V	0.23ppm + 0.2µV	0.19ppm + 0.2µV	0.36ppm + 0.2µV
1.3V	0.23ppm + 0.3µV	0.19ppm + 0.3µV	0.36ppm + 0.3µV
6.5V	0.23ppm + 0.6µV	0.19ppm + 0.6µV	0.36ppm + 0.6µV
13V	0.23ppm + 1.0µV	0.19ppm + 1.0µV	0.36ppm + 1.0µV
65V	0.23ppm + 5.4µV	0.19ppm + 5.4µV	0.36ppm + 5.4µV
130V	0.23ppm + 10µV	0.19ppm + 10µV	0.36ppm + 10µV
600V	0.23ppm + 50µV	0.19ppm + 50µV	0.36ppm + 50µV
1200V	0.23ppm + 92µV	0.19ppm + 92µV	0.36ppm + 92µV

Stability specifications apply for constant line, load and temperature ($\pm 1^\circ\text{C}$). Measured over a bandwidth of DC to 2Hz.

*Divided Output ($Z_0 = 450\Omega$)

Temperature Coefficient

Range	Using Internal Cal		Without Use Of Internal Cal		
	0-35°C	35-50°C	0-10°C	10-35°C	35-50°C
650mV	0.10ppm + 0.01µV	0.40ppm + 0.01µV	0.10ppm + 0.01µV	0.10ppm + 0.01µV	0.40ppm + 0.01µV
1300mV	0.10ppm + 0.02µV	0.40ppm + 0.02µV	0.14ppm + 0.02µV	0.14ppm + 0.02µV	0.56ppm + 0.02µV
0.65mV	0.10ppm + 0.02µV	0.40ppm + 0.05µV	0.10ppm + 0.02µV	0.10ppm + 0.02µV	0.40ppm + 0.05µV
1.3mV	0.10ppm + 0.02µV	0.40ppm + 0.05µV	0.14ppm + 0.02µV	0.14ppm + 0.02µV	0.56ppm + 0.05µV
6.5V	0.01ppm + 0.10µV	0.05ppm + 0.11µV	0.01ppm + 0.10µV	0.01ppm + 0.10µV	0.05ppm + 0.11µV
13V	0.01ppm + 0.20µV	0.05ppm + 0.20µV	0.10ppm + 0.20µV	0.10ppm + 0.20µV	0.40ppm + 0.20µV
65V	0.10ppm + 1.0µV	0.40ppm + 1.8µV	0.41ppm + 1.0µV	0.22ppm + 1.0µV	0.56ppm + 1.80µV
130V	0.10ppm + 2.0µV	0.40ppm + 2.5µV	0.42ppm + 2.0µV	0.24ppm + 2.0µV	0.69ppm + 2.5µV
600V	0.10ppm + 9.5µV	0.40ppm + 18 µV	0.41ppm + 9.5µV	0.22ppm + 9.5µV	0.56ppm + 18.0µV
1200V	0.10ppm + 18.3µV	0.40ppm + 24 µV	0.42ppm + 18.3µV	0.24ppm + 18.3µV	0.69ppm + 23.8µV

Specifications apply immediately following stabilization to a change in ambient temperature (thermal time constant = .5°C/min.). Temperature coefficient adder applicable only when outside of the 12°C window of the calibration temperature.

1.5 ppm. Valhalla's 1.5 ppm traceability uncertainty is achieved through the use of our primary standard cells, (certified to better than 1 ppm at the one volt level) and a reference divider which yields an additional 0.1 ppm uncertainty up to ten volts. The direct input calibration routine of the 2720GS reduces transfer uncertainties encountered by conventional DC standards by eliminating the need to measure the units output during the calibration process.

For added convenience, one touch of the units "Display Tolerance" key provides an instant calculation and display of the 2720GS specification (including full compensation for time since last calibration.) Valhalla Service Centers provide NBS traceable calibration support for the 2720GS Direct Voltage System or consult factory for details on our Rent-A-Reference program.

Safety That Makes Sense

To prevent inadvertent exposure to dangerous voltage levels without the annoyance of constantly tripping into standby, the 2720GS utilizes an unique safeguard format called Vari-Safe™. The Vari-Safe™ operating format permits users to make changes in the output voltage of up to 25% of output or 30 volts whichever is greater. Other built-in safeguards include, selectable current limiting and a dedicated internal voltmeter which ensures that the analog output corresponds with the digital setting at all times. No other instrument offers this level of safety protection and operator convenience all in one model. The 2720GS has been designed to meet and exceed tough UL, IEC and CSA specifications for instrument safety.

Built-In 550 Step Memory Enhances Operating Efficiency

To put the ultimate finishing touch on operator productivity, the 2720GS is configured with a user definable memory control system. The built-in non-volatile memory allows the operator to walk through pre-programmed calibration procedures for DVM's and DC calibrators alike. Each of the more than 550 steps of procedure memory accepts data for test number, output value, UUT tolerance and selectable standby/operate bring-up mode. To further enhance the ergonomics of the memory control system, each step is available at the touch of a finger, thus eliminating the need to search for external plug-ins.

2720GS Configuration Guide

- Autoranging Digital Nullmeter
- 1 Touch Auto-Null™ Function
- IEEE-488 Interface
- Multi-reference Monitoring System
- Real Time Clock (12/24 hr)
- Dual Alpha-numeric Displays
- Step Control with Auto-Repeat
- Display Tolerance Function
- UUT Deviation
- Divided Output

- Local and Remote Sensing
- Vari-Safe™ Output Format
- Front-Panel Calibration Keylock
- 30 Day Internal Cal
- Covers-On External Cal
- Built-In 559 Step Memory Control System
- Bipolar Output 10nV to 1200V
- 30 Day Accuracy: 1.6 PPM
- 24 Hour Stability: 0.25 PPM
- Linearity: ± 0.3 PPM
- Accuracy Valid $\pm 6^\circ\text{C}$ from Calibration Temperature
- 100mA Current Sourcing
- Resolution: 0.01 PPM
- Automatic Output Ranging
- Self-Diagnostics
- Front-Panel GPIB Address Selection and Display
- Selectable Current Limits
- GPIB Status Indicators
- UUT Error Limit
- UTT Calibration Status
- Display Test
- Time Since Last Cal
- Twin Microprocessors
- Optional Reference System Battery Back-up
- Optional External Reference Modules



Performance Characteristic Table

Range	Resolution nV/ppm	Measurement Accuracy 90 Days (ppm of setting + μ V)	Maximum Current	Wideband Noise 10Hz to 10KHz	Linearity
650mV	10nV/.014ppm	2.9ppm + 0.27 μ V	450 Ω Z _O	10 μ V RMS	0.14 μ V
1300mV	10nV/.007ppm	3.3ppm + 0.47 μ V	450 Ω Z _O	10 μ V RMS	0.26 μ V
.65V	10nV/.014ppm	2.9ppm + 0.54 μ V	100mA	30 μ V RMS*	0.22 μ V
1.3V	10nV/.007ppm	3.3ppm + 0.67 μ V	100mA	30 μ V RMS*	0.32 μ V
6.5V	10nV/.002ppm	2.2ppm + 1.75 μ V	100mA	30 μ V RMS*	0.9 μ V
13V	100nV/.007ppm	2.6ppm + 3.35 μ V	100mA	30 μ V RMS*	1.8 μ V
65V	1 μ V/.014ppm	3.3ppm + 17.1 μ V	100mA	50 μ V RMS	10 μ V
130V	1 μ V/.007ppm	3.7ppm + 33 μ V	100mA	50 μ V RMS	18 μ V
600V	10 μ V/.016ppm	4.0ppm + 156 μ V	30mA	500 μ V RMS	85 μ V
1200V	10 μ V/.008ppm	4.4ppm + 298 μ V	30mA	500 μ V RMS	165 μ V

The linearity of the 2720GS is defined as the maximum allowable deviation from a straight line between zero and full scale of each range. Valid $\pm 6^{\circ}$ C from calibration temperature within 10° C to 35° C.

*Add 20 μ V RMS for loads greater than 10mA

Digital Nullmeter/Measurement Performance Table

Range	Resolution	Accuracy 3yr. 0-50 $^{\circ}$ C	Input Impedance
0-200 μ V	10nV	0.2% + 50nV	10G Ω ($10^{10}\Omega$)
200-2000 μ V	100nV	0.2% + 150nV	100G Ω ($10^{11}\Omega$)
2-20mV	1 μ V	0.2% + 1 μ V	1T Ω ($10^{12}\Omega$)
20-200mV	10 μ V	0.2% + 10 μ V	10T Ω ($10^{13}\Omega$)
200mV-2000V	100mV	10% + 100mV	60M Ω \pm 10%

Maximum Input Current: Less than 25pA

Zero Stability: 100nV/hour, 30nV/ $^{\circ}$ C

Overload Protection: 2000V indefinitely

Maximum Common Mode: 2000V from ground or output low

Settling Time (To within PPM of final value)

Range	10ppm	5ppm	2ppm
1300mV/650mV	500mS	2 Sec.	10 Sec.
1.3V/.65V	500mS	2 Sec.	8 Sec.
13V/6.5V	300mS	1 Sec.	5 Sec.
130V/65V	600mS	3 Sec.	10 Sec.
1200V/600V	800mS	3 Sec.	10 Sec.

For range and or polarity change, add 1 second.

Real Time Clock/Calendar

Accuracy: 2 ppm (0° - 50°)

Format: 12 or 24 hr., Mo/Day/Yr or Day/Mo/Yr user selectable

Battery Back-up: 5000 hours with no power applied

Daylight Savings Time: User selectable

General

Warm-up Time: 5 minutes to within 5 ppm of final value, 15 minutes to within 1 ppm of final value (times 2 if battery back-up not used).

IEEE-488 Configuration: SH1AH1T6TE6L4LE4SR1RL1PP2C1DT1C0 (Talk/listen sub-addressable)

Power: 115/230 VAC 50-400 Hz, 125 VA

Size: 178mm H x 432mm W x 483mm D (7"x17"x19")

Weight: 23KG/48 lbs. net, 25KG/55 lbs. shipping

Ordering Information

Model 2720GS	Direct Voltage System	\$10,495.00
Option "HSR"	Ultra-Stable Reference Package	3,995.00
Option "54-4T"	Lower Cost/Reduced Performance	(-2000.00)
Option "BAT"	Battery Back-up System	595.00
Option "EBU"	Battery Conditioning System	595.00
Option "RP-20"	Rear Panel I/O Terminals	195.00
Option "EXR1"	1V External Reference Module	995.00
Option "EXR7"	7V External Reference Module	995.00
Option "EXR10"	10V External Reference Module	995.00
Option "GP-1"	1 Meter GPIB Cable	95.00
Option "GP-2"	2 Meter GPIB Cable	115.00
Option "RX7"	Rack Mount Kit	60.00
Option "BBL"	Dual Banana Shielded Leads	25.00
Option "SL-48"	Gold Surfaced Spade Lug Leads	55.00
Option "SP-2"	2 Year Spare Parts Kit	395.00
Additional	Operating/Maintenance Manual	65.00

Specifications and prices subject to change without notice.



**VALHALLA
SCIENTIFIC**
 Building New Standards for Technology

7576 Trade Street
 San Diego, California 92121
 619/578-8280 Telex 181750