SECTION I

1.0.0 DESCRIPTION AND SPECIFICATIONS

1.1.0 General Description

1.1.1 The EDC Model 521 is a microprocessor controlled enhanced version of the field proven Model 520. An industry standard 6500 series microprocessor has been incorporated to improve the reliability, and versatility of the instrument.

1.1.2 The Model 521 Programmable DC Voltage Standard is a highly versatile reference source, designed to meet the needs of computer systems, production line testing, automated calibration, and standards laboratories.

1.1.3 The instruments have a specified accuracy, and are traceable through a bank of saturated standard cells to the U. S. National Institute of Standards and Technology.

1.1.4 Resolution of each range, in each function, is 1 ppm.

1.1.5 The instruments are highly accurate references which can be used for calibration of digital voltmeters, analog meters, semiconductor analyzing systems, analog references for computers, analog-to-digital converters, telemetry and data acquisition systems, and wherever a stable source is required.

1.1.6 The variable, constant current mode is designed for use in calibration and simulation of strain gages and other transducers.

1.1.7 There are no adjustments made during normal operation; the trims are made during calibration and are described in the calibration procedure.

1.1.8 The circuitry is completely solid state made of discrete, hybrid and/or integrated circuits packaged on etched glass circuit boards. These are proven circuits, using derated components to insure long life and maximum reliability.

1.1.9 The instrument is overload and short-circuit proof, and is fully operational in normal environmental conditions.

1.1.10 The Standard Source will drive a short circuit indefinitely without damage to the instrument, and will recover to rated specifications in less than 100µs.

1.2.0 Features and Applications

1.2.1 Features:

Accuracies based on one full year calibration cycle and conservatively specified by using the "Limit of Error" (or Worst - Case) methods.

E Mode: ±(0.002% of setting + 0.0005% of range + 3 µV)
I Mode: ±(0.005% of setting + 1 µA)

Programming: IEEE-488 (GP-IB) and local/manual control. (Note: Operator has control of local/remote mode i.e., shutdown not required to re-establish "local" control.)

3 Voltage ranges (1 ppm resolution or 6 decades)

± 100 Vdc resolved to 100 µV
± 10 Vdc resolved to 10 µV
± 100 mVdc resolved to 0.1 µV

2 Current ranges (1 ppm resolution or 6 decades)

± 100 mAdc resolved to 0.1 µA
± 10 mAdc resolved to 0.01 µA

(Note: 100 Vdc Compliance with variable control.)

Floating output. Optically isolated between analog output and digital input lines.

True bipolar control with balance zero.

Magnitude is maintained during polarity changes, and scaled on function changes and range changes in the manual mode. i.e., this eliminates the requirement of reentering the magnitude.

A "crowbar", or short circuit, of the output may be selected.

1.2.2 Applications:

Calibration of DVMs, DMM, meters, chart recorders, A/D converters, ATE, monitors, controllers, logging systems, etc.

Simulation of thermocouple and strain gages. (4 to 20 mA and 10 to 50 mA) and other transducers.

NOTE: Compliance voltage from 1V to 100 Vdc. Lower compliance limits are selectable. Linearity check of amplifiers and function modules.

1.3.0 Output Specifications

1.3.1 Voltage Mode

Range (full scale)	100 mVdc ±111.111 0 mVdc	10 Vdc ±11.111 10 Vdc	100 Vdc ±111.111 0 Vdc
Resolution (1 ppm)	100 nV	10 µV	100 µV
Compliance Current	EMF into 1 meg Ohms	100 mA	100 mA
Output Impedance	20 Ohms	10 milliohms	10 milliohms

Accuracy (Basis for accuracy statement):
The Accuracy Statement is based on the "Limit of Error" (or "worst case") method. All other specifications noted hereafter, which effect accuracy, e.g., line, load, temperature, and drift changes are included in the accuracy statement. Thus, all other specifications are listed as *non-Additive.

±(0.002% of setting + 0.0005% of range + 3 µV)

Note: The "+ 3 µV" specified above applies primarily to the 100 mV range where measurements at these low levels should be stated conservatively. It becomes insignificant on the higher ranges.

Note: The accuracy statement above is based on the "Limit of Error" method and is VALID FOR ONE YEAR calibration cycles. The "Limit of Error" accuracy may be increased to tighten tolerances by:

A) Shortening re-calibration cycle, i.e., more frequently than the suggested 1 year cycle. and/or

B) Elimination of "worst case" conditions by implementing carefully monitored, standards laboratory procedures.

Stability: 8 hrs: ±0.00075%; 24 hrs: ±0.001%
(*non-additive)90 days: ±0.0015%; 1 year: ±0.002%

Line & Load Regulation: ±0.0005% No load to full load
(*non-additive) ±10.0% line fluctuation

Noise & Ripple: rms: ±0.0005% of range + 2 µV
In a band pass of 0.1 Hz to 100 kHz

1.3.2 Current Mode

Range	10 mAdc	100 mA
Full Scale	±11.111 1. mAdc	±111.111 0 mAdc
Resolution (1 ppm)	10 nA	100 nA
* Compliance Voltage	± 0 - 100 Vdc	± 0 - 100 Vdc
Output Conductance	0.1 µs	0.1 µs

*** Note: Voltage Compliance Limit Control**
The compliance voltage may be limited via a jumper.
The limits are: >± 100 V, ±46 V, ±32 V, ±18 V, ±4 V and ±1 V.

Accuracy: (See definitions under Voltage mode)
±0.005% of setting + 1 µA

Stability: 8 hrs: ±0.001%; 24 hrs: ±0.002%
(*non-additive)90 days: ±0.0025%; 1 year: ±0.005%

1.4.0 General Specifications

Isolation:
Power Transformer to analog output:
2.5×10^4 Megohms, 300 pF
Control logic to analog output; optically isolated.
10^9 Ohms, 130 pF, 500 Vdc

Temperature Coefficient:
Ambient: ±0.0005%/°C
Operating Limit: ± 0.001%°C

Switching and Settling Times:
Step Changes: 5 ms
Range Changes: 1 s

Protection: Voltage mode: Short-circuit and overload protection.
Current mode: Open-circuit protection.
Front panel enunciator will indicate malfunction condition.

Warm-up Time: 2 hours