DVC-8500

HIGH-PRECISION VOLTAGE SOURCE

FEATURES
- ±19.999 Volts full-scale output range
- Millivolt settability with accuracy of ±25 ppm of setting ±1/2 LSB (0.005% of full-scale range)
- Rated accuracy up to 25 mA output
- Unique/Ergonomically correct front panel lever switches
- Vernier control provides ±1.5 mV offset with 50 μV graduations
- Current from short-circuit-proof output transformer isolated ±300 volts to AC line
- Aluminum case includes bench-top stand
- Optional panel mount kit
- Choice of 100, 115, or 230 VAC power supplies
- Calibration traceable to NIST

GENERAL DESCRIPTION

The DVC-8500 is a low-cost 4 1/2 digit voltage reference source with a full-scale output range of -19.999 Volts to +19.999 Volts in 1 millivolt steps. The calibrator features high performance for such a small, low-cost instrument.

An active buffered output amplifier provides very low output impedance and up to 25 milliamps output current. An oven-stabilized zener diode internal reference provides an overall output accuracy of ±500 μV and ±25 ppm of the setting with zero drift of ±5 μV /°C and full-scale drift of 4 ppm /°C max. Output is set by unique front-panel lever switches which provide rapid, positive contact adjustment. Voltage outputs may be continuously varied within ±1.5 millivolts of selected readings by using a front panel vernier control. The DVC-8500 output is available from both front panel banana jacks and a rear panel 36-pin gold-plated PC connector fitted with lug terminals.

The rear connector has sense feedback inputs to reduce errors caused by cable resistance. A front-panel LED overload lamp lights if the output exceeds 25 mA and current limiting occurs at 70 mA output. The output circuit accepts up to ±25 mA source or sink current at rated accuracy. The rear connector also includes a low-Z output of the +10 Volt reference source with 5 mA maximum drive for external reference tracking. Wideband output noise is 25 microvolts, pk-pk maximum. Powered by a choice of 100, 115 or 230 VAC ±10%, and 47 to 440 Hz at 10 watts, the DVC-8500 offers transformer isolation up to ±300V dc. Output line rejection is within ±50 microvolts of zero. The black-anodized extruded aluminum housing provides excellent shielding from electrical noise. The small size and light-weight design of the DVC-8500 makes it an ideal portable instrument for a technician’s repair kit. When mounted on its bench-top tilt stand, the DVC-8500 uses very little space and can be positioned close to test circuits.
FUNCTIONAL SPECIFICATIONS

TYPICAL BETWEEN 0 AND +30°C AT STEADY AMBIENT TEMPERATURE AFTER 5 MINUTES WARMUP.

**VOLTAGE OUTPUT**

**OUTPUT TYPE**
Shielded transformer isolated, active low impedance DC voltage output, current limited.

**OUTPUT VOLTAGE RANGE**
0 to +19.999 Volts DC or 0 to -19.999 Volts DC, lever switch selected, 1 mV steps (Range ±0.0005 Volts using vernier control).

**OUTPUT CURRENT RANGE**
0 to 25 mA (source current) to rated voltage output accuracy.

**OUTPUT OVERLOAD**
Greater than 25 mA (source current) will illuminate front panel LED overload lamp. Output is current limited (continuous short-circuit proof) to 70 mA (source current) at any voltage up to ±20V dc.

**OUTPUT IMPEDANCE**
Less than 10 milliohms.

**CAPACITIVE LOAD**
No limitation.

**PERFORMANCE**

**ACCURACY @ +25°C**
Within ±2 ppm of setting, ±500 μV when calibrated (0.005% of full-scale range). Set within ±1 mV increments. A front panel vernier control provides ±1.5 mV continuous offset with 50 μV graduations.

**TEMP. DRIFT OF ZERO**
Within ±5 μV/°C

**TEMP. DRIFT OF CAL.**
Within ±4 ppm of setting/°C

**OPER. TEMP. RANGE**
0°C to +50°C

**STORAGE TEMP. RANGE**
-25°C to +85°C

**WARM-UP TIME**
5 minutes to rated accuracy

**OUTPUT NOISE**
25μV pk-pk, wideband (no cap load)

**REFERENCE SOURCE**
6.4V oven-stabilized low TC zener reference diode

**AC LINE VOLTAGE REJ.**
Zero: ±50 μV over full line range. Calibration: ±25 ppm of setting over full line range

**POWER TRANSFORMER ISOLATION**
1000 Megohms. Transformer primary has a grounded shield for capacitive isolation.

**BREAKDOWN**
300 VRMS, min.

**FRONT PANEL**

**OUTPUT SEL. SWITCHES**
Six lever-operated, detented switches are set in millivolts (+19999 mV range)

**POLARITY**
2 positions, + or -

**LEADING DIGIT**
2 positions, 0 or 1

**4 DIGITS**
10 positions, 0 thru 9

**OUTPUT VERNIER**
Rotary potentiometer, range ±1.5 mV of selected output. Graduated in 50 μV divisions. Clockwise rotation labeled "INCR" (increase) will increase the absolute value of the selected output. Counter-clockwise rotation labeled "DECR" (decrease) will decrease the absolute value of the selected output.

**OVERLOAD LIGHT**
Red LED lamp illuminates if output exceeds ±25 mA.

**POWER SWITCH**
Toggle switch, AC power on or off.

**POWER LIGHT**
Red LED lamp illuminates when AC power is on.

**INPUT/OUTPUT CONNECTORS**

**FRONT PANEL**
Voltage output (blue) and output common (black) available from two (2) gold plated brass banana jacks, 0.166" (4.22 mm) i.d., 0.56" (14.2 mm) deep, 0.75" (19.05 mm) between centers. (Order test leads, model 38-8193902)

**REAR CONNECTIONS: VOLTAGE OUTPUT**
Parallel connection with front panel jack.

**OUTPUT AND REF. COMM.**
Parallel connection with front panel jack. Transformer isolated ±300V from case ground.

**REFERENCE OUTPUT**
Low impedance ±10 Volts dc output from ±6.4V ref. diode. Drain must not exceed ±5 mA maximum. Ref. output is opposite polarity of calibrator output.

**SENSE INPUT**
Connect to remote load to compensate for cable resistance voltage drops. See diagram. This input must be tied to voltage output if not used.

**SENSE COMMON**
Return for sense inputs. Tie to output common if sense is not used.

**POWER SUPPLY**

**REQUIREMENT**

**DVC-8500A**
115 VAC, ±10%, @ 47-440 Hz, 10 watts (includes US-style, 3-prong line cord)

**DVC-8500E**
230 VAC, ±10%, @ 47-440 Hz, 10 watts (includes US-style, 3-prong line cord)

**DVC-8500J**
100 VAC, ±10%, @ 47-440 Hz, 10 watts (includes US-style, 3-prong line cord)

**GROUNDING**
Ground wire to case, but transformer-isolated ±300 VRMS from output common.

**FUSES**

**DVC-8500A**
0.15 A AGC SLO-BLO

**DVC-8500E**
0.1 A AGC SLO-BLO

**DVC-8500J**
0.15 A AGC SLO-BLO

**MECHANICAL DIMENSIONS**

**CASE**
5.59"W x 2.11"H x 5.78"D (142.0 x 53.6 x 146.8 mm)/Bench-top stand retracted)

**BEZEL**
5.86"W x 2.25"H x 0.50"THK (148.7 x 57.0 x 12.7 mm)

**SERVICING**
Bezel, front panel and mother board are removable from front while unit remains secured in panel. Bezel is lifted off by removing the two 0.050-inch (4-40) Allen hex key set screws on the bottom side edges. PCB board may be removed by loosening the PCB board guide track, retaining screws on the lowest position of the panel mounting seats.

**WEIGHT**
2.25 pounds (1.0 Kg)

**CUTOUT**
5.62" x 2.16" (142.7 x 54.8 mm)
REMOTE SENSING

Use remote sensing for applications with long leads, high currents, or voltage drop output errors. Referring to the equivalent circuit shown, note that four leads are connected to a remote load. Two of these leads carry the calibrator output while the other two leads are sense inputs to correct for voltage drop errors.

The sense inputs have approximately 8K ohms input impedance, therefore use only low resistance sense leads.

To use the sense leads, detach the shorting bars on the rear connector. Clip the sense leads directly at the load receiving calibrated voltage. Be sure to reinstall the shorting bars when not using the sense leads.

The two 470Ω resistors (shown across the calibrator outputs) prevent the output amplifier from being overdriven if the sense terminals are inadvertently left open. This protects sensitive loads from the output amplifier’s full-scale voltage.

REAR CONNECTIONS

Rear connections are dual 36-pin PC edgeboard connections on 0.1” centers. Individual connections consist of 4 gold-plated fingers on a common pad area in parallel with the 4-finger pad on the bottom. Each dual-pad (8 fingers total) is drilled and plated through for optional lug connection using 4-40 hardware. Shorting bars and 4-40 hardware are included to short sense and common connections if not used.

For rear connections, use a Viking #3VH-3611JN-5 or equivalent PC connector.
IN LABORATORY, BENCHTOP ENvironments, REcalIBRATION FOR THE DVC-8500 IS SUGGESTED EVERY 90 DAYS DUE TO NORMAL COMPONENT AGING. IN APPLICATIONS WITH TEMPERATURE CYCLING, EXCESSIVE VIBRATION OR POWER LINE VARIATIONS, RECALIBRATION MAY BE REQUIRED MORE OFTEN THAN 90 DAYS.

1. RECOMMENDED EQUIPMENT
A. Voltage reference source with known overall accuracy of ±25 ppm.
B. Calibrated Digital Voltmeter with 100 microvolt or finer resolution.
   DC common mode rejection must be 92 dB minimum (25 ppm) with
   a common mode voltage range of ±20 volts.
C. All equipment should be warmed up for at least 15 minutes before
   proceeding.
   Do not recalibrate the instrument if present calibration is within
   tolerance. A suggested recalibration wiring diagram is shown.

CHECK CALIBRATION AT THESE SETTINGS WITH THE VERNIER CONTROL AT ZERO:
+19.999V -19.999V
+10.000V -10.000V
+8.000V -8.000V
+0.000V -0.000V

Calibration is needed if:
A. Zero is off more than ±100 μV.
B. Any of the above non-zero readings is off by more than ±1 millivolt.

2. READING*
*Warning: - Readjustment procedure should be performed only if “zero reading” is off by more than 200mV and “non-zero reading” is off by more
   than 400mV. Warranty will be voided if this procedure is exercised. Proceed to Step 3 (Zero Offset Adjustment).

   The internal PC board must be partially removed for access to the calibration
   adjustments.
A. Disconnect the power plug from the AC outlet. Leave sense shor
   ting bars attached if installed. If the rear PC connector is used, remove it and
   reestablish sense connections after opening the case.
B. Loosen the two .50 inch Allen-head hex key set-screws on the
   lower side edges of the front bezel. Swing the bezel out and up from
   the bottom, lifting the bezel off the two engaging pins of the case top.
C. Loosen the PC board retaining screws blocking the board guide tracks.
   Locate the cluster of four screws on each case panel mounting seat. The
   bottom screws on both sides should be backed out to allow the PC
   board to slide out the front. Pull the PC board far enough out to expose
   the trim potentiometers behind the lever switches. Reestablish the
   sense connections by using the shorting bars or jumpers.
CAUTION! AC Line voltage will be present in the case.

3. ZERO OFFSET ADJUSTMENT
   A. Set the DVC-8500 lever switches to +00000 volts.
   B. Set the DVC-8500 Vernier control to zero.
   C. Detach any external load from the output terminals and turn on AC power.
   D. Set the DVC-8500 Common Mode Compensation (Potentiometer
      R46 shown on the PC board layout) to half rotation (centered).
      Skip this step for previously calibrated units which are within
      reasonable calibration.
   E. Adjust the ZERO Offset Control (R53) until the DVC-8500 output is
      zero volts.
   F. Switch the DVC-8500 polarity lever switch to -00000. If the output
      voltage changes, readjust R46 for a zero volt output.
   G. Reset the polarity to +00000. Repeat steps E, F and G until both +00000
      and -00000 settings both give zero outputs.

4. FULL SCALE ADJUSTMENT
A. Set the Balance Control (R27) and Full Scale Adjust Control (R39) to
   half rotation (centered). Skip this step for previously calibrated units
   which are within reasonable calibration.
B. Leave the Load Resistance at open circuit, and Vernier control
   to zero.
C. Set the DVC-8500 lever switches to +19.000.
D. Set the external Voltage Reference Source at +19.0 Volts. Connect
   the DVM between the Reference Source and the
   DVC-8500. Adjust R39 until the DVM indicates a zero null.
E. Set the DVC-8500 and the reference Source to -19.0 Volts. Readjust
   R27 to null the DVM.
F. Set the DVC-8500 and the Reference Source to +19.0 Volts and
   readjust R39 if necessary. Repeat steps E, F and G to produce +19.000V
   and -19.000V outputs from the DVC-8500 which track those of the
   Reference Source.
G. Reassemble the DVC-8500 PC board into its case, turn on the power
   and allow the instrument to warm up for 15 minutes. Recheck calibra
   tion. There should not be a significant change.
OPTIONAL FRONT PANEL MOUNTING

Standard DVC-8500 calibrators are designed for benchtop use and have a built-in stand and rubber feet. The DVC-8500 may be panel mounted using an optional mounting kit, part number 38-8193022. The user would cut a hole in their panel according to the dimensions shown in Figure 1. After removing the tilt-up stand and rubber feet, simply attach the two U-shaped straps to the rear of the DVC-8500 with the two screws provided.

ACCESSORY KIT (PART # 38-8193022)

Includes:
- Two U-Strip Case Supports
- One 36-Pin Edge Connector
- Four 18-8 Screws
- Four Lock Washers #4
- Two Flat Washers #4

Figure 1. FRONT PANEL CUTOUT (copy and use for template)
WARRANTY

Calibrators Inc. warrants all of its products are free from defects in material or workmanship under normal use and service for a period of 18 months from the date of shipment. Calibrators Inc. obligations under this warranty are limited to replacing or repairing, at our option, at our factory or facility, any of the products which within the application period after shipment be returned to us, transportation charges prepaid, and which are, after examination, disclosed to the satisfaction of Calibrators Inc. to be thus defective. The warranty does not apply to any products equipment which have been repaired or altered, except by Calibrators Inc., or which have been subjected to misuse, negligence or accident. Under no circumstances shall Calibrators Inc. liability exceed the original purchase price.

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ORDERING GUIDE

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<td>DVC-8500A</td>
<td>Calibrator, 115 VAC</td>
</tr>
<tr>
<td>DVC-8500E</td>
<td>Calibrator, 230 VAC</td>
</tr>
<tr>
<td>DVC-8500J</td>
<td>Calibrator, 100 VAC</td>
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Accessories:
Panel-Mount Kit
P/N 38-8193022
Consists of (2) U-Straps, rear PC board connector and hardware

Test Lead Set,
P/N38-8193902
Consists of (2) 3-foot, 20 gauge leads, red and black. Stackable banana plugs and retracting hook clips

PAYMENT METHODS:
Net 30 *

*C.O.D. Pending credit approval

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