

Model MV106J/MV116J

$\pm 10\text{nVdc}$ to $\pm 11\text{Vdc}$

Precision DC Voltage Standard Source



**KH KROHN-HITE
CORPORATION**

Operating Manual

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MV 106 & MV116
OPERATORS
MANUAL

Serial No. _____

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MV106 & MV116 OPERATORS MANUAL



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NOTE: Errata and addendum (if any) will appear in the back of this manual.

LIST OF DRAWINGS

Description	Drawing Number
Schematic - MV106 and MV116 Power Transformer	CA4690A
Schematic - MV106 and MV116 Power Supply	CA4692A
Schematic - MV106 Front Panel	CB4639A
Schematic - MV116 Front Panel	CB4640A
Schematic - MV106 Reference Amp	CB4643A
Schematic - MV116 Reference Amp	CB4699A
Layout - MV106 Layout	CB4691B
Layout - MV106 Calibration Adjustments	CB4693B
Layout - MV116 Layout	CB4694B
Layout - MV116 Calibration Adjustments	CB4695B
Reference Drawing	930727A

WARRANTY

The Krohn-Hite Corporation (K-H) warrants to the original purchaser each instrument manufactured by them to be free from defects in material and workmanship. This warranty is limited to servicing, repairing and/or replacing any instrument or part thereof returned to the K-H factory for that purpose in accordance with the instructions set forth below; and furthermore to repair or replace all materials, except tubes, fuses, transistors and other semiconductor devices which shall within one year of shipment to the original purchaser be returned to the K-H factory and upon examination be deemed defective.

K-H instruments may not be returned to the factory under the terms of this warranty without the prior authorization of the K-H Service Department. All instruments returned to K-H for service hereunder should be carefully packed and shipped. All transportation charges shall be paid by the purchaser.

K-H reserves the right to discontinue instruments without notice and to make changes to any instrument at any time without incurring any obligation to so modify instruments previously sold.

This warranty is expressly in lieu of all other obligations or liabilities on the part of K-H. No other person or persons is authorized to assume in the behalf of K-H any liability in the connection with the sale of its instruments.

CAUTION: The instrument you have purchased is a precision instrument manufactured under exacting standards. Any attempts to repair, modify or otherwise tamper with the instrument by anyone other than an K-H employee or authorized representative may result in this warranty becoming void.

FACTORY SERVICE REQUEST AND AUTHORIZATION

WARRANTY SERVICE

Instruments may be returned only on prior authorization. Please obtain a RETURN AUTHORIZATION NUMBER either directly from the factory or from an authorized K-H Representative. (See General Information below.)

CHARGEABLE REPAIRS

If requested, an estimate of charges will be submitted prior to repairs. We suggest that you request a RETURN AUTHORIZATION NUMBER to facilitate handling.

GENERAL INFORMATION

A) Please provide the following information in order to expedite the repair:

- 1) Indicate MODEL
- 2) Serial Number
- 3 Complete description of the trouble:

Symptoms, measurements taken, equipment used, lash-up procedures, attempted repairs, suspected location of failure and any other pertinent information.

B) Freight Charges must be PREPAID.

C) The RETURN AUTHORIZATION NUMBER should be noted on your documentation.

D) See Packing Suggestions - next page.

PACKING SUGGESTION

Although your K-H instrument is built for laboratory, production environment and some field environment, it is NOT ruggedized. Therefore...

1. Be sure the carton is **STRONG** enough to carry the weight of the instrument, e.g. use double wall corrugation.
2. Be sure the carton is **LARGE** enough to allow for sufficient packing material, e.g., at least 2 inches all around the instrument. The packing material should be able to be compressed and then return to its approximate original volume.
3. For better handling, the shipment should always be by **AIR FREIGHT** (expect for short distances). You might use either UPS "blue label" or common air freight carrier, second day air.

Please do not bounce it across the country in a truck. It may not hurt it, but it certainly is not going to do a laboratory instrument much good.

4. **QUESTIONS?** Just contact us. We will be pleased to help you.

SECTION I

1.0.0 DESCRIPTION AND APPLICATIONS

1.1.0 General Description and Applications

- 1.1.1 The precision DC Voltage Standard Source is a highly versatile reference source, designed to meet the needs of computer systems, production line testing, automated calibration, and standards laboratories.
- 1.1.2 The instruments have a specified accuracy, and are traceable through a bank of saturated standard cells to the National Institute of Standards and Technology.
- 1.1.3 Depending on the model of the instrument, resolutions of 0.1 ppm are attainable.
- 1.1.4 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 where ever a stable source is required.
- 1.1.5 There are no adjustments to make during normal operation; the trims are made during calibration and are described under the calibration procedure.
- 1.1.6 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.
- 1.1.7 The instrument is overload and short-circuit proof, and is fully operational in adverse environmental conditions.
- 1.1.8 The Standard Source will drive a short circuit indefinitely without damage to the instrument, and will recover to rated specifications in less than 2 minutes.
- 1.1.9 When used with a voltmeter, the source becomes a potentiometer for measuring dc voltages.

1.2.0 Output Specifications:

MODEL & SERIES	MV106J	MV116J
OUTPUT: 10 V RANGE 1 V RANGE 100 mV RANGE 10 mV RANGE RESOLUTION: (1ppm) 10 V RANGE 1 V RANGE 100 mV RANGE 10 mV RANGE	± 11.111 10 Vdc -- ± 111.111 0 mVdc ± 11.111 10 mVdc 10 μ V -- 0.1 μ V 0.01 μ V	± 11.111 10 Vdc ± 1.111 110 Vdc ± 111.111 0 mVdc -- 10 μ V 1 μ V 0.1 μ V --
OUTPUT ACCURACY: Calibration Accuracy: $\pm(0.003\%$ of setting +0.0005% of range +2 μ V)		
STABILITY: *(non-additive) 1 hr. 8 hrs. 1 yr.	$\pm(0.0005\%$ of range +2 μ V) $\pm(0.001\%$ of range +2 μ V) $\pm(0.0025\%$ of range +2 μ V)	
RIPPLE & NOISE: *(non-additive) rms, 0.08 Hz to 100 kHz 10 V Range 1 V Range 100 mV Range 10 mV Range	50 μ V -- 1 μ V 0.5 μ V	50 μ V 40 μ V 1 μ V --
OUTPUT CURRENT: (with remote sensing) 10V Range See: Output 1 V Range Impedance 100 mV Range 10 mV Range	50 mA -- into $R_L > 100$ K Ω into $R_L > 100$ K Ω	50 mA 50 mA into $R_L > 100$ K Ω --
LINE & LOAD REGULATION: *(non-additive)	$\pm 0.0005\%$	$\pm 0.0005\%$
OUTPUT IMPEDANCE: All Z_{out} are fixed constants 10 V Range 1 V Range 100 mV Range 10 mV Range	100 $\mu\Omega$ -- 3 Ω 3 Ω	100 $\mu\Omega$ 100 $\mu\Omega$ 3 Ω --

1.3.0 General Specifications

1.3.1 Warm Up Time: 30 seconds (min); 60 minutes (max)

1.3.2 Temperatures:

Calibration	23 ° C ±1 ° C
Ambient	20 ° C to 30 ° C
Operating Limit	-10 ° C to 50 ° C
Storage	-40 ° C to 85 ° C

1.3.3 Temperature Coefficient:

Ambient	±0.0005%/° C
Operating Limit	±0.001%/° C

1.3.4 Power Requirements:

Selectable:	115 or 220 Vac, ±10%
Line Frequency:	50 Hz to 400 Hz
Power:	30 Watts

1.3.5 Settling Time:

Step Change:	300 mS
Range Change:	700 mS

1.3.6 Common Mode Rejection:

120 db, dc to 400 Hz

1.3.7 Isolation:

Either terminal may be floated 500 Vdc with respect to chassis ground.

1.3.8 Dimensions:

5.22 H x 17 W x 10.9 D inches 133 H x 432 W x 277 D mm

1.3.9 Weight:

13 lbs.; 6.0 kg (net)
17 LBS. 7.7 kg (Shipping Weight)

1.3.10 Protection: Short circuit and overload protection. Automatic recovery.

1.3.11 Circuit Condition Indicator:
Front panel indicator for short circuit, overload, over-voltage condition low line voltage or malfunction.

1.3.12 Documentation:

- A) Certification of Compliance traceability to U. S. National Institute of Standards and Technology.
- B) Calibration laboratory certification.
- C) Operators' manual including mechanical layout and schematics.

SECTION II

2.0.0 INSTALLATION

2.1.0 Mounting

2.1.1 Krohn-Hite Corporation instruments may be obtained in several case configurations.

2.1.2 Portable units are rugged, light weight, completely enclosed in a dust tight case supplied with a carrying handle.

2.1.3 Rack mountable instruments are designed primarily for mounting in the standard 19" relay rack. When installing in the rack, it is recommended that nylon inserts be placed between the cup washer and the front panel to prevent scratching of the paint.

2.2.0 AC Power Input Considerations

2.2.1 All instruments are supplied with a standard three (3) prong polarized plug and power cable.

2.2.2 A multi-tap transformer is provided, however it is set to 115 Vac or 230 Vac via the slide switch on the internal chassis. Other voltages can be accommodated by making the proper selections of the transformer taps.

SECTION III

3.0.0 OPERATION OF INSTRUMENT

3.1.0 Front Panel Controls

3.1.1 Power Switch: Rocker off-on, line power.

3.1.2 Polarity Switch: This switch has 3 settings. With the polarity switch on "+" the red output terminal is positive with respect to the black terminal. On "-" the red output terminal is negative with respect to the black terminal. On "0" a short circuit exists between the red and black output terminals.

3.1.3 Decade Switches: The decade switches are used to select the desired output, relative to its position from the decimal point light.

3.1.4 Range Switch: This is a three position switch which selects one of the ranges.

3.2.0 Front Panel Indicators

3.2.1 Overload lamp: This lamp will be on during initial power on. It should turn off after a few seconds. This lamp is used to indicate failure in the chopper stage. Refer to section 4.7.0 of the manual.

3.3.0 Output Terminals

3.3.1 Output and Sense Terminals: Four terminals are provided for output and sense. The red terminals represent the polarity with respect to the black as the common terminals. The red terminals are indicated by the polarity switch.

NOTICE: THE SENSING CIRCUIT MUST BE COMPLETE!

Please refer to Drawing #930727, in the rear of this manual, for the two-wire and four-wire connections.

3.3.2 If a high impedance or a low current load is connected, the output and sense terminals may be shorted with the sense links (provided) e.g., plus output to plus sense.

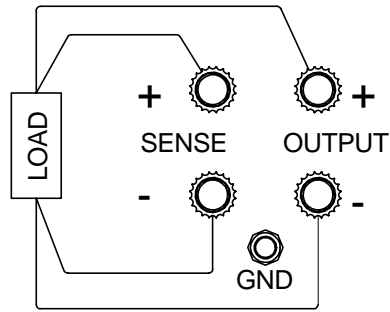
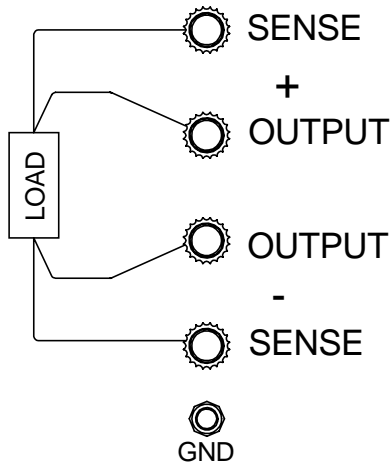
3.3.3 If drawing current is desired, the remote sensing capability should be used. The advantage of remote sense is that the output and the 2 sense lines are brought directly to the load, thus eliminating the IR drop of the output lines. The metal terminal is case ground.

3.4.0 Warm-up Time

3.4.1 It is recommended that the instrument is given a one-hour warmup time before use.

SENSE CONNECTIONS

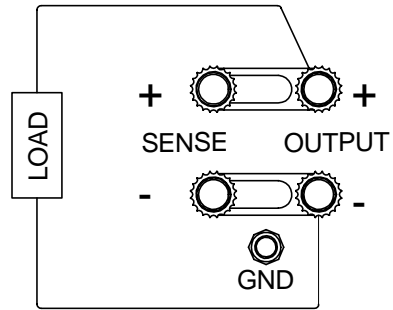
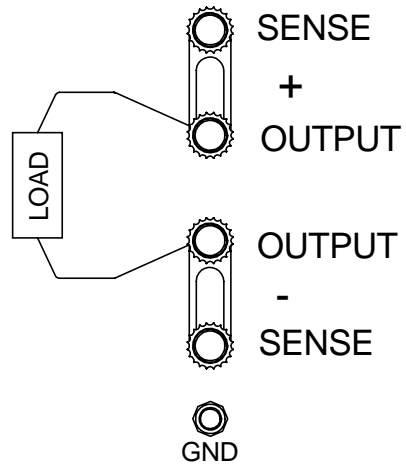
HIGH CURRENT LOAD



[Sense Links Removed]

FIG 1

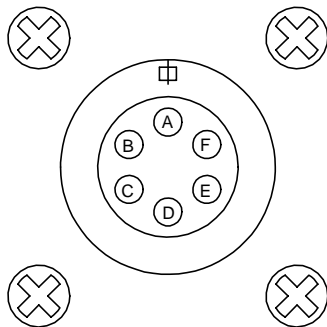
LIGHT LOAD



[Sense Links Installed]

FIG 2

OUTPUT CONNECTOR PIN FUNCTIONS



- PIN A Chassis Ground
- PIN B + Output
- PIN C - Output
- Pin D Not Used
- Pin E - Sense
- Pin F + Sense

FIG 3