

Model 4032

AC Voltage Reference/Calibrator



**KH KROHN-HITE
CORPORATION**

Operating Manual

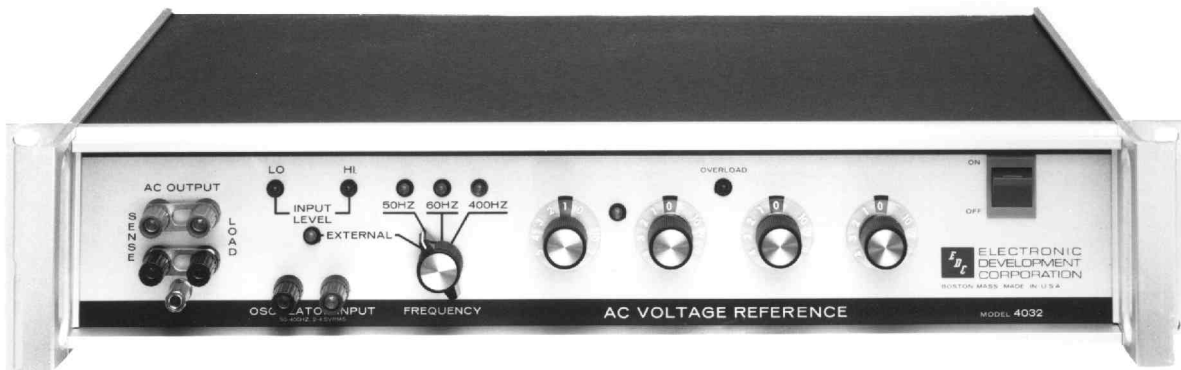
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MODEL 4032
OPERATORS
MANUAL

Serial No. _____

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MODEL 4032 OPERATORS MANUAL



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

4032 MANUAL

LIST OF DRAWINGS

DESCRIPTION

DRAWING #

Reference Drawing

930727A

LIMITED WARRANTY

The Krohn-Hite Corporation 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 Krohn-Hite 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 Krohn-Hite factory and upon examination be deemed defective.

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

Krohn-Hite 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 Krohn-Hite. No other person or persons is authorized to assume in the behalf of Krohn-Hite 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 Krohn-Hite 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 Krohn-Hite 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 Krohn-Hite 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** (except 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 SPECIFICATIONS

1.1.0 General Description

- 1.1.1 The Model 4032 is an inexpensive, highly versatile Reference Voltage Source, designed to meet the needs of computer systems and standards laboratories. The unit has a specified absolute voltage accuracy and is laboratory calibrated against an AC measuring system having traceability accuracy to a precision DC Standard having a calibration of 0.002%. The calibration of this unit is traceable to the National Institute of Standards and Technology through reference standards maintained at Krohn-Hite Corporation.
- 1.1.2 Frequency calibration is obtained by calibrating against a standard having a resolution of 0.1 ppm.
- 1.1.3 The instrument is a highly accurate Voltage Reference which can be used in standard laboratories for calibration of meters, scopes, and other AC voltage measuring devices. Calibration of amplifiers is simplified by eliminating the need of input monitoring devices which makes this instrument practical for production testing of input-output devices.
- 1.1.4 The unit is short circuit protected. An automatic over-load protection circuit is activated in the event of a short circuit. Removal of the short restores normal operation.
- 1.1.5 The unit has provisions for an external oscillator input. This permits the use of a frequency source which has insufficient output to drive the device to be calibrated, but having the desired frequency characteristics to be used in the calibration. External oscillators must be capable of delivering 10 volts rms into a 100 k load at the external input terminals of the AC Voltage Standard.

1.2.0 Applications

1.2.1 One of the major applications of the Model 4032 is in device calibration. Constant monitoring of the Standard is not required. This eliminates several additional pieces of equipment formerly required in AC calibration set ups. The reduction of calibration source errors permits calibration to more precise, and in many cases, more realistic specifications.

1.2.2 The instrument is an easy to use, inexpensive calibrator for meters. It is an excellent reference for A/D converters, amplifiers, rms converters, AC gain-control circuits and oscillators.

It is ideally suited as the AC Voltage input for transconductance amplifiers such as Krohn-Hite Corporation models PCS-2B, 3200 and 3210.

1.2.3 The light weight of the unit makes it a desirable laboratory instrument, as it may be hand carried from station to station. The only set up required of the operator, is to select and dial the frequency and voltage outputs desired.

1.3.0 Electrical Specifications

1.3.1 Amplitude Output Range (rms):
10 Vac.

1.3.2 Setability:
1.00 to 11.11 Vac.

1.3.3 Resolution:
1 mV steps

1.3.4 Voltage Accuracy:
Limit of Error method*: All peripheral specifications, i.e.; error for line and load changes, temperature change, drift and noise are listed for information and are non-additive to the accuracy statement.

$\pm(0.06\% \text{ of setting} + 20 \text{ microvolts})$

1.3.5 Voltage Stability:
24 hours: $\pm 0.007\%$
1 month: $\pm 0.01\%$
6 months: $\pm 0.015\%$

1.3.6 Compliance Current (loading):
5mA

1.3.7 Load Regulation (no load to full load):
 $\pm 0.005 \%$

1.3.8 Line Regulation:
 $\pm 0.005 \%$

1.3.9 Frequency Range:
45Hz to 1KHz

Internal: Three internal frequencies factory installed:
50 Hz, 60 Hz, and 400 Hz.

External: This instrument accepts frequencies within 45 Hz to 1 kHz from an external oscillator. Input amplitude should be between 8V and 11V RMS which may be monitored by the "input level" lights.

1.3.10 Harmonic Distortion:
50 Hz - 0.27%
60 Hz - 0.18%
400 Hz - 0.03%

1.3.11 Frequency accuracy:
1.0%

1.3.12 Frequency stability:
 $\pm 0.05\%$ (8 hours)

1.4.0 General Specifications

1.4.1 Power Requirement (selectable):

115 or 220 Vac $\pm 10\%$; 50/60 Hz; 30 W

1.4.2 Temperature:

Calibration	$23^{\circ}\text{C} \pm 1^{\circ}\text{C}$
Nominal Operating	20°C to 30°C
Safe Operation	0°C to 55°C
Storage	-20°C to 60°C
Temperature Coefficient	$0.002\% / ^{\circ}\text{C}$

*Temperature coefficient is an adder to uncertainty specification that does not apply unless operating more than $\pm 5^{\circ}\text{C}$ from the calibration temperature.

1.4.3 Dimensions: Rack and bench mountable.

Height 3.5 x Width 19.0 x Depth 12 inches; (8.9 x 48.3 x 30.5 cm.)

1.4.4 Weight:

8 lbs; 3.63 Kg. Shipping weight: 12 lbs; 5.4 Kg.

1.4.5 Warranty (parts and labor):

One Year.

1.4.6 Calibration Cycle:

One Year.

1.4.7 Certification:

A Certificate of Compliance traceable to the U.S. National Institute of Standards and Technology is supplied.

SECTION II

2.0.0 INSTALLATION

2.1.0 Mounting

- 2.1.1 The 4032 is designed for mounting in a standard 19" wide relay rack. When installing in a rack, it is recommended that nylon washers be placed under the mounting screws to prevent scratching of the unit. Feet and tilt bales are also supplied for bench mounting.
- 2.1.2 All units are supplied with handles and weigh only 8 pounds. The overall size is 3.5" high, 19" wide and 12" deep.
- 2.1.3 Power requirements are 105 - 125 Vac, or 210 - 250 Vac; 50 Hz or 60 Hz.
- 2.1.4 The unit is designed to be easily transported from one lab to another and to be in operation in less than one minute from turn on time.
- 2.1.5 This unit is self-contained and needs no further unpacking other than connecting the power.
- 2.1.6 A two position slide switch is mounted on the rear panel which is used to set the line voltage requirements to 115 Vac or 230 Vac. Make sure this switch is in the proper position for your line power prior to turning the instrument on for the first time.

2.2.0 Preventive Maintenance

2.2.1 The decade switches and frequency switch are lubricated at the factory. It is recommended that these switches are not serviced during the first year of operation.

2.2.2 **NOTE:** Over-zealous, arbitrary, or unnecessary cleaning may damage the contacts, which should be maintained below 10 milliohms.

CLEANING: DO NOT ARBITRARILY CLEAN THE SWITCHES

2.2.3 In many instances, lubrication may be all that is required.

RELUBRICATE AFTER CLEANING!

LUBRICATING - DO NOT USE OIL!!!

***THE USE OF A CLEANER WITHOUT LUBRICATING WILL SHORTEN
THE LIFE OF THE SWITCHES TO ABOUT TWO MONTHS.***

2.2.4 Switch Contacts cleaner: Krohn-Hite Corporation recommends that the switches be cleaned with CAIG LABORATORIES DeoxIT D5.

2.2.5 Switch Contacts lubrication: Krohn-Hite Corporation recommends that the switches be coated with CAIG LABORATORIES PreservIT P5.

2.2.6 Apply a small amount of the above product carefully to the switch contacts. Rotate switch several times to disperse the lubricant.

SECTION III

3.0.0 OPERATION OF THE INSTRUMENT

3.1.0 Quick Start

- 3.1.1 Set the 110/220 switch on the rear panel. The power cord of the standard source should be plugged into any convenient outlet of 115 or 220 Vac, 50-60 Hz.
- 3.1.2 The level lights on the front panel will indicate the operation of an external oscillators if one is used. If the internal oscillator is to be used, frequency selection should be made at this time.
- 3.1.3 The desired output voltage is now selected by the decade switches. And now the load may be connected to the output terminals.
- 3.1.4 If drawing current is desired, the remote sense capability should be used. The advantage of remote sense is that you have four wire output and the sense lines are brought directly to the load, thus eliminating the IR drop of the output lines.

Note: When the remote sense capability is used the sense links must be removed.

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.**

- 3.1.5 There are no adjustments made during normal operation. The trims are made during calibration and are described under the calibration procedure.
- 3.1.6 The instrument is overload and short-circuit proof. It is fully operational in normal environmental conditions.

3.2.0 Front Panel Controls

- 3.2.1 **Power Switch:**
Push on Push off line power with indicator.
- 3.2.2 **Frequency Select Switch:**
The frequency select switch is used to select one of three internal frequencies. This switch also provides a means to select an externally applied oscillator.
- 3.2.3 **Decade Switches:**
The decade switches are used to select the desired output voltage. The value of each switch is referenced to the decimal lamp. The MSD cannot be dialed to zero. It is possible to resolve the output in 1 millivolt steps.

3.2.4 Voltage Output and Sense Terminals:

4 terminals are provided for output and sense. If a high impedance or a low current load is connected, the output and sense terminals may be shorted with the sense links (provided).

3.2.5 External oscillator terminals:

2 terminals are provided for connection to an external oscillator. The oscillator should be able to supply eight to ten Volts RMS into a 200K load.

3.3.0 Front Panel Indicators

3.3.1 Level LED's:

The level LED's are used to set the input level to the 4032 if an external oscillator is used. The desired level is approximately 8-11 volts RMS. If the input level is too hi the "HI" LED will be on and the input level must be decreased. If the input level is to low, the "LO" LED will be on and the input level must be increased.

3.3.2 Overload Indicator:

The overload indicator will indicate any or all of the following conditions:

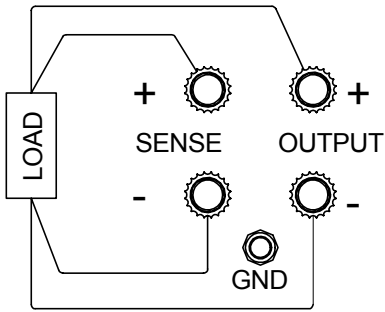
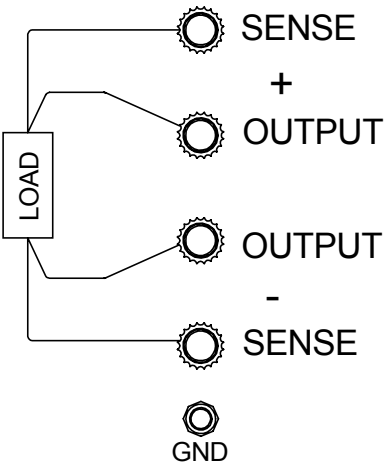
- a. Load is drawing more than rated current
- b. Low line voltage
- c. Short Circuit
- d. Sense loops not complete
- e. Frequency switch on external, with no voltage on external oscillator terminals.

3.3.3 Decimal point lamp:

With the unit power switch in the on position, the decimal point lamp will light. The decimal point lamp is positioned between the MSD switch and the 2SD switch.

SENSE CONNECTIONS

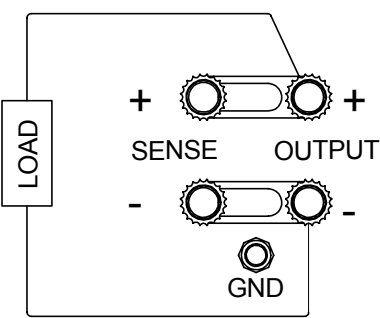
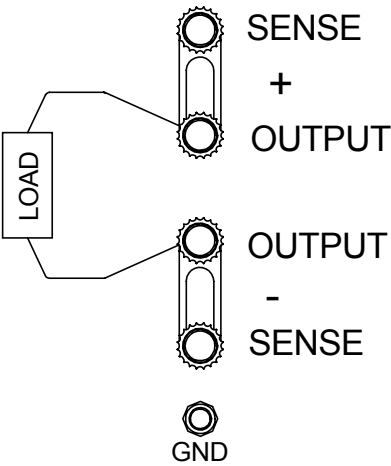
HIGH CURRENT LOAD



[Sense Links
Removed]

FIG 1

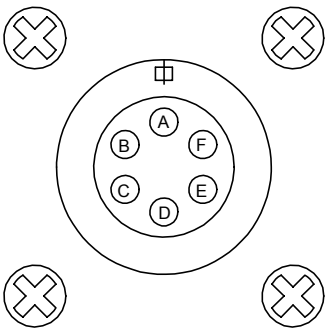
LIGHT LOAD



[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