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INSTRUCTION AND OPERATING MANUAL

FOR

MODEL 452A

CAPACITIVE VOLTAGE
DIVIDER

HEWLETT-PACKARD COMPANY
395 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

INSTRUCTIONS

MODEL 452A

CAPACITIVE VOLTAGE DIVIDER

INTRODUCTORY

The -hp- Model 452A Capacitive Voltage Divider provides a voltage division of 1000-to-1 and is designed to be used with the -hp- Model 400A, 400C or 410A*VTVM. Voltages as high as 25,000 volts rms can be measured with the Divider. When used with the Model 410A*VTVM, the Divider will permit the measurement of voltages over the range from 25 cps to 20 megacycles. When used with the Model 400A or 400C VTVM, the Divider will permit the measurement of voltages over a range from 25 cps to the upper frequency limit of the voltmeter.

A nominal 15 micromicrofarad vacuum capacitor is used as the high-voltage capacitor. In series with this capacitor are relatively low-voltage capacitors totaling approximately 15,000 mmf. Thus, the input capacity of the divider is only approximately 15 mmf.

UNPACKING

The Model 452A is packaged in two packages. One package contains the metal base of the Divider and the second contains the vacuum capacitor. These two packages should be unwrapped carefully and inspected for possible damage in shipment. If any shipping damage is discovered, follow the procedure set out in the Warranty at the back of this Manual.

PART^A

The vacuum capacitor fits into the hole in the top of the base. The set screw wrench for tightening the #8 set screw that holds the capacitor in place is located on the inside of the plate on the bottom of the base for the Divider. The base plate can be removed by removing the screws that hold the plate in place.

If two or more Dividers are ordered at one time, make certain that the proper vacuum capacitor is assembled with its proper base, for the reason that the vacuum capacitors are not necessarily interchangeable without readjusting the capacity values in the bases of the Divider.

SAFETY

WHEN MEASURING THE HIGH VOLTAGES OF WHICH THE DIVIDER IS CAPABLE, SAFETY OF PERSONNEL AND EQUIPMENT IS IMPORTANT. THE SAFETY WARNINGS IN THIS MANUAL SHOULD BE READ THOROUGHLY AND FOLLOWED CAREFULLY IN ORDER TO PRECLUDE THE POSSIBILITY OF FATAL ACCIDENTS.

* Also Model 410B

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GROUNDING

The Divider is designed to be operated with the common (lower) terminal grounded. When measuring high voltages, the common terminal should be grounded through a large conductor having negligible impedance. Failure to heed this precaution can cause the base of the Divider and the VTVM itself to be at a high potential and can further cause the voltmeter to arc to the power line feeding the voltmeter, thus connecting the Divider to a power line.

CORONA

Any conductor that is connected to the high voltage terminal at the top of the Divider should be wrapped smoothly around the terminal with no sharp edges projecting. This precaution is intended as a safeguard against corona discharge which can affect the accuracy of the readings by loading the voltage generator and can reduce the breakdown voltage of the Divider.

FREQUENCY RANGE

The Divider itself can be used to measure voltages over a frequency range from 25 cps to 20 megacycles. However, the useable range of the instrument is ordinarily determined by the voltmeter that is used. The -hp- Model 410A* will permit the use of the Divider over its whole rated range. The -hp- Model 400A and 400C voltmeters permit measurements from 25 cps to 1 mc and 2 mc respectively.

MAXIMUM VOLTAGE

At low frequencies the Divider can be used to measure voltages up to 25,000 volts rms. However, at higher frequencies the maximum voltage that can be applied to the Divider is reduced, owing to the current limitation of the capacitors. The maximum voltage that can be applied to the Divider at various frequencies is given in the following table:

<u>Frequency</u>	<u>Maximum Voltage</u>
60 cps	25 kilovolts
100 cps	22 kilovolts
1 mcs	20 kilovolts
10 mcs	15 kilovolts
20 mcs	7 kilovolts

SHIELDING

When making high voltage measurements, it is desirable to make certain that voltage pick-up within the voltmeter will not cause an erroneous reading. Pick-up is to be expected more in the Model 410A* than in the Models 400A or 400C because of the very high impedance levels in the Model 410A.* *Also Model 410B

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The presence of voltage pick-up can be determined by connecting the voltage to be measured to the Divider without connecting the voltmeter to the Divider. (All safety precautions given under "Operation" below should be followed). The voltmeter terminals should be shielded with a shielded type plug.

If an appreciable reading is obtained on the voltmeter under these conditions, an error will occur in any measurements that are made. In order to avoid such error, it is necessary to ground the voltmeter with a good ground. If grounding does not correct the trouble, it is desirable to isolate the voltmeter as well as possible. If the voltage generator is a high frequency generator, shortening the power cord or placing rf chokes in the power cord for the voltmeter usually will reduce the pickup.

ACCURACY

The Divider is adjusted to be accurate within 1 percent. However, at the higher frequencies the voltmeter used will often introduce an error because of the loading effect of the voltmeter on the Divider.

When using the Model 400C, 410A, or 410B, the Divider is accurate within 3 percent at frequencies down to 25 cps. When using the Model 400A, the voltage from the Divider is approximately 5 percent low at 40 cps and 10 percent low at 25 cps.

BREAKDOWN VOLTAGE

The gap between the high voltage terminal and the breakdown terminal has been adjusted so that an arc will occur at approximately 25 kilo volts rms.

OPERATION

CAUTION : Never work directly on high voltage equipment unless both conductors are shorted together as described below.

1. Connect Divider to voltmeter by means of shielded plug and cord attached to Divider. Make certain that ground terminal of shielded plug is connected to ground (lower) terminal of voltmeter. If the Model 410A VTVM is used, the probe should be placed on the holder on the back of the compartment door of the 410A. The Divider should be then connected to the terminals on the front of the compartment door. Connect the probe and ground clip to the shielded plug terminals on the Divider when using the Model 410B.
2. Set the range switch on voltmeter to high range.
3. Solidly ground the binding post projecting from the lower part of the Divider.
4. Connect ground or neutral side of voltage to be measured to binding post projecting from the lower part of the Divider.

5. MAKE CERTAIN THAT VOLTAGE GENERATOR IS OFF AND THAT ANY CAPACITORS ARE DISCHARGED.

6. Connect a shorting strap from ground to high voltage conductor. It is recommended that the shorting strap be permanently connected to ground and that the strap be of the type in which an insulator at least 2 feet long is used to move the "hot" side of the strap.

7. Connect high voltage conductor to be measured to terminal on top of Divider.

8. Remove shorting strap from high voltage conductor.

9. Apply voltage to be measured.

10. Reset voltmeter range switch if necessary to obtain readable meter deflection. BE VERY CAREFUL NOT TO TOUCH ACCIDENTLY THE DIVIDER.

11. Multiply reading obtained on voltmeter by 1000 to obtain voltage applied to Divider.

12. After measurement has been made, turn off voltage generator.

13. Wait several minutes so that any capacitors (including Divider) in circuit can bleed off.

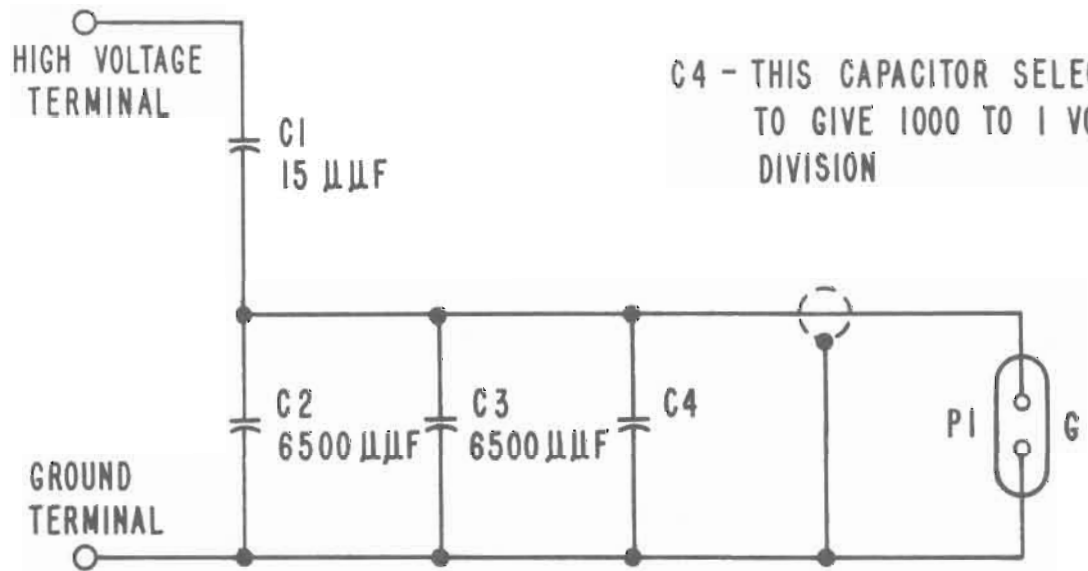
14. USE GROUNDING STRAP TO DISCHARGE DIVIDER. CONNECT STRAP TO HIGH VOLTAGE TERMINAL OR CONDUCTOR. EXERCISE AS MUCH CAUTION WHEN DISCONNECTING DIVIDER AS WHEN CONNECTING.

15. Remove high voltage conductor from high voltage terminal of Divider.

REPAIR AND CALIBRATION

Should any of the capacitors in the Divider fail, the replacement capacitor must be selected to give the proper voltage division ratio. This can be done most easily by applying a 30-volt rms voltage of approximately 1000 cps in frequency to the Divider. The capacitors should then be selected so that a 1000:1 division is obtained as read on a voltmeter such as the -hp- Model 400A or 400C.

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C4 - THIS CAPACITOR SELECTED TO GIVE 1000 TO 1 VOLTAGE DIVISION

SCHEMATIC DIAGRAM OF MODEL 452 A

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number, type number and serial number when referring to this instrument for any reason.

WARRANTY

Hewlett-Packard Company warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof (except tubes, fuses and batteries). This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty, and include the model number, type number and serial number. On receipt of this information, we will give you service instructions or shipping data.
2. On receipt of shipping instructions, forward the instrument prepaid, and repairs will be made at the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

SHIPPING

All shipments of Hewlett-Packard instruments should be made via Railway Express. The instruments should be packed in a wooden box and surrounded by two to three inches of excelsior or similar shock-absorbing material.

DO NOT HESITATE TO CALL ON US

HEWLETT-PACKARD COMPANY

Laboratory Instruments for Speed and Accuracy

395 PAGE MILL ROAD



PALO ALTO, CALIF.



LIST OF MANUFACTURERS CODE LETTERS
FOR REPLACEABLE PARTS TABLE

<u>Code Letter</u>	<u>Manufacturer</u>
A	Aerovox Corp.
B	Allen-Bradley Co.
C	Amperite Co.
D	Arrow, Hart and Hegeman
E	Bussman Manufacturing Co.
F	Carborundum Co.
G	Centralab
H	Cinch Manufacturing Co.
I	Clarostat Manufacturing Co.
J	Cornell Dubilier Electric Co.
K	Electrical Reactance Co.
L	Erie Resistor Corp.
M	Federal Telephone and Radio Corp.
N	General Electric Co.
O	General Electric Supply Corp.
P	Girard-Hopkins
HP	Hewlett-Packard
Q	Industrial Products Co.
R	International Resistance Co.
S	Lectrohm, Inc.
T	Littelfuse, Inc.
U	Maguire Industries, Inc.
V	Micamold Radio Corp.
W	Oak Mfg. Co.
X	P. R. Mallory Co., Inc.
Y	Radio Corp. of America
Z	Sangamo Electric Co.
AA	Sarkes Tarzian
BB	Signal Indicator Co.
CC	Sprague Electric Co.
DD	Stackpole Carbon Co.
EE	Sylvania Electric Products, Inc.
FF	Western Electric Co.
GG	Wilkor Products, Inc.
HH	Amphenol
II	Dial Light Co. of America
JJ	Leecraft Manufacturing Co.
ZZ	Any tube having RMA standard characteristics