SPECIFICATIONS

MODEL:	5321 Portable two section DC HYPOT.
INPUT:	115 volts, 60 Hz, single phase, 7 amperes, through five foot, three conductor line cord with standard three-prong grounding type plug.
OUTPUT VOLTS:	0-100 kilovolts DC continuously adjustable from zero.
OUTPUT SHORTING:	Mechanically assisted gravity operated device automatically shorts the output when H.V. is off.
KILOVOLTMETER RANGES:	0-25/50/100 kilovolts DC.
ELECTRONIC CIRCUIT BREAKER:	Continuously adjustable for high voltage shut off in two ranges, LO - 10 to 1,000 microamperes, HI - 1,000 to 5,000 microamperes.
CONTROL SECTION TERMINATION:	Terminated in a female connector for control cable.
HIGH VOLTAGE SECTION TERMINATION:	Terminated in disconnectable shielded high voltage cable, return terminals and male connector for control cable.
ELECTRONIC CURRENT METER RANGES:	0-5/50/500/5,000 microamperes DC.

STARTING WITH SERIAL No. 62

Q-1929
December 17, 1968

GENERAL FEATURES - CONTROL SECTION

LINE CORD

Three conductor input power cable terminated in either a three-prong grounding type plug (if adaptor is used connect the ground lead to earth ground), or two-prong plug with ground lead and clip.

CONTROL CABLE

Ten conductor control cable terminated in a male connector (for connection to control section) and a female connector (for connection to high voltage section). This cable provides only control signals necessary for operation of the two sections and does not carry any high voltage.

CAUTION: DO NOT connect LINE CORD until CONTROL CABLE is connected to BOTH sections. DO NOT disconnect CONTROL CABLE until KILOVOLTMETER reads zero and LINE cord is disconnected.

CONTROL CABLE CONNECTOR

For connecting the CONTROL CABLE to the CONTROL SECTION.

POWER SWITCH

Makes or breaks all primary power (line voltage) to the instrument.

POWER INDICATOR

Clear lens lamp indicates line power is available to the high voltage control circuit and any internal assemblies.

PRIMARY FUSE OR CIRCUIT BREAKER

The AC input line is protected against overloads by either a fuse of circuit breaker. If excessive current flows in primary circuit the fuse or circuit breaker will open. The breaker may be reset by pressing in on the button.

Should the fuse or breaker ever open, the cause should be investigated.

HIGH VOLTAGE SWITCH

This three position lever switch, operating in the low voltage input line, controls the energizing or de-energizing of the high voltage control circuit. With this switch in the OFF position, the high voltage control circuit is de-energized and no high voltage is available at the output termination, regardless of the position of the VOLTAGE control. In the CONTINUOUS position with the VOLTAGE control at zero volts, the high voltage control circuit will be energized and the lever switch will remain in this position until returned to center OFF by the operator. In the MOMENTARY position with the VOLTAGE control at zero volts, the high voltage control circuit will be energized only as long as the operator holds the lever switch in this position.

HIGH VOLTAGE INDICATOR

Red lens lamp indicates the high voltage control circuit is energized.

KILOVOLT METER

This meter is connected directly across the output terminals, thus indicating the true terminal voltage being applied to the test item, and is therefore independent of internal regulation.

KILOVOLTS SELECTOR SWITCH

This switch provides for selecting KILOVOLTMETER ranges. The VOLTAGE control travel will be approximately the ratio of the selected range to the maximum range.

ELECTRONIC CURRENT METER AND CALIBRATION

Indicates the leakage current in the METERED RETURN side of the output circuit. This current meter is driven by a high gain balanced bridge amplifier which is powered by an independent DC power supply. The amplifier is electronically protected against burnout should it be accidentally overloaded.

Recalibration is necessary whenever the electron tube, meter or any component part of the electronic current metering circuit is replaced. If the tube is replaced the instrument power should be left ON for at least 24 hours to age the tube before proceeding with the calibration. The procedure for this calibration consists of the following steps:

1. Remove LINE cord from power source.

ELECTRONIC CURRENT METER AND CALIBRATION (Continued)

2. Remove the four (4) corner screws from the two inch wide panel at the top of the CONTROL section or the control panel on units without the small panel.

3. Lift panel and amplifier assembly from case and replace the defective component. On single panel units the VTCB is mounted to the chassis and the VTUA is mounted to the microammeter.

4. Replace panel.

5. Turn POWER, HIGH VOLTAGE, and MICROAMMETER DAMPING switches to OFF position and rotate VOLTAGE control to full counter-clockwise position.

6. Set mechanical zero of both the KILOVOLTMETER and MICROAMMETER.

7. Connect the CONTROL CABLE to the CONTROL and HIGH VOLTAGE sections and connect the LINE cord to a power source as indicated on the nameplate and specifications sheet.

8. Turn the POWER switch ON and allow the instrument to warm-up for 90 seconds.

9. Set OUTPUT CURRENT switch to HI and OUTPUT CURRENT control to full clockwise position (MAX.).

10. Place the KILOVOLTS selector switch on the lowest range.

11. Place the MICROAMPERES switch in the next to lowest range.

12. A resistive load with 1% tolerance is required for accurate calibration of the current meter. The resistance of the load is calculated by R = E/I, where E is the full scale voltage on the lowest KILOVOLT range. "I" is the full scale current on the next to the lowest MICROAMPERES range. The wattage rating of the load should be at least twice the calculated value E x I. Connect this load between the HIGH VOLTAGE output and METERED RETURN. Place the GROUND switch in the BYPASS RETURN position.

13. The two (2) potentiometers that control calibration are located under the two white snap plugs in the two inch wide panel. The ZERO ADJUST is on the right and the FULL SCALE is on the left or to the right of the microammeter as FULL SCALE is the upper and ZERO the lower.

14. Turn the ZERO ADJUST until the MICROAMMETER pointer rests at ZERO.

15. Place the HIGH VOLTAGE lever switch in the CONTINUOUS position.

16. Increase the output voltage to the value of E chosen in step 12 and turn the FULL SCALE ADJ. until the MICROAMMETER pointer rests at FULL SCALE. Decrease voltage to zero.

17. The current meter is now calibrated, replace the snap plugs.

MICROAMPERES SELECTOR SWITCH

Provides for selecting MICROAMMETER ranges. The highest range facilitates metering of charging current and the intermediate or lower ranges provide easier and more accurate indication of lower current.

MICROAMMETER DAMPING SWITCH

When testing highly capacitive loads the MICROAMMETER may exhibit a tendency to fluctuate with line voltage transients. Switching this switch ON will minimize the fluctuation and indicate an average reading. This switch should normally be in the OFF position.

VOLTAGE CONTROL

A continuously variable VOLTAGE control gives the operator smooth control of the output voltage from zero to maximum. This VOLTAGE control is equipped with a zero return interlock switch, making it necessary for the control to be at its zero output volts position before the high voltage control circuit can be energized. This prevents the sudden application of high voltage to the item under test.

OUTPUT CURRENT SELECTOR SWITCH AND CONTROL

This instrument is equipped with an electronic circuit breaker, which allows the operator to select any desired output current from minimum to maximum microamps. Any time this selected output current is exceeded, when tests are being made, the output high voltage will be de-energized and it will be necessary to return the VOLTAGE control to its zero volts position, before high voltage can be reapplied. During the warm-up high voltage cannot be energized.

This switch has two positions HI and LO. It allows the operator to select two ranges of adjustment (as specified on SPECIFICATIONS sheet) for the electronic circuit breaker.

This control is used in conjunction with the breaker range selector switch. It is continuously adjustable from the minimum to the maximum current of either breaker range.

To adjust the electronic circuit breaker, it is necessary to use the instrument's current meter to indicate the current at which the breaker is to be set. The breaker is then adjusted to trip when the current meter indicates this current. In order to have a current flow through the indicating current meter and the electronic circuit breaker, connect a load across the output of the HYPOT. This load does not have to be precision and need only be large enough to allow a reasonable control of the current flowing in the metering circuit by use of the variable

OUTPUT CURRENT SELECTOR SWITCH AND CONTROL (Continued)

VOLTAGE control. The necessary load can be calculated by ohms law ($R = E/I$)

WHERE: R = load resistance necessary
E = approximately 10% of full scale
I = desired current for which the electronic breaker is to be set.

1. Set the OUTPUT CURRENT selector switch on the range necessary to cover the desired current.

2. Rotate the OUTPUT CURRENT control to its full clockwise position (MAX.).

3. Turn the POWER, HIGH VOLTAGE, and MICROAMMETER DAMPING switches to OFF position.

4. Connect the CONTROL CABLE and the line cord into a power source as indicated on the nameplate and the specification sheet. If an adaptor is used connect the ground lead to earth ground.

5. Rotate VOLTAGE control knob fully counter-clockwise.

6. Turn the POWER switch to ON position and allow instrument 90 seconds to warm-up.

7. Connect the high voltage output cable to one end of the calculated load.

8. Connect the RETURN cable to the other end of the load and METERED RETURN terminal.

9. Set the MICROAMPERES selector switch to a readable range within the desired current set point for the breaker.

10. Operate HIGH VOLTAGE switch to CONTINUOUS or MOMENTARY position.

11. Rotate the VOLTAGE control clockwise until the current meter indicates the desired current for setting the breaker.

12. Rotate the OUTPUT CURRENT control counter-clockwise very slowly until the HIGH VOLTAGE indicator lamp goes out.

13. Return the VOLTAGE control to its full counter-clockwise position to re-energize high voltage.

14. To recheck the breaker trip point, rotate the VOLTAGE control slowly in the clockwise direction until the HIGH VOLTAGE indicator lamp goes out. It may be necessary to retouch the calibration of the breaker.

15. After step 14 is complete, the circuit breaker is set.

BACK-UP BREAKER

A BACK-UP overload breaker set for maximum output current, senses current demand in the RETURN side (METERED and BYPASS return) of the output providing secondary back-up protection.

METERED RETURN AND BYPASS RETURN TERMINALS AND GROUND SWITCH

The switch (located on the CONTROL SECTION) in conjunction with the METERED RETURN and BYPASS RETURN terminals (located on the HIGH VOLTAGE SECTION) provides a means for directing the unwanted current around the current meter by grounding either the METERED RETURN or the BYPASS RETURN terminal.

By connecting the return side of the specimen to the METERED RETURN terminal and selecting BYPASS RETURN with the GROUND switch (which grounds the BYPASS RETURN terminal) all leakages from the high voltage connection to the specimen, to ground and other unwanted leakages to ground will be directed around the current meter. Only the specimen leakage current will flow through the current meter. By selecting METERED RETURN with the GROUND switch (which grounds the METERED RETURN terminal), the total leakage to ground will flow through the current meter.

When testing a specimen that may have isolated metalic parts that provide a leakage path between the two points where the high voltage and return connections are made, the BYPASS RETURN terminal may be used as a guard circuit. If these isolated metalic parts are connected together and to the BYPASS RETURN terminal, any leakage from the high voltage point to these parts will be directed around the metering circuit.

NOTE: When using the BYPASS RETURN terminal as a guard circuit, the GROUND switch should be in the BYPASS RETURN position unless the specimen return side is earth ground. Under this condition the GROUND switch should be in the METERED RETURN position. See DC HYPOT TESTING manual for complete description and use of METERED RETURN and BYPASS RETURN terminals and GROUND switch.

SECTION III

G E N E R A L F E A T U R E S

(HIGH VOLTAGE SECTION)

GENERAL FEATURES - HIGH VOLTAGE SECTION

CONTROL CABLE CONNECTOR

For connecting the CONTROL CABLE to the HIGH VOLTAGE SECTION.

CAUTION: DO NOT connect LINE cord until CONTROL CABLE is connected to BOTH CONTROL and HIGH VOLTAGE SECTIONS. DO NOT disconnect CONTROL CABLE until KILOVOLTMETER reads zero and LINE cord is disconnected.

GROUND TERMINAL

Provides external connection for high voltage cable shield and for SAFETY grounding the HYPOT case.

BYPASS AND METERED RETURN TERMINALS

See BYPASS RETURN and METERED RETURN TERMINALS and GROUND SWITCH in GENERAL FEATURES - CONTROL SECTION.

SAFETY INTERLOCK RECEPTACLE

The SAFETY INTERLOCK receptacle provides for interlocking the high voltage control circuit from a remotely located switch. This receptacle is electrically located in series with the high voltage lever switch, and has a jumper wire across the terminals of the mating plug as the instrument is shipped from the factory. To use the SAFETY INTERLOCK, remove the twist-lock plug from its receptacle and remove the jumper wire from its terminals. Connect the wires of the remotely located switch to the terminals of this plug and re-insert the plug into its twist-lock receptacle. While the remotely located switch is open, the high voltage control circuit will be disabled and no high voltage will be available at the output termination, regardless of the setting of any other controls on the instrument. This switch must be closed in conjunction with the other conditions described under HIGH VOLTAGE SWITCH.

HIGH VOLTAGE OUTPUT TERMINATION

Disconnectable shielded high voltage cable.

CAUTION: This cable should NOT BE connected to the HIGH VOLTAGE SECTION until the CONTROL CABLE is connected to the CONTROL SECTION and HIGH VOLTAGE SECTION and the KILOVOLTMETER indicates zero.

HIGH VOLTAGE INDICATOR

Red lens lamp indicates the high voltage control circuit is energized.

* OUTPUT SHORTING

For safety of operating personnel as well as fast discharge of the amplivolt output capacitor this instrument is equipped with a mechanically assisted gravity operated OUTPUT SHORTING device. In instruments that have oil immersed amplivolts, output shorting and its associated mechanism is contained in the oil tank. For proper functioning of the shorting device the instrument must always be in the upright position when in operation.

Any time the high voltage control switch, the power switch, or both are OFF, the HIGH VOLTAGE output termination will be shorted to the low return side (by-pass return) of the amplivolt. When the high voltage control circuit is energized OUTPUT SHORTING will be removed so that a test can be conducted. Any time the high voltage control circuit is de-energized by any means, turning OFF the HIGH VOLTAGE control switch, test component failure, power failure or interruption, etc., the OUTPUT SHORTING actuator will be de-energized and OUTPUT SHORTING will be applied by mechanically assisted gravity force, thus, providing fail-safe operation.

When this occurs the amplivolt output capacitor and the component under test will be discharged through a nominal current limiting resistance.

* NOT ON ALL INSTRUMENTS, see SPECIFICATION sheet.