

**AC DIELECTRIC TEST SET**  
**600P SERIES**

**Model Number 610-2P**

**VERSION 1.1**

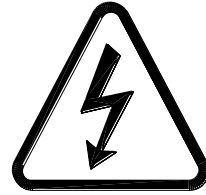
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## GENERAL SAFETY PRECAUTIONS



# CAUTION



### HIGH VOLTAGE

**This equipment is capable of providing POTENTIALLY LETHAL VOLTAGES!  
Improper operation or test practices may result in injury or death to the operator or surrounding personnel.**

The operation of High Voltage test equipment should only be performed by personnel familiar with HIGH VOLTAGE testing and safety procedures. The operator of this equipment must be aware of all hazards associated with High Voltage testing. The operator is responsible for himself and others in close proximity of the testing area.

Some General Safety Practices for working with High Voltage Test Equipment have been listed below for your reference.

- Become familiar with your instrument before performing an actual test
- Know your work area, check that all circuits are de-energized and locked out.
- Never work alone; always work with another qualified worker.
- Mark off entire work area with barriers and warning tape.
- Make all personnel aware of your testing activities.
- Be aware of dangerous conditions that may arise from energizing a test specimen.
- Never modify test equipment, modifications to equipment could introduce an unknown hazard or hinder a designed-in safety feature.
- DO NOT operate damaged equipment. Remove power, and do not use the equipment until safe operation can be verified by service-trained personnel.

Phenix Technologies, Inc. assumes no liability for unsafe or improper use of test equipment.

## TECHNICAL SPECIFICATIONS

### Input

120 volts, 50/60 Hz, single phase, 2 kVA, 17 amperes or  
220 volts, 50/60 Hz, single phase, 2 kVA, 9 amperes

### Output Rating

10 kilovolts, 200 milliamperes

### Duty Cycle

5 MINUTES ON /15 MINUTES OFF at 200 milliamperes

### Type of Cooling

Uncirculated Air

### Distortion

Less than 5 percent

### Impedance

Less than 15 percent at rated current

### Operating Ambient Temperature

0-40 degrees Celsius

### Output Termination

High voltage cable (4.5 meters/15 feet), shielded.

### Metering

**Output Voltmeter:** 4.5" (114 mm) analog type, accuracy 2% of full scale. Range(s) of 0 to 10 kV.

**Output Currentmeter:** 4.5" (114 mm) analog type, accuracy 3% of full scale. Range(s) of 0 to 200 mA.

### Sizes and Weights

Cabinet section: 20"(508mm) W x 16"(407mm) D x 12"(305mm) H.  
Weight: 80 pounds (36 kg).

## UNCRATING PROCEDURE

1. Exercise care in removing shipping materials so as not to damage unit.
2. Perform visual inspection to determine if unit was damaged during shipment. If there are any signs of physical damage (such as dents, scratches, oil leaks), contact the factory before proceeding.
3. Pull out the chassis from the cabinet and check that all printed circuit boards are firmly in position. Visually inspect for any loose wires or components. (If any loose wires or components are found, refer to the appropriate circuit diagram.)

## ELECTRICAL SET-UP

**WARNING: Be sure the Main Power plug on the rear of the unit is unplugged before proceeding.**

1. Locate the desired location for the test set. Prepare the main power input cable for plugging in to the proper facility power (i.e., 110 volts AC, 230 volts AC, etc.). Leave plug unconnected at this time.
2. Connect a sufficient ground from the rear of the test set marked "GND" to a proper facility ground using a low inductance cable with a minimum rating equal to the input rating of the test set.
3. External Interlock

If an external interlock is not to be used, plug the connector as supplied into the socket on the rear of the cabinet marked "EXT INTLK". If an external interlock is to be used, remove the jumper on the male connector of the "EXT INTLK" circuit and connect the external security circuit at these points. (NOTE: The external interlock circuit must consist of a closed loop of dead contacts. When the control power is on, the external circuit will be energized with 115 volts AC.)

4. Connect input main power cable to the rear of the test set and then to the facility power.

### High Voltage Connection

**WARNING: Main power circuit breaker on the front panel must be in the OFF position before proceeding.**

1. Connect Jumper Clip on binding posts for Standard, or Guard Mode as desired. (if applicable) (see 4-2 and 4-3)
2. Install the high voltage cable to the rear connection of the test set and to the high side of the test specimen.
3. Connect the low side (return) of test specimen to the return binding post. If the unit does not have Guard feature, connect low side of specimen to cable shield or ground stud, whichever is more convenient.

**Warning: On units with Guard feature, always assure that Jumper Clip is installed securely between Ground (GND) and either Return (RTN) or Guard (GRD) as appropriate for the selected mode of operation.**

DO NOT OPERATE UNIT WITHOUT JUMPER CLIP SECURELY INSTALLED.

## GROUND-GUARD-RETURN CONNECTIONS

(Not on all units)

### 1. **Standard Mode (RTN)**

The standard configuration is set up to measure the current from the high side of the unit under test to ground. This configuration must be used if it is not possible to isolate the low voltage side of the object under test from ground.

The connection of the low side of the unit under test is connected directly to ground. The transformer base connector post has the jumper installed between the "GND" and the "RTN" posts.

This measures the output current flowing from the high voltage output through the unit under test to ground and the current meter then senses the return current from ground to the "RTN" terminal of the high voltage transformer.

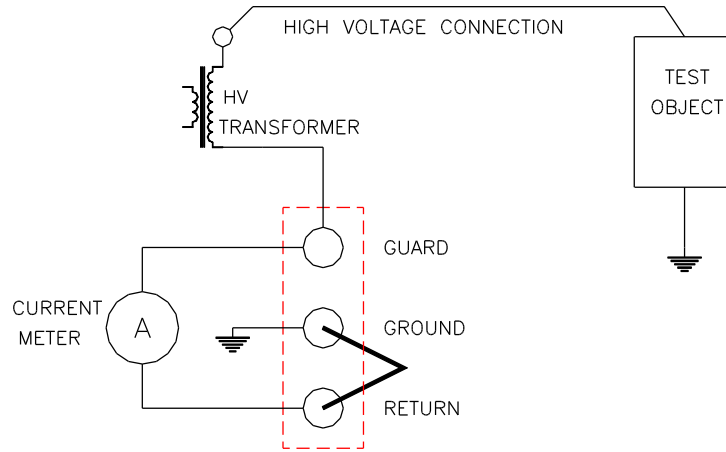
### 2. **Guard Mode**

For test objects that can be isolated from ground it may be desirable to use the Guard Mode. In this mode only current passing through the test object will be displayed on the current meter. This will be especially important if very small currents are to be observed.

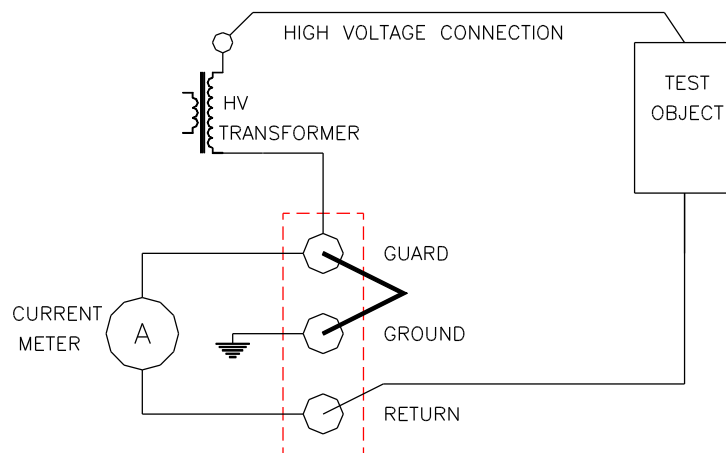
In this mode the current path does not flow directly to ground from the low side of the unit under test, but flows through the currentmeter first and then to ground.

The connection to be made is (1) connect the low side of the unit under test directly to the post marked "RTN" and (2) connect the jumper between the "Guard" and "GND" posts. (NOTE: Ensure the "GND" post is grounded.)

Figure 1



STANDARD MODE



GUARD MODE



## OPERATION INSTRUCTIONS

1. Ensure proper electrical set-up has been performed.
2. Check that the Raise Voltage dial is set to "0" (zero start position).
3. Set the Overcurrent Trip to the desired current level setpoint. Setting of "1" will trip off the unit when drawing 10% of rated output current. Setting of "11" will trip off the unit when drawing 110% of rated output current.
4. Select the appropriate voltmeter range for the desired test voltage (if applicable).
5. Select the appropriate voltmeter range for the desired test voltage (if applicable).

### High Voltage Applied

6. Turn on the front panel circuit breaker. Control Power lamp will illuminate.
7. Press and hold HV On push-button.(If separate HV Off switch is supplied, it is not necessary to continue to hold HV On switch)
8. Rotate the Raise Voltage dial and watch the Output Voltage and Output Currentmeter until desired levels are reached.
9. Record data, if desired, and lower the output after testing is completed. Release HV On button; high voltage will shut off. (Some models have separate HV Off switch)

### Overcurrent Failure

10. If an overcurrent situation occurs, the overcurrent lamp will illuminate and high voltage will be shut off. To regain high voltage, the Raise Voltage dial must be returned to zero and the Overcurrent Reset button must be depressed (lamp will extinguish).
11. After all testing is completed, turn off the front panel circuit breaker. Remove the input power cable from the facility power input.

### Burn Feature (Optional)

If it is desired to burn a fault in order to make location easier, press the BURN switch. In this mode the overcurrent detector is disabled and a current limiting reactor is placed in series with the primary of the high voltage transformer. Current will be limited to approximately 200 mA AC.

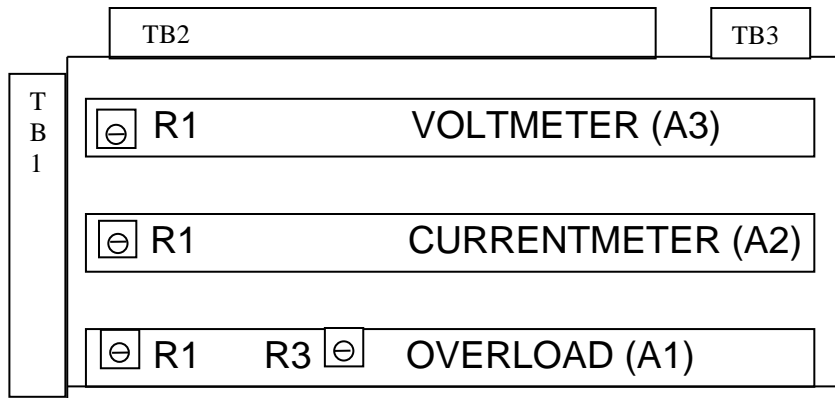
## CALIBRATION

All calibrations have been done at the factory. Periodic calibration of the output voltmeter and output currentmeter should be done annually.

NOTE: Refer to Electrical Diagram Section to select schematics pertaining to the model number of your test set.

### Locating the Plug-in Boards

The calibration boards are positioned in the unit as shown in the following diagram.



1. **Output Voltmeter (A3), PCB 1021**

Connect a precision high voltage voltmeter across the output to ground. Raise the output to approximately 80% of the full scale deflection. Adjust the reading on the panel meter (M2) by means of potentiometer R1 (on PCB1021, A3) to a corresponding reading. Repeat for Medium and High ranges (if applicable).

2. **Output Currentmeter (A2), PCB 1021**

On units with Guard feature, place binding post jumper between Ground and Guard binding posts. Connect a precision ammeter between high voltage and Return (if unit has Guard feature) or Ground (no Guard feature). Raise the output to approximately 80% of the full scale deflection. Adjust the reading on the panel meter (M1) by means of potentiometer R1 (on PCB 1021, A2) to a corresponding reading.

3. **Overcurrent (A1), PCB 1020, Drawing Number -31102000**

This calibration should not need adjustment (factory adjusted). If the overcurrent circuit is out of calibration, perform the following steps.

- a. With unit off, short the output terminal to ground through an appropriate currentmeter. (NOTE: M1 on front panel may be used for current indication by just connecting a short between the high voltage output and ground.)
- b. Set the Overcurrent Trip potentiometer on the front panel to "1".

## CALIBRATION

- c. Turn on HV On and adjust the output current slowly until 10% of rated current (check nameplate) is displayed on the currentmeter.
- d. Adjust potentiometer R1 on PCB 1020 until the Overcurrent lamp illuminates and high voltage is shut off.
- e. Set the Overcurrent Trip potentiometer on front panel to "11".
- f. Turn on HV On and adjust the output current slowly until 110% of rated current is displayed on meter.
- g. Adjust potentiometer R3 on PCB 1020 until the Overload lamp illuminates and high voltage is shut off.
- h. Repeat steps "B" through "G" as necessary until both settings are calibrated.

# TROUBLESHOOTING

## General

If the controls do not operate properly after having been used according to the instructions, the following hints may help.

- ◆ Check main facility input power to the test set.
- ◆ Check indicating lamps. (Spare lamps are available through Phenix Technologies.)
- ◆ Check operation of circuit breaker (CB1). Control Power lamp should be on. Make sure all plug-in circuit boards are properly plugged in.
- ◆ Check all plug connections, internal and external, on the test set.

## Specific Problems

### 1. High voltage cannot be turned on?

- External interlock is open.
- Raise Voltage dial is not in lower limit position.
- Protection circuit (Overcurrent) is not Reset.
- Faulty relay contacts.
- Faulty HV On Hold switch.

### 2. Voltage control inoperable?

- High voltage is not on (K1 not energized or see number 1 above).
- Faulty regulator "T1".
- Faulty step-up transformer "T2".
- Faulty autotransformer "T3", if applicable.

### 3. Overcurrent inoperable?

- Improper sensitivity (adjust Overcurrent Trip (R1) on front panel).
- Defective SCR1 or IC1 on PCB 1020, A1.
- Check the +24 volts DC and +15 volts DC regulator on PCB 1020, A1.
- Check input voltage to PCB 1020 at pin X.
- Check LP2 and relay K2A on PCB 1020, A1.

### 4. Currentmeter inoperable?

- Connection between currentmeter and high voltage test specimen return either shorted or open.
- D1 open or shorted on PCB 1021, A2.
- Meter movement damaged (50 microamps DC movement).
- Bad solder connection on PCB 1021, A2.
- Unit operating in Guard mode with specimen return grounded.

## TROUBLESHOOTING

### 5. Voltmeter inoperable?

- Connection between voltmeter and high voltage output either shorted to ground or open.
- D1 or D2 open or shorted on PCB 1021, A3.
- Meter movement damaged (50 microamps DC movement).
- No high voltage present at output bushing.
- Bad solder connection on PCB 1021, A3.

### 6. No output voltage from high voltage section?

- Defective metering circuit.
- No input to voltage regulator section, possible problems with K1 contacts, regulators (T1), autotransformer (T3, if applicable), or with CB1.
- Internal connection broken.
- High voltage winding of T2 short circuited (measure input or primary side from regulator).

## STORAGE OF EQUIPMENT

If the equipment will be stored for a prolonged period, the following precautions are recommended.

1. The equipment should be covered and kept in a warm, dry environment (95% maximum humidity, 5 to 50 degrees C).
2. In no case should the test unit be stored outdoors (unless previously specified in the original purchase agreement).

CIRCUIT DIAGRAM SYMBOLS  
SYMBOLS POUR SCHEMA DE CIRCUIT  
SYMBOLE ZU SCHEMA

REF	SYMBOL	DESCRIPTION	DESCRIPTION	BEMENKUNG
A		Amplifier	Unite d'amplificateur	Verstärker
ARSR		Surge Arrestor	Parafoudre	Ueberspannungsableiter
C		Capacitor	Condensateur	Kondensator
BSHG		Bushing	Tranversee	Durchfuehung
C		Electrolytic Capacitor	Condensateur electrol	Eleckrolytik kondensator
F		Fuse	Fusible	Sicherung
CT		Current Transformer	Transformateur de Courant	Stromtransformer
CB		Circuit Breaker	Interupteur	Unterbrecher
K		Relay, Contactor	Relais, Contacteur	Relais, Schütz
L		Inductor	Self	Drossel, Spule
MOT		Motor	Moteur	Motor
MOV		Movistor	Parafoudre	Movistor
NE		Neon	Parafoudre	Ueberspannungsableiter
LP		Lamp, Indicator	Lampe	Meldeleuchte
R		Resistor	Resistance	Widerstand
R		Variable Resistor	Resistance Variable	Widerstand
T		Transformer	Transformateur	Transformer
TB		Terminal Block	Borne	Løsbare Klemme
X		Connector	Prise de Courant	Steckverbindung
K		Relay Contact Normally Open	Contact Normalement Ouvert	Schlierskontakt
K		Relay Contact Normally Closed	Contact Normalement Ferme	Oeffnungskontakt
K		Changeover Contact	Contact de Changement	Umschaltkontakt
		Shielded Wire	Cable blindé	Abgeschirmetes Kabel
TR		Transistor	Transisteur	Transistor
M		Analog Meter	Insrument Analogue	Analog Meter
D		Diode	Diode	Diode
Z		Zener	Diode Zener	Zener
SCR		Thyristor	Thyristor	Thyristor
SW		Normally Open Maintained Switch	Interrupteur Normalement Maintenu Ouvert	Schrittschalter (Schliesser)
SW		Normally Closed Maintained Switch	Interrupteur Normalement Maintenu Ferme	Schrittschalter (Oeffner)
SW		Normally Closed Momentary Switch	Interrupteur Normalement Ferme Momentanement	Druckschalter (Oeffner)
SW		Normally Open Momentary Switch	Interrupteur Normalement Ouvert Momentanement	Druckschalter (Schliesser)
DP		Current Overload Device	Dispositif De Sûr Intensive	UeberstromschutzEinheit

## ELECTRICAL DIAGRAMS

	<u>Drawing Number</u>	<u>Description</u>
1.	31102000	Overload Circuit, Overcurrent PCB 1020
2.	9607009	AC Dielectric Test Set Model 610-2P 120V
3.	9607018	AC Dielectric Test Set Model 610-2P 220V



## **PARTS ORDERING INFORMATION**

Replacement parts are available from Phenix Technologies, Inc.

Changes to Phenix Technologies' products are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest technical improvements developed in our Engineering Department. It is, therefore, important when ordering parts to include the serial number of the unit as well as the part number of the replacement part.

When your purchase order is received at our office, a representative of Phenix Technologies will contact you to confirm the current price of the part being ordered. If a part you order has been replaced with a new or improved part, an Applications Engineer will contact you concerning any change in part number.

Your order for replacement parts should be sent to:

Replacement Parts Department  
Phenix Technologies, Inc.  
75 Speicher Drive  
Accident, Maryland 21520

## RECOMMENDED SPARE PARTS

Phenix Technologies recommends that the customer purchase and stock the following parts for normal maintenance of the unit. The recommended quantity should be sufficient to support the unit during normal operation.

If the unit will be operated at an isolated site for an extended period or will be subjected to unusual stresses, a larger quantity of parts should be stocked as spares. In such a case, contact your Phenix Technologies' sales representative for a recommendation.

Current prices may be obtained by contacting the Parts Ordering Department at Phenix Technologies.

Part Name	Computer Number	Recommended Quantity
Analog Panel Meter, Yokogawa, 50 $\mu$ A, 260400CYCY	1501010	1
Lamps, 31-963.4	1420150	5
Limit Switch, 2HBA190-1	1866005	1
Output Leads, 16 feet, RG8/U	30070003	1
Overcurrent Circuit, PCB 1020	31102000	1
Contactora, 25 amp, 3 pole	1705462	1
Switch, 31-121	1860120	1

## RETURNED MATERIAL

If for any reason it should become necessary to return this equipment to the factory, the Service Department of Phenix Technologies, Inc. must be given the following information:

Name Plate Information  
Model Number  
Serial Number  
Reason for Return  
Cause of Defect

If Phenix Technologies, Inc. deems return of the part appropriate, it will then issue an "Authorization for Return".

If return is not deemed advisable, other inspection arrangements will be made.

NOTE: Material received at this plant without the proper authorization shall be held as "Customer's Property" with no service until such time as the proper steps have been taken.

Your cooperation is requested in order to ensure prompt service.