

Users Manual

Phenix Technologies Inc.



VACUUM INTERRUPTER TEST SET

Model Number 660-10P

Version 3.2

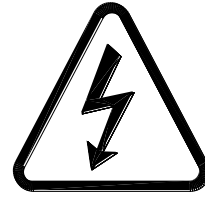
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GENERAL SAFETY PRECAUTIONS



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.

SPECIFICATIONS

GENERAL SPECIFICATIONS

- Tests up to 24.9 kV class interrupters in accordance with ANSI C37.60 specifications
- Portable two-piece unit
- Rugged construction for field use
- Security/Safety interlock circuit
- Digital, direct-reading output kilovoltmeter with memory feature
- Digital, direct-reading output currentmeter
- LCD display for easy reading in direct sunlight
- Digital dwell timer, 1-999 seconds
- Selectable rate of rise, 500 and 3000 volts per second
- Failure indicator with reset switch
- Programmable output voltage setpoint control. Digital, pushbutton potentiometer and dual-speed, electromechanical controller with output voltage feedback insure correct test voltage regardless of ramp rate or power supply fluctuations. There is no test voltage overshoot such as is associated with meter-relay type meters.
- Single-ended high voltage test transformer develops 0-60 kVAC with respect to ground potential.

TECHNICAL SPECIFICATIONS

INPUT: 120 VAC, 6 A, 60 Hz **or** 220 VAC, 3 A, 50 Hz

OUTPUT: 0-60 kVAC (single-ended) at 10 mA

DUTY CYCLE: 5 minutes ON/15 minutes OFF @ 10 mA

METERING:

Voltmeter: 3 1/2 digit LCD display
Range: 0-60.0 kVAC
Accuracy: +/-1% FS

Currentmeter: 3 1/2 digit LCD display
Range: 0-10.0 mA
Accuracy: +/-1% FS

TIMER: Adjustable, 3 digit, 1-999 seconds

DIMENSIONS (approximate):

Controls: 15" W x 10.5 D x 13" H; 31 lbs.
(381 mm W x 267 mm D x 330 mm H; 14 kg)

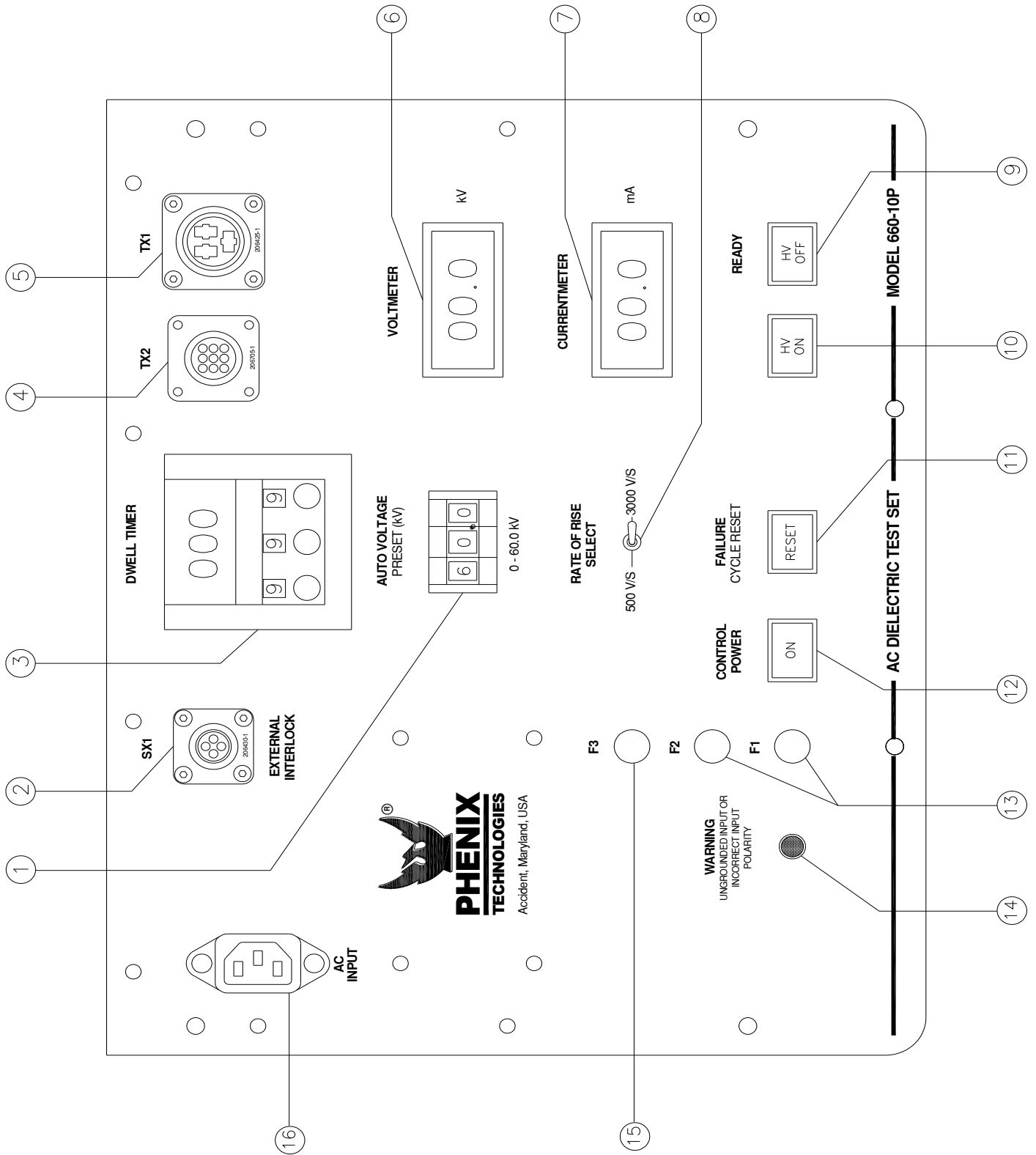
HV Transformer: 14" W x 14" D x 17" H; 66 lbs.
(356 mm W x 356 mm D x 432 mm H; 30 kg)

CONTROL AND METERING DESCRIPTION

(Paragraphs are keyed to FIGURE 1)

1. Auto Voltage Preset. Press (+) and (-) buttons to select desired test level. Range 00.0 to 60.0 kV.
2. SX1 Connector. Provision for connecting external interlocking switching loop. Open loop prevents high voltage turn on.
3. Dwell Timer. Rotate knobs to preset desired test dwell time. Test time is displayed digitally.
4. TX2 Connector. Connect mating cable to high voltage tank. Metering circuits.
5. TX1 Connector. Connect mating cable to high voltage tank. Power circuits.
6. Output Voltmeter. Dual function digital meter displaying output voltage or failure voltage directly in kilovolts.
7. Output Currentmeter. Digital currentmeter to directly display the test current in milliamperes.
8. Rate of Rise Select. Switch to select desired rate of rise (500 V/S or 3000 V/S).
9. HV Off Switch/Ready Indicator. Press to turn high voltage off and to abort testing cycle. Lights when high voltage can be turned on.
10. HV On Switch/Indicator. Press to turn high voltage on and to start testing cycle. Lights when high voltage is on. High voltage will not turn on until Ready indicator is lit or if Failure indicator is lit.
11. Failure Indicator/Cycle Reset Switch. Lights to show that failure has occurred or cycle has completed. Press to reset memory meter, cycle and failure detector circuits so that testing may proceed.
12. Control Power On Switch/Indicator. Press to turn on control power. Lights to show that control power is on.
13. Input Power Fuses F1 and F2. Connect power cord to main power source. Main fuses to protect entire test set (10A/120V or 5A/220V).
14. Fault Indicator. Lights if unit not grounded or line and neutral inputs are reversed. Correct fault so light is out before operating unit.
15. F3 Fuse. Protects primary circuit of high voltage transformer (5A Slo Blow/120V or 5A/220V).
16. Power Input Connector.

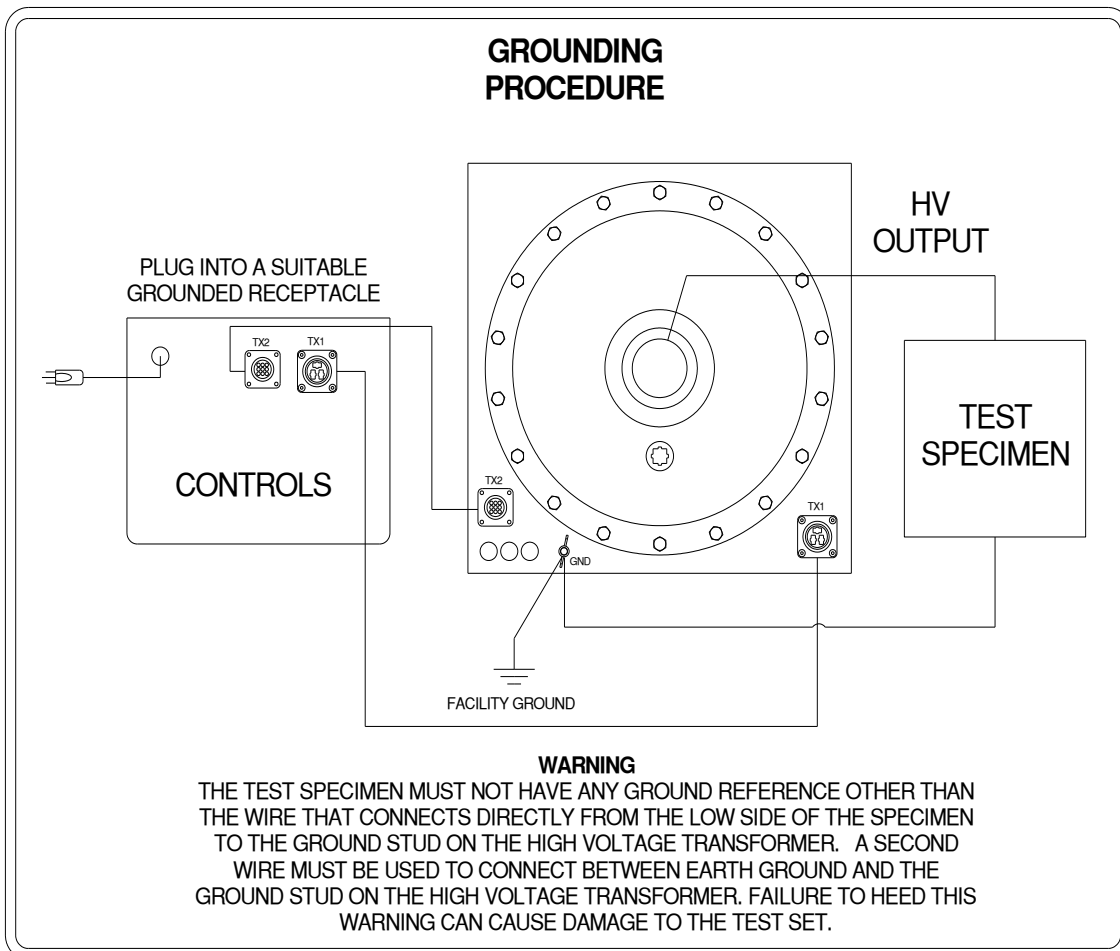
Figure 1



CONNECTIONS AND GROUNDING

- Position set in the desired location.
- Ground set by use of ground terminal on base of high voltage transformer.
- Connect TX1 and TX2 cables between controls and high voltage transformer.
- Connect SX1 - external interlock circuit as appropriate.
- Connect return lead, provided, to low side of test specimen.
- Connect high voltage output to high side of test specimen.
- Connect main power cord to appropriate receptacle.

(Further instructions on test connections may be found in ANSI C37-60.)



OPERATION INSTRUCTIONS

1. Check connections, power and ground to test set and specimen under test (refer to ANSI C37-60).
2. Turn on control power.
3. Select the desired voltage test level.
4. Select the desired rate of rise.
5. Select the desired dwell time (1-999 seconds).
6. When ready to start test, press HV on switch. (If unit does not operate at this point, check for open interlock circuit.)
7. Voltage will rise to the predetermined level, at the predetermined rate of rise, dwell for the predetermined time, lower and shut off automatically.
8. If failure occurs, the memory meter will record the failure voltage and the high voltage will shut off. Press reset to proceed with further testing.
9. To perform another test, reset the cycle by pressing reset and go back to #3.

NOTE: If it is desired to abort a test in process, press the high voltage off switch.

RECALIBRATION

DO NOT ATTEMPT THIS CALIBRATION UNLESS QUALIFIED TO WORK ON ENERGIZED HIGH VOLTAGE TEST EQUIPMENT!!

Voltmeter-Normal Mode

1. Connect a standard voltmeter with a range of 0-60 kVAC from the high voltage terminal of the test transformer to ground.
2. Remove Front Panel perimeter screws and carefully lift and support panel in raised position.
3. Turn on high voltage and raise output until 48 kVAC is read on standard meter.
4. Locate R8 Output Adjustment calibration potentiometer on (A2) PCB 1175.
5. Adjust voltmeter calibration potentiometer until panel meter agrees with standard.
6. Raise and lower output and compare panel meter with standard at various points.
7. Shut off high voltage and disconnect standard meter.

Voltmeter-Failure Mode

1. Verify that the panel meter has been previously calibrated in the Normal Mode before proceeding.
2. Remove Front Panel perimeter screws and carefully lift and support panel in raised position.
3. Turn on high voltage and raise output until 50 kVAC is read on panel meter.
4. Using a hot stick, bring a ground wire into proximity of the high voltage output causing a flashover.
5. Locate R3 PRI VM CAL potentiometer on the main circuit board PCB 1150.
6. Adjust voltmeter calibration potentiometer until panel meter agrees with voltage present before flashover.
7. Repeat to verify setting.

Currentmeter

1. Connect set to a load that will draw approximately 10 milliamperes AC.
2. Connect a standard currentmeter with a range of 0-10 milliamperes AC.
3. Remove Front Panel perimeter screws and carefully lift and support panel in raised position.

RECALIBRATION

4. Locate Current Output Adjustment calibration potentiometer, R1, on (A3) PCB 1078.
5. Turn on high voltage and raise output until 10 milliamperes is read on standard meter.
6. Adjust currentmeter calibration potentiometer until panel meter agrees with standard.
7. Raise and lower output and compare panel meter with standard at various points.
8. Shut off high voltage and disconnect standard meter.

Overcurrent Trip Adjustment

1. Connect a load that will draw approximately 11 milliamperes at 20-50 kVAC.
2. Remove Front Panel perimeter screws and carefully lift and support panel in raised position.
3. Locate Overcurrent Adjustment calibration potentiometer, R3, on (A4) PCB 1020.
4. Energize output and raise to 11 milliamperes AC.
5. Adjust calibration potentiometer on PC 1020 until set trips off.
6. Press reset.
7. Energize output and verify overload trip point.

PARTS LIST

ITEM	DESCRIPTION	QTY	PART NO.
	<u>Control Unit</u>		
PCB1150	PCB 1150 Assy	1	31115011
PCB1023	PCB 1023 Autovoltage Ckt	1	31102301
PCB1020	PCB 1020 Overcurrent Ckt	1	31102002
PCB1078	PCB 1078 Currentmeter Ckt	1	31107813
PCB1175	PCB 1175 Voltmeter Ckt	1	31117505
	<u>Motor / Variac Assy</u>		
MOTOR	Motor Bodine 744KC-22T5	1	1560715
T3 (120 V)	Variac 501 Staco	1	1890120
T3 (220 V)	Powerstat 05F305	1	1890330
LL,UL,ZS	Limit Switch U3L-121-DB	3	1866015
" "	Cams	3	41000002
	Cam Shaft	1	40500030
	Motorized Variac Bracket	1	40400135
	<u>Front Panel</u>		
BULBS	6.3V Mini Bulbs EAO	4	1420143
CON 3,5	3 Ckt CON .1	2	1152250
CON 14	4 Ckt CON .1	1	1152260
CON 4,6	10 Ckt CON .1	2	1152210
CON 7,11	8 Ckt CON .1	2	1152285
CON 9,10	6 Ckt CON .1	2	1152270
F1,F2,F3	Fuse Holder	3	1603920
F1,F2 (120 V)	Fuse 10 Amp 250V 3AG	2	1603610
F3 (120 V)	Fuse 5 Amp 250V SB	1	1603628
F1,F2,F3 (220 V)	Fuse 5 Amp, 3AG	3	1603605
HANDLES	Front Panel Handles	2	2101710
LENS(W)	White EAO Lens	1	1422153
LENS(R)	Red EAO Lens	1	1422150
LENS(G)	Green EAO Lens	1	1422151
LENS(B)	Blue EAO Lens	1	1422148
LP5	115V Neon 1/3W	1	1423260
LINE CORD	18-3 Power Cord	1	1077167
M1,2	Panel Meter 3 ½ Digit LCD	2	1506400
Power Input	Power Input Receptacle	1	1153328
R1	Pushbutton Pot 10K	1	1761094
RESIST	56 KOhm, .5W, 10% (120V)	2	1713300
RESIST	120KOhm .5W, 1% (220V)	2	1724050
SW1	EAO Latch 2P 31-262	1	1860265
SW2,3	EAO Mom 1P 31-121	2	1860120
SW4	EAO Mom 2P 31-122	1	1860125
SW5	Switch Toggle	1	1865010
SX1	4 Pin Amp Chassis Connector	1	1151162
SX1	24-20 AWG Female Pins	2	1151174
SX1 Plug	4 Pin Cable Plug	1	1151162
SX1 Plug	Male Solder Pins	2	1151176
SX1 Plug	Cable Clamp	1	1151186
TX1	High Current Receptacle, Female	1	1151179
TX1	High Current Pins, Female	2	1151184
TX2	9 Pin Amp Chassis Connector	1	1151154
TX2	24-20 AWG Male Pins	4	1151170
TIMER	Panel Timer ATC365	1	1480170

PARTS LIST

<u>PCB1150</u>			
A1-A4	PCB Connector 22-P-Card Edge	4	1152565
A1-A4	Card Edge Guides	8	1152571
C1,2	Capacitor 1000uf 50V Elect	2	1098940
C3,4,6	Capacitor 2.2uf 50V	3	1094438
C5	Capacitor 3300uf 25V Elect	1	1099331
C7,8	Capacitor .1uf 20V	2	1093020
C9,10,11	Capacitor .01uf 1kV	3	1092050
X1,2,3	8 Pin Phoenix Conn & Plug	3	1152608
CON3,5	3 Ckt Hdr .1	2	1152251
CON14	4 Ckt Hdr .1	1	1152261
CON13	4 Ckt Hdr .156	1	1152263
CON4,6	10 Ckt Hdr .1	2	1152211
CON7,11	8 Ckt Hdr .1	2	1152286
CON9,10	6 Ckt Hdr	2	1152271
D1-8,13	Diode 1N4007	9	1780025
D9-12	Transzorb 18V (1N6279A)	4	1780068
K1	Relay 3 Pole 120V Coil	1	1700610
K1	Socket	1	1157600
K2-10	Relay 4 Pole 120V Coil	9	1701305
MOV1,2	Movistor 130V	2	1606100
MOV2 (220V)	Movistor 275V	1	1606110
PCB1150	PCB 1150 Rev. B	1	1111502
R1	Pot 1500 Ohm 25W	1	1761010
R2	Resistor 90.9K Ohm .5W 1%	1	1723800
R2 (220V)	Resistor 90.9K Ohm .5W 1% 2 pcs. Series	2	1723800
R3,8	Pot 5K Type 64W	2	1761054
R4	Resistor 5.1K Ohm .5W 1%	1	1722110
R5	Resistor 200 Ohm 10W	1	1740400
R6	Resistor 1500 Ohm 10W	1	1742050
R9	Resistor 49.9K Ohm .25W 1%	1	1734050
R11,12	Resistor 10K Ohm .25W	2	1722600
REG1	Voltage Reg 15V 1A (7815)	1	1794010
REG2	Voltage Reg 15V 1A (7915)	1	1794015
REG3	Voltage Reg 5V 3A (LM323)	1	1794040
SG1	Spark Gap 90V	1	1605510
SW1	Toggle Switch PCB	1	1865010
T1	Transformer "MPC-Y-15"	1	1894340
TP1-7	Test Points	7	1356300
T2 (220V)	P8620 230/115V 05F305	1	1894425

PARTS LIST

<u>Miscellaneous</u>			
M1 Protection Bd	Voltmeter Surge Protection Board	1	31126501
M2 Protection Bd	Currentmeter Surge Protection Board	1	31126500
TX1 Cable	Complete TX1 Cable (Power)	1	30110013
TX1 Cable	High Current Plug, Female Pins	1	1151180
TX1 Cable	High Current Plug, Male Pins	1	1151181
TX1 Cable	High Current Pins, Male	2	1151182
TX1 Cable	High Current Pins, Female	2	1151184
TX1 Cable	Cable Clamp, Size 17	2	1151188
TX2 Cable	Complete TX2 Cable (Signal)	1	30010013
TX2 Cable	9 Pin Cable Plug, Size 13	2	1151164
TX2 Cable	24-20 AWG Female Pins	10	1151174
TX2 Cable	Cable Clamp, Size 13	2	1151187
LP1 (Key Sw Opt)	115V Neon 1/3 W	1	1423260
SW1 (Key Sw Opt)	EAO 2 Pole Key Switch	1	1860296
<u>HV Unit</u>			
TX1	High Current Receptacle – Male Pin	1	1151178
TX1	High Current Pins - Male	2	1151182
TX1	Receptacle Protector Cap, Size 17	1	1151196
TX2	9 Male Pin Receptacle, Size 13	1	1151154
TX2	Contact Pins – 24-20 AWG, Male	2	1151170
TX2	Receptacle Protector Cap, Size 13	1	1151195
R2	470 Ohm Resistor	1	1740990
SG1	90V Spark Gap	1	1605110
R1	200 Megaohm Resistor – 2 pcs. Series	2	1748410
HV Cable	HV Output Cable – 5 ft.	1	30070001
Boot	Red Boot – Alligator	1	1352131
Clip	100 Amp Alligator	1	1353020
Return Cable	Return Cable – 10 FT., Black	1	30080002
Ground Cable	Ground Cable – 10 FT., 10 Ga.	1	30080003
RTN/GND Cable	Boot – Black	2	1353041
RTN/GND Cable	Clip - Alligator	2	1353042

MAINTENANCE

No solution or chemical stronger than ordinary mild soap and water solution should be applied to the cabinet area of this unit. Care must be used when cleaning the meter faces and console panel. Abrasives may remove printing and descriptive titles and scratch meter faces. When cleaning, always have unit disconnected from power source. Never attempt to clean inside the unit as the cleaning solution may cause damage to the electronic components.

In the event it becomes necessary to replace any parts, a complete description can be found with the supplied parts list.

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.

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

In order to maintain your set in full operating condition with a minimum of down time, the following spare parts should be kept on hand to avoid unnecessary phone calls, expensive modes of shipment, delays in repairs, etc. Pricing is available upon request.

<u>Quantity</u>	<u>Description</u>	<u>Part Number</u>
5	Pilot Light Bulb 6.3V	1420143
5	Fuse 10Amp 3AG (120V)(F1,2)	1603610
5	Fuse 5 Amp Slow Blow (120V)(F3)	1603628
5	Fuse 5 Amp 3 AG (220V)(F1-3)	1603605
1	Panel Meter 3 ½ Digit LCD	1506400

ANSI C37.60-1981

Standard Requirements for Overhead, Pad Mounted, Dry Vault and Submersible Automatic Circuit Reclosers and Fault Interrupters for AC Systems.

Copies of standards may be obtained from:

The Institute of Electrical and Electronic Engineers, Inc.
345 East 47th Street
New York, NY 10017

(800)678-IEEE

ELECTRICAL SCHEMATICS

<u>Drawing Number</u>	<u>Description</u>
1. 31117505	Peak Detector Circuit (PC 1175)
2. 31102002	Overload Circuit (PCB 1020)
3. 31107813	Digital Meter Circuit (PCB 1078)
4. 31102301	Auto/Overvoltage Circuit (PCB 1023E)
5. 9607029	Oil Vacuum Interrupter Test Set (120V)
6. 9607030	Oil Vacuum Interrupter Test Set (220V)