

User's Manual



AC DIELECTRIC TEST SET 600P SERIES

Model Number 610-2P (120V & 220V)

Version 3.2

Phenix Technologies, Inc.

75 Speicher Drive
Accident, Maryland 21520

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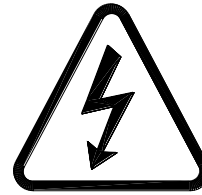
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ATTACHMENTS:
TAD1U Timer Manual

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.

SECTION 1: TECHNICAL SPECIFICATIONS

Input

110-120 Volts, 60 Hz, 1 Phase, 2.4 kVA, 20 Amperes
OR
220-240 Volts, 60 Hz, 1 Phase, 2.4 kVA, 10 Amperes

Output Rating

10 kV, 200 mA, 2kVA

Duty Cycle

5 MINUTES ON / 15 MINUTES OFF at 2 kVA

Type of Cooling

Uncirculated air

Distortion

Less than 5 percent

Impedance

Less than 10 percent at rated current

Operating Ambient Temperature

0-40 degrees Celsius

Output Termination

High voltage cable (4.8 meters/16 feet), shielded.

Metering

Output Voltmeter:	Display:	3 ½ digit LCD
	Accuracy:	±(0.8% of Reading ±0.2% of Range)
	Ranges:	0 to 10kV

Output Currentmeter:	Display:	3 ½ digit LCD
	Accuracy:	±(0.8% of Reading ±0.2% of Range)
	Ranges:	0 to 200mA

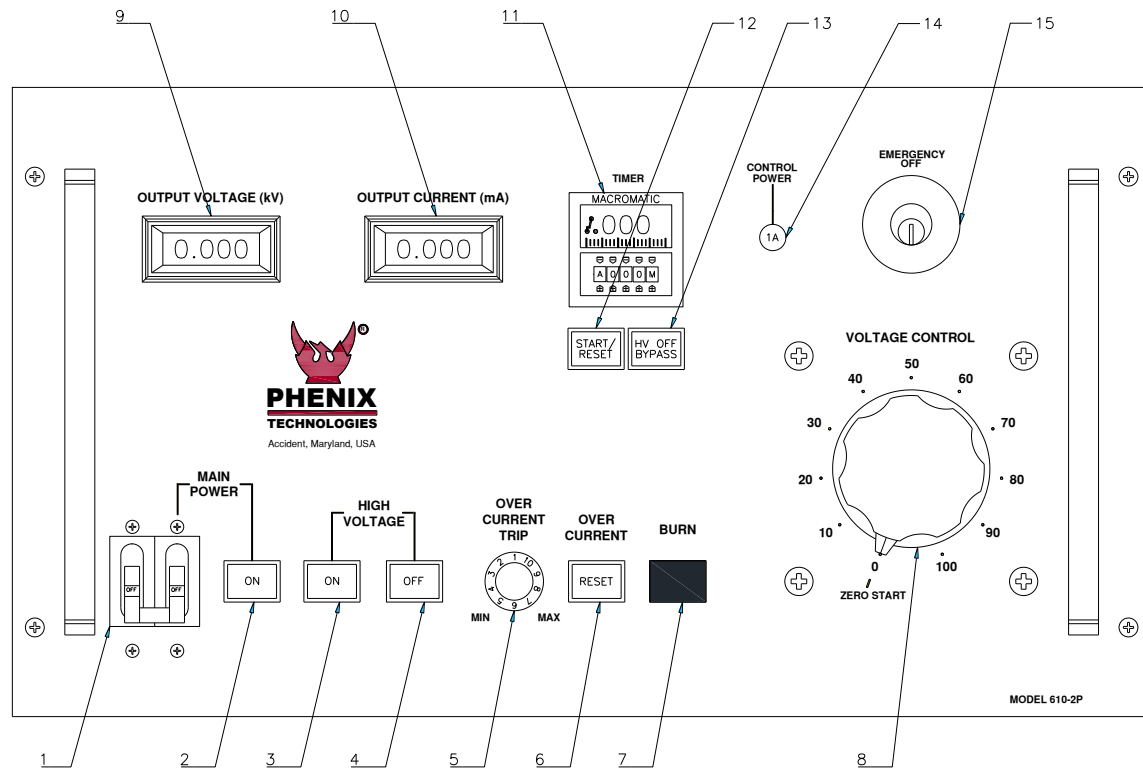
Sizes and Weights

Cabinet section: 20"(508mm)W x 16"(407mm) D x 12"(305mm) H.
Weight: 67 pounds (30 kg).

SECTION 2: 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.)

SECTION 3: CONTROLS AND INDICATORS



The following paragraphs are keyed to the above panel diagram.

1. **Main Power Circuit Breaker**
Turns main power of unit on and off and provides input overload protection.
2. **Main Power Lamp**
Illuminates to indicate input power is supplied to unit.
3. **High Voltage ON**
Momentary switch activates power to high voltage circuits when required conditions are met. **High Voltage On** lamp illuminates red to indicate high voltage circuits are energized.

Conditions required for **High Voltage On** are:

- Power applied to unit and **Main Power Breaker** (1) on, **Main Power** lamp illuminated (2).
- **External Interlock** circuit series loop must not be open (Back Panel).
- **Voltage Control** (8) must be at zero. (Zero Start)
- Overcurrent circuit must be reset if **Reset** lamp is illuminated (6).

CONTROLS AND INDICATORS

4. **Overcurrent Trip Adjust**
Dial adjusts from 1 to 11 corresponding to 10% to 110% of rated output current. **Overcurrent Trip/Reset** lamp illuminates and high voltage turns off when output current exceeds setting, causing circuit to trip. Circuit also acts as short circuit and overload protection on high voltage output. To reactivate high voltage, **Voltage Control** (8) must be returned to zero, and **Overcurrent Reset** switch (6) must be pressed to clear overcurrent circuit.
5. **Overcurrent Reset**
Reset lamp illuminates to show that overcurrent circuit has tripped. High voltage circuits are deactivated. Momentary **Reset** switch must be pressed to extinguish **Reset** lamp to allow high voltage to be reapplied after returning **Voltage Control** (8) to zero.
6. **Burn**
This switch when depressed inserts a line reactor in the primary of the high voltage transformer for location of failures in the test specimen. A (yellow) indicator lamp illuminates when depressed. (OPTION)
7. **Voltage Control**
Turn clockwise to raise output voltage. High voltage cannot be activated if **Voltage Control** is not started at zero.
8. **Voltmeter**
Displays output voltage of test set, units in kilovolts.
9. **Currentmeter**
Displays output current of test set, units in milliamps.
10. **Timer**
Test time can be set using the buttons on the face of the timer to select a time and a range to count to. The timer should be used in mode A. For more information see attachment, TAD1U Timer Manual)
11. **Start/Reset**
Press to start the timer after test voltage has been reached. Press again to reset the timer to the original setting.
12. **HV Off Bypass**
Press to allow high voltage to remain on after timer has expired. Indicator lights when depressed.
13. **Control Power**
Unit's control power protected by one or two resettable circuit breakers. Depress tripped breaker to reset if a fault occurs in the control power circuit.
14. **Emergency Off**
Depress Emergency Stop button to de-energize high voltage output in case of emergency. Test set is supplied with keys that must be used to reset Emergency Off switch if depressed.

CONTROLS AND INDICATORS

15. **Flashing Light**

Connector on Back Panel used to connect optional warning light with magnetic mount base to indicate visually when HV is energized. (Option sold separately)

16. **Warning Circuit**

Connector on Back Panel to connect external light or audible alarm that will activate when HV is energized. This connector consists of dry contacts rated 250VAC, 5A meaning customer supplied power for external device required.

SECTION 4: 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. External Warning Circuits

Two options for providing an external warning circuit are provided on the connector rail. WX1 is a powered circuit and provides 120V power to an external flashing red warning light with magnetic mount (sold separately). WX2 provides a dry set of contacts to which an external warning device and its required power can be connected using the included plug.
5. 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 the low side (return) of test specimen to the high voltage cable shield lead (green) or to the rear of the test set (ground stud), whichever is more convenient.
2. Install the high voltage cable to the rear connection of the test set. Connect the center conductor to the high side of the test specimen.

SECTION 5: 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 currentmeter range for the desired test current (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 voltage control 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 current limiting reactor is placed in series with the primary of the high voltage transformer.

SECTION 6: CALIBRATION

CAUTION:

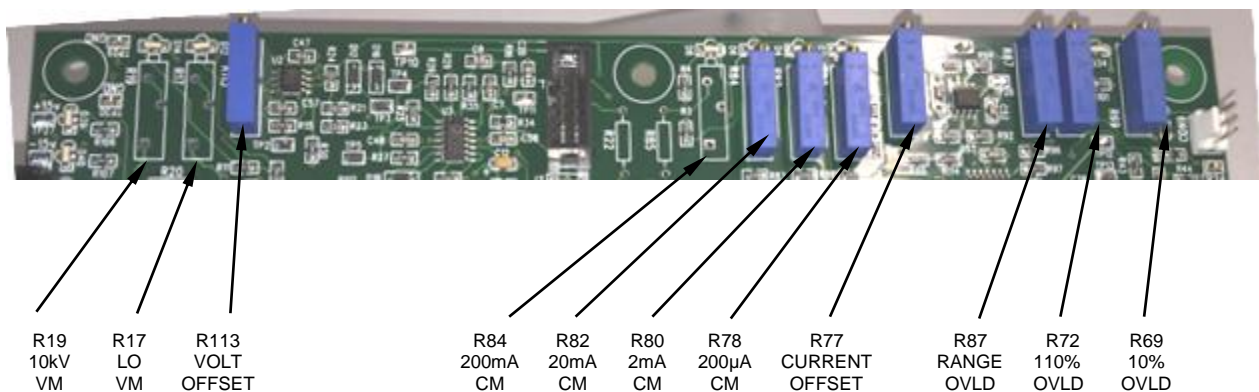
Calibration should only be done by persons familiar with High Voltage testing and safety procedures.

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

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

Locating the Calibration Adjustments

The calibration points are shown in the following diagram.



1. Output Voltmeter

Connect a precision high voltage voltmeter between the single range high voltage output to ground. Raise the output to approximately 80% of the rated output voltage. Adjust the reading on the panel meter (M2) by means of potentiometer R19 to a corresponding reading. Linearity may be checked at points between 10% and 100% of rated tap voltage.

2. Output Currentmeter

It is necessary to connect adequately rated High Voltage loads (isolated from ground) to the high voltage unit that will allow each full range current to be drawn at approximately 15% or higher output voltage. This allows sufficient resolution to adjust current levels. All ranges can be calibrated from 10 kV output.

Connect a precision ammeter between the low potential side of the appropriate high voltage load and the "GND" post. Raise the output to approximately 80% of the range. Adjust the reading on the panel meter (M1) by means of potentiometer R84 to a corresponding reading.

NOTE: An optional method is to use current injection between RTN and GND (Guard Mode). **Do not turn High Voltage on for this method!**

CALIBRATION

3. **Overcurrent**

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: A High Voltage Load will give better resolution and make calibration easier.
- b. Set the Current Trip potentiometer on the front panel to "1".
- 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 R15 until the Reset lamp illuminates and high voltage is shut off.
- e. Set the Current 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 R103 until the Overload lamp illuminates and high voltage is shut off.
- h. Repeat step "B" through "G" as necessary until both settings are calibrated.

4. **Range Overcurrent:**

R87 sets an overcurrent for the ranges and should be set to trip at approximately 112% of full range current on medium range setting with current trip potentiometer set at "11."

NOTE: For Single Range models, the Range Overcurrent adjust is not used in calibration adjustments

5. **Voltage offset adjustment (R113):**

The voltage offset should be done with the voltage output lead connected to board ground. This typically can be done by connecting the output to the guard terminal. Once connected, the offset should be adjusted until the output meter reads nearest to zero. This offset adjustment should be done before adjustments to the voltage ranges are made. Test point T10 may also be used to make this adjustment.

6. **Current offset adjustment (R77):**

The current offset should be done with the current input connected to board ground. This typically can be done by placing a jumper from the guard to the return terminal. Once jumped, the offset should be adjusted until the output meter reads nearest to zero. This offset adjustment should be done before adjustments to the current ranges are made. Test point T37 may also be used to make this adjustment.

SECTION 7: 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 all control and switch settings.
- ◆ Check indicating lamps. (Spare lamps are available through Phenix Technologies.)
- ◆ Check CB202
- ◆ Check operation of main power circuit breaker (CB201). Main Power lamp should be on.
- ◆ Check Transformer Power circuit breaker.
- ◆ Check all plug connections, internal and external, on the test set.

Specific Problems

1. High voltage cannot be turned on?

- Emergency off has been pressed – pull switch button up.
- External interlock is open (SX1).
- Voltage Control dial is not in zero start position.
- Protection circuit (Overload Trip) is not Reset.
- Transformer Power circuit breaker is off or faulty.
- Faulty HV On or Off switch.
- Faulty relay contacts.

2. Voltage control inoperable?

- Transformer Power circuit breaker faulty.
- Problem with power cable between Controls and High Voltage Unit.
- High voltage is not on (K201 not energized or see number 1 above).
- Faulty regulator “T201.”
- Faulty step-up transformer in high voltage unit (T301).

3. Overload Trip inoperable?

- Improper sensitivity (adjust Current Trip (R15) on front panel).
- Defective U13.
- Check the +15 volts DC and -15 volts DC regulator (U16, U17).
- Check LP4 (RESET) and relay K7 on PCB 1387.

TROUBLESHOOTING

Specific Problems (Cont'd)

4. **Currentmeter inoperable?**

- Binding post jumper clip installed between ground and guard with a grounded test object.
- Connection between currentmeter and high voltage test specimen return connected improperly.
- Meter damaged
- Faulty, TX1 interconnect cable.
- Damaged or inoperative range switch or wiring.
- Faulty Circuit on PCB1387.

5. **Voltmeter inoperable?**

- Faulty TX1 interconnect cable.
- Meter damaged
- No high voltage present at output bushing.
- Damaged or inoperative Measurement Divider Switch.
- Faulty circuit on PCB1387.

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

- Defective metering circuit.
- No input to voltage regulator section, possible problems with K201, regulator (T201), or with Transformer Power circuit breaker.
- Internal connection broken.
- High voltage winding of T301 short circuited.
- Refer also to 1 and 2.

SECTION 8: 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).

SECTION 9: CIRCUIT DIAGRAM SYMBOLS

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	Tranversée	Durchfuehung
C		Electrolytic Capacitor	Condensateur électrol	Elektrolytik kondensator
F		Fuse	Fusible	Sicherung
CT		Current Transformer	Transformateur de Courant	Stromtransformer
CB		Circuit Breaker	Intérupteur	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	Lösbare Klemme
X		Connector	Prise de Courant	Steckverbindung
K		Relay Contact Normally Open	Contact Normalement Ouvert	Schlierskontakt
K		Relay Contact Normally Closed	Contact Normalement Fermé	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 Fermé	Schrittschalter (Oeffner)
SW		Normally Closed Momentary Switch	Interrupteur Normalement Fermé Momentanement	Druckschalter (Oeffner)
SW		Normally Open Momentary Switch	Interrupteur Normalement Ouvert Momentanement	Druckschalter (Schliesser)
DP		Current Overload Device	Dispositif De Sur Intensité	UeberstromschutzEinheit

SECTION 10: ELECTRICAL DIAGRAMS

	<u>Drawing Number</u>	<u>Description</u>
1.	9607040	600P Series AC Dielectric Test Set Model 610-2P (120V)
2.	9607042	600P Series AC Dielectric Test Set Model 610-2P (220V)

SECTION 11: PARTS LIST

CONTROLS AND REGULATION SECTION			
ITEM	P/N	DESCRIPTION	QTY
CABLE	1077140	14/3 POWER SUPPLY CORD, NEMA 5-15P / IEC 320 C13, 6.5'	1
CB201 (120V)	1601325	25A 1P CKT BRKR 250V	1
CB201 (220V)	1601317	15A, 2P, 240V, AIRPAX, IELHK11-1-72-15.0-01-V	1
CB202	1601465	AIRPAX, 1P, 240V, 1A, BREAKER	1
D101-5	1780025	DIODE 1N4007	5
K201	1705465	ABB # DP30C3P-1	1
K201AUXA,B	1701500	ABB # CADP40-11	2
LP101	1422150	31-903.2 LENS, EAO RED	1
LP101	1420162	LAMP 24V RED	1
LP102	1422148	31-903.6 LENS, BLUE	1
LP102	1420160	LAMP 24V BLUE	1
LP103	1422151	31-903.5 LENS, GREEN	1
LP103	1420161	LAMP 24V GREEN	1
LP104	1423300	31-040-005 SOCKET	1
LP104,106	1420163	LAMP 24V WHITE	2
LP104,6-7	1422153	31-903.7 LENS CLEAR	3
M101-2	31138800	PCB1388: METER PROTECTION BD	2
M101-2	1506400	KNS DMO-66PHX 3 1/2 DIG LCD	2
M101-2	1152152	10 PIN SOCKET CONNECTOR	4
M101-2	1079909	RIBBON CABLE 10 COND	6 FT
MOV201 (120V)	1606100	MOVISTOR V130LA10A	1
MOV201 (220V)	1606110	MOVISTOR V275LA40A	1
P1	1153328	SCREW MOUNT POWER INLET RECEPT. 15A 250V IEC 320	1
R15	1355910	46-15-010 DIAL 30-0-11	1
R15	1761098	10 K, 2 W, LINEAR	1
R15	1355101	26-15-61-3 KNOB	1
R15	1355905	47-15-023 STATOR BLACK	1
R15	1355102	31-15-10-1 PEAKED CAP	1

SECTION 11: PARTS LIST

CONTROLS AND REGULATION SECTION			
ITEM	P/N	DESCRIPTION	QTY
OUTPUTCBL	30070003	OUTPUT CABLE, 16' W/GROUND LEAD FOR 600P SERIES	1
PCB1387	31138713	PCB1387: 610-2P CNTRLS & METERING	1
SW101-103	1860120	31-121.025 EAO, MOM. 1POLE	3
SW104	1862917	SERIES 04 CONT BLOCK 1NC #704-900.2	1
SW104	1860791	SERIES 04 MUSHROOM-KEY RELEASE, 704-076.0	1
SW106	1860265	31-262.025 EAO LATCH 2POLE	1
SW107	1860260	31-261.025 EAO LATCH 1POLE	1
SW201	1866005	SW,ROLLER,20A Z-15GW22-B7-K	1
SX1	50100001	SX1 AMP PLUG	1
SX1,WX1	1151152	AMP CHS RCPT., 4F PIN, SIZE 11	2
SX1,WX1-2	1151174	CONTACT PINS, 24-20 AWG, FEMALE	6
T201 (120V)	1890200	1010B VARIABLE, STACO	1
T201 (220V)	1890215	1220 VARIABLE, STACO (240V)	1
T202 (220V)	1894425	P-8620 230/115 STPDN 50VA AUTO	1
TB201-202	1154311	3-141 TERM BLK PNL MNT	2
TB201-202	1154953	MS-3-141 MARKER STRIP	2
TMR1	1480120	PANEL MOUNT DIGITAL TIMER	1
WX2	1151150	AMP CHS RCPT.,4M PIN, SIZE 11	1
WX2	1151170	CONTACT PINS, 24-20 AWG, MALE	2
WX2	1151186	CBL CLAMP, SIZE 11 SMALL	1
WX2	1151160	AMP 4F PIN CBL PLUG, SIZE 11	2

HV SECTION			
ITEM	P/N	DESCRIPTION	QTY
D301-304	1780063	1.5KE12A 1N6273A 10V XORB	4
MOV301-303 (120V)	31107000	PCB1070: 3 PC MOVISTOR BD (130V) (2013)	1
MOV301-303 (220V)	31107001	PCB1070: 3 PC MOVISTOR BD (275V) (2013)	1
R301	1746605	6W, 33.3 MEG, 1%, #SSX103 w/END CAPS	1
R303-304	1740185	10W, 30 OHMS,1% WIRE WOUND	2
SPG301	1605110	CG90L, CPL SPARKGAP 90V	1
T301 (120V)	38321910	GA1-1910	1
T301 (220V)	38320661	GA1-0661	1

SECTION 12: 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

SECTION 13: 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.

<u>Part Name</u>	<u>Computer Number</u>	<u>Recommended Quantity</u>
Digital Panel Meter, 3 1/2", 0-2V Input	1506400	1
Limit Switch, 2HBA190-1	1866005	1
Relay, 30A/3P CONTACTOR	1705465	1
Switch, 31-121	1860120	1
Led 24V White	1420163	3
Led 24V Red	1420162	1
Led 24V Green	1420161	1
Led 24V Blue	1420160	1

SECTION 14: 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.

