

**PORTABLE HIGH CURRENT TEST SET MANUAL**

**MODEL NUMBER HC1**

**Version 5.3**



**Phenix Technologies, Inc**  
**A Division of Doble Engineering**  
75 Speicher Drive  
Accident, Maryland 21520

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**DANGER / WARNINGS**

**WARNING !!**

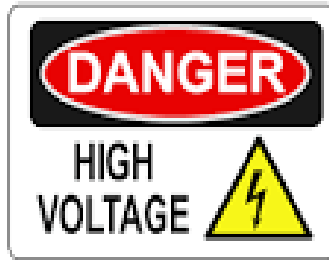


**DANGER**

**Grounding of this unit is necessary for the safe operation of this equipment. Disconnect inputs before ungrounding this equipment.**

# **DANGER / WARNINGS**

## **GENERAL SAFETY PRECAUTIONS**



### **HIGH CURRENT**

**This equipment can produce POTENTIALLY LETHAL VOLTAGES and /or SEVERE BURNS! 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.

# INTRODUCTION

The HC1 is a portable high current test set built for field and shop use. Designed using the latest technology, the HC1 combines a variable high current output with appropriate controls and instrumentation for testing thermal, magnetic, and solid-state motor overload relays, molded-case circuit breakers, and ground fault trip devices. The HC1 can be used in many other applications requiring a high current source.

The HC1 provides a short duration output of 1000 amps through a typical 150 ampere molded-case circuit breaker when an instantaneous trip element must be tested. Sufficient current is available for testing time delay characteristics of motor overload relays and molded-case circuit breakers.

The unique auto-sensing feature makes the HC1 easy to operate. Sensing leads, which operate on either normally open or normally closed (non-energized) devices, are connected to the test object auxiliary or non-energized contacts. The output current level can be easily pre-set. When the output is initiated, the pre-set output current locks on and the timer starts. When the test set senses a change in state of the test object auxiliary contacts (NO to NC or NC to NO), the current shuts off and the timer stops.

If set to sense current, unit will shut current off at approximately 10% of range switch setting of currentmeter when test object goes open. For instantaneous trip tests, the memory feature of the currentmeter holds the peak current value until reset by the operator.

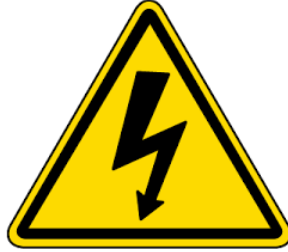
# TECHNICAL SPECIFICATIONS



## TECHNICAL DATA AND SPECIFICATIONS

<b>INPUT:</b>	110-120 Volts, 20 Amps – Slow Blow Fuse 50 Hz or 60 Hz (must be preset) or 220-240 Volts, 10 Amps – Slow Blow Fuse 50 Hz or 60 Hz (must be preset)
<b>OUTPUT:</b>	0-120 Volts, 0-5 amperes 0-24 Volts, 0-25 amperes 0-6 Volts, 0-120 amperes 0-3 Volts, 0-240 amperes
<b>OVERLOAD:</b>	Short duration overloads are possible on each tap. The test set is capable of up to 1000 amps, depending on the impedance of the test circuit.
<b>DUTY CYCLE:</b>	Continuous at 100% 5 minutes ON/15 minutes OFF at 200% 1 minute ON/5 minutes OFF at 300% 30 seconds ON/5 minutes OFF at 400%
<b>INSTRUMENTATION:</b>	Currentmeter: 3 1/2 digit LCD Ranges: 0-1.999/19.99/199.9/1000 amperes Accuracy: +/- .5%  Timer: 6 digit LCD, in cycles or seconds Ranges: 0-999999 cycles or 0-9999.99 seconds Accuracy: +/- 0.1% reading
<b>DIMENSIONS:</b>	21.25" W x 16.75" D x 13.75" H; 59 lbs. (220 V unit; 61 lbs.) (540 mm W x 426 mm D x 350 mm H; 26.8 kg) (220 V unit; 27.7 kg)  Cables: 4 lbs. (1.8 kg.)
<b>OUTPUT LEADS:</b>	5 ft. sense control leads 5 ft. (#2) high current leads 5 ft. low current leads (10 Ga)
<b>ENVIRONMENTAL AND ENCLOSURE RATINGS:</b>	Not intended for wet locations Indoor use only
IP Rating:	IPX0
Temperature Rating:	10 – 40 degrees Celsius
Humidity Rating:	< 95%
Altitude Rating:	<3300 ft. (1000m)
Pollution Degree:	2
Overvoltage Category:	II

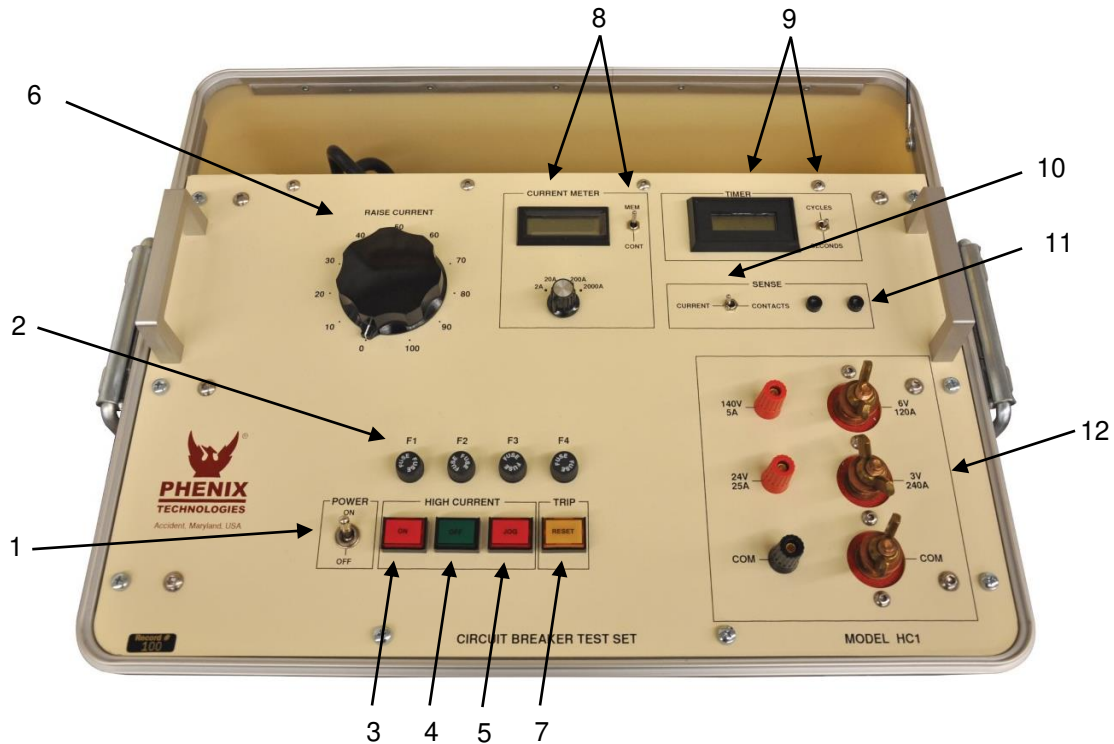
## SECTION 2: DEVICE WARNINGS



1. For safe operation, it is important that the unit be plugged into a properly grounded receptacle.
2. This unit is **NOT** designed for use in energized circuits.
3. **WARNING:** Due to leakage current within the solid-state circuitry, it is **STRONGLY RECOMMENDED** to turn control power off when changing the output leads.
4. **NEVER** connect sense jacks to energized contacts or terminals being injected by test unit.
5. Unit is designed to be carried for transport. Handles are on the side of the case for lifting. 2 personnel recommended to transport unit. Before lifting secure lid and all cables in unit with latches. Warning: Unit is > 90 lbs. Best practices for lifting should be followed as not to cause injury. Lift with knees and keep back straight.

## SECTION 3: CONTROLS AND INDICATORS

### Control Panel



The following is a listing of the controls, switches, and lamps on the control panel and a description of their functions.

1. **POWER** This controls the input power to the control and the power section.
2. **Fuses:**
  - F1, F2** This protects the high-power circuits of the unit.
  - F3** This protects the variable transformer.
  - F4** This protects control circuitry and power supplies.
3. **HC ON** When pressed, this allows current to flow from the unit (provided that the output is shorted as through a closed breaker). If this output current exceeds 10% of the selected output current range, the output will be maintained when the switch is released. Also, the **TIMER** will begin to run at this point.
4. **HC OFF** When this is pressed, the output current will cease to flow from the unit.
5. **JOG** This switch is used when it is desired to preset output current to a specific level. When pressed, the output current will begin to flow as it would when **HC ON** is pressed. The difference is that the **TIMER** will not begin running in this mode, and the output current will cease to flow when the switch is released, regardless of its magnitude.



## CONTROLS AND INDICATORS

### CONTROL PANEL (Cont'd)

6. **RAISE CURRENT** Controls current level from minimum to maximum of output tap when HC ON or JOG is activated. Use with JOG to preset current level through test object.
7. **TRIP/RESET** This switch serves several purposes.
- 1) When in CONTACTS mode, the lamp will illuminate to indicate that non energized contacts of the test specimen connected to the SENSE INPUTS has changed states.
  - 2) When in CURRENT mode, the lamp will illuminate to indicate that the output current has dropped below the 10% level.
  - 3) When pressed, the TIMER will be reset to zero.
  - 4) When the CURRENTMETER MEM/CONT is set to the MEM mode, pressing reset will release currentmeter from its highest registered reading. If the output current is not at zero, the present output reading will be maintained until either the output level increases, or the reset is pressed again.
  - 5) When illuminated, it must be pressed to reset controls for further operation.
8. **CURRENTMETER** This displays the RMS value of the output current level of the unit. There are four ranges available:

2 Amp	1.999
20 Amp	19.99
200 Amp	199.9
2000 Amp	1999

**WARNING: Please note that there is no correlation between the currentmeter range switch setting and the rating of the taps.**

#### MEM/CONT

When set to the CONT (continuous) mode, the meter will continuously update to display the output current level. When placed in the MEM (memory) mode, the meter will retain the highest output current level achieved. If the level again exceeds this value, the meter will be updated. If you are below the highest level, pressing RESET will update the meter to the present level of output.

Please note that the MEM mode of operation will only maintain the reading for a short time before the reading starts to decay.

#### 9. TIMER

The timer will begin counting when HC ON is pressed and the current surpasses the 10% level. The timer will stop when the current drops below the 10% level in the SENSE CURRENT mode. When in the SENSE CONTACTS mode, the timer will stop when a change in the SENSE INPUTS is detected.

The timer can be set to read CYCLES or SECONDS.

## CONTROLS AND INDICATORS

### CONTROL PANEL (Cont'd)

- 10. SENSE SWITCH** This can be set to CONTACTS or CURRENT mode. When placed in CONTACTS mode, the unit will react to a change in condition of the SENSE INPUTS. Upon a change in condition, the TIMER will stop running and the output current will cease to flow. The TRIP lamp will illuminate as an indication to the operator of a change in condition.

**CAUTION: In CONTACTS mode, sense leads must be properly connected to non-energized contacts operated by the test specimen, or the timer will not shut off when the test specimen goes open. If the sense leads are not used, the sense switch must be in CURRENT position for proper functioning.**

When the SENSE switch is set to the CURRENT mode, the unit will react to the output current dropping below 10% of the level of the selected current range.

- 11. SENSE Input** These are connected to an auxiliary set of contacts (non-energized) regardless if they are normally open or closed. When RESET is pressed, the unit will remember its state. If the state changes, the unit will react to this change if the SENSE switch is set to CONTACTS.

**CAUTION: Please do not attempt to connect these to the same set of contacts which you intend to energize, or to energized auxiliary contacts. This may cause damage to the unit.**

- 12. OUTPUT** Connectors for the four outputs taps (0-120 Volts at 5 amperes)  
(0-24 Volts at 25 amperes) (0-6 Volts at 120 amperes) (0-3 Volts at 240 amperes).

## SECTION 4: BASIC APPROACH TO TESTING



The HC1 is basically a continuously variable high current source, the magnitudes of which are dependent on the output tap which is selected. Please refer to the Technical Data and Specifications for the voltage and current ratings of the taps.

The output current is controlled by use of the RAISE CURRENT knob on the control panel. By turning the knob in the clockwise direction, the current is raised. By turning the knob in the counterclockwise direction, the output magnitude is decreased.

The RMS value of the output current is displayed on the CURRENTMETER. If the MEM/CONT switch is in the CONT (for CONTinuous), the meter displays the real-time value of the output. If the MEM/CONT switch is in the MEM (for MEMory), the highest value of the output current is displayed.

When a breaker is to be tested, the operator may select the SENSE CONTACTS mode or the SENSE CURRENT mode of operation. If an auxiliary set of non-energized contacts are available, the SENSE CONTACTS mode may be selected. By pressing JOG or RESET, the state of the contacts (be it normally open or normally closed) are remembered by the unit. The operator may then preset the output current to the desired level by use of the JOG switch. When this is done, by pressing HC ON (and assuming that the current level exceeds 10% of the CURRENTMETER range selected), the current will continue flowing after the switch is released and the TIMER will begin to run.

When the contacts connected to the SENSE INPUTS change state, the TIMER will stop running and the output current will cease to flow. The TRIP lamp will illuminate as an indication to the operator. If the MEM/CONT switch is in the MEM mode, the highest output current achieved will be displayed on the CURRENTMETER. The operator should note this level before the readings begin to decay. Pressing RESET will zero the TIMER and CURRENTMETER readings and prepare the unit for operation again.

When the SENSE switch is set to the CURRENT mode, the SENSE INPUTS are not used. This position was meant mainly for single pole breakers in which the SENSE INPUTS cannot be used. In this mode, initiation of the test is the same as in SENSE CONTACTS mode. The difference is the completion of the test. When the output current falls below 10% of range (as when the contacts of the breaker open), the TIMER stops running and the output current turns off. The TRIP lamp illuminates as an indication to the operator.

## SECTION 5: CALIBRATION

### TIMER

The timer is run from a precision programmable oscillator and should never require calibration.

### CURRENTMETER

The calibration of the currentmeter should be checked annually. To do this, place the MEM/CONT switch in the CONT position. Place the range switch in the lowest range. With nothing connected to the output and the CURRENT CONTROL knob in its fully counterclockwise position (zero position), adjust R75 until the CURRENTMETER reads zero.

Short output from the lowest current tap to the common tap with adequately rated cable. With appropriate test equipment (RMS), raise the output current to 80% of the range and adjust the corresponding calibration potentiometer to agree with your standard. Repeat this process for each current range using the tap with the closest higher current rating than the metering range.

Low	R84
Med-L	R85
Med-H	R69
High	R73

**SECTION 6: ELECTRICAL SCHEMATICS****Drawing Number****Description**

- |            |                                  |
|------------|----------------------------------|
| 1. 9304500 | HC-1 Electrical Schematic (120V) |
| 2. 9304501 | HC-1 Electrical Schematic (220V) |

## SECTION 7: HC-1 PARTS LIST

Item	Part No.	Description	QTY
INPUT	1077143	14/3, SJT, 8'PWR CORD (1FD92)	1
INPUT	1150944	3420-8, BUSHING 8(16)	1
OUTPUT	1351100	BINDING POST 459 BLACK	1
OUTPUT	1351102	BINDING POST 459-102 RED	2
SENSE	1351111	PIN JACK 39F1562	2
SENSE	1351112	PIN PLUG BLACK	2
CT1	1892206	CURRENT TRANS. 1000/1	1
F1-4	1603920	#345613A 1P PNL MNT FUSEHLDER (3 AG)	4
F1-3	1603629	MDA 20 SLOW BLOW FUSE (120V) – User Replaceable	3
F1-3	1603625	MDA 10 SLOW BLOW FUSE (220V) – User Replaceable	3
F4	1603603	AGC-3 (120V) – User Replaceable	1
F4	1603602	AGC-1.5 (220V) – User Replaceable	1
J1, J2	1151955	JUMPER-JAX ROHS	2
M1	1506400	KNS DMO-66PHX 3 1/2 DIG LCD	1
MOV1,2	1606100	MOVISTOR V130LA10A (120V)	2
MOV1-2	1606110	MOVISTOR V275LA40A (220V)	2
PS1	1590110	PS 5VDC,5A, SW-OPEN FRAME	1
R200,201	1741990	10W, 1K, 1% WIREWOUND	2
SSR1	1700340	RELAY SOLID STATE 25A 120V	1
SW1,3,4,5	1420143	10-1307.1369 EAO LAMP 6.3V	4
SW1,4	1422150	31-903.2 LENS, EAO RED	2
SW1,3,4,5	1860120	31-121.025 EAO, MOM. 1POLE	4
SW2,8,9	1865010	MPC223 PCB TOGGLE	3
SW3	1422152	31-903.4 LENS, YELLOW	1
SW5	1422151	31-903.5 LENS, GREEN	1
SW6	1355310	KNOB PKAP-50B-1/4	1
SW6	1863047	ROTARY SW 2P 2-6 POS-S (10WA355)	1
SW7	1865005	C-H7565K7 TLG 2PDT	1
T1	1890201	STACO 1010B VARIAC (120V)	1
T1	1890204	1020B VAR. STACO (220V)	1
T2	8321164	GA1-1164	1
TIMER	1152210	10 PIN CONNECTOR	1
TIMER	1501057	LCD DISPLAY BEZEL	1
TIMER	31144100	PCB1441: HC COUNTER W/ DISPLAY	1
PCB1223	31122305	PCB1223 ASSY FOR HC 0.3,1,2,3	1
PCB1361	31136100	PCB1361 HC CONTROLS AND PWR ASSY	1

## SECTION 8: 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.

Send orders for replacement parts to:

**Service Department  
Phenix Technologies, Inc.  
75 Speicher Drive  
Accident, Maryland 21520**

**Ph: 1 (301) 746-8118  
Fax: 1 ((301) 895-5570  
E-mail: [info@phenixtech.com](mailto:info@phenixtech.com)**

## SECTION 9: 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 cases, contact Phenix Technologies for a recommendation.

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

Qty	Part Number	Item	Description
3	1603629	F1-3 (120V)	MDA 20 SLOW BLOW FUSE (120V) – User Replaceable
3	1603625	F1-3 (120V)	MDA 10 SLOW BLOW FUSE (220V) – User Replaceable
1	1603603	F4 (120V)	Fuse, 3A, 250V, Fast Acting Fuse – User Replaceable
1	1603600	F4 (220V)	Fuse, 1.5A, 250V, Fast Acting Fuse – User Replaceable
4	1420143	*HC ON, HC OFF, JOG, RESET	Lamp, 6.3V
4	1860120	SW1,3,4,5	Switch, HC ON, OFF, JOG, RESET
1	1506400	M1	Current Meter, 3 ½ Digit
1	31144100	Timer	PCB1441: HC COUNTER W/ DISPLAY



## SECTION 10: 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.

## SECTION 11: CUSTOMER COMMENTS/SUGGESTIONS

Phenix Technologies made significant efforts to ensure that the materials in this Operator’s Manual are correct. If there are concerns or comments as you have used this information, Phenix Technologies appreciates any feedback.

Unit Serial Number:

Sect	Page(s)	Comment

Please return to Phenix Technologies, Engineering Department, 75 Speicher Drive, Accident, MD 21520 USA.

Phone: 1 (301) 746-8118, Fax: 1 (301) 895-5570 or Email: [info@phenixtech.com](mailto:info@phenixtech.com)