USER'S MANUAL

PORTABLE HIGH CURRENT TEST SET

MODEL NUMBER HC2

Version 4.4

ARTEST



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

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DANGER / WARNINGS

WARNING !!

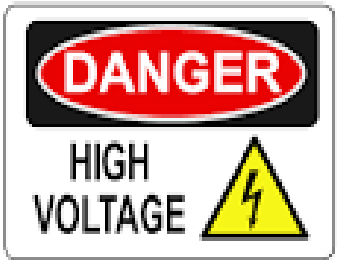


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DANGER

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

GENERAL SAFETY PRECAUTIONS



HIGH CURRENT

This equipment is capable of providing 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.

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INTRODUCTION

The HC-2 is a portable high current test set built for field and shop use. Designed using the latest technology, the HC-2 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 HC2 can be used in many other applications requiring a high current source.

The HC-2 provides a short duration output of 2,000 amps through a typical 200 amp 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 HC-2 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.

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SECTION 1: TECHNICAL SPECIFICATIONS



INPUT: 110-120 Volts, 20 Amps – Delay Circuit Breaker
50 Hz or 60 Hz (must be preset)
or
220-240 Volts, 10 Amps – Delay Circuit Bre
50 Hz or 60 Hz (must be preset)

Input voltage as ordered

OUTPUT: 0-70 Volts, 0-25 amperes
0-14 Volts, 0-125 amperes
0-7 Volts, 0-250 amperes
0-3.5 Volts at 500 amperes

OVERLOAD: Short duration overloads are possible on each tap. The test set is capable of up to 2000 amps, depending on the impedance of the test circuit.

DUTY CYCLE: 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%

INSTRUMENTATION: Currentmeter: 3 1/2 digit LCD
Ranges: 0-1.999/19.99/199.9/1999 amperes
Accuracy: +/- .5%

Timer: 6 digit LCD, in cycles or seconds
Ranges: 0-999999 cycles or 0-9999.99 seconds
Accuracy: +/- 0.1% reading

DIMENSIONS: 21.25" W x 16.75" D x 13.75" H; 93 lbs. (220 V unit; 95 lbs.)
(540mm W x 426 mm D x 350 mm H; 42.2 kg) (220 V unit; 43 kg)
Cables: 11.5 lbs. (5.2 kg.)

OUTPUT LEADS: 5 ft. sense control leads
5 ft. high current leads (4/0 and 4 Ga)
5 ft. low current leads (10 Ga)

ENVIRONMENTAL AND ENCLOSURE RATINGS: 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

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SECTION 2: DEVICE WARNINGS

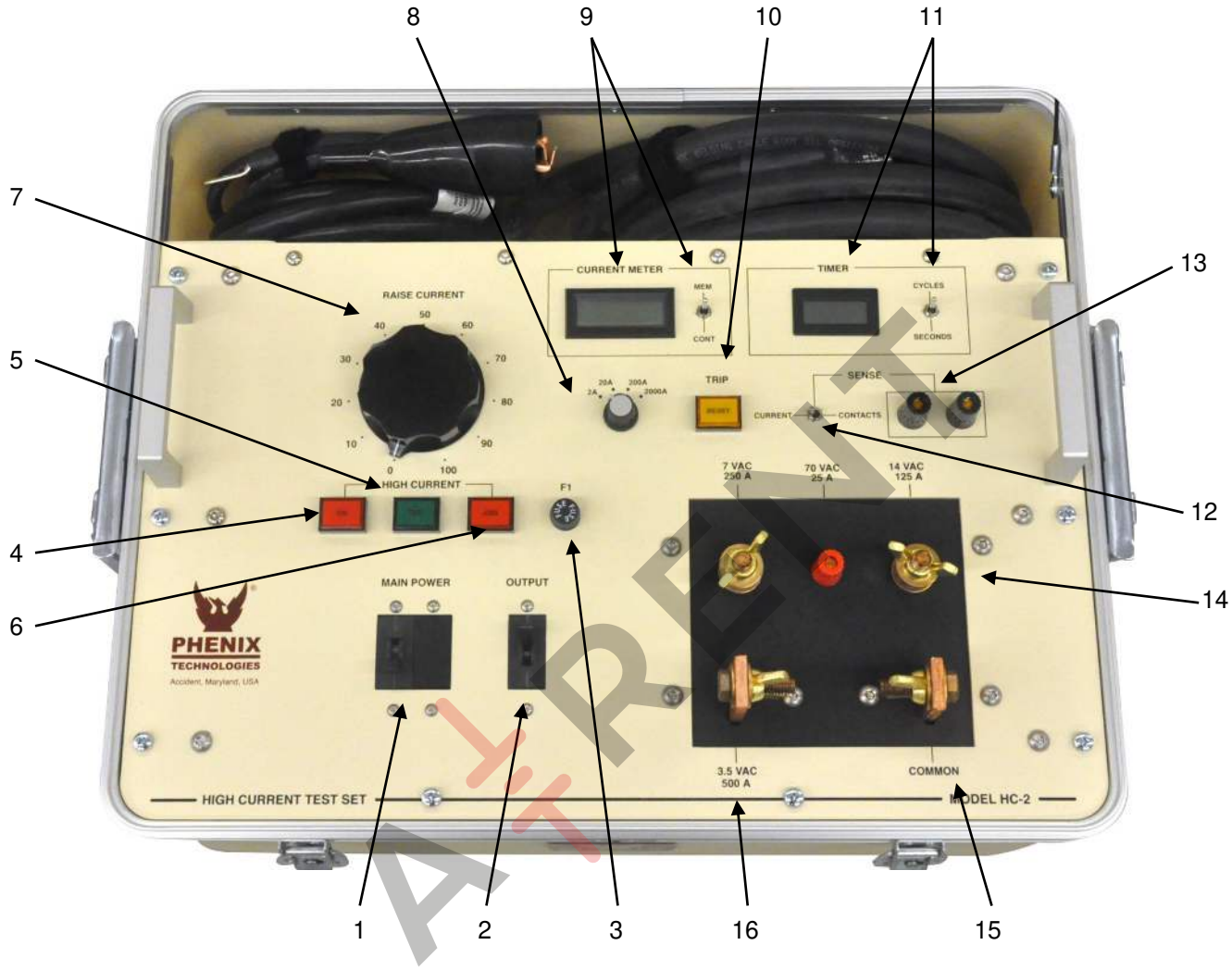


1. For safe operation, it is important that the unit be plugged into a properly grounded receptacle.
2. This unit is **NOT** designed for use in energized circuits.
3. **WARNING**: Due to leakage current within the solid-state circuitry, it is **STRONGLY RECOMMENDED** to turn control power off when changing 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.

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SECTION 3: CONTROLS AND INDICATORS

HC2 Control Panel



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1. MAIN POWER This circuit breaker controls the input power to the control and the power sections.

2. OUTPUT This circuit breaker protects the variable transformer.

3. F1 This protects the control circuitry and power supplies.

4. 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.

5. HC OFF When this is pressed, the output current will cease to flow from the unit.

6. 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

HC2 Control Panel (Cont'd)

7. 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.

8. RANGE SWITCH Four ranges available are 2 Amp (R84), 20 Amp (R85), 200 Amp (R-69), 2000 Amp (R73)

9. 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.

10. TRIP/RESET This switch serves several purposes.

1) When in CONTACTS mode, the lamp will illuminate to indicate that the 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.

11. 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.

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CONTROLS AND INDICATORS

12. 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.

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.

13. SENSE INPUTS 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.

14. CONNECTORS Locations for 3 test connections (7 VAC, 250 A), (70 VAC 25 A), (14 VAC, 125 A).

15. COMMON Electrical connection for test cable.

16. CONNECTOR Test connection (3.5 VAC, 500 A).

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SECTION 4: BASIC APPROACH TO TESTING

The HC2 is basically a continuously variable high current source, the magnitudes of which are dependent on the output tap that is selected. Please refer to the Technical Data and Specifications for the voltage and current ratings of the taps. The test object should be connected between one of the output taps and the common tap.

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.

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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

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SECTION 6: ELECTRICAL SCHEMATICS

Drawing Number	Description
1. 9304510	HC-2 Electrical Schematic (120V)
2. 9304511	HC-2 Electrical Schematic (220V)

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SECTION 7: HC-2 PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY
CB1 (120V)	1601395	CKT BRKR HOLE COVER (120V)	1
CB1, CB2 (120V)	1601330	30A 1P CKT BRKR 250V (CE) (120V)	2
CB1 (220V)	1601317	15A 2P CKT BRKR 250V (CE) (220V)	1
CB2 (220V)	1601315	15A 1P CKT BRKR 250V (CE) (220V)	1
CT1	1892206	CURRENT TRANS. 1000/1	1
F1	1603603	AGC-3 (120V) – User Replaceable	1
F1	1603602	AGC-1.5 (220V) – User Replaceable	1
F1	1603920	1P PNL MNT FUSEHLDER (3 AG)	1
LP1,3	1422150	LENS, EAO RED	2
LP1-4	1420143	EAO LAMP 6.3V	4
LP2	1422151	LENS, GREEN	1
LP4	1422152	LENS YELLOW	1
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
PCB1361	31136100	PCB1361: HC CNTRLS AND PWR ASSY	1
PS1	1590110	PS 5VDC,5A, SW-OPEN FRAME	1
R200,201	1741990	10W, 1K, 1% WIREWOUND	2
PCB1223	31122305	PCB1223 ASSY FOR HC 0.3,1,2,3	1
SSR1	1700345	SOLID STATE RELAY 40A (120V)	1
SSR1	1700335	CRYDOM RELAY 25A (220V)	1
SW1,3,4,5	1860120	EAO, MOM. 1POLE	4
SW2,8,9	1865010	MPC223 PCB TOGGLE	3
SW6	1355310	KNOB	1
SW6	1863047	ROTARY SW 2P 2-6 POS-S	1
T1	1890231	STACO 1510 VARIAC	1
TIMER	1501057	BEZEL KIT	1
TIMER	31144100	PCB1441: HC COUNTER/TIMER	1
T2	38321185	GA1-1185	1

ARCHIVE

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

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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.

Part Name	Computer Number	Recommended Quantity
Lamps, 6.3 V, EAO	1420143	8
EAO Momentary – 1 POLE Switch (SW1, 3, 4, 5)	1860120	1
Binding Post – RED	1351102	1
Binding Post - BLACK	1351100	1
F1 (120V) 3 AG 3 Amp – User Replaceable	1603603	1
F1 (220V) 3 AG 1.5 Amp – User Replaceable	1603602	1
Current Meter – KNS 3 ½ digit	1506400	1
Timer – PCB1441	31144100	1
Lens – Red EAO	1422150	1
Lens – Green EAO	1422151	1
Lens – Amber EAO	1422152	1

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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.

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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

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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