

# USER'S MANUAL



## PORTABLE HIGH CURRENT TEST SET

MODEL NUMBER HC-3

Version 4.1



Rev 9/1/2016 nab

HC-3

## INTRODUCTION

The HC-3 is a portable high current test set built for field and shop use. Designed using the latest technology, the HC-3 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 HC-3 can be used in many other applications requiring a high current source.

The HC-3 provides a short duration output of up to 4000 amps through a typical 400 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 HC-3 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 9% (5% of range at 4000 amps) 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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DANGER / WARNINGS

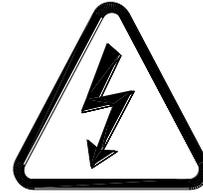
# **WARNING !!**

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

## 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.**

- **Get 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:** 220-240 Volts 25 Amp-Delay  
50 Hz or 60 Hz (must be preset)
- OUTPUT:** 0-15 Volts, 0-200 Amps  
0-7.5 Volts, 0-400 Amps  
0-3.75 Volts, 0-800 Amps
- OVERLOAD:** Short duration overloads are possible on each tap. The test set is capable of up to 4000+ 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/10 minutes OFF at 300%  
10 seconds ON/5 minutes OFF at 400%  
3 seconds ON/5 minutes OFF at 500%
- INSTRUMENTATION:** Currentmeter: 4 1/2 digit LCD  
Ranges: 0-1.9999/19.999/199.99/4000+ amperes  
Accuracy: +/- .5% to 2000 Amps,  $\pm$  1% 2000-4000 Amps of Range F.S.
- Timer: 6 digit LCD, in cycles or seconds  
Ranges: 0-999999 cycles or 0-9999.99 seconds  
Accuracy: +/- 0.1% reading
- DIMENSIONS:** 22 1/4" W x 22 1/4" D x 46" H; (205 lbs. with cables)  
(565 mm W x 565 mm D x 1168 mm H; 96 kg)
- OUTPUT LEADS:** 8 ft. sense leads  
2 ft. high current leads (Parallel 4/0)  
6 ft. low current leads (10 Ga)  
4 ft medium current leads (4 Ga)

## 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. 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.

## SECTION 3: CONTROLS AND INDICATORS



The following is a listing of the controls, switches, and lamps on the control panels and a description of their functions. Refer to Figures 1 and 2 below.

## CONTROLS AND INDICATORS



**Figure 1. HC-3 Controls**

- |                      |   |
|----------------------|---|
| <b>1. INPUT</b>      | Input cable plugs in here to provide input power.   |
| <b>2. MAIN POWER</b> | This controls the input power to the control and the power section and protects the power circuits. |
| <b>3. OUTPUT</b>     | Protects the variable transformer.  |
| <b>4. F1, F2</b>     | Fuses to protect the control circuitry and power supplies.  |

## CONTROLS AND INDICATORS

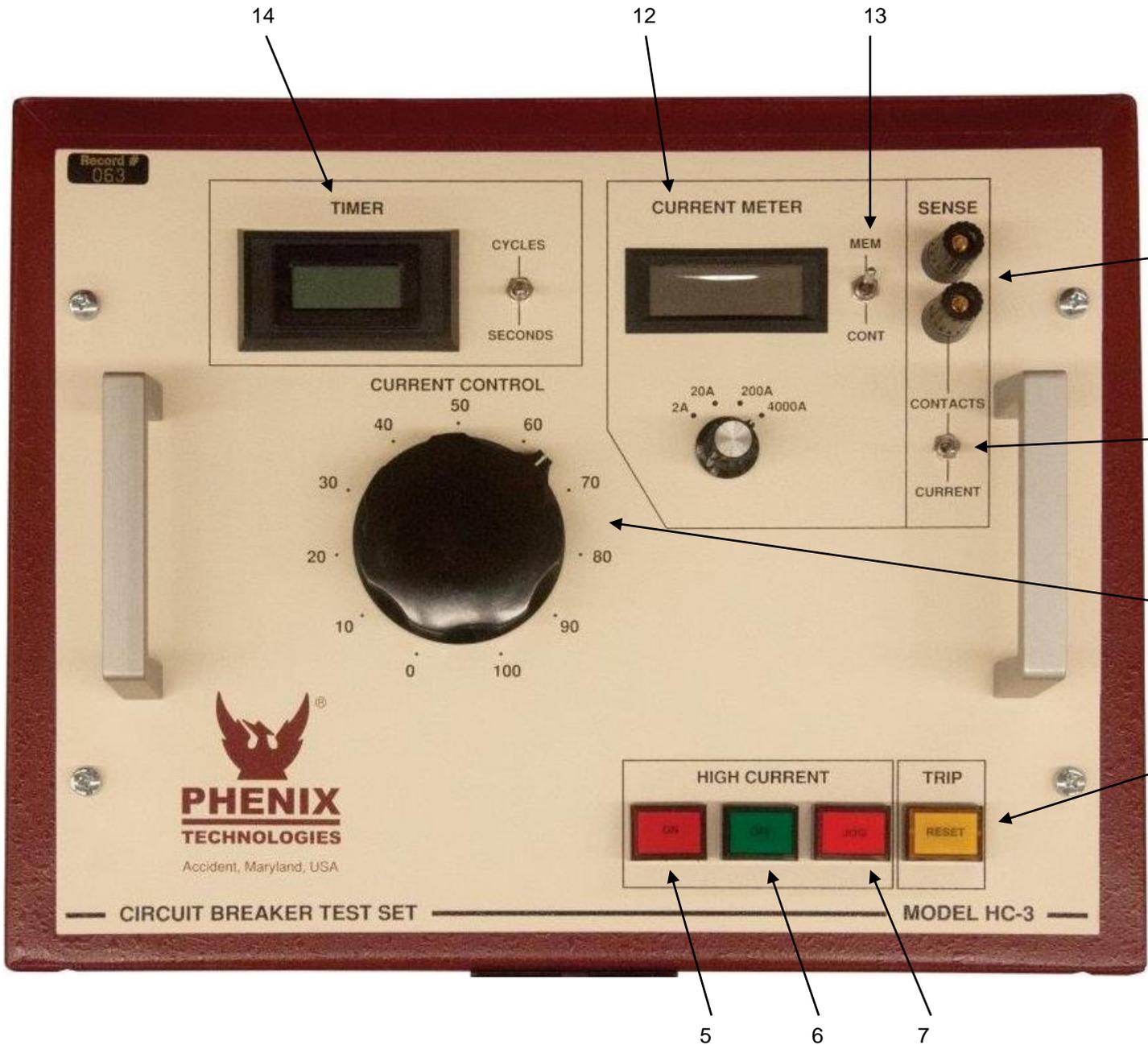


Figure 2. HC-3 Controls and Indicators

- 5. 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 approximately 9% (5% of 4000A range) 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.
- 6. HC OFF** When this is pressed, the output current will cease to flow from the unit.

## CONTROLS AND INDICATORS

### 7. 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.

### 8 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 9% level (5% of 4000A range).
- 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.

### 9. CURRENT CONTROL

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.

### 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 (Normally Open to Normally Closed, or Normally Closed to Normally Open). 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 approximately 9% (5% of 4000A range) of the level of the selected current range.

### 11. 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.

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

## CONTROLS AND INDICATORS

**12. CURRENTMETER** This displays the RMS value of the output current level of the unit. There are four ranges available:

2 Amp	1.9999
20 Amp	19.999
200 Amp	199.99
4000 Amp	4000+

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

**13. 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.

**14. TIMER**

The timer will begin counting when HC ON is pressed and the current surpasses the 9% or 5% level. The timer will stop when the current drops below the 9% or 5% 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.

## SECTION 4: BASIC APPROACH TO TESTING

The HC3 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 CURRENT CONTROL knob on the control panel. By turning the knob in the clockwise direction, the current is raised. By turning the knob in the counter-clockwise 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 approximately 9% of the CURRENTMETER range selected; 5% on 4000A range) 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 9% or 5% 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 on a yearly basis. To do this, place the MEM/CONT switch in the CONT position. Place the range switch in the 2 AMP range. With nothing connected to the output and the CURRENT CONTROL knob in its fully counter-clockwise position, adjust R10 until the CURRENTMETER reads zero. With appropriate test equipment (RMS) raise the output current to 80% of each range and adjust the corresponding calibration potentiometer to agree with your standard.

2 Amp	R84
20 Amp	R85
200 Amp	R69
4000 Amp	R73

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

1. 9304531

HC-3 Electrical Schematic

## SECTION 7: HC-3 PARTS LIST

Qty	Phenix Stock #	Item	Description
<b>INPUT PANEL</b>			
1	1153311		Cable, Input Connector
1	1153310		Panel, Input Connector
2	1603602	*F1, F2	Fuse, 1.5A, 250V, Fast Acting Fuse
2	1603920	F1, F2	Fuse Holder
2	1601327	CB1, CB2	25 Amp 2 Pole Circuit Breaker
<b>CONTROLS</b>			
2	1351100	JACKS-SENSE	Binding Post, Black
1	1892206	CT1	Current Transformer
4	1420143	*HC ON, HC OFF, JOG, RESET	Lamp, 6.3V
1	1422151	HC OFF	Lens, Green
2	1422150	HC ON, JOG	Lens, Red
1	1422148	RESET	Lens, Blue
1	1422152	RESET	Lens, Yellow
1	1506405	M1	Current Meter, 4 ½ Digit
2	1606110	MOV1, 2	Movistor V275LA40A
1	1590110	P.S. 5V	Power Supply, 5 Volt
1	31136100	PCB1361	PCB1361: HC CNTRLS AND PWR ASSY
1	31122305	PCB1223	PCB1223 ASSY FOR HC 0.3,1,2,3
2	1151955	J1, J2	JUMPER-JAX ROHS
2	1741990	R200,201	Resistor, 1K, 10W
1	1721700	R206	Resistor, 910 Ohm, .5W, 1%
1	1712175	R207	Resistor, 8.2 Kohm, .5W, 1%
3	1860120	SW1,3,4,5	Switch, HC ON, OFF, JOG, RESET
3	1865010	SW2,8,9	Mem/Cont, Cycles/Seconds, Current/Contacts
1	1355310	SW6	Knob, Current Range SW
1	1863042	SW6	Switch, Current Range
1	1505420	Timer	Timer, Red Lion, Sub Cub D, SCUB-D2-00/A
1	1505421		Timer Bezel Kit, HWK-60-000/D
<b>REGULATOR/OUTPUT</b>			
1	1700375	SSR1	Relay, Solid State
1	1890239	T1	Transformer, Variable
1	2350124	Fan 1	Cooling Fan
1	1077300		Cord Set, Fan
1	38601678	T2	Output Transformer, IA1-1678
<b>MISCELLANEOUS/MECHANICAL</b>			
1	2371045	*	Latch, Cover
2	2109525		Glides, Cart
2	2109500		Bumpers, Cover

## SECTION 8: RECOMMENDED SPARE PARTS

Qty	Part Number	Item	Description
2	1603602	*F1, F2	Fuse, 1.5A, 250V, Fast Acting Fuse
4	1420143	*HC ON, HC OFF, JOG, RESET	Lamp, 6.3V
1	1351100		BINDING POST 459 BLACK
4	1603920	F1-4	#345613A 1P PNL MNT FUSEHLDER (3 AG)
3	1603629	F1-F3	MDA 20 SLOW BLOW FUSE (120v)
3	160325	F1-3	MDA 10 SLOW BLOW FUSE (220V)
1	1602603	F4	AGC-3 (120V)
1	1603602	F4	AGC-1.5 (220V)
1	1506400	M1	KNS DMO-66PHX 3 ½ DIG LCD
4	1420143	SW1,3,4,5	10-1307 1369 EAO LAMP 6.3V
2	1422150	SW1,4	31-903.2 LENS, EAO RED
4	1860120	SW1,3,4,5,	31-121 025 EAO, MOM, 1 POLE
1	1422152	SW3	31-903.4 LENS, YELLOW
1	1422151	SW5	31-903.5 LENS, GREEN
1	1865	SW7	C-H7565K7 TLG 2PDT
1	1505420	TIMER	MDMU0000 RED LION COUNTER/TIMER
1	2371045		Latch, Cover

## SECTION 9: 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 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.

