

# PI-5000

## Mobile Two Piece Circuit Breaker Test Set

- **Input: 480 VAC +/- 10%**
- **55.2 KVA Continuous ( Test up to 4000 Amp Circuit Breakers)**
- **Digital Memory Ammeter Controller MAC-21**
- **Selectable Output Connections for all types impedance loads**
- **Variable pulse times for convenient preset output current**
- **Two-piece ruggedized enclosures for ease of mobility and accessibility**



### DESCRIPTION

The PI-5000 is composed of the PI2500 and the AUX-5000 auxiliary output unit, which when combined gives the unit the capability of testing 4000 ampere breakers, with essentially the same specifications as the proven PI-4000B. The auxiliary unit is smaller than the PI2500, so it can also be maneuvered easily in tight spaces, or lowered into shafts and manholes that would not be possible with a larger single piece unit.

The AUX-5000 enclosure is easily attached to the PI-2500 output stabs by means of horizontal bus bars with stainless steel socket head cap bolts and sturdy nut plates. The AUX-5000 enclosure is simply rolled into place to mate with the PI-2500 test set, and then the cap screws are tightened. It is recommended to use a stubby fine pitch ratchet wrench or a pneumatic air ratchet, with an allen wrench hex bit.

The main electrical power and ground connections to the AUX-5000 are the same twist-lock connectors as those on the PI-2500. Power cables attached and stored in a compartment in the AUX-5000 are then connected to the PI-2500. The connectors are color-coded for proper connections to be connected with black to black and red to red.

There is also a control cable with easily twist lock quick connectors which connects from the AUX-5000 to the PI-2500.

The output of the AUX-5000 accommodates standard breaker stabs, for continuous output of 4000 amperes. It can also be configured in series mode for a continuous output of 2000 amperes. The configuration switch on the PI2500 must be set to 4000 or 2000 for proper output readings.

The combined unit, known as the PI-5000, can only be used on 480 VAC.

### APPLICATIONS

This test set will test low-voltage, molded-case and metal-clad, direct acting AC circuit breaker from various manufactures. The test set can also be used on high current applications like ratio transformers, and heat runs. Using SCR's the **PI-5000** eliminates closing time errors. Initiation at the zero crossover point eliminates DC offset in the current waveform and results in accurate, repeatable test results even with short-duration currents for high speed solid state or electromechanical trip devices. The reduced length and width of the test set allows it to be maneuvered in tight spaces and it can be lowered into a shaft 26" x 30", or a manhole 40" diameter. Provisions have been made on the bottom of the frame for a lifting sling to be attached without slipping from the corners. The rugged silver plated copper stab adaptors supplied with the test set are designed to be used for both vertical and horizontal stabs, and have both 1/2" and 3/4" output plates.

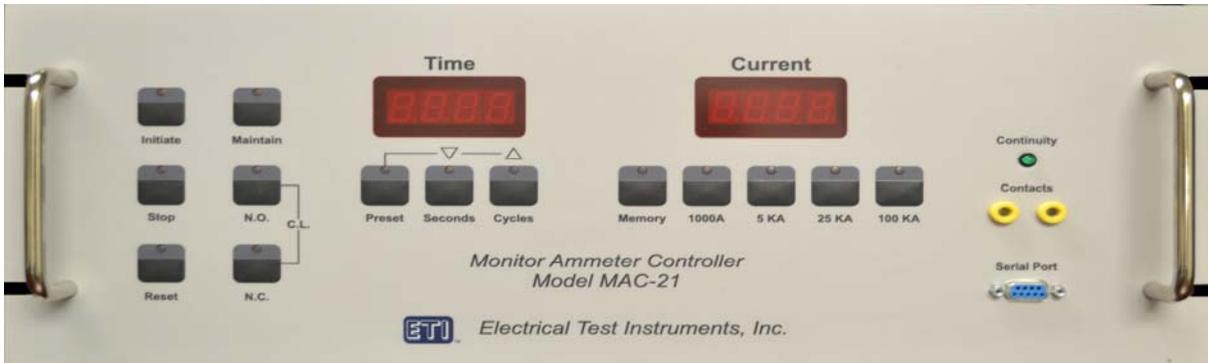
### ADVANCED FEATURES

**Serial port:** This standard serial port may be connected to a printer, computer, or other device to print or store time and current values of test results in ASCII format. It is set for 9600 baud, 8 bits, 1 stop bit, no parity. This interface enables you to download data into various computer software programs.

**Initiating Control:** The advance initiate circuitry provides both pulse preset modes for cycles or seconds for output duration. The pulse mode automatically pulses the output to any preset programmed duration. This provides additional testing capabilities for electromechanical and solid state trip devices. A short preset pulse duration also allows for instantaneous tripping without preheating the breaker under test. A long preset time can be used for heat runs on cables or other devices up to maximum 9999 seconds.

**Zero DC Offset:** Use of digitally controlled SCR's instead of a contactor to initiate the output of the test set eliminates closing time error and thereby ensures precise initiation at the zero crossover point of the output current waveform every time. Initiation at the zero crossover point ensures symmetrical output current by eliminating DC offset in the current waveform. Therefore accurate, repeatable test results are assured even with currents of very short duration, as when conducting tests of instantaneous or short delay trips.

# Monitor Ammeter Controller



## Model MAC-21 Control Panel Description

**INITIATE key:** This key is used to turn ON the output of the test set. The LED in the key indicates that the MAC-21 is attempting to turn the output ON. In MOMENTARY mode, the key must be held to keep output current on. In MAINTAIN mode, once current is detected, the output will stay on until the breaker trips, or the STOP or RESET button are pressed.

**STOP key:** This key is used to turn the output of the test set OFF. Use of this key is usually necessary only when in MAINTAIN mode, and it is necessary to abort the test before the breaker trips. The STOP key is also used to access peak RMS and last average RMS values. See description of CURRENT DISPLAY for details.

**RESET key:** This key resets the displays on the MAC-21, and arms the pulse reading system. The LED on the key indicates that the system is reset and armed. RESET also takes the unit out of PRESET ADJUST mode.

**DOWNLOAD key combination:** On models equipped with a printer option, the STOP and RESET keys may be pressed simultaneously to send the time and current readings in ASCII format to a printer or computer, via the serial port.

**MAINTAIN key:** This key toggles the MAINTAIN or MOMENTARY mode for initiation; its LED indicates that this mode is enabled. When in MAINTAIN mode, the INITIATE key need only be pressed briefly to turn output on. For test sets with motorized vernier, the MAINTAIN key may be pressed while output is ON to provide automatic current hold feature. The LED in the MAINTAIN key will blink while this mode is set, and the vernier motor will be activated whenever the current varies more than 5 amperes from the value displayed when the key was pressed. The key may be pressed again to return to normal mode. STOP or RESET will also discontinue current hold.

**NORMALLY OPEN key:** This key is used to set the Normally Open contacts mode when testing a device with an normally open auxiliary contacts. In N.O. mode, the timer starts as soon as current (about 3% of range) is detected after the INITIATE key is pressed, and stops when the STOP key is pressed or a break in continuity is sensed at the CONTACTS binding posts. Timing accuracy in this mode is typically +/- 0.01 seconds.

**NORMALLY CLOSED key:** This key is used to set the Normally Closed contacts mode when testing a device with an normally closed auxiliary contacts. In N.C. mode, the timer starts as soon as current (about 3% of range) is detected after the INITIATE key is pressed, and stops when the STOP key is pressed or a break in continuity is sensed at the CONTACTS binding posts. Timing accuracy in this mode is typically +/- 0.01 seconds.

**Current Latch key combination:** When the N.O. and N.C. keys are pressed simultaneously, both LEDs light, indicating C.L. mode (Current Latch). This is the normal power-up default mode for the test set, and is recommended for all tests. In this mode, current is continuously sampled, and when it exceeds approximately 10% of the current range value, the timer starts, and calculation of pulse current begins. When current stops the timer stops and the final value for pulse current is calculated and displayed as well as the time.

**PRESET key:** This key toggles the PRESET ADJUST mode, indicated by illumination of its LED. This feature is used to set current test durations for short times (jog or instantaneous) using the cycles or long times (heat runs) using the seconds modes. When not in PRESET mode, the LED will flash if the displayed time exceeds the preset limit.

**TIME DISPLAY:** This 4 digit LED display indicates the elapsed time of a current pulse. In SECONDS mode, it displays time up to 9.999 seconds, then autoranges to 99.99 seconds, 999.9 seconds, and 9999 seconds. In CYCLES mode, it reads time (based on 60 Hz), up to 999.9 cycles, then autoranges to 9999 cycles

**SECONDS key:** This key normally selects the SECONDS timebase. SECONDS or CYCLES timebase may be selected at any time before, during, or after a test.

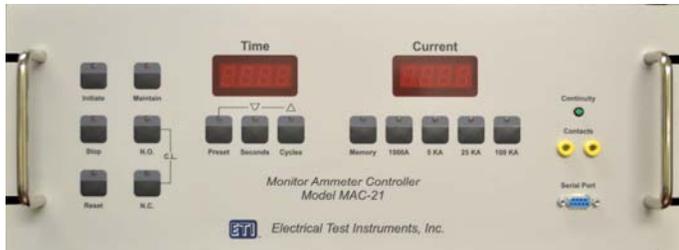
**CYCLES key:** This key normally selects the CYCLES timebase. SECONDS or CYCLES timebase may be selected at any time before, during, or after a test.

**CURRENT DISPLAY:** This 4 digit LED display indicates the output current. In CONTINUOUS mode, as well as in MEMORY mode before and during a test, the display indicates true-RMS output current in real time. This display can also indicate peak RMS and last average current. This feature allows the test set to be used to test various solid state trip devices used on circuit breakers. It may not be accurate for times less than half a cycle.

**MEMORY key:** This key toggles the MEMORY mode, indicated by illumination of its LED. In MEMORY mode (LED on), the current display will read the continuous output current until the test is complete. At this time, the LED will flash, and the display will read the computed true-RMS value of the entire current pulse for the duration indicated on the TIME display. This key may be pressed at any time before, during, or after the test, to toggle between the two modes.

# PI-5000

## Mobile Two Piece Circuit Breaker Test Set



## SPECIFICATIONS

### MAC-21 Monitor Ammeter Controller

#### Current Ranges:

- 0-1000 Amps
- 5 Kilo-Amps
- 25 Kilo-Amps
- 100 Kilo-Amps

#### Current Accuracy:

- Continuous
- +/- 0.5% of reading + .5% Full Scale
- Pulse
- +/- 1% of reading + 1% Full Scale Pulse

#### Timer Ranges:

- 0-9999.999 Seconds
- 0-9999.9 Cycles

#### Timer Accuracy:

- +/- 0.005% of reading +/- 1 count

#### Dimensions and Weight—(MAC-21)

- Height: 8.5 in. (216 mm)
- Width: 19.5 in. (495 mm)
- Depth: 13.0 in. (330 mm)
- Weight: 15 lb. (6.8 kg)

#### Included Accessories

- Input power plugs 1 pair
- Series output bus bars 3 pcs
- Stab Adaptor Assembly 1 pair
- Stab, BS-50HV (1/2" Universal) 1 set
- Stab, BS-75HV (3/4" Universal) 1 set
- Contacts leads 1 pair
- Technical manual 1 copy

### PI-5000 Output Current & Overload Capabilities

7.6 V (Par)	15.2 V (Series)	Over-load	Duty	Max ON Time	Min OFF Time	Max Input Curr 480V
4000 A	2000 A	1X	100%	Continu-ous	N/A	96 A
5600 A	2800 A	1.4 X	50%	15 Min	15 Min	134 A
8000 A	4000 A	2 X	25%	5 Min	15 Min	192 A
16000 A	8000 A	4 X	6%	1 Min	15 Min	384 A
20000 A	10000 A	6 X	2%	6 Sec	2 Min	480 A
32000 A	16000 A	8 X	1.6%	1 Sec	1 Min	672 A
40000 A	20000 A	10 X	1%	0.5 Sec	1 Min	960 A
60000 A	30000 A	MAX	.1%	0.03 Sec	1 Min	1440 A

#### Input Supply:

- 480 VAC + 10%, -15% Single Phase
- 60 Hz (50 Hz at 10% lower maximum line voltages)

#### Dimensions and Weight—(Control Unit PI-2500)

- Height: 41 in. (1041 mm)
- Width: 29 in. (737 mm)
- Depth: 25 in. (635 mm)
- Weight: 515 lb. (192 kg)

#### Dimensions and Weight—(Aux Unit PI-5000)

- Height: 35 in. (889 mm)
- Width: 30 in. (762 mm)
- Depth: 25 in. (635 mm)
- Weight: 585 lb. (218 kg)

**Electrical Test Instruments, Inc.**