PI-1600 Gen2
Portable Circuit Breaker Test Set

- Input: 208-240 VAC +/- 10% (Switch Selectable
- 9.8KVA Continuous (Test up to 1600 Amp Circuit Breakers)
- Digital Memory Ammeter Controller MAC-21
- Rugged plastic and aluminum enclosure with removable protective lids
- Selectable Output Connections for all types impedance loads
- Variable pulse times for convenient preset output current

DESCRIPTION

The **PI-1600** Circuit Breaker Test System incorporates modular design and flexibility to provide unequaled capability in a portable package. The **PI-1600** test set is two test sets in one. The **PI-800** section can be used alone, on 120 or 240 VAC supplies, generates continuous current of 400, 800, amps at 4.2 kVA, with peak output to over 10x. When configured for the **PI-1600** the *PI-AUX* output unit is connected in series or parallel to the **PI-800**. The *PI-AUX* boosts total power to 9.8KVA, and allows testing of drawout breakers and MCB's to 1600 Amps. The units are housed in rugged interlocking suitcase-size enclosures. Each piece weighs no more than 125 pounds, allowing one person hand truck mobility. Basic operation is very simple, and the proven **MAC-21** instrumentation provides optimal output control and measurement. The **MAC-21** instrumentation is supplied in a separate rugged portable case, interlocks on top of the **PI-800**, and connects to a cable in the rear of the test set.

The **PI-1600** consists of a strong aluminum frame, housed in a rugged plastic and aluminum enclosure with removable sealed front and back lids. Comfortable recessed side handles provide ease of handling and mobility. All controls, indicators, and input connections are on the front panel. The versatile 50 amp input plugs may be connected to heavy duty portable cords for 120 VAC, 208 VAC, or 240 VAC. Individual leads may also be used to connect to buswork.

The output connections are on the rear, along with an auxiliary Output ON indicator, configuration switch, and output fan vents, which can help cool cables and breakers. The bus stabs have pressed-in 3/8"-16 stainless steel threaded inserts, which eliminates the need for nuts, and the configuration bars are slotted for quick and easy changing for various breaker sizes.

The sixteen silver plated output bus connectors allow configuration for continuous outputs of 1600 amperes at 4.2 VAC, and 800 amperes at 8.4 VAC, for testing molded case breakers with cables. With the optional 1/2 inch stab bus assembly connected for 1600 amperes at 4.2 VAC, which can be used for testing of air drawout breakers. Output stabs are designed with pressed-in 3/8"-16 stainless steel threaded inserts, which eliminates the need for nuts, and the configuration bars are slotted for quick and easy changing for various breaker sizes.

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-1600** 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.

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 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

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Monitor Ammeter Controller
MAC-21

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 auto ranges 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 auto ranges to 9999 cycles

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

CYCLES key: This key normally selects the CYCLES time base. SECONDS or CYCLES time base 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.

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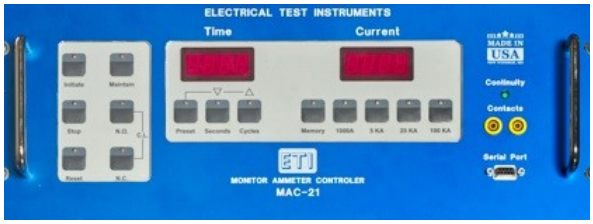

Monitor Ammeter Controller

Portable Circuit Breaker Test Set

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)
- Weight 23 lbs. (10.5 kg)

- Depth: 13.0 in. (330 mm)
- Weight: 15 lb. (6.8 kg)

Dimensions and Weight (PI-800):
- Height: 11.5 in. (292 mm)
- Width: 21.5 in. (546 mm)
- Depth with lids: 22.5 in (572 mm)
- Weight: 125 lb. (57 kg)

Dimensions and Weight (PI-AUX)
- Height: 11.5 in. (292 mm)
- Width: 21.5 in. (546 mm)
- Depth with lids 22.5 in (572 mm)
- Weight: 115 lb. (52 kg)

Specifications

PI-1600 Output Current & Overload Capabilities

5 V	10 V	20 V	Over-load	Duty	Max ON Time	Min OFF Time	Max Input Curr 240V
1600 A	800 A	400 A	1X	100%	Continuous	N/A	38 amps
2250 A	1125 A	563 A	1.4 X	50%	15 Min	15 Min	53 amps
3200 A	1600 A	800 A	2 X	25%	5 Min	15 Min	75 amps
4800 A	2400 A	1200 A	3 X	10%	2.5 Min	20 Min	112 amps
6400 A	3200 A	1600 A	4 X	6%	75 Sec	20 Min	150 amps
8000 A	4000 A	2000 A	5 X	4%	4 Sec	2 Min	187 amps
11200 A	5600 A	2800 A	7 X	2%	2 Sec	2 Min	262 amps
16000 A	8000 A	4000 A	10 X	1%	0.6 Sec	1 Min	375 amps

Additional Equipment Required:
Requires a complete PI-800 (including MAC-21) for operation
See separate data sheet for specification on PI-800

Input Supply:
- 240 VAC + 10%, -15% (Switch Selectable), Single Phase
- 60 Hz (50 Hz at 10% lower maximum line voltages)

Included Accessories
- Input Power Connector 2 each
- Series Bar Outer 4 each
- Series Bar Inner 4 each
- Series Bar 1600 1 each
- Output Plate 4 each
- 1/2 inch Universal Stabs 2 each
- Contacts leads 1 pair
- Remote Cable 1 each
- Technical manual 1 copy