MAC-21 Gen2
Monitor Ammeter Controller

The heart of the MAC-21 consists of a PIC microprocessor core unit, It is connected to a motherboard, which contains a regulated power supply, some support circuitry,. Software contained in the PIC, (also known as "firmware"), performs the required real-time data collection, measurement, user interface, and output control functions.

The keyboard / display PC board contains virtually all of the hardware for the user interface (LED displays and keyboard), as well as contact sensing and output initiation circuitry. The eight LED digits are multiplexed, and have limited alphanumeric capability for more flexible indication of such conditions as overrange. The keys are scanned at roughly 60 times per second, and incorporate LED's to indicate status. An audible indicator (beeper) sounds when a key is pressed. The contact sensing circuitry uses the key scanning system, with a transformer for isolation. The sensing signal is a repetitive pulse of low voltage and low current, and contact sensing leads may be handled without fear of shock. Two separate optically isolated signals are provided for output initiation with an electromechanical contactor or SCR. All functions of the keyboard / display PC board are handled by a single PPI.

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.