MicroLok® II Vital Input/Output (I/O) PCBs

MicroLok II Vital Input and Output boards perform the essential task of interfacing vital external systems and equipment to the CPU logic. ASTS USA provides a wide variety of Vital I/O board for numerous applications and needs (e.g. switch machine operation and point monitoring, signal lamp driving and track circuit occupancy check). Boards are available for 12V, 24V and other circuits, as well as applications requiring an extra measure of protection from transient voltages. For smaller applications that do not require 16 separated input and output channels, the “Mixed Vital I/O” PCB is available with eight inputs and eight outputs. ASTS USA’s Vital I/O boards have been providing fault-free service at hundreds of U.S. and international railroad and transit sites for nearly two decades.

Descriptions

Non-Isolated Vital Output PCBs (N17060501, N17060502, N17066801, N17066802)

The Non-Isolated Vital Output PCBs interface CPU vital instructions to external relay coils and similar loads. All PCBs provide sixteen independent outputs and include versions for 12V and 24V circuit applications. For the “501” and “502” boards, each output is protected by a PolySwitch, which acts like a circuit breaker. When the overcurrent trip point is reached (approximately 0.75A), the PolySwitch switches to a high impedance. The switch resets to its normal low impedance when the additional load or short is removed. For the “801” and “802” boards, circuit protection is provided by a fuse. The front panels of the Non-Isolated Vital Output PCBs are equipped with 16 discrete LEDs to show the on-off states of individual channels.

Isolated Vital Output PCBs (N17065801 and N17065802)

Isolated Vital Output boards provide “double-break” control of outputs to switch machines, relay coils, etc. Both 12V and 24V versions of this board are available, and both can be wired to provide eight uni-polar or four bi-polar outputs. Each output provides a “+” and a “–” connection that is isolated from equipment house/case house battery and other outputs. Outputs are jumper selectable (JP1 – JP8) to drive normal uni-polar vital relays, or outputs can be combined to drive bi-polar relays. Front panel indicators include eight discrete LEDs to show the on-off states of the individual output channels.

Standard Vital Input PCBs (N17061001, N17061002, N17061003, N17061004)

The Vital Input PCB interfaces with external devices such a track circuit relay contacts. These PCBs are available in four models for system voltages of 12V, 24V, 50V and 10V. Standard Vital Input PCBs respond to the presence or absence of voltage and indicate a 1 or 0, respectively, through the motherboard data bus to the CPU PCB. All Vital Input PCBs provide 16 isolated (+/-) discrete channels for external inputs. Inputs can be wired in a uni-polar or bi-polar configuration. Inputs are only accepted as “On” when the positive voltage value is within a specified range (refer to specifications). Each input channel includes surge protection components, an input monitor signal from the CPU PCB, an opto-isolator for isolation between input signals and cardfile operating voltages, and data latches for delivering received bits through the motherboard bus to the CPU PCB. Sixteen LEDs on the boards’ front panels report the states of individual input channels.

Mixed Vital I/O PCBs (N17061601, N17061602, N17061603, N17066701, N17066702)

The Mixed Vital I/O PCBs combine the functions of the Standard Vital Output and Standard Vital Input PCBs, and utilize the same output and input circuitry,
Mixed Vital I/O PCBs (cont'd)

These boards are ideal for MicroLok II installations where a relatively small number of vital I/O channels are present and/or cardfiles with a limited number of slots.

The eight isolated vital input circuits, which interface with external devices, are isolated from all other inputs, the motherboard I/O Bus, cardfile chassis, and system battery to a minimum of 2000Vrms isolation. All eight non-isolated outputs on the PCB share a common floating N12 (isolated from system ground).

Each input circuit senses the voltage (vital level detector) applied to it, translates that voltage into a specific "On" or "Off" state, and then makes that state available to the cardfile CPU via the cardfile motherboard I/O data bus. When an input is detected and the CPU system diagnostics are valid, the system software turns the corresponding LED input indicator "On." Each circuit is vital in the sense that it will not falsely indicate an "On" state to the CPU.

Inputs are only accepted as "On" when the positive voltage value is within the voltage range specification of the board. The eight non-isolated vital output circuits, which interface with external devices, are controlled by "high side" software-controlled switches (FET). The FETs are used to connect battery (+) to the outputs. Loads are connected from the outputs to battery (–). All eight outputs share a common N12.

Two styles of these PCB are available (all information applies to both PCB styles unless noted otherwise):

- N170616xx PCBs protect each output using a PolySwitch, which acts like a circuit breaker. When the over-current trip point is reached (about 0.75A), the PolySwitch switches to a high impedance. The PolySwitch resets to its normal low impedance when the additional load or short is removed.

- N170667xx PCBs protect each output using a fuse. The fuse is mounted to the PCB (SMT) and is not user-serviceable.

Separate banks of eight LEDs each show the on-off states of each input or output channel. As with the 16-channel PCBs, the Mixed Vital I/O PCBs are accommodate 12V or 24V signaling circuits.

Isolated Vital I/O PCB (N451910-2101)

The Isolated Vital I/O PCB is typically used in MicroLok II railroad applications where MicroTrax or E-Code track circuits are being used for train detection and communications (e.g. End-of-Siding, Intermediate). This board incorporates double-break style circuit protection and is intended for house-to-house I/O circuits where protection is needed from voltage transients (e.g. lightning induced).

Each isolated output can operate a switch lock coil and/or any 12 volt relay with at least 150 ohms resistance. The Isolated Vital I/O module contains four inputs and two outputs. Front panel indicators include three "Master" unit LEDs monitoring one output and two inputs, and three "Slave" unit LEDs monitoring one output and two inputs.
MicroLok® II Vital Input/Output (I/O) PCBs

Descriptions (cont’d)
Non-Isolated Vital I/O PCBs (N451910-6601, -6602)
Non-Isolated Vital I/O PCBs are typically used in MicroLok II/MicroTrax railroad applications where there is an interface to a relay-based interlocking control system. Double-break isolation is not required. Two versions of this module (12 volt outputs driving minimum 65 ohm coils or 24 volt outputs driving minimum 130 ohm coils) are available. The Non-Isolated I/O PCB contains four inputs and four outputs. Front panel indicators include four discrete LEDs for monitoring inputs, and four more for monitoring outputs.

Advantages
- Interfaces MicroLok II to wide variety of external devices and circuits.
- Ample I/O channels available.
- Isolated Vital Output boards provide extra layer of transient voltage protection.
- Front panel LEDs provide easy monitoring of individual channels.
- All boards proven in years of railroad and transit service.

Specifications
- Refer to ordering tabulation for specifications of each MicroLok II Vital I/O PCB.

Ordering and Additional Information
- Refer to tabulation for Vital I/O PCBs’ part numbers.
- Contact your ASTS USA Account Executive for Vital I/O PCB applications and MicroLok II applications possibilities in general.
- Request the following ASTS USA Service Manuals for additional information:
  - Standard (Non-Isolated) Vital Output: SM-1D1.0024
  - Isolated Vital Output: (Contact ASTS USA for manual)
  - Standard Vital Input: SM-6800A
  - Mixed Vital I/O: SM-1D1.0006
  - Isolated Vital I/O: SM-6470B
  - Non-Isolated Vital I/O: SM6470B

<table>
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<th>Order No.</th>
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<th>Inputs (Max.)</th>
<th>Outputs (Max.)</th>
<th>Voltage</th>
<th>Notes</th>
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Notes:
(1): Battery must be between 9.8 and 16.2 Vdc.
(2): For 8 uni-polar or 4 bi-polar outputs.
(3): Battery must be between 18.0 and 32.0 Vdc
(4): Outputs @24V, inputs @50V
(5): 8 isolated inputs, 8 non-isolated outputs
(6): Outputs capable of driving any 12V relay @150 ohms (min.).
(7): Outputs capable of driving 12V (65 ohm) or greater relays.

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