Interlocking Solutions
MicroLok® II
**MicroLok® II Wayside Control System**

The Ansaldo STS MicroLok® II Wayside Control System for mass transit, metro, main lines and freight applications, combines the functions of railway signalling and control into one space saving, easy to maintain card file.

Whether rail networks are in need of vital control logic, non-vital control logic, or non-vital code communications, the MicroLok II Wayside Control System offers unparalleled flexibility in a single package.

- **Code system for non-vital control and indications**
- **Vital Interlocking Control**
- **Event Recording**
- **Line Wire Communications**
- **Cab Signalling Code Generation**
- **Coded Track Circuit Communication**
- **Train Detection**
- **These include:** wayside functions, both in the field and remotely.
- **Efficient and cost effective solution to perform key applications. This flexibility provides users with an**
  versatility to suit a range of requirements.
- **The MicroLok II Wayside Control System is available in a variety of configurations to suit a range of**
  applications. This flexibility provides users with an efficient and cost effective solution to perform key
  wayside functions, both in the field and remotely. These include:
  - **Train Detection**
  - **Track Circuit Integrity**
  - **Coded Track Circuit Communication**
  - **Coded Track Circuit Communication**
  - **Line Wire Communications**
  - **Event Recording**
  - **Vital Interlocking Control**
  - **Code system for non-vital control and indications**
- **Unparalleled flexibility in a single package.**
  The MicroLok II Wayside Control System offers non-vital control logic, or non-vital code communications,
  whether rail networks are in need of vital control logic, or whether critical applications require a user-friendly design that can be tailored to each unique application, regardless of the configuration.

**MicroLok II Wayside Control System**

**Comprehensive and Versatile**

For signalling locations across entire rail networks, the MicroLok II system is most comprehensive solution.

Its versatile design includes the vital control logic, electronic coded track circuits, and the I/O capacity required at intermediate signal and repeater locations, as well as other wayside control positions.

MicroLok II protects the safety of both passengers and freight by verifying end to end rail integrity, including train detection, defective insulated joints, or broken rails.

**Hardware**

The MicroLok II Wayside Control System consists of plug in PCB cards installed in a metal card file.

The card file contains slots for up to 19 PCB cards. When installed each card plugs into a common back plane motherboard, which distributes circuit board operating power and CPU control commands.

**Programming**

The MicroLok II Wayside Control System is designed to be programmed by the user, using:

- **Boolean Logic Programming**
- **Ladder Logic Graphic User Interface Tool**
- **Windows-based development system**

**Vital Logic**

MicroLok II vital logic is based on the MicroLok I vital interlocking control system that has proven its reliability in domestic and international railway and rail transit applications for more than 20 years.

**Non-Vital Logic**

The Geenisys® 2000 non-vital logic controller has been repackaged for insertion in the MicroLok II system card file. This enables non-vital logic and data transmission functions to be executed by the MicroLok II system. It also separates vital logic from non-vital logic to reduce testing time.

The Geenisys 2000 based non-vital logic is compatible with other systems, such as the GRS Datatrain I/II and Harmon MCS-1 communication systems.

**User Friendly**

The user-friendly design of the MicroLok II system means users can program controls tailored to each unique application, regardless of the configuration.

**Application**

The functional capabilities and flexibility of MicroLok II Wayside Control System make it the ideal choice for a wide variety of wayside signalling and control applications. These include:

- **Direct control of wayside signals**
- **Switch machine control and switch point position monitoring**
- **Switch lock position monitoring**
- **Monitoring of mainline track circuits**
- **Through the rails communications to adjacent wayside control systems**
- **Monitoring of interlocking OS track circuits**
- **Cab signal carrier/code generation**
- **Line wire communications interface**
- **Local manual control of wayside signals and switch machines for maintenance and contingency operations.**
- **Vital serial communications to other compatible interlocking control and coded track circuit systems**
- **Non-vital controller logic**
- **Non-vital (code line) communications to remote office**
- **IP connectivity for LAN based TCP/IP networks**

**Event Recorder**

The MicroLok II Wayside Control System can record events with a time and date stamp for any variable, input or output used by the system. These event files are easily accessed and read via a laptop PC.

**Coded Track Circuits**

Coded track circuit capability is provided by the inclusion of MicroTrax® coded track circuit PCB cards. Two PCB cards can provide coded track circuits for approaches at a double track universal crossovers.

**Dark Territory**

In dark territories, this reliable solution works with a radio link or other remote communication system to provide advance notification of track conditions to approaching trains. In addition, the system enables users to control all signal types, and drive relay or solid state outputs while having the ability to receive inputs from external sources.

**Benefits**

The flexible and fully scalable MicroLok II system can grow with expanding railway requirements. It can service additional technological enhancements and act as a platform for ATP, ATO and other technologies as required.

The MicroLok II advanced communications configuration allows railways to securely monitor and control the signalling system from any point with Internet connectivity.

With the ability to introduce both local and central control panels, MicroLok II provides enhanced field and centralised office capabilities.

MicroLok II is a flexible choice for customers. It provides compatibility with open source products including a variety of track circuit equipment, train control systems, signal lamps and on-board technologies.

The MicroLok II system also offers Hot Standby options to increase system availability.
MicroLok® II Cardfiles

At the heart of every MicroLok® II system is the cardfile. Cardfiles used in MicroLok II systems accommodate the full range of user system applications and PCB configurations in a single unit. While most cardfiles are designed for 19 inch equipment rack installations, Ansaldo STS also manufactures compact and convenient cardfiles for special-purpose applications, such as wayside case installations.

All MicroLok II cardfiles can also be shelf or wall mounted as needed, and are designed to be CE-compliant for grounding.

### General Purpose Cardfiles

The general-purpose MicroLok II System cardfile contains the system’s central controlling logic and circuits that interface this logic to external circuits. Logic and interface circuits are contained on the familiar Eurocard format plug-in printed circuit boards (PCBs). Two versions of this cardfile are available, including a unit with a single motherboard governed by one CPU PCB, and a unit with dual (identical) motherboards that incorporate separate CPU boards for their respective sets of PCBs. The dual motherboard version allows two MicroLok II subsystems to be housed in one cardfile for applications such as hot standby, and for locations where two single-motherboard cardfiles are not required or adequate space is not available.

Both cardfiles contain 19 card slots. All external wiring is connected to the cardfile via 48-pin or 96-pin connector/ cable assemblies attached to connectors along the rear of the cardfile. In the typical equipment rack installation, this wiring is routed to separate adjacent terminal strips. To prevent accidental insertion of a PCB in the wrong cardfile slot, each PCB is equipped with male keying pins. Dual in-line package (DIP) switches within the connector housings are used to set the cardfile bus address for communications between the CPU and other PCBs.

The MicroLok II general purpose cardfile can be mounted in a standard 19 inch equipment rack, or on a wall or shelf using mounting brackets.

### Programming

MicroLok cardfiles can be used for the following applications:

- Control of LED or incandescent lamp wayside signals
- Switch machine control and indication
- Switch lock position monitoring
- Monitoring of mainline track circuits for track occupancy indications and track circuit problems such as a faulty insulated joint or broken rail
- Through-the-rails communications to adjacent wayside control systems
- Monitoring of interlocking OS track circuits
- Cab signal carrier/code generation
- Line wire communications interface
- Control and indication of level crossings
- Local manual control of wayside signals and switch machines for maintenance and contingency operations
- Vital remote communications to other compatible interlocking control and coded track circuit systems
- Non-vital controller logic and code line communications to remote offices

### Specifications

**PCB Design/Mounting:**

- Standard Eurocard

**Total PCB Slots:**

- 19

**Slot Bus Addressing:**

- Via 8-rocker DIP switches in connector housings

**Upper PCB Connectors:**

- 48 and 96-pin male

**Mounting:**

- 19” rack x 7U Wall or Shelf

**Operating Temperature:**

- -40°C to +70°C

### Features

The MicroLok II Half Box cardfile shares all of the basic design characteristics of standard MicroLok II 19 inch cardfiles, but is only 280mm wide which allows maximum space savings inside an equipment case. The MicroLok II Half Box contains 10 slots and includes a motherboard that is used to interconnect MicroLok II PCBs.

Proper general purpose cardfile can be equipped with an optional standoff mounted Serial-to-Ethernet Converter PCB to permit Internet-based communications with remote systems or terminals, mounted on the upper rear of the motherboard and incorporates an RJ-45 jack for the Ethernet connection. The jack is accessible on the top surface of the cardfile’s back cover.

### Benefits

- Space saving design ideal for case mounted MicroLok II installations
- Fills the gap between full size MicroLok II cardfiles and the MicroLok Object Controller
- Can be installed in wayside equipment cases
- Features minimal number of field configured PCB slots
- Uses all standard MicroLok II PCBs except 32 channel non-vital I/O
- Allows railway to use standard PCBs for all MicroLok II installations
- Compatible with all 48-pin MicroLok II connector/ cable assemblies
- Equipped with remote communication ports for vital or non-vital communications
- Ethernet communications option available
- Uses the standard MicroLok II application software and executive software

The MicroLok® II Half Box cardfile is designed for use in MicroLok II installations where an extra compact cardfile is needed. The Half Box cardfile contains several front panel ports for configuration of standard serial communication channels. These include one nine-pin RS-232 and two nine-pin RS-485 ports. In addition, the Half Box cardfile can be equipped with an optional standoff mounted Serial-to-Ethernet Converter PCB to permit Internet-based communications with remote systems or terminals, mounted on the upper rear of the motherboard and incorporates an RJ-45 jack for the Ethernet connection. The jack is accessible on the top surface of the cardfile’s back cover.
MicroLok® II Object Controller

Our MicroLok® II Object Controllers perform many of the functions of larger vital and non-vital wayside systems without the need for space consuming rack card files and plug-in PCBs. The user is able to select from a series of completely self-contained units, each tailored to suit a specific range of applications.

Mechanical installation simply requires a screw driver, a simple I/O wiring connector and the related connector tool. If a unit develops a fault, it can be quickly replaced as a complete assembly.

Our MicroLok Object Controllers meet rail industry environmental standards for vibration resistance and operation over extreme ranges of temperature and humidity.

Features

The basic MicroLok Object Controller is contained in a ruggedised, high impact plastic housing that can be shelf or wall mounted in either the horizontal or vertical position. Its compact dimensions enable it to be installed into enclosures as small as the typical 400 x 400 x 200 mm wayside case.

Internal heat is dissipated through vent holes in the housing so no active ventilation is required. Electronic components are mounted on PCBs inside the housing. Different PCBs are installed in the various MicroLok Object Controllers according to the application. None are plug in boards that require field installation and MicroLok Object Controllers are not field serviceable.

All Object Controllers are designed to satisfy industry standard specifications for vibration, shock, temperature and humidity resistance. Electrical isolation is rated at 2000 V ac for one minute, channel to channel.

Each MicroLok Object Controller is shipped with separate Wago brand wire connectors for I/O and power wiring. The only tools needed for installation are a screwdriver and a Wago connector insertion tool.

All MicroLok Object Controllers are equipped with discrete LEDs, in several colours, to indicate unit operating status and fault conditions. A single Unit Health LED gives an instant indication of the MicroLok Object Controllers status. If this LED is not flashing at the proper 1/sec rate, an internal fault is indicated. Other LEDs report conditions such as serial communications transmit/receive/error status, vital I/O channel energised/deenergised and Conditional Power Supply (CPS) active. Some LEDs can be programmed to light or flash per user specifications in the application software.

The Microlok Object Controller 4000 series is designed to drive Ansaldo STS LED signals, and is equipped with a Conditional Power Supply output that removes output power to the signal in the event of a fault. This CPS eliminates the need for a separate Vital Cut Off Relay where a failover-to-red configuration is not required.

The MicroLok Object Controller operates from a nominal 12 V dc/2.0A power source.

Benefits

• Compact – does not require large housing or equipment rack mounting
• Rugged construction – designed to withstand the railway and transit environment
• Fully isolated design – 2000V limit; no plug in PCBs or modules to field calibrate, install or replace
• Mounting with minimal electrical/power connections enables fast installation and/or replacement
• Bipolar and discrete inputs/outputs can be combined into a variety of configurations
• LEDs report unit health, status of individual I/O and serial channels
• Serial ports for TCP/IP or EIA RS-232 communications

Specifications

I/O and Serial Communications

I/O Options:
- Vital Inputs and Outputs, Proximity Sensor Inputs, Analog Inputs, Ansaldo STS LED signal drivers, non-vital and outputs

Vital Outputs:
- Voltage Range: 12 to 14 V dc
- 200 ohms per discrete output (max)
- 300 ohms per bipolar output (max)
- Each pair - 1 bipolar or 2 discrete

LED Signal Outputs:
- Battery draw (3 signals on at same time) - 84 W (max) continuous, 7A at 12V
- Battery Input Fuse, 15A slow-blow Signal Unit Limit, Object Controller 4000 series units can operate up to three 160mm units or two 210mm units at any given time

CPS Output:
- Voltage - 12.2 V dc (regulated when input battery is above 11V)
- Current - 3.0A (max) from each output terminal on Object Controller connector J1 total 6.5A (max)
- Power (3 signals on at same time) - 80W (max) continuous

Isolation:
- 2000 V ac between battery input and CPS output

Efficiency:
- 85% with output power at 80W

Vital Input Impedance:
- 2000 ohms per discrete input
- 2000 ohms per bipolar input

Maximum I/O ‘On’:
- 6 (with 200 ohm loads)

Analog Input:
- Range - 0 to 30 V dc (nom)
- 50 V dc (max) without damage to input (input measures up to 30 V dc)
- Impedance - 10K ohms
- Voltage Isolation - 2000 V ac between input leads and battery
- Accuracy: +0.2 V dc from 0 to 10 V dc, ±2.0% from 10 to 30 V dc
- Response Time (DC measurement only), readings updated once per second (approx)

Serial Ports:
- Options - TCP/IP (RH-4S), EIA RS-232 (DB9)
- Protocols - MicroLok II, Genisys®, Peer to Peer

Network Adapter Interface:
- Available - up to 3 adaptors
- Functions application Port Routing (peer protocol), Web Tool (access unit diagnostics)

PC Access Requirements:
- PC with Ethernet port
- Ethernet crossover cable or standard Ethernet cable
- Internet Explorer Version 6.0 or higher
- Java Run Time Environment Version 1.2 or higher

Electrical

Power Input:
- 9.8 to 16.2 V dc (12.0 V dc nom)
- Current draw: 2 inputs and 2 outputs ON - 1.8A

Isolation:
- 2000 V ac for 1 minute, channel to channel

Mechanical

Unit Weight:
- 3.1 kg

Mounting:
- Shelf or wall, vertical or horizontal

Environmental

Temperature Range:
- -40°C to +70°C

Humidity:
- 95% relative humidity at +70°C

Shock and Vibration:
- Compliant with AREMA Manual Part 11.5.1, Class B environment
MicroLok® II Printed Circuit Boards and Panels

MicroLok® II systems are supplied with numerous plug-in PCBs and panels to meet the full range of system application I/O, power and user operating/maintenance needs. These boards and panels are equipped with informative and easy-to-use maintainer controls and or displays. Several of the boards are also equipped with front-panel remote data ports for on-site programming and diagnostics.

General Description

MicroLok II PCBs utilise the familiar Eurocard design with integral front control/display panel. The CPU PCB (common to all systems) incorporates two alphanumeric LED displays and 2-position toggle switches that allow on-unit access to and adjustment of, selected configuration parameters, as well as event and error logs. This PCB also provides a 9-pin PC port for interfacing the various MicroLok II software programming and diagnostic tools.

MicroLok II vital and non-vital I/O boards all incorporate discrete LEDs to enable monitoring of individual I/O channels. Dual-colour LEDs are used on boards that interface bi-polar I/O. These PCBs interface the CPU to many different external equipment and subsystems.

To ensure reliable operation in vital applications, individual input and output channels on the Vital I/O PCBs are periodically monitored by the CPU for proper operation. This is done as a background operation without affecting the normal flow of information. If any I/O channel fails a CPU test, the MicroLok II system is designed to downgrade the entire system to the most restrictive (safe) state.

All PCBs are secured to the cardfile with two slotted machine screws, while two levers enable smooth insertion and extraction without damage to PCB pins or backplane connectors.

MicroLok II built-in Local Control Panels enable the cardfile to function as a self-contained LCP, thus eliminating the need for a separate LCP panel. This device incorporates a generic double crossover track plan with pushbuttons and LEDs for switch and signal operations/indications. A plastic card can be inserted over this plan to change the interlocking configuration to single crossover, etc. as required by the installation.

MicroLok® II Vital Hot Standby

When rail traffic is busy, you can’t afford the downtime caused by a single point failure.

Now, MicroLok® II is available in a hot standby configuration, allowing seamless transfer between main and standby units to further improve overall system reliability, availability and safety.

The microprocessor-based Vital Hot Standby Synchronisation (Sync) PCB adds a new network protocol for partnering two MicroLok II units to provide redundant seamless operation and increase availability of the overall system. Both units of the pair deliver the same synchronised physical outputs.

Should one unit of the pair become disabled through a system reset, power down or other error condition, the internal logic and output states remain the same but control transfers to the remaining unit.

Features

MicroLok II with Hot Standby is a redundant configuration of two synchronised MicroLok II units linked through an Ethernet interface, which receives the same field inputs and delivers the same outputs.

VCOR relays are cross connected and provide information that both units are operational.

Each unit is programmed the same way and synchronisation is achieved at the executive level with additional hardware (synchronisation PCB).

Software loading is minimised and responsiveness is minimally affected.

MicroLok outputs are delivered to an isolation module, or other suitable field interface device, structured in a way that no single point failure can adversely affect both MicroLok units.

MicroLok is now the leading solution for redundant, hot standby operation and can help improve the safety, reliability, and efficiency of your operation.

Benefits

• Provides for exceptionally high reliability and availability via redundant MicroLok II systems
• Smooth, seamless failover from on-line (hot) to standby MicroLok II
• Negligible disruption to signalling systems during failover
• Ability of either unit to assume control
• Elimination of mismatched outputs
• Freedom of catastrophic shut down from single element failure
• Self-contained PCB is microprocessor-based, does not place added processing load on main CPU
• Identical software in each unit
• Improved availability
• Failed unit can be repaired without system shut down

MDSC – MicroLok II Hot Standby with Seamless Changeover

• Two Continuously Operating MicroLok II
MicroLok® II
Isolation Modules

Ansaldo STS Output Isolation Modules provide the equivalent of double-break circuit protection where the system is controlling vital relays or interfacing line circuits in a separate equipment hut or case. This module can also be used to create a vital bi-polar output from two single break standard outputs.

N348-Series Output Low Power Isolation Modules

The N348-Series Low Power Output Isolation module is designed to isolate MicroLok II vital outputs and deliver a replicated/isolated DC output voltage. There are two variations of this module, including a configuration with two identical circuits that convert vital non-isolated outputs to isolated outputs, and a configuration having a single bi-polar isolated output. In addition, each of these units is available in 12V or 18V versions.

In typical applications, the N348-Series Low Power Output Isolation provides the security inherent with double break circuits to operate relays or MicroLok II inputs in remote huts or cases. Surge protection to a level of 30 joules is built in, but external line-to-ground arrestors are recommended for additional protection.

MicroLok II Hot Standby Application

The N348-Series Lower Power Isolation Module is particularly useful for MicroLok II units in a Hot Standby configuration. For each input to this device, two internal diodes are provided so that the Module is responsive to redundant MicroLok II units. Particular attention was given in creating a unit for which a conservative redundancy, isolation module outputs can be wired in parallel.

Elimination of any common galvanic connection point is one part of a general philosophy of total isolation between MicroLok II units to preclude the possibility that a surge or lightning strike that could affect both units simultaneously. In either embodiment of the logical “OR” function, (diode “OR”-ing or cross wired outputs) the isolation module is ideally suited as a MicroLok II accessory directed at providing uninterrupted service.

It is particularly useful in implementation of seamless transfer of control or truly hot stand-by operation.

N348-Series Output Low Power Isolation Modules

To further protect and enhance the reliability of MicroLok II, MicroLok Object Controller (OC) and other system circuits, Ansaldo STS has developed the Input Isolation Module as a companion product to the Output Isolation Modules. In its simplest application, the Input Isolation provides a standalone component that can isolate an external battery source. It can also be used with the Bi-Polar Output Isolation Module to permit series-chaining of three or more M-3 or M-23 point machines with Electronic Circuit Controllers.

General Features

The Input Isolation Module is similar in operation to Ansaldo STS Output Isolation Modules, however instead of being driven from a MicroLok II or OC vital output channel, this module is driven from an external battery source. It can be used anywhere that the battery arising from an external source requires isolation and the current demands of the output are less than 1.5 watts.

The Input Isolation Module can be set up with two unipolar inputs or with a single bi-polar input. It provides increased front end surge protection using multiple stages of MOVs, inductors, and Tranzorbs. The Input Isolation Module consists of a plastic, DIN railmountable module with two internal circuit boards.

N170-Series Output Isolation Modules

N170-Series Output Isolation Modules contain two independent circuits that can be interconnected to create a single, isolated bi-polar output when required by the application.

Three versions of this module are available. All three models are controlled by a nominal MicroLok II 12V vital output. Module N17001101 (12V output) provides an output slightly greater than the battery source voltage. Current is limited to 0.4A with voltage fold-back occurring at that point. Module N17001102 (50V output) also provides an output proportional to the battery source voltage, with fold-back occurring at approximately 0.13A. Module N17001103 (24V output) also provides an output proportional to the battery source voltage, with fold-back occurring at approximately 0.4A.

A 120V version of the N170-Series Output Isolation module has voltage characteristics suited for circuits controlling non-Ansaldo STS USA LED signals; contact your Ansaldo STS USA Account Executive for additional design and application information on this particular module.

All Ansaldo STS Isolation Modules consist of a 2-piece plastic case with internal PCB and external screw lock wiring terminals. The case is mounted in a standard equipment rack using a DIN rail, or can be wall-mounted.

Specifications

<table>
<thead>
<tr>
<th>Input Connection Options:</th>
<th>2 individual isolated unipolar circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Battery Range:</td>
<td>9.6 Vdc to 16.2 Vdc (required to energize)</td>
</tr>
<tr>
<td>Load Drive (Each Circuit):</td>
<td>400 ohms impedance or higher</td>
</tr>
<tr>
<td>Input Source:</td>
<td>Connected to external battery</td>
</tr>
<tr>
<td>Required protection:</td>
<td>Line-to-line and line-to-ground (Ansaldo STS USGA)</td>
</tr>
</tbody>
</table>
MicroLok® II
Operation of LED Signals

With simple hardware and software modifications, MicroLok® II-based systems can now drive LED colour light signals.

This makes the MicroLok II product family readily adaptable to the growing demand for these long-life, low-maintenance signals. For this application, an LED 12 board has been added to the roster of MicroLok II PCBs to enable direct driving of LED signals, without the need of complex and costly interfacing equipment.

Light-out and other fault detection monitors are built into the PCB/signal unit circuitry, and composing or modifying the system’s application software to accommodate the new board is simple and straightforward.

Description

The LED 12 PCB is capable of driving up to 12 Ansaldo STS Colour Light LED Signal units. Unlike non-Ansaldo STS LED signal configurations, vital circuitry is contained in the LED 12 PCB itself (not the signal unit circuitry). Full and highly accurate light-out detection is performed by both the PCB and the LED unit. Each output of the LED12 board reads signal electrical values and compares them to predetermined ranges, in order to indicate the signal is in the correct state (on/off) and is producing the necessary light output. Each output includes a switch that applies/removes a negative source from the output, preventing the LED signal from lighting due to noise, as well as providing a means to perform off state signal integrity checking. The state of an output is displayed on the board’s front panel by a corresponding LED. Light-out and other fault conditions are also indicated by front panel LEDs.

The MicroLok II-based LED signal driver circuit also includes low cost Constant Current Regulator modules and Driver Protection boards. The Module provides a constant 350mA regulated current output for driving the LED Signals (no direct battery power input required), while the Protection Board provides a high degree of protection for the LED 12 PCB from surges that may be induced on the signal’s field wiring connections.

While the LED 12 board is not designed to operate non-Ansaldo STS USA LED signals, MicroLok II applications can be designed to drive these signals.

Benefits

- Enables LED signal operation from any MicroLok II based system
- Only one new cardfile PCB, modest software adjustments
- All vital circuitry secured in the MicroLok II LED 12 PCB
- PCB output channel circuit design assures correct signal state, no errors from transient signals
- Constant Current Regulator provides precise signal operating power level
- Driver Protection Board guards against transients induced in field wiring.

Basic MicroLok II/LED Signal Application

MicroLok® II
Control of Level Crossings

MicroLok® II has evolved from a highly reliable railway wayside control system into an equally reliable controller for roadway level crossings.

MicroLok II is capable of performing the complete range of crossing-related functions such as monitoring train-approach (track occupancy) indications, triggering gate mechanisms and lights (via crossing controller), interfacing traffic light systems, enabling on-site manual control of the gates, and operating various peripheral indicators such as trackside warning indicators for train operators.

MicroLok II has been further developed to control a system of four crossing gates to prevent entrapment of a motor vehicle between the gates.

Typical Configurations and Applications

For level crossing applications, the MicroLok II system uses a configuration similar to wayside signalling applications. Key components include a standard PCB cardfile, a CPU logic board, a set of vital and non-vital (as required) input/output PCBs, a Power Supply/CPS PCB and a Vital Cut-Off Relay.

The CPU PCB contains the system’s vital decision-making logic and is responsible for requesting the operation of the gate mechanism(s) in response to a train approach detection. The CPU also performs continuous internal and external diagnostics. In the event any diagnostic fails, the crossing system will lower the gates irrespective of a train detection indication. This is done by routing vital power to the crossing controller through the contacts of the CPU-controlled VCOR relay. Loss of this power is designed to revert the system to the most restrictive (safe) state.

MicroLok II can be configured and programmed to monitor train detection indications through a variety of means. For example, line wire circuits can be used to pass these indications to the MicroLok II crossing controller system. The line circuit relays are energised by an adjacent MicroLok II interlocking system, which detects the actual track occupancy condition. This indication is fed to the MicroLok II crossing system as a vital input(s) to the cardfile. Other inputs can include gate controller status, gate arm position (up/down), crossing case power failure, flasher check and on-site manual (pushbutton) operation of the gates. Vital output channels are used to energise interface relays between the cardfile and the crossing controller unit.

The overall arrangement is well suited for complex level crossing locations involving multiple tracks and track circuits, or several crossings in close proximity to each other.

MicroLok II’s CPU board serial ports can also be used as a communication medium for receipt of crossing track occupancy indications from an adjacent MicroLok II installation. In the typical application, the crossing MicroLok II system shares a fibre optic communications network with other (e.g. interlocking) MicroLok II systems. Since the same communication network is also used to convey information to and from a central office, crossing operations can thus be checked from that office in the form of MicroLok II event logs.

MicroLok II’s parallel I/O can also be interfaced to various auxiliary crossing components such as crossing warning indicator lamps for the train operator and pedestrian signs such as ‘DO NOT WALK’. As with wayside signalling-based MicroLok II systems, the highway crossing applications are easily programmed using the Windows®-based MicroLok II Development System software package.

For installations where smaller wayside cases are preferred in place of full-size houses, the MicroLok Object Controller can be used to perform many level crossing functions.
MicroLok® II
Track Circuits

MicroLok® II Track Circuits permit the system to perform the critical function of train detection in railway applications, both along the mainline and interlocking locations. The MicroTrax® Coded Track Circuit is a total track circuit system that enables very long track circuits, accurate train detection regardless of ballast conditions, and data-intensive through-the-rails communications.

For railway interlocking (e.g. end of siding), the Track Circuit provides a simple and reliable means of detecting trains within the interlocking tracks (no track occupancy relays required).

General Description

The MicroTrax Coded Track Circuit system is a solid state programmable microprocessor-based system designed to control wayside circuit applications in non-electrified territory.

A MicroTrax system consists of a cardfile assembly with plug-in modules and one track interface panel per operating track. The plug-in modules are specific to the requirements of the location. For example, certain locations may only require track circuit operation, others may require signal lighting and others may require driving relays and/or receiving inputs. Each individual location may combine portions or all of the options noted.

Primarily the MicroTrax Coded Track Circuit system is used to manage track circuits, providing end-to-end rail integrity including detection of train shunt, faulty insulated joints or broken rail. Generally, the track coding (equivalent to 4 wire HD circuitry) is accomplished through the rails, however it may also operate over line wire. In addition to managing track circuits, this system allows the user to control signals, drive relay outputs and receive inputs from external sources.

Benefits

- MicroTrax and E-Code PCBs provide a highly flexible interface between the rails and the MicroLok CPU
- Both PCBs are highly adaptable to various interlocking and mainline applications
- Both PCBs are equipped with detailed LED indications for routine monitoring and diagnostics
- E-Code front panel permits on-unit track circuit adjustments.
- GS Track Circuit PCB is ideal for intra-interlocking train detection, without vital relays

Features

- Track circuits in excess of 8km with minimum 3 ohm ballast
- Configurable software allowing a single “typical” program usable for all customer locations including control points, intermediate signals, repeater locations, etc
- 20 user-defined track codes with 12 second acceptance time
- 2 user-defined fast codes with 6 second acceptance time (typically used for tumbledown and sleep mode)
- Quick Shunt mode (reduces shunt time from 6-12 seconds to 100 milliseconds)
- System power conservation feature (sleep mode)
- Adjustments for track circuits and signal lighting made from the CPU module
- Compatibility with highway crossing motion sensors/predictors without the need for external blocking units

MicroLok® II
Vital Radio (MVR)

The introduction of Computer Based Interlocking (CBI) to the railway network has led to the requirement for vital serial data communication between distributed CBIs.

To date such communication has been provided via closed/hardwired communication systems (eg copper or fibre optic cables). The installation of these cables has generally involved large capital expenditure due to trenching, cabling and ongoing maintenance costs.

The MicroLok® Vital Radio (MVR) is a point to point, open transmission communication system, developed by Ansaldo STS to transport vital serial data between distributed CBI applications in low to medium density railway networks.

Benefits

- Cost Effective
  The MVR provides a cost-effective solution for vital serial communication, while maintaining a fail safe communication link.

- Improved Safety
  Risk analysis of the MVR has identified improved overall system safety when compared to conventional systems, which means occupational health and safety risks associated with the installation of the system are significantly reduced.

- Easy to Use Communication System
  The MVR provides an easy to use and configure communication system, facilitated by the simple point to point architecture.

- Reduced Installation Times
  Installation times are reduced because the MVR does not require the installation of cable paths.

- Robust System Security
  The MVR has adopted the Advanced Encryption Standard (AES), which further enhances the robustness of system security. Combined with the data integrity assurance of the MicroLok Peer protocol the MVR provides secure communications within the open transmission environment.

- Private Network for Data Transmission
  The MVR utilises licensed frequencies for radio communication, which creates a private network for data transmission. This alleviates the likelihood of interference from other sources, with the Australian Communication and Media Authority (ACMA) planning and managing the radio frequency spectrum in Australia.

- Radio transmission is a proven communication medium and is used for the transfer of mission and safety critical data in numerous industries.

- COTS Compatible
  The MVR is compatible with commercial off the shelf (COTS) equipment. This enables advances in radio technology to be incorporated into the system and alleviates reliance on single supplier and/or product availability.

- Remote Area Suitability
  The MVR is highly suitable for remote areas (depending on terrain conditions), especially for locations that lack existing cabling suitable for CBI communication requirements.