

Level Crossing Solutions



Level Crossing Mechanism Model 95

The Hitachi Rail STS Model 95 Level Crossing Mechanism has been built with safety and reliability in mind.

It is simple to service and has been designed to be installed with standard tools.

Our solid state level crossing motor controller is a proven SIL2 module that provides dependable performance and safety.

General Description

The Model 95 Level Crossing Mechanism provides railways with superior quality and performance in a variety of crossing configurations.

Designed to exceed the specifications of the American Railway Engineering and Maintenance-of-Way Association (AREMA), the Model 95 is at the core of each Hitachi Rail STS Level Crossing System.

The Model 95 is remarkably easy to service as each part can be readily accessed and replaced in the field. It is available with Hitachi Rail STS's new electronic motor controller.

This electronic controller provides a test button feature and LED indicator to quickly check functionality of the gate mechanism. The device incorporates a Power-Down function, as well as thermal protection and holdclear activation. All of these features are within a single unit that utilises solid state technology for ease of maintenance and improved reliability.

The Model 95 is a durable, compact unit and features cast aluminium housing that is significantly lighter than previous mechanisms. Yet it still packs an impressive 2700 Nm of stall torque in its highly efficient motor. It has the thermal and voltage protection of self-restoring internal circuit breakers, protecting valuable equipment from weather or power surges.

In addition, it includes heavy-duty coil springs, dampeners and high-strength gears.



Features

- Vital relay or electronic gate control options
- Dynamic braking
- Built-in thermal surge protection
- Cast aluminium housing
- Onboard LEDs and test push buttons to speed periodic testing and troubleshooting
- Maintenance switch to make the repair of broken gates faster and easier
- Model 95 in Exit Gate configuration has a gravity feature that ensures motorists will not be trapped on level crossings in the event of a power failure.

Advantages

- Lightweight, compact design allows for easy installation
- Engineered for increased durability and serviceability
- Indefinite motor stall
- Highly efficient drive motor and gears
- Heavy duty horizontal and vertical buffers.

Specifications

Dimensions:	584 mm x 533 mm x 349 mm (HxWxD)
Weight:	83.9 kg (with cover) 72.6 kg (without cover)
Handling:	Eyebolt for lifting
Motor Voltage:	12 Vdc or 24 Vdc
Motor Current:	15.0 A
Motor Stall Torque:	2700 Nm
Hold Clear:	12 Vdc unit: 150 to 160 mA 24 Vdc unit: 185 mA
Ckt. Breaker:	12 Vdc unit: 20A 24 Vdc unit: 10A
Ckt. Brkr. Open Time:	100% of load rating for 1 hr 125% of load rating for up to 1 hr 200% of load rating within 1 min
Motor Relay:	PN-150HD vital plug-in
Temperature:	-40°C to +70°C
Life cycle of 200000 operations	IP 67 (with stainless steel enclosure)



Model 95 Upgrade and Retrofit Components

For new installations, the Model 95 Level Crossing Boom Mechanisms are typically ordered and factory-configured for each specific application.

Hitachi Rail STS also offers several retrofit kits to enable customers to readily modify existing Model 95 Mechanisms to add additional features, capabilities or reconfigure a unit for a different application.

The retrofit kits employ Hitachi Rail STS factory-quality hardware and are designed to result in mechanisms that are equivalent to factory-supplied models.

Installation and Adjustment Tools

The Model 95 Level Crossing Gate Mechanism is designed to be installed with standard tools. All gate mechanisms are shipped with a tool kit. This kit includes a variety of wrenches including Allen wrenches for buffer and cam adjustments and a hold down pin. A torque wrench, a spring scale, or both is used to set the counterweights. Hitachi Rail STS offers an optional torque wrench kit that includes a torque wrench and a socket.

Gate Arm Light Fuse Retrofit Kit

This kit provides in-mechanism fusing for gate arm light circuits. The fuse holder, which mounts to the electrical assembly inside the mechanism, includes two fuse circuits and space for two spare fuses. Four 10 A, automotive-type fuses are supplied with the kit.

Maintenance Switch and Power-Down Module

The Model 95 Maintenance Switch makes replacing a gate arm easier and safer by allowing the gate to be driven down without the weight of the gate arm to assist. This switch eliminates the need to connect jumpers inside the mechanism to drive the gate down. Selected models of the Model 95 are equipped with the Maintenance Switch as a built-in component.



The retrofit kit permits switch installation in existing Model 95 Gate Mechanisms not already equipped. The Power-Down Module provides the electrical power to drive down the gate during gate servicing or replacement.

Electronic Conversion

The Electronic Gate Controller Upgrade Kit improves the reliability of the Model 95 Gate Mechanism by removing the standard non-vital motor control relay and replacing it and other discrete components with a completely electronic circuit. The new circuit contains all of the functions of the existing design and adds a test feature to aid in trouble shooting. Versions of the kit are available for entrance and exit gates, and 12V or 24V circuits. Note: This equipment is designed only to be installed on the non-vital versions of Model 95 Gate Mechanisms.

Heater Kits

Heater kits are provided to prevent frost formation on the gate mechanism's internal electrical and mechanical components. The resistor unit is mounted on the gate mechanism's electrical module bracket. Three versions of this kit are available to operate on 24V, 120V or 240V power.

Level Crossing Gate Arms and Accessories

Complementing the Hitachi Rail STS Model 95 Level Crossing Mechanism is a cost-effective line of level crossing gate arms, counterweights and wind braces.



Gate Arms

Each gate arm has one or two fixed aluminium sections and two aluminium or fibreglass telescoping sections. The gate arms are linked to the support assembly by a shear pin that allows breakaway, to prevent damage to the mechanism in case the arm is struck.

Red and white diagonal striping draws attention to the arm to aid visibility, even in poor weather or at night. Striping is High Intensity grade which meets all industry standards.

Arm visibility can be enhanced with weather-proof 102 mm or 178 mm dual-direction lights. Light unit wiring (coiled-cord or standard) can be fully plug-connected for easy replacement.

For arm attachment to the Model 95 Gate Mechanism, a gate arm bracket is provided. This unit is designed with shear pins to prevent major damage.

Advantages

- Mounts on existing equipment
- Reduces inventory and installation problems
- Tough aluminium or fibreglass arms - stand straight (no warping), proven design
- Telescoping arms to 12.2 m
- High-Intensity red and white reflective striping
- No painting required
- 102 mm and 178 mm 2-way lights with plug-in wiring
- Three gate arm lights with adjustable deflection angles to meet varying field conditions
- Attaches to a breakaway adaptor to minimise damage in case the arm is struck.

Specifications

Construction:	Aluminium/fibreglass or all-fibreglass
Lengths:	3.65m to 12.2m
Striping:	High Intensity
Lights:	10.2 cm or 17.8 cm, dual-direction
Cord Sets:	Coiled-cord or standard
Wiring:	Plug-connected or hard-wired

Wind Braces

Hitachi Rail STS wind guard brackets keep the crossing gate arms from swaying excessively in high winds when in the 'up' position. Two versions can be ordered:

- Rigid model with tubular aluminium arms
- Flexible model with an adjustable arm holding depth.

Arm Counterweights

Weight kits are available for crossing gates and exit gates to ensure proper balance in all arm positions, and to minimise loads on the gate mechanism. Standard square weight kits are available for the full range of arm lengths.

New rectangular weight kits shift the weight further out on the arm, thus allowing the installation of a lower total weight package at the end of the arm. Either of these kits consists of a sufficient number of weights to balance the respective arm.

Also available from Hitachi Rail STS are extension arms for the weights to help the balance adjustment, on longer arms.

Flashing Light Units and Assemblies

Hitachi Rail STS' Flashing Lights meet or exceed industry standards for motorist visibility at level crossings in all types of environments and installations, and are designed for maximum ease of maintenance.

At the heart of the assembly is an LED-based light unit that is simpler in design, longer lasting and consumes much less power than comparable incandescent lamp units.

The HC-120 is available in a variety of multi-light assembly configurations, as well as individual light unit designs. Included is a retrofit version that allows replacement of existing incandescent light units with the new LED technology.

Flashing Light Units

Hitachi Rail STS Flashing Light units combine the best features of existing housing design with LED light source technology, and are compliant with AREMA standards. The external shell is fully sealed against water and dust, and incorporates a sighting device that permits field alignment on the arm assembly by just one person. The rear of the unit is equipped internally with a terminal strip that allows quick connect and disconnect of light module and external wiring. Hood and background options include 508 mm or 610 mm diameter in high impact plastic or aluminium construction.

The LED-based light module generates light via a matrix of high-efficiency LEDs that form a coherent beam when viewed externally. The combined LEDs are brighter than similar incandescent units and consume 40% less power than a comparable incandescent lamp with the same brilliance. As a result, the LED light module helps extend the life of back-up batteries at crossing locations where these batteries are used. The LED matrix has an estimated operating life of 100,000 hours. In the event a single LED fails, overall beam intensity is reduced by less than 2 percent. Optically, this unit replaces earlier lights with 30°/15°, 20°/32°, 70°/0° spread and deflection patterns.

The HC-120 LED light module incorporates a hard-coated polycarbonate red lens that is both vandal and water-resistant. Bright LED side lights (white) are included to enable the train driver to confirm the flashing light is operational. The module housing is



for water and dust protection. Selected light modules also incorporate a built-in voltage regulator to ensure against overvoltage damage from the external power supply. Lightning and surge protection circuitry is also provided.

A retrofit kit version of the light module is also available for direct replacement of incandescent lamp units. No special modifications are required on the flashing light assembly or housing when upgrading to the LED lamps.

Flashing Light Assemblies

Hitachi Rail STS Flashing Light assemblies utilise all-aluminium brackets and junction-box crossarms, and are provided with two light units for 1-way configurations, or four light units for 2-way configurations. Crossarm versions are available with extension arms for additional clearance on the crossing mast. Clear access for wiring is provided through a threaded crossarm-mounted fitting. Threaded elbows permit independent horizontal (azimuth) and vertical (range) adjustment of each signal. Standard AREMA terminals serve as quick connect/disconnect points. Light unit options include the new LED or traditional incandescent models, fitted with a variety of hoods and backgrounds made of high durability plastic or aluminium. Flashing Light assemblies can be mounted on 114mm or 140mm OD masts, and selected models are designed for use with Hitachi Rail STS's Model 95 Gate Crossing Mechanism.

Advantages

- 1- or 2-way mast-mounted arm assemblies available
- AREMA-compliant design
- LED module brighter than incandescent lamps
- Consumes 30% less power than incandescent lamps
- Increased available battery back-up time for level crossing warning systems
- Sufficient light output is maintained if discrete LED failure should occur
- Water-tight housing with side-view lights (white)
- Polycarbonate lens
- Replaces lights with 30°/15°, 20°/32°, and 70°/0° spread and deflection patterns.

Specifications

LED Types:	Red and white, non-regulated
LED Loss:	<2% of total output with loss of 1 LED
LED Life:	100,000 hours @ 10 volts
Total Luminosity:	705 Candelas (calculated)
Light Wavelength:	630 nm (dominant)
Viewing Angle:	30 degrees
Side Lights:	LED light units (white)
Current Draw:	10 volts = 1 Amp
Regulated Voltage:	6 to 18 V dc, 5 to 13 V ac
Power Consumption:	10W @10 V dc
LED Current Limit:	10 volts (max.)
VA Limit:	12 VA @10 volts
Operating Temp:	-40°C to +85°C

Level Crossing Bells

Hitachi Rail STS Crossing Bells give added warning for pedestrians at level crossings. In addition to traditional electro-mechanical bells, Hitachi Rail STS provides the latest in solid-state electronic bells which have no moving parts requiring maintenance.

Two versions of the electronic bell are available, including the omni-directional "OB-1" which provides a 360 degree audible broadcast, and the uni-directional "UB-1" which provides a 180 degree broadcast. The UB-1 is ideal for directing the bell broadcast away from residential areas.

The stroke rate and audible level of the OB-1 and UB-1 comply with all applicable AREMA standards. All internal electronics are contained on a single circuit board that is coated for full weather protection, and the electronics include built-in transient surge protection.

Bells mount on a 114mm or 140 mm OD mast with a stainless steel set screw.



Specifications

Broadcast Options:	360o or 180o
Audible Range:	75 dBa - 105 dBa @ 3 m
Operating Power:	12 Vdc +25%
Dimensions:	172mm (D) x 365mm (H)
Mast Mounting:	114 mm or 140 mm OD
Environmental:	Per AREMA C&S manual 11.5.1 Class B
Vibration and Shock:	Per Hitachi Rail STS USA spec EU-7997

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. CAD view of the site/s is available to the operators, locally from the MicroLok cabinet or remotely from the control centre

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".

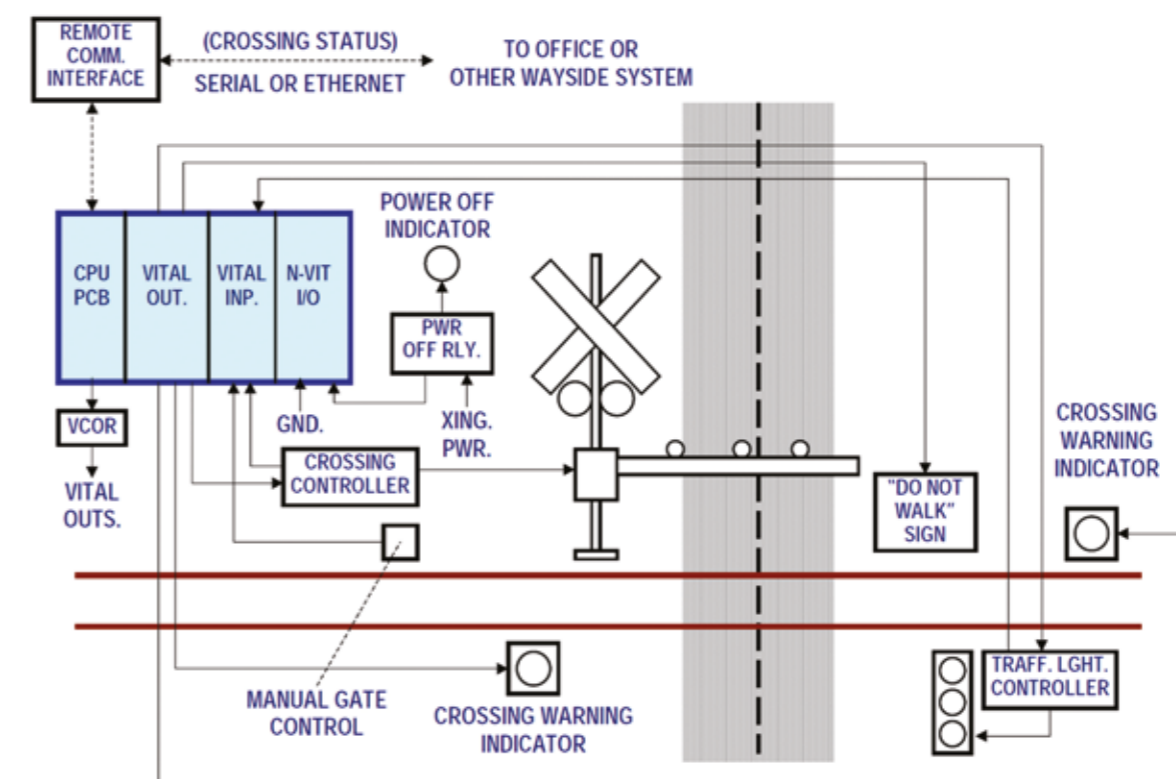
As with wayside signalling-based MicroLok II systems, the highway crossing applications are easily programmed using the Windows®-based MicroLok II Development System software package.

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.

Advantages

- Handles the full range of crossing devices and functions
- Compatible with Hitachi Rail STS or non-Hitachi Rail STS crossing equipment
- Based on service-proven wayside signalling systems
- Designed for fail-safe operations (gates down upon system failure)
- Ample memory, I/O channels and serial ports for any crossing application
- Stand-alone system or integrated with larger wayside/ office control system
- Permits remote reporting/monitoring of crossing conditions
- Several options for receipt of crossing track occupancy indications.
- SIL4
- Operating temperature -40°C to +70°C
- Availability 99.988325 % with hot standby configuration

MicroLok® is a registered trademark of Hitachi Rail STS USA, Inc.



Four-Quadrant Gate Crossing System

Safety at roadway level crossings has long been a concern for railways and governments alike.

At issue are impatient motorists who go around crossing gates in an attempt to drive over the level crossing before the arrival of a train. This behaviour often meets with fatal results to motorists and train crews. To address these concerns, and to improve level crossing safety for both motor vehicles and trains, Hitachi Rail STS has developed the Four-Quadrant Gate Crossing System.

General Description

With the Hitachi Rail STS Four-Quadrant Crossing System, the level crossing is treated as an interlocked junction between two rights-of-way, the street and the railway track. The system primarily consists of four level crossing signal/gate assemblies, an inductive motor-vehicle detection loop, a vital/non-vital processor, and train detection system by wheel sensors. Gate operation is controlled so that motor vehicles will not be trapped on the crossing during the approach of a train.

Signal/Gate Assemblies

Two Model 95 signal/gate assemblies are installed on each side of the track so the roadway is completely blocked on both sides of the rail right-of-way when the gates are down and a train is approaching the crossing. Those gate mechanisms mounted on the signals installed on the exit side of the crossing are designed to raise the gates should power to the level crossing warning system fail. The entrance gates, during such a circumstance, will drop to the 'down' position.

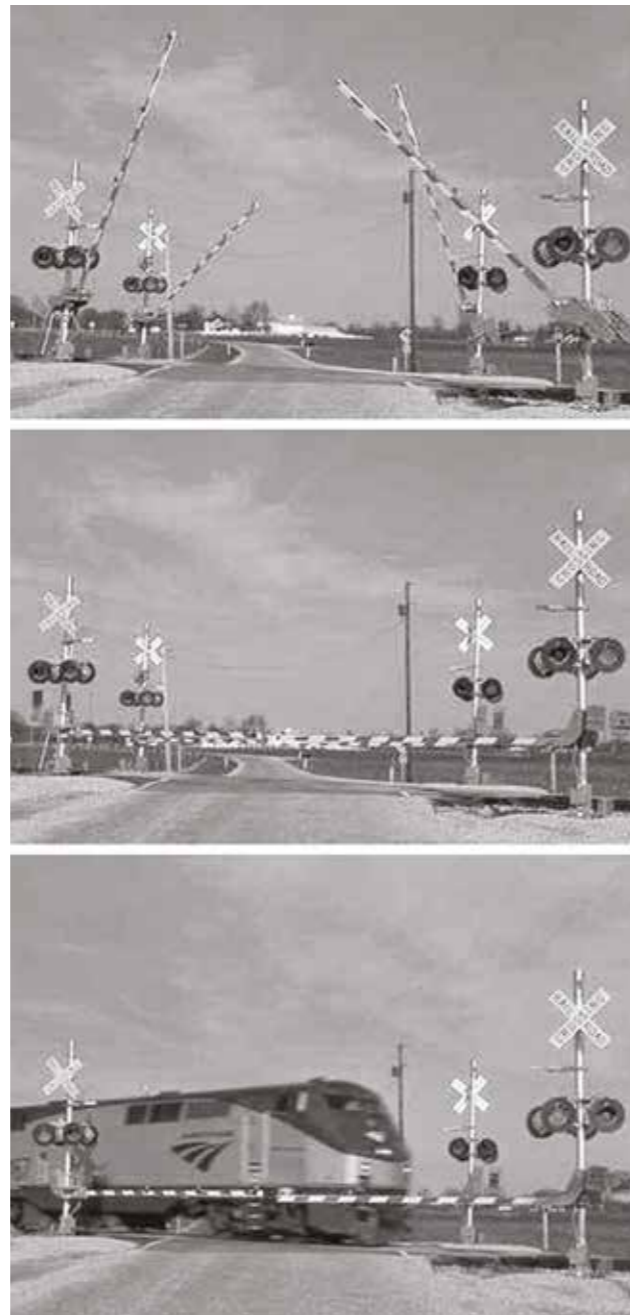
This mitigates the possibility of a motor vehicle being trapped on the crossing by a down gate blocking the crossing location's exit-side lane.

Loop Detectors (Optional)

If requested, loop detectors are buried beneath the roadway surface to detect motor vehicles as they pass over the crossing. The loop output is sent to the warning system's vital/non-vital processor. If a vehicle is on the crossing when a train approaches and activates the level crossing warning system, the exit gates will remain raised to allow the vehicle to exit the crossing.

Wheel Sensors

Wheel sensors are used to detect the presence of a train within the crossing approaches and initiate operation of the crossing warning system.



MicroLok® II Vital/Non-Vital Processor

The MicroLok II Wayside Control System functions as a vital/non-vital processor, and serves as the heart of the control system. It executes the vital logic required for gate operation, motor-vehicle detection, and the locomotive cab indications (VMI in cab signal territory) that alert the train driver of a motor vehicle (or other obstruction) on the crossing. It also tests for loop-detector faults, crossing-system intrusion and broken gates, and, if detected, generates a maintenance call.

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Operation

The vital portion of the MicroLok II system constantly monitors the status of the loop detectors that indicate whether a motor vehicle is travelling over or is stopped on the crossing.

Loop status information is also passed to the non-vital portion of the MicroLok II processor, which directs the information to a data logger for recording. When a train enters one of the level crossing warning system's approach wheel sensors, the approach wheel sensors relay is de-energised, the warning lights begin to flash, the bell begins to ring, and the vital processor checks if the crossing is occupied by a motor vehicle or other obstruction. If the crossing is clear (as determined via input from the motor-vehicle detection loops), the MicroLok II processor will allow the gates to begin their descent seven seconds after the activation of the lights and the bell.

If, however, the crossing is blocked by a motor vehicle, for example, the MicroLok II processor will allow the gates guarding the entrance lanes of the crossing to descend, but it will keep the exit gates raised to allow the vehicle to exit the crossing. At the same time, the locomotive cab signal (in cab signal territory) will be reduced from a clear indication to an approach-medium indication. If the crossing still is not clear 10 seconds later, the cab signal is reduced to an approach

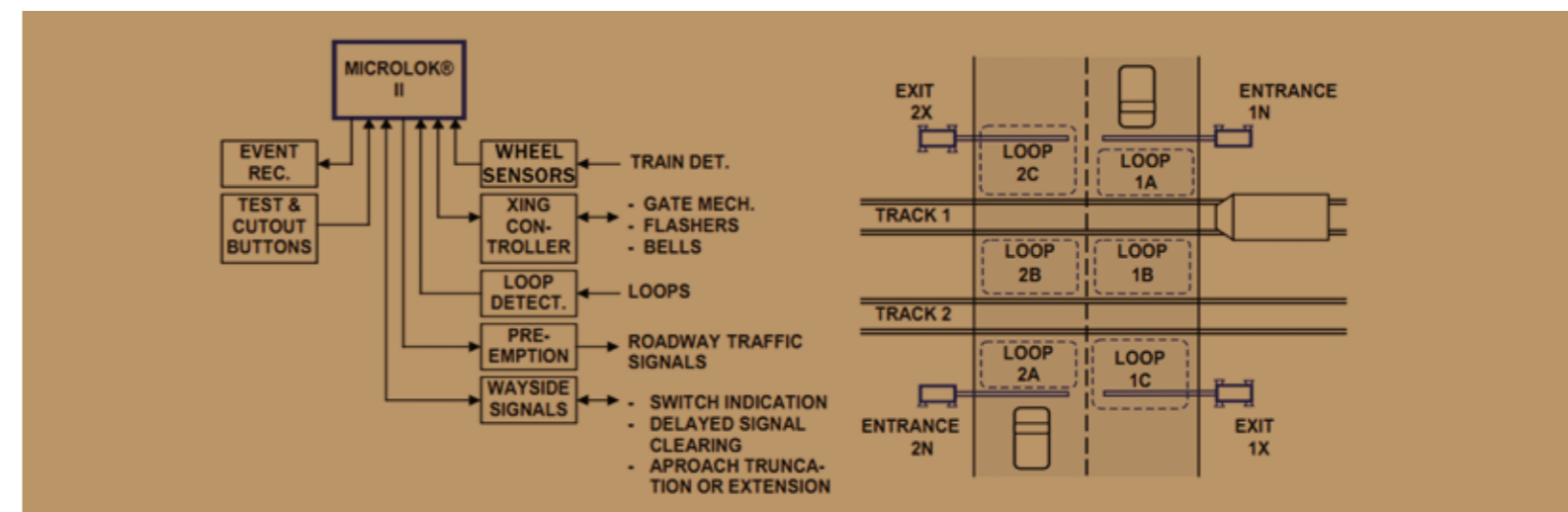
indication, and then to a restrictive indication 10 seconds later if the crossing still is obstructed. These cab-signal reduction points are located so that the train can stop before reaching the crossing and, in the case of passenger trains or rail transit vehicles, without causing alarm or discomfort among the passengers.

Application

While the Hitachi Rail STS Four-Quadrant Gate Level-Crossing System can be applied at any roadway crossing location, it is most effective in areas equipped with cab signalling/on-board vehicle control, where it can alert train operators to a motor vehicle or other obstruction on the crossing.

Advantages

- Four-quadrant gate level-crossing configuration
- Motor-vehicle detection
- Issues locomotive-cab warning: Alerts train driver of motor vehicle or other obstruction at the crossing so a train can stop before reaching the crossing
- 'Gate-down' indication
- Broken-gate detection and indication
- Counterbalanced exit gates rise if power fails so motor vehicles are not trapped in the crossing
- Defective loop-detector test and indication
- Abnormal-condition detection and indication.



 **Hitachi Rail STS**

Via Paolo Mantovani, 3-5
16151 Genoa
Italy

sts.hitachirail.com

