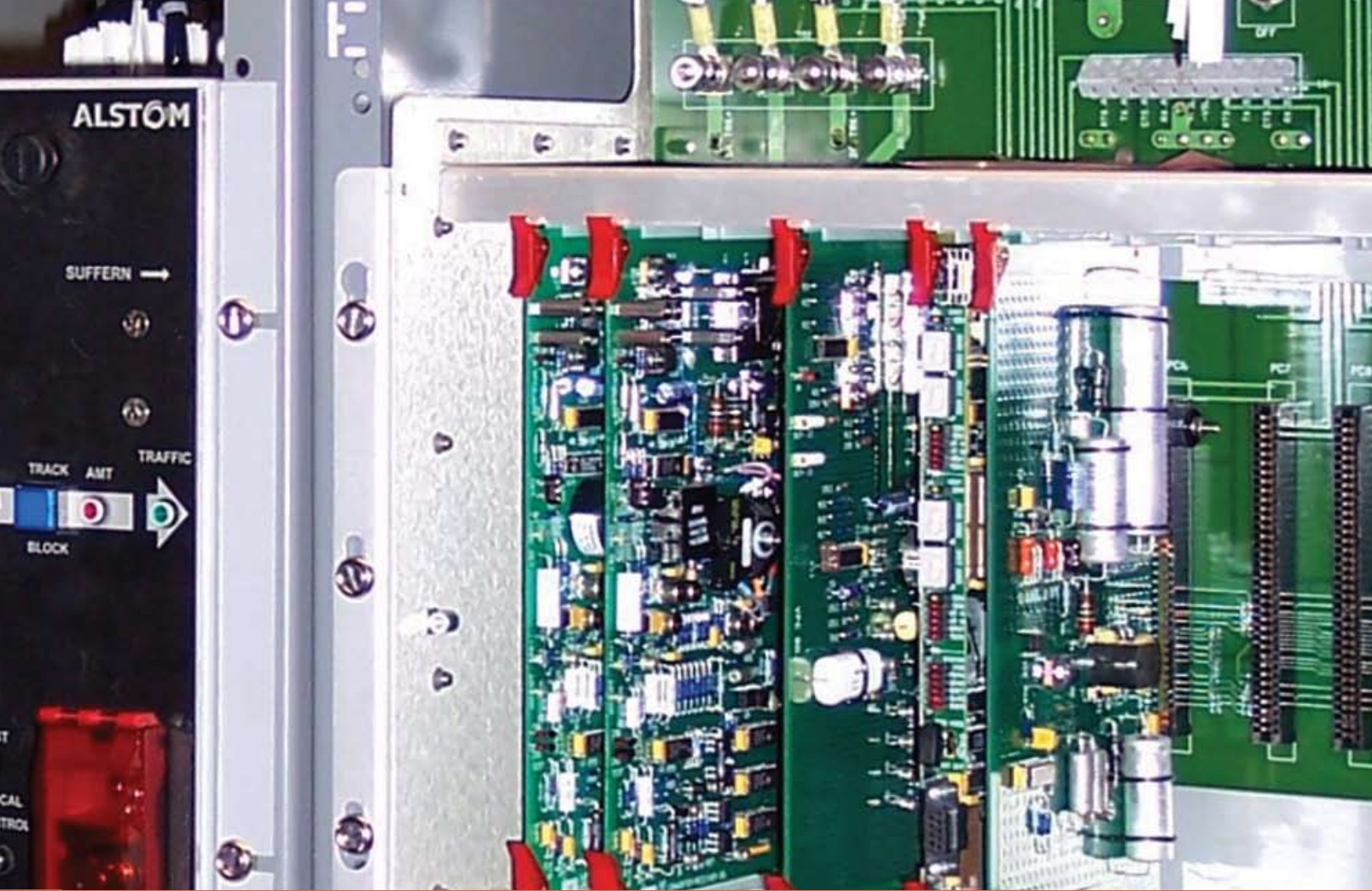




Track Circuit Components in Rack

Track Circuits



In This Section:

Genrakode™ II

Genrakode™ II Code T

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Dual Code High-Frequency Track Circuit

WEE-Z® Impedance Bonds

Receiver Coils

Genrakode™ II Track Circuit and Communication System



Genrakode II

The latest generation of **Genrakode™** adds new features to the reliability, maintainability and value for which the product has become known. First developed in 1989, the Genrakode Track Circuit and Communications System is a family of microprocessor-based modules used for vital signal clearing and train detection, non-vital block indication, and non-vital initiation of signal tumble-down. Genrakode is a DC-coded, bidirectional system fully compatible with Electrocode™ IV.

The Genrakode II CPU board, with Intelligent Diagnostics, a built-in Data Logger and point & click configuration, makes the Genrakode system a truly exceptional value.

This microprocessor-based system for train detection and cab signaling is ideal for all rail applications.

The flexible, cost-effective system allows for eliminating pole lines and relays and adding signaling to dark territory.

Ordering Information

For assistance in ordering a Genrakode II system or Genrakode Code T, please go to the Alstom website for online configuration of Genrakode module ordering number or contact the Alstom Customer Service Center at 800-717-4477.

Genrakode™ II Track Circuit and Communication System

FEATURES

Reliability

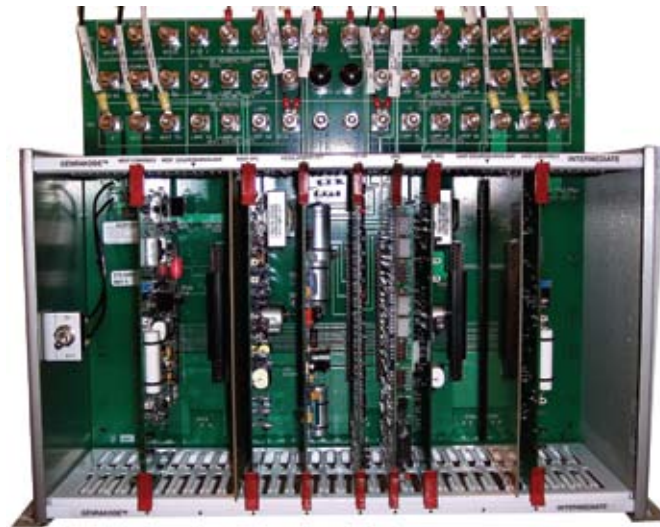
- No safety notice in over 20 years of operation
- Mean Time Between Failure (MTBF) rating of 18.7 years
- Over 78 million hours in field operation
- Installed at over 35 customer properties around the world
- Safety Assurance Logic (SAL) for fail-safe operation

Maintainability

- No periodic testing of receiver modules
- Intelligent diagnostics
- Code T provides advanced diagnostics
- Simple design that is easy to maintain

Value

- Huge cost savings by elimination of pole lines and relays
- Flexible design that is compatible with all major track circuits and interlockings
- Integrated data logger at no additional cost
- User programmable



Genrakode II

Advance Features

Code 9

- Code 9 provides additional vital signaling capabilities

Code T

- Code T provides up to eight individual indications from each location for advanced diagnostic and maintenance functions

Cab Signaling

- Three cab signal modules are available, each capable of driving the 5 standard cab signal rates: 75, 120, 180, 270, 420 PPM.
- Carrier frequencies of 60 Hz, 100Hz, and 250 Hz are available

Remote Operation

- Serial communications link at intermediate signal locations provides additional flexibility by permitting remote control of signals and codes

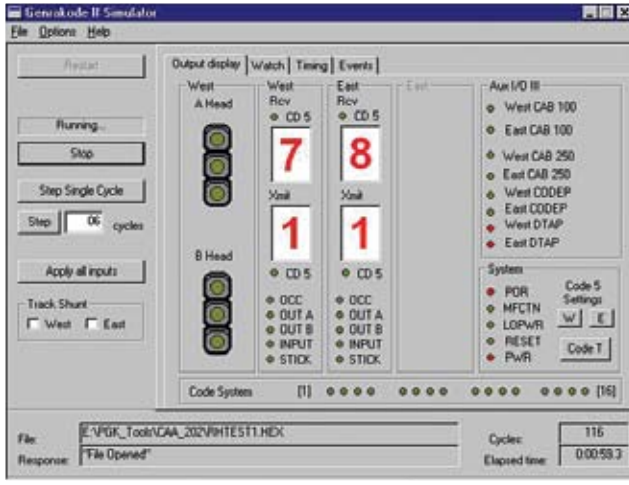
Enhanced CAA

- Enhanced Computer Aided Application (CAA) package. Includes editing and printing features that accelerate the application process

Ground Fault Detection

- Integrated within the Genrakode unit – no additional or external equipment needed
- Has a field adjustable detection threshold
- Is automatically cycle checked to verify proper operation
- When combined with Code T, can remotely report the status of proper operation and ground fault status

Genrakode™ II Track Circuit and Communication System



PC Based Simulator

FEATURES

Regulated Lamp Drive Voltage Maximizes Signal Bulb Life

- The output voltage is regulated for both input voltage and lamp load current changes.
- Therefore, signal lamps can be operated at a constant lamp voltage.
- This increases lamp life and reduces signal maintenance requirements.

Isolated Logic Power Supply

- Improves lightning and noise immunity

Track to Line Board Simplifies Code Rerouting

- Track-to-Line board simplifies application when applying Genrakode in dark territory with existing DC crossing circuits.

Serial Communication Eliminates Relay Interfaces

- A serial communications link between Genrakode and VPI is available which reduces cost by eliminating relay interfaces and reducing the number of discrete wires required.

PC-Based Simulator

- A full featured PC based Simulator is available to assist in the development and evaluation of the application programming.

Easy to use configurator

- A PC based configuration tool simplifies ordering by automatically generating the appropriate ALSTOM part number.

Fail Safe Operation

- Safety Assurance Logic provides fail-safe operation.
- No safety bulletins have been issued for either system software or hardware components.

Long Track Circuit length

- Track circuits lengths of up to 29,000 feet are attainable (welded rail, 10 ohms DC ballast).

Solid State Construction

- 100% solid state construction reduces maintenance costs by eliminating relays.

User-Programmable

- User-programmable using a Windows™ based Computer Aided Application (CAA) package to provide rapid application development.

Intelligent Diagnostics – Increases Availability

- Intelligent diagnostics and built-in battery-backed data logger provides a time and date-stamped log of all external events as well as any internal fault.

Cable Integrity Check – Reduces Troubleshooting

- Optional Cable integrity check provides additional security by detecting external cable failures.
- Real-time independent Code 5 selection for each track circuit allows for compatibility with adjacent coded track circuits.

Automatic Receiver Checking – Reduces Maintenance

- Automatic receiver level checking lowers maintenance costs by eliminating the requirement for manual periodic verification.

Intermediate Module

The Intermediate Module supports two track circuits and signals for both directions. It is used at intermediate signal locations to transmit and decode line circuit information via the rails from adjacent modules. Since the module drives signal lamps and mechanisms directly and performs all lightout detection, no relays are required.

The Intermediate Module can directly drive up to six individual color light signal aspects or up to two searchlight mechanisms in each direction. Outputs are continuously checked for correct state and all lamps are checked to insure that filaments are intact. Optional cable integrity checking is also available.

Also featured are options which permit signals to be approach-lit or approach-lit only when AC power is lost. A dedicated input on the Auxiliary I/O Board may be used to approach-light the signal when AC power is lost, thus reducing the drain on the batteries. Auxiliary inputs are provided which allow the displayed aspect to be down-graded. These inputs are typically used for switch controllers, slide fences and other equipment.

Control Point Module

The Control Point Module supports up to two independent track circuits when interfacing with the interlocking relay logic at the location, via discreet inputs and outputs or up to 8 independent track circuits when interfacing directly to a VPI Interlocking Control System. It is used at end-of-block signal locations to initiate code transmission to other signal locations through the rails, decode signals from the rails, energize relay outputs reflecting the decoded line circuit information and optionally to generate cab signal rates.



Genrakode Cab Signal Module

Cab Signal Module

Cab signaling is used in conjunction with the Control Point, Repeater, Switch Lock, and Intermediate Modules. The traditional 100Hz rate coded, or two-aspect ON/OFF cab signal system is implemented by overlaying the cab signaling onto the GENRAKODE track circuit. 60Hz and 250Hz carrier frequencies are also available.

Switch Lock Module

The Switch Lock Module supplies all functions necessary at a switch lock location including line circuit signal control, series track circuit lock release, siding timer release, switch lock magnet control and padlock contact direction.

Repeater Module

The Repeater Module is used at cut sections and is used to extend distances between signal locations. The codes transmitted from the repeater are re-generated, minimizing distortions and increasing system reliability.

Genrakode™ Code T

The Revolutionary Railroad Communication System from Alstom Expand your remote monitoring capabilities without expanding your budget with Genrakode and Genrakode Code T

Genrakode™ Code T provides an additional non-vital communications channel at no additional cost. Using the rails as the communications medium, non-vital communications can be received at the ends of the signaling block from all locations within the block. A unique location ID as well as a specific message identification allows the source of each message to be precisely pinpointed. By interlacing the non-vital messages with the existing vital train detection and vital signaling, remote monitoring eliminates the need for trenching cable or expensive radio communications systems.

Genrakode Code T potential uses include:

- Monitoring of grade crossing health
- Intrusion alarm reporting
- Signal filament status
- Status of commercial power

Benefits

Genrakode Code T applications can help simplify your maintenance activities, save you thousands of dollars and keep you in constant communication with your remote wayside locations.

Additional communication channel at no extra cost

By combining traditional train detection and vital communications through the rail with a binary coding scheme, Genrakode now provides a secondary communication channel that can be used for any non-vital signaling need.

Save cost by reducing the size of your battery system

Simply use Code T to monitor the status of the commercial AC power that keeps your batteries fully charged. As soon as power is lost, you can be notified giving you ample time to avoid failure due to discharged batteries.

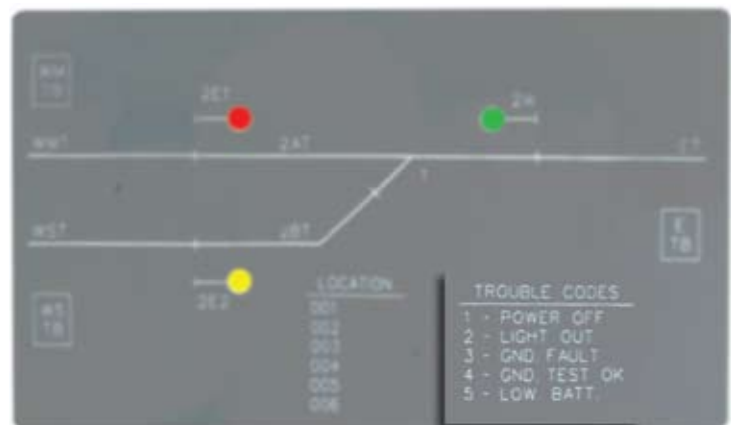
Remotely monitor the status of your grade crossing equipment

Use Code T to extract critical health information that can be reported back to a central location or dispatching office.

Ordering Information

For assistance in ordering a Genrakode II system or Genrakode Code T, please go to the Alstom website for online configuration of Genrakode module ordering number or contact Alstom Customer Service Center at 800-717-4477.

Typical Code T Assignment



Genrakode™ Test Unit

FEATURES

- **Rugged design – housed in a protective case and operates from -20° to +70° Celsius**
- **Portable – lightweight and easy to transport**
- **Easy to use – user-friendly, intuitive console**
- **Wide power voltage range (9 to 16 VDC)**
- **RS-232 communications port for connection to terminal or computer**
- **Flash upgradability of software**
- **Configuration settings are stored in non-volatile memory**



Genrakode Test Unit

The **Genrakode™ Test Unit** was engineered with three primary design goals in mind: portability, functionality, and upgradability.

The test unit is compatible with all existing Genrakode and Genrakode-compatible systems to date, including various competitors' products. The unit is capable of receiving DC track codes 1 through 9 and also features for possible future codes. AC codes 1 through 8, 28, 32, 42, 43, 48, and 72 are also supported.

The test unit features two simultaneously operating channels: East and West. While both channels are independent from each other, certain settings must remain the same between the two channels. Specifically, the AC/DC mode selection, the Code 5 type, and the DC Normal vs. Transit rate selection must be the same for both transmit and receive on both channels.

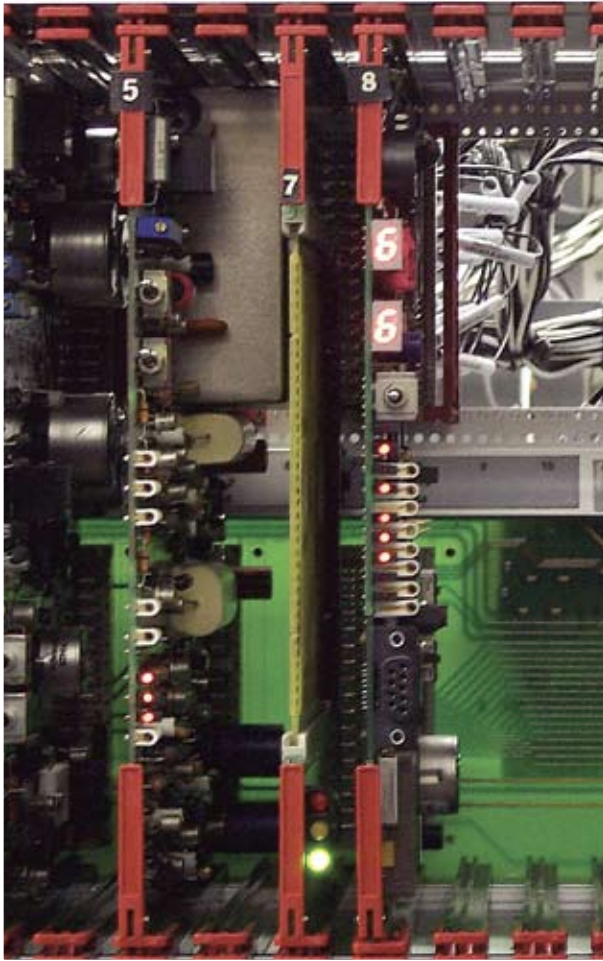
The right side of the unit is essentially a mirror of the left side: Both sides feature a two digit 14-segment display and Code 5 LED that indicate the code currently being received, if any. Additionally, both sides contain a code select rotary switch, a Code T transmit enable switch, a Code 5/6 transmit switch, and a transmit enable switch.

The test unit also features over-voltage, current, and thermal protection. For example, accidental connection of the track leads to a 12 volt DC battery source will not damage the device. Connecting the power connection or track leads backwards (i.e. negative to positive and vice versa) will also not result in damage to the unit. While the device contains numerous such protections, the maximum voltage that may be applied to any part of the device without causing damage is 16 VDC.

Ordering Information

Description	Ordering Number	Price
Genrakode Test Unit	20182-119-01	\$ 3,295.00

Dual Code High-Frequency Track Circuit



Track Circuit

The Alstom Signaling Inc. **Dual Code High-Frequency Track Circuit** reliably operates in the presence of electrical noise generated by chopper-controlled vehicles. The track circuit is ideally suited for use on continuous welded rail, where insulated joints are neither desired nor required. Combining solid-state devices with proven vital circuit relays, this track circuit eliminates the need for insulated joints, protects against interference from foreign current picked up in the rails, increases track circuit versatility,

FEATURES

Immune to Electrical Noise

- From chopper-controlled vehicles
- From foreign current interference
- Four frequencies/track for maximum security

No Insulated Joints Required

- Savings in track maintenance
- Ideal for welded rail

Easy to Maintain

- Solid-state electronic components
- Plug-in printed circuit boards
- Equipment for a number of circuits can be centrally housed

High Capacity

- For cab signaling and speed control or for automatic train operation
- Two-way data exchange between wayside and train

and provides a simple and proven method of transmitting function commands to the train for cab signals and speed control or for complete automatic operation. Track circuit lengths of up to 1,800 feet can be obtained, with suitable ballast conditions. A unique feature of the dual code high-frequency track circuit is the flexibility afforded by the "building block" concept. This allows the basic track circuit to be upgraded with more features added to accommodate stages of expanding facilities.

Dual Code High-Frequency Track Circuit

The **Dual Code High-Frequency Track Circuit** equipment consists of WEE-Z® bonds, a solid state transmitter and receiver, and a track relay. With the exception of the WEE-Z bond, this equipment can be housed in a central equipment room or in a wayside case. The WEE-Z bond couples information between the rails and the electronic wayside equipment (via a single twisted-pair line circuit), defines block limits, and confines pertinent frequencies to the applicable track circuits. The transmitter and receiver consist of printed circuit boards which plug into a rack-mounted cabinet located near the associated track relays. The transmitter supplies, and the receiver

responds to, the high-frequency signals in the rails, which provide track occupancy detection and automatic train protection commands. Up to eight frequencies are available for track occupancy detection. One or two additional frequencies can be used to transmit cab signal and/or speed control information, depending on the amount of information required. The WEE-Z bond traction current return can be connected to a traction return feeder, to a substation, or to a bond on an adjacent track. For more detail on WEE-Z bonds, see the following page.

System Operation

Train Detection

The track is divided into blocks, with each block checked for occupancy by high-frequency track circuits. Except at interlockings, there are no insulated joints for block separation. The bonds also inject into the track speed commands that are picked up by the train. WEE-Z bonds are located at the ends of each track circuit, with one circuit usually in each block but two or more circuits in longer blocks. Except at interlockings, a particular bond serves as a track circuit boundary, the transmitter coupling for one circuit and the receiver coupling for the next downstream track circuit. An ATP transmitter at the leaving end of the track circuit feeds high-frequency energy to the track, using the WEE-Z bond as a coupling transformer. Acting as a receiver, a bond at the entering end of the circuit energizes a track relay if the signal from the transmitter is not shunted by the axles of a train. The transmitter and receiver associated with one particular track circuit are tuned to the same frequency.

Automatic Speed Commands

The high-frequency track circuit equipment is the communication channel between the wayside and train for the ATP speed limit commands. In addition, the WEE-Z bonds and rails are the transmission mediums for the train to wayside communications (TWC) system. The ATP speed command channel has a frequency separate from the train detection and TWC frequencies. When a train is detected in a circuit, a speed command generated by the wayside track transmitter at the leaving end of the circuit is transmitted through the rails to the train to control its speed.

Interlockings

At interlockings, special track circuits and insulated joints permit safe operation of opposing traffic moves. The system allows propulsion return currents to flow unimpeded through the rails, while blocking train and track signals and permitting cab signals to reach only the desired train.

Ordering Information

For assistance in ordering a Dual Code High-Frequency Track Circuit, please contact the Alstom Customer Service Center at 1-800-717-4477.

WEE-Z[®] Impedance Bonds



2800 Amp/Rail Bond



4000 Amp/Rail Bond

“WEE-Z Impedance Bonds are designed for rapid transit audio frequency (AF) track circuits. They are used to terminate each end of an AF Track Circuit having different frequencies. The bonds are tuned to a respective frequency using capacitors mounted on circuitry inside the bond. WEE-Z bonds provide a low resistance for equalizing the propulsion current in the rails. Alstom WEE-Z bonds are also qualified as water tight and submersible up to four atmospheres (100 foot depth). The high capacity 4,000 Amp/Rail bond is ideal for customers who operate long, high performance trains with short headways.”

They are also used for:

- Cross-bonding between tracks
- A connector for a negative return
- Coupling the track circuit transmitter and receiver to the rails
- Coupling cab signal energy to the rails
- Inhibiting the transmission of other frequencies along the rail
- Coupling bi-directional Train-to-Wayside Communication (TWC) through the rails

WEE-Z bonds are configured for:

- Short-range track circuits less than 1,000 feet (304.8m)
- Long-range track circuits up to 1,800 feet (548.6m)
- With or without Train-to-Wayside Communications
- Receive/Receive function only

Ordering Information

Description	Amps	Ordering Number	Price
WEE-Z BOND COMPLETE	2,800 amp/rail	30859-008-XX	\$ 5,700.00
WEE-Z BOND COMPLETE	2,800 amp/rail	30859-009-XX	\$ 5,700.00
WEE-Z BOND COMPLETE	2,800 amp/rail	30859-010-XX	\$ 5,700.00
WEE-Z BOND COMPLETE	4,000 amp/rail	30859-011-XX	\$ 7,995.00
WEE-Z BOND COMPLETE	4,000 amp/rail	30859-012-XX	\$ 7,995.00

Receiver Coils



Receiver coil

Receiver coils are used for 100 Hz cab signaling systems – both continuous and coded. They are mounted underneath the front of the locomotive above the rails. The encapsulated coils inductively couple 100 Hz signals from the rails to the onboard

vehicle signaling equipment. Integrated into the coil assembly is a test coil used to verify ATC operation during daily departure testing. During this testing the locomotive cannot be powered and the brake must be applied.

Call Our
Customer Service
Center

1-800-717-4477

Ordering Information

Description	Ordering Number	Price
RECEIVER COIL COMPLETE - RH	52100-010-05	\$ 1,795.00
RECEIVER COIL COMPLETE - LH	52100-010-06	\$ 1,795.00