

Advanced Automatic Train Control Spread Spectrum Radio (AATC-SSR) DESCRIPTION

AATC-SSR Definition

The AATC-SSR is a multi-functional digital data transmitter-receiver used for digital data communication and range measurement. The AATC-SSR with suitable antenna and mounting/installation kits is a Radio Set (RS) and can be used in a variety of rail vehicle and wayside configurations. The AATC-SSR is identical in all RS configurations. Only the differences in the mounting and installation kit (Antenna, Product Identification Module (PIM), and mounting) define a specific RS configuration and its use. The Product Identification Module is a serial electrically erasable programmable read only memory (EEPROM) which provides the radio with its configuration type i.e. vehicle, or wayside radio. The AATC-SSR is designed specifically for the railroad environment and requires professional installation and operation.

AATC-SSR Operation

The AATC-SSR provides for data exchange between RSs, between the AATC-SSR and a Train Controller, and between the AATC-SSR and a Station Computer. The AATC-SSR has serial interface capability to a Global Positioning System (GPS) Receiver and the Radio Test Set (RTS), a specialized test equipment.

The AATC-SSR operation is controlled by firmware (embedded software). The AATC-SSR hardware, in combination with this firmware, is designed for operation in a communications network of similar AATC-SSRs to perform train control or other similar applications. A network can contain as few as two AATC-SSRs or as many as several hundred AATC-SSRs. The firmware is specifically designed to support networks of AATC-SSRs spread out along railways or tunnels, where multiple radio frequency (RF) links may need to be cascaded to provide communications from a source to a remote destination. Highly reliable communications is provided through a variety of techniques including spread spectrum and redundant RF channels.

Using the RF communications signals, the AATC-SSRs cooperatively measure the range between pairs of AATC-SSRs. The range measurements are reported to a control station, which is connected to one of the AATC-SSRs in a network, and the Control Station can use these ranges to establish and track the locations of AATC-SSR equipped vehicles.

The AATC-SSR operates in the 2400 MHz to 2483.5 MHz frequency band. Its transmit center frequency can be controlled to be anywhere from 2423.75 MHz to 2462.75 MHz in 1 MHz steps. The AATC-SSRs share the RF band using a combination of time division, frequency division, and code division multiple access techniques. The communications network structure is managed by a control station computer, which assigns time and frequency resources to each of the AATC-SSRs.