

# **SLT-100 Automatic Equipment Identification**

**Preliminary Manual**

**December 2007**

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## **Notice**

**Use of this equipment requires a license from the Federal Communications Commission (FCC) for operation under 47 CFR 90.**

### **COMPLIANCE STATEMENTS:**

This device uses, generates, and radiates radio frequency energy. The radio frequency energy produced by this device is well below the maximum exposure allowed by the Federal Communications Commission (FCC).

Operation is subject to the following conditions: 1. This device may not cause harmful interference, and 2. this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at this own expense.

### **CAUTION: EXPOSURE TO RADIO FREQUENCY RADIATION**

To comply with FCC RF exposure requirements, the following antenna installation and device operating configurations must be satisfied. The antenna for this unit must be fixed and mounted with a separation distance of at least 12.2 inches or (31 cm) from all persons in occupational environment and 27.6 inches or (70 cm) in general population areas.

### **MODIFICATIONS:**

The FCC requires the user to be notified that any changes or modifications to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment. The correction of interference caused by unauthorized modification, substitution, or attachment will be the responsibility of the user. The manufacturer and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from failing to comply with these guidelines.

## I. Purpose

The Short Line Technologies ("SLT") model SLT-100 reads AEI (Automatic Equipment Identification) RFID Tags for any rolling railroad stock. These tags comply with the requirements of the Association of the American Railroads ("AAR") Standard S-918.

## II. Functionality

Through the use of the most modern technology, maximum allowable effective radiated power and innovative error correcting software, the SLT-100 offers a significant improvement in the percentage of AEI tags read correctly.

In addition to its core functionality of reading the AEI Tags that are mounted on passing rolling railroad stock, the SLT-100 provides two additional key features:

1. **Direction Sensing** – Two 24 GHz Doppler radar sensors, one on each side of the SLT-100 enclosure, sense the presence and direction of railcar motion on either side of unit. By accurately sensing direction of the train, whose AEI tags are being read, the cost of a 2<sup>nd</sup> Tag Reader on the opposite side of the track is avoided.
2. **Wireless Communications** – Radio communications between the SLT-100 and its host computer eliminates the need for lengthy and expensive communications cable installation. The built-in data radio modem provides reliable communications to a host computer equipped with a companion modem. This offers a typical range of about 0.6 mile. By placing a Booster-Bridge within approximately 0.6 miles of the SLT-100, total coverage distance of as great as 30 miles is possible.

## III. Installation

The SLT-100 is designed for simple, inexpensive installation.

1. **Mounting** -- The SLT-100 should be mounted 8 to 12 feet from the rail. Usually a 2 to 3 inch steel pipe supports the unit, however it may be secured to any convenient object that is sturdy enough to hold the SLT-100 rigid even when a train is passing. The mounting is two 12 inch wide Unistrut™ 1 5/8" on the rear of the unit. The SLT-100 comes with a set of clamps for a 2 1/2 " pipe. The Unistrut<sup>1</sup> catalog offers a vast array of other mounting options to satisfy any mounting requirement.

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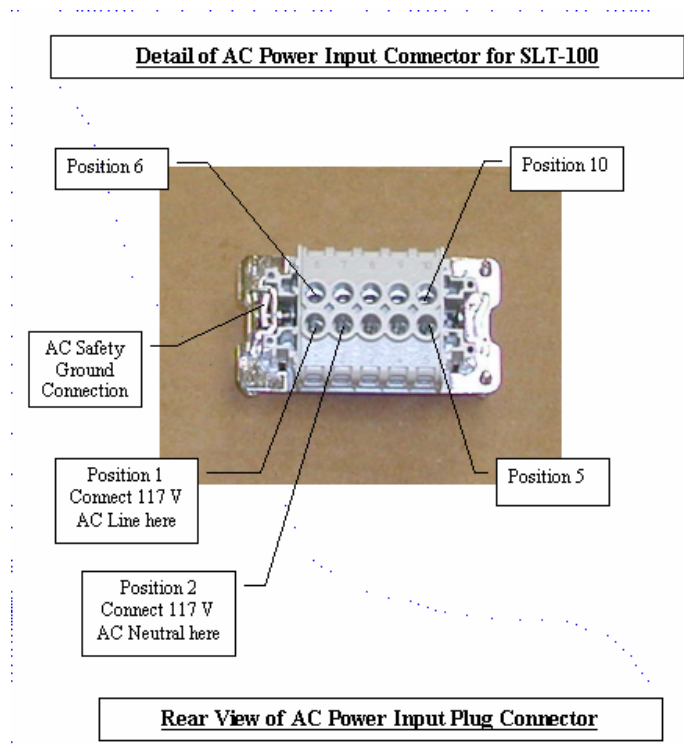
<sup>1</sup>Unistrut

4205 Elizabeth • Wayne, MI 48184

Tel: 800 521-7730 • Fax: 734-721-4106

[www.unistrut.com](http://www.unistrut.com)

2. **Height** -- The mounting height of the SLT-100 Tag Reader should place the center of the box about 3 feet above the rail. The front of the enclosure should be parallel to the rails. [ does this say what you want it to?]
3. **Power** – The SLT-100 requires approximately 40 watts of standard 117 VAC, 60 Hz power. All applicable electrical code requirements should be adhered to. The power connection is made through a mating connector that uses screw terminals to terminate the power wires.



## IV. Wireless Communications

There are three options for communicating with the SLT-100: short range, long range, and mesh.

In the course of this discussion it is important to bear in mind that coverage distances provided are generalizations, based on average conditions of terrain, ground cover, and levels of electrical noise and interference. The only way to be certain that a specific path will work is to conduct a site survey. Please contact the factory if you wish to arrange for such a study.

1. **Short Range** – A distance of approximately (see the note above) 0.6 miles may be realized using the 2.4 GHz modem built into the SLT-100. At the receiving [should this be receiver or receiving?] end a 2.4 GHz modem connects to the

USB port of the controlling computer. A laptop computer with this radio modem is also used for the initial setup.

2. **Long Range** – For distances up to 30 miles (under ideal conditions), a frequency hopped 900 MHz link is used. To establish this link, a **2.4 GHz / 900 MHz Bridge Modem** must be installed within 0.6 miles of the SLT-100. No direct connection to the SLT-100 is required. The Bridge Modem is in a weather proof NEMA enclosure and requires a few watts of 117 VAC power and an external 900 MHz antenna. This antenna must be mounted at a height sufficient for the link distance required.
3. **Mesh** – The built-in modem in each SLT-100 will automatically linkup with any other commonly designated SLT-100 units within 0.6 miles. For example, a line of ten SLT-100 Tag Readers spaced up to 0.6 mile apart would carry the data of all the Readers for 10 miles plus 0.6 miles from the nearest reader. This will work equally well in a two dimensional grid setup which is ideal for use in a switching yard. When installing the SLT-100 with a communications mesh, please contact the factory for proper programming.

## V. Setup

The initial setup of the SLT-100 AEI Tag Reader should be made while observing both the reader and the tracks. However, the person doing the setup must be at least 50 feet directly behind the SLT-100.

1. Load the SLT CD-ROM supplied with the SLT-100 on a computer running Windows XP. Follow the setup instructions on the screen.
2. Attach the 2.4 GHz Modem using the supplied USB cable.

### Tag Reader

1. Obtain a known good-working AEI Tag, not more than five years old. Be sure that it is mounted on an aluminum or steel plate at least one inch wider and longer than the tag. It is critical that the tag be mounted on a metal plate; failure to do so will invalidate the setup procedure.
2. Walk in front of the track, facing the tag reader. Holding the tag at your side with your arm extended, slowly walk along the track toward the SLT-100 while an assistant observes the computer screen for the following readings: The point where the SLT-100 begins to read the tag, and continue walking until the readings stop. Repeat this process while holding the tag approximately three feet above the track. In both cases readings should continue for a width of 30 feet. If this does not happen, check the installation carefully and repeat the test.

3. Move to the control point and set the office computer up according to the instructions Short Line Data Systems.

### **Direction Sensor**

These steps will verify and calibrate the microwave Doppler sensors whose input determine the traveling direction of the train. This procedure will require the availability of a locomotive that can move back and forth over a distance of  $\pm 0.5$  miles from the location of the SLT-100 at normal speed..

1. While watching the **Direction Setup Page** of the computer have a consist approach from 0.5 miles away at normal speed. Note the distance at which the computer indicates the direction of approach. If the range of speed that the train may approach is great, repeat the procedure at high and low limits of speed. Adjust the **Direction Sensitivity** for that direction (Left or Right) so that the direction appears on the screen when the train is about 100 yards from the reader.
2. Repeat the procedure with the train approaching from the opposite direction. The radar cross section of the front and rear of the locomotive should be similar. Approaching in reverse should have no significant effect on this setup.