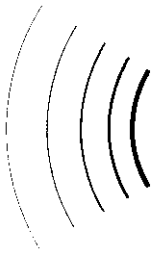
EXHIBIT I

Operator's Manual for Savi Technology Model Savi GateReader 410R

Savi Technology
FCC ID: KL7-410GR-V12



Savi GateReader 410R Installation Guide

Version 1.0

SAVI TECHNOLOGY
A Raytheon Company

Savi Technology
FCC ID: KL7-410GR-V12
Operator's Manual

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Problems with the product or the manual? After you have checked your connections and the *Savi GateReader 410R Installation Guide*, please call Savi technical support at 1-888-994-SAVI (994-7284), or send e-mail to help@savi.com at any time.

Federal Communications Commission (FCC) Notice

The Federal Communications Commission has established technical standards regarding radio frequency energy emitted by computer devices. 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 with radio/TV reception. 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 his own expense.

Warning

Changes or modifications to this equipment that are not expressly approved by Savi Technology could void the authority to operate this equipment.

Savi Technology is not responsible for radio/TV interference caused by using unauthorized cable or by making unauthorized changes to this equipment.

Preface

This manual exists to help RFID technicians to install the Savi GateReader 410R as part of the Savi System.

Related Publications

Savi System Installation Guide	JDM-1004
Savi Asset Manager User Guide, v.2.0	DOC-2009

Audience

This *Savi GateReader 410R Installation Guide* is written for technical personnel who are familiar with the Savi System and its components.

What's New in this Edition

This is the first revision to the first edition of the *Savi GateReader 410R Installation Guide*. It adds instructions for installing ferrite filters on component cables.

Organization of this Manual

This guide describes how to install the Savi GateReader 410R.

Chapter 1, "Introduction," describes the features and available models of the Savi GateReader 410R.

Chapter 2, "Configuration," describes the mounting and connections of the Savi GateReader 410R's central control panel.

Chapter 3, "Installation," describes procedures and mounting devices for installing the Savi GateReader 410R.

Chapter 4, "Maintenance," briefly describes some troubleshooting procedures for possible problems with the Savi GateReader 410R.

Appendix A, "Savi System Description," describes the overall system of Savi hardware and software.

Conventions Used in this Manual

The table below explains the conventions of typography and usage in this book.

Typographic and usage conventions

Notation	*Example*	*Meaning and use*
note		***Note*** *Notes call attention to facts or advice that seem to deserve special attention.*
caution notice		***Caution*** *Caution notices call attention to the possibility of damage to the product, the system, or your work (for example, potential loss of data).*
warning notice		***Warning*** *Warning notices call attention to the possibility of injury to people.*
sans-serif typeface	Terminal Locked!	messages, prompts, window names, and other text as displayed on the screen, where column alignment is *not* important.
equal-spaced font	1005 DATA	examples of data files, program code, and other text where column alignment is important.
boldface type	A:\INSTALL	text you enter exactly as shown.
italic type	*name*.bmp or *tag_id*	a variable. The italicized text is replaced by the appropriate information. This can be something you type, such as the file name in the first example shown here, or displayed information, such as `tag_id` in the second example. Italic type is also used for *emphasis* of a word or phrase that is new or especially important.
control key	CTRL+Z	a keyboard control code. This example tells you to hold the control key while you press the Z key.

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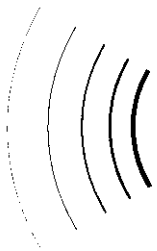
Chapter 3: Installation

Chapter 4: Maintenance



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1 Introduction

The Savi GateReader 410R is intended for use in applications where short-range, directed tag communications are required, such as at gates, checkpoints, and other portals. Using the Savi GateReader as part of the Savi System, you can perform vehicle tracking, tag collections, and data exchanges with tags.

Savi System

The Savi System uses state-of-the-art wireless technology to monitor, track, and locate assets in complex commercial, industrial and military environments.

The system comprises tags (also called transponders), interrogators (also called readers), RF Relays or RF Links, and a computer with RFID management software installed. Tags can store, transmit, and receive data and commands from interrogators, or can initiate communication when triggered by sensors.

SaviTags and SaviReaders communicate through Savi's proprietary radio communications protocol called Batch Collection® To gather asset information, collection commands are either relayed to tags from the computer, through fixed or transportable interrogators, or issued directly by the operator from hand-held readers.

Please see Appendix A, "Savi System Description," for a more complete description of the system and its components.

RFID Management Software

To communicate with Savi GateReaders, use one of these Savi software packages for RFID system management:

- Savi Asset Manager, version 2.0

  Savi Asset Manager software is used for wide area tracking to control and monitor Savi System components. It has a graphical user interface for ease-of-use when scheduling automated events or exporting tag collection data to your other business systems.

- Savi Retriever, version 2.0

  Savi Retriever software operates fully unattended, collecting and forwarding asset data from multiple sites to a central business system.

GateReader Description

The Savi GateReader is used to track the movement of containers, vehicles, and other assets as they enter or leave a chokepoint or gate. The Savi GateReader 410R can communicate with tags in motion, and with multiple tags simultaneously. The GateReader also has the ability to distinguish between tags travelling in opposite directions along adjacent lanes.

The Savi GateReader operates at dual frequencies: 433.92 MHz for normal tag communications, and 2.44 GHz for wakeup signals. The GateReader uses the Echelon LonWorks™ network and is designed to communicate optimally with the SaviTag 410. Its power source can be 85 to 264 Vac.

GateReader Components

The Savi GateReader 410R consists of four primary components:

- control panel
- RF unit
- primary and secondary wakeup antennas
- motion sensor

Control Panel

The control panel contains a microprocessor for controlling all of the GateReader components, memory for data buffering, a LonWorks network interface, an AC adapter and DC regulator that provide power to all components, and a terminal block to connect wiring for power, the RF unit, and one or more antennas.

RF Unit

The RF unit consists of a 433.92 MHz receiver, a 433.92 MHz transmitter, and an antenna. Once a tag (or tags) receives a wakeup signal from the wakeup antennas, the RF unit then communicates with the tag, transmitting data back to the host computer through the control panel's LonWorks network interface.

Wakeup Antennas

There are two types of wakeup antennas for the GateReader: primary and secondary. The primary wakeup antenna connects to the control panel and the motion sensor. It also controls, and supplies power to, the secondary wakeup antenna. Each GateReader may have up to two sets of primary and secondary wakeup antennas. The wakeup antennas send a

2.44 GHz RF signal to tags to wake them up. The tags then transmit data using a 433.92 MHz signal that is received by the RF unit.

Motion Sensor

The motion sensor detects oncoming vehicles and then triggers the activation of the primary and secondary wakeup antennas.

Network Communications

The Savi GateReader 410R supports two types of network protocols: Echelon's LonWorks network and RS-232.

Communications to and from the Savi GateReader are principally accomplished with the Echelon LonWorks network protocol. The LonWorks network is a robust network protocol designed for industrial applications. The LonWorks network is used for communication with tags, sensors, other readers, and the host computer. Savi GateReader also supports point-to-point or point-to-multi-point communication via radio frequency modem.

Both incoming and outgoing LonWorks ports are provided for network communication when the Savi GateReader is daisy-chained with other interrogators in an installation.

An RS-232 port is also provided for diagnostics using appropriate diagnostic software and for downloading buffered data.

Tag Communications

The Savi GateReader communicates with SaviTag 410 model tags, and has the ability to transfer data with tags travelling up to 25 miles per hour.

The Savi GateReader is a dual-frequency device: it uses 433.92 MHz signals to communicate with tags, but uses a 2.44 GHz wakeup signal when a tag approaches. When the vehicle sensor detects motion, it triggers activation of the gate controller. The gate controller then activates the wakeup antennas to send a wakeup signal (2.44 GHz) to the approaching tags so that the controller can begin collecting tag data (433.92 MHz).

The range for the 2.44 GHz wakeup signal is 20 to 50 feet from the wakeup antenna. The range for the 433 MHz signal is approximately 200 feet from the transmitter to a line-of-sight tag (assumes no obstructions).

Models and Options

Table 1-1 shows the available hardware options for the Savi GateReader 410R.

Table 1-1 Savi GateReader models

Model	*Description*	*Frequency*
SR-410GR-021	Savi GateReader 410R Control Panel, 433 MHz RF Unit, 2 Primary Wakeup Antennas, cables (two-pole configuration)	433 MHz/ 2.44 GHz
SR-410GR-041	Savi GateReader 410R Control Panel, 433 MHz RF Unit, 2 Primary Antennas, 2 Secondary Antennas, cables (four- and five-pole configurations)	433 MHz/ 2.44 GHz
SRA-GR-101	Motion Sensor for Savi GateReader 410R (RF type)	10.5 GHz
SRA-GR-102	Motion Sensor for Savi GateReader 410R (IR type)	N/A
SRA-GR-201	Antenna Set for Savi GateReader 410R (2 Secondary Antennas)	N/A
SRA-GR-301	Enclosure for Savi GateReader 410R	N/A

Mounting hardware, a power-monitoring device, a tripod assembly, and a solar power unit are also available from Savi.

Installation Overview

Installing the Savi GateReader 410R takes place in four major steps:

- mount, configure, and wire the control panel in a NEMA-rated enclosure (Chapter 2, "Configuration).
- position the GateReader components (control panel, RF unit, primary and secondary wakeup antennas, and motion sensor) for efficient communication ("Positioning Savi GateReader Components" on page 3-9)
- connect power and network cables and turn on power ("Connecting Savi GateReader Devices" on page 3-13)
- verify communication between the Savi GateReader and the host computer ("Verifying Savi GateReader Communication" on page 3-17)

2 Configuration

This chapter describes the mounting placement and wiring configuration of the control panel in a NEMA-rated enclosure. It also describes how to install ferrite filters on all power and network cables.

Mounting the Control Panel

The control panel is mounted inside a NEMA-rated watertight enclosure. Figure 2-1 shows the dimensions of the control panel and the location of the four mounting holes.

Enclosures such as Hoffman catalog number U-U605025 can be used that include space to mount AC outlets and supporting hardware. (A fan and heater powered from the source AC maintain operating temperatures within the enclosure.)

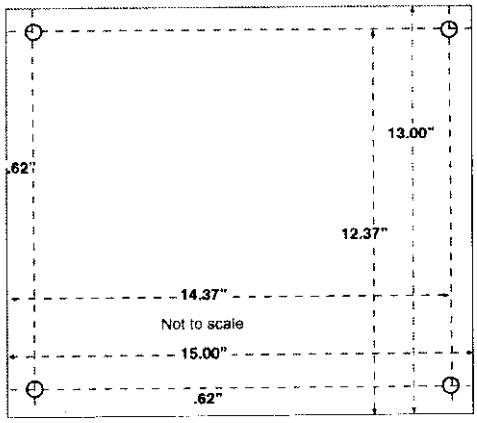


Figure 2-1 Control panel mounting holes

Wiring the Control Panel

The Savi GateReader control panel has five terminal blocks that connect wiring to all the other components of the GateReader. This section details the wiring connections for those five terminal blocks.

Figure 2-2 shows the position of the five terminal blocks on the Savi GateReader's control panel. Tables 2-1 through 2-5 list the connections for the terminal blocks.

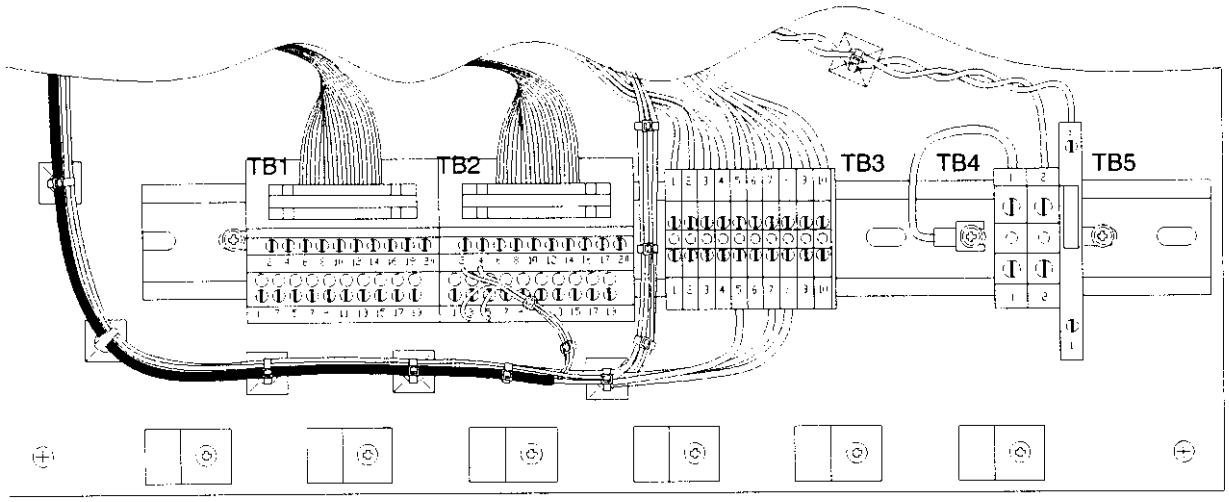


Figure 2-2 Savi GateReader 410R control panel terminal blocks

Table 2-1 lists the wiring by screw for terminal block 1. Terminal block 1 connects the 433 MHz RF functions.

Table 2-1 Wiring for terminal block 1

Signal Name	Terminal Screw No.	Connect to	Cable	Description
TX_VCC	1	BLACK	433 MHz Cable 1	Transmitter power supply for RFCOM1
TX_VCC	2	BLACK	433 MHz Cable 2	Transmitter power supply for RFCOM2
TX_DATA	3	BROWN	433 MHz Cable 1	Transmit data to RFCOM1
TX_DATA	4	BROWN	433 MHz Cable 2	Transmit data to RFCOM2
RX_VCC	5	RED	433 MHz Cable 1	Receiver power supply for RFCOM1
RX_VCC	6	RED	433 MHz Cable 2	Receiver power supply for RFCOM2
RX_DATA	7	ORANGE	433 MHz Cable 1	Receive data from RFCOM1
RX_DATA	8	ORANGE	433 MHz Cable 2	Receive data from RFCOM2
RSSI	9	YELLOW	433 MHz Cable 1	Receive Signal Strength Indicator from RFCOM1; higher the voltage is, stronger the signal
RSSI	10	YELLOW	433 MHz Cable 2	Receive Signal Strength Indicator from RFCOM2; higher the voltage is, stronger the signal
DIG_CNTRL	11	GREEN	433 MHz Cable 1	Digital circuit power supply for RFCOM1
DIG_CNTRL	12	GREEN	433 MHz Cable 2	Digital circuit power supply for RFCOM2
TX_PWR_ADJ	13	BLUE	433 MHz Cable 1	Transmit power level adjustment for RFCOM1; higher the voltage is, stronger the transmit power

Table 2-1 Wiring for terminal block 1

Signal Name	Terminal Screw No.	Connect to	Cable	Description
TX_PWR_ADJ	14	BLUE	433 MHz Cable 2	Transmit power level adjustment for RFCOM2;higher the voltage is, stronger the transmit power
EE_CLK	15	VIOLET	433 MHz Cable 1	Calibration EEPROM Clock line for RFCOM1
EE_CLK	16	VIOLET	433 MHz Cable 2	Calibration EEPROM Clock line for RFCOM2
EE_DATA	17	GRAY	433 MHz Cable 1	Calibration EEPROM Data line for RFCOM1
EE_DATA	18	GRAY	433 MHz Cable 2	Calibration EEPROM Data line for RFCOM2
GND	19	WHITE	433 MHz Cable 1	Signal Ground for RFCOM1
GND	20	WHITE	433 MHz Cable 2	Signal Ground for RFCOM2

Table 2-2 lists the wiring by screw for terminal block 2 for four- and five-pole configurations. Terminal block 2 connects cables for the components of the GateReader: sensors, antennas, monitoring LEDs, and so on. For two-pole configurations, see Table 2-3.

Table 2-2 Wiring for terminal block 2, four- and five-pole configuration

Signal Name	Terminal Screw No.	Connect to	Cable	Description
No Connection	1			
TEST3	2	YELLOW	LED Cable	Yellow LED control signal
TEST2	3	RED	LED Cable	Red LED control signal
TEST1	4	GREEN	LED Cable	Green LED control signal
GND	5	WHITE	Wakeup Antenna 2	Signal ground for Sensor 2
		BLACK	LED Cable	LED common ground

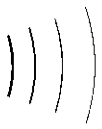


Table 2-2 Wiring for terminal block 2, four- and five-pole configuration

Signal Name	Terminal Screw No.	Connect to	Cable	Description
SEN_B	6	VIOLET	Wakeup Antenna 2	Input signal from Sensor 2
ANT_OK_2B	7	YELLOW	Wakeup Antenna 2	Connection check for Secondary Antenna 2
ANT_PWR2B	8	GRAY	Wakeup Antenna 2	Power supply for Secondary Antenna 2
GND	9	ORANGE	Wakeup Antenna 2	Signal ground for Secondary Antenna 2
ANT_OK_1B	10	YELLOW	Wakeup Antenna 1	Connection check for Secondary Antenna 1
GND	11	ORANGE	Wakeup Antenna 1	Signal ground for Secondary Antenna 1
ANT_PWR1B	12	GRAY	Wakeup Antenna 1	Power supply for Secondary Antenna 1
GND	13	WHITE	Wakeup Antenna 1	Signal ground for Sensor 1
SEN_A	14	VIOLET	Wakeup Antenna 1	Input signal from Sensor 1
ANT_OK_2A	15	BROWN	Wakeup Antenna 2	Connection check for Primary Antenna 2
ANT_PWR2A	16	BLACK	Wakeup Antenna 2	Power supply for Primary Antenna 2
GND	17	RED/ GREEN	Wakeup Antenna 2	Signal ground for Primary Antenna 2
ANT_OK_1A	18	BROWN	Wakeup Antenna 1	Connection check for Primary Antenna 1
GND	19	RED/ GREEN	Wakeup Antenna 1	Signal ground for Primary Antenna 1
ANT_PWR1A	20	BLACK	Wakeup Antenna 1	Power supply for Primary Antenna 1

Table 2-3 lists the wiring by screw for terminal block 2 for two-pole configurations. Terminal block 2 connects cables for the components of the GateReader: sensors, antennas, monitoring LEDs, and so on. For four- and five-pole configurations, see Table 2-2.

Table 2-3 Wiring for terminal block 2, two-pole configuration

Signal Name	*Terminal Screw No.*	*Connect to*	*Cable*	*Description*
No Connection	1			
TEST3	2	YELLOW	LED Cable	Yellow LED control signal
TEST2	3	RED	LED Cable	Red LED control signal
TEST1	4	GREEN	LED Cable	Green LED control signal
GND	5	WHITE	Wakeup Antenna 2	Signal ground for Sensor 2
		BLACK	LED Cable	LED common ground
SEN_B	6	VIOLET	Wakeup Antenna 2	Input signal from Sensor 2
ANT_OK_2B	7	YELLOW	Wakeup Antenna 2	Connection check for Secondary Antenna 2
ANT_PWR2B	8	GRAY	Wakeup Antenna 2	Power supply for Secondary Antenna 2
GND	9	ORANGE	Wakeup Antenna 2	Power ground for Secondary Antenna 1
ANT_OK_1B	10	BROWN	Wakeup Antenna 2	Connection check for Secondary Antenna 1
GND	11	ORANGE	Wakeup Antenna 1	Power ground for Primary Antenna 1
ANT_PWR1B	12	BLACK	Wakeup Antenna 2	Power supply for Secondary Antenna 1
GND	13	WHITE	Wakeup Antenna 1	Signal ground for Sensor 1
SEN_A	14	VIOLET	Wakeup Antenna 1	Input signal from Sensor 1
ANT_OK_2A	15	YELLOW	Wakeup Antenna 1	Connection check for Primary Antenna 2

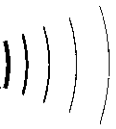


Table 2-3 Wiring for terminal block 2, two-pole configuration

Signal Name	Terminal Screw No.	Connect to	Cable	Description
ANT_PWR2A	16	GRAY	Wakeup Antenna 1	Power supply for Primary Antenna 2
GND	17	GREEN / GREEN	Wakeup Antenna 1,2	Signal ground for Primary and Secondary Antenna 2
ANT_OK_1A	18	BROWN	Wakeup Antenna 1	Connection check for Primary Antenna 1
GND	19	RED / RED	Wakeup Antenna 1,2	Signal ground for Primary and Secondary Antenna 1
ANT_PWR1A	20	BLACK	Wakeup Antenna 1	Power supply for Primary Antenna 1

Table 2-3 lists the wiring by screw for terminal block 3. Terminal block 3 connects the LonWorks network.

Table 2-4 Wiring for terminal block 3

Signal Name	Terminal Screw No.	Connect to	Cable	Description
Data+	1	ORANGE	LonWorks	Data line for Lonworks, incoming
Data–	2	WHITE	LonWorks	Data line for Lonworks, incoming
Data+	3	ORANGE	LonWorks	Data line for Lonworks, outgoing
Data–	4	WHITE	LonWorks	Data line for Lonworks, outgoing
15V	5	YELLOW	Digital Module	15V power supply
7.2V	6	No Connect		7.2V power supply
5V	7	RED	Digital Module	5V power supply

Table 2-4 Wiring for terminal block 3

Signal Name	*Terminal Screw No.*	*Connect to*	*Cable*	*Description*
GND	8	BLACK	Digital Module	Ground
15V	9	BLUE, BLUE	Wakeup Antenna 1 & 2	15V power supply
GND	10	No Connect		Ground

Table 2-5 lists the wiring by screw for terminal blocks 4 and 5. Terminal block 4 connects AC power within the GateReader control panel. Terminal block 5 connects to the source AC power line

Table 2-5 Wiring for terminal blocks 4 and 5

Signal Name	*Terminal Screw No.*	*Connect to*	*Cable*
EARTH GROUND	TB4, 1	GREEN	AC
NEUTRAL	TB4, 2	WHITE	AC
HOT	TB5, 1	BLACK	AC

Installing the Ferrite Filters

When you install the Savi GateReader, you must install ferrite filters (supplied in the installation kit) on several cables inside the control panel enclosure:

- each 2.4 GHz antenna cable (large filter)
- each 433.92 MHz antenna cable (large filter)
- the AC power cable (large filter)
- each LonWorks cable (small filter)

Figure 2-3 shows the approximate positions of the ferrite filters within the enclosure. These ferrite filters are clamshell-type filters that prevent radio interference. Two sizes of filters work with the control panel cables:

- Large filters (Savi part number 660-02029-001) fit all the antenna and AC power cables.
- Small filters (Savi part number 660-02025-001) fit the LonWorks network cables.

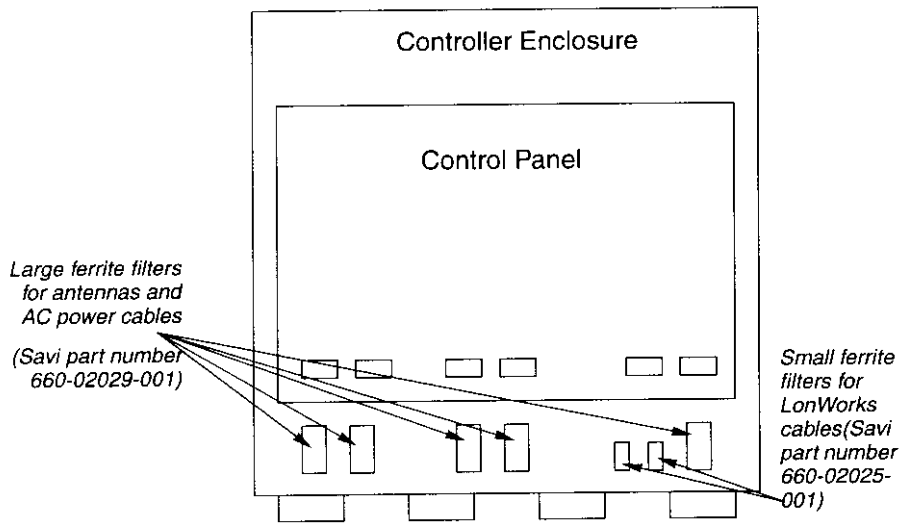


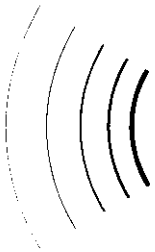
Figure 2-3 Placing the ferrite filters inside the enclosure

Inside the enclosure, each ferrite filter installs on the cable between the enclosure opening to cable conduit and the cable clamp on the control panel.

To install the ferrite filters:

1. Identify the correct ferrite filter for each cable.

   The installation kit includes all necessary filters; five large ones for antenna and power cables, and two small ones for LonWorks cables.
2. Open the ferrite filter; insert a fingernail or other thin item between the latch and the body of the ferrite filter.
3. Place the opened ferrite filter so that the cable lies in the groove on either side of the filter.
4. Close the ferrite filter until the latch clicks and locks.
5. Repeat for each cable until all antenna, power, and LonWorks cables have ferrite filters installed.



3 Installation

This chapter describes the balance of the installation process:

- positioning the Savi GateReader components (control panel, RF unit, primary and secondary wakeup antennas, and motion sensor) in different configuration
- connecting power and network cables, and turning on power
- testing communication between the Savi GateReader and the host computer

Configuration Overview

Three standard configurations are used when installing a Savi GateReader in the field:

- five-pole configuration for monitoring two-way vehicle traffic moving faster than ten miles per hour.
- four-pole configuration for monitoring two-way vehicle traffic moving slower than ten miles per hour.
- two-pole configuration for monitoring primarily one-way vehicle traffic moving slower than ten miles per hour.

Five-Pole Configuration

The five-pole configuration requires site preparation, positioning one control panel, one RF unit, two motion sensors, two primary wakeup antennas, and two secondary wakeup antennas, and then connecting network cables and the power supply.

Site Preparation

Before installing Savi GateReader components and network connections, some site preparation is necessary. First, conduct a site survey and draft installation plans to anticipate the configuration of all devices. Use the positioning recommendations in this manual wherever possible.

Once the plan is in place, install mounting poles, underground conduit, and NEMA enclosures according to the plan, and in accordance with all safety and legal requirements. Other site preparation considerations include, but are not limited to, supplying power, providing telephone connections, and installing power safety or monitoring devices.

Configuration

Place a 20-foot to 35-foot pole 10 feet from the edge of the road. Install the control panel and RF unit (in a NEMA enclosure) on this pole.

On one side of this pole, place a 22-foot pole that is 32 feet from the it and parallel to the road. Install a secondary wakeup antenna on this pole.

On the other side of the pole with the control panel, place an 11-foot pole that is 32 feet from it and parallel to the road. Install a primary wakeup antenna and a motion sensor on this pole.

The two remaining poles are placed on the other side of the road and 10 feet from the edge of the road. Across from the 22-foot pole, place an 11-foot pole and install a primary wakeup antenna and a motion sensor on it. Across from the 11-foot pole, place a 22-foot pole and install a secondary wakeup antenna on it. Refer to Figure 3-1 for a diagram of the configuration.

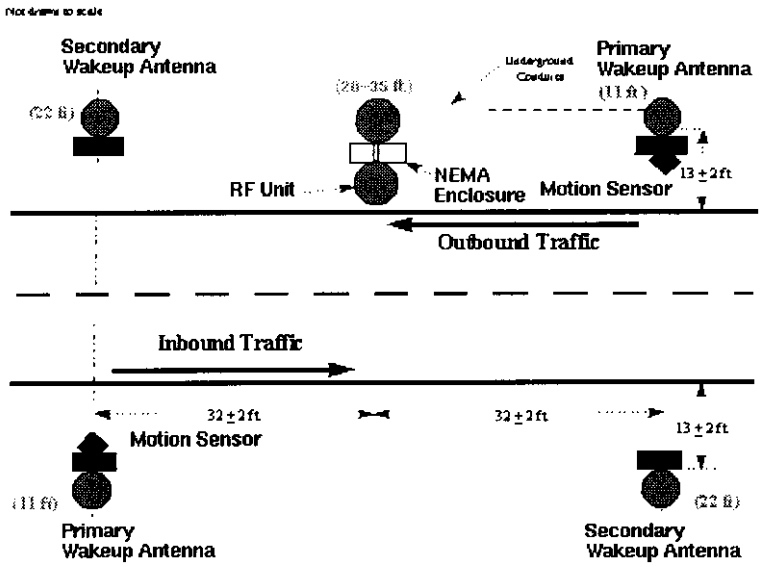


Figure 3-1 Five-pole configuration

Position the control panel and RF unit in the center of the array, between the two sets of antennas, as shown in Figure 3-1.

Connections

For the Savi GateReader to function as a single unit, its components need to be connected together with the appropriate cables.

Connect the control panel to the primary wakeup antenna using Savi-supplied network cable. Connect the primary wakeup antenna to both the secondary wakeup antenna and the motion sensor(s) to link the components of the Savi GateReader. Run the cables through underground conduits to protect them from damage.

Adequate site preparation is critical since the conduit between the primary and secondary wakeup antennas typically must be installed to run underground, *beneath* the road or tracks.

Power

The control panel requires 86 to 264 VAC power. The internal AC adapter and DC regulator supply power to all the components, including the motion sensor.

Four-Pole Configuration

The four-pole configuration requires site preparation, positioning one control panel, one RF unit, two motion sensors, two primary wakeup antennas, and two secondary wakeup antennas, and then connecting network cables and the power supply.

Site Preparation

Before installing Savi GateReader components and network connections, some site preparation is necessary. First, conduct a site survey and draft installation plans to anticipate the configuration of all devices. Use the positioning recommendations in this manual wherever possible.

Once the plan is in place, install mounting poles, underground conduit, and NEMA enclosures according to the plan, and in accordance with all safety and legal require-

ments. Other site preparation considerations include, but are not limited to, supplying power, providing telephone connections, and installing power safety or monitoring devices.

Configuration

Place a 22-foot pole 10 feet from the edge of the road. Install the control panel (in a NEMA enclosure), RF unit, and secondary wakeup antenna on this pole.

Place an 11-foot pole that is 64 feet from the first pole and 10 feet from the road. Install a primary wakeup antenna and motion sensor on this pole.

Across the road from the 22-foot pole, place an 11-foot pole that is 10 feet from the road. Install a primary wakeup antenna and motion sensor on this pole.

Across the road from the 11-foot pole, place a 22-foot pole that is 10 feet from the road. Install a secondary wakeup antenna on this pole. Refer to Figure 3-2 for a diagram of the configuration.

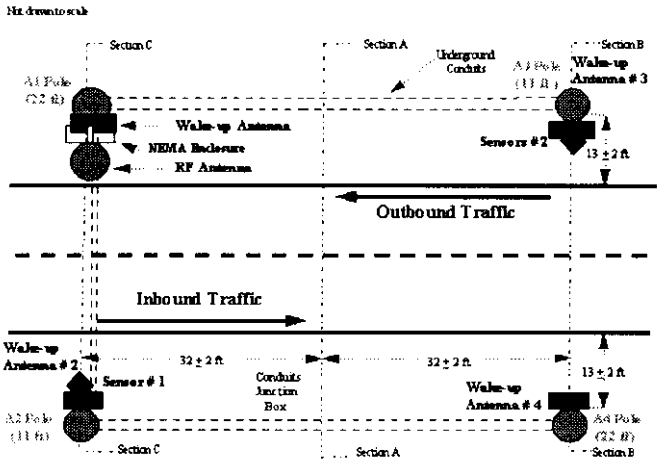


Figure 3-2 Four-pole configuration

The connections and power information for the four-pole configuration is the same as for the five-pole configuration.

Two-Pole Configuration

The two-pole configuration requires site preparation, positioning one control panel, one RF unit, two motion sensors, two primary wakeup antennas (one of which is wired in a secondary position), and the connecting network cables and the power supply.

Note

The two-pole configuration can also be used for bi-directional traffic as long as the vehicle speed does not exceed ten miles per hour and traffic only travels in one direction at a time. Angle the motion sensors toward the road so that they can detect traffic from either direction.

Site Preparation

Before installing Savi GateReader components and network connections, some site preparation is necessary. First, conduct a site survey and draft installation plans to anticipate the configuration of all devices. Use the positioning recommendations in this manual wherever possible.

Once the plan is in place, install mounting poles, underground conduit, and NEMA enclosures according to the plan, and in accordance with all safety and legal requirements. Other site preparation considerations include, but are not limited to, supplying power, providing telephone connections, and installing power safety or monitoring devices.

Configuration

In a two-pole single-lane configuration shown in Figure 3-3, place one pole 10 feet from the edge of the road. Mount the control panel (in NEMA enclosure), primary wakeup antenna, and one motion sensor on it.

Place the second pole directly across the road and 10 feet from the edge of the road; mount the second primary wakeup antenna and the second motion sensor on it.

Note

Be sure to angle each motion sensor toward the road to detect traffic, as shown in Figure 3-3.

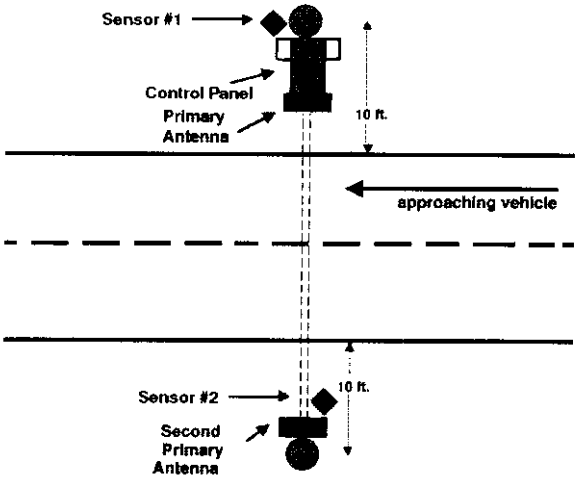


Figure 3-3 Two-pole configuration

The connections and power information for the two-pole configuration is the same as for the five-pole configuration.

Monitoring Bi-directional Lanes or Tracks

The planning and configuration for monitoring a road or railroad tracks with bi-directional traffic are the same as for monitoring a single lane, except that an additional motion sensor and two additional wakeup antennas are required to track tags approaching from the other direction.

Monitoring Split Lanes or Tracks

The configuration for monitoring split lanes is similar to monitoring a single direction lane. Each direction requires a motion sensor monitor and two antennas, primary and secondary, one on each side of the road. Position a single controller centrally between the two lanes.

Positioning Savi GateReader Components

Savi has tested each component to determine its ideal position relative to oncoming vehicles, tags, and other devices. Whenever possible, follow Savi recommendations *exactly* for positioning reader components, varying the measurements by no more than 2 feet from the recommended heights or distances.

Contact your Savi customer service representative, or Savi technical support, if you find that you cannot exactly match the configuration but would like to confirm that a similar arrangement still works effectively.

Note

To prevent draining the tag battery, do not park a vehicle containing a tag within 50 feet of the primary or secondary (wakeup) antenna.

Positioning the RF Unit

The height of the 433 MHz RF unit is critical to the proper functioning of the Savi GateReader. It must be high enough to detect tags on the far side of a vehicle or train.

Mount the RF unit:

- in the center of the Savi GateReader array
- 20–35 feet above the surface of the road or tracks
- with the face cover of the RF unit vertical, parallel to the pole, as shown in Figure 3-4

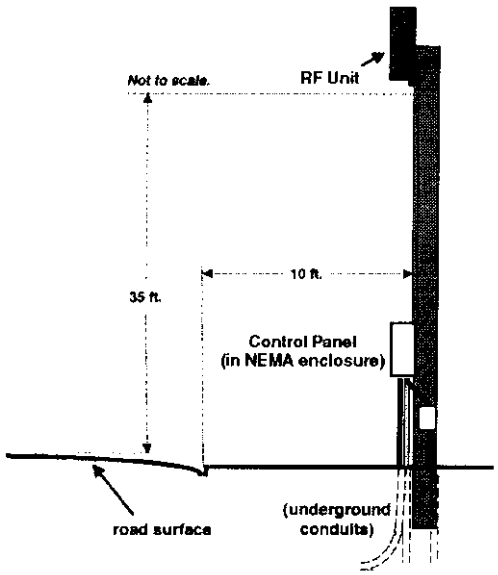


Figure 3-4 Positioning the RF unit

Positioning the Wakeup Antennas

Each set of primary and secondary wakeup antennas typically monitors a single direction of oncoming traffic.

Figure 3-5 shows, when monitoring bi-directional lanes, the configuration alters slightly to accommodate the additional traffic direction. For a bi-directional lane, it is very important to:

- Raise the position of the secondary wakeup antenna to a height of 20 feet so that it can "look over" traffic from the direction it is *not* monitoring, as shown in Figure 3-5.
- Angle the secondary wakeup antenna so that the face is tilted slightly downward, at about a 30 degree angle.
- Position the primary wakeup antenna at a height of 10 feet

- Angle the primary wakeup antenna so that it faces slightly upward by about 30 degrees.
- Position both 10 feet from the edge of a road, or 14 feet from the edge of a track.

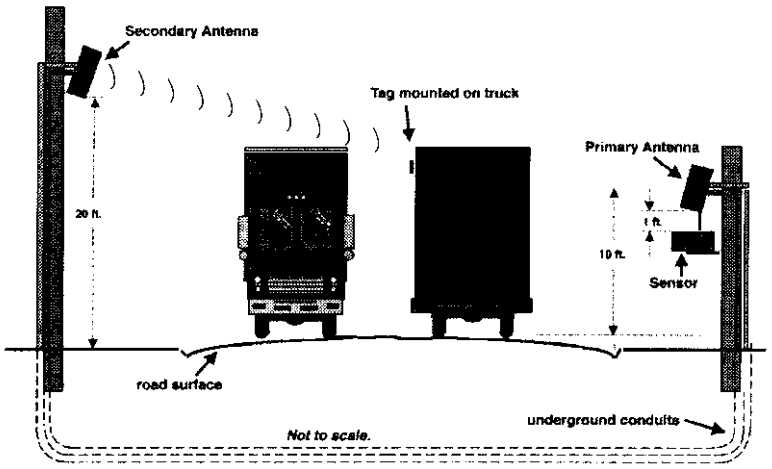


Figure 3-5 Front view of antenna positions for bidirectional lanes

For a single-direction only configuration, position the two antennas as shown in Figure 3-6:

- 32 feet from the control panel, toward the direction of approaching traffic they are monitoring
- at a height of 10 feet directly across from each other
- 10 feet back from the outer edge of the road, or 14 feet back from the edge of the outer rail of a railroad track
- with the front of the antenna facing the lane, perpendicular to the surface of the road or tracks (parallel to the side of a passing vehicle or train)

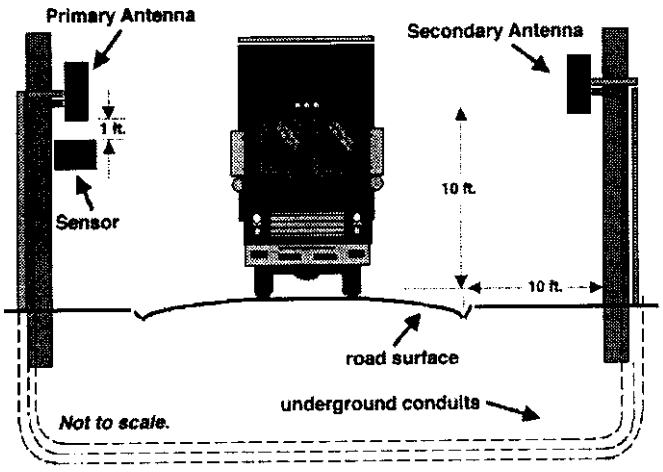


Figure 3-6 Front view of antenna positions for single lane

Positioning the Motion Sensor

The motion sensor is generally mounted on the same pole (or building) as the primary wakeup antenna. Securely mount the motion sensor so that its position won't change. If the position (angle) of the motion sensor changes, it affects the ability of the Savi GateReader to function properly.

Position the motion sensor:

- directly below the primary wakeup antenna, at a height of 9 feet
- with the motion sensor's direction of aim angled 60 degrees toward oncoming traffic, as shown in Figure 3-7
- with the bottom of the motion sensor parallel to the ground; in other words, no "tilt" is required in the position of the motion sensor

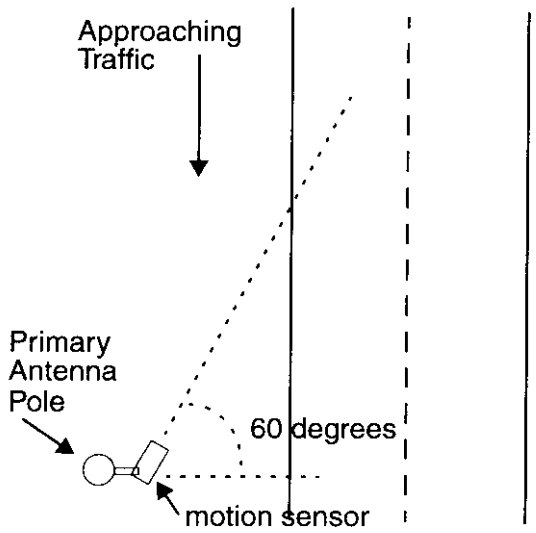


Figure 3-7 Motion sensor angle for monitoring approaching traffic

Connecting Savi GateReader Devices

Once you have positioned and mounted the Savi GateReader devices, you can connect the network and data cables. Savi recommends running all data and network cables through weatherproof conduits, either underground, or above ground attached to the mounting pole. Make sure to install conduits for all connecting cables according to the initial site installation plan and current safety and legal procedures.

Because network and data cables run through parallel conduits with the power cables, you can perform this step simultaneously for both sets of connections.

Control Panel Connections

The control panel terminal blocks connect to the RF unit, the sensors and antennas, the LonWorks network, and internal and external AC power:

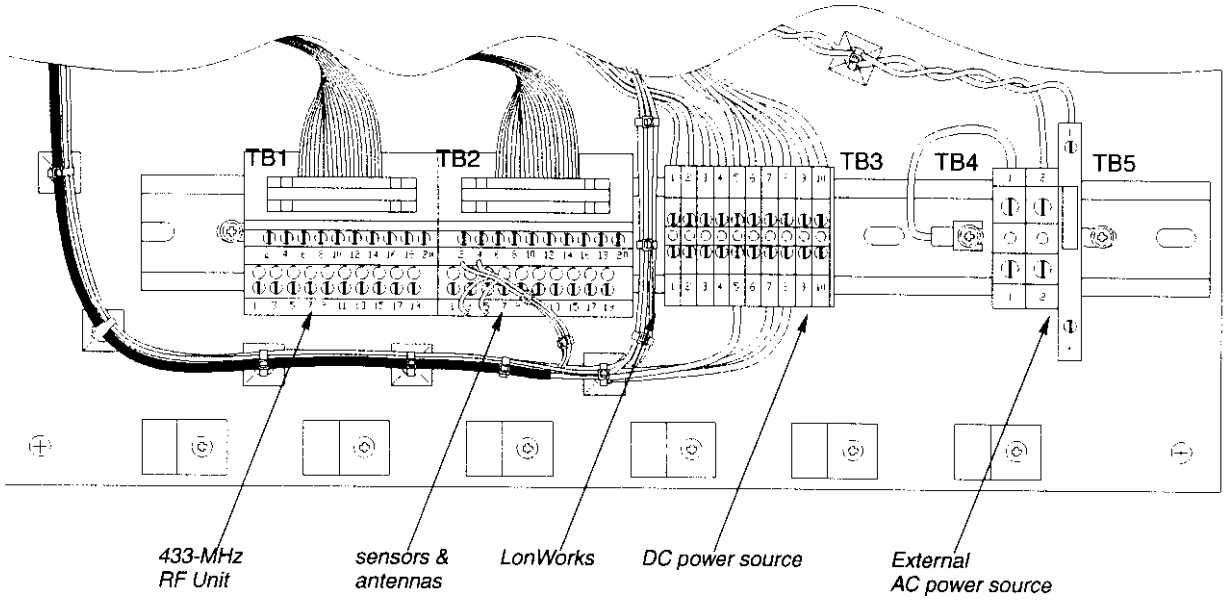


Figure 3-8 Control panel connections to external cables

- 433-MHz RF unit cables

  Terminal block 1 connects to the 433-MHz RF unit.
- sensor and antenna cables

  Terminal block 2 connects to the motion sensor and both primary wakeup antenna cables.

Note

Make sure to record which antenna connection (A or B) corresponds to which direction of traffic. You will need this information to configure Savi Asset Manager for the Savi GateReader.

- LonWorks

  Screws 1–4 of terminal block 3 provide data to the LonWorks network cables.
- DC power source

  Screws 5–10 of terminal block 3 connect DC power to the RF modem and the LonWorks router.

Antenna Connections

The primary wakeup antenna connects to the control panel, motion sensor, and secondary wakeup antenna:

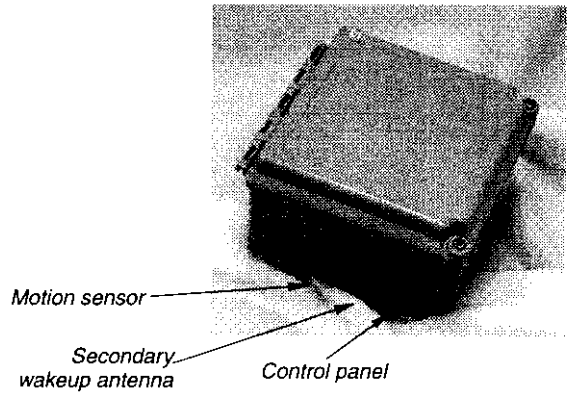


Figure 3-9 Primary wakeup antenna connection ports

- control panel

  This port uses data cable with a ten-pin connector to connect the primary wakeup antenna and the control panel. Power is supplied to the primary wakeup antenna through this connection.

- secondary wakeup antenna

  This port uses network cable with a five-pin connector to connect the primary wakeup antenna to the secondary wakeup antenna. The secondary wakeup antenna does not connect to the control panel; instead, the primary wakeup antenna maintains the connection to the control panel for both units.

- motion sensor

  This port uses network cable with a four-pin connector to connect the primary wakeup antenna to the motion sensor. Power is supplied to the motion sensor through this connection.

Connection Procedures

When attaching the ten-pin or five-pin connectors to any Savi GateReader device:

1. Plug the cable into the appropriate socket of the device with the notch at the bottom.
2. Push the locking ring forward firmly and rotate clockwise to lock the connector.

Supplying Power to the Savi GateReader

The power supply for the Savi GateReader is managed through a principal power connection to the gate control panel.

Power Port

A standard power plug with a three-prong plug is connected to the control panel. This cord can be plugged into a standard outlet for 110VAC.

A 220-volt power cord is also provided. To use this 220-volt power cord, replace the standard power plug with it at the screw terminal.

Additional Ports

The control panel contains a fuse for circuit protection. Chapter 4, "Maintenance," provides instructions on replacing the fuse.

Once the Savi GateReader components are mounted, connected, and powered, you are ready to verify the Savi GateReader's network communications.

Verifying Savi GateReader Communication

To confirm that a Savi GateReader is installed and functioning correctly, it is necessary to verify that the computer can communicate with the Savi GateReader, and that the Savi GateReader is able to collect tags.

Verification Procedures

Follow these procedures to verify Savi GateReader communication:

1. Using a computer with a test program installed, locate the Savi GateReader ID.

   Some software applications, such as Savi Asset Manager, detect the presence of the Savi GateReader automatically.

In this case, simply open the software application and check to see that the Savi GateReader is listed in the network hierarchy (node tree). Its appearance in the list confirms that the device has been detected.

2. Verify that the Savi GateReader is able to communicate with a tag by using a test tag and, using the software, performing a sample tag collection.

Refer to the reference material accompanying the test program software for specific instructions for performing the above functions. When these procedures have been completed, the Savi GateReader is installed and operational.

Initial Equipment Verification

The control panel contains four LEDs that indicate when certain components are functioning. Three are on the diagnostic module; one is on the DC converter.

Figure 3-10 shows the LEDs on the LED diagnostic module. The green LED begins flashing once per second ten seconds after initialization, indicating that the firmware is operating normally. A lit red LED indicates one of the motion sensors was triggered. A lit yellow LED indicates at least one tag was collected through the RF unit.

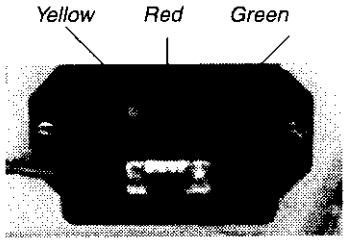


Figure 3-10 Diagnostic module with LEDs

When the green LED on the DC regulator is lit, AC power is going to the AC adapter. Figure 3-11 shows this LED.

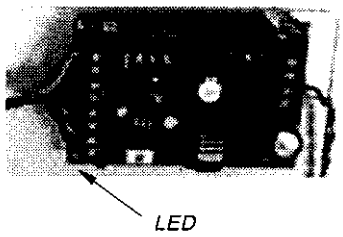
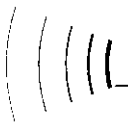
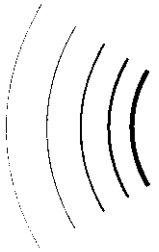


Figure 3-11 DC regulator with LED





4 Maintenance

With minimal care, a Savi GateReader should perform flawlessly. However, in the event that a problem with a Savi GateReader occurs, this chapter should help you fix it.

Maintenance

Savi GateReaders are designed to be maintenance-free. They are manufactured with the highest-quality components and are thoroughly tested before delivery.

Self-Maintenance Functions

The Savi GateReader has two self-maintenance functions that operators should be familiar with. The first is an automatic "reset" function. The gate reader resets itself if it detects power fluctuations or other disturbances that disrupt its normal operations. The gate reader can also be reset manually by disconnecting and then reconnecting the power source.

The second self-maintenance function monitors the status of cable connections between all of the reader components. The gate controller continuously polls the cable connections. If it detects a cable disconnect, it reports the problem to the host system.

Circuit Protection

The Savi GateReader is equipped with a primary power fuse for circuit protection. The AC power fuse is mounted in the screw terminal as shown in Figure 4-1. This fuse is a commercially-available 4-amp, 250-volt, 0.25 by 1.25 inch, slo-blo type fuse.

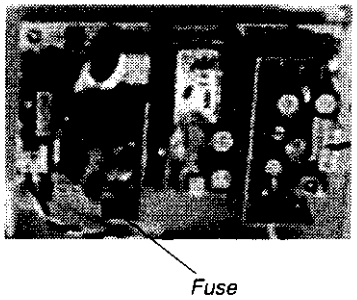


Figure 4-1 AC power fuse

In the unlikely event that a Savi GateReader fails or problems occur that simple troubleshooting cannot solve, the Savi GateReader should be returned to Savi Technology.

Troubleshooting

Table 4-1 lists causes and solutions to problems that might occur with the Savi GateReader.

Table 4-1 Possible problems and solutions

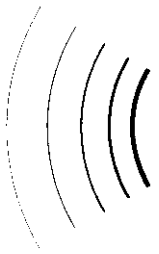
Problem	Solution
➢ No power (indicator light is off)	♦ Verify the presence and voltage of the main AC power source by connecting a test unit to the power outlet. Check any fuses or switches associated with the main AC power source. ♦ Check that the AC/DC adapter is functioning properly by testing it in another setting. ♦ Verify the continuity of the AC power fuse on the Savi GateReader. ♦ Verify that the power cable is securely plugged into the power source, the adapter unit, and the Savi gate controller input. ♦ Replace the power cable.
➢ Not detecting vehicles or tags	♦ Confirm the position settings for the sensor and the wakeup antennas. The positions should not be allowed to shift or vehicle detectability could be affected. ♦ Confirm the position setting for the gate controller.
➢ Network cables damaged or disconnected	♦ Verify that the network cable is securely plugged into each component of the Savi GateReader. ♦ If using a cable adapter, verify the connections. ♦ Verify that the network cable is securely plugged into the *correct* COM port on the computer. (COM1 is usually a DB9M connector. COM2 is usually a DB25M connector.)
➢ ID needs confirmation	♦ Verify gate reader ID by checking the label attached to the side of the gate controller. ♦ Compare the Savi GateReader serial number to the ID used in the management software.
➢ Unknown	♦ Reset the Savi GateReader by disconnecting and then reconnecting the power source. ♦ Call Savi technical support.

Technical Support

If your Savi GateReader presents a problem that neither this manual nor troubleshooting tips can help you solve, contact Savi technical support in either of two ways:

- Telephone 1-888-994-SAVI (North America only) or 1-650-428-0550 between 9:30 a.m. and 5 p.m. Pacific Time.
- Send e-mail to help@savi.com at any time.

Whether you use the telephone or e-mail, please have the details of the problems at hand when you contact Savi.



A Savi System Description

The Savi System uses state-of-the-art wireless technology to monitor, track, and locate assets and to remotely control operations in complex commercial, industrial, and military environments.

Savi System

The system comprises tags (also called transponders), readers (also called interrogators), RF relays or links, integrated products, and a computer with controlling software installed. Tags can store, transmit, and receive data and commands from interrogators, or when triggered by sensors. SaviTags and SaviReaders communicate through a proprietary radio communications protocol, Savi Enhanced Batch Collection.™ To gather asset information, collection commands are either relayed from the computer to tags through SaviReaders or Savi GateReaders, or issued directly by operators from Savi MobileReaders.

The Savi Enhanced Batch Collection System™ (EBCS) protocol lets each interrogator maintain communications with all tags that lie within its radio "micro-cell," while providing additional security and advanced collection support. A SaviReader can store data from all the tags within its radio range and can relay the data to the system operator either by real-time command or on a pre-programmed schedule. A Savi GateReader can support up to four antennas, reading tags in motion and discriminating between bi-directional

lanes. Operators can use a Savi MobileReader to perform collections and exchange data with the tags wherever installing SaviReaders is not practical or where portability is desired.

Savi RFID System Solutions

Savi offers two complete RFID system solutions that include the necessary hardware and software components required to manage complex asset tracking: the Savi InsideTRAK™ system and the Savi Yard Management System™.

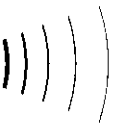
Savi's InsideTRAK system is a commercial, off-the-shelf RFID solution that allows users to track, monitor, and locate readily accessible capital assets. The system includes a SaviTag 310 which attaches to equipment so that it can be instantly located as it moves through a facility. The system improves logistics management and deters theft of high-cost capital assets.

Savi Yard Management System is a commercial RFID system that automates data collection and task assignment, from gate check-in and parking, to dock assignment and hostler operations. The system is controlled by Savi Asset Manager software with additional Gate, Dock, and Yard application modules.

Savi Software and Integrated Products

Savi System software and integrated products control the RFID hardware, either individually or in a network. These products include:

- Savi Asset Manager™
- Savi Retriever™
- Savi Tools™
- Savi Docking Station™



Savi Asset Manager monitors and controls Savi RFID components, collecting and disbursing data as needed for asset management and tracking. It is preinstalled in a desktop computer with a 17-inch monitor. Asset Manager stores collected data in its local, relational database. It exports the data to your main SQL database or file system, either on demand or on a convenient schedule. It uses visual maps to help you control which physical areas are to be collected. You can collect information from any area on a regular schedule of your choice. Asset Manager also includes a graphical user interface (GUI) to simplify your control tasks; you can close the GUI and still leave the Asset Manager able to run scheduled events. Savi Asset Manager communicates with a variety of active and passive tags and readers through a modem, a SaviNet network, or a LonWorks network.

Savi Retriever automates the collection and forwarding of asset data. It uses a network of Savi interrogators to retrieve data from tags. It then forwards the collected information through a modem, local area network, or satellite transceiver to a central information system, thus allowing assets to be monitored and tracked at multiple sites. Once configured, all system functions are automated for unattended operation.

The Savi Tools program lets you diagnose, troubleshoot, and test Savi hardware capability. Savi Tools offers low-level control of Savi System hardware components in an easy-to-use graphical user interface. With Savi Tools you can manage and fine-tune devices, collect data, define settings, and perform detailed system and network troubleshooting.

Savi Docking Stations write data directly into the memory of SaviTags, cutting the time required to initiate a new tag or update an existing one. The Savi Docking Station connects directly to the SaviTag through a four-pin connector in the sliding dock, and connects to the computer through a standard RS-232 cable. The companion Windows-compatible software program lets you copy data files from the computer to tags or read data from tags, either to the screen or to computer files. You can process tags one at a time or in batches, through a file that associates tag ID numbers with data files.

Savi RFID Hardware Components

Tags are small, radio transceivers that can store user-defined data in nonvolatile, read/write memory, and can be monitored and controlled by other devices. Active tags contain their own power source to generate a radio signal. Passive tags receive their power from an interrogator by radio frequency transmission.

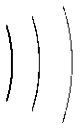
Tags are normally in an energy-conserving "sleep" mode until reception of a wake-up command from an interrogator. Each tag makes a distinctive beeping noise on command from an interrogator, thereby making individual tags easy to locate and identify.

Reader, or interrogators, are electronic devices that send and receive signals from tags. Readers include a microprocessor to verify, decode, and route data for transmission to a host system, usually a computer with appropriate RFID management software installed.

The frequency of a reader's transmission determines its range and its ability to communicate with tags. An antenna, or multiple antennas, sends and receives transmissions. The antenna is either enclosed with the reader, or can be housed separately.

Savi System RFID components include:

- SaviTag 410™
- SaviTag 310 ™
- SealTag™
- SaviReader410R™
- Savi GateReader 410R™
- SaviReader 310R™
- Savi MobileReader 410R™
- Savi RF Relay™
- RF Link™
- Support for TIRIS and Amtech passive tags and readers



SealTags, available with 256 bytes of standard memory and as much as 128 KB of extended memory for mass data storage, are designed for applications in the transportation and logistics industries.

The SaviTag 410 has its own database engine and file system. It features up to 128 KB of read/write memory, and a connector port for wired high speed data transfer. The SaviTag 410 supports tag-initiated communication triggered by system sensors. The tag is hermetically sealed in a plastic waterproof case that can withstand shock and vibration.

The SaviTag 310 contains a unique and permanent identification number for each tagged piece of equipment. Designed for use with the Savi InsideTRAK system, the SaviTag 310 is available with 128 bytes of read/write memory and 128 KB of random access memory. The tag is hermetically sealed in a plastic waterproof case that can withstand shock and vibration.

The SaviReader 410R has an adjustable omni-directional range of up to 300 feet and can be networked to provide cellular coverage of a nearly unlimited area. Its power source can be 92 to 125 VAC, 184 to 250 VAC, or 6 to 15 VDC. A portable tripod mount, a solar power unit, or a vehicle power cable are also available for use with the SaviReader. In addition, the SaviReader 410R supports active or passive communication with various RFID devices using SaviNet or Echelon LonWorks networks.

The Savi GateReader410R is designed for RFID applications that require short-range, directed tag communication such as container and vehicle tracking at gates, checkpoints, or other passages. The dual-frequency gate interrogator features a 2.45-GHz wakeup signal, a 433-MHz standard signal, an adjustable range, and the ability to read tag information from a tag moving up to 25 mph with as many as three other tags in the reader's field. It can also distinguish between tags travelling along two adjacent vehicle lanes in opposite directions. The gate interrogator supports communication via modem or LonWorks network.

The SaviReader 310R model features 128 KB of random access memory that buffers data for retrieval by a host computer on demand. Designed for use with the Savi InsideTRAK system, the SaviReader 310R triggers an alarm and notifies security if any tagged asset is removed from a building or facility.

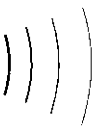
The Savi MobileReader410R (previous models were called Hand Held Interrogator, or HHI) is a portable, rechargeable, battery-powered unit that has all the functionality of the SaviReader 410R with an adjustable omni-directional range of up to 200 feet, an integrated bar-code reader, and RFDC communications capability. The Savi MobileReader 410R has memory to store the data it collects. Operators can display the data or transfer the data to a host computer. The Savi MobileReader 410R supports a variety of external data interfaces, including direct input from bar codes. The Savi MobileReader 410R is based on Intermec's JANUS platform, and feature a PCMCIA slot for expanded memory.

The Savi RF Relay provides wireless network links between SaviReaders and a host computer in a LonWorks network configuration. With an omni-directional range of 7,500 feet, Savi RF Relays support wired connections of up to 62 SaviReaders. Housed in a rugged NEMA enclosure, the Savi RF Relay communicates at 2.4 GHz; an optional model communicates at 900 MHz.

The Savi RF Link allows wireless communication between SaviReaders and a host computer in a SaviNet (RS-485) network configuration. With an omni-directional range of nearly one mile, RS-232 or RS-485 cables connect each RF link to a computer or (RS-485 only) to interrogators. RF links can also be configured as repeaters, allowing several miles of extension in effective SaviNet network coverage.

The Savi System provides support for both active and passive RFID through the Echelon LonWorks network.

TIRIS tags are passive tags with a frequency range of 124.2–134.2 KHz, and a read range of up to 2 meters. TIRIS readers are available in three models: a standard model that



uses antennas positioned within 10 feet of the reader, a remote model that uses antennas located as far as 1000 feet from the reader, and a hand-held model.

Amtech tags are passive tags with a read range of 50 feet or greater, and a frequency range of 915 MHz for North America or 2.45 GHz worldwide. The Amtech SmartPass Reader incorporates the ability to read tags at slow or high speed, to identify and validate vehicles on entry or exit, and to signal a gate to open or close. The Amtech system complies with ISO standards.

Glossary

active — (RFID systems are called "active" when the transponder, or tag, contains its own battery to generate an RF transmission. *Contrast with* passive.

asset — Any item that has a SaviTag attached to it, so the Savi System can track it. Assets are usually containers or vehicles.

beeper — A SaviTag feature that makes an audible noise and can be turned on or off remotely. The beeper is useful in locating an individual tag.

byte — A unit of information consisting of 8 bits. In ASCII code, a byte equals one character.

collection — The process in which an interrogator collects the ID numbers of all tags that are within its radio range.

collection search — A type of collection in which the interrogator collects ID numbers from only those tags that match a specified search definition. Collection searches are useful for finding which containers or pallets contain a specific item. *Contrast with* tag database search.

collection threshold — A criterion for selecting tags based on how many times a tag has been collected.

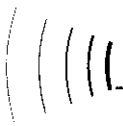
COM port — A communications port on the computer, through which it connects to RFID hardware such as an interrogator network, an HHI, or a Tag Docking Station. Four port choices are available in Savi software: COM1, COM2, COM3, and COM4.

configuration — (1) The way you have your computer set up. (2) The total combination of hardware components that make up an RFID system.

configure — To change hardware or software actions by changing settings. For example, you can configure hardware by resetting physical elements like DIP switches. You can also set configuration parameters in software.

data file — A computer file that contains information to be written to a tag or data written from a tag.

data format — The form in which information is stored, manipulated, or transferred.



destination — A disk or tag that receives data.

extended memory — Random-access memory (RAM) in SaviTags. This memory is RAM with a battery back-up power source. Extended memory is available in several sizes, from 8 KB to 128 KB. *Contrast with* standard memory.

firmware — Program code stored permanently in read-only memory (ROM). Each Savi tag and interrogator contains firmware.

hertz (Hz) — The unit of frequency of vibrations or oscillation, defined as the number of cycles per second. Named for the physicist Heinrich Hertz.

Hz — *See* hertz.

interrogator — A device that uses radio communication to exchange information with tags. The Savi System includes both a Fixed Interrogator and a Hand Held Interrogator (HHI).

interrogator ID — An identification number uniquely assigned by Savi to each interrogator. Savi software uses this number to identify an individual interrogator in the network. The interrogator ID is the serial number (S/N) on the interrogator's physical label.

KB — Kilobyte, usually as a measure of memory or disk space; 1024 bytes.

local — Capable of direct communication using wires only, as opposed to remote. An RF link communicates between local and remote interrogators.

local node — A node that is connected to the computer by cable.

LonWorks™ — A proprietary network protocol from Echelon Corporation that supports star, bus, and loop wiring topologies ("free topology" architectures).

MB — Megabyte, usually as a measure of memory or disk space; 1024 KB or 1,048,576 bytes.

node — An element within a network. The computer communicates with nodes. Savi software recognizes six types of nodes: interrogators, RF links, and computers, each of which can be connected to local or remote networks.

passive — An RFID system is called "passive" if the transponders (tags) receive the energy they required to generate RF transmission from a reader. *Contrast with* active.

port — A socket on the back panel of a computer where you plug in a cable for connection to a network or a peripheral device.

power adapter — A device that converts AC electricity into the DC electricity that a device such as the Tag Docking Station requires.

power cord — The connection between a hardware device and its source of electrical power. A power cord's source connector must match the receptacles commonly found where the unit is being used.

protocol — Communications protocol. A formal set of rules for sending and receiving data on a communication line.

random-access memory (RAM) — A type of computer memory that can be written to and read from. RAM commonly refers to the internal memory of your computer, where your data and programs live until you save them or the power is turned off on your computer.

read — To transfer information from a tag's memory using a source outside the tag (such as an interrogator).

reader — A device that detects the presence of a tag. *See* interrogator.

read-only memory (ROM) — A type of computer memory whose contents can be read but not changed; used for storing firmware. *See also* firmware.

remote — At a distance; not connected directly by wires.

remote node — A node that is connected to the computer by RF links, not by a direct cable.

repeater — *See* RS-485 repeater.

reset — To restore the default settings for a device with one action or command.

RF — Radio frequency, usually referring to signals used for communication between interrogators and tags and between RF link pairs.

RFID — Radio-frequency identification.

ROM — *See* read-only memory.

RS-232 and RS-485 — The physical and electrical communications protocols used between Savi equipment and the computer. With the RS-232 protocol, only a single interrogator or RF link can be attached to the computer. With the RS-485 protocol, multiple Fixed Interrogators and RF links can be attached. Savi software supports operations with both protocols.

RS-485 repeater — A device in an interrogator or RF link that, when enabled, intercepts and reconditions the communication signals that pass through it.

RSSI — Received Signal Strength Indicator. This number indicates the strength of the radio signal that the tag sends to the interrogator, and it provides an approximate indication of distance. A higher value indicates that the tag is closer to the interrogator.

Savi System — The collection of all Savi hardware and software products.

SaviTag — An RFID tag with advanced features produced by Savi Technology.

SealTag — A type of Savi RFID tag, distinguished by its distinctive shape, larger size, and the presence of extended memory.

standard memory — Erasable programmable read-only memory (EEPROM) that is part of every Savi tag. SaviTags have 128 or 256 bytes of standard memory, to hold configuration information such as the tag ID number and tag name. The first 43 bytes of standard memory are reserved for Savi functions. *Contrast with* extended memory.

standard node — A node that requires an immediate RS-485 acknowledgment from the local RF link when sending an RS-485 packet to a remote node. An interrogator is a standard node.

tag — A small, battery-powered radio transceiver that can store user-defined data in nonvolatile, read/write memory, and can be monitored and controlled by interrogators. Savi tags include SealTags and TyTags.

tag database search — A type of collection in which the interrogator queries only the current tag to match a specified search definition. Tag database searches are useful for finding additional information about the items on one pallet or in one container, once the container has been located.

tag ID — A decimal number that uniquely identifies each Savi tag. Savi establishes the ID when the tag is manufactured; it cannot be changed.

tag name — A string of 1 to 16 alphanumeric characters that provide another way of identifying a tag. You assign the tag name.

TAV — Total Asset Visibility, a set of data formats proprietary to Savi.

TIRIS — Texas Instruments Registration and Identification System, a line of RFID hardware.

troubleshoot — To locate and correct an error or the cause of a problem or malfunction in hardware or software.

TyTag — A type of SaviTag, no longer available. TyTags are distinguished from SealTags by their distinctive shape, smaller size, and the absence of extended memory.

wakeup — A signal transmitted by the interrogator to wake up all the tags within its RF communications range. If a tag does not hear any other interrogator RF transmission for 30 seconds, it returns to its low-power mode.

write — To transfer information from the computer to another location, such as a tag or a disk.

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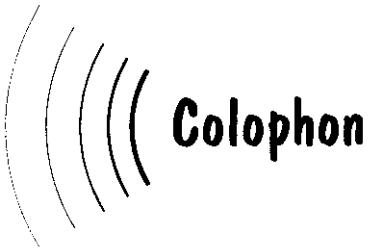

Colophon

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