

# **Savi RF Relay (RFR-100 and RFR-200) Installation Guide**

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**Version 2.0**



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# Regulatory Approvals

## 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.



*Changes or modifications to this equipment that are not expressly approved by Savi Technology could void the warranty and 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.*




## Product Safety

The RFR-100 and RFR-200 are ETL listed (UL 1950).

# Conventions in this Guide

The following table explains guide conventions and typography usage.

## Guide Conventions

Example	Meaning and Use
<b>Note:</b>	<i>Notes call attention to facts or advice that deserve special attention.</i>
	<i>Caution notices call attention to the possibility of damaging the product, the system, or your work (for example, potential loss of data).</i>
	<i>Warning notices call attention to the possibility of injury to people.</i>
	<i>Examples provide a scenario to further explain the preceding direction or procedure.</i>
<b>Terminal Locked</b>	Bold type is used for prompts, field names, and other text as displayed on the screen.
<b>A:\INSTALL</b>	Bold type is also used for text you enter exactly as shown.
1005      DATA	Monospaced type is used for system messages, examples of data files, program code, and other text where column alignment is important.
<i>name.bmp</i> or <i>tag_id</i>	Italic type is used for emphasis of a word or phrase that is new or especially important.
<b>Ctrl + Z</b>	Used for a keyboard control codes or manual keystrokes. This example tells you to hold the <b>Ctrl</b> key while you press the <b>Z</b> key.

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# 1

# Overview

This manual describes how to install both the Savi RF Relay model 100 (RFR-100) and the Savi RF Relay model 200 (RFR-200). Both models provide wireless links among readers or between readers and a host computer. The RFR-100 connects to RS-485 networks, while the RFR-200 connects to LonWorks® networks.

# The RF Relay

In situations where wired connection is impractical between a host computer and a network of SaviReaders (or between two sub-networks of SaviReaders), two Savi RF Relays can create a wireless connection. This connection allows one host computer to control readers that monitor a much larger physical area than is possible using only wired connections.

The Savi RF Relay is available in two models, both of which are described in this manual:

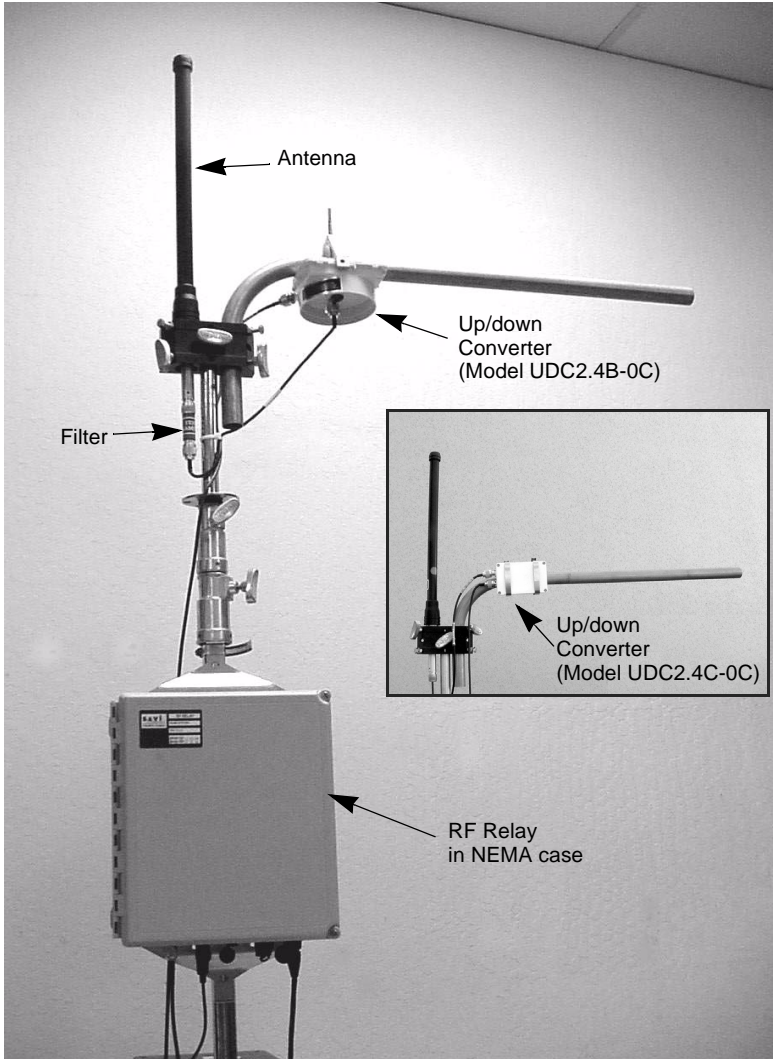
- The RFR-100 model provides a long-distance wireless link in an RS-485 network, using an RF modem.
- The RFR-200 model provides a long-distance wireless link in a LonWorks network, using an RF modem.

Both models of the Savi RF Relay have four basic components:

- The RF Relay itself, which includes a wireless transceiver and network interface in a weatherproof NEMA enclosure
- An up/down converter (two models), which provides necessary frequency conversion between the RF Relay and the antenna
- A bandpass filter that attaches to the end of the antenna (up/down converter model UDC2.4B-0C only)
- An omnidirectional 2.4 GHz antenna

Figure 1-1 shows a Savi RF Relay with its antenna and up/down converter mounted on the same mast.

*Figure 1-1 Savi RF Relay Components*



# RF Relay Specifications

The Savi RF Relay is designed for indoor or outdoor use. Table 1-2 describes its specifications.

*Table 1-2 RFR-100 and RFR-200 specifications*

<b>Physical</b>	
Dimensions:	32 cm (12.5 in.) x 28 cm (11 in.) x 15 cm (6 in.)
Material:	Molded fiberglass
Weight:	45 kg (10 lb)
<b>Environmental</b>	
Temperature:	-32°C to +70°C (operating) -40°C to +70°C (storage)
<b>Wireless</b>	
Frequency:	2.450–2.474 GHz (transmit and receive)
Range:	2.4 kilometers (1.5 miles) minimum, line-of-sight
Transmission Power:	500 mW (27 dBm) max. ERP
Modulation:	BPSK
Antenna	2.4 GHz Omnidirectional, 9dBi
Receiver Sensitivity:	-101 dBm
Type:	Triple Conversion Superheterodyne
IF Frequency:	902–928 MHz
Approval:	Unlicensed operation under FCC part 15.247
<b>Digital</b>	
Data Rate:	64.516 Kbps (Transmit/Receive RF Data Mode) 38.4 Kbps (RS-485 network communication, Model 100) 78 Kbps (LonWorks network communication, Model 200)
<b>Power</b>	
AC Source:	100–240 VAC, 50/60 Hz, 1.2–0.6 A
DC Source:	12–24 VDC, 3 A
Approval:	UL 1950

# 2

# Installation

Installing the Savi RF Relay requires pre-planning your hardware needs to match your site and application. Discuss site-specific issues with your Savi customer service representative. The *Savi System Installation Guide* (Savi part number 805-00968-010/ order number JDM-1004) describes the overall process of planning an RFID network.

This chapter describes the RF Relay installation process.



*To comply with FCC Section 1.1307 for RF exposure requirements, a minimum separation distance of 2m (79 inches) is required between the antenna and all persons.*

**Note:** *The Savi RF Relay is used in sophisticated wireless data networks. The RF Relay is not sold to the general public. Unless installation is performed by knowledgeable personnel with both software and RF experience, nodes in the WLAN are likely to be incorrectly configured, with the result that the entire network is compromised or rendered inoperable.*

# Network Placement

Two Savi RF Relays bridge a minimum distance of 2.4 kilometers (1.5 miles) line-of-site as a wireless connection between a host computer and a SaviReader network, or between two sub-networks of SaviReaders within a network.

Determine in advance where you will need to use Savi RF Relays to complete your Savi System, and then identify power sources, installation locations, and where to run cables.

**Note:** *To ensure the best RF range, do not install the Savi RF Relay where its antenna will be obstructed by metal surfaces.*

Figure 2-1 illustrates a Savi RF Relay connected to a host computer that communicates by RF with a wired network of remote SaviReaders.

*Figure 2-1 Two RF Relays Linking a Computer with a Wired Network*

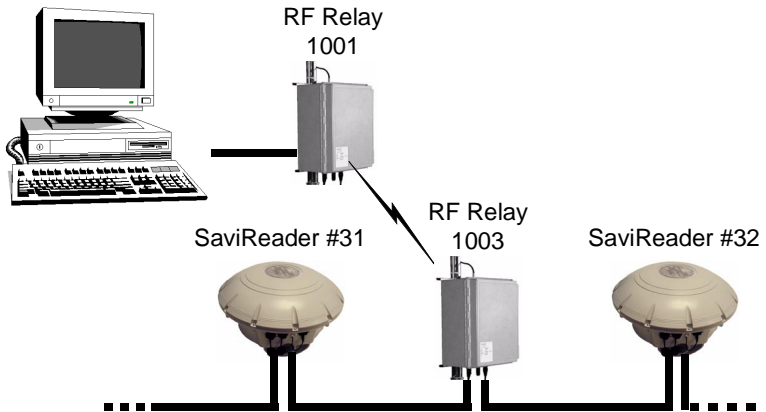
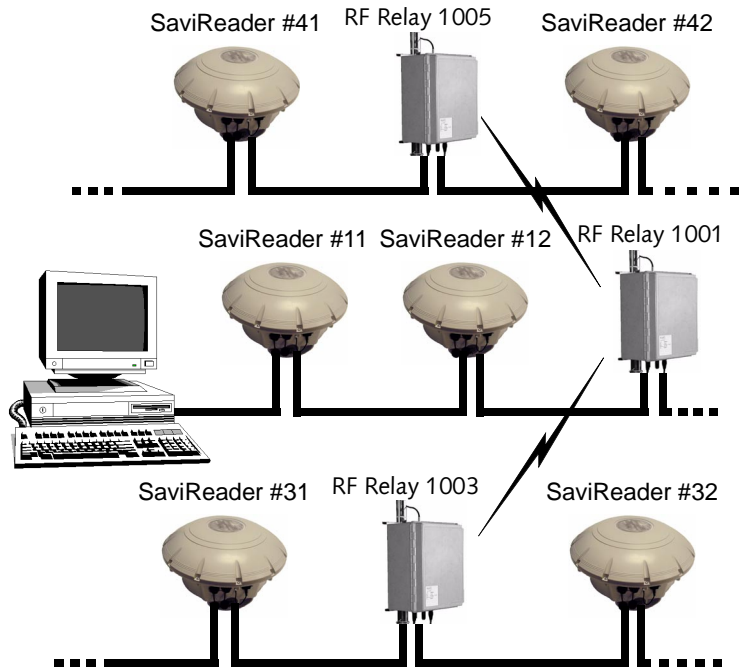


Figure 2-2 illustrates Savi RF Relays that make connections among a wired network of SaviReaders attached to a host computer and two other wired networks of SaviReaders.

*Figure 2-2 Savi RF Relays Linking Two SaviReader Wired Networks*



## **Mounting the Relay Components**

As you decide where to mount RF Relay components in relation to each other, keep in mind that the up/down converter connects to the NEMA enclosure through a coaxial cable with a maximum length of 153 dm (50 feet). The up/down converter (model UDC2.4B-0C only) connects to the antenna filter through a 46 cm (18 in.) coaxial cable. The up/down converter model UDC2.4C-0C connects directly to the antenna using the 61 cm (24 in.) coaxial cable.

Although you can move a Savi RF Relay after you install it, Savi recommends that you make sure each relay is operational before you install it in a position that is hard to reach.

Mounting kits available from Savi Technology include hardware to mount a Savi RF Relay on a pole (wooden, metal, or concrete), wall, or a tripod. Please refer to the instructions included with the mounting kit for proper installation.

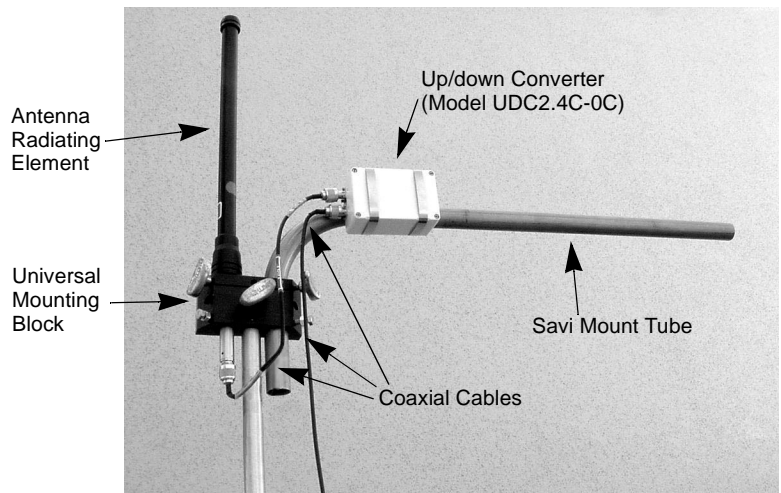


## **Mounting the Antenna**

Be sure to mount the antenna so that its radiating element is clear of obstructions.

**Note:** *Note that the antenna is not grounded; therefore Savi recommends that you install a lightning-protection device in your system. Since the antenna has vertical gain, it is very important to mount it so that the radiating element is vertical.*

*Figure 2-3 Mounted Antenna with Model UDC2.4C-0C Converter*



# Physical Connections

The rest of this chapter provides instructions about how to install an RF Relay and verify that your installation is correct.

» **To install an RF Relay:**

1. Attach the filter to the antenna if you are using an up/down converter model UDC2.4B-0C.
2. Mount the RF Relay, antenna or antenna/filter combination, and up/down converter.

*Refer to the instructions provided in the Savi Mounting Kit.*

3. Connect the RF Relay, antenna or antenna/filter combination, and up/down converter to each other using the provided coaxial cables.
4. Connect the power cable to the RF Relay.
5. Connect the network cable(s) to a computer or to a SaviReader in a daisy-chain configuration.

*Note:* After you have installed at least two RF Relays, you can verify that they are installed correctly as described in “Verification” on page 2-11.

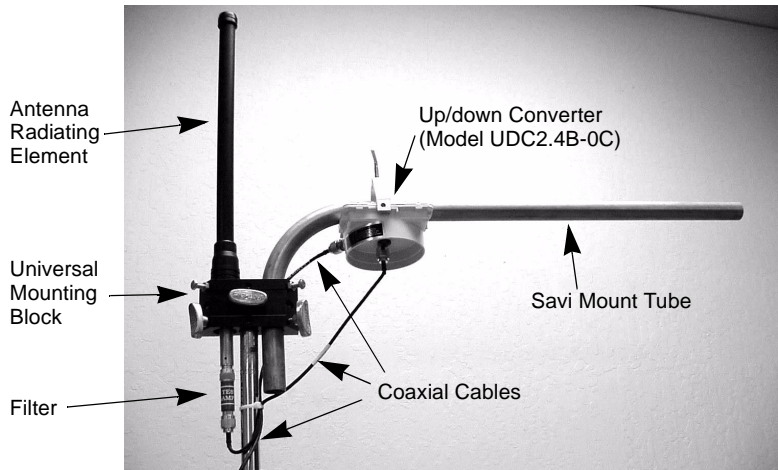
## Attaching the Filter to the Antenna

*Note:* The filter is used only with the up/down converter model UDC2.4B-0C.

The filter is designed to fit onto the connector end of the antenna. Attach the filter by screwing it onto the antenna. The coaxial cable that will run between the up/down converter and the antenna will then attach directly to the filter.

- » **To connect the antenna/filter to the up/down converter:**
1. Attach the male connector of the 46 cm (18 in.) cable to the port on the end of the filter.
  2. Turn the connector clockwise until it is firmly attached to the filter.
  3. Attach the cable's female connector to the port that is near the center of the up/down converter.

Figure 2-4 Mounting the Antenna with Filter



4. Turn the connector clockwise until it is firmly attached to the up/down converter.

## Interconnecting the Relay Components

To connect the components of the RF Relay to each other, you must connect the RF Relay itself to the up/down converter. The system does not function if you connect the RF Relay directly to the filter (or to the antenna).



*Do not connect or disconnect the up/down converter while the RF Relay is connected to a power supply.*

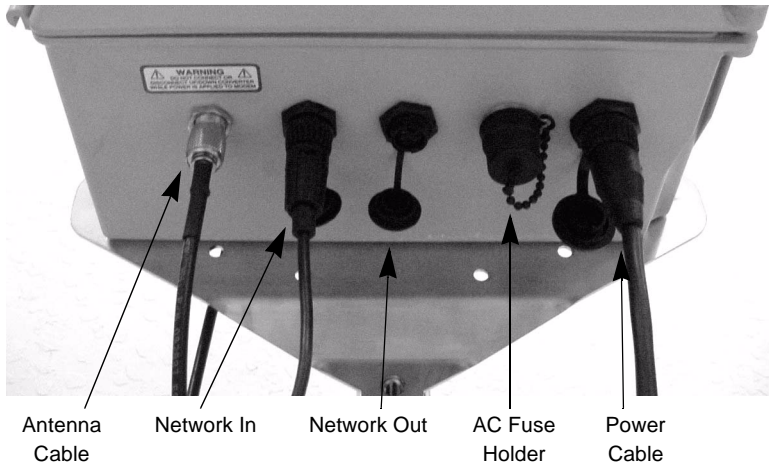
## Physical Connections

» **To connect the up/down converter to the NEMA enclosure:**

1. Using the 153 dm (50 ft.) cable, which has a male connector at each end, attach the smaller of the connectors to the antenna-cable port on the RF Relay.

*The antenna-cable port is the farthest to the left side on the bottom of the relay NEMA enclosure, as shown in Figure 2-5.*

Figure 2-5 RF Relay, Bottom View



2. Turn the connector clockwise until it is firmly attached to the antenna-cable port.
3. **For the Model UDC2.4B-0C converter:** Attach the other connector to the female port on the side of the up/down converter.
4. **For the Model UDC2.4C-0C converter:** Attach the other connector to the converter port marked **IU** (indoor unit).
5. Turn the connector clockwise until it is firmly attached to the up/down converter.

## Connecting the Power Cable

The power source can be 12 to 24 VDC, 110 VAC, or 220 VAC. The RF Relay does not require modifications for different power sources. An appropriate power cable is supplied, depending on the requirements specified when the order was placed:

- The 220 VAC cable terminates in a European connector.
- The 110 VAC cable terminates in a North American connector.

You can also power the RF Relay from a Savi Solar Power Module, or by vehicle power. A fixed-length, molded cable is supplied with the Solar Power Module. The Vehicle Power Cable can be purchased as an accessory item.



*Make sure that the antenna (with filter for the model UDC2.4B-0C up/down converter) is connected before you connect the power cable.*

» **To connect the power cable:**

1. On the bottom of the Relay NEMA enclosure, plug the power cable's female connector into the **POWER** socket located next to the AC fuse holder. See Figure 2-5 on page 2-8.
2. Push the locking ring forward and rotate it clockwise until you feel resistance.
3. Then rotate the connector slightly further in the same direction *until you distinctly feel it "click" into place as it locks.*
4. Connect the other end of the power cable to an appropriate power source, such as the Savi Solar Power Module or an AC outlet.

## Connecting the Network Cable(s)

Two network cables connect a Savi RF Relay to a SaviReader or to a host computer through a network data cable.

### Connecting the Network Cable(s) to the RF Relay

*Note:* You will use the same Savi-supplied network cables whether you are installing a SaviNet or a LonWorks network configuration (unless you are connecting to a host computer).

» **To connect the network cables:**

1. While aligning the notch, plug the cable's female connector into the **NETWORK IN** port on the RF Relay.  
(See Figure 2-5 on page 2-8.)
2. Push the locking ring forward and rotate it clockwise until you feel resistance. Then rotate the connector slightly further *until you distinctly feel it "click" into place as it locks.*
3. Connect the other end of the cable either to a SaviReader in a serial configuration or to a host computer.

*If you are connecting to a computer, make sure you are using the proper adapter cable.*

If the RF Relay is installed between two readers in a wired network, use the **NETWORK OUT** port to connect to the second reader.

# Verification

To determine whether RF Relays have been installed correctly, follow the steps below to perform a simple test.

» **To verify installation:**

1. Following the procedure described in the previous section, connect one RF Relay to a SaviReader.
2. Connect a second RF Relay to a host computer.
3. From the host computer, use Savi Asset Manager (SAM) software to perform a check-status event.

If the relays are installed properly, the reader will return its status to the host computer.





# 3

## Maintenance

With minimal care, a Savi RF Relay should perform flawlessly. However, in the event that a problem with an RF Relay occurs, the procedures in this chapter should help you troubleshoot it.



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

*Using the equipment in a manner not specified by the manufacturer might impair the protection that the equipment provides.*

# Repair and Maintenance

The Savi RF Relay is designed to need very little maintenance. Savi RF Relays are manufactured with quality components and are thoroughly tested before delivery.

As in any outdoor networked system, exposed RF Relay components need to be checked occasionally for physical damage. Periodically check cables and enclosures that are exposed to the elements to make sure they have not been damaged.

## Replacing the Fuse

If the RF Relay power fails, follow the troubleshooting tips found in Table 3-10. You may need to change the AC fuse.

» **To replace the fuse:**

1. Unscrew the fuse holder cover, which is attached to the RF Relay by a short chain.

*The fuse holder is located on the bottom of the RF Relay and to the left of the **POWER** socket, as shown in Figure 2-5 on page 2-8.*

2. Push in the fuse holder cap and unscrew it counter-clockwise.
3. Remove the fuse from the fuse holder cap and replace it.

*The RF Relay uses a 4-amp, 250-volt fuse.*

4. While aligning the notches in the fuse holder cap, push it into the receptacle and screw it clockwise.
5. Screw the fuse holder cover back into place on the RF Relay.

## Changing Channels

Savi RF Relays have been factory configured for operation; no settings or adjustments are required. However, it may become necessary to change the transmit and receive channels because of other equipment within the same area operating at the same frequency. The RF Modem inside the RF Relay can be set to transmit and receive at any one of 240 frequencies (channels). Frequency codes 10–250 are assigned to these channels. Table 3-9 on page 3-15 lists the frequency codes and their corresponding frequency. The steps following describe how to configure the RF Relay for operation at a different frequency.

*Note:* RF Relays are preset at the factory to channel 100.

### Model RFR-100 Only

#### Required Equipment

The following equipment is required to reconfigure channels:

- RS-485 Adapter Cable (Savi P/N 830-00911-001 or 830-00911-002)
- DB25M to DB9F Adapter (to connect to the PC serial port)
- PC with a HyperTerminal program

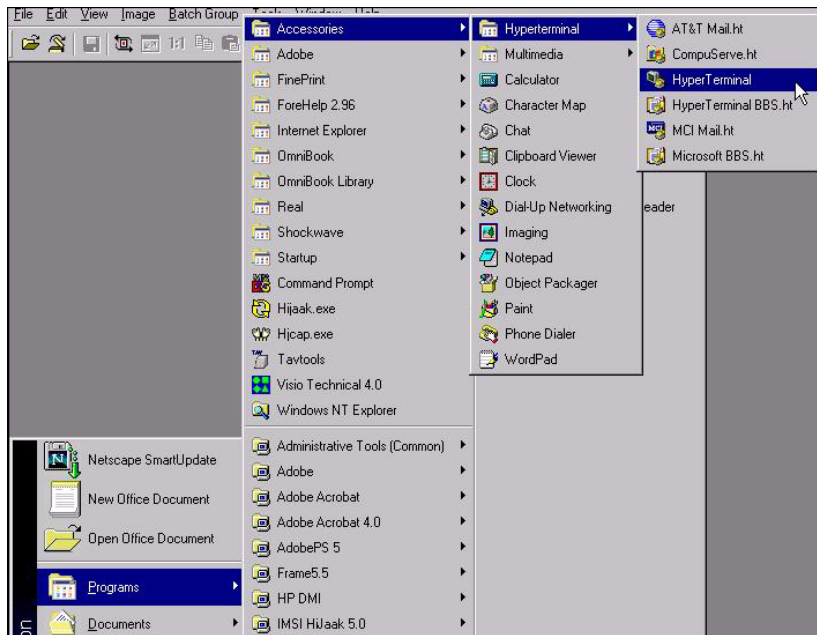
*Note:* It is not necessary to open the relay cover to change transmit and receive frequencies for the RFR-100.

## Repair and Maintenance

- » **To change channels for the RFR-100:**
  1. Connect the RS-485 adapter cable to the RS-485 port on the RFR-100 and to the RS-232 port on the PC using the DB25M to DB9F adapter.
  2. From the Windows Start menu, select **Programs>Accessories>Hyperterminal>HyperTerminal**. The system displays the Connection Description window.

*Note:* If your screen displays a Hyperterminal program folder, double-click the **Hypertrm.exe** icon.

Figure 3-1 Access to the HyperTerminal Program



3. In the Connection Description window, enter a **Name** of your choice for the connection (for example 38K) and select an icon.
4. Click **OK**.

*The system displays the Connect To window.*

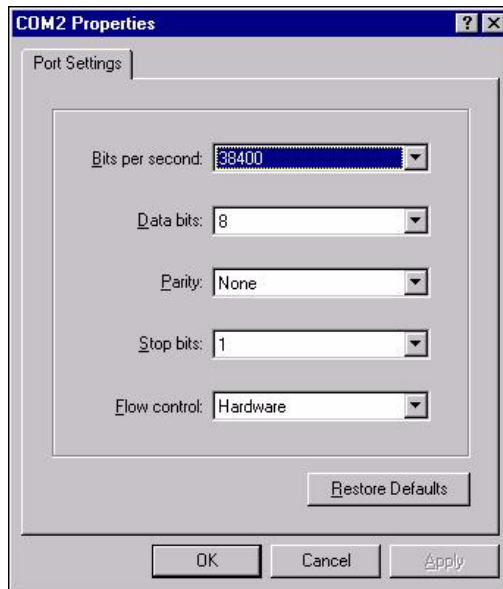
Figure 3-2 HyperTerminal Connect To Window



5. Click the down arrow at the right of the **Connect using** field to display the list of connections and select the **COM** port that corresponds to the port to which the RF Relay is connected.
6. Click **OK**.

*The system displays the COM Properties window.*

Figure 3-3 HyperTerminal COM Properties Window



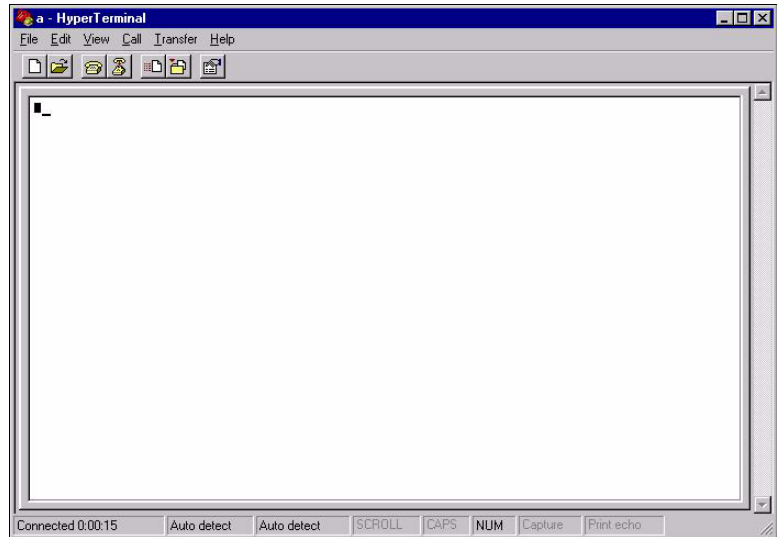
7. Enter the port configuration settings as follows:
  - a. **Bits per second** - 38400
  - b. **Data bits** - 8
  - c. **Parity** - None
  - d. **Stop bits** - 1
  - e. **Flow control** - Hardware

**Note:** You can type the settings or click on the down arrow to the right of each field to display a list from which you select the appropriate setting.

8. Click **OK**.

*The system displays the HyperTerminal main window.*

Figure 3-4 HyperTerminal Main Window



9. Apply AC power to the RFR-100.
10. Wait 5 seconds for the unit to complete its start up checks.
11. Type **at** to open the file.
12. Hold down the **Shift** key on the PC keyboard and type +++ rapidly to place the modem into configuration mode.

*Note:* This may require multiple attempts.

13. Verify that **OK** displays in the PC HyperTerminal main window.

*Note:* For each key you press from this point on the PC screen will display double characters.

## ***Repair and Maintenance***

14. From the range of 10 to 250 (the factory setting is CH 100), determine the channel to use.



*The new channel should be at least twenty channels from the factory setting in order to prevent interference.*

15. Type **ATS61**=[insert new channel number] and press **Enter** to set the new transmit channel.
16. Type **ATS62**=[insert new channel number] and press **Enter** to set the new receive channel.
17. Type **AT&V1** and press **Enter** to display the S Register settings on the screen.
18. Verify that S Registers 61 and 62 are set to the channel that you selected in Step 14. If not, repeat Steps 15 through 17.
19. Type **AT&W** to store the new configuration.
20. Remove the RS-485 adapter cable.
21. Disconnect and reconnect the power to the RFR-100 to return it to data mode.



## **Model RFR-200 Only**

### **Required Equipment**

The following equipment is required to reconfigure channels:

- RS-232 Cable, DB25F
- DB25M to DB9F Adapter (to connect to the PC serial port)
- PC with a HyperTerminal program and Windows 98 or NT



*In order to change transmit and receive frequencies, it is necessary to open the cover of the RFR-200. To prevent voiding the warranty, do not attempt any other modifications or maintenance.*

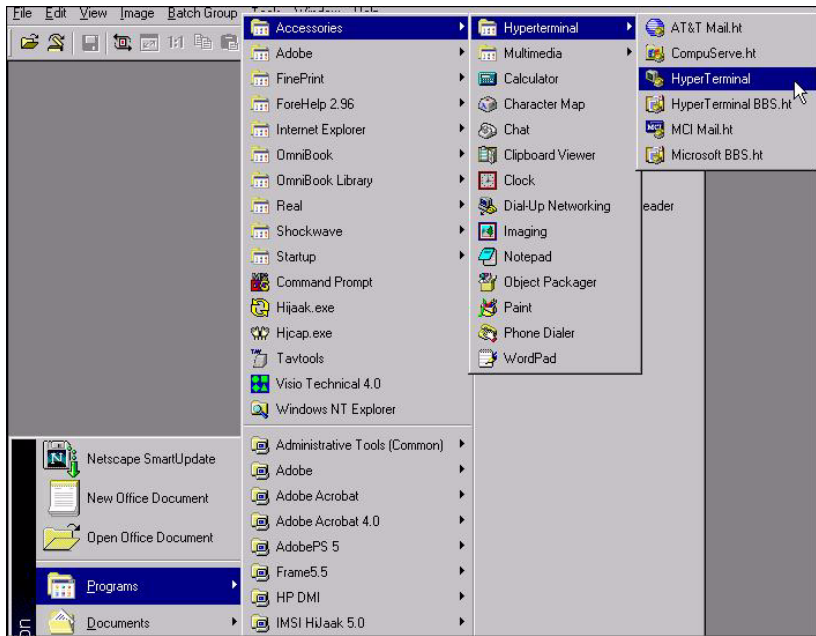
» **To change channels for the RFR-200:**

1. Open the cover of the RF Relay.
2. Remove the DB25M RS-232 cable connector from the RF modem.
3. Connect the RS-232 cable to the RS-232 port on the RF modem and to the RS-232 port on the PC using the DB25M to DB9F adapter.
4. From the Windows **Start** menu, select **Programs>Accessories>Hyperterminal>HyperTerminal**. The system displays the Connection Description window.

**Note:** *If your screen displays a Hyperterminal program folder, double-click the **Hypertrm.exe** icon.*

## Repair and Maintenance

Figure 3-5 Access to the HyperTerminal Program



5. In the Connection Description window, enter a **Name** of your choice for the connection (for example 57K) and select an icon.
6. Click **OK**.

*The system displays the Connect To window.*

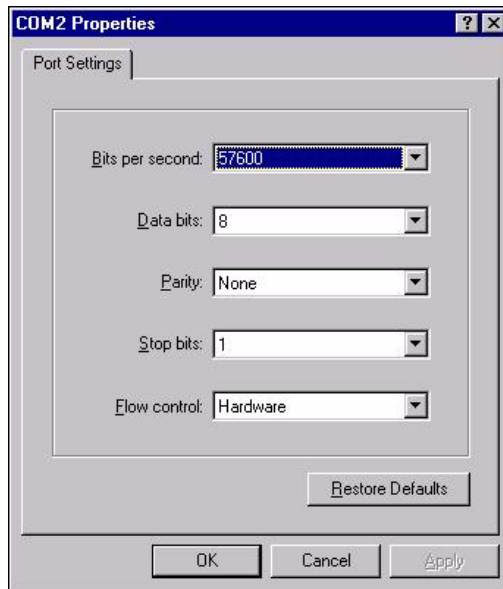
Figure 3-6 HyperTerminal Connect To Window



7. Click the down arrow at the right of the **Connect using** field to display the list of connections and select the **COM** port that corresponds to the port to which the RF Relay is connected.
8. Click **OK**.

*The system displays the COM Properties window.*

Figure 3-7 HyperTerminal COM Properties Window



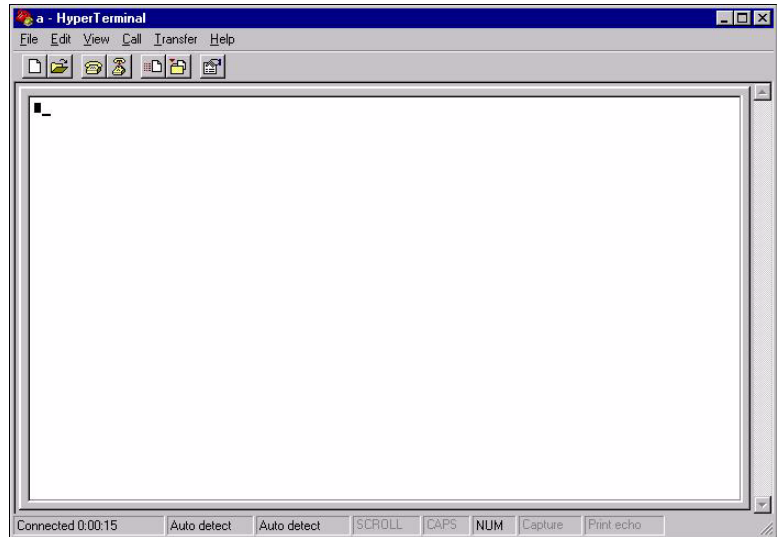
9. Enter the port configuration settings as follows:
  - a. **Bits per second** - 57600
  - b. **Data bits** - 8
  - c. **Parity** - None
  - d. **Stop bits** - 1
  - e. **Flow control** - Hardware

**Note:** You can type the settings or click on the down arrow to the right of each field to display a list from which you select the appropriate setting.

10. Click **OK**.

*The system displays the HyperTerminal main window.*

Figure 3-8 HyperTerminal Main Window



11. Apply AC power to the RFR-100.
12. Wait 5 seconds for the unit to complete its start up checks.
13. Click on Properties and verify proper COM port setting.
14. Click on Configure and verify port settings per Figure 3-7.
15. Click **OK**.
16. Click **OK**.
17. Hold down the **Shift** key on the PC keyboard and type +++ rapidly to place the modem into configuration mode.

*Note:* This may require multiple attempts.

18. Verify that **OK** displays in the PC HyperTerminal main window.

*Note:* For each key you press from this point on the PC screen will display double characters.

## ***Repair and Maintenance***

19. From the range of 10 to 250 (factory setting is CH 100), determine the channel to use.



*The new channel should be at least twenty channels from the factory setting in order to prevent interference.*

20. Type **ATS61=[insert new channel number]** and press **Enter** to set the new transmit channel.
21. Type **ATS62=[insert new channel number]** and press **Enter** to set the new receive channel.
22. Type **AT&V1** and press **Enter** to display the S Register settings on the screen.
23. Verify that S Registers 61 and 62 are set to the channel that you selected in Step 19. If not, repeat Steps 20 through 22.
24. Type **AT&W** to store the new configuration.
25. Remove the RS-232 cable from the RF Modem and replace the RS-232 cable from the LonWorks module.
26. Disconnect and reconnect the power to the RFR-200 to return it to data mode.
27. Close the cover to the RF Relay and secure it shut.

Table 3-9 Frequency Code Assignments - Model ISM2.4-C64

<b>Freq. Code</b>	<b>Up/Down Converter "C" Freq. (GHz)</b>	<b>Freq. Code</b>	<b>Up/Down Converter "C" Freq. (GHz)</b>	<b>Freq. Code</b>	<b>Up/Down Converter "C" Freq. (GHz)</b>
10	2.4500	40	2.4530	70	2.4560
11	2.4501	41	2.4531	71	2.4561
12	2.4502	42	2.4532	72	2.4562
13	2.4503	43	2.4533	73	2.4563
14	2.4504	44	2.4534	74	2.4564
15	2.4505	45	2.4535	75	2.4565
16	2.4506	46	2.4536	76	2.4566
17	2.4507	47	2.4537	77	2.4567
18	2.4508	48	2.4538	78	2.4568
19	2.4509	49	2.4539	79	2.4569
20	2.4510	50	2.4540	80	2.4570
21	2.4511	51	2.4541	81	2.4571
22	2.4512	52	2.4542	82	2.4572
23	2.4513	53	2.4543	83	2.4573
24	2.4514	54	2.4544	84	2.4574
25	2.4515	55	2.4545	85	2.4575
26	2.4516	56	2.4546	86	2.4576
27	2.4517	57	2.4547	87	2.4577
28	2.4518	58	2.4548	88	2.4578
29	2.4519	59	2.4549	89	2.4579
30	2.4520	60	2.4550	90	2.4580
31	2.4521	61	2.4551	91	2.4581
32	2.4522	62	2.4552	92	2.4582
33	2.4523	63	2.4553	93	2.4583
34	2.4524	64	2.4554	94	2.4584
35	2.4525	65	2.4555	95	2.4585
36	2.4526	66	2.4556	96	2.4586
37	2.4527	67	2.4557	97	2.4587
38	2.4528	68	2.4558	98	2.4588

## Repair and Maintenance

Table 3-9 Frequency Code Assignments - Model ISM2.4-C64

Freq. Code	Up/Down Converter "C" Freq. (GHz)		Freq. Code	Up/Down Converter "C" Freq. (GHz)		Freq. Code	Up/Down Converter "C" Freq. (GHz)
39	2.4529		69	2.4559		99	2.4589
100	2.4590		130	2.4620		160	2.4650
101	2.4591		131	2.4621		161	2.4651
102	2.4592		132	2.4622		162	2.4652
103	2.4593		133	2.4623		163	2.4653
104	2.4594		134	2.4624		164	2.4654
105	2.4595		135	2.4625		165	2.4655
106	2.4596		136	2.4626		166	2.4656
107	2.4597		137	2.4627		167	2.4657
108	2.4598		138	2.4628		168	2.4658
109	2.4599		139	2.4629		169	2.4659
110	2.4600		140	2.4630		170	2.4660
111	2.4601		141	2.4631		171	2.4661
112	2.4602		142	2.4632		172	2.4662
113	2.4603		143	2.4633		173	2.4663
114	2.4604		144	2.4634		174	2.4664
115	2.4605		145	2.4635		175	2.4665
116	2.4606		146	2.4636		176	2.4666
117	2.4607		147	2.4637		177	2.4667
118	2.4608		148	2.4638		178	2.4668
119	2.4609		149	2.4639		179	2.4669
120	2.4610		150	2.4640		180	2.4670
121	2.4611		151	2.4641		181	2.4671
122	2.4612		152	2.4642		182	2.4672
123	2.4613		153	2.4643		183	2.4673
124	2.4614		154	2.4644		184	2.4674
125	2.4615		155	2.4645		185	2.4675
126	2.4616		156	2.4646		186	2.4676
127	2.4617		157	2.4647		187	2.4677



Table 3-9 Frequency Code Assignments - Model ISM2.4-C64

<i>Freq. Code</i>	<i>Up/Down Converter "C" Freq. (GHz)</i>		<i>Freq. Code</i>	<i>Up/Down Converter "C" Freq. (GHz)</i>		<i>Freq. Code</i>	<i>Up/Down Converter "C" Freq. (GHz)</i>
128	2.4618		158	2.4648		188	2.4678
129	2.4619		159	2.4649		189	2.4679
190	2.4680		211	2.4701		232	2.4722
191	2.4681		212	2.4702		233	2.4723
192	2.4682		213	2.4703		234	2.4724
193	2.4683		214	2.4704		235	2.4725
194	2.4684		215	2.4705		236	2.4726
195	2.4685		216	2.4706		237	2.4727
196	2.4686		217	2.4707		238	2.4728
197	2.4687		218	2.4708		239	2.4729
198	2.4688		219	2.4709		240	2.4730
199	2.4689		220	2.4710		241	2.4731
200	2.4690		221	2.4711		242	2.4732
201	2.4691		222	2.4712		243	2.4733
202	2.4692		223	2.4713		244	2.4734
203	2.4693		224	2.4714		245	2.4735
204	2.4694		225	2.4715		246	2.4736
205	2.4695		226	2.4716		247	2.4737
206	2.4696		227	2.4717		248	2.4738
207	2.4697		228	2.4718		249	2.4739
208	2.4698		229	2.4719		250	2.4740
209	2.4699		230	2.4720			
210	2.4700		231	2.4721			

# Troubleshooting

Table 3-10 following lists problems that could occur with the Savi RF Relay, along with possible solutions.

In the unlikely event that a Savi RF Relay fails or problems occur that simple troubleshooting cannot solve, Savi Technical Support may recommend that you return the Savi RF Relay to Savi Technology.

*Table 3-10 Possible Problems and Solutions*

<b>Problem</b>	<b>Solution</b>
No power	<ul style="list-style-type: none"><li>– Confirm that power is available to the RF Relay by checking all circuit breakers, power switches, and safety switches.</li><li>– If AC- powered, verify the presence and voltage of the power by connecting a test unit to the power source. Check the AC fuse. (See “Replacing the Fuse” on page 3-2.)</li><li>– If solar-powered, verify the output voltage of the module to be 12 VDC.</li><li>– Verify that the power cable is securely plugged into the power source and the RF Relay input.</li><li>– Try a different power source.</li><li>– Replace the power cable.</li></ul>
No data communication	<ul style="list-style-type: none"><li>– Verify that the network cable is securely plugged into the RF Relay.</li><li>– Verify that the network cable is securely plugged into the <i>correct</i> COM port on the computer. COM1 is usually a DB9 connector. COM2 may be a DB9 or DB25 connector.</li><li>– Verify that the cable itself is not damaged.</li></ul>
COM port unavailable (possibly used for another device such as a mouse)	<ul style="list-style-type: none"><li>– Connect the RF Relay cable to another COM port.</li><li>– Verify that the software setting matches the COM port where the RF Relay is connected.</li></ul>
Unknown	<ul style="list-style-type: none"><li>– Turn the RF Relay power off and then back on.</li><li>– Call Savi Technical Support.</li></ul>

# Getting Assistance

If you have trouble with the product, after you have checked your connections and the *Savi RF Relay (RFR-100 and RFR-200) Installation Guide*, contact Savi Technical Support.

## Technical Support

To contact Savi Technical Support:

- Telephone 1-888-994-SAVI (7284) between 5:00 a.m. and 5:00 p.m., Pacific Time
- Or send e-mail to **help@savi.com** at any time

Whether you contact Savi by telephone or e-mail, please have the exact sequence of operations (if possible) that caused the problem and the following information available:

- Site location
- Incident description
- Estimated severity level of the incident
- Model number and version
- Serial number
- Computer type (Gateway, Dell, etc.) and model
- Operating system and service pack level
- Network protocol

Please contact Savi Technical Support if you have suggestions for how Savi can improve the next revision of the product or this manual.

