Intermec

**User's
Manual**

9181/9183 900MHz RF Equipment

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Before You Begin

This section introduces you to standard warranty provisions, safety precautions, warnings and cautions, document formatting conventions, and sources of additional product information.

Warranty Information

To receive a copy of the standard warranty provision for this product, contact your local Intermec sales organization. In the U.S. call (800) 755-5505, and in Canada call (800) 688-7043. Otherwise, refer to the Worldwide Sales & Service list that comes with this manual for the address and telephone number of your Intermec sales organization.

Safety Summary

Your safety is extremely important. Read and follow all warnings and cautions in this book before handling and operating Intermec equipment. You can be seriously injured, and equipment and data can be damaged if you do not follow the safety warnings and cautions.

Do not repair or adjust alone   Do not repair or adjust energized equipment alone under any circumstances. Someone capable of providing first aid must always be present for your safety.

First aid   Always obtain first aid or medical attention immediately after an injury. Never neglect an injury, no matter how slight it seems.

Resuscitation   Begin resuscitation immediately if someone is injured and stops breathing. Any delay could result in death. To work on or near high voltage, you should be familiar with approved industrial first aid methods.

Energized equipment   Never work on energized equipment unless authorized by a responsible authority. Energized electrical equipment is dangerous. Electrical shock from energized equipment can cause death. If you must perform authorized emergency work on energized equipment, be sure that you comply strictly with approved safety regulations.

Warnings and Cautions

The warnings and cautions in this manual use the following format.

Warning
A warning alerts you of an operating procedure, practice, condition, or statement that must be strictly observed to avoid death or serious injury to the persons working on the equipment.

Avertissement
Un avertissement vous alerte d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour éviter l'occurrence de mort ou de blessures graves aux personnes manupulant l'équipement.

Caution
A caution alerts you to an operating procedure, practice, condition, or statement that must be strictly observed to prevent equipment damage or destruction, or corruption or loss of data.

Conseil
Une précaution vous avertit d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour empêcher l'endommagement ou la destruction de l'équipement, ou l'altération ou la perte de données.

Notes: *Notes are statements that either provide extra information about a topic or contain special instructions for handling a particular condition or set of circumstances.*

About This Manual

All the information you need to install, configure, maintain, and troubleshoot the 9181 Base Radio Unit and the 9183 Radio Repeater is in this manual. This manual is written for the person who will be installing and configuring this equipment. Many of the parameters need to be set by the network administrator. This manual assumes that you are familiar with your network and data communications.

* The Model 200 Controller is usually referred to as "the controller."

* "JANUS devices" refers to all the readers and vehicle-mount computers (VMC) in the JANUS family of data collection computers.

* "Data collection devices" refers to all the Intermec products including JANUS devices that can communicate through a controller.

Other Intermec Manuals

You may need additional information for working with the 9181 or the 9183 in an Intermec data collection network. This list contains only some of the manuals for Intermec's more recent products that can communicate with this Intermec 900 MHz equipment. To order manuals, contact your local Intermec representative.

Manual	Intermec Part No.
Data Communications Reference Manual	044737
Model 200 Controller System Manual	063439
Model 200 Controller Technical Reference Manual	064398
RF System/9180 Controller User's Manual	054292
RF System/9185 Controller User's Manual	056543
9189 RF Gateway User's Manual	066164
JANUS 2010 Hand-Held Computer User's Manual	058426
JANUS 2020 Hand-Held Computer User's Manual	059951
JANUS 2050 Vehicle Mount Computer User's Manual	062874

1

9181 Base Radio Unit

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Learning About the 9181 Base Radio Unit
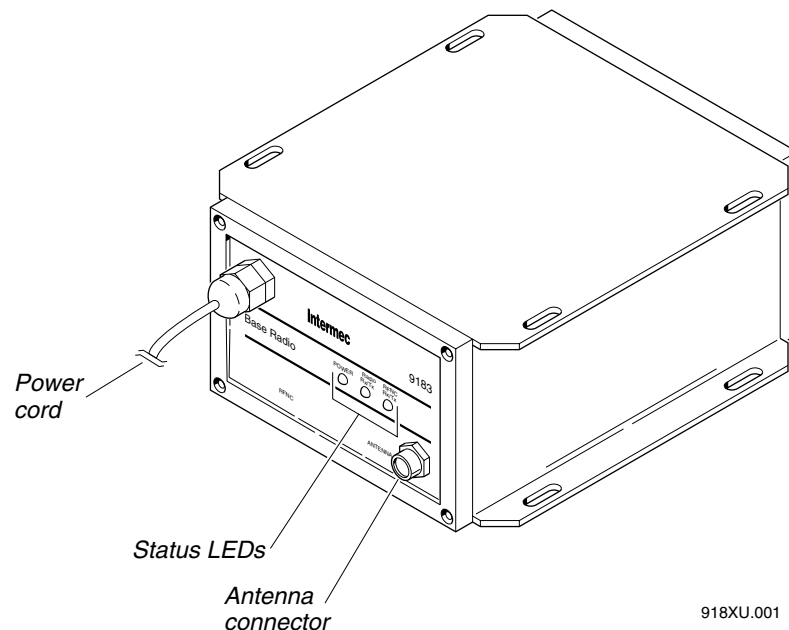
The 9181 Base Radio Unit (BRU) links the Model 200 Controller or another Intermec network controller to the Intermec 900 MHz RF data collection network. It broadcasts information from the controller to the Intermec RF devices and receives RF signals from the devices, passing the information back to the controller.

Note: The only physical connection to the BRU, other than the power cord, is to a serial port on the controller. The antenna attaches to a connector on the front panel, either directly or through a coax cable.

Understanding the BRU Components

This figure shows the components for the BRU. The communications port connector, status LEDs, antenna connector, and power cord are all on the front panel.

9181 BRU Components

Power cord

Status LEDs

Antenna connector

918XU.001

Understanding the BRU Status LEDs

The front panel of the base radio unit contains three LEDs that continuously display the status of the unit. During power up and self tests, all LEDs are on and then they turn off. If all tests pass, the LEDs will show the status described in this table.

LED	Description
Power	Indicates the BRU is receiving power.
Radio Rx/Tx	Lights when BRU is receiving or transmitting a packet through the radio.
RFNC Rx/Tx	Lights when the BRU is receiving or transmitting a packet of information with the controller.

Note: When the 9181 is connected to a controller, the controller sends out a packet every second. This causes the Radio Rx/Tx and the RFNC Rx/Tx LEDs to blink once a second.

Installing the BRU

To install the BRU, make sure that you use cables that are appropriate for the distance between the BRU and the controller. Then, use one of these procedures.

Mounting to Drywall Surfaces

If mounting the unit to drywall (sheetrock), make sure it is mounted on a ceiling joist. Plastic anchors in drywall will not safely support the BRU.

Mounting to Wood Surfaces

If mounting the unit to wood, the minimum thickness must be 0.5 inch (12.7 mm). Use 5/16-inch sheetmetal or wood screws.

Mounting to Metal Surfaces

If mounting the unit to a metal surface, the minimum unreinforced thickness must be 14 gauge (steel).
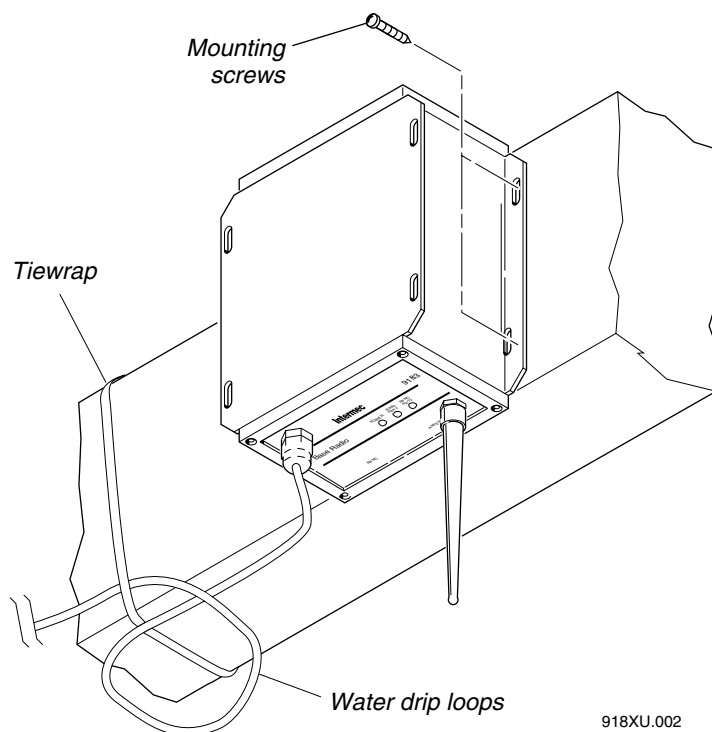
To install the BRU

1. Locate the BRU within 4 feet (1.22 m) of a power outlet.

2. Bolt the BRU to the rafters so the antenna points down. The front panel LEDs should be visible from the ground.

3. You may want to review the section "Terminating the Cable at the BRU" carefully before you continue.

   Route the cable between the BRU and the controller and secure with plastic tie wraps or cable clamps. At the end of the cable near the BRU, create a 7-inch drip loop to prevent water from leaking into the connector. Leave a similar loop in the power cord.

4. Attach the antenna to the BRU so it points down. Make sure it is at the lowest point of the ceiling and reaches below all beams, pipes, and ducts.

Installing the 9181 BRU

918XU.002

Connecting the BRU to the Model 200 Controller

To connect the BRU and the Model 200 Controller, you need to know if you have a 2-port or 4-port RF controller card in the controller. You will also need:

- Intermec cable kit (Intermec P/N 055003) or equivalent. Each kit contains two sets of connectors and pins: one for the controller and one for the BRU.

- Belden 89688 cable (Intermec P/N 583326) or equivalent. The BRU and the controller may be separated by as much as 2,000 feet (650 meters) with a data rate of 64 Kbps.

To connect the BRU to the Model 200 Controller

1. Refer to "Terminating the Cable at the BRU" and "Terminating the Cable at the Controller End" later in this chapter for important information on terminating the cable before you connect the BRU and controller.

2. Connect the 9-socket end of the cable to the controller.

   - If you have a 2-port RF controller card, connect one end of the Belden cable to one of the ports on the card.

   - If you have a 4-port card, Intermec provides you with a 4-port interface cable. Insert the controller end of the interface cable into the port on the RF controller card. Connect one end of the Belden cable to one of the downline connectors (DNLN 1, DNLN 2, DNLN 3, or DNLN 4).

3. Connect the other end of the cable to the BRU.

Connecting the BRU to the 9180 Controller

To connect the BRU and the 9180 Network Controller, you need:

- Intermec cable kit (Intermec P/N 055003) or equivalent. Each kit contains two sets of connectors and pins: one for the controller and one for the BRU.

- Belden 89688 cable (Intermec P/N 583326) or equivalent. The BRU and the controller may be separated by as much as 2,000 feet (650 meters) with a data rate of 64 Kbps.
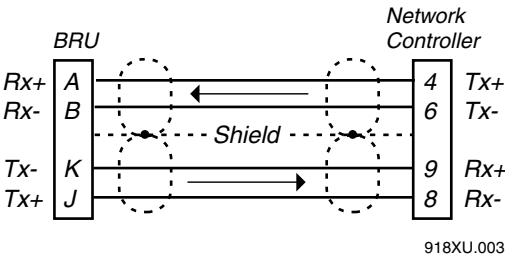
To connect the BRU to the 9180 controller
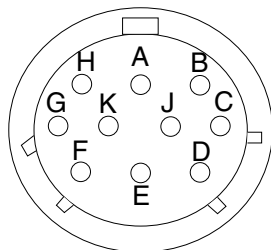
1. Refer to "Terminating the Cable at the BRU" and "Terminating the Cable at the Controller End" later in this chapter for important information on terminating the cable before you connect the BRU and controller.

2. Connect the 9-socket end of the cable to one of the downline connectors (DNLN 1 or DNLN 2) on the controller. Refer to the table on the next page for DNLN port pin assignments.

3. Connect the other end of the cable to the BRU. Refer to the table on the next page for BRU pin assignments.

DNLN Port Pin Assignments

Pin No.	Function
8	RXD Input Circuit A (Differential input pair for receive data)
9	RXD Input Circuit B
4	TXD Output Circuit A (Differential output pair for transmit data)
6	TXD Output Circuit B
1	Shield Ground
3	Shield Ground
7	Circuit Ground
5	+5 VDC

BRU to Network Controller Connection

918XU.003

BRU Pin Assignments

Pin	Function
A	RX+
B	RX-
J	TX+
K	TX-

All other open pins are not used.

Terminating the Cable at the BRU

The conductor and cable shield for the BRU must be terminated properly. Do not terminate the cable with any other connector than the ones that Intermec recommends. Placing a DB-9 or any other connector at the BRU end of the cable and then running a short cable to the BRU connector is not acceptabl*e* and will result in poor performance.

Note: If you are attaching the connector to the cable before running the cable along the ceiling, make sure the cable will not have to pass through any small holes or other obstructions that will not let the connector through.

You may want to test or Ohm out the cable for shorts before connecting it to either the BRU or the controller.

Connectors That Require a Banding Tool

Follow the instructions that come with the cable carefully. The bands that secure the cable shield to the BRU connector backshell is a standard shell (0.25 inch) and can be tightened with any automotive CV joint boot banding tool.

Note: Do not overtighten the band or it will cut through both the shield and the internal wires.

Once the shield band is installed, make sure you heat the waterproof heat shrink in place to protect the back of the connector.

Clamp-Type Connectors

Note: If you are using the clamp-type BRU connector, assemble the BRU connector kit onto the end of the cable. Make sure the cable shield is properly terminated in the connector backshell.

Terminating the Cable at the Controller End

Once the BRU is mounted and the cable is routed and secured to the controller, size up the cable and provide plenty of extra cable length before you cut the cable.

Cut the cable and terminate it with the 9-pin D shell connector from the kit.

Note: It is very important that you connect the cable shield to the backshell of the connector.

Troubleshooting the BRU

During power up and the self tests, all LEDs are on. If any of the self tests fail, the LEDs will blink. The LED blink patterns are listed in this table.

Fault	Radio Rx/Tx LED	RFNC Rx/Tx LED
ROM Test	rapid blinking	rapid blinking
RAM Test	rapid blinking	off
CPU Test	off	rapid blinking

Note: Do not confuse the rapid blinking in the self tests with the blinking (every second) that occurs when the controller sends out status packets. To verify which blinking is occurring, disconnect the BRU from the controller.

2

9183 Radio Repeater

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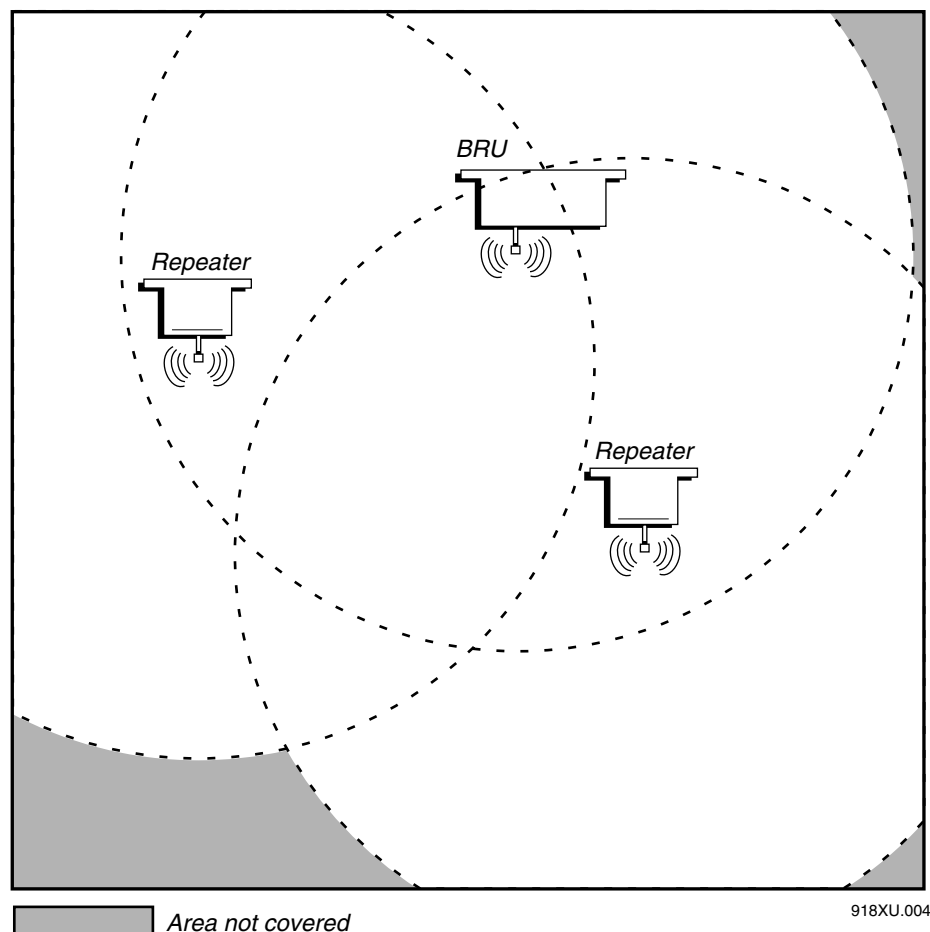
Learning About the 9183 Radio Repeater

The 9183 Radio Repeater stores and forwards information between the data collection devices and the 9181 Base Radio Unit (BRU). You use a repeater when distance or physical layout impedes radio reception and transmission.

Sending data through a repeater is called a repeat count (or hop). Up to seven repeat counts are allowed for each signal, but Intermec highly recommends that you do not use more than three repeat counts, since they slow down data transmission.

The figure on the next page shows how the repeaters increase the area covered by the transmissions emitted from the BRU. The BRU can only cover a certain area, represented by the dotted circle surrounding it in the figure. The repeaters increase the area as shown by the dotted circles around them.
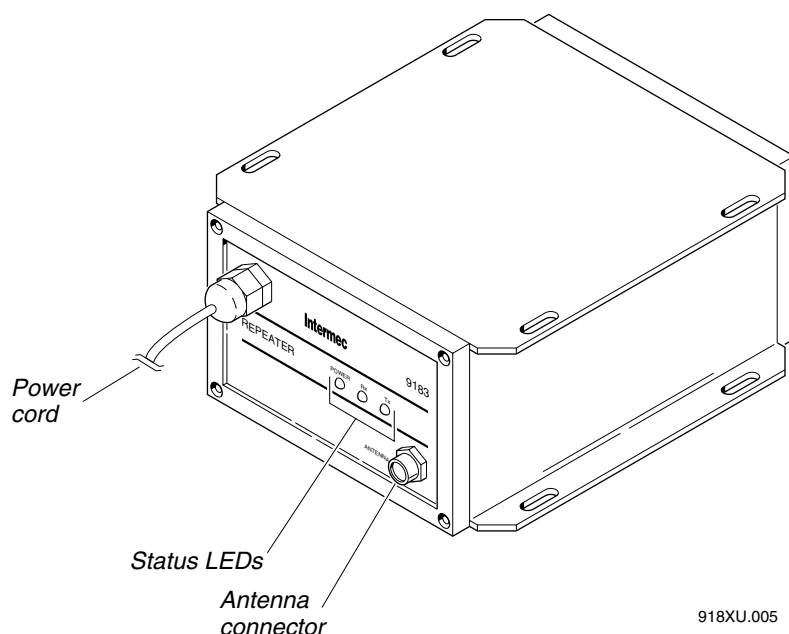
Repeaters Extending the RF Transmission Area

Area not covered   918XU.004

Understanding the Repeater Components

This figure shows the components for the repeater. The front panel contains three LEDs, the antenna connector, and the power cord. The DIP switches are not accessible from the exterior of the unit. For help, see "Understanding the DIP Switches" later in this chapter.

9183 Repeater Components

918XU.005

Understanding the Repeater Status LEDs
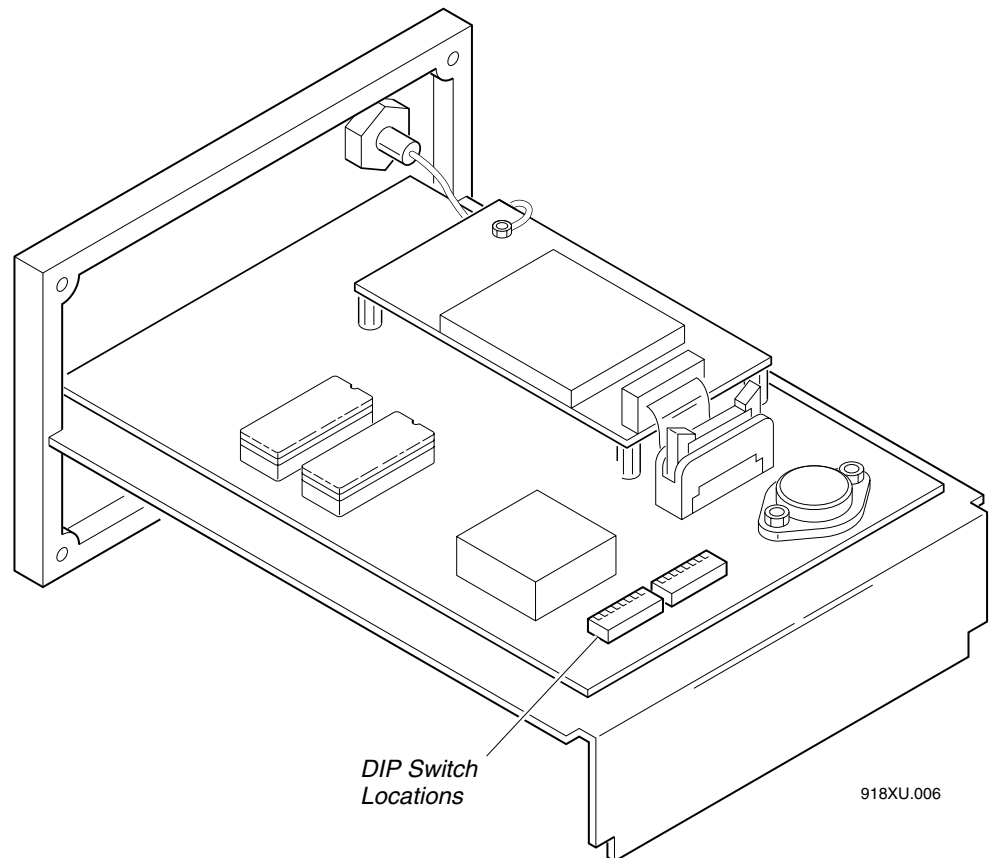
The front panel of the repeater contains three LEDs that continuously display the status of the unit. During power up and self tests, all LEDs are on. If all tests pass, the LEDs will show the status described in this table.

LED	Description
Power	Lights when the repeater is receiving power.
RX	Lights when the repeater is receiving data.
TX	Lights when the repeater is transmitting data.

Setting the DIP Switches

Inside the repeater are two banks of DIP switches, SW1 and SW2. You need to set these DIP switches during installation to configure the RF channels on the repeater. The RF channels must match the channels used in the data collection network.

9183 DIP Switches

DIP Switch
Locations

918XU.006

Switches 1, 2, and 3 of SW1 determine which RF channel the repeater uses.

SW1 Switches

RF Channel	1	2	3
924 MHz	off	off	off
921 MHz	on	off	off
918 MHz	off	on	off
915 MHz	on	on	off
912 MHz	off	off	on
909 MHz	on	off	on
906 MHz	off	on	on

Caution
Proper torque value is critical when replacing the front panel. Too little torque will allow water to enter the housing. Too much torque will damage the gasket.

Conseil
Il est critique de déterminer une valeur correcte pour le moment de torsion lors du remplacement du panneau avant. Un moment de torsion inférieur laissera entrer de l'eau dans le boîtier. Un moment de torsion trop élevé endommagera le joint d'étanchéité.

To set the DIP switches

1. If the repeater is installed, shut down the RF system. Disable all data collection devices and the controller.

2. If the repeater is installed, unplug the power cord. Remove the unit from the mounting location.

3. Remove the four screws on the rear panel and remove the panel.

4. The DIP switches are located on the PCB assembly. Use a pointed object to move the switches to the required positions.

5. Position the rear panel on the housing and secure with the four screws. Tighten each screw until the gasket between the front panel and the housing begins to bulge slightly. Do not overtighten.

6. Mount the repeater and plug in the power cord. For help, see "Installing the Repeater" later in this chapter.

You can now restart the RF system.

Installing the Repeater

The only cable used by the repeater is the power cord; it is not cabled to any other device.

Note: The DIP switches must be set prior to installation.

Mounting to Drywall Surfaces

If mounting the unit to drywall (sheetrock), make sure it is mounted on a ceiling joist. Plastic anchors in drywall will not safely support the repeater.

Mounting to Wood Surfaces

If mounting the unit to wood, the minimum thickness must be 1/2 inch. Use 5/16-inch sheetmetal or wood screws.
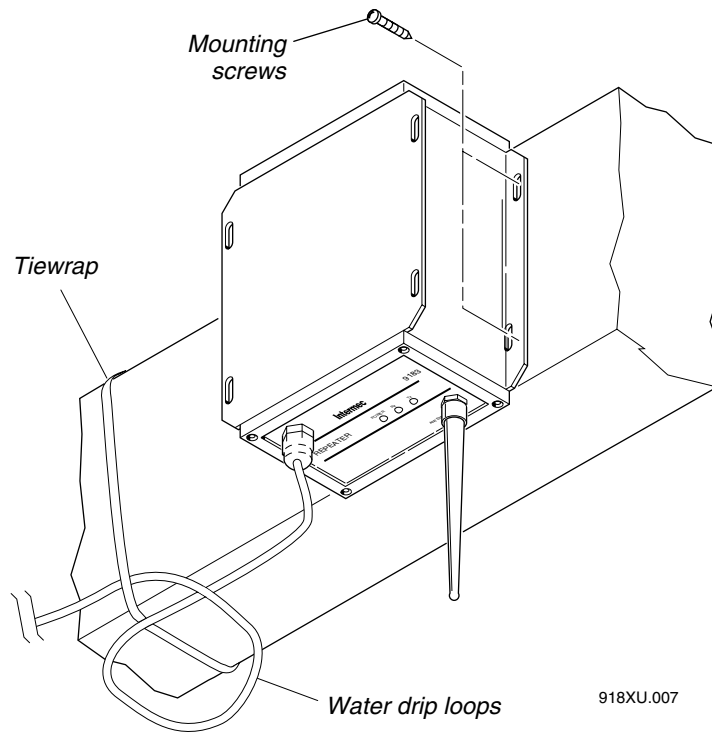
Mounting to Metal Surfaces

When mounting the unit to metal surfaces, the minimum unreinforced thickness must be 14 gauge (steel).

To install the repeater

1. Locate the repeater within 4 feet of a power outlet.

2. Bolt the repeater to the rafters or beams so the antenna points straight down. The front panel LEDs should be visible from the ground.

3. Before plugging in the power cord, create a 7-inch water drip loop in the power cord a few inches below the repeater's lowest point to prevent water from leaking into the connector.

4. Attach the antenna to the repeater so it points down. Make sure it is at the lowest point of the ceiling and reaches below all beams, pipes, and ducts.

Installing the 9183 Repeater

918XU.007

Troubleshooting the Repeater

During power up and self tests, all LEDs are on. If any of the self tests fail, the LEDs will blink. The LED blink patterns are listed in this table.

Fault	RX LED	TX LED
ROM Test	blinking	blinking
RAM Test	blinking	off
Internal RAM	off	blinking