

Radio Frequency (RF) Temperature Sensor System Installation and Operation Manual





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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Warning! FCC Regulations state that any unauthorized changes or modifications to this equipment not expressly approved by the manufacturer could void the user's authorization to operate this equipment.

READ ALL INSTRUCTIONS CAREFULLY before attempting to install or operate the RF Sensor System.

SAVE THIS INSTRUCTION MANUAL — This instruction manual contains important operating instructions for the RF Sensor System.

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1 Overview

CPC's Radio Frequency (RF) Sensor System provides refrigerated case temperature monitoring and control without the time and expense required to wire multiple temperature sensors

from the cases back to the area controllers. All sensors in the RF Sensor System family are completely wireless, transmitting their values to receivers in the store area that pass them back to the area controllers.

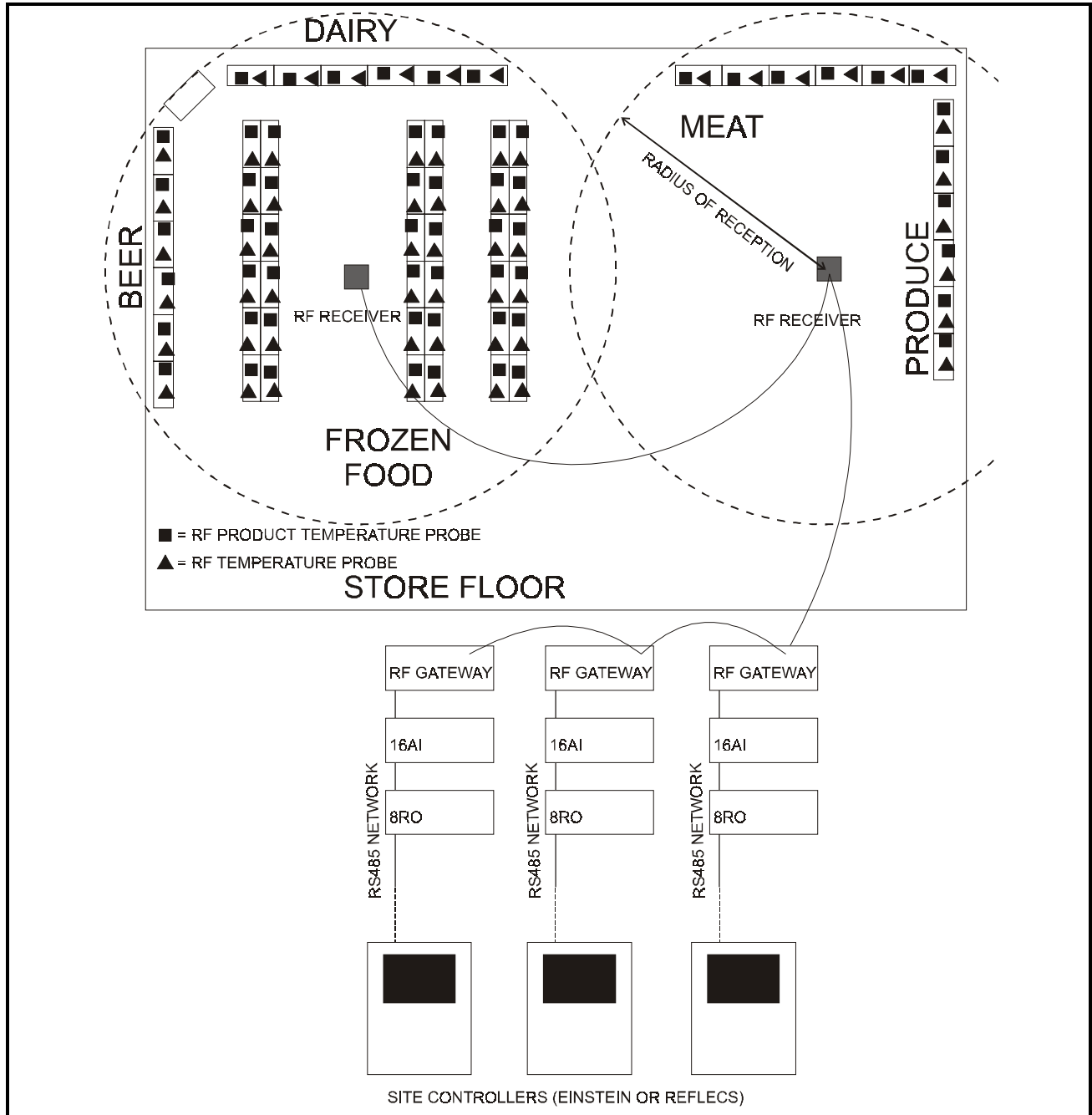


Figure 1-1 - RF System Diagram

1.1. Hardware Components

1.1.1. Sensors

1.1.1.1. RF Ambient Temperature Sensors



Figure 1-2 - Ambient Temperature Sensor (Internal Model Shown)

The RF Ambient Temperature Sensor is an enclosure with a built-in broadcast antenna. This sensor may be mounted anywhere within a refrigerated case, as long as it is within 150 feet of an RF Receiver and within a clear line of sight to the receiver's antenna.

Four models of the RF Ambient Temperature Sensor are available. Each model has either internal or external temperature sensing elements, and either clean switch or defrost termination digital inputs. **Table 1-1** lists all RF Ambient Temperature Sensor models along with their characteristics.

Part Number	Description
809-3542	RF Internal Ambient Sensor, w/ sensor element mounted inside enclosure, and with a built-in clean switch button for alarm suspension during cleaning
809-3544	RF External Ambient Sensor, w/ external NSF-approved stainless steel bullet sensor and neoprene leads, with external leads for connection to clean switch
809-3552	RF Internal Ambient Sensor, w/ sensor element mounted inside enclosure and external leads for connection to digital defrost termination sensor
809-3550	RF External Ambient Sensor, w/ external NSF-approved stainless steel bullet sensor and neoprene leads, with external leads for connection to digital defrost termination sensor

Table 1-1 - RF Ambient Sensor Models

1.1.1.2. RF Long-Range Ambient Sensors



Figure 1-3 - Long-Range Ambient Sensor Enclosure

The RF Long-Range Ambient Sensor improves on the 150 feet transmitter-to-receiver maximum distance of the other internal & external sensor models. The cylindrical enclosure holds a “whip” antenna capable of transmitting to receivers as far away as 200 feet.

Like the shorter-range sensors described in **Section 1.2.1.1.**, there are both internal and external models of the long-range sensors, both with either clean switch or digital defrost termination inputs. **Table 1-2** lists each long-range sensor model.

Part Number	Description
809-3543	Long-Range Internal Ambient Sensor, w/ internal temperature sensor element and clean switch button
809-3545	Long-Range External Ambient Sensor, w/ NSF approved stainless steel bullet sensor and neoprene leads, with external leads for clean switch
809-3549	Long-Range External Ambient Sensor, w/ NSF approved stainless steel bullet sensor and neoprene leads, with external leads for digital defrost termination sensor
809-3551	Long-Range Internal Ambient Sensor, w/ internal sensor element and external leads for digital defrost termination sensor

Table 1-2 - Long-Range RF Ambient Sensor Models

1.1.1.3. RF Product Simulator



Figure 1-4 - RF Product Simulator

The RF Product Simulator (P/N 809-3548) mimics the thermal characteristics of product within refrigerated cases or freezers. Temperature readings from product simulators can be used to verify product remains within acceptable food safety levels.

The sensing element and transmitting antenna for the RF Product Sensor are inside the enclosure and may transmit to receivers up to 150 feet away. The sensor also has an internal clean switch, which is activated by pressing a button on the enclosure.

1.1.2. RF Receiver



Figure 1-5 - RF Receiver

The RF Receiver (P/N 837-3510) is an antenna that mounts to the ceiling of the sales area or on top of a refrigerated case. The RF Receiver accepts transmissions from RF Ambient Temperature Sensors and RF Product Simulators. It passes the sensor readings it receives to the RF Gateway by way of an RS485 network connection.

Up to six RF Receivers may be mounted within a single building.

1.1.3. RF Gateway

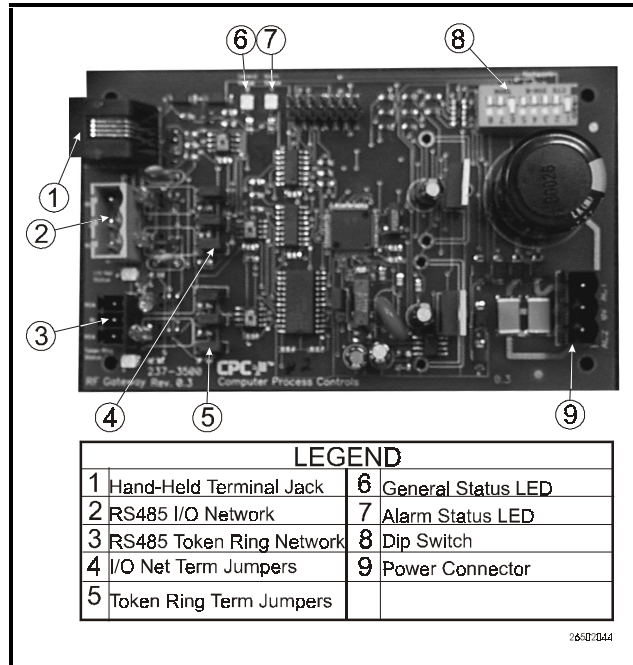


Figure 1-6 - RF Gateway Board

The RF Gateway (P/N 810-3500) is an RS485 peripheral board compatible with both Einstein and REFLECS (RMCC, BEC, and BCU) systems. The RF Gateway serves as an interface between the RF Receivers, which send messages from the sensors, and the area controllers, which use the sensor values for logging, controlling, and alarming. Each Einstein or REFLECS controller that will read values from RF Sensors must be equipped with an RF Gateway.

Sensors and product simulators that will be used by an Einstein must be “commissioned” in the RF Gateway’s software. Once a sensor is commissioned, the gateway then assigns the sensor to a virtual "board and point" address. This allows the area controller to tie application inputs to RF Sensor values in the same way traditional 16AI board and point inputs are set up.

1.1.4. Hand-Held Terminal

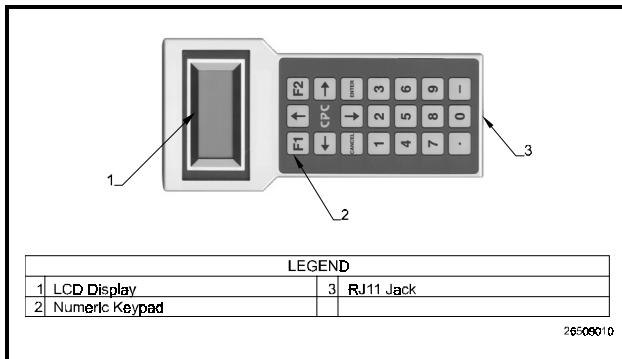


Figure 1-7 - Hand-Held Terminal (HHT)

The Hand-Held Terminal (HHT) (P/N 811-3110), shown in *Figure 1-7*, connects directly to the RJ11 jack on an RF Gateway and is used to commission RF Sensors and view the status of the system.

2 Installing the RF Gateway

Installing the RF Gateway device for a site controller involves mounting and powering the device, connecting to the CPC controller's RS485 network, and networking the RF Gateway with other gateways and receivers on-site.

2.1. Mounting the RF Gateway

The RF Gateway is typically mounted in the same area as the site controller, near the controller's 16AI, 8RO, and other RS485 network peripherals. The RF Gateway is designed to fit into a standard 3" snap track (supplied with the board).

The RF Gateway should be mounted in an environment with ambient temperature between -40°F and 150°F, with a non-condensing relative humidity between 5% and 95%.

2.2. Powering the RF Gateway

The RF Gateway requires 24VAC power from a Class 2 center-tapped transformer. CPC supplies several sizes of center-tapped transformers for powering multiple 16AIs, 8ROs, and other RS485 peripheral boards of the Einstein and REFLECS systems.

Refer to your controller's user manual for information on how to use the center-tapped transformers listed in **Table 2-1** to power multiple RS485 I/O devices. The RF Gateway requires **4VA** of power to operate.

Figure 2-1 shows how to connect the 56VA and 100VA transformers to the RF Gateway power connector. **Figure 2-2** shows how to connect the 175VA transformer to the RF Gateway.

	Three-Board	Six-Board	Ten-Board
P/N	640-0043	640-0045	640-0048
Power Rating	56 VA	100 VA	175 VA

Table 2-1-Power Ratings for CPC Transformers

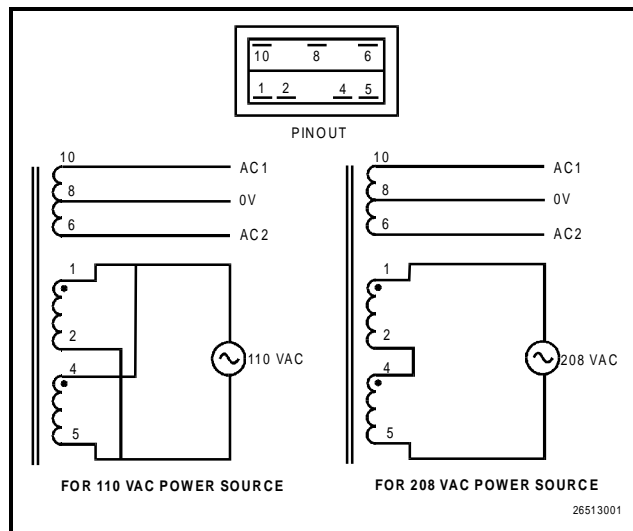


Figure 2-1 - Pinout for the 56VA (640-0043) and 100VA (640-0045) Transformers

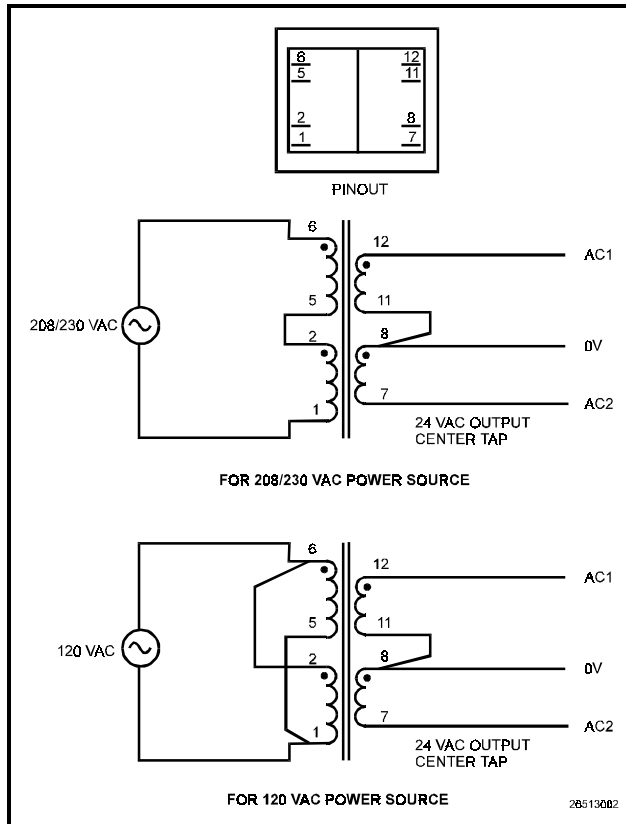


Figure 2-2 - Pinout for the 175VA (640-0048) Transformer

2.3. Wiring the RF Gateway to a CPC Site Controller (I/O Network)

Each Einstein or REFLECS site controller that will receive a temperature value from an RF Sensor must have an RF Gateway installed on its RS485 I/O Network. For Einstein controllers, this means the RF Gateway will be installed on the I/O Network; for RMCC, BEC, BCU, and other REFLECS products, the RF Gateway will be installed on the COM A or COM D network.

2.3.1. Wire Connection

Using shielded three-conductor network cable (Belden #8641 or equivalent), connect the RS485 I/O Network wire to the three-terminal connector on the RF Gateway board as shown in *Figure 2-3*. For further information about how RS485 networks are configured, refer to your site controller's user manual.

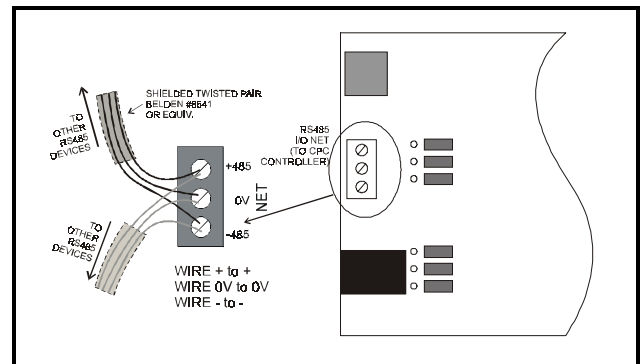


Figure 2-3 - Connecting the RF Gateway to the RS485 Network

2.3.2. Setting the Board Numbering Dip Switch

The Einstein or REFLECS controller interprets the RF Gateway board as a series of four 16AI Analog Input boards numbered in succession. Dip switches 1 through 4 set the first board number used by the RF Gateway; when this number is set, the RF Gateway will also use the next three board numbers above the first board number. For example, if an RF Gateway dip switch is set to board number 3, the RF Gateway will use board numbers 3, 4, 5, and 6 on the I/O Network.

Note: The RF Gateway dip switch is mounted upside down on the circuit board. Figure 2-4 and Figure 2-5 show the correct positions of the dip switches when viewed upside down.

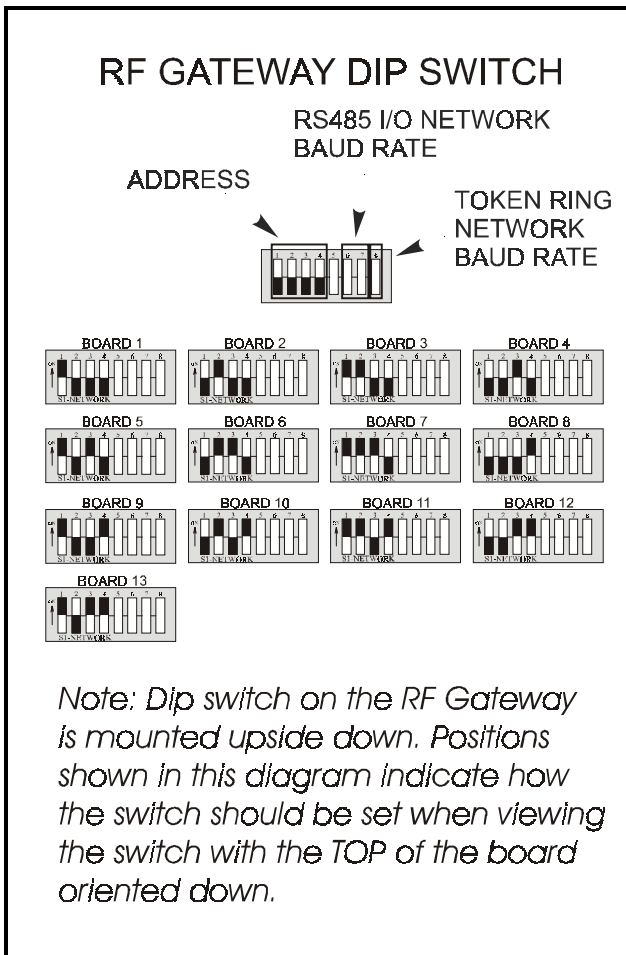


Figure 2-4 - Dip Switch Setting for Numbering RF Gateway

2.3.3. Setting the Baud Rate Dip Switch

Dip switches 6 and 7 control the baud rate at which the RF Gateway communicates with the site controller on the RS485 Network. These switches must be set to the same baud rate setting as the Einstein or REFLECS (usually 9600 baud).

Dip switch 8 controls the baud rate at which the RF Gateway communicates with the other devices on the Token Ring Network. This baud rate may only be set to either 9600 baud (switch DOWN) or 19600 baud (switch UP). All RF Gateways and RF Receivers on the Token Ring Network must have the same baud rate dip switch setting. It is recommended you use 9600 baud as the Token Ring Network baud rate.

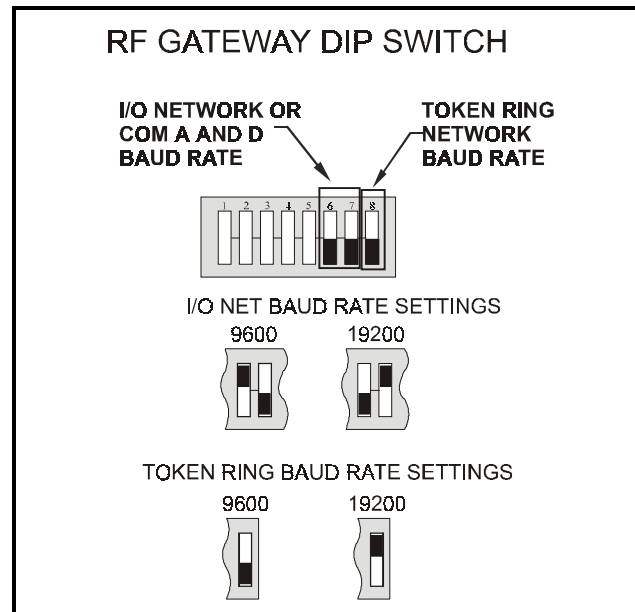


Figure 2-5 - Dip Switch Setting for Numbering RF Gateway

2.3.4. Setting the RS485 I/O Termination Jumpers

As part of an area controller's RS485 I/O (COM A or COM D) Network, an RF Gateway must be terminated if it is the end device of a daisy chain. Refer to the controller's user manual for information about daisy chain networks and how they are terminated.

To terminate the RF Gateway, set the I/O Network Jumpers to the LEFT position as shown in **Figure 2-6**. To unterminate the RF Gateway, set the jumpers to the RIGHT position.

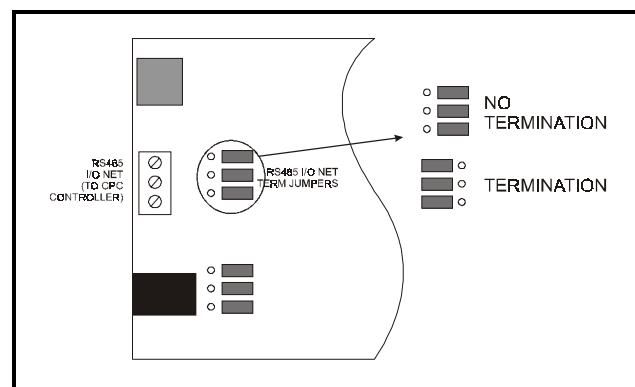


Figure 2-6 - RF Gateway RS485 I/O Network Termination

2.4. Networking Gateways and Receivers (Token Ring Network)

The RS485 Token Ring Network interconnects all RF Gateways and Receivers on the site. Like the RS485 I/O Networks that interconnect the area controllers, input boards, output boards, and RF Gateways, the Token Ring Network must be set up in a **daisy chain** configuration. All devices must be wired together in a single chain as shown in *Figure 2-7*, with no branches and with no device connected to more than two other devices.

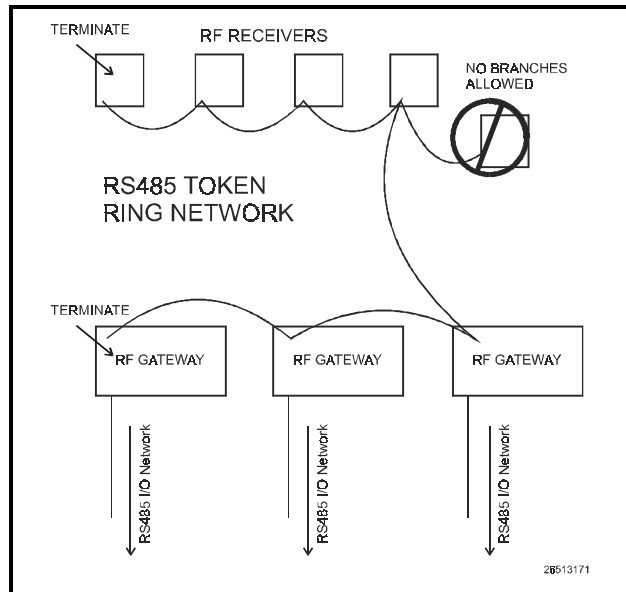


Figure 2-7 - Daisy Chain Configuration - Token Ring Network

2.4.1. Wiring the Token Ring Network to the Gateway

Using shielded three-conductor cable (Belden #8641 or equivalent), wire the RF Gateway to the Token Ring Network as shown in *Figure 2-8*.

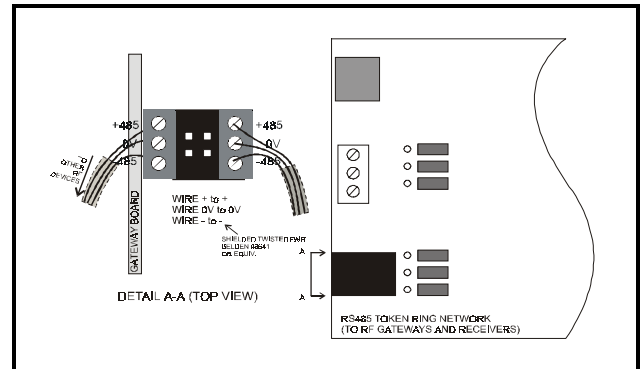


Figure 2-8 - Token Ring Network Wiring

2.4.2. Setting the Token Ring Network Termination Jumpers

As shown in *Figure 2-7*, the Token Ring daisy chain must be terminated at the two devices at the end of the chain. The location of the termination jumpers on the RF Gateway are shown in *Figure 2-9*. To terminate an RF Gateway, set the jumpers to the LEFT position. To unterminate the RF Gateway, set the jumpers to the RIGHT position.

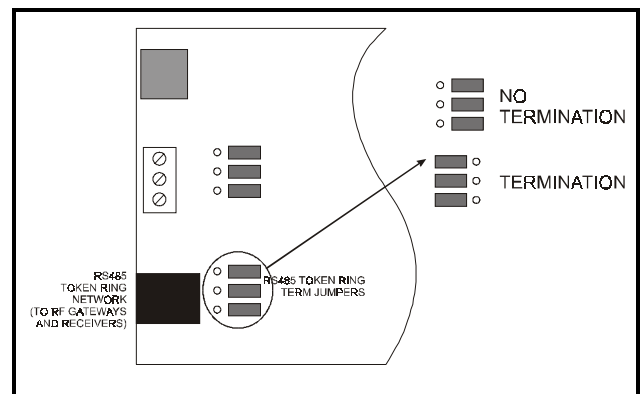


Figure 2-9 - RS485 Token Ring Network Termination

3 Installing the RF Receiver

Installing an RF Receiver requires mounting the receiver, powering the receiver, and networking the receiver together with other receivers and gateways on the RS485 Token Ring Network.

3.1. Mounting and Placement of the RF Receiver

3.1.1. Environmental Operating Conditions

The RF Receiver should be mounted in an environment with ambient temperature between 30°F and 120°F, with a non-condensing relative humidity between 5% and 95%.

3.1.2. Placement

The RF Receiver must be placed above the sales floor within 150 feet of the sensors it will receive transmissions from. Each RF Sensor in the store must be no more than 150 feet from an RF Receiver, so for installations that require multiple receivers, make sure each RF Receiver is placed so that all RF Sensors have a receiver within the maximum distance.

3.1.3. Mounting

The receiver may be mounted either against the ceiling (with the antenna pointing toward the floor) or on top of a case (with the antenna pointing directly toward the ceiling). Alternately, the receiver may be mounted sideways (e.g. on a riser or a wall), but this will limit the range of reception to only those RF Sensors that are within the 180° arc of the direction the antenna is pointing (i.e. it may not pick up sensors located behind the receiver base).

Note the status LEDs and wire connections are located on the bottom of the receiver enclosure; try to mount the receiver so that these connections are accessible.

3.2. Powering the RF Receiver

The RF Receiver requires a 9VDC power source. A 110VAC to 9VDC transformer is supplied with the RF Receiver. Plug the adapter into the receiver base, and connect the transformer to a 110VAC line.

3.3. Wiring the RF Receiver to a CPC Site Controller

Each RF Receiver passes along sensor values it receives to an RF Gateway on its RS485 Token Ring Network.

3.3.1. Wire Connection

Connect the Token Ring Network wire to the three-terminal connector on the RF Receiver board as shown in *Figure 3-1*.

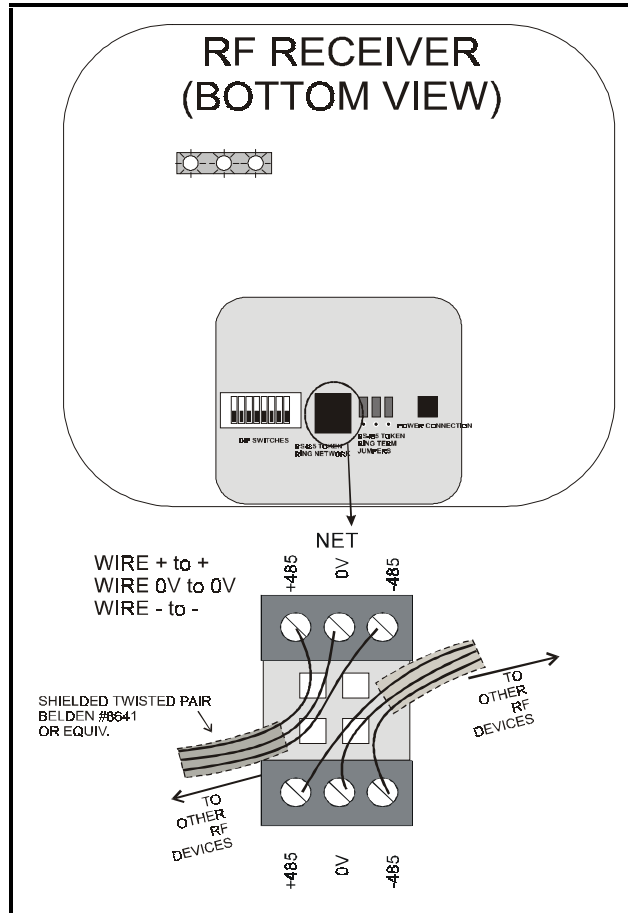


Figure 3-1 - Connecting the RF Receiver to the RS485 Network

3.3.2. Setting the Token Ring Net-

work Termination Jumpers

The devices at each end of the Token Ring Network daisy chain must be terminated. To terminate the Token Ring Network at the RF Receiver, set the jumpers to the UP position, as shown in *Figure 3-2*. To unterminate the RF Gateway, set the jumpers to the DOWN position.

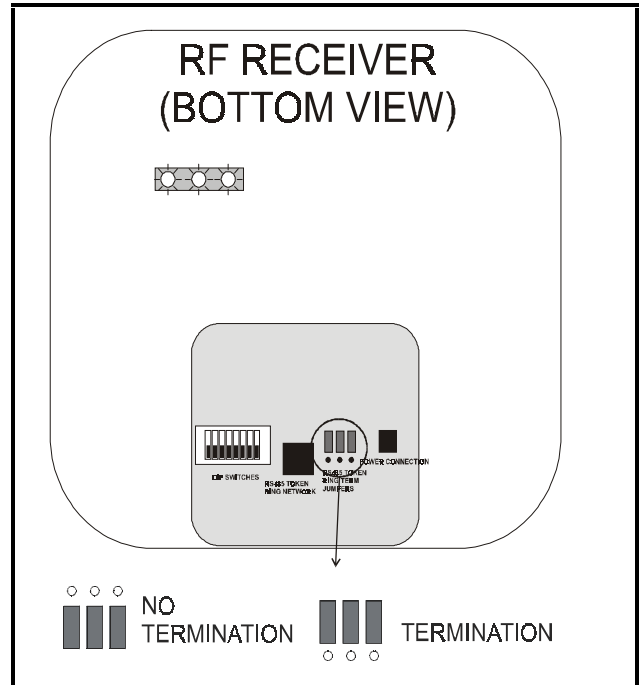


Figure 3-2 - RF Receiver Token Ring Termination Settings

3.3.3. Setting the Receiver Numbering Dip Switch

The RF Receiver must be identified with a unique number on the RF Gateway network. This allows RF Gateways to determine the source of incoming temperature readings. RF Receivers must be numbered sequentially, starting with #1 and continuing to the maximum number of receivers allowed (currently 6).

To assign an RF Receiver a number on the RF Gateway network, set switches 1-5 to the desired number. See *Figure 3-3*.

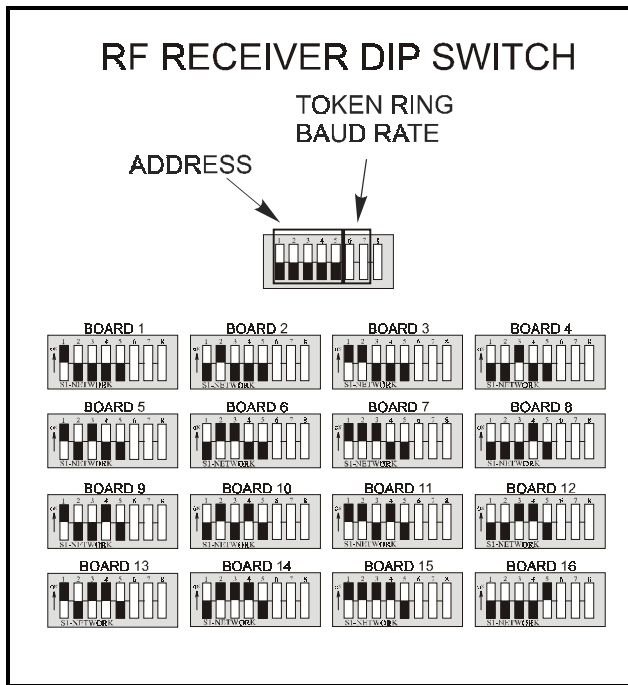


Figure 3-3 - Dip Switch Setting for Numbering RF Receiver

3.3.4. Setting the Baud Rate Dip Switch

Dip switches 6 and 7 control the baud rate at which the RF Receiver communicates with the site controller on the Token Ring Network. These switches should be set to the same position as all other Token Ring Network devices so they will communicate at the same baud rate. It is recommended the baud rate be set at 9600 baud for all Token Ring devices.

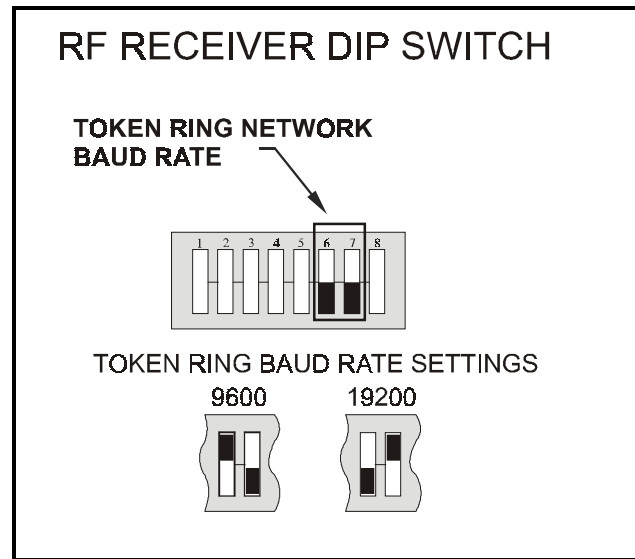


Figure 3-4 - Dip Switch Setting for RF Receiver Baud Rate

4 Installing the RF Sensor

This section details how to install the various models of RF Sensors, including mounting and placement, activation, and clean switch and defrost termination wiring.

4.1. Placement of RF Sensors

Ideally, all RF Sensor models, including product simulators, should be located somewhere within a refrigerated case where a clear line of sight exists between itself and an RF Receiver. In any case, **the signal path between the RF Sensor and the RF Receiver should not be blocked by large amounts of product or thick metal case walls.**

4.1.1. RF (Short-Range) Ambient Sensor

The RF Ambient Sensor kit includes a plastic mounting clip. This clip may be fastened anywhere on a shelf or the side of a refrigerated case. After mounting the clip, the sensor may be snapped on to the mounting clip.

4.1.2. RF Long-Range Transmitter

The RF Long-Range Sensor transmitter enclosure is equipped with two endcaps, each of which has a mounting hole. Screw the sensor enclosure to a shelf or the side of a case using the endcap mounting holes.

4.1.3. RF Product Simulator

The RF Product Simulator kit includes a plastic mounting clip. This clip may be fastened anywhere on a shelf or the side of a refrigerated case. After mounting the clip, the sensor may be snapped on to the mounting clip.

4.2. Activation

All RF Sensors will be shipped with the power OFF (a.k.a. Sleep mode) to save battery life. The sensors must be activated before they will start transmitting. To activate the sensor, locate the Service button and press for **one second** (see *Figure 4-1* for the service pin locations).

When activated, the sensor LED will stay ON for one second to indicate the sensor is exiting Sleep mode and beginning operation.

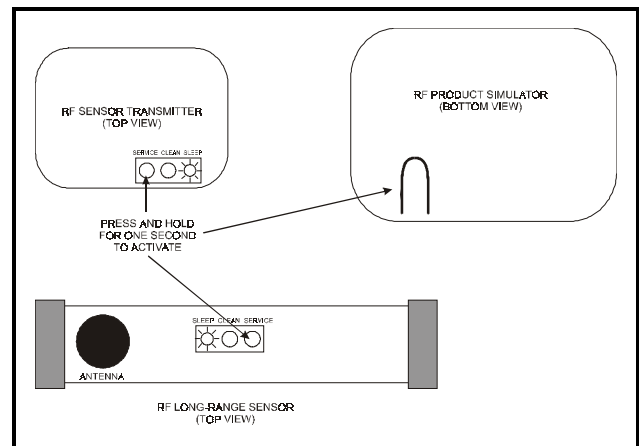


Figure 4-1 - RF Sensor Activation

4.2.1. Verifying Active State

When an RF Sensor is active, you can verify its active state by momentarily pressing the Service button and then releasing. If active, the status LED will flash once. If the light does not come on, it is either in Sleep mode or has a dead or missing battery.

4.3. Clean Switch and Defrost Termination Wiring

Sensor models with internal clean switches do not require any extra wiring to enable clean switch functionality; the button on the sensor enclosure acts as a clean switch.

Sensor models with connections for external clean switches and digital defrost termination sensors are equipped with a two-wire pigtail. Connect the clean switch or defrost termination contacts to these leads.

WARNING! External clean switch and defrost termination inputs are to be connected to dry contacts only. Do not connect the leads to any voltage or current source. Doing so will damage the sensor and void the warranty.

5 Commissioning the RF Sensors

5.1. What is Commissioning?

Commissioning is the act of linking an RF Sensor's input to a virtual "board and point" address in a specific RF Gateway's memory so it can be read and used by a CPC area controller.

The act of commissioning involves assigning each virtual board and point in an RF Gateway's software with either the temperature value or the digital input value from a specific RF Sensor. This is achieved by:

- Specifying the unique ID number of the RF Sensor that will supply the value to the chosen board and point address, and
- Specifying whether the board and point address will output the sensor's temperature value or the digital input value (from either the clean switch or the defrost termination sensor).

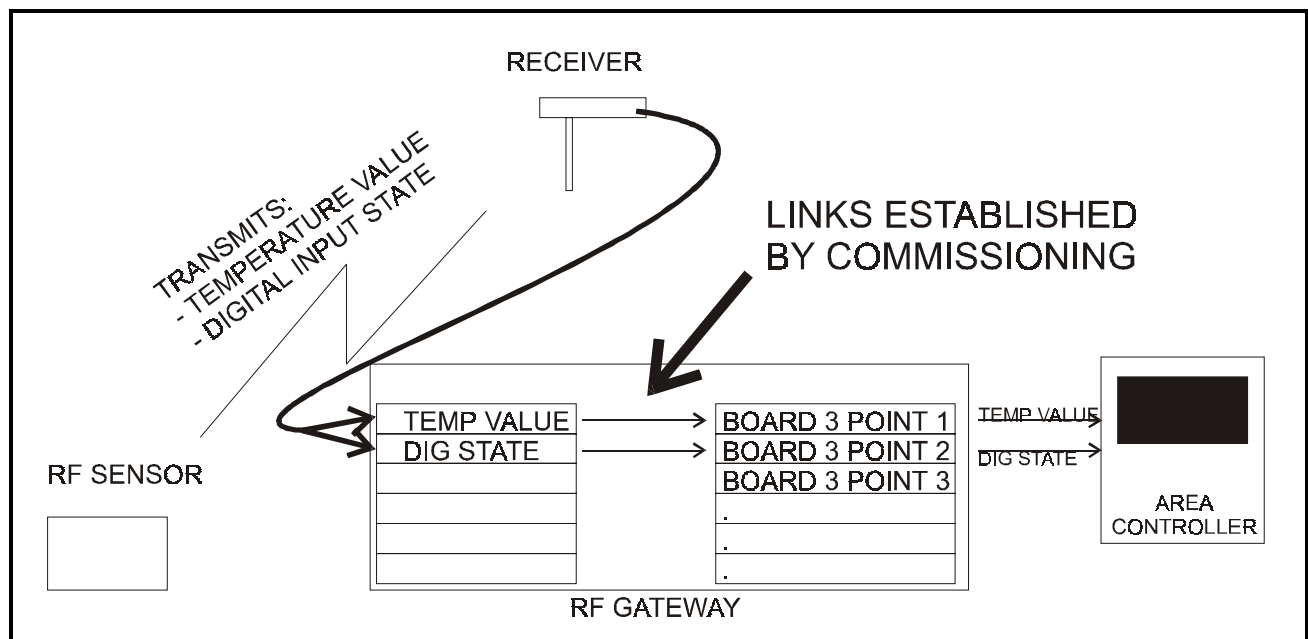


Figure 5-1 - The Process of Commissioning

A sensor can be commissioned either by manually entering sensor ID numbers into the RF Gateway software or by pressing a sensor's service pin to broadcast the ID number to the RF Gateway via an operational RF Receiver.

When using the Manual Entry method of commissioning sensors, it is recommended you remove each perforated ID tag after installation and attach it to a data sheet along with information about its location and the name of the Einstein or REFLECS controller that will read the sensor's value. *Appendix A* provides a template that may be photocopied for creating RF Sensor data sheets.

5.2. Manual Entry Method

Each RF Sensor and product simulator has a sticker on the enclosure that displays an ID number unique to the sensor. This sticker also has a perforated tag that may be removed from the enclosure.

When you've collected all the ID numbers from the RF Sensors and product simulators for your site, the ID numbers may be entered on the RF Gateways to commission the sensors.

5.2.1. Entering the ID Numbers on the RF Gateway

The RF Gateway board is designed to simulate four 16AI Analog Input boards, each of which has sixteen inputs, for a total of 64 inputs per gateway. To commission a sensor, you must use the Hand-Held Terminal to associate the sensor ID number with a "board and point" input address on the gateway.

1. Plug the Hand-Held Terminal into the HHT jack on the RF Gateway. The HHT should power up and display the opening screen.

```
CPC - RF GATEWAY
VER: 1.00F01

( PRESS D )
```

2. Press the **DOWN ARROW** key to display the Options menu.

```
OPTION:
1= SET SENSOR ID
2= STATUS-DEG F
3= STATUS-DEG C
```

3. Press the **RIGHT ARROW**, **1**, **DOWN ARROW**, and **DOWN ARROW** to select the "Set Sensor ID" option and navigate to the ID Entry Method screen.

```
ID ENTRY METHOD
1 = ENTER ID #
2 = SERVICE PIN
METHOD: 1
```

4. In the ID Entry Method screen, press **RIGHT ARROW**, **1**, **DOWN ARROW**, and **DOWN ARROW** to select the "Enter ID #" method and navigate to the Enter Starting Board Address menu.

```
ENTER STARTING
BOARD ADDRESS
( 3 4 5 6 )
BOARD: 3
```

5. The Enter Starting Board Address menu allows you to jump to Point 1 of the number

of the "board" you wish to configure. The four board numbers reserved by this gateway are shown in parenthesis on line 3 of the screen. To begin commissioning sensors on a "board," press **RIGHT ARROW**, the number of the board you wish to configure, **DOWN ARROW**, and **DOWN ARROW**.

6. The commissioning screen for Point 1 of the board number you chose will be visible on the screen. There are two configurable parameters on this screen: TYPE, and ID. Press the **RIGHT ARROW** key to move the cursor to the TYPE field.

```
BOARD: 3
POINT: 1
TYPE :>TEMP
ID:
```

7. If you want this board and point input to be the temperature read by the RF Sensor, press **1** to change the TYPE field to "TEMP." If you want this board and point input to be the state of the RF Sensor's digital output (whether it be its clean switch or defrost termination sensor input), press **2** to change the TYPE field to "DIGITAL." When selected, press the **DOWN ARROW** key to confirm.
8. The cursor should now be on the ID field. In the ID field, enter the number from the ID tag or sticker on the RF Sensor enclosure. When finished, press the **DOWN ARROW** key to confirm and save.

```
BOARD: 3
POINT: 1
TYPE : TEMP
ID: >0000024940
```

9. Press the **DOWN ARROW** key again to move on to the next point on the board. Follow **steps 6 through 8** again to commission the next board point. If you wish to switch to a different board, pressing **F2** will move you

back to the Enter Starting Board screen described in **step 4**.

NOTE: For simplicity, it is recommended you commission a sensor's digital input value on the point immediately after its temperature value. For example, if Sensor A's temperature value is commissioned as Board 1, Point 1, commission its digital input value as Board 1, Point 2.

5.3. Service Pin Method

All RF Sensor models have a service pin that, when pressed, will transmit its ID number. The service pin can be used to commission the sensor by commanding the RF Gateway to receive the transmitted ID number and assign it to a "board and point" input address.

This process will likely require two people: one to set the RF Gateway up to receive the sensor ID transmissions, and one on the sales floor to press the service pins.

WARNING! Make sure no one else on site is commissioning or activating sensors while you are commissioning sensors. Otherwise, the RF Gateway may read a service button transmission from the wrong RF Sensor and commission improperly.

5.3.1. Setting up the RF Gateway to Receive ID Transmissions

The RF Gateway board is designed to simulate four 16AI Analog Input boards, each of which has sixteen inputs, for a total of 64 inputs per gateway. To commission a sensor, you must use the Hand-Held Terminal to associate the sensor ID number with a "board and point" input address on the gateway.

1. Plug the Hand-Held Terminal into the HHT jack on the RF Gateway. The HHT should power up and display the opening screen.

```
CPC - RF GATEWAY
VER: 1.00F01

( PRESS D )
```

2. Press the **DOWN ARROW** key to display the Options menu.

```
OPTION:
1 = SET SENSOR ID
2 = STATUS-DEG F
3 = STATUS-DEG C
```

3. Press the **RIGHT ARROW**, **1, DOWN ARROW**, and **DOWN ARROW** to select the "Set Sensor ID" option and navigate to the ID Entry Method screen.

```
ID ENTRY METHOD
1 = ENTER ID #
2 = SERVICE PIN
METHOD: 2
```

4. In the ID Entry Method screen, press **RIGHT ARROW**, **2, DOWN ARROW**, and **DOWN ARROW** to select the "Service Pin" method and navigate to the Enter Starting Board Address menu.

```
ENTER STARTING
BOARD ADDRESS
( 3 4 5 6 )
BOARD: 3
```

5. The Enter Starting Board Address menu allows you to jump to Point 1 of the number of the "board" you wish to configure. The four board numbers reserved by this gateway are shown in parenthesis on line 3 of the screen. To begin commissioning sensors on a "board," press **RIGHT ARROW**, the number of the board you wish to configure, **DOWN ARROW**, and **DOWN ARROW**.
6. The commissioning screen for Point 1 of the board number you chose will be visible on the screen. There are two configurable parameters on this screen: TYPE, and ID. Press the **RIGHT ARROW** key to move the cursor to the TYPE field.

```
BOARD: 3
POINT: 1
TYPE :>TEMP
ID:
```

7. If you want this board and point input to be the temperature read by the RF Sensor, press **1** to change the TYPE field to "TEMP." If you want this board and point input to be the state of the RF Sensor's digital output (either its clean switch or defrost termination sensor input), press **2** to change the TYPE field to "DIGITAL." When selected, press the **DOWN ARROW** key to confirm.
8. The cursor should now disappear, and line 4 of the display will read "(PRESS SRVC PIN)." Press and hold the Service button on the RF Sensor for **one second** and then release. The RF Gateway should receive the Service button message and fill the ID field in with the ID number of the RF sensor.

```

BOARD:  3
POINT:  1
TYPE :  TEMP
(PRESS SRVC PIN)

```

The RF Gateway will wait one minute to receive the Service button signal. If it is not received, the message "SRVC PIN TIMEOUT" will appear (you may also manually cancel the wait time by pressing **CANCEL**.)

If commissioning was unsuccessful, press the **UP ARROW** key and repeat **steps 7 and 8**. If the sensor will still not commission, refer to *Appendix B* for troubleshooting information, or attempt to commission the sensor using the Manual Entry method (**Section 5.2**).

9. Press the **DOWN ARROW** key again to move on to the next point on the board. Follow **steps 6 through 8** again to commission the next board point. If you wish to switch to a different board, pressing **F2** will move you

back to the Enter Starting Board screen described in **step 4**.

NOTE: For simplicity, it is recommended you commission a sensor's digital input value on the point immediately after its temperature value. For example, if Sensor A's temperature value is commissioned as Board 1, Point 1, commission its digital input value as Board 1, Point 2.

5.3.2. Hand-Held Terminal Screen Navigation Tips

- At any time, pressing **F1** on the HHT will move you back to the opening screen.
- Any time you are entering data in a field where the arrow cursor is visible, pressing **CANCEL** will clear the field. During commissioning, pressing **CANCEL** with the cursor in an ID field will delete a sensor from the RF Gateway's memory (see **Section 5.5**, *Decommissioning a Sensor from the RF Gateway*).

5.4. Verifying Successful Commissioning

Immediately after being commissioned, the RF Gateway will begin grabbing sensor transmissions from its associated RF Sensors. You may verify that all RF Sensors you have commissioned for this gateway are communicating properly by viewing their status using the Hand-Held Terminal. Refer to **Section 7.4** for instructions on how to do this.

5.5. Decommissioning a Sensor from the RF Gateway

RF Sensor records may be deleted or "decommissioned" from the RF Gateway's memory. The process of decommissioning a sensor is similar to commissioning, except instead of entering ID numbers, you must delete them.

5.5.1. Decommissioning Manually

Entered ID Numbers

If you commissioned the sensors using the Manual Entry method, follow the instructions in **Section 5.2.** to navigate to the commissioning screen of the sensor input you wish to delete.

```
BOARD: 3  
POINT: 1  
TYPE : TEMP  
ID: >0000024940
```

Press the **RIGHT ARROW** key twice until the arrow cursor points to the ID number entered for the sensor. Press **CANCEL** to erase this number. The sensor input is now decommissioned. If this sensor has both a temperature and a digital value input commissioned, repeat this process for the second input.

5.5.2. Decommissioning ID Numbers Entered By Service Pin

If you commissioned the sensors using the Service Button method, follow the instructions in **Section 5.3.** to navigate to the commissioning screen of the sensor input you wish to delete.

```
BOARD: 3  
POINT: 1  
TYPE : TEMP  
ID: >0000024940
```

Press the **RIGHT ARROW** key twice until the arrow cursor points to the ID number entered for the sensor. Press **CANCEL**. This will both erase this number and cause the RF Gateway to prompt you to press the service button. If you wish to commission a different input to this board and point, you may press the service pin of the new sensor now to commission it. Otherwise, if you wish to leave this board and point empty, press **CANCEL** again to end the wait time.

If this sensor has both a temperature and a digital value input commissioned, repeat this process for the second input.

6 Connecting Sensors to Einstein/REFLECS

The commissioning process described in **Section 5** assigns each sensor a virtual "board and point" address in an RF Gateway's memory. Once a sensor is commissioned, the controller on the RF Gateway's RS485 I/O Network treats the RF Gateway in all respects as a series of four 16AI Analog Input Boards numbered in succession.

Programming Einstein and REFLECS applications to use RF Sensor values is exactly the same process as programming Einstein and REFLECS applications to use conventional temperature sensors connected to 16AI input points; just enter the virtual board and point address of the RF Sensor in the input definition fields.

Refer to your site controller's user manual for information about setting up board and point addresses for inputs in Einstein and REFLECS applications.

7 Operation and Maintenance of the RF Sensor System

7.1. Status LEDs

7.1.1. RF Sensors

All RF Sensor models have a single LED on top of the enclosure. This LED will flash once every three seconds to indicate the sensor is operating in Clean mode. Aside from Clean mode, there are only three events that will cause the LED to be ON.

1. The LED will be ON for one second when you activate the sensor (see **Section 4.2., Activation**).
2. The LED will flash twice when you switch the sensor into Sleep mode (see **Section 7.5., RF Sensor Sleep Mode**).
3. The LED will flash once each time you press the Service Button while the sensor is in Active mode. This indicates the sensor is not in Sleep mode.

7.1.2. RF Receivers

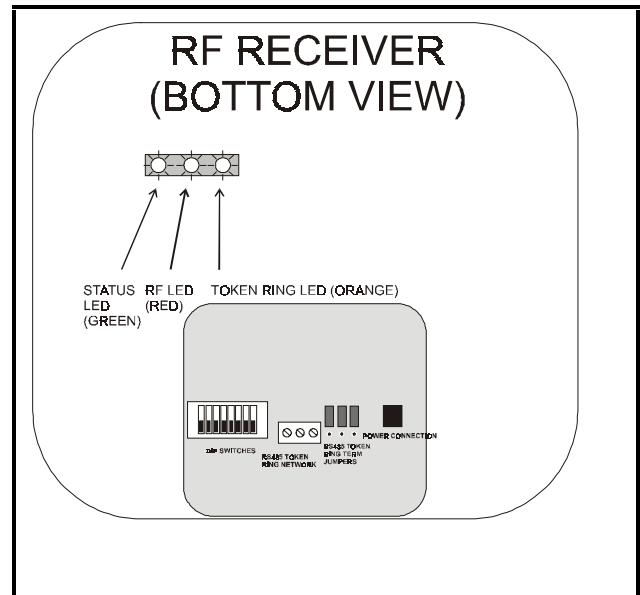


Figure 7-1 - RF Receiver LED Locations

The RF Receiver has three LED indicators: the STATUS LED, the RF LED, and the TOKEN RING LED.

7.1.2.1. The Status LED

The STATUS LED flashes GREEN once per second to indicate the receiver is ON. If this light does not flash, the receiver is unpowered.

7.1.2.2. The RF LED

The RF LED flashes RED every time it receives a transmission from an RF Sensor. In a properly working system, this light should flash occasionally several times over the course of 3-5 minutes. If after five minutes the LED does not flash at all, there may be a problem with the receiver.

7.1.2.3. The Token Ring LED

The TOKEN RING LED flashes ORANGE when it sends transmission data to the RF Gateways. The rate at which this light turns ON depends on the number of receivers on site, because RF Receivers take turns sending collected data to the gateways. In a properly work-

ing system, if this light does not come on at all for one minute, there may be a problem with either the RF Receiver or the Token Ring Network.

7.1.3. RF Gateway

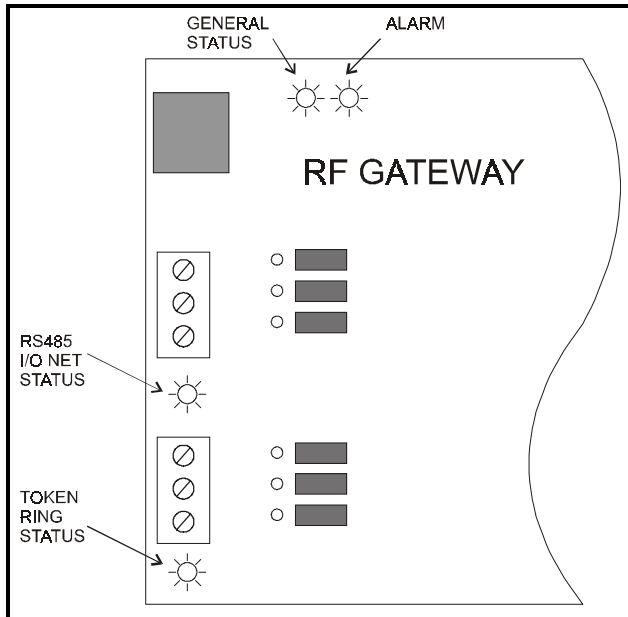


Figure 7-2 - RF Gateway LED Locations

The RF Gateway has four LEDs: a General Status LED, an ALARM LED, an RS485 I/O NET STATUS LED, and a TOKEN RING STATUS LED (Figure 7-2).

7.1.3.1. The General Status LED

The General Status LED light flashes GREEN once every second to indicate it is powered up.

7.1.3.2. The Alarm LED

The Alarm LED (red) indicates when an alarm condition exists for the RF Gateway. There are five possible LED states, each of which indicates a different condition.

- **OFF** - No alarm conditions are active, and the RF Gateway is functioning normally.
- **Flashes 4 times/second** - There is a problem with the physical hardware (ROM) of the RF Gateway board. The board may need to be replaced.
- **Flashes 2 times/second** - There is no user configuration on this RF Gateway - no sensors are commis-

sioned in its memory, and it is essentially in an empty state. This LED state will occur when the board is first powered up on-site.

- **Flashes 1 time/second** - The RF Gateway is not communicating with the area controller due to a possible RS485 I/O Network or controller failure.
- **ON with no flashing** - The RF Gateway is not detecting any traffic on the Token Ring Network. Check Token Ring Network connections.

7.1.3.3. RS485 I/O Network Status LED

The RS485 I/O Network Status LED flashes ORANGE to indicate traffic on the I/O Network. If this light does not come on at all and the ALARM LED is flashing once per second, there is a problem with the RS485 I/O Network or the area controller.

7.1.3.4. Token Ring Network Status LED

The Token Ring Network Status LED will flash ORANGE briefly every time a message is passed across the Token Ring Network. However, when the RF Gateway receives a message that it detects as a message from one of its commissioned sensors, the LED will flash brightly for 1/2 second.

If the RF Gateway has commissioned sensors and is communicating properly, you should see this LED flash brightly several times within the course of a few minutes.

7.2. Clean Switch Operation

The clean switch input on the RF Sensors allows you to manually suspend all temperature alarming on the case so that the case may be cleaned or serviced.

Activating Clean mode for an RF Sensor or product simulator is slightly different depending on whether the clean switch contacts are internal (i.e. activated by pressing the Clean button on the enclosure) or external.

7.2.1. Internal Clean Switch

For sensor models equipped with "Clean" buttons, press and hold the Clean button for 3 seconds to switch the sensor from Normal mode to Clean mode. After 3 seconds, the sensor LED should start flashing to indicate Clean mode is active.

While the sensor is in Clean mode, pressing and holding the Clean button again for 3 seconds will switch the sensor back into Normal mode. The LED should no longer flash when the sensor has successfully switched to Normal mode.

7.2.2. External Clean Switch

An externally wired clean switch may be either a push button or a static switch. If the clean switch is a push button, press and hold the button for 3 seconds to switch from Normal to Clean mode. To switch from Clean mode back to Normal mode, press and hold the button for 3 seconds.

If the clean switch is a static switch, the sensor will go into Clean mode when the switch is in the CLOSED position for longer than 3 seconds. Clean mode will end when the switch is returned to the OPEN position.

Like the internal clean switch, the sensor's LED will flash once per three seconds when in Clean mode.

7.3. Battery Life and Replacement

The battery life of an RF Sensor depends on the frequency of transmission. Sensors configured to transmit once every three minutes (the factory default) will have a battery life of seven years, while sensors configured to transmit once every 40 seconds will have a battery life of three years.

Batteries may be replaced by opening the sensor enclosure, removing the battery from the circuit board, and replacing it with a new battery. The battery is a special low-temperature battery available from CPC (P/N 119-5101) — **DO NOT USE ANY OTHER REPLACEMENT BATTERY.**

7.3.1. Reactivating the RF Sensor

After removing and replacing the battery, the sensor will revert back to Sleep mode and will need to be reactivated. Refer to **Section 4.2., Activation**, for information about how to activate an RF Sensor.

7.4. Viewing Status Using the Hand-Held Terminal

For troubleshooting purposes, the RF Gateway allows you to view the temperature and digital input values of all commissioned RF Sensors with the Hand-Held Terminal.

1. Plug the Hand-Held Terminal into the HHT jack on the RF Gateway. The HHT should power up and display the opening screen.

```
CPC - RF GATEWAY
VER: 1.00F01

( PRESS D )
```

2. Press the **DOWN ARROW** key to display the Options menu.

```
OPTION:
1= SET SENSOR ID
2= STATUS-DEG F
3= STATUS-DEG C
```

3. Press the **RIGHT ARROW**, and press **2** to view temperatures in degrees Fahrenheit or **3** to view temperature in degrees Celsius. Press **DOWN ARROW** twice to navigate to the Enter Starting Board Address screen.

```
ENTER STARTING
BOARD ADDRESS
( 3 4 5 6 )
BOARD: 3
```

- The Enter Starting Board Address menu allows you to jump to Point 1 of the number of the "board" you wish to look at. The four board numbers reserved by this gateway are shown in parenthesis on line 3 of the screen. To view status of sensors on a "board," press **RIGHT ARROW**, the number of the board you wish to configure, **DOWN ARROW**, and **DOWN ARROW**.
- Point 1 of the board you selected in **step 4** should be visible. This screen will display the type of input this point is configured as, and the last recorded value of the sensor.

```
BOARD:  3
POINT:  1
TYPE :  TEMP
VALUE:  77.1
```

```
BOARD:  3
POINT:  2
TYPE :  DIGITAL
VALUE:  OFF
```

Use the **UP ARROW** and **DOWN ARROW** keys to scroll through all 64 "board and point" addresses on the RF Gateway.

If a point's value shows the message "NO UPDATE," this means the RF Gateway has not received a transmission from the RF Sensor for at least several minutes. Refer to *Appendix B* for troubleshooting information.

If a point's value shows the message "NOT CFG," this means the point you are viewing was never configured or commissioned and is essentially "empty." If this point is supposed to be commissioned, follow the instructions in **Section 6** to commission the point.

TIP: While viewing the status of points, if you wish to switch to viewing points on a different board, press F2 to navigate directly to the Enter Starting Board screen.

7.4.1. Viewing Update Counts

In addition to viewing the current values of all RF sensors and inputs with the HHT, you may also view how many sensor value updates the RF Gateway has received for a sensor. This will allow you to troubleshoot an RF Sensor by analyzing its performance over a period of time.

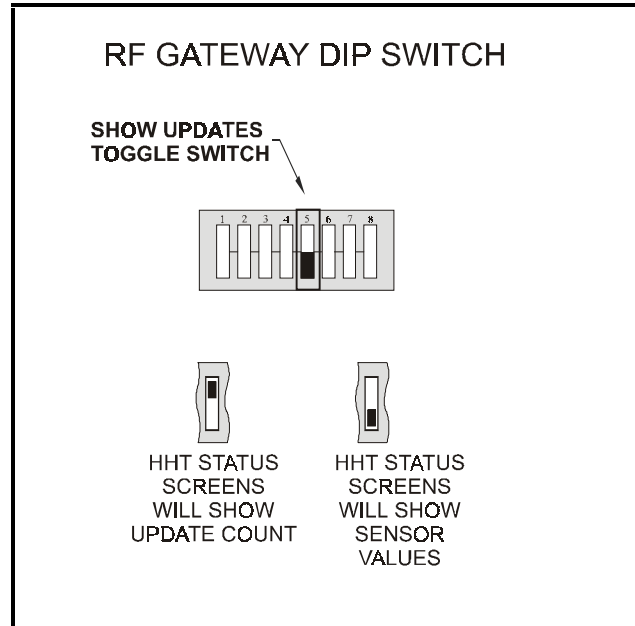


Figure 7-3 - Show Updates Dip Switch on RF Gateway

To make the HHT show sensor value updates, locate switch #5 on the RF Gateway dip switch, and set this switch to the ON position (**Figure 7-3**). The HHT will now show sensor update counts instead of temperature or digital input values on the status screens. Follow the instructions given in **Section 7.4., Viewing Status Using the Hand-Held Terminal**, to view update counts for each sensor.

```
BOARD:  3
POINT:  1
TYPE :  TEMP
VALUE:  862
```

The number in the VALUE field is the number of updates the RF Gateway has received from the commissioned sensor since the last time the sensor's count was reset to zero.

NOTE: The Show Updates switch does not affect the values being sent from the RF Gateway to the site controller. The RF Gateway will only send temperature values and digital input values to the site controller, not update count values.

7.4.1.1. Resetting the Sensor Update Count

The update count for a sensor can be reset in two ways. To clear an individual input's count, navigate to the input's HHT status screen and press CANCEL. The VALUE field should reset to zero. A power loss to the RF Gateway will reset all update counts back to zero.

7.5. RF Sensor Sleep Mode

Each RF Sensor is shipped from the factory in a deactivated state called Sleep mode. During Sleep mode, the sensor will not broadcast or do anything that will drain the battery.

Section 4.2. explains how to activate a sensor that is in Sleep mode. To return an active sensor to Sleep mode, press and hold the Service button on the sensor enclosure for **ten seconds**. The sensor's LED will flash twice to indicate the sensor has entered Sleep mode.

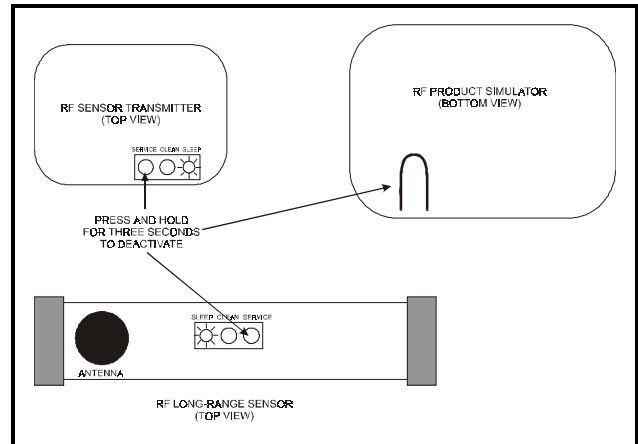


Figure 7-4 - Putting a Sensor in Sleep Mode

Site Controller Name	Standard Circuit Name	Sensor ID Sticker Number	Physical Location (Description)	Board #	Point #	Temp or Digital?
		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				
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		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				

Site Controller Name	Standard Circuit Name	Sensor ID Sticker Number	Physical Location (Description)	Board #	Point #	Temp or Digital?
		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				
		┌ - - - - ┐ └ - - - - ┘				
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		┌ - - - - ┐ └ - - - - ┘				
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Site Controller Name	Standard Circuit Name	Sensor ID Sticker Number	Physical Location (Description)	Board #	Point #	Temp or Digital?
		┌ - - - - ┐ └ - - - - ┘				
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