ZFR1800 Series Wireless Field Bus System Quick Reference Guide

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Refer to the QuickLIT Web site for the most up-to-date version of this document.

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Johnson Controls

ZFR1800 Series Wireless Field Bus System Quick Reference Guide

Introduction

This document is a high-level overview with specific reminders, meant **only** as a quick reference for field personnel. This document covers:

- *Designing and Planning the ZFR1800 Series Wireless Field Bus System*
- *Installing the ZFR1800 Series Wireless Field Bus System*
- *Commissioning the ZFR1800 Series Wireless Field Bus System*
- *Balancing the System*

For detailed information on specific topics, refer to the resources in *Related Literature*.

Acronyms

CCT = Controller Configuration Tool

BACnet® = Building Automation Control Network

FAC = Advanced Application Field Equipment Controller

FEC = Field Equipment Controller

IOM = Input/Output Module

MS/TP = Multidrop Serial Bus/Token-Passing

PAN = Personal Area Network

VMA = Variable Air Volume Modular Assembly

WEFC = Wireless-Enabled Field Controller (FEC, FAC, IOM, VMA)

ZCT = ZFR Checkout Tool

Designing and Planning the ZFR1800 Series Wireless Field Bus System

Ensure that the system is well designed with good line-of-sight communication paths and distances, according to the guidelines in the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295).*

One ZFR1811 router is required per field controller. This pairing of a router and an FEC, FAC, IOM, or VMA16 field controller is a Wireless-Enabled Field Controller (WEFC).

A ZFR1800 Series system consists of:

- up to eight ZFR1810 Wireless Field Bus Coordinators per field bus
- up to 35 Wireless-Enabled Field Controllers (WEFCs) per coordinator / PAN

- up to 100 WEFCs per field bus, depending on the network engine (32 with NCE, 50 with NAE35)
- up to nine WRZ Sensors per WEFC

Note: Up to 100 total WEFC and WRZ Sensors per PAN

- additional ZFR1811 Wireless Field Bus Routers connected to MS-ZFRRPT-0 Repeater accessories, as required, acting as repeaters

  Note: Repeaters extend the wireless transmission distance of the BACnet data communications, fill in any gaps within the wireless mesh network, and provide multiple wireless data transmission pathways.

For detailed information on location guidelines for a ZFR1800 Series system, and for estimating the number of ZFR1811 Routers needed as repeaters for extending wireless transmission range, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

In designing and planning the system, pay special attention to these points:

- Every WRZ Sensor should be within 15 m (50 ft) of at least two ZFR1811 Routers.
- Every ZFR1811 Router should be within 15 m (50 ft) of at least two other ZFR1811 Routers.
- The ZFR1810 Coordinator should be at the center of the mesh network and within 15 m (50 ft) of at least two ZFR1811 Routers.
- If any WRZ Sensor, ZFR1811 Router, or ZFR1810 Coordinator is not within 15 m (50 ft) of at least two other ZFR1811 Routers, then use ZFR1811 Routers and ZFRRPT Repeater accessories to function as repeaters to provide multiple wireless data pathways.

  Note: WRZ sensors **do not** act as repeaters in the ZFR1800 Series Wireless Field Bus System.
- The maximum distance between the ZFR1810 Coordinator and the farthest ZFR1811 Router/Repeater should be less than 76.2 m (250 ft).
- Transmissions may use up to ten hops to transmit data to the coordinator; transmissions that require more than ten hops do not reach the coordinator due to network restrictions. A hop is the movement of data from one wireless device in the network to another wireless device in the network.

- When a wireless mesh network forms, each device receives an address from its parent. The addressing algorithm can extend up to 5 addresses in depth from the coordinator. Refer to Figure 1.

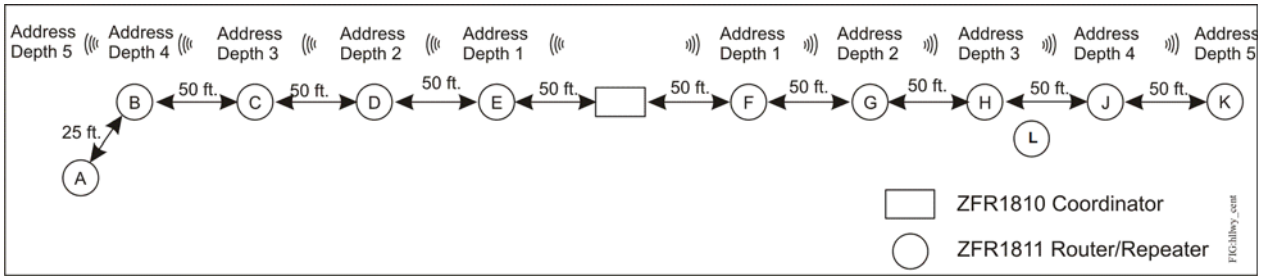

Figure 1: Address Depths

Note: Sensor devices cannot communicate directly with routers at depth 5. They must be able to join the mesh at depth 4 or lower. For example, suppose a WRZ sensor is physically located in the same room as its VMA with **Address K** at depth 5. Since **Address K** cannot support any sensors directly, the sensor must be within range of **Device J** at depth 4 and send its data to **Device J**, which then forwards it to **Address K**.

Note: When a router joins the mesh, it does so based on the availability and signal quality of other devices around it at that point in time. For example, although **Device L** is physically located in the proximity of **Device H,** it may get its address from **Device J** when it joins, making it a depth 5 device and effectively limiting the growth of the mesh from that point.

The effective transmission range and signal quality varies because of wireless signal absorption and reflection due to metal obstructions, walls, ceilings, floors, and furniture found in typical building interiors.

Transmission ranges between ZFR1800 Series products may be less than the maximum distances shown in Table 1.

Table 1: Indoor Line-of-Sight Transmission Ranges

Range Type	Transmission Distance	
	ZFR1810 Coordinator, ZFR1811 Router/Repeater	**WRZ Series Sensor**
Recommended	15.2 m (50 ft)	15.2 m (50 ft)
Maximum, Line of Sight	76.2 m (250 ft)	30 m (100 ft)

Note: Use the optional, battery-operated WRZ-SST-120 Wireless Sensing System Tool with any model WRZ Series Sensor as a site survey tool to determine the wireless signal strength between potential locations of ZFR1800 or WRZ devices to survey your application and adjust device locations before permanently installing the devices. Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (Part No. 24-10563-12)* for more information on the tool.

Installing the ZFR1800 Series Wireless Field Bus System

Ensure that the physical installation of the ZFR1810 Coordinator and all the ZFR1811 Routers/Repeaters have good line-of-sight communication paths (wherever possible), good wired connections, and correct DIP switch settings per the guidelines in the following documents:

- *ZFR1810 Wireless Field Bus Coordinator Installation Instructions (Part No. 24-10325-2)*
- *ZFR1811 Wireless Field Bus Router Installation Instructions (Part No. 24-10325-10)*
- *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*

Pay special attention to these points:

- Mount all ZFR1811 Routers/Repeaters and the antenna of the ZFR1810 Coordinator in the same horizontal plane where possible, preferably just above the ceiling panels. See Figure 2.

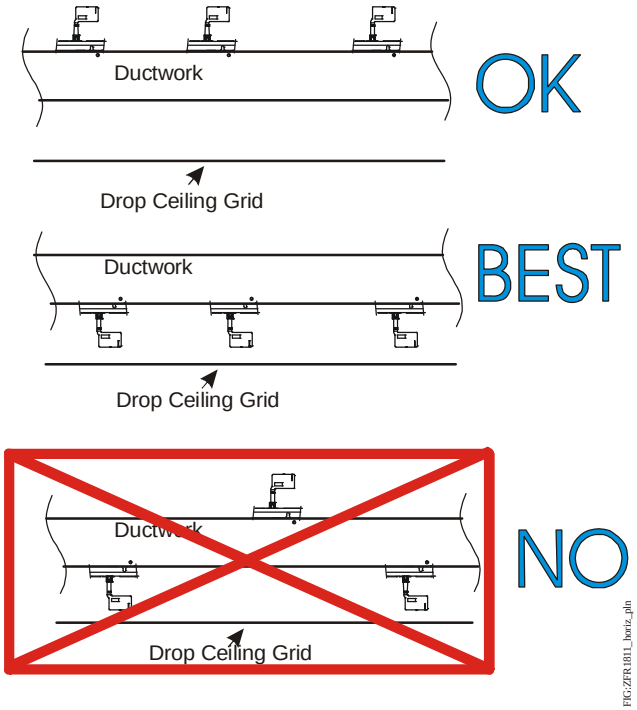

Figure 2: Mount ZFR1811 Routers/Repeaters in the Same Horizontal Plane Below Pipes, Duct Work, or Metal Obstructions

- For best signal transmission, vertically orient the ZFR1811 Router/Repeater or the ZFR1810 Coordinator's antenna with at least 50 mm (2 in.) exposed below (and clear of) any pipes, duct work, or other metal obstructions.

  Do not mount a ZFR1811 Router/Repeater or the ZFR1810 Coordinator's antenna in a horizontal orientation.

When mounting the ZFR1811 Router/Repeater or the ZFR1810 Coordinator's antenna to an enclosure, mount it to the top, bottom, or side of the enclosure. See Figure 3.

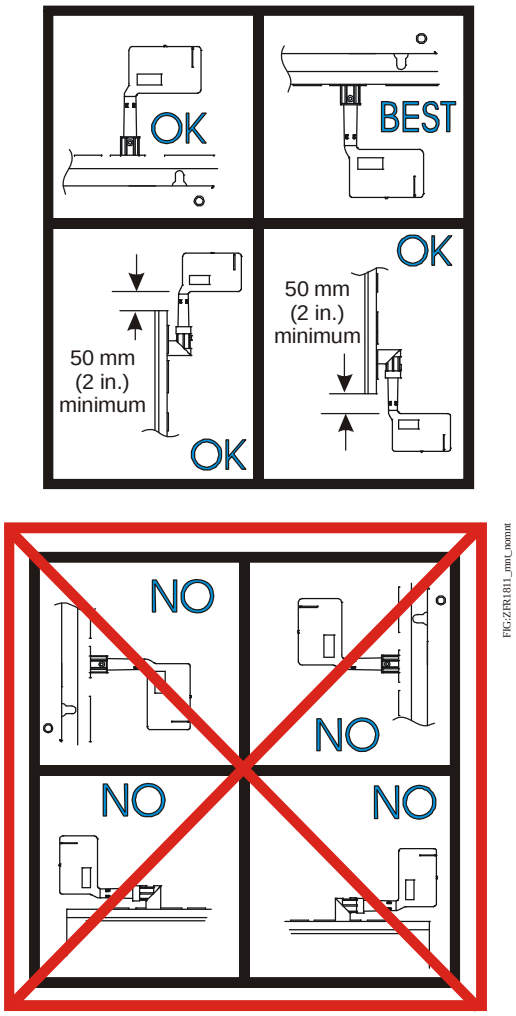

Figure 3: Proper and Improper Mounting Orientations

- Do not mount the ZFR1810 Coordinator's antenna or the ZFR1811 Router/ Repeater in recessed areas, metal enclosures, or shelving units.
- Avoid configurations where a microwave oven is located between two wireless devices. Avoid locating the ZFR1810 Coordinator near areas that may contain a microwave oven, such as an employee break area or cafeteria. At a minimum, ensure that no microwave ovens are within 6 m (20 ft) of a ZFR1810 Coordinator.
- Locate the ZFR1810 Coordinator's antenna and the ZFR1811 Router/Repeater in line-of-sight with as many ZFR1811 Routers/Repeaters and WRZ Sensors as possible. Ensure that the line-of-sight is clear of duct work and that metal studs or I-beams are at least 30 to 61 cm (12 to 24 in.) from the antenna end of the ZFR1811 router.

- Locate the ZFR1810 Coordinator on the same floor as the associated ZFR1811 Routers/Repeaters and WRZ Sensors and as close as possible to the center of the wireless mesh.
- Connect the ZFR1811 router to the correct jack on the field controller. Refer to the *ZFR1811 Wireless Field Bus Router Installation Instructions (Part No. 24-10325-10)*.
- Select PAN Addresses that are unique within the site.
- Select PAN Addresses that result in unique MS/TP addresses for each ZFR1810 Coordinator on a trunk. We recommend that you set the PAN addresses of multiple ZFR1810 coordinators on the same trunk sequentially to guarantee that each ZFR1810 has a unique MS/TP Address on the bus. Refer to the *ZFR1810 Wireless Field Bus Coordinator Installation Instructions (Part No. 24-10325-2)* and *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

Note: Once the PAN has been selected and other devices start to join the network, do not change the PAN switches to another value and then back again. Changing the PAN switches causes that device to clear its network information, resulting in abandoned children. This can lead to duplicate network (short) addresses and controller online/offline toggling.

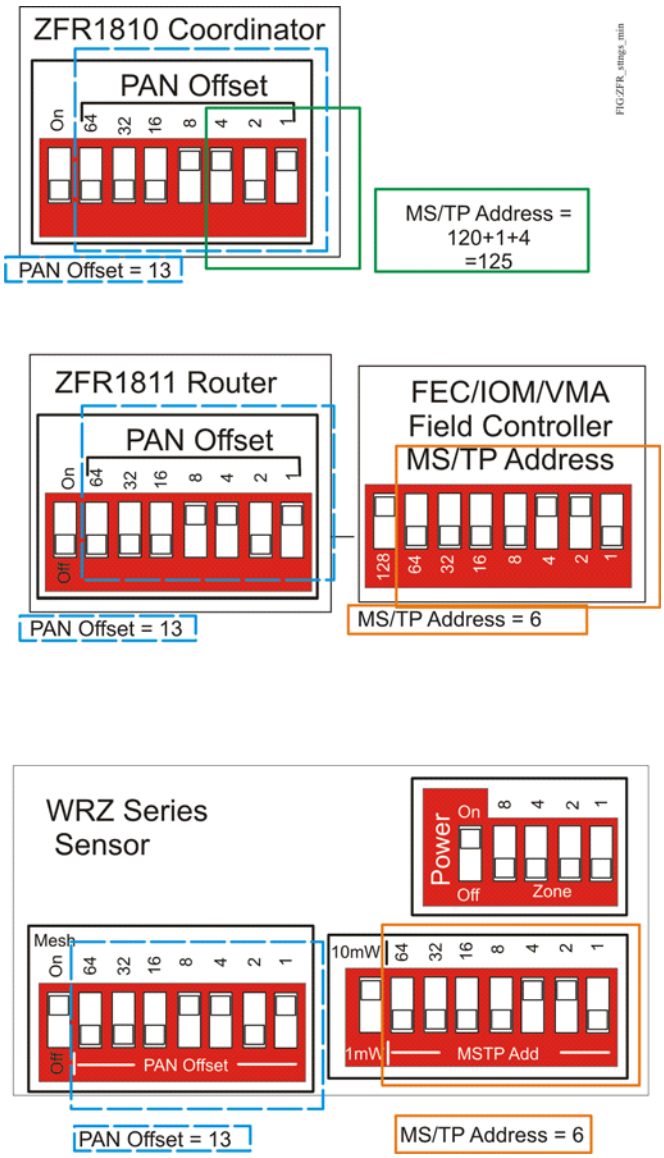

Figure 4: Sample DIP Switch Settings

Commissioning the ZFR1800 Series Wireless Field Bus System

Once a ZFR1800 Series System has been planned and installed according to the guidelines in *Designing and Planning the ZFR1800 Series Wireless Field Bus System* and *Installing the ZFR1800 Series Wireless Field Bus System*, use these steps to commission the system.

1. Power the system and verify communications in the ZFR1800 Series Wireless Field Bus System using the Signal Strength (ZFR1810 Coordinator) or Status (ZFR1811 Router/Repeater) LEDs.
   a. Remove the ZFR1810 Coordinator from the wired MS/TP bus before starting the wireless network and verifying wireless communications.
   b. Power up the ZFR1810 Coordinator.
   c. Power up the ZFR1811 Routers/Repeaters.
   d. **Do not** power up the WRZ sensors.

   Note: Turning on the WRZ sensors before the wireless mesh is formed and operating can deplete the battery prematurely as the WRZ sensor tries to find the mesh network.

   e. Wait 5 to 15 minutes for the mesh network to form. After the network forms, the Signal Strength (ZFR1810 Coordinator) or Status (ZFR1811 Router/Repeater) LEDs should show the two or three-flash pattern indicating good signal strength.

Table 2: ZFR1810 Coordinator Status LEDs

Name	Color	Normal	Descriptions
Wireless	Green	flash	**flash - 2 Hz** = Normal operation (ZFR1810 Coordinator is receiving BACnet frames over the wire). **Off Steady** = Not receiving BACnet frames. **On Steady** = Stopped receiving BACnet frames.
Signal Strength	Green	**Signal Strength**[1] **Indication**: **3 flashes** - Excellent **2 flashes** - Good **1 flash** - Weak **OFF for 3 seconds** - None	**OFF Steady** = Not able to start a network. **ON Steady with Signal Strength displayed once every 10 seconds** = Normal operation (ZFR1810 Coordinator is a member of a wireless network).

1. Signal Strength appears once every 10 seconds or when the Network Optimize/Reform button on the ZFR1810 Coordinator is depressed momentarily (less than 5 seconds).

Table 3: ZFR1811 Router Status LED

Name	Color	Signal Strength Indication[1]	Descriptions
Signal Strength	Green	**3 Flashes** - Excellent **2 Flashes** - Good **1 Flash** - Weak **OFF for 3 seconds** - None	**OFF Steady** = No power (or normal operation for more than 2 hours). **OFF Steady with 1 Flash every 10 seconds** = ZFR1811 Router is not a member of a wireless network, invalid PAN OFFSET setting, no ZFR1810 Coordinators or ZFR1811 Routers in area. **ON Steady with Signal Strength displayed once every 10 seconds** = ZFR1811 Router is a member of a wireless network. **OFF Steady with Signal Strength displayed once every 10 seconds** = Wireless network is actively communicating, but ZFR1810 Coordinator cannot be reached (for example, coordinator lost power). **Rapid Flashes for 5 minutes** - rapid flashes occur for up to 5 minutes: • when the Reform Network option is initiated to the network, the ZFR1811 router disconnects itself from the network • when the PAN OFFSET is changed on the ZFR1811 router • when the PAN OFFSET is changed on the ZFR1811 router after it has already joined another PAN • when you change the channel mask using CCT. For example, you might change the channel mask to force the network to a specific channel. It would be better to force the channel change through the engineering view of the coordinator at the NAE. However, it can take up to an hour for all the devices in the PAN to locate the coordinator on the new channel.

1. The Signal Strength LEDs on all the ZFR1811 routers in a network extinguish after approximately 2 hours of normal operation, making the ZFR1811 less distracting when installed in an open area. To re-enable the ZFR1811 LEDs for troubleshooting purposes, perform a scan using the ZCT or push the Network Optimize Push Button on the ZFR1810 coordinator for 2 -3 seconds.

- If a ZFR1810 Coordinator shows poor signal strength, you may improve the signal strength by moving the device's antenna a couple of inches in either horizontal direction.

If you cannot complete Step 1, review the information in *Designing and Planning the ZFR1800 Series Wireless Field Bus System* and refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295*).

For more information, refer to the following documents:

- *ZFR1810 Wireless Field Bus Coordinator Installation Instructions (Part No. 24-10325-2)*
- *ZFR1811 Wireless Field Bus Router Installation Instructions (Part No. 24-10325-10)*

2. Use the ZFR Checkout Tool (ZCT) to perform a scan of the mesh.
   a. Ensure all controllers and repeaters are communicating on the ZFR system mesh. (Refer to the *Troubleshooting* section in the *ZFR1800 Series Wireless Field Bus System Technical Bulletin [LIT-12011295]).*
   b. Select the Status Tab and ensure everything in the Device Status column is green.
   c. Select the Routing Tab and verify there are no controllers requiring more than five hops to communicate with the ZFR1810 coordinator.

d. If new devices are failing to join the network, or if the ZCT indicates abandoned children or duplicate short addresses, you may benefit from reforming the network using the Commands > Reform Network menu item. Devices should come online in 5 to 15 minutes. **Be careful** with network reforms. If all the devices are not online, a reform can make things worse, particularly if done too frequently. A good practice during startup commissioning is to reform nightly as you leave the site, which allows the mesh to stabilize by morning.

Note: Disconnect the NAE from the MSTP network before initiating a reform. The extra communication traffic that the NAE attempts while the ZFR PAN is in this mode can be very disruptive, causing the reform to take longer or fail.

Note: The Signal Strength LED on the ZFR1811 Routers flash rapidly for 5 minutes when the Network Reform command is received. See Table 3.

For more information on the ZCT, refer to the *Using the ZFR Checkout Tool (ZCT)* chapter of the *Controller Tool Help*.

3. Use the Controller Configuration Tool (CCT) to check addressing and versions of all wirelessly enabled devices on the trunk.

   a. Use the MS-BTCVT-0 Wireless Commissioning Converter at the FC/SA Out Bus connection of the coordinator.

   Note: Use a six-wire phone extension cable (less than 100 ft long), such as CBL-NETWORK025, to place the Wireless Commissioning Converter in a convenient location.

   b. In CCT 10.0 and earlier, use Tools > Controller Information to ensure that the radio firmware on each ZFR1811 Router and the boot firmware and main firmware on each associated field controller is at the same version on each WEFC in the mesh network. Note the devices that are not compliant; this is required in Step 4. **This is no longer a requirement at CCT10.1, WEFC firmware version 6.2,** and above.

Note: The ZFR1811 router Radio Firmware updates with the main code download. Ensure that the ZFR1811 router is connected to the associated controller during the main code download so that the radio firmware updates.

   c. Remember that the MS/TP trunk can support a mix of wireless controller and wired controller versions.

   d. Ensure that the ZFR1810 Coordinator version is equal to or higher than the version of each WEFC.

   e. Ensure that the Supervisory Controller (NxE) version is equal to or higher than the ZFR1810 Coordinator version in order to take advantage of all features in a controller.

For more information on CCT, refer to the Controller Tool *Help (LIT-12011147)*. For information on uploading or downloading devices firmware, refer to the *Loading Devices* chapter of the Controller Tool *Help*.

4. Use Point Schedule to mass-download controllers.

Note: You can also use CCT to download controllers individually or use CCT Trunk utilities to mass-download controllers. See *Upgrading Field Devices* on page 27.

   a. Ensure all ZFR1810 Coordinators are connected to the Field Bus to allow for mass download of all controllers (wired and wireless) of one model type (FEC, IOM, VMA).

   Note: Prior to Release 5.1, download only one controller model at a time.

   b. Plug the MS-BTCVT-0 Wireless Commissioning Converter into the ZFR1810 Coordinator at the FC/SA Out Bus connection.

   c. Download the boot firmware for each controller with Point Schedule, based on the findings of Step 3 (mismatched versions).

   Note: Ensure that all controllers have downloaded the boot firmware successfully before downloading the main and application firmware.

   d. Download the main and application firmware for each controller with Point Schedule, based on the findings of Step 3 (mismatched versions).

   Note: During a mass download of controllers, you may experience an occasional download failure. Retry the download of those failed controllers before using the troubleshooting process.

   Note: The controller Fault LED may have a fast flash if the SA bus device is offline. This is normal as the WRZ sensors are defined in the application, but are not yet powered and communicating.

   Note: A Main code download may take more than 2 hours, based on the number of controllers.

   For more information on using Point Schedule to download controllers, refer to the Controller Tool *Help (LIT-12011147)*.

5. Turn on WRZ Sensors using the power DIP switch (see Figure 4). The sensors locate the nearest parent device on the wireless mesh within 15 minutes.

   For more information on WRZ sensors, refer to the *WRZ Series Wireless Room Temperature Sensors Installation Instructions (Part No. 24-10332-2)*.

6. Use ZCT to perform a scan of the mesh network to ensure all sensors are online.

   a. Check the Sensor Status column to ensure all devices are online and are green.

b. If any sensors have not come online, initiate a signal strength test. Press and hold the manual occupancy override button on the WRZ Series Sensor for 2 seconds or more, then release the button. After you release the button, the signal strength code displays.

Table 4: WRZ Sensor to ZFR1811 Router Wireless Signal Strength

Flashes	Signal Strength
3	Excellent/Sensor has joined network
2	Good/Sensor has joined network
1	Weak/Sensor has joined network
0	None/Sensor has not joined network
Rapid Flash Rate (8)	Unable to locate associated wireless-enabled field controller

On LCD models, the signal strength is shown on the display on the face of the sensor (callout in Figure 5).

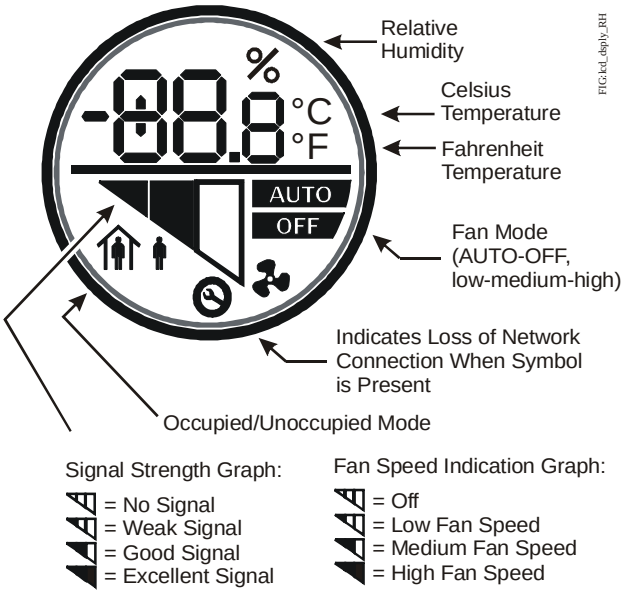

Figure 5: Sensor LCD (WRZ-MTB, WRZ-STR, WRZ-THB, WRZ-TTB, and WRZ-TTD Models)

For more information on the ZCT, refer to the *Using the ZFR Checkout Tool (ZCT)* chapter of the CCT *Help (LIT-12011147)*.

7. Verify the MS/TP wired trunk communications.
   a. Connect all of the ZFR1810 coordinators and other devices to the MS/TP wired trunk.
   b. If a Network Automation Engine (NAE) is available, log on to the NAE and check that all controllers and sensors are online and updating. If no NAE is available, use the Point Schedule utility.
8. Continue with your normal system commissioning procedure.

Using the ZFR Wireless USB Dongle

The LED on the ZFR USB Dongle is used to show connection status to a wireless mesh in addition to wireless activity. The LED illuminates solid after successfully joining the mesh. The LED flashes while communication packets are being sent wirelessly from the dongle to a ZFR system mesh. A small pinhole button on the ZFR USB dongle is reserved for future features.

Setting ZFR Wireless USB Dongle Parameters in CCT

Use the Load Device dialog box in CCT to set wireless connection parameters.

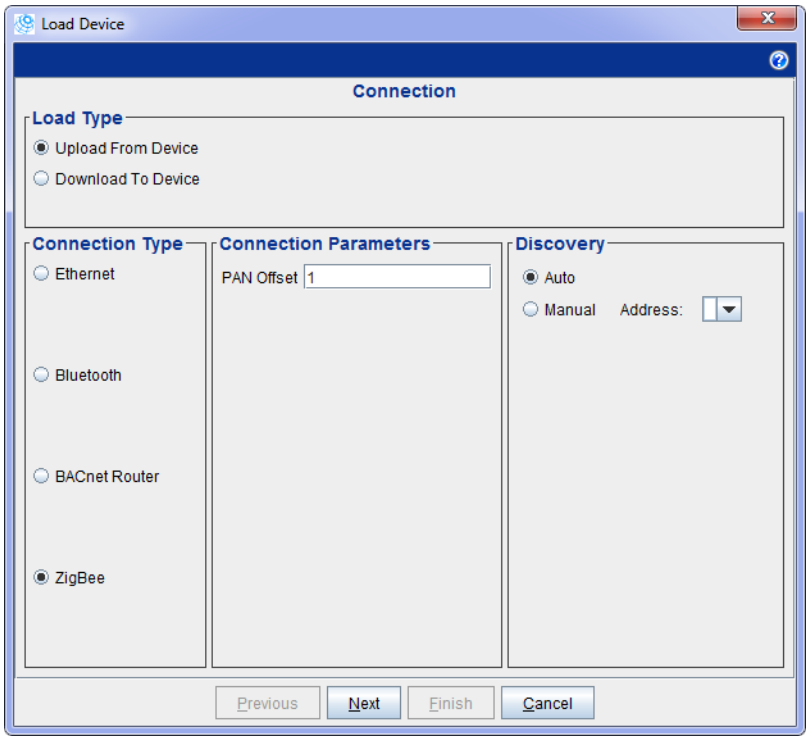

Figure 6: CCT Load Device Screen

1. Insert the ZFR USB dongle in an available USB port.
2. Because the dongle does not connect to the mesh at the ZFR1810 Coordinator, you should locate the laptop near a router or repeater with an available address. Depending on the mesh, you may need to relocate the laptop to another location to connect to the mesh.
3. Select the Zigbee connection type.
4. Enter the PAN ID of the wireless mesh you want to join.
5. Click Next.

   The ZFR USB dongle LED flashes rapidly (approximately 3 times a second) until it successfully joins the mesh. The LED illuminates solid after successfully joining the mesh. The LED flashes during communication with wirelessly enabled field controllers.

If the ZFR USB dongle cannot join the mesh after 1 minute, the LED turns off. Refer to the *Troubleshooting* section of the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* to diagnose why the ZFR dongle could not join the wireless mesh.

Setting ZFR Wireless USB Dongle Parameters in ZCT

Use the main screen of ZCT to set wireless connection parameters.

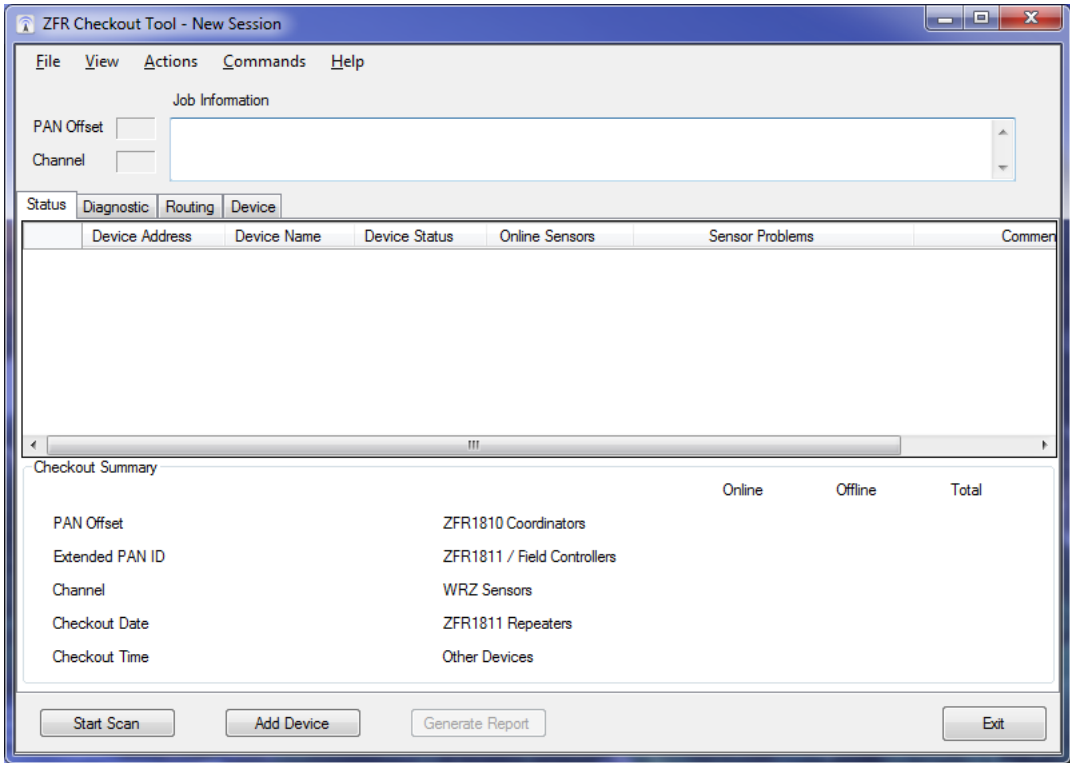

Figure 7: ZCT Load Device Screen

1. Insert the ZFR USB dongle in an available USB port.
2. Because the dongle does not connect to the mesh at the ZFR1810 Coordinator, you should locate the laptop near a router or repeater with an available address. Depending on the mesh, you may need to relocate the laptop to another location to connect to the mesh.
3. Click **Start Scan**. The Scan Configuration dialog box appears.

Note: Refer to the ZCT section of the Controller Tool *Help (LIT-12011147)* for further information about the options available in the Scan Configuration dialog box.

4. Enter the PAN ID of the wireless mesh you want to join.
5. Select the ZFR system mesh channel number if it is known. Otherwise, leave this parameter set to Auto. Entering a known channel number can decrease the amount of time it takes to connect to the wireless mesh.

6. Click **Scan** to connect to the mesh. The ZFR USB dongle LED flashes rapidly (approximately 3 times a second) until it successfully joins the mesh. The LED illuminates solid after successfully joining the mesh. The LED flashes during communication with wirelessly enabled field controllers.

   If the ZFR USB dongle cannot join the mesh after 1 minute, the LED turns off. Refer to the *Troubleshooting* section of the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* to diagnose why the ZFR dongle could not join the wireless mesh.

Balancing the System

For best results, use:

- CCT Commissioning Only with the MS-BTCVT-0 Wireless Commissioning Converter at the ZFR1810 Coordinator
- CCT Passthrough (ADS/ADX or NAE)

You can also use CCT Commissioning Only with the ZFR USB Adapter (dongle), but we do not recommend this method at this time.

Related Literature

Table 5: Wireless Metasys® System Related Documentation

For Information On	See Document
Applications, Features, and Benefits of the ZFR1800 Series Wireless Field Bus System	*ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*
Using the WRZ-SST Series Wireless Sensing System Tool with a WRZ Series Sensor to Perform a Site Survey for Pre-determining Potential Locations for Installation, and to Test Wireless Signal Strength In Advance of ZFR1800 Series System Installation	*WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (Part No. 24-10563-12)*
Planning the Layout of a ZFR1800 Series System	*ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*
Locating and Installing a ZFR1810 Coordinator	*ZFR1810 Wireless Field Bus Coordinator Installation Instructions (Part No. 24-10325-2)*
Locating and Installing a ZFR1811 Router	*ZFR1811 Wireless Field Bus Router Installation Instructions (Part No. 24-10325-10)*
Locating and Installing WRZ Wireless Sensors	*WRZ Series Wireless Room Sensors Installation Instructions (Part No. 24-10332-2)*
	WRZ-STR0000-0 Wireless Refrigerator/Freezer Temperature Transmitter and Probe Assembly Installation Instructions (Part No. 24-10332-10)
Commissioning, Configuring, Operating, and Troubleshooting the ZFR1810 Coordinator, ZFR1811 Routers, WRZ Wireless Sensors, and the ZFR1800 Series Wireless Field Bus System	*ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*
Testing Wireless Signal Strength, Locating WRZ Series Sensors and ZFR1811 Routers	*ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*
Troubleshooting MS/TP Communications Bus (FC bus) Issues	*MS/TP Communications Bus Technical Bulletin (LIT-12011034)*
Using the MS-BTCVT-1 Wireless Commissioning Converter to Connect to Wireless-Enabled Field Controllers (WEFCs)	*Wireless Commissioning Converter Installation Instructions (Part No. 24-10108-2)*
Analyzing and Troubleshooting the Wireless Network Created by the ZFR1800 System	*Controller Tool Help (LIT-12011147)*

Appendix: Wireless Upgrade

This appendix is a high-level overview of how to upgrade wireless trunks at a site using Metasys Release 5.3 or higher version CCT. This appendix covers:

- *Planning for Site Upgrade*
- *Upgrading a Site*
- *Troubleshooting*

For more detailed information on specific topics, see the *Wireless Metasys® System Related Documentation* table.

For upgrading, Release 10.1 version CCT and the Trunk Utilities feature allow you to do the following:

- Download single files and attributes to multiple controllers
- Download Multiple CAFs
- Read/Write Attributes online
- Manage Attribute Templates
- Upload Multiple CAFs

  Note: This feature is not recommended for use with wireless devices.

- Upgrade Multiple CAFs

It is beyond the scope of this document to describe step-by-step procedures for using this feature. The Trunk Utilities feature is covered extensively in Controller Tool *Help (LIT-12011147)*. In CCT, go to Help > Topics, and select *Working with Trunk Utilities* (Figure 8).

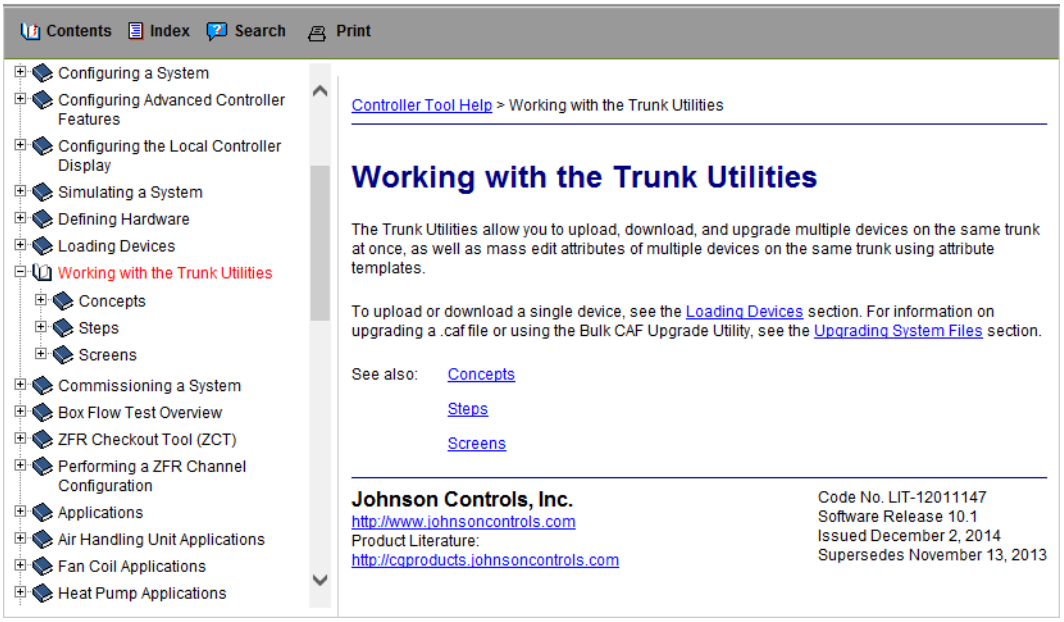

Figure 8: CCT Help Trunk Utilities Topic

Note: We do not recommend using the full functionality of Trunk Utilities with wireless devices at this release. However, the use of Trunk Utilities features included in this document are acceptable with wireless devices at this release.

Planning for Site Upgrade

When upgrading a site, it is important to appropriately estimate the time it takes to complete the upgrade process. Large sites may take several days to upgrade. In order to facilitate a seamless upgrade, plan your site visit so that large site upgrades can be broken up into several days if required.

When planning for your site visit, keep in mind the following time estimates for downloads:

- Boot Code for a single controller may take up to 2 minutes.
- Main Code for a single controller may take up to 8 minutes. When upgrading multiple WEFCs on a PAN, multiple controllers of the same model are automatically updated simultaneously to decrease the overall upgrade time.
- Application Code for a single controller may take up to 5 minutes.

Before arriving on site, ensure your technician laptop has CCT 10.1 installed. The set of procedures included in this appendix **only** covers upgrading using Release 10.1 of CCT.

Upgrading a Site

Upgrading a site to the next revision of Metasys software is a multi-procedure process. This appendix provides a high-level overview of these procedures. This appendix is not a replacement for respective device, controller, or software installation instructions or other upgrade related literature. For more information on specific devices, controllers, or software, see the *Wireless Metasys® System Related Documentation* table.

The following procedures describe upgrading a site that has wireless devices. These procedures are similar to upgrading wired devices; however, the procedures included in this appendix incorporate newly added functionality of the Release 10.1 version of CCT. Some of the functionality of the NAE Point Schedule is replaced in this version of CCT with the Trunk Utilities feature.

Note: We recommend upgrading the firmware in each ZFR1810 on the MS/TP bus before upgrading the other wireless devices.

If you are upgrading a site using a version of CCT prior to Release 5.3, you must use the NAE Point Schedule to upgrade the site. Refer to the NAE Point Schedule *Help* and other FSC provided literature.

Connecting to a Wireless Trunk

To begin the wireless upgrade process, use a Wireless Commissioning Converter (BTCVT) to connect to any ZFR1810 Wireless Field Bus Coordinator connected to a trunk (Figure 9).

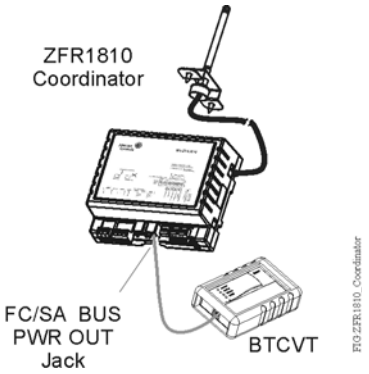

Figure 9: Converter Connected to ZFR1810 Wireless Field Bus Coordinator

For more information on using the Wireless Commissioning Converter, refer to the *Wireless Commissioning Converter Installation Instructions (Part No. 24-10108-2)*.

Connecting to a trunk using the Wireless Commissioning Converter is the preferred method. Disconnect the MSTP trunk from the NAE during firmware and application downloads to decrease the wireless network traffic and improve the download success rate. If this method is not available, use the Ethernet NAE Passthrough to connect to a trunk.

The least preferable method is to use the ZFR USB dongle to connect to a trunk. You can use this method to read controller information and upgrade Application Code. However, **we do not recommend** it for use when upgrading Main Code to field controllers.

Completing Trunk Analysis

Once you connect to a trunk, you can begin the upgrade process by completing a trunk analysis and recording trunk information gathered during analysis.

Note: The upgrade process is completed on a trunk-by-trunk basis. The procedures included in this appendix detail upgrading a trunk. The procedures need to be repeated for every trunk you wish to upgrade.

To complete a trunk analysis, take a snapshot of the present condition of the trunk using the Metasys SMP UI. Record the information captured in the Bus Health Index and Bus Performance Index.

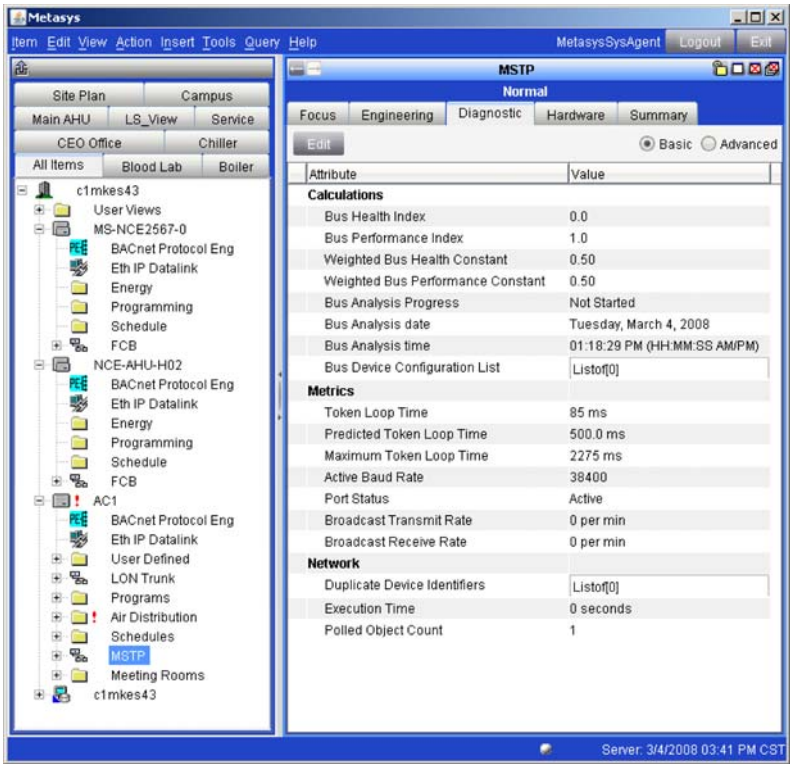

Figure 10: Metasys SMP UI Displaying Bus Health Index and Bus Performance Index

For more information on appropriate parameters and their impact on the upgrade process, refer to the *MS/TP Communication Bus Technical Bulletin (LIT-12011034)*.

After recording the Bus Health Index and Bus Performance Index, you should run a wireless scan on the wireless mesh associated with the trunk. Use the ZCT Tool to perform this analysis.

To launch the ZCT Tool, in CCT, go to Tools > Wireless > ZFR Checkout Tool.

Note: To complete this part of the analysis, you need to use the ZFR USB Dongle (ZFR-USBHA-0).

During the wireless mesh analysis, note any detected weak signal strength between any controllers in the mesh. Keep in mind any weak signals impact the time it takes to upgrade a trunk.

If new devices fail to join the network, you may want to try reforming it. View the **Associated Children** table in ZCT. If a router has 0 children available, new devices cannot join the network through the router. This is expected if the router already has the maximum number of devices. However, if the router does not have the maximum number of devices, the router has too many abandoned children, and a reform is warranted.

Next, after completing a wireless scan of the wireless mesh, you can continue your trunk analysis by taking a snapshot of controller information for your and the customer's records.

To capture controller information:

1. Ensure that you are connected to the trunk using the Wireless Commissioning Converter (BTCVT). You can also connect to the trunk using Ethernet NAE Passthru.
2. In CCT, go to Tools > Controller Information. The Controller Information Wizard appears. The wizard auto-discovers all devices (wired and wireless) on the trunk.

   Note: Multiple ZFR1810 Wireless Field Bus Coordinators may be present on a trunk. Several coordinators may appear. All coordinators on a trunk can be upgraded in parallel.

3. Once the wizard completes auto-discover, a complete list of all devices appears (Figure 11). The list includes controller information, such as device name, description, type, and status. Hold CTRL and click all rows to select all the devices listed. Click **Copy to Clipboard**.

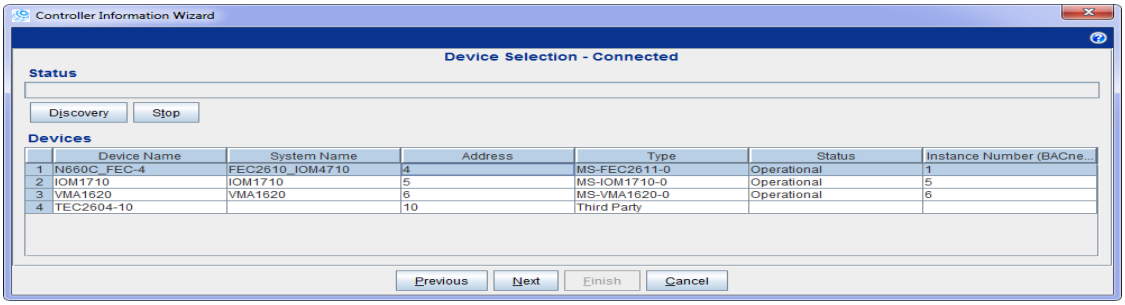

Figure 11: Controller Information Wizard

Note: Note the Main Code, Boot Code, and Radio Code firmware versions.

4. Open Microsoft® Excel, and paste the information copied from the Controller Information Wizard to a spreadsheet. Save this spreadsheet for your and the customer's records. Repeat this process at the end of the upgrade for comparison and for supplying the customer with a record of a completed site upgrade.

Before you complete this portion of the upgrade procedure, execute standard upgrading procedures, such as running reports for Offlines, Overrides, and Alarms. Save and back up these reports for your and the customer's records.

Uploading CAF Files

1. Go to Tools > Trunk Utilities > Upload Multiple Controllers.

2. The Trunk Utilities Wizard auto-discovers all of the devices on a trunk (wired and wireless). Click **Next** when auto-discover is complete.

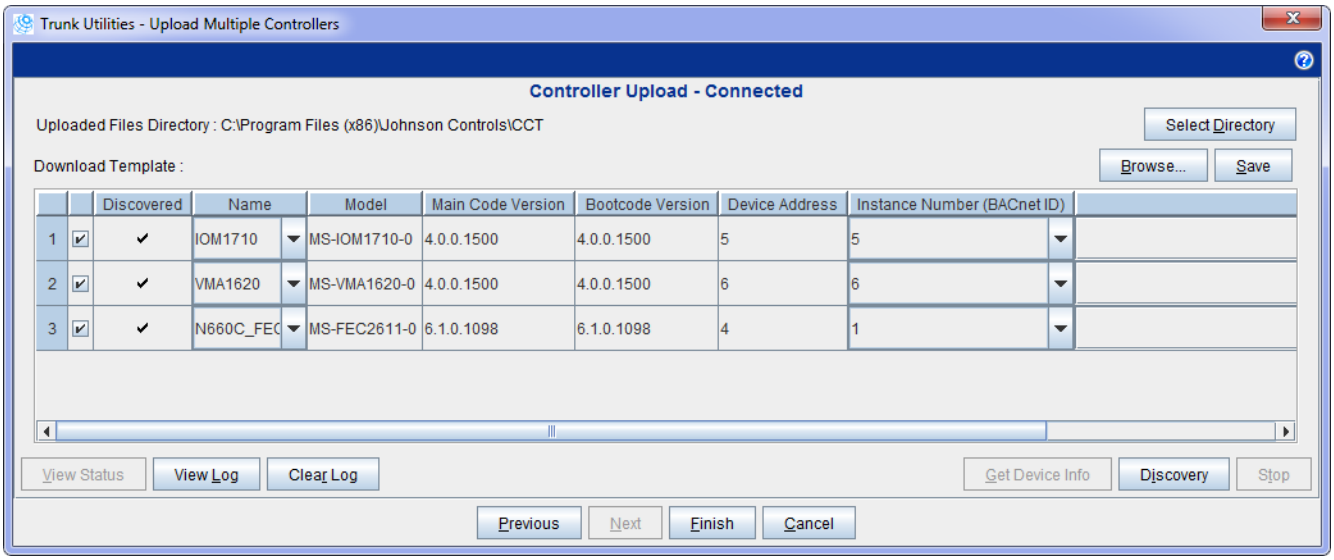

Figure 12: Trunk Utilities Upload Multiple CAF Window

3. The Controller Upload screen appears. To change the default destination folder for uploaded files, click **Browse** and select the desired directory location.

   Note: For the field, a typical preferred directory location is [Job_Name]/[Supervisory_Controller]/Trunk_Number.

4. Click **Finish** to upload the CAF files to the directory denoted in Step 3. The CAF files are named [System_Name_address].caf, and files with the same name are overwritten.

5. After the upload is complete, click **View Status** and **View Log**. Copy the information captured in both files, and save to a document for use in a final report for your and the customer's records.

6. Back up all uploaded CAF files and move the backup to a safe location.

Upgrading CAF Files

Once you have uploaded the CAF files, you can upgrade the files using CCT.

1. Go to Tools > Bulk CAF Upgrade Utility.

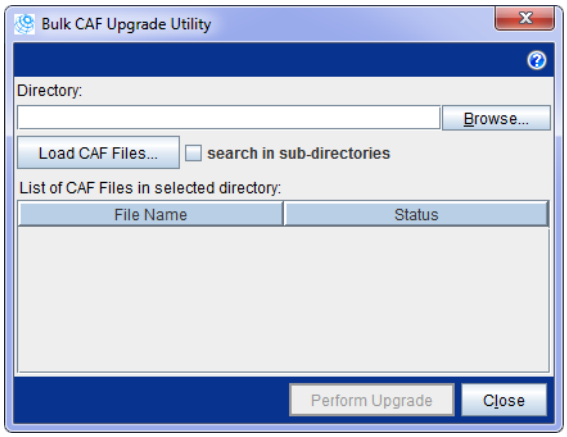

Figure 13: Bulk CAF Upgrade Utility Window

2. Browse to the directory containing the previously uploaded CAF files. Click **Open**.
3. Click **Load CAF Files**.
4. A list of CAF files and their status appears in the Bulk CAF Upgrade Utility window. Click **Perform Upgrade**.

Attribute Template Files

If there are multiple controllers on a trunk with the same base Application Code, it is optimal to use the Attribute Templates provided in CCT. This feature allows you to upload or download the same Application Code to multiple controllers. This feature also reads or writes individual parameter values into the Application Code as defined by in the template.

To create a new template in CCT, go to Tools > Trunk Utilities > Manage Attribute Templates. Figure 14 shows an example of an Attribute Template.

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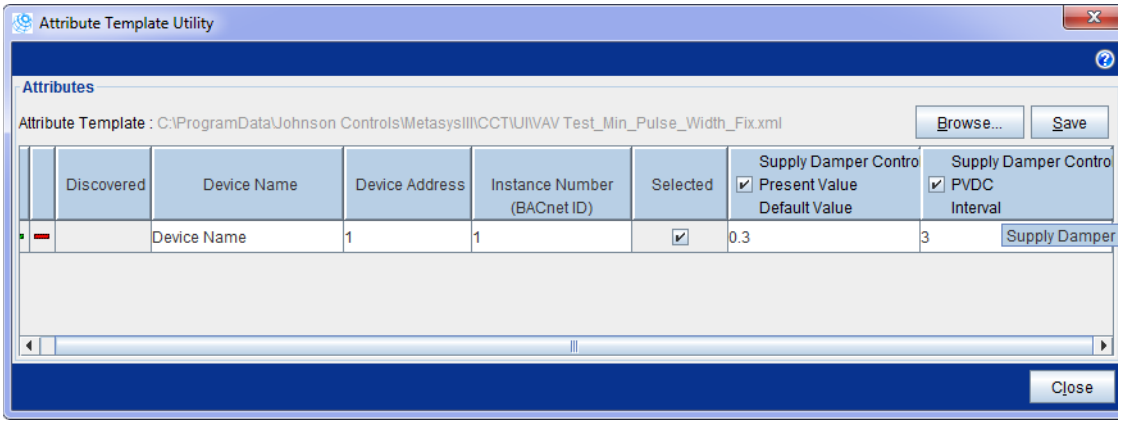

Figure 14: Attribute Template Example

To populate the Attribute Template with data, go to Tools > Trunk Utilities > Read/Write Attributes. The wizard auto-discovers devices, and you can manually select any number of devices to apply the Attribute Template to.

Click **Browse** to open the desired template file. Click **Read Attributes** to read the values from the devices selected in the previous step.

Note: During the read process, new rows are added automatically to the Attribute Template for each controller discovered. You do not need to manually add rows for each controller when building an Attribute Template.

To save the template, click **Save**. Close the Attribute Template Utility by clicking **Close** before proceeding.

Upgrading the ZFR1810 Wireless Field Bus Coordinator

CCT supports upgrading multiple ZFR1810 Wireless Field Bus Coordinators simultaneously. Before beginning the upgrade process on ZFR1810 Wireless Field Bus Coordinators, ensure all CAF applications are closed.

Note: Disconnect the MS/TP trunk from the NAE during firmware and application downloads to decrease the wireless network traffic and improve the download success rate. If this method is not available, use the Ethernet NAE Passthrough to connect to a trunk.

To begin the upgrade process for a ZFR1810 Wireless Field Bus Coordinator:

1. Go to Tools > Trunk Utilities > Download ZFR.
2. The wizard auto-discovers any and **only** ZFR1810 devices. Select the devices you wish to upgrade (CTRL + Click to select multiple devices). Click **Next**.
3. Select the check boxes next to the devices to upgrade (Figure 15).

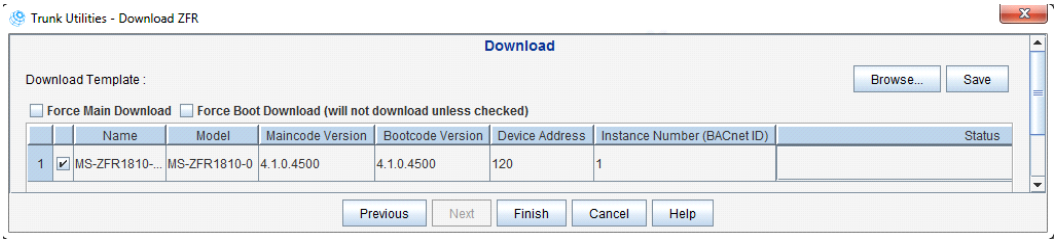

Figure 15: Trunk Utilities - ZFR1810 Download Window

Note: The Force Main Download and Force Boot Download check boxes allow you to force a main code or boot code download to all selected devices. In some scenarios, you may be required to download the boot code before proceeding with the workflow.

4. Click **Finish** to begin downloading the upgrade files for the ZFR1810 Wireless Field Bus Coordinator.

For the ZFR1810 Wireless Field Bus Coordinator, the Main Code downloads are multicast, meaning several downloads occur at the same time. During the download process, you can monitor progress by clicking View Status and View Log in CCT.

While the download process occurs, wireless peer-to-peer communications within the wireless mesh continue to function. However, peer-to-peer communication between wireless and wired devices or with other wireless meshes on a trunk are interrupted. Communication with the supervisory controller to other devices may also be interrupted. Wireless devices may temporarily appear offline. This may occur if the ZFR1810 download or upgrade process exceeds 5 minutes.

Upgrading Field Devices

After upgrading the ZFR1810 Wireless Field Bus Coordinator, the next step in the upgrade process is to upgrade the field devices. To complete the upgrade process for a trunk, you can upgrade both wireless and wired devices at the same time.

Connect to the trunk using the same methods as outlined in *Connecting to a Wireless Trunk*.

Note: After upgrading FEC26 files, FEC26 applications may no longer fit into FEC26 controllers physical memory. The file size of some objects increases from revision to revision and subsequently requires more memory in the controller. If an application download fails after upgrading, use the System Capacity meter in CCT to determine how much controller memory the application uses. If the meter reads that the application takes greater than 90% of the controller memory, you may encounter controller resets or problems loading applications. If this scenario occurs, large applications for controllers may need simplification or may need to be distributed across multiple controllers.

In CCT 10.1, follow this high-level procedure to upgrade field devices:

1. Go to Tools > Trunk Utilities > Download Multiple Controllers. Allow the wizard to auto-discover devices on the trunk. Click **Next**.
2. The next window displays device information. Select or deselect the devices as needed.
3. Click **Finish** to begin downloading the CAF files.

Completing a Site Upgrade

Once all devices on a trunk are upgraded, put the wired FC Bus connections back in place and complete a final trunk and wireless mesh analysis. See *Completing Trunk Analysis* for a high-level procedure.

When completing the final analysis of the wireless mesh, save a copy of the Wireless Checkout Report for your and the customer’s records.

In addition to the Wireless Checkout Report, review the Event Log on the Site Management Portal (SMP). Run reports for Offlines, Overrides, Alarms, and so on, and compare the final reports to the reports taken at the beginning of the upgrade procedure. Save copies for your and the customer's records.

If the customer has CCT installed on site, upgrade CCT for customer use at this point.

This document does **not** cover upgrading CCT. For more information on upgrading CCT, refer to *CCT Installation Instructions (LIT-12011529)*.

Troubleshooting

For troubleshooting topics regarding the upgrade process for wireless trunks and devices, refer to the internal documentation listed in this section.

For information on recommended Metasys revision versions for controllers, refer to *FSC Article 20210*.

For information on minimum required firmware codes, refer to *FSC Article 27272*.

For information on using NAE Point Schedule for downloading upgrade files for wireless devices, refer to the NAE Point Schedule literature and Appendix B of the *ZFR1800 Series Wireless Field Bus Technical Bulletin (LIT-12011295)*.

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