Technical Bulletin

Bulletin Number: TB-2024228-BW01 **Date Published: 08/15/2024**

Title: 2300-359 Dual Radio Interface Description and Installation

Summary: The Southern Technologies 2300-359 Dual Radio Interface enables a SmartScanNG or NG² defect detector to transmit over two radios simultaneously, necessary at locations that serve railroad companies operating on separate frequencies.

The Dual Radio Interface includes a five-foot interface cable for the SmartScanNG or NG², mounting screws, and cable mounting clamps. Southern Technologies also offers custom radio interface cables for popular models.

☐ **Critical (Affects safe operation of the system)** ☒ **Informational**

Distribution List: N/A

Table of Contents

Example Application

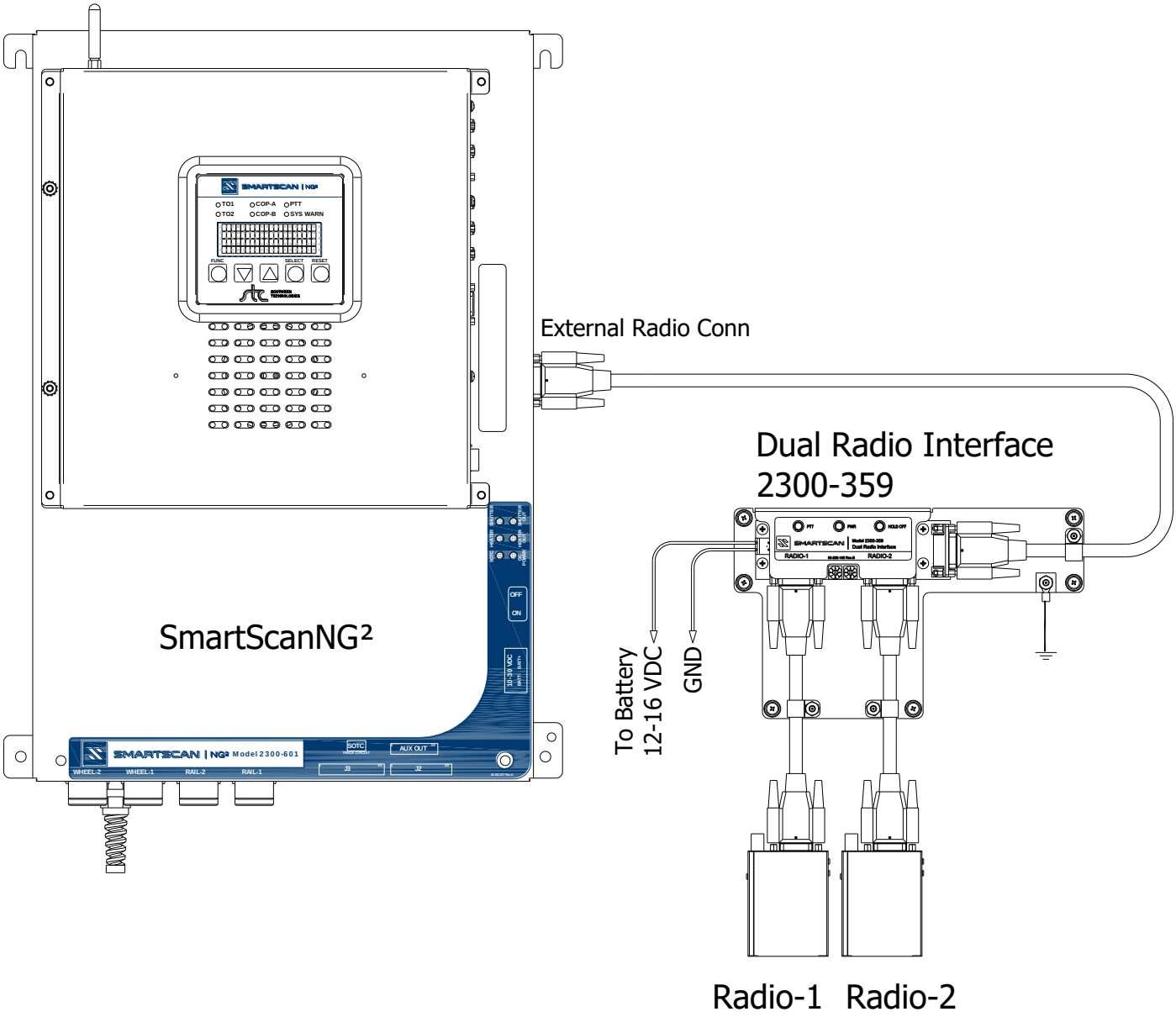

Figure 1: Example application of a SmartScanNG² controlling two Ritron DTX+ radios.

In Figure 1, the Dual Radio Interface controls two Ritron DTX-160 radios. All three cables are part number 10-119-023, five feet in length. We include one of the 10-119-023 cables with the unit. Radio interface cables compatible with the SmartScanNG/NG² also work with the Dual Radio Interface.

For customers with one Ritron radio who want to add a second Ritron, we offer assembly 23000-352, which lets you use your existing radio, surge arrestor, and antenna cable from the SmartScan NG². The assembly provides a 3-inch wide copper mounting bar, one Ritron DTX-160 radio, a surge arrestor, mounting hardware, and cables.

Dimensions

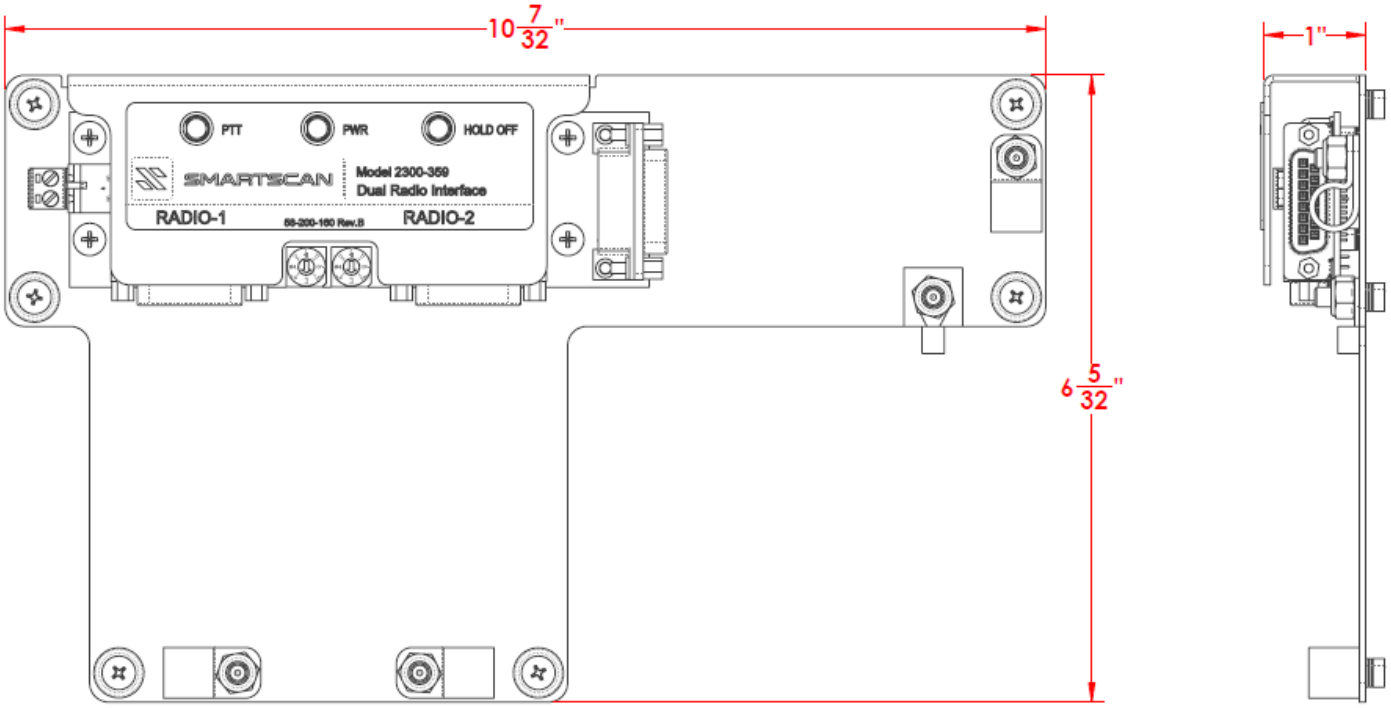

Figure 2: The Dual Radio Interface dimensions are 10-7/32" x 6-5/32" x 1"

The aluminum chassis in Figure 2 is large enough to accommodate the printed circuit board and the included cable clamp strain reliefs that support the interface cables.

Features

- Simultaneously transmits over two radios for dual-frequency broadcasts.
- Combines the HoldOff signal from each radio, preventing radio transmissions if either channel is busy. If a channel remains busy for an extended period, the NG/NG² employs HoldOff logic to transmit at an appropriate time.
- The defect detector listens for DTMF tones from Radio-1 to provide the Rebroadcast feature that repeats the last announcement to the train crew.
- A HoldOff LED indicates that one or both radios are busy receiving radio traffic.
- A PTT LED indicates when the unit provides both radios with the Push-to-Talk signal.
- The Power LED indicates that the defect detector supplies power.

Features Complementing Ritron DTX-160 Radios

- The Ritron DTX-160 connected to the Radio-1 connector is programmable using the serial interface of the SmartScanNG².
- Two eight-position selector switches provide channel selection for each radio.
- The power supply input is reverse-polarity protected and used to power the Ritron radios through the interface cables.

Pin Out for Radio-1 and Radio-2 Connectors

DSUB15 - Male – T*wo user-supplied radios are plugged into these connectors using radio interface cables.*

Refer to Items 9 and 12 of Figure 4

1	CS0	Channel Select low-bit (Used only by Ritron radios)
2	CS1	Channel Select mid-bit (Used only by Ritron radios)
3	CS2	Channel Select high-bit (Used only by Ritron radios)
4	No Connection	There is no internal connection.
5	No Connection	There is no internal connection.
6	12V OUT	Power to Ritron Radio 1.5A max. (Supplied from the Dual Radio Interface external power connector.)
7	TX AUDIO	Audio Input to Radio from the NG/NG² equipment.
8	No Connection	There is no internal connection.
9	PGN In/Out	Used by the SmartScanNG² for programming the Ritron Radio connected to Radio-1.
10	No Connection	There is no internal connection.
11	No Connection	There is no internal connection.
12	RX AUDIO OUT	Receive audio output from Radio-1. There is no connection on the Radio-2 connector.
13	DCD Carrier Detect	Output from the radio. Indicates the channel is busy.
14	PTT	Push-to-Talk Input to the radio.
15	Ground	Battery Ground and System Ground.

Pin Out for the Defect Detector Connector

DSUB15 - Male – *This connector connects to the defect detector through the interface cable.*

Refer to Item 5 of Figure 4

1	No Connection	There is no internal connection.
2	No Connection	There is no internal connection.
3	No Connection	There is no internal connection.
4	No Connection	There is no internal connection.
5	No Connection	There is no internal connection.
6	12V IN	Regulated 12VDC from the SmartScanNG/NG² that powers the circuitry in the Dual Radio Interface.
7	TX AUDIO	Transmit audio from the SmartScanNG/NG²
8	Ground	Battery Ground and System Ground
9	PGM	SmartScanNG² only. Programming I/O from the Ritron radio connected to Radio-1. There is no connection on the SmartScanNG.
10	No Connection	There is no internal connection.
11	No Connection	There is no internal connection.
12	RX AUDIO	Receive audio input from Radio-1 that allows DTMF signals to trigger the Rebroadcast function.
13	DCD Carrier Detect	Indicates a channel is busy receiving radio traffic.
14	PTT Push-To-Talk	Push-to-Talk signal output from the defect detector.
15	Ground	Battery Ground and System Ground.

Front View of DSUB15 Pin Locations for All Three Connectors

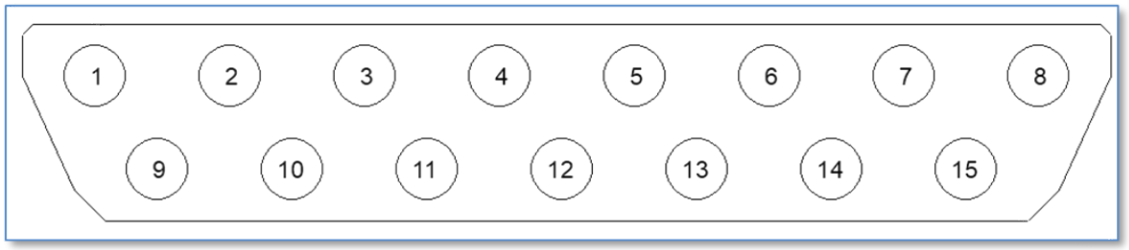

Figure 3 – Pin number identification of the Male DSUB-15 connectors as viewed from the front (pin side).

Figure 3 above shows the pin locations on the male DSUB15 connector.

Installation

Refer to Figure 4 on the next page for component locations.

1. Power down the SmartScanNG or SmartScanNG² defect detector.

2. If the defect detector has the optional internal Ritron DTX-160 Radio, remove it for use with the Dual Radio Interface. Southern Technologies offers assembly 23000-352 that provides a Ritron DTX-160 (like the one installed in the defect detector) and all cables and mounting hardware.

3. Mount the Dual Radio Interface assembly onto a wall in a convenient location using the included mounting screws.

4. If you have a radio plugged into the SmartScanNG/NG² defect detector, unplug the existing radio from the defect detector and plug it into Radio-1 or Radio-2 of the Dual Radio Interface — see items 9 and 12 on the next page.

5. Plug the second radio into the unused radio connector of the Dual Radio Interface.

6. Connect the provided 10-119-023 cable from the defect detector to the Dual Radio Interface. — see item 5 on the next page.

7. Secure the cables with the supplied cable clamps to provide strain relief for the connectors.

8. Ground the Dual Radio Interface chassis by connecting the included green 12AWG stranded wire to a common point of the bungalow's earth grounding system or the grounding lug on the SmartScanNG², which is grounded to the building ground. Use only as much wire as needed and trim the remainder to reduce inductance — see item 7 on the next page for the grounding stud location.

9. **Do this step only if you are using Ritron DTX-160 radios.** Connect a 12VDC to 16VDC power supply to the Dual Radio Interface Power Connector — item 1 on the next page. The power source should be able to supply a minimum of 3 amps. If you have a 12-volt defect detector system, it is okay to use a battery connection. *You may leave the power input connector unconnected when not using Ritron Radios.*

10. Turn on the defect detector. The PWR LED should light as the SmartScanNG/NG² defect detector powers up.

Component Identification

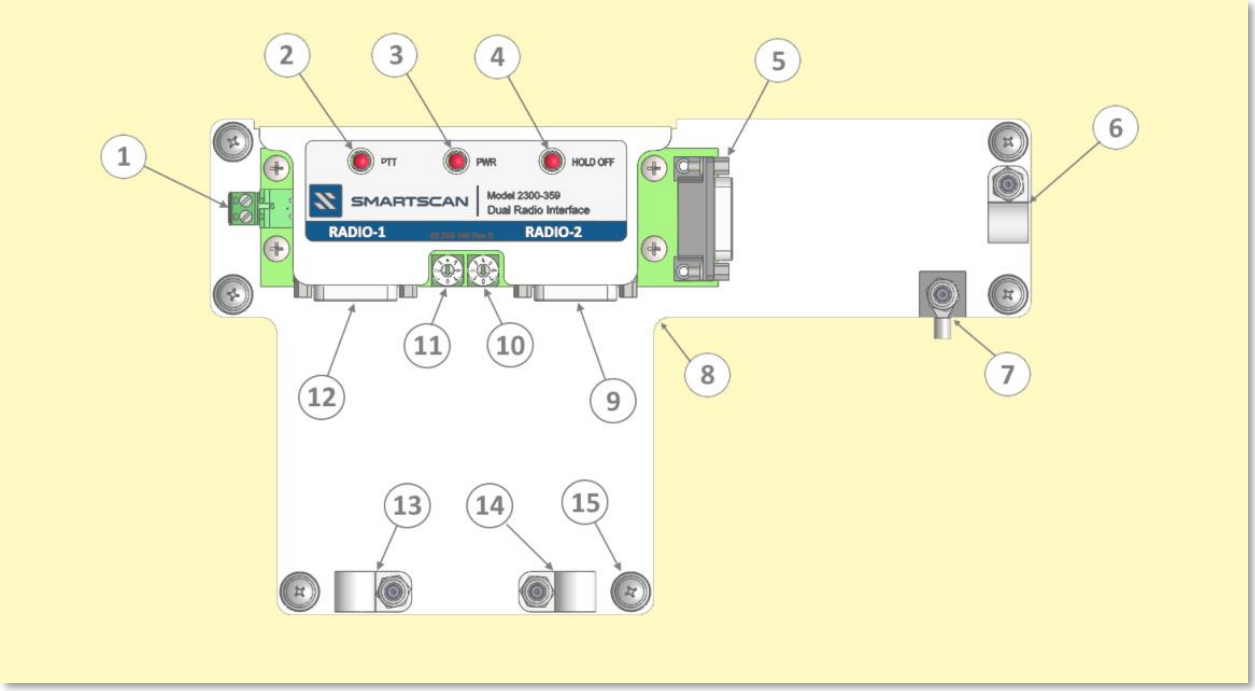

Figure 4 - Dual Radio Interface Assembly Components

1	Power Connector	9 to 16VDC, 3 Amps Max. Connect to power if using Ritron Radios.
2	Push To Talk LED	Indicates when the PTT signal is provided to both radios.
3	Power LED	Indicates when power is applied from the defect detector for the internal electronics.
4	HoldOff LED	Indicates that one or both radios are receiving radio traffic.
5	SmartScanNG/NG² Connector	DSUB-15 male connector for the SmartScanNG/NG².
6	Cable Clamp	3/8" ID cable clamp for the SmartScanNG/NG² interface cable.
7	Grounding Lug	Grounding connection.
8	Mounting Plate	14 gauge aluminum, powder coated, white.
9	Radio-2 Connector	DSUB-15 male connector. Connect to Radio-2.
10	Channel Selector Switch for Radio-2	8-position switch that selects the channel on the Ritron DTX-160 connected to the Radio-2 connector.
11	Channel Selector Switch for Radio-1	8-position switch that selects the channel on the Ritron DTX-160 connected to the Radio-1 connector.
12	Radio-1 Connector	DSUB-15 male connector. Connect to Radio-1.
13	Cable Clamp	3/8" ID cable clamp for Radio-1 interface cable.
14	Cable Clamp	3/8" ID cable clamp for Radio-2 interface cable.
15	Mounting Screw	Six mounting screws are included (#8-18 X 1-1/4")

Considerations When Mounting Antennas

Separating the Radio-1 and Radio-2 antennas as far as possible is considered good practice to reduce the possibility of causing interference on other channels. Also, the antennas should be mounted away from the Temperature Probe because it provides a potential entry point for RF into the bungalow. The following explains the reasoning.

Two transmitting antennas mounted close to each other can sometimes result in Intermodulation Distortion (IMD); this is when the two transmitting frequencies mix and interact in the final RF amplifier stages of one or both radios, resulting in interference generated at other frequencies. Specifying the minimum allowable distance between antennas is challenging because the presence of IMD can also depend on radio design and RF power output levels—the closer the antennas, the more likely radio design and RF power come into play.

IMD interference can happen at multiple frequencies related to the two transmitting frequencies. However, you can predict where interference directly adjacent to the transmitting frequencies could crop up by subtracting the two transmitting frequencies, then adding the difference to the highest transmitting frequency and subtracting the difference from the lowest.

For example, if the two transmitting frequencies from Radio-1 and Radio-2 are 160.710 MHz (AAR Channel 40) and 161.160 MHz (AAR Channel 70), the most substantial interference could occur at 160.260 MHz (AAR Channel 10) and 161.610 MHz.

Our wayside equipment has built-in RF filters for the Temperature Probe and track hardware inputs. In addition, we wind the Temperature Probe cable through two clamp-on ferrite cores that form common-mode chokes to suppress RF energy, and we modify the Temperature Probe housing with RF shielding. The distance between the radio antennas and the Temperature Probe provides a fourth layer of RF interference rejection for an abundant safety margin.