

Sierra Radio Systems Station Controller

Extend Your Device Control Network With Data Radios



sierraradio.net

Using Data Radios On The DCN

The Sierra Radio Systems Device Control Network, or DCN for short, defines the physical connections, signaling and command structure to allow main control systems like a Raspberry Pi and control modules to communicate.

The DCN physical interconnection can be wired or wireless. This document describes how data radios can be used build or extend your device control network.

The DCN manual goes into great detail about the format of data and command syntax. This document describes data radio equipment and configuration to provide wireless network connectivity.

Sierra radio offers a range of data radio options. In this manual, we will describe the radio models available, how to wire them up and how to configure them.

Current models supported

- DR20-US
- DR20-EU
- DR30-US
- DR30-EU
- DRM-V3



These radio modules connect to the Raspberry Pi host adapter or a control module using two terminal pins and two conductor wire to connect the RS-485 A and B wires.

The data radio also needs 12 VDC to operate. The antenna is connected to the SMA connector. Just making these simple connections is all you need get your data radio connection up and running.

Data Radio Specifications

Model	Frequency Band	RF Power Output
DR20-US	915 MHz	100 mW
DR20-EU	868 MHz	100 mW
DR30-US	915 MHz	1 Watt
DR30-EU	868 MHz	1 Watt

Frequency Range

The US models use the 902-928 MHz license free ISM band. The DR20-US and DR30-US radios are programmed to operate on a center frequency of 915 MHz.

The European models use the 868 MHz Short Range Device band. European radios are programmed to operate on a center frequency of 868 MHz.

Modulation

The data radio uses LoRa data modulation. LoRa is a spread spectrum technology that provides extended range over conventional data radio modems.

Programming

The data radios come pre-programmed for your region and are ready to go. It is possible to change the frequency and power level of the radio using software utilities but normally there is no need to do this.

Connections

- The data radio provides the following connections.
- 2.1mm DC power jack for 12 V DC power
- 4 pin terminal block for the RS-485 data coming from the Raspberry Pi host adapter, a control device or a DCN hub.
- DB9 data connector for optional RS-232 connectivity. Not normally used in the SRS Station Controller system.
- SMA female antenna connector.

Special note to European customers.

Please consult your countries regulations for maximum RF power output on the specific frequency of choice to make sure you are in compliance with governmental regulations.



Left Side

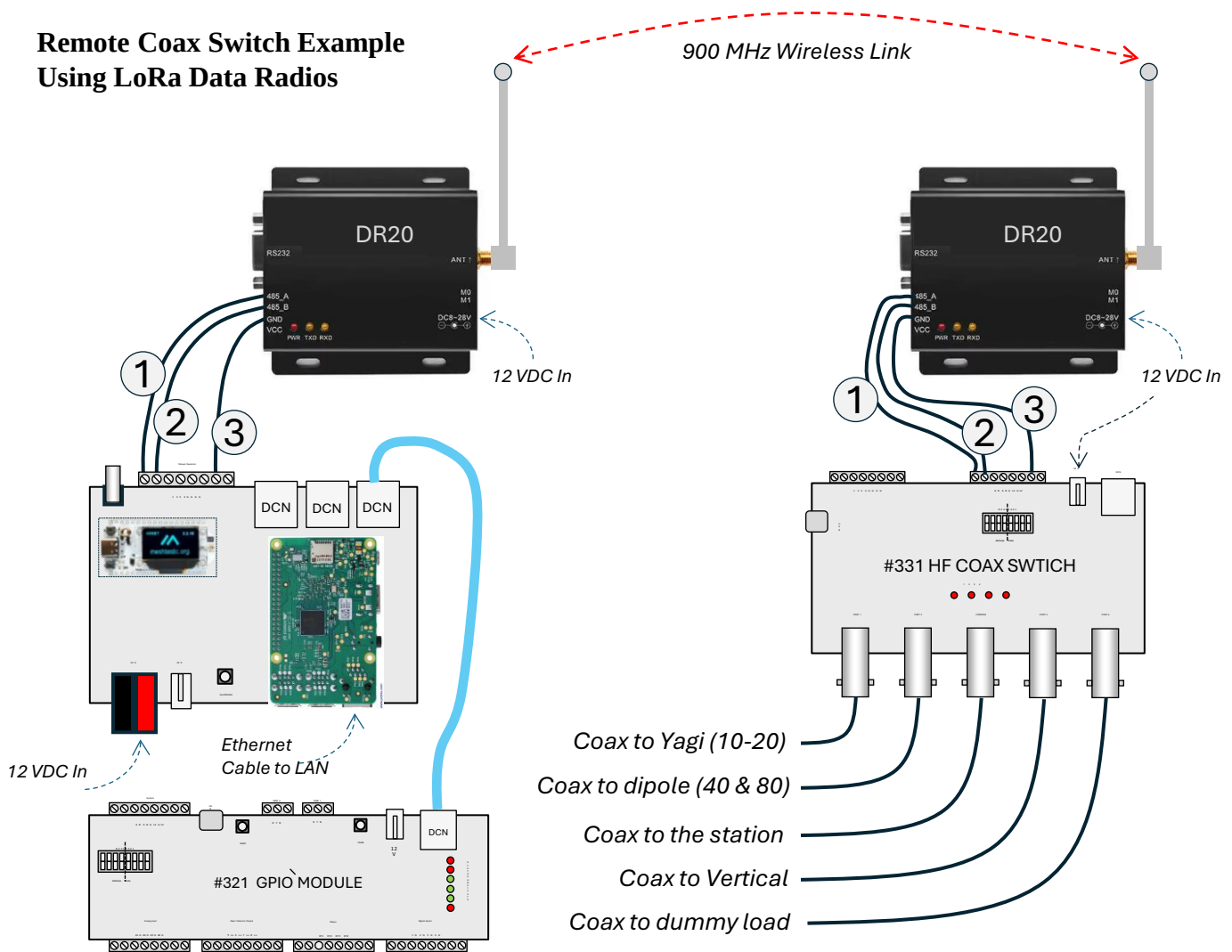
- DB-9 connector for RS-232 interface.
- 4 Pin terminal block
 - RS-485-A
 - RS-485-B
 - Ground
 - +12 VDC



Right Side

- +12 VDC 2.1mm barrel jack
- 2 configuration switches
- SMA antenna connector

Remote Coax Switch Example Using LoRa Data Radios



In this example, the station controller is located in the man radio station with the Raspberry Pi serving up the node red dashboard and the GPIO module connection to various devices to control power, measure voltages, temperatures, etc.

The tower is located several hundred feet from the radio station and has multiple HF antennas. The remote coax switch module switches various antennas to a single feed line returning to the radio station. All of the remote antenna switch commands are now sent over the 900 MHz data link from the radio station to the base of the tower where all the antenna feedlines come into a single switch box.

Connections

- ① RS-485-A
- ② RS-485-B
- ③ Ground (This is not necessary for the system to work but having a common ground is always a good idea.)

Meshtastic Data Radios

Meshtastic is a popular communications system that uses LoRa modulation schemes, like the DR series of data radios already discussed in this document. Meshtastic adds an end to end mesh networking layer and messaging applications that run on mobile devices, tablets and computers. Meshtastic is mostly used as an off-grid text messaging system. In addition to this mode, Meshtastic also supports sending short text messages. This feature makes it possible to transmit Station Controller control messages over a Meshtastic network.

The most popular channel configuration is called “Long Fast” which defines the frequency, data rate and other operating parameters. When setting up your Station Controller wireless DCN links with Meshtastic DO NOT USE the Long Fast setting on your Meshtastic radios. We recommend you select another channel and add encryption to keep your communications between devices private.

The SRS Station Controller Raspberry Host Adapter includes a socket which can be populated with a Heltec V3 Meshtastic data radio. These popular radios can be found at many sources on the internet. SRS also offers a small data radio module for the Heltec V3 data radio allowing remote control module to connect to Heltec radio with a simple CAT 6 cable.



Heltec V3 Meshtastic Data Radio

Set up is quick and easy. Once the radios are configured properly, simply plug in the radios and start communicating over the air.

One advantage of the use of the Meshtastic radio in the station control application is ability to monitor and insert traffic on the wireless network from your smart phone or tablet.

All control traffic is sent in human readable characters. You can even type commands on the Meshtastic messaging app and control the remote device.

Meshtastic Data Radios

Typical configuration for use with the Station Controller

In your Meshtastic app, in addition to the basic setup including device name, region, etc., set the following parameters:

Channels

Choose a channel configuration that will not cause any interference with other Meshtastic users in your area. For example, never use LONG-FAST. This is commonly used as the general chat channel configuration.

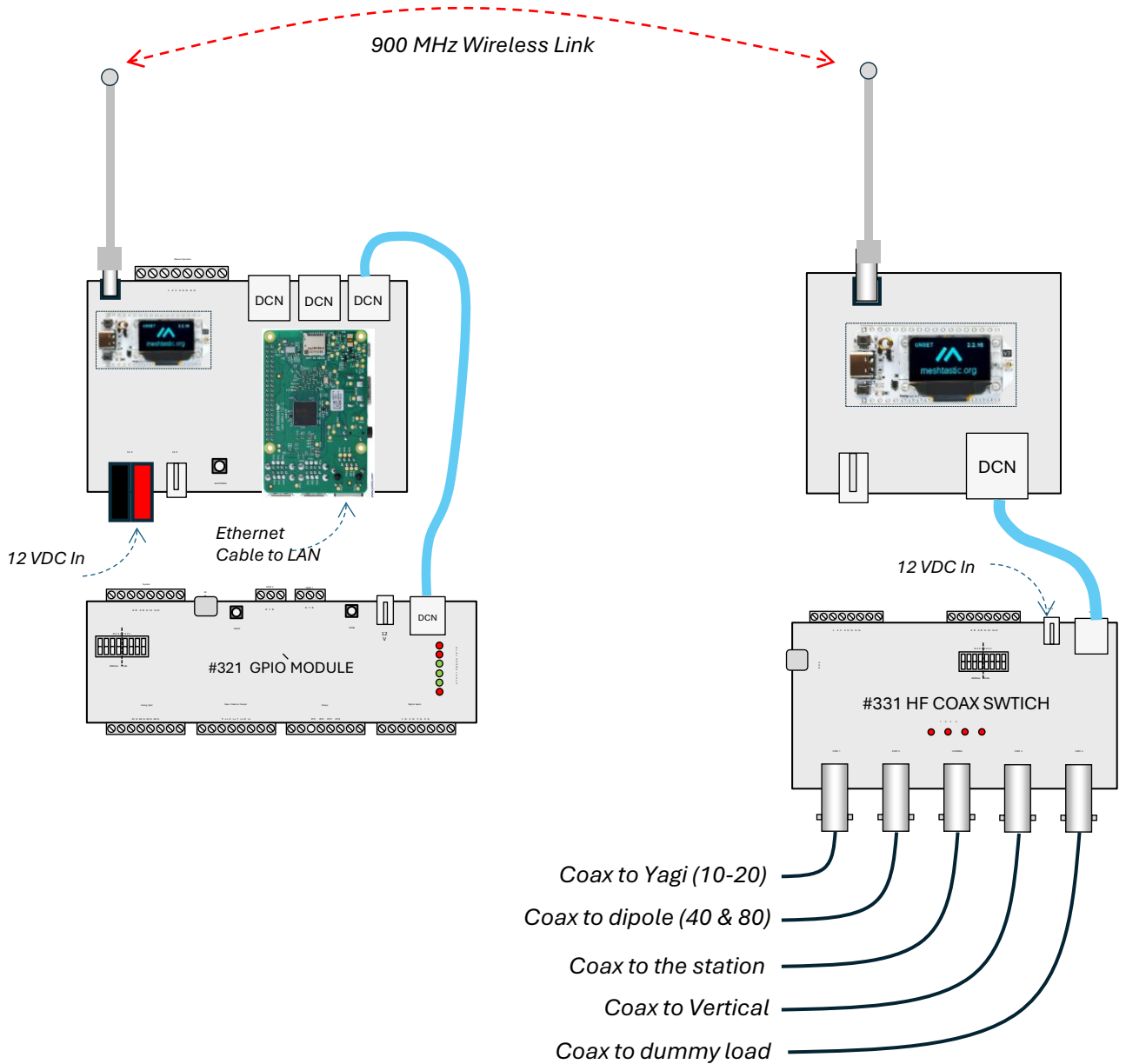
You may choose to create your own private channel and optionally run encryption. For a simple test to make sure the basics are working you may want to try ShortFast. Once you confirm proper operation you may choose to change channels and turn encryption on.

Serial

Serial enabled	CHECK
Echo enabled	Un-CHECK
RX	20
TX	19
Serial baud rate	BAUD_9600
Serial mode	TEXTMSG
Override console	Un-CHECK



Remote Coax Switch Example Using Meshtastic Data Radios



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Choosing The Right Data Radio

Any of the solutions presented here will work in many situations where it's necessary to transmit data over several hundred feet and up to a several miles under the right conditions.

In choosing which data radio to use you should consider the pros and cons of each type of radio. This table show some of the differences to help you choose the right solution

Device Family	Maximum Power	Range	Meshing	Latency	Phone / Tablet Interface
SRS DR20 and DR30	1 Watt	Long	No	Low	No
Heltec V3 Meshtastic	100 mW	Medium	Yes	Medium	Yes

Summary

The DR series of data radios provide the best performance and lowest latency when compared to the Meshtastic radios.

The advantage of the Meshtastic radios is the ability to leverage the use of intermediate mesh nodes and monitor or control devices using text commands on a mobile phone or tablet.