Modular Integration Instructions

TWIG V Module 12907

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Revision: A

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1. Introduction and List of Rules

1.1. Purpose and Scope

The purpose of this document is to provide supplemental information to the "Application Guide for the TWIG V Module 12907" and is intended to be used by an OEM for incorporating the TWIG V module into an end product.

1.2. Applicable Documents
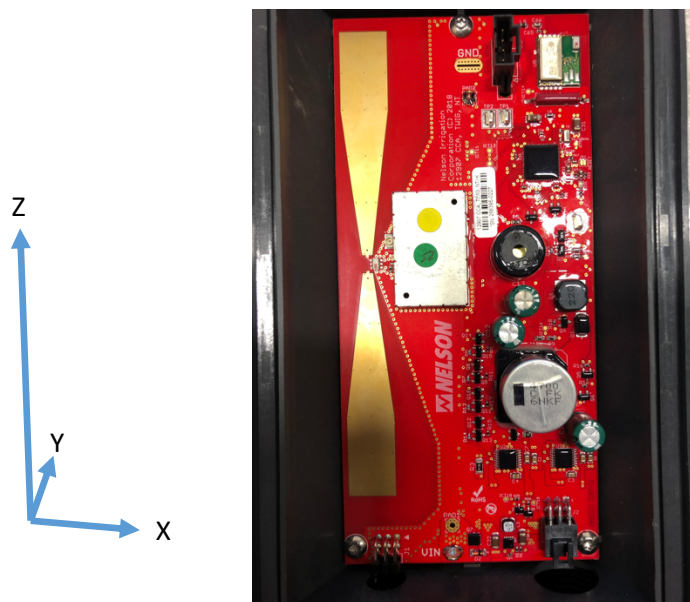
- Application Guide for the TWIG V Module 12907

1.3. List of Rules

The FCC rules governing this module are found in 47 CFR § 15.247.

2. Operational Use Conditions

The TWIG V module is designed to be used for outdoor agricultural and industrial applications. The module should be installed in an enclosure that protects the module from moisture. Care should be taken to ensure that moisture does not siphon through cables that enter the enclosure.

The TWIG V module radio network is intended to be used with antennas that are vertically polarized. The TWIG V module must be mounted vertically as shown in figure 1 below when using the internal antenna:

Figure 1. Using Internal Antenna in Vertical Orientation.

All external antennas used with the TWIG V module should be connected in a manner outlined in sections 5.2 and 5.3 of the "Application Guide for the TWIG V Module 12907".

The firmware in the TWIG V module enables the wireless transceiver to operate using LoRa$^{®}$ modulation using a spreading factor of eight using a 500 KHz bandwidth. The transmit power is set to 24 dBm. The wireless transceiver is configured to operate on any of fifty channels, with channel 1 centered at 902.5 MHz and channel 50 centered at 927.0 MHz.

3. RF Exposure Conditions

The maximum transmit duty cycle for the TWIG V module is 25%. For safe operation, persons should maintain a distance greater than 20 cm from any antenna that is connected to the TWIG V module.

4. Antennas

The specifications for the antennas are listed in section 4 of the "Application Guide for the TWIG V Module 12907". All external antennas used with the TWIG V module should be connected in a manner outlined in sections 5.2 and 5.3 of the "Application Guide for the TWIG V Module 12907".

5. Label and Compliance Information

Section 5 of the "Application Guide for the TWIG V Module 12907" provides detailed information for labeling and compliance for any end products that incorporate the TWIG V module.

6. Test Modes

Testing modes are available to be used for unintentional radiator testing of the end product. These modes are available on TWIG V modules that do not have an assigned ID and are accessible from the console and power cable shown in Figure 2.
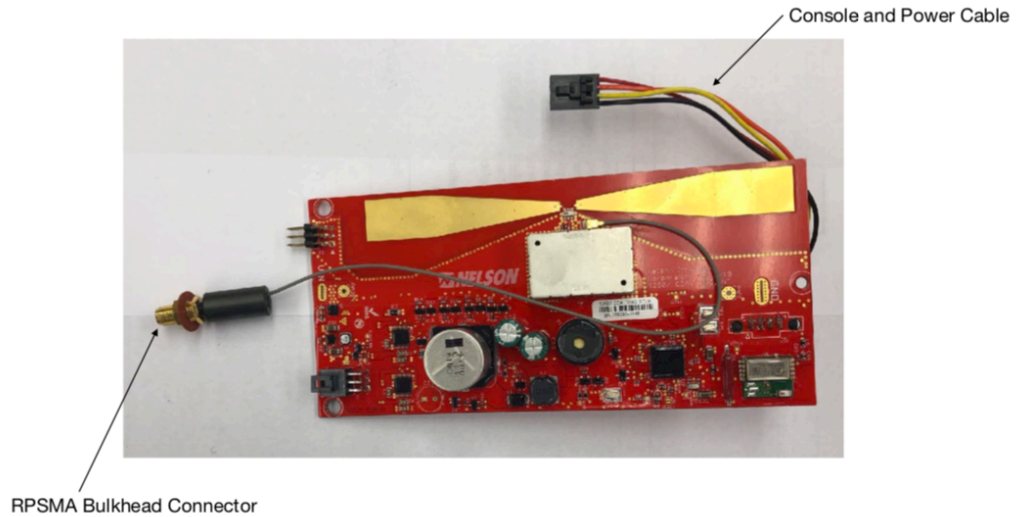
Figure 2. TWIG V Module with Console and Power Cable.

The console connector has the following pinout:

> Pin 1: Supply voltage (1.8 to 5.5 volts DC)
> Pin 2: Module RX
> Pin 3: Module TX
> Pin 4: Ground

The serial port that is configured as 115,200 baud, 8 bits, no parity, and one stop bit (115200/8/N/1). The available commands for this test are:

abc - test command that returns "xyz=0"

clock - returns current value of tick()

help - list commands

reset - hard reset board.

bleQuiet - silence the BLE advertising

radioReset - reset the radio

setAntenna - select the antenna. setAntenna=0 -> INTERNAL; setAntenna=1 -> EXTERNAL

setTxPower - specify the transmit power. setTxPower=10 -> approx 24dBm

setModulatedTx - put the radio into pseudo-random transmit for n cycles. n=0 will transmit until the power is removed. setModulatedTx=0 -> transmit

getFrequency - return current testing frequency in Hz.

setFrequency - set the testing frequency in Hz. setFrequency=915000000 -> Testfrequency=915000000

versions - returns versioning information

setRxRTU - set unit in receive only mode (CAD detect with 250msec wakeup)

setRxHub - set unit in packet receiving mode ()

setRxExtender - set unit in packet receiving mode

To configure the TWIG V module for use as an RTU for as an unintentional radiator, the following command sequence is recommended:

setFrequency=915000000<CR>
```
Testfrequency=915000000
```

bleQuiet<CR>
```
BLE in quiet mode
```

setAntenna=1<CR>
```
Antenna = EXTERNAL
```

setRxRTU<CR>
```
RTU Rx mode
```

To configure the TWIG V module for use as a Hub for as an unintentional radiator, the following command sequence is recommended:

setFrequency=915000000<CR>
```
Testfrequency=915000000
```

bleQuiet<CR>
```
BLE in quiet mode
```

setAntenna=1<CR>
```
Antenna = EXTERNAL
```

setRxHub<CR>
```
Hub Rx mode
```

To configure the TWIG V module for use as an Extender for as an unintentional radiator, the following command sequence is recommended:

setFrequency=915000000<CR>
```
Testfrequency=915000000
```

bleQuiet<CR>
```
BLE in quiet mode
```

setAntenna=1<CR>
```
Antenna = EXTERNAL
```

setRxExtender<CR>
```
Extender Rx mode
```

7. Additional Testing

The modular transmitter is only FCC authorized for specific rule parts (i.e. FCC transmitter rules) listed on the grant. The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.