1.0 DEVICE OVERVIEW

The HERMES1 module is a small form factor, low- power, unlicensed 915 MHz radio transceiver that delivers up to a 500 KBs data rate for distances up to several miles.

This document describes how to integrate the HERMES1 module into a system.

1.1 Interfaces to the HERMES1 radio module

The radio module can connect to a host device such as a PC via the USB 2.0 connector, CN1. This USB connector provides power and serial communications for the module.

Alternatively, when it is installed in an embedded host, power, signal and programming connections are provided through the 14-pin connector J2. See Figure 1-2 and Table 1-1 for the pinout and pin description.

Note: Only one of these interfaces can be used at a time.

FIGURE 1-1: HERMES1 MODULE DIMENSIONS

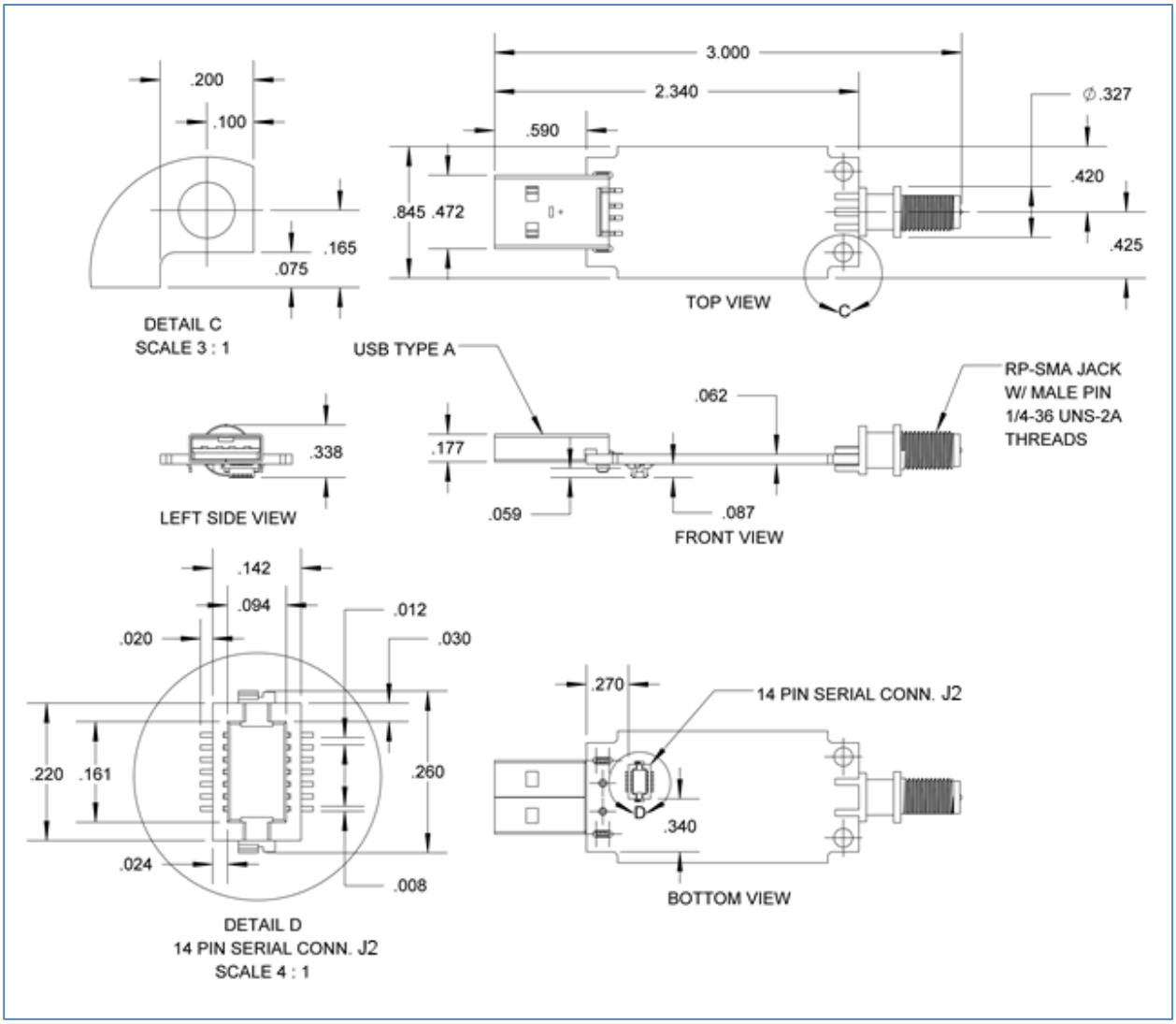

Figure 1-2 HERMES1 PINOUT

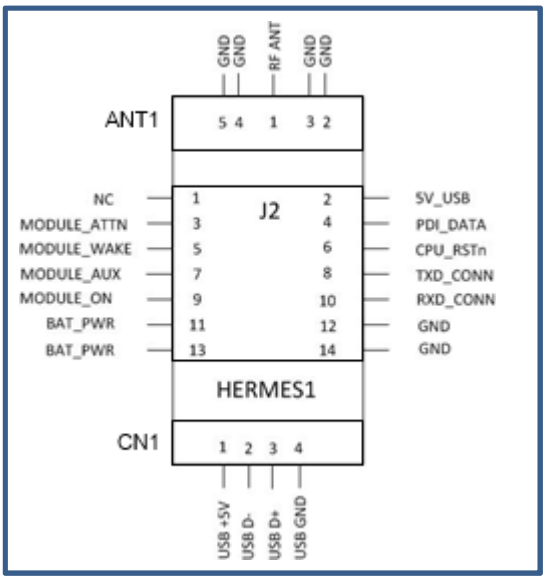

TABLE 1-1: HERMES1 PIN DESCRIPTION

Pin	Symbol	Type	Description
J2-1	NC		Not Connected
J2-2	5V_USB	Power	5V Positive Supply Output, derived from USB +5V
J2-3	MODULE_ATTN	DI	MODULE_ATTN Control Line
J2-4	PDI_DATA	DIO	CPU Program Data
J2-5	_MODULE	DI	MODULE_WAKE Control Line
J2-6	CPU_RSTn	DI	CPU Reset active low
J2-7	MODULE_AUX	DIO	Auxilary Control Line
J2-8	TXD_CONN	DO	UART Txd → Host Asynch Communications
J2-9	MODULE_ON	DO	MODULE_ON Indication Line
J2-10	RXD_CONN	DI	UART RxD ← Host Asynch Communications
J2-11	BATT_PWR	Power	System Positive Supply Input
J2-12	GND	Power	System Ground
J2-13	BAT_PWR	Power	System Positive Supply Input
J2-14	GND	Power	System Ground
CN1-1	USB +5V	Power	USB Input Supply, +5V
CN1-2	USB D-	DIO	USB Communication Line, D-
CN1-3	USB D+	DIO	USB Communication Line, D+
4	USB GND	Power	USB Ground
ANT1-1	RF ANT	DIO	Antenna, 50 Ohm impedance
ANT1-2	GND	Power	Antenna Ground reference
ANT1-3	GND	Power	Antenna Ground reference
ANT1-4	GND	Power	Antenna Ground reference
ANT1-5	GND	Power	Antenna Ground reference

2.0 External Antennas

This device has been designed to operate with the antennas listed below in Table 2-1, having a maximum gain of 5.15 dBi. Antennas not included in this list or having a gain greater than 5.15 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 Ohms. To reduce potential radio interference to other users, the antenna type and its gain from the approved list in Table 2-1, should be so chosen that the equivalent isotropically radiated power (e. i. r. p.) is not more than that permitted for successful communication.

TABLE 2-1: TESTED EXTERNAL ANTENNA TYPES

Type	Gain (dBi)	DGSI #	Manufacturer	Mfg. Part Number
Monopole	3.3	01790685	Linx Tech.	ANT-916-CW-RCS
Monopole	2.2	01790686	Linx Tech.	ANT-916-CW-RAH
Dipole	2.0	59001001	Nearson Inc.	S1551AH-915S
Dipole	2.5	59001004	Nearson Inc.	S161AH-915
Dipole	2.5	59001005	Nearson Inc.	S161AH-915R
Dome	2.5	59001020	Taoglas Limited	RG.02.01.3000W
Collinear Dipole	5.15	56704838	Laird	FG9023

3.0 REGULATORY APPROVAL

This section outlines the regulatory information for the HERMES1 module for the following countries:

• United States
• Canada

3.1 United States

This module may only be used in Durham Geo Slope Indicator end products. Changes or modifications not expressly approved by Durham Geo Slope Indicator could void the user's authority to operate the equipment.

The finished product is required to comply with all applicable FCC equipment authorizations regulations, requirements and equipment functions not associated with the transmitter module portion.

3.1.1 LABELING AND USER INFORMATION REQUIREMENTS

The HERMES1 module has been labeled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

Model: HERMES1
Contains FCC ID: 2AFGQ-HERMES1

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation

A user's manual for the product should include the following statement:

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 to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and 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.

3.1.2 RF EXPOSURE

WARNING!

FCC and IC Radiation Exposure Statement:
This equipment complies with FCC's and IC's RF radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) & user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

3.1.3 APPROVED EXTERNAL ANTENNA TYPES

To maintain modular approval in the United States, only the antenna types that have been tested shall be used. It is permissible to use different antenna manufacturer provided the same antenna type and antenna gain (equal to or less than) is used.

Testing of the HERMES1 module was performed with the antenna types listed in Table 2-1.

3.2 Canada

The HERMES1 module has been certified for use in Canada under Industry Canada (IC) Radio Standards Specification (RSS) RSS-210 and RSSGen. Modular approval permits the installation of a module in a host device without the need to recertify the device.

3.2.1 LABELING AND USER INFORMATION REQUIREMENTS

The host device shall be properly labeled to identify the module within the host device.

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words “Contains transmitter module”, or the word “Contains”, or similar wording expressing the same meaning, as follows:

MODEL: HERMES1
Contains IC: 20515-HERMES1

User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

This device complies with Industry Canada license- exempt RSS standard(s). Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Indus- trie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux con- ditions suivantes:
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (from Section 7.1.2 RSS-Gen, Issue 3, December 2010): User manuals for transmitters shall display the following notice in a conspicuous location:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Can- ada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The above notice may be affixed to the device instead of displayed in the user manual.

3.2.2 RF EXPOSURE

All transmitters regulated by IC must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).

3.2.3 APPROVED EXTERNAL ANTENNA TYPES

The HERMES1 module can only be sold or operated with antennas with which it was approved. Transmitter may be approved with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest gain antenna of each combination of transmitter and antenna type for which approval is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type having equal or lesser gain as an antenna that had been successfully tested with the transmitter, will also be considered approved with the transmitter, and may be used and marketed with the transmitter.
When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

Approved external antenna types for the HERMES1 module are listed in Table 2-1.

Revision List

Date	Rev	Author	Change
8/26/15	1.0	Lauren V	Initial Release
4/22/16	2.0	Vincent C	Update Antenna Table 2-1
4/23/16	3.0	Brad B.	All Sections Updated
5/13/16	3.1	Brad B.	Removed Sec. 3.3
5/27/16	3.2	Brad.B	Sec 3.1.1, FCC ID corrected w/ hyphen
6/1/16	3.3	Brad.B.	Removed Australia.