Dust Networks

D1100/ M1010EVM Evaluation Kit Quick Start Guide

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FCC Warning

The FCC has developed guidelines to reduce any possible hazard due to exposure of the human body to electromagnetic radiation (such as radio waves). In accordance with these guidelines, the antenna should be positioned at a distance greater than 4 cm (1.57in) from users and bystanders, 2 cm (.79 in) from hands, wrists, feet, and ankles when the device is transmitting.

EMI Warning

This equipment has been tested and found to comply with the limits pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in an appropriate 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 communication. 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:

(1) Reorient or relocate the receiving antenna.

(2) Increase the separation between the equipment and receiver

(3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

(4) Consult the dealer or an experienced radio or television technician for assistance.

Contents

About This Guide

This guide provides information required to successfully demonstrate the capabilities of the D1100 Evaulation Kit. It provides various pinout and connector information for attaching sensors to a M1010 Evaluation Module and instructions for setting up a network.

Related Documents

The following documents are available for a SmartMesh Network:

- *D1100 Evaluation Kit Quick Start Guide* (this guide)
- *SmartMesh Manager Application Programming Interface* (API) Guide
- *M1010 Mote Integration Guide*
- *SmartMesh Network Planning Guide*
- *SmartMesh Network Administration Guide*

Conventions Used

The following conventions are used in this guide:

- `Computer type` indicates information that you enter, such as specifying a URL.
- **Bold type** indicates buttons, fields, and menu commands.
- *Italic type* is used to introduce a new term.

Note: Notes provide more detailed information about concepts.

Cautions: Cautions advise you about actions that might result in a loss of data.

Warning! Warnings advise you about actions that may cause physical harm to the hardware or your person.

M1010 Evaluation Module

This chapter provides specifications for the M1010 Evaluation Module (M1010-EVM) provided in the D1100 Evaluation Kit. The M1010-EVM can be used as a reference design for integrating an M1010 Mote into a self-contained device.

M1010 Evaluation Module

The M1010-EVM consists of an M1010-A Mote, packaged with an antenna, battery holder, status LEDs, I/O connectors, and a recessed reset switch. The M1010-EVM board is packaged in a plastic enclosure suitable for mounting on a wall or other vertical surface.
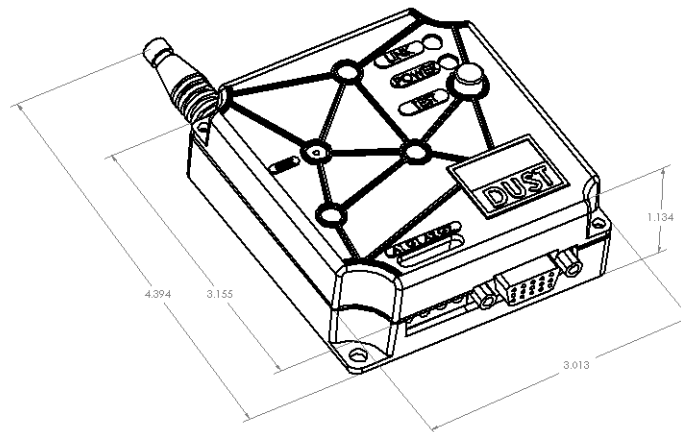

Figure 1-1. M1010 Evaluation Module

Connector P1

Connector P1 is a 4-position terminal block connector that accepts 12-22 AWG wire. It assumes 0 to 5 V inputs, and contains internal filter circuitry for 60 Hz noise.

Table 1-1.   **P1 Connector Pinouts**

Pin Number	Pin Name	I/O	Description
1	A1	I	Analog input 1 (0 - 50)
2	GND	I	Ground
3	A2	I	Analog input 2 (0 - 50)
4	GND	I	Ground

Warning: Reverse biasing these inputs may result in damage to the device.

Connector P2

Connector P2 is an HD-15 female connector, as shown in Figure 1-2. It assumes
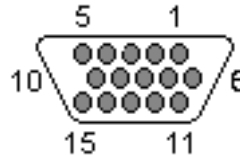0 to 1.5 V analog inputs, and is unfiltered. All digital I/O are LVTTL (3 V) signaling.

Figure 1-2.   **HD-15 Female Connector**

Table 1-2.   **P2 Connector Pinouts**

Pin Number	Pin Name	I/O	Description
1	TX	O	UART Transmit
2	D5	I/O	Digital I/O 5 or SOF (see the *M1010 Mote Integration Guide*, Appendix C)
3	D2	I/O	Digital I/O 2
4	A7	I	Analog input 7
5	A4	I	Analog input 4
6	RX	I	UART Receive
7	D6	I/O	Digital I/O 6
8	D3	I/O	Digital I/O 3
9	GND	I	Ground
10	A5	I	Analog input 5
11	D7	I/O	Digital I/O 7
12	D4	I/O	Digital I/O 4 or CTS (see the *M1010 Mote Integration Guide*, Appendix C)
13	D1	I/O	Digital I/O 1
14	A6	I	Analog input 6
15	A3	I	Analog input 3
Note: All I/O, including UART, are at LVTTL (3 V) signaling levels. An external level converter is required for RS-232 communications.			

Warning: Reverse biasing these inputs may result in damage to the device.

Serial Interface

Connector P2 provides a flow-controlled serial interface with timing information (using TX, RX, CTS, and SOF), as described in the *M1010 Mote Integration Guide,* Appendix C. Serial port settings are 9600 bps, 8 data bits, no parity, 1 stop bit.

Power Supply

The M1010-EVM board is powered by a pair of L91 1.5 V AA lithium batteries (or equivalent), and comes with a standard double AA battery holder. The M1010-EVM does not contain a power switch. Units are tested and shipped in deep sleep mode. To place the device into deep sleep, short pins 1 and 6 on P2, and reset the M1010-EVM. The status LEDs should remain off, and the device remains asleep until it is reset. To activate the unit, press reset with pins 1 and 6 unconnected.

Absolute Maximum Ratings

Table 1-3. Absolute Maximum Ratings

Parameter	Min	Max	Units	Condition
Supply voltage V_{BAT} (V_{CC})	2.7	3.6	V	Referenced to GND
Voltage on any pin	-0.3	V_{CC} +0.3	V	Referenced to GND

Digital I/O current
  Source
  Sink
  Total I/O
		2
		6
		24
			mA
			mA
			mA	

Storage temperature	-40	+85	°C	
Operating ambient temperature	-40	+85	°C	

Warning: The M1010 Mote is an ESD-sensitive device. Use caution when handling in order to prevent permanent damage to the device.

Recommended Operating Conditions

Table 1-4. **Operating Conditions**

Parameter	Min	Max	Units	Condition
Analog input impedance		75	kΩ	
Analog input capacitance		40	pF	

Wireless Specifications

Table 1-5. **Wireless Specifications**

Parameter	Max	Units
Frequency Band	902 - 928	MHz
RF output power	4	dBm
Transmit data rate	76.8	kpbs
Receiver sensitivity (at 15 dB SNR)	-93	dBm
Range Outdoors (1m elevation) Indoors	>100 10 - 30 typical	m m

Antenna

Avoid handling the module by its antenna. For best results, place all devices so that the antenna points to the ceiling. Devices placed close to the ground may have a significantly reduced range. In the event of communications difficulties, try changing the orientation of the module.

Regulatory Information

The FCC ID: SJC-M1010EVM. This device complies with Part 15 o the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

> **Caution:** Unauthorized modification or changes not expressly approved by Dust Networks™ Inc. could void compliance with regulatory rules, and thereby your authority to use this equipment.

SmartMesh Manager

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This chapter describes the D1100 SmartMesh Manager provided in the D1100 Evaluation kit. The D1100 is used to configure and control a network of M1010 motes, and provides data and configuration information via an XML/RPC interface.

Description

The D1100 SmartMesh Manager consists of a single board computer and an M1010 mote. The M1010 mote acts as a radio gateway between the single board computer and the Dust Network. An API is provided to allow users to develop custom interfaces or data logging applications. Refer to the *SmartMesh Manager API Guide* for further information.
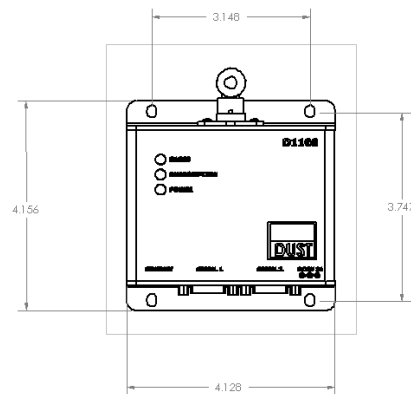

Figure 2-1. **SmartMesh Manager (Top View) and Antenna (Side View)**

Connections

The D1100 SmartMesh Manager has the following ports available:

- **10/100 Ethernet port**—Used for connection to a LAN or direct connection to a computer using the cross-over cable provided in the D1100 Evaluation Kit. Refer to the *SmartMesh Manager Administration Guide* for information on configuring the IP address of the SmartMesh Manager.

- **Serial 1 port (RS232)**—Reserved for future connection. 115 kbps maximum. Not flow controlled (TX, RX, ground only).

- **Serial 2 port (RS232)**—Command line interface (38400 bps, 8 data bits, no parity, 1 stop bit. Not flow controlled (TX, RX, ground only).
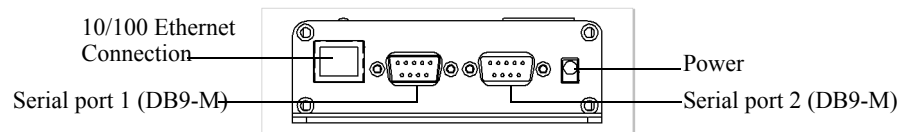
- **Power**—5 VDC, center positive, 2A.

Figure 2-2. **SmartMesh Manager Connectors**

Technical Specifications

Table 2-1. **Technical Specifications for SmartMesh Manager**

Category	Description
Processor	Intel PXA255, 400 MHz
Radio	M1010 gateway mote
Radio operating frequency	902 - 928 MHz, frequency hopping (FCC 15.247)
Transmit power	4 dBm
Receive sensitivity	-93 dBm
Connectors	10/100 Ethernet, 2 RS232 (5 V) serial, 1 power
Power	5VDC, 2A max
Antenna	Nearson 1/2 wave dipole
Range	10-30 m indoors (typical) 100 m outdoors
Environment	-10 °C to +70 °C
API interface	XML/RPC

Regulatory Information

The FCC ID: SJC-D1100. This device complies with Part 15 o the FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

> **Caution:** Unauthorized modification or changes not expressly approved by Dust Networks™ Inc. could void compliance with regulatory rules, and thereby your authority to use this equipment.

Setting Up a Network

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This chapter describes how to set up a D1100 Evaluation Kit in a simple sensor network. For a more detailed explanation, see the Getting Started Guide that came with your evaluation kit.

Setting Up the SmartMesh Manager

❶ Install the SmartMesh Console software.

❷ Connect Manager to the PC using the cross-over cable.

❸ Connect power to the Manager.

❹ If necessary, adjust the IP address of the PC to allow connection with the manager.

❺ Start Console.

❻ Connect to Manager.

❼ Go on to set up the network.

Setting Up the Network

❶ Power up one evaluation module by resetting it.

❷ Press the Test button on the module.

The green Power LED should turn on. If it does not, make sure that the batteries are properly seated. The Link LED starts blinking when the module has found the network. When the module joins the network, the Link LED remains on.

❸ Form the network by powering up additional modules (repeat steps 1 and 2).

❹ Use the Console to verify network connectivity. For more information about configuring and managing the network, refer to the *SmartMesh Network Administration Guide*.