



**Embedded Planet**

**LoRa® Data Concentrator 8-Channel North America Radio Card**

**EPM2M-LORA-DC-8-NA**



# LoRa Data Concentrator 8-Path North America Radio

Card

## USER MANUAL

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## Features

- High Performance LoRaWAN Data Concentrator Card
- North America 915MHz Sub-GHz ISM Band
- Semtech SX1301 Radio Chip
- Semtech SX1257 Transceivers
- Low Power
- High Node count support
- Selectable SPI or USB Interface
- USB Debug Port

## Description

The EPM2M-LORA-DC-8-NA Radio Card is a LoRa Data Concentrator Radio for use in LoRaWAN packet forwarding gateways. The radio Card is based on the Semtech SX1301 Base Band Processor and the SX1257 Radio Transceiver. Both SPI and USB interfaces are provided for easy interfacing to processor based systems.

The Card acts as a data Concentrator of LoRa packets received from remote radio Cards. This Card also transmits data to remote radio Cards allowing for two-way control of remote devices.

The radio Card nominally operates in the 915MHz ISM band in uplink and downlink paths.

## Typical Operating Parameters

Parameter	Value
Supply Voltage	5.0VDC
I/O Pin Voltage	-0.3VDC to Vsupply +0.3VDC
RF Power Output	+20dBm
Storage Temperature	-20°C to +85°C
Storage Humidity (non-condensing)	10% to 80% RH
Operating Temperature	0°C to +70°C
Operating Humidity (non-condensing)	10% to 80% RH

### Operation

The EPM2M-LORA-DC-8-NA supports the LoRaWAN Protocol. Reference this protocol for specific operational details and additional information.

The SX1301 provides the wireless baseband processing for the Card. It receives digitized bitstreams from the SX1257 transceivers. The SX1301 adaptive demodulators receive the packets and stores them in a FIFO. This stored data is available to the host via the host interface. Received packets can be time-stamped using a GPS input.

During Transmission, the data pakets are modulated and sent through the transceivers as required.

### Software Considerations

The radio Card receives microcode downloaded from the host via the host interface.

The radio Card interface control is made through a Hardware Abstraction Layer (HAL). This code is available from Embedded Planet.

### Electrical Characteristics

Transmit Frequency Range(s):	923.3MHz to 927.5MHz
Receive Frequency Range(s):	902.3MHz to 914.9MHz
Rated output power:	+24dBm
Antenna type:	External
Antenna Peak Gain (dBi)	1.2
Antenna Linx Technologies Inc.	ANT-916-CW-HWR-RPS

Modulation Type(s)	Chirp Spread Spectrum
Data Rate(s)	290bps to 50kbps
Number of channels	64 + 8 uplink channels (RX); 8 downlink channels (TX)
Occupied Bandwidth	Uplink (RX): 200kHz increments (902.3MHz – 914.9MHz) and 500kHz increments (903MHz – 914.9MHz)  Downlink (TX): 500kHz (923.3MHz – 927.5MHz)



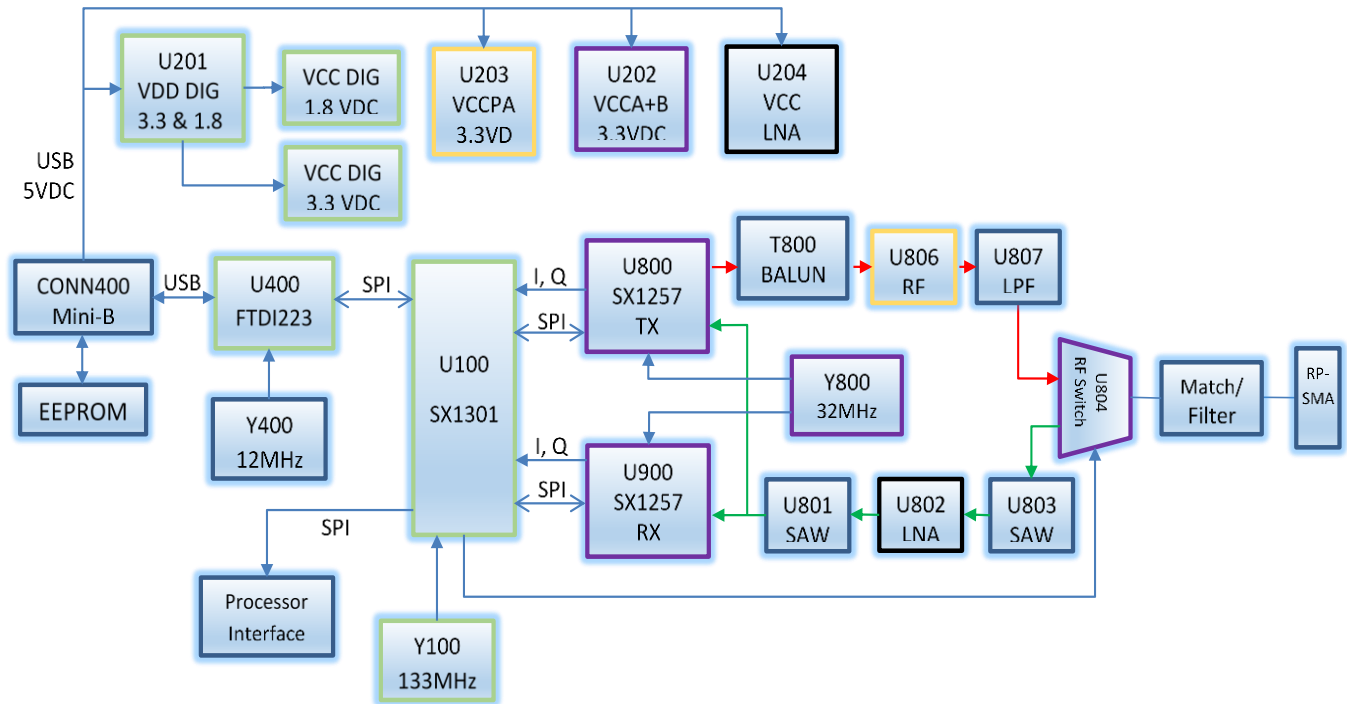
## LoRa Data Concentrator 8-Path North America Radio

### Card

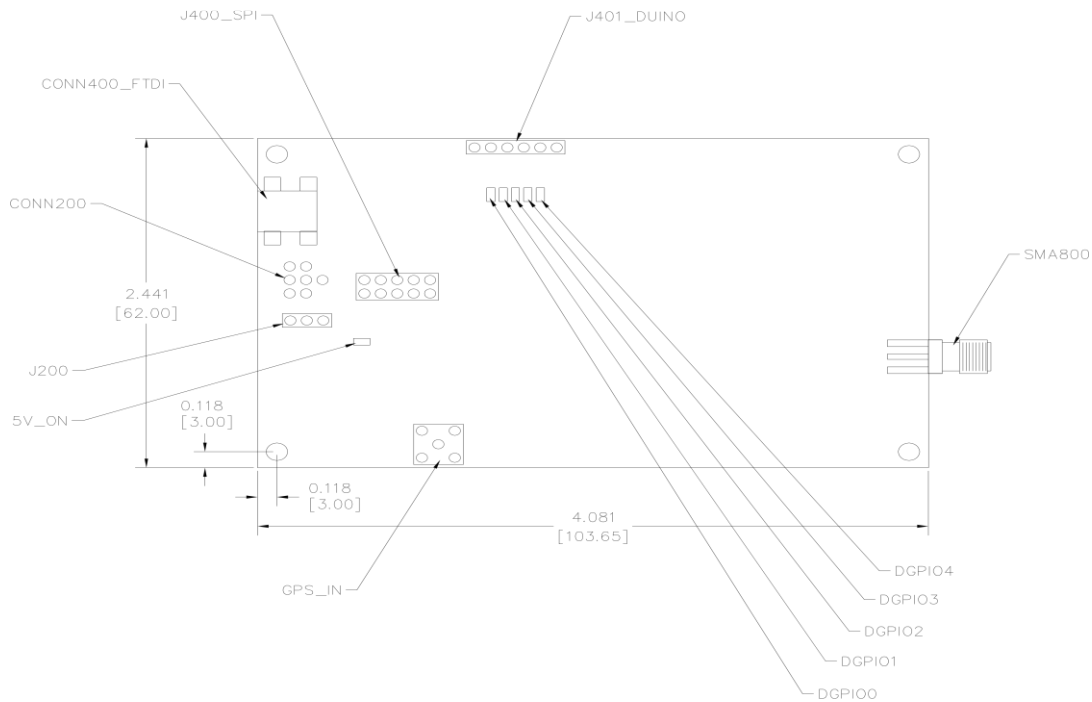
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Emissions Type (ITU Class)	n/a
Maximum Duty Cycle	None; 400msec max dwell time per channel

## Block Diagram



### Mechanical Dimensions and Interfaces



Reference Designator	Description
GPS_IN	External GPS Antenna Connector
CONN200	Power Connector
CONN400_FTDI	USB Serial Port Connector
J200	Interface Mode Selector
J400_SPI	SPI Bus Connector
J401_DUINO	Arduino Interface Connector
SMA800	LoRa Radio Antenna Connector
DGPI00	User Defined
DGPI01	User Defined
DGPI02	User Defined
DGPI03	User Defined
DGPI04	Packet Traffic
5V_ON	Power LED

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J400_SPI Connector pin#	Description
1	SCK
2	SCK1
3	MOSI
4	MOSI1
5	MISO
6	MISO1
7	CSN
8	CSN1
9	RESET
10	RESET1

J401_DUINO Connector pin#	Description
1	CSN
2	MISO
3	MOSI
4	SCK
5	GND
6	RESET

J200_INTERFACE Connector pin#	Description
1	VCONN200 (from host board 5V)
2	V+P5V for board
3	VCC_USB (from USB connection 5V)





Card

## LoRa Data Concentrator 8-Path North America Radio

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## References

Semtech SX1301 Datasheet

Semtech SX1257 Datasheet

FTDI FT2232HL Datasheet

Qorvo RFPA0133 Datasheet

## OEM Responsibilities

**WARNING:** The OEM must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Embedded Planet FCC identifier for this product.

**Contains FCC ID: PZSLORA-DC-8**

### Approved antenna:

Part number = ANT-916-CW-HWR-RPS

Vendor = Linx Technologies

Electrical Specifications

Center Frequency: 916MHz

Recommended Freq. Range: 900–930MHz

Bandwidth: 30MHz

Wavelength:  $\frac{1}{2}$ -wave

VSWR:  $\leq 2.0$  typical

Peak Gain: 1.2dBi

Impedance: 50-ohms

Connection: RP-SMA or SMA

Operating Temp. Range:  $-30^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$

The OEM of the EPM2M-LORA-DC-8-NA module must only use the approved antenna(s) listed above (or equivalent), which have been certified with this module. The OEM integrator must not provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user manual of the end-product.



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## USER MANUAL

### FCC REGULATORY STATEMENTS Model US/FCC EPM2M-LORA-DC-8-NA

The OEM must follow the regulatory guidelines and warnings listed below to inherit the Embedded Planet modular approval.

The EPM2M-LORA-DC-8-NA holds full modular approvals and has been certified for integration to products only by OEM integrators under the following conditions:

1. The antenna(s) must be installed such that a minimum separation distance of 20 cm is always maintained between the radiator (antenna) and all persons.
2. The transmitter module must not be operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

If the two conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

**IMPORTANT NOTE:** If these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### Power Exposure Information

Federal Communication Commission (FCC) Radiation Exposure Statement:

To comply with FCC RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and operating in conjunction with any other antenna or transmitter.

### OEM Responsibilities

**WARNING:** The OEM must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Embedded Planet FCC identifier for this product.

Contains FCC ID: **PZSLORA-DC-8**

The OEM of the EPM2M-LORA-DC-8-NA module must only use the approved antenna(s) listed above, which have been certified with this module. The OEM integrator must not provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user manual of the end-product.



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The user manual for the end-product must also include the following information in a prominent location:

To comply with FCC RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

#### **EPM2M-LORA-DC-8-NA 8-channel Concentrator Card**

If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on visible on outside of device:

The enclosed 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

Label and text information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

**CAUTION:** The OEM should have their device which incorporates the **EPM2M-LORA-DC-8-NA** tested by a qualified test house to verify compliance with FCC Part 15 Subpart B limits for unintentional radiators.

**WARNING:** Changes or modifications not expressly approved by Embedded Planet could void the user's authority to operate the equipment.

### Regulatory Statements

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

- Re-orient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.



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- Consult the dealer or an experienced radio/TV technician for help.

FCC Warning:

“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

### Revision History

Revision	Description	Date
RA00	Initial	6/3/2016
RB00	Added FCC and IC statements, changed Concentrator to Concentrator	10/22/2018
RC00	Edited typos, SMA to RP-SMA, updated FCC statements for OEM	11/20/2018