Linx
TECHNOLOGIES

MS Series
Master Development System
User´s Guide

Wireless made simple®

⚠ Warning: Some customers may want Linx radio frequency ("RF") products to control machinery or devices remotely, including machinery or devices that can cause death, bodily injuries, and/or property damage if improperly or inadvertently triggered, particularly in industrial settings or other applications implicating life-safety concerns ("Life and Property Safety Situations").

NO OEM LINX REMOTE CONTROL OR FUNCTION MODULE SHOULD EVER BE USED IN LIFE AND PROPERTY SAFETY SITUATIONS. No OEM Linx Remote Control or Function Module should be modified for Life and Property Safety Situations. Such modification cannot provide sufficient safety and will void the product's regulatory certification and warranty.

Customers may use our (non-Function) Modules, Antenna and Connectors as part of other systems in Life Safety Situations, but only with necessary and industry appropriate redundancies and in compliance with applicable safety standards, including without limitation, ANSI and NFPA standards. It is solely the responsibility of any Linx customer who uses one or more of these products to incorporate appropriate redundancies and safety standards for the Life and Property Safety Situation application.

<u>Do not use this or any Linx product to trigger an action directly from the data line or RSSI lines without a protocol or encoder/decoder to validate the data.</u> Without validation, any signal from another unrelated transmitter in the environment received by the module could inadvertently trigger the action.

<u>All RF products are susceptible to RF interference that can prevent communication.</u> RF products without frequency agility or hopping implemented are more subject to interference. This module does not have a frequency hopping protocol built in.

<u>Do not use any Linx product over the limits in this data guide.</u> Excessive voltage or extended operation at the maximum voltage could cause product failure. Exceeding the reflow temperature profile could cause product failure which is not immediately evident.

<u>Do not make any physical or electrical modifications to any Linx product.</u> This will void the warranty and regulatory and UL certifications and may cause product failure which is not immediately evident.

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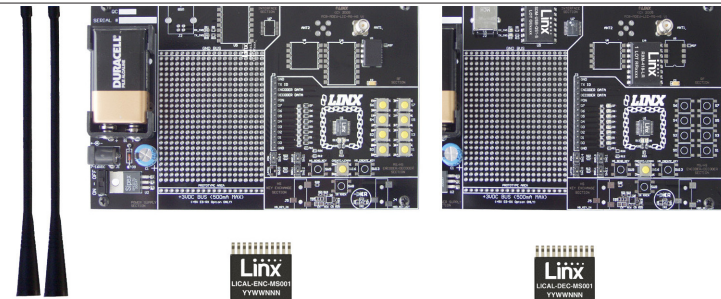
User´s Guide

Figure 1: MS Series Master Development System

Introduction

The MS Series encoders and decoders are ideal for remote control and command, security, keyless entry, status monitoring and a host of similar applications. They allow the status of up to eight buttons or contacts to be securely transferred via a wireless link. The Master Development System gives a designer all the tools necessary to incorporate the MS Series into a product. This guide shows how to take full advantage of the development boards included with the system. The Master Development System serves several important functions:

- Rapid Evaluation: It allows the performance and features of the MS Series encoder and decoder to be quickly evaluated.

- Design: It shows how to design with the MS Series and how to interface with other components. It also demonstrates the overall system function, making it easy to develop the initial system design.

- Prototype Development: It allows for additional circuitry to be placed directly on the board so that it can act as the first prototype of the product. All of the signals are available on a wire-wrap header for easy connection to external circuitry.

This kit includes 2 development boards, 2 MS Series encoders*, 2 MS Series decoders*, and two CW Series antennas, 1 LR or ES Series transmitter, 1 LR or ES Series receiver, full documentation and batteries. The decoder board is populated with 1 QS Series USB module.

*One part is soldered to the board, one extra is for use on your first prototype board.

Ordering Information

Ordering Information	
Part Number	**Description**
MDEV-LICAL-MS	MS Series Master Development System with LR Series
MDEV-LICAL-MS-ES	MS Series Master Development System with ES Series

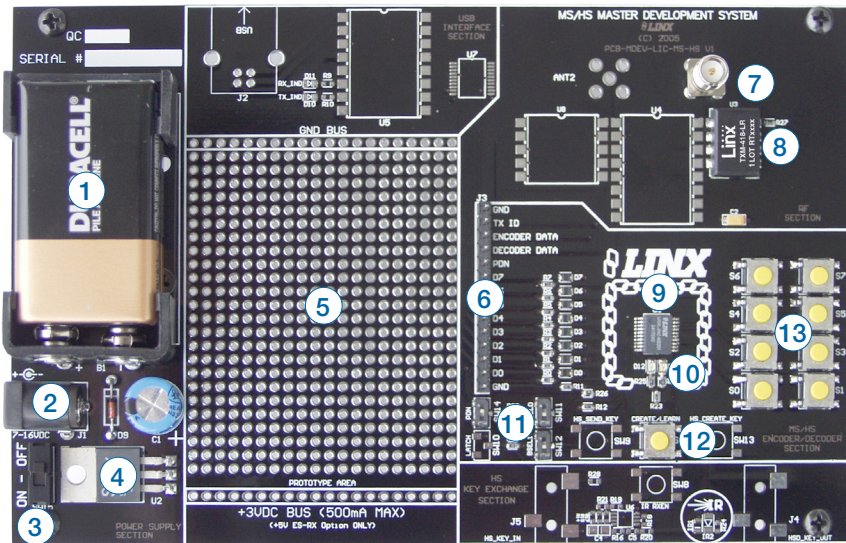Figure 2: Ordering Information

MS Series Encoder Development Board

Figure 3: MS Series Encoder Development Board

1. 9V Battery
2. Power Jack
3. On-Off Switch
4. Voltage Regulator
5. Prototype Area
6. Break-Out Header
7. Reverse-Polarity SMA Antenna Connector
8. LR Series Transmitter Module
9. MS Series Encoder
10. Indicator LEDs
11. Function Switches
12. CREATE Button
13. Data Line Buttons

MS Series Deccoder Development Board

Figure 4: MS Series Deccoder Development Board
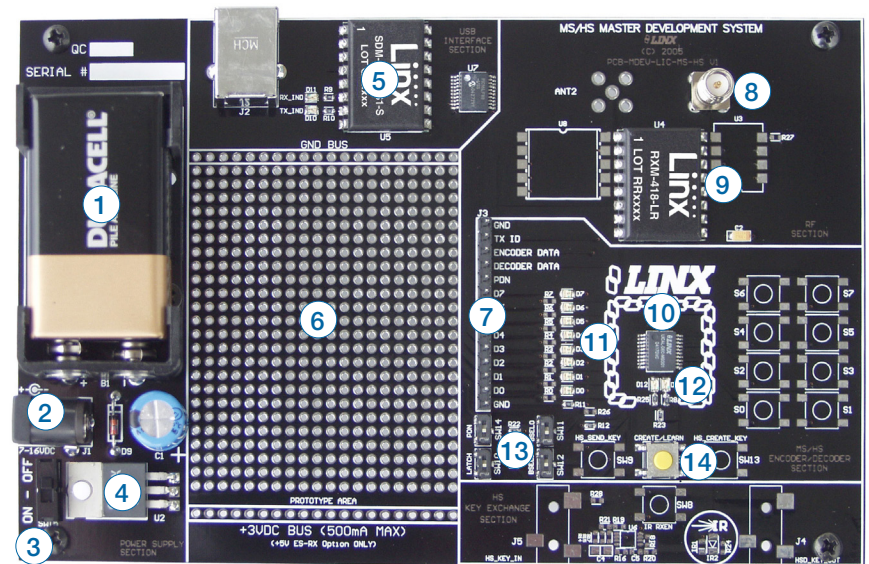
1. 9V Battery
2. Power Jack
3. On-Off Switch
4. Voltage Regulator
5. QS Series USB Module
6. Prototype Area
7. Break-Out Header
8. Reverse-Polarity SMA Antenna Connector
9. LR Series Receiver Module
10. MS Series Decoder
11. Data Line LEDs
12. Indicator LEDs
13. Function Switches
14. LEARN Button

Using the Development Boards

Use of the development boards is straightforward. After unpacking the development system, attach an antenna to each board, install the supplied 9V battery and turn on the power switches. The encoder and decoder are set at the factory and work straight out of the box. To create a new address, follow these steps:

1. Press and hold the CREATE button on the encoder board to create a new Address. The Address is randomized for as long as the button is held down. Once comfortable that the number is sufficiently random, release the button.

2. Once the CREATE button is released, the MODE_IND LED begins to flash to indicate that it is ready to accept Control Permissions. Press all of the data line buttons that are to be authorized, then press the CREATE button again or let the encoder time out.

3. Press the LEARN button on the decoder board and the MODE_IND LED starts flashing. Press any of the data line buttons on the encoder board and press the LEARN button again or let the decoder time out. The encoder's Address has been learned by the decoder and they can now operate together.

Troubleshooting

If the boards fail to work out of the box, then try the following:

*   Check the battery to make sure it is not dead.

*   Make sure that the baud rate switches are set the same on both boards.

*   Make sure that the antenna is connected and has the correct polarity connector.

*   Check to see if the PDN switch is on, placing the encoder and decoder into Power Down Mode. In most cases, the encoder PDN switch should be in the up position.

*   Make sure that the Control Permissions are set correctly. If the encoder is not set to use a particular line, then when the button on the encoder board is pressed, the MODE_IND LED on the decoder board lights up, but the data line LED does not light up.

If all of these appear to be in order, then call +1 800 736 6677 or email techsupport@linxtechnologies.com for technical support.

The Prototyping Area

The prototyping area is the same on both boards and contains a large area of plated through holes so that external circuitry can be placed on the board. This circuitry can be interfaced with the MS encoder or decoder through the header to the right. At the bottom of this area is a row connected to the 3V power supply and at the top is a row connected to ground.

All of the data lines are connected to a wire-wrap header to the right, allowing easy access from the prototyping area. The DATA_IN, DATA_OUT and TX_ID lines are also available on the header, as well as the PDN lines from the RF modules. This allows complete control of the entire system from the prototyping area, giving the designer a great deal of flexibility in using the boards.

The Power Supply

The power supply is the same on both boards and consists of a standard 9V battery and a power jack connected to a 3.0V voltage regulator. The regulator can provide approximately 500mA of current to the prototyping area. If the added circuitry needs more than this, then the designer must add an external supply. If the circuit consistently draws more than 100mA of current, it might be better to use the power jack, as the battery may run down fairly quickly, reducing testing and development time.

The jack accepts a standard 5.5mm plug with the tip ground and the outer shell 7 to 16VDC positive supply. A reverse voltage protection diode is included on the board to protect the circuitry in case the voltage on the plug is reversed, but it is still a good idea to double-check the polarity.

The Encoder Board

The encoder board has two sections that are of primary interest: the encoder area and the transmitter area.

The Encoder Area

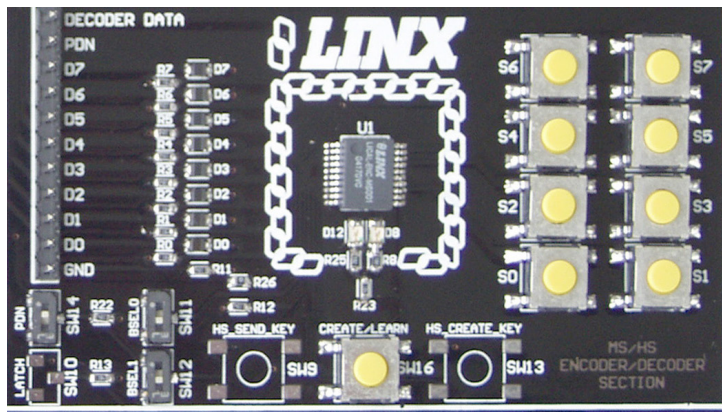Figure 5 shows the encoder area of the development board.

Figure 5: The Encoder Area

The encoder is placed in the center beneath the Linx logo. To the right are buttons that pull the encoder data lines high when pressed. Button S0 corresponds to data line D0, S1 to D1 and so forth.

The diodes to the left isolate the data lines from each other while allowing any line to activate the SEND line.

Beneath the encoder are two LEDs. D12 is connected to the MODE_IND line and lights up as described in the MS Encoder Data Guide. D8 is connected to the TX_CNTL line and provides visual feedback by lighting up when the encoder sends a word.

Beneath the LEDs is a button that is connected to the CREATE line. This button is used to create the Address and set the Control Permissions as described in the MS Series Encoder Data Guide.

There are three function switches to the left of the CREATE button. BSEL0 and BSEL1 are used to set the baud rate of the encoder as described in Figure 6. The maximum baud rate for the LR Series is 10,000bps, so only 2,400 and 9,600bps can be used on boards populated with these modules. The ES Series can use all four baud rates.

Baud Rate Selection Table		
SEL_BAUD1	SEL_BAUD0	Baud Rate (bps)
0	0	2,400
0	1	9,600
1	0	19,200
1	1	28,800

Figure 6: Baud Rate Selection Table

Note: The decoder board must be set to the same baud rate in order for the signal to be received correctly. The maximum baud rate for the LR Series is 10,000bps, so only 2,400 and 9,600bps can be used on boards populated with these modules. The ES Series transmitter can use all four baud rates. If the switch is up, then the line is high, if it is down, then the line is low.

The PDN switch connects the TX_CNTL line of the encoder to the PDN line of the transmitter so that the TX Control Mode of the encoder can be tested. This mode is described in the MS Series Encoder Data Guide.

If a BSEL switch is up, then the line is high (1, VCC); if down, then the line is low (0, GND). If the PDN switch is up, then the encoder's TX_CNTL line is connected to the transmitter's PDN line; if down, it is not connected and the LR Series transmitter is not activated unless its PDN line is pulled high externally. The ES Series transmitter has an internal pull-up, so is active unless pulled low.

The Encoder Board RF Area
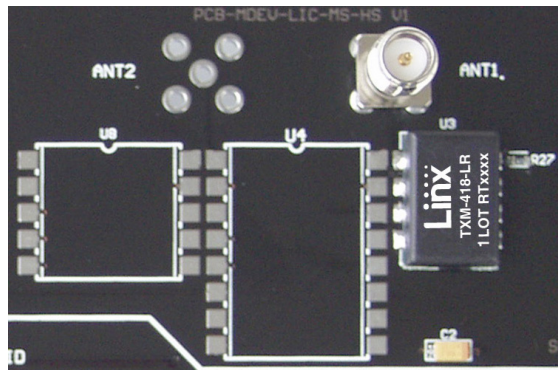Figure 7 shows the RF area of the development board.

Figure 7: The Encoder Board RF Area

This board can be populated with either the LR Series transmitter (as shown) or the ES Series transmitter. The LR Series transmitter is placed on the right side and the ANT1 connector is populated. The ES Series transmitter is placed on the left and the ANT2 connector is populated. R27 is connected to the LADJ line of the LR transmitter to reduce the output power to approximately 0dBm. The LR Series transmitter is capable of producing more output power than may be legally acceptable, so by reducing the output power, the range experienced with the evaluation kit more closely resembles the rage that can be achieved with a final certified product.

The Decoder Board
The decoder board has three main sections of interest: the decoder area, the receiver area, and the USB area.

The Decoder Area
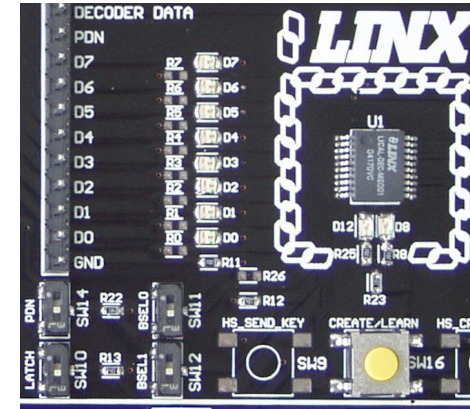Figure 8 shows the decoder area of the development board.

Figure 8: The Decoder Area

The decoder is placed in the center beneath the Linx logo. To the left are LEDs that are connected to the decoder data lines. These light up when the decoder receives a signal from the encoder to take the data line high. LED D0 corresponds to data line D0 and so forth.

Beneath the decoder are two LEDs. D12 is connected to the MODE_IND line and lights up as described in the MS Series Decoder Data Guide. D8 is connected to the RX_CNTL line and provides visual feedback by lighting up when the decoder activates the receiver when in RX Control Mode.

Beneath the LEDs is a button that is connected to the LEARN line. This button is used to learn the Address from the encoder as described in the MS Series Decoder Data Guide.

There are four function switches to the left of the CREATE button. BSEL0 and BSEL1 are used to set the baud rate of the decoder as described in Figure 6.

The PDN switch connects the RX_CNTL line of the encoder to the PDN line of the receiver so that the RX Control Mode of the decoder can be tested. This mode is described in the MS Series Decoder Data Guide.

The LATCH switch places the decoder into Latch Mode when on, so that the data lines will go high when a valid signal is received and stay high until a second valid signal is received. If the switch is off, the data lines are momentary.

The Decoder Board RF Area
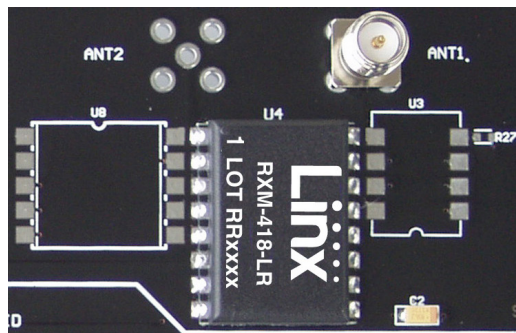
Figure 9 shows the RF area of the development board.

Figure 9: The Decoder Board RF Area

This board can be populated with either the LR Series receiver (as shown) or the ES Series receiver. Both modules can be placed on the same pads in the center of the section, but the ANT1 connector is populated for the LR receiver and the ANT2 connector is populated for the ES receiver.

The Decoder Board USB Area

The decoder development board has a Linx SDM-USB-QS USB interface module for use with the included development software. The module is powered by the USB bus so does not pull any current from the battery. Figure 10 shows this section.
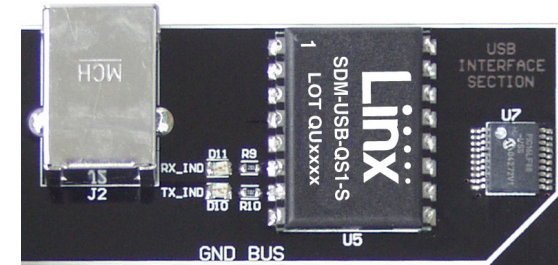

Figure 10: The Decoder Board USB Area

The microcontroller on the right monitors the data lines and generates commands that are sent to the development software on the PC via the QS Series USB module. The RX_IND LED to the left of the module flashes to indicate that data is being received from the PC, and the TX_IND line flashes to indicate that the module is sending data to the PC.

Installing the Software and Drivers

The first time a QS module is plugged into a computer, Windows displays the Found New Hardware Wizard, which guides the installation of the drivers. The drivers are included on the CD, so point the wizard to the CD when prompted. The drivers have not gone through Microsoft's verification process, so a message may appear warning of this. Click "Continue Anyway" to finish the installation process.

Application Note AN-00201 (Installing the SDM-USB-QS-S Drivers) describes the installation of the drivers in detail. The drivers should be installed before running the Development Software.

The MS Series Master Development System Software automatically starts when the CD is inserted and the player in Figure 11 appears.

Figure 11: Software Installer

The View Documentation button shows a list of the application notes and manuals related to the MS Series. Selecting one of these opens the file in Adobe Acrobat. The Play Movie button plays a short video about Linx in the Player Screen, which can be controlled with the Selection Keypad. Clicking the button on the bottom right of the player opens the Linx Technologies homepage in the computer's default browser.

The View Documentation list also allows for the installation of Adobe Acrobat Reader, so that the documents may be viewed, and Flash, which may be required if the Linx video does not play correctly.

Clicking the Install Software button starts the Installation Wizard, which guides the installation of the development software. The installer places the software application, MS Series documentation, and USB drivers at the installed location on the computer's hard drive.

MS Series Master Development System Software

The MS Series Master Development System software can be used in one of two modes. The default mode is as a simulation of the system. This is a good way of showing how the MS Series can work in a system for activating lights and doors.

The second mode is for use with the development system. When the decoder board is plugged into the USB port, the kit can be used to activate the features in the software. When a data line goes high on the decoder, the microcontroller sends a command to the computer to control the functions in the software.

Figure 12: The MS Series Master Development System Software

Clicking the Help label at the top of the window opens the guide for using the development software. Please see this document for details on operation of the software.
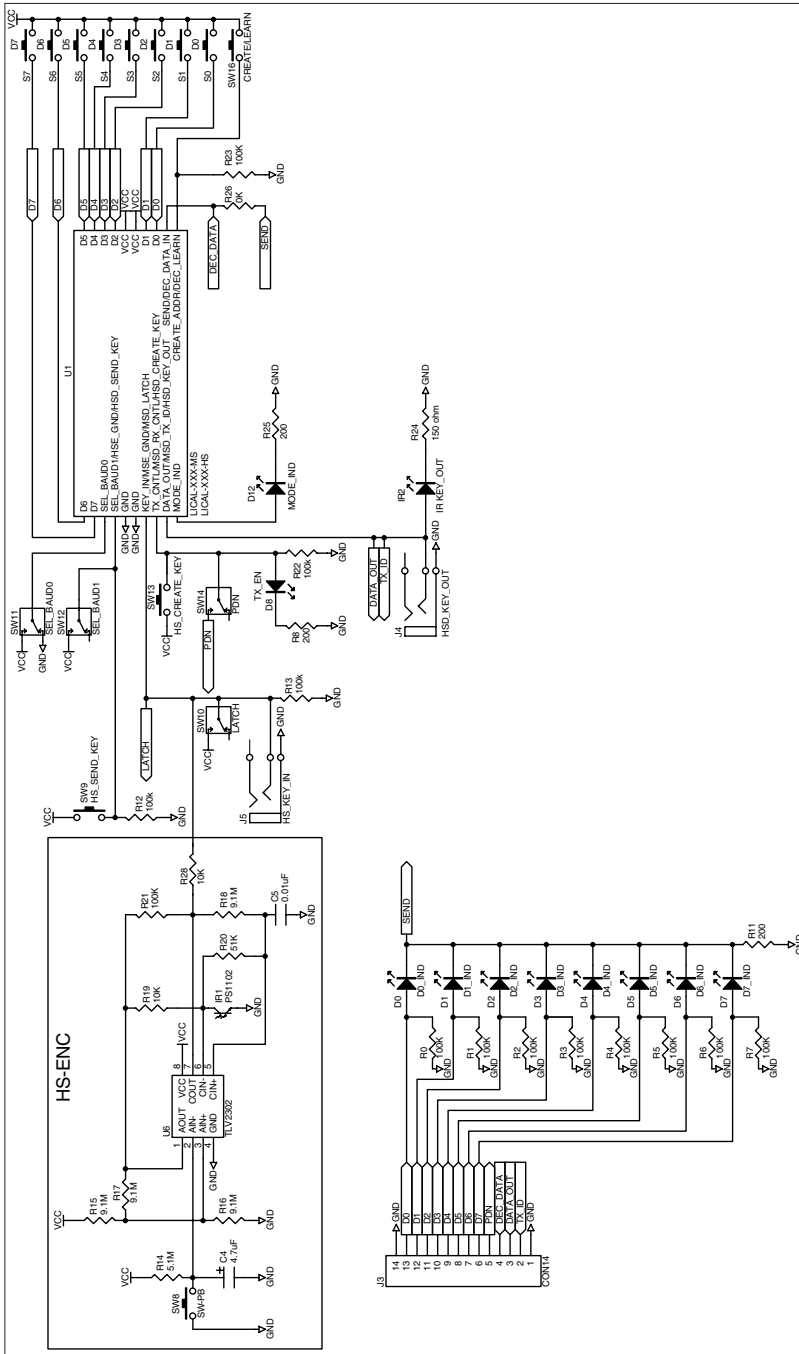
Schematics

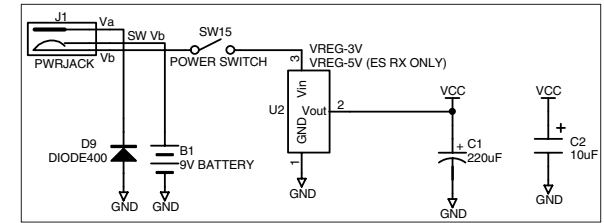Figure 13: Figure 11: Encoder / Decoder Section
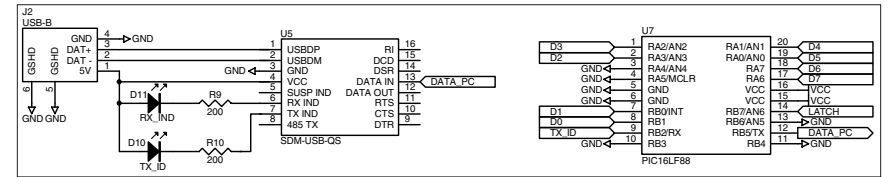
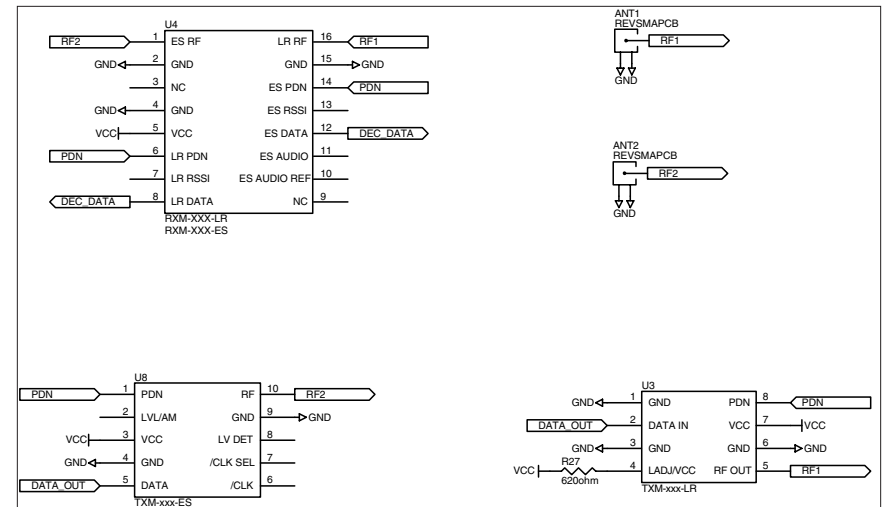Figure 14: Power Supply Section

Figure 15: USB Section

Figure 16: RF Section

Linx Technologies
159 Ort Lane
Merlin, OR, US 97532

Phone: +1 541 471 6256
Fax: +1 541 471 6251

www.linxtechnologies.com

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