LINX® TECHNOLOGIES
WIRELESS MADE SIMPLE®

MASTER EVALUATION/DEVELOPMENT SYSTEM

MS Series Master Development System User's Guide
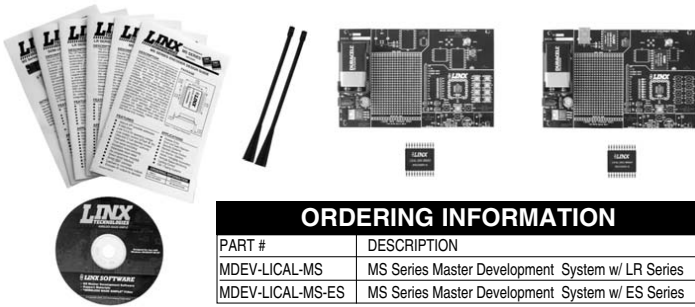
INTRODUCTION

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 is intended to give a designer all the tools necessary to incorporate the encoder and decoder into a product. This guide will show how to take full advantage of the development boards included with the system. Data Guides for the encoder and decoder are included with the system or may be downloaded from the Linx Technologies website. 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 encoder and decoder 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.

The Master Development System includes 2 development boards, one set up for the encoder and the other for the decoder, 2 MS Series encoders*, 2 MS Series decoders*, and two CW Series antennas. The boards may be populated with either the LR Series or the ES Series RF modules. The decoder board will also be populated with 1 QS Series USB module.

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

Revised 1/28/08

MS SERIES ENCODER DEVELOPMENT BOARD
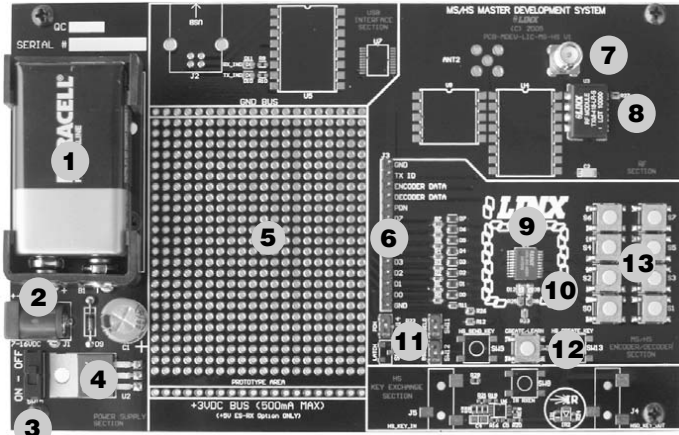

Figure 1: MS Series Encoder Development Board

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

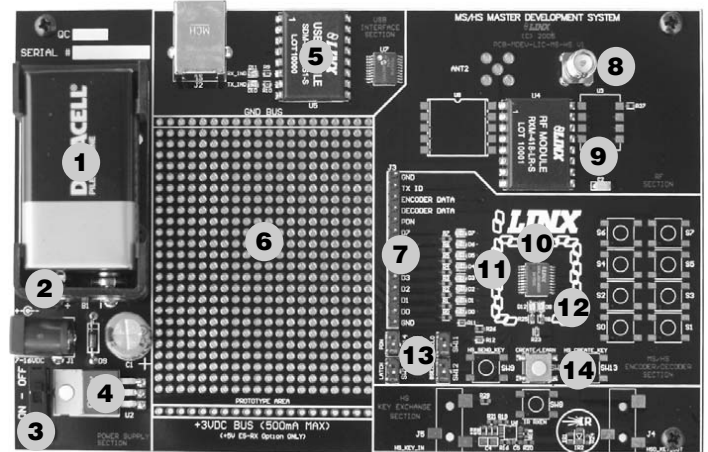## MS SERIES DECODER DEVELOPMENT BOARD

Figure 2: MS Series Decoder 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.   RP-SMA Antenna Connector
9.   LR Series Receiver
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 will have default settings from the factory and will 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 Code Word. The Code Word will be 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 will begin to flash to indicate that it is ready to accept Control Permissions. Press all of the data line buttons that are to be recognized, then press the CREATE button again.

3. Press the LEARN button on the decoder board and the MODE_IND LED will start flashing. Press any of the data line buttons on the encoder board and press the LEARN button again. The encoder's Code Word has been learned by the decoder and they will 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.

• 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 on.

• Make sure that you set your Control Permissions correctly. If you have not set the encoder to use a particular line, then when you press a button on the encoder board, the MODE_IND LED on the decoder board will light up, but the data line LED will not light up.

If all of these appear to be in order, then you can call 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 breakout 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 will need more than this, then the designer must add an external supply. If the circuit will consistently draw 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 has been 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

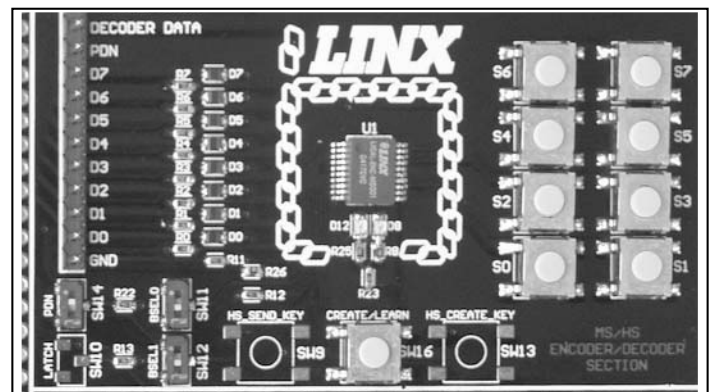The figure below shows the encoder area of the development board.

Figure 3: The Encoder Area

The encoder is placed in the center beneath the Linx logo. To the right are buttons that will 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 will light up as described in the MS Encoder Data Guide. D8 is connected to the TX_CNTL line and will provide visual feedback by lighting up when the encoder sends a word.

THE ENCODER BOARD (CONT.)

Beneath the LEDs is a button that is connected to the CREATE line. This button is used to create the Code Word 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 the adjacent table. *Important* The decoder board must be set to the same baud rate in order for the signal to be received correctly.

BSEL1	BSEL0	Baud Rate
0	0	2,400
0	1	9,600
1	0	19,200
1	1	28,800

Table 1: Baud Rate Selection Table

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.

The PDN switch will connect 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, V_{CC}); 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 will not be activated unless the PDN line is pulled high externally. The ES Series transmitter has an internal pull-up, so will be active unless pulled low.

The Encoder Board RF Area

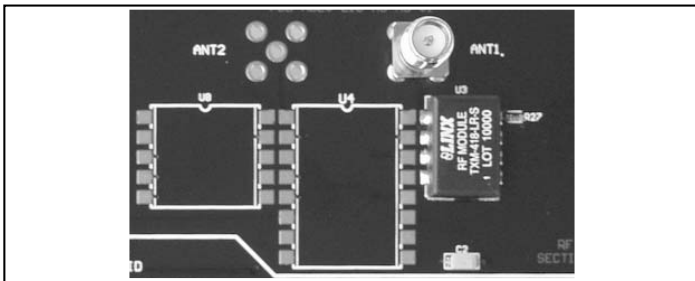The figure below shows the RF area of the development board.

Figure 4: 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 will be placed on the right side and the ANT1 connector will be populated. The ES Series transmitter will be placed on the left and the ANT2 connector will be 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 will more closely resemble 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

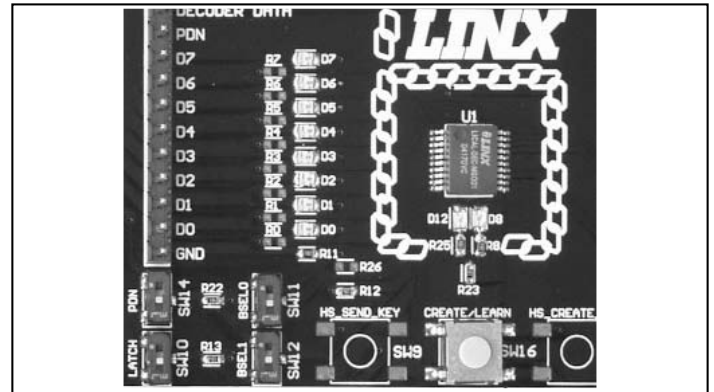The figure below shows the decoder area of the development board.

Figure 5: 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 will 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 will light up as described in the MS Series Decoder Data Guide. D8 is connected to the RX_CNTL line and will provide 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 Code Word 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 Table 1. *Important* The encoder 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 receiver 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 will connect 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 will place 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 (CONT.)

The Decoder Board RF Area

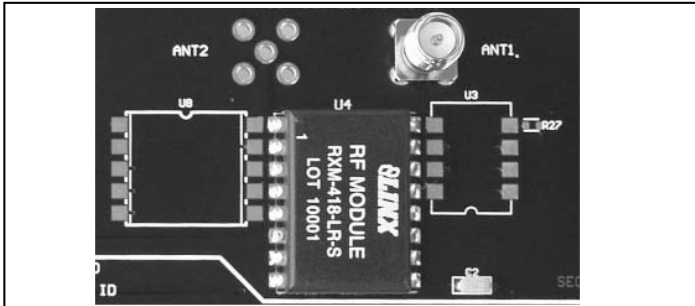The figure below shows the RF area of the development board.

Figure 6: 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 will be populated for the LR receiver and the ANT2 connector will be populated for the ES receiver.

The Decoder Board USB Area

The development boards have a Linx SDM-USB-QS-S module for use with the included development software. This module is powered by the USB bus so will not pull any current from the battery. The figure below shows this section.
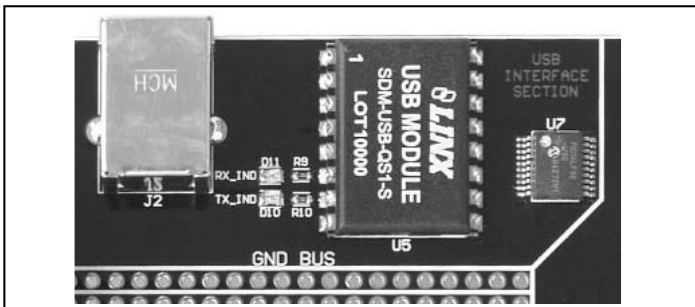

Figure 7: The Decoder Board USB Area

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 will flash to indicate that data is being received from the PC, and the TX_IND line will flash to indicate that the module is sending data to the PC.

INSTALLING THE SOFTWARE AND DRIVERS

The software included with the Master Development System uses the QS Series Direct Drivers and cannot be used with the Virtual COM Port Drivers. For this reason, only the Direct Drivers are included on the CD with the software.

The first time a QS module is plugged into a computer, Windows will display the Found New Hardware Wizard, which will guide you through installing the drivers. 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 will automatically start when the CD is inserted and the player in the figure below will appear.
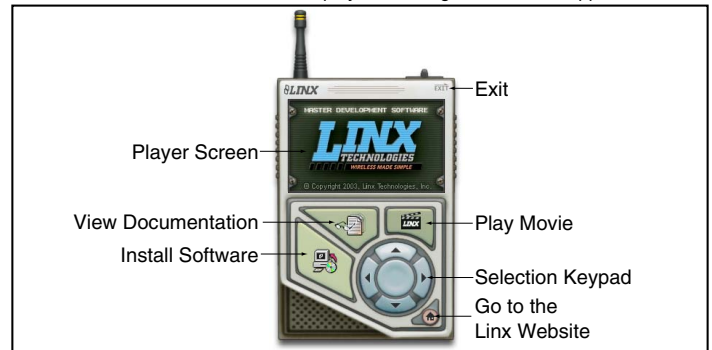

Figure 8: Software Installer

Clicking the Install Software button will start the Installation Wizard, which will guide you through the installation of the development software. The View Documentation button will show a list of the application notes and manuals related to the MS Series. Selecting one of these will open the file in Adobe Acrobat. The Play Movie button will play 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 will open 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. There is also the option of installing Flash, which may be required if the Linx video does not play correctly.

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 will send a command to the computer to control the functions in the software. Please see the documentation included with the software for details.
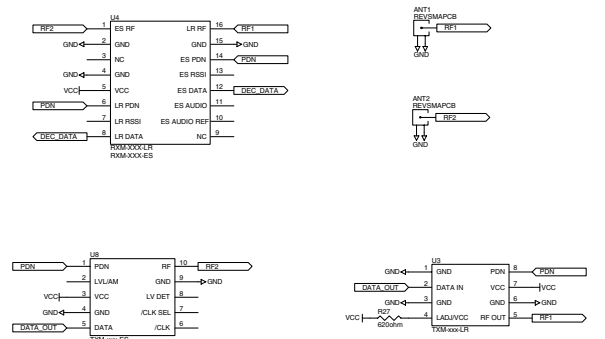
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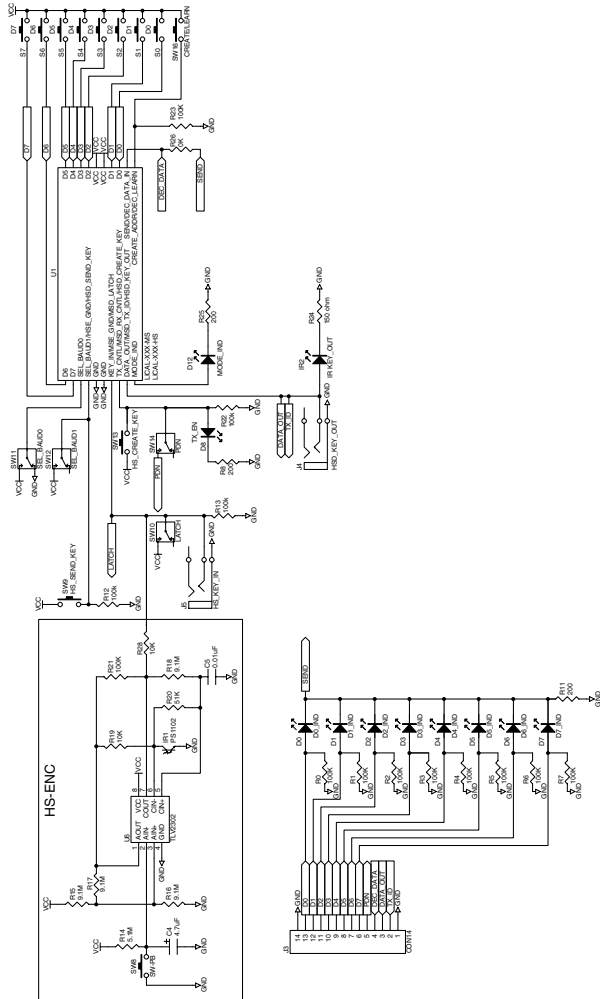
POWER SUPPLY SECTION

USB SECTION

RF SECTION
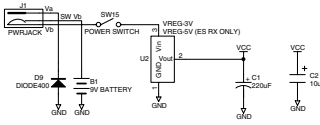
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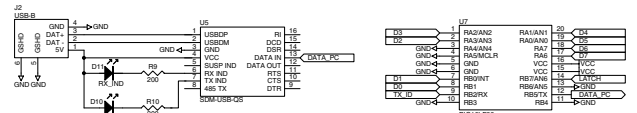
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