MS KEYFOB TRANSMITTER DATA GUIDE

DESCRIPTION

The Linx MS Series Keyfob transmitter is ideal for remote control and command applications. Available in 315, 418 (standard), or 433.92MHz versions, it has been pre-certified for FCC Part 15, Industry Canada, and European CE (433MHz) compliance. This dramatically reduces development cost and time to market. The high-performance synthesized design provides superior frequency accuracy and minimizes body proximity effects. When combined with an LR or LT Series module, the Keyfob can operate at distances of up to 750 feet. Ease of use and security are dramatically enhanced by the on-board MS Series encoder, which allows instant creation of up to 16,777,216 (2^{24}) unique addresses without cumbersome DIP switches or cut traces. When paired with a MS Series decoder, Keyfob identity can be determined and button permissions established. The Keyfob is available with 1 to 5 buttons and can be custom labeled.
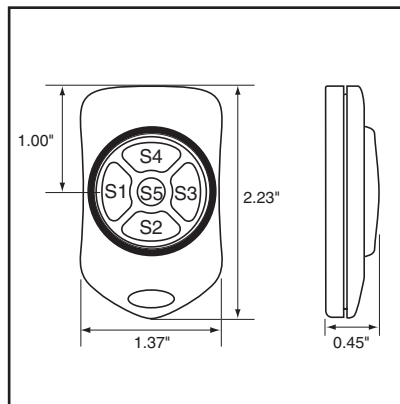

Figure 1: Physical Dimensions

FEATURES

- FCC, Canada, and CE pre-certified
- Utilizes the advanced MS encoder
- Long range
- Simple user setup
- 2^{24} unique addresses
- 1 to 5 buttons
- Compact, stylish package

APPLICATIONS INCLUDE

- General Remote Control
- Keyless Entry
- Garage / Gate Openers
- Call Systems
- Home / Industrial Automation
- Wire Elimination

OEM Configurations

With a one-time NRE and minimum order, Linx can configure the keypad and label areas to meet your specific requirements. Contact Linx for details.

ORDERING INFORMATION

PART #	DESCRIPTION
OTX-***-HH-KF#-MS-xxx	MS Keyfob Transmitter
MDEV-***-HH-KF#-MS	MS Keyfob Development System
# = Number of Buttons, 1 to 5	
*** = 315, 418 (Standard), 433.92MHz	
xxx = Color Leave blank for standard Black	
WHT = White CGY= Gray CBL = Blue	
CRE = Red CPU = Purple	

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ELECTRICAL SPECIFICATIONS

Parameter	Designation	Min.	Typical	Max.	Units	Notes
POWER SUPPLY						
Operating Voltage	V_{CC}	2.1	3.0	3.6	VDC	–
Supply Current	I_{CC}	–	3.4	–	mA	–
Power-Down Current	I_{PDN}	–	5.0	–	nA	1
TRANSMITTER SECTION						
Transmit Frequency Range:	F_C					
OTX-315-HH-KF#-MS		–	315	–	MHz	–
OTX-418-HH-KF#-MS		–	418	–	MHz	–
OTX-433-HH-KF#-MS		–	433.92	–	MHz	–
Center Frequency Accuracy	–	-50	–	+50	kHz	–
Data Rate	–	–	9,600	–	bps	–
ENVIRONMENTAL						
Operating Temperature Range	–	-40	–	+85	°C	1

Notes
1. Characterized, but not tested.

THEORY OF OPERATION

The MS Series Keyfob Transmitter combines a high-performance synthesized transmitter with an on-board MS Series encoder IC to form a highly reliable, yet cost-effective RF remote control transmitter. The transmitter's advanced synthesized architecture delivers superior stability and frequency accuracy while minimizing the effects of temperature and body proximity.

The advanced MS Series encoder has several advantages over previous solutions. It provides more security by offering 2^{24} addresses, which is several orders of magnitude greater than older encoders. Furthermore, the address is instantly established with a simple button press, eliminating cumbersome DIP switches and cut traces. When paired with a MS Series decoder, keyfob identity can be determined and distinct transmitter-receiver relationships established.

The Keyfob operates in the following manner: when a button is pressed on the Keyfob, power is applied to the internal circuitry and the encoder IC is enabled. The encoder then detects the logic states of the button data lines. The encoder data is used to modulate the transmitter, which, through the antenna, conveys the data into free space. The transmission cycle continues until the button is released. On the receiver side, a MS Series decoder IC is used to check the transmitter's address bits against the address saved in memory. If a match is confirmed, and if the decoder has permission to recognize the specific button being pressed, the decoder's outputs are set to replicate the transmitter's button states. These outputs can then be used to activate external circuitry required by the application.

The transmitter is compatible with the LT and LR product families. For applications where range is critical, the LR Series receiver is the best choice due to its outstanding sensitivity. When the Keyfob transmitter is combined with an LR Series receiver and MS Series decoder, ranges of up to 750 feet are possible. Applications operating over shorter distances will also benefit from the increased link reliability and superior noise immunity provided by the LR receiver.

SETTING THE TRANSMITTER ADDRESS

The Keyfobs are all supplied from the factory with a default address and all buttons authorized. The address is changed by using a paper clip or probe to press the CREATE_ADDR button on the board through the hole in the back of the case. When the button is depressed, a LED will light up in the MODE_IND window, indicating that the address is being created. The address will be randomized for as long as the button is held down. When the button is released, the randomized address is saved and the LED will begin flashing to indicate that the Control Permissions may now be set. Press the buttons that the Keyfob user will have the authority to access. Press the CREATE_ADDR button with the paper clip again or wait 17 seconds for it to time out. The address and Control Permissions are now set. The decoder will need to learn the address before it will accept any transmissions. Please see the Typical Applications section of this data guide or the MS Series Decoder Data Guide for details.

CREATE_ADDR Button Access

Figure 2: CREATE_ADDR Button Access

BUTTON ASSIGNMENTS

The Keyfob is available in five button configurations. Those configurations and the corresponding switch numbers are shown in the figure below. The table shows which encoder data line has been assigned to each switch. When a button is pressed, the data line will go high, causing the corresponding data line on the decoder to go high if the address has been learned.
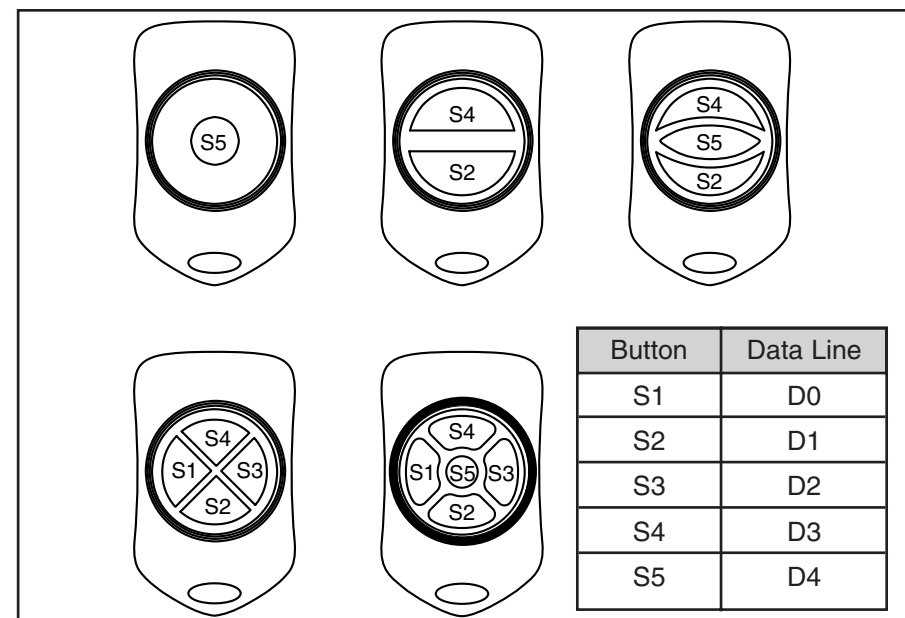

Button	Data Line
S1	D0
S2	D1
S3	D2
S4	D3
S5	D4

*Figure 3: OTX-***-HH-KF#-MS Button Assignments*

CONTENTION CONSIDERATIONS

It is important to understand that only one transmitter at a time can be activated within a reception area. While the transmitted signal consists of encoded digital data, only one carrier of any particular frequency can occupy airspace without contention at any given time. If two transmitters are activated in the same area at the same time, then the signals will interfere with each other and the decoder will not see a valid transmission, so it will not take any action.

BATTERY REPLACEMENT

The transmitter utilizes a standard CR2032 lithium button cell. In normal use, it will provide 1 to 2 years of operation. Access for replacement is accomplished by gently prying apart the two halves of the Keyfob at the seam (fingernails or a coin will do). Once the unit is open, remove the battery by sliding it out from beneath the retainer.

There may be the risk of explosion if the battery is replaced by the wrong type. Replace it with the same type of battery while observing the polarity shown in the adjacent figure.
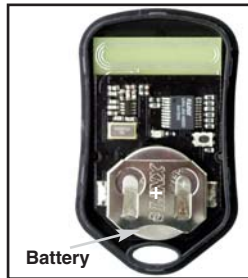

Battery

Figure 4: Battery Access

ASSEMBLY DIAGRAM

*Figure 5: OTX-***-HH-KF#-MS Assembly*

COMPLIANCE REQUIREMENTS

The OTX-***-HH-KF#-MS has been pre-certified by Linx Technologies for FCC Part 15 and Industry Canada RSP-100 compliance. The 433.92MHz version has also been tested for CE compliance for use in the European Union. The 315MHz and 418MHz versions are not legal for use in Europe.

LABELING / INSTRUCTION REQUIREMENTS

The OTX-***-HH-KF#-MS Keyfob Transmitter has already been labeled in accordance with FCC, Industry Canada, and CE regulations in effect as of the date of this document. No further labeling of the unit is needed; however, it is necessary to include the following statement in the end product's instruction manual or insert card for FCC compliance. Industry Canada only requires the shaded portion. EU does not require a statement.

INSTRUCTION TO THE USER

This device complies with Part 15 of the FCC Rules.

Operation of this device 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.

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.

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

Place the above statement in the instruction manual or insert card.

TYPICAL APPLICATIONS

The signal sent by the Keyfob transmitter can be received by the LR Series receiver module or the LT Series transceiver module. The outstanding sensitivity of the LR Series receiver offers the best range when used with the Keyfob transmitter. The receiver module is then connected directly to the MS Series decoder, which will decode the transmitted signal.

RXM-***-LR

When a button is pressed on the transmitter, a corresponding line on the decoder will go high. This can then be connected to external circuitry to perform whatever function is required by the application.

The decoder must learn the transmitter's address before they can work together. This is done by taking the LEARN line on the decoder high, typically with a pushbutton. The MODE_IND line will start switching (if a LED is attached, this will cause it to flash) indicating that the decoder is in Learn Mode. Press any of the buttons on the transmitter to initiate a transmission. Take the LEARN line high again to exit Learn Mode and the system is ready for use. The figure below shows a schematic for a typical application.

LICAL-DEC-MS001

The Keyfob is set to 9,600bps, so SEL_BAUD0 should be tied high and SEL_BAUD1 tied low.

The decoder has several unique features, such as Latch Mode, Receiver Control, and TX_ID.

If the LATCH line is tied to V_{CC}, the outputs will go high on the first transmission, then low on the second. It is shown tied low, so the outputs will be momentary (high for as long as a signal is received instructing the decoder to make them high).

The RX_CNTL line can be connected to the PDN line of the receiver and the decoder will activate the receiver with a 10% duty cycle This greatly reduces the average current consumption of the system. The adjacent

Figure 6: LR Receiver and MS Decoder Schematic

figure shows it tied to ground, but to use this feature, connect the RX_CNTL line of the decoder directly to the receiver's PDN line.

The TX_ID line will output a number associated with the originating transmitter / encoder. Application Note AN-00156 shows how to use this feature.

Data guides for the modules, the MS encoder, and the MS decoder can be found on the Linx Technologies web site, www.linxtechnologies.com.
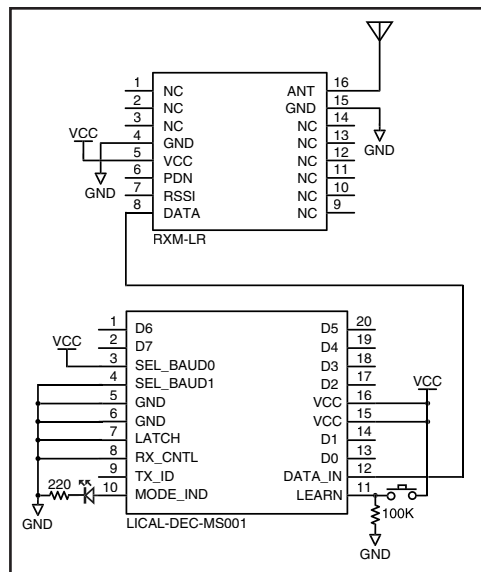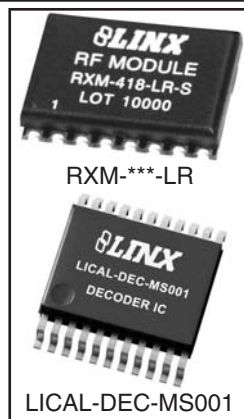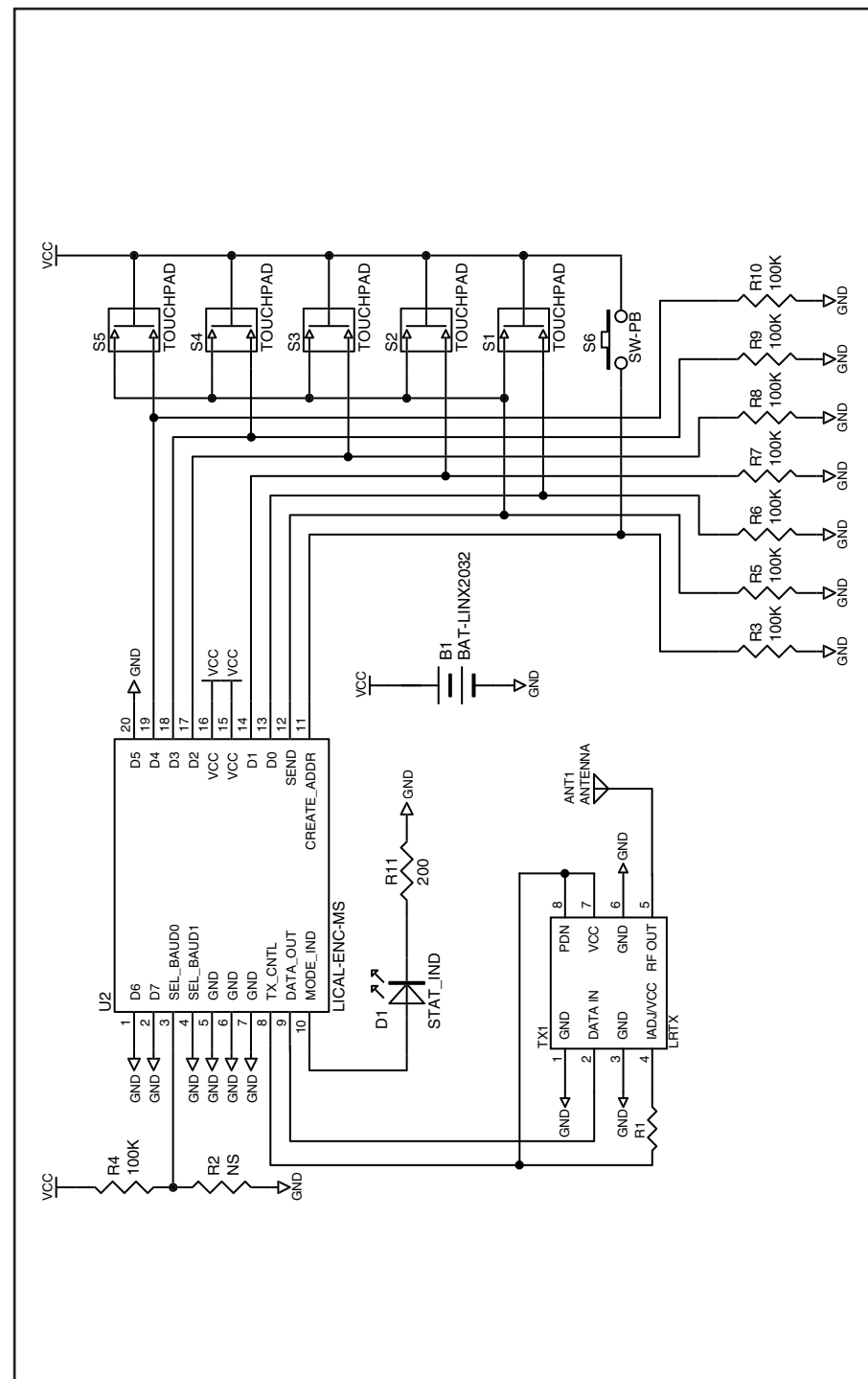

*Figure 7: OTX-***-HH-KF#-MS Schematic Diagram*

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