

## MS KEYFOB TRANSMITTER DATA GUIDE

### DESCRIPTION

The Linx MS Series Keyfob transmitter is ideal for remote control and command applications. Available in 315, 418, or 433.92MHz versions, it has been pre-certified for FCC Part 15, Industry Canada, and European CE (433MHz version only) 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 receiver, the keyfob can operate at distances of up to 1,000ft. Ease of use and security are dramatically enhanced by the on-board MS Series encoder, which allows instant creation of 16,000,000 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 in 1 to 5 button configurations and can be custom labeled.

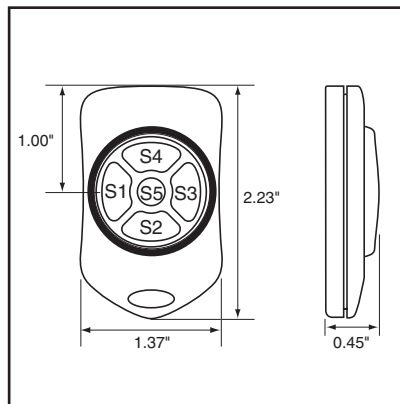


Figure 1: Physical Dimensions



### FEATURES

- FCC, Canada, and CE Pre-Certified
- Utilizes the advanced MS encoder
- Long range
- Simple user setup
- 2<sup>24</sup> unique addresses
- 1 to 5 buttons
- Compact, stylish package

### 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.

### APPLICATIONS INCLUDE

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

### ORDERING INFORMATION

PART #	DESCRIPTION
OTX-***-HH-KF#-MS-xxx	MS Keyfob Transmitter
EVAL-***-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

ELECTRICAL SPECIFICATIONS

Parameter	Designation	Min.	Typical	Max.	Units	Notes
POWER SUPPLY						
Operating Voltage	V <sub>CC</sub>	2.1	3.0	3.6	VDC	—
Supply Current	I <sub>CC</sub>	—	3.4	—	mA	—
Power-down Current	I <sub>PDN</sub>	—	5.0	—	nA	1
TRANSMITTER SECTION						
Transmit Frequency Range	F <sub>C</sub>					
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	—	—	9600	—	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 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<sup>24</sup> 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 LC 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 the MS Series decoder chip, ranges up to 1,000 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 encoder address is set by using a paper clip to press the CREATE\_ADDR button on the board through the hole in the back of the case. When the button is depressed, an LED on the board will light up 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 address is stored in memory and the LED will begin flashing to indicate that the Control Permissions may now be set. Press the buttons that the transmitter 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 and the address is 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 on learning an address.



Figure 2: CREATE\_ADDR Button Access

BUTTON ASSIGNMENTS

The keyfob is available in five unique 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 addresses match.

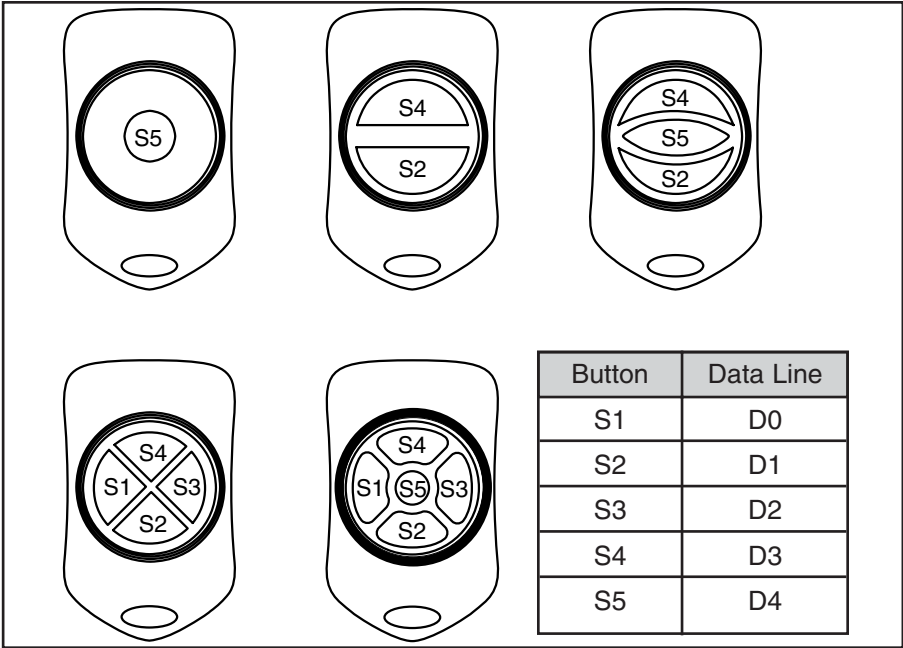


Figure 3: OTX-\*\*\*-HH-KF#-MS Button Assignments

## 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 battery. 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. Replace it with the same type of battery while observing the polarity shown on the retainer and shown in the adjacent figure.

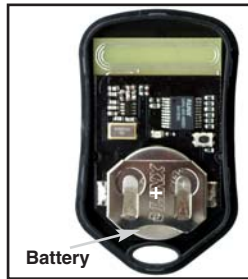


Figure 4: Battery Access

## ASSEMBLY DIAGRAM

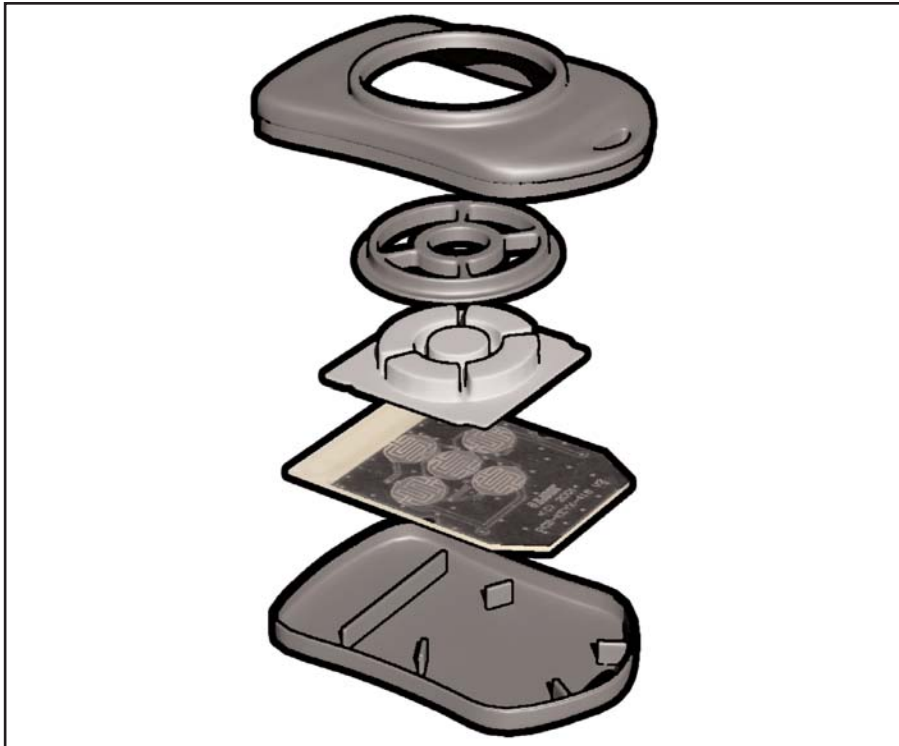


Figure 5: OTX-\*\*\*-HH-KF#-MS Assembly

## 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 Remote Command Unit has already been labeled in accordance with FCC, Industry Canada, and European 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.

### 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 APPLICATION

The signal sent by the Keyfob transmitter can be received by the LC Series receiver module or the LR Series receiver 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.

The basic operation for the system is that when a button is pressed on the transmitter, a corresponding pin 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 an 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.

The Keyfob is set to 9600bps, so SEL\_BAUD0 should be tied to Vcc and SEL\_BAUD1 tied to ground.

The decoder has several unique features, such as Latch Mode, Receiver Control, and TX\_ID.

If the LATCH line is tied to Vcc, 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 reduces the average current consumption of the system.

The adjacent 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 AN00156 shows how to use this feature.

Data guides for the receivers, the MS encoder, and the MS decoder can be found on the Linx Technologies web site, [www.linxtechnologies.com](http://www.linxtechnologies.com).

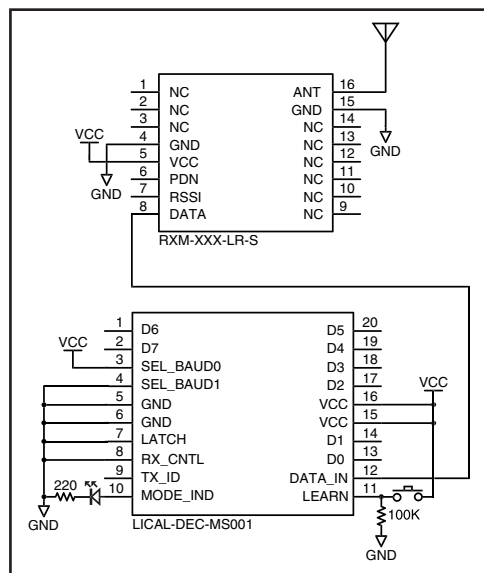


Figure 6: LR Receiver and MS Decoder Schematic

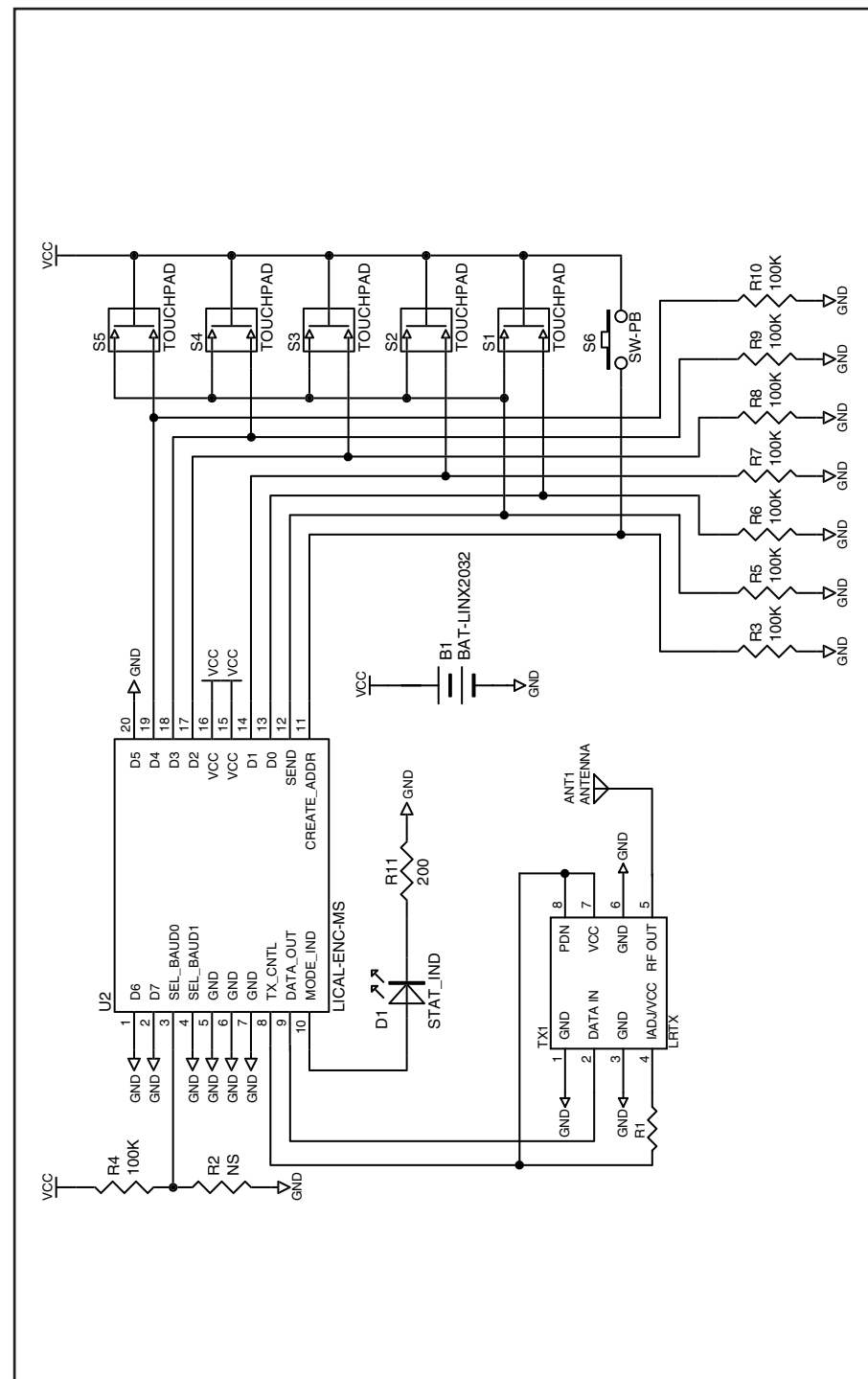


Figure 7: OTX-\*\*\*-HH-KF#-MS Schematic Diagram



## U.S. CORPORATE HEADQUARTERS

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