LINX TECHNOLOGIES
WIRELESS MADE SIMPLE

EVALUATION/DEVELOPMENT SYSTEMS

KH SERIES EVALUATION KIT DATA GUIDE

INTRODUCTION

The KH-series basic evaluation/development system is intended to give a designer all the tools necessary to incorporate KH-series modules correctly and legally into an end product.The development boards themselves serve several important functions.

- Rapid Module Evaluation -The boards allow rapid performance evaluation in a user's environment.
- Design Benchmark - During the design process, the boards provide a benchmark against which the performance of your own design may be judged.
- Application Development - An on-board prototyping area is provided on the receiver board to allow rapid product development.

The purpose of this guide is to show the designer how to take full advantage of the basic development boards included with the kit.

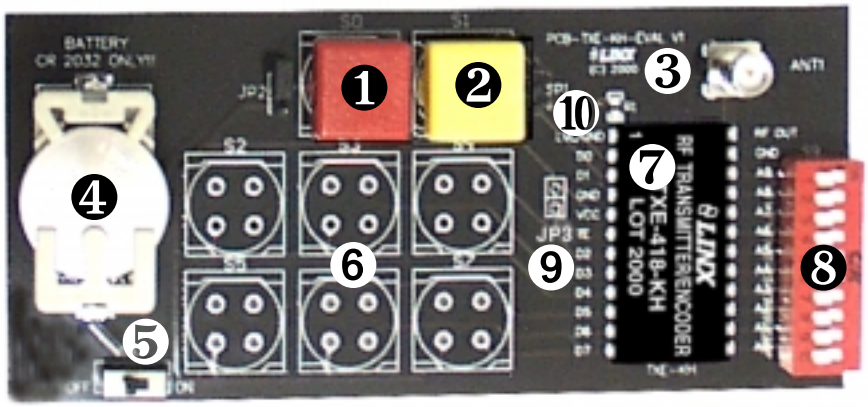
THEORY OF OPERATION

TRANSMITTER/ENCODER EVALUATION BOARD

The transmitter board is powered by an on-board 3V lithium battery. It has two SPST push-button switches, the position of which is encoded into a data stream by the module. If a switch is closed, the module will capture the settings of the 10-position DIP-switch address bits and push-button states for encoding and transmission. The transmitter will transmit continuously when any switch is closed or when TE (transmit-enable) is pulled high (default).

RECEIVER/DECODER EVALUATION BOARD

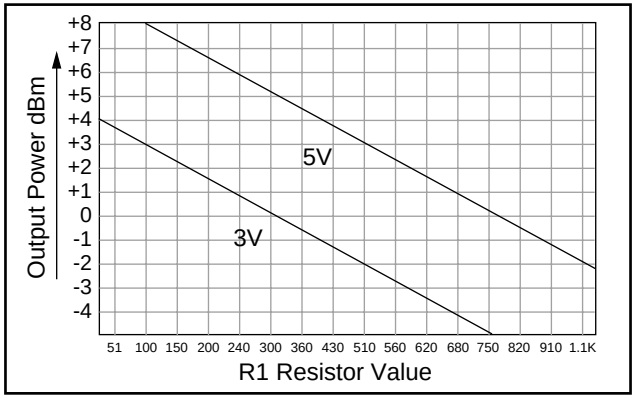
The KH-series receiver exhibits a sensitivity of greater than -97dBm. Under line-of-sight conditions the transmitter/receiver link can operate over distances in excess of 300 feet. The data recovered by the KH-series receiver from the transmitter board is internally decoded. If the settings of the 10-position dip switches on the receiver board match the address setting of the transmitter, the data pins are updated to match the state of the data pins (or pushbuttons) of the transmitter. To demonstrate this, one data pin is used to drive an LED while another is used to activate a buzzer. Switching transistors are used as drive buffers as the KH module cannot directly source the current necessary to operate these devices.



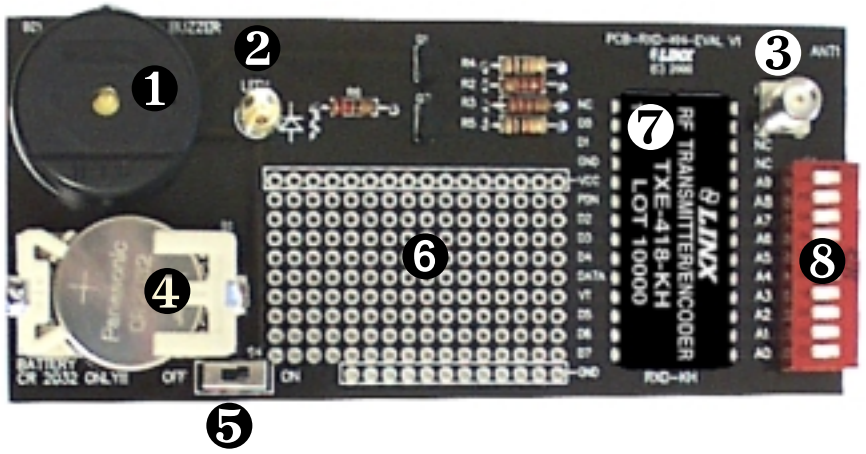
1. Push-Button - D0 (with jumper JP2 for hands-free continuous transmit)
2. Push-Button - D1 (with jumper JP1 for hands-free continuous transmit)
3. Reverse Polarity SMA Antenna Connector
4. Battery - 3VDC (Use CR2032-style battery only)
5. Power Switch
6. Additional Switch Options
7. KH-Series Transmitter Module
8. 10-Position Address DIP Switches
9. Transmit-Enable Cut-Trace/Jumper (JP3)

Cut trace if you wish to control transmit-enable.
Default setting - Active High.

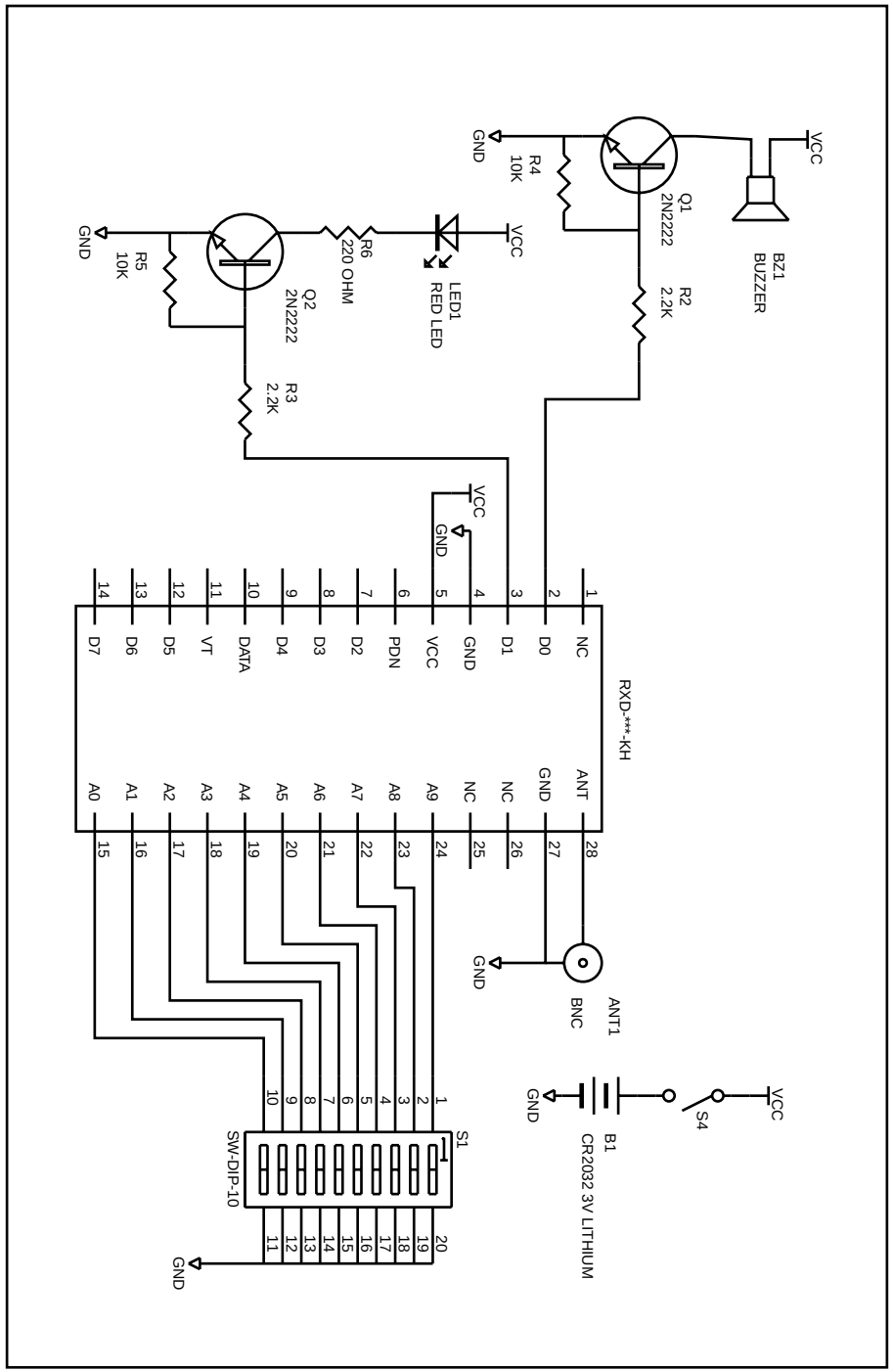
10. R1 - Output Level Adjustment (See Below)



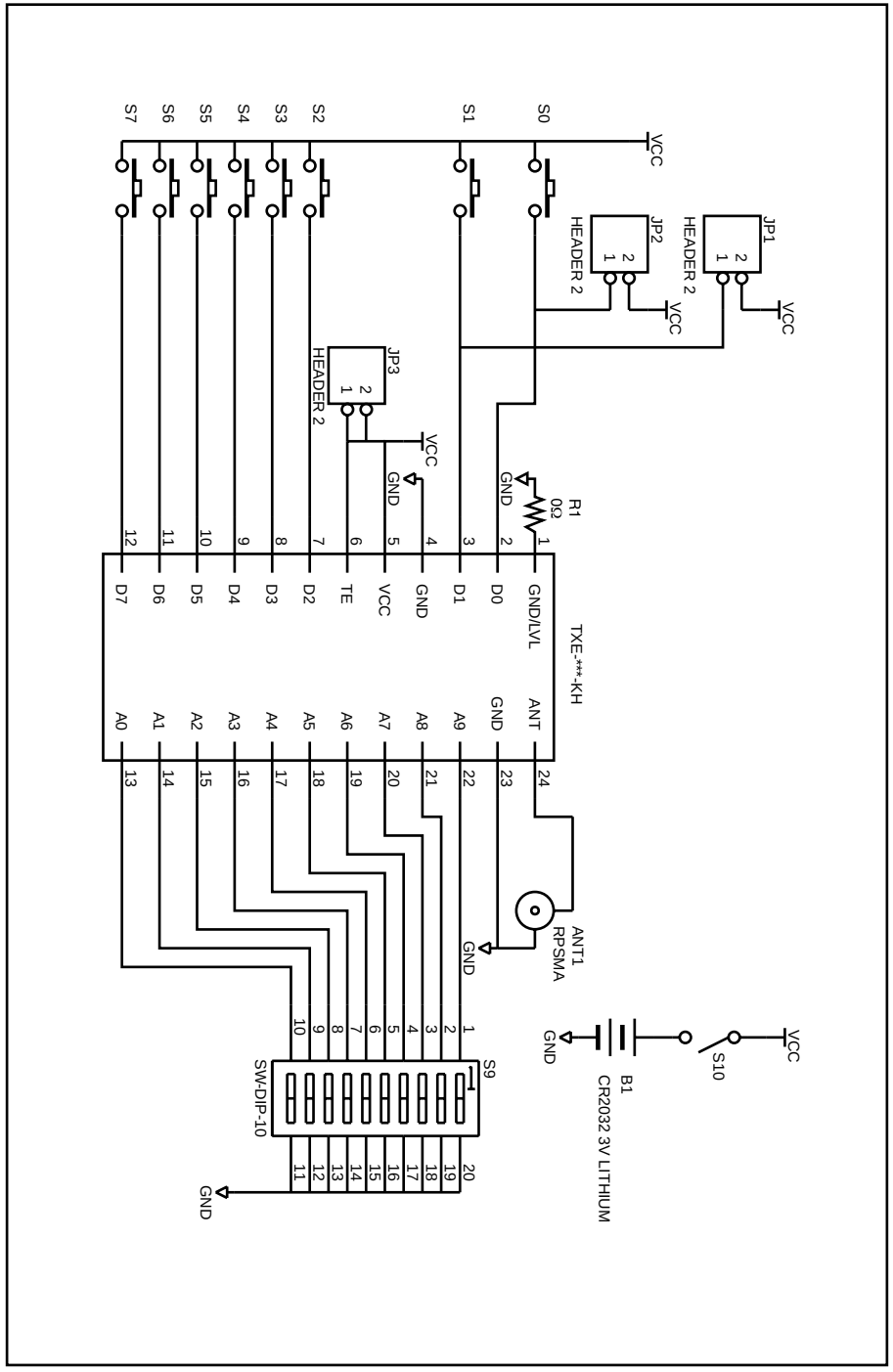
Power Output vs. R1 Resistor Value



1. Buzzer - D0
2. LED - D1
3. Reverse Polarity SMA Antenna Connector
4. Battery - 3VDC (Use CR2032-style battery only)
5. Power Switch
6. Development Area
7. KH-Series Receiver Module
8. 10-Position Address DIP Switches



RXD-KH-EVAL Schematic



TXE-KH-EVAL Schematic

RANGE TESTING

Several complex mathematical models exist for determining path loss in many environments. These models vary as the transmitter and receiver are moved from indoor operation to outdoor operation. Although these models can provide an estimation of range performance in the field, the most accurate method is to simply perform range tests using the transmitter and receiver in the intended usage environment.

Simple range testing can be performed with the transmitter and receiver evaluation boards. To prepare the boards for range testing insure that JP3 is closed on the transmitter board and that the address line DIP switches on both boards are identically set. Pressing S0 on the transmitter board will activate the buzzer on the receiver board while S1 activates the LED. Placing a jumper across JP1 or JP2 will cause the transmitter to transmit continuously. This allows for hands-free testing. Walk away from the transmitter with the receiver in hand until the buzzer or LED is no longer activated. This is the effective operating range of the KH-series TX/RX pair in your environment.

To achieve maximum range, keep objects such as your hand away from the antenna and ensure that the antenna on the transmitter board has a clear and unobstructed line-of-sight path to the receiver board. Range-performance is determined by many interdependent factors. If the range you are able to achieve is significantly less than specified by Linx for the module type you are testing, then there is likely a problem either with the board or the ambient RF environment in which the board is operating. First, check the battery, check all jumper routing, DIP-switch positions, and antenna connection. If this fails to resolve the issue, please contact Linx technical support.

DEVELOPMENT USING THE PROTOTYPING AREA

In addition to their evaluation functions the boards may also be used for actual product development. To facilitate this, access is available on both boards to all data and address lines. Locations S2-S7 are available for population of user switches or direct interface of logic level inputs. The receiver board features a prototyping area with breakout headers to facilitate the addition of application specific circuitry.

IMPORTANT NOTE: The on-board CR2032 style battery has very low *current capacity with only about 3 mA available for external circuitry. If circuitry added by the user requires a higher current, the on-board battery must be removed and the board powered from an external source.*

USING THE BOARDS AS A DESIGN REFERENCE

The basic evaluation boards included in this kit are very simple, yet they illustrate some important techniques that you may wish to incorporate into your own board layout. You will observe that the KH mounting pads extend slightly past the edge of the part. This eases hand assembly and allows better heat conduction under the part if rework is necessary. Next, observe the use of a full ground-plane fill on the lower side of the board. This ground-plane serves three important purposes:

First, since a 1/4-wave antenna is employed, the ground-plane is critical to serve as a counterpoise (you may wish to read application note #00500; Antennas: Design, Application, Performance for additional details on how a ground-plane affects antenna function).

Second, a ground-plane will suppress the transfer of noise between stages of a product as well as unintentional radiation of noise into free space.

Third, a ground-plane allows for the implementation of a microstrip feed to the antenna. The term microstrip refers to a PCB trace running over a ground-plane which is designed to serve as a transmission line between the module and the antenna. A microstrip is implemented on these demo boards. If you are unfamiliar with microstrip calculations you may wish to refer to the KH-series receiver data guide.

ABOUT ANTENNAS

The choice of antennas is one of the most critical and often overlooked design considerations. The range, performance, and legality of an RF link is critically dependent upon the type of antenna employed. Linx also offers a variety of other antenna styles which you may wish to consider for your design requirements. Included with your kit are two Linx connectorized whip antennas which should be connected prior to using the kit. Despite the fact the antennas are not centered on the board's ground-plane they exhibit an outstanding VSWR of 1.3 to 1.7 and suitably demonstrate the modules' best practical performance.

IN CLOSING

Here at Linx "Wireless Made Simple" is more than just our motto, it is our commitment. A commitment to the highest caliber of product, service, and support. That is why, should you have questions or encounter any difficulties using the MDEV kit, you'll be glad to know many resources are available to assist you. First, check carefully for the obvious, then visit our website:

www.linxtechnologies.com

or call 800-736-6677 between 8AM - 4PM PST to speak with an application engineer.

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