Linx TECHNOLOGIES

MT 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.

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. Without validation, any signal from another unrelated transmitter in the environment received by the module could inadvertently trigger the action.

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

Do not use any Linx product over the limits in this data guide. 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.

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

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MT Series Master Development System

User´s Guide

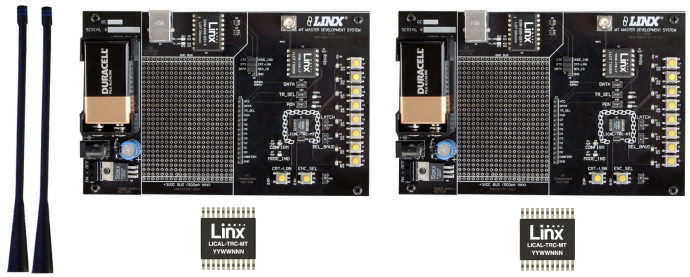


Figure 1: MT Series Master Development System

Introduction

The MT Series transcoders are ideal for bidirectional 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 transcoder's rich feature set also allows it to meet the needs of far more complex applications. The Master Development System gives a designer all the tools necessary to incorporate the transcoder 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: The boards allow the performance and features of the MT Series transcoder to be quickly elevated.
- Design: It shows how to design with the transcoder 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 fully-assembled development boards, 4 MT Series transcoders* and two CW Series antennas. The boards are also populated with LT Series RF transceiver modules and the QS Series USB modules.

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

Ordering Information

Ordering Information	
Part Number	**Description**
MDEV-LICAL-MT	MT Series Master Development System

Figure 2: Ordering Information

MT Series Master Development Board

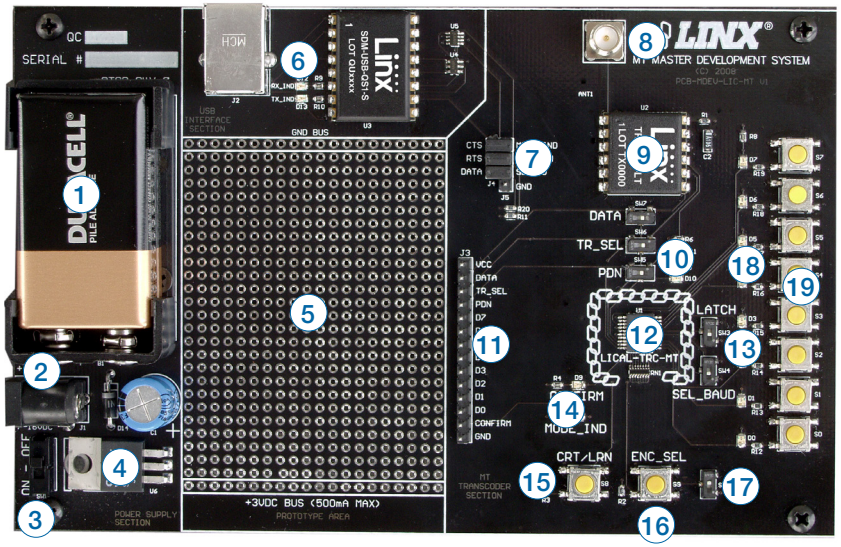


Figure 3: MT Series Master Development Board

1. 9V Battery
2. Power Jack
3. On-Off Switch
4. Voltage Regulator
5. Prototyping Area
6. QS Series USB Module
7. USB Interface Jumpers
8. RP-SMA Antenna Connector
9. LT Series Transceiver
10. Routing Switches
11. Break-Out Header
12. MT Series Transcoder
13. Function Switches
14. Indicator LEDs
15. CRT/LRN Button
16. ENC_SEL Button
17. ENC_SEL Switch
18. Status Line LEDs
19. Status Line Buttons

Using the Development Boards Manually

Use of the development system is straightforward. After unpacking the development boards, attach an antenna to each board, install the supplied 9V battery, remove the USB interface jumpers, and turn on the power switches. The transcoders will have default settings from the factory and will work straight out of the box. To create new addresses, follow these steps:

1. Choose one board and press and hold the CRT/LRN button while the ENC_SEL button is pressed to enter Create Mode. The Address is randomized for as long as the CRT/LRN button is held down (the ENC_SEL is not monitored once Create Mode has been entered). After a brief press, release the button.
2. Once the CRT/LRN button is released, the MODE_IND LED begins to flash to indicate that it is ready to accept status line assignments. Press all of the status line buttons that are to be inputs, then press the CRT/LRN button again or let the transcoder time out after 15 seconds.
3. Press the CRT/LRN button on the second board and the MODE_IND LED starts flashing. On the first board, press each of the status line buttons that are to be authorized. They can be pressed in any order, individually or together. The transcoder on the second records the Address of the transmitting transcoder. It records each status line activation as the Control Permissions. Press the CRT/LRN button again or let the transcoder time out after 15 seconds to exit Learn Mode.
4. Repeat steps 1 through 3 for the second board.

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
- Check to make sure that the USB interface jumpers are removed
- Make sure that the baud rate switches are set the same on both boards. Note that the LT Series transceiver on the board can only operate at 9,600bps.
- Make sure that the antenna is connected and has the correct polarity connector.
- Make sure that the status lines are set correctly. The transcoder does not activate a status line if it has been set as an input, so a status line that is an input on one board needs to be an output on the other board.
- Make sure that you set your Control Permissions correctly. If you have not set the transcoder to use a particular line, then when you press that line's button on one board, the MODE_IND LED on the other board lights up, but the status line LED does not light up.
- Make sure that any advanced features that may have been activated through the included software are set correctly. For example, if Targeted Device Addressing has been enabled, then only the transcoder with the correct address responds. These features may need to be disabled to allow manual operation. The advanced features are controlled through the Serial Interface Engine and can be accessed with the included software.

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 contains an area of plated through holes so that external circuitry can be placed on the board. This circuitry can be interfaced with the transcoder through the breakout header to the right. At the bottom is a row connected to the 3V power supply and at the top is a row connected to ground.

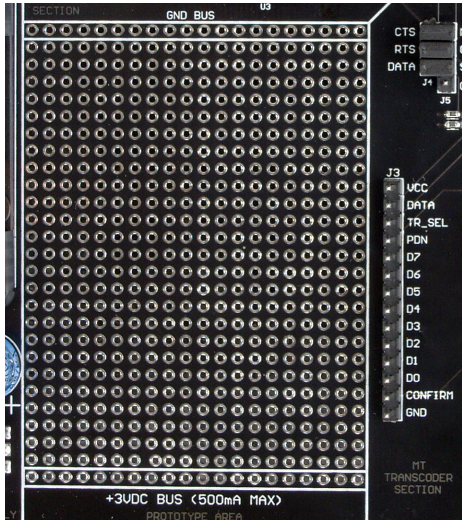


Figure 4: The Prototyping Area

All of the status lines are connected to a wire-wrap header to the right, allowing easy access from the prototyping area. The TR_DATA, TR_SEL, TR_PDN and CONFIRM lines are also available on the header. This allows complete control of the entire system from the prototyping area.

The RF Area

This board uses the LT Series transceiver for the wireless link. R1 is connected to the LADJ line of the transceiver to reduce the output power to the approximate limit of Part 15.231 of the FCC regulations. For applications where Part 15 limits are not applicable or output levels can be legally raised, R1 can be changed according to the graph in the LT Series Transceiver Data Guide.

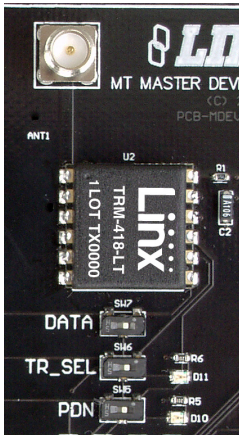


Figure 5: The RF Area

The three switches below the transceiver connect the TR_DATA, TR_SEL and TR_PDN lines to either the transceiver or the header in the Prototyping Area. This prevents collisions on the lines resulting from connecting the transcoder, transceiver, and external circuitry to the same lines. If the switches are to the left, then the transcoder is connected to the header; if they are to the right, the transcoder is connected to the transceiver. Pads have been placed for LEDs to indicate the states of the TR_SEL and PDN lines. These indicators can be useful for debugging during development, but have been left to the user to populate if desired.

The Transcoder Area

The transcoder is placed in the center of the chain logo. To the right are two function switches. SEL_BAUD sets the baud rate of the transcoder. If the switch is up, the baud rate is 28,800bps; if down, the baud rate is 9,600bps. *Important* Both transcoders must be set to the same baud rate. The on-board transceiver is only capable of operation at 9,600bps.

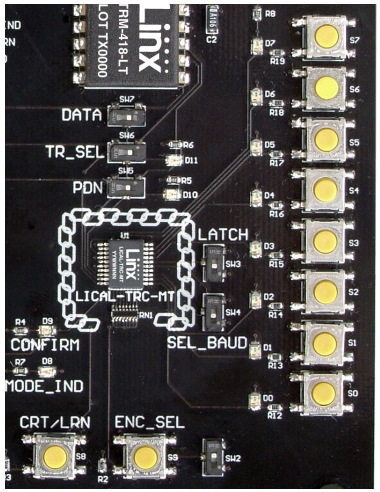


Figure 6: The Transcoder Area

If the LATCH switch is up, then the status lines are latched. If the switch is down, then the status lines are momentary.

To the right of the function switches are a column of status line LEDs and a column of status line buttons. Each status line has one LED and one button, so button S0 and LED D0 correspond to status line D0; S1 and D1 to line D1 and so forth. Pressing a button takes the status line high when the line is set as an input. The LED activates when a line set as an output goes high.

There is no isolation between the LEDs and the buttons, so pressing the button for a status line input also activates the LED. Resistors provide short circuit protection if a button is pressed for an output line that is pulled low.

Beneath the transcoder are two LEDs. D8 is connected to the MODE_IND line and lights up as described in the MT Transcoder Data Guide. D9 is connected to the CONFIRM line and lights up when the transcoder receives a valid confirmation from a remote unit.

Beneath the LEDs is a button that is connected to the CRT/LRN line. This button is used to create the Address, set the Control Permissions, and learn an address as described in the MT Series Transcoder Data Guide.

Next to the CRT/LRN button is a button connected to the ENC_SEL line. This button is used with the CRT/LRN button to create the Address and set the Control Permissions. Next to the button is a switch that takes the ENC_SEL line high so that the transcoder can be placed into Encoder Only mode. If the switch is up, then the line is controlled by the button. If the switch is down, then the line is connected to V_{CC}.

The USB Area

The development boards have a Linx SDM-USB-QS-S module for use with a PC. This module is powered by the USB bus so no current is drawn from the battery.

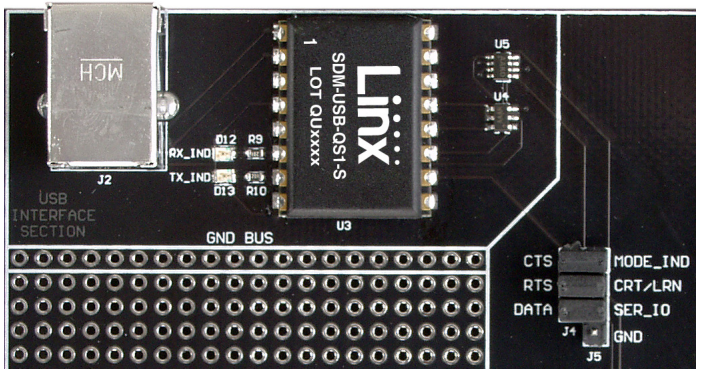


Figure 7: The USB Area

The jumpers to the right connect the USB module to the transcoder when the USB interface is in use and should be disconnected when not in use. U4 is a switch that connects the SER_IO line on the transcoder to either the RXD or TXD lines on the USB module based on the state of the RTS line. U5 is a level translator that converts the 5V signals from the USB module to 3V for the transcoder and vice versa. The RX_IND LED to the left of the module will flash when data is being received from the PC, and the TX_IND line will flash when the module is sending data to the PC.

The Power Supply

The power supply 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.

Switch and Jumper Quick Reference

- **SW1** – This switch activates power to the board.
- **SW2** – This switch pulls the ENC_SEL line high so that the transcoder can be used as an encoder only (positioned down) or operated with button S9 (positioned up).
- **SW3** – Labeled LATCH, this switch is connected to the LATCH line on the transcoder. If the switch is positioned down, then the status line outputs are momentary. If it is positioned up, then the status line outputs follow the Latch Mask (all outputs latched unless changed through the Serial Interface Engine).
- **SW4** – Labeled SEL_BAUD, this switch sets the baud rate of the transcoder to either 9,600bps (positioned down) or 28,800bps (positioned up).
- **SW5** – Labeled PDN, this switch connects the TR_PDN line on the transcoder to either the PDN line of the transceiver (positioned to the right) or to the prototyping header (positioned to the left).
- **SW6** – Labeled TR_SEL, this switch connects the TR_SEL line on the transcoder to either the T/R_SEL line on the transceiver (positioned to the right) or to the prototyping header (positioned to the left).
- **SW7** – Labeled DATA, this switch connects the TR_DATA line on the transcoder to either the DATA line on the transceiver (positioned to the right) or to the prototyping header (positioned to the left).
- **S0–S7** – These buttons are connected to the status lines on the transcoder
- **S8** – This button is connected to the CRT/LRN line on the transcoder
- **S9** – This button is connected to the ENC_SEL line on the transcoder
- **J3** – This is a wire wrap header for use with the prototyping header. Labels next to the header indicate which transcoder lines are connected to which pins.
- **J4 and J5** – These headers are for use with jumpers to connect the USB module to the transcoder when using the Serial Interface Engine with the included software. If the board is to be used manually, then the jumpers should be removed as the USB interface section will hold the lines in specific states.

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 MT Series Master Development System Software Installer automatically starts when the CD is inserted and the player in the figure below appears.

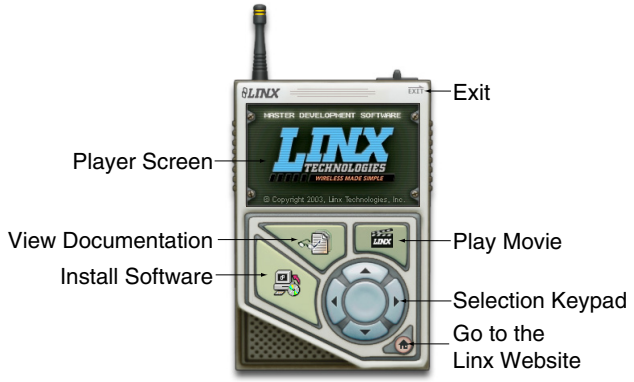


Figure 8: Software Installer

The View Documentation button shows a list of the application notes and manuals related to the MT 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, MT Series documentation, and USB drivers at the installed location on the computer's hard drive.

MT Series Master Development System Software

The MT Series Master Development System software can be used in one of two modes. The default mode provides basic control of the transcoder through the serial interface engine.

The second mode is for full development of software designed to control the transcoder through the SIE. It shows all of the commands, the packets sent to the transcoder and the responses from the transcoder as well as a full view of the transcoder's memory bank. This allows full access and control of the transcoder, aiding in product development.

Both modes interface to the development boards through the USB module, demonstrating the simplicity of the hardware / software interface. Clicking a button on one computer causes the development board to activate, sending a command to the other development board. The other board then outputs the command to another computer where an action takes place, demonstrating the power and simplicity of the MT Series system. Note that the USB Interface Jumpers must be installed in order for the software to communicate with the transcoder.

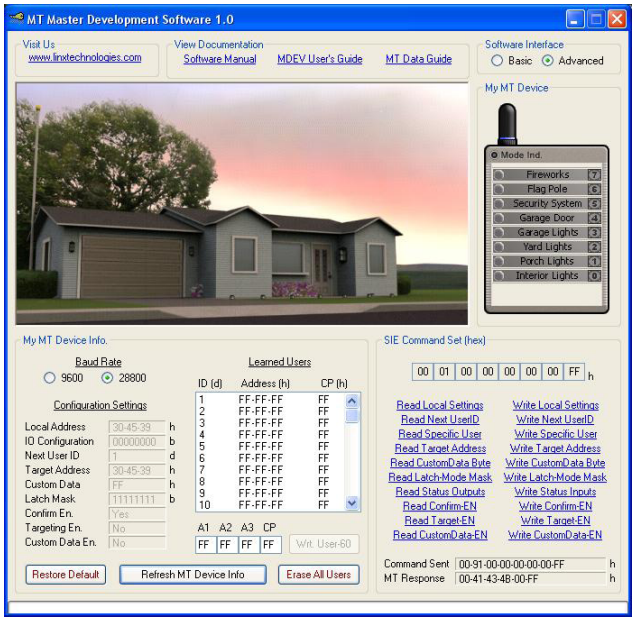


Figure 9: The MT Series Master Development System Software

Under the View Documentation label at the top of the screen are links to the MT Series documents, including the full documentation for the software. Please see this document for details on operation of the software.

Resources

Support

For technical support, product documentation, application notes, regulatory guidelines and software updates, visit www.linxtechnologies.com

RF Design Services

For customers who need help implementing Linx modules, Linx offers design services including board layout assistance, programming, certification advice and packaging design. For more complex RF solutions, Apex Wireless, a division of Linx Technologies, creates optimized designs with RF components and firmware selected for the customer's application. Call +1 800 736 6677 (+1 541 471 6256 if outside the United States) for more information.

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For customers with specialized needs, custom antennas and design services are available along with simulations of antenna performance to speed development. Learn more at www.linxtechnologies.com.

Schematics

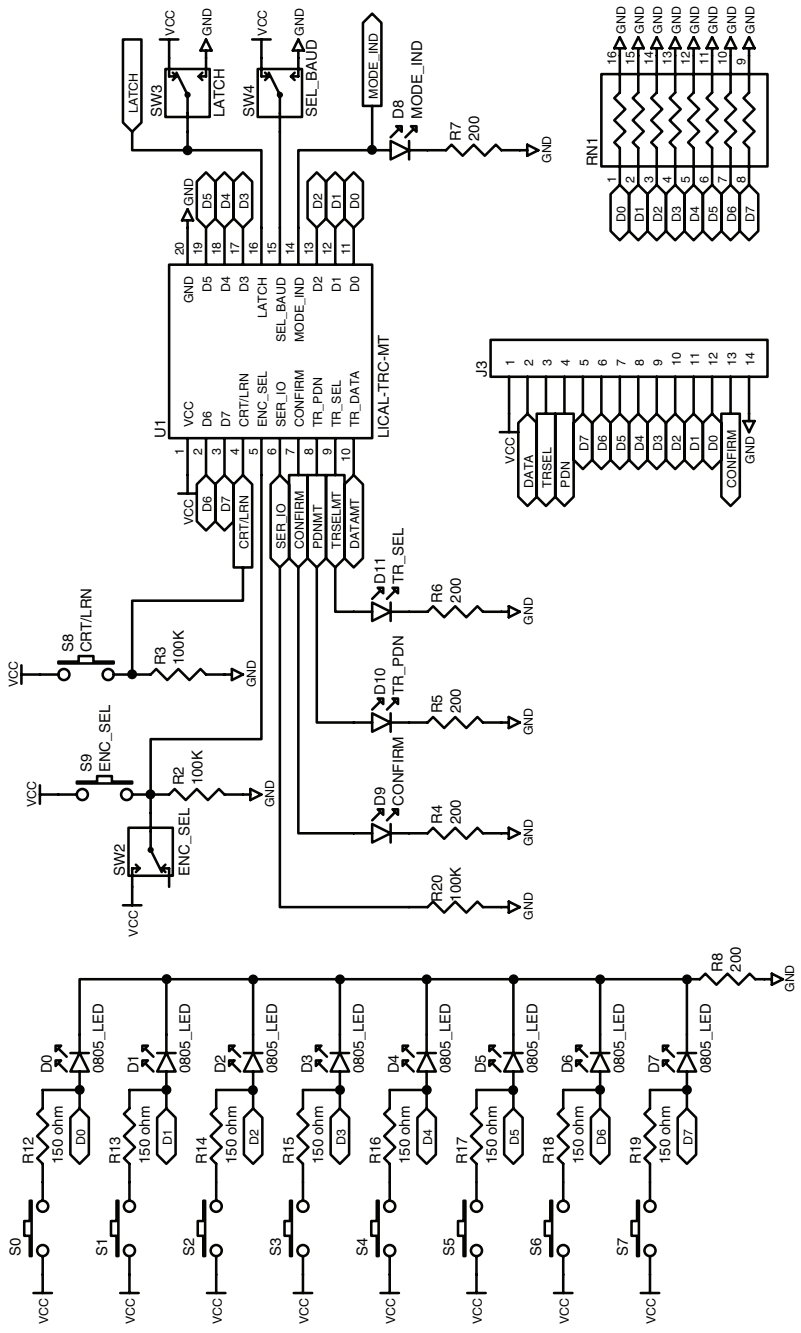


Figure 10: Transcoder Section

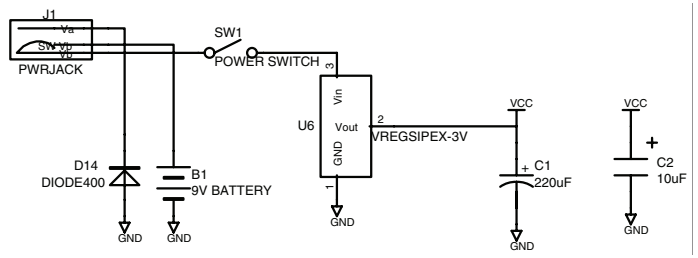


Figure 11: Power Supply Section

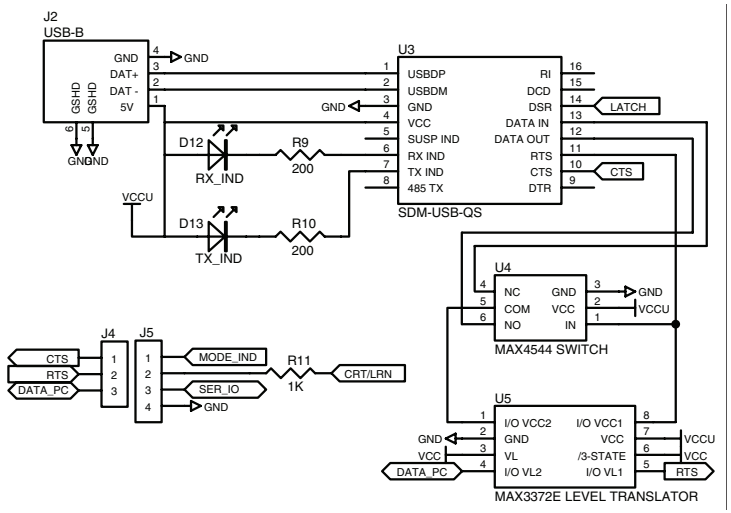


Figure 12: USB Section

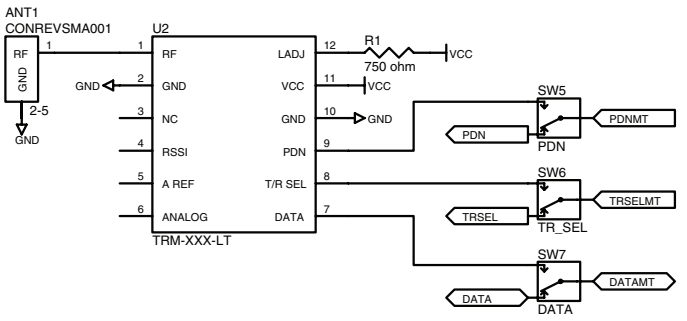


Figure 13: RF Section

Notes

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