



HumRC™ 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 have a frequency hopping protocol built in, but the developer should still be aware of the risk of interference.

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.

Ordering Information

Ordering Information	
Part Number	Description
EVAL-***-RC	HumRC™ Series Basic Evaluation Kit
MDEV-***-RC	HumRC™ Series Master Development System
HUM-***-RC	HumRC™ Series Remote Control Transceiver
HUM-900-RC-UFL	HumRC™ Series Remote Control Transceiver, Certified, UFL Connector
HUM-900-RC-CAS	HumRC™ Series Remote Control Transceiver, Certified, Castellated Connection
EVM-***-RC	HumRC™ Series Carrier Board
EVM-900-RC-UFL	HumRC™ Series Carrier Board with Certified module, UFL Connector
EVM-900-RC-CAS	HumRC™ Series Carrier Board with Certified module, Castellated Connection
MDEV-DEMO-RC-A	Development System Remote Control Demo Board, Type A
MDEV-DEMO-RC-B	Development System Remote Control Demo Board, Type B
MDEV-PGDOCK	Development System Programming Dock
MDEV-PROTO	Development System Prototype Board
CON-SOC-EVM	EVM Module Socket Kit

*** = Frequency; 900MHz, 2.4GHz

Figure 2: Ordering Information

Programming Dock

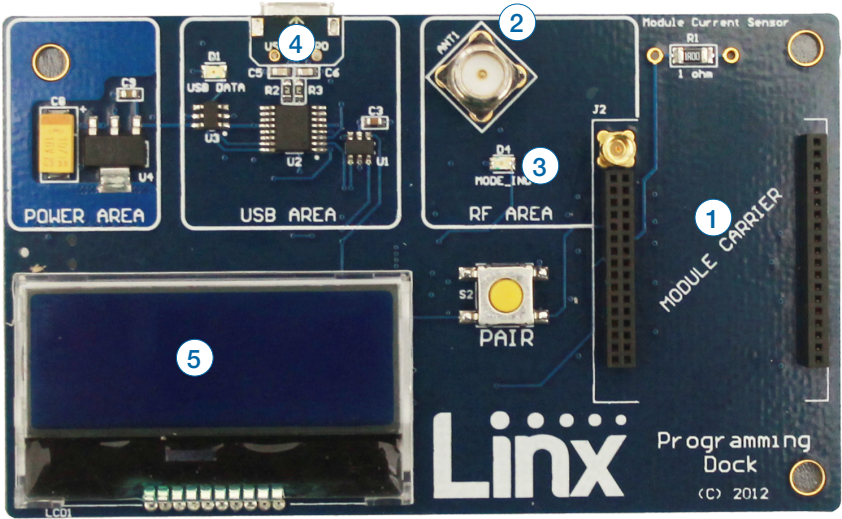


Figure 5: Programming Dock

Programming Dock Objects

1. Carrier Board Socket
2. RP-SMA Antenna Connector
3. MODE_IND LED
4. Micro USB Connector
5. LCD Display

Prototype Board

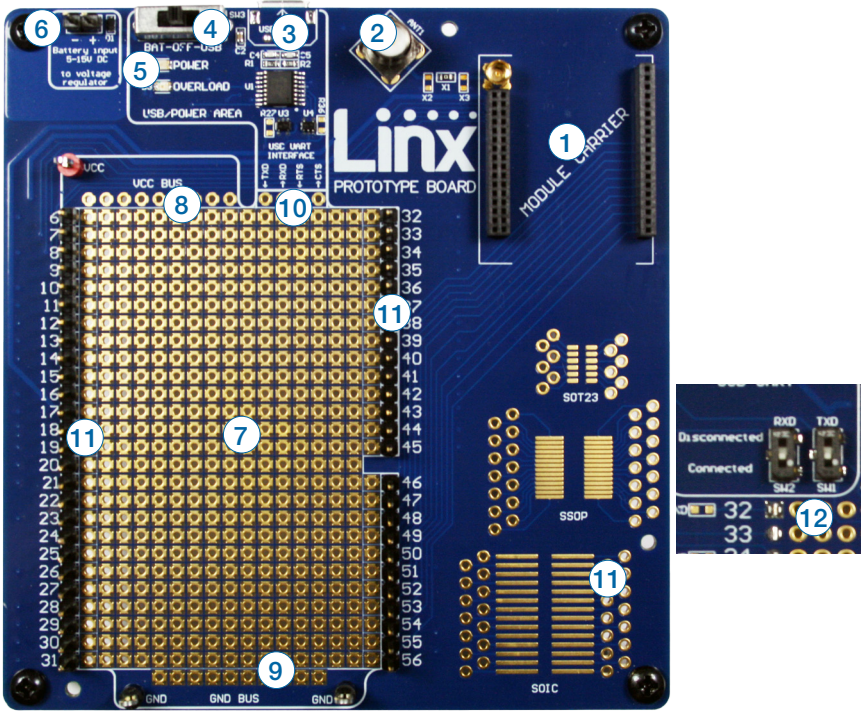


Figure 7: Prototype Board

Prototype Board Objects

1. Carrier Board Socket
2. RP-SMA Antenna Connector
3. Micro USB Connector
4. Power Switch
5. Power LED
6. External Battery Connection
7. Prototyping Area
8. 3.3V Supply Bus
9. Ground Bus
10. USB Interface Lines
11. Module Interface Headers
12. Command Data Interface Routing Switches (on back)

Using the Programming Dock

Snap a Carrier Board onto the socket on the Programming Dock as shown in Figure 8.

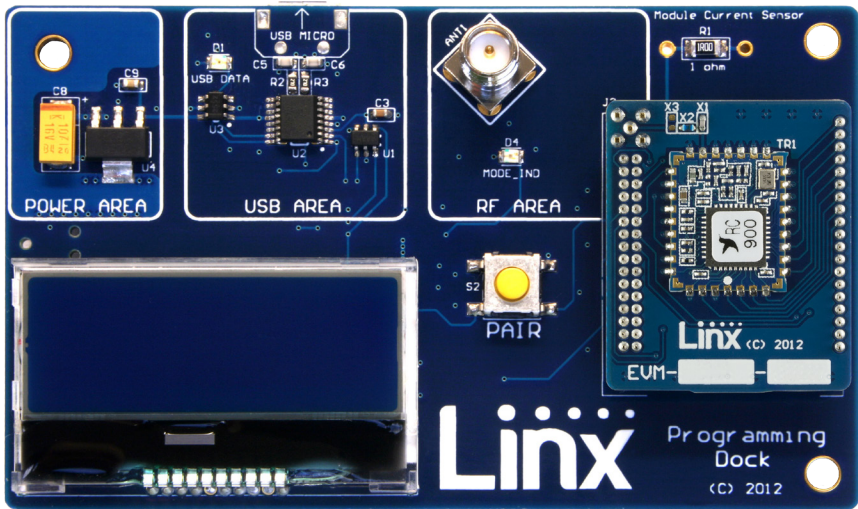


Figure 8: Programming Dock with a Carrier Board

Connect a micro USB cable into the connector at the top of the board. Plug the other end into a PC. The board is powered by the USB bus. The demonstration software included with the kit or custom application software can be used to configure the module through its Command Data Interface. The LCD is used to display information about the module. This includes the module's local address and a custom nickname. The nickname is entered using the development kit software and can be any name that helps distinguish the modules from one another. This is convenient when multiple programming docks are connected to the same computer. Please see the development kit software section for more information on the nicknames.

The HumRC™ Series transceiver has a serial Command Data Interface that offers the option to configure and control the transceiver through software instead of through hardware. This interface consists of a standard UART with a serial command set. This allows for fewer connections in applications controlled by a microcontroller as well as for more control and advanced features than can be offered through hardware pins alone.

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 reliable method is to simply perform range tests using the modules in the intended operational environment.

Range testing can be performed with the Remote Control Demo Boards. To prepare the board for range testing, simply turn it on by switching the power switch to the ON position. Pressing a status line button on one board (the IU) activates an LED on the other board (the RU). The RU then sends an acknowledgement back to the IU, which turns on the CONFIRM LED. This indicates good bi-directional RF communications and lets the user set one board down and walk with the other board.

As the maximum range of the link in the test area is approached, it is not uncommon for the signal to cut in and out as the radio moves. This is normal and can result from other interfering sources or fluctuating signal levels due to multipath effects. This results in cancellation of the transmitted signal as direct and reflected signals arrive at the receiver at differing times and phases. The areas in which this occurs are commonly called “nulls” and simply walking a little farther usually restores the signal. If the signal is not restored, then the maximum range of the link has been reached.

To achieve maximum range, keep objects such as your hand away from the antenna and ensure that the antenna on the transmitter 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 products you are testing, then there is likely a problem with either the board or the ambient RF environment in which the board is operating. First, check the battery, switch positions, and antenna connection. Next, measure the receiver's RSSI voltage with the transmitter turned off to determine if ambient interference is present. High RSSI readings while the transmitter off indicate there is interference. If this fails to resolve the issue, please contact Linx technical support.

Note: The Remote Control Demo boards are designed for hardware configuration. If the modules are changed through software configuration then the boards may not operate as expected. A restore to default configuration can be used to reset the modules.

Supply for the module is connected through R17. This can be removed and replaced by another supply or used to measure the current consumption of the module.

Note: The onboard 3.3-volt regulator has approximately 400mA available for additional circuitry when plugged into a PC. If more current is required, the user must power the board from an external supply or a USB charger with more current capabilities, up to 1A.

Figure 11 shows the bottom of the board.

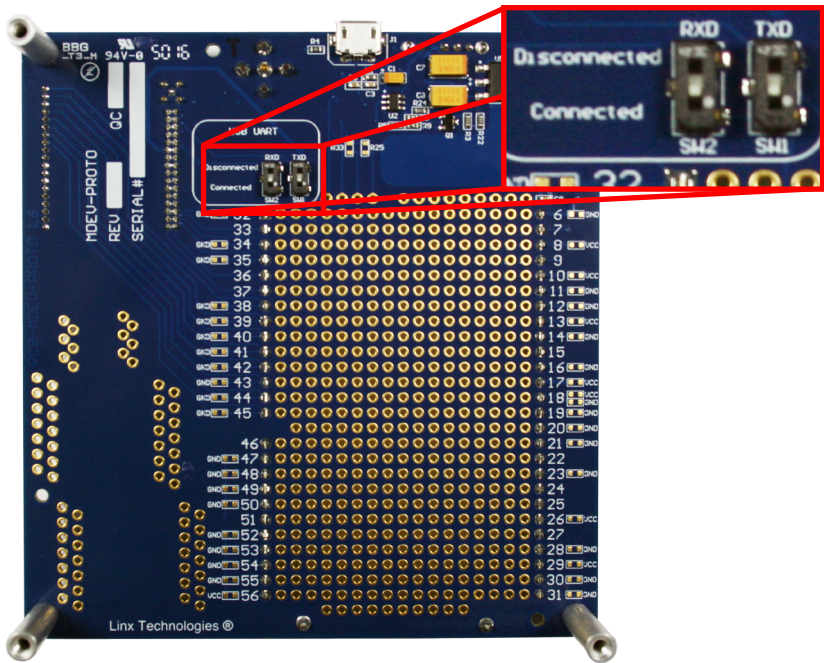


Figure 11: Prototype Board Bottom Side

SW1 and SW2 connect the USB interface to the Command Data Interface lines on the module. This allows the prototype board to be used with the development kit software or a custom application. When in the “USB Connected position”, the module is connected to the USB interface. The “Header Only” position connects the module to the header.

Footprints for 0603 size resistors are on most lines so that pull-ups or pull-downs can easily be added to the lines. The pads are connected to V_{CC} or GND based on the most common configuration for the module. The schematic at the end of this document shows how each line is connected.

The Development Kit Demonstration Software

The development kit includes software that is used to configure and control the module through the Programming Dock. The software defaults to the Demo & EZConfiguration tab when opened (Figure 13). This window offers basic configuration and demonstration of the module's functionality with the current configuration.

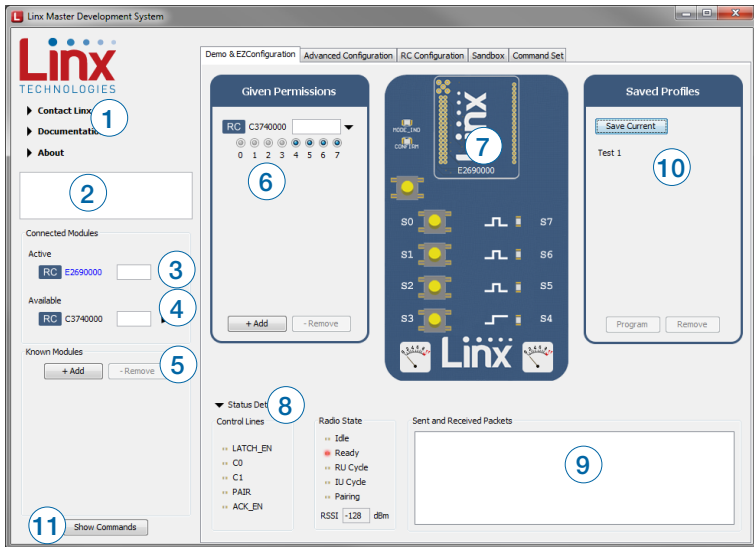


Figure 13: The Master Development System Software Demo and EZConfiguration Tab

1. Clicking the Contact Linx, Documentation and About labels on the left side expands them to show additional information and links to the latest documentation. This is shown in Figure 15.
2. The Help window shows tips and comments about the software.
3. The active module is connected to the PC and being configured by the software.
4. Available modules are connected to the PC but are not currently being configured or controlled by the PC
5. Known Modules are not currently connected to the PC, but have either been connected to the software in the past or have been manually entered.
6. The Given Permissions window shows the list of modules that are paired with the active module and the Permissions Mask for each one.
7. The demo area replicates a remote control device. The appearance changes with the programmed configurations.

The Advanced Configuration tab (Figure 16) offers more detailed configuration options for the active module.

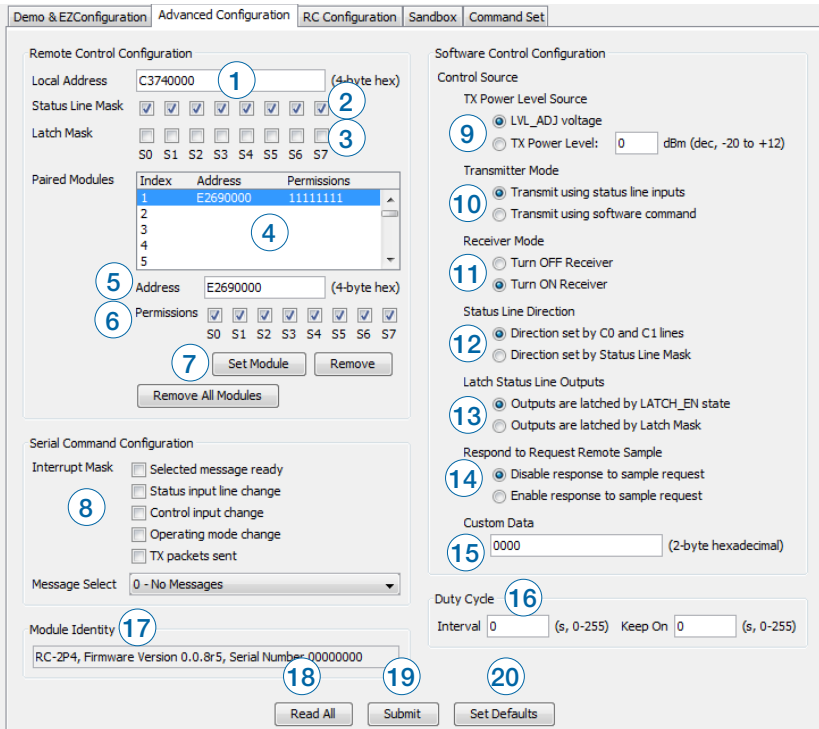


Figure 16: The Master Development System Software Advanced Configuration Tab

1. The Local Address box shows the module's local address in hexadecimal format. This can be changed by typing a new hex value.
2. The Status Line Mask sets the status lines as either inputs or outputs. If the box is checked then the line is an input.
3. The Latch Mask determines if the status line outputs are latched or momentary. If the box is checked then the output is latched. This setting has no effect on lines that are configured as inputs.
4. The Paired Modules Window lists all of the modules that are paired with the active module and their Permissions Mask.
5. The Address box enables manual pairing of a module. Enter an address into this box and press the Set Module button to add the address to the list.
6. The Permissions Mask determines whether a specific module is authorized to control a specific status line output. If the box is checked then the module is authorized to control that line.

19. The Submit button writes all changes to the active module.
20. The Set Defaults button restores the active module to factory default conditions.

The Command Set tab (Figure 17) allows specific commands to be written to the module.

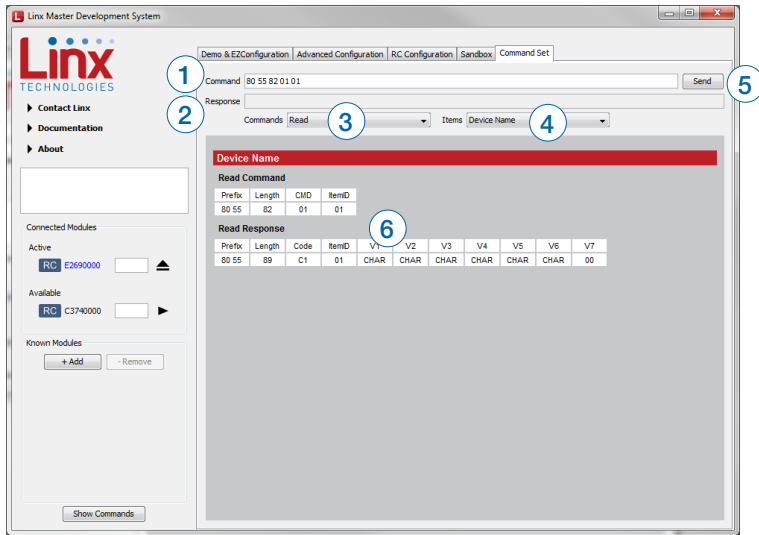


Figure 17: The Master Development System Software Command Set Tab

1. The Command box shows the hexadecimal values that are written to the module. Values can be typed into the box or a command can be selected from the Commands menu.
2. The Response box shows the hexadecimal values that are returned from the module in response to a command.
3. The Commands drop-down menu shows all of the commands that are available for the active module (Figure 18). Selecting one of the commands from this menu automatically fills in the Command box. The values can be adjusted by typing in the box.

The Sandbox tab shows the interaction of all of the connected modules on one screen. Figure 20 shows two modules on the screen, but up to 8 modules can fit at one time.



Figure 20: The Master Development System Software Sandbox Tab

Clicking a button on one device causes the module to transmit control messages. Paired modules with appropriate Permissions Mask settings activate and their status is updated in the software. Paired modules that are not connected to the PC can activate a module that is connected and the connected module's status is reflected in the software.

The Sandbox is a convenient place to show the interaction of multiple units in one location, but it is a reflection of actual module operation. It is not a simulation.

7. The Pairing Status area shows the current status of any pairing operations.
8. The request Remote Sample configures the module to request a response from a remote unit. This area configures the type of sample that should be in the response and the address of the unit that should respond.
9. The Read All button reads all of the current configurations from the active module.
10. The Submit button writes all changes to the active module.
11. The Set Defaults button restores the active module to factory default conditions.
12. The Commit button writes any changed configurations to non-volatile memory. The changes should be written to the module using the Submit button first, then the Commit button is used to make the changes permanent.

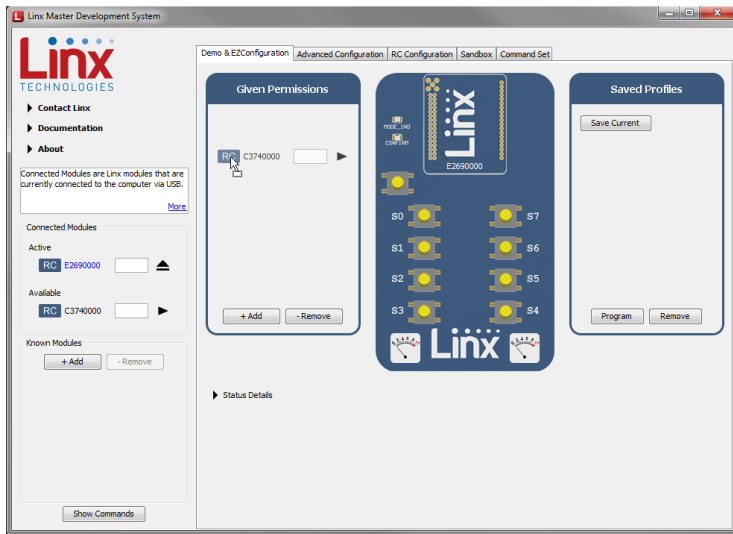


Figure 24: The Master Development System Software Pairing Modules

Once the module is dropped into the Given Permissions window it is written to the active module's memory. Clicking on the down arrow displays the paired module's Permissions Mask. This configures which output lines the paired module is authorized to control. In Figure 25 the Permissions are inactive since the active module only has inputs and no outputs to control.

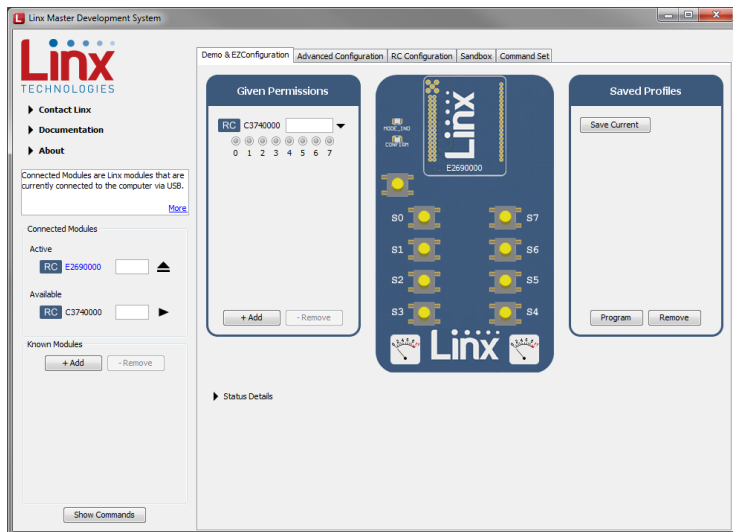


Figure 25: The Master Development System Software Paired Modules

This tab shows the advanced configurations enabled by the module's Command Data Interface. Any changes are highlighted in red. In the example in Figure 28 the output mask has been changed to all inputs, S0 is latched, the Paired module is given full permissions, the status line direction is set by the mask and the outputs are latched by the Latch Mask. Clicking the Set Module button sets the updated Permissions Mask. Clicking the Submit button writes all of the changes to the module's memory.

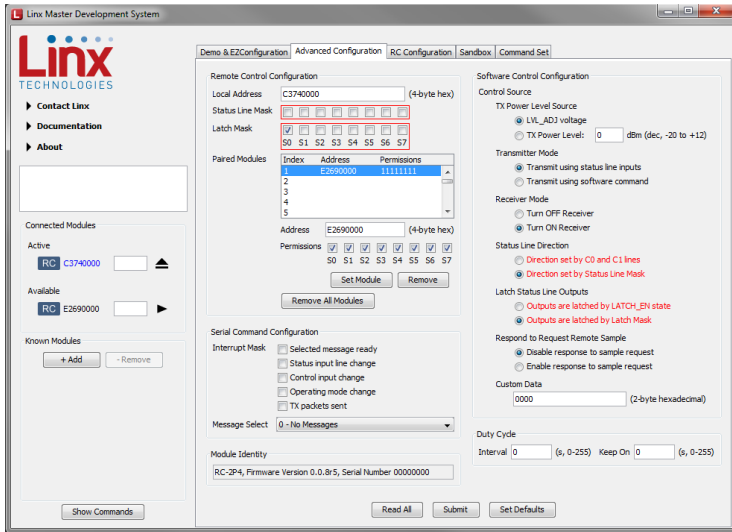


Figure 28: The Master Development System Software Advanced Configuration with Changes

This configuration changes the module to have all outputs. This is shown by clicking on the Demo & EZConfiguration tab Figure 29.



Figure 31: The Master Development System Software Transmitting Module



Figure 32: The Master Development System Software Receiving Module

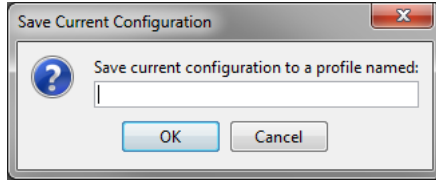


Figure 35: The Master Development System Software Save Profile

Once saved, the profile appears in the window, as shown in Figure 36.



Figure 36: The Master Development System Software with a Saved Profile

To apply a profile, select it from a list and click the Program button. Clicking the Remove button removes it from the list.

Remote Control Demo Board Schematic

Note: The Remote Control Demo boards are designed to accept carrier boards for multiple module families. Some circuitry is not applicable for some modules.

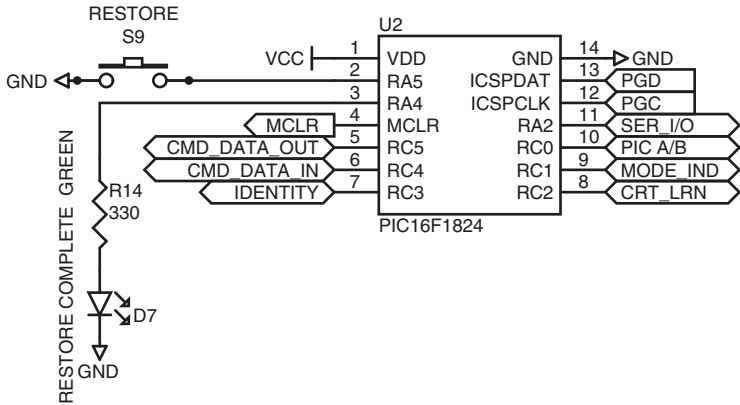


Figure 38: Remote Control Demo Board Microcontroller Area Schematic

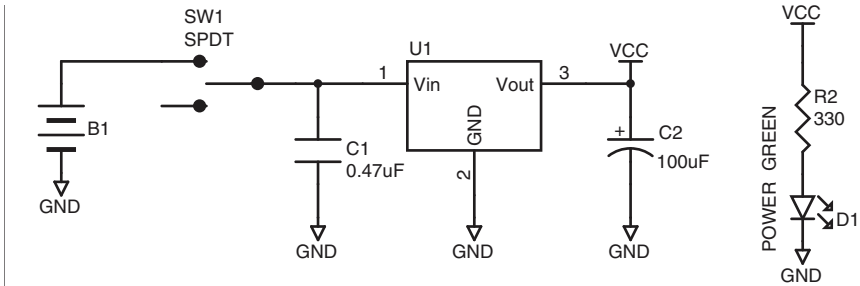


Figure 39: Remote Control Demo Board Power Supply Area Schematic

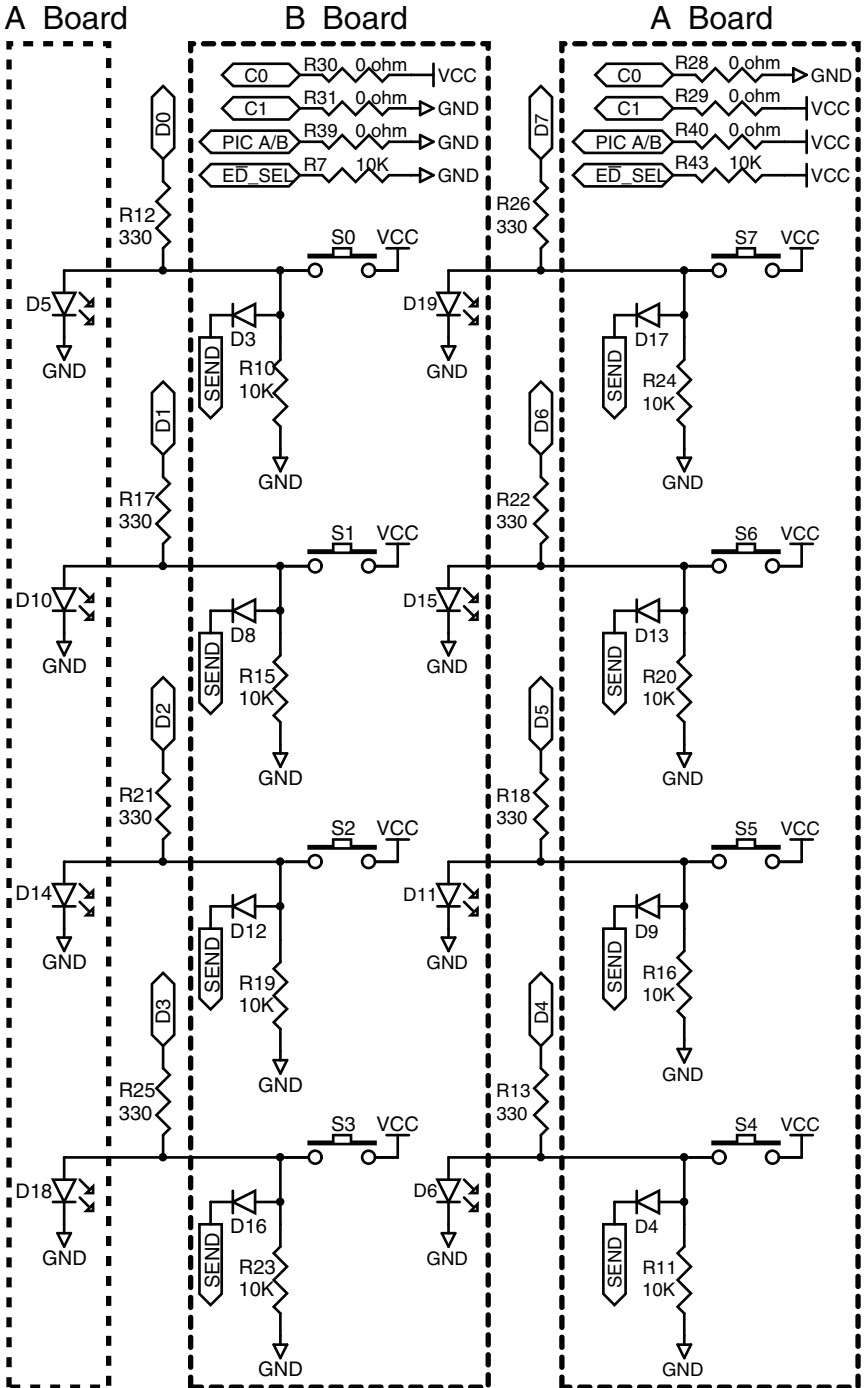


Figure 41: Remote Control Demo Board Remote Control Area Schematic

Programming Dock Board Schematic

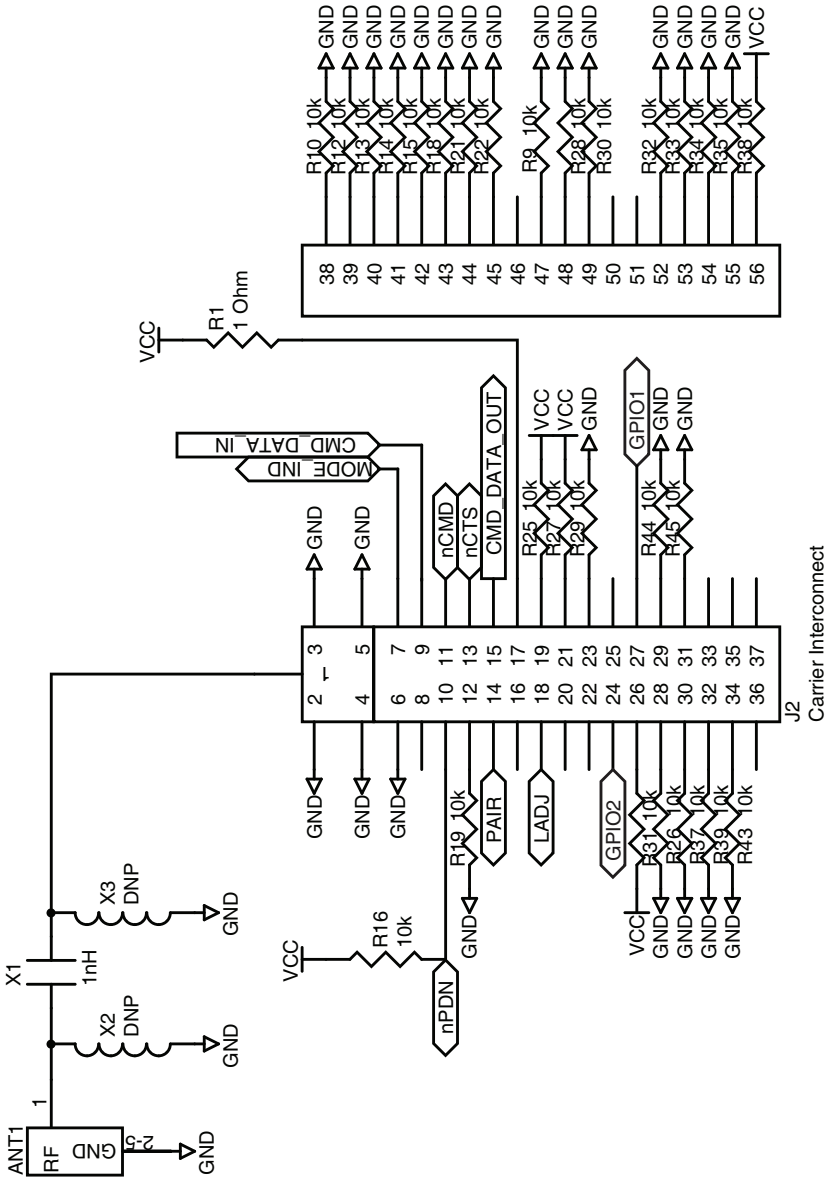


Figure 43: Programming Dock Board RF Carrier Area Schematic

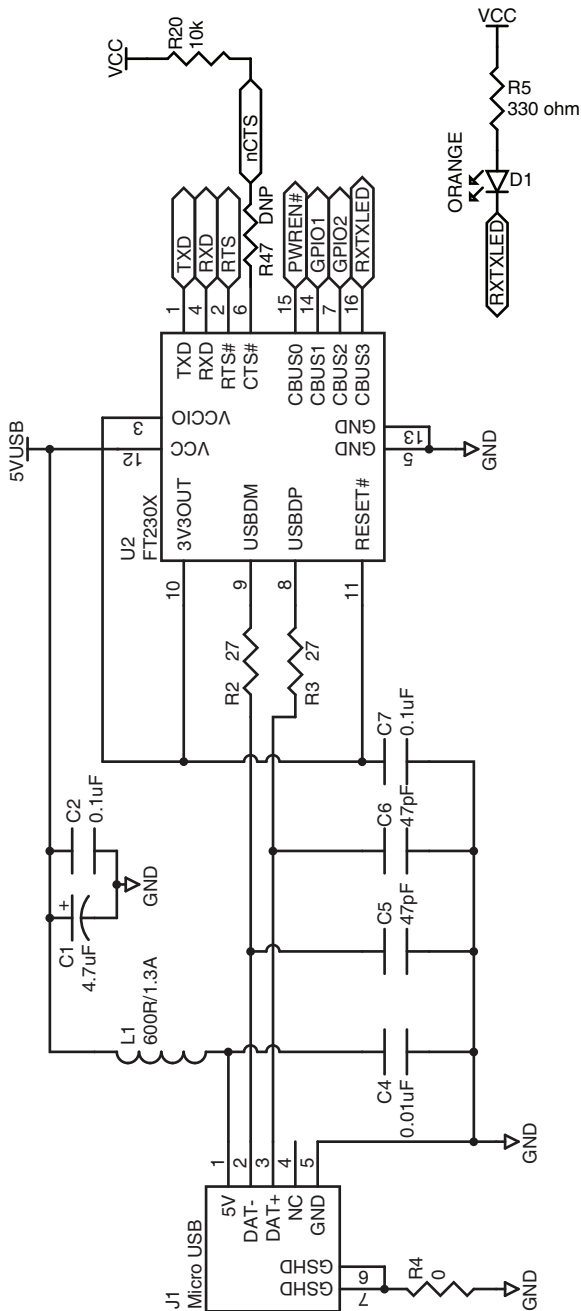


Figure 46: Programming Dock Board USB Area Schematic

Prototype Board Schematic

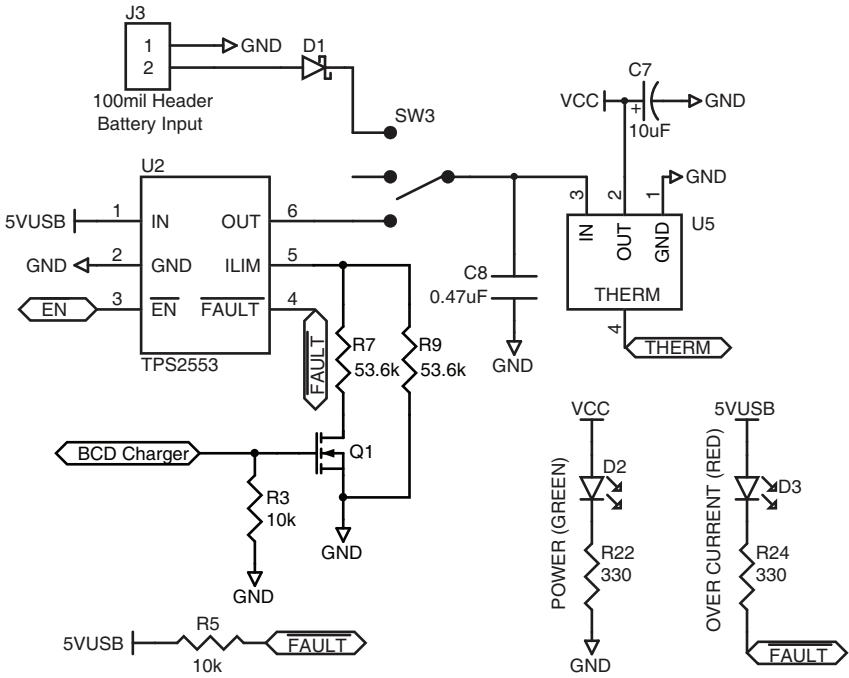


Figure 48: Prototype Board Power Supply Area Schematic

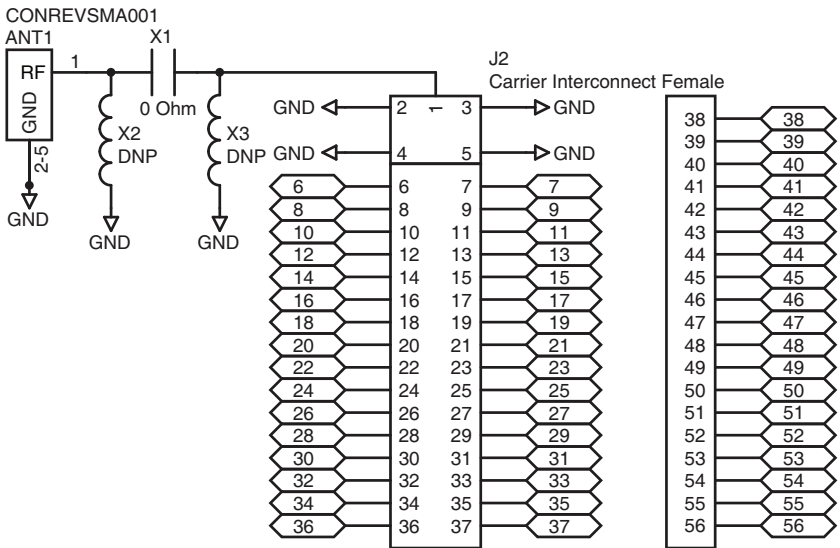


Figure 49: Prototype Board RF Carrier Area Schematic

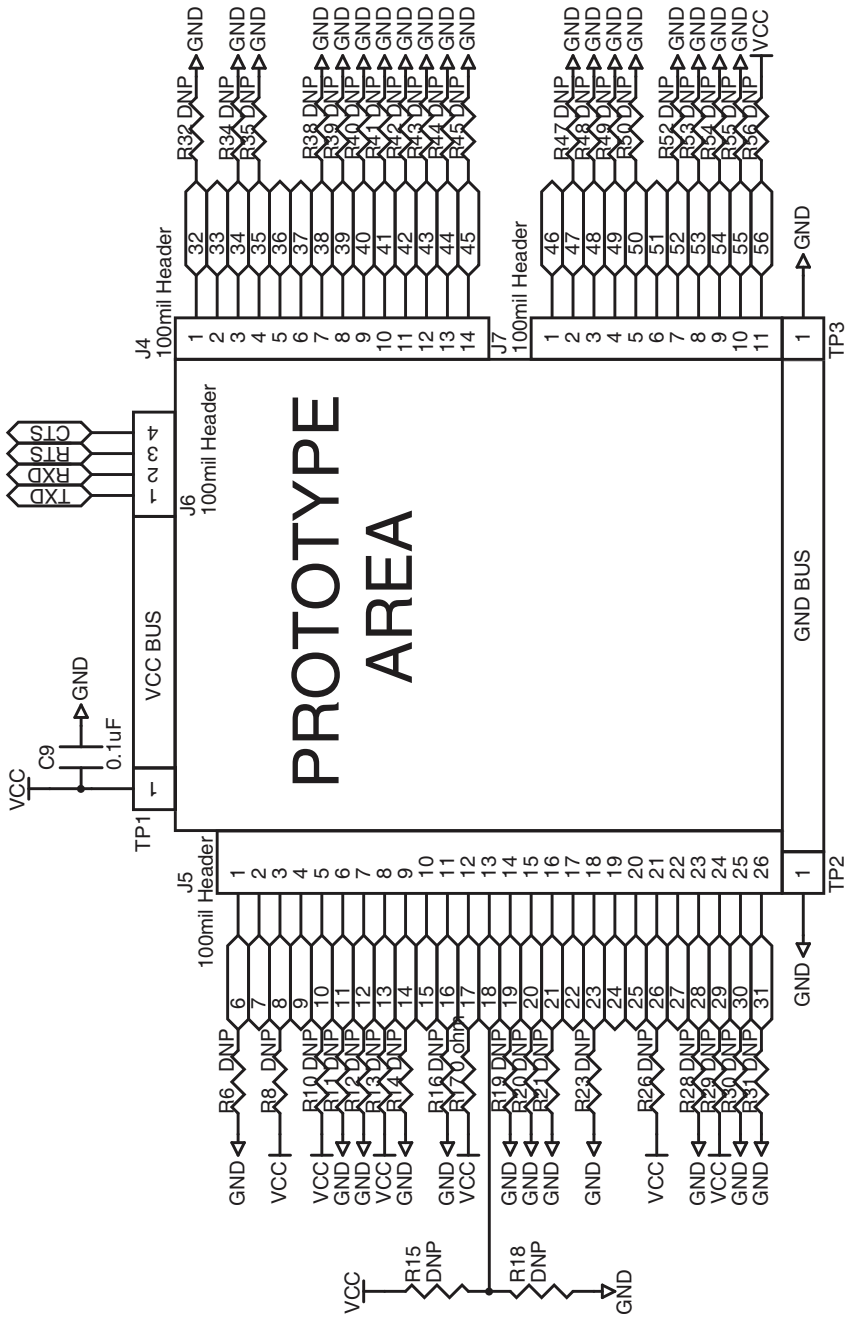


Figure 51: Prototype Board Prototype Area Schematic



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