Linx
TECHNOLOGIES

HumPRO™ 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

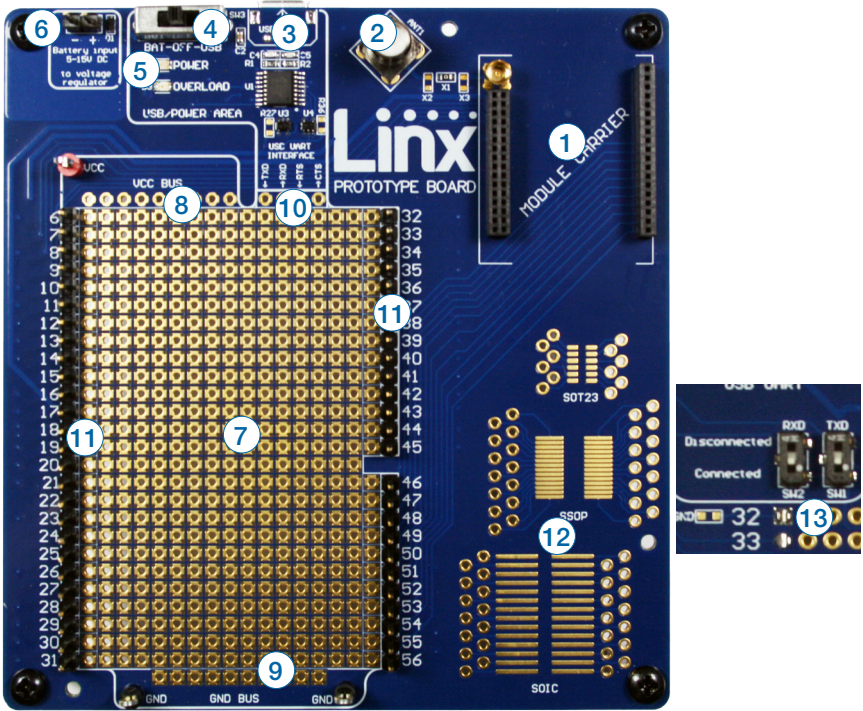| Ordering Information	
Part Number	**Description**
MDEV-***-PRO	HumPRO™ Series Master Development System
MDEV-A-900-PRO	Amplified HumPRO™ Series Master Development System
HUM-***-PRO	HumPRO™ Series Data Transceiver
HUM-***-PRO-CAS	HumPRO™ Series Data Transceiver with Castellation Connection
HUM-***-PRO-UFL	HumPRO™ Series Data Transceiver with U.FL Connector
HUM-A-900-PRO-CAS	Amplified HumPRO™ Series High Power Data Transceiver with Castellation Connection
HUM-A-900-PRO-UFL	Amplified HumPRO™ Series High Power Data Transceiver with U.FL Connector
EVM-***-PRO	HumPRO™ Series Carrier Board
EVM-A-900-PRO-CAS	Amplified HumPRO™ Series Carrier Board, Castellation Connection with an edge-mount RP-SMA connector
EVM-A-900-PRO-UFL	Amplified HumPRO™ Series Carrier Board, U.FL Connector
MDEV-PGDOCK	Development System Programming Dock
MDEV-PROTO	Development System Prototype Board
CON-SOC-EVM	EVM Module Socket Kit
*** = Frequency; 868, 900MHz	

Figure 2: Ordering Information

Amplified HumPRO™ Series Carrier Board

Figure 4: Amplified HumPRO™ Series Transceiver Carrier Board

Amplified HumPRO™ Series Carrier Board Objects

1. Amplified HumPRO™ Series Transceiver
2. Edge-mount RP-SMA RF Connector
3. Dual Row Header
4. Single Row Header

HumPRO™ Series Carrier Board Pin Assignments

ANTENNA	1		2-5	GND (RF Connector)	38 EX
					39 C̅R̅E̅S̅P̅
					40 NC
GND	6	o o	7	MODE_IND	41 NC
R̅E̅S̅E̅T̅	8	o o	9	CMD_DATA_IN	42 NC
POWER_DOWN	10	o o	11	C̅M̅D̅	43 NC
NC	12	o o	13	C̅T̅S̅	44 NC
PB	14	o o	15	CMD_DATA_OUT	45 NC
LNA_EN	16	o o	17	VCC	46 BE
NC	18	o o	19	NC	47 NC
PA_EN	20	o o	21	NC	48 NC
NC	22	o o	23	NC	49 NC
NC	24	o o	25	NC	50 NC
NC	26	o o	27	NC	51 NC
NC	28	o o	29	NC	52 NC
NC	30	o o	31	NC	53 NC
NC	32	o o	33	NC	54 NC
NC	34	o o	35	NC	55 NC
NC	36	o o	37	NC	56 NC

Figure 5: HumPRO™ Series Transceiver Carrier Board Pin Assignments (Top View)

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 UART Interface Lines
11. Module Interface Breakout Headers
12. Standard SMT Package Footprints
13. Command Data Interface Routing Switches (on back)

Using the Prototype Board

Snap a Carrier Board onto the socket on the Prototype Board as shown in Figure 8.
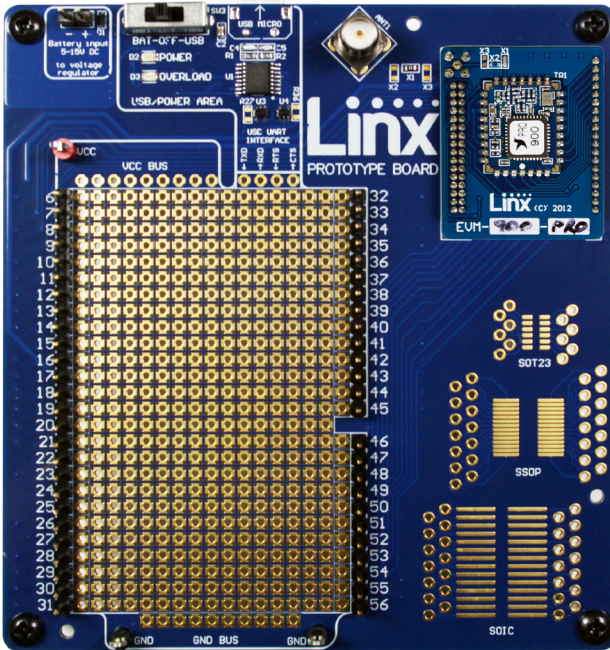
Figure 8: Prototype Board with a Carrier Board

Connect a micro USB cable into the connector at the top of the board. Plug the other end into a PC or any USB charger. The board is powered by the USB bus. This board features a prototyping area to facilitate the addition of application-specific circuitry. The prototyping area contains a large area of plated through-holes so that external circuitry can be placed on the board. The holes are set at 0.100" on center with a 0.040" diameter, accommodating most industry-standard SIP and DIP packages. Footprints for standard surface mount packages are also included to aid prototyping.

At the top of the prototyping area is a row connected to the 3.3V power supply and at the bottom is a row connected to ground. External circuitry can be interfaced to the transceiver through the breakout headers. The numbers next to the headers correspond to the pin numbers on the Carrier Board. Figure 4 shows the pin assignments for the Carrier Board.

The OVERLOAD LED indicates that that too much current is being pulled from the USB bus. This is used to prevent damage to the parts or the bus. The overload condition is reset once the excess current draw is removed.

Using the Programming Dock

Snap a Carrier Board onto the socket on the Programming Dock as shown in Figure 10.
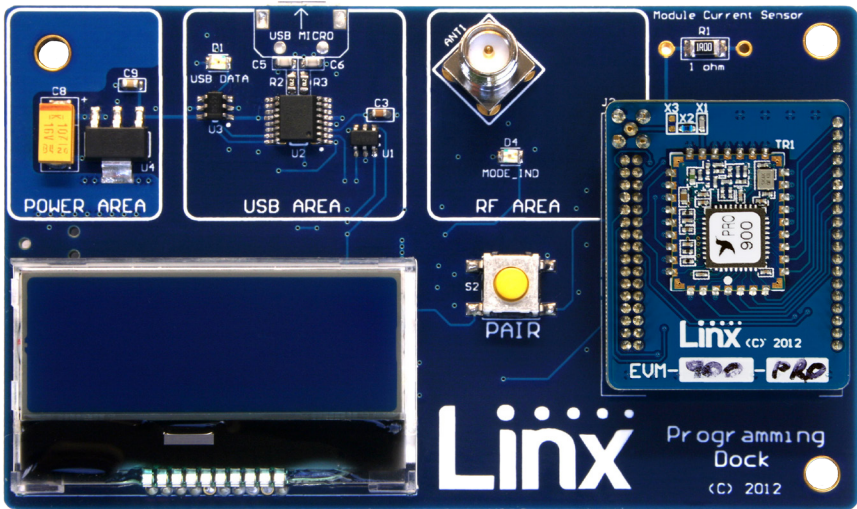

Figure 10: Programming Dock with a Carrier Board

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 HumPRO™ Series transceiver has a serial Command Data Interface that is used to configure and control the transceiver. This interface consists of a standard UART with a serial command set.

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 Advanced Configuration tab when modules are plugged in (Figure 11). This window configures the module's settings.
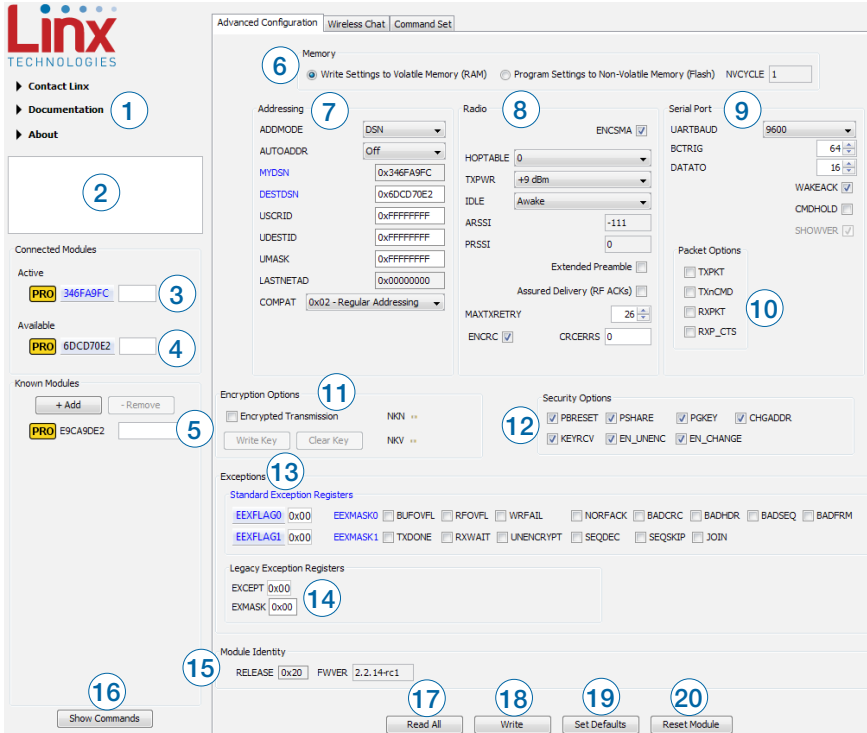
Figure 11: The Master Development System Software Advanced Configuration Tab

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 12.

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 software.
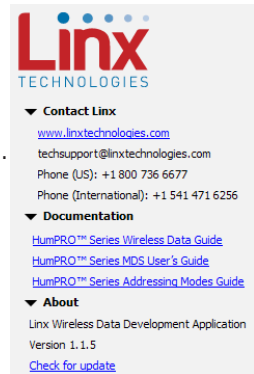
Figure 12: Additional Information

- Checking the Extended Preamble box configures the module to send a long preamble at the beginning of every packet.

- Checking the Assured Delivery box enables RF acknowledgements and retries when an acknowledgement is not received.

- MAXTXRETRY sets the maximum number of times that the module will retry sending the packet before an exception is thrown.

- Checking the ENCRC box enables the CRC checks on the incoming data. The CRC Errors box shows the number of errors since the last power cycle or the last time the count was reset.

9. The Serial Port group configures all of the UART serial port settings.

- The UARTBAUD menu configures the serial port baud rate, which is used by the module to set the over-the-air RF data rate.

- The Byte Count Trigger (BCTRIG) sets the number of bytes that the UART receives before triggering the transmission of a packet.

- The UART Data Timeout (DATATO) sets the number of milliseconds from the last character received on the UART before the module transmits the data in its buffer.

- Selecting the WAKEACK box instructs the module to output the acknowledgement (0x06) on the UART when the module wakes from sleep or power cycle.

- Selecting the CMDHOLD box instructs the module to buffer any received over-the-air data while processing configuration commands.

- Selecting the SHOWVER box instructs the module to output the firmware version information when the module starts up from a power cycle or reset.

10. The Packet Options group configures the explicit packet transmission and reception, allowing the host microcontroller to control when packets are sent and how they are received. These are set in the PKTOPT register.

11. The Encryption Options group configures the encryption settings.

- Selecting the Encrypted Transmission box enables encryption.

- Clicking the Write Key button opens a window where the 128-bit AES key can be entered (Figure 13).

- Clicking the Clear Key button opens a window where the key can be cleared (Figure 13).

20. The Reset Module button issues a command to restart the module.

21. When an 868MHz module is active, the ENCSMA becomes a drop-down menu that selects the LBT + AFA settings (Figure 15).
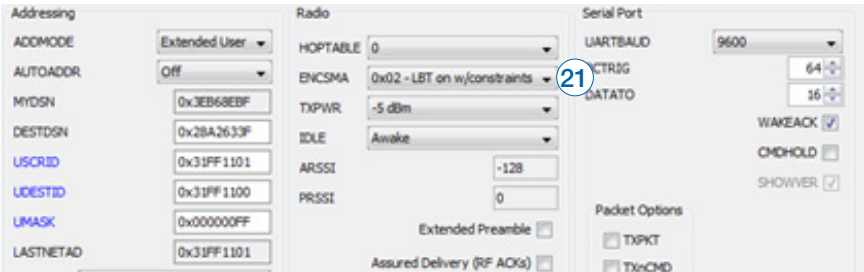

Figure 15: The Master Development System Software 868MHz Advanced Configuration Tab

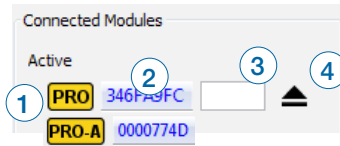The modules are shown with four identifiers as shown in Figure 16.

Figure 16: The Master Development System Software Module Identifiers

1. The type of module (HumPRO™ or Amplified HumPRO™ Series)

2. The module's local address.

3. A custom name that can be given to the module. Type a name into the box and press Enter to apply it. This name is shown on the LCD display on the programming dock (Figure 17).

4. The active module has an eject symbol that disconnects the software from that module when clicked. The Available modules have a play symbol that makes that module active when clicked.

The Wireless Chat tab (Figure 18) offers a demonstration of sending data between two modules. There is a window for each connected module.

Figure 18: The Master Development System Software Wireless Chat Tab

1. The top of the window shows the address or nickname of the associated module.

2. The chat screen shows the chat messages that have been sent and received. Transmitted messages are in pink, received are in blue.

3. The Send box is where the message text is entered. The message is transmitted when the Send button is clicked.

4. The TX Times box shows how many times the module has transmitted.

5. The RX Count box counts the number of messages that the module has received.

6. The Clear button clears all of the messages from the chat window.

7. The RSSI box indicates the signal strength of the last received message.

8. When the Show As Bytes box is selected the messages are shown as bytes in the chat window.

The Command Set tab (Figure 21) allows specific commands to be written to the module.
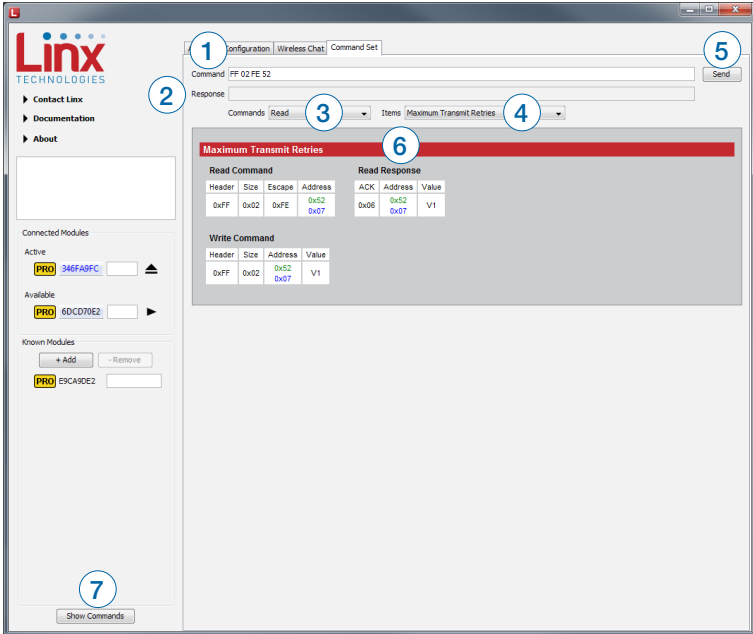
Figure 21: The Master Development System Software Command Set Tab

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 22). Selecting one of the commands from this menu automatically fills in the Command box. The values can be adjusted by typing in the box.
4. The Items drop down menu displays all of the items that are available for the active module (Figure 23). Selecting one of the items from this menu automatically fills in the Command box. The values can be adjusted by typing in the box.
5. Clicking Send writes the values in the Command box to the module.
6. The structure of the selected command and its response is shown in the main window. Please see the HumPRO™ Series Transceiver Data Guide for definitions of each value.
7. The Show Commands button opens a window that shows the bytes sent to the module and the responses from the module (Figure 24).

Development Kit Demonstration Software Example

This example shows how to configure two modules to work with each other. The software defaults to the Advanced Configuration tab when opened (Figure 25).
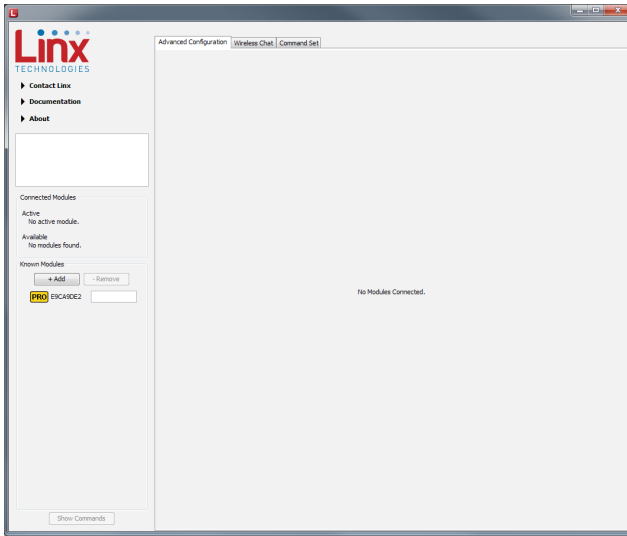

Figure 25: The Master Development System Software Advanced Configuration Tab at Start-up

Install Carrier Boards onto the Programming Docks and plug a USB cable between the Programming Docks and the PC. The software automatically detects attached devices. The first module that is identified appears under the Active label. This is the module that is actively controlled by the software. Subsequent modules are listed under the Available label as shown in Figure 26.
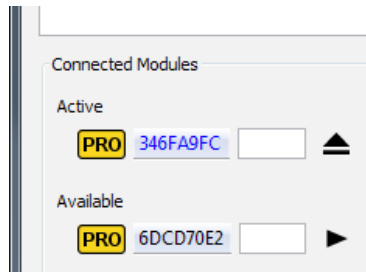
Figure 26: The Master Development System Software Connected Modules

Once the modules are detected by the software, the appropriate options are displayed on the Advanced Configurations tab. The module's documents appear under the Documentation link.

Changing the active module is accomplished by clicking the play symbol next to the desired module. Changes can now be made to this module.

There are several settings that must match in order for the modules to be able to communicate. This example uses the following settings.

- Addressing mode is DSN

- The DSN Destination Address is the DSN address of the other module. In this example, the module with the 346FA9FC DSN Source Address has the DSN Destination Address of 6DCD70E2 and vice versa.

- The Hopping Pattern is 1.

- The UART Baud Rate is 38400.
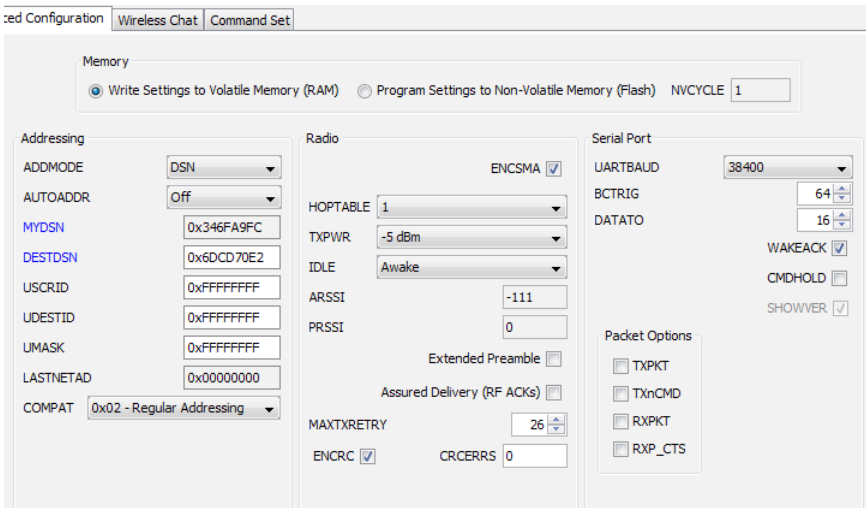
Figure 29: The Master Development System Software Advanced Configuration with Changes Written

Other settings can be used as long as they match on both modules. Once the settings are changed and submitted to both modules, the Wireless Chat tab can be used to transfer data.
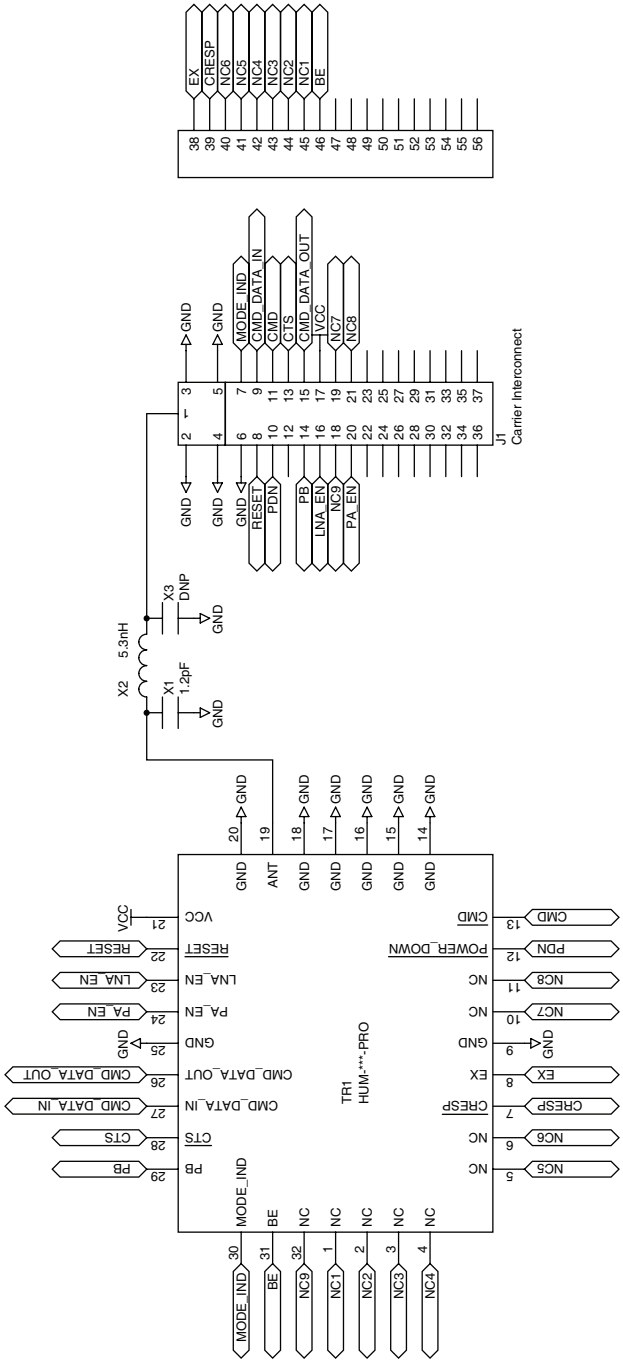
Carrier Board Schematic

Figure 31: HumPRO™ Series Transceiver Carrier Board Schematic
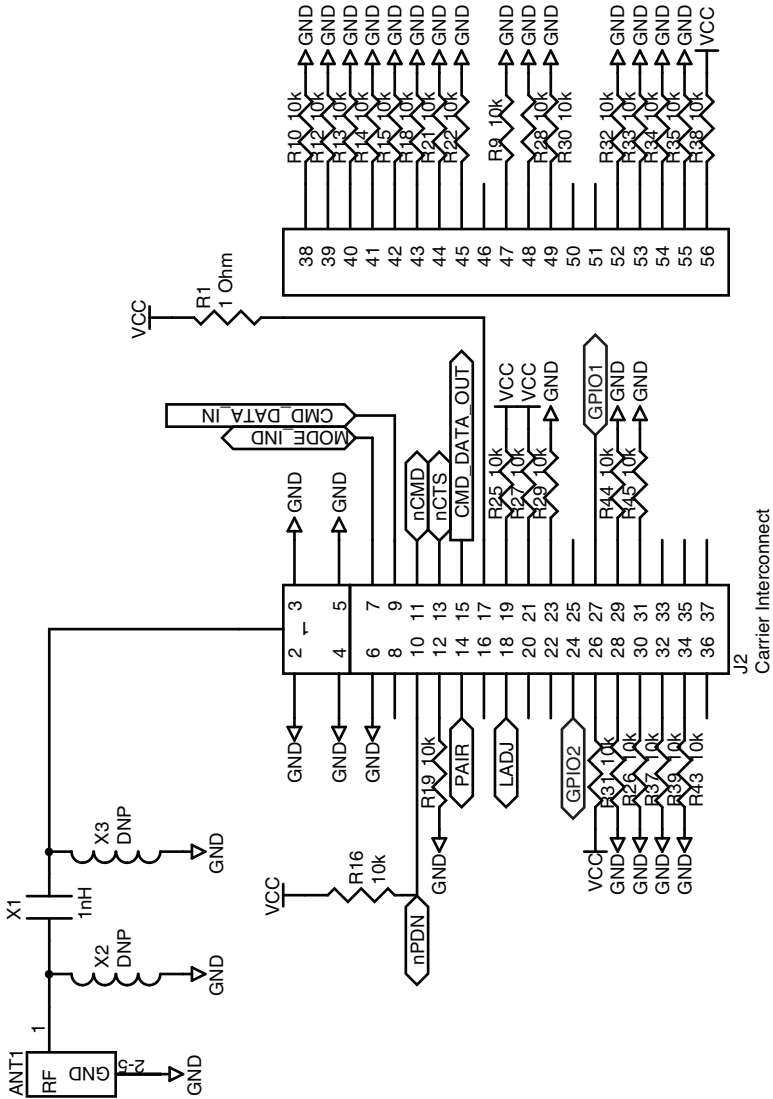
Programming Dock Board Schematic

Figure 33: Programming Dock Board RF Carrier Area Schematic

Figure 36: Programming Dock Board USB Area Schematic
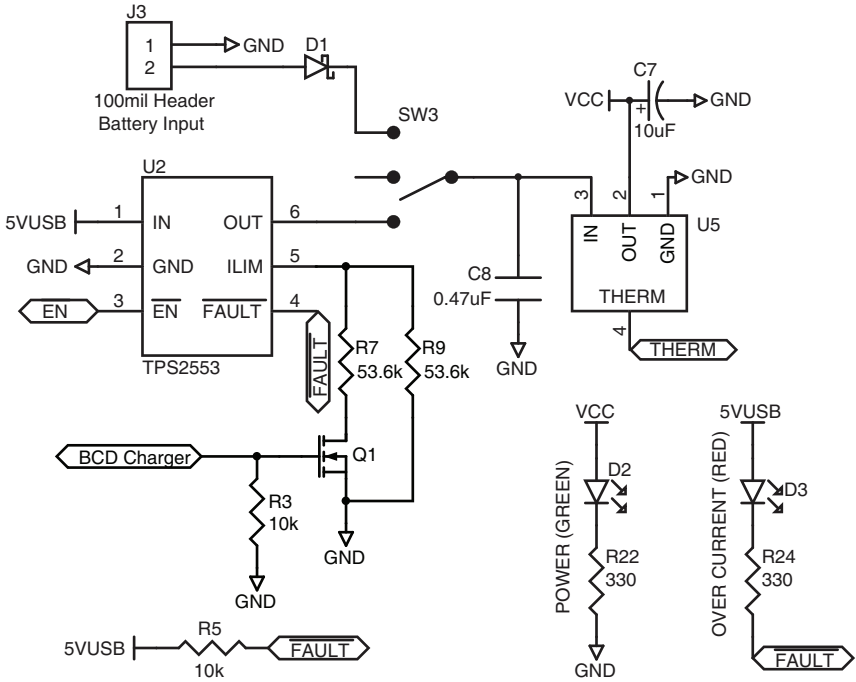
Prototype Board Schematic

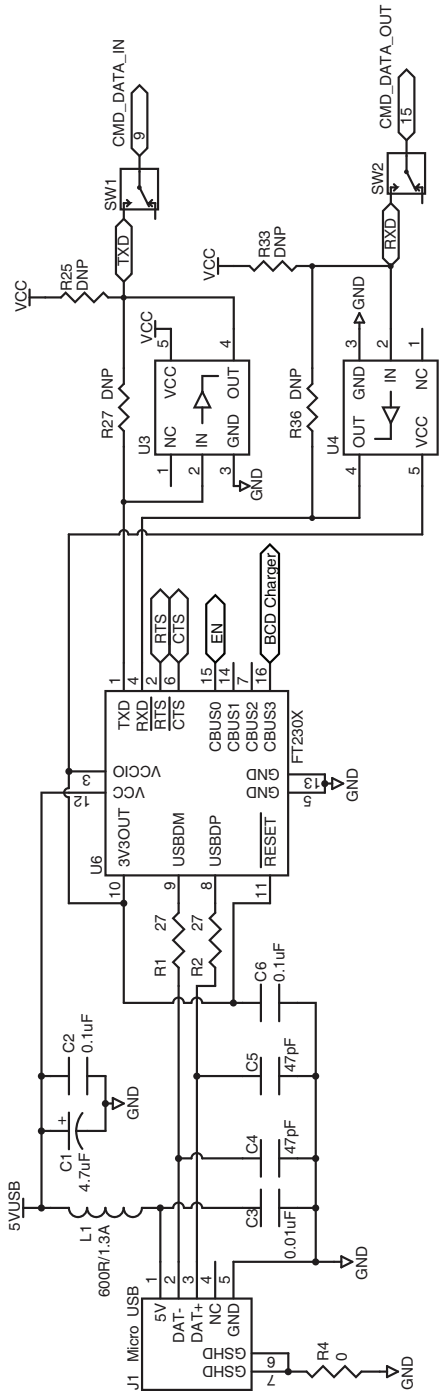Figure 38: Prototype Board Power Supply Area Schematic

Figure 40: Prototype Board USB Area Schematic

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