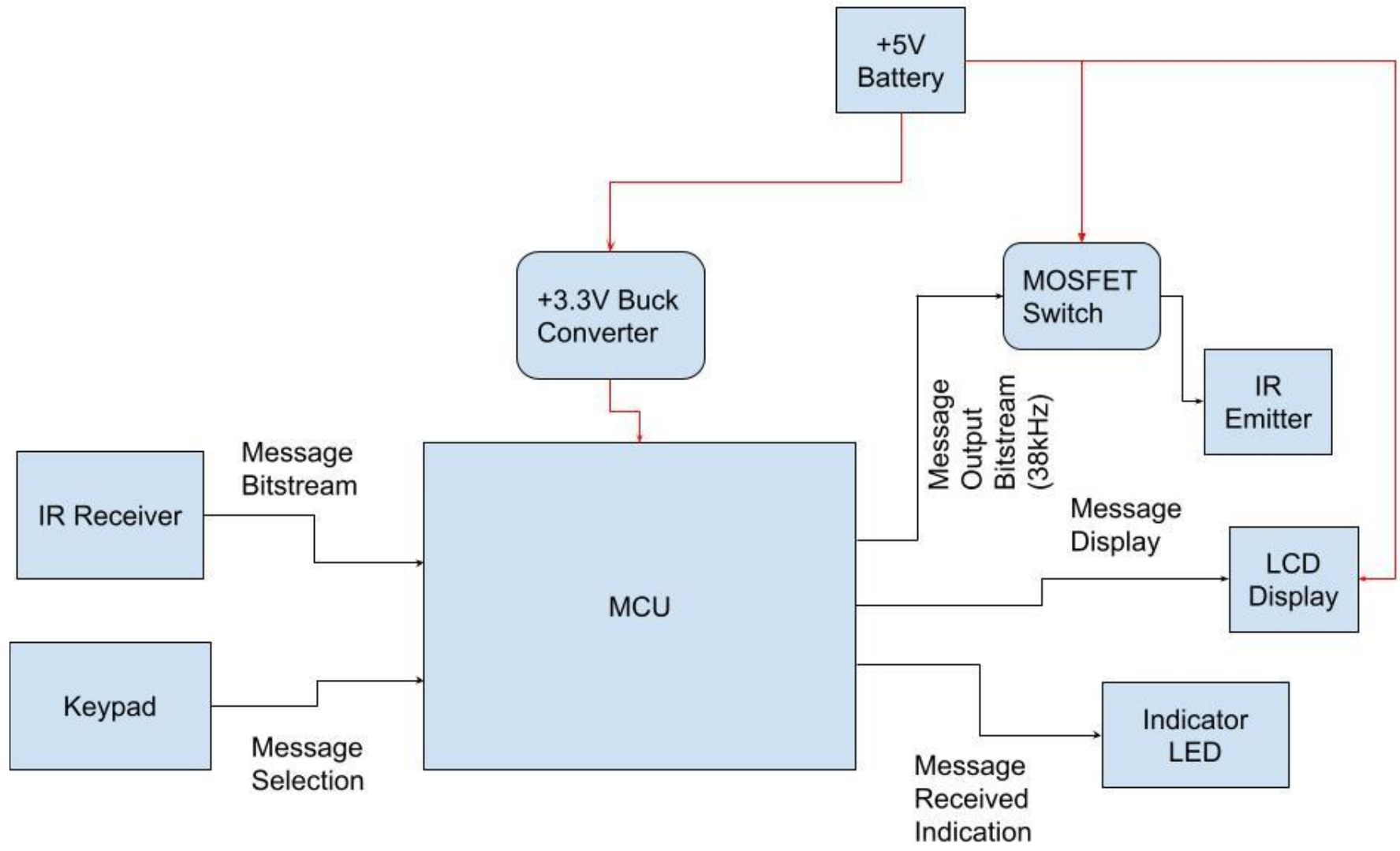
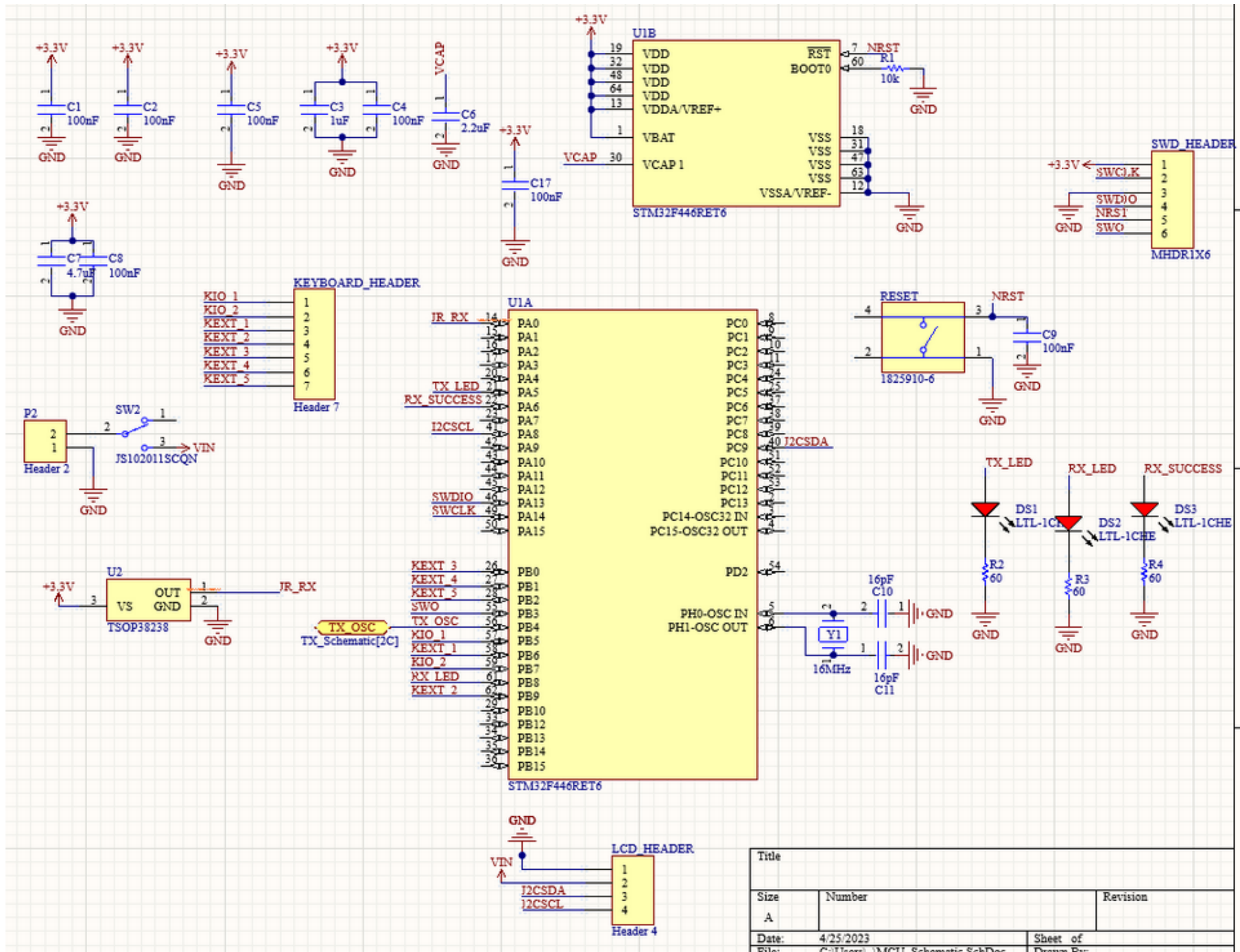


# Block Diagram

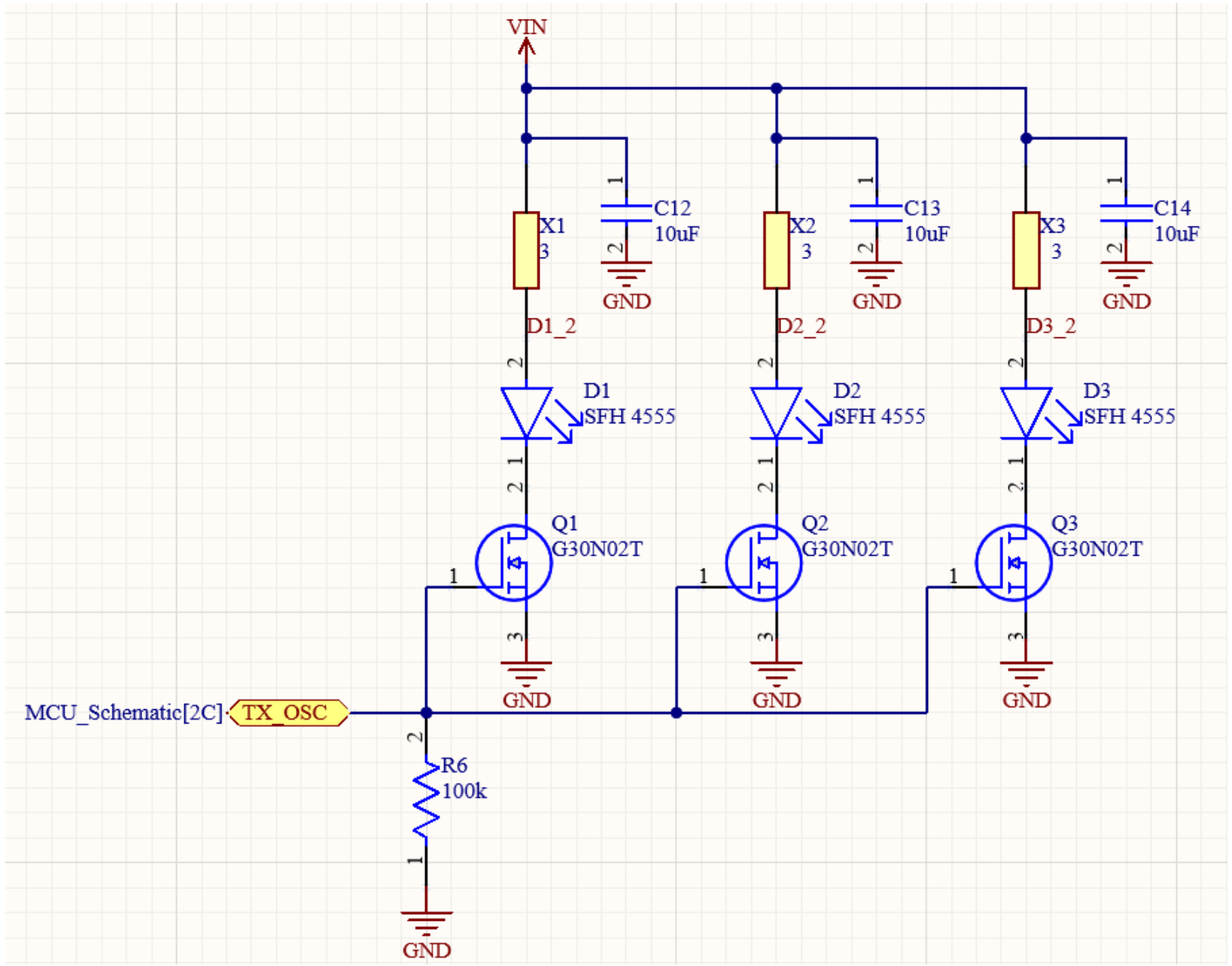


# Circuit Diagrams: MCU

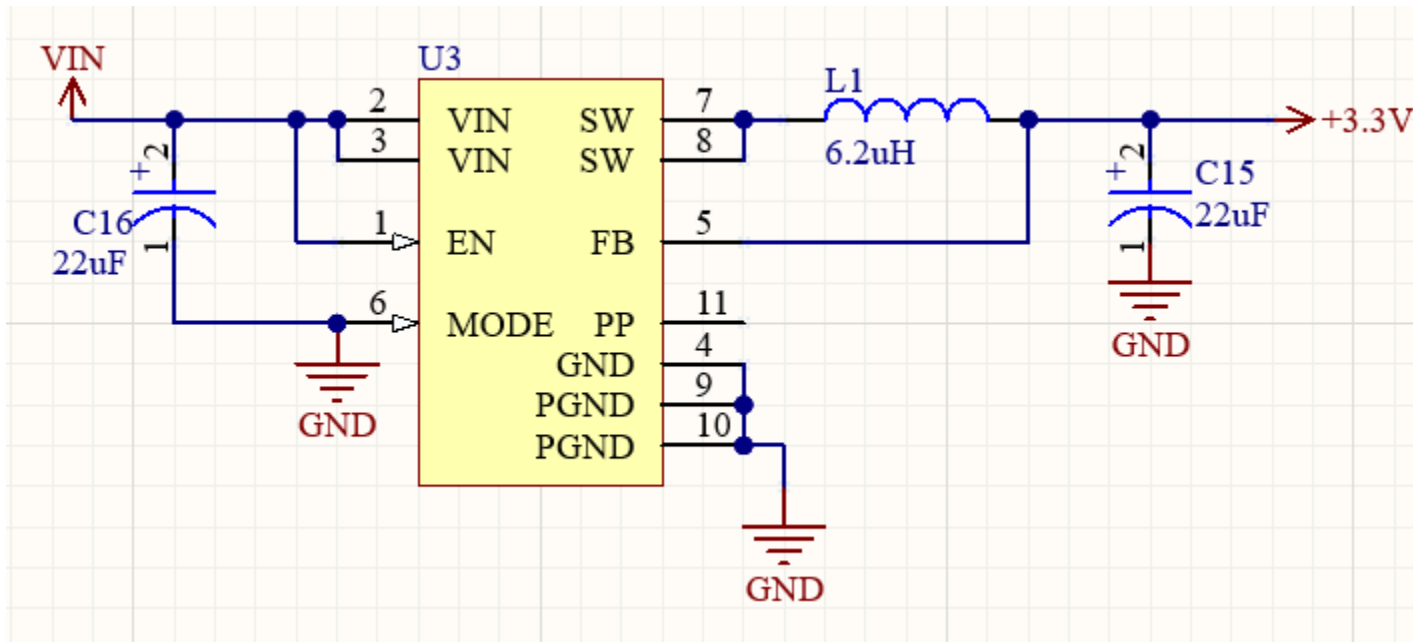


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# Circuit Diagrams: Transmitter



# Circuit Diagrams: Power Supply



## Outline of Code

- 1) Enable keypad and receiver GPIO interrupts; set up transmitter and LCD
- 2) When message is received (in receiver timer ISR):
  - 2a) Decode → start\_word, message\_id, transmitter\_id, receiver\_id, message\_word, stop\_word
  - 2b) If the message is ACK for a message we sent, set global ACK\_rxed  
If the message is valid (start and stop words are correct):
    - 2c) Transmit ACK if we are an intended recipient
    - 2d) Repeat message if we aren't the only intended recipient and we haven't already transmitted this msg
    - 2e) If we are an intended recipient, display the msg, transmitter, and receiver on LCD
- 3) In main(), poll keypad results (keypad GPIO ISR sets message\_ready flag), does all of bottom 3 LCD screen writes
  - 3a) Take in keypad inputs to navigate UI to choose message ID
  - 3b) Uses keypad inputs to navigate to select receiver's ID
- 4) When message to send is entered from keypad (including message number and intended receiver id):
  - 4a) Disable keypad interrupts
  - 4b) Encode msg → bool bits[46]  
Until we receive the ACK or max number of attempts is reached:
    - 4c) Transmit encoded msg, then delay (allow message to reach receiver and ACK to reach us)
  - 4d) Reset ACK\_rxed and message\_ready, re-enable keypad interrupts

## Message Encoding Protocol

- Send start and stop words to verify that the received message is valid.
- Intersperse 0's in between every bit of the other words to prevent IR from being on too long (receiver saturates if pulses are too long).

Start word	Message ID	Transmitter ID	Receiver ID	Message	Stop Word
5 bits	7 bits + 7 0's	5 bits + 0's	5 bits + 5 0's	5 bits + 5 0's	7 bits
11011	0000000001010	0000100010	0000101010	0010101010	1101011
11011	0000011	00101	00111	01111	1101011
11011	3	5	7	15	1101011

3rd message this device has sent

↑

Sent from device 5

↖

Intended for device 7

↑

Send message 15: messages[15] = "U-Chemical"

↖

## User Manual

1. Power on using the switch on the side.
2. Navigate to the desired message category using the ↑ and ↓ keys on the keypad. The selected category is indented.
3. Press the → key to enter a category, or the ← key to return to category selection.
4. Within a category, navigate to the desired message using the ↑ and ↓ keys. The selected message is indented.
5. Press enter (the center blue key) to select the message.
6. After selecting a message, navigate to the desired receiver using the ↑ and ↓ keys. The selected receiver is indented.  
*Note: Select receiver 0 to send the message to everyone.*
7. Press enter (the center blue key) to select the receiver. The message will immediately be transmitted to the desired receiver.
8. When a message is received, the message will be displayed on the top line of the LCD, and the green indicator LED will turn on. Press the “alert off” key (the top left green key) to turn off the LED.