



**Notes:**  
 This is a development board for testing only. None of the signals are connected to the microcontroller as a result. Connections are made using jumpers between the Board I/O and Jeenode I/O headers. Also, this schematic is incomplete. During development, it was realized that the MPXV sensor would output UP TO 5V, which, if connected to an ATtiny input pin, would potentially destroy that input or the whole micro controller when the ATtiny is configured for 3V signalling (as the Jeenode Micro V3 is). As a result, any voltages greater than 3V (or that have the POTENTIAL to be greater than 3V) require a resistor divider to bring their voltage down to a MAX of 3V. Luckily, the same 5V to 3V voltage divider can be used for all voltages to be measured (20k top/30k bottom). A 20k/30k voltage divider will take a MAX 5V signal and make it a MAX 3V signal. Use the Batt Sense circuit as an example. The Batt Sense voltage divider allows up to 5V of battery voltage (3xAA) to be measured. This does not interfere with the sensitivity of the ADC, since at 3V signalling 3V will be FullScale - ie 3xAA fresh AA batteries at 4.9V will measure a little under 3V on the microcontroller, which the microcontroller will report as between 950-1000 where 1024 is FullScale with a 10-bit ADC.

Also, the 10-bit ADC of the ATtiny84 proved insufficient to register the small pressure changes that we are looking for when monitoring a furnace filter. In order to take full advantage of the sensitivity of the MPXV pressure sensor, a 16-bit ADC similar to the Texas Instruments ADS1115 (adafruit breakout board ID 1085) or the 18-bit ADC MicroChip MCP3424 ([http://jeelabs.net/projects/hardware/wiki/Analog\\_Plug](http://jeelabs.net/projects/hardware/wiki/Analog_Plug)) is required. Using the ADS1115 is not so simple, since the Adafruit library requires the Wire library, which is incompatible with the Jeenode Micro.

The memory chip (U2) has not been tested at all. It was thrown in to possibly permit OTA updates (see Moteinos @ LowPowerLabs.com). However, as of now, I have not spent any time attempting to get this to work. The flash chip could also be used as a temporary data storage. It's possible the memory chip could interfere with RFM12 or ISP programming, since it shares the same data lines. However, my development board has had a memory chip installed (but not used), and no interference with either function has been noticed.

- Hooking it up:**  
 The following connections have been tested:
- Assemble PCB correctly using components identified in this drawing.
  - Add an Adafruit ADS1115 breakout board
  - Add a 20k/30k resistor divider. Connect PRESS to the top of this divider; connect ADS1115 A0 to the middle of this divider. For this and all resistor dividers, connect the bottom of the divider to GND.
  - Add another 20k/30k resistor divider. Top of divider connects to +BATT; middle connects to ADS1115 A1.
  - Connect +3V to ADS1115 A2. This is optional to monitor the 3V power rail.
  - Add a third 20k/30k resistor divider. Top of divider connects to +5V power rail; middle connects to ADS1115 A3.
  - Connect DIO2 to 5V EN
  - Connect DIO1 to ADS1115 SDA (bit-banged i2c Data)
  - Connect GND to ADS1115 GND
  - Connect +3V to ADS1115 VDD. NOTE: this makes the ADS1115 a 3V device - do NOT exceed the max voltage - VDD+0.3 or 3V3 in this case - of the ADS1115, unless you intend to release the magic smoke of the ADC. This is the reason for the 3 voltage dividers used in this setup.
  - Connect AIO1 to ADS1115 SCL (bit-banged i2c Clock)

**Code considerations:**  
 The ATtiny does not support the Arduino Wire library. A TinyWire library exists, but it would interfere with the communications between the RFM12B. The only other option is to use the i2c implementation provided by Jeelib. The Adafruit ADS1X15 library will not work since it relies on the Wire library. You will need to manually translate the ADS1X15 library to be compatible with the Jeenode Micro. You could also use the Jeelabs Analog Plug - I have not tested this but it should work much better, and includes a native JeeNode library.

Rev 1 Changes:  
 - Added Batt Sense Circuit  
 - Corrected ISP Header (J1)  
 \*Swapped SCK and RESET  
 - Added 1DQ Pull-Up

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