MCM Requirements

1. Control Panel (same as other boards)
2. CAN (same as other boards)
3. 2x LEDs (same as other boards)
4. 12V Filter Circuit
    a. 12V line coming into the board needs to go through an RC circuit **before** it goes the Retroreflective sensors
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/8j5bppe3xvva1m9f0wll7yteq37lt0x6
        ii. Create 6 standard size thru-holes
            1. See image for hole spacing

5. 2x Retroreflective Connectors
    a. Each connector is 6 pins
        i. Pins 1, 2, 4, and 5 are the same on both connectors
            1. Pins 1 and 4 are connected to 12V rail
            2. Pins 2 and 5 are connected to GND
        ii. Pins 3 and 6 go to individual Input Capture Module digital input pins (you can use different pin #s for these if it makes routing easier, but you can only pick from pins (8, 38, 48, 49, 74)
            1. Connector 1
                a. Pin 3 = 48
                b. Pin 6 = 74
            2. Connector 2
                a. Pin 3 = 38
                b. Pin 6 = 49
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/omeyx7aeli9eglnmt5syyj0s8xraunum
        ii. R1, R5 = 15 kΩ
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF1502U/P15.0KAACT-ND/283388
        iii. R2, R6 = 5 kΩ
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF4991U/P4.99KAACT-ND/384808
        iv. R3, R4 = 680 Ω
            1. http://www.digikey.com/product-detail/en/vishay-dale/CRCW1210680RFKEA/541-680AACT-ND/3231989

v. C1, C2 = 3.9 nF
    1. http://www.digikey.com/product-detail/en/tdk-corporation/C3216C0G1H392J060AA/445-4003-1-ND/1965649

6. 2x Kelly Connectors
    a. Each connector is 12 pins
        i. Pins 1, 2, 4, 5, 7, 8, 10, and 11 are the same on both connectors
            1. Pins 1, 4, 7, and 10 go to V_out on the MCP4725
            2. Pins 2, 5, 8, and 11 go to VSS on the MCP4725 (also "analog gnd")
        ii. Pins 3, 6, 9, and 12 each go through a voltage divider to a random digital pin
            1. Thus, 4 digital pins are needed for each connector
    b. Link to schematic → https://uwmadison.box.com/s/37xuuv5opzdydc1s6f2anupdyp7s1621
    c. R1 = 10 kΩ
        i. http://www.digikey.com/product-detail/en/rohm-semiconductor/MCR25JZHF1002/RHM10.0KBDCT-ND/2291353
    d. R2, R3 = 4.7 kΩ
        i. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14YJ472U/P4.7KVCT-ND/249609
    e. R4, R6, R8, R10, R12, R14, R16, R18 = 3 kΩ
        i. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14YJ302U/P3.0KVCT-ND/249604
    f. R5, R7, R9, R11, R13, R15, R17, R19 = 1 kΩ
        i. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14YJ102U/P1.0KVCT-ND/160445
    g. C2 = 0.1 µF
        i. http://www.digikey.com/product-detail/en/kemet/C1206C104K5RAC7867/399-1249-1-ND/411524
    h. C3 = 10 µF
        i. http://www.digikey.com/product-detail/en/kemet/T520A106M010ATE080/399-4788-1-ND/1001276
    i. Digital-to-Analog Converter
        i. MCP4725
            1. http://www.digikey.com/product-detail/en/microchip-technology/MCP4725A0T-E-CH/MCP4725A0T-E-CHCT-ND/1817328

BCM Requirements

1. Control Panel (same as other boards)
2. CAN (same as other boards)
3. 2x LEDs (same as other boards)
4. 12V Filter Circuit
    a. 12V line coming into the board needs to go through an RC circuit **before** it goes the Retroreflective sensors
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/8j5bppe3xvva1m9f0wll7yteq37lt0x6
        ii. Create 6 standard size thru-holes
            1. See image for hole spacing
5. 2x Retroreflective Connectors
    a. Each connector is 6 pins
        i. Pins 1, 2, 4, and 5 are the same on both connectors
            1. Pins 1 and 4 are connected to 12V rail
            2. Pins 2 and 5 are connected to GND
        ii. Pins 3 and 6 go to individual Input Capture Module digital input pins (you can use different pin #s for these if it makes routing easier, but you can only pick from pins (8, 38, 48, 49, 74)
            1. Connector 1
                a. Pin 3 = 48
                b. Pin 6 = 74
            2. Connector 2
                a. Pin 3 = 38
                b. Pin 6 = 49
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/omeyx7aeli9eglnmt5syyj0s8xraunum
        ii. R1, R5 = 15 kΩ
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF1502U/P15.0KAACT-ND/283388
        iii. R2, R6 = 5 kΩ
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF4991U/P4.99KAACT-ND/384808
        iv. R3, R4 = 680 Ω
            1. http://www.digikey.com/product-detail/en/vishay-dale/CRCW1210680RFKEA/541-680AACT-ND/3231989
        v. C1, C2 = 3.9 nF

1. http://www.digikey.com/product-detail/en/tdk-corporation/C3216C0G1H392J060AA/445-4003-1-ND/1965649

6. 1x Pressure Switch Connector
    a. Connector is 4 pins
        i. Pins 1 and 2 are both shorted to the 3.3V rail on the Max32
        ii. Pin 3 is connected to any individual digital pin through an RC filter
        iii. Pin 4 is connected to any individual digital pin through an RC filter
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/vinrngykpq3xfk7x988kxak09fmm6nl9
        ii. R = 1690 Ω
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF1691U/P1.69KAACT-ND/384590
        iii. C = 47 µF
            1. http://www.digikey.com/product-detail/en/murata-electronics-north-america/GRM31CR61A476ME15L/490-5528-1-ND/2334924
7. 2x FET Connectors
    a. 2 groups of FETs – group of 4 and group of 2
    b. 5-pin connector for group of 4 // 3-pin connector for group of 2
        i. The extra pin in each group is for GND
    c. Put the 3 pin connector next to the “Front” retroreflective 4-pin connector
    d. Put the 5 pin connector next to the “Back” retroreflective 4-pin connector

VNM Requirements

1. Control Panel (same as other boards)
2. CAN (same as other boards)
3. 2x LEDs (same as other boards)
4. 12V Filter Circuit
    a. 12V line coming into the board needs to go through an RC circuit **before** it goes the Retroreflective sensors
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/8j5bppe3xvva1m9f0wll7yteq37lt0x6
        ii. Create 6 standard size thru-holes
            1. See image for hole spacing
5. Inertial Measurement Unit
    a. No Connector
    b. Thru-hole connections needed for Sparkfun breakout (already has RC circuits on breakout)
        i. https://www.sparkfun.com/products/13762?_ga=1.9998262.206798762.1441390851
    c. BRD file you can use to do thru-hole alignment
        i. https://uwmadison.box.com/s/c2dazg0sms4rolm4a7ogwfzqz3so9p7n
    d. Only using J1 and J3
        i. J1
            1. Pin 1 (SCL) = 21
            2. Pin 2 (SDA) = 20
            3. Pin 3 (VDD) = 3.3V
            4. Pin 4 (GND) = GND
        ii. J3
            1. Pin 1 (VDDIO) = Don't connect to anything – put a thru-hole though for mechanical stability
            2. Pin 2 (AD0) = Don't connect to anything – put a thru-hole though for mechanical stability
            3. Pin 3 (CS) = Don't connect to anything – put a thru-hole though for mechanical stability
            4. Pin 4 (INT) = Any general digital pin

6. 1x Retroreflective Connectors
    a. Connector is 9 pins
        i. Pins 1, 4, and 7 are connected to 12V rail
        ii. Pins 2, 5, and 8 are connected to GND

iii. Pins 3, 6, and 9 go to through a separate RC filter individual Input Capture Module digital input pins (you can use different pin #s for these if it makes routing easier, but you can only pick from pins (8, 38, 48, 49, 74)
    1. Pin 3 = 48
    2. Pin 6 = 74
    3. Pin 9 = 38

b. RC Filter
    i. Link to schematic → https://uwmadison.box.com/s/mask41vi7sjbguoueoct3ho9m3paodrj
    ii. R1, R5, R8 = 15 kΩ
        1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF1502U/P15.0KAACT-ND/283388
    iii. R2, R6, R9 = 5 kΩ
        1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF4991U/P4.99KAACT-ND/384808
    iv. R3, R4, R7 = 680 Ω
        1. http://www.digikey.com/product-detail/en/vishay-dale/CRCW1210680RFKEA/541-680AACT-ND/3231989
    v. C1, C2, C3 = 3.9 nF
        1. http://www.digikey.com/product-detail/en/tdk-corporation/C3216C0G1H392J060AA/445-4003-1-ND/1965649

VSM Requirements

1. Control Panel (same as other boards)
2. CAN (same as other boards)
3. 2x LEDs (same as other boards)
4. Pressure Sensor
    a. No connector, sensor is thru-hole into the PCB
5. 1x Limit Switch Connector
    a. Connector is 4 pins
        i. Pins 1 and 2 are both shorted to the 3.3V rail on the Max32
        ii. Pin 3 is connected to any individual digital pin through an RC filter
        iii. Pin 4 is connected to any individual digital pin through an RC filter
    b. RC Filter
        i. Link to schematic → https://uwmadison.box.com/s/vinrngykpq3xfk7x988kxak09fmm6nl9
        ii. R = 1690 Ω
            1. http://www.digikey.com/product-detail/en/panasonic-electronic-components/ERJ-14NF1691U/P1.69KAACT-ND/384590
        iii. C = 47 µF
            1. http://www.digikey.com/product-detail/en/murata-electronics-north-america/GRM31CR61A476ME15L/490-5528-1-ND/2334924
6. 2x Thermistor Connectors
    a.