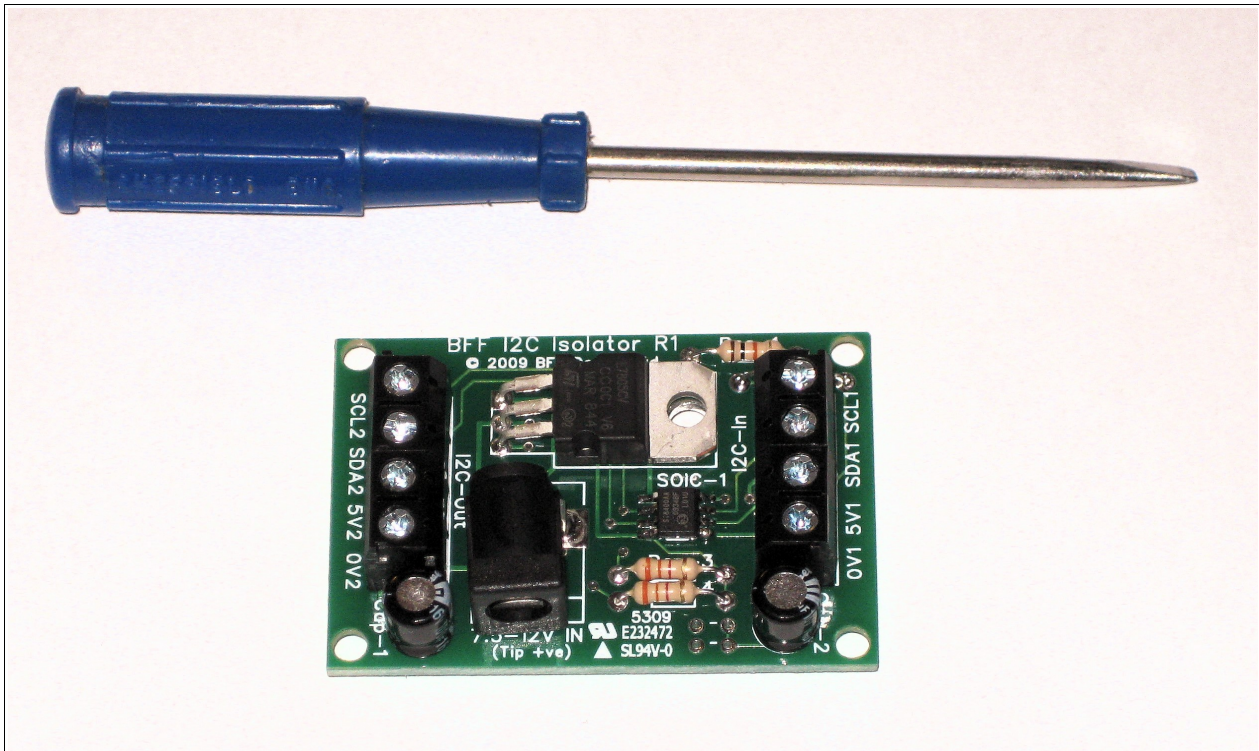


BFF Design Ltd – BFF I²C Isolator Card



IMPORTANT – WHEN THE ISOLATOR CARD IS FITTED TO YOUR SERVO DRIVE **DO NOT** POWER DOWN THE 40SPU-1 CARD WHILST THE SERVO SYSTEM IS MOVING.

ALWAYS STOP THE DRIVE FIRST BY CLOSING THE PID SERVO CONTROLLER SOFTWARE ON THE PC **BEFORE** CUTTING THE POWER TO THE 40SPU-1 CARD.

POWER DOWN THE ISOLATOR CARD **BEFORE** POWERING DOWN THE 40SPU-1 CARD.

With the isolator card fitted the 5V 40SPU-1 supply no longer provides the MD03 5V logic supply. The logic elements of the MD03 controllers are powered by the I2C Isolator card and will therefore remain active until the I2C Isolator card power supply is removed. Closing the BFF PID Servo Controller software before powering down the 40SPU-1 card will allow the card to instruct the MD03 controllers to stop driving before it is made inactive.

Powering down the I2C Isolator card will cut the logic supply to the MD03's and stop them driving (so long as the 5V is supplied by the voltage regulator on the I2C Isolator card).

1. Introduction

Disruptive electrical noise on the I²C, 5V and 0V logic lines between the 40SPU-1 card and the MD03 motor speed controllers can be present on DIY motion systems that use higher current and/or noisy drive motors. If the noise is heavy enough intermittent voltage spikes on these logic lines can interrupt the proper operation of the PICAXE 28X2 microcontroller on the 40SPU-1 causing the servo drive to stop operation.

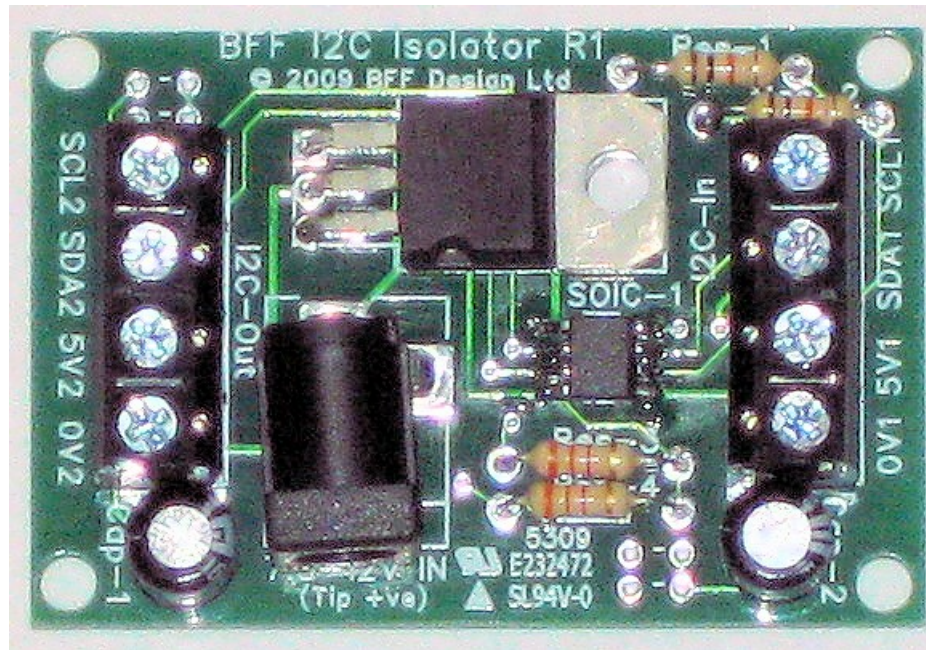
The BFF I²C Isolator Card uses the [Silicon Labs Si8400](#) I²C Isolator chip to provide electrical isolation of the I²C lines (including logic 5V and 0V) connecting the 40SPU-1 signal processor card to the MD03 motor speed controllers. Full bi-directional communications are supported by the isolator card to allow the 40SPU-1 to both write and read the MD03 I²C registers whilst being electrically isolated from the MD03's and their ground connections to the drive motors.

For effective isolation the card should be powered by a 9V DC supply that is fully independent of the 5V DC supply used to power the 40SPU-1. The on-board voltage regulator provides the 5V logic supply to the MD03's. Alternatively a separate 5V supply can be used to provide the MD03 logic supply. In either case ground connections **SHOULD NOT** be shared by the 40SPU-1 and MD03 logic supplies.

IMPORTANT

- Although the isolator card will protect the 40SPU-1 from the effects of electrical noise, electrical conditions can still arise in which the I2C comms can seize with the I2C Isolator card fitted. This can happen, for example, when

heavy vibration effects are configured (eg runway vibrations) and the MD03 controllers attempt to drive very fast reversing movements against the inertia of the platform and/or heavy unbalanced loads. On my platform for example configuring heavy runway vibration then running the platform unloaded (ie against the full unbalanced load of the bungee spring) can cause problems for the MD03 controllers and the I2C Isolator card. So the MD03's and the I2C comms can be affected by heavy and erratic motor drive conditions - take care not to configure too heavy runway vibration effects in your DIY motion platform and avoid operating it in a heavily unbalanced condition.



2. Connections and Settings

Refer to photo -

- A) I2C-In – (right side) 4 terminal screw connector – connect to CN4-2 on 40SPU-1. Wire the SCL1, SDA1, 5V1 and 0V1 lines on the Isolator directly to the SCL, SDA, 5V and 0V connections on the 40SPU-1.
- B) I2C-Out – (left side) 4 terminal screw connector – connect SCL2, SDA2, 5V2 and 0V2 to the SCL, SDA, 5V and logic GND connections on the MD03 motor speed controllers. If the Isolator card 2.1mm power-in connector is active then 5V2 is the 5V supply for the I2C bus and it supplies the logic voltage for the MD03's. If a separate 5V supply is used for the MD03's and the 2.1mm power connector is inactive then 5V2 is the 5V input for the un-isolated half (2) of the Isolator card.
- C) 2.1mm (tip +ve) power input connector. 9V DC is recommended, however the on-board 7805 voltage regulator can handle supply voltages between 7.5V and 12V to produce the 5V output voltage for connector 5V2 to supply the MD03 speed controller logic voltage.

3. Information

The SDA1 and SCL1 lines are pulled high with on-board 10K resistors. The 10K resistors combine with the existing 4K7 pull up resistors on the 40SPU-1 to give pull-up currents of approx 1.5mA with 5V (5V1) logic supply.

The SDA2 and SCL2 lines are pulled high with on-board 3K3 resistors to give the 1.5mA pull-up currents with the 5V (5V2) supply. It is not expected that additional external pull-up resistors are used on the I2C-Out side of the card.

If you require different pull-up resistors on the card to allow use with your own projects then let me know.

Provision is made for the addition of capacitors between the SDA and SCL lines and ground should they be required. See the Si8400 data sheet for more information.

4. Typical System Wiring

An illustrative overall system wiring arrangement is shown overleaf.

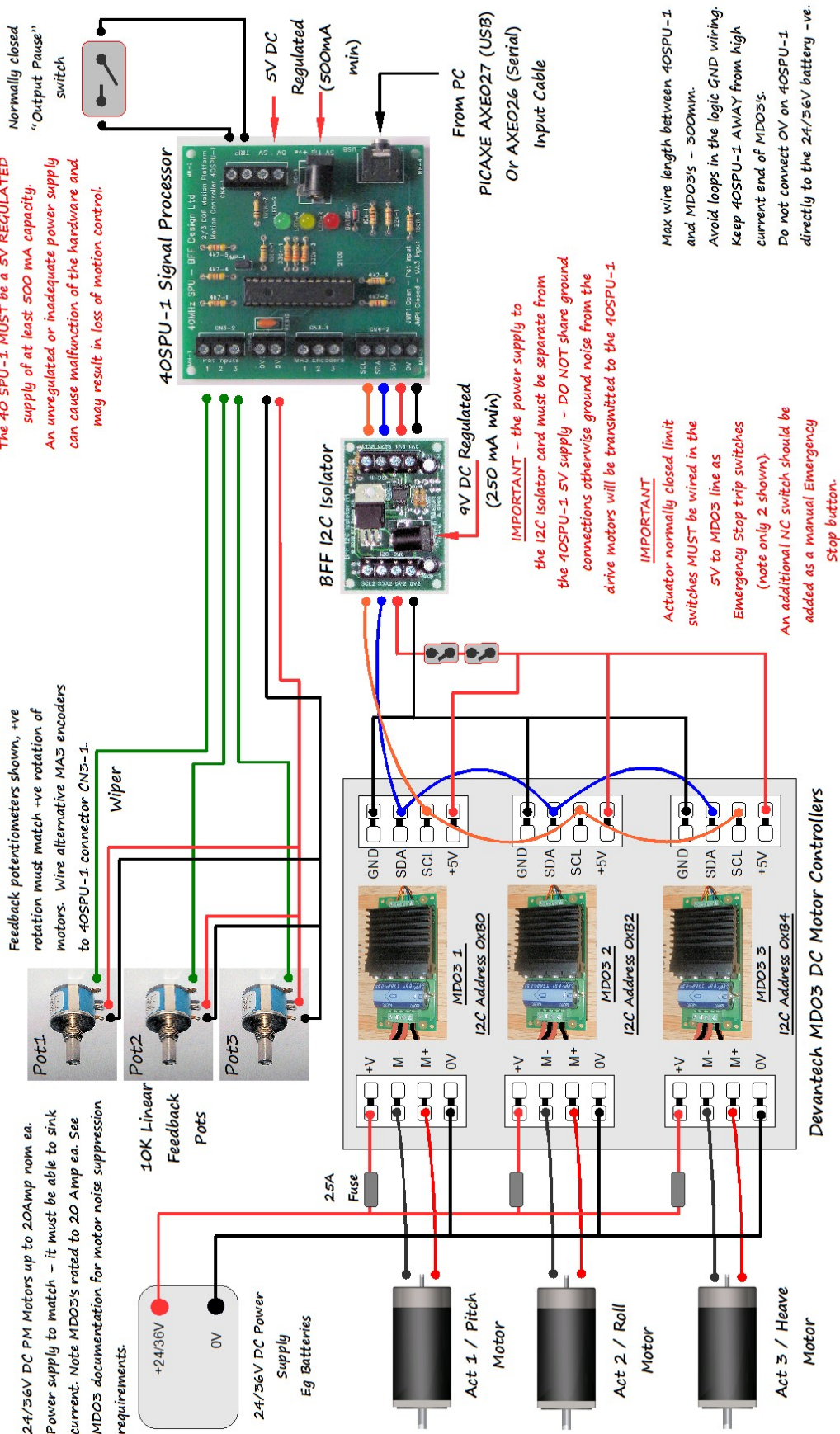
The I²C Isolator card is connected between the 40SPU-1 and the MD03's. The 9V power supply for the I²C Isolator card MUST be independent of the 5V logic supply for the 40SPU-1 for the 40SPU-1 to be protected from voltage spikes on the 5V and 0V lines.

If the MD03's and 5V2 are supplied with a separate, external 5V supply then the 2.1mm power connector on the I²C Isolator card should NOT be connected.

NOTE the positions of the actuator over-travel limit switches on the I2C-Out side of the isolator card. They must be fitted between the isolator card and the MD03's NOT between the 40SPU-1 and the isolator card.

Make sure that your position feedback pots are electrically insulated from any platform/motor structure that might transit electrical ground noise emanating from the operating motors back to the 40SPU-1. This is especially important if the pots are physically fitted to the motor/gearbox drive shafts.

DIY Motion Platform Illustrative System Wiring – With BFF I2C Isolator Card



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