

Preliminary *Beam Stabilizer Add-on Card*



User's Manual



September 19, 2011
Revision A

Introduction:

Beam stabilizers are used to correct for dynamic laser beam pointing errors in optical systems. These pointing errors can be a combination of slow varying (thermal) and higher frequency error (mechanical vibration from fans, water pumps, etc.).

A beam stabilizer uses active mirrors to compensate for beam pointing errors. By sampling a small percentage of the beam, the actual beam motion can be tracked out using position sensing detectors.

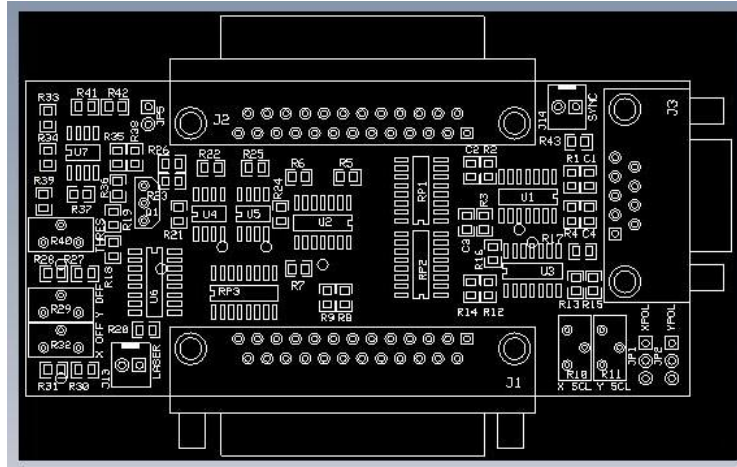
This manual covers the operation of Optics In Motion's beam stabilizer add-on card which can be used with any of our fast steering mirrors driven with our analog controller box. This card performs all functions necessary to configure our standard fast steering mirrors to lock to an external detector.

Optics In Motion also offers a beam stabilizer mirror (model OIMBS01), this model is an open loop mirror head. No internal mirror angle sensor is present on this model. If the external beam is off or blocked the mirror shuts off and returns to its rest position (set by flexure springs only). There are several advantages in using the beam stabilizer add-on PCB combined with our standard closed loop fast steering mirror. If the external beam is blocked the mirror will switch to internal feedback and return to the offset location set by the add-on PCBs offset potentiometers. In addition, the beam stabilizer add-on card can be interfaced to a PC via a NI multifunction card. The PC can control mirror position and scan the fast steering mirror field of view for the external detector (if the beam does not fall on the detector due to drift)

Figure 1: Beam Stabilizer Card (part number OIMBS1080)



The beam stabilizer card shown in figure 1 attaches to the (25 socket D) Command I/O connector of the fast steering mirrors analog controller. It derives all required power from the controller. The position sensing detector connects to the stabilizer card via the male 9 pin D connector.



Beam Stabilizer Card Connectors/Jumpers and Potentiometers

J1 - 25 socket D connector, used for optional computer interface to stabilizer card

J2 - 25 pin D connector, attaches to the fast steering mirror 'Command I/O' connector on the analog controller

J3 - 9 pin D connector, input connector for the position sensing detector

JP1 - 3 terminal jumper, x polarity attach short across pin 1 and pin 2 for inverted polarity and pin 2 and pin 3 for non-inverted polarity.

JP2 - 3 terminal jumper, y polarity attach short across pin 1 and pin 2 for inverted polarity and pin 2 and pin 3 for non-inverted polarity.

JP5 - 2 terminal jumper, short pin 1 to pin 2 to disable external detector locking

J13 - 2 pin molex connector, used to turn on an external laser (+5volts = ON, 0 volts = OFF)

J14 - 2 pin molex connector, used to monitor laser sync signal for pulsed laser applications.

R10 & R11 - Multi-turn potentiometer, adjusts position sensing detectors scale factor for x and y axes

R29 & R32 - Multi-turn potentiometer, adjusts fast steering mirror offsets used to point mirror onto detector

R40 - Multi-turn potentiometer, adjusts power level that triggers the int/ext switch to lock on the external detector.

Figure 2: Detector (part number OIMPSD4, OIMPSD9, OIMQUAD10)

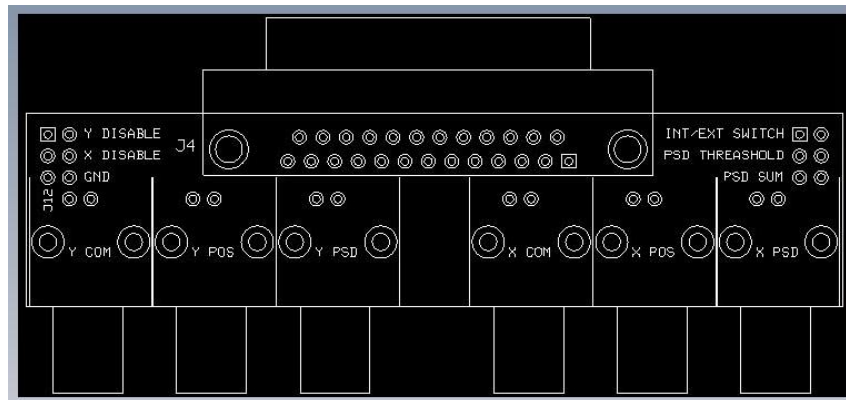
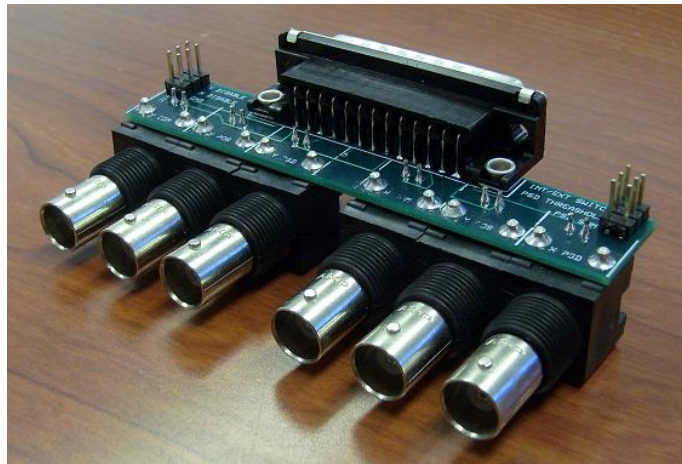


Optics In Motion offers the following choice of detectors:

- 1) PSD 9x9 mm (OIMPSD9)
- 2) PSD 4x4 mm (OIMPSD4)
- 3) QUAD Cell 10 x 10 mm (OIMQUAD10)

All detectors are housed in a Thor Labs CP02T 30 mm Cage Plate with a SM30L10 Lens Tube to act as a light baffle. The detector mount has an 8-32 threaded hole on the bottom to allow mounting. Figure 2 shows the detector module mounted on a Thor Labs pedestal pillar post. The detector modules have a 24" long pigtailed cable with a 9 pin socket D connector.

Figure 3: BNC Adapter Board (part number OIMBNC01)



BNC Adapter Board Connections

BNC outputs

X & Y COM – (Input) Command signal to the FSM range +10 V to -10 V

X & Y POS – (Output) Monitors the position of the FSM (internal position sensor)

X & Y PSD – (Output) Monitors the external detector position outputs

Header J12 I/O

PINS 1 & 2 – Y Disable, if jumpered (Pin 1 tied to Pin 2) the FSM Y axis is disabled

PINS 3 & 4 – X Disable, if jumpered (Pin 3 tied to Pin 4) the FSM Y axis is disabled

PINS 5 & 6 – Ground reference, used as reference to monitor sum and threshold

Header J11 I/O

PINS 1 & 2 – Internal/External Switch, disables external lock if jumpered (Pin 1 tied to Pin 2)

PINS 3 & 4 – PSD threshold, level (sum voltage) at which the FSM will lock in external mode

PINS 5 & 6 – PSD sum, monitors the power level on the external detector

Manual Mode - uses an external function generator and oscilloscope to determine amplitudes and polarities of feedback.

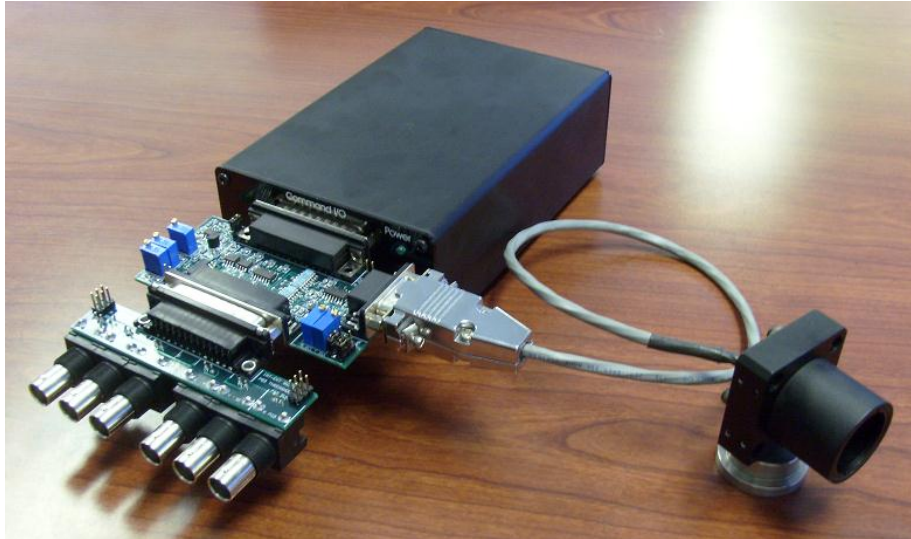
Connect the Beam Stabilizer Card to the Analog Controller.



Connect the BNC adapter board to the Beam Stabilizer Card.



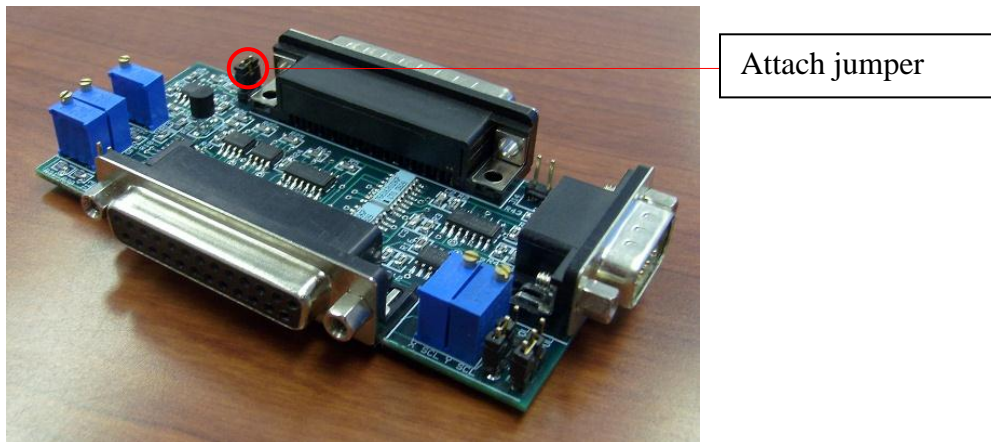
Connect the detector to the Beam Stabilizer Card.



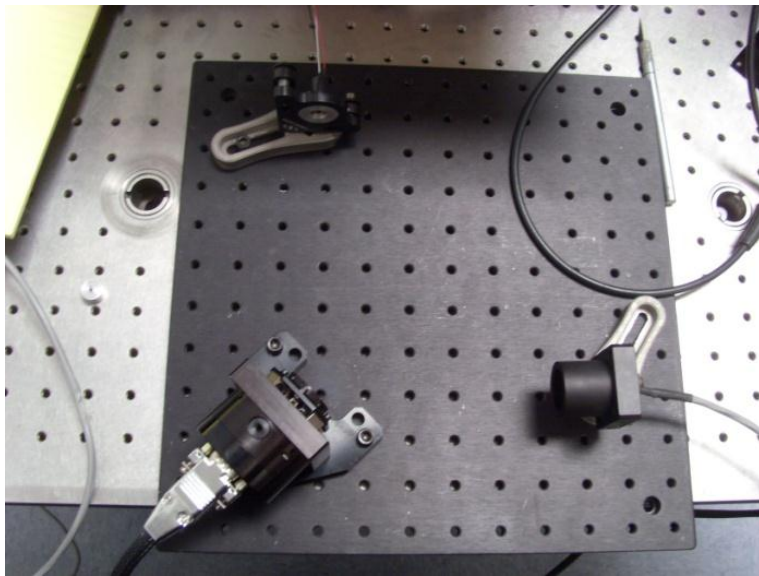
Connect the Fast Steering Mirror to the rear of the Analog Controller with the FSM Cable.



Disable the Beam Stabilizer Card with a jumper.



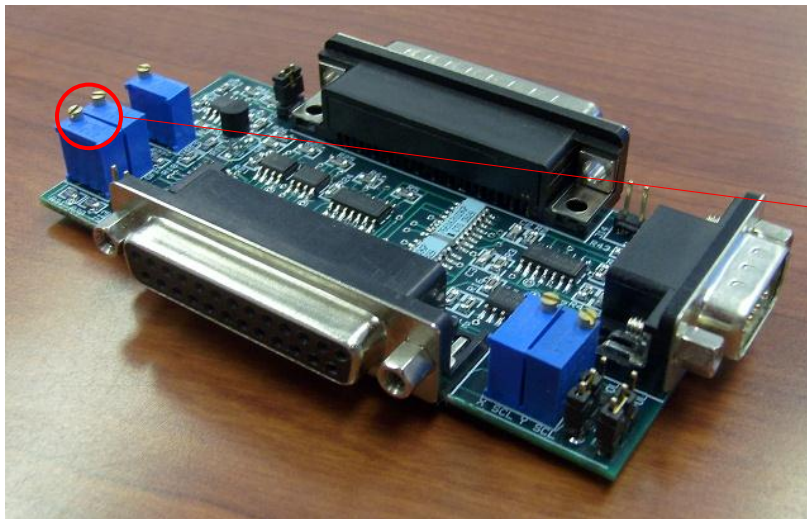
Set up the laser, Fast Steering Mirror and detector such that the beam bounces off the mirror and onto the detector.



Connect the power source to the Analog Controller and turn it on.

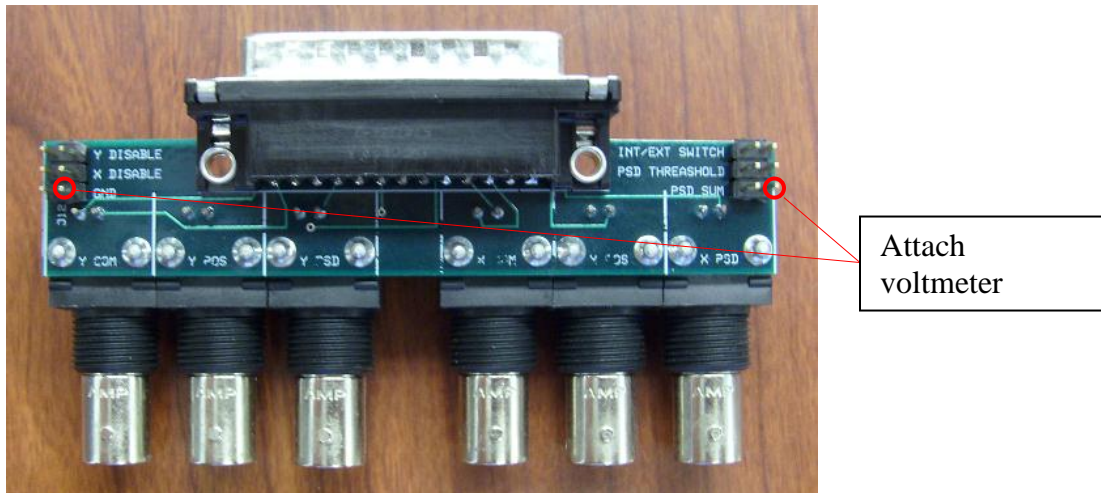


To adjust the mirror position manually so the beam falls on the detector, adjust the offset potentiometers for the X and Y axes accordingly.

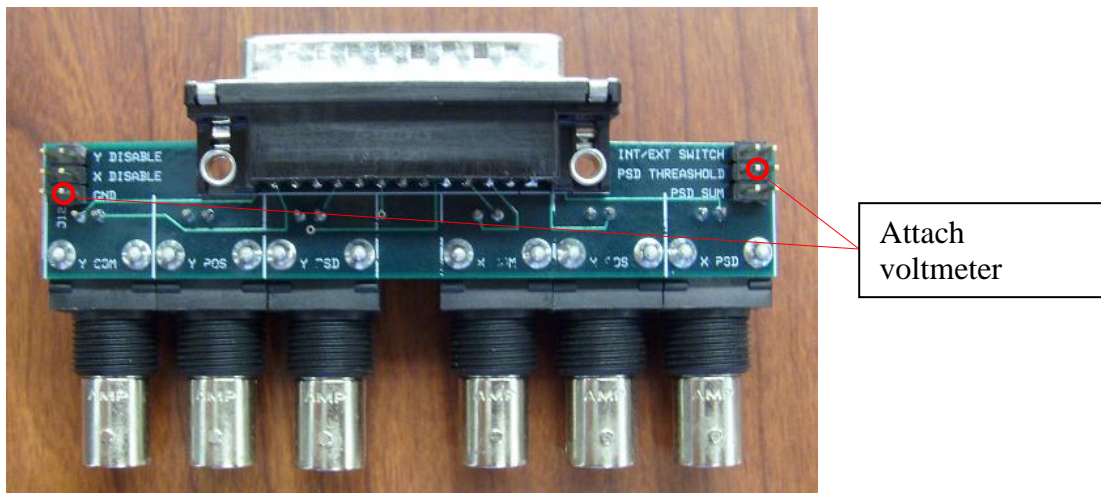


Turn these potentiometers to adjust the offset of the

Measure the sum signal on the BNC Adapter Board. It should be between 2 and 10 volts. Adjustment of the sum signal will require attenuating or increasing the power of the laser.



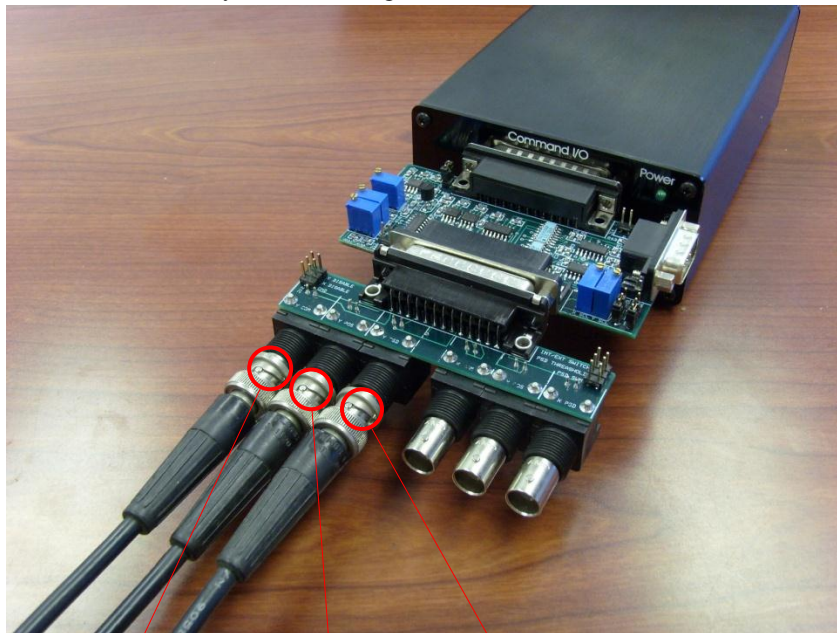
The threshold setting determines the amount of light necessary for the FSM to lock onto position. The threshold should be set to about 1 volt.





Adjust threshold
with this pot

Connect the assembly to a function generator and run a sine wave on the X or Y axis (X or Y COM BNC Inputs).

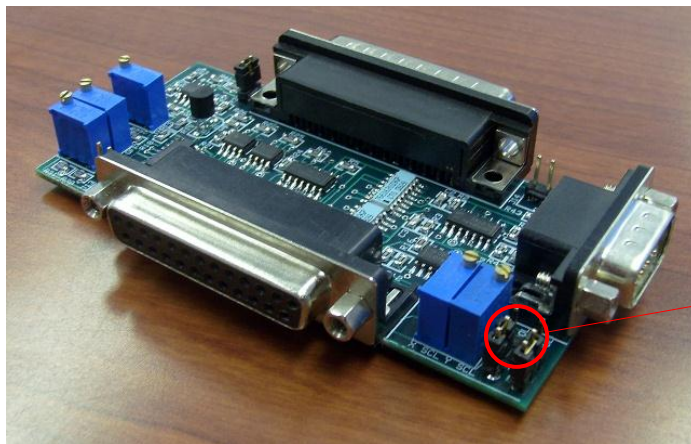


FSM Command

FSM Position

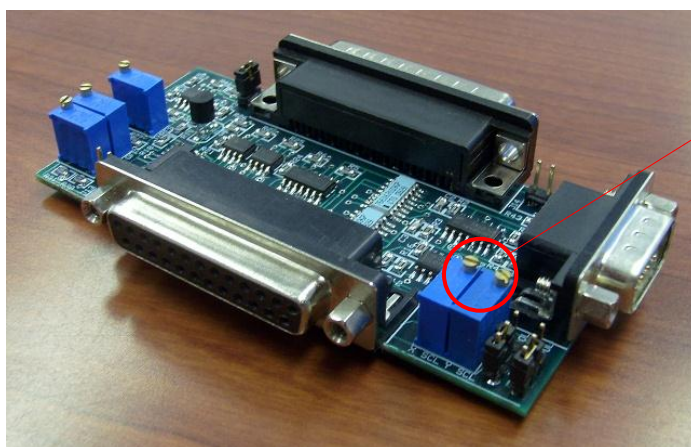
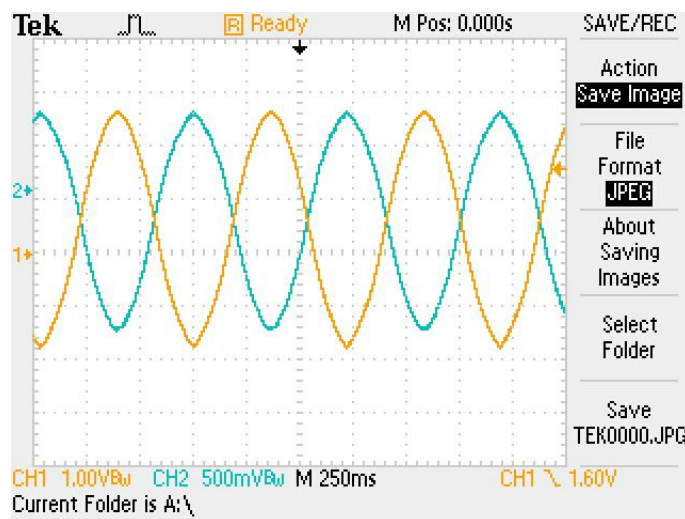
PSD Position

The functions should be completely out of phase. This can be corrected with the polarity jumper.



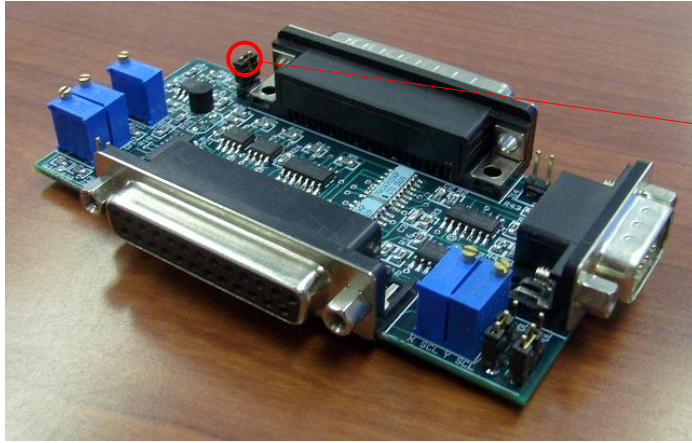
Move jumper to change polarity for X or Y axis.

Set scale factor so that the amplitudes of the FSM and detector functions are the same.



Adjust the scale of the X and Y axes with these

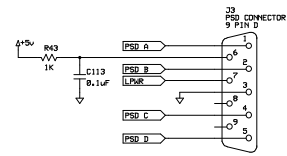
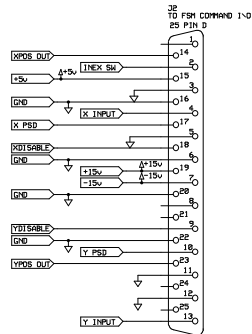
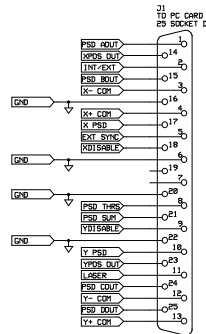
When all adjustments have been made for both axes (x and y axes), turn off the sine wave commands to the x and y position inputs and remove the disabling jumper that was inserted earlier. This will allow the FSM to switch its feedback from the internal detector to the external detector. This change can be verified by obstructing the beam between the mirror and the detector and noting a jiggling in the mirror.



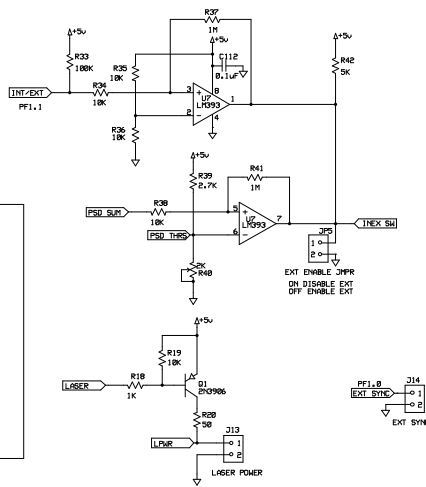
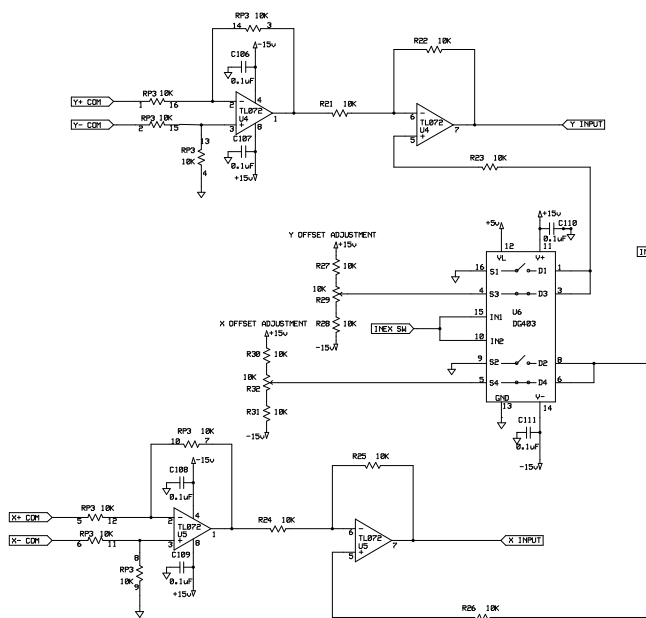
Remove this
jumper to enable
the external

Beam Stabilizer Add-on PCB



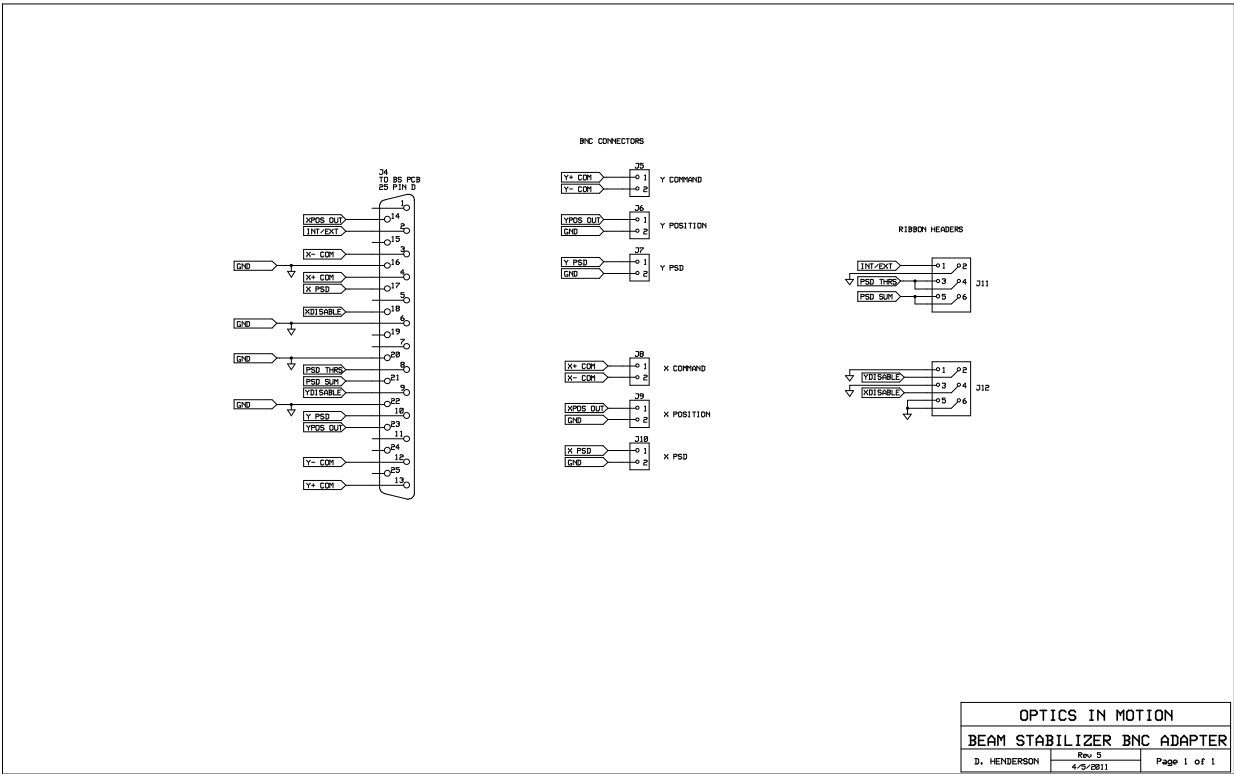
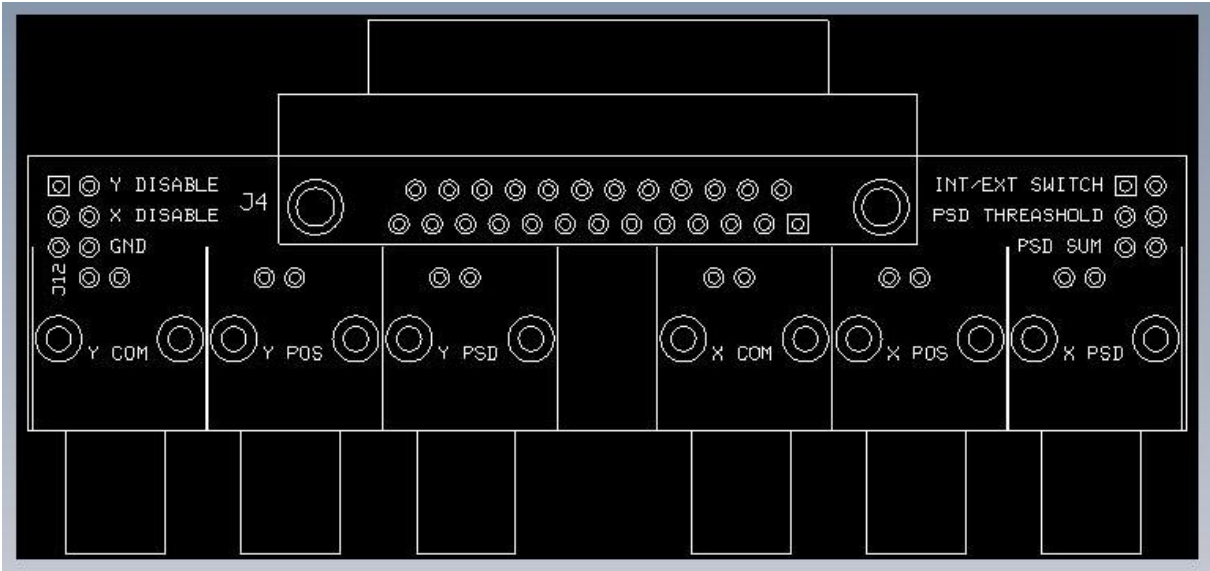


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BNC Adapter Board



Optional Cable, Beam Stabilizer PCB to NI 6221 (37 pin) multifunction card

