Application Note
TADII - Threshold Angle Detector Operation and Calibration Instructions

Operation

The *TADII* is a *Dual Axis Threshold Angle Detector*, which has adjustable threshold (trigger) and hysteresis (reset) angles, and a trigger delay time function. There are five open drain outputs (see Figure 2). The two outputs for the pitch axis (plus & minus) and for the roll axis (plus & minus) independently actuate when the threshold angle has been exceeded, by turning the transistor on. These outputs automatically reset (transistor off) when the unit is tilted back within the hysteresis angle (ref. Figure 1). The remaining open drain output is used to indicate when the unit is within all four set threshold limits, in both the pitch and roll axes. The delay function, which prevents false triggering due to shock or vibration, requires the threshold limit to be exceeded for a preset amount of time (customer specified), prior to triggering. By adjusting the delay time, and the range between the threshold and hysteresis angle settings, performance in dynamic environments can be optimized.

The threshold limits, hysteresis angles and the delay time are all factory set prior to shipment. A mating *calibration board** is available, which allows the user to perform field adjustments to the pitch and roll threshold limits, hysteresis angles, and the trigger delay time.

** Calibration board required for field adjustments!*

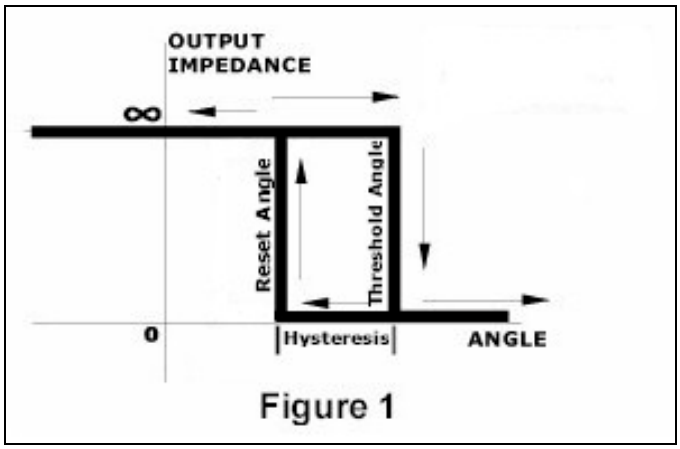

Figure 1

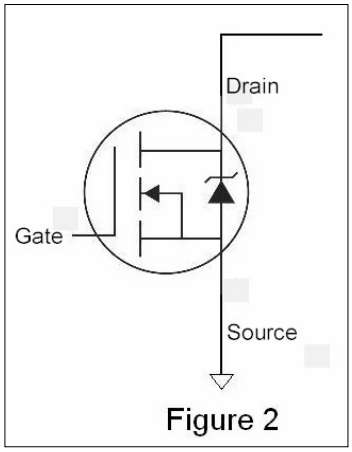

Figure 2

Note: trigger angle – hysteresis = reset angle.

Specifications

Electrical

Supply voltage……...+7.5VDC to +30VDC
Supply current…….. 10mA
Output voltage (max)……+30VDC (transistor off)
Output current ……..1A (max)
Max 'on' resistance..…… 0.4Ω
Operating temperature……-30°C to +70°C . .
Storage temperature……..… -55°C to +125°C

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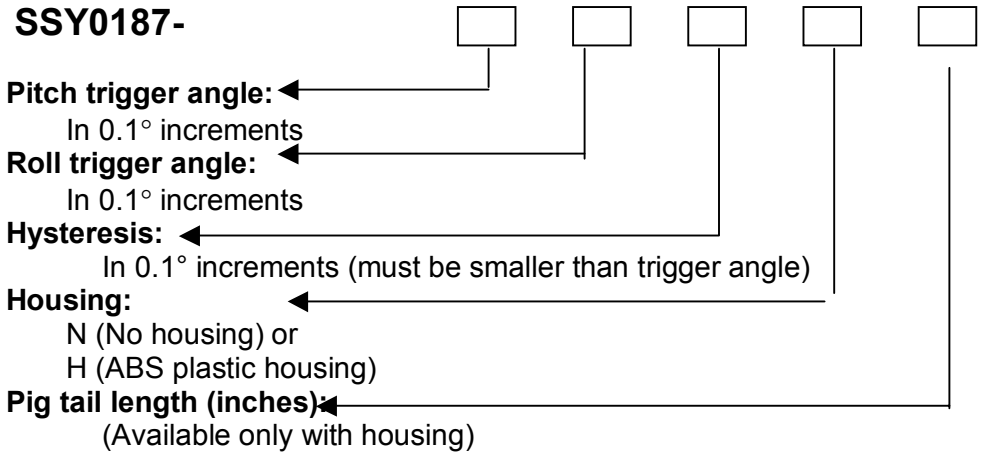
General

Threshold angle (adjustable) ……..……0.2° to 40° (sensor dependent.)
Resolution……..…..> 1% of threshold angle.
Hysteresis (adjustable) ……...1% to 100% of threshold angle.
Response time ……..…. sensor dependent.
Delay time (adjustable) ……..….0 to 10 sec.
Accuracy (setting)……0.1° or threshold angle ÷ 200, whichever is greater

Part Number Composition



Examples

(1) A unit with a 10 degree trigger angle for both pitch and roll, a 1 degree hysteresis angle, and enclosed in an ABS plastic housing with five inch pig tail leads would be ordered as part number *SSY0187-100-100-10-H-5*.

(2) A unit with a .3 degree trigger angle for pitch, a .5 degree trigger angle for roll, a 0.1 degree hysteresis angle and no housing, the designated part number would be *SSY0187-3-5-1-N*.

Electrical Connection Diagram

Pin #	Wire Color	Function
1	BLACK	GROUND
2	ORANGE	THRESHOLD LIMIT INDICATION (output)*
3	BROWN	PITCH POSITIVE (output)*
4	BLUE	PITCH NEGATIVE (output)*
5	YELLOW	ROLL POSITIVE (output)*
6	WHITE	ROLL NEGATIVE (output)*
7	GREEN	SUPPLY Vdc+
8	RED	SUPPLY Vdc+

**** Pin #'s 2 through 6 are the transistor outputs. Pin #'s 7 and 8 are Supply voltage inputs, and are shorted together.***

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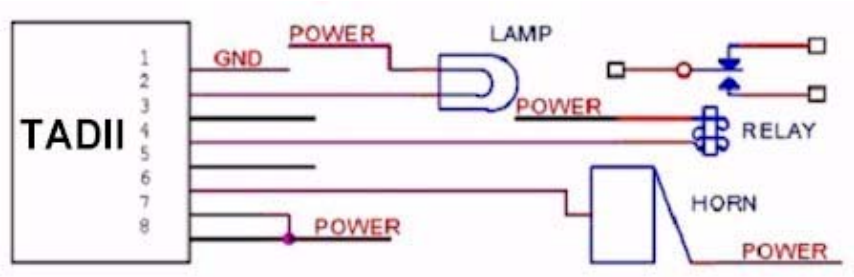
Electrical Connection Example

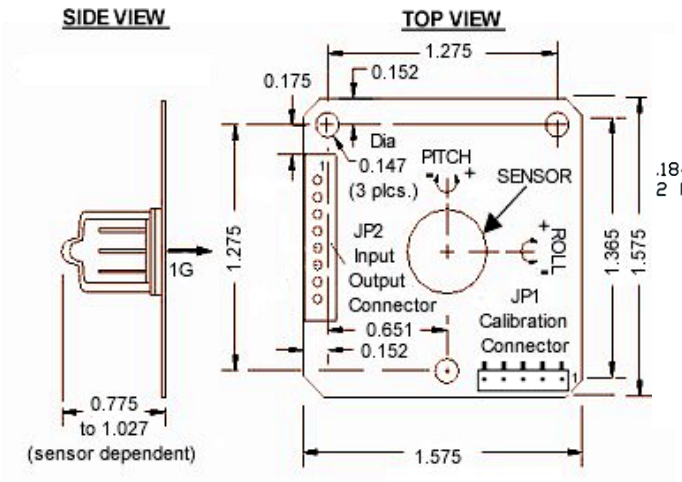


Calibration Instructions *(calibration board p/n SA40127 required, reference Technical Note #STN-219-XXXX)*

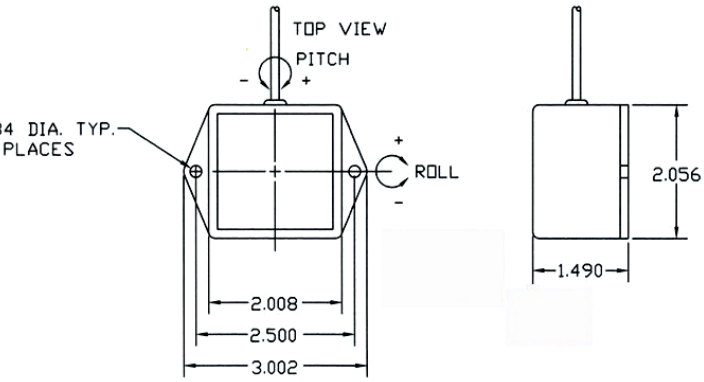
WARNING: ***Performing this calibration routine voids the factory calibration settings, and are non-retrievable!***

1. Attach the TADII to a rotating platform, ensuring that the board will be rotated about the ROLL Axis. ROLL+ should be a clockwise rotation and ROLL- should be a counter-clockwise rotation (see below). If calibrating an open architecture version, secure with three screws through the 0.147" mounting holes. If calibrating an ABS Plastic Housed version, secure with two screws through the 0.184" mounting holes.

Open Architecture Version



ABS Plastic Housing



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2. Level the platform.

3. Make sure that the CAL switch on the calibration board (p/n SA40127) is in the OFF position. Connect the harness from JP2 on the calibration board to the mating connector at JP2 on the TADII. Connect the harness from JP3 on the calibration board to the mating connector at JP1 on the TADII.

4. Connect the two wires exiting from the JP1 location on the calibration board to a DC power supply set between +10 to +25Vdc. Connect the red wire to the plus terminal, and the black wire to the common (ground) terminal of the power supply. Turn on power supply.

5. Turn the CAL switch (S10) to the ON position, and ensure that the green 'CAL ON' LED (DS6) is illuminated.

6. Set Delay Time *(*Note: Delay time must be set prior to threshold limit and hysteresis angle calibration!)*

    a. Connect a DC voltmeter between delay time test points, T1 & T2, on the calibration board. Each second of delay time is equal to +0.493Vdc. Multiply 0.493 by desired delay time in seconds (0-10 max) to ascertain correct voltage reading.
    b. Turn the delay pot (R17) until correct voltage is read between T1 and T2. Press DELAY switch (S9) on calibration board.

7. Set Roll Axis

    a. Tilt board in the ROLL+ (clockwise) direction to desired threshold angle.
    b. Push RT+ button (S5).
    c. Tilt board to desired ROLL+ hysteresis (reset) angle.
    d. Push RH+ button (S6).
    e. Tilt board in the ROLL- (counter-clockwise) direction to desired threshold angle.
    f. Push RT- button (S7).
    g. Tilt board to desired ROLL- hysteresis (reset) angle.
    h. Push RH- button (S8.)
    i. Tilt the TADII passed the ROLL+ and ROLL- threshold angles, and ensure that the corresponding LED's (DS2 and DS4) on the calibration board light up respectively.

8. Set Pitch Axis
    a. Rotate the TADII 90 degrees, so that it is being rotated about the Pitch Axis. PITCH+ should be a clockwise rotation and PITCH- should be a counter-clockwise rotation. Secure to platform.
    b. Tilt board in the PITCH+ (clockwise) direction to desired threshold angle.
    c. Push PT+ button (S4.)
    d. Tilt board to desired PITCH+ hysteresis (reset) angle.
    e. Push PH+ button (S3.)
    f. Tilt board in PITCH- (counter-clockwise) direction to desired threshold angle.
    g. Push PT- button (S2.)

h. Tilt board to desired PITCH- hysteresis (reset) angle.
i. Push PH- button (S1.)
j. Turn board past PITCH+ and PITCH- threshold angles and ensure that the corresponding LED's (DS5 and DS1) on the calibration board light up respectively.
k. Turn the CAL switch (S10) to the OFF position. Disconnect calibration board from the TADII.
l. Calibration is complete.

Output Status Matrix

The matrix below illustrates the operational status (ON or OFF) of the individual outputs, when calibrated to a threshold angle of +/-0.3 degrees in both the pitch and roll axes, with zero (0) degrees hysteresis.

Output (MOSFET)	Roll<-.3°	-.3°< Roll<.3°	Roll>.3°	Pitch<-.3°	-.3°<Pitch<.3°	Pitch>.3°
Pin 2	OFF	*(Note 1)*	OFF	OFF	*(Note 1)*	OFF
Pin 3	-	-	-	OFF	OFF	ON
Pin 4	-	-	-	ON	OFF	OFF
Pin 5	OFF	OFF	ON	-	-	-
Pin 6	ON	OFF	OFF	-	-	-

Note 1: If both the roll and pitch axes are within 0.3 degrees in the above example, the output is ON.

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