CTi

TILT – 05

Dual – Axis Inclinometer
Three – Axis Accelerometer

Features

- Measuring range two-dimensional: ±90°
- High accuracy: err. < 0.25°
- High resolution: 0.1° | 1 mg
- Three-axis accelerometer
- Low power consumption: <8 mA (@ 5 V)
- Full duplex UART communication, 3.3 V TTL
- Small size: 1"x 1" (25.4 x 25.4 mm)
- Low cost ($25 each for 1000 pcs)

Applications

- Platform control, alignment, and stabilization
- Solar panel tracking and control systems
- Tilt sensing and leveling
- Telescopic and scissor platform monitoring
- Motion/position measurement
- Navigation and GPS compensation
- Robotic position sensing
- Agricultural and industrial vehicle tilt monitoring

Accessories

GUI Software	WinCTi-Tilt®

Specifications

Power source	3.3 – 17 VDC
Measuring range	±90° (two-dimensional)
Resolution	0.1°	1 mg
Accuracy	0.2° (Typical), 0.4° (Maximum error in full range)
Zero offset error[1]	< ±0.1° (@20°C)[2], Maximum offset drift: ±0.011° /°C
Repeatability	< 0.1°
Accelerometer range	±2 g/±4 g selectable
Sensor Bandwidth	200 Hz
Baud rate	2.4kbps – 460.8kbps selectable, default: 115.2kbps
Data format	ASCII, port settings: 1 start bit, 8 data bits, 1 stop bit & no parity
Output data rate	1, 2, 5, 10, 20, 25, 40, 50 and 100 Hz selectable
LED indicators	Data transmission rate Flashing at current data rate
Power consumption (@ 5 V)	< 8 mA @ data rate <10Hz 15mA @ maximum data rate
GUI software	WinCTi-Tilt®
Serial interface	3.3V TTL UART
Temperature sensor resolution	1°C
Operating Temperature	-40°C to +85°C (-40°F to +185°F)

Part Number [3]

TILT – XX X – X – XX

Design Model
A1 (Obsolete)
<u>*B1*</u>

Interface
3   RS232
4   RS422
8   RS485
A   Analog
<u>*U   UART*</u>
W   Wireless

Housing Material
A   Anodized Aluminum
P   ABS Plastic
S   Stainless Steel 316L
<u>*O   OEM (No Housing)*</u>

Family Series
<u>*05   Small Size Series (1"x1")*</u>
10   Multi Interface Series
15   Analog Series
20   Economical Series
3x   Static Inclinometer Series
5x   Dynamic Inclinometer Series
70   Harsh Environment Series

[1] Zero g offset can be easily corrected and saved by user.
[2] Units can be calibrated between -40°C and 85°C on request.

[3] Available options for this model are <u>underlined</u>

TILT − 05

WinCTi-Tilt Software

WinCTi-Tilt is a graphical user interface (GUI) software provided by CTi Sensors for visualization aide, device configuration, and data logging. WinCTi-Tilt is designed to be user-friendly and intuitive to users. The package can be downloaded from the CTi Sensors website.
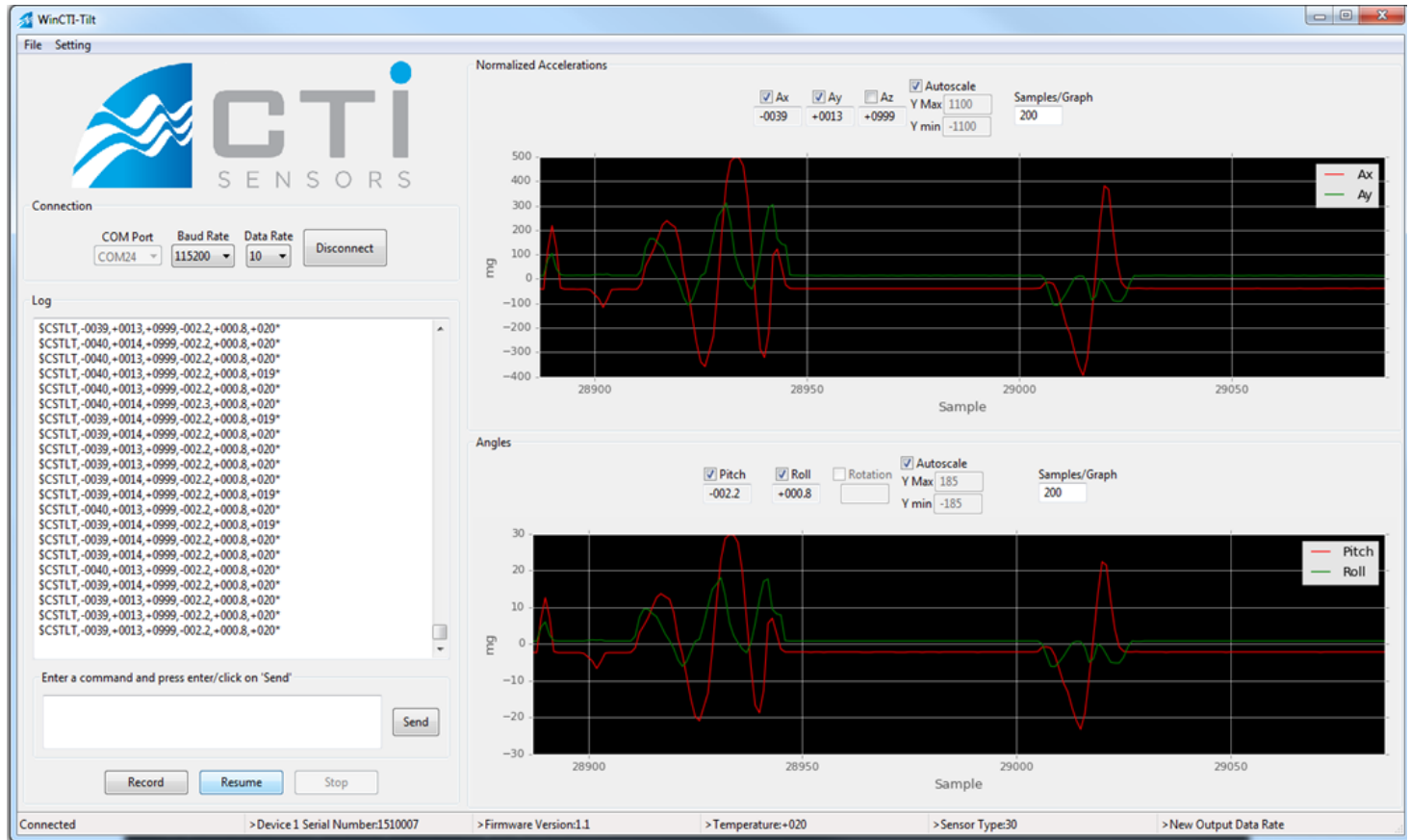
Serial Interface and Data Format

TILT − 05 uses the following ASCII format, very similar to the widely used NMEA 0183 protocol, for data output:

- Default message: $CSTLT,$A_{XN}$,$A_{YN}$,$A_{ZN}$,$\alpha_X$,$\alpha_Y$,T*CC<CR><LF>
- Optional message: $CSACC,$A_X$,$A_Y$,$A_Z$*CC<CR><LF>

Which:

    A_{XN},A_{YN},A_{ZN}: Normalized X, Y and Z accelerations in mg

    A_X,A_Y,A_Z: True X, Y and Z accelerations in mg

    α_X, α_Y: Pitch and Roll angles in degrees, horizontal installation

    T: Internal temperature in degrees centigrade

    CC: Checksum (Two ASCII characters)

    <CR> <LF>: Carriage return, and line feed characters

Example:

- $CSTLT,−0153,−0221,+0963,−008.7,−012.7,+020*6F<CR><LF>
- $CSACC,−0156.4,−0226.3,+0981.2*49<CR><LF>

8-bit Checksum

Checksum is calculated by XORing all characters between $ and * (not including the $ and the * characters) based on the NMEA standard. It results in two hexadecimal characters which are sent in ASCII format.

TILT – 05

Configuration Commands

TILT – 05 uses a simple command format which allows user to change the device configuration and request specific information or data. All commands start with a '[' character, and end with a carriage return character. All responses end with a carriage return and newline character. Table I shows the list of the interface commands for TILT – 05. Letter 'n' after '['character is the unit number which is set to n=1 by default, and can be set by user to any number from 1 to 9.
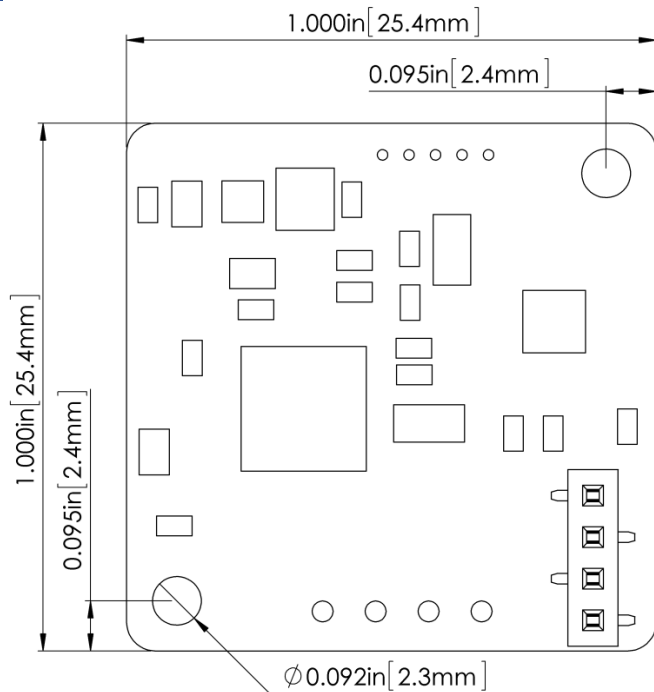
Table I. Interface commands for TILT – 05

Command	Description	Response	Description
[n<cr>	Ping unit number n	>!n<cr><lf>	Acknowledge ping
[N?<cr>	Request unit number	>Unit Number: n	Returns unit number, default: n=1
[n#m<cr>	Change unit number n to (non-zero) unit number m, 1≤ m ≤ 9	>New Unit Number: m	n=old unit number, m=new unit number, default: n=1
[n#FW<cr>	Save unit number into flash memory	>Current Unit Number, n, was written into flash memory as the default Unit Number for this device!	Unit number will be changed permanently, and current unit number will be saved into the flash memory as the default unit number.
[nV<cr>	Firmware Version	>Firmware Version:d.d	Returns firmware version
[nS<cr>	Serial Number	>Device n Serial Number:ddddddd	Returns 7-digit serial number
[nBxxx<cr>	Baud rate setting: xxx= 2:2400, 4:4800, 9:9600, 19:19200, 38:38400, 57:57600, 115:115200, 230:230400, 460:460800 (bps)	>Change to new Baud Rate:dddddd	Selected baud rate should support current data rate. Otherwise, baud rate will not be changed.
[nBFW<cr>	Save baud rate into flash memory	>Current Baud Rate, dddddd, was written into flash memory as the default Baud Rate!	Baud rate will be changed permanently, and current baud rate will be saved into the flash memory.
[nDxxx<cr>	Data rate setting: xxx= 1, 2, 5, 10, 20, 25, 40, 50, and 100 Hz	>New Output Data Rate: xxx	Default data rate is 2 Hz. New data rate will be saved into the flash memory.
[nARx<cr>	Selecting accelerometer measurement range: x=2, 4, 8	> New Accelerometer Range is: +/- xg	New accelerometer range will be saved into the flash memory (Default range is ±2 g).
[nZA<cr>	Zero g offset correction for X and Y axes	>Accelerometer Zero Offset Adjusted: X Offset: ddd, Y Offset: ddd	Resolution of the offset registers is 2 mg, with an effective offset adjustment range of -256 mg to +254 mg for each axis.
[nMxy<cr>	Output messages ON/OFF x = I: Inclinometer data A: Accelerometer data Y = S: single message C: Continuous message X: Message Off	Data message will be sent out once, continuously or will be turned off	Example for inclinometer data: *[1MIS*: Sends out one data message *[1MIC*: Continuously sends out data message *[1MIX*: Stops sending out data message

Continued…

Command	Description	Response	Description
`[nMxCFW<cr>`	Save output message ON/OFF status into flash memory x = I: Inclinometer data A: Accelerometer data	`>Current ON/OFF message status was written into flash memory as the default status!`	Current message ON/OFF status will be saved into flash memory. Example: `[1MICFW`
`[nRFD<cr>`	Reset to factory default (Firmware version 1.62 and higher)	`> Reset to factory default!`	Resets the selectable parameters (except baud rate) to their default values.

Dimensional Drawing

1.000in [25.4mm]
0.095in [2.4mm]
1.000in [25.4mm]
0.095in [2.4mm]
⌀0.092in [2.3mm]

Warranty

This product has 18 months limited warranty:

CTI SENSOR, INC. "CTI" warrants its products against defects in material and workmanship for a period of 18 months from the date of the shipment to the customer provided the products have been stored, handled, installed and used under proper conditions. CTI's liability under this limited warranty shall extend only to repair or replace the defective product, at CTI's option. This warranty does not cover misuse or careless handling and it is void if the product has been altered or repaired by personnel not authorized by CTI. CTI disclaims all liability for any affirmation, promise, or consequential damages caused by the product. No warranties, expressed or implied, are created with respect to CTI's products except those expressly contained herein. The customer acknowledges the disclaimers and limitation contained herein, and relies on no other warranties or affirmations.

For more information please refer to the following link:

www.CTiSensors.com/warranty

Note

This unit comes with special pricing for researchers and students.

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