

IMU6410 V0.97 Data Logger Release Notes and SDANT10, ZB1 Introduction

March 12, 2012

New Features (beta)

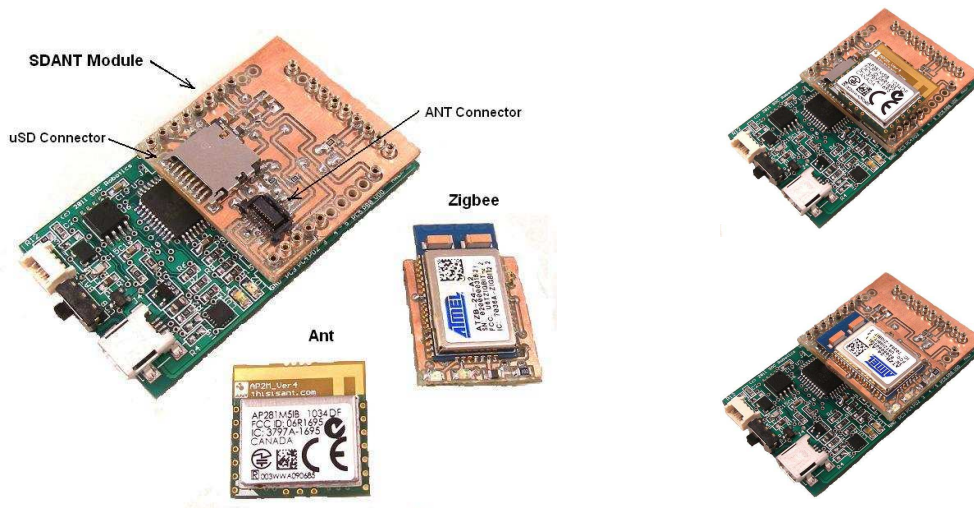
The following new features have been added:

- microSD FAT16/FAT32 support for SDANT daughter card
- interrupt driven UART1 support with putchar1, getchar1, puts1, etc.
- support for ANT wireless modules with SDANT10 daughter card
- support for new SOC ZB1 Zigbee wireless module for SDANT10 daughter card
- extensive logging features added to support microSD
 - o start logging at future time
 - o terminate logging after time period exceeded, button press or keyboard halt
 - o start logging if threshold is exceeded on any sensor axis
 - o stores data as printable ASCII time stamped
 - o user define file name or system automatically creates file name
 - o start logging on power up
 - o automatic file name incrementing so new file is created on each power up
 - o auto restart of logging with defined restart time
 - o can combine delayed start with thresholding - thresholding only starts after a delayed start time
- new clock with year, month, day, hour, minute, seconds and mseconds
- smaller (4K) bootloader supported to provide more code space
- on board serial flash can be configured to log subset of MEMs sensor data
- complementary AHRS filter implemented
- real time clock error fixed

Complete source code is available for download from the download page at www.soc-robotics.com. See the section at the end of this note for a more detailed description of logging modes.

SDANT10 Adapter

The SDANT10 module is a daughter card that attaches to the IMU6410. The card has a microSD push-push connector and ANT wireless connector. The ANT wireless connector (Molex) accepts ANT wireless modules communicating with the Atmega1284Ps second uart (UART1) using a 57,600 baud serial link. The ANT connector also accepts our new ZB1 Zigbee wireless module communicating at 38,400 baud. Both wireless modules are interchangeable.



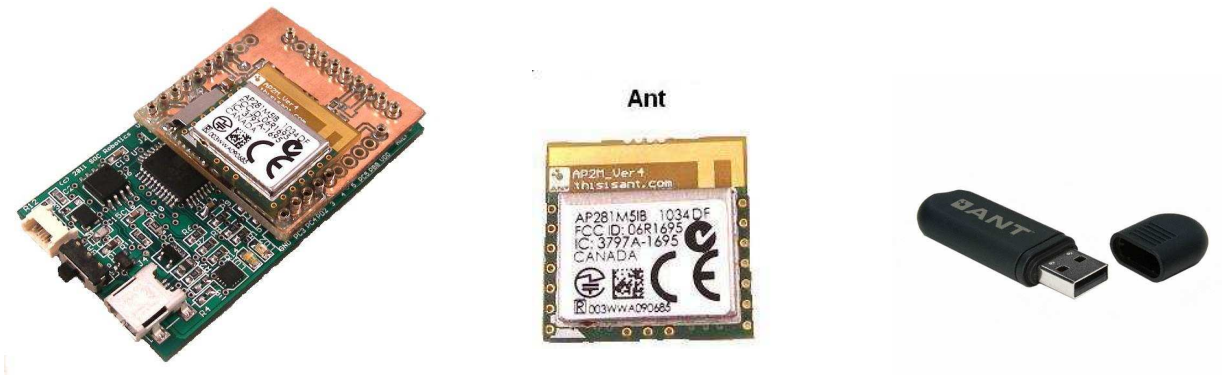
ZB1 Module

The ZB1 module is a new SOC Robotics Zigbee compatible adapter with an Atmel ZigBit ATZB-24-2A Zigbee module attached to it. The Molex connector on the bottom ZB1 is compatible with the ANT wireless base connector on the SDANT10. The ZigBit comes preloaded with SerialNet and is ready to join a Zigbee network as a slave device. Software on the IMU6410 configures the Zigbee node for correct network operation. SerialNet supports an extensive AT command set.



ANT Modules

ANT modules are available from several distributors and is a standard, off the shelf, component. Compatible ANT modules are the ANTAP281M5IB and ANTC782M5IB. ANT wireless devices support high speed over air operation with small packet data rates reaching 200Hz.



USB10Z

The USB10Z is a USB Zigbee communications device that attaches to a PC and is available directly from SOC Robotics, Inc.

Availability

The SDANT and ZB1 will be available in late March 2012. The USB10Z is available now.

Next Version 0.98 Features

The next release of the IMU6410 Data Logger will provide extensive support for both ANT wireless and ZigBee wireless operation. The V0.98 release will come with a new desktop application for real time data logging, data retrieval and control. V0.98 is scheduled for late April release to coincide with the introduction of the SDANT and ZB1.

IMU6410 Data Logger Overview V0.97

With the introduction of microSD data logging a more sophisticated set of logging functions were needed to handle a variety of logging applications.

The IMU6410 Data Logger manages the acquisition and storage of 10 DOF MEMs sensor data to either the on board 1Mx8 (or 8Mx8) serial flash or attached microSD storage device using the SDANT10 adapter.

The microSD subsystem supports both a FAT16 and FAT32 file system automatically. Files are stored by a user specified unique name or automatically using a default incremental naming convention starting with the three letter IMU followed by a file number - IMU00001.txt. The incremental naming system automatically creates the next name in sequence as below:

IMU00001.txt
IMU00002.txt

.

IMU0nnnn.txt

Logging configuration settings are selected using the “l” command at the top level command menu. As logging mode selections are entered they are automatically stored in EEPROM. The data logger checks if a microSD is installed in the SDANT10 adapter. By default data from all four MEMs sensors is logged to microSD.

Several logging trigger conditions activate logging such as delayed start, keyboard start, threshold start or switch start. Delayed start allows logging to start at some time in the future. This allows the IMU6410 can be placed in a specific location, such as an instrument carriage, without, so the effects of sensor placement is not logged. Keyboard start is for immediate data logging start. Just enter the start logging command or the 9t, 10t commands. Threshold start depends on certain sensor values exceeding defined thresholds as a percentage plus or minus of full range at the current value. Switch start allows the press of a button to start and stop logging. The start of logging is indicated by a fast blinking Green LED.

There are also several logging stop modes. Halt logging is a keyboard command that immediately stops logging and closes the logging file. Timeout stop terminates logging after a specific time delay in seconds. Switch stop uses a switch to stop logging. Note that if switch stop and timeout are both selected then which one occurs first stops logging.

Delayed start and thresholding can be combined to allow time to place IMU6410 in position so that logging doesn't start prematurely. For example, say it takes 30 seconds to place the IMU6410 into a test jig after which movement on any axis exceeding a specific threshold is the trigger to start logging. This allows the IMU6410 to capture significant events defined by the user.

Thresholding start can be set on an individual sensor and sensor axis basis. So, for example, if the x axis acceleration exceeds +1G and the magnetometer axis falls below a specific value logging starts while all other sensors are ignored.

Automatic power up logging is also supported. This allows power cycling to start a logging event. This mode simplifies field-logging applications. By combining power on logging with

delayed start, thresholding, timeout termination and incremental file naming it becomes possible to prepare an IMU6410 for field logging by simply cycling the power on and off.

Auto restart is a mode that closes files after a specific time period in seconds and then opens a new file to continue logging in combination with the file name increment function. The file system requires that a file be closed to save it. If power is lost and all the data is in a single file then that file is lost. By opening and closing smaller files data loss due to power failure is significantly reduced. Up to 32,000 files can be created.

Logging command summary:

- ? - Logging parameters summary
- p - Powerup log start mode
- a - Arm/disarm switch PB0
- t - Terminate mode (b,t,h)
- w - Start logging at future time
- j - Threshold mode setup
- y - Log restart mode setup
- u - Store data in uSD or Serial Flash
- x - Enter sensor range
- s - Start data logging
- h - Halt data logging
- i - Enter Sensor ID1 or ID2 name
- e - Erase chip
- d - Select sensor(s) to log (a-accelerometer,g-gyro,m-mag,b-barometer)
- r - Retrieve data
- l - Log rate (msec)
- f - Output format (raw,processed,minmax)
- c - Display command summary
- q - Quit data logging mode

Example of a logging event setup:

Enter the “u” command to select logging to the microSD and select incremental logging – this resets the file number to 1.

Enter the “t” command to set terminate mode to time out and enter a time out period in seconds. If 60 seconds is entered then after 60 seconds logging will stop and the file closed (saved).

Enter the “y” command to enable automatic restart and enter the number of restarts. If 20 restarts are selected and a time out period of 60 seconds is selected this will result in 20 files starting with the name IMU00001.txt and ending in IMU00020.txt to be created.

Enter the “w” command to set a future logging start time. If this time is set to 45 seconds then you have 45 seconds from power up to place the unit in position before logging to the microSD starts.

Enter the “p” command to enable automatically start logging on power up. Each time the IMU6410 is powered on it will start logging based on the other entered parameters rather than waiting for a keyboard “10t” or “9t” command.

Note that each time the unit is powered up a new file start number is used. So if 20 files are logged during the first power up then the next power up will start the file number at 21. If the u command is used again then the file numbering starts at 1 again.

Automatic restart is also designed to recover from power failures. If 20 restarts are selected and power is lost at file cycle 14 only file 14 is lost. On the next power up file 15 is stored and so on.

Thresholding is also supported as a start condition. By combining delayed start with thresholding it is possible to both place the unit in position and start logging based on a MEMs sensor event. Thresholding is based on a percentage sensor value change from the current resting state rather than an value entered as an absolute number. This allows the unit to be placed in variety of different configurations with a change in orientation or translation triggering a logging start condition.