RD4247MAG3110 6DOF Evaluation Kit Data Streaming Procedure

Jacques Trichet

18 Dec 2014

Introduction

- This Document details how to set-up Freescale 6DOF demokit (MAG3110 magnetometer and MMA8451 Accelerometer) in order to achieve raw data streaming
- We will use a simple Serial Terminal Software to communicate with the “Bridge“ MCU through the USB serial port. This “bridge” (located on the RD4247MAG3110 kit intermediate Board) is a MC9S08QE08 device that realizes the USB (actually SCI) to I2C conversion and handles dumb sensors management (initialization and data collection)
- Described procedure will allow user to control Freescale 6DOF and collect raw data without Sensor Toolbox PC software Environment

Software and Hardware used

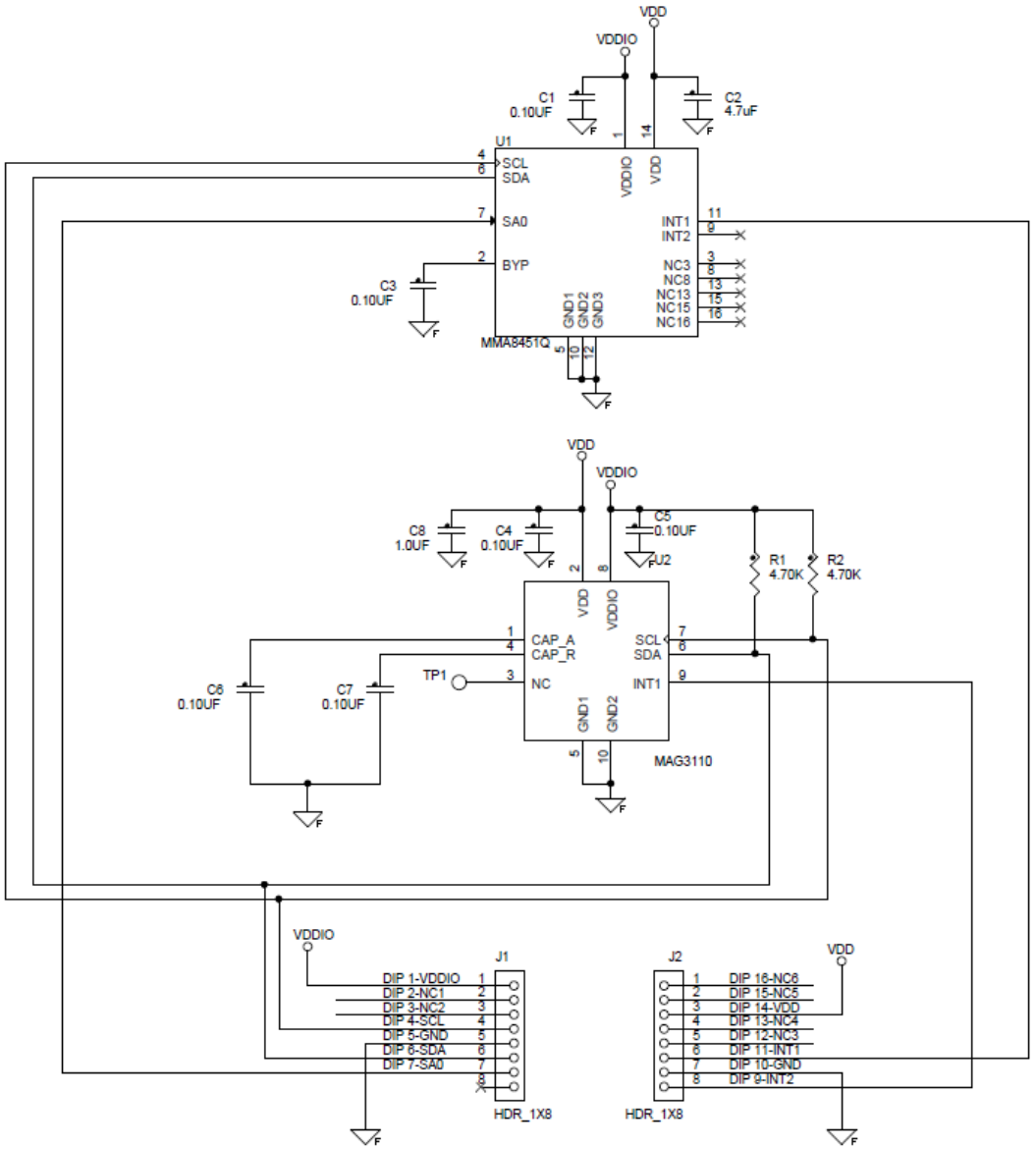
- ***RealTerm***

  For demonstration purpose, we will use RealTerm free Serial Terminal Software available at http://realterm.sourceforge.net/index.html#downloads_Download. Note that most Terminal Programs (such as Microsoft Window HyperTerminal) can be used as well. RealTerm has the advantage of being user friendly and powerful, combining numerous possibilities (such as hexadecimal display format) through a handy user interface.

- ***RD4247MAG3110 EVK***

  The 6DOF DUT is the complete development kit RD4247MAG3110 that includes both the LFSTBEB3110 and the LFSTBUSB boards. This hardware (see picture) can be ordered directly at http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=LFSTBEB3110&tab=Buy_Parametric_Tab&fromSearch=false

LFSTBEB3110 DIP16 Board Schematic



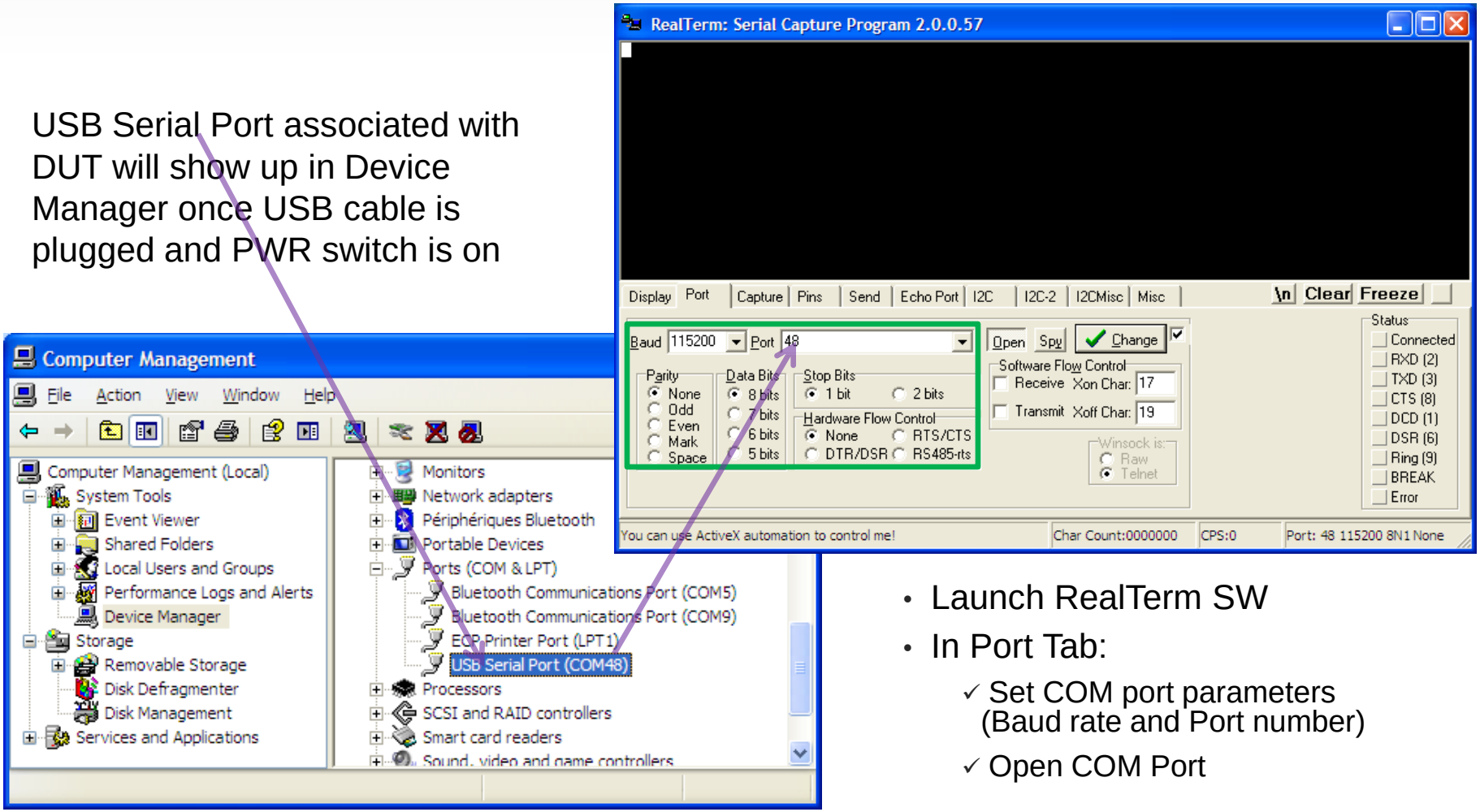
NOTES:

VDDIO = VDD = 2.5 VDC
I2C Pull Up Resistors are off board

Default/standard I2C address:
- 0x0E for MAG3110
- 0x1C for MMA8451Q (SA0=0)

Configure and Open Serial Com Port

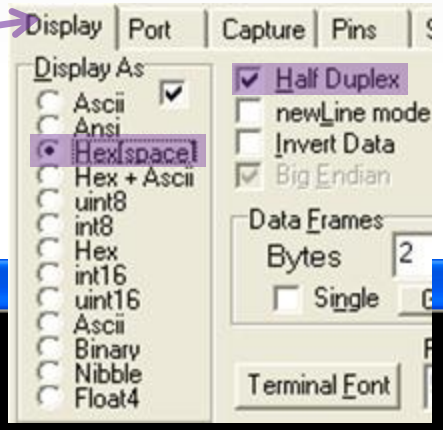
USB Serial Port associated with DUT will show up in Device Manager once USB cable is plugged and PWR switch is on



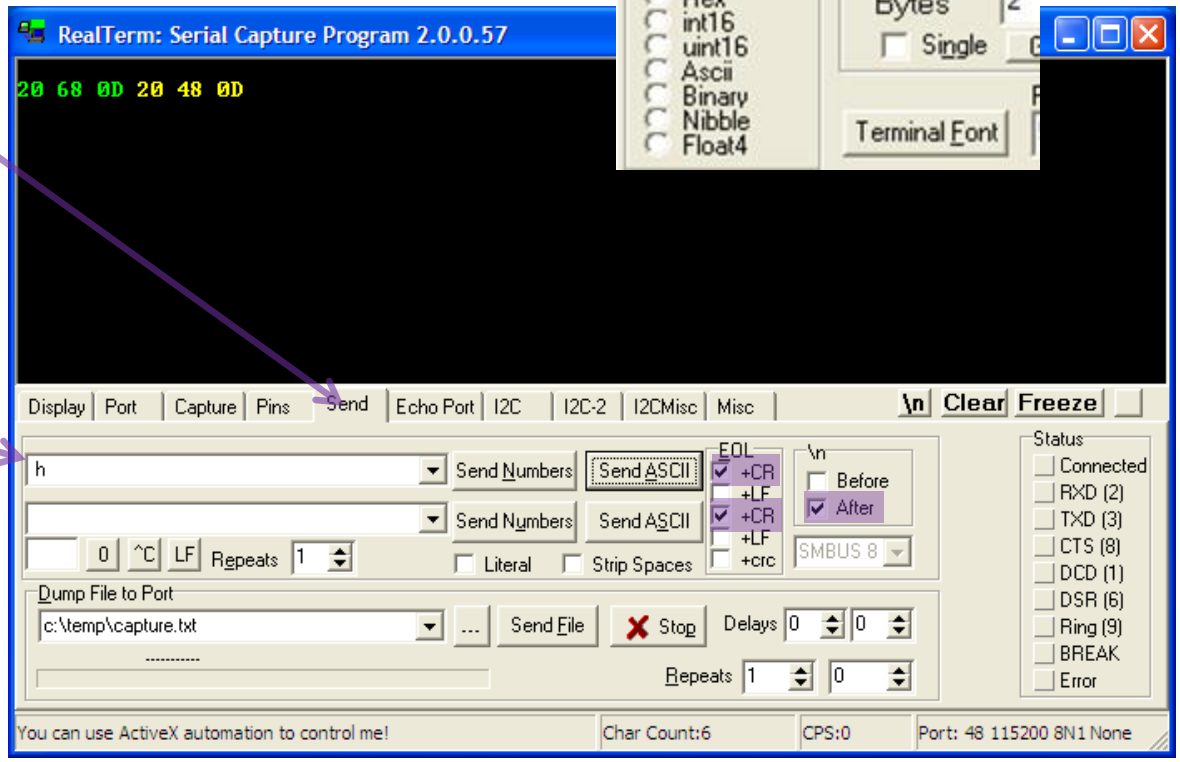
- Launch RealTerm SW
- In Port Tab:
  - ✓ Set COM port parameters (Baud rate and Port number)
  - ✓ Open COM Port

Check Serial Port Communication (Handshake)

- Suggested RealTerm Display tab settings:
  - tick Half Duplex to show outgoing characters in green
  - Display As Hex[space] to see characters hexadecimal code



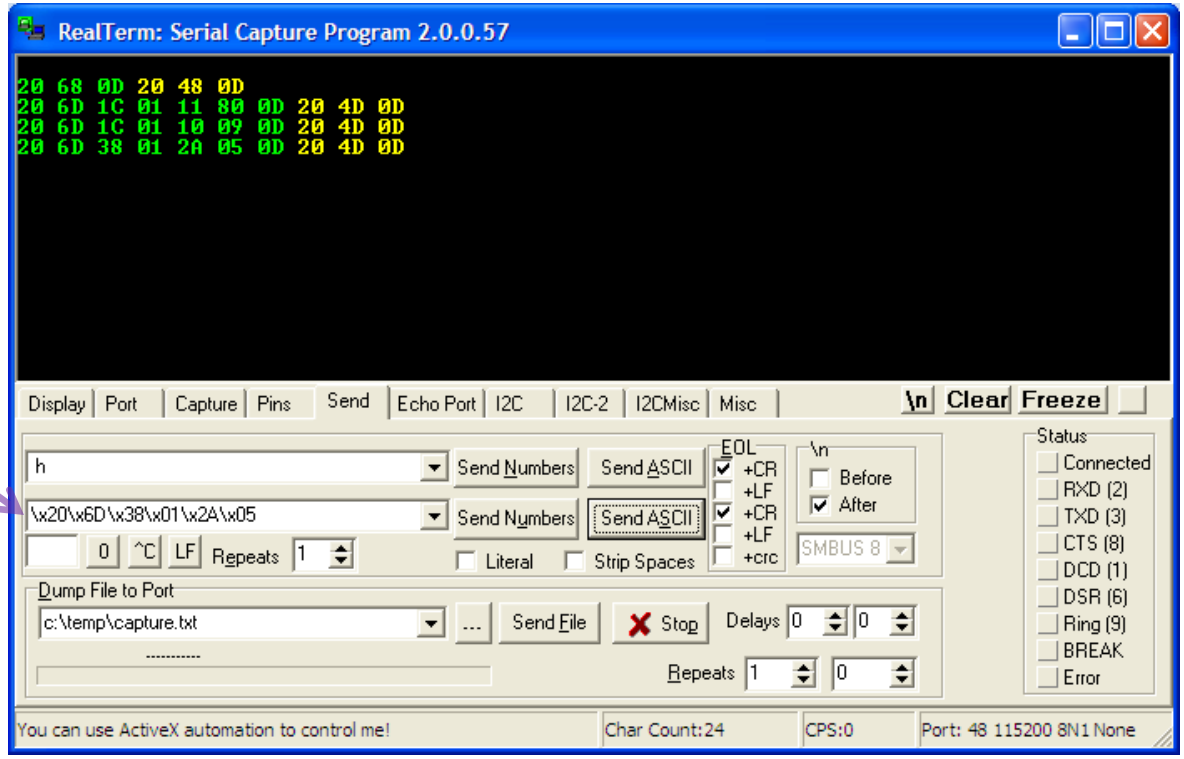
- In RealTerm Send tab:
  - tick EOL +CR to automatically add a carriage return to sent data
  - tick \n After to automatically change to a new line
  - **type “<space>h” in field**
  - Hit **Send ASCII** button
- The DUT will echo “<space>H<CR>” as confirmed by the yellow codes “20 48 0D”



DUT Initialization

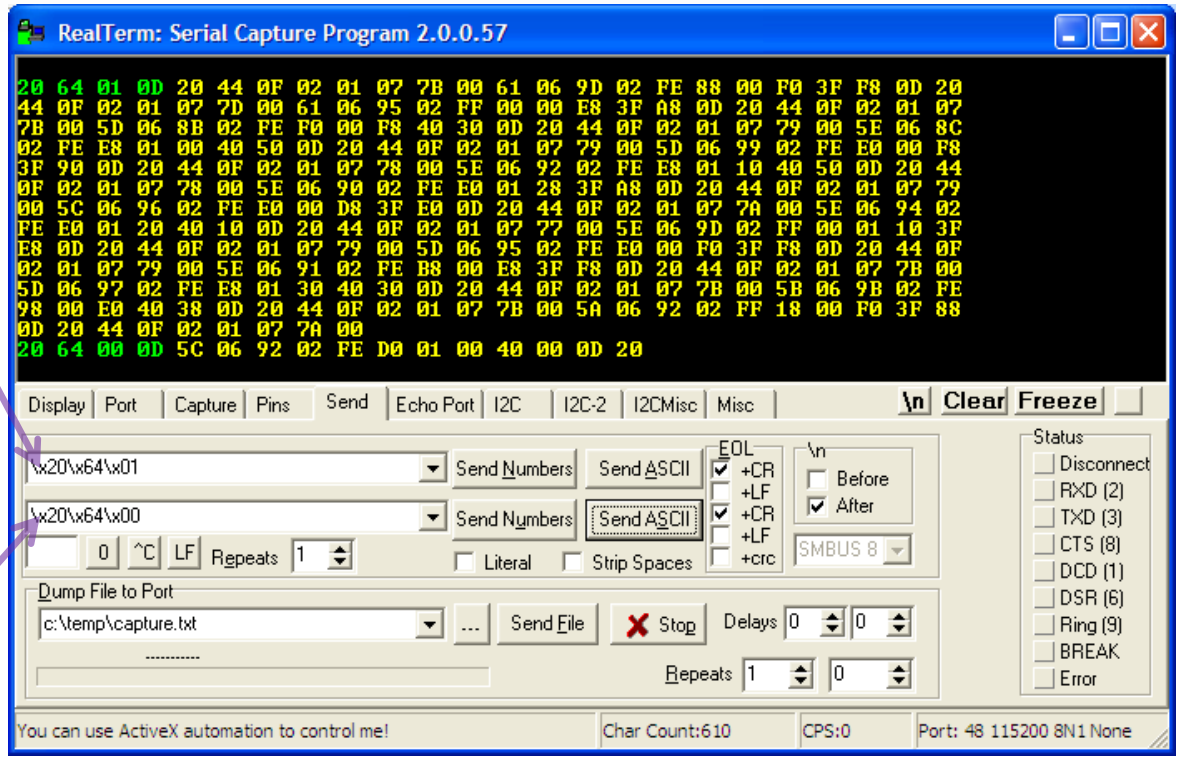
- A specific Initialization Sequence must be sent to the DUT after power-up:
  - This commands/answers sequence is reflected as the last 3 lines of RealTerm log window below

- Use backslash with Hexadecimal code “\xHH” to send any value. The string associated to 3rd command is shown here
- DUT will acknowledge each command by issuing “<space>M<CR>” answer i.e. “20 4D 0D”



Data Streaming Start/Stop commands

- Start data Streaming
  - This command will trigger the transfer of raw measured data as19 bytes data packets transmitted continuously at about 40Hz rate
- Stop data Streaming
  - Streaming will stop after ongoing packet transfer is complete

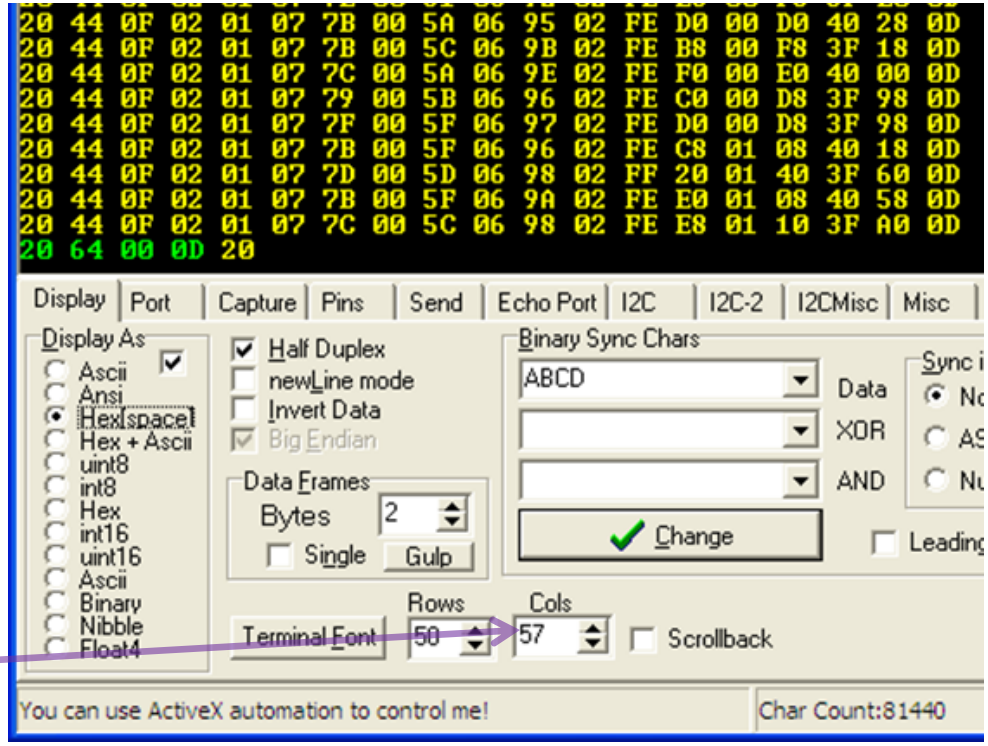


6DOF Data Packet Format

20 44 0F 02 01 05 44 02 9E FF C6 02 FE E8 00 C8 3F 10 0D

Header - 1st sensor X,Y,Z data - 2nd sensor X,Y,Z data - <CR>

- MAG3110 is 1st sensor, MMA8451 is 2nd one
- the 2 sensors X,Y,Z data are coded as 2's complement 16bits signed integers (left justified if sensor resolution is less than 16 bits)
- last char of data packet (i.e. <CR>) shall not be used as sync byte as it could also be found in sensors data fields. Header is more appropriate as sync pattern. Anyway as packet size and format is invariant, a sync pattern is even not necessary
- Trick: In RealTerm Display tab, select 57 as Columns number to align data packets



Exemple of Communication Sequence for Data Streaming

Step #	Command	Answer	Purpose
1	20 68 0D	20 48 0D	Handshake (**optional, to verify if communication is ok**)
2	20 69 0D	20 49 60 51 10 01 40 02 FF FF 0D	Get Bridge Rev Info (**optional**)
3	20 6C **1C** 01 07 0D	20 4C 01 07 **C4** 0D	MMA3110 I2C Addr.= x**1C** (7-bits Addr.= x0E). **Optional:** Read Who_Am_I Register 0x07, Answer = 0x**C4** is correct
4	20 6D **1C** 01 11 80 0D	20 4D 0D	Write in Ctrl_Reg2 to enable Auto_Mrst
5	20 6D 1C 01 10 09 0D	20 4D 0D	Write in Ctrl_Reg1 to set mode to active with Output data rate to 40Hz
6	20 6D **38** 01 2A 05 0D	20 4D 0D	MMA8451Q I2C Addr.= x**38** (7-bits Addr.= x1C). Set device in active mode with Reduced Noise Mode
7	20 64 01 0D	20 44 0F 02 01 FC 70 FE 0E 04 85 02 0D 44 E6 1C 32 F0 0D 20 44 0F 02 01 FC 70 FE 0E 04 85 02 0D 44 E6 1C 32 30 0D	Start data streaming
8	20 64 00 0D	No specific answer	Stop data streaming

Conclusion

- Freescale 6DOF demokit (RD4247MAG3110) can easily be configured by sending a few commands via a serial terminal Software
- Once Data streaming is triggered, DUT continuously provides 6DOF data packets to the Host PC through the COM port at about 40Hz rate. Extraction of the 6 measurement values out of a data packet is quite straightforward
- Instructions provided in the document can be applied to more sophisticated programs that are able to use a serial port object such as Matlab script or Microsoft Visual Studio project. This enables automatic collection of the 6DOF raw measurement as well as real time data processing and plotting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