4.2.9 USB stick schematics

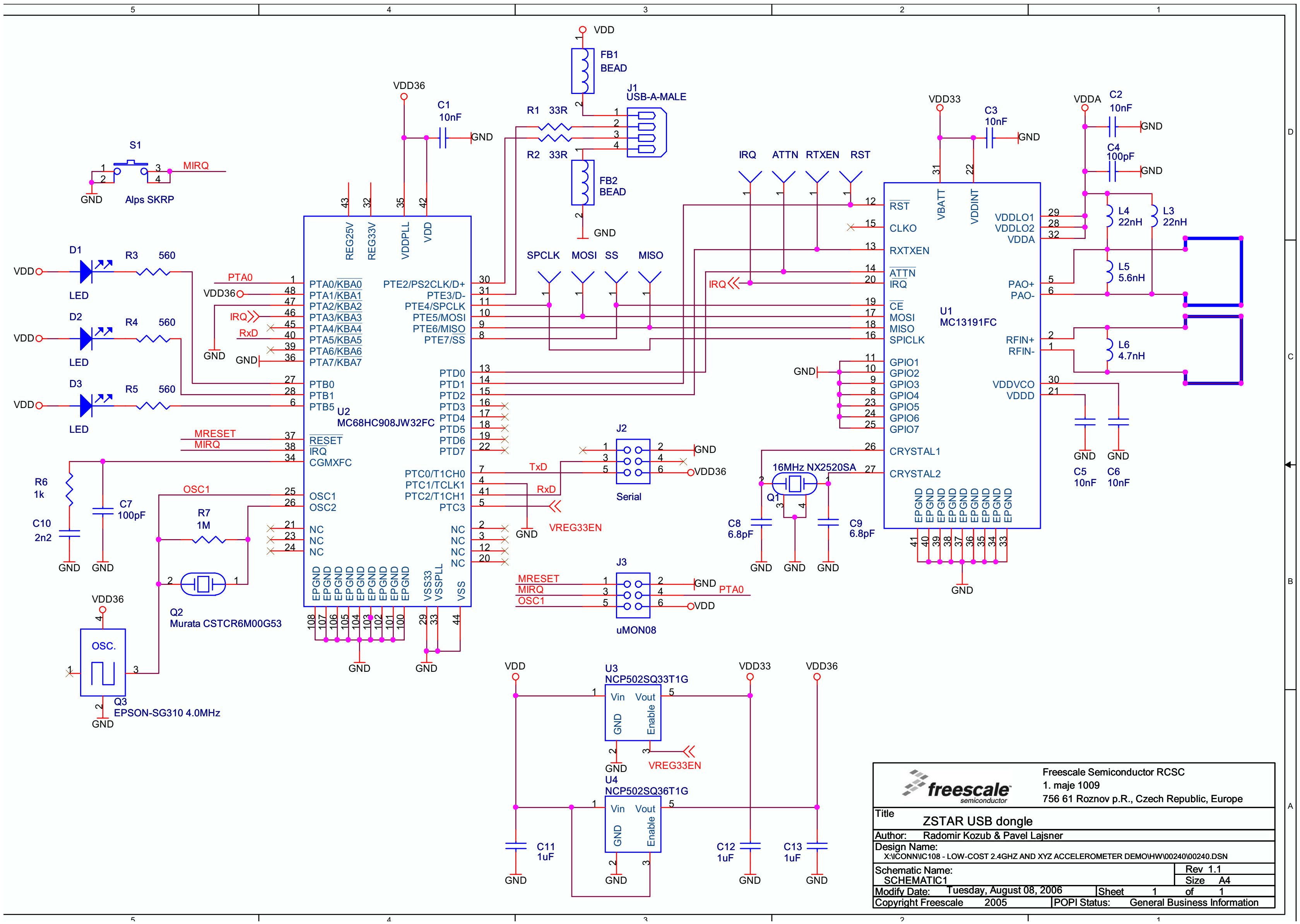


Figure 4-4USB stick schematics

4.3 Bill of Materials

Table 4-1USB stick bIll of materials

Item	Quantity	Reference	Part	Manufacturer	Manufacturer order code
1	5	C1,C2,C3,C5,C6	10nF	TDK	C1608CH1E103J
2	2	C4,C7	100pF	TDK	C1608CH1H101J
3	2	C8,C9	6.8pF	TDK	C1608CH1H070D
4	1	C10	2n2	TDK	C1608CH1H222J
5	3	C11,C12,C13	1uF	TDK	C1608JB1C105K
6	3	D1,D2,D3	Kingbright KP-1608SEC	Kingbright	KP-1608SEC
7	2	FB1,FB2	Ferrite bead	TDK	GLF1608T100M
8	1	J1	USB-A-MALE	Molex	48037-1000
9	1	J2	Serial	N/A	
10	2	L3,L4	22nH	TDK	MLG1608B22NJT
11	1	L6	4.7nH	TDK	MLG1608B4N7ST
12	1	L5	5.6nH	TDK	MLG1608B5N6DT
13	1	Q1	16MHz NX2520SA	NDK	NX2520SA 16MHz EXS00A-02940 Specification n° EXS10B-07228
14	1	Q2	Murata CSTCR6M00G15	Murata	CSTCR6M00G15
15	2	R1,R2	33R	resistor 0603 package	
16	3	R3,R4,R5	560R	resistor 0603 package	
17	1	R6	1k	resistor 0603 package	
18	1	R7	1M	resistor 0603 package	
19	1	U1	MC13191FC	Freescale	MC13191FC
20	1	U2	MCHC908JW32FC	Freescale	MCHC908JW32FC
21	1	U3	NCP502SQ33T1G	ON Semi	NCP502SQ33T1G
22	1	U4	NCP502SQ36T1G	ON Semi	NCP502SQ36T1G
23	1	S1	switch SKRP	Alps	SKRPADE010 (or SKRPACE010 or SKRPABE010)

Chapter 5 Software Design

5.1 Introduction

This section describes the design of the ZSTAR software blocks. The software description comprises these topics:

- SMAC (Simple Media Access Controller) modifications description
- 'Air' ZSTAR RF protocol protocol description
- Serial STAR protocol and ZSTAR extensions (over USB) protocol description
- AN2295 Bootloader (over USB) implementation notes

5.2 SMAC (Simple Media Access Controller)

The SMAC is a simple ANSI C based code stack available as sample source code which can be used to develop proprietary RF transceiver applications using the MC13191.

5.2.1 SMAC Features

- Compact footprint:
  - 2K FLASH
  - 10 bytes (+ maximum packet length) RAM
  - As low as 16kHz bus clock
- Can be used to demonstrate coin cell operation for a remote control
- MC13191 compatible
- Very-low power, proprietary, bi-directional RF communication link
- ANSI C source code targeted at the HCS08 core and portable to almost any CPU core (including 4-bit)
- Low priority IRQ
- Sample application included, extremely easy to use
- Liberally commented
- Metrowerks CodeWarrior Experimental edition for support

5.2.2 Modifications of SMAC for ZSTAR demo

The development of the ZSTAR software is based on the free SMAC stack available from Freescale. The SMAC version used was 4.1a. Two sorts of modifications were made since the original version did not support the HC08 family or the MC9S08QG8 derivative of the 9S08 family. All changes are made using conditional compile options, using `ZSTARQG8` and `ZSTARJW32` definitions.

A fully detailed description of the SMAC is in the SMAC Reference Manual (SMACRM.pdf), available together with SMAC source code.

5.2.2.1 MC9S08QG8 SMAC modifications (Sensor Board)

Here the modifications of the SMAC are very minimal, since the core, peripherals and naming conventions are the same as in the MC9S08GB/GT code (originally in the SMAC 4.1a code).

The main changes are listed below:

`drivers.c:`

- `void MC13192Wake (void)` function not implemented, ATTN pin not connected to the microcontroller.
- `void RTXENDeAssert(void)` and `void RTXENAssert(void)` functions not implemented, RXTXEN pin not connected to the microcontroller.

`mcu_hw_config.c:`

- A set of functions
  `void SetGPIO(unsigned char gpio);`
  `void ClearGPIO(unsigned char gpio);`
  `void ToggleGPIO(unsigned char gpio);`
  added for the purpose of driving LED's connected to the MC13191 GPIO pins.
- `void UseExternalClock(void)` and void `UseMcuClock(void)` functions not implemented, no external clock available to the microcontroller.
- RESET pin handling in `void MC13192Restart(void)` and `void MC13192ContReset(void)` functions omitted since the RESET pin is not connected to the microcontroller.
- RESET, ATTN and RXTXEN pins handling in `void GPIOInit(void)` and `void MCUInit(void)` functions omitted since these pins are not connected to the microcontroller.
- LED toggling added into `void MCUInit(void)` during the waiting for MC13191 to initialize.

`device_header.h:`

- Several SPI, TPM and SOPT definitions added at the top of the standard <mc9s08qg8.h> header file.

created `port_config_ZSTARQG8.h` file with target specific defines (GPIO assignments, etc.)

5.2.2.2 MCHC908JW32 SMAC modifications (USB stick)

There are several modifications of SMAC required to

1. compile for the HC08 family member MCHC908JW32
2. reflect that the MC13191 connects to the microcontroller in a slightly different way (as described in chapter 4.2.3 MC13191 to MCHC908JW32 microcontroller interface) - namely, MC13191's IRQ pin.

The 9S08 to HC908 porting required slight changes in the following files:

`mcu_spi_config.c:`

- `void SPIInit(void)` function modified to initialize the HC908 SPI module.

`mcu_spi_config.h:`

- `SPIWaitTransferDone()`, `SPIClearRecieveStatReg()`, `SPIClearRecieveDataReg()`, `SPISendChar(u8Char)` and `SPIRead()` macros changed to work with the HC908 SPI module.

Further changes are relevant to the ZSTAR JW32 platform and specific connections:

`drivers.h:`

- `CLEAR_IRQ_FLAG` macro changed to reflect KBI module serving IRQ requests from MC13191.

`mcu_hw_config.c:`

- `void UseExternalClock(void)` and void `UseMcuClock(void)` functions no implemented, no external clock available to the microcontroller.
- LED toggling added into `void MCUInit(void)` during waiting for MC13191 to initialize.
- `UINT8 IRQPinLow(void)` function returns the state of the pin PTA3/KBI3 instead of the IRQ pin.

`mcu_hw_config.h:`

- `IRQFLAG, IRQACK(), IRQInit() and IRQPinEnable()` macros changed to reflect KBI module serving IRQ requests from the MC13191.

`device_header.h:`

- Several KBI definitions added at the top of the standard <mc68hc908jw32.h> header file.

created `port_config_ZSTARJW32.h` file with target specific defines (GPIO assignments, etc.)

5.2.2.3 Generic SMAC modifications (USB stick + Sensor Board)

Several modifications of SMAC have been made in order to improve the behavior with some older MC13191 silicon versions. Namely a software time-out functions (using microcontroller's TIM/TPM timer functions) have been added into `UINT8 PDDataRequest(tTxPacket *psPacket)` and `UINT8 PLMEEnergyDetect (void)` functions in `simple_phy.c` file.

Both functions wait for the `gu8RTxMode` variable to change to `IDLE_MODE`. This variable should change in the `void interrupt IRQIsr(void)` function once the execution of a specified task (in MC13191) finishes. Under some rare circumstances, an IRQ event (and also an `IRQIsr()` interrupt) does not occur, so this software workaround has been implemented to avoid a software lock-up.

5.3 ZSTAR RF protocol

The ZSTAR demo uses very simple protocol to transfer the accelerometer, button and calibration data between the Sensor Board and the USB stick over the RF medium. The protocol is built on top of SMAC (Simple Media Access Controller) drivers that are available for the MC13191 transceivers family. The protocol is bidirectional allowing the set up of independent connections amongst numerous pairs of ZSTAR demos.

All data is transferred in so-called Zpackets. This protocol is primarily targeted at simple demo purposes, allowing a fast transfer of the accelerometer data in short packets with minimum overheads and with minimum battery loads (most of the receive windows eliminated, short transmit packets, etc.).

5.3.1 Zpacket format

The ZSTAR Zpacket is contained inside the MC13191 standard packet structure, which is consistent with the IEEE 802.15.4 Standard. The SMAC library transparently adds a 16 bit Packet control field (see chapter 7.2.1.1 of IEEE 802.15.4 Standard specifications) to differentiate packets from ZigBee and other standards.

The Zpacket becomes a payload data for the SMAC standard packet and contains the following fields:

- Network number
- RX strength
- Zcommand
- Zdata

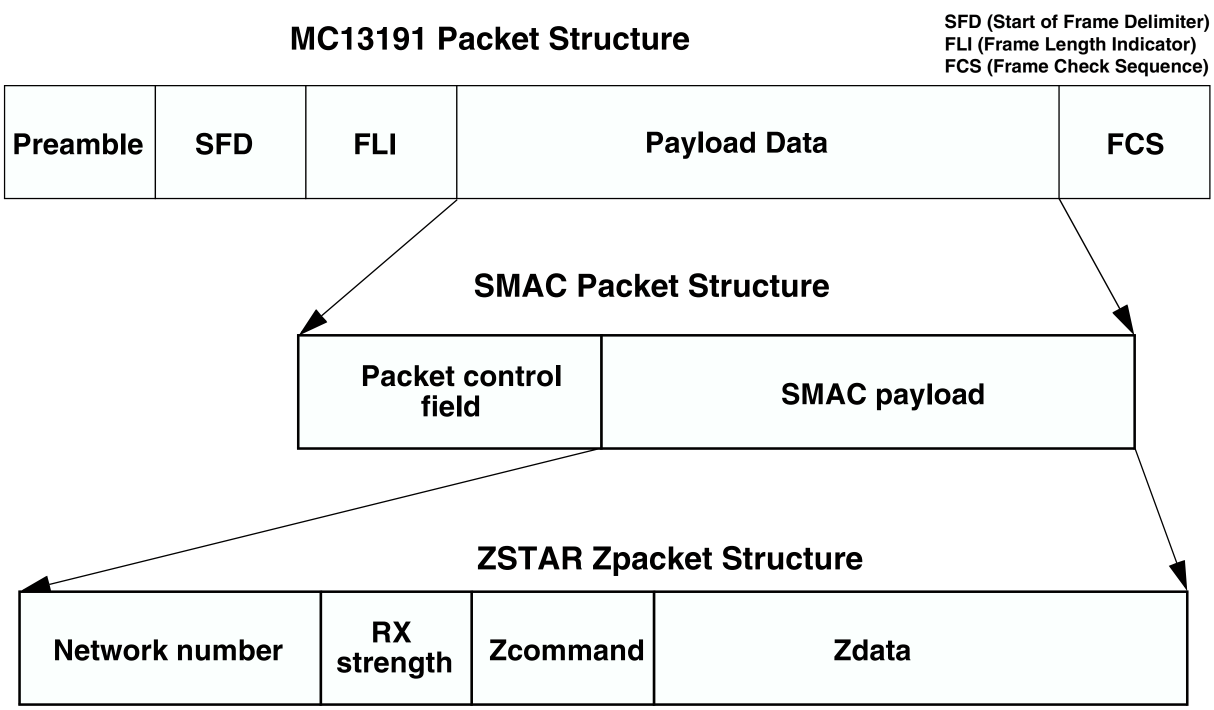


Figure 5-1Zpacket format

5.3.1.1 Network number

The network number is randomly generated at the beginning of the connection between the USB stick and the Sensor Board. It is used to determine between various connections. Packets with different Network numbers are simply ignored.

This field is 16 bits long.

5.3.1.2 RX strength

This field reports the strength of the last received packet on the other end of the connection. This value simply tells us how well the other side receives ‘our packets’. This can be used by transmission power management functions to change the transmission power if the other party receives packets with enough strength.

The values reported are retrieved using the `MLMELinkQuality()` SMAC primitive.

This field is 8 bits long.

5.3.1.3 Zcommand

The ZSTAR demo protocol uses a few simple commands to establish and maintain the data flow between the Sensor Board and USB stick.

The command is carried in Zcommand field and is 8 bits long. The commands are defined as listed in Table 5-1.

Table 5-1ZSTAR Zcommand List

ZCommand	ZCommand code	Direction	Zdata
ZSTAR_BROADCAST	‘B’ (0x42)	USB stick to Sensor Board	none
ZSTAR_ACK	‘A’ {0x41)	USB stick to Sensor Board	none
ZSTAR_CALIB	‘K’ (0x4B)	USB stick to Sensor Board	calibration data to Sensor Board
ZSTAR_STATUS	‘S’ (0x53)	USB stick to Sensor Board	g-range selection data to Sensor Board
ZSTAR_CONNECT	‘C’ (0x43)	Sensor Board to USB stick	calibration data from Sensor Board
ZSTAR_DATA	‘D’ (0x44)	Sensor Board to USB stick	accelerometer values, button levels, g-range selection

5.3.1.4 Zdata

The Zdata field follows the Zcommand field and may be empty if the actual command doesn’t require any additional data. The data format is dependent on the Zcommand. A detailed description is in the next chapter.

5.3.2 ZSTAR protocol Zcommand description

5.3.2.1 ZSTAR_BROADCAST

This command is sent when the USB stick tries to establish connection with the Sensor Board. The USB stick first generates a new random network number which is then ‘broadcast’ to any Sensor Board that is not yet connected to a USB stick. The USB stick transmits this command on a free channel, while the Sensor Board searches all available channels. Once a Sensor Board receives this command, it responds with a ZSTAR_CONNECT.

5.3.2.2 ZSTAR_CONNECT

This command is a reply to ZSTAR_BROADCAST, ZSTAR_CALIB or ZSTAR_STATUS commands sent by the USB stick. The Zdata field contains the calibration data stored in the Sensor Board, in the following format:

Zdata bytes:	0	1	2	3	4	5
	Xvalue (0g)	Xvalue (1g)	Yvalue (0g)	Yvalue (1g)	Zvalue (0g)	Zvalue (1g)

Figure 5-2ZSTAR_CONNECT Zdata format

5.3.2.3 ZSTAR_DATA

Once the connection is established, the Sensor Board starts to periodically transmit accelerometer, button and g-range status data towards the USB stick.

The Zdata field contains 4 bytes; the actual X, Y and Z accelerometer values and a byte with status information.

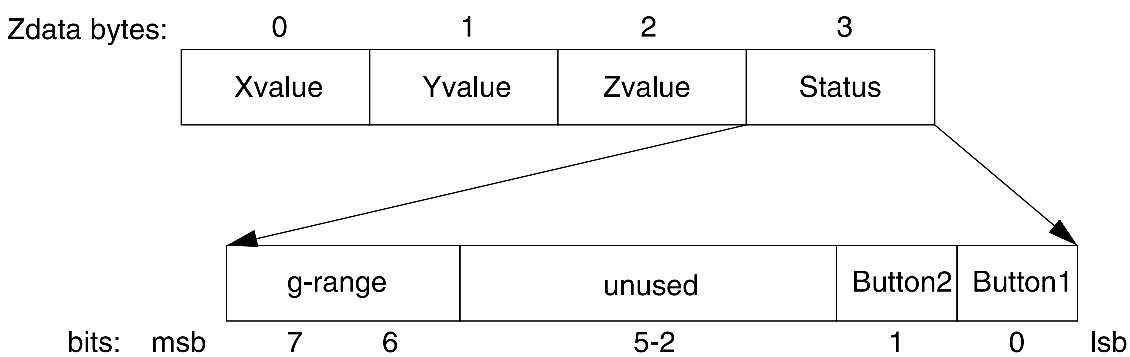


Figure 5-3ZSTAR_DATA Zdata format

Each transmission of a ZSTAR_DATA packet is acknowledged by a ZSTAR_ACK packet from the USB stick, although the Sensor Board does not always open the reception window to receive this acknowledgement, in order to save the battery charge.

5.3.2.4 ZSTAR_ACK

This command is sent as the data acknowledgement so the Sensor Board board knows that the connection is still alive. If the receive window is opened by the Sensor Board and the ZSTAR_ACK has not been received, the operation (periodic transmission of a ZSTAR_DATA packet) continues but the Sensor Board will try to receive an acknowledgement more frequently. If the acknowledgement is not received several times, the connection is dropped and the Sensor Board will try to re-establish the connection again. The USB stick will recognize this situation once several ZSTAR_DATA packets have not been received.

5.3.2.5 ZSTAR_CALIB

This command carries the calibration data provided by the USB stick for the Sensor Board and is sent instead of a ZSTAR_ACK packet. The calibration data is intended to be stored in Flash memory of the Sensor Board. Since the Sensor Board does not receive after every ZSTAR_DATA packet, the USB stick keeps sending a ZSTAR_CALIB until the Sensor Board confirms reception using a new ZSTAR_CONNECT packet.

5.3.2.6 ZSTAR_STATUS

This command carries the g-range data provided by the USB stick for the Sensor Board and is sent instead of a ZSTAR_ACK packet. The g-range data is intended to switch the g-range of accelerometer sensor. Since the Sensor Board does not receive after every ZSTAR_DATA packet, the USB stick keeps sending a ZSTAR_STATUS until the Sensor Board confirms reception using a new ZSTAR_CONNECT packet.

5.4 STAR protocol and ZSTAR extensions (over USB)

The ZSTAR demo uses a subset of the original STAR demo protocol commands. This way, most of the software originally developed for the RD3112 (STAR) is also usable with the ZSTAR.

The STAR demo communicates over the RS232 serial line with a simple text-based protocol. The same protocol is used in ZSTAR for communication between the USB stick and a PC (over a virtual serial port). The PC application sees the same interface (serial port) and the same protocol as if a STAR demo was connected.

5.4.1 Communication handshake ‘R’ (0x52)

Initially, a handshake (commands needed to test/establish the connection between the PC and the ZSTAR demo) is conducted. This is accomplished by the PC sending an ‘R’ command, the ZSTAR demo responding with ‘N’. In this way, the PC application sees that the demo is ready for communication. Communication is reset, and any debug or system modes are disabled.

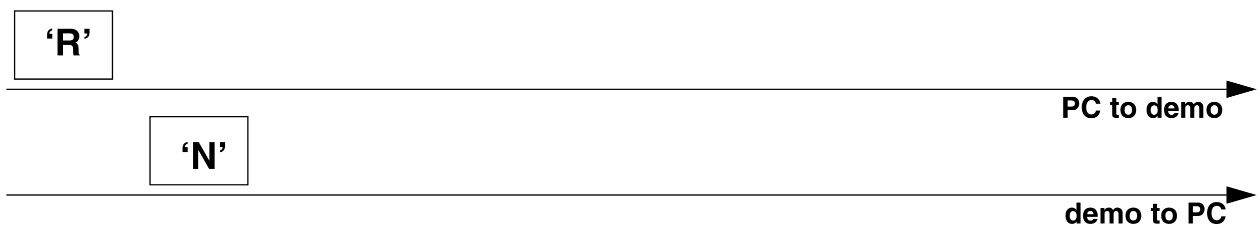


Figure 5-4 Communication handshake ‘R’ (0x52)

5.4.1.1 Extended Communication handshake ‘r’ (0x72)

To determine whether a ZSTAR or STAR demo is connected, Only the ZSTAR demo implements an Extended Handshake Communiation command. Once the PC sends the ‘r’ command, the ZSTAR demo responds with a ‘Z’.

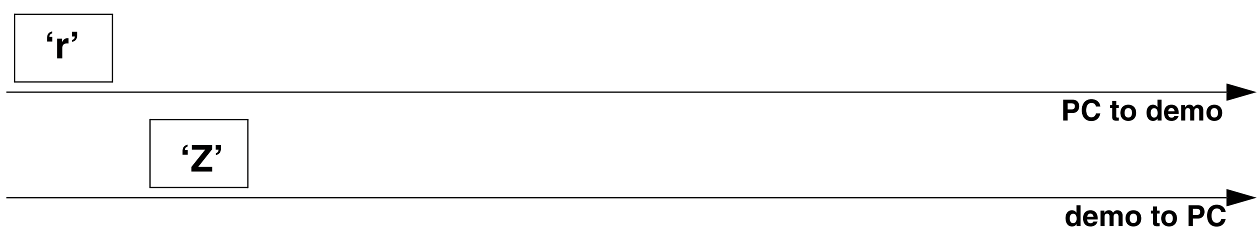


Figure 5-5 Extended Communication handshake ‘r’ (0x72)

5.4.2 Accelerometer data transfer ‘V’ (0x56)

The PC sends the Values ‘V’ command, the demo responds with 6 bytes in the following sequence:

'x', X-value, 'y', Y-value, 'z', Z-value, simply an ‘x’ character followed by the actual X-axis accelerometer binary value, then a ‘y’ followed by the actual Y-axis accelerometer binary value and a ‘z’ followed by the actual Z-axis accelerometer binary value. Since the ZSTAR demo caches the last (over the air) transmitted values, these values are immediately provided to the PC.

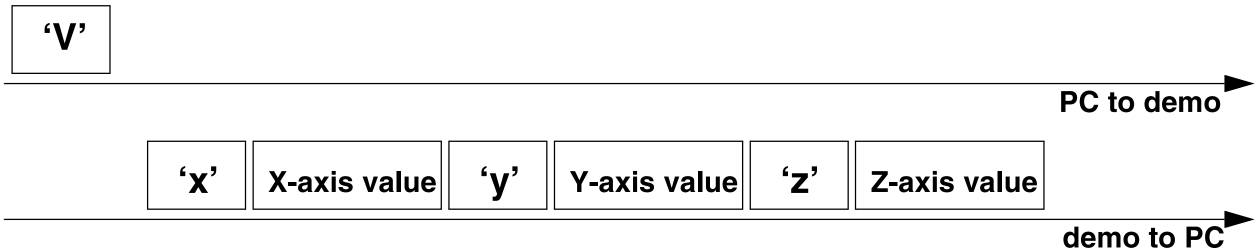


Figure 5-6 Accelerometer data transfer 'V' (0x56)

5.4.2.1 Extended Accelerometer data transfer 'v' (0x76)

The ZSTAR demo has also two buttons designed on the Sensor Board. To acquire the actual state of these buttons, the original 'V' command has been extended to a 'v' command, that provides the same information, followed by a 'b' character and a binary byte containing the actual state. The least two significant bits are used, the others are reserved. If a button is pressed, the actual bit is set to '1', and if depressed, the bit is '0'.

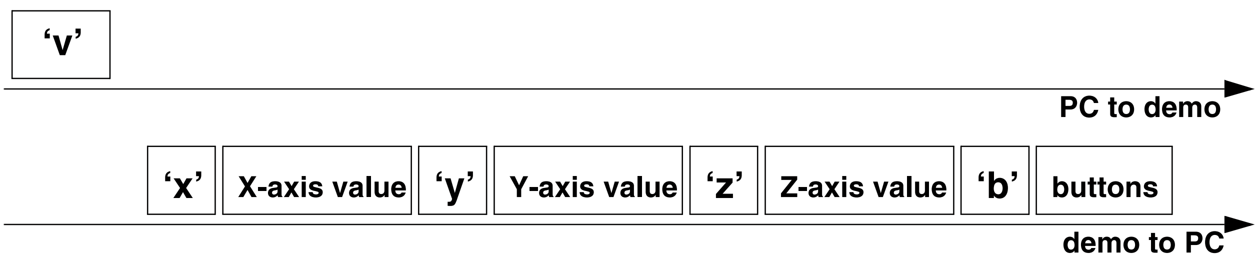


Figure 5-7 Extended Accelerometer data transfer 'v' (0x76)

5.4.3 Calibration data 'K' (0x4B)

The calibration data is the accelerometer values for specific g (acceleration) levels. The values for 0g and 1g (Earth gravity) are provided for each axis. The values are stored in the Flash memory of the Sensor Board and are transferred to the USB stick once the air connection is established (as described in chapter 5.3.2.2 ZSTAR_CONNECT). These values are stored in the USB stick for retrieval by the PC using the 'K' command.

The PC sends the Calibration data 'K' command, the demo responds with 9 bytes in the following sequence:

'X', Xval0, Xval1, 'Y', Yval0, Yval1, Z', Zval0, Zval1, simply an 'X' character followed by the 0g and 1g X-axis calibration accelerometer binary values, and the same for Y- and Z-axis.

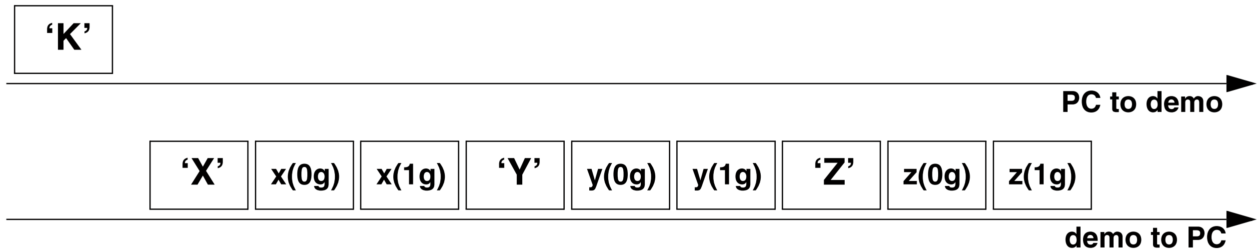


Figure 5-8Calibration data ‘K’ (0x4B)

5.4.4 Calibration process ‘k’ (0x6B)

The calibration process is initiated by a ‘k’ command from the PC, followed by 6 bytes of calibration data. These are to be stored in the Flash memory of the Sensor Board being used. More in chapter 5.3.2.5 ZSTAR_CALIB.

The calibration data is just 6 bytes in the following sequence:

Xval0, Xval1, Yval0, Yval1, Zval0, Zval1 - 0g and 1g calibration accelerometer binary values for X-, Y- and Z-axis. No response from the demo is provided. Verification of the calibration data stored can be done using the Calibration data ‘K’ (0x4B) command.

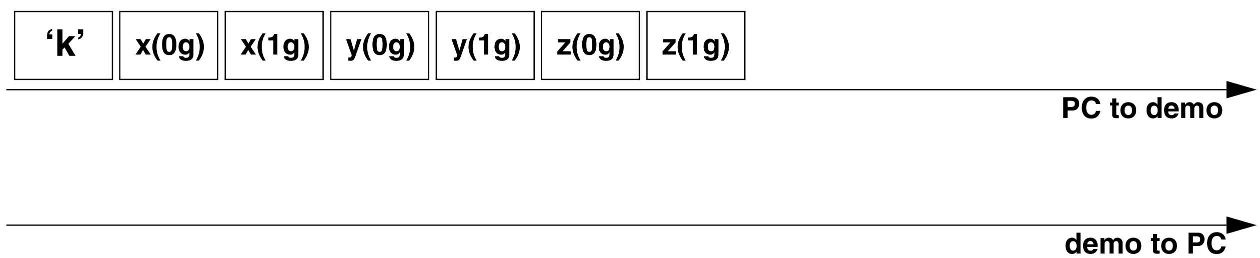


Figure 5-9Calibration process ‘k’ (0x6B)

5.4.4.1 Remaining STAR demo commands

The remaining STAR commands, such as 'F', 'G', 'H', '0', '1', '2', '3' and 'E' are not implemented in the ZSTAR demo.

5.4.5 Additional ZSTAR commands

5.4.5.1 g-select reading ‘G’ (0x47)

The ZSTAR demo allows dynamic selection of the g-range for the accelerometer sensor (see details in chapter 3.4.2 g-select connections), thus additional commands are implemented to read and change the g-range.

When the PC issues a ‘G’ command, the ZSTAR demo responds with the g-range actually selected. A ‘0’, ‘1’, ‘2’ or ‘3’ character is returned where ‘0’ is for the 1.5g range, ‘1’ for 2.0g , ‘2’ for 4.0g and ‘3’ for the 6.0g range. If a different sensor (e.g. MMA7261Q) is implemented on the Sensor Board, the g-ranges are 2.5g, 3.3g, 6.7g and 10g respectively.

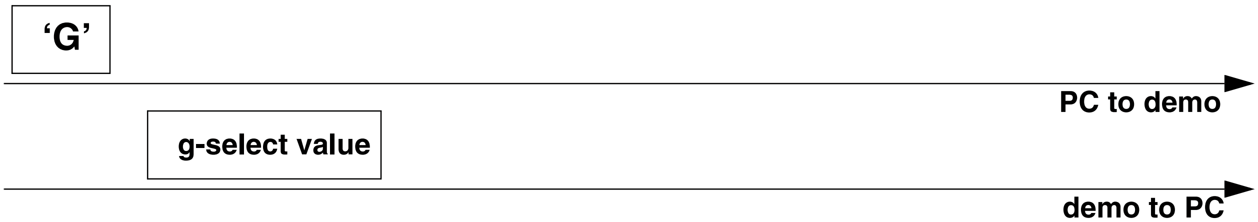


Figure 5-10g-select reading ‘G’ (0x47)

5.4.5.2 g-select setting ‘g’ (0x67)

To select the g-range of the sensor on the ZSTAR Sensor Board, a ‘g’ command is issued. It needs to be followed by the required g-range (‘0’, ‘1’, ‘2’ or ‘3’). The USB stick board then communicates this selection to the Sensor Board over the air (see more in 5.3.2.6 ZSTAR_STATUS).

No response from the demo is provided. To verify which g-range has been selected, the g-select reading ‘G’ (0x47) command can be used.

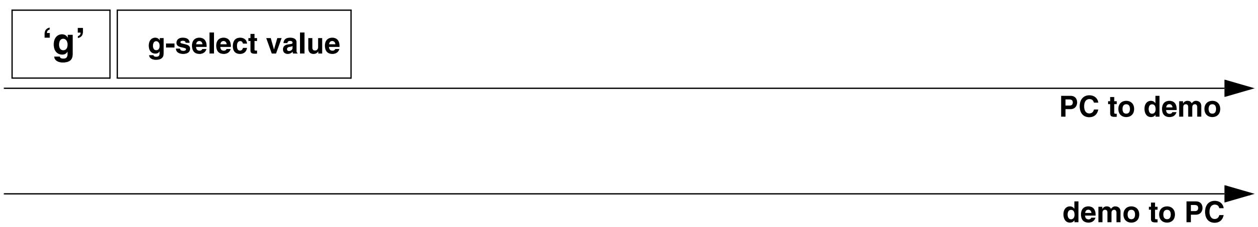


Figure 5-11g-select setting ‘g’ (0x67)

5.4.5.3 Info ‘I’ (0x49)

The Info command ‘I’ has only been added to determine which version, compile date, and author of the USB stick software has been implemented. The demo returns a plain text information, and this command is usually issued over terminal (e.g. HyperTerminal) software.

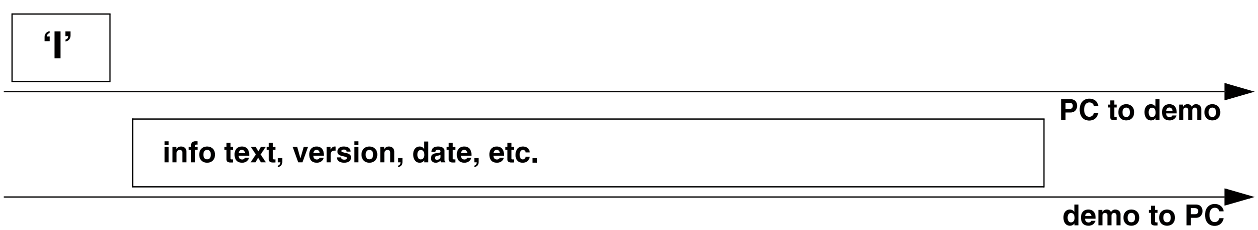


Figure 5-12Info ‘I’ (0x49)

5.4.5.4 Debug on ‘U’ (0x55) and Debug off ‘u’ (0x75)

Various debug information can be observed after issuing a ‘U’ command, usually in terminal (e.g. HyperTerminal) software. Mainly, information on the air protocol is displayed in text, information on the detected channel energy during the surveying for a free channel is shown, channel numbers, and, once the connection is established, the network number. The received level of packets from the Sensor Board and the reported USB stick packet level are shown, as well as command names, etc. This can be useful in determining the communication range between the USB stick and the Sensor Board.

The debug information is no longer displayed after issuing a 'u' command or Communication handshake 'R' (0x52).

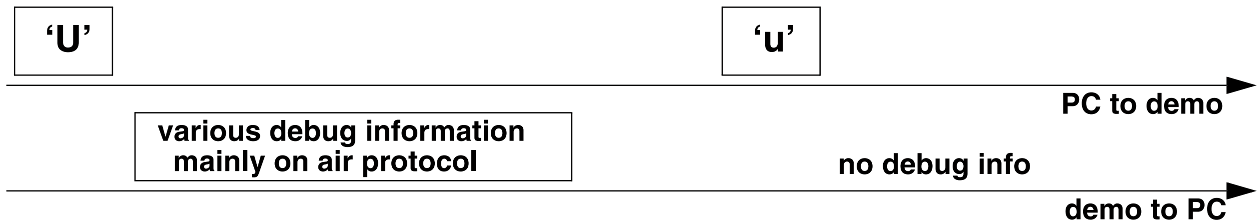


Figure 5-13 Debug on 'U' (0x55) and Debug off 'u' (0x75)

5.4.6 Further debug and test commands

5.4.6.1 Forced channel number selection

In order to allow effective testing and debugging, few additional commands have been added. If, before a connection between the USB stick and Sensor Board is established, any hexadecimal number command ('0' through '9' or 'A' through 'F') is sent, the connection will be established on this specific channel number (0 to 15). Any new channel can be selected, sending the new channel number command. The selection becomes effective during the new connection is being established.

The return to the automatic mode (where a random channel with the minimum energy is selected) can be forced only by a complete software reset (ie. removing the USB stick from the USB slot).

5.4.6.2 Semiautomatic self-calibration

For the purpose of easier semiautomatic calibration of the ZSTAR demo, additional Calibration command 'Q' (0x51) has been added. This command is usually issued over terminal (e.g. HyperTerminal) software.

A user is required to place the Sensor Board into 3 specific positions, in which the Earth gravity will induce a maximum acceleration in each of X, Y, and Z axes. Before issuing the first 'Q' command, the Sensor Board must be placed flat, ie. with Z-axis aiming toward the Earth core. For the second issue of 'Q' calibration command, the board's X-axis has to aim toward the Earth core. The board should 'stay' on its right edge. Next, the Y-axis is calibrated, with the board 'staying' on its top edge. Finally, after issuing the fourth 'Q' command, the calibration data are sent to the Sensor Board, actually using ZSTAR_CALIB command. The text help is provided during the self-calibration process.

5.5 Bootloader

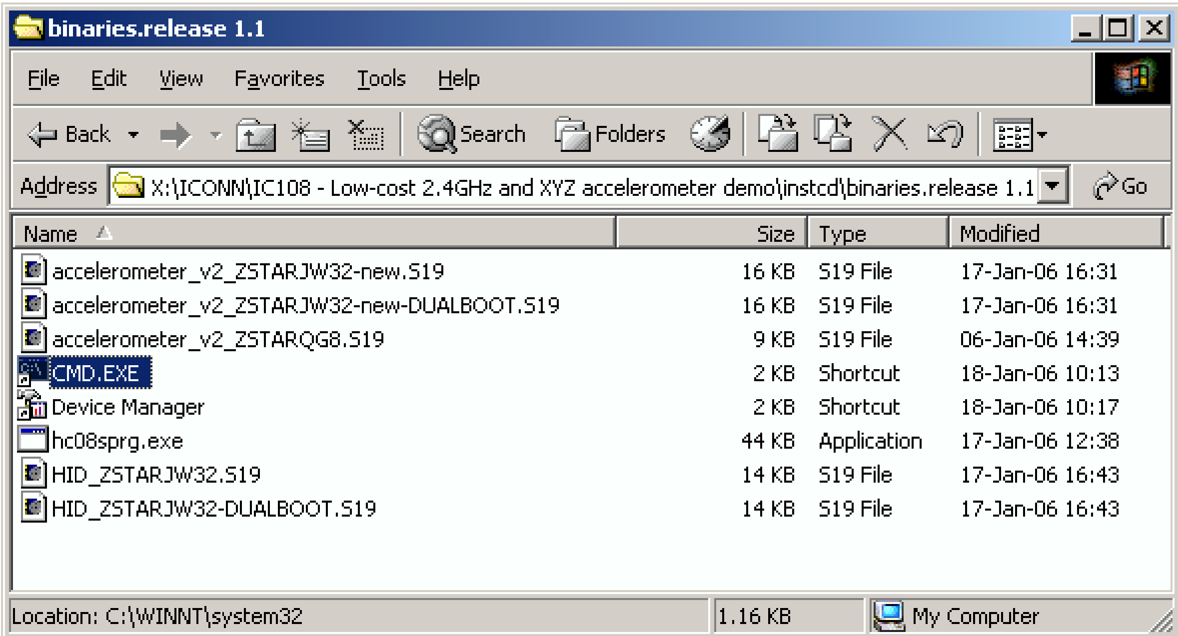
There's bootloader software implemented in MCHC908JW32 microcontroller. The bootloader is based on AN2295 Application note - Developer's Serial Bootloader for M68HC08 and HCS08 MCUs and AN2295SW accompanied software. The original AN2295 bootloader targets serial connections between the PC and applications, and since the MCHC908JW32 implements a virtual serial port application, the USB version of the AN2295 bootloader has been created to allow reprogramming of Flash memory in the USB stick.

The USB virtual serial port software is fully described in AN3153 Application note - Using the Full-Speed USB Module on the MCHC908JW32; the MCHC908JW32 bootloader implements the same virtual serial port but under a different PID (the PC sees that serial port as a different application from ZSTAR).

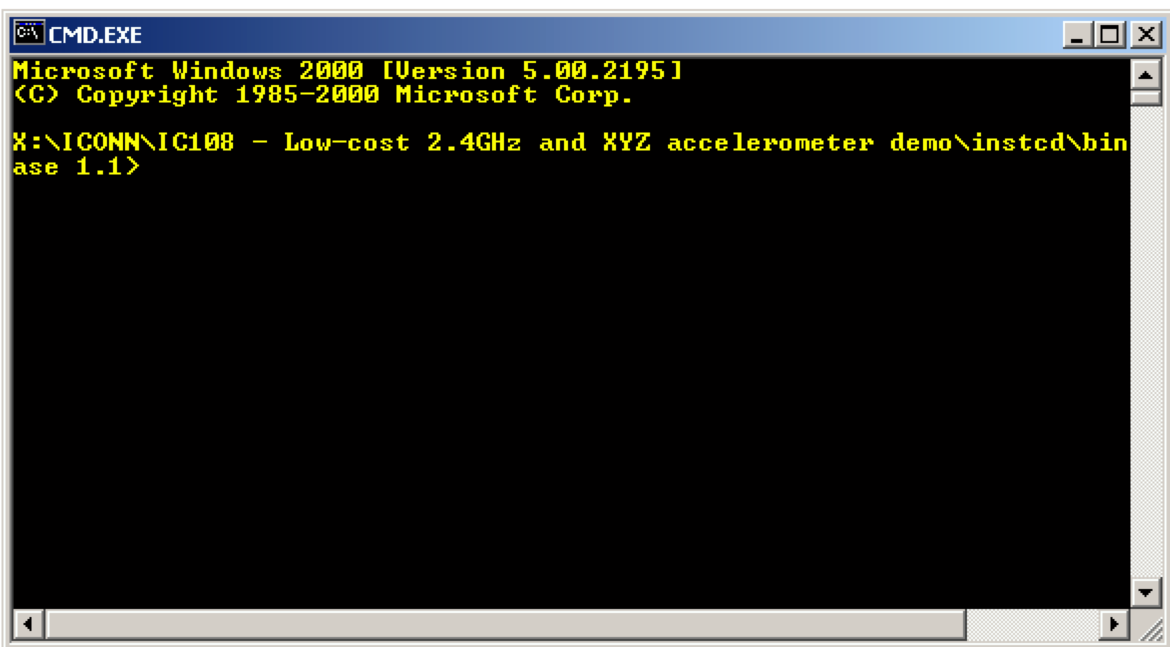
The bootloader drivers installation guide can be found in chapter 6.1.2 AN2295 Bootloader Drivers installation.

5.5.1 Bootloading procedure

1. Find on the installation CD the folder with binaries:

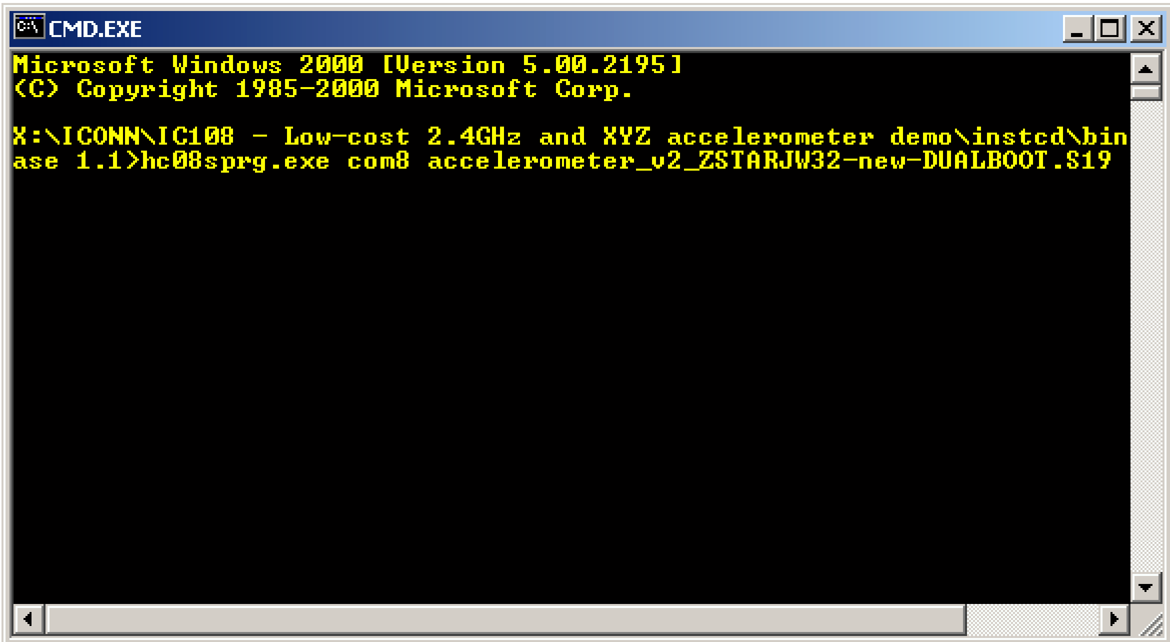


2. Start (double-click) the CMD.EXE shortcut, a command line window should appear:

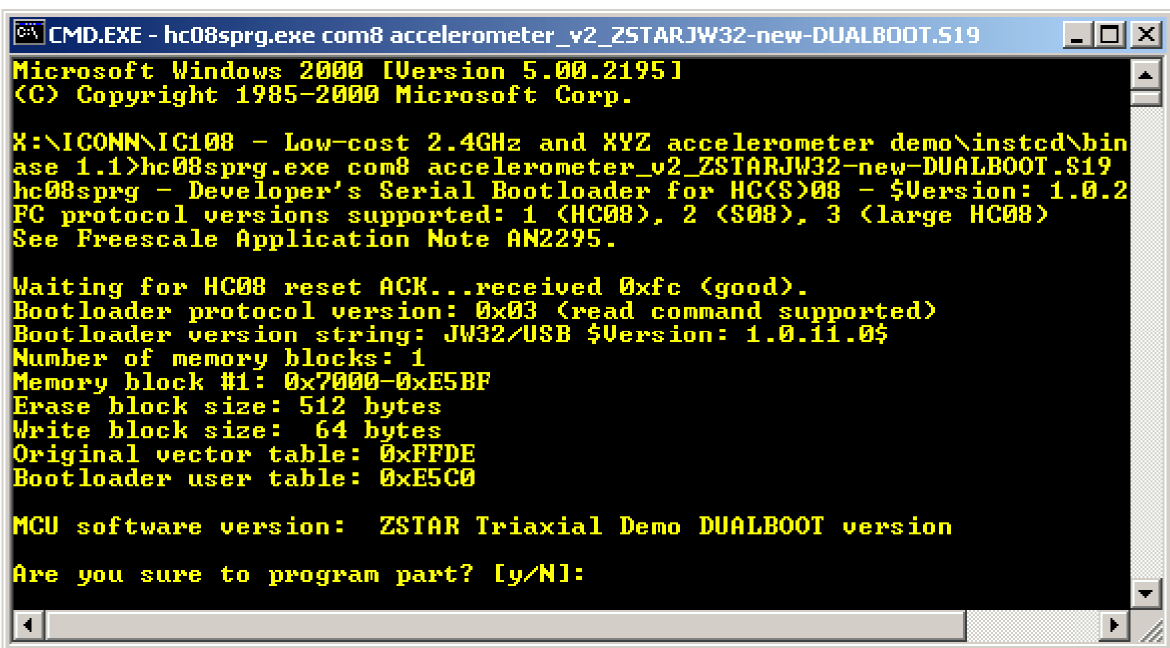


3. Now type: hc08sprg [bootloader com port number] [binary (S file) that you want to bootload], just like this:

```
hc08sprg.exe com8 accelerometer_v2_ZSTARJW32-new-DUALBOOT.S19
```

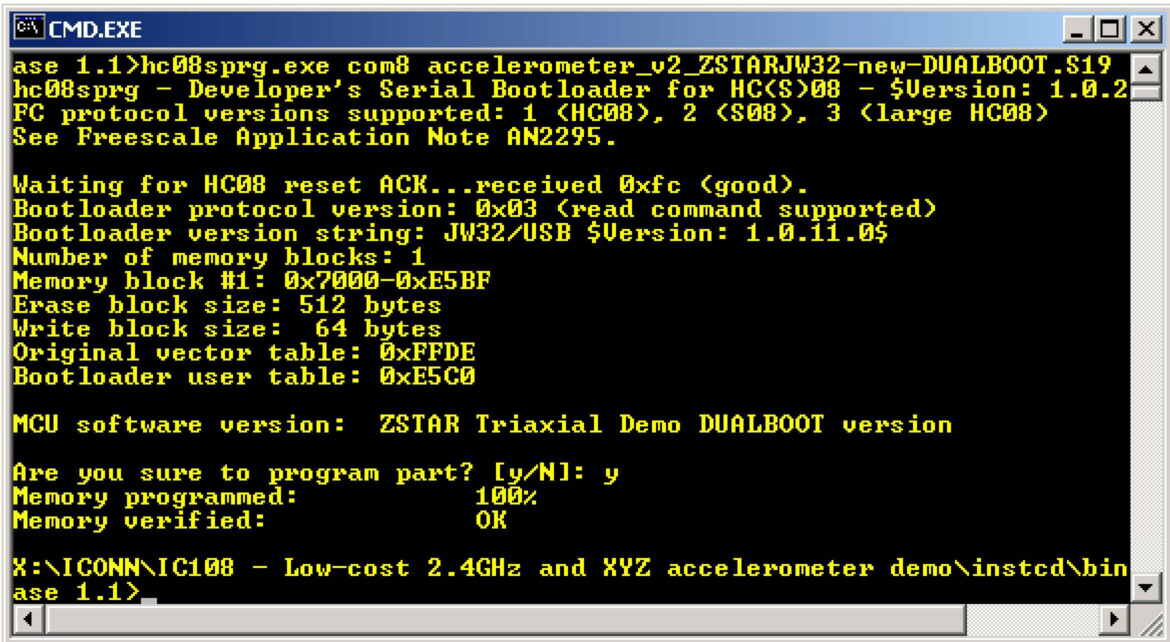


4. Press ENTER and initial bootloader communication will start:



If this screen does not appear, remove the USB stick and start from the beginning.

5. Just confirm with Y, and the binary will be loaded onto the USB stick:



The bootloader disappears (in Device Manager) and the newly loaded software starts to execute.

Using this procedure the software in the USB stick can be changed anytime.

5.5.2 Dualboot guidelines

NOTE: The USB stick already comes from factory with two dualboot-aware applications pre-programmed.

USB stick and AN2295 Bootloader software provide a way of having two different software (devices) in one USB stick. In order to do this, two dualboot-aware versions of the software needs to be consecutively bootloaded onto the USB stick:

Follow the sequence of instructions in the 5.5.1 Bootloading procedure for two dualboot versions of software:

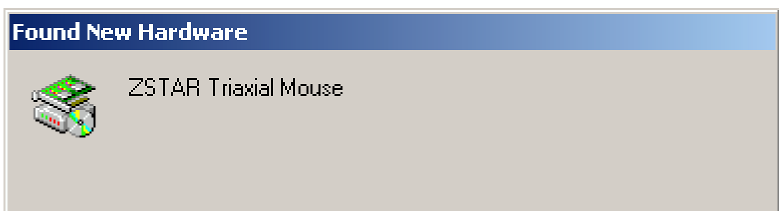
1. First bootload `accelerometer_v2_ZSTARJW32-new-DUALBOOT.S19.`

After bootloading, ZSTAR Triaxial Demo (COM1) should appear in Device Manager.

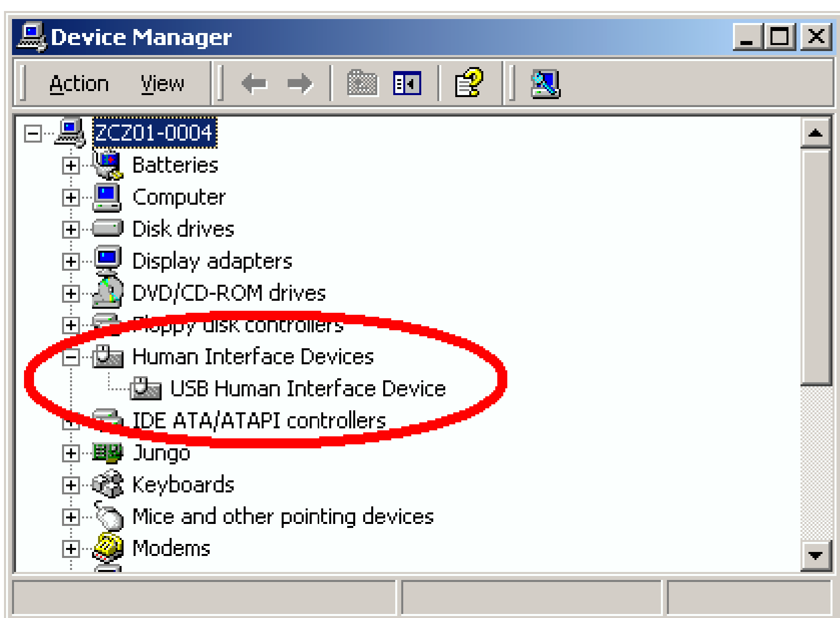
2. Next, remove the USB stick again, press the button, re-insert the stick and bootload

`HID_ZSTARJW32-DUALBOOT.S19` software in.

After bootloading, a new device (ZSTAR Triaxial Mouse) should appear:



The ‘tilt’ mouse will install automatically and also appear in the Device Manager:



5.5.2.1 Dualboot applications switching

Having both dualboot-aware applications programmed in the USB stick, they can be switched just by quickly pressing the button (having the USB stick inserted into the USB slot). The applications will appear and disappear accordingly.

The ‘tilt’ mouse application in order to work must have sensor board calibrated correctly (e.g. using RD3152MMA7260Q_SW.exe or 5.4.6.2 Semiautomatic self-calibration procedure).

Chapter 6
Application Setup

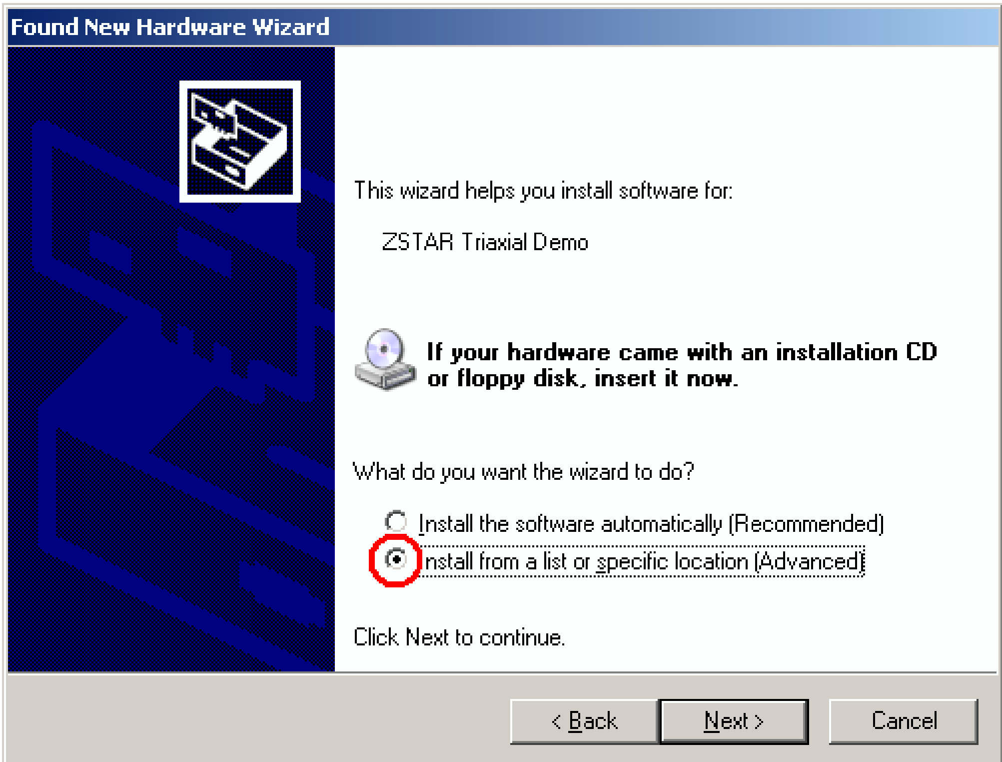
6.1 ZSTAR Installation Procedure

6.1.1 USB stick installation

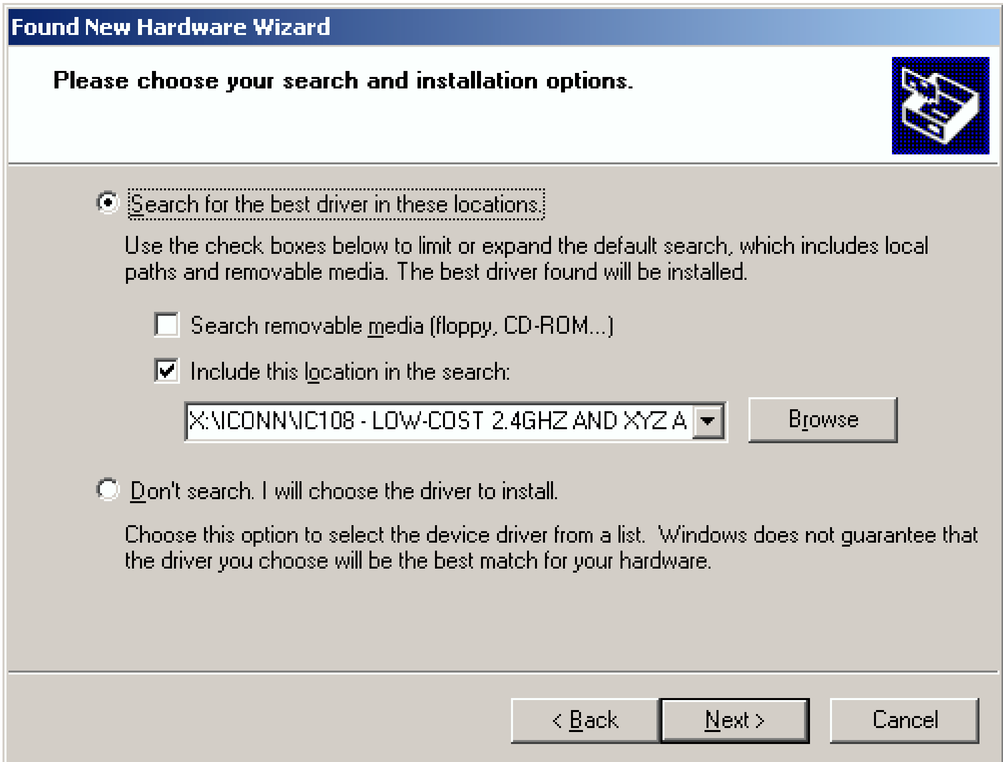
First of the all, we have to install the USB stick to your PC. Please follow the next steps.

1. Plug the USB stick into a USB slot.The ‘Found New Hardware’ announcement should appear:

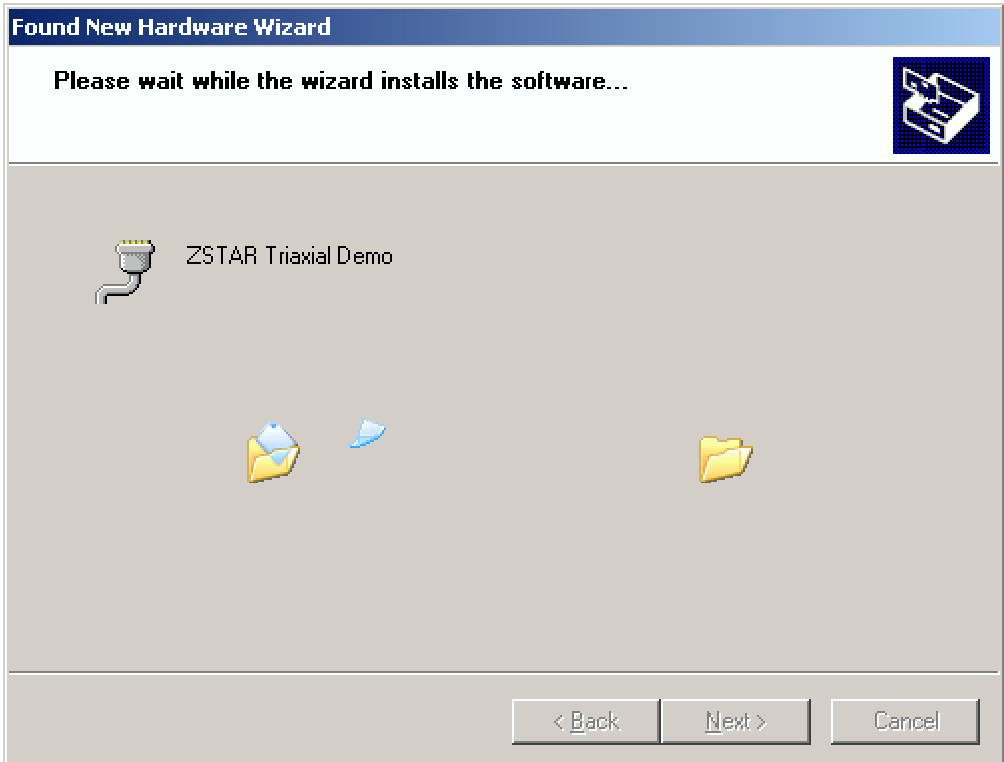
2. Then the installation wizard starts for new hardware. Choose “Install from a list or special location“



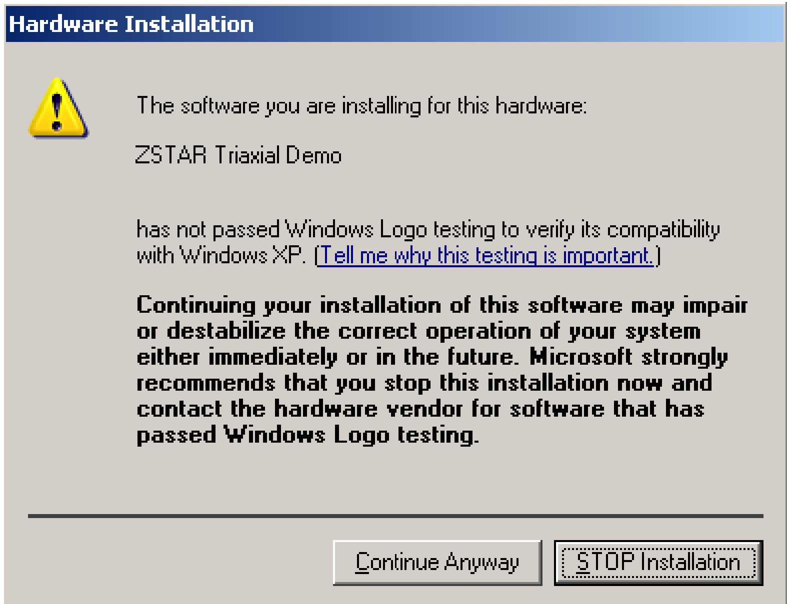
3. Point to the Installation CD as the driver path:



4. Installation should continue:

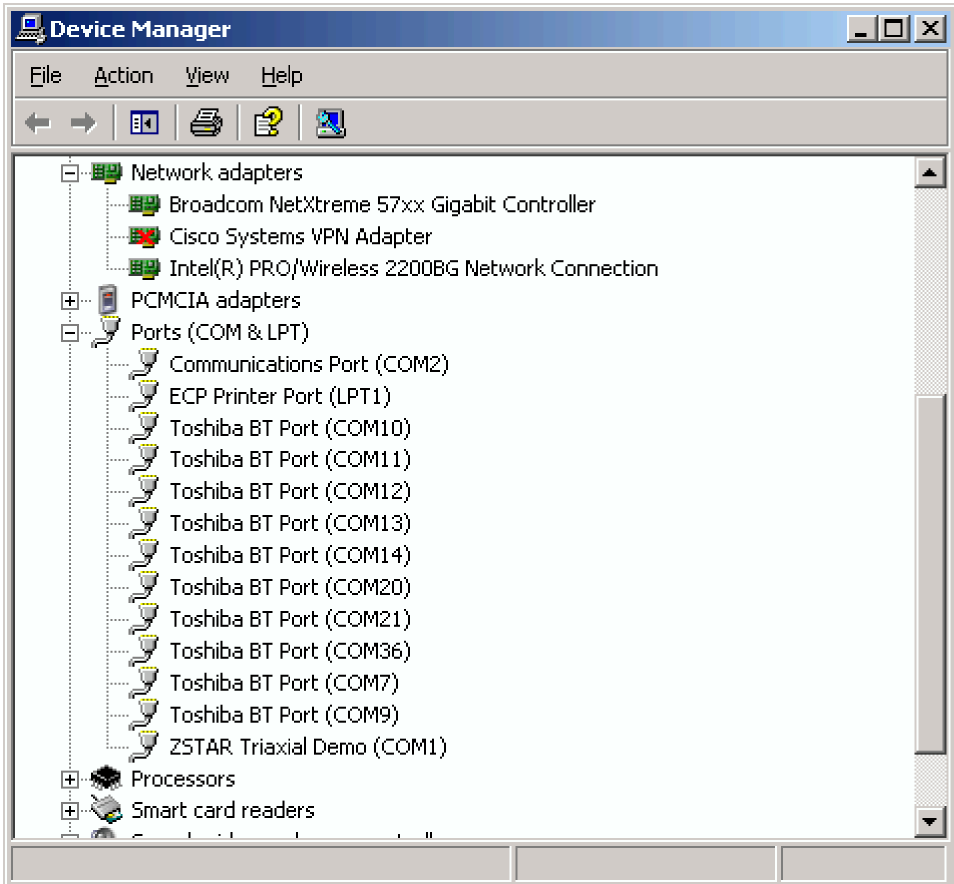


5. If you are using Windows XP SP2, you will be asked to stop or continue installation because the drivers are not certified by Microsoft. Select the “Continue Anyway” button



6. Installation should succesfully finish.

7. Check whether a new serial port (ZSTAR Triaxial Demo) has appeared in your Device Manager (My Computer, right click, Manage, Device Manager):



8. If required, the ZSTAR Triaxial Demo COM port maybe renumbered using the standard procedure in Windows operating system:

   Right click for **Properties**, **Port Settings** tab, **Advanced** button and change the COM port number accordingly.

9. Launch the RD3152 software “RD3152MMA7260QSW.exe" and select the COM port number which you may have assigned in Device Manager.

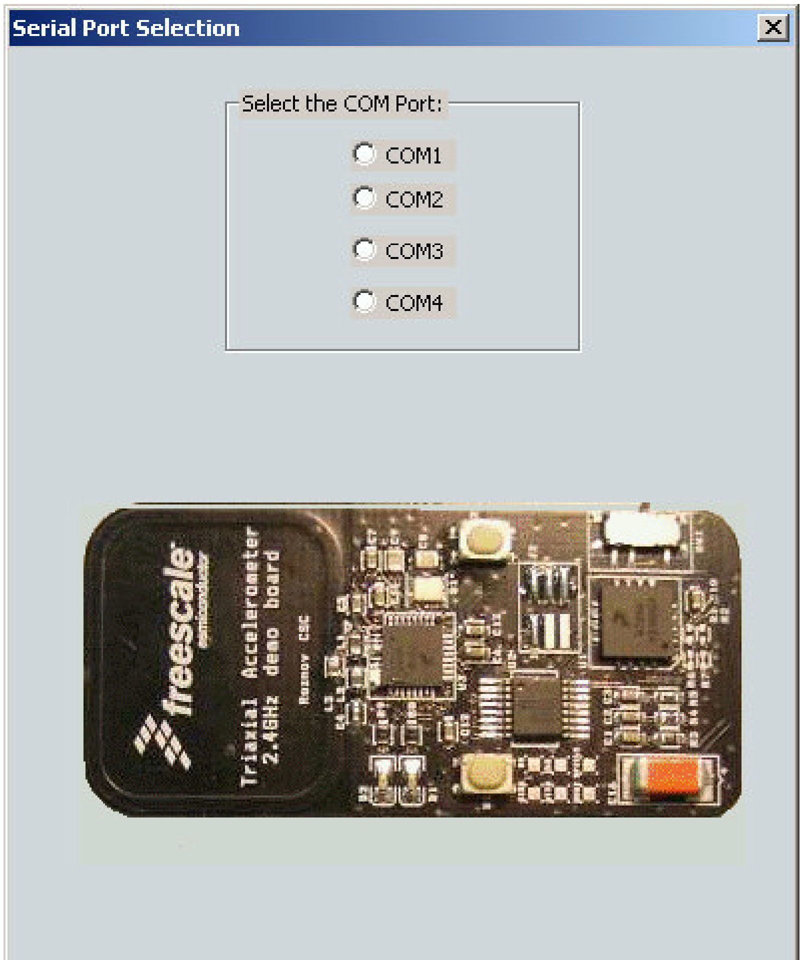


Figure 6-1

If no error message appears, the COM port is opened correctly and software communicates with the USB stick.

10. Now lets go and check data from the ZSTAR Sensor Board.

Raw data, 2D/3D screen, or Scope work should be used for this purpose. While moving (turning, shaking) with a ZSTAR Sensor Board, data from the separate axis should change accordingly.

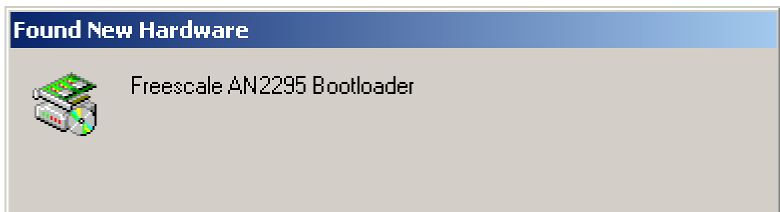
The RD3152MMA7260QSW calibration screen can be used for sensor calibration (calibration data is stored in the Sensor Board).

6.1.2 AN2295 Bootloader Drivers installation

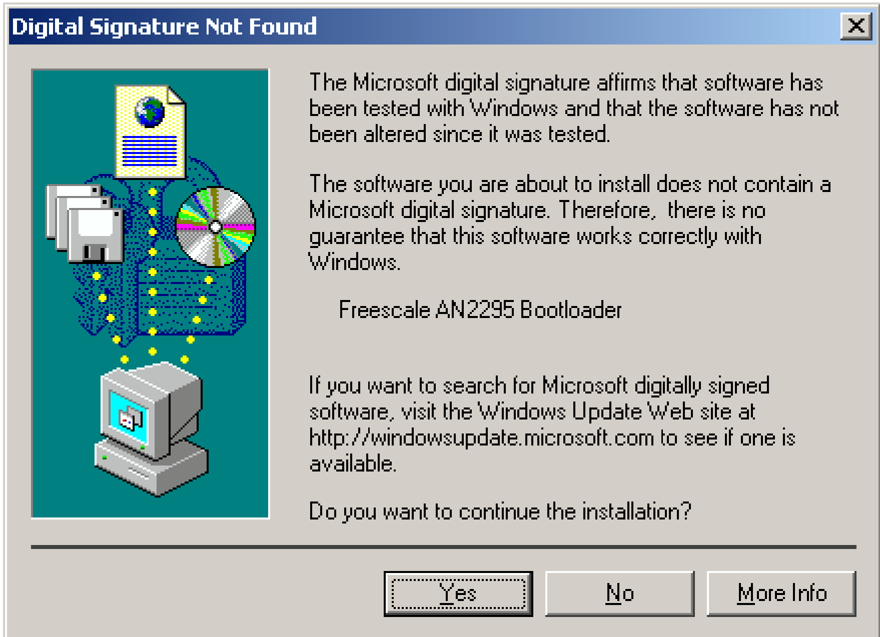
This procedure assumes that ZSTAR Demo drivers are already installed. The drivers are alse common for the bootloader (= are already present in Windows folders). If not, the procedure will be identical to the ZSTAR drivers installation.

1. Press the Button on the USB stick and insert it into a USB connector (keeping the button pressed when inserted).

The following window appears:

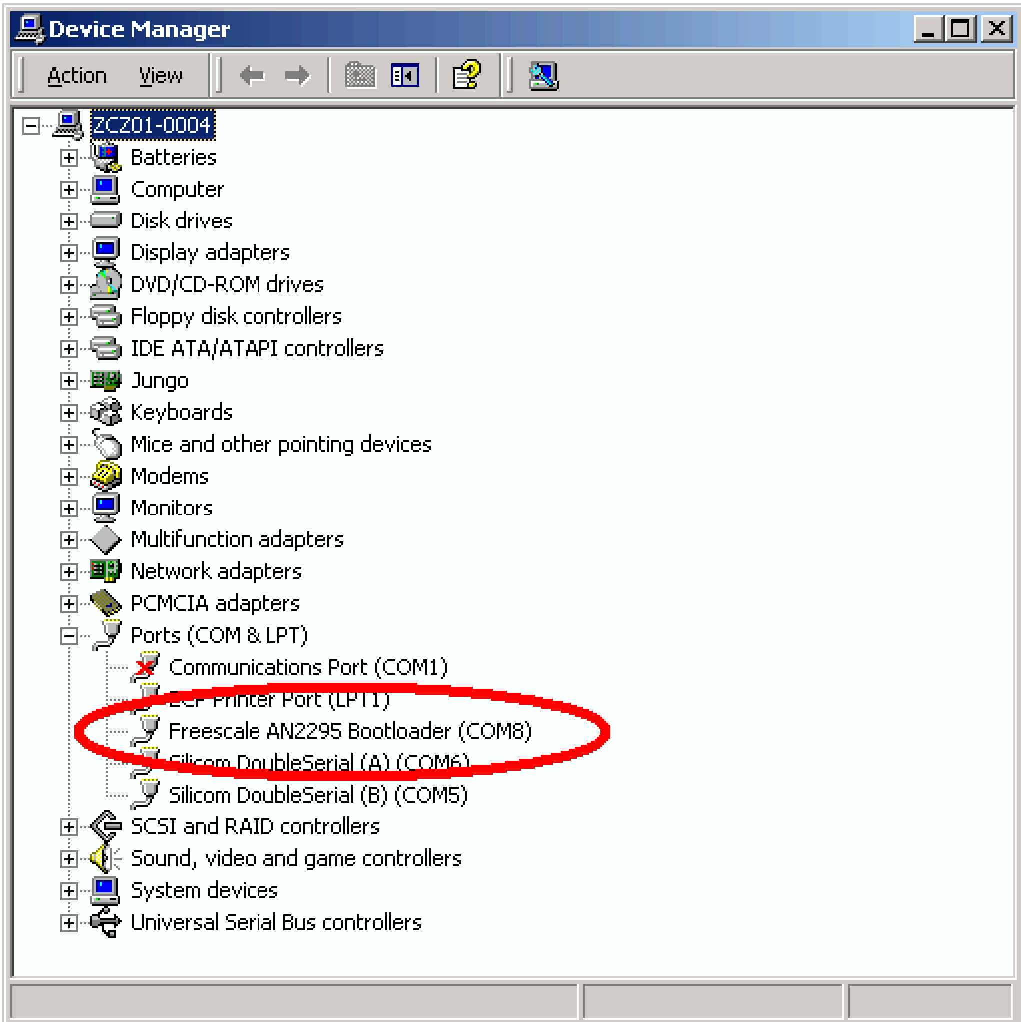


2. The PC searches for an appropriate driver (as the ZSTAR Demo, in some instances a folder with drivers (`zstar.inf` and `usbser.sys`) needs to be selected), then the following window should appear:



3. Just click Yes, and the bootloader port will be installed (as seen in the Device manager):
4. Right click **My computer** on the Desktop > **Properties**, **Hardware** tab, **Device Manager** button.

5. A similar setup should be observed:



6. Note down the COM port number (here, COM8); this is the port number of the Bootloader

Once the software in the USB stick needs to be updated, the Bootloader can be invoked anytime, just by pressing the button while inserting the USB stick into the USB slot.

Appendix A
References

The following documents can be found on the Freescale web site: http://www.freescale.com.

1. AN2295 Application note - Developer's Serial Bootloader for M68HC08 and HCS08 MCUs
2. AN3153 Application note - Using the Full-Speed USB Module on the MCHC908JW32
3. MC9S08QG8 Datasheet
4. MCHC908JW32 Datasheet
5. MMA7260Q Datasheet
6. MC13191 Datasheet

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