



USER MANUAL

Free2move Wireless Audio Headset

Version 2.00



BLUETOOTH is a trademark owned by
Bluetooth SIG, Inc., U.S.A. and licensed to Free2move

Rev: a
2007-10-16

Table of contents

1	General information	3
1.1	Supported hardware	3
1.2	General I/O	3
1.3	Default settings	6
1.4	Supported Bluetooth profiles	6
2	Button interface	8
2.1	Power up/down	8
2.2	Headset/Handsfree specific	8
2.3	Headset specific	8
2.4	Handsfree specific	8
2.5	A2DP specific	9
2.6	Clear paired devices and restore to default settings	9
3	UART Command Interface	10
3.1	DO Commands	10
3.2	GET and SET commands	13
3.3	GET only commands	14
3.4	SET only commands	17
3.5	EVENT indications	18
4	Getting started	21
4.1	Configure Hyper Terminal	21
4.2	Start up the Bluetooth module and enter pairing mode	23
5	Example Hardware	25
5.1	Schematic	25
5.2	Microphone input	26
6	Firmware revision history	27
6.1	V. 2.00	27
6.2	DRAFT V. 1.00	27

1 General information

Wireless Audio Headset (WAH) is Free2move's standard firmware for Headset applications. It is intended for applications that want to incorporate Headset functionality to be able to communicate with for example mobile phones. The firmware can be used either as stand-alone with a button interface as the only input of controlling the firmware or connected to another serial device (e.g. microcontroller) through the UART interface.

The current version includes the following Bluetooth profiles:

- A2DP (sink)
- AVRCP (controller)
- HFP 1.5 (headset)
- HSP (headset)
- SPP (slave)

Firmware running on the Free2move Bluetooth module		The connecting device is typically a mobile phone	
Wireless Audio Headset	Direction	"Mobile phone"	
A2DP (sink)	← ●	A2DP (source)	
AVRCP (controller)	● →	AVRCP (target)	
HFP 1.5 (headset)	← →	HFP 1.5 (audio gateway)	
HSP (headset)	← →	HSP (audio gateway)	
SPP (endpoint)	← →	SPP (connecting)	

1.1 Supported hardware

The Wireless Audio Headset V. 2.00 firmware is currently supported on the following Free2move products:

- F2M03MLA Free2move Low power Bluetooth Multimedia module with Antenna (Article nr. F2M03MLA-S03)

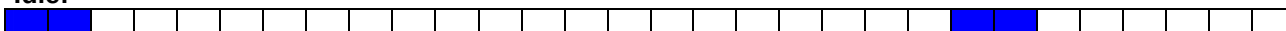
1.2 General I/O

1.2.1 Leds

Leds	PIO	Description
RED	6	Red led (recommended color)
BLUE	7	Blue led (recommended color)

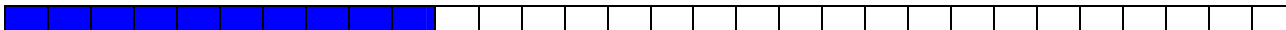
The different states of the Wireless Audio firmware are indicated with the following led indications:

Idle:



Blue led on for 200 ms and off for 2000 ms.

Connected:



Blue led on for 1000 ms and off for 2000 ms.

Power On/Off:



Blue led on for 2000 ms and off for 200 ms

Pairing:



Blue led on for 100 ms and then red led on for 100 ms

1.2.2 Buttons

Buttons I/O	PIO	Stdard funct. (BEN = 0)	Alternative funct. (BEN=1)	Active	Description
BEN	8	-	-	High	Enable A2DP specific buttons
UP	9	UP	FORWARD	High	Volume up
DOWN	10	DOWN	BACKWARD	High	Volume down
MFB	11	MFB	PLAY/PAUSE	High	Multi Function Button

Most buttons has more than one functionality. The MFB, UP and DOWN buttons have dual proposes depending on the BEN input.

Standard functions (BEN = 0):

MFB: The Multi Function Button is used for a variety of different purposes. For example power on/off, pick up an incoming call, drop an active call, set the module in pairing mode, etc.

UP: The UP button is used for increasing the volume.

DOWN: The DOWN button is used for decreasing the volume.

Alternative functions (BEN=1):

PLAY/PAUSE: The PLAY/PAUSE button is used for a variety of different purposes. For example to play or pause a active A2DP stream, mute a active call, connecting to A2DP source and stopping a active audio stream.

FORWARD: The FORWARD button is used for jumping forward to next song or fast forward the current song. When the FORWARD button and the BACKWARD button are held down for >10 sec. the list of paired devices is cleared.

BACKWARD: The BACKWARD button is used for jumping back to the previous song or to fast backward the current song. When the FORWARD button and the BACKWARD button are held down for 10 sec. the list of paired devices is cleared.

1.2.3 Power hold

The POWER_HOLD (PIO[1]) output is used for controlling an external voltage regulator. When the Bluetooth module is powered up correctly; POWER_HOLD will go high in order to enable the voltage regulator. The module will automatically power down by putting POWER_HOLD low after a specified idle time (see section 3.2.3).

I/O	PIO	Active	Direction	Description
POWER_HOLD	1	High	Output	Hold power high for external power regulator

1.2.4 Battery measurement

The BAT (AIO[0]) input can be used to measure external voltage levels. For more information regarding the battery commands see section 3.2.5.

I/O	AIO	Direction	Description
MEASURE_BAT	0	Input	Measure battery voltage (0V-VCC)

1.2.5 Internal audio codec

The Bluetooth module F2M03MLA has an internal audio CODEC that is made for direct speaker drive and microphone input using a minimum number of external components (see product datasheet for detailed information). The AUX_DAC output can be used for bias voltage for the microphone. For more information about the AUX_DAC see section 3.4.2.

Audio I/O	Signal Direction	Description
Audio In-P-Left	Input (analogue)	Microphone input positive left channel
Audio In-N-Left	Input (analogue)	Microphone input negative left channel
Audio In-P-Right	Input (analogue)	Microphone input positive right channel
Audio In-N-Right	Input (analogue)	Microphone input negative right channel
AUX_DAC	Output (analogue)	Microphone bias voltage (0V-VCC)
Audio Out-P-Left	Output (analogue)	Speaker output positive left channel
Audio Out-N-Left	Output (analogue)	Speaker output negative left channel
Audio Out-P-Right	Output (analogue)	Speaker output positive right channel
Audio Out-N-Right	Output (analogue)	Speaker output negative right channel

1.2.6 External audio codec

Disabled in current version of Wireless Audio Headset firmware.

PCM I/O	Signal Direction	Description
PCM_IN	Input	Synchronous data input
PCM_OUT	Output	Synchronous data output
PCM_CLOCK	Output	Synchronous data clock
PCM_SYNC	Output	Synchronous data sync

1.2.7 Serial Peripheral Interface

This interface is used for program emulation/debug and IC test. It is also the means by which the F2M03 flash may be programmed, before any 'boot' program is loaded.

The SPI signals should be routed out from the module to be able to upgrade the firmware on the module in the future when the module is already soldered on a main PCB.

SPI I/O	Description
SPI CSB	Chip select for Synchronous Serial Interface, active low
SPI MISO	Serial Peripheral Interface data output
SPI CLK	Serial Peripheral Interface clock
SPI MOSI	Serial Peripheral Interface data input

1.2.8 Asynchronous data interface

The UART can be used for extended information, configuration settings and is also the interface to send serial data over the Bluetooth link. See section 3.2.4 for more information about the UART interface.

UART I/O	Signal Direction	F2M03 - Active	Description
TX	Output	High	UART transmit data
RX	Input	High	UART receive data
RTS	Output	Low	UART request to send
CTS	Input	Low	UART clear to send

1.3 Default settings

The WAH firmware is shipped with the following settings as factory default:

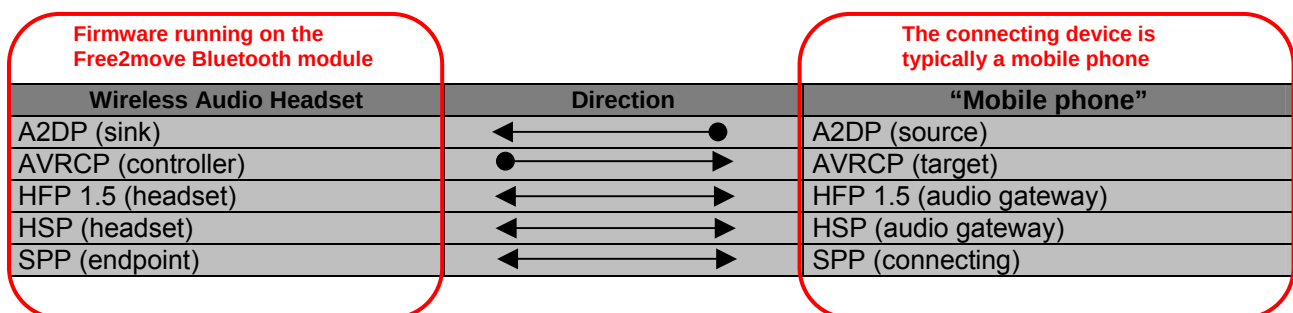
Parameter	Default Value
Security	Enabled
PIN code	"0000" in ASCII format
Local Bluetooth name	Free2move WA
Automatic reconnect	Enabled
Automatic answer	Disabled
Automatic power up	Disabled
Automatic switch off	Enabled
Automatic switch off timeout	2 min
MP3 decoding	Disabled
UART baudrate	38400 bps
UART stop bits	1
UART parity	None
Print Battery Measurements	Disabled
Battery Warning Level	Disabled
Battery Shutdown Level	Disabled
Volume HFP level	10
Volume A2DP level	10
Volume Tone level	21
Volume Mic level	8

These settings can be configured through the UART interface. For more information see section 3.2.

1.4 Supported Bluetooth profiles

The current version includes the following Bluetooth profiles:

- A2DP (sink)
- AVRCP (controller)
- HFP 1.5 (headset)
- HSP (headset)
- SPP (slave)



1.4.1 Headset and Handsfree Profile (HSP/HFP)

The Headset and Handsfree profile is used for full duplex audio connections to mobile phones and similar for telephone call purpose.

WAH supports both the Headset and the Handsfree Profile as the "Headset role". The connecting device must have either the Headset or Handsfree Profile as "Audio Gateway role". The profile used between WAH and the connecting devices depends on the supported profiles. If the WAH firmware initiates the connection it will first try to use the Handsfree profile, if this fails it will choose the Headset profile.

1.4.2 Advanced Audio Distribution Profile (A2DP)

The A2DP profile is used for receiving high quality audio data.

WAH supports A2DP sink which make it possible to receive audio streams from an A2DP source. The current A2DP decoder supports SBC and MP3 decoding. The MP3 decoding can be enabled over the UART interface (see section **3.2.8** for more information)

This software contains MP3 technology which incorporates intellectual property owned by Thomson and/or Fraunhofer Gesellschaft. Supply of this product does not convey a license under the relevant intellectual property of Thomson and/or Fraunhofer Gesellschaft nor imply any right to use this product in any finished end user or ready-to-use final product. An independent license for such use is required. For details, please visit <http://www.mp3licensing.com>.

1.4.3 Audio/Video Remote Control Profile (AVRCP)

The AVRCP profile is used for controlling the Audio stream from the streaming device.

If the remote unit supports AVRCP “target” the AVRCP profile is used for controlling the A2DP stream (E.g. play, pause and changing song)

1.4.4 Serial Port Profile (SPP)

The Serial Port Profile is used for sending and receiving serial data to the remote device.

See section **3.1.6** for more information about sending serial data over the Bluetooth link.

2 Button interface

2.1 Power up/down

2.1.1 Power up

Hold MFB for 2 sec. when WAH is off. WAH will try to connect to the last paired device until a connection or power down timeout occurs.

2.1.2 Power down

Hold MFB for >5 sec. when WAH is on.

2.1.3 Pairing

Hold MFB for >5 sec. when WAH is off. WAH will remain in pairing mode for 5 min.

2.1.4 Automatic power down

When the power down timeout occurs the WAH will automatically power down. The default timeout is 2 min.

2.2 Headset/Handsfree specific

2.2.1 Answer call

Press MFB during incoming call to answer the call.

2.2.2 Drop call

Press MFB during active call to drop the current call.

2.2.3 Increase/Decrease Volume

Press UP or DOWN in order to control the volume.

2.3 Headset specific

2.3.1 Dial last called number

Press MFB in order to dial the last called number.

2.4 Handsfree specific

2.4.1 Voice dial

Press MFB in order to do a voice dial.

2.4.2 Reject incoming call

Hold down MFB for >2 sec. during an incoming call in order to reject it.

2.4.3 Transfer active call to phone

Hold down MFB for >2 sec. during an active call in order to transfer it to the phone.

2.5 A2DP specific

2.5.1 Play

If a song is paused, press PLAY/PAUSE in order to play.

2.5.2 Pause

If a song is playing, press PLAY/PAUSE in order to pause.

2.5.3 Connect to A2DP source

Hold PLAY/PAUSE for >2 sec. in order to connect to the A2DP source.

2.5.4 Forward

Press FORWARD in order to jump to next song.

2.5.5 Backward

Press BACKWARD in order to jump to previous song.

2.5.6 Fast forward

Hold FORWARD for >800 ms in order to jump forward in active song.

2.5.7 Fast backward

Hold BACKWARD for >800 ms in order to jump backwards in active song.

2.5.8 Stop

Hold PLAY/PAUSE for >2 sec. in order to stop an active A2DP connection.

2.6 Clear paired devices and restore to default settings

Hold the buttons MFB UP and DOWN for >15 sec. in order to clear the list of paired devices and restore all settings to default.

3 UART Command Interface

The WAH firmware from V. 2.00 supports configuration through the UART interface. The firmware can be configured and extra status information can be sent from the module by using the UART interface.

Factory default settings for the UART interface are: 38400 bps, 8 data bits, 1 stop bit and no parity.

All commands sent and received over the interface are ended by a carriage return (“\r”).

If a command isn’t recognized by the firmware, it will answer with “UNKNOWN COMMAND X \n\r” where X is the command received by the module.

All commands and arguments are interpreted as ASCII data. When an argument is specified as (text) this only state that the input or output argument most probably is Alphabetical characters. When an argument is specified as (number) it states that the input or output argument is interpreted as a ASCII number given in the interval described within brackets [].

Some commands use the argument HFP. This is an argument and/or indication from either the Handsfree(HFP) or the Headset(HSP) Profile. Since WAH can only act upon one Headset/Handsfree connection they both share the same argument. The “EVENT PROFILE” command will state which Profile is in use. For more information see section **3.5.12**.

3.1 DO Commands

The DO commands is typically the commands that can be altered by using the buttons (e.g. power on and answering an incoming phone call)

All DO commands sent to the WAH will be responded with the status information. If the command is successful the WAH will respond with an OK and if the command is unsuccessful the module will respond with FAIL. Some responses will give extra status information after a comma. See example below.

Example to send the answer command:

If there is an incoming call to the phone the call can be answered by sending “DO ANSWER \r” over the UART interface. If the command was sent successful, WAH will answer with “DO ANSWER OK\n\r”. If it does not exist any incoming call, WAH will answer with “DO ANSWER FAIL, No incoming call\n\r”.

3.1.1 POWER

To power up the application using the UART interface send “DO POWER ON \r” if the WAH recognize the command it will answer with “DO POWER ON OK\n\r”.

To power down the application using the UART interface send “DO POWER OFF \r” if the WAH recognize the command it will answer with “DO POWER OFF OK\n\r”.

Command	Argument	Action
DO POWER	ON	Power up the module
	OFF	Power down module

3.1.2 PAIR

Command	Argument	Action
DO PAIR	ON	Set the module in pairing mode
	OFF	Return to normal mode

3.1.3 RESET

Command	Action
DO RESET	Soft reset the module

3.1.4 CONNECT

The CONNECT command is used to connect to the last paired/connected device. The CONNECT command cannot be used as a general command for connecting to a given Bluetooth address.

It is only possible to connect the WAH to already paired devices. The remote Bluetooth device should be responsible for setting up a new connection.

Command	Argument	Action
DO CONNECT	A2DP	Connect to last connected A2DP device
	AVRCP	Connect to last connected AVRCP device
	HFP	Connect to last connected HFP device
	SPP	Connect to last connected SPP device

3.1.5 DISCONNECT

Command	Argument	Action
DO DISCONNECT	A2DP	Disconnect from A2DP device
	AVRCP	Disconnect from AVRCP device
	HFP	Disconnect from HFP device
	SPP	Disconnect from SPP device

3.1.6 SEND

The SEND command uses the Serial Port Profile for sending argument X to the connected device.

Command	Argument	Action
DO SEND	X	Sends string X of data to the connected SPP device

3.1.7 VOL

The VOL command can be used to set the gain of the specific profile or just increment/decrement the volume of the current Profile in use.

Command	Argument 1	Argument 2	Action
DO VOL	+		Increase volume
	-		Decrease volume
	MG	(number)[0-15]	Set microphone gain
	SHG	(number)[0-15]	Set HFP gain
	SAG	(number)[0-15]	Set A2DP gain

3.1.8 ANSWER

Command	Action
DO ANSWER	Answer incoming call

3.1.9 REJECT

Command	Action
DO REJECT	Reject incoming call

3.1.10 HANGUP

Command	Action
DO HANGUP	Hang up current call

3.1.11 CALL

Command	Argument	Action
DO CALL	LAST	Dial the last called number
	VOICE	Do a voice dial call

3.1.12 TRANSFER

Command	Action
DO TRANSFER	Transfers the call between the HAW and the connected device

3.1.13 PLAYPAUSE

Command	Action
DO PLAYPAUSE	Send a Play or Pause event to the connected AVRCP device

3.1.14 STOP

Command	Action
DO STOP	Send a Stop event to the connected AVRCP device

3.1.15 FORWARD

Command	Action
DO FORWARD	Send a Forward event to the connected AVRCP device (next song)

3.1.16 BACKWARD

Command	Action
DO BACKWARD	Send a Backward event to the connected AVRCP device (previous song)

3.2 GET and SET commands

The commands presented below are readable through the GET command and are writeable through the SET command. When commands have more than one argument, a comma separates each argument.

Example to SET the power command:

This example shows how you can configure the WAH to auto start up and auto shutdown after 20 sec in idle mode.

The power configuration can be set by sending "SET POWER 1, 20\r" over the UART interface. If the command was sent successful, WAH will answer with "SET POWER OK\r\n\r".

3.2.1 NAME

This command is used to set or read the name of the WAH. The argument must be 1-32 characters.

Command	Argument 1, Name
[GET,SET] NAME	(text)

3.2.2 PIN

This command is used to set or read the pin code of the WAH. The argument must be 1-16 characters.

Command	Argument 1, Pin code
[GET,SET] PIN	(text, number)

3.2.3 POWER

This command is used to set or read the power configuration of the WAH.

Command	Argument 1, Auto start up	Argument 2, Auto shutdown
[GET,SET] POWER	(number)[0,1] (on, off)	(number)[0-65535] (seconds)

3.2.4 UART

Command	Argument 1, Baudrate	Argument 2, Stop bits	Argument 3 Parity
[GET,SET] UART	(number)[24,48,96,192,384,576,1152]	(number)[0-2]	(number)[0-2]

Argument 1, Baudrate	Baudrate [bps]
24	2400
48	4800
96	9600
192	19200
384	38400 (default)
576	57600
1152	115200

Argument 2, Stop bits	Stop bits
0	No stop bit
1	One stop bit (default)
2	Two stop bits

Argument 3, Parity	Parity
0	No parity (default)
1	Odd parity
2	Even parity

3.2.5 BATTERY

AIO[0] input of the F2M03MLA can be used for battery monitoring. Battery monitoring is disabled by default but it can be activated with the “SET BATTERY” command. Argument 1 is 1 when Battery monitoring is activated and 0 when deactivated. If battery monitoring is activated it will measure the input voltage every 30th second and print the value as an “EVENT BATTERY” indication.

The battery thresholds can be calculated from the following equation:

$$AIO = V_BAT \times 1000 \times \frac{R_{12}}{R_{11} + R_{12}}$$

AIO is the threshold value (Argument 2 and 3) and V_BAT is the desired threshold voltage in Volt.

R_{12} and R_{11} is from the Example schematic and if we use the values from the example design, the equation can be simplified to:

$$AIO = V_BAT \times 1000 \times \frac{150k}{220k + 150k} \approx V_BAT \times 405$$

Command	Argument 1, Enable values	Argument 2, Warning threshold value	Argument 3 Shutdown threshold value
[GET,SET] BATTERY	(number)[0,1]	(number)[0-65535]	(number)[0-65535]

3.2.6 AUTOFEATURES

Command	Argument 1, Auto reconnect	Argument 2, Auto answer
[GET,SET] AUTOFEATURES	(number)[0,1] (on, off)	(number)[0,1] (on, off)

3.2.7 VOLUME

Command	Argument 1, Mic. gain	Argument 2, HFP gain	Argument 3 A2DP gain	Argument 3 Tone gain
[GET,SET] VOLUME	(number)[0-15]	(number)[0-15]	(number)[0-15]	(number)[0-22]

3.2.8 ENABLEMP3

Command	Argument 1, Enable mp3
[GET,SET] ENABLEMP3	(number)[0,1]

3.3 GET only commands

The following commands are used to retrieve information from the WAH or the connected device. These commands cannot be used with the SET command.

3.3.1 ADDR

Read the local Bluetooth address.

Command	Return Argument 1, Bluetooth addr.
GET ADDR	(text) "XX:XX:XX:XX:XX:XX"

3.3.2 REMOTE

Read remote Bluetooth address or name from the current HFP(Headset/Handsfree) connection.

Command	Argument 1	Return Argument 2
GET REMOTE	ADDR	(text) "XX:XX:XX:XX:XX:XX"
	NAME	(text)

3.3.3 FIRMWARE

Read firmware name.

Command	Return Argument 1, Firmware name
GET FIRMWARE	(text)

3.3.4 SWVERSION

Read firmware version.

Command	Return Argument 1, Software version
GET SWVERSION	(text)

3.3.5 HWVERSION

Read hardware version of the Bluetooth module.

Command	Return Argument 1, Hardware version
GET HWVERSION	(text)

3.3.6 ARTICLE

Read article number of product.

Command	Return Argument 1, Article number
GET ARTICLE	(text)

3.3.7 FCC

Read FCC id of product.

Command	Return Argument 1, FCC Id
GET FCC	(text)

3.3.8 QDID

Read Bluetooth QDID of product.

Command	Return Argument 1, Bluetooth qdid
GET QDID	(text)

3.3.9 STATE

Read the current state of each Bluetooth profile.

Command	Argument 1 Profile	Return Argument 2 State id	Return Argument 2 State name
GET STATE	A2DP	(number)	(text)
	AVRCP	(number)	(text)
	HFP	(number)	(text)
	SPP	(number)	(text)

A2DP State id	A2DP State name
0	Initialising
1	Ready
2	Initiating
3	Signaling Active
4	Connected
5	Streaming

AVRCP State id	AVRCP State name
0	Initialising
1	Ready
2	Connecting
3	Connected

HFP State id	HFP State name
0	Initialising
1	Ready
2	Connecting
3	Connected
4	Outgoing Call Establish
5	Incoming Call Establish
6	Active Call

SPP State id	SPP State name
0	Initialising
1	Ready
2	Connecting
3	Connected
4	Disconnecting

3.3.10 RSSI

Read the RSSI value of the current Bluetooth connection. The value can be from -128 to 127. The RSSI values is only present if a HFP connection is established.

Command	Return Argument 1, Rssi value
GET RSSI	(number)

3.3.11 LINKQUALITY

Read the Link Quality value from the current Bluetooth connection. The link quality is a value of the current Bit Error Rate (BER). The LINKQUALITY values is only present if a HFP connection is established.

Command	Return Argument 1, Link quality value
GET LINKQUALITY	(number)

As a rule of thumbs, a link with a BER between 0 and 0.1% is workable. Trying to run a link with a BER above 1% gives poor results. The table below shows the different value representation of the BER reading.

Between 255 and 215 each digit represent 0.0025% BER. Thus:

Value	BER
255	0.0
254	0.0025%
253	0.0050%
252	0.0075%
etc., until...	
215	0.1%

Between 214 and 90 each digit represent 0.08% BER. Thus:

Value	BER
215	0.1%
214	0.18%
213	0.26%
etc., until...	
90	2.1%

Between 89 and 0 each digit represent 0.64% BER. Thus:

Value	BER
90	2.1%
89	2.74%
88	3.38%
etc., until...	
0	59.7%

3.4 SET only commands

3.4.1 DEFAULT

Command	Action
SET DEFAULT	Set all configurable settings to factory default. Removes list of paired devices

3.4.2 PIOAUXDAC

Changes the output voltage of AUX_DAC. The default value is 128 and is ~1.8V when VCC=3.3V. The output voltage is depending on VCC voltage level.

Command	Argument 1	Action
SET PIOAUXDAC	(number)[0-255]	Output value of AUX_DAC output (0V-VCC)

3.5 EVENT indications

3.5.1 A2DP DECODER

Indication of which decoder is used in the current A2DP stream.

Event	Argument 1, Used decoder
EVENT A2DP DECODER	(text)[MP3,SBC]

3.5.2 BATTERY

If “SET BATTERY” is enabled to show values, the following EVENT is received every 30 sec.

Event	Argument 1, Battery value
EVENT BATTERY READING	(number)

If the warning or/and shutdown threshold values are enabled by the “SET BATTERY” command and the threshold value is over the actual input value the following events will be received.

Event	Argument 1, Battery message	Argument 2, Comment
EVENT BATTERY	DEAD (shutdown threshold)	(text)
	LOW (warning threshold)	

3.5.3 STATE

Every time the state of the WAH is changed the following event is received. Look at section 3.3.9 for more information about the different State id:s.

Event	Argument 1 Profile	Argument 2 State id	Return Argument 2 State name
EVENT STATE	A2DP	(number)	(text)
	AVRCP	(number)	(text)
	HFP	(number)	(text)
	SPP	(number)	(text)

3.5.4 READY

The READY event is received when the Bluetooth module has started up properly.

Event	Argument 2, Comment
EVENT READY	(text)

3.5.5 POWER

Event indicating if power up/down has occurred.

Event	Argument 1	Argument 2, Comment
EVENT POWER	ON	
	OFF	(text)

3.5.6 PAIR

Event indicating pairing mode.

Event	Argument 1
EVENT PAIR	ON
	OFF

3.5.7 VOL

Event indicating changes in gain levels.

Event	Argument 1 Gain type	Argument 2 Gain	Return Argument 2 Comment
EVENT VOL	MG	(number)	(text)
	SHG	(number)	(text)
	SAG	(number)	(text)

Argument 1 Gain type	Description
MG	Microphone Gain
SHG	Speaker Headset Gain
SAG	Speaker A2DP Gain

3.5.8 CALLER ID

If caller id is enabled by the remote device the following indication is received.

Event	Argument 1	Return Argument 2 Comment
EVENT CALLER ID	ENABLED	
	DISABLED	(text)

If caller id is enabled the following two indications will be received upon an incoming call.

Event	Argument 1 Phone number
EVENT CALLER ID	(Number)

Event	Argument 1	Return Argument 2 Name
EVENT CALLER ID	NAME	(text)

3.5.9 REMOTE

If the remote device is connected with the Handsfree profile the following indications will be received upon changes in telephone signal strength and battery charge levels.

Event	Argument 1	Argument 2 Gain
EVENT REMOTE	SIGNAL STRENGTH	(number)[0-5]
	BATTERY CHARGE	(number)[0-5]

3.5.10 RECEIVE DATA

If the SPP is connected and the remote device sends data to WAH, the following indication will be received.

Event	Argument 1 Data
EVENT RECEIVE DATA	(data)

3.5.11 RING

If an incoming call is received, the following indication will be received until the call is answered or rejected.

Event
EVENT RING

3.5.12 PROFILE

Since both Handsfree and Headset Profile shares the use of argument HFP in all commands implemented in WAH "EVENT PROFILE" is used to distinguish which Profile is in use. This event is received upon every new Headset or Handsfree connection.

Event	Argument 1	Argument 2 Comment
EVENT PROFILE	HFP	(text)
	HSP	(text)

4 Getting started

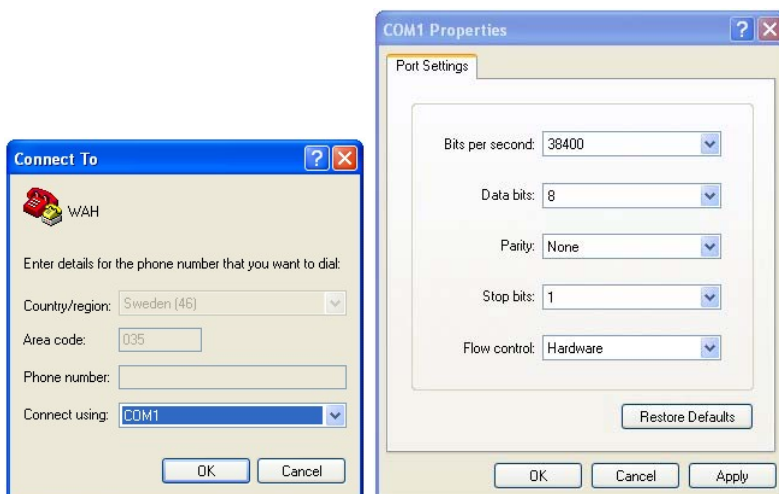
The Wireless Audio Headset (WAH) firmware can easily be tested on a PC with a serial port terminal application such as *Hyper Terminal* in Windows.

4.1 Configure Hyper Terminal

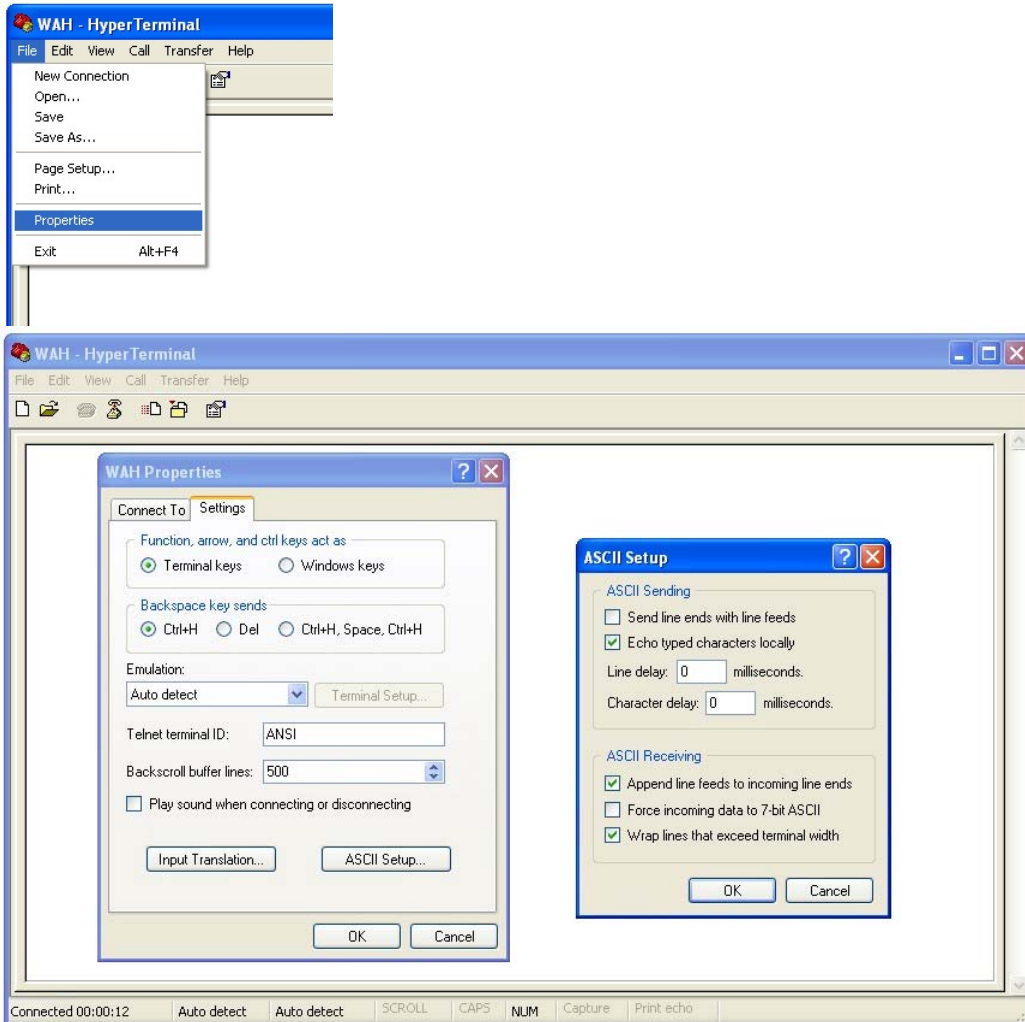
Start *Hyper Terminal* and create a “New Connection”.



Specify which serial port and settings to use.

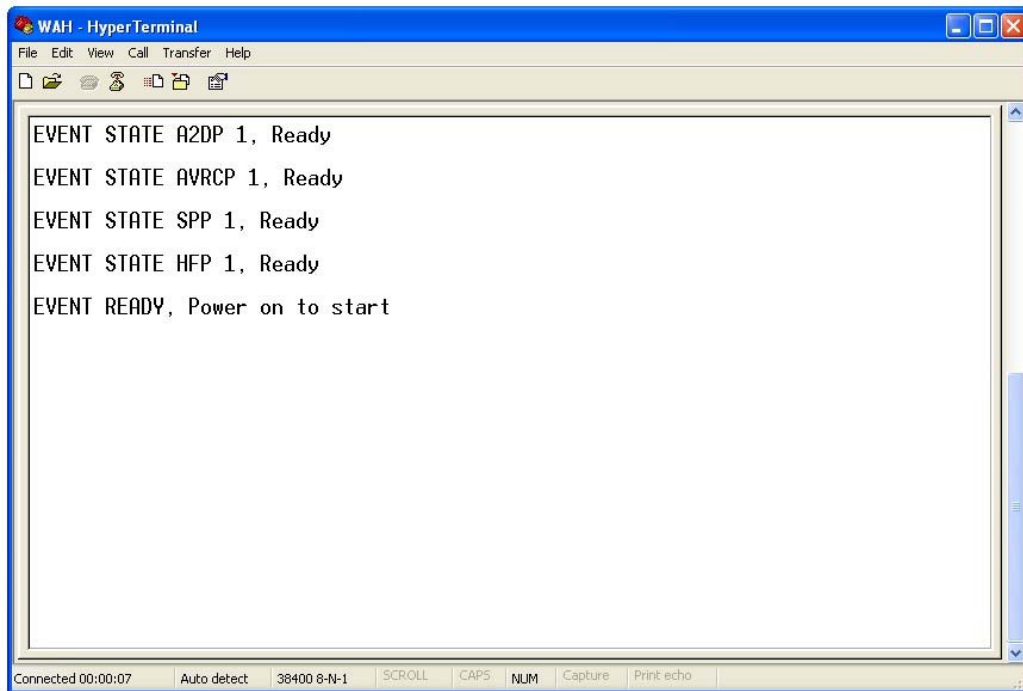


Enter *Properties* and then *ASCII Setup...* Enable *Echo typed characters locally* in order to see the locally generated text on screen.

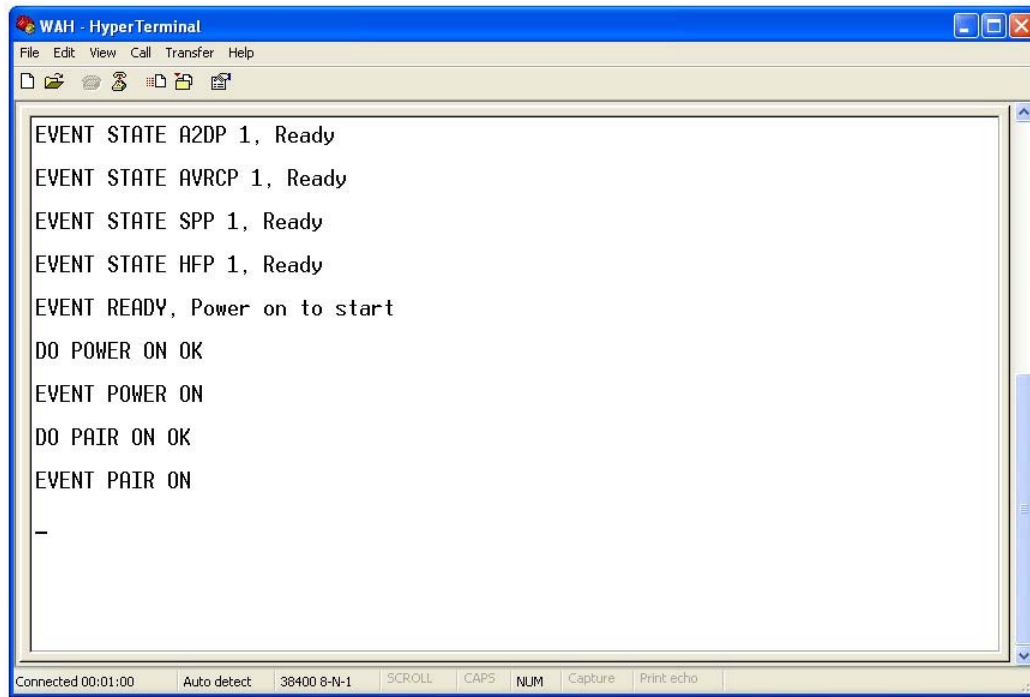


4.2 Start up the Bluetooth module and enter pairing mode

When the module is powered up the following messages will appear on the screen.



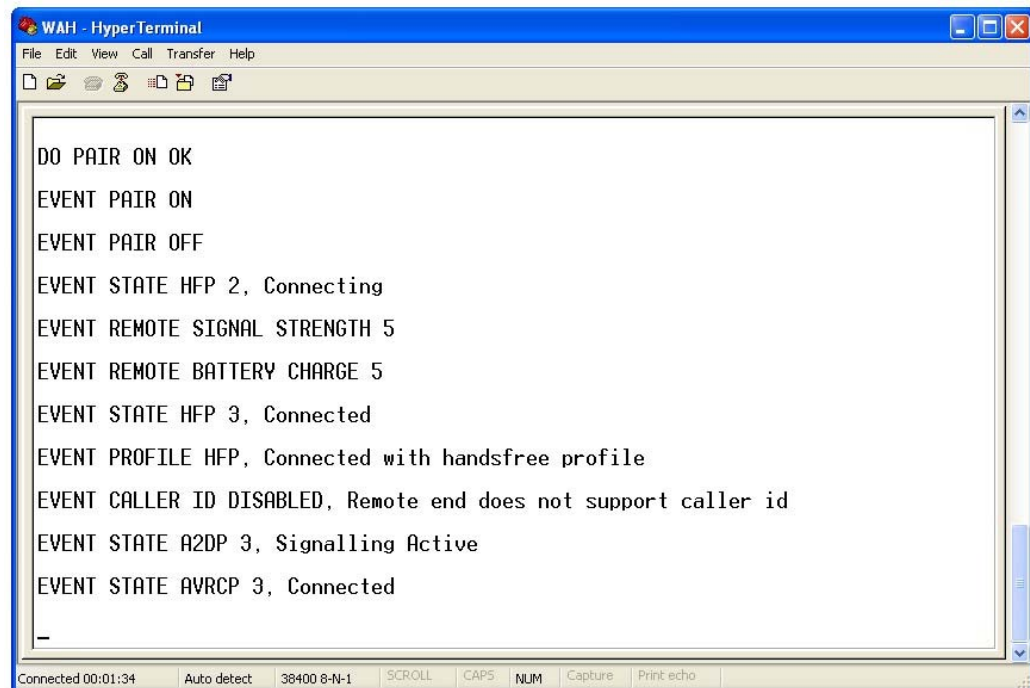
Start the application by sending “DO POWER ON \n\r”. Set the module in pairing mode with the “DO PAIR ON \n\r” command.



```
WAH - HyperTerminal
File Edit View Call Transfer Help
EVENT STATE A2DP 1, Ready
EVENT STATE AVRCP 1, Ready
EVENT STATE SPP 1, Ready
EVENT STATE HFP 1, Ready
EVENT READY, Power on to start
DO POWER ON OK
EVENT POWER ON
DO PAIR ON OK
EVENT PAIR ON
-
```

Connected 00:01:00 | Auto detect | 38400 8-N-1 | SCROLL | CAPS | NUM | Capture | Print echo

Now connect and pair the WAH from the remote Bluetooth device and the following messages will appear on the screen if your mobile phone supports the Handsfree, AVRCP and A2DP Bluetooth Profiles.

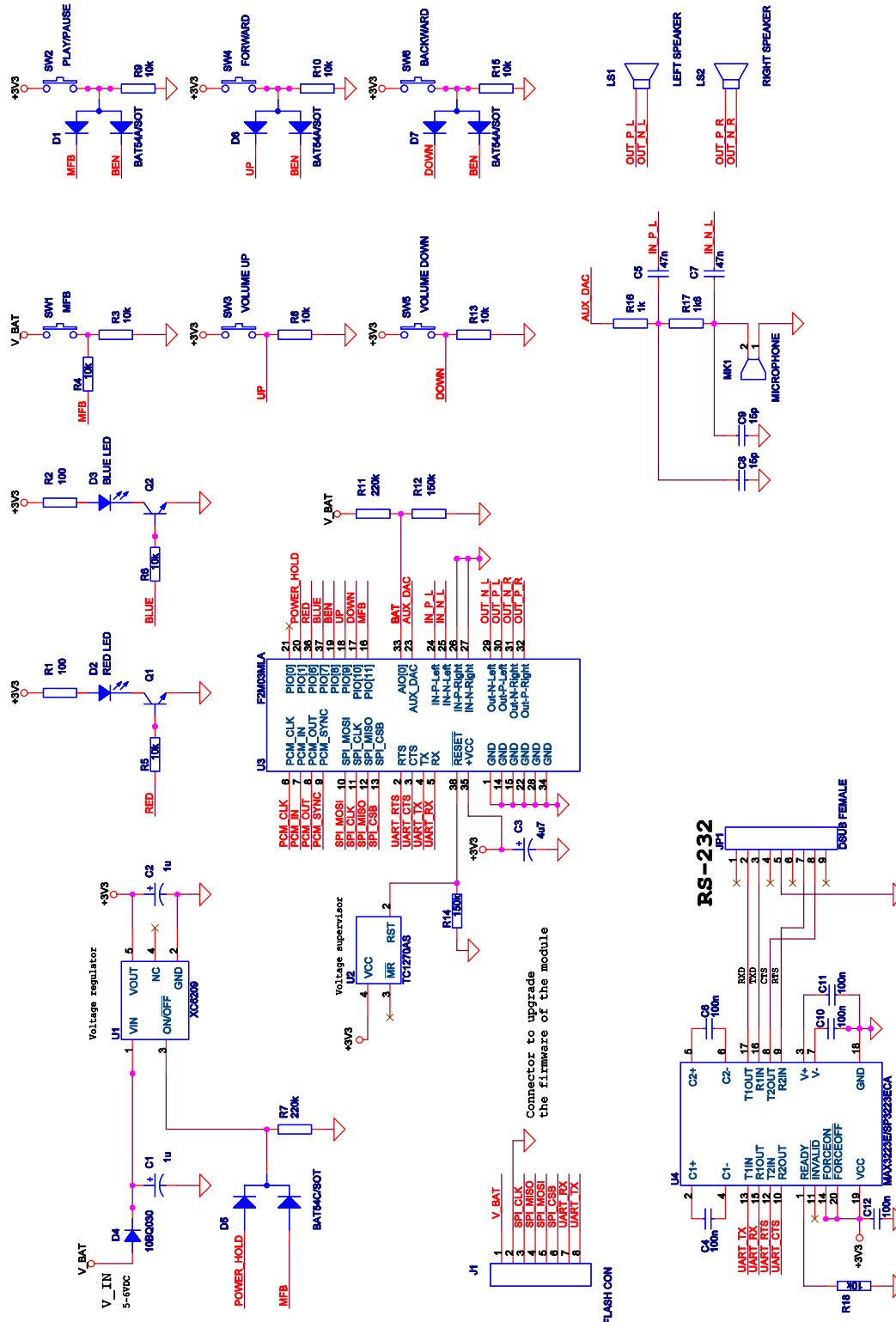


```
WAH - HyperTerminal
File Edit View Call Transfer Help
DO PAIR ON OK
EVENT PAIR ON
EVENT PAIR OFF
EVENT STATE HFP 2, Connecting
EVENT REMOTE SIGNAL STRENGTH 5
EVENT REMOTE BATTERY CHARGE 5
EVENT STATE HFP 3, Connected
EVENT PROFILE HFP, Connected with handsfree profile
EVENT CALLER ID DISABLED, Remote end does not support caller id
EVENT STATE A2DP 3, Signalling Active
EVENT STATE AVRCP 3, Connected
-
```

Connected 00:01:34 | Auto detect | 38400 8-N-1 | SCROLL | CAPS | NUM | Capture | Print echo

5 Example Hardware

5.1 Schematic



5.2 Microphone input

The audio-input is intended for use from $1\mu\text{V}@94\text{dB SPL}$ to about $10\mu\text{V}@94\text{dB SPL}$. With biasing-resistors R16 and R17 equal to $1\text{k}\Omega$, this requires microphones with sensitivity between about -40dBV/Pa and -60dBV/Pa . The microphone for each channel should be biased as shown in the schematic.

The input impedance at AUDIO_IN_N_LEFT, AUDIO_IN_P_LEFT, AUDIO_IN_N_RIGHT and AUDIO_IN_P_RIGHT is typically $20\text{k}\Omega$. C5 and C7 should be 47nF . R17 sets the microphone load impedance and is normally in a range of 1 to 2 $\text{k}\Omega$. R16, C8 and C9 improve the supply rejection by decoupling supply noise from the microphone. Values should be selected as required in the specification. R16 may be connected to a convenient supply (typically 1.8V delivered by AUX_DAC output).

6 Firmware revision history

6.1 V. 2.00

New features in this version:

- SPP profile
- UART command interface

6.2 DRAFT V. 1.00

First version.

Contact information

For support questions please contact your local dealer

For other purposes use: info@free2move.se

Website: www.free2move.se

Local dealer/distributor

A large, empty rectangular box with a dashed border, intended for the user to write the name of their local dealer or distributor.

The information given herein includes text, drawings, illustrations and schematics that are believed to be reliable. However, Free2move makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. Free2move will in no case be liable for any incidental, indirect or consequential damages arising out of sale, resale, use or misuse of the product. Users of Free2move products should make their own evaluation to determine the suitability of each such product for the specific application.