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Site Monitoring Systems by Comlab

FMBM-01/-02 AM-FM Broadcast Monitor	**Version 2.1** September 2015
Reference Manual	**MAN1024**

Davicom AM-FM Broadcast Monitor

Reference Manual

www.davicom.com

Man 1024

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1 General Information

1.1 Limited Warranty

Comlab Telecommunications Inc. warrants all its products to be free from manufacturing defects for a period of two years after delivery to the original purchaser. All warranty returns must be authorized by a Comlab representative.

The limitation of liability under this warranty shall be to repair or replace any part of the product, which proves to be defective after inspection by Comlab. This warranty shall not apply to any Comlab product that has been disassembled, modified, physically or electrically damaged, inappropriately installed, or any product that has been subjected to conditions exceeding the applicable specifications or ratings.

Comlab assumes no liability for any direct, indirect or consequential injury, loss, economic loss, damage, fines or penalties incurred through the use, or inability to use Comlab products.

Comlab products are not intended for use in medical, life-saving, life-sustaining or critical applications. Comlab customers using or selling Comlab products for use in such applications do so at their own risk and agree to fully indemnify Comlab for any damages resulting from such improper use or sale.

Comlab reserves the right to make design changes to its products without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of obligation and liability assumed by Comlab with respect to its products. Comlab neither makes nor authorizes any person or company to make any other guarantee or warranty concerning its products.

1.2 Safety

The Davicom FMBM should be installed by qualified technical personnel only. Installation of this device by an unqualified person could result in hazardous conditions to the installer or other personnel, and/or damage the FMBM or other equipment. Ensure that proper safety precautions have been taken before installing this FMBM and any associated equipment.

The FMBM is designed to meet standard safety requirements, and it is extremely important that it not be modified in any way. Modification of this equipment will void the warranty and could pose a hazard to the user of this equipment or to maintenance personnel. Service of the FMBM should be performed by qualified technical personnel who are familiar with the unit. Note that the Davicom FMBM is designed for indoor use in a dry location, Installation and operation in other locations could be hazardous.

Depending on your installation, the FMBM may contain HIGH VOLTAGES. Exercise caution when working in and around the unit if it is connected to your site wiring.

1.3 Regulatory Compliance

FCC (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Comlab may void the user's authority, as granted by the FCC, to operate this device and should not be made.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.

2   Introduction

Davicom's AM/FM Broadcast Monitor (FMBM) is designed to be used as a receiver for on-site and off-site monitoring of broadcast transmitters. It offers a large number of advanced features in a compact, low-cost package. Remotely controllable through Davicom's line of intelligent site monitoring systems, the FMBM can also be manually configured and operated without a Davicom unit.

The FMBM offers the following features:
- Synthesized tuning
- Non-volatile configuration storage
- On-site monitoring of transmitter power
- Off-air monitoring of receive signal strength
- FM deviation measurement and alarms
- Multiplex Input/Output (model -02 only)
- Selectable pre-emphasis on analog and digital audio outputs (model -02 only)
- AES digital audio output option (model -02 only)
- Carrier frequency measurement and alarms
- RDS/RBDS decoding
- Balanced audio output on back panel and headphone output on front
- Alarm contacts for:
    - stereo absence
    - high deviation
    - low deviation
    - low power
    - carrier frequency drift

- All alarm levels are settable by the user, locally or remotely
- Full remote control and monitoring through any Davicom unit via the USB interface
- EMI / RFI Shielded.

Designed for full and easy integration into the Davicom's powerful control and monitoring structure, the FMBM gives you the benefit of remotely monitoring the key RF parameters of your AM or FM transmitter to ensure regulatory compliance.

2.1 Specifications

AM Band	Tuning range	520-1710 kHz
	Tuning step	1 kHz, 10 kHz (selectable)
FM Band	Tuning range	88-108MHz
	Tuning step	50, 100, 200 kHz (selectable)
	Program de-emphasis	50 or 75 uS (selectable, internal jumper)
Low-level (Antenna) input	Connector	F Type
	Input range	-70 to -33 dBm, Absolute Maximum: +3 dBm (2mW)
High-level input	Connector	BNC
	Input range	-16 to +20 dBm, Absolute Maximum: +26dBm (400mW)
Multiplex Input/Output (model -02 only)	Connector	BNC (Menu selectable Input or Output Mode)
	MPX IN	MPX Input level adjustable from rear panel
	MPX OUT	MPX Output level set to 3Vpp
Carrier frequency drift measurement (FM band only)	Accuracy	± 0.3ppm for a temperature range of 0 to 50°C
	Resolution	100Hz
RDS/RBDS decoder	Type	PS, PTY, RT
Analog audio outputs	Type	Balanced
	Output impedance	600Ω
	Connector	Pluggable screw terminal
	Level	Preset to +8dBu
Digital audio output (model -02 only)	Level	Preset to -14dBFS at 100% modulation
Headphone output	Load impedance	> 8Ω
	Connector	3.5mm (standard stereo)
FM deviation monitor	Connector	Pluggable screw terminal
	Output impedance	600Ω
	Level	0 to 7Vdc, 33 mV/kHz, 75kHz set for 2.5V out
RF power monitor	Connector	Pluggable screw terminal
	Output impedance	600Ω
	Level	0 to 7Vdc (adjustable), 0.5 V/dB
Peak Detector (model -02 only)	Integration time	1 ms, 2.5 ms and 5 ms (selectable, internal jumpers)
Alarm relays. Normally open, isolated contacts that can be individually set to normally closed by internal jumpers	Absolute maximum rating	0.6A @ 125Vac, 0.6A @ 110Vdc, 2A @ 30Vdc
	Connector	Pluggable screw terminal
	Alarm functions	Low power
		Frequency drift
		High deviation
		Low deviation
		Stereo absence
USB interface	Function	Allows remote control and continuous alarm monitoring through compatible Davicom units
		Also used for firmware upgrades
Software remote control	Through Davicom Unit	Frequency Band
		FM peak-deviation limit
		FM deviation peaks-per-minute count
		FM low-deviation limit
		FM low-deviation timeout
		FM frequency-drift limit
		FM RF alignment
		Low-power limit
		AM low-modulation limit
		AM low-modulation timeout
Manual control	Via front panel pushbuttons	Same functions as software remote control above plus:
		RF input selection
		Headphone volume adjustment
		Power reference level
Power Supply	Voltage, Max Current	12 Vdc, 500 mA with all alarm relays on
Dimensions & Weight		1 RU, half width, 1.0 kg (2.2 lbs)

Table 1. Specifications

3 Description, Installation & Connections

3.1 Hardware

3.1.1 Front panel

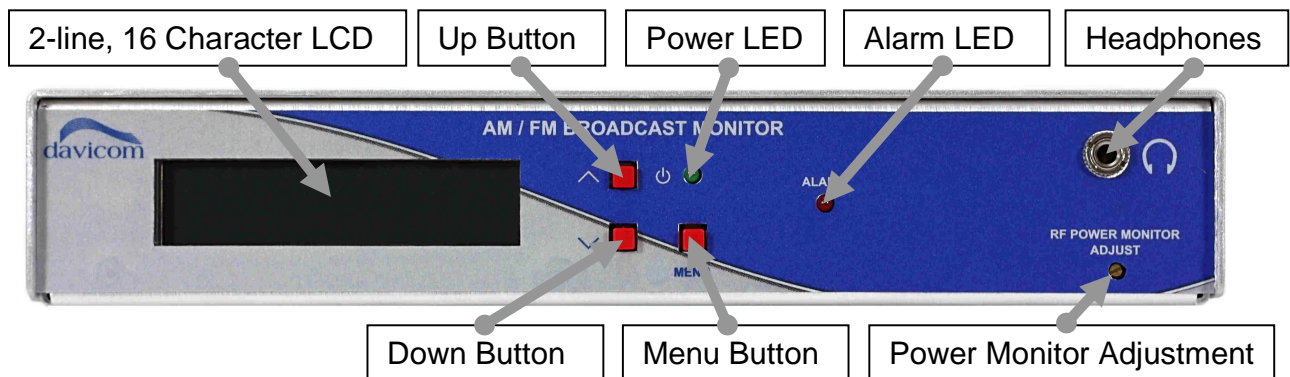| 2-line, 16 Character LCD | Up Button | Power LED | Alarm LED | Headphones |

| Down Button | Menu Button | Power Monitor Adjustment |

Figure 1. Front Panel

- 2-Line, 16 Character LCD: Backlit display shows current readings and displays menu settings.
- Up Button ∧: Increases headphone volume in Default mode and scrolls forward through configuration menu in Menu mode.
- Down Button ∨: Decreases headphone volume in Default mode and scrolls backward through configuration menu in Menu mode.
- Power LED: Indicates that unit is powered-up and operational.
- Menu Button: Shifts to Menu mode when in Default mode and selects menu item when in Menu mode.
- Alarm LED: Shows aggregate status of all alarms in FMBM.
- Power Monitor Calibration: 10-turn potentiometer, allows calibration of back-panel RF-Level DC output. See Section 4.4.7.
- Headphone Jack: 3.5 mm jack for standard stereo headphones.

3.1.2 Back panel & screw-terminal pinout

The FMBM's back panel has plug-in screw terminal connectors for the alarm relay outputs, the RF-Level and FM Deviation voltage outputs and for the balanced audio outputs. It also has the input connectors for the Antenna and High-Level RF inputs as well as the USB and 12Vdc power connectors. Model -02 has a multiplex input/output connector and an **optional** AES digital output.
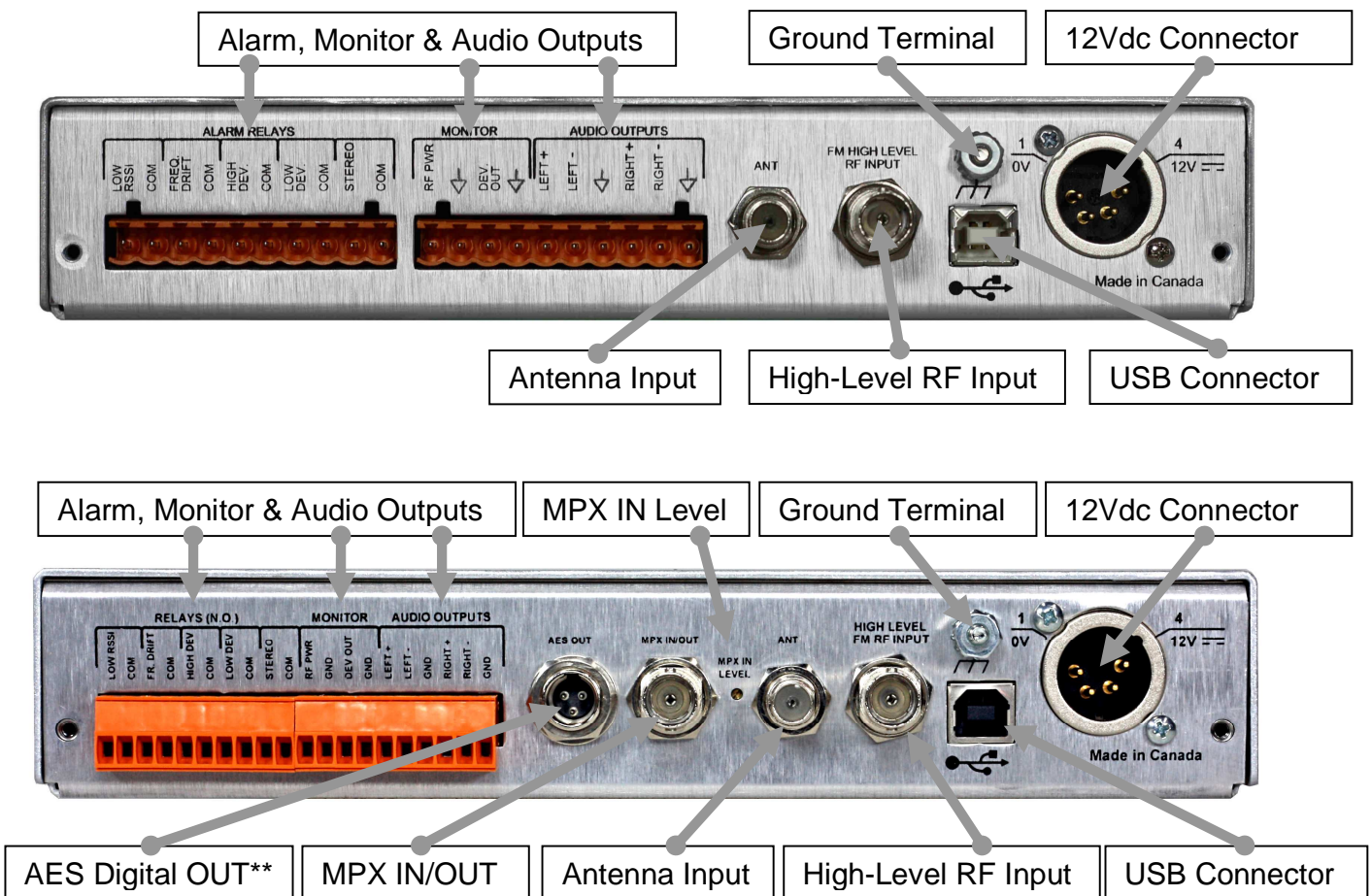

Figure 2. Back panel of FMBM-01 (Top) and FMBM-02 (Bottom)

- Alarm, Monitor & Audio Outputs (see Figure 3 for details)
- Antenna Input*: Type F connector for low-level RF input from 75Ω antenna.
- Ground Terminal: Chassis ground lug.
- High-Level RF Input: Input for use with on-site directional couplers or other signal sampling devices that allow the FMBM to measure and monitor transmitter levels. Note that when using the high level input, nothing must be left connected to the low level (antenna) input and vice-versa because this could cause improper calibration. The corresponding RF Input selection must be made in the operating Menu.

- 12Vdc Power Connector: Davicom standard XLR power connector. The corresponding female XLR connector is supplied with the FMBM's accessories.
- USB Communications (Type B) Connector: Connector for interface to Davicom units or to a PC.
- AES Digital Output** (Mini XLR connector, Model -02 only): **optional** AES digital output with jumper selectable rates of 44.1 kHz, 48 kHz, 88.2 kHz and 96 kHz. The connector pinout is given below:
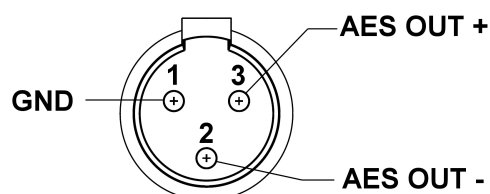
The recommended Mini XLR female connector for the AES Digital Output is a TA3FSH from Switchcraft Inc. This connector is not provided with the unit. See Appendix B for AES digital output option installation instructions.

- MPX IN/OUT (BNC connector, Model -02 only): multiplex input/output (selectable from the on-screen menu). Can accept more than 1Vpp in input mode and provides up to 3Vpp in output mode.
- MPX IN Level (Model -02 only): MPX In level adjust.

* *Attention: To ensure correct operation, make sure the antenna is not located close to sources of RF interference.*

** *The option must be installed to have digital AES audio signals present on the rear panel mini XLR connector. The AES digital output option can be installed by the user at any time after the initial purchase (Ordering number: FM-AES)*
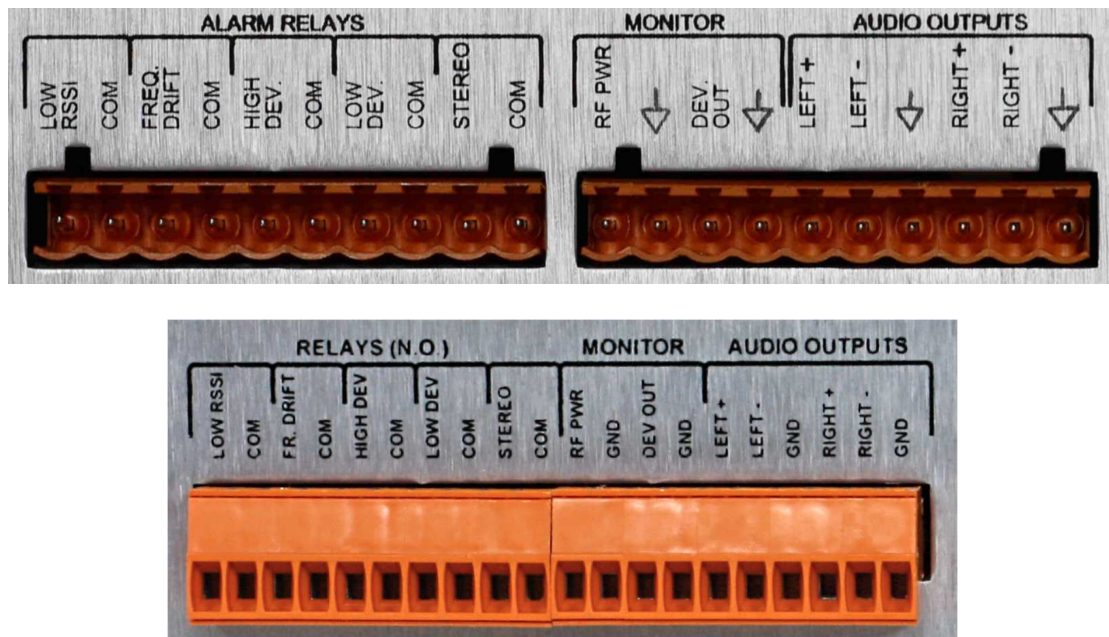
Figure 3. Alarm Relay, Monitor and Analog Audio output pinouts (Model -01: Top, Model -02: Bottom)

- Alarm Relay Outputs: The alarm relays are factory configured as normally open (NO), but can be changed to normally closed (NC) by setting internal jumpers. See Section 4.4.2 for details on setting these jumpers.
- RF PWR Monitor Output: This output produces a voltage that is proportional to the RF Power level at 0.5V/dB. Its level can be adjusted via the Power Monitor Calibration Menu item. See Section 4.4.7. **NOTE: If the peak deviation exceeds 100 kHz, the RF PWR Monitor Output may be affected.**
- DEV. OUT (Modulation) Monitor Output: This output produces a voltage that is proportional to the FM Modulation (Deviation) at 33mV/kHz. It is factory set to produce 2.5V for 75 kHz of deviation.
- Audio Outputs: Balanced audio outputs for Left and Right audio signals. Default level is +8dBu and is adjustable from 0 to +10dBu through the Audio Level Menu item. Adjusting the analog audio level will also adjust the digital audio level.

3.1.3 Cables, connections and accessories

Standard accessories include a USB cable, a 4-pin female XLR connector for 12Vdc power (+12V is on Pin 4 and Ground is on Pin 1) and plug-in screw-terminals for the Alarm Relay, Monitoring and Audio outputs.

3.1.4 Power supply

The FMBM operates from any standard 12Vdc Power Supply, such as the Davicom ILPS5012N, that can source up to 1A.

3.2 Software

The included CD contains the USB driver for the FMBM, the firmware update software, the firmware file itself and an electronic version of this manual.

The FMBM itself requires no other special software installation. It is normally delivered with its operating firmware pre-installed.

It is however possible to update this firmware when new features or bug fixes become available. The firmware can be updated by following the procedure given in Appendix A.

4 Operation

The Davicom FMBM can be operated in three different modes.

The first mode uses the front-panel LCD and 3 control buttons. This is for stand-alone operation where the FMBM's alarm contacts are connected to external alarm monitoring status inputs.
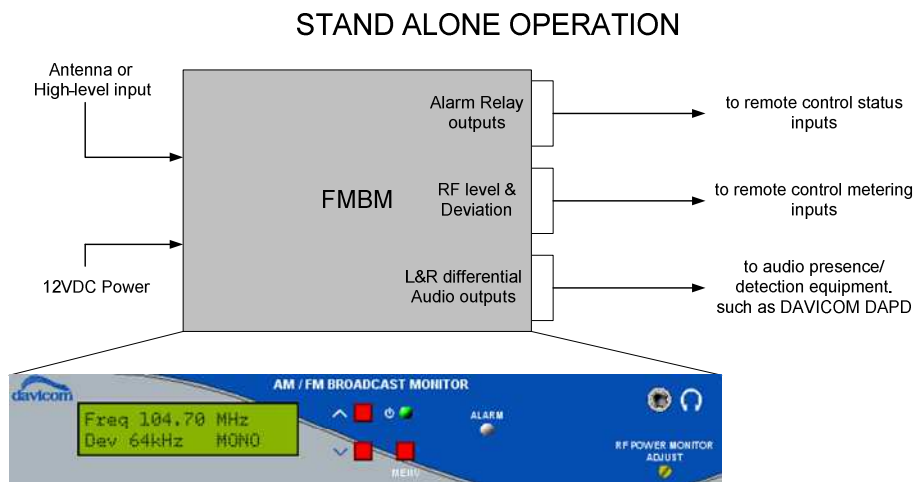

Figure 4. Stand-alone operation. Described in Section 4.1.

The second mode operates through any Davicom Intelligent Remote Control system that is running firmware version 5.42 or higher. This mode offers remote control capability and close integration with the Davicom's automation structure.
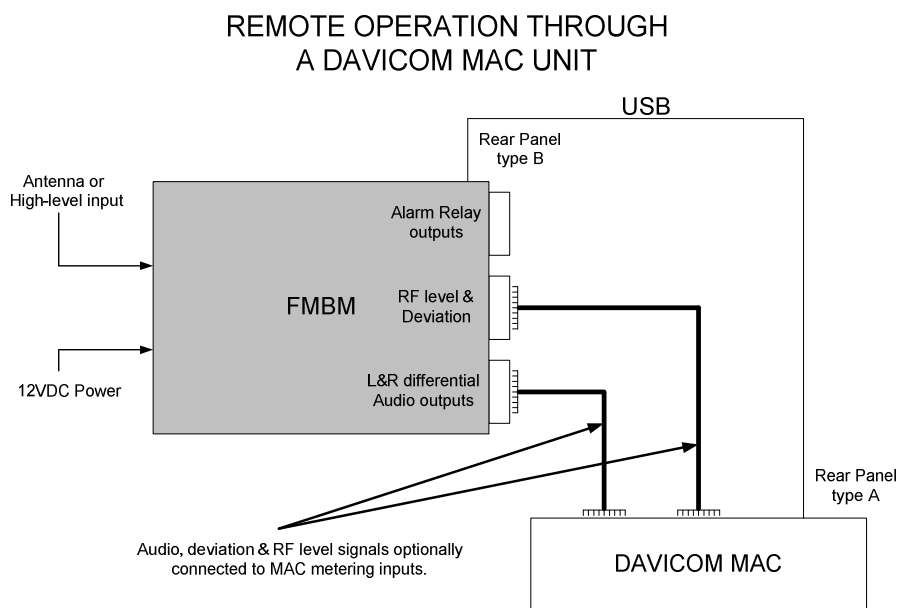
Figure 5. Operation with a Davicom unit. Described in Section 4.2.

The third mode is via the FMBM's back-panel USB connector in conjunction with a communications-terminal program such as HyperTerminal, commonly found on Windows Operating Systems. The FMBM's USB communications driver must be installed prior to operating in this mode. This driver is included on the CD supplied with the FMBM.

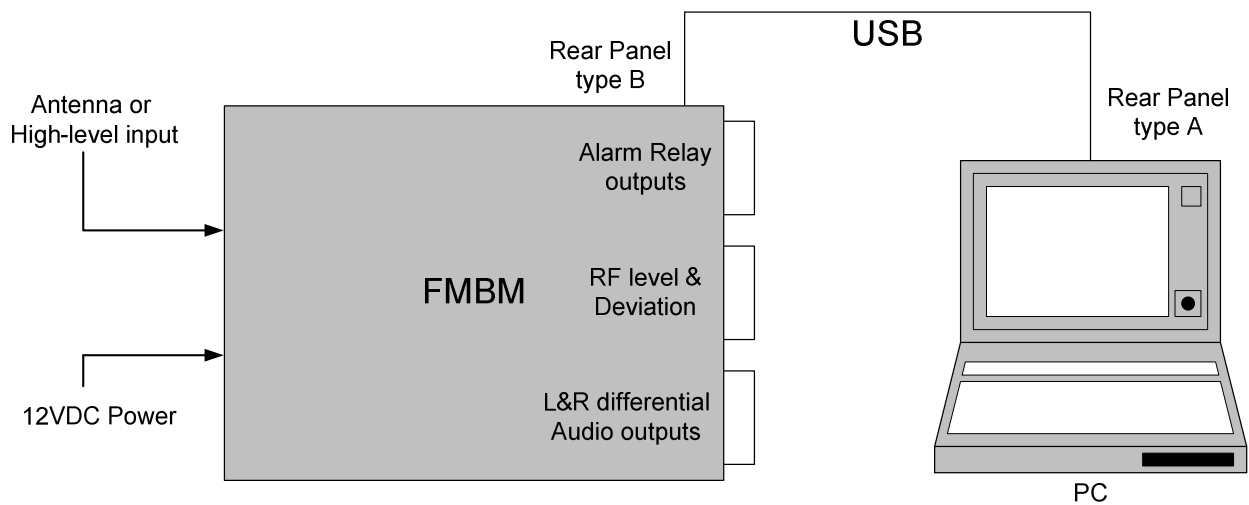## REMOTE OPERATION THROUGH
A PC & HYPERTERMINAL SOFTWARE

Figure 6. Operation with a PC. Described in Section 4.3.

4.1 Local operation with front-panel display & buttons

4.1.1 Default display

If an appropriate high-level signal or antenna is connected to the unit and it is powered from a 12 Vdc power supply, the FMBM will automatically start displaying the receive frequency and modulation level, alternating between the frequency drift and signal strength. Display of stereo presence/absence (ST/MONO) is permanently present on the bottom right of the LCD screen.

Note that at all times when in this Default display mode, the UP and DOWN buttons control the audio output level going to the headphones.

The 2 screens below show displays that would typically appear when tuned to a monophonic station at 104.7 MHz. The display alternates between the 2 screens over an 8 second period. The shaded fields would obviously vary depending on the frequency selected and on the station's signal parameters.

```
┌────────────────────────┐   ┌────────────────────────┐
│ Freq 104.70 MHz        │   │ F Drift -0.25kHz       │
│ Dev 64kHz   MONO       │   │ RSSI -59dBm MONO       │
└────────────────────────┘   └────────────────────────┘
```

The fields indicate the selected receive **Freq**uency, the frequency **Dev**iation (FM Modulation), the presence (or absence) of a **St**ereo (**Mono**) signal, the amount of carrier **F**requency **Drift** between the received carrier frequency and the FMBM's highly-stable internal frequency reference and finally, the Receive Signal Strength Indicator (**RSSI**). If the High-Level RF input is selected, **RSSI** is replaced by **Lvl**, and the units become Volts instead of dBm.
If the AM band is selected, typical displays would be as shown below, where **Mod** is the AM Modulation index.

```
┌────────────────────────┐   ┌────────────────────────┐
│ Freq  800.0kHz         │   │ F Drift -.1kHz         │
│ Mod  100%   MONO       │   │ RSSI -68dBm MONO       │
└────────────────────────┘   └────────────────────────┘
```

When the signal source is set to MPX, these the following screen is displayed:

```
┌────────────────────────┐
│ MPX IN                 │
│ Dev  75kHz   MONO      │
└────────────────────────┘
```

4.1.2 Menu selection mode

Pressing the MENU button once will display the first menu item. Pressing the UP (or DOWN) button after the first MENU press scrolls to the next (or preceding) menu item. Pressing a second time selects that menu item and allows it to be modified by pressing the UP or DOWN buttons. The table below presents the menu items in order and their possible settings.

UP/DOWN steps	First press on MENU	Second press on MENU
1	Exit Firmware v1.x.x	
2	Band AM FM	Band AM FM ^FM
3	Tuning Step	Tuning Step ^200 kHz {or 50 kHz, 100 kHz}
4	Frequency	Frequency ^107.5 MHz
5	Alarm Display	^No Alarms {or list of active alarms}
6	RF Input	RF Input ^Antenna {or High Level}
7	MPX Mode	MPX Mode ^Input {or Output}
8	Source	Source ^Tuner {or MPX Input)
9	Audio Level	Audio Level ^+8 dBm
10	Peak Deviation* Limit	Peak Dev Limit ^75 kHz
11	Peaks/min Count	Peaks/min Count ^8
12	Low Deviation* Limit	Low Dev Limit ^0 kHz
13	Low Deviation* Timeout	Low Dev Timeout ^30
14	Power Monitor Calibration	Pwr Mon Cal ^Ref Lvl = {or Set New Level}
15	Low Power Limit	Low Power Limit ^-3 dBm
16	Frequency Drift Limit	Freq Drift Limit ^1.0 kHz
17	Stereo Alarm Setting	Stereo Alarm ^Disabled
18	RDS Data	{Program Station} {Program Type} {Radio Text}
19	RF Alignment	RF Alignment ^ 62 RSSI: -64dBm
20	Firmware Upgrade	Firmware V 1.4 ^Cancel {or Update}
21	Exit Firmware v1.x.x	

Table 2. Menu items and description

Note that on the AM band, the term Deviation is replaced by Modulation

1- **Exit** exits the Menu selection mode and returns to the default display. Note that an Exit exists at both the very beginning and very end of the Menu Selection mode. Firmware version is also shown in the Exit screen.

2- **Band AM-FM** allows selection between the AM and FM broadcast bands. Note that an appropriate antenna or high-level signal must be connected to the rear-panel connectors.

3- **Tuning Step** allows selection between steps of 50, 100 or 200 kHz when tuning across the FM broadcast band. In AM Mode, the steps are 1 and 10 kHz. Note that certain settings can produce difficult reception conditions. For example, if starting at 104.2 MHz and selecting 200 kHz steps, one could never actually select actual operating frequencies as used in North America (104.1, 104.3, 104.5 …).

4- **Frequency** is for the actual operating frequency of the receiver. Operating frequency covers 88 to 108 MHz in FM mode and 520 to 1710 kHz in AM mode. Note that the receive frequency doesn't actually become active until the MENU button has been pressed to exit the selection mode.

5- **Alarm Display** shows a summary of the alarms that are active in the unit.

6- **RF Input** selects internal calibration and settings to account for the 51dB attenuator that is in series with the high-level input. Both the high-level and low-level (antenna) inputs are connected together through the 51dB attenuator. <u>Therefore, only one input must be connected at a time for readings to be accurately measured.</u>

7- **MPX Mode** selects the MPX connector as an Input or an Output.

8- **Source** selects the signal source: Tuner (Antenna) or MPX (MPX connector).

9- **Audio Level** sets the audio level for the rear-panel audio outputs and is adjustable from 0 to +10 dBm referenced to 600 Ω (0 to +10 dBu). This menu also sets the audio level of the digital AES output on the rear panel. When the audio level is set to +8 dBm, the audio level on the digital AES output is -14 dBFS.

10- **Peak Deviation Limit** sets the threshold above which the deviation peak counter will increment. It is adjustable from 1 to 150 kHz.

11- **Peaks/min Count** sets the number of counts in the preceding minute above which the High Deviation Alarm will become active. The count threshold can be set from 1 to 9 counts per minute. When the "OFF" mode is selected, the alarm will be active each time the deviation exceeds the limit set in step 10, and it will toggle normal when the deviation falls back below the limit.

12- **Low Deviation Limit** sets the level below which the Low Deviation Timeout timer starts. It is adjustable from 0 to 79 kHz.

13- **Low Deviation Timeout** sets the number of seconds during which the deviation must be continuously below the Low Deviation Limit for a Low Deviation Alarm to become active.

14- **Power Monitor Calibration** operates in 2 different modes, depending on which RF Input is selected (Antenna or High Level in Menu step 6). If Antenna input mode was selected, pressing the MENU button here in Menu step 14, sets a new reference level that is used by the FMBM as the normal receive signal level. See Menu step 15 for setting the alarm level that will be x dB below this normal level.

   If High-level input mode was selected in Menu item 6, the display shows the voltage that is output to the rear panel RF Power Monitor output. This output level is calibrated through the front-panel potentiometer (RF Power Monitor Adjust.) while injecting a known level of RF at the High-level input connector.

15- **Low Power Limit** sets the number of dB below the Power Monitor Calibration level (Menu item 14) that will set a low-power alarm. It can be set from -1 to -9 dB for High-level mode and from -1 to -99 dB for Antenna input mode.

16- **Frequency Drift Limit** sets the frequency range beyond which the FMBM will activate the frequency drift alarm. It can be set to any value between 0.5 kHz to 10 kHz and is only used on the FM band.

17- **Stereo Alarm setting** allows users to enable or disable the stereo presence alarm. This is useful for stations that normally transmit in Mono mode only. It is used on the FM band only.

18- **RDS Data** turns on the RDS data display mode that shows the {Program Station}, {Program Type} and {Radio Text} data as it is transmitted by the station. It is useable on the FM band only for stations that do transmit RDS or RDBS data. RDS data is displayed for a period of approximately 2 minutes and then the display reverts to its default mode.

19- **RF Alignment** allows fine tuning of the RF input circuit to optimize signal reception depending on antenna type and matching. Selecting this Menu item displays a tuning setting between 0 and 127 as well as an RSSI level in dBm. Press the up or down buttons to change the tuning setting in order to maximize the receive signal level. Once the highest signal is achieved, exit the Alignment mode by pressing the Menu button again.

20- **Firmware Upgrade** allows users to upgrade the FMBM's operating firmware to install new versions that could incorporate improvements, new features and corrections to bugs. Selecting this menu item, without pressing the upgrade button, also shows the current version number of the firmware installed in the unit. See Appendix A for details.

21- **Exit** exits the Menu selection mode and returns to the default display. Note that an Exit exists at both the very beginning and very end of the Menu Selection mode. Firmware version is also shown in the Exit screen.

4.2 Remote operation through Davicom unit

Using the supplied cable, connect your FMBM's USB port to the back-panel USB Port on any Davicom unit (DV-200, Mini and Micro). Note that the Davicom units MUST be running Firmware Version 5.42 or higher. If this is not the version of Firmware you have, please go to the www.davicom.com web site for support.

Power-up the FMBM and wait a few seconds for it to automatically sync with the Davicom. To connect to the FMBM through the Davicom, first connect to the unit in your usual way, start-up DavLink and connect to your unit.

Once connected, click on the Configuration icon in the DavLink Toolbar:
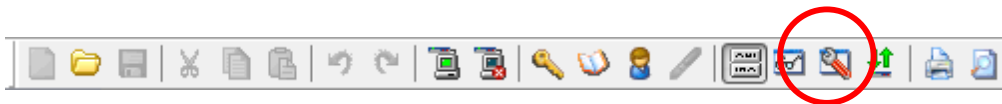
The following MAC Configuration window will appear. Select the Devices Tab
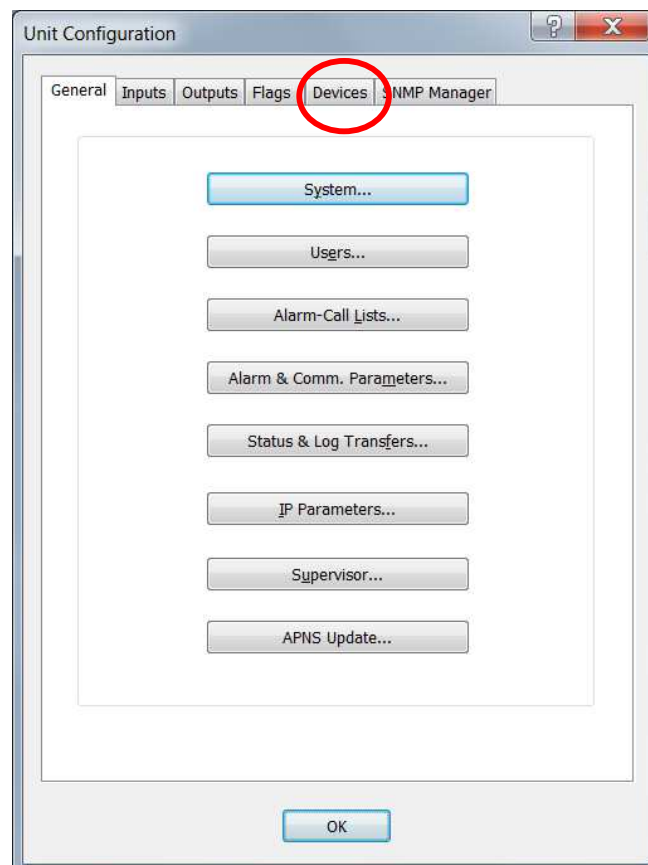
Figure 7. Configuration window.

Then click on the "Davicom Expansions" button as shown in Figure 8 below.
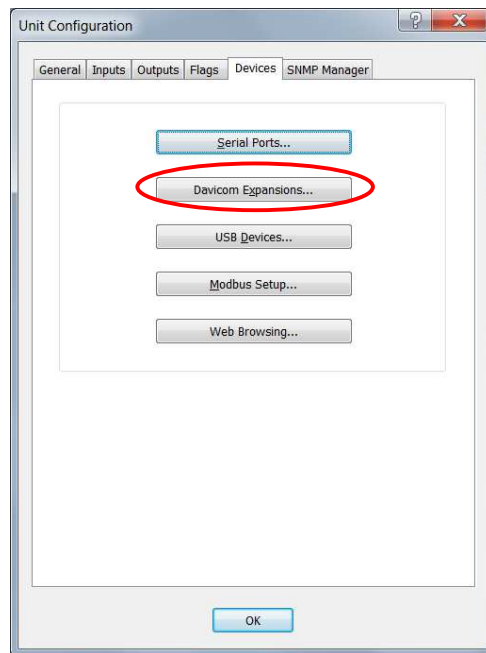
Figure 8. Devices window.

Clicking on the "Davicom Expansions" button brings-up the window of Figure 9 which allows configuration of the FMBM and all its settings:
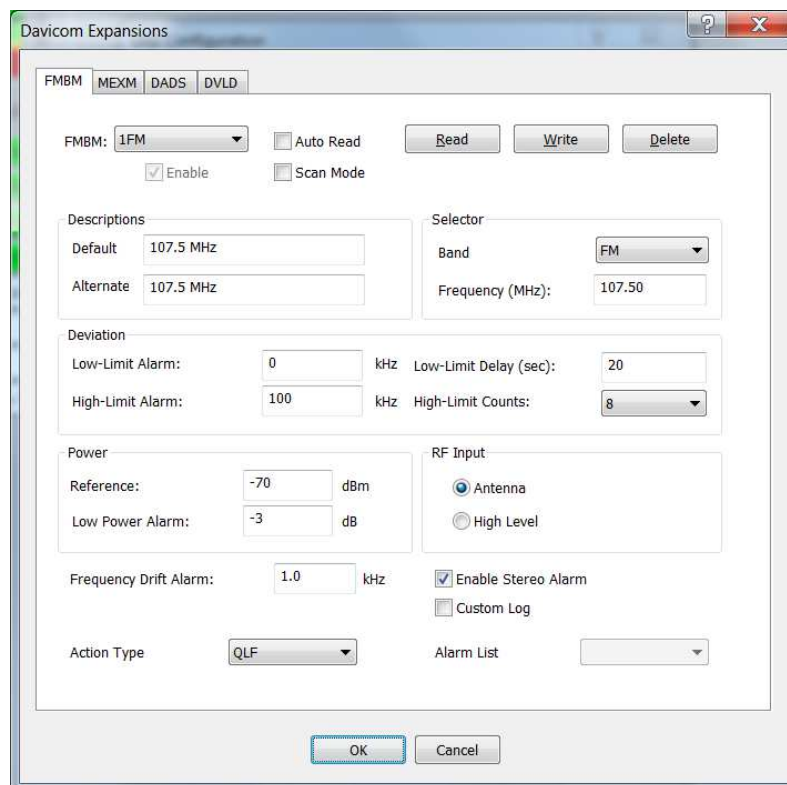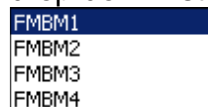

Figure 9. FMBM Configuration window.

If the FMBM was not connected or had not been detected by the Davicom, a message at the top of the window would have indicated that no FMBM was detected.

FMBM drop-down list
The Davicom can accommodate up to 4 FMBM units which are selected through the FMBM drop-down list.

FMBM1
FMBM2
FMBM3
FMBM4

Auto Read
Checking the Auto Read box ensures that the readings displayed in the AM/FM Broadcast Monitor screen are automatically refreshed every time a different unit is selected from the FMBM drop-down list. Otherwise, the Read button must be pressed to refresh the display with the latest readings from the corresponding FMBM.

Read & Write
Clicking on these buttons reads the data from the FMBM, or writes data to the FMBM following any changes made in the configuration screen. The Write operation is necessary because changes made to the settings displayed on the screen are only present in your PC and aren't transferred to the connected FMBM until the Write button is pressed.

Descriptions (Default and Alternate)
These descriptions are used to identify the FMBM whenever alarms are sent or events are logged in the Davicom unit's System Log. The Default description is in Unicode and can accommodate any compatible international alphabet. The Alternate description is in ASCII and is generally used for an English description. The Davicom automatically copies the Default into the Alternate description if the Alternate field is empty and if the language is ASCII compatible.

Band
The operating frequency band is selected with the Band drop-down list

FM
AM
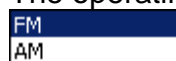
The operating frequency is set in the Frequency field. For AM, it can be set from 520 to 1710 kHz and for FM it can be set from 88 to 108 MHz. Note that the actual frequency isn't transferred to the FMBM until the Write button is pressed.

Received Signal Strength Indicator (RSSI)
The Low Limit field indicates the number of dB below the Normal Level at which the RSSI Alarm will be set. The Normal Level is set on-site with the FMBM's front-panel screen and Menu buttons. Whenever the RSSI alarm turns on, the MAC's 1FM01 flag will become true. This flag can then be used in the Davicom's logic structure with Virtual Logic Gates to perform different actions and send alarms.

Note that if more than one FMBM is connected, the MAC will create flags 2FM01 for the 2nd FMBM, 3FM01 for the 3rd FMBM and so on.

Deviation
The Deviation (Modulation) Low limit field indicates the number of kHz of deviation below which the Low Deviation alarm will be set to on. Note that this low-deviation condition must be present for a time greater than the time set in the Low Deviation Timeout field explained below. This alarm will also turn on the Davicom's 1FM03 flag which can be used with Virtual Logic Gates to perform different actions or make alarm calls.

The Deviation (Modulation) High limit field indicates the number of kHz of deviation above which the High Deviation counter will make one count (see "High Deviation Alarm counts per Minute" below).

High Deviation Alarm counts per minute
This field indicates the number of high-deviation counts per minute, above which the High Deviation Alarm and 1FM03 flag will be turned on.

Low deviation Timeout
This field indicates the time, in seconds, during which the low deviation condition must be continuously present for the Low Deviation Alarm and 1FM03 flag to be turned on.

Frequency Drift Limit
The frequency Drift Limit field indicates the number of kHz above which the Frequency Drift Alarm will be set to on. This alarm will also turn on the Davicom's 1FM02 flag which can be used with Virtual Logic Gates to perform different actions or make alarm calls.

The following table summarizes the Davicom's FMBM-related logic flags.

DESCRIPTION	FMBM1	FMBM2	FMBM3	FMBM4	*FMBM5**	*FMBM6**	*FMBM7**	*FMBM8**	Note
LOW RSSI	1FM01	2FM01	3FM01	4FM01	*5FM01*	*6FM01*	*7FM01*	*8FM01*	Low RF signal
FREQ. DRIFT	1FM02	2FM02	3FM02	4FM02	*5FM02*	*6FM02*	*7FM02*	*8FM02*	Carrier frequency offset
LOW/HIGH DEV.	1FM03	2FM03	3FM03	4FM03	*5FM03*	*6FM03*	*7FM03*	*8FM03*	Low/High deviation, timeout, # of counts
STEREO	1FM04	2FM04	3FM04	4FM04	*5FM04*	*6FM04*	*7FM04*	*8FM04*	Absence of stereo pilot
SUMMARY ALARM	1FM05	2FM05	3FM05	4FM05	*5FM05*	*6FM05*	*7FM05*	*8FM05*	Summary Alarm for FM01/02/03/04

NOTE: FMBM5/6/7/8 Active Only when FMBM1 is in Scan Mode

To view the current levels and alarm states of the FMBM, go back to the DavLink main screen and click to the "View" (eyeglasses) icon as shown below.

This will display the screen as shown in Figure 10a below.

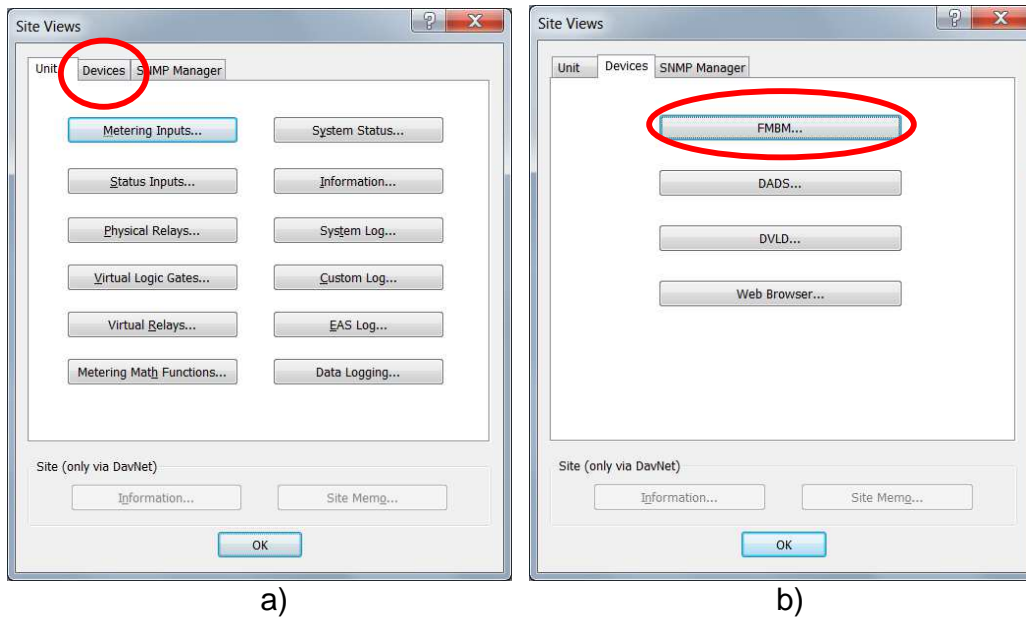a)   b)

Figure 10. Site Views screen

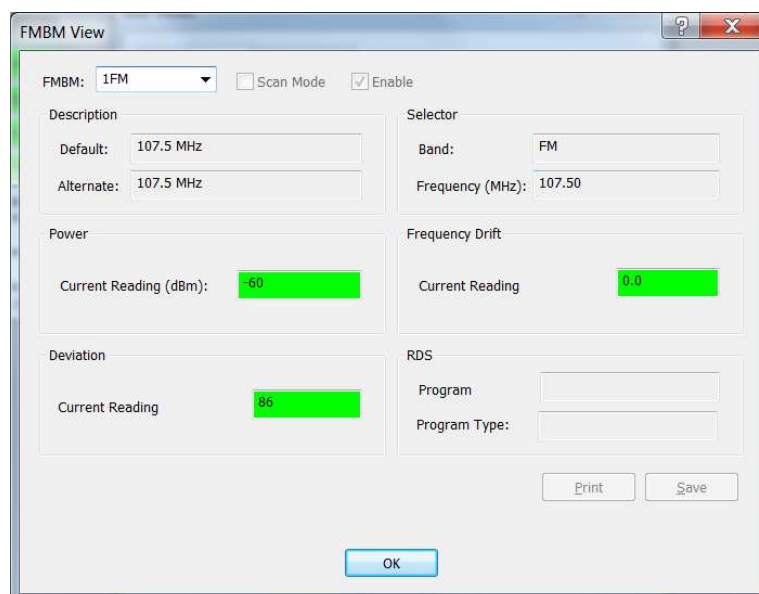Click on the Devices tab and then on the FMBM button (Figure 10b), this will display the screen shown in Figure 11.

Figure 11. FMBM Visualization window.

4.3 Remote operation with a PC

The FMBM can also be operated through its back-panel USB interface. This requires using a PC with a USB Port and a communications program such as HyperTerminal that is supplied with the Windows XP OS. Other equivalent terminal-type programs like TeraTerm freeware can also be used. This mode of operation is known as the VT-100 mode.

You must also have previously installed the FMBM's USB driver so that your PC can communicate with the FMBM. This driver is included in the software package found on the CD supplied with the FMBM (see section 3.2).

The communications parameters that must be set in your communications program (HyperTerminal or equivalent) are: 115200 baud, No parity, 8 bits, 1 stop bit, no flow control and the appropriate COM port. Once communications is established, enter "M" for Main menu and the following screen will appear.
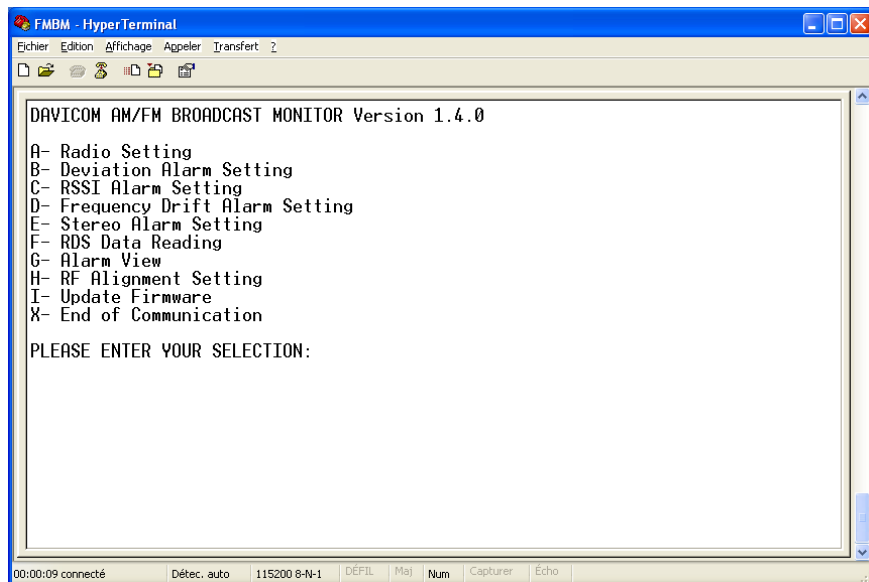
Figure 12. Main VT-100 menu screen

Menu items are selected simply by pressing the corresponding letter on your keyboard.

Pressing A (for Radio Settings) will display the following screen and allow setting of parameters such as the operating band, receive frequency, etc.
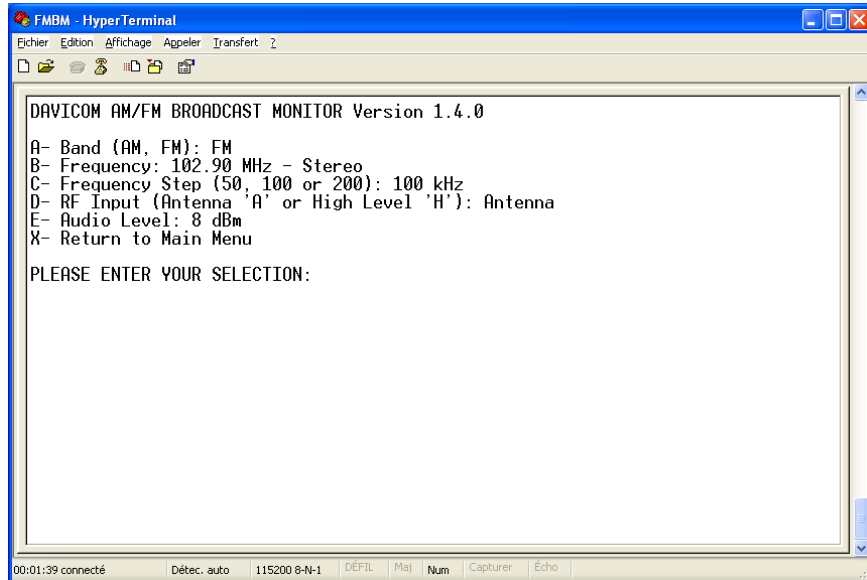

Figure 13. "A" Radio Setting menu

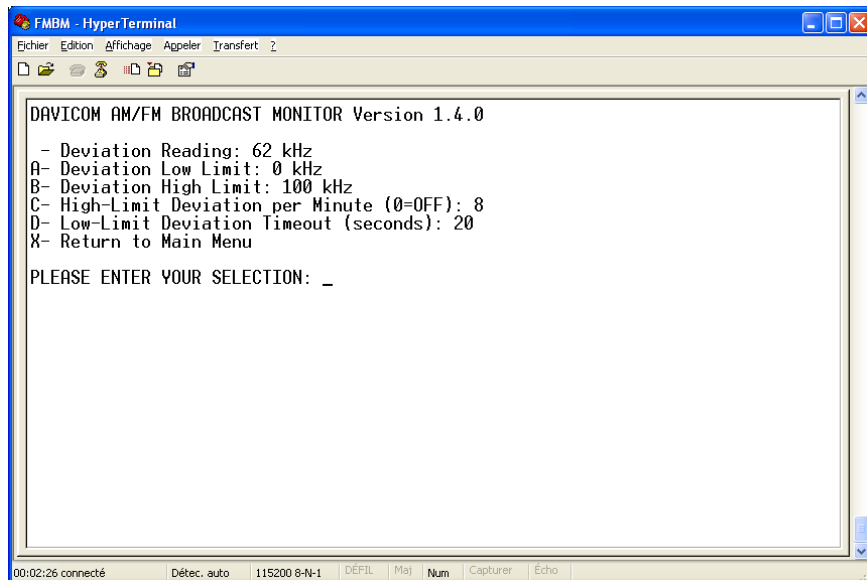Starting from the main screen of Figure 12 and pressing "B" will display the menu of Figure 14.

Figure 14. "B" Deviation Alarm Setting menu

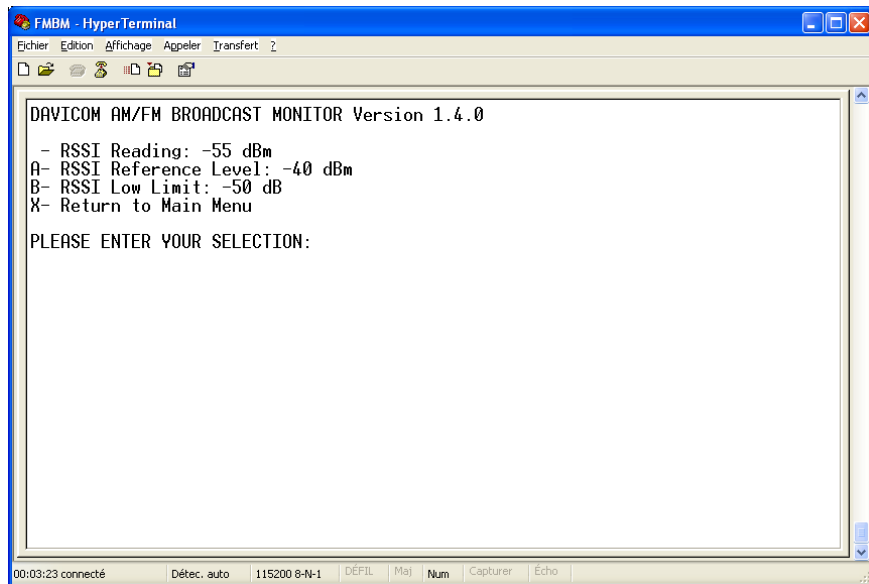The following screens are obtained by pressing the corresponding letters on your keyboard.
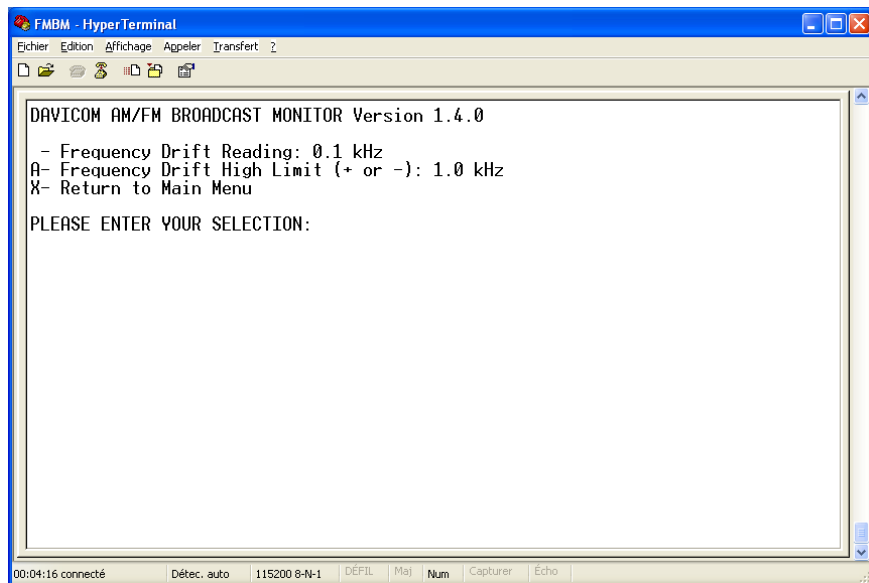

Figure 15. "C" RSSI Menu screen

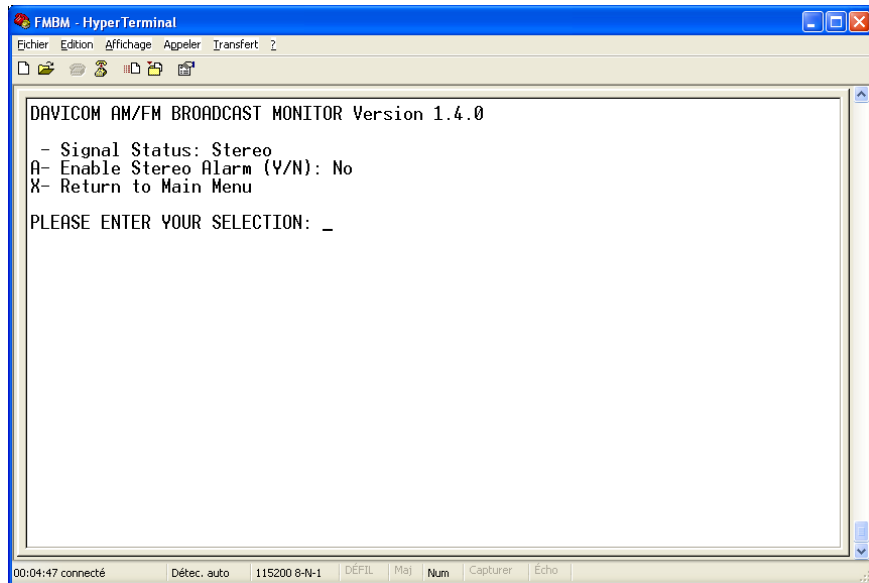

Figure 16. "D" Frequency Drift Menu screen.

Figure 17. "E" Stereo Alarm Menu screen.

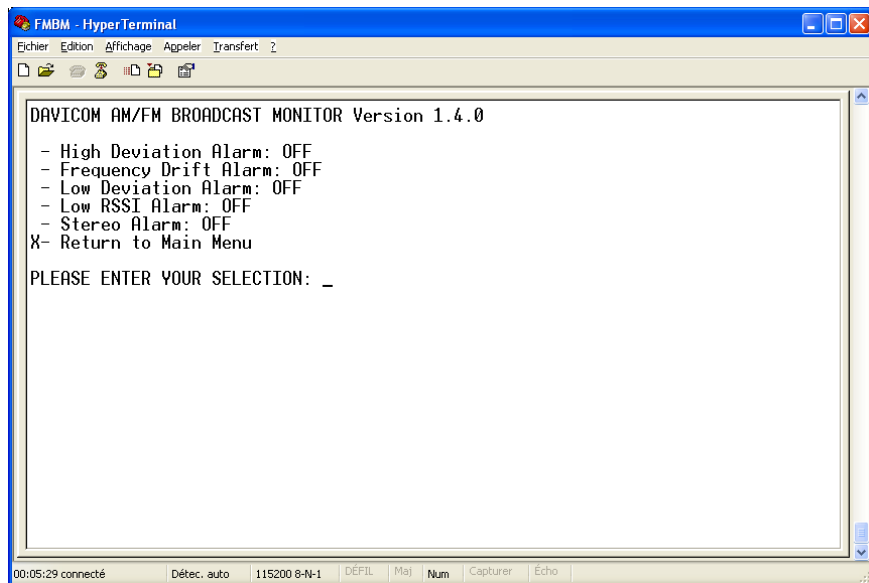Note that the "F" key has no effect in VT-100 mode

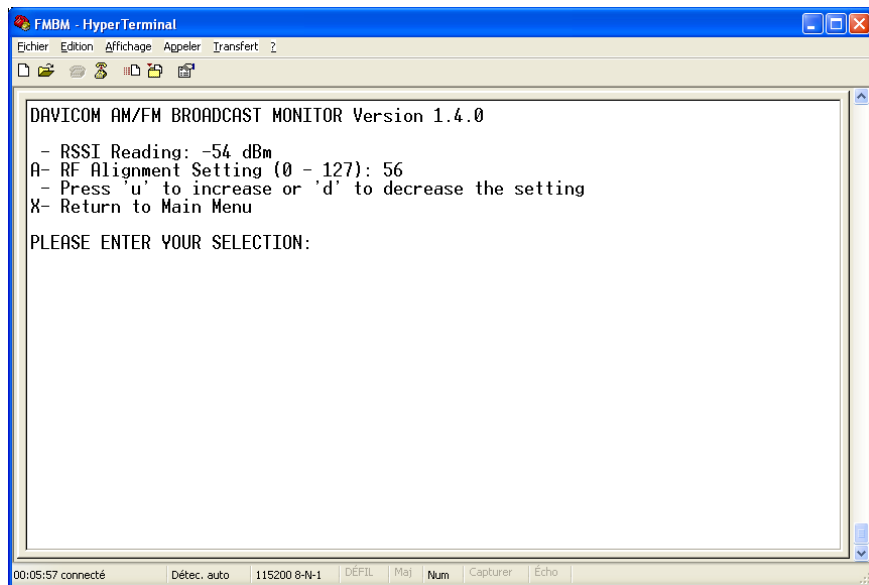**Figure 18. "G" Alarm Summary Menu screen**

Figure 19. "H" RF Alignment Menu screen.

Note that the "I" Update Firmware selection is used to set the FMBM in firmware update mode where it awaits input from the "FMBMUpgradeTool.exe" software (see Appendix A).

Pressing the "X" key exits the VT-100 mode and terminates communications. To re-start, simply press the "M" key again.

4.4 Settings & adjustments

The FMBM has 9 internal jumpers, one RF alignment, one RF level calibration and one MPX level adjustment that allow users to optimize operation of the unit for their particular requirements. No other user adjustments are required for normal operation.

4.4.1 Program de-emphasis jumper (JP7)

This jumper sets the de-emphasis curve to either 75μS or 50μS, depending on the region of the world where the FMBM is being used. This jumper is located near the 12Vdc XLR Power connector as shown at the top right of Figure 20. Set the jumper for the desired de-emphasis curve as indicated on the PCB silk screen. For deliveries in North America, the jumper is set to the 75μsec position, for European destinations, it is set to the 50μsec position.

4.4.2 Relay mode selection jumpers (JP2-JP6)

These 5 jumpers set the default connection mode of the alarm relay outputs. They can each be individually set to Normally Open (NO) or Normally Closed (NC). The 5 jumpers are located as shown at the bottom right of Figure 20. Set the jumpers as shown on the PCB silk-screen.

4.4.3 Power monitor filter jumper (for AM mode, JP1)

The Power Monitor filter jumper adds extra filtering to the detected signal envelope in order to smooth out variations when in AM mode. This helps to improve the RF Power detection readings when operating on the AM band. This jumper's location is shown at the bottom left of Figure 20. Set the jumper as shown on the PCB silk-screen. Default position is set to FM.

4.4.4 RF alignment

RF Alignment is not necessary for normal operation of the FMBM unit. Depending on antenna type and matching, RF alignment does however allow fine tuning of the RF input circuit in order to optimize signal reception in weak-signal areas.

RF Alignment is achieved through the front-panel menu and buttons. Press the Menu button and then scroll down to the RF Alignment menu item by pressing the Down button. Selecting this Menu item displays a tuning setting between 0 and 127, as well as an RSSI level in dBm. Press the up or down buttons to change the tuning setting in order to maximize the receive signal level. Once the highest signal is achieved, store the setting and simultaneously exit the RF Alignment mode by pressing the Menu button again.

4.4.5 Pre-emphasis (JP9-JP10)

A Pre-emphasis correction (75 μs) will be applied to the audio output signals when jumpers JP9 and JP7 are installed. The correction is applied to the analog output as well as the digital output when the FM-AES option is installed.

4.4.6 Peak Integration Time Constant (JP8, JP11)

Select the proper jumper combination (shown on PCB) to select the peak detector's integration time constant. Possible integration times are 1 ms, 2.5 ms and 5 ms (at 99%).

4.4.7 RF level calibration

RF level adjustment is achieved through the FMBM's internal menus and built-in voltmeter. This calibration operates in 2 modes, depending on the RF Input that is selected.

<u>Antenna Mode</u>
If you are in Antenna input mode, press the Menu button and scroll down to the Power Monitor Calibration Menu item.

```
Power Monitor
Calibration
```

Press Menu again and you will see the current value of the reference level:

```
Pwr Mon Cal
^Ref Lvl=-xxdBm
```

Press the Up or Down button and you will see:

```
Pwr Mon Cal
^Update Ref Lvl
```

Pressing Menu here samples the input signal and sets the new reference level to the currently received signal level and exits the menu item. To exit, simply press the Up or Down buttons to scroll to the Menu mode exit.
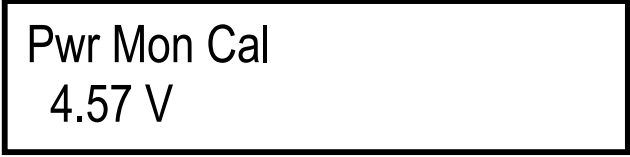
<u>High Level Mode</u>
If you are in High-Level input mode, inject a known RF signal into the unit's RF input, and then press the Menu button and scroll down to the Power Monitor Calibration Menu item.

You should see the following screen:

```
Power Monitor
Calibration
```

Press Menu again and you will see:

| Pwr Mon Cal |
| 4.57 V |

The voltage shown is the actual voltage present at the FMBM's back-panel Deviation-monitor output. With a small screwdriver, adjust the "RF Power Monitor Adjust" on the right side of the FMBM's front-panel to obtain a 5V output that will correspond to the nominal RF Power at the input. The transfer function is 0.5V/dB. Pressing the Menu button again will exit this mode and allow you to scroll back up (or down) to the Menu mode exit.
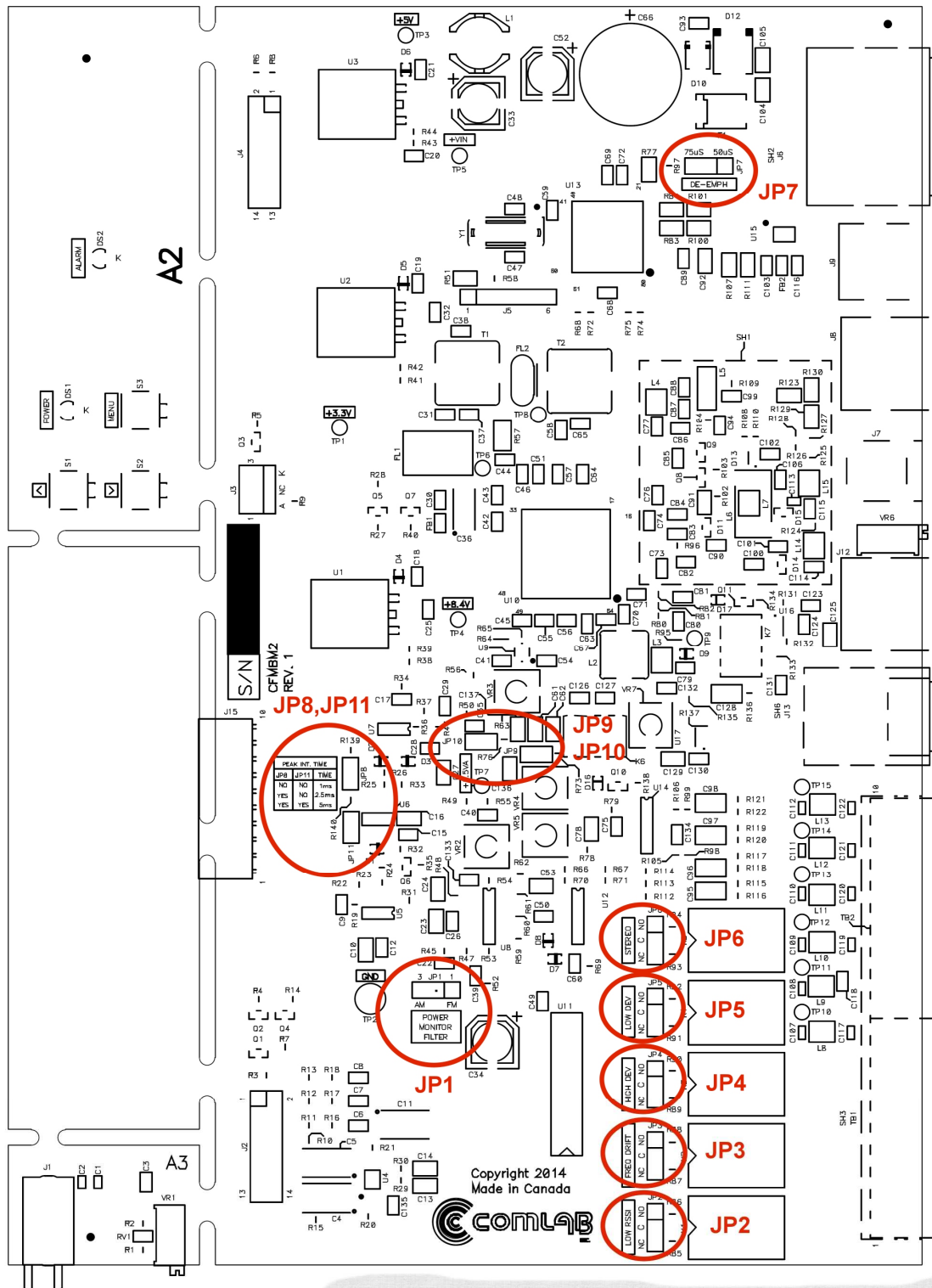
Figure 20 Printed Circuit Board Layout and jumper locations

5 Support/Contact

For technical support concerning this product, please consult the www.davicom.com web site or contact us:

- By telephone at 1-866-282-3380 (toll-free in North America) or at +1-418-682-3380 from elsewhere.
- Through our web site at www.davicom.com/contact

Davicom's address is:

Davicom, a division of Comlab Inc
2300 León-Harmel, Suite 220
Quebec City, Quebec
Canada, G1N 4L2

6 Appendix A

Upgrading the unit's firmware

To upgrade the FMBM's operating firmware, you will need:

- The FMBM itself and its 12Vdc power supply
- A USB (type A to type B) cable
- A personal computer (PC) running Windows XP or higher.
- The "FMBMUpgradeTool.exe" software
- The "*.hex" file containing the firmware program
- The USB driver that should have been previously installed on the PC.

To update the firmware, you must start-up the FMBM and connect its USB port to one of your PC's USB ports with the USB cable. Once connected, your Windows OS may detect that a new driver is needed for the FMBM's USB interface. If it asks for the driver, just direct the installation wizard to the location where the driver is located on your computer, or to the FMBM's installation CD.

Once the driver is installed, you will be able to communicate with the FMBM.
1. Start the FMBMUpgradeTool program. The screen shown in Figure 21 will appear.
2. On the FMBM's front-panel, press the Menu button and use the down button to scroll to the "Firmware Upgrade" menu item.
3. Press Menu again to select this item and enter the actual upgrade mode.
4. Press the Up or Down button to select "Update".
5. Press the Menu button to set the FMBM in standby mode for the update process.
6. The FMBMUpgradeTool should detect that an FMBM is connected to your PC.
7. Once detected, you can click on "Open Firmware File" to browse to the location where the firmware file is located on your computer.
8. Select this file and then click on "Write Firmware to Unit"
9. The display will show the update process with Erase, Write and Verify steps.
10. Once these steps are completed, click on "Restart FMBM Unit" to finalize the update process in the FMBM.
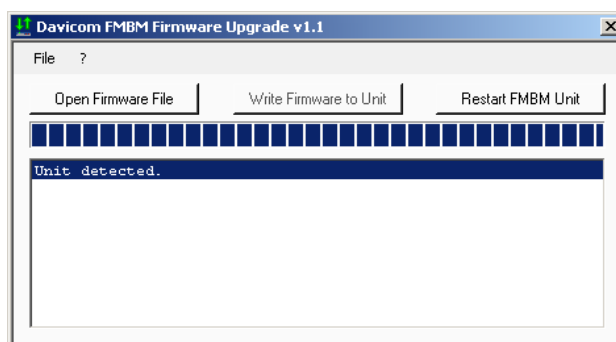11. Exit the FMBMUpgradeTool program by selecting File and then Exit.

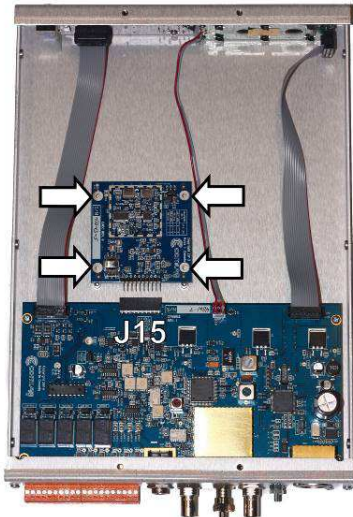**Figure 21 Firmware Upgrade Tool screen**

7 Appendix B

To install the Digital Audio AES output option:

1. Remove the FMBM cover screws (10 places) as shown below:

2. Insert the AES card into the J15 socket

3. Secure the card with the 4 screws provided with the AES card
4. Re-install the FMBM cover
5. Remove the "Not Installed" sticker located above the Mini XLR connector on the rear panel.