

# Quadravox

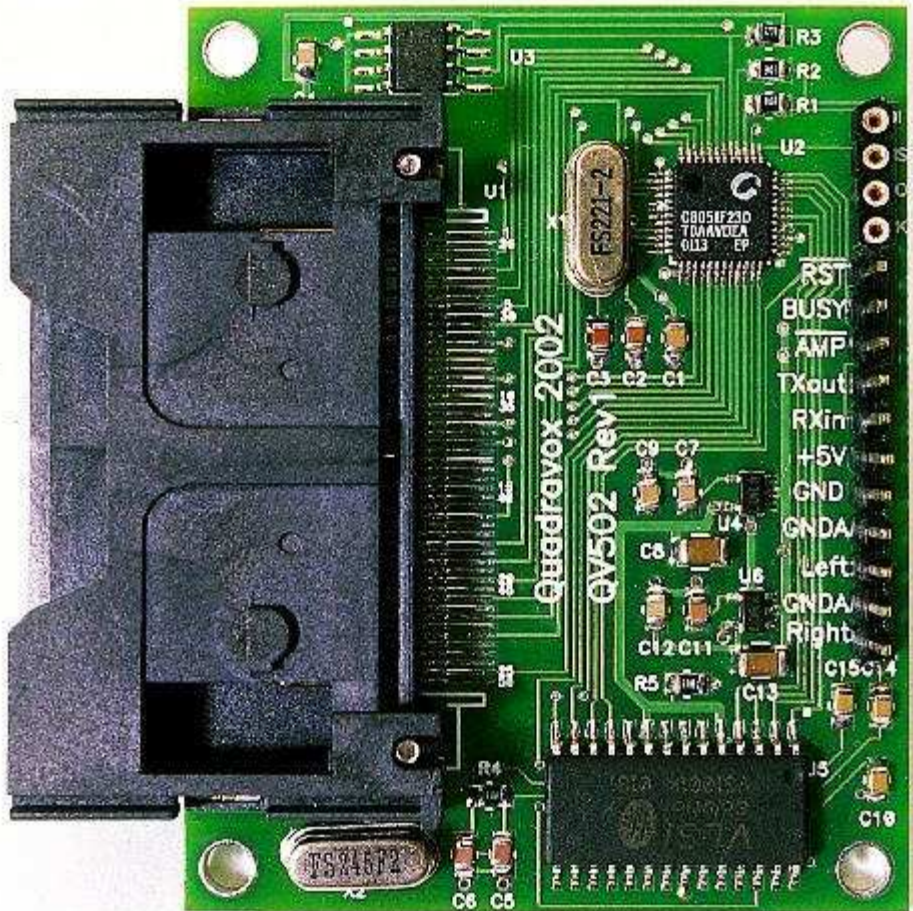
## QV502 MP3 Sound Module

### Description:

The system is a digital sound output module utilizing the MPEG 1, Layer III (MP3) coding algorithm. The QV502 is a minimal RS232 controlled line output module.

- The memory is a CompactFlash module with standard DOS/Windows formatting. The system algorithm is designed to handle FAT12, FAT16 and FAT32 volumes, although the FAT32 functions have not yet been verified. The CompactFlash must be programmed using a standard CompactFlash reader/writer.
- The decoder is the VLSI Oy VS1001. The VS1001 is a full-spec MP3 decoder capable of handling all layer III formats, both CBR and VBR.
- The native control protocol for the QV502 is RS232. The baud rate is 9600.
- Controls and connections are:
  - line-level stereo output (volume controlled)
  - CF card slot
  - RS232 RXD/TXD signals, 0-5V, assumes level convertor or active-low signals
  - Reset line, active low - hardware reset for system
  - AMP\_ line, low when unit is playing
  - BUSY line, high when unit is performing an operation (including power up)
  - Ground and power (3.6V-7V) connections
- Board dimensions are 2.0" x 2.5" (50.8mm x 63.5mm) with the socket extending 0.4" (10mm). The Compact Flash card protrudes an additional 0.6" (15.6mm). Mounting holes are 0.125" diameter (3.2mm) on dimensions 1.75" x 2.25" (44.5mm x 57.2mm).

Please note that the photographs in this document are of the revision 1 PCB. The production PCB uses through-hole passive components, but all dimensions and pinouts are identical to the revision 1 board.



## QV502 Connections

The QV502 module connections are arranged in a single row of 100mil spaced pins. All logic pins are 5V tolerant except RST\_. The pins beginning at the RST\_ end are:

- 1) RST\_ an active low hardware reset line. This control, if used, should be open-drain because the module's processor will also pull the line low during power up.
- 2) BUSY (labeled P1) is an active high signal that rises when any operation is initiated. It is artificially stretched to 1ms minimum with one exception – during playback, volume operations are shortened to 3us to minimize interference with the data transfer. BUSY is high at startup and remains so until the unit is ready for operation.
- 3) AMP\_ (labeled P2) is an active low signal that occurs only during actual playback time
- 4) TXD is the RS232 transmit pin of the QV502. It is a 3.3V/gnd signal with a resting level at logic high.
- 5) RXD is the RS232 input pin of the QV502.
- 6) +5V nominal; 4V to 16V
- 7) Power ground
- 8) analog signal reference ground
- 9) left channel output
- 10) analog signal reference ground
- 11) right channel output

The RS232 connection is 9600B, 8 data bits, no parity. The signals are 3.3V logic levels (5V tolerant) and of the same polarity as the output of a standard MAX232 type level shifter.

## RS232 Control Protocol:

This version of the firmware incorporates the following commands:

- 0x00-0x7F: one of 128 directly addressed sounds
- 0x80-0xB8: sets volume of both channels to one of 56 levels (0 is mute) <volume returned>
- 0xC0-0xCF: set balance left (right channel is attenuated 0-15 levels) <balance returned>
- 0xD0-0xDF: set balance right (left channel is attenuated 0-15 levels) <balance returned>
- 0xE0: play file 0-255, with the file number defined by the next transmitted byte
- 0xE1: play file 256-511, with the file number (-256) defined by the next transmitted byte
- 0xE4: return the hardware revision number
- 0xE5: return the software revision number
- 0xE7: retrieve file. The second byte contains a coded representation of the file name
- 0xE8: pop phrase
- 0xE9: push phrase
- 0xEA: unmute left channel <mode returned>
- 0xEB: mute left channel <mode returned>
- 0xEC: unmute right channel <mode returned>
- 0xED: mute right channel <mode returned>
- 0xEE: set extended balance; the second byte is +/- 56. Negative = left. <balance returned>
- 0xEF: return the number of files detected, modulo 256
- 0xF0: stop instantly
- 0xF1: clear loop mode; play in progress will complete
- 0xF2: increment volume <volume returned>
- 0xF3: decrement volume <volume returned>
- 0xF4: set loop mode <mode returned>
- 0xF5: get status
- 0xF6: get errors <errors returned>
- 0xF7: S/W reset
- 0xF8: pause
- 0xF9: resume
- 0xFA: job balance left <balance returned>
- 0xFB: jog balance right <balance returned>
- 0xFC: get volume <volume returned>
- 0xFD: get balance <balance returned>
- 0xFE: get revision <software major type returned (4 for this version)>
- 0xFF: get type <hardware type returned>

Each operation results in a single byte return. This is the status byte except where indicated. The return from Play takes place at the completion of play.

**Status values:**

The status word bits indicate:

- 7: hardware error
- 6: alternate busy bit
- 5: no card in socket
- 4: pause
- 3: blank (selected file does not exist in this memory)
- 2: mute
- 1: loop
- 0: playing

**Error values:**

The error word bits indicate:

- 7: auto-update failed checksum and was aborted. Cycle power to restart.
- 6: I2C no acknowledgment
- 5: I2C timeout
- 3: sector error (memory does not use standard 512B sectors)
- 0: serial EEPROM

## QV300s2 Demonstration Software

### **Description:**

The 300s2 software has two functions when used in conjunction with the QV502: it simplifies the transfer of data to the CompactFlash, and it provides a means of testing and demonstrating the QV502 operation provided power and RS232 level-shifting have been handled in external circuitry.

### **Operation:**

**System setup-** use the Setup tab to set the module type (always QV531 for this module), the serial port, the baud rate (only 9600 allowed for the QV502), and the CF memory size (used in calculating project space remaining).

**Project management-** use the Data tab to set up, save, and restore projects. Beginning with a new project, add files in MP3 format as required. Files will be recorded in the order of the listing with the first file in the list being assigned the value 0. Files can be rearranged by dragging and dropping them in the list. This version of the software does not check for available space in the module. It is best to delete all files from the Compact Flash before rewriting it.

**Recording and playback-** use the Recording tab to do two separate functions: write files to the CompactFlash, transparently renaming them 000.mp3 to nnn.MP3 based on the position in the list, and play files from the QV502 module. Please note that the Transfer function works only with the CF adapter; it does not cause the files to be loaded via the RS232 control stream. In addition to the files themselves, the project table file is also written to the CF. It is best to delete all files prior to writing a new set to eliminate the possibility of a conflicting file name. The controller looks only at the first three characters of the name, so a file named "000blah.mp3" would be confused with "000.mp3". It is not necessary to format the disk. The current version of QV300s2 does not have a facility for erasing all files, so this must be done using normal Windows functions first.

Playing files is possible only after the CF has been replaced in the unit. To play a single file, double-click on it in the list. To play all files, use the "Play" button. The volume may be set at any time using the volume slider.

**Module development-** use the Module tab to see the detailed operation of the device interface. As each command is selected, its single-byte RS232 code appears in the window (this version of the software incorrectly shows 0x00 for balance; it should have 0xC0 as the base). If the command requires additional data, as do play file, set volume, and set balance, enter the additional data in the data window. Set Balance requires a value of +0-15 to shift the balance left and -0-15 to shift it to the right. Set Volume accepts positive numbers from 0 to 56. The entry mode can be switched from hexadecimal to decimal using the radio buttons.

The value returned by the controller will be displayed in the "returned" window. Get Status can be used at any time.

## QV502 Electrical Characteristics

### Absolute Maximum Ratings:

Stresses above these limits may cause permanent damage to the system. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may effect device reliability.

Ambient temperature under bias	-40°C to +125°C
Storage temperature	-65°C to +150°C
Power supply voltage	0 to +16 V

**DC Characteristics:** standard operating temperature  $-30^{\circ}\text{C} \leq \text{TA} \leq +85^{\circ}\text{C}$

### Power supply

Symbol	Description	Min	Typ	Max	Units	Conditions
V <sub>DD</sub>	Supply voltage	4.0	5.0	16.0	V	
I <sub>DD</sub>	Supply current (idle)	--	32	TBD	mA	No CF memory inserted *

\*The choice of CompactFlash memory card has a large effect on operating current. A brand with automatic power-down such as SanDisk or Lexar will have effectively nil additional idle current. Current during playback varies from approximately 55mA to 65mA depending on CF card characteristics.

### Control lines:

Value	Description	Min	Typ	Max	Units	Conditions
V <sub>IL</sub>	<b>Input low voltage</b> RXD	V <sub>SS</sub>	--	0.7	V	
V <sub>IH</sub>	<b>Input high voltage</b> RXD	2.0	--	5.0	V	
V <sub>OL</sub>	<b>Output low voltage</b> TXD, AMP <sub>-</sub> , BUSY	0	--	0.2	V	@25mA
V <sub>OH</sub>	<b>Output high voltage</b> TXD, AMP <sub>-</sub> , BUSY	2.7	3.3	--	V	@25mA

**AC Characteristics:** standard operating temperature  $-30^{\circ}\text{C} \leq \text{TA} \leq +85^{\circ}\text{C}$

Description	Min	Typ	Max	Units	Conditions
<b>RS232 Baud rate</b> DB9 RS232	--	9600	--	B	
<b>Line level output impedance</b>	--	32	--	Ω	10uF coupling capacitor in series

## **Online Support:**

Quadravox maintains the latest specifications, schematic diagrams, and support software in the support section of our website, [www.quadravox.com/support.htm](http://www.quadravox.com/support.htm).

For questions not answered there or for other inquiries, please write us at [support@quadravox.com](mailto:support@quadravox.com), or call 1-972-669-4002.

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