# Quad Radio PCI Card Installation and Configuration
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INTRODUCTION

The QRV Communications Quad Radio PCI Card is used to interface FM narrowband radios to the Asterisk PBX running on standard PC hardware. The card supports 4 radio interfaces which can be used independently and concurrently. Each interface, or "channel" has its own dedicated RJ-45 connector, adjustments, CTCSS/DCS encoder/decoder and codec. Here is a block diagram of what is on the Quad Radio Interface:
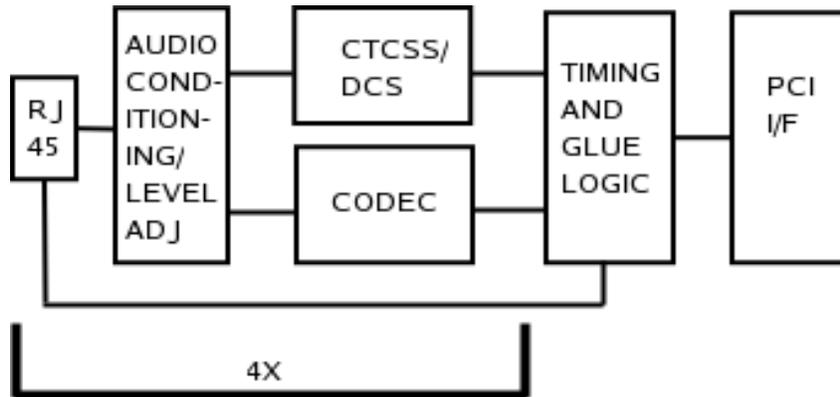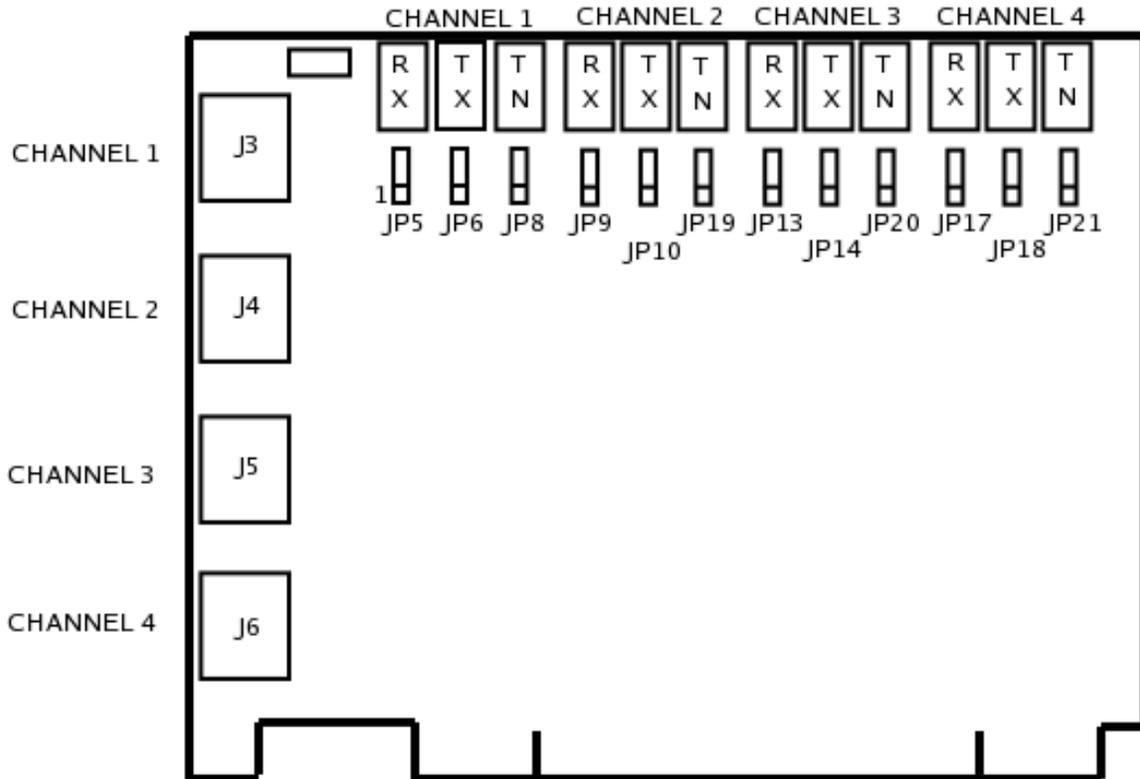

The Quad Radio Interface has several connectors, jumpers and adjustments which are described as follows: There are 4 RJ-45 connectors (one for each radio interface), 12 pots, and 12 ea. 3 position jumpers. The RJ-45 connectors are pinned out in a manner which allows 7 conductor shielded flat modular cable to be used to make the connection between the Quad Radio Interface and each radio. There are 3 ea. audio level pots and 3 ea. 3 position jumpers for each of the 4 channels. The audio level adjustments, and 3 position jumpers are positioned on the board in a manner which makes them easy to locate for any given channel. The illustration below shows the locations of the RJ-45 connectors, pots, and 3 position jumpers. Tables following the illustration identify the pinouts are for the RJ-45 connectors, the functions of the pots, and the functions of the 3 position jumpers.

To interface a radio to one of the ports. 4 signals will be required at a minimum. These signals are: Receive Audio, Transmit Audio, Receive Signal Present (COR), and Push to Talk (PTT). Additionally a 5th signal, an external tone decoder input, can be optionally connected to support an external CTCSS/DCS tone decoder.

The layout of the Quad Radio PCI card is shown below.

QUAD RADIO PCI CARD LAYOUT

| CHANNEL 1 | CHANNEL 2 | CHANNEL 3 | CHANNEL 4 |

| R X | T X | T N | R X | T X | T N | R X | T X | T N | R X | T X | T N |

CHANNEL 1   J3

CHANNEL 2   J4

CHANNEL 3   J5

CHANNEL 4   J6

1
JP5 JP6 JP8 JP9   JP19 JP13   JP20 JP17   JP21
              JP10   JP14   JP18

CONNECTIONS

As stated above, the Quad Radio Interface uses RJ-45 connectors. The pinout of these connectors is as follows:

RJ-45 Pinout Table

Pin	Name	I/O	Description
1	RXA	Input	Receive Audio from your radio
2	COR	Input	Carrier detect from your radio
3	UIOA	I/O	User I/O A (programmable function)
4	SUBTONE	Output	Subaudible Tone
5	PTT	Output	Push-To-Talk to your transmitter
6	UIOB	I/O	User I/O B (programmable function)
7	TXA	Output	Transmit Audio to your transmitter
8	GND	-	Signal Return

RXA

Repeater Receive Audio. Connect this signal to either the discriminator (recommended), or a point where De-Emphasized audio is present at a constant level regardless of the setting of the receiver's volume control. Preferably, the signal point chosen in the receiver should have at least 2 volts peak-to-peak of audio or discriminator noise. The impedance of this input is approximately 50K ohms.

COR

Carrier Operated Relay (COR). This signal should go to ground when a signal opens the squelch on the receiver and be pulled up to at least 5 volts when there is no signal. This input has a 1 megohm resistor in series followed by a 3.0V zener diode to limit the input voltage. Note: If your radio only has an open collector output for COR, then you will need to add a pullup resistor externally.

UIOA

User I/O A. This signal can be used as the clock line for the Doug Hall RBI-1 adapter, a UART receive line (Rxd) for radios which are controlled with asychronous serial data, or as a digital input or output for additional control capabilities. This signal may be left unconnected in repeater interfacing applications. This I/O has a 220 ohm 1/16W resistor in series and a diode clamp to 5 volts and ground with a 10K pullup resistor. The I/O uses LVTTL signaling thresholds. If this pin is used as an input, it should not be driven past 8 volts or below -3 volts to protect the 220 ohm series resistor.

SUBTONE

This signal brings out the analog CTCSS or DCS tone for the transmitter. If you want to be able to change the output CTCSS tone remotely, this signal will need to be connected to your transmitter's modulator. This signal may be left unconnected initially to simplify your initial setup. This signal has a 1-6K (appx.) output impedance depending upon the setting of the TN pot.

PTT

Push To Talk. This signal goes to ground when app_rpt wants to key the transmitter. The output driver for this signal is an N-channel MOSFET capable of switching 1 Amp. To reduce the chance of ground loops, it is advisable to keep the switching current in the tens of milliamps or less.

UIOB

User I/O B. This signal can be used as a data line for the Doug Hall RBI-1 adapter, a UART transmit data line (Txd) for radios which are controlled with Asynchronous serial data, an input for an external CTCSS or DCS tone decoder in a repeater application, or as an input or output for additional control capabilities. This I/O has a 220 ohm 1/16W resistor in series and a diode clamp to 5 volts and ground with a 10K pullup resistor. The I/O uses LVTTL signaling thresholds. If this pin is used as an input, it should not be driven past 8 volts or below -3 volts to protect the 220 ohm series resistor.

TXA

Transmit Audio. This signal is connected to the microphone or line in connections on your transmitter. This signal is capable of providing up to 6V peak-to-peak of transmit audio at 600 ohms.

GND

This is the return for all of the other signals. It should be connected to DC ground in the repeater system.

JUMPERS

There are 3 jumper settings for each channel. The function for the jumper is enabled when the jumper is in the 2 pins closest to the level adjustment pots (pins 2-3). The function is disabled when the jumper is in the position furthest from the level adjustment pots (pins 1-2). For further clarification, the board outline shows the location of pin 1 on JP5.

The RX De-Emphasis setting should be installed when you are taking audio directly from your receiver's discriminator.

The TX Pre-emphasis jumper setting should be enabled if you are feeding TX audio directly to the modulator of your transmitter. TX Pre-emphasis should be disabled if you are feeding TX audio into the microphone or high level audio input which goes through the transmitter's speech limiting and filtering circuits. Note: app_rpt does not currently limit the peaks of the audio. Use of this option is not recommended at this time.

The CTCSS Tone in TX audio should only be used when you are also using TX Pre-Emphasis. If your TX audio is going in to the transmitter's speech and filtering circuits, this function should be disabled, and you should use the dedicated SUBTONE signal on the RJ-45 connector to feed the CTCSS tone into the modulator of your transmitter.

JUMPER FUNCTION TABLE

FUNCTION	CH1	CH2	CH3	CH4
RX De-emphasis	JP5	JP9	JP13	JP17
TX Pre-emphasis	JP6	JP10	JP14	JP18
CTCSS Tone in TX Audio	JP8	JP19	JP20	JP21

As mentioned previously, UIOA and UIOB take on different functions depending on how the port is configured. Below is a table showing the functions of UIOA and UIOB for the various operating modes supported.

I/O FUNCTION TABLE

OPERATING MODE	UIOA	UIOB
REPEATER	RESERVED	EXTERNAL TONE DECODER INPUT
RBI-1 REMOTE BASE	RBSCLK	RBSDATA
TMG707A REMOTE BASE	RXD	TXD
FT897 REMOTE BASE	RXD	TXD
IC-706 REMOTE BASE	RXD	TXD

LEVEL ADJUSTMENTS

There are 3 sets of level adjustment pots for each channel. These are multi-turn pots. The pot labeled RX on the board outline is used to adjust the receive level. The pot labeled TX adjusts the transmit audio level, and the pot labeled TN adjusts the CTCSS/DCS subtone level.

The audio level adjustment procedure for the RX and TX pots is described in the PDF document "audio_levels.pdf" available from at http://app-rpt.qrvc.com