SDR-IQ Serial Port

Rev. 1.00

Nov 1, 2011

This document describes the proceedures needed to update the SDR-IQ's firmware.

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1. DE9 Connector Description

The SDR-IQ has a DE9M connector on the back that has several uses for connecting to external radios and a few other purposes. It does not implement all the standard RS232 signals and just implements receive(RD) and transmit(TD) data. Below is the SDR-IQ pinout.
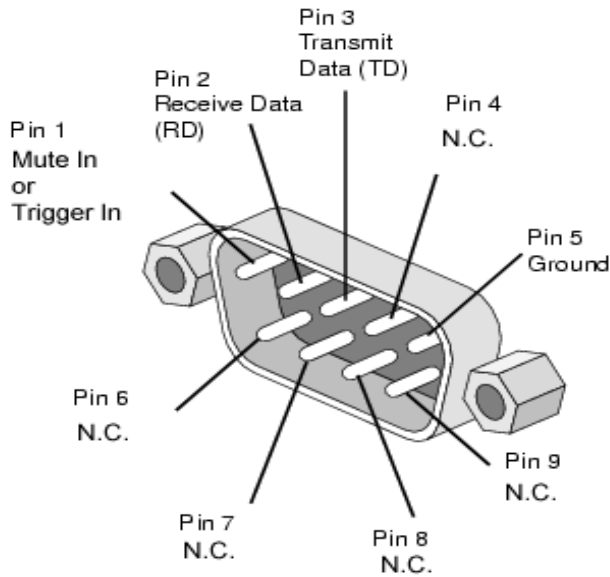
The internal electrical circuit of the DE9 Connector of the SDR-IQ is shown below:
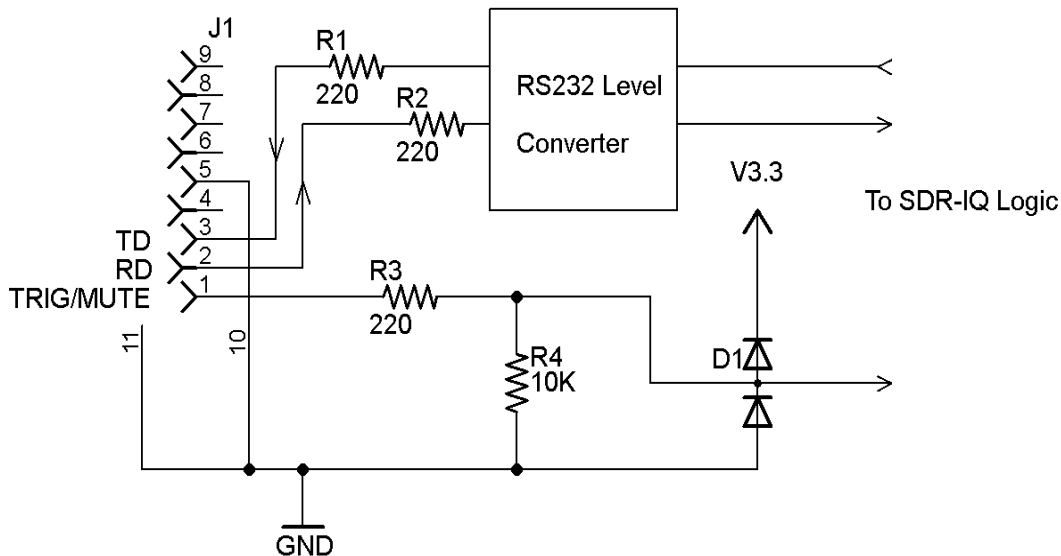
2. Functionality

2.1. RS232 Communications

The RS232 communications is done through custom messages on the USB interface and therefore does NOT look like a standard virtual serial port on a PC. The primary use is for an application to communicate with an external radio or device through the same USB interface that connects to the SDR-IQ. The protocol for doing this is described in the SDR-IQ protocol manual. The maximum useable Baud rate is 115200bps.

2.1.1   RS232 Serial Port Open

Purpose: Specifies and opens the SDR-IQ RS232 Serial port.
Control Item Code: 0x0200
Control Item Parameter Format:

The SDR-IQ serial port is opened with the following parameters. Data is received and transmitted via the Data Item 2 messages.

Parameter 1 == Port number (not used)
Parameter 2 == Data Item Number (not used, always uses data Item 2)
Parameter 3 == Number data bits (not used, always 8)
Parameter 4 == Parity 0==no parity, 1==Odd, 2 == Even
Parameter 5 == Stop bits
Parameter 6 == Flow Control(not used)
Parameter 7,8,9,10 == 32 bit bit rate value

Example, to open the SDR-IQ RS232 port to 9600 bps, odd parity, 2 stop bits.
The host sends:
[0E][00] [00][02] [00] [02] [08] [01] [02] [00] [80][25][00][00]
The Target would reply with the following:
[0E][00] [00][02] [00] [02] [08] [01] [02] [00] [80][25][00][00]

2.1.2   RS232 Serial Port Close

Purpose: Closes the SDR-IQ RS232 Serial port.
Control Item Code: 0x0201
Control Item Parameter Format:

This message closes the SDR-IQ serial port.

Parameter 1 == Port number (not used)

Example, to close the SDR-IQ RS232 port.
The host sends:
[05][00] [01][02] [00]
The Target would reply with the following:
[05][00] [01][02] [00]

2.1.3 Serial Port Data Item 2

Purpose: This data message is used to send and receive RS232 serial port data to and from the SDR-IQ.

Data 2 Item Parameter Format:

H(lsb)	H(msb)	data byte 1	data byte 2	data byte 3	data byte 4	data byte N-1	data byte N

Where the 16 bit header H is the total number of bytes in the message(N+2) OR'ed with 0xC0.

The Port must be opened and configured first using the message described above. The port can be closed after the host is done or just left open for future use.

Example, to send 5 bytes 0x12, 0x34, 0x56, 0x78, 0x9A to the SDR-IQ serial port:
The host sends this:
[07][C0] [12] [34] [56] [78] [9A]
The SDR-IQ does not respond to this message.

Example, if SDR-IQ receives 3 bytes 0x55, 0xAA, 0x01on the SDR-IQ serial port:
The SDR-IQ sends this back to the Host:
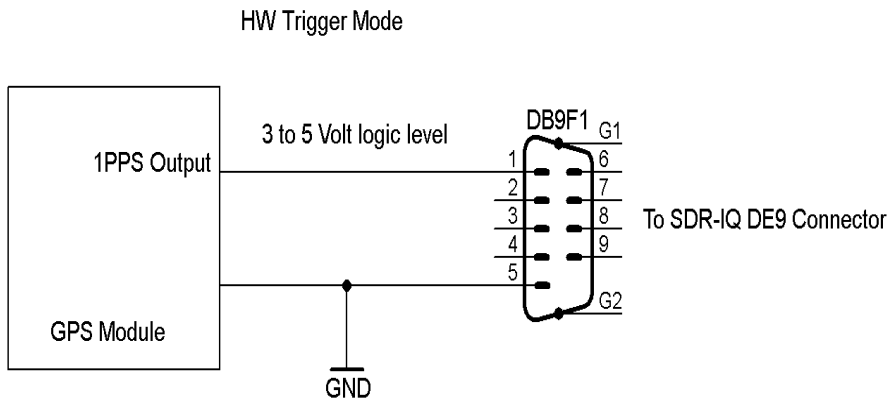[05][C0] [55] [AA] [01]

2.2. Mute Input on DE9 Pin 1

In normal continuous receive mode, Pin 1 of the DE9 connetor can be used to mute the data going back to the PC. A high logic level(3 to 5 Volts) on pin 1 will cause the SDR-IQ to send all zeros for I/Q data. This can be used to silence the audio perhaps while transmitting. Because of buffering delays, the audio muting will not be instantaneous.
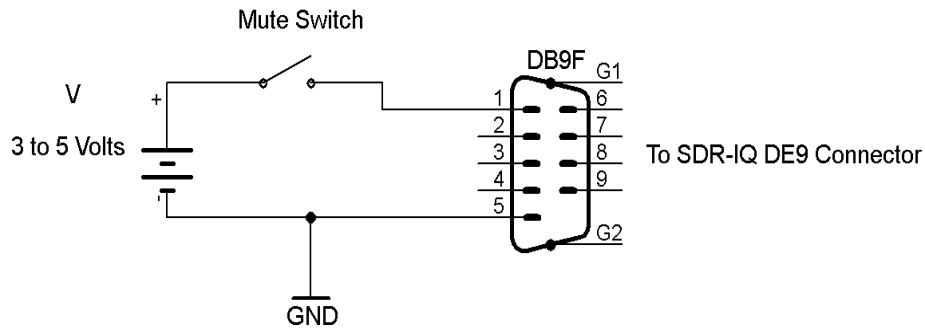
2.3. Trigger Capture Input on DE9 Pin 1

The SDR-IQ can run in a hardware trigger mode where it will wait for a positive logic edge on Pin 1 of the DE9 connector then send back N blocks of I/Q data then stop and wait for another positive edge on Pin 1. This is useful for capturing RF data synchronous to an external time source such as the 1 pulse per second output of a GPS module. Due to limitations in the SDR-IQ hardware, this trigger mode will synchronize to the next output sample and not to the next A/D sample time so is not useful for applications needing high resolution triggering.

One use for this is to look at CODAR signals in the HF band as most are sent at a 1 second rate locked to GPS.

HW Trigger Mode

```
                    3 to 5 Volt logic level      DB9F1  G1
                                                  1    6
   1PPS Output                                    2    7
                                                  3    8    To SDR-IQ DE9 Connector
                                                  4    9
                                                  5
                                                       G2
   GPS Module

                              GND
```

Also note that the SDR-IQ's sample clock can drift up to 50ppm or so with temperature so this can also limit the accuracy of triggger mode captures over long periods of time.

2.4. Forced Boot Mode Input on DE9 Pin 2

A final use of the DE9 Connector is to be able to force the SDR-IQ into boot mode so that new firmware can be loaded into it. Normally this is not needed but in some rare cases, the firmware can become corrupt and not allow normal updating. By applying a +6 to +15 Volt level on pin 2 of the DE9 while powering up the SDR-IQ by plugging in the USB cable, The boot mode can be entered allowing the firmware to be updated. Once the SDR-IQ has entered the boot mode(Slow blinking of the yellow LED), the voltage can be removed from Pin 2 of the DE9 connector. One easy way to do this is to use a 9 volt battery and clip leads to get it into this mode.

Force Boot Programming Mode

Connect DB9 Then USB cable to Power Up in Boot Mode
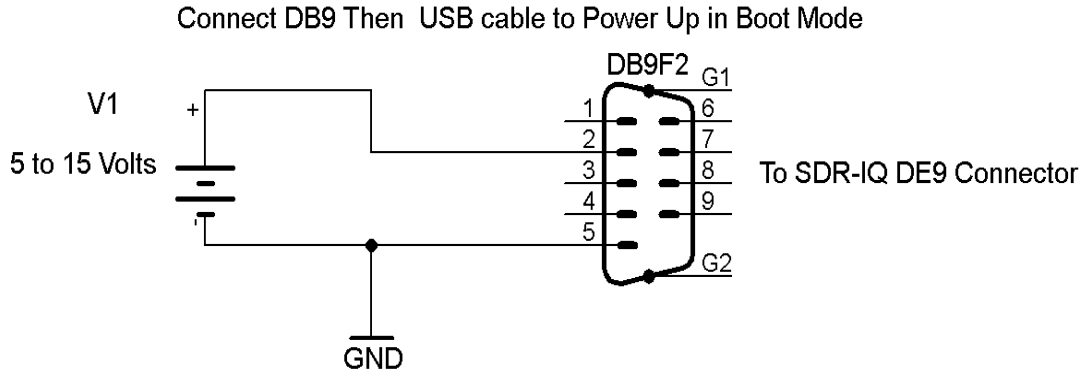
Note this "feature" has caused problems for many using external radios attached to the SDR-IQ serial port. If the external radio is turned off while the SDR-IQ is powered up, the boot mode may be entered since there is no power on the radios serial port and that is interpreted as a high level by the SDR-IQ. The only solution is to power up the external radio first or unplug the serial cable while powering up the SDR-IQ.

3. Change Log

Revision 1.00   Initial release.