CAN4VSCP - RS232

Smart CAN4VSCP serial interface

Reversion 1.0 - 2014-02-28

Abstract

CAN4VSCP-RS22 is a very simple interface module for connecting a computers RS-232 interface to the VSCP CAN bus. The module is constructed to interface the VSCP network and is hardwired for its speed and other VSCP specific parameters. This lowers the cost for the device and makes it very easy to use. The module comes with a serial boot loader installed which makes it very easy to update the software in the module when the need occurs. The module fully adopts to the CAN4VSCP specification and is powered directly over the bus with a 9 - 28VDC power source.

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All boards produced by *Grodans Paradis AB* are ROHS compliant.

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Chapter 1

CAN4VSCP - RS232

CAN4VSCP-RS232 is a serial interface to the CAN4VSCP bus. The module can be attached to a standard DIN Rail or be mounted directly on a wall (ordered separately). The module fully adopts to the CAN4VSCP specification and is powered directly over the bus with a 9-28V DC power source (for example with CAN4VSCP-POWER). All that is needed is a CAT5 or better twisted pair cable. Buss length can be a maximum of 500 meters with drops of maximum 24 meters length (up to a total of 120 meters). As for all VSCP4CAN modules the communication speed is fixed at 125 kbps.

1.1 Most current information

You can find the most current information about the CAN4VSCP-RS232 module at http://www.grodansparadis.com/can4vscp_rs232/can4vscp_rs232.html. On the site you can also find links to the latest firmware and schematics and recipes for its use.

1.2 The raw facts

1.3 Hardware

Parameter	Value
Supply voltage	9-28VDC
PCB Size	42 mm x 72mm
Power requirements	0.1W.
Communication RS-232	57500 baud, 8N1, without hardware/software handshake.
Communication VSCP4CAN	125kbps

Table 1.1: The raw facts

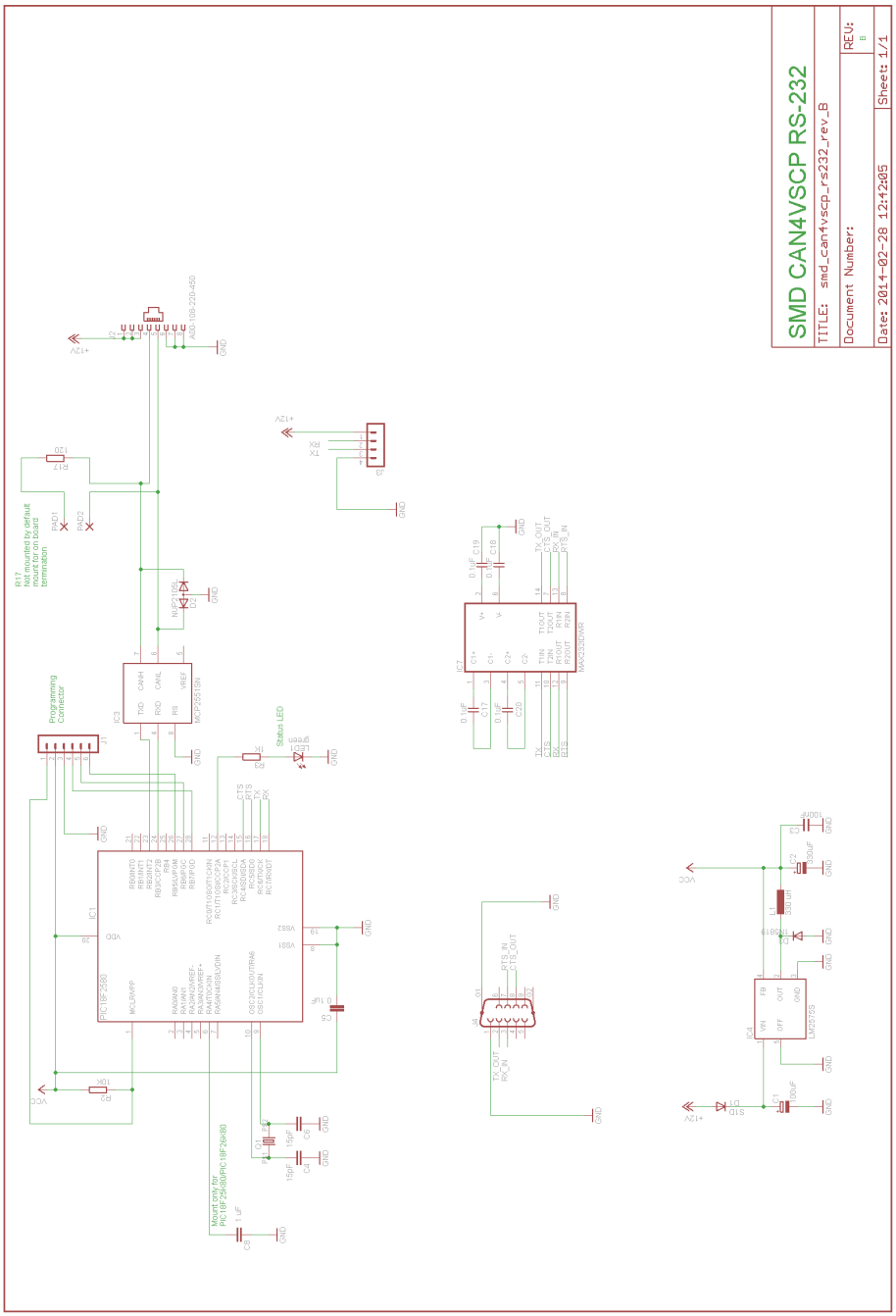

Figure 1.1: Schema for the Paris relay module

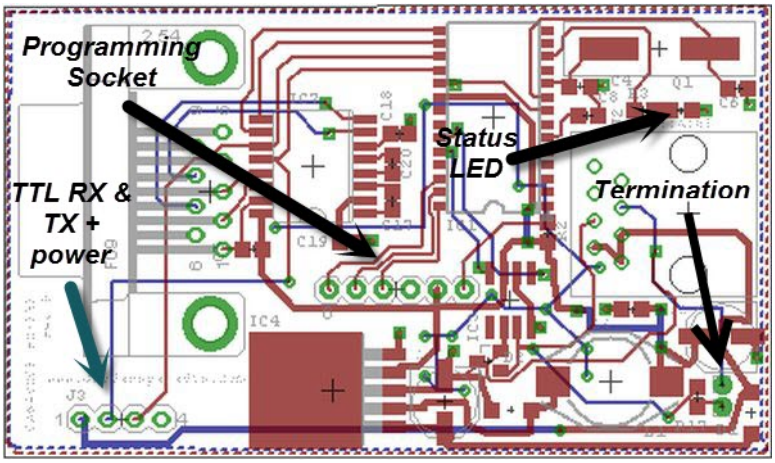

Figure 1.2: Road map to module

Some key positions on the module is outlined in the figure below

1.3.1 TTL level pinhead

J3 can be used if you want to connect CAN4VSCP-RS232 to another card using TTL serial levels. On this pin RX/TX + power and ground is available.

Pin	Description
1	Power: 9V+28V
2	RX
3	TX
4	GND

1.3.2 ICSP Programming pinhead

The in circuit programming pinhead can be used to program (or debug) the mikroprocessor. The socket directly fits the low cost PICKIT2 programmer, but any pic programmer can obviously be used. The pinput is described below. Pin 6 is connected to RB5/LVPGM of the processor.

Pin	Description
1	VPP/MCLR
2	VDD (+5V)
3	VSS (Ground)
4	PGD
5	PGC
6	LVPGM

1.3.3 Termination

Both ends of a CAN4VSCP bus should be terminated with a 120 ohm resistor. If the CAN4VSCP RS-232 is on one end of a bus this termination can be shorted

Figure 1.3: PICKIT2 programmer

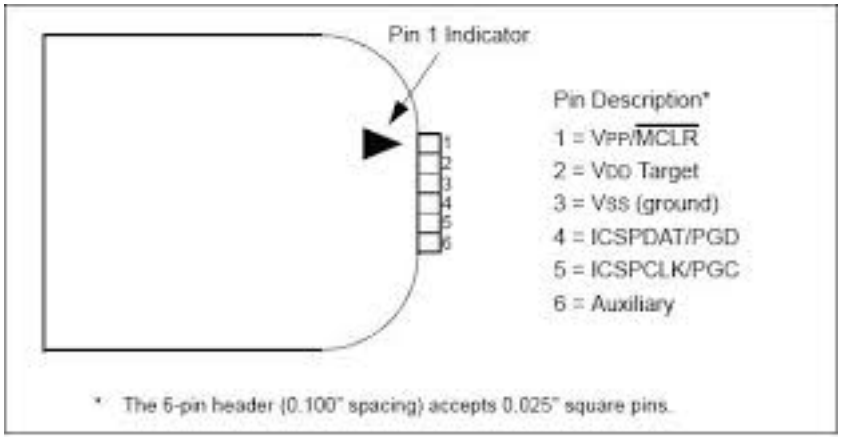

Figure 1.4: Pinout for ICSP programming socket

to enable the onboard resistor.

1.3.4 Status LED

The power LED is steady on when the device is powered and will blink shortly when events are received. Fault conditions are indicated by a blinking LED. Fast blinking: bus error. Slow blinking: Bus warning.

LED	Description
Steady	Powered. No error. No traffic on bus.
Short untimed blinks	Traffic on bus.
Slow blinking	Bus error warning. Something is wrong on the CAN4VSCP bus and if not fixed a bus off will result.
Fast blinking	Bus off. Something is very wrong of the CAN4VSCP bus and the driver to the bus has unconnected itself from the bus. When the bus behaves as normal again it will automatically connect again. The problem can typically be shorted CANH/CANL, only one devices on the bus, a device with wrong bitrate on the bus. To not terminate both ens of the bus with a 120 ohm resistor can also give problems.

1.4 Cable and connectors

The unit is powered over the CAN4VSCP bus. The CAN4VSCP normally uses CAT5 or better twisted pair cable. You can use other cables if you which. The important thing is that the CANH and CANL signals uses a twisted cable. For connectors you can use RJ10, RJ11, RJ12 or the most common RJ45 connectors. There are different versions

1.4.0.1 Serial connection - DSUB9, female

The DSUB-9 connector can connect the device to a computer or other device with a RS-232 serial connection. The communication parameters are always set to 57600, N81 (No parity, eight databits, one stopbit), no handshake. A standard USB to RS-232 adapter fits directly if a RS-232 serial port is missing.

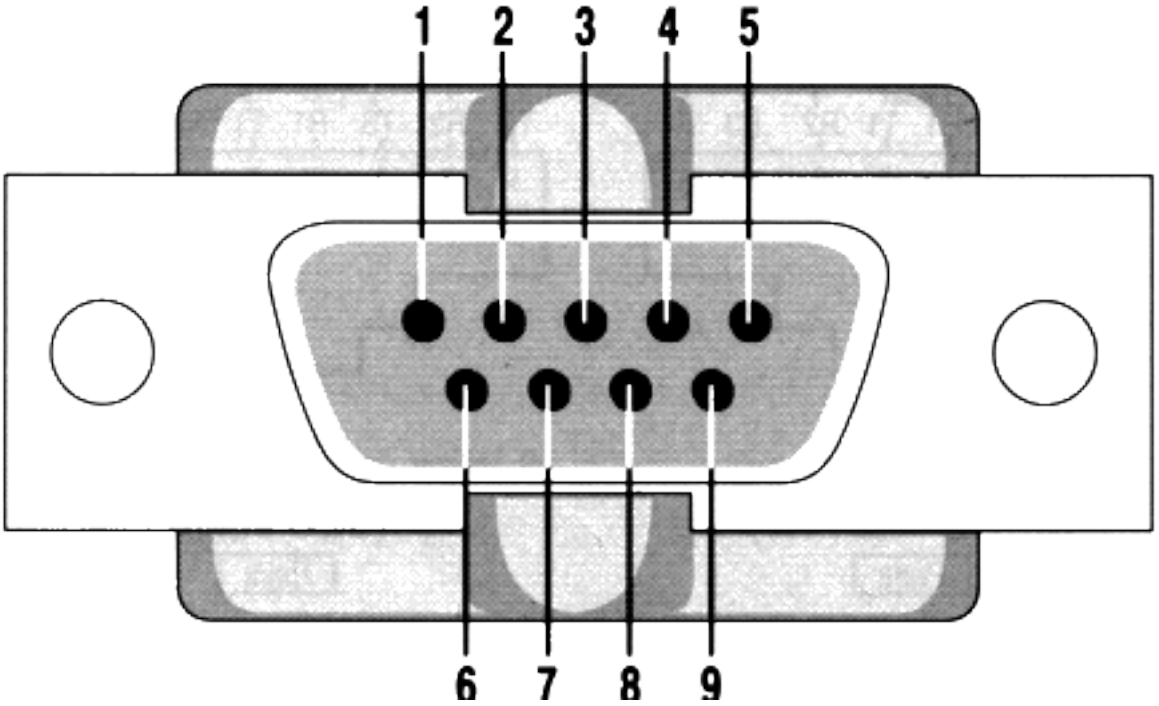

Figure 1.5: RS-22 connector

Pin	Description
1	GND
2	Transmit data (TXD) out
3	Receive data (RXD) in
4	Not used
5	Not used
6	Not used
7	Request to send (RTS) in
8	Clear to send (CTS) out
9	Not used

RTS and CTS is currently not used.

1.4.0.2 RJ-XX pin-out

RJ-11/12/45 pin-out

Always use a pair of wires for CANH/CANL fort best noise immunity. If the EIA/TIA 56B standard is used this condition will be satisfied. This is good as most Ethernet networks already is wired this way.

1.4.1 Cable length

CAN4VSCP always communicate with 125kbps. This means that if you use a good quality cable it can be up to a maximum of 500 meters using AWG24 or

Pin	Use	RJ-11	RJ-12	RJ-45	Patch Cable wire color T568B
1	+9-28V DC			RJ-45	Orange/White
2 1	+9-28V DC		RJ-12	RJ-45	Orange
3 2 1	+9-28V DC	RJ-11	RJ-12	RJ-45	Green/White
4 3 2	CANH	RJ-11	RJ-12	RJ-45	Blue
5 4 3	CANL	RJ-11	RJ-12	RJ-45	Blue/White
6 5 4	GND	RJ-11	RJ-12	RJ-45	Green
7 6	GND		RJ-12	RJ-45	Brown/White
8	GND			RJ-45	Brown

Table 1.2: RJ-XX pin-out

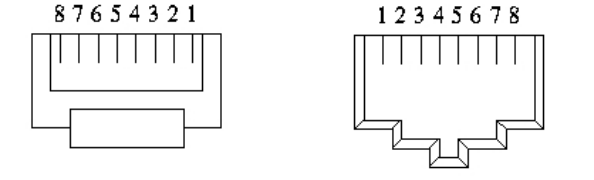

Figure 1:
End view of RJ45 Plug

Figure 2:
Looking into an RJ45 Jack

Figure 1.6: RJ-45 pin out

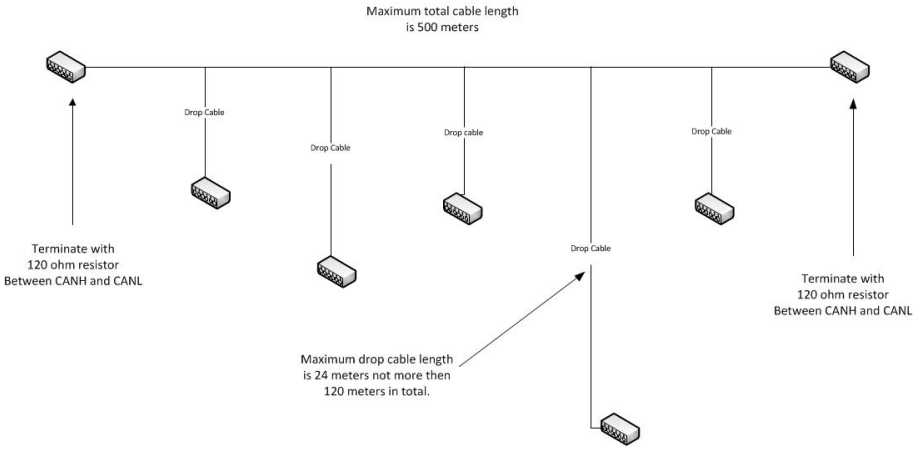

Figure 1.7: CAN4VSCP bus with drops and terminations

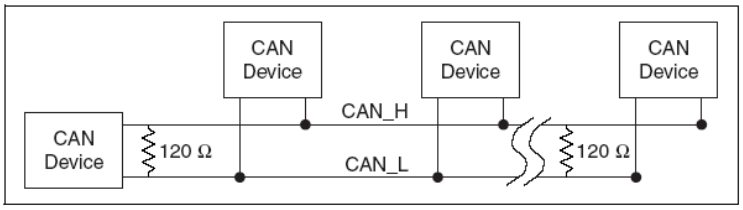

Figure 1.8: Termination

similar (CAT5) . Actual length depend on the environment and other parameters. Drops with a maximum length of 24 meters can be taken from this cable and the sum of all drops must not exceed a total of 120 meters.

1.4.2 Termination

The CAN4VSCP bus, as all CAN based networks, should be terminated with a 120 ohms resistor between CANH and CANL at both ends of the cable.

If you use CAT5 this termination should be placed between the blue - blue/white cables at both end of your bus.

On the board there is a jumper for an on-board terminator. See figure above.

1.4.2.1 Why are terminators required?

Terminators are needed to cancel signal echos in the cable. In short you get less noise in the cable if you use them. It is recommended to use them even if at 125 kbit it is possible that your bus will work anyway.

1.4.3 Power the module

You normally power the module through the RJ45 connector over the CAN4VSCP bus. See 1.4.0.2 for a description of which pins to use for power and ground. The voltage range is +9VDC - 28VDC. The current need depend on how many modules you want to power.

An alternative way to power the module is through the daisy chain connector described above. Just connect +9V - 28V to it's pin 1 and ground to pin 4. Needless to say you can't have power supplied by the CAN4VSCP bus at the same time.

1.4.4 Best practice

Even if it is possible to have cable lengths up to 500 meters it is better to stay at shorter distances to have some margins. Here are some guidelines for a reliable set up

- Total cable length of 300m, stub cables count double their length in that total.
- Nodes count as 6m in that total.
- Never less than 30cm of cable between nodes, nor between a stub connection and a node.
- No more than 50 nodes connected.

Following this best practice you will have a setup that will work reliable even in harsh environments.

1.5 Installing the module

Connect the module to the CAN4VSCP bus. The green led on the module should light up indicating that the device is powered. Connect a serial device to the RS-232 connector and now your module is ready to use.

1.6 Updating firmware

There is two ways you can use to update the firmware of the device. You can program the device using the programming socket on board or you can use a special bootloader program to program the device over the serial channel.

1.6.1 Update firmware using the ICP connector

The firmware of a circuit equipped with a Microchip microprocessor usually can be programmed in circuit. That is when it is mounted on a printed circuit board. This is also true for the CAN4VSCP RS-232 module which have the programming connector on-board (J3). If you have a programmer for Microchip processors (Real ICE, ICD-2, ICD-3, PICKIT-2, PICKIT3 or other) you can program your own firmware or the latest official firmware into the module using MPLAB or similar tools. You can always find a link to the latest firmware on the CAN4VSCP RS-232 module home page (http://www.grodansparadis.com/can4vscp_rs232/can4vscp_rs232.

1.6.2 Update firmware with bootloader program

You need a Windows/Linux equipped PC to load the CAN4VSCP-RS-232 module with new firmware. Download the bootloader from the CAN4VSCP RS-232 homepage. You can always find a link to the latest firmware and bootloader on the CAN4VSCP RS-232 module home page (http://www.grodansparadis.com/can4vscp_rs232/can4vscp_rs2
The bootloader code is desctobed here http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PA
and a Linux version is here http://sourceforge.net/projects/tinypicbootload/files/.

1.7 Driver

A CANAL driver (VSCP Level I driver) is available for the CAN4VSCP RS-232 module both for windows and for Linux. This driver can be used with the VSCP daemon and with VSCP Works and other software. The interface that is exported is described in part VII of the specification document (http://vscp.org/docs.php) and it is easy to interface from your own programs. The VSCP helper dll can also be a convinient tool to use for this.

1.8 Where can I find the source code?

Most VSCP modules from Grodans Paradis AB is Open hardware/Open source meaning that both the hardware information as well as the source code is available. This means that you can modify the source code and /or the hardware to your specific needs if you want.