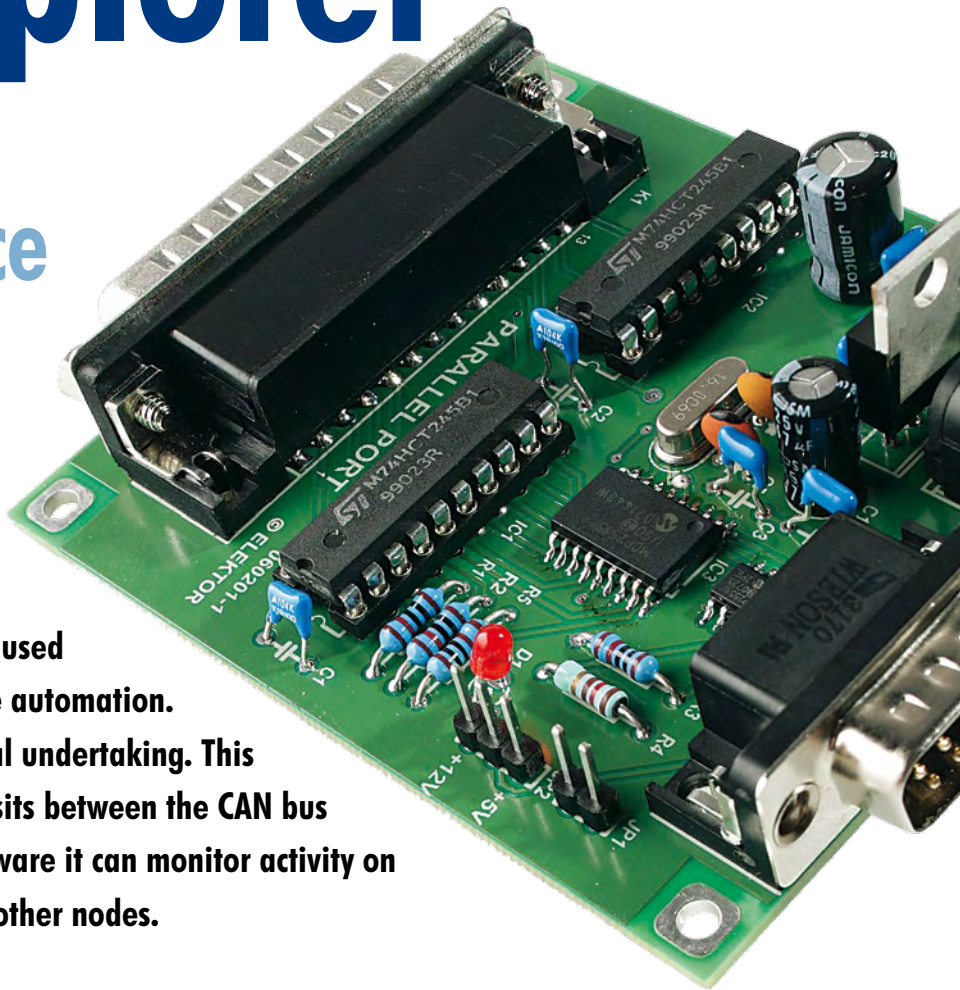


CAN Explorer

Versatile PC-CAN Interface

Fredi Krüger

The CAN bus network is usually associated with vehicle systems or industrial automation but it can also be used in many other situations including home automation. Implementing the network is not a trivial undertaking. This low-cost solution is a CAN board which sits between the CAN bus and a PC. Using the versatile (free) software it can monitor activity on the network and test the functioning of other nodes.



Although originally conceived (by Bosch) to provide a network linking together electronic vehicle subsystems, the CAN bus was later adopted by companies specialising in industrial control systems. A quick trawl of the Internet indicates that the CAN bus has many devotees who have used it in a number of interesting applications [1]. Among the advantages of this network are its excellent error detection, good interference rejection and a wide range of low-cost components. Following links [2a] and [2b] will fill in some of the background information on this network standard. The available node hardware extends from so-called Stand-Alone-Controllers up to microcontrollers with integrated CAN controllers.

One of the difficulties in a network is to establish communication, so that information can be sent reliably between different system components. The level of difficulty is further multiplied if it is necessary to build the whole network from scratch and manage bidirectional data on the network. This article presents a CAN bus-to-PC

interface card which together with the use of free software can not only monitor traffic on an existing CAN network but also send and receive CAN-format messages and monitor the functioning of other nodes on the network. Use of these features gives the user a good insight into the workings and capabilities of the CAN bus.

Simple, low-cost and versatile

The CAN controller chip MCP2515 from Microchip is relatively low-priced while the PC software is available free-of-charge from Microchip [3]. The software allows direct access to the CAN controller's registers to configure the controller for specific applications. CAN bus messages can also be sent and received and a configurable filter/mask allows the user to set-up and test for message acceptance.

The board interfaces to the PC using the parallel printer port which nowadays (unless your printer is very old) is hardly ever used. This port offers good communication speed and low-

cost interface hardware (with regard to Windows Vista problems, see the *LabTalk* article elsewhere in this magazine). The parallel printer port must be configured in software for bidirectional data flow.

In order for the hardware to run the software from Microchip it is necessary that the circuit diagram (**Figure 1**) corresponds closely to the CAN bus board described by Microchip on their web site [3]. Two 74HCT245 bus transceivers (IC1, IC2) are used to buffer signals between the printer port and the MCP2515 CAN controller chip (IC3). Communication to the chip takes place using the serial SPI interface with the necessary signals produced/received by the PC software via parallel port pins. The additional signals are used to poll/control the status of other signals of the CAN controller. An MCP2551 (IC4) is used as the CAN bus driver/receiver but alternatives like the PCA82C521 are also suitable.

The PCB for this project, no. **060201-1** can be ordered through Elektor's business partner ThePCBShop. Jump-

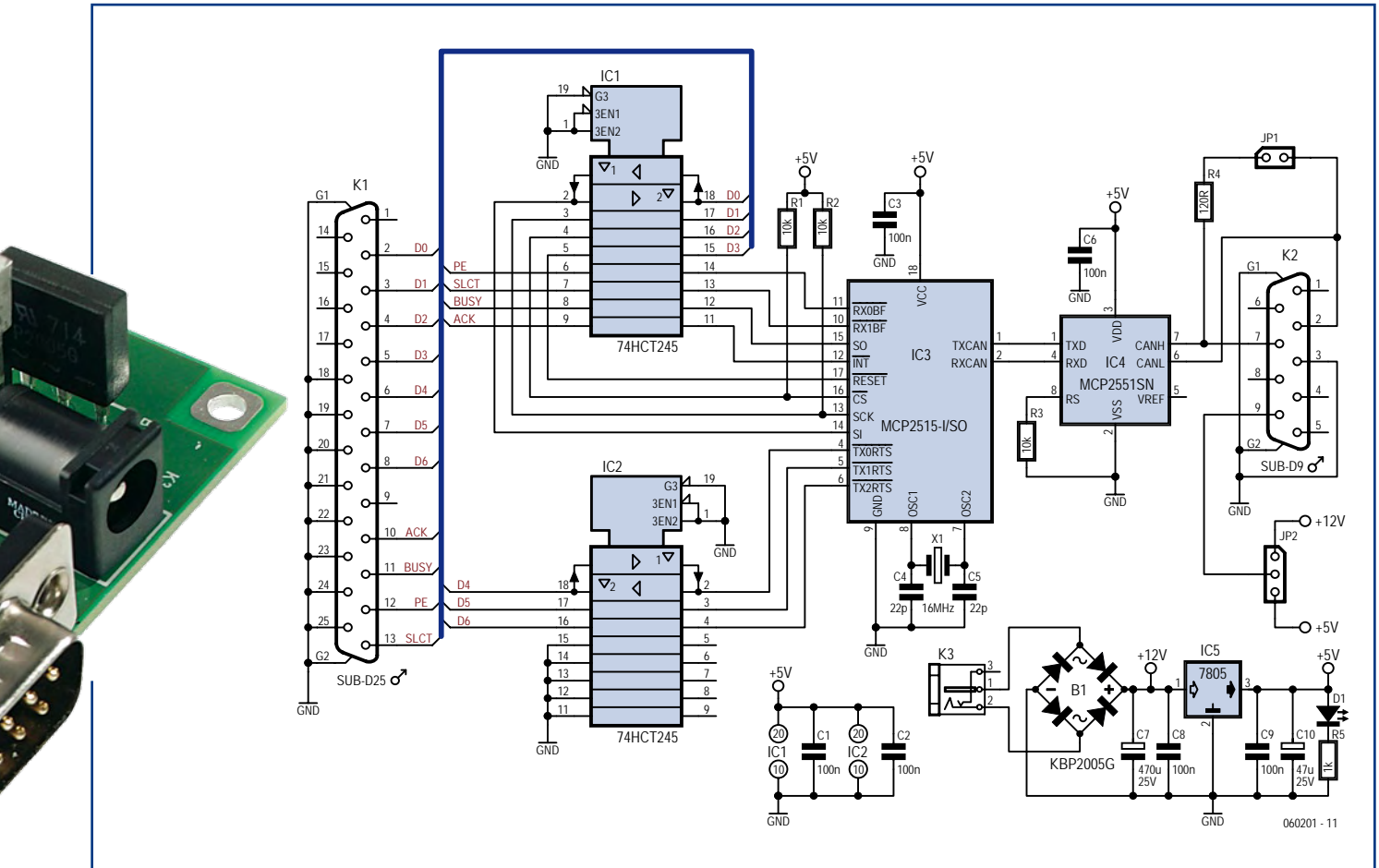


Figure 1. Bus transceivers IC1 and IC2 buffer signals between the printer port and the CAN controller chip (IC3). IC4 is a CAN bus driver.

er JP1 can be used to connect a 120 Ohm terminating resistor across the network cable if this board is the end node. This is recommended to reduce signal reflections in the cable. Physical connection to the CAN bus is made via a PCB mounted 9-way sub-D connector (K2). Pin assignments are given on the circuit diagram and spare pins are used to allow the board to be powered from the bus connector with either 12 V or 5 V (use JP2 to select). Alternatively a separate mains adapter input is provided (K3) to power the board. The bridge rectifier (B1) ensures that a mains adapter ('wall wart') producing a low-voltage AC or DC output (with a plug wiring of either polarity) can be used without problem.

Fitting it all together

The resistors and capacitors can be fitted first, followed by the other components according to their size. Make sure that the correct polarity is observed for the electrolytic capacitors (C7; C10), LED (D1), rectifier (B1), and

do pay attention to the correct orientation of the ICs on the board. Once you are happy that the layout is correct and you have not made any unintentional solder bridges between pads and tracks, it is time to connect the power supply (8 V to 12 V) to connector K3. LED D1 should now light. With the board connected to the par-

allel printer port of a PC and with the software (described below) running the hardware will automatically be recognised as an 'Eval-Board'.

Software

Software for the project can be downloaded free-of-charge from the Micro-

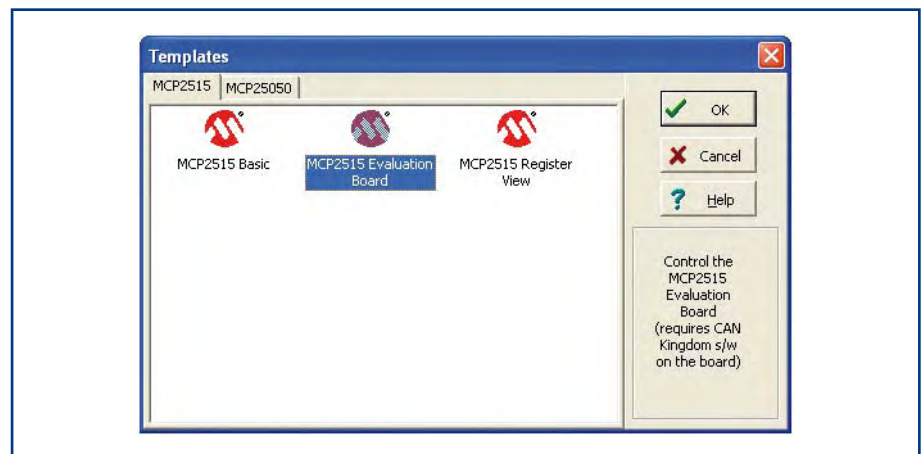


Figure 2. Following software installation and a few mouse clicks, these options are available.

able from the Elektor website [6]. Selecting 'MCP2515 Register View' gives you access to all the internal registers of the MCP2515. A new window pops up for each of the selected functions (**Figure 3**). Selecting 'MCP2515 Evaluation Board' / 'MCP2515 Basic' switches the software into bus-monitoring mode and bus activity is displayed (**Figure 4**). More detailed information of the software is available from the Microchip website [3].

(060201-1)

Web Links

- [1] <http://caraca.sourceforge.net>
- [2a] http://www.computer-solutions.co.uk/info/Embedded_tutorials/can_tutorial.htm
- [2b] http://en.wikipedia.org/wiki/Controller_Area_Network
- [3] http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=1406&dDocName=en531891
- [4] www.kvaser.com
- [5] www.driverlinx.com/download/dlportio.htm
- [6] www.elektor.com/canbusE

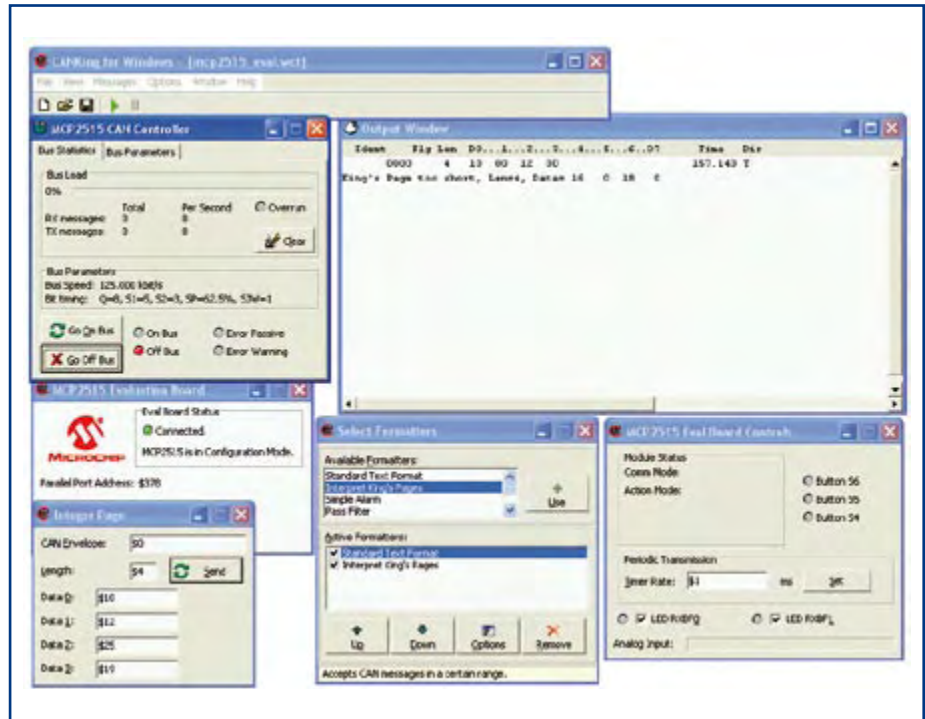


Figure 4. Choosing 'MCP2515 Evaluation Board' / 'MCP2515 Basic' (see Figure 2) switches the software into bus monitor mode showing all bus traffic.