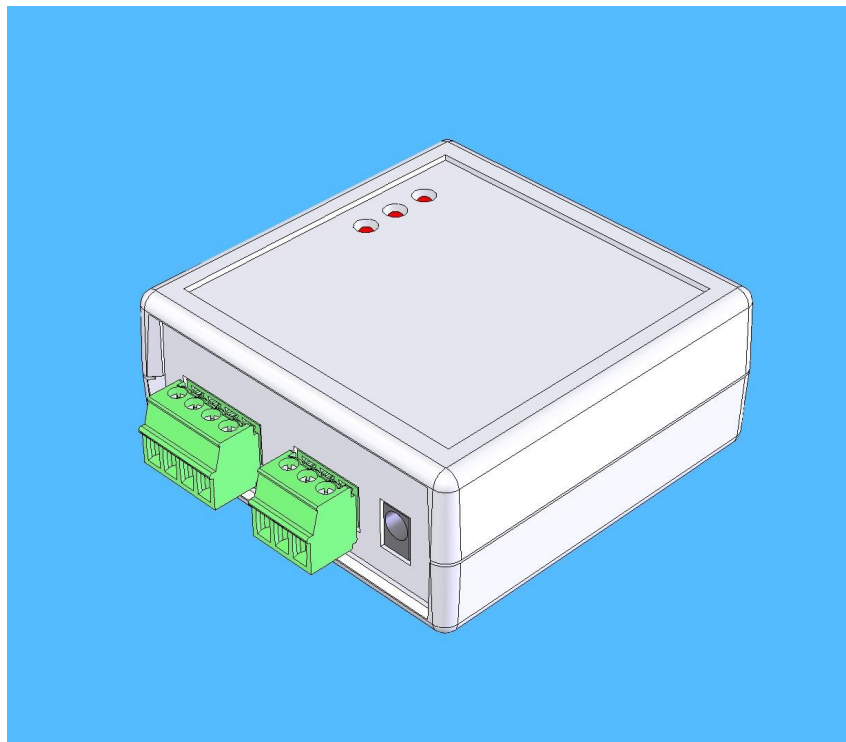


User manual

28.12.2005
V1.0

DCS771 USB-to-RS-485 converter



Nokeval

INTRODUCTION

DCS771 is used to add an RS-485 connection in a PC computer. It is connected in a USB port, and the drivers create a virtual COM port that can be used just as an ordinary COM port. Even the baud rates and bit configuration can be changed in Windows port settings – these require no jumper settings. DCS771 can be used with a variety of protocols, including Nokeval SCL and Modbus ASCII and RTU.

DCS771 can give a small amount of power from the USB to the RS-485 devices. For example, two Nokeval radio receivers RTR970's can be powered. If more power is needed, it can be fed to the bus conveniently with a dedicated screw terminal.

To aid troubleshooting, DCS771 is equipped with three indicator LEDs. The 485 bus is connected with screw terminals eliminating the need to make solder joints on the cables.

Due to individual serial number on every device, these devices retain the COM port number if detached and replugged, even in a different USB port. This increases reliability.

SPECIFICATIONS

USB connection

Connection:	USB 1.1 or 2.0
Bus chip:	FTDI FT232BM
Consumption:	100 mA
Connector:	USB-B (USB-A-B lead included).

Regulations

EMC immunity
EN 61326

EMC emissions
EN 61326 class B

RS-485 bus

Baud rates	Any up to 115200 bit/s
Data bits	5..8
Parity	All modes supported
Stop bits	1, 1.5, 2
Bus length	1000 m
Devices on bus	max 32 normal load devices or 128 1/4 load devices
Load	1/4 load

Power from USB

Voltages	10 V 120 mA or 24 V 50 mA
Short circuit protect	Yes

General

Dimensions:	66x67x28 mm
Operating temp:	0...60 °C
Galvanic isolation:	No

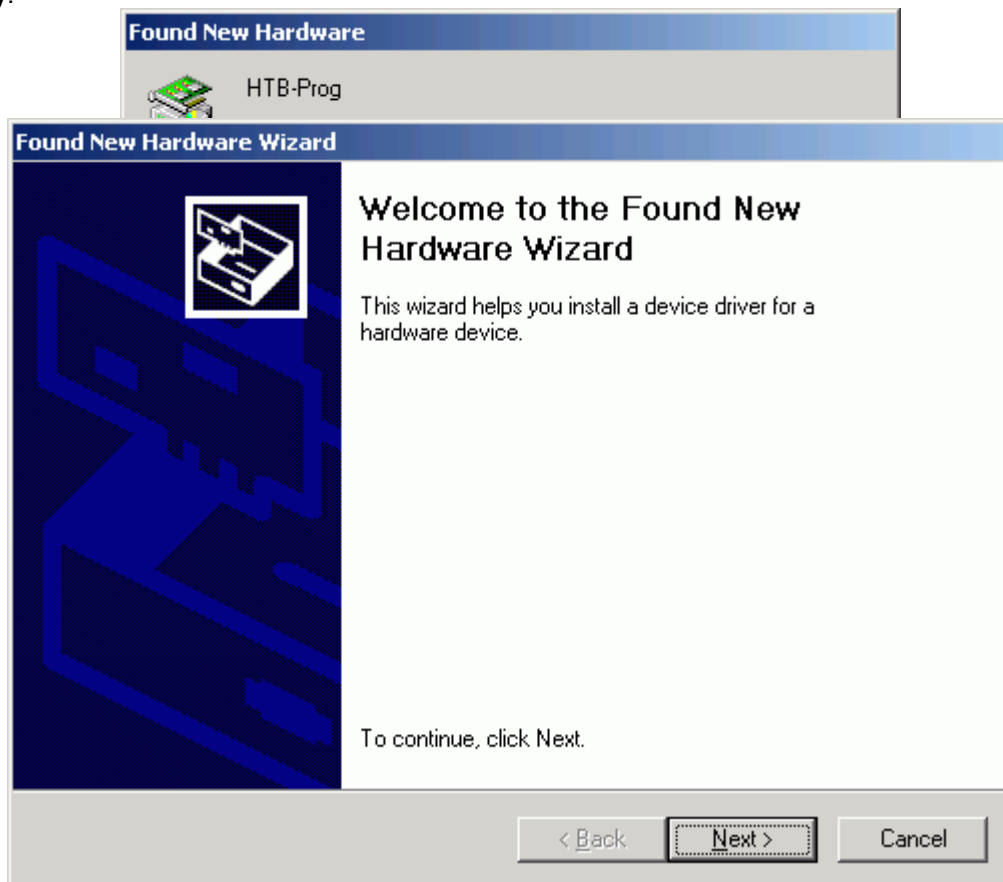
DRIVERS

Installing

The USB interface chip needs two drivers: one for USB bus and the other to create a virtual serial port.

The drivers can be obtained from a Nokeval Software CD or downloaded from the USB chip manufacturer: www.ftdichip.com (Drivers, FT232BM, VCP). The installation below assumes using CD, but using downloaded drivers is quite similar.

Insert the Nokeval Software CD and plug in the device. Windows should detect it and start installing automatically:



Found New Hardware Wizard

Install Hardware Device Drivers

A device driver is a software program that enables a hardware device to work with an operating system.



This wizard will complete the installation for this device:

 HTB-Prog

A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.

What do you want the wizard to do?

- Search for a suitable driver for my device (recommended)
- Display a list of the known drivers for this device so that I can choose a specific driver

< Back Next > Cancel


Found New Hardware Wizard

Locate Driver Files

Where do you want Windows to search for driver files?



Search for driver files for the following hardware device:

 HTB-Prog

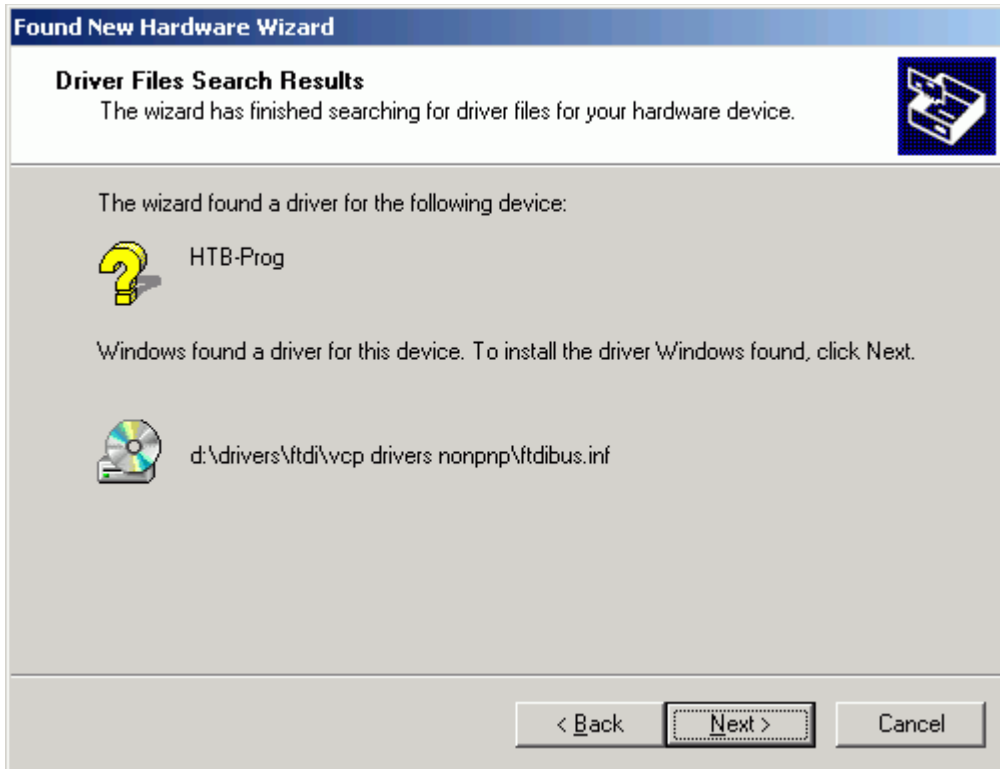
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.

To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.

Optional search locations:

- Floppy disk drives
- CD-ROM drives
- Specify a location
- Microsoft Windows Update

< Back Next > Cancel

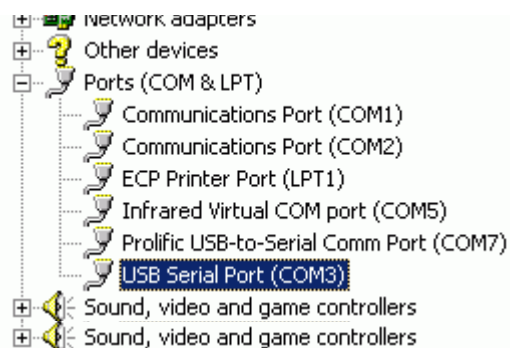


When USB bus driver ftdibus.inf is installed, Windows wants to install the virtual serial port driver, that makes the device to look like an ordinary COM port.



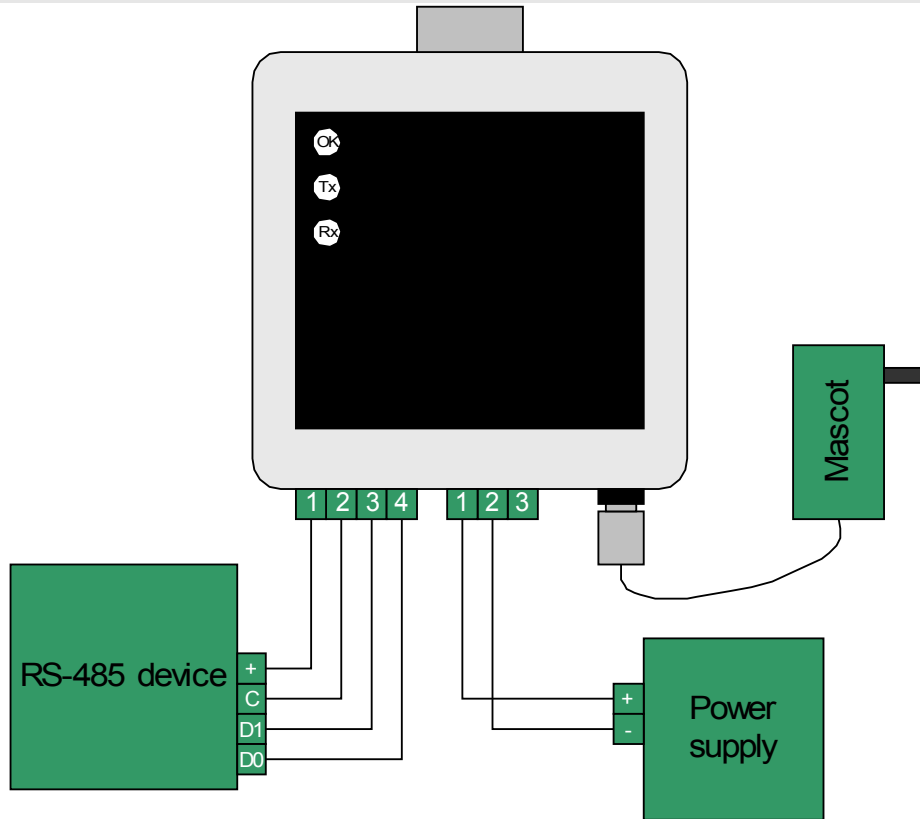
Install in the same way as the bus driver. When all is complete, the OK indicator on the device should be lit.

Finally it is necessary to find out, which COM port represents the device. Open Control Panel, System, Hardware, Device Manager. In the device tree, expand Ports, and there should be USB Serial Port (COM3), for an example.



CONNECTING

485 bus connections



DCS771 has four terminals for the RS-485 bus: Power supply +, Common, D1, and D0. These are connected one-to-one to the other devices on the bus. The D1 and D0 lines carry the data in both directions (one direction at a time, i.e. Half-duplex). Common wire is needed to equalize the ground potential of the bus devices. It must be connected even if no power is taken from the DCS771.

However the older Nokeval devices do not have a Common terminal available – in that case connect only D1 and D0.

If the bus devices are to be powered via the DCS771, the power is provided in the bus connector terminals 1+ and 2-. The DCS771 can obtain that power with various ways, see the next section.

There has been quite rich use of names for the signal lines. Even EIA/TIA recommended "A" and "B" have been used with two meanings. Nokeval has decided to use the names defined by Modbus standard, D1 and D0. The table below shows typical names for the lines:

D1	D0
+	-
B	A
A	B

The cable should be of a twisted pair, minimum diameter 0.5 mm (24 AWG). A shielded cable may be used to increase immunity to disturbances. The shield should be grounded at one end only.

Power options

DCS771 can provide the supply voltage for the bus devices. It can obtain this power with three ways:

From the USB

Jumper JP1 is set in position "USB" and the voltage selected with JP2 (options are 10 or 24 V). The maximum current is stated in the specifications.

External power supply

The external supply is connected in connector J1. Jumper JP1 is set in position "External". The voltage and current depend on the external power supply – the DCS771 only routes it from a connector to another.

External Mascot

JP1 is set in "External". DCS771 routes the Mascot voltage from connector J3 to connector J2.

To open the case and access the jumpers, unscrew the two screws in the bottom.

Terminating and fail-safing

If the bus is longer than some dozens of meters or if the highest baud rates are used, the bus must be terminated in order to avoid reflecting the signal from the bus ends. The reflections will cause bit errors.

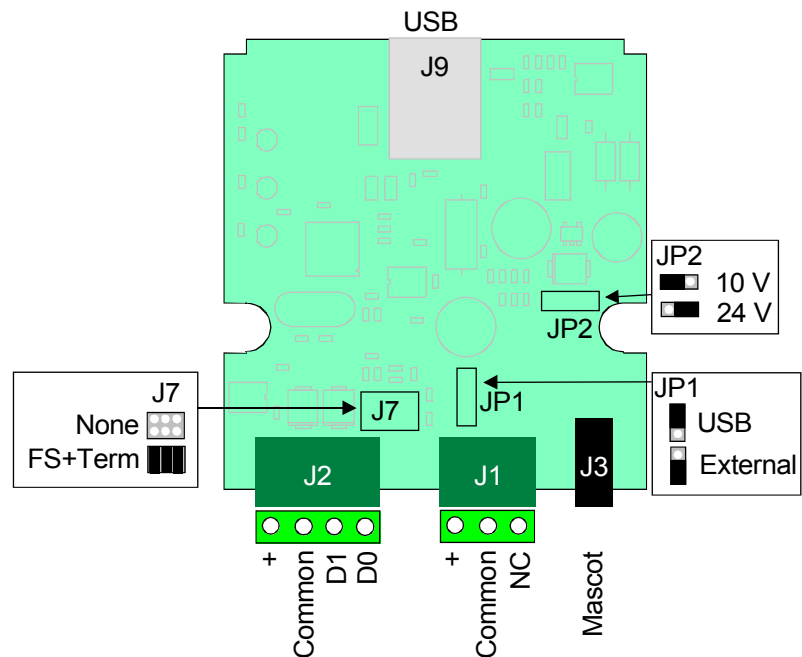
The bus topology should be **daisy-chain**, although short stubs (a couple of meters) are acceptable. The first and the last device on the bus should be terminated. Most RS-485 devices provide some means of terminating without external components, typically closing a jumper or a DIP switch.

Fail-safe resistors are needed to ensure the correct state on the bus when nobody is transmitting. They make at least 0.2 V voltage between lines D1 and D0. Modbus specification recommends that the bus has only one device fail-safing. So it is natural to have the fail-safe on the master of the bus.

DCS771 can do both terminating and fail-safing with jumper settings. Their default setting is on. They may be changed by opening the case – unscrew the two screws in the bottom.

The **termination** provided by DCS771 is an AC termination (there is a resistor 110 ohms and a capacitor 1 nF in series). It is enabled by closing the middle jumper on J7. It should be enabled, if DCS771 is the first or the last device on the bus.

The **fail-safe** resistors are 500 ohms to 5 V, as recommended in Modbus specifications. They are enabled by closing the first and the third jumper on J7. They should be closed, if there is no other fail-safing devices on the bus.



TROUBLESHOOTING

The indicator LEDs in the DCS771 are very helpful when something is wrong with the communications.

Step 1: Drivers

Check if the OK LED is lit in the DCS771. If not, reinstall the drivers.

Step 2: Transmission

Start your PC application and check that the Tx LED is blinking on the DCS771. If not, there is something wrong with your application – a wrong COM port probably.

Step 3: Reception

If the Tx LED is blinking but Rx is not, then your slave device is not responding. Check that it is powered up, it is wired correctly, and that the serial settings are correct.

Step 4: Bus voltage

Use a multimeter to measure the voltage between D1 and D0 lines. It should be at least 0.2 V, D1 being more positive. If it is 0 V, there is a short-circuit, or wire break, or no fail-safe enabled on any device.

Measure the voltage at every device, ensuring the polarity is still correct (D1 more positive).

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