

100BASE-T1 USB Interface User Manual



CHANGES

Date	Description	Created By	Review By
1.12.2020	Initial Release	VB	MM

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1 About

This document describes the use of the 100BASE-T1 USB Interface.

2 Introduction

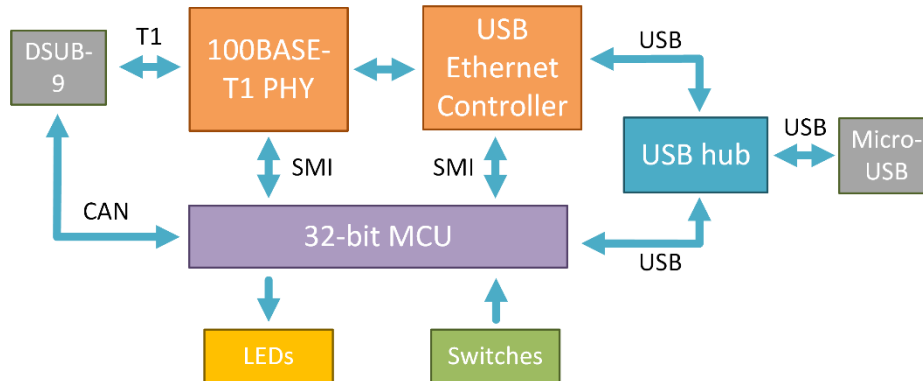


Figure 1 Block Diagram

The 100BASE-T1 USB Interface connects a 100BASE-T1 network to any computer with an USB port. The converter acts as an Ethernet network interface card (Chapter 4.4.3) when plugged into an USB port. The interface easily connects Automotive Ethernet devices with OPEN Alliance BroadR-Reach (OABR) port, such as cameras or ECUs, directly to any PC without a need of an on-board network card.

The interface establishes a point-to-point link between an unshielded twisted-pair IEEE 100BASE-T1 (IEEE 802.3bw) port and USB-LAN port, and works as a Network Interface Card allowing the user to configure the network adapter's parameters, such as IP address and mask. The converter features a DSUB9 (BroadR-Reach, CAN bus) and Micro-USB connector. The OABR channel's Master/Slave configuration is selected by a switch button or by software utility (Chapter 5.2).

The interface offers a possibility to access SMI registers of the 100BASE-T1 transceiver (PHY) via a CAN bus or a USB's virtual serial port. This enables the user to evaluate signal strength, detect polarity of the T1 port, carry out a BroadR-Reach media test to diagnose cable errors, fine-tune the PHYs parameters, and generally to read and write the registers.

2.1 Features

- 100BASE-T1 to USB-LAN interface
- Acts as USB 2.0 Ethernet Adapter
- Master / Slave configuration by on-board dip switches or by software utility
- Automatic polarity detection for Slave
- 4 LEDs for states
- USB powered
- 100BASE-T1 cable test
- PHY SMI registers accessible via CAN bus or USB virtual serial port
- Drivers for Windows, Linux, Mac
- Free-of-charge Windows utility to check the device status
- Table or DIN-rail mount

3 Technical Specification

Electrical	
Ports	1x 100BASE-T1 (BroadR-Reach / OABR) 1x USB Ethernet Network Card (NIC) 1x Virtual COM Port (USB CDC) 1x CAN 2.0B (HS)
Power	USB-powered via Micro-USB connector (5 V DC)
Consumption	150 mA @ 5 V (350 mA peak)
LEDs	3x Status Indicator 1x Power
Button and Switches	2x DIP switch (Master/Slave, User) 1x Tactile switch (Reset factory defaults)
100BASE-T1 Master/Slave	Configurable by on-board dip switch or by software utility over USB
Supported Operating Systems	Windows, Linux, Mac
Transreceivers	100BASE-T1: NXP TJA1102 USB 2.0 LAN: Microchip LAN9500A
Firmware	Upgradable via USB
Microcontroller	32-bit
Mechanical	
Connectors	1x D-SUB9M 1x Micro-USB
Dimensions (L x W x H)	108 x 54 x 30 mm
Weight	83 g
Operating Temperature	0 to 70 °C
Protection	IP20
Placement	Table (adhesive pads included) DIN-rail mount (clip sold separately)

Table 1 Technical Specification



Figure 2 100BASE-T1 USB Interface

4 Device Description

4.1 Overview

The interface has two connectors, four LEDs, two DIP switches and a reset button.

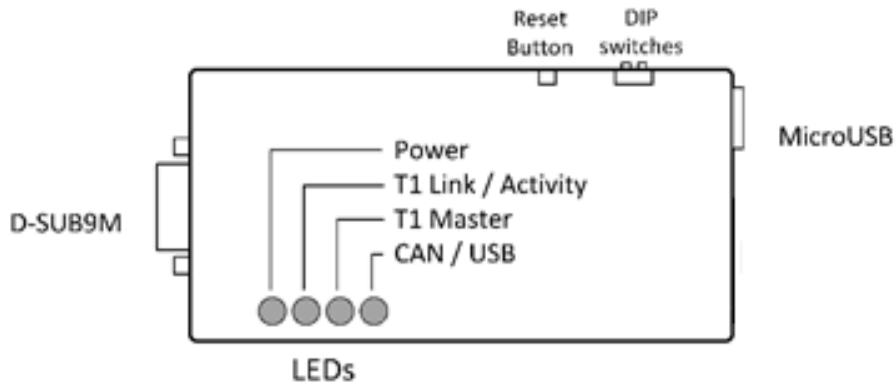


Figure 3 Top View

4.2 Power



Figure 4 Power Options

The device shall be mainly powered over micro-USB connector. The user can also power the device externally in order to lower the power drawn from the USB port.

4.3 100BASE-T1 Connection

Connect 100BASE-T1 network over DSUB9M pins 4 (BP - Positive) and 5 (BM - Negative). Connect LAN over USB. Do not forget to select the select T1 Master/Slave configuration depending on your use case (Chapter 4.4.2), and to power the device (Chapter 0).

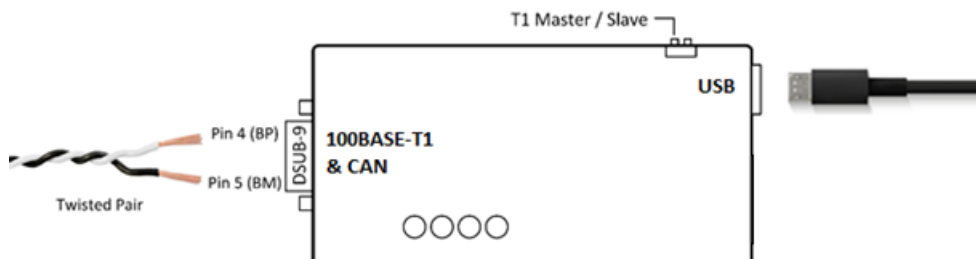


Figure 5 Connection

4.4 Pinout

4.4.1 100BASE-T1 & CAN

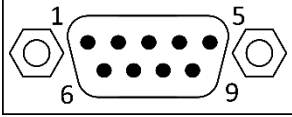
DSUB 9 Male	Pin	Name
 <p>D-SUB9M Front view</p>	1	
	2	CAN_L
	3	GND
	4	T1-BP (OABR)
	5	T1-BM (OABR)
	6	
	7	CAN_H
	8	
	9	

Table 2 100BASE-T1 & CAN Pin Assignment

4.4.2 DIP switches

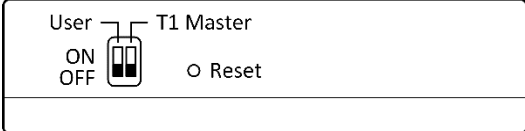
DIP switches	Pin	Name
	T1 Master	Master/Slave configuration
	User	N/A; Currently unused

Table 3 DIP Switch Pin Assignment

Note: To change the T1 mode to Master, switch T1 Master to „ON“ (up).

4.4.3 USB-LAN

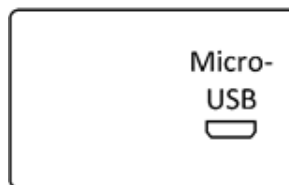


Figure 6 Micro USB

When the interface is plugged into a USB port of a PC, it gets enumerated as a standard Ethernet network card (NIC) and a virtual COM port. The network card can be used as a standard LAN interface. The COM port allows the user to monitor the interface state (see Chapter 5.2).

4.5 LED Status Information

The six LEDs provide the following status information:

LED	Colour	State	Meaning
Power	Green	Off	The device is not powered
		On	The device is powered
T1 Link / Act	Green	Off	Link is not established

		On	Link is established
		Blinking	Link activity
T1 Master	Green	Off	Slave
		On	Master
Communication CAN/USB	Green	Flash	Request received
		On	USB enumerated
		Off	USB connection is not active

Table 4 LED Function Description

4.6 CAN Bus Termination

Status information of the 100BASE-T1 Media Converter can be obtained over USB or CAN bus. In case of a CAN bus connection, there is no internal termination resistor inside the device. Therefore, a proper termination of the CAN bus is needed. The user needs to make sure the CAN bus is properly terminated at both ends.

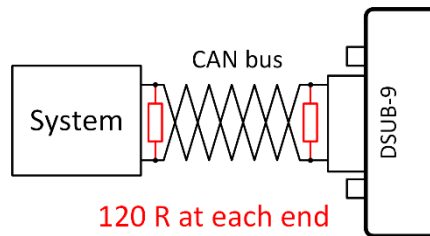


Figure 7 CAN Bus Termination

4.7 Factory Reset

The reset button is located on the side of the device (see Figure 3). For resetting to factory defaults, power the device, wait a few seconds and then press and hold the button for 10 seconds. The button can be pressed by tweezers or a pencil.

5 Usage

The interface offers a plug&play bi-directional connection between 100BASE-T1 and PC connected over USB.

5.1 USB-LAN to 100BASE-T1 Conversion

Purpose of the interface is to connect a computer to 100BASE-T1 (BroadR – Reach). When the interface is plugged into a PC, it will be enumerated as a standard Ethernet network card and a virtual COM port.

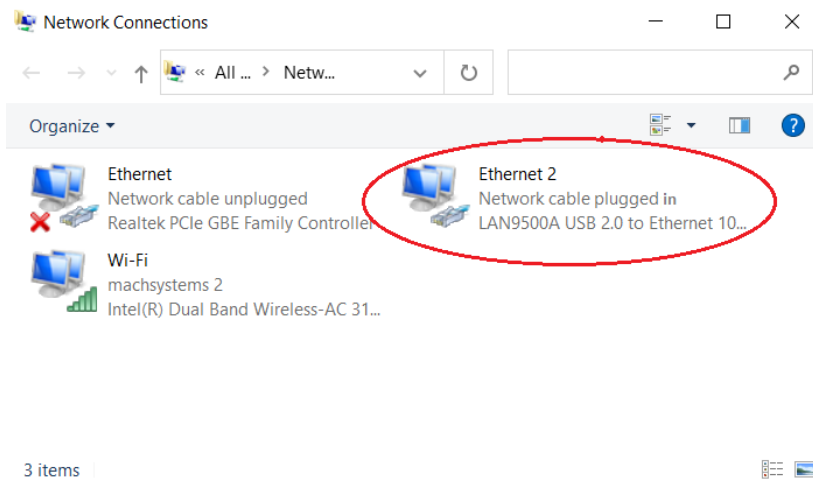


Figure 8 Network Card

In order to lower the power drawn from the USB port, an external power supply can be connected over DSUB connector (4.2).

100BASE-T1 mode can be changed by software (Chapter 5.2) or by hardware (set DIP switches to position „ON“ for User mode „Master“).

5.2 Diagnostic over USB

When connect the media converter to PC over USB, it will be enumerated as a virtual COM port. Windows 10 operating system and newer is supported.

The 100BASE-T1 Media Converter Utility PC application allows to read the status of the device. The utility can be downloaded from www.machsystems.cz/en/support.

Run “100BASE-T1 Media Converter.exe”. Now you see window of Windows application as shown below. To start monitoring, click once on button „Connect“.

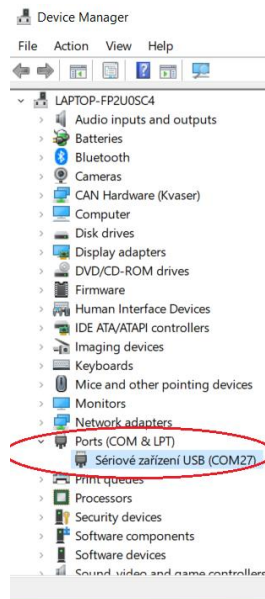


Figure 9 Serial COM port

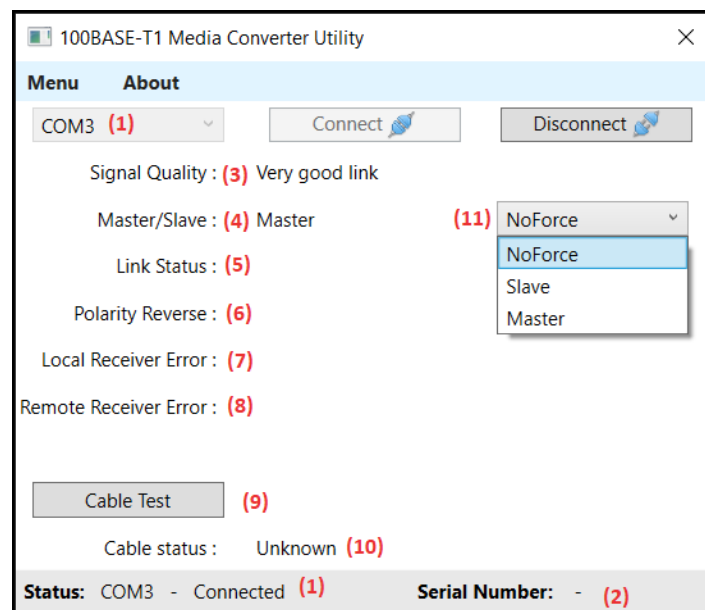


Figure 10 Main Screen of the utility

- (1), COM port number of the device
- (2) Device's serial number
- (3) T1 signal quality
- (4) current T1 mode
- (5) T1 link status
- (6), (7), (8) T1 link errors
- (9), (10) T1 port cable test
- (11) T1 Master / Slave forcing

Note: Mode of the Media Converter can be changed by software (11) or by hardware (set DIP switch T1 Master to position „ON“ for User mode „Master“).

6 Firmware Update

For updating the device's firmware, you will need a .MSF firmware file, MsFirmwareUpdater application, and a Micro-USB cable.

6.1 Preparations

The device's firmware can be updated over USB. To do so, connect your Media Converter to the PC over USB. If you are connecting your product to the computer for the first time, it takes a little bit more time than usual. Please download the MsFirmwareUpdater application and the MSF firmware file from our support page www.machsystems.cz/en/support and extract all files into a new folder.

1. Run "MsFirmwareUpdater.exe"
2. Click on "Load from File" button
3. Select the .msf file
4. Select RS-232 interface and the correct COM port.

Shown information under "Load from File" button depends on the selected .msf file. "Variant Id check" shall be checked by default. "New Protocol" checkbox shall be checked by default too.

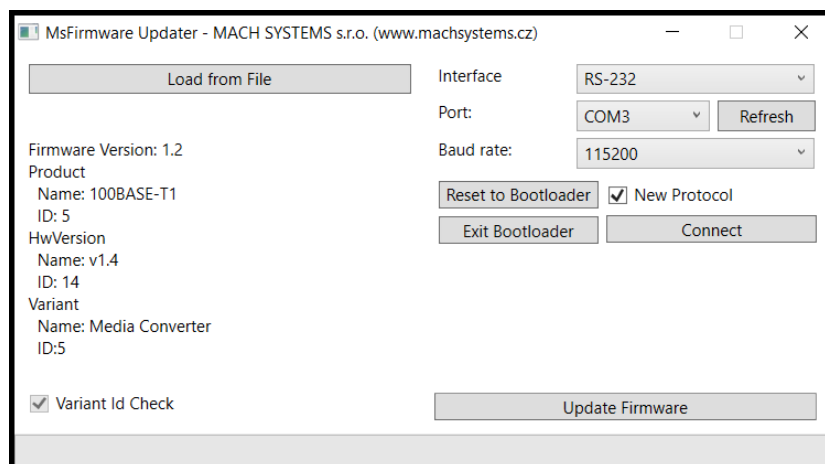


Figure 11 MsFirmwareUpdater - Main Window

In many cases you can connect to your MACHSYSTEMS device over more than one ports, interfaces and speeds of transmission. Choose one connection from the dropdowns. It is recommended to use "Baud rate" value 115200.

RS-232	COM3	115200
CAN	COM4	9600
		19200

Figure 12 Interface Dropdown

Figure 13 Port
Dropdown

Figure 14 Baud Rate Dropdown

Note: After you open the app, check the COM port number. Default number is valid only for the connecting app to the device, but not for the updating firmware itself.

6.2 Updating Process

Steps:

1. Make sure “New Protocol” checkbox is checked.
2. Click “Reset to Bootloader”.
Wait until the device is enumerated (usually 5 - 15 seconds).
3. The device will switch into bootloader mode and a new COM port will be added.
Note: For devices connected over USB, the virtual COM port number will differ for normal and bootloader mode of the device. Thus, if you restart the device into bootloader, you shall refresh the ports (Refresh button) so that you can then use the bootloader COM port. In this case, select this new COM port.
4. Click on “Refresh” button so that the new port is available in drop-down.
5. Select a different COM port than you found in default settings from the dropdown.
6. Click “Connect”.
7. Click “Update Firmware” and wait until the flashing is finished.
Progress bar in the bottom shows flashing progress.
8. Once finished, a pop-up windows will be shown. Click “OK”.

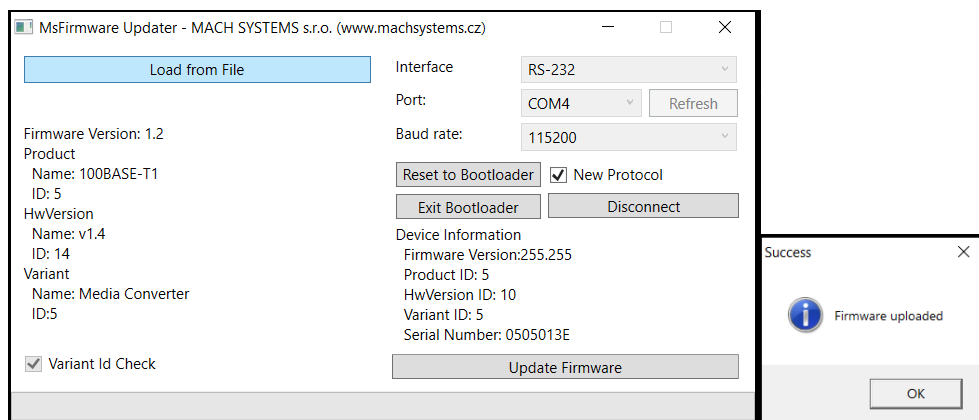


Figure 16
MsFirmwareUpdater -
Device Connected

Figure 15
MsFirmwareUpdater -
Firmware Update
Succeeded

7 Legal Information

7.1 Usage Warning

WARNING FOR ALL USERS

WARNING! - YOUR USE OF THIS DEVICE MUST BE DONE WITH CAUTION AND A FULL UNDERSTANDING OF THE RISKS!

THIS WARNING IS PRESENTED TO INFORM YOU THAT THE OPERATION OF THIS DEVICE MAY BE DANGEROUS. YOUR ACTIONS CAN INFLUENCE THE BEHAVIOR OF A DISTRIBUTED EMBEDDED SYSTEM, AND DEPENDING ON THE APPLICATION, THE CONSEQUENCES OF YOUR IMPROPER ACTIONS COULD CAUSE SERIOUS OPERATIONAL MALFUNCTION, LOSS OF INFORMATION, DAMAGE TO EQUIPMENT, AND PHYSICAL INJURY TO YOURSELF AND OTHERS. A POTENTIALLY HAZARDOUS OPERATING CONDITION IS PRESENT WHEN THE FOLLOWING TWO CONDITIONS ARE CONCURRENTLY TRUE: THE PRODUCT IS PHYSICALLY INTERCONNECTED TO A REAL DISTRIBUTED EMBEDDED SYSTEM; AND THE FUNCTIONS AND OPERATIONS OF THE REAL DISTRIBUTED EMBEDDED SYSTEM ARE CONTROLLABLE OR INFLUENCED BY THE USE OF THE CAN NETWORK. A POTENTIALLY HAZARDOUS OPERATING CONDITION MAY RESULT FROM THE ACTIVITY OR NON-ACTIVITY OF SOME DISTRIBUTED EMBEDDED SYSTEM FUNCTIONS AND OPERATIONS, WHICH MAY RESULT IN SERIOUS PHYSICAL HARM OR DEATH OR CAUSE DAMAGE TO EQUIPMENT, DEVICES, OR THE SURROUNDING ENVIRONMENT.

WITH THIS DEVICE, YOU MAY POTENTIALLY:

- CAUSE A CHANGE IN THE OPERATION OF THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT.
- TURN ON OR ACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- TURN OFF OR DEACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- INHIBIT, TURN OFF, OR DEACTIVATE NORMAL OPERATION.
- MODIFY THE BEHAVIOR OF A DISTRIBUTED PRODUCT.
- ACTIVATE AN UNINTENDED OPERATION.
- PLACE THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT INTO AN UNINTENDED MODE.

ONLY THOSE PERSONS WHO:

(A) ARE PROPERLY TRAINED AND QUALIFIED WITH RESPECT TO THE USE OF THE DEVICE,

(B) UNDERSTAND THE WARNINGS ABOVE, AND

(C) UNDERSTAND HOW THIS DEVICE INTERACTS WITH AND IMPACTS THE FUNCTION

AND SAFETY OF OTHER PRODUCTS IN A DISTRIBUTED SYSTEM AND THE APPLICATION FOR WHICH THIS DEVICE WILL BE APPLIED, MAY USE THE DEVICE.


PLEASE NOTE THAT YOU CAN INTEGRATE THIS PRODUCT AS A SUBSYSTEM INTO HIGHER-LEVEL SYSTEMS. IN CASE YOU DO SO, MACH SYSTEMS s.r.o. HEREBY DECLARES THAT MACH SYSTEMS s.r.o.'s WARRANTY SHALL BE LIMITED TO THE CORRECTION OF DEFECTS, AND MACH SYSTEMS s.r.o. HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OVER AND ABOVE THE REFUNDING OF THE PRICE PAID FOR THIS DEVICE, SINCE MACH SYSTEMS s.r.o. DOES NOT HAVE ANY INFLUENCE ON THE IMPLEMENTATIONS OF THE HIGHER-LEVEL SYSTEM, WHICH MAY BE DEFECTIVE.

7.2 Disposal and Recycling Information



When this product reaches its end of life, please dispose of it according to your local environmental laws and guidelines.

7.3 Declaration of Conformity


MACH SYSTEMS

EU Declaration of Conformity (DoC)

We

Company Name	MACH SYSTEMS s.r.o.	City	Prague
Postal Address	Pocernicka 272/96	Country	Czech Republic
Postcode	108 00		

declare that the DoC is issued under our sole responsibility and belongs to the following products:

100BASE-T1 Media Converter
100BASE-T1 USB Interface

Objects of the declaration:

Product	Product Number
100BASE-T1 Media Converter	100BASET1-MC-ETH
100BASE-T1 USB Interface	100BASET1-USB-IF

The objects of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/30/EU - EMC Directive
2011/65/EU - RoHS (recast)


The following harmonised standards and technical specifications have been applied:

EN 55032	EN 61000-4-2
EN 63000	EN 61000-4-4

Signed for and on behalf of: MACH SYSTEMS s.r.o.

Place of issue: Prague, Czech Republic

Date of issue: November 20th 2020

Signature: 

Name, function: Miroslav Machacek, Managing Director

MACH SYSTEMS s.r.o.
www.machsystems.cz

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Kvaser is a registered trademark of Kvaser AB in Sweden and other countries.

8 Ordering Information

Product Number	Description
100BASE-T1-USB-IF	100BASE-T1 USB Interface
DIN-CLIP	Clip for mounting on a DIN rail

Table 5 Ordering numbers for 100BASE-T1 USB Interface

9 Contact

MACH SYSTEMS s.r.o.

www.machsystems.cz

info@machsystems.cz

Czech Republic



Company registration: 29413893

EU VAT number: CZ29413893