Ethernet thermometer TME

a thermometer with Ethernet data transmission

ASCII, HTTP (WEB), SMTP (e-mail), and SNMP protocols

TME

Datasheet

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TABLE OF CONTENTS

BASIC INFORMATION

Description

TME is a simple temperature sensor with an Ethernet interface. It measures temperatures from –55 °C to +125 °C. The measured temperature value can be read in several ways, including through an intranet.

Communication is controlled by different TCP/IP protocols. Thanks to that, a method suitable for a given application can be selected. The temperature value is sent in an ASCII format, Spinel compatible; no conversion of the value is necessary. The temperature value is sent directly in degrees Centigrade (Celsius). The system allows communication with the aid of SNMP protocol (UDP), or by sending an e-mail if the temperature goes outside of preset limits.

Features

- Temperature measurements in the range from –55 °C to +125 °C; resolution 0.1 °C
- Data transmission with the aid of TCP/IP protocols (10/100 Ethernet)
- Intranet
- Data transmission in a simple ASCII format (Spinel) with no necessity of conversion
- E-mail alert if the value goes outside of preset limits
- SNMP protocol
- Possible installation on a DIN rail

Software

- An user frendly configuration program is included free of charge
- A demo program, including commented source code, is also free of charge

Technical Parameters

Power supply ..... 4 to 6 V (max. 230 mA)

Operating temperatures for sense ..... –55 °C to +125 °C

Accuracy ..... ±0.5 °C from –10 °C to +85 °C; and ±2 °C outside of that range

Operating temperatures for electronic components .....–40 °C to +85 °C

Ethernet connection ..... TBase 10/100 RJ45

Dimensions ..... 54 × 33 × 24 mm

Weight ..... 70 g (incl. 0.5 m cable)

Ethernet default settings

IP address..... 192.168.1.254

Subnet mask ..... 255.255.255.0 (8 bits; C mask)

Gateway..... 0.0.0.0

Installation options

Mounting:

- Without a holder *(standard)*
- With a DIN rail mount

Length of cable:

- 2.9 m *(standard)*
- 10 cm to 20 m

Sensor workmanship:

- Sealed in shrinking plastic tubing *(standard)*
- In a metal tube, ø 6 mm

Please do not hesitate to contact us if you have specific requirements for the TME module's workmanship and functionality.

Connection

The Ethernet interface is connected on the front side into an RJ45 connector. It is connected with a standard (uncrossed) cable to a HUB or Switch.

On the rear side of the module, there is a power-supply connector (cf. the Fig. 2) The power is connected via a coaxial connector with a 3.8 × 1.3 mm (minus outside; plus inside; Fig. 1).

Fig. 1 – power-suppy

Accessories

- The power supply unit with cable and the corresponding connector (3.8 × 1.3 mm).
- Power-supply cable, 2 m long, with a 3.8 × 1.3 mm connector. The other end is open, with conductors to be wired into the power source.
- A power-supply cable from a USB 2.0 port.

Indicators

ON (green) indicator (top LED indicator in the Fig. 2)

TITLE: Indication of the power-supply voltage

TCP/IP connection (yellow) indicator (bottom LED indicator in the Fig. 2)

TITLE: Indicates established TCPIP connection.

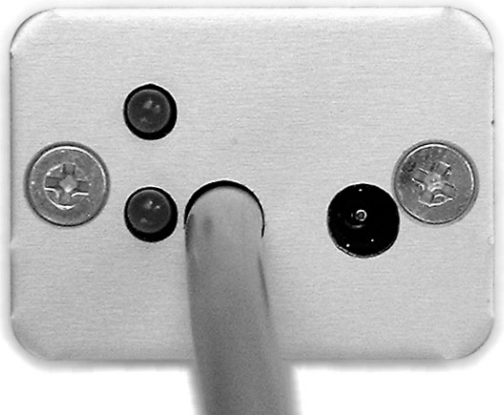

Fig. 2

FAQ

What settings are necessary so that the thermometer will work in my network?

The parameters (IP address and subnet mask) of the network connection should be correctly set. The settings are described for Windows operating systems.

1) Connect the TME to your network[1] and run the included configuration program.
2) Click on "Search according to MAC". In the dialog box which appears, insert the MAC address written on the label on the thermometer (cf. the Fig. 5).
3) The program will try to find the TME according to this address. If it is found, a configuration panel appears. Click on "Network Settings". The configuration panel is replaced by a screen shown in the Fig. 9.
4) Change the IP address and subnet mask as necessary, and click on "Set."
5) After a while the thermometer will register in the network with the new parameters.

How can I find the thermometer's IP address?

1) The default IP address of the thermometer is 192.168.1.254. If you have changed this address, or cannot connect to the thermometer at this address, follow the steps described below.
2) Activate the included configuration program and find the TME according to the MAC address written on the label placed on the thermometer's side.
3) As soon as the program finds the TME, click on "Network Settings." The thermometer's IP address is the first item.

I do not know the actual IP address and I need to change it.

1) Run the included configuration program and find the TME according to the MAC address written on the label placed on the thermometer's side.
2) As soon as the program finds the TME, click on "Network Settings." The thermometer's IP address is the first item. Change the address and click on "Set."

[1] If the IP address of the TME (192.168.1.254) is not compatible with your network, you must set the IP address of a PC from which you want to change the TME settings compatible with the preset IP address of the TME. After that, connect the TME to this PC and change the TME's IP address.

SETTINGS

The TME thermometer can be set by:

- Configuration program
- Telnet protocol (cf. page 11)

Configuration program

The configuration program for Windows operating systems can be downloaded for free from www.papouch.com/en/ . It will enable you to set all the necessary parameters of your TME thermometer.

The program can find the TME connected to the network either according to its IP address, or the MAC address, after which you will be able to change its parameters.

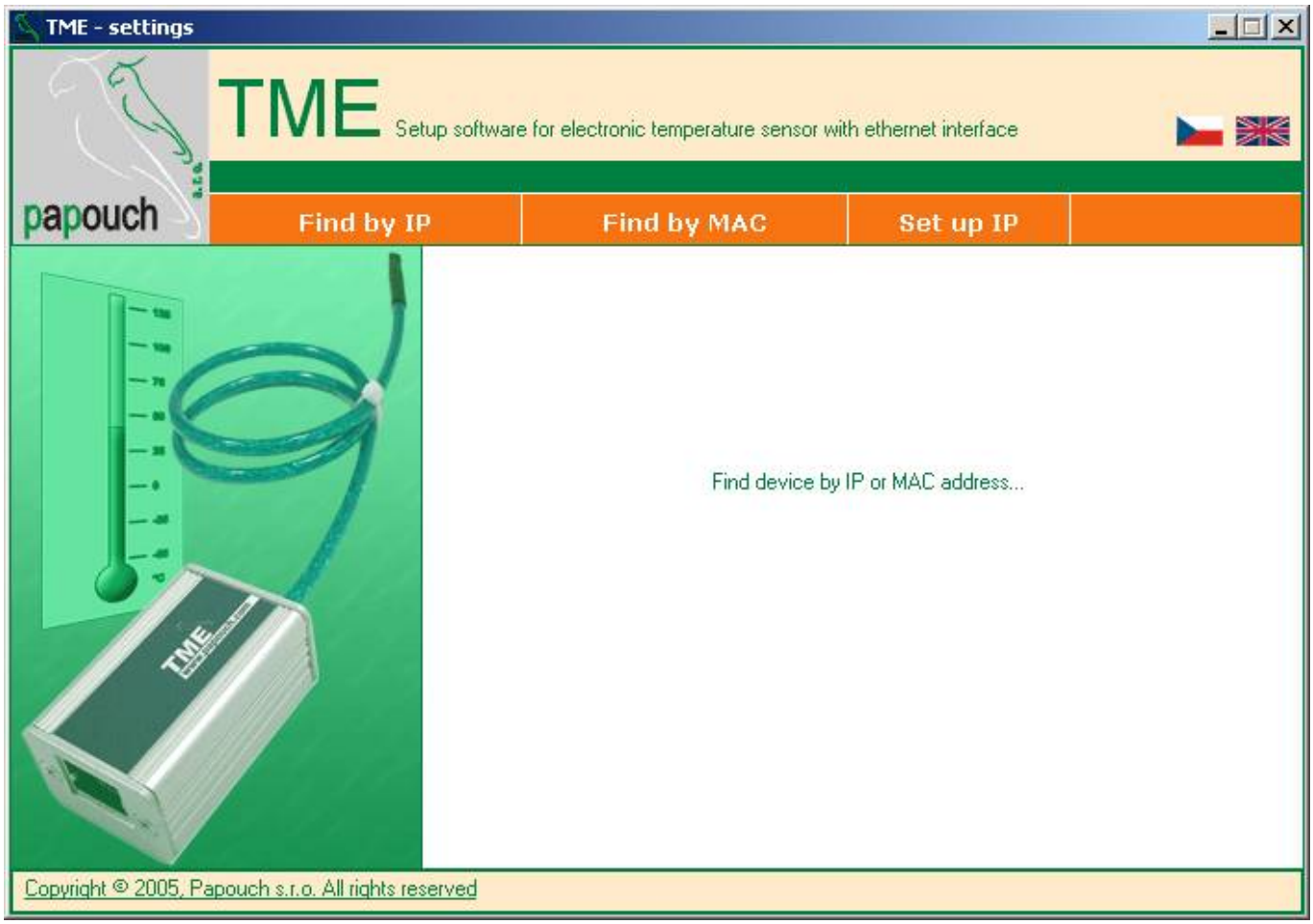

Fig. 3 – the main screen of the configuration program

Search according to IP address

When you click on this button, a dialog box for setting the requested IP address is displayed first (cf. the Fig. 4).

The program will then try to find the TME thermometer at the address you have inserted. If you are successful and find the thermometer, the configuration panel will be displayed in the main window of the program.

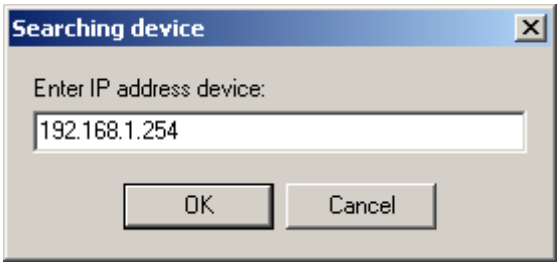

Fig. 4 – entering the requested IP address

Search according to MAC address

When you click on this button, a dialog box for setting the relevant thermometer's MAC address (cf. the Fig. 5) is displayed first (cf. the Figure).[2]

The program will then try to find the TME according to this address. If you are successful and find the thermometer, the configuration panel will be displayed in the main window of the program.

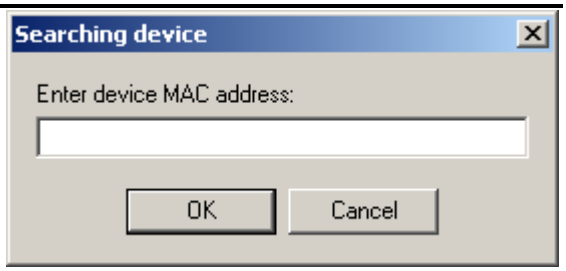

Fig. 5 – entering the requested MAC address

Setting of IP address

After clicking on this button, the thermometer's parameters are to be set in two steps.

In the first step (cf. the Fig. 6), the TME thermometer's MAC address should be entered.

Fig. 6 – changing the IP address of a thermometer with a known MAC address

In the second step, a new IP address, subnet mask and gateway of the TME thermometer are to be set. If you are not sure what values you should set, please contact your network administrator, who will give them to you.

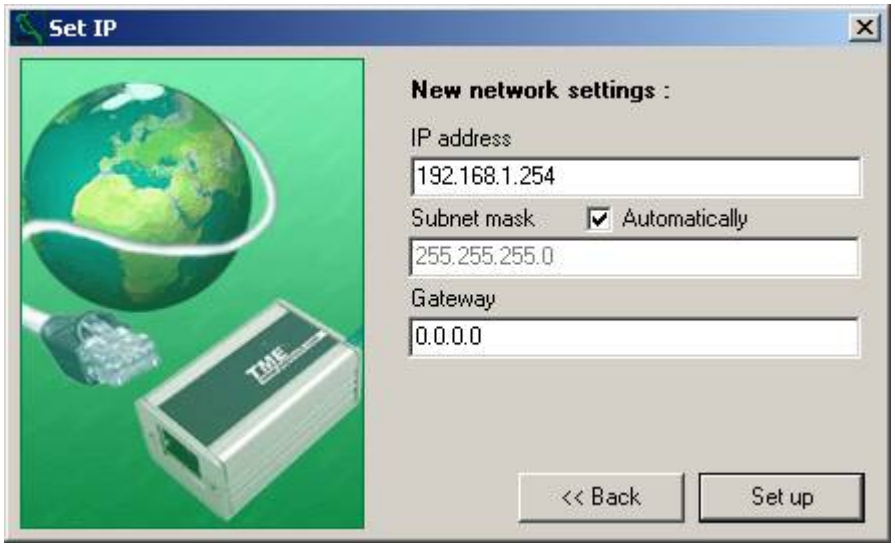

Fig. 7

Configuration panel – thermometer settings

This configuration panel is displayed in the main window after correct connection to the thermometer (after entering its IP or MAC address). When you click on the "Thermometer settings" tab, the following items of the settings will be displayed.

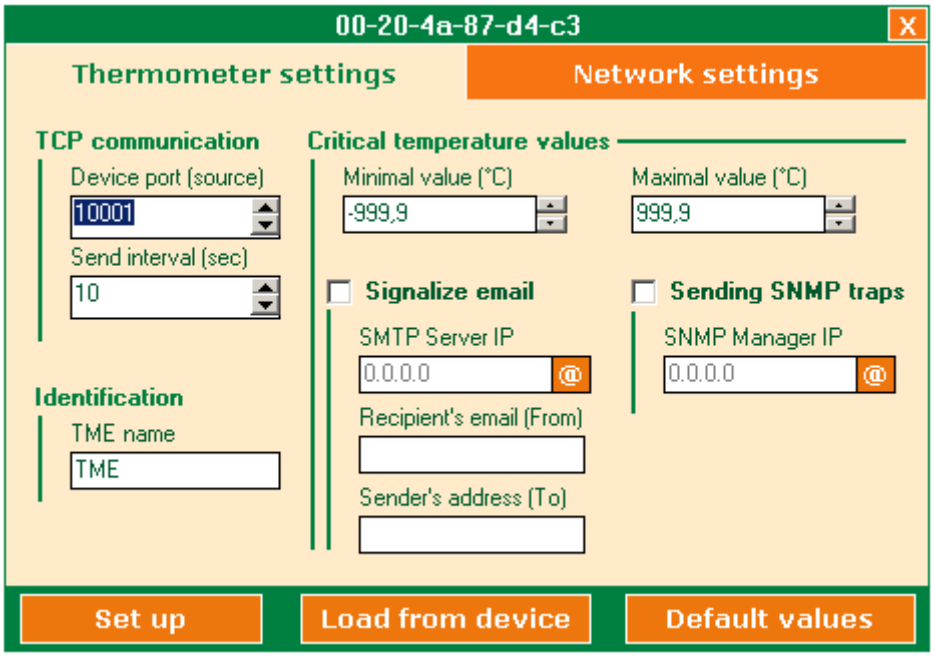

Fig. 8 – Configuration panel – thermometer settings

TCP communication

Device port

Here you can set the network port which communicates with the thermometer.

Send interval

Intervals (in seconds) in which the measured temperature is sent.

Identification

TME name

It enables identification of a particular thermometer among others.

Critical temperature values

Minimal value

If the temperature falls below this minimum value, an e-mail or SNMP trap (depending on the following setting) will be sent.

Maximal value

If the temperature rises above this maximum value, an e-mail or SNMP trap (depending on the following setting) will be sent.

[2] The MAC address of the TME thermometer is written on its side. It is a 12-character code, e.g. 01-23-45-67-89-AB.

Signalize email

The following settings are only active if this field is checked.

SMTP server IP

The IP address of the SMTP server to be used for sending the e-mail alerts. It must be a server which does not require the sender's authentication. A symbolic address can be entered into this field and converted to the IP address by clicking on the button marked "@" to the right of the field. (The SMTP server must be available at this time.)

From:

Thermometer's e-mail address.

To:

E-mail address to which “temperature out-of-limits" alerts will be sent.

Sending SNMP traps

The following settings are only active if this field is checked.

SNMP manager IP

The IP address of the PC with the SNMP manager to be used for sending the SNMP traps. A symbolic address can be entered into this field and converted to the IP address by clicking on the button marked "@" to the right of the field. (The SNMP manager must be available at this time.)

Configuration panel – network settings

This configuration panel is displayed in the main window after correct connection to the thermometer (after entering its IP or MAC address). When you click on the "Network settings" tab, the following items of the settings will be displayed.

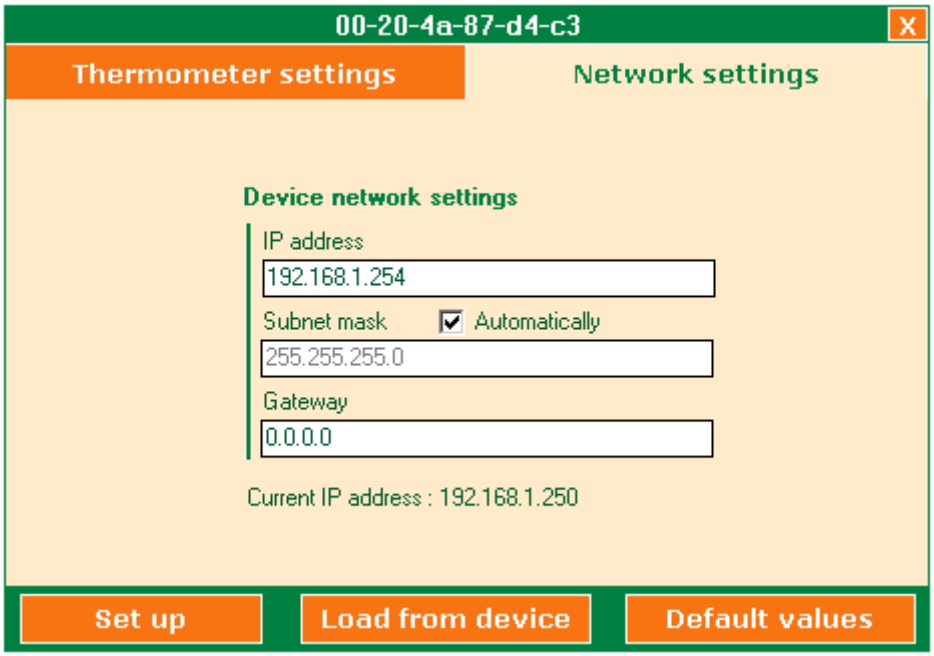

Fig. 9 – Configuration panel – network settings

Device network settings

IP address

Thermometer's IP address. If you are not sure that it is correct, consult the matter with your network administrator.

Subnet mask

Mask of the net in which the TME thermometer is connected.

Gateway

Gateway address

Telnet protocol

Logging into the setting mode

You can log into the setting mode via Telnet using the following procedure. The procedure is described for Windows operating systems.

1) Type "cmd" in the command line (Start/Run…) and push Enter (cf. Fig. 10).

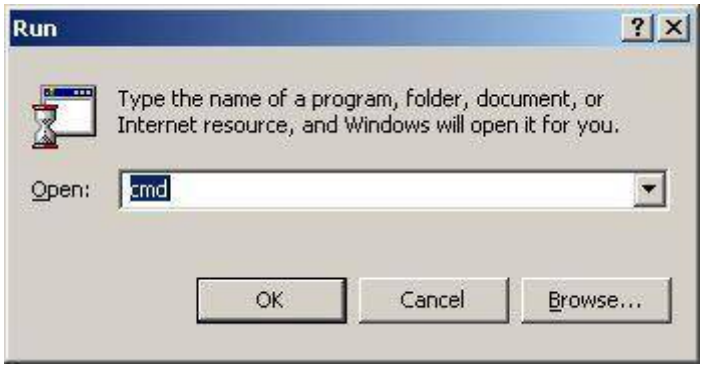

Fig. 10 – Run…

2) Run Telnet. (Type "Telnet" in the newly opened window and push Enter – cf. the Fig. 11.

Fig. 11 – Run…

3) Now you can connect to the thermometer. Its IP address setting from the manufacturer is 192.168.1.254. (Type "open 192.168.1.254" in the window and push Enter.) (cf. Fig. 12)

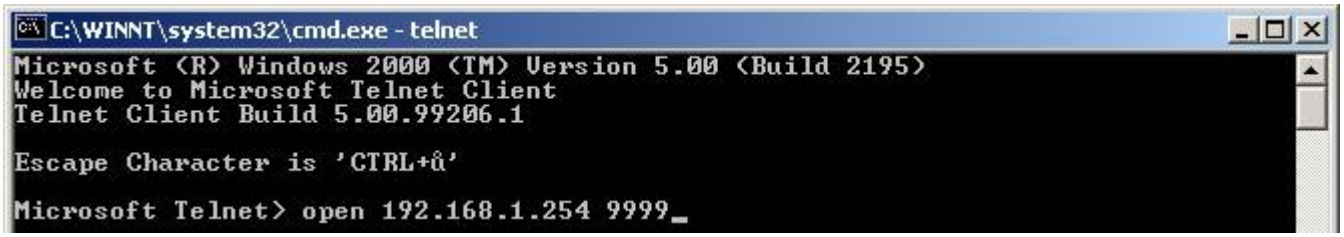

Fig. 12 – Connection to the thermometer

4) You have to confirm the option by pushing Enter immediately after loading. The setting menu is now displayed. (Cf. Fig. 13.)

Fig. 13 – Main setting menu

Server configuration

Items of this menu can be configured after selecting the menu by entering "0" and pushing Enter.

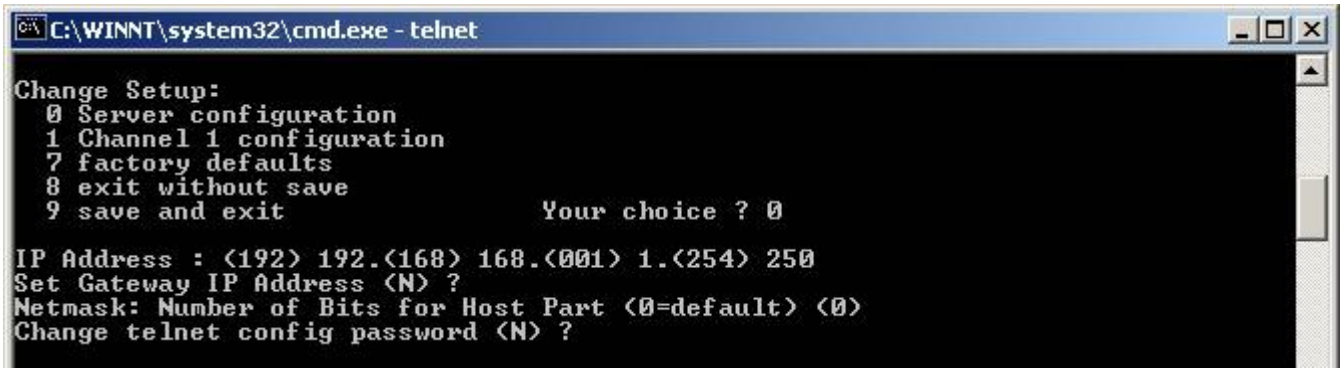

Fig. 14 – "Server configuration" menu

IP Address

The IP address of the module. Type each of the four numbers in the IP address separately, and confirm it by pushing Enter.

Initial value: 192.168.1.254

Set Gateway IP Address

Gateway IP addr

For the "Set Gateway IP Address" item, set "Y" to change its value. You will be prompted to enter the new value. Type each of the four numbers in the IP address separately, and confirm it by pushing Enter.

Netmask

Here you can set how many bits of the IP address is the net part.

The subnet mask is given as the number of bits which determine the range of the local subnet. For example, if the value is `2`, mask `255.255.255.252` is used. The value determines the number of the bits taken from the right-hand side. The maximum value is 32.

Sometimes mask types A, B, and C are referred to. They signify values of 24, 16, and 8 bits, respectively.

Initial value: 8 (type "C" mask)

Example:
Mask 255.255.255.0 (binary 11111111 11111111 11111111 00000000) signifies 8.
Mask 255.255.255.252 (binary 11111111 11111111 11111111 11111100) signifies 2.

Change Telnet config password

Enter new Password

This item sets the password which is required for configuration via Telnet.

For the "Change Telnet config password" item, set "Y" to change its value. You will be prompted to enter the new password.

Note: If the password is lost, it cannot be recovered on the user level, and the thermometer must be sent to the manufacturer for a service intervention.

Channel 1 configuration

Items of this menu can be configured after selecting the menu by entering "1" and pushing Enter.

```
****************** Channel 1 ******************
Source Port        : 10001
Send Temperature   : 00010 s
TME Name           : TME
Max_temp           : +032.0
Min_temp           : +029.3
SNMP send Trap     : Enabled
IP SNMP Manager    : 192.168.1.42
Send Email         : Enabled
IP SMTP Server     : 195.70.130.4
Email From         : mojetm@papouch.com
Email To           : tmeth@centrum.cz


Change Setup:
  0 Server configuration
  1 Channel 1 configuration
  7 factory defaults
  8 exit without save
  9 save and exit                Your choice ? 1

Source Port       : (10001)
Send Temperature  : (00010) s
TME Name          : (TME)

Max_temp          : (+032.0)

Min_temp          : (+029.3)

Enabled Trap(Y) or (N)  (Y) ?

IP SNMP Manager   : (192) .(168) .(001) .(042)
Enabled Email(Y) or (N)  (Y) ?

IP SMTP Server    : (195) .(070) .(130) .(004)
Email From        : (mojetm@papouch.com)

Email To          : (tmeth@centrum.cz)
```

Fig. 15 – menu „Channel 1 configuration“

Source Port

This item sets the local port on which the thermometer will expect the TCP/IP connection request.

Initial value: 10001

Send Temperature

Setting of the time period for sending the actual temperature values once the TCP/IP connection is established. The range of possible values is from 2 s to 3,600 s.

Initial value: 10

TME Name

Here you can enter a distinctive name for the thermometer.

Max_temp

It sets a temperature limit; if the temperature goes above it, an e-mail alert or SNMP trap is sent. The initial value is +999.9 °C. If you do not wish to change this setting, you can simply push Enter.

Min_temp

It is set similar to Max_temp. If the temperature goes below it, an e-mail alert or SNMP trap is sent. The initial value is –999.9 °C. If you do not wish to change this setting, you can simply push Enter.

Enabled trap

This feature lets you allow (Y) or disallow (N) the sending of SNMP traps. If trap sending is allowed, settings of the following items can be modified.

IP SNMP Manager

Here you can enter the IP address of the device (usually a PC on which an SNMP manager is installed) to which the traps will be sent. Type each of the four numbers in the IP address separately, and confirm it by pushing Enter.

Enabled Email

This feature lets you allow (Y) or disallow (N) the sending of e-mail alerts. If e-mail sending is allowed, settings of the following items can be modified.

IP SMTP Server

The IP address of the SMTP server via which the "temperature out of limits" e-mail alerts will be sent.

Email From

The e-mail address of the TME thermometer.

Email To

The e-mail address to which the e-mail alerts are to be sent.

Factory defaults

If you select this item, the thermometer's default values will be reset. After completion, the Telnet connection will be terminated (option number 7).

Exit without save

Termination without saving the changed parameters (option number 8).

Save and exit

This option will save the changes you have made. If you have changed any setting, the thermometer will be restarted. Then you will have to reconnect to it – if you have changed its port and IP address, you will have to modify the connection parameters correspondingly (option number 9).

HOW TO CONNECT TO TME

The temperature values measured by the TME thermometer can be retrieved in several ways.

- Via a web interface
- With the aid of the demo program (cf. page 18)
- Via TCP, using a simple ASCII protocol (cf. page 16)
- With the aid of the SNMP protocol (cf. page 20)
- By e-mail (cf. page 23)

WEB interface

The thermometer contains a website with the actual temperature value.

After entering the thermometer's IP address into an Internet browser the page you can see here in the Fig. 16 will be displayed.[3] In the centre, you can see the name of the sensor and the temperature value measured by the TME. (This value is updated automatically approx. each 5 seconds.) If you click on the manufacturer's logo in the upper left-hand corner, you can visit the manufacturer's website; or you can display the contact data by clicking on "Contact" on the toolbar.

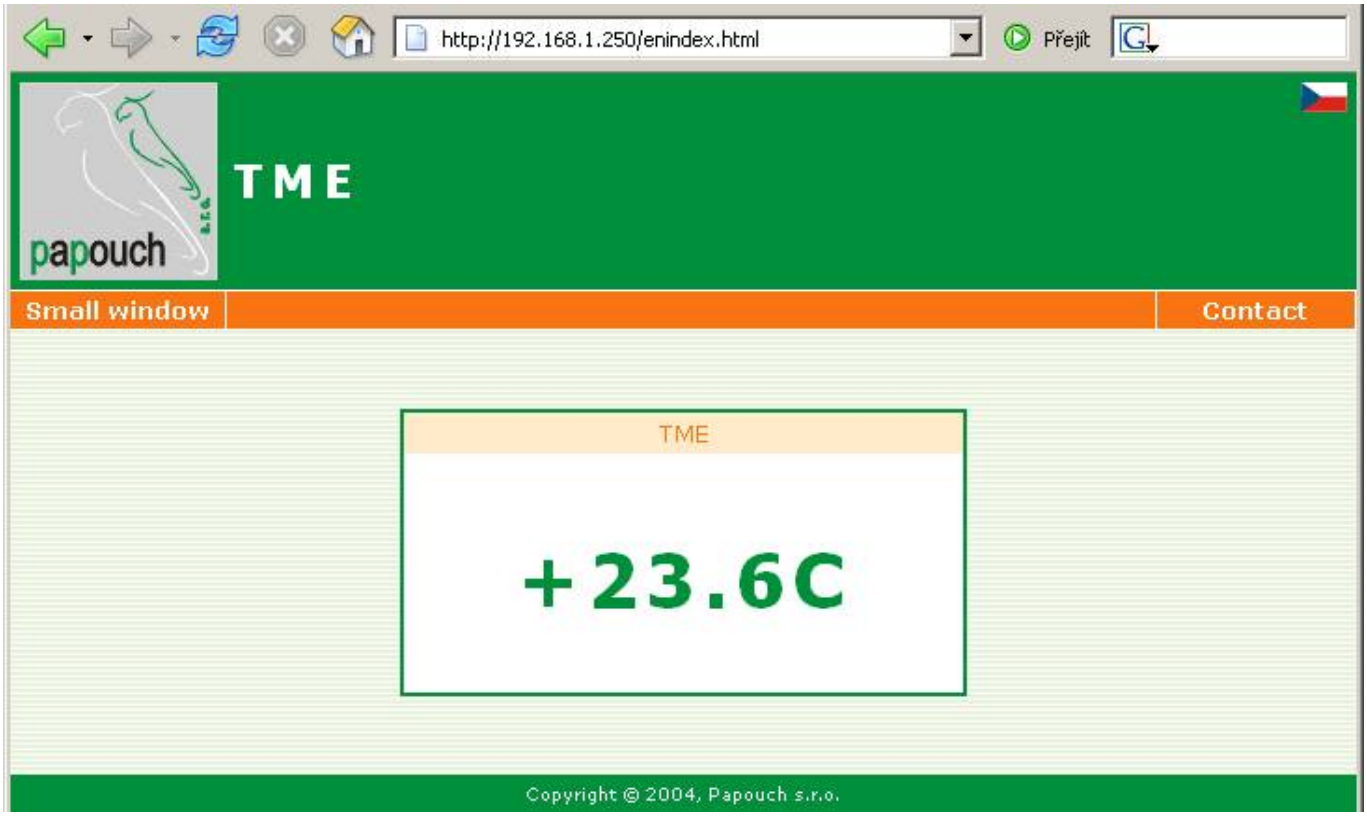

Fig. 16 – main page

[3] The website in the module can be graphically adapted to your specifications. Web page is optimalized for Internet Explorer 5.01, Firefox 1.7. and Netscape 7.2. or newer versions. Address must be entered in following format: http://[IP_address_of_TME]/ For example: http://192.168.1.254/ for TME in default configuration.

The "Small window" link will display a small window with the temperature value[4]. When you click on "Small Window" a caution will appear "Web page you browse is attempting to close a window. Do you wish to close the window?" This box can be closed by clicking on "Yes".

A new window will tell you that an HTML application is being opened (HTA). In following window "Download file" click on "Open". A small website will be opened – cf. the Fig. 17.

It shows the measured temperature value and the name of the sensor[5]. The windows can be closed using the cross in the bottom right-hand corner. If you select the letter "i", you can display contact information; and the www.papouch.com link takes you to the manufacturer's website. The temperature value is updated automatically approx. every 5 seconds.

Fig. 17 – small window

[4] Small window with temperature is a HTML Application (HTA), which can be executed only in Internet Explorer 5.01 or newer.

[5] The name of the sensor can be changed in the settings described on page 9, under the heading “TME name”, or within the configuration program.

Demo program

At www.papouch.com/en/ a demo program can be downloaded free of charge, showing how the temperature measurement works. You can also download free of charge its complete commented source code for Delphi 7.

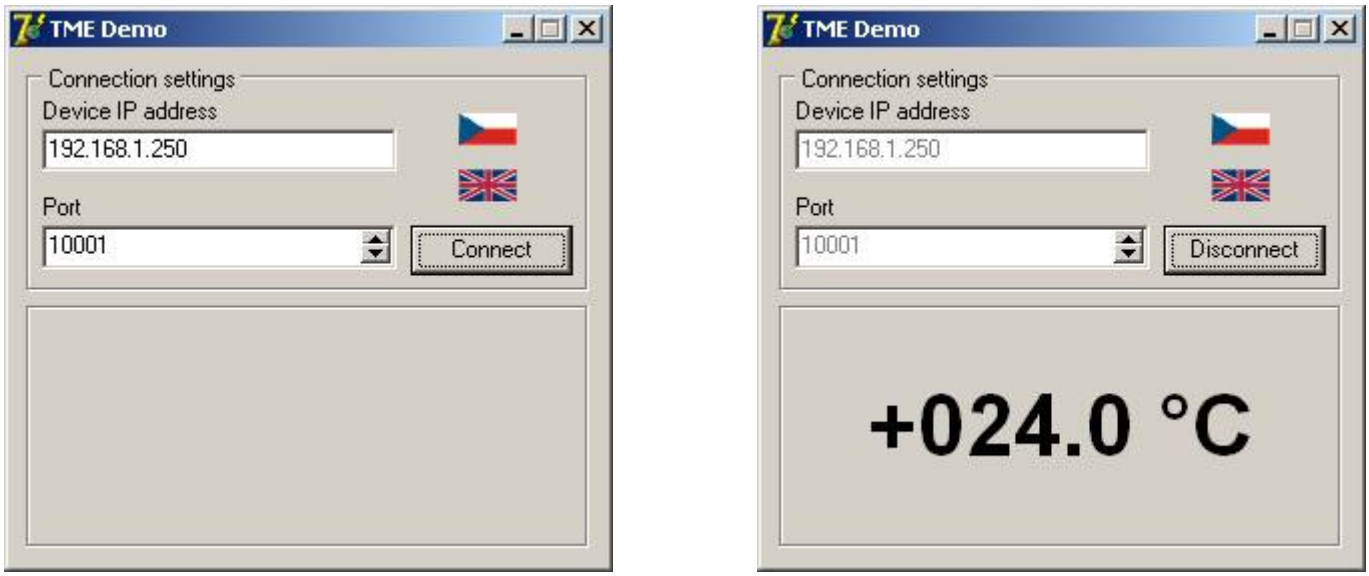

Fig. 18 – demo program

After opening the program, you can fill in the IP address and communication port of the thermometer and push the "Connect" button. If the connection to the thermometer has been successful, the measured temperature value is displayed in the bottom part of the window.

TCP connection

The thermometer plays the role of a server and waits for a connection request on the set IP address and port. After connecting, it sends to the client, within the set time periods, the temperature value in an ASCII format compatible with the Spinel protocol.[6] [7]

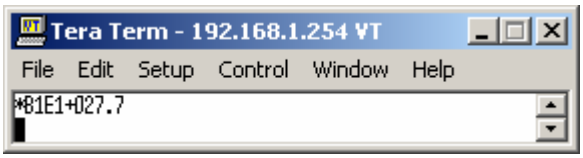

Fig. 19 – thermometer values in the TCP/IP terminal

Example of a connection via a terminal program

(This example is displayed with the aid of Tera Term software [8].)

Create a new connection (File/New connection…). The dialog box shown in the Fig. 20 is now displayed. Select the TCP/IP option and enter the thermometer's IP address and port. In the Figure, you can see the initial values valid for the thermometer

Confirm the dialog. Upon successful connection, the window shown in the Fig. 19 will be displayed. This window displays the temperature values sent from the TME thermometer in the set time intervals.

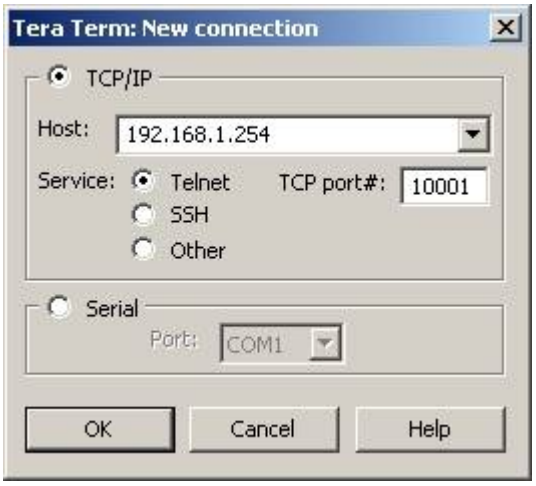

Fig. 20 – new connection

Message format

The temperature-value message is sent in the following format:

`*B1E1[sign][degrees].[tenths][enter]`

`[sign]` ..... 1 Byte; "+" or "–" sign

`[degrees]` ..... 3 Byte; temperature in degrees Centigrade (Celsius); always a three-digit number; filled with zeros from the left as necessary

`.` ..... 1 Byte; decimal point

`[tenths]` ..... 1 Byte; tenths of degree

`[enter]` ..... 1 Byte; terminating character "Enter" (DEC: 13; HEX: 0x0D)

All characters are sent in ASCII format. An example is shown in the Fig. 19.

[6] The procedure for setting the parameters is described in Chapter "Settings", which starts on page 7.

[7] The format used is compatible with the Spinel 66 protocol.

[8] Tera Term terminal software can be downloaded from: http://hp.vector.co.jp/authors/VA002416/teraterm.html

SNMP

General

SNMP (Simple Network Management Protocol) is a standard protocol for management of various devices in an Ethernet network. It is built on UDP protocol and ensures quick delivery of control codes and responses between devices on which SNMP applications run.

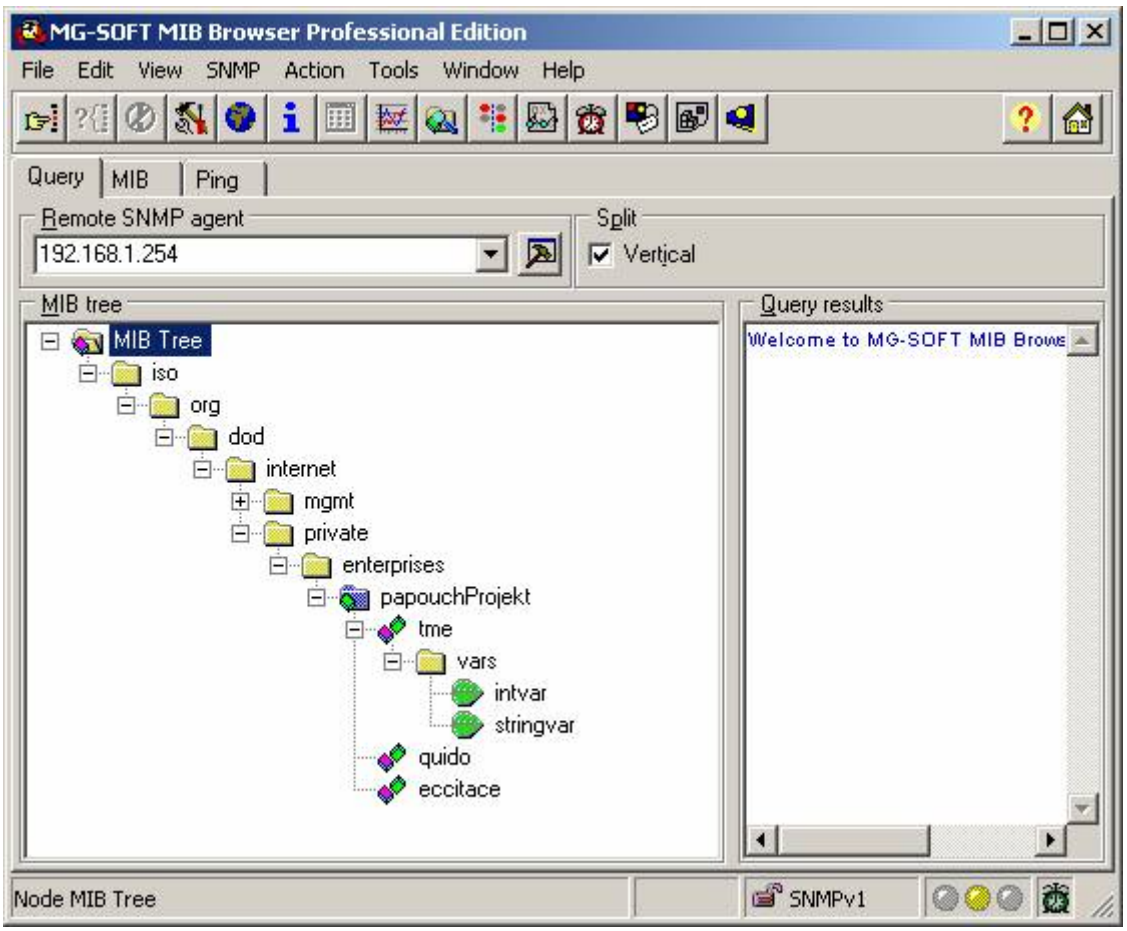

Fig. 21 – MIB tree

SNMP ensures that requests are delivered to and responses from such applications. It works independently of specific features in lower- or higher-level application. This protocol is based on three entities: administrator (which generates commands and receives messages), agent (which responds to commands and creates messages), and proxy (which transfers network traffic).

The SNMP administrator sends requests to the agent's UDP port 161 and receives non-requested messages (traps) from agents on UDP port 162.

TME is an SNMP agent. It receives commands from a UDP port 161. The administrator asks about data stored in the local MIB database (Management Information Base, one of the Internet standards), which consists of a hierarchic tree structure with the administered data. The module does not contain the standard complex database but only a sub-tree with data necessary for processing the TME thermometer data.

Descriptions of the MIB table tree and of SMI (Structure of Management Information) are attached in Papouch-SMI.mib and TMESNMP.mib text files. The programmer should include these two descriptions into the SNMP administrator structure (SNMP version 2.0).

Data in the MIB tree can be accessed through the name of the object, expressed as a series of positive integers separated with dots and describing the path to the object in the MIB tree structure.

TME as an SNMP agent enables the sending of automatic traps to the administrator via UDP port 162.

Using SNMP

Include in your SNMP manager the description of the MIB table from the Papouch-SMI.mib and TMESNMP.mib files [9].

Then you should set the "Rad community" option to "public".

MIB table

Two types of „object“ (intvar and stringvar) are inside of one object „identifier var“.

intvar

Type.....32 Byte (integer)

Value .....Temperature value without a decimal point. The actual temperature is obtained when you divide this variable by 10.

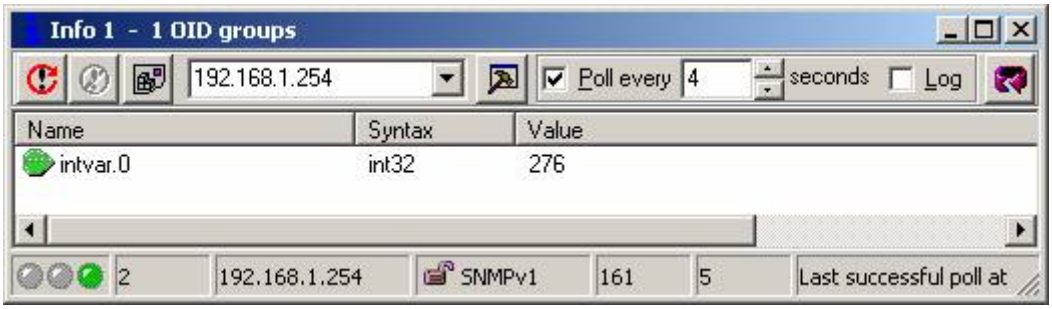

Fig. 22 – intvar

stringvar

Type.....string

Value .....The actual temperature value as a character string: +28.0

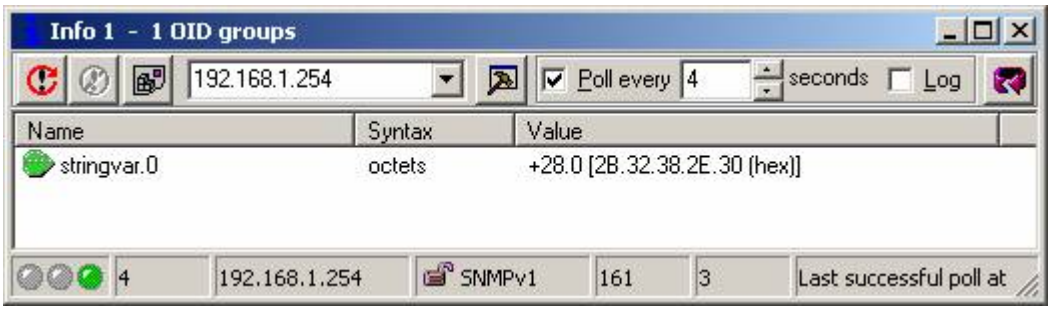

Fig. 23 – stringvar

[9] You can download these files from www.papouch.com/en/ .

Automatic messaging – traps

TME supports the sending of traps. Two settings are necessary for this feature: allowing the sending, and the addressee's IP address (SNMP administrator or manager).

If trap sending is enabled, each trap contains both the intvar and the stringvar values.

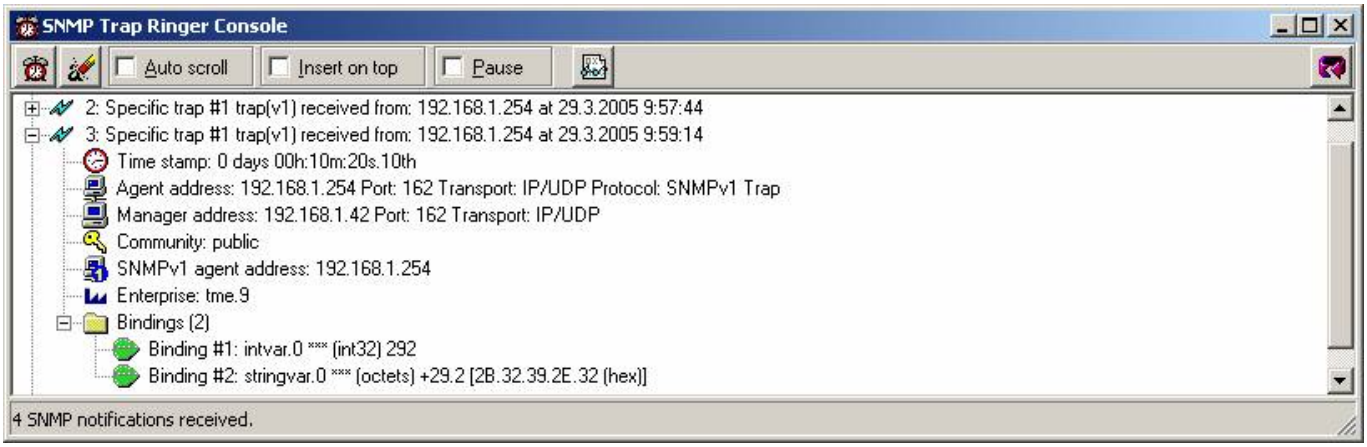

Fig. 24 – trap

Traps are only sent if the temperature value goes outside of the preset limits. For successful delivery of traps, the IP address of a PC with an SNMP manager must be correctly set.

Sending e-mails

The TME thermometer can send e-mail alerts if the temperature value goes outside of the preset limits. These limits are the same as those for SNMP traps, and are set in Item "Enabled Email" and the following ones on page 15. (The delivery of e-mail alerts requires the IP addresses of the SNMP server and of the sender and addressee to be correctly set.)

Papouch s.r.o.

Data transmission in industry, line and protocol conversions, RS232/485/422/USB/Ethernet/GPRS/ WiFi, measurement modules, intelligent temperature sensors, I/O modules, and custom-made electronic applications.

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