

# TCP/IP Voltmeter/Thermometer.

TCP/IP voltmeter is device that allows remote measurement of voltage and temperature over local area network (LAN) or internet. It also allows switching On/Off various devices with a relay.

This datasheet is intended for versions :

Hardware version : v5

Software version : v1.7, v1.8.



## Contents at the glance :

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2. Start working with TCP/IP Voltmeter
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4. Upload web page to EEPROM
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### 1. Technical parameters

Power supply : + 5 to + 25 Volts (DC)

Power consumption : 160 mA / 5V

DC Voltmeter - measuring range: 0 to + 50 V (2 channel)

Thermometer - measuring range: -20 to + 125 Celsius

- Relay -
- max. switching voltage : 110 V DC, 125 V AC
  - nominal switching capacity : 1 A 30 V DC
  - max. switching power : 30 W , 62,5 V A (resistive load)
  - max. switching current : 1 A

### 2. Start working with TCP/IP voltmeter

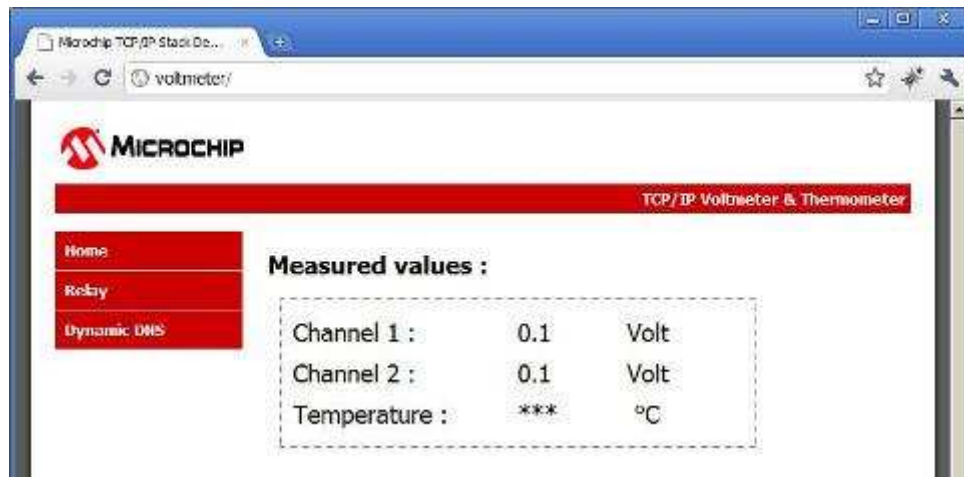
1. Connect ethernet cable to TCP/IP voltmeter.
2. Connect temperature sensor and cables for voltmeter and cables to relay.
3. Connect the power supply.

If TCP/IP voltmeter is connected to the network and power is on, voltmeter will begin to send and receive packets. This is indicated by yellow and green LED diode. If both are blinking, then the voltmeter is working properly. Red LED diode means that the power supply is connected.

To connect to the TCP/IP voltmeter, enter an address in the browser: <http://mchpboard>. It is also possible to connect via IP address, for example: <http://192.168.1.100> (this IP address may be different). You can check your IP address with Microchip Ethernet Discoverer tool. (more in chapter Utilities).

You can get the IP address using the tool MCHPDetect. TCP/IP voltmeter obtain IP address automatically when connected to the network (it includes DHCP client) or it may have a static IP address. More about static IP address in Chapter 5.

Main page screenshot:



### 3. Reading data from TCP/IP voltmeter

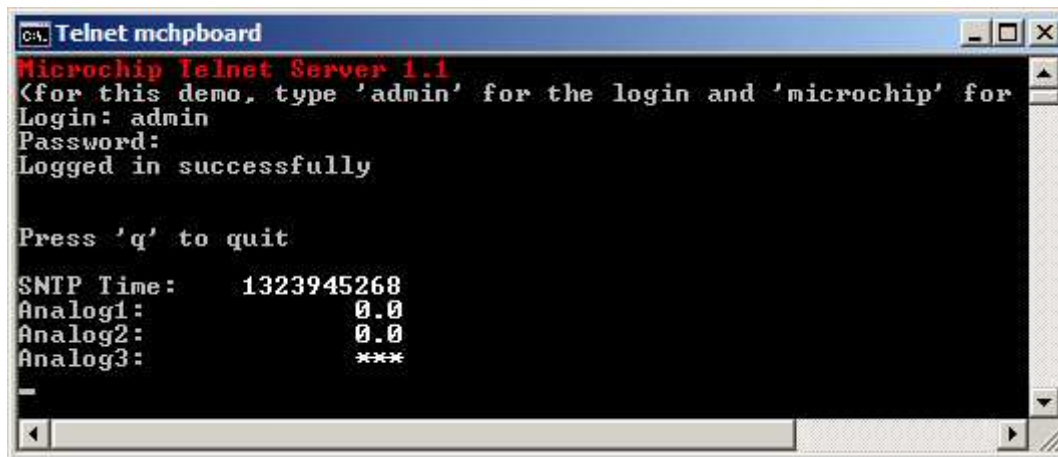
You can read the measured values from TCP/IP voltmeter in different ways :

- using web browser
- using TCP client
- with telnet client
- with SNMP client
- reading XML file directly

a. **Web browser.** Using web browser is a simple way to read data from TCP/IP voltmeter. You can use any web browser (IE, Firefox, Chrome...). Web browser must support AJAX technology. Data are transmitted to the web browser in the XML file that is reading by javascript.

b. **TCP client.** TCP/IP voltmeter works as TCP server and listens on port 9760. You can read data from the TCP/IP voltmeter with any TCP client. This means voltage, temperature and control relay. Source code for TCP client is in software package.

c. **Telnet.** To read data from TCP/IP voltmeter you can use a telnet client. Telnet client is installed by default in Windows OS. It should be added via Control Panel - Programs and Features - Turn Windows features on or off (Windows Vista). Jumper 2 is On.



d. **SNMP client.** TCP/IP voltmeter includes an SNMP agent, so you can use any SNMP client to control all functions of TCP/IP voltmeters. This version supports SNMP v2 version.

More about SNMP in Wikipedia :

[http://en.wikipedia.org/wiki/Simple\\_Network\\_Management\\_Protocol](http://en.wikipedia.org/wiki/Simple_Network_Management_Protocol)

e. **Reading XML file directly.** When TCP/IP voltmeter communicates with web browsers, it sends him Status.xml file. In software package is software that directly reads this XML file. So you can read data without web browser. Source code is written in C++ language.

#### 4. Upload web page to EEPROM

HTML pages are stored in external EEPROM. User has access to the EEPROM and can change the pages if needed.

To upload pages to the EEPROM, tool MPFS2.exe is used.

Upload new pages to EEPROM, step by step:

1. Edit your HTML page and save it in the \Webpages directory
2. Create .bin file (with Tool "Convert WebPages to MPFS.bat")
3. Start application MPFS2.exe
4. Enter the path to the .bin file and hostname (default hostname is MCHPBOARD)
5. Press Upload button
6. Press F5 in web browser (refresh) to view a new page.



## 5. Setting static IP address

Setting static IP addresses is done with two commands : arp and ping.  
Precondition: TCP/IP Voltmeter is connected to the network and works.

1. Open command prompt as Administrator  
( button Start , type : "cmd" , then Ctrl + Shift + Enter )
2. In the command prompt write 2 commands : "arp -s" and then "ping" :  
C:\>arp -s new\_IP\_address MAC\_address  
C:\>ping new\_IP\_address
3. For example :  
C:\>arp -s 192.168.1.35 00-04-a3-00-00-00  
C:\>ping 192.168.1.35 (192.168.1.35 is new IP address)
4. Command C:\>arp -a displays all static , dynamic and MAC addresses.

TCP/IP Voltmeter has MAC address : 00-04-a3-00-00-00.

## 6. Dynamic DNS Service

Dynamic DNS service is used for access to TCP/IP from internet if TCP/IP voltmeter is placed in the local area network (LAN) and it does not have public IP address.

To use the Dynamic DNS server you need to do the following steps :

1. Create an account on a public DNS server ([www.no-ip.com](http://www.no-ip.com), [www.dyn.com](http://www.dyn.com), [www.dnsomatic.com](http://www.dnsomatic.com))
2. Set up "port forwarding" on your router.
3. Enter username, password and host in page Dynamic DNS in TCP/IP voltmeter.

Detailed instructions on setting it are in external .pdf file.

## 7. Network and SNMP settings

TCP/IP voltmeter contains web pages to configure network connection. Pictures shows page for settings of network values and SNMP clients.

MAC Address:	00 04 A3 00 00 00
Host Name:	MCHPBOARD
	<input checked="" type="checkbox"/> Enable DHCP
IP Address:	192.168.1.101
Gateway:	192.168.1.1
Subnet Mask:	255.255.255.0
Primary DNS:	192.168.1.1
Secondary DNS:	0.0.0.0
<input type="button" value="Save Config"/>	

Read Comm1 :	public
Read Comm2 :	read
Read Comm3 :	
Write Comm1 :	private
Write Comm2 :	write
Write Comm3 :	public
<input type="button" value="Save Config"/>	

Incorrect setting of IP addresses or other parameters may cause that TCP/IP voltmeter will not work. Therefore, be careful. Changed values are stored in EEPROM. If you want

to set default settings, so it is necessary to erase the EEPROM. This will restore the default settings.

### Erasing EEPROM :

1. Turn off TCP/IP voltmeter.
2. Connect pins in jumper J1.
3. Turn on TCP/IP voltmeter and wait at least 5 seconds.
4. Remove connection in jumper J1 and EEPROM has been erased.

## 8. Inputs & outputs

TCP/IP voltmeter has 3 inputs and 1 output. It includes 2 analog inputs (2 channel voltmeter), 1 digital input (thermometer) and 1 digital output (relay).



**DC Voltmeter:** DC voltmeter contains operational amplifier on input. It has 1 MOhm input impedance. It isolates external input voltage from microprocessor. TCP/IP Voltmeter contains 2 separate channels. Both channels share a common ground. Voltmeter measures only positive voltage, measurement range is 0 V to 50 Volt. Circuit diagram of input amplifier is in chapter Schematics.

**Thermometer:** Thermometer uses external temperature sensor that connects to the TCP/IP Voltmeter with 3 cables. It uses precise temperature sensor DS18B20 from Dallas. It is calibrated during manufacturing and accurate is 0.5 Celsius.

Cables marking of temperature sensor :

Vdd – braun cable  
Data – black cable  
GND – blue cable

**Relay:** is a single-pole type relay for switching max. 110V and max. 1 A current. In idle mode relay is open.

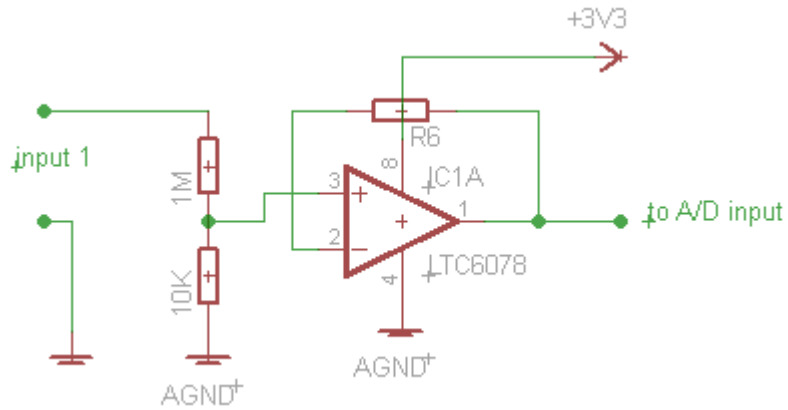
Datasheet for relay : <http://www.farnell.com/datasheets/22540.pdf>

**Power supply:** TCP/IP voltmeter is supplied by external source of +5 to +25 Volts (DC). This voltage is on the board stabilized to 3.3 Volts. Jack socket je type RASM712X and is designed for 5.5 mm jack. In the center is a positive voltage.

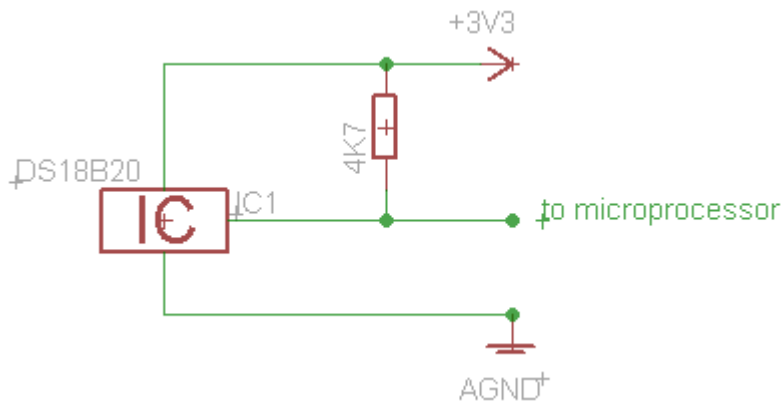


## 9. Schematics

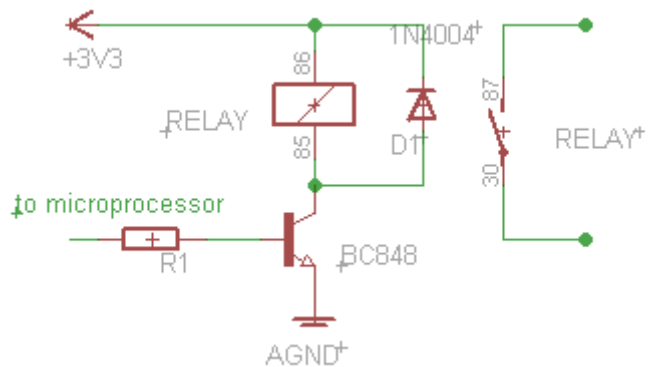
Circuit diagram of DC voltmeter input amplifier ( 1 channel ) :



Circuit diagram of external temperature sensor :



Circuit diagram of relay :



## 10. Jumpers settings

This version contains 3 jumpers J1 – J3.

- J1 – erasing EEPROM ( see chapter 7 )
- J2 – enable advanced functions (TCP server, SNMP, telnet)
- J3 – not used

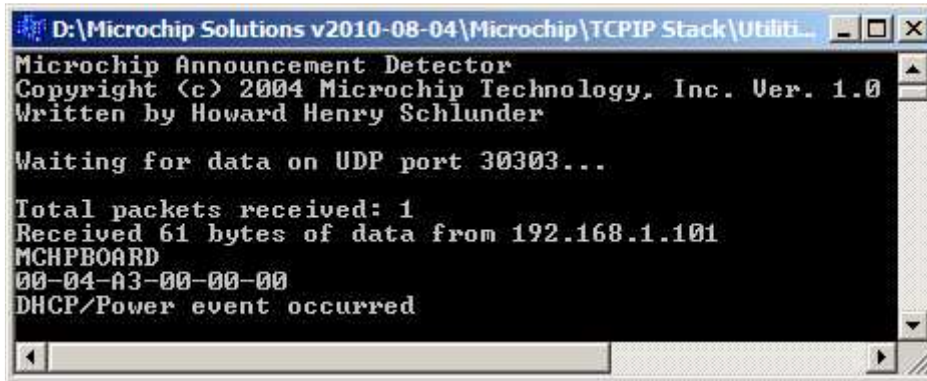


If jumper 2 is connected, all the advanced features (TCP server, SNMP, telnet) are enabled.

## 11. Utilities & software

Software package contains utility intended for monitoring correct functionality of TCP/IP voltmeter. It includes following utilities: MCHPDetect, MCHPEXplorer, MPFS2.exe.

MCHPDetect.exe – this tool will show whether the web voltmeter is successfully connected to the network. It is waiting on port 30303 and when the web voltmeter connect to the network it capture UDP packet. It also shows the IP address which has been allocated from the DHCP server.

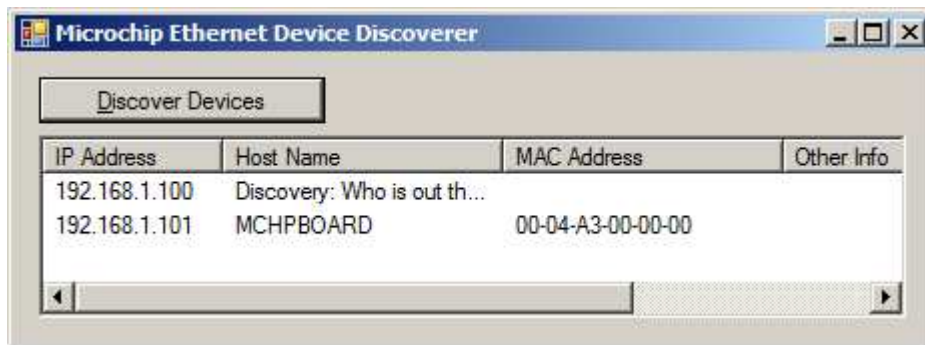


```
D:\Microchip Solutions v2010-08-04\Microchip\TCPIP Stack\Utiliti...
Microchip Announcement Detector
Copyright (c) 2004 Microchip Technology, Inc. Ver. 1.0
Written by Howard Henry Schlunder

Waiting for data on UDP port 30303...

Total packets received: 1
Received 61 bytes of data from 192.168.1.101
MCHPBOARD
00-04-A3-00-00-00
DHCP/Power event occurred
```

MCHPEXplorer.exe – displays connected devices and its MAC address.



MPFS2.exe - tool for uploading pages to the EEPROM. (see Chapter 4)

Very suitable program for analyzing packets is Wireshark. It is freely available ([www.wireshark.org](http://www.wireshark.org)).

## 12. Passwords

Some sites are password protected and requires authentication. Here is a list of passwords.

### Network and SNMP settings:

User : admin  
Password : microchip

### Telnet :

User : admin  
Password : pass

### SNMP :

Read communities : public , read  
Write communities : private , write , public

**Disclaimer.**

This document has been carefully prepared and checked. No responsibility can be assumed for inaccuracies.

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