

TCP/IP Voltmeter & Ammeter

TCP/IP voltmeter is device that allows remote measurement of voltage and current over local area network (LAN) or internet. Version V11 contains two voltmeters and two ammeters. All inputs are independent and they are galvanically isolated from the board.

This datasheet is intended for versions :

Hardware version : **V 11**
Software version : **V 5.0**



Contents at the glance :

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1. Technical parameters

TCP Voltmeter V11 contains 2 Voltmeters and 2 Ammeters. It allows to measure simultaneously two voltages and two currents.

Measuring range: DC Voltmeter : **+/- 70 V** (both channels)
 DC Ammeter : **+/- 5 A** (both channels)

Resolution: DC Voltmeter : **0,01 V** (error : 0.01 V)
 DC Ammeter : **0,01 A** (error : 0.01 A)

Input impedance Voltmeter : **2.00 Mohm** (both channels)
Shunt resistor Ampermeter: **0.01 Ohm / 3 W** (both channels)

Speed measurement : **2 x** per second

Power supply : + 5 to + 30 Volts (DC)
Power consumption : 160 mA / 5V
Board size : 87 x 68 mm

2. Start working with TCP/IP voltmeter

- 1 - Connect ethernet cable to TCP/IP voltmeter.
- 2 - Connect cables for voltmeter and ammeter to measuring device.
- 3 - Connect the power supply.
- 4 - Start web browser or other application.

When 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. Blue 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 local IP address with **Microchip Ethernet Discover** tool. This tool will show you your IP and MAC address. More info in chapter **Software**.

TCP/IP voltmeter obtain dynamic IP address automatically when connected to the network (it includes DHCP client) or it may have a static IP address.

Main page screenshot:

Microchip TCP/IP Stack Demc x

← → ↻ 192.168.1.104/index.htm

MICROCHIP

TCP/IP Voltmeter &

Home

Dynamic DNS

Network Configuration

SNMP Configuration

Measured values :

Voltage 1 :	0.0	V
Current 1 :	0.0	A
Voltage 2 :	0.0	V
Current 2:	0.00	A

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 SNMP client
Reading XML file directly

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.

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 and current. This port is hard-coded and can not be changed. Source code for TCP client is in software package.

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.

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.

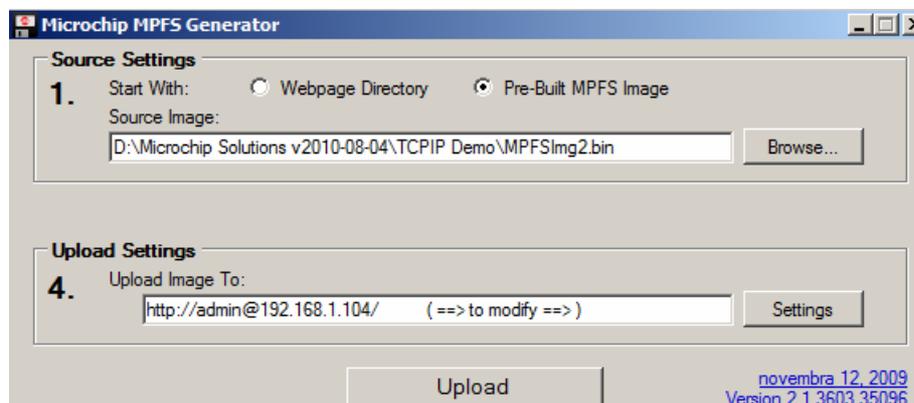
4. Upload web page to FLASH memory

HTML pages are stored in external FLASH memory. User has access to this memory and can change the pages if needed. You may also add your own pages.

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

Upload new pages to FLASH memory, 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.

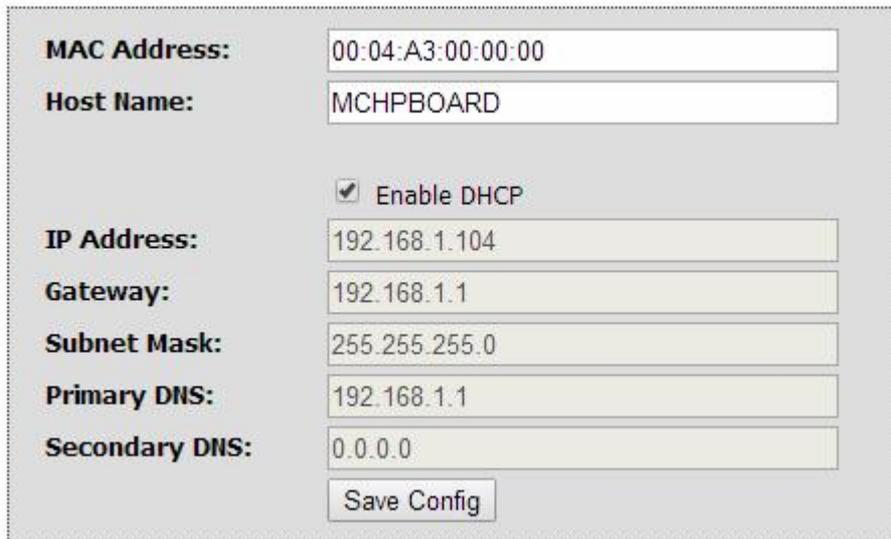


5. Network configuration

TCP/IP voltmeter contains web interface to configure network connection. You can change the host name, IP address and MAC address. You can also disable/enable the DHCP server.

Incorrect setting of IP addresses or other parameters may cause that TCP/IP voltmeter will not work. Therefore, be careful.

Network settings screenshot :



MAC Address:	00:04:A3:00:00:00
Host Name:	MCHPBOARD
	<input checked="" type="checkbox"/> Enable DHCP
IP Address:	192.168.1.104
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"/>

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.

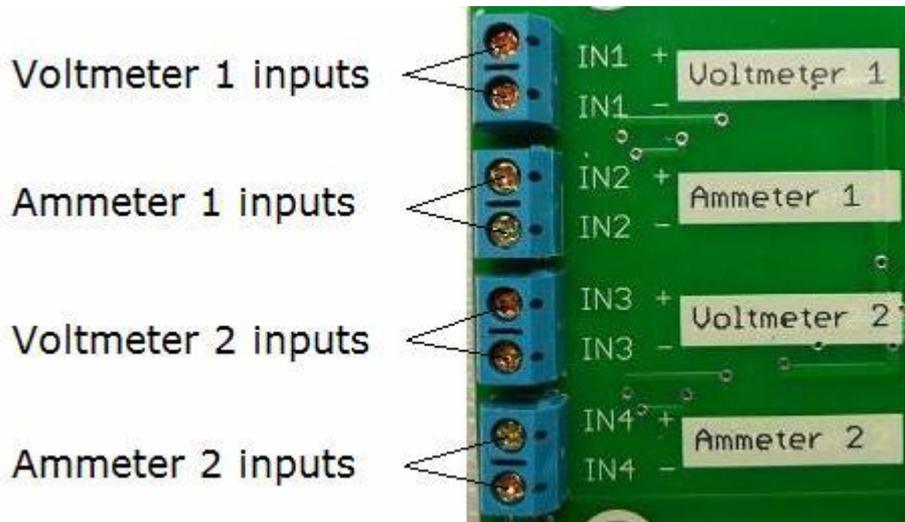
To use the Dynamic DNS server you need to do the following steps :

1. Create an account on a public DNS server (www.no-ip.com, www.dyn.com, 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 document.

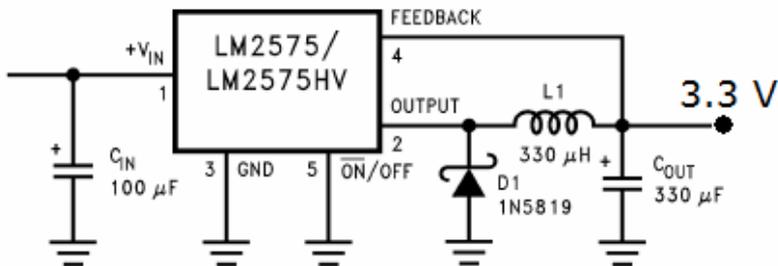
7. Inputs and outputs connectors

TCP/IP voltmeter has 4 input connectors, input description is in the picture.

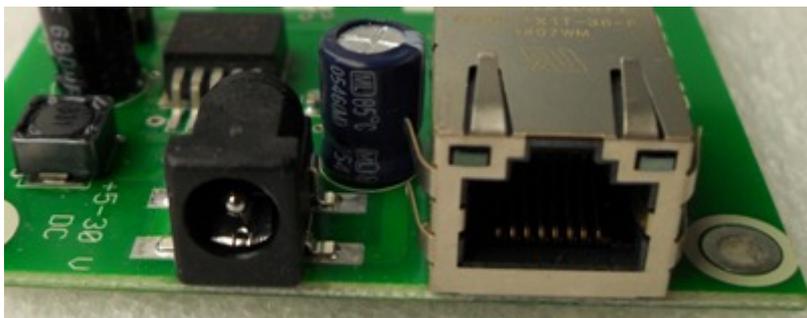


8. Power supply

TCP/IP voltmeter is designed for a wide range power supply. TCP/IP voltmeter is supplied by external source of +5 to +30 Volts (DC). This voltage is on the board stabilized to 3.3 Volts. DC/DC converter LM2575 is used. Current consumption is around 160 mA/ 5V. At higher supply voltages the current is smaller.



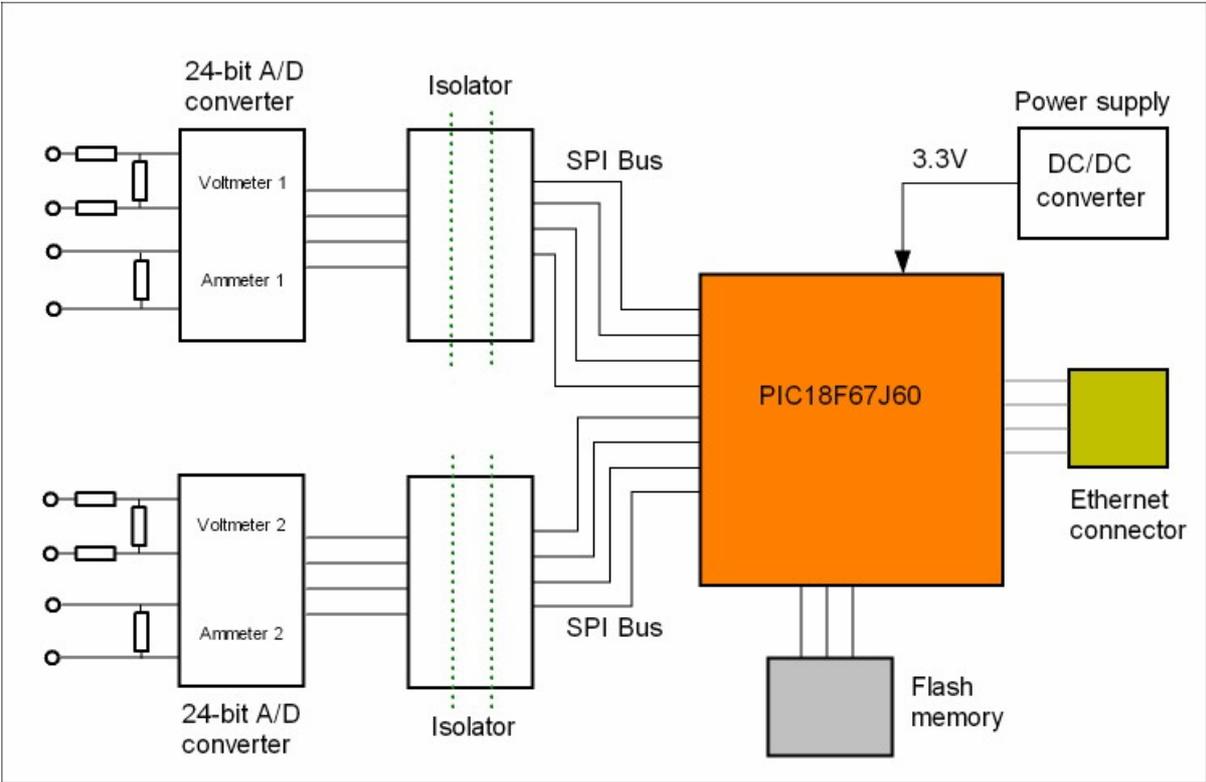
Jack socket is type RASM712X and is designed for 5.5 mm diameter jack. In the center is a positive voltage.



9. Hardware & schematics

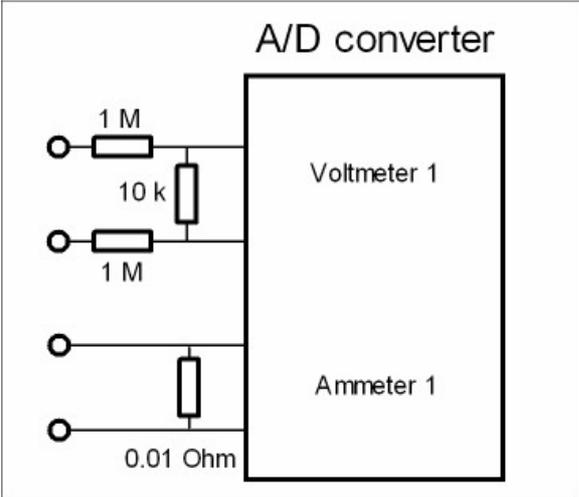
TCP/IP voltmeter has 4 analog inputs. It includes 2 x DC voltmeter and 2 x DC Ammeter. This board uses a 24-bit converter LTC2492. It is a 2-channel A/D converter. First channel is used for voltmeter, second for ammeter. Voltmeter and ammeter are fully galvanically isolated from the board.

Circuit diagram of V11:



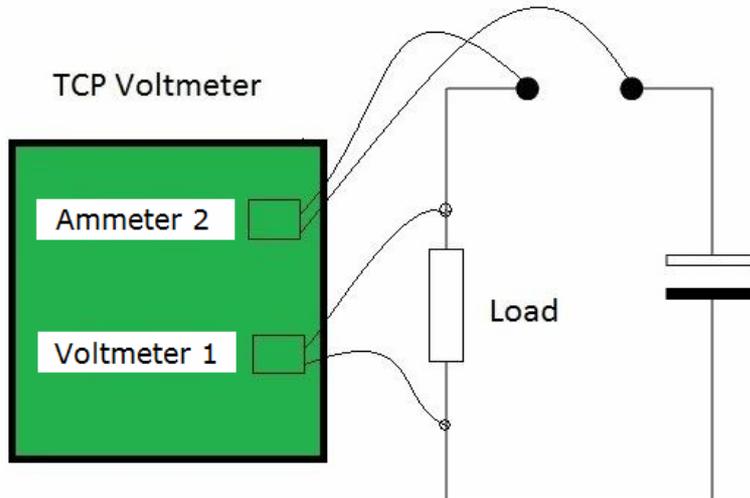
Note : voltmeter and ammeter in the common IC. Voltmeter has voltage divider 2 x 1 Mohm/10 kOhm on input, Ammeter uses shunt resistor value 0.01 Ohm. Inputs for Voltmeter and Ammeter are differential.

Inputs of one channel DC Voltmeter / Ammeter :



Note : if you measure the current and voltage in one circuit, so use Voltmeter 1 and Ammeter 2. See the picture below. In this case they are completely separated and do not affect each other. If you use as input Voltmeter 1 and Ammeter 1, so the TCP voltmeter will show incorrect values. This is the only limitation. Otherwise you can use the inputs for voltmeter and ammeter according to your needs.

Voltage and current measurement in a single circuit:



10. 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.

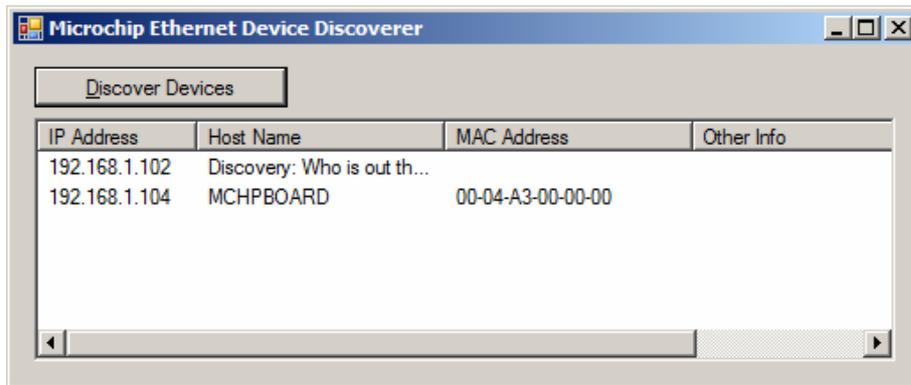
TCP voltmeter still sends the packet after the reset or after switching on power.

```
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. Run this tool if you need to know your IP address and MAC address.



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

Wireshark - very suitable program for analyzing packets is Wireshark. It is freely available (www.wireshark.org). You can keep track all the packets which TCP voltmeter sends and receives.

11. Passwords

Some sites are password protected and requires authentication. Here is a list of passwords. Passwords are entered during production and later can not be changed.

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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