

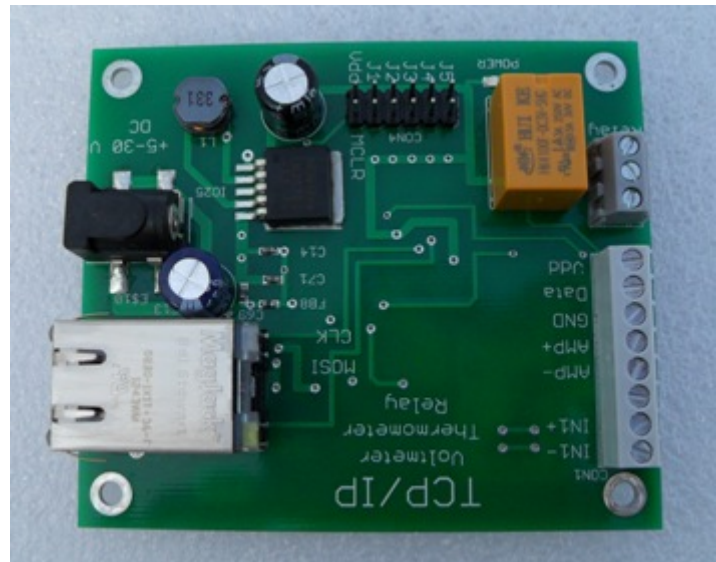
TCP/IP Voltmeter & Thermometer & Relay

TCP/IP voltmeter is device that allows remote measurement of voltage ,temperature and control relay over local area network (LAN) or internet. Version V10 contains 1 x DC Voltmeters, 1 x Thermometer and 1 x Relay. Voltmeter is galvanically isolated from the board.

This datasheet is intended for version :

Hardware version : **V 10**

Software version : **V 5.1**



Contents at the glance :

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1. Technical parameters

TCP Voltmeter V10 contains 1 DC Voltmeter , 1 x Thermometer and 1 x Relay . It allows to measure simultaneously one voltage, one temperature and control relay.

DC Voltmeter :

Measuring range: **0 - 50 V**
Resolution: **0,01 V** (error : 0.01 V)
Input impedance : **1.0 Mohm**
Speed measurement : **2 x** per second

Thermometer :

Measuring range: **- 25 C to + 120 C**
Resolution: **: 0.1 C** (error : 0.1 C)
Speed measurement : **every 5** seconds

Relay :Max. Switching Voltage : **300 V AC** (60 V DC)Max. Switching Current : **3 A**Max. Switching Power : **750 VA** (90 W)Contact Ratings: **3 A 250 V AC** (3A 30 V DC)Power supply : **+5 to +30 Volts** (DC)Current consumption : **160 mA / 5V**Board size : **78 x 67 mm****Digital inputs :**Jumpers **J3 , J4** : **digital inputs (low = 0 V , high = 3.3 V)**

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 :

The screenshot shows the web interface for the Microchip TCP/IP Voltmeter. At the top left is the Microchip logo. A red navigation bar contains the text 'TCP/IP Voltmeter'. Below this is a vertical menu with red buttons for 'Home', 'Relay', 'Dynamic DNS', 'Network Configuration', and 'SNMP Configuration'. The main content area is titled 'Measured values :' and contains a table with the following data:

Voltage [IN1]:	14.95	V
Current [AMP]:	0.0	A
Temperature :	21.1	°C
Input 1 [J3]:	high	
Input 2 [J4]:	high	
Relay state:	OFF	

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.

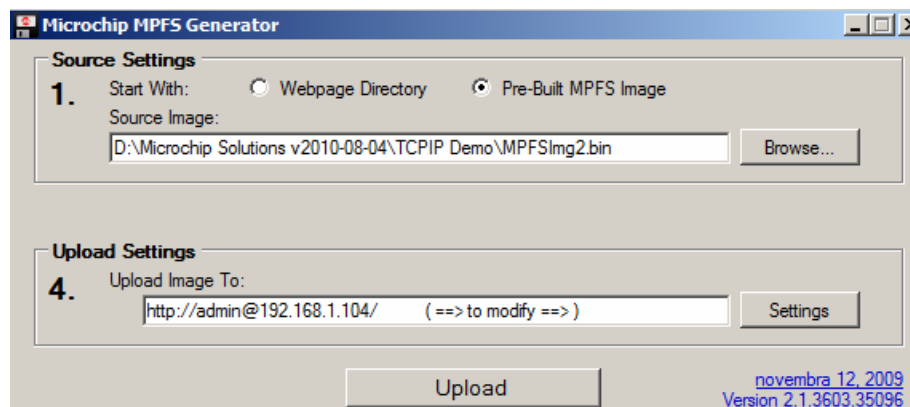
4. Upload web page to FLASH memory

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.

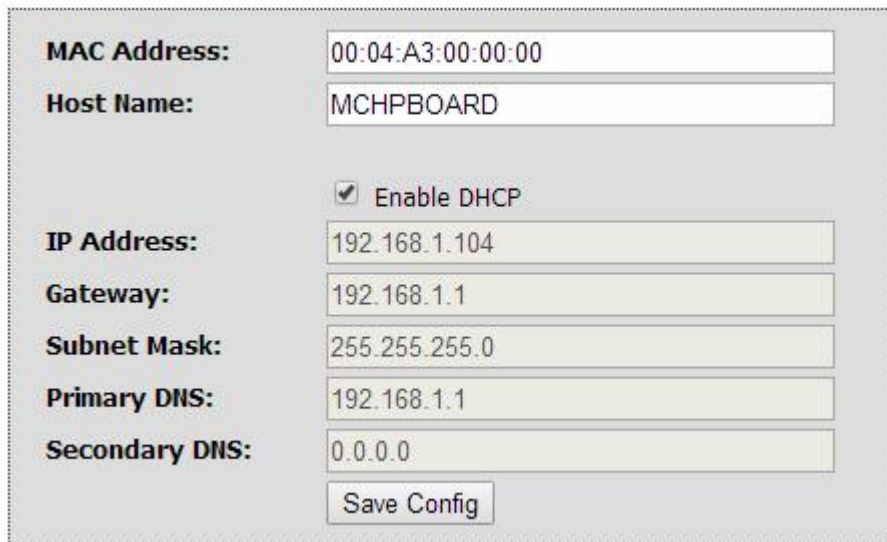


5. Network configuration

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. If you want to restore the original settings, so it's possible. More in Chapter 11.

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

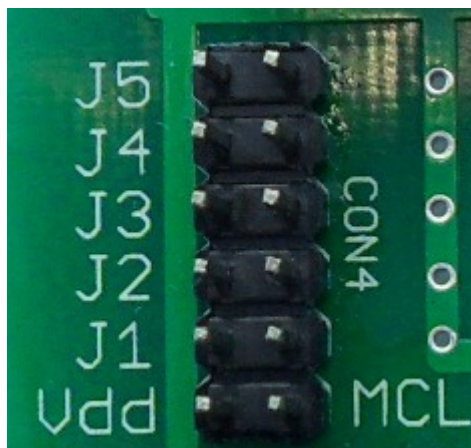
Dynamic DNS service is used for access to TCP/IP from internet if TCP/IP voltmeter is placed in the local area network (LAN) and it does not have public IP address.

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.

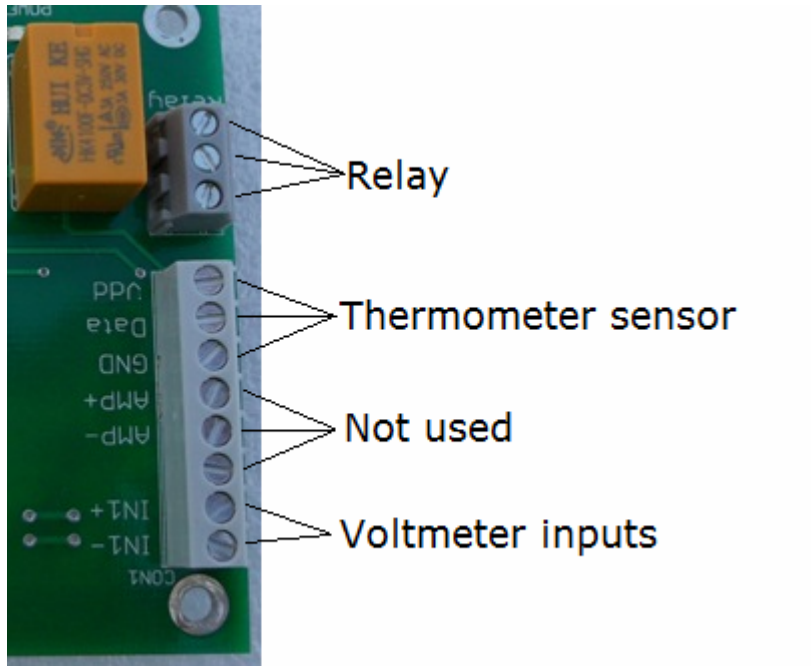
Detailed instructions on setting it are in external document.

7. Inputs and outputs connectors



Left site of headers J1 – J5 is connected to GND.

- J1 – Flash memory erase
- J2 – Not used
- J3 – Input (low / high)
- J4 – Input (low / high)
- J5 – Relay state indication

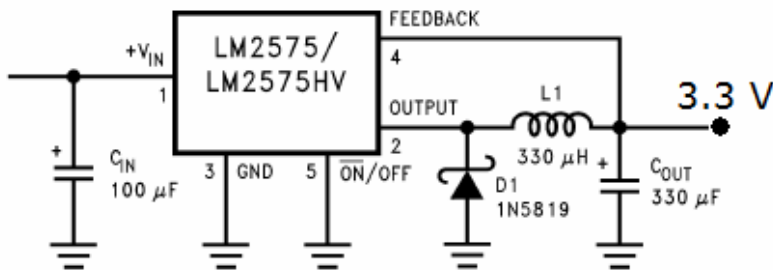


Thermometer sensor :

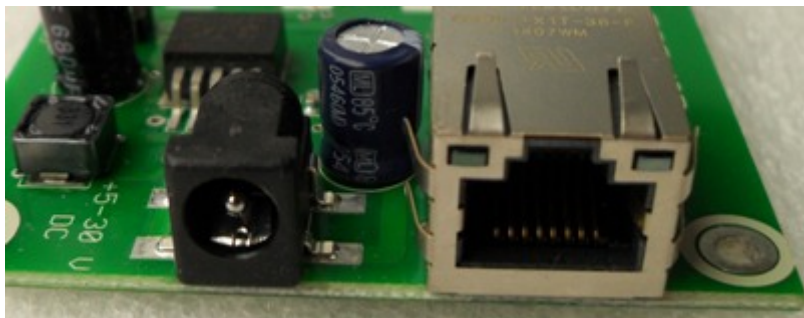
Vdd – red wire
 Data – yellow wire
 GND – black wire

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.



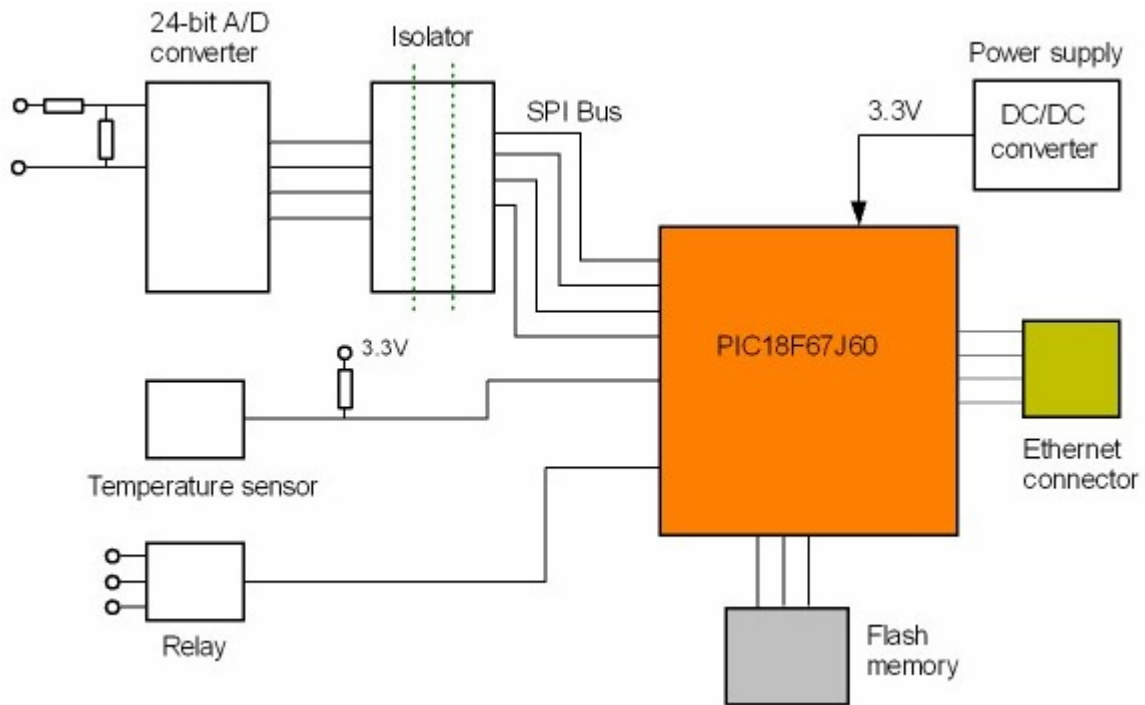
Jack socket is type RASM712X and is designed for 5.5 mm diameter jack. In the center is a positive voltage.



9. Hardware & schematics

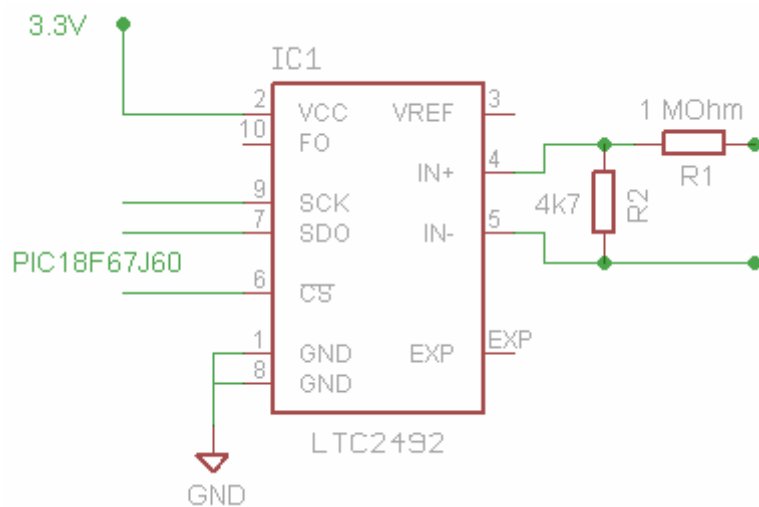
TCP/IP voltmeter includes 1 x DC Voltmeter 1 x Thermometer and 1 x Relay. Voltmeter is fully galvanically isolated from the board. It uses 24-bit A/D converter.

Circuit diagram of V10 :



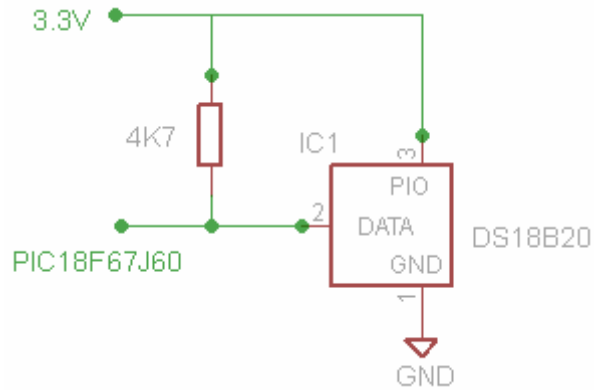
Voltmeter schematic :

Voltmeter uses differential input. On the input is voltage divider 1 Mohm / 4.7 kOhm. A/D converter communicates with a microprocessor via the SPI bus, which is galvanically isolated.



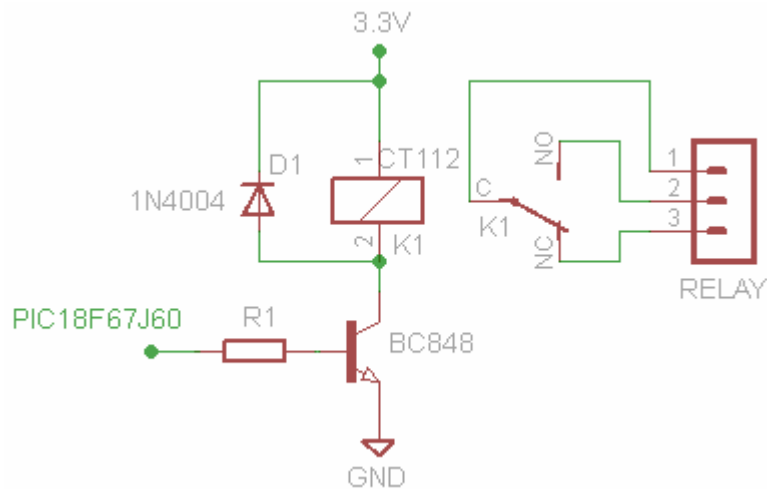
Thermometer schematic :

Thermometer uses as a sensor DS18B20. Data are sent directly to the microprocessor PIC18F67J60 through 1-wire bus. The sensor is factory calibrated and is immediately ready to use.



Relay schematic :

Relay is used for power supply 3.3V. PIC18F67J60 control a relay through a NPN transistor.

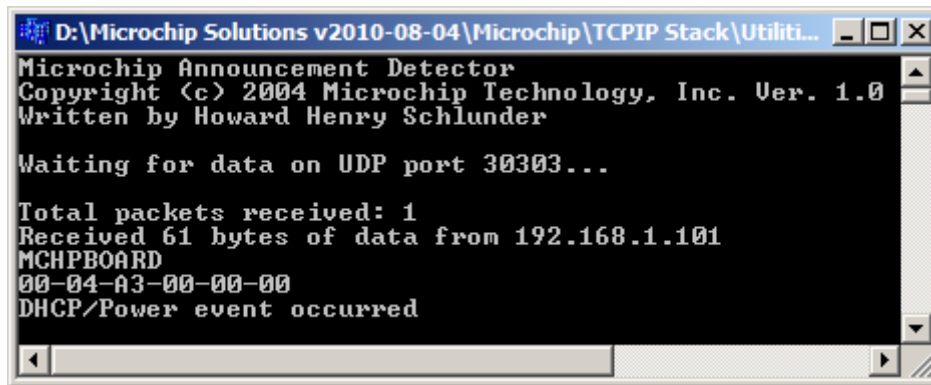


10. Software

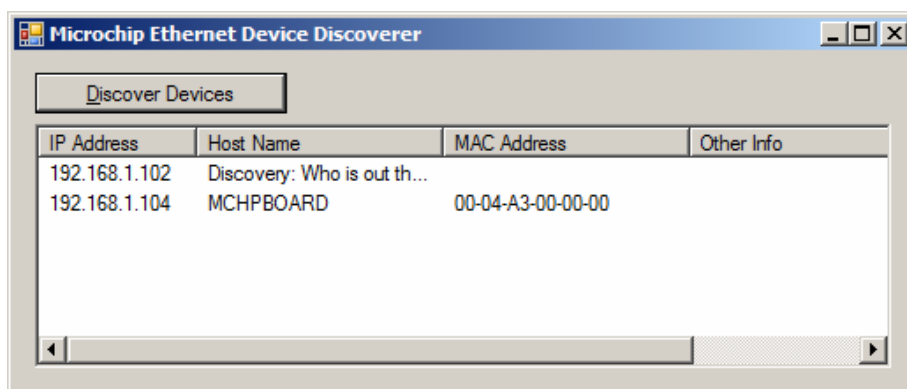
Software package contains utility intended for monitoring correct functionality of TCP/IP voltmeter. It includes following utilities: MCHPDetect, MCHPEXplorer, MPFS2.exe.

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.



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 EEPROM. (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.

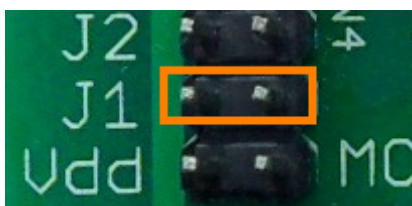
11. Erase Flash memory

If you change your settings in the 'Network settings' and want to restore the original settings, so it is necessary to erase the Flash memory.

It is achieved in several steps :

1. Turn off the power to the board.
2. Insert the jumper to position J1
3. Turn on the power and wait 5 seconds.
4. Remove the jumper from position J1.

After this the board use the original setting and saved changes are deleted.



12. 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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