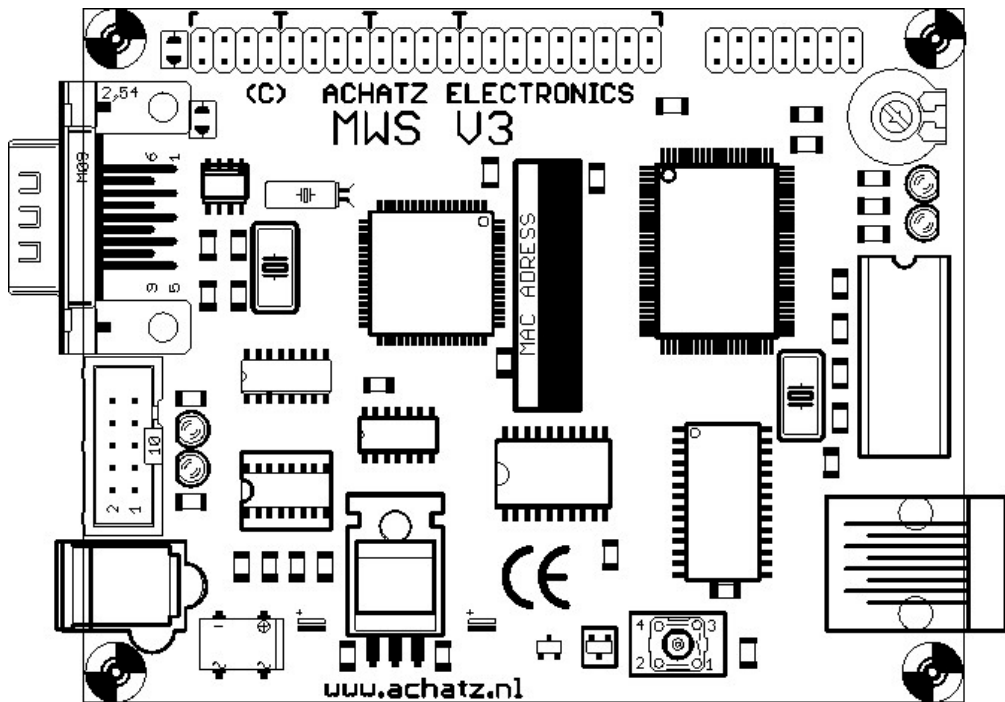


# Hardware Manual



# WebCat Server



Achatz Electronics  
The Netherlands

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For specific information on the components mounted on the board, please  
refer to the Data Book of the builder or second sources.

**SERIAL NO**

**MAC ADDRESS**

**NET MASK**

**GATEWAY**

**IP ADDRESS**

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## **1 About the MWS V3 Board**

The Web Cat Server is a low priced Evaluation Board with Ethernet Interface.  
Fully compatible to NUT/OS (the “LINUX” for ATMEL Controllers)  
Fully compatible to BASCOM (the best BASIC Compiler at this moment)  
The board is equipped with a powerful ATMEGA 128 RISC Controller.

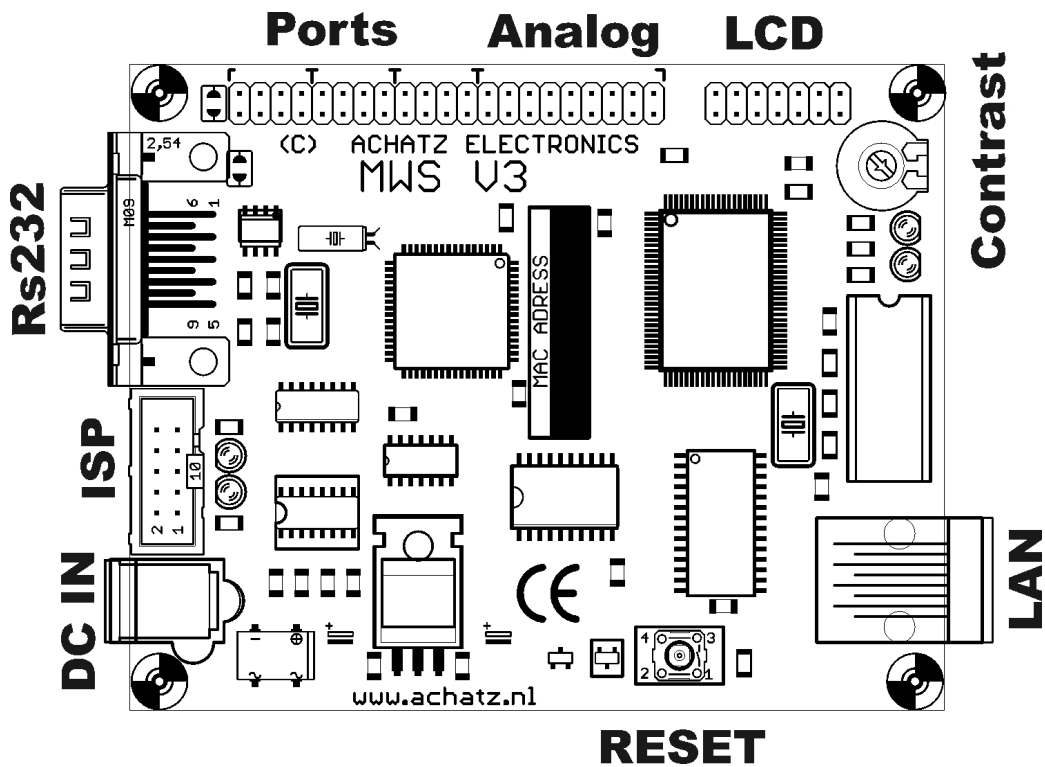
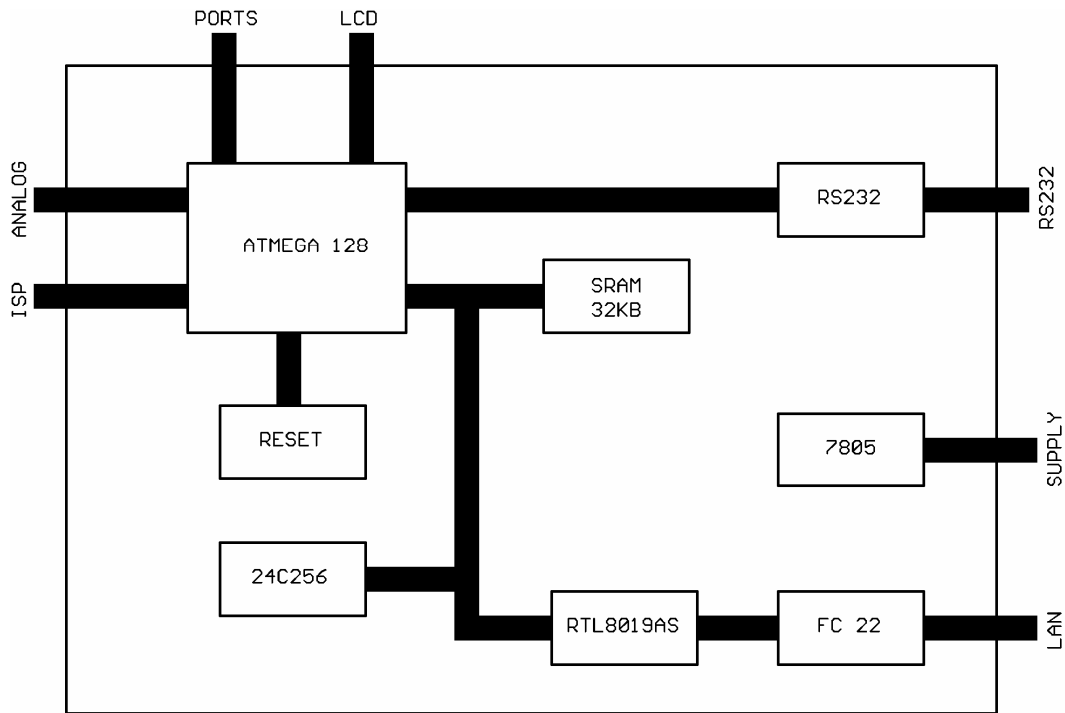
### **1-1 Applications**

- Home and Building Systems
- Alarm Installation
- Remote Monitoring via Web
- Diagnostics via Ethernet
- Industrial Remote Applications
- Networked Sensors
- Email Reporting Machine
- Internet Radio
- and a lot of more things .....

### **1-2 Specifications**

- ATMEGA 128 RISC Microcontroller
- RTL 8019 AS Ethernet Controller
- 128 KB In-System programmable Flash ROM
- 4 KB In-System programmable EEPROM
- 32 KB SRAM
- 32 KB I2C EEPROM
- 22 programmable digital I/Os
- RS 232 Interface
- In System Programming Features
- LCD Interface
- Contrast Potentiometer for the LC-Display
- 8 channel Analog/Digital Converter
- Reset Controller
- Reset Switch
- LEDs for Power, Programming, Ethernet Link and Activity
- Voltage Regulator onboard
- Onboard rectifier bridge
- Power Supply 2.1 mm barrel connector
- Single Power Supply 7,5 – 16 VDC
- Supply Current 80 mA
- Professional made PCB with two layers
- Size 100 x 80 mm

1-3 Block Diagram



## **2 Quick Start**

### **2-1 What is needed for setup?**

Please check if the following hardware and software items are available:

- A standard PC running Windows or Linux, equipped with a serial COM port, LPT port and a Ethernet adapter card.
- Terminal software (HyperTerminal)
- A power supply. It should provide 7.5 – 16 VDC, 100 mA.
- A twisted pair cable connected to a hub or a cross over cable for using without a hub
- An STK 200/300 compatible programming adapter
- A serial communication cable

### **2-2 Installation**

Remove the MWS V3 board from the bag. Visually inspect the board to verify that it was not damaged during transportation.

Connect MWS V3s DB9 RS232 port to a PC com port using a serial cable.

Use a twisted pair Ethernet cable connecting to a hub or switch or use a twisted pair cross cable connecting directly to a PCs Ethernet card.

Connect a power supply to the MWS V3 barrel connector.

Apply power to the MWS V3 board by connecting the power supply to an Electrical outlet. When the MWS V3 board is powered up, the PWR LED should go on. There is a rectifier bridge and a voltage regulator installed at the MWS board. Therefore do not care about the polarity of the barrel connector.

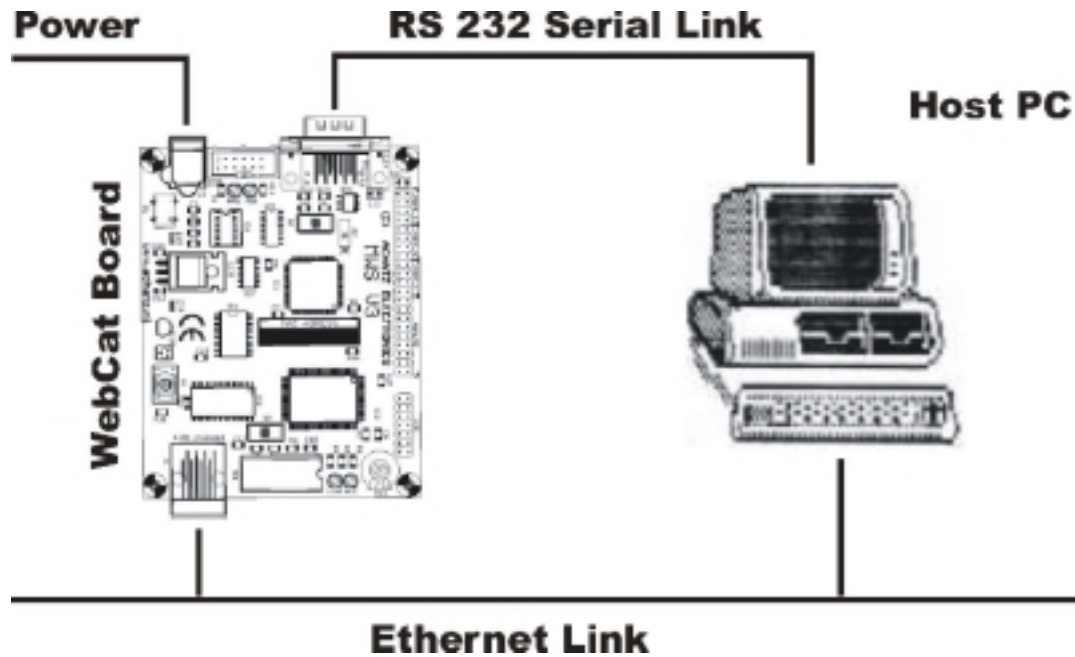
Start a terminal emulation program at 38400 baud or any higher rate up to 115200 baud, no parity, 8 data bits, 1 stop bit and no handshake.

Reset the MWS V3 board by pressing the reset-switch. Hold down the spacebar on the Terminal emulation program and wait some seconds.

The BaseMon firmware will show a welcome message.

**2-3 Cable Connections**

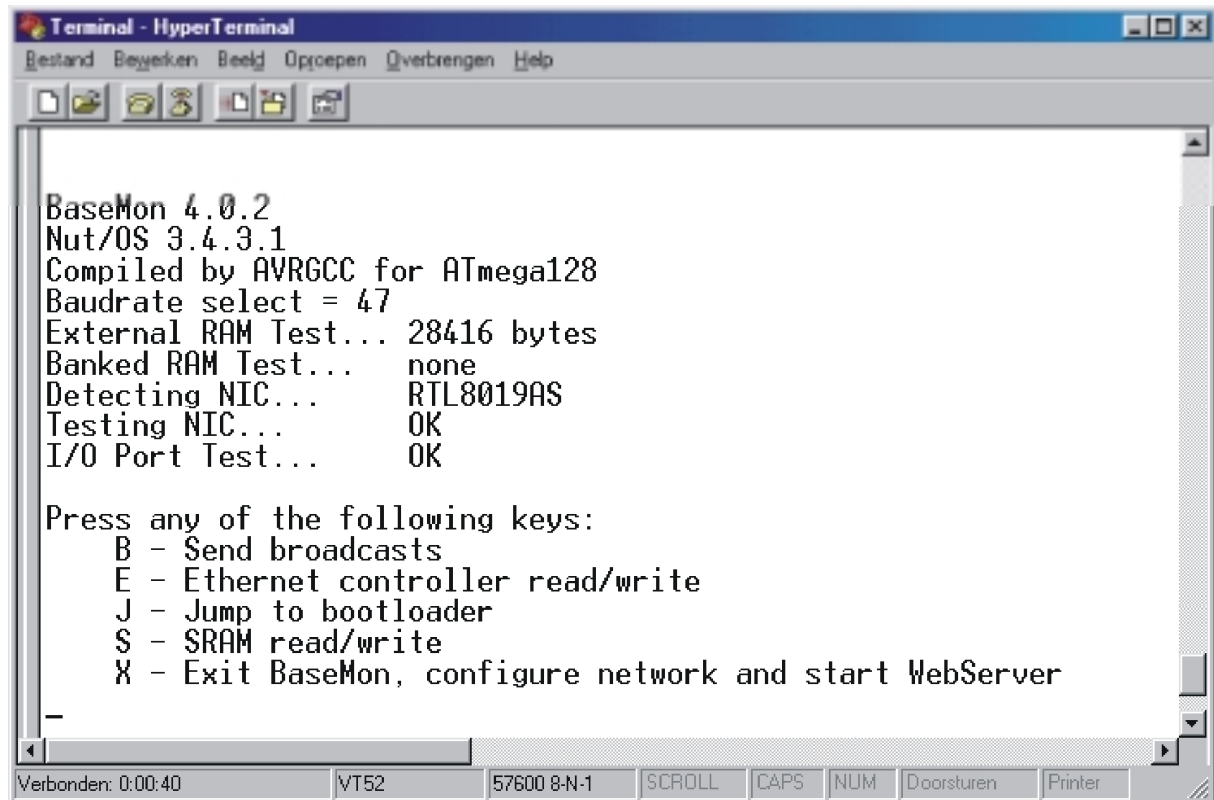
Before you can use the WebCat Board you will need a Personal Computer  
This PC will act as a Development System and should run under MS-Windows  
or under Linux.



Between the Development System and the WebCat Board there are two connections required. First the RS232 serial Link and second the Ethernet Link. For the serial Link you need a Null-Modem cable. If the Ethernet Link is connected directly to the PC's Ethernet adapter card you need a 10Base-T cross over cable or a standard 10Base-T patch cable when connected to a hub or a switch.

### 3 Testing the MWS V3 Board

The MWS V3 board will be delivered with a preloaded firmware. Start the terminal program, hold down the spacebar on the PC after powering up or pressing the reset button on the MWS V3 board. After some seconds the following message should appear:



```
Terminal - HyperTerminal
Bestand  Bewerken  Beeld  Oproepen  Overbrengen  Help

BaseMon 4.0.2
Nut/OS 3.4.3.1
Compiled by AVRGCC for ATmega128
Baudrate select = 47
External RAM Test... 28416 bytes
Banked RAM Test... none
Detecting NIC... RTL8019AS
Testing NIC... OK
I/O Port Test... OK

Press any of the following keys:
  B - Send broadcasts
  E - Ethernet controller read/write
  J - Jump to bootloader
  S - SRAM read/write
  X - Exit BaseMon, configure network and start WebServer

-

Verbonden: 0:00:40  VT52  57600 8-N-1  SCROLL  CAPS  NUM  Doorsturen  Printer
```

#### 3-1 Ethernet Controller Read/Write Loop

Press E and the MWS board will enter an endless loop. The ID of the RTL8019AS at base address H8300 is shown.

```
Id=0x5070
```

This test can be stopped pressing a key.

#### 3-2 Sending Broadcasts loop

Press E and the MWS board will start sending Ethernet broadcasts in an Endless loop.

```
SW-RESET...OK
RTL8019AS jumper mode: IRQ0 AUTO
```

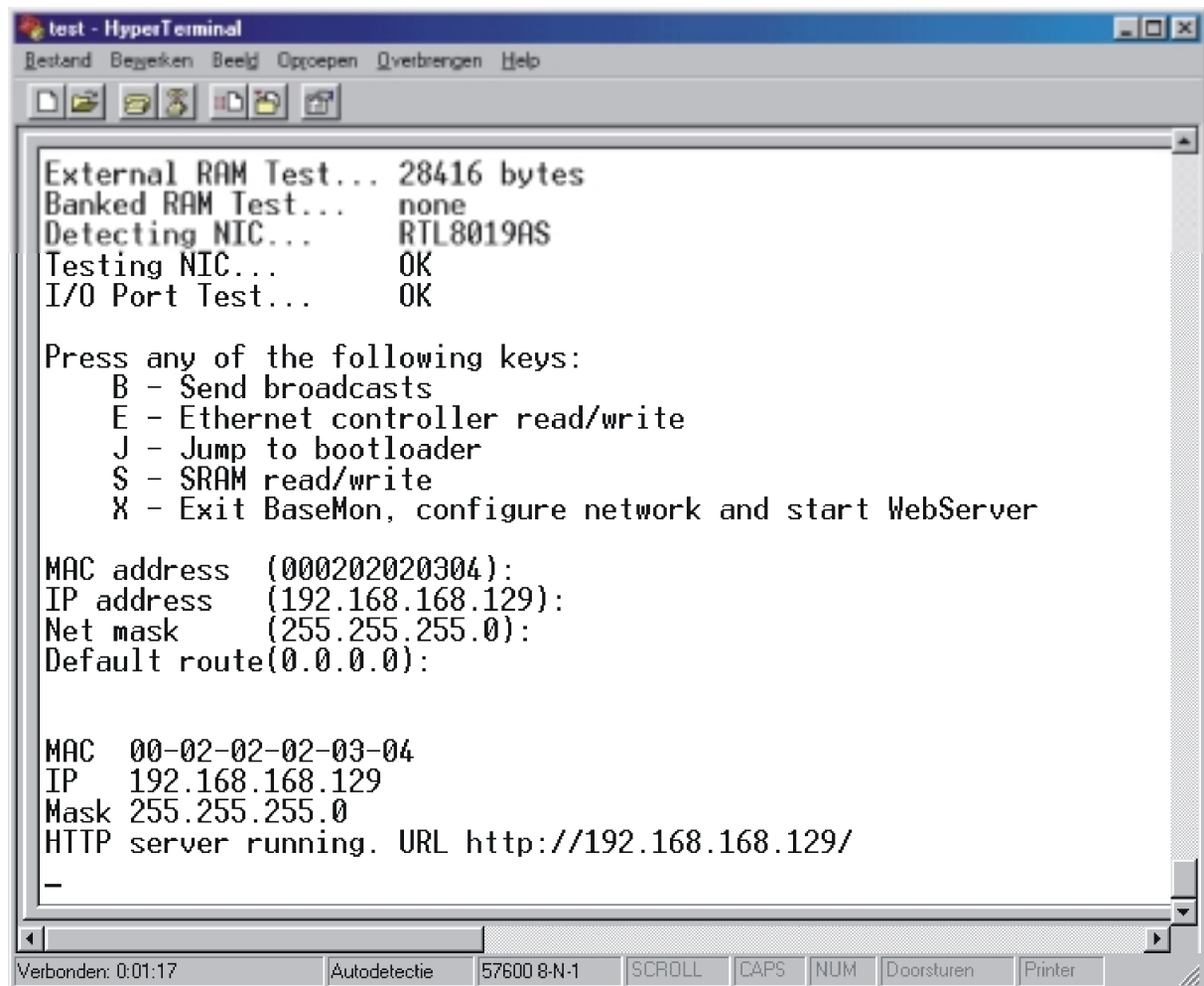
### 3-3 SRAM Read/Write loop

Press S and the MWS board will test the external SRAM.

Check address and databus.  
Press any key to stop

### 3-4 Exit BaseMon

Press X and the BaseMon will initialize the NUT/OS operating system and Nut/Net TCP/IP stack and finally starting a HTTP application. But before the HTTP application is entered you will be asked for the MAC address, IP address, network mask and for the gateway address.



```
test - HyperTerminal
Bestand Bezoeken Beeld Oproepen Overbrengen Help

External RAM Test... 28416 bytes
Banked RAM Test... none
Detecting NIC... RTL8019AS
Testing NIC... OK
I/O Port Test... OK

Press any of the following keys:
  B - Send broadcasts
  E - Ethernet controller read/write
  J - Jump to bootloader
  S - SRAM read/write
  X - Exit BaseMon, configure network and start WebServer

MAC address (000202020304):
IP address (192.168.168.129):
Net mask (255.255.255.0):
Default route(0.0.0.0):

MAC 00-02-02-02-03-04
IP 192.168.168.129
Mask 255.255.255.0
HTTP server running. URL http://192.168.168.129/
-

Verbonden: 0:01:17 Autodetectie 57600 8-N-1 SCROLL CAPS NUM Doorsturen Printer
```

After each power on or each reset the BaseMon System is waiting for about 30 seconds before starting the WebServer-Application again. This time is used for re-entering the BaseMon Test and Configuration Utility via the serial Interface.

## **4 Network Configuration**

### **4-1 DHCP Method**

The MWS V3 board is shipped with a blank EEPROM which is holding the configuration. If a DHCP server is installed in your network, the MWS V3 board will request its IP address, network mask and the gateway IP. If there is no DHCP server available, the MWS V3 board will switch to the ARP method.

### **4-2 ARP Method**

The ARP method can be used to set the boards IP address. In this case the MWS V3 board sets its address from the first received ICMP packet.

An ARP entry can be manually created on the PC and then a ping packet will be sent From the PC to the MWS V3 board.

Enter the following command to create an ARP entry for an MWS V3 board with a MAC address of 00:02:02:02:03:04 and an IP address of 192.168.168.129 on a LINUX command line shell:

```
arp -s 192.168.168.129 00:02:02:02:03:04
```

On a Windows DOS prompt use this command:

```
arp -s 192.168.168.129 00-02-02-02-03-04
```

Now enter this command in LINUX or DOS:

```
ping 192.168.168.129
```

The first ping packet that arrives at the MWS V3 board with the MAC address 00:02:02:02:03:04 will set the IP address of that MWS V3 board to 192.168.168.129. The default gateway is not set and the network mask will be set to 255.255.255.0

### **4-3 Reset to factory default**

The ARP method can only be used on a blank EEPROM.

Using the ARP method the configuration will be stored in the EEPROM and is used in the next system start up. To clear the EEPROM, and enabling the ARP method again, you have to use the ISP software for erasing the content.

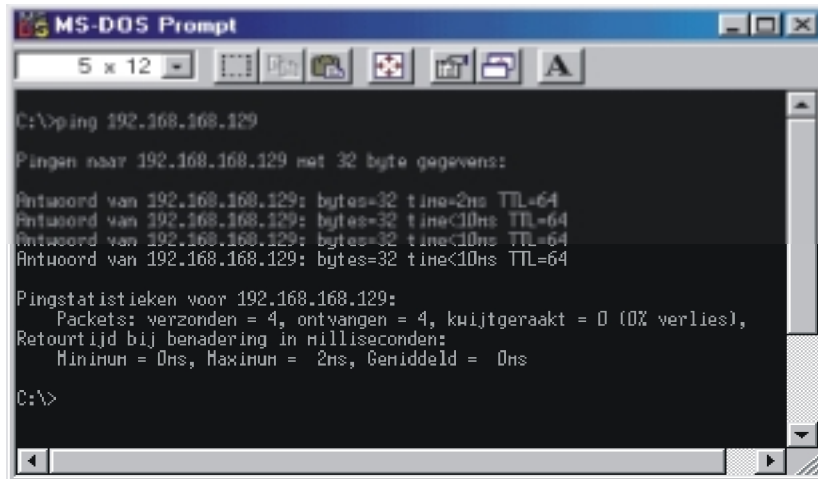
### **4-4 Manual configuration**

With the preloaded firmware you can manually configure the boards IP address, Gateway address and network mask. This can be done together with a terminal Emulation program connecting the MWS V3 board an a PC via a serial cable.

#### 4-5 Testing the Network

To test the TCP/IP communication we use PING, a very popular TCP/IP utility program. Please open a DOS window (you can find it in the Windows Start menu) and enter:

```
ping 192.168.168.129
```



```
MS-DOS Prompt
5 x 12
C:\>ping 192.168.168.129

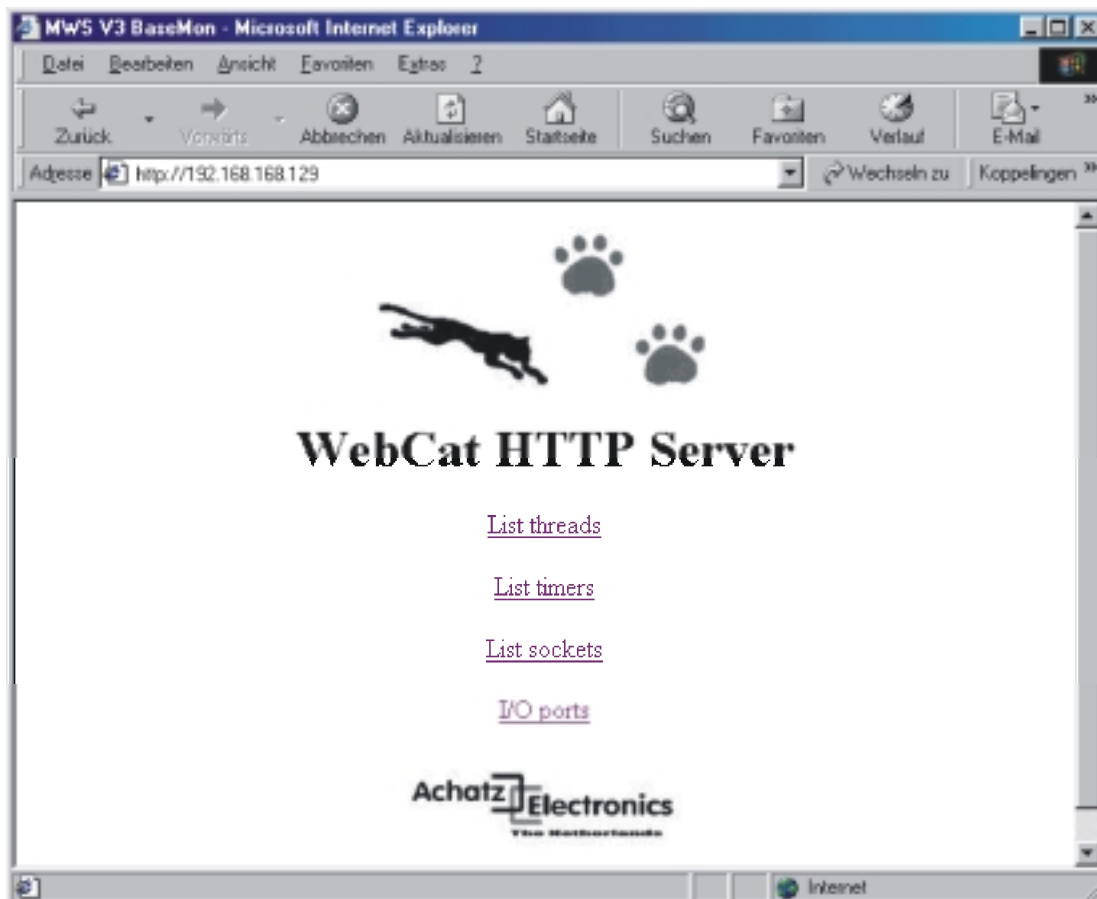
Pingen naar 192.168.168.129 met 32 byte gegevens:

Antwoord van 192.168.168.129: bytes=32 time=2ms TTL=64
Antwoord van 192.168.168.129: bytes=32 time<10ms TTL=64
Antwoord van 192.168.168.129: bytes=32 time<10ms TTL=64
Antwoord van 192.168.168.129: bytes=32 time<10ms TTL=64

Pingstatistieken voor 192.168.168.129:
    Packets: verzonden = 4, ontvangen = 4, kwijtgeraakt = 0 (0% verlies),
    Retourtijd bij benadering in milliseconden:
        Minimum = 0ms, Maximum = 2ms, Gemiddeld = 0ms

C:\>
```

Open the URL <http://192.168.168.129>. The MWS V3 will deliver you a small page. That's it. Now you are online with the MWS V3 and your Browser is connected to the MWS board.



## **5 Hardware Description**

This chapter describes the most interesting components of the WebCat Board and gives a short overview about their respective functions.

### **5-1 Power Supply**

For operating the MWS V3 Board you need a universal AC Adapter. Before plugging the adapter into the Wall Socket, please follow the Instructions shown below.

**VOLTAGE:** Set the voltage selector switch to the required voltage (7.5 – 16 VDC)

**CURRENT:** Ensure that the device to be powered is suitable for use with 100 mA current

**INPUT PLUG:** Select the correct size Input Plug (2.1 mm barrel connector)

**POLARITY:** The polarity is not important because we use a on-board rectifier bridge

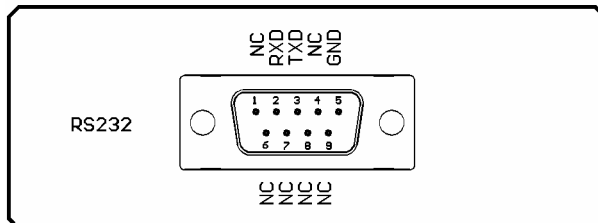


**5-3 RS 232 Interface**

For an easy connection between the MWS V3 board and your development system you can use the serial interface. A RS232 standard compliant Sub-D port with 9 pins realize this interface.

A UART (IC6) is used for creating this communication port.

Pins	Signal	Function
1	NC	Not connected
2	RXD	receive data
3	TXD	transmit data
4	NC	Not connected
5	GND	ground signal
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

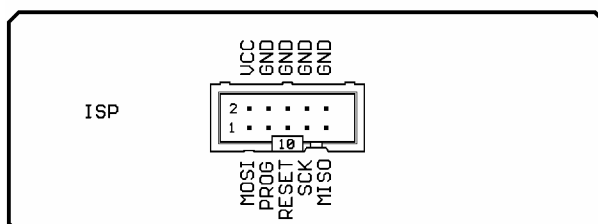


**5-4 ISP Interface**

The multiplexer (IC5) switches the Atmel programming pins, which are used by the Serial port during normal operation.

The PROG-LED shows the programming mode.

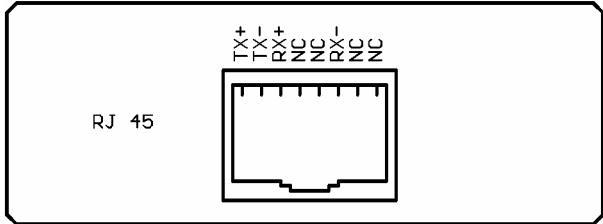
Pins	Signal	Function
1	MOSI	data input
2	VCC	5 VDC Supply
3	PROG	programming
4	GND	ground signal
5	RESET	active low reset
6	GND	ground signal
7	SCK	serial clock
8	GND	ground signal
9	MISO	data output
10	GND	ground signal



5-5 Ethernet Interface

The onboard RJ45 connector is providing a twisted pair Ethernet port. This port is connected to a RTL8019AS Ethernet Controller Chip (IC2). It supports full-duplex function which enables transmission and receiving through the twisted pair link to Ethernet hubs. The green link LED lights up to indicate that a valid 10BASE-T link beat is established. If the LED remains off after power is applied, check for a proper RJ-45 connection. The yellow activity LED indicates data traffic on the Ethernet.

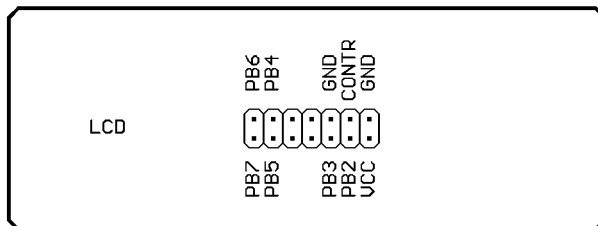
Pins	Signal	Function
1	TX+	transmit+
2	TX-	transmit-
3	RX+	receive+
4	NC	not connected
5	NC	not connected
6	RX-	receive-
7	NC	not connected
8	NC	not connected



**5-6 LCD Interface**

The LCD Interface is designed using a Hitachi HD44780 based LCD. In order to save I/Os, the 4 bit mode is selected. If a LED Backlight is required please use a extern Power supply for this job and do not use IC8 for it.

Pins	Signal	Function
1	GND	ground signal
2	VCC	5 VDC
3	CONTR	contrast
4	PB2	Register select
5	GND	Read/Write
6	PB3	Enable Signal
7	NC	not connected
8	NC	not connected
9	NC	not connected
10	NC	not connected
11	PB4	Port PB4
12	PB5	Port PB5
13	PB6	Port PB6
14	PB7	Port PB7



**5-7 RESET Controller**

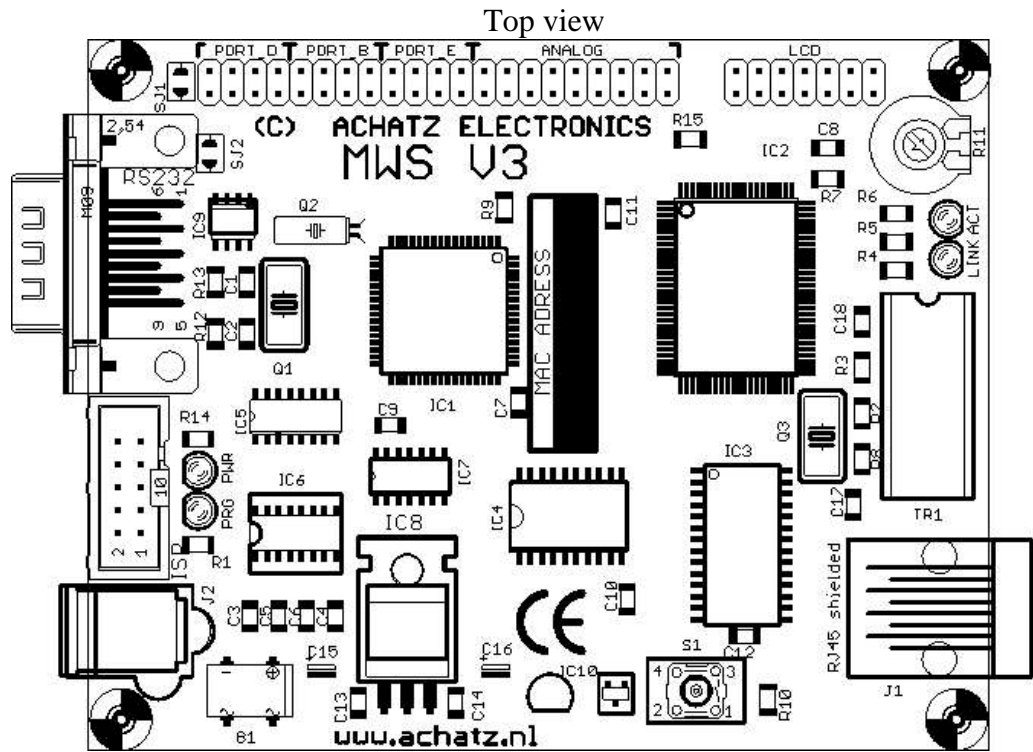
IC 10 or IC11 are system supervisor circuits designed to monitor VCC in digital systems and provide a reset signal to the host processor when necessary. This device will protect EEPROM data from corruption when the processor power supply voltage drops below the reset threshold.

**5-8 I2C EEPROM**

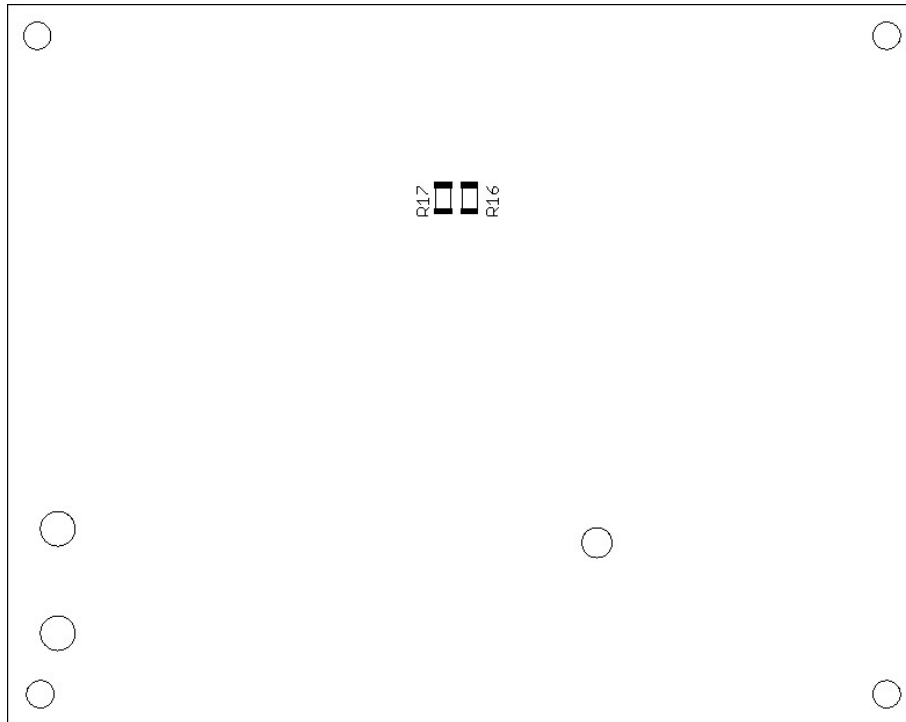
The MWS V3 board will be delivered with a additional I2C EEPROM (IC9). It can be activated when solder pads SJ1 and SJ2 are shorted. SCL is hardwired to PD7 and SDA is hardwired to PD6.



7 Board Layout



Bottom view



Note: AREF can be jumpered to GND or VCC shorting R16(VCC) or R17(GND)

## 8 Parts List

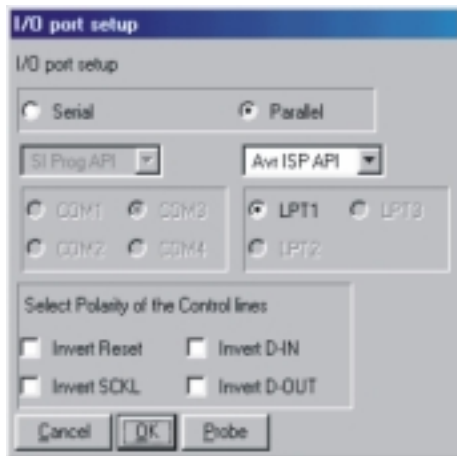
Part	Value	Package
ACT	LED	LED3mm
ANALOG	2x9	Pinheader
C1	22pf	C1206
C2	22pf	C1206
C3	100nf	C1206
C4	100nf	C1206
C5	100nf	C1206
C6	100nf	C1206
C7	100nf	C1206
C8	100nf	C1206
C9	100nf	C1206
C10	100nf	C1206
C11	100nf	C1206
C12	100nf	C1206
C13	22pf	C1206
C14	22pf	C1206
C15	22uf	2,5
C16	22uf	2,5
C17	10nf	C1206
C18	10nf	C1206
IC1	MEGA 128-16	TQFP64
IC2	RTL8019AS	SQFP100
IC3	62256	S028L
IC4	74HC573D	S020W
IC5	4053D	S016
IC6	MAX232	S016
IC7	74HCT04D	S014
IC8	7805T	T0220
IC9	24LC256	S08
*IC10	DS1811	S0T23
*IC11	TS809C	S0T23
* IC10 or IC11 is assembled		

Part	Value	Package
ISP	10 pin	ML10
J1	RJ45	4/8 pin
J2	DC Con	
LCD	2x07	Pinheader
LINK	LED	LED3mm
PORT_B	2x04	Pinheader
PORT_D	2x04	Pinheader
PORT_E	2x04	Pinheader
PRG	LED	LED3mm
PWR	LED	LED3mm
Q1	14M7456	Crystal
Q2	32K768	Crystal
Q3	20M000	Crystal
R1	1K	R1206
R2	270R	R1206
R3	270R	R1206
R4	1K	R1206
R5	1K	R1206
R6	4K7	R1206
R7	4K7	R1206
R8	200R	R1206
R9	4K7	R1206
R10	4K7	R1206
R11	5K	LI10
R12	2K2	R1206
R13	2K2	R1206
R14	1K	R1206
R15	27K	R1206
R16/17	0R	R1206
RS232	M09HP	SUBD
S1	Switch	RESET
TR1	FC-22	Filter

## 9 Settings

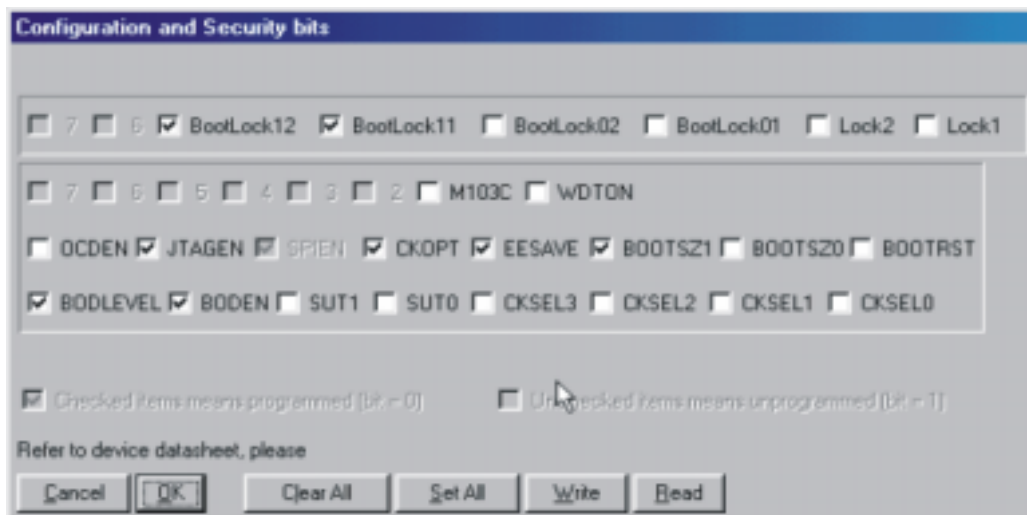
### 9-1 ISP Interface Setup

Open the dialog box where you can select the interface type and the port number where the hardware is connected.



### 9-2 Security Bits

The MWS V3 board will be shipped with the following secure bits set for the ATMEL. Please do not change this settings.



**10 Further Information**

For further technical information – like software description etc. – please check out the CD-ROM, which is included with every WebCat Board.

Further information about hardware, firmware and developing system can be found at:

Atmel Controller	<a href="http://www.atmel.com">www.atmel.com</a>
NUT/OS	<a href="http://www.egnite.de">www.egnite.de</a>
Applications	<a href="http://www.egnite.de/de/links.html">www.egnite.de/de/links.html</a>
BASCOM	<a href="http://www.mcselec.com">www.mcselec.com</a>
AVRGCC	<a href="http://www.avrfreaks.net">www.avrfreaks.net</a>
ICCAVR	<a href="http://www.imagecraft.com">www.imagecraft.com</a>
MWS V3	<a href="http://www.achatz.nl">www.achatz.nl</a>
RTL8019AS	<a href="http://www.realtek.com.tw">www.realtek.com.tw</a>
Layout Editor	<a href="http://www.cadsoft.de">www.cadsoft.de</a>



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<http://www.achatz.nl>

# WARRANTY

For the WebCat Board we grant a 2 Year warranty starting with the date of purchase. In case of claims and necessary repairs, please fill out completely and attach this voucher. In case the unit has been used improperly there are no claims under warranty possible anymore.

**Achatz Electronics**  
**Baanstraat 134**  
**6372 AJ Landgraaf**  
**The Netherlands**

**info@achatz.nl**



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