CMX-MicroNet Evaluation Version for the Freescale MCF5208

Getting Started Guide

The version of the Metrowerks tools used for CMX-MicroNet™ were:
Codewarrior Development Studio for Coldfire version 6.4

Installation

The CMX-MicroNet software is distributed in the form of a setup.exe file.
If you received your software via email in a .zip file, the zip file is password-protected only to make it more likely to make it through corporate email firewalls. The zip file password is “cmx”.

Run setup.exe.
The default installation directory, c:\MICRONET, may be changed to another location.

Caution: We recommend installing the software in a root-level directory. The reason for this is that you may experience problems linking if the software is installed in too “deep” a directory. Some of the tools have a finite limit on the length of a directory/path specification, and if this limit is exceeded, then you will experience problems. This kind of issue has become much more common in recent years, with the advent of long file names.

When you are prompted for a password during installation, use “CMX-MICRONET” (case-sensitive).

What is installed:
Folders:

- Manual – We highly recommend reading the manual, mn309man.pdf.
- Demo_apps – This directory contains the source files for the projects.
- Demo_apps\web1_pages – Has the web pages used by the web1 application.
- Demo_apps\web2_pages – Has the web pages used by the web2 application.
- MCF5208EVB – contains the projects and an evaluation version of the netlib library.
- Netlib – This directory normally hold the core CMX-MicroNet library. For the evaluation version only the CMX-MicroNet header files are here.
- PCtestprograms – These are programs, to run on a PC. They are used so that the CMX-MicroNet MCF5208 software has something to talk to. See the README.TXT file.
- Util – These are various utilities used in building the software. See the util.txt file.

Files:

- Tcp_app.c – example program for testing CMX-MicroNet TCP/IP echo client and server.
- Web1.c – example program showing a simple HTTP server.
- Web2.c – example program showing an HTTP server with server-side-includes, a POST function and a JAVA applet.
- Callback.c - user callback routines, described in the manual, for CMX-MicroNet. This is also where IP addresses etc are configured.
- Callback2.c - user callback routines modified for the web2 application. This is also where IP addresses etc are configured.
- install.log – Produced during the install, if you have an installation problem while running setup.exe, please email CMX tech support this file.
- license.txt – the software license
- unwise.exe – use this should you wish to uninstall the software

Please email CMX at the following email address to report bugs or problems with the CMX-MicroNet Evaluation Version: cmx@cmx.com

CMX-MicroNet Evaluation Version limitations

The CMX-MicroNet Evaluation Version has some limitations that the full CMX-MicroNet does not have.

- The evaluation version will only run for 30 minutes or send 1,000 TCP/IP and/or UDP/IP packets before locking up. The board may be reset to run for another 30 minutes or 1,000 packets. PING reply packets and ARP packets do not count towards the packet limit.
- The options included with the evaluation version are Ethernet, HTTP Server and TFTP.
- The Ethernet MAC address is fixed at 00-00-12-34-56-78.
- The configuration defines in mnconfig.h are fixed and may not be changed. For example, in the full CMX-MicroNet up to 127 sockets can be open at a time, but in the evaluation version only five sockets may be open at one time. Some other restrictions are that the receive buffer is 1518 bytes, the TCP_WINDOW, which is the amount of data that can be sent in a single packet, is 1460 bytes, and six web pages, five GET functions and five POST functions may be added to the virtual file system. See the **Mnconfig.h** section below for a full list.
- The header files in the Netlib directory and the header files in the Source directories may not be changed.
- RTOS support is not included.
- Web pages and graphics files are limited to 64 KB each in size.

The following are limitations common to all versions of CMX-MicroNet.

- IP options are ignored.
- ICMP only supports echo reply.
- TCP sends MSS option, received options are ignored.
- TCP respects other side's window, but uses a fixed window itself.
- Every TCP packet must get an ACK before the next one can be received. (No delayed ACKs).

Getting Started

➔ The included example programs and projects are very important in both verifying correct installation and configuration, but also in giving you a working piece of code.

➔Do not change any of the header files in the netlib directory. The netlib library has been built using those files so changing any of them would cause a conflict between the library code and the application code.

Mnconfig.h

mnconfig.h is used to select the protocols used, number of sockets, sizes of transmit and receive buffers, etc. See the Configuration File section of the manual for details.

Here is what the mnconfig.h for the evaluation version looks like. For each of the #defines, there is an explanation in the manual which describes what the default settings are, what the setting does, etc.

```
/**********************************************************
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**********************************************************/

#ifndef MNCONFIG_H_INC
#define MNCONFIG_H_INC 1

/* Protocols */
#define MN_NUM_INTERFACES  1
#define MN_TCP          1
#define MN_UDP          1
#define MN_UDP_CHKSUM   1
#define MN_ETHERNET     1
#define MN_SLIP         0
#define MN_PPP          0
#define MN_PING_REPLY   1
#define MN_IGMP         0

/* Sockets */
#define MN_NUM_SOCKETS       5
#define MN_SOCKET_WAIT_TICKS 600
#define MN_SOCKET_INACTIVITY_TIME   0

/* Send and Recv buffers */
#define MN_ETH_RECV_BUFF_SIZE       1518
#define MN_ETH_XMIT_BUFF_SIZE       1518
#define MN_UART_RECV_BUFF_SIZE      512
#define MN_UART_XMIT_BUFF_SIZE      512

/* TCP/IP options */
#define MN_TIME_TO_LIVE     64
#define MN_ETH_TCP_WINDOW   1460
```

```
#define MN_UART_TCP_WINDOW  256
#define MN_TCP_RESEND_TICKS 600
#define MN_TCP_RESEND_TRYS  12
#define MN_PING_GLEANING    0
#define MN_PING_BUFF_SIZE   32
#define MN_ALLOW_BROADCAST  0
#define MN_ALLOW_MULTICAST  0
#define MN_MULTICAST_TTL    1
#define MN_IGMP_LIST_SIZE   4
#define MN_IP_FRAGMENTATION      0
#define MN_IP_REASSEMBLY_TIME    60
#define MN_NUM_REASSEMBLIES      2
#define MN_REASSEMBLY_BUFF_SIZE  3000
#define MN_COPY_FRAG_DATA        1

/* Ethernet */
#define MN_POLLED_ETHERNET  0
#define MN_ETHER_WAIT_TICKS 5
#define MN_USE_HW_CHKSUM    0

/* ARP */
#define MN_ARP              1
#define MN_ARP_WAIT_TICKS   600
#define MN_ARP_TIMEOUT      0
#define MN_ARP_AUTO_UPDATE  0
#define MN_ARP_CACHE_SIZE   4
#define MN_ARP_KEEP_TICKS   6000
#define MN_ARP_RESEND_TRYS  6

/* DHCP */
#define MN_DHCP                     0
#define MN_DHCP_RESEND_TRYS         4
#define MN_DHCP_DEFAULT_LEASE_TIME  36000

/* BOOTP */
#define MN_BOOTP              0
#define MN_BOOTP_RESEND_TRYS  6
#define MN_BOOTP_REQUEST_IP   1

/* DNS */
#define MN_DNS                 0
#define MN_DNS_WAIT_TICKS      300
#define MN_DNS_SEND_TRYS       3
#define MN_USE_PPP_DNS         0
#define MN_DNS_RECV_BUFF_SIZE  252
#define MN_DNS_XMIT_BUFF_SIZE  64

/* PPP options */
#define MN_USE_PAP             1
#define MN_PAP_USER_LEN        10
#define MN_PAP_PASSWORD_LEN    10
#define MN_PAP_NUM_USERS       1
#define MN_PPP_RESEND_TICKS    300
#define MN_PPP_RESEND_TRYS     6
#define MN_PPP_TERMINATE_TRYS  2
#define MN_FAST_FCS            1

/* Modem */
#define MN_MODEM           0
#define MN_DIRECT_CONNECT  1

/* HTTP */
#define MN_HTTP                  1
#define MN_SERVER_SIDE_INCLUDES  1
```

```
#define MN_INCLUDE_HEAD          0
#define MN_URI_BUFFER_LEN        52
#define MN_BODY_BUFFER_LEN       52
#define MN_HTTP_BUFFER_LEN       1460

/* FTP */
#define MN_NEED_MEM_POOL     0
#define MN_MEM_POOL_SIZE     4096
#define MN_FTP_SERVER        0
#define MN_FTP_MAX_PARAM     24
#define MN_FTP_BUFFER_LEN    1460
#define MN_FTP_USER_LEN      10
#define MN_FTP_PASSWORD_LEN  10
#define MN_FTP_NUM_USERS     1
#define MN_FTP_CLIENT        0
#define MN_FTPC_USER_LEN         10
#define MN_FTPC_PASSWORD_LEN     10
#define MN_FTPC_ACCOUNT_LEN      0
#define MN_FTPC_CMD_BUFF_SIZE    64
#define MN_FTPC_REPLY_BUFF_SIZE  128
#define MN_FTPC_FILE_BUFFER_LEN  1460
#define MN_FTPC_WAIT_TICKS       600

/* TFTP */
#define MN_TFTP              0
#define MN_TFTP_RESEND_TRYS  3
#define MN_TFTP_USE_FLASH    0

/* SMTP */
#define MN_SMTP             0
#define MN_SMTP_BUFFER_LEN  1460
#define MN_SMTP_AUTH        0

/* SNTP */
#define MN_SNTP            0
#define MN_SNTP_WAIT_TICKS 300
#define MN_SNTP_SEND_TRYS  3

/* POP3 */
#define MN_POP3                  0
#define MN_POP3_CMD_BUFFER_LEN   25
#define MN_POP3_REPLY_BUFFER_LEN 512
#define MN_POP3_LINE_BUFFER_LEN  1000
#define MN_POP3_WAIT_TICKS       600

/* SNMP */
#define MN_SNMP             0
#define MN_SNMP_VERSION2C   0
#define MN_SNMP_TRAP        0
#define MN_SNMP_IN_BUFF_SIZE  484
#define MN_SNMP_OUT_BUFF_SIZE 484

/* Virtual File System */
#define MN_VIRTUAL_FILE    1
#define MN_NUM_VF_PAGES    6
#define MN_VF_NAME_LEN     20
#define MN_FUNC_NAME_LEN   20
#define MN_NUM_POST_FUNCS  5
#define MN_NUM_GET_FUNCS   5
#define MN_USE_LONG_FSIZE  0
#define MN_USE_EFFS_THIN   0
#define MN_USE_EFFS        0
#define MN_USE_EFFSM       0
#define MN_USE_EFFS_FAT    0
```

```
#endif   /* ifndef MNCONFIG_H_INC */
```

The tcp_app application

This program can be configured to run as either a TCP echo client or TCP echo server by changing the following define in tcp_app.c:

#define SERVER_MODE   0   /* set to 1 if a server, or 0 if a client */

We recommend starting with the example set for TCP client mode, as shown above.

You also need to edit callback.c in the demo_apps directory to change the default network IP addresses. The gateway IP address and subnet mask should be set also. Application specific functions (callbacks) in this file can be changed, if required. If a gateway is not used (gateway IP address is set to 255.255.255.255) then the IP address of the PC and the IP address of the board must be set so they are on the same network. e.g. both are 192.168.2.xxx.

The program, when configured for CLIENT_MODE, will attempt to connect via TCP/IP to a TCP echo server (such as the included TCP echo server program tcp_svr.exe that runs on a PC) at the destination IP location indicated in tcp_app.c and using the echo service port 7. It sends data continuously to this address and then receives it back from the echo server.

You could then do the opposite, use the PC tcp_cli.exe program, and set the example to run as a server. In this case, the PC will send data to the example program running on the MCF5208, which will then echo it back to the PC. When using tcp_cli.exe you must supply a parameter that is the same as the IP address set in the eth_src_addr array in tcp_app.c. e.g.

```
Tcp_cli 192.168.2.3
```

Tcp_cli.exe and Tcp_svr.exe both display the data they receive on the screen.

See the **Using the included Metrowerks projects** section for more details on using the tcp_app application.

The web1 application

The web1 application demonstrates how to use the HTTP server to serve up a simple web page. The web page, index.htm, and its graphics file are in the demo_apps\web1_pages directory. The HTML2C utility has been used to convert those files into .c and .h files that are included in the project. Note that the main web page must be called index.htm or index.html.

If server-side-includes, POST functions and JAVA applets are not used, a web server application can be created in just a few steps.

- Convert web pages to .c and .h files using the HTML2C utility.
- #include the created .h files in your application after #include "micronet.h"
- In the main function call mn_init() before calling any other CMX-MicroNet functions.
- Call functions mn_assign_interface() and mn_open_interface() to set up the IP addresses.
- Add the web pages to the virtual file system with the mn_vf_set_entry() function call and the parameters defined in the .h files created by HTML2C.

- Call the mn_server() function. This function normally does not return.

See the **Using the included Metrowerks projects** section for more details on using the web1 application.

The web2 application

The web2 application serves up a web page with two frames, two server-side-includes, a form and a JAVA applet. If your OS does not have a JAVA virtual machine go to http://java.sun.com/getjava and download the JAVA Runtime Environment (JRE) for your OS.

Server-side-includes are a way of inserting dynamic data into a web page. A special tag is placed into the web page specifying a GET function to be called by CMX-MicroNet. A GET function must be placed into the virtual file system with a call to function mn_gf_set_entry(). This user-defined function passes the data to be placed into the web page to the HTTP server, which then replaces the tag with the passed data. For example in bot.htm there is the tag:

```
<param name=Tick value="<!--#exec cgi="getTickVal"-->">
```

When the HTTP server sees the "<!--#exec cgi= string it looks for a function name inside the following quotes. It then looks up the function name in the virtual file system and runs the associated function, which in this case is get_tick_func. A GET function must take a pointer to a pointer to a buffer as a parameter and return the number of bytes placed in the buffer as a word16 variable. See web2.c and the CMX-MicroNet manual for details.

Forms in web pages are handled through POST functions. The ACTION attribute of the form is set to the name of a user-defined POST function. A POST function must be placed into the virtual file system with a call to function mn_pf_set_entry(). When the submit button of the form is clicked the function associated with the POST function name is executed. A POST function is passed a pointer to the socket associated with the web page. The mn_http_find_value function can be called to get the value(s) of the variable(s) in the POST request. In a POST function either the mn_http_set_message function must be called to send a message back to the browser or the mn_http_set_file called to send a web page back to the browser. In the web2 example it looks for a variable called display and if found places the passed value in the msg_buff array. If the msg_buff array was successfully updated an HTTPStatus204 message is sent. This tells the web browser that the POST was successful but that no web page will be returned. See web2.c, bot.htm and the CMX-MicroNet manual for details.

The web server can also serve up JAVA applets. The applet .class files are converted to .c and .h files using HTML2C and added to the virtual file system the same as other web pages. A powerful feature is the ability of JAVA applets to establish a TCP connection with CMX-MicroNet thus allowing immediate bi-directional communication between the applet and the board. In the web2 example a socket is opened up for listening on port 2000 before the HTTP server is started. The JAVA applet opens up a TCP connection at startup and then listens for data coming from the board. Function mn_app_server_idle() in callback2.c is called whenever the web server is not busy processing packets. In the web2 example this function has been modified to make sure there is a socket on port 2000 available to listen for incoming connections and every five seconds the system timer tick value is sent to all sockets with a destination port of 2000. Note that multiple JAVA applets may connect to the board at the same time. See web2demo.java, web2.c and callback2.c for more details.

See the **Using the included Metrowerks projects** section for more details on using the web2 application.

Using the included Metrowerks projects

The following project files are provided in the MCF5208EVB directory.

TCP echo client or server	Tcp_app\tcp_app.mcp
Simple web server	Web1\web1.mcp
More advanced web server	Web2\web2.mcp

➔ Open the projects using Codewarrior Development Studio for Coldfire version 6.4.

➔ Before running the project, make sure callback.c has the desired IP network settings.

The projects come with two targets, one that runs from the SDRAM on the board, and one that runs from flash.

To flash the board, select Flash Programmer from the tools menu. Click Load Settings, then from the project's main directory pick example_rom.xml. Select Program / Verify and pick the selected file. This will be tcp_app_rom.elf.s19, web1_rom.elf.s19 or web2_rom.elf.s19. Select Erase / Blank Check and click Erase. When that is done select Program / Verify and click program. After programming is complete you can use the debugger to run the application.

If you change one of the web pages in the web server examples then you must run the HTML2C utility found in the util directory to create new .c and .h files. For example if index.htm is modified you would run:

```
Html2c index.htm
```

That will create index.c and index.h. See the Virtual File System section of the CMX-MicroNet manual for more information on using the Virtual File System.

To access the web pages using one of the HTTP server examples, in the browser's address box enter http:// followed by the board's IP address defined in callback.c. e.g.

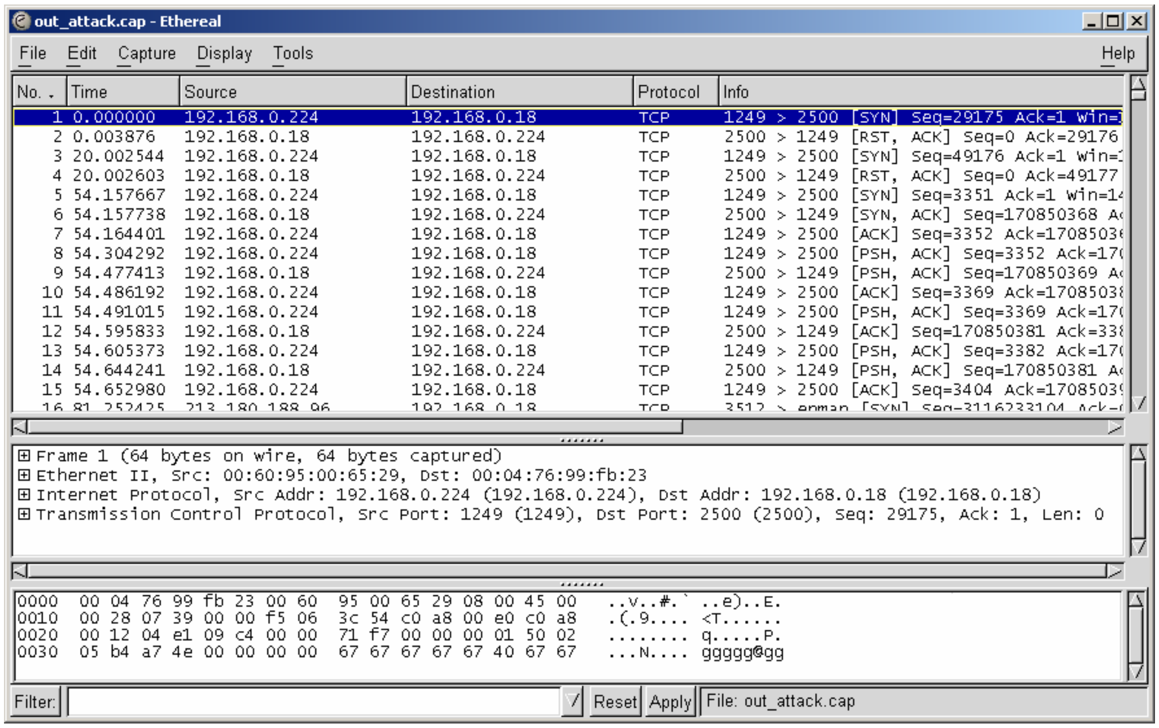
http://192.168.2.3

Debugging

Besides using the included PC-side TCP/UDP client/server test programs, we highly recommend the use of a packet sniffer. These allow you to see all transmitted frames and see exactly what is going on. Some of the freeware ones, like Wireshark (formerly known as Ethereal), are surprisingly good.

Freeware Packet Sniffers for Windows
AnalogX PacketMon - www.analogx.com
Anasil - www.sniff-tech.com
CommView - www.tamosoft.com
Wireshark - www.wireshark.org
Sniff'em - www.sniff-em.com

Commercial
Klos Technologies' SerialView, PacketView www.klos.com
Windows Packet sniffing library for C#, C++, VB - http://www.packet-sniffing.com



```
No.  Time       Source          Destination     Protocol  Info
  1  0.000000   192.168.0.224   192.168.0.18    TCP       1249 > 2500 [SYN] Seq=29175 Ack=1 Win=
  2  0.003876   192.168.0.18    192.168.0.224   TCP       2500 > 1249 [RST, ACK] Seq=0 Ack=29176
  3  20.002544  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [SYN] Seq=49176 Ack=1 Win=
  4  20.002603  192.168.0.18    192.168.0.224   TCP       2500 > 1249 [RST, ACK] Seq=0 Ack=49177
  5  54.157667  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [SYN] Seq=3351 Ack=1 Win=1
  6  54.157738  192.168.0.18    192.168.0.224   TCP       2500 > 1249 [SYN, ACK] Seq=170850368 A
  7  54.164401  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [ACK] Seq=3352 Ack=1708503
  8  54.304292  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [PSH, ACK] Seq=3352 Ack=17
  9  54.477413  192.168.0.18    192.168.0.224   TCP       2500 > 1249 [PSH, ACK] Seq=170850369 A
 10  54.486192  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [ACK] Seq=3369 Ack=1708503
 11  54.491015  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [PSH, ACK] Seq=3369 Ack=17
 12  54.595833  192.168.0.18    192.168.0.224   TCP       2500 > 1249 [ACK] Seq=170850381 Ack=33
 13  54.605373  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [PSH, ACK] Seq=3382 Ack=17
 14  54.644241  192.168.0.18    192.168.0.224   TCP       2500 > 1249 [PSH, ACK] Seq=170850381 A
 15  54.652980  192.168.0.224   192.168.0.18    TCP       1249 > 2500 [ACK] Seq=3404 Ack=1708503
 16  81.252425  213.180.188.96  192.168.0.18    TCP       3512 > enman [SYN] Seq=3116233104 Ack=

⊞ Frame 1 (64 bytes on wire, 64 bytes captured)
⊞ Ethernet II, Src: 00:60:95:00:65:29, Dst: 00:04:76:99:fb:23
⊞ Internet Protocol, Src Addr: 192.168.0.224 (192.168.0.224), Dst Addr: 192.168.0.18 (192.168.0.18)
⊞ Transmission Control Protocol, Src Port: 1249 (1249), Dst Port: 2500 (2500), Seq: 29175, Ack: 1, Len: 0

0000  00 04 76 99 fb 23 00 60  95 00 65 29 08 00 45 00   ..v..#.` ..e)..E.
0010  00 28 07 39 00 00 f5 06  3c 54 c0 a8 00 e0 c0 a8   .(.9.... <T......
0020  00 12 04 e1 09 c4 00 00  71 f7 00 00 00 01 50 02   ........ q.....P.
0030  05 b4 a7 4e 00 00 00 00  67 67 67 67 67 40 67 67   ...N.... ggggg@gg
```

Figure 1 Ethereal freeware packet sniffer