Setting Up and Using the
JK Micro Flashlite 386Ex Board
For Embedded TCP/IP Applications

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For Partial Fulfillment of the Requirements for
ENT 692 Embedded TCP/IP

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General notes on the Flashlite 386EX Board

The Flashlite 386EX board should run with no modifications or software loaded since the operating system (X-Dos) and support files are in a ROM Drive (A:). To interact with the board, you need to use a terminal program (such as Hyperterminal) and connect the Flashlite 386EX board to the terminal using the CONSOLE (J11) connector. The Com port settings for the terminal need to be set at 9600,n,8,1. For more information consult the Flashlite 386Ex User's Manual (Sec 2 of this manual) page 11. Note that there is an error in the User's Manual. It states that the Flashlite 386Ex "uses hardware handshaking". According the Errata, the Flashlite 386Ex uses neither software flow control or hardware handshaking.

Since the Flashlite 386Ex boots to A: (the Rom Drive), the AUTOEXEC.BAT file cannot be modified. To get around this problem, the AUTOEXEC.BAT file has a line to run a file called STARTUP.BAT that is found on B: (the Flash Drive).

If the Flashlite 386EX board crashes on startup, the problem usually lies in the STARTUP.BAT file. To abort the startup sequence so that the STARTUP.BAT file can be edited, hold down CNTR - C on the terminal while the board is being powered up. This will bypass the STARTUP.BAT file. For more information consult the Flashlite 386Ex User's Manual (Sec 2 of this manual) page 12-13.

To place programs onto the Flashlite 386EX board, you will need a terminal program with X-MODEM file transfer capabilities. One such program is HyperTerminal which is included with most WINDOWS systems (but is NOT installed automatically – consult Windows help for instructions on how to add this program). It should be noted that if you are using HyperTerminal, there are two different X-Modem Protocols for file transfer: 1K Xmodem and Xmodem. Use Xmodem for the transfers, 1K Xmodem does not work properly with the Flashlite 386Ex's UP utility.

With the Flashlite 386EX board connected to the dumb terminal, first go to the directory were you wish the program to be uploaded to. Then type *UP* you will then be asked to "Enter filename then upload file with X-Modem protocol …" (For more information consult page 20 of the Flashlite 386Ex User's Manual in section 2). Then go to the file transfer menu of the terminal program you are using and send the file you wish to place on the board.

The following instructions assume that EDIT.COM is placed on B: This program allows editing of text files on the Flashlite 386Ex board and can be found on the installation CD at .. \V-25Utilities\edit

DiskOnChip

Because of the limited room on the Flashlite 386EX's Flash Drive (512K Bytes), a Disk on a chip can be added in socket U6 to add additional storage space. For more information see DiskOnChip Documentation.

The DiskOnChip currently installed (Millennium MD2800-D08) has the capacity of 8Mb. Other than plugging in the IC in the proper location (U6) and in the proper orientation, no further setup is needed although utilities and drivers for other operating systems are available from M-Systems website at http://www.m-sys.com.

Some documentation and utilities for DiskOnChip can be found on the CD in the ..\DiskOnChip directory.

Installing the Ethernet/Serial/Parallel Board

To install the Ethernet/Serial/Parallel Board Connect a ribbon cable must from J9 on the 386Ex board to J1 on the Multi I/O Board and a second ribbon cable must connect J13 on the 386Ex to J2 on the Multi I/O Board. (See Users Manual for the Ethernet/Serial/Parallel board (Section 3 of this report), but note that in the Installation section the line that reads "Connect J1 on the Flashlite386 to J1 on the expansion…." Should be "Connect **J9** on the Flashlite386 to J1 on the expansion…").

Installing the Ethernet Packet Driver Software

To make use of the Ethernet controller, packet driver software must be placed on the Flashlite 386Ex's B: drive and run the STARTUP.BAT file. The full process is described in the Users Manual for the Ethernet/Serial/Parallel board, but to summarize:

1. Upload the Flashpkt.COM file that can be found in the following CD Rom directory
    ..\Ethernet\flashpkt
2. Create or edit the existing B:STARTUP.BAT to include the line
    FLASHPKT 0x60
    This line can be easily added by using the EDIT utility (consult the Flashlite 386Ex User's Manual page 20 for instruction on using the EDIT utility).

Configuring the Network (creating a WATTCP.CFG file)

If the network you are connecting to has a BOOTP server, Programs using WATTCP will automatically be configured by the server.

If BOOTP is not available (as is the case here at USM), you must create a WATTCP.CFG file on the B: Drive that includes network information. For more details on this consult the WATTCP README File (Section 9) and the WebTCP User Manual (Section 5).

For the Web Server and Telnet Link Server to work, you need a minimum WATTCP.CFG file that consists of two lines as follows:

> my_ip = xxx.xxx.xxx.xxx
> netmask = yyy.yyy.yyy.yyy

With the packet driver install and the WATTCP.CFG file available, all the programs written using the WATTCP library (see Installation of the WATTCP Library for Borland C/C++ below) are now able to run.

Common Error Messages While Using WATTCP Enabled Programs

No Packet Driver Found	Packet Driver was installed improperly in STARTUP.BAT or the Address/IRQ were improperly defined See Users Manual for the Ethernet/Serial/Parallel board for more information.
WATTCP.CFG not found	WATTCP.CFG file was not found **OR** the WATTCP.CFG file is not in the same directory as the WATTCP enabled program you are trying to run. If WATTCP.CFG does not exist, refer to WATTCP README File for information on its creation. If WATTCP.CFG does exist on another drive, just copy it to the drive were the program is located. Since this file is text, putting the location of the file in the PATH will **NOT** correct the problem, only copying the file will fix the error.
BOOTP Failed	When the WATTCP.CFG file is not found, WATTCP will try to request an IP address and Netmask from the BOOTP server. This Error occurs if the BOOTP server fails to respond (at USM, BOOTP is not used and therefor you will always get this error after receiving a "WATTCP.CFG not found" error.

Setup instruction for using Flashlite 386EX board as a Simple Web Server

To use the Flashlite 386Ex as a Web server do the following:
1. Upload WEBTCP.EXE that can be found on the CD at ..\Ethernet\webtcp
2. Create a directory call \WWW and place your web pages (and other web page related files) in that directory. Sample files on the CD in the ..\Ethernet\html directory.
3. Add the line:

   WEBTCP –v

   to the end of the STARTUP.BAT file found at B:\ of the Flashlite 386Ex board.
4. Restart the Flashlite 386Ex board
5. When the Flashlite 386Ex board comes back up, DO NOT HIT ANY Key. Go to a computer on the same network and, using a browser, call up the web page you put in your \WWW directory using the IP Address and file name (eg 131.95.116.58\index.htm)

If you have a DiskOnChip installed and wish to store your webpages there, you will need to add the following lines to the STARTUP.BAT File:

   Set pc =9000
   C:
   B:\Webtcp -v

All web related files will need to be stored in C:\www. If the SET PC=9000 line is left out, the web pages will not be able to be served (you will receive a 404 File not Found error).

The –V option (used above in WebTcp command lines) puts WebTcp into verbose mode. This will provide information about hits and diagnostic information onto the console connected to the Flashlite 386Ex board. This mode can be helpful for diagnosing problems but can be shut off by removing the –V from the example bat file lines above.

For more information see WebTCP User Manual (Section 5 in the manual).

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Advanced Web Page Services

The Flashlite 386Ex board comes with a number of utilities and features allowing for more advanced web features:

1. **DSF TSR** This program allows served files to be updated and to be changed dynamically via COM1 (RS-232). Refer to both the WebTCP User Manual and the DFS Manual (included in the back of section 5 in the manual). The files for this utility are contained on the CD ..\Ethernet\webtcp in the DFS.ZIP file.

2. **HDWR.SCR** This feature allows users to change the state of output ports via the web using the GET method of from input. For this to work the following line must be in the STARTUP.BAT file:

   SET HW=YES

   This is demonstrated by the HDWR.HTM demo web page found on the CD in ..\Ethernet\html directory. (see the WebTCP User Manual for further information).

3. **Server Parsed Files (.SHT)** This TSR service allows hardware parameters to be displayed using static web pages using special tags. There are two TSR examples included on the CD (both being in the PARSER.ZIP file in ..\Ethernet\webtcp directory) along with the C code for each. To see a demonstration of this, load the TSR_NS.EXE file to the Flashlight 386EX board along with the TEST.SHT file found in the the ..\Ethernet\html directory. Then run TSR_NS.EXE then run WEBTCP. For more information on this see WebTCP User Manual.

Setup instructions for using Flashlite 386EX board to serve as Telnet Server

First off it should be noted that the **TELNETD** program that comes with WATTCP **does NOT work** with the Flashlite 386Ex board. It was included with the WATTCP package as part of the licensing agreement.

That said, it is possible using Borland C/C++ 4.52 and WATTCP to create a program that will allow interaction with the Flashlite 386Ex board via a telnet session. This program will be discussed in the section entitled *TELTALK.C- A Telnet Data Link Programming Example Using WATTCP Library Functions* below.

Installation of Borland C/C++ 4.52

To install Borland C/C++ version 4.52 do the following:
1. Insert the JK Microsystems Flashlite 386EX CD into the drive
2. Since this CD does not autorun, Open Windows Explorer and browse to the CD drive and double click on SETUP
3. Follow on screen instructions with the following
   - Do a full installation
   - Do not change the default directory (this documentation assumes that \BC45 is the root directory for Boarland C/C++)
4. There is a chance you will get the following error at DISK 24 when installing:
   BWCC32.PAK - The file you are trying to open is already in use by another program. Quit the other program, then try again.

If this occurs on a Windows 98 machine, cancel out of the install process and go to START | RUN | MSCONFIG and in the General Tab choose SELECTIVE STARTUP and then uncheck LOAD STARTUP GROUP ITEMS and reboot your machine and try again. Don't forget to undo these settings after the install is successful.

If this occurs on a Windows 95 machine, cancel out of the install process and restart windows in safe mode and try to install the program again.

For other installation problems and possible solutions, refer to Section 6 in this manual or the Installation FAQ in the part entitled *BORLAND C++ 4.5 and Turbo C++ for Windows*.

Installation of WATTCP libraries for use with Borland C/C++

To allow the creation of Ethernet capable programs, WATTCP libraries have to be made available to Borland C/C++. These libraries were somehow excluded from the zip file (wat9609.zip) that came with the Flashlite 386EX board. Searching the Internet, the full version of WATTCP was located at http://www.wattcp.com/, this has been included on the CD included with this manual.

To install the libraries:
1. Insert the JK Microsystems Flashlite 386EX CD into the drive
2. Open Windows Explorer and browse to the CD drive. Double click on the WATTCP directory.
3. Select all the directories, and drag and drop them into the \BC45 directory on C:
4. At this point you will get a warning:
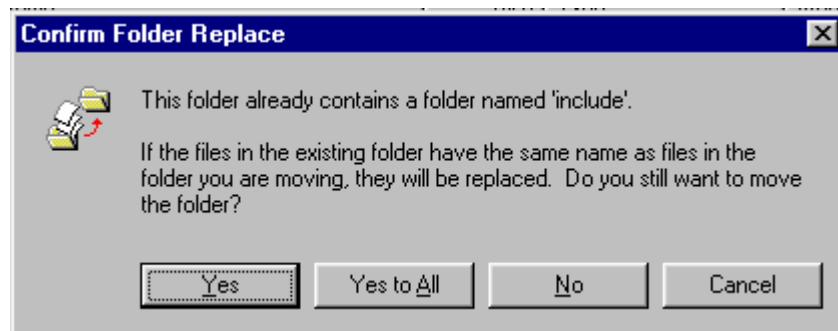
Just click on YES. You will get a other windows with similar messages (just the folder name will change) answer YES to these as well. WATTCP will NOT overwrite any existing Borland C/C++ files but just add its files to these folders. Once copying is completed, Borland C/C++ is now ready to compile programs capable of Ethernet communications.

Further information on the WATTCP Network Programming Library can be found in the manual in Section 10.

Getting Started with Borland C/C++ 4.52 Programming

Most of the information needed to start programming are included in the GETTING Started with the Borland IDE document on the CD and in the manual in section 7. This document is fairly complete so this topic will not be covered in detail here.

Some items, however do need to be added:

1. When entering the project information (as shown in the first page of the GETTING Started with the Borland IDE), Target Method should be set to Small, Large or Huge. Other sizes (such as TINY) will not compile when using WATTCP LIBRARIES.

2. To use the WATTCP libraries, they must be added to the project. The steps are shown on the last page of the GETTING Started with the Borland IDE document. As stated in the document, you need to add the node to the executable in the project window. The libraries for WATTCP can be found in the ..\BC45\LIB directory and are called WATTCPSM.LIB, WATTCPLG.LIB and WATTCPHG.LIB. The library added **MUST** match the size of the TARGET METHOD selected in step 1 above (eg if SMALL is selected for the Target Method, WATTCPSM.LIB should be used)..

For programming examples showing how to use various ports and board options see Flashlite C Programming. For port address information, see Flashlite 386Ex User's Manual pages 13-16.

There many examples of WATTCP enabled code to be found on the CD at ..\WATTCP\APPS. For full documentation, refer to Section 10 in the manual containing this report (The WATTCP NETWORK PROGRAMMING LIBRARY documentation).

For programming info concerning the Multi-I/O Board see the Multi-I/O Users Manual and files contained within DRIVERS.ZIP found on the CD in the ..\MULTI-IO\ directory.

TELTALK.C - A Telnet Data Link Programming Example Using WATTCP Library Functions

TELTALK is loosely based on the program TTALK.C that can be found in tcp.zip on the CD in the ..\Ethernet\tcp_ex directory. Using this program as I guide, TELTALK.C was developed to act as a TELNET server or server for a data link program that can be interfaced via any number of languages including Visual Basic.

For demonstration purposes, TELTALK randomly sets an array of ten numbers. These numbers can be transmitted or changed via the client computer (Via Telnet or Data Link Program).

For this test program, TELTALK accepts 4 commands:

1. **GET_ARRAY #** - TELTALK sends the #'th value in the array. This demonstrates that ANY value in used in a C Program can be transmitted on command.

2. **PUT_ARRAY #,y** - Change the value in array location # to the value of y. This demonstrates that a value sent over the Ethernet connection can be used by the program.

3. **GET_PORT_A** – Transmit the current value of hardware PORT A (set for input) over the Ethernet connection.

4. **DEBUG** – This command toggles debug mode which sends data to the CONSOLE (COM1) for debugging purposes. If left on, this mode causes the data communications over the Ethernet connection to be significantly slower, so this mode should only be used for debugging and testing only.

For more information, read the remarks in the code (..\C-Programs\TelTalk.C) and refer to the Wattcp Network Programming Library Documentation in Section 10 of this report