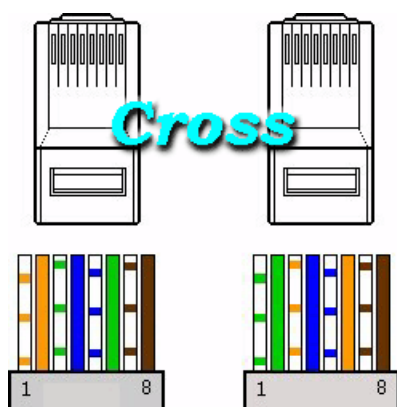


## Example of Development Program Web Server Control of ET-dsPIC33WEB V1.0

### Hardware Requirements

#### The necessary equipments

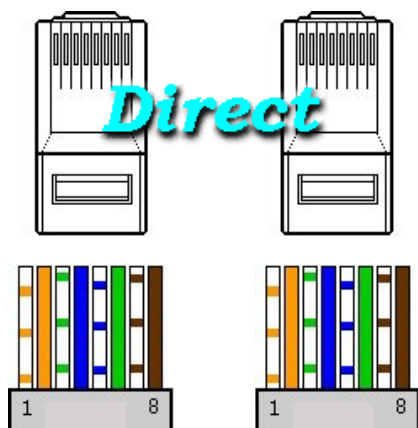
- Board Microcontroller ET-dsPIC33WEB V1.0
- Module ET-MINI ENC28J60
- At least 13 Cables to connect circuit
- Character LCD 16x2
- Module EEPROM 25LC256
- PIC/dsPIC Programmer version ET-PGMPIC USB or other versions with USB Cable
- Power Supply for Board ET-dsPIC33WEB V1.0 (7-12V/850mA)
- Computer that has Ethernet LAN Port
- Cable of LAN System; in this case, there are 2 cases as follows;
  - The first case: It connects with computer directly and LAN Cable must be Cross Interface.



10BaseT cross-cable diagram

RJ-45 plug		RJ-45 jack
TD+ 1		1 TD+
TD- 2		2 TD-
RD+ 3		3 RD+
n/c 4		4 n/c
n/c 5		5 n/c
RD- 6		6 RD-
n/c 7		7 n/c
n/c 8		8 n/c

- The second case: It connects through HUB of computer Server; in this case, it must be Direct Interface.



10BaseT cross-cable diagram

RJ-45 plug		RJ-45 jack
TD+ 1		1 TD+
TD- 2		2 TD-
RD+ 3		3 RD+
n/c 4		4 n/c
n/c 5		5 n/c
RD- 6		6 RD-
n/c 7		7 n/c
n/c 8		8 n/c

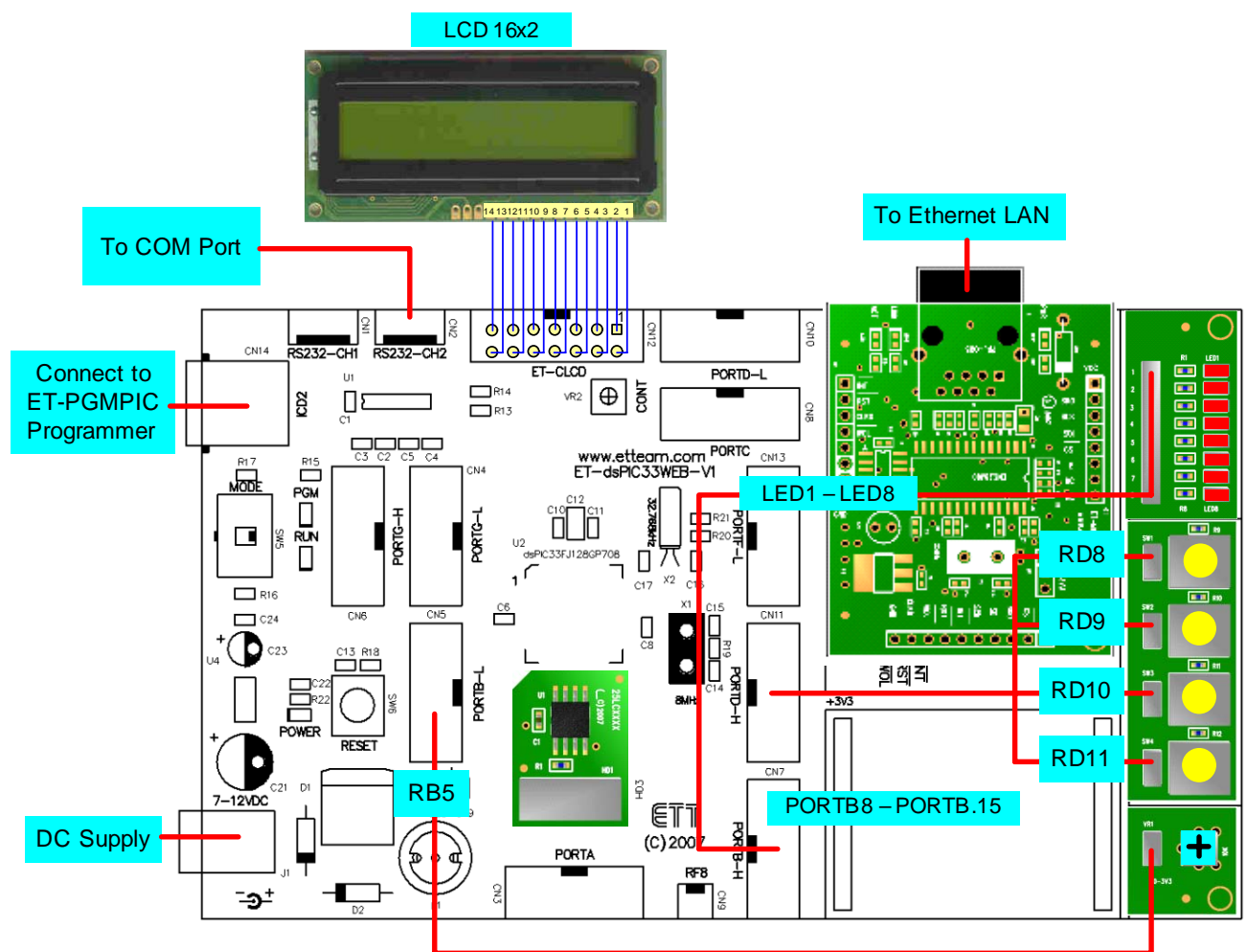
## Software Requirements

- Install Program MPLAB IDE v7.61 (the lastly version, July 2007)
- Program Compiler C30 version 3.01 Student Edition
- Program TCP/IP Stack 4.02 (the lastly version, July 2007)
- Program to receive-transmit RS232 Serial data such as ProComm or HyperTerminal of Windows
- Program Internet Explorer or Program opens general Webpage

*\*\*\*User must install these programs completely.*

## Procedure to test

1. Interface Circuit completely as shown in the picture below.



Picture displays the connection of signals to test.

## Signal Connection

Example Code Program that is Web Server Control is provided by ETT to be a guideline and example to apply, test operation, modify and develop as desired. This example Code is developed from example code of Microchips and ETT takes Source Code of TCP/IP Stack V4.02 from Microchips to modify and correspond with I/O devices of Board ET-dsPIC33WEB V1.0 that is only updated and modified Code, especially a part of Webpage and HTML in the part of Process I/O Function. For further detail of functions that are TCP/IP Stack will be refer to the original of Microchips, so user can learn and study further details related to application of TCP/IP Stack functions from the provided documents by Microchips and we do not mention about it.

The provided example by ETT is the application of a small Web Server Control; in this case, it shows the method to send/transmit command through Webpage to control operation of I/O devices on Board ET-dsPIC33WEB V1.0 such as Digital Output (LED), Digital Input (SW), Analog Input (ADC) and LCD Display. The method to test operation follows the example program is to interface signal I/O of MCU with I/O circuits as shown below.

- **Ethernet Module:** It connects with Ethernet LAN and use Module ET-MINI ENC28J60 that can transmit/receive data with maximum speed 10MB. For function of the connection uses signal SPI1 of MCU as described below;
  - **RF6** is used to be **SCK** to connect with Ethernet Module (ET-MINI ENC28J60).
  - **RF7** is used to be **SDI** to connect with Ethernet Module (ET-MINI ENC28J60).
  - **RF8** is used to be **SD0** to connect with Ethernet Module (ET-MINI ENC28J60).
  - **RD14** is used to be **CS** to connect with Ethernet Module (ET-MINI ENC28J60).
  - **RA12** is used to be **INT1** to connect with Ethernet Module (ET-MINI ENC28J60); in this example, it is not used, so user must set Jumper **INT** (EN/DS) to **DS** position (Disable: Not use).
  - **RA13** is used to be **WOL** to connect with Ethernet Module (ET-MINI ENC28J60); in this example, it is not used, so user must set Jumper **WOL** (EN/DS) to **DS** position (Disable: Not use).
  - **RD15** is used to be **RST** to connect with Ethernet Module (ET-MINI ENC28J60); in this example, it

is not used, so user must set Jumper **RST** (EN/DS) to **DS** position (Disable: Not use).

- **SPI Memory Module:** It stores Webpage File and CGI Scrip and uses Module 25LC256. For function of the connection uses signal SPI2 of MCU as described below;
  - **RG6** is used to be **SCK** to connect with SPI Memory.
  - **RG7** is used to be **SDI** to connect with SPI Memory.
  - **RG8** is used to be **SD0** to connect with SPI Memory.
  - **RD12** is used to be **CS** to connect with SPI Memory.
- **I/O Control Signal:** It controls operation and receive Input value to display result on Webpage; in this case, there are 4 groups as follows;
  - 8 Bit Digital Output by using LED to display operation status
  - 4 Bit Digital Input by using Push-Button Switch to be Input
  - 1 Channel Analog Input 12 Bit by using adjustable Resistor to be Input
  - Character Display LCD 16x2 to display messages

dsPIC33FJ128GP708	LED
RB8	LED1
RB9	LED2
RB10	LED3
RB11	LED4
RB12	LED5
RB13	LED6
RB14	LED7
RB15	LED8

dsPIC33FJ128GP708	SW
RD8	SW1
RD9	SW2
RD10	SW3
RD11	SW4

dsPIC33FJ128GP708	VR1 (0-3V3)
RB5	VR1

dsPIC33FJ128GP708	LCD
RD0	D4
RD1	D5
RD2	D6
RD3	D7
RD4	RS
RD5	RW
RD6	EN

## Set Configuration into Board ET-dsPIC33WEB V1.0

Normally, Configuration values of Board have already set completely in the part of Source Code such as IP Address, DHCP Name or other values. Example that is provided by ETT is set the Configuration values follow the Default values internal Code as follows;

- **Device IP Address is 192.168.1.200**
- **Gateway IP Address is 192.168.1.255**
- **Subnet mask is 255.255.255.0**
- **DNS Server IP Address is 192.168.1.255**
- **DCHP Protocol = Enable, DHCP name = dspic33web**

However, user can modify Configuration values by self without going to modify values at Source Code; in this case, it will do through Channel 2 RS232 Serial Port Communication (RS232-CH2) by using Program Serial Terminals such as ProComm or HyperTerminal and then use the following conditions to connect;

Baudrate = 19200BPS, Data Bit = 8 Bit, Parity Bit = None, Stop Bit = 1 Bit, Flow Control = None

After user has already opened Program HyperTerminal, set the connection, and interfaced Cable from RS232-CH2 of Board ET-dsPIC33WEB V1.0 with Compact PC completely, user must press Switch SW1 that is connected with Port-RB8 for a while and

then press Switch RESET of Board and remove it instantly but Switch SW1 remain pressing, Program Monitor will verify that SW1 is pressed in the beginning step of operation or not. If Switch is pressed for a while at least 4 seconds, it will enter Setup Configuration Mode of Board; on the other hand, it is not found, it will go to the next step to run as normal. If SW1 is pressed for a while at the beginning operation (after reset), it will send back message and menu command through Port RS232-CH2, so user can press key to select number follows the topics to modify Configuration values as desired as in the example below;

BUTTON0 held for more than 4 seconds. EEPROM contents erased.

Microchip TCP/IP Config Application (v4.02, Aug 22 2007)

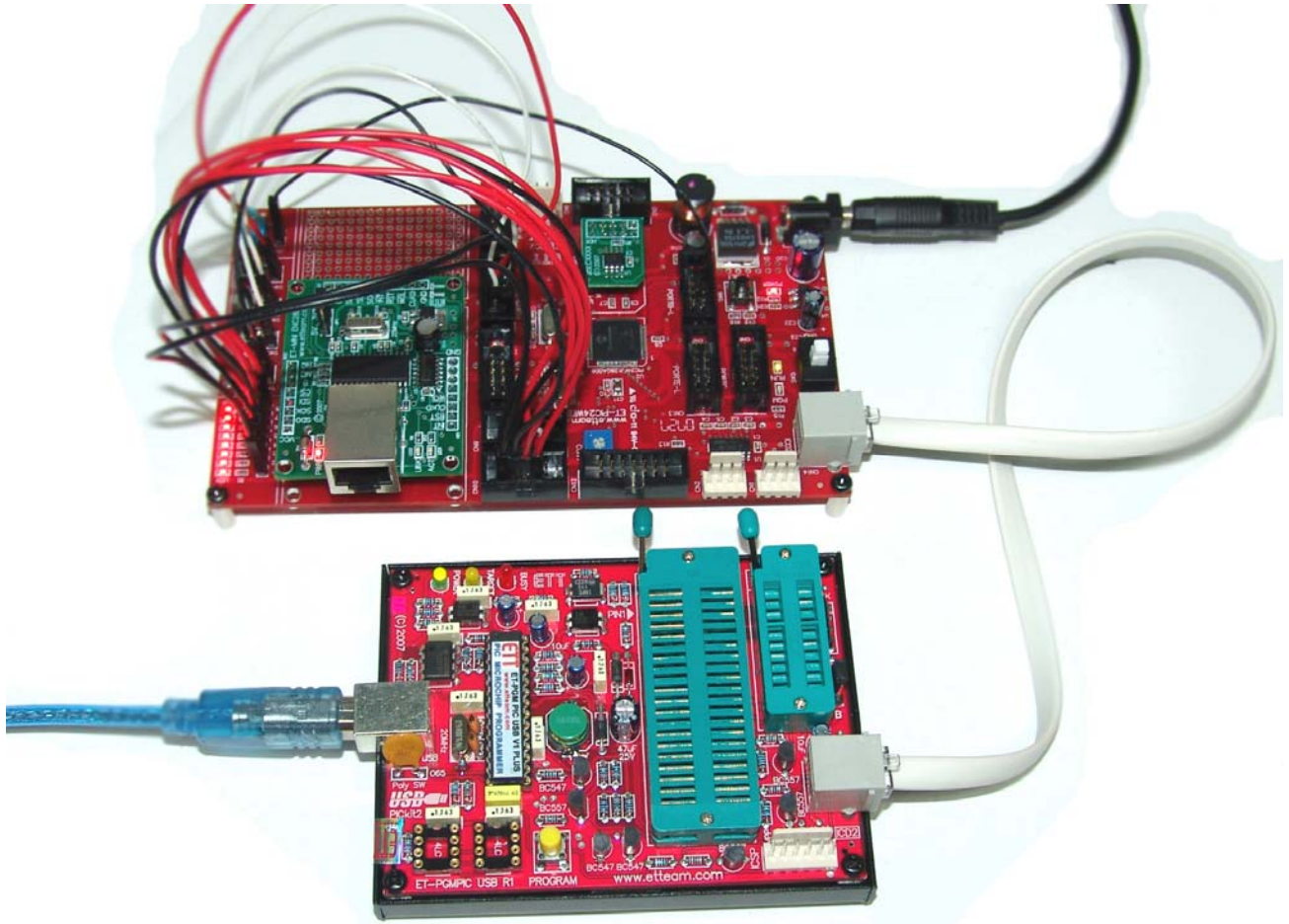
```
1: Change serial number:          0
2: Change host name:              DSPIC33WEB
3: Change static IP address:      192.168.1.200
4: Change static gateway address: 192.168.1.255
5: Change static subnet mask:     255.255.255.0
6: Change static primary DNS server: 192.168.1.255
7: Change static secondary DNS server: 192.168.1.255
8: Disable DHCP & IP Gleaning:    DHCP is currently enabled
9: Download MPFS image.
0: Save & Quit.
```

Enter a menu choice:



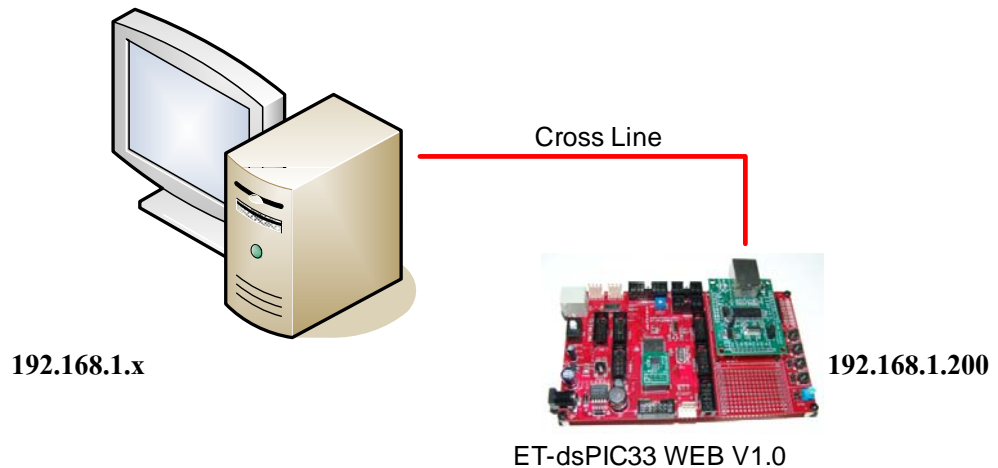
## Procedure to test Web Server Control

1. Install Module and connect signals with I/O devices completely as shown in the example below.

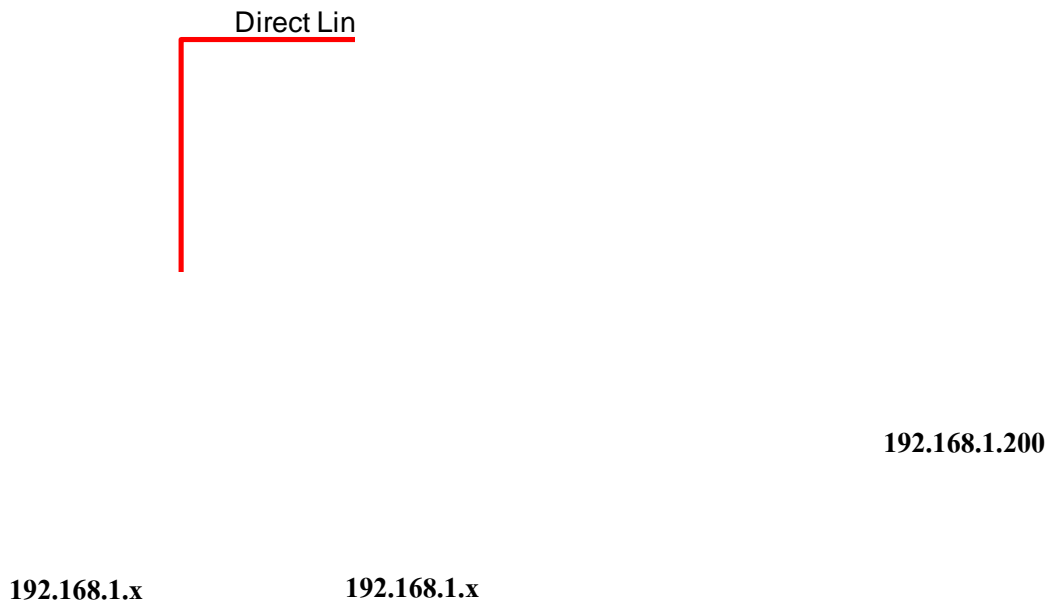


Picture shows example of Hardware connection.

2. Interface Cable LAN between Board and LAN Network; if interfacing signal through HUB, cable must be Direct Interface; and if interfacing with LAN Card of computer, cable must be Cross Interface as shown in the picture below.



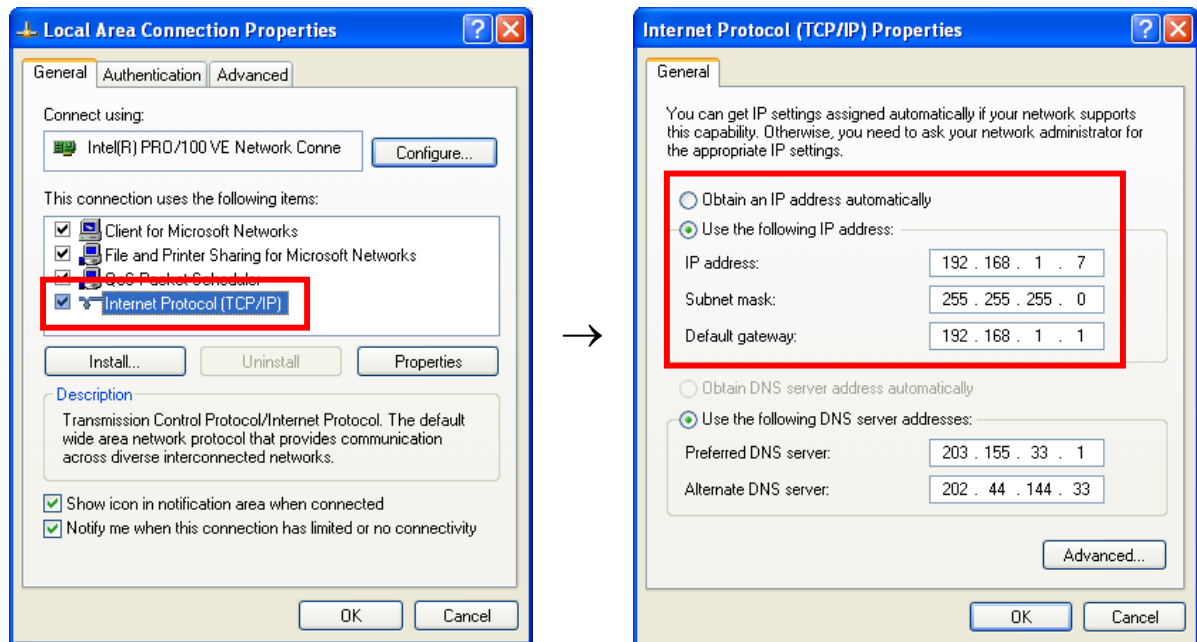
Picture shows the connection between ET-dsPIC33WEB and LAN Card of computer and using Cable as Cross Interface.



Picture shows the connection between ET-dsPIC33WEB and HUB of LAN System and using Cable as Direct Interface.

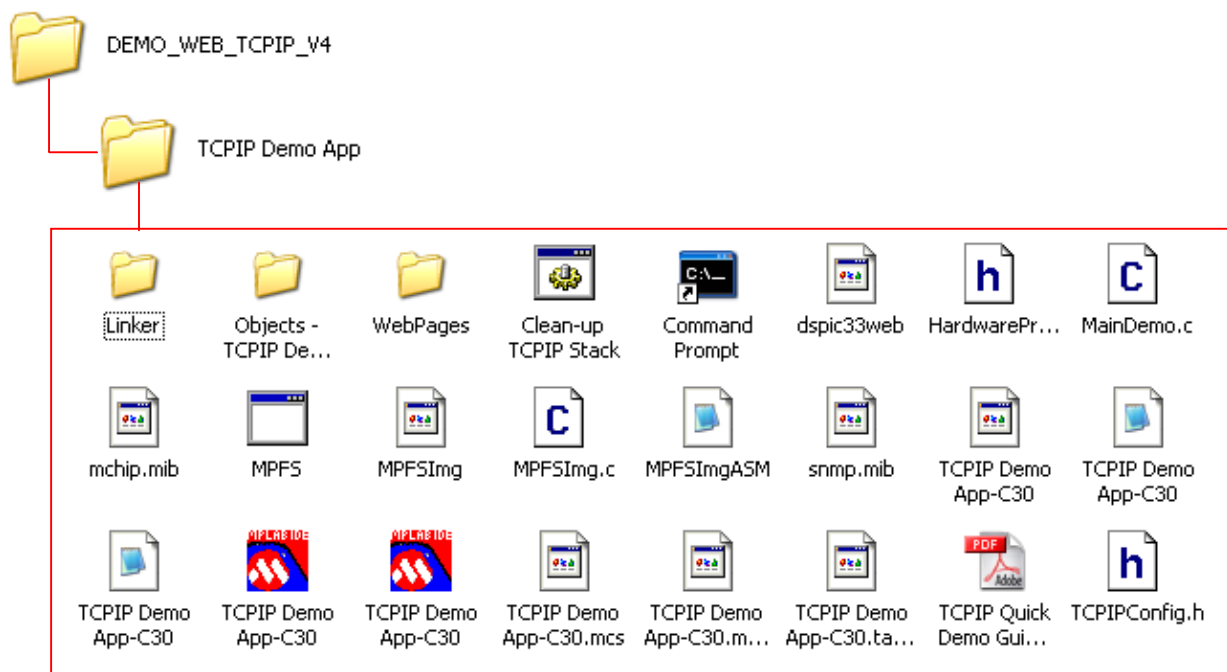
2. Download Code that is in "**\\DEMO\_WEB\_TCPIP\_V4\\TCPIP Demo App\\TCPIP Demo App.HEX**" into Board; in this case, user can learn and study the procedure to download Code from the topic "**Download Code into Board**" in the part of manual.
3. Set **IP Address** of computer and makes **Subnet mask:** and **IP address** to be the same class as Board ET-dsPIC33WEB V1.0. In this example, **IP** of Board is **192.168.1.200**; so user must set **IP Address** of computer to be **192.168.1.xxx** (xxx = 0 to 255 but it is unlike 200 that is IP of board); and then set **Subnet mask:** to be **255.255.255.0** as shown in the picture below.





Picture displays example of setting IP Address of computer.

4. Open **Program Command Prompt** that is in the Folder **"...\DEMO\_WEB\_TCPIP\_V4\TCPIP Demo App"**.



When double click ICON, it will display window of **Command Prompt** as follows;

```
C:\...\ DEMO_WEB_TCPIP_V4\TCPIP Demo App>
```

5. Test the connection by using **Ping** to the IP number of board; in this example, it is **192.168.1.200**. User must type command **ping 192.168.1.200** and then **enter** as shown in the picture below.

```
C:\...\ DEMO_WEB_TCPIP_V4\TCPIP Demo App>ping 192.168.1.200
```

Result of Ping if the connection is complete, it will display following message as in the example below;

```
C:\...\DEMO_WEB_TCPIP_V4\TCPIP Demo App>ping 192.168.1.200
```

```
Pinging 192.168.1.200 with 32 bytes of data:
```

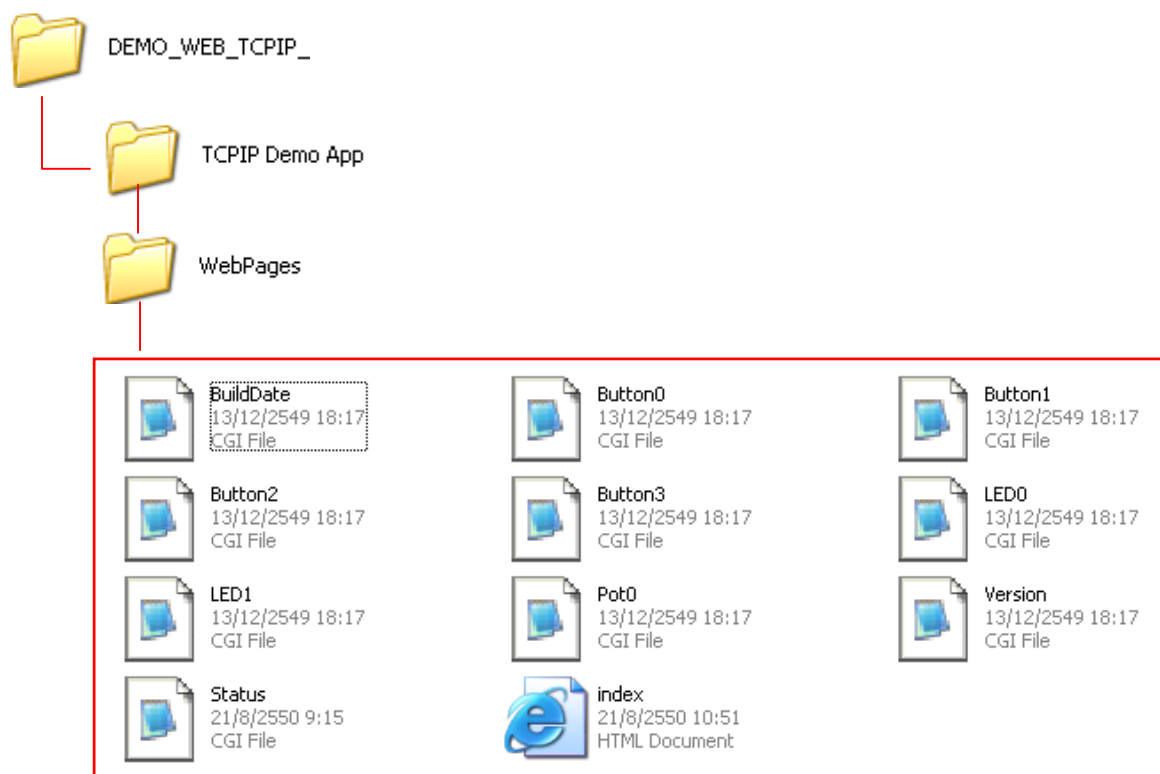
```
Reply from 192.168.1.200: bytes=32 time<1ms TTL=100  
Reply from 192.168.1.200: bytes=32 time<1ms TTL=100  
Reply from 192.168.1.200: bytes=32 time<1ms TTL=100  
Reply from 192.168.1.200: bytes=32 time<1ms TTL=100
```

```
Ping statistics for 192.168.1.200:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

## Compile Webpage

User can modify new details of Webpage by entering Folder **"...\Examples\DEMO\_WEB\_TCPIP\_V4\TCPIP Demo App\Webpages"** and using any Program Notepad or Text Editor to modify those codes.



Filename that is Webpage will be **index.html** and the next 10 files left will be CGI Scrip to receive/transmit data between Webpage and Board ET-dsPIC33WEB V1.0. After user has already modified the desired codes completely, user must compile the new code again to be Binary (.bin) file to download this file to store in SPI Memory Module (25LC256) on board. Microchips provide file "MPFS.EXE" that is device to accommodate user to develop program in this part. This file is a program that runs as Command Line type to convert files internal Folder to be Binary File. The procedure to compile Webpage File is described below;

- Open window **Command Prompt**, click **Shortcut** of **Command Prompt** that is provided in Folder **"...\ET-dsPIC33WEB\Examples\DEMO\_WEB\_TCPIP\_V4\TCPIP Demo App"**.
- Type command **MPFS Input Output**

- o **Input:** It means that Folder name that is used to store all desired files to convert into Binary File; in this case, Folder name is "Webpages".
- o **Output:** It means that Output Filename that is converted and its surname is specified to be bin; in this case, Output Filename is specified to be "dspic33web.bin".

```
C:\...\TCPIP Demo App>mpfs Webpages dspic33web.bin
Adding 'Webpages\BUILDDATE.CGI'...
MPFS Size so far 247...
Adding 'Webpages\BUTTON0.CGI'...
MPFS Size so far 254...
Adding 'Webpages\BUTTON1.CGI'...
MPFS Size so far 261...
Adding 'Webpages\BUTTON2.CGI'...
MPFS Size so far 268...
Adding 'Webpages\BUTTON3.CGI'...
MPFS Size so far 275...
Adding 'Webpages\INDEX.HTML'...
MPFS Size so far 7056...
Adding 'Webpages\LED0.CGI'...
MPFS Size so far 7063...
Adding 'Webpages\LED1.CGI'...
MPFS Size so far 7070...
Adding 'Webpages\POT0.CGI'...
MPFS Size so far 7077...
Adding 'Webpages\STATUS.CGI'...
MPFS Size so far 7387...
Adding 'Webpages\VERSION.CGI'...
MPFS Size so far 7394...
```

**Picture displays result of compiling Webpage File.**

File "**dspic33web.bin**" that is created in the same folder as Program MPFS; in this case, it will be in "**...\ET-dSPIC33WEB\Examples\DEMO\_WEB\_TCPIP\_V4\TCPIP Demo App**" as in the example below;



- Open **Program Internet Explorer** and type **IP Address** number of Board; in this case, it is **192.168.1.200** or **DHCP** name of board that is "**dspic33web**" in the blank of **Address** and then **Enter** to test.

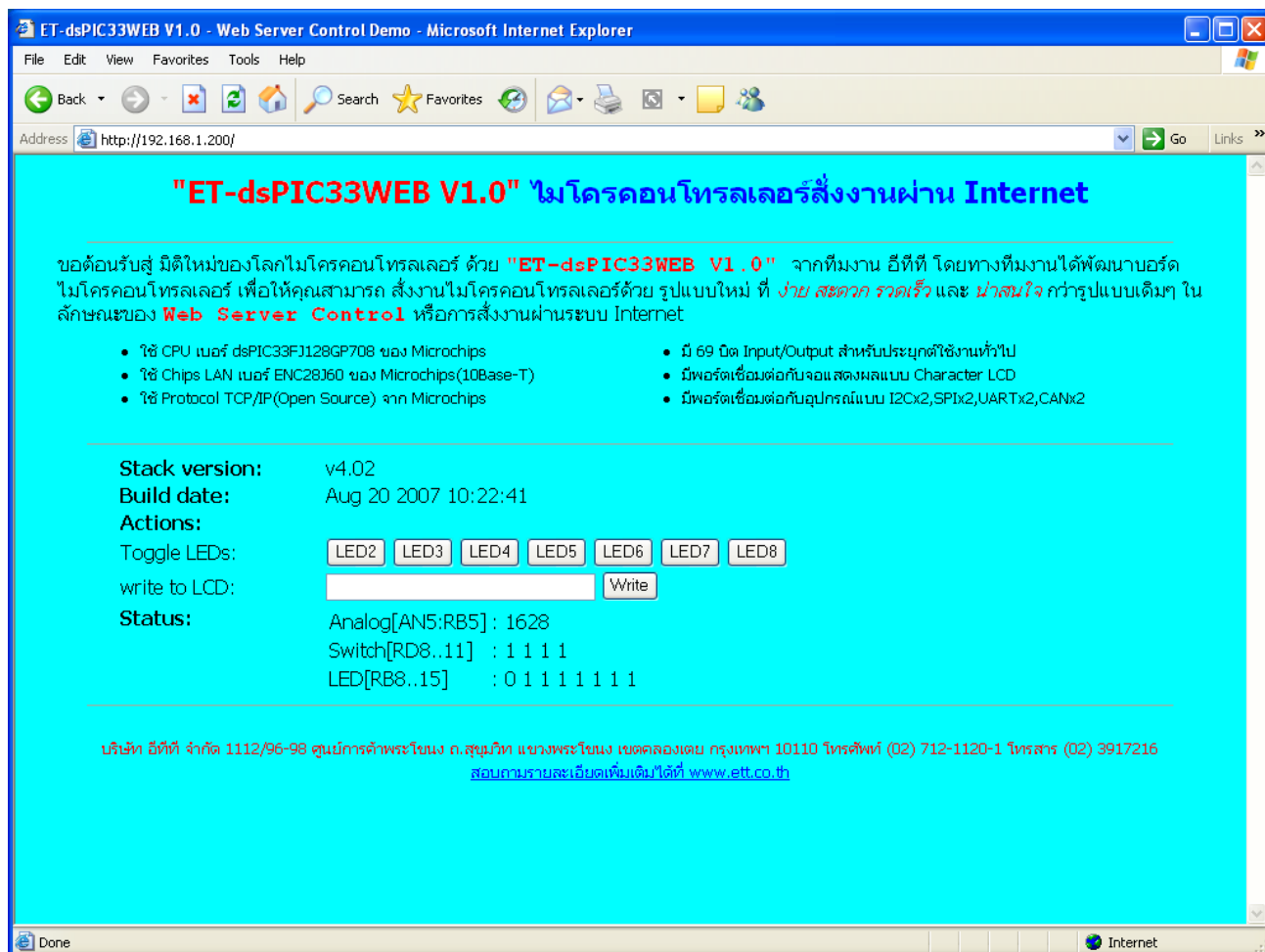
```
\...\Examples\DEMO_WEB_TCPIP_V4\TCPIP Demo App>ftp 192.168.1.200
Connected to 192.168.1.200.
220 Ready
User (192.168.1.200:(none)): ftp
331 Password required
Password:ett
230 Logged in
ftp> put dspic33web.bin
200 Ok
150 Transferring data...
#####
226 Transfer Complete
ftp: 7595 bytes sent in 0.00Seconds 7595000.00Kbytes/sec.
ftp> quit
221 Bye
```

Picture displays example of using Command FTP to download File **dspic33web.bin** into Board.

**NOTE:** Password that is used in command does not echo to user; in this case, user must type all 3 order (ett) correctly otherwise user can not login. If user type incorrect password and can not login, user must use command **quit** and start the new process again.

## Test Operation of Web Server Control

After user has already downloaded code into Board and downloaded Webpage Files into board completely, user can test operation of example program of Web Server Control instantly. First, open **Program Internet Explorer** and type **IP number** of board into the blank of **Address**; in this example, it is **192.168.1.200** and it will display window Webpage as shown in the picture below.



Picture displays the feature of Web Server Control of ET-dsPIC33WEB V1.0.

From this example program, user can test transmitting command that controls the operation of I/O internal Board ET-dsPIC33WEB V1.0 from Webpage directly as follows;

- **Toggle LEDs:** User can test operation by click **Button LED2-LED8**, when user clicks mouse in each time, it makes LED convert status to the opposite side that is alternating on and off.
- **Write to LCD:** User can type the desired message not longer than 32 characters and click **"Write"** to transmit the message to display on LCD Display on Board.
- **Status:** There are 3 parts to display result as follows;
  - **Analog[AN5:RB5]:** It displays results from the converted signal Analog to Digital at Pin RB5 that is connected with VR 10K on board. When



user adjusts VR1, it makes status of A/D change follows the adjustment that is in the range of 0..4095.

- **Switch[RD8..11]:** It displays status of pressing Switch SW1-SW4 on board. When Switch is pressed, its status will be "0" but if Switch is not pressed, its status will be "1".
- **LED[RB8..15]:** It displays status of Port RB8..15 that is connected with LED on board. Values will be changed follows the clicking Button LED2..LED8. If value is "1", it makes LED off but if value is "0", it makes LED on. LED1 can not be controlled by button because LED1 is reserved to display operation of TCP/IP that will be alternated on and off all the time.

## Development and Update Code Program

All Codes in this project is a part of all standard Protocol TCP/IP that is developed by Microchips, it makes user can use functions in those files instantly without modifying any code that is in a part of Protocol TCP/IP. The necessary Code that must be modified is a part of Application Layer of TCP/IP Stack only but files that are a part of Application in this Project will be separately stored in Folder name **"..\DEMO\_WEB\_TCPIP\_V4\TCPIP Demo App"**.

- **HardwareProfile.h:** It is a part to set details of Signal I/O for connecting with external device. In this case, user must set it corresponding with Hardware system of Board ET-dsPIC33WEB V1.0 such as Ethernet Driver (ET-MINI ENC28J60), SPI Memory Module (25LC256), LCD, LED, SW, and ADC.
- **TCPIPConfig.h:** It is a part to set Default values related to TCP/IP Stack such DHCP Name, IP Address of board, and MAC Address of board.
- **MainDemo.c:** It is a part of Main Program that calls TCP/IP Stack and then takes data from Stack to process and finally determine result. For example, compiling command from CGI Scrip and take Instruction Code to command LED Output and LED Display and including reading status of I/O to transmit to Refresh Status of Webpage.
- **Wabpage Files** such as HTML and CGI Scrip in Folder name **"Webpages"** is a part that can be modified by user but if user wants to modify value in CGI Scrip differently, user must modify Code in File

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"MainDemo.c" to be corresponding with the new modified value.