Micrel KS8841/2 16Bit Bus BSP User's Manual

Version 1.0

07/28/2006

Contents

1 Overview

The KS8841/2 BSP is developed under Renesas M16C/62P microprocessor[1] with Renesas HEW (High-performance Embedded Workshop) IDE.

The KS8841/2 BSP[2] contains the KS8841/2 driver and OpenTCP[3] protocol stack with no OS (Operating System) involved.

This manual is divided into two parts. The first part describes how to run KS8841/2 BSP with OpenTCP 1.0.4 on Micrel KS8841 and KS8842 demo board.

The second part describes how to install, and build KS8841/2 BSP by using the Renesas SKP16C62P StarterKit Plus (SKP).

→ *NOTE: KS8841/2 BSP works for Micrel KS8841 and KS8842 demo board.*

[1] Please reference the **M16C62_Hardware_Manual** from SKP CD for detail information about M16C/62P microprocessor via the website www.renesas.com..

[2] BSP is Board Support Package.

[3] OpenTCP® is a license and royalty free TCP/IP stack available to the public. It was created by Viola Systems in Finland (www.violasystems.com). The code is supported and distributed via the website www.opentcp.org.
Please reference the **OpenTCP_App_Note** manual for detail information about OpenTCP protocol stack.

2 CLI Commands

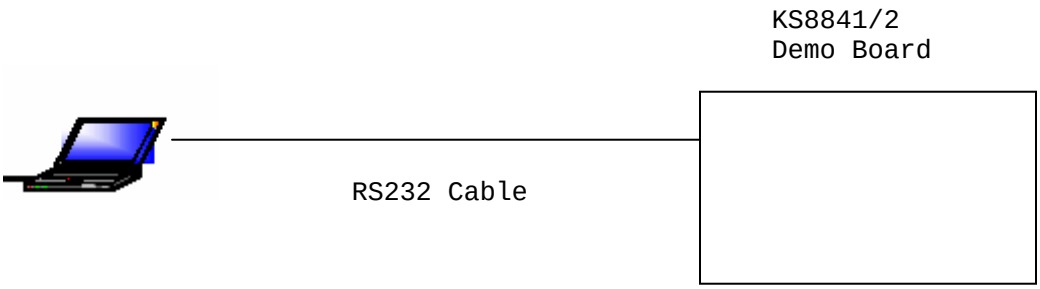
The KS8841/2 BSP provides a set of CLI commands to help user to debug KS8841/2 device through the RS-232 serial port from your host laptop.

2.1 Connecting a Serial Cable for the Terminal Emulator

Connect the serial port of the laptop and serial port of the KS8841/2 demo board via a RS-232 cable.

After completed of serial connection, set up the communications software. Any communication software for personal computer communications can be used (Hyper terminal, Windows terminal and etc.).

→ *NOTE: The HyperTerminal serial port setup is 38400 8-N-1.*



2.2 Running the KS8841/2 BSP

After power up the KS8841/2 demo board, The ks8841/2 BSP code is running at M16C/62P flash. The following BSP message is displayed on the host Hyper terminal screen as Figure 2-2-1 or Figure 2-2-2.

The BSP messages contain:

- Bus interface of KS8841 or KS8842 interface.
- OpenTCP Ethernet driver version.
- KS8842 or KS8841 hardware driver version.
- KS8841/2 Chip ID.
- KS8841/2 Device Revision.
- KS8842 or KS8841 base address that is mapped to the CPU memory space.
- MAC address of KS8841 or KS8842 station.
- IP address of KS8841 or KS8842 target.
- Port Link Status.

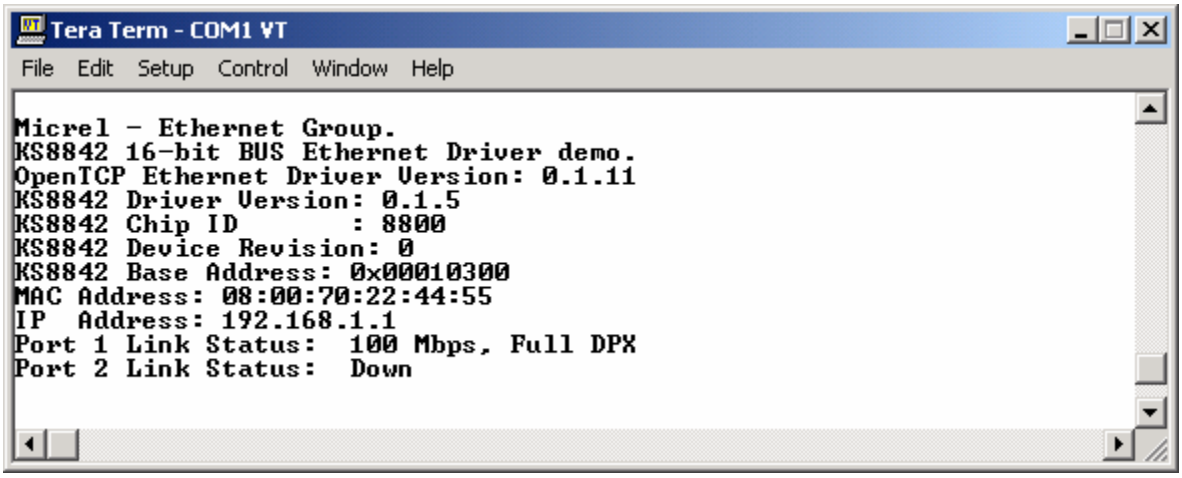


Figure 2-2-1 BSP message on KS8842 Demo Board

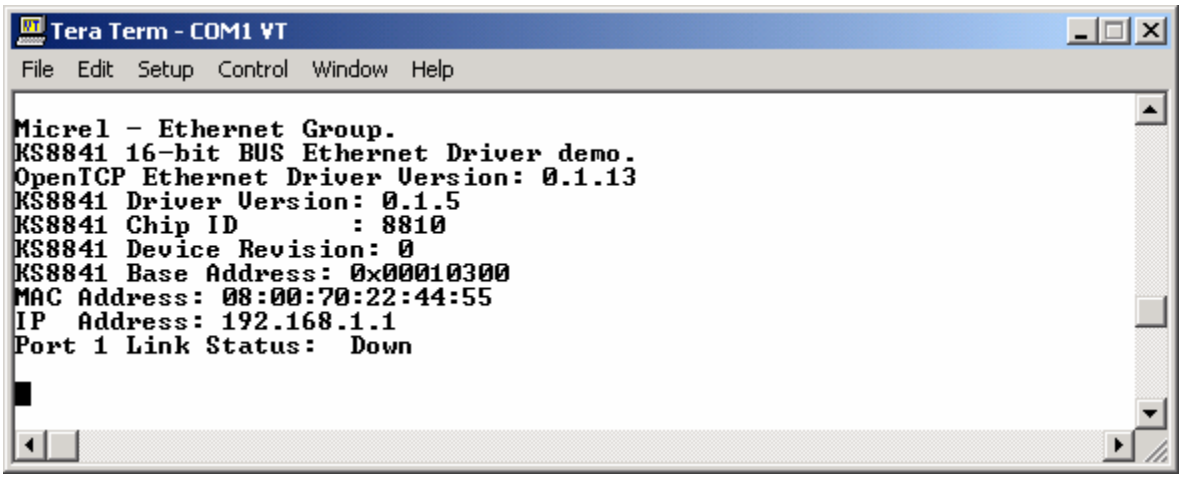


Figure 2-2-2 BSP message on KS8841 Demo Board

2.3 CLI Commands Descriptions

From CLI command prompt, type **hwhelp**, will display all the CLI commands that the BSP provides (Figure 2-3-1).

⇨ **hwhelp**

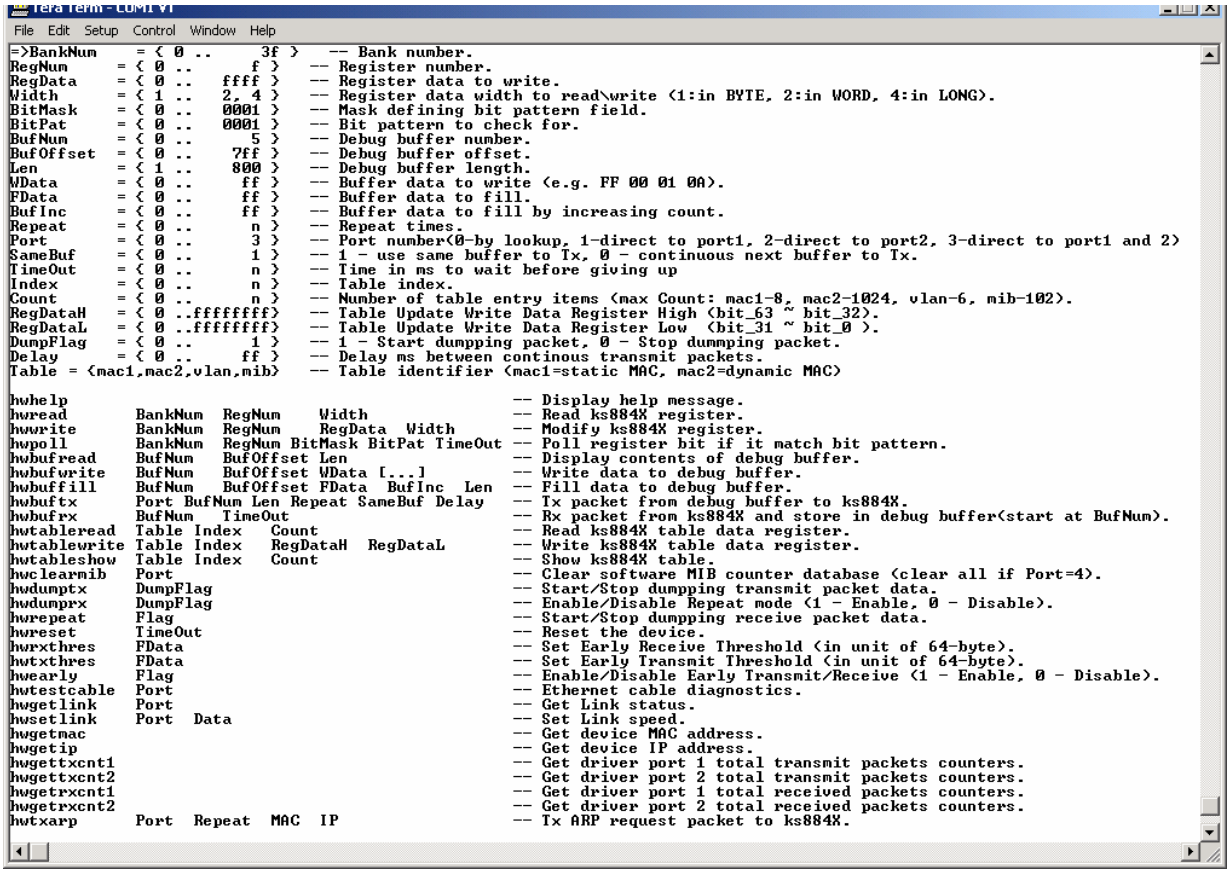


Figure 2-3-1 hwhelp display

The top of portions are CLI command input\output data format.

```
BankNum     = { 0 ..     3f }   -- Bank number.
RegNum      = { 0 ..      f }   -- Register number.
RegData     = { 0 ..   ffff }   -- Register data to write.
Width       = { 1 ..   2, 4 }   -- Register data width to read\write (1:in
                                   BYTE, 2:in WORD, 4:in LONG).
BitMask     = { 0 ..   0001 }   -- Mask defining bit pattern field.
BitPat      = { 0 ..   0001 }   -- Bit pattern to check for.
BufNum      = { 0 ..      5 }   -- Debug buffer number.
BufOffset   = { 0 ..    7ff }   -- Debug buffer offset.
Len         = { 1 ..    800 }   -- Debug buffer length.
WData       = { 0 ..     ff }   -- Buffer data to write (e.g. FF 00 01 0A).
FData       = { 0 ..     ff }   -- Buffer data to fill.
BufInc      = { 0 ..     ff }   -- Buffer data to fill by increasing count.
Repeat      = { 0 ..      n }   -- Repeat times.
Port        = { 0 ..      3 }   -- Port number(0-by lookup, 1-direct to
                                    port 1, 2-direct to port 2, 3-direct to
                                    port 1 and 2)
SameBuf     = { 0 ..      1 }   -- 1 - use same buffer to Tx, 0 - continuous
                                    next buffer to Tx.
TimeOut     = { 0 ..      n }   -- Time in ms to wait before giving up
Index       = { 0 ..      n }   -- Table index.
Count       = { 0 ..      n }   -- Number of table entry items (max Count:
                                    mac1-8, mac2-1024, vlan-6, mib-102).
RegDataH    = { 0 ..ffffffff}   -- Table Update Write Data Register High
                                   (bit_63 ~ bit_32).
RegDataL    = { 0 ..ffffffff}   -- Table Update Write Data Register Low
                                  (bit_31 ~ bit_0 ).
DumpFlag    = { 0 ..      1 }   -- 1 - Start dumpping packet, 0 - Stop
                                   dummping packet.
Delay       = { 0 ..     ff }   -- Delay ms between continous transmit
                                    packets.
Table = {mac1,mac2,vlan,mib}    -- Table identifier (mac1=static MAC, mac2=dynamic
                                    MAC)
```

The bottom of portions are CLI command syntax, describe as following:

→ *Note: All the inpu\output data is in hex format.*

The following CLI commands are used to access the device registers.

hwread BankNum RegNum Width -- Read KS8841/2 register.

```
=>hwread 20 0 2
=>bank32-reg.00 : 8801
```

Read bank 32, register 0, with data width is WORD[4] format.

hwwrite BankNum RegNum RegData Width -- Modify KS8841/2 register.

```
=>hwwrite 2 0 12345678 4
=>hwread 2 0 4
=>bank02-reg.00 : 12345678
```

[4] BYTE is 8-bit, WORD is 16-bit, and DWORD is 32-bit data width.

Write bank 2, register 0, with data value 0x12345678 in DWORD format.

hwpoll BankNum RegNum BitMask BitPat TimeOut -- Poll register bit if it match bit pattern.

=>hwpoll 11 2 0001 0000 10

Polling bank 17, register 2, bit 1 if it match 0b pattern, in 10 ms.

=>hwpoll 11 2 0001 0001 10
=>ERROR: Time out

If 10 ms passed, and match bit pattern no found, ERROR message display.

The following CLI commands to prepare an Ethernet packet and transmit from CLI command to KS8841/2 device. There are total six data buffer for the user to store the Ethernet packet. One data buffer can only store one Ethernet packet, and must be a completed Ethernet packet.

hwbufwrite BufNum BufOffset WData [...] -- Write data to debug buffer.
=>hwbufwrite 0 0 ff ff ff ff ff ff 08 00 70 22 44 55

Write a destination MAC address (broadcast), source MAC address (08:00:70:22:44:55) to the data buffer 0, data buffer offset 0.

hwbuffill BufNum BufOffset FData BufInc Len -- Fill data to debug buffer.**=>hwbuffill 0 0c 01 02 3c**

Fill data buffer 0, start from data buffer offset 0x0c, with data 0x01, and increasing by 0x02, totally filling data length is 0x3c (60 bytes).

hwbufread BufNum BufOffset Len -- Display contents of debug buffer
=>hwbufread 0 0 3c
=>
00000000 ff ff ff ff ff ff 08 00 - 70 22 44 55 01 03 05 07
00000010 09 0b 0d 0f 11 13 15 17 - 19 1b 1d 1f 21 23 25 27
00000020 29 2b 2d 2f 31 33 35 37 - 39 3b 3d 3f 41 43 45 47
00000030 49 4b 4d 4f 51 53 55 57 - 59 5b 5d 5f

Display the contents of data buffer 0, offset 0, data length 0x3c (60 bytes).

hwbuftx Port BufNum Len Repeat SameBuf Delay -- Tx packet from debug buffer to KS8841/2

=>hwbuftx 1 0 3c 2 1 0

Transmit packet to Port 1 of KS8842, from data buffer 0, with packet length 60 bytes, transmit 2 times, using the same buffer, no delay between transmit packets.

=>hwbuftx 2 0 5ea 10 1 0

Transmit packet to Port 2 of KS8842, from data buffer 0, with packet length 1514 bytes, transmit 16 times, using the same buffer, no delay between transmit packets.

=>hwbuftx 3 0 5ea 3e8 1 1

Transmit packet to Port 1 and Port 2 of KS8842, from data buffer 0, with packet length 1514 bytes, transmit 1000 times, using the same buffer, delay 1ms between transmit packets.

=>hwbuftx 0 0 3c 6 0 0

Transmit packet to KS8842 by lookup mode or KS8841, from data buffer 0, with packet length 60 bytes, transmit 6 times, continuous next buffer for next transmit[5], no delay between transmit packets.

hwdumptx DumpFlag -- Start/Stop dumpping transmit packet data
=>hwdumptx 1

Start dumping transmits packets to the screen when every packet sends to KS8841/2 device from CPU system. Eg,

```
=>hwbuftx 1 0 3c 1 1 0
Tx Cntl Word: 0x8113, Byte Count: 0x003c
Tx On port 1
Pkt Len=60
DA=ff:ff:ff:ff:ff:ff
SA=08:00:70:22:44:55
Type=0103
 0000   ff  ff  ff  ff  ff  ff  08  00  70  22  44  55  01  03  05  07
 0010   09  0b  0d  0f  11  13  15  17  19  1b  1d  1f  21  23  25  27
 0020   29  2b  2d  2f  31  33  35  37  39  3b  3d  3f  41  43  45  47
 0030   49  4b  4d  4f  51  53  55  57  59  5b  5d  5f
```

The first line of message tells you what "Control Word", and "Byte Count" is written to the KS8841/2 TXQ.

=>hwdumptx 0

Stop dumping transmits packets to the screen.

hwdumprx DumpFlag -- Start/Stop dumpping receive packet data
=>hwdumprx 1

Start dumping received packets (received from KS8841/2 device) to the screen when every packets received from KS8841/2 device to CPU system. Eg, if PING from the laptop:

```
Rx Cntl Word: 0x82c8, Byte Count: 0x003c
Rx On port 2
Pkt Len=60
DA=ff:ff:ff:ff:ff:ff
SA=00:50:ba:15:56:29
Type=0806
 0000   ff  ff  ff  ff  ff  ff  00  50  ba  15  56  29  08  06  00  01
```

[5] If you already prepare the six buffers with different Ethernet packets data, it will transmit data buffer from 0 to 5 one by one.

```
0010   08  00  06  04  00  01  00  50  ba  15  56  29  c0  a8  01  0a
0020   00  00  00  00  00  00  c0  a8  01  01  00  00  00  00  00  00
0030   00  00  00  00  00  00  00  00  00  00  00  00
```

The first line of message is Receive Status from register RXSR and RXBC.

=>hwdumprx 0

Stop dumping received packets to the screen.

The following CLI commands are used to access the device indirect access registers for the VLAN table, static MAC table, dynamic MAC table, and MIB counters.

hwtableread Table Index Count -- Read ks884X table data register

```
=>hwtableread vlan 0 6
=>    DataH DataM    DataL
0000   0000 00000000 000f0001
0001   0000 00000000 000f0001
0002   0000 00000000 000f0001
0003   0000 00000000 000f0001
0004   0000 00000000 000f0001
0005   0000 00000000 000f0001
```

Read VLAN tables from entry 0 for total 6 entries.

```
=>hwtableread mac1 0 2
=>    DataH DataM    DataL
0000   0000 00000000 00000000
0001   0000 00000000 00000000
```

Read static MAC tables from entry 0 for total 2 entries.

```
=>hwtableread mac2 2 4
=>    DataH DataM    DataL
0002   0000 0199d33d bb1ee313
0003   0000 014ef0d7 fa7feddc
0004   0000 01823988 e0157890
0005   0000 0102cc09 29e95603
```

Read dynamic MAC tables from entry 2 for total 4 entries.

```
=>hwtableread mib 20 4
=>    DataH DataM    DataL
0020   0000 0102cc09 40007229
0021   0000 0102cc09 40000000
0022   0000 0102cc09 40000000
0023   0000 0102cc09 40000000
```

Read MIB counters from entry 32 for total 4 entries.

→ Note: DataH column shows data from bit_79 to bit_64,
DataM column shows data from bit_63 to bit_32,
DataL column shows data from bit_31 to bit_0.

```
hwtablewrite Table Index RegDataH RegDataL      -- Write ks884X table data
                                                   register
=>hwtablewrite vlan 1 00000000 000ba00a

Write VLAN table with data value 0x00000000 to data bit 63 to data bit 32,
0x000ba00a to data bit 31 to data bit 0.

hwtableshow Table Index Count          -- Show ks884X table.
=>hwtableshow vlan 0 6
Entry  Status   VID    FID  Port( 1 2 3)
0000   valid    0001   0000       M M M
0001   valid    0010   0010       M M -
0002   valid    0001   0000       M M M
0003   valid    0001   0000       M M M
0004   valid    0001   0000       M M M
0005   valid    0001   0000       M M M

Display VLAN table from entry 0 for total 6 entries.

=>hwtableshow mac1 0 2
Entry  Status   MAC                FID  Port( 1 2 3)  UseFID  Override
0000   invalid  00-00-00-00-00-00  0000       - - -   FALSE   FALSE
0001   invalid  00-00-00-00-00-00  0000       - - -   FALSE   FALSE

Display static MAC table from entry 0 for total 4 entries.

=>hwtableshow mac2 0 4
Entry  Status   MAC                FID  Port( 1 2 3)  AgingTime
0000   learned  00-50-ba-15-56-29  0000       - M -   00
0001   learned  08-00-70-22-44-55  0000       - - M   00
0002   invalid  d3-3d-bb-1e-e3-13  0009       - M -   02
0003   invalid  f0-d7-fa-7f-ed-dc  0014       M - -   01

Display dynamic MAC table from entry 0 for total 4 entries.
```

```
=>hwtableshow mib 0 1
                      Port 1      Port 2      Port 3       Driver
RxLoPriorityByte     : 00000000    00000629    00000298     00000605    RxByte
RxHiPriorityByte     : 00000000    00000000    00000000     00000002    RxBroadcastPkts
RxUndersizePkt       : 00000000    00000000    00000000     00000002    RxMulticastPkts
RxFragments          : 00000000    00000000    00000000     00000004    RxUnicastPkts
RxOversize           : 00000000    00000000    00000000     00000006    RxTotalPkts
RxJabbers            : 00000000    00000000    00000000
RxSymbolError        : 00000000    00000000    00000000     00000000    RxRuntError
RxCRCError           : 00000000    00000000    00000000     00000000    RxCRCError
RxAlignmentError     : 00000000    00000000    00000000     00000000    RxMIIError
RxCtrl8808Pkts       : 00000000    00000000    00000000     00000000    RxTooLong
RxPausePkts          : 00000000    00000000    00000000     00000000    RxInvalidFrame
RxBroadcastPkts      : 00000000    00000002    00000000     00000000    RxIPChecksumError
RxMulticastPkts      : 00000000    00000000    00000000     00000000    RxTCPChecksumError
RxUnicastPkts        : 00000000    00000004    00000004     00000000    RxUDPChecksumError
Rx64Octets           : 00000000    00000001    00000001     00000000    RxTotalError
Rx65to127Octets      : 00000000    00000004    00000003     00000000    RxErrorFrameInterrupt
Rx128to255Octets     : 00000000    00000001    00000000     00000000    RxOverrunInterrupt
Rx256to511Octets     : 00000000    00000000    00000000     00000000    RxStopInterrupt
Rx512to1023Octets    : 00000000    00000000    00000000     00000000    RxOSDroppedPkts
Rx1024to1522Octets   : 00000000    00000000    00000000     00000006    RxInterrupt

TxLoPriorityByte     : 00000000    00000298    00000629     00000278    TxByte
TxHiPriorityByte     : 00000000    00000000    00000000     00000004    TxTotalPkts
TxPausePkts          : 00000000    00000000    00000000
TxBroadcastPkts      : 00000000    00000000    00000000     00000000    TxLateCollision
TxMulticastPkts      : 00000000    00000000    00000000     00000000    TxMaximumCollision
TxUnicastPkts        : 00000000    00000004    00000004     00000000    TxUnderrun
TxLateCollision      : 00000000    00000000    00000000     00000000    TxTotalError
TxDeferred           : 00000000    00000000    00000000     00000000    TxAllocMemFail
TxTotalCollision     : 00000000    00000000    00000000     00000000    TxStopInterrupt
TxExcessiveCollision : 00000000    00000000    00000000     00000000    TxOSDroppedPkts
TxSingleCollision    : 00000000    00000000    00000000     00000000    TxUnderrunInterrupt
TxMultiCollision     : 00000000    00000000    00000000     00000004    TxDoneInterrupt

RxDroppedPackets     : 00000000    00000000    00000000
TxDroppedPackets     : 00000000    00000000    00000000
```

Display MIB counters for all the ports, and driver statistic counters.

→ Note: From left to right columns, the first four columns show MIB counters from device registers. The fifth to seventh columns shows driver statistic counters.

hwclearmib Port -- Clear software MIB counter database (clear all if Port=4)

Clear all the MIB counters by per-port or all the ports.

The following CLI commands are used to get\set device PHY link status.

hwgetlink Port -- Get Link status.

```
=>hwgetlink 1
=>^[00000000,000186a0,00000002,0000010f,0005010f,00000000]$
```

Display link status in hex by following sequence:
[LinkStatus, LinkSpeed, LinkDuplex, LinkCapable, LinkAdvertisement, LinkPartnerCapable]

```
For the Link status information 'LinkStatus':
0  means Link is download
1  means Link is good

For the Link Speed status information 'LinkSpeed':
1000000  means Link Speed is 100Mbps
100000   means Link Speed is 10Mbps

For the Link Duplex mode status information 'LinkDuplex':
0x01  means Link Duplex is full duplex
0x02  means cable is crossed
0x04  means is reversed

For the Link Capable status information 'LinkCapable':
0x00000001  means 10BaseT full duplex
0x00000002  means 10BaseT half duplex
0x00000004  means 100BaseTX full duplex
0x00000008  means 100BaseTX half duplex
0x00000100  means Link Pause

For the Link Auto-Negotiation Advertisement status information
'LinkAdvertisement':
0x00000001  means 10MBPS full duplex
0x00000002  means 10MBPS half duplex
0x00000004  means 100MBPS full duplex
0x00000008  means 100MBPS half duplex
0x00000100  means Pause frame
0x00010000  means enable Auto MDIX
0x00020000  means Force MDIX
0x00040000  means Auto Polarity

For the Link Partner Capabilities status information 'LinkPartnerCapable':
0x00000001  means 10MBPS full duplex
0x00000002  means 10MBPS half duplex
0x00000004  means 100MBPS full duplex
0x00000008  means 100MBPS half duplex
0x00000100  means Pause frame
```

hwsetlink Port Data -- Set Link speed.

```
=>hwsetlink 1 00000004
=>Set Port 1 with Data=00000004

The PHY port's auto-negotiation advertisement link speed, duplex, and pause
frame are set according to 'Data' value:

0x00000001,   10MBPS, full duplex
0x00000002,   10MBPS, half duplex
0x00000004,   100MBPS, full duplex
0x00000008,   100MBPS, half duplex
0x00000100,   Pause frame
0x00010000,   Auto MDIX (Micrel)
0x00020000,   Force MDIX
```

The following CLI commands are used to enable\disable Early Transmit\Receive function on KS8841 only.

hwrxthres FData -- Set Early Receive Threshold (in unit of 64-byte)
=>hwrxthres 1

Set Early receive threshold to 64 bytes.

hwtxthres FData -- Set Early Transmit Threshold (in unit of 64-byte)
Set Early transmit threshold to 64 bytes.

hwearly Flag -- Enable/Disable Early Transmit/Receive (1 - Enable, 0 - Disable).

=>hwearly 1

Enable Early transmit\receive function.

=>hwearly 0

Disable Early transmit\receive function.

hwrepeat Flag -- Enable/Disable Repeat mode (1 - Enable, 0 - Disable).

=> hwrepeat 1

Enable KS8842 Repead mode function.

=> hwrepeat 0

Disable KS8842 Repead mode function.

3 Running the OpenTCP Demo

3.1 Setting the Target IP

In order to use the demo, you must first assign an IP address to the target. The KS8841/2 demo board is assigned a fix IP address 192.168.1.1, and if you connect one of Ethernet port from KS8841/2 target to your laptop. You should use an IP number on the same sub-net as you laptop. For example, set the IP address of your laptop is 192.168.1.10 (Figure 3-2-1).

→ *Note: If you want to use a IP address other than this, you need to edit the gui_demo.c file and rebuild your project.*

3.2 Connecting a Cable for the Ethernet Connection

Connecting an Ethernet cable between your laptop and one of the ports on the KS8842 demo board. Or

Connecting an Ethernet cable between your laptop and port 1 on the KS8841 demo board.

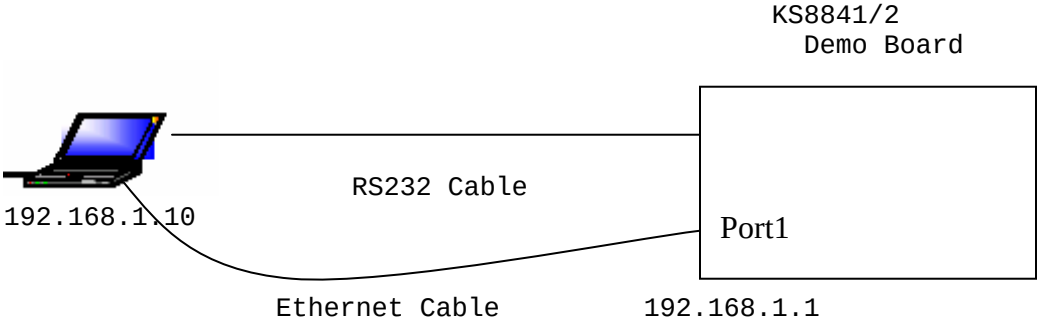


Figure 3-2-1 Example of connection between KS8841/2 Demo Board and Laptop

3.3 PING to KS8841/2 Demo Target

You can use the **PING** command from your laptop Windows Command Prompt to test whether the KS8841/2 is accessible over the network (Figure 3-3-1).

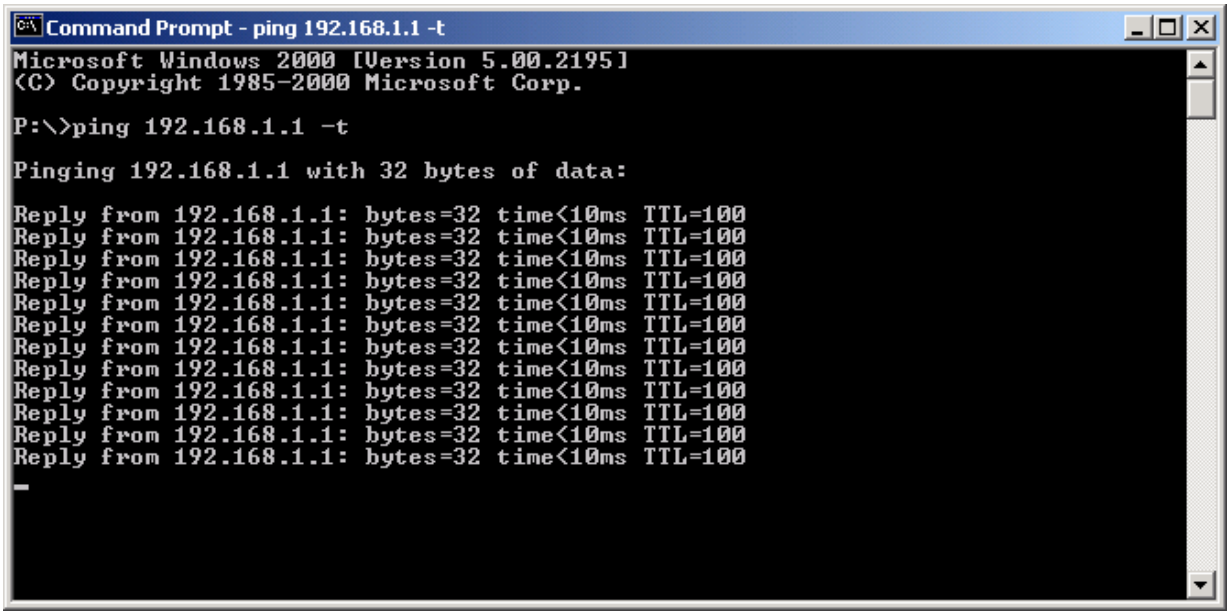


Figure 3-3-1 Issue PING from the laptop Command Prompt

3.4 Running Windows TCP GUI Demo Program

The KS8841/2 BSP packet also provides a Windows GUI program tcp_gui.exe that can run on your laptop to test whether the KS8841/2 is accessible in the real TCP\IP application protocol.

From the directory that you installed the KS8841/2 BSP packet on your host laptop, double click **M16C Software\Demo Programa\TCP GUI Demo\tcp_gui.exe**. An interactive TCP GUI Window will come up. Change the IP address in the upper left-hand corner of the window by clicking on the IP address button (Figure 3-4-1).

→ *NOTE: You should change the IP address to the one that you assigned to your board.*

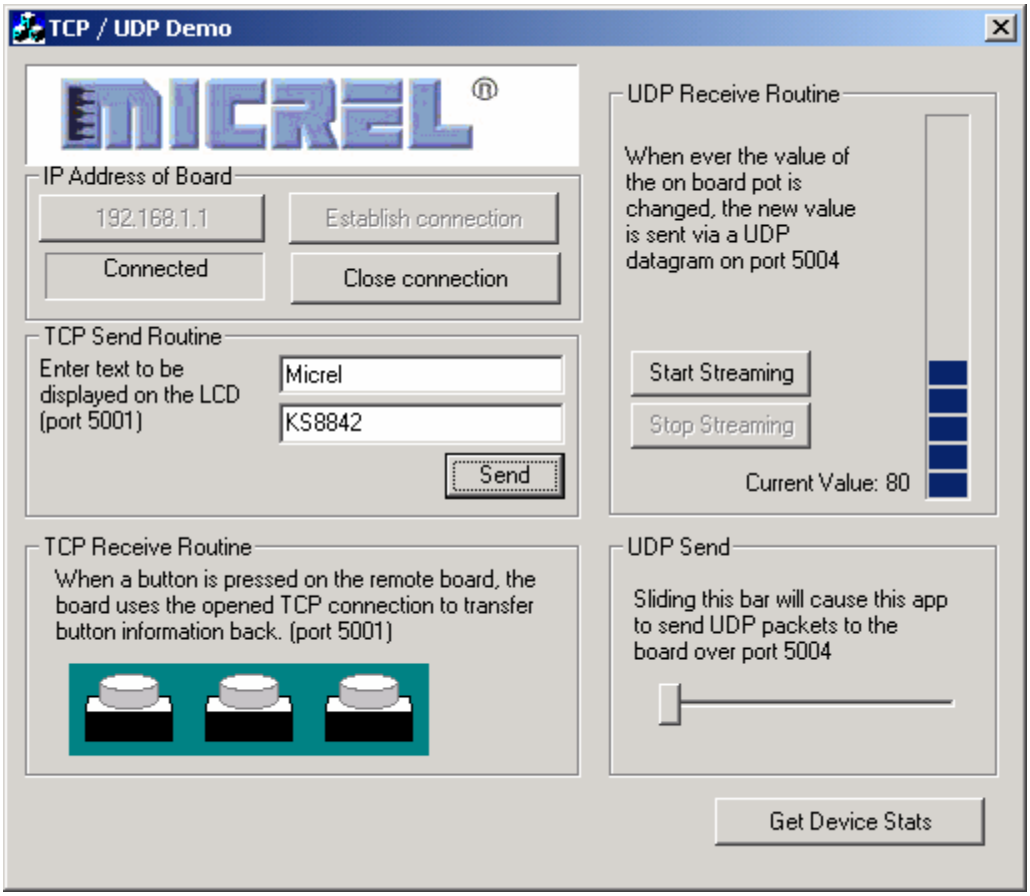


Figure 3-4-1 - Interactive TCP Windows GUI Program

Now click the "**Establish connection**" button in order to open a TCP and UDP connection to your target board. If a successful connection is made, the LCD on the target board will read "Conn Est" meaning connection established. The demo has been set up so that the OpenTCP stack will close a socket if it remains inactive for more than 2 minutes.

To write to the LCD, simply type in the edit boxes (one for each line on the LCD) and click the "**Send**" button. This sends the LCD text using the TCP socket it opened when the connection was established.

When a button is pressed on the target board, that info is also sent via the TCP connection to the windows program and the corresponding picture of the button on the GUI will change.

To send/receive UDP packets, click the "**Start Streaming**" button. This will send a TCP packet to the target board telling it to start sending the current A2D value of the pot via a UDP packet every time it changes. Also, when the slider bar on the GUI is moved, the new value is send to the target board via UDP packets and the value is displayed on the LCD.

4. LinkMD GUI Demo Program

The Micrel LinkMD software is a Windows Graphical User Interface (GUI) program that simplifies and expedites the evaluation and testing of the KS8841/2. Three separate Window tabs provide menu selections to check the PHY's link status and capabilities; perform cable diagnostics and integrity check on transmit and receive datapaths.

To launch the LinkMD program, navigate to the directory with the Micrel LinkMD software (**M16C Software\Demo Program\LinkMD GUI Demo**) and double click on the LinkMD.exe file. The LinkMD program will start and display the Capabilities menu page. The other two menu pages are Diagnostics and PHY. Common to all three pages are the Exit button to close the LinkMD program and the Help button to display the current version of LinkMD software.

4.1 Capabilities Tab

The Capabilities Tab, shown in Figure 4-1, provides the following basic link status and settings for the KS8841/2.

- Link Status section shows the current link speed, duplex, MDI/MDIX and polarity settings of the KS8841/2. If there is no link, these four fields are dimmed to indicate no status.

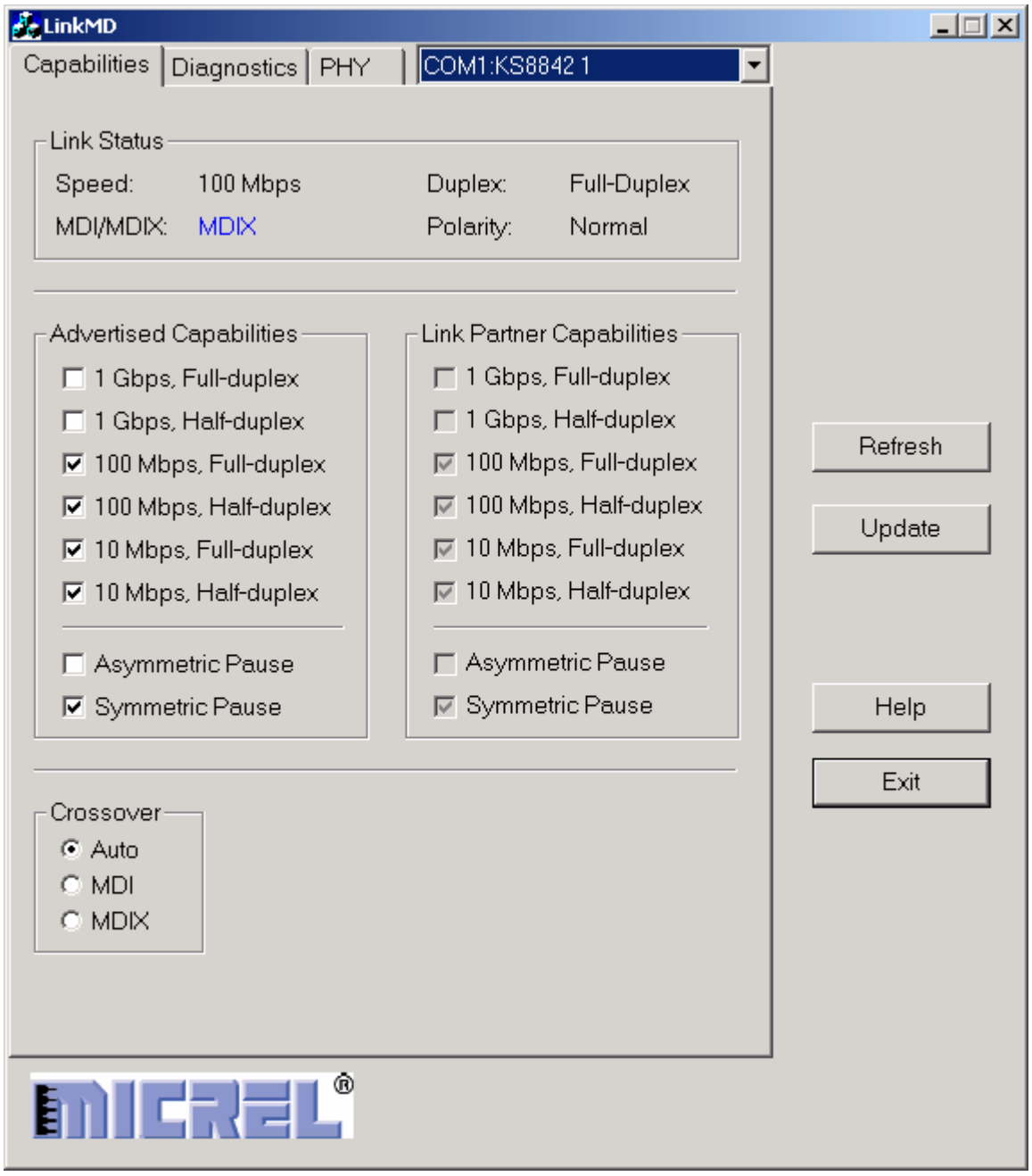
- Advertised Capabilities and Link Partner Capabilities sections show the speed, duplex and full duplex flow control capabilities of the KS8841/2 and its link partner. KS8841/2 capabilities are programmable. Its link partner capabilities are read only, and dimmed to indicate no capabilities when there is no link.

- Crossover option allows the PHY to be set in HP Auto-MDIX for automatic detection and correction for straight through and crossover cabling, or forced to either MDI or MDIX mode.

To read the latest PHY status, press the Refresh button.

To configure the PHY, set the desired settings and press the Update button.

Figure 4-1: LinkMD - Capabilities Tab



4.2 Diagnostics Tab

The Diagnostics Tab provides the menu page to check the cable status and the integrity of transmit and receive datapaths. These two selections are provided by the cable diagnostic test and the TX/RX traffic test, respectively.

Cable Diagnostic Test

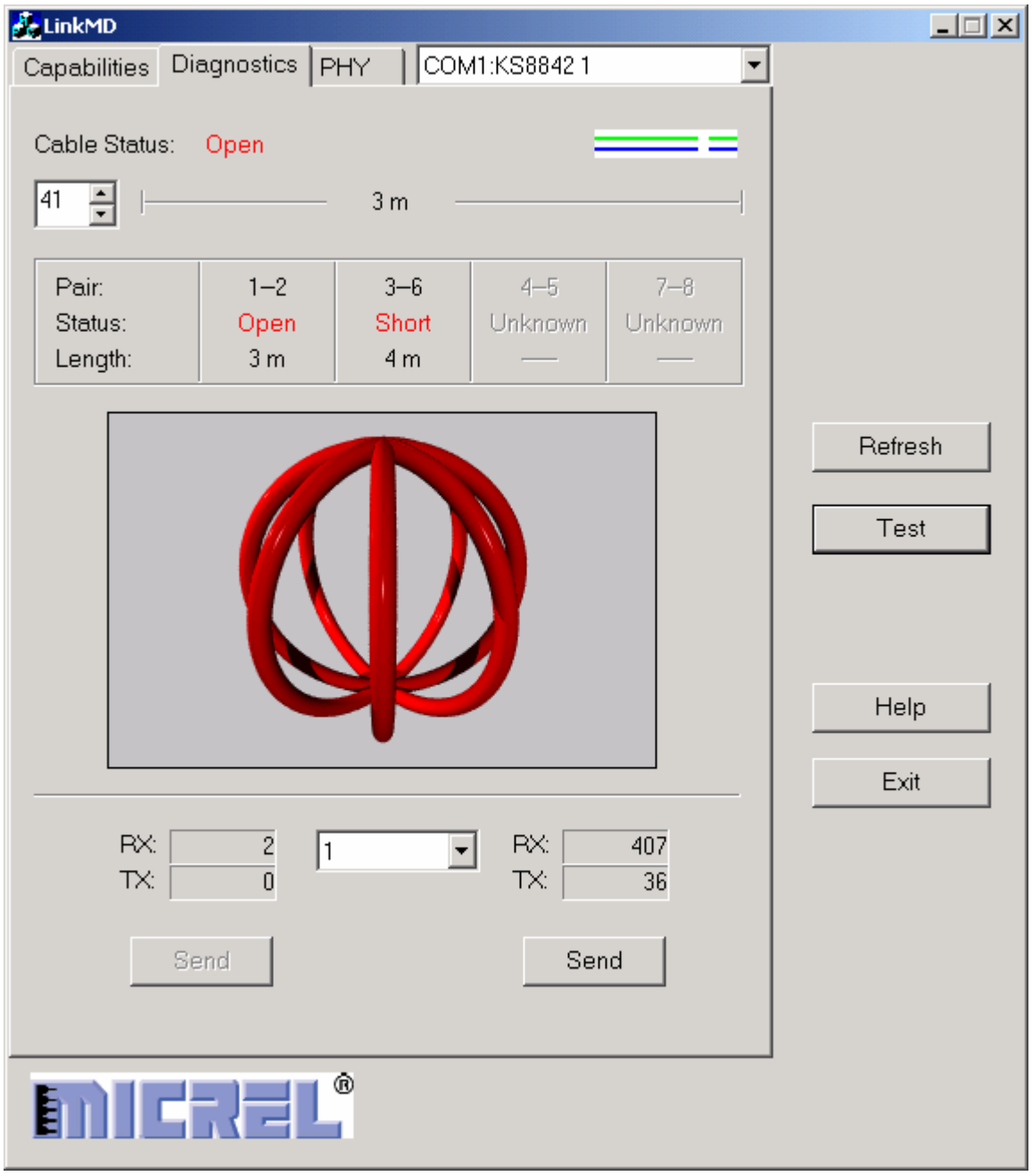
The cable diagnostic test is enabled only when there is no link to the KS8841/2 PHY. This test provides the following cable information for the differential pairs connected to pins {1,2} and {3,6} of the RJ-45 jack.

- Status: Indicates whether the differential pair is **Open**, **Short**, or **Unknown** (no link and no cable test conducted). If there is a physical link, Status is **Good**.
- Length: Provides approximate distance in meters to the open or short cable fault. If there is a physical link, Length has no meaning and displays an empty field.

To run the cable diagnostic test, press the Test button.

Figure 4-2 shows the sample test results of the cable diagnostic test where a 4 meters short and 3 meters open were found on the differential pairs connected to pins {1,2} and {3,6} of the RJ-45 jack, respectively.

Figure 4-2: LinKMD – Diagnostics (Cable Status) Tab



4.3 TX/RX Traffic Test

The TX/RX traffic test uses Ethernet packets to check the integrity of transmit and receive datapaths. This test requires the KS8841/2 PHY to have a physical link established with a PHY on the PC that is connected to the KS8841/2 via RS232 Serial interface, as shown in Figure **4-3**.

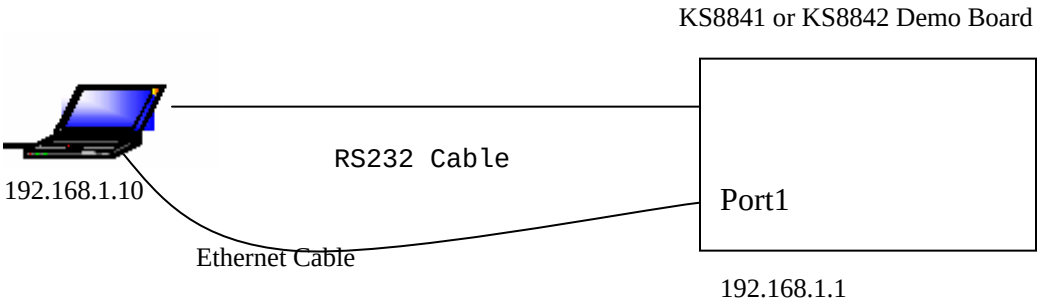


Figure 4-3: TX/RX Traffic Test Setup

The PC should be connected to only two PHYs. One is the KS8841/2 via RS232 serial interface; and the other could be either a PHY on the motherboard or a network interface card (NIC). The PHYs should be configured with different static IP addresses under the same subnet. See section 4-3 on how to configure network settings for Windows XP.

The Cable Status field at the top of this menu page displays the cable link status of the KS8841/2. Before starting the TX/RX traffic test, press the Refresh button to check the latest cable status. If there is a link, the status will display either **Crossed** for a crossover connection or **Good** for a straight connection. If there is no link, the status will display **Unknown**.

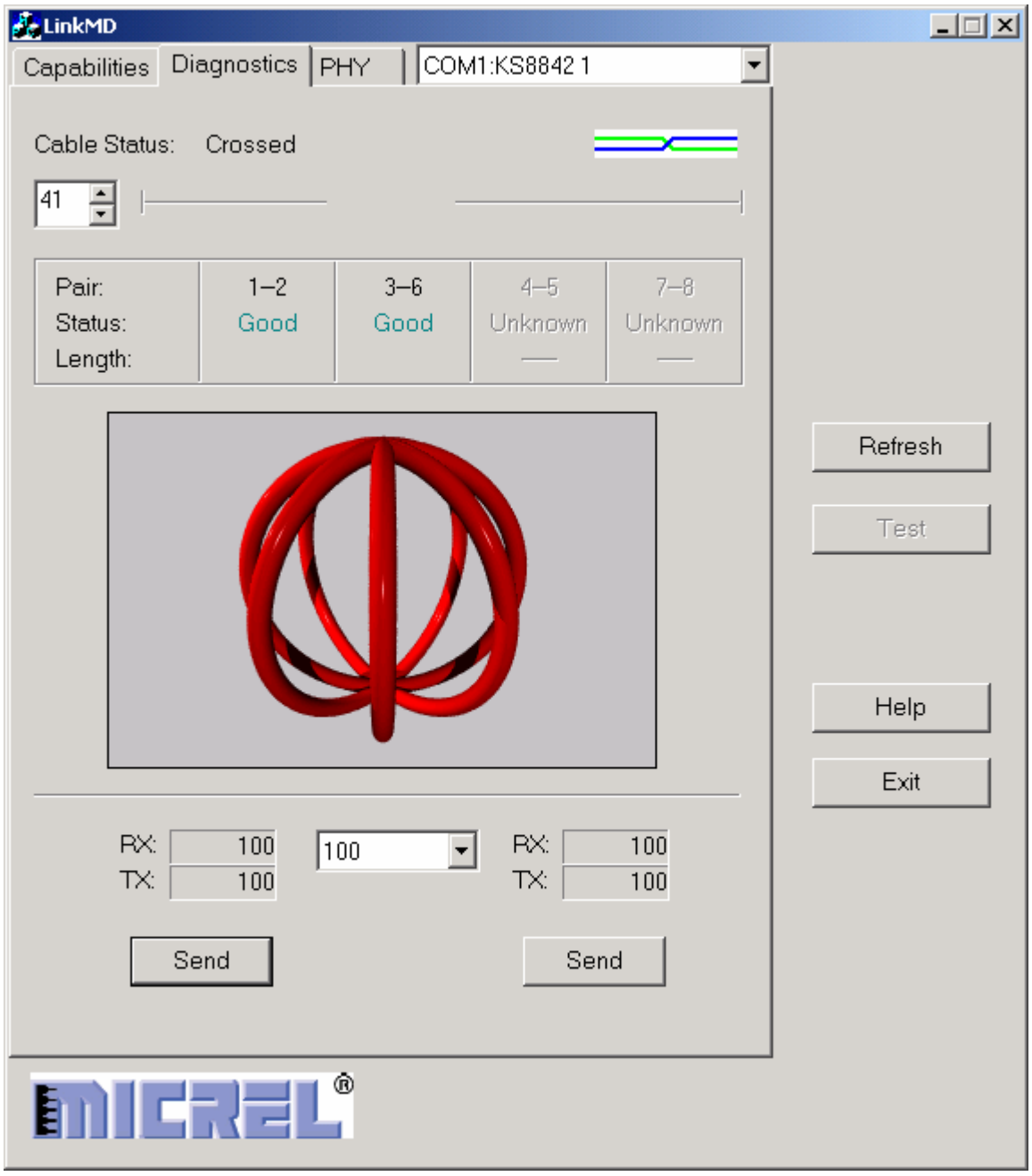
For the test setup in Figure **4-3**, the TX/RX counters and Send button at the bottom left of this menu page are associated with the KS8841/2 PHY. Similarly, the TX/RX counters and Send button at the bottom right of this menu page are associated with the other PHY.

The drop down menu between the TX/RX counters selects the number of Ethernet packets to send. The selections are 1, 10, 100, 1000, or Continuous.

The Send buttons start the transmission of packets with respect to either KS8841/2 PHY or other PHY. The sample test results in 4-4 shows 100 packets sent by the KS8841/2 PHY and 100 packets received by other PHY. Also, all 100 packets sent by the other PHY are received the KS8841/2 PHY. Note, if

```
the PC is sending ARP packets or other Ethernet traffic is present, the
transmit count and receive count may differ.
```

Figure 4-4: LinkMD – Diagnostics (Traffic Test) Tab



5 KS8841/2 BSP Installation

This section describes how to install, and build KS8841/2 BSP under Renesas HEW Version 3.01.05 / OpenTCP 1.04 for Renesas M16C/62P.

Before install KS8841/2 BSP, The Renesas SKP16C62P StarterKit Plus (SKP) CD[6] for M16C/62P must be installed on the host system (Microsoft Windows).

> → *Note: The SKP kit comes with an integrated software development environment, HEW (IDE, C-compiler, assembler, and linker), KD30 Debugger, and FoUSB (Flash-over-USB™) Programmer.*
>
> → *NOTE: For more detail information about HEW, see the SKP16C62P_Tutorial_1_HEW from Renesas.*

The ks88xx_v1.0.0 SW Driver.zip ZIP file under directory "Software\M16C software\Driver" contains:

- OpenTCP protocol stack, and demo program.
- BSP functions including UART driver, LCD driver etc.
- KS8841 or KS8842 Ethernet driver.
- Windows TCP GUI demo program.
- Windows LinkMD GUI demo program.

5.1 Creating a KS884x BSP Directory

Create a KS884x directory under installDir (eg. MTOOL\ks884x), and copy the ks884x.zip to MTOOL\ks884x. Unzip ks884x.zip under MTOOL\ ks884x directory. It is successful if you see a new the directory MTOOL\ks884x\OpenTCP_104.

The most of subdirectories and files are the same as you download from OpenTCP website, the KS8841/2 BSP only add or modify following subdirectories and files:

Directory	Status	Description
ks884x\OpenTCP_104\ks884x\ethernet_ks884x.c	Add	OpenTCP Ethernet Driver for Micrel KS8841/2 device.
ks884x\OpenTCP_104\gui_demo.c	Modify	Change target IP to 192.168.1.1. Init UART driver, and polling UART receive.
ks884x\OpenTCP_104\arch\M16C\set30_62pskp.inc	Modify	Change the ISP in vector table to ks884xIntr ISP.
ks884x\OpenTCP_104\ks884x	Add	This directory contains the KS8841/2 driver.
ks884x\OpenTCP_104\arch\uart	Add	This directory contains UART driver and CLI parser.

[6] Please contact Renesas support on how to get SKP CD via the website www.renesas.com .

6 Building KS8841/2 BSP from HEW

This section describes how to build KS8841/2 BSP for KS8841/2 demo board from Renesas HEW project facility.

6.1 Starting HEW KS884x Project

To start HEW, from your development Windows PC, click on the **Start-> Programs -> Renesas High-performance Embedded Workshop -> High-performance Embedded Workshop** . After HEW opens, from the Welcome dialog box (Figure 6-1-1), select "**Browse to another project workspace**" option, and then click **OK**.

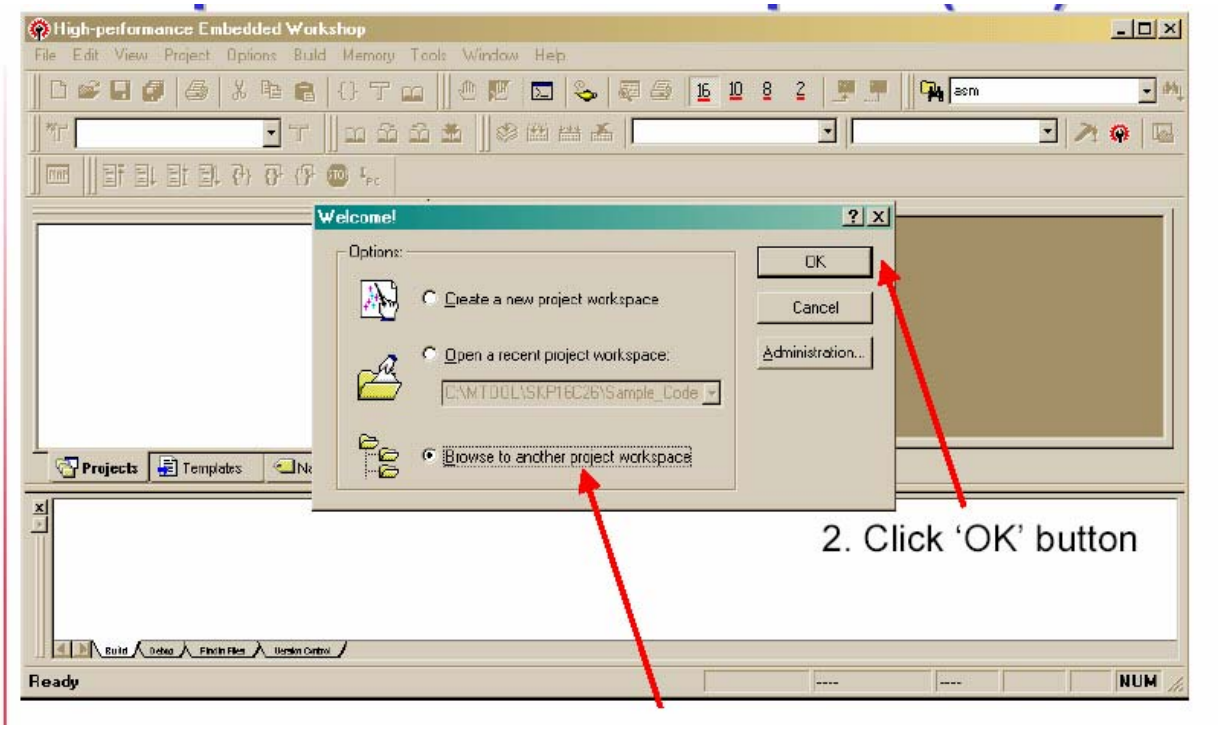


Figure 6-1-1: HEW Main Window

Then click on Browse, selection of **Hew3** under MTOOL\ks884x\OpenTCP_104\arch\M16C directory from the Workspace Browse window (Figure 6-1-2).

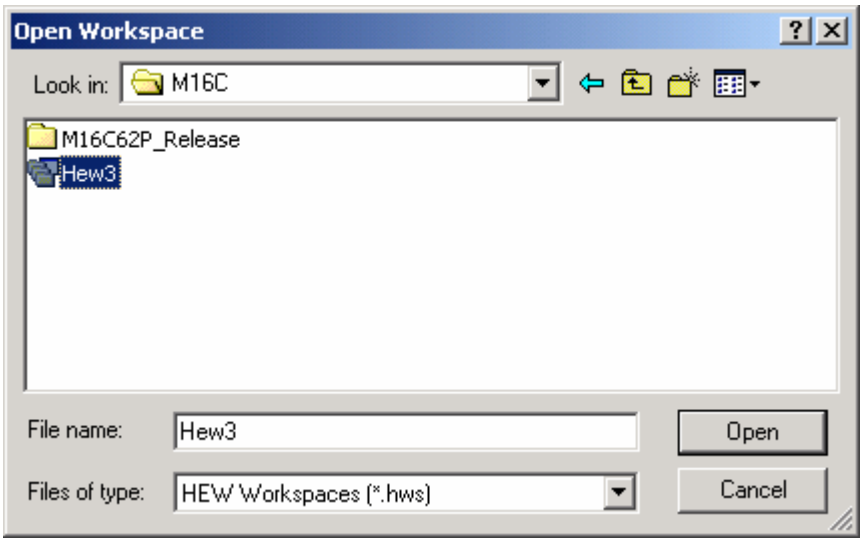


Figure 6-1-2: HEW Workspace Browse Window

HEW workspace should look like the figure 6-1-3 below.

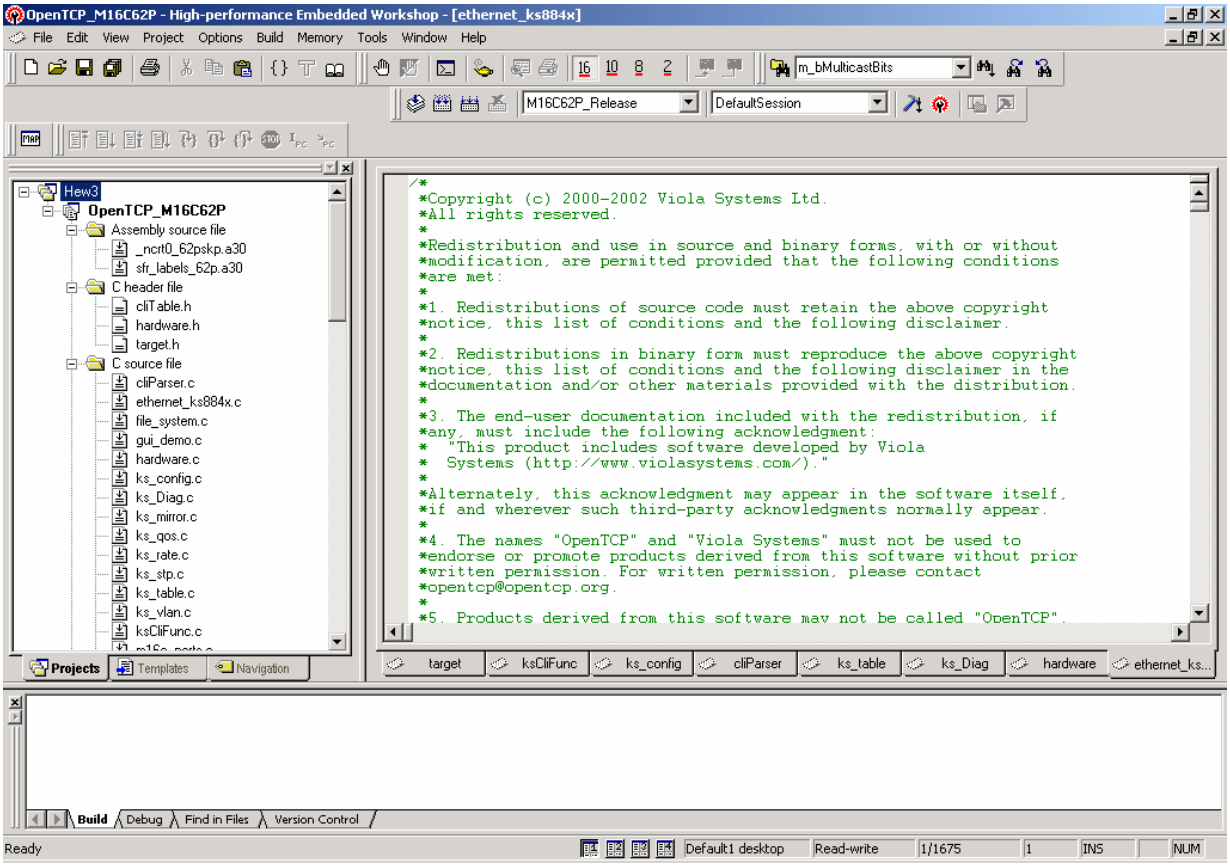


Figure 6-1-3: HEW Workspace

6.2 Build KS8841/2 BSP from HEW

If need to rebuild the KS8841/2 BSP from HEW, click on the '**Build All**' icon. This will re-compile and link all the source files.
Status, errors, messages, etc during a build process is displayed on the Output window (Figure 6-2-1).

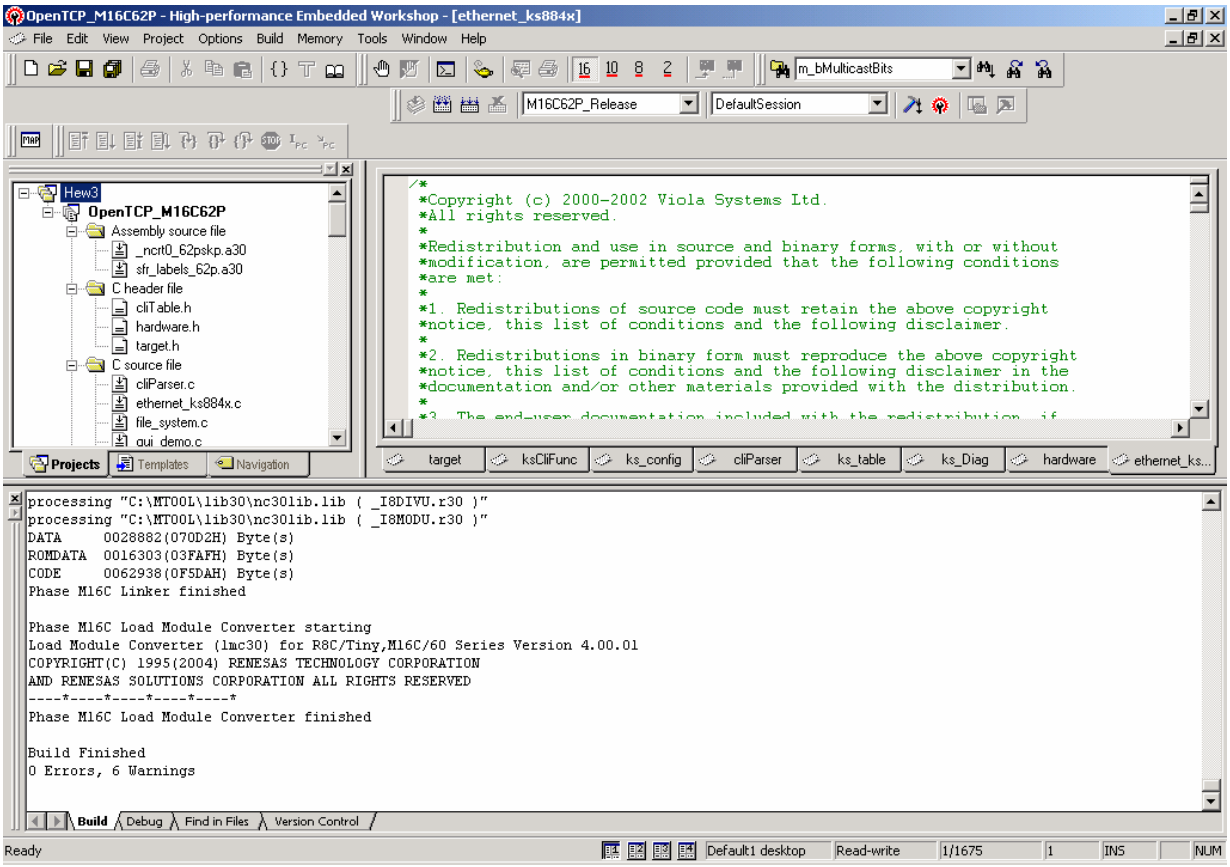


Figure 6-2-1: HEW Workspace with Output window

6.3 Build KS8842 BSP

To rebuild the KS8842 BSP from HEW, click on the **'Options -> Renesas M16C Standard Toolchain'.**
From **'C -> Defines'**, add **DEF_KS8842 1,** then **Build All**'(Figure 6-3-1).

Now an executable file **OpenTCP_M16C62P.mot** has been created in the MTOOL\ks884x\OpenTCP_104\arch\M16C\M16C62P_Release directory.

→ *NOTE: Rename **OpenTCP_M16C62P.mot** to **OpenTCP_M16C62P_ks8842.mot**.*

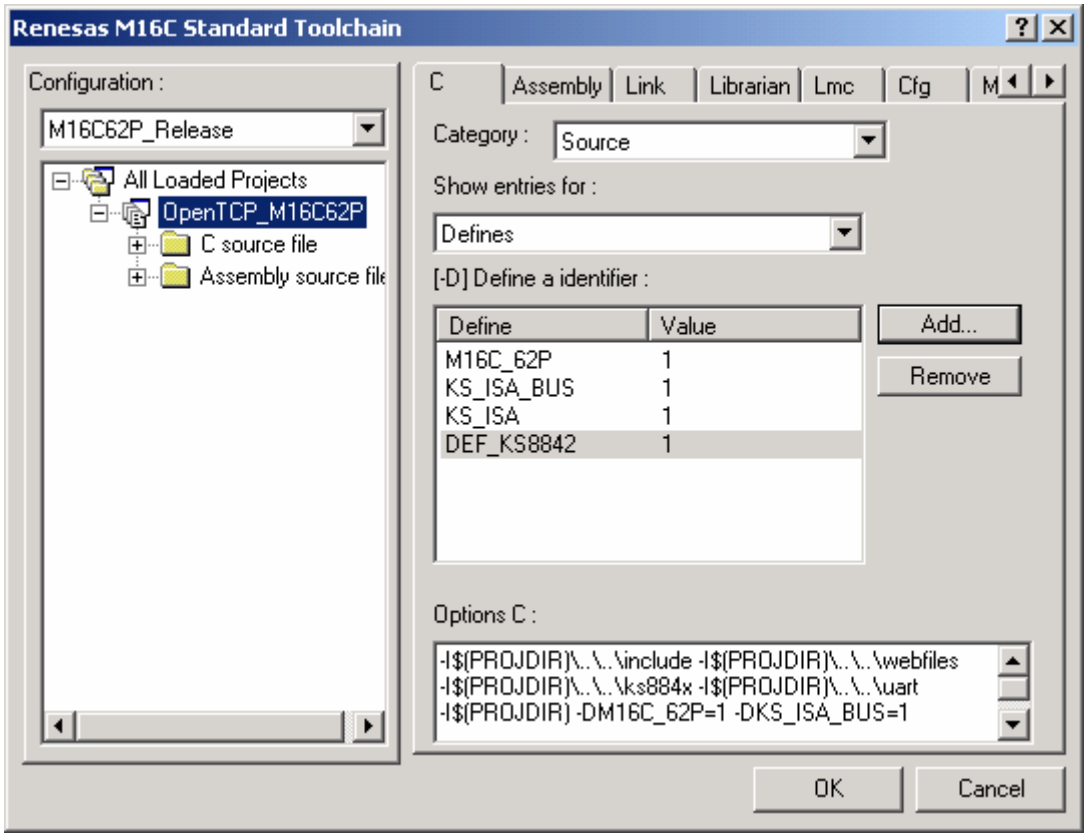


Figure 6-3-1: Renesas M16C Standard Toolchain window to build KS8842 BSP

6.4 Build KS8841 BSP

To rebuild the KS8841 BSP from HEW, click on the **'Options -> Renesas M16C Standard Toolchain'.**
From **'C -> Defines'**, add **DEF_KS8841 1,** then **Build All'**(Figure 6-4-1).

Now an executable file **OpenTCP_M16C62P.mot** has been created in the MTOOL\ks884x\OpenTCP_104\arch\M16C\M16C62P_Release directory.

→ *NOTE: Rename **OpenTCP_M16C62P.mot** to **OpenTCP_M16C62P_ks8841.mot**.*

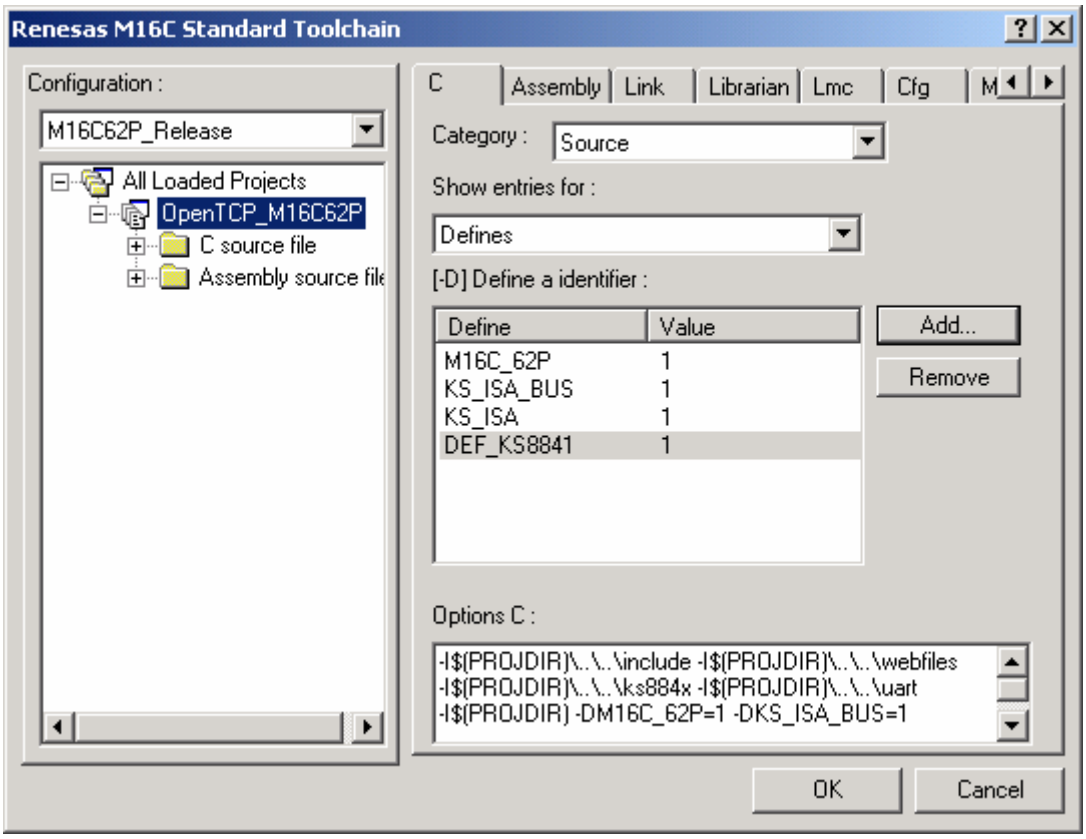


Figure 6-4-1: Renesas M16C Standard Toolchain window to build KS8841 BSP

7 Downloading (re-loading) the Firmware Program

Updating the KS8841/2 BSP is currently possible done by FoUSB (Flash-Over-USB™). FoUSB along with the ICD (RTA-FoUSB-MON) to download (reprogramming) the M16C/62P flash MCU with firmware.

Before downloading the demo program, First, Renesas FoUSB has been installed in your host system (Microsoft Windows)[7].

Seconds, connect the RTA-FoUSB-MON (ICD) to your host system and to your KS8841/2 demo board (Figure 7-1).

Figure 7-1: M16C/62P System Connectivity for FoUSB programmer

→ *IMPORTANT! When using RTA-FoUSB-MON connect to the KS8841/2 demo board, switch the power source switch on the RTA-FoUSB-MON to "**TARGET**" Powered Mode since the power supply on the KS8841/2 demo board will provide power to the KS8841/2 demo board as well as the RTA-FoUSB-MON. If the switch is left at "USB" Powered Mode, some MCU pins may be driven to undesirable levels.*

7.1 Running FoUSB Programmer

Apply the 5V power supply to External Power Input on the KS8841/2 demo board. Click on **Start -> Programs -> Renesas-Tools -> Flashover-USB Ver. 2.01. -> FoUSB Programmer** and a screen similar to Figure 7-1-1 will be displayed.

[7] Please reference the **RTA-FoUSB-MON_Users_Manual** for how to install FoUSB ICD.

Figure 7-1-1 Example of FoUSB Programmer Screen with KS8841/2 demo board Connected

7.2 Downloading KS8841/2 BSP

To download the KS8841/2 BSP, perform following steps:

1. Click on **OPEN** on FoUSB main GUI. Windows file selection menu appears as shown in Figure 7-2-1.

2. Find the demo file (e.g., **OpenTCP_M16C62P_ks8842_v0.1.11.mot** for KS8842, and **OpenTCP_M16C62P_ks8841_v0.1.11.mot** for KS8841) for loading into MCU flash. The selected target file appears on FoUSB main GUI beside **FILE** as shown in Figure 7-2-2.

3. Click on **PROGRAM** on FoUSB main GUI. The Program Flash dialog box appears as shown in Figure 7-2-3.

4. Click on **Program** of the Program Flash GUI. The loading of target program into MCU flash will start at this point and the progress of flash programming will be shown dynamically by a moving bar located at the lower part of this dialog box. After a successful programming of the flash, a *Program Completed Successfully* dialog box will appear.

5. Click on **OK** button and the dialog box disappear.

6. Click on **EXIT** button on the lower right corner of the main GUI to exit FoUSB Programmer.

→ *Note:*
*Select **Erase->Program->Verify** option (the default option) from Choose an Operation.*
*Select **Erase Only Needed Blocks** option from Erasing Options.*

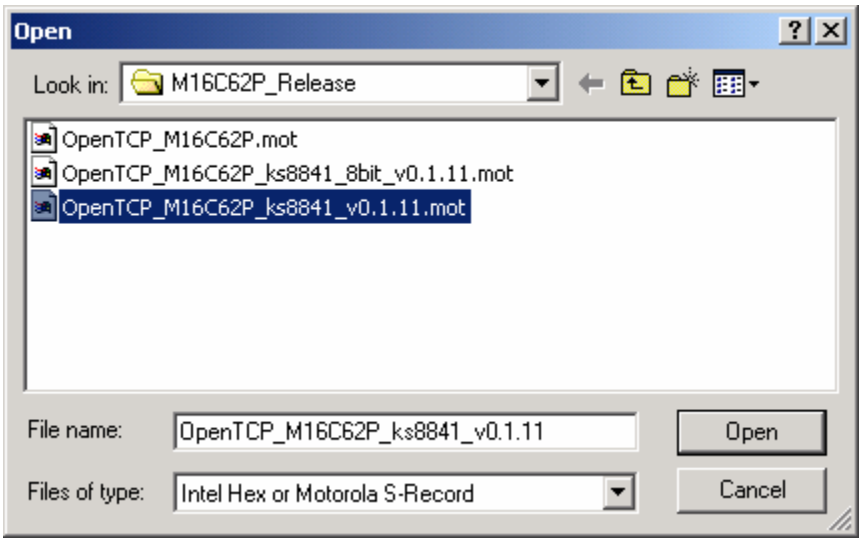


Figure 7-2-1 Dialog box for file selection

Figure 7-2-2 FoUSB main GUI after file selection

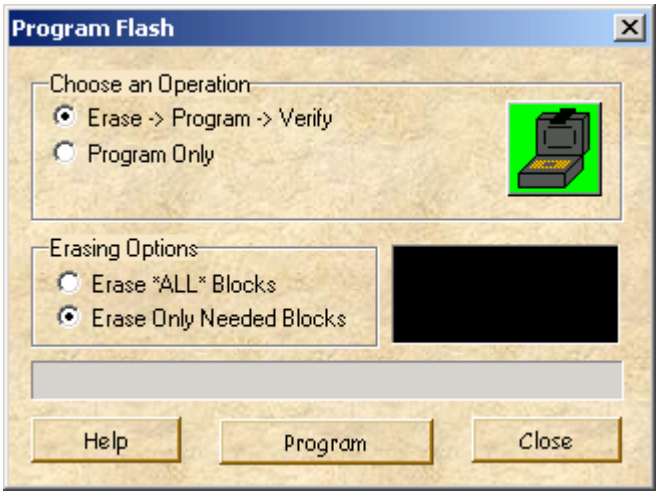


Figure 7-2-3 Menu options for programming flash