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ISP1362 PCI/DOS X2 User's Guide

(Host Controller)

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Rev.	Date	Descriptions	Author
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1. Introduction

The ISP1362 PCI/DOS Mini Evaluation Kit consists of small software modules that run various types of USB host functions—such as USB mouse, USB audio and USB printer—to demonstrate flexibility of implementation with different types of applications by using the ISP1362. These software modules have been developed using DOS for easy porting purposes.

One such software program for testing basic USB host functions and the USB mouse is called *X2*. This document explains the use of the X2 software program to test these functions.

2. Hardware

2.1. System and Hardware Requirements

The ISP1362 Evaluation Kit runs on any PC/XT/AT with the following specifications:

- PC motherboard with PCI slot supplying 5 V
- Pentium 200 MHz or faster CPU
- Microsoft® Windows® 98 only
- VGA adapter with at least 512 K video memory
- A USB mouse.

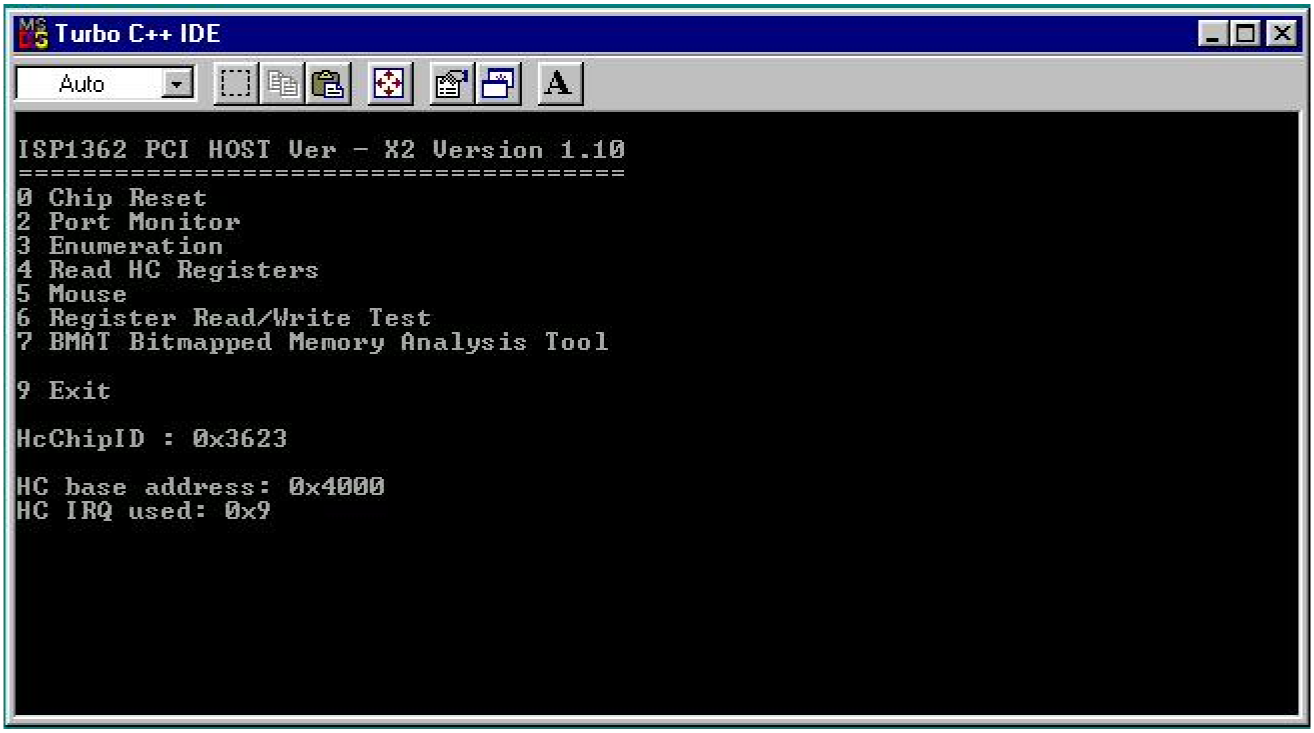
3. Running X2

1. Before running X2, make sure that these files are in the same directory on your hard disk:
   - X2.exe
   - Egavga.bgi
   - logo.bmp.
2. To boot up the program, use a Windows 98 bootable diskette.
3. To start the program, switch to the hard disk directory that contains the files, type **X2**[1] at the DOS prompt, and press the **Enter** key.
   The main menu screen appears (see Figure 3-1:).
4. To choose an option, press the corresponding number.

HcChipID is the ChipID of the ISP1362. For example, if you are using the ISP1362 ES3, the ChipID is 0x3623.

HC base address denotes the I/O address that PC BIOS has allocated to the ISP1362 PCI/DOS Mini Eval Kit. *HC IRQ used* denotes the IRQ.

[1] In this document, items that you type or click are indicated in bold.



```
ISP1362 PCI HOST Ver - X2 Version 1.10
======================================
0 Chip Reset
2 Port Monitor
3 Enumeration
4 Read HC Registers
5 Mouse
6 Register Read/Write Test
7 BMAT Bitmapped Memory Analysis Tool

9 Exit

HcChipID : 0x3623

HC base address: 0x4000
HC IRQ used: 0x9
```

Figure 3-1: Main Menu of the X2 DOS Program

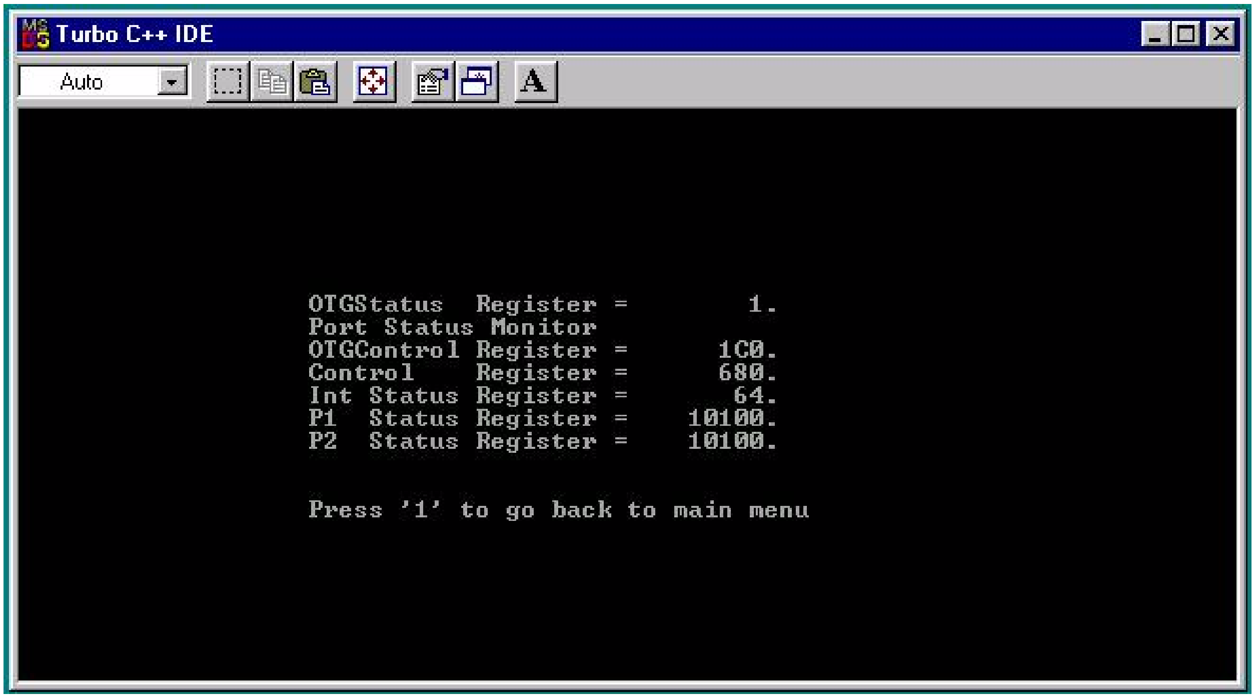
4. Menu Items

4.1. Chip Reset—[Press 0]

This routine resets the ISP1362 to its default values.

4.2. Port Monitor—[Press 2]

This routine polls the two downstream ports of the ISP1362 and displays some Host Controller and OTG registers (see Figure 4-1). If a connection is detected, it enables the port and reports on the screen whether the connected device is of full-speed (FS) or low-speed (LS) type. Press **1** to go back to the main menu.



```
OTGStatus  Register =        1.
Port Status Monitor
OTGControl Register =      1C0.
Control    Register =      680.
Int Status Register =       64.
P1  Status Register =    10100.
P2  Status Register =    10100.

Press '1' to go back to main menu
```

Figure 4-1: Port Monitor for the ISP1362

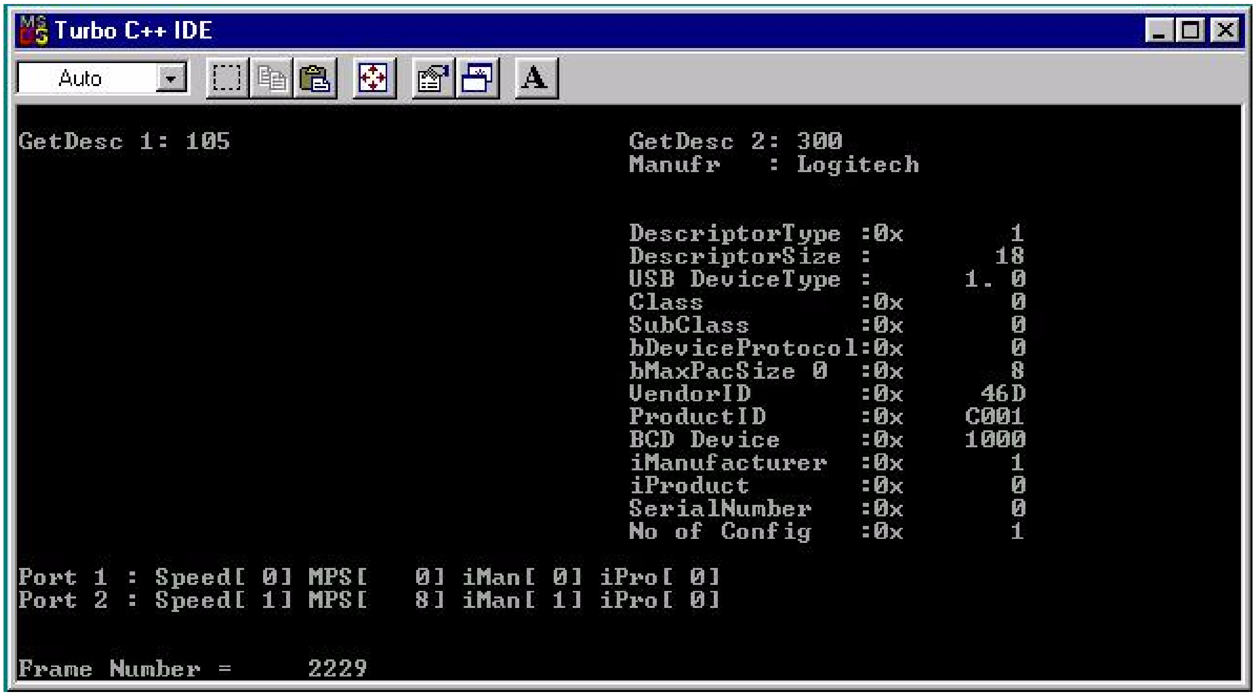
4.3. *Enumeration—[Press 3]*

This routine checks the USB device connected to any of the two downstream ports (see Figure 4-2). It gets the following information from the connected USB device, if available:

- Device Descriptor
- Configuration Descriptor
- String Descriptor for the manufacturer and product names.

To go back to the main menu, press **9**.

Note: This is **not** a complete enumeration process.

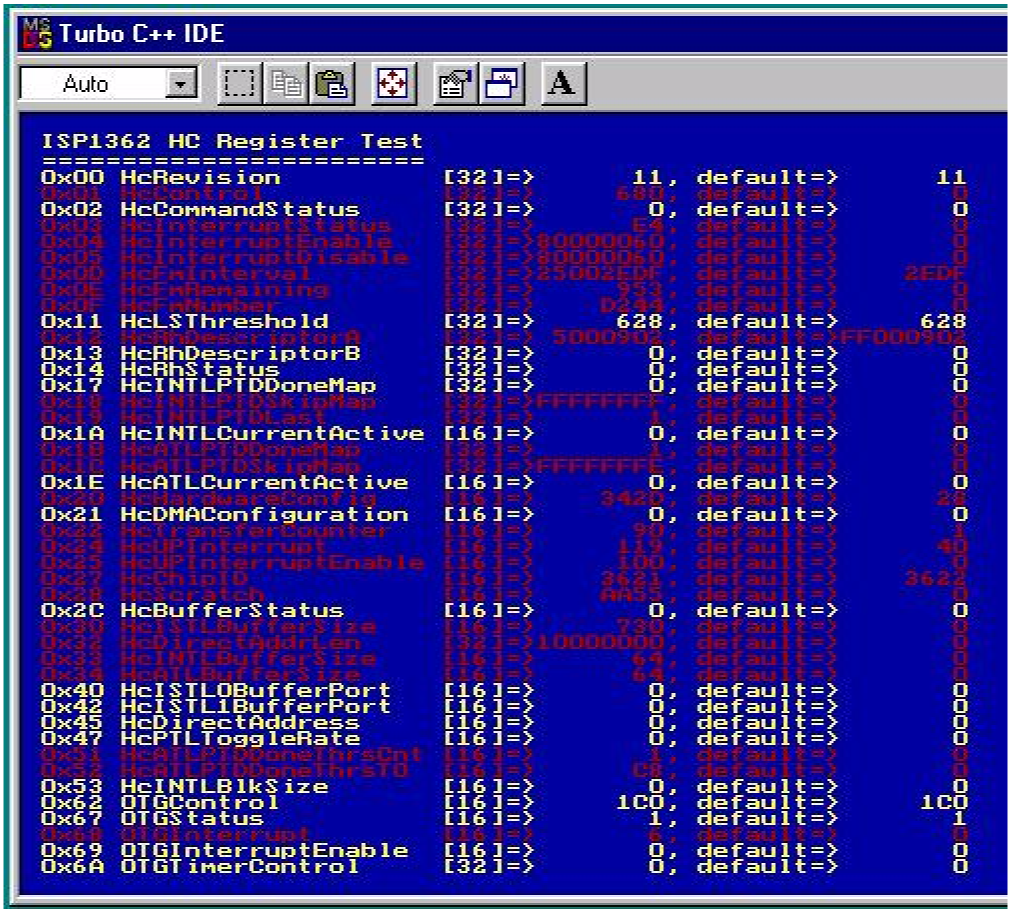


```
GetDesc 1: 105                          GetDesc 2: 300
                                        Manufr    : Logitech

                                        DescriptorType :0x       1
                                        DescriptorSize :        18
                                        USB DeviceType :      1. 0
                                        Class          :0x       0
                                        SubClass       :0x       0
                                        bDeviceProtocol:0x       0
                                        bMaxPacSize 0  :0x       8
                                        VendorID       :0x     46D
                                        ProductID      :0x    C001
                                        BCD Device     :0x    1000
                                        iManufacturer  :0x       1
                                        iProduct       :0x       0
                                        SerialNumber   :0x       0
                                        No of Config   :0x       1

Port 1 : Speed[ 0] MPS[   0] iMan[ 0] iPro[ 0]
Port 2 : Speed[ 1] MPS[   8] iMan[ 1] iPro[ 0]


Frame Number =      2229
```

Figure 4-2: Enumeration of Logitech Mouse

4.4. Read HC Registers—[Press 4]

This routine reads all the registers of the Host Controller and OTG (see Figure 4-3). If a value read in a register is different from the default value, it appears in red. If a value read is the default value, it appears in yellow. Pressing any key will return you to the main menu.



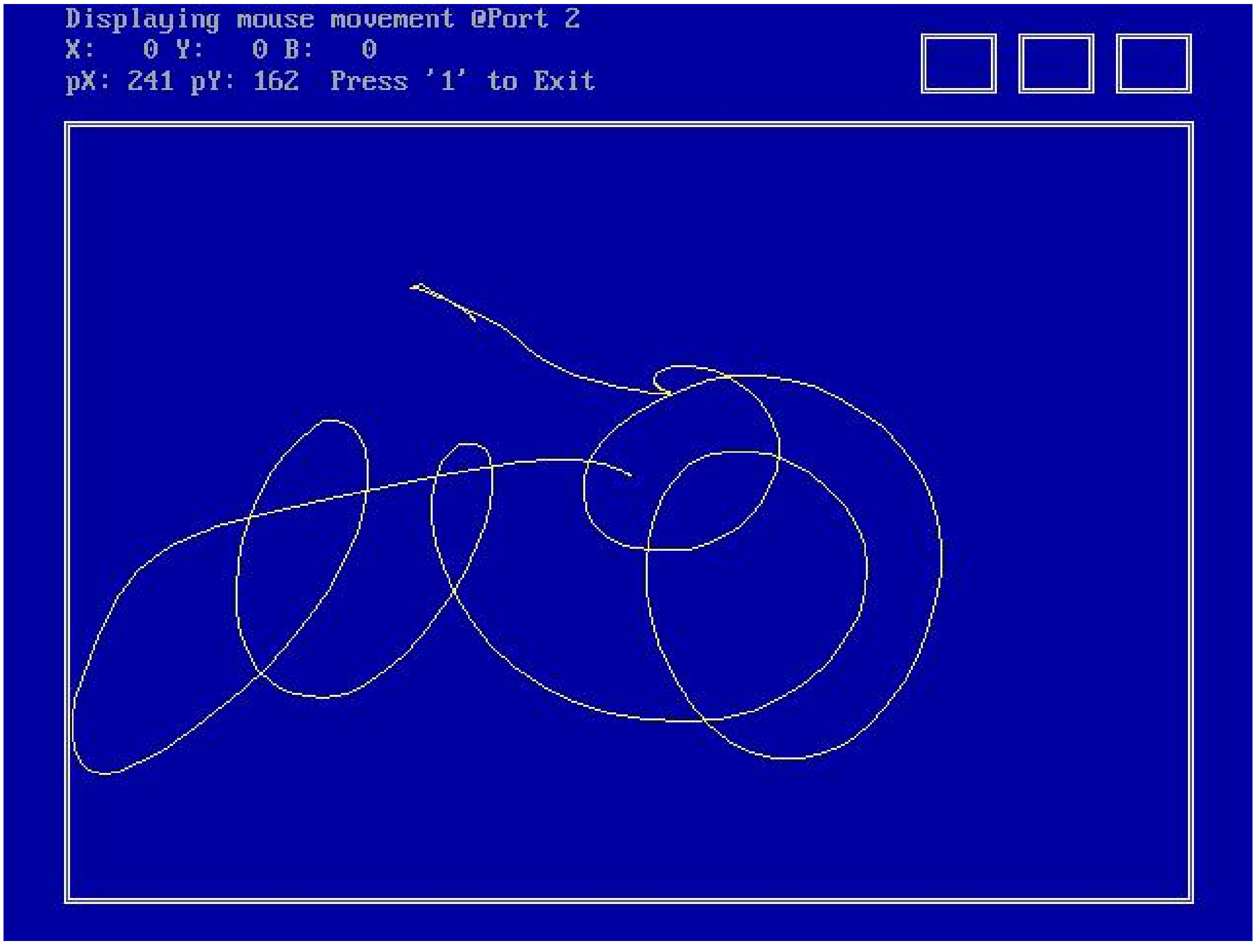
```
ISP1362 HC Register Test
========================
0x00 HcRevision          [32]=>      11, default=>      11
0x01 HcControl           [32]=>     680, default=>       0
0x02 HcCommandStatus     [32]=>       0, default=>       0
0x03 HcInterruptStatus   [32]=>      E4, default=>       0
0x04 HcInterruptEnable   [32]=>80000060, default=>       0
0x05 HcInterruptDisable  [32]=>80000060, default=>       0
0x0D HcFmInterval        [32]=>25002EDF, default=>    2EDF
0x0E HcFmRemaining       [32]=>     933, default=>       0
0x0F HcFmNumber          [32]=>    D244, default=>       0
0x11 HcLSThreshold       [32]=>     628, default=>     628
0x12 HcRhDescriptorA     [32]=> 5000902, default=>FF000902
0x13 HcRhDescriptorB     [32]=>       0, default=>       0
0x14 HcRhStatus          [32]=>       0, default=>       0
0x17 HcINTLPTDDoneMap    [32]=>       0, default=>       0
0x18 HcINTLPTDSkipMap    [32]=>FFFFFFFF, default=>       0
0x19 HcINTLPTDLast       [32]=>       1, default=>       0
0x1A HcINTLCurrentActive [16]=>       0, default=>       0
0x1B HcATLPTDDoneMap     [32]=>       1, default=>       0
0x1C HcATLPTDSkipMap     [32]=>FFFFFFFE, default=>       0
0x1E HcATLCurrentActive  [16]=>       0, default=>       0
0x20 HcHardwareConfig    [16]=>    3420, default=>      28
0x21 HcDMAConfiguration  [16]=>       0, default=>       0
0x22 HcTransferCounter   [16]=>      90, default=>       1
0x24 HcuPInterrupt       [16]=>     119, default=>      40
0x25 HcuPInterruptEnable [16]=>     100, default=>       0
0x27 HcChipID            [16]=>    3621, default=>    3622
0x28 HcScratch           [16]=>    AA55, default=>       0
0x2C HcBufferStatus      [16]=>       0, default=>       0
0x30 HcISTLBufferSize    [16]=>     730, default=>       0
0x32 HcDirectAddrLen     [32]=>10000000, default=>       0
0x33 HcINTLBufferSize    [16]=>      64, default=>       0
0x34 HcATLBufferSize     [16]=>      64, default=>       0
0x40 HcISTL0BufferPort   [16]=>       0, default=>       0
0x42 HcISTL1BufferPort   [16]=>       0, default=>       0
0x45 HcDirectAddress     [16]=>       0, default=>       0
0x47 HcPTLToggleRate     [16]=>       0, default=>       0
0x51 HcATLPTDDoneThrsCnt [16]=>       1, default=>       0
0x52 HcATLPTDDoneThrsTO  [16]=>      C8, default=>       0
0x53 HcINTLBlkSize       [16]=>       0, default=>       0
0x62 OTGControl          [16]=>     1C0, default=>     1C0
0x67 OTGStatus           [16]=>       1, default=>       1
0x68 OTGInterrupt        [16]=>       6, default=>       0
0x69 OTGInterruptEnable  [16]=>       0, default=>       0
0x6A OTGTimerControl     [32]=>       0, default=>       0
```

Figure 4-3: Reading ISP1362 Registers

4.5. *Mouse—[Press 5]*

Before running this program, you must first connect a mouse to one of the two downstream ports. On activation, it tries to enumerate the connected mouse, and subsequently, switches into a graphical screen to display the movement of the mouse (see Figure 4-4). Pressing the mouse buttons will cause the respective three squares at the upper-right corner of the screen to light up.

Note: This routine does not check for the presence of the mouse. It simply assume that the mouse is connected. To exit this routine, press **1**.

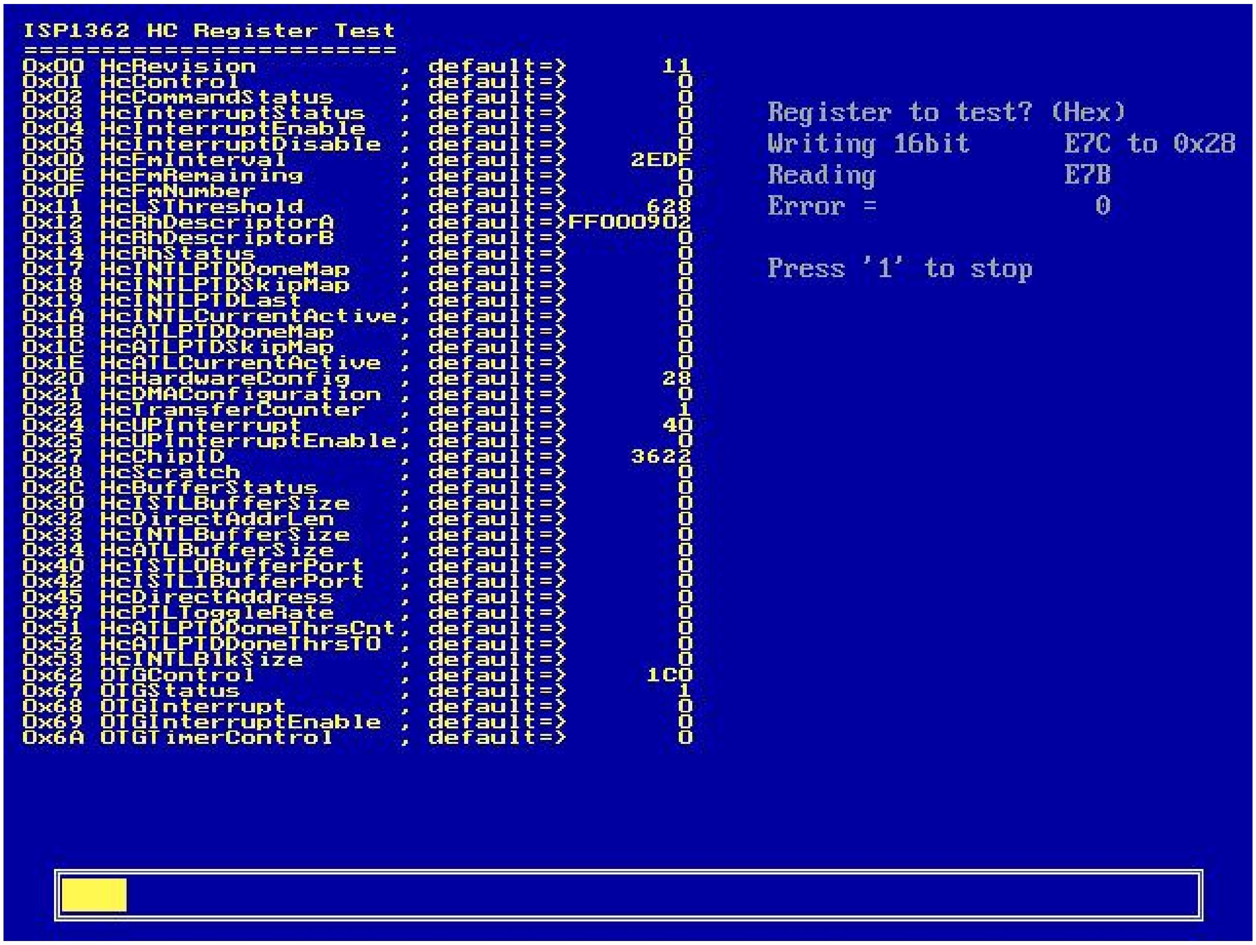


```
Displaying mouse movement @Port 2
X:   0 Y:   0 B:   0
pX: 241 pY: 162  Press '1' to Exit
```

Figure 4-4: Movement of Mouse

4.6. *Register Read/Write Test—[Press 6]*

This routine tests specific Host Controller and OTG registers. A common register to test is the HcScratch register (0x28). Typing **28** and pressing the **Enter** key would indicate the writing and reading of a sequential incremental 16-bit value to the HcScratch register. To stop this test and return to the main menu, press **1**.



```
ISP1362 HC Register Test
========================
0x00 HcRevision         , default=>      11
0x01 HcControl          , default=>       0
0x02 HcCommandStatus    , default=>       0
0x03 HcInterruptStatus  , default=>       0
0x04 HcInterruptEnable  , default=>       0
0x05 HcInterruptDisable , default=>       0
0x0D HcFmInterval       , default=>    2EDF
0x0E HcFmRemaining      , default=>       0
0x0F HcFmNumber         , default=>       0
0x11 HcLSThreshold      , default=>     628
0x12 HcRhDescriptorA    , default=>FF000902
0x13 HcRhDescriptorB    , default=>       0
0x14 HcRhStatus         , default=>       0
0x17 HcINTLPTDDoneMap   , default=>       0
0x18 HcINTLPTDSkipMap   , default=>       0
0x19 HcINTLPTDLast      , default=>       0
0x1A HcINTLCurrentActive, default=>       0
0x1B HcATLPTDDoneMap    , default=>       0
0x1C HcATLPTDSkipMap    , default=>       0
0x1E HcATLCurrentActive , default=>       0
0x20 HcHardwareConfig   , default=>      28
0x21 HcDMAConfiguration , default=>       0
0x22 HcTransferCounter  , default=>       1
0x24 HcUPInterrupt      , default=>      40
0x25 HcUPInterruptEnable, default=>       0
0x27 HcChipID           , default=>    3622
0x28 HcScratch          , default=>       0
0x2C HcBufferStatus     , default=>       0
0x30 HcISTLBufferSize   , default=>       0
0x32 HcDirectAddrLen    , default=>       0
0x33 HcINTLBufferSize   , default=>       0
0x34 HcATLBufferSize    , default=>       0
0x40 HcISTL0BufferPort  , default=>       0
0x42 HcISTL1BufferPort  , default=>       0
0x45 HcDirectAddress    , default=>       0
0x47 HcPTLToggleRate    , default=>       0
0x51 HcATLPTDDoneThrsCnt, default=>       0
0x52 HcATLPTDDoneThrsTO , default=>       0
0x53 HcINTLBlkSize      , default=>       0
0x62 OTGControl         , default=>     1C0
0x67 OTGStatus          , default=>       1
0x68 OTGInterrupt       , default=>       0
0x69 OTGInterruptEnable , default=>       0
0x6A OTGTimerControl    , default=>       0
```

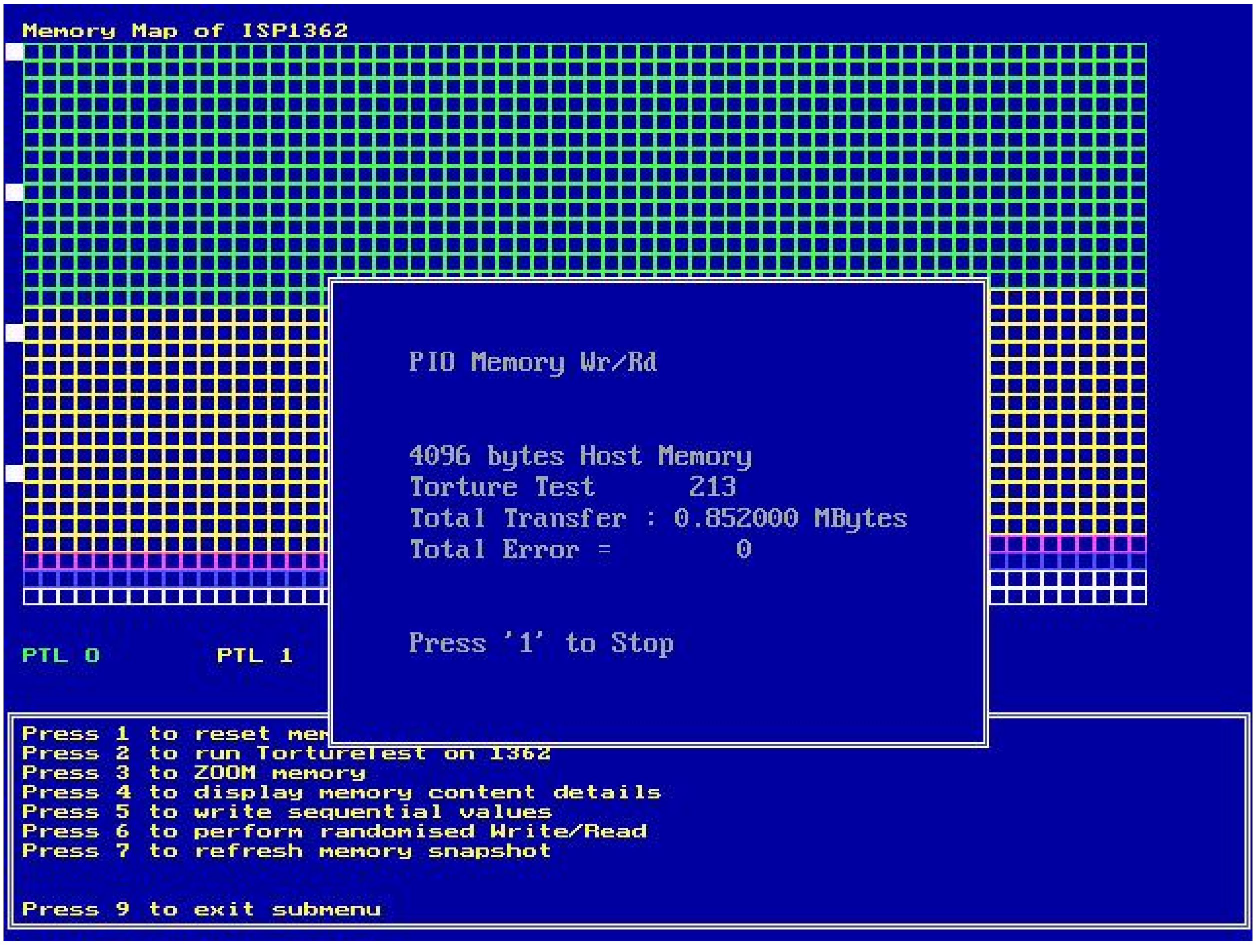
```
Register to test? (Hex)
Writing 16bit       E7C to 0x28
Reading             E7B
Error =               0

Press '1' to stop
```

Figure 4-5: Read Write of the HcScratch Register

4.7. *BMAT Bitmapped Memory Analysis Tool—[Press 7]*

This routine is useful for checking the memory transfer of the ISP1362. Pressing various keys on the keyboard perform different memory transfer checks as given in the following table.

Key Press	Memory Transfer Check
1	Resets the memory
2	PIO memory WR/RD (The memory is written, read and verified for errors in the PIO memory transfer.)
4	Displays the memory content of the memory map
5	Writes sequential values to the memory
6	Performs a randomized write/read
7	Refreshes the memory snapshot
9	Exits and return to the main menu



```
Memory Map of ISP1362

PTL 0          PTL 1
```

```
PIO Memory Wr/Rd

4096 bytes Host Memory
Torture Test        213
Total Transfer : 0.852000 MBytes
Total Error =         0

Press '1' to Stop
```

```
Press 1 to reset mem
Press 2 to run TortureTest on 1362
Press 3 to ZOOM memory
Press 4 to display memory content details
Press 5 to write sequential values
Press 6 to perform randomised Write/Read
Press 7 to refresh memory snapshot

Press 9 to exit submenu
```

Figure 4-6: PIO Write, Read and Verify, or Memory Transfer

4.8. Exit—[Press 9]

To exit the DOS program, press **9**.

5. Notes

- The aim of this evaluation kit is to demonstrate ISP1362 functionality through some basic USB operations. It does not represent the optimal way of programming the ISP1362.
- The X2 program does not use any hardware interrupts for operation.
- This program is compiled with Borland® Turbo C Ver. 3.00.
- The two most important low-level access files are:
    - reg.c
    - buf_man.c.

  The reg.c file provides the register access routines. These routines must be modified if a different hardware platform is used. The buf_man.c s file provides buffer management routines.

  The file usb.c provides the USB level routines, such as GetDescriptor. A good understanding of the USB protocol is necessary to modify this part of the code.

6. References

- *ISP1362 Single-chip Universal Serial Bus On-The-Go controller*
- *Universal Serial Bus Specification Rev. 2.0* (full-speed and low-speed sections)
- *On-The-Go Supplement to the USB 2.0 Specification Rev. 1.0*
- *ISP1362 PCI Evaluation Kit User's Guide.*