Easy Technical Guide to Understand PC Motherboard, Troubleshoot Problems and Its Repair: PART – II

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ABSTRACT: With the technological advancement the use of computers in our day to day life is indispensible. In the first part of this paper series different VRM circuits of Integrated Motherboard was discussed in detail. The fault finding of VRM circuit and its remedies was also described. In the second part of this paper series Input / Output controller block of the motherboard is discussed thoroughly. The hands on practical experience to Test and Troubleshoot various sections of I/O controller block are described.

KEYWORDS: Computer, Motherboard, I/O controller, Keyboard, Floppy Drive.

I. INTRODUCTION

Today's world would be incomplete without computers. There are very few activities which do not need usage of computers. Educational Institutions, commercial establishment, health care, Government and individuals use computers in one way or other. Now a days with fast development in the branches of computer engineering and information technology the ultimate use of computer became a necessity in our day to day life. Hence, there is a crucial need to have easy and correct fault diagnosis of computers.

This paper purports to address the inevitable in life when we deal with equipments: getting a faulty equipment to work. The paper suggests preventive and corrective maintenance methods for PCs that one often comes across when posing a maintenance personnel.

Since last few decades troubleshooting of Personal computers has received much attention. To get easy diagnosis of PCs, now a days lot of practical and theoretical aspects have been understood and experimented.

In the first part of this paper series different VRM circuits of Integrated Motherboard was discussed in detail. The fault finding of VRM circuit and its remedies was also described [1].

In the second part of this paper details of Input / Output Controller block, its pin configuration, trouble shooting and testing of various sections of I/O controller block is described.

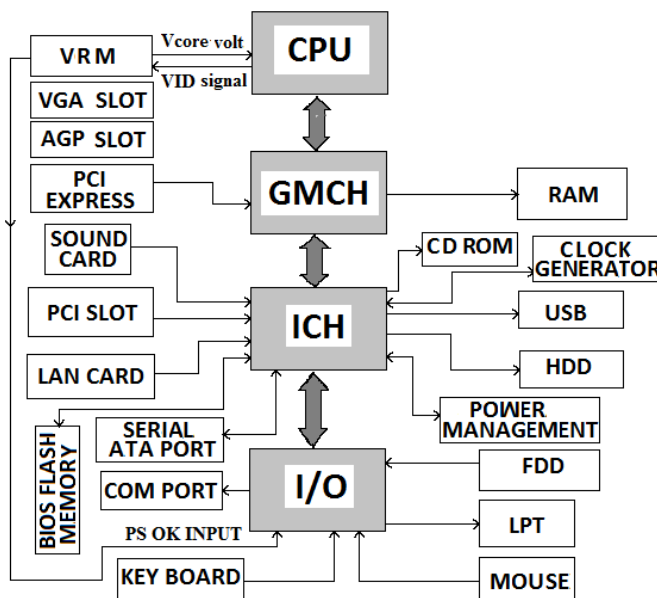The block diagram of Integrated Mother board is as shown in Fig.1

Fig.1 Block Diagram of Integrated Motherboard

II. DETAILS OF SUPER I/O CONTROLLER BLOCK

The main function of this block is to control Key-board, Mouse, Parallel Port, COM Port (RS 232), FDD Port, ACPI Interface Section etc. Super I/O controller IC is used to control and perform all the functions. This is a 128 Pin IC. Different companies like ITE, Winbond, SMBC, SMBD are pioneering in fabrication of this IC[2]. The internal block diagram of I/O controller IC W83627DHG is as shown in Fig.2.
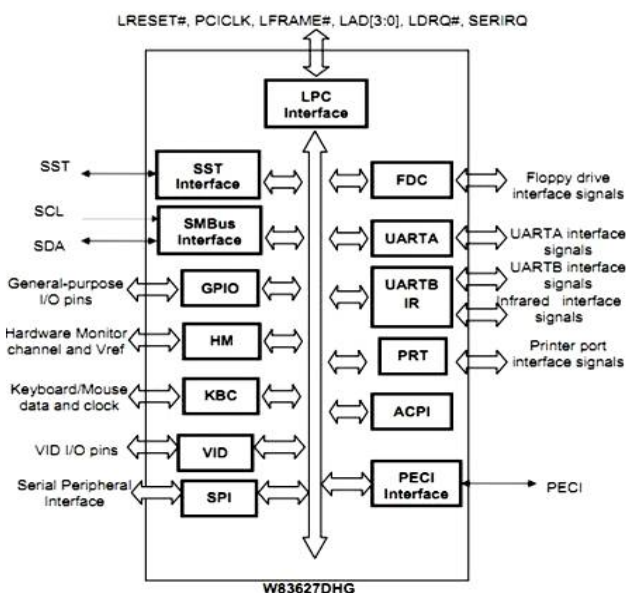

Fig.2 Internal Block Diagram of I/O Controller

Brief description of this IC (128 Pins) is as follows. It consists of total main eleven Sections[3].

(1) FDC Interface Section (Pin No.1 to 16) :

The main function of this section is to control 34 pin Floppy Drive and to transfer data serially from the Floppy Drive. Through various pins of this section the spindle and slide Motor which is inside the Floppy Drive can be switched ON/OFF.

(2) LPC Interface Section (Pin No.18 to 22) :
This section controls all the sections of Input /Output controller so that this IC comes in function.

(3) Direct Memory Access (DMA) (Pin No. 23 to 30):

With the help of DMA the data transfer from any storage device can be done without the use of CPU. Means it just bypasses the CPU for data transfer.

(4) Multimode Parallel Port Section (Pin No.31 to 48) :

To this port Parallel and Serial device is connected which transfers the data to and forth. The parallel and serial devices can be connected if multifunction parallel port is used. But if only parallel port is used one can make use of only parallel device. P-I to P-III motherboard uses Parallel Port where as P-III, P-IV, P-V motherboard uses multifunction Parallel Port. Fig. 3 Shows the connection of Parallel port with I/O controller IC.
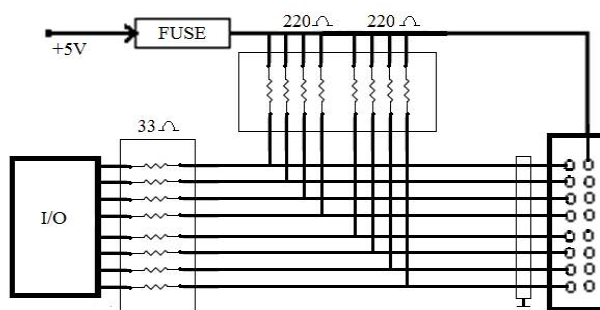

Fig.3 Parallel port with I/O controller IC

(5) Communication Interfacing Section (Pin No.49 to 57 & Pin No. 78 to 85) :

The main function of this section is to control series communication devices like MODEM, LAN Card etc. and to transfer data to and fro.

(6) Key- Board Interface Section (Pin No.58 to 60 and Pin No. 62,63,65,66) :
This section transfers the data through Normal and PS2 keyboard as well as PS2 Mouse. Fig. 4 shows the circuit of Keyboard and Mouse Interface[4].

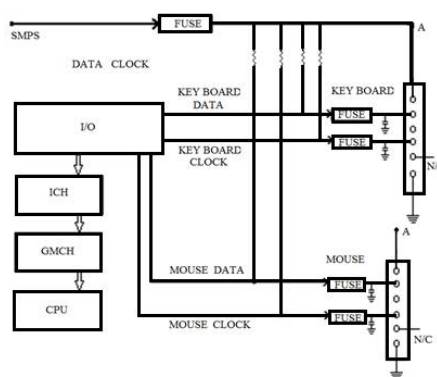# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Fig.4 Keyboard and Mouse Interface

(7) ACPI (Advance Control Power Interface) section (Pin No.67,68,74,76) :
The main function of ACPI is to control standby section of Input / Output controller. The 5V supply (Violet Wire) from SMPS is used to switch ON this section. It is also in function during system ON or system shutdown.

(8) General Purpose Input / Output Port :

- Pin No.64 : Suspend indication available during system Suspend.
- Pin No.69 : This is an Infrared Receive Data Output pin.
- Pin No.70 : Output pin of Reset Signal used to Restart the system.
- Pin No.72 : Output pin of Power O.K. signal used to make SMPS continue ON.
- Pin No.73 : Input pin of chipset suspend signal.
- Pin No.87 : Output pin for Infrared transfer Signal.
- Pin No.88 : Input pin for Infrared Receive Signal.
- Pin No.89 : Watch Dog Time Output pin used to send system in standby mode.
- Pin No.90 : Output pin of Power LED indication.
- Pin No.91 : This is a Bit 1 Input Output pin of Port - 2. This pin is used to give serial clock pulse as an input.
- Pin No.92 : It is a Bit 2 Input Output pin.

(9) Hardware Monitoring Interface Section(Pin No.:94 to 96, 98 to 113,Pin No.115,116,118):

This is used for HT (Hyper Threading Technology Base Mother board). The main function of this section is to Sense and Display the Temperature of CPU, CPU core voltage, System Volt or system current. During CPU Over Temperature or High Voltage/ Low Voltage it makes the system Auto Shutdown so that CPU is not damaged thereby making CPU secure.

(10) Game Port, Joy Stick Port, MIDI Port(Pin No.119 to 128):
* Pin No.119 : Serial Data Input pin of MIDI Port 2
* Pin No.120 : Serial Data Output Pin of MIDI Port.
* Pin No.121 to 128 : Used for Joystick. It can also be used for Bit to Bit data Input – Output.

(11) Power Division Section :
* Pin No : 12,48,77,114 : These are Positive Input Supply pins of digital section of I/O controller IC.
   5V supply is applied to these pins.
* Pin No. 61: This is a Positive Input supply pin of stand by section. From SMPS, to this pin standby voltage of
   5V (Violet wire) is given.
* Pin No. 28: This pin is Input supply pin of Host Interface section which requires 3.3V supply.

* Pin No. 97: This is a Positive Input Supply pin of Analog Section which uses 5V supply.
* Pin No. 17,20,55,86: These are negative Input pins of all sections of IC. These pins are connected to GND.

III. TESTING AND FAULT FINDING OF VARIOUS SECTIONS

The troubleshooting of different sections is described as below [5].

(1) FDC Interface Section :

This section is checked when we connect Floppy Drive and if it is not detected.
If FDD cable and Floppy Disk Drive is correct check this section as following.

(i)   First in CMOS set up enable Drive A, Drive B as 1.44 MB or according to Floppy Drive.
(ii)   If in CMOS set up, setting is correct then check Drive select pin of Floppy Drive. It should be low.
(iii)   If High is available on this pin then check status (for Low) on DSA pin of I/O controller.
(iv)   If DSA pin is low then check for Track open between I/O controller and FDD connector.
(v)   If DSA pin is High and even if Floppy Drive is not detected then there may be a problem with I/O controller IC. Replace it.
(vi)   If After connecting Disk, during writing Write Protect Messages is available, then check High on WP pin of IC. If this pin is low, then check for Network Resistance OPEN.
(vii)   If this pin is High, then also WP message is available, I/O controller IC is faulty. Replace it.

(2) Parallel Port Section :

When Parallel Device is connected to parallel Port and if it is not working, this section has to be checked.

(i)   First check for Parallel Port Enable in CMOS set up.
(ii)   Then check for Mode ECP, EPP of Parallel Port .
        Set auto function to Auto in CMOS set up.
(iii)   If CMOS setting is correct check for Low on PNF pin of IC.
        If high is available through PNF: Parallel Port, Printer cable or Printer may be faulty.
(iv)   If PNF pin is low then check logic on PD0 to PD7 pins. If it is o.k., even if Parallel Device is not detected, I/O controller IC may be faulty.

(3) Key Board Interface Section :

If during Power ON Display is available but Keyboard or PS2 mouse is not working, this section can be checked in following manner.

(i)   First check Key Board Connector for OPEN or Loose.
(ii)   If it is O.K. then check for 5 Volt on Vcc pin.
(iii)   If supply is not available, then check Jumper of supply line for OPEN.
(iv)   If Jumper is connected between 2 & 3, connect it between 1 and 2.
(v)   Now if also supply is not coming, check for FUSE OPEN connected to pin 2.
(vi)   If FUSE is O.K., check for coil
(vii)   If supply is available, check for GND on Ground Supply pin of connector.
(viii) If Ground supply is O.K., still if Key Board is not working, then check for 4.5 V supply on Key Board Data or Clock pin.
(ix)   If supply is O.K. but still Key Board is not working, I/O controller IC is faulty. Replace it.

(4) Hardware Monitoring Interface Section :
This section is checked when during Power On, Display is available but system is hanging on Post screen or system frequently restarts by giving message of Overheat.

(i)   If during Power on,system hangs on system post screen, then before Post screen Press CMOS

enter Key.

(ii) If in CMOS Set up also system Hang is available then VRM section or CPU may be faulty.

(iii) If in CMOS Set up, there is no system hang, then problem with Motherboard or thermal diode of CPU. Change for thermal diode short.

IV. CONCLUSION

The details of I/O controller block of Integrated Motherboard is presented..The functions of individual section of this I/O controller block are described. Troubleshooting and Testing of various faults of these sections are suggested and concluded for easy repair and maintenance.

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