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## 4. Troubleshooting

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### 4-1. General spec

#### Tools used for repairing the product

- System Diagnostics Disk
- MS-DOS Booting Disk
- System Diagnostics Card
- Screwdrivers (+,-)
- Tweezers
- Multi-meter
- Oscilloscope
- Logic Analyzer

#### Replaceable unit (FRU: Field Replaceable Unit)

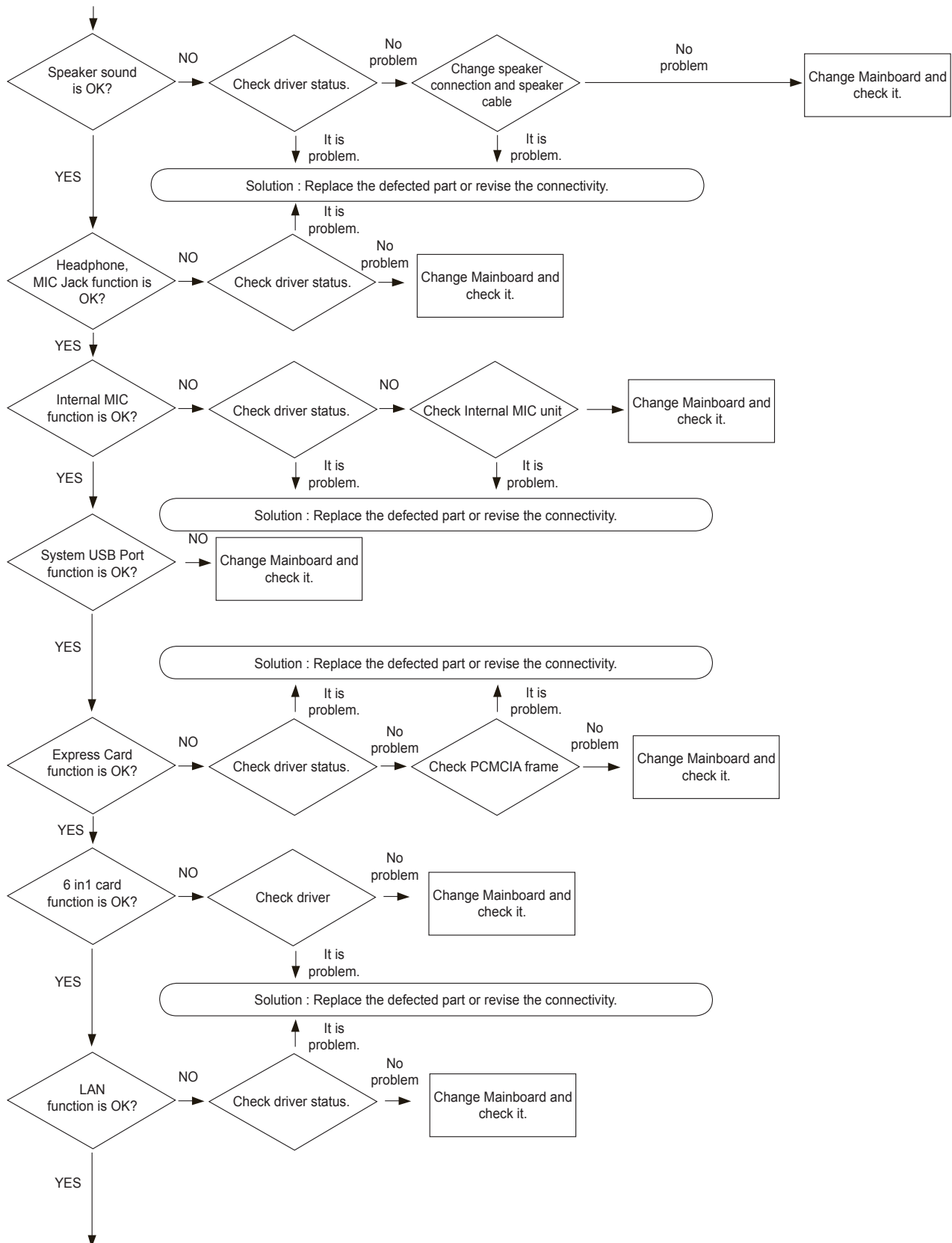
- DDR2 RAM Module
- 2.5" SATA HDD
- ODD – Super multi Dual layer drive or DVD Combo Drive or Etc.
- Wireless LAN Module
- Bluetooth Module (Option)
- MDC Module (Option)
- Key Board
- System Fan
- Touch Pad
- LCD Panel
- LCD Inverter
- Main Board
- Express Card Frame
- Harness Cable-Touchpad FFC, MDC Cable (On board), MDC Cable (To RJ11), Bluetooth Cable, LCD Cable,  
Wireless LAN Antenna 3 types, Camera cable, DMB Antenna

## 4. Troubleshooting

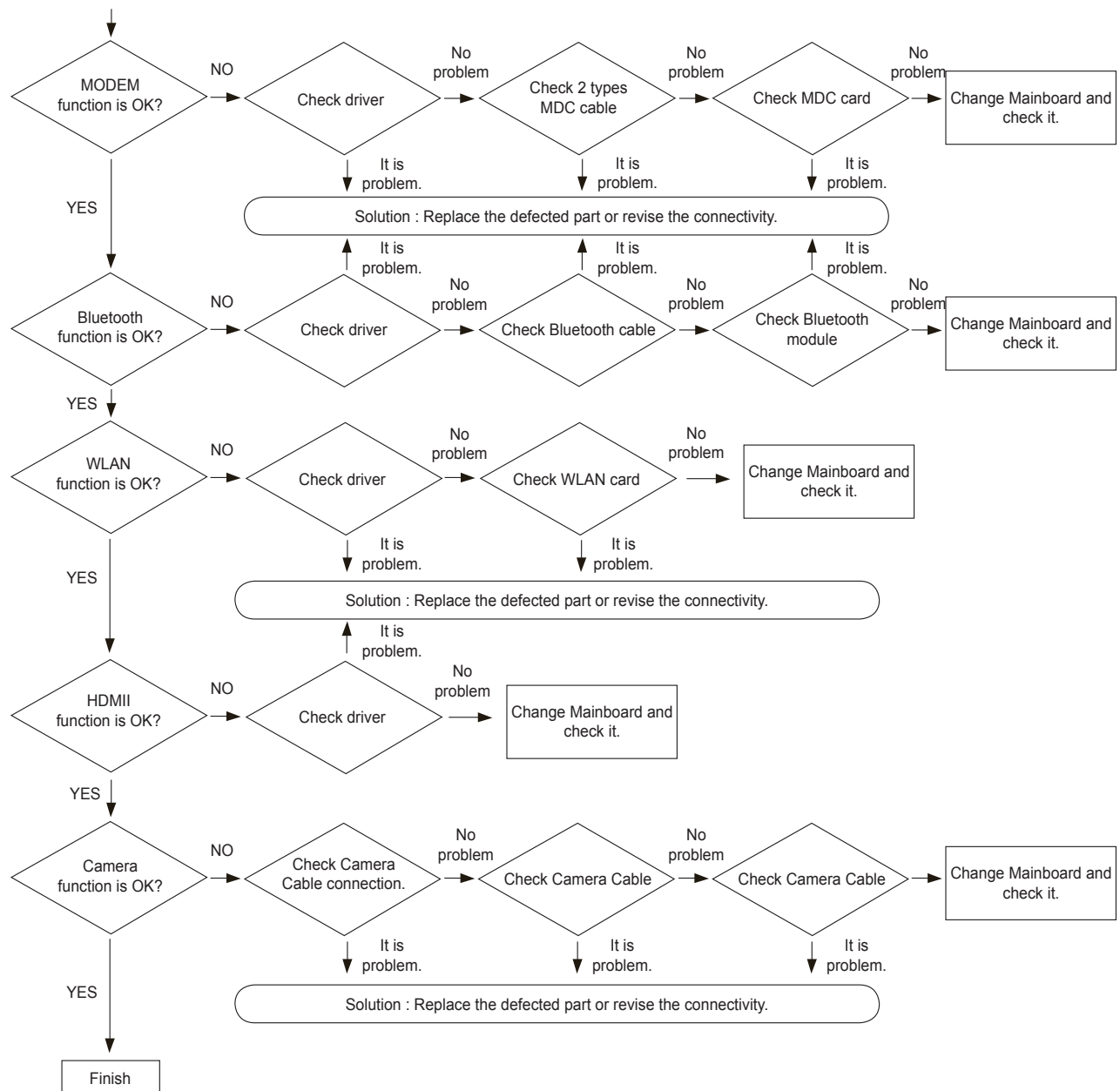
### 4-2. Debugging Flow Chart



## 4. Troubleshooting



## 4. Troubleshooting



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### 4-3. System Diagnosis

#### System Diagnostics Card

The Diagnostics Card shows the system operations during the POST (Power On Self Test) in a 2 digit hexadecimal number by connecting the cable to the 10 pin connector below the PCMCIA slot after separating the Top part. The card is used to evaluate the reason for the malfunction without disassembling the system when the system malfunctions and to test if the system operates normally after replacing a defective FRU.

#### Chipset POST Codes Table

POST Code	Function	Phase	Component
0xA0	MRC Entry	PEI	chipset/MRC
0x01	Enable MCHBAR	PEI	chipset/MRC
0x02	Check ME existence	PEI	chipset/MRC
0x03	Check for DRAM initialization interrupt and reset fail	PEI	chipset/MRC
0x04	Determine the system Memory type based on first populated socket	PEI	chipset/MRC
0x05	Verify all DIMMs are DDR2 and SO-DIMMS, which are unbuffered	PEI	chipset/MRC
0x06	Verify all DIMMs are Non-ECC	PEI	chipset/MRC
0x07	Verify all DIMMs are single or double sided and not mixed	PEI	chipset/MRC
0x08	Verify all DIMMs are x8 or x16 width	PEI	chipset/MRC
0x09	Calculate number of Row and Column bits	PEI	chipset/MRC
0x10	Calculate number of banks for each DIMM	PEI	chipset/MRC
0x11	Determine raw card type	PEI	chipset/MRC
0x12	Find a common CAS latency between the DIMMS and the MCH	PEI	chipset/MRC
0x13	Determine the memory frequency and CAS latency to program	PEI	chipset/MRC
0x14	Determine the smallest common timing value for all DIMMS	PEI	chipset/MRC
0x17	Power management resume	PEI	chipset/MRC
0x18	Program DRAM type (DDR2/DDR3) and Power up sequence	PEI	chipset/MRC
0x19	Program the correct system memory frequency	PEI	chipset/MRC
0x20	Program the correct Graphics memory frequency	PEI	chipset/MRC
0x21	Early DRC initialization	PEI	chipset/MRC
0x22	Program the DRAM Row Attributes and DRAM Row Boundary registers PRE JEDEC.b	PEI	chipset/MRC
0x23	Program the RCOMP SRAM registers	PEI	chipset/MRC
0x24	Program DRAM type (DDR2/DDR3) and Power up sequence	PEI	chipset/MRC
0x25	Program the DRAM Timing	PEI	chipset/MRC
0x26	Program the DRAM Bank Architecture register	PEI	chipset/MRC
0x27	Enable all clocks on populated rows	PEI	chipset/MRC
0x28	Program MCH ODT	PEI	chipset/MRC
0x29	Program tRD	PEI	chipset/MRC
0x30	Miscellaneous Pre JEDEC steps	PEI	chipset/MRC
0x31	Program clock crossing registers	PEI	chipset/MRC
0x32	Program the Egress port timings	PEI	chipset/MRC
0x33	Program the Memory IO registers	PEI	chipset/MRC
0x34	Perform steps required before JEDEC	PEI	chipset/MRC
0x35	Perform JEDEC memory initialization for all memory rows	PEI	chipset/MRC
0x36	Setup DRAM control register for normal operation and enable	PEI	chipset/MRC

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POST Code	Function	Phase	Component
0x37	Do ZQ calibration for DDR3	PEI	chipset/MRC
0x38	Perform final Dra/Drb programming, Set the mode of operation for the memory channels	PEI	chipset/MRC
0x39	Set Enhanced addressing mode for each channel	PEI	chipset/MRC
0x40	Perform steps required after JEDEC init	PEI	chipset/MRC
0x41	Program the receive enable reference timing control register	PEI	chipset/MRC
0x42	Post receive enable initialization	PEI	chipset/MRC
0x43	Enable sense amps. Reset read/write DQS pointers	PEI	chipset/MRC
0x44	Perform ME steps	PEI	chipset/MRC
0x45	Clear DRAM initialization bit in the ICH.	PEI	chipset/MRC
0x46	Program Thermal Management	PEI	chipset/MRC
0x47	Program TS on DIMM	PEI	chipset/MRC
0x48	Program TS on Board	PEI	chipset/MRC
0xAF	Exit MRC	PEI	chipset/MRC
0xE0	#define MEM_ERR_BAD_DIMM (S11)	PEI	chipset/MRC
0xE1	#define MEM_ERR_ECC_DIMM (S06)	PEI	chipset/MRC
0xE2	#define MEM_ERR_SIDES (S07)	PEI	chipset/MRC
0xE3	#define MEM_ERR_WIDTH (S08, S10)	PEI	chipset/MRC
0xE4	#define MEM_ERR_TRFC (FindTrasTrpTrcd)	PEI	chipset/MRC
0xE5	#define MEM_ERR_CAS_LATENCY (S12, S13)	PEI	chipset/MRC
0xE6	#define MEM_ERR_REFRESH (ProgDrt )	PEI	chipset/MRC
0xE7	#define MEM_ERR_BL8 (S14)	PEI	chipset/MRC
0xE9	#define MEM_ERR_FREQUENCY (findTCLTacTClk, S13, S12, ProgramGraphicsFrequency, ProgMchOdt, GetPlatformData)	PEI	chipset/MRC
0xEA	#define MEM_ERR_SIZE (S14)	PEI	chipset/MRC
0xEC	#define MEM_ERR_TRAS (FindTrasTrpTrcd)	PEI	chipset/MRC
0xED	#define MEM_ERR_TRP (FindTrasTrpTrcd)	PEI	chipset/MRC
0xEE	#define MEM_ERR_TRCD (FindTrasTrpTrcd)	PEI	chipset/MRC
0xEF	#define MEM_ERR_TWR (FindTrasTrpTrcd)	PEI	chipset/MRC
0xF0	#define MEM_ERR_RCVEN_FINDLOW (CalibrateRcvenForGroup)	PEI	chipset/MRC
0xF1	#define MEM_ERR_RCVEN_FINDEdge (CalibrateRcvenForGroup)	PEI	chipset/MRC
0xF2	#define MEM_ERR_RCVEN_FINDPREAMBLE (CalibrateRcvenForGroup)	PEI	chipset/MRC
0xF6	#define MEM_ERR_RCVEN_PREAMBLEEDGE (CalibrateRcvenForGroup)	PEI	chipset/MRC
0xF3	#define MEM_ERR_RCVEN_FINDCENTER (CalibrateRcvenForGroup)	PEI	chipset/MRC
0xF4	#define MEM_ERR_TYPE (S11, S04)	PEI	chipset/MRC
0xF5	#define MEM_ERR_RAWCARD (S11)	PEI	chipset/MRC
0xFA	#define MEM_ERR_SFF (ProgWrioDll)	PEI	chipset/MRC
0xFB	#define MEM_ERR_THERMAL (ProgramThrottling)	PEI	chipset/MRC
0xA0xx	Launch BIOS ACMSclean	PEI	chipset/TXT
0xA4xx	Launch BIOS ACMScheck	PEI	chipset/TXT
0xE5	Wait for ME ready	DXE	HECI/iAMT
0xE6	ME Ready	DXE	HECI/iAMT

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**Core POST Codes Table**

POST Code	Function	Phase	Component
0x00	Early Microcode update for CAR	CEI / SEC	Core
0x01	Enable CAR	CEI / SEC	Core
0x02	CAR Done, initial stack	CEI / SEC	Core
0xEE	unknown CPU ID to load uCode	CEI / SEC	CPU
0xEF	unknown DT CPU to load uCode	CEI / SEC	CPU
0xnn	File count found in a volume	PEI	Core
0x11	Debug Test driver for debug test PPI 1 (If install debugTest driver)	PEI	Core
0x22	Debug Test driver for debug test PPI 2 (If install debugTest driver)	PEI	Core
0x33	Debug Test driver for debug test PPI 3 (If install debugTest driver)	PEI	Core
0x44	Entry point of loadfile	PEI	Core
0x88	Entry point of apMuLoader	PEI	Core
0x80	A PEIM found	PEI	Core
0x82	PEIM not dispatched yet	PEI	Core
0x84	PEIM satisfies depex	PEI	Core
0x86	Image loaded but fail on security	PEI	Core
0x88	Executing a PEIM	PEI	Core
0x8A	Processing notify event for newly installed PPI	PEI	Core
0x8C	Handing off to next phase (DXE)	PEI	Core
0x8F	Fail to hand off to next phase, system halt	PEI	Core
0x90	All.PEIM.dispatched!.Going.to.DxeIpl.	PEI	Core
0xCC	AP Micro-code update	PEI	Core
0x20	S3 resume entry	S3 resume	Core
0x21	Start running Boot-time bootscripts	S3 resume	Core
0x22	Start running Run-time bootscripts	S3 resume	Core
0x23	End of S3 resume, jump back to Waking vector	S3 resume	Core
0x80	Initialize the chipset	Crisis Recovery	Core
0x81	Initialize the bridge	Crisis Recovery	Core
0x82	Initialize the CPU	Crisis Recovery	Core
0x89	Set Huge Segment	Crisis Recovery	Core
0x83	Initialize system timer	Crisis Recovery	Core
0x84	Initialize system I/O	Crisis Recovery	Core
0x88	Initialize Multi Processor	Crisis Recovery	Core
0x8A	Initialize OEM special code	Crisis Recovery	Core
0x8B	Initialize PIC and DMA	Crisis Recovery	Core
0x8C	Initialize Memory type	Crisis Recovery	Core
0x8D	Initialize Memory size	Crisis Recovery	Core
0x8F	Initialize SMM	Crisis Recovery	Core
0x90	System memory test	Crisis Recovery	Core
0x91	Initialize interrupt vectors	Crisis Recovery	Core
0x92	Initialize Run Time Clock	Crisis Recovery	Core
0x99	Initialize security	Crisis Recovery	Core
0x93	Initialize video	Crisis Recovery	Core
0x94	Output one beep	Crisis Recovery	Core
0x98	USB Initialization	Crisis Recovery	Core

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POST Code	Function	Phase	Component
0x95	Initialize the installed boot devices	Crisis Recovery	Core
0x96	Clear Huge segment	Crisis Recovery	Core
0x97	Boot Crisis Disk	Crisis Recovery	Core
0x20	DXE starts	DXE	Core
0x30	BIOSPSM	DXE	Core
0x02	BIOSBlockIO	DXE	Core
0x00	BIOSPSM Exception Handler - Divide error	BIOSPSM	Core
0x38	Cannot locate LegacyRegion DXE	BIOSPSM	Core
0xB1	ACPISupport driver Installed	DXE	Core
0xE0	BDS Entry	DXE	Core
0x07	IA32 variable driver entry	DXE	Core
0x0D	consplitter driver entry	DXE	Core
0x10	partition driver entry	DXE	Core
0x49	pciRootBridge driver entry	DXE	Core
0xC6	pciBusDriver entry	DXE	Core
0xE0	Go to legacy BIOS or BDS Entry Point	DXE	Core
0x90	Start Image	DXE	Core
0x90	Start Image Successfully	DXE	Core
0x90	Start Image Failed	DXE	Core
0x33	Debug Test driver for debug test PPI 1	DXE	Core
0x22	Debug Test driver for debug test PPI 2	PEI	Core
0x11	Debug Test driver for debug test PPI 3	PEI	Core
0x02	Invalid event # for measuring Separator Event	PEI	TCG
0x02	Invalid event # for measuring Separator Event	PEI	TCG
0x02	PCR Index over limit (PCR > 23)	PEI	TCG
0x02	TCG copy memory failed	PEI	TCG
0x09	TCG log event failed	PEI	TCG
0x09	Setup event log failed	PEI	TCG
0x12	TIS set active locality failed	PEI	TCG
0x12	TIS relinquish active locality failed	DXE	TCG
0x12	TIS wait command ready failed (prepare to send)	DXE	TCG
0x12	TIS abort 'send 'command due to timeout	DXE	TCG
0x12	TIS abort 'sendAndGo 'command due to timeout	DXE	TCG
0x04	TIS wait bit set failed before send last byte	DXE	TCG
0x12	TIS abort command due to timeout before send last byte	DXE	TCG
0x04	TIS wait bit clear failed when sending last byte	DXE	TCG
0x22	TCG Physical Presence execution	DXE	TCG
0xB1	TCG DXE common pass through	DXE	TCG
0xE3	First Legacy BIOS Task table for legacy reset	LBT	Core
0x20	Verify that DRAM refresh is operating by polling the refresh bit in PORTB.	LBT	Core
0xDA	Dummy PCIE Init entry, now handled by driver	LBT	Core
0x29	PMM (POST Memory Manager) init	LBT	Core
0xE5	WHEA init	LBT	Core
0x33	PDM (Post Dispatcher Manager) init	LBT	Core
0x01	IPMI init	LBT	Core



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POST Code	Function	Phase	Component
0xD8	ASF Init	LBT	Core
0x09	Set in-POST flag in CMOS that indicates we are in POST. If this bit is not cleared by postClearBootFlagJ (AEh), the TrustedCore on next boot determines that the current configuration caused POST to fail and uses default values for configuration. Clear the	LBT	Core
0x2B	Enhanced CMOS init	LBT	Core
0xE0	EFI Variable Init	LBT	Core
0xC1	PEM (Post Error Manager) init	LBT	Core
0x3B	Debug Service Init (ROM Polt)	LBT	Core
0xDC	POST Update Error	LBT	Core
0x3A	Autosize external cache and program cache size for enabling later in POST.	LBT	Core
0x0B	Enable CPU cache. Set bits in cmos related to cache.	LBT	Core
0x0F	Enable the local bus IDE as primary or secondary depending on other drives detected.	LBT	Core
0x10	Initialize Power Management.	LBT	Core
0x14	Verify that the 8742 keyboard controller is responding. Send a self-test command to the 8742 and wait for results. Also read the switch inputs from the 8742 and write the keyboard controller command byte.	LBT	Core
0x1A	Initialize DMA command register with these settings: 1. Memory to memory disabled 2. Channel 0 hold address disabled 3. Controller enabled 4. Normal timing 5. Fixed priority 6. Late write selection 7. DREQ sense active 8. DACK sense active low. Initialize	LBT	Core
0x22	Reset the keyboard.	LBT	Core
0x40	Test A20 line	LBT	Core
0x67	Quick initialization of all Application Processors in a multi-processor system	LBT	Core
0x32	Compute CPU speed.	LBT	Core
0x69	Initialize the handler for SMM.	LBT	Core
0x6B	If CMOS is bad, load Custom Defaults from flash into CMOS. If successful, reboot.	LBT	Core
0x3C	If CMOS is valid, load chipset registers with values from CMOS, otherwise load defaults and display Setup prompt. If Auto Configuration is enabled, always load the chipset registers with the Setup defaults (Rel 6.0).	LBT	Core
0x3D	Load alternate registers with CMOS values	LBT	Core
0x42	Initialize interrupt vectors 0 thru 77h	LBT	Core
0x46	Verify the ROM copyright notice	LBT	Core
0x45	Initialize all motherboard devices.	LBT	Core
0x49	1. Size the PCI bus topology and set bridge bus numbers. 2. Set the system max bus number. 3. Write a 0 to the command register of every PCI device. 4. Write a 0 to all 6 base registers in every PCI device. 5. Write a -1 to the status register of every PC	LBT	Core
0xC6	Initialize note dock	LBT	Core
0xC5	PnPnd dual CMOS (optional)	LBT	Core

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POST Code	Function	Phase	Component
0x48	Verify that the equipment specified in the CMOS matches the hardware currently installed. If the monitor type is set to 00 then a video ROM must exist. If the monitor type is 1 or 2 set the video switch to CGA. If monitor type 3, set the video switch to m	LBT	Core
0xD1	Initialize BIOS stack	LBT	Core
0xD3	Setup E820h and WAD memory map	LBT	Core
0x24	Set segment-register addressability to 4 GB	LBT	Core
0xCC	Redirect Int 10h to enable target board to use a remote serial video (PICO BIOS).	LBT	Core
0x8A	Initialize Extended BIOS Data Area and initialize the mouse.	LBT	Core
0x9D	Initialize Security Engine.	LBT	Core
0x55	USB Initialization	LBT	Core
0x52	Verify keyboard reset.	LBT	Core
0x54	Initialize keystroke clicker if enabled in Setup.	LBT	Core
0x76	Check status bits for keyboard-related failures. Display error messages on the screen.	LBT	Core
0x4A	Initialize all video adapters in system	LBT	Core
0x4C	Shadow video BIOS ROM if specified by Setup, and CMOS is valid and the previous boot was OK.	LBT	Core
0x59	Register POST Display Services, fonts, and languages with the POST Dispatch Manager.	LBT	Core
0x57	Initialize 1394 Firewire	LBT	Core
0xD6	Initialize PC card	LBT	Core
0x58	Test for unexpected interrupts. First do an STI for hot interrupts. Secondly, test the NMI for an unexpected interrupt. Thirdly, enable the parity checkers and read from memory, checking for an unexpected interrupt.	LBT	Core
0x3F	ROMPolit memory init	LBT	Core
0xC4	Install the IRQ vectors (Sever Hotkey)	LBT	Core
0x7C	Initialize the hardware interrupt vectors from 08 to 0F and from 70h to 77H. Also set the interrupt vectors from 60h to 66H to zero.	LBT	Core
0x41	ROM Pilot Init	LBT	Core
0x4B	Initialize QuietBoot if it is installed. Enable both keyboard and timer interrupts (IRQ0 and IRQ1). If your POST tasks require interrupts off, preserve them with a PUSHF and CLI at the beginning and a POPF at the end. If you change the PIC, preserve the e	LBT	Core
0xDE	Initialize and UNDI ROM (fro remote flash)	LBT	Core
0xC6	Initial and install console for UCR	LBT	Core
0x4E	Display copyright notice.	LBT	Core
0xD4	Get CPU branding string	LBT	Core
0x50	Display CPU type and speed	LBT	Core
0xC9	pretask before EISA init	LBT	Core
0x51	EISA Init	LBT	Core
0x5A	Display prompt "Press F2 to enter SETUP"	LBT	Core
0x5B	Disable CPU cache.	LBT	Core
0x5C	Test RAM between 512K and 640K.	LBT	Core
0x60	Determine and test the amount of extended memory available. Determine if memory exists by writing to a few strategic locations and see if the data can be read back. If so, perform an address-line test and a RAM test on the memory. Save the total extended	LBT	Core

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POST Code	Function	Phase	Component
0x62	The amount of memory available. This test is dependent on the processor, since the test will vary depending on the width of memory (16 or 32 bits). This test will also use A20 as the skew address to prevent corruption of the system memory.	LBT	Core
0x64	Jump to UserPatch1.	LBT	Core
0x66	Set cache registers to their CMOS values if CMOS is valid, unless auto configuration is enabled, in which case load cache registers from the Setup default table.	LBT	Core
0x68	Enable external cache and CPU cache if present. Configure non-cacheable regions if necessary.	LBT	Core
0x6A	Display external cache size on the screen if it is non-zero.	LBT	Core
0x6C	Display shadow message	LBT	Core
0xCA	post EISA init	LBT	Core
0x70	Check flags in CMOS and in the TrustedCore data area for errors detected during POST. Display error messages on the screen.	LBT	Core
0x72	Check status bits to see if configuration problems were detected. If so, display error messages on the screen.	LBT	Core
0x4F	Initialize MultiBoot. Allocate memory for old and new MultiBoot history tables.	LBT	Core
0xCD	Reclaim console vector after HW vectors initialized.	LBT	Core
0x7D	Initialize Intelligent System Monitoring.	LBT	Core
0x7E	The Coprocessor initialization test. Use the floating point instructions to determine if a coprocessor exists instead of the ET bit in CR0.	LBT	Core
0xC1	Check Boot Type (Server BIOS)	LBT	Core
0x80	Disable onboard COM and LPT ports before testing for presence of external I/O devices..	LBT	Core
0xCA	Redirect Int 15h to enable target board to use remote keyboard (PICO BIOS).	LBT	Core
0x88	Initialize interrupt controller.	LBT	Core
0x81	Run late device initialization routines.	LBT	Core
0x87	Initialize motherboard configurable devices.	LBT	Core
0x85	Display any ESCD read errors and configure all PnP ISA devices.	LBT	Core
0x82	Test and identify RS232 ports.	LBT	Core
0x84	Test and identify parallel ports.	LBT	Core
0x86	Initialize onboard I/O and BDA according to CMOS and presence of external devices.	LBT	Core
0x83	Configure Fisk Disk Controller.	LBT	Core
0xCE	Initialize digitizer device and display installed message if successful.	LBT	Core
0x89	Enable non-maskable interrupts.	LBT	Core
0x8C	Initialize both of the floppy disks and display an error message if failure was detected. Check both drives to establish the appropriate diskette types in the TrustedCore data area		
0xCB	Redirect Int 13h to Memory Technologies Devices such as ROM, RAM , PCMCIA, and serial disk (PICO BIOS).		
0xCD	Remap I/O and memory address space for PCMCIA (PICO BIOS).		
0x90	Initialize hard-disk controller. If the CMOS ram is valid and intact, and fixed disks are defined, call the fixed disk init routine to initialize the fixed disk system and take over the appropriate interrupt vectors.		
0x8B	Setup interrupt vector and present bit in Equipment byte.		

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POST Code	Function	Phase	Component
0x95	1. Check CMOS for CD-ROM drive present 2. Activate the drive by checking for media present 3. Check sector 11h (17) for Boot Record Volume Descriptor 4. Check the boot catalog for validity 5. Pick a boot entry 6. Create a Specification Packet	LBT	Core
0x92	Jump to UserPatch2.	LBT	Core
0xB6	If password on boot is enabled, a call is made to Setup to check password. If the user does not enter a valid password, Setup does not return.	LBT	Core
0x98	Search for option ROMs. Rom scan the area from C800h for a length of BCP_ROM_Scan_Size (or to E000h by default) on every 2K boundary, looking for add on cards that need initialization.	LBT	Core
0x93	Build the MPTABLE for multi-processor boards	LBT	Core
0xD9	IPMI late init	LBT	Core
0x9C	Set up Power Management. Initiate power-management state machine.	LBT	Core
0xC7	Late note dock init	LBT	Core
0x9E	Enable hardware interrupts	LBT	Core
0xA0	Setup time tick for current date/time	LBT	Core
0xA2	Setup Numlock indicator. Display a message if key switch is locked.	LBT	Core
0xA4	Initialize typematic rate	LBT	Core
0xDB	StrongROM Test	LBT	Core
0xE2	OEM security key test	LBT	Core
0xC2	Write PEM errors.	LBT	Core
0xBA	Initialize the SMBIOS header and sub-structures.	LBT	Core
0xC3	Display PEM errors.	LBT	Core
0xA8	Overwrite the "Press F2 for Setup" prompt with spaces, erasing it from the screen.	LBT	Core
0xAA	Scan the key buffer to see if the F2 key was struck after keyboard interrupts were enabled. If an F2 keystroke is found, set a flag.	LBT	Core
0xE1	Start Periodic Timer (TC Subscribe)	LBT	Core
0xAC	Check if "Enter SETUP" is pressed.	LBT	Core
0x8F	Count the number of ATA drives in the system and update the number in bdaFdiskcount.	LBT	Core
0x91	Configure the local bus IDE timing register based on the drives attached to it.	LBT	Core
0x9F	Check the total number of Fast Disks (ATA and SCSI) and update the bdaFdiskCount.	LBT	Core
0xD7	Check if FirstWare HPA exists	LBT	Core
0xAE	Clear ConfigFailedBit and InPostBit in CMOS.	LBT	Core
0xB0	Check for errors and decide if needs to run Setup.	LBT	Core
0xB2	Change status bits in CMOS and/or the TrustedCore data area to reflect the fact that POST is complete.	LBT	Core
0xB5	Fade out OEM Logo or post string	LBT	Core
0xC5	End hotkey detection (Server BIOS)	LBT	Core
0xBE	If BCP option is enabled, clear the screen before booting.	LBT	Core
0xB6	If password on boot is enabled, a call is made to Setup to check password. If the user does not enter a valid password, Setup does not return.	LBT	Core
0xBC	Clear parity-error latch	LBT	Core

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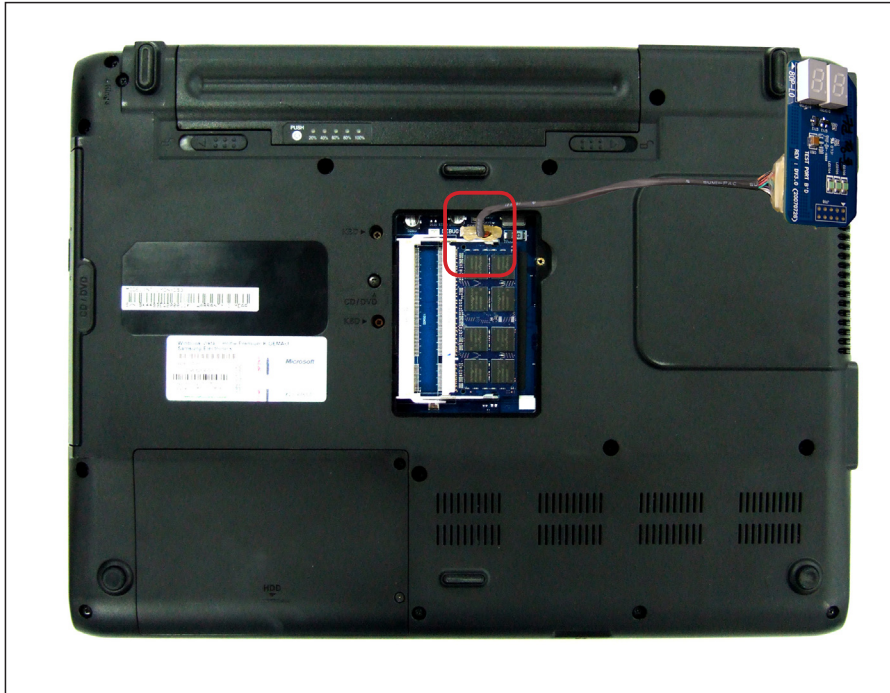
## 4. Troubleshooting

POST Code	Function	Phase	Component
0xB7	Initialize ACPI BIOS.	LBT	Core
0x9B	Enable CPU management (Geyserville I)	LBT	Core
0xBD	Display Boot First menu if MultiBoot is installed and hotkey pressed.	LBT	Core
0xBF	Check virus and backup reminders.	LBT	Core
0x97	Create pointer to MP table in Extended BDA.	LBT	Core
0x99	Check support status for Self-Monitoring Analysis Reporting Technology (disk-failure warning).	LBT	Core
0xB1	Unload ROM Pilot	LBT	Core
0xDD	Perform remote flash if requested	LBT	Core
0xC7	If UCR redirection is installed, remove display manager and unhook INT10	LBT	Core
0XDF	Shutdown the PXE UNDI code	LBT	Core
0xB3	Store enhanced CMOS values in non-volatile area	LBT	Core
0xE4	Last Legacy BIOS Task before hand off to UEFI/DXE	LBT	Core
0xB9	Clear all screen graphics before booting.	bootLegacy	Core
0xC0	INT19 entry for legacy boot	bootLegacy	Core
0xEF	Invalid AP #	SDXE	Core
0xEF	Non-Yohna and non-Morem class CPU found for SDXE (getTSCFreq)	SDXE	Core
0xEE	AP cannot synch BSP in SDXE (syncWithBSP)	SDXE	Core
0xEE	BSP cannot synch w/ AP in SDXE (syncWithAP)	SDXE	Core

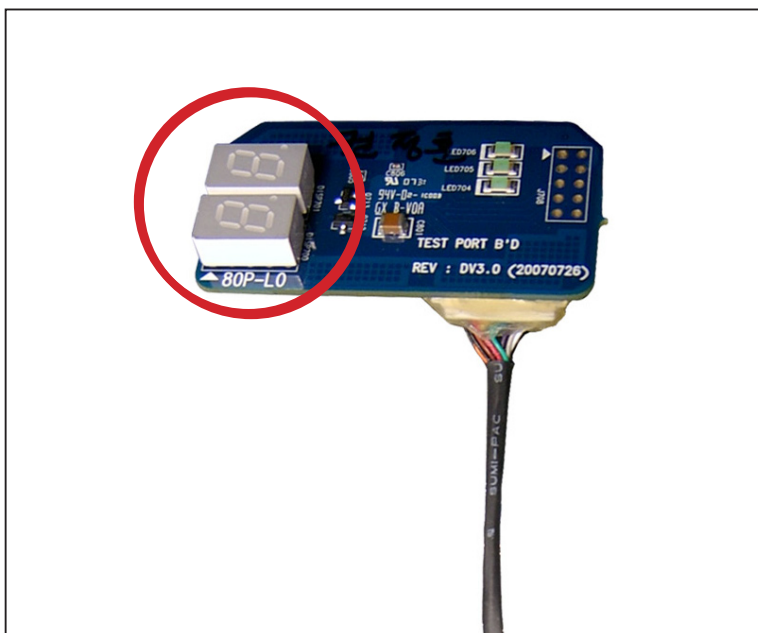
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## 4. Troubleshooting

### System Diagnostics Card



- Connect debug card cable to J4 in Main board like picture.



- Debug code is shown at the viewer in red line.

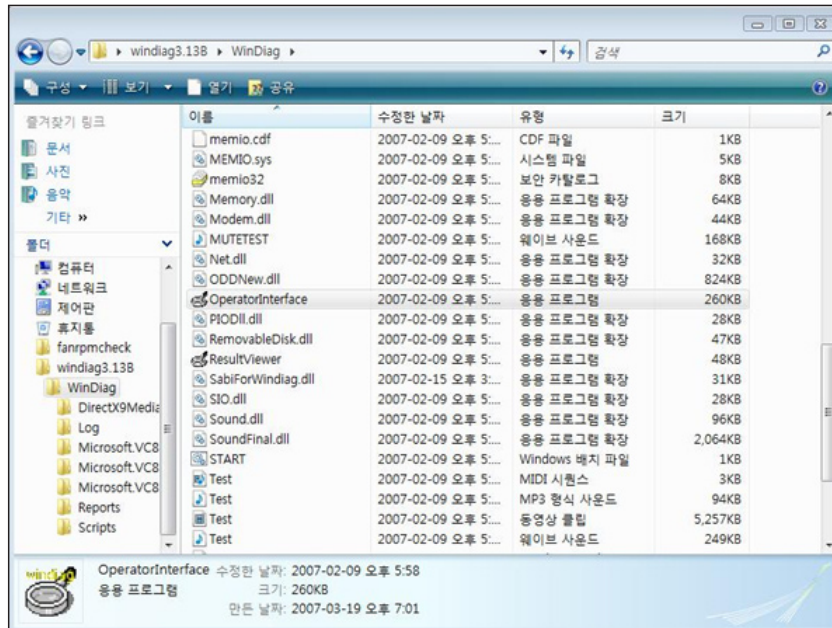


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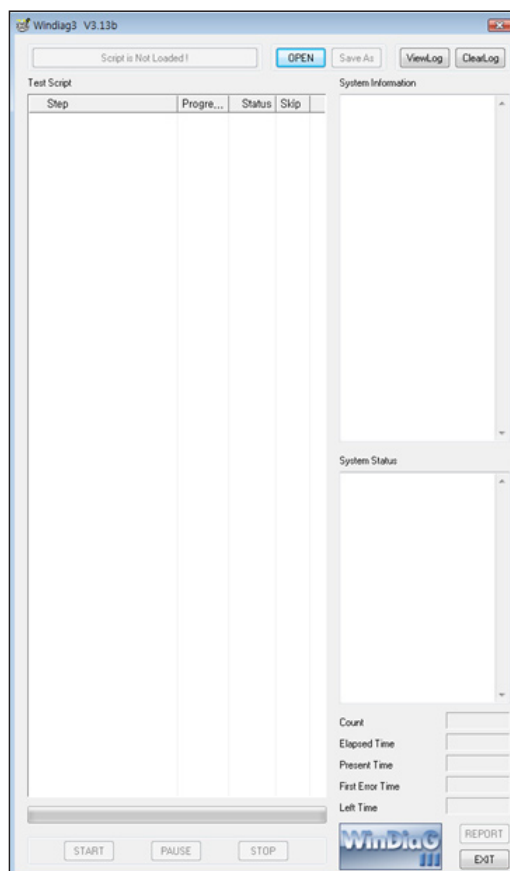
## 4. Troubleshooting

### 4-4. Diagnosis application

1. After copying Windiag3 in any folder, execute OperatorInterface.exe.



2. If OperatorInterface.exe runs properly, this window will be shown.



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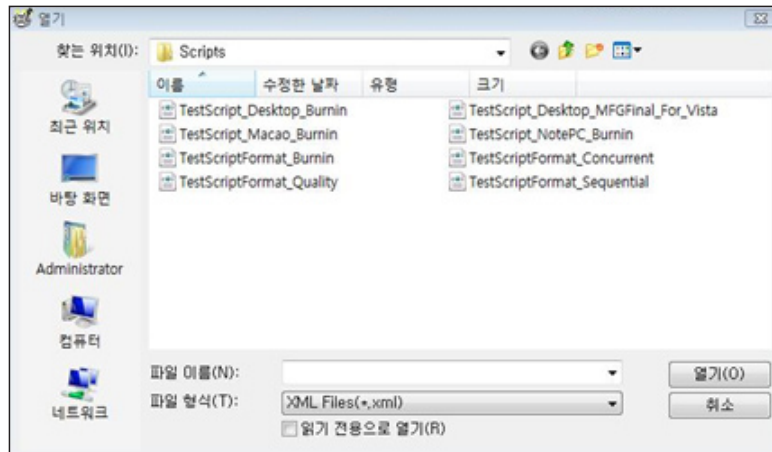
## 4. Troubleshooting

- Click "Open" to open Script file.

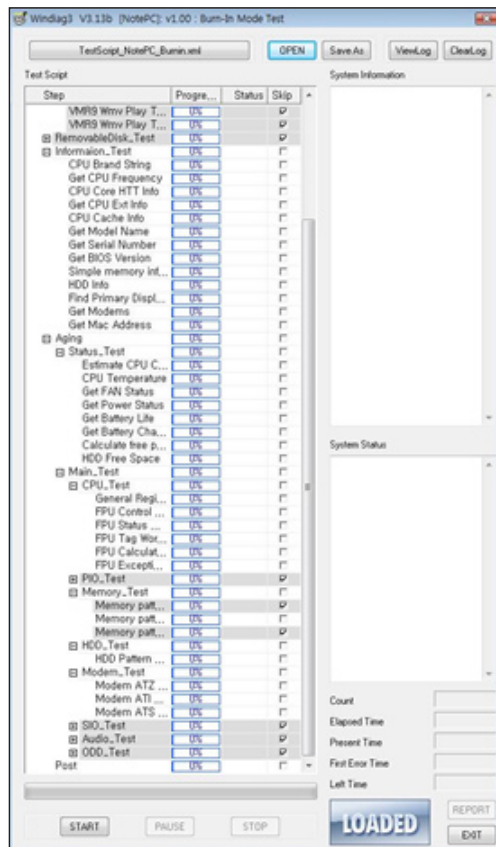
In case of Note PC, click TestScrip\_NotePC\_Bumin.xml.

In case of Desktop, click의 TestScript\_Desktop\_Burnin.xml

When you would like to execute each item for only once : Select the testScriptFormat\_Concurrent.xml.



- After that, OperatorInterface shows the following scripts on the left of the display.

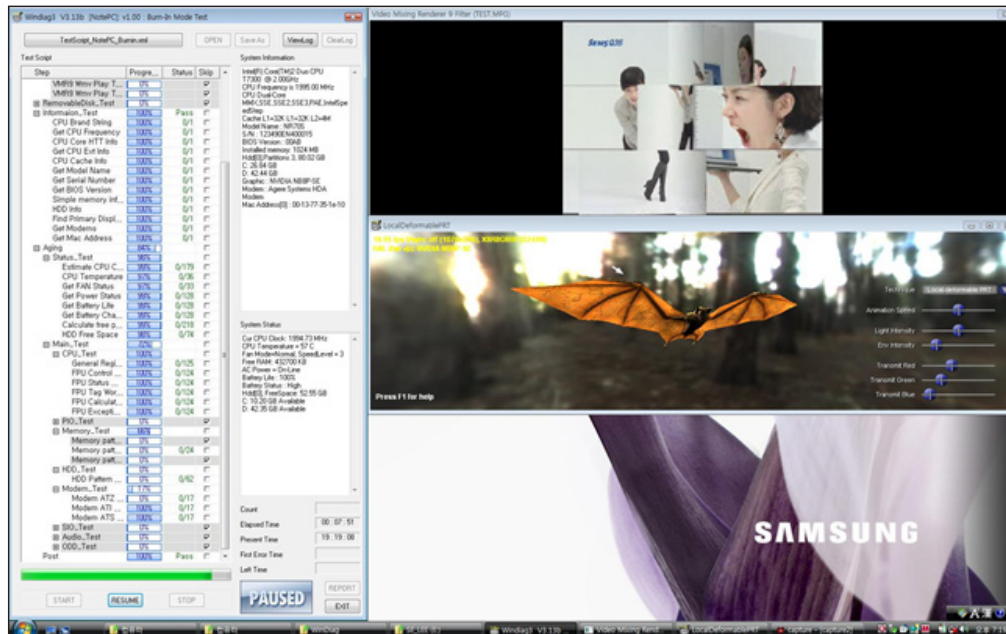




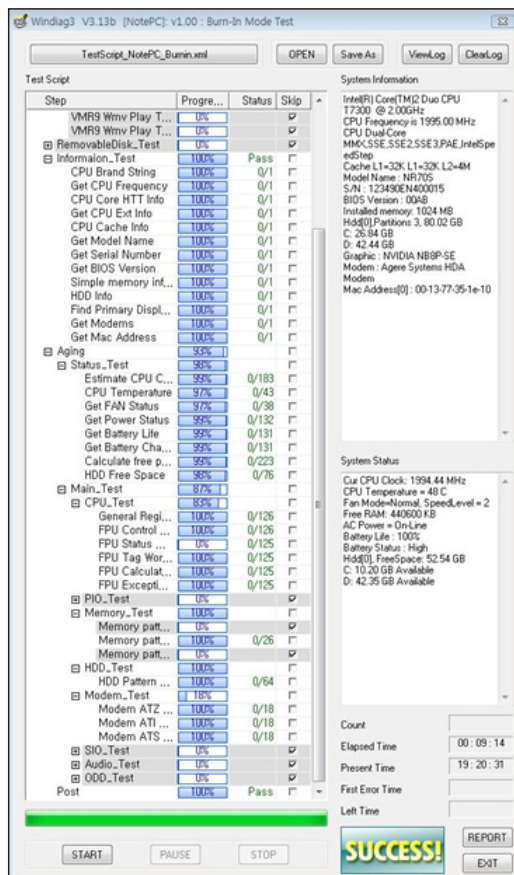
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## 4. Troubleshooting

- Click "Start" button, then test begins.



- If you want to stop this, click "stop" button. If all modules don't stop in 2 minutes 30 seconds, message window will ask you about a forced stop. At that time, by selecting "yes", it can be ended by force.



- Click "EXIT", then it will be closed.

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## 4. Troubleshooting

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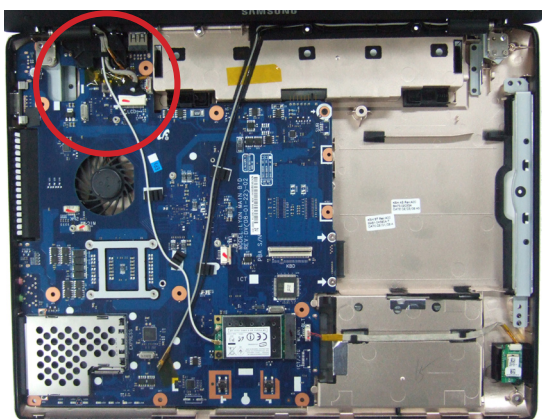
### 4-5. Hardware Troubleshooting

For information on how to disassemble the parts, refer to the "Disassembly and Reassembly" section of Chapter 4.

#### LCD related troubles.

---

1. The screen is dark or the colors of the screen are distorted.
  - Check the connection status between the LCD module and the LCD cable, between the LCD cable and the main board LCD connector and between the LCD cable and the LCD inverter.
  - Replace the LCD cable or LCD inverter.
  - Check if there is a part of the LCD that is bent or broken due to impact.



2. No picture appears on the screen.
  - Check the connection status between the LCD module and the LCD cable, between the LCD cable and the main board LCD connector and between the LCD cable and the LCD inverter.
  - Replace the LCD cable or LCD inverter.
  - Check if the System LED of the main board is blinking. (Check if it is operating or not)
  - Check if the memory module is out of order.
  - Check if the Power button can be normally pressed.
3. The LCD brightness is not adjusted.
  - Check if the LCD inverter is out of order.
  - Check the BIOS version and check if the standard adapter is used.
  - Replace the LCD cable or LCD inverter and check if it is out of order.
4. The LCD blinks while the system is in operation.
  - Check if there is a magnetic body near the LCD connector or the system or check if there is an exterior defect to the LCD or system.
  - Replace the LCD cable or LCD inverter and check if it is out of order.
  - Check if a standard adapter is being used (19V/4.73A/90W).

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## 4. Troubleshooting

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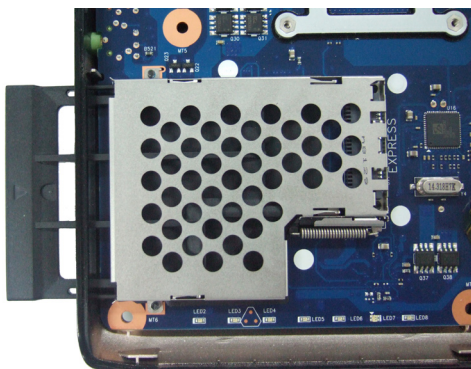
### Main System Troubles

---

5. The system is not turned on.
  - Check if the AC adapter LED is lit and if the adapter is properly connected to the system. (Check the adapter LED)
  - If the AC adapter is not connected, check the charge status of the battery. Even if the battery is charged, if the remaining battery charge is too low, the system may not be turned on.(As the following figure shows, press the PUSH button on the battery and check the remaining battery charge via the LEDs)
  - Check if there are any alien substances in the Power switch.
  - Replace the main board.



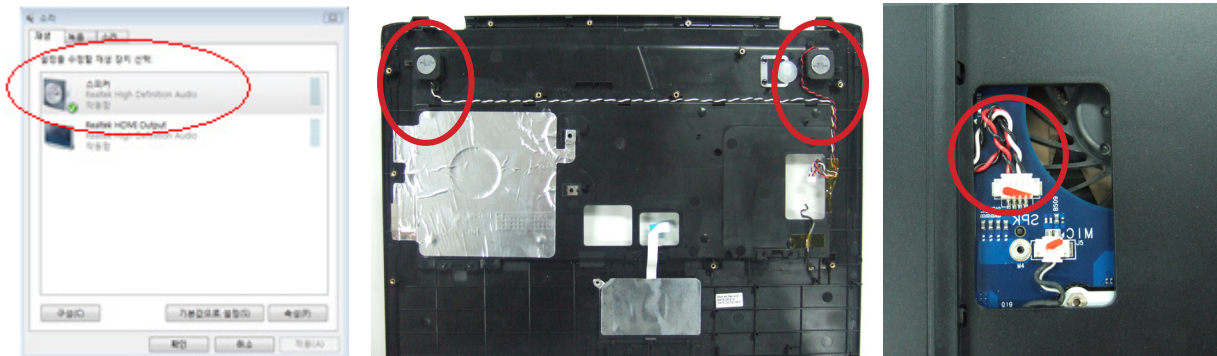
6. Although system power is supplied, the system does not boot or immediately turns off after being turned on.
  - Since this may be a short circuit in the system, disconnect the power immediately, disassemble the system and check if there are any conducting alien objects such as a screw inside.
  - Check the connection status between the CPU and the RHE.
  - Replace the memory module and check if it is out of order.
  - Reset the RTC Reset terminal next to the memory socket.
  - Replace the main board.
7. The PCMCIA card is not inserted or the Eject button does not work.
  - This may occur when the insulator within the PCMCIA slot is enwrapped.
  - Replace the PCMCIA slot frame and check if it is out of order.



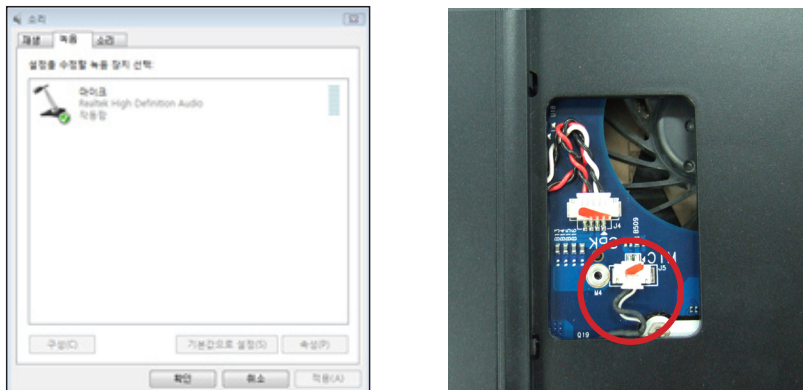
8. There is no sound from the speaker.
  - Check if the sound is muted after booting up Windows.
  - Control panel → Sound, Check if the default output is "Speaker".
  - Check the connection status of the speaker cable and check if the speaker is out of order.
  - Check if there is a magnetic object near the speaker.
  - Replace the main board.

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## 4. Troubleshooting



9. I cannot hear sound through the headphones.
  - Check if the sound is muted in Windows.
  - Check that the default setting is "Speaker" on Control Panel-Sound-Playback.
  - Turn the volume up.
  - Check a foreign substance in Headphone jack.
  - Replace the main boarda.
10. Internal MIC or External MIC isn't work.
  - Check the sound driver and setting.  
Like below picture, Check if the default record device is "MIC" at the Control panel → Sound.
  - In case of Internal MIC, Check the MIC connection.
  - Replace the main boarda.

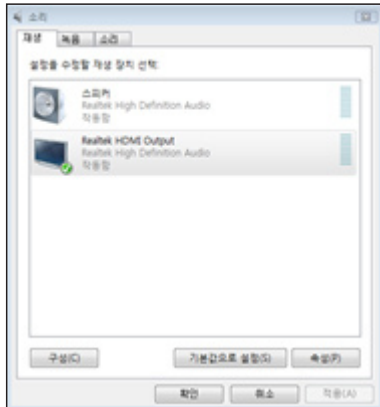


11. HDMI port isn't work correctly.
  - Check if Audio and Video driver is installed correctly.
  - Check if Display Manager is installed correctly.
  - If only sound isn't out, Check the default output device is "HDMI" on Sound information.
  - Change Main board.
  - The sound dose not work with DVI-HDMI cable, Please use the HDMI to HDMI Cable.



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## 4. Troubleshooting



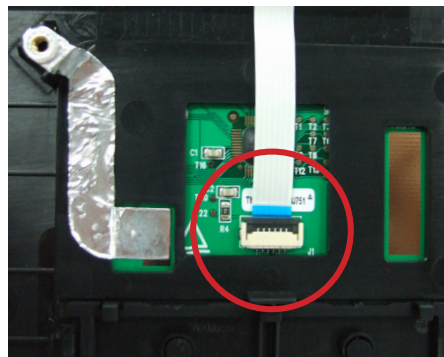
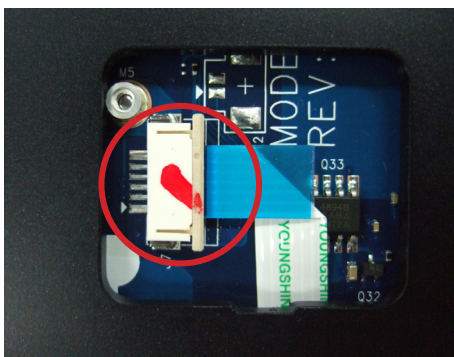
### 12. The HDD is not recognized.

- Check if HDD connection is no problem.
- If the 'Operating system not found' message appears during the booting process even though the HDD is recognized by CMOS, the operating system of the HDD may be corrupted or the HDD is out of order. In this case, format the HDD and reinstall the operating system or replace the HDD with a new one.



### 13. Touch Screen is work abnormally.

- Check the connection of Touch Screen FFC.
- Check the connection of Touch Pad Module.



- If you can not find any connection issue, please change the part.

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## 4. Troubleshooting

14. The battery is not charge or the battery charge LED malfunctions.

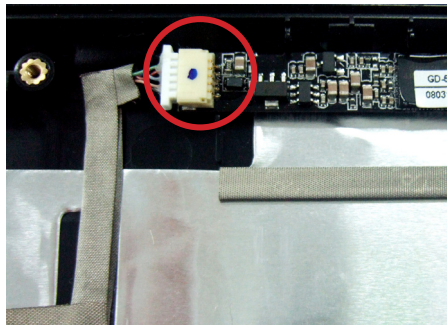
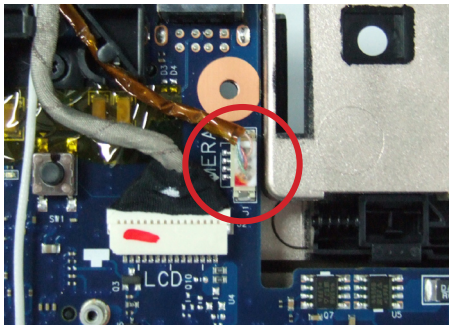
- Check the standard voltage of the adapter.



- Check if the battery is defective.
- Replace the Main board.

15. Camera is not working correctly

- Check if the Camera cable connection is no problem on Main board.
- Check if connection is no problem between Camera cable and Camera module.
- Change the Camera cable or the Camera module.
- Replace the Main board.



16. The LAN function does not work.

- Check if the LAN cable is properly connected.
- Check of the LAN driver is properly installed.
- If the driver is properly installed, check if the LAN cable jack is out of order.
- Replace the Main Board.

17. The wireless LAN does not work normally.

- Check if the WLAN driver is properly installed.
- Check if the WLAN antenna cable is properly connected.
- Change WLAN card and check it.
- Replace the Main Board.

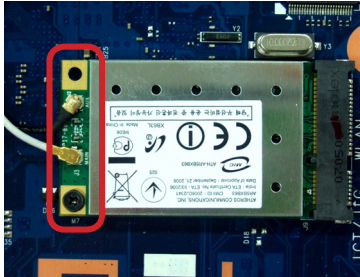
\*. In the case of Intel Shirley Peak 1x2 AGN, Atheros 802.11 BG card there are the #1, #2 antenna pin,  
In the case of Intel Shirley Peak 3x3 AGN card there are all of #1, #2, #3 pin.

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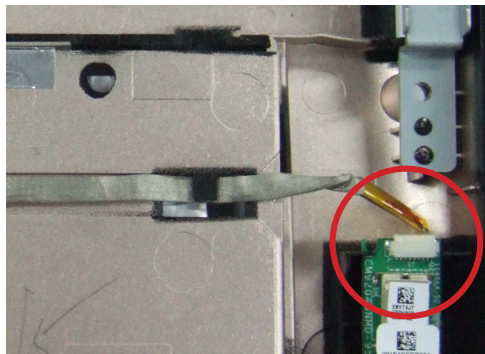
## 4. Troubleshooting

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18. Bluetooth isn't work normally.

- Check the connection between Main board and Bluetooth cable.
- Check the connection between Bluetooth module and Bluetooth cable.



### When Booting up the Computer

---

19. The "Invalid system Disk, Replace the Disk and then press any key" message appears.
- This message may appear when the connected USB memory or CD media does not include bootable data.
  - The "Reboot and Select proper Boot device or Insert Boot Media in selected Boot device and press a key" message appears.
  - Check if the signal and power cables are properly connected to the hard disk drive.
  - Check if the hard disk drive is recognized in the BIOS SETUP.
  - The operating system on the hard disk drive is corrupted. Reinstall Windows.
20. The "To enter BIOS SETUP, press <F2>, To continue, press <F1>" message appears.
- This message happen when the BIOS settings are different from the system environment.  
In this case, setup the BIOS according to your system environment.
  - Press <F2> to enter the BIOS SETUP.
  - Check if the data and time are correct in the BIOS SETUP.
  - Save the settings and restart the system.
21. The "CMOS Checksum error" message appears.
- This message may appear when the CMOS battery of the main board is completely discharged.  
In this case, replace the battery with a new one of the same type and set up the BIOS SETUP according to your system environment.
22. Windows boots up in safe mode.
- This may happen when Windows was not shut down normally.  
Therefore, shut down the system by selecting Start > Turn Off Computer.
  - This may happen when the system settings have been incompletely recognized.
  - Run Check Disk.

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## 4. Troubleshooting

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23. I cannot boot up the computer with a USB floppy drive or from USB memory.

- Check if the diskette is bootable.
- This may happen when the booting priority of the device is low.  
In this case, change the booting priority in the BIOS SETUP.

---

### When Shutting Down the Computer

---

24. The computer is not shut down.

- If Windows does not end normally, you can forcibly shut down the system by pressing the Power button.  
If the power saving feature is activated on the Power button, press the Power button for more than 4 seconds to turn the computer off. If the computer is then turned on again, Check Disk is automatically run.

---

### Windows / Screen Related Problem

---

25. The computer hangs while running a program

- If the running program causes an error.  
In Windows, press the <Ctrl>, <Alt> and <Del> key combination, select the application program and click on End Task in the Applications tab of the [Windows Task Manager] window.
- If Windows does not respond, restart the computer. Restart the computer by pressing the Power button.

26. No picture is displayed on the external monitor.

- Press the Switch LCD/CRT monitor function key and check if the screen output is output to another display device.
- Check if the hardware is out of order referring to the descriptions in the LCD related section of the Hardware Troubleshooting.

---

### ODD Related Troubles

---

27. A ODD disc is not recognized or read.

- Check if the ODD module and the main board are properly connected.
- Replace the ODD, if necessary.
- Some virus occur the malfunction on the ODD driver, Please update McAfee and then Scan the system.

---

### Power-Saving Mode Related Troubleds

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28. Connection a USB device to the computer in standby mode.

- If the USB device is connected to the computer in standby mode, the screen may be abnormally displayed.  
You have to connect a USB device when the computer is operating normally.

29. A USB device is not working normally when the computer returns from standby mode.

- In this case, separate and reconnect the USB device.

30. The picture is displayed abnormally when the computer running the Command Prompt (MS-DOS) enters standby mode and then returns from standby mode.

- Press the <Alt> and <Tab> key combination to display the picture on the screen.



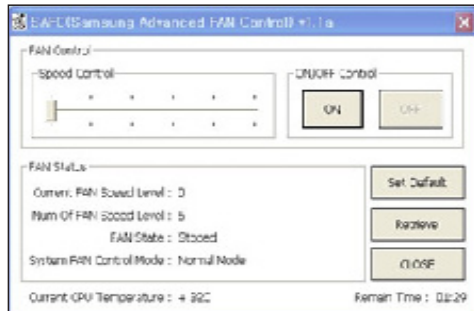
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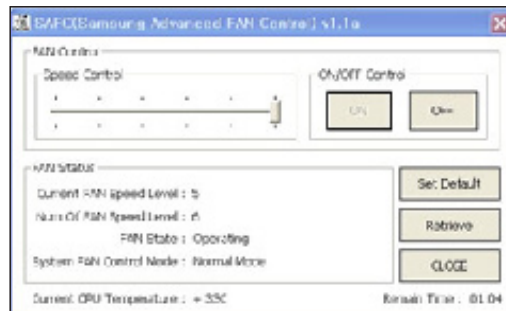
### 4-6. CPU Fan Control

#### Checking the Work of FAN

One can turn the fan on & off and check the fan's operational conditions without system disassembly



Pic (1) Fan off status



Pic (2) Fan off status

- SAFC's default setting is "Fan off" or "Minimum Fan Speed".
- Press "ON" in "ON/OFF Control" Fan is turned on to maximum fan speed.
- Press "OFF" in "ON/OFF Control" Fan returns to default setting.

#### Checking the Normal Working State of FAN Control

##### (1) Normal mode

CPU fan control

CPU SPEED	Stage	Address (Hexa)	RPM	EMC2102 Count(HEX)	Noise	For CPU temperature CPU Sensor(on/off)
I 단계	OFF	-	-	-	20dBA	-
	1	-	2000	3D	23dBA	45/30
	2	-	2200	37	25dBA	55/50
	3	-	2400	33	27dBA	65/60
	4	-	2700	2E	29dBA	70/65
	5	-	3000	29	32dBA	75/70
	6	-	3300	25	35dBA	80/75
II 단계	6	-	3300	25	35dBA	87/80
III 단계	6	-	3300	25	35dBA	92/87
		OS Throttling				95
		ACPI Notify				98
		Dos Throttling				95/90
		Shutdown				100

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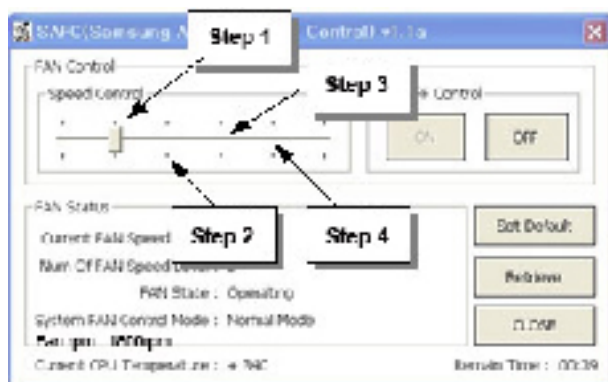
## 4. Troubleshooting

### (2) Etiquette mode

CPU SPEED	Voltage (Volt)	Address (Hexa)	RPM	EMC2102 Count(HEX)	Noise	For CPU temperature CPU Sensor(on/off)
	OFF	-	-	-	20dBA	-
	1	-	2000	3D	23dBA	60/55
	1	-	2000	3D	23dBA	65/60
	1	-	2000	3D	23dBA	70/65
	2	-	2200	37	25dBA	75/70
	3	-	2400	33	37dBA	80/75
	4	-	2700	2E	32dBA	85/80
	5	-	3300	25	35dBA	90/85
		OS Throttling				95
		ACPI Notify				98
		Dos Throttling				95/90
		Shutdown				100

### (3) Battery mode

CPU SPEED	Stage	Address (Hexa)	RPM	EMC2102 Count(HEX)	Noise	For CPU temperature CPU Sensor(on/off)
	OFF	-	OFF	-	20dBA	-
	1	-	2000	3D	23dBA	50/40
	2	-	2200	37	25dBA	65/60
	3	-	2400	33	27dBA	70/65
	4	-	2700	2E	32dBA	75/70
	5	-	3300	25	35dBA	80/75
	6	-	3300	25	35dBA	85/80
		OS Throttling				95
		ACPI Notify				98
		Dos Throttling				95/90
		Shutdown				100



Pic (3) Adjust FAN State

#### [ Fan Voltage Measurement ]

- Read Fan RPM indicated in SAFC.

#### [ Fan Voltage Pass/Fail determination ]

- If Fan RPM satisfies "rpm spec +/-10%", then Fan test is "PASS".

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## 4. Troubleshooting

### 4-7. Battery Use Time

Check the following check lists for systems where the battery use time is too short to diagnose problems.

#### Check the battery

Check if the battery is out of order referring to the Battery check program distributed to Service Centers and the 'Battery Check Manual' included in the 'Note-PC A/S Guide'

#### (1) Battery Check List

Please mark "✓" in the box (□) of each applicable items, after checking the battery status with the "battery checking program"

1. Does the battery communicate normally with system?

- ☐ PASS  
☐ FAIL

2. Is the battery charged normally?

- ☐ PASS  
☐ FAIL

3. Is the battery discharged normally?

- ☐ PASS  
☐ FAIL

4. Is the battery still in warranty?

- ☐ Excess than 6 months : Out of warranty  
☐ Excess than 300 Cycles : Out of warranty  
☐ Less than 6 months : PASS  
☐ Less than 6 months : FAIL

#### (2) Criteria for each of the check lists.

1. Does the battery communicate normally with system?

☐ PASS

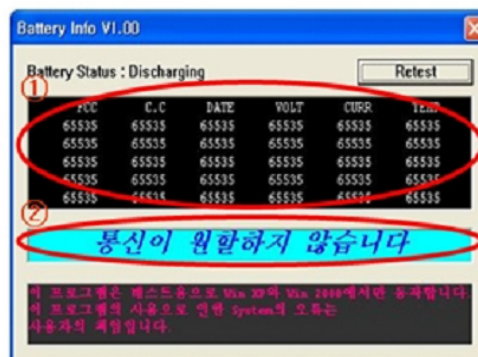
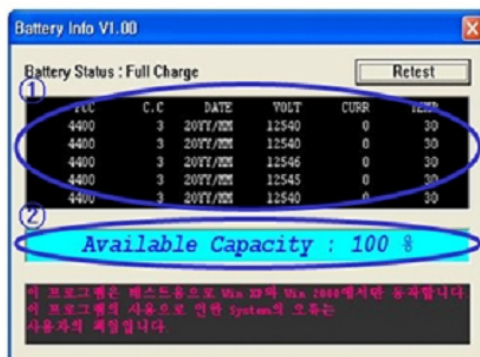
☒ FAIL

①: Data displayed in the data window.

①: The code 65535 displayed

②: Available capacity displayed : 0 ~ 100%

②: Displayed the error message in Korean  
"통신이 원활 하지 않습니다"



☞ recommended : When the communication failed, please set a normal battery to the system and check first which -battery or system- has the problem.

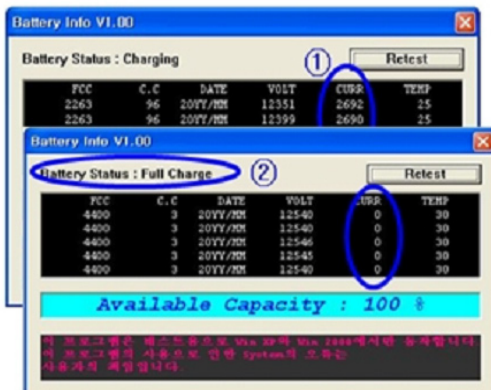
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### 2. Is the battery charged normally?

☐ PASS

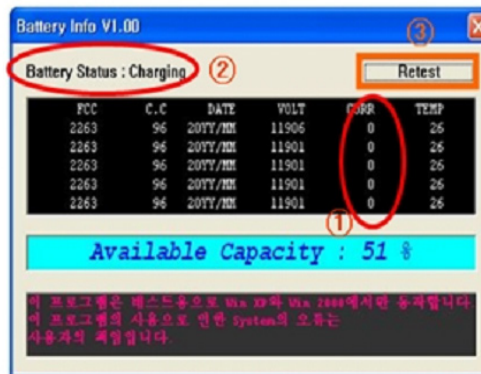
①: Pass, if the CURR values are within 35 ~ 3500



②: Pass, even if the CURR value is 0 but the battery is in status of Full Charge

☐ FAIL

①,②: Fail, if the CURR values are 0 and the battery status is in Charging.

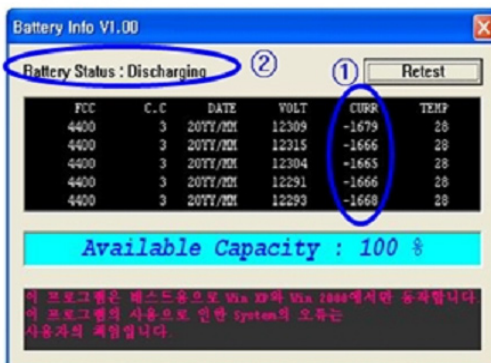


③: if the CURR value is 0 and in status of Charging, please reconfirm the "fail" after 2-3 times of Retest.

### 3. Is the battery discharged normally?

☐ PASS

①,②: Pass, if the CURR values are within -50 ~ -5000 and the battery status is in Discharging.



☐ FAIL

Fail, if the System is off status when the adaptor is removed from the System

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## 4. Troubleshooting

### 4. Is the battery still in warranty?

- ☐ Excess than 6 months : Out of warranty
- ☐ Excess than 300 cycles : Out of warranty

☞ **Warranty period : Within 6 months after sales date, more than 60% of initial electric capacity after 300 cycles.**

\* **Reference** : If a battery is out of warranty, the battery can not be considered as "defected". So if a customer requests to exchange his battery in this case, the battery should be provided **onerously with sales price**. So please persuade customer to use continuously his battery, with the explanation of effective capacity of his battery, if the battery have no defect but only small decrease of capacity.

- ☐ Less than 6 months : PASS

- ☐ Less than 6 months : FAIL

☞ ①Please refer to "Capacity Standard Table" (or ②Capacity Standard Graph). Please judge Pass or Fail after checking the sales date of a battery. Pass, if the capacity of the battery is over than the value of corresponded date of "Available Capacity" column in the Table. Fail, if the capacity is lower than the value.

\* **Reference** : The battery capacity can have individual error according to the user's circumstance of the battery. So it is recommended that the battery should be checked (with Battery Check Program) after calibration (Smart Battery Calibration: Full charge/discharge or Full discharge/charge)

### [Example]

- ☐ Less than 6 months: PASS

①: Available Capacity: 93%

Duration of Use : 1month(30days)

Available Capacity of warranty: 87.8%

Battery Info V1.00						
Battery Status : Full Charge						
						Retest
FCC	C.C	DATE	VOLT	CURR	TEMP	
4127	15	20YY/MM	12777	2573	25	
4127	15	20YY/MM	12792	2587	25	
4127	15	20YY/MM	12475	0	25	
4127	15	20YY/MM	12486	0	25	
4127	15	20YY/MM	12476	0	25	
① Available Capacity : 93 %						
이 프로그램은 테스트용으로 Vba 20와 Vba 1000에서만 동작합니다. 이 프로그램의 사용으로 인한 system의 오류는 사용자의 책임입니다.						

- ☐ Less than 6 months: FAIL

①: Available Capacity: 51%

Duration of Use : 1month(30days)

Available Capacity of warranty: 87.8%

Battery Info V1.00						
Battery Status : Charging						
						Retest
FCC	C.C	DATE	VOLT	CURR	TEMP	
2263	96	20YY/MM	12236	1915	25	
2263	96	20YY/MM	12341	2606	25	
2263	96	20YY/MM	12364	2608	25	
2263	96	20YY/MM	12376	2598	25	
2263	96	20YY/MM	12376	2609	25	
① Available Capacity : 51 %						
이 프로그램은 테스트용으로 Vba 20와 Vba 1000에서만 동작합니다. 이 프로그램의 사용으로 인한 system의 오류는 사용자의 책임입니다.						

\* **Reference** : If the sale date is 2004.5.10 and service receipt date is 2004.6.10, the Duration of Use is regarded as 1 month(30days)



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## 4. Troubleshooting

### (3) Battery capacity Table

Duration of Use	Available Capacity(%)
Within 0.5month (15days)	More than 93.6 %
Within 1.0month (30days)	More than 87.8 %
Within 1.5month (45days)	More than 82.5 %
Within 2.0month (60days)	More than 77.8 %
Within 2.5month (75days)	More than 73.6 %
Within 3.0month (90days)	More than 70.0 %
Within 3.5month (105days)	More than 66.9 %
Within 4.0month (120days)	More than 64.4 %
Within 4.5month (135days)	More than 62.5 %
Within 5.0month (150days)	More than 61.1 %
Within 5.5month (165days)	More than 60.3 %
Within 6.0month (180days)	More than 60.0 %

#### \* Reference

**Duration of Use** : The using period from the sales date of the system (with battery)

**Available Capacity(%)** : The real capacity of the battery, decreased from the design capacity by the user's circumstance, keeping status or etc.

### (4) Battery Check Program

**① Battery Status** : Full Charge, in Charging, Full Discharge, in Discharging

**② FCC** : Full Charge Capacity. Expected capacity when the battery will be charged fully.

**③ C.C** : The times of full discharge after full charge

**④ DATE** : Sales date of the System year/month

**⑤ VOLT** : The voltage of charge or discharge of the battery

**⑥ CURR** : The current of charge or discharge of the battery

**⑦ TEMP** : The temperature of battery

**⑧ Available Capacity** : The percentage of present maximum available capacity compared to design capacity. Or “통신이 원활하지 않습니다”: the error message when System MICOM can not communicate with battery.

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## 4. Troubleshooting

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### Check the battery use environment

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1. Generally, the battery usage time in advertisements by notebook manufacturers refers to the maximum battery use time. Since the system specifications and the usage environment may differ, the user's battery usage time may differ from the advertisement even if there is no problem with the system.
2. Conditions for the company's maximum battery use time
  - a. Minimum LCD brightness, base system, the wireless LAN R/F is turned off, Battery Manager- Maximum Battery Mode
  - b. Measuring Tool: Battery Mark v.4.0.1
3. If a customer complains about the battery usage time, let them know that the battery usage time may differ depending on the model specifications and the usage environment and recommend the following usage environment for longer battery time.
  - a. Use the company's power-saving program, Battery Manager, and set Battery Manager to Maximum Battery Mode.
  - b. LCD brightness: Set to the minimum level as long as the user does not experience inconvenience.
  - c. Disable unnecessary devices
    - : Turn the wireless LAN R/F switch off and disable USB devices (DMB, fingerprint recognition and Bluetooth)

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## 4. Troubleshooting

### 4-8. Etc

#### CPU Information

0902-002228	T5450_1.66G	LF80537GF0282MT
0902-002228	T5670_1.80G	LF80537GG0332M
0902-002254	T5550_1.83G	LF80537GF0342MT
0902-002254	T5750_2.0G	LF80537GF0412M
0902-002331	T5870_2.0G	LF80537GG0412MN
0902-002326	T5850_2.16G	LF80537GF0482M
0902-002341	P8400_2.26G	AW80577SH0513M
0902-002337	P8600_2.40G	AW80577SH0563M
0902-002336	T9400_2.53G	AW80576GH0616M
0902-002340	P9500_2.53G	AW80576SH0616M
0902-002356	P7350_2.0G	AW80577SH0413M

#### Model-Name

Region	Class	Class(모델군)	SAP Matching
			Reference Header
Korea	국판 직판	NT-P510-COM	NT-P510
	국판 유통	NT-R510-CSM	NT-R510
	국판 행망	NT-S510-CSM	NT-S510
Overseas	EHQ	NT-R510-GOV	NT-R510
		NP-P510-EHQ	NP-P510
	CIS	NP-R510-EHQ	NP-R510
		NP-P510-CIS	NP-P510
		NP-R508-CIS	NP-R508
		NP-R510-CIS	NP-R510
	CHN	NP-P510-CHN	NP-P510
		NP-R508-CHN	NP-R508
		NP-R510-CHN	NP-P510

9항 : (A : Vista Premium logo, B : Vista Basic logo)  
 10항 : (A : INT GFX. S : EXT GFX.)  
 13, 14항 : 출항지 코드

#### (1) 제품군 구분

당사업부 취급 제품 구분 : Notebook PC, Desktop PC, Post PC, PC용 Option, Server, Server용 Option 6개 제품군

제품군	Notebook PC	Desktop PC	Post PC	PC/Post PC용 Option	SVR	SVR용 Opt.
코 드	N	D	X	A	Z	3자리 7개

#### (2) 채널 구분

해당 제품의 판매대상 시장을 정의



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## 4. Troubleshooting

구 분	Notebook PC		Post PC		PC용 Opt.
채 널	국판	해외(자가 수출)	국판	해외(자가 수출)	
코 드	T	P	Q	E	A

### (3) 구분자 : - 로 고정

### (4) 모델군

모델별, Line-up별 모델군 표시

구 분	Desktop PC		Notebook PC
	Tower형	Desk형	
Technical Leading	T	H	T
Performance	P	B	P
Value	V	R	V / Z
Entry	A	-	A
New Form Factor	F		-
Ultra Slim	Z		Q
2 SP. Thin & Light	-		X
A/V Multi-media			M
Main Stream			R

### (5-6) 모델명

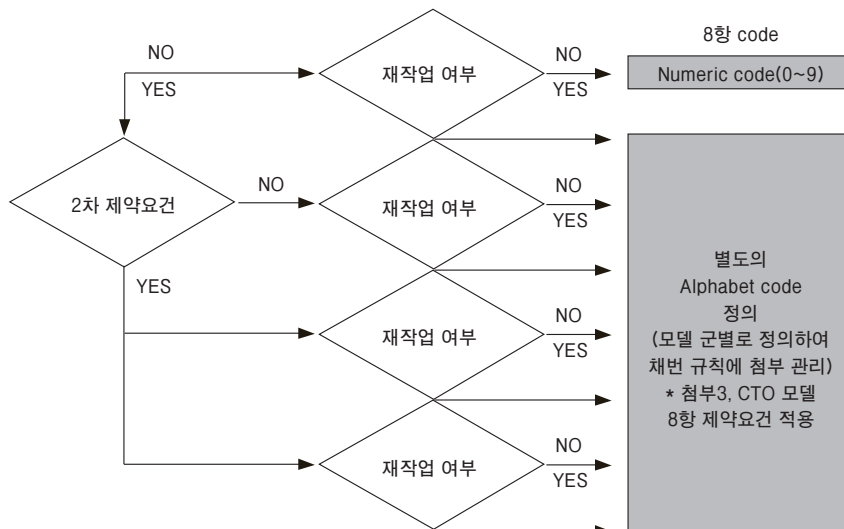
고유 모델명을 Line-up 계획에 의거하여 채번

### (7) MS and Intel

적용 OS 및 CPU 표기 : CPU의 경우 IIP 운영을 위한 조건만을 충족

### (8-10) CTO 채번

1~7항 & 11~14항 코드 기준으로 순차 채번 : 000, 001, 002, 003 ~ 9ZZ -. 순서는 모델 발생 순서임



### (11) 구분자 : / 로 고정