

# TROUBLE SHOOTING GUIDE FOR NOTEBOOK

4024

BY:

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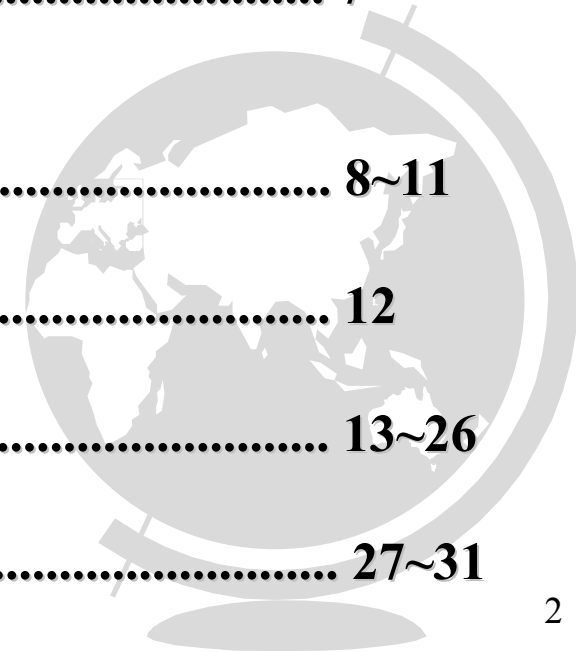
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# 4024 N/B MAINTENANCE

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## 1. DEFINITION OF CONNECTORS & SWITCHES

- J1 : PARALLEL PORT
- J2 : CRT VIDEO CONNECTOR
- J3 : SERIAL PORT
- J4 : AUDIO CARD CONNECTOR
- J5 : PS/2 KEYBOARD/MOUSE CONNECTOR
- J6 : ICON LCD MODULE CONNECTOR
- J7 : POWER JACK
- J8 : LCD MODULE CONNECTOR
- J9 : COVER SWITCH CONNECTOR
- J10 : INTERNAL KEYBOARD CONNECTOR
- J11 : INTERNAL KEYBOARD CONNECTOR
- J12 : MONO LCD POWER CONNECTOR
- J13 : DC/AC CONVERTER ASSEMBLY (BACKLIGHT) CONNECTOR
- J14 : FLOPPY DISK DRIVE AND CD-ROM DRIVE CONNECTOR
- J15 : PCMCIA IC CARD CONNECTOR
- J16 : SPEAKER CONNECTOR
- J17 : TRACKBALL CONNECTOR
- J18 : HARD DISK CONNECTOR
- J19 : TRACK PAD BUTTON CONNECTOR
- J501, J502 : MEMORY MODULE CONNECTOR
- SW1 : POWER SWITCH
- SW2, SW3 : PRIMARY BATTERY CONNECTOR
- SW4, SW5, SW6: CPU TYPE SELECTION
- SW6 : CPU CLOCK SPEED SETTING
- SW7, SW10 : SECONDARY BATTERY CONNECTOR
- SW8, SW9 : TRACK BUTTON

## 2 . LOCATION OF CONNECTORS & SWITCHES



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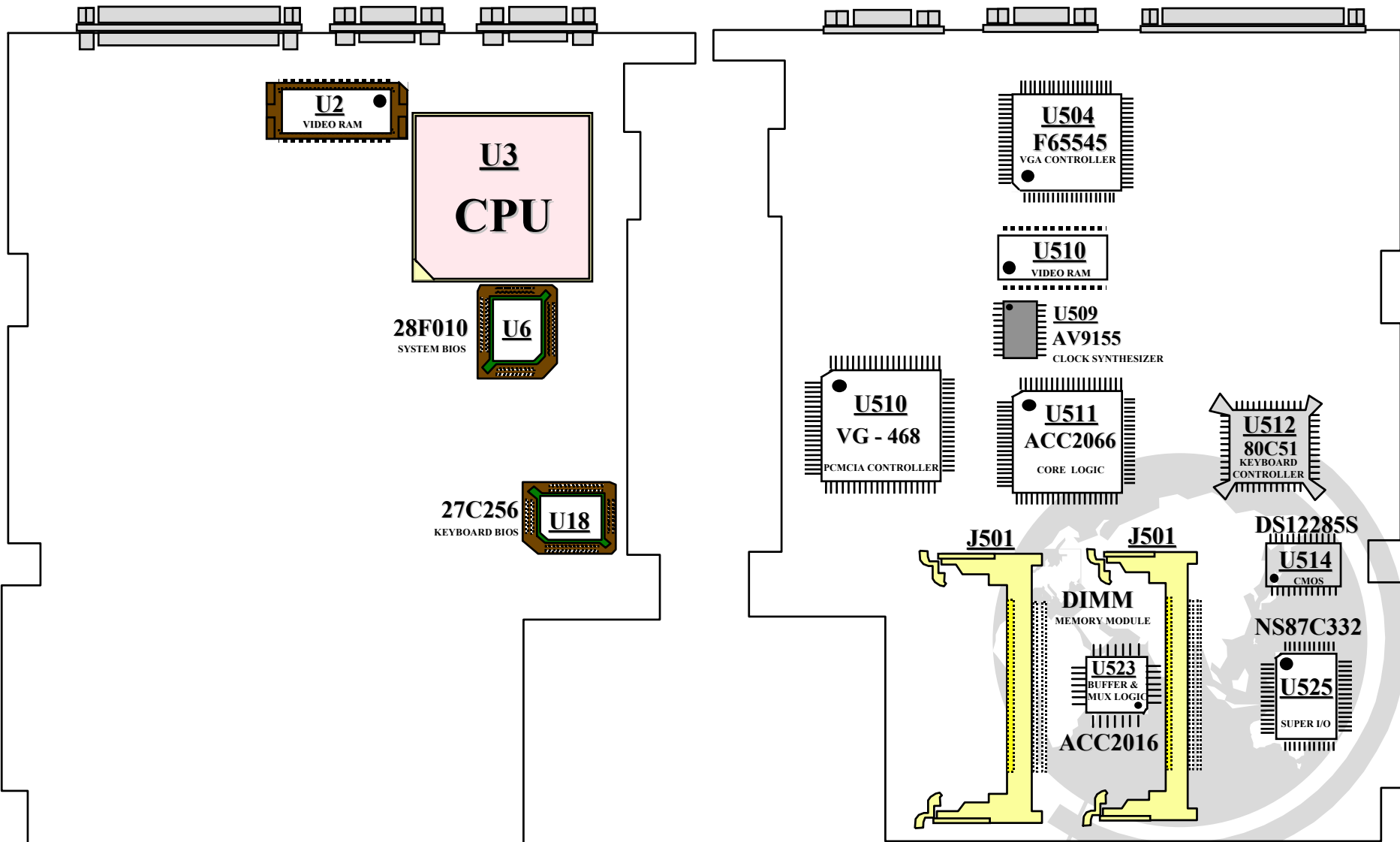
## **3. MAJOR COMPONENTS**

- 1. U3 CPU**
- 2. U511 ACC2066 CORE LOGIC**
- 3. U523 ACC2016 BUFFER & MUX LOGIC**
- 4. U504 C&T F65540 LCD/VGA CONTROLLER**
- 5. J501 , J502 DIMM MEMORY MODULE**
- 6. U6 28F010 SYSTEM BIOS**
- 7. U18 27C256 KEYBOARD BIOS**
- 8. U512 80C51 KEYBOARD CONTROLLER**
- 9. U525 NS87C332 SUPER I/O CONTROLLER**
- 10. U510 VG-468 PCMCIA CONTROLLER**
- 11. U509 AV9155 CLOCK SYNTHESIZER**
- 12. U514 DS12285S REAL TIME CLOCK**
- 13. U507 , U2 VIDEO MEMORY**



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## 4. LOCATION OF MAJOR COMPONENTS



## 5. PIN DESCRIPTIONS OF MAJOR COMPONENTS

### 5.1 ACC2066 CORE LOGIC

| SYMBOL          | PIN | TYPE | DESCRIPTION                                                                                                                |
|-----------------|-----|------|----------------------------------------------------------------------------------------------------------------------------|
| CLOCK PINS      |     |      |                                                                                                                            |
| CLKSRC          | 16  | I    | CPU INTERNAL CLOCK SOURCE INPUT TO 2066.                                                                                   |
| EXT16M          | 39  | I    | ALTERNATIVE BUS CLOCK INPUT.                                                                                               |
| SYSCLK          | 128 | O    | PERIPHERAL CLOCK.                                                                                                          |
| CLKOUT          | 14  | O    | CLOCK OUTPUT PROVIDING THE CCKOCK FOR THE CPU.                                                                             |
| CLKI            | 13  | I    | CLOCK FEEDBACK FROM CLKOUT.                                                                                                |
| X14M1           | 144 | I    | 14.318MHZ CRYSTAL INPUT.                                                                                                   |
| X14M2           | 143 | O    | 14.318MHZ CRYSTAL OUTPUT.                                                                                                  |
| 486CLK          | 37  | O    | CLOCK FOR 486 CPU.                                                                                                         |
| RESET PINS      |     |      |                                                                                                                            |
| PWRGD           | 72  | I    | POWER GOOD SIGNAL FROM POWER SUPPLY.                                                                                       |
| CPURST          | 12  | O    | CPU RST OUTPUT.                                                                                                            |
| RESETDRV        | 145 | I/O  | SYSTEM RESET.                                                                                                              |
| CPU PINS        |     |      |                                                                                                                            |
| /ADS            | 48  | I/O  | ADDRESS STROBE.                                                                                                            |
| M-/IO           | 24  | I/O  | MEMORY OR I/O ACCRESS.                                                                                                     |
| D-/C            | 25  | I    | INDICATES THE BUS IS A DATA OR A CONTROL CYCLE.                                                                            |
| W-/R            | 26  | I/O  | WRITE OR READ ACCESS.                                                                                                      |
| /RDY            | 18  | I/O  | THIS PIN IS THE READY SIGNAL TO THE CPU.                                                                                   |
| /NA             | 19  | O    | THIS PIN IS A MULTIFUNCTION PIN.BUT NO CONNECT IN 4024 MODEL.                                                              |
| /DTYWE          |     |      |                                                                                                                            |
| PHOLD           | 32  | O    | CPU HOLD REQUEST                                                                                                           |
| H LDA           | 73  | I    | HOLD ACKNOWLEDGE INPUT FROM CPU.                                                                                           |
| INTR            | 23  | O    | INTERRUPT TO THE CPU                                                                                                       |
| NMI             | 30  | O    | NON-MASKABLE INTERRUPT TO THE CPU.                                                                                         |
| /KEN            | 17  | O    | 486 CACHE ENABLE.                                                                                                          |
| NPU SIGNAL PINS |     |      |                                                                                                                            |
| /NPBZY          | 74  | I/O  | THIS IS A MULTIFUNCTION PIN. IN THE 486 SINGLE PHASE CLOCK MODE, THIS PIN IS THE /FLUSH PIN TO THE 486 CPU ( 4024 MODEL ). |
| /CLKSEL         |     |      |                                                                                                                            |
| /FLUSH          |     |      |                                                                                                                            |
| /NPERR          | 49  | I    | MATH COPROCESSOR ERROR.                                                                                                    |
| /BLAST          | 160 | I    | THIS PIN INDICATE THE LAST CYCLE OF BURST MODE.                                                                            |
| /IGNNE          | 21  | O    | IGNORE NUMERIC ERROR.                                                                                                      |
| /BRDY           | 31  | I/O  | BURST READY OUTPUT TO THE CPU.                                                                                             |
| /READYO         | 177 | I    | THIS IS A MULTIFUNCTION PIN.IN 4024 MODEL THIS PIN IS /LBA TO SENSE EXISTENCE OF LOCAL BUS PERIPHERALS.                    |
| /LBA            |     |      |                                                                                                                            |
| /BE0            | 76  | I/O  | BYTE ENABLE FOR D0-D7 DURING R & W CYCLE.                                                                                  |
| /BE1            | 77  | I/O  | BYTE ENABLE FOR D8-D15 DURING R & W CYCLE.                                                                                 |
| /BE2            | 78  | I/O  | BYTE ENABLE FOR D16-D23 DURING R & W CYCLE.                                                                                |
| /BE3            | 79  | I/O  | BYTE ENABLE FOR D24-D31 DURING R & W CYCLE.                                                                                |
| A2-A31          |     | I/O  | LOCAL ADDRESS BUS.                                                                                                         |
| LA20            | 80  | I/O  | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN 4024 MODEL.                                                               |
| /LGRNT          |     |      |                                                                                                                            |
| D0-D31          |     | I/O  | CPU DATA BUS.                                                                                                              |

| SYMBOL      | PIN | TYPE | DESCRIPTION                                                                                                                      |
|-------------|-----|------|----------------------------------------------------------------------------------------------------------------------------------|
| PARITY PINS |     |      |                                                                                                                                  |
| PAR0        | 172 | I/O  | GENERATE PARITY CHECK FOR EACH BYTE.                                                                                             |
| PAR1        | 173 | I/O  | GENERATE PARITY CHECK FOR EACH BYTE.                                                                                             |
| PAR2        | 175 | I/O  | GENERATE PARITY CHECK FOR EACH BYTE.                                                                                             |
| PAR3        | 176 | I/O  | GENERATE PARITY CHECK FOR EACH BYTE.                                                                                             |
| DRAM PINS   |     |      |                                                                                                                                  |
| /RAS0       | 110 | O    | DRAM ROW ADDRESS STROBE FOR DRAM BANK0.                                                                                          |
| /RAS1       | 111 | O    | DRAM ROW ADDRESS STROBE FOR DRAM BANK1.                                                                                          |
| /RAS2       | 113 | O    | DRAM ROW ADDRESS STROBE FOR DRAM BANK2.                                                                                          |
| /RAS3       | 115 | O    | DRAM ROW ADDRESS STROBE FOR DRAM BANK3.                                                                                          |
| /CAS0       | 106 | O    | DRAM COLUMN ADDRESS STROBE.                                                                                                      |
| /CAS1       | 107 | O    | DRAM COLUMN ADDRESS STROBE.                                                                                                      |
| /CAS2       | 108 | O    | DRAM COLUMN ADDRESS STROBE.                                                                                                      |
| /CAS3       | 109 | O    | DRAM COLUMN ADDRESS STROBE.                                                                                                      |
| /MBE0       | 95  | O    | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /KRMOEA     |     |      |                                                                                                                                  |
| /MBE1       | 102 | O    | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /KRMOEB     |     |      |                                                                                                                                  |
| /MBE1       | 103 | I/O  | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /LOCK       |     |      |                                                                                                                                  |
| /LRQ        |     |      |                                                                                                                                  |
| /MBE3       | 105 | O    | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /EADS       |     |      |                                                                                                                                  |
| CACHE PINS  |     |      |                                                                                                                                  |
| /KTGWE      | 94  | I/O  | THIS IS A MULTIFUNCTION PIN. IN THE MODEL 4024 IF BIT0 OF REGISTER 26 IS SET TO 1, THIS PIN FORCES A ZERO OUTPUT TO CPU/SMI PIN. |
| /LRDY       |     |      |                                                                                                                                  |
| /SMI        |     |      |                                                                                                                                  |
| /KRMWE      | 83  | O    | THIS IS A MULTIFUNCTION PIN. THIS PIN INDICATE THE CRT OFF IN THE N/B 4024.                                                      |
| /KRMWEA     |     |      |                                                                                                                                  |
| /KRMWE      | 82  | O    | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /KRMWEB     |     |      |                                                                                                                                  |
| TGLA2       | 22  | O    | THIS IS A MULTIFUNCTION PIN. THIS PIN INDICATE THE FDD MODE IN THE N/B 4024.                                                     |
| TKA3A       |     |      |                                                                                                                                  |
| TGLA3       | 33  | O    | THIS IS A MULTIFUNCTION PIN. USED FOR INDICATE THE ROM DISABLE.                                                                  |
| TKA3B       |     |      |                                                                                                                                  |
| MATCH1      | 50  | I/O  | THIS IS A MULTIFUNCTION PIN.USED FOR INDICATE SIO1 OFF AND ITS ACTIVE LOW.                                                       |
| MATCH2      | 20  | I/O  | THIS IS A MULTIFUNCTION PIN. BUT NO CONNECTED IN MODEL 4024.                                                                     |
| /KTOE       |     |      |                                                                                                                                  |
| /MDIR       | 36  | O    | MD BUS DIRECTION CONTROL. BUT NO CONNECTED.                                                                                      |
| MDLAT       | 35  | O    | MD LATCH FOR POST WRITE OPERATION.                                                                                               |
| /WEN        | 84  | O    | DRAM WRITE ENABLE.                                                                                                               |

# 4024 N/B MAINTENANCE

## 5. PIN DESCRIPTIONS OF MAJOR COMPONENTS

### 5.1 ACC2066 CORE LOGIC

| SYMBOL      | PIN | TYPE | DESCRIPTION                                                                            |
|-------------|-----|------|----------------------------------------------------------------------------------------|
| MUX PINS    |     |      |                                                                                        |
| MA0         | 85  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA1         | 86  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA2         | 88  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA3         | 90  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA4         | 91  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA5         | 92  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA6         | 93  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA7         | 98  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA8         | 99  | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA9         | 100 | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| MA10        | 101 | I/O  | DRAM ADDRESS BIT 0.                                                                    |
| SD BUS PINS |     |      |                                                                                        |
| SD0 - SD15  |     | I/O  | SYSTEM DATA BUS.                                                                       |
| /XDIR       | 28  | O    | THIS IS A MULTIFUNCTION PIN. IT IS THE XD BUS CONTROL IN THE MODEL 4024.               |
| /ENABUS     | 29  | O    | THIS IS A MULTIFUNCTION PIN.ENABLE ADDRESS BUFFER FOR BUS QUIET OPERATION IN THE 4024. |
| SA BUS PINS |     |      |                                                                                        |
| SA0         | 116 | I/O  | SYSTEM ADDRESS BIT 0.                                                                  |
| SA1         | 117 | I/O  | SYSTEM ADDRESS BIT 1.                                                                  |
| SA17        | 118 | I/O  | THIS IS A MULTIFUNCTION PIN. IN THE 4024 THIS PIN IS AN INPUT FROM CPU /SMIACT.        |
| /SA18       | 120 | I/O  | THIS IS A MULTIFUNCTION PIN. THIS PIN OUTPUTS A ZERO IN GRANT BUS CYCLE IN 4024 MODEL. |
| /SA19       | 17  | O    | THIS IS A MULTIFUNCTION PIN.THIS PIN IS AN OUTPUT TO CPU /STPCLK.                      |
| MUI0        | 157 | I    | MULTIPLEXED INPUT FOR KBINT,IRQ3-9 AND RTC INT.                                        |
| MUI1        | 158 | I    | MULTIPLEXED INPUT FOR IRQ10-15,KGA20, /IOCHK.                                          |
| MUI2        | 159 | I    | MULTIPLEXED INPUT FOR DRQ0-7, /KBRST.                                                  |
| SEL0        | 136 | O    | THESE ARE SELECT PINS FOR THE MULTIPLEXER.                                             |
| SEL1        | 137 | O    |                                                                                        |
| SEL2        | 138 | O    |                                                                                        |
| DAC0        | 150 | O    | THESE PINS ARE FOR MULTIPLEXED DMA GRANT TO GENERATE /DACK0-3, /DACK5-7.               |
| DAC1        | 152 | O    |                                                                                        |
| DAC2        | 151 | O    |                                                                                        |
| BALE        | 126 | I/O  | ADDRES LATCH ENABLE.                                                                   |
| /MEMR       | 140 | I/O  | AT BUS MEMORY READ COMMAND. ACTIVE LOW.                                                |
| /MEMW       | 141 | I/O  | AT BUS MEMORY WRITE COMMAND.ACTIVE LOW.                                                |
| /SMEMR      | 148 | I/O  | SYSTEM BUS MEMORY READ COMMAND. ACTIVE LOW.                                            |
| /SMEMW      | 149 | I/O  | SYSTEM BUE MEMORY WRITE COMMAND.ACTIVE LOW                                             |
| /MEMCS16    | 132 | I/O  | MEMORY 16-BIT CHIP SELECT.                                                             |

| SYMBOL  | PIN | TYPE | DESCRIPTION                                  |
|---------|-----|------|----------------------------------------------|
| /IOCS16 | 131 | I/O  | I/O 16-BIT CHIP SELECT.                      |
| /ZWS    | 123 | I    | ZERO WAIT STATE.                             |
| IOCHRDY | 133 | I/O  | I/O CHANNEL READY FROM EXPANSION BUS.        |
| AEN     | 129 | O    | BUS HOLD ACKNOWLEDGE.                        |
| /REF    | 146 | I/O  | REFRESH CYCLE.                               |
| /MASTER | 134 | I    | AT BUS MASTER INPUT.                         |
| /SBHE   | 130 | I/O  | SYSTEM BUS HIGH BYTE ENABLE.                 |
| SPEAKER | 122 | O    | OUTPUT TO DRIVE SPEAKER.                     |
| TC      | 27  | O    | TERMINAL COUNT OF ANY DMA CHANNEL IS REACHED |
| TURBO   | 75  | I    | TURBO SPEED CONTROL.                         |
| RTCAS   | 40  | O    | ADDRESS STROBE FOR 146818 REAL TIME CLOCK.   |
| /ENMAX  | 139 | I/O  | MA0-3 MUX ENABLE.                            |



## 5. PIN DESCRIPTIONS OF MAJOR COMPONENTS

### 5.2 C & T F65540 LCD/VGA CONTROLLER

| SYMBOL       | PIN | TYPE | DESCRIPTION                                  |
|--------------|-----|------|----------------------------------------------|
| /RESET       | 207 | I    | RESET.                                       |
| /ADS         | 22  | I    | ADDRESS STROBLE.                             |
| M/IO         | 31  | I    | INDICATES MEMORY OR I/O CYCLE.               |
| W/R          | 11  | I    | INDICATES A READ OR WRITE OPERATION.         |
| /RDYRTN      | 23  | I    | READY RETURN.                                |
| /LRDY        | 24  | O    | LOCAL READY.                                 |
| /LDEV        | 25  | O    | LOCAL DEVICE.                                |
| LCLK         | 27  | I    | LOCAL CLOCK.                                 |
| /BE0         | 43  | I    | BYTE ENABLE 0.                               |
| /BE1         | 32  | I    | BYTE ENABLE 1.                               |
| /BE2         | 21  | I    | BYTE ENABLE 2.                               |
| /BE3         | 10  | I    | BYTE ENABLE 3.                               |
| A2 - A27     |     | I    | SYSTEM ADDRESS BUS.                          |
| D0 - D31     |     | I/O  | SYSTEM DATA BUS.                             |
| CLK          | 201 | I    | BUS CLOCK.                                   |
| PAR          | 31  | I/O  | PARITY.                                      |
| /FRAME       | 22  | I    | CYCLE FRAME.                                 |
| /IRDY        | 23  | I    | INITIATOR READY.                             |
| /TRDY        | 24  | S/TS | TARGET READY.                                |
| /STOP        | 27  | S/TS | STOP.                                        |
| /DEVSEL      | 25  | S/TS | DEVICE SELECT.                               |
| /PERR        | 29  | S/TS | PARITY ERROR.                                |
| /SERR        | 30  | OD   | SYSTEM ERROR.                                |
| /INTA        | 200 | OD   | INTERRUPT.                                   |
| AD00 - AD31  |     | I/O  | PCI ADDRESS / DATA BUS.                      |
| C/BE0 - CBE3 |     | I    | BUS COMMAND / BYTE ENABLE.                   |
| IDSEL        | 11  | I    | INITIALIZATION DEVICE SELECT.                |
| AA0 - AA9    |     | I/O  | ADDRESS BUS FOR DRAMS A AND B.               |
| CA0 - CA9    |     | O    | ADDRESS BUS FOR DRAM C.                      |
| /RASA        | 156 | O    | ROW ADDRESS STROBE FOR DRAM A.               |
| /RASB        | 123 | O    | ROW ADDRESS STROBE FOR DRAM B.               |
| /RASC        | 101 | O    | ROW ADDRESS STROBE FOR DRAM C.               |
| /CASAL       | 160 | O    | COLUMN ADDRESS STROBE FOR DRAM A LOWER BYTE. |
| /CASAH       | 159 | O    | COLUMN ADDRESS STROBE FOR DRAM A UPPER BYTE. |
| /CASBL       | 126 | O    | COLUMN ADDRESS STROBE FOR DRAM B LOWER BYTE. |
| /CASBH       | 125 | O    | COLUMN ADDRESS STROBE FOR DRAM B UPPER BYTE. |
| /CASCL       | 104 | I/O  | CAS FOR THE DRAM C LOWER BYTE.               |
| /CASCH       | 103 | I/O  | CAS FOR THE DRAM C UPPER BYTE.               |
| /WEA         | 157 | O    | WRITE ENABLE FOR DRAM A.                     |
| /WEB         | 124 | O    | WRITE ENABLE FOR DRAM B.                     |
| /WEC         | 102 | O    | WRITE ENABLE FOR DRAM C.                     |
| /OEAB        | 155 | O    | OUTPUT ENABLE FOR DRAMS A AND B.             |
| /OEC         | 100 | I/O  | OUTPUT ENABLE FOR DRAMS C.                   |
| MAD0 - MAD15 |     | I/O  | MEMORY DATA BUS FOR DRAM A.                  |
| MBD0 - MBD15 |     | I/O  | MEMORY DATA BUS FOR DRAM B.                  |
| MCD0 - MCD15 |     | I/O  | MEMORY DATA BUS FOR DRAM C.                  |

| SYMBOL   | PIN | TYPE | DESCRIPTION                                   |
|----------|-----|------|-----------------------------------------------|
| PO - P15 |     | O    | 16 BIT FLAT PANEL DATA OUTPUT.                |
| SHFCLK   | 70  | O    | SHIFT CLOCK. PIXEL CLOCK FOR FLAT PANEL DATA. |
| FLM      | 67  | O    | FIRST LINE MARKER                             |
| LP       | 68  | O    | LATCH PULSE.                                  |
| M        | 69  | O    | M SIGNAL FOR PANEL AC DRIVE CONTROL.          |
| ENAVDD   | 62  | O    | POWER CONTROL FOR PANEL DRIVER VOLTAGE VDD.   |
| ENAVEE   | 61  | O    | POWER CONTROL FOR PANEL DRIVER VOLTAGE VEE.   |
| ACTI     | 53  | I/O  | ACTIVITY INDICATOR.                           |
| ENABKL   | 54  | I/O  | ENABLE BACKLIGHT OUTPUTS.                     |
| HSYNC    | 65  | O    | CRT HORIZONTAL SYNC.                          |
| VSNC     | 64  | O    | CRT VERTICAL SYNC.                            |
| RED      | 60  | O    | CRT ANALOG VIDEO OUTPUT FROM RAMDAC.          |
| GREEN    | 58  | O    | CRT ANALOG VIDEO OUTPUT FROM RAMDAC.          |
| BLUE     | 57  | O    | CRT ANALOG VIDEO OUTPUT FROM RAMDAC.          |
| RSET     | 55  | I    | SET POINT REGISTER FOR THE INTERNAL RAMDAC.   |
| AVCC     | 59  | VCC  | ANALOG POWER.                                 |
| AGND     | 56  | GND  | ANALOG GROUND PIN.                            |
| XTAL1    | 203 | I/O  | CRYSTAL IN.                                   |
| XTAL0    | 204 | O    | CRYSTAL OUT.                                  |
| /STNDBY  | 178 | I    | STANDBY CONTROL PIN.                          |
| CVCC0    | 205 | VCC  | ANALOG POWER PIN.                             |
| CGND0    | 202 | GND  | ANALOG GROUND PIN.                            |
| CVCC1    | 206 | VCC  | ANALOG POWER PIN.                             |
| CGND1    | 208 | GND  | ANALOG GROUND PIN.                            |
| IVCC     | 80  | VCC  | POWER / GROUND (INTERNAL LOGIC).              |
| IGND     | 77  | GND  |                                               |
| IVCC     | 181 | VCC  |                                               |
| IGND     | 184 | GND  | POWER / GROUND (BUS INTERFACE).               |
| BVCC     | 9   | VCC  |                                               |
| BGND     | 12  | GND  |                                               |
| BGND     | 26  | GND  |                                               |
| BVCC     | 42  | VCC  | POWER / GROUND (MEMORY INTERFACE A).          |
| BGND     | 39  | GND  |                                               |
| BGND     | 52  | GND  |                                               |
| MVCCA    | 158 | VCC  |                                               |
| MGNDA    | 161 | GND  | POWER / GROUND (MEMORY INTERFACE B).          |
| MVCCB    | 142 | VCC  |                                               |
| MGNDB    | 139 | GND  |                                               |
| MVCCC    | 108 | VCC  |                                               |
| MGNDC    | 105 | GND  | POWER / GROUND (MEMORY INTERFACE C).          |

## 5. PIN DESCRIPTIONS OF MAJOR COMPONENTS

### 5.3 NS87332 SUPER I/O CONTROLLER

| SYMBOL      | PIN   | TYPE | DESCRIPTION                                 |
|-------------|-------|------|---------------------------------------------|
| A0 - A10    |       | I    | ADDRESS BUS.                                |
| /ACK        | 85    | I    | ACKNOWLEDGE.                                |
| /AFD        | 78    | I/O  | AUTOMATIC FEED XT.                          |
| AEN         | 20    | I    | ADDRESS ENABLE.                             |
| /ASTRB      | 81    | O    | ADDRESS STROBLE.                            |
| BADDR0      | 55    | I    | BASE ADDRESS 0.                             |
| BADDR1      | 58    | I    | BASE ADDRESS 1.                             |
| /BOUT1      | 73    | O    | BAUD OUTPUT 1.                              |
| /BOUT2      | 65    | O    | BUAD OUTPUT 2.                              |
| BUSY        | 84    | I    | PRINTER BUSY.                               |
| CFG0 - CFG4 |       | I    | DEFAULT CONFIGURATION.                      |
| CLK48       | 57    | I    | CLOCK 48. THE CLK48 RESET STRAP OPTION.     |
| /CSOUT      | 3     | O    | CHIP SELECT OUTPUT.                         |
| /CTS1,2     |       | I    | CLEAR TO SEND.                              |
| D0 - D7     |       | I/O  | DATA BUS.                                   |
| /DCD1,2     |       | I    | DATA CARRIER DETECT.                        |
| DENSEL      | 48    | O    | DENSITY SELECT.                             |
| /DIR        | 41    | O    | DIRECTION.                                  |
| /DRO0,1     | 44,45 | O    | DRIVE SELECT 0,1.                           |
| DRATE0,1    | 52,51 | O    | DATA RATE 0,1.                              |
| /DRV2       | 49    | I    | DRIVE 2.                                    |
| /DSKCHG     | 32    | I    | DISK CHANGE.                                |
| /DSR1,2     | 76,68 | I    | DATA SET READY.                             |
| /DSTRB      | 78    | O    | DATA STROBE.                                |
| /DTR1,2     | 71,63 | O    | DATA TERMINAL READY.                        |
| /ERR        | 79    | I    | PRINTER ERROR.                              |
| /EDACK      | 5     | I    | DMA ACKNOWLEDGE.                            |
| FDRO        | 4     | O    | DMA REQUEST.                                |
| HCS0        | 58    | O    | HARD DRIVE CHIP SELECT 0.                   |
| /HCS1       | 57    | O    | HARD DRIVE CHIP SELECT 1.                   |
| IDED7       | 60    | I/O  | IDE BIT 7.                                  |
| /IDEH1      | 56    | O    | IDE HIGH BYTE.                              |
| /IDEL0      | 55    | O    | IDE LOW BYTE.                               |
| IDENT       | 54    | I    | IDENTITY.                                   |
| IDLE        | 43    | O    | IDLE INDICATE THE FDC IS IN THE IDLE STATE. |
| IOCHRDY     | 53    | O    | I/O CHANNEL READY.                          |
| /INDEX      | 47    | I    | INDEX SIGNALS THE BEGINING OF A FDD TRACK.  |
| /INIT       | 80    | I/O  | INITIALIZE (PRINTER).                       |
| /IOCS16     | 59    | I    | I/O CHIP SELECT 16-BIT.                     |
| IRO3,4      | 1,100 | O    | INTERRUPT 3 AND 4.                          |
| IRO5        | 98    | I/O  | INTERRUPT 5.                                |
| IRO6        | 97    | O    | INTERRUPT 6.                                |
| MR          | 2     | I    | MASTER RESET.                               |
| MFEM        | 53    | I/O  | MFEM.                                       |

| SYMBOL      | PIN   | TYPE | DESCRIPTION                                 |
|-------------|-------|------|---------------------------------------------|
| /MTR0,1     | 46,43 | O    | MOTOR SELECT 0,1.                           |
| PD          | 45    | O    | POWER DOWN.                                 |
| PD0 - PD7   |       | I/O  | PARALLEL PORT DATA.                         |
| /PDACK      | 54    | I    | PRINTER DMA ACKNOWLEDGE, VALID IN ECP MODE. |
| PDRQ        | 33    | O    | PRINTER DMA REQUEST.                        |
| /PWDN       | 3     | I    | POWER DOWN.                                 |
| PE          | 83    | I    | PAPER END.                                  |
| PNF         | 49    | I    | PRINTER NOT FLOPPY.                         |
| /RD         | 19    | I    | READ.                                       |
| /RDATA      | 35    | I    | READ DATA.                                  |
| /RI1,2      | 70,62 | I    | RING INDICATOR.                             |
| /RTS1,2     | 74,66 | O    | REQUEST TO SEND.                            |
| SIN1,2      | 75,67 | I    | SERIAL INPUT.                               |
| SLCT        | 82    | I    | SELECT.                                     |
| /SLIN       | 81    | I/O  | SELECT INPUT.                               |
| SOUT1,2     | 73,65 | O    | SERIAL OUTPUT.                              |
| /STB        | 95    | I/O  | DATA STROBE.                                |
| /STEP       | 40,81 | O    | STEP.                                       |
| TC          | 6     | I    | TERMINAL COUNT.                             |
| /TRK0       | 37    | I    | TRACK 0.                                    |
| VDDDB,VDDC  | 50,99 |      | POWER SUPPLY.                               |
| /VLD0,1     | 56,63 | I    | VALID DATA.                                 |
| VSSB - VSSE |       |      | GROUND.                                     |
| /WAIT       | 84    | I    | WAIT.                                       |
| /WR         | 18    | I    | WRITE.                                      |
| /WDATA      | 39,83 | O    | WRITE DATA.                                 |
| /WP         | 36,92 | I    | WRITE PROTECT.                              |
| /WGATE      | 38,82 | O    | WRITE GATE.                                 |
| /WRITE      | 95    | O    | WRITE STROBE.                               |
| X1/OSC      | 7     | I    | CRYSTAL1/CLOCK.                             |
| X2          | 8     | O    | CRYSTAL2.                                   |
| /ZWS        | 3     | O    | ZERO WAIT STATE.                            |

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## 6. SWITCH & JUMPER SETTING

| CPU VOLTAGE | JP1  | PIN 8 OF SW6 |
|-------------|------|--------------|
| 3.45V       | 1-2  | ON           |
| 3.9V        | 2-3  | ON           |
| 5.0V        | OPEN | OFF          |

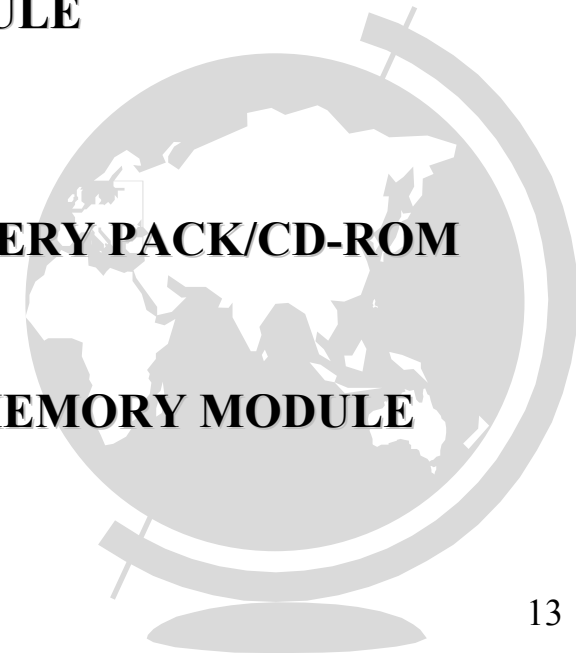
| CPU CLOCK SPEED<br>(MHZ) | SW6 |     |     |
|--------------------------|-----|-----|-----|
|                          | 2   | 3   | 4   |
| 20MHZ                    | ON  | ON  | OFF |
| 25MHZ                    | ON  | OFF | ON  |
| 33MHZ                    | OFF | ON  | ON  |

| CPU TYPE               | SW4 |     |     |     |     |     |     |     | SW5 |     |     |     |     |     |     |     | SW6 |     |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                        | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 6   | 7   |
| INTEL SX (NORMAL)      | OFF | OFF | OFF | OFF | OFF | ON  | OFF | ON  | OFF | ON  | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| INTEL DX/DX2 (NORMAL)  | OFF | OFF | OFF | OFF | OFF | ON  | OFF | ON  | ON  | OFF | ON  | ON  | OFF | OFF | OFF | OFF | OFF | OFF |
| INTEL SX/SX2 (SMM)     | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | OFF | ON  | OFF | OFF | OFF | ON  | ON  | ON  | OFF | OFF |
| INTEL DX/DX2/DX4 (SMM) | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | ON  | OFF | ON  | ON  | OFF | ON  | ON  | ON  | OFF | OFF |
| CYRIX DX/DX2/DX2V      | ON  | OFF | ON  | ON  | ON  | OFF | ON  | OFF | ON  | OFF | ON  | ON  | OFF | OFF | ON  | OFF | OFF | OFF |
| CYRIX 5X86             | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | ON  | OFF | ON  | ON  | OFF | ON  | ON  | ON  | OFF | OFF |
| AMD DX2/DX4 (NORMAL)   | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | ON  | ON  | OFF | OFF | OFF | OFF | OFF | OFF |
| AMD DX4 NV8T           | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | ON  | ON  | OFF | OFF | OFF | OFF | OFF | OFF |
| AMD DX2 NV8T           | OFF | ON  | OFF | OFF | OFF | OFF | OFF | ON  | ON  | OFF | ON  | ON  | OFF | OFF | OFF | OFF | OFF | OFF |
| AMD DX4 SV8B           | OFF | ON  | OFF | OFF | ON  | ON  | ON  | OFF | ON  | OFF | ON  | ON  | OFF | ON  | ON  | ON  | ON  | ON  |
| AMD DX2 SV8B           | OFF | ON  | OFF | OFF | ON  | ON  | ON  | OFF | ON  | OFF | ON  | ON  | ON  | ON  | ON  | ON  | ON  | ON  |

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## 7. ASSEMBLY & DISASSEMBLY

- 7.1 — SYSTEM VIEW
- 7.2 — KEYBOARD
- 7.3 — HARD DISK DRIVE
- 7.4 — FLOPPY DISK DRIVE
- 7.5 — BATTERY PACK
- 7.6 — TRACKBALL MODULE
- 7.7 — SYSTEM BOARD
- 7.8 — LCD
- 7.9 — SECONDARY BATTERY PACK/CD-ROM DRIVE
- 7.10 — DIMM MEMORY MODULE
- 7.11 — CPU



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## 7.1 SYSTEM VIEW

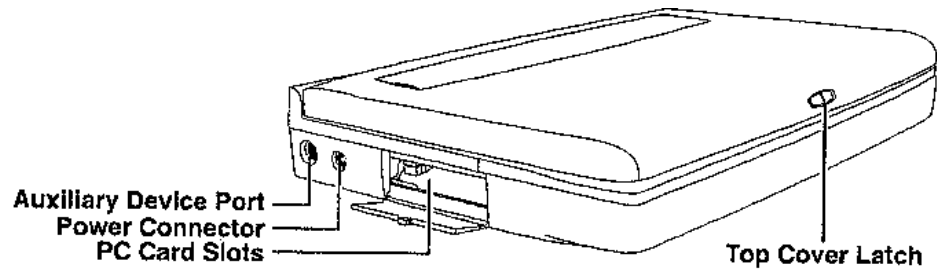


Figure7-1-1 Notebook Front and Left-Side Views

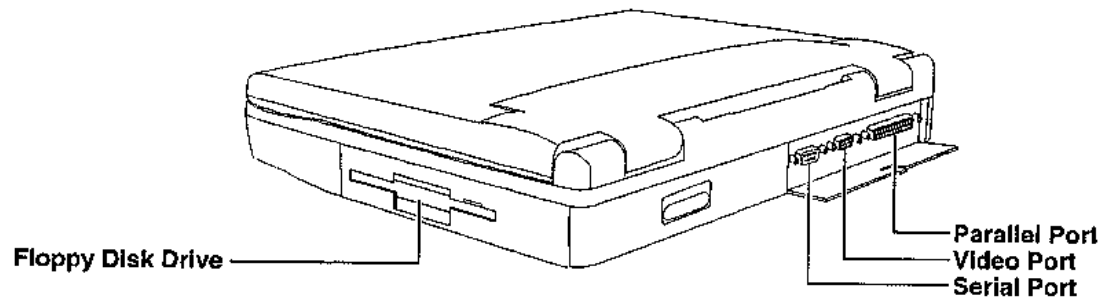


Figure7-1-2 Notebook Rear and Right-Side Views

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## 7.2 KEYBOARD

### Disassembly

1. Open the top cover (LCD cover).
2. Slide the two keyboard latches inward ( Figure 7-2-1 Arrow A )
3. Pry up the metal tabs ( Figure 7-2-1 Arrow B ) and lift the keyboard.
4. Unplug the keyboard cable ( Figure 7-2-2 #1 )

### Reassembly

1. Reconnect the keyboard cable ( Figure 7-2-2 #1 )
2. Insert the four lower hooks ( Figure 7-2-1 #2 ) to the chassis at an angle and then lay down the keyboard.
3. Slide the two keyboard latches outward to lock the keyboard in position.

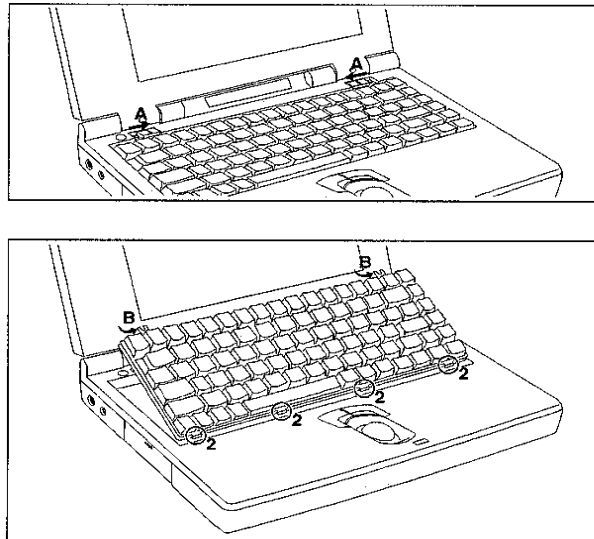


Figure 7-2-1. Keyboard Disassembly/reassembly



# 4024 N/B MAINTENANCE

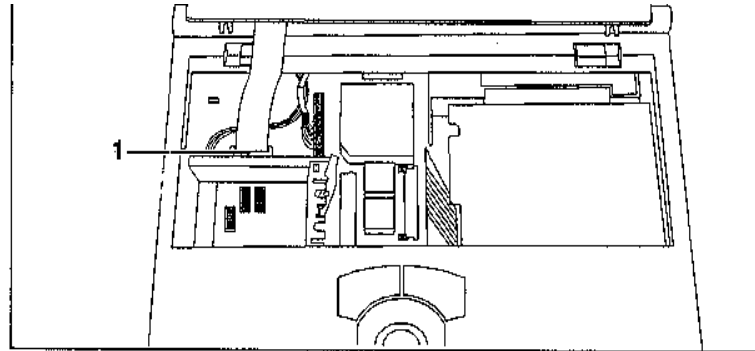


Figure 7-2-2. Keyboard Disassembly/Reassembly

## 7.3 HARD DISK DRIVE

### Disassembly

1. Open the top cover (LCD cover).
2. Using a pointed tool, slide the three safety catches toward the right of the notebook (Figure 7-3-1 Arrow A) if you are facing the front of the notebook. Then slide the cover plate downward (Figure 7-3-1 Arrow B) until it is free and carefully put the plate aside without pulling the cable between the trackball and system board.
3. Remove the screw (Figure 7-3-1 #1) securing the hard disk to the chassis.
4. Unplug the hard disk cable (Figure 7-3-1 #2) and lift the hard disk drive free.

### Reassembly

1. Fit the hard disk back into place and connect the hard disk cable (Figure 7-3-1 #2)
2. Secure the hard disk to the chassis with one screw (Figure 7-3-1 #1)
3. To replace the cover plate, first insert the front hooks to the chassis at an angle and then lay down the lower end, making sure the lower hooks fit into place. Finally slide the three safety catches back to the locked position.



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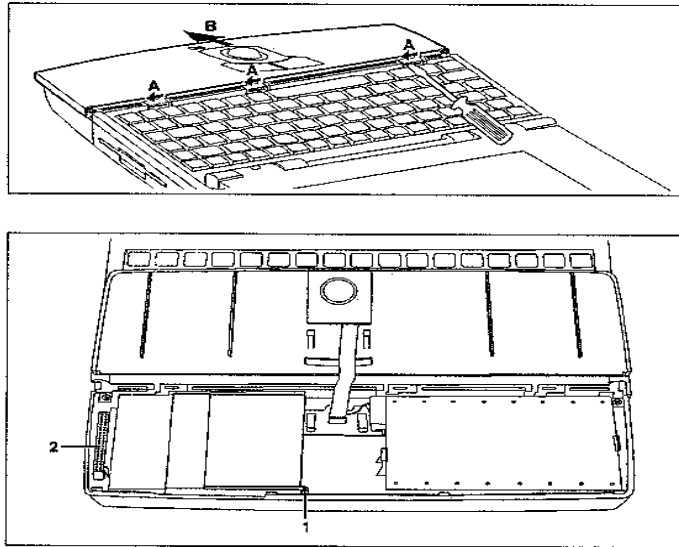


Figure7-3-1. Hard Disk Drive Disassembly/Reassembly

## 7.4 FLOPPY DISK DRIVE

### Disassembly

The floppy disk drive comes in an easy-to-replace package. To remove the package, simply push in the safety catch(Figure 7-4-1 Arrow A)and slide it out of its compartment(Figure 7-4-1 Arrow B)

### Reassembly

Slide the floppy disk drive package into the compartment until the safety catch clicks into place.

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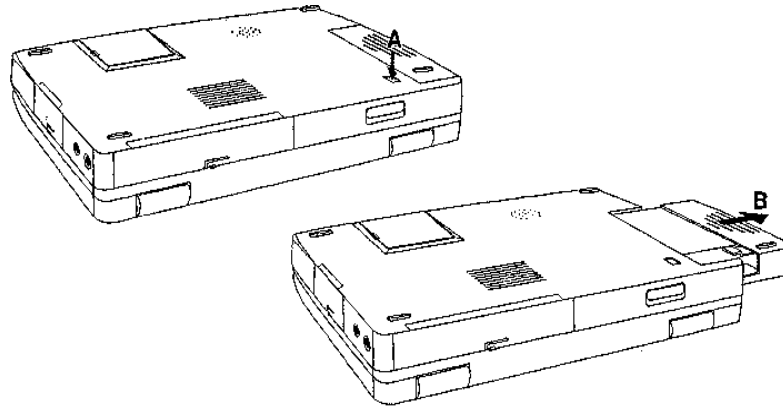


Figure 7-4-1. Floppy Disk Drive Disassembly/Reassembly

## 7.5 BATTERY PACK

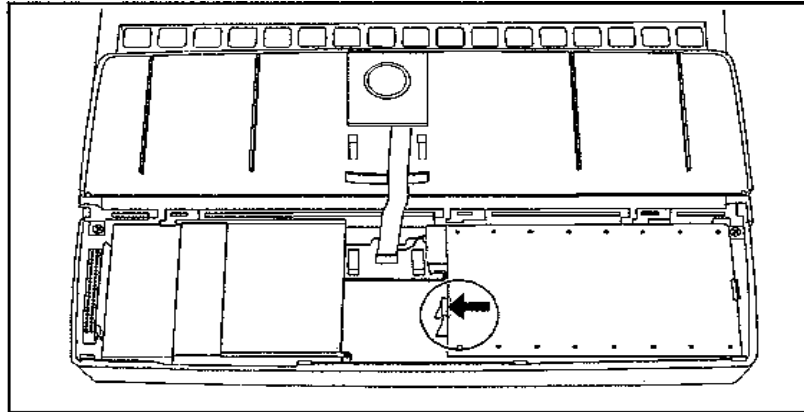
### Disassembly

1. Open the top cover (LCD cover).
2. Remove the lower cover plate. (See step 2 in Section 7-3 Disassembly).
3. Release the battery pack by prying the retaining clip (Figure 7-5-1 Arrow) and lift the battery pack out of its compartment.

### Reassembly

1. Align the battery pack with its compartment and fit it into place. Make sure the retaining clips secure the battery pack.
2. Replace the lower cover plate. (See step 3 in Section 7-3 Reassembly).

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**Figure 7-5-1. Battery Pack Disassembly/Reassembly**

## **7.6 TRACKBALL MODULE**

### **Disassembly**

1. Open the top cover (LCD cover).
2. Remove the lower cover plate. (See step 2 in Section 7-3 Disassembly).
3. Unplug the trackball cable (Figure 7-6-1 #1).
4. Remove the two screws (Figure 7-6-1 #2) securing the trackball module to the lower cover plate and lift the trackball module free.

### **Reassembly**

1. Secure the trackball module to the lower cover plate with two screws (Figure 7-6-1 #2).
2. Connect the trackball cable (Figure 7-6-1 #1).
3. Replace the lower cover plate. (See step 3 in Section 7-3 Disassembly).

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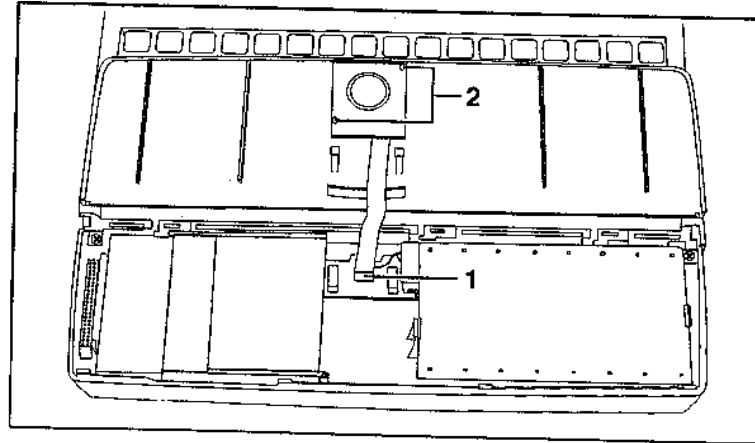


Figure 7-6-1. Trackball Module Disassembly/Reassembly

## 7.7 SYSTEM BOARD

### Disassembly

1. Remove the PC card(s), if installed.
2. Remove the floppy disk drive/CD-ROM drive/secondary battery pack package. (See Section 7-4 Disassembly).
3. Remove the keyboard. (See Section 7-2 Disassembly).
4. Remove the lower cover plate. (See step 2 in Section 7-3 Disassembly) the trackball cable.
5. Remove the hard disk drive. (See Section 7-3 Disassembly)
6. Remove the battery pack. (See Section 7-5 Disassembly)
7. Unplug all the connectors from the system board.

Unplug

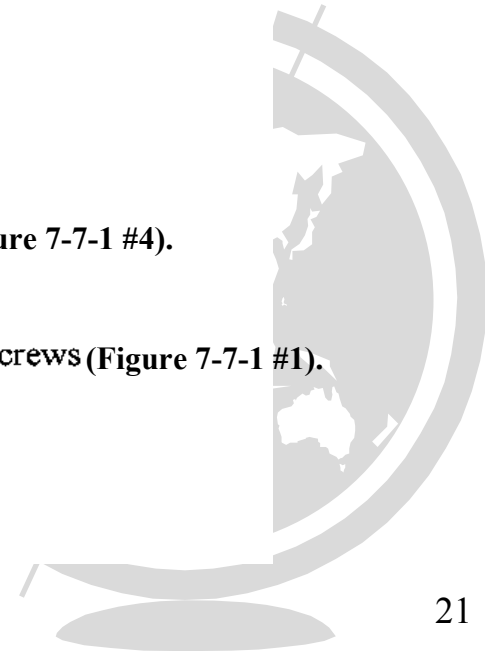


## **4024 N/B MAINTENANCE**

8. Remove three screws(Figure 7-7-1 #1) and six hexnut screws(Figure 7-7-1 #2) from the rear panel.
9. Remove two screws(Figure 7-7-1 #3) from the bottom of the notebook.
10. Remove two screws(Figure 7-7-1 #4) securing the top cover to the chassis.
11. Separate the top cover from the chassis.
12. Remove the screw(Figure 7-7-1 #5) securing the system board to the chassis.
13. Remove the bracket(Figure 7-7-1 #6).
14. Remove the Power Button cap (Figure 7-7-1 #7).
15. Lift the system board free.

### **Reassembly**

1. Align and fit the system board back into place.
2. Replace the Power Button cap (Figure 7-7-1 #7).
3. Replace the bracket(Figure 7-7-1 #6) and the screw (Figure 7-7-1 #5).
4. Align the top cover with the chassis and replace the two screws (Figure 7-7-1 #4).
5. Replace the three bottom screws(Figure 7-7-1 #3).
6. Replace the three rear panel screws(Figure 7-7-1 #2) and six hexnut screws (Figure 7-7-1 #1).
7. Reconnect all the connectors to the system board.
8. Replace the battery pack. (See Aection 7-5 Reassembly).



## 4024 N/B MAINTENANCE

9. Replace the hard disk drive. (See Section 7-3 Reassembly).
10. Reconnect the trackball cable. Replace the lower cover plate. (See Step 3 in Section 7-3 Reassembly).
11. Replace the keyboard. (See Section 7-2 Reassembly).
12. Replace the floppy disk drive/CD-ROM drive/secondary battery pack package.  
(See Section 7-4 Reassembly).
13. Replace the PC card(s).

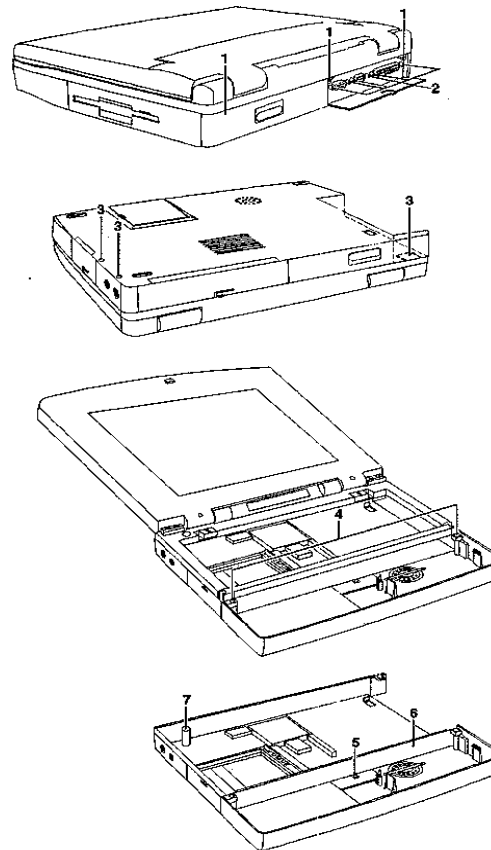


Figure 7-7-1. System Board Disassembly/Reassembly



# **4024 N/B MAINTENANCE**

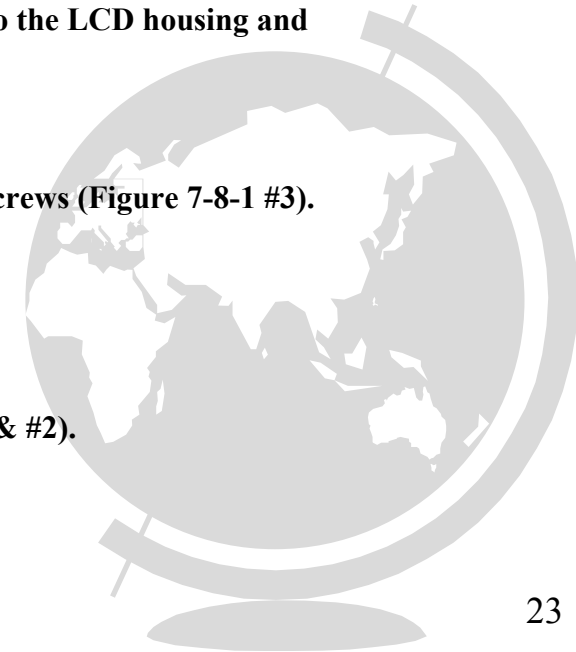
## **7.8 LCD**

### **Disassembly**

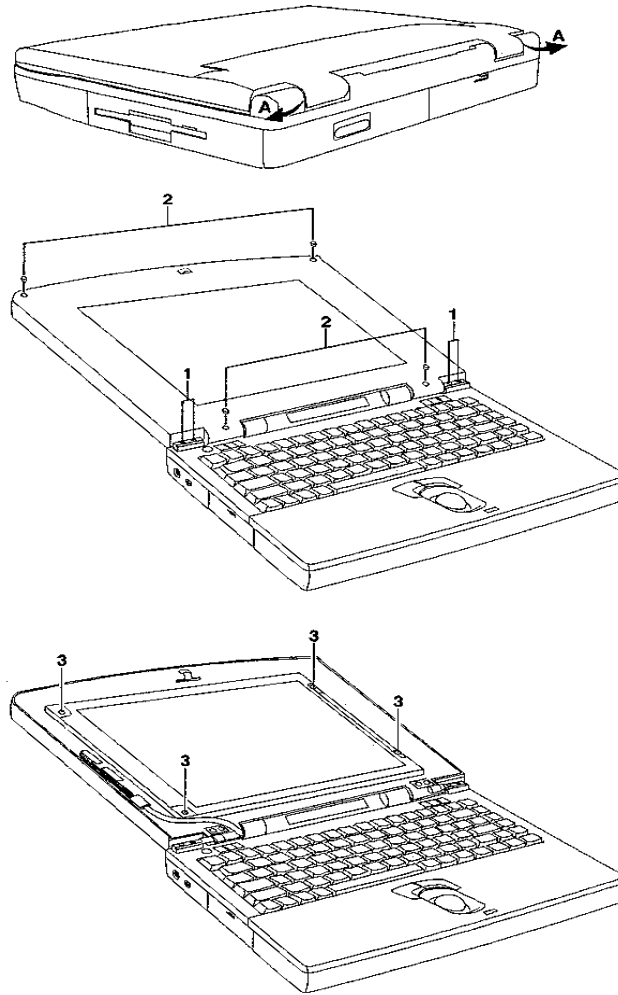
1. Remove the hinge covers by inserting a flat screwdriver to force them out (Figure 7-8-1 Arrow A).
2. Open the LCD/cover.
3. Remove the four screws (Figure 7-8-1 #1) under the hinge covers.
4. Remove the four cushions and the four screws inside (Figure 7-8-1 #2).
5. Separate the lcd panel from the LCD housing.
6. Unplug the four screws (Figure 7-8-1 #3) securing the LCD to the LCD housing and lift the LCD free.

### **Reassembly**

1. Align the LCD with the LCD housing and secure with four screws (Figure 7-8-1 #3).
2. Reconnect all the connectors.
3. Align and fix the LCD panel back into the LCD housing.
4. Replace the eight screws and four cushions (Figure 7-8-1 #1 & #2).
5. Close the LCD/covers.
6. Replace the two hinge covers.



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**Figure 7-8-1. LCD Disassembly/Reassembly**



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## 7.9 SECONDARY BATTERY PACK/CD-ROM DRIVE

Either the secondary battery pack or the CD-ROM drive occupies the same compartment as the floppy disk drive. To install your option, you have to remove whichever occupies there (See Figure 7-4-1 and its description).

The secondary battery pack or CD-ROM drive comes in an easy-to-replace package. Simply slide it into the compartment until the safety catch clicks into place.

## 7.10 DIMM MEMORY MODULE

1. Carefully place the notebook with its bottom facing up.
2. To remove the access cover (Figure 7-10-1 #1), press its latch and lift the cover.
3. To install the DIMM, align the DIMM's notched end with the socket's corresponding end and firmly insert the DIMM into the socket at an angle (Figure 7-10-2 Arrow A) Then push down (Figure 7-10-2 Arrow b) until the retaining clips lock the DIMM into position.

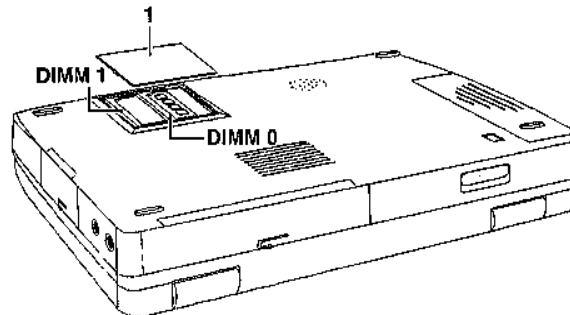


Figure 7-10-1 DIMM installation



# 4024 N/B MAINTENANCE

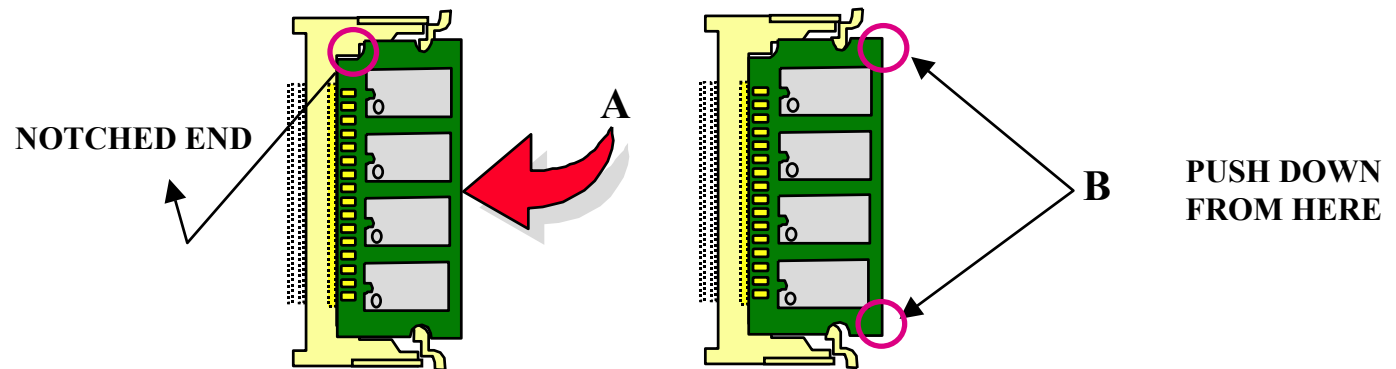


Figure 7-10-2 DIMM installation

## 7.11 CPU

1. Open the top cover (LCD cover).
2. Lift up the keyboard without unplugging the keyboard cable. (See step 2 and 3 in Section 7-2 Disassembly).
3. Remove the CPU by pulling it straight up.
4. Aligning the beveled corner, install the new CPU by inserting its pins into the corresponding holes on the socket.

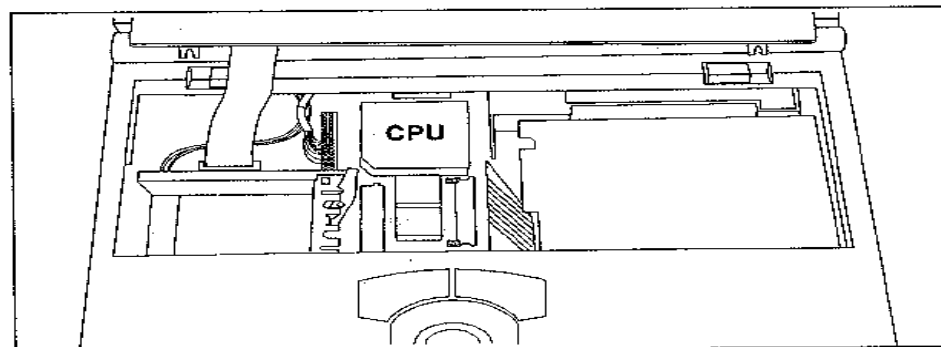


Figure 7-11-1. CPU Location

## 8. MAINTENANCE DIAGNOSTICS

### 8.1 INTRODUCTION

**EACH TIME THE COMPUTER IS TURNED ON, THE SYSTEM BIOS RUNS A SERIES OF INTERNAL CHECKS ON THE HARDWARE. THIS POWER-ON SELF TEST (POST) ALLOWS THE COMPUTER TO DETECT PROBLEMS AS EARLY AS THE POWER-ON STAGE. ERROR MESSAGES OF POST CAN ALERT YOU TO THE PROBLEMS OF YOUR COMPUTER.**

**IF AN ERROR IS DETECTED DURING THESE TESTS, YOU WILL SEE AN ERROR MESSAGE DISPLAYED ON THE SCREEN. IF THE ERROR OCCURS BEFORE THE DISPLAY IS INITIALIZED, THEN THE SCREEN CANNOT DISPLAY THE ERROR MESSAGE. ERROR CODES OR SYSTEM BEEPS ARE USED TO IDENTIFY A POST ERROR THAT OCCURS WHEN THE SCREEN IS NOT AVAILABLE.**

**THE VALUE FOR THE DIAGNOSTIC PORT (378H) IS WRITTEN AT THE BEGINNING OF THE TEST. THEREFORE, IF THE TEST FAILED, THE USER CAN DETERMINE WHERE THE PROBLEM OCCURRED BY READING THE LAST VALUE WRITTEN TO PORT 378H BY THE PIO DEBUG BOARD PLUG AT PIO PORT.**

## 8. MAINTENANCE DIAGNOSTICS

### 8.2 POWER-ON SELF TEST ERROR MESSAGES

**IF AN ERROR IS DETECTED DURING POST, THE ERROR MESSAGES WILL SHOWN ON SCREEN IF THE SCREEN IS AVAILABLE.**

| MESSAGE                        | POSSIBLE CAUSE                                                                                                  | RECOMMENDED ACTION                                                                                                           |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| NO BOOT DEVICE AVAILABLE       | BOTH DRIVE AND DRIVE C ARE NOT FORMATTED AS BOOTABLE.                                                           | 1. REPLACE THE DISKETTE WITH A BOOTABLE DISKETTE OR FORMAT DRIVE C AS BOOTABLE.<br>2. REPLACE THE DISKETTE OR THE HARD DISK. |
| HARD DISK READ FAILURE         | THE HARD DISK IS DAMAGED OR NOT CONFIGURED PROPERLY                                                             | 1. CHECK THE CABLE AND POWER CORD FOR PROPER INSTALLATION<br>2. REPLACE HARD DISK                                            |
| NO BOOT SECTOR ON HARD DISK    | THE HARD DISK HAS NOT BEEN PARTITIONED OR THE PARTITION TABLE IS DAMAGED.                                       | 1. RUN FDISK<br>2. REPLACE HARD DISK                                                                                         |
| FIXED DISK 0 FAILURE           | 1. HARD DISK IS NOT WORKING OR NOT CONFIGURED PROPERLY<br>2. INCORRECT CONFIGURATION OF HARD DISK IN CMOS SETUP | 1. RUN SETUP<br>2. REPLACE THE SIGNAL AND POWER CABLES<br>3. REPLACE HARD DRIVE<br>4. REPLACE SYSTEM BOARD.                  |
| FIXED DISK CONFIGURATION ERROR | INCORRECT CONFIGURETION OF HARD DISK IN CMOS SETUP                                                              | 1. RUN SETUP<br>2. REPLACE HARD DISK                                                                                         |
| FIXED DISK CONTROLLER FAILURE  | THE EMBEDED CONTROLLER ON THE HARD DISK IS DAMAGED.                                                             | 1. RUN SETUP<br>2. REPLACE THE HARD DISK<br>3. REPLACE THE SYSTEM BOARD                                                      |
| KEYBOARD CONTROLLER FAILURE    | THE KEYBOARD CONTROLLER IS DAMAGED                                                                              | 1. REPLACE KEYBOARD<br>2. REPLACE THE SYSTEM BOARD                                                                           |

(TO BE CONTINUED)

## 8. MAINTENANCE DIAGNOSTICS

### 8.2 POWER-ON SELF TEST ERROR MESSAGES

| MESSAGE                                               | POSSIBLE CAUSE                                                               | RECOMMENDED ACTION                                                                                                            |
|-------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| KEYBOARD STUCK KEY FAILURE                            | BIOS DISCOVERED A STUCK KEY DURING POST                                      | 1. DO NOT PRESS ANY KEY DURING POST<br>2. REPLACE THE KEYBOARD                                                                |
| KEYBOARD CLOCKLINE & DATALINE FAILURE                 | INTERFACE BETWEEN KEYBOARD AND KEYBOARD CONTROLLER FAILED.                   | 1. REPLACE KEYBOARD<br>2. REPLACE SYSTEM BOARD                                                                                |
| KEYBOARD FAILURE                                      | KEYBOARD TEST FAILURE.                                                       | 1. REPLACE KEYBOARD<br>2. REPLACE SYSTEM BOARD                                                                                |
| REAL TIME CLOCK FAILURE                               | REAL-TIME CLOCK FAILS BIOS TEST OR THE RTC DOES NOT UPDATE THE TIME.         | 1. REPLACE SYSTEM BOARD                                                                                                       |
| MEMORY FAILED AT PHYSICAL ADDRESS: XX                 | CIRCUITRY ASSOCIATED WITH THE MEMORY CHIPS HAS FAILED.                       | 1. REPLACE THE DIMM MEMORY MODULES<br>2. REPLACE THE SYSTEM BOARD                                                             |
| DECREASING AVAILABLE MEMORY                           | MEMORY FAILED.                                                               | 1. REPLACE THE DIMM MEMORY MODULES<br>2. REPLACE THE SYSTEM BOARD                                                             |
| TIMER 2 FAILURE                                       | POSSIBLE U511 ACC2066 IS DAMAGED                                             | 1. REPLACE THE SYSTEM BOARD                                                                                                   |
| SHUTDOWN FAILURE                                      | POSSIBLE CPU RESET FAILED                                                    | 1. CHECK THE SWITCH SETTINGS OF THE SYSTEM BOARD                                                                              |
| DISKETTE DRIVE 0 FAILURE                              | BIOS CANNOT FIND A FLOPPY DISK DRIVE BUT DRIVE A IS CONFIGURED IN CMOS SETUP | 1. CHECK THE FLOPPY DISK DRIVE CABLE FOR PROPER CONNECTION<br>2. REPLACE THE FLOPPY DISK DRIVE<br>3. REPLACE THE SYSTEM BOARD |
| INVALID CONFIGURATION INFORMATION - RUN SETUP PROGRAM | CURRENT SYSTEM CONFIGURATION DOES NOT MATCH WITH WITH CMOS SETUP VALUES      | 1. CHECK ALL OF I/O DEVICE FOR PROPER INSTALLATION<br>2. RUN SETUP<br>3. REPLACE SYSTEM BOARD                                 |

## 8. MAINTENANCE DIAGNOSTICS

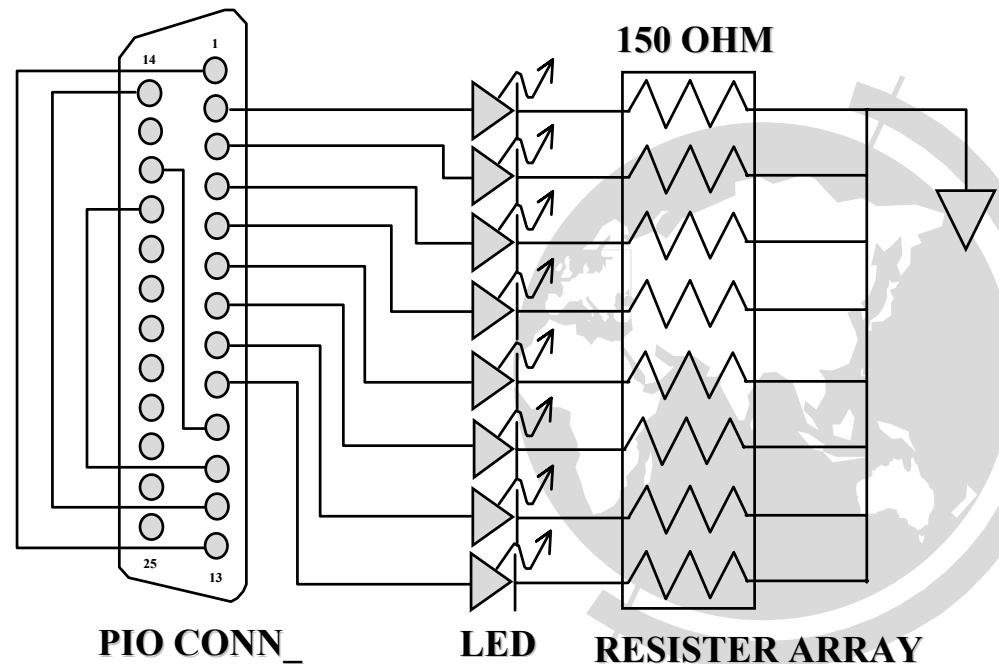
### 8.3 PIO PORT (378H) DIAGNOSTIC TOOLS

#### A. PARTS USED:

|                                  |     |
|----------------------------------|-----|
| ■ LED                            | * 8 |
| ■ RESISTER ARRAY, 10PIN, 150 OHM | * 1 |
| ■ PIO CONNECTOR                  | * 1 |

#### B. CIRCUIT:

PIN1 : STROBE ↔ PIN 13 : SLCT  
PIN10: ACK# ↔ PIN 16 : INT#  
PIN11: BUSY ↔ PIN 17 : SELIN#  
PIN12: PTERR ↔ PIN 14 : AUTOFD#  
PIN 2 ~ PIN 9 : PD0 ~ PD7



## 8. MAINTENANCE DIAGNOSTICS

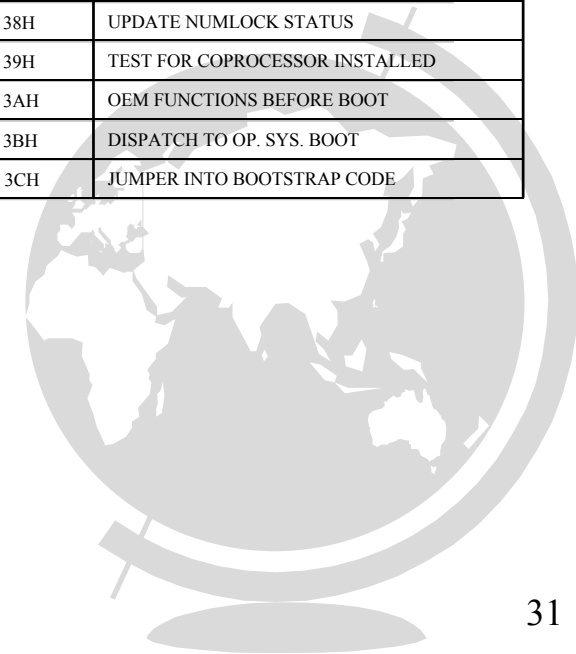
### 8.4 ERROR CODES

**FOLLOWING IS A LIST OF ERROR CODES IN SEQUENCE DISPLAY ON THE PIO DEBUG BOARD.**

| ERROR CODE | DESCRIPTION                       |
|------------|-----------------------------------|
| 00H        | SOME TYPE OF LONG RESET           |
| 01H        | TURN OFF FAST A20 FOR POST        |
| 02H        | RESET CACHE CONTROLLER            |
| 03H        | SINGAL POWER ON RESET             |
| 04H        | INITIALIZE THE CHIPSET            |
| 05H        | SPECIAL INIT OF VGA               |
| 06H        | SEARCH FOR ISA BUS VGA ADAPTER    |
| 07H        | RESET PIC S                       |
| 08H        | RESET COUNTER/TIMER 1             |
| 09H        | INITIALIZE VIDEO ADAPTERS         |
| 0AH        | INITIALIZE COLOR ADAPTER          |
| 0BH        | INITIALIZE MONOCHROME ADAPTER     |
| 0CH        | TEST 8237 PAGE REGISTERS          |
| 0DH        | CHECKSUM THE ROM                  |
| 0EH        | TEST KEYBOARD                     |
| 0FH        | TEST KEYBOARD CONTROLLER          |
| 10H        | CHECK IF CMOS RAM VALID           |
| 11H        | TEST BATTERY FAIL AND CMOS X-SUM  |
| 12H        | USER REGISTER CONFIG THROUGH CMOS |
| 13H        | SIZE MEMORY                       |
| 14H        | TEST MEMORY REFRESH WORKING       |
| 15H        | DISPATCH TO RAM TEST              |
| 16H        | TEST THE DMA CONTROLLER           |
| 17H        | INITIALIZE 8237A CONTROLLER       |

| ERROR CODE | DESCRIPTION                      |
|------------|----------------------------------|
| 18H        | INITIALIZE INT VECTORS           |
| 19H        | RAM QUICK SIZING                 |
| 1AH        | PROTECTED MODE ENTERED SAFELY    |
| 1BH        | RAM TEST COMPLETED               |
| 1CH        | PROTECTED MODE EXIT SUCCESSFUL   |
| 1DH        | SETUP SHADOW                     |
| 1EH        | GOING TO INITIALIZE VIDEO        |
| 1FH        | SERACH FOR MONOCHROME ADAPTER    |
| 20H        | SERACH FOR COLOR ADAPTER         |
| 21H        | NO VIDEO DISPLAY                 |
| 22H        | SIGNON MESSAGES DISPLAYED        |
| 23H        | SPECIAL INIT OF KEYBOARD CTRLR   |
| 24H        | TEST IF KEYBOARD PRESENT         |
| 25H        | TEST KEYBOARD INTERRUPT          |
| 26H        | TEST KEYBOARD COMMAND BYTE       |
| 27H        | FATAL ERROR<197>HALT POST        |
| 28H        | TEST, BLANK AND COUNT ALL RAM    |
| 29H        | PROTECTED MODE ENTERED SAFELY(2) |
| 2AH        | RAM TEST COMPLETE                |
| 2BH        | PROTECTED MODE EXIT SUCCESSFUL   |
| 2CH        | UPDATE OUTPUT PORT               |
| 2DH        | SETUP CACHE CONTROLLER           |
| 2EH        | TEST IF 18.2HZ PERIODIC WORKING  |
| 2FH        | TEST FOR RTC TICKING             |

| ERROR CODE | DESCRIPTION                            |
|------------|----------------------------------------|
| 30H        | INITIALIZE HARDWARE VECTORS            |
| 31H        | SPECIAL INIT OF THE COMM AND LPT PORTS |
| 32H        | CONFIGURE THE COMM AND LPT PORTS       |
| 33H        | INITIALIZE THE FLOOPIES                |
| 34H        | INITIALIZE THE HARD DISK               |
| 35H        | INITIALIZE THE OPTION RAMS             |
| 36H        | OEM'S INIT OF POWER MANAGEMENT         |
| 37H        | SEARCH AND INIT THE MOUSE              |
| 38H        | UPDATE NUMLOCK STATUS                  |
| 39H        | TEST FOR COPROCESSOR INSTALLED         |
| 3AH        | OEM FUNCTIONS BEFORE BOOT              |
| 3BH        | DISPATCH TO OP. SYS. BOOT              |
| 3CH        | JUMPER INTO BOOTSTRAP CODE             |



## **9. TROUBLE SHOOTING**

**9.1 NO POWER**

**9.2 NO DISPLAY**

**9.3 VGA CONTROLLER FAILURE**

**9.4 LCD NO DISPLAY**

**9.5 EXTERNAL MONITOR NO DISPLAY**

**9.6 MEMORY TEST ERROR**

**9.7 KEYBOARD TEST ERROR**

**9.8 TRACK PAD/BALL TEST ERROR**

**9.9 DISKETTE DRIVE TEST ERROR**

**9.10 HARD DRIVE OR CD-ROM TEST ERROR**

**9.11 CMOS TEST ERROR**

**9.12 SIO PORT TEST ERROR**

**9.13 PIO PORT TEST ERROR**

**9.14 BATTERY RE-CHARGE FAILURE**

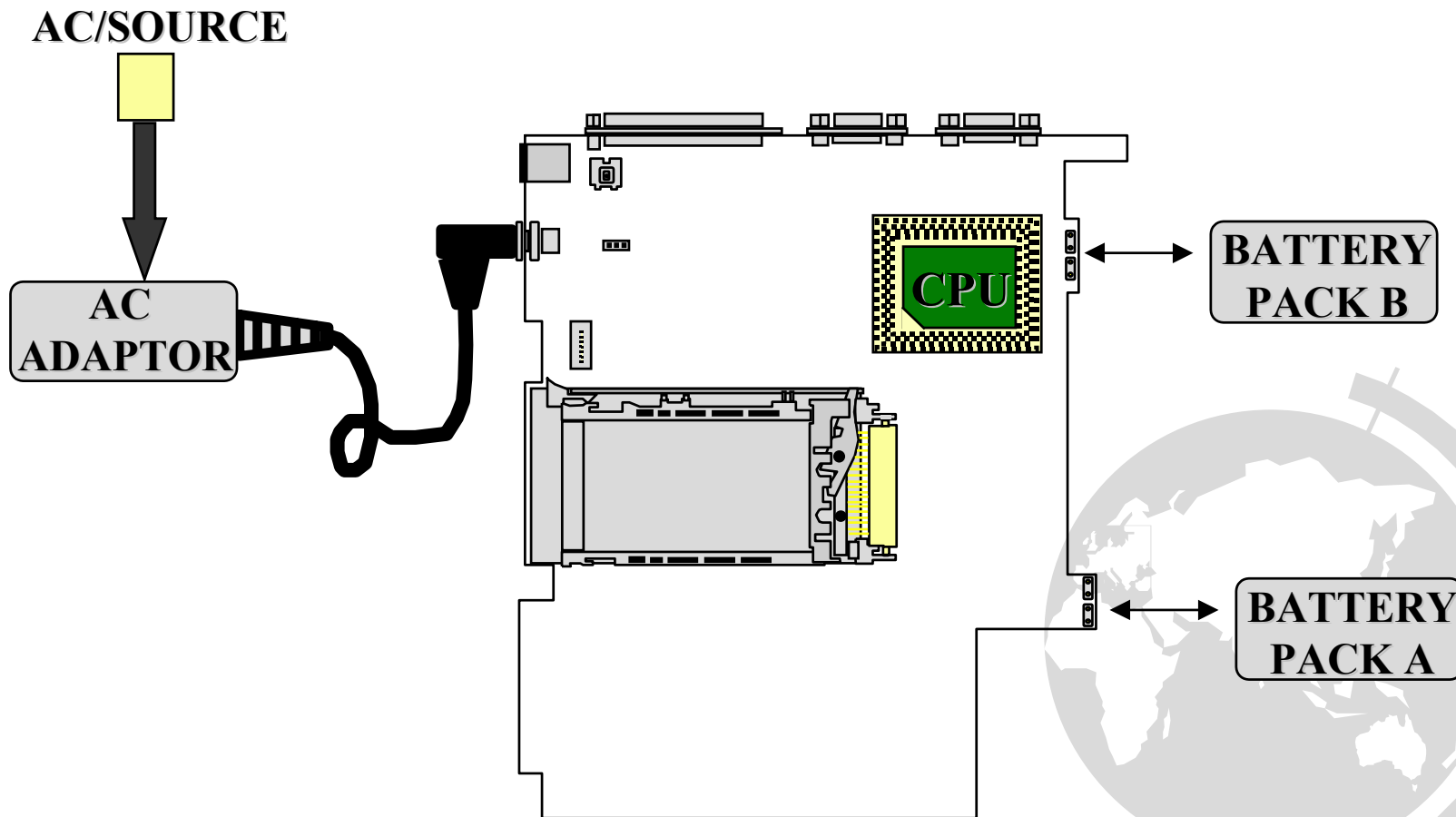


# 4024 N/B MAINTENANCE

## 9.1 NO POWER

**SYMPTOM:**

**WHEN THE POWER BUTTON IS PRESSED, NOTHING HAPPENS, POWER INDICATOR IS NOT LIGHT UP.**



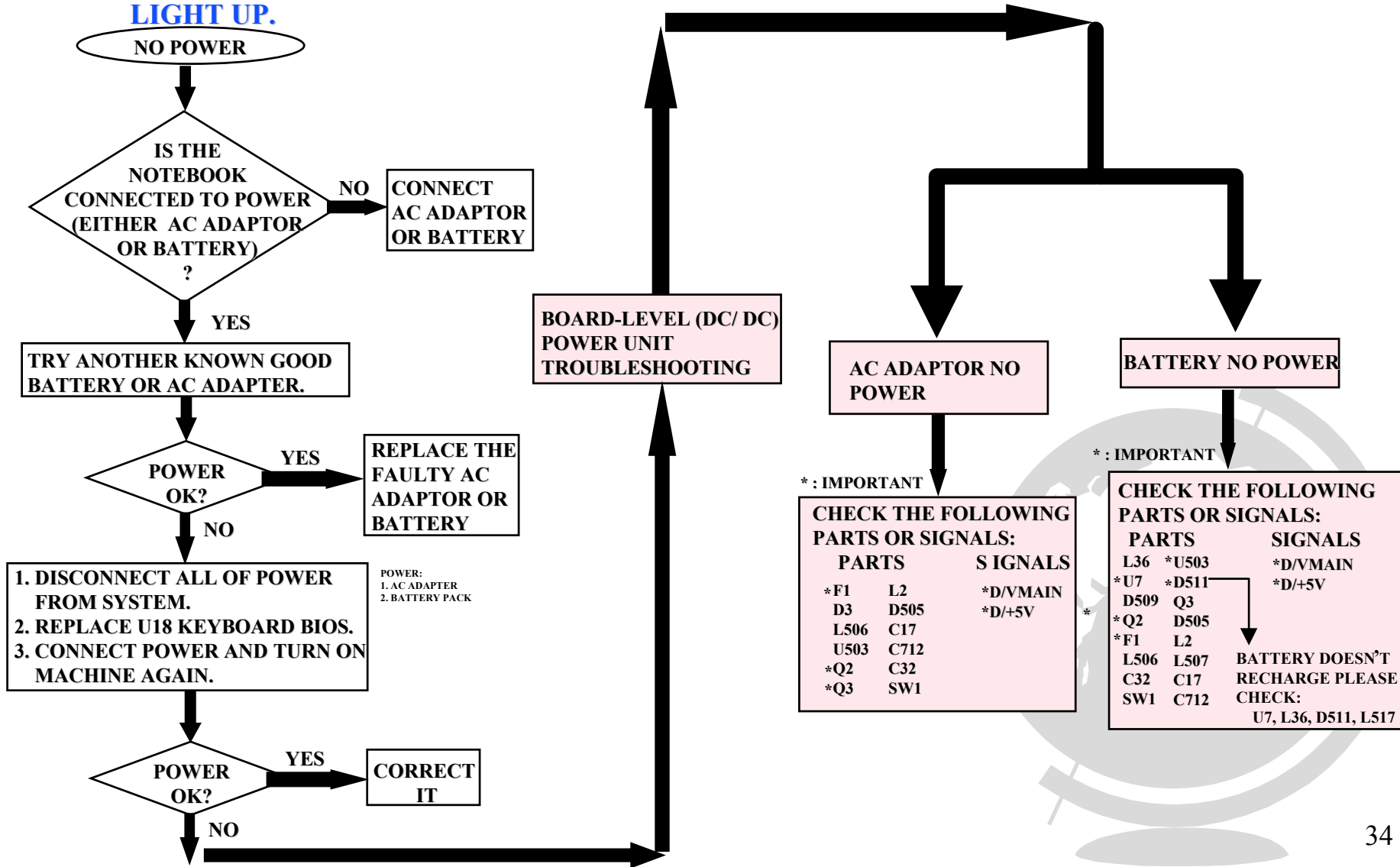
NO POWER: FREQUENTLY BROKEN F1 FUSE.

# 4024 N/B MAINTENANCE

## 9.1 NO POWER

### SYMPTOM:

WHEN THE POWER BUTTON IS PRESSED, NOTHING HAPPENS, POWER INDICATOR IS NOT LIGHT UP.

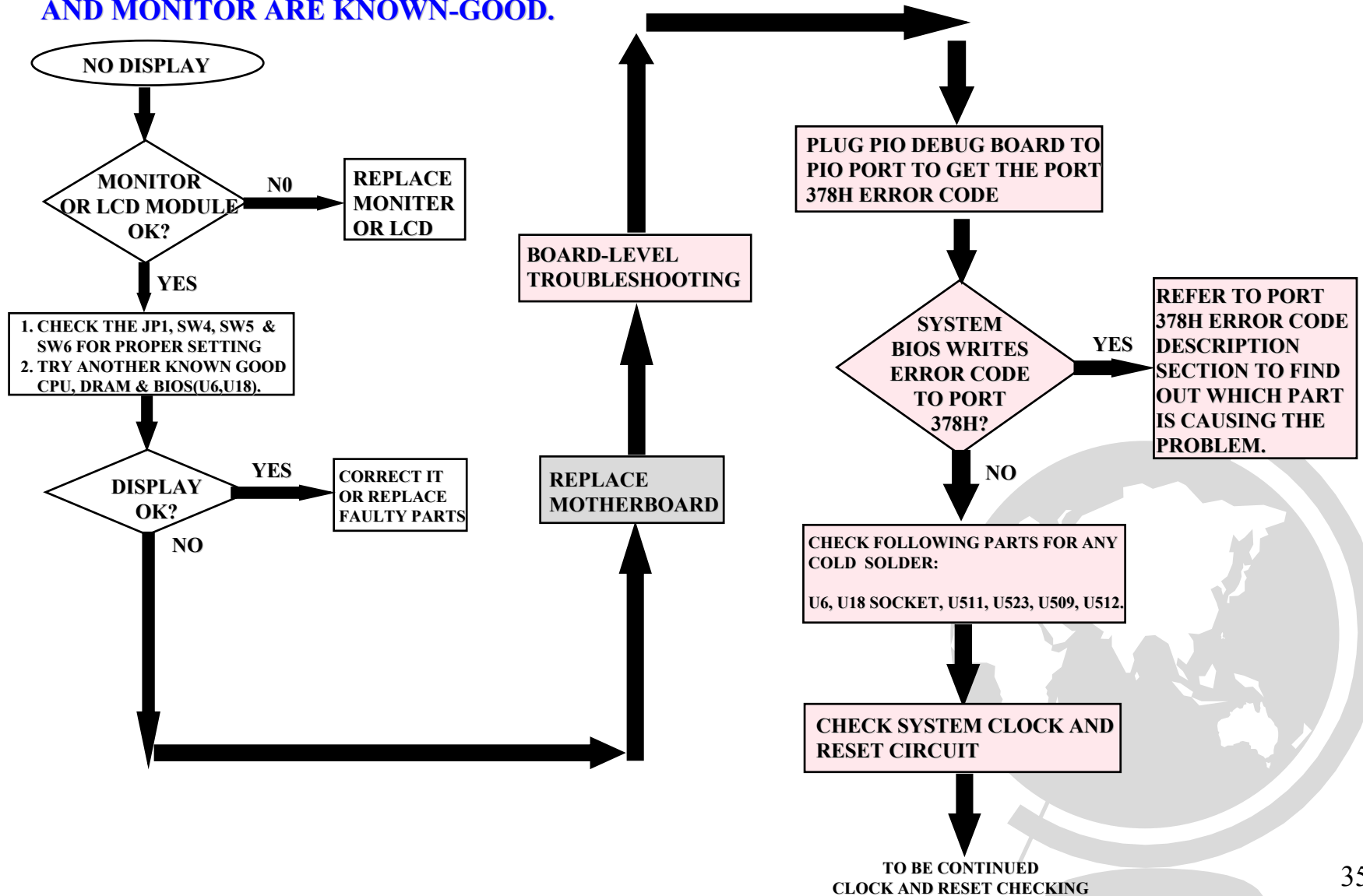


# 4024 N/B MAINTENANCE

## 9.2 NO DISPLAY (SYSTEM FAILURE)

### SYMPTOM:

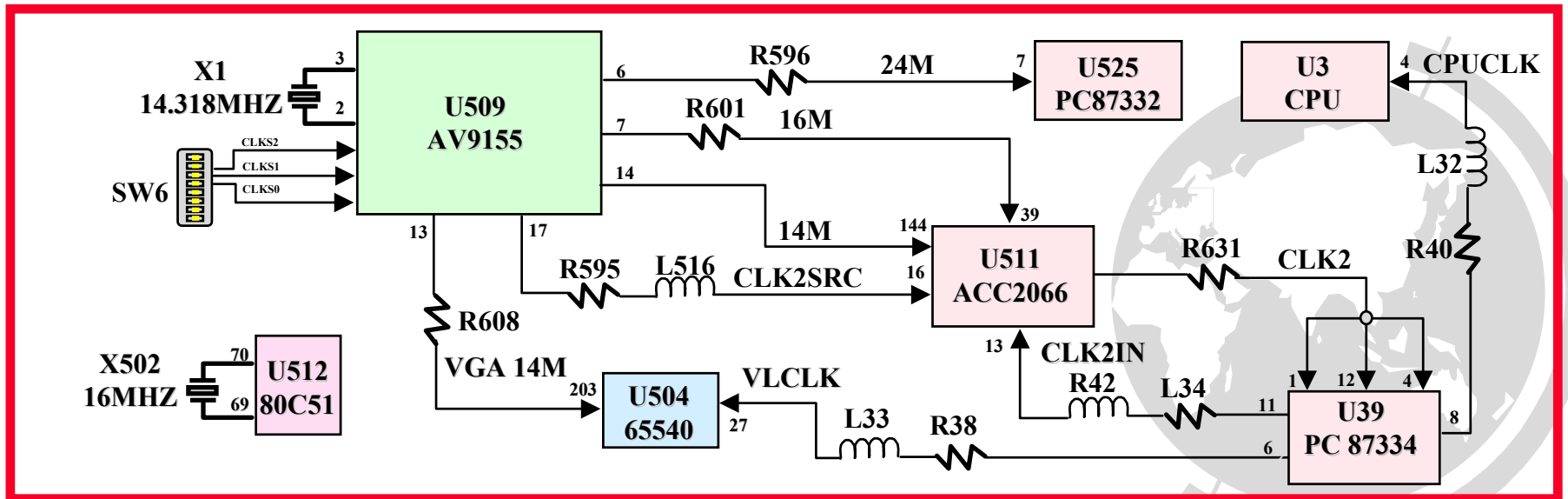
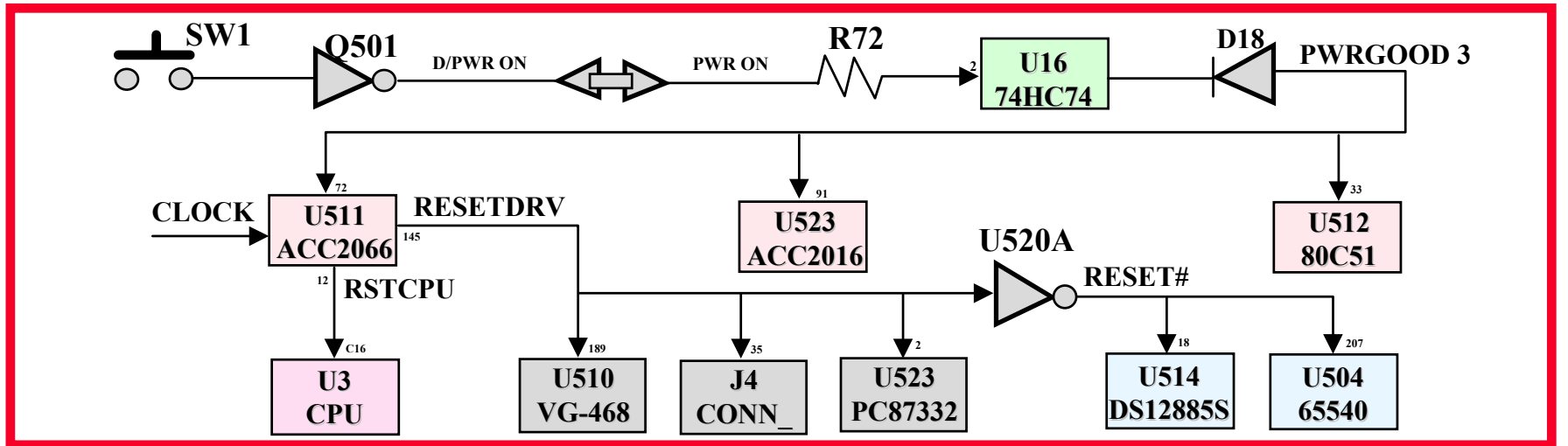
THERE IS NO DISPLAY ON BOTH LCD AND MONITOR AFTER POWER ON ALTHOUGH THE LCD AND MONITOR ARE KNOWN-GOOD.



# 4024 N/B MAINTENANCE

## 9.2 NO DISPLAY (SYSTEM FAILURE)

\*\*\*\*\*CLOCK AND RESET CIRCUIT CHECKING\*\*\*\*\*

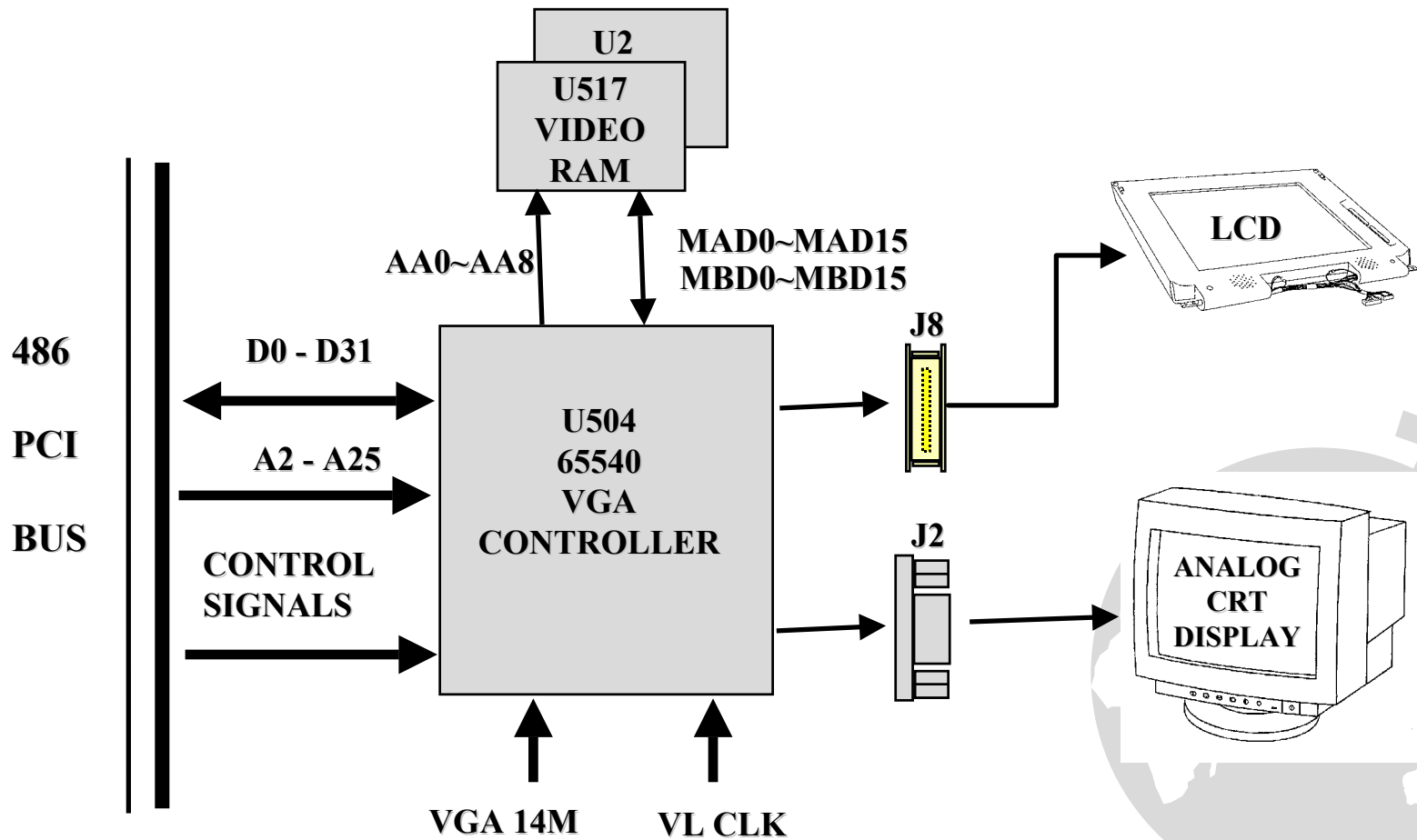


# 4024 N/B MAINTENANCE

## 9.3 VGA CONTROLLER FAILURE

### SYMPTOM:

THERE IS NO DISPLAY ON BOTH LCD AND MONITOR ALTHOUGH POWER-ON-SELF-TEST IS PASSED.

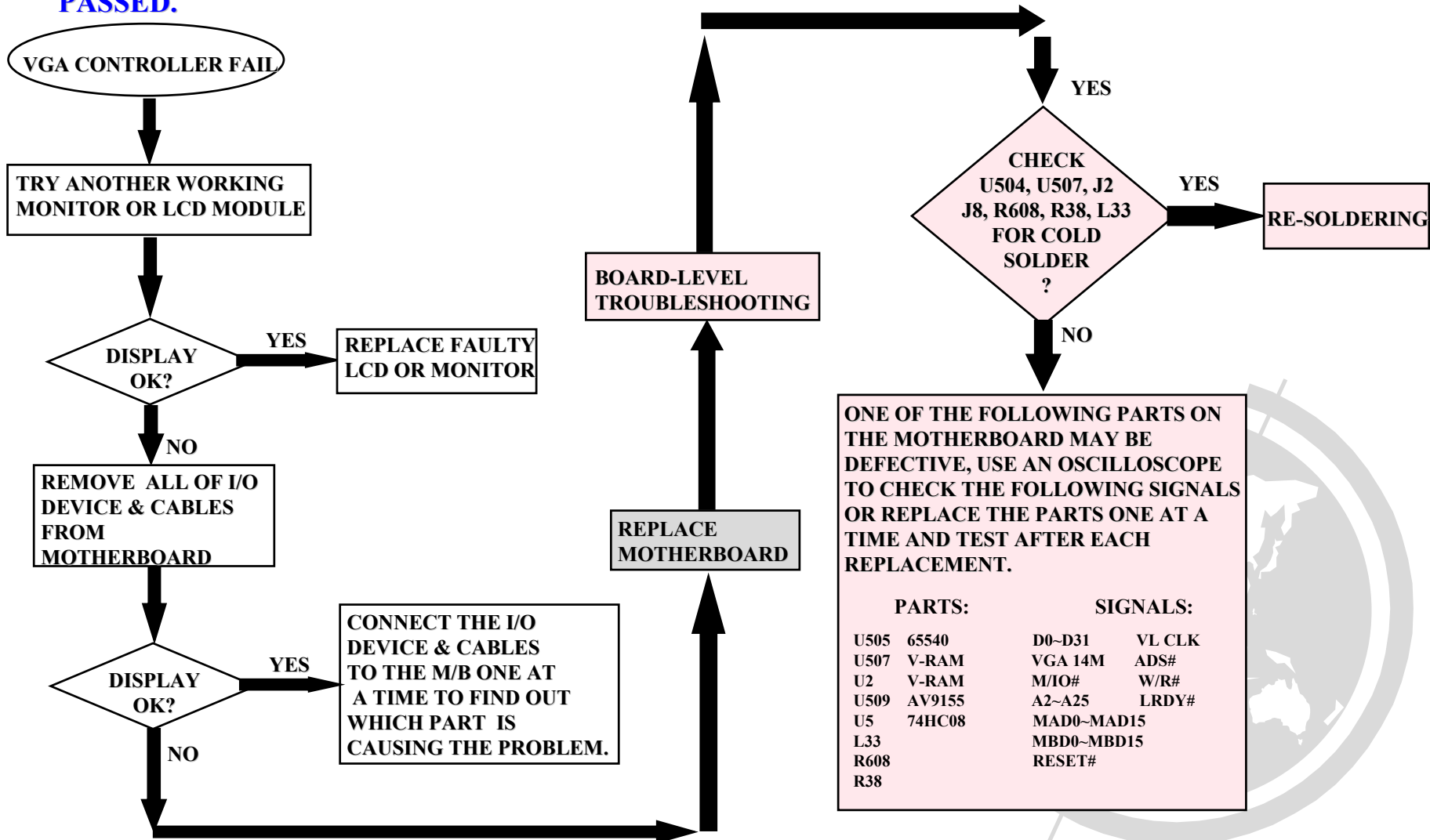


# 4024 N/B MAINTENANCE

## 9.3 VGA CONTROLLER FAILURE

### SYMPTOM:

THERE IS NO DISPLAY ON BOTH LCD AND MONITOR ALTHOUGH POWER-ON-SELF-TEST IS PASSED.



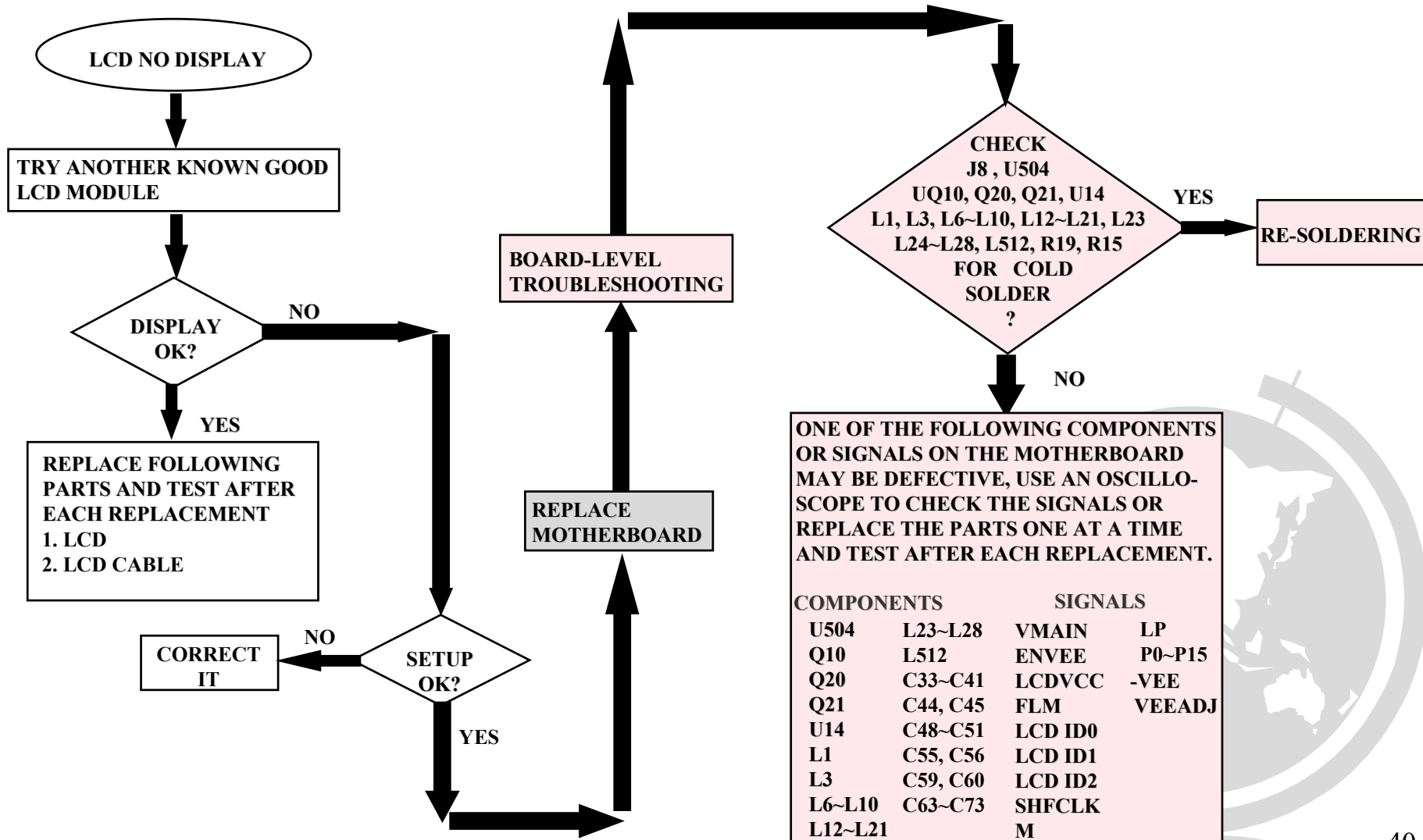


# 4024 N/B MAINTENANCE

## 9.4 LCD NO DISPLAY OR PICTURE ABNORMAL

### SYMPTOM:

THE LCD SHOWS NOTHING OR ABNORMAL PICTURE, BUT IT IS OK FOR EXTERNAL MONITOR.

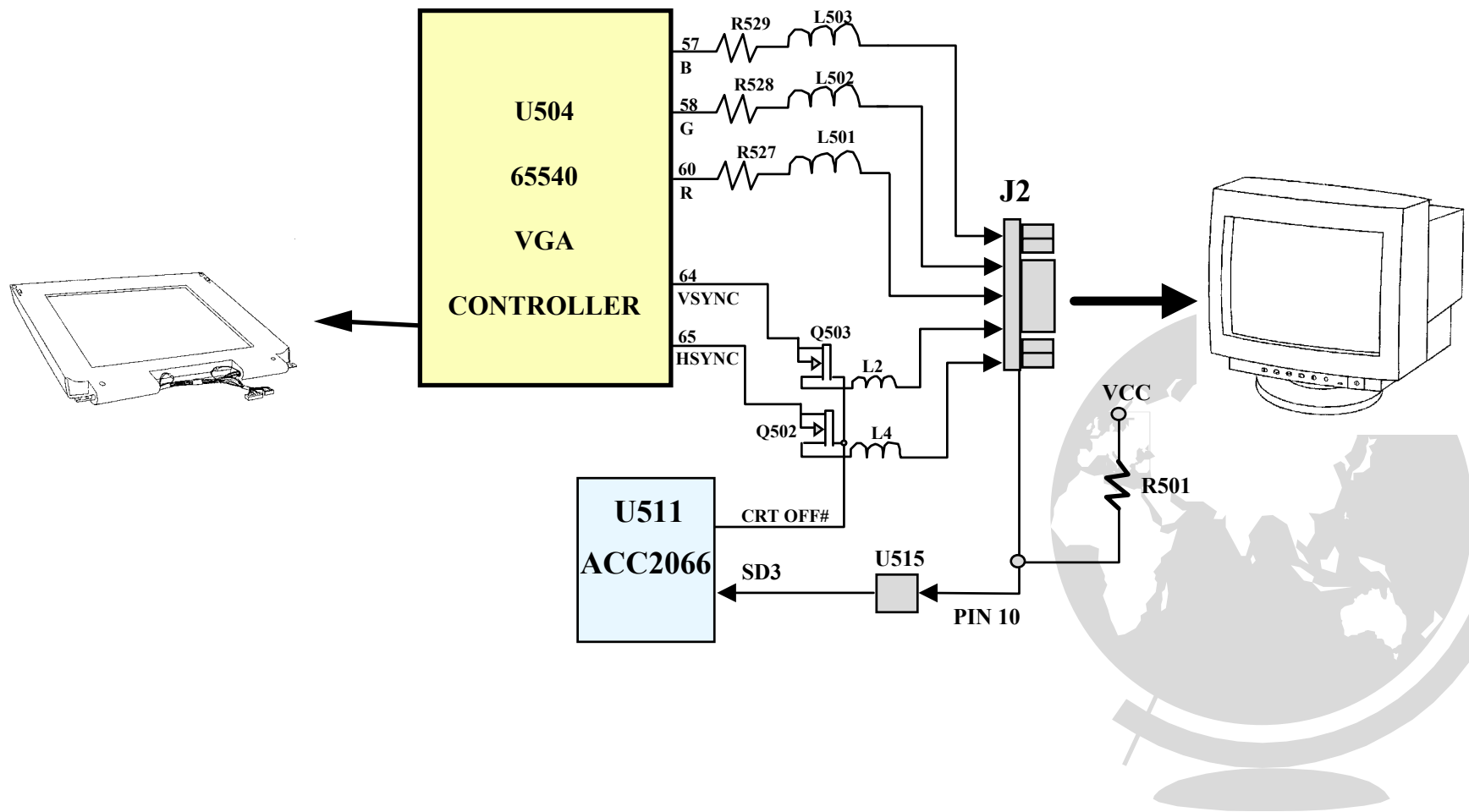


# 4024 N/B MAINTENANCE

## 9.5 EXTERNAL MONITOR NO DISPLAY OR COLOR ABNORMAL

**SYMPTOM:**

**THE CRT MONITOR SHOWS NOTHING OR ABNORMAL COLOR, BUT IT IS OK FOR LCD.**

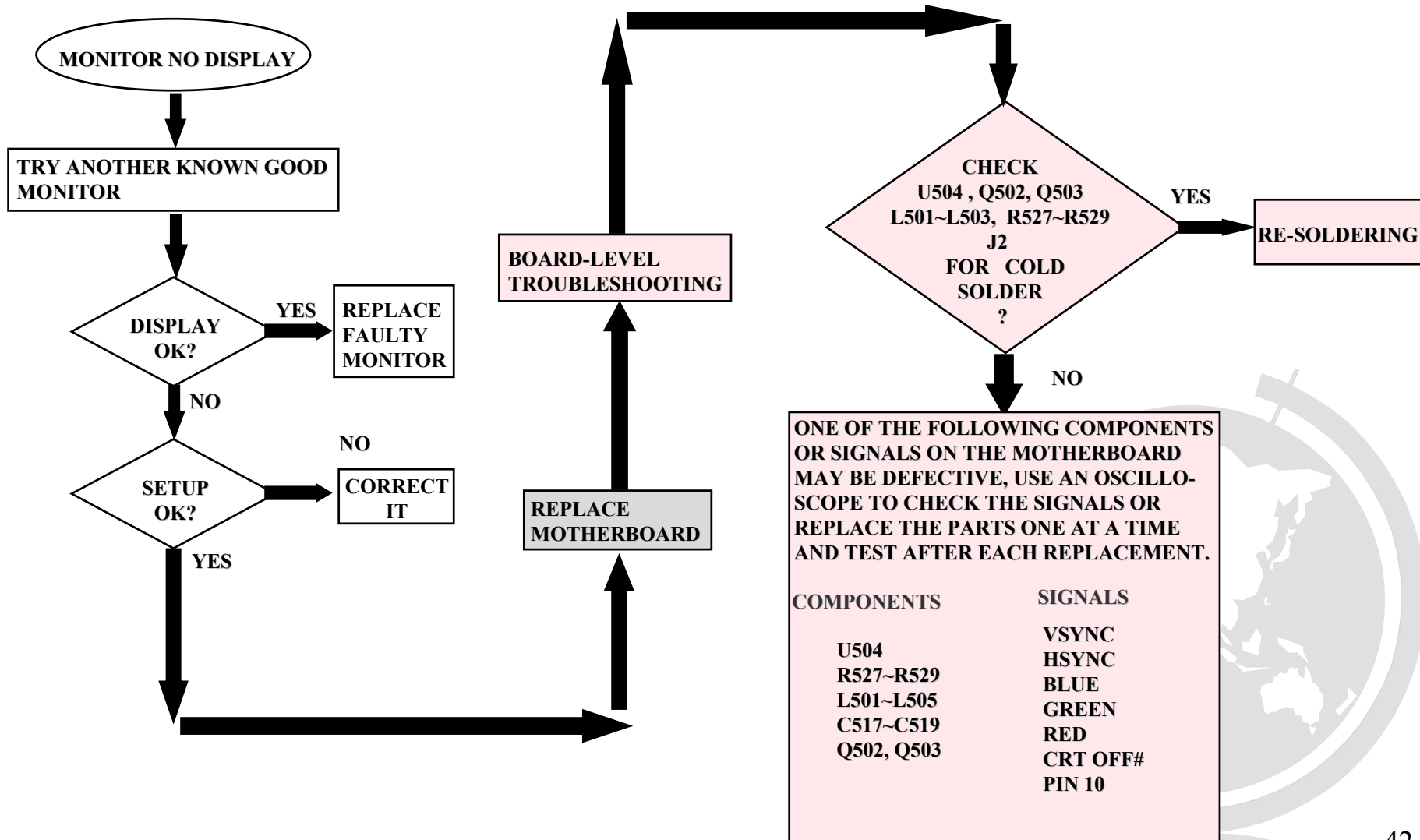


# 4024 N/B MAINTENANCE

## 9.5 EXTERNAL MONITOR NO DISPLAY OR COLOR ABNORMAL

**SYMPTOM:**

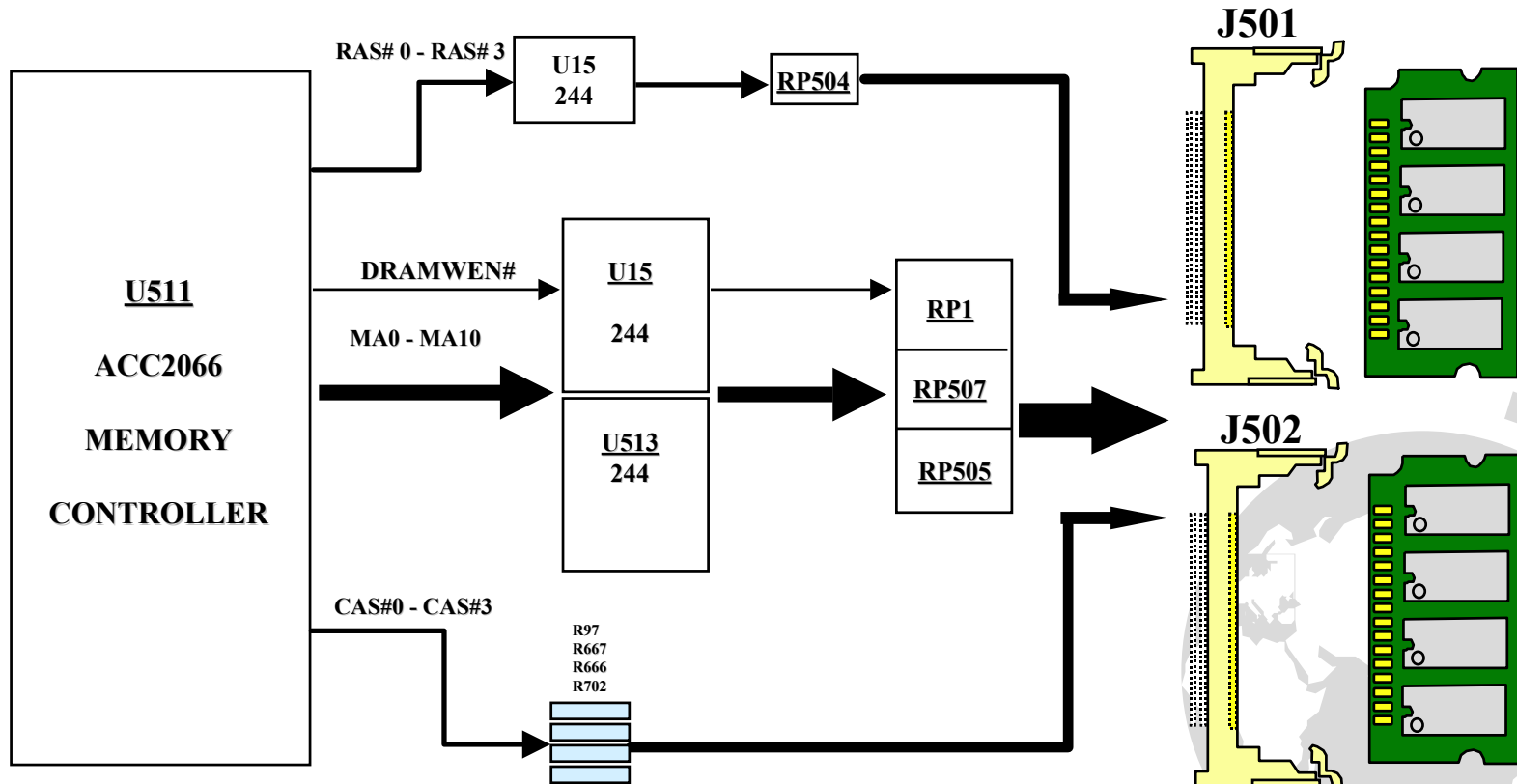
**THE CRT MONITOR SHOWS NOTHING OR ABNORMAL COLOR, BUT IT IS OK FOR LCD.**



## 9.6 MEMORY TEST ERROR

**SYMPTOM:**

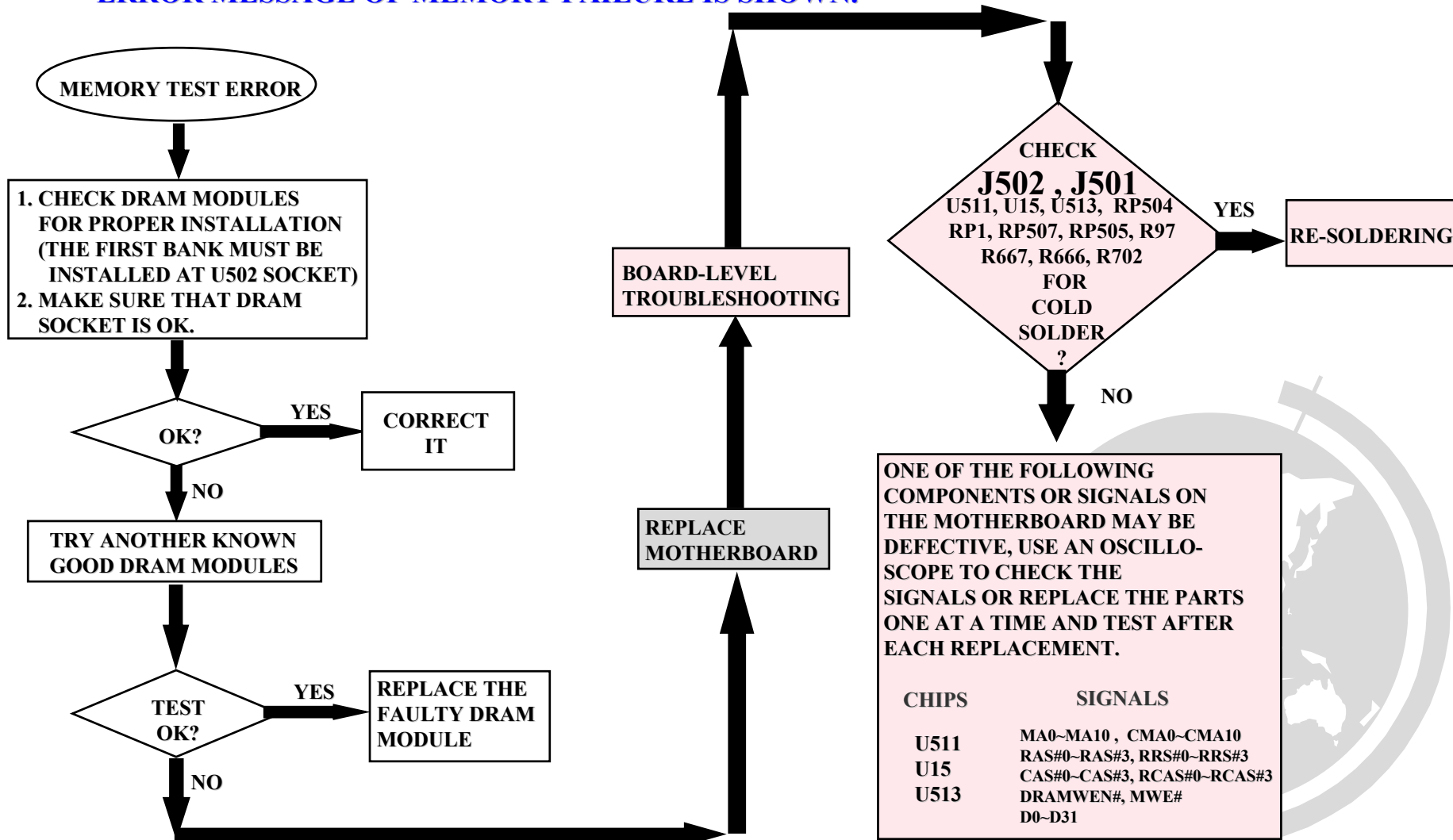
**PIO DEBUG BOARD SHOWS THE PORT 378H ERROR CODE IS STOPPED AT 15H, 14H, 13H OR ERROR MESSAGE OF MEMORY FAILURE IS SHOWN.**



## 9.6 MEMORY TEST ERROR

### SYMPTOM:

PIO DEBUG BOARD SHOWS THE PORT 378H ERROR CODE IS STOPPED AT 15H, 14H ,13H OR ERROR MESSAGE OF MEMORY FAILURE IS SHOWN.

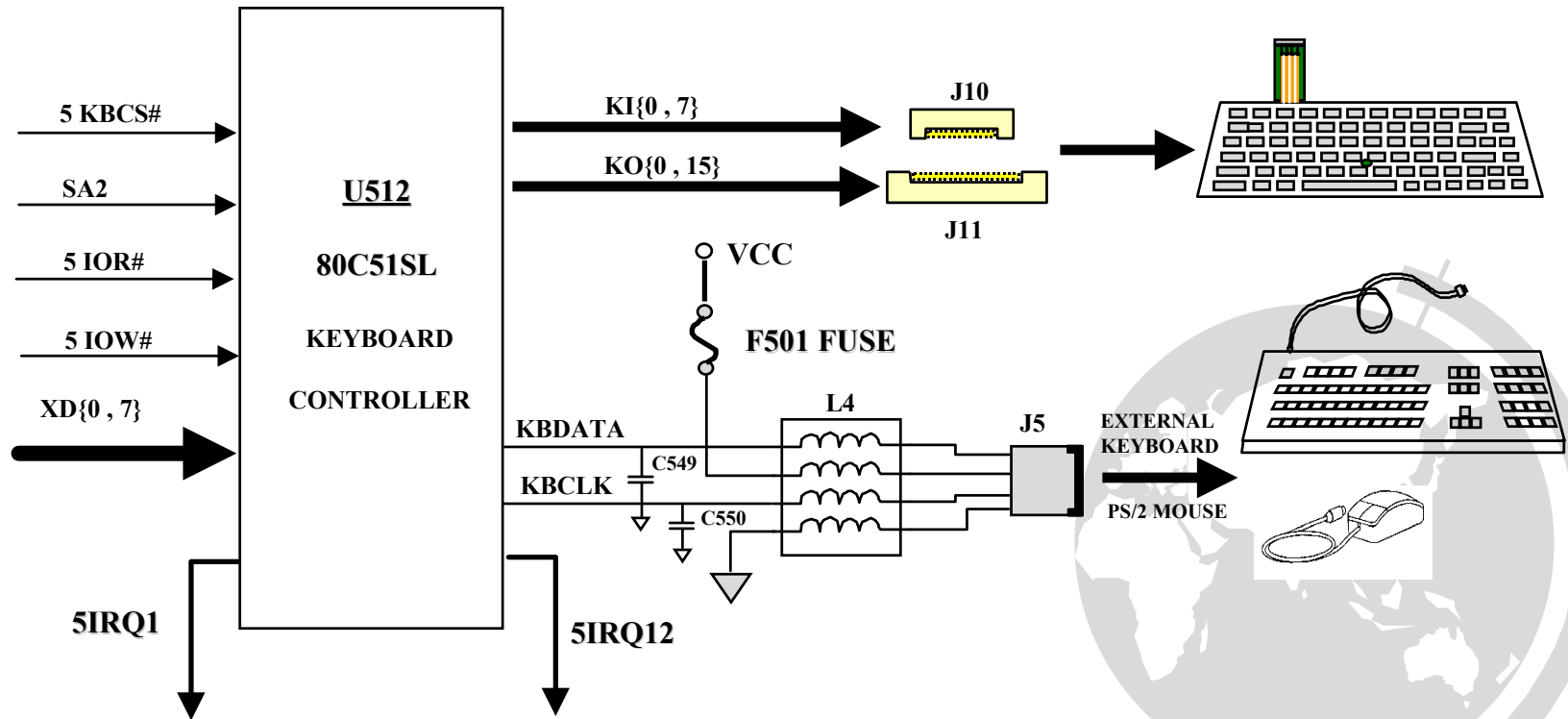


# 4024 N/B MAINTENANCE

## 9.7 KEYBOARD TEST ERROR (INCLUDING EXTERNAL KEYBOARD & PS/2 MOUSE)

**SYMPTOM:**

**ERROR MESSAGE OF KEYBOARD FAILURE IS SHOWN OR ANY KEY DOESN'T WORK.**

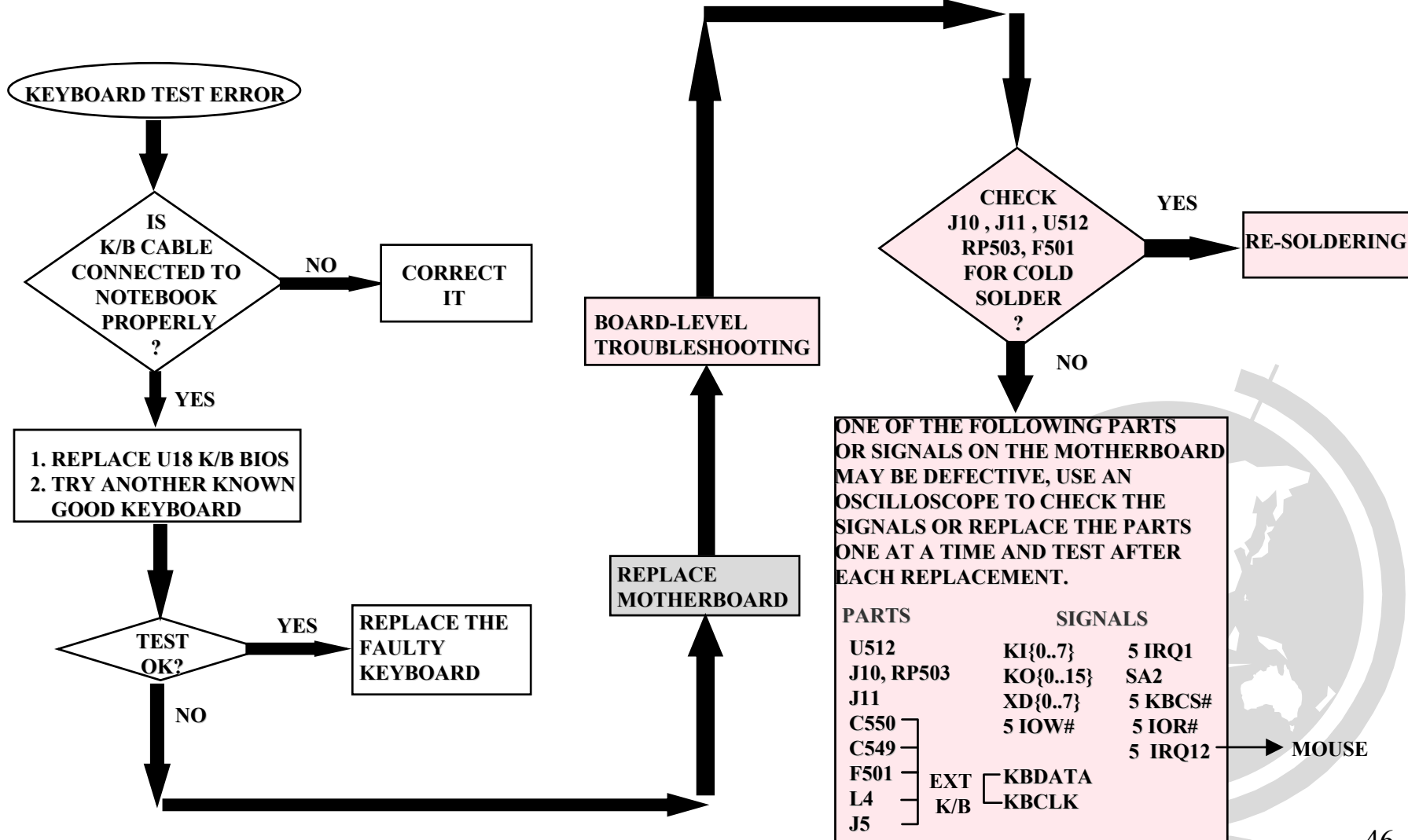


# 4024 N/B MAINTENANCE

## 9.7 KEYBOARD TEST ERROR (INCLUDING EXTERNAL KEYBOARD & PS/2 MOUSE)

**SYMPTOM:**

**ERROR MESSAGE OF KEYBOARD FAILURE IS SHOWN OR ANY KEY DOESN'T WORK.**

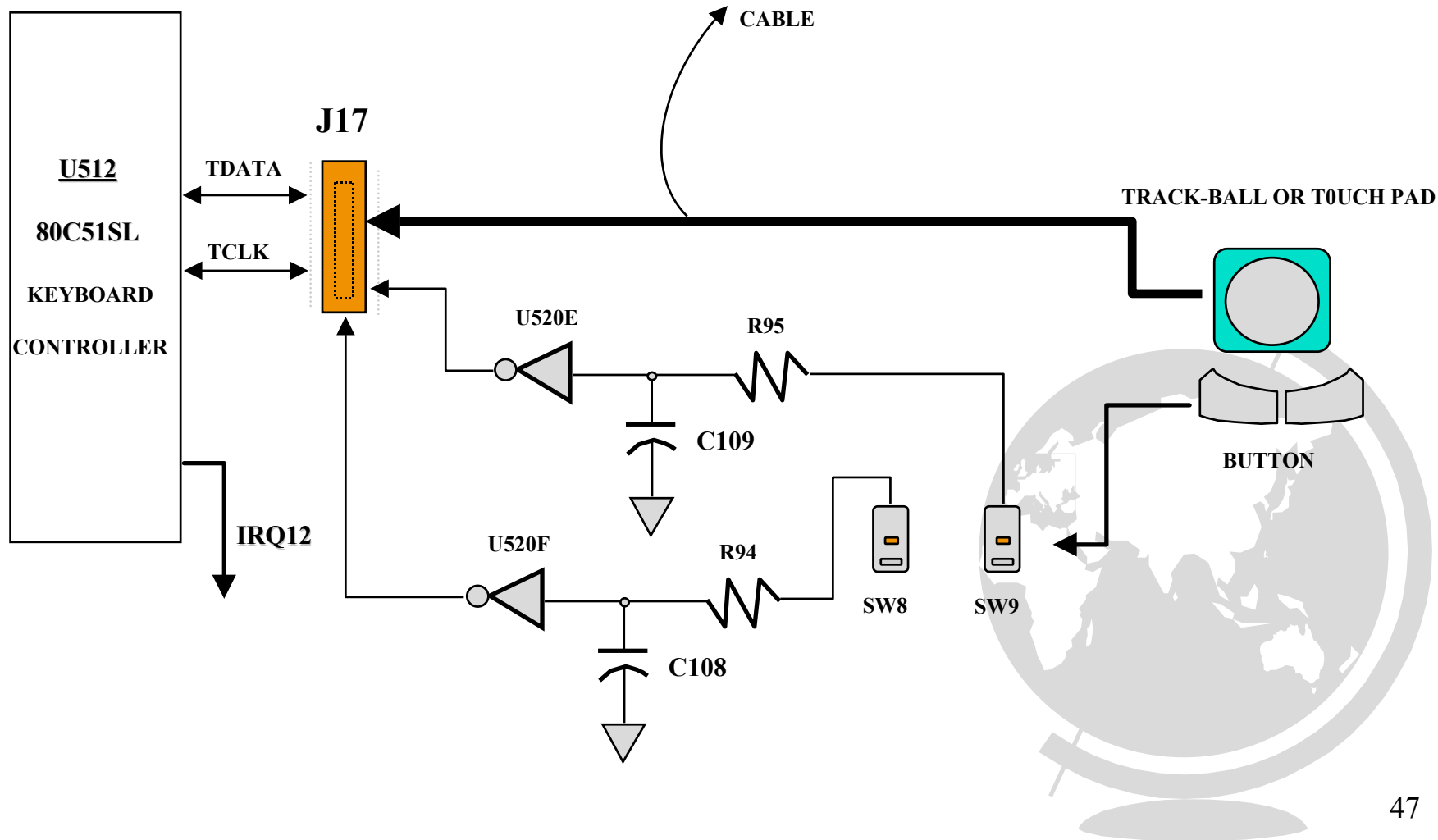


# 4024 N/B MAINTENANCE

## 9.8 TRACK-BALL OR TOUCH-PAD TEST ERROR

**SYMPTOM:**

**AN ERROR MESSAGE IS SHOWN WHEN THE TRACK POINTER IS ENABLED.**

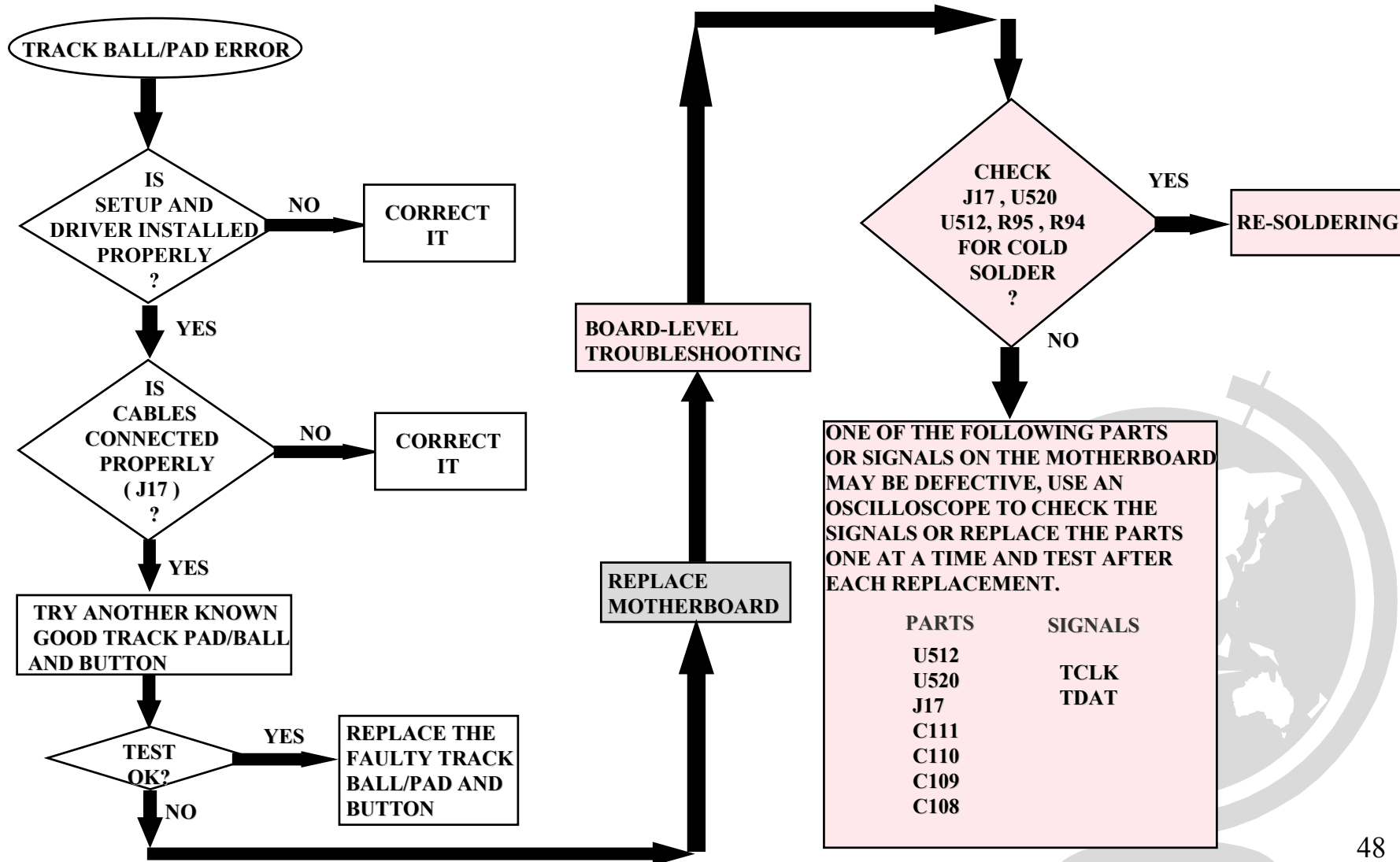


# 4024 N/B MAINTENANCE

## 9.8 TRACK-BALL OR TOUCH-PAD TEST ERROR

### SYMPTOM:

AN ERROR MESSAGE IS SHOWN WHEN THE TRACK POINTER IS ENABLED.

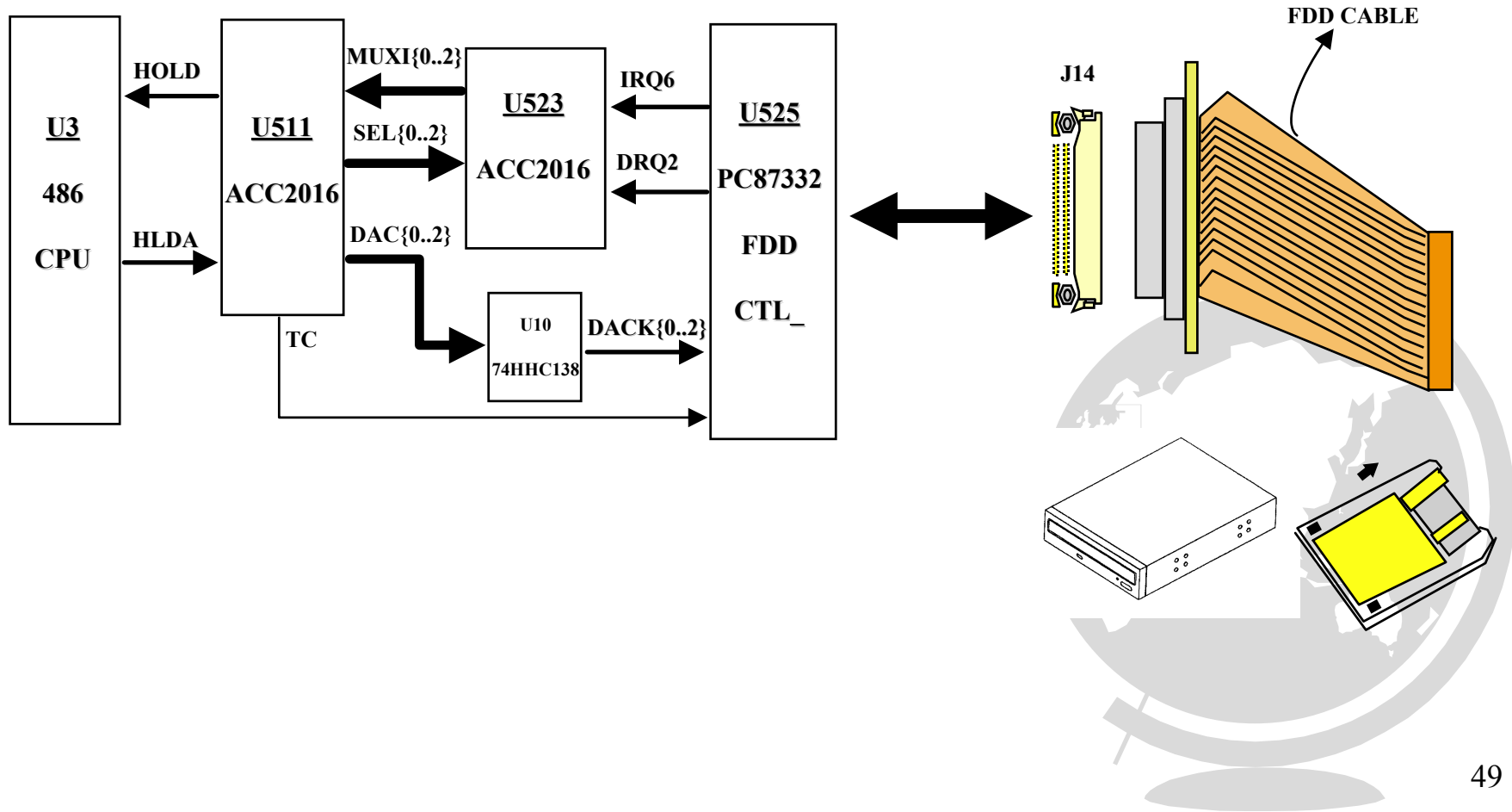


# 4024 N/B MAINTENANCE

## 9.9 DISKETTE DRIVE TEST ERROR

### SYMPTOM:

AN ERROR MESSAGE IS SHOWN WHILE LOADING DATA FROM DISK TO SYSTEM.

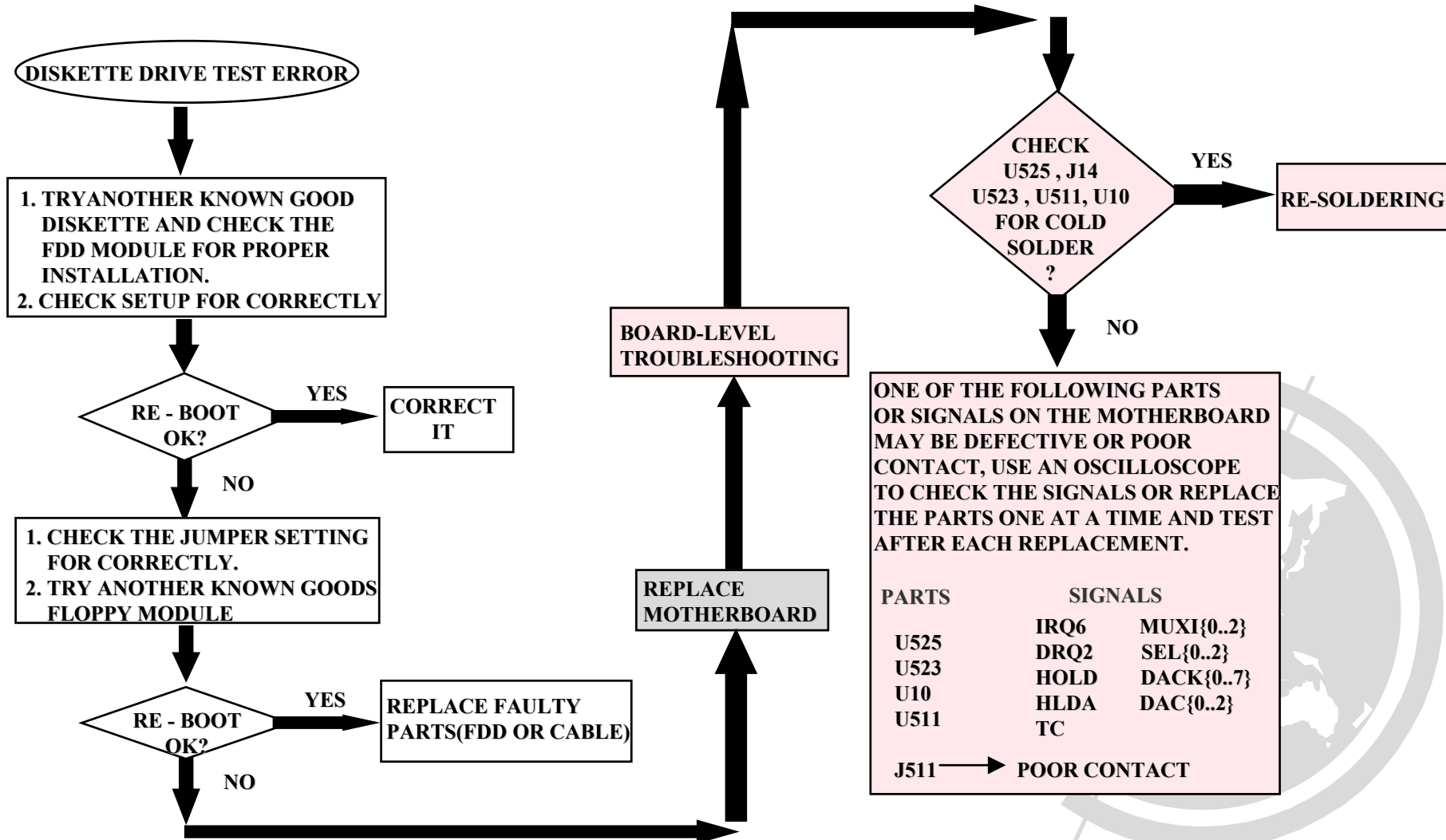


# 4024 N/B MAINTENANCE

## 9.9 DISKETTE DRIVE TEST ERROR

### SYMPTOM:

AN ERROR MESSAGE IS SHOWN WHILE LOADING DATA FROM DISK TO SYSTEM.

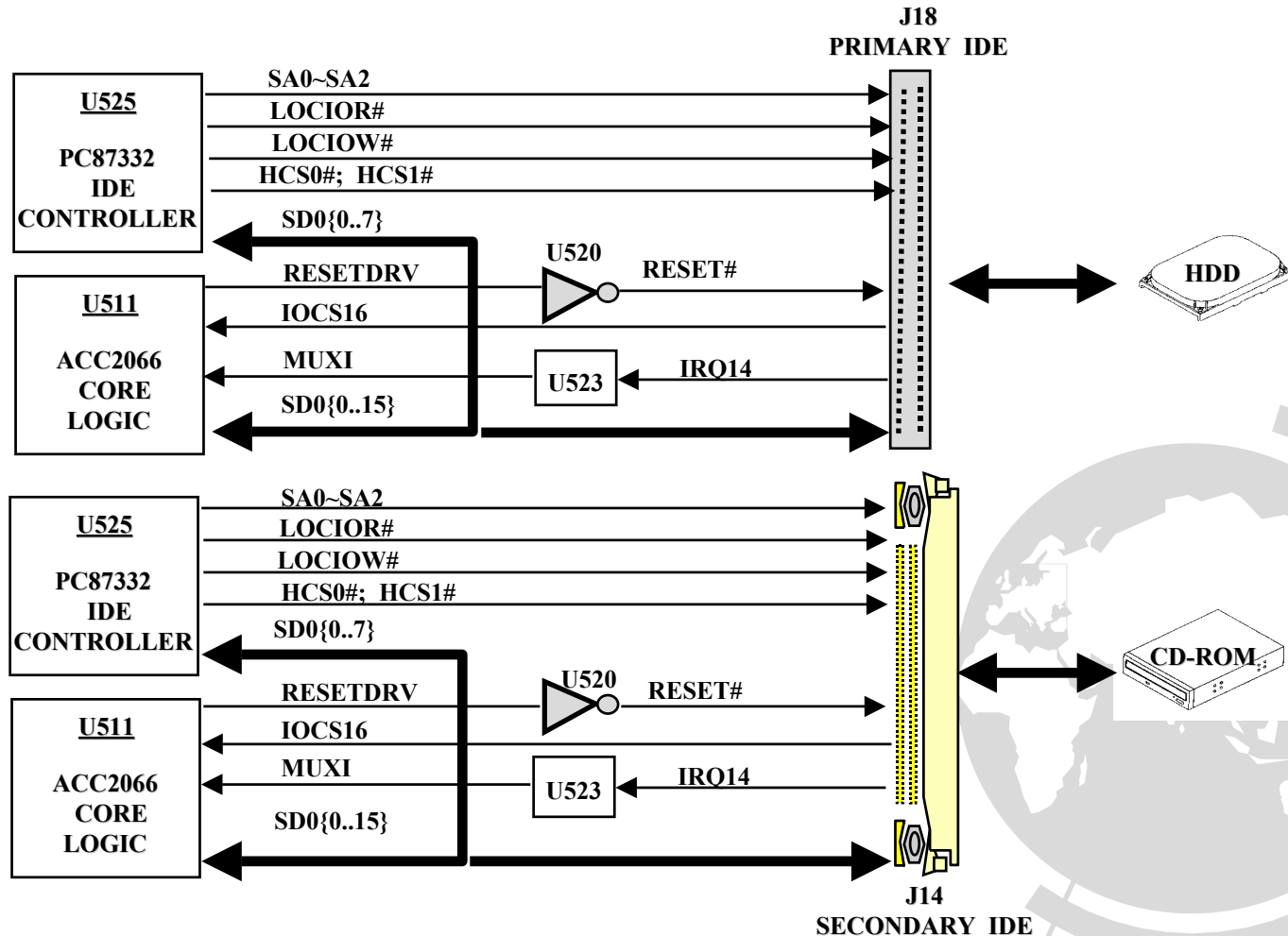


# 4024 N/B MAINTENANCE

## 9.10 HARD DRIVE OR CD-ROM TEST ERROR

### SYMPTOM:

EITHER AN ERROR MESSAGE IS SHOWN, OR THE DRIVE MOTOR SPINS NON-STOP, WHILE READING DATA FROM OR WRITING DATA TO HARD-DISK.

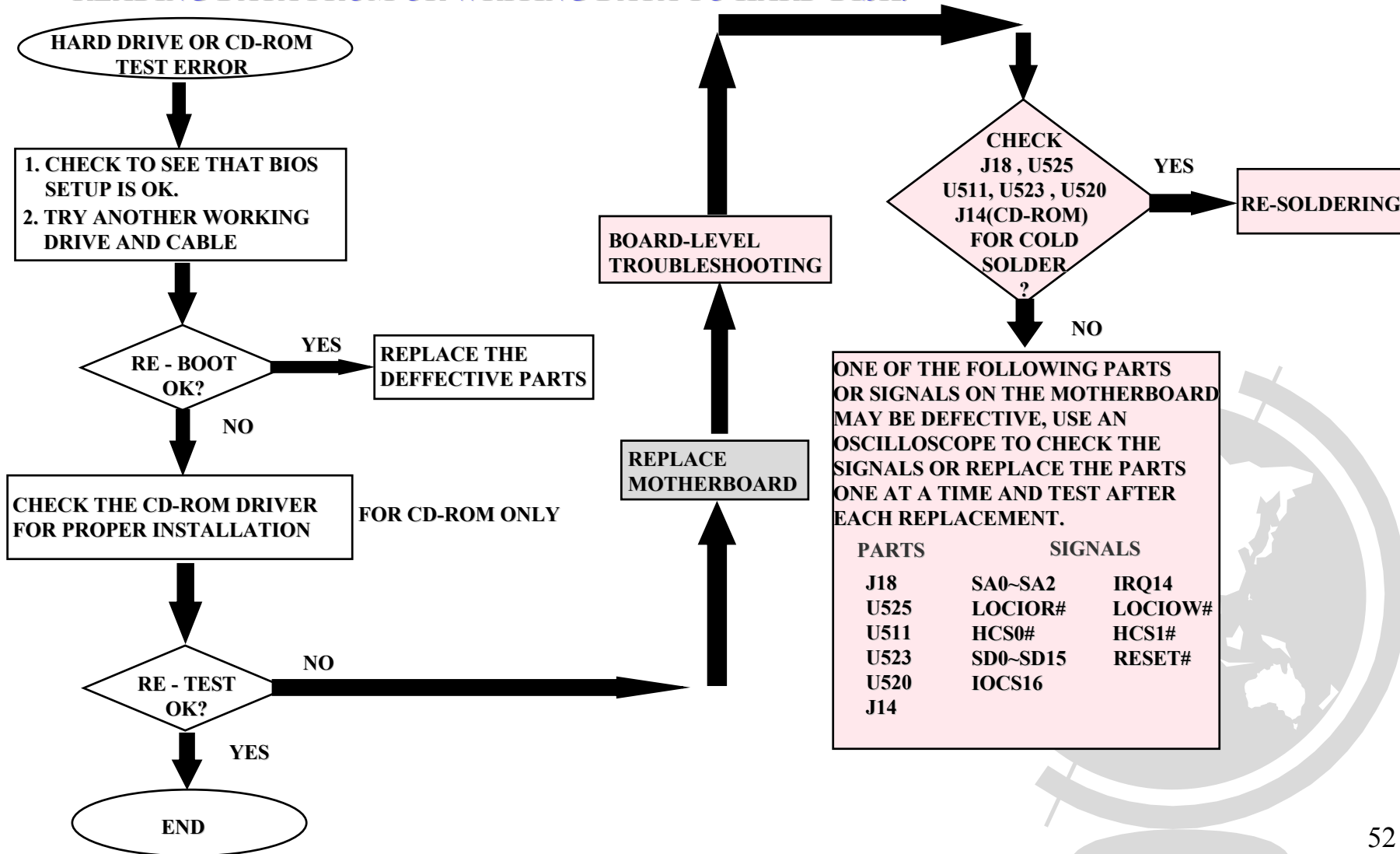


# 4024 N/B MAINTENANCE

## 9.10 HARD DRIVE OR CD-ROM TEST ERROR

### SYMPTOM:

EITHER AN ERROR MESSAGE IS SHOWN, OR THE DRIVE MOTOR SPINS NON-STOP, WHILE READING DATA FROM OR WRITING DATA TO HARD-DISK.

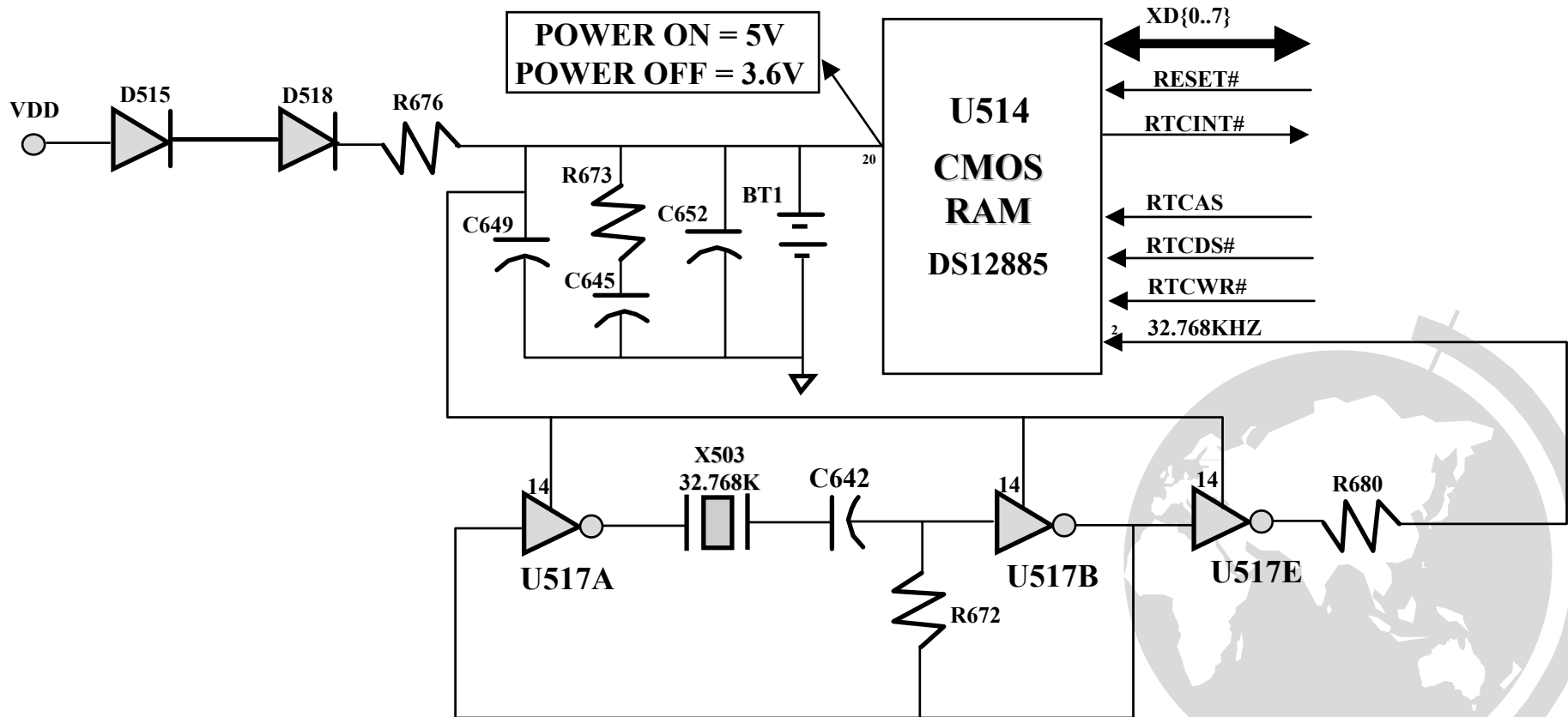


# 4024 N/B MAINTENANCE

## 9.11 CMOS TEST ERROR

**SYMPTOM:**

- 1. ERROR CODE IS STOPEED AT 10H.**
- 2. CMOS DATA LOST, OR INACCURATE SYSTEM TIME & DATE.**

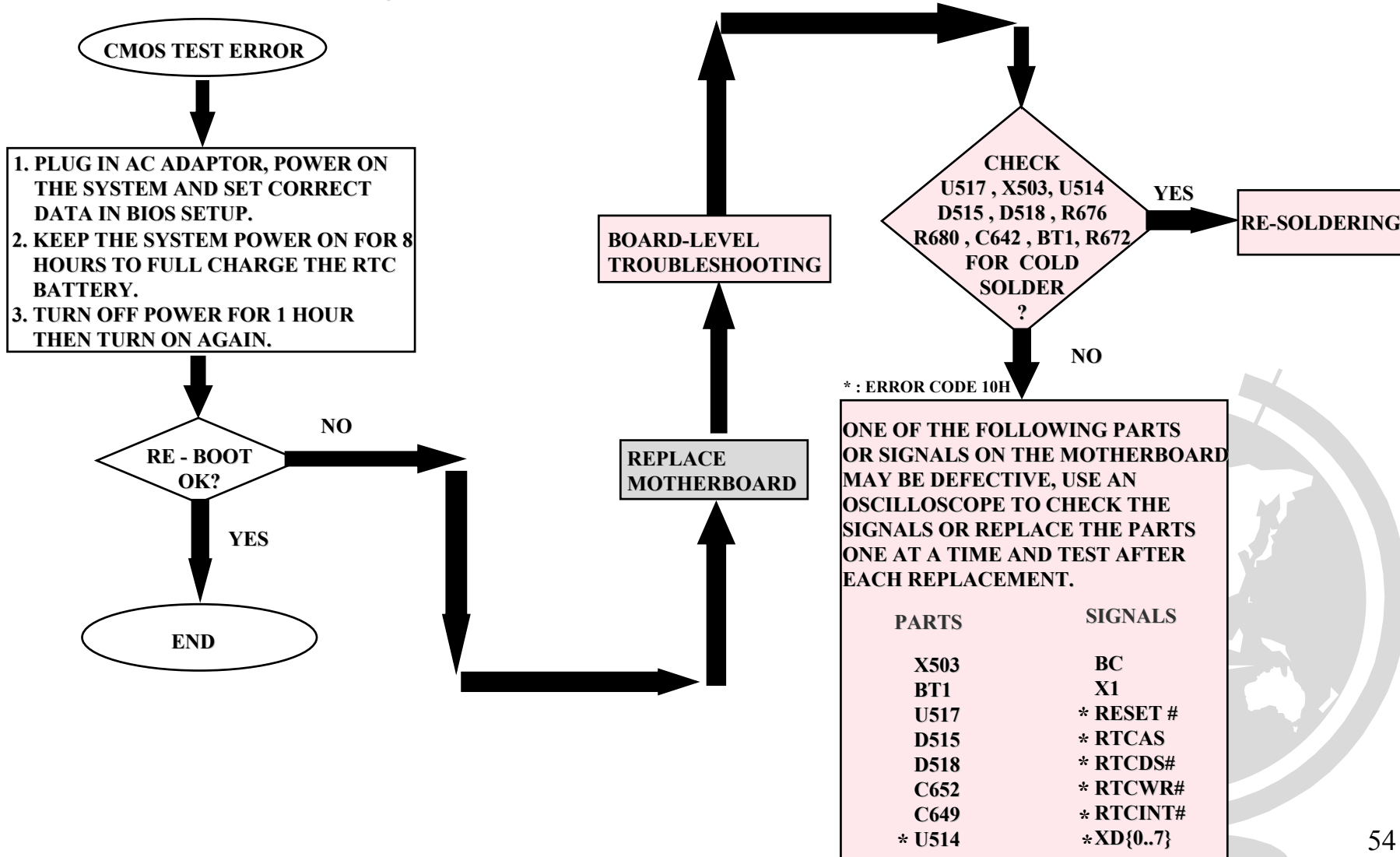


# 4024 N/B MAINTENANCE

## 9.8 CMOS TEST ERROR

### SYMPTOM:

1. ERROR CODE IS STOPEED AT 10H.
2. CMOS DATA LOST, OR INACCURATE SYSTEM TIME & DATE.

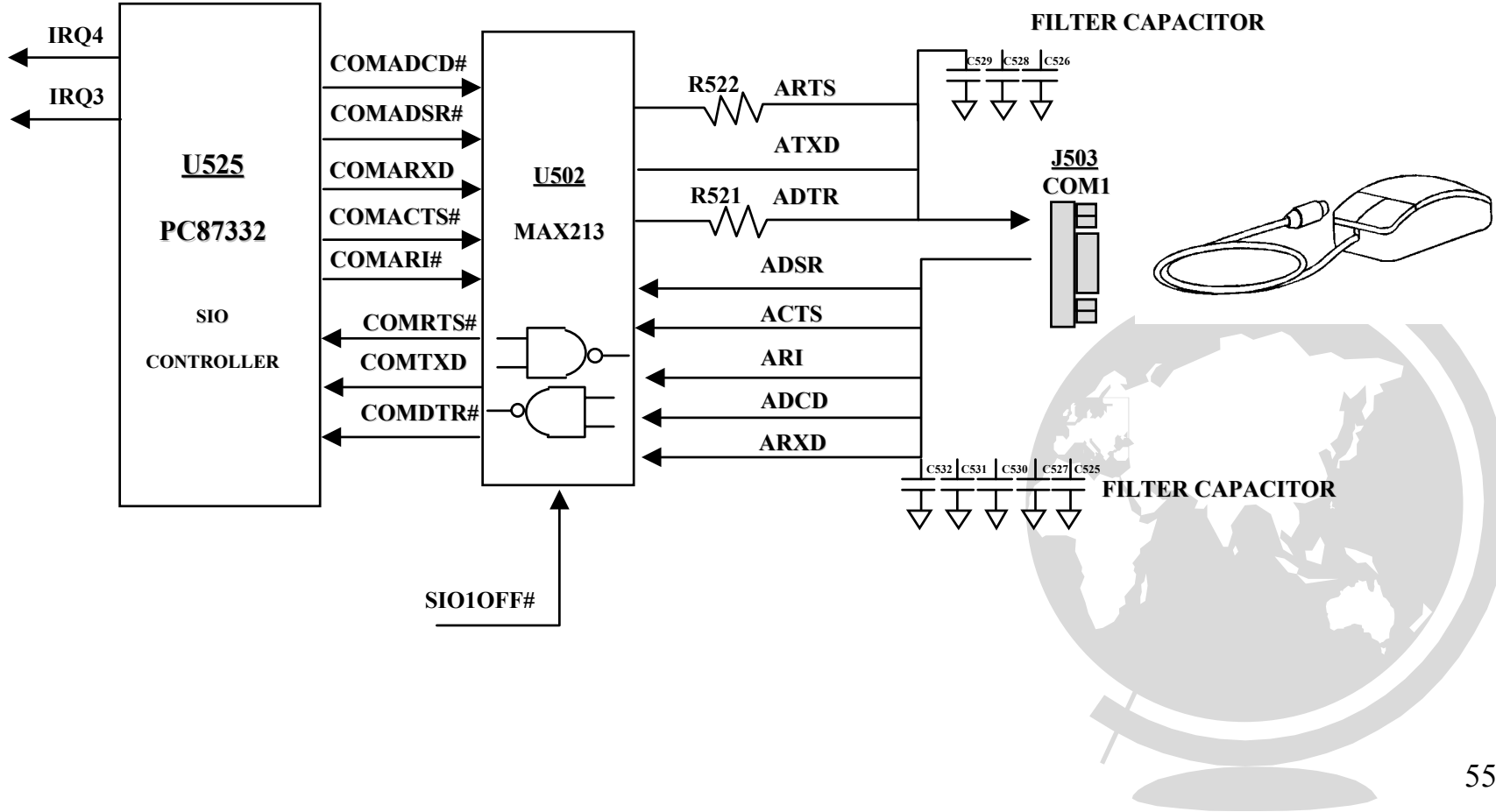


# 4024 N/B MAINTENANCE

## 9.12 SIO PORT TEST ERROR

**SYMPTON:**

**AN ERROR DISPLAY OCCURS WHEN A MOUSE OR OTHER I/O DEVICE IS INSTALLED.**

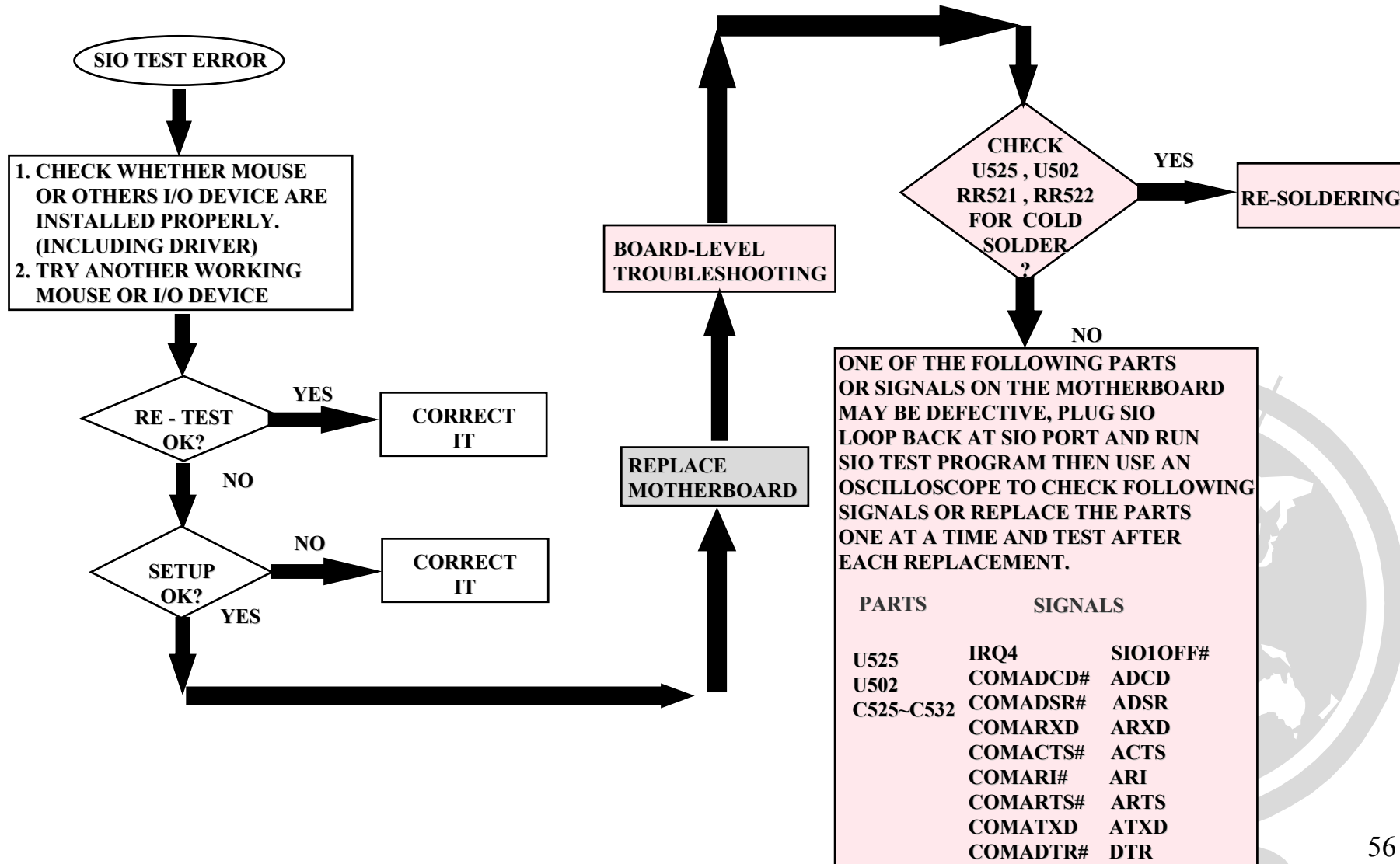


# 4024 N/B MAINTENANCE

## 9.12 SIO PORT TEST ERROR

**SYMPTON:**

**AN ERROR DISPLAY OCCURS WHEN A MOUSE OR OTHER I/O DEVICE IS INSTALLED.**

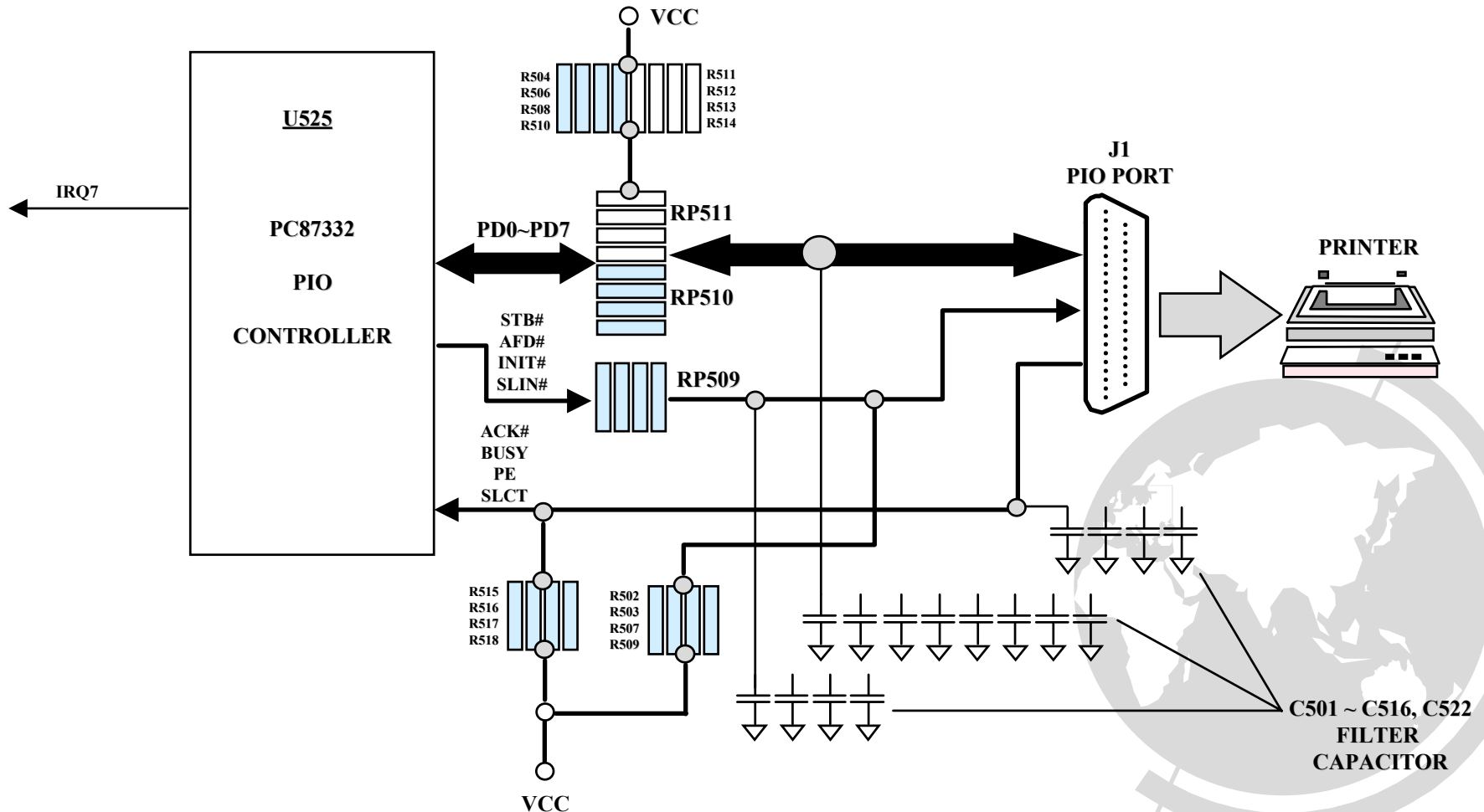


# 4024 N/B MAINTENANCE

## 9.13 PIO PORT TEST ERROR

**SYMPTOM:**

**WHEN A PRINT COMMAND IS ISSUED, PRINTER PRINTS NOTHING OR GARBAGE.**

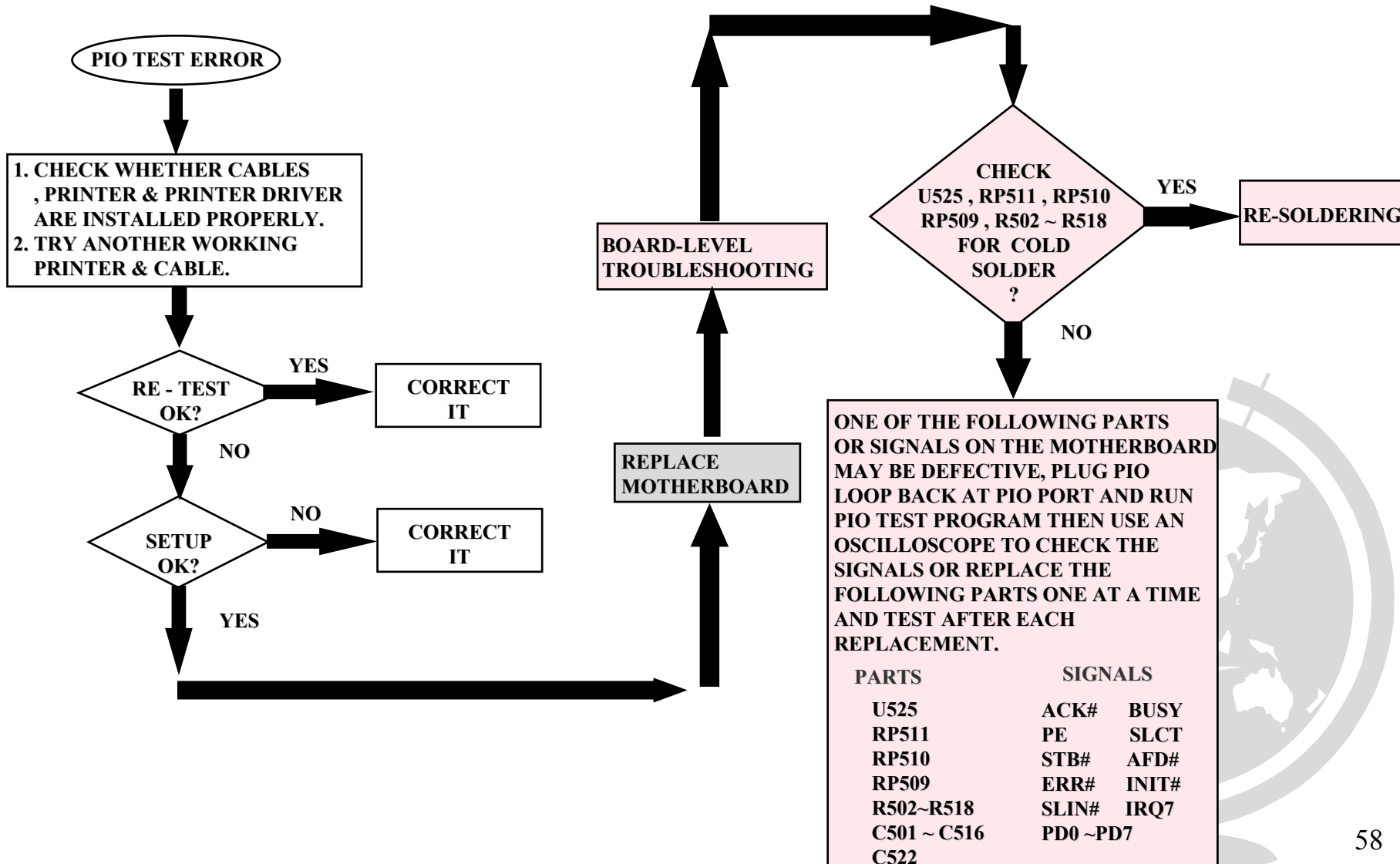


# 4024 N/B MAINTENANCE

## 9.13 PIO PORT TEST ERROR

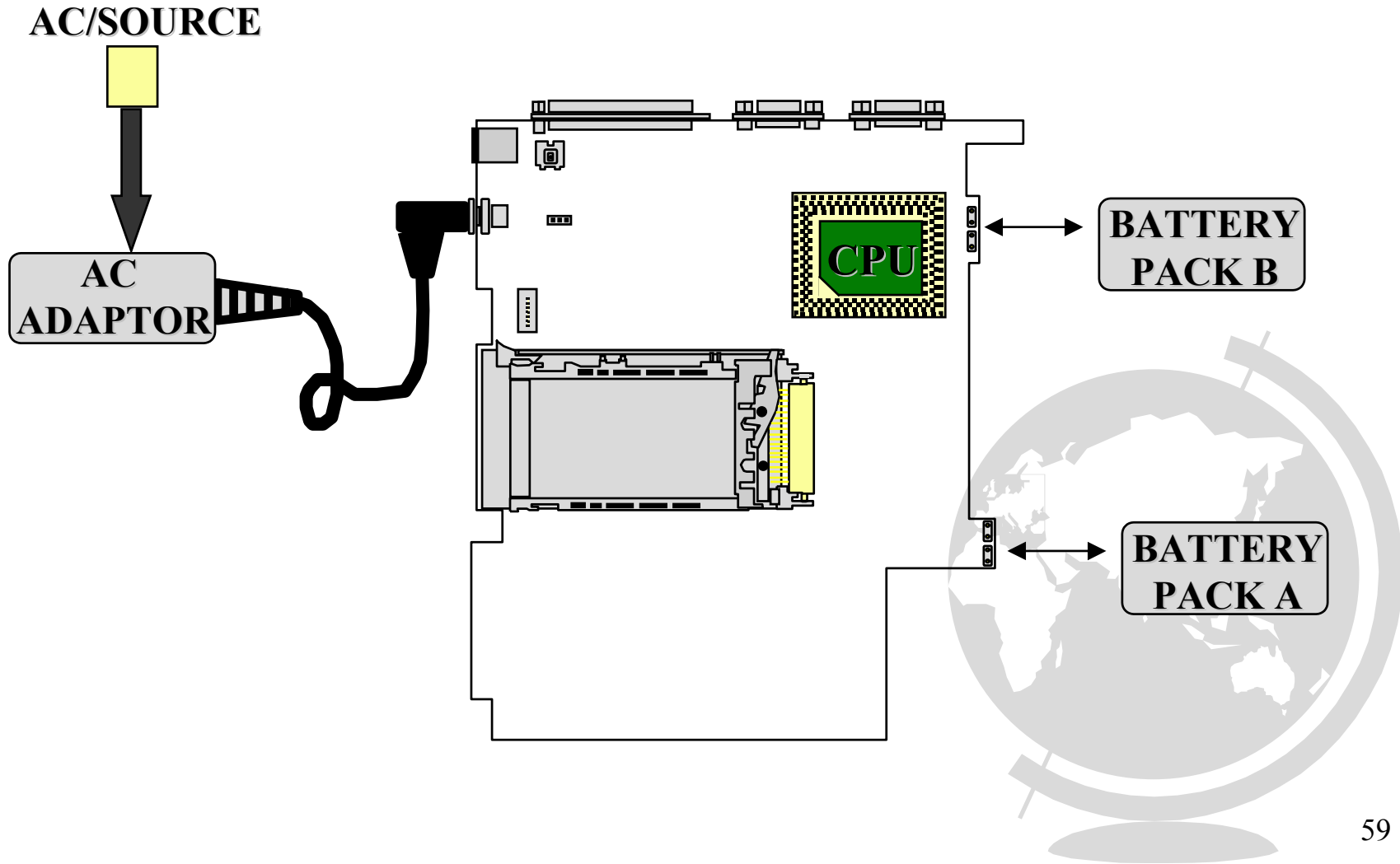
### SYMPTON:

WHEN A PRINT COMMAND IS ISSUED, PRINTER PRINTS NOTHING OR GARBAGE.



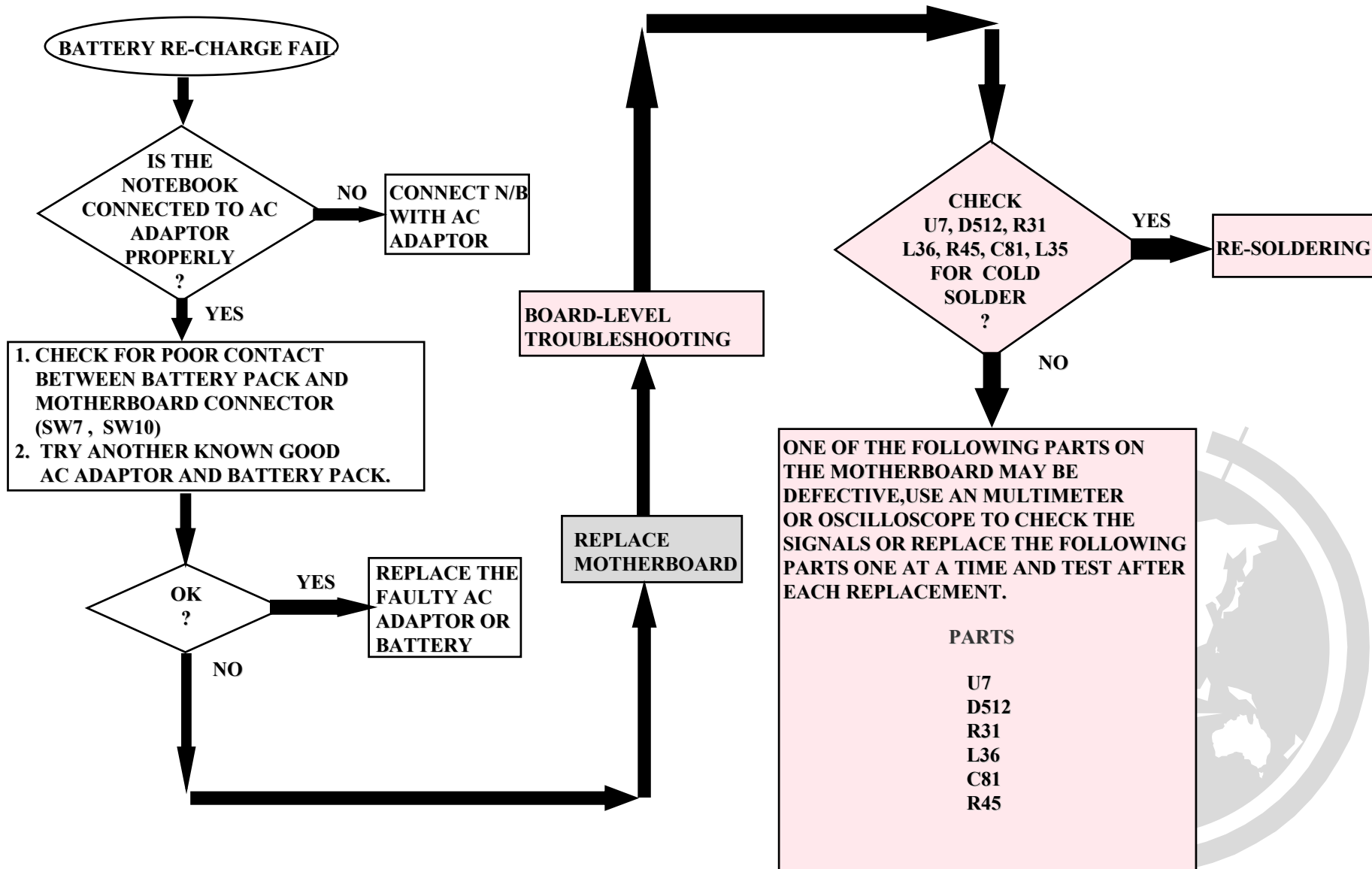
# 4024 N/B MAINTENANCE

## 9.14 BATTERY RE-CHARGE FAILURE



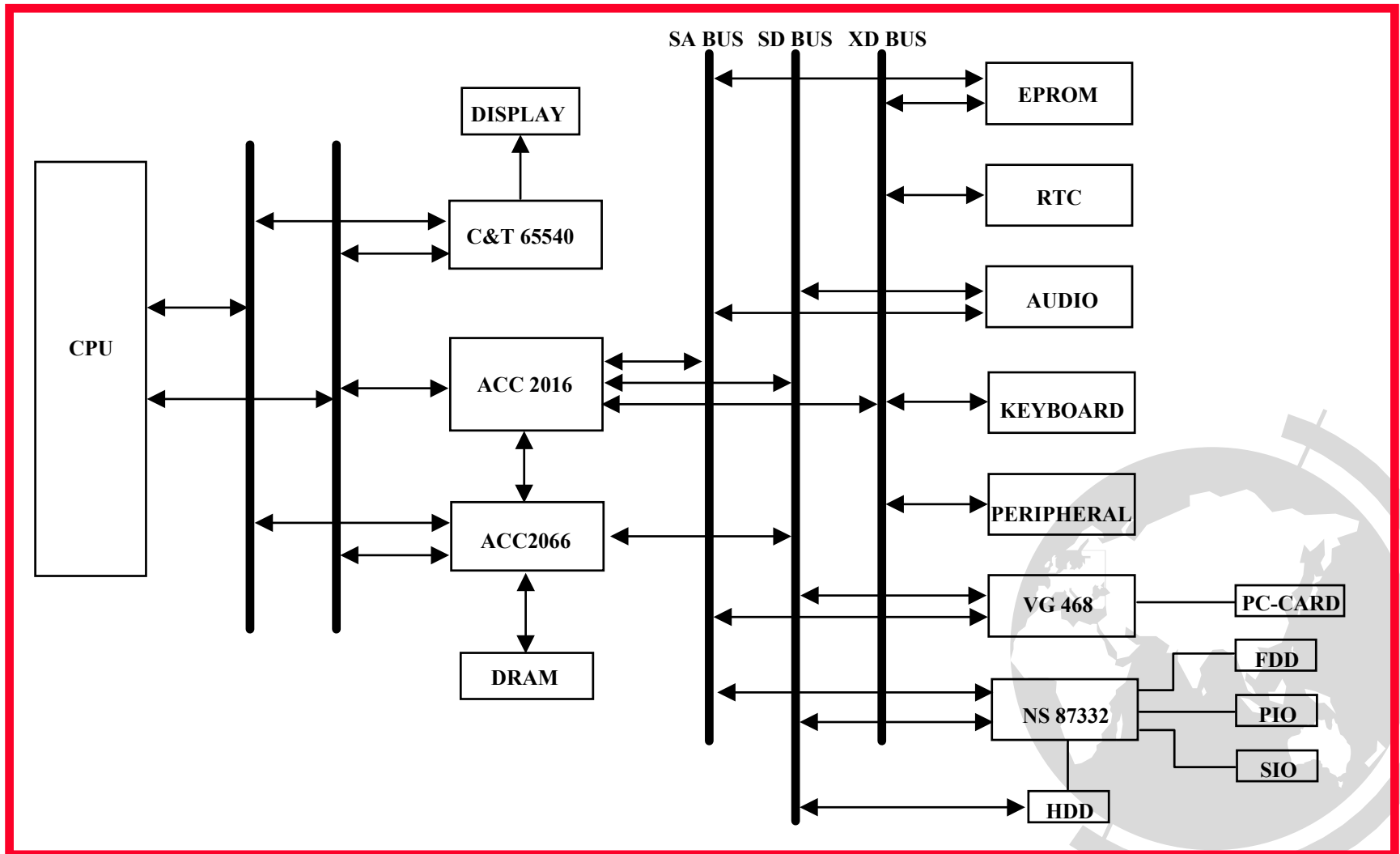
# 4024 N/B MAINTENANCE

## 9.14 BATTERY RE-CHARGE FAILURE



# 4024 N/B MAINTENANCE

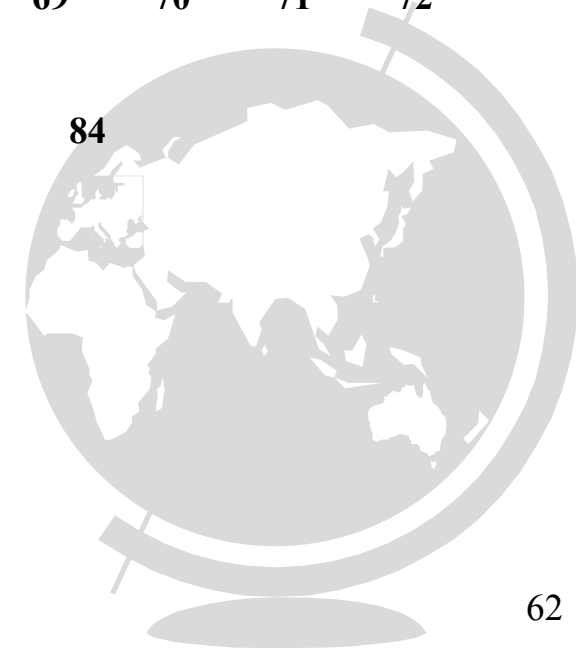
## 10. SYSTEM BLOCK DIAGRAM & SCHEMATISS



# 4024 N/B MAINTENANCE

## 10. SYSTEM BLOCK DIAGRAM & SCHEMATISS

|     |     |     |     |     |     |     |     |     |     |     |     |     |    |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|
| 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  | 99 | 100 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 |    |     |
| 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 |     |     |     |    |     |
| 124 | 125 | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72 |     |
| 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  |     |    |     |



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**9. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOATD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



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**DC /DC BOARD**



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**DC /DC BOARD**



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**DC /DC BOARD**



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**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



**10. SYSTEM BLOCK DIAGRAM & SCHEMATISS**

**MOTHER-BOARD**

**DC /DC BOARD**



# 4024 N/B MAINTENANCE

## 11. SERVICE PARTS RECOMMEND

### MODULES:

| NO. | PART NO.     | PARTS DESCRIPTION         | LOCATION | FAIL RATE | REMARK |
|-----|--------------|---------------------------|----------|-----------|--------|
| 1   | 411663800004 | 4024 MOTHER BOARD         |          | 4.00%     |        |
| 2   | 411663800001 | 4024 AUDIO BOARD          |          | 1.20%     |        |
| 3   | 523410290001 | FDD FD-05HF-4630          |          | 1.20%     |        |
| 4   | 441663800001 | BATTERY PACK NICD         |          | 1.90%     |        |
| 5   | 441663800002 | BATTERY PACK NIMH         |          | 1.90%     |        |
| 6   | 323799990002 | DRAM MODULE 8MB           |          | 0.25%     |        |
| 7   | 323799990001 | DRAM MODULE 4MB           |          | 0.30%     |        |
| 8   | 531001620075 | KEYBOARD (US)             |          | 0.50%     |        |
| 9   | 531001620073 | KEYBOARD (SX)             |          | 0.50%     |        |
| 10  | 531001620067 | KEYBOARD (KR)             |          | 0.50%     |        |
| 11  | 531001620074 | KEYBOARD (UK)             |          | 0.50%     |        |
| 12  | 441663800051 | LCD MONO                  |          | 0.30%     |        |
| 13  | 441663800053 | LCD SHARP STN             |          | 1.20%     |        |
| 14  | 441663800054 | LCD SHARP TFT             |          | 0.30%     |        |
| 15  | 411663800016 | 4024 TRANS BD 9.4" TFT    |          | 0.80%     |        |
| 16  | 411663800018 | 4024 TRANS BD 10.4" TFT   |          | 0.80%     |        |
| 17  | 441663800020 | 4024 TRANS DSTN           |          | 1.80%     |        |
| 18  | 442170800003 | TRACLBALL ASSY            |          | 2.10%     |        |
| 19  | 340663800002 | PALMREST:4024             |          | 0.40%     |        |
| 20  | 340663800008 | COVER REAR:4024           |          | 0.40%     |        |
| 21  | 323799990003 | DRAM MODULE 16MB          |          | 0.10%     |        |
| 22  | 422663800041 | CABLE ASSY ;ICON LCD,4024 |          | 2.00%     |        |
| 23  | 441464000002 | AC ADAP ASSY;4023         |          | 0.50%     |        |
| 24  |              |                           |          |           |        |
| 25  |              |                           |          |           |        |
| 26  |              |                           |          |           |        |
| 27  |              |                           |          |           |        |

### COMPONENTS:

| NO. | PART NO.     | PARTS DESCRIPTION        | LOCATION    | FAIL RATE | REMARK |
|-----|--------------|--------------------------|-------------|-----------|--------|
| 1   | 295000010003 | FUSE;FAST,5A 32V,TUBE    | F1          | 5.00%     |        |
| 2   | 283305402001 | IC;EPROM,32K*8,120NS     | U18         | 0.70%     |        |
| 3   | 283415502002 | IC;FLASH,128K*8,150NS    | U6          | 0.50%     |        |
| 4   | 284565540001 | IC;65540,VGA CTLR,PQFP   | U504        | 3.50%     |        |
| 5   | 291000627201 | DIMM SOCKET,72P          | J6          | 1.10%     |        |
| 6   | 284509055001 | IC;CH9055D,FREQ GENN_    | U509        | 1.01%     |        |
| 7   | 284500468001 | IC;VG468,PC CARD CTLR    | U510        | 0.40%     |        |
| 8   | 284102066001 | IC;ACC2066,SYS CTLR      | U511        | 1.50%     |        |
| 9   | 284580051001 | IC;80C51SL,KBD CTLR      | U512        | 0.30%     |        |
| 10  | 286512885001 | IC;DS12885S              | U514        | 0.20%     |        |
| 11  | 284102016002 | IC;ACC2016,BUFFER CHIP   | U1          | 1.02%     |        |
| 12  | 284587332001 | IC;PC87332VLJ,SUPER I/O  | U525        | 4.20%     |        |
| 13  | 286100471001 | IC;MAX471,CURRENT SENSE  | U7,U508     | 0.90%     |        |
| 14  | 328201603001 | TR;RFD16N03L,N-FET       | Q2,Q3,Q5,Q8 | 1.01%     |        |
| 15  | 286200213001 | IC;MAX213,RS-232         | U502        | 1.30%     |        |
| 16  | 286300786001 | IC;MAX786CAL,PWM CTLR    | U503        | 0.30%     |        |
| 17  | 338936010002 | BATTERY PACK,NI-MH,3.6V  | BT1         | 0.80%     |        |
| 18  | 344663800025 | SLIDE;HDD COVER,4024     |             | 6.50%     |        |
| 19  | 344663800010 | BUTTON;PWR,4024          |             | 0.30%     |        |
| 20  | 344663800016 | HOUSING;LCD,SHARP-TFT    |             | 1.40%     |        |
| 21  | 344663800002 | HOUSING;LCD,LM64P81      |             | 1.40%     |        |
| 22  | 421663800021 | FPC ASSY;HDD CON,4024    | HDD CABLE   | 0.21%     |        |
| 23  | 421663800022 | FPC ASSY;FDD CON,4024    | FDD CABLE   | 0.30%     |        |
| 24  | 422663800003 | WIRE ASSY;MB TO LCD,TFT  | LCD CABLE   | 0.20%     |        |
| 25  | 422663800001 | WIRE ASSY;LCD TO MB,MONO | LCD CABLE   | 0.15%     |        |

**12. BOM TREE (1)**



**12. BOM TREE (2)**



**12. BOM TREE (3)**



**12. BOM TREE (4)**



## **14. EXPLODED VIEWS**



**14. EXPLODED VIEWS**



## **14. EXPLODED VIEWS**



## **14. EXPLODED VIEWS**



## **14. EXPLODED VIEWS**



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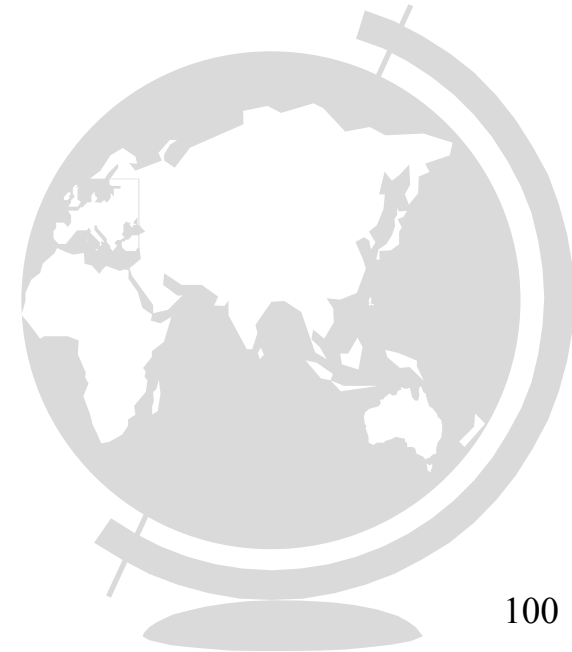
## **14. EXPLODED VIEWS**



## **14. EXPLODED VIEWS**



## **14. EXPLODED VIEWS**



# **4024 N/B MAINTENANCE**

## **13. SPARE PARTS LIST**



# **4024 N/B MAINTENANCE**



# **4024 N/B MAINTENANCE**



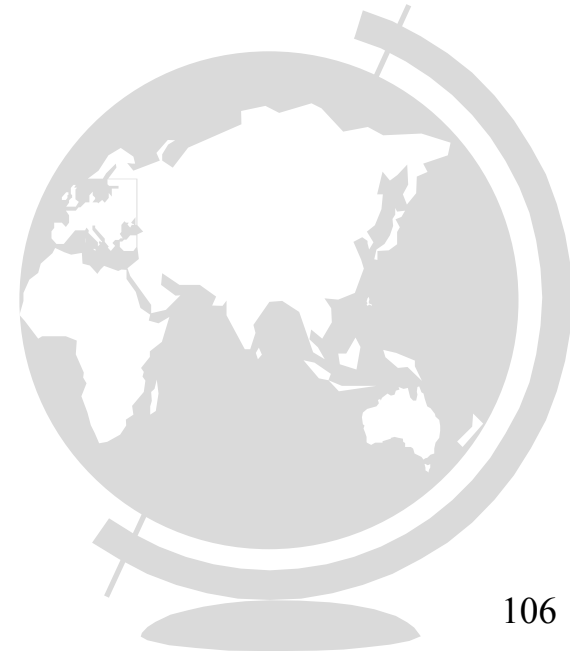
# **4024 N/B MAINTENANCE**



# **4024 N/B MAINTENANCE**



# **4024 N/B MAINTENANCE**



# **4024 N/B MAINTENANCE**

## **15. LCD ME KIT**



# **4024 N/B MAINTENANCE**

## **15. LCD ME KIT**

