AlphaPC 164 Motherboard

User's Manual

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1 About This Manual

This manual describes the AlphaPC 164 motherboard, a module for computing systems based on the Digital Semiconductor 21164 Alpha microprocessor and the companion Digital Semiconductor 21172 core logic chipset. It describes the features of the motherboard and how to set the configuration jumpers. The manual is intended for users of the AlphaPC 164 motherboard to assist them in installing the motherboard and populating it with memory modules and peripheral cards.

1.1 Document Conventions

The following conventions are used in this document.

Caution: Cautions indicate potential damage to equipment, software, or data.

Note: Notes provide additional information about a topic.

Numbering: All numbers are decimal or hexadecimal unless otherwise indicated. In case of ambiguity, a subscript indicates the radix of nondecimal numbers. For example, 19 is a decimal number, but 19_{16} and 19A are hexadecimal numbers.

Extents: Extents are specified by a single number or a pair of numbers in angle brackets ($<\,>$) separated by a colon (:), and are inclusive. For example, bits <7:3> specify an extent including bits 7, 6, 5, 4, and 3. Multiple bit fields are shown as extents.

Register Figures: Register figures have bit and field position numbering starting at the right (low-order) and increasing to the left (high-order).

Signal Names: All signal names are printed in boldface type. Signals whose names originate in an industry-standard specification, such as PCI or IDE, are printed in the case used in the specification (usually uppercase). Active low signals have either a pound sign "#" appended, or a "not" overscore bar (for example: **SDONE**, **DEVSEL#**, and **RESET**).

Italic Type: *Italic* type emphasizes important information and indicates complete titles of documents.

Terms: The following terms are used in this document:

This term...	Refers to...
Microsoft Windows NT installation guide	The Microsoft *Windows NT Workstation Installation Guide* and the *Windows NT Server Installation Guide*.
Windows NT	The Microsoft Windows NT Workstation and the Windows NT Server operating systems.

2 Features of the AlphaPC 164 Motherboard

This section lists the AlphaPC 164 motherboard features and shows the location of major components, connectors, and jumpers.

AlphaPC 164 Features

The AlphaPC 164 motherboard uses a Digital Semiconductor 21164 Alpha microprocessor and companion Digital Semiconductor 21172 core logic chipset.

Table 1 lists the features of the AlphaPC 164 motherboard. Figure 1 shows the board outlines, and identifies the location of jumpers, connectors, and major components. Table 2 lists and defines these items. Refer to Section 4 for connector pinouts. Refer to Section 3 for jumper configurations.

Table 1 AlphaPC 164 Features

Feature	Description
Microprocessor	Digital Semiconductor 21164 Alpha microprocessor (64-bit RISC)
Chipset	Digital Semiconductor 21172 core logic chipset, consisting of one control chip and four data chips, that provides an interface to system memory and the PCI bus
DRAM memory	16-MB to 512-MB memory array -- One bank of either 4 (128-bit) or 8 (256-bit) commodity, 36-bit, 70-ns SIMMs
Caching	
L1 Icache	8-KB, direct-mapped, instruction cache on the CPU chip
L1 Dcache	8-KB, direct-mapped, data cache on the CPU chip
L2 Scache	96-KB, three-way, set-associative, write-back, unified instruction and data cache on the CPU chip
L3 backup cache	Onboard 1-MB, direct-mapped, synchronous SRAM backup cache with 128-bit data path
I/O and miscellaneous support	32-bit and 64-bit, 33-MHz PCI
	Four dedicated PCI expansion slots (two 64-bit)
	PCI/IDE control (CMD646)
	Intel 82378ZB PCI-to-ISA bridge chip
	Two dedicated ISA expansion slots
	SMC FDC37C935 combination chip provides control for diskettes, two UARTs with modem control, parallel port, keyboard, mouse, and time-of-year clock
	1-MB flash ROM
Firmware	Windows NT ARC firmware

Figure 1 AlphaPC 164 Jumper/Connector/Component Location

MK-2306-35
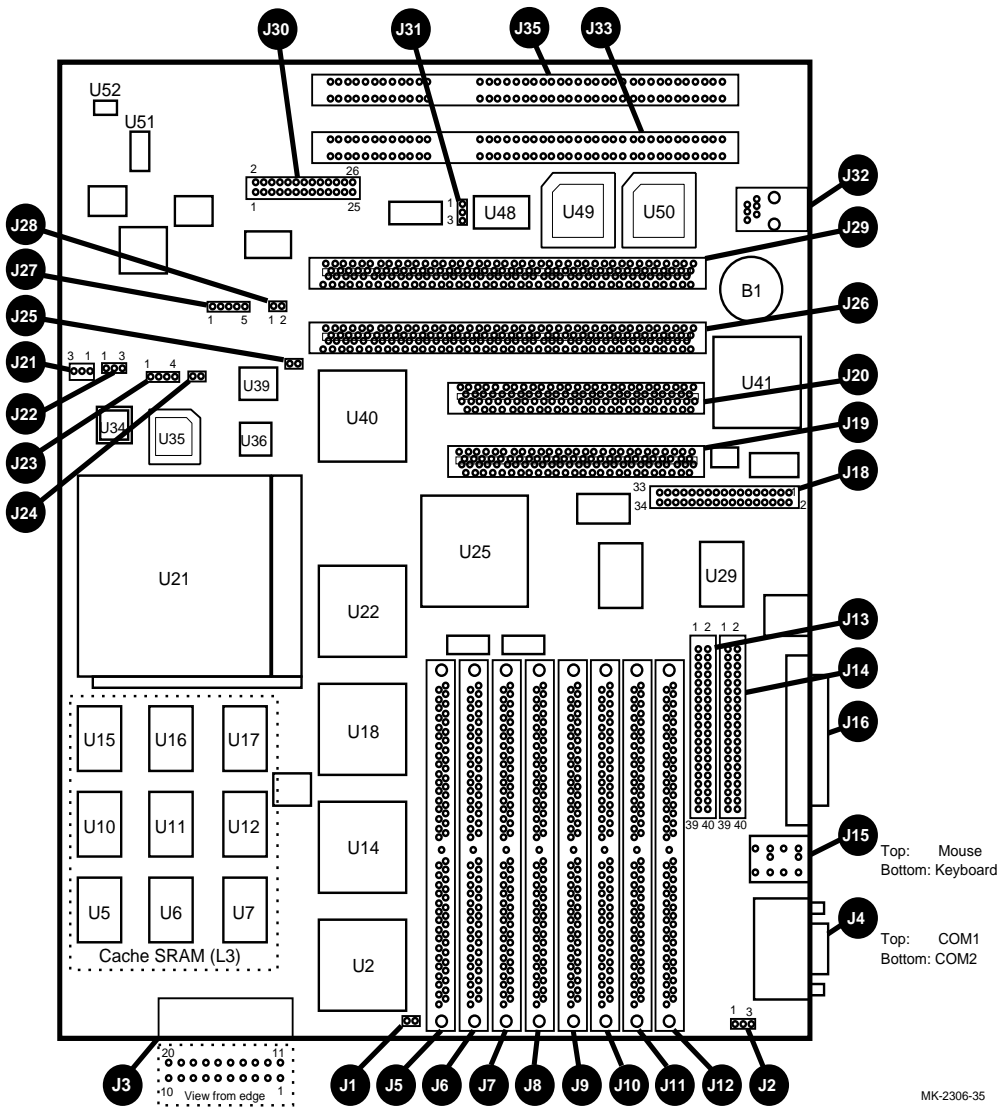
Table 2 AlphaPC 164 Jumper/Connector/Component List

Item #	Description	Item #	Description
B1	RTC battery (CR2032)	J1	Memory bus width jumper
J2	Fan power, enclosure (+12V)	J3	Power (+3V, +5V, -5V, +12V, -12V)
J4	COM1/COM2 (DB9) connectors	J5	DRAM SIMM 0 [35:0] connector
J6	DRAM SIMM 1 [71:36] connector	J7	DRAM SIMM 2 [107:72] connector
J8	DRAM SIMM 3 [143:108] connector	J9	DRAM SIMM 4 [179:144] connector
J10	DRAM SIMM 5 [215:180] connector	J11	DRAM SIMM 6 [251:216] connector
J12	DRAM SIMM 7 [287:252] connector	J13	IDE drive 2/3 connector
J14	IDE drive 0/1 connector	J15	Keyboard/mouse connectors
J16	Parallel I/O connector	J18	Diskette (floppy) drive connector
J19	PCI slot 3 (32-bit)	J20	PCI slot 2 (32-bit)
J21	Microprocessor fan/fan sense connector	J22	Enclosure fan +12V power connector
J23	Speaker connector	J24	Reset button connector
J25	Halt button connector	J26	PCI slot 1 (64-bit)
J27	Power LED connector	J28	Hard-drive LED connector
J29	PCI slot 0 (64-bit)	J30	Configuration jumpers
J31	Flash update enable/disable jumper	J32	SROM test port connector
J33	ISA slot 1	J35	ISA slot 0
U2	Data switch 0 (DSC 21172-BA)	U5 to U7	Cache SRAM (L3)
U10 to U12	Cache SRAM (L3)	U14	Data switch 1 (DSC 21172-BA)
U15 to U17	Cache SRAM (L3)	U18	Data switch 2 (DSC 21172-BA)
U21	Microprocessor, socketed (DSC 21164 Alpha)	U22	Data switch 3 (DSC 21172-BA)
U25	I/O interface and address control (DSC 21172-CA)	U29	IDE controller
U34	Microprocessor clock crystal, 36.66-MHz (default), socketed	U35	Microprocessor clock PLL (TriQuint TQ2061)
U36	System clock PLL (CDC 2586)	U39	Serial ROM, socketed (Xilinx XC17128D)
U40	PCI-to-ISA bridge (Intel 82378ZB)	U41	Combination controller, Super I/O (SMC FDC37C935)
U48	Flash ROM (1MB)	U49	PCI arbiter PAL
U50	PCI interrupt request PAL	U51	Power controller
U52	Power sense	—	—

2.1 Power Requirements

The AlphaPC 164 motherboard has a total power dissipation of 116 W, excluding any plug-in PCI and ISA devices. Table 3 lists the power requirement for each dc supply voltage.

The power supply must supply a **DCOK** signal to the system reset logic.

Table 3 Power Supply DC Current Requirements

Voltage/Tolerance	Current[1]
+3.4 V dc, ±3%	5.0 A
+5 V dc, ±5%	12.0 A
–5 V dc, ±5%	0 A
+12 V dc, ±5%	1.0 A
–12 V dc, ±5%	100.0 mA

[1]Values indicated are for an AlphaPC 164 motherboard (64MB DRAM) excluding adapter cards and disk drives.

Caution: Fan Sensor Required
The 21164 microprocessor cooling fan *must* have a built-in sensor that will drive a signal if the airflow stops. The sensor is connected to motherboard connector J21. When the signal is generated, it resets the system.

2.2 Environmental Requirements

The 21164 microprocessor is cooled by a small fan blowing directly into the chip's heat sink. The AlphaPC 164 motherboard is designed to run efficiently by using only this fan. Additional fans may be necessary depending upon cabinetry and the requirements of plug-in cards.

The AlphaPC 164 motherboard is specified to run within the environment listed in Table 4.

Table 4 AlphaPC 164 Motherboard Environmental Requirements

Parameter	Specification
Operating temperature	10°C to 40°C (50°F to 104°F)
Storage temperature	–55°C to 125°C (–67°F to 257°F)
Relative humidity	10% to 90% with maximum wet bulb temperature 28°C (82°F) and minimum dew point 2°C (36°F)
Rate of (dry bulb) temperature change	11°C/hour ±2°C/hour (20°F/hour ±4°F/hour)

2.3 Physical Parameters

The AlphaPC 164 motherboard is an ATX-size printed-wiring board (PWB) with the following dimensions:

- Length: 30.48 cm (12.0 in. ±0.0005 in.)

- Width: 24.38 cm (9.6 in. ±0.0005 in.)

- Height: 6.0 cm (2.4 in.)

The motherboard can be used in certain desktop and deskside systems that have adequate clearance for the 21164 microprocessor heat sink and fan. All ISA and PCI expansion slots are usable in standard desktop or deskside enclosures.

3 AlphaPC 164 Jumper Configuration

The AlphaPC 164 motherboard has three groups of jumpers at location J1, J30, and J31. These jumpers set the hardware configuration and boot options. Figure 1 shows the jumper location on the AlphaPC 164 motherboard. Figure 2 shows the jumper functions for each group. Section 3.1 through Section 3.7 describe the jumper configurations.

3.1 Memory Bus Width Jumper (J1)

The memory bus width can be either 128 bits (J5 through J8 populated with SIMMs and J9 through J12 empty) or 256 bits (J5 through J12 populated with SIMMs). When using a memory bus width of 128 bits, jumper J1 must be in. When using a memory bus width of 256 bits, jumper J1 must be out.

3.2 System Clock Divisor Jumpers (IRQ3 Through IRQ0)

The system clock divisor jumpers are located at J30–1/2 (IRQ3), J30–3/4 (IRQ2), J30–5/6 (IRQ1), and J30–7/8 (IRQ0). The jumper configuration set in IRQ3 through IRQ0 determines the frequency of the microprocessor's system clock output. These four jumpers set the speed at power-up as listed in Figure 2. The microprocessor frequency divided by the ratio determines the system clock frequency.

3.3 Bcache Size Jumpers (CF1 and CF2)

The Bcache size jumpers are located at J30–11/12, CF1 and J30–13/14, CF2. These jumpers configure the Bcache as specified in Figure 2.

3.4 Bcache Speed Jumpers (CF4 and CF5)

The Bcache speed jumpers are located at J30–17/18, CF4 and J30–19/20, CF5. These jumpers select the Bcache timing parameters used to compute a value that is loaded into the microprocessor's Bcache configuration register at power-up time. Because the Bcache SRAMs are soldered onto the board, the default jumper configuration selecting an SRAM access time of 9 ns as shown in Figure 2 will *always* be used.

Figure 2 AlphaPC 164 Configuration Jumpers

J30 System Configuration Jumpers

			Frequency	Ratio	IRQ3	IRQ2	IRQ1	IRQ0	Comments
IRQ3	1		366 MHz	11	Out	In	Out	Out	
IRQ2	3		400 MHz	12	Out	Out	In	In	
IRQ1	5		433 MHz	13	Out	Out	In	Out	
IRQ0	7		466 MHz	14	Out	Out	Out	In	
			500 MHz	15	Out	Out	Out	Out	
			All other combinations						Reserved

CF0 9 Reserved (Default Out)

			Bcache Size	CF1	CF2	Comments
CF1	11		1MB	Out	Out	Default
CF2	13		2MB	Out	In	
			All other combinations			Reserved

CF3 15 Reserved (Default Out)

			Bcache Speed	CF4	CF5	Comments
CF4	17		9 ns	Out	Out	Default
CF5	19		All other combinations			Reserved

CF6 21 Mini-Debugger (Default Out)

CF7 23 Boot_Option (Default Out)

25 Not Used

J1 Memory Bus Width Jumper

1   In = 128-Bit Bus
2   Out = 256-Bit Bus
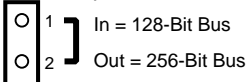
Note: Jumper must be out when all
eight DRAM SIMM sockets are populated.

J31 Flash ROM Update Jumper

1
2   1 to 2 In = Disable
3   2 to 3 In = Enable (Default)
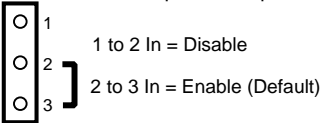
MK-2306-36A

3.5 Mini-Debugger Jumper (CF6)

The Mini-Debugger jumper is located at J30–21/22 (CF6). The default position for this jumper is out (Figure 2). The Alpha SROM Mini-Debugger is stored in the SROM. When this jumper is in, it causes the SROM initialization to trap to the Mini-Debugger (communication through connector J32) after all initialization is complete, but before starting the execution of the system flash ROM code.

3.6 Boot Option Jumper (CF7)

The boot option jumper is located at J30–23/24 (CF7). The default position for this jumper is out (Figure 2). This jumper selects the image to be loaded into memory from the system flash ROM. With the jumper out, the Windows NT ARC firmware is loaded. With the jumper in, the fail-safe booter is loaded. For more information about the fail-safe booter, refer to Section 8.3.

3.7 Flash ROM Update Jumper (J31)

When J31–2/3 are jumpered together (default), the flash ROM is write-enabled. When J31–1/2 are jumpered together, the flash ROM is write-protected.

4 AlphaPC 164 Connector Pinouts

This section lists the pinouts of all connectors (see Table 5 through Table 21). See Figure 1 for connector locations.

Table 5   Peripheral Component Interface (PCI) Bus Connector Pinouts

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
32-Bit and 64-Bit PCI Connectors (J19, J20, J26, J29)							
A1	**TRST#**	A2	**+12V**	A3	**TMS**	A4	**TDI**
A5	**VDD**	A6	**INTA**	A7	**INTC**	A8	**VDD**
A9	—	A10	**VDD**	A11	—	A12	**GND**
A13	**GND**	A14	—	A15	**RST#**	A16	**VDD**
A17	**GNT#**	A18	**GND**	A19	—	A20	**AD[30]**
A21	**+3V**	A22	**AD[28]**	A23	**AD[26]**	A24	**GND**
A25	**AD[24]**	A26	**IDSEL**	A27	**+3V**	A28	**AD[22]**
A29	**AD[20]**	A30	**GND**	A31	**AD[18]**	A32	**AD[16]**
A33	**+3V**	A34	**FRAME#**	A35	**GND**	A36	**TRDY#**
A37	**STOP#**	A38	**STOP#**	A39	**+3V**	A40	**SDONE**
A41	**SBO#**	A42	**GND**	A43	**PAR**	A44	**AD[15]**
A45	**+3V**	A46	**AD[13]**	A47	**AD[11]**	A48	**GND**
A49	**AD[09]**	A50	Not used	A51	Not used	A52	**C/BE#[0]**
A53	**+3V**	A54	**AD[06]**	A55	**AD[04]**	A56	**GND**
A57	**AD[02]**	A58	**AD[00]**	A59	**VDD**	A60	**REQ64#**
A61	**VDD**	A62	**VDD**	B1	**-12V**	B2	**TCK**
B3	**GND**	B4	**TDO**	B5	**VDD**	B6	**VDD**
B7	**INTB**	B8	**INTD**	B9	**PRSNT1#**	B10	—
B11	**PRSNT2#**	B12	**GND**	B13	**GND**	B14	—
B15	**GND**	B16	**CLK**	B17	**GND**	B18	**REQ#**
B19	**VDD**	B20	**AD[31]**	B21	**AD[29]**	B22	**GND**
B23	**AD[27]**	B24	**AD[25]**	B25	**+3V**	B26	**C/BE#[3]**
B27	**AD[23]**	B28	**GND**	B29	**AD[21]**	B30	**AD[19]**
B31	**+3V**	B32	**AD[17]**	B33	**C/BE#[2]**	B34	**GND**
B35	**IRDY#**	B36	**+3V**	B37	**DEVSEL#**	B38	**GND**
B39	**LOCK#**	B40	**PERR#**	B41	**+3V**	B42	**SERR#**
B43	**+3V**	B44	**C/BE#[1]**	B45	**AD[14]**	B46	**GND**
B47	**AD[12]**	B48	**AD[10]**	B49	**GND**	B50	Not used
B51	Not used	B52	**AD[08]**	B53	**AD[07]**	B54	**+3V**
B55	**AD[05]**	B56	**AD[03]**	B57	**GND**	B58	**AD[01]**
B59	**VDD**	B60	**ACK64#**	B61	**VDD**	B62	**VDD**

Table 5   (Continued) Peripheral Component Interface (PCI) Bus Connector Pinouts

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
64-Bit PCI Connectors Only (J26, J29)							
A63	**GND**	A64	**C/BE#[7]**	A65	**C/BE#[5]**	A66	**VDD**
A67	**PAR64**	A68	**D[62]**	A69	**GND**	A70	**D[60]**
A71	**D[58]**	A72	**GND**	A73	**D[56]**	A74	**D[54]**
A75	**VDD**	A76	**D[52]**	A77	**D[50]**	A78	**GND**
A79	**D[48]**	A80	**D[46]**	A81	**GND**	A82	**D[44]**
A83	**D[42]**	A84	**VDD**	A85	**D[40]**	A86	**D[38]**
A87	**GND**	A88	**D[36]**	A89	**D[34]**	A90	**GND**
A91	**D[32]**	A92	—	A93	**GND**	A94	—
B63	—	B64	**GND**	B65	**C/BE#[6]**	B66	**C/BE#[4]**
B67	**GND**	B68	**D[63]**	B69	**D[61]**	B70	**VDD**
B71	**D[59]**	B72	**D[57]**	B73	**GND**	B74	**D[55]**
B75	**D[53]**	B76	**GND**	B77	**D[51]**	B78	**D[49]**
B79	**VDD**	B80	**D[47]**	B81	**D[45]**	B82	**GND**
B83	**D[43]**	B84	**D[41]**	B85	**GND**	B86	**D[39]**
B87	**D[37]**	B88	**VDD**	B89	**D[35]**	B90	**D[33]**
B91	**GND**	B92	—	B93	—	B94	**GND**

Table 6 ISA Expansion Bus Connector Pinouts (J33, J35)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	2	IOCHCK#	3	RSTDRV	4	SD7
5	VDD	6	SD6	7	IRQ9	8	SD5
9	–5V	10	SD4	11	DRQ2	12	SD3
13	–12V	14	SD2	15	ZEROWS#	16	SD1
17	+12V	18	SD0	19	GND	20	IOCHRDY
21	SMEMW#	22	AEN	23	SMEMR#	24	SA19
25	IOW#	26	SA18	27	IOR#	28	SA17
29	DACK3#	30	SA16	31	DRQ3	32	SA15
33	DACK1#	34	SA14	35	DRQ1	36	SA13
37	REFRESH#	38	SA12	39	SYSCLK	40	SA11
41	IRQ7	42	SA10	43	IRQ6	44	SA9
45	IRQ5	46	SA8	47	IRQ4	48	SA7
49	IRQ3	50	SA6	51	DACK2#	52	SA5
53	TC	54	SA4	55	BALE	56	SA3
57	VDD	58	SA2	59	OSC	60	SA1
61	GND	62	SA0	63	MEMCS16#	64	SBHE#
65	IOCS16#	66	LA23	67	IRQ10	68	LA22
69	IRQ11	70	LA21	71	IRQ12	72	LA20
73	IRQ15	74	LA19	75	IRQ14	76	LA18
77	DACK0#	78	LA17	79	DRQ0	80	MEMR#
81	DACK5#	82	MEMW#	83	DRQ5	84	SD8
85	DACK6#	86	SD9	87	DRQ6	88	SD10
89	DACK7#	90	SD11	91	DRQ7	92	SD12
93	VDD	94	SD13	95	MASTER#	96	SD14
97	GND	98	SD15	—	—	—	—

Table 7 DRAM SIMM Connector Pinouts (J5 Through J12)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	**GND**	2	**DQ1**	3	**DQ2**	4	**DQ3**
5	**DQ4**	6	**DQ5**	7	**DQ6**	8	**DQ7**
9	**DQ8**	10	**VDD**	11	**GND**	12	**A0**
13	**A1**	14	**A2**	15	**A3**	16	**A4**
17	**A5**	18	**A6**	19	**A10**	20	**DQ9**
21	**DQ10**	22	**DQ11**	23	**DQ12**	24	**DQ13**
25	**DQ14**	26	**DQ15**	27	**DQ16**	28	**A7**
29	**A11**	30	**VDD**	31	**A8**	32	**A9**
33	**RAS3**	34	**RAS2**	35	**DQ17**	36	**DQ18**
37	**DQ19**	38	**DQ20**	39	**GND**	40	**CAS0**
41	**CAS2**	42	**CAS3**	43	**CAS1**	44	**RAS0**
45	**RAS1**	46	**VDD**	47	**WE**	48	NC
49	**DQ21**	50	**DQ22**	51	**DQ23**	52	**DQ24**
53	**DQ25**	54	**DQ26**	55	**DQ27**	56	**DQ28**
57	**DQ29**	58	**DQ30**	59	**VDD**	60	**DQ31**
61	**DQ32**	62	**DQ33**	63	**DQ34**	64	**DQ35**
65	**DQ36**	66	**VDD**	67	NC	68	NC
69	NC	70	NC	71	**GND**	72	**GND**

Table 8 IDE Drive Bus Connector Pinouts (J13, J14)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	**$\overline{\text{RESET}}$**	2	**GND**	3	**IDE_D7**	4	**IDE_D8**
5	**IDE_D6**	6	**IDE_D9**	7	**IDE_D5**	8	**IDE_D10**
9	**IDE_D4**	10	**IDE_D11**	11	**IDE_D3**	12	**IDE_D12**
13	**IDE_D2**	14	**IDE_D13**	15	**IDE_D1**	16	**IDE_D14**
17	**IDE_D0**	18	**IDE_D15**	19	**GND**	20	NC (key pin)
21	**MARQ**	22	**GND**	23	**$\overline{\text{IOW}}$**	24	**GND**
25	**$\overline{\text{IOR}}$**	26	**GND**	27	**CHRDY**	28	**BALE**
29	**MACK**	30	**GND**	31	**IRQ**	32	**$\overline{\text{IOCS16}}$**
33	**ADDR1**	34	**NC**	35	**ADDR0**	36	**ADDR2**
37	**$\overline{\text{CS0}}$**	38	**$\overline{\text{CS1}}$**	39	**$\overline{\text{ACT}}$**	40	**GND**

Table 9 Diskette Drive Bus Connector Pinouts (J18)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	**GND**	2	**DEN0**	3	**GND**	4	NC
5	**GND**	6	**DEN1**	7	**GND**	8	**INDEX**
9	**GND**	10	**MTR0**	11	**GND**	12	**DR1**
13	**GND**	14	**DR0**	15	**GND**	16	**MTR1**
17	**GND**	18	**DIR**	19	**GND**	20	**STEP**
21	**GND**	22	**WDATA**	23	**GND**	24	**WGATE**
25	**GND**	26	**TRK0**	27	**GND**	28	**WRTPRT**
29	**ID0**	30	**RDATA**	31	**GND**	32	**HDSEL**
33	**ID1**	34	**DSKCHG**	—	—	—	—

Table 10 Parallel Bus Connector Pinouts (J16)

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	**STB**	2	**PD0**	3	**PD1**	4	**PD2**
5	**PD3**	6	**PD4**	7	**PD5**	8	**PD6**
9	**PD7**	10	**ACK**	11	**BUSY**	12	**PE**
13	**SLCT**	14	**AFD**	15	**ERR**	16	**INIT**
17	**SLIN**	18	**GND**	19	**GND**	20	**GND**
21	**GND**	22	**GND**	23	**GND**	24	**GND**
25	**GND**	—	—	—	—	—	—

Table 11 COM1/COM2 Serial Line Connector Pinouts (J4)

COM1 Pin (Top)	COM1 Signal	COM2 Pin (Bottom)	COM2 Signal
1	DCD1	1	DCD2
2	RxD1	2	RxD2
3	TxD1	3	TxD2
4	DTR1	4	DTR2
5	SG1	5	SG2
6	DSR1	6	DSR2
7	RTS1	7	RTS2
8	CTS1	8	CTS2
9	RI1	9	RI2

Table 12 Keyboard/Mouse Connector Pinouts (J15)

Keyboard Pin (Top)	Keyboard Signal	Mouse Pin (Bottom)	Mouse Signal
1	KBDATA	1	MSDATA
2	NC	2	NC
3	GND	3	GND
4	VDD	4	VDD
5	KBCLK	5	MSCLK
6	NC	6	NC

Table 13 SROM Test Data Input Connector Pinouts (J32)

Pin	Signal	Name
1	NC	—
2	SROM_CLK_L	Clock out
3	GND	—
4	NC	—
5	TEST_SROM_D_L	SROM serial data in
6	NC	—

Table 14 Input Power Connector Pinouts (J3)

Pin	Voltage	Pin	Voltage	Pin	Voltage	Pin	Voltage
1	+3.3 V dc	2	+3.3 V dc	3	Ground	4	+5 V dc
5	Ground	6	+5 V dc	7	Ground	8	**P_DCOK**
9	NC	10	+12 V dc	11	+3.3 V dc	12	−12 V dc
13	Ground	14	NC	15	Ground	16	Ground
17	Ground	18	−5 V dc	19	+5 V dc	20	+5 V dc

Table 15 Enclosure Fan (+12 V dc) Power Connector Pinouts (J2, J22)

Pin	Voltage
1	Ground
2	+12 V dc
3	Ground

Table 16 Speaker Connector Pinouts (J23)

Pin	Signal	Name
1	**SPKR**	Speaker output
2	**GND**	—
3	**GND**	—
4	**GND**	—

Table 17 Microprocessor Fan Power Connector Pinouts (J21)

Pin	Signal	Name
1	**+12V**	—
2	**FAN_CONN_L**	Fan connected
3	**GND**	—

Table 18 Power LED Connector Pinouts (J27)

Pin	Signal	Name
1	**POWER_LED_L**	Pull-up to **VDD**
2	**GND**	—
3	NC	—
4	NC	—
5	NC	—

Table 19 IDE Drive LED Connector Pinouts (J28)

Pin	Signal	Name
1	**HD_ACT_L**	Hard drive active
2	**HD_LED_L**	Pull-up to **VDD**

Table 20 Reset Button Connector Pinouts (J24)

Pin	Signal	Name
1	**RESET_BUTTON**	Reset system
2	**GND**	—

Table 21 Halt Button Connector Pinouts (J25)

Pin	Signal	Name
1	**HALT_BUTTON**	Halt system
2	**GND**	—

Note: The Halt button is not used with the Windows NT operating system.

5 Configuring and Upgrading DRAM Memory

For higher system speed or greater throughput, DRAM memory can be upgraded either by replacing SIMMs with those of greater size, or by widening the memory bus from 128 bits to 256 bits by adding more SIMMs.

Note: When configuring or upgrading DRAM, the following rules must be observed:

- All SIMMs must be 36-bit and have a 70-ns or faster access time.

- All SIMMs must be of equal size.

5.1 Configuring DRAM Memory

Table 22 lists the DRAM memory configurations available. Refer to Figure 1 for SIMM connector location.

Table 22 AlphaPC 164 DRAM Memory Configurations

Total Memory	128-Bit Memory Mode (J1 In) J5 Through J8 Populated with SIMM Sizes...
16MB	1Mb X 36
32MB	2Mb X 36
64MB	4Mb X 36
128MB	8Mb X 36
256MB	16Mb X 36
Total Memory	**256-Bit Memory Mode (J1 Out) J5 Through J12 Populated with SIMM Sizes...**
32MB	1Mb X 36
64MB	2Mb X 36
128MB	4Mb X 36
256MB	8Mb X 36
512MB	16Mb X 36

5.2 Upgrading DRAM Memory

There are three options for upgrading DRAM memory (Table 23).

Table 23 Memory Upgrade Options

Option	Memory Bus Width Before	Memory Bus Width After	Upgrade Possibilities
1	128-bit	128-bit	Replace the 4 SIMMs in sockets J5 through J8 with SIMMs of greater size, thus retaining the 128-bit memory bus width.
2	128-bit	256-bit	Add 4 SIMMs in sockets J9 through J12 with sizes equal to those in sockets J5 through J8, thus widening the memory bus width to 256 bits.
3	256-bit	256-bit	Replace the 8 SIMMs in sockets J5 through J12 with SIMMs of greater size.

To widen the memory bus to its 256-bit maximum (upgrade option 2), add four SIMMs and make a jumper change (remove J1). The SIMMs that you add must be of the same size (*n*Mb X 36-bit) and have an access time equal to or less than the four SIMMs already in the system. Refer to Figure 1 for SIMM connector and jumper location.

1. *Observe antistatic precautions.* Handle SIMMs only at the edges to prevent damage.

2. Remove power from the system.

3. Hold the SIMM at an angle with the notch facing the key in the socket.

4. Firmly push the module into the connector and stand the module upright. Ensure that the SIMM snaps into the metal locking clips on both ends.

5. For 128-bit memory bus width, jumper J1 must be in. For 256-bit memory bus width, jumper J1 must be out.

6. Restore power to the system.

6 Interrupts and ISA Bus Addresses

This section lists the system and I/O interrupt assignments. It also lists the physical AlphaPC 164 I/O space assignments.

6.1 Interrupts

Table 24 lists each AlphaPC 164 ISA interrupt and its source.

Table 24 ISA Interrupts

Interrupt Number	Interrupt Source
IRQ0	Internal timer 1
IRQ1	Keyboard
IRQ2	Interrupt from controller 2
IRQ3	COM2
IRQ4	COM1
IRQ5	Available
IRQ6	Diskette
IRQ7	Parallel port
IRQ8#[1]	Reserved
IRQ9	Available
IRQ10	Available
IRQ11	Available
IRQ12	Mouse
IRQ13	Available
IRQ14	IDE
IRQ15	IDE

[1]The # symbol indicates an active low signal.

6.2 ISA I/O Address Map

Table 25 lists the AlphaPC 164 ISA I/O space address mapping.

Table 25 ISA I/O Address Map

Range (hex)	Usage
000-00F	8237 DMA #1
020-021	8259 PIC #1
040-043	8253 timer
060-061	Ubus IRQ12 and NMI control
070	CMOS RAM address and NMI mask register
080-08F	DMA page registers
0A0-0A1	8259 PIC #2
0C0-0DF	8237 DMA #2
2F8-2FF	Serial port—COM2
370-377	Secondary diskette
3BC-3BF	Parallel port—LPT1
3F0-3F7	Primary diskette
3F8-3FF	Serial port—COM1
800	FLASH_ADR19 register
801	AlphaPC 164 configuration register
804-806	PCI interrupt registers

6.3 Flash ROM Address Map

The address range for the flash ROM is FFF8.0000–FFFF.FFFF. Flash space of
1MB is obtained by double mapping this 512KB space. FLASH_ADR19 register at
I/O location 800h provides this function. Writing a 0 to this location enables the
lower 512KB of flash. Writing a 1 to this location enables the upper 512KB of flash.

7 Windows NT ARC Firmware

The Windows NT ARC firmware initializes the system and enables you to install and boot the Windows NT operating system. This firmware resides in the flash ROM on the AlphaPC 164 motherboard.

7.1 Firmware Conventions

To select and choose different options in the Windows NT firmware menus, use the following keys:

Key	Description
Arrow	The arrow keys are used to select different options.
Enter	The Enter key is used to choose the highlighted option.
Esc	The escape key is used to close a menu or cancel an operation.

7.2 Firmware Menu Access

When you power up your system, the firmware displays a blue screen on the monitor, initializes the firmware drivers, and displays the Boot menu, the first menu of the Windows NT firmware menus. The currently selected option in the menu is highlighted.

Note: If autoboot is enabled, you must cancel autoboot to interact with the firmware. To cancel autoboot, press the Esc key before the timeout period expires.

7.3 Firmware Menu Structure

The diagram on the following page shows the structure of the Windows NT firmware menus.

Note: The text of some of the options may differ, and some options may not always be available.

Boot menu:

Boot Windows NT

Boot an alternate operating system...

Run a program...

Supplementary menu... ⟶ **Supplementary menu:**

Install new firmware...

Install Windows NT from CD-ROM

Setup the system... ⟶ **Setup menu:**

Display hardware configuration

Boot menu...

Set the time...

Set default environment variables...

Set default configuration...

Set system language...

Manage boot selection menu... ⟶ **Manage boot selection menu:**

Setup autoboot...

Machine specific setup...

Add a boot selection...

Edit environment variables...

Change a boot selection...

Reset system to factory defaults...

Verify boot selections...

Help

Delete a boot selection...

Supplementary menu, and do not save changes...

Dump boot selections

Supplementary menu, and save changes...

Rearrange boot selections...

Setup the system...

Machine specific setup menu:

Switch Operating System...

Partition disks...

Setup the system...

Note: Arrows indicate flow between menu screens.

This symbol...	Means...
⟶	Takes you to a submenu
⤴	Returns you to the previous menu in the hierarchy

7.4 Firmware Menu Descriptions

This section describes the Windows NT firmware menu options.

7.4.1 Boot Menu

This section describes the Boot menu options.

Boot menu . . .
   ↳ **Boot Windows NT**

Boots the default boot selection. Note that the string "Windows NT" will appear as the name of your default boot selection.

Boot menu . . .
   ↳ **Boot an alternate operating system . . .**

Provides a menu of all boot selections; choose one to boot the system.

Boot menu . . .
   ↳ **Run a program . . .**

Runs an ARC application. This option prompts you for the path to the ARC application and runs it.

Boot menu . . .
   ↳ **Supplementary menu . . .**

Takes you to the Supplementary menu.

7.4.2 Supplementary Menu

This section describes the Supplementary menu options.

Boot menu . . .
   ↳ **Supplementary menu . . .**
      ↳ **Install new firmware . . .**

Runs the firmware update program. Ensure that there is no CD-ROM in your CD-ROM drive, and that your firmware diskette is in the appropriate drive. Choose this option to start the firmware update. Note that it will appear as if your system is restarting as the firmware update program reinitializes the system. See Section 7.6 for directions on how to update your firmware once the firmware update program has started.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Install Windows NT from CD-ROM**

Starts an installation of Windows NT from a CD-ROM. See Section 7.7 for more information about installing Windows NT.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**

Takes you to the Setup menu.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Display hardware configuration**

Displays your hardware configuration in three screens. The first screen displays information about your processor and memory, as well as the firmware version. The second screen displays firmware-supported devices, that were detected, with their ARC names. The third screen displays information about PCI devices found in your system.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Boot menu . . .**

Returns you to the Boot menu.

7.4.3 Setup Menu

This section describes the Setup menu options.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Set the time . . .**

Allows you to set the system date and time.

Boot menu . . .
    ↳ **Supplementary menu . . .**
        ↳ **Setup the system . . .**
           ↳ **Set default environment variables . . .**

Allows you to set the default system partition. The system partition is the disk partition where the Windows NT osloader, PALcode, and HAL reside. Note that choosing this option removes all current boot selections.

If you are unsure of the values for your system, use the following typical values:

Media:	**SCSI Hard Disk**
SCSI bus number:	**0**
SCSI ID:	**0**
Partition:	**1**

Boot menu . . .
    ↳ **Supplementary menu . . .**
        ↳ **Setup the system . . .**
           ↳ **Set default configuration . . .**

Allows you to describe your system's monitor resolution, diskette capacity, keyboard type, and SCSI host ID to the firmware.

If you are unsure of the values for your system, use the following typical values:

Monitor resolution:	**1024 x 768**
First floppy drive capacity:	**3.5 " 1.44MB**
Second floppy drive capacity:	**None**
Keyboard:	**U.S. 101-key keyboard**
SCSI host ID:	**7**

Note: SCSI host ID refers to the SCSI ID of the SCSI host adapter on a given SCSI bus.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Set system language . . .**

Allows you to specify the language that you want to use while interacting with the firmware. American English is the only language built into the firmware. If you want to use another language, ensure that your firmware language support disk is in your diskette drive before choosing this option.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Manage boot selection menu . . .**

Takes you to the Manage boot selection menu.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Setup autoboot . . .**

Allows you to specify whether or not the system should autoboot your default boot selection. If you choose to autoboot, you will also be prompted for the number of seconds to wait before autoboot should occur.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Machine specific setup . . .**

Takes you to the Machine specific setup menu (if one exists). Note that this option might not be present.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Edit environment variables . . .**

Allows you to edit the firmware environment.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Reset system to factory defaults . . .**

Resets all options to the factory defaults.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Help**

Provides rudimentary help for the Setup menu.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Supplementary menu, and do not save changes . . .**

Returns you to the Supplementary menu, discarding any changes made from the Setup menu.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Supplementary menu, and save changes . . .**

Returns you to the Supplementary menu, saving any changes made from the Setup menu. Note that if you have not made any changes, this option might not appear.

7.4.4 Manage Boot Selection Menu

This section describes the Manage boot selection menu options.

Boot menu . . .
  ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
      ↳ **Manage boot selection menu . . .**
        ↳ **Add a boot selection . . .**

Allows you to manually add a new boot selection (usually you do not need to do this because installing Windows NT will automatically add a boot selection for the newly installed operating system).

Boot menu . . .
   ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
     ↳ **Manage boot selection menu . . .**
      ↳ **Change a boot selection . . .**

Allows you to modify a boot selection.

Boot menu . . .
   ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
     ↳ **Manage boot selection menu . . .**
      ↳ **Verify boot selections**

Checks your boot selections and reports any problems found.

Boot menu . . .
   ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
     ↳ **Manage boot selection menu . . .**
      ↳ **Delete a boot selection . . .**

Allows you to delete a boot selection from a list of all boot selection names.

Boot menu . . .
   ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
     ↳ **Manage boot selection menu . . .**
      ↳ **Dump boot selections**

Displays all your boot selections.

Boot menu . . .
   ↳ **Supplementary menu . . .**
    ↳ **Setup the system . . .**
     ↳ **Manage boot selection menu . . .**
      ↳ **Rearrange boot selections . . .**

Allows you to rearrange your boot selections, changing which is the default boot selection.

Boot menu . . .
　↳ **Supplementary menu . . .**
　　↳ **Setup the system . . .**
　　　↳ **Manage boot selection menu . . .**
　　　　↳ **Setup the system . . .**

Returns you to the Setup menu.

7.4.5 Machine Specific Setup Menu

This section describes the Machine specific setup menu options.

Boot menu . . .
　↳ **Supplementary menu . . .**
　　↳ **Setup the system . . .**
　　　↳ **Machine specific setup . . .**
　　　　↳ **Switch Operating System . . .**

Switch which firmware is active on reset or power-up.

Boot menu . . .
　↳ **Supplementary menu . . .**
　　↳ **Setup the system . . .**
　　　↳ **Machine specific setup . . .**
　　　　↳ **Partition disks . . .**

Starts the disk partition utility. See Section 7.5 for detailed information on this utility.

Boot menu . . .
　↳ **Supplementary menu . . .**
　　↳ **Setup the system . . .**
　　　↳ **Machine specific setup . . .**
　　　　↳ **Setup the system . . .**

Returns you to the Setup menu.

7.5 Using the Disk Partition Utility

The disk partition utility is used to partition your hard drive and to format or quick format a partition with a FAT file system. The disk partition utility also displays information about the drive, such as the manufacturer and model ID strings and the ARC path. See Section 7.4.5 for instructions on how to start the disk partition utility.

When you start the disk partition utility, the default selection is the first partition on the first disk on your system. If no partitions exist on that disk, the default selection is the unpartitioned space on the first disk.

Special Keys

The following chart lists the disk partition utility special keys and their functions.

Key	Description
Up and down arrows	Change selections in the active cell.
Left and right arrows	Change the active cell.
Esc	Exit the disk partition utility.
Keyboard commands	Listed in the Keyboard Commands box. To perform a specific action on the current selection, type the key associated with the action.

Help

The disk partition utility provides context-sensitive on-screen help. The keyboard commands available for the current selection in the active cell are shown in the Keyboard Commands box.

Creating the System Partition

Create and format a partition. To make this partition the system partition, select it and type **S**.

Note: Although the disk partition utility displays changes immediately, partition changes are not actually committed until you either exit the utility or perform an action that requires the changes to be committed (that is, formatting). You will always be prompted for confirmation before changes are committed.

7.6 Using the Firmware Update Utility

The firmware update utility updates the flash ROM with firmware from the *Update and Windows NT 3.51 Firmware* diskette. See Section 7.4.2 for instructions on how to start the firmware update utility.

To update your firmware, follow this procedure:

1. Ensure that there is no CD-ROM in your CD-ROM drive and that your firmware diskette is in the appropriate drive.

2. From the Firmware Update menu, choose **Update Windows NT Firmware**.

3. When prompted to continue the update, choose **Yes**. If the boot selection *does not* match the firmware that you flashed, you will be prompted to update the boot selection.

4. If you are prompted to update the boot selection, choose **Yes**.

5. When the update has completed, restart your computer.

7.7 Installing the Windows NT Operating System

This section supplements the Microsoft Windows NT installation guide for installing the Windows NT operating system on an AlphaPC 164 system.

If you already have a previous version of Windows NT installed, see the Microsoft Windows NT installation guide for information about how to upgrade to a new version of the operating system.

7.7.1 Requirements

You need the following hardware and software to install the Windows NT operating system on an AlphaPC 164 system:

- A 100MB or larger hard drive

Note: For information regarding IDE/ATA hard drives, ATAPI CD-ROM drives, and support for QLogic ISP 1020 SCSI host adapters, see the README.TXT file on the *Update and Windows NT 3.51 Firmware* diskette.

- Memory:
    – 16MB of memory (DRAM; 32MB is recommended) is required for the Windows NT Workstation operating system
    – 32MB of memory (DRAM) is required for the Windows NT Server operating system
- The Microsoft Windows NT compact disc
- The *Update and Windows NT 3.51 Firmware* diskette

Note: This diskette is required for the Windows NT 3.51 operating system. Future versions of Windows NT may not require this diskette. Contact your OEM or system vendor for details.

7.7.2 Before Installing Windows NT

Before you install Windows NT, ensure that you have completed the following tasks:

- Defined the environment variables for the default system partition. For more information about describing your system configuration, see the description for **Set default environment variables . . .** in Section 7.4.

- Described your system configuration to the firmware. For more information about describing your system configuration, see the description for **Set default configuration . . .** in Section 7.4.

- Provided the required system partition on your hard disk. The following chart specifies the free space and file-system requirements for installing the Windows NT operating system:

Item	Free Space Required	File System Requirement
System partition	5MB	FAT[1]
Windows NT 3.51 operating system	94MB	FAT or NTFS

[1]System partition must be FAT.

The system partition is the disk partition that contains the hidden files `OSLOADER.EXE` and `HAL.DLL` in the subdirectory `\OS\WINNT351`. If the system partition is large enough, it can also contain the Windows NT operating system, or you may choose to use a separate partition. The system partition and the Windows NT operating system may also be on different hard disks.

7.7.3 Starting Windows NT Setup

Windows NT Setup, located on the Microsoft Windows NT compact disc, installs the Windows NT operating system. Windows NT Setup provides a brief description of the available key functions at the bottom of the screen.

During the Windows NT installation procedure, you may be prompted for the type of computer that you have. For the AlphaPC 164 system, choose Digital AlphaPC 164. If AlphaPC 164 is not one of the choices, then insert the *Update and Windows NT 3.51 Firmware* diskette. The following procedure supersedes the Starting Setup on a RISC-Based Computer section of the Microsoft Windows NT installation guide.

To start the Windows NT Setup program, follow this procedure:

1. Insert the Windows NT compact disc in the CD-ROM drive.

2. Restart your computer.

3. From the Boot menu, choose **Supplementary menu . . .** .

4. From the Supplementary menu, choose **Install Windows NT from CD-ROM**.

5. Follow the instructions on the screen.

Note: If you have an Alpha Windows NT driver diskette for your video card, you can use the driver to install the Windows NT operating system. Follow this procedure:

   1. Choose Custom Setup.

   2. Choose display type Other, and insert the graphics disk driver when asked for the manufacturer-supplied hardware support disk.

8 Troubleshooting

This section provides solutions to some of the common problems that you may encounter while using the Windows NT firmware and installing the Windows NT operating system. This section also provides a description of post and beep codes, and instructions on how to use the fail-safe booter.

Problem

When you turn on your computer, nothing displays.

Solutions

Check the following:

- Ensure that the video card is correctly connected to the monitor.

- Ensure that the flash ROM update procedure was performed correctly. If you have a terminal attached to COM1, check the output for error messages after verifying that the flash ROM update procedure was performed correctly.

Problem

While booting the Windows NT operating system, you receive one of the following error messages:

- `The required system file DISPLAY_DRIVER.DLL is bad or missing.`
- `The required system file DISPLAY_DRIVER.SYS is bad or missing.`

Solutions

These error messages indicate video driver problems. Use the following chart to solve common video driver problems:

If the...	Then...
Driver becomes disabled	Boot the Windows NT operating system with the last known good configuration.
Incorrect video driver is chosen while installing the Windows NT operating system	Reinstall the Windows NT operating system with the correct driver.
New video card was installed before the driver was installed	Reinstall the old video card, boot the Windows NT operating system, and install the driver for the new video card. Then install the new video card and reboot the Windows NT operating system.

8.1 Beep Codes

The beep codes provide error information about the AlphaPC 164 system. Table 26 lists and describes the beep codes.

Table 26 Beep Codes

Beep Code	Description
1–2–3	This sequence represents the fail-safe booter startup
4	No valid header found in ROM; loading entire ROM
5,6,7	Same meaning as Post code 3F fatal error subcodes

8.2 Post Codes

The post codes indicate the progress of the SROM and Windows NT firmware. Table 27 lists and describes the post codes.

Table 27 Post Codes

Post Code (hex)	Description
00	Firmware initialization is complete
01	CPU speed detected
02	CPU speed converted
03	Configuration jumpers read
04	Bcache configuration value computed
05	Bcache control value computed
06	Bcache turned off
07	Memory timing registers written
08	Memory control register written
09	Memory bank 0 register written
0B	DRAMs awakened
0C	Memory sized and memory bank 0 written
0F	Bcache turned on
13	All of memory rewritten (good data parity written)
14	Memory errors cleared; start reading system ROM
15	Loading ROM without SROM decompression
16	Loading ROM using SROM decompression
17	System ROM loaded to memory

Table 27   (Continued) Post Codes

Post Code (hex)	Description
18	Icache flush code written to memory
19	CPU errors cleared; jump to system code
20	ISA bus reset
3A	Jumping to SROM Mini-Debugger
3F	Fatal error. Second code identifies source of error: 05 = No memory found 06 = Checksum error detected when image was read back from memory 07 = Could not determine the SIMM type
41	Firmware environment has been loaded
42	Firmware services have been initialized
50	A fatal error has occurred (FATAL)
51	The Boot menu illegally returned (FATAL)
75	System initialization is complete—start firmware setup
76	Checking system information for sanity
77	About to initialize the video subsystem
78	PCI configuration is complete; about to initialize the keyboard
79	About to configure PCI devices
80	About to initialize the PCI bus (hard restart)
81	About to initialize the PCI bus (soft restart)
85	About to validate the SCB
86	Early initialization of firmware API
87	About to initialize the system chipset
88	Initialize vendor API
89	The firmware kernel debugger module is starting
95	Video subsystem and keyboard are okay; using graphic console
96	Video or keyboard is missing or broken; using COM1 as console
97	Trying to initialize video subsystem and keyboard as graphic console
98	Serial ports have been initialized; firmware initialization is starting
99	The firmware is about to initialize the serial ports
BF	Fail-safe booter startup

8.3 Fail-Safe Booter

The fail-safe booter provides an emergency recovery mechanism when the primary firmware image contained in flash memory has been corrupted. When flash memory has been corrupted, such that no image is safely loaded from the flash, the fail-safe booter can be run to facilitate booting another image from a diskette that is capable of reprogramming the flash.

Starting the Fail-Safe Booter

The fail-safe booter can be started in one of two ways:

- If the primary firmware image is unavailable when the system is powered on or reset, the fail-safe booter automatically runs. When the fail-safe booter runs, the system emits a series of beeps through the speaker as beep code 1-2-3, that is, one beep and a pause followed by two beeps and a pause followed by three beeps. Then the diskette activity light flashes. To start the firmware update utility, the user must insert the *Update and Windows NT 3.51 Firmware* diskette containing the file FWUPDATE.EXE.

- The fail-safe booter can also be started manually as follows:

  1. Add jumper CF7 as described in Section 3.6.

  2. Insert the *Update and Windows NT 3.51 Firmware* diskette into the diskette drive.

  3. Proceed to Section 7.6 and follow the procedures.

9 Battery Recycle/Disposal Information

NOTICE:

Recycle or dispose of batteries promptly in accordance with your organization's environmental policies. If this is a LITHIUM battery, the following additional precautions may apply:

- Replace batteries correctly to prevent possible explosion.

- Replace batteries with the same or equivalent type.

- Prior to disposal or recycling, protect all batteries against accidental short circuiting by affixing nonconductive tape across battery terminals or conductive surfaces.

- Keep small batteries away from children.

10 Ordering Associated Documentation

The following table lists some of the available third-party documentation that supports the AlphaPC 164 motherboard. You can order literature directly from the vendor.

Title	Vendor
Alpha AXP Architecture Reference Manual (PN EY–T132E–DP)	Call 1–800–344–4825 from the U.S. or Canada, or call Butterworth-Heinemann (Digital Press) at 1–800–366–2665.
Alpha Architecture Handbook (PN EC–QD2KB–TE)	Digital Equipment Corporation Digital Semiconductor 75 Reed Road Hudson, MA 01749 USA

Call the Digital Semiconductor Information Line:

United States and Canada 1–800–332–2717

Outside North America +1–510–490–4753

Visit the Digital Semiconductor World Wide Web Internet site: http://www.digital.com/semiconductor |
Digital Semiconductor 21164 Alpha Microprocessor Data Sheet (PN EC–QP98B–TE)	Digital Equipment Corporation (See previous entry.)
Digital Semiconductor 21164 Alpha Microprocessor Hardware Reference Manual (PN EC–QP99B–TE)	Digital Equipment Corporation (See previous entry.)
Digital Semiconductor 21172 Core Logic Chipset Technical Reference Manual (PN EC–QUQJA–TE)	Digital Equipment Corporation (See previous entry.)
Alpha Microprocessors SROM Mini-Debugger User's Guide (PN EC–QHUXB–TE)	Digital Equipment Corporation (See previous entry.)

Title	Vendor
PCI System Design Guide	PCI Special Interest Group 1–800–433–5177 (U.S.) 1–503–797–4207 (International) 1–503–234–6762 (FAX)
PCI Local Bus Specification, Rev 2.1	PCI Special Interest Group (See previous entry.)
82420/82430 PCIset ISA and EISA Bridges (includes 82378IB/ZB SIO) (PN 290483)	Intel Corporation Literature Sales P.O. Box 7641 Mt. Prospect, IL 60056 USA 1–800–628–8686 FaxBACK® Service 1–800–628–2283 BBS 1–916–356–3600
Super I/O Combination Controller (FDC37C935) Data Sheet	Standard Microsystems Corporation 80 Arkay Drive Hauppauge, NY 11788 USA Phone: 1–516–435–6000 FAX: 1–516–231–6004
Hardware Compatibility List	Contact Microsoft's Customer Service representatives at 1–800–426–9400, or access CompuServe Information Systems in Library 1 of the WINNT forum (GO WINNT) or Library 17 of the MSWIN32 forum (GO MSWIN32).