MITSUBISHI

Lightning Motherboard

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Front View

Mini-tower
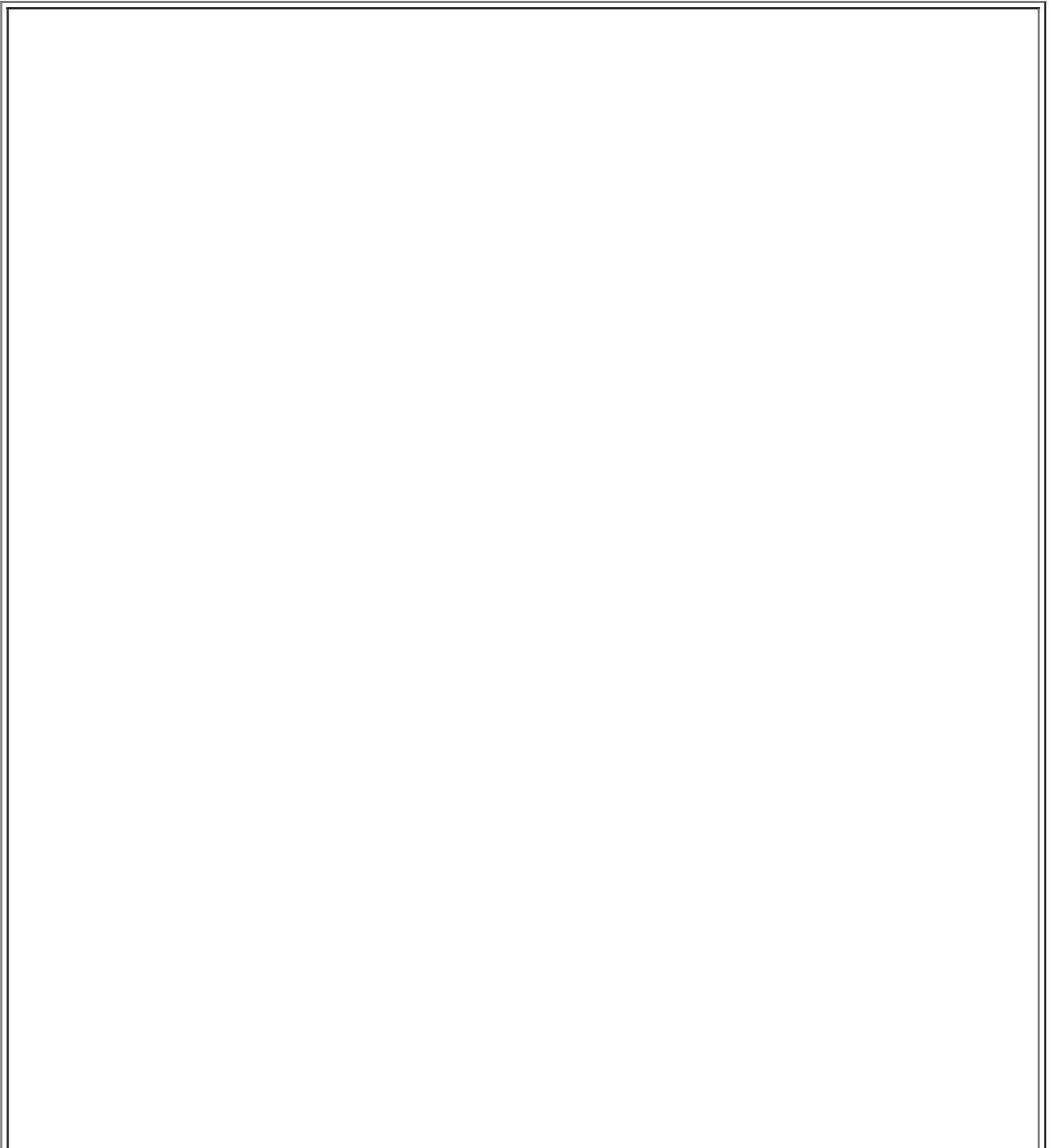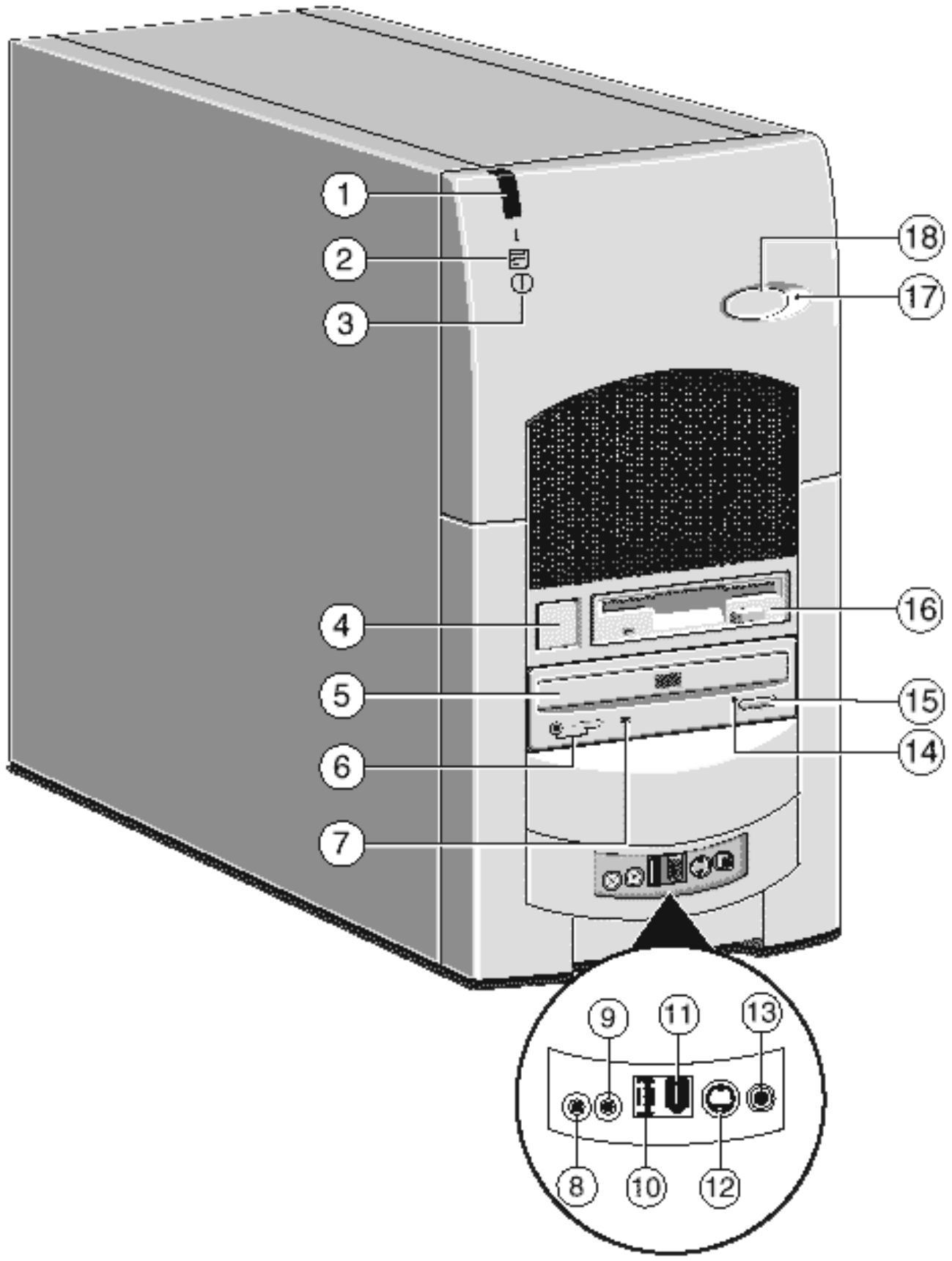
| 1	Infra-red sensor	10	Universal Serial Bus (USB) port
2	Hard disk activity indicator	11	FireWire port (factory option)
3	Power Mode light	12	S-Video In port (factory option)
4	Power button	13	Composite Video In port (factory option)
5	CD-ROM disc drawer (platter)	14	CD emergency eject hole

6	CD headphone jack & volume control	15	CD Eject button
7	CD activity indicator	16	Diskette drive
8	Line In socket for audio input	17	Message LED alerts you that you have an unread message
9	Headphones socket	18	Message Cancel button clears the Message LED alert

Desktop
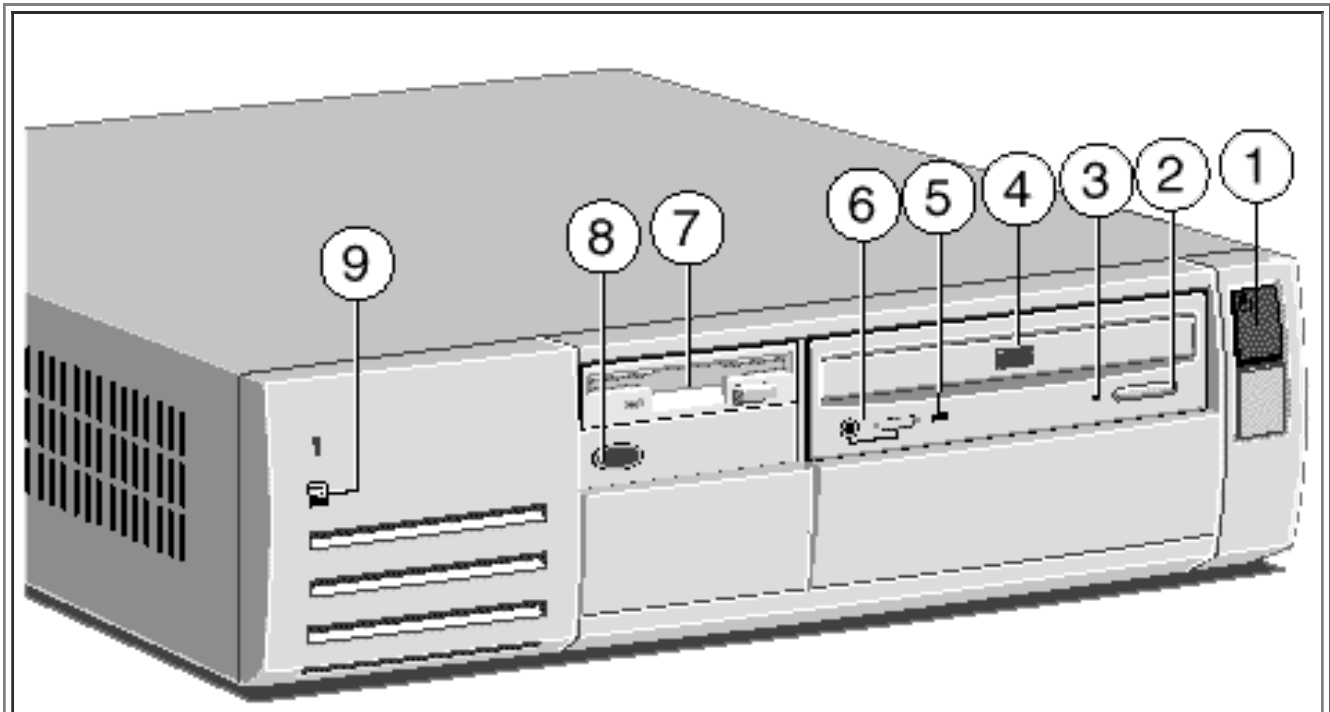
1	Power button	6	CD phono jack & volume control
2	CD Eject button	7	Diskette drive
3	CD emergency eject hole	8	Infra-red sensor (optional)
4	CD-ROM disc drawer (platter)	9	Hard disk activity indicator
5	CD activity indicator		

Rear View

Mini-tower
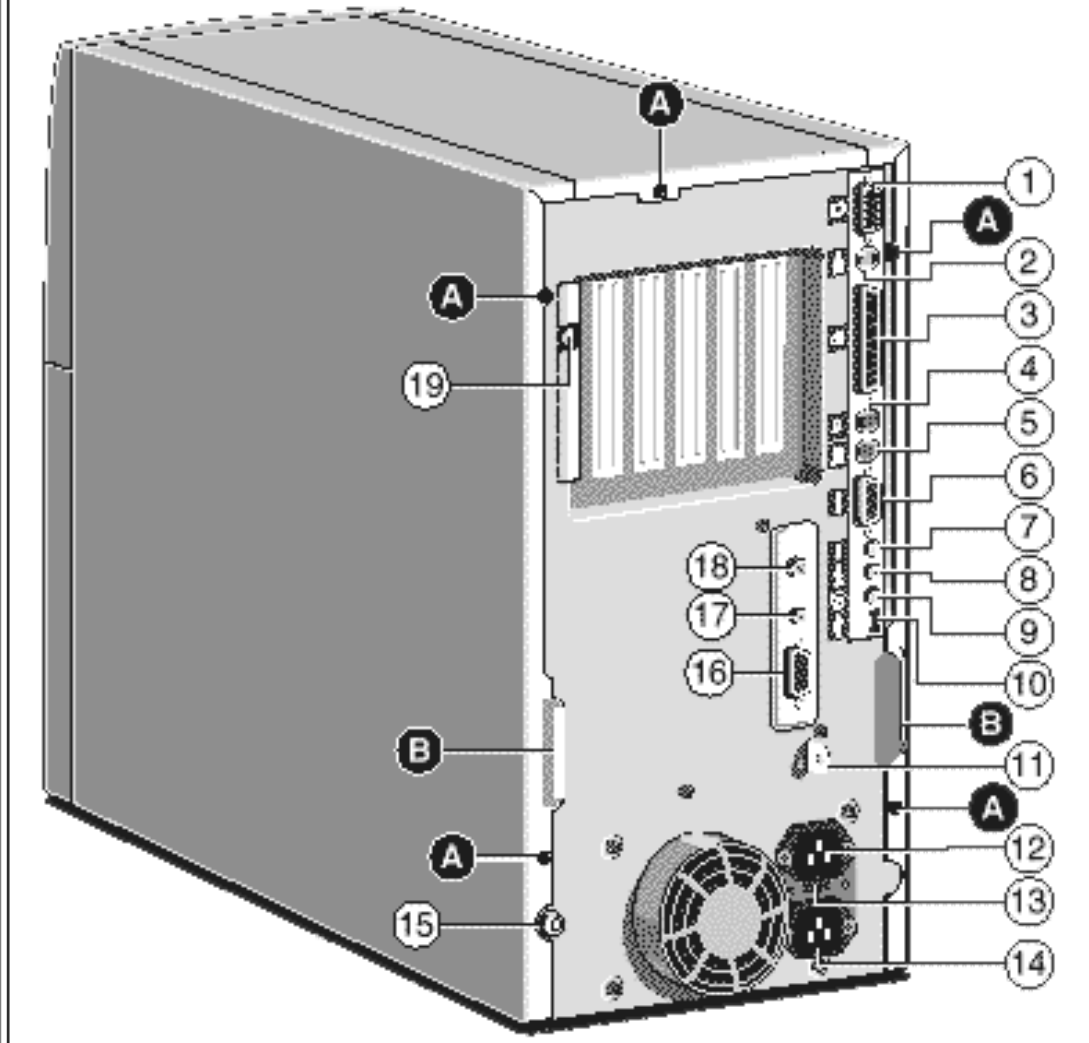
1	Monitor port	12	AC power outlet for monitor
2	S-Video Out port for displaying the monitor image on a television (factory option)	13	Voltage selection switch
3	Parallel (printer) port	14	AC power inlet from AC supply
4	Mouse port	15	Caselock
5	Keyboard port	16	MIDI/Joystick port
6	Serial port	17	Auxiliary Line In socket (factory option)
7	Microphone socket	18	SPDIF digital audio output for sending digital audio to an external audio amplifier (factory option)
8	Line Out socket for audio output	19	Modem port
9	Speaker socket		
10	Universal Serial Bus (USB) port	A	Side panel fixing screws

| 11 | Security loop for cable or padlock | B | Handles to assist side panel removal |

Desktop
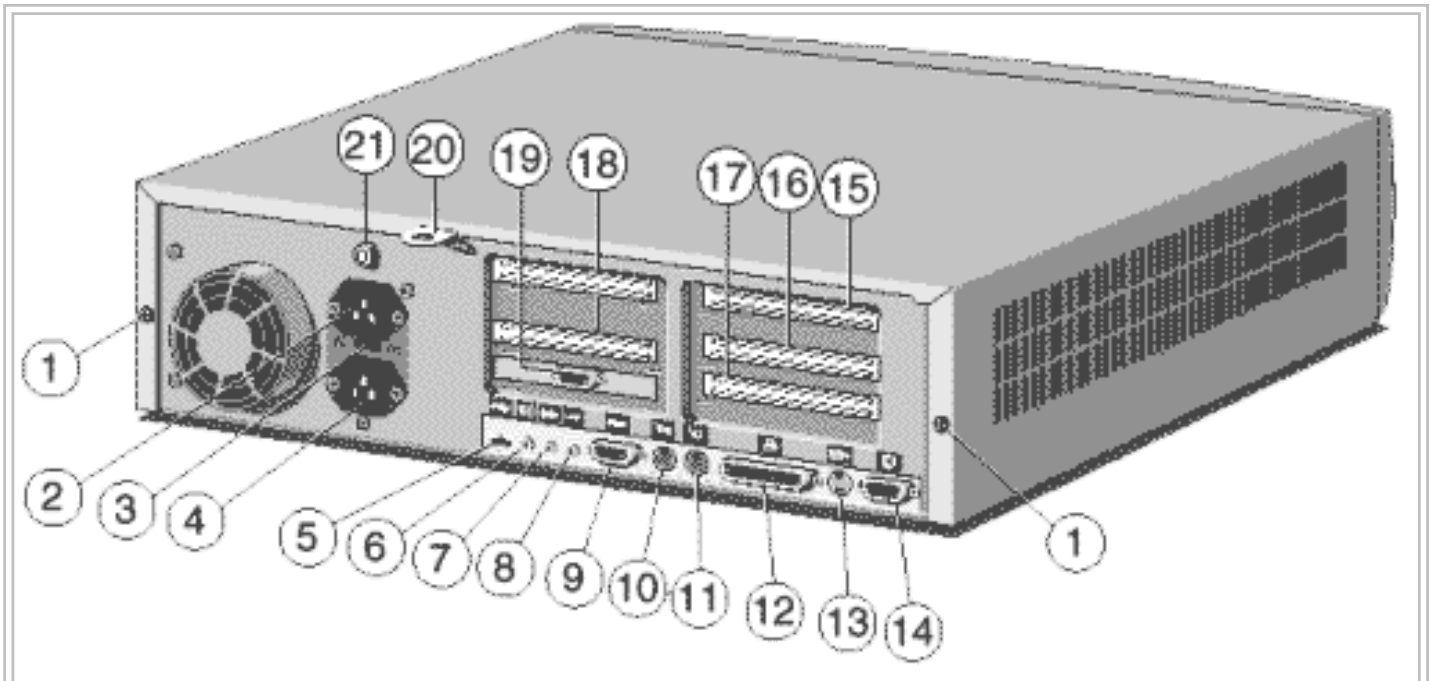
1	Casing screws for the top cover	12	Parallel (printer) port
2	AC power outlet for monitor	13	Video out port (option)
3	Voltage selection switch	14	Monoitor port
4	AC power inlet from AC supply	15	PCI slot (full-length)
5	Double USB port	16	ISA slot (full-length)
6	Audio output (speaker) jack	17	ISA slot (half-length)
7	Audio line-out jack	18	PCI slots (two half-length)
8	Microphone input jack	19	Serial port 2 (optional)
9	Serial (modem) port 1	20	Security loop for cable or padlock
10	PS/2 Keyboard port	21	Caselock (key supplied)
11	PS/2 Mouse port		

Motherboard
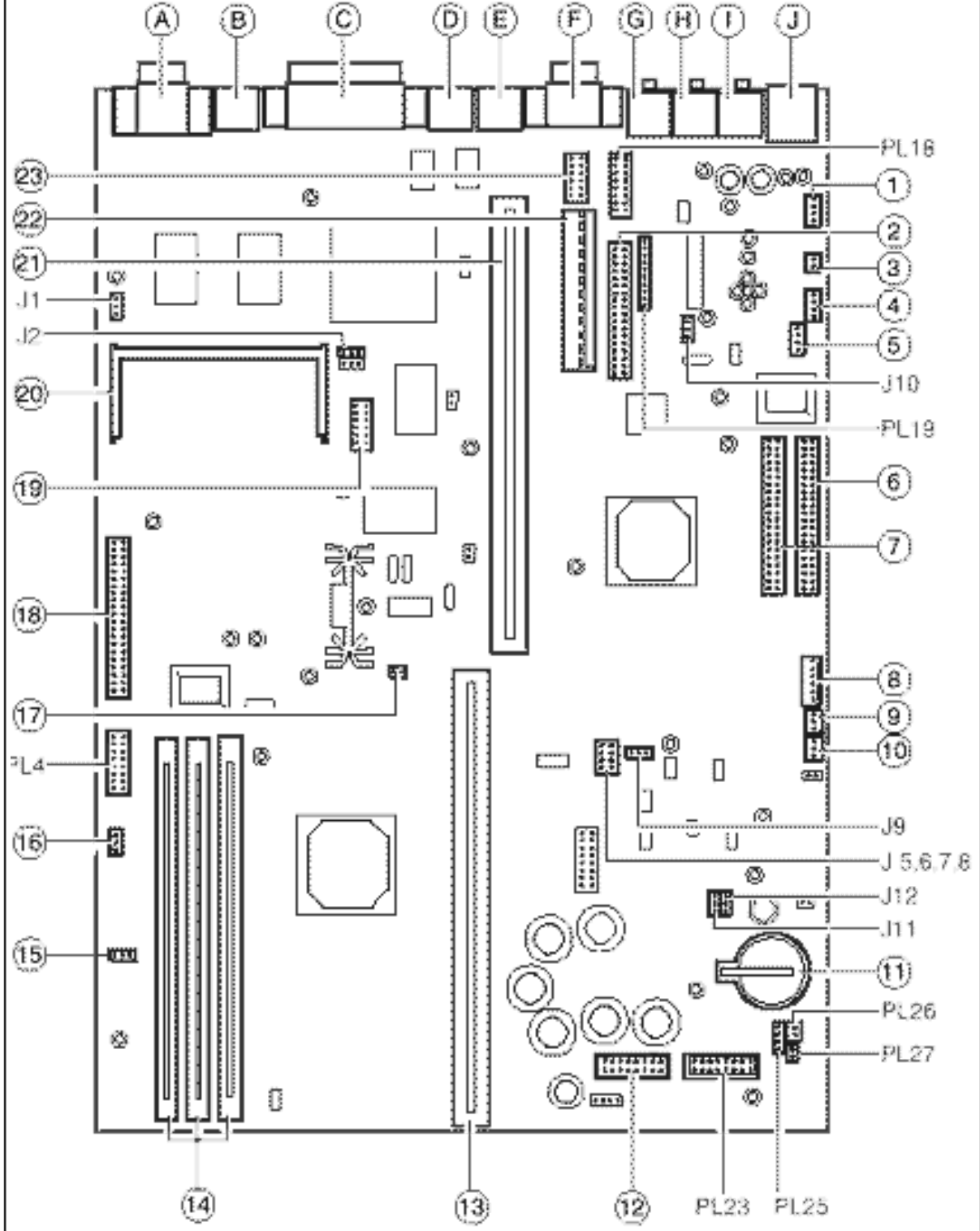
1	Auxiliary Line In internal connector (option)	12	Front panel conn. option
2	1.44MB diskette drive connector	13	Processor slot
3	S/P Dif. (option) dig. audio	14	DIMM sockets
4	CD audio connector	15	Case fan connector
5	Front panel USB internal connector (option)	16	CPU fan connector
6	Primary E-IDE connector	17	Processor heat sense input
7	Secondary E-IDE connector	18	VEC/AMC feature connector

8	PSU logic connector	19	TV tuner connector (option)
9	'Wake on LAN' connector	20	Video memory upgrade socket
10	"Wake on Call" Modem connector	21	Riser board connect
11	CMOS battery	22	Motherboard power connector
		23	COM2 interface (option)
J1	On-board video enable/disable	A	Monitor port
J2	BIOS program enable/disable	B	TV Out (S-Video) port (factory option)
J5-8	Processor clock multipliers	C	Parallel (printer) port
J9	DSP enable/disable (option)	D	PS/2 Mouse port
J10	Audio subsystem enable/disable	E	PS/2 Keyboard port
J11	Red power LED enable/disable	F	Serial port COM1
J12	Clear CMOS	G	Microphone socket
PL4	Server management (option)	H	Line Out socket
PL18	Joystick/MIDI internal connector	I	Speaker socket
PL19	Voice modem audio connector	J	Dual USB port
PL23	Front panel controls/options		
PL25	Internal case speaker (if fitted)		
PL26	Message light (option)		
PL27	Message switch (option)		

Note : Lightning incorporates Intel 440LX chipset (66MHz system bus)
Lightning BX incorporates Intel 440BX chipset (66 or 100MHz system bus)

Memory

The motherboard's three DIMM sockets accept DIMMs of up to 128 Mbytes in any combination (giving a maximum memory capacity of 384 Mbytes). The slot 'MM1'nearest to the processor is recommended to be used first.

Note that the Lightning and Lightning BX motherboards use DIMMs of different specifications. See below for details and ensure that you fit the correct type.

Lightning
The DIMMs you use must have the following specification: gold contacts, 3.3V, 64 or 72-bit,

unbuffered, SDRAM-type with Serial Presence Detect (SPD) and a CAS latency of 2 at 66 MHz. If you use any other type of DIMM you risk damaging the motherboard.

Lightning BX
The DIMMs you use must meet the following specification:
Serial Presence Detect (SPD), gold contact, 64-bit, (or 72-bit ECC), unbuffered, 3.3V, SDRAM type, Intel PC100 spec compliant.

The ECC capabilities of 72-bit DIMMs will only operate if all the DIMMs in the system are 72-bit.

Using DIMMs of a different type could affect system performance with a risk of damaging the motherboard.

MS600 (MV) Processor Upgrades Page

This is the processor upgrade page for MS600 with the model number prefix MV.

To use the tables below, select the processor you wish to upgrade to and confirm that the upgrade is possible. Then check additional requirements such as BIOS upgrades & processor speed jumper settings.

MS600 (MV) Processor upgrades	
Processor type and speed	**Is it supported?**
Pentium II 233Mhz	YES
Pentium II 266Mhz	YES
Pentium II 300Mhz	YES

Processor Speed Jumper Table

Listed below are the Processor Speed Jumpers for an MS Series computer with a model number prefix of MV.

MS600 Processor Speed Jumper Settings (I=jumper fitted, O=No jumper)				
J5	**J6**	**J7**	**J8**	**CPU Speed**
I	I	I	O	200
O	I	I	O	233
I	I	O	I	266
O	I	O	I	300

BIOS Upgrade

For MV (MS600) model machines, there is no updated BIOS currently available.

Cache

Cannot be Upgraded

Video RAM

Cannot be Upgraded

Jumper Settings

There are only a few jumpers on the motherboard that you may need to alter. All others are set at the factory and should not be changed.

On the motherboard, pin 1 of each jumper block is indicated by a small triangular marking.

Warning - Do not change jumper settings unnecessarily as you may damage the system processor, the motherboard, or both.

On-board video disabling (J1)
If you install a video adapter expansion card, the computer should automatically detect this and disable the on-board video adapter. If for some reason this does not happen, and you experience problems with a newly-fitted card, you can manually disable the on-board video adapter by moving jumper J1 from position 2-3 (EN) to position 1-2 (DIS).

Processor multiplier (J5 to J8)
The details below are given for the clock speeds of processors known at the time of writing. Higher speed and overdrive processors may become available, in which case consult your supplier for further information.

In the case of the Lightning BX, the processor will send information to the BIOS and the BX chipset, ensuring that the required bus frequency is set automatically.

You then have to set the links as below.

					CPU bus speed	
J5	J6	J7	J8	Ratio	66MHz bus	100MHz bus *
I	I	I	O	3	200	-

O	I	I	O	3.5	233	350
I	I	O	I	4	266	400
O	I	O	I	4.5	300	450
I	I	O	O	5.0	333	-

I = jumper fitted, O = No jumper

*** Lightning BX only***

Audio DSP (J9)

If you need to disable the PCI audio accelerator (DSP) move jumper J9 from pins 1-2 (EN) to pins 2-3 (DIS).

Audio disabling (J10)

The on-board audio system can be disabled by removing jumper J10 from pins 1-2 (EN) to pins 2-3 (DIS). Disabling the audio system frees the interrupt and DMA channel used by that system (normally IRQ5 and DMA1).

BIOS upgrade and reprogram (J12, J2)

These jumpers should not normally be changed except by a service engineer or at the direction of a service engineer.

CMOS is cleared by moving the jumper J12 to the 2-3 (CLR) position for a few moments while the system is turned off and the power cord removed, then returning it to the 1-2 (NOR) position. It must be returned to normal before the power is reconnected.

BIOS reprogramming (J2) requires special software.

Clearing CMOS	J12
CMOS battery connected (default)	1-2*
CMOS battery disconnected	2-3
BIOS reprogramming	J2
Enabled	1-2
Disabled	2-3

* This jumper **must** be returned to the normal position before reconnecting the power cord.

Fan Connectors, PL3 & PL2

Pins	CPU Fansink PL3	Pins	Main fan PL2
1	Ground	1	Ground

2	+ 12v	2	+ 12v (controlled)*
3	Fan Fail	3	Fan Fail

* This voltage varies to control the fan speed. This is determined from the processor's heatsink temperature sensor.

CMOS

Replacing the configuration battery

The computer keeps a record of its current hardware configuration in a CMOS memory chip which is sustained by a small battery. This battery has a life of up to 5 years. If you find that you have to reconfigure the computer every time you turn it on, the battery is probably failing and needs to be replaced.

The battery is a 3 volt lithium type (CR2032 or equivalent) typically used in calculators and other small, battery-powered electronic items.

To replace the battery

Turn off the computer and unplug all power cords.
Take suitable anti-static precautions and remove the right side panel.
Using a non-conductive implement, release the latch that holds the battery in place. The battery will pop up allowing you to lift it out of the holder.

Danger! You must not use a metal or other conductive implement to remove the battery. If a short-circuit is accidentally made between the battery's positive and negative terminals, the battery may explode.

Check that the replacement battery looks the same as the battery you have removed.
Taking care not to touch the top or bottom surface of the battery, pick up the replacement with the positive (+) terminal upwards. Press the battery into the holder using a non-conductive implement.
Refit the right side panel.
Dispose of the discharged battery in accordance with the battery manufacturer's instructions.
The next time you turn on the computer you will have to run the BIOS Setup utility to reset the hardware configuration.

System Resources

Components	Interrupts (IRQs)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Components																
System timer																
Keyboard controller																
PIC daisy chain																
Infra-red remote control BS																
Serial port 1 BS																
Audio JS																
Diskette controller BS																
Parallel port (usually sharable)																
Real time clock																
On-board video (sharable) JS																
USB (sharable) BS																
Mouse BS																
Co-processor																
Primary E-IDE BS																
Secondary E-IDE BS																

Components	DMA channels							
	0	1	2	3	4	5	6	7
Audio JS								
Diskette controller BS								
Parallel port (in ECP mode) BS								
DMAC daisy chain								

Key

Fixed assignment   BS = Can be disabled by BIOS Setup

Usual assignment   JS = Can be disabled by changing a motherboard jumper setting

Alternative assignment by BIOS Setup

Alternative assignment by Plug-and-Play

POST Beep Codes

Code	Beeps	Test which failed
16	1-2-2-3	BIOS ROM checksum
20	1-3-1-1	DRAM refresh.
22	1-3-1-3	8742 keyboard controller
2C xxxx	1-3-4-1	RAM failure on address line xxxx.
2E xxxx	1-3-4-3	RAM failure on data bits xxxx of low byte of memory bus.
30 xxxx	1-4-1-1	RAM failure on data bits xxxx of high byte of memory bus.
46	2-1-2-3	Check ROM copyright notice
58	2-2-3-1	Test for unexpected interrupts
98	1-2	Video configuration failure, or option ROM checksum failure. (One long, two short beeps.)