Software Publishers Association

Multimedia Personal Computer

MPC Working Group

Minimum Multimedia PC Level 1 System Requirements

Hardware

- **386SX or higher processor**
- **2 MB RAM**
- **30 MB hard disk**
- **VGA or VGA+ display**
- **Two button mouse**
- **101 key keyboard**
- **CD-ROM drive:**
  - CD-DA outputs, sustained 150 kB/sec transfer rate without consuming more than 40 percent of CPU bandwidth in the process
  - Average seek time of 1 second or less
  - MSCDEX 2.2 driver or equivalent that implements the extended audio APIs
  - Subchannel Q support (P, R-W optional)
- **Audio board:**
  - 8-bit DAC, Linear PCM sampling, 22.05 and 11.025 kHz rate, DMA/FIFO with interrupt
  - 8-bit ADC, Linear PCM sampling, 11.025 kHz rate, microphone level input
  - Music synthesizer
  - On-board analog audio mixing capabilities
- **Serial port, parallel port**
- **MIDI I/O port**
- **Joystick port**
- **Headphones or speakers connected to your computer system**

System Software

Binary compatibility with Windows 3.0 plus Multimedia Extensions or Windows 3.1

CD-ROM/ Sound Card Audio Cable Standard for MPC Components:
The following cable standards apply only to MPC components (CD-ROM drives or sound cards sold separately). Full systems and upgrade kits are not required to observe the following specification:

A Multimedia PC CD-ROM drive component must include a minimun2 4 inch cable to connect the drive's analog audio output connector to an MPC sound card's analog audio input connector. The cable's open sound card connector must be a female 4 pin Molex 70066-G, 70400-G, or 70430-G connector with 2.54 mm pitch, or the equivalent, with the following pin assignments: pin 1- left signal, pin 2-ground, pin 3- ground, pin 4- right signal.

A Multimedia PC sound card component must be capable of mating with the CD-ROM audio cable by having a 2.54 mm pitch Molex 70553male connector on the card (or the equivalent), or by including a short patch cable. The patch cable must plug into the non-standard sound card connector and have an open male connector (Molex 70107-A, or the equivalent) for attaching to the CD-ROM cable female connector. The pin assignments on the sound card connectors must be complementary to the CD-ROM audio cable connectors.

Please note that the above requirements are *minimum* system requirements and not a recommendation by the Multimedia PC Marketing Council for a particular system configuration.

Minimum Multimedia PC Level 2 System Requirements

Hardware

- **25 MH 486SX or compatible microprocessor**
- **4 megabytes of RAM (8 megabytes recommended)**
- **3.5" Floppy drive**
- **Hard drive (160 MB minimum)**
- **Video display resolution of at least 640x480 with 65,536 (64K)colors**
- **Two button mouse**
- **101 key Keyboard (or functional equivalent)**
- **CD-ROM Drive:**
  - Doublespeed with CD-DA outputs (Capable of sustained 300 KB/sectransfer rate)
  - No more than 40% of the CPU bandwidth may be consumed when maintaining a sustained transfer rate of 150 KB/sec
  - Average seek time of 400 milliseconds or less
  - 10,000 hours MTBF
  - CD-ROM XA ready (mode 1 capable, mode 2 form 1 capable, mode2 form 2 capable)
  - Multisession capable
  - MSCDEX 2.2 driver or equivalent that implements the extended audio APIs
  - Subchannel Q support (P, R-W optional)
- **Audio board:**
  - 16-bit DAC, Linear PCM sampling; 44.1, 22.05, and 11.025 kHzrate, DMA/FIFO buffered transfer capability
  - 16 bit ADC, Linear PCM sampling; 44.1, 22.05, and 11.025 kHzrate, DMA/FIFO buffered transfer capability; microphone input
  - Music synthesizer
  - On-board analog audio mixing capabilities
  - CD-ROM XA audio capability is recommended.
  - Support for the IMA adopted ADPCM software algorithm is recommended.
- **Serial port**
- **Parallel port**
- **MIDI I/O port**
- **Joystick port**
- **Headphones or speakers connected to your computer system**

System Software

Binary compatibility with Windows 3.0 plus Multimedia Extensions or Windows 3.1

CD-ROM/ Sound Card Audio Cable Standard for MPC Components:
The following cable standards apply only to MPC components (CD-ROM drives or sound cards sold separately). Full systems and upgrade kits are not required to observe the following specification:

A Multimedia PC CD-ROM drive component must include a minimun2 4 inch cable to connect the drive's analog audio output connector to an MPC sound card's analog audio input connector. The cable's open sound card connector must be a female 4 pin Molex 70066-G,70400-G, or 70430-G connector with 2.54 mm pitch, or the equivalent, with the following pin assignments: pin 1- left signal, pin 2-ground, pin 3- ground, pin 4- right signal.

A Multimedia PC sound card component must be capable of mating with the CD-ROM audio cable by having a 2.54 mm pitch Molex 70553male connector on the card (or the equivalent), or by including a short patch cable. The patch cable must plug into the non-standard sound card connector and have an open male connector (Molex 70107-A, or the equivalent) for attaching to the CD-ROM cable female connector. The pin assignments on the sound card connectors must be complementary to the CD-ROM audio cable connectors.

Please note that the above requirements are *minimum* system requirements and not a recommendation by the Multimedia PC Marketing Council for a particular system configuration.

Minimum Multimedia PC Level 3 System Requirements

The **MPC3** Specification defines the minimum system functionality for Level 3 compliance, but is not a recommendation for any particular system configuration.

The MPC specifications are the result of industry-wide discussion and debate. This consensus makes the MPC specification valuable in helping create a growing installed base of standardized multimedia computers, and in turn, creates a strong incentive for Multimedia PC software investment and development. The MPC specifications also serve as a guide to consumers purchasing Multimedia PCs, upgrade kits and components.

MPC3 does not replace the **MPC1** and **MPC2** specification; rather, it defines an updated platform suitable for delivering enhanced multimedia functionality.

CD-Rom Drive	Processor	I/O	System Software
Floppy Drive	User Input	Video	System Config
Hard Drive	Definitions	Audio	Upgrade Config
Audio Cable	Graphics	RAM	Communications

Processor

The CPU must pass the MPC Test Suite. The MPC Test Suite is benchmarked on a 75 MHz Pentium(R) processor system with hardware assisted MPEG1 capability and only level one cache, as well as on a 100 MHz Pentium[R] processor system with 256KB second level cache and software MPEG. This specification is not intended to exclude other microprocessor brands or architectures from compliance as long as they pass the MPC Test Suite.

RAM

8 MB required

Floppy Drive

3 1/2 inch; 1.44 MB floppy drive
Inclusion of floppy disks in laptops is optional

Hard Drive

540 MB minimum unformatted capacity.
At least 500 MB usable capacity, excluding sections reserved for diagnostics and other overhead.

Hard Drive Performance Test Criteria

- No more than 40% CPU utilization for a 1.5 MB/second sustained transfer rate under Windows 3.11 or DOS and no more than 7% CPU utilization for a 1.5 MB/second sustained transfer rate under Windows 95, OS/2, and Windows NT.
- Interface transfer rate greater than or equal to 9 MB/sec.
- Media data rate greater than or equal to 3 MB/sec.
- Mean service time of less than 5 ms for random writes with interarrival delay of 20 ms.
- Average access time must be less than or equal to 20.2 ms.
- Interface overhead less than or equal to 700(sec.
- Average total latency (rotation + servo + retry) (7.5 ms which implies > 4000 RPM.
- Average seek less than or equal to 12 ms computed from random I/Os exercising the entire disk.
- Less than or equal to 10% of random I/Os will have a service time greater than 25 ms and less than or equal to 1.0% greater than 30 ms.

CD-ROM Drive

Data must be transferred to the host system in block sizes of 2048, 2336 and/or 2352 bytes, as appropriate for each CD format. The data need not include the compact Disc Audio (Red Book) data.

Background CPU utilization: The driver must not use CPU cycles except in response to a host system request. This does not apply to autoplay in Windows 95.

CD Formats

- Must be capable of reading Compact Disc Audio (Red Book) discs, as well as Compact Disc Mode 1 and Mode 2 (form 1 and form 2) formatted discs, including mixed mode and multisession media as well as CD-ROM, CD-ROM XA, Photo CD, CD Recordable (part II), Video CD, Enhanced Music CD (CD Extra) and CD-i discs. In addition, the drive and included driver software must be compatible with Microsoft's MSCDEX version 2.2 or later (or equivalent), implement the extended audio APIs and be capable of reading Q channel information.
- CD-ROM drive with CD-DA (Red Book) outputs and volume control.
- CD-ROM drive must have on-board buffers and implement read-ahead buffering.

CD Performance Test Criteria

- Cache service greater than or equal to 1.5 MB per sec.
- Less than or equal to 10% of random I/Os have a service time greater than 500 ms and less than or equal to 1.0% greater than 1000 ms.
- No more than 40% CPU utilization for a sustained 550 KB/sec transfer rate under Windows 3.11 or DOS and no more than 7% CPU utilization for a sustained 550 KB/sec transfer rate under Windows 95, OS/2, and Windows NT.
- The CPU usage requirement should be achieved for read block sizes no less than 16 KB and a lead time of no more than is required to load the CD-ROM buffer with 1 read block of data.
- Sequential access time: An application via the standard operating system access methods must have the ability to read sequential, error free, 16K blocks every 33.3 ms with 99.5% of the reads taking no more than 13.3 ms.

  #### Desktop

  - Sustained sequential transfer rate of 550 KB/sec.
  - Average service access time of less than or equal to 250 ms (in 4x mode) computed

- Sustained sequential transfer rate of 550 KB/sec.
- Average service access time of less than or equal to 250 ms (in 4x mode) computed from single sector random reads I/Os exercising the entire 60 minute disc.

Laptop

- Sustained sequential transfer rate of 550 KB/sec.
- Average service access time of less than or equal to 400 ms (in 4x mode) computed from single sector random reads I/Os exercising the entire 60 minute disc.

Audio System Test Criteria

- 8/16-bit samples, with: linear PCM encoding CODEC with 8.0, 11.025, 16.0, 22.05, and 44.1sample rates; stereo channels. Full duplex support is recommended.
- (13% for 44.1 kHz (and 7% for 22.05 kHz) CPU utilization 16-bit stereo sound for playback or record (assumes buffered ISA to PCI DMA transfers).
- 0.1 Vrms high impedance dynamic mono-microphone input support with input gain control.
- Internal wave table synthesizer capabilities with multi-voice, multi-timbral capacity, 16 simultaneous melody voices plus 6 simultaneous percussive voices.
- OPL3 FM synthesis support. This specification is not intended to exclude other FM synthesizers as long as they pass the MPC Test Suite.
- CD-ROM drive with CD-DA (Red Book) outputs and volume control.
- Internal mixing capabilities to combine input from three (recommended four) sources and present the output as a stereo, line-level audio signal at the back panel. The four sources are: CD Red Book, synthesizer, DAC (waveform), and (recommended but not required) an auxiliary input source. Each input must have at least a 3-bit volume control (8 steps) with a logarithmic taper. (4-bit or greater volume control is strongly recommended). If all sources are sourced with -10dB (consumer line level: 1 milliwatt into 600 ohms=0dB) without attenuation, the mixer will not clip and will output between 0 dB and +3 dB. Individual audio source and master digital volume control registers and extra line-level audio sources are highly recommended.

Speakers:

If external speakers are included in the system, the following are required:

- Must be at least a two-piece system.
- Frequency Response from 120 Hz to 17.5 kHz.
- Power rating must be measured and tested at a minimum of 3 watts/channel at 100Hz, 1kHz and 10kHz at 1% THD; 6 watts RMS (3W+3W) into 4 ohms, at 1% THD, at 1kHz, with both channels driven.
- Sound pressure level must be measured at 1/2 -meter on axis from speaker and should be capable of an SPL of 92 dB from 250 HZ to 7.5 kHz.
- Input connectors are as follows: 3.5 mm stereo jack where tip is left channel, sleeve is right channel and body is ground or audio input using 3.5 mm stereo jack with industry standard channel orientation, supplied with at least a six foot cable to attach to computer sound source.
- Speaker connector must be mono type where tip is positive and body is ground or left speaker output 3.5 mm mono jack where tip is positive and case is negative. If stereo headphone output jack is included, it must mute the speaker when headphone is used.
- Noise ratio must be at least 65 dB.
- Input sensitivity requires no more than 300 millivolts for rated power output.
- Volume controls must be included in either hardware on the speaker or in software.
- Input impedance must be greater than 5000 ohms.
- In a three-piece system, the satellites shall have the same requirements as above.

Subwoofer Requirements:

- Frequency response must be at least 40 Hz to 250 Hz (+/- 3 dB).
- Power minimum is 15 watts at 1% THD.
- Power ratings should be measured at 40 Hz and 100 Hz at 1% THD.
- Input sensitivity must be adjustable from 300 millivolts to one volt for maximum output power.
- Both inputs must be mixed in the woofer circuitry.
- Input impedance must be greater than 1000 ohms.

(Guidelines for synthesizer implementation available on request; includes MIDI playback support).

Graphics Performance

Color space conversion and scaling capability are required.
Direct access to frame buffer for video-enabled graphics subsystem required with a resolution of 352 x 240 at 30 fps (or 352 x 288 at 25 fps) at 15 bits/pixel, unscaled, without cropping.

Controller Performance

- PCI 2.0 compliant graphics controller.
- Write less than or equal to 14 PCI clocks per 32 bytes at 10 MB/sec.
- Wait states less than or equal to 16 PCI clocks leadoff, less than or equal to 8 clocks subsequent accesses.

Primary Surface Support

- Linear access to full frame buffer in all pixel modes.

Offscreen Surface Support

- Greater than or equal to 1 Window of arbitrary size in pixel formats different than primary (greater than or equal to 3 windows recommended).
- CLUT8, RGB555, and RGB565 offscreen surfaces support in hardware.
- YUV 4:2:2 (YUY2) pixel format support in offscreen surfaces support in hardware.
- Scaling of offscreen surfaces - interpolate in X and replicate in Y in hardware (Bilinear interpolation in X and Y recommended).
- Clipping of offscreen surfaces in hardware.

Manageability

- VESA VBE/PM BIOS.
- DPMS Power Management Support.

Video Playback

MPEG1 (hardware or software) with OM-1 compliance required.
Direct access to frame buffer required with a resolution of 352 x 240 at 30 fps (or 352 x 288 at 25 fps) at 15 bits/pixel, unscaled, without cropping.
All codecs--hardware and/or software--must support a synchronized audio/video stream with a resolution of 320 x 240, 15 bits/pixel, 30 frames/second, unscaled, dropping no more than 3% of the frames.

User Input

Standard 101 key or greater IBM-style keyboard, with standard PS/2 style, DIN or Universal Serial Bus (USB) connector, or keyboard which delivers identical functionality utilizing key-combinations.
Two-button or greater mouse or pointing device, PS/2 or USB style with at least one additional communication port remaining free.

I/O

16550AF UART or equivalent serial controller with standard 9-pin or 25-pin asynchronous serial port, programmable up to 115.2K baud.
Standard 25-pin parallel port with interrupt capability.
1 MIDI port with In, Out, and through, must have interrupt support for input and FIFO transfer.
IBM style analog or digital joystick or USB port.

Communications Controller (if provided must meet the following)

V.34 fax/modem (28.8 Kbps).

Communications/Driver

- TAPI compliant inbound and outbound call control.

System Software

Multimedia PC system software must offer binary compatibility with Windows 3.11.
System must offer binary compatibility with DOS version 6.0 or higher.

Minimum Full System Configuration

A full Multimedia PC Level 3 system requires the following elements and components, all of which must meet the full functional specifications outlined above:

CPU
RAM
Hard Drive
Floppy Drive
CD-ROM Drive
Audio
Graphics Performance
Video Playback
User Input
I/O
System Software

Minimum Upgrade Kit Configuration

A Multimedia PC Level 3 Upgrade Kit requires the following elements and components, all of which must meet the full functional specifications outlined above:

CD-ROM Drive
Audio
I/O
OR, CD-ROM drive, soundcard, interface software

(Providing system software with Upgrade Kits is optional).

Upgrade Components

Upgrade components must meet the full functional specifications outlined above.

Sound Card.
Must use MPC audio cable (see below).
CD-ROM Drive.
Must use MPC audio cable (see below).
Video Playback Card.
Speakers.

CD-ROM/Sound Card Audio Cable Standard for MPC Components

The following cable standards apply only to MPC components (CD-ROM drives or sound cards sold separately). Full systems, notebooks, docking accessories and upgrade kits are not required to observe the following specification.

A Multimedia PC CD-ROM drive component must include a minimum 24 inch cable to connect the drive's analog audio output connector to an MPC sound card's analog audio input connector.

The cable's CD-ROM drive interface must be a 2.54mm pitch female latched connector with the following pin assignments: pin 1-left signal, pin 2-ground, pin 3-ground, pin 4-right signal. This is shown in Figure 1.

The cable's sound card interface is defined as a 2.54mm pitch shrouded (latched or unlatched) or unshrouded connector. An optional reliable, cost effective, user friendly solution to cabling the PC sound card component directly to the CD-ROM drive component is also detailed in Figure 1. It identifies a polarized (post removed) unshrouded, 2.54mm pitch post unlatched connector mounted on the sound card which interfaces with an identically polarized female receptacle.

If mating to a non-standard sound card connector, i.e., a connector not having a 2.54mm pitch, use a short patch cable as illustrated in Figure 2. The pin assignments on the sound card connectors must be complementary to the CD-ROM audio cable connector.

The Connector Selection Guide identifies the AMP Inc. and Molex Inc. part numbers, or their equivalent, including the optional polarized solution and the short patch cable configuration. It is available for download in Adobe Acrobat (PDF) format, or you can request it from mpcinfo@spa.org.

To download, you will need the Acrobat format reader available for download free from Adobe at http://www.adobe.com. Some browsers require you to set "**Load to Disk**" before downloading.

- Download MPC Connector Selection Guide from http://www.spa/mpsc/contable.pdf *(24K in PDF format)*

Definition of terms used in HD and CD-ROM performance sections:

Average Access Time

Average Access time is the average time required, after issuing a single sector read command to a uniformly distributed random sector number spanning the entire disc, until the selected sector data has been transferred into system memory and good status has been returned. This is measured at the system application level (through the OS and the driver) as an average of at least 500 subsequent, randomly selected sector reads and specified as a typical value (allowing plus or minus 10% margin on individual drive/system tests). The test

assumes the use of a new and undamaged disc containing at least 60 minutes of Mode 1 data. At the start of the test the disc must be spinning inside the drive.

Interface overhead

The interface overhead is a measure of the protocol and command processing overhead in issuing a request to the hard drive. This is computed by measuring the service time of requests that access the cache buffer for a variety of request sizes. A linear regression is performed to estimate the amount of time required to transfer zero sectors of data based on the service time of the other transfer sizes.

Cache Service Time

The cache service time is the data rate of accesses satisfied by the drive's buffer cache. Since the interface rate may also depend on the transfer rate of the associated host-bus adapter, the combination of host-bus adapter and disk drive must meet the specified interface data rate. The transfer rate is measured by generating I/O references of various request sizes to the same disk blocks. The increase in service time for each increase in request size is computed and corresponds to the transfer rate.

Media data rate

The media data rate is the average data rate across the entire disc's surface. This is measured by generating random I/O operations of varying request sizes and computing the increase in service time for each increase in request size.

Average latency

The average latency is often considered to be 1/2 the rotation period. Instead of quoting 1/2 the rotation period, this parameter should be taken directly from drive latency measurements so as to include any missed disk revolutions and servo-alignment overheads. This is computed by measuring the distribution of service times for various cache-miss seek distances and determining the mean of the service time, discounting the seek time.

Average seek

The average seek test is a measure of the drive's seek performance. It represents the mean service time of random I/Os spread over the entire surface of the disc minus the latency and overhead. The requests are generated by producing a random number between 0 and the number of sectors on the disc and accessing that sector.

Service time outliers

For the average seek test, the distribution of service times is computed. The outlier performance stipulation limits the number of I/O operations that are allowed to take an extraordinary amount of time to complete. Such outliers are usually an indication of missed rotations due to soft errors or servo alignment problems. In a multimedia capable system, such outliers in the service time are detrimental.

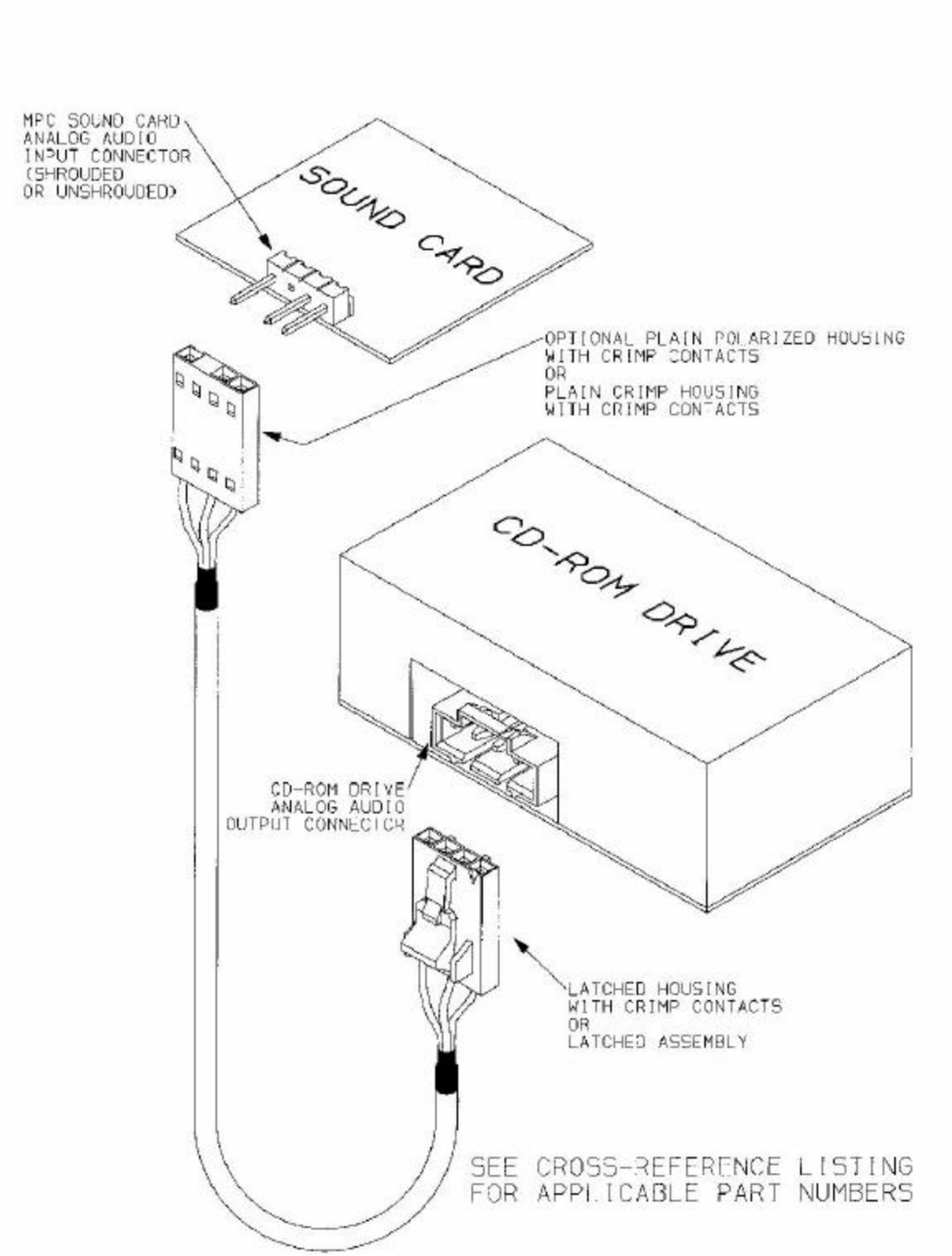

FIGURE 1

Figure 1 – Cabling the PC Sound Card Directly to the CD-ROM Drive

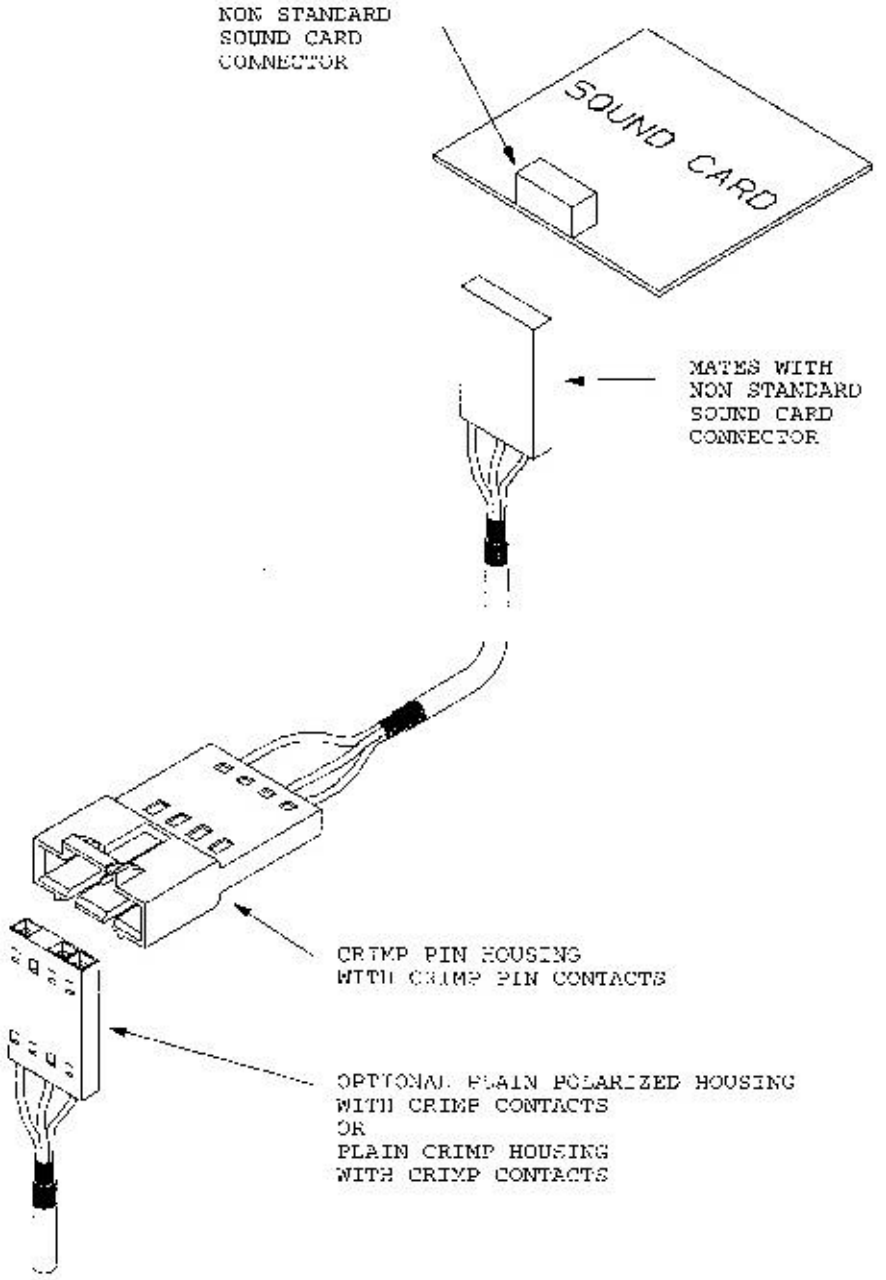

FIGURE 2 mpc sound card

Figure 2 – Using a Patch Cable

CONNECTOR SELECTION GUIDE
CRIMP PRODUCT AND ASSOCIATED TOOLING

HOUSING COMPONENTS

	Plain Polarized Receptacle Housing	Plain Crimp Receptacle Housing	Crimp Receptacle Housing w/Latch	Crimp Pin Housing
AMP AMPMODU ™ MTE P/N	104938-1	103688-3	104257-3	103653-3
Molex C-Grid SL ™ P/N	70470 Series 50-89-1558	70066 "A" Version 50-57-9004	70066 "G" Version 50-57-9404	70107 Series 70107-0003

CRIMP CONTACTS

	Plating - 15 Microinches Gold		Plating - Tin	
	Wire Range		Wire Range	
	#22 - #26 AWG	#28 - #32 AWG	#22 - #26 AWG	#28 - #32 AWG
AMP AMPMODU ™ Short Point Part Number (Female)	104480-3	104481-3	104480-2	104481-2
AMP AMPMODU ™ MTE Pin Part Number (Male)	104505-4	104506-4	104505-2	104506-2
	#22 - #24 AWG	**#24 - #30 AWG**	**#22 - #24 AWG**	**#24 - #30 AWG**
Molex C-Grid SL ™ Part Number (Female - 70058 Series)	16-02-0087	16-02-0082	16-02-0086	16-02-0069
Molex C-Grid SL ™ Pin Part Number (Male)	16-02-0081	16-02-0077	16-02-0107	16-02-0105

HAND TOOLS

	Wire Range	Part Number
AMP	#22 - #26 AWG	58438-1
	#28 - #32 AWG	
Molex	#22 - #24 AWG	11-01-0208
	#24 - #30 AWG	11-01-0209

APPLICATORS

	Wire Range	Contact P/N Series	Model K Applicator P/N	CLS Machine Applicator P/N
AMP Quick Change Applicator for AMP-O-LECTRIC Machine (Model K) or AMPOMATOR CLS Machine	#22 - #26 AWG	104480	567297-2	567297-1
		104505	567239-2	
	#28 - #32 AWG	104481	567296-2	567296-1
		104506	567240-1	
Molex Universal Mini-Mac	#22 - #24 AWG	70058	Applicator P/N	
			11-18-2019	
	#24 - #30 AWG	70058	11-18-2211	

CONNECTOR SELECTION GUIDE

INSULATION DISPLACEMENT (IDC) PRODUCT AND ASSOCIATED TOOLING

CONNECTOR ASSEMBLY WITH LATCH

	Plating - 15 Microinches Gold		Plating - Tin	
	Wire Range		Wire Range	
	#22 - #26 AWG	#26 - #30 AWG	#22 - #26 AWG	#26 - #30 AWG
AMP AMPMODU ™ MTE Part Number	103957-3	103960-3	103956-3	103959-3
Molex C-Grid SL ™ Part Number	#22 AWG	#24 AWG	#22 AWG	#24 AWG
	14-56-7047	14-56-2042	14-56-7042	14-60-0042
	#26 AWG	#28 AWG	#26 AWG	#28 AWG
	14-56-2044	14-56-2046	14-60-0044	14-60-0048

PISTOL GRIP HAND TOOLS FOR DISCRETE WIRE

	Component	Part Number
AMP AMPMODU ™ MTE	Pistol Grip	58074-1
	Modular Termination Head	58336-1
Molex C-Grid SL ™	Pistol	11-21-5194