PrintPartner 16DV/ADV
PAGE PRINTER
PRODUCT DESCRIPTION

FUJITSU LIMITED

Communications and Electronics

Tokyo, Japan

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PREFACE

This manual gives the product specifications for the PrintPartner 16DV/ADV (PP16DV/ADV) page printers. The manual provides prospective customers with required engineering specifications.

Chapter 1: Describes the main features.

Chapter 2: Gives the model configuration and equipment structure.

Chapter 3: Gives the functional, electrical, environmental, and paper specifications.

Chapter 4: Describes the control panel (LED indicators, LCD, and push-button switches). It also summarizes control panel's setup functions and the printer utility programs, MarkVision and PPMENU.

Chapter 5: Gives information on the interface, its hardware specifications, and software specifications. It also summarizes command sets.

Chapter 6: Explains maintenance.

Chapter 7: Lists options and supplies.

Appendixes: Give information on symbol sets, fonts, and nameplate and label locations.

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ILLUSTRATIONS AND TABLES

CHAPTER 1 FEATURES

The PrintPartner 16DV/ADV are high-performance, user-friendly, laser page printers suitable for a wide range of applications. With a minimum of modifications, it can be used for OEM applications.

Its 600 × 600 dpi print density or 2400 × 600 dpi print density (FEIT) makes the print quality almost the same as that of a full-character printer. (FEIT is the acronym of Fujitsu Enhanced Imaging Technology.)

The PrintPartner 16DV emulates the HP LaserJet 5 page printers. The PrintPartner 16ADV emulates the HP LaserJet 5 page printers and the PostScript level 2 printers.

The PrintPartner 16DV/ADV comes standard with a bit-map font, 114 scalable fonts available in HP LaserJet 5 emulation. The PrintPartner 16ADV comes standard also with 35 scalable fonts available in PostScript level 2 emulation.

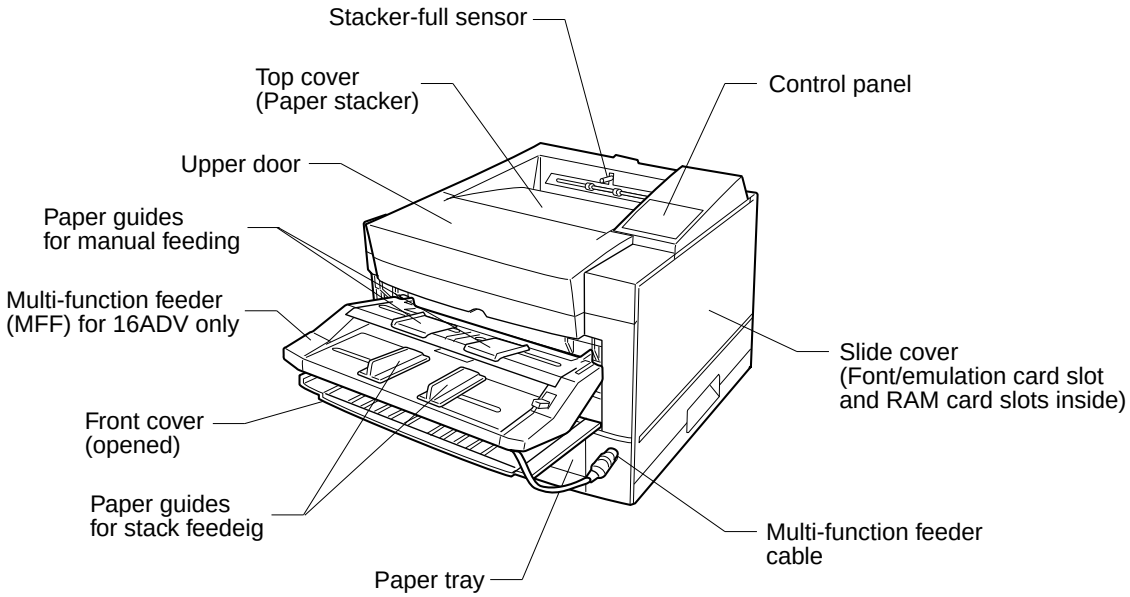
Up to 64M bytes can be added to download commercial fonts (valid in HP LaserJet 5 emulation) or print a large amount of graphic data.

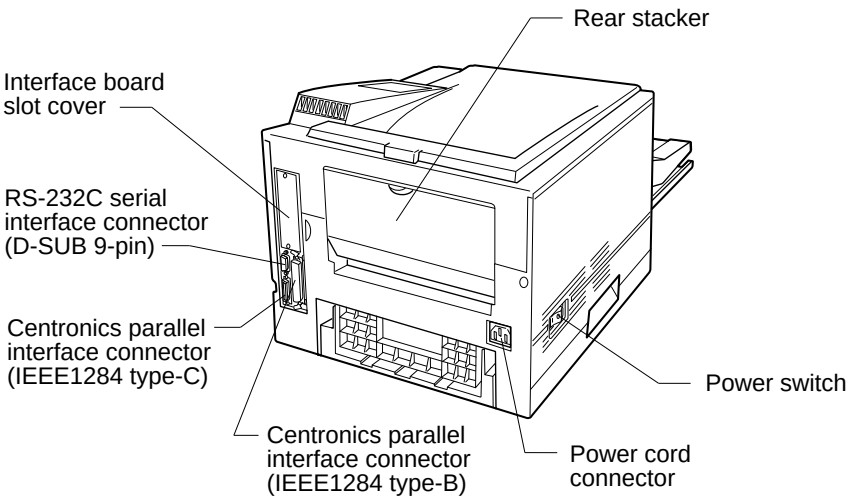
The PrintPartner 16ADV also comes standard with a multi-function feeder (MFF) which facilitates handling of envelopes, labels, and transparencies.

This chapter describes the following features:

- Fine print quality
- Quiet operation
- Easy paper handling
- User-friendly operation
- High reliability and easy maintenance
- Compact design (small footprint)
- Wide variety of interfaces
- Environment friendly

Figure 1.1 shows the overall view.





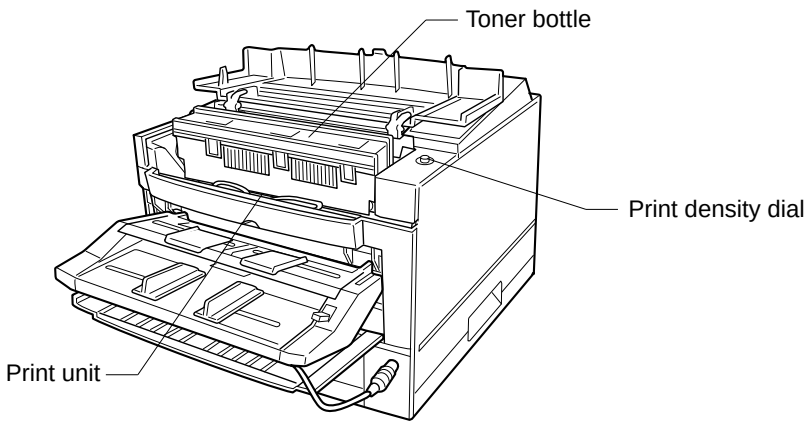


Figure 1.1 PrintPartner 16DV/ADV printer

1.1 Fine Print Quality

The PrintPartner 16DV/ADV uses electrophotography and a laser unit that is compact, easy to control, and consumes very little power.

The print resolution is 600 × 600 dpi (23.6 lines/mm), for example, 64 × 64 dots for 8-point characters. Natural curves and very fine lines are printed clearly.

The print resolution is equivalent to 2,400 × 600 dpi (horizontally 95.4 lines/mm and vertically 23.6 lines/mm), for example, about 256 × 64 dots for 8-point characters. Graphic and curve are printed quite smoothly. The print resolution is equivalent to 1,200 dpi using the smoothing technology FEIT (Fujitsu Enhanced Imaging Technology). FEIT is valid in 600 dpi mode.

See Appendix B about font samples.

1.2 Quiet Operation

The PrintPartner 16DV/ADV generates about 48 dBA of sound pressure during simplex printing making it quiet enough for an office environment.

1.3 Easy Paper Handling

The PrintPartner 16DV/ADV uses a 550-sheet fixed size paper tray (tray 1). An additional 500-sheet paper tray is offered with an optional paper feeder (tray 2).

Paper is loaded automatically from the paper tray and ejected to the top cover (output stacker) face-down in the correct order.

The manual feed slot and the multi-function feeder are provided for printing on the media shown below. The rear stacker is also provided for this printing.

- Envelopes
- Adhesive labels
- Transparencies
- Heavy or special paper
- Nonstandard size paper

An optional duplex unit is provided for double-sided printing.

1.4 User-Friendly Operation

The control panel consists of eight push-button switches, four LED indicators, and an LCD (two lines by sixteen characters).

The LED indicators and LCD provide printer status information and error messages.

Print menu, such as a message language, paper size, and line spacing, can be set easily using the control panel or remotely using the utility programs, MarkVision and PPMENU.

1.5 High Reliability and Easy Maintenance

The PrintPartner 16DV/ADV design has been simplified. The print unit, the toner bottle, and the cleaner can be removed and replaced easily without getting hands dirty.

A variety of functions are integrated onto the single printed circuit board (main controller, mechanism controller, and driver).

The self-diagnostics function checks printer hardware.

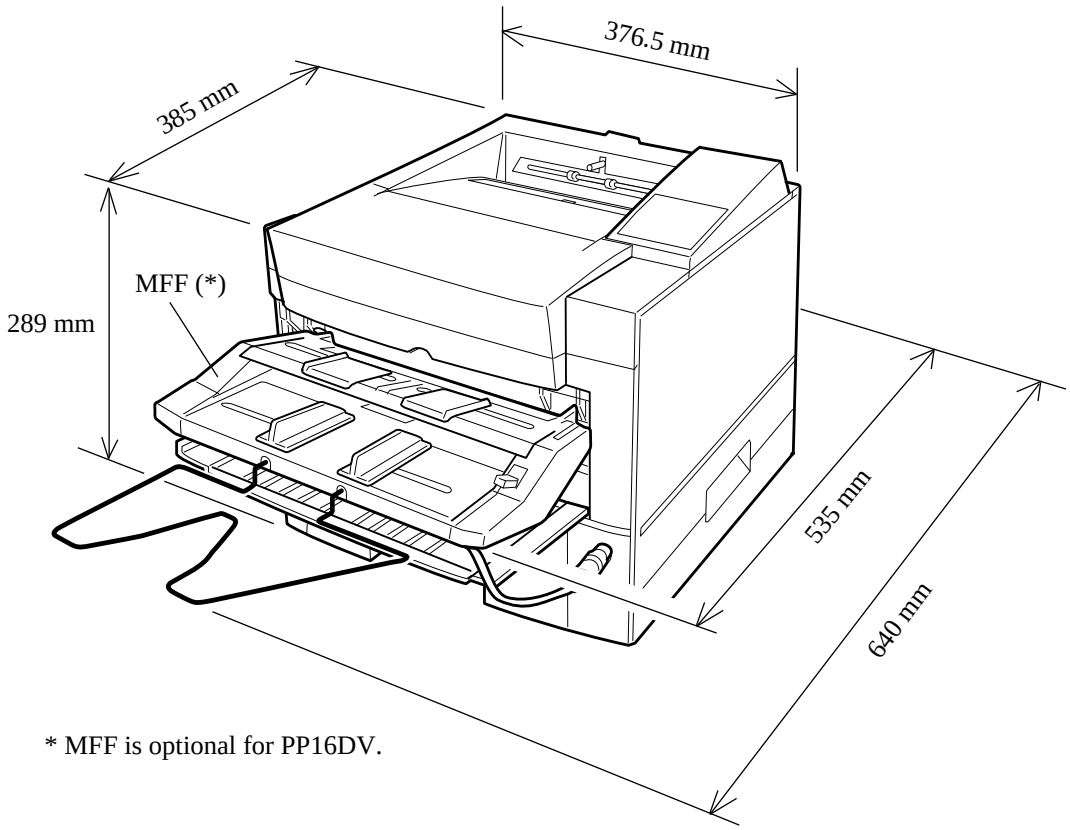
Almost all printer operations and regular maintenance procedures are performed from the front, right side, and rear of the printer. The side cover is removable.

The above items have improved reliability and made maintenance easier, both for general users and service technicians.

1.6 Compact Design (Small Footprint)

The PrintPartner 16DV/ADV is so compact (it has a small footprint) that it fits easily beside a personal computer on the same desk. Also, it is so light-weight that it can be transported easily.

Figure 1.2 shows the printer's dimensions.



* MFF is optional for PP16DV.

Figure 1.2 Printer dimensions

1.7 Wide Variety of Interfaces and Emulation

The PrintPartner 16DV/ADV comes standard with two bidirectional Centronics parallel interfaces (IEEE1284 TYPE-B and TYPE-C connectors) and an RS-232C serial interface (D-SUB 9-pin connector). Three optional interface boards, LocalTalk (AppleTalk compatible), Ethernet (TCP/IP and NetWare corresponding), and IrDA, are offered.

The PrintPartner 16DV/ADV comes standard with the HP LaserJet 5 emulation. The PrintPartner 16ADV comes standard also with the PostScript level 2 compatible emulation (optional for the PrintPartner 16DV). Two optional emulation cards, PostScript level 2 compatible and IBM/EPSON compatible, are offered.

An interface board slot and an emulation card connector are provided. Figure 1.3 shows installation of an interface board and an emulation card.

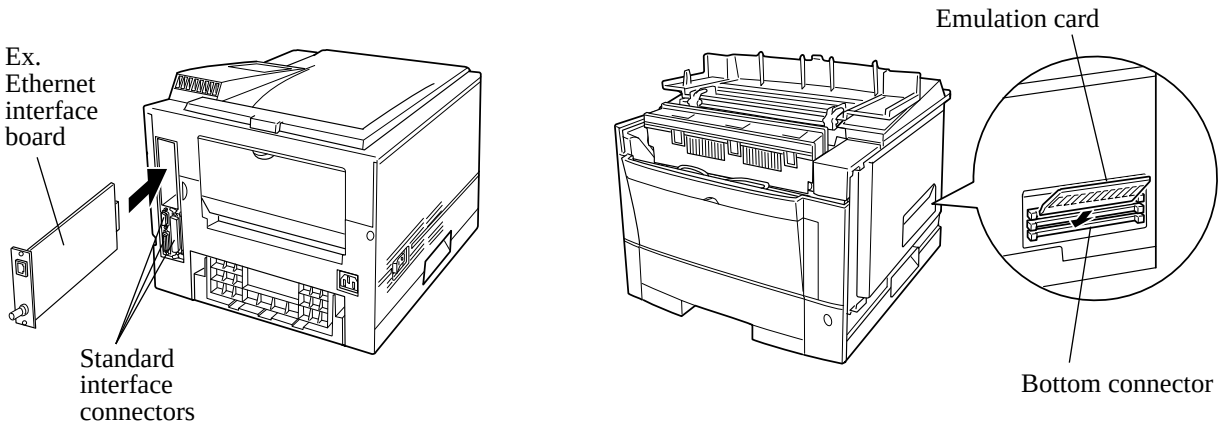


Figure 1.3 Optional interfaces and emulation

1.8 Environment Friendly

The PrintPartner 16DV/ADV uses a newly-developed printing process that does not generate toner waste. This means that the printer uses toner effectively and an operator does not need to deal with wasted toner.

The power-saving design (intelligent heater on/off sensing) reduces power consumption.

Ozone emission is low, so there is no need to exchange ozone filter as regular maintenance.

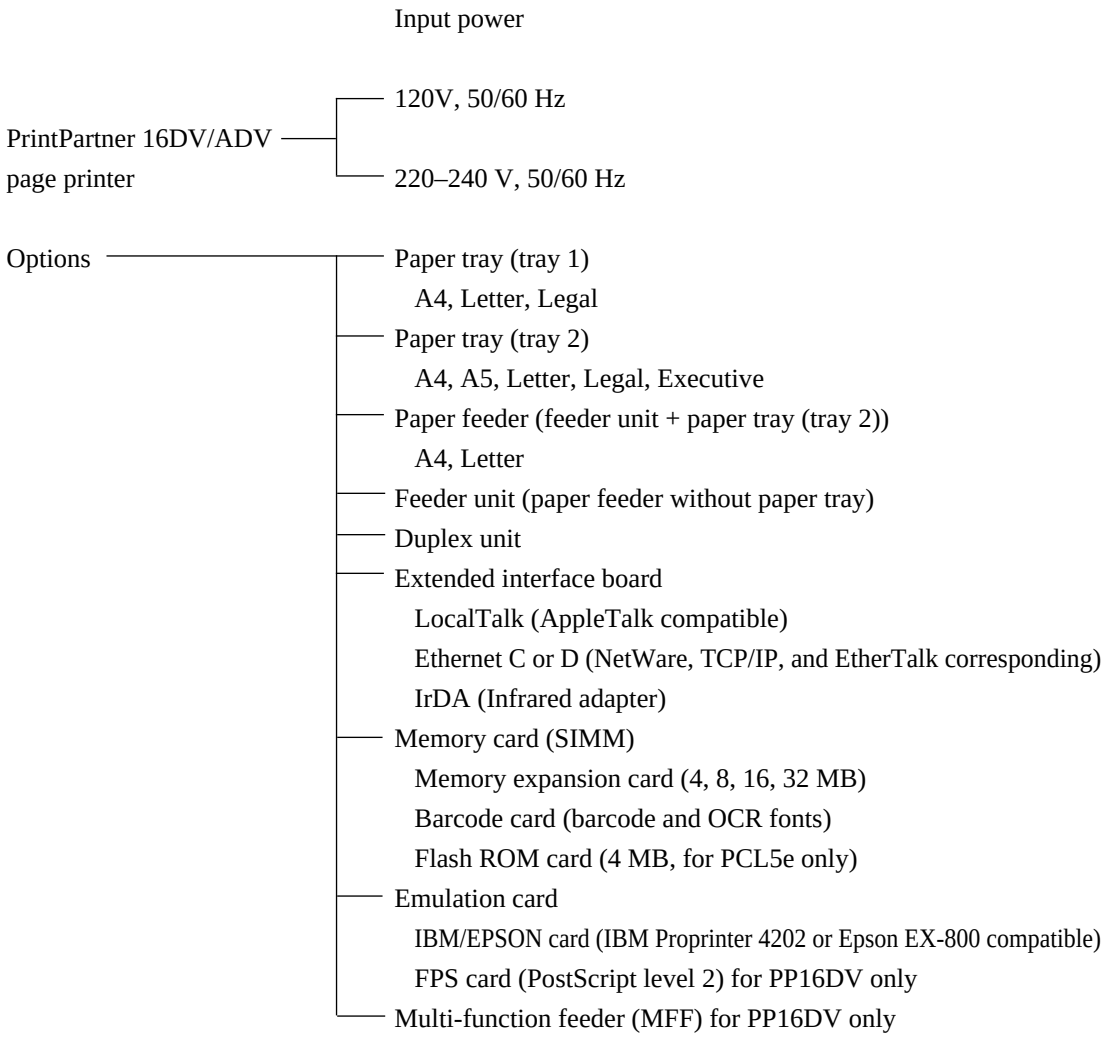
Plastic parts are marked with the plastic content for ease of product recycling.

The user-selectable economy mode extends the lifetime of the toner bottle.

CHAPTER 2 MODEL CONFIGURATION AND EQUIPMENT STRUCTURE

This chapter gives the model configuration and equipment structure. Printer specifications differ between the 120V version printers and the 220V version printers.

2.1 Model Configuration



This printer is shipped with a fixed size of paper tray (A4 or letter size).

The resident emulations are the HP LaserJet 5 (PCL6) and the PostScript level 2 (for PP16ADV only).

The standard interfaces are two Centronics parallel (bi-directional) and an RS-232C serial.

2.2 Block Diagram

Figure 2.1 shows a block diagram of the PrintPartner 16DV/ADV printers.

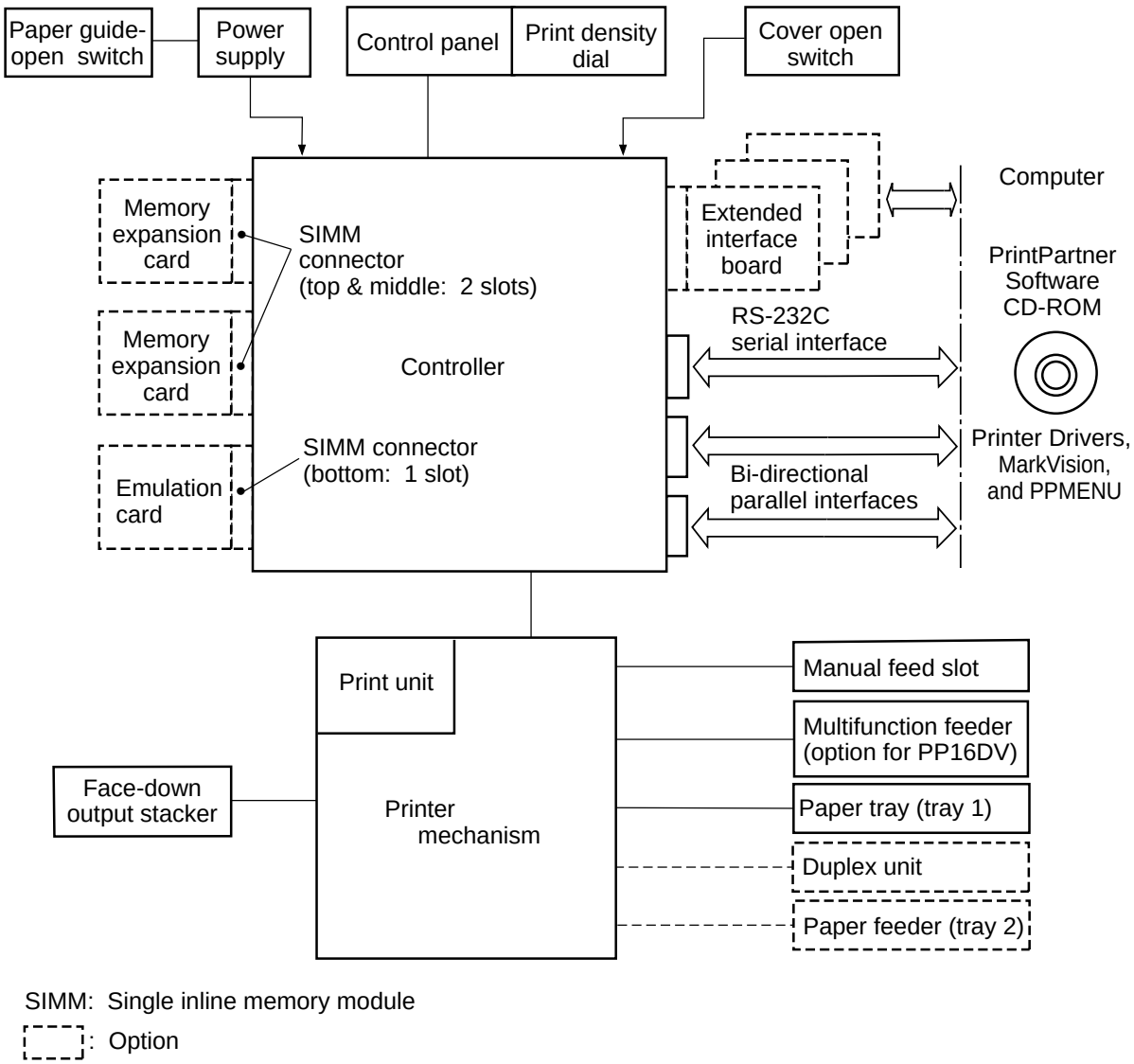


Figure 2.1 Printer block diagram

(1) Printer mechanism

The printer mechanism consists of a printing unit, paper feed mechanism, power supply, and a controller.

The printing unit consists of a laser unit, a print unit (photoconductive drum, developing magnet roller, precharger, and toner), a transfer charger, and a fuser unit.

Images are printed using an electrographic process:
The laser unit, modulated by video signals, sends light to the photoconductive drum and generates a latent electrostatic image that is converted to a toner image in the print unit. The paper attracts the toner image from the photoconductive drum, and the image is transferred to the paper.

Heat generated by the heat roller fuses the transferred toner image to the paper, and the page is ejected from the printer module.

The photoconductive drum is then cleaned for the next printing.

The above operations are continuous and enables uninterrupted quality printing.

(2) Controller

The controller controls the interfaces to the computer, mechanism controller, and control panel.

(3) Control panel and MarkVision/PPMENU

The control panel has LED indicators, LCD, and push-button switches. The LED indicators display basic printer status, for example, whether the printer is online, whether the power supply is on, and whether an error has occurred. The LCD shows status or error messages. The push-button switches control printer operation, for example, resetting the printer and printing a status report.

The printer setup can be changed using the control panel (menu mode). It can also be changed remotely using the printer utility programs, MarkVision and PPMENU.

See Chapter 4 for details on control panel operation and MarkVision/PPMENU.

(4) Interfaces

Two bi-directional Centronics parallel interfaces and an RS-232C serial interface are standard. Other interfaces are available as an accessory. See Chapter 5 for details.

(5) Memory Expansion cards

The RAM card is used to expand the resident RAM memory (4 MB) to download soft fonts or to process more data.

The RAM card is a SIMM type board and its memory capacity is 1M, 2M, 4M, 8M, 16M, or 32M bytes. RAM cards are installed to the top and middle SIMM connectors on the controller board. So, up to 64 MB can be added.

(6) Emulation card

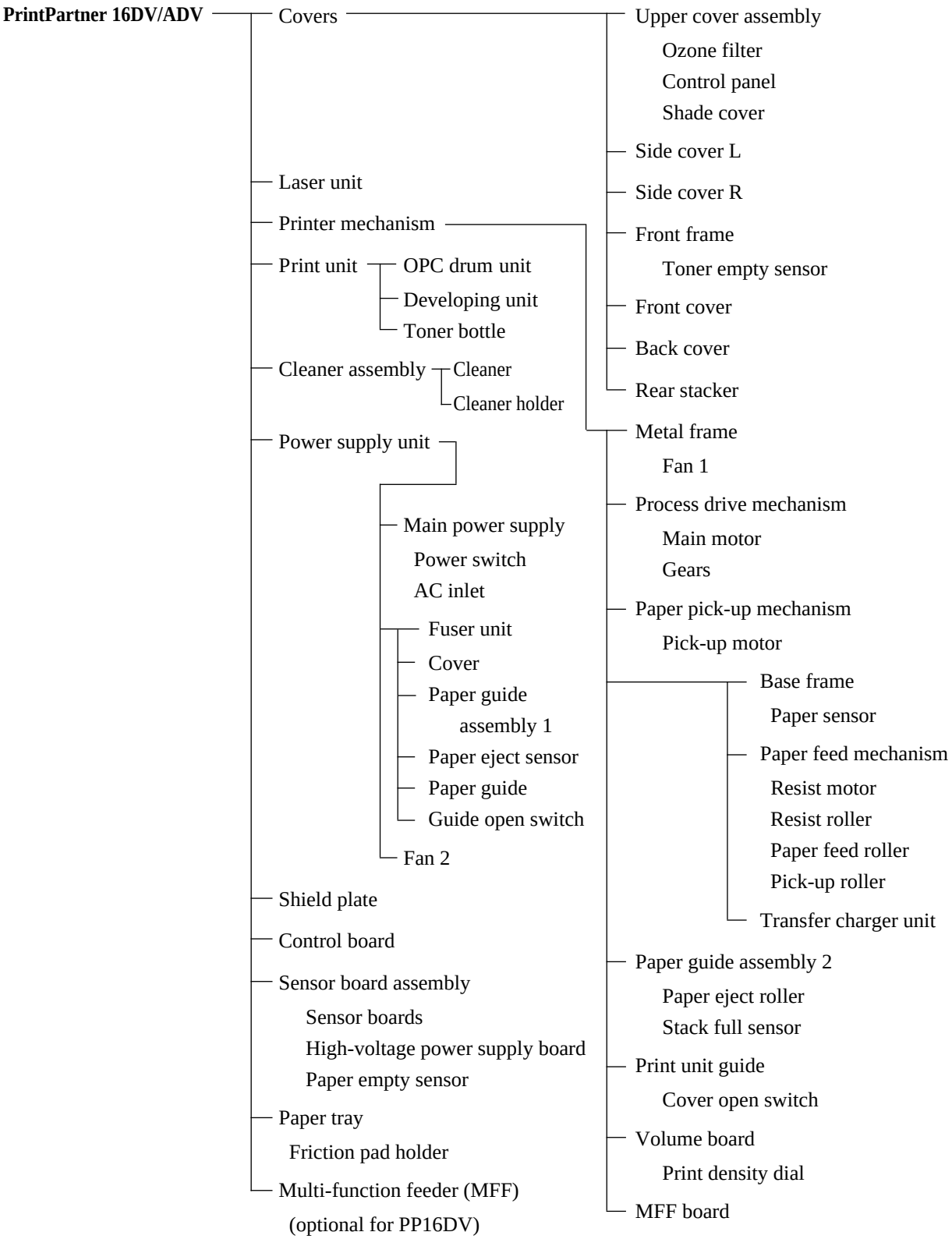
The emulation card is used to add a printer emulation.

The emulation card is a SIMM type board and is installed to the bottom SIMM connector on the controller board.

An FPS card (PostScript level 2 compatible emulation, for PP16DV only) and an IBM/EPSON card are available.

2.3 Structure

The standard printer without options has the following structure, shown in Figure 2.2. The main power supply and fuser unit differ with AC input voltage (120 or 220 - 240 VAC).



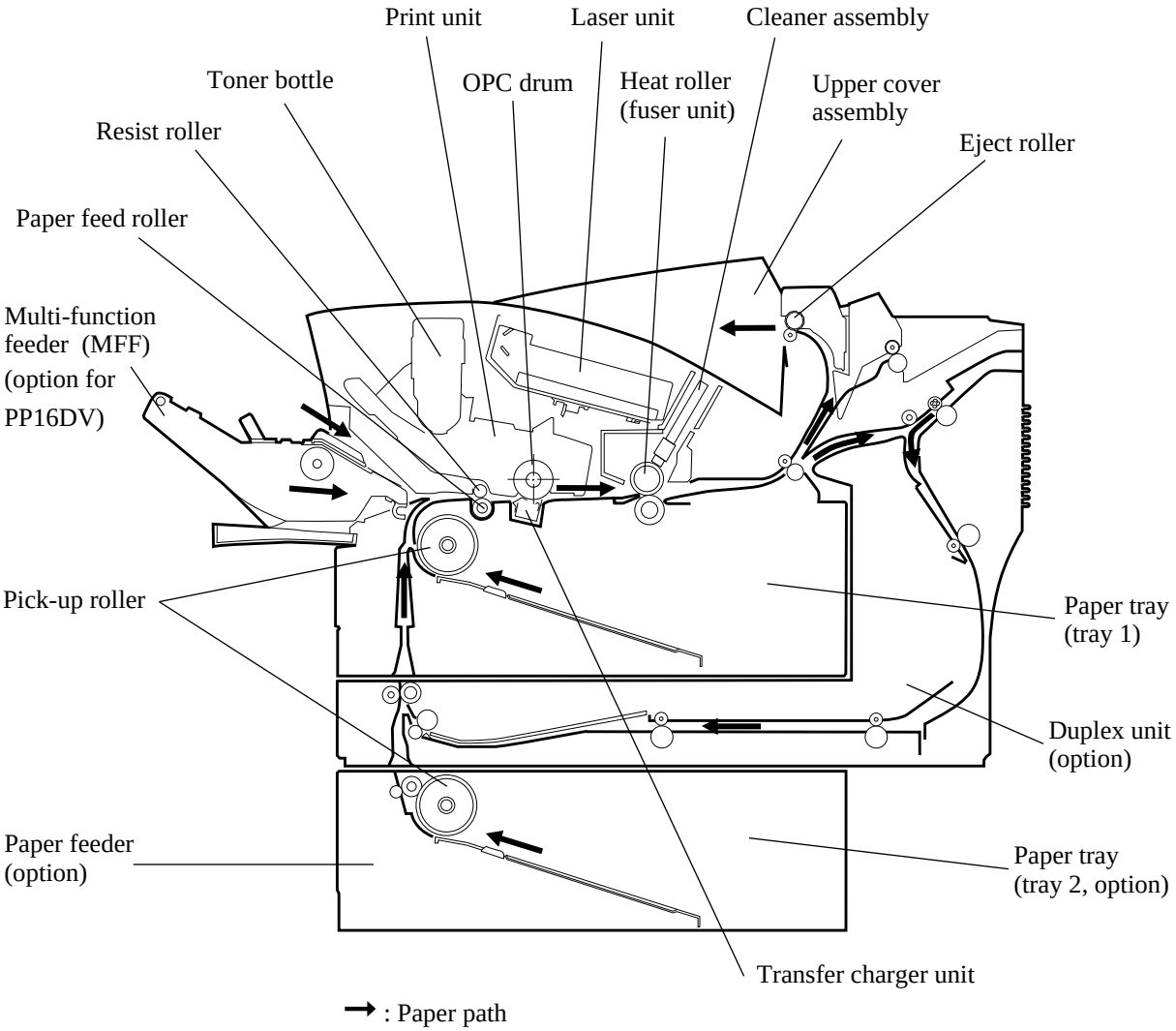


Figure 2.2 Structure (with duplex unit + paper feeder (tray 2))

(1) Covers

The covers consist of the following:

- Upper cover assembly
- Side cover L
- Side cover R
- Front frame
- Front cover
- Back cover
- Stacker

a. Upper cover assembly

The upper cover assembly covers the top of the printer mechanism and stacks printed paper.
The upper cover assembly has a hinge to enable the front (upper door) to open. The print unit and toner bottle can be replaced when the upper door is open.
The upper cover has a hinge to enable the shade cover to open. The cleaner can be replaced when the shade cover is open.
The control panel is located at the top right and the ozone filter is inserted at the right rear. It consists of four LED indicators, an LCD, and eight push-button switches, enabling communication between the user and printer.

b. Side cover L

This cover covers the left side of the printer mechanism.

c. Side cover R

This cover covers the right side of the printer mechanism.
This cover is opened to add or replace optional cards (RAM card or emulation card).

d. Front frame

This frame is secured to the front of the printer mechanism.

e. Front cover

This cover is opened when paper is fed manually or the multi-function feeder is used.

f. Back cover

This cover covers the rear of the printer mechanism.

g. Rear stacker

The rear stacker can be opened or closed to select the output destination of printed paper. The rear stacker is usually closed to eject paper to the upper cover side.
When envelopes, labels, or transparencies are used, the rear stacker must be opened to eject paper to the rear and stack it.
Also when a paper jam occurs, the rear stacker is opened to remove the jammed paper.

(2) Laser unit

The laser unit is provided in the upper cover.
Images are written on the photoconductive drum of the print unit by laser beams emitted from the laser unit.

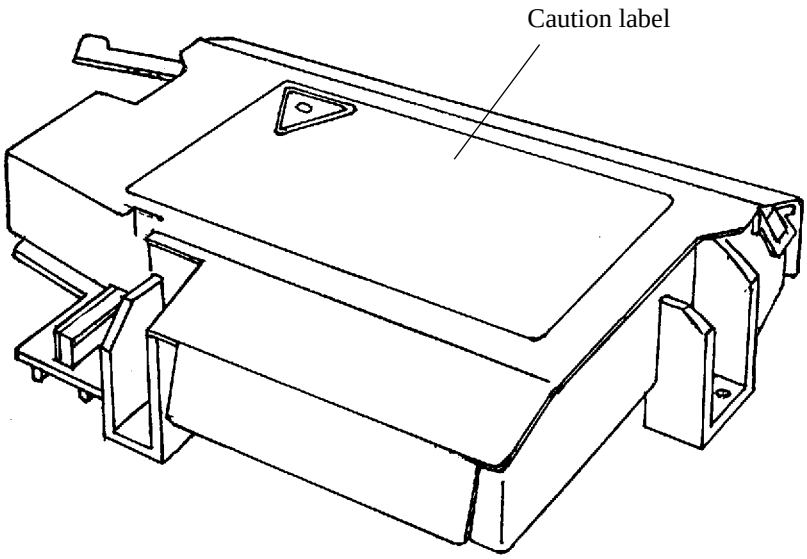


Figure 2.3 Laser unit

⚠CAUTION : Do not look at a laser beam directly.

This label is put on the laser unit.

(3) Printer mechanism

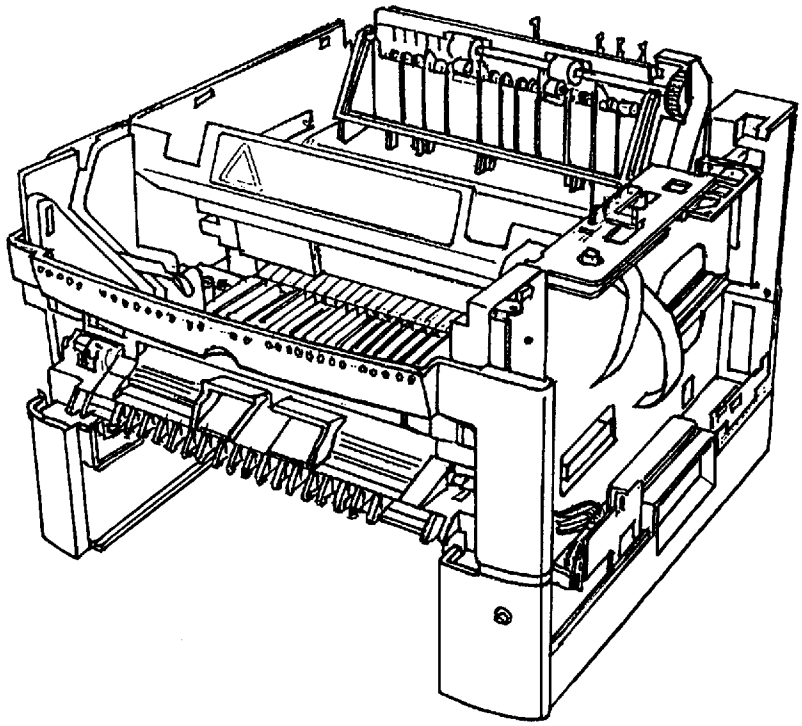


Figure 2.4 Printer mechanism

a. Metal frame
This frame is the basic frame of the printer mechanism and made of sheet metals.
All parts are tightened with screws or snap-fitted to this frame.
The fan (FAN1) is installed on this frame.

b. Process drive mechanism
This mechanism consists of the mechanism that drives the print unit and fuser unit, a DC motor, and drive system (gears, etc.).

c. Paper pick-up mechanism
This mechanism feeds paper loaded in the paper tray to the base frame of the printer mechanism sheet by sheet.
This mechanism consists of a stepping motor and drive system (gears, etc.).

d. Base frame
This frame is main part of the mechanism that transports paper and transfers toner to the paper.
- Sensor that detects the picked paper
- Transfer charger unit (service technicians replaceable)
- Paper feed mechanism
  (A stepping motor, resist roller, paper feed roller, and pick-up roller are tightened with screws or snap-fitted to this frame.)

e. Paper guide assembly 2
This guide transports printed paper to the output stacker. This guide is snap-fitted to the frame on which the paper eject roller is installed.
The stacker-full sensor is installed on this assembly.

f. Print unit guide
This guide is used to install the print unit in the printer.
The cover open switch that detects opening and closing of the upper door is installed on the left guide.
This guide is snap-fitted to the frame.

g. Volume board
The volume board has a variable resistor to control the print density. The control dial is accessible when the upper door is open.

h. Multi-function feeder board (MFF board)
This board has a connector for the multi-function feeder (MFF).

(4) Print unit (user replaceable)

The print unit consists of a photoconductive (OPC) drum unit and a developing unit. It lasts about for 40,000 pages printed at 5% coverage in continuous print mode at 25°C (77°F) and 50% RH.
It can be changed easily by the user.

a. Toner bottle (user replaceable)
The toner bottle contains new toner. It lasts for about 5,000 pages printed at 5% coverage in continuous print mode. However, the toner bottle installed on the new print unit has a shorter life. It can be changed easily by the user.

(5) Cleaner assembly

The cleaner assembly consists of a cleaner and a cleaner holder.

a. Cleaner (user replaceable)
The cleaner wipes the heat roller. It lasts for about 5,000 pages printed at 5% coverage in continuous print mode. It must be replaced by the user when the toner bottle is empty and replaced.

b. Cleaner holder (reusable)
The cleaner holder holds the cleaner. It locks the cleaner by a simple mechanism which can be easily operated by the user.

(6) Power supply unit

This unit consists of the following parts:

- Main power supply
  - Power switch
  - AC inlet
- Fuser unit
  - Cover
  - Paper guide assembly 1
  - Paper eject sensor
  - Paper guide
  - Guide open switch
- Fan (FAN 2)

a. Main power supply

The main power supply supplies +5 VDC and +24 VDC for the logic devices and printer mechanism. There are two types of power supplies: one for input voltage of 120 VAC and the other for 220 to 240 VAC.

The main power supply is equipped with a power switch and an AC inlet.

The main power supply is attached with screws to the cover of the fuser unit.

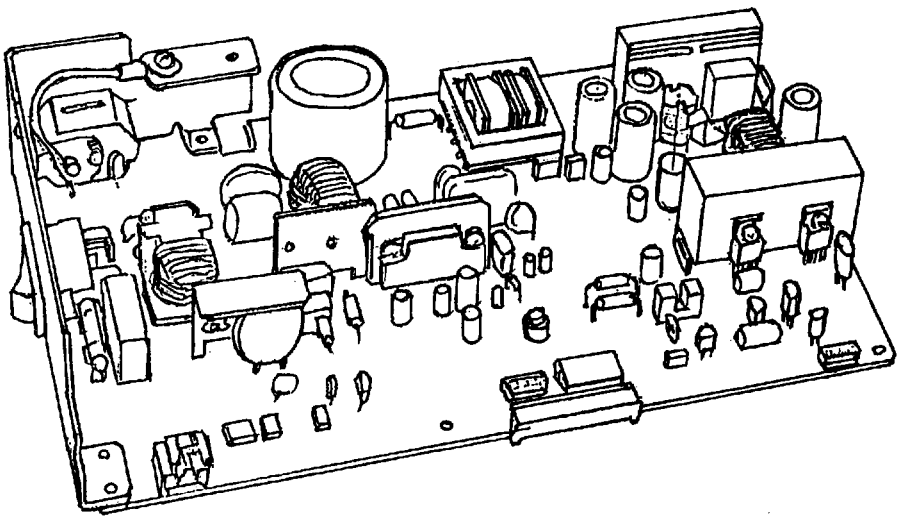


Figure 2.5 Power supply unit

b. Fuser unit (service technicians replaceable)

The fuser unit has an aluminium heat roller and a pressure roller. It fixes the image of toner particles on the paper using heat and pressure.

It has a temperature sensor and a thermal fuse for safety.

It lasts about for 100,000 pages printed at 5% coverage on A4 paper in continuous print mode. There are two types: one for input voltage of 120 VAC and the other for 220 to 240 VAC.

c. Cover

This cover, classified as a component belonging under the fuser unit category, covers the main power supply. It is attached on the bottom of the fuser unit and the power supply is installed under (inside) the cover. The paper guide assembly 1 is also installed at the edge of the cover.

d. Paper guide assembly 1

This assembly transports paper from the fuser unit to the eject roller.
When a paper jam occurs, the paper guide assembly can be drawn out to remove the jammed paper.
A guide open switch detects normal installation of the paper guide assembly.

e. Fan (FAN 2)

This fan ventilates the power supply unit.
This fan is tightened with screws to the right side of the power supply unit.

(7) Shield plate

This plate covers the control board.
This plate is tightened with screws to the right side of the printer mechanism frame.

(8) Control board

The control board is the main controller of this printer. It has four ROMs for firmware, mechanism control, and interface control. It has connectors for two Centronics interface cables, an RS-232C serial interface cable, an optional interface board, optional memory expansion cards, and an emulation card of the future.

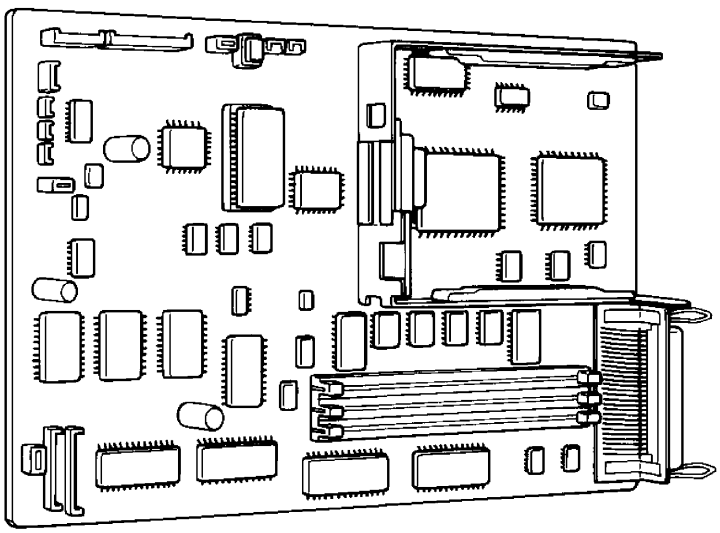


Figure 2.6 Control board

(9) Sensor board assembly

a. Sensor boards
There are two sensor boards.
They detect the presence of paper, the size of paper, paper empty, and paper ejection.

b. High-voltage power supply board (HV board)
The high-voltage power supply, which supplies high voltage to the pre-charger and the transfer charger unit, is tightened with screws to the left side of the sensor board assembly.

(10) Paper tray

The paper size is universal among A4, Letter, and Executive. The capacity of the paper tray (tray 1) is 550 sheets for 0.09 mm thick paper. An optional 500-sheet paper feeder (tray 2) is provided. Its paper size is universal among A4, A5, Letter, Legal, and Executive.

(11) Multi-function feeder (MFF)

The multi-function feeder is optional for PP16DV. It feeds envelopes, labels, transparencies, heavy paper, and nonstandard size paper. The capacity is 100 sheets for 0.09 mm thick paper or 30 envelopes.

CHAPTER 3 SPECIFICATIONS

This chapter gives detailed specifications of the PrintPartner 16DV/ADV, starting with general specifications like printer mechanism specifications and going on to electrical specifications such as input voltage and power consumption, environmental specifications, and paper specifications.

3.1 General Specifications

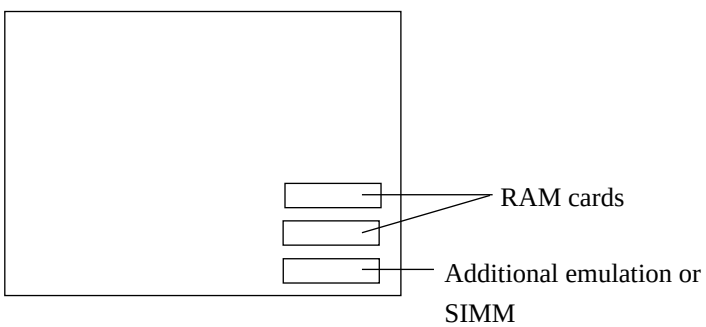
3.1.1 Printer mechanism

Color of Enclosures	Light gray (Munsell No. 2.5Y 7.2/0.4)
Printing Technology	Laser unit and electrophotography
Developing	Toner and magnetic roller
Fusing	Fuser unit (heat roller)
Printing Speed	A4 size: 16.12 pages per minute Letter size: 17.00 pages per minute
Resolution	600 × 600 dpi
Smoothing	Equivalent to 2,400 dpi (horizontally) with Fujitsu Enhanced Imaging Technology (FEIT)
Warm-up Time	At 25°C (77°F): 65 seconds or less Warm-up Time means the time that the printer takes to become ready to print (READY message is displayed) after the power switch is turned on.
First Print Time	At 25°C (77°F): 30 seconds or less First Print Time means the time that it takes to start picking up an A4 size paper from the paper tray and eject to the output stacker.
Copy	Up to 999 copies
Recommended Duty Cycle	5,000 pages per month (about 250 pages per day) Up to 35,000 pages per month

3.1.2 Printer controller

Main Controller	CPU NKK R4645 (125 MHz)
	LSI specially designed for DMA
	Partial bit map
Emulations	Automatically sensed or selected by the control panel (menu mode) or the host (printer utility programs, MarkVision and PPMENU)
Standard:	HP LaserJet 5 (PCL6)
	PostScript level 2 compatible (for PP16ADV)
Optional:	PostScript level 2 compatible (for PP16DV)
	IBM Proprinter 4202/EPSON EX-800 compatible (9-wire dot matrix printer)
Firmware ROM	Flash ROM or mask ROM on the controller board
System RAM (resident):	4M bytes
RAM expansion card (SIMM, optional):	1M, 2M, 4M, 8M, 16M, and 32M bytes
Barcode SIMM card (optional)	For barcode printing Scalable barcode (PCL5e only) Scalable OCR-A/OCR-B fonts HP Jet CAPs commands compatible
Flash SIMM card (optional)	For overlay printing 4MB capacity Able to store overlay data permanently (Printer driver has an overlay manager.) Transmission time saved For PCL5e only
SIMM Connectors	Three connectors
Top & middle connectors (2 slots):	RAM cards for memory expansion
Bottom connector (1 slot):	For additional emulation or SIMM

Printer right side view with the side cover open



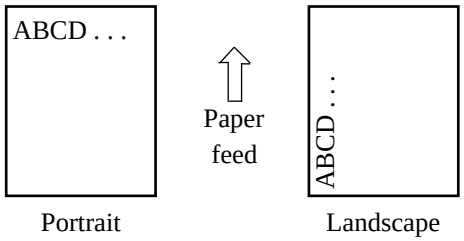
3.1.3 Interfaces

Computer Interfaces	Automatically sensed by the printer
Standard:	• Bidirectional parallel (Centronics, IEEE1284 TYPE-B, ECP mode corresponding) • Bidirectional parallel (Centronics, IEEE1284 TYPE-C, ECP mode corresponding)) • Serial (RS-232C, D-SUB 9-PIN)
Optional:	One of the following optional interfaces can be used at a time. • LocalTalk (AppleTalk compatible, FPS card required) • Ethernet C or D (NetWare, TCP/IP, and EtherTalk corresponding) • IrDA (Infrared interface adapter with the following specs.) – 1.5 m cable, infrared receiver movable to up/down/left/right, power supplied from printer – IrDA 1.0 SIR and 9600 to 115,200 bps – Windows 95 IR driver 2.0

3.1.4 Fonts

Fonts	Selectable via application software or from the control panel (menu mode) or the host (printer utility programs, MarkVision and PPMENU)	
Standard:	HP LaserJet 5 emulation: 1 bitmap font and 114 scalable fonts	
	1 bitmap	Line Printer
	114 scalable	Antique, Aries, Leos, Libra, EF Bodoni, Bodoni, EF Clarendon, Cooper,Courier, Century Schoolbook, URW Clarendon, Coronet, Saturn, Dorado, Goudy Old Style, Garamond No. 8, EFGrandera, Letter Gothic 75, Mauritius, Nimbus Sans, Nimbus Sans Condensed, Nimbus Roman, Taurus, Gemini, EFRivero, Morrison, Lyra, Cassiopeia, Symbol, Sorts, Saturn Monospaced
Standard (PP16ADV):	PostScript level 2: 35 scalable fonts (compatible)	
Optional (PP16DV)		Courier, Helvetica, Helvetica Narrow, Times, Symbol, Palatino, New Century Schoolbook, Avant Garde, Bookman, Zapf Chancery, Zapf Dingbats
Downloading:	Bit map fonts and scalable fonts (outline fonts)	
	The user’s own fonts and logos	

Font Orientation	Portrait or landscape, rotatable in any direction



Symbol Sets (HP LaserJet 5 emulation)	Selectable via application software or from the control panel (menu mode) or the host (printer utility programs, MarkVision and PPMENU)
Standard:	USASCII, ECMA-94, Roman-8, and the following Roman extensions (ISO IRV, ISO Italian, ISO Swedish, ISO Spanish, ISO Portuguese, ISO Norwegian)
International Symbol Sets	Selectable via application software Some symbol sets for several languages (American English, British English, French, German, Italian, Swedish, Spanish, Portuguese, Norwegian, etc.)

3.1.5 Paper

Paper specifications	See Section 3.7.
Paper tray	A4 or Letter size at shipment for both standard and optional trays
Capacity:	550 sheets (0.09 mm thick paper) for standard tray 500 sheets (0.09 mm thick paper) for optional tray
Stacker	Face-down (upper cover) and face-up (rear stacker)
Capacity:	250 sheets (0.09 mm thick paper) for face-down stacking 20 sheets (0.09 mm thick paper) for face-up stacking Capacity may decrease depending on paper types and paper curl conditions.
Paper Feed Control	Selectable via application software or from the control panel (menu mode) or the host (printer utility programs, MarkVision and PPMENU)
Paper tray:	Automatic feeding
Manual feed slot:	Manual insertion

3.1.6 Control panel

Push-button Switches	READY, FORM FEED, CONT., TRAY SELECT, MENU, ENTER, +, –, RESET, RESET MENU, MFF PAPER SIZE, SELF TEST, PRINT FONT
LED Indicators	POWER, ONLINE, DATA, ERROR (basic status)
LCD	2 lines by 16 characters (status and error messages)
Print density dial	Accessible when the upper door is opened

3.1.7 Printer utility programs

MarkVision™ by Lexmark	Remotely monitors printer status and displays optional printer's features. MarkVision™ runs in Windows 95 or Windows NT 4.0.
PPMENU	Remotely sets up printer features. PPMENU runs in PC DOS 5.02, MS DOS 3.3 or higher, or Windows 3.X or Windows 95 in DOS full screen mode.

3.1.8 Other specifications

Standard and Regulations	The following are approved.
Safety:	UL 1950 FDA 21 CFR Chapter 1, Subchapter J Class I CNA/CSA-C22.2 No. 950 EN60 950 EN60 825 Chapter 1
Radiation (EMI):	FCC Part 15 Class B CE mark Canadian standard (DOC) class B VCCI class B C-Tick mark AS/NZS 3548: 1995 class B (complies with Class A when the Ethernet interface board is used.)
Acoustic Noise	Sound pressure level (bystander position)
Printing:	48 dBA (without optional duplex unit)
Sleep mode:	Background noise level Declared noise emissions in accordance with ISO9296 and ISO7779 and EN 27779-1991 (less than 70 dBA)
Ozone Emission	0.1 ppm or less (average) This value is for eight-hour continuous printing in a room with a volume of 1000 cubic feet without air ventilation at 25°C, 50% RH. It however depends on printing conditions such as office environments and printing cycle.

3.2 Electrical Specifications

Input AC Power	120 VAC ± 10%, 50/60 Hz +2/–4 Hz, single-phase 220 to 240 VAC +6%/-10%, 50/60 Hz +2/–4 Hz, single-phase
Power Consumption	Maximum 650 W Average 500 W or less (operating) 30 W or less (sleep mode)

3.3 Environmental Specifications

Temperature	Operating	10 to 35°C (50 to 95°F)
	Storage	Unpacked: 0 to 40°C (32 to 104°F) Packed: - 20 to 40°C (- 4 to 104°F)
	Gradient	15°C/h or less
Humidity	Operating	20 to 80% RH
	Storage	Unpacked: 20 to 80% RH (noncondensing) Packed: 10 to 95% RH (noncondensing)
	Gradient	30% RH/day or less
	Max wet bulb	29°C (84°F)
Altitude (Packaged)	0.25 atmospheric pressure (10300 m, 34000 feet)	
Vibration	Operating	0.2 G (printing quality not guaranteed)
	Idle	0.5 G
Drop Test	Operating	Withstanding a drop test from 3 cm-height aslant. (printing quality not guaranteed)
	Packed	Withstanding a 45-cm (18-in) drop test.
Tilt	Operating	2°
Electrostatic Strength	9 kV minimum (measuring instrument: Capacitor, 330 Ω, 150 pF) When executing test printing by the contact method (10 Hz, 3 minutes)	

To keep print quality good:

- Keep the printer away from direct sunlight or light beam, high temperature, high humidity, and dust.
- Leave space around the printer for air ventilation.
- Place the printer on a sturdy, level surface.

3.4 Physical Specifications

Dimensions	Width	376.5 mm (14.8 inches)
	Depth	640 mm (25.2 inches) with MFF (*)
		385 mm (15.2 inches) without MFF (*)
	Height	289 mm (11.4 inches)
Weight	Printer	17 kg (37.5 pounds)
	MFF (*)	1 kg (2.2 pounds)

* MFF includes paper support wire. It is optional for PP16DV.

3.5 Reliability

MTBF	4000 h	
	(MTBF: powered on for eight hours per day in the recommended duty cycle)	
MTTR	0.5 h	
Machine Life	About 500,000 pages (A4 paper) or 5 years, whichever comes first.	
Consumables Life (average)	Print unit	About 40,000 pages of 5% coverage printing, continuous printing on A4 paper or about one year after unpacking, whichever comes first. The print unit life depends on print coverage, paper type and operating and/or storage conditions.
	Toner bottle	About 5,000 pages of 5% coverage continuous printing on A4 paper. About 2,500 pages of 5% coverage continuous printing on A4 paper when installed on a new print unit. The print unit and/or toner bottle can be changed by the operator.
	Cleaner	About 5,000 pages of 5% coverage continuous printing on A4 paper. The cleaner must be changed by the user when the toner bottle is changed.
	Fuser unit	About 100,000 pages of 5% coverage continuous printing on A4 paper. The fuser unit can be changed by a service technician.

3.6 Protection and Limits

Power to the printer is automatically turned off to protect the mechanism, control unit, and power supply when the following abnormal conditions are detected:

- High temperature of the fuser unit (overheating or malfunction)
- Short-circuit or cut-off of the fuser unit’s thermal sensor
- Short-circuit of a motor driver
- Fire alarm check of a motor

3.7 Paper Specifications

The PrintPartner 16DV/ADV prints on a variety of types and sizes of paper, so long as they meet the requirements shown below. Pretest unspecified or unusual printing materials to ensure that they do not cause a problem in charging, heating, or paper feeding.

3.7.1 Type, size, and thickness

Type

Paper tray:	Plain cut-sheet photocopy paper (equivalent to Xerox 4024) and bond paper
Manual feed slot or MFF:	In addition to the above, overhead projector transparencies (equivalent to 3M 731), envelopes (COM-10, Monarch, C5, DL, and B5), and labels

Size

Paper tray:	A4	210 mm × 297 mm (8.3 × 11.7 in)
	A5	148 mm × 210 mm (5.8 × 8.3 in), tray 2 only
	Letter	215.9 mm × 279.4 mm (8.5 × 11 in)
	Legal	215.9 mm × 355.6 mm (8.5 × 14 in), tray 2 only
	Executive	184.2 mm × 266.7 mm (7.25 × 10.5 in)
Manual feed slot or MFF:	Min. 100 mm wide × 148 mm long (3.94 × 5.81 in)	
	Max. 216 mm wide × 356 mm long (8.5 × 14 in)	

Thickness (weight) Practical values depend on paper quality.

Paper tray:	60 to 90 g/m^2 (50 to 70 kg or 17 to 24 lb. bond)
Manual feed slot or MFF:	60 to 105 g/m^2 (50 to 90 kg or 17 to 28 lb. bond)
	Special paper (transparency films, envelopes, adhesive labels)

Note:
The ream weight is given in parentheses: kilogram weight of 1000 sheets of 788 mm × 1091 mm paper (1.16 g/m^2) or pound weight of 500 sheets of 17 inch × 22 inch paper (3.76 g/m^2)

3.7.2 Printing area

No characters can be printed outside the bold line in Figure 3.1 because of the physical restrictions of the printing mechanism.

Unit: mm

Printing area	C C’	D D’	E E’	F F’
Unprintable area	4	4	4	4
Not guaranteed area	1	1	1	1

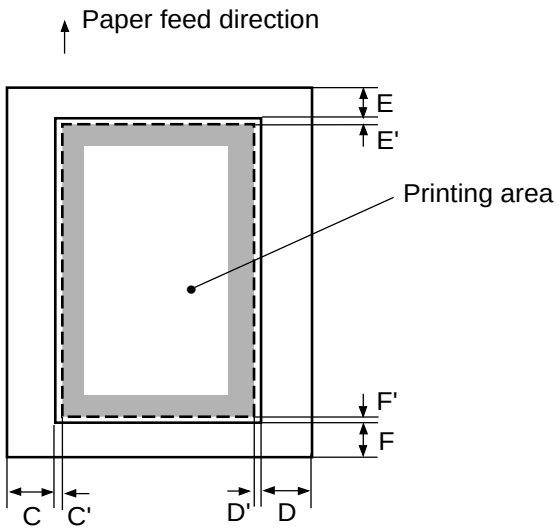
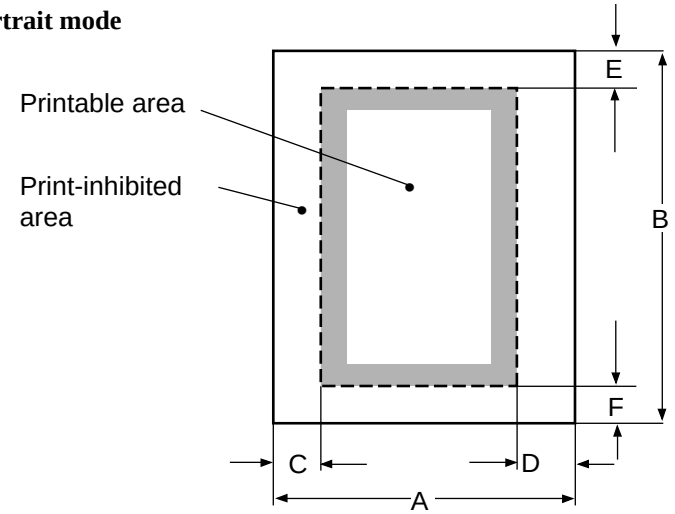


Figure 3.1 Printing area

Printable areas vary with the emulation. Figure 3.2 shows the printable areas for the HP LaserJet 5 emulation. See Programmer's Manuals for other emulations.

Portrait mode



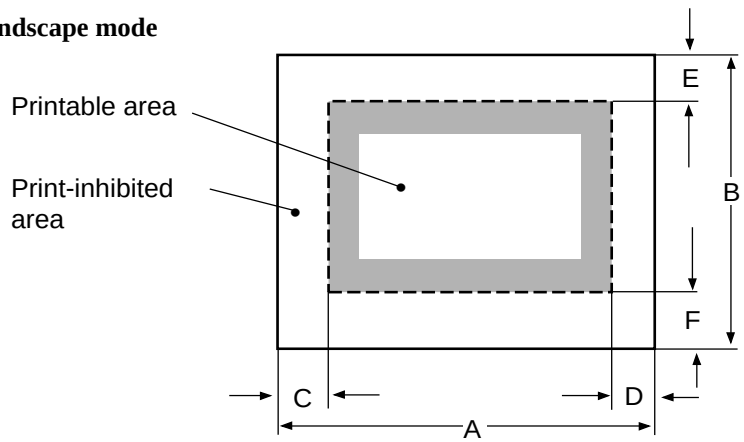
A: Physical page width
B: Physical page length
C: Left print-inhibited area
D: Right print-inhibited area
E: Top print-inhibited area
F: Bottom print-inhibited area

Unit: dot (1/600 in)

Size	Width × Length	A	B	C	D	E	F
Legal	8.5 × 14 in	5100	8400	150	150	100	100
Letter	8.5 × 11 in	5100	6600	150	150	100	100
Executive	7.25 × 10.5 in	4350	6300	150	150	100	100
A4	210 × 297 mm	4960	7014	142*	142*	100	100
A5	148 × 210 mm	3496	4960	142	142	100	100

* 80 dots when 80 columns/line is selected for A4 print width in PCL menu in menu mode

Landscape mode



A: Physical page width
B: Physical page length
C: Left print-inhibited area
D: Right print-inhibited area
E: Top print-inhibited area
F: Bottom print-inhibited area

Unit: dot (1/600 in)

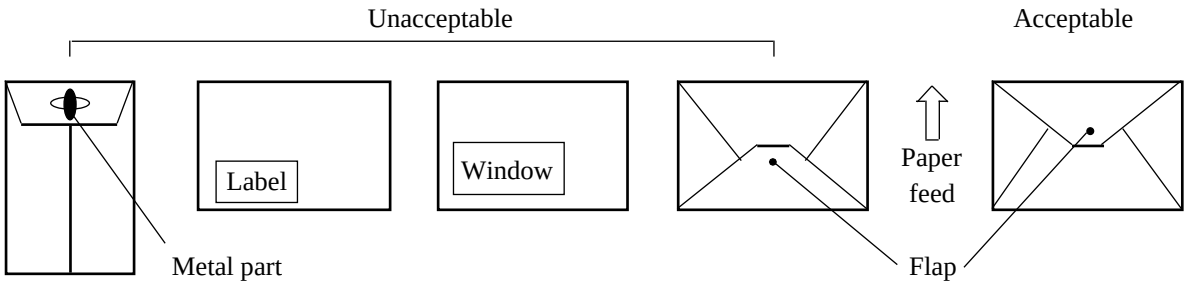
Size	Width × Length	A	B	C	D	E	F
Legal	8.5 × 14 in	8400	5100	120	120	100	100
Letter	8.5 × 11 in	6600	5100	120	120	100	100
Executive	7.25 × 10.5 in	6300	4350	120	120	100	100
A4	210 × 297 mm	7014	4960	118	118	100	100
A5	148 × 210 mm	4960	3496	118	118	100	100

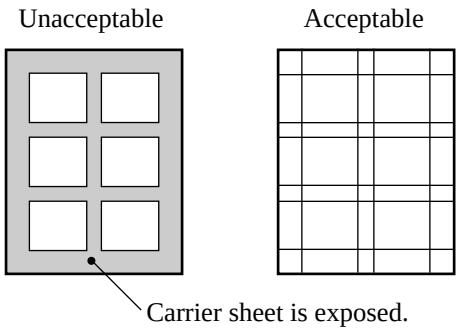
Figure 3.2 Printable area (HP LaserJet 5 emulation)

3.7.3 Other precautions

- Use good-quality paper.
- Ensure that paper is not wrinkled or curled.
- Handle and store paper carefully to make sure they are not warped or damaged.
- Do not use stapled paper or paper having metal parts. They will seriously damage the photoconductive drum.
- Select envelopes from the following five types: COM-10, Monarch, C5, DL, and B5.
- Do not use “Unacceptable” envelopes and labels illustrated below.

Envelopes:
Labels:





3.7.4 Paper storage

To avoid problems with print quality and jams, store paper as follows:

- Do not expose paper to moisture or direct sunlight. Overly damp paper may cause electrostatic charge to be lost. Excessively dry paper may cause undesired electrostatic charge. Both cause poor print quality.
- Store remaining paper in tits original package, if possible. Otherwise, repackage them.
- Storing paper vertically may cause paper to curl, and cause jams.

CHAPTER 4 CONTROL PANEL AND PRINTER UTILITY PROGRAMS

4.1 Control Panel

The control panel consists of four LED indicators, an LCD (two lines by sixteen characters), and eight push-button switches.

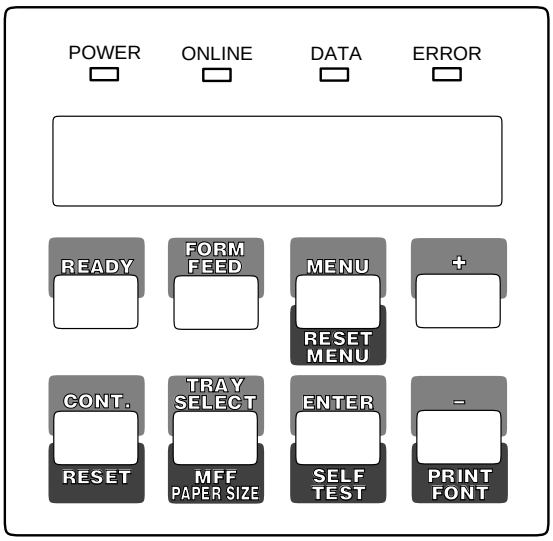


Figure 4.1 Control panel

4.1.1 Indicators

The indicators show the printer's status, as follows:

Main meaning

POWER: Indicates printer power is on.

ONLINE: Indicates the printer is online and ready to print.

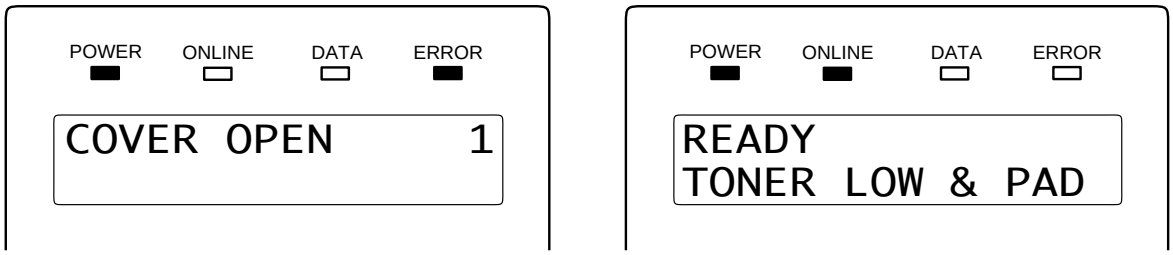
DATA: Flashes when data is being sent from the computer. Lights steadily when the printer buffer contains unprocessed data.

ERROR: Indicates an error has occurred. Details are indicated by the message displayed in the LCD.

4.1.2 LCD

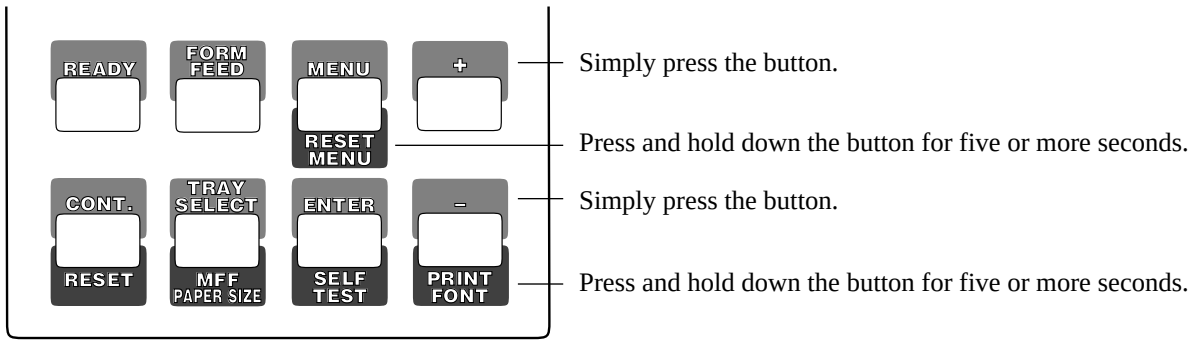
The liquid-crystal display (LCD) shows status and error messages with two lines by sixteen characters.

- Error message informs the user of a condition requiring an action, such as TRAY*n* PAPER OUT, COVER OPEN*n*, or PAPER JAM*n*
- Status message informs the user of a condition requiring no action, such as WARMING UP or SELF TEST
- A certain status message informs the user of a condition requiring an action, such as TONER LOW & PAD or REPLACE PARTS



4.1.3 Buttons

One or two functions are assigned to a button. To use the functions represented by the top labels, simply press the button. To use the functions represented by the bottom labels, press and hold down the button for five or more seconds.



4.1.4 Menu mode

The menu mode allows the user to change the printer's defaults using the four buttons on the control panel. The control panel has the menu mode to configure the printer to suit the requirements of user's computer, software, and documents. The menu mode is structured as a tree consisting of submenus, items, and options as shown in the next page.

The following shows the structure of the menus in menu mode. An asterisk (*) indicates a default option.

- Menu Mode
  - Page Format Menu
    - Copies – 001* to 999
    - Paper/Envelope – A4* (Europe), A5, Letter* (USA), Legal, Executive, COM-10, DL, Monarch, B5, C5
    - Orientation – Portrait* or Landscape
    - Form Lines – 060* (USA), 064* (Europe), or 005 to 128
    - Page Protect – Auto* or On
    - Duplex Mode (†) – On* or Off
    - Binding (†) – Long Edge* or Short Edge

    † Displayed when an optional duplex unit is installed.
  - Quality Menu
    - Smoothing (FEIT) – On* or Off
    - Resolution – 600* or 300 dpi
    - Economy Mode – Off* or On
    - Thick Paper – Off* or On
  - PCL Font Menu
    - Font Source – Internal*, Soft, SIMM
    - Font Number – 000*, 001, 002, ..., N (depending on the font source, max. 999)
    - Pitch Size – 0.44* to 99.99 (characters/inch, 0.01 increments)
    - Point Size – 4.00* to 999.75 (point, 0.25 increments)
    - Symbol Set – Roman 8*, ISOL1, ISOL2, ISOL5, PC8, etc...
    - Courier – Regular* or Dark
  - PCL Menu
    - Top Offset – 0.0* or –25.0 to +25.0 (mm, 0.1 increments)
    - Left Offset – 0.0* or –25.0 to +25.0 (mm, 0.1 increments)
    - A4 Print Width – Normal* or 80 Columns/Line
    - Auto Attach FF – No* or Yes
    - Auto CR – LF* or LF+CR
    - Auto LF – CR* or CR+LF
  - FPS Menu
    - Jam Recovery – Off* or On
    - Print FPS Errors – On* or Off
    - Job Timeout – 0* or 10 to 300 (0: no check)
    - Wait Timeout – 0 or 10 to 300* (0: no check)
    - Manual Timeout – 40*, 0 or 10 to 300 (0: no check)
    - Model Selection – Auto Model*, Memory Model, Speed Model
  - Config Menu
    - Personality – Auto*, PCL, PS
    - Auto Continue – Off* or On
    - I/O Timeout – 15* or 5 to 300 (seconds)
    - I/O Buffers – Auto*, 32K, 64K, 128K, 256K (bytes)
    - Power Save – On after 15 min*, 30 min, 60 min, 120 min, Off
  - Parallel Menu
    - Acknowledge – ACK Width 1*, ACK Width 2, ACK Width 3
    - Bi-direction – On* or Off
    - NPAP Mode – Auto* or On, Off
  - Serial Menu
    - Baud Rate – 1200, 2400, 4800, 9600*, 19200, 38400, 57600
    - Pacing – DTR* or Xon/Xoff
    - DTR Porality – Hi* or Low
    - ROBUST XON – On* or Off
  - Network Menu
    - NPAP Mode – Auto* or On
    - BootP – No* or Yes
    - IP Address – ###, ###, ###, ### (### = 0, 1, 2, ..., 255)
    - IP Netmask – ###, ###, ###, ### (### = 0, 1, 2, ..., 255)
    - IP Gateway – ###, ###, ###, ### (### = 0, 1, 2, ..., 255)
    - EtherTalk TR – 1st*, 2nd, 3rd, 4th, Non
  - Clear Warning
    - <Clear Warning> – Print Unit
- Self Test Menu
  - PCL Page Config – Start
  - FPS Page Config (††) – Start

  †† For PP16DV, displayed when an optional FPS is installed.
- Font Print Menu
  - PCL Font List – Start
  - FPS Font List (††) – Start
- Tray Select Mode
  - Tray – Tray 1*, Tray 2, MFF
  - Manual Feed – Off* or On
- MFF Paper Size Mode
  - MFF Paper/Envelope – A4* (Europe), A5, Letter* (USA), Legal, Executive, COM10, Monarck, C5, DL, B5

4.2 Printer Utility Programs

The PrintPartner 16DV/ADV is equipped with the three printer utility programs: Printer Management Utility Program, MarkVision™; Printer Remote Setup Utility Program, PPMENU; and Remote Printer Utility Program. This section describes MarkVision™ and PPMENU, standard for the PrintPartner 16DV/ADV.

These utility programs can be used in the environments shown below:

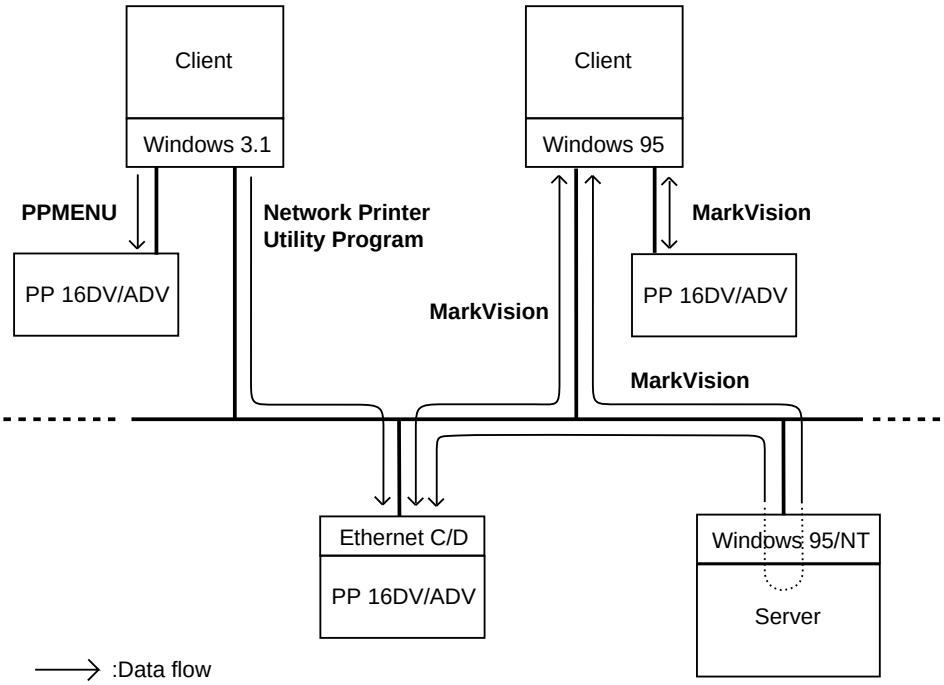


Figure 4.2 Printer utility programs

4.2.1 MarkVision™

MarkVision™ by Lexmark is an integrated software for managing printers, stored in the “PrintPartner Software CD-ROM” which comes with the printer. It has the following main functions:

- Monitoring the printer
- Displaying the printer status and features (including options) and statistics
- Providing the printer control panel on the computer’s screen (remote control panel)

These functions are most effective and valuable for remote printers in network environments. MarkVision™ is automatically activated when an abnormal condition occurs in the printer. It operates in Windows 95 environments only.

The remote control panel is quite a nice function that enables the user to easily and remotely operate the printer even if the printer is set up remotely. MarkVision™ displays the printer control panel on the computer’s screen and gives the user the exactly same functions as available with the control panel of the printer. The user can perform a function by clicking a button on the computer’s screen without pushing a button of the printer’s control panel.

To use MarkVision™, the computer and its operating environments must be as follows:

- IBM PC/AT or compatible or PS/2
- Microsoft Windows 95 or NT 4.0 (not Windows 3.1/3.11)
- VGA (640 x 400) or higher display
- Hard disk drive installed (9 MB essential for MarkVision™)
- CD-ROM drive

Menu Bar Functions

The top menu bar offers three functions. The screen displays information and a graphic of the printer corresponding to the function selected. The bottom line displays printer status. Help is available from each screen.

The three functions of the top menu bar are as follows:

Status: Shows a printer status message which is identical to the message appearing on the printer control panel. The status is also indicated graphically. The user can determine what the printer is doing and what the printer needs to complete the task. It also includes information about the printer's features including options which are installed on the printer.

With an optional setting, the MarkVision™ icon flashes to let the user know there is a problem with the printer even if the icon is minimized on the monitor.

Control Panel: Allows the user to remotely operate the printer. It displays an exact replica of the physical control panel on the printer, on the monitor. The user can click the appropriate button on the screen by the mouse as if he is pressing the real button on the printer control panel by a finger. Both panels have exactly the same functions.

Statistics: Summarizes details about jobs such as the total number of jobs printed, total pages, and average print time.

4.2.2 PPMENU

PPMENU, stored in the “PrintPartner Software CD-ROM” which comes with the printer, allows the user to change printer’s features directly from the computer display and keyboard. Operations are easy enough that the user’s manual need not be referenced once the user is familiar with the printer.

PPMENU is useful to configure the printer to suit the requirements of user’s computer, software, and documents to be printed.

The parameters changed using PPMENU affect page layout, font, and printer control. If software programs have printer drivers, the printer drivers control these parameters for the user. The user may never need to change the settings manually using PPMENU.

To use PPMENU, the computer and its operating environments must be as follows:

- IBM PC/AT or compatible or PS/2
- PC DOS 5.02, MS-DOS 3.3, or higher or
  Windows 3.X or Windows 95 in DOS full screen mode
- VGA (640 x 480 dots) or higher display
- Hard disk drive installed (1 MB essential for PPMENU)
- CD-ROM drive

Main Menu and Menu Bar Functions

The PPMENU’s main menu offers functions to select print options for user documents. It also offers an operation guide of some keys and a help message line. If the printer is not ready or has an error, a status message is displayed.

The top menu bar offers the three pull-down menus: library, special, and options. The user can select parameter options or perform a function by using the main menu and top menu bar accessed through the mouse or keyboard.

One of the six languages is selectable for messages when installing PPMENU.

The following shows the structure of the menus in PPMENU. An asterisk (*) indicates a default option.

- Main menu
  - Page Format
    - Copies – 1* to 999
    - Paper – A4* (Europe), A5, Letter* (USA), Legal, Executive, COM-10, DL, Monarch, B5, C5
    - Orientation – Portrait* or Landscape
    - Form Lines – 60* (USA), 64* (Europe), or 5 to 128
    - Paper Source – Tray 1*, Manual Feed, Tray 2, MFF, Auto (tray 1 not used), Auto (tray 2 not used), Auto (MFF not used), Auto (all select)
    - Page Protect – Auto*, On
    - Duplex Mode – On or Off*
    - Binding – Short Edge or Long Edge*
  - Font Settings
    - Typeface – CourierMd*, MorrisonRg, Taurus, etc.
    - Font Source – Internal*, Soft Font, SIMM Font
    - Pitch – 10.00* or 0.44 to 99.99 (0.01 increments)
    - Point Size – 12.00* or 4.00 to 999.75 (0.25 increments)
    - Symbol Set – Roman 8*, PC–8, etc...
    - Courier Style – Regular* or Dark
  - Print Quality
    - Smoothing – 1200 dpi Class* or Off (Resolution is 600 dpi)
    - Smoothing – On* or Off (Resolution is 300 dpi)
    - Resolution – 300 or 600*
    - Economy Mode – On or Off*
    - Thick Paper – On or Off*
  - SEND
  - EXIT

- Menu Bar
  - Library
    - Read User Settings
    - Read Default Settings
    - Save Current Settings
    - Upload
    - Send
    - Exit
  - Special
    - Personality Setting – Auto*, PCL, FPS
    - Print Report – Self Test Report or Font List Report
    - Clear Warning – Print Unit
    - FPS Related Settings – Jam Recovery: On or Off*
    - FPS Related Settings – PS Error Report: On or Off*
    - Auto Continue – On or Off*
    - PCL Menu – Top Offset: 0.0* or –25.0 to +25.0 mm (0.1 mm increments)
    - PCL Menu – Left Offset: 0.0* or –25.0 to +25.0 mm (0.1 mm increments)
    - PCL Menu – A4 Print Width: Normal* or 80 Columns/Line
    - PCL Menu – Auto Attach FF: No* or Yes
    - PCL Menu – Auto CR: LF* or LF+CR
    - PCL Menu – Auto LF: CR* or CR+LF
    - Power Save – Off, After 15minutes*, After 30minutes, After 60minutes, After 120minutes
  - Option
    - Interface Settings – I/O Timeout: 15* to 300 seconds
    - Interface Settings – Baud Rate: 19200, 9600*, 4800, 2400, 1200
    - Interface Port Select – Parallel Interface: LPT1*, LPT2, LPT3
    - Interface Port Select – Serial Interface: COM1* or COM2
  - Help
    - General Information
    - Keyboard Layout
    - Help Index
    - How to Use the Mouse
    - About

4.3 Printer Drivers

Printer driver is a software acting under MS-Windows 3.1, 95, NT 3.51, or NT 4.0 and provides the printer with the information which can be read by the printer. Internal values of printer environments can be specified by the printer driver, and the user can specify paper size, resolution and/or other selectable values.

To use the printer driver, the computer and its operating environments must be as follows:

- IBM PC/AT or compatible
- Microsoft Windows 3.1, 95, NT 3.51, or NT 4.0
- VGA (640 x 400) or higher display
- Hard disk drive installed (2 MB essential for a printer driver)
- 3.5” double-sided high density (2HD) floppy disk drive or CD-ROM drive

The PrintPartner 16DV and 16ADV come with the following printer drivers:

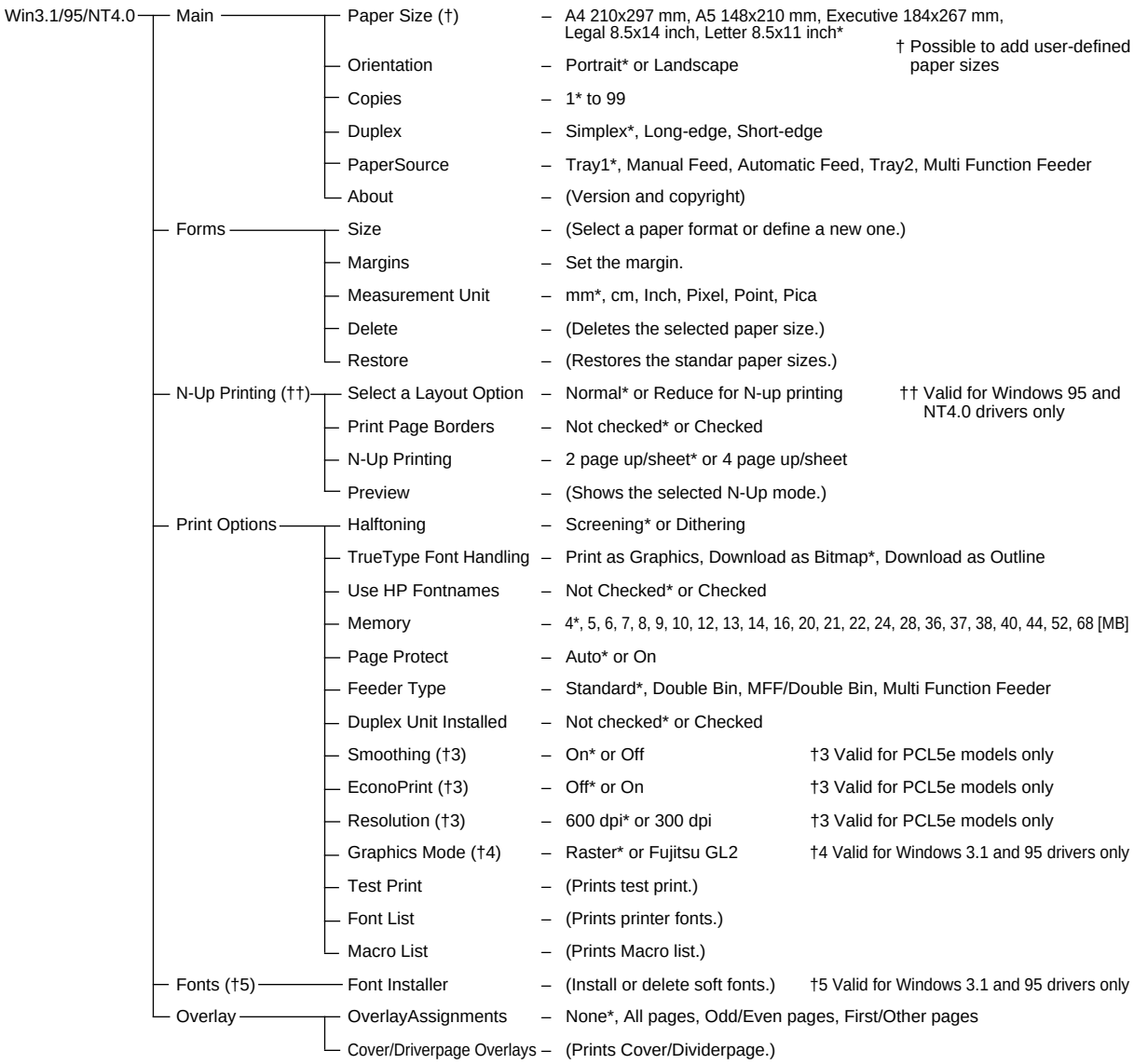
- Standard drivers for Windows 3.1
- Standard drivers for Windows 95
- Standard drivers for Windows NT 3.51
- Standard drivers for Windows NT 4.0

In addition, the PrintPartner 16ADV comes with the following printer drivers:

- FPS drivers for Windows 3.1
- FPS drivers for Windows 95
- FPS drivers for Windows NT 3.51
- FPS drivers for Windows NT 4.0

This section shows the settings of each driver. An asterisk (*) indicates a default option.

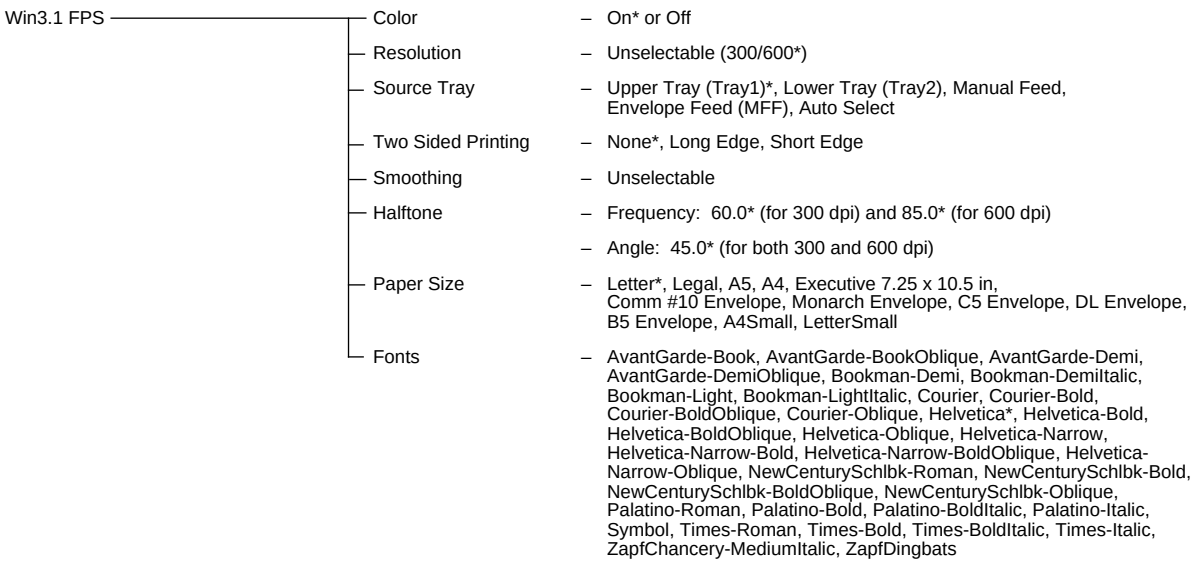
4.3.1 Standard printer drivers for Windows 3.1, 95, and NT 4.0



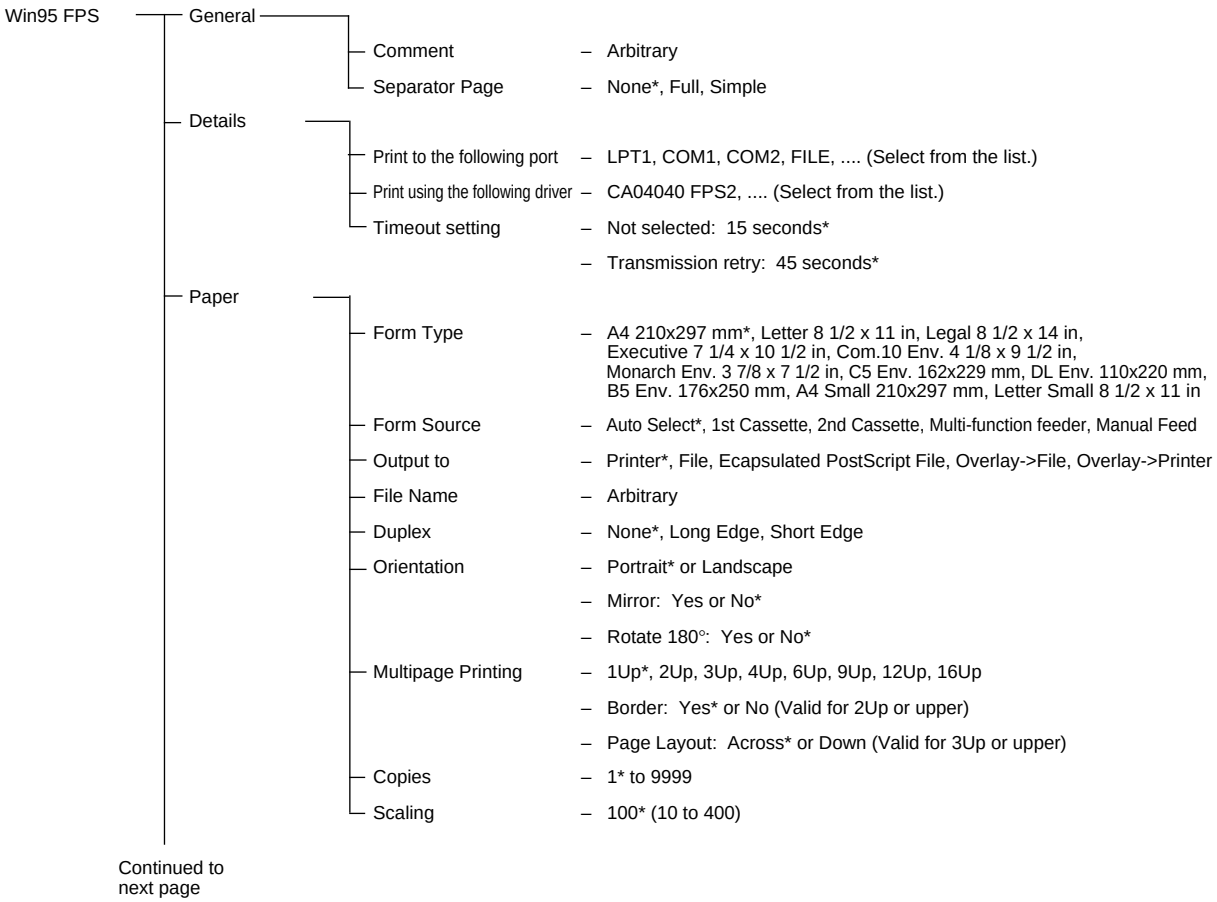
4.3.2 Standard printer drivers for Windows NT 3.51

- WinNT3.51
  - Printer Setup
    - Source – Auto*, Tray1, Tray2, MFF (MultiFunction Feeder), Manual Feed
    - Name – (None), Letter*, Letter Small, Legal, Executive, A4, A4 Small, Note, Envelope #10, Envelope DL, Envelope C5, Envelope B5, Envelope Monarch
    - Amount (Kilobytes) – 4096*, 5120, 6144, 7168, 8192, 9216, 10240, 12288, 13312, 14336, 16384, 20480, 21504, 22528, 24576, 28672, 36864, 37888, 38912, 40960, 45056, 53248, 69632
    - Page Protect – Not checked* or Checked
  - Device Color/Halftone Properties
    - Halftone Pattern – 2x2, 2x2 Enhanced, 4x4, 4x4 Enhanced, 6x6, 6x6 Enhanced*, 8x8, 8x8 Enhanced, 10x10, 10x10 Enhanced, 12x12, 12x12 Enhanced, 14x14, 14x14 Enhanced, 16x16, 16x16 Enhanced
    - Device Gamma – 1.0000* (0.1344 to 6.5000)
    - Pixel Diameter – DEVICE* (191.0% ~ 1/900", 384.6% ~ 1/900", 576.9% ~ 1/900", 769.2% ~ 1/900", 967.7% ~ 1/900", 1153.8% ~ 1/900", 1363.6% ~ 1/900", 1578.9% ~ 1/900")
    - Luminance (CIE Y) – 100.00* (25.00 to 400.0)
  - Document Properties
    - Form – Letter*, Letter Small, Legal, Executive, A4, A4 Small, Note, Envelope #10, Envelope DL, Envelope C5, Envelope B5, Envelope Monarch
    - Orientation – Portrait* or Landscape
    - Copies – 1* to 99
    - Two Sided Operation – None*, Long side, Short side
  - Advanced Document Properties
    - Graphics Resolution – 600 dots per inch*, 300 dots per inch, 150 dots per inch, 75 dots per inch,
    - Media Type – Auto (All Select)*, Auto (Tray1 not used), Auto (Tray2 not used), Auto (MFF not used), No Auto feed
    - Color – Monochrome* (fixed)
    - Scan for Rules – Not checked or Checked*
    - Print Text as Graphics – Not checked* or Checked
  - Halftone Color Adjustment
    - Contrast – 0* (-100 to +100)
    - Brightness – 0* (-100 to +100)
    - Dark Picture – Not checked* or Checked
    - Negative – Not checked* or Checked
    - Linear=1.0 – Not checked* or Checked
    - Red – Not checked or Checked (1.000)*
    - Green – Not checked or Checked (1.000)*
    - Blue – Not checked or Checked (1.000)*
    - Black Ref – 0.000* to 0.400
    - White Ref – 0.600 to 1.000*
    - Picture – 1 Reference Colors, 2 RGB Test Colors*, 3 NTSC Color Bar
    - View – Not checked or Checked*
    - Maximize – Not checked* or Checked
    - Palette – Not checked* or Checked
    - Scale – Not checked or Checked*
    - Flip X – Not checked* or Checked
    - Flip Y – Not checked* or Checked

4.3.3 FPS printer drivers for Windows 3.1



4.3.4 FPS printer drivers for Windows 95



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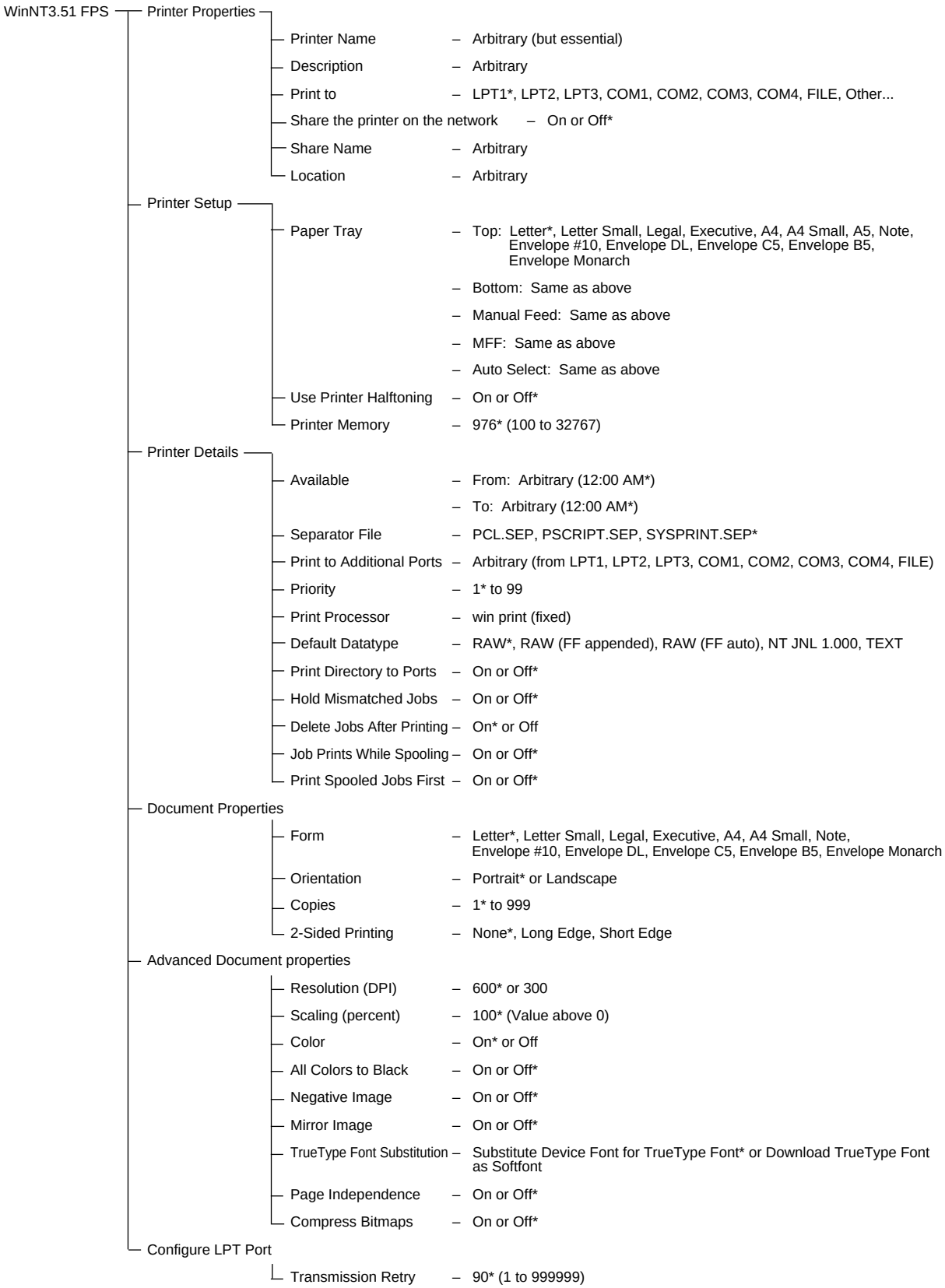
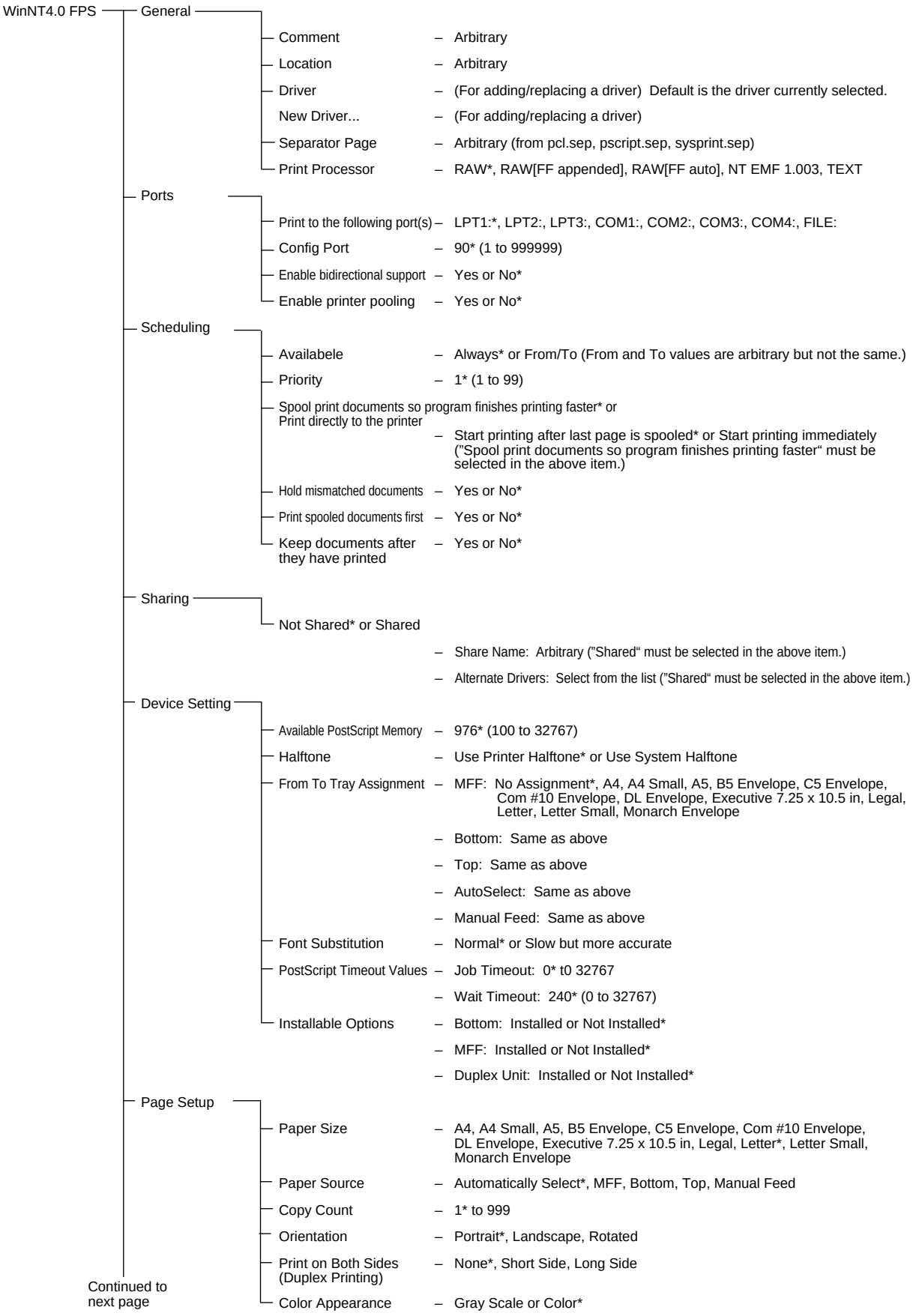
- Graphics
  - Resolution – 600dpi* or 300 dpi
  - Halftone – Use Printer Settings* or Use Settings Below
    - Frequency: 85.0* (Valid when “Use Settings Below” is selected)
    - Angle: 45.0* (Valid when “Use Settings Below” is selected)
  - Graphics Effects – Negative Page: Yes or No*
    - Negative Image Only: Yes or No*
    - All Colors to Black: Yes or No*
    - Image Smoothing: Yes or No*
  - Fill Resolution – Course or Fine*
- Features
  - Printer Features – Features: EconomyMode and FEIT
    - Current Feature Settings: Printer Setting*, Off, On (for each feature)
  - Installable Printer Options – Options: 2nd Cassette, Multi-function Feeder, and Duplexer
    - Current Option Settings: Installed or Not installed* (for each option)
  - Virtual Memory (KB) – 1800* (0 to 32,000)
- PostScript
  - Data Compression – None, Medium, High*
  - Header – Download with Each Job: Yes* or No
  - Binary Data – Send as Tagged Binary or Send as Ascii85*
  - Print PostScript Error Information – Yes or No*
  - Clear Memory per Page – Yes or No*
  - Send Ctrl+D at Start of Job – Yes or No*
  - Send Ctrl+D at End of Job – Yes* or No
- Fonts
  - TrueType Fonts – Send to Printer as: Adobe Type 1* or Bitmap (Type 3)
    - Use Printer Fonts for All TrueType Fonts: Yes or No*
    - Use Substitution Table: Yes* or No
  - Font Substitution Table – For Truetype Font: (Select from the list.)
    - Use Printer Font: (Select from the list.)
- Overlays
  - Overlay/Simple Text Order – First Page/Other Pages* or Odd Pages/Even Pages
  - Overlay Selections – First Page: (None*)
    - Other Pages: (None*)
    - Odd Pages: (None*)
    - Even Pages: (None*)
    - Bottom* or Top
  - Simple text Selections – First Page: (None*)
    - Other Pages: (None*)
    - Odd Pages: (None*)
    - Even Pages: (None*)
    - Bottom* or Top

4.3.5 FPS printer drivers for Windows NT 3.51



4.3.6 FPS printer drivers for Windows NT 4.0



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- Advanced
  - Paper Size – A4, A4 Small, A5, B5 Envelope, C5 Envelope, Com #10 Envelope, DL Envelope, Executive 7.25 x 10.5 in, Legal, Letter*, Letter Small, Monarch Envelope
  - Orientation – Portrait*, Landscape, Rotated
  - Paper Source – Automatically Select*, MFF, Bottom, Top, Manual Feed
  - Copy Count – 1* to 999
  - Print on Both Sides (Duplex Printing) – None*, Short Side, Long Side
  - Color Appearance – Gray Scale or Color*
  - Resolution – 600* or 300
  - Scaling – 100* (1 to 1000)
  - TrueType Font – Substitute with Device Font* or Downloaded as Softfont
  - Metafile Spooling – Enable or Disable*
  - PostScript Options – Mirrored Output: Yes or No*
    - Negative Output: Yes or No*
    - Page Independence: Yes or No*
    - Compress Bitmaps: Yes* or No
    - Generated Job Control Code: Yes* or No
    - Send CTRL-D Before Each Job: Yes or No*
    - Send CTRL-D After Each Job: Yes* or No
  - Printer Features – None

CHAPTER 5 INTERFACE INFORMATION

5.1 Overview

The PrintPartner 16DV/ADV printer communicates with the host through two parallel interfaces and a serial interface or an optional interface. The printer automatically selects the interface proper to the occasion. This chapter describes the parallel and serial interfaces. For locations of the parallel and serial interface connectors and the optional interface's slot, see Figure 1.3.

5.2 Parallel Interface (IEEE 1284-B Connector)

The parallel interface is a bidirectional Centronics interface (nibble mode of the IEEE 1284 standard is supported).

5.2.1 Hardware requirements

Signal levels: TTL-compatible
0.0 to +0.4 V for low-level
+2.4 to +5.0 V for high-level

Input circuit: SN74LS14 or equivalent
Figure 5.1 shows the parallel interface input circuit.

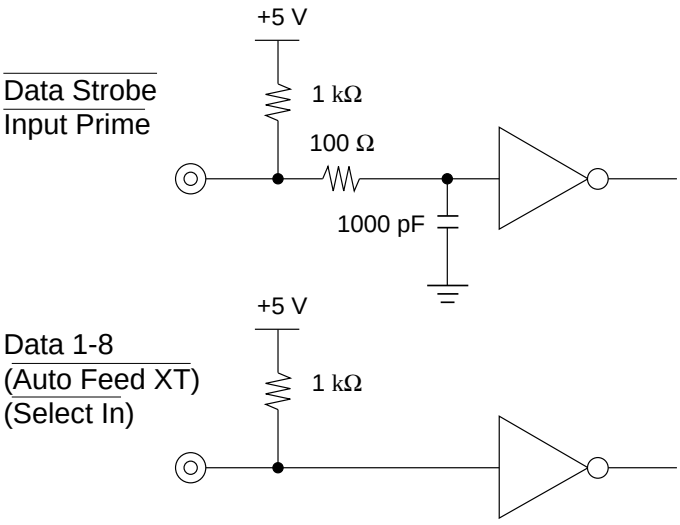


Figure 5.1 Parallel interface input circuit

Output circuit: SN74LS06 or equivalent

Figure 5.2 shows the parallel interface output circuit.

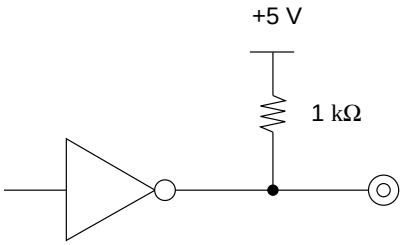


Figure 5.2 Parallel interface output circuit

5.2.2 Connector pin assignment

Connector (cable side): Shielded plug

Amphenol DDK57FE-30360 or equivalent

Figure 5.3 shows the parallel interface connector.

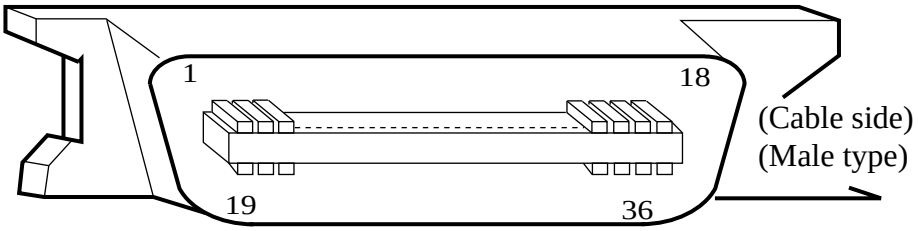


Figure 5.3 Parallel interface connector (IEEE1284-B)

Signal definition:

Table 5.1 lists parallel interface signals and their functions.

Table 5.1 Parallel interface signals

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
1	19	$\overline{\text{Data Strobe}}$ ($\overline{\text{DSTB}}$)	Input	• Strobe pulse for reading data (Data 1 to Data 8). The printer reads data when this signal is low. • The pulse width must be 0.5 μs or more at the printer's receiving terminal.
		Host Clock		This signal is set high when the host requests the reverse data transfer phase (nibble mode).

Table 5.1 Parallel interface signals (continued)

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
2 3 4 5 6 7 8 9	20 21 22 23 24 25 26 27	Data 1 Data 2 Data 3 Data 4 Data 5 Data 6 Data 7 Data 8	Input Input Input Input Input Input Input Input	• Data 1 to Data 8 signals correspond to parallel data bits 1 to 8. • Data 8 is the most significant bit. • All signals must go high at least 0.5 µs before the falling edge of the $\overline{\text{Data Strobe}}$ signal, and must stay high for at least 0.5 µs after the rising edge.
10	28	$\overline{\text{Acknowledge}}$ ($\overline{\text{ACK}}$)	Output	• Pulse signal indicating data reception completed (or data reception enabled) status • Issued when the printer switches from offline to online
		Printer Clock		Reverse data transfer phase: This signal goes high when data being sent to the host is established. Reverse idle phase: This signal is set low then goes high to interrupt the host, indicating that data is available.
11	29	Busy	Output	Data cannot be received when this signal is high, e.g., if the buffer is full or an error occurs.
		Printer Busy		Reverse data transfer phase: Data bit 3, data bit 7, then forward path (host to printer) busy status
12	28	Paper Empty (PE)	Output	This signal goes high if paper runs out.
		Ack Data Req		Reverse data transfer phase: Data bit 2, then data bit 6 Reverse idle phase: This signal is set high until the host requests data and, after that, follows the Data Available signal.
13	28	Select (SLCT)	Output	This signal goes high when the printer is selected (online), and goes low when the printer is deselected (offline).
		X Flag		Reverse data transfer phase: Data bit 1, then data bit 5
14	30	$\overline{\text{Auto Feed XT}}$	Input	Reserved (*1)
		Host Busy		Reverse data transfer phase: This signal is set low when the host can receive data, and goes high when the host has received data. Following a reverse data transfer, the interface enters the reverse idle phase when the Host Busy signal goes low and the printer has no data. Reverse idle phase: This signal goes high when the Printer Clock signal goes low so that the interface re-enters the reverse data transfer phase. If it goes high with the 1284 Active signal low, the 1284 idle phase is aborted and the interface returns to the compatibility mode.

Table 5.1 Parallel interface signals (continued)

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
15	–	–	–	Not used
16	–	Signal Ground (SG)	–	Logic ground level (0 V)
17	–	Frame Ground (FG)	–	Printer chassis ground line FG and SG are connected.
18	–	–	–	Not used
19 to 30	–	Signal Ground (SG)	–	Twisted-pair return lines
31	30	$\overline{\text{Input Prime}}$ ($\overline{\text{IN PRM}}$)	Input	Reserved (*1)
32	29	$\overline{\text{Fault}}$	Output	This signal goes low under the following printer conditions: (1) Offline (2) Paper out (3) Cover open (4) Other printer error
		$\overline{\text{Data Available}}$		Reverse data transfer phase: This signal is set low when the printer is ready to send data to the host. During the data transfer, it is used as data bit 0 (LSB), then data bit 4. Reverse idle phase: This signal is used to indicate that data is available.
33	–	–	–	Not used
34	–	–	–	Not used
35	–	+5 V	Output	Pulled up to +5 V through a 1.0 kΩ resistor
36	30	($\overline{\text{Select In}}$)	Input	Reserved (*1)
		1284 Active		This signal goes high to cause the printer to enter the reverse data transfer phase (nibble mode).

*1 Assigned as a signal name, without any function.

Notes:

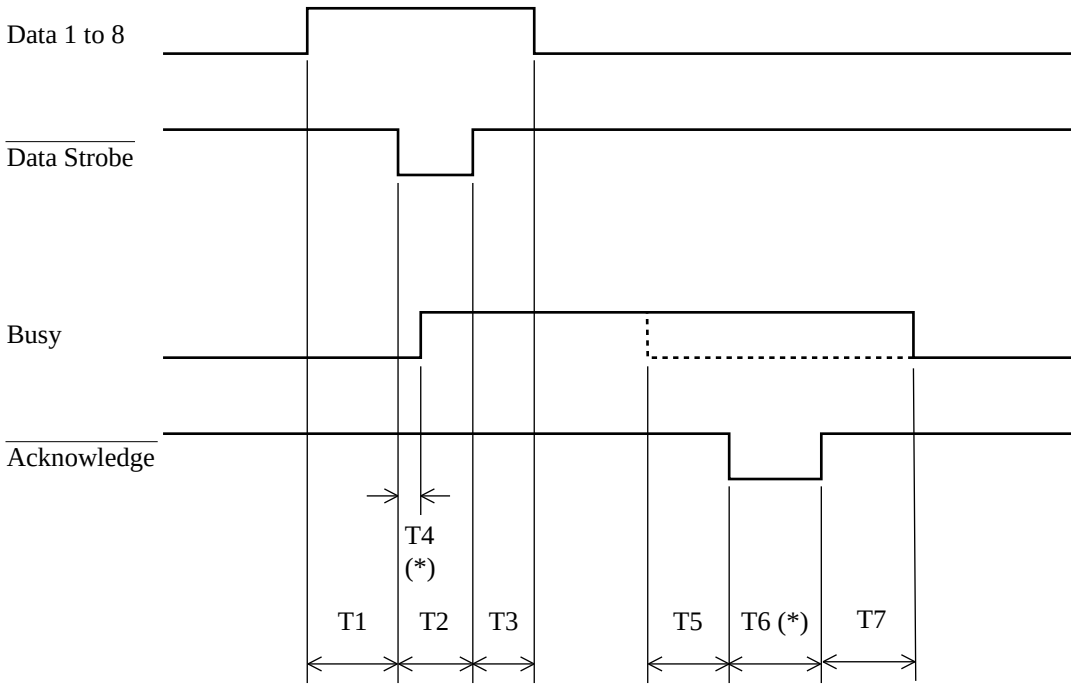
1. Left-aligned signal names are in compati mode and right-aligned ones are in nibble mode.
2. The direction (input and output) refers to the printer.
3. Return line: Twisted-pair return line connected to the signal ground level

5.2.3 Data transmission timing

The PrintPartner 16DV/ADV uses a bi-directional parallel interface complying with IEEE 1284. This interface is also compatible with the conventional Centronics interface. Data transfer from host to printer is performed according to Centronics standard, called compatible mode. Data transfer from printer to host is performed according to the IEEE 1284 standard, called nibble mode.

In compatible mode, the printer receives data from the computer in handshaking mode based on the Busy and $\overline{\text{Acknowledge}}$ signals from the printer and the $\overline{\text{Data Strobe}}$ signal from the computer. For the $\overline{\text{Data Strobe}}$ and $\overline{\text{Acknowledge}}$ signals, the timing of the Busy signal must be as shown in the compatible mode of Figure 5.4a.

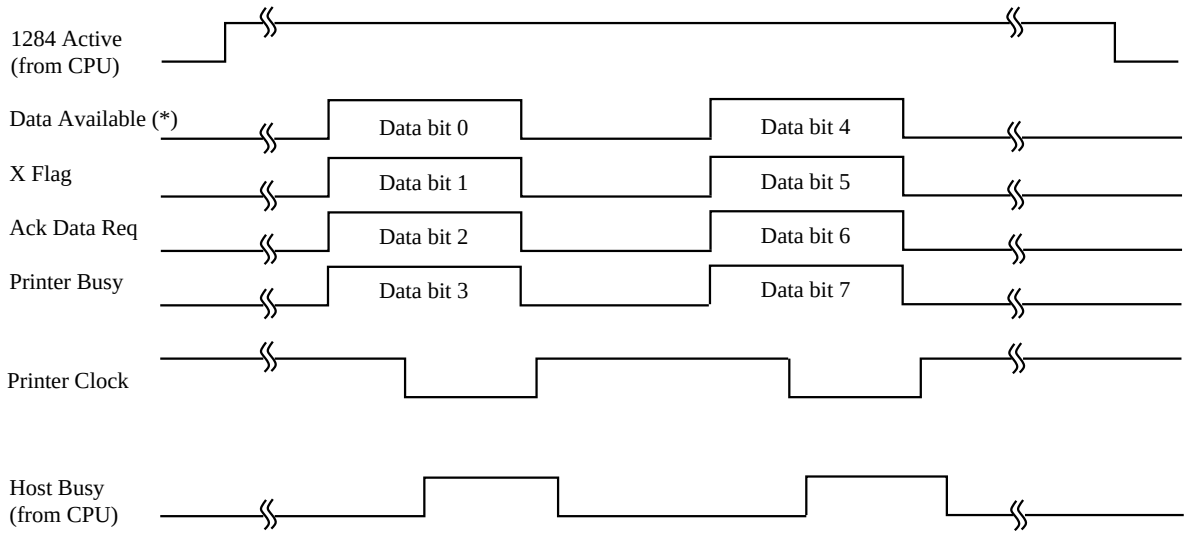
To send data from the printer to the host, the interface enters the nibble mode where data is sent in units of four bits (nibble) using four output signal lines as data paths. The data transfer sequence in nibble mode involves negotiation phase, reverse idle phase, reverse data transfer phase, and termination phase. Figure 5.4b shows the reverse data transfer phase where data is sent.



* The values of T4 and T6 are assumed that the host uses ITTL for its input circuits.

T1, T2, T3 > 0.5 µs
T4 < 0.5 µs (*)
T5, T7 = 0 µs
T6 = 0.5 µs (*)

Figure 5.4a Data transmission timing (compatible mode)



* $\overline{\text{Data Available}}$ is assigned for the cable.

Figure 5.4b Data transmission timing (nibble mode)

5.3 Parallel Interface (IEEE 1284-C Connector)

The parallel interface is a bidirectional Centronics interface (nibble mode of the IEEE 1284 standard is supported).

5.3.1 Hardware requirements

Signal levels: TTL-compatible
0.0 to +0.4 V for low-level
+2.4 to +5.0 V for high-level

Input circuit: SN74LS14 or equivalent
Figure 5.5 shows the parallel interface input circuit.

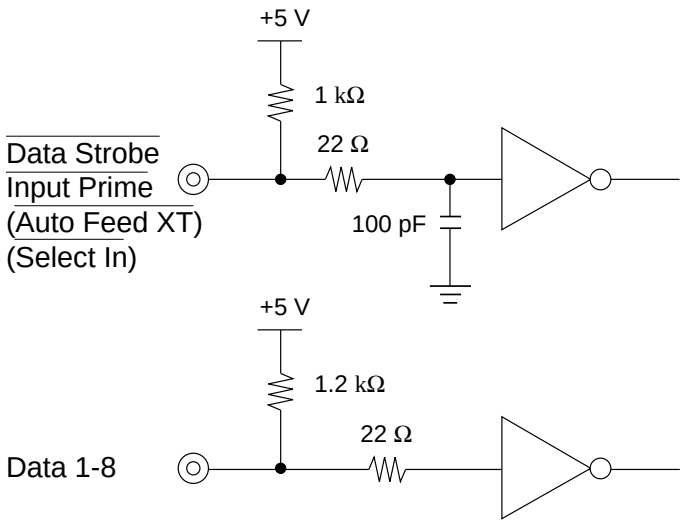


Figure 5.5 Parallel interface input circuit

Output circuit: SN74LS244 or equivalent
Figure 5.6 shows the parallel interface output circuit.

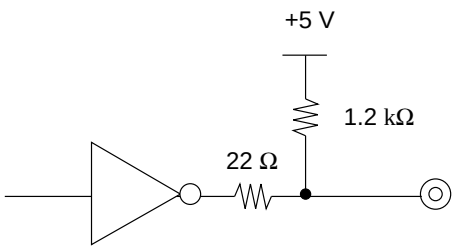


Figure 5.6 Parallel interface output circuit

5.3.2 Connector pin assignment

Connector (cable side): Shielded plug

MOLEX 52316-3611 (shielded cover kit with latches) or equivalent

Figure 5.7 shows the parallel interface connector.

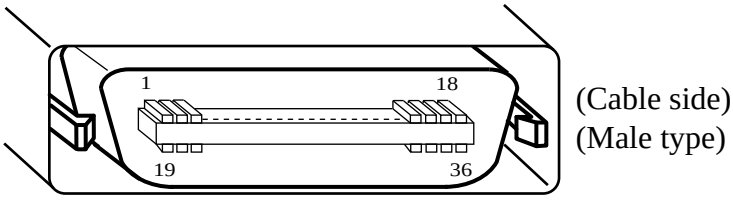


Figure 5.7 Parallel interface connector (IEEE1284-C)

Signal definition:

Table 5.2 lists parallel interface signals and their functions.

Table 5.2 Parallel interface signals

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
1	19	Busy	Output	Data cannot be received when this signal is high, e.g., if the buffer is full or an error occurs.
		Printer Busy		Reverse data transfer phase: Data bit 3, data bit 7, then forward path (host to printer) busy status
2	20	Select (SLCT)	Output	This signal goes high when the printer is selected (online), and goes low when the printer is deselected (offline).
		X Flag		Reverse data transfer phase: Data bit 1, then data bit 5
3	21	$\overline{\text{Acknowledge}}$ ($\overline{\text{ACK}}$)	Output	• Pulse signal indicating data reception completed (or data reception enabled) status • Issued when the printer switches from offline to online
		Printer Clock		Reverse data transfer phase: This signal goes high when data being sent to the host is established. Reverse idle phase: This signal is set low then goes high to interrupt the host, indicating that data is available.

Table 5.2 Parallel interface signals (continued)

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
4	22	$\overline{\text{Fault}}$	Output	This signal goes low under the following printer conditions: (1) Offline (2) Paper out (3) Cover open (4) Other printer error
		$\overline{\text{Data Available}}$		Reverse data transfer phase: This signal is set low when the printer is ready to send data to the host. During the data transfer, it is used as data bit 0 (LSB), then data bit 4. Reverse idle phase: This signal is used to indicate that data is available.
5	23	Paper Empty (PE)	Output	This signal goes high if paper runs out.
		Ack Data Req		Reverse data transfer phase: Data bit 2, then data bit 6 Reverse idle phase: This signal is set high until the host requests data and, after that, follows the Data Available signal.
6	24	Data 1	Input	• Data 1 to Data 8 signals correspond to parallel data bits 1 to 8. • Data 8 is the most significant bit. • All signals must go high at least 0.5 µs before the falling edge of the $\overline{\text{Data Strobe}}$ signal, and must stay high for at least 0.5 µs after the rising edge.
7	25	Data 2	Input	
8	26	Data 3	Input	
9	27	Data 4	Input	
10	28	Data 5	Input	
11	29	Data 6	Input	
12	30	Data 7	Input	
13	31	Data 8	Input	
14	32	$\overline{\text{Input Prime}}$ ($\overline{\text{IN PRM}}$)	Input	Reserved (*1)
15	33	$\overline{\text{Data Strobe}}$ ($\overline{\text{DSTB}}$)	Input	• Strobe pulse for reading data (Data 1 to Data 8). The printer reads data when this signal is low. • The pulse width must be 0.5 µs or more at the printer's receiving terminal.
		Host Clock		This signal is set high when the host requests the reverse data transfer phase (nibble mode).
16	34	($\overline{\text{Select In}}$)	Input	Reserved (*1)
		1284 Active		This signal goes high to cause the printer to enter the reverse data transfer phase (nibble mode).

Table 5.2 Parallel interface signals (continued)

Connector pin number	Return line pin number	Signal Compati mode Nibble mode	Direction	Description
17	35	$\overline{\text{Auto Feed XT}}$	Input	Reserved (*1)
		Host Busy		Reverse data transfer phase: This signal is set low when the host can receive data, and goes high when the host has received data. Following a reverse data transfer, the interface enters the reverse idle phase when the Host Busy signal goes low and the printer has no data. Reverse idle phase: This signal goes high when the Printer Clock signal goes low so that the interface re-enters the reverse data transfer phase. If it goes high with the 1284 Active signal low, the 1284 idle phase is aborted and the interface returns to the compatibility mode.
18	–	–	Input	Host Logic High
19 to 35	–	Signal Ground (SG)	–	Twisted-pair return lines
36	–	–	Output	Peripheral Logic High

*1 Assigned as a signal name, without any function.

Notes:

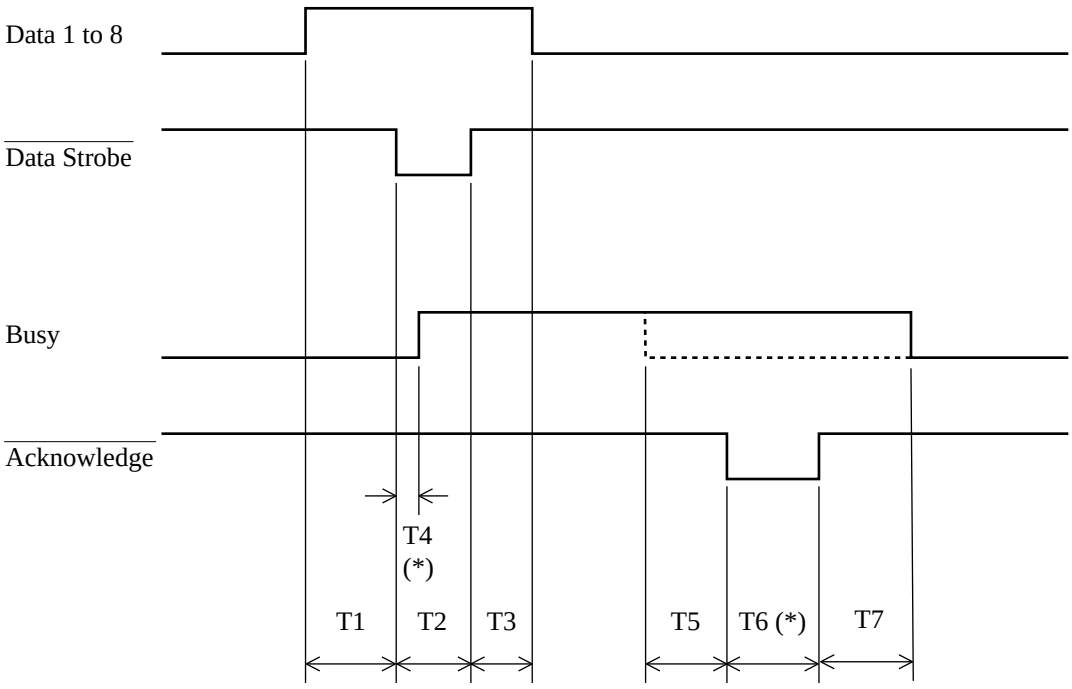
1. Left-aligned signal names are in compati mode and right-aligned ones are in nibble mode.
2. The direction (input and output) refers to the printer.
3. Return line: Twisted-pair return line connected to the signal ground level

5.3.3 Data transmission timing

The PrintPartner 16DV/ADV uses a bi-directional parallel interface complying with IEEE 1284. This interface is also compatible with the conventional Centronics interface. Data transfer from host to printer is performed according to Centronics standard, called compatible mode. Data transfer from printer to host is performed according to the IEEE 1284 standard, called nibble mode.

In compatible mode, the printer receives data from the computer in handshaking mode based on the Busy and $\overline{\text{Acknowledge}}$ signals from the printer and the $\overline{\text{Data Strobe}}$ signal from the computer. For the $\overline{\text{Data Strobe}}$ and $\overline{\text{Acknowledge}}$ signals, the timing of the Busy signal must be as shown in the compatible mode of Figure 5.8a.

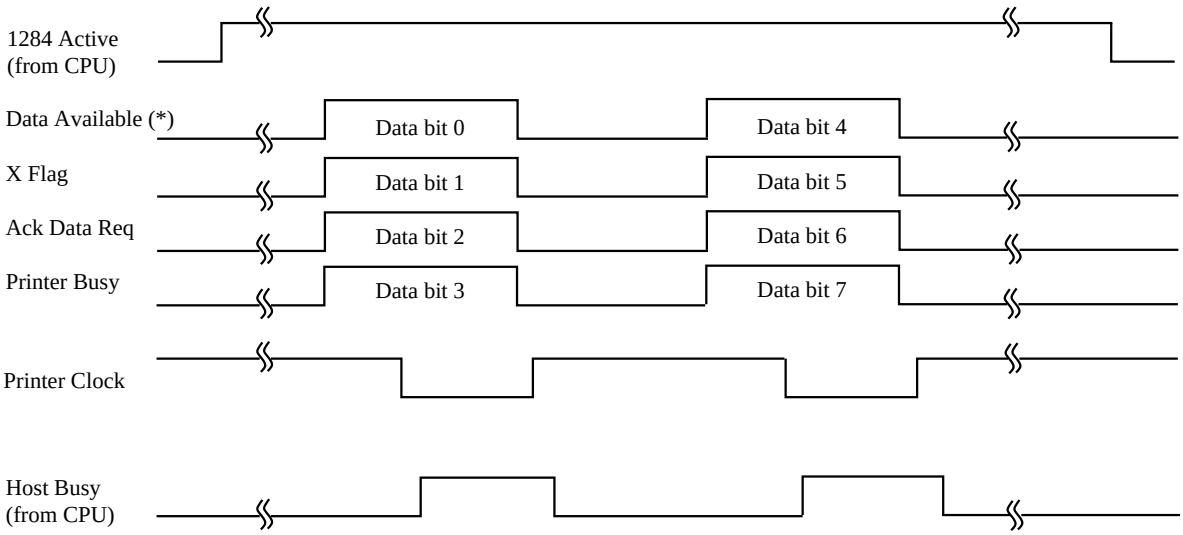
To send data from the printer to the host, the interface enters the nibble mode where data is sent in units of four bits (nibble) using four output signal lines as data paths. The data transfer sequence in nibble mode involves negotiation phase, reverse idle phase, reverse data transfer phase, and termination phase. Figure 5.8b shows the reverse data transfer phase where data is sent.



* The values of T4 and T6 are assumed that the host uses ITTL for its input circuits.

T1, T2, T3 > 0.5 µs
T4 < 0.5 µs (*)
T5, T7 = 0 µs
T6 = 0.5 µs (*)

Figure 5.8a Data transmission timing (compatible mode)



* $\overline{\text{Data Available}}$ is assigned for the cable.

Figure 5.8b Data transmission timing (nibble mode)

5.4 RS-232C Serial Interface

The RS-232C serial interface is a standard interface of this printer.

5.4.1 Hardware requirements

Signal levels:

–3 V or lower for a mark condition (logical 1)
+3 V or higher for a space condition (logical 0)

Input circuit:

An MC1489AL or equivalent is used to convert from the RS-232C level to the TTL level.

Figure 5.9 shows the RS-232C interface input circuit.

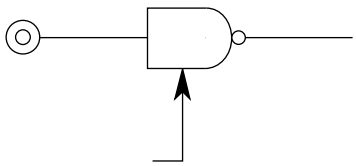


Figure 5.9 RS-232C interface input circuit

Output circuit:

An MC1488L or equivalent is used to convert from the TTL level to the RS-232C level.
A 1000-pF capacitor suppresses noise on the output signal line.

Figure 5.10 shows the RS-232C interface output circuit

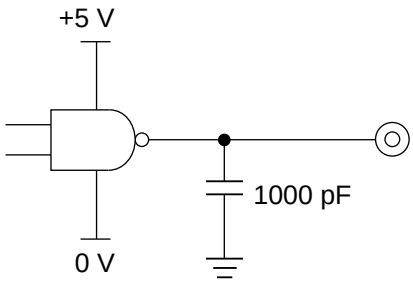


Figure 5.10 RS-232C interface output circuit

5.4.2 Connector pin assignment

Connector (cable side):

D-subminiature Cannon or Cinch DB-9 plug or an equivalent connector that conforms to EIA standards

Figure 5.11 shows the serial interface connector.

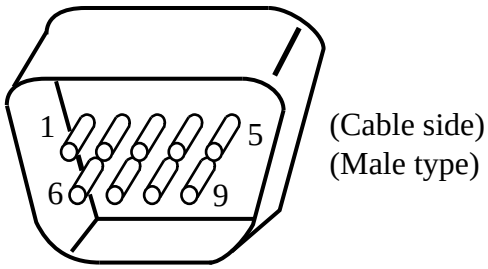


Figure 5.11 Serial interface connector

Signal definition:

Table 5.3 lists RS-232C interface signals and their functions.

Table 5.3 RS-232C interface signals

Pin number	Signal name	Direction	Description
1	RTS	Output	Request to Send Space state when the printer is ready to transmit data
2	TD	Output	Transmitting Data
3	RD	Input	Receiving Data
4	DSR	Input	Data Set Ready The printer can receive or transmit data when this signal is in the space state.
5	SG		Signal Ground (common return)
6, 8	DTR	Output	Data Terminal Ready Space state when the printer is ready to receive or transmit data

Notes:

1. The space state corresponds to the high level of the interface signal.
2. The direction (output or input) is viewed from the printer side.

5.4.3 Serial data format

The format of 10-bit or 11-bit serial data, given in Figure 5.12, consists of a start bit, data bits, a parity bit, and stop bits. A bit is in the mark state when not being transmitted. Data bits start with the least significant bit (LSB). For example, the character “K” (hexadecimal 4B) is transmitted as shown in Figure 5.12 (7 data bits, even parity).

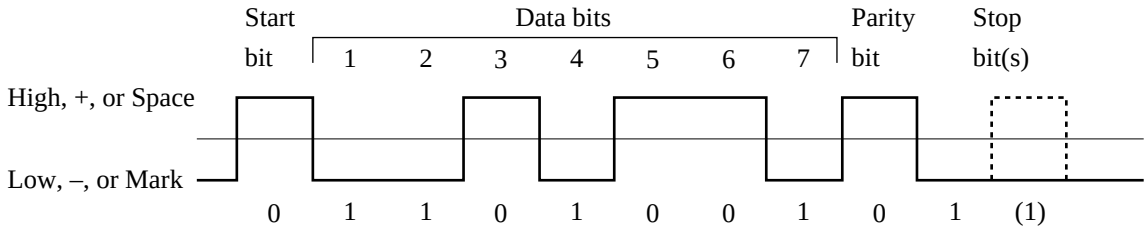


Figure 5.12 RS-232C data format

5.4.4 Cable connection diagrams

The connector at the printer side is a 9-pin type. The connector at the computer side is a 9-pin type or a 25-pin type.

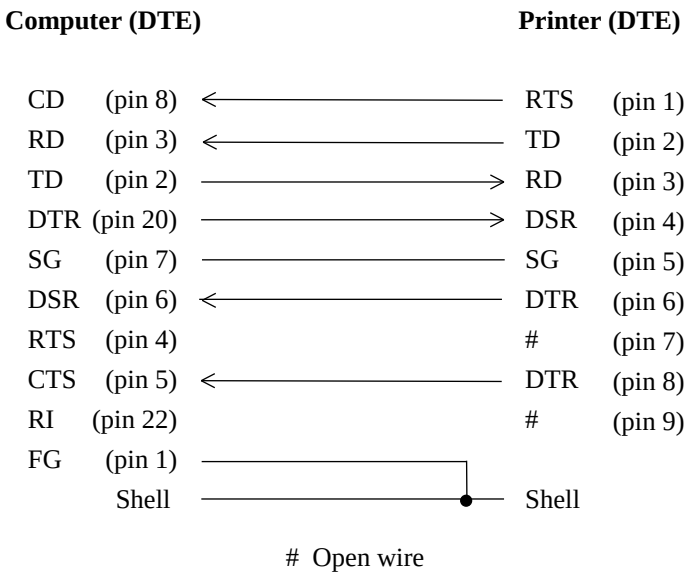


Figure 5.13a Example of RS-232C cable wiring (25-pin connector at computer side)

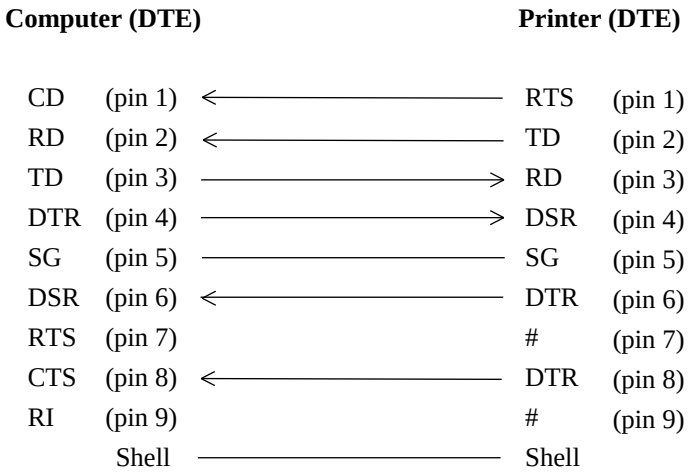


Figure 5.13b Example of RS-232C cable wiring (9-pin connector at computer side)

5.4.5 Data protocols

Different types of protocols are used for the RS-232C serial interface, depending on the computer manufacturer. These protocols prevent the print data receive buffer from overflowing because interface data transmission is faster than buffer data printing. The printer uses specific character codes or an interface signal for each protocol to inform the computer of the buffer status, as follows:

(1) X-ON/X-OFF or DC1/DC3 protocol

With either protocol, the XOFF (DC3) code (hexadecimal 13) is transmitted from the printer when less than 255 bytes of buffer space remains. The XON (DC1) code (hexadecimal 11) is transmitted when less than 255 bytes of data remains in the buffer.

Normal data processing cannot be guaranteed if data is transmitted to the printer when insufficient buffer space is available after the XOFF code has been transmitted.

When the printer is first turned on, the DTR signal is set to the space state (ready) and an XON (DC1) code is transmitted from the printer. When the printer is placed offline, the XOFF code is transmitted even if the buffer is not full. The XON code is transmitted when the printer is placed online again.

(2) DTR protocol

The DTR signal is set off (low). That is, the Busy signal is issued when 255 bytes of data remain in the buffer. When the printer is placed offline, the DTR signal is set off (low).

Transmission must stop within 255 bytes after the DTR signal is set off (low).

The validity of data cannot be guaranteed if data exceeding the buffer capacity is transmitted regardless of the DTR signal.

Buffer-full recovery timing:

Data transmission is suspended while the DTR signal is set off (low), but printing continues. When the buffer empty area exceeds 255 bytes, the DTR signal is set on (high) indicating that the printer is ready to accept data.

5.5 Command Sets

5.5.1 Printer emulation

This section gives an overview of the Hewlett-Packard LaserJet 5 command set and the PostScript level 2 command set. The former is the resident emulation of the PrintPartner 16DV and 16ADV. The latter is the resident emulation of the PrintPartner 16ADV, but an optional emulation of the PrintPartner 16DV. This section does not provide the command details and programming examples needed to modify software packages or write user programs.

The printer automatically senses the proper emulation. Either emulation can be set by the menu mode (config menu, personality item) of the control panel, according to the table shown below.

Printer emulation	Option to be selected in menu mode
HP LaserJet 5 (PCL6)	PCL
PostScript level 2 (optional for PP16DV)	FPS

When a new emulation is selected, the printer initializes control information on printer features. All downloaded fonts and page format data are lost.

The following section (5.5.2) lists commands available in the HP LaserJet 5 emulation.

5.5.2 HP LaserJet 5 command set summary

5.5.2.1 HP LaserJet 5 PCL mode

The printer responds to all HP LaserJet 5 control codes and escape sequences the same way as the native printer. The following listing is in command level sequence:

Control code	**Description**
BS	Backspace. Move the cursor left one column (HMI).
HT	Horizontal tabulation. Move the cursor to the next horizontal tab stop.
LF	Line feed. Move down the cursor one line (VMI).
FF	Form feed. Print the current page and move the cursor to the top of the next page.
CR	Carriage return. Move the cursor to the left margin of the current line.
SO	Shift out. Select the secondary font.
SI	Shift in. Select the primary font.
ESC	Begin an escape sequence.
SP	Space. Move the cursor right one column (HMI).

Level 1 escape code	**Description**
ESC 9	Clear left and right margins.
ESC E	Reset all settings to the defaults and set the PCL mode.
ESC =	Half line feed. Move down the cursor half a line.
ESC Y	Display functions mode on. Print all codes received.
ESC Z	Display functions mode off
ESC z	Start the self test function. It is ignored by this printer.

Level 2 escape code	**Description**
ESC (# @	Select a symbol set or font attributes for the primary font. (#: 0 or 1=default symbol set, 2=current primary symbol set, 3=default font's attributes)
ESC (# Z_n	Select a symbol set for the primary font. (#Zn: symbol set ID; #: 0 to 2047, Zn: A-Z, [, \,], and ^)
ESC (# X	Select the primary font by the font ID. (#: font ID; 0 to 32767)
ESC) # @	Select a symbol set or font attributes for the secondary font. (#: 0=default symbol set, 1=default primary symbol set, 2=current primary symbol set, 3=default secondary font's attributes)
ESC) # Z_n	Select a symbol set for the secondary font. (#Zn: symbol set ID; #: 0 to 2047, Zn: A-Z, [, \,], and ^)
ESC) # X	Select the secondary font by the font ID. (#: font ID; 0 to 32767)

Level 3 escape code	Description
ESC & a # C	Move the cursor to the new column. (#: column number; plus signed=relatively right, minus signed=relatively left, no sign=absolutely from the left edge)
ESC & a # G	Feed paper.
ESC & a # H	Move the cursor to the new horizontal position. (#: 1/720" increments; plus signed=relatively right, minus signed=relatively left, no sign=absolutely from the left edge)
ESC & a # L	Set the left margin at column #. (Left edge=column 0)
ESC & a # M	Set the right margin at column #. (Left edge=column 0)
ESC & a # P	Rotate the printing direction. (#: 0 to 90 (<90)=0°, 90 to 180 (<180)=90°, 180 to 270 (<270)=180°, 270 or larger=270°)
ESC & a # R	Move the cursor to the new line. (#: row; plus signed=relatively downward, minus signed=relatively upward, no sign=absolutely from the top margin)
ESC & a # V	Move the cursor to the new vertical position. (#: 1/720" increments; plus signed=relatively downward, minus signed=relatively upward, no sign=absolutely from the top margin)
ESC & d # D	Auto underline on. (#: 0=fixed position, 3=floating position)
ESC & d # @	Auto underline off. (#: any value)
ESC & f # S	Store or recall (push or pop) the cursor position (#: 0=store the current position, 1=move to the last stored position)
ESC & f # X	Select a macro control function. (#: 0=start definition, 1=stop definition, 2=execute, 3=call, 4=enable auto overlay, 5=disable auto overlay, 6=delete all macros, 7=delete all temporary macros, 8=delete last ID macro, 9=make temporary, 10=make permanent)
ESC & f # Y	Specify a macro ID. (#: macro ID; 0 to 32767)
ESC & k # G	Specify the interpretation of line termination codes, CR, LF, and FF.

#	CR	LF/FF
0	—	—
1	Add LF	—
2	—	Add CR
3	Add LF	Add CR

ESC & k # H	Set the horizontal spacing (HMI). (#: 1/120" increments; 0-32767, 12=10 cpi) Select a font pitch for the primary and secondary fonts. (#: 0=10 cpi, 2=16.66 cpi, 4=12 cpi)
ESC & k # S	Set the pitch for the primary and secondary fonts (#: 0=10 cpi, 2=16.66 cpi)

ESC & L # A	Set the page size. (#: 1=executive, 2=letter, 3=legal, 26=A4, 80=letter (Manarch 7-3/4), 81=Business (Commercial 10), 90=International DL, 91=International C5, 100=International B5)
ESC & L # C	Set the vertical spacing (VMI). (#: 1/48" increments; 0 to 32767, 8=6 lpi)
ESC & L # D	Set the line spacing. (#: lines per inch; 1, 2, 3, 4, 6, 8, 12, (or 0), 16, 24, or 48)
ESC & L # E	Set the top margin, (#: lines)
ESC & L # F	Set the text length (#: lines)
ESC & L # H	Select a paper source. (#: 0=unchange, 1=bin 1, 2=manual feed slot, 3=manual feed slot for envelope, 4=bin 2, 254=auto select)
ESC & L # L	Perforation skip on/off. (#: 0=off, 1=on)
ESC & L # O	Set the page orientation. (#: 0=portrait, 1=landscape, 2=reverse portrait, 3=reverse landscape)
ESC & L # P	Set the page length. (#: lines; 63=Executive, 66=letter, 70=A4, 84=legal — with 6 lpi)
ESC & L # U	Move the long edge (left edge) of virtual physical paper. (#: 1/720" increments; -paper width ≤ # ≤ +paper width)
ESC & L # X	Set the number of copies for each page. (#: 1 to 32767)
ESC & L # Z	Move the short edge (top edge) of virtual physical paper. (#: 1/720" increments; -paper length ≤ # ≤ +paper length)
ESC & p # X < data >	Transparent print data. Print any characters even those allocated in the control character code area. (#: byte count of transparent print data)
ESC & R # F	Enable od disable accepting read data until printing the page data is finished. (#: 0=Flush all complete pages, 1=flush all pages)
ESC & s # C	End-of-line wrap on/off. (#: 0=on, 1=off)
ESC (f # W	Define symbol set. (#: 0 to 32767)
ESC (s # B	Set the stroke weight for the primary font. (#: -127 to 127 but available from -7 to +7; -7=ultra thin, -6=extra thin, -5=thin, -4=extra light, -3=light, -2=demi light, -1=semi light, 0=medium book or text, 1=semi bold, 2=demi bold, 3=-bold, 4=extra bold, 5=black, 6=extra black, 7=ultra black)
ESC (s # H	Set the pitch for the primary font. (#: cpi)
ESC (s # P	Set the spacing mode for the primary font. (#: 0=fixed, 1=proportional)
ESC (s # S	Set the style for the primary font. (#: 0 to 32767; 0=upright, 1=italic, 4=condensed, 5=condensed italic, 8=compressed or extra condensed, 24=expanded, 32=outlined, 64=inlined, 128=shadowed, 160=outlined shadowed)

ESC (s # T	Select a type face for the primary font. (#: 0 to 32767; 0 to 255 (one byte specification) and 256 to 32767 (two byte specification) One byte: 0=Line Printer, 1=Pica, 2=Elite, 3=Courier, 4=Helv, 5=Tms Rmn, 6=Letter Gothic, 7=Script, 8=Prestige, 9=Calson, 10=Orator, etc.) Two bytes: 4100=CG Triumvirat, 4101=CG Times, 4110=Futura 2, 4111=CG Palatino, 4112=ITC Souvenir, etc.)
ESC (s # V	Set the point size for the primary font. (#: points; 1 point is 1/72" height.)
ESC (s # W < data >	Download a character. (#: byte count of character header and character pattern data; 0 to 32767)
ESC) s # B	Set the stroke weight for the secondary font. (#: -127 to 127 but available from -7 to +7; -7=ultra thin, -6=extra thin, -5=thin, -4=extra light, -3=light, -2=demi light, -1=semi light, 0=medium book or text, 1=semi bold, 2=demi bold, 3=-bold, 4=extra bold, 5=black, 6=extra black, 7=ultra black)
ESC) s # H	Set the pitch for the secondary font. (#: cpi)
ESC) s # P	Set the spacing mode for the secondary font. (#: 0=fixed, 1=proportional)
ESC) s # S	Set the style for the secondary font. (#: 0 to 32767; 0=upright, 1=italic, 4=condensed, 5=condensed italic, 8=compressed or extra condensed, 24=expanded, 32=outlined, 64=inlined, 128=shadowed, 160=outlined shadowed)
ESC) s # T	Select a type face for the secondary font. (#: 0 to 32767; 0 to 255 (one byte specification) and 256 to 32767 (two byte specification) One byte: 0=Line Printer, 1=Pica, 2=Elite, 3=Courier, 4=Helv, 5=Tms Rmn, 6=Letter Gothic, 7=Script, 8=Prestige, 9=Calson, 10=Orator, etc.) Two bytes: 4100=CG Triumvirat, 4101=CG Times, 4110=Futura 2, 4111=CG Palatino, 4112=ITC Souvenir, etc.)
ESC) s # V	Set the point size for the secondary font. (#: points; 1 point is 1/72" height.)
ESC) s # W < data >	Download the font header. (#: byte count of font header data; 26=HP LaserJet +, 64=HP LaserJet -, -D, -P, -)
ESC * b # M	Set the raster graphics compression mode. (#: 0=no compression, 1=run-length mode, 2=TIFF revision 4.0 mode, 3=delta compression mode, 5=adaptive mode)
ESC * b # W < data >	Transfer one row of data for rester graphics. (#: byte count)
ESC * b # Y	Move the cursor vertically to provide blank areas in a raster graphics area. (#: number of dots at the current resolution; 0 to 32767)
ESC * c # A	Specify the horizontal size of a rectangle. (#: PCL unit; -32767 to 32767)
ESC * c # B	Specify the vertical size of a rectangle. (#: PCL unit; -32767 to 32767)
ESC * c # D	Specify the font ID for the subsequent soft font management. (#: 0 to 32767)

ESC * c # E	Specify the character code for the character downloaded next. (#: 0 to 65535)
ESC * c # F	Select a soft font management function. (#: 0=delete all, 1=delete all temporary fonts, 2=delete last ID font, 3=delete last character of last ID font, 4=make temporary, 5=make permanent, 6=copy the current font with the current ID)
ESC * c # G	Specify the shading level or the fill pattern ID. (#: 0 to 32767; For shading 1=100; 1=1% dark, 100=100% dark For pattern 1-6; 1=horizontal line, 2=vertical line, 3=diagonal line (///), 4=diagonal line (\\\), 5=square hatching, 6=diamond hatching)
ESC * c # H	Specify the horizontal size of a rectangle. (#: 1/720" increments; -32767 to 32767)
ESC * c # P	Fill the rectangle. (0=solid fill, 1=white fill, 2=shaded fill, 3=cross-hatched fill, 4=fill with the user defined pattern, 5=fill with the current pattern)
ESC * c # Q	Control user defined pattern. (#: 0=delete all, 1=delete last temporary pattern, 2=delete last ID pattern. 4=make temporary last ID pattern, 5=make permanent last ID pattern)
ESC * c # R	Set symbol set ID code. (#: 0 to 32767)
ESC * c # S	Symbol set control.
ESC * c # V	Specify the vertical size of a rectangle. (#: 1/720" increments; -32767 to 32767)
ESC * c # W <data>	User defined pattern.
ESC * p # X	Move the cursor to the new horizontal position. (#: dots; plus signed=relatively right, minus signed=relatively left, no sign=absolutely from the left edge)
ESC * p # R	Set pattern reference point. (#: 0=rotate with the print direction, 1=fix)
ESC * p # Y	Move the cursor to the new vertical position. (#: PCL unit; plus signed=relatively downward, minus signed=relatively upward, no sign=absolutely from the top margin)
ESC * r # A	Start printing raster graphics. Specify the left margin of raster graphics. (#: 0=position 0, 1=current position)
ESC * r # C	End printing raster graphics. Specify the end of raster graphics data transfer. (#: any value)
ESC * r # F	Set the raster graphics presentation mode. (#: 0=raster row in X axis of logical page, 3=raster row in lateral axis of physical page)

ESC * s # I — Request status readback storage information.
(#: 0=font, 1=macro, 2=user defined pattern, 3=symbol set (for unbound scalable font), 4=font extended)

ESC * s # T — Set status readback location type. (#: 0=invalid location, 1=currently selected, 2=all locations, 3=internal, 4=downloaded, 5 and 7=SIMMs)

ESC * s # U — Set status readback location unit.

Location type	#
0	* (invalid location)
1	* (currently selected)
2	* (all locations)
3	0=all internal
4	0=all down loaded 1=temporary down load 2 =permanent download
5 and 7	0=all SIMMs 1=highest priority SINNMMs 2=lowest priority SINNMMs

ESC * s # X — Return the reply data to the host computer.

ESC * s 1 M — Replay the total capacity of available memory.

ESC * t # R — Set the raster graphics resolution. (#: dots per inch; ex. for 600 dpi: 0 to 75=75, 75 (<75) to 100=100, 100 (<100) to 150=150, 150 (<150) to 200=200, 200 (<200) to 300=300, 300 or larger =600)

ESC * t # S — Specify the width of the raster graphics area. (#: 0 to logical paper width minus current left graphics margin)

ESC * t # T — Specify the height of the raster graphics area. (#: 0 to logical paper length minus current vertical cursor position)

ESC * v # **N** — Select a source transparency mode. (#: The remainder when # is divided by 256 is used as the parameter; 0=source is transparent, 1=source is opaque)

ESC * v # O — Select a pattern transparency mode. (#: The remainder when # is divided by 256 is used as the parameter; 0=pattern is transparent, 1=pattern is opaque)

ESC * v # T — Set the print model pattern. (#: 0=solid fill (default), 1=white fill, 2=PCL shading pattern, 3=PCL cross-hatching pattern)

5.5.2.2 HP LaserJet 5 HP-GL/2 mode

The HP-GL/2 mode is useful when using the PrintPartner 16DV/ADV page printer instead of an HP X-Y plotter or equivalent.

Picture Frame Set Commands

ESC * c # X	Set the horizontal size of the picture frame on the actual physical paper. (#: 1/720" increments; 0 to 32767)
ESC * c # Y	Set the vertical size of the picture frame on the actual physical paper. (#: 1/720" increments; 0 to 32767)
ESC * c # T	Set the anchor point of the picture frame to the current cursor position in PCL6 mode. (#: 0)
ESC * c # K	Set the horizontal plot size in HP-GL/2 mode, or assume the horizontal size of the picture frame in PCL6 mode to be this size. (#: inches; 0 to 32767)
ESC * c # L	Set the vertical plot size in HP-GL/2 mode, or assume the vertical size of the picture frame in PCL6 mode to be this size. (#: inches; 0 to 32767)
ESC * % # B	Enter HP-GL/2 mode from PCL6 mode. (#: 0 or even number = the pen position is set to the last pen position in the last HP-GL/2 mode, 1 or odd number = the pen position is set to the current cursor position in the current PCL6 mode)
ESC * % # A	Enter PCL6 mode from HP-GL/2 mode. (#: 0 or even number = the cursor position is set to the last cursor position in the last PCL6 mode, 1 or odd number = the cursor position is set to the current pen position in the current HP-GL/2 mode)

Configuration and Status Set Commands

DF	Set defaults to parameters other than scaling points, pen position, pen thickness, pen up/down state, and rotation in HP-GL/2 mode.
IN	Set defaults to all parameters to initialize the plotter.
IP	Set (or input) scaling points P1 and P2 with absolute plotter coordinates.
IR	Set (or input) scaling points P1 and P2 by the ratios to the picture frame sizes.
IW	Set (or input) the window area (soft clipping area).
PG	Advance a full page. Not supported by HP LaserJet 5
RO	Rotate the coordinate system in 90 degrees.
RP	Replot. Not supported by HP LaserJet 5.
SC	Scaling on/off. Set the user unit coordinate system or reset to the absolute plotter unit coordinate system.

Vector Commands

AA	Plot (or move along) an arc around the center specified by absolute coordinates.
AR	Plot (or move along) an arc around the center specified by relative coordinates.
AT	Plot (or move along) an arc through the three points specified by absolute coordinates.
CI	Plot a circle around the current pen position.
PA	Plot (or move to) the points specified by absolute coordinates.
PU	Pen up. Raise the pen and move to the points specified.
PR	Set the relative plot mode and move to the points specified by relative coordinates.
RT	Plot (or move along) an arc through the three points specified by relative coordinates.
PD	Pen down. Lower the pen and plot the points specified.
PE	Plot a polyline encoded from parameters of PA, PR, PU, PD, and SP commands to reduce data.
BR	Plot a Bezier curve specified by relative coordinates.
BZ	Plot a Bezier curve specified by absolute coordinates.

Polygon Commands

PM	Polygon mode on/off.
EP	Edge (or outline) the polygon stored in the polygon buffer.
FP	Fill the polygon stored in the polygon buffer.
RA	Fill (but do not edge) the rectangle specified by absolute coordinates.
RR	Fill (but do not edge) the rectangle specified by relative coordinates.
EA	Edge (or outline) the rectangle specified by absolute coordinates.
ER	Edge (or outline) the rectangle specified by relative coordinates.
WG	Fill (but do not edge) a wedge around the current pen position.
EW	Edge (or outline) a wedge around the current pen position.

Line and Fill Attributes Select Commands

AC	Specify the anchor corner (start point) of the fill pattern by absolute coordinates.
FT	Select the type of a fill pattern for an area fill command.
LA	Select the line attribute, or the shape of the end or joint of lines.

LT	Select the line type, or the lengthwise pattern of lines, and the length the pattern.
PW	Specify the width of the logical pen, or the thickness of lines. The unit of pen width is determined by the WU command.
RF	Define the raster fill pattern, or fill pattern created by users dot by dot in matrix.
SM	Symbol mode on/off. Plot the specified character (marker) at each end of vectors.
SP	Select a logical pen.
SV	Specify the screened vector, or the type of a image pattern imposed on lines.
TR	Transparency mode on/off. With mode on, the background is visible through blank areas of the foreground.
UL	User-defined line type. Create a type of line which is substituted for a line type defined by the LT command.
WU	Select the unit of pen width for the PW command.

Character Plotting Commands

AD	Define characteristics of the alternate font.
CF	Specify an outline character fill mode and whether or not characters are to be edged (outlined).
CP	Character plot. Move the logical pen by the specified numbers of character cells (character spaces and lines).
DI	Set the direction (inclination) of characters relative to the absolute plotter coordinates.
DR	Set the direction (inclination) of characters relative to the scaling points P1 and P2.
DT	Define a terminator character that specifies the end of printing a character string in label mode.
DV	Define variable text path. Set the plotting direction of a character string in 90 degrees and set the direction of line feeding.
ES	Extra spaces. Increase or decrease the character spacing and line spacing.
FI	Font primary. Specify the font, to which the font ID is assigned in PCL mode, as the standard font.
FN	Font secondary. Specify the font, to which the font ID is assigned in PCL mode, as the alternate font.
LB	Label mode. Plot a character string using the current active font.

The following control characters are available. Other characters are NOP commands.

Char	Function
ETX	Default of terminator character
BS	Back space
HT	Double space
LF	Line feed
CR	Carriage return
SO	Alternate character set selection
SI	Standard character set selection
SP	Space
DEL	Space

LO — Label origin. Move the origin of plotting a character string in label mode.

SA — Select alternate font. Make the alternate font active.

SB — Scalable or bitmap fonts. Enable or disable scalable fonts to be changed to bitmap fonts.

SD — Define characteristics of the standard font.

SI — Specify the character width and height in absolute size (cm).

SL — Specify the slant of characters by tanâ+.

SR — Specify the character width and height relative to the distance between the scaling points P1 and P2.

SS — Select standard font. Make the standard font active.

TD — Transparent data. Plot characters assigned to control codes, for example, “←” to the escape code (decimal 27) in the PC-8 character set.

5.5.2.3 HP LaserJet 5 PJL mode

This section lists all the Printer Job Language (PJL) commands, which arrange printing jobs in a shared printer system and read printer status messages back to the user. Except UEL, PJL commands start with @PJL followed by a command name, option data, and an LF character.

Kernel Commands	**Description**
UEL	Universal Exit Language. Unlike other PJL commands, the command is an escape sequence: ESC % -– 1 2 3 4 5 X. All printing jobs controlled by PJL start with UEL and end with UEL. The UEL command has a function to exit the current printer language and return control to PJL.
ENTER	Specify the current printer language. Option: LANGUAGE
COMMENT	Insert notes among the PJL command lines.

Job Separation Commands	**Description**
JOB	Make the printer recognize start of jobs and reset the page count. It enables specifying the pages to be printed in jobs, naming jobs, and separating jobs. Option: NAME, JOB, EOJ
EOJ	Make the printer recognize stop of jobs and reset the page count. Option: NAME

Environment Commands	**Description**
DEFAULT	Set or change default values in the user default environment.
SET	Enable changing to the specified value until a job is finished in the PJL current environment.
INITIALIZE	Change the user default environment or the PJL current environment to the factory default values.
RESET	Change the PJL current environment to the user default values.

Status Readback Commands	**Description**
INQUIRE	Request specified environment variables in the PJL current environment.
DINQUIRE	Request specified environment variables in the user default environment.
ECHO	Return <words> in this command to the host computer.
INFO	Respond with information of specified statuses. Option: ID, CONFIG, MEMORY, STATUS, VARIABLES, USTATUS, PAGECOUNT

USTATUS	Enable responding with status information asynchronously, that is, when the printer status changes, when a job starts or ends, when a printed page is ejected, or when specified seconds elapsed. Option: DEVICE, JOB, PAGE, TIMED
USTATUSOFF	Disable responding with asynchronous status information in the current interface.

Additional Commands	**Description**
PRINTREPORT	Print a status report or a font report. Option: SELFTEST, PRINTFONT
CLEARWARNING	Clear the consumables replacement request to the print unit. Option: PRINTUNIT

5.5.3 PostScript Operators (Commands)

The PostScript level 2is the resident emulation of the PrintPartner 16ADV, but an optional emulation of the PrintPartner 16DV. For operators (commands) available in the PostScript level 2 emulation, refer to “PostScript Level 2 Reference Manual” provided by Adobe Systems Incorporated.

CHAPTER 6 MAINTENANCE

6.1 Overview

The PrintPartner 16DV/ADV printer, with its simple mechanism and latest electronics techniques, is highly reliable and easy to maintain. Changing spare parts require no adjustments so that replacement is easy.

6.2 Preventive Maintenance

No scheduled maintenance is required. However, it is recommended that the printer be kept clean to increase the service life and MTBF.

6.3 Maintenance Philosophy

The printer is designed to make maintenance as infrequent as possible. No periodic lubrication is required.

Quality assurance

- Every unit is checked before assembly.
- All products go through full inspection.
- All spare parts are easy to change. (MTTR: 0.5 h)

6.4 Diagnostics

6.4.1 ROM/RAM check

When power is turned on, a ROM sum and RAM write/read check are performed automatically.

6.4.2 Error display

Printer operation is checked by firmware and, if an error is detected, the error status is displayed on the LCD on the control panel.

6.5 Maintenance Tool

6.5.1 Self test printing

The SELF TEST button prints a setup report page which summarizes printer option settings. It can be used to easily check the electrical and mechanical states of the printer without the help of a computer. It also distinguishes between printer and computer errors, and confirms correct operation after an error recovery. The PRINT FONT button can be used instead. It prints font report pages which list all available fonts.

6.6 Recommended Spare Parts

The following parts can be replaced.

(1) Upper cover assembly
(2) Pick-up roller assembly
(3) Feed roller assembly
(4) Cover-open switch
(5) Main motor
(6) Pick-up motor
(7) Transfer charger unit
(8) Fan 1
(9) Fan 2
(10) Power supply board
    100 to 120 VAC
    220 to 240 VAC
(11) High-voltage power supply board (HV board)
(12) Separator assembly (friction pad)
(13) Stacker-full sensor assembly (SF sensor board)
(14) Control panel unit
(15) Multi-function feeder board (MFF board)
(16) Mechanism board (shield plate)
(17) Paper sensing switch (PSS board)
(18) ROM board (controller board and ROM)
(19) Volume board (print density control board)
(20) Frame-2 assembly

CHAPTER 7 OPTIONS AND SUPPLIES

7.1 Options

(1) Paper trays (tray 1)
    A4
    Letter
    Executive
    A5
(2) Extended interface boards
    LocalTalk board 2 (AppleTalk compatible)
    Ethernet board C or D (NetWare, TCP/IP, and EtherTalk corresponding)
    IrDA board (infrared adapter)
(3) Memory expansion cards
    4MB RAM card
    8MB RAM card
    16MB RAM card
    32MB RAM card
    * Two cards can be installed.
(4) Emulation card
    IBM/EPSON card (IBM Proprinter 4202 or EPSON EX-800 compatible)
(5) Other cards
    Barcode card (barcodes and OCR fonts)
    Flash ROM card (4MB, for PCL5e only)
(6) Paper feeders (second paper tray: feeder unit and tray 2)
    Legal
    A4
    Letter
    Executive
    A5
(7) Feeder unit (without paper tray)
(8) Duplex unit (two-sided printing)

Options for the PrintPartner 16DV only

(1) FPS card (PostScript level 2 compatible)
(2) Multi-function feeder (MFF)

7.2 Consumables

(1) Print unit
(2) Toner pack (two toner bottles)
(3) Cleaner pad (two cleaner pads)
(4) Toner kit (two tonner bottles and two cleaner pads)

7.3 Periodic Replacement Parts

(1) Fuser unit
- 120 VAC
- 220 to 240 VAC

7.4 Documentation

(1) User’s Manual
(2) Maintenance Manual
(3) Schematic Diagrams
(4) Parts Catalogue

APPENDIX A SYMBOL SETS

(1) Roman-8 (ID:8U)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
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3			#	3	C	S	c	s			È	°	û	Æ	Đ	µ
4			$	4	D	T	d	t			Ê	Ç	á	å	ð	¶
5			%	5	E	U	e	u			Ë	ç	é	í	Í	¾
6			&	6	F	V	f	v			Î	Ñ	ó	ø	Ì	—
7			’	7	G	W	g	w			Ï	ñ	ú	æ	Ó	¼
8			(	8	H	X	h	x			´	¡	à	Ä	Ò	½
9			)	9	I	Y	i	y			`	¿	è	ì	Õ	ª
a			*	:	J	Z	j	z			ˆ	¤	ò	Ö	õ	º
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(2) ISO8859-1 Latin 1 (ID:0N)

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2			"	2	B	R	b	r			ç	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t			¤	´	Ä	Ô	ä	ô
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6			&	6	F	V	f	v			¦	¶	Æ	Ö	æ	ö
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9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
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b			+	;	K	[	k	{			«	»	Ë	Û	ë	û
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(3) PC-8 (ID:10U)

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5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7	•	↨	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	·
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b	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╦	■	δ	√
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(4) PC-8 (Danish/Norwegian, ID:11U)

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1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▦	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	┃	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	õ	╢	╞	╓	µ	÷
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9	○	↓	)	9	I	Y	i	y	ë	Ö	ã	╣	╔	┘	Θ	·
a	◙	→	*	:	J	Z	j	z	è	Ü	Ã	║	╩	┌	Ω	·
b	♂	←	+	;	K	[	k	{	ï	ø	ℓ	╗	╦	█	δ	√
c	♀	∟	,	<	L	\	l	|	î	£	’n	╝	╠	▄	∞	n
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(5) PC-85 (ID:12U)

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1	☺	◄	!	1	A	Q	a	q	ü	æ	í	▩	┴	Ð	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▦	┬	Ê	Ô	‗
3	♥	‼	#	3	C	S	c	s	â	ô	ú	|	├	Ë	Ò	¾
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	—	È	õ	¶
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	Á	┼	ı	Õ	§
6	♠	▬	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	•	↨	'	7	G	W	g	w	ç	ù	º	À	Ã	Î	þ	¸
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	©	╚	Ï	Þ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	®	╣	╔	┘	Ú	¨
a	◙	→	*	:	J	Z	j	z	è	Ü	¬	‖	╩	┌	Û	·
b	♂	←	+	;	K	[	k	{	ï	ø	½	╗	╦	■	Ù	ı
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(6) Windows 3.1 Latin 1 (ID:19U)

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3			#	3	C	S	c	s	*f*	“	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	„	”	¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	…	•	¥	*µ*	Å	Õ	å	õ
6			&	6	F	V	f	v	†	–	¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	‡	—	§	·	Ç	×	ç	÷
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9			)	9	I	Y	i	y	*‰*	™	©	¹	É	Ù	é	ù
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(7) DeskTop (ID:7J)

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(8) PS Text (ID:10J)

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3			#	3	C	S	c	s			£	‡	ˆ		a	
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(9) Ventura International (ID:13J)

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2			"	2	B	R	b	r			Â	”	ô	Ø	ã	¶
3			#	3	C	S	c	s			È	°	û	Æ		†
4			$	4	D	T	d	t			Ê	Ç	á	å		‡
5			%	5	E	U	e	u			Ë	ç	é	í	Í	—
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b			+	;	K	[	k	{		↵	‹	£	ù	Ü	Š	«
c			,	<	L	\	l	|		→	›	¥	ä	É	š	•
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(10) Ventura US (ID:14J)

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2			"	2	B	R	b	r				”				¶
3			#	3	C	S	c	s				º				†
4			$	4	D	T	d	t								‡
5			%	5	E	U	e	u								—
6			&	6	F	V	f	v								–
7			’	7	G	W	g	w								
8			(	8	H	X	h	x			©					
9			)	9	I	Y	i	y			®					
a			*	:	J	Z	j	z			™					
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(11) Microsoft Publishing (ID:6J)

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(12) Legal (ID:1U)

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3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			'	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	[	k	§								
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f			/	?	O	_	o									

(13) ISO United Kingdom (ID:1E)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			£	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	[	k	{								
c			,	<	L	\	l	|								
d			-	=	M	]	m	}								
e			.	>	N	^	n	¯								
f			/	?	O	_	o									

(14) ASCII (ID:0U)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	‘	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	[	k	{								
c			,	<	L	\	l	|								
d			-	=	M	]	m	}								
e			.	>	N	^	n	~								
f			/	?	O	_	o	▩								

(15) ISO Swedish (ID:0S)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	É	P	é	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			¤	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	Ä	k	ä								
c			,	<	L	Ö	l	ö								
d			-	=	M	Å	m	å								
e			.	>	N	Ü	n	ü								
f			/	?	O	_	o									

(16) ISO Italian (ID:0I)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	§	P	ù	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			£	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	°	k	à								
c			,	<	L	ç	l	ò								
d			-	=	M	é	m	è								
e			.	>	N	^	n	ì								
f			/	?	O	_	o	▩								

(17) ISO Spanish (ID:2S)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	§	P	`	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			£	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	¡	k	º								
c			,	<	L	Ñ	l	ñ								
d			-	=	M	¿	m	ç								
e			.	>	N	^	n	~								
f			/	?	O	_	o									

(18) ISO German (ID:1G)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	§	P	`	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	Ä	k	ä								
c			,	<	L	Ö	l	ö								
d			-	=	M	Ü	m	ü								
e			.	>	N	^	n	ß								
f			/	?	O	_	o									

(19) ISO Norwegian (ID:0D)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	Æ	k	æ								
c			,	<	L	Ø	l	ø								
d			-	=	M	Å	m	å								
e			.	>	N	^	n	¯								
f			/	?	O	_	o	▒								

(20) ISO French (ID:1F)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	à	P	μ	p								
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			£	3	C	S	c	s								
4			$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7			’	7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
a			*	:	J	Z	j	z								
b			+	;	K	°	k	é								
c			,	<	L	ç	l	ù								
d			-	=	M	§	m	è								
e			.	>	N	^	n	¨								
f			/	?	O	_	o									

(21) Windows 3.0 Latin 1 (ID:9U)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p				º	À	Đ	à	ð
1			!	1	A	Q	a	q		‘	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r		’	¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t			¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v			¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	×	ç	÷
8			(	8	H	X	h	x			¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y			©	¹	É	Ù	é	ù
a			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
b			+	;	K	[	k	{			«	»	Ë	Û	ë	û
c			,	<	L	\	l	|			¬	¼	Ì	Ü	ì	ü
d			-	=	M	]	m	}			-	½	Í	Ý	í	ý
e			.	>	N	^	n	~			®	¾	Î	Þ	î	þ
f			/	?	O	_	o				¯	¿	Ï	ß	ï	ÿ

(22) MC Text (ID:12J)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p	Ä	ê	†	∞	¿	–	‡	
1			!	1	A	Q	a	q	Å	ë	°	±	¡	—	·	Ò
2			"	2	B	R	b	r	Ç	í	¢	≤	¬	“	‚	Ú
3			#	3	C	S	c	s	É	ì	£	≥	√	”	„	Û
4			$	4	D	T	d	t	Ñ	î	§	¥	*f*	‘	‰	Ù
5			%	5	E	U	e	u	Ö	ï	•	*μ*	≈	’	Â	ı
6			&	6	F	V	f	v	Ü	ñ	¶	∂	Δ	÷	Ê	ˆ
7			'	7	G	W	g	w	á	ó	ß	∑	«	◇	Á	˜
8			(	8	H	X	h	x	à	ò	®	∏	»	ÿ	Ë	¯
9			)	9	I	Y	i	y	â	ô	©	π	…	Ÿ	È	˘
a			*	:	J	Z	j	z	ä	ö	™	∫		/	Í	˙
b			+	;	K	[	k	{	ã	õ	´	ª	À	¤	Î	°
c			,	<	L	\	l	|	å	ú	¨	º	Ã	‹	Ï	¸
d			-	=	M	]	m	}	ç	ù	≠	Ω	Õ	›	Ì	˝
e			.	>	N	^	n	~	é	û	Æ	æ	Œ	fi	Ó	˛
f			/	?	O	_	o		è	ü	Ø	ø	œ	fl	Ô	ˇ

(23) PC-852 (ID:17U)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0		►		0	@	P	`	p	Ç	É	á	⣿	└	đ	Ó	-
1	☺	◄	!	1	A	Q	a	q	ü	Ĺ	í	▩	┴	Đ	ß	˝
2	☻	↕	"	2	B	R	b	r	é	Í	ó	▦	┬	Ď	Ô	˛
3	♥	‼	#	3	C	S	c	s	â	ô	ú	▏	├	Ë	Ń	ˇ
4	♦	¶	$	4	D	T	d	t	ä	ö	Ą	┤	—	ď	ń	˘
5	♣	§	%	5	E	U	e	u	ů	Ľ	ą	Á	┼	Ň	ň	§
6	♠	▬	&	6	F	V	f	v	ć	ľ	Ž	Â	Ă	Í	Š	÷
7	•	↨	'	7	G	W	g	w	ç	Ś	ž	Ě	ă	Î	š	¸
8	◘	↑	(	8	H	X	h	x	ł	ś	Ę	Ş	╚	ě	Ŕ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	ę	╣	╔	┘	Ú	¨
a	◙	→	*	:	J	Z	j	z	Ő	Ü		║	╩	┌	ŕ	·
b	♂	←	+	;	K	[	k	{	ő	Ť	ź	╗	╦	■	Ű	ű
c	♀	∟	,	<	L	\	l	|	î	ť	Č	╝	╠	▄	ý	Ř
d	♪	↔	-	=	M	]	m	}	Ź	Ł	ş	Ż	═	Ţ	Ý	ř
e	♫	▲	.	>	N	^	n	~	Ä	×	«	ż	╬	Ů	ţ	■
f	☼	▼	/	?	O	_	o	⌂	Ć	č	»	┐	¤	▀	´	

(24) PC-Turkish (ID:9T)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0		▶		0	@	P	`	p	Ç	É	á	⣿	└	╨	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▦	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	▏	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	Ğ	╢	╞	╓	μ	÷
7	•	↨	'	7	G	W	g	w	ç	ù	ğ	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	İ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	·
a	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
b	♂	←	+	;	K	[	k	{	ï	ç	½	╗	╦	■	δ	√
c	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	n
d	♪	↔	-	=	M	]	m	}	ı	¥	¡	╜	═	▌	φ	²
e	♫	▲	.	>	N	^	n	~	Ä	Ş	«	╛	╬	▐	ϵ	■
f	☼	▼	/	?	O	_	o	⌂	Å	ş	»	┐	╧	▀	∩	

(25) Windows 3.1 Latin 2 (ID:9E)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p				°	Ŕ	Đ	ŕ	đ
1			!	1	A	Q	a	q		‘	ˇ	±	Á	Ń	á	ń
2			"	2	B	R	b	r	,	’	˘	˛	Â	Ň	â	ň
3			#	3	C	S	c	s		“	Ł	ł	Ă	Ó	ă	ó
4			$	4	D	T	d	t	„	”	¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	…	•	Ą	µ	Ĺ	Ő	Í	ő
6			&	6	F	V	f	v	†	–	¦	¶	Ć	Ö	ć	ö
7			'	7	G	W	g	w	‡	—	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x			¨	¸	Č	Ř	č	ř
9			)	9	I	Y	i	y	‰	™	©	ą	É	Ů	é	ů
a			*	:	J	Z	j	z	Š	š	Ş	ş	Ę	Ú	ę	ú
b			+	;	K	[	k	{	‹	›	«	»	Ë	Ű	ë	ű
c			,	<	L	\	l	|	Ś	ś	¬	Ľ	Ě	Ü	ě	ü
d			-	=	M	]	m	}	Ť	ť	-	˝	Í	Ý	í	ý
e			.	>	N	^	n	~	Ž	ž	®	ľ	Î	Ţ	î	ţ
f			/	?	O	_	o	▒	Ź	ź	Ż	ż	Ď	ß	ď	˙

(26) Windows 3.1 Latin 5 (ID:5T)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p				°	À	Ğ	à	ğ
1			!	1	A	Q	a	q		‘	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	,	’	ç	²	Â	Ò	â	ò
3			#	3	C	S	c	s	*f*	“	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	„	”	¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u	…	•	¥	*µ*	Å	Õ	å	õ
6			&	6	F	V	f	v	†	–	¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	‡	—	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	ˆ	˜	¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	‰	™	©	¹	É	Ù	é	ù
a			*	:	J	Z	j	z	Š	š	ª	º	Ê	Ú	ê	ú
b			+	;	K	[	k	{	‹	›	«	»	Ë	Û	ë	û
c			,	<	L	\	l	|	Œ	œ	¬	¼	Ì	Ü	ì	ü
d			-	=	M	]	m	}			-	½	Í	İ	í	ı
e			.	>	N	^	n	~			®	¾	Î	Ş	î	ş
f			/	?	O	_	o	▩		Ÿ	¯	¿	Ï	ß	ï	ÿ

(27) ISO 8859-1 Latin 2 (ID:2N)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p				°	Ŕ	Đ	ŕ	đ
1			!	1	A	Q	a	q			Ą	ą	Á	Ń	á	ń
2			"	2	B	R	b	r			˘	˛	Â	Ň	â	ň
3			#	3	C	S	c	s			Ł	ł	Ă	Ó	ă	ó
4			$	4	D	T	d	t			¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u			Ľ	ľ	Ĺ	Ő	Í	ő
6			&	6	F	V	f	v			Ś	ś	Ć	Ö	ć	ö
7			'	7	G	W	g	w			§	ˇ	Ç	×	ç	÷
8			(	8	H	X	h	x			¨	¸	Č	Ř	č	ř
9			)	9	I	Y	i	y			Š	š	É	Ů	é	ů
a			*	:	J	Z	j	z			Ş	ş	Ę	Ú	ę	ú
b			+	;	K	[	k	{			Ť	ť	Ë	Ű	ë	ű
c			,	<	L	\	l	|		Ź	ź	Ě	Ü	ě	ü
d			-	=	M	]	m	}			-	˝	Í	Ý	í	ý
e			.	>	N	^	n	~			Ž	ž	Î	Ţ	î	ţ
f			/	?	O	_	o				Ż	ż	Ď	ß	ď	˙

(28) ISO 8859-2 Latin 2 (ID:5N)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	@	P	`	p				°	À	Ğ	à	ğ
1			!	1	A	Q	a	q			¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r			ç	²	Â	Ò	â	ò
3			#	3	C	S	c	s			£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t			¤	´	Ä	Ô	ä	ô
5			%	5	E	U	e	u			¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v			¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w			§	·	Ç	×	ç	÷
8			(	8	H	X	h	x			¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y			©	ı	É	Ù	é	ù
a			*	:	J	Z	j	z			ª	º	Ê	Ú	ê	ú
b			+	;	K	[	k	{			«	»	Ë	Û	ë	û
c			,	<	L	\	l	|			¬	¼	Ì	Ü	ì	ü
d			-	=	M	]	m	}			-	½	Í	İ	í	ı
e			.	>	N	^	n	~			®	¾	Î	Ş	î	ş
f			/	?	O	_	o				¯	¿	Ï	ß	ï	ÿ

(29) Math-8 (ID:8M)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	∴	Π	∵	π				¯	⊕	Å	⌈	⌉
1			√	1	Α	Ρ	α	ρ			↑	∀	⊙	⊣	⌊	⌋
2			″	2	Β	Σ	β	σ			→	∃	⊗	⊢	⌠	⌡
3			°	3	Γ	Τ	γ	τ			↓	⊤	⊖	⌙	{	}
4			∞	4	Δ	ϒ	δ	υ			←	⊥	⊘	ə	⌊	⌋
5			÷	5	Ε	Φ	ϵ	φ			⇑	∪	∧	∫	⌠	⎮
6			∝	6	Ζ	Χ	ζ	χ			⇒	∩	∨	∮	⌽	⎮
7			′	7	Η	Ψ	η	ψ			⇓	∈	⩒	∠	⌡	⌡
8			(	8	Θ	Ω	θ	ω			⇐	∋	¬	∅	⎲	⎴
9			)	9	Ι	∇	ι	ϑ			⇕	∉	○	ℵ	‖	〉
a			×	e	Κ	∂	κ	φ			↔	⊂	·	ב	∠	⌟
b			+	ε	Λ	ς	λ	ϖ			⇳	⊃	•	ג	/	\
c			,	<	Μ	≤	μ	≃			⇔	⊄	●	ℭ	–	〈
d			–	=	Ν	≠	ν	≡			⇄	⊅	○	ℑ	=	∓
e			.	>	Ξ	≥	ξ	≠			⇆	⊆	†	ℜ	*	±
f			/	≈	Ο	_	ο	▩			⇀	⊇	‡	ℨ	≅	

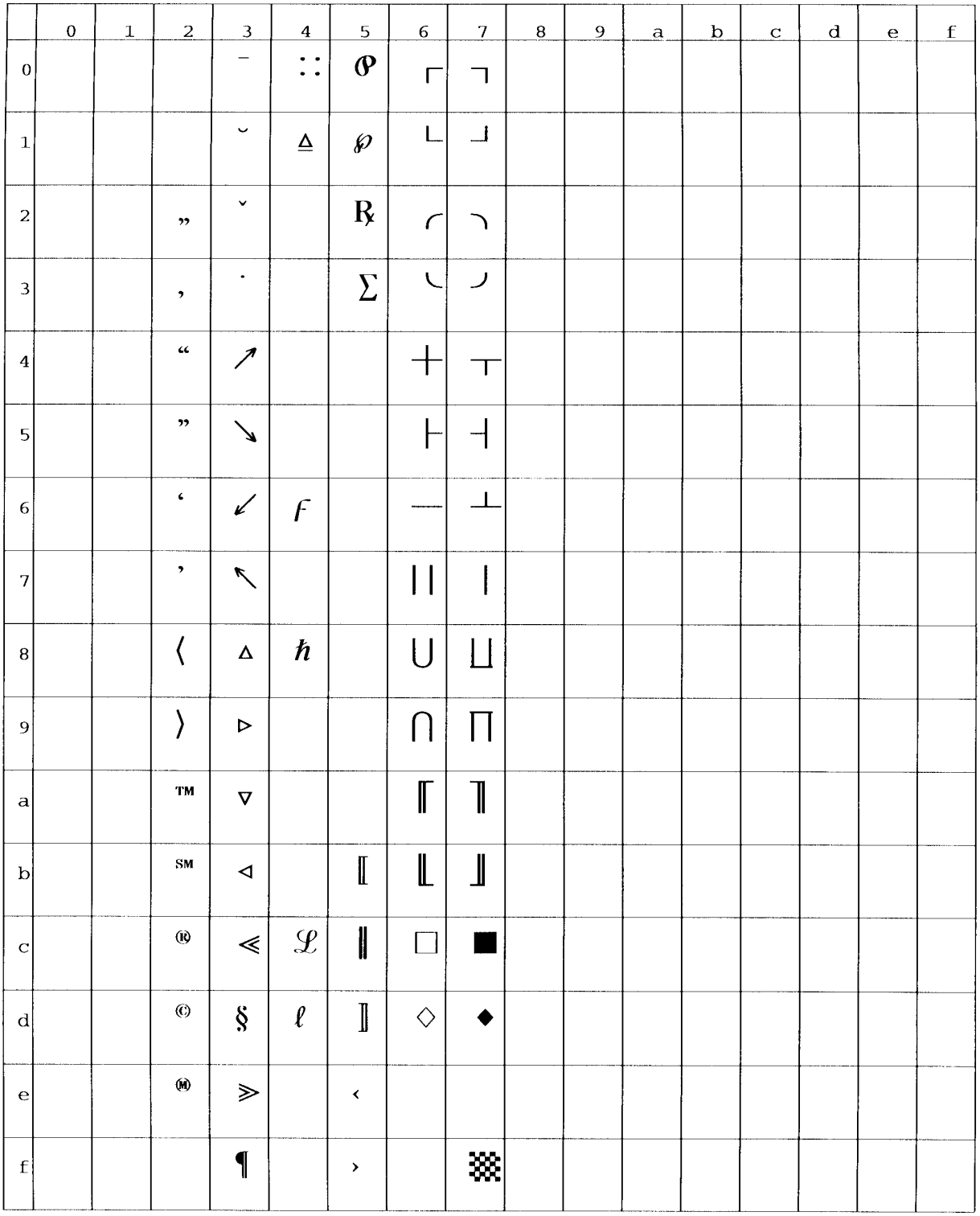
(30) PS Math (ID:5M)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	≅	Π	¯	π				°	ℵ	∠	◇	
1			!	1	Α	Θ	α	θ			ϒ	±	ℑ	∇	⟨	⟩
2			∀	2	Β	Ρ	β	ρ			′	″	ℜ	®	®	∫
3			#	3	Χ	Σ	χ	σ			≤	≥	℘	©	©	⌠
4			∃	4	Δ	Τ	δ	τ			/	×	⊗	™	™	⎮
5			%	5	Ε	Υ	ε	υ			∞	∝	⊕	∏	Σ	⌡
6			&	6	Φ	ς	φ	ϖ			ƒ	∂	∅	√	⌠	⌝
7			∍	7	Γ	Ω	γ	ω			♣	•	∩	·	⎮	⎮
8			(	8	Η	Ξ	η	ξ			♦	÷	∪	¬	⌡	⌡
9			)	9	Ι	Ψ	ι	ψ			♥	≠	⊃	∧	⌈	⌉
a			*	:	ϑ	Ζ	φ	ζ			♠	≡	⊇	∨	⎮	⎮
b			+	;	Κ	ϒ	κ	{			↔	≈	⊄	⇔	⌊	⌋
c			,	<	Λ	∴	λ	|			←	…	⊂	⇐	⌠	⌝
d			−	=	Μ	ϒ	μ	}			↑	⎮	⊆	⇑	{	}
e			.	>	Ν	⊥	ν	~			→	—	∈	⇒	⌡	⌡
f			/	?	Ο	_	ο				↓	↵	∉	⇓	⎮	

(31) Ventura Math (ID:6M)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	≅	Η	‾	π			◇	®	≤	↓	⎪	∏
1			!	1	Α	Θ	α	θ			✓	⊃	♦	←	·	™
2			∀	2	Β	Ρ	β	ρ			⌊	⊇	≥	®	∠	⇐
3			#	3	Χ	Σ	χ	σ			⌈	⌠	∂	″	⌡	⇔
4			∃	4	Δ	Τ	δ	τ			⎪		ℵ	*f*		∨
5			%	5	Ε	Υ	ε	υ			⌊	♣	′	ℑ	{	Σ
6			&	6	Φ	ς	φ	ϖ			⌊	⊕	ℜ	©	⌠	™
7			∍	7	Γ	Ω	γ	ω			⎪	⊗	℘	±	⟩	⎪
8			(	8	Η	Ξ	η	ξ			⇑	⊆	∞	→		⌋
9			)	9	Ι	Ψ	ι	ψ			⇒	∪	♠	↑	¬	∅
a			*	:	ϑ	Ζ	φ	ζ			⇓	—	∝	≠	∇	∩
b			+	;	Κ	⌈	κ	{		↵	⊄	…	•	≡	⌠	∈
c			,	<	Λ	∴	λ	|		→	⊂	⎪	/	°	⎪	©
d			−	=	Μ	⌉	μ	}		␣	⌡	∧	♥	↔	⌉	∉
e			.	>	Ν	⊥	ν	~		▪	⎪	↵	×	⌉	⌡	⌉
f			/	?	Ο	_	*o*			□	}	≈	ϒ	∫	÷	⟨

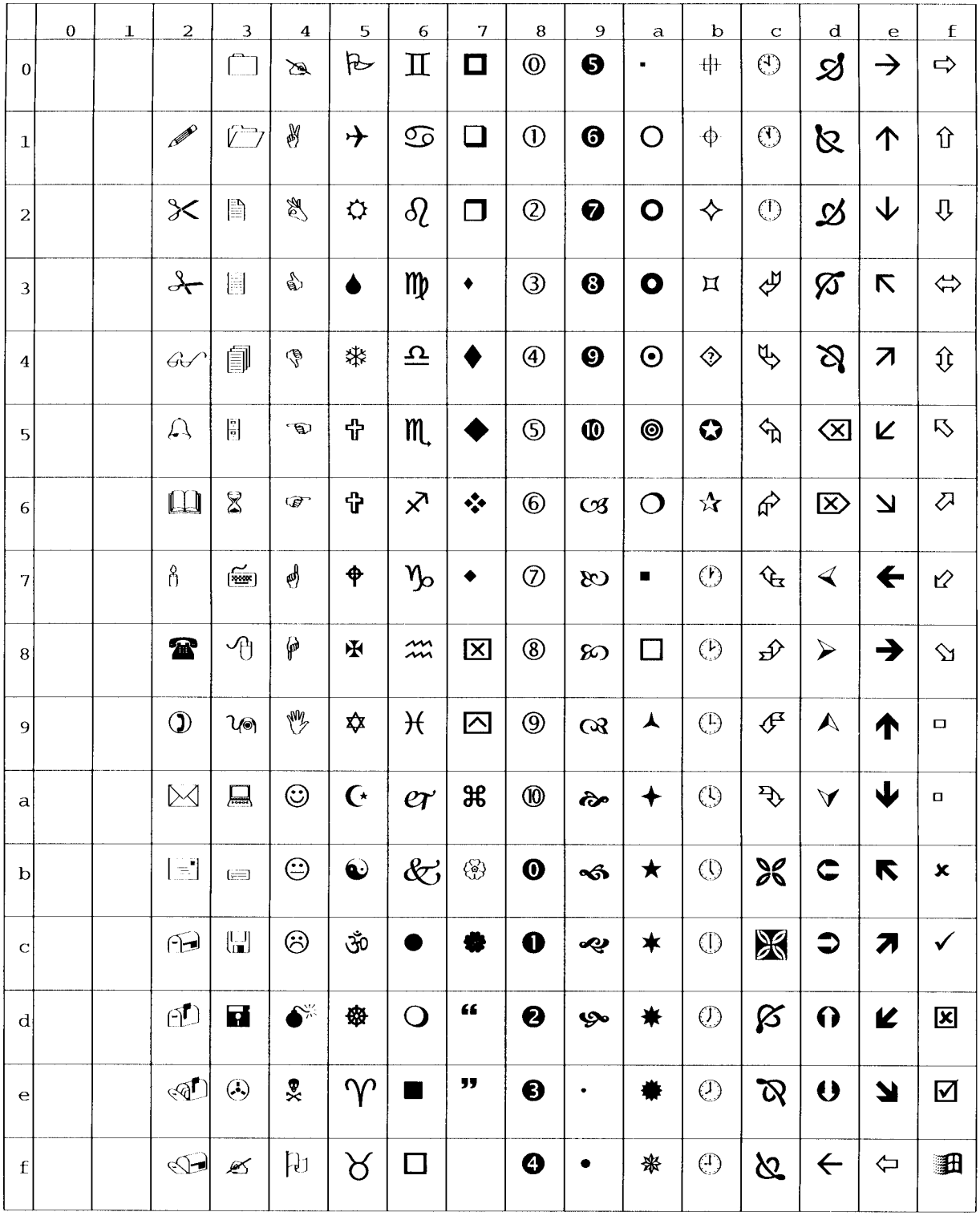
(32) PI Font (ID:15U)



(33) Symbol (ID:19M)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0				0	≅	Π	‾	π				°	ℵ	∠	◊	
1			!	1	Α	Θ	α	θ			ϒ	±	ℑ	∇	〈	〉
2			∀	2	Β	Ρ	β	ρ			′	″	ℜ	®	®	∫
3			#	3	Χ	Σ	χ	σ			≤	≥	℘	©	©	⌠
4			∃	4	Δ	Τ	δ	τ			⁄	×	⊗	™	™	⌡
5			%	5	Ε	Υ	ε	υ			∞	∝	⊕	∏	∑	⎛
6			&	6	Φ	ς	φ	ϖ			*f*	∂	∅	√	⎛	⎞
7			∍	7	Γ	Ω	γ	ω			♣	•	∩	·	⎜	⎜
8			(	8	Η	Ξ	η	ξ			♦	÷	∪	¬	⎝	⎠
9			)	9	Ι	Ψ	ι	ψ			♥	≠	⊃	∧	⎡	⎤
a			*	:	ϑ	Ζ	φ	ζ			♠	≡	⊇	∨	⎜	⎜
b			+	;	Κ	[	κ	{			↔	≈	⊄	⇔	⎣	⎦
c			,	<	Λ	∴	λ	|			←	…	⊂	⇐	⎧	⎫
d			−	=	Μ	]	μ	}			↑	⏐	⊆	⇑	⎨	⎬
e			.	>	Ν	⊥	ν	~			→	—	∈	⇒	⎝	⎭
f			/	?	Ο	_	ο				↓	↵	∉	⇓	⏐	

(34) Wingdings (ID:579L)



APPENDIX B RESIDENT FONTS

This appendix gives printing samples (scanned in 400 dpi) of resident fonts.

There are 115 types of resident fonts (one bitmap font and 114 scalable fonts) in HP LaserJet 5 emulation and 35 types of resident fonts in PostScript level 2 emulation:

B.1 HP LaserJet 5 Emulation

One bitmap font

LinePrinter 8.46 point, 16.66 pitch ABCDEFGHIJKLMnopqrstuvwxyz0123456789

114 scalable fonts

Courier Md ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Courier MdIt *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Courier Bd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Courier BdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Morrison Rg ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Morrison It *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Morrison Bd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Morrison BdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Taurus ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Taurus It *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Taurus Bd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Taurus BdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Coronet *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
EFClarendon CdBd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
EFClarendon ExBd **ABCDEFGHIJKLMNopqrstuvwxyz01**
Lyra Md ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Lyra MdIt *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Lyra Bd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Lyra BdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Lyra LiCd ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Lyra LiCdIt *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Lyra CdMd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Lyra CdMdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Lyra CdBd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Lyra CdBdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Lyra ExtnMd ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Lyra ExtnMdIt *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Lyra ExtnBdIt ***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Lyra ExtnBd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
AntiqueOlv ABCDEFGHIJKLMNopqrstuvwxyz0123456789
AntiqueOlv It *ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
AntiqueOlv Bd **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
AntiqueOlv Cmpct **ABCDEFGHIJKLMNopqrstuvwxyz0123456789**

Garamond	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Garamond Krsv	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Garamond Hf	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Garamond KrsvHf	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Mauritius	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Leos Md	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Leos Mdlt	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Leos Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Leos ExBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Nimb Sans	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Nimb Sans It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Nimb Sans Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Nimb Sans BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Nimb Sans Cd	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Nimb Sans CdIt	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Nimb Sans CdBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Nimb Sans CdBdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Nimb Roman	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Nimb Roman It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Nimb Roman Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Nimb Roman BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
LetterGot75	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
LetterGot75 It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
LetterGot75 Bd	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
LetterGot75 BdIt	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Aries	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Aries It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Aries Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Aries BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Libra	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Libra It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Libra Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Libra BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
EFBodoni No2	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Bodoni No5	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Bodoni No5 It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Bodoni No5 Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Bodoni No5 BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
CooperBlk	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
CooperBlk It	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
CentSchl	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
CentSchl It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
CentSchl Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
CentSchl BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Clarendon Bk	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Clarendon Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Saturn	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Saturn Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Saturn Extn	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Saturn ExtnBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**

Dorado Li	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Dorado LiIt	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Dorado Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Dorado BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Dorado	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Dorado It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Dorado ExBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Dorado Cd	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Dorado CdBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
GoudyOs	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
GoudyOs It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
GoudyOs Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
GoudyOs BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
GoudyOs ExBd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
EFGrandera	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
EFGrandera It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
EFGrandera Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
EFGrandera BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Gemini	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Gemini It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
Gemini Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
Gemini BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
EFRivero Bd	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
Cassiopeia	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
SaturnMono	ABCDEFGHIJKLMNopqrstuvwxyz0123456789
SaturnMono It	*ABCDEFGHIJKLMNopqrstuvwxyz0123456789*
SaturnMono Bd	**ABCDEFGHIJKLMNopqrstuvwxyz0123456789**
SaturnMono BdIt	***ABCDEFGHIJKLMNopqrstuvwxyz0123456789***
Dingbats	✡✢✣✤✥✦✧★☆✪✫✬✭✮❏❐❑❒▲▼◆❖◗❙❚✐✑✒✓✔✕✖✗✘✙
Dingbats	✡✢✣✤✥✦✧★☆✪✫✬✭✮❏❐❑❒▲▼◆❖◗❙❚✐✑✒✓✔✕✖✗✘✙
Dingbats	✯→➾➙❫➔⟶➡✽◗→↔†⬅✭✲△❨‡★✱➣✝➨☆❖➉①②③④⑤⑥⑦⑧⑨
Dingbats	✱➘➼➤➣➝➞➡✸➧➽➻➵➤✳✳▽◗❑✳✲➝✕➼✿➾➉①②③④⑤⑥⑦⑧⑨
Dingbats	❄♦♠⇨❴▷⊃⊃⇨✣⇨⇔▷✚♣✤✳❙❵✕✳✳♡❚⇤⇹✢⇸⑩1234⑤6789
Symbol	ΑΒΧΔΕΦΓΗΙϑΚΛΜΝοπθρστυϖωξψζ0123456789
Sorts	✌✍✎✏☜☞✐✑☝☺☹☻✂✁❏❐❑❒•♦◆❖•⊠⌧⌘🗀🗁🗎🗏🗐⌛🖮🖰✆

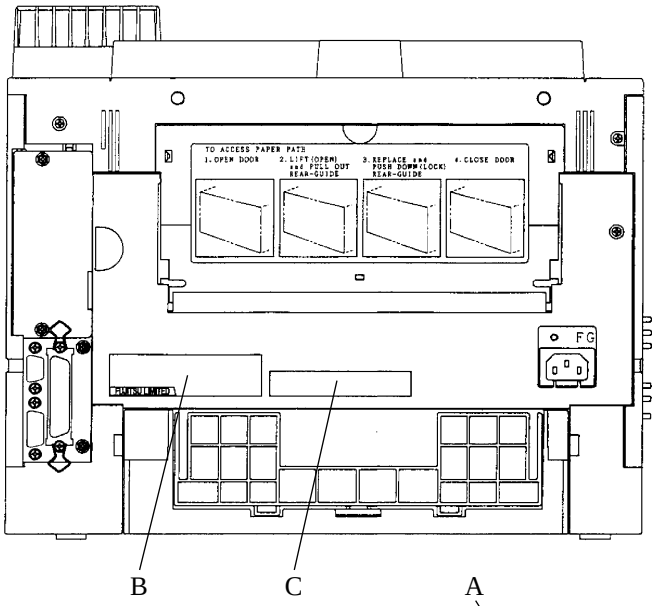
B.2 PostScript Level 2 Emulation

Courier	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Oblique	***ABCDabcd1234!@#$***
	Oblique	*ABCDabcd1234!@#$*
Helvetica	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Oblique	***ABCDabcd1234!@#$***
	Oblique	*ABCDabcd1234!@#$*
Helvetica Narrow	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Oblique	***ABCDabcd1234!@#$***
	Oblique	*ABCDabcd1234!@#$*
Times	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Italic	***ABCDabcd1234!@#$***
	Italic	*ABCDabcd1234!@#$*
Symbol		ΑΒΧΔαβχδ1234!≅#∃
Palatino	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Italic	***ABCDabcd1234!@#$***
	Italic	*ABCDabcd1234!@#$*
NewCentury Schoolbook	Regular	ABCDabcd1234!@#$
	Bold	**ABCDabcd1234!@#$**
	Bold, Italic	***ABCDabcd1234!@#$***
	Italic	*ABCDabcd1234!@#$*
AvantGarde	Book	ABCDabcd1234!@#$
	Demi	**ABCDabcd1234!@#$**
	Demi, Oblique	***ABCDabcd1234!@#$***
	Book, Oblique	*ABCDabcd1234!@#$*
Bookman	Light	ABCDabcd1234!@#$
	Demi	**ABCDabcd1234!@#$**
	Demi, Italic	***ABCDabcd1234!@#$***
	Italic	*ABCDabcd1234!@#$*
ZapfChancery	Medium, Italic	*ABCDabcd1234!@#$*
ZapfDingbats		✡✢✣✤✪❂✻❄➿➾✓✔✂✠✁✄

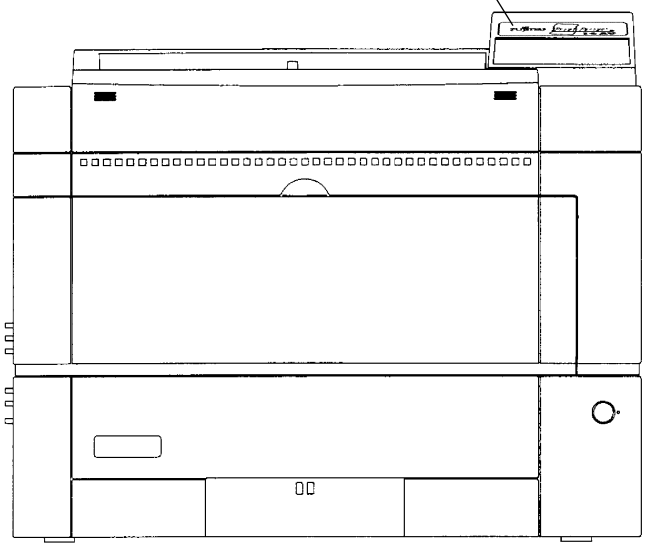
APPENDIX C PRINTER LOGO AND LABELS

PrintPartner 16DV/ADV page printer

Back



Front



Logo and labels

Logo or label	Position
Logo	A
Regulation-approved label	B
Spec, number, and revision label	C