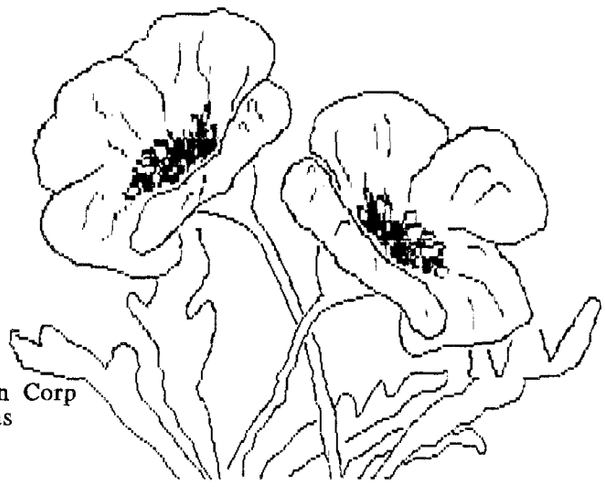
PoppyII

WORKSTATION PRODUCT INFORMATION



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Charter Information Corp
Austin, Texas

1987

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INTRODUCTION

PoppyII is a network workstation that runs PC-DOS and compatible programs. It also runs CPM-86 compatible programs. An emulator, which runs under CPM-86, is provided which allows PoppyII to run CPM-80 programs.

A PoppyII workstation is composed of five physical modules:

1. Processor board (with internal cables)
2. Keyboard
3. Monitor
4. Terminal Adapter (TA)
5. TA external cable

The processor board, terminal adapter, and TA external cable are made by CI. The keyboard and monitor are identical to those used by the IBM PC; they may be purchased from CI or may be customer supplied.

The Terminal Adapter (TA) resides on the outboard end of the TA external cable. It has connectors for the TA external cable, monitor, keyboard, and remote serial port. The TA contains the speaker and active electronics that demultiplex the signals from the TA cable, conditioning them for the keyboard, speaker, monitor and (optionally) the serial port.

PoppyII functions as a workstation in a TurboDOS operating system network. A single network may include workstations running programs compatible with CPM-80, CPM-86, and PC-DOS.

For 16 bit processor software, PoppyII runs either:

PC-DOS with TurboDOS-PC or

TurboDOS (compatible with CPM-86).

PoppyII can run most 8 bit, CPM type software by utilizing TZ80. This program, running under TurboDOS, emulates a Z80

processor running under CPM.

PoppyII peripherals are classified as system shared, display, and other.

System shared peripherals (such as discs and printers) are usually connected to the master processor. They are available to workstations on the network under control of the operating system; they have no PoppyII hardware. All workstations can access multiple disks, printers, and other system peripherals. File and record locks are supported, as is a complete spooling capability.

PoppyII has an integrated display controller on the processor board. Display types include:

MDA (IBM Monochrome Display Adapter)
HGC (Hercules Monochrome Graphics Controller)
CGA (IBM Color Graphics Adapter)
EGA (IBM Enhanced Graphics Adapter)

Switching between display types is automatic. A later section is devoted to a description of PoppyII display capabilities.

Other peripherals include the keyboard, speaker, serial port, parallel (printer) port, DMA, interrupt controller, and counter timers. PoppyII support of these peripherals is discussed in a separate section.

The serial port has been implemented in a manner such that the connector may be located either at the Terminal Adapter or locally on the computer case.

COMPATIBILITY

PoppyII was designed to be compatible with the IBM PC as far as practical. There are many differences in the hardware (after all, the PC design dates from 1981), but the test is performance. PoppyII rates a 2.9 in Norton Utilities.

A few PC-DOS programs access disk controllers directly instead of using OS and BIOS calls. Since disk controllers are not on or accessible to PoppyII, these programs will not work.

PC-DOS programs written for PC-DOS prior to 2.0 and not updated may not work since only versions 2.0 and later are currently supported.

Many programs that are designed for PC type machines have been successfully tested, but the testing has not been exhaustive (it never will be). Successful tests in the PC-DOS mode:

Articulate Publications
Medicalis
Ashton Tate
dBase II
dBase III+
MultiMate
Borland
Sidekick
Turbo Pascal
Lightning
Reflex
Turbo Basic
Brown Bag Software
Word Processor
Home Base
Computer Associates
SuperCalc III
Lexisoft
Spellbinder
Spellbinder Desktop Publishing

Compatibility

Lotus
1-2-3
Symphony
MicroPro
Wordstar
Wordstar 2000
MicroSoft
Macro Assembler
Flight Simulator
Windows
Mouse
Paintbrush
Show Partner
Mouse Systems
PC Paint
NewStar
NewWord III (WordStar clone+)
Paperback Software
VP Planner (1-2-3 clone+)
VP Info (dBase II clone+)
Public domain
Kermit (communications)
PC-Talk (communications)
Procomm
Various games
Forth
Ryan McFarland
RM Cobol
Softcraft
Btrieve
SoftKlone
Mirror (Crosstalk clone)
Xerox
Ventura Desktop Publishing

Failures:

BASIC and BASICA as provided by Compaq fail. BIOS facilities specific to Compaq are suspected.

Turbo Prolog is written such that it will not work on a network system where the program resides on a remote drive.

PROCESSORS

PoppyII has two microprocessors. These are the central processor (CP) and the peripheral processor (PP).

The CP is an 80188 running at 8 mhz with no wait states. In this arrangement, it is estimated to be between two and one half to three times as fast as the 8088 processor on the IBM PC. Norton utilities indicate a rating of about 2.9.

Three sections of memory may be accessed by the CP. Main memory (640k) begins at address 00000h; ROM (32k) begins at address F8000h. An optional 64k ROM is available which begins at address F0000h. Display controller memory (256k), located at standard PC locations, is accessible to the CP, but only for display controller purposes. An 8k sram for OS and BIOS scratch area is located at EE000h. An optional 32k sram is available which begins at E8000h. See Appendix A for a detailed listing of PoppyII memory allocation.

The PP effects most peripheral functions, though it has only a minor role in the control of the display. The PP is a Super8 microcontroller running at 20 mhz. PP program memory is a 4k ROM.

DISPLAY

DISPLAY TUTORIAL

A display screen is composed of rows and columns of dots. The technical term for one dot is a pel, the shortened form of "picture element".

The number of rows and columns of pels is independent of the size of the screen, instead it is a function of the display controller. The more rows and columns, the higher the resolution, i.e. the better the picture. Typical numbers are 640 columns and 400 rows, although these vary widely with the controller type.

Each pel, at an instant in time, has two properties: intensity and color. When counting intensities, remember that one intensity is "unlit", and another is "lit", so three intensities are required to represent one intermediate level. Thus the most basic monochrome display would have two intensities (unlit and lit) and one color. More complex adapters may have up to four (one being unlit) intensities for each of three colors.

To display characters, pels are grouped into arrays or character positions. Character positions are also denoted by columns and rows. A screen with 640 pel columns could display 80 columns of characters by allocating 8 pel columns for each character column. The same screen with 200 pel rows, might display 25 character rows with 8 pel rows per character row. This would be called an 80x25 character display with an 8x8 character matrix.

A display controller may be considered to be either pel or character oriented. A pel oriented controller allows the CP to directly control the properties of each pel by storing values for these properties in controller memory. Since each pel is under direct CP control, these controllers are called APA (all points addressable) controllers.

A character oriented controller allows the CP to control character

positions but not individual pels. For each character position, one byte of controller memory determines the character to be displayed while a separate byte controls the character attributes. The controller generates the appropriate properties for each pel based on character patterns in its memory.

An APA controller can do anything a character controller can do, but it requires a lot of CP resources to effect control of each pel (remember a character typically consists of 64 to 126 pels). The character controller has specialized circuits that do a very good job of character generation.

POPPYII DISPLAY TYPES

Displays for PC compatibles are often described in terms of display adapters (adapter is the IBM term for controller). On the PC and most compatibles, a display adapter is chosen and purchased separately from the computer; it comes in the form of a card that plugs into an expansion slot. PoppyII takes a different approach: the capabilities of three IBM and one non IBM adapter are all built into the PoppyII processor card. It is still effective to describe the PoppyII display controller in terms of the types of display adapters it emulates. The four display types are:

MDA (IBM Monochrome Display Adapter)
HMG (Hercules Monochrome Graphics)
CGA (IBM Color Graphics Adapter)
EGA (IBM Enhanced Graphics Adapter).

Each of the above adapters have I/O port and memory addresses by which they are addressed by the CP. The PoppyII display controller is adaptive in that switching between emulation of the various adapter types is effected by addressing of the type, if the controller is in its auto switch mode. Thus, when a program addresses the I/O port of an adapter, PoppyII senses this and changes its display emulation to that of the adapter being addressed. An exception is that PoppyII knows what type of monitor is attached and will not switch to an adapter not supported by that monitor.

The remainder of this section of the manual is devoted to the description of the four adapters mentioned above.

MDA (IBM Monochrome Display Adapter)

A character oriented controller with 80 columns and 25 rows. Each character space is made up of a 9 column by 14 row array of dots (the screen is 720 columns by 350 rows for a total of 252,000 pels), providing excellent resolution. The character set includes the 96 ASCII characters plus 159 other characters, ranging from happy faces to single and double lines with special corner and junction characters. Judicious use of these extra characters enables the programmer to create many displays that appear to be done using APA (all points addressable) graphics.

The MDA provides three levels of intensity (unlit, low, normal).

Screen contents are controlled by two bytes of display memory for each of the 2000 character positions. One byte designates the character (space is one of the characters) to be displayed while the other defines the attributes for that character (intensity, reverse video, blinking, underline).

The monitor must be monochrome (discrete, TTL).

HMG (Hercules Monochrome Graphics)

Two modes. The character mode provides a complete emulation of the MDA (see above).

The graphics mode provides an APA addressable graphics display with 720 columns and 348 rows of dots. A single bit in HMG memory controls each pel, thus pel properties are limited to 2 intensity levels. There are two independent pages of display memory, and the program may select which one controls the display at any time.

HMG signals are the same as those from the MDA, as is the monitor.

CGA (IBM Color Graphics Adapter)

This type has seven modes: three APA graphics and four character displays.

APA MODES

COLUMNS	ROWS	COLORS	INTENSITIES
320	200	1	4
320	200	3	2
640	200	1	2

CHARACTER MODES

COL.	ROWS	CLRS.	INTENS.	OTHER ATTRIBUTES
40	25	1	3	Reverse Video, Blink
40	25	3*1	2	Blink
80	25	1	2	Reverse Video, Blink
80	25	3*1	2	Blink

The notation 3*1 color indicates the following color capabilities:

Foreground: one of two sets active at any time; each pel/character may select from three colors in active set.

Background: one active from set of 16.

The first two character modes are designed for use with a home television as a monitor. They are of little concern except for compatibility with some early (mostly game) software.

Signals from the CGA include: Red, Green, Blue, and overall intensity. The CGA may be used with either the CGA monitor or the EGA monitor.

EGA (IBM Enhanced Graphics Adapter)

A type introduced by IBM to strengthen color graphics capability and stay compatible with the previously introduced MDA and CGA, EGA is a bit of a kludge. It possesses all the modes of the MDA and CGA plus four more, all APA:

ADDITIONAL APA MODES

COLUMNS	ROWS	COLORS
320	200	16 each pel
640	200	16 each pel
640	350	16 each pel
640	350	Unlit, Dim, Bright, Bright Blinking

The three color modes above require the selection of a palette of 16 crayons from a set of 64.

Signals from the EGA include: Primary red, Secondary red, Primary blue, Secondary blue, Primary green, Secondary green. This provides each of the three colors with four levels of intensity (including unlit).

The EGA is normally used with the EGA color monitor, but may be used with the CGA color monitor or, in the last above mode (plus the MDA mode), with a monochrome monitor. In this case, Secondary green becomes lit/unlit and Secondary blue becomes intensity.

OTHER PERIPHERALS

PC-DOS programs access peripherals in three general ways: (1) DOS calls, (2) ROM BIOS interrupts, and (3) directly with I/O instructions to the hardware. Programs that use the DOS calls and BIOS interrupts are considered "well behaved". In general, well behaved programs will run correctly on PoppyII.

PoppyII supports all PC-DOS interrupts and function calls and all ROM BIOS interrupts.

PoppyII supports direct access to the hardware for the following peripherals:

- keyboard.
- speaker (including the timer usually dedicated to the speaker).
- programmable interrupt controller.
- display adapters.
- serial (com) port 1.
- timers 0 & 2.

PoppyII does not support direct hardware access to:

- hard disc controller.
- soft disc controllers.
- parallel (printer) port.
- DMA channels.

Disc and printer functions are available through the PC-DOS/TurboDOS path as they should be for shared devices.

Through the PC-DISK Product, PoppyII supports direct reading of PC-DOS formatted diskettes.

PoppyII provides six keyboard related features not normally available on the PC:

Other Peripherals

1. key click using the speaker.
2. use of the shift key when CAPS LOCK is on gives upper case letters.
3. slow (11 characters/second) or fast (22 characters/second) keyboard auto repeating.
4. blinking underline or blinking block cursor.
5. turning off the video after 10 minutes of no video or keyboard activity.
6. large (44 character) or small (8 character) keyboard buffer.

Each of these may be enabled or disabled via keyboard commands or the PoppyII utility program PPUTIL.

CABLES

There is one major and optionally one minor cable set associated with PoppyII:

- TA set consists of an internal TA cable and an external TA cable.
- Local Serial Port internal cable (optional).

Internal cables connect the board with a connector on the back of the system case. In this section, the term inboard denotes the end of the cable nearest the processor board; outboard denotes the end farthest from the processor board.

INTERNAL CABLES

Internal cables transmit signals from the processor board to the back of the case. Each of the internal cables provides a panel mount plug to which the corresponding external cable is attached.

For product definition purposes, internal cables are grouped with the processor board.

TA INTERNAL

The internal TA cable is a 24", 26 conductor ribbon cable. The inboard end has a 26 pin female header connector that mates with a male header on the processor board at location J2. The outboard end has a panel mount transition connector providing a female DB25 that mates to the inboard end of the external TA cable.

SERIAL PORT INTERNAL

The serial port internal cable delivers signals to a connector on the case. These signals are identical in function to those provided by the PC serial port. PoppyII avoids a paddle board by providing the proper serial port voltage levels on the processor board.

The cable is a 30", 20 conductor ribbon cable. The inboard end has a 20 pin female header connector that mates with a 20 pin header on the processor board at location J3. The outboard end has a panel mount transition connector providing a male DB25 connector for the external cable.

Note that this connector and its associated internal cable are utilized only if the serial port is to be local to the system case rather than accessible on the TA.

EXTERNAL CABLES

External cables carry signals from the back panel of the S100 box to the external device.

TA EXTERNAL

The external TA cable is made up of individually shielded pairs. The number of pairs required is dependent upon the type of monitor as follows:

Monochrome 5
EGA Color 9

Caution: Do not use a monitor without a matching cable; the results are likely to be disastrous, including harm to the processor board and the monitor.

There is a male DB25 connector on the inboard end. This connector has an internal jumper that tells the processor board whether the monitor is monochrome, color, or EGA. This mates with the panel mounted outboard connector of the internal TA

cable.

The outboard end terminates in a male DB25 connector which mates with a female DB25 on the TA. The TA may be up to 200 feet from the processor board. In addition to the connector for the external TA cable, the TA has four other connectors:

1. A direct wire connection to a wall plug type transformer that provides power.

2. A female DIN 5 circular connector for the keyboard cable.

3. A female DB9 connector for the monitor cable.

4. A male DB25 connector for the remote serial port.

MDA CABLE

PIN# POPPYII	SIGNAL NAME	PIN# TA
2	DI	2
15	DI*	15
5	TXD	5
18	TXD*	18
6	DOUT	6
19	DOUT*	19
7	VID	7
20	VID*	20
8	INT	8
21	INT*	21
13	GND/SHLD	13

Cables

EGA CABLE

PIN# POPPYII	SIGNAL NAME	PIN# TA
2	DI	2
15	DI*	15
5	TXD	5
18	TXD*	18
6	DOUT	6
19	DOUT*	19
7	SBLU	7
20	SBLU*	20
8	SGRN	8
21	SGRN*	21
9	BLU	9
22	BLU*	22
10	GRN	10
23	GRN*	23
11	RED	11
24	RED*	24
12	SRED	12
25	SRED*	25
13 & 16	GND/SHLD	13

CGA CABLE

PIN# POPPYII	SIGNAL NAME	PIN# TA
2	DI	2
15	DI*	15
5	TXD	5
18	TXD*	18
6	DOUT	6
19	DOUT*	19
8	INT	8
21	INT*	21
9	BLU	9
22	BLU*	22
10	GRN	10
23	GRN*	23
11	RED	11
24	RED*	24
13 & 3	GND/SHLD	13

SERIAL EXTERNAL

The external serial cable is a customer supplied item. Unshielded 8 conductor cable may be used. The signals supported by the PoppyII serial connector are as follows:

PIN#	SIGNAL NAME	DIRECTION
20	DTR	OUT
4	RTS	OUT
2	TXD	OUT
3	RXD	IN
5	CTS	IN
8	CD	IN
22	RI	IN
7	GND	--

REQUISITES

A workstation such as PoppyII must be part of a system. The systems in which PoppyII can operate have the following characteristics:

1. S100 bus chassis. The S100 bus is used to provide power to PoppyII and a network path between the PoppyII processor board and the master processor board. Each PoppyII requires one slot in the S100 chassis.

2. Master processor. The master must communicate with workstations by I/O mapped instructions. This requirement is satisfied by virtually all master boards.

3. TurboDOS network operating system. Release 1.43 or later, configuration F, G, H, or I. CI provides master and slave circuit drivers for use with the TurboDOS operating system. Configurations are a function of the master processor and supported workstations as follows:

   F 16 bit master, 16 bit workstations.
   G 8 bit master, 8 and/or 16 bit workstations.
   H 16 bit master, 8 and/or 16 bit workstations.
   I 8 or 16 bit master, 8 and/or 16 bit workstations.

SOFTWARE INSTALLATION

With your PoppyII workstation is a diskette containing all the software drivers and sample files necessary to generate an operating system that will run your PoppyII. You must be in possession of TurboDOS version 1.43 or later to generate a workable system. Assuming knowledge of TurboDOS operating system generation, the following is a suggested procedure for creating an operating system that will run PoppyII.

1. Included on your diskette are POPPY2.GEN and POPPY2.PAR files and all necessary driver modules except those that are TurboDOS serialized modules (STDSLAVE and CPMSUP). The .GEN and .PAR files may be used as is or may be modified to suit your requirements. Once modified, use TLINK to create an OSSLAVEx.SYS file for PoppyII by entering the command

   TLINK POPPY2 OSSLAVEx.SYS

   where x is your desired slave suffix (see P2SFX_ below).

2. Modify your current .GEN and .PAR files that are used to create OSMASTER.SYS to include the PoppyII circuit driver (PP2MCD) and, optionally, the PC-DISK support driver (DSKPC).

   NOTE: PC-DISK is a product developed by Charter Information Corp to allow the reading, writing, and formatting of PC-DOS diskettes directly on a PoppyII when in PC-DOS mode. Its use precludes the necessity for PCD, a utility for reading PC-DOS disks in TurboDOS mode. See Appendix G for a complete discussion of PC-DISK.

Patch points for the two modules are as follow (_ is the circuit driver letter):

PP2MCD: P2ADR_ - 16 byte slave port address table.

Defines the address of the command port as seen from the master processor. Each address is an odd number since the corresponding data port is the command port minus one (if command port is 5F, data port is 5E). The first entry in the table is for the slave known as node 1, the second for node 2, etc. An entry of FF in the table indicates that there is no Poppy at this node and no testing should be done. Default for the 16 bytes is 5F,5D.....43,41. The entries in this table correspond to the I/O address jumpers described under HARDWARE SETUP.

P2SFX_ - 16 byte slave suffix table.

Contains the letter to append to OSSLAVE for this node, i.e. if an A is placed in the second byte, then the second node would receive OSSLAVEA.SYS as its operating system. The default is all Q (OSSLAVEQ.SYS).

DSKPC: PPTDSK - 26 byte table that corresponds to local PC-DOS floppy drive A-Z.

Enter the corresponding TurboDOS drive (0=A, 1=B, etc.) For example, the entry PPTDSK = 3,4 would indicate that PC-DOS drive A is TurboDOS drive D and PC-DOS drive B is TurboDOS drive E. All drives defined in PPTDSK must be known to TurboDOS (included in DSKAST). In the example above, TurboDOS must have floppy drives D and E defined. Bit 7 may be set on if you do not wish to allow formatting on the drive. This would typically be set on if you were using a 96 TPI drive for reading and writing 48 TPI floppies, but do not want to format on that drive since the disk may not be able to read reliably in a normal 48 TPI PC drive.

The entry PPTDSK = 3,84 is identical to the previous example except that formatting PC-DOS drive B will not be allowed.

DRVTBL - This table is not in DSKPC, but rather in your floppy disk driver.

Its length depends on the number of floppy drives your floppy disk driver supports. The table is described here because it affects the PC-DISK package. The first byte in the table refers to the first floppy drive supported by this driver, the second byte to the second drive, etc. the following bits are defined:

Bits 0-1: step rate of the drive (as defined by Western Digital 279x). These bits are controller chip dependent and actually do not affect the performance of PC-DISK.

Bit 3: on indicates access to this drive restricted to PC-DISK package only. In other words, even though TurboDOS knows about this disk, any access to it via TurboDOS will return an error. This prevents the possibility of placing a PC-DOS disk in the drive and having TurboDOS read it and possibly try to rewrite the directory which would destroy the data on the disk. If this bit is not set on, care must be taken to not allow TurboDOS access to a PC-DOS disk. If you only want to read the diskette, this may be accomplished by setting the drive to read only via the TurboDOS SET command.

Bit 4: 1=mini floppy, 0=8" floppy. This bit should be set on if the drive is a 5.25".

Bit 5: 1=96 TPI drive, 0=48 TPI drive.

HARDWARE SETUP

There are several hardware options on the PoppyII board. These options allow one to change I/O port address, serial port location (local or remote), and eprom size.

I/O ADDRESS (J5)

Located at the bottom center of the board to the right of the voltage regulator is a 7x2 jack which is used to control the PoppyII I/O port address. Turn the board so that the S100 connector points up (or away) for the following discussion. Each jack pair corresponds to one bit: open is 1, short is 0. From this aspect, the jacks are numbered 7..1 from left to right. Jack assignment is as follows:

```
7  6  5  4  3  2  1
.  .  .  .  .  .  .
.  .  .  .  .  .  .
```

Jacks 7..1 correspond to bits 7..1 of the board's I/O address. Each PoppyII requires two ports - command and data. Bit 0 for the data port is 0 (even address) and for the command port 1 (odd address). Therefore, this bit is not included on the 7x2 jack.

Each board must have a unique pair of I/O port addresses, normally they start at 5Fh/5Eh and proceed toward 41h/40h. Boards are manufactured so that the command/data ports are at 5Fh/5Eh (0101111).

SERIAL PORT LOCATION

As shipped, the serial port connector is active on the TA (remote from the system case). If you wish the serial port to be local to the system case, you must transfer the IC at location U13 on the TA to U60 on the PoppyII. This will activate the serial connector at J3 on the PoppyII and disable the serial connector on the TA.

EPROM SIZE (J4)

The PoppyII is shipped with a 27256 eprom occupying memory locations FE000-FFFFF. To change to a 27512 eprom occupying memory F0000-FFFFF, locate J4 under the IC at U6. The jumper area is as follows:

```
3.  .__.1
      2
```

To convert to the larger eprom, cut the trace connecting 1 to 2 and solder 2 to 3.

HARDWARE INSTALLATION

PoppyII hardware installation is simple. Before proceeding, make certain you have the following items:

- PoppyII processor board.
- Terminal Adapter.
- TA internal cable.
- TA external cable.
- Keyboard.
- Monitor.
- A DB25 cutout on your S100 box for the TA connector (part of the TA internal cable).
- If you are going to use the serial port, you will also need a (customer supplied) serial port external cable.
- If you are going to use the serial port in the local mode, you will need a serial port internal cable and another DB25 cutout on your S100 box.

Assuming you have a running system and all the above parts, the following hardware installation procedure is suggested:

1. Turn off the power to your S100 box and remove the cover.
2. Insert the PoppyII processor board in the chassis. Don't force it, it should go in smoothly. Make certain it is in snug. Remove it and re-insert it; this will help clean the contacts on the chassis connector.

3. Place the TA internal cable so that the female DB25 connector is near the panel cutout and the other end (with the header plug) is near the matching connector (J2) on the processor board. Push the DB25 connector through the panel cutout to make certain the cable path is clear. With the screws provided, fasten the DB25 connector to the panel cutout. Plug the other end of the cable into the only connector on the top of the PoppyII processor board that it will fit.

4. If you are activating the serial port in the local mode, connect the internal cables in a similar fashion.

5. Replace the S100 box cover.

6. Uncoil enough of the external TA cable to allow you to plug its DB25 connector to the TA DB25 connector on the S100 box panel. Uncoil the other end to gain access to the TA distribution box and attach monitor and keyboard cables to their respective receptacles in the TA distribution box. It is a good idea to do this before stringing the cable.

7. Plug the TA distribution box power plug into a convenient wall socket.

8. Plug the monitor into a wall socket and turn it on.

9. Turn on the S100 box power and check the voltages if you are so inclined.

10. Once you are satisfied that both the hardware and software are working satisfactorily, relocate the monitor and keyboard to their working location and string the cable. The keyboard DIN connector is held in the TA distribution box by friction; the other cables should be fastened in place with the screws on their respective connectors.

OPERATION - TurboDOS

This section provides a guide to PoppyII operation under TurboDOS. Familiarity with TurboDOS is assumed. This is neither a reference nor a tutorial for the TurboDOS operating system.

When PoppyII boots, it displays the TurboDOS signon screen. The TurboDOS slave operating system is resident in your workstation placing the workstation in the TurboDOS mode. If you wish to run CPM-86 compatible programs under TurboDOS, you should log on in the standard TurboDOS manner and proceed.

TZ80

This is a CPM/80 emulator program which runs under TurboDOS-86. It is activated by the command:

TZ80

from a TurboDOS prompt. When TZ80 is active, a right parenthesis is used as the system prompt. From this prompt, you may run most programs designed for CPM-80 and 8 bit TurboDOS, including all the 8 bit TurboDOS utilities. To return to TurboDOS-86, enter HOME and then CTRL-C on the keyboard.

OPERATION - PC-DOS

To run programs under PC-DOS, you must replace the TurboDOS slave operating system in your workstation with a combination of TurboDOS-PC and PC-DOS. This is accomplished by the command:

BOOTPC

BOOTPC may be executed from the TurboDOS signon screen system prompt without a TurboDOS logon or, if you are already logged on under TurboDOS, from a TurboDOS system prompt in user# 31.

This executes the program BOOTPC.CMD in user# 31. This program reads the file 31:BOOTFILE.DSK which looks like a PC-DOS formatted disc, and proceeds to boot PC-DOS from this "disc". For some PC-DOS programs, you will need to have the ANSI driver present; in these instances, you should expand the boot command to the following:

BOOTPC ANSI

Inclusion of the ANSI driver is not the default because it occupies memory space; other than memory use, it will not prevent any programs from running.

NOTE: The rest of the discussion in this section applies only to PC-DOS remote disks (those not defined as PC-DOS local diskettes by the PC-DISK product). PC-DOS local diskettes are handled exactly as they would be on an IBM PC.

The directory system on remote drives remains that of TurboDOS and the PC-DOS directory system is simulated by assigning PC-DOS directories to TurboDOS user#s. The PC-DOS root directory is assigned to user 30.

TurboDOS-PC takes special actions when certain PC-DOS commands are issued. When the PC-DOS command MKDIR (or MD) is invoked, you may specify the user# to which this subdirectory is to be assigned or leave it to TurboDOS-PC. To

maintain control of user#-subdirectory correspondences, you will always want to specify the user#. This is accomplished by making the command of the form:

MKDIR nn#ddna

where nn is the user# that you wish assigned to this subdirectory and ddna is the subdirectory name. Thus the command:

MKDIR 22#TURBO

will create the directory TURBO and assign it to correspond with user#22.

When you execute the MKDIR command, a read only file is created in the parent directory with the name of the directory being created. In addition, two files are created in the user# assigned to the subdirectory (with names . and ..). It is unnecessary to concern yourself with the contents of these files.

If you do not specify a user#, TurboDOS will assign one for you, and this may result in confusion.

The PC-DOS CHDIR (or CD) command and use of directory paths actually supply a user#. This scheme works well, but the number of subdirectories is limited by the 32 user#s per disk of TurboDOS.

KEYBOARD CONTROLS

You may control the way your workstation operates by special keyboard entries. These actions may be taken at any time and are effective irrespective of the operating system (but not necessarily the program) in use:

- The speaker normally provides a keyboard click. This may be toggled off and on by the keyboard entry CTRL-ALT-MINUS (-).

- When the CAPS LOCK is on, the shift key will normally produce lower case letters. This may be toggled off and on by the entry CTRL-ALT-PLUS (+).

  Note: The PLUS and MINUS keys used in the above toggles must be on the numeric pad, not on the main key bank.

- When a key is held down, the action is as though the key were pressed repeatedly. The standard rate is 11 repetitions per second. There is a higher rate (approximately double) that may be toggled by the entry CTRL-ALT-SLASH (/).

- The cursor is normally a blinking underline. This may be toggled between underline and rectangle by the entry CTRL-ALT-SEMICOLON (;).

- The monitor will go blank after a period of 10 minutes with no keyboard or video activity. Pressing any key or any video activity will restore the monitor display. This feature may be toggled by pressing CTRL-ALT-RIGHT SQUARE BRACKET (]).

- The keyboard type-ahead buffer on an IBM PC is capable of holding 8 characters. This may be changed to a 44 character buffer by pressing CTRL-ALT-LEFT SQUARE BRACKET ([).

Note: Any characters in the type-ahead buffer are cleared when the keyboard buffer size is changed.

- The PoppyII workstation may be rebooted (to the TurboDOS signon screen) by pressing CTRL-ALT-DEL.

The following keyboard commands are functional only under PC-DOS (PS refers to the key that is labeled * and PrtSc):

- You may print the monitor screen to the currently assigned print route by the entry SHIFT-PS.

- You may send a line feed to the currently assigned print route by pressing CTRL-ALT-PS.

- You may send a form feed to the currently assigned print route and close the current print file (if any) by pressing ALT-PS. This is particularly useful from within a program, since PC-DOS often does not close files, and therefore does not cause printing to occur unitl you have returned to a prompt.

UTILITY PROGRAMS

The utilities described in this section are specific to the PoppyII board. The description of each utility specifies whether it runs under TurboDOS, PC-DOS, or both.

PPSELAUT

PoppyII select auto (PC-DOS). Causes execution of a batch file of the name AUTOnnnn.BAT where nnnn is the network node number of the executing workstation. If a batch file of the proper name is not found, you will get a "Command not found..." message.

For example, if your workstation is node 0003 on the network,

```
PPSELAUT
```

will look for the file AUTO0003.BAT and execute it.

There is a standard batch file (AUTOEXEC.BAT) that is executed by PC-DOS when it is booted. This file, as it comes from the factory, has as its last line:

```
PPSELAUT
```

Since I want my display to be in Hercules Full mode and audio key click to be off, my file (AUTO0002.BAT) contains the lines:

```
PPVID HERC1 LOCK
PPUTIL D
```

Customize your BAT file(s) to suit your needs.

To determine the node number of your workstation, run PPSELNAM.

PPSELNAM

PoppyII select name (PC-DOS). Displays the name of the AUTOnnnn.BAT which will be executed at the workstation when PPSELAUT is run. The nnnn is the network node number of the executing workstation.

PPUTIL [parm...]

PoppyII utility program (both). PPUTIL is used to select various POPPYII options such as keyboard auto repeat rate, key click on/off, type of caps lock, size of cursor, screen saver, and keyboard buffer size. It may be invoked with or without parameters (more than one parameter may be used). When invoked without parameters, it enters an interactive mode and the following actions are displayed:

A	--	FAST Keyboard Auto Repeat
B	<-->	SLOW Keyboard Auto Repeat
C	<-->	Key Click ON
D	--	Key Click OFF
E	<-->	IBM PC Style Caps Lock
F	--	TTY Style Caps Lock
G	<-->	SMALL Cursor
H	--	LARGE Cursor
I	<-->	Screen Saver ON
J	--	Screen Saver OFF
K	<-->	Small (IBM) Keyboard Buffer
L	--	Large Keyboard Buffer

Current settings are shown by a highlighted <-->. Typing the letter in the left hand column changes the current setting. For instance, assuming that the settings are as shown above, typing a H will cause the cursor to change from an underline to a block.

If one or more parameters are included in the command line, the program will execute and exit without intervention. For example, if you wish to change to a block cursor and no key

click each time you boot PC-DOS, you might execute:

```
PPUTIL DH
```

in your AUTOxxxx.BAT file.

PPVID [parm...]

PoppyII video control (PC-DOS). PPVID is used to select a mode for the display controller. It may be invoked with or without parameters (more than one parameter may be used). When invoked without parameters, it enters an interactive mode and the following actions are displayed:

EXIT	Leave PPVID.
EGA	Switch to enhanced graphics mode.
CGA	Switch to color graphics mode.
HERC0	Switch to Hercules half mode.
HERC1	Switch to Hercules full mode.
MDA	Switch to monochrome adapter mode.
AUTO	Enable auto switching.
LOCK	Disable auto switching.

Those actions that may be selected are displayed in reverse video. For example, if you have a monochrome monitor, it is invalid to switch to CGA, so that option is not in reverse video and cannot be selected. Use the ↑ and ↓ keys to move to the correct selection and the Return key to invoke the selection.

If one or more parameters (from the left column of the above list) are included in the command, the program will execute and exit without intervention. For example, if you have a monochrome monitor, each time you boot PC-DOS, you might execute:

```
PPVID HERC1 LOCK
```

Note: If you do not change the display mode via your BAT file(s), the PoppyII boots up as if you had specified PPVID EGA LOCK (locked in EGA mode).

APPENDIX A - MEMORY ALLOCATION

Location	Description
00000-003FF	80188 interrupt vector locations
00400-004FF	IBM ROM Bios data area
00500-005FF	IBM PC-DOS and IBM EGA data area
00600-9FFFF	Operating system and TPA
A0000-BFFFF	256k video memory
E8000-EDFFF	Optional static ram
EE000-EE4FF	PoppyII Bios scratch area
EE500-EE8FF	Unused
EE900-EEE77	BOOTPC code and data/boot code scratch area
EEE78-EEFFA	Unused
EEFFB	SSR ACK flag
EEFFC	MSR flag
EEFFD	Node number
EEFFE	Circuit number
EEFFF	Slave suffix character of OSSLAVEx.SYS
EF000-EFFFF	Video Bios scratch area
F0000-F7FFF	Optional ROM
F8000-FBFFF	Video Bios and fonts
FC000-FC3FF	PC-Disk Bios
FC400-FDFFF	Unused
FE000-FFA6D	PoppyII Bios
FFA6E-FFE6F	CGA fonts
FFE70-FFFEF	PoppyII boot code
FFFF0-FFFFF	Reset code

APPENDIX B - INTERRUPT VECTORS

Below are those interrupts that the PoppyII software supports. All vector numbers are in hexadecimal.

Vector	
0	Divide by zero
1	Single step
2	NMI
3	Breakpoint
4	Overflow
5	Print screen service routine
6	Undefined instruction
7	ESC op code
8	IRQ0 from 8259 (timer 0 - hardware clock tick)
9	IRQ1 from 8259 (keyboard character)
A	IRQ2 from 8259 (crt vertical retrace)
B	IRQ3 from 8259 (Com 2 - internal modem)
C	IRQ4 from 8259 (Com 1 - serial port)
10	Video services
11	Equipment list
12	Memory size
13	Diskette
14	Serial I/O
15	Cassette (status return is same as PC-XT)
16	Keyboard character
17	Printer (supported by TurboDOS-PC)
19	Bootstrap (supported by BOOTPC only)
1A	Time of day
1B	Keyboard break
1C	Timer tick
1D	Video parameter pointer
1E	Diskette parameters
1F	Video graphics font table
20-41	PC-DOS functions
48-4F	Vectors for 80188 internal interrupt controller
5C	PoppyII send request acknowledge

Appendix B - Interrupt Vectors

5D	Master send request
61	Clock interrupt for TurboDOS (PoppyII Bios interrupts clock driver every 20 ms for TurboDos tick)
64	Master to PoppyII test
DF	TurboDOS-86 specific function calls
E0	TurboDOS-86 function calls that are CPM-86 compatible

APPENDIX C - PORT ADDRESSES

Below are those ports that the PoppyII supports. All port numbers are in hexadecimal.

Port	
20-21	Programmable interrupt controller (8259)
40-43	Counter/timer (8253) - timers 0 and 2 only
60-63	Programmable Peripheral Interface (8255)
A0	NMI mask register
100	PoppyII <-> master command/status port
102-106	Super8 <-> 80188 communications
111	Super8 debug port
390	PoppyII <-> master data port
3B0-3BF	Monochrome Display Adapter
3C0-3CF	Enhanced Graphics Adapter
3D0-3DF	Color Graphics Adapter
3F8-3FF	Asynchronous communications (Com 1)

APPENDIX D - STATUS PORT

Below is a description of the PoppyII status port. All numbers in this appendix are in hexadecimal.

Bit

---

7 Unused

6 **MSR ACK** - Master send request acknowledge. Turned on by PoppyII interrupt service routine (out 40 to port 100) as a result of the master issuing MSR command (C0). Turned off by master issuing clear command (81) or clear MSR command (C1). Indicates to the master that PoppyII is ready to receive message from master.

5 **SLV SEND REQ** - Slave send request. Turned on by PoppyII (out 20 to port 100) as a result of the operating system telling circuit driver to send a message to the master. Turned off by master issuing clear command (81) or SSR ACK command (01). Indicates to master that the PoppyII wishes to send a message.

4 **TST ACK** - Test acknowledge. Turned on by PoppyII interrupt service routine (out 10 to port 100) as a result of the master issuing test command (40). Turned off by master issuing clear command (81) or clear test ack command (41). Used by master to determine if PoppyII is alive after period of inactivity. Also turned on by PoppyII to indicate it is ready to send a message to the master.

3-1 Unused

0 **DLD REQ** - Download request. Turned on by PoppyII (out 01 to port 100). Turned off by master issuing clear command (81) or clear download request bit command (00). Tells master to download a new copy of the operating system (such as when CTL-ALT-DEL is pressed).

APPENDIX E - MASTER COMMANDS TO POPPYII

Below is a list of the commands that the master processor may issue to the PoppyII board. All numbers are in hexadecimal.

00 **CLEAR DOWNLOAD REQUEST** - Clears bit 0 (DOWNLOAD REQUEST) of status port.

01 **SLV SEND REQ ACK** - Clears bit 5 (SLV SEND REQ) of the status port and causes interrupt vector 5C to be executed in the 80188.

40 **TEST** - Causes interrupt vector 64 to be executed in 80188. Interrupt service routine should turn on bit 4 of the status port.

41 **CLEAR TEST ACK** - Causes bit 4 (TST ACK) of the status port to be cleared.

80 **RESET** - Places 80188 in reset. When released by command 81, the 80188 will start executing commands at location FFFF0. Wait 5 milliseconds before issuing another command. *Note*: A hardware reset may be accomplished by shorting the jumper pins (J6) located in the upper left corner of the board.

81 **CLEAR** - Releases the 80188 from reset (if it was in reset) and clears all status port bits. Either handshake on the status port or wait 5 milliseconds after issuing this command before issuing another command to PoppyII.

C0 **MASTER SEND REQUEST** - Causes interrupt vector 5D to be executed in 80188. Interrupt service routine should turn on bit 6 of the status port.

C1 **CLEAR MSR ACK** - Causes bit 6 (MSR ACK) of the status port to be cleared.

APPENDIX F - NETWORK INTERFACE

Below is a description of how the master and PoppyII interface with each other over the network. In the description M indicates master, S indicates slave (PoppyII), and the -> or <- shows the direction of the exchange. All numbers are in hexadecimal.

RESET SLAVE

M->S Command 80 (reset). Master delays 5 milliseconds so reset can be accomplished in slave.

M->S Command 81 (clear). Master delays 5 milliseconds.

M->S Do a TEST SLAVE as described below. PoppyII will not talk until this is done.

TEST SLAVE

M->S Command 40 (test request). Causes interrupt in slave.

S->M Turn on bit 4 of status port (TST ACK) by outing 10 to port 100.

M->S Command 41 (clear TST ACK). Clears bit 4 of status port.

MASTER SEND MESSAGE

M->S Command C0 (master send request). Causes interrupt in slave.

S->M Turn on bit 6 of status port (MSR ACK) by outing 40 to port 100. Slave executes IN to get first byte of data.

M->S Master sees MSR ACK on and OUTs first byte of data (message length) to slave.

M->S Command C1 (clear MSR ACK).

M->S Sends rest of message to data port.

SLAVE SEND MESSAGE

S->M Turn on bit 5 (SLV SEND REQ) of status port by outing 20 to port 100.

M->S Master sees SLV SEND REQ on and issues command 01 (SLV SEND REQ ACK). Causes bit 5 of status port to be cleared and interrupts slave.

S->M Slave turns on bit 4 of status port (TST ACK) by outing to port 0 and sends message via OUTs to master.

M->S Command 41 (clear TST ACK). Clears bit 4 of status port. Master executes IN instruction to get message from slave.

OS DOWNLOAD

M->S Reset slave as described under RESET SLAVE above.

M->S Send 3 bytes via data port:

Byte: 1 = PoppyII node #
2 = PoppyII circuit #
3 = PoppyII OSSLAVEx suffix character

S->M One byte message containing slave suffix character as described under SLAVE SEND MESSAGE above.

M->S OS record as described under MASTER SEND MESSAGE above.

Repeat previous 2 steps until master sends one byte message to PoppyII containing default drive. This indicates end of the download.

APPENDIX G - PC-DISK

PC-DISK is a product developed by Charter Information Corp to allow the reading, writing, and formatting of PC-DOS diskettes directly on a PoppyII when in PC-DOS mode. Its use precludes the necessity for PCD, a utility for reading/writing PC-DOS disks in TurboDOS mode. PC-DISK works only on floppy diskettes. It currently supports access to IBM PC type 5.25" diskettes either one or two sided and 8 or 9 sectors per track. The diskettes to be used are always 48 tracks/inch (standard PC type), but the 48 tracks/inch diskette may be read, written or formatted on either a 48 TPI or 96 TPI disk drive. Support for 3.5" diskettes and high capacity diskettes is planned.

Below are the requirements that must be met in the TurboDOS operating system residing in the master processor for PC-DISK to be functional. This section is included for master processors whose drivers do not already support PC-DISK. All descriptions below assume TurboDOS 16 bit.

First, define the user-defined function entry point USRFCN:: in your master processor drivers. Code must be written here such that if register BH (register H if TurboDOS 8 bit) equals 0x10 a jump is made to external entry point DSKPC via the instruction JMP DSKPC# (JP DSKPC## if TurboDOS 8 bit).

All other changes must be made in your floppy disk driver module:

1. DSKPC sets the high byte of the operation code (PDRFCN) on. In other words, a read, which is normally op code 0x00, becomes 0x80. This is important for two reasons. First, it is used to determine whether access to the drive is allowed by TurboDOS. For this purpose, define a table named DRVTBL which may be changed via the .PAR file. See the section SOFTWARE INSTALLATION for a description of this table. At the beginning of the driver, if the requested drive is restricted to PC-DOS and the high bit of PDRFCN is off, return an error to TurboDOS.

Second, the high bit is used for the format operation. The driver must adjust the track to seek to if it is to format a PC disk on a 96 TPI drive. In any case, turn off the high bit of PDRFCN after doing the above tests.

2. Place code in your driver to determine whether this is a PC disk. If so, read track 0, sector 2 (file allocation table) to determine the number of sides and sectors/side. This information is stored in the first byte of the FAT (media descriptor byte) as follows:

Bit 0:	1=double sided	0=not double sided
Bit 1:	1=8 sectors/track	0=not 8 sectors/track

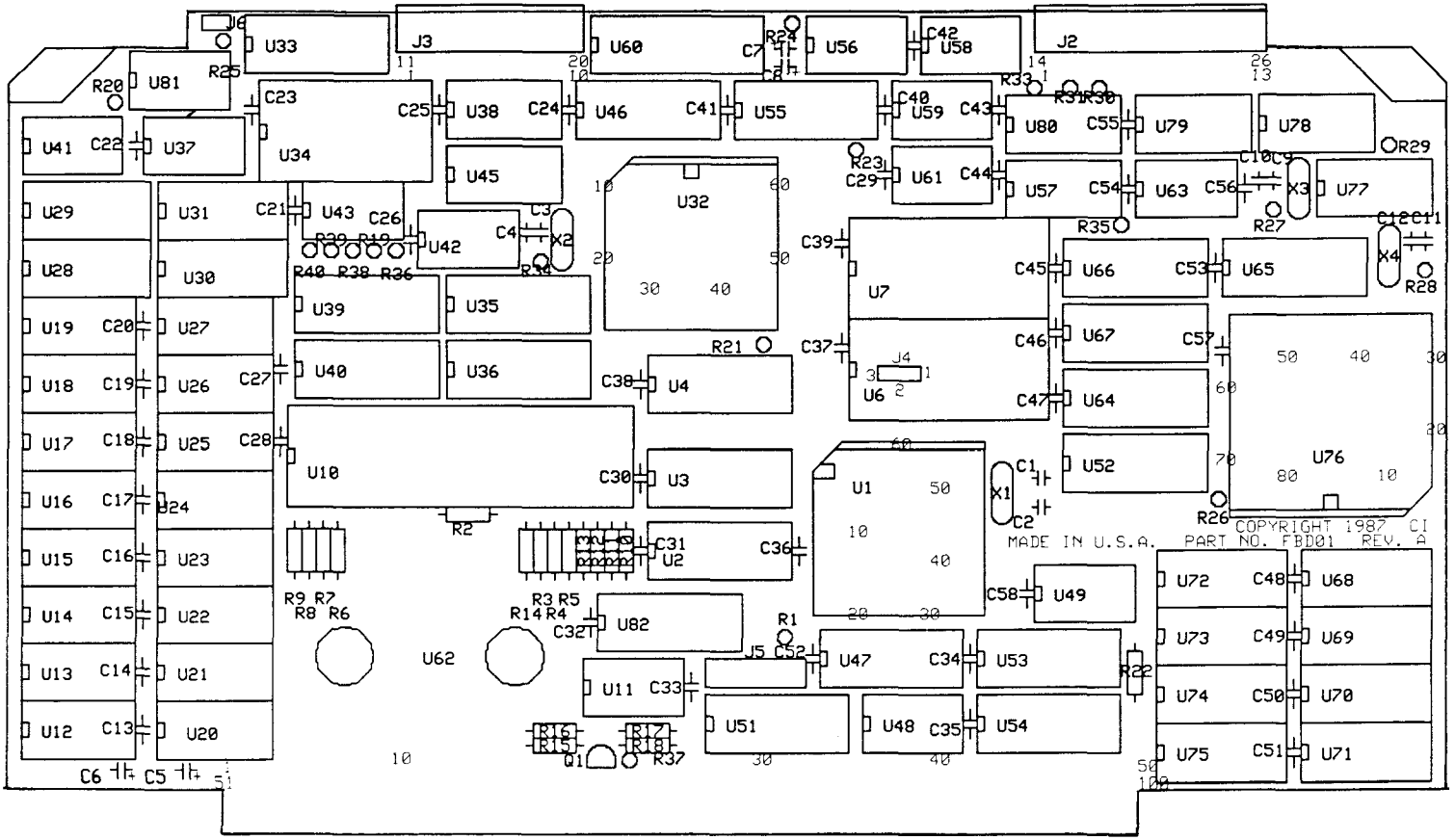
3. The following applies if you have information beyond the normal 11 bytes stored in the drive specification table (like translation table or disk type code). If so, once you have found the drive specification table for this disk, store its address away. Never use the location PDRDST passed to the driver by TurboDOS. Use the address that you have saved.

4. PC-DISK requests the reading and writing of PC floppies one sector at a time by requesting a logical sector (base 0). This number is stored in the word PDRTRK. In other words, assuming a PC disk with 9 sectors/side and double sided, a request where PDRTRK=0 is for the first sector on side 1, while PDRTRK=9 would be for the first sector on side 2. The driver must change this logical sector into the format desired by the floppy disk controller (usually head, track, sector).

5. PC-DISK is also capable of formatting a diskette. This is done one track and one side at a time. The track number to be formatted is passed in PDRTRK. The number of bytes to write are passed in PDRTC. The sector word (PDRSEC) is not used except to pass two

flag bits. The first bit (bit 7 of PDRSEC)requests double density if on, single density if off (all PC-DOS diskettes are double density). The other bit (bit 7 of PDRSEC+1) indicates the side to be formatted. Off is side 1, on is side 2.

6. If desired, 96 TPI drives can be used to read, write, and format 48 TPI drives simply by doubling the track number that is to be seeked to. Note, however, that writing or formatting on a 96 TPI drive will often create discs that cannot be read on a 48 TPI drive. Therefore, 96 TPI drives should be used, for the most part, only to read 48 TPI discs.


U33
J3
U60
C7
R24
U56
C42
U58
J2
U81
R25
R20
C23
C25
U38
C24
U46
C41
U55
C40
U59
C43
R33
R31
R30
U80
C55
U79
U78
U41
C22
U37
U34
U45
R23
C29
U61
C44
U57
C54
U63
C56
C10
C9
X3
U77
R29
R27
C12
C11
X4
R28
U29
U31
C21
U43
C26
R39
R19
U42
C4
C3
X2
R34
U32
U28
U30
R40
R38
R36
U39
U35
C39
U7
C45
U66
C53
U65
U19
C20
U27
C46
U67
C57
U18
C19
U26
C27
U40
U36
C38
U4
R21
C37
J4
U6
C47
U64
U17
C18
U25
C28
U10
C30
U3
U1
C1
X1
C2
U52
U76
R26
U16
C17
U24
R2
C31
U2
C36
U15
C16
U23
R9
R7
R8
R6
R3
R5
R14
R4
C32
U82
R1
C58
U49
U72
C48
U68
U14
C15
U22
U62
J5
C52
U47
C34
U53
R22
U73
C49
U69
U13
C14
U21
U11
C33
U74
C50
U70
U12
C13
U20
R16
R15
Q1
R17
R18
R37
U51
U48
C35
U54
U75
C51
U71
C6
C5
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