

**MONO/GRAPHICS/PRINTER
ADAPTER**

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2.3 Connection of Mono/Graphics/Printer Adapter in backplane of system unit

- Look inside the system unit. In the left rear are locations of expansion slots (see fig. 1).
- Remove the corresponding system expansion slot cover screw, and pull out the cover. (see fig. 1), save both items.
- Plug the Mono/Graphics/Printer Adapter vertically into the expansion slot, using the card guide (see fig. 2).
- Fasten the Mono/Graphics/Printer Adapter cover with pre-saved screw, thus securing the board into the system unit.

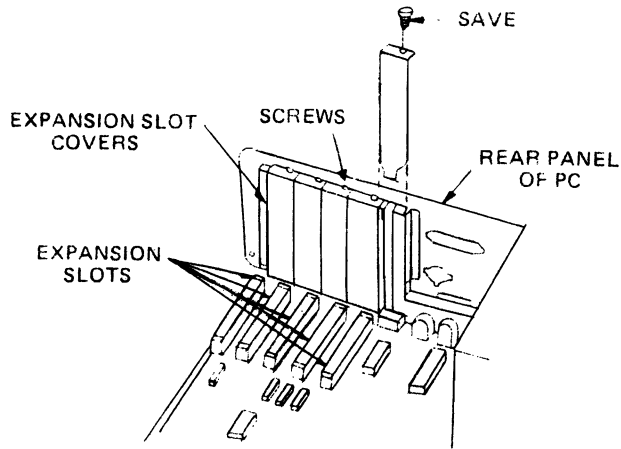


Figure 1. Expansion Slot

2.4 System board switch setup

Warning:

Before you change any switch settings, record down how the switches are presently set.

- Make sure that as any other video board that use the same screen memory buffer Monochrome Display/Printer Adapter (BOOOO - BFFFF).
- There are two switch blocks on the system board, mark SW1 and SW2, these 8 positions mark 1, 2, 3, 4, 5, 6, 7, 8 on each switch block, Besides, there is a on/off indicator on the side. If you press a switch position down to "off" side the status of that switch position is "off". On the other hand, if you press a switch position down to "on" side, the status of that switch position is "on".
- Find out the switch block 1 (SW1), and look at switch positions 5,6 (we are interested on those two positions only).
- Set the switches to their proper position according the following table.

SWITCH BLOCK 1	
Position	Position
5	6
OFF	OFF

2.5 Closing the system unit

- Put the top cover of the system unit back on its tracks.
- Slide the cover toward the rear of the unit until it is back in place. Take care that it does not catch on the ribbon cable.
- Fasten the two cover screws which you removed in step 2.2.

2.6 Interface to the external devices

- Plug the Monochrome monitor to the D-Shell 9 pins connector.
- Plug the parallel printer to the D-Shell 25 pins connector.

2.7 Reconnection of cables to external devices

- a. Reconnect all cables which you removed in step 2.1. Refer to IBM's guide to operations section 2, "Setup", if you have trouble in recabling the system.

3. INITIAL POWER-UP

- a. Place a copy of your normal IBM PC DOS system diskette in drive A.
- b. Power up the system in the normal sequence.
- c. Does the system come up in the normal manner with system prompt?
 - Appropriate switches (power, CRT) on,
 - Recabling of system correct (display, power)
 - Appropriate diskette installed in diskette drive.If this step cannot be successfully complete, do not continue!
- d. If further troubleshooting is requested, remove power from the system, open the cabinet, check cable orientation, check system board. If this does not allow the system to operate, remove the Mono/Graphics/Printer Adapter interface card and see if the system is back to normal. This will isolate the problem to the adapter or others.
- e. Press Ctrl-P then type DOS command Dir (CR) and see if the printer will print all the data as the screen display. If not, check, the printer power or cable connection, or go to step d.

Warning:

Always remove power from your computer system before modifying it.

4. I/O REGISTERS DEFINITION:

Hex address	Function of Register
3B8	Mode Select Register
3B9	Preset Light Pen Latch
3BA	Status Register
3BB	Clear Light Pen Latch
3BC	Printer Data Port
3BD	Printer Status
3BE	Printer Control Port
3B4	6845 Index Register
3B5	6845 Data Register

4.1 Mode-select register: (3B8)

Bit 0: not used.

Bit 1: A 1-selects 720 by 348 graphics mode. A 0-selects alphanumeric mode.

Bit 2: not used.

Bit 3: enable Video signal.

Bit 4: not used.

Bit 5: change background intensity to blink bit.

Bit 6: not used.

Bit 7: page number.

4.2 Light-pen set (3B9)

4.3 Status Register: (3BA)

Bit 0: Horizontal Sync.

Bit 1: light-pen trigger set.

Bit 2: light-pen switch.

Bit 3: Video dot.

Bit 4: not used.

Bit 5: not used.

Bit 6: not used.

Bit 7: Vertical sync.

4.4 Light-pen reset (3BB)

4.5 Printer data port: (3BC)

4.6 Printer status port: (3BD)

- Bit 0, 1, 2: not used.
- Bit 3 : error (pin 15).
- Bit 4 : select (pin 13)
- Bit 5 : paper end (pin 12).
- Bit 6 : acknowledge (pin 10).
- Bit 7 : busy (pin 11).

4.7 Printer control port: (3BE)

- Bit 0: strobe (pin 1).
- Bit 1: auto feed (pin 14).
- Bit 2: initialize (pin 16).
- Bit 3: select in (pin 17).
- Bit 4: interrupt enable (IRQ7).

5. CONFIGURING THE GRAPHICS CARD

5.1 Display buffer

Mono/Graphics/Printer Adapter uses 64K of the 128K IBM set aside as the PC's video buffer. This 64K buffer is divided into two approximately 32K buffers for each of the two graphics pages. The 4K buffer used by the IBM Monochrome Display/Printer Adapter falls within Mono/Graphics/Printer Adapter first graphics page, and the IBM Color Graphics Adapter's 16K buffer falls within Mono/Graphics/Printer Adapter second graphics page. For this reason, neither card can be used in the system at the same time as Mono/Graphics/Printer Adapter.

Page 0 = B0000–B7FFF (32K bytes)

Page 1 = B8000–BFFFF (32K bytes)

The printer connected to Mono/Graphics/Printer Adapter will serve as the system's primary printing device (i.e. as LPT1: in DOS terminology. (Any parallel port printer or plotter can be used with the Graphics Card, although the operation of those printers will vary with their control codes.

5.2 Text mode dot generation

In text mode, the display buffer is used to store the character codes and the attribute codes for displayed characters. The offset of the storage is:

B0000–B0FFF (4K bytes)

The text display is 80 characters wide and 25 lines long. All the characters are stored continuously using up 160 bytes per line. For each character, one byte is used for the character code and one for the attribute.

Offset of the character code of a character:

$$= 160 * (\text{LINE} - 1) + 2 * (\text{COLUMN} - 1)$$

Offset of the attribute of a character:

$$= 160 * (\text{LINE} - 1) + 2 * (\text{COLUMN} - 1)$$

where LINE is between 1 and 25
and COLUMN is between 1 and 80

Mono/Graphics/Printer Adapter has a hardware character generator which can do 256 different characters specified by the character codes. There is an attribute decoder which can underline, reverse Video, blank, bold face, or blink any character. The character generator conforms to the standard IBM PC character font.

The attribute decoder follows these rules:

7 6 5 4 3 2 1 0	Attribute Codes
B 0 0 0 1 0 0 0	Blank
B 0 0 0 1 0 0 1	Underline
B 0 0 0 1 1 1 1	Normal Display
B 1 1 1 1 0 0 0	Reverse Video

where 1 = 0 for normal body
1 for bold body.

If the blinker is off (i.e. the display mode control port bit 5 = 0),
 then B = 0 for normal background
 1 for blinking

5.3 Graphics mode dot generation

When Mono/Graphics/Printer Adapter is in the bit-mapped mode,
 the two pages display buffer can be alternately displayed.

While a page or screen is being displayed, any alternation to the
 buffer for that page will be shown on the display. Another pages
 will be shown only when it is selected.

The page selection is done by using bit 7 of the Display Mode
 Control Port in the following manner:

0 for page 0
 1 for page 1

The buffer area is allocated as follows:

Page 0 = B0000 – B7FFF
 Page 1 = B8000 – BFFFF

The offset (into the page) of the byte containing dot (x, y) in
 each page is:

$$\begin{aligned} &2000H * (Y \text{ MOD } 4) \\ &+ \\ &90 * \text{INTEGER } (Y/4) \\ &+ \\ &\text{INTEGER } (X/8) \end{aligned}$$

and the bit in the byte that stores the dot is bit position

$$7 - (X \text{ MOD } 8)$$

Where X is between 0 and 719
 Y is between 0 and 347

EXAMPLE:

The offset of (300, 250) is

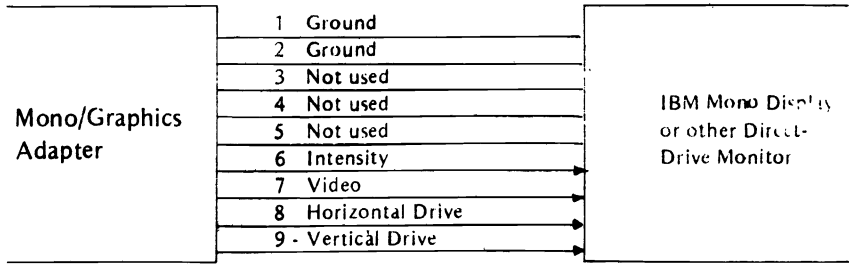
$$\begin{aligned} &2000H * (250 \text{ MOD } 4) \\ &+ \\ &90 * (\text{INTEGER } (250/4)) \\ &+ \\ &\text{INTEGER } (300/8) \end{aligned}$$

$$\begin{aligned} &= 2000H * (2) + 90 * (62) + (37) \\ &= 4000 H + 5617 \\ &= 4000H + 15F1H \\ &= 55F1H \end{aligned}$$

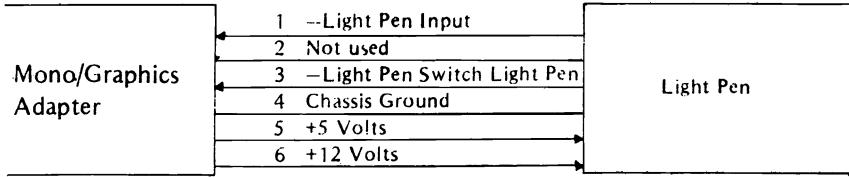
and bit position is

$$7 - (300 \text{ MOD } 8) = 7 - (4) = 3.$$

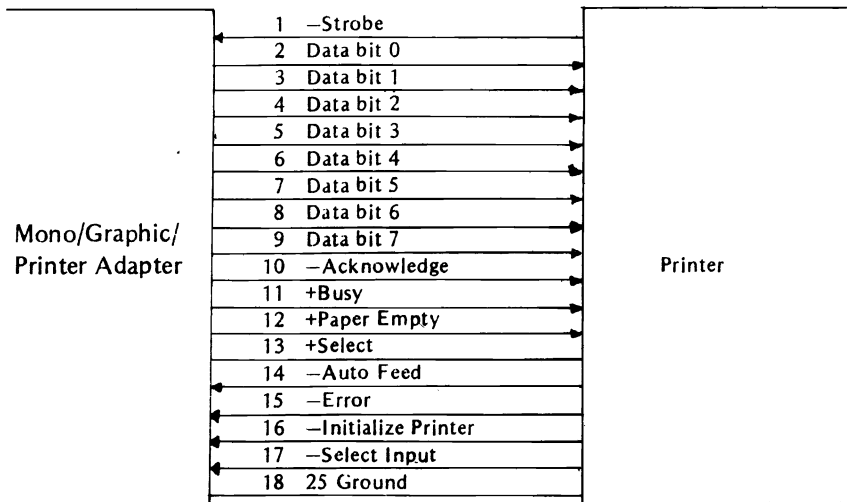
6. SPECIFICATION OF CONNECTORS



Monochrome display interface (9 Pin D-Shell Connector)



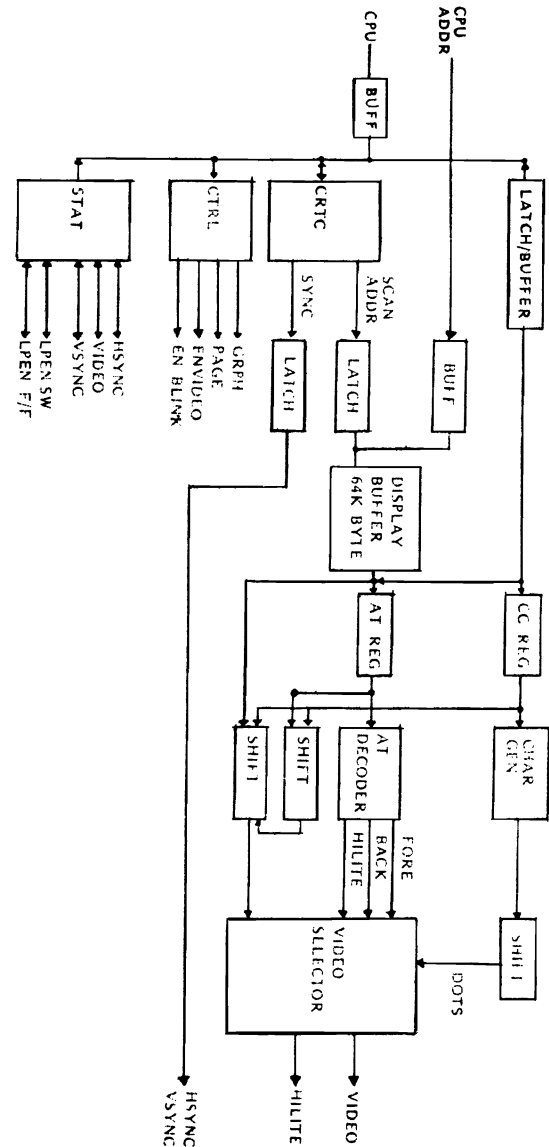
Light Pen Interface (6 Pin Din Connector)



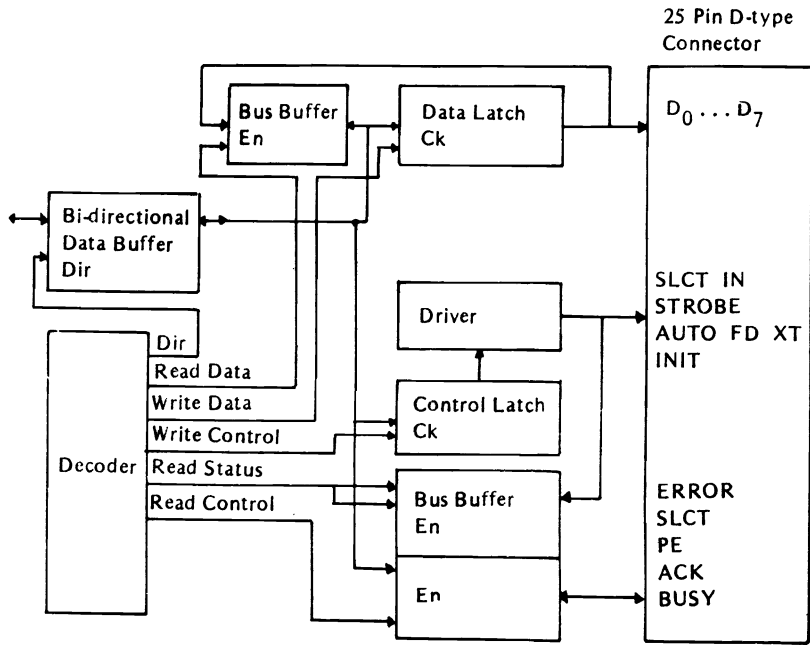
Printer Adapter Interface (25 Pin D-Shell Connector)

7. BLOCK DIAGRAM

7.1 Display hardware block diagram



7.2 Printer hardware block diagram



The Y-818 is a 97 Pin flat package custom LSI device which provides many of the functions needed to implement most of The IBM PC adapters. The Y-818 provides a highly integrated solution. It supports all the functions of The IBM Monochrome/Display Adapter, Hercules Compatible 720 x 348 Monochrome Graphics and IBM Printer Port.

