IBM Personal Computer 3278/79 Emulation Adapter Technical Reference

First Edition (October 1983)

Changes are periodically made to the information herein; these changes will be incorporated in new editions of this publication.

Products are not stocked at the address below. Requests for copies of this product and for technical information about the system should be made to your authorized IBM Personal Computer dealer.

A Reader's Comment Form is provided at the back of this publication. If this form has been removed, address comments to IBM Corporation, Personal Computer, P.O. Box 1328-C, Boca Raton, Florida 33432. IBM may use or distribute any of this information you supply in any way it believes appropriate without incurring any obligations whatever.

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

Warning: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

INSTRUCTIONS TO USER

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, reference manuals, and the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.

- Relocate the equipment with respect to the receiver.

- Move the equipment away from the receiver.

- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

- Ensure that side option mounting screws, attachment connector screws, and ground wires are tightly secured.

- If peripherals not offered by IBM are used with this equipment, it is suggested that you use shielded, grounded cables with in-line filters, if necessary.

If necessary, consult your dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

CAUTION
This product is equipped with a UL-listed and CSA-certified plug for the user's safety. It is to be used in conjunction with a properly grounded receptacle to avoid electrical shock.

Preface

This publication provides technical information about the IBM Personal Computer 3278/79 Emulation Adapter Card. This manual describes the hardware design and provides interface information for the IBM Personal Computer and IBM Personal Computer XT.

The information in this publication is for reference, and is intended for hardware and software designers, programmers, engineers, and interested persons who need to understand the design and operation of the IBM Personal Computer.

Contents

Section 1. IBM Personal Computer 3278/79 Emulation Adapter

Introduction

The IBM Personal Computer 3278/79 Emulation Adapter card supports emulation of the base 3270 data stream and controls communication between the IBM Personal Computer and an IBM control unit. All system control signals and voltage requirements are provided through a 2 by 31 position card edge tab. A coaxial connector (type BNC) joins this adapter card to the control unit.

The adapter card will accept, decode, and execute commands issued from the control unit or the IBM Personal Computer. All information from the control unit is sent in the form of a 12–bit frame over a coaxial link. Transition checks include mid–bit transition and transmission parity.

Adapter Block Diagram

Adapter Block Diagram

1-2
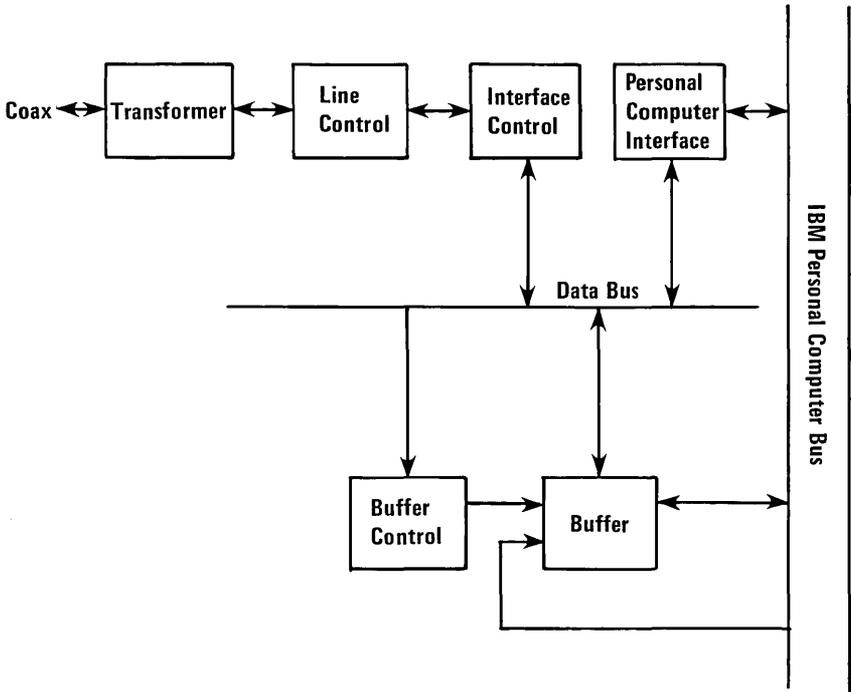
I/O Address Locations

This table describes the I/O address locations for the registers that define and control the emulation adapter.

Base Address Hex I/O Space	Low Address Bits	Register
2D0	0 0 0	Interrupt/Status Register
2D1	0 0 1	Visual/Sound Register
2D2	0 1 0	Cursor Address Register 7-0
2D3	0 1 1	Cursor Address Register 15-8
2D4	1 0 0	Control Register
2D5	1 0 1	Scan Code Register
2D6	1 1 0	Terminal ID Register

I/O Address Locations

Interrupt/Status Register (2D0)

This 8–bit register on the emulation adapter is accessed by the
IBM Personal Computer. Bits 0 through 5 are Interrupt (I) bits,
which are set by the emulation adapter and reset by the IBM
Personal Computer. Bits 6 and 7 are Status (S) bits, which are set
and reset by the adapter.

> **Note:** Interrupt Level–2 is used by the emulation adapter.

Bit	I/S	Function
0	I	Keystroke Accepted
1	I	Reset Command Decoded
2	I	Visual/Sound Register Updated
3	I	Reserved
4	I	Base Buffer Modified Complete
5	I	Load I/O Address Command Decoded
6	S	Buffer Being Modified
7	S	Interrupt Generated

Interrupt/Status Register

Visual/Sound Register (2D1)

This 8-bit register is set and reset by the emulation adapter
except for the sound alarm (bit 6) which is reset by any Write
operation from the IBM Personal Computer to this register
with any data. No other bits are affected by a Write operation
from the IBM Personal Computer to this address. Each time this
register is loaded by the adapter logic, bit 2 in the Interrupt/Status
Register is set.

Bit	Function	Frame Bit
0	0 = 80 characters per line	3
1	Inhibit Feature Step of Address Counter	5
2	Inhibit Display	6
3	Inhibit Cursor	7
4	Reverse Cursor	8
5	Blink Cursor	9
6	Sound Alarm	
7	Enable Clicker	

Visual/Sound Register

Cursor Address Register (2D2, 2D3)

This 16–bit register is internal to and is set by the emulation adapter. This register requires two addresses and can be read by the IBM Personal Computer. This register contains the current value of the I/O Address Counter. In 3278/79 emulation mode, this register indicates the location of the cursor.

Control Register (2D4)

This is an 8–bit Read/Write register internal to the emulation adapter and accessed by the IBM Personal Computer. It requires one address to read and write.

Bit	Function
0	Coax Enable
1	Reserved
2	Reserved
3	Keystroke Available
4	Reserved
5	Test
6	Reserved
7	Disable Interrupt

Control Register

Bit 0

This bit is set by the IBM Personal Computer, causing the emulation adapter to become enabled and on–line. After this bit is set, the first POLL causes a POR response to be sent to the control unit. The bit is initially reset during hardware power–on. It is also reset by the RESET command or by the IBM Personal Computer. When this bit is reset, the emulation adapter ignores all transmissions from the control unit. Thus, it causes the control unit to timeout and set the "GO TO SLEEP" latch for that line.

Bit 1   Reserved.

Bit 2   Reserved.

Bit 3   This bit is set by the IBM Personal Computer and notifies the emulation adapter that the Scan Code Register has been loaded. This data is then handled as a keystroke. This bit is reset by a POLL ACK or RESET command from the control unit.

Bit 4   Reserved.

Bit 5   This bit is set by the IBM Personal Computer. It allows the IBM Personal Computer to do limited functional testing of the IBM Personal Computer 3278/79 Emulation Adapter card. The coaxial link is automatically disabled.

Bit 6   Reserved.

Bit 7   This bit is initially reset by the hardware power–on
              cycle. Then it is set and reset by the IBM Personal
              Computer. Setting this bit inhibits the sending of
              interrupts to the IBM Personal Computer, but it does
              not prevent setting the interrupt/status bit (0–5). If
              an interrupt is set when the Mask bit is on, subsequent
              removal of the Mask bit will allow that interrupt to
              pass through to the IBM Personal Computer.

Scan Code Register (2D5)

This 8–bit register is internal to the emulation adapter and is set
and reset by the IBM Personal Computer. This register requires
one address.

In 3278/79 Emulation mode, this register is used by the IBM
Personal Computer to send a keystroke code to the control unit.
The IBM Personal Computer will not change the contents of this
register if bit 3 of the Control Register is set.

   Note: The scan code placed in this register must be the
   ones–complement of the data to be sent to the control unit.

Terminal ID Register (2D6)

This 8–bit register is internal to the emulation adapter and is set and reset by the IBM Personal Computer. It requires one address.

This register *must* be set by the IBM Personal Computer *before* enabling the coaxial link.

> **Note:** The Terminal ID placed in this register must be the ones–complement of the data to be sent to the control unit.

Memory Address Locations

There are 8KB of RAM reserved for the emulation adapter. The beginning address is CE000; the ending address is CFFFF.

Base Address Hex	Low Address Bits	Register
CE000 - Starting address	PC Address bits 12-0	RAM Data

Memory Address Locations

Accepted Commands

Below is a list of the commands sent from the control unit and recognized by the IBM Personal Computer 3278/79 Emulation Adapter Card.

Note: The emulation adapter will respond to all good transmissions.

Commands	Coaxial Frame Bits 5 6 7 8 9
READ Poll (include priority)	0 0 0 0 1
Read Data	0 0 0 1 1
Read Address Counter High	0 0 1 0 1
Spare	0 0 1 1 1
Read Terminal ID	0 1 0 0 1
Read Multiple	0 1 0 1 1
Read Status	0 1 1 0 1
Spare	0 1 1 1 1
Poll Acknowledge	1 0 0 0 1
Spare	1 0 0 1 1
Read Address Counter Low	1 0 1 0 1
Spare	1 0 1 1 1

(Part 1 of 2) Accepted Commands

Commands	Coaxial Frame Bits 5 6 7 8 9
Spare	1 1 0 0 1
Spare	1 1 0 1 1
Spare	1 1 1 0 1
Spare	1 1 1 1 1
WRITE Reserved	0 0 0 0 0
Reset	0 0 0 1 0
Load Address Counter High	0 0 1 0 0
Clear	0 0 1 1 0
Spare	0 1 0 0 0
Load Control Register	0 1 0 1 0
Write Data	0 1 1 0 0
Insert Byte	0 1 1 1 0
Search Forward	1 0 0 0 0
Search Backward	1 0 0 1 0
Load Address Counter Low	1 0 1 0 0
Load Mask	1 0 1 1 0
Spare	1 1 0 0 0
Spare	1 1 0 1 0
Spare	1 1 1 0 0
Escape	1 1 1 1 0

(Part 2 of 2) Accepted Commands