



*Personal Computer
Hardware Reference
Library*

IBM RT PC Options Installation

The following statement applies to this IBM product. The statement for other IBM products intended for use with this product will appear in their accompanying manuals.

Federal Communications Commission (FCC) Statement

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A 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 commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Instructions to User: Properly shielded and grounded cables and connectors must be used for connection to peripherals in order to meet FCC emission limits. Proper cables are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables or by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

CAUTION:

This product is equipped with a 3-wire power cord and plug for the user's safety. Use this power cord in conjunction with a properly grounded electrical outlet to avoid electrical shock.

Third Edition (June 1988)

This major revision obsoletes previous editions of the IBM RT PC Options Installation.

This edition applies to all subsequent releases until otherwise indicated in new editions or technical newsletters. Changes are made periodically to the information herein; these changes will be incorporated in new editions of this publication.

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Safety Notice Translations

DANISH

ADVARSEL

Page 1-4, 1-10

ADVARSEL - Enheden er tung. Der bor mindst vare to personer til at lofte systemenheden, der vejer op til 42 kg. - Sluk for systemet.

Page 3-6

ADVERSEL: Chippens ben kan være skarpe.

Page 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

ADVARSEL: Sluk for strømmen på systemenheden og tag stikket ud af stikkontakten.

Page 9-5

ADVARSEL - de elektriske kabler og stik er udformet for maksimal sikkerhed. Benyt kun stikkontakter med jordforbindelse for at undgå elektrisk stød.

Safety Notice Translations (Continued)

DUTCH

GEVAAR

Waarschuwing

Schakel de systeemeenheid en alle randapparatuur uit en haal de netspanningsstekkers van de systeemeenheid en van alle randapparatuur uit de stopcontacten, voordat u een kap opent of een signaalkabel loshaalt.

Pag. 1-4, 1-10

“LET OP! - Deze machine is zwaar. Er zijn drie of meer mensen voor nodig om de systeemmachine, die maximaal 42 kg weegt, op te tillen. - Zet het systeem uit”.

Page 3-6

LET OP! Raak de pennen niet aan. Ze zijn scherp.

Pag. 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4 LET OP! Schakel de stroom van de systeemseenheid uit en trek het netsnoer uit het stopcontact.

Page 9-5

“LET OP! - De machines hebben elektriciteitskables en stekers die aan de veiligheidsvoorschriften voldoen”.

Sluit de machines alleen aan op een contactdoos met randaarde om elektrische schokken te vermijden.

Safety Notice Translations (Continued)

FINNISH

VAROITUS

Huomio

Ennen minkään yhteyskaapelin tai kannen irrottamista, katkaise virta systeemyksiköstä ja kaikista siihen liitetyistä laitteista; irroita sitten kaikki verkkojohdot pistorasioistaan.

Sivu 1-4, 1-10

VAROITUS - Laite on painava. Keskusyksikön nostamiseen tarvitaan vähintään kaksi henkilöä - yksikkö saattaa painaa jopa 42 kg. - Katkaise järjestelmästä virta.

Sivu 3-6

VAROITUS: Älä koske piikkeihin - ne ovat teräviä.

Sivut 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, ja 8-4

VAROITUS: Katkaise virta keskusyksiköstä ja irrota virtajohto pistorasiasta.

Sivu 9-5

VAROITUS - Laitteen virheetön ja turvallinen toiminta vaatii, että se liitetään vain maatettuun pistorasiaan.

Safety Notice Translations (Continued)

FRENCH

DANGER

Attention!

Avant de retirer le couvercle de protection ou de débrancher les câbles de signalisation:

- Mettre en position hors tension tous les interrupteurs de l'unité et des périphériques.
- Débrancher tous les cordons d'alimentation de leur prise murale.

Pag. 1-4, 1-10

ATTENTION: Cette unité pèse 42 kg. Prévoir au moins deux personnes pour la déplacer. Mettre le système hors tension (voir la figure).

Page 3-6

ATTENTION: Ne touchez pas les broches, elles sont pointues.

Page 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

ATTENTION: Mettez l'unité centrale hors tension et débranchez le câble d'alimentation de la prise murale.

Page 9-5

ATTENTION: Ce matériel est équipé de câbles électriques et de fiches répondant aux normes de sécurité. Il doit être connecté à un réceptacle électrique muni d'une mise à la terre réglementaire, afin d'éviter tout risque électrique.

Safety Notice Translations (Continued)

GERMAN

ACHTUNG

Achtung

Vor dem Entfernen von Verkleidungen oder dem Trennen von Signalkabeln Netzschalter der Systemeinheit und aller angeschlossenen Geräte ausschalten. Dann alle Netzkabel aus den Netzsteckdosen Ziehen.

Seite 1-4, 1-10

Vorsicht - da die Systemeinheit sehr schwer ist (ca 42 kg), sollte sie stets von mindestens 3 Personen gehoben werden - System ausschalten.
(Eine Abbildung zeigt den Netzschalter und illustriert, wie das Geräet angehoben werden soil.)

Seiten 3-6

VORSICHT! Die scharfkantigen Kontaktstifte nicht ber hren; Verletzungsgefahr!

Seiten 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

VORSICHT! Die Systemeinheit ausschalten und Netzstecher aus der Steckdose ziehen.

Seite 9-5

Vorsicht - alle Geräete verfuegen ueber Kabel und Stecker.

Zur Vermeidung von elektrischen Schlaegen alle Geräete nur an geerdete Steckdosen anschliessen.

Safety Notice Translations (Continued)

ITALIAN

PERICOLO

Attenzione

Prima di togliere qualsiasi coperchio o scollegare qualsiasi cavo di segnale, spegnere gli interruttori di alimentazione dell'unità di sistema e di tutti i dispositivi collegati; scollegare poi dalle prese di corrente tutti i cavi di alimentazione esterni.

Pag. 1-4, 1-10

PERICOLO - Questa unità può pesare sino ad un massimo di 42 chili.

Per sollevarla sono richieste tre o più persone. Spegnere il sistema (è riportata una figura rappresentante l'interruttore e l'azione da effettuare).

Pag. 3-6

PERICOLO - Non toccare i contatti. I contatti sono taglienti.

Pag. 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

PERICOLO - Spegnere il sistema e scollegare il cavo di alimentazione dalla presa elettrica.

Pag. 9-5

AVVERTENZA - Tutte le unità sono dotate di cavi e spine progettate per la sicurezza. Per evitare scariche elettriche usare prese con messa a terra.

Safety Notice Translations (Continued)

JAPANESE

注意：

カバーを取り外したり、信号ケーブルを切り離したりする場合には、必ずシステム装置の電源スイッチとすべての接続装置の電源スイッチをオフにしてから、すべての外部電源ケーブルをコンセントから抜いてください。

注意：

システム・ユニットの電源をオフにしてから、電源ケーブルを抜いてください。

システム装置の重量は42 Kgくらいになります。重いですから、3人以上で持ち上げるようにしてください。

ピンに触れないように気を付けてください。

注意

各装置には、安全設計されたコードやプラグがあります。電氣的ショックを予防するために、装置は全て接地端子のあるコンセントにのみ差し込むようにしてください。

Safety Notice Translations (Continued)

NORWEGIAN

ADVARSEL

Advarsel

Før du tar av dekselet eller trekker ut signalkabler, må du slå av nettbryterne på systemenheten og alle tilkoblede enheter (AV, Off eller O) og trekke ut alle nettkablene fra stikkontaktene.

Side 1-4 og 1-10

“ADVARSEL: Systemenheten veier inntil 42 kilo, og man bør være tre eller flere for å bære den. Slå maskinen av.” (Se på tegningen som viser hvordan du gjør det.)

Side 3-6

“ADVARSEL: Ikke ta på kontakpolene”

Side 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, og 8-4

“ADVARSEL: Slå av strømmen på systemenheten og trekk ut nettkabelen fra stikkontakten”

Side 9-5

“ADVARSEL: Enhetene er utstyrt med kabler og plugger som bare må koples til forskriftsmessig jordede stikkontakter”

Safety Notice Translations (Continued)

PORTUGUESE

PERIGO

Cuidado

Antes de remover qualquer tampa ou de desligar qualquer cabo de sinal coloque os interruptores de corrente eléctrica da unidade do sistema e de todos os dispositivos a ela ligados na posição de desligado (off) e desligue das tomadas todos os cabos externos de corrente eléctrica.

Páginas 1-4, 1-10

CUIDADO - Dado que este dispositivo é pesado, são necessárias três ou mais pessoas para levantar a Unidade do Sistema que pesa cerca de 42 Kg. Coloque o interrupter na posição "OFF"

Páginas 3-6

CUIDADO - Não toque nos pinos, pois são aguçados.

Páginas 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

CUIDADO - Desligue a unidade do sistema e retire a cabo de alimentação da tomada.

Página 9-5

CUIDADO - Os dispositivos têm cabos eléctricos e tomadas que obedecem a regras de segurança. Ligue todos os dispositivos apenas a tomadas com fio de terra para evitar choques eléctricos.

Safety Notice Translations (Continued)

SPANISH

PELIGRO

Precaution

Antes de quitar cualquier cubierta o desconectar cualquier cable de señal, coloque los interruptores de alimentación en la unidad del sistema y en todos los dispositivos conectados en posición de APAGADO; desenchufe entonces todos los cables externos de alimentación de las tomas de corriente.

Pag. 1-4, 1-10

PRECAUCION - Este dispositivo es pesado. Se debería levantar la unidad central entre tres o más personas. Su peso es superior a 42 Kg (92 lb). Utilice un elevador a ser posible.

Pag. 3-6

PRECAUCION - No toque la patillas. Las patillas son puntiagudas.

Pag. 2-3, 3-4, 4-4, 5-4, 6-5, 7-4, 8-4

PRECAUCION - Desconecte la alimentación de la unidad central y desenchufe el cable de alimentación de la toma de corriente.

Pa. 9-5

ATENCION - Los cables y enchufes eléctricos de los dispositivos han sido diseñados con vistas a la seguridad. Enchufe los dispositivos sólo en tomas de corriente con conexión de tierra para evitar posibles descargas eléctricas.

Safety Notice Translations (Continued)

SWEDISH

VARNING

Varning

Innan du tar bort någon kåpa eller lossar någon signalkabel måste du slå från strömbrytarna på systemenheten och alla anslutna enheter samt lossa alla nätkablar från sina uttag.

På sidan 1-4, 1-10: finns följande varningstext:

VARNING - Denna enhet är tung. Två eller flera personer bör hjälpas åt att lyfta systemenheten som kan väga upp till 42 kg.

På sidan 3-6 finns följande varningstext

VARNING - Rör inte stiften, de är vassa.

På sidorna 2-3, 3-4, 4-4, 5-4, 6-5, 7-4 och 8-4 finns följande varningstext

VARNING - Slå av strömmen till systemenheten och lossa nätkabeln från cluttaget.

På sidan 9-5 finns följande varningstext:

VARNING - Enheterna är av säkerhetsskäl försedda med jordade nätkblar. De får endast anslutas till jordade cluttag.

Notes:

About This Book

Purpose

IBM RT PC Options Installation shows you how to install optional adapters and drives in the IBM RT Personal Computer®. The book is written to cover every possible IBM RT PC system setup situation. Because each system is different, the book cannot tell you, in all cases, the exact slot for each adapter. The book does provide, however, the possible slots you can use, depending on the combination of adapters you have. The book also tells you where to install each of the optional drives.

This book provides step-by-step instructions to help you install optional adapters, fixed-disk drives, and diskette drives in the IBM 6150 system units and optional adapters in the IBM 6151 system unit. These instructions apply whether you are installing options in a new system or adding options to a system already in use.

Who Should Read This Book

This book is written for a person trained to install drives and adapters in IBM RT PC system units. The only tools needed are a small and a medium flat-bladed screwdriver.

Task may go smoother if only one person reads and follows the steps. However, two or more people should handle the heavier devices.

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How to Use This Book

Read Section 1, “Getting Started” for instructions on removing the covers from the system units. Read this section when installing options in a new system or when adding options to a system already in use.

Both system units are shown in many drawings. Select the appropriate drawing for reference.

To protect yourself and the equipment, do the steps in order and carefully read and follow the instructions under the Warning and Caution notices.

Section 2, “Removing and Installing Drives in the IBM 6150 System Unit” gives instructions for installing the optional fixed-disk and diskette drives.

The instructions in Section 3, “Installing the Adapters” provide general information for installing the optional adapters and the system unit covers.

Section 4, “Processor Options” through Section 8, “Additional Options” contain the information needed to install the different optional adapters.

Section 9, “Checking Out the Option Installation” provides a detailed procedure to ensure that the options you installed have been recognized by and properly integrated within the system unit.

A Reader’s Comment Form and Book Evaluation Form are provided at the back of this book. Use the Reader’s Comment Form at any time to give IBM information that may improve the book. After you become familiar with the book, use the Book Evaluation Form to give IBM specific feedback about the book.

Related Information

You do not need to read any other books before you do this task, but you might find the following books helpful:

- *IBM RT PC Guide to Operations* describes the IBM 6151 and IBM 6150 system units, the displays, keyboard, and other devices that can be attached. This guide also includes procedures for operating the hardware and moving the IBM 6151 and IBM 6150 system units.
- *IBM RT PC Installing and Customizing the AIX Operating System* provides step-by-step instructions for installing and customizing the AIX™ Operating System, including how to add or delete devices from the system and how to define device characteristics. This book also explains how to create, delete, or change AIX and non-AIX minidisks.
- *IBM RT PC Problem Determination Guide* provides instructions for running diagnostic routines to locate and identify hardware problems. A problem determination guide for software and two high-capacity (1.2MB) diskettes containing the IBM RT PC diagnostic routines are included.
- *IBM RT PC User Setup Guide* provides instructions for setting up and connecting devices to the system units. This book also gives procedures for testing the setup (packaged with *IBM RT PC Options Installation*).

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To order additional copies of this publication, use either of the following sources:

- To order from your IBM representative, use Order Number SA23-2609.
- To order from your IBM dealer, use part 22F9802.

A binder is included with the order.

See *IBM RT PC Bibliography and Master Index* for order numbers of IBM RT PC publications and diskettes.

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Section 1. Getting Started

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About This Section

This section shows you how to remove the system unit covers. See “IBM 6150 System Unit” on page 1-4 or “IBM 6151 System Unit” on page 1-10, whichever applies.

The section then shows you how to identify and record the options on the appropriate system unit diagram.

Removing the Covers From the System Units

To remove the covers from the system unit, follow the instructions under either “IBM 6150 System Unit” or “IBM 6151 System Unit” on page 1-10, whichever applies.

Note: Do not operate the system unit with the covers removed. Operating with the covers on ensures adequate cooling of the components.

IBM 6150 System Unit

You do not need any tools to remove the covers of the system unit.

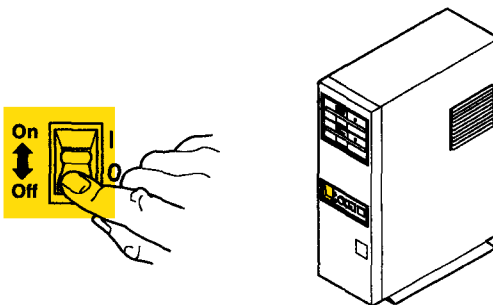
Note: You might find this task easier if you put the unit on a sturdy table.

CAUTION

This device is heavy. Three or more people should lift the system unit, which weighs up to 42 kg (92 lb). Use a dolly if possible. Refer to “Safety Notice Translations” on page iii.

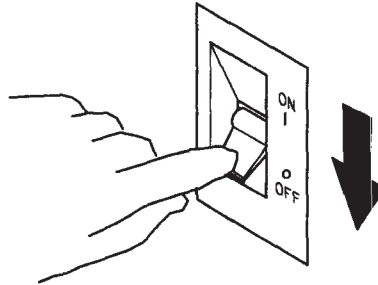
Do the following to remove the IBM 6150 covers:

1. Turn the system off.



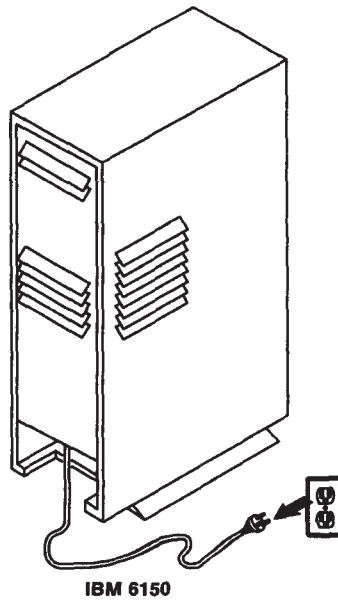
AJZIF025

2. Turn any connected devices off.



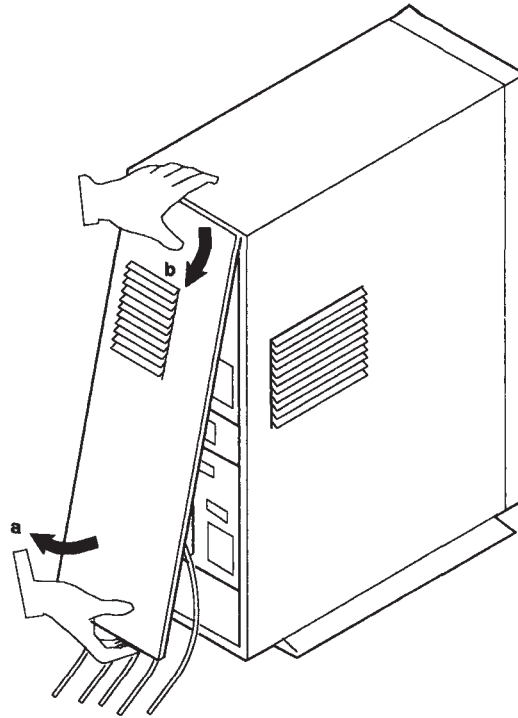
AJZIF026

3. Unplug the power cable from the electrical outlet.



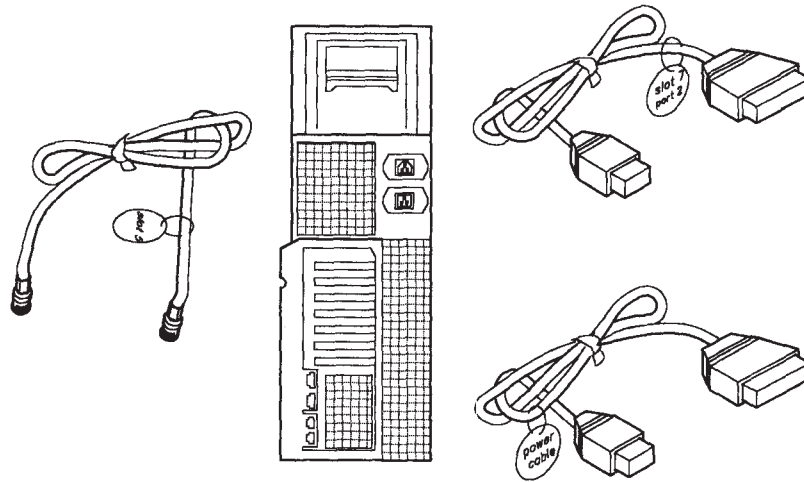
AJZIF027

-
4. To remove the rear cover:
 - a. Firmly grasp the bottom and snap the cover free.
 - b. Rotate the cover outward until the hooks are clear of the top of the unit.



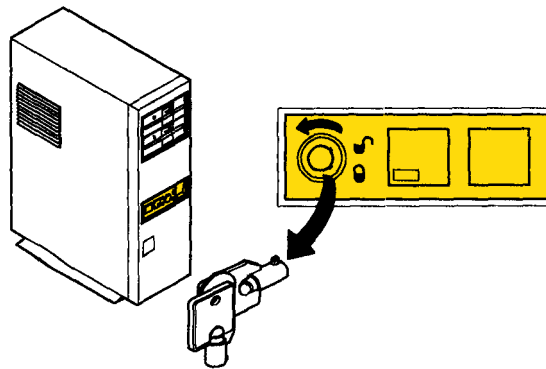
AJZIF028

-
5. If connected, unplug the display power cable and system unit power cable. Label any cables you unplug from the rear of the system unit.



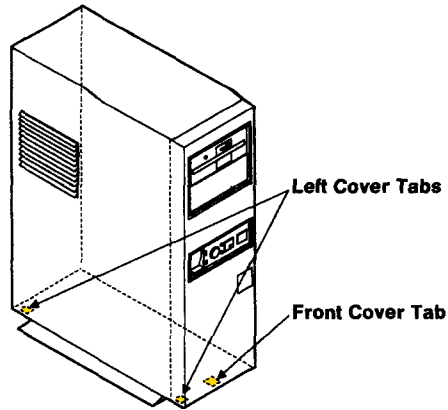
AJZIF029

6. Unlock the keylock by turning the key counterclockwise. Remove the key.



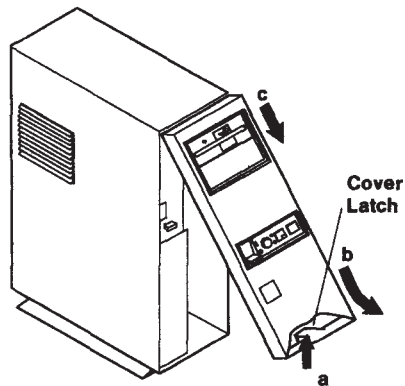
AJZIF030

-
7. Notice the location of the three tabs on the bottom of the system unit.



AJZIF031

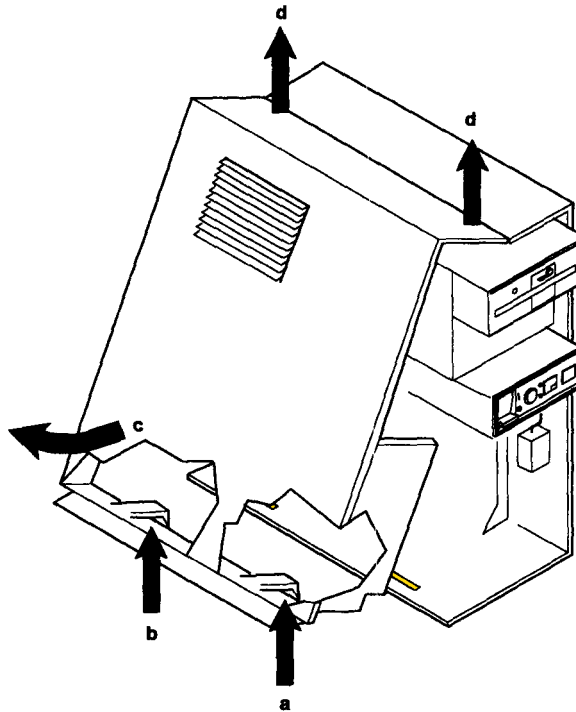
8. To remove the front cover:
- Push up on the tab until it is free from the hole in the bottom of the unit.
 - Rotate the cover out, away from the bottom of the unit.
 - Lower the cover until the hooks are clear of the top of the unit.



AJZIF032

9. To remove the left side cover:

- a. Find the tab under one outside edge of the left-side cover. Push up on the tab until it is free of the hole in the cover.
- b. Do the same to the tab on the other side.
- c. Rotate the cover out, away from the bottom of the unit.
- d. Lift the side cover up until the hooks are free of the loops in the top of the unit.



AJZIF033

IBM 6151 System Unit

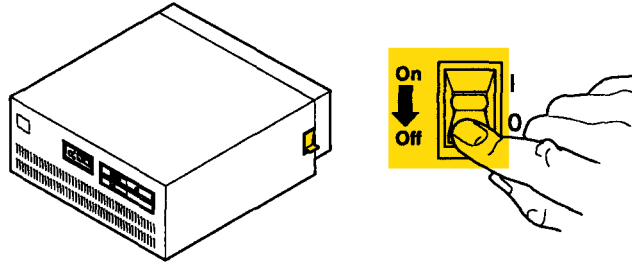
You need a medium-sized flat-bladed screwdriver to remove the system unit cover.

CAUTION

This device is heavy. Two or more people should lift the system unit, which weighs 25 kg (56 lb). Refer to “Safety Notice Translations” on page iii.

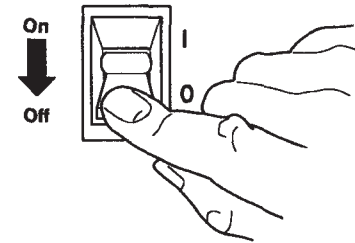
Do the following to remove the IBM 6151 covers:

1. Turn the system off.



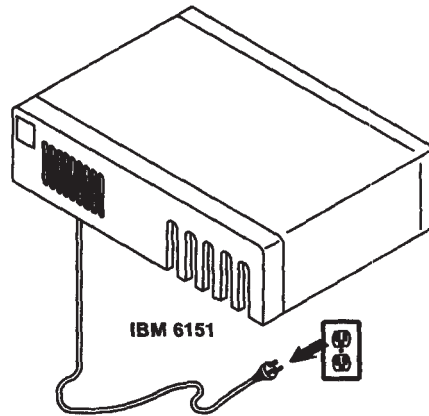
AJZIF034

2. Turn any connected devices off.



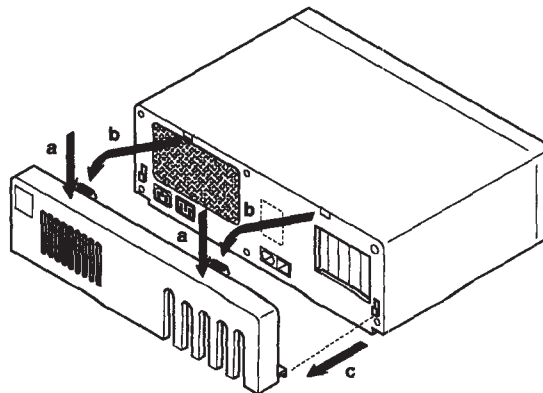
AJZIF035

-
3. Unplug the power cable from the electrical outlet.



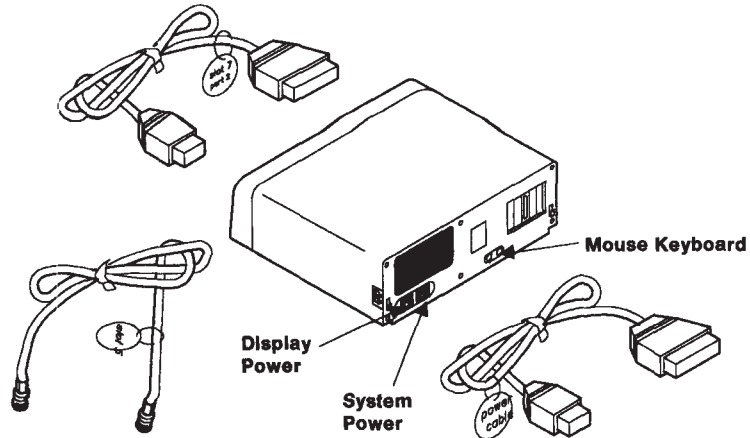
AJZIF036

4. To remove the rear cover:
 - a. Push down on the rear cover, directly over the two loops.
 - b. Remove the loops from the top hooks.
 - c. Lift the cover off the bottom hooks.



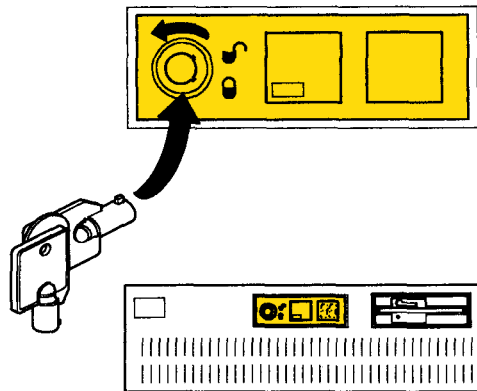
AJZIF037

-
5. Label any cables you unplug from the rear of the system unit.



AJZIF038

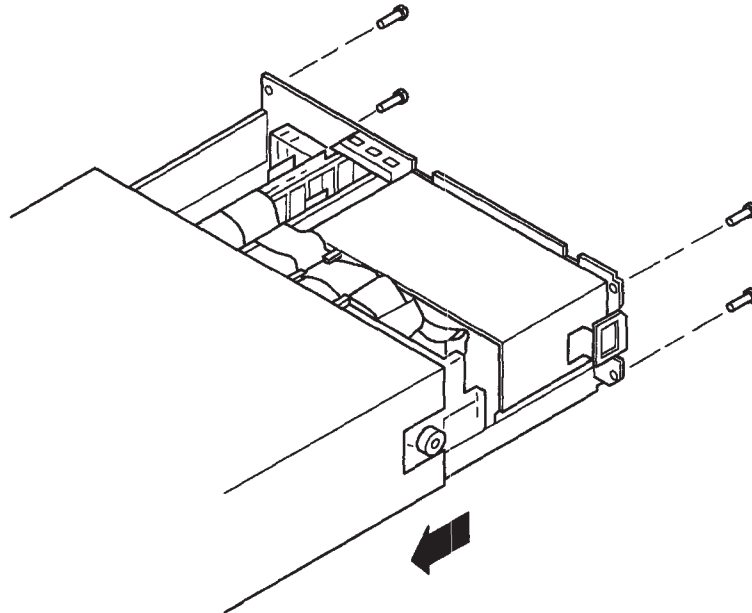
6. Unlock the keylock by turning the key counterclockwise. Remove the key.



AJZIF039

-
7. Remove the four screws holding the top cover in place.
 8. Face the front of the unit and pull forward on the cover, sliding it off the system unit.

Note: Gently lift the center of the cover when sliding it off. This prevents the cover from snagging the flat cable.



AJZIF041

Recording Optional Drives and Adapters

This book provides detailed instructions for installing the optional drives and adapters and for changing the addresses and interrupt levels on the adapters. The book is written to cover all possible system setups. Because each system is different, the book cannot tell you, in all cases, the exact slot for each adapter. The book does provide, however, the possible slots you can use, depending on the combination of adapters you have.

Unfold the applicable system unit diagram in Appendix A. These diagrams show the inside of the system units. Before you install the options, you must plan where to install them and then record their locations. You can then use the completed diagram as a guide when you install the options.

Read and work through the rest of this section, writing the names of the drives and adapters on the diagram as you learn where they must be installed.

Recording Drive Positions For IBM 6150 System Units

When originally purchased, IBM 6150s have one fixed-disk drive installed in position C. Optional second and third fixed-disk drives vary in memory capacity, depending on the fixed-disk and diskette drive adapter used. If you are installing a second or third internal fixed-disk drive, write the size of the drive in drive positions D and E on the diagram.

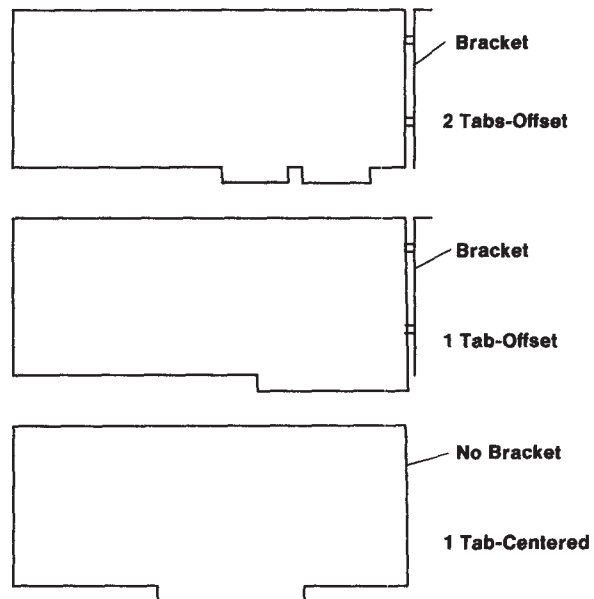
The diskette drive (an IBM Personal Computer AT® High Capacity Diskette Drive) is in drive position A. The second diskette drive can be either an IBM Personal Computer AT High Capacity Diskette Drive or an IBM personal Computer AT Dual-Sided Diskette Drive. If you are installing a second diskette drive, write the size of the drive in drive position B.

Identifying Adapter Positions

Look at the adapter slots on the system diagram you unfolded earlier. In the IBM 6150, notice that adapter slots 2, 4, 5, 7, and 8 have two tab slots, while adapter slots 3 and 6 have only one tab slot. If an adapter has one tab, try to put it in adapter slot 3 or 6, saving the positions with two slots for adapters with two tabs.

In the IBM 6151, notice that slots 2, 3, 4, and 5 have two tab slots, while slot 1 has only one tab slot. If an adapter has only one tab, try to put it in adapter slot 1, saving the slots with two tabs for adapters with two tabs.

The following illustration shows the tab positions of the adapters you can install in the system units. The adapters all have one of the following basic forms:



AJZIF217

System Board Slots

Adapters having one central tab go in system board slots B, C, and D. Either the IBM RT PC Processor and Memory Management Card, the IBM RT PC Advanced Processor Card (APC), or the IBM RT PC Enhanced Advanced Processor Card (EPC) can be installed in slot A. Slot B is reserved for the optional IBM RT PC Floating-Point Accelerator or the IBM Advanced Floating-Point Accelerator. Slot C, *with the exception of the IBM RT PC 8M-byte Fast Memory Expansion*, should contain the first memory option, and slot D should contain the second memory option. When used, the IBM RT PC 8M-byte Fast Memory Expansion should always be installed in Slot D.

Note: Under certain conditions, you may have to move the first memory option if you install a second one; refer to “Installing Memory Options” on page 5-4. Do not move these adapters unless told to do so. No other adapters may be installed in slots B, C, or D.

Adapters in Fixed Positions

Certain adapters must be installed in specific adapter slots:

- **Fixed-Disk and Diskette Drive Adapters**

When the IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter is installed in adapter slot 1 of an IBM 6150, the first two 40M byte fixed-disk drives and the two diskette drives connect to this adapter. To add a third 40M byte fixed-disk drive, you must install a second IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter in adapter slot 2. The first drive adapter is preprinted on the system unit diagram in Appendix A.

If the IBM RT PC ESDI Magnetic Media Adapter is installed in adapter slot 1 of an IBM 6150, the first two IBM RT PC 70MB ESDI Fixed-Disk Drives (Type R70) and two diskette drives can be accommodated; a second ESDI Magnetic Media Adapter in adapter slot 2 is required for a third IBM RT PC 70MB ESDI

Fixed-Disk Drive (Type R70). If a third fixed-disk drive is not installed, slot 2 can be used for a different adapter.

If the IBM RT PC Extended ESDI Magnetic Media Adapter is installed in adapter slot 1 of an IBM 6150, up to three IBM RT PC Extended ESDI Fixed-Disk Drives (Type E) and two diskette drives can be installed internally. In this case, a second drive adapter is not needed, and a different adapter can be used in slot 2.

Warning: Use of the IBM RT PC Extended ESDI Magnetic Media Adapter requires use of the IBM RT PC Advanced Processor Card (APC) or the IBM RT PC Enhanced Advanced Processor Card, together with IBM RT PC Extended ESDI Fixed-Disk Drives (Type E). The IBM RT PC 70MB Extended ESDI Fixed-Disk Drive (Type E70) and the IBM RT PC 70MB ESDI Fixed-Disk Drive (Type R70) have different formats and are *not* interchangeable.

Either an IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter, an IBM RT PC ESDI Magnetic Media Adapter, or an IBM RT PC Extended ESDI Magnetic Media Adapter can be installed in slot 6 of an IBM 6151; additional internal drives cannot be added to this system.

- **IBM RT PC Personal Computer AT Coprocessor Option**

If you have an IBM RT PC Personal Computer AT Coprocessor Option, it must be installed in adapter slot 8 of the IBM 6150 or in slot 5 of the IBM 6151. If you do not have the IBM RT PC Personal Computer AT Coprocessor Option, you can install a different adapter (but *not* an AT 512 KB Memory Expansion Option) in these two slots.

- **IBM PC Enhanced Graphics Adapter**

The IBM PC Enhanced Graphics Adapter must be installed in either slot 3 or 6 of the IBM 6150 and in slot 1 of the IBM 6151.

- **IBM Monochrome Display and Printer Adapter**

The IBM Monochrome Display and Printer Adapter must be installed in slot 3 of the IBM 6150 and in slot 1 of the IBM 6151.

Recording Adapter Positions

Look at the applicable system unit diagram and at the list of the adapters you bought. Decide where you can install the adapters, and write the adapter names on the appropriate system unit diagram.

Note: The positions of the components and modules on the adapters and drives may vary slightly from the drawings shown in this book, depending on the manufacturer. However, the options function in the same way, and you should install them as shown in this book.

Adapter Conflicts

The adapters you choose may conflict in memory address range, interrupt level or DMA channel.

Conflicting Memory Addresses

When adapters conflict due to identical or overlapping memory addresses, first try to resolve the conflict by changing address jumper modules on the adapters. If this action does not resolve the conflict, ensure that applicable software enables only one adapter at a time for memory address operations. If you are still unable to resolve the conflict, consult your place of purchase.

Conflicting Interrupt Levels

The method of resolving interrupt level conflicts depends on whether the interrupt level is required or optional. A required level cannot be reset, but an optional level can be selected either by changing jumper module positions on the adapter or through applicable software.

Required and optional interrupt levels may be shareable or nonshareable. A shareable level can be used by more than one adapter on the same level (but not at the same time). A nonshareable level can not be used by any other adapter at any time.

Refer to the Interrupt and DMA Usage Chart on pages 1-21 and 1-22 to plan your system configuration.

Conflicting DMA Channels

DMA channel conflicts can usually be resolved by changing DMA jumper modules on the applicable adapter. If the conflict is not resolved, one of the conflicting adapters must be deleted from your system.

Refer to the Interrupt and DMA Usage Chart on page 1-21 and 1-22 to plan your system configuration.

Determining Adapter Conflicts

The charts on this and the facing page shows interrupt levels and DMA channels used by various adapters.

Make a list of all the adapters you intend to use in one machine. To the right of the adapter list create two columns, one for interrupt level and one for DMA channel.

If any DMA channel appears twice, a conflict exists and must be resolved using the methods in “Conflicting DMA Channels.”

If an interrupt level appears twice or more, determine whether the conflicting adapters have changeable or shareable interrupt levels. Then refer to “Conflicting Interrupt Levels” on page 1-19 and to the installation text for the conflicting adapters.

Interrupt and DMA Usage																		
Device/Adapter	Interrupt Level											DMA Channel						
	3	4	5	6	7	9	10	11	12	14	15	0	1	2	3	5	6	7
Extended ESDI Fixed-Disk and Diskette Drive ^{1 2 3}				DX				(O)	(O)			FO	FO	DX	FO			
ESDI Fixed-Disk and Diskette Drive				DX						FX				DX				
Personal Computer AT Fixed-Disk and Diskette Drive				DX						FX				DX				
Portable Disk Drive (Primary Position)				DX				(O)	(OD)			FO	FO	DX				
Portable Disk Drive (Secondary Position)				DX				(O)	(OD)					DX	FX			
SCSI ²								(O)	(O)			O	O		O	O	O	O
Streaming Tape								(X)										
Enhanced Graphics ⁴						X												
Mono./Printer					X													
Multiprotocol								(O)	(O)			OD			O			
Token-Ring								(O)	(O)					O	OD	O	O	
3278/79 Emulation ⁴						X												
5080 Attachment ⁵								(X)							O	OD	O	
S/370 Host Interface ⁵								(X)							OD	O	O	

OD - Optional Default (Shipped with this Setting)

X - Required

O - Optional

() - Shareable

DX - Required for Diskette

FX - Required for Fixed-Disk

FO - Optional For Fixed-Disk

¹ Level 6 is used in nonshared mode for compatibility, or levels 12 and 14 can share for a new mode.

² Optional interrupt levels and DMA channels can be set through software.

³ DMA Channel 3 is only available when a second Extended ESDI Adapter is used

⁴ The enhanced graphics adapter (EGA) and 3278/79 Emulation adapter may be used together; at this printing, there is no known program that uses interrupt level 9 on the EGA.

⁵ The 5080 attachment adapter and the S/370 host interface adapter are designed to operate together at the defined default values. If these adapters are reconfigured for other optional DMA channels, the user must provide driver/application software.

Interrupt and DMA Usage																		
Device/Adapter	Interrupt Level										DMA Channel							
	3	4	5	6	7	9	10	11	12	14	15	0	1	2	3	5	6	7
Megapel Display Adapter								(X)							O	O	OD	
Megapel Printer Port					X													
Advanced Mono. Graphics								(X)										
Extended Mono. Graphics								(X)										X
Advanced Color Graphics								(X)										
PC Network	O						O							X				
Baseband Network	O	O	O	O	O	O												
Personal Computer AT Serial/Parallel Adapter	SO	SO	PO		PO													
4-Port Asynchronous							(O)	(O)	(O)									
8-Port Asynchronous	(OD)	(O)					(O)											
5080 Peripheral Attachment							(O)	(O)	(O)									
Personal Computer AT Coprocessor Option (X)											(X)							
6150 Serial Port A (2) 7												O		O				
6150 Serial Port B (1)													O		O			

X - Required

O - Optional

OD - Optional Default

() - Shareable

PO - Optional for Parallel

SO - Optional for Serial (Shipped W/This Setting)

⁶ DMA channel 3 is only required when the PC Network Adapter is used with the Personal Computer AT Coprocessor Option.

⁷ The AIX operating system restricts serial port A (2) to use of DMA channel 0; DMA channel 2 is used by the diskette adapter. DMA channel 2 may be available when other operating systems are used.

⁸ DMA channels 5 and 6 are not supported by IBM software.

Section 2. Removing and Installing Drives in the IBM 6150 System Unit

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Installing the Third Fixed-Disk Drive	2-11
Installing a Fixed-Disk Drive in Position C	2-13
Installing a Fixed-Disk Drive in Position D	2-23
Installing a Fixed-Disk Drive in Position E	2-35
Removing a Fixed-Disk Drive from Position C	2-45
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IBM RT PC ESDI Magnetic Media Adapter	2-54
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About This Section

This section gives general instructions for handling drives to prevent damage from static electricity discharge.

Instructions are also given for installing and removing additional fixed-disk drives, drive adapters, and the second diskette drive. For a drawing of the drive positions, see the IBM 6150 system unit diagram in Appendix A.

CAUTION

Before doing any procedure, turn off power to the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

Handling Static-Sensitive Drives

Warning: Fixed-disk drives and diskette drives are sensitive to static electricity discharge. The drives are wrapped in antistatic bags to prevent this damage.

Take the following precautions:

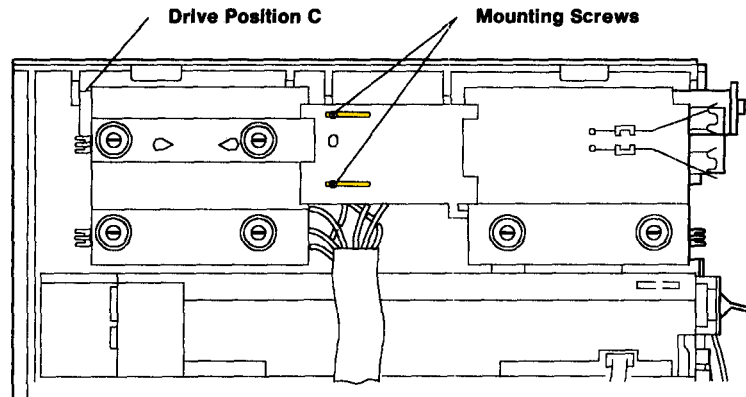
- Do not remove the antistatic bag from the drive until you are ready to install the drive in the system unit.
- Do not grasp the center part of the fixed-disk drive when you are handling the drive. The squeezing action could damage the circuit board. Handle the drive by the frame only.
- Do not drop or lay the fixed-disk drive down roughly; that action may permanently damage the drive.

Observe the following general procedures to protect the drive from static discharge:

1. Lay the fixed-disk drive (still wrapped in its antistatic bag) on a flat surface near the system unit.
2. Position yourself so you do not have to walk around while exchanging the drive. This helps prevent the generation of static electricity.
3. Touch a metal part of your system unit with one hand and the antistatic bag with the other hand. This places your body, the drive, and the system unit as the same ground potential, thus preventing an accidental static discharge.
4. Slide the antistatic bag off the fixed-disk drive.
5. Handle the fixed-disk drive by the frame only while installing or removing it. It is recommended that you use both hands to reduce the chance of dropping the drive.
6. If you are exchanging a drive, put the exchange fixed-disk drive back in the antistatic bag.

Cooling Fan Removal

1. Loosen the two mounting screws and slide the fan bracket to the right.
2. Remove the cooling fan assembly.
3. Disconnect the cooling fan power connector at drive position C.



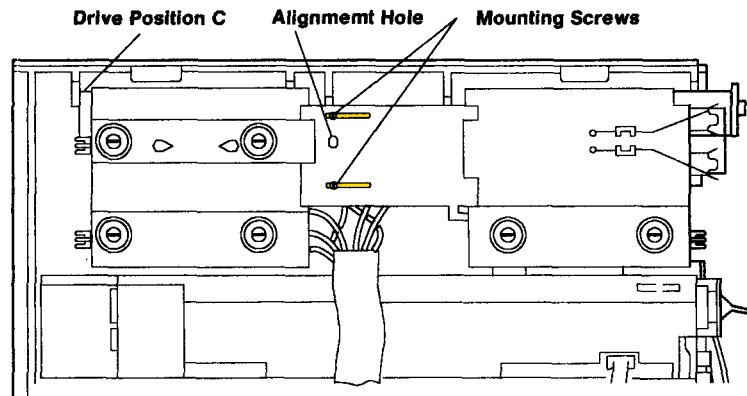
AJZIF044

Cooling Fan Replacement

1. Connect the fan power connector at drive position C. Be sure to connect drive C also.

Note: Be sure the cooling fan assembly is mounted as shown.

2. Insert the right end of the cooling fan assembly onto the front cage, then slide the fan bracket to the left behind the rear cage until the alignment holes, between the two screws, align.
3. Tighten the two mounting screws.



AJZIF045

Internal Fixed-Disk Options

Warning: Before installing additional fixed-disk drives, ensure that the drives, cables, and fixed-disk drive adapter(s) you intend to use are compatible. The following information is designed to help you make that compatibility determination.

The IBM 6150 standard configuration has one fixed-disk drive installed in drive position C. This drive is connected through a fixed-disk and diskette drive cable bundle to one of three types of fixed-disk and diskette drive adapters installed in adapter slot 1:

- IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter

The IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter is used *only* with the R40 fixed-disk drive; the Personal Computer AT Fixed-Disk and Diskette Drive Adapter *will not* operate with R70, E70, E114 or 310 megabyte fixed-disk drives.

Up to two R40 fixed-disk drives can be operated from a single Personal Computer AT Fixed-Disk and Diskette Drive Adapter; installation of a third internal R40 fixed-disk drive requires a second Personal Computer AT Fixed-Disk and Diskette Drive Adapter and a Fixed-disk and Diskette Drive Second Cable.

- IBM RT PC ESDI Magnetic Media Adapter

The IBM RT PC ESDI Magnetic Media Adapter is used *only* with the R70 fixed-disk drive and *will not* operate with R40, E70, E114 or 310 megabyte fixed-disk drives. Refer to “IBM RT PC ESDI Magnetic Media Adapter” on page 2-54.

Up to two R70 fixed-disk drives can be operated from a single IBM RT PC ESDI Magnetic Media Adapter; installation of a third internal R70 fixed-disk drive requires a second IBM RT PC ESDI Magnetic Media Adapter and a Fixed-disk and Diskette Drive Second Cable.

-
- IBM RT PC Extended ESDI Magnetic Media Adapter

The IBM RT PC Extended ESDI Magnetic Media Adapter is used *only* with E70, E114 and 310 megabyte fixed-disk drives and *will not* operate with R40 or R70 fixed-disk drives. In addition, the Extended ESDI Magnetic Media Adapter *must* be used with the IBM RT PC Advanced Processor Card (APC) or with the IBM RT PC Enhanced Advanced Processor Card.

Up to three E70, E114 or 310 megabyte fixed-disk drives can be used with a single Extended ESDI Magnetic Media Adapter.

If you are installing a second drive, use the chart on 2-9 and 2-10 to determine the correct drive position and installation procedures for the new drive.

If you are installing a third drive, use the charts on 2-11 through 2-13 to determine the correct drive position and installation procedures for the new drive.

Installing the Second Fixed-Disk Drive

Use the following chart to determine the correct position of the new drive and the installation procedure to use.

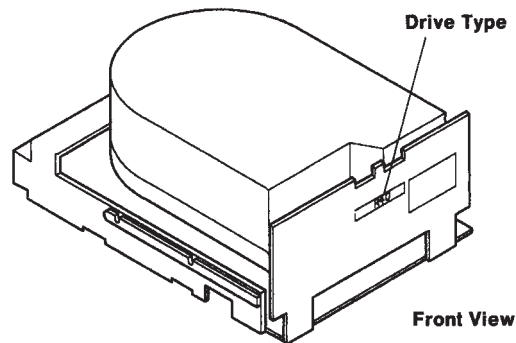
Note: When using the IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter or IBM RT PC ESDI Magnetic Media Adapter, fixed-disk drives in position C and D *must* be alike, that is, R40 with the Personal Computer AT Fixed-Disk and Diskette Drive Adapter, and R70 with IBM RT PC ESDI Magnetic Media Adapter. If a different drive occupies position C, *do not* use this chart. Go to the chart on page 2-12, use Steps 2 through 5 under the heading, "Installation Procedure to Use", and install your two new drives in drive positions C and D.

Drive Shipped in System *	New Drive Type	Position of New Drive	Installation Procedure to Use
R40	R40	D	"Installing a Fixed-Disk Drive in Position D" on page 2-23
	R70	E	"Installing a Fixed-Disk Drive in Position E" on page 2-35
R70	R40	E	"Installing a Fixed-Disk Drive in Position E" on page 2-35
	R70	D	"Installing a Fixed-Disk Drive in Position D" on page 2-23

* If you are not sure which drive is in your system, see the appropriate system unit diagram in Appendix A to locate your drive. Use the illustration on page 2-10 to determine which drive you have, and then return to this chart.

Drive Shipped in System *	New Drive	Position of New Drive	Installation Procedure to Use
Any of the following: E70 E114 310	E70	D	“Installing a Fixed-Disk Drive in Position D” on page 2-23
	E114	D	“Installing a Fixed-Disk Drive in Position D” on page 2-23
	310	D	“Installing a Fixed-Disk Drive in Position D” on page 2-23

* If you are not sure which drive was shipped with your system, see the appropriate system unit diagram in Appendix A to locate your drive. Use the following illustration to determine which drive you have, and then return to this chart.



AJZIF046

Installing the Third Fixed-Disk Drive

Drives Now Installed in System *			New Drive	Position of New Drive	Installation Procedure to Use
C	D	E			
R40	R40		R40 or R70	E	R40 “Installing a Fixed-Disk Drive In Position E” on page 2-35. or R70 “Installing a Fixed-Disk Drive In Position E” on page 2-35.
R70	R70		R40 or R70	E	R40 Same as above or R70 Same as above
R40	xxx	R70	R40	D	R40 “Installing a Fixed-Disk Drive in Position D” on page 2-23.
R70	xxx	R40	R70	D	R70 Same as above

* If you are not sure which drives are in your system, see the appropriate system unit diagram in Appendix A to locate your drives. Use the illustration on page 2-10 to determine which drives you have, and then return to this chart.

Drives Now Installed in System *			New Drive	Position of New Drive	Installation Procedure to Use
C	D	E			
R40	xxx	R70	R70	D	R70 <ol style="list-style-type: none"> 1. "Removing a Fixed-Disk Drive in Position E" on page 2-49. 2. "Removing a Fixed-Disk Drive in Position C" on page 2-45 3. "Installing a Fixed-Disk Drive in Position C" on page 2-13 4. "Installing a Fixed-Disk Drive in Position D" on page 2-23 5. "Installing a Fixed-Disk Drive in Position E" on page 2-35
R70	xxx	R40	R40	D	R40 Same as above.

* If you are not sure which drives are in your system, see the appropriate system unit diagram in Appendix A to locate your drives. Use the illustration on page 2-10 to determine which drives you have, and then return to this chart.

Drives Now Installed in System *			New Drive	Position of New Drive	Installation Procedure to Use
C	D	E			
(E or 310)		xxx	E or 310	E	“Installing a Fixed-Disk Drive in Position E” on page 2-35.

Warning: The IBM RT PC Extended ESDI Magnetic Media Adapter requires the use of either the IBM RT PC Advanced Processor Card (APC) or the IBM Enhanced Advanced Processor Card, together with IBM RT PC Extended ESDI Fixed-Disk Drives (E or 310 megabyte).

Installing a Fixed-Disk Drive in Position C

In order for drives to match in drive positions C and D (see the note regarding R40 and R70 drives on page 2-9) you may be required to swap the positions of drives C and E. Use the following steps to install the drive in position C and to move the disk adapter to the correct slot.

Warning: Handle the fixed-disk drive carefully. Dropping, shaking, or rough handling can damage both the drive and any stored data and can cancel the warranty.

Refer to the system unit diagram in Appendix A to locate position C.

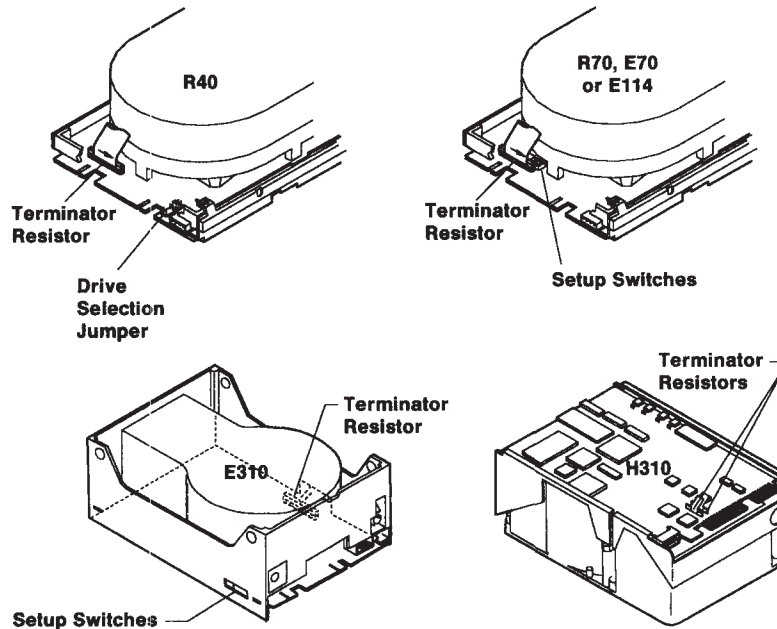
Refer to “Handling Static-Sensitive Drives” on page 2-4 before beginning this section.

Use the following steps to install the fixed-disk drive in position C:

Warning: Follow *all* instructions under “Removing the Covers from the System Units” on page 1-4 before installing the drive in position C.

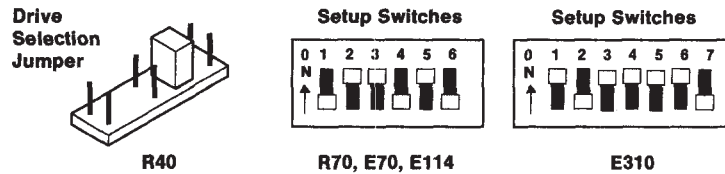
1. Remove the cooling fan assembly. Refer to “Cooling Fan Removal” on page 2-5.
2. Use the following illustration to identify which drive you are installing.

Note: IBM 310 megabyte fixed-disk drives may look like either of the bottom two examples below.



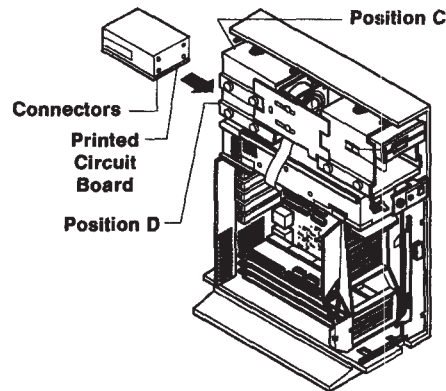
AJZIF221

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3. Check the drive selection jumper or switches for the correct setting, and make sure the terminator resistor(s) are present on the drive.



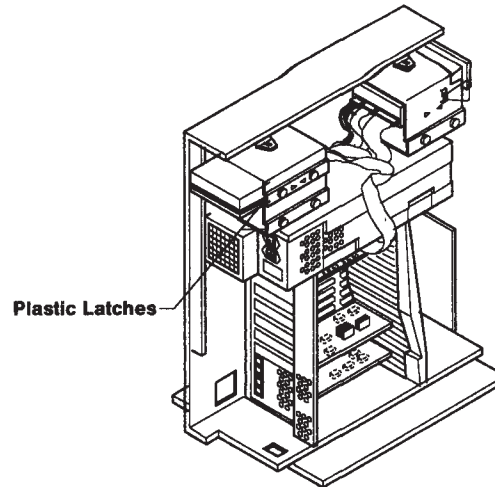
AJZIF048

4. Hold the drive with the printed circuit board on the bottom and the connectors toward the center of the unit.



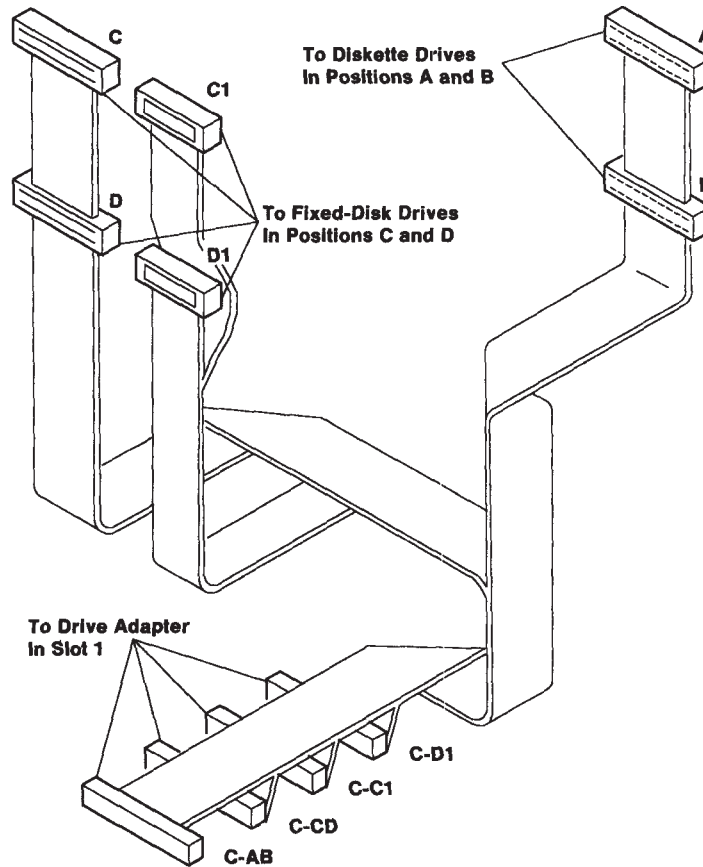
AJZIF058

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5. Facing the rear of the unit, place the drive on the side rails and slide it into drive position C. Push the drive in until the plastic latches snap into position, holding the drive in place.



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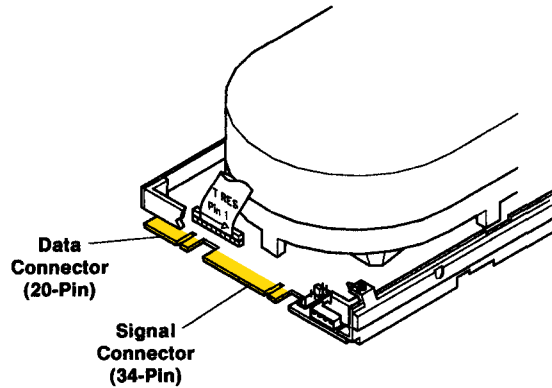
6. Look at the diagram of the disk and diskette cable bundle.



AJZIF051

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7. Connect C on the cable to the 34-pin connector on the rear of the drive in position C. Connect C1 to the 20-pin connector on the drive.

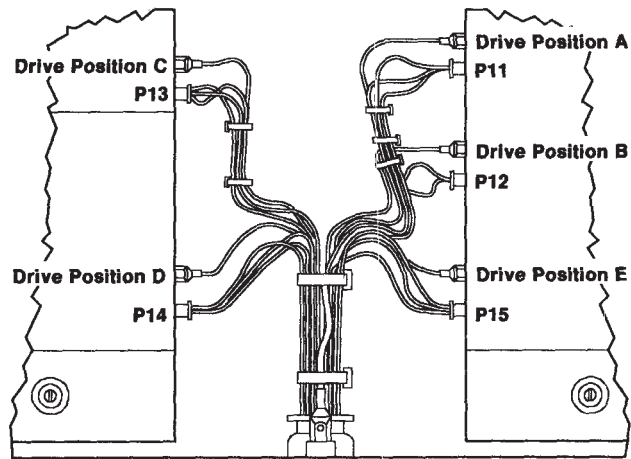
Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



AJZIF061

8. Look at the diagram of the power cable. The 4-pin connectors connect as follows:

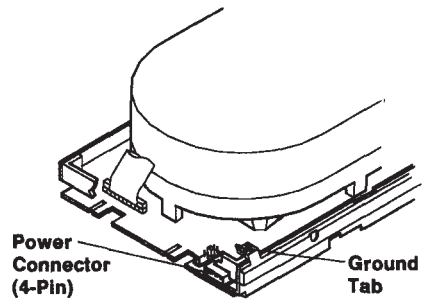
- P10 is connected to the power supply.
- P11 is connected to the first diskette drive, position A.
- P12 connects to the second diskette drive, position B.
- P13 connects to the first fixed-disk drive, position C.
- P14 connects to the second fixed-disk drive, position D.
- P15 connects to the third fixed-disk drive, position E.



AJZIF053

-
9. Connect P13 on the power cable to the 4-pin connector on the rear of the fixed-disk drive in position C. Connect the ground wire from the power cable to the ground tab on the drive.

Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.

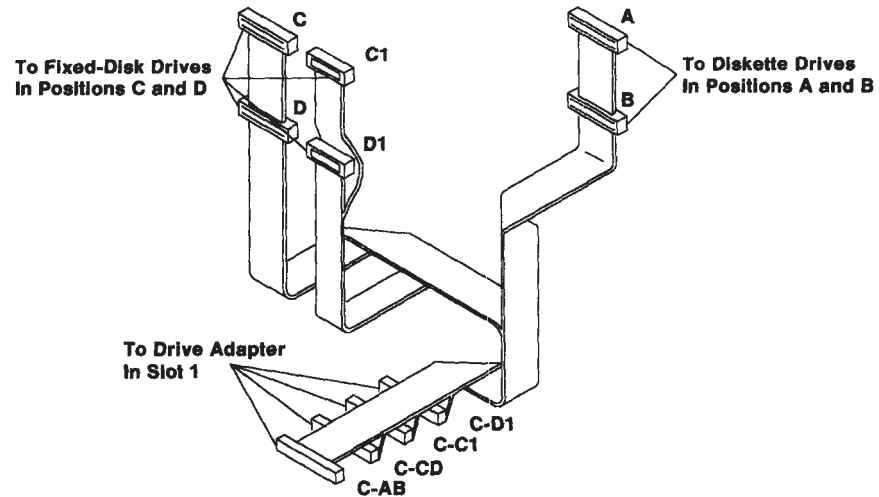


AJZIF063

10. Look at the diagram of the cable bundle.

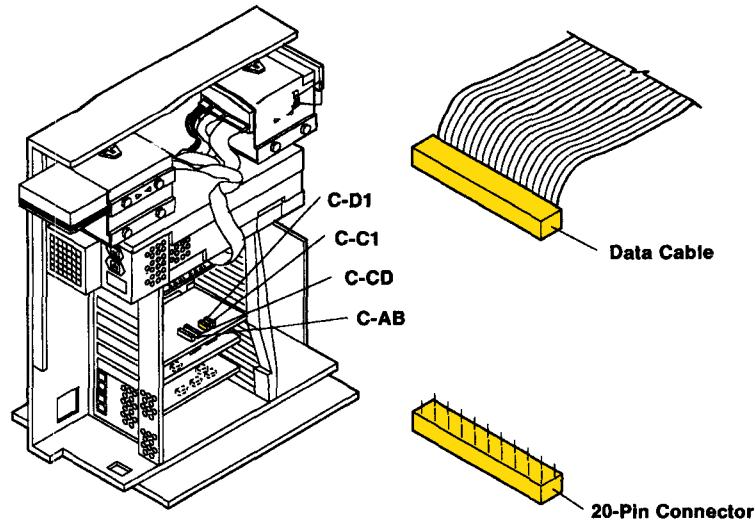
Warning: The jumpers on the adapter must be reset if the adapter was previously installed in adapter slot 2. See “IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter” on page 2-53 if the new drive is an R40 fixed-disk drive, or “IBM RT PC ESDI Magnetic Media Adapter” on page 2-54 if the new drive is an R70 fixed-disk drive, for jumper settings.

Using the drive adapter previously removed from drive position E, connect C-AB and C-CD to the 34-pin connectors on the adapter.



AJZIF065

-
11. Connect C-C1 on the cable bundle to the 20-pin connector on the drive adapter.



AJZIF056

12. Put the adapter in adapter slot 1. Replace the screw.
13. If this is the last drive to be installed, replace the cooling fan assembly. See “Cooling Fan Replacement” on page 2-6.
14. If there are other options to be installed, do so now, and then check out the system using Section 9, “Checking Out the Option Installation” on page 9-1.

Installing a Fixed-Disk Drive in Position D

Warning: Handle the fixed-disk drive carefully. Dropping, shaking, or rough handling can damage both the drive and any stored data and can cancel the warranty.

The fixed-disk drive types installed in drive positions C and D *must* be the same drive type. The drives do not operate correctly if drive types are mixed.

Refer to the system unit diagram in Appendix A to locate drive position D.

Refer to “Handling Static-Sensitive Drives” on page 2-4 before beginning this section.

Warning: Follow *all* instructions under “Removing the Covers From the System Units” on page 1-4 before installing the second drive.

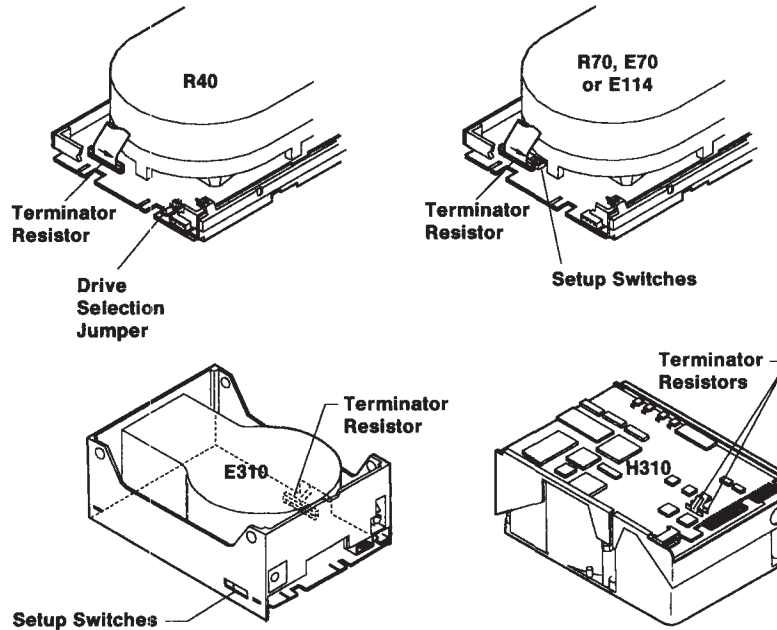
Use the following steps to install the fixed-disk drive in position D:

1. Remove the cooling fan assembly. See “Cooling Fan Removal” on page 2-5.

Warning: Do not bend the pins!

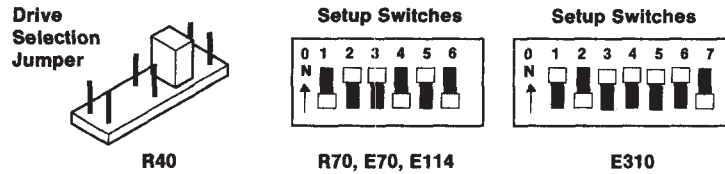
2. Remove the terminator resistor(s) by pulling the paper tab(s), if present, or by inserting a small, flat-bladed screwdriver under the resistor. Carefully pry up alternate ends of the resistor(s) to lift evenly.

Note: IBM 310 megabyte fixed-disk drives may look like either of the bottom two examples below.



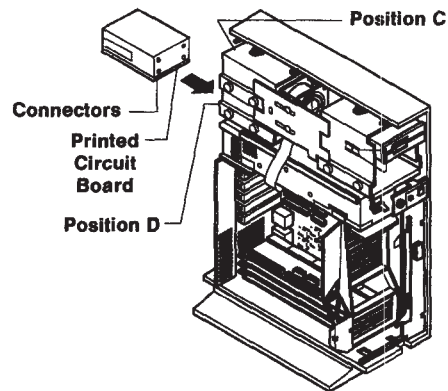
AJZIF221

-
3. Check the drive selection jumper or switches for the correct setting.



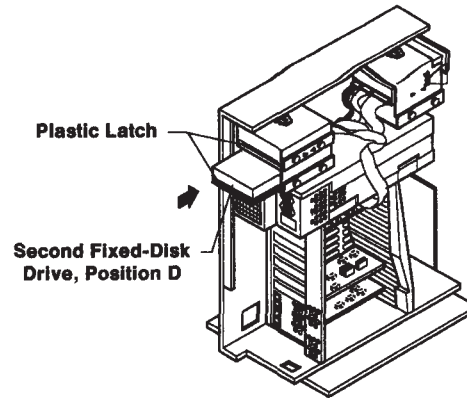
AJZIF048

4. Hold the drive with the printed circuit board on the bottom and the connectors toward the center of the unit.



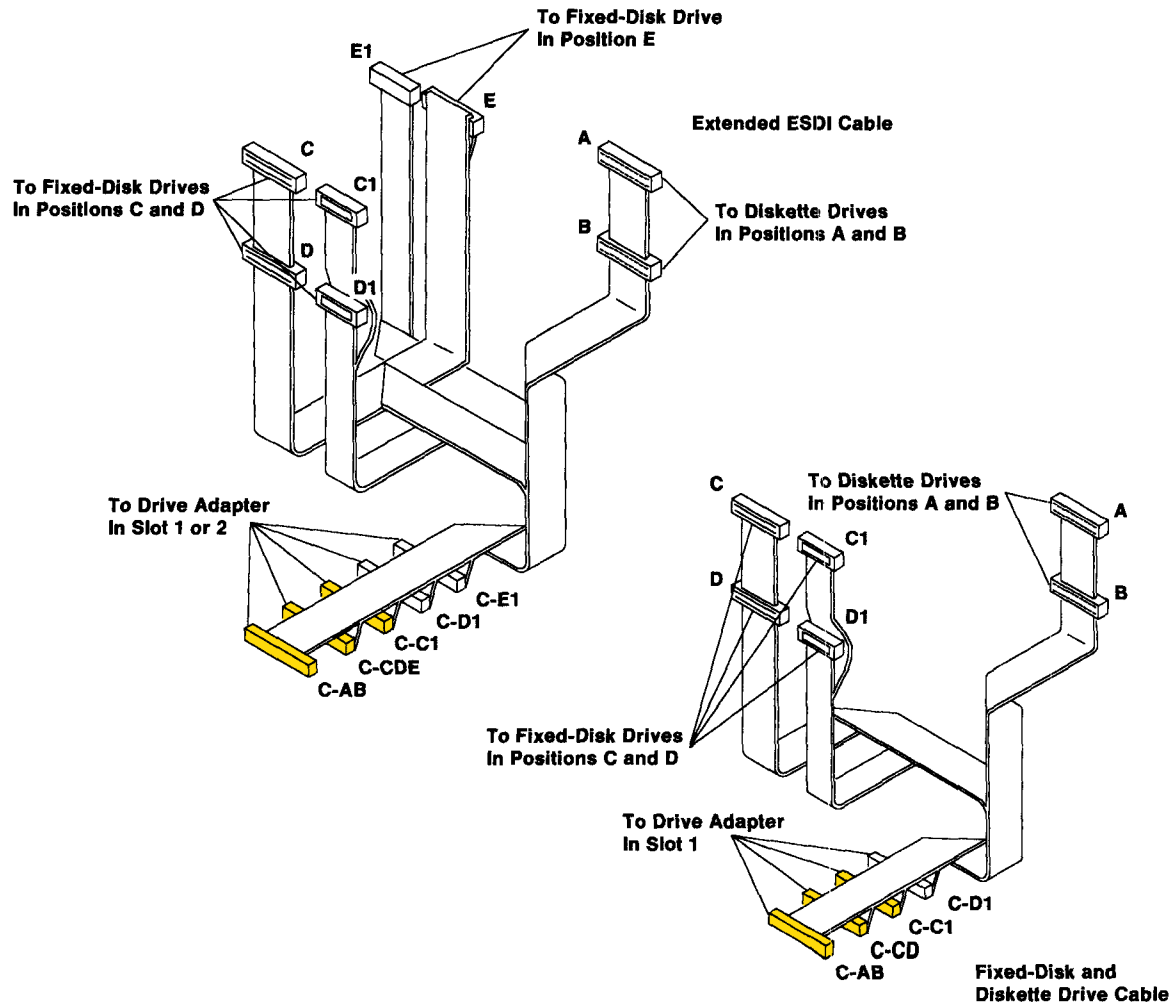
AJZIF058

-
5. Facing the rear of the unit, place the drive on the side rails and slide it into drive position D. Push the drive in until the plastic latches snap into position, holding the drive in place.



AJZIF059

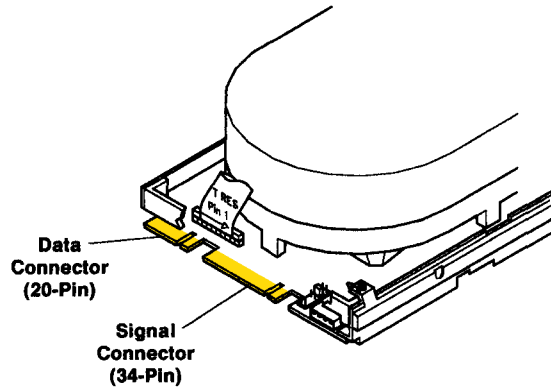
6. Look at the diagram of the disk and diskette cable bundle that applies to your system.



AJZIF060

-
7. Connect D on the cable to the 34-pin connector on the rear of the drive in position D. Connect D1 to the 20-pin connector on the drive.

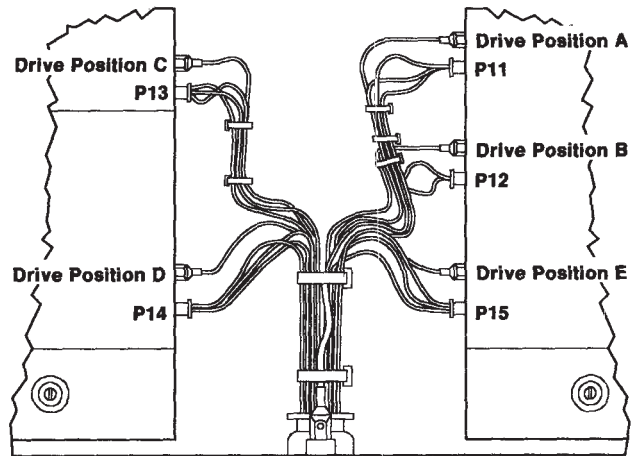
Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



AJZIF061

8. Look at the diagram of the power cable. The 4-pin connectors connect as follows:

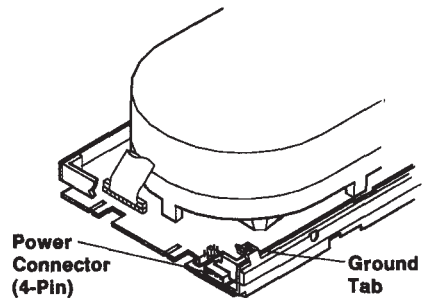
- P10 is connected to the power supply.
- P11 is connected to the first diskette drive, position A.
- P12 connects to the second diskette drive, position B.
- P13 is connected to the first fixed-disk drive, position C.
- P14 connects to the second fixed-disk drive, position D.
- P15 connects to the third fixed-disk drive, position E.



AJZIF053

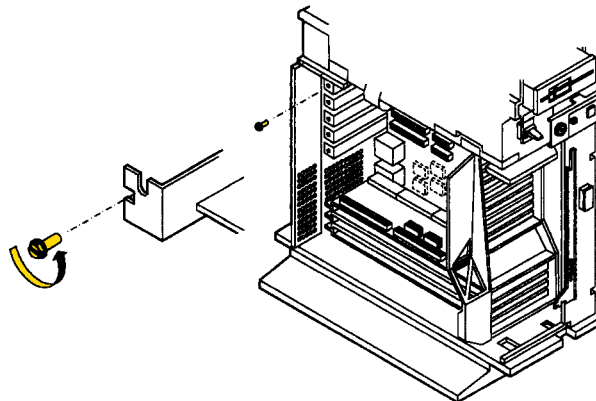
-
9. Connect P14 on the power cable to the 4-pin connector on the rear of the fixed-disk drive in position D. Connect the ground wire from the power cable to the ground tab on the drive.

Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



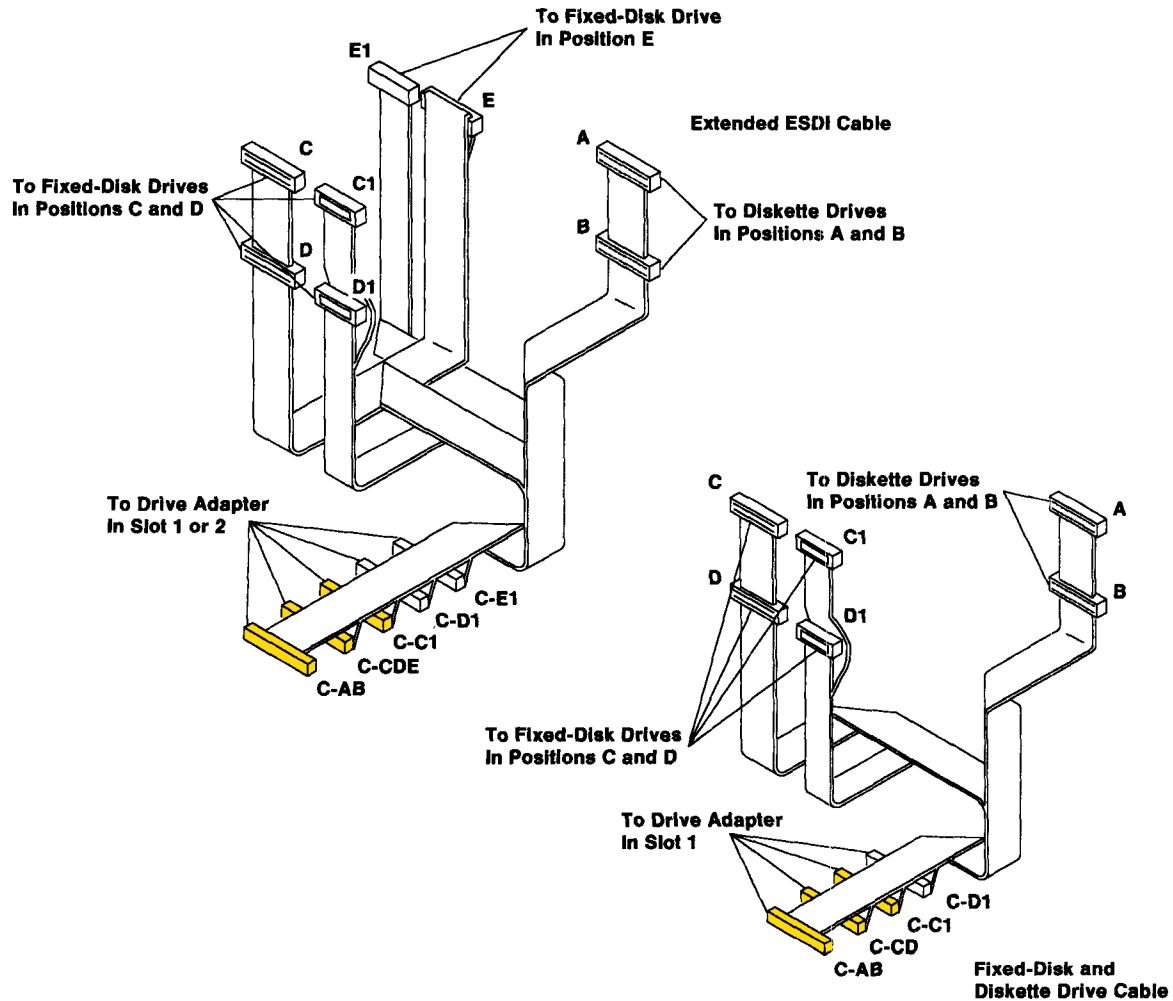
AJZIF063

10. Remove the screw holding the drive adapter in adapter slot 1. Slide the adapter out of the slot, leaving the cables attached.



AJZIF064

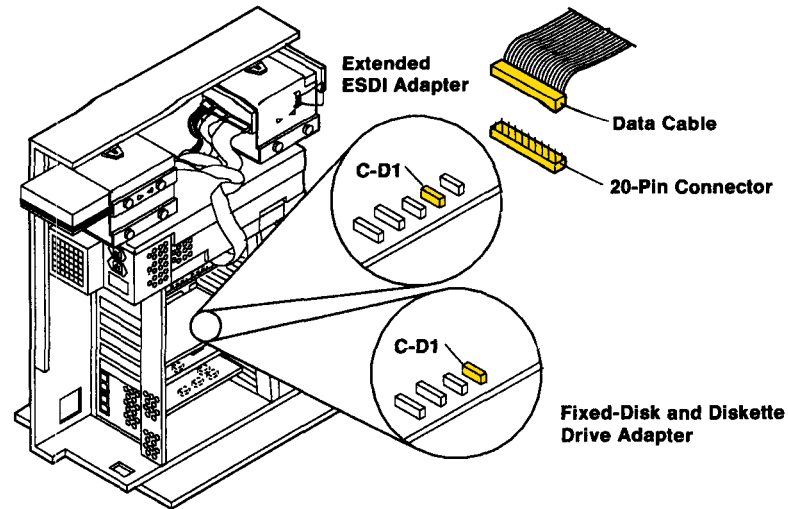
11. Look at the diagram of the cable bundle that applies to your system.



AJZIF065

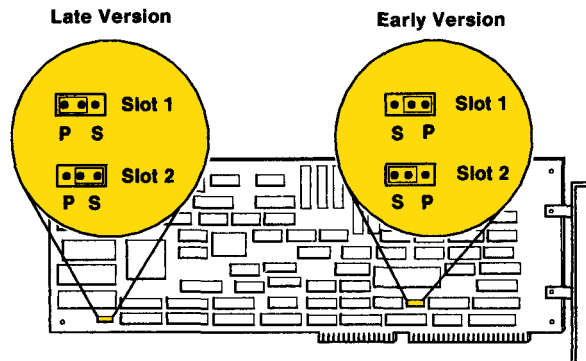
C-AB and C-CD or C-CDE are connected to the 34-pin connectors on the drive adapter, and C-C1 is connected to the 20-pin connector.

-
12. Connect C-D1 on the cable bundle to the 20-pin connector on the drive adapter applicable to your system.



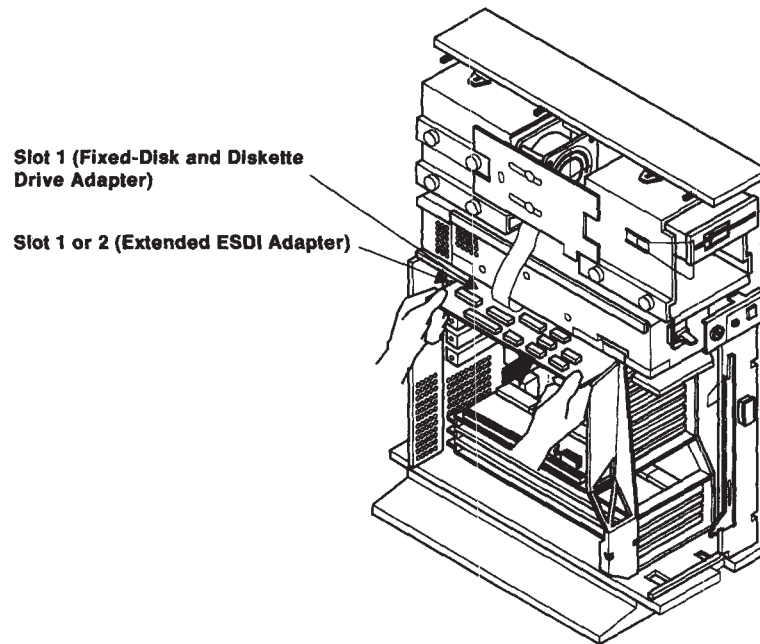
AJZIF066

13. If your system uses the IBM RT PC Extended ESDI Magnetic Media Adapter, set Jumper J6 according to which slot the adapter will occupy.



AJZIF067

-
14. Put whichever drive adapter your system uses back in the appropriate slot as shown below, and replace the screw.



AJZIF068

15. If this is the last drive to be installed, replace the cooling fan assembly. See “Cooling Fan Replacement” on page 2-6.
16. If there are other options to be installed, do so now, and then check out the system using Section 9, “Checking Out the Option Installation” on page 9-1.

Notes:

Installing a Fixed-Disk Drive in Position E

Warning: Handle the fixed-disk drive carefully. Dropping, shaking, or rough handling can damage both the drive and any stored data and can cancel the warranty.

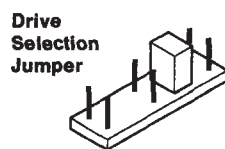
Refer to the system unit diagram in Appendix A to locate drive position E.

Refer to “Handling Static-Sensitive Drives” on page 2-4 before beginning this section.

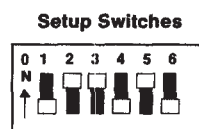
Warning: Follow *all* instructions under “Removing the Covers From the System Units” on page 1-4 before you install the fixed-disk drive in drive position E.

Use the following steps to install the fixed-disk drive in position E:

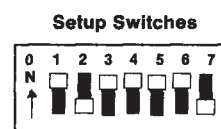
1. Remove the cooling fan assembly. See “Cooling Fan Removal” on page 2-5.
2. Check the drive selection jumper or setup switches for the correct setting.



R40



R70, E70, E114



E310

AJZIF048

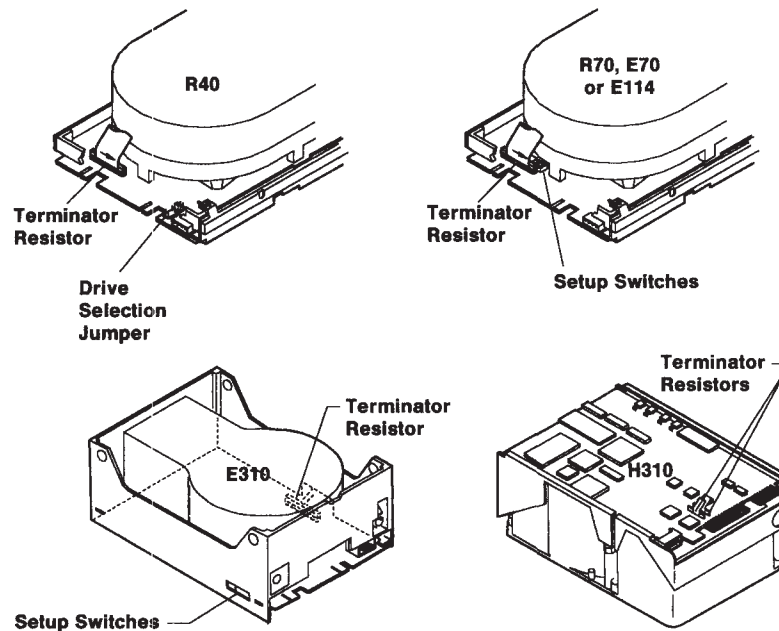
CONTINUE

3. Take the following actions with the terminating resistor(s):

- If the third fixed-disk drive is an R40 or R70, ensure that the terminator resistor is in place.
- If the third fixed-disk drive is an E or 310 megabyte, remove the terminator resistor(s) by pulling the paper tab(s), if present, or by inserting a small, flat-bladed screwdriver under one end of each resistor. Carefully pry up, alternating ends to lift evenly.

Warning: Failure to remove the terminating resistor from the third Type E or 310Mb fixed-disk drive may result in adapter module damage.

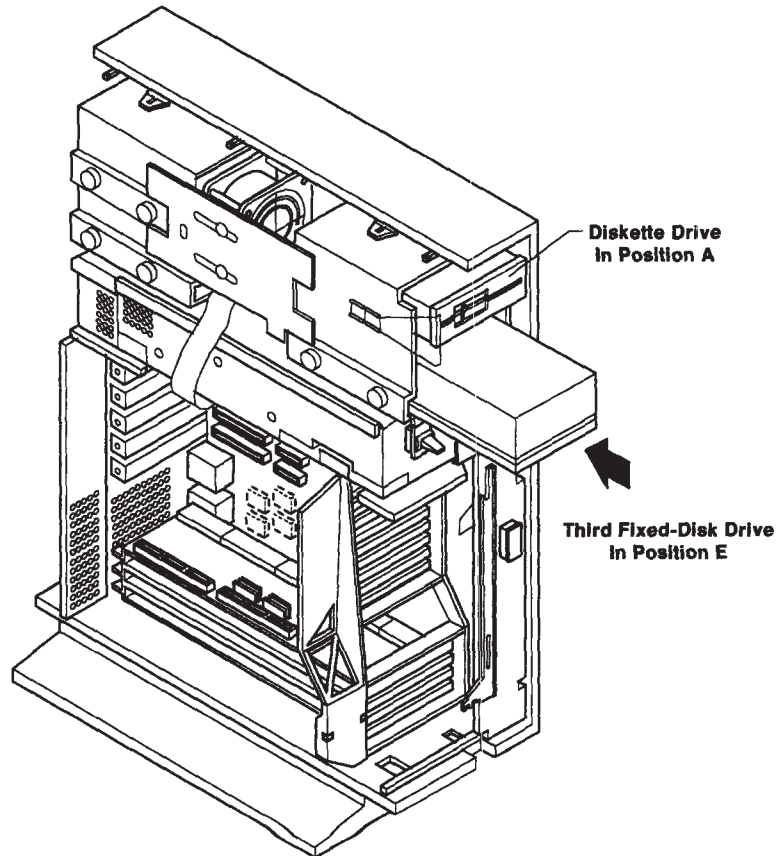
Note: IBM 310 megabyte fixed-disk drives may look like either of the bottom two examples below.



AJZIF221

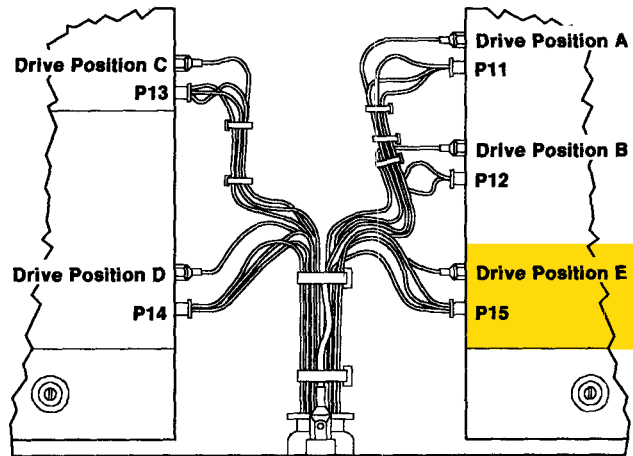
-
4. Hold the drive with the printed circuit board on the bottom and the connectors toward the center of the system unit. Place the drive on the side rails and slide it into drive position E.

Push the drive in until the plastic latches snap into position, holding the drive in place.



AJZIF070

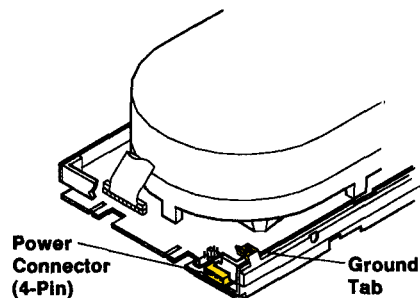
-
5. Look at the diagram of the power cable. The drive in position E connects to connector P15.



AJZIF053

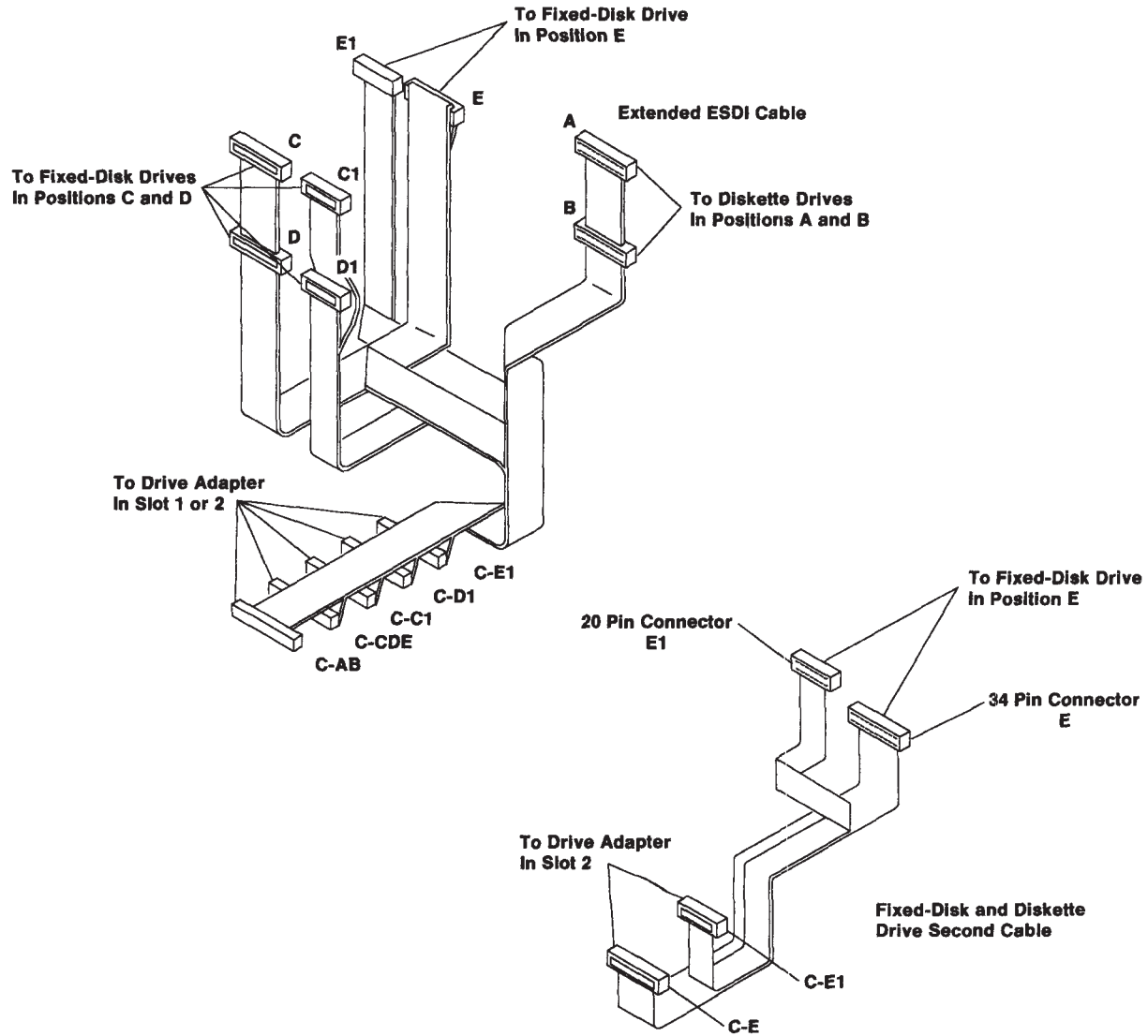
6. Connect P15 on the power cable to the 4-pin connector on the rear of the fixed-disk drive. Connect the ground wire to the ground tab on the drive.

Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



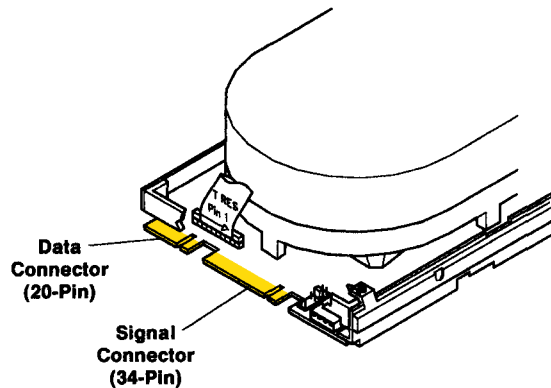
AJZIF063

7. Look at the diagram of the cable bundle applicable to your system.



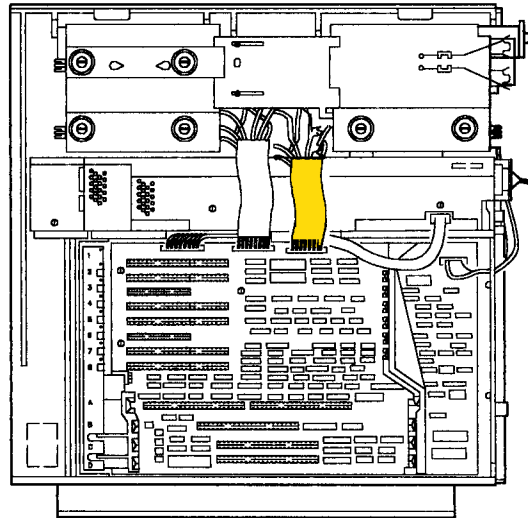
AJZIF073

-
8. Connect E on the cable to the 34-pin connector on the rear of the new fixed-disk drive. Connect E1 to the 20-pin connector on the drive.



AJZIF061

9. If you are installing R40 or R70 fixed-disk drives, route the fixed-disk and diskette drive second cable bundle around and in front of the power supply.



AJZIF075

10. Set the jumpers on the drive adapter according to which drive you are installing:

- If you are using R40 fixed-disk drives, refer to “IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter” on page 2-53.

Warning: The jumpers on the IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter must be reset if the adapter was previously installed in adapter slot 1.

- If you are using R70 fixed-disk drives, refer to “IBM RT PC ESDI Magnetic Media Adapter” on page 2-54.

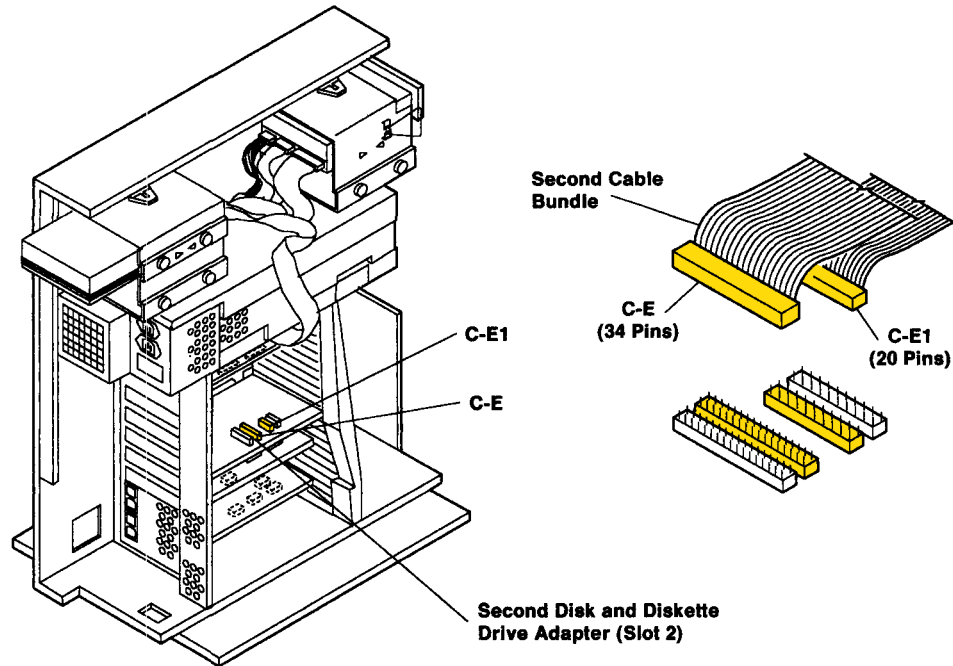
Warning: The jumpers on the IBM RT PC ESDI Magnetic Media Adapter must be reset if the adapter was previously installed in adapter slot 1.

- If you are using E or 310 megabyte fixed-disk drives, first remove the IBM RT PC Extended ESDI Magnetic Media Adapter as shown in Step 10, page 2-30. If you wish to change adapter slot positions, refer to the illustration that accompanies Step 13 on page 2-32. Note which version adapter you have, and set Jumper J6 as shown.

Warning: Jumper J6 on the IBM RT PC Extended ESDI Magnetic Media Adapter must be set according to which adapter slot is used. Refer to the illustration on page 2-32 to set Jumper J6.

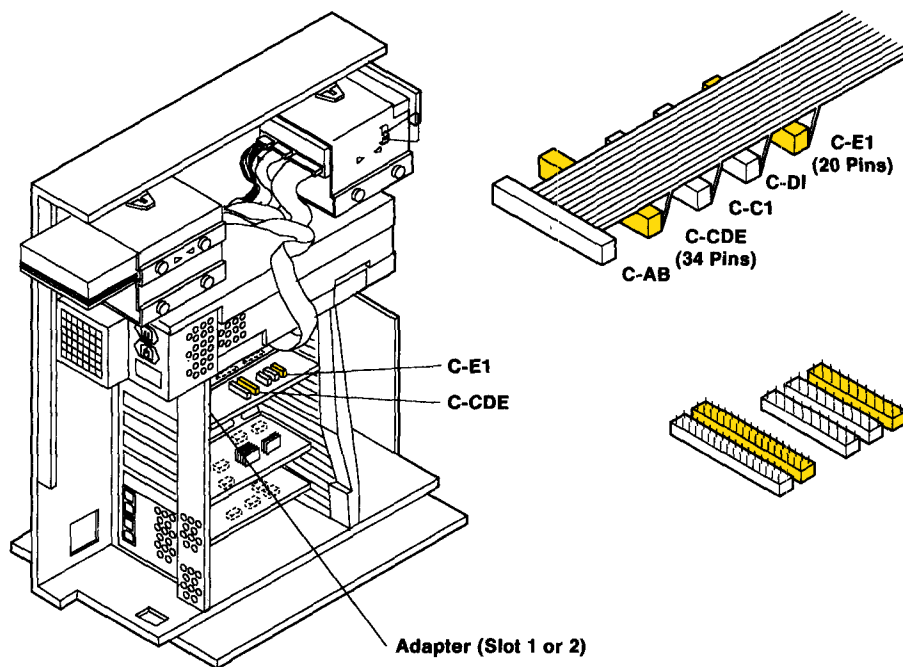
11. Connect the cable bundle to the drive adapter applicable to your system:

- If you are installing an R40 or R70 fixed-disk drive, connect C-E and C-E1 of the fixed-disk and diskette drive second cable bundle as shown.



AJZIF076

- If you are installing an E or 310 megabyte fixed-disk drive, connect C-E1 (C-CDE is already connected) to the IBM RT PC Extended ESDI Magnetic Media Adapter as shown.

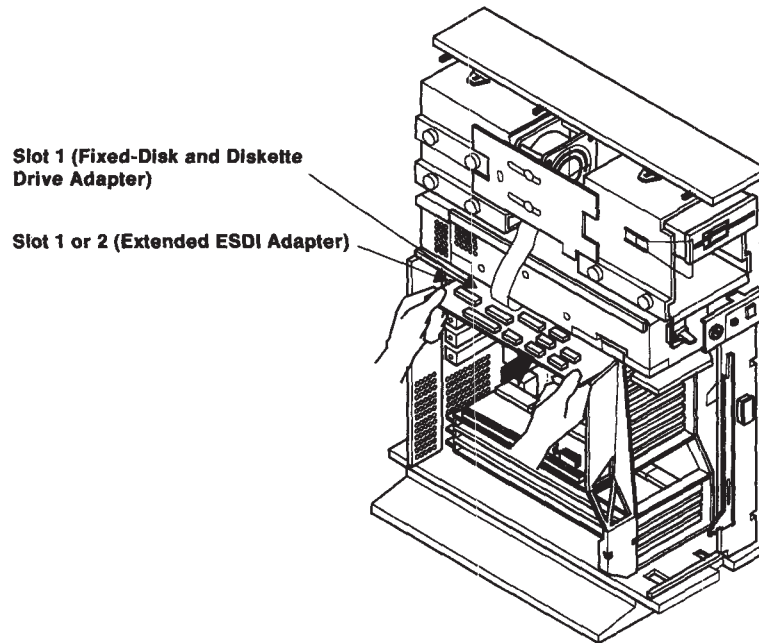


AJZIF077

12. Install the adapter:

- If you are installing an R40 or R70 fixed-disk drive, install the second drive adapter in adapter slot 2. If you need instructions for installing the adapter, see “Installing Adapters” on page 3-7.

-
- If you are installing an E or 310 megabyte fixed-disk drive, install the IBM RT PC Extended ESDI Magnetic Media Adapter in the slot determined by the J6 jumper setting in Step 13, on page 2-32. If you need instructions for installing the adapter, see “Installing Adapters” on page 3-7.



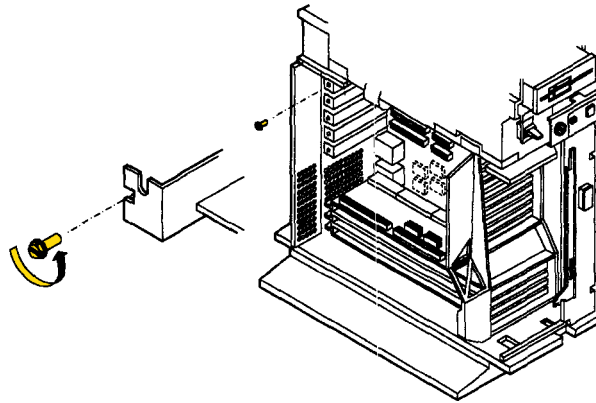
AJZIF068

13. Replace the cooling fan assembly. See “Cooling Fan Replacement” on page 2-6.
14. If there are other options to be installed, do so now, and then check out the system using Section 9, “Checking Out the Option Installation” on page 9-1.

Removing a Fixed-Disk Drive from Position C

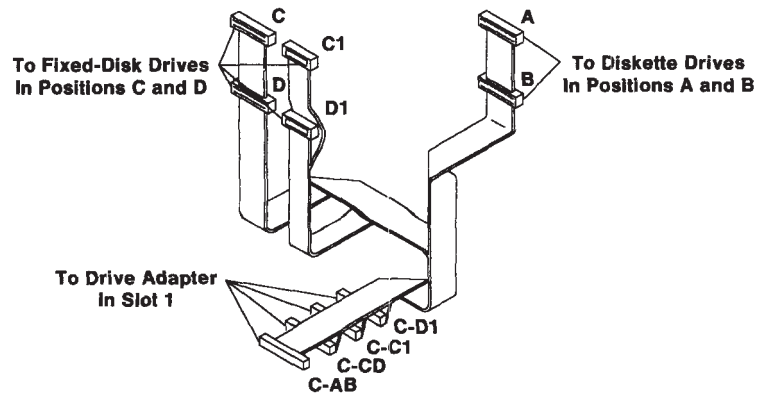
Follow these instructions to remove the fixed-disk drive installed in drive position C:

1. Remove the screw holding the drive adapter in adapter slot 1. Slide the adapter out of the slot.



AJZIF083

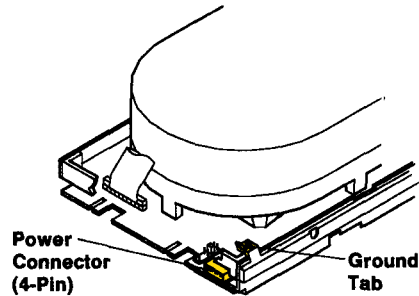
2. Disconnect the 34-pin connectors C-AB and C-CD and the 20-pin connectors C-C1 and if connected, C-D1.



AJZIF084

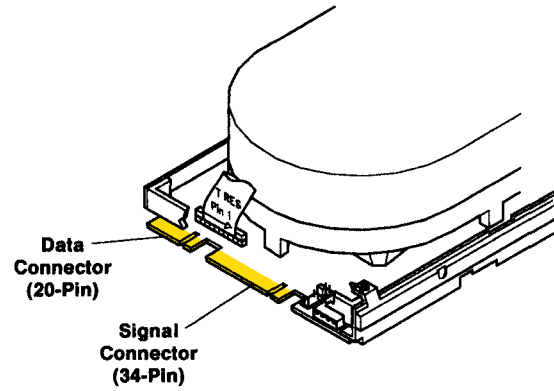
-
3. If the drive is to be reinstalled in drive position E, set the adapter to the side. It will be reinstalled in a later procedure.
 4. Remove the cooling fan assembly. See “Cooling Fan Removal” on page 2-5.
 5. Disconnect P13 on the power cable from the 4-pin connector on the rear of the fixed-disk drive in position C. Disconnect the ground wire from the ground tab on the drive.

Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



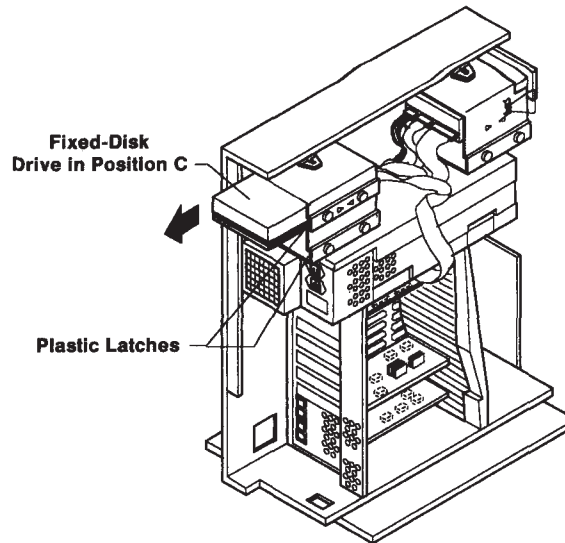
AJZIF063

-
6. Disconnect data cable C1 from the 20-pin connector on drive C.
Disconnect signal cable C from the 34-pin connector on the drive.



AJZIF061

-
7. Facing the rear of the unit, release the plastic latches holding the drive in place and carefully remove the drive from position C.



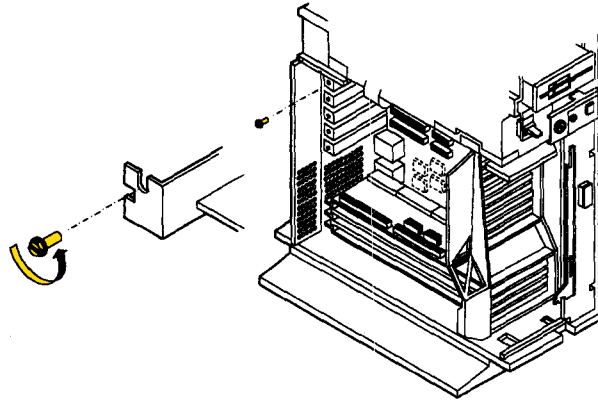
AJZIF087

8. If the drive is to be reinstalled in drive position E, see “Installing a Fixed-Disk Drive in Position E” on page 2-35 for installation of the drive and the replacement of the cooling fan.

Removing a Fixed-Disk Drive from Position E

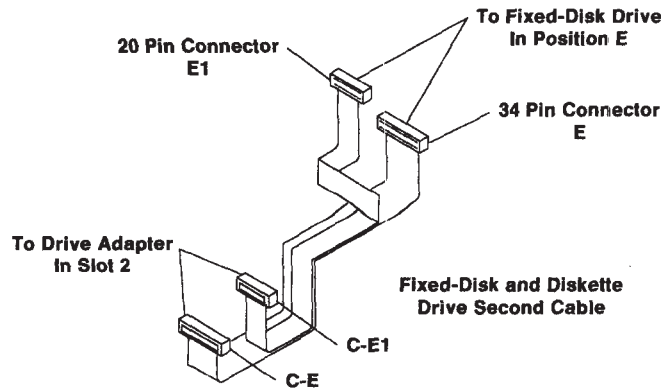
Follow these instructions to remove the fixed-disk drive installed in drive position E:

1. Remove the screw holding the drive adapter in adapter slot 2. Slide the adapter out of the slot.



AJZIF088

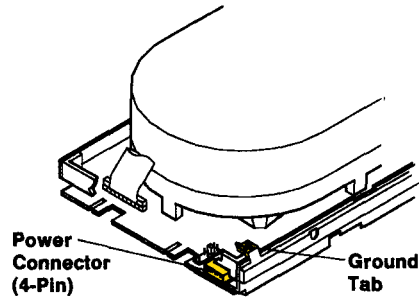
2. Disconnect the 34-pin connector C-E and the 20-pin connector C-E1.



AJZIF089

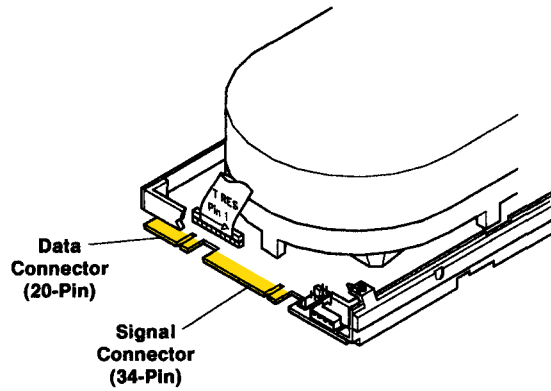
-
3. If the drive is to be reinstalled in drive position C, set the adapter to the side. It will be reinstalled in a later procedure.
 4. Remove the cooling fan assembly. See “Cooling Fan Removal” on page 2-5.
 5. Disconnect P15 on the power cable from the 4-pin connector on the rear of the fixed-disk drive in position E. Disconnect the ground wire from the ground tab on the drive.

Note: Internal fixed-disk drives may differ in appearance. Data, signal, and power connectors, however, remain in the same relative positions.



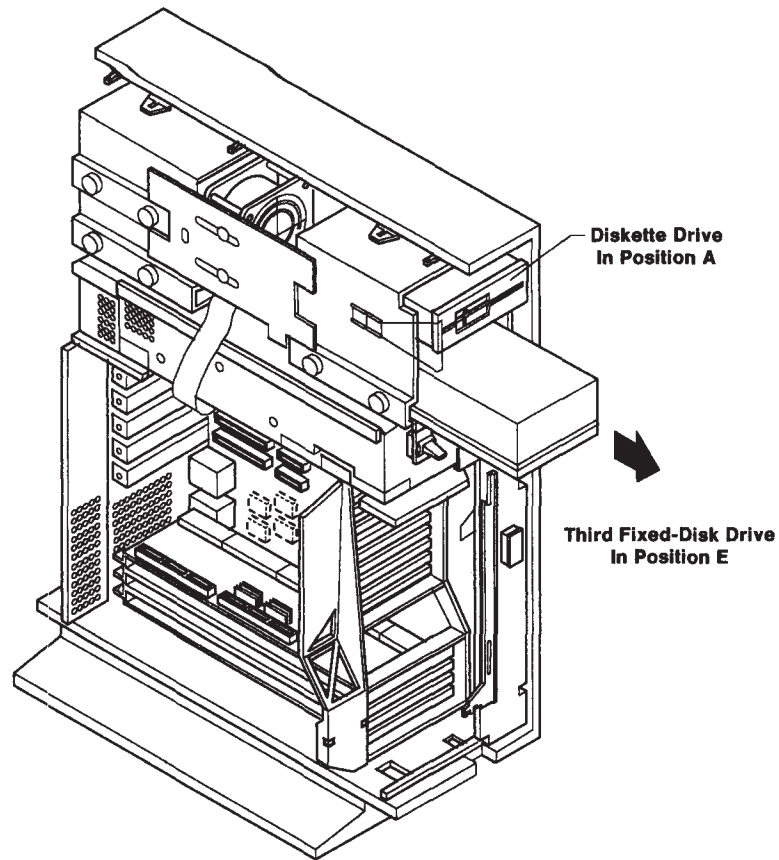
AJZIF063

-
6. Disconnect data cable E1 from the 20-pin connector on drive E.
Disconnect signal cable E from the 34-pin connector on the drive.



AJZIF061

-
7. Facing the front of the unit, release the plastic latches holding the drive in place and carefully remove the drive from position E.



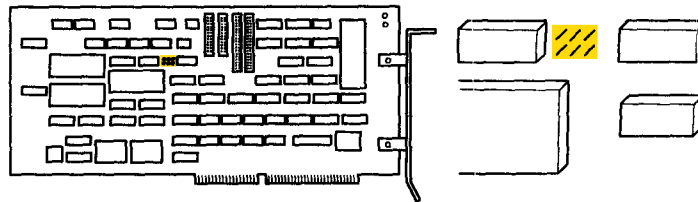
AJZIF092

8. If the drive is to be reinstalled in drive position C, see “Installing a Fixed-Disk Drive in Position C” on page 2-13 for installation of the drive and replacement of the cooling fan.

IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter

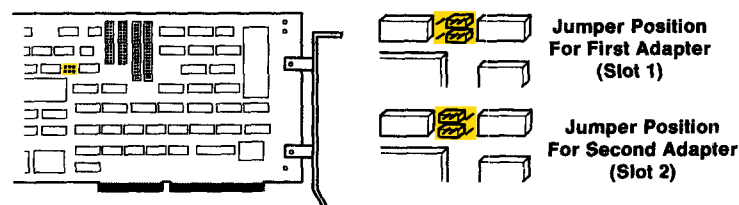
The IBM Personal Computer AT Fixed-Disk and Diskette Drive Adapter is used with the R40 fixed-disk drive. You may use up to two Personal Computer AT Fixed-Disk and Diskette Drive Adapters. The adapter in slot 1 can operate one or two R40 fixed-disk drives in drive positions C and D; in slot 2, the adapter can operate an R40 fixed-disk drive in drive position E. The Personal Computer AT Fixed-Disk and Diskette Adapter *will not* operate an R70 fixed-disk drive.

Before installing the drive adapter, you must set the jumpers.



AJZIF079

To set the jumpers, lift the jumpers off the pins and install them as shown below:



AJZIF080

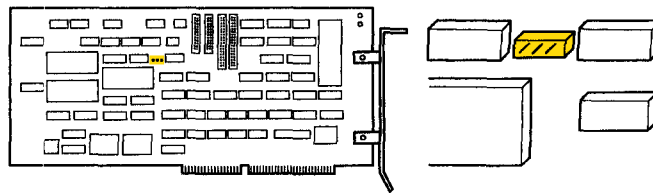
Note: Do not install the drive adapter until told to do so in the drive installation instructions.

If there are other options to be installed, do so now, and then check out the system using Section 9, "Checking Out the Option Installation" on page 9-1.

IBM RT PC ESDI Magnetic Media Adapter

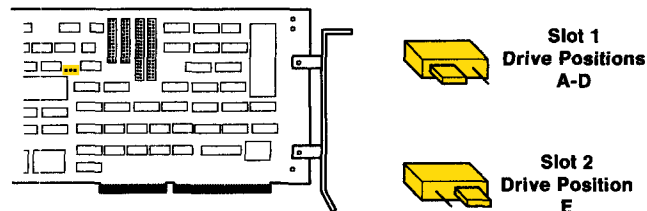
The IBM RT PC ESDI Magnetic Media Adapter is used with the R70 fixed-disk drive. You can use up to two IBM RT PC ESDI Magnetic Media Adapters. The adapter in slot 1 can operate one or two R70 fixed-disk drives in drive positions C and D; in slot 2, the adapter can operate an R70 fixed-disk drive in drive position E. The IBM RT PC ESDI Magnetic Media Adapter *will not* operate a R40 fixed-disk drive.

Before installing the drive adapter, you must set the jumpers.



AJZIF081

To set the jumpers, lift the jumpers off the pins and install them as shown in the following drawing:



AJZIF082

Note: Do not install the drive adapter until told to do so in the drive installation instructions.

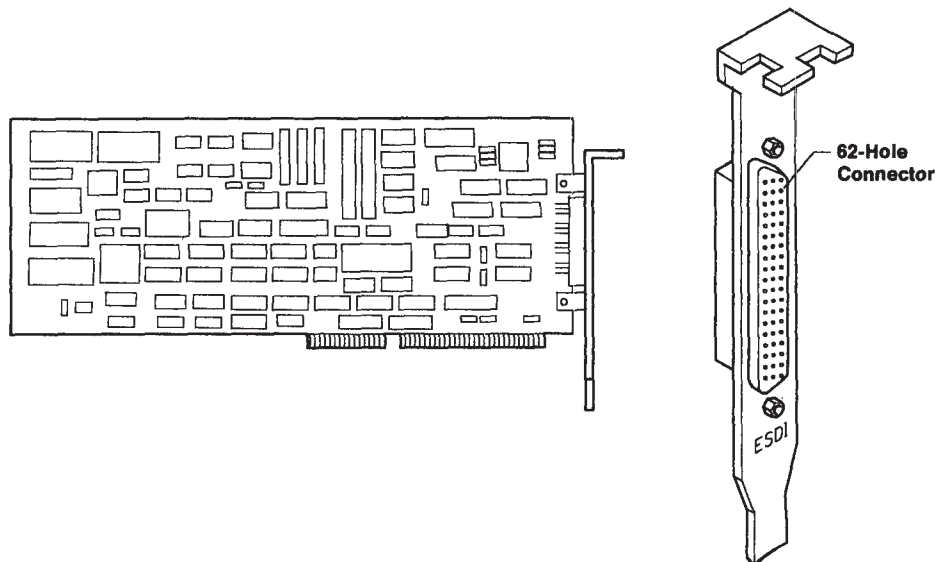
If there are other options to be installed, do so now, and then check out the system using Section 9, "Checking Out the Option Installation" on page 9-1.

External Fixed-Disk Options

IBM 6156 Portable Disk Drives Models 001 or 003 can be attached to the IBM 6150 or IBM 6151 by using the IBM RT PC Portable Disk Drive Adapter.

IBM RT PC Portable Disk Drive Adapter

The IBM RT PC Portable Disk Drive Adapter is used with IBM RT PC Portable Fixed Disk Drives Models 001 or 003. The end of the adapter which contains the 62 pin connector is marked with the letters, ESDI.



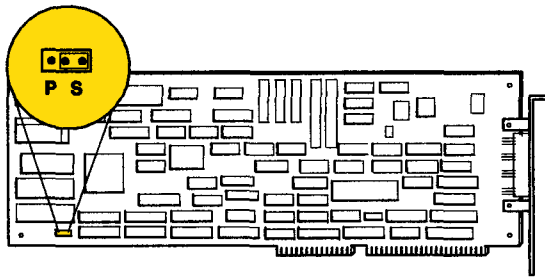
AJZIF207

Setting Jumper J6

Jumper J6 should be set to the secondary position (S) as shown.

Installing: The IBM RT PC Portable Disk Drive Adapter can be installed in slots 2, 4, 5, 7, or 8 in IBM 6150, and in slots 2, 3, 4, or 5 in IBM 6151.

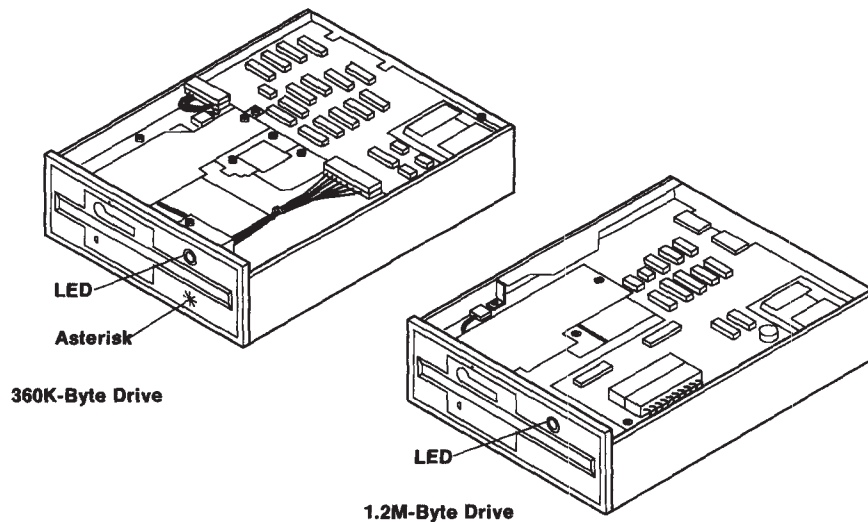
If there are other options to be installed, do so now, and then check out the system using Section 9, “Checking Out the Option Installation” on page 9-1.



AJZIF218

Diskette Options

You can install either an IBM Personal Computer AT High Capacity Diskette Drive (1.2M-byte memory) or an IBM personal Computer AT Dual-Sided Diskette Drive (360K-byte memory) in position B. See the system unit diagram for a picture of the correct position.



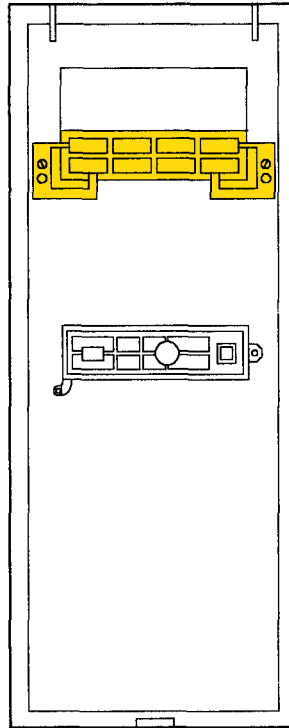
AJZIF093

Refer to “Handling Static-Sensitive Drives” on page 2-4 before beginning this section.

Warning: Follow *all* instructions under “Removing the Covers From the System Units” on page 1-4 before you begin this task.

Use the following steps to install the second diskette drive:

1. On the system unit, locate the faceplate covering the second diskette position.

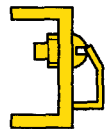
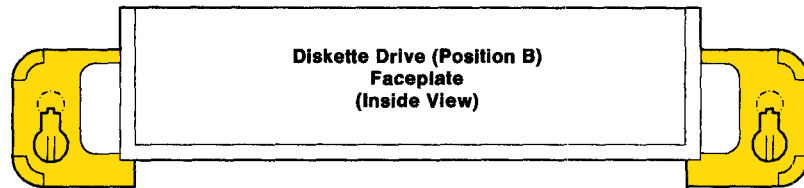


**System Unit Cover
(Inside View)**

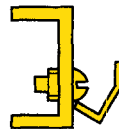
AJZIF094

2. Remove the faceplate as follows:

- a. Pull the plastic tabs out of the way. You may need to use a screwdriver to do this.



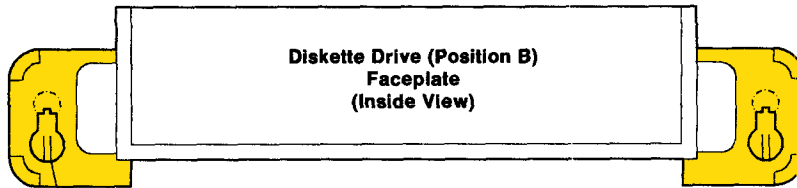
1. Before



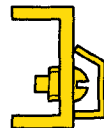
2. Pull the Tab Out.

AJZIF095

- b. Slide the faceplate up until the bolts are in the large openings.



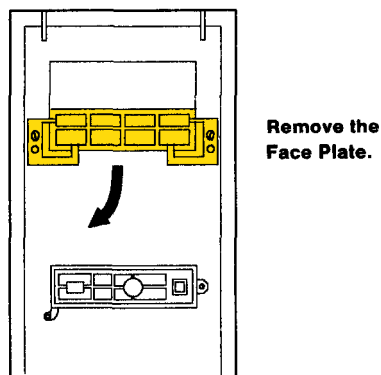
Bolt In
Large Opening



3. After

AJZIF096

-
- c. Pull the faceplate off the two bolts holding it in place.

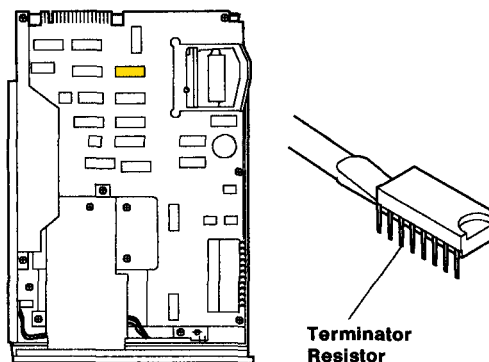


AJZIF097

3. Remove the cooling fan assembly. See “Cooling Fan Removal” on page 2-5.
4. Turn the diskette drive upside down and locate the terminating resistor.

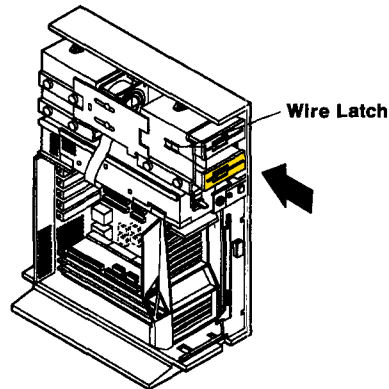
Warning: Do not bend the pins!

5. Insert a small, flat-bladed screwdriver under the resistor and lift. Alternate ends of the resistor to lift evenly.



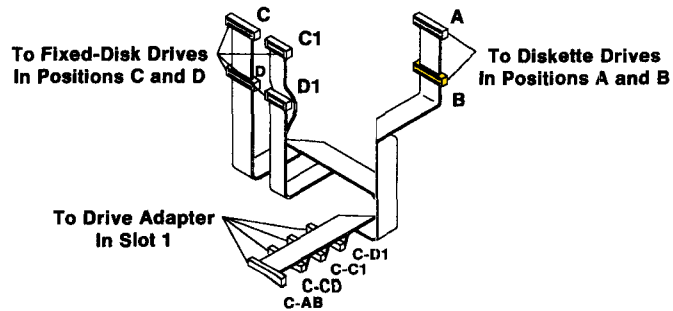
AJZIF098

-
- Pull the wire latch aside, place the diskette drive on the rails, and slide it into drive position B. Ensure that the wire latches hold the drive firmly in place.



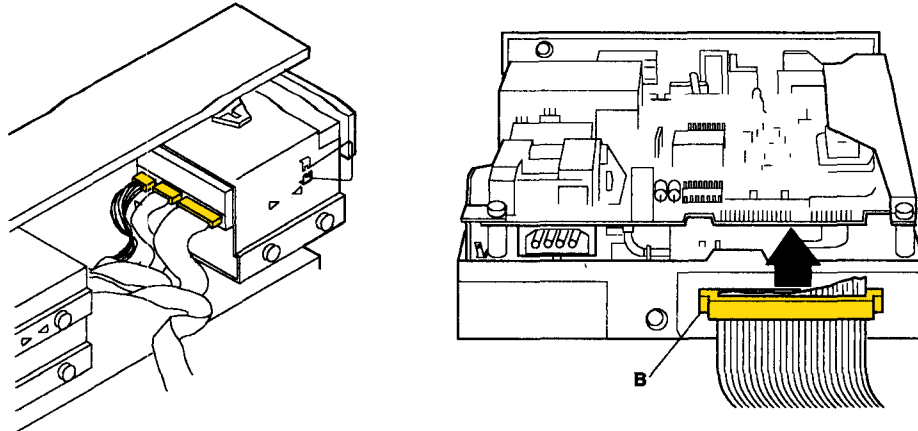
AJZIF099

- Look at the diagram of the disk and diskette cable bundle, which is already installed. The first two (if two are installed) fixed-disk drives and the diskette drive in position A connect to this cable bundle.



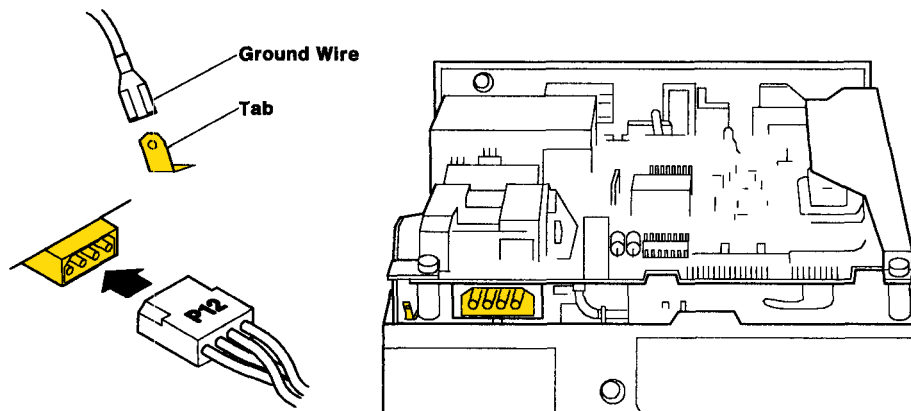
AJZIF100

-
8. Connect B on the cable to the 34-pin connector on the rear of the second diskette drive.



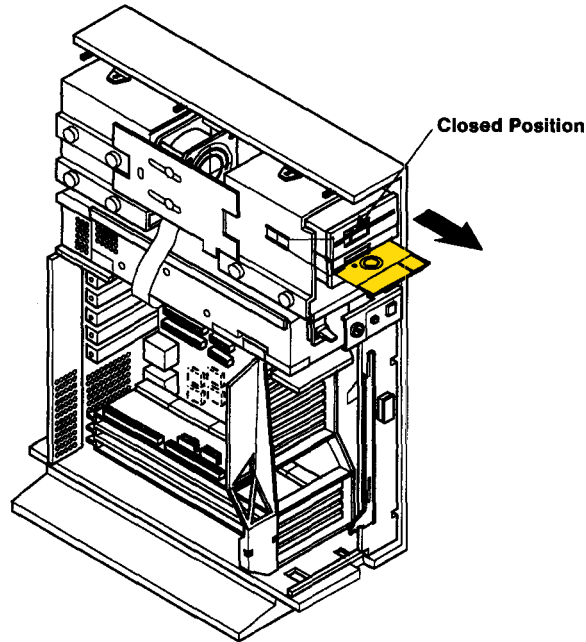
AJZIF101

9. Connect P12 on the power connector to the 4-pin connector on the rear of the diskette drive. (See page 2-29 for a diagram of the power cable and connectors.) Connect the ground wire to the ground tab on the second diskette drive.



AJZIF102

-
10. Turn the diskette drive lever counterclockwise to open it and remove the shipping card, if one is present.



AJZIF103

11. Replace the cooling fan assembly. See "Cooling Fan Replacement" on page 2-6.
12. You have finished installing the drives. If there are other options to be installed, do so now, and then check out the system again, using Section 9, "Checking Out the Option Installation" on page 9-1.



Section 3. Installing the Adapters

CONTENTS

About This Section	3-3
General Instructions	3-4
Handling Static-Sensitive Adapters	3-4
Installing Adapters	3-7
Installing the Covers on the System Units	3-15
IBM 6150 System Unit	3-15
IBM 6151 System Unit	3-18

About This Section

This section gives general instructions for handling and installing adapters. Once you are familiar with how to install an adapter, go to the appropriate adapter section for slot, jumper and switch information.

General Instructions

The following pages supply general instructions for handling adapters. Read these instructions now, but *do not* unpack any adapters until you read the instructions for installing each one.

CAUTION

Before doing any procedure, turn off power to the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

When you are finished, see “Installing the Covers on the System Units” on page 3-15.

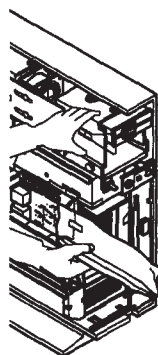
After all options have been installed, check out the installation by following the procedure in Section 9, “Checking Out the Option Installation”

Handling Static-Sensitive Adapters

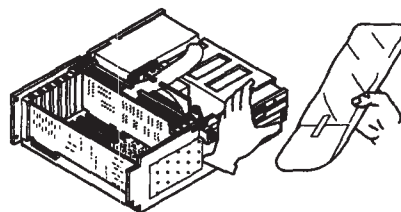
Warning: Adapters can be damaged by static electricity discharge. The adapters are wrapped in antistatic bags to prevent this damage.

Take the following precautions when handling devices sensitive to static electricity discharge:

1. Hold the device (still in the antistatic bag) in one hand, and with the other hand, touch the metal on the system unit frame.



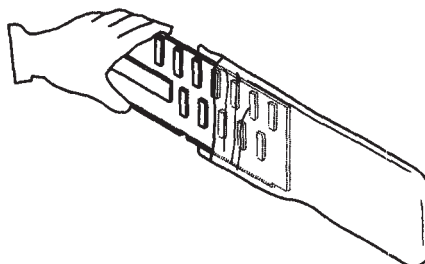
IBM 6150



IBM 6151

AJZIF104

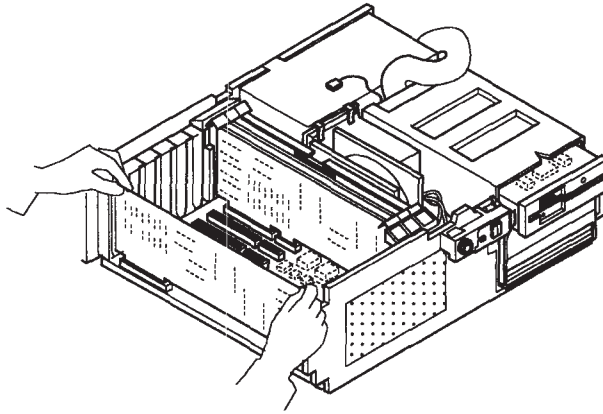
2. Immediately remove the device from the antistatic bag.



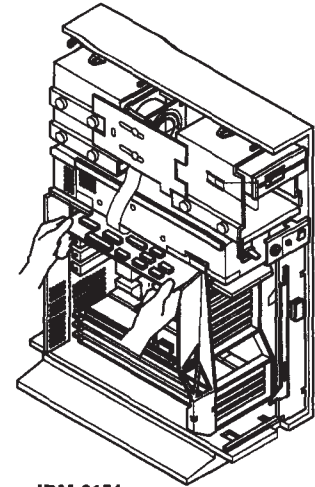
AJZIF105

When handling devices:

- Hold adapters by the corners or bracket only. Do not touch the components, modules, or connections.



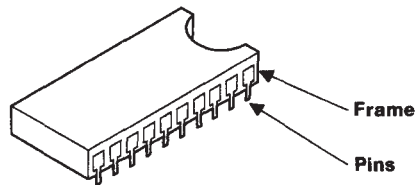
IBM 6150



IBM 6151

AJZIF106

- Hold modules by the frames.



AJZIF107

CAUTION

Do not touch the pins. The pins are sharp. Refer to “Safety Notice Translations” on page iii.

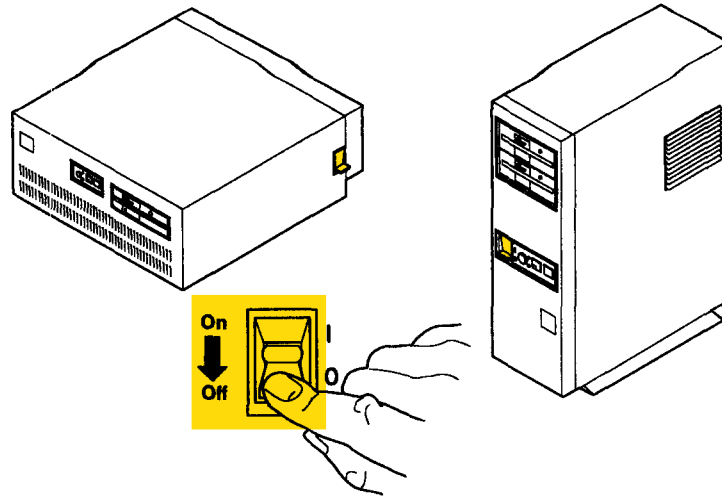
Installing Adapters

The following pages give detailed instructions for installing adapters in the system unit. Some of the adapters in the numbered adapter slots have connectors to which you can connect devices outside of the system unit. Adapters in the four system board slots (A, B, C, and D) do not connect to external devices.

Instructions are given from the following arrangement: the system unit is on a table. For IBM 6150, the front of the unit is toward your right hand. You are facing the left side of the unit with all three covers removed. For IBM 6151, you are facing the front of the system unit with the top and rear covers removed.

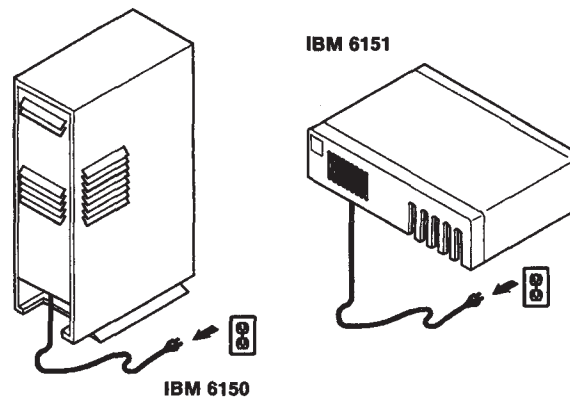
The steps for installing optional adapters are:

1. Turn off the power on the system unit.



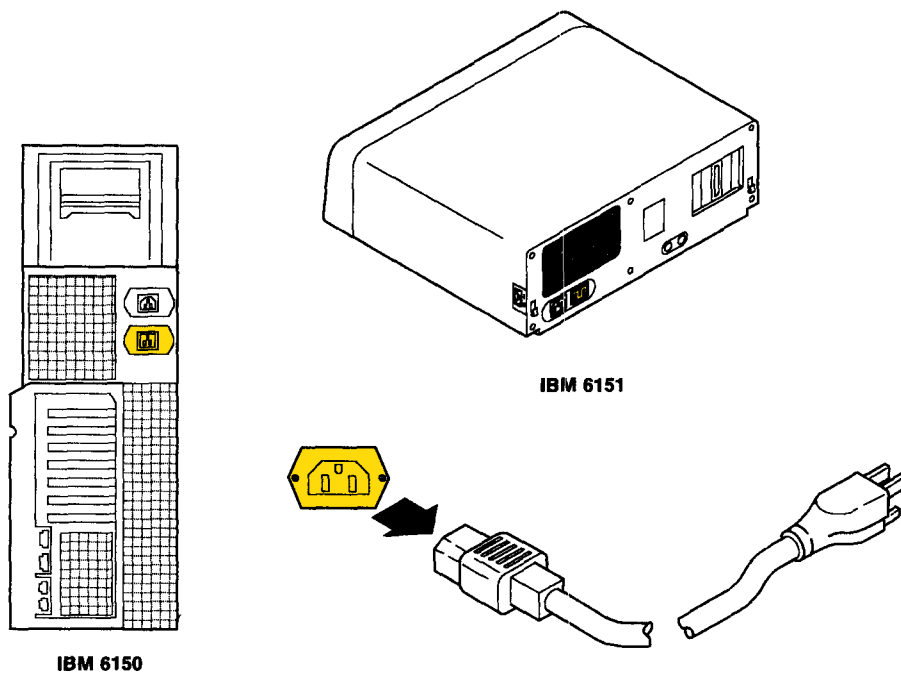
AJZIF108

2. Unplug the power cable on the system unit from the electrical outlet.



AJZIF109

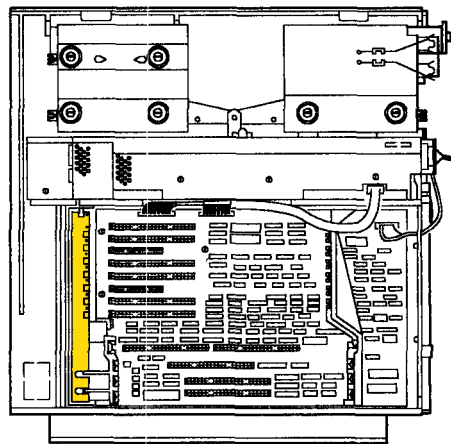
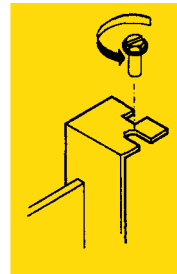
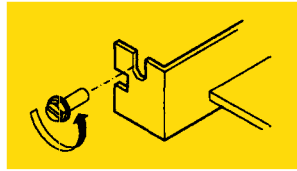
-
3. If connected, unplug the display power cable and system unit power cable from the system unit.



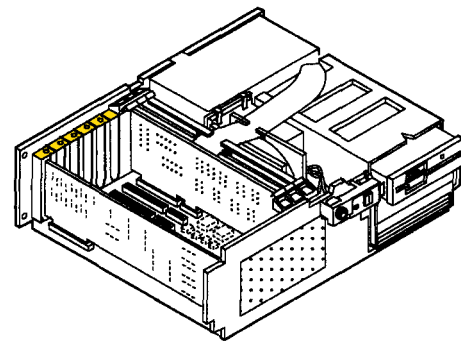
AJZIF110

4. Remove the covers using the instructions under “Removing the Covers From the System Units” on page 1-4.

-
5. For the numbered adapter slots, remove the screw holding the adapter slot cover in place. Save the screw to install the adapter later. Save the adapter slot cover in case you remove an adapter in the future. You must have either an adapter or a slot cover in each slot.



IBM 6150

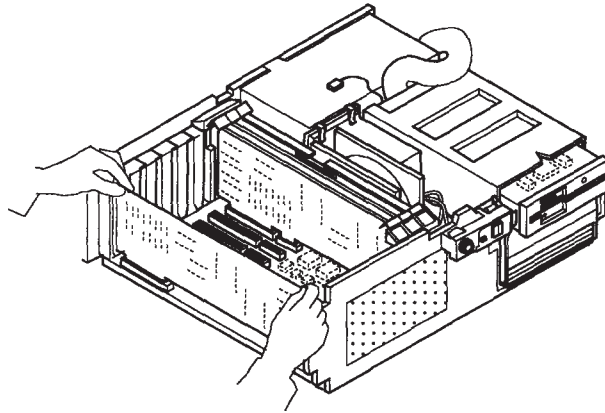


IBM 6151

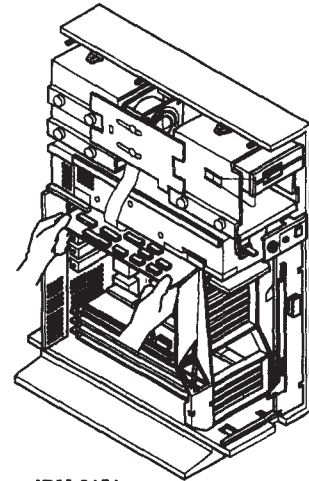
AJZIF111

6. Unpack the adapter using the instructions under “Handling Static-Sensitive Adapters” on page 3-4.

-
7. Hold the adapter by the bracket and edges. Point the tab toward the slot on the system board and press the adapter into place. Ensure that the right edge is in the plastic guides and the adapter is completely in position.



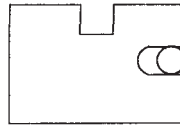
IBM 6150



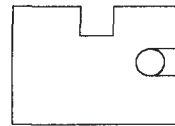
IBM 6151

AJZIF112

-
8. Align the screw holes and ensure that the adapter bracket is even with the frame.



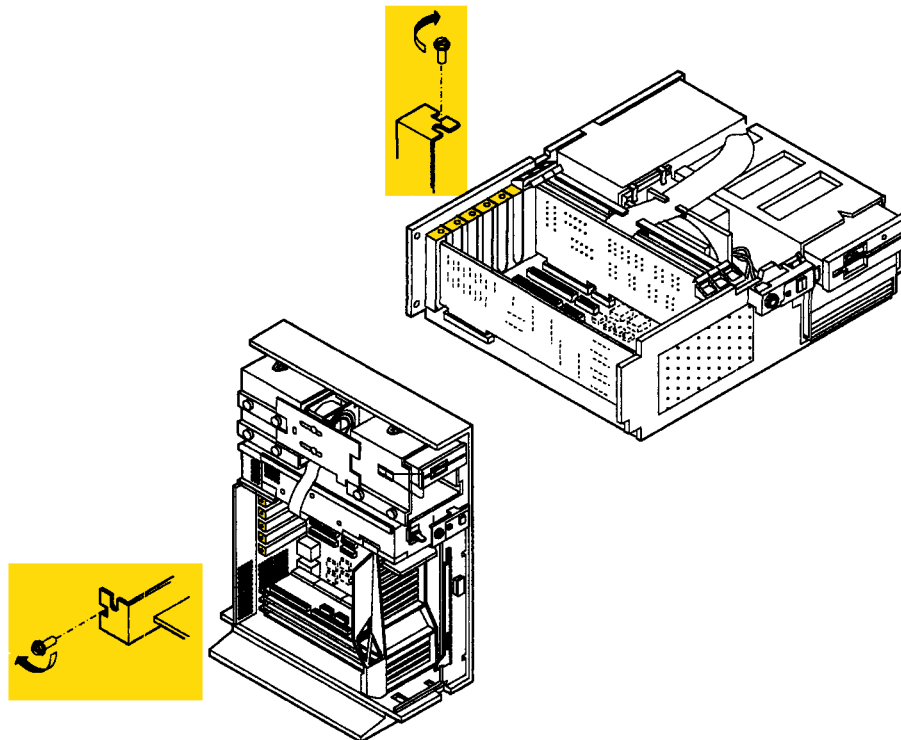
**Not
Aligned**



**Correctly
Aligned**

AJZIF113

9. Install the screw you removed in step 2.

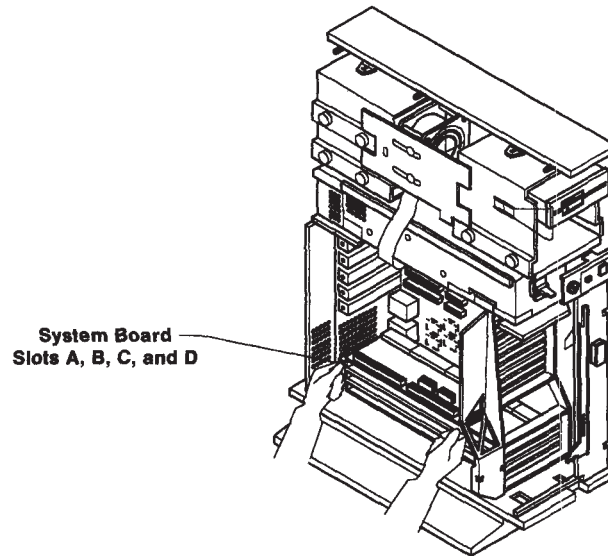


AJZIF114

10. Adapters in system board slots B, C, and D have no screws or brackets. Slide these adapters into the slots as in Step 7.

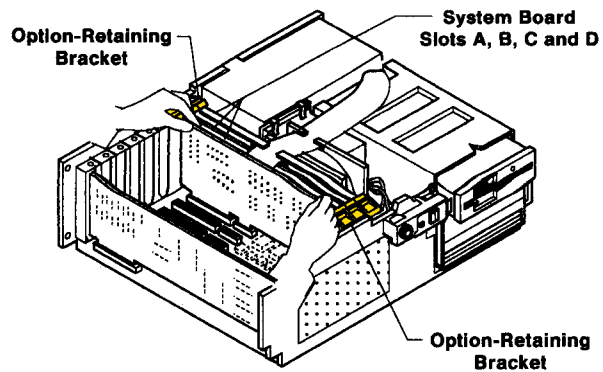
Adapters in system board slots B, C, and D are retained by:

- In IBM 6150, the left cover holds these adapters in place.



AJZIF115

- In IBM 6151, the plastic option retainers hold the adapters in place. Open the retainers, slide the adapters into the slots as in Step 7, and close the retainers.



AJZIF116

11. If any other options remain to be installed, do so now, and then check out the installation by using the procedure in Section 9, “Checking Out the Option Installation” on page 9-1.

Refer to the system unit diagram for the locations of the adapters. Use the table of contents and go to the instructions for the specific adapter.

Installing the Covers on the System Units

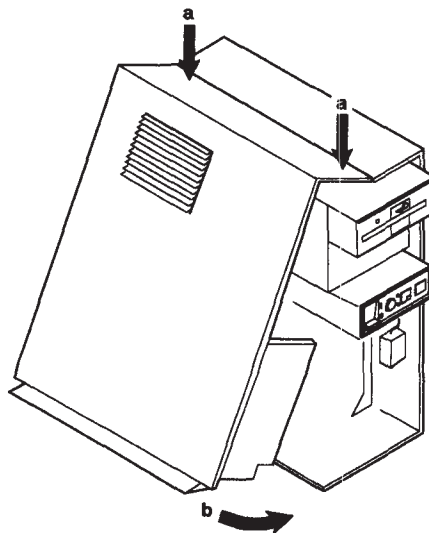
Ensure that you have installed all options before you install the covers on the system unit.

Note: Do not operate the system unit with the covers removed. Operating with the covers on ensures adequate cooling of the components.

IBM 6150 System Unit

Do the following to install the covers on IBM 6150:

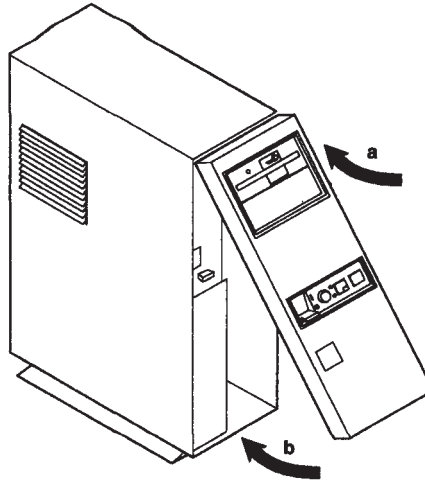
1. To install the left side cover:
 - a. Insert the top hooks in the loops in the top of the frame.
 - b. Rotate the bottom of the cover inward and snap the cover in place.



AJZIF117

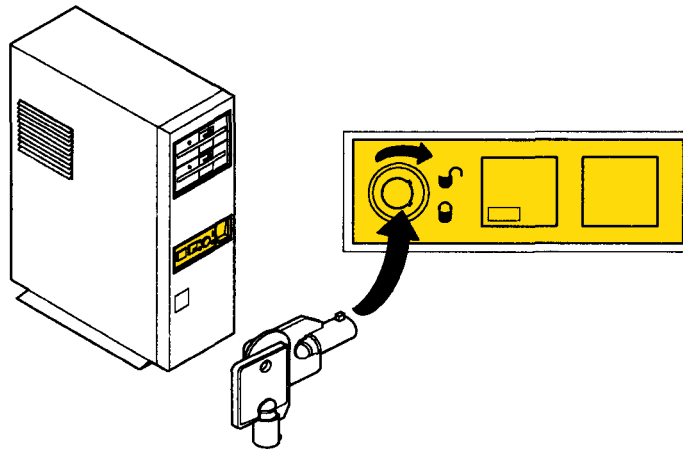
2. To install the front cover:

- a. Insert the hooks under the top cover edge.
- b. Rotate the cover in and snap the cover in place.



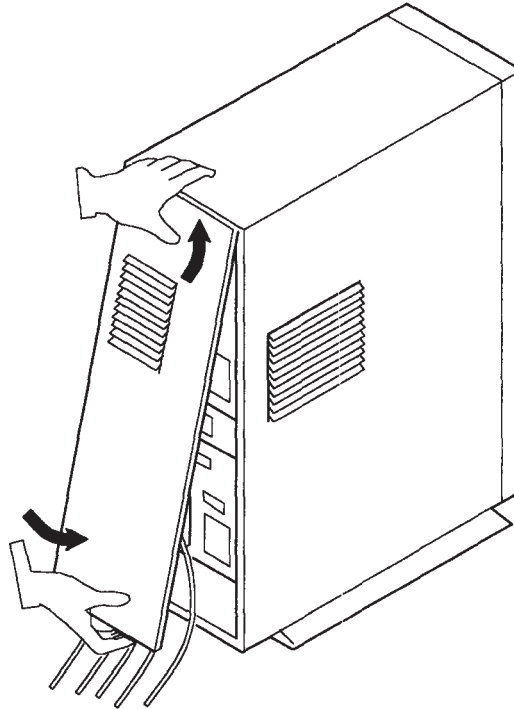
AJZIF118

3. Insert the key into the keylock and turn the key clockwise.



AJZIF119

-
4. Connect any cables you disconnected earlier. Arrange the cables so that you can fit the rear cover in place.



AJZIF120

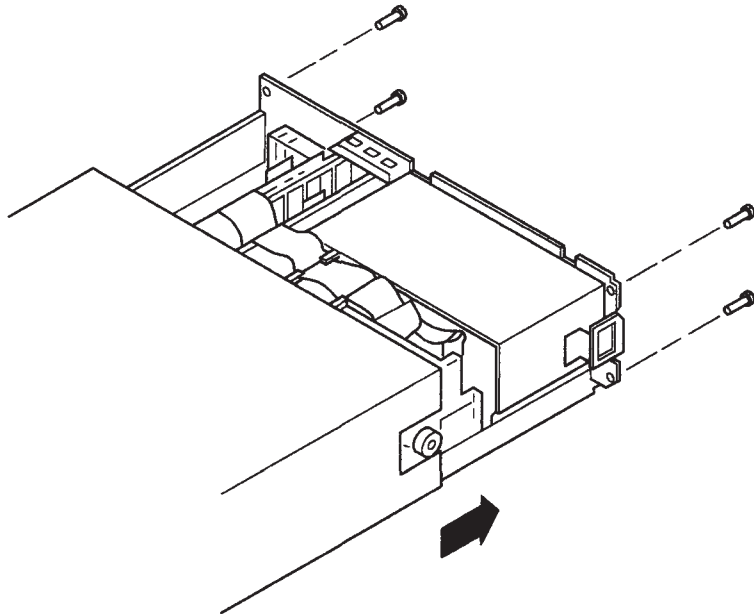
After you have installed the options, it is important to record hardware changes on the record stored in the system. Verify the options installation by following the procedure in Section 9, “Checking Out the Option Installation” on page 9-1.

If you need to set up the system, go to the check list in Section 1 of *IBM RT PC User Setup Guide* for instructions to continue the setup process.

IBM 6151 System Unit

Ensure that you have installed all optional adapters before you put the cover on the system unit. Do the following:

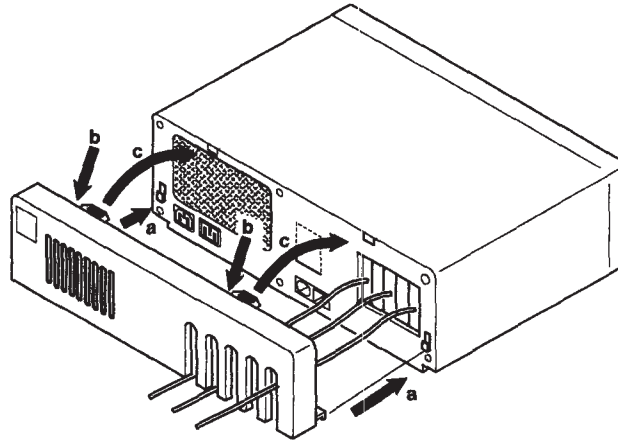
1. To install the top cover, face the front of the system unit and slide the cover over the unit. Ensure that all cables are safely pushed out of the way.



AJZIF121

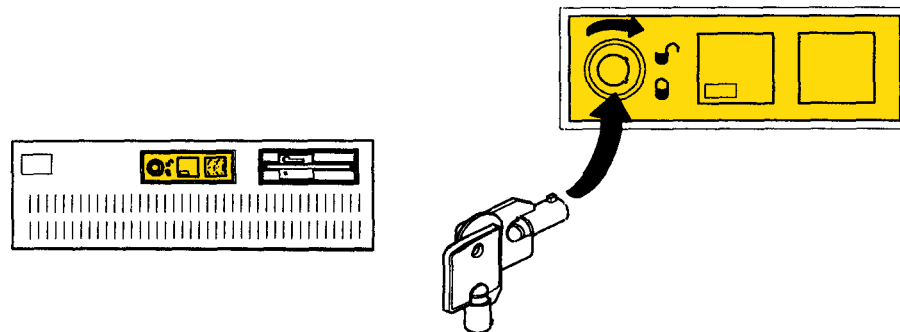
2. Fit the rear cover plate in place. Tighten the screws.

-
3. Connect any cables you disconnected earlier. Then, to install the rear cover, slide the cables into the slots in the cover.
 - a. Insert the bottom hooks into the holes.
 - b. Push down on the cover.
 - c. Insert the top clips into the loops.



AJZIF123

4. Insert the key into the keylock and turn the key clockwise.



AJZIF124

After you have installed the options, it is important to record hardware changes on the record stored in the system. Verify the

options installation by following the procedure in Section 9, “Checking Out the Option Installation” on page 9-1.

If you need to set up the system, go to the checklist in Section 1 of *IBM RT PC User Setup Guide* for instructions to continue the setup process.

Section 4. Processor Options

CONTENTS

About This Section	4-3
Installing Processor Options	4-4
IBM RT PC Personal Computer AT Coprocessor Option	4-5
IBM RT PC Floating-Point Accelerator	4-7
IBM Advanced Floating-Point Accelerator	4-8

About This Section

The following pages show how to install various processing options. None of the option cards connect to devices outside of the system units.

Installing Processor Options

CAUTION

Before doing any procedure, turn off power on the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

If you have not removed the covers, see “Removing the Covers From the System Units” on page 1-4.

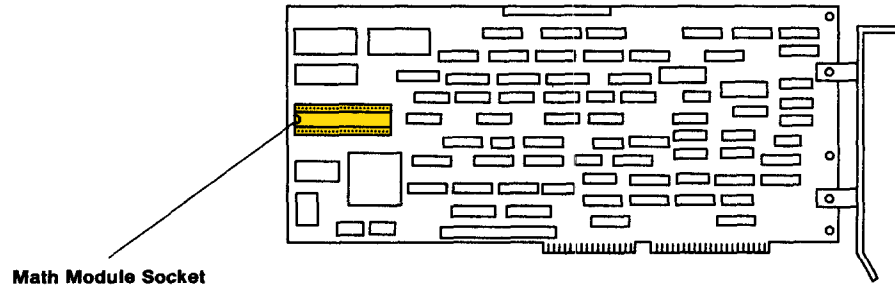
Refer to “General Instructions” on page 3-4 when necessary for information on installing adapters.

After all options have been installed, it is important to complete the checkout procedure in Section 9, “Checking Out the Option Installation.”

IBM RT PC Personal Computer AT Coprocessor Option

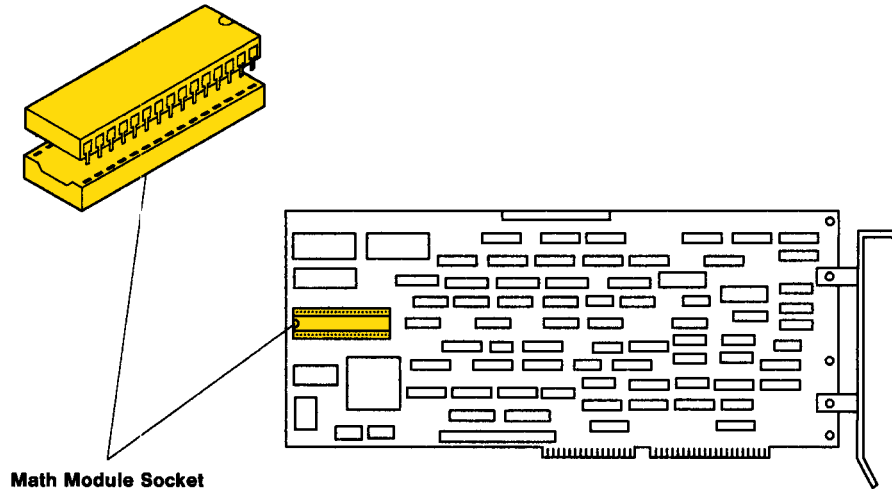
You can install one IBM RT PC Personal Computer AT Coprocessor Option in a system unit.

If you have the IBM Personal Computer AT Math Co-Processor, install it in the position shown in the following drawing:



AJZIF125

To install the IBM Personal Computer AT Math Co-Processor, align the pins on the module with the connector on the IBM RT PC Personal Computer AT Coprocessor Option. Align the notch on the module with the notch on the connector. Press the module into place.



Math Module Socket

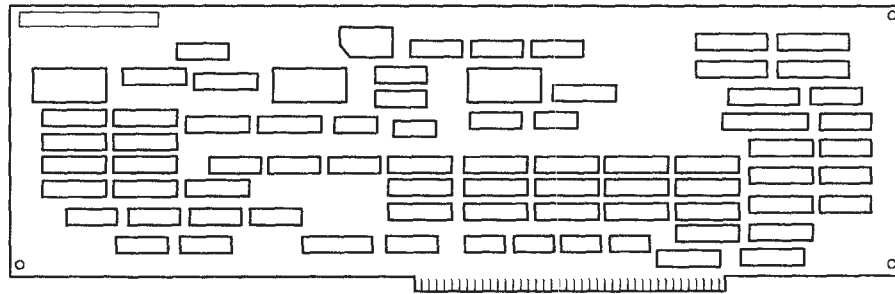
AJZIF126

Warning: You must install the IBM RT PC Personal Computer AT Coprocessor Option in adapter slot 8 in IBM 6150 and in adapter slot 5 in IBM 6151.

Installing: See the system unit diagram for the correct adapter slot.

IBM RT PC Floating-Point Accelerator

You can install one IBM RT PC Floating-Point Accelerator in a system unit.



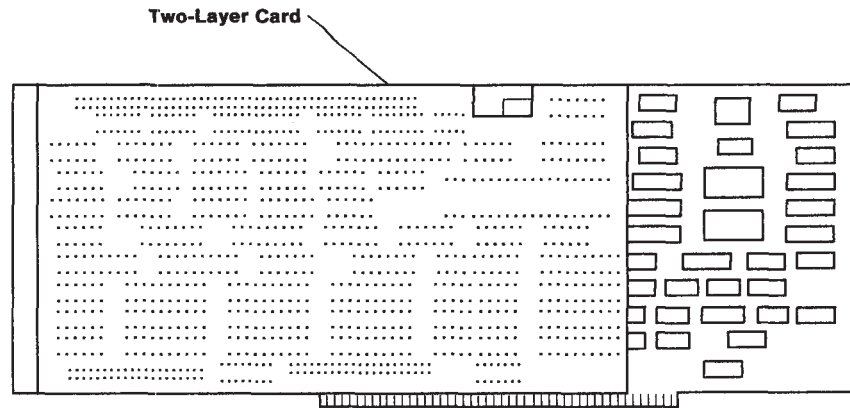
AJZIF127

Warning: You must install this option in system board slot B.

Installing: See the system unit diagram for the location of system board slot B.

IBM Advanced Floating-Point Accelerator

You may install one IBM Advanced Floating-Point Accelerator in a system unit.



AJZIF128

Warning: This option replaces the IBM RT PC Floating-Point Accelerator, if installed, and must be located in slot B of the system board.

Installing: See the system unit diagram for the location of system board slot B.

If the IBM Advanced Floating-Point Accelerator is being added as a separate option, use the diskette enclosed with the option, and refer to *Installing and Customizing the AIX Operating System*, "Reinstalling the VRM."

Section 5. Memory Options

CONTENTS

About This Section	5-3
Installing Memory Options	5-4
IBM Personal Computer AT 512KB Memory Expansion Option	5-5
IBM RT PC 1MB Memory Expansion Option	5-7
IBM RT PC 2MB Memory Expansion Option	5-8
IBM RT PC 4MB Memory Expansion Option	5-9
IBM RT PC 4MB Fast Memory Expansion Option	5-10
IBM RT PC 8MB Fast Memory Expansion Option	5-11

About This Section

The following memory options supply additional memory for the system. Memory board modules may be in different locations, depending on the manufacturer. The module positions do not effect the function of the memory option, and installation of the option remains unchanged.

Installing Memory Options

CAUTION

Before doing any procedure, turn off power on the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

If you have not removed the covers, see “Removing the Covers From the System Units” on page 1-4.

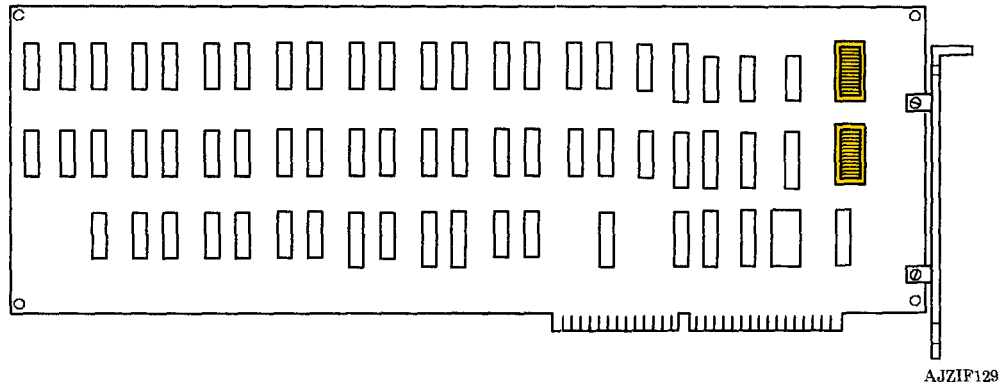
Memory option slot assignments differ, depending on which memory option or combination of memory options you choose.

Refer to “General Instructions” on page 3-4 when necessary for information on installing adapters.

After all options have been installed, it is important to complete the checkout procedure in Section 9, “Checking Out the Option Installation.”

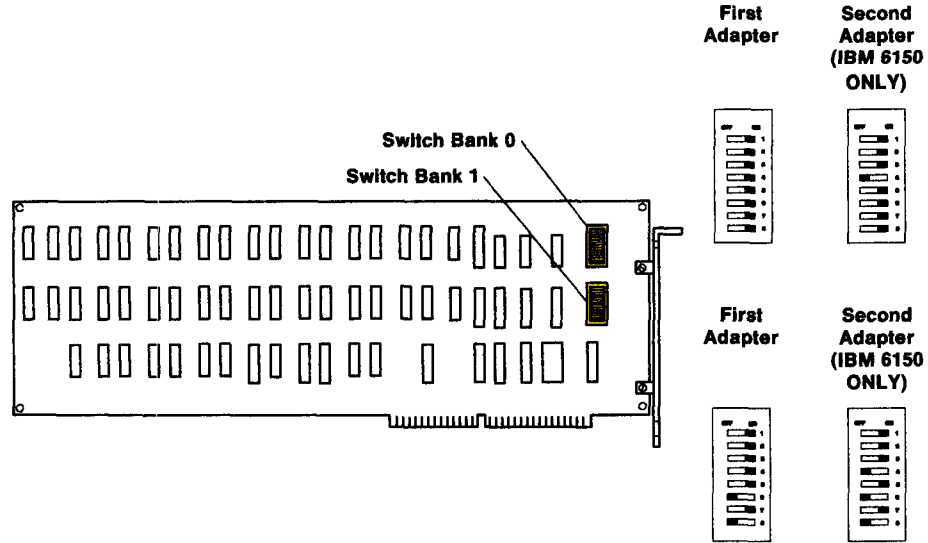
IBM Personal Computer AT 512KB Memory Expansion Option

You can install two IBM Personal Computer AT 512KB Memory Expansion Options in IBM 6150 and one in IBM 6151.



Note: The IBM Personal Computer AT 512KB Memory Expansion Option should only be used in conjunction with the IBM RT PC Personal Computer AT Coprocessor Option.

If you need to reset the switches, use an opened paper clip or a ball-point pen to do so. Set the switches as shown in the following drawing:

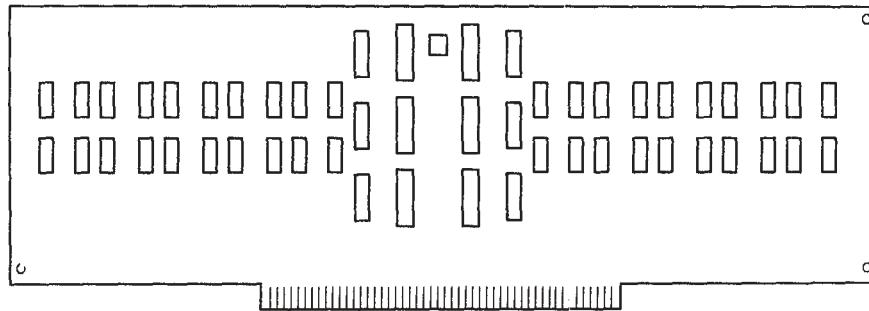


AJZIF130

Warning: Do not install this adapter in slot 8 in IBM 6150 or in slot 5 in IBM 6151.

Installing: This adapter can be installed in adapter slot 2, 4, 5, or 7 in the IBM 6150 and in adapter slot 2, 3, or 4 in the IBM 6151. See the system unit diagram to locate the adapter slots.

IBM RT PC 1MB Memory Expansion Option



AJZIF131

The IBM RT PC 1MB Memory Expansion Option is designed for use *only* with the IBM RT PC Processor and Memory Management Card.

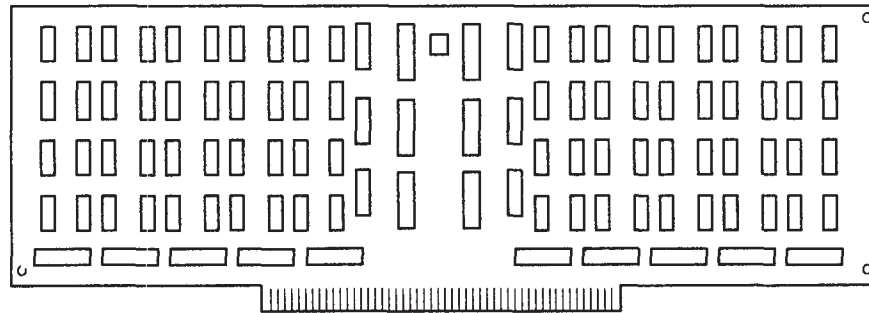
Warning: You must install this memory option in system board slot C or D.

Installing: When the IBM RT PC 1MB Memory Expansion Option is used alone, it should be installed in slot C.

When the IBM RT PC 1MB Memory Expansion Option is used with another memory option, the smaller capacity memory option should be installed in slot D. Both memory options *must* be designed for use with the IBM RT PC Processor and Memory Management Card.

See the system unit diagram for the correct adapter slot.

IBM RT PC 2MB Memory Expansion Option



AJZIF132

The IBM RT PC 2MB Memory Expansion Option is designed for use *only* with the IBM RT PC Processor and Memory Management Card.

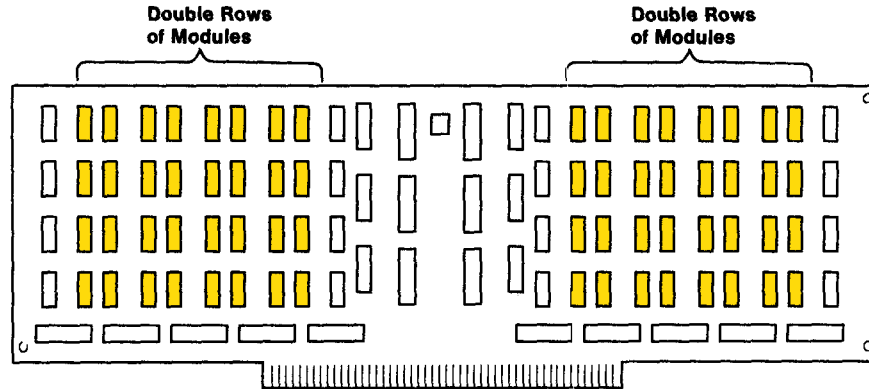
Warning: You must install this memory option in system board slot C or D.

Installing: When the IBM RT PC 2MB Memory Expansion Option is used alone, it should be installed in slot C.

When the IBM RT PC 2MB Memory Expansion Option is used with another memory option, the smaller capacity memory option should be installed in slot D. Both memory options *must* be designed for use with the IBM RT PC Processor and Memory Management Card.

See the system unit diagram for the correct adapter slot.

IBM RT PC 4MB Memory Expansion Option



AJZIF133

The IBM RT PC 4MB Memory Expansion Option is designed for use *only* with the IBM RT PC Processor and Memory Management Card.

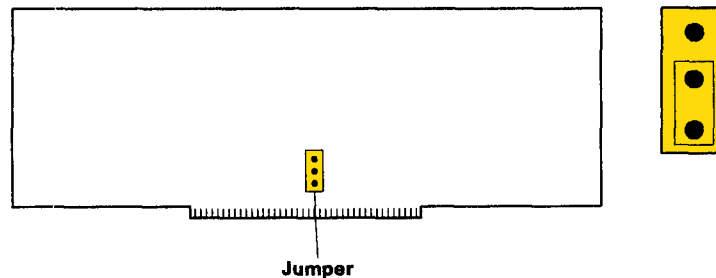
Warning: You must install this memory option in system board slot C or D.

Installing: When the IBM RT PC 4MB Memory Expansion Option is used alone, it should be installed in slot C.

When the IBM RT PC 4MB Memory Expansion Option is used with a second memory option, the smaller capacity memory option should be installed in slot D. Both memory options *must* be designed for use with the IBM RT PC Processor and Memory Management Card.

See the system unit diagram for the correct adapter slot.

IBM RT PC 4MB Fast Memory Expansion Option



AJZIF134

The IBM RT PC 4MB Fast Memory Expansion Option is designed for use *only* with the IBM RT PC Advanced Processor Card (APC). The IBM RT PC 4MB Fast Memory Expansion Option can be identified by the inscription “4MB Enhanced ECC Memory.”

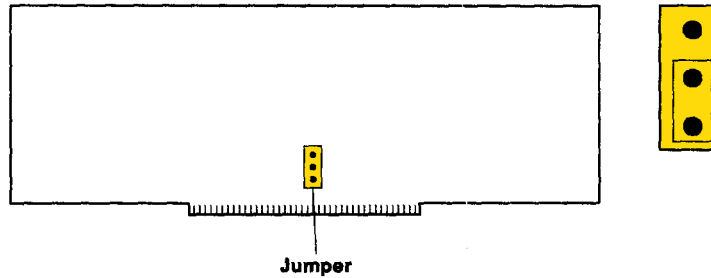
Warning: You must install this memory option in system board slot C or D.

Installing: When the IBM RT PC 4MB Fast Memory Expansion Option is used alone, it should be installed in slot C.

When the IBM RT PC 4MB Fast Memory Expansion Option is used with a second memory option, the smaller capacity memory option should be installed in slot D. Both memory options *must* be designed for use with the IBM RT PC Advanced Processor Card. Ensure that fast memory jumpers are set as shown.

See the system unit diagram for the correct adapter slot.

IBM RT PC 8MB Fast Memory Expansion Option



AJZIF135

The IBM RT PC 8MB Fast Memory Expansion Option is designed for use *only* with the IBM RT PC Advanced Processor Card (APC).

The IBM RT PC 8MB Fast Memory Expansion Option can be identified by the inscription “8MB Enhanced ECC Memory.”

Warning: You must install this memory option in system board slot C or D.

Installing: When the IBM RT PC 8MB Fast Memory Expansion Option is used alone, it should be installed in slot C.

When the IBM RT PC 8MB Fast Memory Expansion Option is used with a second memory option, the smaller capacity memory option should be installed in slot D. Both memory options *must* be designed for use with the IBM RT PC Advanced Processor Card. Ensure that memory option jumpers are set as shown.

See the system unit diagram for the correct adapter slot.



Section 6. Communication and Network Adapter Options

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About This Section

Communication and network adapters allow the system to communicate with other systems, terminals, work stations), modems, printers, and plotters. On IBM 6150, you can also use Serial Ports 1 and 2 for these connections.

Installing Communication and Network Options

CAUTION

Before doing any procedure, turn off power on the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

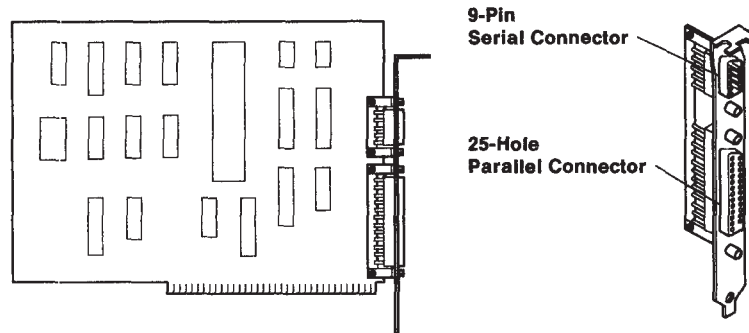
If you have not removed the covers, see “Removing the Covers From the System Units” on page 1-4.

Refer to “General Instructions” on page 3-4 when necessary for information on installing adapters.

After all options have been installed, it is important to complete the checkout procedure in Section 9, “Checking Out the Option Installation.”

IBM Personal Computer AT Serial/Parallel Adapter

You can install a total of two IBM Personal Computer AT Serial/Parallel Adapters in the system unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF136

Jumper Module Positions

Whether or not you use the IBM Monochrome Display and Printer Adapter together with one or two IBM Personal Computer AT Serial/Parallel Adapters determines the position of jumper modules on each serial/parallel adapter.

After locating your system configuration in the examples on the next page, use the instructions there and on following pages to set the appropriate jumper modules.

Note: Because of the varied parallel printer port configurations that are possible when the IBM Monochrome Display and Printer Adapter is used with one or two IBM Personal Computer AT Serial/Parallel Adapters, ensure that the parallel printer ports are correctly set up with the AIX DEVICES command. Refer to “Adapter Conflicts” on page 1-19 for more information.

-
- IBM Monochrome Display and Printer Adapter not used
 - The first adapter jumper modules should be set to the primary (Interrupt Level 4 for the serial jumper and Interrupt Level 7 for the parallel jumper) position.
 - The second adapter jumper modules should be set to the alternate positions (Interrupt Level 3 for the serial jumper and Interrupt Level 5 for the parallel jumper).
 - IBM Monochrome Display and Printer Adapter used
 - With *one* IBM Personal Computer AT Serial/Parallel Adapter:

Set the jumper modules to the alternate position (Interrupt Level 3 for the serial jumper and Interrupt Level 5 for the parallel jumper).
 - With *two* IBM Personal Computer AT Serial/Parallel Adapters:

The first adapter jumper modules should be set to the alternate positions (Interrupt Level 3 for the serial jumper and Interrupt Level 5 for the parallel jumper).

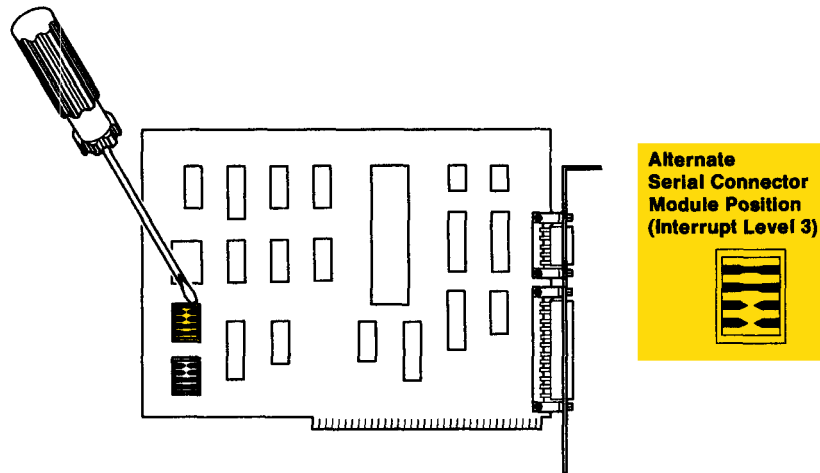
The second adapter jumper modules should be set to the primary position (Interrupt Level 4 for the serial jumper and Interrupt Level 7 for the parallel jumper).

Note: The parallel port of the second serial/parallel adapter is not used in this case. Ensure that the parallel port of the second adapter is not activated by the AIX DEVICES command, or a conflict will exist on Interrupt Level 7.

Serial Jumper Module

To change the serial jumper module position, do the following:

1. Locate the top jumper module which sets the interrupt level for the serial port.



AJZIF137

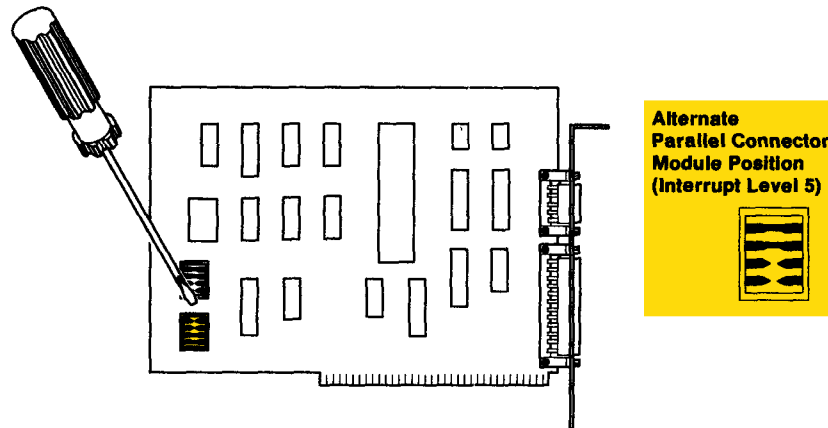
Warning: Do not bend the pins!

2. Carefully insert a small, flat-bladed screwdriver under the module and lift, alternating ends to lift the module evenly.
3. Rotate the jumper module to the desired position, and reinstall.

Parallel Jumper Module

To change the parallel jumper module position, do the following:

1. Locate the bottom jumper module which sets the interrupt level for the parallel connector.



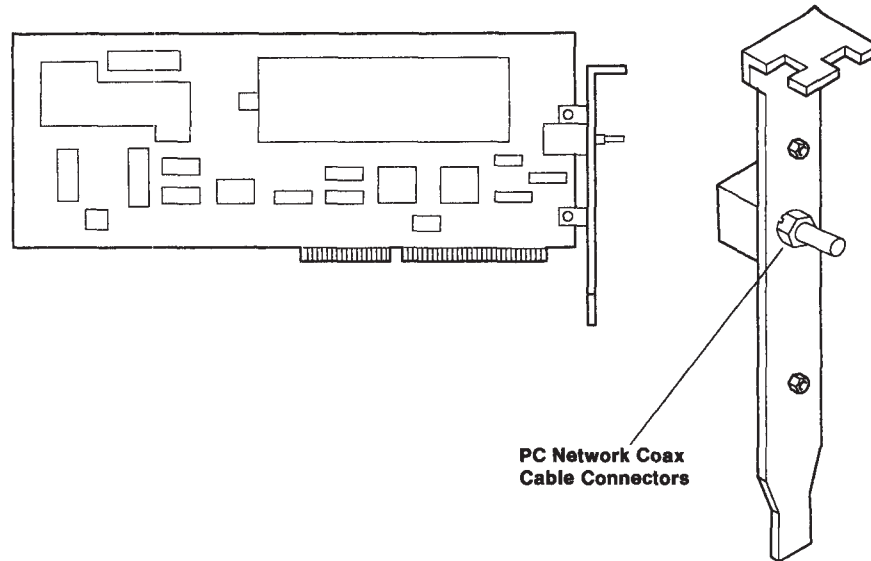
AJZIF138

2. Carefully insert a small, flat-bladed screwdriver under the module and lift, alternating ends to lift the module evenly.
3. Rotate the jumper module to the desired position, and reinstall.

Installing: You may install this adapter in adapter slots 2 through 8 in IBM 6150 and in slots 1 through 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

IBM PC Network Adapter

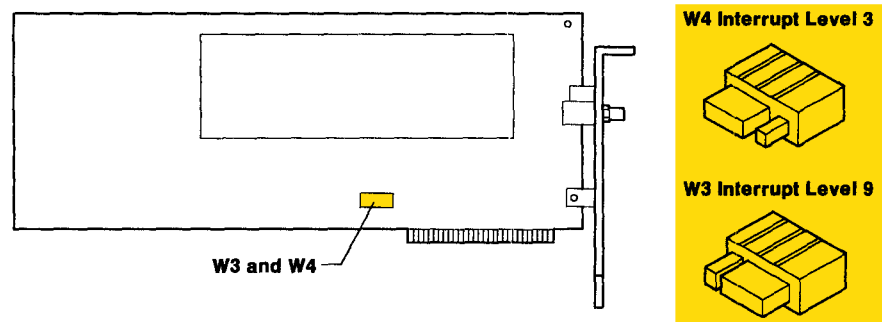
You can install one IBM PC Network Adapter in an IBM RT PC System Unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF139

The jumpers on this adapter can be set to either interrupt level 3 or 9. If you have the IBM PC Enhanced Graphics Adapter or the IBM Personal Computer 3278/79 Emulation Adapter, ensure that the interrupt level on the IBM PC Network Adapter is set to 3, since these other two adapters use 9. To set the interrupt level to 3, set jumper W4 as shown. To set the interrupt level to 9, set the same jumper (called W3 when set at 9) as shown in the illustration below.

Note: See *Installing and Customizing the AIX Operating System* for additional information about interrupt conflicts. Also see “Adapter Conflicts” on page 1-19.



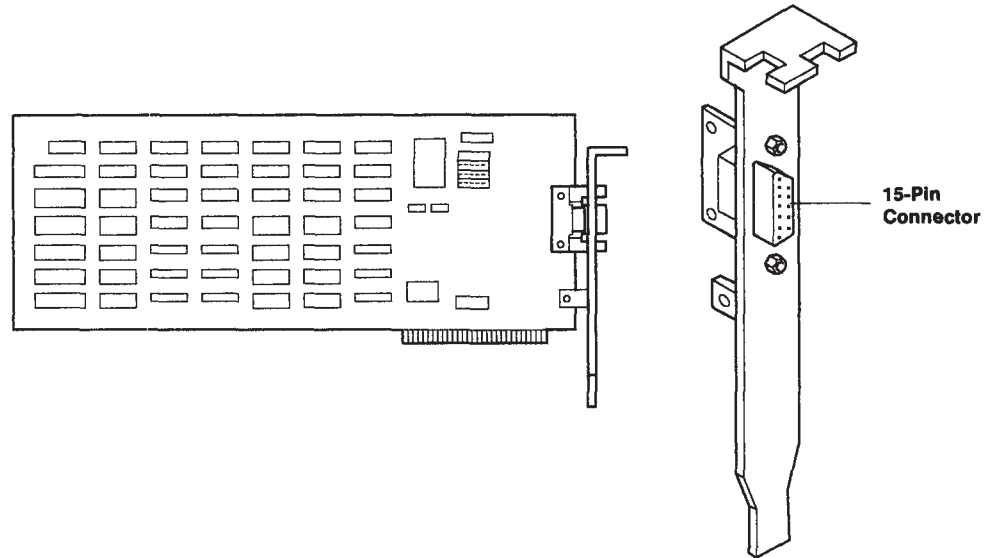
AJZIF140

Installing: You can install this adapter in slots 2 through 8 in IBM 6150 and in slots 1 through 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

In IBM 6151, you can more easily connect cables if you install the adapter in a slot other than adapter slot 1.

IBM RT PC Baseband Adapter

You can install two IBM RT PC Baseband Adapters in an IBM RT PC System Unit. The Baseband Adapter is used with the Ethernet¹ Network. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF141

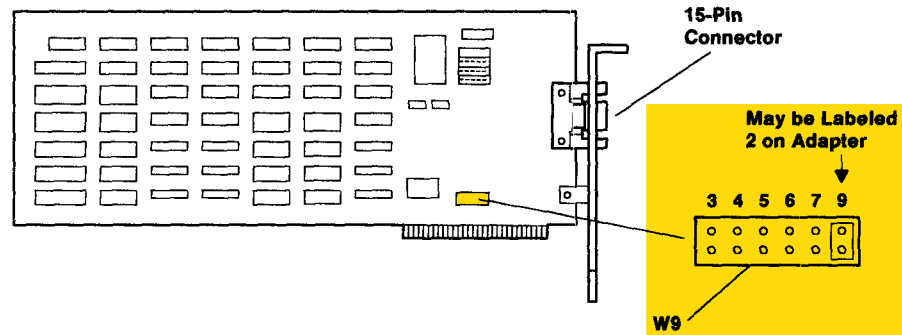
Note: Use the instructions on the following pages to set the jumpers on the Baseband adapter.

1 Registered trademark of Xerox Corporation

Interrupt Selection Jumper (W9)

Set the interrupt level of the Interrupt Selection Jumper to any of the available interrupt levels except interrupt 6, which is used by the diskette drives. If you are using two Baseband Adapters, ensure that different interrupt levels have been selected. See “Adapter Conflicts” on page 1-19.

Note: The factory setting for this jumper is interrupt 9.



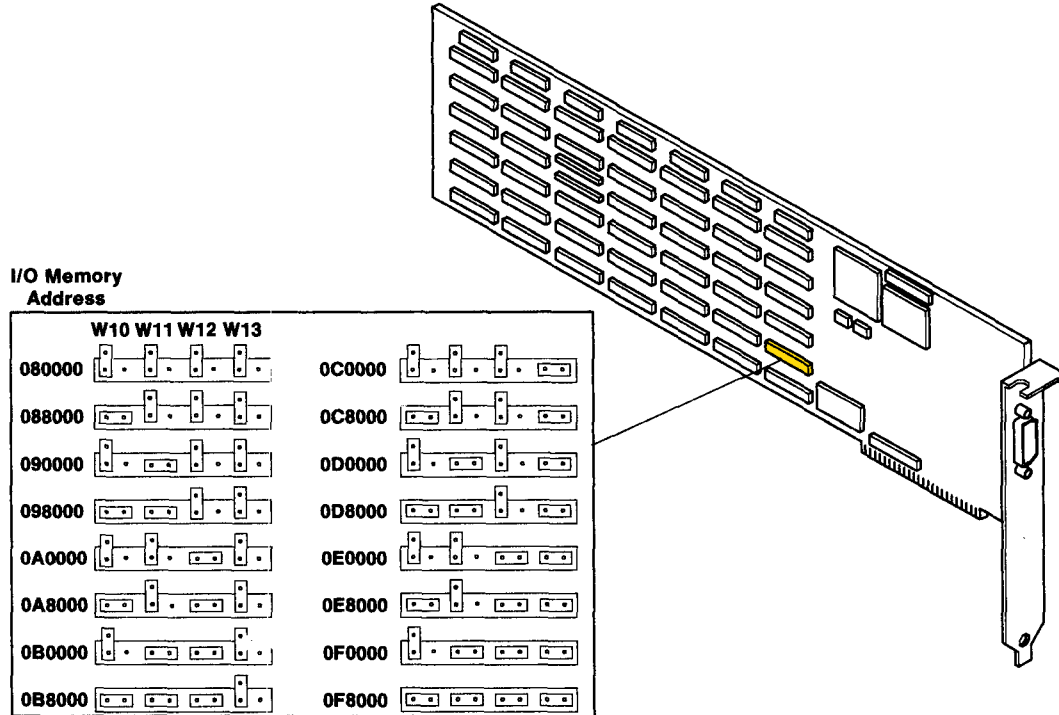
AJZIF142

I/O Memory Address Jumpers (W10-W13)

When using two Baseband Adapters, you must change the factory-set I/O memory address of one. Note the configuration of jumpers W10-W13, and use the following chart to select a different address,

When using a single Baseband Adapter, you may change the I/O memory address jumpers W10-W13 to an alternate setting listed below.

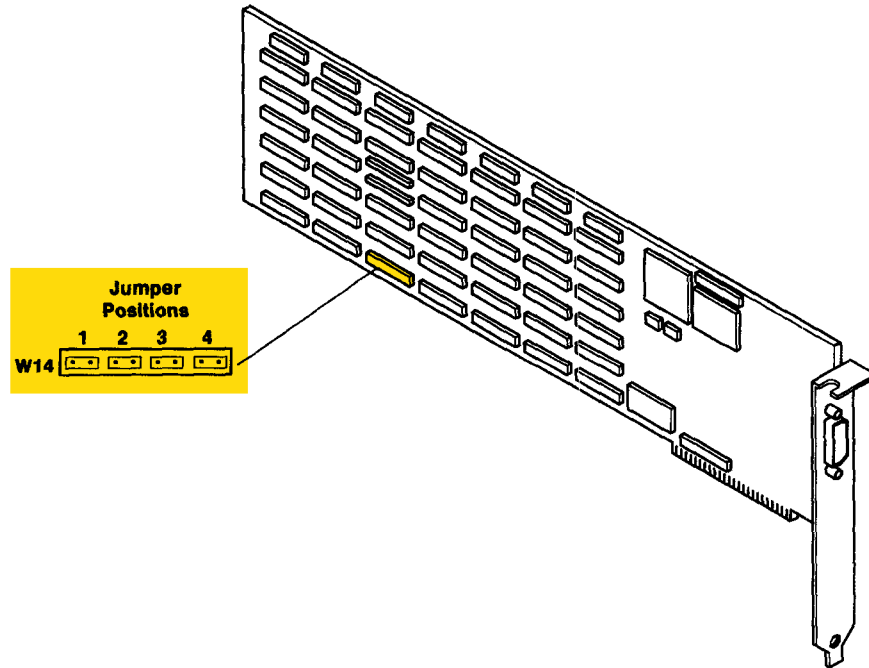
Note: Ensure that memory addresses do not conflict with those of other adapter options. See “Conflicting Memory Addresses” on page 1-19.



AJZIF143

Software Interrupt Timer Jumper (W14)

The setting of W14 determines the interrupt request rate. Use the following chart to set the jumper to the desired setting.



AJZIF144

Position 1	Interrupts every 9.1 ms
Position 2	Interrupts every 18.3 ms
Position 3	Interrupts every 36.6 ms
Position 4	Interrupts every 73.2 ms

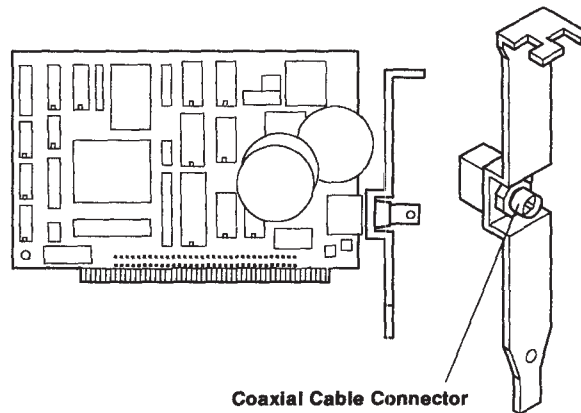
Installing: You can install this adapter in slots 2 through 7 in IBM 6150 and in slots 1 through 4 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

In IBM 6151, you can more easily connect cables if you install the adapter in a slot other than adapter slot 1.

IBM Personal Computer 3278/79 Emulation Adapter

There are two versions of 3278/79 Emulation Adapters in use. The long adapter is the earlier design and has no jumper or switch settings. You can install one early version adapter per system unit. The later, short adapter version has a switch bank, and up to four adapters of this version can be installed per system unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

Warning: The early, long adapter version of the 3278/79 Emulation Adapter cannot be used in the same machine with the later, short version, nor can the long adapter be used with the IBM PC 3278/79 Emulation Adapter Distributed Function Terminal (DFT) Device Driver.



AJZIF145

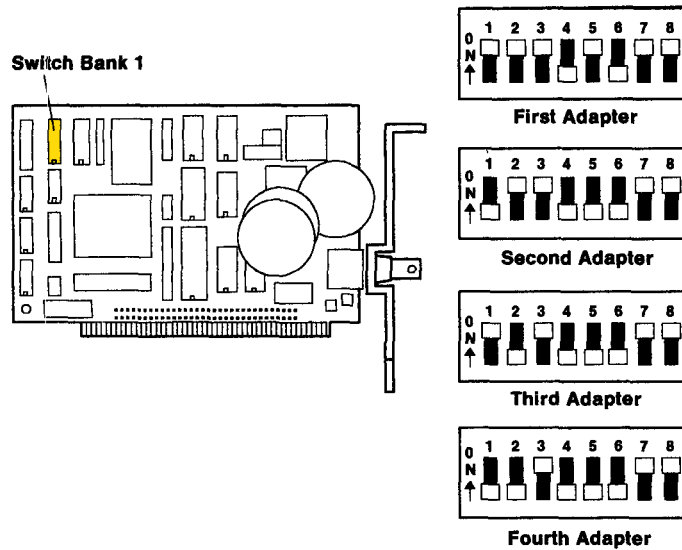
Note: The connector extends beyond the bracket. Rotate or tilt the adapter to install it.

Use the table on the following page to set the switches on the short adapter version.

Setting Switch Bank 1

Set Switch Bank 1 as shown below.

Note: Remove any tape that may be covering the switch bank.



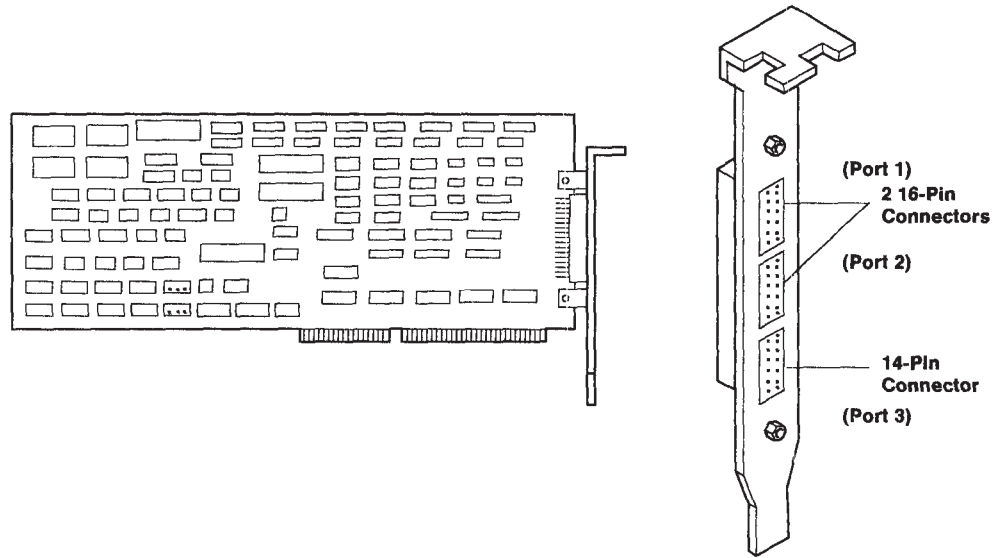
AJZIF146

Installing: You can install this adapter in slots 2 through 8 in the IBM 6150 and in slots 1 through 5 in the IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

Note: This adapter requires Interrupt Level 9. For more information, refer to “Adapter Conflicts” on page 1-19.

IBM RT PC Multiprotocol Adapter

You can install two Multiprotocol Adapters in a system unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

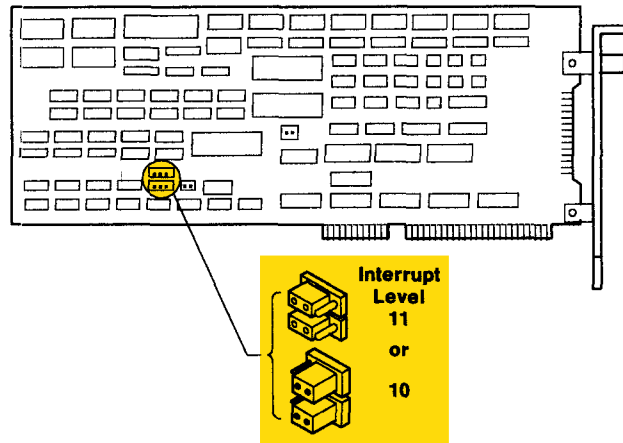


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Note: Use the instructions on the following pages to set the jumpers on the Multiprotocol Adapter.

Interrupt Level Jumper

Use the following figure to set the interrupt level at 11 or 10. If you are using two Multiprotocol Adapters, ensure that each has a different interrupt level. For more information, refer to “Adapter Conflicts” on page 1-19.



AJZIF148

I/O Address and DMA Channel Jumpers

The I/O Address and DMA Channel Jumpers have two settings each. If you are using two Multiprotocol Adapters, ensure that each adapter is set to a different DMA channel. For more information, refer to “Adapter Conflicts” on page 1-19.

Set the jumpers as shown below.

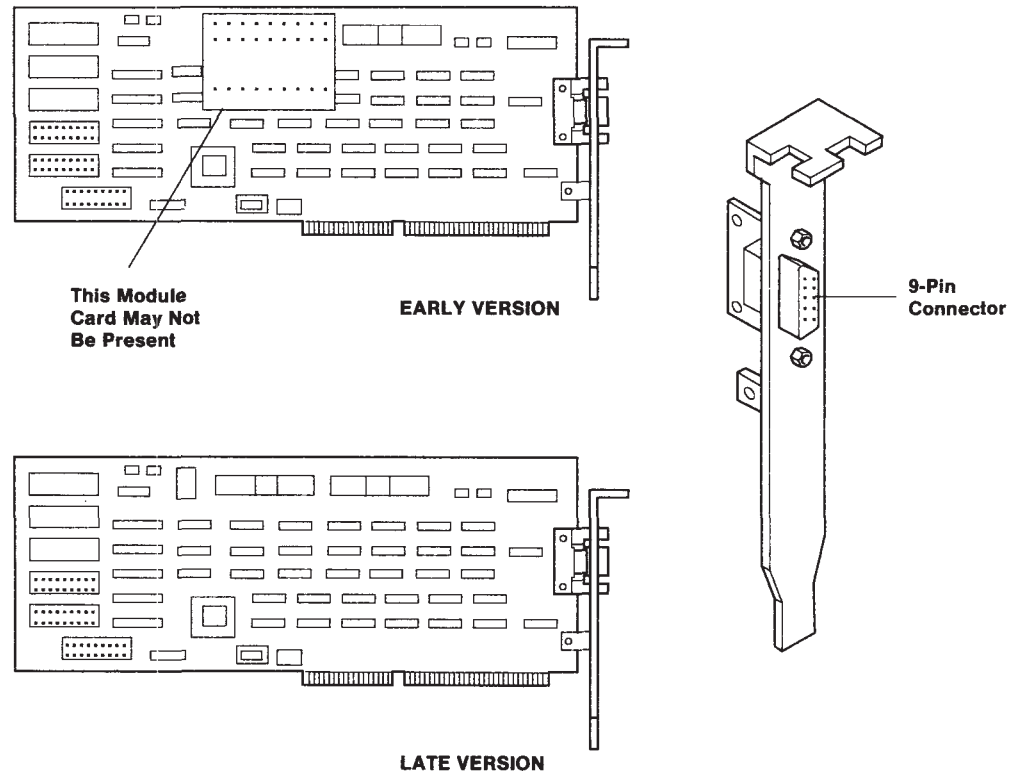


AJZIF149

Installing: You can install this adapter in slots 2, 4, 5, 7, or 8 in IBM 6150 and in slots 2, 3, 4, or 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

IBM Token-Ring Network RT PC Adapter

The IBM Token-Ring Network RT PC Adapter exists in two versions, distinguishable by module placement. The number of IBM Token-Ring Network RT PC Adapters that can be installed in an IBM RT PC System Unit depends on the version or combination of versions used. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF150

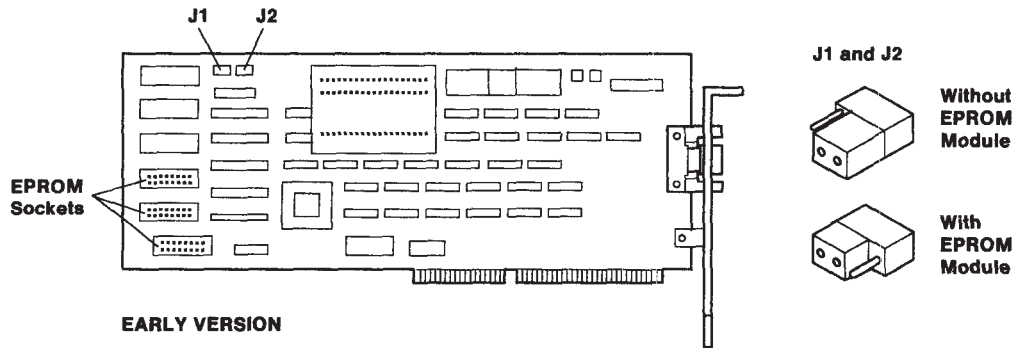
Use the instructions on the following pages to set the jumpers on both adapter versions.

IBM Token-Ring Network RT PC Adapter (Early Version)

You can install up to two adapters of this version in an IBM RT PC System Unit.

EPROM Jumpers

The position of jumpers J1 and J2 is determined by the presence of EPROM modules.



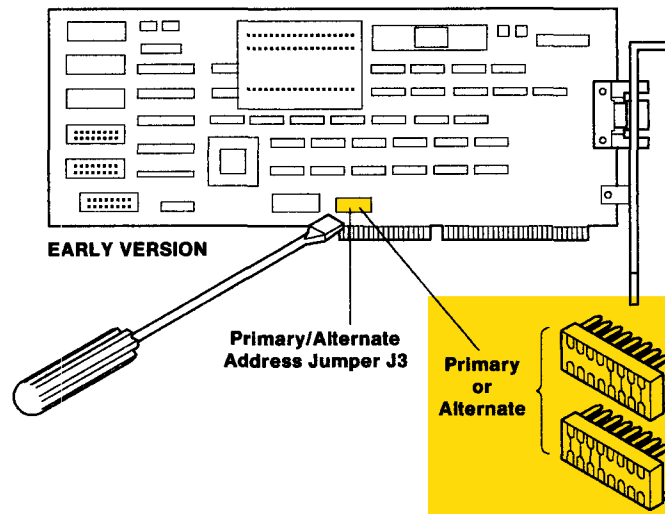
AJZIF151

Primary /Alternate Address Jumper

The position of jumper module J3 sets the adapter I/O address as Primary (the default setting) or Alternate. Jumper J3 also sets the DMA level at 5 for Primary and 6 for Alternate. To change J3, do the following:

1. Carefully insert a small, flat-bladed screwdriver under the J3 jumper module, alternately lifting the ends to extract the module evenly.

Warning: Do not bend the pins!

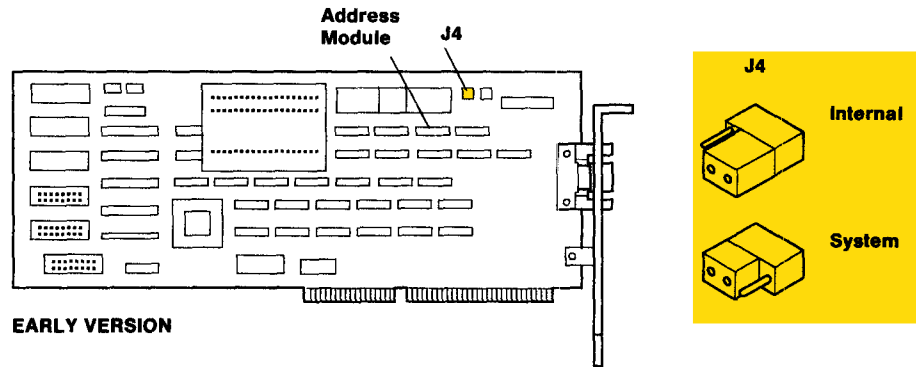


AJZIF152

2. Turn the module 180° and reinstall.

Adapter Address Jumper

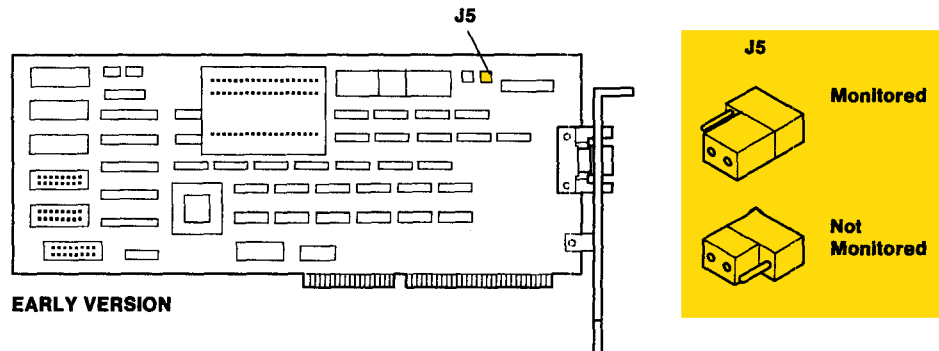
The Adapter Address Jumper J4 is used to indicate that an Address Module is present and should be set to the Internal position.



AJZIF153

Processor Activity Timer Jumper

The setting of the Processor Activity Timer Jumper J5 determines if processor activity is monitored or not monitored. Jumper J5 should be set to the Monitored position.



AJZIF154

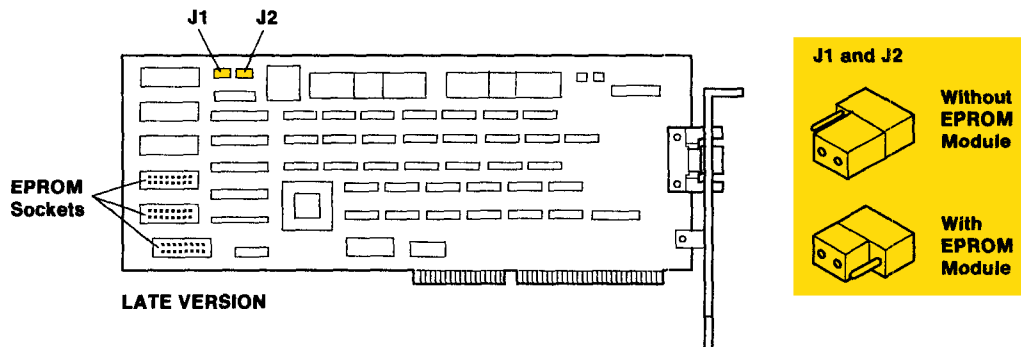
Installing: You can install this adapter in slots 2, 4, 5, 7, and 8 in Model 25 and in slots 2 through 5 in Model 10, whichever is available. See the system unit diagram for slot locations.

IBM Token-Ring Network RT PC Adapter (Late Version)

You can install up to four late version adapters in an IBM RT PC System Unit, depending on whether early and late adapter versions are combined.

EPROM Jumpers

The position of jumpers J1 and J2 is determined by the presence of EPROM modules.



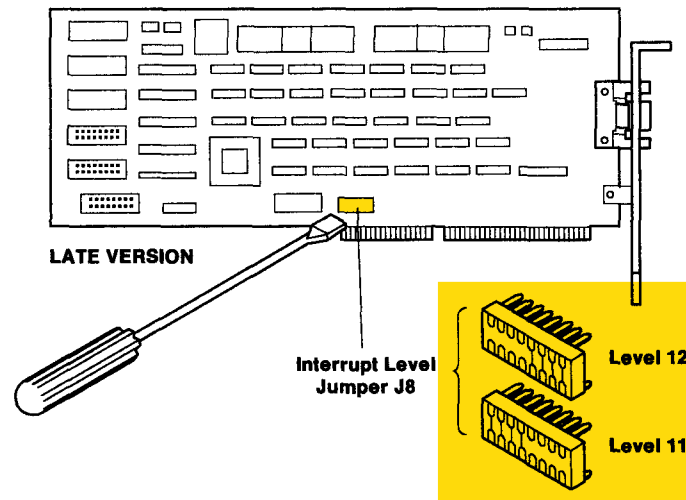
AJZIF155

Interrupt Level Select

The position of jumper module J8 determines the interrupt level; level 12 is the default setting. To change J8, do the following:

1. Carefully insert a small, flat-bladed screwdriver under the J8 jumper module, alternately lifting the ends to extract the module evenly.

Warning: Do not bend the pins!

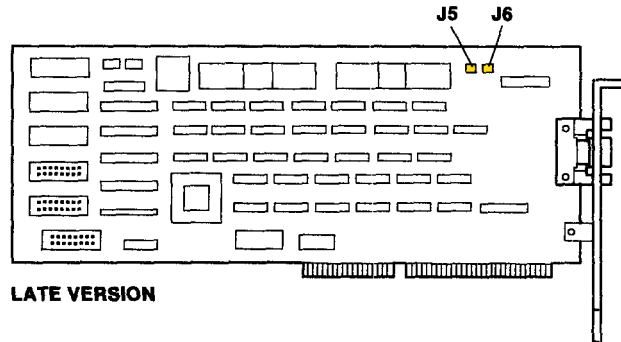


AJZIF156

2. Turn the module 180° and reinstall.

Selecting the I/O Address









Jumpers J5 and J6 select the I/O address on the late adapter version.



AJZIF157

Use the table and instructions on the following pages to set jumpers J5 and J6.

- If *only* the late adapter version is being used, select one J5-J6 combination per adapter from the following table.
- If one early adapter version is used with one or more late adapter versions, only three of the four J5-J6 combinations are available, depending on the setting of J3 on the early adapter version:
 - When the early adapter version Jumper Module J3 is set for Primary, select one J5-J6 combination per late adapter version from the last three rows of the following table.
 - When the early adapter version Jumper Module J3 is set for Alternate, select one J5-J6 combination per late adapter version from the first, third, or fourth rows of the following table.
- If two early adapter versions are used with one or more late adapter versions, only the last two rows in the J5-J6 combination table are available for use with the late adapter version.

Address	DMA CHANNEL	J5	J6
01C0 - 01CF	5		
0140 - 014F	6		
11C0 - 11CF	7		
11D0 - 11DF	3		

AJZIF158

Installing: You can install this adapter in slots 2, 4, 5, 7, and 8 in Model 25 and in slots 2 through 5 in Model 10, whichever is available. See the system unit diagram for the correct slot.

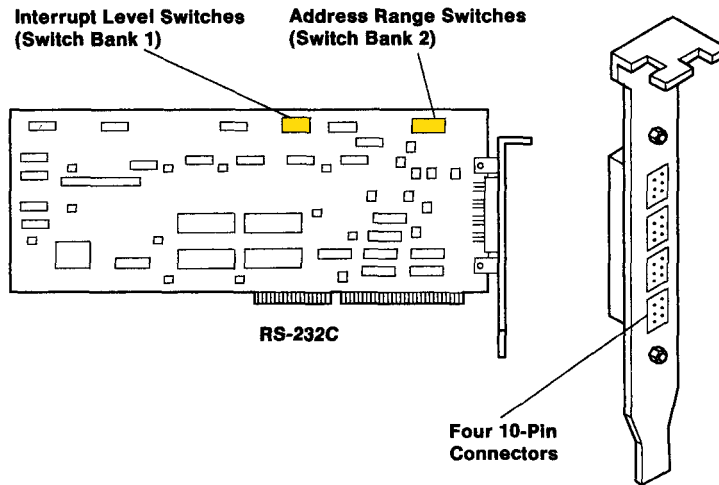
An IBM Token-Ring Network RT PC Adapter with the address range 11C0 - 11CF can *not* be installed in slot 8 of Model 25 or in slot 5 of Model 10.

IBM RT PC 4-Port Asynchronous Adapters

You can install any combination of RS232C and RS422A Asynchronous 4-Port Adapters together with one RT PC 5080 Peripheral Adapter, for a total of four in IBM 6150 and three in IBM 6151.

Note: Buffered versions of the RS232C and RS422A 4-Port Asynchronous Adapters can be identified by a plus symbol (+) stamped on the end of the adapter near the cable connector. Both buffered and non-buffered adapters can be installed in the same system.

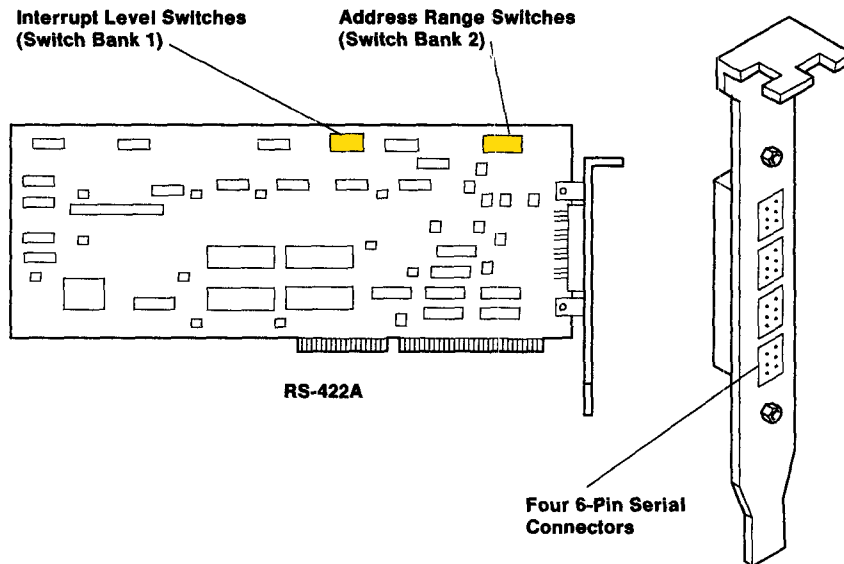
With the IBM RT PC 4-Port Asynchronous RS232C Adapter and the correct cables, you can connect a system unit to printers, plotters, terminals, or modems located up to 15.2 m (50 ft) from the system unit.



AJZIF159

With the IBM RT PC 4-Port Asynchronous RS422A Adapter and the correct cables, you can connect a system unit to ASCII terminals located up to 1212 meters (3963 feet) from the system unit.

Note: If you use cables longer than 122 meters (399 feet), you must provide surge protection. Also, do not install these cables outdoors.



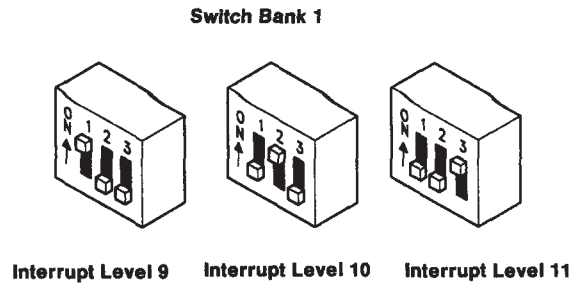
AJZIF160

Interrupt Level Switches

Use the following diagram to set the interrupt level on all the 4-port adapters. Nonbuffered 4-Port Asynchronous adapters should be grouped on one interrupt level, and Buffered 4-Port Asynchronous Adapters should be grouped on another, preferably higher, interrupt level.

Interrupt Level 10 is recommended when using the 4-Port Asynchronous Adapter together with the SCSI Adapter. If the 4-Port Asynchronous Adapter is set for Interrupt Level 11, certain

functions in the SCSI Adapter may be affected. See “Adapter Conflicts” on page 1-19.



AJZIF161

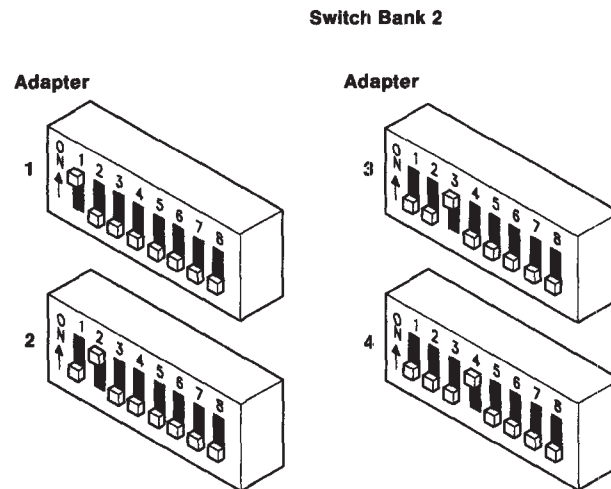
Note: When 4-port and 8-port adapters are used together, each type of adapter must be set to a different interrupt level.

Adapters installed in the RT PC should not be set to the same interrupt level as those installed in the IBM 6192 Expansion Unit.

Address Range Switches

The address switches are set for operation of one adapter in a system. If you install more than one adapter, you must set the address switches. Likewise, if you are adding adapters to a system that already has one or more asynchronous adapters installed, you must remove the installed adapters and set the address switches as shown below.

Use an opened paper clip or a ball-point pen to set the address switches.



AJZIF162

Installing: You can install either 4-port adapter in adapter slot 2, 4, 5, 7, or 8 in IBM 6150 and in slot 2, 3, 4, or 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

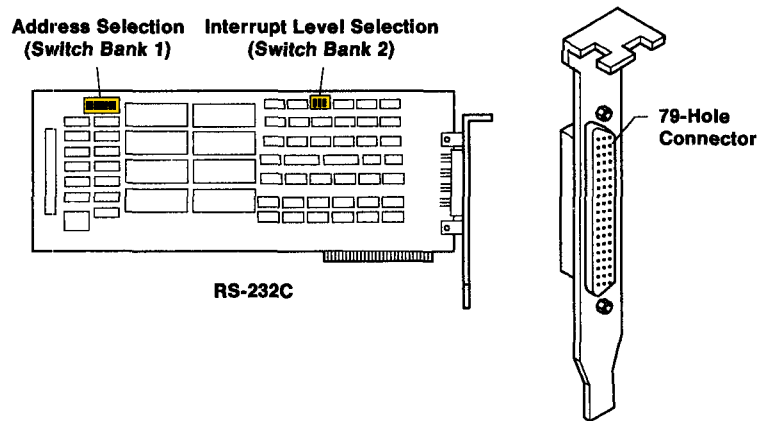
IBM RT PC 8-Port Asynchronous Adapters

You can install any combination of IBM RT PC 8-Port Asynchronous RS-232C Adapter, IBM RT PC 8-Port Asynchronous RS-422A Adapter, or IBM RT PC 8-Port Asynchronous MIL-STD 188 Adapters for a total of six in the IBM 6150 and four in the IBM 6151. Use of the IBM 5080 Peripheral Attachment Adapter limits the maximum number of 8-port asynchronous adapters to four in the IBM 6150 and two in the IBM 6151.

Note: Using 8-Port Asynchronous Adapters concurrently with 4-Port Adapters, PC AT Serial/Parallel Adapters, and/or 6150 Serial Ports may result in reduced performance (depending on line speed and usage) of devices attached to the 8-Port Adapters.

8-Port Asynchronous RS-232C Adapter

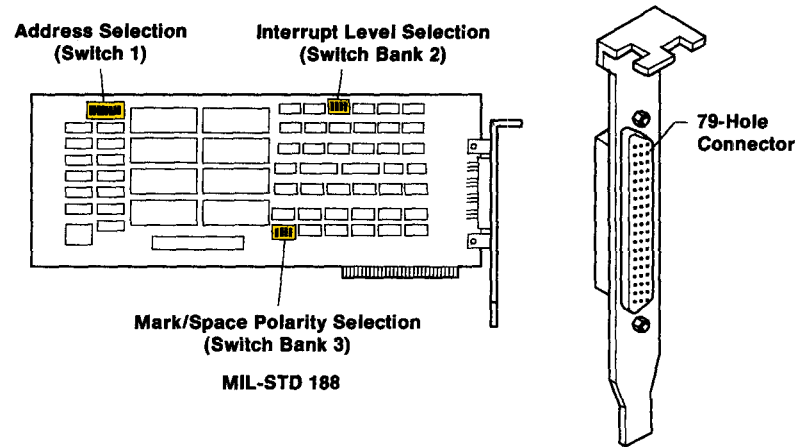
With the 8-Port Asynchronous RS-232C Adapter you can connect a system unit or 6192 Expansion Unit - Model 001 to printers, plotters, terminals, or modems located up to 15.2 m (50 ft) from the system unit.



AJZIF208

8-Port Asynchronous MIL-STD 188 Adapter

With the 8-Port Asynchronous MIL-STD 188 Adapter you can connect a system unit or 6192 Expansion Unit - Model 001 to printers, plotters, terminals, or modems located up to 15.2 m (50 ft) from the system unit.

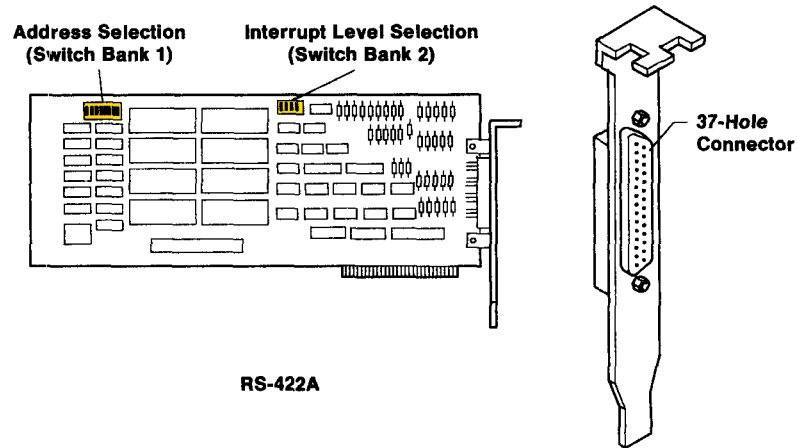


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8-Port Asynchronous RS-422A Adapter

With the 8-Port Asynchronous RS-422A Adapter you can connect a system unit or 6192 Expansion Unit - Model 001 to ASCII terminals located up to 1212 meters (3963 feet) from the system unit. The 8-Port Asynchronous RS-422A Adapter contains secondary surge protection.

Note: Do not install these cables outdoors.



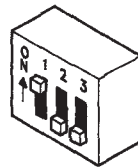
AJZIF210

Interrupt Level Switches

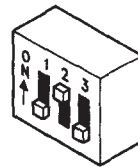
Use the following diagram to set the interrupt level on IBM 8-port adapters; use an opened paper clip or a ball-point pen to set the switches.

Note: Set all 8-port adapters to the same interrupt level to ensure optimum performance. When used together, 4-port and 8-port adapters must be set to different interrupt levels.

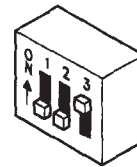
Adapters installed in the RT PC must be set to different interrupt levels from those installed in the IBM 6192 Expansion Unit.



Interrupt Level 9



Interrupt Level 3

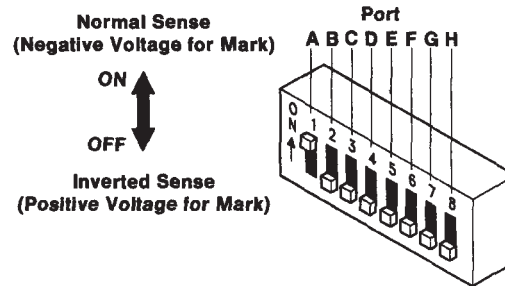


Interrupt Level 4

AJZIF203

Mark/Space Polarity Selection Switch (8-Port Asynchronous MIL-STD 188 Adapter only)

Use the following diagram to set mark/space polarity for Ports A through H on each 8-Port Asynchronous MIL-STD 188 Adapter; an opened paper clip or ball-point pen can be used to set the switches.

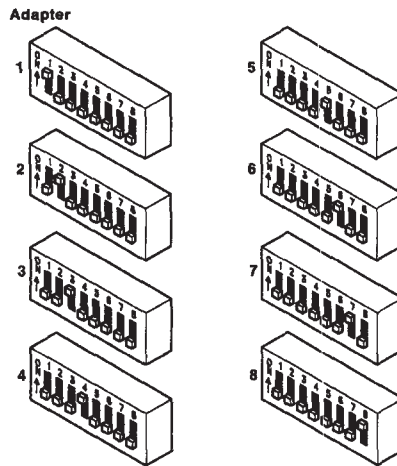


AJZIF204

Address Range Switches

The address switches allow up to eight 8-port adapters to be addressed. Adapter switches must be set so that no address gaps exist, and the switch settings must agree with the number of adapters used. That is, the first adapter installed must use the settings shown for Adapter 1, the second adapter the settings shown for Adapter 2, and so on through Adapter 8.

Use an opened paper clip or a ball-point pen to set the address switches as shown below.



AJZIF202

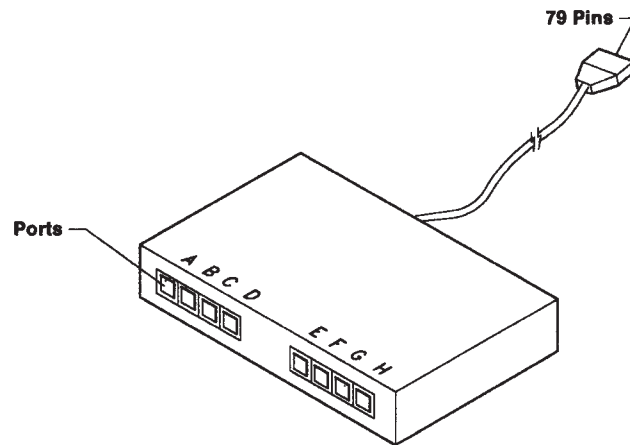
Installing: You can install IBM 8-port adapters in adapter slots 2, 3, 4, 5, 6, 7, or 8 in IBM 6150, in slots 1, 2, 3, 4, or 5 in IBM 6151 or in slots 1, 2, 3, 4, 5, or 6 in the IBM 6192. See the system unit diagram or IBM 6192 installation instructions for the adaptor slot locations.

IBM RT PC 8-Port Cable Assemblies

IBM RT PC 8-Port Cable Assemblies attach IBM RT PC 8-Port Asynchronous Adapters to devices such as printers, plotters, terminals, or modems.

8-Port Cable Assembly - RS-232C/MIL-STD 188

The IBM RT PC 8-Port Cable Assembly - RS-232C/MIL-STD 188 provides eight 10-pin MODU connectors.

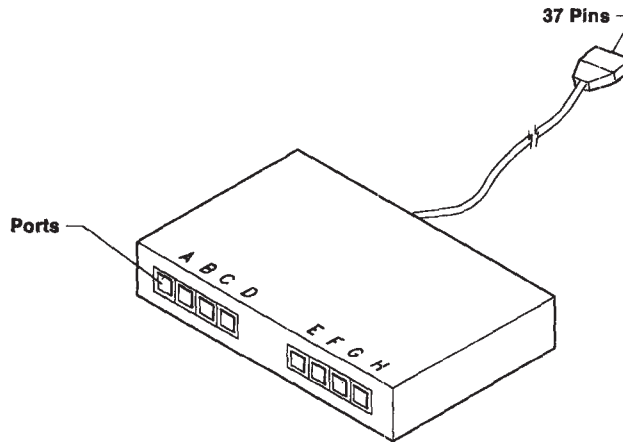


AJZIF201

Installing: Plug the 79-pin connector into the desired 8-port RS-232C adapter or 8-port MIL-STD 188 adapter; then connect up to eight devices using the 10-pin MODU connectors on the covered panel of the cable assembly.

8-Port Cable Assembly - RS-422A

The IBM RT PC 8-Port Cable Assembly - RS-422A provides eight 6-pin MODU connectors.



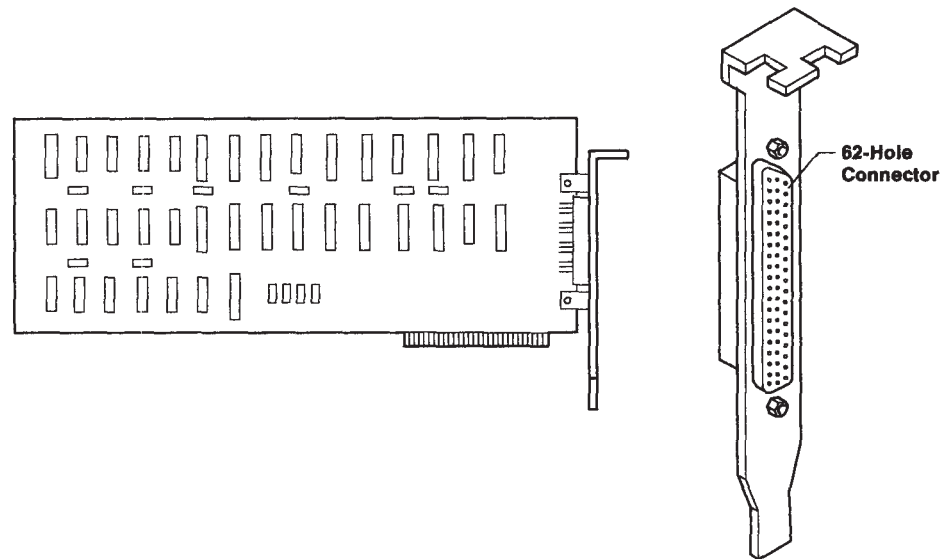
AJZIF200

Installing: Plug the 37-pin connector into the desired 8-port RS-422A adapter; then connect up to eight devices using the 6-pin MODU connectors on the covered panel of the cable assembly.

IBM RT PC Expansion Unit Adapter

The IBM RT PC Expansion Unit Adapter enables connection of the 6192 Expansion Unit - Model 001 to the IBM RT PC.

Note: Interrupt levels are passed on to the system unit from adapters installed in the 6192 Expansion Unit. Interrupt levels are *not* shareable between adapters in the system unit and adapters in the expansion unit.



AJZIF205

Installing: One Expansion Unit Adapter can be installed for each IBM RT PC; use slots 2 through 8 in the IBM 6150 and slots 1 through 5 in the IBM 6151. See the system unit diagram in Appendix A for the adapter slot locations.

For more information, refer to *IBM RT PC 6192 Expansion Unit Setup and Options Installation*.

Section 7. Display Adapter Options

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Switch Settings	7-7
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IBM RT PC Extended Monochrome Graphics Display Adapter	7-16
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About This Section

The following pages show how to install the adapters to which you connect the display devices. You can install two display adapters in the system unit, but the adapters must be different types.

Installing Display Adapter Options

CAUTION

Before doing any procedure, turn off power on the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

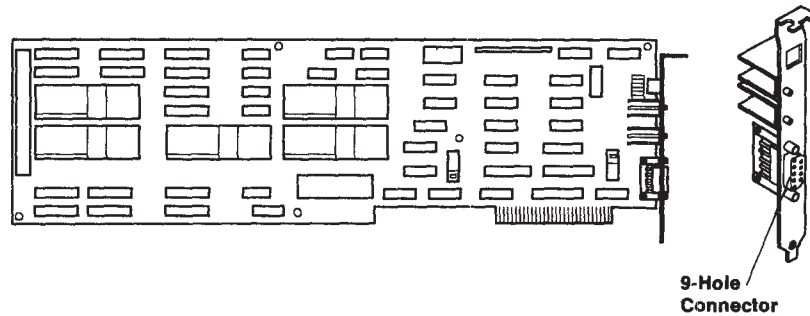
If you have not removed the covers, see “Removing the Covers From the System Units” on page 1-4.

Refer to “General Instructions” on page 3-4 when necessary for information on installing adapters.

After all adapters have been installed, it is important to complete the checkout procedure in Section 9, “Checking Out the Option Installation.”

IBM PC Enhanced Graphics Adapter

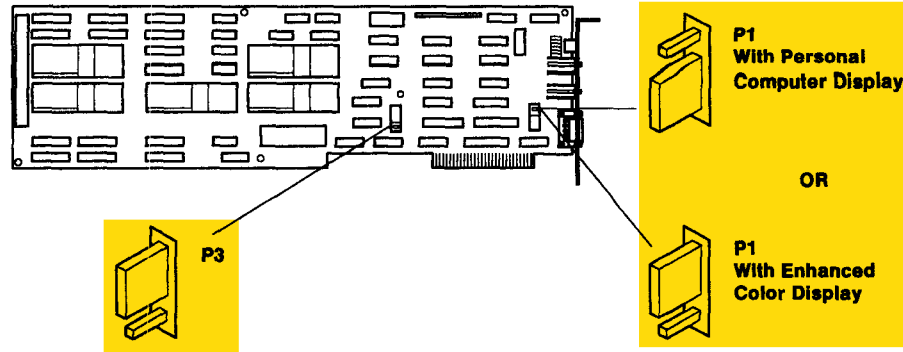
You can install one IBM PC Enhanced Graphics Adapter in the system unit. This adapter connects either the IBM Personal Computer Enhanced Color Display or the IBM Personal Computer Display to the system unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF163

Jumper Settings

Use the following illustration to set the jumpers.



AJZIF164

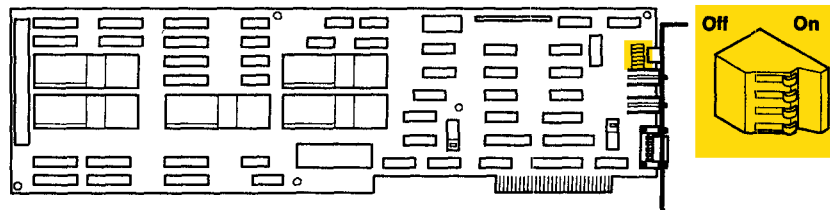
Use the charts on the following pages to correctly set the switches for the display attached to the Enhanced Graphics Adapter.

Switch Settings

Use this table when **one** of the following conditions is present:

- The AT Coprocessor Adapter **is not** installed.
- The display attached to the Enhanced Graphics Adapter **is not** assigned to the AT Coprocessor Adapter.
- The display attached to the Enhanced Graphics Adapter **is** assigned to the AT Coprocessor Adapter in **shared mode**.

Type of Display Attached to the Enhanced Graphics Adapter	Sw1	Sw2	Sw3	Sw4
IBM Personal Computer Enhanced Color Display	Off	On	On	Off
IBM Personal Computer Display	Off	Off	On	Off



AJZIF165

Use this table to set the switches if any of the following conditions are present:

- The IBM Personal Computer Display (5151) is attached to the Enhanced Graphics Adapter.
- The IBM Personal Computer Display (5151) is assigned to the AT Coprocessor Adapter in *dedicated* mode.
- Another display is also installed and assigned to the AT Coprocessor Adapter in dedicated mode.

IBM 5151 Display Assignment	Second Display Mode of Operation	Sw1	Sw2	Sw3	Sw4
Primary	80 X 25 Color	Off	Off	On	Off
Primary	40 X 25 Color	On	Off	On	Off
Secondary	80 X 25 Color	Off	On	Off	On
Secondary	40 X 25 Color	On	On	Off	On

Use this table to set the mode switches when any of the following conditions are present:

- The IBM Personal Computer Enhanced Color Display (5154) is attached to the Enhanced Graphics Adapter.
- The IBM Personal Computer Enhanced Color Display (5154) is assigned to the AT Coprocessor Adapter in *dedicated* mode.
- Another display is also installed and assigned to the AT Coprocessor Adapter as a second display.

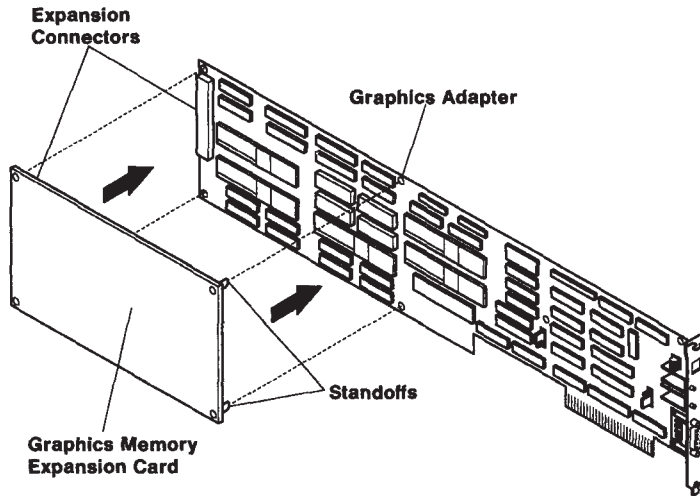
IBM 5154 Display Assignment	IBM 5154 Display Operating Mode or Emulation Mode	Sw1	Sw2	Sw3	Sw4
Primary	80 X 25 High Resolution	Off	On	On	Off
Primary	80 X 25 Enhanced Color	On	On	On	Off
Secondary	80 X 25 High Resolution	Off	Off	On	On
Secondary	80 X 25 Enhanced Color	On	Off	On	On

If you need to install the expansion card, go to “IBM PC Graphics Memory Expansion Card” on page 7-10. If you need to install the expansion kit, go to “IBM PC Graphics Memory Expansion Kit” on page 7-12. To install the adapter, go to page 7-13.

IBM PC Graphics Memory Expansion Card

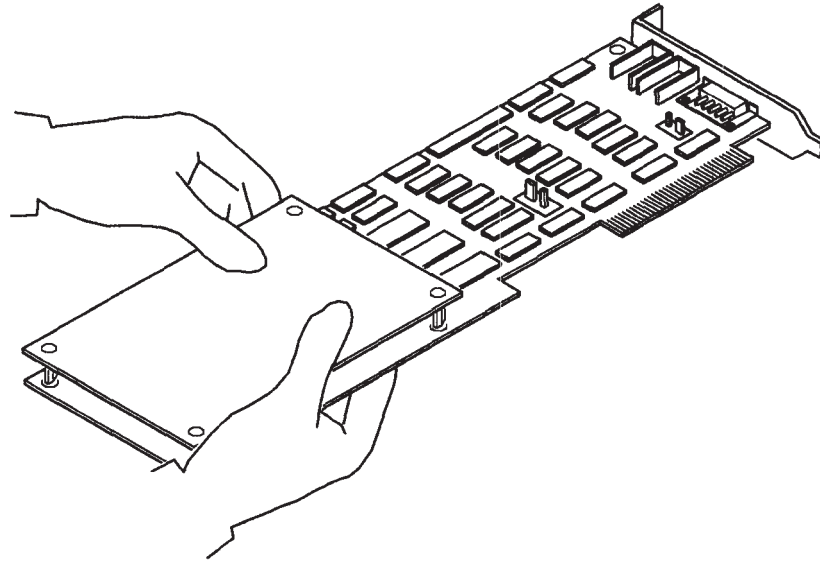
Do the following two steps to install the IBM PC Graphics Memory Expansion Card, which gives the color adapter a total of 128K bytes of memory. If you need to install modules on the expansion card, go to “IBM PC Graphics Memory Expansion Kit” on page 7-12, install the modules, and then return to this page.

1. Align the expansion card with the adapter.



AJZIF186

2. Press the card and adapter together.



AJZIF167

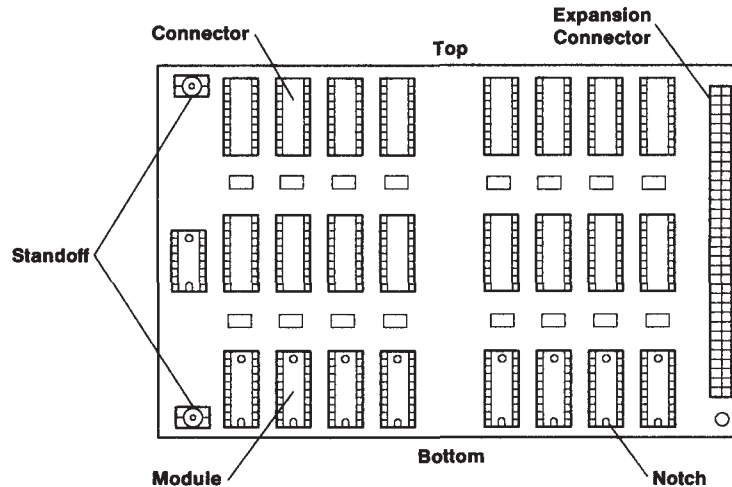
IBM PC Graphics Memory Expansion Kit

Do the following three steps to install the IBM PC Graphics Memory Expansion Kit. You can install this option on the IBM PC Graphics Memory Expansion Card to give the adapter a total of 256K bytes of memory.

Warning: You will damage the module or card if you install the modules incorrectly. Do not bend the pins!

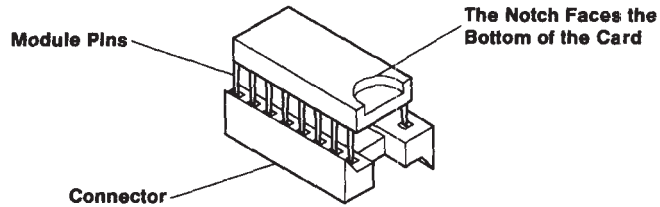
Do the following:

1. Put the expansion card on a flat surface with the components facing up, as shown in the following drawing:



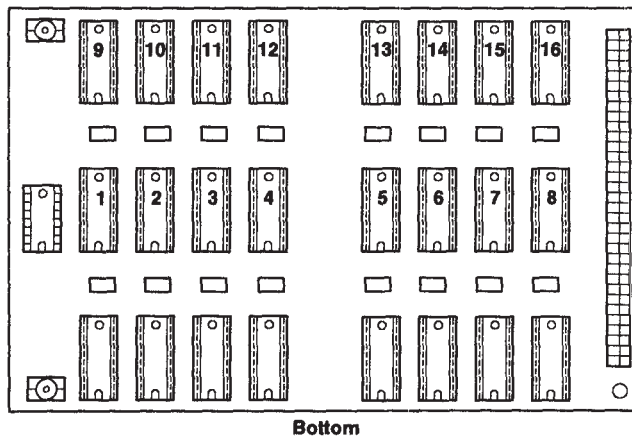
AJZIF168

-
2. Install each module with the notch facing the bottom edge of the card, as shown in the following drawing:



AJZIF169

3. Align the pins of each module with the connector on the card and press each of the 16 modules in place.



AJZIF170

Go to “IBM PC Graphics Memory Expansion Card” on page 7-10 to install the expansion card.

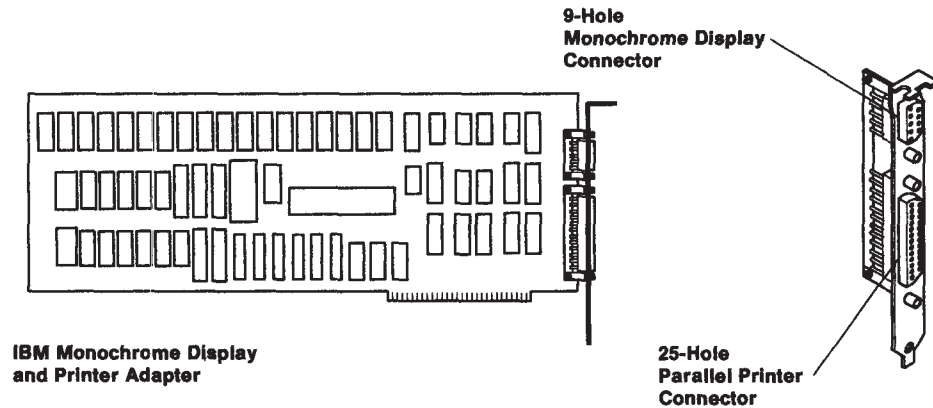
Warning: You must install this adapter in adapter slot 3 or 6 in IBM 6150 and in slot 1 in IBM 6151.

Installing: See the system unit diagram for the correct adapter slot.

IBM Monochrome Display and Printer Adapter

You can install one IBM Monochrome Display and Printer Adapter in a system unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

Do not install any monochrome adapter with the number 1804065, 1804073, or 1501667 printed on it. This system does not support these three adapters.



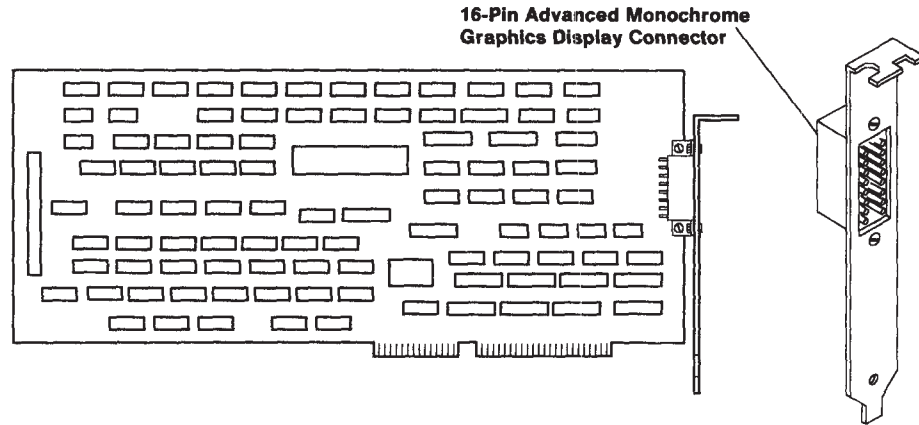
AJZIF171

Warning: You must install this adapter in adapter slot 3 in IBM 6150 and in slot 1 in IBM 6151.

Installing: See the system unit diagram for the correct adapter slot.

IBM RT PC Advanced Monochrome Graphics Display Adapter

You can install one IBM RT PC Advanced Monochrome Graphics Display Adapter in a system unit.

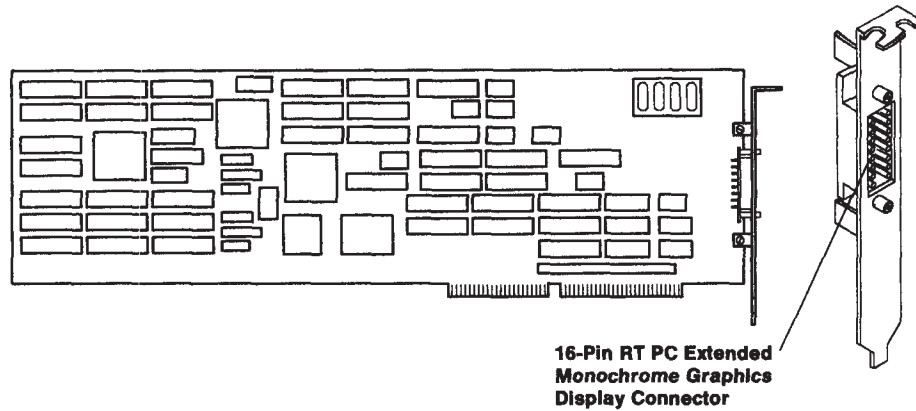


AJZIF172

Installing: You can install this adapter in adapter slot 2, 4, 5, 7, or 8 in IBM 6150 and in slot 2, 3, 4, or 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

IBM RT PC Extended Monochrome Graphics Display Adapter

You can install one IBM Advanced Color Graphics Display Adapter in a system unit.

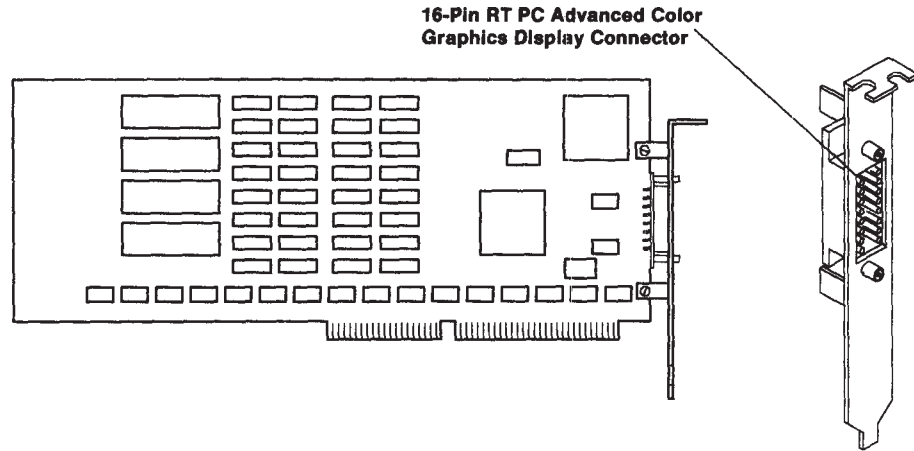


AJZIF173

Installing: You can install this adapter in adapter slot 2, 4, 5, or 7 in IBM 6150 and in slot 2, 3, or 4, in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

IBM RT PC Advanced Color Graphics Display Adapter

You can install one RT PC Advanced Color Graphics Display Adapter in a system unit.



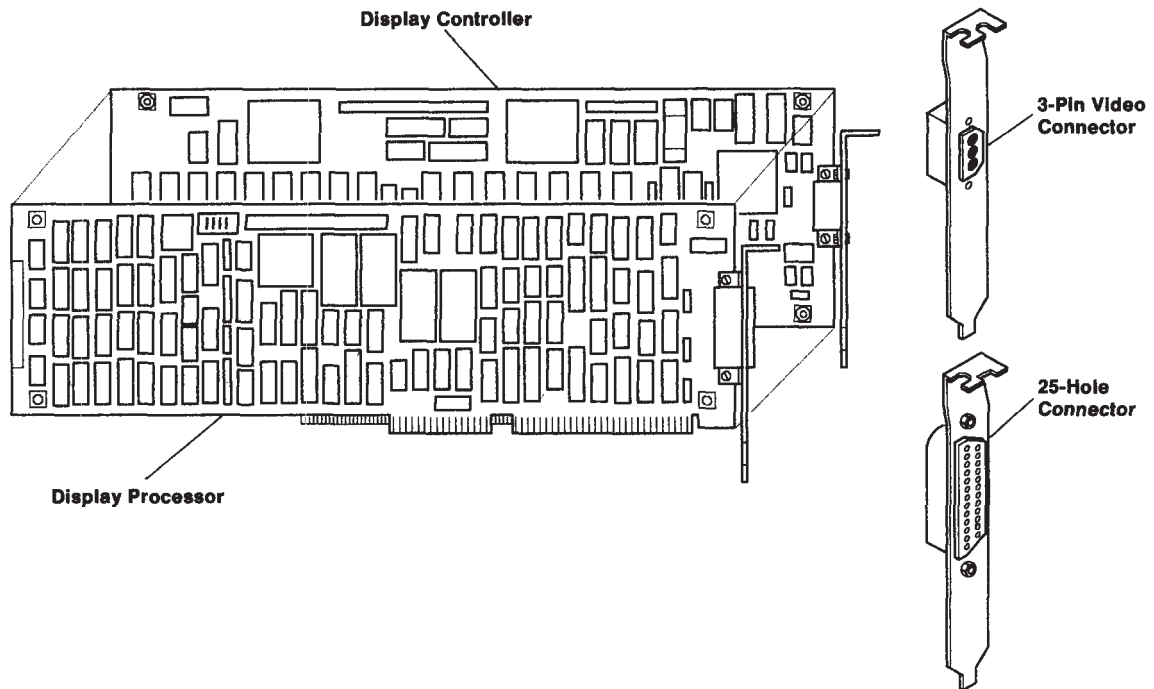
AJZIF174

Installing: You can install this adapter in adapter slot 2, 4, 5, 7, or 8 in IBM 6150 and in slot 2, 3, 4, or 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

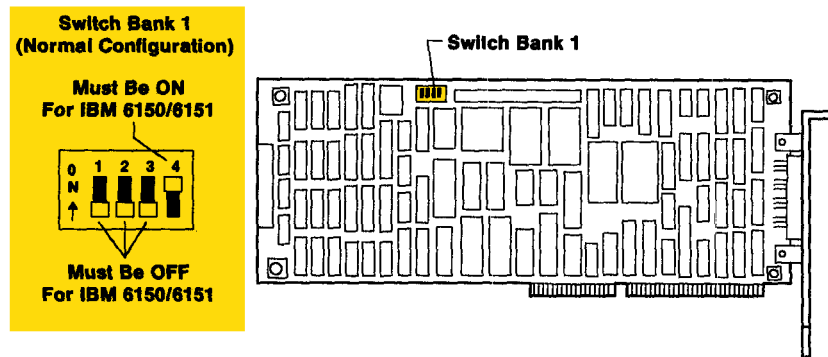
IBM Megapel Display Adapter

You can install one IBM Megapel Display Adapter in an IBM 6150 or 6151 system unit. The Megapel Adapter consists of the Display Processor and the Display Controller, which are mechanically and electronically linked. The mechanical linking requires two adjacent long adapter slots. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

The next page shows how to configure the Display Processor.



AJZIF175



AJZIF206

The illustration above shows the normal Switch Bank 1 configuration. Use the following table to set Switch Bank 1 if your configuration requirements differ.

Note: If you are using the IBM Monochrome Display and Printer Adapter in conjunction with the Megapel adapter, the printer port on the Megapel adapter must be disabled or a conflict will exist on Interrupt Level 7. Refer to “Adapter Conflicts” on page 1-19 and to the Interrupt and Usage Table on page 1-21 and 1-22.

If you have a Color Graphics Adapter (CGA) or an adapter that emulates CGA (EGA, for instance) Switch 3 of Switch Bank 1 must be set to OFF.

Switch	Function	Off	On
1	Reserved; must be Off		
2	Printer Port	Disable	Enable
3	Color Graphics Emulation	Disable	Enable
4	Reserved; must be On		

Installing: The Megapel Adapter requires two adjacent, long adapter slots. Slots 4 and 5 in the IBM 6150 and slots 2 and 3, 3 and 4, or 4 and 5 in the IBM 6151 can be used.

See the system unit diagram to locate the adapter slots.



Section 8. Additional Options

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IBM RT PC 5080 Attachment Adapter	8-6
IBM RT PC 5080 Peripheral Attachment Adapter	8-7
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IBM S/370 Host Interface Adapter	8-9
IBM RT PC Small Computer System Interface (SCSI) Adapter	8-10
Setting the Address Jumper (J1)	8-11
Interrupt Level	8-12

About This Section

This section contains other adapters that can be installed in the IBM RT PC System Units. Slot positions and jumper settings are provided where necessary.

Installing Additional Options

CAUTION

Before doing any procedure, turn off power on the system unit and all connected devices, and unplug system unit and device power cables from electrical outlets. Refer to “Safety Notice Translations” on page iii.

If you have not removed the covers, see “Removing the Covers From the System Units” on page 1-4.

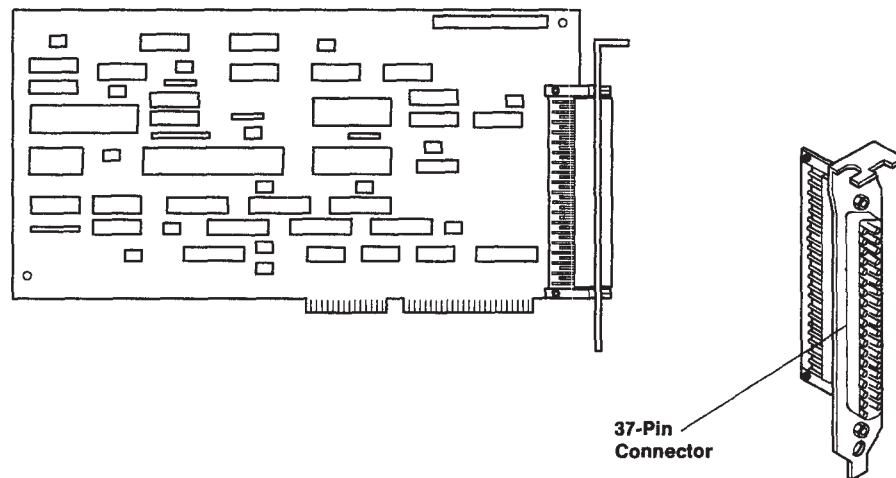
Refer to “General Instructions” on page 3-4 when necessary for information on installing adapters.

After all options have been installed, it is important to complete the checkout procedure in Section 9, “Checking Out the Option Installation.”

IBM RT PC Streaming Tape Drive Adapter

You can install one RT PC Streaming Tape Drive Adapter in a system unit.

Warning: To comply with FCC regulations on Electromagnetic Interference for Class B computing equipment, the drive cable must be shielded and properly grounded. Use of substitute cabling not properly shielded and grounded may result in a violation of the FCC regulation.



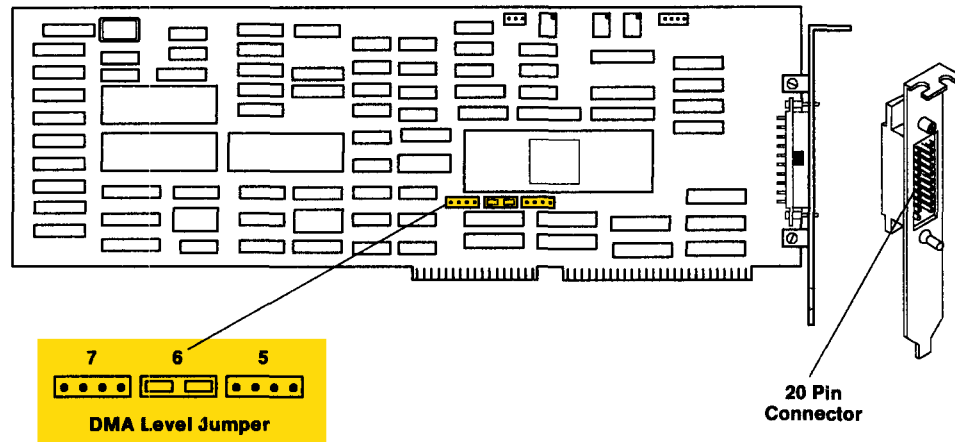
AJZ1F177

Installing: You can install this adapter in slot 2, 4, 5, 7, or 8 in IBM 6150 and in slots 2 through 5 in IBM 6151, whichever is available. See the system unit diagram for the correct adapter slot.

IBM RT PC 5080 Attachment Adapter

You can install one RT PC 5080 Attachment Adapter in an IBM 6150. You cannot install this adapter in an IBM 6151 System Unit.

Note: Ensure that the DMA Level Jumper is set for level 6 as shown. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.



AJZIF178

Installing: You can install this adapter in slots 2, 4, 5, 7, or 8 in an IBM 6150. See the system unit diagram to locate the adapter slots.

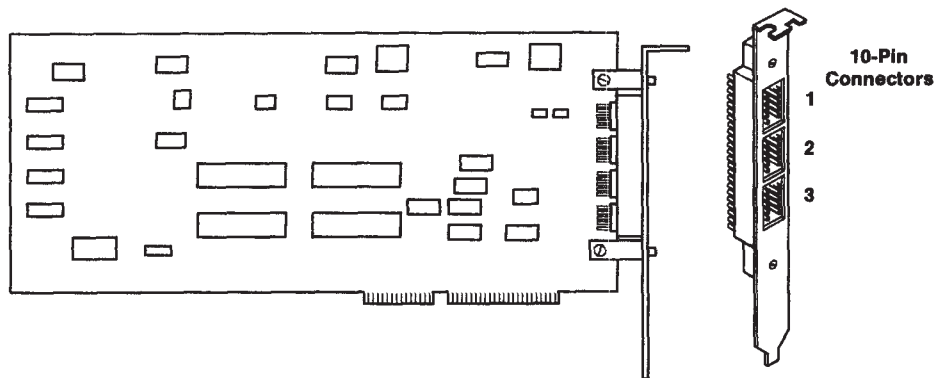
IBM RT PC 5080 Peripheral Attachment Adapter

You can install one RT PC 5080 Peripheral Attachment Adapter in each system unit.

Any combination of the two types of asynchronous 4-port adapters can be installed together with the RT PC 5080 Peripheral Attachment adapter for a total of four adapters in the IBM 6150 and three in IBM 6151 system units.

Use of the IBM 5080 Peripheral Attachment Adapter limits the maximum number of 8-port asynchronous adapters to four in the IBM 6150 and two in the IBM 6151.

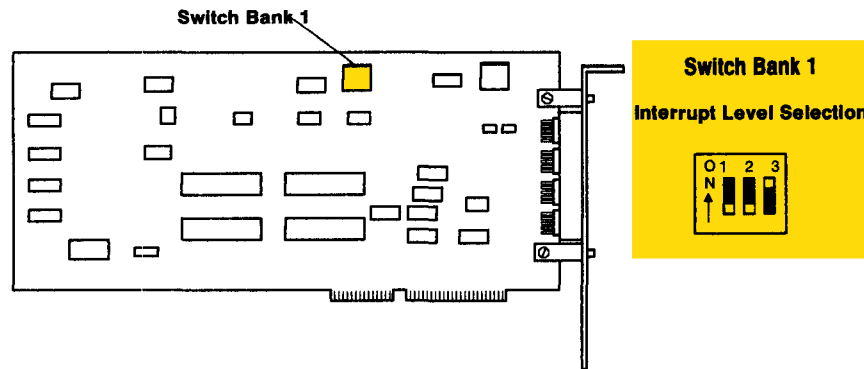
Use the instructions on the following pages to set the switches.



AJZIF179

Interrupt Level

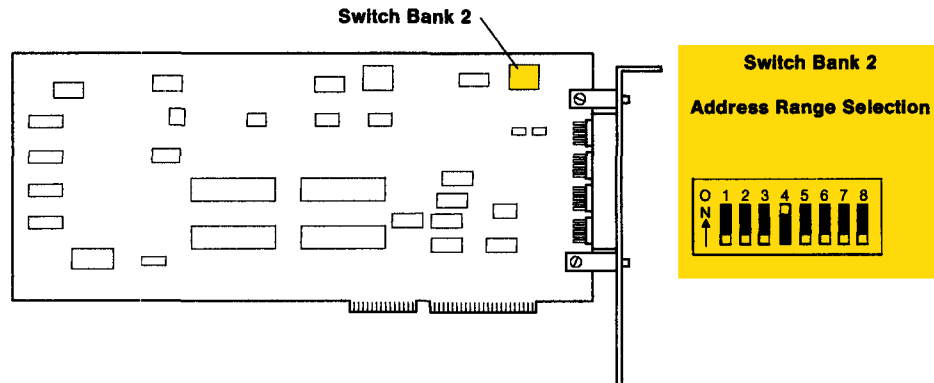
Set the interrupt level switches as shown:



AJZIF180

Address Range

Set the address range switches as shown:



AJZIF078

Installing: You can install this adapter in slots 2, 4, 5, 7, or 8 in the IBM 6150 and in slots 2 through 5 in the IBM 6151. See the system unit diagram to locate the adapter slots.

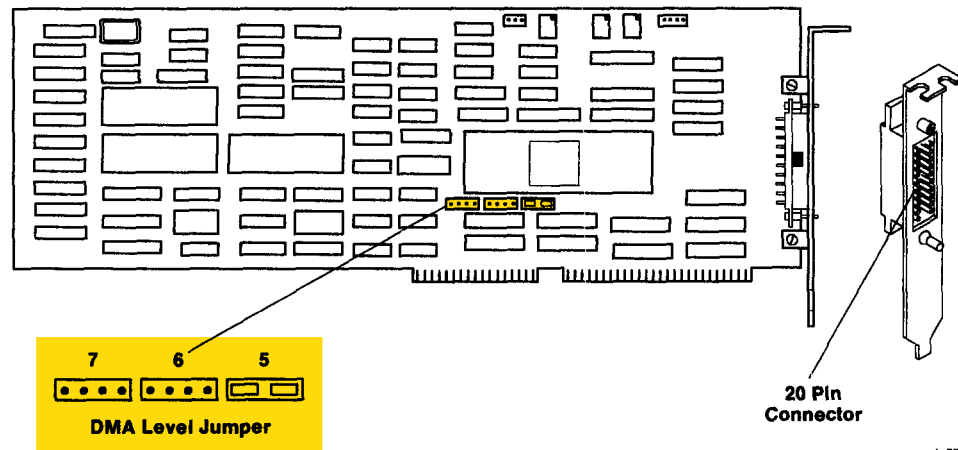
IBM S/370 Host Interface Adapter

You can install one IBM S/370 Host Interface Adapter in an IBM 6150 or IBM 6151.

See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

Set the DMA Level Jumpers for level 5 as shown.

Warning: If the IBM RT PC 5080 Attachment Adapter and IBM S/370 Host Interface Adapter are used together, ensure that their DMA channel settings do not conflict with other cards in the IBM 6150. Operating the IBM RT PC 5080 Attachment Adapter and S/370 Host Interface Adapter at the same DMA level via software enabling is not recommended.

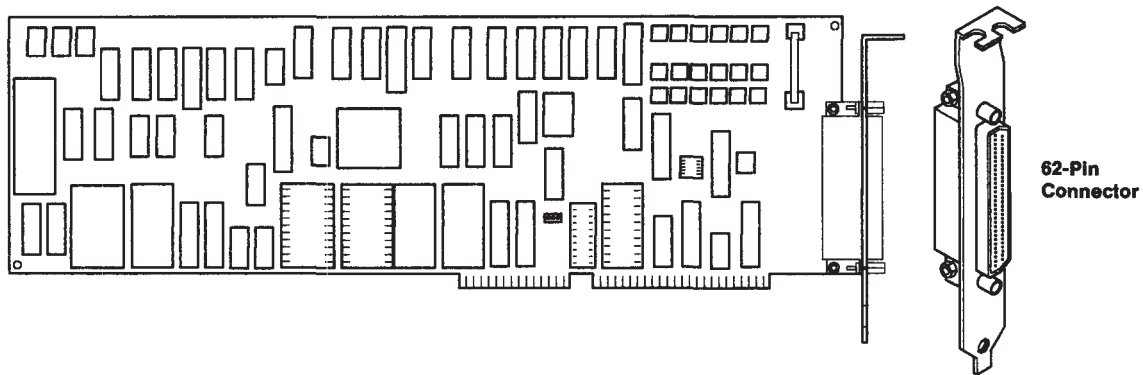


Installing: You can install this adapter in slots 2, 4, 5, 7, or 8 in an IBM 6150 and in slots 2, 3, 4, or 5 in an IBM 6151. See the system unit diagram to locate the adapter slots.

IBM RT PC Small Computer System Interface (SCSI) Adapter

References to the IBM RT PC Small Computer System Interface Adapter are abbreviated as RT PC SCSI Adapter in this publication.

You can install up to two IBM RT PC SCSI Adapters in an IBM RT PC System Unit. See “Federal Communications Commission (FCC) Statement” on the inside of the title page.

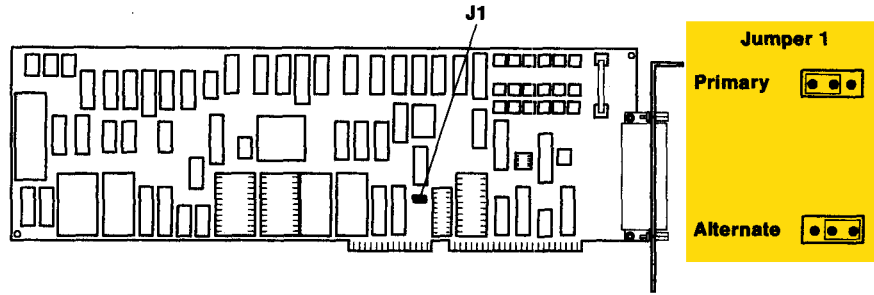


AJZIF182

Installing: You can install this adapter in slots 2, 4, 5, 7, and (except when DMA Channel 7 has been software selected) 8 in the IBM 6150; the adapter can be used in slots 2, 3, 4, and (except when DMA Channel 7 has been software selected) 5 in the IBM 6151. See the system unit diagram in Appendix A to locate the adapter slots.

Note: Use the instructions on the following page to set the jumper on the IBM RT PC SCSI Adapter.

Setting the Address Jumper (J1)



AJZIF183

The following table shows the address ranges provided by jumper J1. If two IBM RT PC SCSI Adapters are used, one must be configured in the Primary J1 position and the other in the Alternate J1 position. A single adapter can be configured for either address range.

Note: Ensure that address ranges do not conflict with other adapter options. Refer to “Conflicting Memory Addresses” on page 1-19 for more information.

J1 Position	Address Range
Primary	0D50 - 0D5F
Alternate	0950 - 095F

Interrupt Level

The adapter uses shared interrupt levels 11 or 12 which are selected by applicable software.

Note: If you are using the SCSI Adapter together with the 4-Port Asynchronous Adapter, ensure that both are not using Interrupt Level 11. If both of these adapters are using Interrupt Level 11, certain ASCII functions in the SCSI may be blocked. Interrupt Level 10 is recommended for the 4-Port Asynchronous Adapter.

Section 9. Checking Out the Option Installation

CONTENTS

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Before You Start	9-3
Checklist	9-6

About This Section

This section provides a detailed procedure to check out option installation. The checkout is an important step toward successful system operation.

Before You Start

Unless you are directed otherwise, if the system has operational problems, go to the *IBM RT PC Problem Determination Guide* and to the *IBM RT PC Hardware Maintenance and Service*, and do a problem determination.

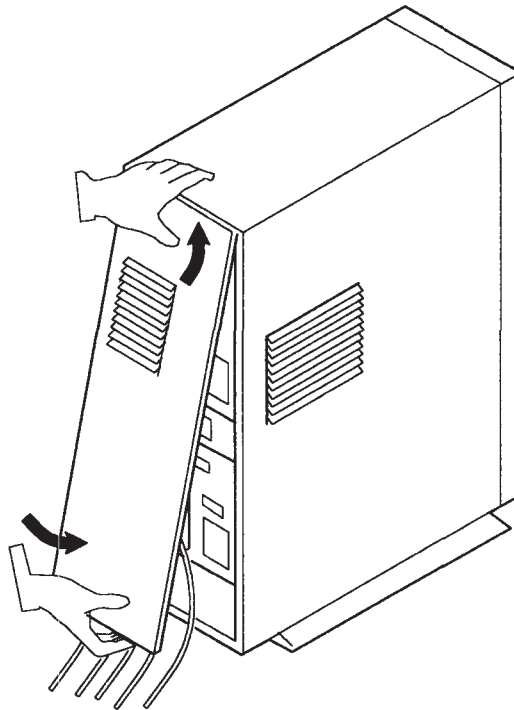
1. Ensure that power switches are off on the system unit and *all* devices and that all power cables have been unplugged from wall or other electrical outlets.
2. Connect the system unit power cable to the power connector on the rear of the system unit. Connect the power cable for each device to the power connector on the device.

CONTINUE TO THE NEXT PAGE

3. Install the rear cover.

- On the IBM 6150 system unit, arrange the cables so that you can fit the rear cover in place.

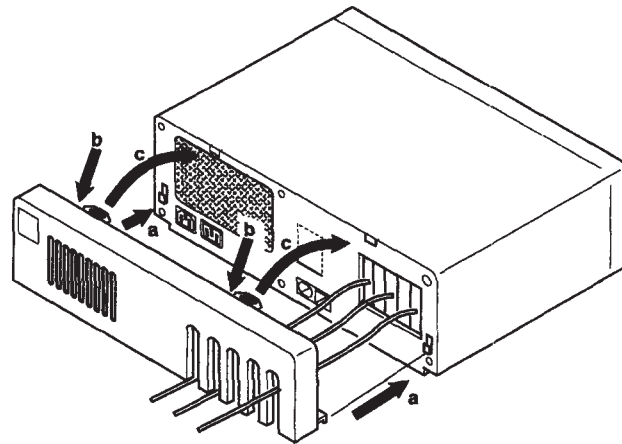
Warning: Do not operate the IBM 6150 system unit for an extended period of time without the rear cover in place. It is recommended that 75 mm (3 inches) minimum clearance be provided between the IBM 6150 system unit cover louvers and adjacent walls or furniture to ensure adequate cooling.



AS07A056

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- On the IBM 6151 system unit, do not remove the cables. Slide the cables into the slots in the cover.
 - a. Insert the lower hooks into the holes in the frame.
 - b. Push down on the back cover.
 - c. Insert the clips on the system unit into the loops on the cover.

Warning: It is recommended that 75 mm (3 inches) minimum clearance be provided between the IBM 6151 system unit cover louvers and adjacent walls or obstructions to ensure adequate cooling.



AS07A057

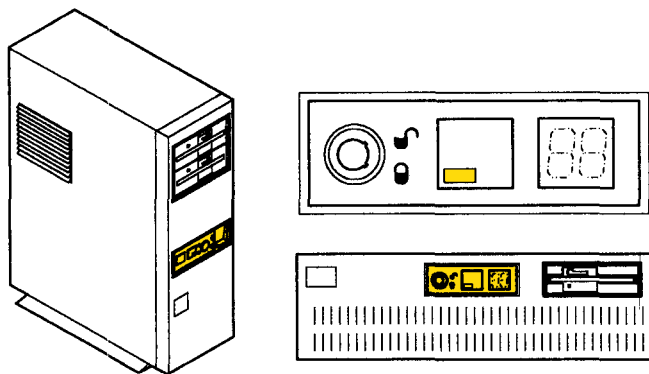
CAUTION

Devices have electrical cables and plugs designed for safety. Plug all devices only into grounded electrical outlets to avoid possible electrical shock. Refer to “Safety Notice Translations” on page iii.

4. Connect all the power cables to grounded electrical outlets.
5. Begin the checklist on the next page.

Checklist

1. Unlock the system unit by turning the key counterclockwise.
2. Get Diagnostic Diskette 1 (DIAG-1) from the pocket in the back cover of *IBM RT PC Problem Determination Guide*; if the notch on the diskette is covered by a tab, remove the tab.
3. Open the diskette drive (the top drive in IBM 6150), and remove any diskette.
4. Turn on the power switches of all devices attached to the system unit.
5. Turn on the system unit power switches, and immediately insert (use the top drive in IBM 6150) the Diagnostic Diskette 1 (DIAG-1) label side up. Close the drive.
6. Is the green power-on light on?



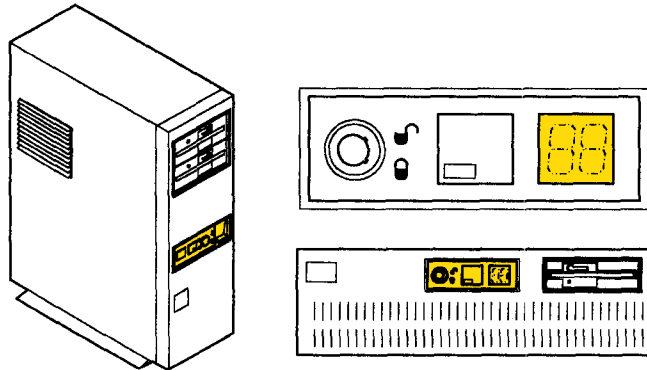
AS07A058

Yes. Go to the next step.

No. Go to Step 32.

CONTINUE TO THE NEXT PAGE

-
7. After the light comes on, wait up to four minutes while numbers flash on and off on the two-digit display.
 8. Is the red two-digit display blank (no numbers on it)?



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Yes. Go to the next step.

No. Go to Step 37.

9. Adjust the brightness and contrast controls on the display, if the display has these controls. If you need help operating the display, see *IBM RT PC Guide to Operations*.

Note: If your system is connected to an IBM 5085 Graphics Processor, the keyboard belongs to the 5081 Display at power on. If you have not switched the keyboard to your display using the **Alt** and **Sw Keybd** keys, see the *5080/RT PC Graphics System Operation*.

CONTINUE TO THE NEXT PAGE

10. Do you see the following information on the display screen?

DIAGNOSTIC OPERATING INSTRUCTIONS

DIAG-1

This diskette contains diagnostics and utilities for your system. You should use these procedures whenever you are having problems with your system which have not been corrected by any software application procedures available.

In general, the procedures will run automatically. However, sometimes you will be required to select options, tell the system when to continue, and do simple tasks and exchange diskettes.

Yes. Go to the next step.

No. Go to Step 37.

11. Read the DIAGNOSTIC OPERATING INSTRUCTIONS.

Some of the key functions are listed below, in case you need them.

- **Enter** continues the procedure or performs an action.
- **End** stops a test or an action.
- **F10** returns to the previous menu and cancels any changes.
- **Escape** resets the procedures and returns to the Diagnostic Operating Instructions.
- **Page Down** lets you see information below that shown on the screen.
- **Page Up** lets you see information above that shown on the screen.
- **Backspace** lets you correct errors.

CONTINUE TO THE NEXT PAGE

12. Press **Enter**.

13. Does the FUNCTION SELECTION menu appear on the screen?

FUNCTION SELECTION

ID ITEM

1 Diagnostic Routines

This selection allows you to test your machine's hardware and determine if you have a hardware problem. Any problem will be indicated by a SRN (Service Request Number). The SRN will allow your service representative to quickly determine what parts are required to repair

Yes. Go to the next step.

No. Go to Step 37.

14. Have any optional adapters been installed?

Yes. Go to the next step.

No. Go to Step 20.

15. Type 2 to select UTILITIES. Use the 2 on the typewriter key area, not the numeric keypad. Press **Enter**. The UTILITY SELECTION menu should appear on the screen.

16. Type 1 to select the SHOW INSTALLED OPTIONS utility. Press **Enter**; processing may take several minutes.

CONTINUE TO THE NEXT PAGE

-
17. Examine the information shown in the INSTALLED OPTIONS LIST. Verify that all adapter and device locations are as shown in the system cabling record (Appendix A) and that addresses, interrupt levels, DMA channels, bus memory addresses and levels are correct.

Is the information in the INSTALLED OPTIONS LIST correct?

Yes. Go to the next step.

No. Go to Step 37.

18. Press Escape; OPERATING INSTRUCTIONS should be displayed.

19. Press Enter; FUNCTION SELECTION should be displayed.

CONTINUE TO THE NEXT PAGE

20. Type 1 to select DIAGNOSTIC ROUTINES, and then press **Enter**; processing may take several minutes

21. Does the following information appear on the screen?

TEST OPTION

Yes. Go to the next step.

No. Go to Step 24.

22. Have you changed, moved, or removed any options?

Yes. Go to the next step.

No. Go to Step 37.

23. Follow the instructions on the screen. If an option that has not been changed, moved, or removed appears on the screen, go to step 37; otherwise, wait for DIAGNOSTIC TEST LIST to be displayed, and then continue to the next step.

CONTINUE TO THE NEXT PAGE

24. The following screen will appear if a fixed-disk drive is not detected in the system unit.

DIAGNOSTIC TEST LIST

This menu displayed because a fixed-disk drive was not detected in the system unit.

Did the above message appear on the screen?

Note: Before answering yes, be sure that the menu is asking about the presence of fixed-disk drives.

Yes. Go to the next step.

No. Go to Step 26.

25. Is a fixed-disk drive installed in the system?

Yes. Go to Step 41.

No. Select OPTION 2, and press **Enter**. Go to the next step.

CONTINUE TO THE NEXT PAGE

26. Does the following information appear on the screen?

DIAGNOSTIC TEST LIST

The following options will be tested by the diagnostics routines.

Yes. Go to the next step.

No. Go to Step 41.

27. Check if all installed options are listed on the screen.

Is the list correct?

Yes. Go to the next step.

No. Go to Step 37.

28. Type 1 to indicate that the list of options is correct. Press **Enter**; processing may take several minutes.

29. When DIAGNOSTIC SELECTION appears on the screen, type 1 to select SYSTEM CHECKOUT, and press **Enter**.

30. When TEST METHOD SELECTION appears, type 1 to select RUN TEST ONE TIME, and then press **Enter**. Processing will take several minutes.

31. When processing finished, did TESTING COMPLETE appear on the screen?

Yes. Go to step 46.

No. Go to Step 37.

CONTINUE TO THE NEXT PAGE

-
32. Check that the system unit power cable is plugged into a wall socket and into the system unit. Also check that the wall socket has power.

Did you find a problem?

Yes. Go to the next step.

No. Go to Step 34.

33. Correct the problem, return to Step 2, and retry the Options Installation Checkout.
34. Obtain a Problem Summary Form from Appendix B of the *IBM RT PC Problem Determination Guide*.
35. Write the number 16-880 on Item 4 of the Problem Summary Form.
36. Have the system unit serviced; go to Step 46.
37. Turn the power off to the system unit and all connected devices.
38. Unplug the system unit and connected device power cords from wall or other electrical outlets.

CONTINUE TO THE NEXT PAGE

39. Check for the following:

- Loose adapters and cables in the system unit
- Incorrect switch and jumper settings on new options
- Interrupt level or DMA channel conflicts between options
- Power at wall or other electrical outlets.

Did you find a problem?

Yes. Go to the next step.

No. Go to Step 45.

40. Correct any problems you found. Plug in all power cables to wall or other electrical outlets, go to Step 2, and retry the Options Installation Checkout.

41. Turn the power off to the system unit and all connected devices.

42. Unplug the system unit and connected device power cords from wall or other electrical outlets.

43. Check for the following:

- Loose fixed-disk drive adapters and cables in the system unit
- Incorrect switch and jumper settings on fixed-disk adapters and drives
- Interrupt level or DMA channel conflicts between options.

Did you find a problem?

Yes. Go to the next step.

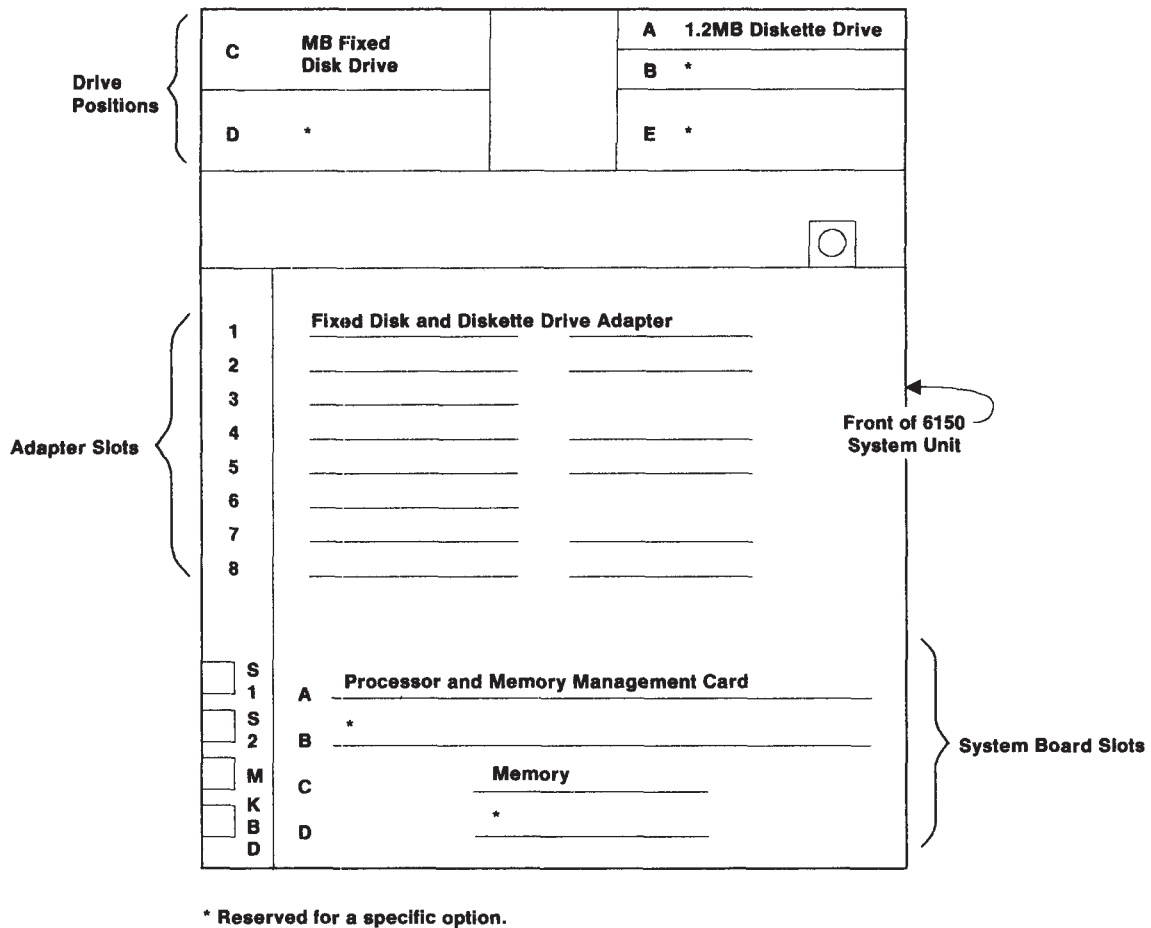
No. Go to Step 45.

CONTINUE TO THE NEXT PAGE

-
44. Correct the problem, plug in all power cables to wall or other electrical outlets, and retry the Options Installation Checkout starting with Step 2.
 45. Go to *IBM RT PC Problem Determination Guide* or to *IBM RT PC Hardware Maintenance and Service*, and perform the problem determination procedure.
 46. Return Diagnostic Diskette 1 to the *IBM RT PC Problem Determination Guide*; the options checkout is complete.

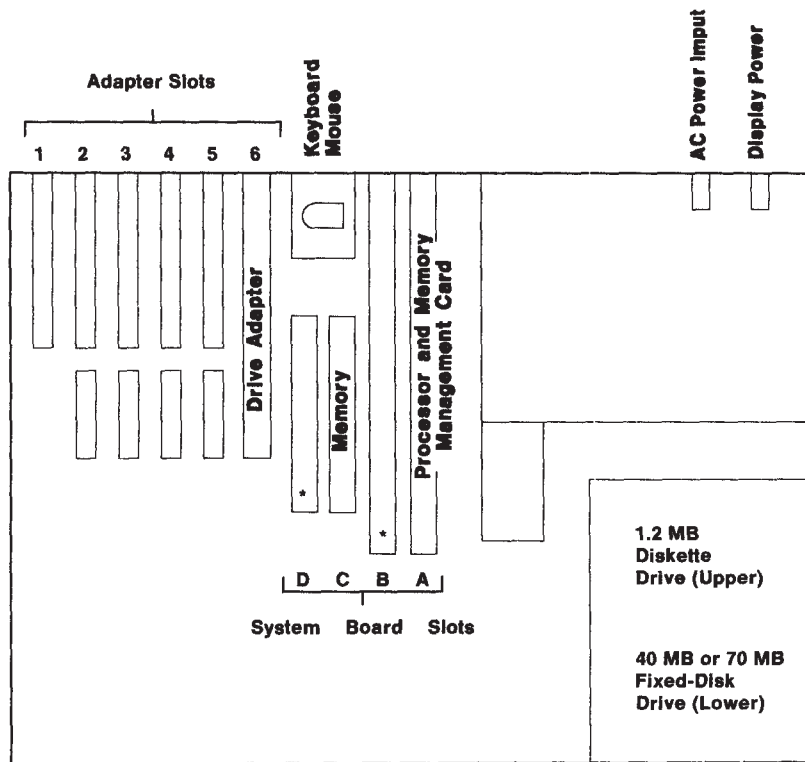
Appendix A. System Unit Diagram Worksheets

The following diagrams show the adapter slots and drive positions. Write the names of the adapters and drives in the locations where you install them.



AJZIF186

Figure A-1. IBM 6150 System Unit Diagram



Front of 6151 System Unit

* Reserved for a specific option.

AJZIF185

Figure A-2. IBM 6151 System Unit Diagram



Glossary

adapter. A printed circuit card that changes the operation of a computer.

address. (1) A name, label, or number identifying a location in storage, a device in a network, or any other data source. (2) A number that identifies the location of data in memory.

all points addressable (APA) display. A display that allows each pel (picture element) to be individually addressed. An APA display allows for images other than ASCII characters to be displayed.

American National Standard Code for Information Exchange (ASCII). The code developed by ANSI for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII character set consists of 7-bit control characters and symbolic characters.

APA. All points addressable.

ASCII. See *American National Standard Code for Information Exchange*.

asynchronous transmission. In data communications, a method of transmission in which the bits included in a character or block of characters occur during a specific time interval. However, the start

of each character or block of characters can occur at any time during this interval.

byte. The amount of storage required to represent one character; a byte is 8 bits.

color display. A display device capable of displaying more than two colors and the shades produced via the two colors, as opposed to a monochrome display.

component. The modules, diodes, capacitors, resistors, jumpers, and other electronics parts on a printed circuit card.

computer. A functional unit that can do mathematical computations and logical operations without human intervention during the actual processing.

connector. A part of the system unit or remote controller to which cables for display stations, printers, and other devices are attached. The word connector is used instead of jack and plug in this book.

decimal. Pertaining to a system of numbers to the base ten; decimal digits range from 0 through 9.

diagram. A drawing that explains how something works or is arranged, rather than showing its appearance.

disk. A flat, circular plate with magnetic surfaces on which information can be stored.

disk drive. See *fixed-disk drive*.

diskette. A thin, flexible magnetic plate that is permanently sealed in a protective cover. A diskette is used to store information copied from a fixed disk.

diskette drive. The mechanism used to read and write information on diskettes.

display screen. The part of the display device that displays information visually.

EIA. Electronic Industries Association.

fixed-disk drive. The mechanism used to read and write information on a fixed disk.

graphics. A type of data created from fundamental drawing units such as lines, geometric shapes, curves, and so on.

hardware. The equipment, as opposed to the programming or software, of a system.

I/O. See *input/output*.

input/output (I/O). Devices in a computing system that enter data into the system, receive data from the system, or both.

jack. A device to which a wire or wires of an electrical circuit can be attached. The jack is designed for insertion of a plug. See *connector*.

jumper. A special length of wire connecting two pins of an adapter or printed circuit card.

K byte (Kb). 1024 bytes.

keylock feature. A security feature in which a lock and key can be used to restrict use of a system or display station.

kg. kilogram; 1000 grams.

kilogram. The fundamental unit of mass in the International System; about 2.2046 pounds.

load. To place a diskette into a diskette drive.

m. See *meter*.

M. Mega; 1 000 000. In referring to computer memory, 1 048 576 bytes.

menu. A displayed list of items from which an operator can select tasks.

meter. A measurement of distance equal to 39.37 inches.

mm. Millimeter. A metric unit of measure equivalent to 0.0394 inches.

mouse. A small user-input device externally attached to the system unit.

modem. See *modulator-demodulator*.

modulator-demodulator (modem). A device that converts data from the computer to a signal that can be transmitted on a communications line, and

converts the signal received to data for the computer.

module. See *component*.

monochrome display. A display device that has only one color.

parallel transmission. In data communication, the simultaneous transmission of a certain number of signal elements (bits) constituting the same telegraph or data signal over a data circuit. Contrast with *serial transmission*.

plotter. A printing device externally attached with cables to the system unit, used to print two-dimensional graphs and charts.

plug. A device that connects the wires of an electrical circuit to an electrical source. The plug is designed to, be inserted into a jack. See *connector*.

port. (1) A part of the system unit or remote controller to which cables for external devices (display stations, terminals, printers) are attached. (2) An access point for data entry or exit.

printer. A device externally attached to the system unit, used to print system output on paper.

problem determination. The process of identifying why the system is not working. Often this process identifies programs, equipment, data communications facilities, or user errors as the source of the problem.

reinstall. To put back the part that was removed.

resistor. An electronic circuit element used to hinder the flow of electric current.

RS-232C. A standard set by the EIA for communication between computers and externally attached equipment.

RS-422A. A standard set by the EIA for communication between computers and externally attached equipment.

serial transmission. In data communication, sequential transmission at successive intervals of signal elements (bits) constituting the same telegraph or data signal over a data circuit. Contrast with *parallel transmission*.

setup. (1) The process or act of preparing and adjusting a machine or device for its assigned work. (2) The way in which the system unit and the external devices are arranged.

system. The computer and its associated devices and programs.

system configuration. A process specifying the machines, devices, and programs forming a particular data processing system.

system unit.. The part of the system that contains the processing unit, the fixed-disk drives and disk, and the diskette drives.

terminal. In data communications, a device, usually equipped with a keyboard

and a display, capable of sending and receiving information over communications lines. See *work station*.

work station. A device at which an individual transmits information to or

receives information from a computer while doing a task. An example of a work station is a display station, terminal, or printer.

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