IBM

Series/1

GA34-0050-8
File No. S1-16

IBM Series/1
Customer Site Preparation Manual

Contains ---- Installation Manual - Physical Planning

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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.

Ninth Edition (June 1986)

This is a major revision of, and obsoletes, GA34-0050-7. Due to the many changes and additions, this manual should be read in its entirety.

Use this publication only for the purpose stated in the preface.

Changes are periodically made to the information herein; any such changes will be reported in subsequent revisions or Technical Newsletters.

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Preface

This manual is a do-it-yourself guide to customer site preparation for the IBM Series/1. It is for use by customers and vendors whose job is planning for the physical installation of the Series/1. The major topics of this manual are site selection, site environment, site safety, electrical power and grounding, data communications, user-equipment wiring, and unit specifications. The user of this manual is not required to have any experience with computers.

Information in this manual was prepared with the assistance of IBM Installation Support Representatives who are experienced in helping IBM customers with site preparation.

Ordering information...

. This manual is available with a binder and a set of divider pages (with tabs) under order number GBOF-3975.

. The manual, binder, and tabs can be ordered separately under the following order numbers...

- Manual GA34-0050
- Tabs GX34-0050
- Binder G580-0082

. Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office in your locality.

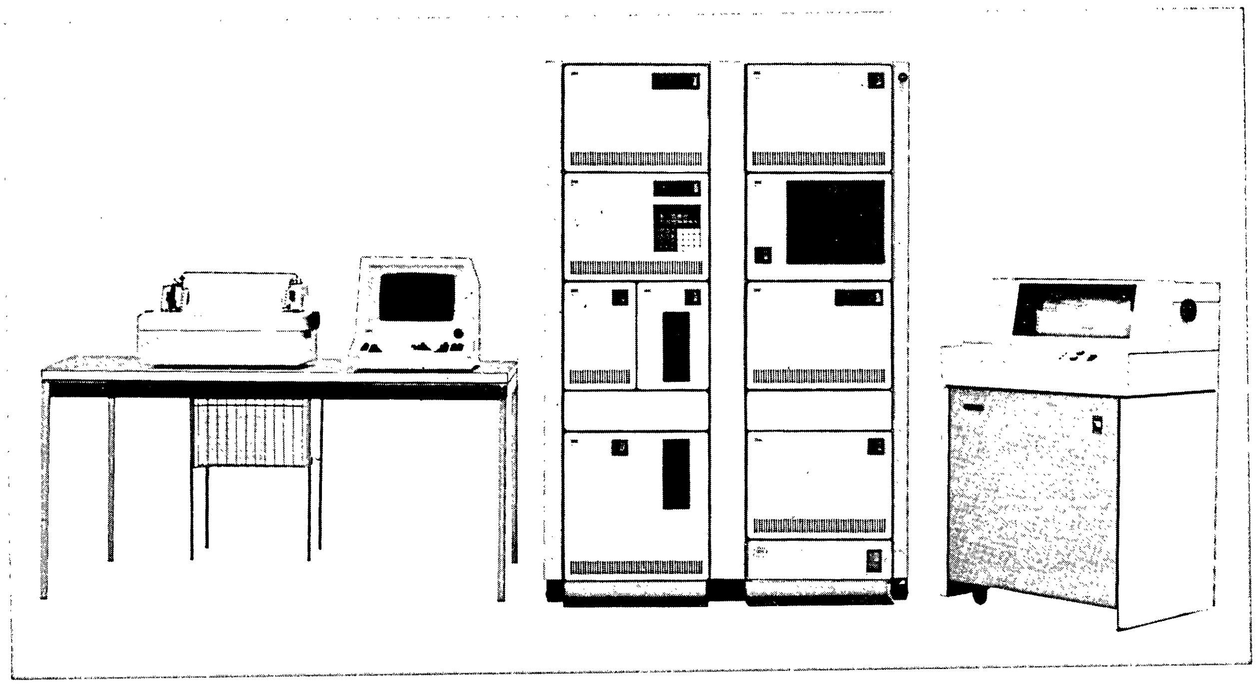
Contents

Chapter 1. Introduction

Introduction to site preparation

Series/1—what is it?

The Series/1 is a small, modular computer system. Units for the Series/1 include processors, disk/diskette storage, printers, keyboard-display stations, data communications, sensor input/output (I/O), and various features for connecting user equipment.



Preparing for Series/1

Once you have ordered the Series/1, the next step is preparing your location for its arrival and installation. Site preparation (sometimes called physical planning or installation planning) is your job. It is an important job.

With proper site preparation, your Series/1 can be installed quickly and efficiently. If proper preparations are made before your computer arrives, you can unpack the units, position them where they are to be installed, and be ready for installation by the IBM customer service representative (CSR).

Most important of all, proper preparation will help your company realize the benefits you expect from your new computer.

When does it have to be done?

Because site preparation is so important, it can't wait. To do the job well and on time, you must follow a **schedule**. With a schedule, you can "countdown" from order to arrival, doing your preparation work in an orderly sequence. This manual will help you with site preparation scheduling.

Who does what?

Although site preparation for Series/1 is **your responsibility**, you may need outside help with some tasks. The procedures in this manual include recommendations and directions for professional assistance with certain site-preparation tasks.

Your job includes arranging for any help you might need from consultants, contractors, or vendors. For example, if your Series/1 has communication features, you may need to arrange with your local communications company to install telephone lines and other communication equipment before the computer arrives. If your Series/1 has features for attachment to your equipment, you may need to arrange for outside help to plan and install the necessary wiring.

While the responsibility for site preparation is yours, IBM assistance with site-preparation planning is available at the current hourly rate.

When your Series/1 arrives, you are responsible for unpacking and placing it in position for installation by the IBM customer service representative. After the IBM customer service representative has switched power on to the computer and checked the computer out, you are responsible for connecting customer setup units such as the 3101 terminal, 4975 printer, 4980 Display Station and other equipment (sensor wiring, communication cables, and other wiring) to the computer.

How this manual can assist you

This manual is designed to assist you in effectively preparing your site for Series/1. Therefore, we urge you to get to **know this manual well and to use it!**

The instructions in this manual are organized according to the major site-preparation tasks, with each major task as a **chapter**. The task chapters are separated by divider pages, with the chapter names on the divider tabs. Therefore, you can easily find the instructions for each part of your job by using the tabs on the side of the manual.

The **chapter topics** are:

- Introduction
- Site selection
- Site environment
- Site safety
- Unit specifications
- Data communications
- Electrical power and grounding
- User-equipment wiring
- Supporting information.

To get maximum benefit from this manual, first scan the entire manual to become familiar with all site-preparation tasks. Then read and understand the instructions for each specific task—before starting to work on it. Be sure to follow the instructions closely.

Since you probably will have several of your people and/or contractors assisting with this job, make sure that everyone follows the instructions contained in this manual.

If your Series/1 system has other IBM equipment attached, refer to Chapter 9 for a list of manuals containing physical planning information.

Scheduling site preparation

Once your company has ordered Series/1 and a delivery date has been confirmed, you should begin site preparation to ensure a smooth installation. Good site preparation requires a project leader or manager to oversee all preparation tasks, detailed action plans, and adherence to the schedule.

Delivery schedules and the time required to prepare a site for Series/1 installation can vary. You should obtain the actual scheduled delivery date for your Series/1 from your IBM Marketing Representative. Your site-preparation schedule should then be tailored to your actual delivery date.

The **site-preparation schedule** is what a typical schedule might look like. It is based on 15-weeks from order to delivery—starting with the 15th week and "counting down" to week 1, when the computer is actually delivered and installed.

Use this schedule in any way that might help you to schedule your site-preparation job. However, note that the "who does" column is the same for any schedule.

Also included with the **site-preparation scheduling worksheet** is a blank worksheet that you may remove or copy to assist in developing your schedule.

Sample site-preparation schedule (part 1 of 3)					
		Who does it?			
Week	Schedule date	Cust-omer	IBM	Date completed	Site-preparation tasks
15	______	o		______	▶ Identify the project manager who will be responsible for all site-preparation tasks.
	______	o		______	▶ Prepare action plans and detailed schedules.
	______	o	o	______	▶ Plan training program for customer employees.
	______	o		______	▶ Begin site selection.
14	______	o	o	______	▶ Review overall site-preparation plans with IBM marketing representative.
					Identify:
	______	o		______	▶ The need for data communication equipment and wiring.*
	______	o		______	▶ The need for user-equipment wiring (such as sensors).*
	______	o		______	▶ The need for cables for the various peripherals and all other cables for devices such as 5250 Display Stations, 3101 Display Terminal, 5230 Data Collection Units.
13	______	o		______	▶ Complete the site-selection tasks (including floor-layout plan showing location of all Series/1 units, user equipment, furniture, and storage).
12					Order:
	______	o		______	▶ Communication equipment and wiring for arrival by week 8.* Decide who will install.
	______	o		______	▶ User-equipment wiring for arrival by week 8.* Decide who will install.
					Schedule:
	______	o		______	▶ Site alterations. Decide who will do the work.
	______	o		______	▶ Training program for customer employees.
11	______	o		______	▶ Verify availability of equipment and services needed for each installation task.

*If necessary, IBM can provide assistance through the Special Product Engineering Services Department (Boca Raton, FL).

Sample site-preparation schedule (part 2 of 3)					
		Who does it?			
Week	Schedule date	Customer	IBM	Date completed	Site-preparation tasks
10					Complete:
	______	•		______	▶ Electrical power layout.
	______	•		______	▶ User-equipment wiring layout.*
	______	•		______	▶ Communications equipment wiring layout.*
9	______	•		______	▶ Order supplies (such as paper, magnetic tape, diskettes, and ribbons).
8	______	•		______	▶ Review site-preparation plans for any schedule problems. Take action to keep on schedule.
					Schedule:
	______	•		______	▶ Communication equipment and wiring installation.*
	______	•		______	▶ User-equipment wiring installation.*
7	______	•		______	▶ Start installation of power outlets for Series/1.
6	______	•		______	▶ Verify all equipment ordered is on site or on a firm delivery schedule.
5	______	•		______	▶ Review overall progress of site preparation with IBM marketing representative.
4	______	•		______	▶ Check receipt of supplies (such as paper and ribbons).
	______	•		______	▶ Complete employee training.
3					Complete installation of:
	______	•		______	▶ Power outlets and verify required Series/1 voltages.
	______	•		______	▶ Communications equipment and wiring, and check it out.*
	______	•		______	▶ User-equipment and customer installed wiring, and test for proper termination, routing, and grounding.*
2	______	•		______	▶ Complete check-out of entire site (including site alterations, safety, and environmental equipment and procedures).

*If necessary, IBM can provide assistance through the Special Product Engineering Services Department (Boca Raton, FL).

Sample site-preparation schedule (part 3 of 3)					
		Who does it?			
Week	Schedule date	Customer	IBM	Date completed	Site-preparation tasks
1	______	°		______	▶ Site preparation complete.
	______	°	°	______	▶ Series/1 units delivered.
	______	°		______	▶ Unpack Series/1 units and move to installation site.
		°			▶ Unpack customer setup units and move to installation site.
	______	°		______	▶ Call IBM customer engineer.
	______		°	______	▶ IBM customer engineer on site to complete IBM installation tasks (powering on and checking out Series/1).
	______		°	______	▶ IBM customer engineer turns Series/1 over to customer.
	______	°		______	▶ Connect user-equipment and communication wiring to the computer.*

*If necessary, IBM can provide assistance through the Special Product Engineering Services Department (Boca Raton, FL).

Site-preparation scheduling worksheet

(page__of__)

Purpose: Use this worksheet for detailed site-preparation scheduling, or for tailoring the typical site-preparation schedule to your particular situation.

Location____________________

Install date____________________

No.	Activity (or task)	Month / Week																													

Accessories and Supplies

The supplies listed below can be ordered through your IBM marketing representative.

Accessories

Diskettes	P/N 2305830	Diskette 1	- 128 byte sectors
	P/N 2305845	Diskette 1	- 256 byte sectors
	P/N 1669954	Diskette 1	- 512 byte sectors
	P/N 1766870	Diskette 2	- 128 byte sectors
	P/N 2736700	Diskette 2	- 256 byte sectors
	P/N 1766872	Diskette 2D	- 256 byte sectors
	P/N 1669044	Diskette 2D	- 512 byte sectors
	P/N 1669045	Diskette 2D	- 1024 byte sectors
Diskette Magazine	P/N 2462521		
Magnetic Tape	N/A*	IBM Multi-System Tape *P/N not required. Order by description from SSD.	
Ribbons:	P/N 1136634	for 4973-1 (black ink)	
	P/N 1136670	for 4973-2 (black ink)	
	P/N 1136652	for 4974-1 (black ink)	
	P/N 7034535	for 4975-1 (black ink)	
	P/N 7032550	for 4975-2 (black ink)	
	P/N 6845100	for 5224-1,2 (black ink)	
	P/N 4412372	for 5225-1,2,3,4 (black ink)	

Supplies

Connectors:	B/M 6843689	2 X 4 Berg connector kit
	B/M 8327397	2 X 8 Berg connector kit
	B/M 8327398	2 X 12 Berg connector kit
	B/M 8327399	2 X 20 Berg connector kit
	B/M 8327400	Berg crimp tool
	B/M 8327401	Amphenol 4-position connector plug
	B/M 8327402	AMP 26-position connector kit
	B/M 8327403	AMP 160-position connector kit
	B/M 8327404	AMP crimp and extractor tool
	B/M 8327405	Continental 56-position connector kit
	B/M 6838818	Berg crimp tool for Feature #1200
	B/M 6838819	Connector kit for Feature #1200

Chapter 2. Site selection

Selecting an appropriate site

One of the most important tasks involved in preparing your location for Series/1 is selecting a **site**.

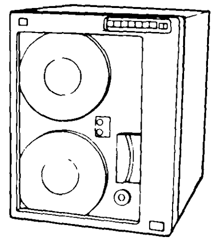
Some important things to consider in selecting a site are:

- The equipment on order
- What the equipment will be used for and how close it should be to the work it will do
- Space needed for the equipment, including operating and servicing
- Floor strength and covering
- Site environment, such as temperature, and humidity
- The electrical power needed
- Safety and security.

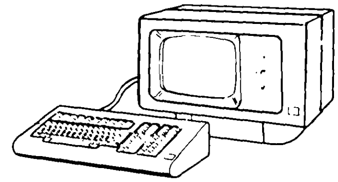
Your company may have already selected a site for Series/1 when placing the order. If so, chances are good that this site can be used if it meets the requirements.

The purposes of this chapter are:

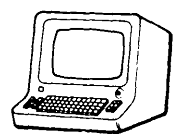
- To help you select a site if you have been given the job, or
- To help you be sure that the site your company selected is an appropriate site for Series/1.



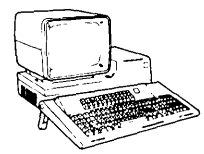
4969 Magnetic Tape Unit



4978 Display Station



4979 Display Station



4980 Display Station

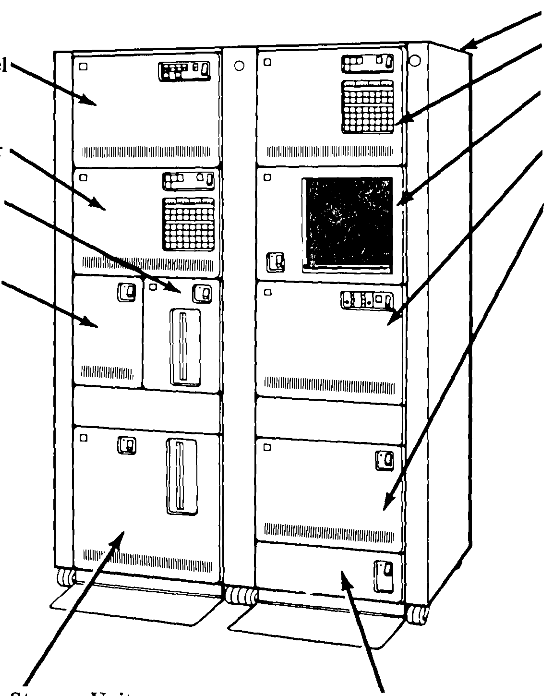
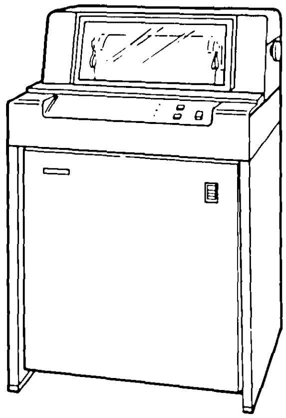
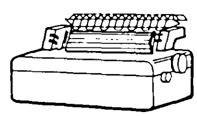


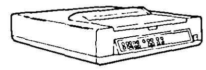
Figure 2-1. (Part 1 of 3) Series/1 machine units



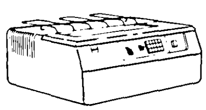
4973 Line Printer



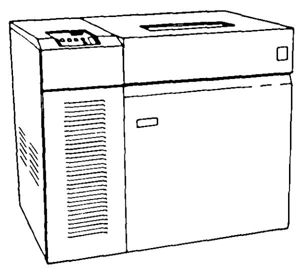
4974 and 4975 Printers



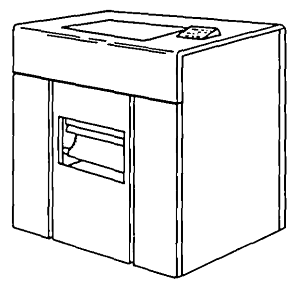
5219 Typewheel Printer



5224 Printer



5225 Printer



5262 Printer

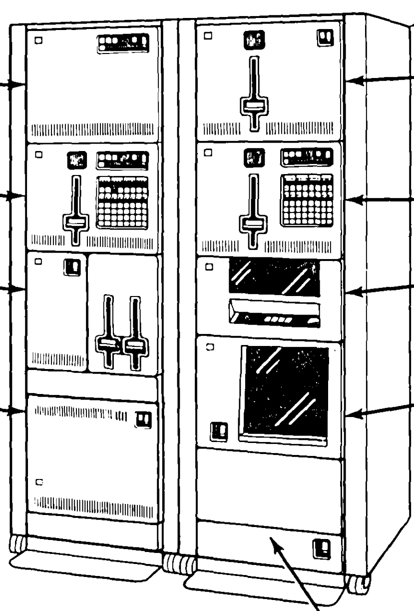


Figure 2-1. (Part 2 of 3) Series/1 machine units

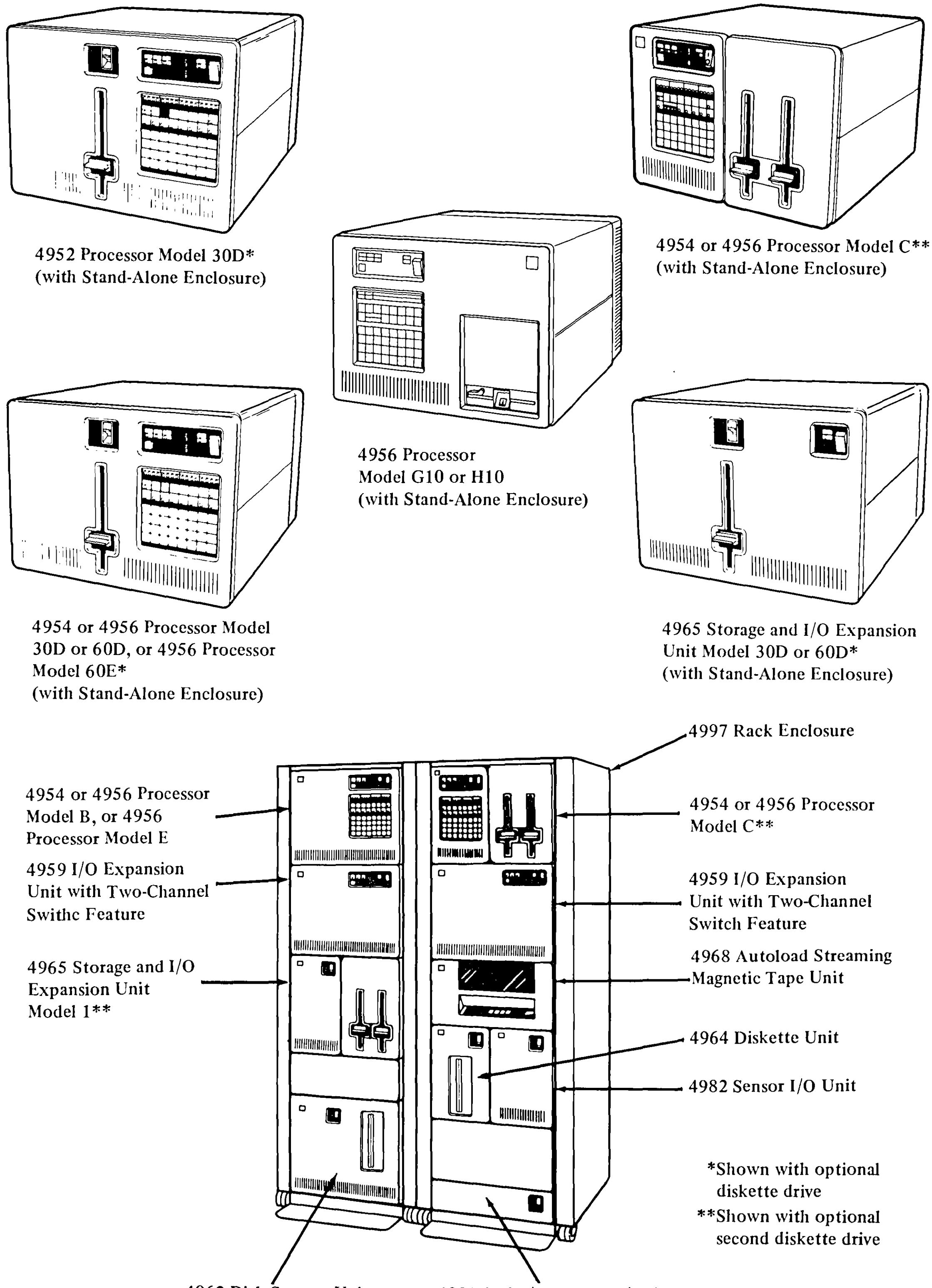


Figure 2-1. (Part 3 of 3) Series/1 machine units

What's coming?

The first thing you need to know is what equipment is coming. Figure 2-1 shows some of the available Series/1 machine units.

To begin site selection, you should make copies of the **product-specification worksheet** (Figure 2-2 on the following page).

Next, from your company's copy of the **Series/1 purchase agreement,** find out what specific Series/1 units are on order.

On the product-specification worksheet, list all the units (products) on order by type, model, and quantity ([1] below). Be sure to use a separate worksheet for each Series/1 System to be installed in any one location.

Now refer to the unit specifications chart in Chapter 5 of this manual for the information needed to fill in the remainder of the worksheet ([2] below).

Use the Information on this worksheet for site selection as well as for other site-preparation tasks.

[1]

Product-specification worksheet

Product (machine)			Power load (kVA)		Heat/output (Btu/hr)		Weight (lb)			
Type	Model no.	Qty	Per unit	Sub total	Per unit	Sub total	Per unit	Sub total	Voltage	Notes
4954	B	1								

[2]

Product-specification worksheet

Product (machine)			Power load (kVA)		Heat-output (Btu/hr)		Weight (lb)			
Type	Model no.	Qty	Per unit	Sub total	Per unit	Sub total	Per unit	Sub total	Voltage	Notes
4954	B	1	.70	.70	1705	1705	50	50	208	

Product-specification worksheet

Product (machine)			Power load (kVA)		Heat-output/hr (Btu)		Weight (lb)			
Type	Model no.	Qty	Per unit	Sub total	Per unit	Sub total	Per unit	Sub total	Voltage	Notes
Totals (all machines)										

Figure 2-2. Product-specification worksheet

What's it for?

Once you know what equipment is coming and have filled in the product-specification worksheet, the next step is to consider how the the equipment will be used. This is **important** in helping make the best site selection. Items to consider follow.

Work Flow

The location of your Series/1 may affect the efficiency of your company's business. Someone may have already considered this and selected a location conducive to efficient work flow. If a site has not been selected, you should explore the matter of efficient work flow before selecting a site.

Other equipment

Will Series/1 control some of your production equipment? If so, the location selected can affect the efficiency of your operation. For example, placing your computer as close as possible to your production equipment gives you better electrical-signal quality as well as a less-expensive hookup.

Space needed?

After reviewing the equipment on order, its use and proximity to its task, you should have a general idea of where to place it. The next step is to prepare a floor-layout plan to ensure that your Series/1 units will actually fit into the selected location with enough room for operating and servicing.

Floor-layout plan

To prepare a floor layout do the following:

1. Mark off the dimensions of your site on grid paper, using either a metric or an English scale.

   The sample floor-layout plans shown in this chapter (Figures 2-3, 2-4, and 2-5) are in English units (1/2 inch = 1 foot). A 1/4 inch = 1 foot and a 1/2 inch = 1 foot layout template is provided in chapter 9 of this manual.

2. Make as many copies as you need of the appropriate floor-layout templates from Chapter 5.

3. Cut the templates out and position them on the grid paper. This helps determine if your units fit in the available space. It also helps you decide the best arrangement for servicing and operating the machines.

   The **service clearance** for the 4997 Rack Enclosure takes care of the service clearance needed for rack-mounted Series/1 units. Service clearance is required for the stand-alone 4952-C Processor and 4973 Printer, but not for the 4974 or 4975 Printers, or 4978 or 4979 Displays, since these units can be easily moved for servicing.

4. Include all other items — such as desks, tables, storage, and other equipment — in the layout. Also, consider the space taken by supporting columns or other room fixtures. Draw all these items to scale on the grid paper. For a typical system, storage space should be reserved for five 279 mm x 432 mm (11 in. x 17 in.) logic binders with 51 mm (2 in.) rings. Larger systems may have up to seven binders.

5. Consider the physical limitations and the routing of the signal cables for the 4973, 4974 and 4975 Printers, the 4978 and 4979 Display Stations, and the 3101 Display Terminal, 5250 Display Terminal, 5250 Display Stations, and 5230 Data Collection Units.
6. When doing your floor layout, consider the power-cord length and the space required for cabling to the computer. More detailed information on this follows in this chapter under "Electrical Power Needed."
7. Consider the potential safety hazard from power and signal cables routed over the floor.
8. See Figures 2-3, 2-4, 2-5 for sample floor layout plans.
9. When estimating the cable length required to connect an external device to an IBM processor, 4965, or I/O Expansion Unit feature installed in a 4997 Enclosure, allow 2–2.5 m (6–8 ft) for a 4997-2 and 1.5–2.0 m (4–6 ft) for a 4997-1, for cable routing through the enclosure.

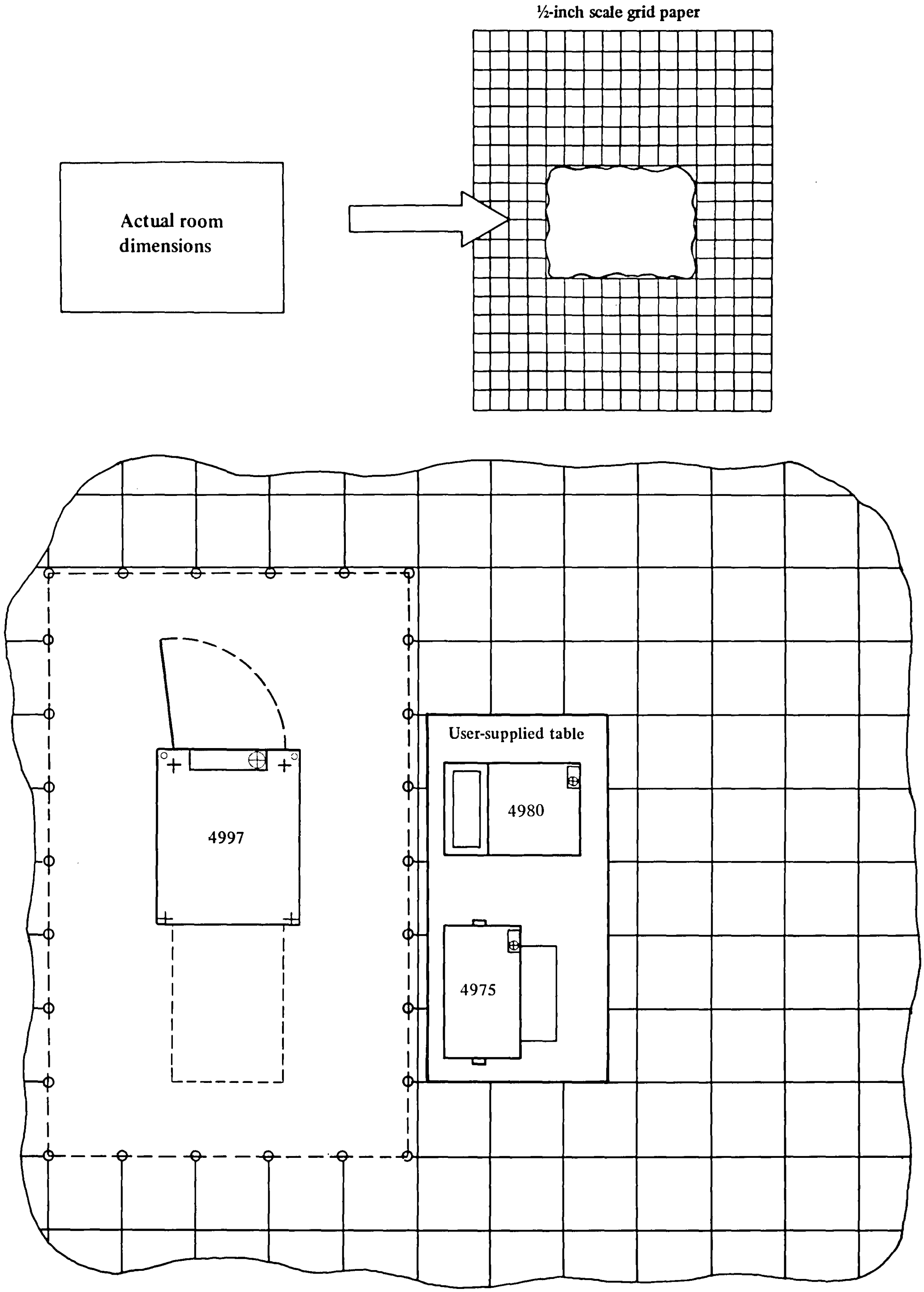


Figure 2-3. Sample floor layout for single rack enclosure

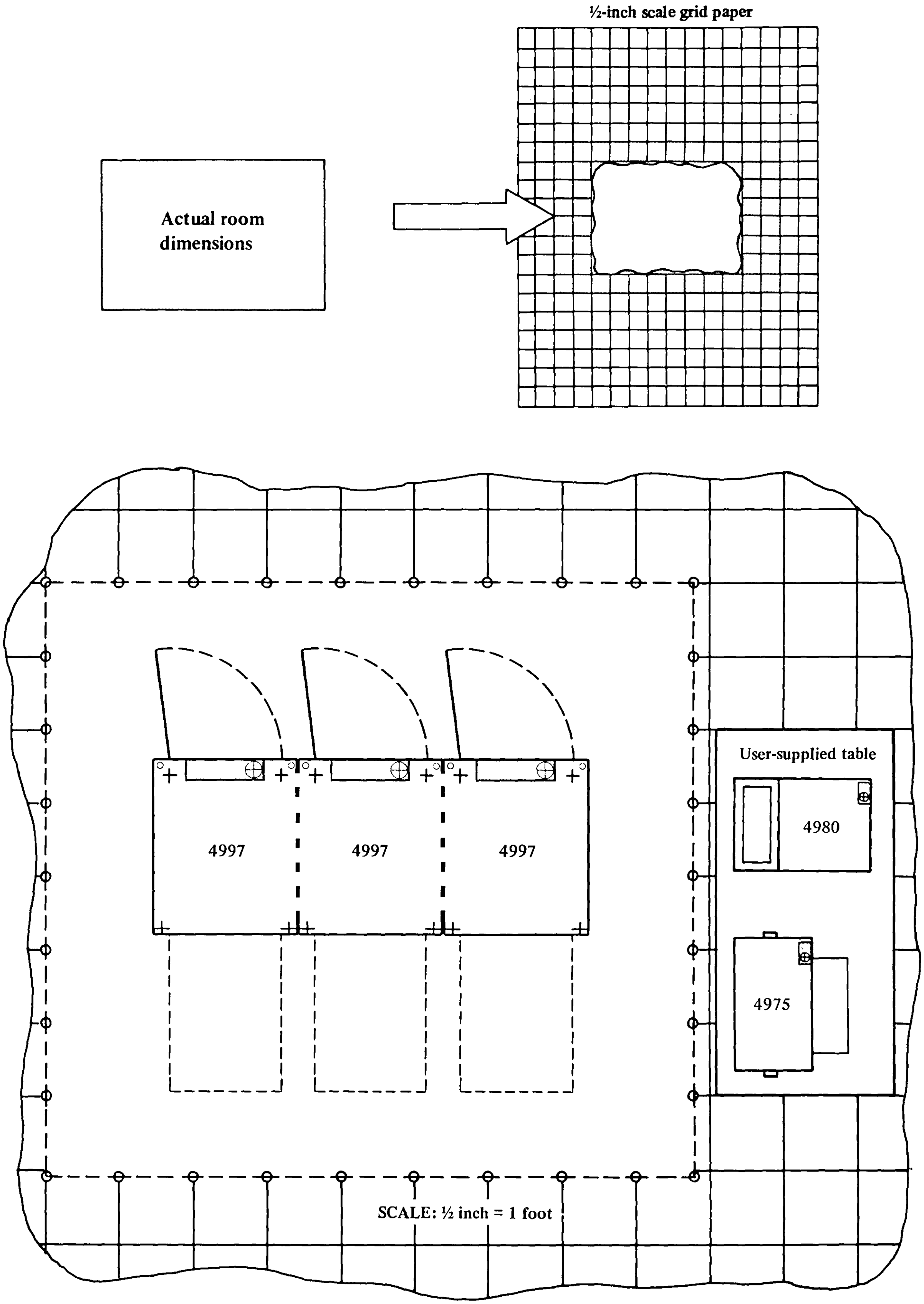


Figure 2-4. Sample floor layout for multiple rack enclosures

What about the floor?

Floor Loading

Having decided on a room with adequate space for Series/1, you must also consider the strength of the floor (floor loading). Your site floor should support Series/1 with no difficulty—but you should be sure.

To find out if your floor is strong enough for Series/1 do the following:

1. Refer to the product-specification worksheet (filled out earlier) for the total weight of your Series/1 units.
2. To the total weight of the Series/1 units, add the total weight of all other items in the room (such as furniture, supplies, other equipment, and cables).
3. Contact someone in your company (such as the building engineer) who can determine whether the floor can support the additional weight. Generally, it takes a structural engineer to accurately calculate floor loading.

Special information on floor loading...

- ▶ If more than three Series/1 rack enclosures are placed side by side, no allowance should be taken for clearance at the ends of the two outer rack enclosures in calculating the floor loading.
- ▶ Regardless of the actual service clearance required, the clearance used in actual floor-loading calculations cannot be more than 760 mm (30 in) in any one direction from the machine.
- ▶ 98 kg/m² (20 lb/sq ft) of the service area used in calculating floor loading must be applied as live load.
- ▶ For a false or raised floor, 49 kg/m² (10 lb/sq ft) of total area used in calculating floor loading must be applied as false-floor load.

Note: Using the IBM method of calculating floor loading, a Series/1 with three or more 4997 Rack Enclosures fully loaded with machines may exceed 367.5 kg/m² (75 lb/sq ft). Such an installation should be reviewed by a qualified consultant.

Floor covering

Floor-covering materials, such as tile and carpet, can cause a buildup of **static electrical charge** on people and furniture. When "charged" people or furniture touch grounded metal surfaces—such as the computer frame—the static buildup discharges. This discharge can cause discomfort and can also result in computer failure.

To avoid these problems, the floor covering for your site should be antistatic. Existing carpets can be treated with antistatic solution. Whether or not your floor covering is antistatic, a proven method of controlling static buildup is by maintaining 40% to 50% relative humidity at your site.

> **Special information on testing floor-covering resistance...**
> If you suspect that your floor covering might give you static charge problems, you can check the resistance of the floor-covering material (or have someone do it for you).
> The resistance of floor covering should not be more than 2×10^{10} ohms or less than 150,000 ohms, when measured with a megohmmeter and a test-electrode kit.
> Refer to applicable national and local safety standards for the testing procedures. (For installations in the U.S., see Chapter 9 of this manual.)

Electrical power needed?

Before you can finish your floor-layout plan and make your final decision on a site, you must also consider the electrical power required for your Series/1. The following paragraphs tell you how to plan for power outlets; Chapter 7 tells you what power you need at the outlets.

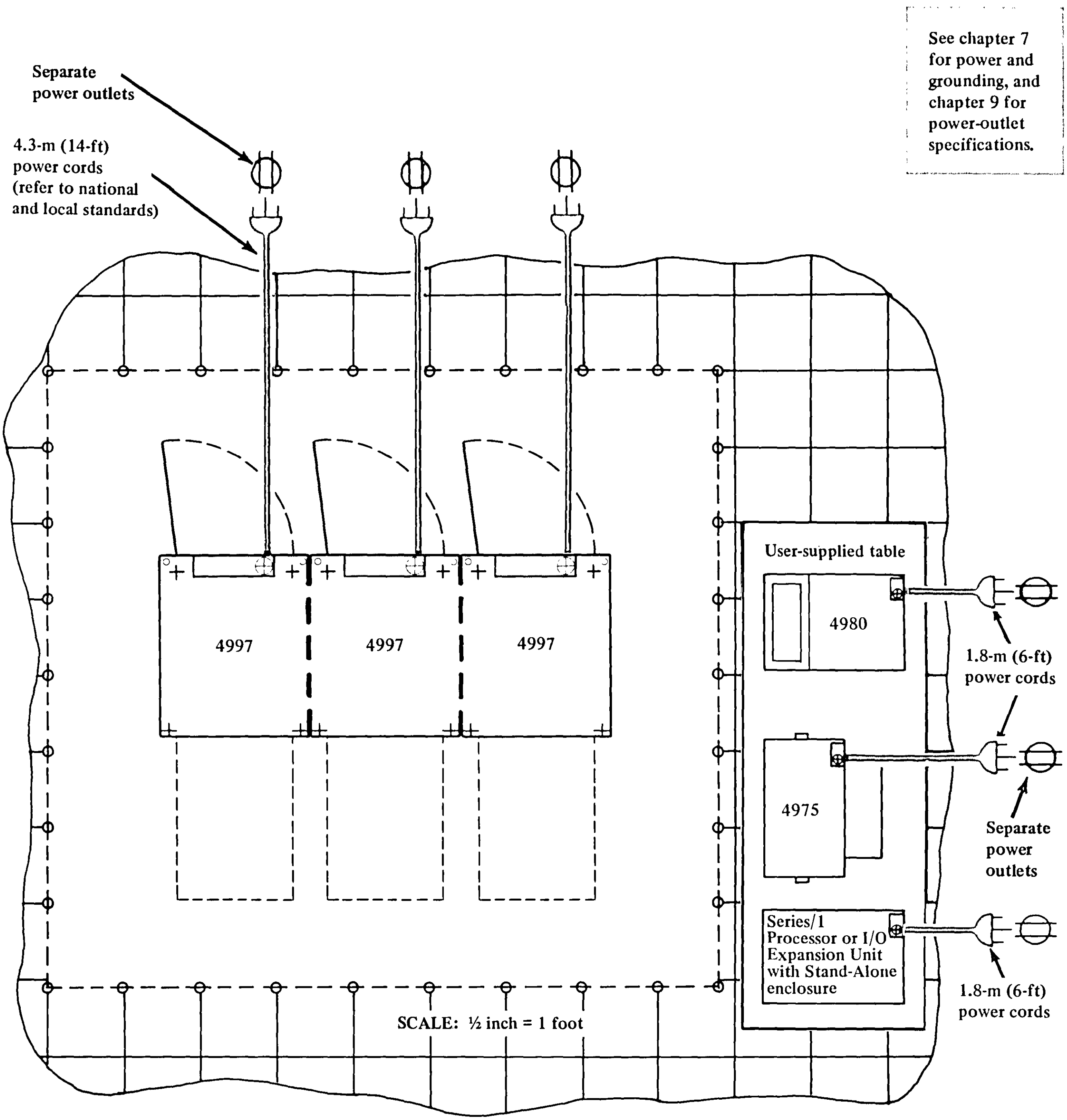
Series/1 rack enclosures and stand-alone units (displays, printers, and 4952-C with stand-alone enclosure) have power cords that connect to your outlets. A separate power outlet on its own branch circuit is required for each rack enclosure and each stand-alone unit.

Refer to Chapter 7 of this manual for additional information on power and grounding. Thoroughly review the information in Chapter 7 before making your final decision on site selection. The power you need may not be available at the site you have in mind. After you have reviewed Chapter 7, you should be able to determine if you have the right power available at your site, or if it can be installed with no major problems.

Now go back to your **floor-layout plan**. Indicate on the plan where you need outlets for your Series/1 units. Be sure to consider the length of the power cords for the rack enclosures and stand-alone units, as shown in Figure 2-5.

Arrange your equipment and outlets so that the power cords are not a tripping hazard.

You also need to plan for power required by any other equipment in the area.



Notes...

In countries other than the U.S. and Canada, Series/I rack enclosures and stand-alone units may be shipped without power plugs attached to the power cords. Some national or local safety standards may require a different type of plug, or direct wiring of the Series/I power cords (instead of a plug-in connection).

Figure 2-5. Sample floor layout showing power outlets for Series/1

What about the surroundings?

A very important item to consider in selecting and preparing your Series/1 site is the condition of your **site environment.** Site environment refers to temperature, humidity, air quality, vibration, and shock.

Series/1 is best suited to business offices and **clean** industrial locations.

If your site does not meet the standards for which Series/1 was designed, you may have to either pick another site or do some things to improve the environment (such as air conditioning and humidity control).

See Chapter 3 of this manual for additional information on checking the environment at your site and what you can do if there are problems.

Safe and secure?

A very important item to consider in selecting any Series/1 site is **safety.** Following the guidelines of your company's safety program will help you decide if the site you have in mind for Series/1 is safe.

There are, however, some safety concerns for computer installations that require special emphasis. These are explained in Chapter 4 of this manual. Review Chapter 4 thoroughly to help you determine if you have planned for maximum safety.

The **security** of the site you select is really a matter of the value that your company places on its assets. In selecting a site for Series/1, you should follow the guidelines of your company for protecting equipment and information.

Computer installations may, however, require some **special consideration** for protection of the information (data) that the computers process. Talk to the people who will be using the computer at your site to see if there are any special security precautions you should take.

Some of the items that your company should consider regarding **physical security** are as follows:

- Controlling the entry of people into the area.
- Secure the area with adequate door locks.
- Storing computer records in secure and fire-safe storage areas.
- Clearly defining responsibility and procedures for people using the computer.
- Developing both backup and recovery procedures in case something goes wrong (such as fire, storm, and flood).

Chapter 3. Site environment

Environmental Conditions

The **environmental conditions** at your site are very important to the successful installation and operation of your Series/1. The environmental conditions of most importance in selecting and preparing a Series/1 site are...

- Temperature and humidity
- Air quality
- Vibration and shock.

For most of these items, there is an **ideal (or optimum) condition,** along with **acceptable conditions** above and below ideal. For example, the ideal temperature range for most Series/1 units is 22.2° to 25.6°C (72° to 78°F), while the acceptable temperature range is 10.0° to 40.6°C (50° to 105°F).

Where environmental conditions are **outside the acceptable range,** you must take steps (such as installing air conditioning) to bring the condition within the acceptable range or closer to the ideal condition.

The main purposes of this chapter are to:

- Help you check your site for proper environmental conditions.
- Give you guidance on what can be done when the proper conditions are not met.

Temperature and humidity

The ideal environment for Series/1 is 22.2° to 25.6°C (72° to 78°F) with 40% to 50% relative humidity. Acceptable ranges (upper and lower limits) of temperature and relative humidity for each Series/1 unit and peripheral environment are given in the **unit-specification charts** in Chapter 5 of this manual. Refer to Chapter 9 for the order numbers of non-Series/1 units physical planning manuals.

To check the temperature and humidity at your site, consider the following:

- The present (existing) environment at the site with Series/1 not installed, or installed but not powered on.
- The environment at the site with Series/1 installed and powered on.

The **existing site environment** should be within the "non-operating environment" range shown in the Series/1 unit-specification charts in Chapter 5. This is important because you can damage your computer by powering it on in conditions outside the specified range.

When Series/1 is installed and **powered on** the conditions of your existing environment change. Series/1 heat output will affect the temperature and humidity of your existing environment. Therefore, when Series/1 is powered on, your site environment should be within the "operating environment" range shown in the Series/1 unit-specification charts in Chapter 5. Again, Series/1 might fail or cause errors if operated at conditions outside the specified range.

Temperature and humidity check-out procedure...

1. **Check the existing environment at your site...**
   - ▶ Measure the temperature.
   - ▶ Measure the humidity.
   - ▶ Compare these values to the nonoperating specifications given in Chapter 8.

2. **Check the operating environment at your site** considering Series/1 installed and powered on...
   - ▶ Start with the existing temperature and humidity.
   - ▶ Calculate the heat load of the existing environment.
   - ▶ Add the heat load of Series/1 units.
   - ▶ Calculate the operating temperature and humidity.
   - ▶ Compare these values to the operating specifications given in Chapter 8.

3. **Find a solution to the temperature and humidity problems if they are outside the specified ranges.**

Checking the Existing Environment

In checking your existing site environment, **first** measure the temperature and humidity. The best device to use for this measurement is a **thermohumidigraph**. This device records temperature and humidity on a chart over a period of time, such as days or weeks.

A **psychrometer** can also be used to measure temperature and relative humidity. With a psychrometer, room temperature is read directly from the dry bulb. Humidity is calculated from the difference between the dry-bulb and wet-bulb readings. Several readings must be taken over a period of time to get a true measurement of changes in temperature and humidity.

If you are unfamiliar with these devices and readings, you should consult an air-conditioning expert.

Next, compare the temperature and humidity readings of your existing site with the operating ranges in the unit-specification charts in Chapter 5 of this manual. If your site readings are **outside the operating range**, you must take steps to bring the temperature and humidity within the specified range. For further information, refer to the section in this chapter entitled "Fixing Temperature and Humidity Problems."

Checking the Operating Environment

The existing temperature and humidity readings from your site are not enough to determine if it will meet operating specifications when the Series/1 is installed and operating.

You must also consider the heat output (heat load) of Series/1 units. That is, you must add the **total machine heat output** (from your product-specification worksheet) to the **heat load of your existing site**.

There are, however, other considerations which must be included in calculating the heat load (such as building construction, window location, people, and lights). Because these items vary from one site to another, you should consult an air-conditioning expert to calculate your **total-site heat load**.

Existing-site heat load
+
Total Series/1 heat-output/hr
=
Total-site heat load

Once the total heat load of your site is known, an air-conditioning expert can determine the projected **operating temperature and humidity** of your site. You can then compare these values to the operating-environment specifications given in the unit-specification charts in Chapter 5.

Fixing Temperature and Humidity Problems

If the temperature and humidity of your site can be held **within the specified ranges** during Series/1 operation, new or additional air conditioning or humidity control is not needed.

One consideration you should make is, that although a large open room may not require new or additional cooling for Series/1, the additional heat may cause discomfort to people in the area.

Problems with temperature and humidity can be complex. If your site environment is **outside the temperature and humidity ranges** specified in Chapter 5, we recommend that you consult an air-conditioning expert for solutions.

Air quality

If you are installing Series/1 in a typical business office or clean industrial location, you probably do not have to worry about the quality of the surrounding air. However, if your site is **unusually dirty** or has a **chemical odor**, you should be concerned.

Air contamination (dirt or corrosive gases in the air) can be **hazardous** to people and **hostile** to computers and other equipment. Dirt and corrosive gases can corrode electronic components in a computer, causing computer failure or errors.

The following paragraphs discuss air quality to:

- Explain air contamination and the problems it causes.
- Guide you in checking your site for air contamination.
- Guide you in solving problems with air contamination.

What is air contamination?

Series/1 is designed for installation in a typical business office or clean industrial location, relatively free from **corrosive gases** and **dust particles.**

Gases—such as sulfur dioxide, nitrogen dioxide, ozone, and acidic gaseous chlorine—are known to cause corrosion and failure of electronic components. However, these are not the only corrosive gases that cause equipment problems.

If you have any reason to suspect the presence of a corrosive gas (for example, the presence of an odor), determine what contaminent is in the air and whether it is in high enough concentrations to be hostile to the Series/1.

In addition to gases, some industrial processes produce ultrafine solid particles in the air, sometimes called particulate contamination. These particles can settle (form dust) in surrounding areas, even though the process producing the particles may be some distance away. Particulates sometimes cause failures of circuits and contacts in electronic equipment.

The maximum **levels of contamination** allowable in a Series/1 environment are defined in the specification chart in this section. These specifications apply only to IBM equipment. For the safety and health of people at the site, refer to applicable national and local safety standards on air contamination. (For installations in the U.S., see Chapter 9 of this manual.)

Maximum levels of corrosive gas and particulates allowable in a general Series/1 environment...

Corrosive gas contaminants

Corrosive gas upper limit is expressed as arithmetic mean values (averages over one year) in $\mu g/m^3$ (micrograms per cubic meter) and ppb (parts per billion, 10^9, by volume).

- Total Reactive Sulfur = 3.2 $\mu g/m^3$

  This includes elemental sulfur vapor (S_8) of up to 2.1 $\mu g/m^3$. Total reactive sulfur is the quantity of elemental sulfur expressed in $\mu g/m^3$ in all gaseous species that reacts with silver to form silver sulfide (e.g., $S_8 H_2 S, CH_3 SH$, etc., but not SO_2). The 3.2 $\mu g/m^3$ of reactive sulfur is equivalent to 3.4 $\mu g/m^3$ or 2.5 ppb of H_2S.
- Sulfur Dioxide = 262 $\mu g/m^3$ (100 ppb)
- Nitrogen Dioxide = 141 $\mu g/m^3$ (75 ppb)
- Ozone = 98 $\mu g/m^3$ (50 ppb)
- Acidic Gaseous Chlorine = 3 $\mu g/m^3$

  Acidic gaseous chlorine is the quantity of elemental chlorine expressed in $\mu g/m^3$ in chlorine containing acidic gases (e.g., $HC1$, $C1_2$, $C10_2$, etc.). The 3 $\mu g/m^3$ is equivalent to 2 ppb of $HC1$ or 1 ppb of $C1_2$.

Particulate contaminants

Particulate upper limit is expressed as arithmetic mean values in $\mu g/m^3$ (micrograms per cubic meter) or $\mu g/cm^2$/30 days (micrograms per square centimeter per 30 days).

- Suspended Particulates = 200 $\mu g/m^3$
- Benzene Soluble Organics = 30 $\mu g/m^3$
- Settleable Particulates = 1500 $\mu g/cm^2$/30 days

Testing for Air Contamination

Testing for gases and particles in the air that might be harmful to Series/1 involves **special equipment and procedures**. Unless someone in your company is qualified, we recommend that you consult an expert in this area.

IBM Installation Support Representatives (or Installation Planning Representatives) can take samples of air at customer sites and have the samples tested in a chemical laboratory. This service is available at the current hourly rate.

Fixing Air-Contamination Problems

If testing of the air at your site reveals unacceptable levels of contamination, action must be taken. Some methods of correction are suggested below. However, an air-conditioning expert should be consulted before implementing any of these methods. These methods are:

- **Filtering corrosive gases** using a chemical-control filtration system such as an activated-carbon filter.
- **Filtering particulates** using a particle-control filtration system.
- **Controlling the relative humidity**—thus reducing the rate of corrosion.
  This can be done by keeping the relative humidity at the low end of the 40% to 50% recommended range.
- **Constructing a sealed, filtered room.**
  This method may be necessary for extremely contaminated environments. It involves constructing a totally enclosed room, supplying the room with clean outside or filtered air, and keeping the room pressurized.

You can purge and pressurize a room with a fan or separate air-conditioning unit that brings uncontaminated air into the room, and maintains a constant air flow from the room to the surrounding area. This process creates a higher air pressure in the room to maintain an outward air flow.

If the Series/1 is mounted in standard 19-inch racks another option would be a sealed rack enclosure with its own air conditioning (from appropriate vendors). Other provisions would be required for printers, display units, and other stand-alone units.

For **more information**, refer to the applicable national and local safety standards. (For installations in the U.S., see Chapter 9 of this manual.)

Vibration and Shock

If you are installing Series/1 in a typical business office or clean industrial location, you may not have to worry about vibration and shock. Minor vibration, however, can cause the equipment to move. You may have to use pads to keep it in place.

To check **vibration levels**, use a standard vibration meter with acceleration and displacement scales. Such meters are available from vibration-equipment suppliers and instrument-rental companies.

Maximum vibration levels for a 4997 Rack Enclosure are a function of weight and can be determined from the charts in Chapter 9.

If your Series/1 site exceeds the vibration levels specified and you cannot relocate to a different area, you can overcome the problem by mounting the Series/1 on shock-absorbing material or a shock-mounted pedestal. Individual unit vibration limits are found in Chapter 9.

You may need the assistance of a mechanical engineer to solve vibration problems.

Altitude

All Series/1 units except the 4969 Models 7D, 7N, and 7P are designed to operate at nominal atmospheric pressure. Pressure measurements are (±2.6%) from sea level to 2 135 m (7000 ft). The 4969 Models 7D, 7N, and 7P can be installed to operate from sea level to 1 524 m (5000 ft). At 1 524 m (5000 ft) the vacuum pump and other adjustments must be made for your specfic altitude. Contact your IBM Marketing representative for applications exceeding these limits.

Chapter 4. Site Safety

A word about safety

A very important part of site preparation is the attention given to **safety.** Always remember, safety involves people as well as property.

The purpose of this chapter is to guide you when making decisions about safety in preparing your site for Series/1.

Safety standards

Series/1 is manufactured to meet the product-safety regulations and requirements of national testing laboratories, such as Underwriters Laboratories (UL) in the U.S.

In preparing your site for Series/1, however, you should follow all **national and local safety standards (codes)** that apply. (For installations in the U. S., see Chapter 9 of this manual).

Hazardous locations

Series/1 is **not designed to operate in hazardous environments** with a potentially explosive atmosphere.

If, however, you have to locate your Series/1 in a hazardous area, consult the applicable national and local safety standards. (See Chapter 9 for U.S. installations.)

Because of the many possible hazardous conditions, you may need to consult civil and chemical engineers on how to eliminate hazardous conditions at your site.

Personal safety

Applying the guidelines of **your safety program** to your Series/1 site is a good starting point. The following items, however, deserve special attention.

Safe Access

Plan for a safe-access route for people to get to and from your Series/1 site. A safe-access route is one that meets national and local safety standards.

A special route or customer guide may be necessary for IBM service people if they are unfamiliar with your company's safety procedures. You should also plan to include IBM service people in your safety-training program.

Putting up Safety Signs

Post signs for emergency and special safety procedures for your site in places that are easily seen. For example, if a Halon or CO^2 total-flooding system is installed for fire control, you should post the appropriate warning signs.

Your local fire inspector can advise you on the type and appropriate location of safety signs.

Outdoor cabling

DANGER
During periods of lightning activity, do not install surge suppressors or cables, perform maintenance, connect or disconnect wires, or handle the surge suppressors in any way. The surge suppressors must be installed and grounded before outdoor cable is connected. As soon as outdoor cable is installed, it must be connected to the surge suppressors to ground the cable shield.

Personal safety requires that surge suppressors be installed on each outdoor or underground circuit run. Station protectors must be installed where cable enters or exits the building. They should be as close as possible to a suitable ground.

As defined by the National Electric Code (NEC), Article 500, station protectors must not be installed where combustible materials or other hazardous conditions exist; therefore, areas where cables enter and leave the building must meet NEC standards. Also the station protector must be grounded at the building entrance or exit point (reference Article 800-31 in NEC).

Safe Site Construction

Walls, Ceilings, and Floors

Walls of a computer room should be noncombustible, fire-resistant, and extend from the floor to the ceiling. If outside walls are next to an area that can burn easily, installing shatterproof windows in the computer room will help protect people and equipment from flying debris and water damage. Sprinklers can also be installed externally over the windows to protect them with a blanket of water.

Where a **false ceiling** is installed, it should be noncombustible and fire-resistant. Steam and water pipes above the false ceiling should be inspected for leakage and condensation.

A **raised floor**, when installed, should also be noncombustible and fire-resistant. The space between the raised floor and regular floor should be cleared of dust and debris. If the regular floor is of combustible material, it should be protected by water sprinklers. The regular floor that supports the computer should also provide drainage.

Air Conditioners

Because the **blowers** in an air-conditioning system can spread fire, special precautions should be taken with the air-handling units. Air **filters** should be noncombustible or fire-resistant. Fusible-link **dampers** should be provided to close off all air ducts leading to and from the computer site. The air-handling units for the computer site should be provided with **emergency power-off** controls in the computer room.

Electrical Systems

Remote **emergency power-off (EPO)** controls may be required for disconnecting the electrical service to the computer area or room (see Chapter 7). EPO controls should disconnect power to the computer and to other equipment in the area or room, except lighting. These controls should be located close to the computer operator and, in the case of a computer room, close to the exits. Consult applicable national and local safety standards (see Chapter 9 for U.S. installations).

Proper **grounding** of the entire electrical system is a must (see Chapter 7).

Emergency lighting should be provided for the computer site. These lights should be battery-operated and should be designed to switch on automatically when normal electrical power is lost.

Fire protection and control

In a computer site, the risk of fire is small if good housekeeping procedures are followed. If you need to store combustible material (paper and other supplies) in the area, plan to use totally enclosed metal cabinets designed for this purpose.

Detecting a Fire

Detecting a fire early allows you more time to do something about it. Dependable **fire-detection equipment** is therefore very important for your Series/1 site.

There are several types of fire detectors—such as heat, smoke, and ionization (air-borne products of combustion) detectors. The advice of a professional from your own staff or a reputable dealer in this type of equipment may be required. Also consult national and local safety standards (see Chapter 9 for U.S. installations).

Putting Out a Fire

Three types of **fire-extinguishing equipment** can be used in a computer area:

- Portable, hand-operated extinguishers
- Sprinkler systems
- Total-flooding systems (CO^2 or Halon gas).

You may use only one of the above or any combination of the three.

The **portable, hand-operated extinguisher** designed for use on electrical fires is usually sufficient for computer rooms. The size and quantity of portable extinguishers for your site can be determined by consulting national and local safety standards (see Chapter 9 for U.S. installations).

Sprinkler systems, if used, should be the **dry-charged type**. In such a system, the pipes are filled with air and the water that feeds the sprinkler pipes is controlled by an automatic valve with a time-delay mechanism. Thus, if a sprinkler head is accidentally opened, an alarm sounds to give you time to manually turn off the water. This prevents unnecessary water damage to your equipment.

If you have an existing sprinkler system and it is not the dry-charged type, you should have high-temperature sprinkler heads installed in the system at the computer location. These high-temperature heads help prevent unnecessary water damage to your equipment if a small fires occurs.

Total-flooding systems are effective only in a totally enclosed area. This system extinguishes a fire by flooding the area in a very short time with carbon dioxide (CO_2) or Halon gas. If this type of fire-extinguishing system is used, there are personal safety requirements that must be met. Refer to applicable national and local safety standards (see Chapter 9 for U.S. installations).

Suitable warning and evacuation procedures should be provided for an area with a total-flooding system. We recommend an immediate audible and visible alarm that provides a 30-second delay before flooding occurs.

The IBM office servicing your equipment must be informed if a total-flooding system is used. IBM must then inform its people of a total-flooding system in any area in which they work and of the emergency procedures for that area. An IBM questionnaire will then be filled out by an IBM manager and a person from your company responsible for the safety of the total-flooding system.

Battery safety

If you have ordered a 4999 Battery Backup Unit, you must supply your own battery and battery charger (see Chapter 7 of this manual).

A **vented battery** can be a safety hazard, especially when it is charging. You should take steps (such as warning signs) to keep flames, sparks, and smokers away. Such a battery can also cause **corrosive damage** to the computer or other equipment. We recommend that you use a sealed battery.

Be careful not to short-circuit the battery terminals or wires when servicing the battery.

Shipping and Moving Safety

Series/1 units installed in a 4997 Rack Enclosure are shipped by various methods, depending upon the customer location and the units included.

A Model 2 Rack Enclosure with no units installed in the lower position (7 and 8) is shipped on a pallet in the U.S. and Canada (see Figure 4-1). Ballast is used instead of a pallet in other countries. A pallet or ballast is needed because the rack enclosure is top-heavy and unstable if tilted more than 12 degrees.

You may have a problem moving the unit on the pallet through doorways and hallways (see dimensions in Figure 4-1). Before removing the rack enclosure from the pallet or removing the ballast, read the caution label at the lower front of the rack enclosure.

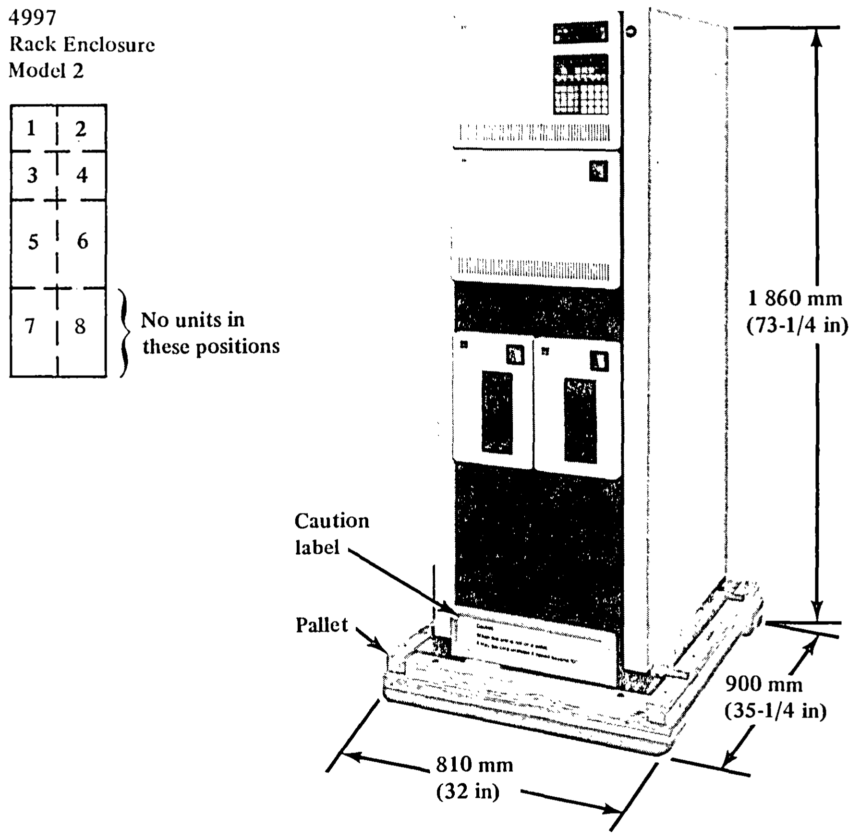
A Model 2 Rack Enclosure with units installed in the lower positions (7 and 8) and all Model 1's are shipped without a pallet (see Figure 4-2) and do not contain ballast. These rack enclosures, however, are unstable if tilted more than 12 degrees.

We recommended that you get a qualified mover to move the rack enclosure to your installation site.

CAUTION

4997 Model 2 Rack Enclosure with no units installed in positions 7 and 8...

- Is shipped on pallet in the U.S. and Canada; contains ballast in other countries.
- Becomes unstable when tilted more than 12° if pallet or ballast is removed. See caution label on rack enclosure.



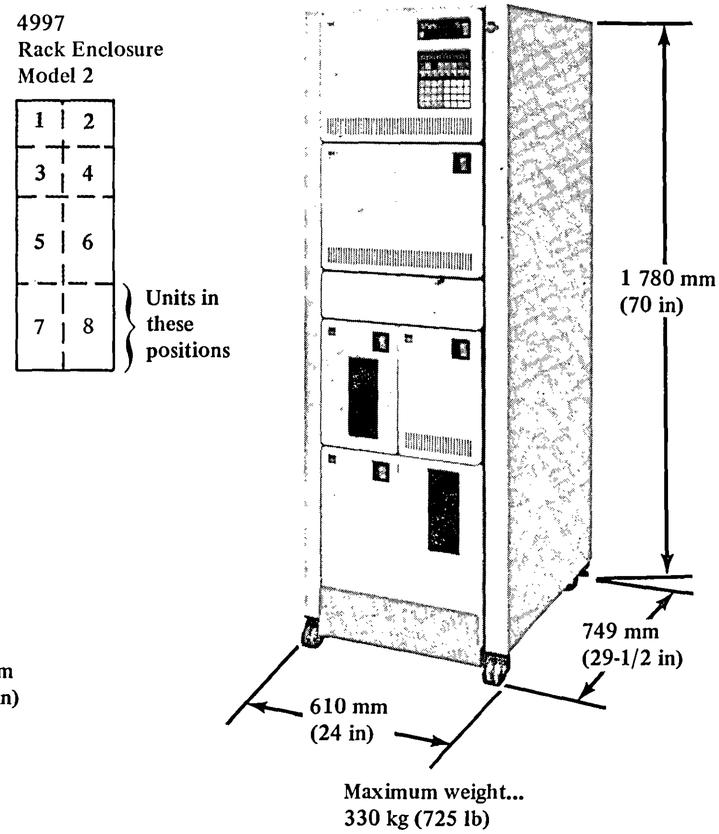
Maximum weight...

- With pallet, 286.4 kg (630 lb)
- With ballast, 358.4 kg (790 lb)

Figure 4-1. Series/1 shipped with a pallet (or ballast)

4997 Model 1 Rack Enclosure,
and
4997 Model 2 Rack Enclosure with units installed in positions 7 and 8...

- Are not shipped on pallet; do not contain ballast.
- Become unstable when tilted more than 12°.



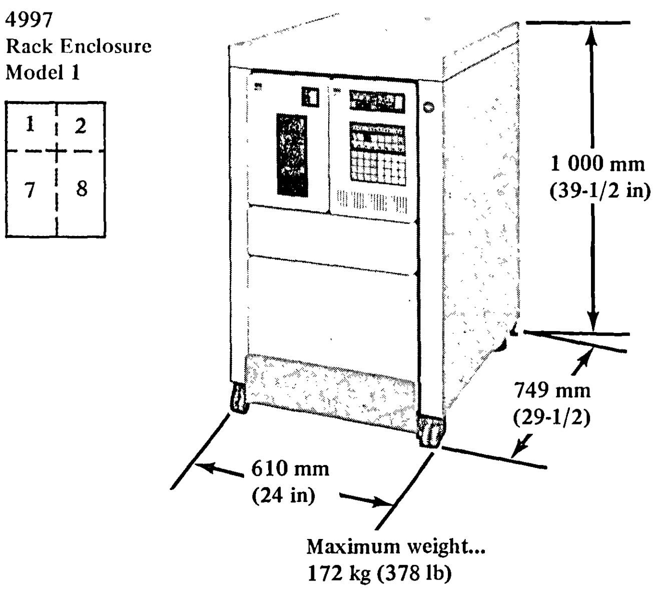


Figure 4-2. Series/1 shipped without a pallet (or ballast)

Chapter 5. Unit specifications

The **specifications** for each IBM Series/1 unit are listed in the following pages. A summary chart of all units is included. For each unit there is a plan view that shows dimensions, service clearances, cable entrances and exits, and the location of casters and leveling pads where applicable.

The symbols used in the plan views are shown in Figure 5-1.

Note: All Series/1 machine types are listed in U.L. report number E33252 as complying with U.L. Standard 478 as NFPA Type II computer equipment.

▭	Cable entry
+	Caster
○	Leveling pad
⊕	Power cable
⊖ ⊖	Service clearance

Figure 5-1. Plan view symbols

Environment

Temperature and relative humidity figures listed for each unit are maximum and minimum operating limits and are not to be construed as optimum operating points. The **optimum operating environment** for Series/1 is 22.2° to 25.6°C (72° to 78°F) and 40% to 50% relative humidity.

Air must flow freely through Series/1 units. The individual unit specification pages provide information about the required air flow. Unless otherwise stated, the fan blower assembly produces forced air cooling.

Metric conversions

In this manual, English units converted into metric units are rounded to the nearest whole number or to the nearest decimal place given. Exceptions are kilograms (kg), watts, cubic meters per minute (m^3/min), lumens per square meter (lumens/m^2), kilograms per square meter (kg/m^2), pertaining to floor loading, and meters (m) pertaining to altitude; these are rounded to the 1/10/50 rule.

To round according to the 1/10/50 rule:

1. When the number is less than 100, round up to the next unit, for example, 23.2 or 23.7 becomes 24.
2. When the number is greater than 100 and less than 1000, round up to the next ten; for example, 163 becomes 170.
3. When the number is greater than 1000, round up to the next 50; for example, 1232 becomes 1250.

Abbreviations and Definitions

A	ampere
ACC	asynchronous communication control
ambient	environment
AWG	American wire gauge
bps	bits per second
BSC	binary synchronous communication
BSM	basic storage module
BTU	British thermal unit
C	Celsius/coupler
CCITT	Consultant Committee of International Telephone & Telegraph (WT)
CE	customer engineer
coax	coacial
cond	conductor
conn	connector
cont	continuous
DAA	Data Access Arrangement
dc	direct current
DCE	data communications equipment
DDA	Direct Disk Attachment
DI	digital input
dist	distribution
DO	digital output
dply	display
DPC	direct program control
DRC	data recording control
EIA	Electronic Industry Association
EPO	emergency power-off
F	Fahrenheit/front
ft	feet
Hz	hertz
in.	inch
I/O	input/output
kcal/hr	kilocalories per hour
kg	kilogram
kg/m^2	kilograms per square meter
kVA	kilovolt ampere
kW	kilowatt
lb	pound
lumens/m	lumens per square meter
m	meter
max	maximum
mfg	manufacturing
min	minimum/minute
mm	millimeter
modem	modulator/demodulator
modulator/demodulator	device that modulates and demodulates communications signals
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
No.	number
PTT	postal telephone and telegraph
PVC	polyvinyl chloride
rfi	radio-frequency interference
RPQ	Request for Price Quotation
service clearance	minimum space required to perform maintenance work
TNL	Technical Newsletter
TSC	two channel switch
TTL	transistor-transistor
TTY	teletypewriter
UL	Underwriters Laboratory
U.S.	United States
V	volt
VCA	voice connecting arrangement

Series/1 unit specifications (metric)

Product			Nonoperating environment			Operating environment		
Type	Model	Unit description	Temperature (C)	Relative humidity (%)	Wet bulb max (C)	Temperature (C)	Relative humidity (%)	Wet bulb max (C)
4952	A, B, C, 30D	Processor						
4954	A, B, C, 30D, 60D	Processor						
4955	A,B,C,D,E,F,	Processor						
4956	B,B10,C,C10, 30D,31D,60D, 61D,60E,E70, E,E10,G10,H10	Processor						
4959	A	I/O Expansion	10° to 51.7°			10° to 40.6°	8% to 80%	26.7°
4962	1,1F,3	Disk Storage						
4962	2,2F,4	Disk Storage						
4963	All	Disk Storage						
4964	1	Diskette						
4965	1, 30D, 60D	Storage and I/O Expansion Unit						
4966	1	Diskette Magazine Unit						
4967	2CA, 2CB, 3CA, 3CB	High-Performance Disk Subsystem						
4968	1AS	Autoload Streaming Magnetic Tape Unit	10° to 43°	8% to 80%	26.7°	15.6°–32.2° see Note 2	20%–80%	22.8°
4969	All	Magnetic Tape Unit						
4973	1	Printer						
4973	2	Printer						
4974	1	Printer						
4975	01A, 01L, 01R	Printer						
4975	02L, 02R	Printer						
4978	1, 2	Display Station (RPQ)	10° to 51.7°			10° to 40.6°	8% to 80%	26.7°
4979	1	Display						
4980	1	Display Station						
4982	1	Sensor I/O						
4987	1	Comm. Subsystem						
4993	1	Series/1–System/370 Termination Enclosure						
4999	1, 2	Battery Backup						
5219	D01, D02	Typewheel Printer	10° to 43°			15.6°–32.2°	20%–80%	22.8°
5224	1, 2	Printer						
5225	1, 2, 3, 4	Printer						
5262	1	Printer						
4997	1A	Rack Enclosure	–	–	–	–	–	–
4997	2A	Rack Enclosure	–	–	–	–	–	–
4997	1B	Rack Enclosure	–	–	–	–	–	–
4997	2B	Rack Enclosure	–	–	–	–	–	–

Notes...

1. The given temperature and relative humidity are upper and lower limits. Do not confuse with ideal (optimum) values, which are 22.2° to 25.6° C and 40% to 50% relative humidity.
2. The 4969 operating temperature is 15.6° to 32.2°C, independent of magnetic tape type used. Because of a 2.8° C (max) temperature difference between ambient inlet air and the tape chamber, the 4969 should not operate at ambient temperatures greater than 29.4° C when using tapes as specified in *Tape Specifications for the IBM One-Half Inch Tape Drives at 556, 800, 1600, and 6250 BPI,* GA32-0006.

Series/1 Unit specifications (metric)

Product			Power load (kVA)	Heat output (watts)	Weight (kg)
Type	Model	Unit description			
4952	A (below 50,000)	Processor (Note 1)	0.3	279	25
4952	A (above 50,000)	Processor (Note 1)	0.3	290	14
4952	B (below 15,399)	Processor	1.0	699	23
4952	B (above 15,400)	Processor	0.7	500	23
4952	C	Processor	0.6	350	43 (Note 4)
4952	30D	Processor	0.81	650	50 (Note 4)
4954	A	Processor (Note 1)	0.3	290	14
4954	B	Processor	0.7	500	23
4954	C	Processor	0.6	350	43 (Note 4)
4954	30D,60D	Processor	0.81	650	50 (Note 4)
4955	A,B,C,D	Processor	0.8	500	23
4955	E	Processor	1.0	699	23
4955	F	Processor	0.7	500	23
4956	B,B10 E,E10	Processor	0.7	500	23
4956	C,C10	Processor	0.6	350	43 (Note 4)
4956	30D,31D, 60D,61D, 60E,E70	Processor	0.81	650	50 (Note 4)
4956	G10,H10	Processor	1.0	600	55 (Note 4)
4959	A (below 22,499)	I/O Expansion	0.8	500	23
4959	A (above 22,500)	I/O Expansion	0.7	500	23
4962	1, 1F, 3	Disk Storage	0.55	480	61
4962	2, 2F, 4	Disk Storage	0.6	559	68
4963	A	Disk Storage	0.5	242	54
4963	B	Disk Storage	0.4	242	54
4964	1	Diskette (Note 1)	0.22	150	18

Series/1 unit specifications (metric)

Product			Power load (kVA)	Heat output (watts)	Weight (kg)
Type	Model	Unit description			
4965	1	Storage and I/O Expansion Unit	0.7	433	43 (Note 4)
4965	30D, 60D	Storage and I/O Expansion Unit	0.81	650	50 (Note 4)
4966	1	Diskette Magazine Unit	0.5	205	42
4967	2CA, 3CA	High-Performance Disk Subsystem	0.77	500	68
4967	2CB, 3CB	High-Performance Disk Subsystem	0.73	400	68
4968	1AS	Autoload Streaming Magnetic Tape Unit	0.2	180	36
4969	4D,4N,4P	Magnetic Tape Unit	0.5	514	59 (Note 3)
4969	7D,7N,7P	Magnetic Tape Unit	1.0	850	84 (Note 3)
4973	1	Printer	0.4	403	132
4973	2	Printer	0.5	403	143
4974	1	Printer	0.12	114	25
4975	01A,01L,01R	Printer	0.14	125	26
4975	02L,02R	Printer	0.19	175	30
4978	1,2	Display Station (RPQ)	0.12	100	22
4979	1	Display	0.15	115	14
4980	1	Display Station	0.2	85	21
4982	1	Sensor I/O (Note 1)	0.2	153	20
4987	1	Comm. Subsystem	0.32	325	45
4993	1	Series/1–System/370 Termination Enclosure	0.04	40	11
4999	1,2	Battery Backup (Note 1)	(Note 2)	109	32
5219	D01,D02	Typewheel Printer	0.25	100	31
5224	1	Printer	0.3	550	68
5224	2	Printer	0.3	600	68
5225	1	Printer	0.60	750	250
5225	2	Printer	0.72	800	250
5225	3	Printer	0.75	900	250
5225	4	Printer	0.90	1 000	250
5262	1	Printer	1.2	1 097	246
4997	1A	Rack Enclosure	–	–	57
4997	2A	Rack Enclosure	–	–	107
4997	1B	Rack Enclosure	–	–	57
4997	2B	Rack Enclosure	–	–	107

Notes...

1. Also need rack adapter weighing 8 kg.
2. Add 0.1 kVA to the power load of the attached processor.
3. Includes a controller weighing 6 kg (feature # 1540, 1545, or 1550).
4. Add 7 kg for units with stand-alone enclosure.

Series/1 unit specifications (English)

Product			Nonoperating environment			Operating environment		
Type	Model	Unit description	Temperature (F)	Relative humidity (%)	Wet bulb max (F)	Temperature (F)	Relative humidity (%)	Wet bulb max (F)
4952	A, B, C, 30D	Processor						
4954	A, B, C, 30D, 60D	Processor						
4955	A,B,C,D,E,F,	Processor						
4956	B,B10,C,C10, 30D,31D,60D, 61D,60E,E70, E,E10,G10,H10	Processor						
4959	A	I/O Expansion						
4962	1,1F,3	Disk Storage	50° to 125°			50° to 105°	8% to 80%	80°
4962	2,2F,4	Disk Storage						
4963	All	Disk Storage						
4964	1	Diskette						
4965	1, 30D, 60D	Storage and I/O Expansion Unit						
4966	1	Diskette Magazine Unit						
4967	2CA, 2CB, 3CA, 3CB	High-Performance Disk Subsystem						
4968	1AS	Autoload Streaming Magnetic Tape Unit	50° to 110°	8% to 80%	80°	60°–90° see Note 2	20%–80%	73°
4969	All	Magnetic Tape Unit						
4973	1	Printer						
4973	2	Printer						
4974	1	Printer						
4975	01A,01L,01R	Printer						
4975	02L, 02R	Printer						
4978	1, 2	Display Station (RPQ)						
4979	1	Display	50° to 125°			50° to 105°	8% to 80%	80°
4980	1	Display Station						
4982	1	Sensor I/O						
4987	1	Comm. Subsystem						
4993	1	Series/1–System/370 Termination Enclosure						
4999	1, 2	Battery Backup						
5219	D01, D02	Typewheel Printer	50° to 110°			60° to 90°	20%–80%	73°
5224	1, 2	Printer						
5225	1, 2, 3, 4	Printer						
5262	1	Printer						
4997	1A	Rack Enclosure	–	–	–	–	–	–
4997	2A	Rack Enclosure	–	–	–	–	–	–
4997	1B	Rack Enclosure	–	–	–	–	–	–
4997	2B	Rack Enclosure	–	–	–	–	–	–

Notes...

1. The given temperature and relative humidity are upper and lower limits. Do not confuse with ideal (optimum) values, which are 72° to 78° and 40% to 50% relative humidity.
2. The 4969 operating temperature is 60° to 90° F, independent of magnetic tape type used. Because of a 5° F (max) temperature difference between ambient inlet air and the tape chamber, the 4969 should not operate at ambient temperatures greater than 85° F when using tapes as specified in *Tape Specifications for the IBM One-Half Inch Tape Drives at 556, 800, 1600, and 6250 BPI,* GA32-0006.

Series/1 unit specifications (English)

Product			Power load (kVA)	Heat output/ (Btu/hr)	Weight (lbs)
Type	Model	Unit description			
4952	A (below 50,000)	Processor (Note 1)	0.3	954	55
4952	A (above 50,000)	Processor (Note 1)	0.3	992	30
4952	B (below 15,399)	Processor	1.0	2 399	50
4952	B (above 15,400)	Processor	0.7	1 705	50
4952	C	Processor	0.6	1 194	95 (Note 4)
4952	30D	Processor	0.81	2 220	111 (Note 4)
4954	A	Processor (Note 1)	0.3	992	30
4954	B	Processor	0.7	1 705	50
4954	C	Processor	0.6	1 194	95 (Note 4)
4954	30D,60D	Processor	0.81	2 220	111 (Note 4)
4955	A,B,C,D	Processor	0.8	1 707	50
4955	E	Processor	1.0	2 389	50
4955	F	Processor	0.7	1 705	50
4956	B,B10, E,E10	Processor	0.7	1 705	50
4956	C,C10	Processor	0.6	1 194	95 (Note 4)
4956	30D,31D, 60D,61D, 60E,E70, E,E10	Processor	0.81	2 220	111 (Note 4)
4956	G10,H10	Processor	1.0	2 080	121 (Note 4)
4959	A (below 22,499)	I/O Expansion	0.8	1 707	50
4959	A (above 22,500)	I/O Expansion	0.7	1 705	50
4962	1,1F,3	Disk Storage	0.65	1 640	135
4962	2,2F,4	Disk Storage	0.7	1 910	150
4963	29A,64A	Disk Storage	0.5	827	120
4963	58B,64B	Disk Storage	0.4	827	120
4964	1	Diskette (Note 1)	0.22	520	40

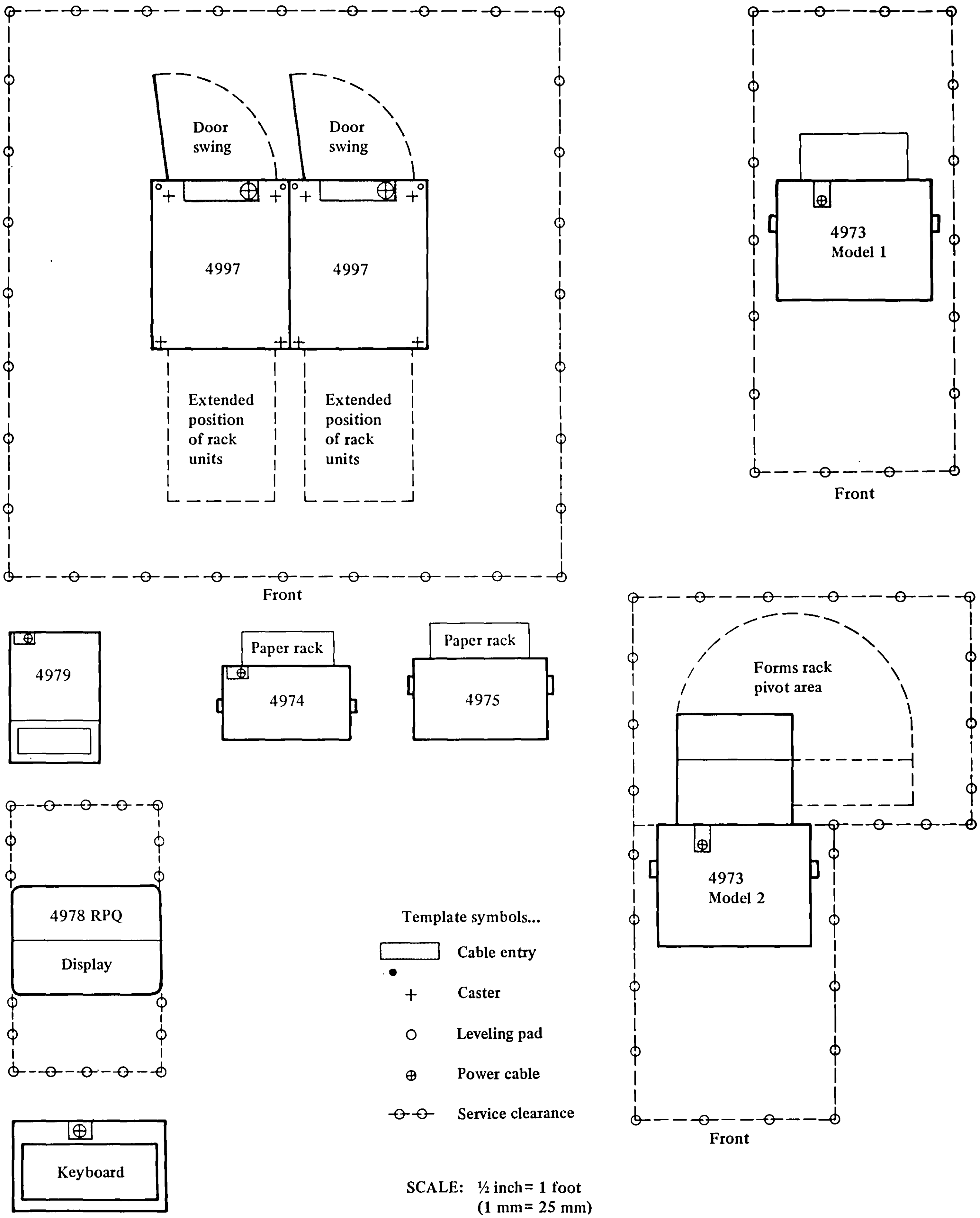
Series/1 unit specifications (English)

Product			Power load (kVA)	Heat output (Btu/hr)	Weight (lbs)
Type	Model	Unit description			
4965	1	Storage and I/O Expansion Unit	0.7	1 480	95 (Note 4)
4965	30D,60D	Storage and I/O Expansion Unit	0.81	2 220	111 (Note 4)
4966	1	Diskette Magazine Unit	0.5	700	93
4967	2CA, 3CA	High-Performance Disk Subsystem	0.77	1 730	150
4967	2CB, 3CB	High-Performance Disk Subsystem	0.73	1 365	150
4968	1AS	Autoload Streaming Magnetic Tape Unit	0.2	615	80
4969	4D,4N,4P	Magnetic Tape Unit	0.5	1 706	140 (Note 3)
4969	7D,7N,7P	Magnetic Tape Unit	1.0	2 900	185 (Note 3)
4973	1	Printer	0.4	1 380	290
4973	2	Printer	0.5	1 380	315
4974	1	Printer	0.12	390	55
4975	01A,01L,01R	Printer	0.14	515	58
4975	02L,02R	Printer	0.19	600	66
4978	1,2	Display Station (RPQ)	0.12	345	60
4979	1	Display	0.15	392	30
4980	1	Display Station	0.2	300	47
4982	1	Sensor I/O (Note 1)	0.2	522	45
4987	1	Comm. Subsystem	0.32	1 090	100
4993	1	Series/1–System/370 Termination Enclosure	0.04	136	25
4999	1,2	Battery Backup (Note 1)	(Note 2)	375	71
5219	D01,D02	Typewheel Printer	0.25	341	68
5224	1	Printer	0.30	1 880	149
5224	2	Printer	0.30	2 050	149
5225	1	Printer	0.60	2 562	550
5225	2	Printer	0.72	2 733	550
5225	3	Printer	0.75	3 074	550
5225	4	Printer	0.90	3 416	550
5262	1	Printer	1.2	3 250	540
4997	1A	Rack Enclosure	–	–	125
4997	2A	Rack Enclosure	–	–	235
4997	1B	Rack Enclosure	–	–	125
4997	2B	Rack Enclosure	–	–	235

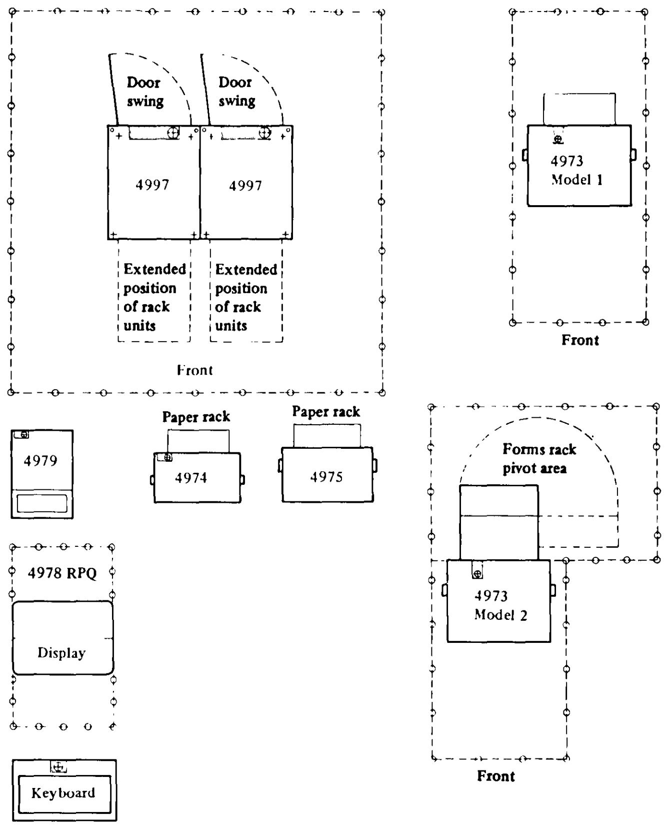
Notes...

1. Also need rack adapter weighing 17 lb.
2. Add 0.1 kVA to the power load of the processor.
3. Includes a controller weighing 13 lb (feature # 1540, 1545, or 1550).
4. Add 15 lb for units with stand-alone enclosure.

Floor-layout templates



Floor-layout templates



Template symbols...

Cable entry

+ Caster

○ Leveling pad

⊕ Power cable

⊖ ⊖ Service clearance

SCALE: ¼ inch = 1 foot
(1 mm = 50 mm)

Environmental limits for Series/1 shipment and storage

The following criteria applies to all Series/1 machines except as noted.

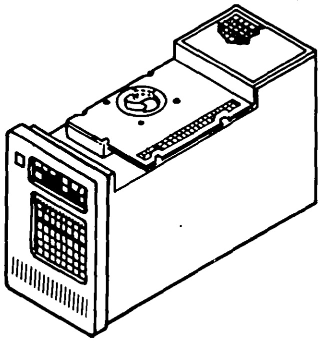
These limits do not apply to supplies (tape, diskettes, cards, paper forms, ribbons, and so on). See individual supply specifications as required.

	Shipment	Storage
Air temperature (except 4978, 4979, and 4980)	-40 to + 60°C (-40 to +140°F)	0.6 to 60°C (33 to 140°F)
Air temperature 4978, 4979, and 4980	20 to + 60°C (-4 to +140°F)	0.6 to 60°C (33 to 140°F)
Relative humidity	5 to 100% excluding rain	5 to 80%
Wet bulb temperature	0.6 to 29.4°C (33 to 85°F)	0.6 to 29.4°C (33 to 85°F)
Vibration	See Chapter 9	
Shock	See Chapter 9	

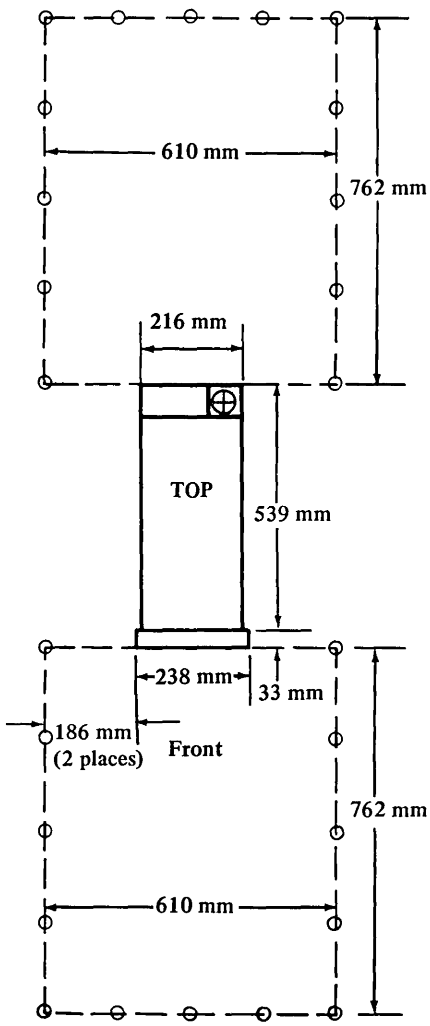
Notes:

1. The upper limit of air temperature is derated 0.6°C (1°F) per 75 m (250 ft) of elevation above 914 m (3000 ft).
2. The upper limit of wet bulb temperature is derated 0.6°C (1°F) per 152 m (500 ft) of elevation above 305 m (1000 ft).
3. Thermal shock and thermal rate of change should be kept to a minimum during all shipment and storage of Series/1 machines.

4952 Processor Model A (below serial #50,000)



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
572	22-1/2
539	22-1/4
238	9-1/2
216	8-1/2
186	8
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	238	572	312
(Inches)	(9-1/2)	(22-1/2)	(12-1/2)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight 25 kg (55 lb)

Heat Output/Hr. 279 Watts (954 Btu)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nomin
100	90 - 110	3.5	100	90 - 110	3.5
110	96.5 - 119	3.5	110	96.5 - 119	3.5
115	104 - 127	3.5	200	180 - 220	2.0
127	111 - 137	3.5	220	193 - 238	2.0
200	180 - 220	2.0	230	202 - 249	2.0
208	180 - 220	2.0	240	210 - 259	2.0
220	193 - 238	2.0			
230	208 - 254	2.0			

kVA	0.3
Phase	1
Branch circuit	15 A

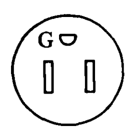
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

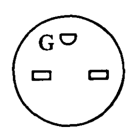
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

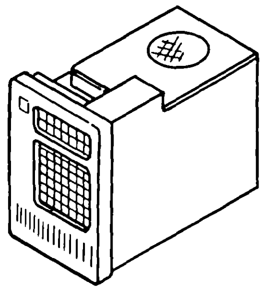
Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

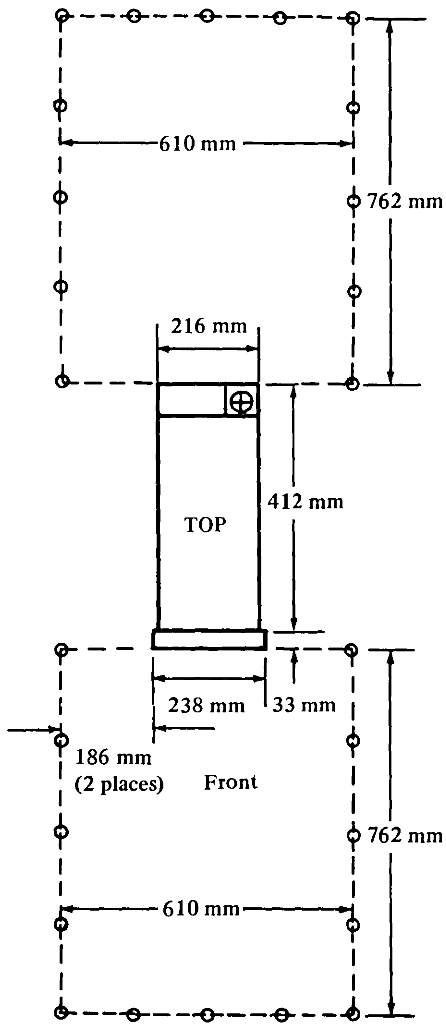
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–45 Hz		
continuous	=	0.27 G peak acceleration
transient	=	0.37 G peak acceleration
45–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient&	=	0.33 G peak acceleration





Millimeters	Inches
762	30
610	24
445	17-1/2
412	16-1/4
238	9-1/2
216	8-1/2
186	8
33	1-1/2

Dimensions

	Width	Depth	Height
Millimeters	238	445	356
(Inches)	(9-1/2)	(17-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight 14 kg (30 lb)

Heat Output/Hr. 290 Watts (992 Btu)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	3.5	100	90 - 110	3.5
110	96.5 - 119	3.5	110	96.5 - 119	3.5
115	104 - 127	3.5	200	180 - 220	2.0
127	111 - 137	3.5	220	193 - 238	2.0
200	180 - 220	2.0	230	202 - 249	2.0
208	180 - 220	2.0	240	210 - 259	2.0
220	193 - 238	2.0			
230	208 - 254	2.0			

kVA	0.3
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

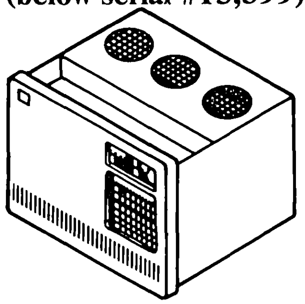
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

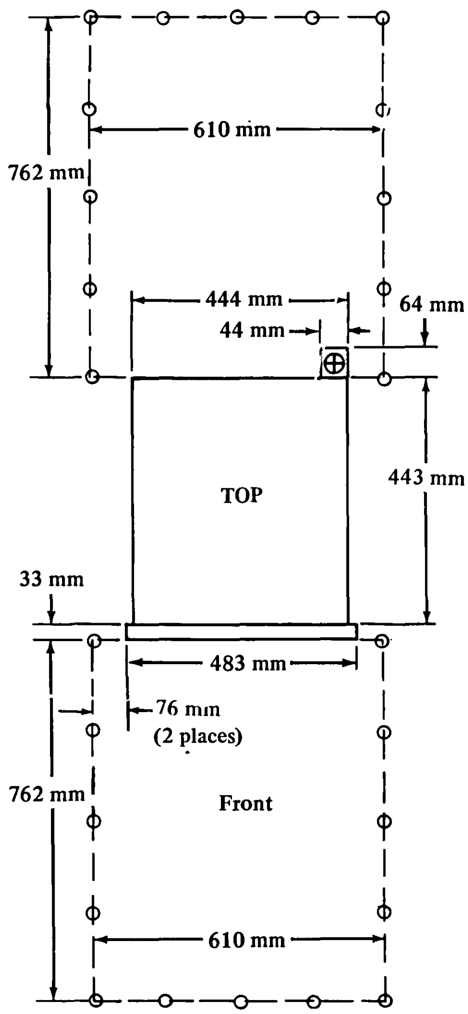
Make sure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits.

5–13 Hz		
continuous	=	0.762 mm (0.005 in.) double amplitude
transient	=	1.016 mm (0.008 in.) double amplitude
13–45 Hz		
continuous	=	0.27 mm (0.005 in.) double amplitude
transient	=	0.37 mm (0.008 in.) double amplitude
45–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4952 Processor Model B (below serial #15,399)



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

The 4952 extends on self-contained slides indicated in the plan view.

Weight 23 kg (50 lb)

Heat Output/Hr. 699 Watts (2 389 Btu)

Required Air Flow convection cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	9.1	100	90 - 110	9.1
110	96.5 - 119	9.1	110	96.5 - 119	9.1
115	104 - 127	9.1	200	180 - 220	5.6
127	111 - 137	9.1	220	193 - 238	5.6
200	180 - 220	5.6	230	202 - 249	5.6
208	180 - 220	5.6	240	210 - 259	5.6
220	193 - 238	5.6			
230	208 - 254	5.6			

kVA	1.0
Phase	1
Branch circuit	15 A

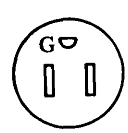
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

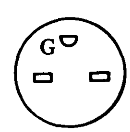
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

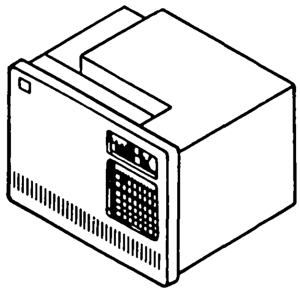
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

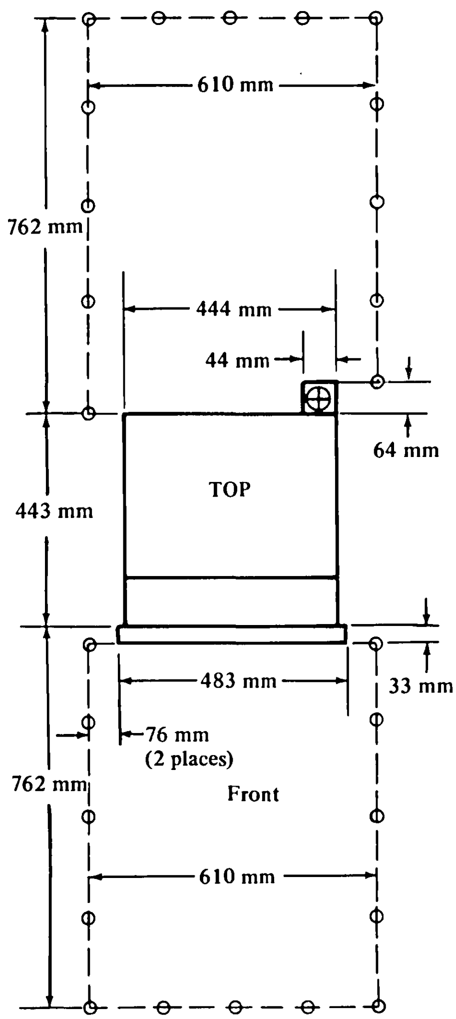
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–45 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
45–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4952 Processor Model B (above serial #15,400)



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 23 kg (50 lbs)

Heat Output 500 watts (1705 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0	100	90 - 110	7.0
110	96.5 - 119	6.4	110	96.5 - 119	6.4
115	104 - 127	6.1	123.5	111 - 136	5.7
200	180 - 220	3.5	200	180 - 220	3.5
208	180 - 220	3.4	220	193 - 238	3.2
220	193 - 238	3.2	230	202 - 249	3.1
230	208 - 254	3.1	235	210 - 259	3.0

kVA	.70
Phase	1
Branch circuit	15A

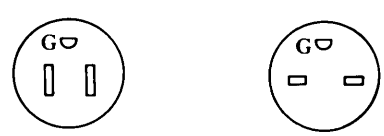
Switch-on and power-line-disturbance input surge current will not exceed 50 amp peak for 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R



Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

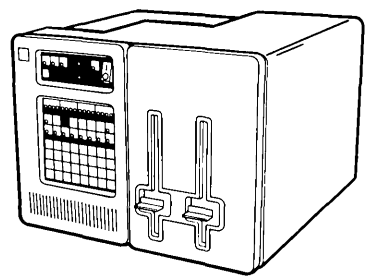
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

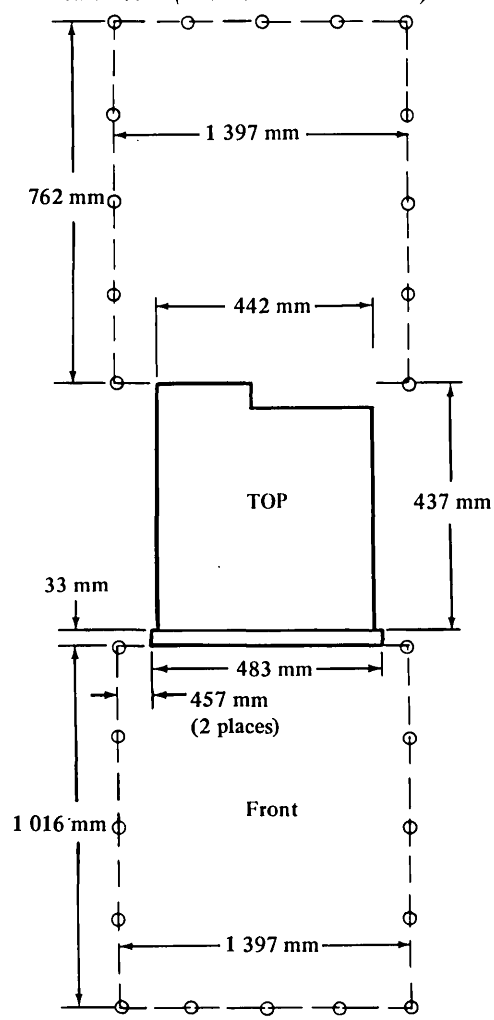
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz	
continuous	= 0.914 mm (0.036 in.) double amplitude
transient	= 1.22 mm (0.048 in.) double amplitude
17–200 Hz	
continuous	= 0.55 G peak acceleration
transient	= 0.73 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4952 Processor Model C
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
483	19
470	18-1/2
457	18
444	17-1/2
437	17
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	470	356
(Inches)	(19)	(18-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 43 kg (95 lb)

Max Heat Output 350 watts (1194 Btu/hr)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0	100	90 - 110	6.0
110	96.5 - 119	5.5	110	96.5 - 119	5.5
115	104 - 127	5.2	123.5	111 - 136	4.9
120	104 - 127	5.0	200	180 - 220	3.0
127	111 - 137	4.8	220	193 - 238	2.7
200	180 - 220	3.0	230	202 - 249	2.6
208	180 - 220	2.9	235	212 - 258	2.6
220	193 - 238	2.7	240	210 - 259	2.5
230	208 - 254	2.6			
240	208 - 254	2.5			

kVA	0.6
Phase	1
Branch circuit	15 A

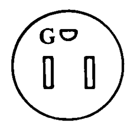
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

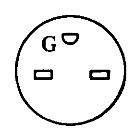
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

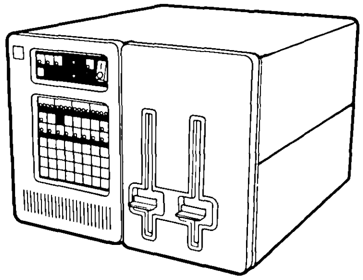
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

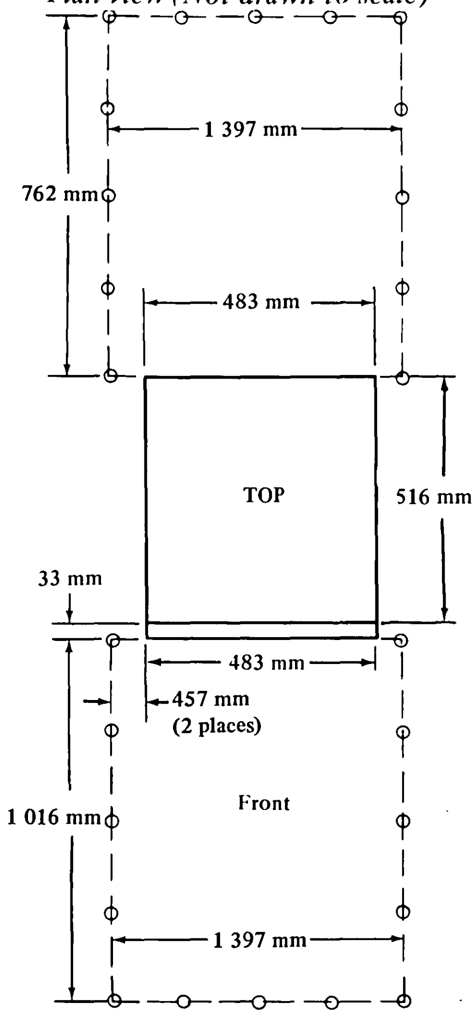
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4952 Processor Model C Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	50
1 016	40
762	30
549	21-3/4
516	20-1/2
483	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	549	356
(Inches)	(19)	(21-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lb)

Max Heat Output 350 watts (1194 Btu/hr)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0
110	96.5 - 119	5.5
115	104 - 127	5.2
120	104 - 127	5.0
127	111 - 137	4.8
200	180 - 220	3.0
208	180 - 220	2.9
220	193 - 238	2.7
230	208 - 254	2.6
240	208 - 254	2.5

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0
110	96.5 - 119	5.5
123.5	111 - 136	4.9
200	180 - 220	3.0
220	193 - 238	2.7
230	202 - 249	2.6
235	212 - 258	2.6
240	210 - 259	2.5

kVA	0.6
Phase	1
Branch circuit	15 A

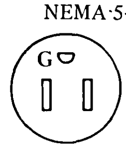
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes peak for over 0.5 cycle.

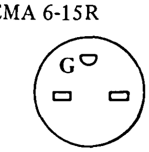
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

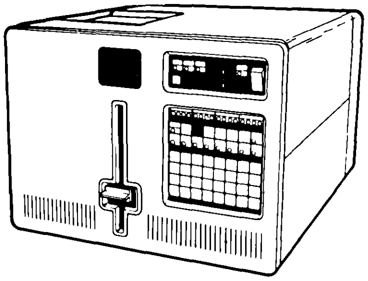
The **temperature and relative humidity** listed on pages 5-3 and 5-5 are upper and lower limits; they are not optimum operating points.

Vibration limits

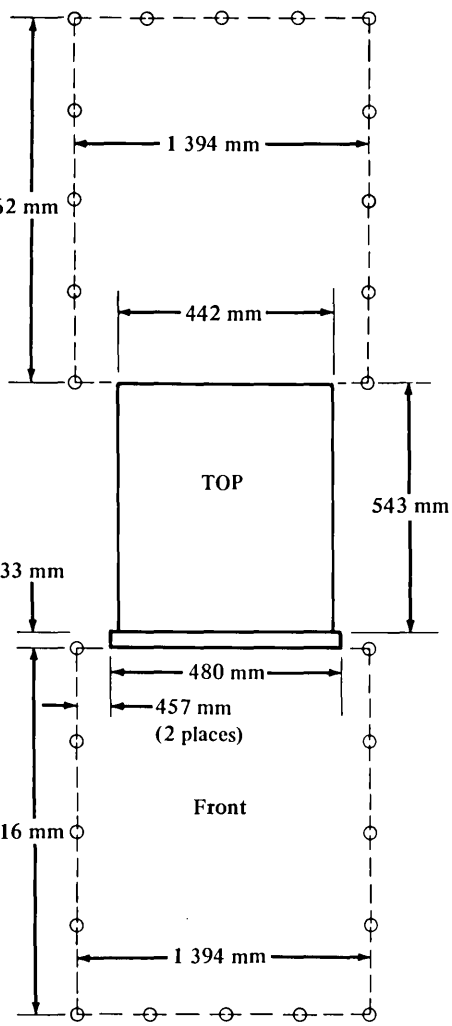
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz	
continuous	= 0.762 mm (0.030 in.) double amplitude
transient	= 1.016 mm (0.040 in.) double amplitude
13–200 Hz	
continuous	= 0.30 G peak acceleration
transient	= 0.40 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4952 Processor Model 30D
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
576	24
543	21-1/2
480	19
457	18
442	17-1/2
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	576	346
(Inches)	(19)	(22-3/4)	(13-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lbs) (with Diskette Drive option)

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15 A

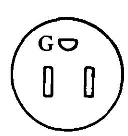
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

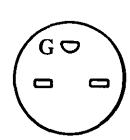
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment.

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

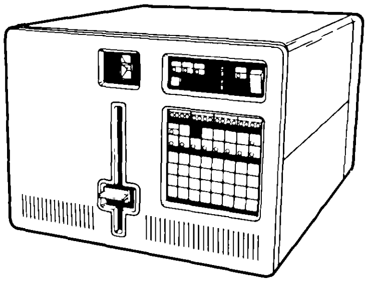
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits.

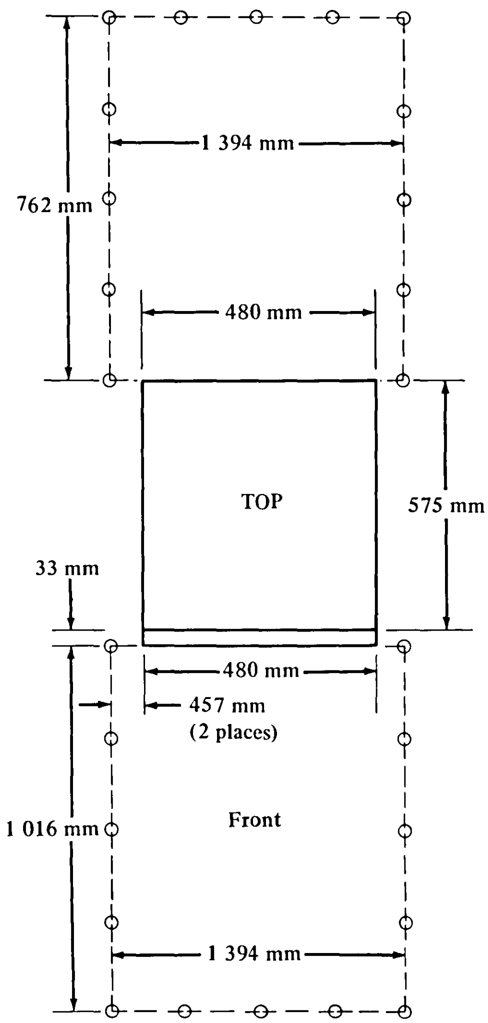
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4952 Processor Model 30D Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
608	24
575	22-3/4
480	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	480	608	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 57 kg (126 lbs) (with Diskette Drive option)

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15 A

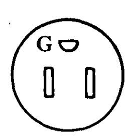
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

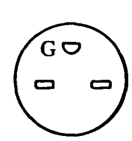
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4952 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

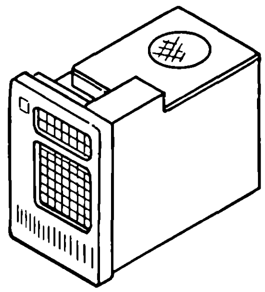
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4952 is designed to operate within the following limits.

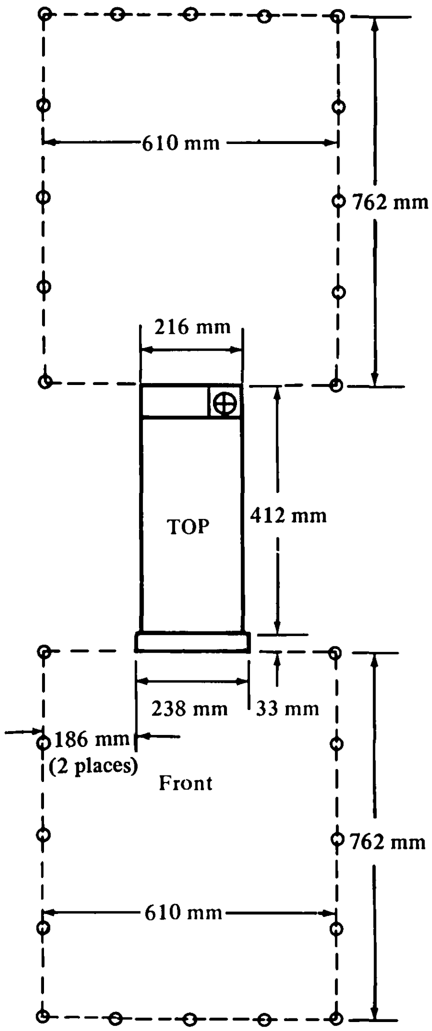
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4954 Processor Model A



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
445	17-1/2
238	9-1/2
216	8-1/2
186	8
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	238	445	356
(Inches)	(9-1/2)	(17-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight	14 kg	(30 lb)
Heat Output/Hr.	290 Watts (992 Btu)	
Required Air Flow	forced-air cooling	

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	3.5	100	90 - 110	3.5
110	96.5 - 119	3.5	110	96.5 - 119	3.5
115	104 - 127	3.5	200	180 - 220	2.0
127	111 - 137	3.5	220	193 - 238	2.0
200	180 - 220	2.0	230	202 - 249	2.0
208	180 - 220	2.0	240	210 - 259	2.0
220	193 - 238	2.0			
230	208 - 254	2.0			

kVA	0.3
Phase	1
Branch	15 A

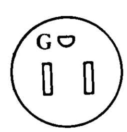
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

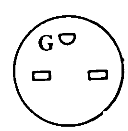
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

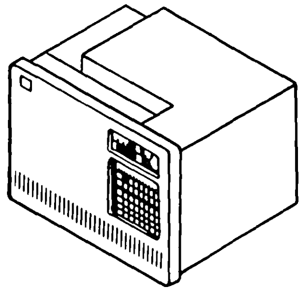
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

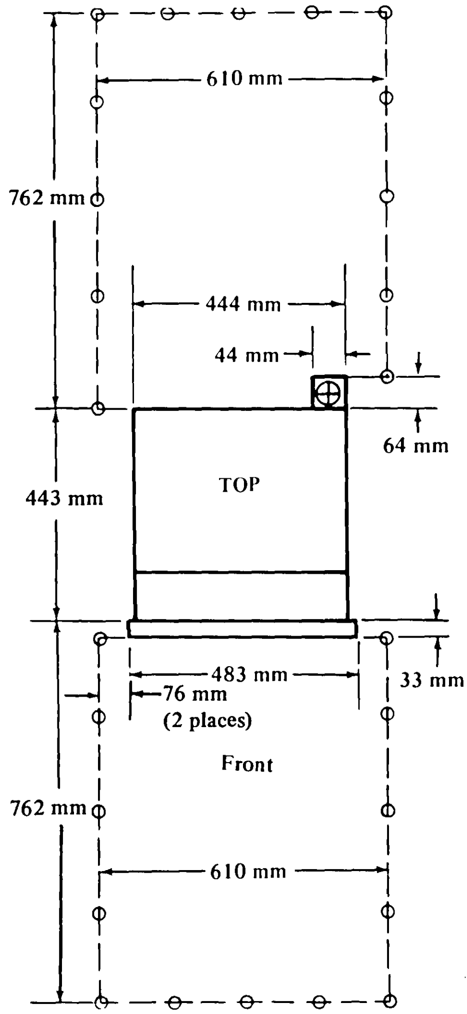
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4954 Processor Model B



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 23 kg (50 lbs)

Heat Output 500 watts (1705 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0	100	90 - 110	7.0
110	96.5 - 119	6.4	110	96.5 - 119	6.4
115	104 - 127	6.1	123.5	111 - 136	5.7
200	180 - 220	3.5	200	180 - 220	3.5
208	180 - 220	3.4	220	193 - 238	3.2
220	193 - 238	3.2	230	202 - 249	3.1
230	208 - 254	3.1	235	210 - 259	3.0

kVA	.70
Phase	1
Branch circuit	15A

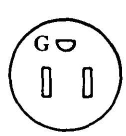
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for 0.5 cycle.

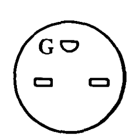
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

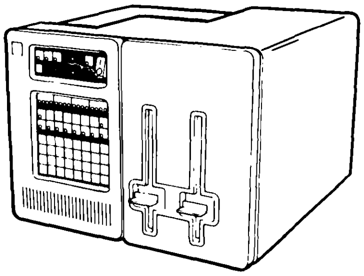
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

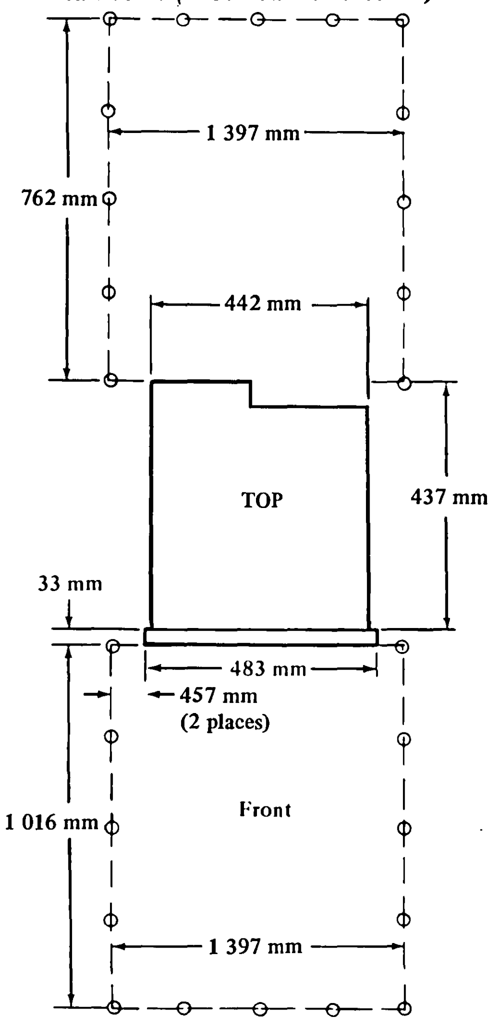
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4954 Processor Model C
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
483	19
470	18-1/2
457	18
442	17-1/2
437	17
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	470	356
(Inches)	(19)	(18-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 43 kg (95 lb)

Max Heat Output 350 watts (1194 Btu/hr)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0	100	90 - 110	6.0
110	96.5 - 119	5.5	110	96.5 - 119	5.5
115	104 - 127	5.2	123.5	111 - 136	4.9
120	104 - 127	5.0	200	180 - 220	3.0
127	111 - 137	4.8	220	193 - 238	2.7
200	180 - 220	3.0	230	202 - 249	2.6
208	180 - 220	2.9	235	212 - 258	2.6
220	193 - 238	2.7	240	210 - 259	2.5
230	208 - 254	2.6			
240	208 - 254	2.5			

kVA	0.6
Phase	1
Branch circuit	15 A

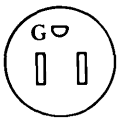
Switch-on and power-line disturbance input surge current will not exceed 50 amperes for over 10 milliseconds.

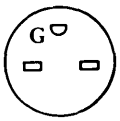
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

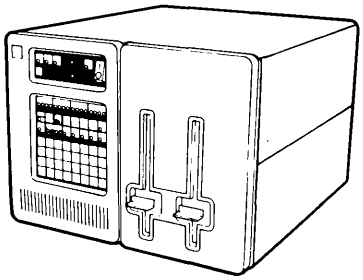
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

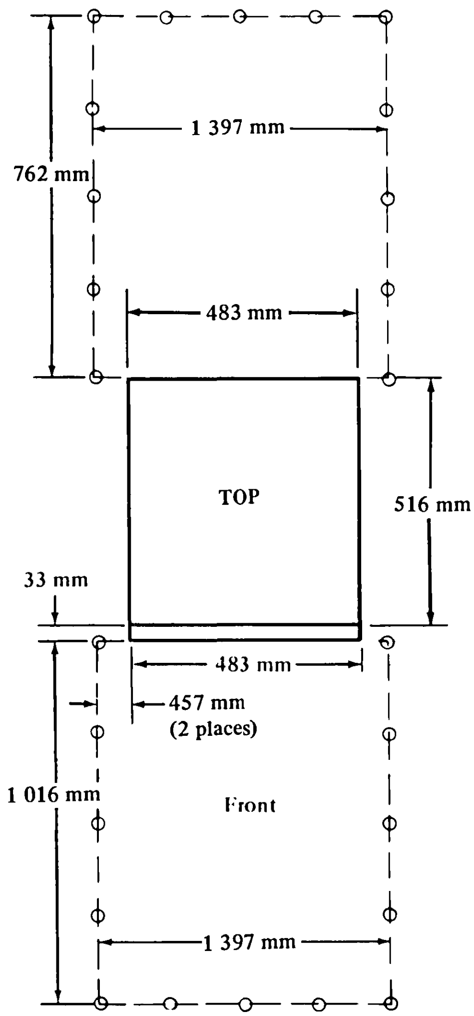
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4954 Processor Model C Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
549	21-3/4
516	20-1/2
483	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	549	356
(Inches)	(19)	(21-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lb)

Max Heat Output 350 watts (1194 Btu/hr)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits Limits	Amps (Nominal)
100	90 - 110	6.0
110	96.5 - 119	5.5
115	104 - 127	5.2
120	104 - 127	5.0
127	111 - 137	4.8
200	180 - 220	3.0
208	180 - 220	2.9
220	193 - 238	2.7
230	208 - 254	2.6
240	208 - 254	2.5

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amp (Nominal
100	90 - 110	6.0
110	96.5 - 119	5.5
123.5	111 - 136	4.9
200	180 - 220	3.0
220	193 - 238	2.7
230	202 - 249	2.6
235	212 - 258	2.6
240	210 - 259	2.5

kVA	0.6
Phase	1
Branch circuit	15 A

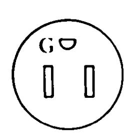
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 10 milliseconds.

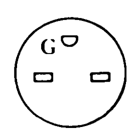
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

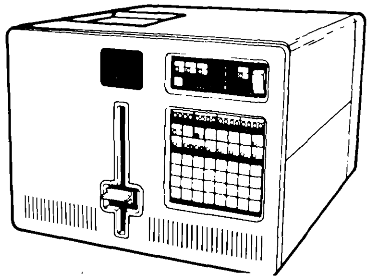
The **temperature and relative humidity** listed on pages 5-3 and 5-5 are upper and lower limits; they are not optimum operating points.

Vibration limits

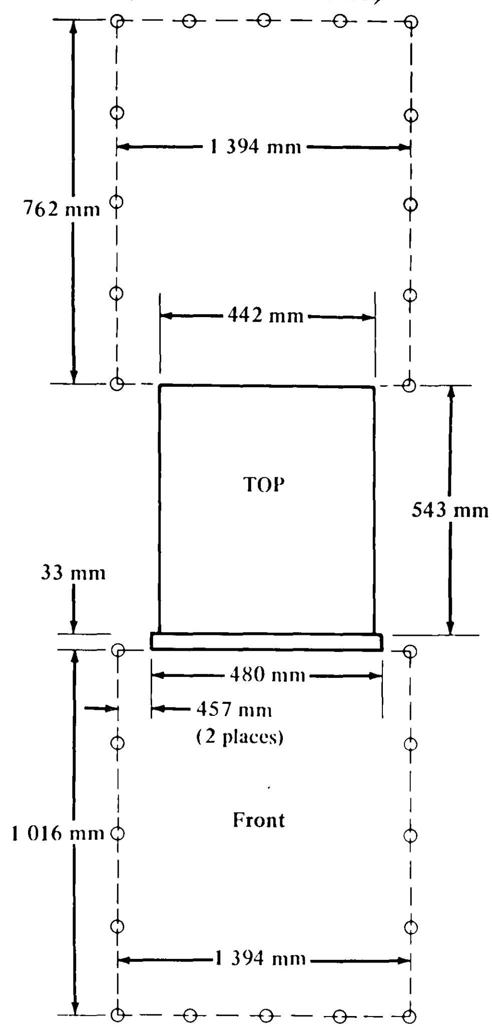
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz	
continuous	= 0.762 mm (0.030 in.) double amplitude
transient	= 1.016 mm (0.040 in.) double amplitude
13–200 Hz	
continuous	= 0.30 G peak acceleration
transient	= 0.40 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4954 Processor Models 30D and 60D
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
576	22-1/2
543	21-1/2
480	19
457	18
442	17-1/2
356	14
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	576	346
(Inches)	(19)	(22-3/4)	(13-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lbs) (with Diskette Drive c

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (nominal)	Volts Nominal	Limits	Am (no
100	90 - 110	8.0	100	90 - 110	8.
110	96.5 - 119	7.3	110	96.5 - 119	7.
115	104 - 127	7.0	123.5	111 - 136	6.
120	104 - 127	6.7	200	180 - 220	4.
127	111 - 137	6.4	220	193 - 238	3.
200	180 - 220	4.0	230	208 - 254	3.
208	180 - 220	3.9	235	212 - 258	3.4
220	193 - 238	3.7	240	210 - 259	3.4
230	208 - 254	3.5			
240	208 - 254	3.4			

kVA	0.81
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

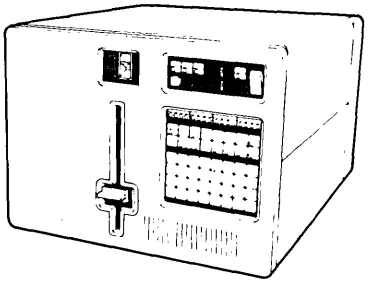
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits.

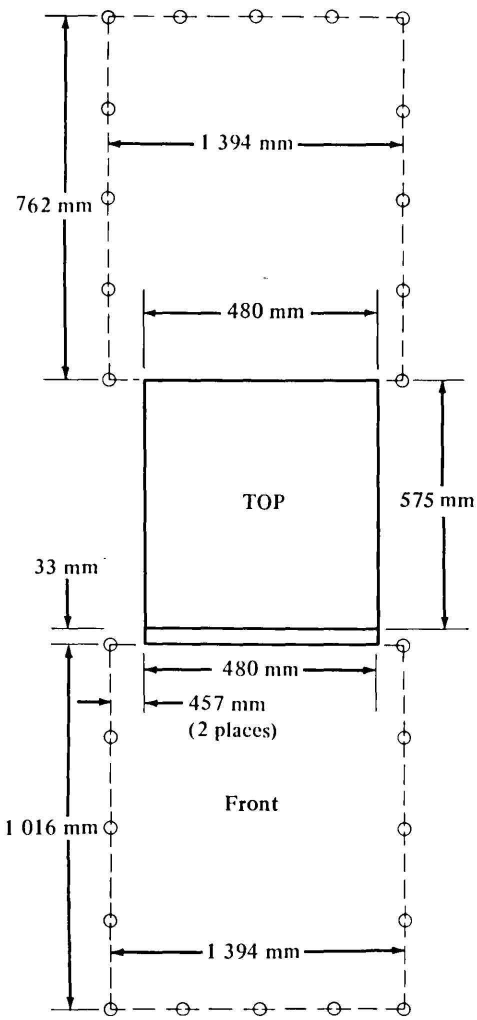
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4954 Processor Models 30D and 60D Stand-Alone
Feature 4520



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
608	24
575	22-3/4
480	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	480	608	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 57 kg (126 lbs) (with Diskette Drive option)

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4954 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

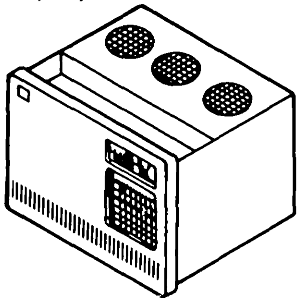
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4954 is designed to operate within the following limits.

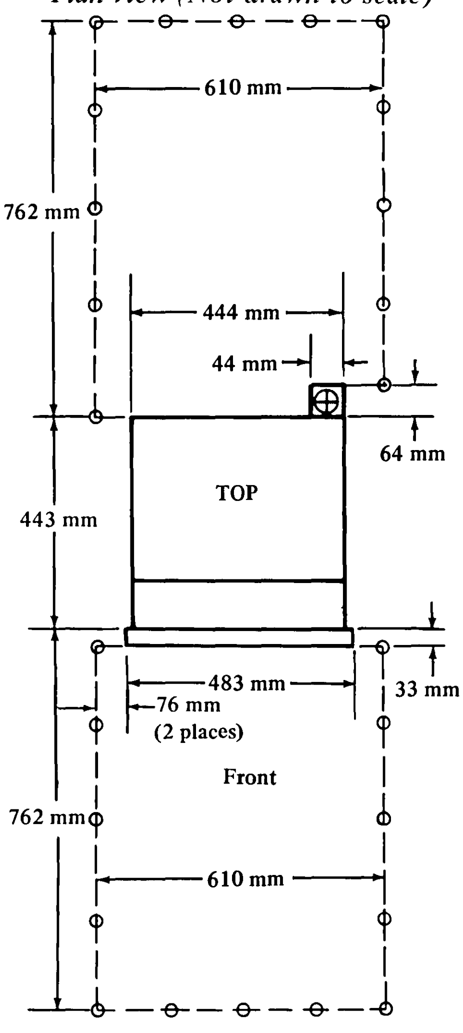
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4955 Processor Models A, B, C, D, and E



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 23 kg (50 lb)

Heat Output/Hr.

Models A,B,C,D	500 Watts	(1 707 Btu)
Model E	699 Watts	(2 389 Btu)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz				50 Hz ± 0.5 Hz			
Volts Nominal	Limits	Models A,B,C,D Amperes	Model E Amperes	Volts Nominal	Limits	Models A,B,C,D Amperes	Model E Amper
100	90 - 110	8.0	9.1	100	90 - 110	8.0	9.1
110	96.5 - 119	8.0	9.1	110	96.5 - 119	8.0	9.1
115	104 - 127	7.0	9.1	123.5	111 - 136	8.0	9.1
200	180 - 220	4.0	5.6	200	180 - 220	4.0	5.6
208	180 - 220	3.9	5.6	220	193 - 238	4.0	5.6
220	193 - 238	4.0	5.6	230	202 - 249	4.0	5.6
230	208 - 254	4.0	5.6	235	210 - 259	4.0	5.6

kVA	0.8	1.0
Phase	1	
Branch circuit	15 A	

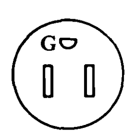
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

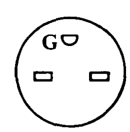
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4955 unit. The hardware fan blower assembly produces forced-air cooling.

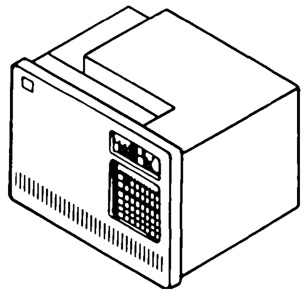
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

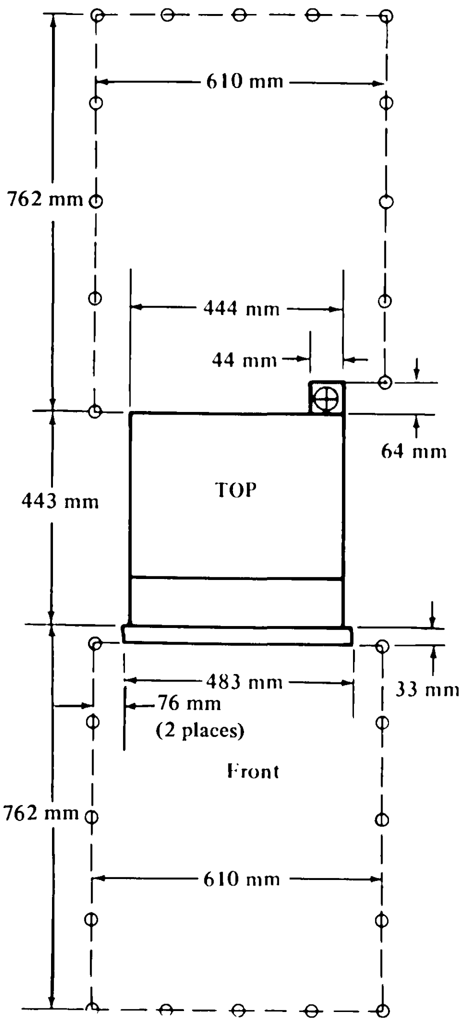
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4955 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4955 Processor Model F



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 23 kg (50 lbs)

Heat Output 500 watts (1705 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0	100	90 - 110	7.0
110	96.5 - 119	6.4	110	96.5 - 119	6.4
115	104 - 127	6.1	123.5	111 - 136	5.7
200	180 - 220	3.5	200	180 - 220	3.5
208	180 - 220	3.4	220	193 - 238	3.2
220	193 - 238	3.2	230	203 - 249	3.1
230	208 - 254	3.1	235	210 - 259	3.0

kVA .70
Phase 1
Branch circuit 15A

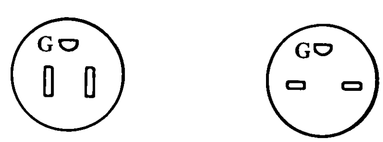
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plut	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R



Environment

Air must flow freely through the IBM 4955 unit. The hardware fan blower assembly produces forced-air cooling.

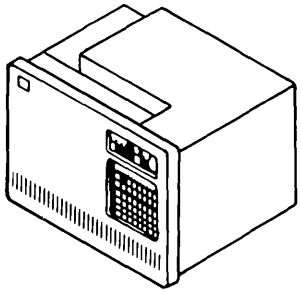
The **temperature and relative humidity** listed on pages 5-3 and 5-5 are upper and lower limits; they are not optimum operating points.

Vibration limits

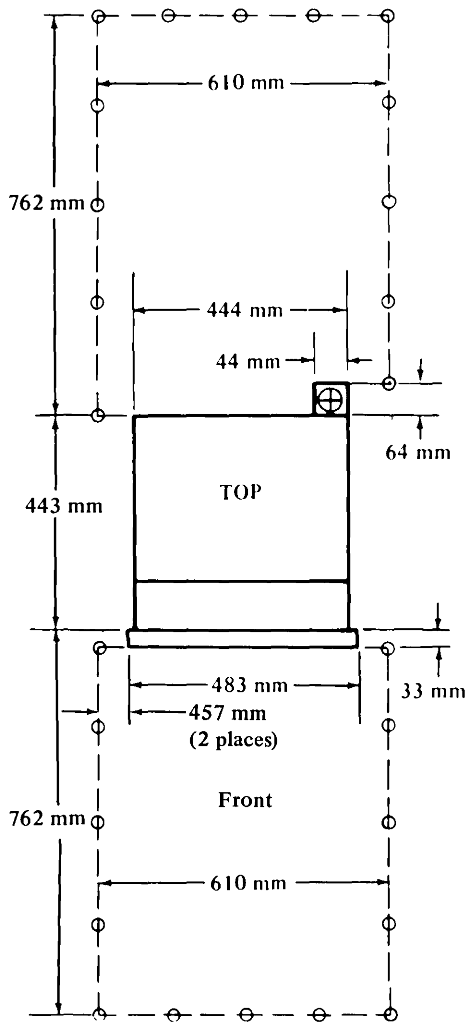
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4955 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

4956 Processor Models B, B10, E, and E10 *Rack Mount*



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
64	2-1/2
44	2
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	457	457
(Inches)	(30)	(30)	(0)	(0)

Weight	23 kg (50 lbs)
Max Heat Output	500 watts (1705 Btu/hr)
Required Air Flow	forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0	100	90 - 110	7.0
110	96.5 - 119	6.3	110	96.5 - 119	6.3
115	104 - 127	6.0	200	180 - 220	3.45
200	180 - 220	3.45	220	193 - 238	3.15
208	180 - 220	3.3	230	202 - 249	3.0
220	193 - 238	3.15	235	210 - 259	2.9
230	208 - 254	3.0			

kVA	0.70
Phase	1
Branch circuit	15A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

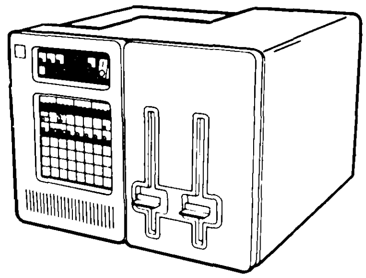
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

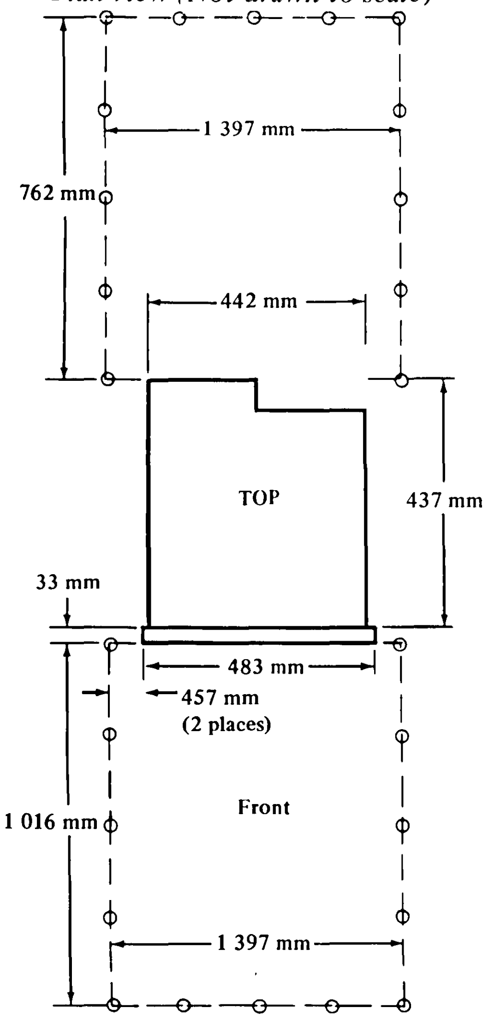
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–14 Hz	
continuous	= 0.762 mm (0.030 in.) double amplitude
transient	= 1.016 mm (0.040 in.) double amplitude
14–45 Hz	
continuous	= 0.30 G peak acceleration
transient	= 0.40 G peak acceleration
45–200 Hz	
continuous	= 0.55 G peak acceleration
transient	= 0.73 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4956 Processor Model C and C10
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
483	19
470	18-1/2
457	18
442	17-1/2
437	17
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	470	356
(Inches)	(19)	(18-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight	43 kg (95 lb)
Max Heat Output	350 watts (1194 Btu/hr)
Required Air Flow	forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0
110	96.5 - 119	5.5
115	104 - 127	5.2
120	104 - 127	5.0
127	111 - 137	4.8
200	180 - 220	3.0
208	180 - 220	2.9
220	193 - 238	2.7
230	208 - 254	2.6
240	208 - 254	2.5

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0
110	96.5 - 119	5.5
123.5	111 - 136	4.9
200	180 - 220	3.0
220	193 - 238	2.7
230	202 - 249	2.6
235	212 - 258	2.6
240	210 - 259	2.5

kVA	0.6
Phase	1
Branch circuit	15 A

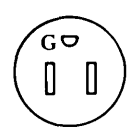
Switch-on and power-line-disturbance input surge current will not exceed 50 amp peak for 0.5 cycle.

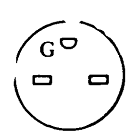
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

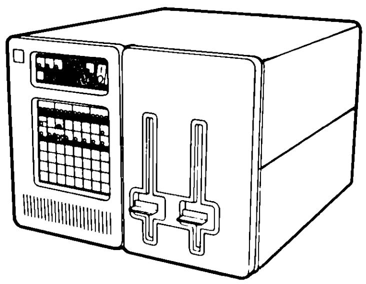
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

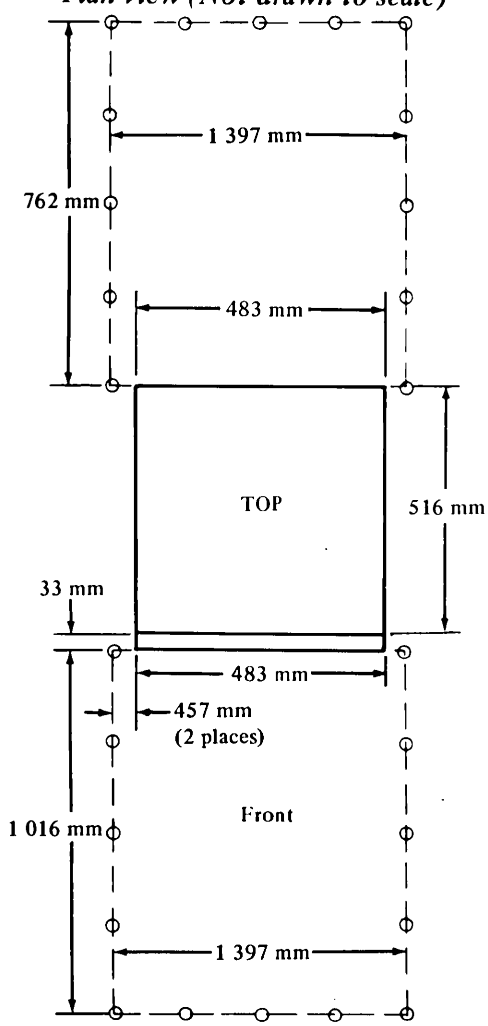
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz	
continuous	= 0.762 mm (0.030 in.) double amplitude
transient	= 1.016 mm (0.040 in.) double amplitude
13–200 Hz	
continuous	= 0.30 G peak acceleration
transient	= 0.40 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4956 Processor Model C and C10 Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
549	21-3/4
516	20-1/2
483	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	549	356
(Inches)	(19)	(21-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight	50 kg (111 lbs)
Max Heat Output	350 watts (1194 Btu/hr)
Required Air Flow	forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	6.0	100	90 - 110	6.0
110	96.5 - 119	5.5	110	96.5 - 119	5.5
115	104 - 127	5.2	123.5	111 - 136	4.9
120	104 - 127	5.0	200	180 - 220	3.0
127	111 - 137	4.8	220	193 - 238	2.7
200	180 - 220	3.0	230	202 - 249	2.6
208	180 - 220	2.9	235	212 - 258	2.6
220	193 - 238	2.7	240	210 - 259	2.5
230	208 - 254	2.6			
240	208 - 254	2.5			

kVA	0.6
Phase	1
Branch circuit	15 A

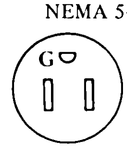
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes peak for over 0.5 cycle.

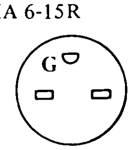
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

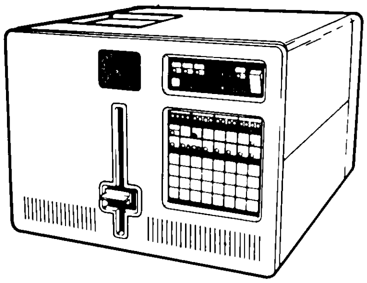
The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

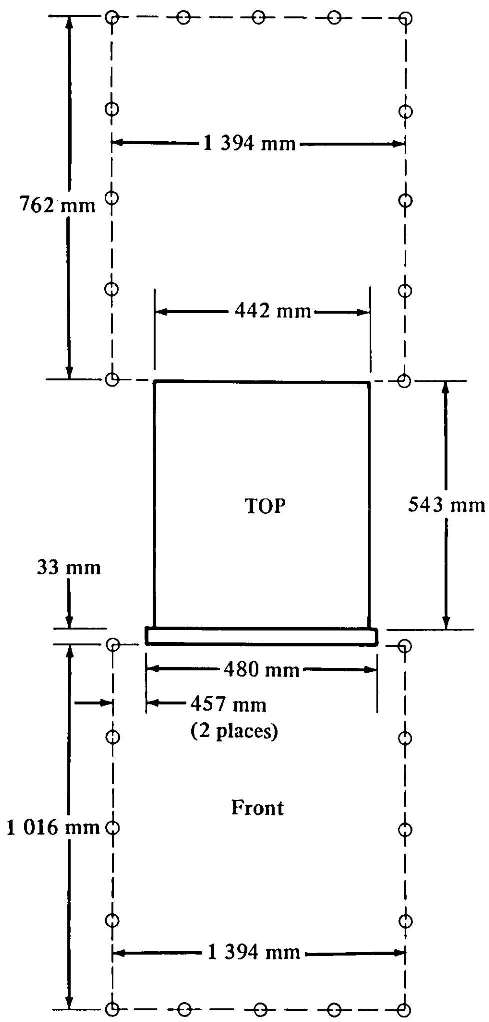
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz	
continuous	= 0.762 mm (0.030 in.) double amplitude
transient	= 1.016 mm (0.040 in.) double amplitude
13–200 Hz	
continuous	= 0.30 G peak acceleration
transient	= 0.40 G peak acceleration
200–500 Hz	
continuous	= 0.25 G peak acceleration
transient	= 0.33 G peak acceleration

4956 Processor Models 30D, 31D, 60D, 61D, 60E, and E70 *Rack Mount*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
576	22-1/2
543	21-1/2
480	19
457	18
442	17-1/2
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	576	346
(Inches)	(19)	(22-3/4)	(13-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lbs) (with Diskette Drive option)

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15 A

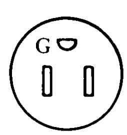
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

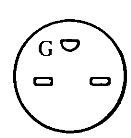
Power Cord

	60 Hz	50 Hz
Length	1. 8m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

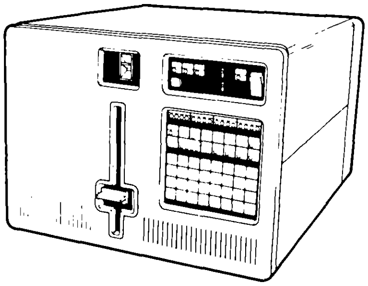
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits.

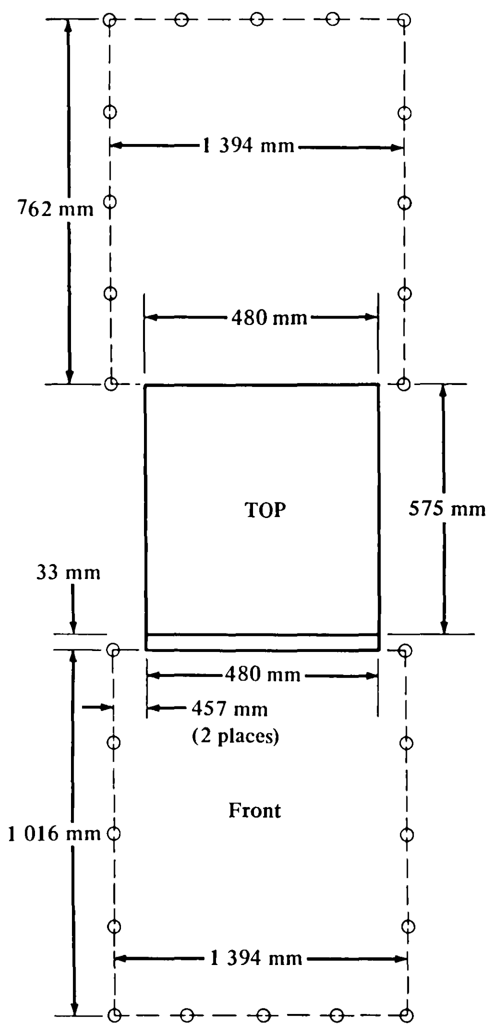
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4956 Processor Models 30D, 31D, 60D, 61D, 60E, and E70 Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
608	24
575	22-3/4
480	19
457	18
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	608	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 57 kg (126 lbs) (with Diskette Drive opti

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nomin:
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15 A

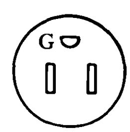
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

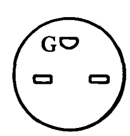
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

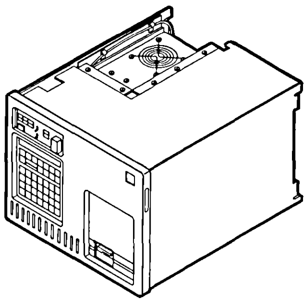
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits.

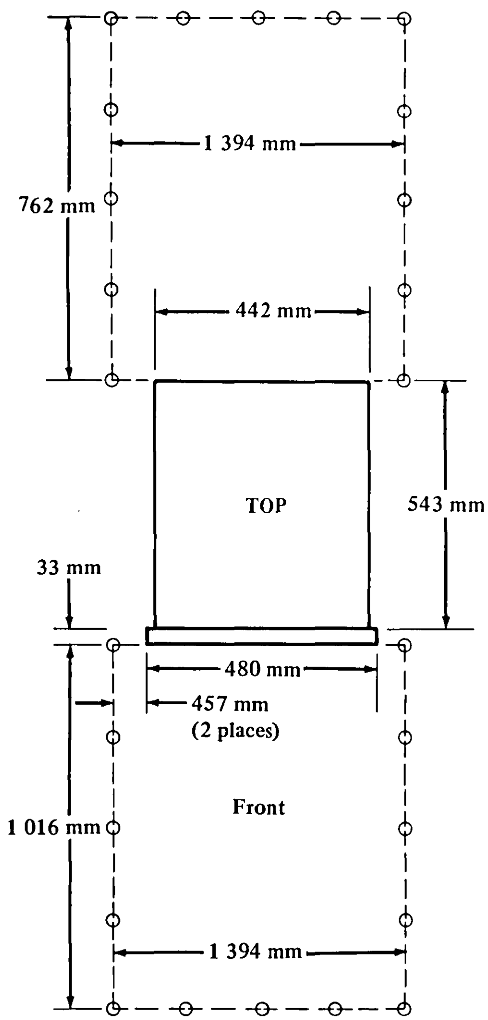
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4956 Processor Models G10 and H10 *Rack Mount*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
576	22-3/4
543	21-1/2
480	19
457	18
442	17-1/2
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	576	346
(Inches)	(19)	(22-3/4)	(13-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 55 kg (121 lbs) (with File options)

Max Heat Output 600 watts (2040 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA 1.0
Phase 1
Branch circuit 15 A

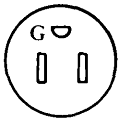
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

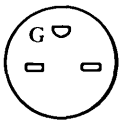
Power Cord

	60 Hz	50 Hz
Length	1. 8m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

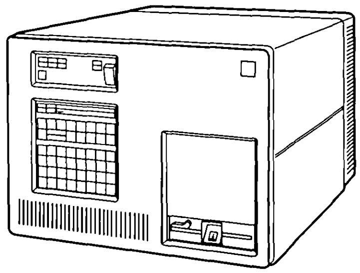
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits.

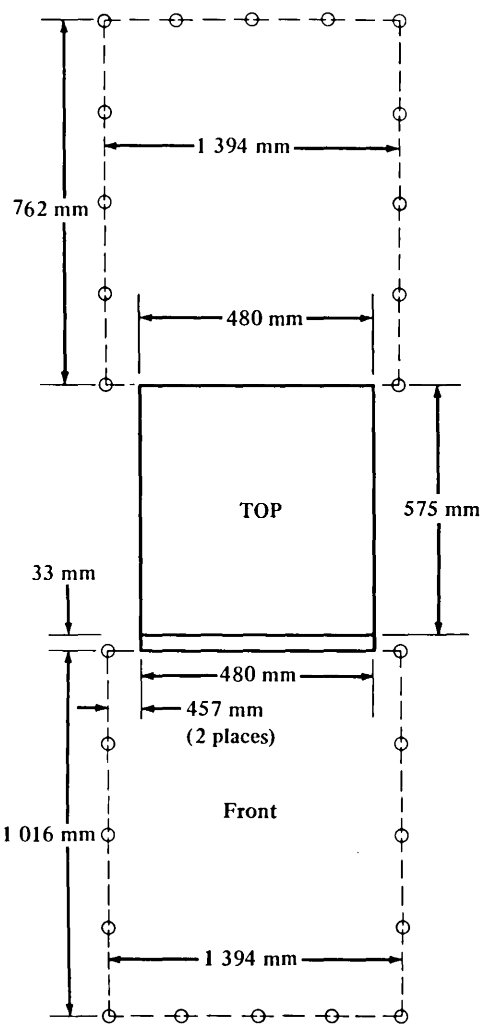
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4956 Processor Models G10 and H10 Stand-Alone *Feature 4521*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
608	24
575	22-3/4
480	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	480	608	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 62 kg (137 lbs) (with File options)

Max Heat Output 600 watts (2040 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	1.0
Phase	1
Branch circuit	15 A

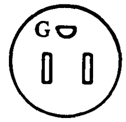
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

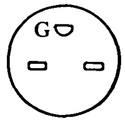
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R .





Environment

Air must flow freely through the IBM 4956 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

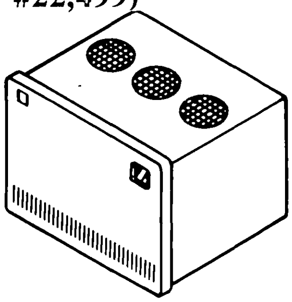
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4956 is designed to operate within the following limits.

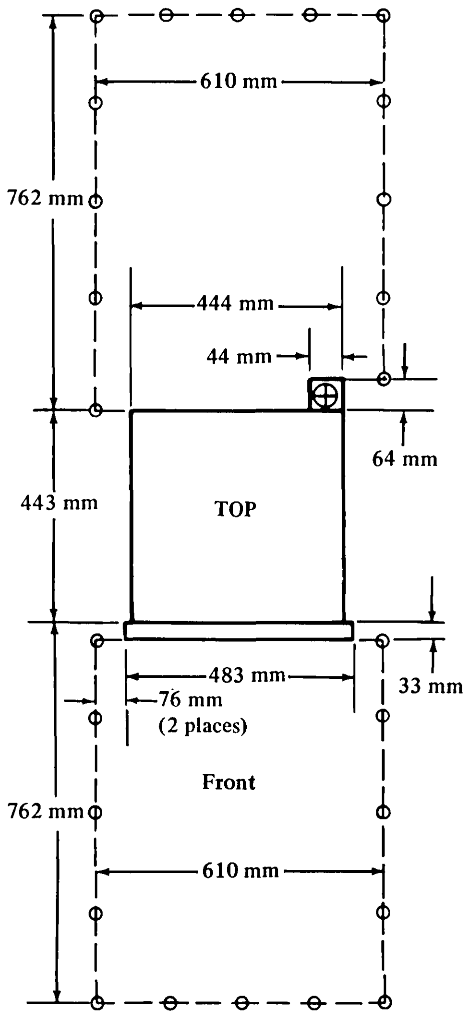
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4959 Input/Output Expansion Unit Model A (below serial #22,499)



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight	23 kg	(50 lb)
Heat Output/Hr.	500 Watts	(1 707 Btu)
Required Air Flow	forced-air cooling	

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	8.0	100	90 - 110	8.0
110	96.5 - 119	8.0	110	96.5 - 119	8.0
115	104 - 127	7.0	123.5	111 - 136	8.0
200	180 - 220	4.0	200	180 - 220	4.0
208	180 - 220	3.9	220	193 - 238	4.0
220	193 - 238	4.0	230	202 - 249	3.9
230	208 - 254	3.9	235	210 - 259	4.0

kVA	0.8
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4959 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4959 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Signal cables

The 4959 is connected to a Series/1 Processor by four flat cables. The cables are available in two lengths: 0.9 m (3 ft) and 1.8 m (6 ft). There are cable entry/exit slots on both the top and bottom of the processors, 4965, and I/O expansion units.

Customer output alarm relay contact

A 4959 with the Two Channel Switch (TCS) feature has an output contact on the TCS console card to allow you to connect an external alarm.

The electrical specifications for the alarm relay contacts are:

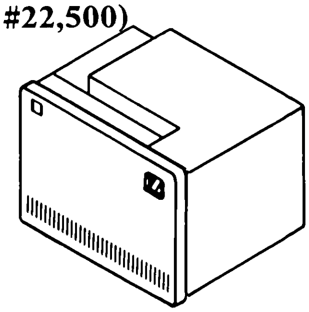
- 12 Vdc, 300 mA resistive
- 24 Vdc, 150 mA resistive.

The terminator for the connector is shipped with the TCS feature (see the installation instructions shipped with the unit).

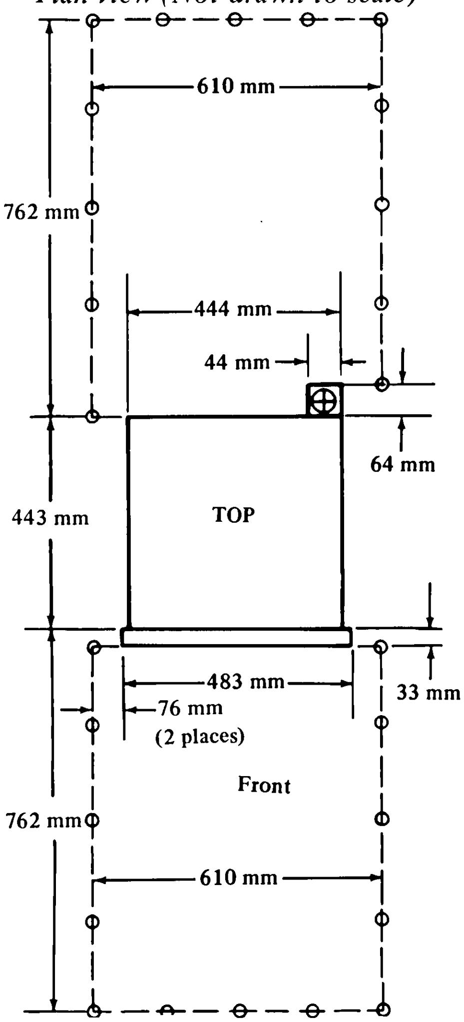
The external alarm is not included with the TCS feature.

CAUTION
If the external alarm is electrically inductive, an appropriate arc-suppression network should be used to protect the relay contacts; otherwise, damage to the contacts can occur.

4959 Input/Output Expansion Unit Model A (above serial #22,500)



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
483	19
444	17-1/2
443	17-1/2
76	3
64	2-1/2
44	1-3/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	476	356
(Inches)	(19)	(18-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight	23 kg	(50 lb)
Heat Output	500 watts (1705 Btu/hr)	
Required Air Flow	forced-air cooling	

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0	100	90 - 110	7.0
110	96.5 - 119	6.4	110	96.5 - 119	6.4
115	104 - 127	6.1	123.5	111 - 136	5.7
200	180 - 220	3.5	200	180 - 220	3.5
208	180 - 220	3.4	220	193 - 238	3.2
220	193 - 238	3.2	230	202 - 249	3.1
230	208 - 254	3.1	235	210 - 259	3.0

kVA	.70
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4959 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4959 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Signal cables

The 4959 is connected to a Series/1 Processor by four flat cables. The cables are available in two lengths: 0.9 m (3 ft) and 1.8 m (6 ft). There are cable entry/exit slots on both the top and bottom of the processors, 4965, and I/O expansion units.

Customer output alarm relay contact

A 4959 with the Two Channel Switch (TCS) feature has an output contact on the TCS console card to allow you to connect an external alarm.

The electrical specifications for the alarm relay contacts are:

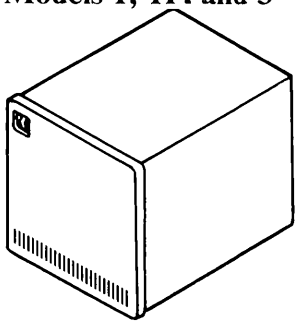
- 12 Vdc, 300 mA resistive
- 24 Vdc, 150 mA resistive.

The terminator for the connector is shipped with the TCS feature (see the installation instructions shipped with the unit).

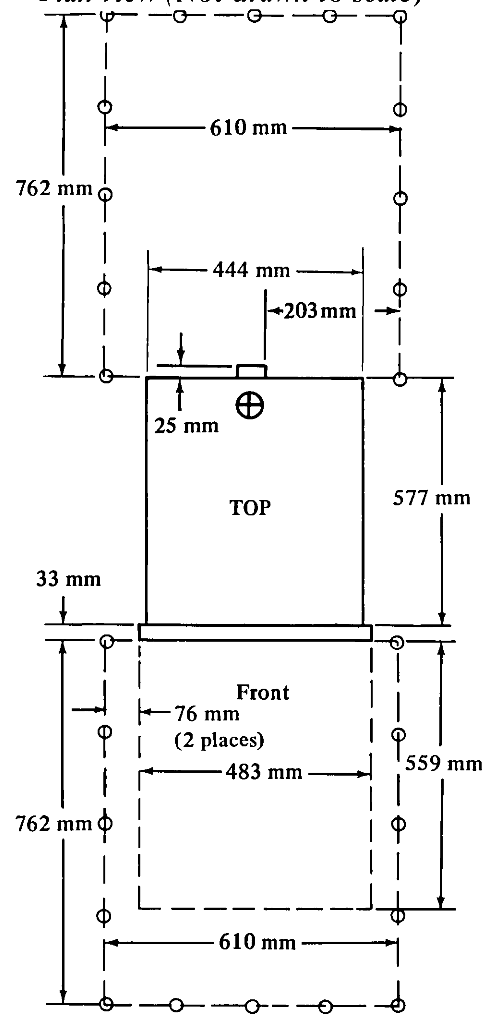
The external alarm is not included with the TCS feature.

CAUTION
If the external alarm is electrically inductive, an appropriate arc-suppression network should be used to protect the relay contacts; otherwise, damage to the contacts can occur.

4962 Disk Storage Unit Models 1, 1F. and 3



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
577	22-3/4
559	22
483	19
444	17-1/2
203	8
76	3
33	1-1/2
25	1

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	610	489
(Inches)	(19)	(24)	(19-1/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 61 kg (135 lb)

Heat output 480 watts (1640 Btu/hr)

Required Air Flow Convection cooling (with internal fan) (see note)

Power Requirements (at full load)

60 Hz ± 0.5 Hz Volts ±10%	Amperes	50 Hz ± 0.5 Hz Volts ±10%	Amperes
100	5.5	100	5.5
115	4.8	110	5.0
200	2.8	123.5	4.5
208	2.6	200	2.8
230	2.4	220	2.5
		235	2.3

kVA	0.55
Phase	1
Branch circuit	15 A

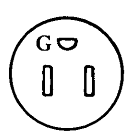
Switch-on and power-line-disturbance input surge current will not exceed 17 amperes for over 5.0 cycle.

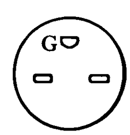
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Note...

90% of each exterior cover surface must not exceed 52° C (125° F).

Environment

Air must flow freely through the IBM 4962 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Note: 90% of each exterior cover surface must not exceed 52°C (125°F).

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4962 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–24 Hz		
continuous	=	0.254 mm (0.01 in.) double amplitude
transient	=	0.381 mm (0.015 in.) double amplitude
24–120 Hz		
continuous	=	0.3 G peak acceleration
transient	=	0.4 G peak acceleration
200–500 Hz		
continuous	=	0.15 G peak acceleration
transient	=	0.23 G peak acceleration

Assume "G" levels from 120–200 Hz to be linear.

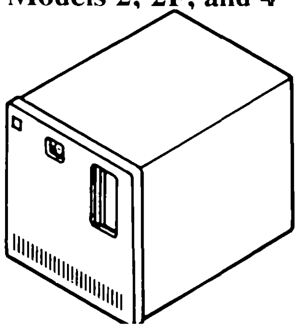
Service accessibility

For servicing, it is necessary to slide the IBM 4962 completely out of the rack. Because of the weight and service considerations, the unit should be mounted at the bottom of the rack. However, the 4962 unit is to be installed so that the top of the unit is no higher than 1.1 m (3.5 ft) above the floor. Adequate service areas to the right, left, and front of the extended unit must be provided. It is your responsibility to ensure that the enclosure, if it is other than an IBM 4997, will not tip when the 4962 unit is fully extended.

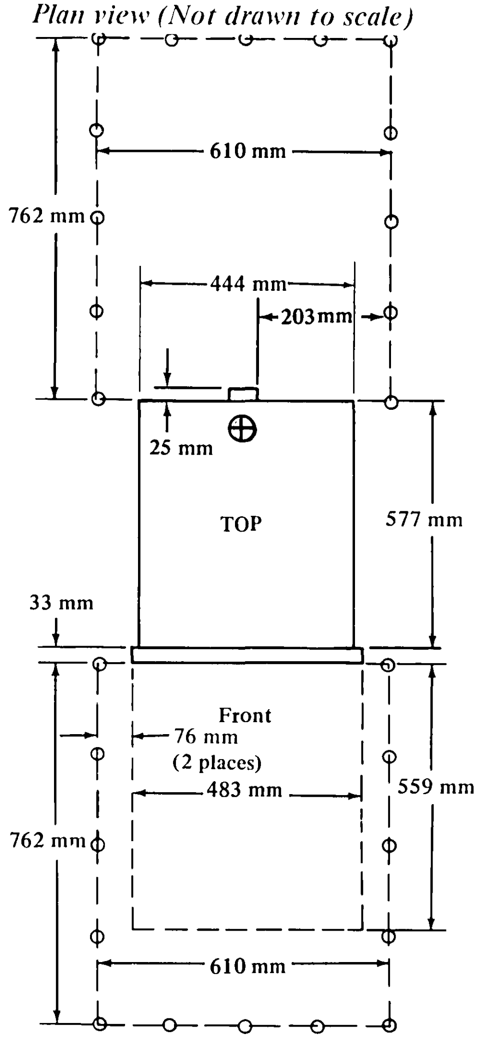
Signal cables

The 4962 Disk Attachment Feature card is connected to the 4962 by four flat cables. The length of each cable is 5m (15 ft).

4962 Disk Storage Unit
Models 2, 2F, and 4



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
577	22-3/4
559	22
483	19
444	17-1/2
203	8
76	3
33	1-1/2
25	1

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	610	489
(Inches)	(19)	(24)	(19-1/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

The 4962 extends on self contained slides indicated in the plan view.

Weight 68 kg (150 lbs)

Heat Output 559 watts (1910 Btu/hr)

Required Air Flow convection cooling (with internal fan) (see note)

Power Requirements (at full load)

60 Hz ± 0.5 Hz		50 Hz ± 0.5 Hz	
Volts ±10%	Amperes	Volts ±10%	Amperes
100	6.0	100	6.0
115	5.2	110	5.2
200	3.0	123.5	4.9
208	2.9	200	3.0
230	2.6	220	2.7
		235	2.6

kVA	0.6
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 19 amperes for over 5.0 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R.	NEMA 6-15R

Note...
90% of each exterior cover surface must not exceed 52° C (125° F).

Environment

Air must flow freely through the IBM 4962 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Note: 90% of each exterior cover surface must not exceed 52°C (125°F).

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4962 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–24 Hz		
continuous	=	0.254 mm (0.01 in.) double amplitude
transient	=	0.381 mm (0.015 in.) double amplitude
24–120 Hz		
continuous	=	0.3 G peak acceleration
transient	=	0.4 G peak acceleration
200–500 Hz		
continuous	=	0.15 G peak acceleration
transient	=	0.23 G peak acceleration

Assume "G" levels from 120–200 Hz to be linear.

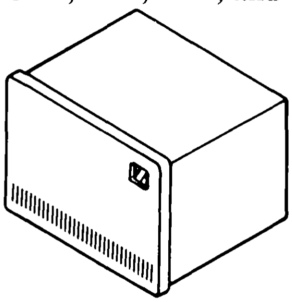
Service accessibility

For servicing, it is necessary to slide the IBM 4962 completely out of the rack. Because of the weight and service considerations, the unit should be mounted at the bottom of the rack. However, the 4962 unit is to be installed so that the top of the unit is no higher than 1.1 m (3.5 ft) above the floor. Adequate service areas to the right, left, and front of the extended unit must be provided. It is your responsibility to ensure that the enclosure, if it is other than an IBM 4997, will not tip when the 4962 unit is fully extended.

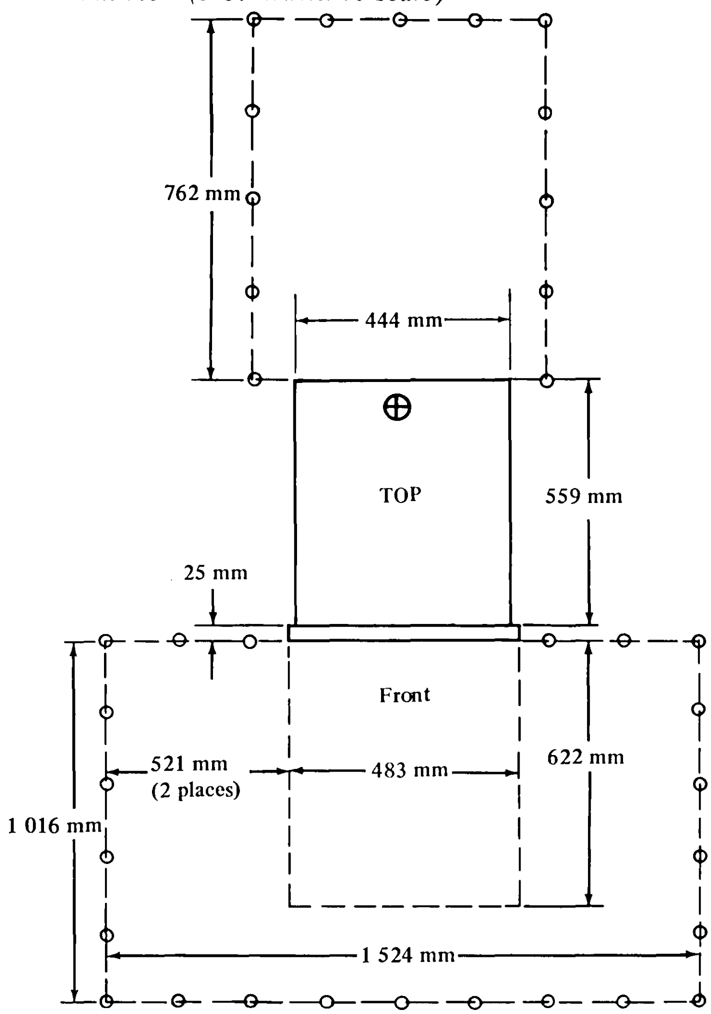
Signal cables

The 4962 Disk Attachment Feature card is connected to the 4962 by four flat cables. The length of each cable is 4.6 m (15 ft).

4963 Disk Storage Unit Models 23A, 23B, 29A, 29B, 58A, 58B, 64A, and 64B



Plan view (Not drawn to scale)



Millimeters	Inches
1 524	60
1 016	40
762	30
622	24-1/2
559	22
483	19
444	17-1/2
25	1

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	584	356
(Inches)	(19)	(23)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	521	521
(Inches)	(40)	(30)	(20-1/2)	(20-1/2)

The 4963 extends on self contained slides indicated in the plan view.

Weight	54 kg	(120 lb)
Heat Output/Hr.	242 Watts	(827 Btu)
Required Air Flow	forced-air cooling	

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	**Limits**	**Amps (Nominal)**	**Volts Nominal**	**Limits**	**Amps (Nomi**
100	90 - 110	5.0	100	90 - 110	5.0
110	96.5 - 119	5.0	110	96.5 - 119	5.0
115	104 - 127	5.0	200	180 - 220	2.5
120	104 - 127	2.5	220	193 - 238	2.5
200	180 - 220	2.5	230	202 - 249	2.5
208	180 - 220	2.5	235	212 - 258	2.5
220	193 - 238	2.5	240	210 - 259	2.5
230	208 - 254	2.5			
240	208 - 254	2.5			

kVA	0.5
Phase	1
Branch circuit	15 A

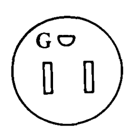
Switch-on power-line-disturbance input surge current will not exceed 50 amperes for over 10 milliseconds and 12 amperes for over 10 seconds.

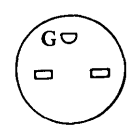
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4963 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4963 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.17 mm (0.007 in.) double amplitude
transient	=	0.27 mm (0.011 in.) double amplitude
17–150 Hz		
continuous	=	0.10 G peak acceleration
transient	=	0.16 G peak acceleration
150–500 Hz		
continuous	=	0.06 G peak acceleration
transient	=	0.08 G peak acceleration

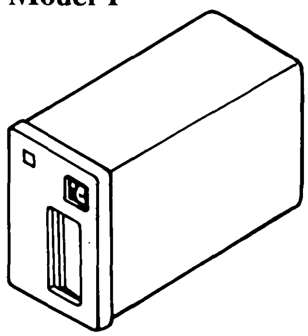
Service accessibility

Adequate service areas to the right, left, and front of the extended unit must be provided. For servicing, it is necessary to slide the unit 622 mm (24.5 in.) out of the rack. It is your responsibility to ensure that the enclosure, if it is other than an IBM 4997, will not tip when the 4963 unit is fully extended.

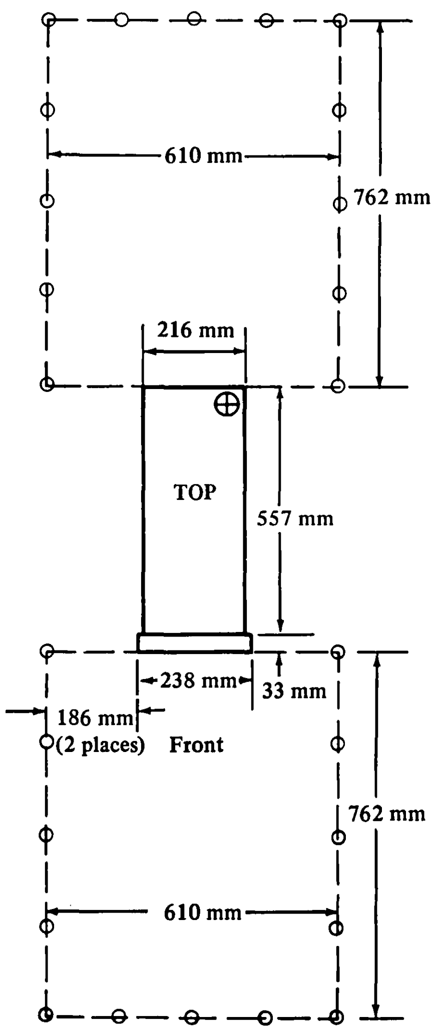
Signal cables

The 4963 Disk Attachment Feature card is connected to the IBM 4963 Disk Storage Unit by two flat cables. The length of each cable is 6.1 m (20 ft). One to three additional 4963 units can also be attached to the base 4963 unit by flat cables.

4964 Disk Storage Unit Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
557	22
238	9-1/2
216	8-1/2
186	8
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	216	590	356
(Inches)	(8-1/2)	(23-1/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight* 18 kg (40 lb)

Heat Output 150 watts (512 Btu/hr)

Required Air Flow convection cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz Volts ±10%	Amperes	50 Hz ± 0.5 Hz Volts ±10%	Amperes
**100	2.50	**100	2.50
115	2.17	110	2.27
		123.5	2.02
**200	1.25	**200	1.25
208	1.20	220	1.14
230	1.09	235	1.06

kVA	0.25
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

*When included, the autotransformer adds 7.3 kg (16 lb) to the weight of the rack.

**4964 units ordered with 100– volt or 200 - volt power options include the step-up autotransformer. However, 60 Hz units shipped after November, 1977, and 50 Hz units shipped after March, 1978, will not use an autotransformer.

Environment

Air must flow freely through the IBM 4964 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-5 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4964 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

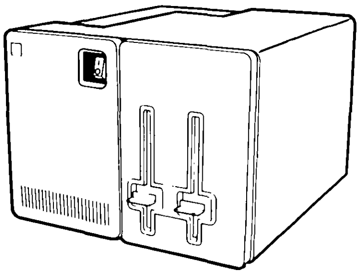
5–25 Hz		
continuous	=	0.254 mm (0.010 in.) double amplitude
transient	=	0.381 mm (0.015 in.) double amplitude
25–150 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.15 G peak acceleration
transient	=	0.25 G peak acceleration

Assume "G" levels from 150–200 Hz to be linear.

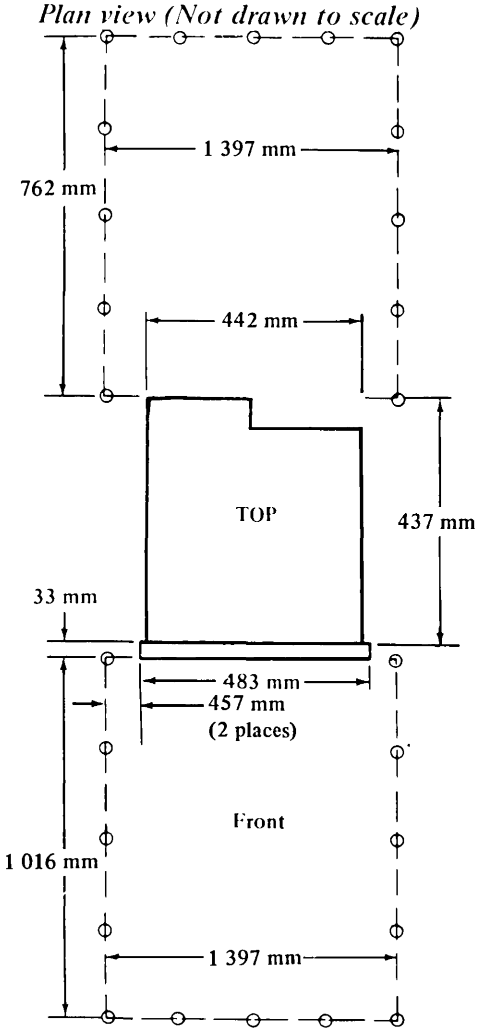
Signal cables

The 4964 Diskette Attachment Feature card is connected to the IBM 4964 Diskette Unit by one cable. The length of the cable is 4.6 m (15 ft).

4965 Storage and I/O Expansion Unit Model 1
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	55
1 016	40
762	30
610	24
483	19
470	18-1/2
442	17-1/2
437	17-1/4
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	470	356
(Inches)	(19)	(18-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 43 kg (95 lb)

Max Heat Output/Hr. 433 watts (1 480 Btu)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0
110	96.5 - 119	6.4
115	104 - 127	6.1
120	104 - 127	5.8
127	111 - 137	5.5
200	180 - 220	3.5
208	180 - 220	3.4
220	193 - 238	3.2
230	208 - 254	3.0
240	208 - 254	2.9

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0
110	96.5 - 119	6.4
123.5	111 - 136	5.7
200	180 - 220	3.5
220	193 - 238	3.2
230	002 - 249	3.0
235	212 - 258	3.0
240	210 - 259	2.9

kVA	0.7
Phase	1
Branch circuit	15 A

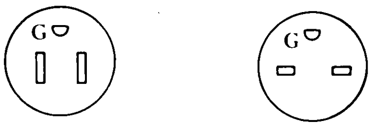
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R



Environment

Air must flow freely through the IBM 4965 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4965 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

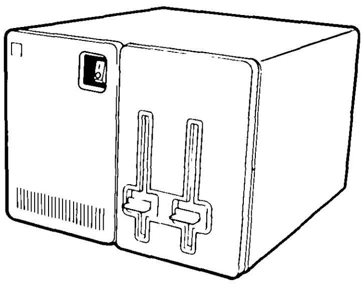
5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

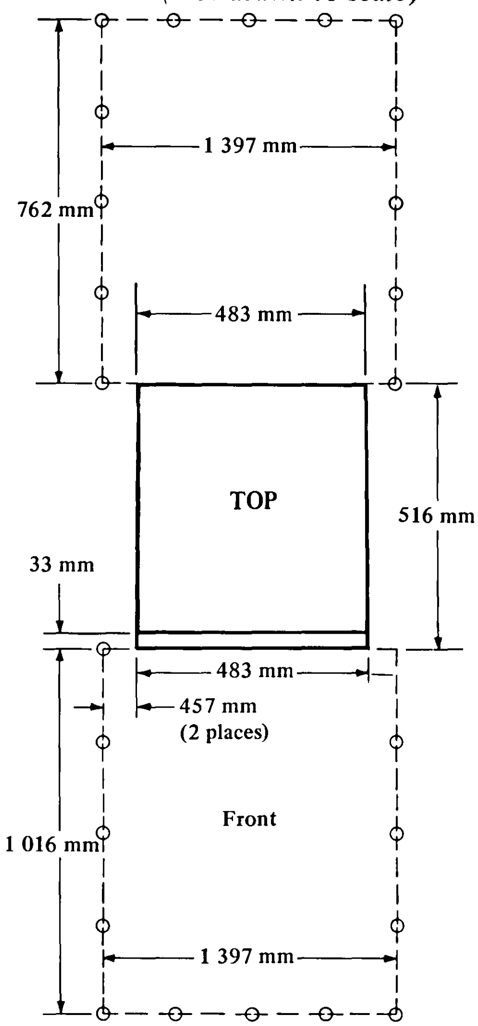
Signal cables

To connect the 4965 Model 1 rack-mounted unit to a Series/1 processor, you need four flat cables. The cables are available in lengths of 0.9 m (3 ft) and 1.8 m (6 ft).

4965 Storage and I/O Expansion Unit Model 1 Stand-Alone



Plan view (Not drawn to scale)



Millimeters	Inches
1 397	50
1 016	40
762	30
610	24
549	21-3/4

Millimeters	Inches
516	20-1/2
457	18
444	17-1/2
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	549	356
(Inches)	(19)	(21-3/4)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lb)

Max Heat Output/Hr. 433 watts (1 480 Btu)

Required Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0
110	96.5 - 119	6.4
115	104 - 127	6.1
120	104 - 127	5.8
127	111 - 137	5.5
200	180 - 220	3.5
208	180 - 220	3.4
220	193 - 238	3.2
230	208 - 254	3.0
240	208 - 254	2.9

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	7.0
110	96.5 - 119	6.4
123.5	111 - 136	5.7
200	180 - 220	3.5
220	193 - 238	3.2
230	202 - 249	3.0
235	212 - 258	3.0
240	210 - 259	2.9

kVA	0.7
Phase	1
Branch circuit	15 A

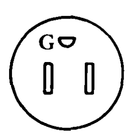
Switch-on and power-line-disturbance input surge current will not exceed a 50 amperes peak for over 0.5 cycle.

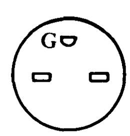
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4965 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4965 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

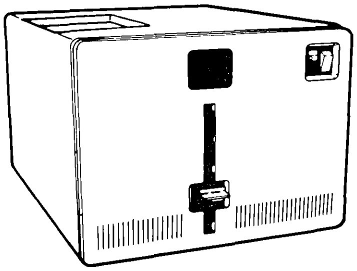
5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–200 Hz		
continuous	=	0.30 G peak aceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

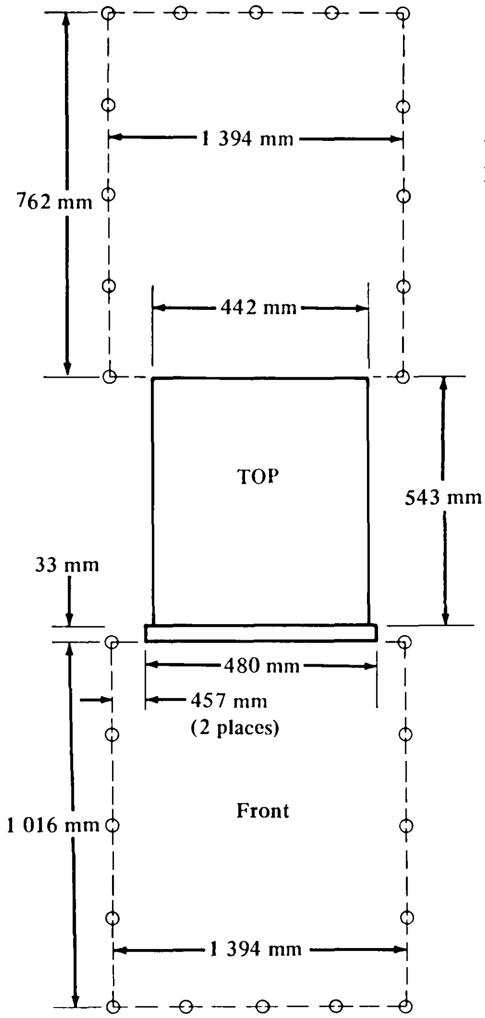
Signal cables

To connect the 4965 Model 1 shelf-mounted unit to a Series/1 processor, you need four external shielded cables. The cables are 3.1 m (10 ft) in length.

4965 Storage and I/O Expansion Unit Models 30D and 60D
Rack Mount



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
576	22-1/2
543	21-1/2
480	19
457	18
442	17-1/2
33	1-1/2

Specifications

Dimensions (incl. front cover)

	Width	Depth	Height
Millimeters	480	576	346
(Inches)	(19)	(22-3/4)	(13-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 50 kg (111 lbs) (with Diskette Drive option)

Max Heat Outp 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15A

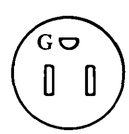
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

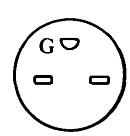
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 mm (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4965 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4965 is designed to operate within the following limits.

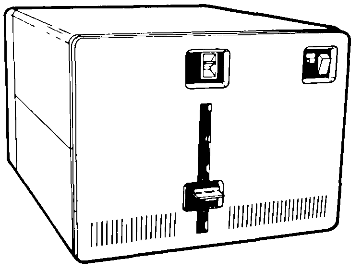
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

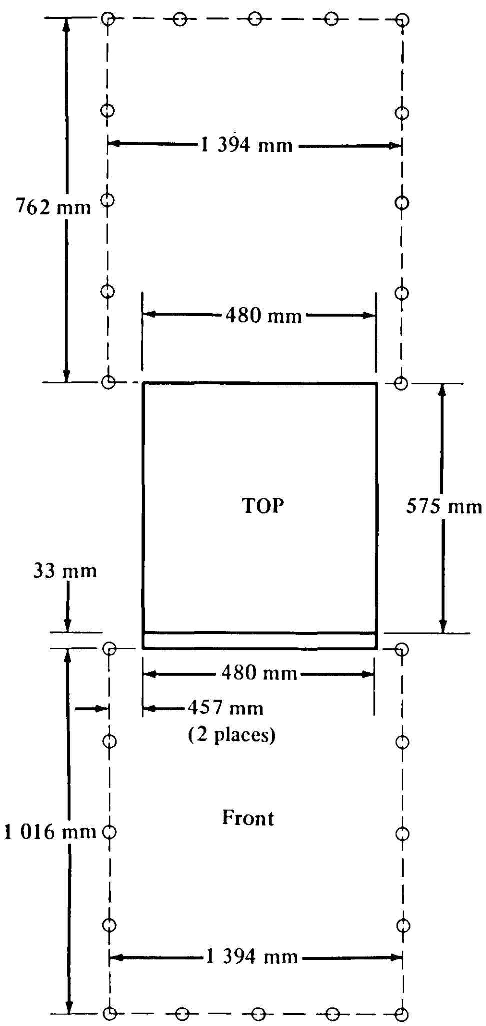
Signal cables

To connect the 4965 Model 30D or 60D rack-mounted unit to a Series/1 processor, you need four flat cables. The cables are available in lengths of 0.9 m (3 ft) and 1.8 m (6 ft).

4965 Storage and I/O Expansion Unit Models 30D and 60D Stand-Alone *Feature 4520*



Plan view (Not drawn to scale)



Millimeters	Inches
1 394	55
1 016	40
762	30
608	24
575	22-3/4
480	19
457	18
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	480	608	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Weight 57 kg (126 lbs) (with Diskette Drive opti

Max Heat Output 650 watts (2220 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nominal)
100	90 - 110	8.0
110	96.5 - 119	7.3
115	104 - 127	7.0
120	104 - 127	6.7
127	111 - 137	6.4
200	180 - 220	4.0
208	180 - 220	3.9
220	193 - 238	3.7
230	208 - 254	3.5
240	208 - 254	3.4

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (nomir
100	90 - 110	8.0
110	96.5 - 119	7.3
123.5	111 - 136	6.5
200	180 - 220	4.0
220	193 - 238	3.7
230	208 - 254	3.5
235	212 - 258	3.45
240	210 - 259	3.4

kVA	0.81
Phase	1
Branch circuit	15A

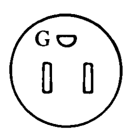
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

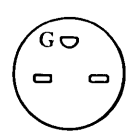
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4965 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4965 is designed to operate within the following limits.

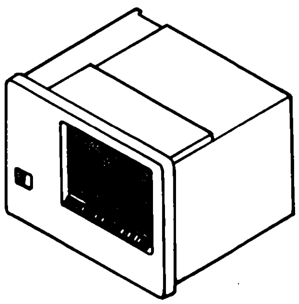
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

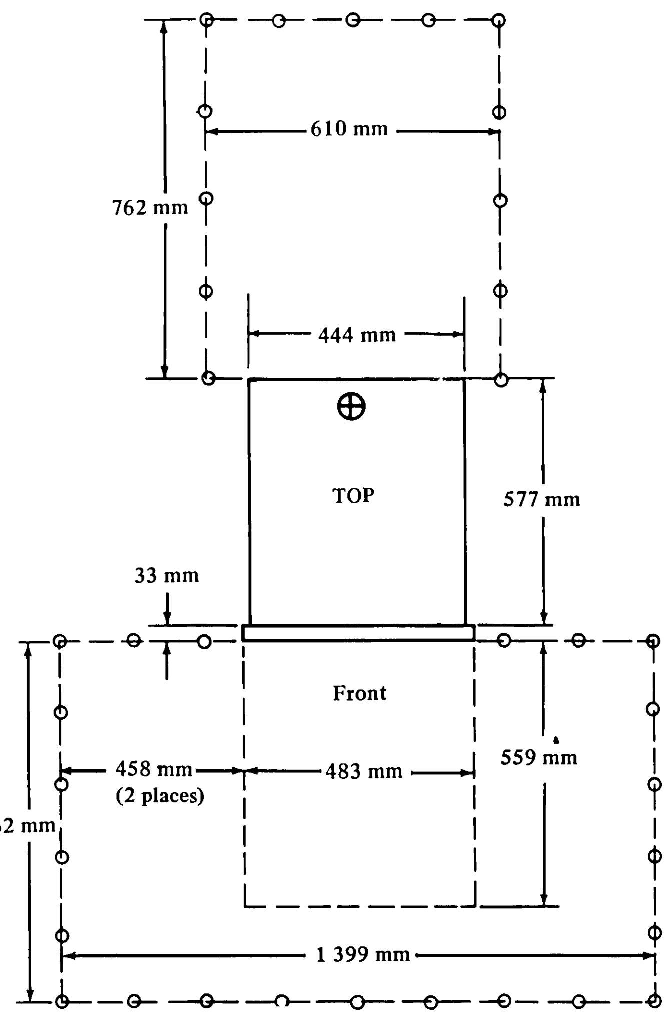
Signal cables

To connect the 4965 Model 30D or 60D shelf-mounted unit to a shelf-mounted Series/1 processor, you need feature #4525 Stand-Alone Enclosure Cable, a 4-in-1 external shielded cable. The cable is 3.1 m (10 ft) in length.

4966 Diskette Magazine Unit Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
1 399	55
762	30
610	24
577	22-3/4
559	22
483	19
458	18
444	17-1/2
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	610	356
(Inches)	(19)	(24)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	458	458
(Inches)	(30)	(30)	(18)	(18)

The 4966 extends on self contained slides indicated in the plan view.

Weight	42 kg	(93 lb)
Heat Output/Hr.	205 Watts	(700 Btu)
Required Air Flow	convection cooling (with internal fan)	

Power Requirements (at full load)

60 Hz ± 0.5 Hz Volts ±10%	Amperes	50 Hz ± 0.5 Hz Volts ±10%	Amperes
100	5.0	100	5.0
115	4.5	110	4.5
200	2.7	123.5	4.5
208	2.7	200	2.8
230	2.7	220	2.8
		235	2.8

kVA	0.5
Phase	1
Branch circuit	15 A

Switch-on and power-line-disturbance input surge curre will not exceed 20 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4966 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4966 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–25 Hz		
continuous	=	0.13 mm (0.005 in.) double amplitude
transient	=	0.20 mm (0.008 in.) double amplitude
25–150 Hz		
continuous	=	0.30 G peak acceleration
transient	=	0.40 G peak acceleration
200–500 Hz		
continuous	=	0.15 G peak acceleration
transient	=	0.25 G peak acceleration
Assume "G" levels from 150–200 Hz to be linear.		

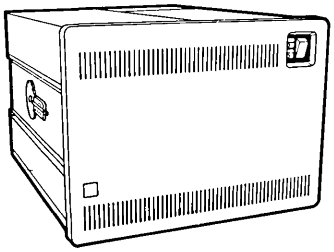
Service accessibility

Adequate service areas to the right, left, and front of the extended unit must be provided. For servicing, it is necessary to slide the unit 622 mm (24.5 in.) out of the rack. It is your responsibility to ensure that the enclosure, if it is other than an IBM 4997, will not tip when the 4966 unit is fully extended.

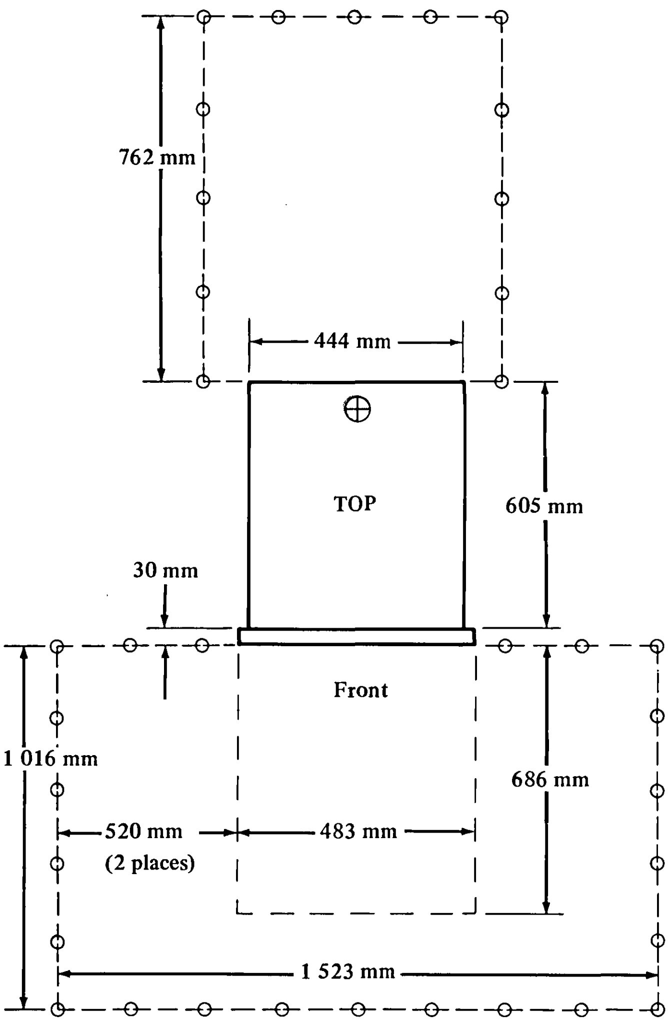
Signal cables

The 4966 Diskette Magazine Unit Feature card is connected to the 4966 by one flat cable. The length of the cable is 4.6 m (15 ft).

4967 High Performance Disk Subsystem Models 2CA, 2CB, 3CA, and 3CB



Plan view (Not drawn to scale)



Millimeters	Inches
1 523	60
1 016	40
762	30
686	27
605	23-3/4
483	19
444	17-1/2
30	1-1/4

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	635	356
(Inches)	(19)	(25)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	520	520
(Inches)	(40)	(30)	(20)	(20)

Weight 68 kg (150 lb)

Heat Output/Hr.

Models 2CA/3CA	500 watts	(1 730 Btu)
Models 2CB/3CB	400 watts	(1 365 Btu)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (maximum) 2CA/3CA	2CB/3CB
100	90 - 110	7.4	7.0
110	96.5 - 119	7.4	7.0
115	104 - 127	7.4	7.0
120	104 - 127	7.4	7.0
127	104 - 137	7.4	7.0
200	180 - 220	3.7	3.5
208	180 - 220	3.7	3.5
220	193 - 238	3.7	3.5
230	208 - 254	3.7	3.5
240	208 - 254	3.7	3.5

50 Hz ± 0.5 Hz

Volts Nominal	Limits	Amps (maximum 2CA/3CA	2CB/3C
100	90 - 110	7.6	7.2
110	90 - 119	7.6	7.2
200	180 - 220	3.8	3.6
220	193 - 238	3.8	3.6
230	202 - 249	3.8	3.6
235	212 - 258	3.8	3.6
240	210 - 259	3.8	3.6

	2CA/3CA	2CB/3CB
kVA	0.77	0.73
Phase	1	1
Branch circuit	15 A	15 A

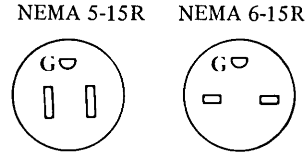
For low volt units, switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle and 19 amperes for up to 20 seconds. For high volt units, switch-on and power-line-disturbance input surge current will not exceed 12 amperes for up to 20 seconds.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1.3 mm

Power Cord Plugs and Receptacles

Volts	115	208/240
Plug	molded cord set (U.S. and Canada only)	molded cord set (U.S. and Canada only)
Receptacle	NEMA 5-15R	NEMA 6-15R



Environment

Air must flow freely through the IBM 4967 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 4967 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.206 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.035 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

Service accessibility

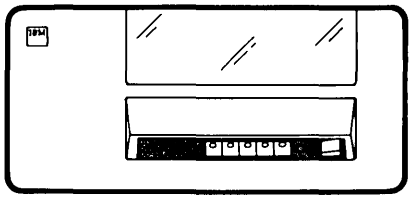
Provide adequate service areas to the right, left, front, and bottom of the extended unit. For service access, the unit must slide 653 mm (25.7 in.) out of the rack and pivot face-down to a vertical position. Allow at least 209 mm (8.2 in.) clearance at the bottom of the unit. If the enclosure is not an IBM 4997, make sure that the enclosure will not tip when the 4967 is fully extended.

Signal cables

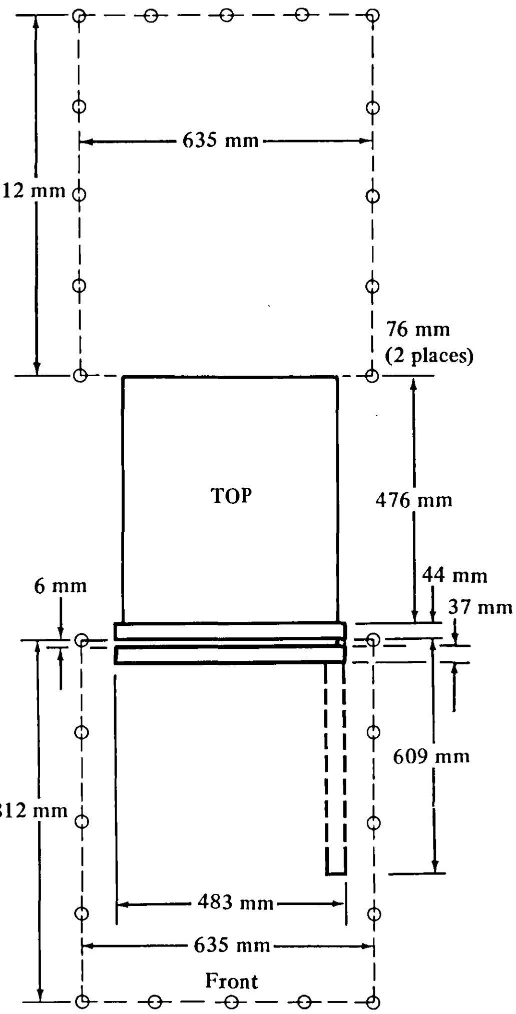
Two flat cables connect the 4967 Disk Attachment Feature Card to the IBM 4967 Disk Unit. The length of each cable is 4.6 m (15 ft).

In addition, one to three 4967 units can be attached to the base 4967 unit by flat cables.

4968 Autoload Streaming Magnetic Tape Unit Model 1 AS



Plan view (Not drawn to scale)



Millimeters	Inches
812	32
609	24
635	25
483	19
476	18-3/4
76	3
44	1-3/4
37	1-1/2
6	1/4

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	563	216
(Inches)	(19)	(22)	(8-3/4)

Service Clearance

	Front	Rear	Right	Left
Millimeters	812	812	76	76
(Inches)	(56)	(32)	(3)	(3)

Weight 36 kg (80 lb)

Heat Output 180 watts (614 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	2.0	100	90 - 110	2.0
115	103 - 126	1.74	110	99 - 122	1.82
120	108 - 132	1.67	220	198 - 242	0.91
200	180 - 220	1.0	230	207 - 253	0.87
208	187 - 229	0.96	240	216 - 264	0.83
220	198 - 242	0.91			
240	216 - 264	0.83			

kVa	0.2
Phase	1
Branch circuit	15 A

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4968 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

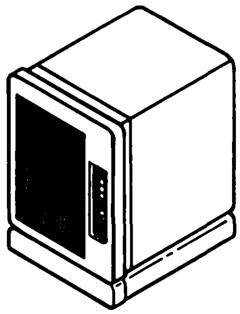
Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4968 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

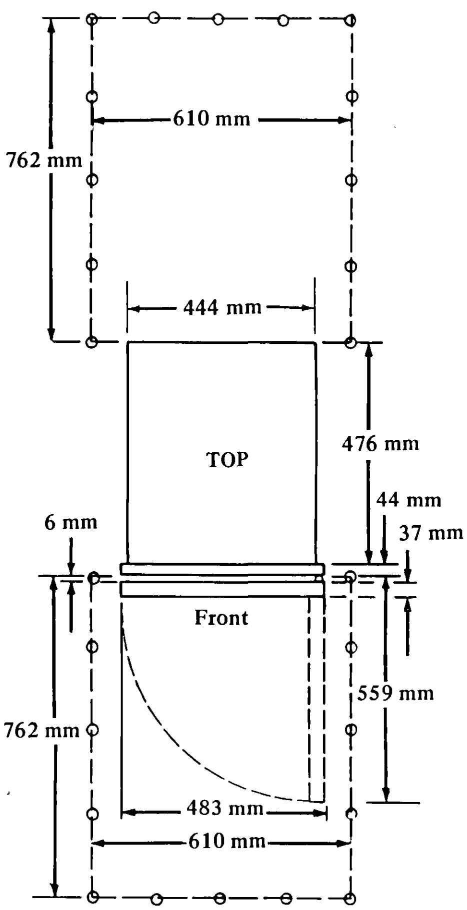
5–17 Hz	
continuous	= 0.127 mm (0.005 in.) double amplitude
transient	= 0.207 mm (0.008 in.) double amplitude
17–200 Hz	
continuous	= 0.07 G peak acceleration
transient	= 0.11 G peak acceleration
200–500 Hz	
continuous	= 0.035 G peak acceleration
transient	= 0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

4969 Magnetic Tape Unit Models 4D, 4N, and 4P



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
559	22
483	19
476	18-3/4
444	17-1/2
44	1-3/4
37	1-1/2
6	1/4

Specifications

Dimensions

	Width	Depth	Height*
Millimeters	483	563	709
(Inches)	(19)	(22-1/4)	(28)

*Includes an 86 mm (3-1/2 in) air diverter.

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 59 kg (130 lb) (with controller)
53 kg (117 lb) (without controller)

Heat Output/Hr. 514 Watts (1 706 Btu)

Required Air Flow forced-air cooling (see note)

Power Requirements (at full load with a controller)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	3.6	100	90 - 110	4.6
110	96.5 - 119	3.6	110	96.5 - 119	4.6
115	104 - 127	3.6	200	180 - 220	2.8
127	111 - 137	3.6	220	193 - 238	2.8
200	180 - 220	1.9	230	202 - 249	2.8
208	180 - 220	1.9	240	210 - 259	2.8
220	193 - 238	1.9			
230	208 - 254	1.9			

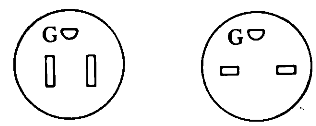
kVa	0.5
Phase	1
Branch circuit	15 A

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R



Note...
Units are designed to operate at nominal atmospheric pressure ±2.6% from sea level to 2 135 m (7 000 ft).

Environment

Air must flow freely through the IBM 4969 unit. The unit is cooled by forced-air fans; therefore, airflow must not be blocked.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points. The 4969 Models 4D, 4N, and 4P are designed to operate at nominal atmospheric pressure ± 2.6% from sea level to 2135 m (7000 ft).

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4969 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz	
continuous	= 0.127 mm (0.005 in.) double amplitude
transient	= 0.207 mm (0.008 in.) double amplitude
17–200 Hz	
continuous	= 0.07 G peak acceleration
transient	= 0.11 G peak acceleration
200–500 Hz	
continuous	= 0.035 G peak acceleration
transient	= 0.055 G peak acceleration

Service accessibility

For servicing, it is necessary to open the front or rear of the 4969 unit. Adequate service areas to the right, left, front, and rear of the unit must be provided. It is your responsibility to ensure that the enclosure will not tip when the 4969 unit is serviced. The mounting surface must be fixed and perpendicular to the floor. The 4969 is mounted to the front and rear vertical rails of the 4997 Model 2 Rack Enclosure using the air baffle provided with the 4969 unit. The air baffle requires a vertical mounting rail thickness of 2.3 mm (0.09 in.). A different rail thickness may prevent mounting the 4969. An electrical outlet is required for servicing equipment.

It is recommended that the 4969 unit be ordered factory mounted in a 4997 Model 2 Rack Enclosure. The 4969 cannot be installed in a 4997 Model 1 Enclosure. If you already have installed an IBM 4997 Model 2 Enclosure with adequate rack space 709 mm (27.9 in.) or an EIA standard enclosure, then it is your responsibility to physically mount the 4969 unit into your preferred position. The IBM Customer Engineer will install the attachment card (Feature #1215), connect the cables, and check out the system. If the 4969 unit is not rack mounted, the IBM Customer Engineer can still check out the unit while it is within its frame and pallet mounted. The Series/1 must be within cable length. It is your resp-sonsibility, in this case, to provide adequate cabling protection and shielding to ensure correct operation.

Signal cables

The 4969 Magnetic Tape Attachment Feature card is connected to the IBM 4969 Magnetic Tape Unit by two flat cables. The length of each cable is 6.1 m (20 ft). Up to four 4969 units can be included in a subsystem attached to one attachment feature card. Each of the expansion units are connected by multiunit cables. The length of each multiunit cable is 1.8 m (6 ft).

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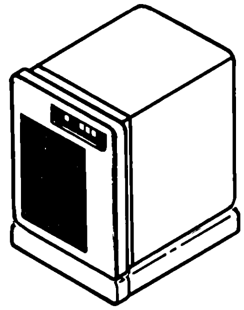
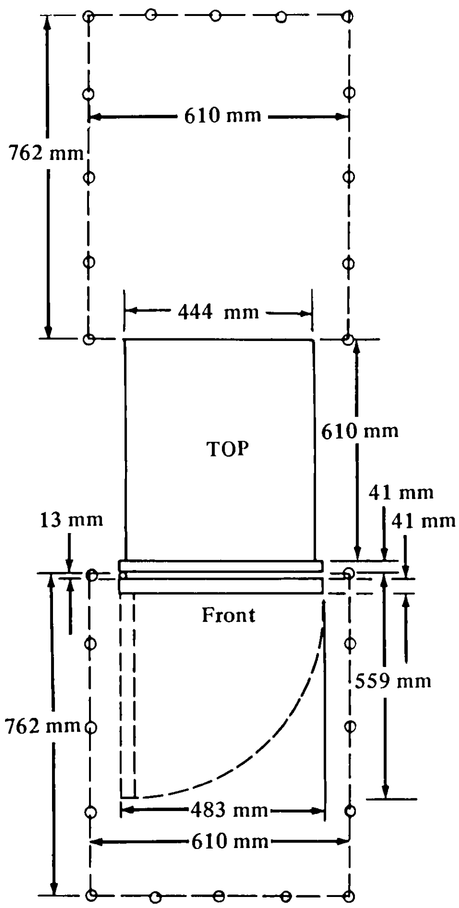
4969 Magnetic Tape Unit Models 7D, 7N, and 7P



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
559	22
483	19
444	17-1/2
41	1-3/4
13	1/2

Specifications

Dimensions

	Width	Depth	Height*
Millimeters	483	705	709
(Inches)	(19)	(28)	(28)

*Includes an 86 mm (3-1/2 in) air diverter.

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 84 kg (185 lb) (with controller)
78 kg (172 lb) (without controller)

Heat Output 850 watts (2900 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load with a controller)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	9.7	100	90 - 110	11.7
110	96.5 - 119	9.7	110	96.5 - 119	11.7
115	104 - 127	9.7	200	180 - 220	6.0
127	111 - 137	9.7	220	193 - 238	6.0
200	180 - 220	5.8	230	202 - 249	6.0
208	180 - 220	5.8	240	210 - 259	6.0
220	193 - 238	5.8			
230	208 - 254	5.8			

kVa	1.0
Phase	1
Branch circuit	15 A

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4969 unit. The unit is cooled by forced-air fans with the air exiting at the top of the unit. At least 75 mm (3 in.) clearance must be left between the top of any Model 7D, 7N, or 7P unit and any equipment mounted above it.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points. The 4969 Models 7D, 7N, and 7P can be installed to operate from sea level to 1 524 m (5000 ft).

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4969 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.207 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.035 G peak acceleration
transient	=	0.055 G peak acceleration

Service accessibility

For servicing, it is necessary to open the front or rear of the 4969 unit. Adequate service areas to the right, left, front, and rear of the unit must be provided. It is your responsibility to ensure that the enclosure will not tip when the 4969 unit is serviced. The mounting surface must be fixed and perpendicular to the floor. The 4969 is mounted to the front and rear vertical rails of the 4997 Model 2 Rack Enclosure using the air baffle provided with the 4969 unit. The air baffle requires a vertical mounting rail thickness of 2.3 mm (0.09 in.). A different rail thickness may prevent mounting the 4969. An electrical outlet is required for servicing equipment.

It is recommended that the 4969 unit be ordered factory mounted in a 4997 Model 2 Rack Enclosure. The 4969 cannot be installed in a 4997 Model 1 Enclosure. If you already have installed an IBM 4997 Model 2 Enclosure with adequate rack space 709 mm (27.9 in.) or an EIA standard enclosure, then it is your responsibility to physically mount the 4969 unit into your preferred position. The IBM Customer Engineer will install the attachment card (Feature #1215), connect the cables, and check out the system. If the 4969 unit is not rack mounted, the IBM Customer Engineer can still check out the unit while it is within its frame and pallet mounted. The Series/1 must be within cable length. It is your resp-sonsibility, in this case, to provide adequate cabling protection and shielding to ensure correct operation.

Signal cables

The 4969 Magnetic Tape Attachment Feature card is connected to the IBM 4969 Magnetic Tape Unit by two flat cables. The length of each cable is 6.1 m (20 ft). Up to four 4969 units can be included in a subsystem attached to one attachment feature card. Each of the expansion units are connected by multiunit cables. The length of each multiunit cable is 1.8 m (6 ft).

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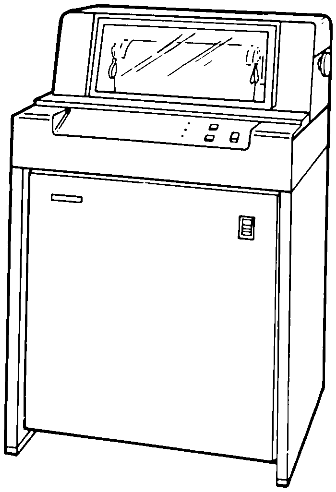
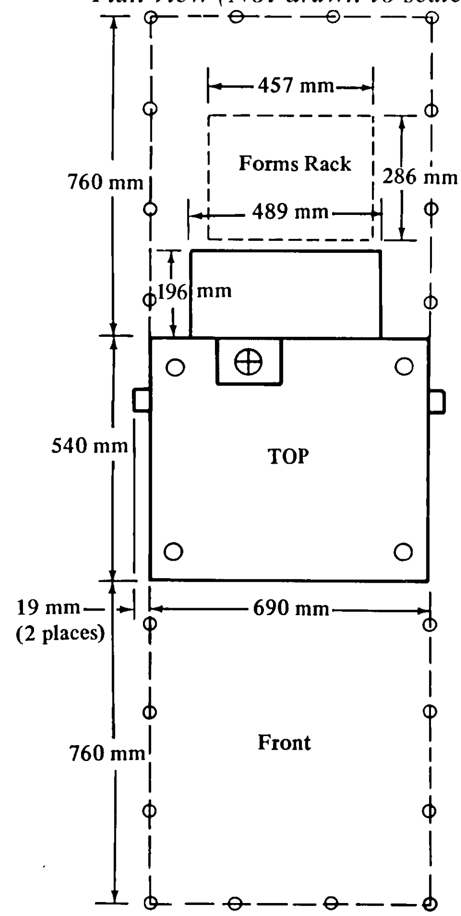
4973 Line Printer Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
760	30
690	27
540	21-1/4
489	19-1/4
457	18
286	11-1/4
196	7-3/4
19	3/4

Specifications

Dimensions

	Width	Depth	Height
Millimeters	690	736	1 080
(Inches)	(27)	(29)	(42-1/2)

Service Clearance

	Front	Rear	Top
Millimeters	760	760	610
(Inches)	(30)	(30)	(24)

Weight (includes forms rack) 132 kg (290 lb)

Heat Output/Hr. 403 Watts (1 380 Btu)

Required Air Flow convection cooling

Power Requirements

*60 Hz + 0.5 Hz		50 Hz + 0.5 Hz	
Volts ±10%	Amperes	Volts ±10%	Amperes
100	3.7	100	3.7
115	3.3	110	3.4
200	1.9	123.5	3.1
220	1.8	200	1.9
		220	1.8
		235	1.7

kVA	0.4
Phase	1
Branch	15 A

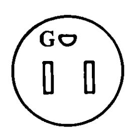
Switch-on and power-line-disturbance input surge current will not exceed 100 amperes for over 0.5 cycle.

Power Cord

Length	1.8 m (6 ft)
Conductors	3
Size	16 AWG

Power Cord Plugs and Receptacles

	(U.S./Canada only)**
Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



*Only 60 Hz 115 Vac available for U.S. and Canada.

**Power cord plugs will be provided and installed on 4973 printers shipped within the U.S. and Canada only. Users receiving 4973 printers in other countries will be required to provide a plug and receptacle with characteristics to comply with local electrical requirements.

Environment

Adequate space must be left around the 4973 printer to allow necessary cooling airflow to the device.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4973 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

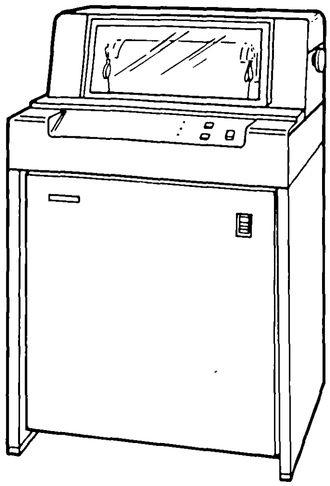
5–17 Hz		
continuous	=	0.128 mm (0.005 in.) double amplitude
transient	=	0.204 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.044 G peak acceleration
transient	=	0.055 G peak acceleration
200–500 Hz		
continuous	=	0.023 G peak acceleration
transient	=	0.038 G peak acceleration

Assume "G" level from 150–200 Hz to be linear.

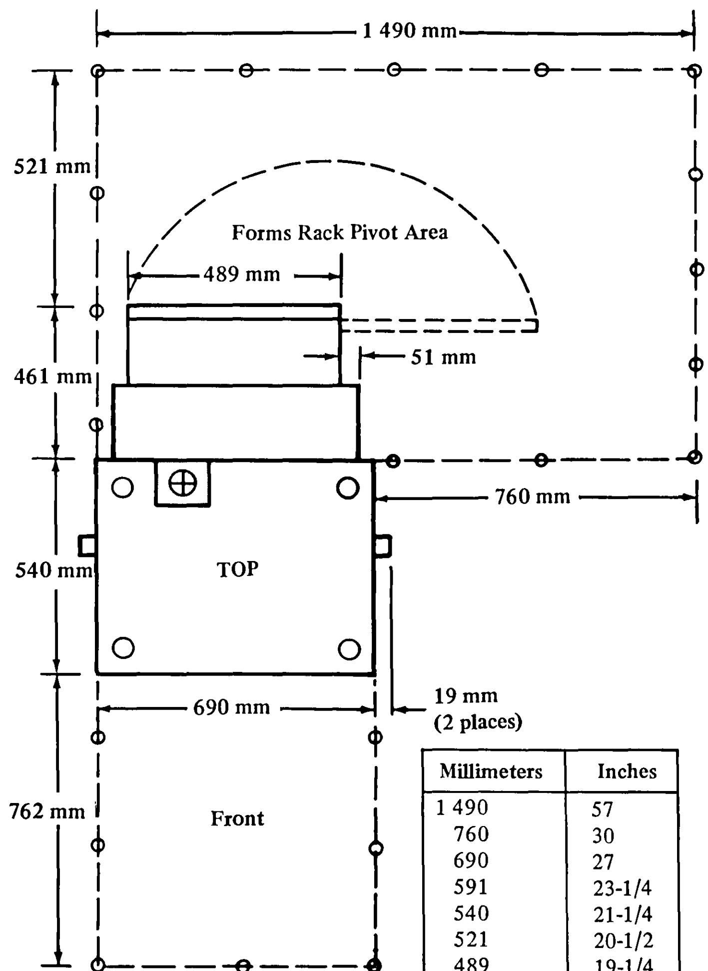
Signal cables

The 4973 Printer Attachment Feature card is connected to the IBM 4973 printer by one signal cable. Signal cables are available in lengths of 6.1 to 46.4 m (20 to 150 ft) in 3.1 m (10 ft) increments. This cable is not supported for outdoor installation.

4973 Line Printer Model 2



Plan view (Not drawn to scale)



Millimeters	Inches
1 490	57
760	30
690	27
591	23-1/4
540	21-1/4
521	20-1/2
489	19-1/4
461	18-1/4
51	2
19	3/4

Specifications

Dimensions

	Width	Depth	Height
Millimeters	690	1 001	1 080
(Inches)	(27)	(39-1/2)	(42-1/2)

Service Clearance

	Front	Rear	Top
Millimeters	760	982	610
(Inches)	(30)	(59-1/4)	(24)

Weight (includes forms rack) 143 kg (315 lb)

Heat Output/Hr. 403 Watts (1 380 Btu)

Required Air Flow convection cooling

Power Requirements

*60 Hz + 0.5 Hz Volts ±10%	Amperes	50 Hz + 0.5 Hz Volts ±10%	Amperes
100	4.6	100	4.6
115	4.1	110	4.2
200	2.3	123.5	3.7
220	2.1	200	2.3
		220	2.1
		235	2.0

kVA	0.5
Phase	1
Branch circuit	15 A

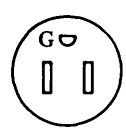
Switch-on and power-line-disturbance input surge current will not exceed 100 amperes for over 0.5 cycle.

Power Cord

Length	1.8 m (6 ft)
Conductors	3
Size	16 AWG

Power Cord Plugs and Receptacles

	(U.S./Canada only)**
Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



*Only 60 Hz 115 Vac available for U.S. and Canada.

**Power cord plugs will be provided and installed on 4973 printers shipped within the U.S. and Canada only. Users receiving 4973 printers in other countries will be required to provide a plug and receptacle with characteristics to comply with local electrical requirements.

Environment

Adequate space must be left around the 4973 printer to allow necessary cooling airflow to the device.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4973 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

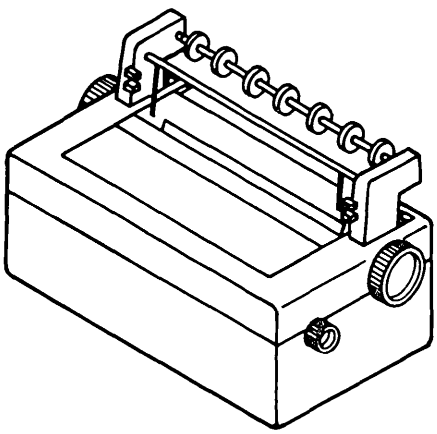
5–17 Hz	
continuous	= 0.128 mm (0.005 in.) double amplitude
transient	= 0.204 mm (0.008 in.) double amplitude
17–200 Hz	
continuous	= 0.044 G peak acceleration
transient	= 0.055 G peak acceleration
200–500 Hz	
continuous	= 0.023 G peak acceleration
transient	= 0.038 G peak acceleration

Assume "G" level from 150–200 Hz to be linear.

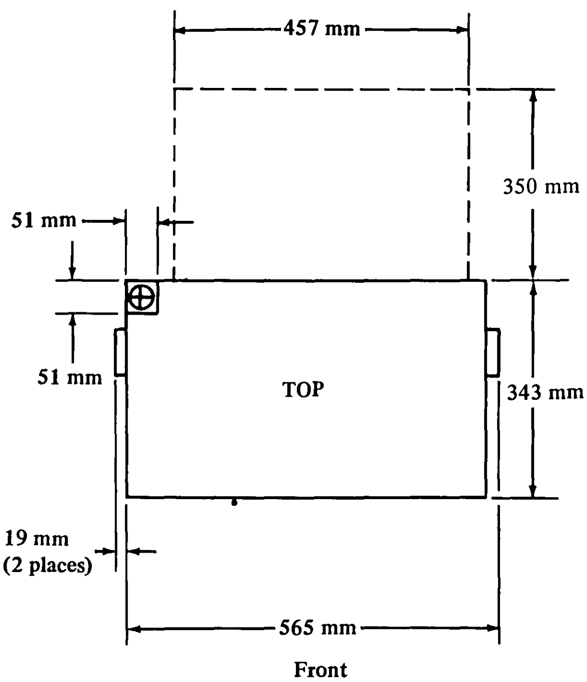
Signal cables

The 4973 Printer Attachment Feature card is connected to the IBM 4973 printer by one signal cable. Signal cables are available in lengths of 6.1 to 46.4 m (20 to 150 ft) in 3.1 m (10 ft) increments. This cable is not supported for outdoor installation.

4974 Printer Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
565	22-1/4
457	18
350	13-3/4
343	13-1/2
51	2
19	3/4

Specifications

Dimensions

	Width	Depth	Height
Millimeters	565	343	305
(Inches)	(22-1/4)	(13-1/2)	(12)

Service Clearance

The 4974 Printer is a free-standing table-top unit and may be moved in all directions for adequate service clearance.

Weight 25 kg (55 lb)

Heat Output/Hr 114 Watts (390 Btu)

Required Air Flow forced-air cooling

Power Requirements

60 Hz ± 0.5 Hz		50 Hz ± 0.5 Hz	
Volts ±10%	Amperes	Volts ±10%	Amperes
100	1.15	100	1.15
115	1.0	110	1.05
200	0.58	123.5	0.93
208	0.55	200	0.58
220	0.52	220	0.52
230	0.50	235	0.49

kVA 0.115
Phase 1
Branch circuit 15 A

Switch-on and power-line-disturbance input surge current will not exceed 30 amperes for over 0.5 cycle.

Power Cord

	*60 Hz	*50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

*Power cord plugs will be provided and installed on 4974 printers shipped within the U.S. and Canada only. Users receiving 4974 printers in other countries will be required to provide a plug and receptacle with characteristics to comply with local electrical requirements.

Environment

Adequate space must be left around the 4974 printer to allow necessary cooling airflow to the device.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

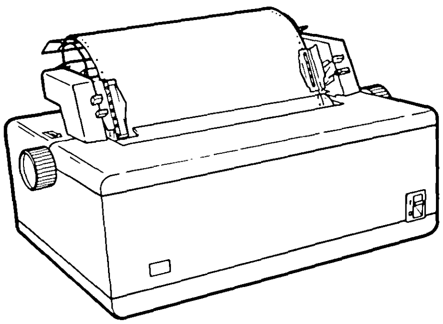
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4974 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.254 mm (0.010 in.) double amplitude
transient	=	0.406 mm (0.016 in.) double amplitude
17–160 Hz		
continuous	=	0.15 G peak acceleration
transient	=	0.25 G peak acceleration

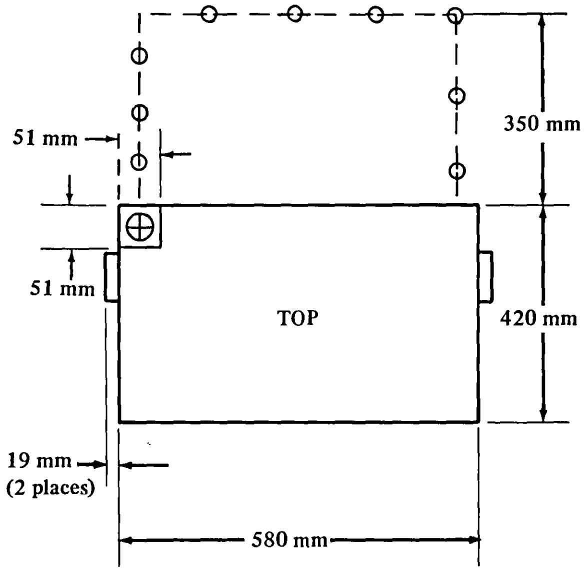
Signal cables

The 4974 Printer Attachment Feature card is connected to the IBM 4974 printer by one signal cable. Signal cables are available in lengths of 6.1 to 46.4 m (20 to 150 ft) in 3.1 m (10 ft) increments. This cable is not supported for outdoor installation.

4975 Printer Models 01L, 01R



Plan view (Not drawn to scale)



Millimeters	Inches
580	23
420	16-1/2
350	13-3/4
51	2
19	3/4

Specifications

Dimensions*

	Width	Depth	Height
Millimeters	580	420	221
(Inches)	(23)	(16-1/2)	(8-3/4)

Service Clearance

The 4975 Printer is a free-standing table-top unit and may be moved in all directions for adequate service clearance.

Weight 26 kg (58 lb)

Heat Output 125 watts (426 Btu/hr)

Required Air Flow forced-air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts		Amps	Volts		Amps
Nominal	Limits	(Nominal)	Nominal	Limits	(Nomina
100	90 - 110	1.4	100	90 - 110	1.4
110	96.5 - 119	1.3	110	96.5 - 119	1.3
120	104 - 127	1.2	200	180 - 220	0.7
127	111 - 137	1.1	220	193 - 238	0.67
200	180 - 220	0.7	230	202 - 249	0.6
208	180 - 220	0.67	240	210 - 259	0.58
220	193 - 238	0.64			
230/240	208 - 254	0.6			

kVA	0.14
Phase	1
Branch circuit	15 A

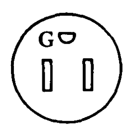
Switch-on and power-line-disturbance input surge current will not exceed 30 amperes for over 0.5 cycle.

Power Cord

	**60 Hz	**50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



*Without forms tractor or document insertion device

**Power cord plugs will be provided.

Note...
See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 4975 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

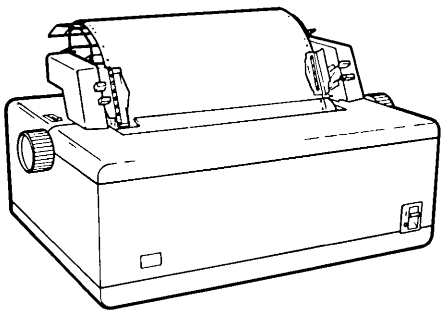
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4975 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

17–150 Hz	
continuous	= 0.07 G peak acceleration
transient	= 0.11 G peak acceleration

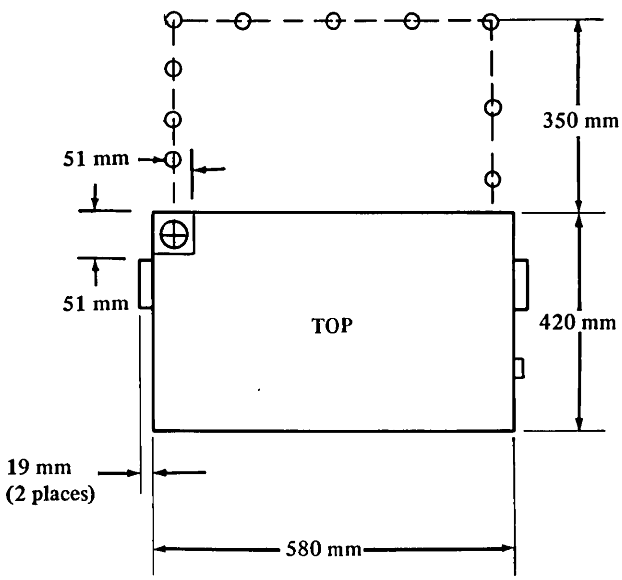
Signal cables

The 4975 printer is connected to the Multifunction Attachment Feature #1310 by one signal cable (refer to Chapter 8 for additional information). The signal cable can be up to 1 219 m (4000 ft) in length. This cable is not supported for outdoor installation.

4975 Printer Models 02L, 02R



Plan view (Not drawn to scale)



Front

Millimeters	Inches
580	23
420	16-1/2
350	13-3/4
51	2
19	3/4

Specifications

Dimensions*

	Width	Depth	Height
Millimeters	580	420	221
(Inches)	(23)	(16-1/2)	(8-3/4)

Service Clearance

The 4975 Printer is a free-standing table-top unit and may be moved in all directions for adequate service clearance.

Weight 30 kg (66 lb)

Heat Output 175 watts (597 Btu/hr)

Required Air Flow forced air cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal
100	90 - 110	1.9	100	90 - 110	1.9
110	96.5 - 119	1.7	110	96.5 - 119	1.7
120	104 - 127	1.58	200	180 - 220	0.95
127	111 - 137	1.5	220	193 - 238	0.86
200	180 - 220	0.95	230	202 - 249	0.83
208	180 - 220	0.91	240	210 - 259	0.79
220	193 - 238	0.86			
240	208 - 254	0.79			

kVA	0.19
Phase	1
Branch circuit	15 A

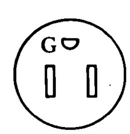
Switch-on and power-line-disturbance input surge current will not exceed 30 amperes for over 0.5 cycle.

Power Cord

	**60 Hz	**50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



*Without forms tractor or document insertion device

**Powei cord plugs will be provided.

Note...
See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 4975 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

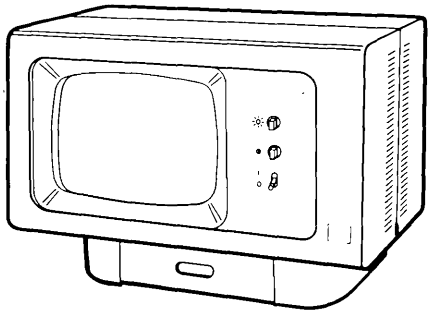
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4975 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

17–150 Hz	
continuous	= 0.07 G peak acceleration
transient	= 0.11 G peak acceleration

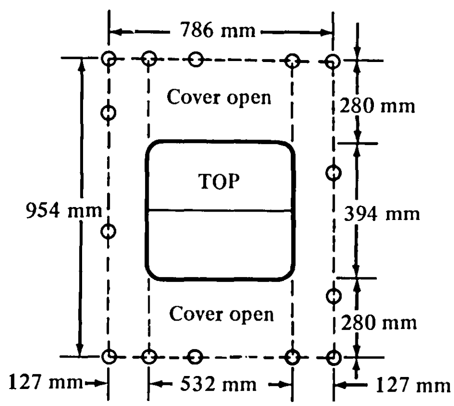
Signal cables

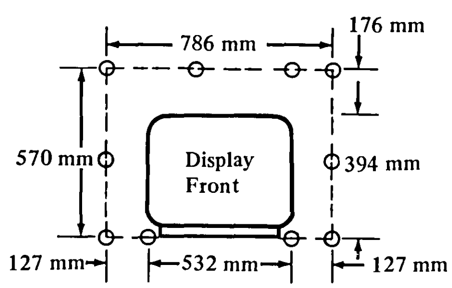
The 4975 printer is connected to the Multifunction Attachment Feature #1310 by one signal cable (refer to Chapter 8 for additional information). The signal cable can be up to 1 219 m (4000 ft) in length. This cable is not supported for outdoor installation.

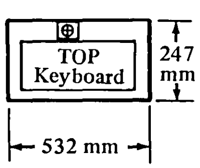
4978 Display Station Model 1–(RPQ)



Plan view (Not drawn to scale)







Millimeters	Inches
954	37-1/2
786	31
570	23
532	21
394	15-1/2
280	11
247	10
127	5

*Power cord plugs will be provided and installed on 4978 displays shipped within the U.S. and Canada only. Users receiving 4978 displays in other countries will be required to provide a plug and receptacle with characteristics to comply with local electrical requirements.

Specifications

Dimensions

	Width	Depth	Height
Display			
Millimeters	532	394	394
(Inches)	(21)	(15-1/2)	(15-1/2)
Keyboard			
Millimeters	532	247	106
(Inches)	(21)	(10)	(4-1/4)

Service Clearance

The 4978 Display Station is a free standing table-top unit and may be moved in all directions for adequate service clearance. Top and side service clearances should be a minimum of 300 mm (1 ft).

Weight

Display	21 kg	(47 lbs)
Keyboard	6 kg	(13 lbs)

Heat Output

Display	100 watts (341 Btu/hr)
Keyboard	5 watts (17 Btu/hr)

Required Air Flow Convection cooling

Power Requirements (display and keyboard)

60 Hz ± 0.5 Hz			50 Hz ± 0.5 Hz		
Volts Nominal	Limits	Amps (Nominal)	Volts Nominal	Limits	Amps (Nominal)
100	90 - 110	1.2	100	90 - 110	1.2
115	104 - 127	1.04	110	96.5 - 119	1.09
200	180 - 220	0.6	123.5	111 - 136	0.97
208	180 - 220	0.58	200	180 - 220	0.6
230	208 - 254	0.52	220	193 - 238	0.55
			235	210 - 259	0.51

kVA	0.12
Phase	1
Branch circuit	15 A

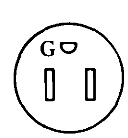
Switch-on and power-line-disturbance input surge current is negligible.

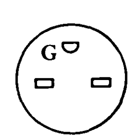
Power Cord

	60 Hz	50 Hz
Length	*1.8 m (6 ft)	*1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

***Power Cord Plugs and Receptacles**

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4978 unit.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4978 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

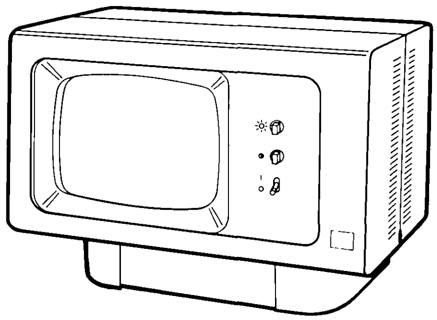
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.203 mm (0.008 in.) double amplitude
17–150 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.035 G peak acceleration
transient	=	0.055 G peak acceleration
Assume "G" level from 150–200 Hz to be linear.		

Signal cables

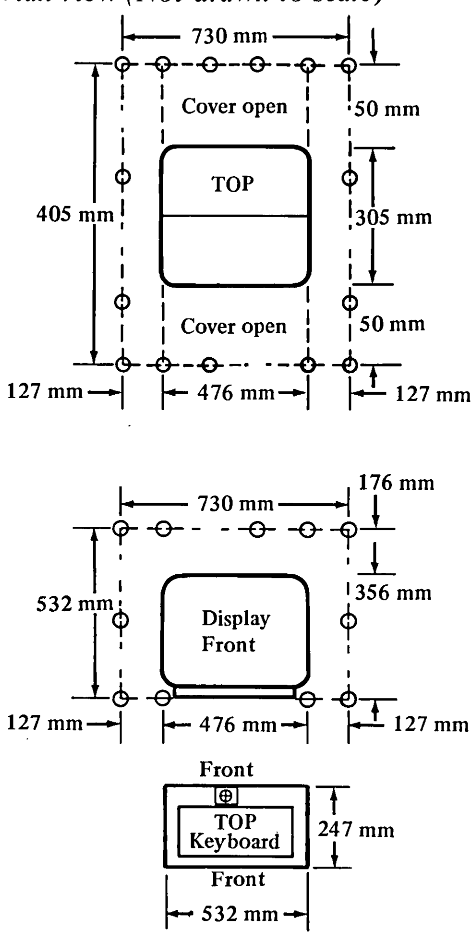
The 4978 Display Attachment Feature card is connected to the IBM 4978 Display Station by one signal cable. This signal cable is available with the 4978 in lengths of 6 to 150 m (20 to 500 ft). The minimum length available when ordered separately is 9 m (30 ft). The signal cable has a bend radius of 67 mm (2.6 in.), and OD of 14 mm (0.56 in.) and a weight of .335 Kg/m (3.6 oz/ft). The usable length of the cable attaching the keyboard to the display is 0.7 m (28 in.) except for RPQ DO2064 which includes a cable with a usable length of 1.7 m (67 in.).

This cable is not supported for outdoor installation.

4978 Display Station Model 2 (RPQ)



Plan view (Not drawn to scale)



Millimeters	Inches
730	28-3/4
532	21
476	18-3/4
405	16
356	14
335	13
247	10
176	7
127	5
50	2

Specifications

Dimensions	Width	Depth	Height**	Height**
Display				
Millimeters	476	335	298	356
(Inches)	(18-3/4)	(13)	(11-3/4)	(14)
Keyboard				
Millimeters	532	247	106	
(Inches)	(21)	(10)	(4-1/4)	

**There are two models of the 4978 rear cable connector version.

Service Clearance

The 4978 Display Station is a free-standing table-top unit and may be moved in all directions for adequate service clearance. Top and side service clearances should be a minimum of 300 mm (1 ft).

Weight

Display	21 kg	(47 lbs)
Keyboard	6 kg	(13 lbs)

Heat Output

Display	100 watts	(341 Btu/hr)
Keyboard	5 watts	(17 Btu/hr)

Required Air Flow convection cooling

Power Requirements (display and keyboard)

60 Hz ± 0.5 Hz

Volts ±10%	Amperes
100	1.2
115	1.04
200	0.6
208	0.58
230	0.52

kVA	0.12
Phase	1
Branch circuit	15 A

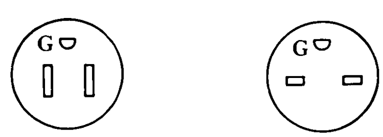
Switch-on and power-line-disturbance input surge current is negligible.

Power Cord

	60 Hz
Length	*1.8 m (6 ft)
Conductors	3
Size	18 AWG

***Power Cord Plugs and Receptacles**

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R



*See 4978 Model 1 for power plug requirements.

Environment

Air must flow freely through the IBM 4978 unit.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4978 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

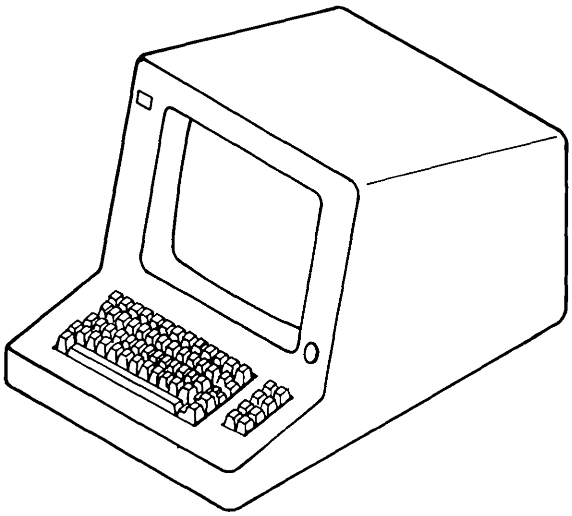
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.203 mm (0.003 in.) double amplitude
17–150 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.035 G peak acceleration
transient	=	0.055 G peak acceleration

Assume "G" level from 150–200 Hz to be linear.

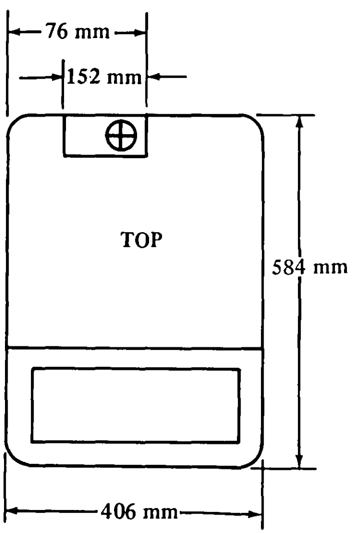
Signal cables

The 4978 Display Attachment Feature card is connected to the IBM 4978 Display Station by one signal cable. This signal cable is available with the 4978 in lengths of 6 to 150 m (20 to 500 ft). The minimum length available when ordered separately is 9 m (30 ft). The signal cable has a bend radius of 67 mm (2.6 in.), and OD of 14 mm (0.56 in.) and a weight of .335 Kg/m (3.6 oz/ft). The usable length of the cable attaching the keyboard to the display is 0.7 m (28 in.) except for RPQ DO2064 which includes a cable with a usable length of 1.7 m (67 in.). This cable is not supported for outdoor installation.

4979 Display Station Model 1



Plan view (Not drawn to scale)



Front

Millimeters	Inches
584	23
406	16
152	6
76	3

Specifications

Dimensions

	Width	Depth	Height
Millimeters	406	584	381
(Inches)	(16)	(23)	(15)

Service Clearance

The 4979 Display Station is a free-standing table-top unit and may be moved in all directions for adequate service clearance.

Weight 14 kg (30 lb)

Heat Output 115 watts (392 Btu/hr)

Required Air Flow *convection cooling

Power Requirements

60 Hz ± 0.5 Hz Volts ±10%	Amperes	50 Hz ± 0.5 Hz Volts ±10%	Amperes
100	1.5	100	1.5
115	1.3	110	1.4
200	0.75	123.5	1.21
208	0.72	200	0.75
230	0.65	220	0.68
		235	0.64

kVA	0.15
Phase	1
Branch circuit	15 A

Switch-on and power-line disturbance input surge current is negligible.

Power Cord

	60 Hz	50 Hz
Length	**1.8 m (6 ft)	**1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

***Power Cord Plugs and Receptacles**

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

*A minimum clearance of 51 mm (2 in) must be provided above the unit to allow warm air exhaust.

**Power cord plugs will be provided and installed on 4979 displays shipped within the U.S. and Canada only. Users receiving 4979 displays in other countries will be required to provide a plug and receptacle with characteristics to comply with local electrical requirements.

Environment

Adequate space must be left around the 4979 Display Station to allow necessary cooling airflow to the device. A minimum clearance of 51 mm (2 in.) must be provided above the unit to allow warm air exhaust.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

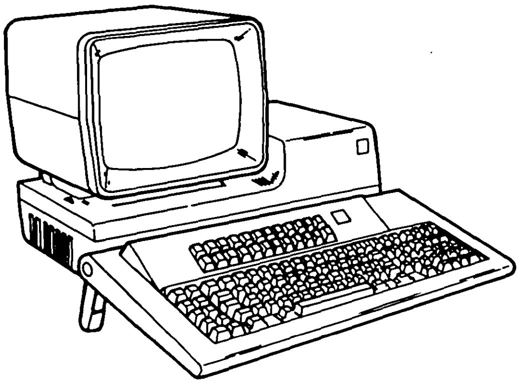
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4979 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz	
continuous	= 0.127 mm (0.005 in.) double amplitude
transient	= 0.203 mm (0.008 in.) double amplitude
17–150 Hz	
continuous	= 0.07 G peak acceleration
transient	= 0.11 G peak acceleration
200–500 Hz	
continuous	= 0.035 G peak acceleration
transient	= 0.055 G peak acceleration
Assume "G" level from 150–200 Hz to be linear.	

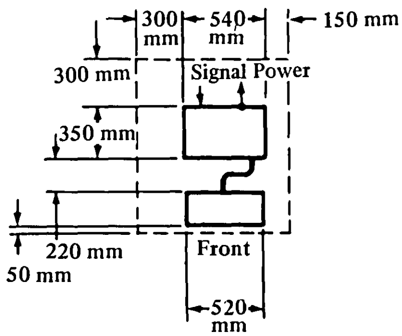
Signal cables

The 4979 Display Attachment Feature Card is connected to the IBM 4979 Display Station by one signal cable. Signal cables are available in lengths of 6.1 to 46.4 m (20 to 150 ft) in 3.1 m (10 ft) increments. This cable is not supported for outdoor installation.

4980 Display Station



Plan view (Not drawn to scale)



Millimeters	Inches
540	21-1/4
520	20-1/2
350	13-3/4
300	12
220	8-3/4
150	6
50	2

Specifications

Dimensions

	Width	Depth	Height
Display			
Millimeters	540	350	460
(Inches)	(21-1/4)	(13-3/4)	(18)

The 4980 is a free-standing table-top unit and may be moved in all directions for adequate service clearance. Top and side service clearances should be a minimum of 300 mm (1 ft). The length of the keyboard cable permits the keyboard to be moved up to 610 mm (24 inches) away from the the display screen.

Weight

Display	7 kg	(15 lbs)
Keyboard	3 kg	(6 lbs)
Logic Unit	12 kg	(26 lbs)

Heat Output/Hour

85 watts (300 Btu)

Required Air Flow Convection cooling

Power Requirements (display and keyboard)

60 Hz ± 0.5 Hz	50 Hz ± 0.5 Hz
Volts Nominal	**Volts Nominal**
100	100
110	110
120	200
127	220
200	230
208	240
220	
240	

kVA	0.2
Phase	1
Branch circuit	15A

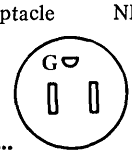
Switch-on and power-line-distrubance input surge current is negligible.

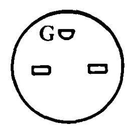
Power Cord

	60 Hz	50 Hz
Length	*1.8 m (6 ft)	*1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

***Power Cord Plugs and Receptacles**

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Note...
See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 4980 unit.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

Make sure that the vibration does not exceed the specified levels. The 4980 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

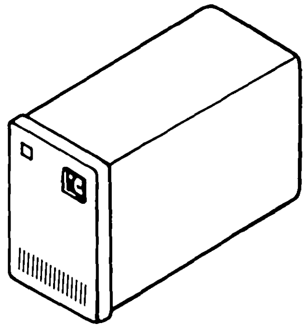
5–17 Hz		
continuous	=	0.127 mm (0.005 in.) double amplitude
transient	=	0.203 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.035 G peak acceleration
transient	=	0.055 G peak acceleration
Assume "G" level from 150-200 Hz to be linear.		

Signal cables

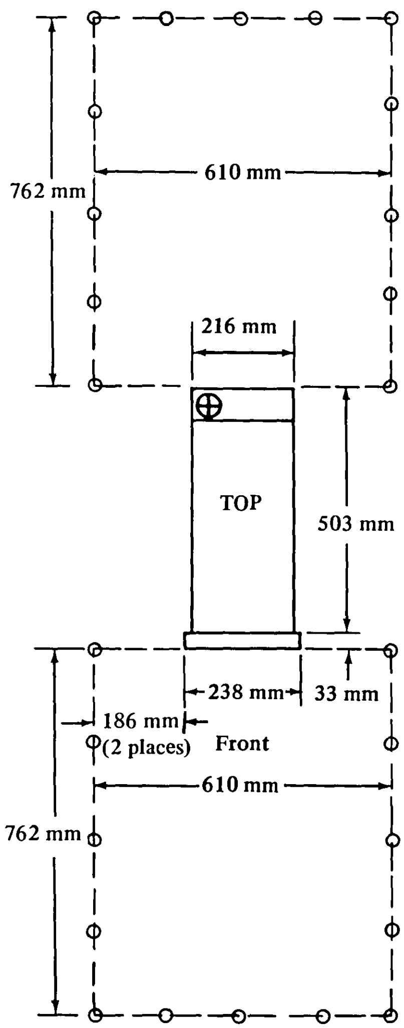
One signal cable connects the 4980 to the Series/1.

For information on connecting this cable, see "Multidrop work-station attachment (feature 1250)" in Chapter 8.

4982 Sensor Input/Output Unit Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
503	19-3/4
238	9-1/2
216	8-1/2
186	8
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	216	536	356
(Inches)	(8-1/2)	(21)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight 20 kg (45 lb)

Heat Output/Hr. 153 Watts (522 Btu)

Required Air Flow natural convection

Power Requirements (at full load)

60 Hz ± 0.5 Hz Volts ±10%	Amperes	50 Hz ± 0.5 Hz Volts ±10%	Amperes
100	2.0	100	2.0
115	2.0	110	2.0
200	1.0	123.5	2.0
208	1.0	200	1.0
230	1.0	220	1.0
		235	1.0

kVA	0.2
Phase	1
Branch circuit	15 A

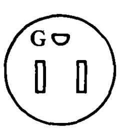
Switch-on and power-line-disturbance input surge current will not exceed 40 amperes for over 0.5 cycle and 15 amperes for over 5.0 cycle.

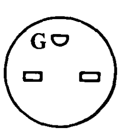
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	16 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4982 unit.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

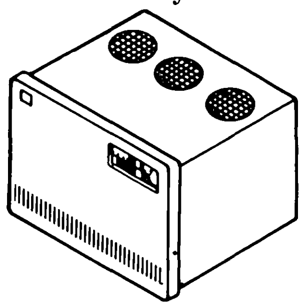
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4982 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

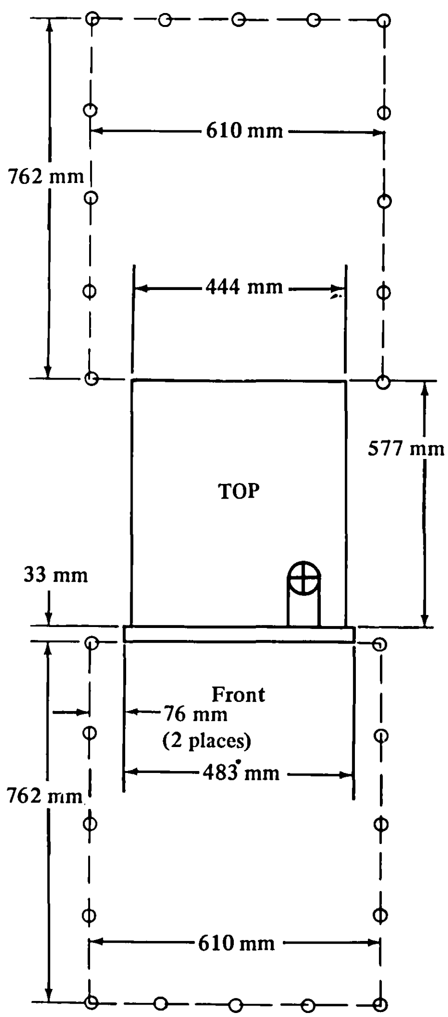
Signal cables

The 4982 Sensor Input/Output Attachment Feature card is connected to the IBM 4982 by three cables. Each cable is 3.1 m (10 ft) long. The cabling from the IBM 4982 to your devices is described in Chapter 8.

4987 Programmable Communications Subsystem



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24-1/2
606	24-1/4
577	23
483	19
444	17-1/2
356	14
76	3
33	1-1/4
25	1

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	610	356
(Inches)	(19)	(24-1/2)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 45 kg (100 lb)

Heat Output/Hr. 325 Watts (1 090 Btu)

Required Air Flow convection cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz		50 Hz ± 0.5 Hz	
Volts	Amperes	Volts	Amperes
100	3.2	100	3.2
115	3.2	110	3.2
200	1.6	123.5	3.2
208	1.6	200	1.6
220	1.6	220	1.6
230	1.6	235	1.6

kVA	0.32
Phase	1
Branch circuit	15 A

Switch-on and power-line disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 4987 unit. The hardware fan blower assembly produces forced-air cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

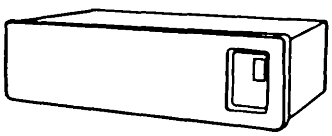
It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4987 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

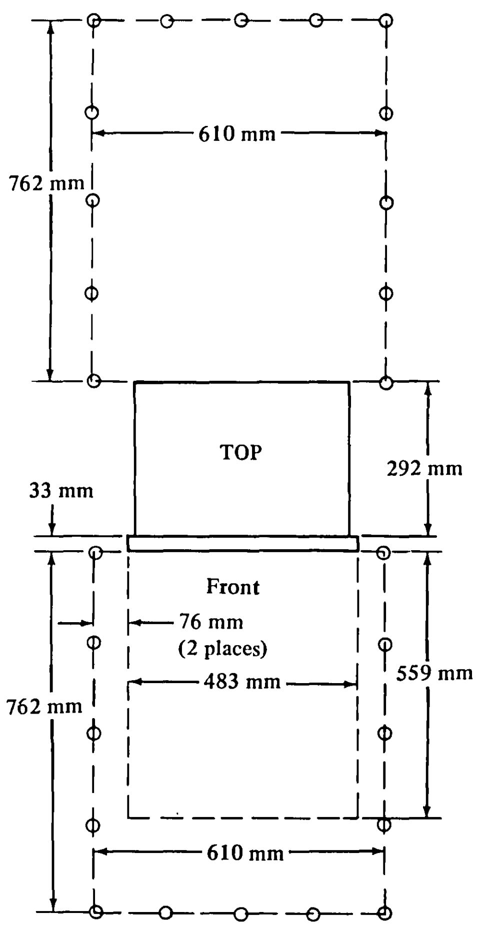
Signal cables

The 4987 Programmable Communications Subsystem Attachment Feature cards are connected to the 4987 enclosure by two flat cables. Each cable is 6.1 m (20 ft) long. The IBM-supplied cables that connect the 4987 communication feature cards to the data communications equipment/data terminal equipment are 6.1 m (20 ft) long. The cable that connects the 4990 Communications Console to the 4987 enclosure is 2.0 m (6.5 ft) long.

4993 Series/1–System/370 Termination Enclosure Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
559	22
483	19
292	11-1/2
76	3
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	483	325	133
(Inches)	(19)	(13)	(5-1/2)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	76	76
(Inches)	(30)	(30)	(3)	(3)

Weight 11 kg (25 lb)

Heat Output/Hr. 40 Watts (136 Btu)

Required Air Flow convection cooling

Power Requirements (at full load)

60 Hz ± 0.5 Hz		50 Hz ± 0.5 Hz	
Volts ±10%	Amperes	Volts ±10%	Amperes
100	0.3	100	0.3
115	0.3	110	0.3
200	0.15	123.5	0.3
208	0.15	200	0.15
230	0.15	220	0.15
		235	0.15

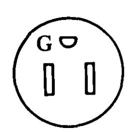
kVA	.04
Phase	1
Branch circuit	15 A

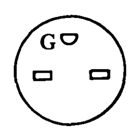
Power Cord

	60 Hz	50 Hz
Length	1.8 m (6 ft)	1.8 m (6 ft)
Conductors	3	3
Size	18 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	115	208/230
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Environment

Air must flow freely through the IBM 4993 unit. The unit is cooled by convection; therefore, airflow must not be blocked.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4993 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Signal cables

The IBM 4993 Attachment Feature card is connected to the IBM 4993 Series/1–System/370 Termination Enclosure by cable. The length of the cable is 2.4 m (7.8 ft).

System/370 cables

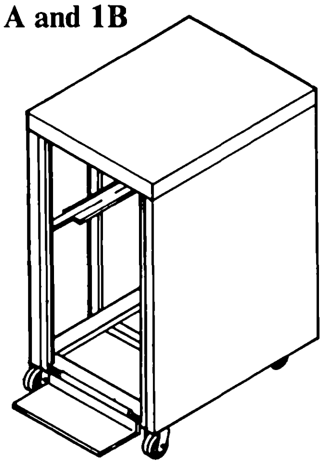
System/370 channel cables are not provided with the Series/1 4993 Termination Enclosure. These cables (cable group number 1806) should be ordered[1] by your IBM marketing representative when System/370 installation planning for the Series/1 is performed. The channel cables connect a Series/1 4993 to a System/370 (Models 135–168) or to an IBM 3031, 3032, 3033, 4331, or 4341 processor, or to a control unit.
Cable group number ... 1806
Number of cables ... 2

Maximum cable length

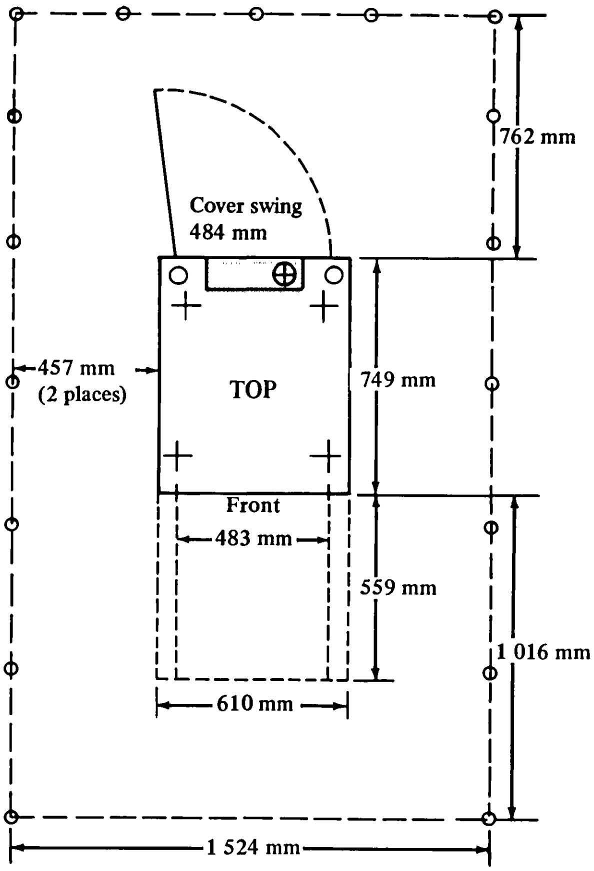
Total cable length of 200 feet (unless modified by general control-to-channel cabling schematic) on which up to eight control units may be attached.

[1] There is a charge for these cables. Order them through Materials Equipment Specialties (MES).

4997 Rack Enclosure Models 1A and 1B



Plan view (Not drawn to scale)



Millimeters	Inches
1 524	60
1 016	40
762	30
749	29-1/2
610	24
559	22
484	19
483	19
457	18

Dimensions

	Width*	Depth	Height
Millimeters	610	749	1 000
(Inches)	(24)	(29-1/2)	(39-1/2)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Maximum Weight**

57 kg (125 lb)

Power Requirements

Power requirements must be calculated using the Product Specification worksheet. The 4997 enclosure is limited to 16 amperes (15 amperes in Canada).

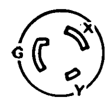
Branch circuit 20 A

Power Cord

Length	4.3 m (14 ft)
Conductors	3
Size	14 AWG

Power Cord Plugs and Receptacles***

Volts	115	208/230
Plug	NEMA L5-20P	NEMA L6-20P
Receptacle	NEMA L5-20R	NEMA L6-20R



*For each additional bay of IBM 4997-1A or 4997-1B enclosure bolted to the first bay increase the overall width of the enclosure by 599.9 mm (23.6 in).

**An additional 7.3 kg (16 lb) must be added if the autotransformer feature is installed.

***Power cord plugs will be provided and installed on 4997 enclosures shipped within the U.S. and Canada only. Users receiving 4997 enclosures in other countries will be required to provide a plug and mating receptacle with characteristics to comply with local electrical requirements.

Environment

Air must flow freely through the IBM 4997 unit. The **temperature and relative humidity** listed on pages 5-3 and 5-5 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration input to a 4997 enclosure does not exceed the specified levels. See the **vibration and shock level** graphs in Chapter 9 for additional information on systems installed in 4997 enclosures.

Rack-mounting fixture

A rack-mounting fixture is used when half-width, 216 mm (8.5 in.), units are mounted in the rack enclosure. The mounting fixture mounts as a full-width, 483 mm (19 in.), unit with the half-width units mounted inside the fixture.

Customer access panel

A customer access panel mounts in the rear of the rack enclosure. This panel provides connectors for the digital input/output feature, timer feature, customer direct program control feature, and the teletypewriter feature. See Chapter 8 for additional information.

Primary power limits

The sum of Underwriter's Laboratory label rated primary power consumption in kVA for each IBM machine type installed in a 4997 Enclosure for U.S. installation may not exceed 1.80 kVA at the lower voltages (100–127.5 Vac) and 3.60 kVA at the higher voltages (200–250 Vac).

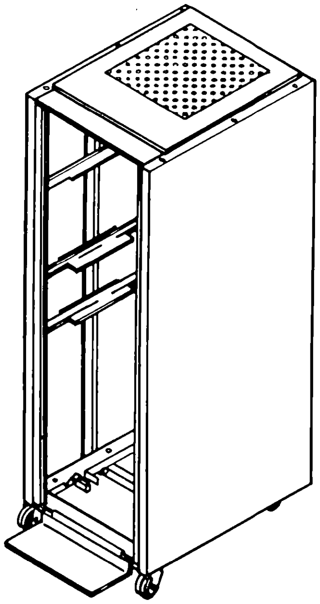
For Canadian installations, the 4997 models 1A and 1B are limited to 1.70 kVA at the lower voltages and 3.40 kVA at the higher voltages. This limit is due to the installation of a 15 amp fuse in the enclosure primary distirubiton panel.

For GBG/I installations, all enclosures are limited to 1.60 kVA at the lower voltages and 3.20 kVA at the higher voltages. These limits are independent of line frequency. The GBG/I primary power limits are somewhat tighter than the U.S. limits due to the wider range of voltages and variation of voltages to be found in worldwide installations.

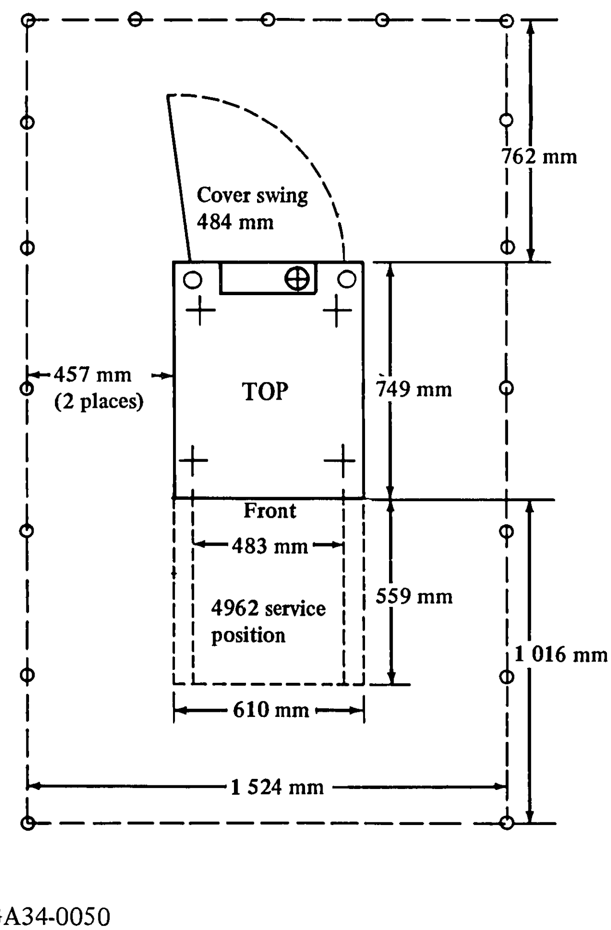
Connecting cables

When estimating the cable length required to connect from an IBM feature in a processor, 4965, or I/O expansion unit machine type installed in a 4997 Enclosure to any external device allow 2–2.5 m (6–8 ft) for a 4997-2 and 1.5–2.0 m (4–6 ft) for a 4997-1 for cable routing through the enclosure.

4997 Rack Enclosure Models 2A and 2B



Plan view (Not drawn to scale)



Specifications

Dimensions

	Width*	Depth	Height
Millimeters	610	749	1 780
(Inches)	(24)	(29-1/2)	(70)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 016	762	457	457
(Inches)	(40)	(30)	(18)	(18)

Maximum Weight**

107 kg (235 lb)

Power Requirements

Power requirements must be calculated using the Product Specification worksheet. The 4997 enclosure is limited to 16 amperes.

Branch circuit 20 A

Power Cord

Length	4.3 m (14 ft)
Conductors	3
Size	14 AWG

Power Cord Plugs and Receptacles***

Volts	115	208/230
Plug	NEMA L5-20P	NEMA L6-20P
Receptacle	NEMA L5-20R	NEMA L6-20R

*For each additional bay of IBM 4997-2A or 4997-2B enclosure bolted to the first bay increase the overall width of the enclosure by 599.9 mm (23.6 in).

**An additional 7.3 kg (16 lb) must be added if the autotransformer feature is installed.

***Power cord plugs will be provided and installed on 4997 enclosures shipped within the U.S. and Canada only. Users receiving 4997 enclosures in other countries will be required to provide a plug and mating receptacle with characteristics to comply with local electrical requirements.

Millimeters	Inches
1 524	60
1 016	40
762	30
749	29-1/2
610	24
559	22
484	19
483	19
457	18

Environment

Air must flow freely through the IBM 4997 unit. The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration input to a 4997 enclosure does not exceed the specified levels. See the **vibration and shock level** graphs in Chapter 9 for additional information on systems installed in 4997 enclosures.

Rack-mounting fixture

A rack-mounting fixture is used when half-width, 216 mm (8.5 in.), units are mounted in the rack enclosure. The mounting fixture mounts as a full-width, 483 mm (19 in.), unit with the half-width units mounted inside the fixture.

Customer access panel

A customer access panel mounts in the rear of the rack enclosure. This panel provides connectors for the digital input/output feature, timer feature, customer direct program control feature, and the teletypewriter feature. See Chapter 8 for additional information.

Primary power limits

The sum of Underwriter's Laboratory label rated primary power consumption in kVA for each IBM machine type installed in a 4997 Enclosure for U.S. installation may not exceed 1.80 kVA at the lower voltages (100–127.5 Vac) and 3.60 kVA at the higher voltages (200–250 Vac).

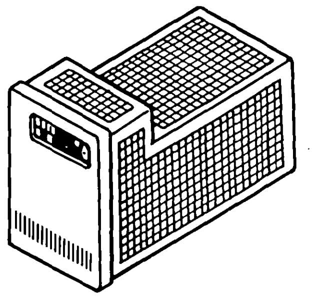
For Canadian installations, the 4997 models 2A and 2B have the same rating as for U.S. applications.

For GBG/I installations, all enclosures are limited to 1.60 kVA at the lower voltages and 3.20 kVA at the higher voltages. These limits are independent of line frequency. The GBG/I primary power limits are somewhat tighter than the U.S. limits due to the wider range of voltages and variation of voltages to be found in worldwide installations.

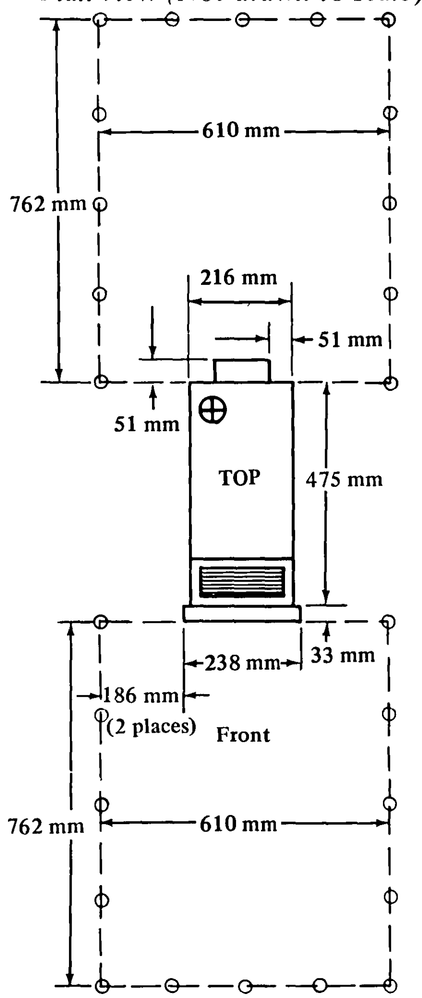
Connecting cables

When estimating the cable length required to connect from an IBM feature in a processor, 4965, or I/O expansion unit machine type installed in a 4997 Enclosure to any external device allow 2–2.5 m (6–8 ft) for a 4997-2 and 1.5–2.0 m (4–6 ft) for a 4997-1 for cable routing through the enclosure.

4999 Battery Backup Unit Model 1



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
475	19
238	9-1/2
216	8-1/2
186	8
51	2
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	216	508	356
(Inches)	(8-1/2)	(20)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight 32 kg (71 lb)

Heat Output/Hr. 109 Watts (375 Btu)

Required Air Flow convection cooling

Power Requirements

47–63 Hz	Amperes
100 V minimum	7.0
127 V maximum	7.0

kVA	0.1 (plus attached processor)
Phase	1
Branch circuit	15 A

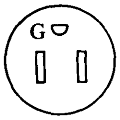
Switch-on and power-line-disturbance surge current is not applicable.

Power Cord

Length	1.8 m (6 ft)
Conductors	3
Size	16 AWG

Power Cord Plugs and Receptacles

Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



Environment

Air must flow freely through the IBM 4999 unit to provide convection cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4999 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Output limits

The 4999 will support a fully populated 4953 or 4955 Model A, B, C, or D, or a 4952 Model B, or 4955 Models E and F if the ac power consumption (measured at the primary power input), corrected for power factor, does not exceed 800 VA (530 watts square wave). The 4999 does not support a 4952 Model A prior to serial number 50,000 or a 4952 Model C.

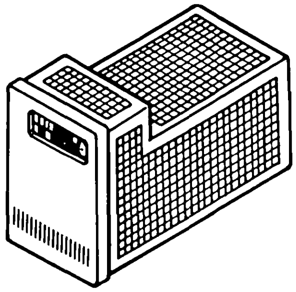
Battery requirements

It is your responsibility to supply a battery to operate with the IBM 4999 Battery Backup Unit. The recommended battery is a sealed 12-volt automotive type with at least a 100 ampere-hour rating.

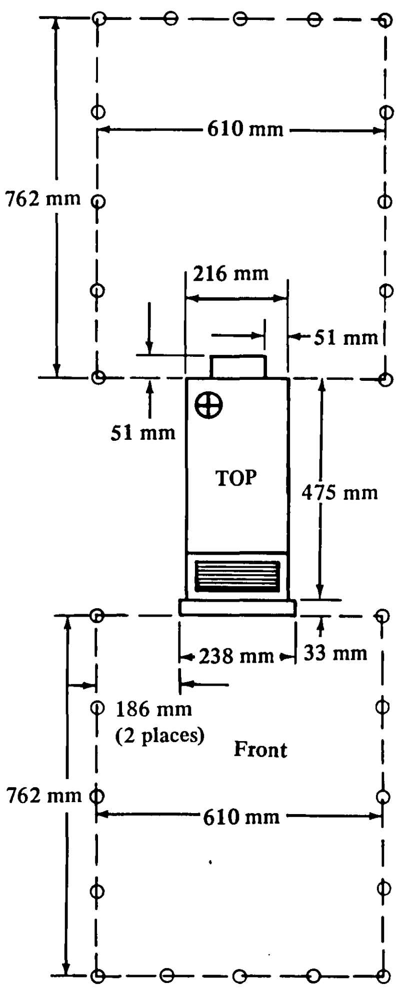
Battery charger requirements

It is your responsibility to supply an adequate battery charger. Normally, being able to recharge the battery in 30 hours is sufficient. But abnormally frequent commercial power interruptions might require you to have a charger that can recharge the battery quicker. The charger should have a three-conductor line cord that is UL listed.

4999 Battery Backup Unit Model 2



Plan view (Not drawn to scale)



Millimeters	Inches
762	30
610	24
475	19
238	9-1/2
216	8-1/2
186	8
51	2
33	1-1/2

Specifications

Dimensions

	Width	Depth	Height
Millimeters	216	508	356
(Inches)	(8-1/2)	(20)	(14)

Service Clearance

	Front	Rear	Right	Left
Millimeters	762	762	186	186
(Inches)	(30)	(30)	(8)	(8)

Weight 32 kg (71 lb)

Heat Output/Hr. 109 Watts (375 Btu)

Required Air Flow convection cooling

Power Requirements

47–63 Hz	Amperes
200 V minimum	3.5
240 V maximum	3.5

kVA	0.1 (plus attached processor)
Phase	1
Branch circuit	15 A

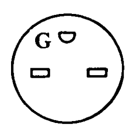
Switch-on and power-line-disturbance input surge current is not applicable.

Power Cord

Length	1.8 m (6 ft)
Conductors	3
Size	16 AWG

Power Cord Plugs and Receptacles

Volts	208/230
Plug	(molded cord set)
Receptacle	NEMA 6-15R



Environment

Air must flow freely through the IBM 4999 unit to provide convection cooling.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

It is your responsibility to ensure that the vibration does not exceed the specified levels. The IBM 4999 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Output limits

The 4999 will support a fully populated 4953 or 4955 Model A, B, C, or D, or a 4952 Model B, or 4955 Models E and F if the ac power consumption, corrected for power factor, does not exceed 800 VA (530 watts square wave). The 4999 does not support a 4952 Model A prior to serial number 50,000.

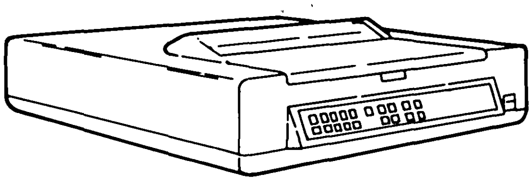
Battery requirements

It is your responsibility to supply a battery to operate with the IBM 4999 Battery Backup Unit. The recommended battery is a sealed 12-volt automotive type with at least a 100 ampere-hour rating.

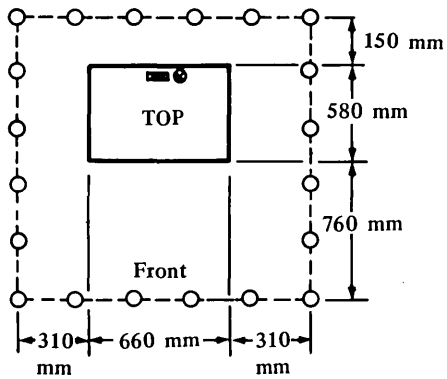
Battery charger requirements

It is your responsibility to supply an adequate battery charger. Normally, being able to recharge the battery in 30 hours is sufficient. But abnormally frequent commercial power interruptions might require you to have a charger that can recharge the battery quicker. The charger should have a three-conductor line cord that is UL listed.

5219 Typewheel Printer
Models D01 and D02



Plan view (Not drawn to scale)



Millimeters	Inches
760	30
660	26
580	23
310	12
150	6

Specifications

Dimensions

	Width	Depth	Height
Printer			
Millimeters	660	580	200
(Inches)	(26)	(23)	(8)
Printer with sheet feed option			
Millimeters	660	580	480
(Inches)	(26)	(23)	(19)
Printer with forms tractor option			
Millimeters	660	580	330
(Inches)	(26)	(23)	(13)

Service Clearance

	Front	Rear	Right	Left	Top
Printer					
Millimeters	760	150	310	310	610
(Inches)	(30)	(6)	(12)	(12)	(24)
Printer with sheet feed option					
Millimeters	760	310	760	310	610
(Inches)	(30)	(12)	(30)	(12)	(24)
Printer with forms tractor option					
Millimeters	760	410	310	310	610
(Inches)	(30)	(16)	(12)	(12)	(24)

Weight

Printer	31 kg	(68 lb)
Printer with sheet feed option	40 kg	(90 lb)
Printer with forms tractor option	33 kg	(74 lb)

Power Requirements

60 Hz + 0.5 Hz	50 Hz + 0.5 Hz	
Volts	Volts	
115	100	200
	110	220
	123.5	240

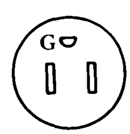
kVA	0.25
Phase	1
Branch circuit	15 A

Power Cord

Length	2.4 m (8 ft)
Conductors	3
Size	16 AWG

Power Cord Plugs and Receptacles

	(U.S./Canada only)
Volts	115
Plug	(molded cord set)
Receptacle	NEMA 5-15R



Note...
See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 5219 unit.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits; they are not optimum operating points.

Vibration limits

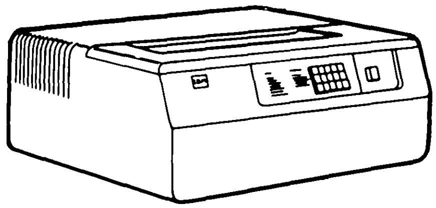
Make sure that the vibration does not exceed the specified levels. The 5219 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.128 mm (0.005 in.) double amplitude
transient	=	0.204 mm (0.008 in.) double amplitude
17–200 Hz		
continuous	=	0.07 G peak acceleration
transient	=	0.11 G peak acceleration
200–500 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration
Assume "G" level from 150-200 Hz to be linear.		

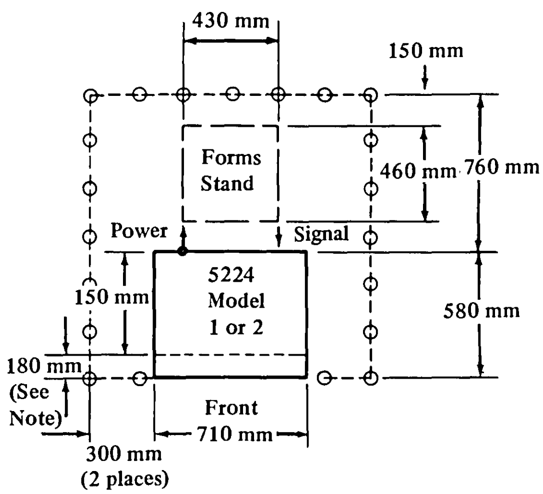
Signal cable

One signal cable connects the 5219 to the Series/1. For information on connecting this cable, see "Printer Attachment—5200 Series" in Chapter 7.

5224 Printer Models 1 and 2



Plan View (Not drawn to scale)



Millimeters	Inches
760	30
710	28
580	23
460	18
430	17
300	12
280	11
180	7
150	6

Specifications

Dimensions

	Width	Depth	Height
Millimeters	710	580	280
(Inches)	(28)	(23)	(11)

Service Clearance

	Front	Rear	Right	Left
Millimeters	0	760	300	300
(Inches)	(0)	(30)	(12)	(12)

Weight 68 kg (149 lb)

Heat Output/Hour	**Model 1**	**Model 2**
Watts	550	600
(Btu)	1 880	2 050

Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz		50 Hz ± 0.5 Hz	
Volts Nominal	Amps (Nominal)	Volts Nominal	Amps (Nominal)
100	3.1	100	3.1
110	2.8	110	2.8
120	2.6	200	1.5
127	2.5	220	1.4
200	1.5	230	1.3
208	1.5	240	1.2
220	1.4		
240	1.2		

kVA	0.3
Phase	1
Branch circuit	15A

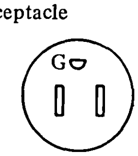
Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

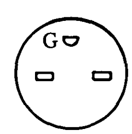
Power Cord

	60 Hz	50 Hz
Length	2.4 m (8 ft)	2.4 m (8 ft)
Conductors	3	3
Size	14 AWG	1 mm

Power Cord Plugs and Receptacles

Volts	125	208/240
Plug	(molded cord) set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R





Notes...
1. A 180 mm (7 inch) paper clearance entry is allowed at the front of the printer.
2. See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 5224 unit. The unit is cooled by forced-air fans; therefore, airflow must not be blocked.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

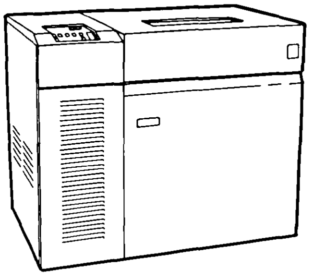
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 5224 is designed to operate within the following limits.

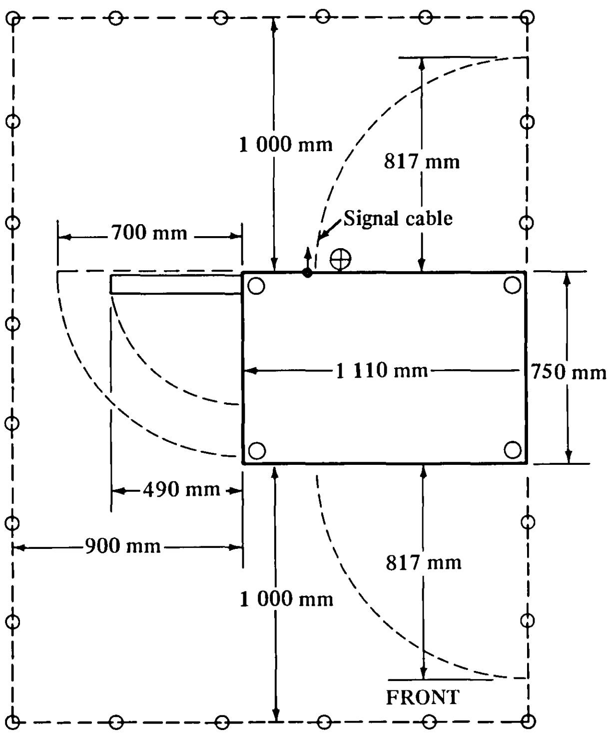
5–17 Hz		
continuous	=	0.050 mm (0.002 in.) double amplitude
transient	=	0.075 mm (0.003 in.) double amplitude
17–150 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

5225 Printer Models 1, 2, 3, and 4



Plan View (Not drawn to scale)



Millimeters	Inches
1 110	43-3/4
1 000	39-1/2
900	35-1/2
817	32-1/4
750	29-1/2
700	27-1/2
490	19-1/4

Note...
See world trade plug requirements in Chapter 9.

Specifications

Dimensions

	Width	Depth	Height
Millimeters	1 110	750	1 000
(Inches)	(43-3/4)	(29-1/2)	(39-1/2)

Service Clearance

	Front	Rear	Right	Left
Millimeters	1 000	1 000	0	900
(Inches)	(39-1/2)	(39-1/2)	(0)	(35-1/2)

Weight 250 kg (550 lbs)

Heat Output/Hour	Model 1	Model 2	Model 3	Model 4
Watts	750	800	900	1 000
(Btu)	(2 562)	(2 733)	(3 074)	(3 416)

Air Flow forced-air cooling (with internal fan)

Power Requirements (at full load)

60 Hz ± 0.5 Hz

Volts Nominal	Amps (Nominal) Model 1	Model 2	Model 3	Model 4
100	5.9	7.2	7.5	9.0
110	5.3	6.4	6.8	8.2
120	4.9	6.0	6.2	7.5
127	4.6	5.7	5.9	7.1
200	2.9	3.6	3.7	4.5
208	2.8	3.5	3.6	4.3
220	2.7	3.3	3.4	4.1
240	2.5	3.0	3.1	3.8

50 Hz ± 0.5 Hz

Volts Nominal	Amps (Nominal) Model 1	Model 2	Model 3	Model 4
100	5.9	7.2	7.5	9.0
110	5.3	6.4	6.8	8.2
200	2.9	3.6	3.7	4.5
220	2.7	3.3	3.4	4.1
230	2.6	3.1	3.3	3.9
240	2.5	3.0	3.1	3.8

	Model 1	Model 2	Model 3	Model 4
kVA	0.60	0.72	0.75	0.90
Phase	1	1	1	1
Branch circuit	20A	20A	20A	20A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

Power Cord

	60 Hz	50 Hz
Length	2.4 m (8 ft)	2.4 m (8 ft)
Conductors	3	3
Size	14 AWG	14 AWG

Power Cord Plugs and Receptacles

Volts	120	208/240
Plug	(molded cord set)	(molded cord set)
Receptacle	NEMA 5-15R	NEMA 6-15R

Environment

Air must flow freely through the IBM 5225 unit. The unit is cooled by forced-air fans; therefore, airflow must not be blocked.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

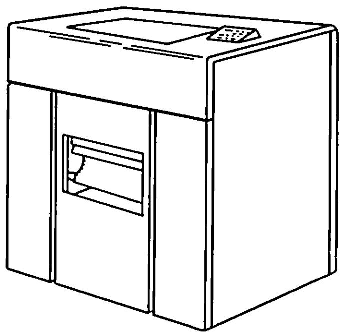
Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 5225 is designed to operate within the following limits.

5–17 Hz		
continuous	=	0.050 mm (0.002 in.) double amplitude
transient	=	0.075 mm (0.003 in.) double amplitude
17–150 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

5262 Printer Model 1



Specifications

Dimensions

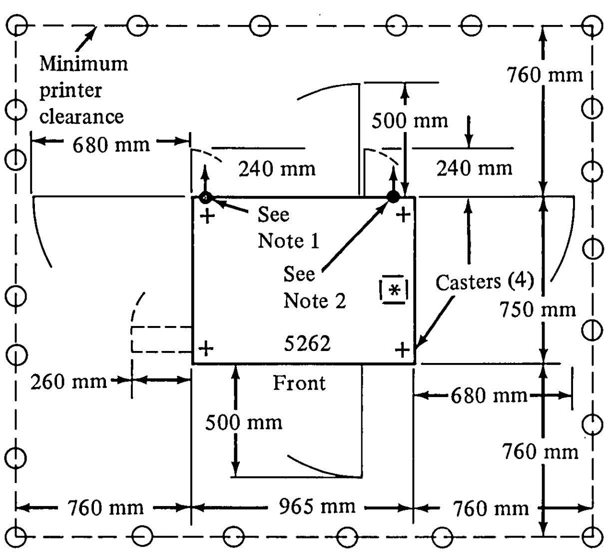
	Width	Depth	Height
Millimeters	965	750	1 000
(Inches)	(38)	(29-1/2)	(39-1/2)

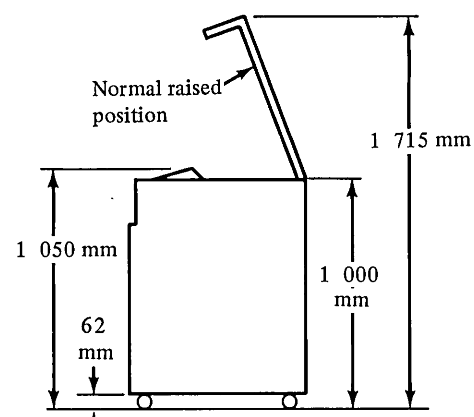
Service Clearance

	Front	Rear	Right	Le
Millimeters	760	760	760	76
(Inches)	(30)	(30)	(30)	(3

Weight	246 kg (540 lbs)
Heat Output/Hour	**Model 1**
Watts	1 100
(Btu)	(3750)
Air Flow	forced-air cooling (with internal fan)

Plan view (Not drawn to scale)





This drawing is not to scale.

*Notes...
1. Signal cable connector location.
2. Power cable location.

Both cables can be routed through a single 64 mm (2-1/2 in) hole in raised floor. Recommended location for the hole is centered between the front and back of the machine, and 100 mm (4 in) in from the right side.

	60 Hz	50 Hz
kVA	1.2	1.4
Phase	1	1
Branch circuit	20A	20A

Switch-on and power-line-disturbance input surge current will not exceed 50 amperes for over 0.5 cycle.

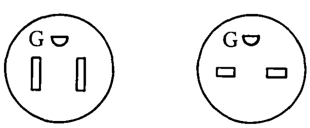
Power Cord

	60 Hz	50 Hz
Length	4.3 m (14 ft)	4.3 m (14 ft)
Conductors	3	3
Size	14 AWG	14 AWG

Power Cord Plugs and Receptacles

Volts	120
Plug	(molded cord set) NEMA WD-1:5-15P

Millimeters	Inches
1 715	67-1/2
1 050	41-1/4
1 000	39-1/2
965	38
760	30
750	29-1/2
680	27
500	19-3/4
260	10-1/4
240	9-1/2
62	2-7/16



Note...
See world trade plug requirements in Chapter 9.

Environment

Air must flow freely through the IBM 5262 unit. The unit is cooled by forced-air fans; therefore, airflow must not be blocked.

The **temperature and relative humidity** listed on pages 5-3 and 5-6 are upper and lower limits and are not to be construed as optimum operating points.

Vibration limits

Make sure that the vibration does not exceed the specified levels. The IBM 5262 is designed to operate within the following limits.

5–17 Hz		
continuous	=	0.050 mm (0.002 in.) double amplitude
transient	=	0.075 mm (0.003 in.) double amplitude
17–150 Hz		
continuous	=	0.036 G peak acceleration
transient	=	0.055 G peak acceleration

See the **vibration and shock level** graphs in Chapter 9 for additional information.

Chapter 6. Data communications

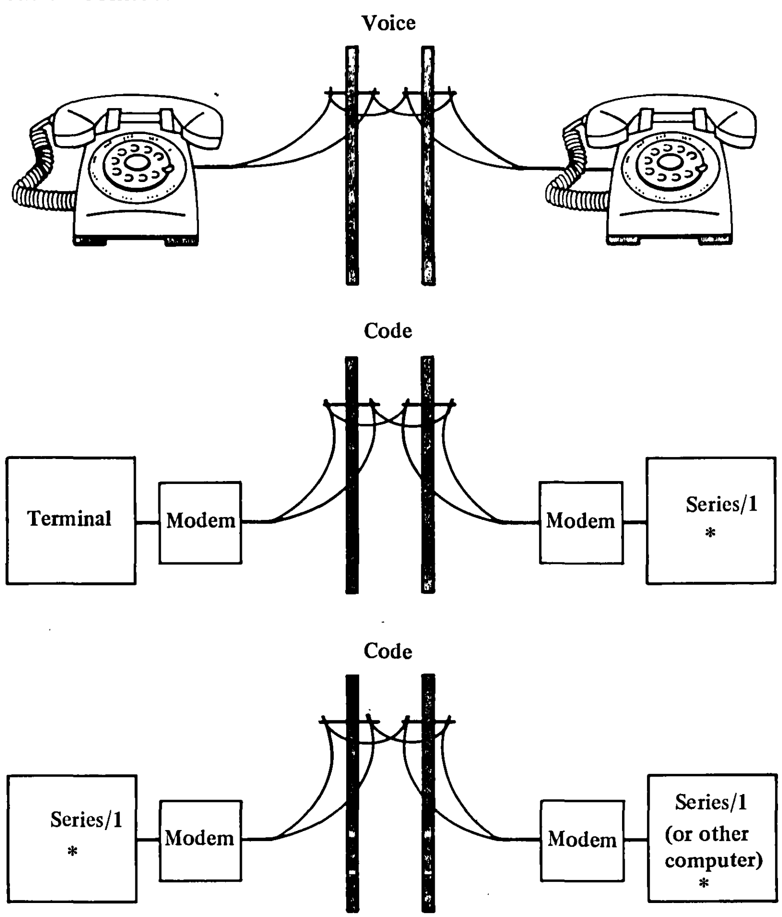
Basic information

Computers and terminals communicate with each other through the use of code. Series/1 communication features handle various standard computer data codes such as ASCII and EBCDIC.[2]

Communication features are designed to handle installations when the computer and terminal devices are far enough apart (remote) to require special communication or telephone lines. In some installations, however, communication features and lines can be used even though the distance is short. Figure 6-1 shows basic communication connections.

For computers and terminals to communicate with each other, they must speak the same language. This means that these devices must use the **same code**, have the **same type** of communication features, and operate at the **same speed**. Speed is referred to in bits-per-second (bps).

In addition to code, feature type, and speed, the distance between computers is also an important factor in data communications. For example, people talking to each other dont need a microphone, an intercom, or a telephone. As the distance between people gets greater, however, such devices become necessary.



* With communications feature

Figure 6-1. Communication between two or more locations any distance apart

American National Standard Code for Information Interchange (ASCII) Extended binary-code interchange code (EBCDIC).

Computer devices located close to each other usually do not use special communication features. The 4979 Display Station, for example, connects to Series/1 with its own attachment circuit card and cable rather than with a communication feature.

Modems

The distance between the computer and peripheral devices also affects the quality of the electrical signals that carry the code. The longer the line, the weaker the signal, due to the impedance of the line. For this reason, remote computer communication usually requires **modems** (see Figure 6-2).

A modem—sometimes called a **data set**—is a device that connects a terminal or computer to communication lines.

The signals produced by a terminal or computer are very weak and generally not in the form used by communication lines. A modem amplifies the signals and puts them in a form that communication lines can handle.

At the receiving end of the communication line, another modem changes the signals back to the form used by the computer or terminal.

While modems are needed with most Series/1 communication features, you can directly connect two devices without a modem (see Figure 6-2). This type of connection is made with the optional **local attachment features**.

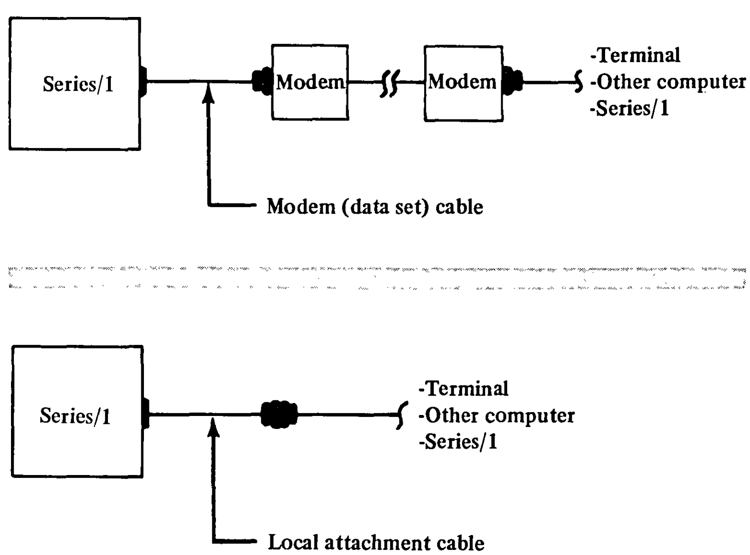


Figure 6-2. Modem and direct connections

Communication lines

A communication line is a set of wires used to transfer information from one location to another. A two-wire line used to transfer information in one direction and then in the opposite direction is called a **half-duplex** line. Changing direction, or **turnaround**, takes time.

To reduce turnaround time, a four-wire, or **full-duplex**, line is sometimes used. With a full-duplex line, one pair of wires is used to send information, and the other pair is used to receive information. In full-duplex mode, therefore, information can be transferred in both directions at the same time.

Some communication features are designed to operate in **half-duplex mode**, but can be connected to a full-duplex (four-wire) line to reduce turnaround time. When connected to a four-wire line, however, these communication features cannot transfer information in both directions at the same time. But the four-wire line does reduce turnaround because one pair of wires is always available for transferring information in either direction.

Communication lines can be either **switched** or **nonswitched**. Switching is done by dialing. Nonswitched lines can be privately owned or leased from a communications company (also called a common carrier). Switched lines are generally provided by a communications company. Equivalent lines and modems, however, can be supplied by the customer.

Networks

Communications lines, modems, and other equipment can be arranged in several ways, depending upon the intended use. The different arrangements of this equipment are called **data links** or **networks**. The **basic types of networks** are as follows:

- Point-to-point, nonswitched
- Point-to-point, switched
- Multipoint, nonswitched.

Figures 6-3, 6-4, and 6-5 explain these basic networks.

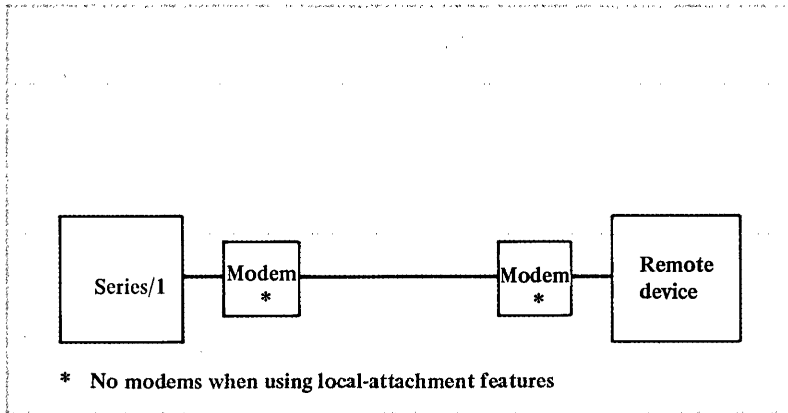


Figure 6-3. Sample communication network (point-to-point, nonswitched)

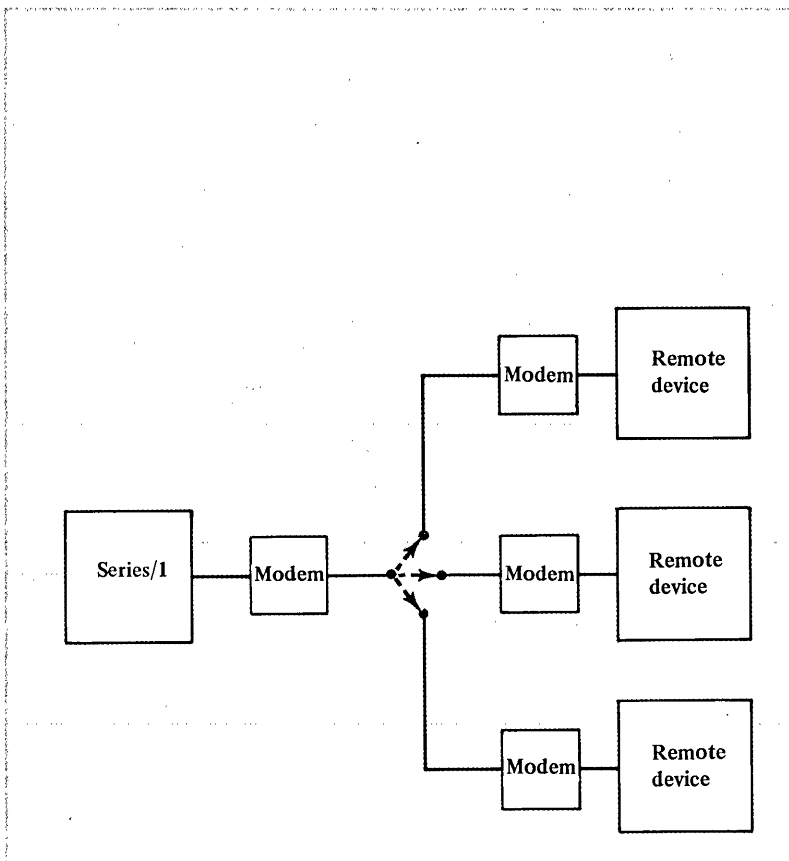


Figure 6-4. Sample communication network (point-to-point), switched)

Multipoint network, nonswitched...

- Series/1 connected to several remote devices in the network
- Nonswitched, permanent connection
- Series/1 calls (polls) remote devices by their number (address)
- Only the called device answers
- The other devices wait their turn for a call

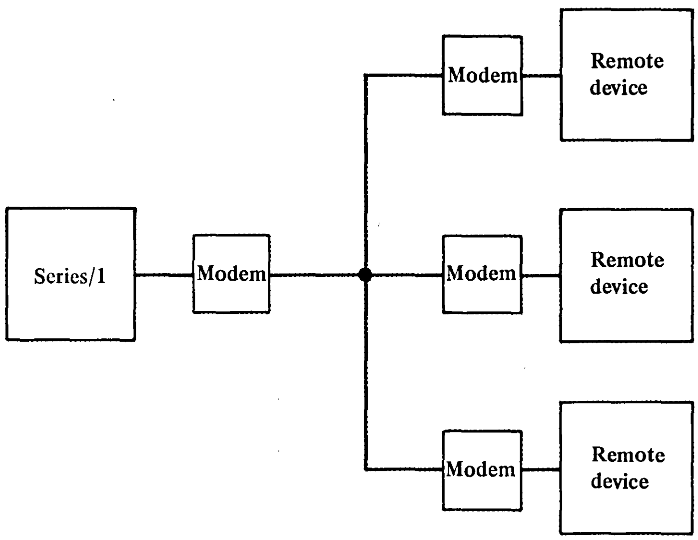


Figure 6-5. Sample communication network (multipoint, nonswitched)

Communication planning and installation

With a basic understanding of data communication and Series/1 communication features, you are ready to plan and arrange for communication equipment and wiring.

The main tasks to be done are:

- Getting an exact list of the Series/1 communication features your company ordered.
- Obtaining or preparing network diagrams.
- Preparing a communication-features planning worksheet.
- Meeting with the IBM Marketing Representative or someone in your company responsible for your communication network.
- Meeting with the local communications-company representative to order needed equipment and wiring.
- Coordinating installation activity with remote locations.

What's coming

In Chapter 2, you filled out a product-specification worksheet for the Series/1 machines on order. You must do a similar job for the communication features on order.

First, make copies of the **communication-features summary worksheet** (Figure 6-7).

Next, find out the specific communication features on order from your company's copy of the **Series/1 purchase agreement.**

Then, check the types and enter the quantities of feature cards and cables on the communication-features summary worksheet.

This worksheet will be your record of communication features for use in your planning and coordinating tasks.

How to prepare for it

Preparing Network Diagrams

Once you know what communication equipment is coming, the next step is to determine how to arrange the equipment at your site and any remote locations. Talk to the person in your company who is responsible for coordinating computer communication networks. He or she may also be able to give you network diagrams for the Series/1 communication equipment. If not, you should prepare your own network diagrams (see Figures 6-3, 6-4, and 6-5).

Make copies of the **communication-features planning worksheet** (Figure 6-34). Use a separate worksheet for each communication feature. On the worksheet, connect the device and modem blocks with lines to indicate the network arrangement for the feature. Indicate whether the network is switched or nonswitched (see Figure 6-3, 6-4, and 6-5).

The network-diagram part of the worksheet is for typical networks. You may have to use additional worksheets or separate sheets of paper to draw your network if the worksheet space is not adequate.

Specifying Communication Equipment and Wiring

Check or fill in as much of the remaining part of the communication-features planning worksheet as you can. See Figures 6-8 through 6-33 for the information needed for your features. You may not be able to answer some items, such as the modem model, until you meet with your local communications-company representative.

Meeting with the Communications-Company Representative

With your planning worksheets prepared, you are ready to contact your communications company (refer to the "Sample Site-Preparation schedule" in Chapter 1 for recommended timing). The purposes of such a meeting are to:

- Define the equipment and wiring to be provided by the communications company.
- Determine the power outlets needed for communications-company equipment.
- Place an order for the needed services.
- Schedule the installation work that the communications company will do before your Series/1 arrives.

Coordinating the Installation with Remote Locations

Some of the devices communicating with your Series/1 might be located at remote sites (other buildings or cities). You will probably have to coordinate the Series/1 installation with these remote locations to be sure that the proper equipment is installed on time.

It is **very important** that the remote equipment match the equipment at your local site—as explained at the beginning of this chapter. Remember:

- Communicating devices must use the same type of communication features.
- The devices must operate at the same speed (bits-per-second).
- The modems must be of the same type.
- Modem strapping (jumpers) must be the same at both ends of the line.

Problems can occur during the installation of communication equipment as a result of mismatched equipment at the communicating locations. You can prevent such problems by proper coordination with remote sites.

We recommend that you send a copy of your completed communication-features planning worksheet to any remote locations. Also, you should follow-up with the installation activities at remote locations.

Wiring practices for Privately Owned Lines when Using Modems

If you are planning to install your own communication lines for a point-to-point, nonswitched network, you should keep the following recommendations in mind:

- All communication lines entering a Series/1 system should have the cable body shield grounded to the frame at the point of entrance to the system. To do this, remove a short section of the outer cable jacket and, use a grounding cable clamp, clamping the cable to the 4997 enclosure frame. This technique provides a positive ground and support for the cable.
- Do not route your communication lines parallel with power lines. Power transients can cause electrical noise in your communication lines. Noise can also be caused by electric motors, radios, and radar equipment.
- Where communication lines exit a building, use shielded, outdoor-type cable.
- Install shunt-type lightning protection on all exterior communication lines, whether they are buried or overhead lines.
- Ground the shields of overhead communication lines where cables enter or exit junction boxes or other points where the shield is broken. For buried lines, ground the shield at each building exit or entry. Shield continuity must not be broken where the ground wire connects to the shield. Cable that includes a drain wire is easier to install where multiple grounding is needed.
- Refer to applicable national and local safety standards for communication requirements. (For installations in the U.S., see Chapter 9 in this manual.)

Communication Feature

A variety of communication features are available for connecting Series/1 to terminals or other computers by communication (telephone) lines. A **terminal** is a device, such as a display station, used to communicate with a computer.

Communication features are optional Series/1 **circuit cards** and **cables** used for different types of communication connections.

The two basic types of Series/1 communication features are:

- Integrated communication features (circuit cards located in the Series/1 processor, 4965, or I/O expansion unit)
- Programmable communication features (circuit cards located in the 4987 Programmable Communications Subsystem).

Figure 6-1 gives an overview of the communication features.

Someone in your company has already selected the specific features to be used at your site. The purpose of this chapter is to help you plan and arrange for the proper communication equipment and wiring for those communication features. You need not be an expert on computer communications. However, some basic information will be helpful.

For planning purposes, a communications feature worksheet is at the end of this chapter.

Cables and connectors

The following table shows the materials, cables, and connectors used in building the various communications and attachment cables.

Card and connector table

Feature and description numbers		Cable part number	Cable description and part number	Grounding description	Card connector	Device connector
Cable	Features					
#2055	7850 Teletypewriter	1632209	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731844 (2 x 8)	Spade lugs 483695
#2056	1310, 1610, 2092, 2096 Asyn local comm	1632211	5354360 shielded 7 cond #22 AWG	100550 #16 AWG	2731844 (2 x 8)	5252593 Female
#2057	1310, 1610, 2074, 2090 2092, 2094, 2096 EIA dataset	1632208	590276 shielded 12 #22 AWG	322063 #16 AWG	2731844 (2 x 8)	5252592 Male
#2058	2075 Binary synch comm H/S	1632210	5337996 shielded 8 twisted pair #24 AWG	322063 #16 AWG	2731388 (2 x 12)	1633672 Ferrone 1633808 Sleeve 5337091 Outer pin 1633674 Socket
#2060	2075 Binary synch V.35 H/S 2080 synch comm H/S	1632206	5337996 shielded 8 twisted pair #24 AWG	322063 #16 AWG	2731388 (2 x 12)	5182931 Conn 523034 Pin
#2061	2096 Prog multi-line current loop	8327455	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731844 (2 x 8)	Spade lugs 483695
#2064	7850 Teletypewriter adapter EIA male	1632924	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731844 (2 x 8)	5252592 Male
#2065	7850 Teletypewriter adapter EIA female	4411751	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731844 (2 x 8)	5252593 Female
#2066	3101 Current Loop	6839455	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731844 (2 x 8)	5252592 Male
	EIA WRAP connector	2704136	106320 #24 AWG		5302663 Conn	765295 Hood
	V35 WRAP connector	1633812	106320 #24 AWG		532478 Conn	
	303 WRAP connector	1633810	480779 Twisted pair #22 AWG		5410152 Conn	1633672 Ferrone 1633673 Sleeve 5410153 Contact 1633809 Pin
	EIA direct connect wrap	1633811	106320 #24 AWG		5252592 Conn	765295 Hood
	FPMLC current loop wrap	6825399	106320 #24 AWG		2731844 (2 x 8)	
#2067	2080 synch comm H/S	6844126	5337996 shielded 8 twisted pair #24 AWG	322063 #16 AWG	2731407 (2 x 15)	4943864 Hood
#2070	7881 Communication adapter	6845570	1142961 shielded #26 AWG	322063 #16 AWG	2731845 (2 x 12)	483695 terminal
#2071	7881 Communication adapter	6031258	1142961 shielded #26 AWG	322063 #16 AWG	2731845 (2 x 12)	1608649 Male
#2723	French 48K modem	1749352	760495 8 twisted pair #20 AWG		1749310 Conn	1749353 Conn
#2724	UK data modem	1727744	765296 Conductor #22 AWG		5302662 Male	5302663 Female
#2946	Japan EIA wrap	2722052	631912 shielded 26 twisted pair #22 AWG		5252593 Conn	5252592 Conn
#2062	2090 EIA full dupl	6839334	590276 shielded #22 AWG	322063 #16 AWG	2731844 (2 x 8)	1655338 Male
#2944	Japan EIA	1632919	1863309 shielded 14 twisted pair #28 AWG	322063 #16 AWG	2731844 (2 x 8)	1655338 Male

Card and connector table (continued)

Feature and description numbers		Cable part number	Cable description and part number	Grounding description	Card connector	Device connector
Cable	Features					
#2100	PCS EIA - M to F	4411831	1863309 shielded 14 twisted pair #28 AWG		1655338 Male	1655336 Female
	Local communications controller (feature 1400)	4498426	7362211 Twinaxial indoor or outdoor		6838959(F) 7363102 7361118	7362230 4498427 7362229(M)
	Local communications controller (feature 1400)	2577672	323921 Coaxial indoor		1836418 1836444	5252643
	Local communications controller (feature 1400)	1833108	5252750 Coaxial outdoor		1836419 1836447	5252643
	Local communications controller (feature 1400) See note.	See note	See note	See note	See note	See note
#4001	Series/1 to PC Channel attachment (Feature #4000)	6095389	6400401 51 twisted #28 AWG		2334924 2x27	6400494
#5770	1310 Multifunction indoor	6844552	838643 shielded 2 twisted pair #22 AWG	347177 #18 AWG	2731843 (2 x 4)	5252592 Male
#5780	Printer attachment–5200 series	6061135	7362211 Twinaxial		2731843	7362229
#5780	Multidrop workstation attachment. See note.	6061135	7362211 Twinaxial		2731843	7362229
#5790	1310 Multifunction See note.	6325704	4716743 shielded 2 twisted pair #26 AWG	See note	2731843 (2 x 4)	8642553

Connectors

▶ Adapter - Amphenol	82-5588 - twinaxial	IBM part number	7362230
▶ Adapter - Amphenol	31-219 coaxial indoor	IBM part number	5252643
▶ Connector - Amphenol	205208-1	IBM part number	1655338
▶ Connector - Amphenol	82-5589	IBM part number	7362229
Connector - Amphenol	31-4541	IBM part number	1836444
Connector - Amphenol	31-4542	IBM part number	1836447
Connector - Amphenol	211070-1	IBM part number	6400494
Connector - Bendix	30220-3	IBM part number	1836444
Connector - Bendix	39100-16	IBM part number	1836447
Connector - Cinch	DB-25P-A106-C33	IBM part number	5252592
Connector - Cinch	DB-25S-A106-C33	IBM part number	5252593
▶ 2 x 4 Berg connector	Berg part number	65043-033 with pin socket 47712	
▶ 2 x 8 Berg connector	Berg part number	65405-005 with pin socket 47712	
▶ 2 x 12 Berg connector	Berg part number	65469-011 with pin socket 47712	
▶ 2 x 16 Berg connector	Berg part number	65268-025 with pin socket 47712	
▶ 2 x 20 Berg connector	Berg part number	65405-013 with pin socket 47712	
▶ 2 x 27 Berg connector	Berg part number	65846-005 with pin socket 47712	

Note...
See the IBM Cabling System Planning and Installation Guide-Cable and Accessories, GA27-3361, for information about ordering and installing IBM Cabling System cable.

1

Programmable

Communications-feature circuit cards located in 4987 Programmable Communications Subsystem...

- Data communications equipment (DCE) attachment features
  - Single-line and two-line features
  - Asynchronous or synchronous
- Local attachment features
  - Two-line asynchronous or synchronous features
  - Direct connection to local devices
- Auto-call attachment feature
  - Auto-call and single-line DCE attachment
  - Asynchronous or synchronous
- Teletypewriter attachment feature
  - Two four-wire dc lines
- Dataphone Digital Service attachment feature
  - Single-line synchronous feature
- Integrated-modem attachment features
  - Connection to switched or leased lines
  - Auto-answer or manual answer for switched lines
  - Asynchronous or synchronous

2

Integrated

Communications-feature circuit cards located in processor or I/O expansion unit...

- Asynchronous communication control (ACC)
  - Single-line adapter
  - Four-line adapter
  - Multi-line controller for eight start-stop lines using up to two four-line adapters
- Binary synchronous communications (BSC)
  - Single-line adapter, medium speed
  - Single-line adapter, high speed
  - Four-line adapter
  - Multi-line controller for up to eight BSC lines using up to two four-line adapters
- Synchronous data link control (SDLC)
  - Single-line adapter
- Programmable multi-line communication (synchronous or asynchronous)
  - Programmable four-line adapter
  - Programmable eight-line control for eight lines using up to two four-line adapters.
- Synchronous communication
  - Single-line control, high speed

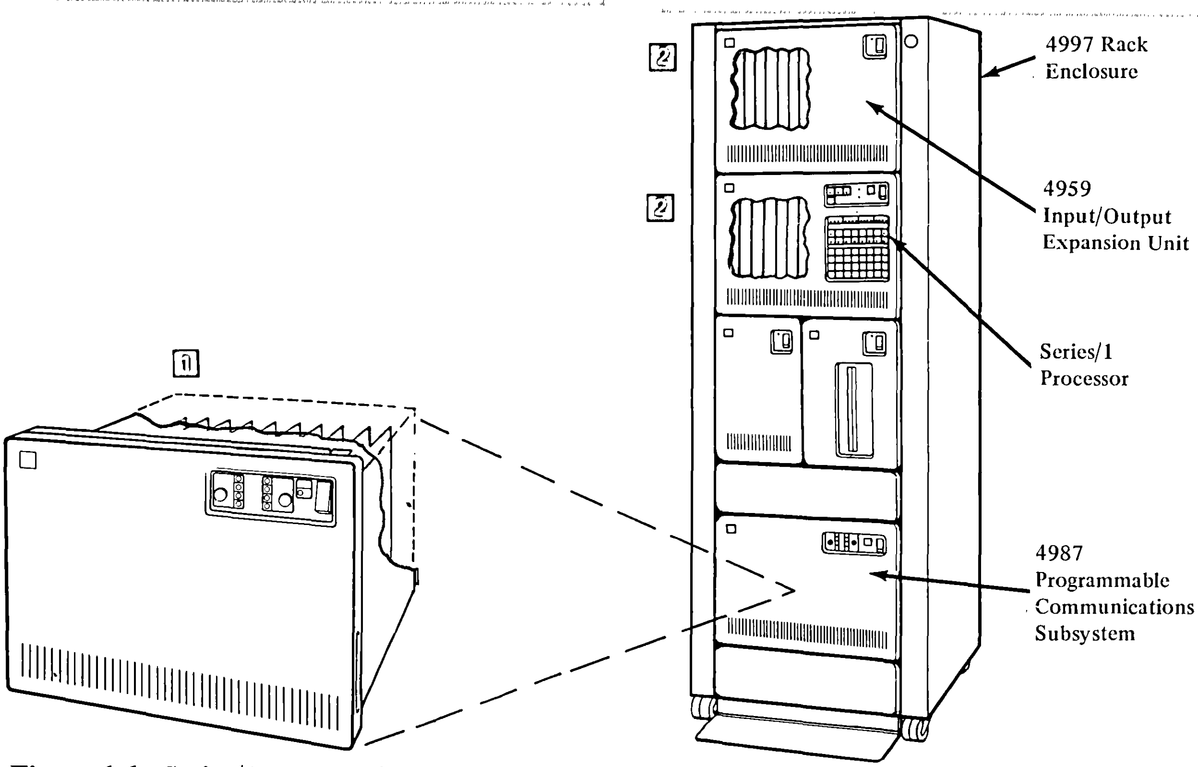


Figure 6-6. Series/1 communication features

Series/1 communication features

Features summary

Series/1 communication feature cards and cables are summarized in Figure 6-7. This figure is also referred to later in the chapter when you inventory your specific communication features.

Cable features and connecting options

Special cable features are available for connecting Series/1 **integrated communication features** (Figure 6-7, part 1) to local devices or communication lines. The various cable features and connecting options are described in detail in Figures 6-8 through 6-18.

Cables for connecting Series/1 **programmable communication features** (Figure 6-7, part 2) to local devices or communication lines are included with the communication features selected. The various cables and connecting options are described in detail in Figures 6-19 through 6-32.

All communication features come with connectors or terminals for connections to devices, modems, or other communication equipment. When estimating the cable length required to connect an IBM feature installed in a Series/1 Enclosure to any external device, allow 2–2.5 m (6-8 ft) for a 4997-2, 1.5–2.0 m (4–6 ft) for a 4997-1, and 1.5 m (4 ft) for 4952-C with stand-alone enclosure for cable routing through the enclosure provided.

Some devices connected to Series/1 communication features use local attachment cables. These cables connect directly to similar cables from the local devices.

Cable and signal connections for Series/1 communication features conform to industry standards as indicated in Figures 6-8 through 6-28. The standards referred to are as follows:

- Electronic Industries Association (EIA)
- Consultive Committee on International Telephone and Telegraph (CCITT).

Current loop cable length

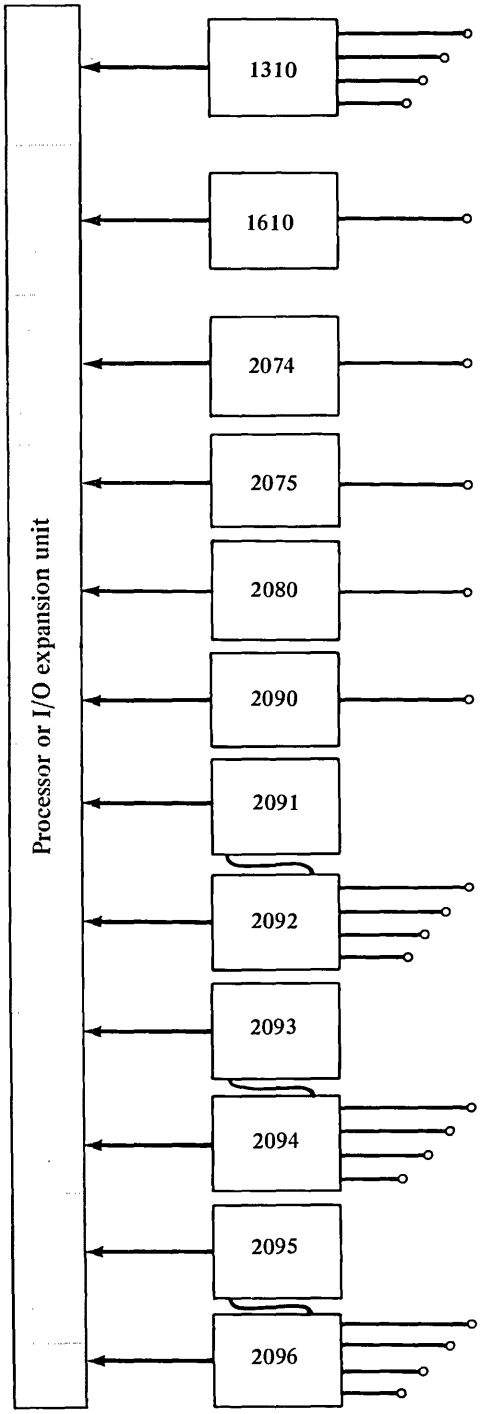
Practical lengths for current loop cables as a part of the communication bit rate are shown in the following table. These distances are conservative and should be satisfactory for most installations. The best transmission is achieved when the terminal and host each power their own transmission lines. While unshielded lines yield greater distances, they are more susceptible to errors in an electrically noisy environment.

Bit rate	*Shielded wire m (ft)*	*Unshielded wire m (ft)*
110	1524(5000)	1830(6000)
150	1524(5000)	1830(6000)
300	1524(5000)	1830(6000)
600	1524(5000)	1830(6000)
1200	1220(4000)	1830(6000)
2400	610(2000)	910(3000)
4800	305(1000)	610(2000)
9600	152(500)	305(1000)

Note: Current loop cables are not supported for outdoor installation.

Communications features summary worksheet (Part 1)

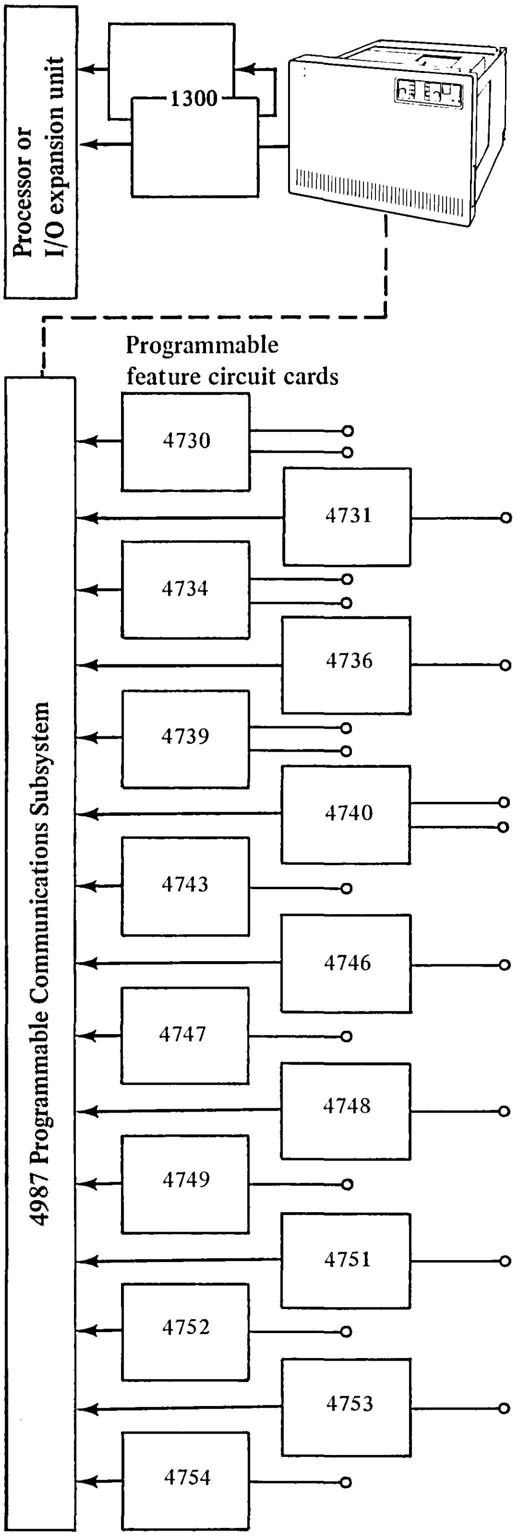
Integrated feature circuit cards



Feature number	Feature description	Features ordered	Quantity ordered
1310	Multifunction attachment	☐	
2056	Asynchronous local attachment cable	☐	
2057	EIA data-set cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
5770	Local attachment cable	☐	
5790	IBM Cabling System attachment cable	☐	
1610	Asynchronous communications single-line control – to 9,600 bps (one line per feature)	☐	
2056	Asynchronous local attachment cable	☐	
2057	EIA data-set cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	
2074	Binary synchronous communications single-line control – to 9,600 bps (one line per feature)	☐	
2057	EIA data-set cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	
2075	Binary synchronous communications single-line control – high-speed to 56,000 bps (one line per feature)	☐	
2058	BSC/high-speed cable	☐	
2060	BSC V.35/high-speed DDN cable	☐	
2080	Synchronous communications single-line control (one line per feature)	☐	
2060	BSC V.35/high-speed DDN cable	☐	
2067	X.21 DCE cable	☐	
2090	SDLC single-line control – to 19.2K bps (one line per feature)	☐	
2057	EIA data-set cable	☐	
2062	EIA FDX cable - RPQ 8T1071 Japan EIA FDX cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	
2091	Asynchronous communications 8-line control (controls up to two 2092 adapters to 2,400 bps)	☐	
2092	Asynchronous communications 4-line adapter (up to four lines per feature)	☐	
2056	Asynchronous local attachment cable	☐	
2057	EIA data-set cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	
2093	Binary synchronous communications 8-line control (controls up to two 2094 adapters)	☐	
2094	Binary synchronous communications 4-line adapter (up to four lines per feature)	☐	
2057	EIA data-set cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	
2095	Feature-programmable 8-line communications control (controls up to two 2096 adapters)	☐	
2096	Feature-programmable 4-line communications adapter (up to four lines per feature)	☐	
2056	Asynchronous local communications cable	☐	
2057	EIA data-set cable	☐	
2061	Current loop cable	☐	
2066	3101 current loop cable	☐	
2724	U.K. modem adapter cable	☐	
2944	Japan EIA data-set cable	☐	
2946	Self-test wrapback cable	☐	

Figure 6-7 (Part 1). Communication-features summary worksheet

Communication-features summary worksheet (part 2)



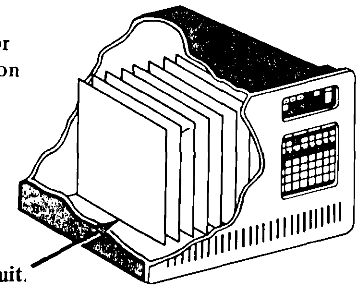
Unit or feature number	Unit or feature description	Units and features ordered ☑	Quantity ordered
4987-1	Programmable Communications Subsystem (Capacity for up to 16 programmable communications features)	☐	
1300	Programmable communications subsystem controller (two circuit cards per feature)	☐	
2066	3101 current loop cable	☐	
2100	EIA extension cable	☐	
3600	Expansion scanner	☐	
4990-1	Communications Console for the 4987	☐	
4730	Half-duplex DCE data-set attachment (Two lines per feature)	☐	______
4731	Full-duplex DCE data-set attachment (One line per feature)	☐	______
4734	TTY current attachment (Two lines per feature)	☐	______
4736	DATA-PHONE* Digital Service attachment (One line per feature)	☐	______
4739	Asynchronous local attachment (Two lines per feature)	☐	______
4740	Synchronous local attachment (Two lines per feature)	☐	______
4743	Auto-call attachment (One line per feature)	☐	______
4746	Asynchronous 1200 bps integrated modem for switched network (U.S.) (One line per feature)	☐	______
4747	Asynchronous 1200 bps integrated modem for leased line with SNBU (U.S.) (One line per feature)	☐	______
4748	Asvnchronous 1200 bps integrated modem for leased line (U.S.) (One line per feature)	☐	______
4749	Asynchronous 1200 bps integrated modem for leased line (non-U.S.) (One line per feature)	☐	______
4751	Synchronous 1200 bps integrated modem with clock for switched network (U.S.) (One line per feature)	☐	______
4752	Synchronous 1200 bps integrated modem with clock for leased line with SNBU (U.S.) (One line per feature)	☐	______
4753	Synchronous 1200 bps integrated modem with clock for leased line (U.S.) (One line per feature)	☐	______
4754	Synchronous 1200 bps integrated modem with clock for leased line (non-U.S.) (One line per feature)	☐	______

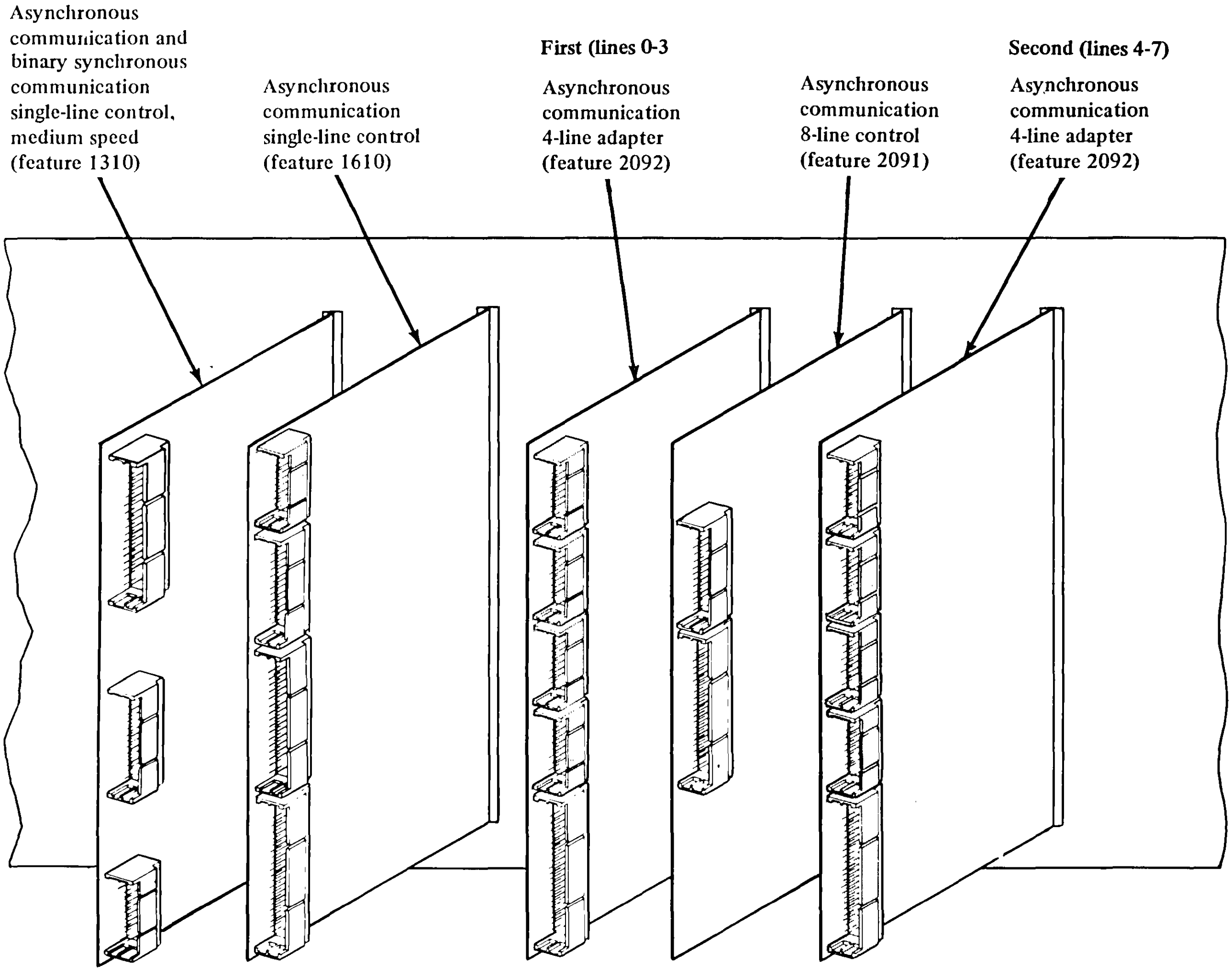
*Trademark American Telephone and Telegraph Co.

Figure 6-7 (Part 2). Communication-features summary worksheet

ACC features...

- ▶ Asynchronous communication control features available in single or multiple lines (up to eight lines).
- ▶ Single-line ACC is one feature circuit card.
- ▶ Multiple-line ACC is two or three feature cards (one control card and one or two adapter cards)
  - – Two cards for one to four lines
  - – Three cards for five to eight lines
- ▶ Speeds from 37.5 to 9,600 bits-per-second (bps), controlled by programming. Multiple-line ACC can handle up to 2,400 bps on all eight lines.
- ▶ Half-duplex operation.





Front view of processor or I/O expansion unit

☐ Cable connection from card to modem (see Figure 6-9)

Figure 6-8. Asynchronous communication control (ACC) features

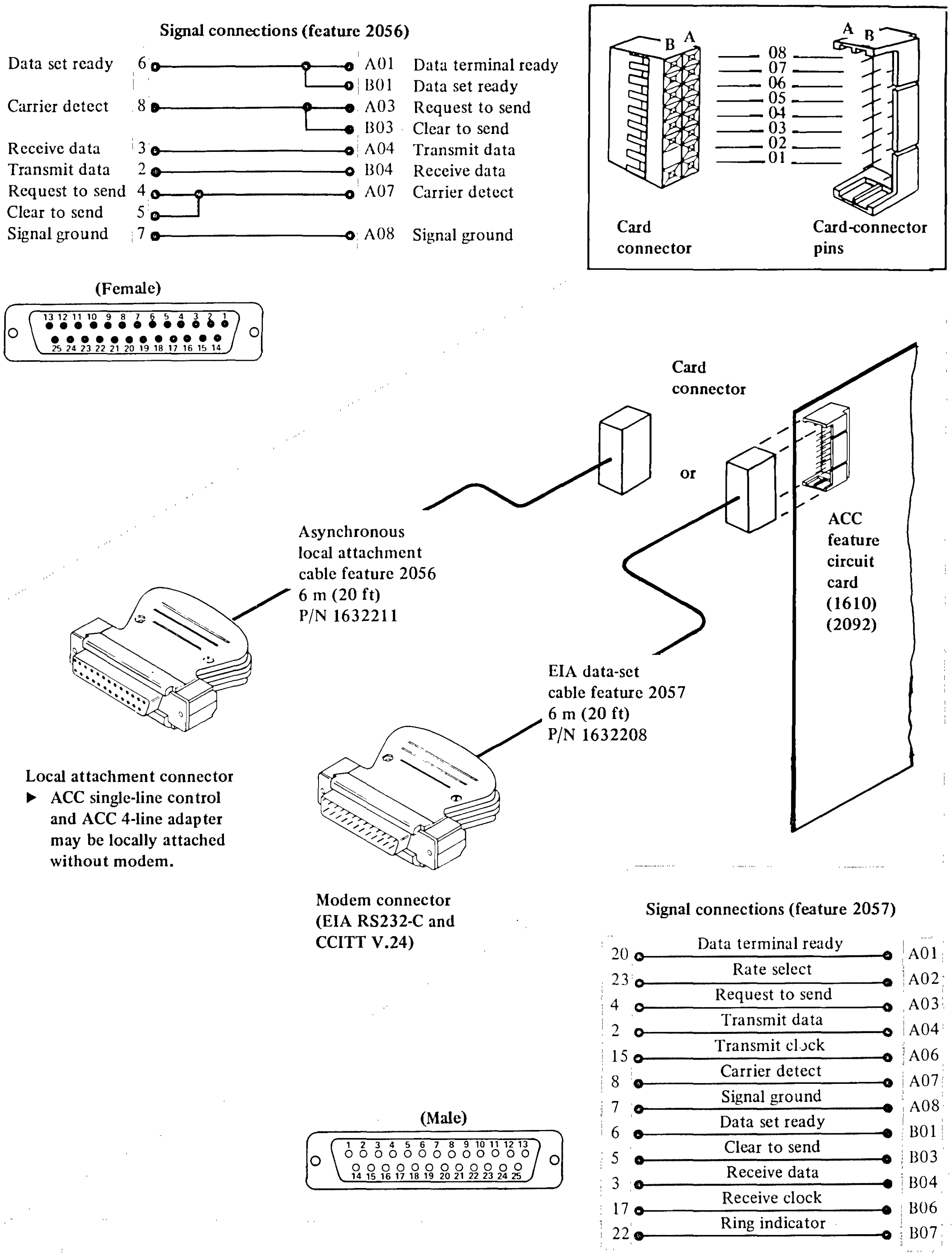
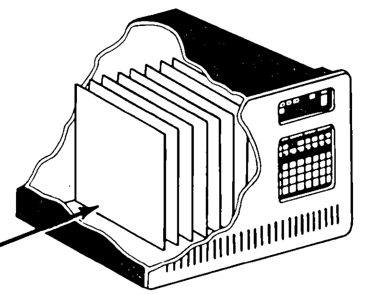


Figure 6-9. Cable and signal connections for ACC features

- ▶ Binary synchronous communication features available in single or multiple lines (up to eight lines).
- ▶ Single-line BSC is one feature circuit card.
- ▶ Multiple-line BSC is two or three feature cards (one control card and one or two adapter cards)
  - – Two cards for one to four lines
  - – Three cards for five to eight lines
- ▶ Medium-speed, single-line BSC handles speeds up to 9,600 bps; high-speed, single-line handles speeds up to 56,000 bps.
- ▶ Multiple-line BSC handles up to 9,600 bps on lines 0–1; up to 2,400 bps on lines 2–7. When only four lines are used, each line can handle up to 4,800 bps.
- ▶ If modem does not supply clocking, a jumper wire can be installed on the feature cards to provide internal (business-machine) clocking. Available only on medium-speed feature. Internal clocking speeds are 600 or 1,200 bps (under program control).
- ▶ Half-duplex operation.



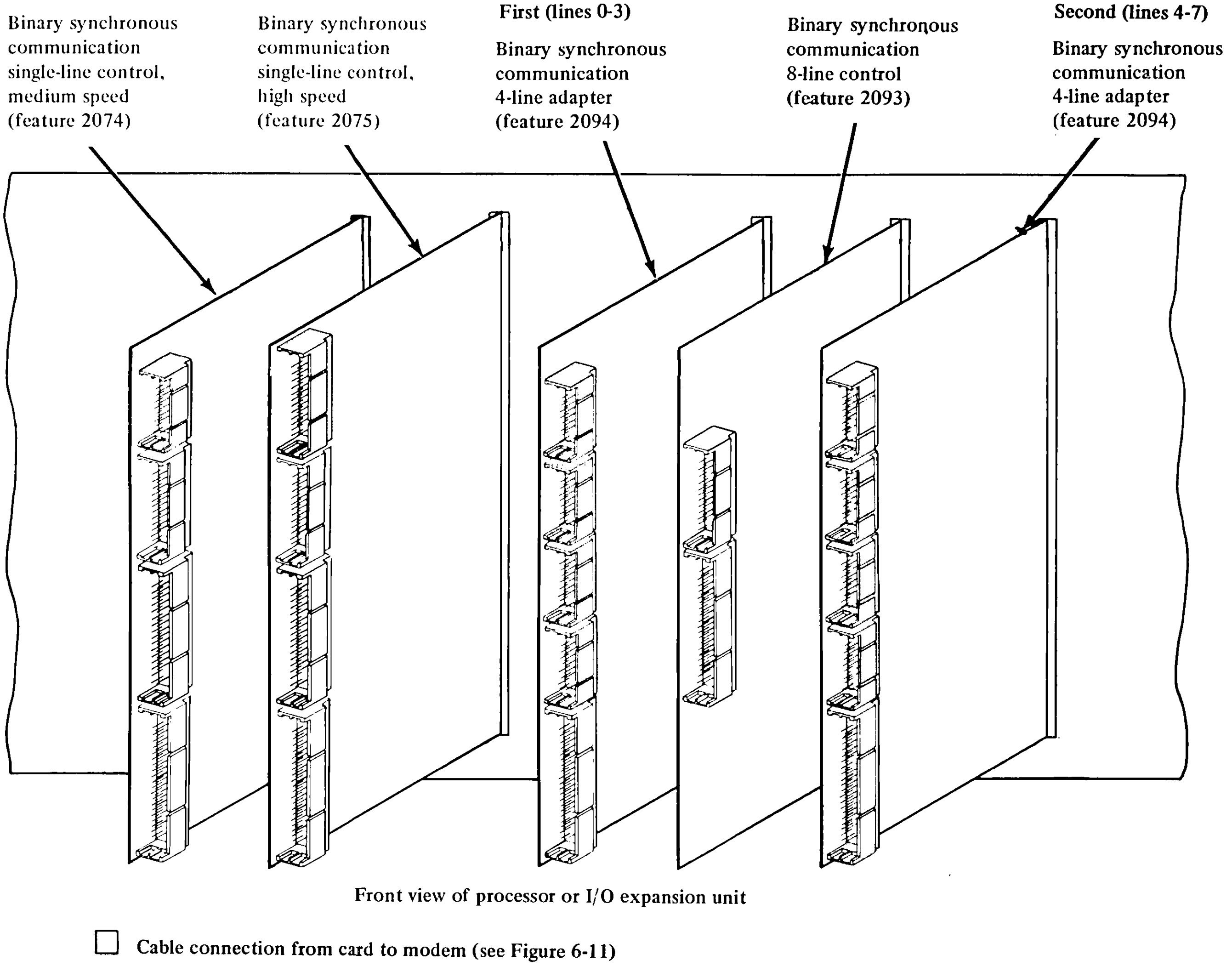


Figure 6-10. Binary synchronous communication (BSC) features

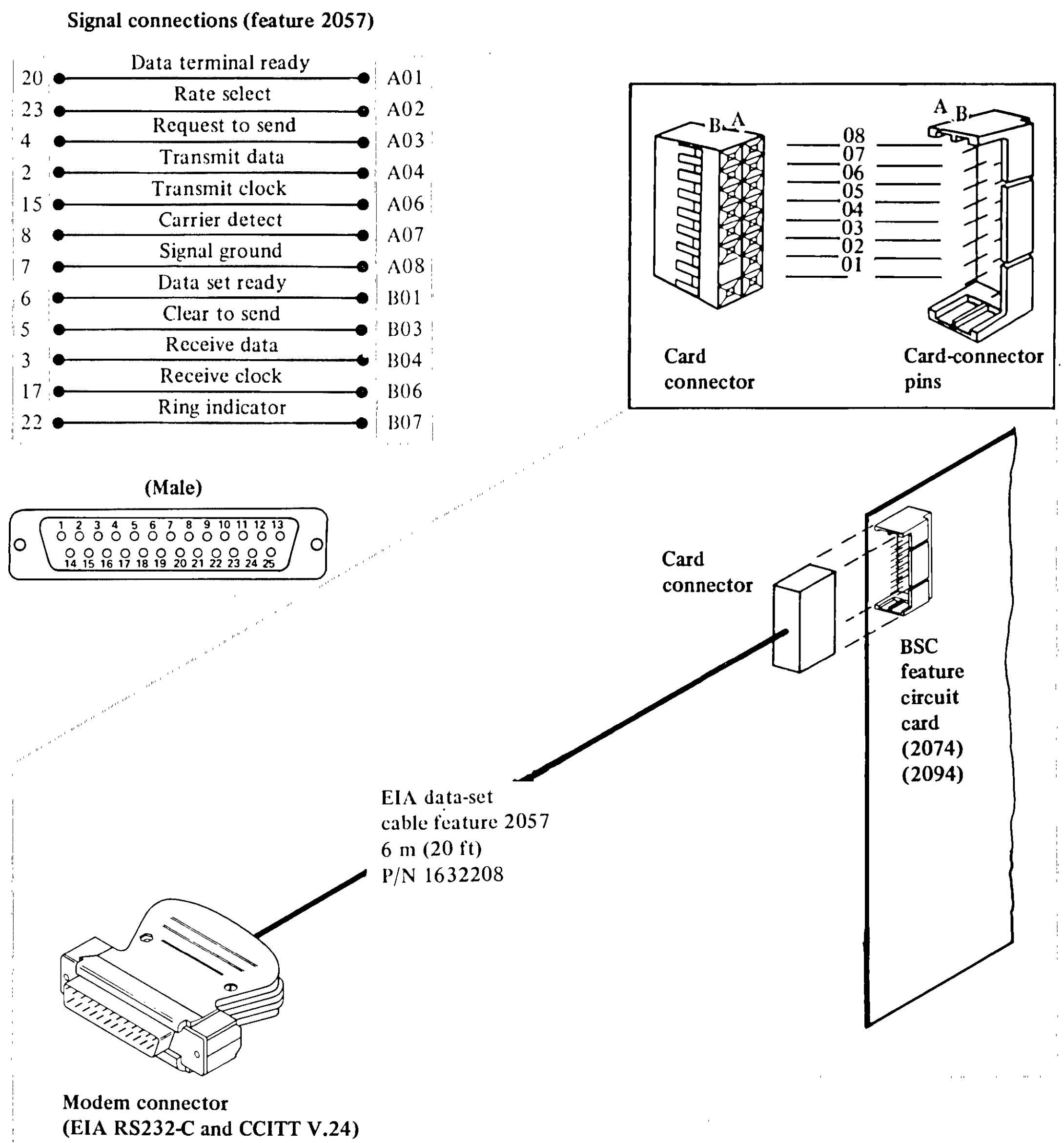


Figure 6-11. Cable and signal connections for medium-speed BSC features

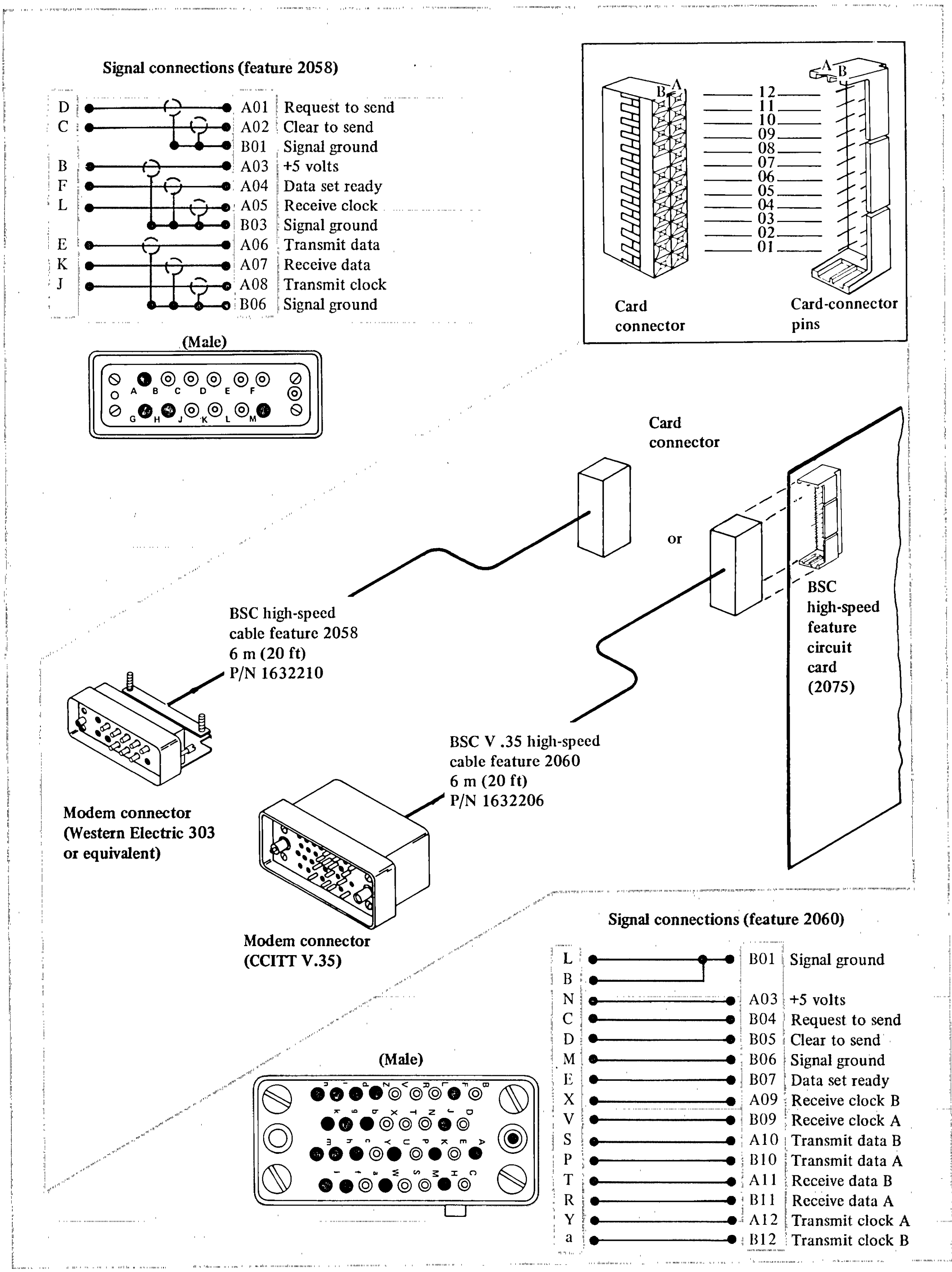


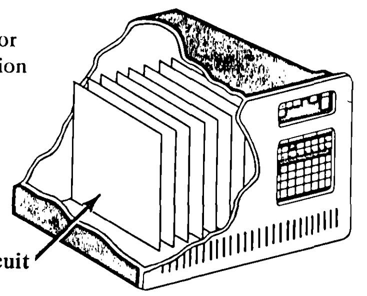
Figure 6-12. Cable and signal connections for high-speed BSC features

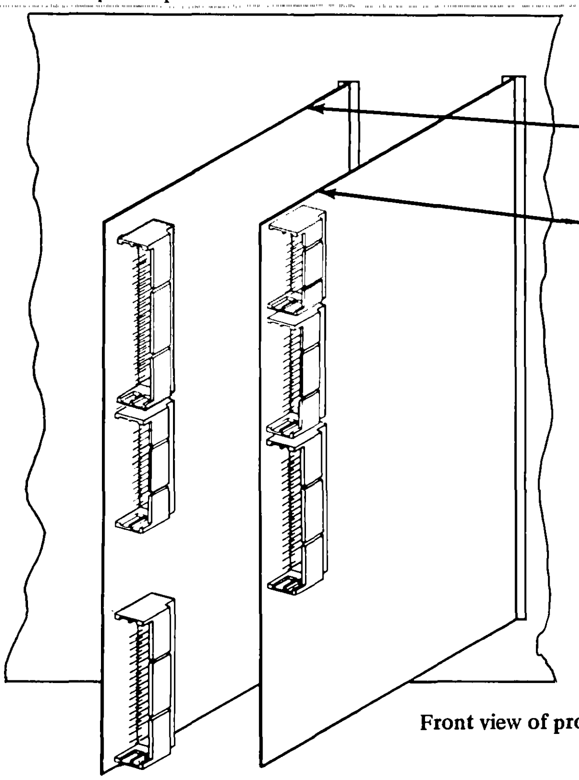
Feature 2090

- ▶ Synchronous data link control for RS-232C interfaces.
- ▶ SDLC is a one-feature circuit card.
- ▶ Speeds of 600 or 1,200 bps using internal clocking; up to 19,200 bps using external (modem) clocking.
- ▶ Internal (business-machine) clocking connected by jumper on feature card.
- ▶ Half-duplex operation.
- ▶ Full-duplex operation with two feature cards.

Feature 2080

- ▶ Synchronous communication single line control/HS attachment for X.21 or V.35 interfaces.
- ▶ SDLC/HDLC or BSC in a one-feature circuit card.
- ▶ Speeds of 9,600 or 48,000 bps with internal clocking; speeds up to 56,000 bps with external clocking V.35 DCE; speeds up to 48,000 bps with external clocking X.21 DCE.
- ▶ Internal (business-machine) clocking for local attachment connected by customer supplied cables (see Figure 6-14 part 4).
- ▶ Half-duplex operation for SDLC/HDLC or BSC.
- ▶ Full-duplex operation for HDLC.





☐ **Cable connection from card to modem or DCE (see Figure 6-14)**

Figure 6-13. Feature 2080 and 2090 attachment cards

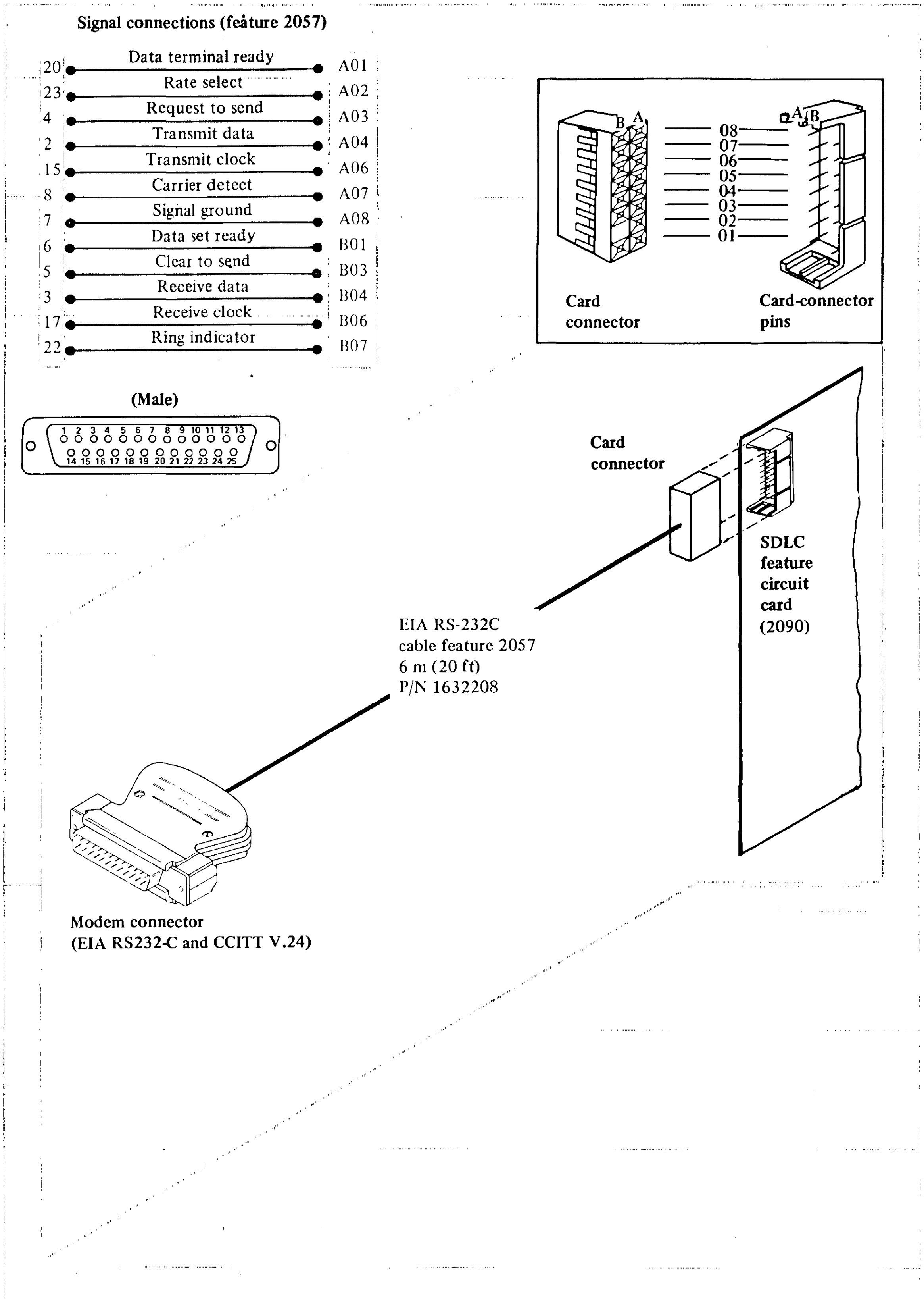


Figure 6-14. (Part 1 of 4) Cable and signal connections for feature 2090

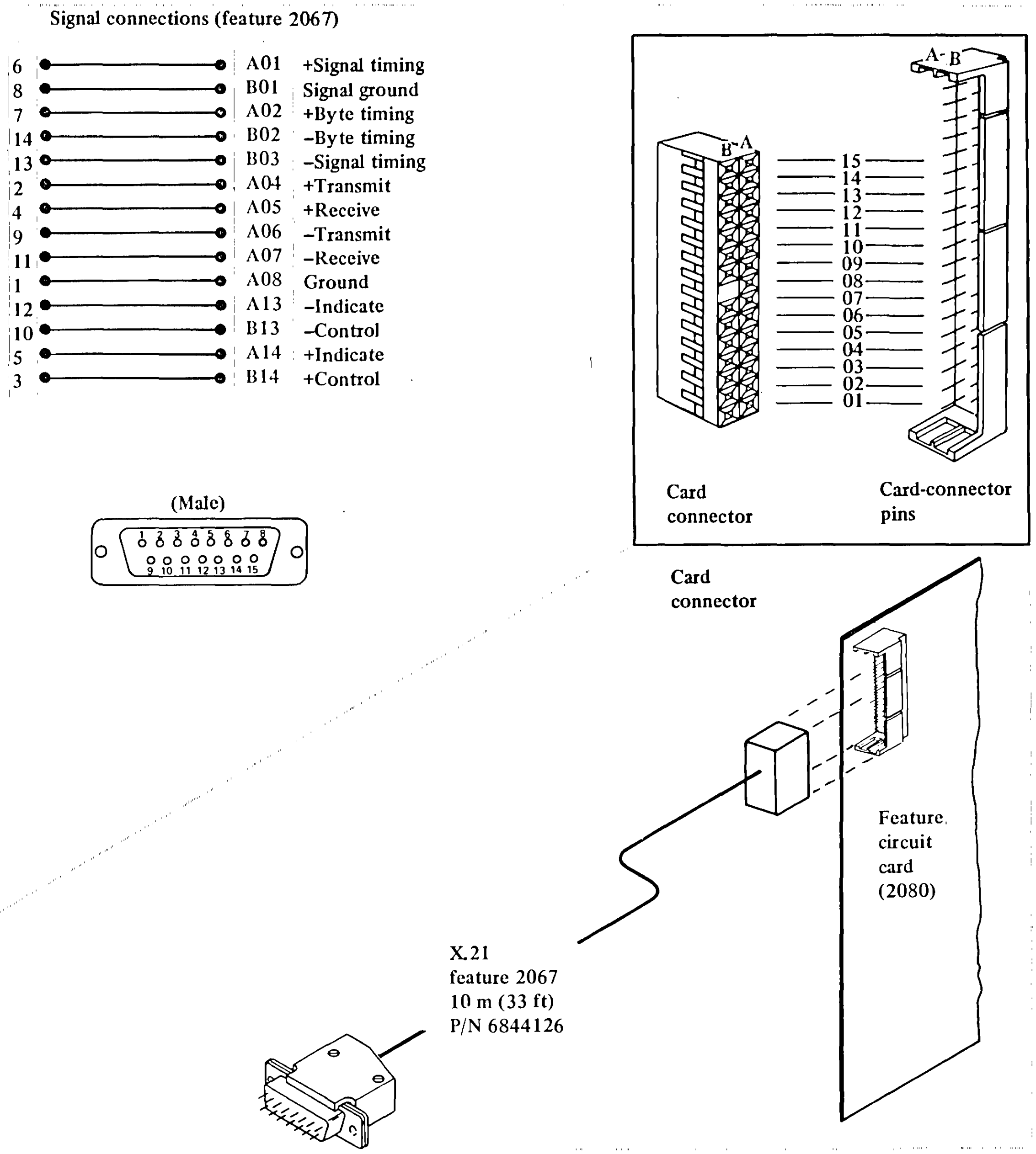
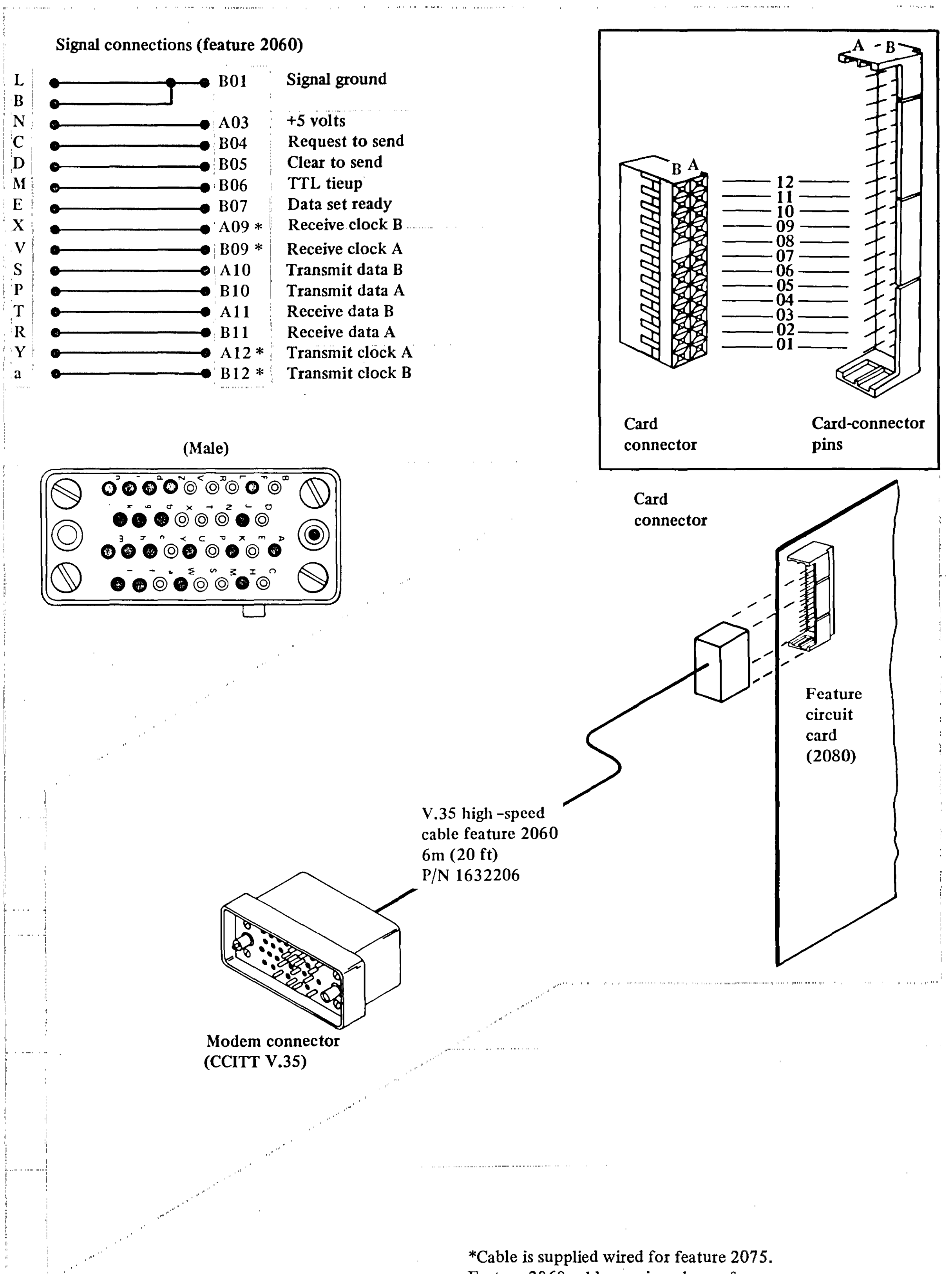


Figure 6-14. (Part 2 of 4) Cable and signal connections for feature 2080

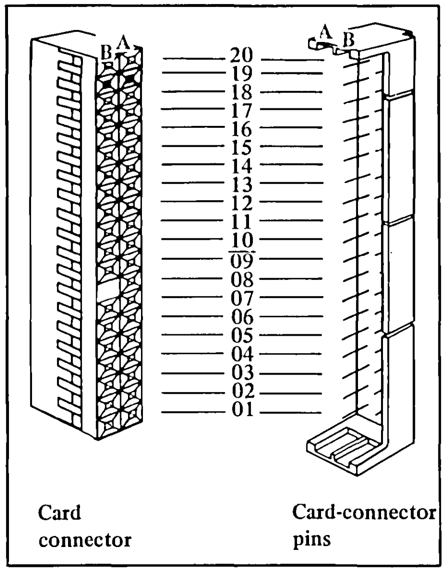


See Figure 6-14 part 4 for customer supplied cable connections.

*Cable is supplied wired for feature 2075. Feature 2060 cable requires change for use with feature 2080. Instructions are provided with feature 2080.

Figure 6-14. (Part 3 of 4) Cable and signal connections for feature 2080

Customer supplied cables



Local attach 1 cable

Series/1 end		Remote end
A19	Local attach 1	Remote end. These jumpers are required if the remote is a F/C 2080 in the Series/1.
B19	Common Gnd	
A18	+32 X CLK SDLC	
B18	+DIV/10 CLK	
A17	+DPLL to S.T. DOT	
B17	+SDLC DPLL 9600 CLK	
A16	Disable S.T. RCVR	
B16	Common Gnd	
A07	–Receive data	See note 1
A06	–Transmit data	See note 5
A05	+Receive data	See note 3
A04	+Transmit data	See note 6

Local attach 2 cable

Series/1 end		Remote end
A20	Local attach 2	Remote end. This jumper is at one end only.
B20	Common Gnd	
A07	–Receive data	See note 1
A06	–Transmit data	See note 2
A05	+Receive data	See note 3
A04	+Transmit data	See note 4
B15	–Signal timing	See note 7
A15	+Signal timing	See note 8

Remote end connections

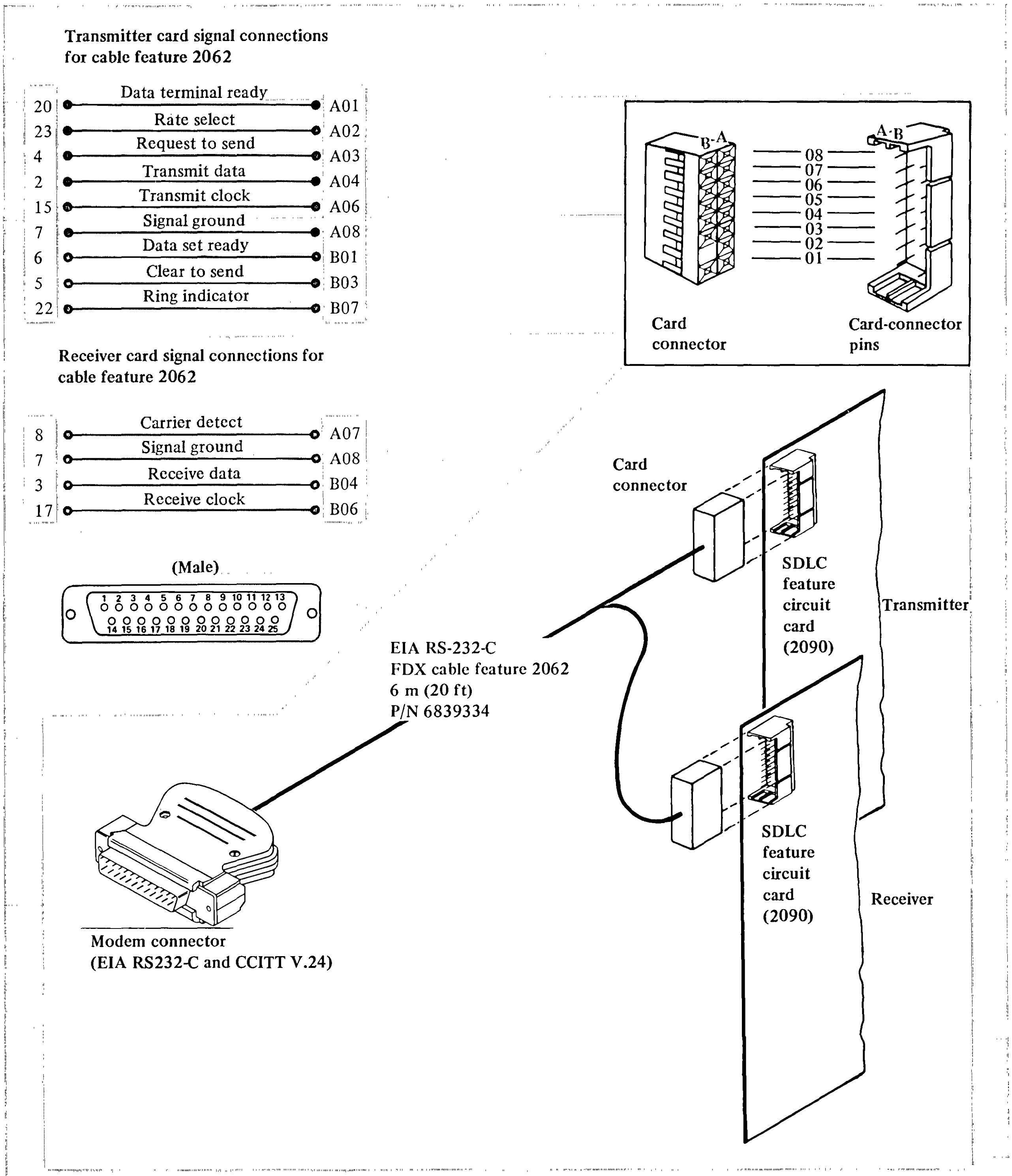
Note 1: A07 connects to –Transmit data at remote end.
Note 2: A06 connects to –Receive data at remote end. (also connects to –Indicate at remote end if remote station is a Series/1).
Note 3: A05 connects to +Transmit data at remote end.
Note 4: A04 connects to +Receive data at remote end. (also connects to +Indicate at remote end if remote station is a Series/1).
Note 5: A06 connects to –Receive data at remote end.
Note 6: A04 connects to +Receive data at remote end.
Note 7: B15 connects to B03 at the remote end.
Note 8: A15 connects to A01 at the remote end.

Local 2 multidrop cable

Series/1 end		Remote end
A20	Local attach 2	Remote end. These jumpers are required if the remote is a F/C 2080 in the Series/1
B20	Common Gnd	
A19	Local attach 1	
B19	Common Gnd	
A07	–Receive data	See note 1
A06	–Transmit data	See note 5
A05	+Receive data	See note 3
A04	+Transmit data	See note 6
B15	–Signal timing	See note 7
A15	+Signal timing	See note 8

Note...
Multipoint master must not have a station address jumpe

Figure 6-14. (Part 4 of 4) Cable and signal connections for feature 2080



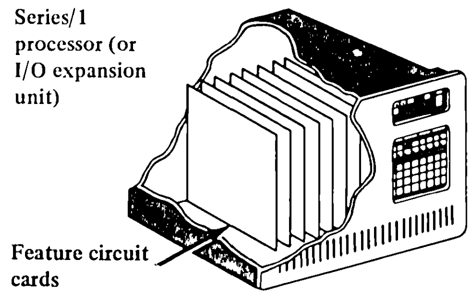
Notes...

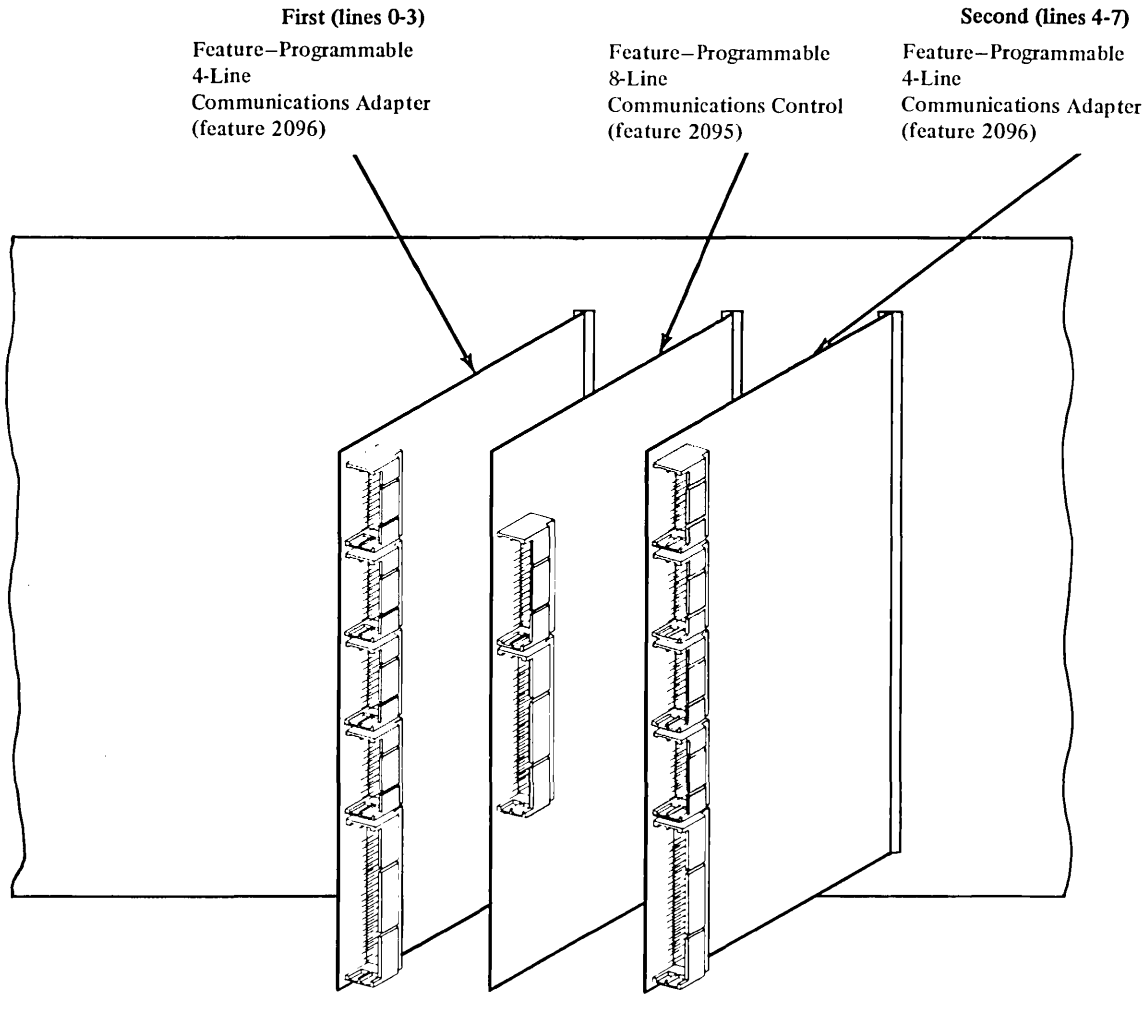
1. Full duplex requires two feature 2090 circuit cards.
2. On the receiver card, pin A01 connects to pin B01.

Figure 6-15. Cable and signal connections for feature 2090 when used as full duplex

Feature–Programmable Multi-Line Communications

- Synchronous or asynchronous programmable communication control features available on multiple lines (up to eight lines).
- Two or three feature cards (one control card and one or two adapter cards).
  - Two cards for one to four lines
  - Three cards for five to eight lines
- Speeds from 37.5 to 19,200 bps are programmable. It can handle up to 19,200 bps on each line (aggregate throughput is 64,000 bps at 12 bits/character).
- Echo-plex operation (4-wire).





☐ Cable connection from card to device (see Figures 6-17 and 6-18)

Figure 6-16. Feature–Programmable Multi-Line Communication features

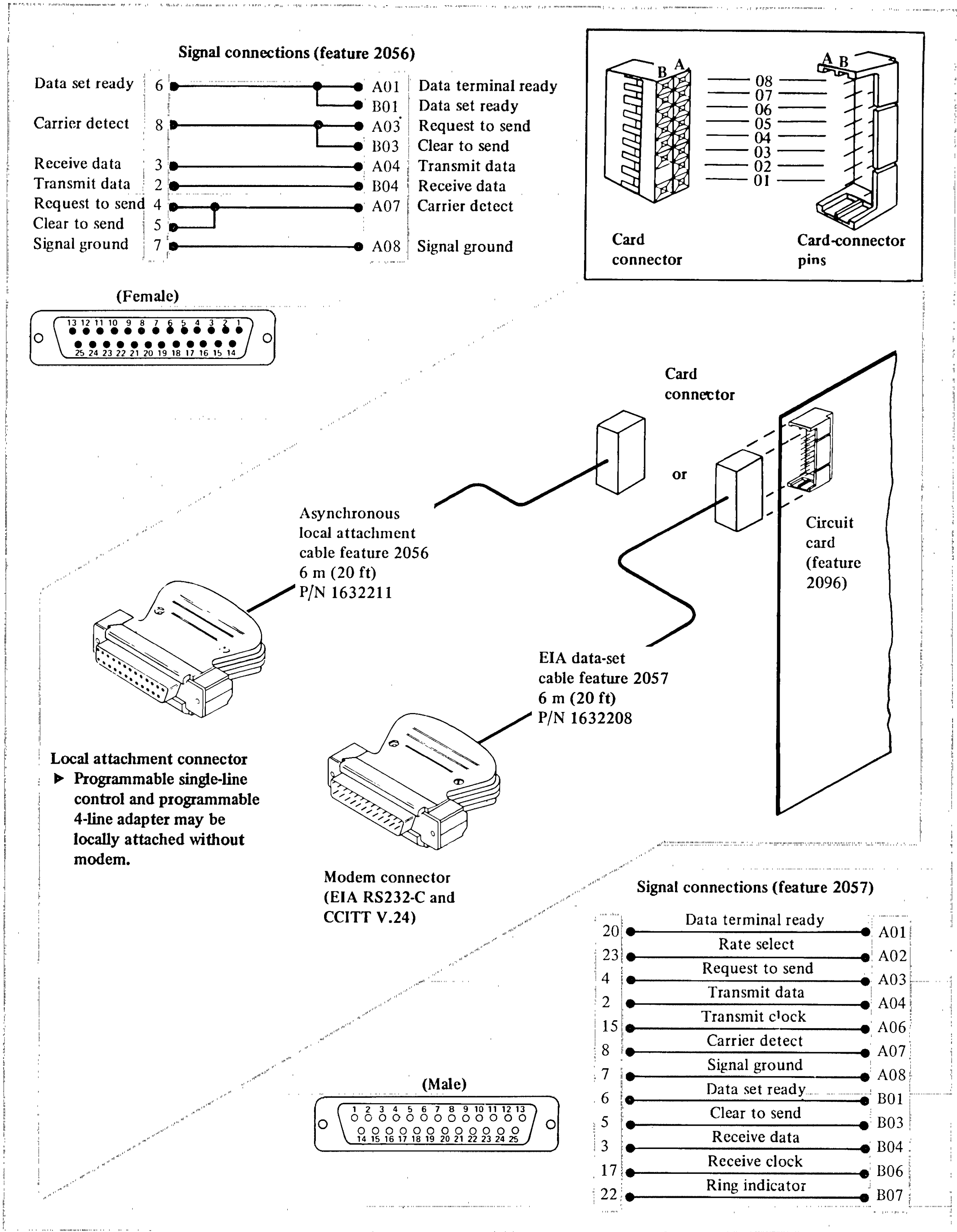


Figure 6-17. Cable and signal connections for Feature—Programmable Multi-Line attachments

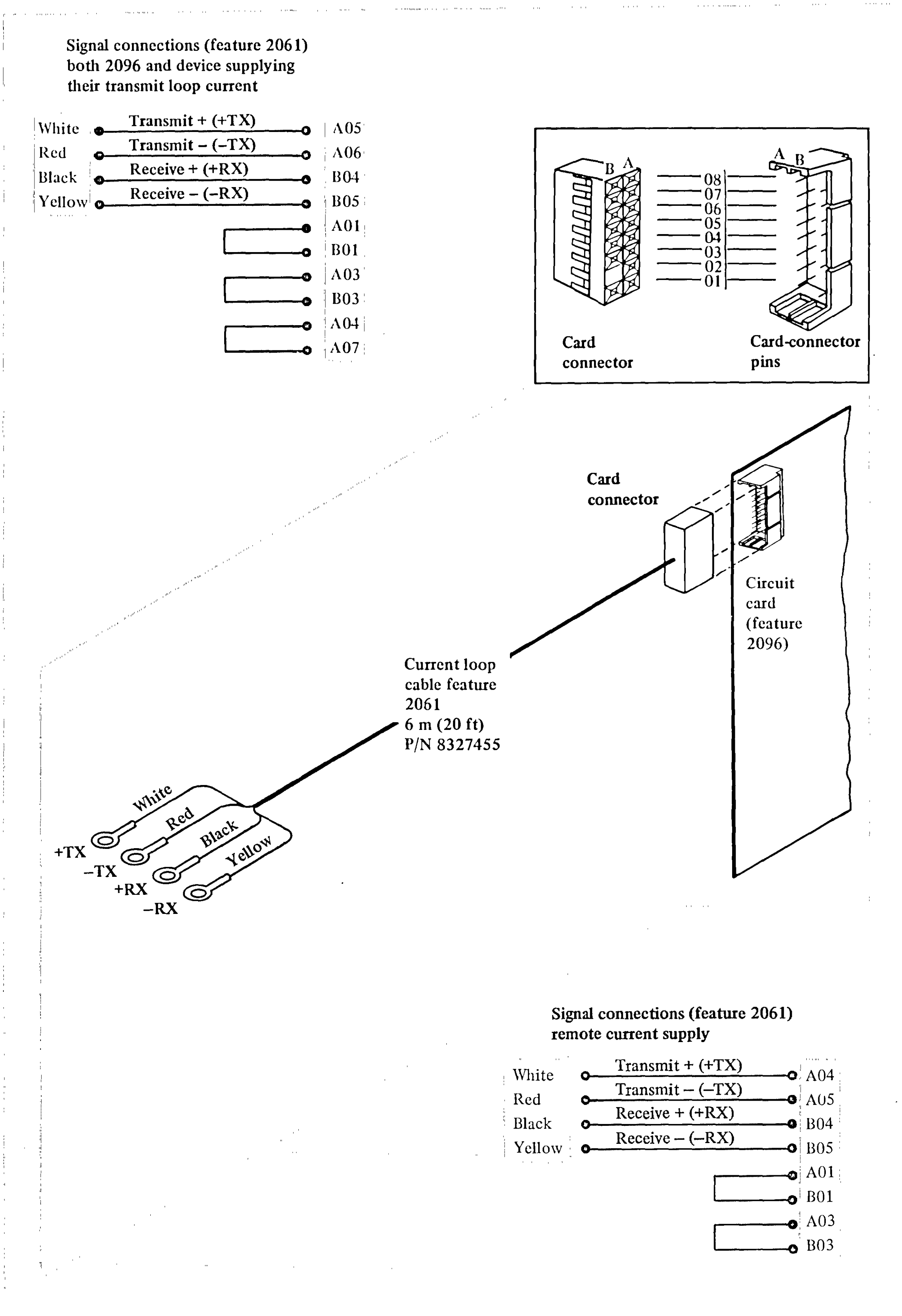


Figure 6-18. Cable and signal connections for Feature–Programmable Multi-Line attachment

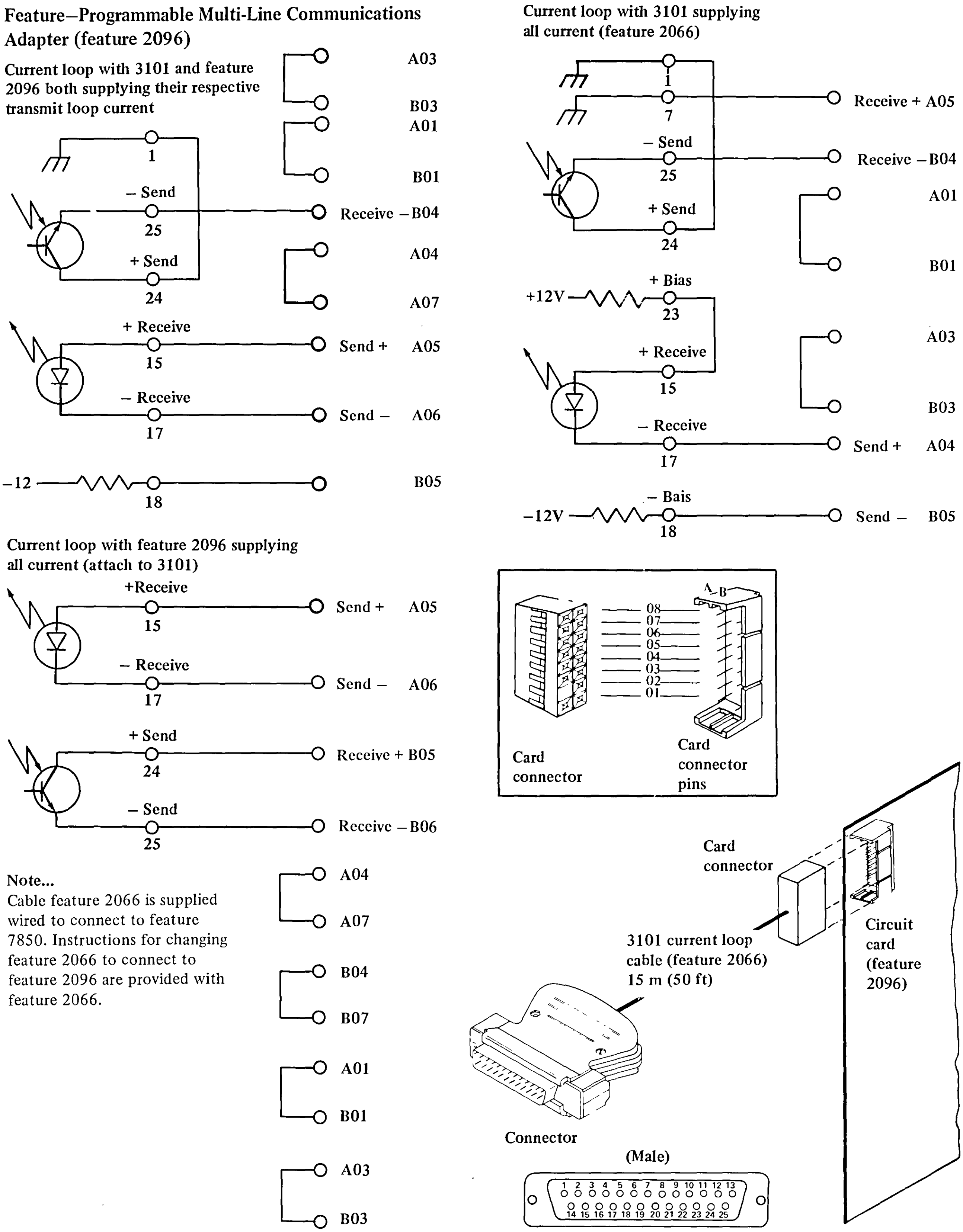


Figure 6-19 (Part 1). Current loop interface for Feature–Programmable Multi-line attachment

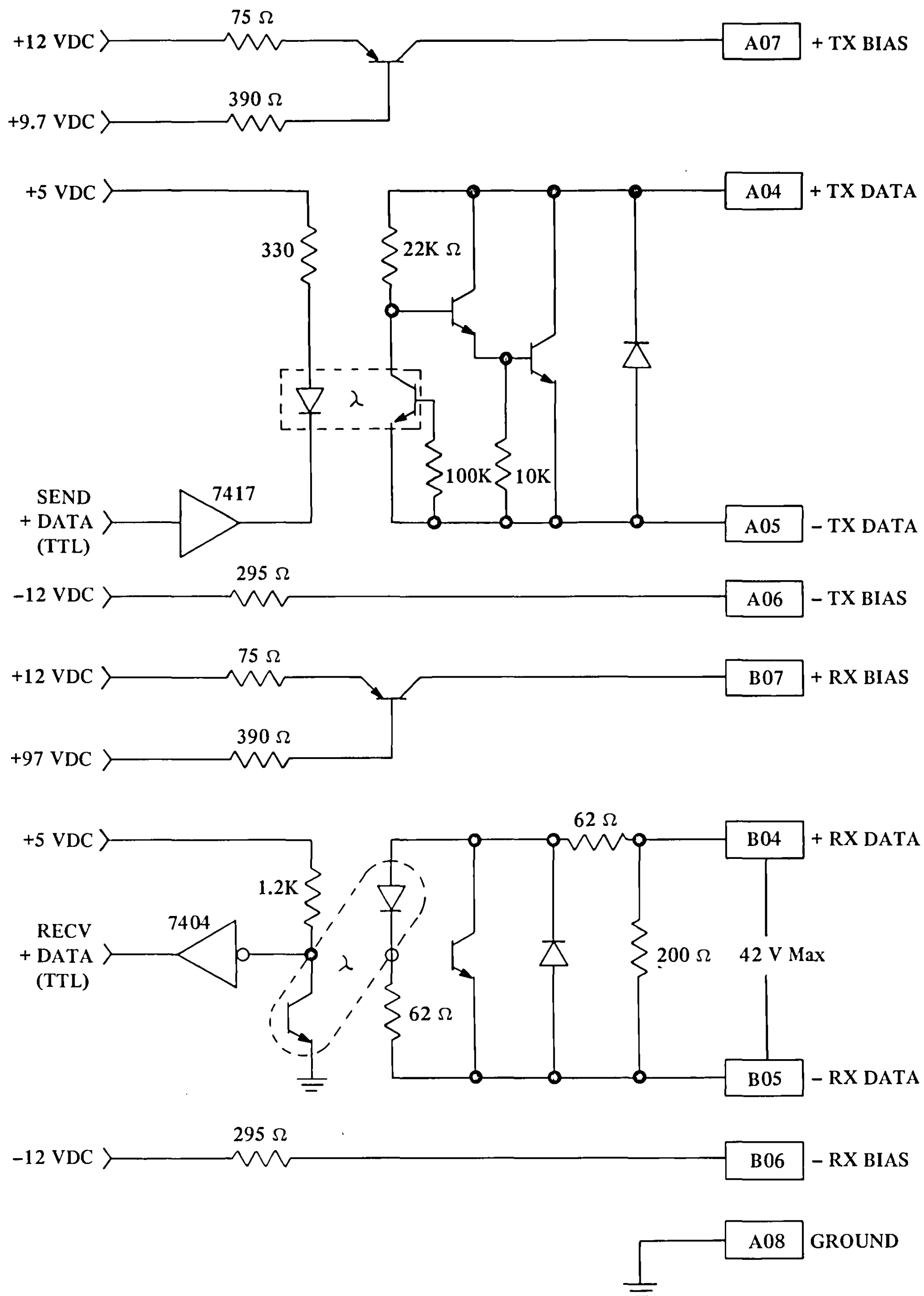
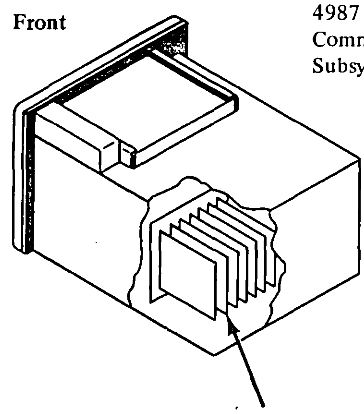


Figure 6-19 (Part 2). Current loop interface for Feature–Programmable Multi-line attachment

DCE data-set attachment features . . .

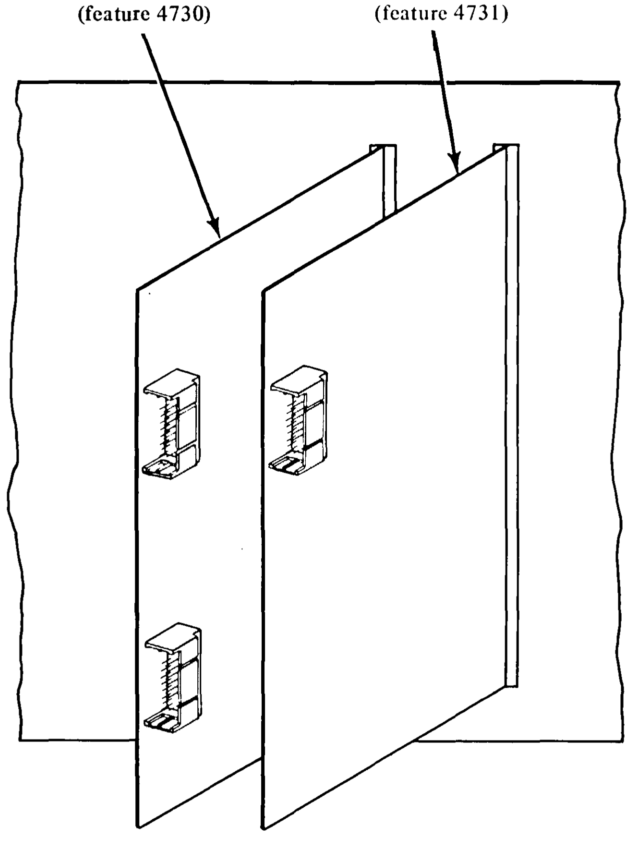
Feature 4730

- Two lines per feature.
- One feature circuit card with connections for two external data sets (modems).
- Asynchronous mode at speeds of 45 to 1,200 bps; 2,400 bps; 4,800 bps; or 9,600 bps–using internal clocking.
- Synchronous mode at speeds up to 9,600 bps–using modem clocking.
- Half-duplex operation.



Feature 4731

- Single line per feature.
- One feature circuit card with connections for one external data set (modem).
- Asynchronous mode at speeds of 45 to 1,200 bps; 2,400 bps; 4,800 bps; or 9,600 bps–using internal clocking.
- Synchronous mode at speeds up to 9,600 bps–using modem clocking.
- Full-duplex operation.



☐ Cable connection from card to modem (see Figures 6-21 and 6-22).

Figure 6-20. Data communication equipment (DCE) data-set attachment features

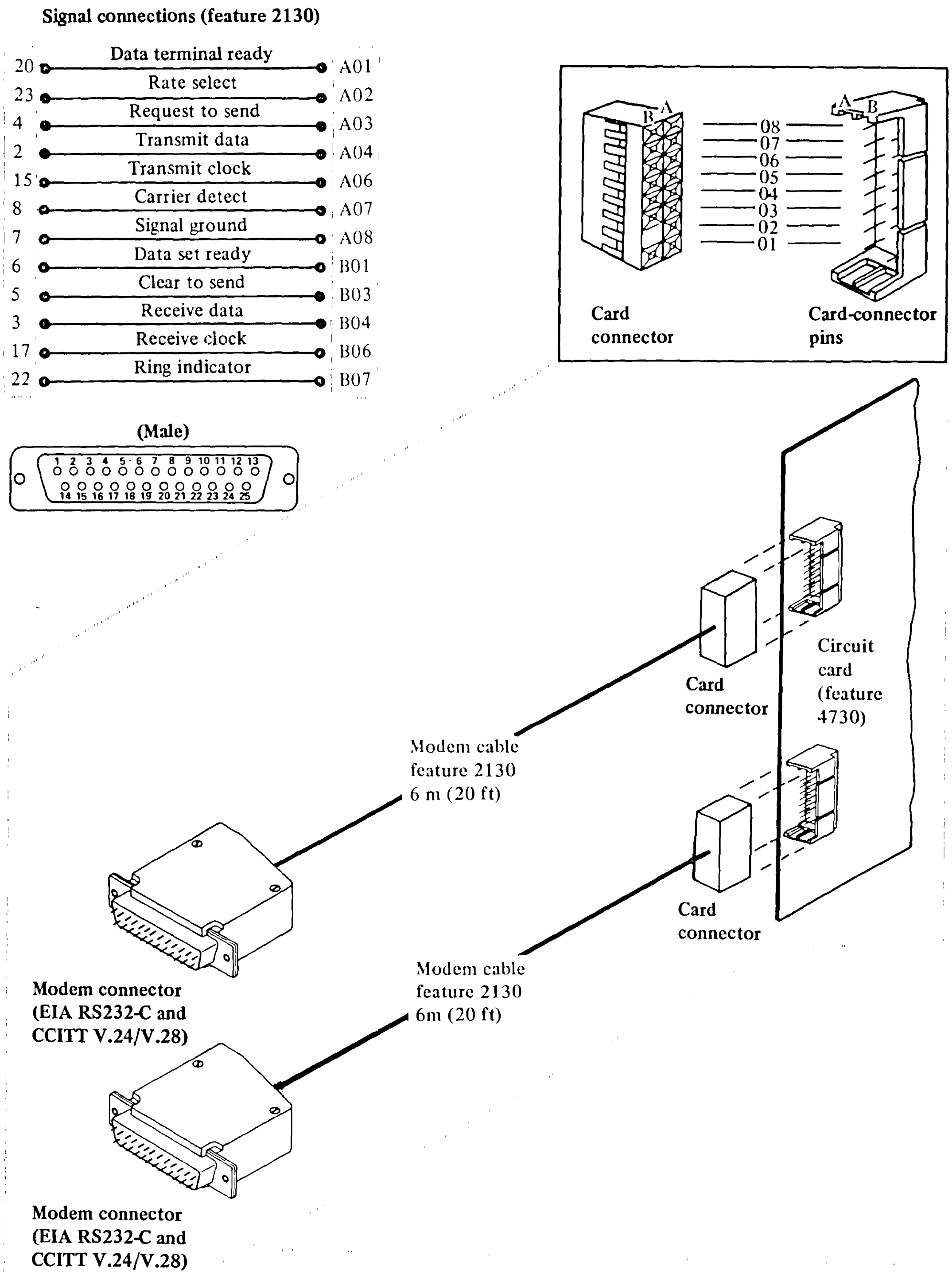


Figure 6-21. Cable and signal connections for half-duplex DCE data-set attachment feature

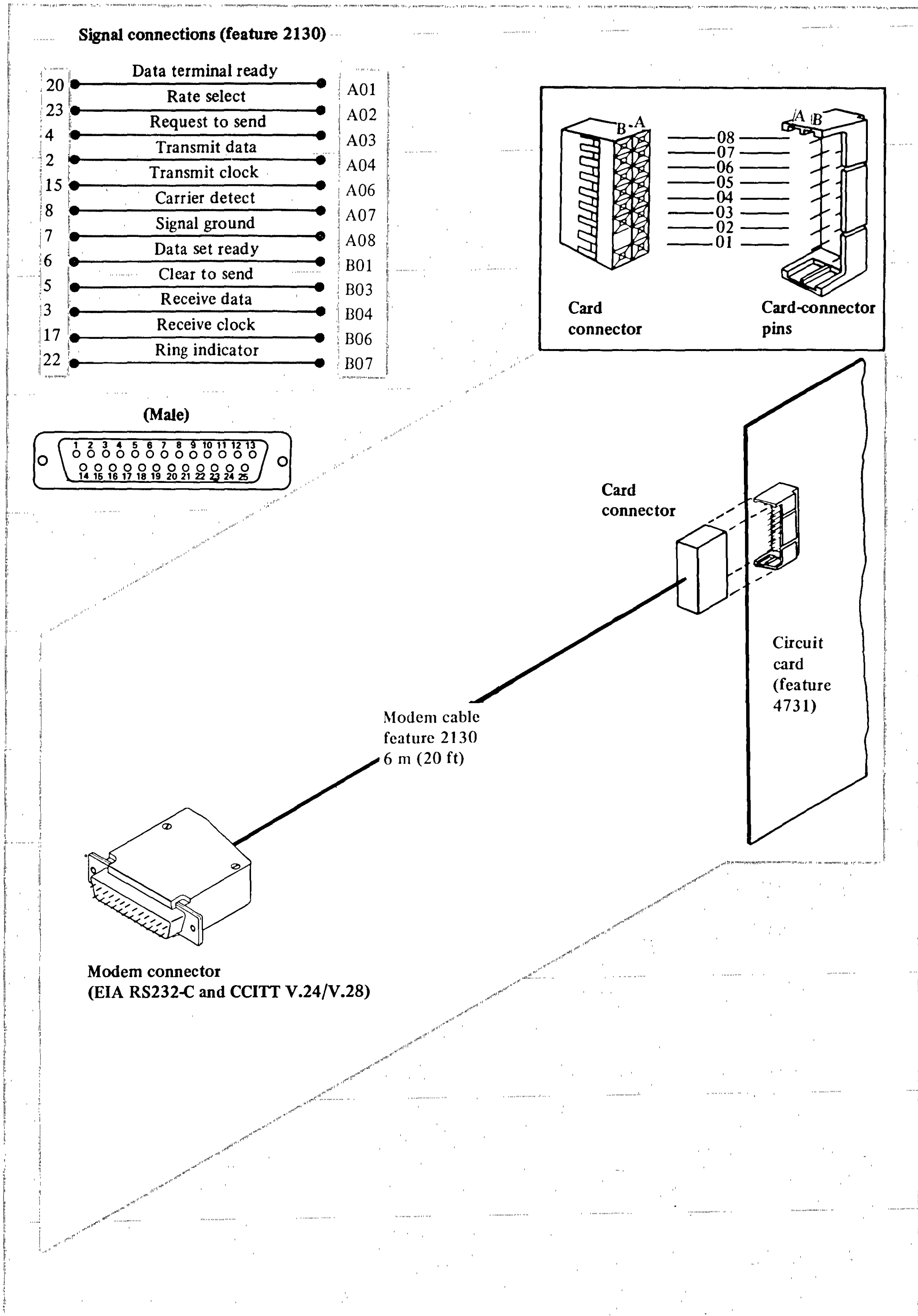
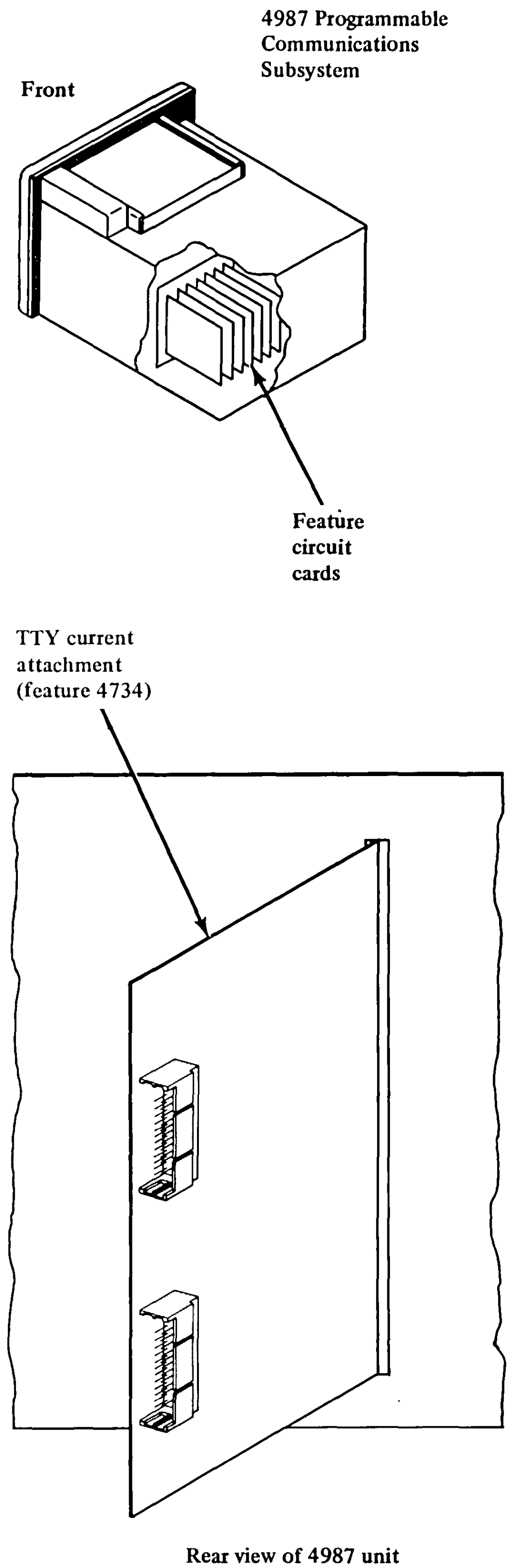


Figure 6-22. Cable and signal connections for full-duplex DCE data-set attachment feature

TTY current attachment feature . . .

- Two lines per feature.
- One feature circuit card with connections for two unipolar dc teletypewriters.
- Speeds of 45 to 1,200 bps; 2,400 bps; 4,800 bps; or 9,600 bps—under program control.
- Attached devices must supply current source for send and receive circuits (20 to 60 mA).
- Half-duplex operation (two or four wire).



☐ Cable connection from card to devices (see Figure 6-24)

Figure 6-23. Teletypewriter (TTY) current attachment feature

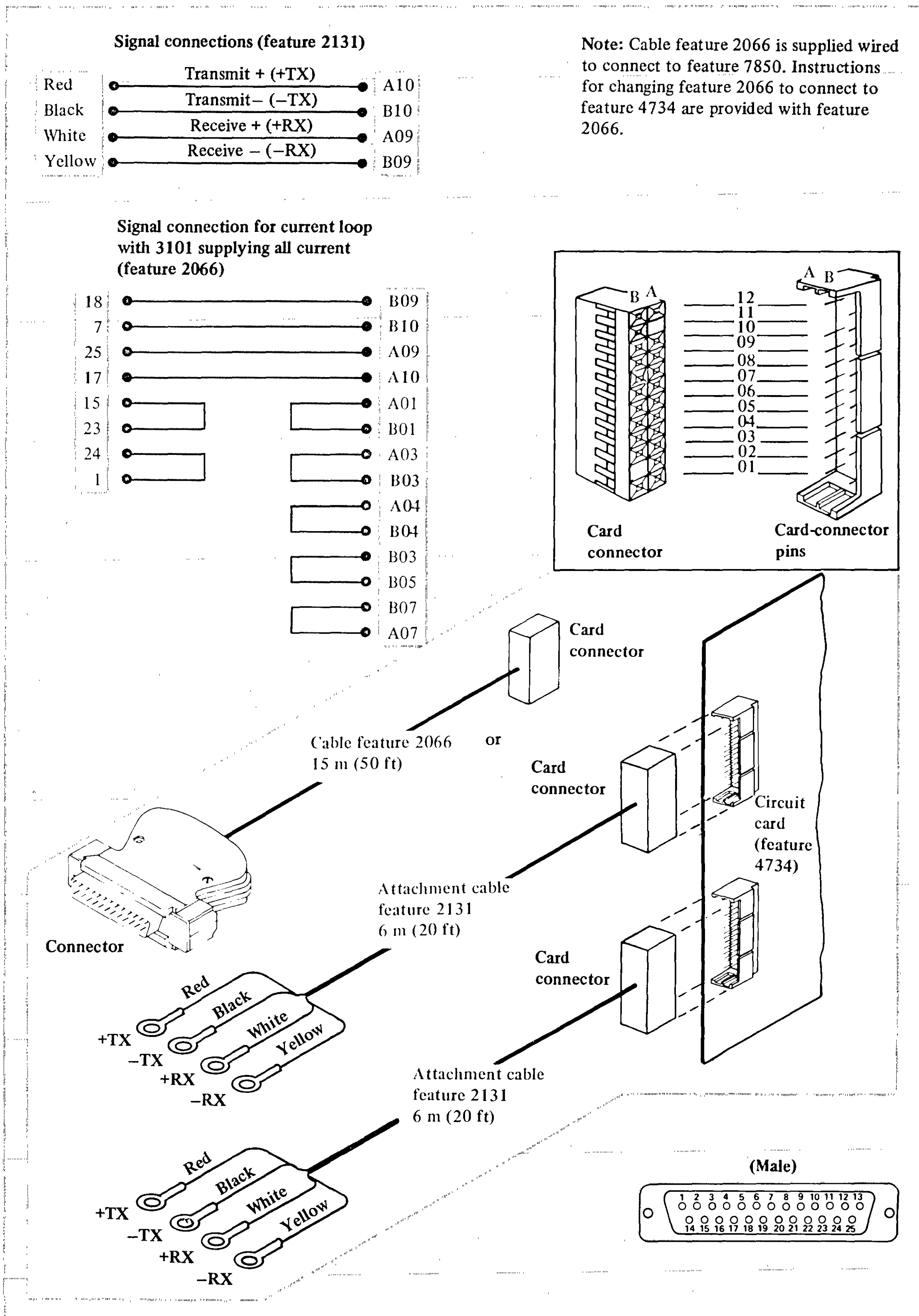
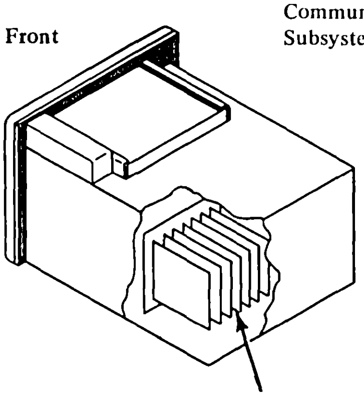
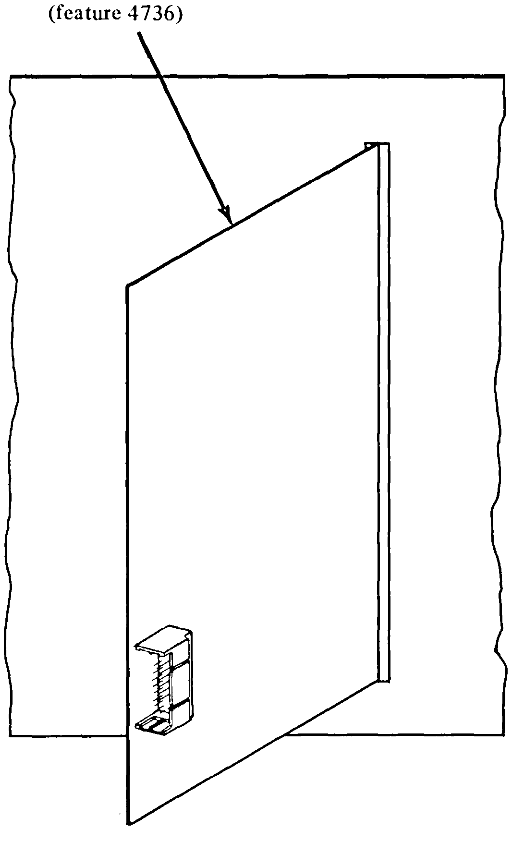


Figure 6-24. Cable and signal connections for TTY current loop attachment feature

DATA-PHONE Digital Service attachment feature...

- One line per feature, non-switched only.
- One feature circuit card with connections to a channel service unit.
- Synchronous mode at speeds of 2,400 bps; 4,800 bps; or 9,600 bps—using modem clocking.
- Half-duplex or full-duplex operation.





☐ Cable connection from card to modem (see Figure 6-26)

Figure 6-25. DATA-PHONE*Digital Service attachment feature

*Trademark of American Telephone and Telegraph Co.

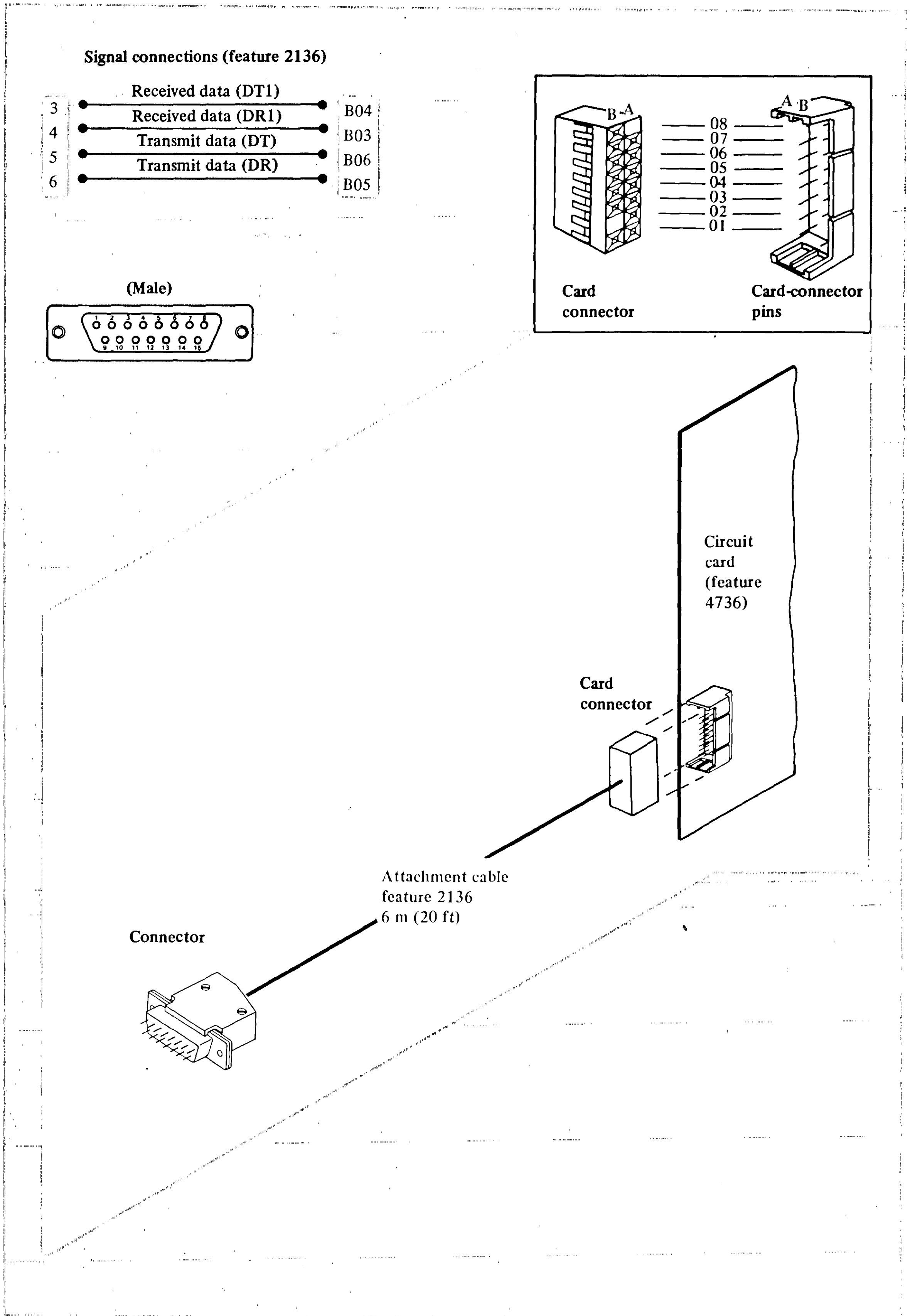


Figure 6-26. Cable and signal connections for DATA-PHONE Digital Service attachment feature

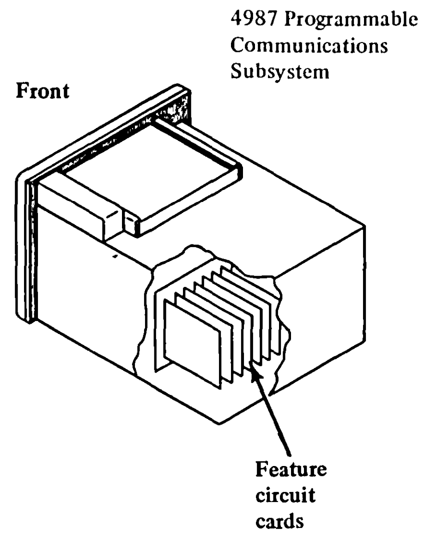
Local attachment features . . .

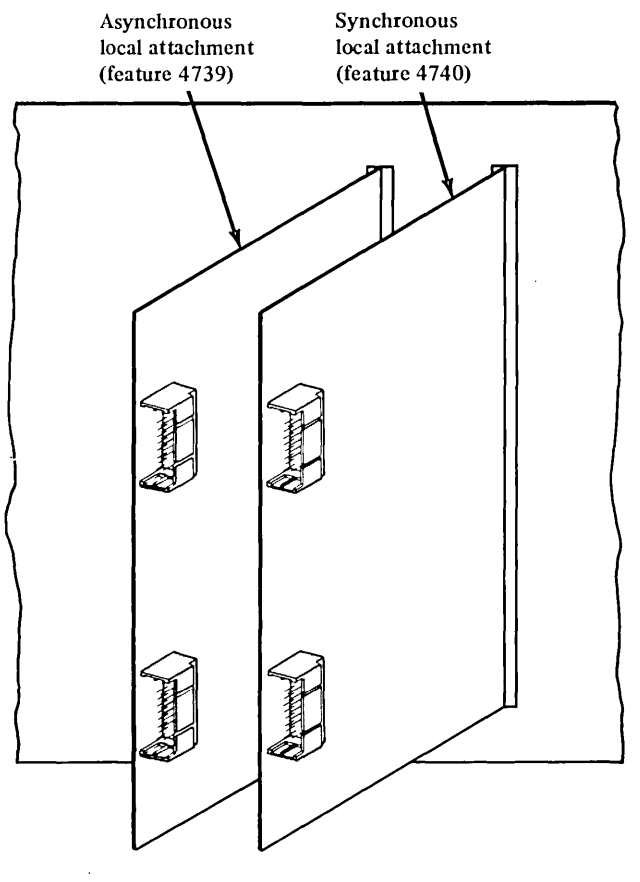
Asynchronous local attachment . . .

- Two lines per feature.
- One feature circuit card with connections for two local devices (terminals or systems)—without the use of modems.
- Speeds of 45 to 1,200 bps; 2,400 bps; 4,800 bps; or 9,600 bps—under program control.
- Half-duplex operation.

Synchronous local attachment . . .

- Two lines per feature.
- One feature circuit card with connections for two local devices (terminals or systems)—without the use of modems.
- Speeds of 600 bps; 1,200 bps; 2,400 bps; 4,800 bps; or 9,600 bps—manually selectable on the feature circuit card.
- Half-duplex operation.





☐ Cable connection from card to devices (see Figure 6-28)

Rear view of 4987 unit

Figure 6-27. Local attachment features

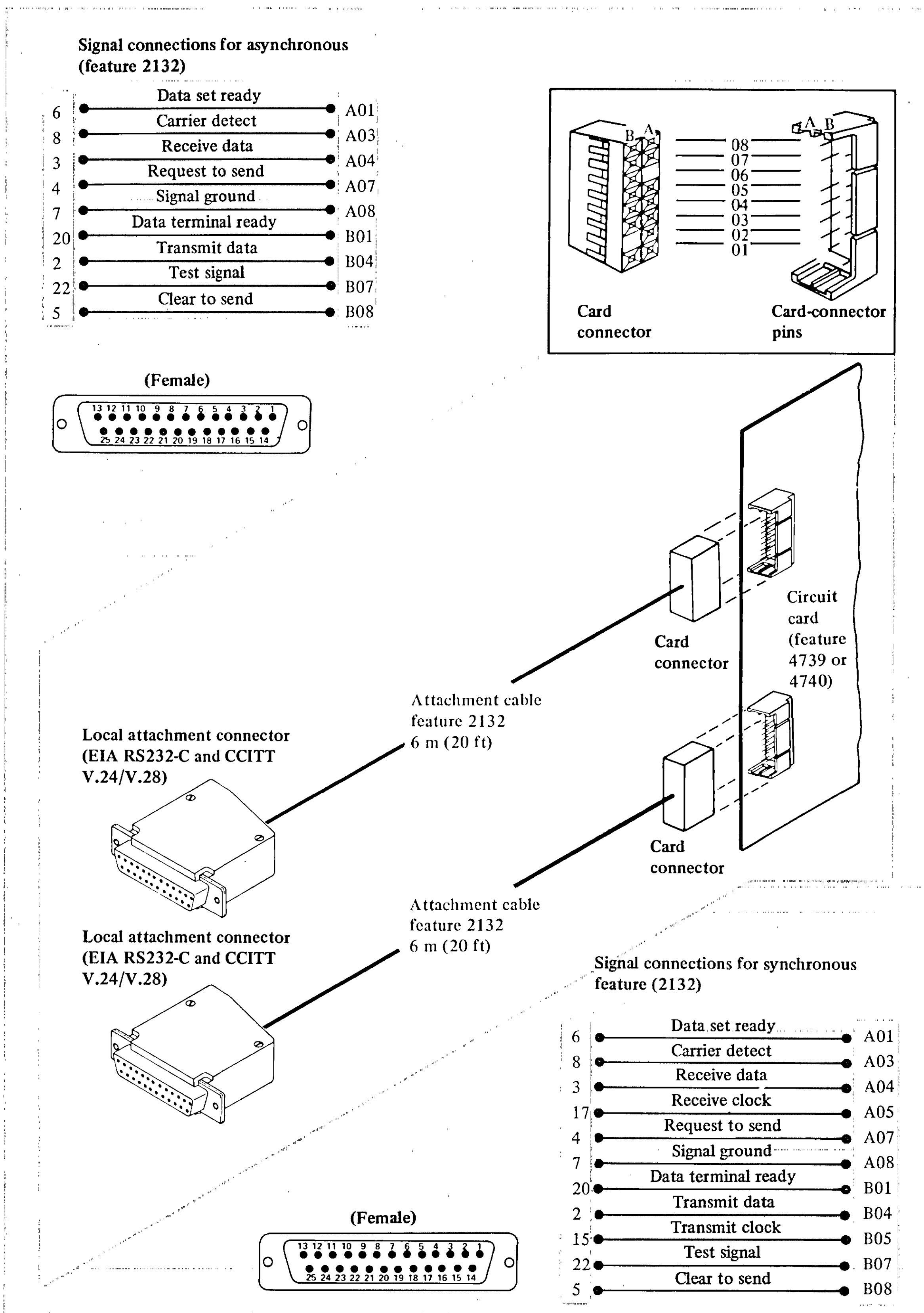
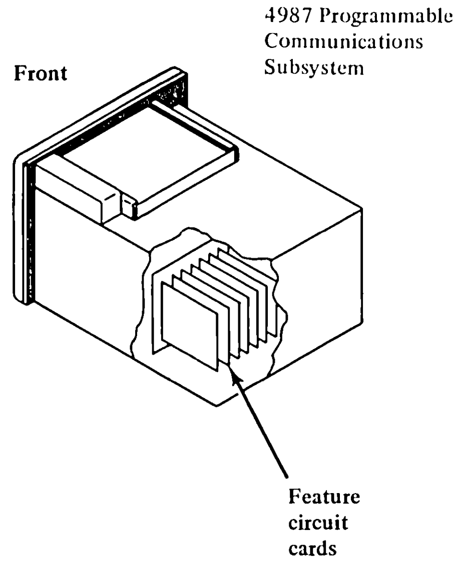
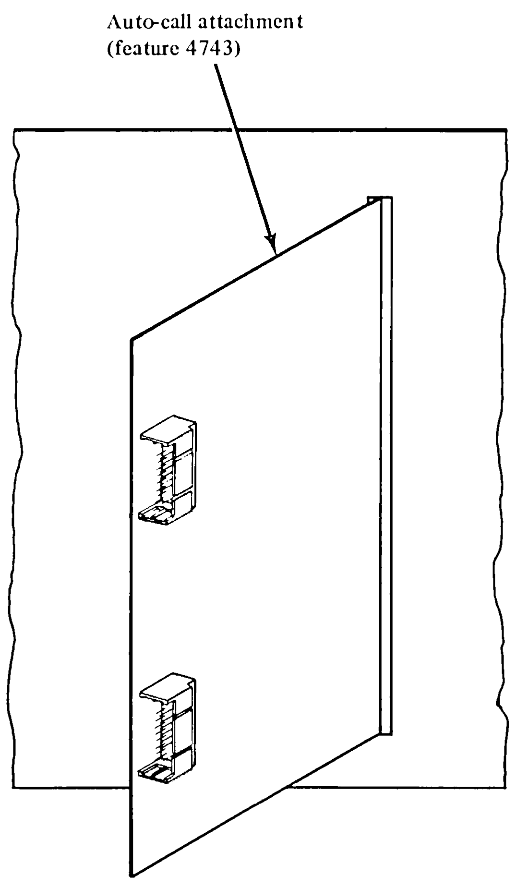


Figure 6-28. Cable and signal connections for local attachment features

Auto-call attachment feature . . .

- One line per feature.
- One feature circuit card with connections for one external modem and one auto-call unit.
- Modem connection same as feature 4730 (see Figure 6-19).
- Auto-call connection is for use with Western Electric type 801 Automatic Calling Unit, or equivalent.





☐ Cable connection from card to modem (see Figure 6-30)

Rear view of 4987 unit

Figure 6-29. Auto-call attachment feature

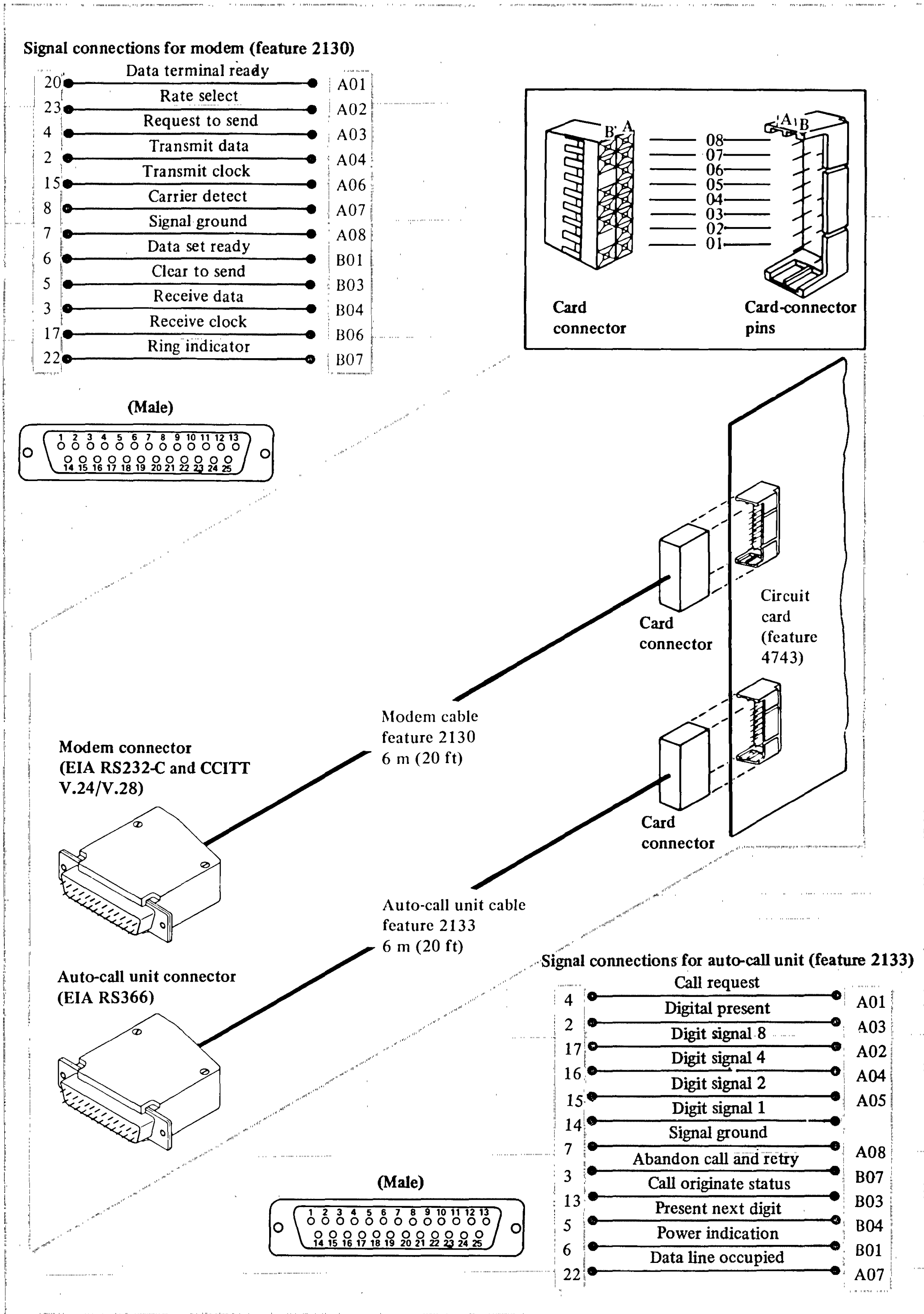


Figure 6-30. Cable and signal connections for auto-call attachment feature

Integrated-modem attachment features . . .

- ▶ Eight feature circuit cards available for connection to communication lines.
- ▶ One line per feature.
- ▶ Asynchronous speeds of 45 to 1,200 bps; synchronous speeds of 600 bps or 1,200 bps – under program control.
- ▶ CCITT V.23 or WE 202 mode–manually selectable on feature card.

Feature 4746–modem for asynchronous switched network (U.S.) . . .
- ▶ Auto-answer (CBS coupler) or manual answer (CDT coupler) options–manually selectable on feature card.
- ▶ Requires Type II local loop lines for speeds over 300 bps.
- ▶ Full-duplex or half-duplex operation.

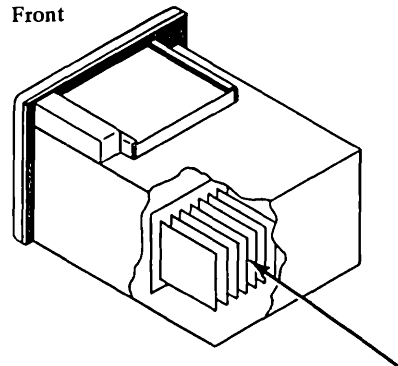
Feature 4747–modem for asynchronous leased line with switched network backup (U.S.) . . .
- ▶ Switched network includes auto-answer (CBS coupler) or manual answer (CDT coupler) options–manually selectable on feature card.
- ▶ Requires C1 conditioned leased lines for speeds over 600 bps.
- ▶ Full-duplex or half-duplex in leased-line mode; half-duplex only in switched-network mode.

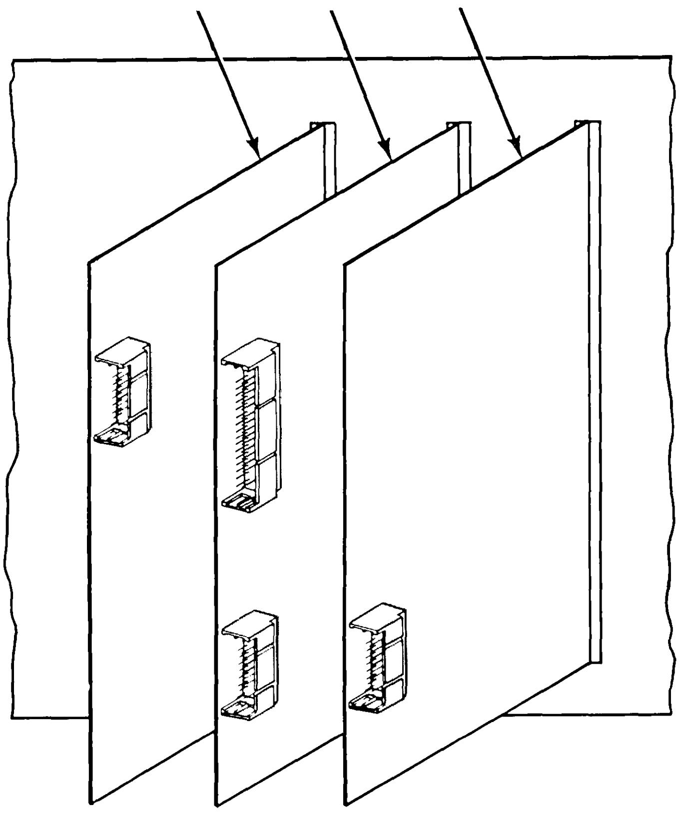
Feature 4748 (U.S. and Canada) and 4749 (non-U.S. and Canada)–modem for asynchronous leased line . .
- ▶ Requires C1 conditioned lines for speeds over 600 bps.
- ▶ Full-duplex or half-duplex operation.

Feature 4751–modem with clock for synchronous switched network (U.S.) . . .
- ▶ Business machine (internal) clocking.
- ▶ Auto-answer (CBS coupler) or manual answer (CDT coupler) options–manually selectable on feature card.
- ▶ Full-duplex or half-duplex operation.

Feature 4752–modem with clock for synchronous leased line with switched network backup (U.S.) . . .
- ▶ Business machine clocking.
- ▶ Switched network includes auto-answer (CBS coupler) or manual answer (CDT coupler) options–manually selectable on feature card.
- ▶ Full-duplex or half-duplex in leased-line mode; half-duplex only in switched-network mode.

Feature 4753 (U.S. and Canada) and 4754 (non-U.S. and Canada)–modem with clock for synchronous leased lines . . .
- ▶ Business machine clocking.
- ▶ Full-duplex or half-duplex operation.





Rear view of 4987 unit

☐ Cable connection from card to communications lines (see Figure 6-32)

Figure 6-31. Integrated-modem attachment features

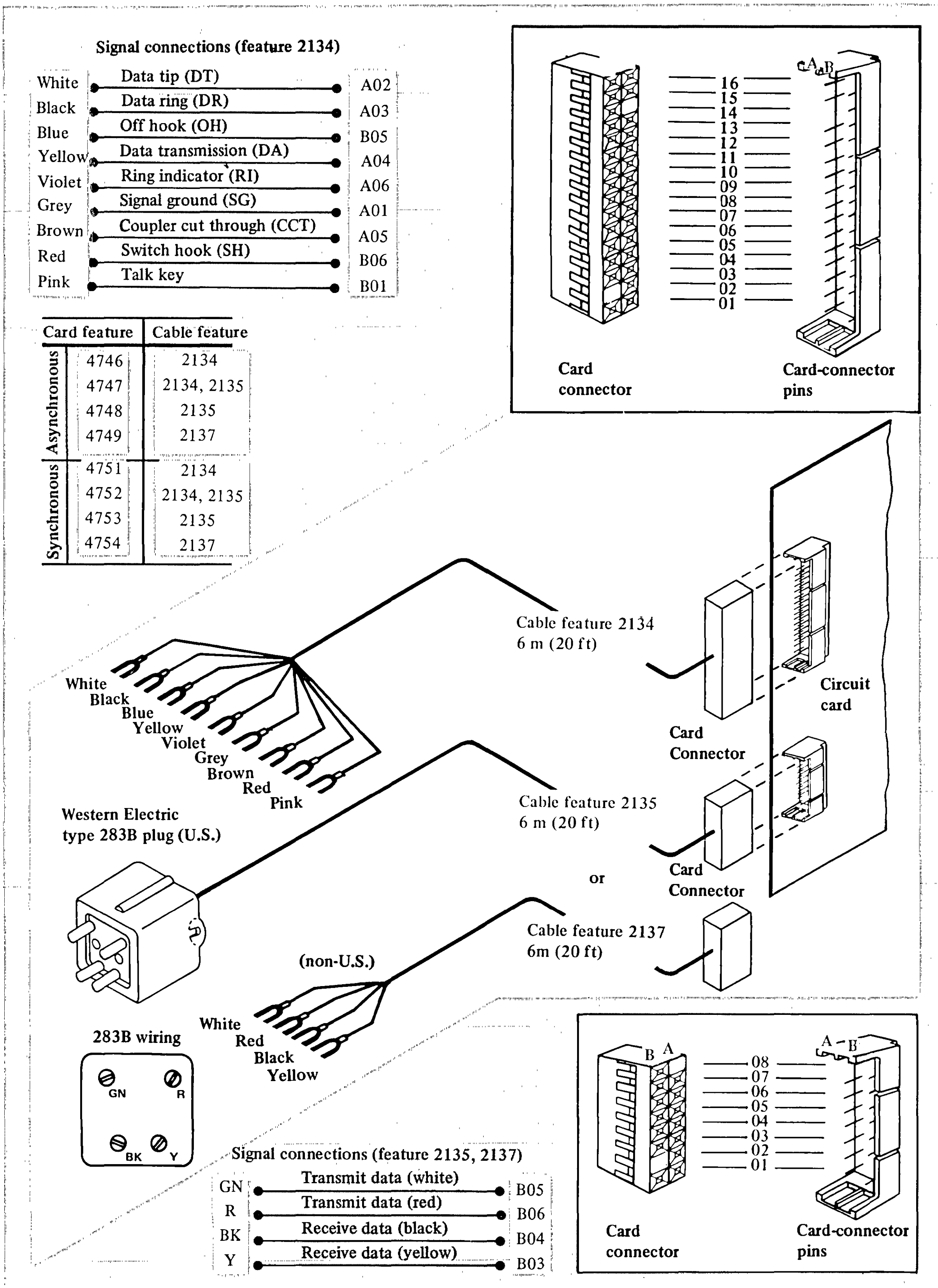
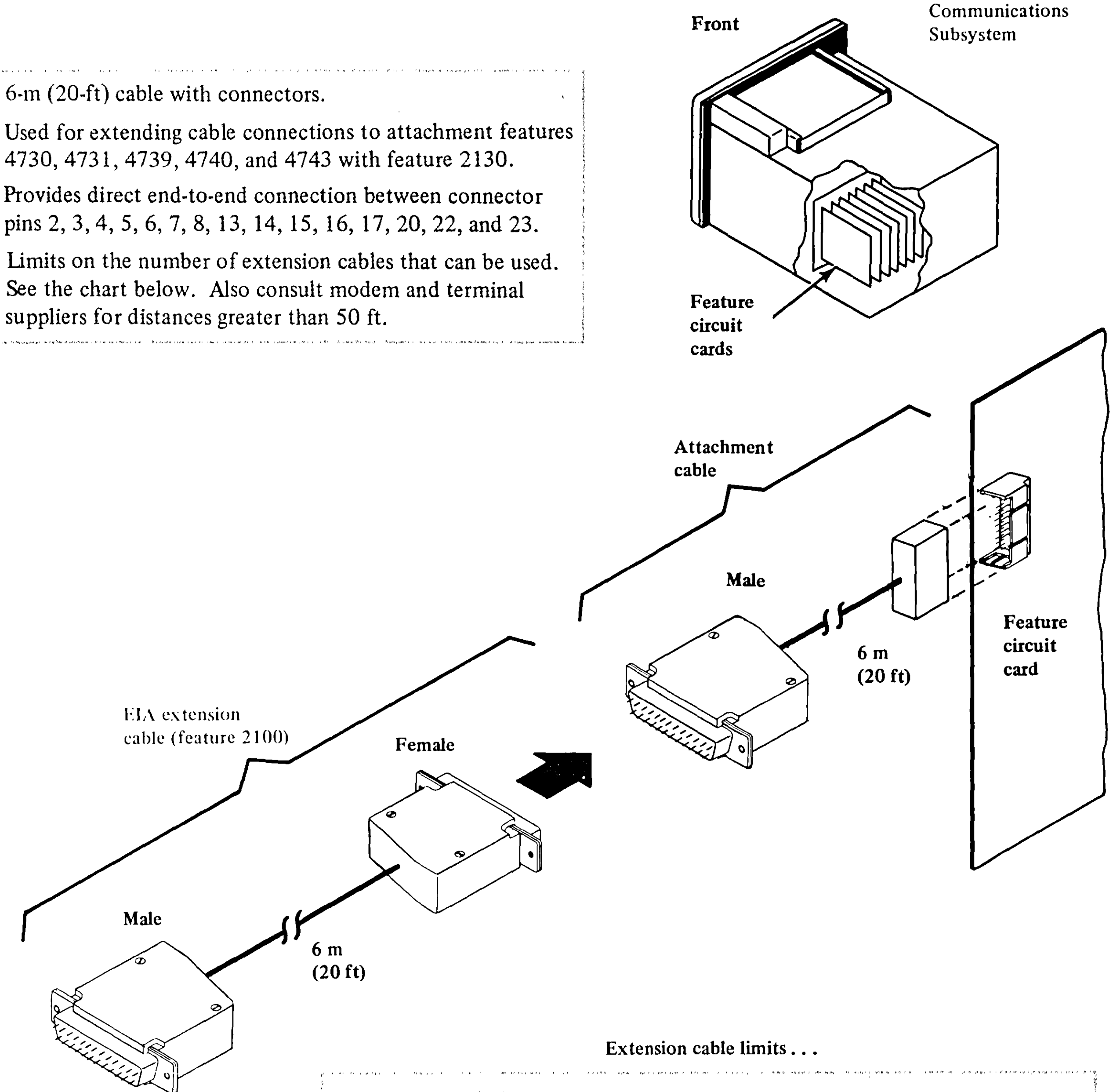


Figure 6-32. Cable and signal connections for integrated-modem attachment features

EIA extension cable (feature 2100) . . .

- ▶ 6-m (20-ft) cable with connectors.
- ▶ Used for extending cable connections to attachment features 4730, 4731, 4739, 4740, and 4743 with feature 2130.
- ▶ Provides direct end-to-end connection between connector pins 2, 3, 4, 5, 6, 7, 8, 13, 14, 15, 16, 17, 20, 22, and 23.
- ▶ Limits on the number of extension cables that can be used. See the chart below. Also consult modem and terminal suppliers for distances greater than 50 ft.



Extension cable limits . . .

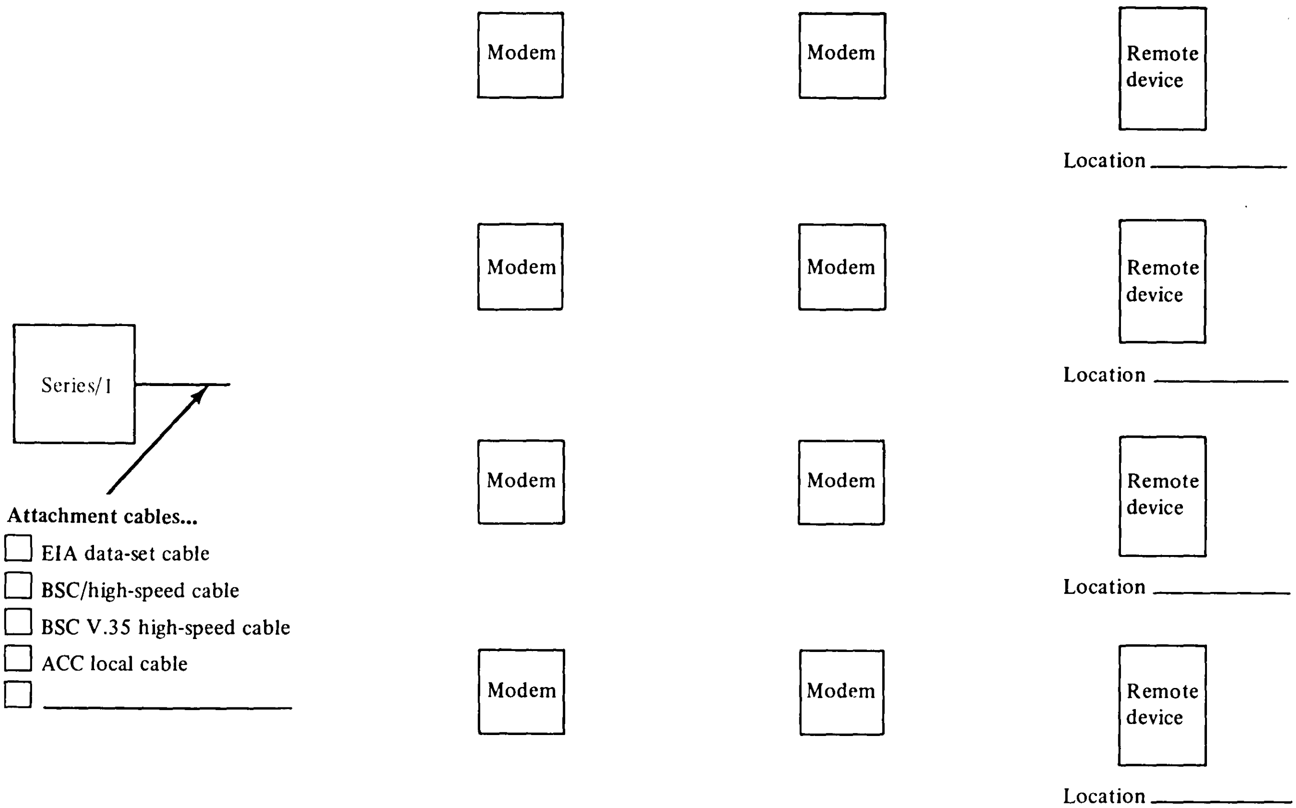
Feature	Mode	Bit rate	Extension cables	Total length
4730, 4739, 4743	Asynchronous	Up to 7,200	9	60.9 m (200 ft)
4730, 4739, 4743	Asynchronous	9,600	1	12.18 m (40 ft)
4730, 4740, 4743	Synchronous	Any	1	12.18 m (40 ft)
4731	Either	Any	1	12.18 m (40 ft)

Figure 6-33. Extension cable for 4987 features

Communication-features planning worksheet

Use a separate worksheet for each communications feature. This worksheet is for ____________________

Network diagram. Connect the blocks below with lines to indicate the network for this feature (see Figures 6-4, 6-5, and 6-6).



Attachment cables...

☐ EIA data-set cable
☐ BSC/high-speed cable
☐ BSC V.35 high-speed cable
☐ ACC local cable
☐ ________________

Network...

☐ Point-to-point, switched ☐ Point-to-point, nonswitched
☐ Multipoint

Line...

☐ Privately owned line ☐ Two-wire ☐ Half-duplex
☐ Leased line ☐ Four-wire ☐ Full-duplex
☐ Dial-up Conditioning ____ Number _____

Speed...

☐ Under 300 bps ☐ 600 bps ☐ 1,200 bps
☐ 2,400 bps ☐ 4,800 bps ☐ 9,600 bps
☐ Over 9,600 bps ☐ ____ bps

Modem...

Manufacturer ☐ IBM ☐ Western Electric ☐ ________
Model __________ Strapping ______________
☐ Auto-call ☐ Auto-answer ☐ Manual answer
DDA (coupler) ☐ CBS ☐ CDT
☐ DATA-PHONE Digital Service

Clocking...

☐ Modem ☐ Machine

Interface...

☐ EIA RS232-C ☐ CCITT V.23 ☐ CCITT V.24
☐ EIA RS366 ☐ CCITT V.28 ☐ CCITT V.35
☐ Current loop (teletypewriter)

Figure 6-34. Communication-features planning worksheet

Chapter 7. Electrical power and grounding

The purposes of this chapter are to:

- Describe the power and grounding needed for the best Series/1 performance.
- Guide you in evaluating existing power and grounding.
- Guide you in installing or modifying power and grounding.

Series/1 rack enclosures contain **power-distribution panels** as shown in Figure 7-1.

Rack-mounted units connect to duplex outlets on the enclosure's power-distribution panel.

- ▶ Rack enclosures connect to customer power outlets.
- ▶ Rack-mounted units connect to power-distribution panel in rack enclosure.
- ▶ Stand-alone units connect to customer power outlets.

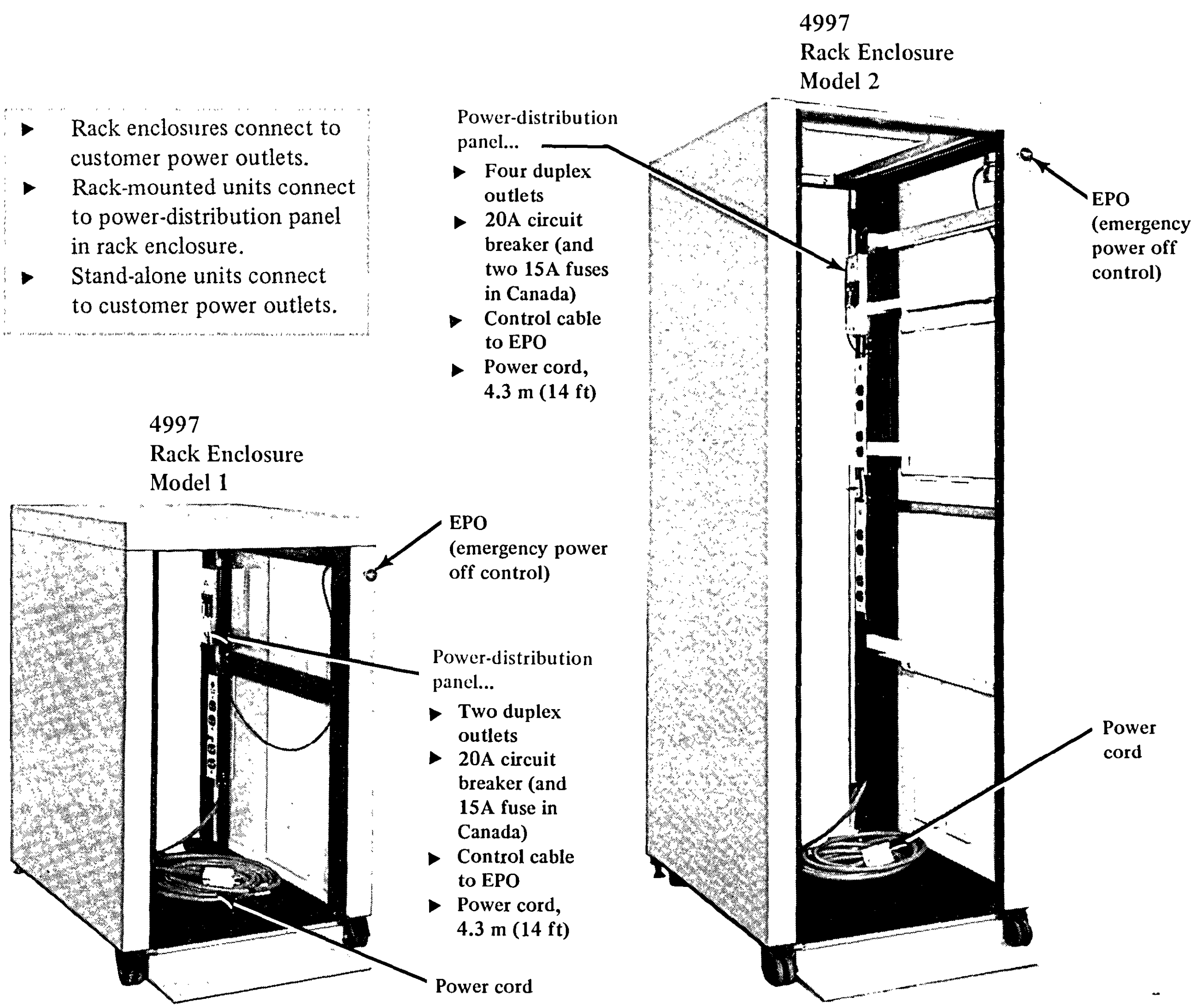


Figure 7-1. Series/1 rack-enclosure power distribution

A power cord from the 4997 power-distribution panel connects to your power outlet. Stand-alone units also connect to your outlets—not to the power-distribution panel in the 4997 rack enclosure.

Voltage ranges for the Series/1 units are included in the following list. (See Chapter 5 for individual unit voltages.)

60 Hertz	50 Hertz
100	100
110	110
115	123.5
120	200
127	220
200	230
208	235
220	240
230	
240	

Power quality

Dedicated Power

Your company must provide dedicated electrical power for Series/1. **Dedicated** means for Series/1 only.

Figure 7-2 shows the elements involved in providing reliable design for the power source supplying a computer system. You should have a **dedicated branch-circuit feeder** for your Series/1, as shown in Figure 7-2. From the dedicated feeder, you need **separate branch circuits** (protected by circuit breakers or fuses) to supply each Series/1 outlet (receptacle). You should not plug units with a high frequency power supply into ground fault interrupt outlets.

Line voltages must be maintained within the tolerance of the rated voltage—measured at the Series/1 power outlet. See the unit specification section for the frequency tolerance of each unit type. Also see, *Primary Power Line Frequency* in this chapter for system related primary power line frequency considerations.

You must also comply with all **national and local safety standards** that apply to your site. (For installations in the U.S., see Chapter 9 of this manual.)

Power Disturbances

The stability of your power can make a big difference in the performance of your Series/1. Power disturbances or **transients** can cause computer failures or errors.

Transients can come into your site on the power-company lines, but they are more often caused by some of your own equipment. For example, transients can be produced by welders, cranes, motors, induction heaters, elevators, X-ray equipment, florescent lighting, copy machines, and other office equipment.

The best way **to prevent problems caused by power disturbances** is to not have any transient-producing equipment on the same power service that feeds Series/1.

Power Isolation

If your best available power source has too many disturbances for Series/1, you might have to isolate your power source with an **isolation transformer**. The severity of the disturbances might require that the isolation transformer include electrostatic shielding and electronic voltage regulation.

Power load

The first step in planning power distribution to your Series/1 power outlets is calculating the **total Series/1 power load** in kilo-volt-amperes (kVA).

Go back to the product-specification worksheet you filled out in Chapter 2 of this manual. Add up the **total kVA** for the units listed on the worksheet, then refer to "Primary power limits" on page 5-115 or page 5-117 to be sure you do not exceed the limits of your 4997 Enclosure. Figure 7-3 shows an example of total power load for a single rack enclosure and associated stand-alone units.

These are maximum values for a full featured unit. Your machine will probably be less than maximum. For a more precise value of the power load for your machine, contact your IBM marketing representative.

You need the total power load (in kVA) of all racks and units to determine the proper **size of your branch-circuit feed** (see "Branch-Circuit Feeder").

Power distribution

Power Outlets

For each Series/1 rack enclosure, you need a **separate power outlet** on a separate branch circuit (see Figure 7-2).

You also need an **individual power outlet** for each stand-alone unit. We urge you to use a single outlet (not duplex) for each stand-alone unit to prevent someone from connecting equipment other than Series/1 to the other half of the duplex outlet.

Note: If you have a stand-alone processor Model 4952-30D, 4954-30D, 4954-60D, 4956-30D, or 4956-60D that is connected to a 4965-30D or 4965-60D Storage and I/O Expansion Unit, you must use a duplex outlet. In this configuration, the line cords of the two units are physically joined but have two separate plugs. This arrangement makes it impossible to reach two separate single outlets.

Specifications for outlets (receptacles) are given in Chapter 5. In countries other that the U.S. and Canada, Series/1 units are shipped without the powerplugs attached to the power cords. Some national or local safety standards may require a different type of plug, or direct wiring of the power cords, instead of a plug-in connection.

Branch Circuits

Make sure that the branch circuits supplying your Series/1 power outlets (see Figure 7-2) are large enough to handle the specified power outlets and the power load of units being supplied. While each rack enclosure requires a **separate branch circuit**, you may connect several outlets for stand-alone units to a single branch circuit—but do not exceed the circuit's capacity.

Branch circuits must be protected at the branch-circuit distribution panel with a time-delay circuit breaker or fuse for each circuit. In-rush current for Series/1 units can be up to 10 times the rated load for the first one-half cycle.

If you have three-phase power to the branch-circuit distribution panel, you should balance the power-outlet loads on the individual phases.

Branch-Circuit Feeder

Make sure that the feeder wires to the branch-circuit distribution panel (see Figure 7-2) are large enough to handle the total Series/1 power load (refer to your product-specification worksheet). This feeder can be three-phase, but Series/1 requires only **single phase** at the individual power outlets.

Power Source

The primary power source shown (see Figure 7-2) is a typical wye-type, three phase service coming from service entrance or separately derived system with appropriate over-current protection and suitable ground (service entrance or building ground).

Primary Power Line Frequency

The accuracy and stability of the line frequency must be considered when evaluating your primary power source. Series/1 machine types have various frequency tolerances, some are 60 Hz (or 50 Hz) ± 0.5 Hz, some are 47–63 Hz. It is possible, if the frequency were to drop to 59.4 Hz, for some machine types to continue operation while the other machines have experienced a power failure. This characteristic must be carefully considered when doing system planning, especially with systems that are to be supported by emergency power sources.

In critical applications, switching to an emergency power source may be necessary if the line frequency variance exceeds ±0.5 Hz, even if the line voltage has remained within tolerances.

Emergency power control

The Series/1 rack enclosure is protected by a 20-ampere circuit breaker on the power-distribution panel. This circuit breaker can be mechanically tripped from the **instant-power-off** (Emergency Pull) control on the front of the rack enclosure (see Figure 7-1).

You may have to provide **emergency-power-off** (EPO) controls for disconnecting your power service. To find out if this is necessary, check applicable national and local safety standards. If so, your emergency controls must disconnect the power service to the computer, as well as other equipment in the computer area or room, except lighting. The EPO controls should be located close to the computer itself and, in the case of a computer room, close to the exits.

You should also provide emergency lighting for the computer site. The AC distribution panel in the 4997 rack must be used to supply power to all the machines included in the rack. This is a necessity in terms of safety. The emergency pull button serves as the instant power off function for an emergency power down of the entire contents of the rack. For this reason devices in the rack must not receive power from another rack or an external outlet.

The maximum allowable current load of the AC distribution panel is 16 amperes which must be considered if you intend to locate non-IBM equipment in the 4997 rack. IBM cannot be involved in any warranty considerations for non-IBM equipment.

Other power needs

You will also need power for other equipment at your Series/1 site. You should have two convenience outlets within 6 feet of your Series/1 for service and test equipment. You also need power for lights, air-conditioning, telephone equipment, and production equipment.

All **non-Series/1 equipment** must be powered from a source other than the Series/1-dedicated branch-circuit distribution panel.

Grounding

A common cause of computer problems is **improper grounding.**

Series/1 power cords contain an insulated **equipment-grounding wire** (green or green with yellow stripe) that connects the machine frame to the equipment ground at the power outlet. All bays of a 4997 multibay enclosure must be connected to the same primary power ground.

Connect the power outlets for Series/1 units with an equipment-grounding wire to a grounding terminal bar in the branch-circuit distribution panel. Connect the grounding terminal bar with an equipment-grounding wire back to the service-entrance grounding electrode (see Figure 7-2).

The grounding wire must be an insulated, noncurrent-carrying conductor, of at least the same size as the branch-circuit feeder. While the grounding wire can be run in the same conduit as the other wires, keep it electrically **isolated** from the neutral wire. The center tap of the service transformer (neutral) and the grounding wire are common only at the service-entrance grounding electrode.

If you cannot run the grounding wire back to the service entrance (such as in a tall building), you can use an exposed section of a cold-water main that has continuous metal to ground.

You may have to use building steel or grounding rods if no other grounding means are available. All grounds must be tested. Check applicable national and local safety standards.

Grounding continuity is **vital** to sensor input/output equipment connected to Series/1 (see "Safety considerations" in Chapter 8).

External unit grounding

Series/1 machine types mounted external to the system enclosure must use the same ground circuit as the processor. No more than 0.5Vdc of ground voltage differential may exist between any grounds on the Series/1 system. This requirement is particularly important when extended (>30m) attach cables are used with the 4979 Display Station and the 4978 Display Station.

Lightning protection

If you are located in an area that is subject to electrical storms, talk to your power company about installing lightning protection on your building service. You might also need to install lightning protection on your power-distribution system.

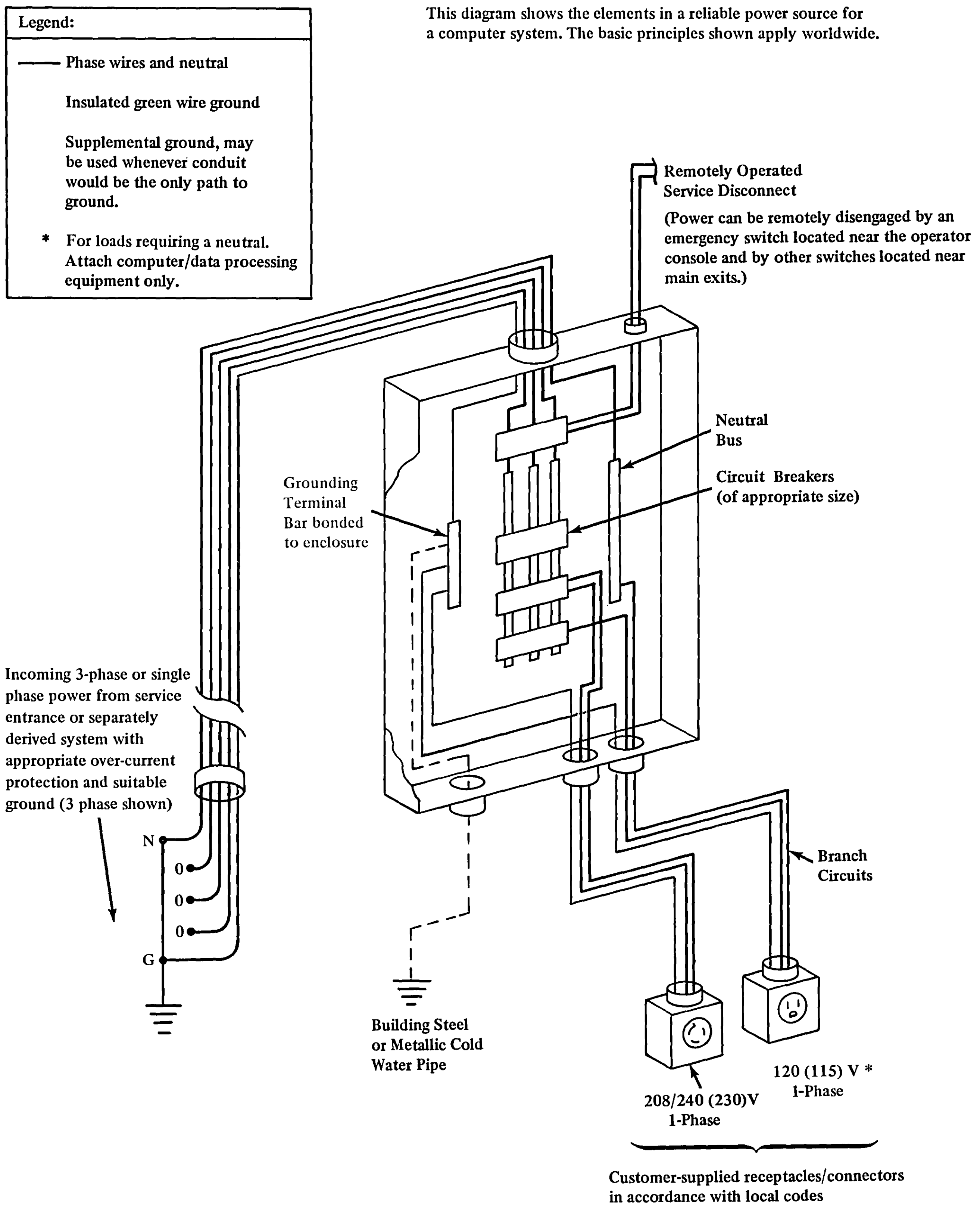


Figure 7-2. Sample electrical power distribution and grounding for Series/1

Product specification worksheet

Product (machine)			Power load (kVA)		Heat-output (Btu/hr)		Weight (lb)			
Type	Model no.	Qty	Per unit	Sub total	Per unit	Sub total	Per unit	Sub total	Voltage	Notes
4954	B	1	.70	.70	1705	1705	50	50	208	PLUGS INTO RACK
4959	A	1	.70	.70	1705	1705	50	50	208	PLUGS INTO RACK
4982	1	1	.20	.20	522	522	45	45	208	PLUGS INTO RACK
4964	1	1	.25	.25	512	512	40	40	208	PLUGS INTO RACK
4962	1F	1	.55	.55	1640	1640	135	135	208	PLUGS INTO RACK
4997	2A	1					235	235	208	
				2.40	RACK POWER REQUIREMENT					
4979	1	3	.15	.45	392	1176	30	90	115	
4974	1	1	.12	.12	390	390	55	55	115	
4973	2	1	.50	.50	1380	1380	315	315	115	
Totals (all machines)				3.47		9030 (Btu)		1015 (lb)		

Notes...

- ▶ Customer specifies voltages when ordering Series/1. See your records for voltages.
- ▶ The values given for power load (kVA) are upper limits and occur when the unit is powered on. During operation, the value of the power load (kVA) will probably be less.
- ▶ Each 4997 rack enclosure has a current (ampere) and power load (kVA) limit. See "Power Requirements" and "Primary power limits" under the 4997 unit specifications in Chapter 5.

Figure 7-3. Sample Series/1 power load (single rack enclosure)

Battery backup unit (4999)

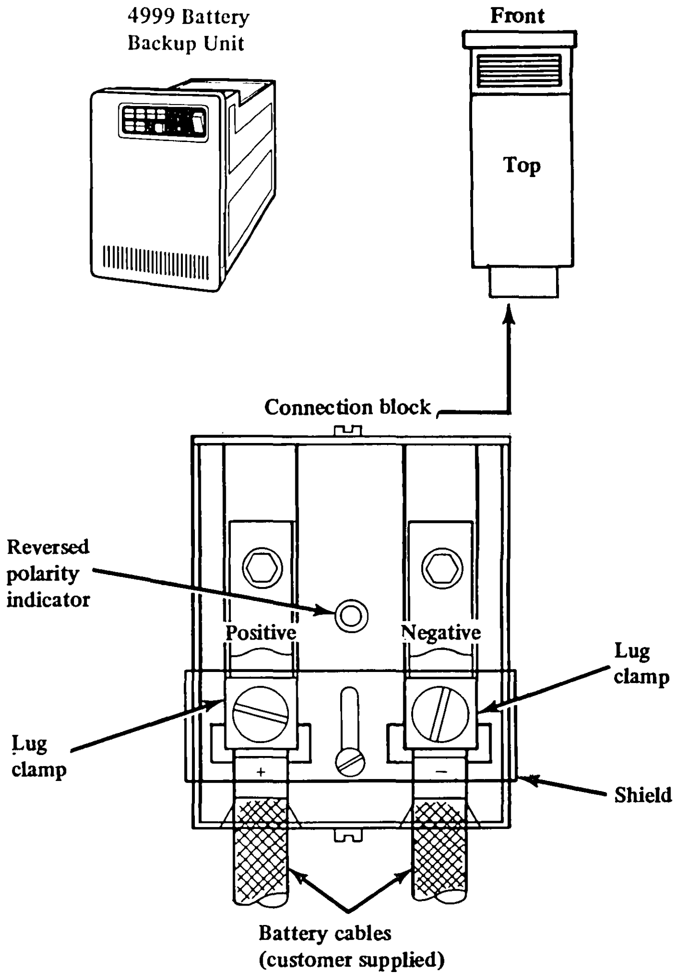
If you had power outages or brown-outs in your area, a battery backup unit may have been ordered for your installation. Check your product-specification worksheet for machine-type 4999. The battery backup unit only provides power backup for certain Series/1 processors.

If you are getting battery backup at your site, there are several things you need to do to prepare for it. You must supply the following:

- The battery (we recommend the sealed automotive type, 12-volt, 100 ampere-hour rating)
- The battery cables
- Battery-charging equipment
- Electrical power for battery-charging equipment.

Figure 7-4 shows the battery-connection block on the 4999 unit. The connection block takes stranded, insulated cables from size No. 8 to No. 2 AWG. You should label the polarity of the cables (+ and -), and twist them together to reduce inductance and electrical noise. Maximum battery cable length is 4.1 meters (13.5 feet), using No. 2 AWG wire.

Connect the battery cables to the 4999 after your computer has been installed.



Cable sizes...

Distance less than 1.1 m (3.5 ft), 8 AWG (3.264 mm)
Distance less than 1.7 m (5.5 ft), 6 AWG (4.115 mm)
Distance less than 2.6 m (8.5 ft), 4 AWG (5.189 mm)
Distance less than 4.1 m (13.5 ft), 2 AWG (6.543 mm)

Figure 7-4. Battery connection for 4999 Battery Backup Unit

Chapter 8. User-equipment wiring

Series/1 offers a variety of options for connecting (or attaching) user or other IBM equipment—depending upon the type of equipment and its use. Users can choose from several available attachment features designed for attaching their equipment to Series/1.

The purposes of this chapter are:

- Explain how user equipment is physically connected to Series/1.
- Guide you in selecting and installing the necessary wiring from your equipment to Series/1.

Your job is to **install or coordinate the installation** of the wiring for your equipment before your Series/1 arrives.[3] You will also make the connections to your Series/1 after it has been installed and checked out by the IBM customer service representative.

User-attachment features are optional **circuit cards** and **cables.** These cards are located in the Series/1 processor, I/O expansion unit, 4965, or sensor I/O unit—depending upon the type of card and the particular Series/1 configuration ordered.

Your equipment is wired directly to the circuit cards or to an optional **customer access panel.** When estimating the cable length required to connect from an IBM feature in a machine type installed in a Series/1 enclosure to any external device allow 2–2.5 m (6–8 ft) for a 4997-2 and 1.5–2.0 m (4–6 ft) for a 4997-1 for cable routing through the enclosure.

Figure 8-1 is an **overview** of the various user-attachment features and their location in the Series/1 units.

It is beyond the scope of this manual to discuss all the types of user equipment that can be attached to the Series/1. Someone in your company has already determined what equipment you will be attaching to your Series/1 and has ordered the necessary Series/1 features.

IBM can provide assistance through the Special Product Engineering Services Department (Boca Raton, Florida).

1 **Attachment-feature circuit cards located in processor or I/O expansion unit...**

- Timer feature
  - Two 16-bit timers per feature card
  - User connections to card or to customer access panel
  - User-supplied wiring
- Integrated digital input/output, nonisolated
  - 32 points of digital input/process interrupt and 32 points of digital output per feature card
  - User connections to card or to customer access panel
  - User-supplied wiring
- Teletypewriter adapter
  - For attaching start-stop I/O devices
  - Full-duplex; speeds up to 9,600 bps
  - User connections to card or to customer access panel
  - Optional device cables available
- Direct program control adapter
  - For attaching up to 16 user devices
  - User connections to card or to customer access panel
  - User-supplied wiring
- Sensor I/O unit attachment
- Printer Attachment - 5200 Series
  - Attachment feature cable
  - Two ports attach up to eight 5200 Series printers
- Multidrop Workstation attachment feature
  - Attachment feature cable
  - Four ports attach up to eight 4980 display stations
- 5250 Information Display System attachment feature
  - Attachment feature cable
  - Four 5250 station attachment ports
  - Up to eight 5250 stations can be attached
- IEEE 488 General Purpose Interface Bus (GPIB) attachment feature

2 **Attachment-feature circuit cards located in 4982 Sensor Input/Output Unit...**

- Available feature cards are
  - Analog input control (one card per unit)
  - Amplifier multirange (one card per unit)
  - Multiplexer/reed relay (eight channels analog input per card)
  - Multiplexer/solid state (sixteen channels analog input per card)
  - Analog output (two points per card)
  - Digital input/process interrupt, non-isolated (sixteen points per card)
  - Digital input/process interrupt, isolated (sixteen points per card)
  - Digital output (16 points per card)
- User connections to feature cards
- User-supplied wiring

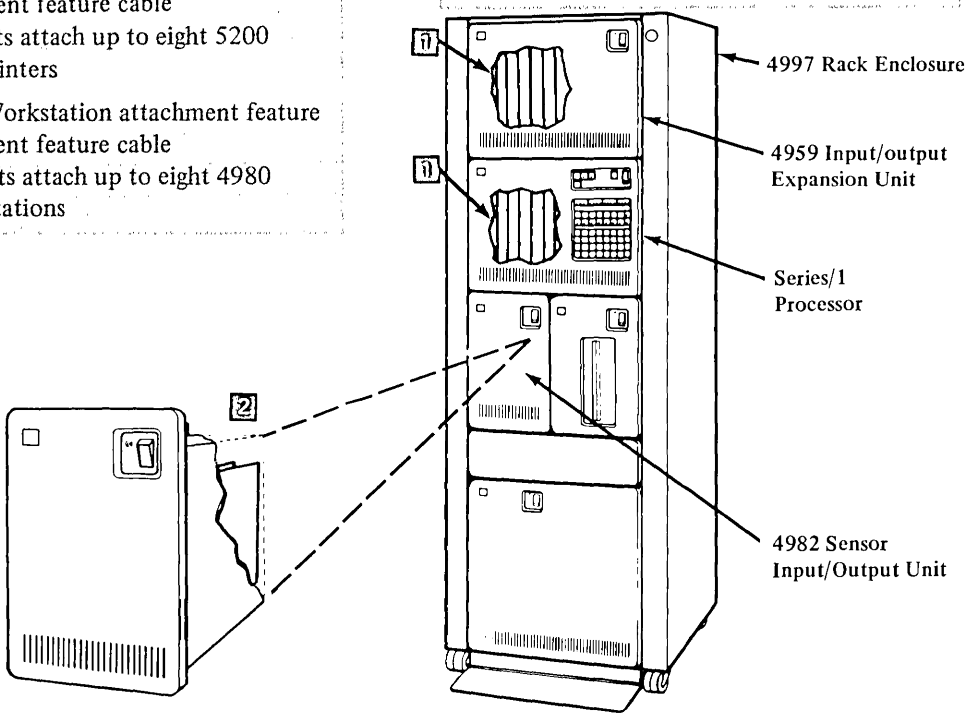


Figure 8-1. User-attachment features

Planning and installing user-equipment wiring

Attaching user equipment to a computer requires electronic know-how. Unless you have an instrumentation expert in your company, we recommend that you get qualified outside help with connecting your equipment to Series/1.

In any case, certain planning and installation guidelines should be followed. These guidelines are covered in the following pages.

What's coming

In Chapter 2, you filled out a product summary worksheet for Series/1 machines on order. You should do the same job for Series/1 user-attachment features on order.

First, make copies of the **user-attachment-features summary worksheet** (Figure 8-8).

Next, find out the specific user-attachment features on order. Refer to your company's copy of the **Series/1 purchase agreement**.

Then, check the types and enter the quantities of feature cards and cables on the summary worksheet. This worksheet will be your record of user-attachment features for use in your planning and coordinating tasks.

Be sure to review the **scheduling recommendations** in Chapter 1 of this manual to help you plan for a timely installation.

Preparing an installation plan

To properly coordinate the wiring of your equipment to Series/1, you should have an installation plan for your equipment. Someone in your company may have made such a plan when Series/1 was ordered. If not, we recommend that you prepare one to help you with your planning and coordinating tasks.

Suggested **items to include** in your installation plan are as follows:

- Location and type of equipment.
- Location of Series/1.
- Specific Series/1 features that your equipment will connect to.
- Type of feature connection (direct-to-card, customer access panel).
- Cables/connectors supplied with Series/1 features.
- Connectors ordered as accessories.
- Cables/connectors that you will supply.
- Feature addresses, feature card location, and signal connections. (Get these from your programmer or systems engineer. You need these for the specific connections to a feature card for a specific device.)
- Wiring schematics or diagrams for your equipment.
- Building layout drawings. (You need these for planning cable routing and determining cable lengths.)

Outdoor cabling restrictions

Outdoor local interconnections are prohibited unless specifically allowed to do so, as indicated in the feature description section (user equipment wiring-section 8) of this manual. Such interconnections require the use of primary surge protectors at building entrances and exits. Refer to "Outdoor Cabling" (Site Safety - Section 4) and "Lightning Protection" (User-equipment wiring - Section 8).

Attachment features

As part of your installation plan, record the **specific information** needed to connect each of your devices to the appropriate Series/1 feature. Make copies of the **user-attachment-features planning worksheet** (Figure 8-5).

Record the information for your equipment as shown in the **sample worksheet** in Figure 8-2. You can then use your worksheet for the **actual connections** of your wiring to Series/1 after it has been installed and checked out by the IBM customer service representative. It will also be a valuable reference for changes and trouble-shooting later on.

User-attachment-features planning worksheet

User-device name and number	User-device location	Sensor type	Voltage range	Cable no.	Pair no.	Series/1 feature type	Feature address	Feature-card location	Signal connection
TANK #1	WARE-HOUSE A	LIMIT SWITCH	0-5V	A	1	DI/DO	XX	X	CONN J1, PIN A20
							(Get from programmer or systems engineer.)	(Get from diagrams shipped with computer.)	(Get from programmer or systems engineer.)

Figure 8-2. Sample user-attachment-features planning worksheet

User-attachment-features planning worksheet

User-device name and number	User-device location	Sensor type	Voltage range	Cable no.	Pair no.	Series/1 feature type	Feature address	Feature-card location	Signal connection

Figure 8-3. User-attachment-features planning worksheet

Selecting signal cable

For sensor and other instrumentation connections to Series/1, we strongly recommend that you use **shielded, stranded, twisted-pair cable** with a suitable outer protective covering, **coax cable**, or **twinax cable**—depending on the application. Twisted-pair cable is commercially available with multiple individually shielded twisted pairs, or with one shielded twisted pair. The shield may be either a braided shield or a foil shield with a drain wire (Figure 8-4).

Some **important points** on cable selection and use are as follows:

- Instrumentation cable with a foil shield is best for low-speed digital and all analog signals.
- Coax cable is best for high-speed digital signals.
- Analog and digital signals should not be mixed within the same multiple-pair cable, or within the same group of single-pair cables.
- DI and DO signals should not be mixed within the same cable.
- Outer protective cable covering must be designed for the environment (temperature, humidity, chemical contamination) in which the cable is used.
- All shielded cable must have an insulated outer covering.

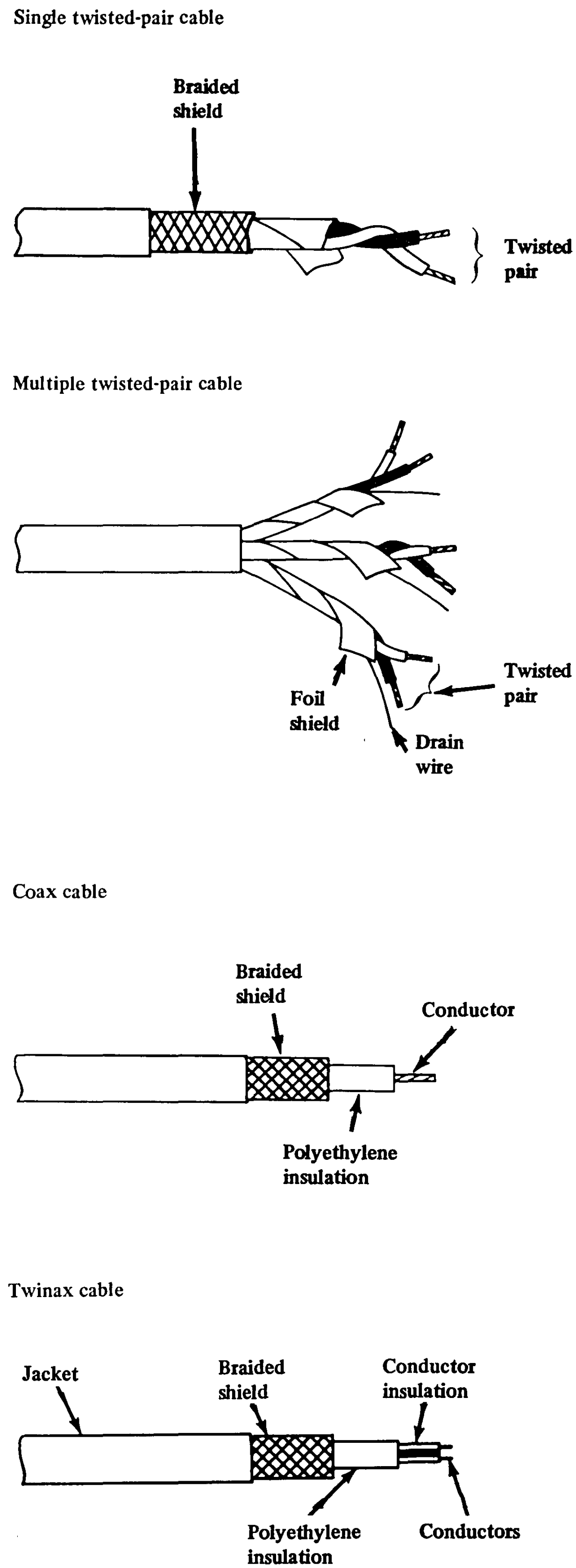


Figure 8-4. Types of signal cable.

Wiring methods

Like cable selection, the way you install your wiring will also affect the success of your installation.

Be sure to comply with all national and local safety standards relating to low-voltage signal wiring (see Chapter 9 for U.S. installations).

Routing Signal Cable

All Series/1 cables available from IBM are jacketed with polyvinyl chloride (PVC), except twinaxial cables, which may be jacketed with Teflon.[4] National Electric Code (NEC) requires that PVC cables routed through air plenums be protected by conduit. Except where prohibited by local codes, Teflon[4] jacketed cables may be run through air plenums without conduit protection.

Be very careful about routing your cables near equipment that can cause electrical interference (noise) in the circuits. Noise, which is an unintended and unwanted electrical signal, can cause your computer to make errors.

Noise is often caused in signal cables that are parallel with other wiring for long distances. Keep signal cables at least 0.3 meters (1 foot) away from any power line or other ac wiring.

Also, keep your signal cables as short as possible. The longer the cable, the greater the chance of noise and signal weakening. Where multiple signal cables connect your equipment to the computer, use the same general route for all the cables.

Many kinds of equipment can cause noise on signal cables if you route your cables too close to them. Some of the common **noise-causers** are as follows:

- Fluorescent, neon, and incandescent lighting fixtures
- Power-distribution wiring, transformers, generators, and alternators
- Motors that drive machinery, such as air conditioners, elevators, escalators, large blowers, and machine tools
- Radio and television transmitters, including citizens-band and public-service equipment
- Signal generators, intercommunication systems, and security systems
- Arc welders, electro-discharge machining equipment, and related equipment
- Radar transmitting equipment
- R.F. induction heaters
- Radio therapy equipment
- Ultrasonic cleaning equipment
- Electromagnetic equipment, such as degaussers and magnetic chucks

Teflon is a registered trademark of DuPont.

- Control equipment (relays, contactors) for machinery and other switching devices that carry or switch relatively large currents.

Signal Conditioning

The use of signal conditioning circuits or techniques may be necessary to obtain satisfactory performance (lack of noise) from your signal cable circuits.

Because of the complexity of signal conditioning techniques, you may need to consult an electrical engineer on how to install "noise conditioners" on your signal wiring circuits.

Grounding Signal Wiring

Proper grounding of your signal wiring will reduce noise as well as make your installation safe. Some **special reminders** on grounding signal wiring are as follows:

- Be sure shielded cables have an insulated outer covering or jacket.
- For cables that run between buildings, ground the shields at the junction boxes where the cable enters and leaves the buildings. Be sure not to break the continuity of the shield at the grounding points.
- If there are unused twisted pairs in a cable, connect them together at one end and ground them at the other end of the cable (at the same point that you ground the shield or drain wire).
- User-equipment ac and dc grounds should have only one common point within a system.
- Ground all cable body shields at the point they enter a Series/1 enclosure. The point of grounding varies for individual features.
- When connecting directly to feature cards located in the processor, 4965, or I/O expansion unit, ground the cable shields to the frame of the 4997 enclosure using grounding cable clamps.

- When connecting directly to feature cards located in the processor, 4965, or I/O expansion unit, ground the cable shields to the frame of the 4997 enclosure using grounding cable clamps.
- When connecting to the customer access panel, ground the cable body shield to the access panel using the threaded screw holes provided, as shown in Figures 8-37 and 8-44.
- When connecting to the 4982 sensor I/O features, ground individual conductor shields to the card connector. Body shields should be grounded to the frame of the Series/1 enclosure at point of entry using grounding cable clamps.

- If grounding cable shields at the Series/1 end does not eliminate noise, try grounding the shields at both ends of the cable. If noise persists, try grounding the shields at the remote end only.
- Do not use building framework, conduits, or sprinkler systems for dc grounding. Service-entrance ground, a cold-water main (with continuous metal to ground), a special grounding bus, or an approved grounding rod is acceptable (see Figure 7-2).

Lightning protection of communication circuits

Lightning or other sources can cause high surges of electrical energy in signal circuits. While it is not possible to prevent all surge related lightning problems, proper grounding and bonding of equipment and the use of surge suppression devices will reduce the effects of surges.

A sample shunt-type protector shown in Figure 8-5 allows normal current flow in the signal circuit, but shunts (or shorts) surge current to ground.

Refer to applicable national and local safety standards for lightning-protector requirements (see Chapter 9 for U.S. installations).

Note: Circuitry to be protected and protect devices can be mutually incompatible. Therefore, indiscriminate use of protectors is not recommended.

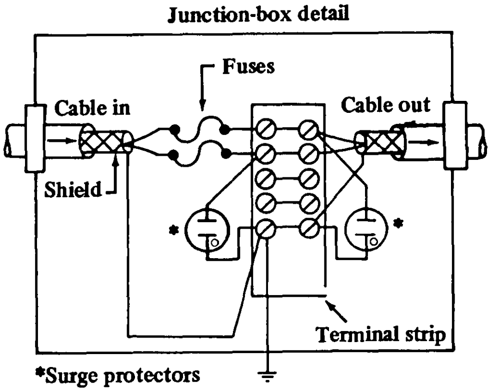


Figure 8-5. Sample shunt-type lightning protector

Checking signal wiring

You can save yourself some time and trouble by thoroughly checking your signal wiring before your computer arrives. The following are some of the things you should check:

- Polarity of twisted pairs. Check to see that wires are not crossed where polarity must be maintained.
- Open circuits in individual wires or shields.
- Short circuits between wires of the same or other pairs.
- Ground on individual wires. Check for shorts between wires and shield, between wires and grounded equipment, or between a shield and unintended grounds.
- High wire resistance. Check the resistance of twisted pairs against the specifications for the particular size and type of wire.

Updating your installation plan

Earlier in this chapter (see "Preparing an installation plan"), you were advised to plan the installation of your wiring in as much detail as possible. There are some **important details** that you might not be able to record in your plan until you actually install your wiring. In any case, you need to record the items listed here as a reference for later changes and trouble-shooting.

Review your installation plan and update it where necessary for the following items:

- Types of cables used.
- Cable lengths between your equipment and Series/1.
- Color code and labeling of wires.
- Types and locations of junction boxes.
- Location of splices.
- Locations where cables enter or leave interior walls, ceilings, floors, or exterior walls.
- Types and locations of lightning protectors.
- Locations of outside cable routes.
- Spare cable parts.
- Polarity of wire connections.
- Locations of grounding points.
- Types and locations of other equipment that could cause noise on your signal cables.

Connecting to Series/1

After your Series/1 arrives and has been checked out by the IBM customer service representative, connect your wiring to the user-attachment features.

To make your connections, you need to refer to the following items:

- Your installation plan.
- The section in this chapter that shows the physical connections for your features (see Figures 8-27 through 8-70).
- The installation instructions and diagrams shipped with Series/1. The installation instructions give you detailed information on cable routing inside the rack enclosure.

Safety considerations

Equally important with an installation that works well is an installation that is safe for people and equipment. Be sure to review your company's safety procedures as well as Chapter 4 of this manual. Some **special reminders** on safe connection of your equipment to Series/1 are:

- Be sure that your wiring complies with national and local safety standards. In particular, hazardous areas require additional precautions. (See Chapter 9 for U.S. installations.)
- Grounding continuity is **vital** to sensor input/output equipment connected to Series/1. Where remote sensors or power supplies are grounded to Series/1, disconnect all sensor wiring **before** disconnecting the Series/1 power cord. Otherwise you can cause **serious damage** to your equipment as well as create a **SHOCK HAZARD.**
- **Before** switching Series/1 power off, be sure that equipment controlled by Series/1 is ready for powering off. Otherwise, you can cause **serious damage** to your equipment.

Class 2 circuits

The following Series/1 features, when installed in an IBM 4952, 4954, 4955, 4956, 4959, 4965, 4982, or 4987 machine type, provide an interface which is within the limited power source requirements of class 2 circuits (remote-control, signalling, and power-limited circuits) as specified in Article 725C of the National Electrical Code (NFPA no. 70).

Feature Name/Description

1310 Multifunction attachment
1400 Local Communication Controller
1560 Integrated Digital Input/Output Non-isolated
1610 Asynchronous Communications Single-Line control
2074 Binary Synchronous Communication Single-Line Control
2075 Binary Synchronous Communications Single-Line Control/High Speed
2080 SDLC/HDLC Single-Line Control (X.21)
2090 SDLC Single-Line Control
2092 Asynchronous Communications 4-Line Adapter
2094 Binary Synchronous Communications 4-Line Adapter
2096 Feature Programmable 4-Line Communication Adapter
3535 Digital Output Nonisolated
4730 Half-Duplex DCE Attach
4734 TTY Current Attachment
4736 Data-Phone, Digital Service Adapter
4739 Asynchronous Local Attach
4740 Synchronous Local Attach
4743 Auto Call Attachment
4731 Full-Duplex DCE Attachment
4746 1200 bps Integrated Modem Async SN
4747 1200 bps Integrated Modem Async LL-SNBU
4748 1200 bps Integrated Modem Async LL
4751 1200 bps Integrated Modem w/Clock SN
4752 1200 bps Integrated Modem w/Clock LL-SNBU
4753 1200 bps Integrated Modem w/Clock LL
5430 Customer Direct Program Control Adapter
7840 Timers
7850 Teletypewriter Adapter
D02118 GPIB Adapter (IEEE 488)
D02350 RS-422 Communications 8-Line Adapter

Basic information

User applications

Sensor I/O

One of the options available for controlling user equipment is the 4982 Sensor Input/Output Unit (refer to the 4982 Description Manual for signal interface specifications).

The 4982 is used with Series/1 to monitor and control user processes (Figure 8-6). Sensors installed in equipment send digital or analog input signals to the computer. The input signals represent the status of the activity being monitored, and the computer translates the signals into meaningful data. The computer can be programmed to accept the input signals on a priority basis, measure and/or record the data, check the data against predetermined standards, and return output signals to the attached equipment.

Sensor I/O can be used in many ways. For example, it can be used to monitor large numbers of manufacturing machines, to control one or more continuous or batch processes, or to monitor one or more sensor-based inputs from a test instrument. Input signals to the computer can come from analog transducers or from digital sources, such as contact closures.

Computer output, both analog and digital, can be used to control many kinds of displays, recorders, and control mechanisms.

Designed for flexibility, Series/1 with sensor I/O can handle a variety of applications, such as:

- Data acquisition
- Process control
- Plant automation
- Laboratory automation

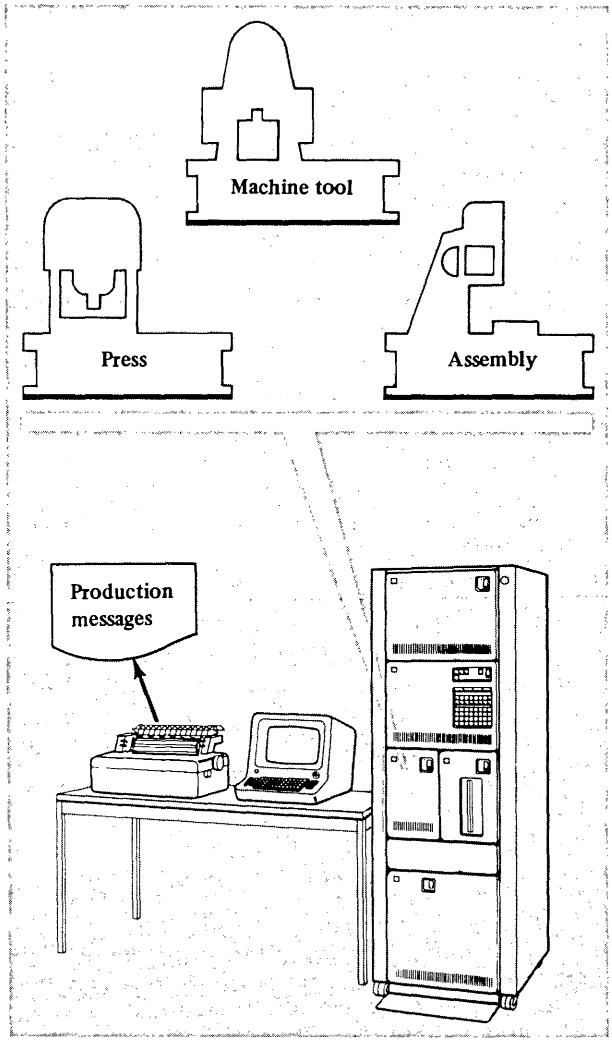


Figure 8-6. Sample plant-automation application

Integrated Digital Input/Output

Another option available for controlling user equipment is the integrated digital input/output (DI/DO) feature.

A simple example of an application of this feature is the controlling of air conditioning equipment (Figure 8-7).

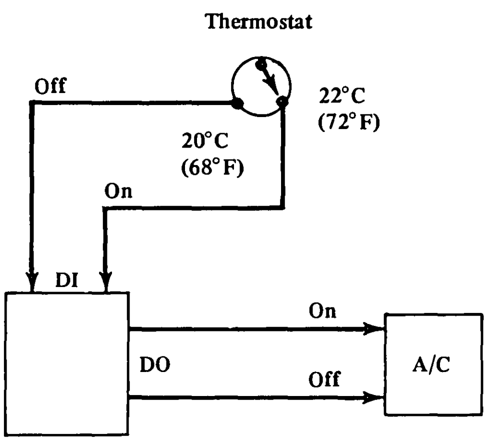


Figure 8-7. Sample energy-conservation application

In this example, when the thermostat senses 22°C (72°F), the wire connected to the Series/1 says "switch on the air conditioning." And when the thermostat senses 20°C (68°F), the wire to Series/1 says "switch off the air conditioning." The wires from the thermostat to Series/1 are the digital input (DI).

The set of wires from Series/1 to the air conditioner tells the air conditioner to switch on or switch off. These wires are the digital output (DO).

The computer uses the information received from the thermostat to control the air conditioner according to the instructions the user has given to the computer in its program. Controlling the air conditioner may be part of an overall energy-conservation plan.

In a similar way, other user devices, such as counters, gauges, and switches, can be monitored. The associated user equipment can be controlled by Series/1 with the integrated DI/DO or sensor I/O features.

Other applications

Other features available for attaching user equipment to Series/1 are as follows:

- Timer feature
- Teletypewriter adapter
- Direct program control adapter
- GPIB adapter.

These features allow the user to attach various kinds of equipment—such as data processing input/output devices, data-acquisition systems, other computers, test instruments, and other custom devices.

Terminology

Some of the common **terms** associated with the user-attachment features are as follows:

Digital in (DI). Can be one of two types of signal input to the computer—voltage sense or contact sense. Voltage sense has two states, on and off. The most common voltage levels sensed are 0 volts and 5 volts dc. Contact sense refers to sensing the opening or closing of an external set of contacts, with the voltage for the circuit provided by the computer.

Digital out (DO). DO is a similar signal to DI voltage sense, except DO is an output from the computer to an external device to control something.

Analog in (AI). An input signal to the computer from some external control device. This type of signal is much more critical than a digital signal because every change in voltage (no matter how small) means something. An analog signal should be as free as possible from interference or noise. The computer may continuously sample the voltage value of the signal to make decisions.

Analog out (AO). The same type of signal as AI, except AO is an output signal from the computer used to control some external device.

Process interrupt (PI). An input signal that alerts the computer to stop what it is doing as soon as possible and do something with the digital input that is waiting to be read by the computer.

Sensor. A device or instrument that senses an action or value in a user process, such as closing a switch or sensing degrees from a thermometer. Sensors also convert such actions or values into a voltage output that is usable by the computer.

GPIB. The term "General Purpose Interface Bus" (GPIB) is commonly used to identify the Institute of Electrical and Electronics Engineers Standard 488 as approved in 1975 (IEEE 488-1975). This interface standard was established to facilitate the interconnection of programmable instrumentation and other system components. Refer to Figure 8-47 for user connection directly to the GPIB feature card.

Series/1 user-attachment features

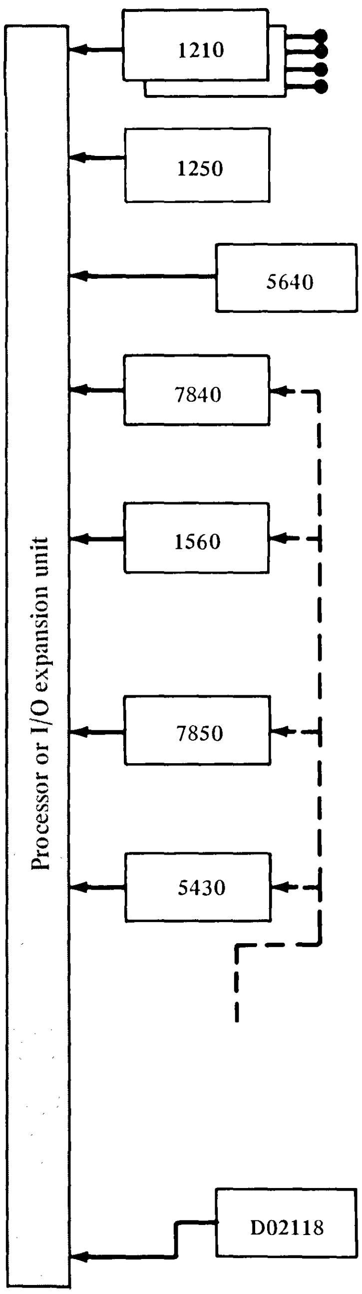
Features summary

You will need to refer to this figure later in this chapter when you count your user-attachment features.

Figure 8-8 summarizes user-attachment feature cards and cables.

User-attachment-features summary worksheet (part 1)

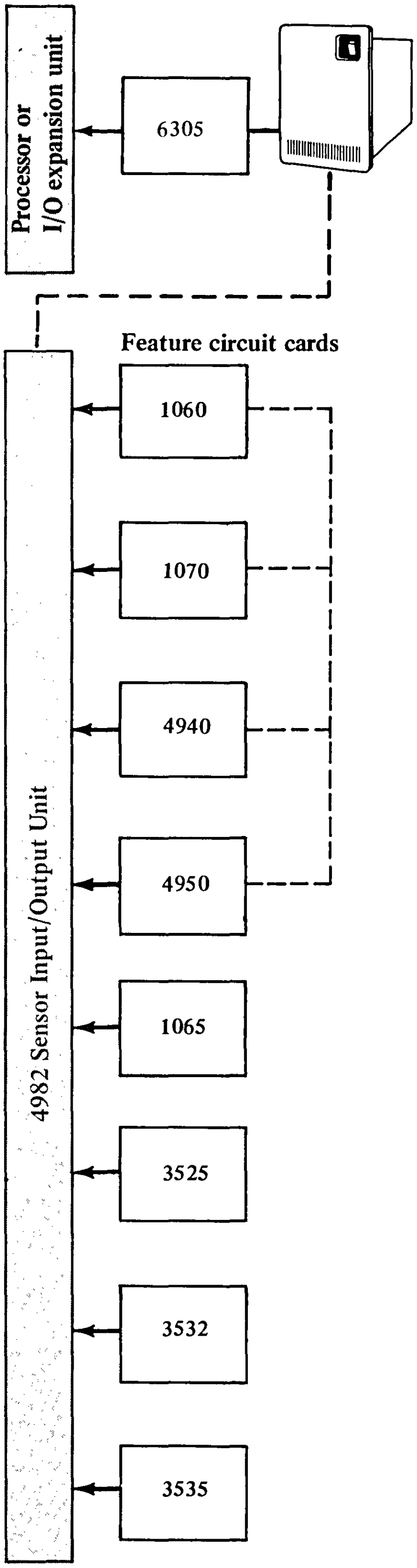
Feature circuit cards



Feature number	Feature description	Features ordered ☑	Quantity ordered
1210	5250 Information Display Station attachment	☐	
5760	5250 Attachment cable	☐	
1250	Multidrop Workstation attachment	☐	
5780	Cable feature for the 1250 attachment	☐	
5640	Printer attachment-5200 series	☐	
5780	Cable feature for the 5640 attachment (maximum 4)	☐	
7840	Timer (Two per card; five clock rates, external gate)	☐	
1560	Integrated digital input/output, non-isolated (there are two groups of 16 DI/PI points and two groups of 16 DO points; there is one 'ready' and one 'external sync' line for each group)	☐	
1593	Integrated DI/DO cable for customer access panel (internal)	☐	
7850	Teletypewriter adapter	☐	
2055	Teletypewriter cable (external)	☐	
2059	Teletypewriter cable for customer access panel (external)	☐	
2064	Teletypewriter cable EIA male	☐	
2065	Teletypewriter cable EIA female	☐	
2066	3101 current loop cable	☐	
5430	Customer direct program control adapter	☐	
1594	DPC adapter cable for customer access panel (internal)	☐	
1590	Customer access panel (Optional rack panel with quick-disconnect connections. Includes internal cables for one 7840 and one 7850. Internal cables for 1560 and 5430 are separate features. Panel provides for connecting up to four 1560 or 5430 features, one 7840, and one 7850.)	☐	
DO2118	General Purpose Interface Bus Adapter	☐	
DO2119	GPIB Adapter Cable	☐	

Figure 8-8 (Part 1). User-attachment-features summary worksheet

User-attachment-features summary worksheet (part 2)



Unit or feature number	Unit or feature description	Units and features ordered ☑	Quantity ordered
4982-1	Sensor I/O unit (Capacity for up to eight sensor I/O cards)	☐	______
6305	4982 sensor I/O unit attachment	☐	______
1060	Analog input control (Required for 1070, 4940, and 4950; one per sensor I/O unit)	☐	______
1070	Amplifier multirange (One per sensor I/O unit)	☐	______
4940	Multiplexer/reed relay (Eight channels analog input per card)	☐	______
4950	Multiplexer/solid state (16 channels analog input per card)	☐	______
1065	Analog output (Two points per card)	☐	______
3525	Digital input/process interrupt, non-isolated (16 points per card)	☐	______
3532	Digital input/process interrupt, isolated (16 points per card)	☐	______
3535	Digital output, non-isolated (16 points per card)	☐	______

Figure 8-9 (Part 2). User-attachment-features summary worksheet

Cable features and connecting options

Cable features are available from IBM for connecting to several of the user-attachment features. These cables and their uses are shown in Figures 8-10 through 8-25.

In most cases, you will supply wiring (cables and connectors) from your equipment to the user-attachment features. The feature descriptions in this chapter indicate where user-supplied cables and connectors are required. (Also see "Selecting signal cable" in this chapter and "Feature-Connector Summary" in Chapter 9.)

Figure 8-26 shows three **optional methods** of connecting user equipment to Series/1 features. The **actual method** that you will use depends upon your application and the specific features your company has ordered.

While several connecting options can be used with some features, only one specific method can be used for the other features. The connecting options for each feature are described in detail in this chapter.

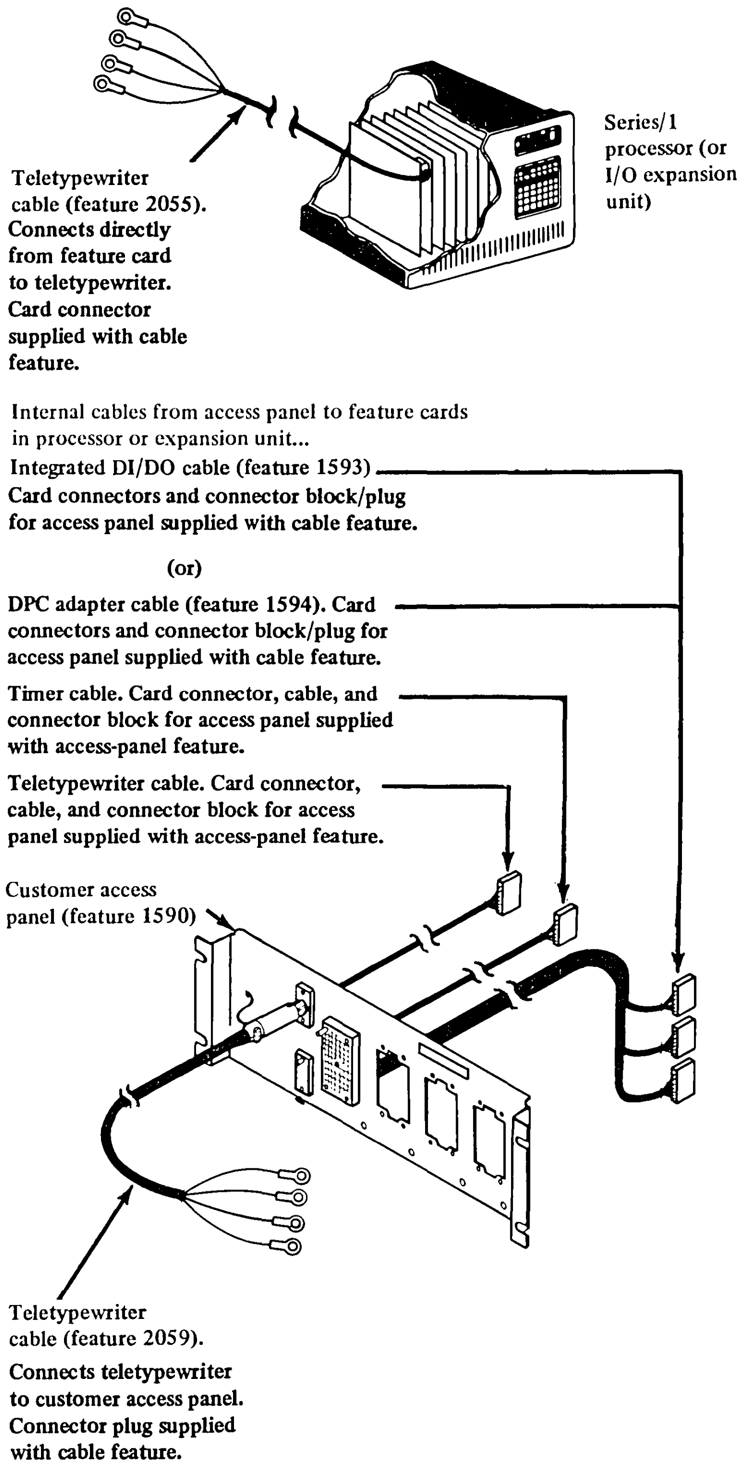
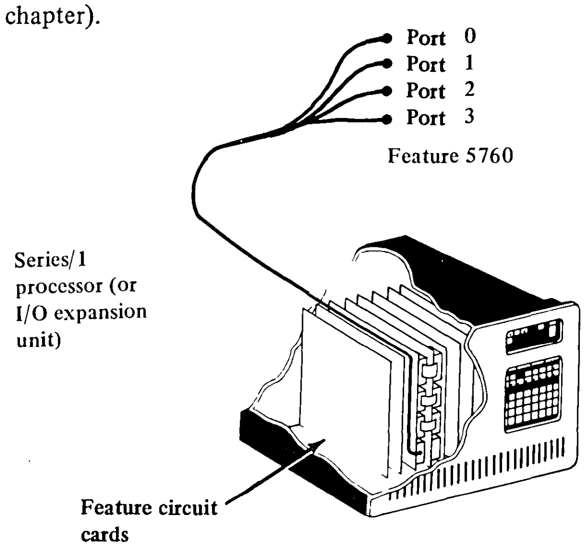
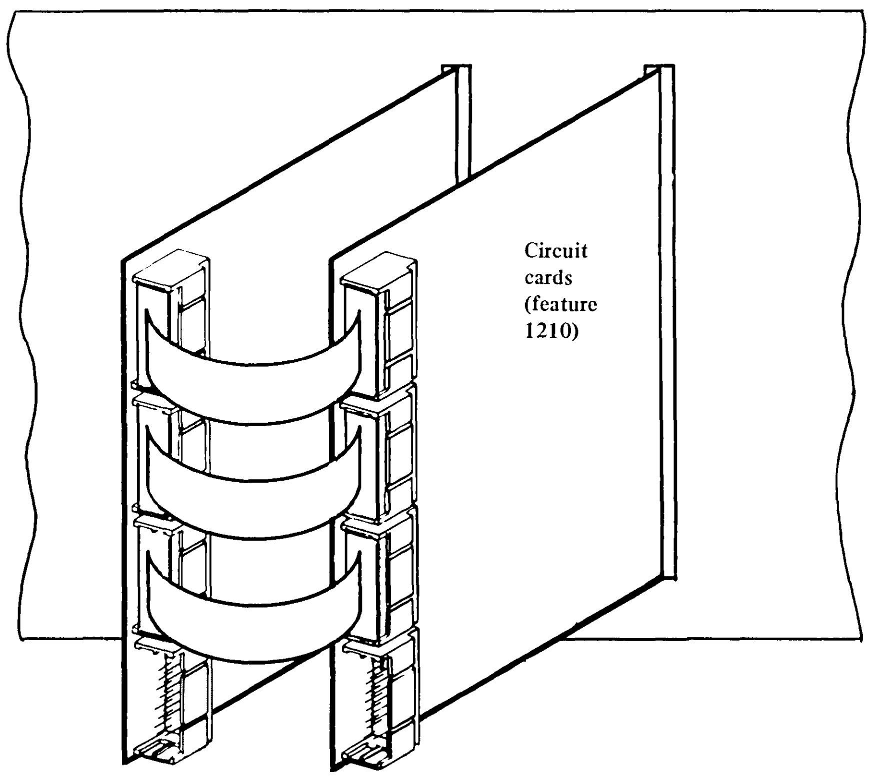


Figure 8-10. User-attachment cable features

5250 Information Display System attachment

- ▶ Two attachment circuit cards per feature.
- ▶ Four 5250 station attachment ports.
- ▶ A twinaxial cable of up to 1524 m (5000 ft) is used to attach:
  - – 5251 Display Station (Models 1 and 11)
  - – 5252 Dual Display Station (Model 1)
  - – 5256 Printer (Models 1, 2, 3)
- ▶ A maximum of seven 5250 stations, in any combination, may be attached to a single port of the 5250 attachment.
- ▶ Each 5250 attachment feature allows up to eight 5250 stations.
- ▶ 5250 attachment cable (feature 5760).
- ▶ Detailed information about coax cable and connectors is contained in the *Installation and Assembly of Coax Cable and Accessories for Attachment to IBM Products,* GA27-2805.
- ▶ Detailed information about the 5250 units is contained in the *IBM 5250 Information Display System Planning and Site Preparation Guide,* GA21-9337.
- ▶ Twinaxial cable is supported for outdoor installation (see Outdoor Cable Installation in this chapter).





☐ Cable connection from card to connector (see Figure 8-12)

Figure 8-11. 5250 Information Display System attachment feature

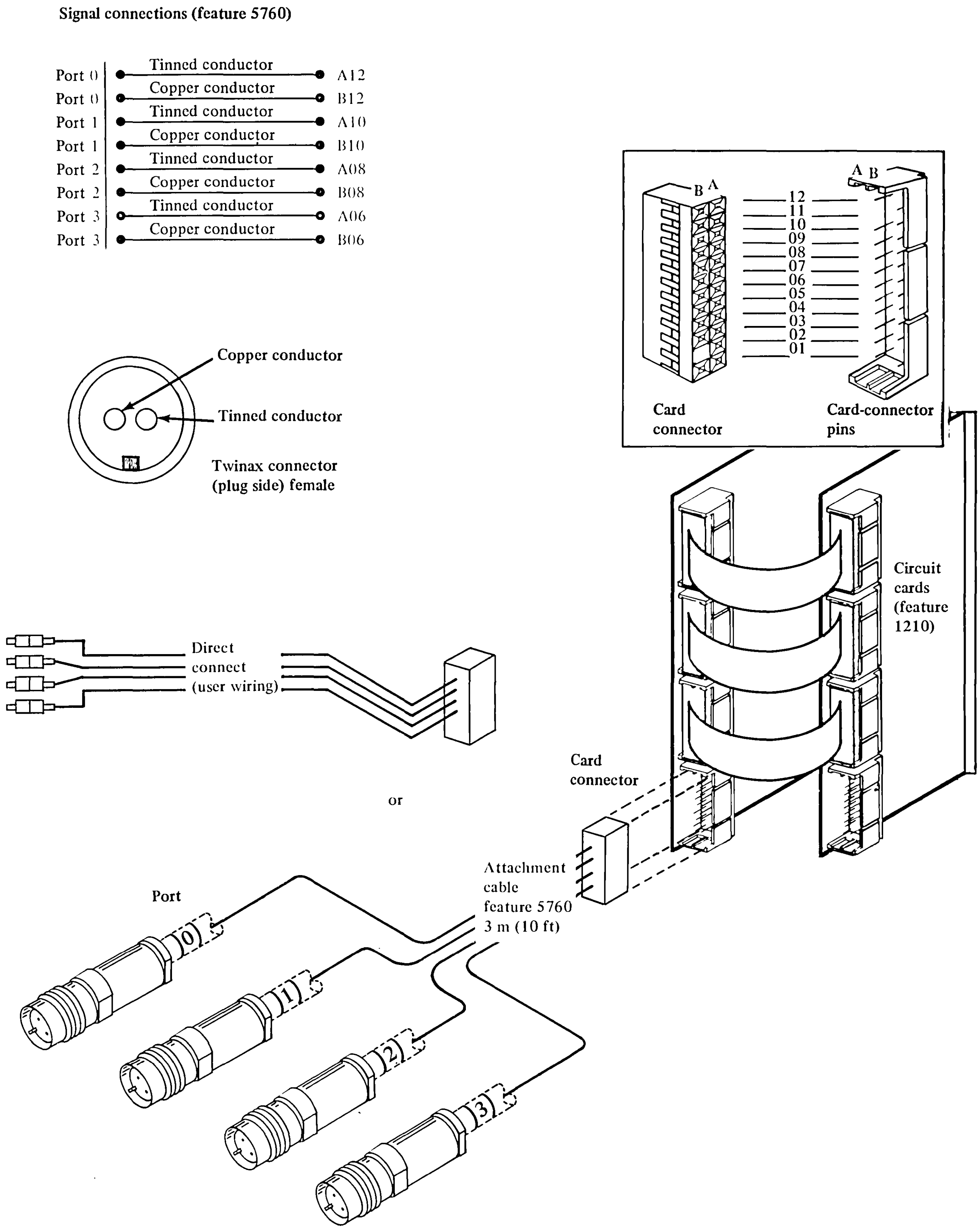


Figure 8-12. Cable and signal connections for 5250 attachment

Cable routing for feature 5760 or for direct connect

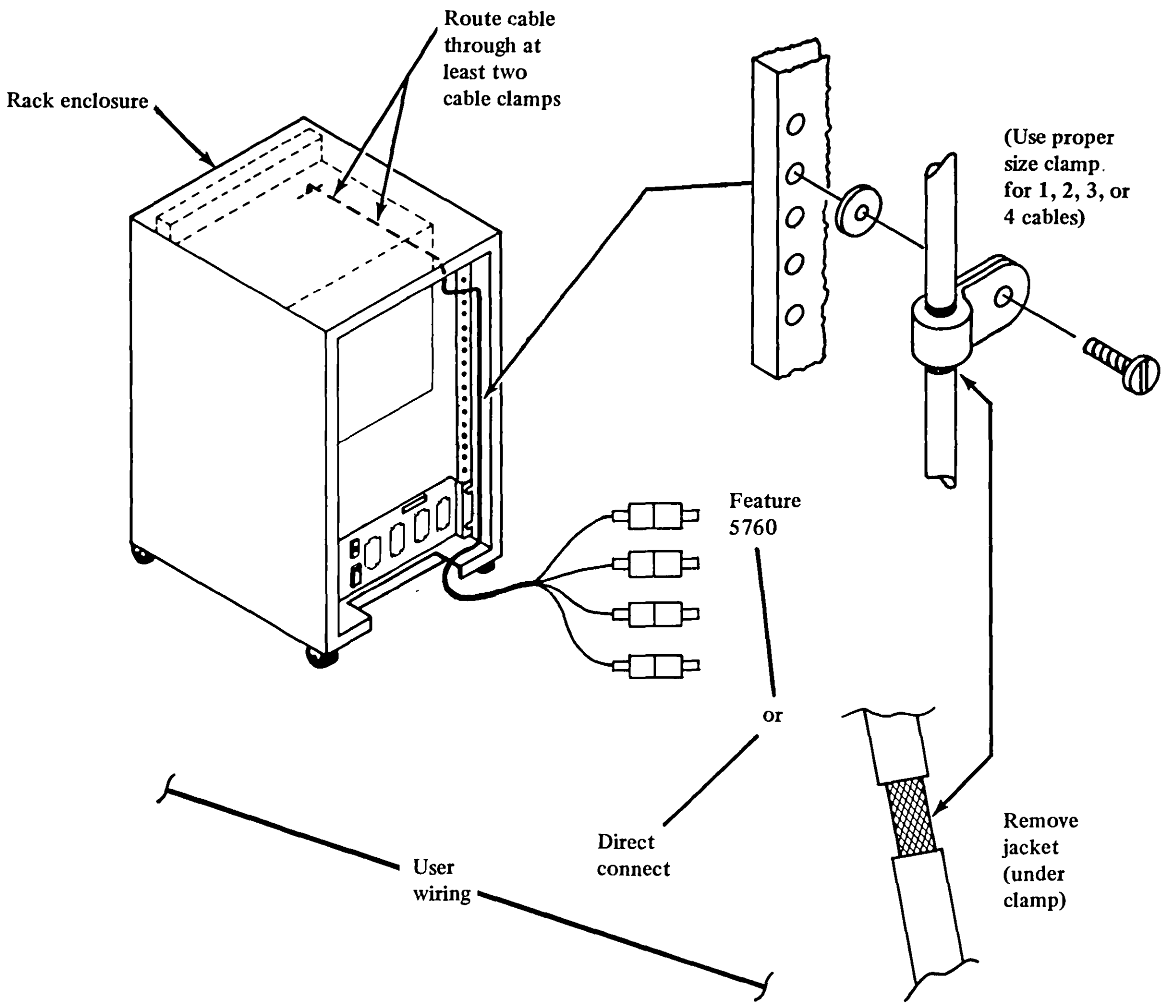


Figure 8-13. Cable routing for feature 5760 or direct connect

Feature 5760 and direct connect attachment

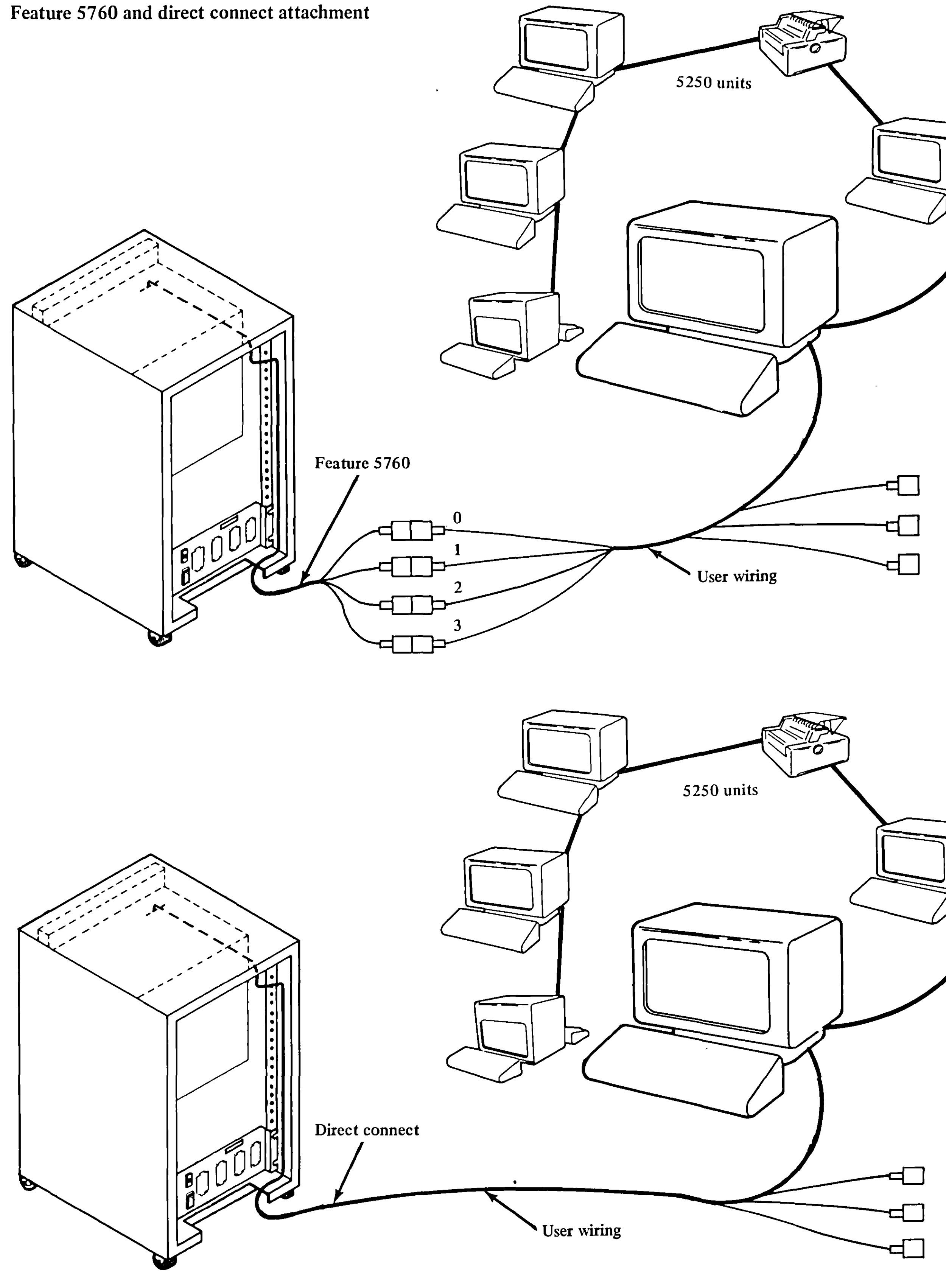
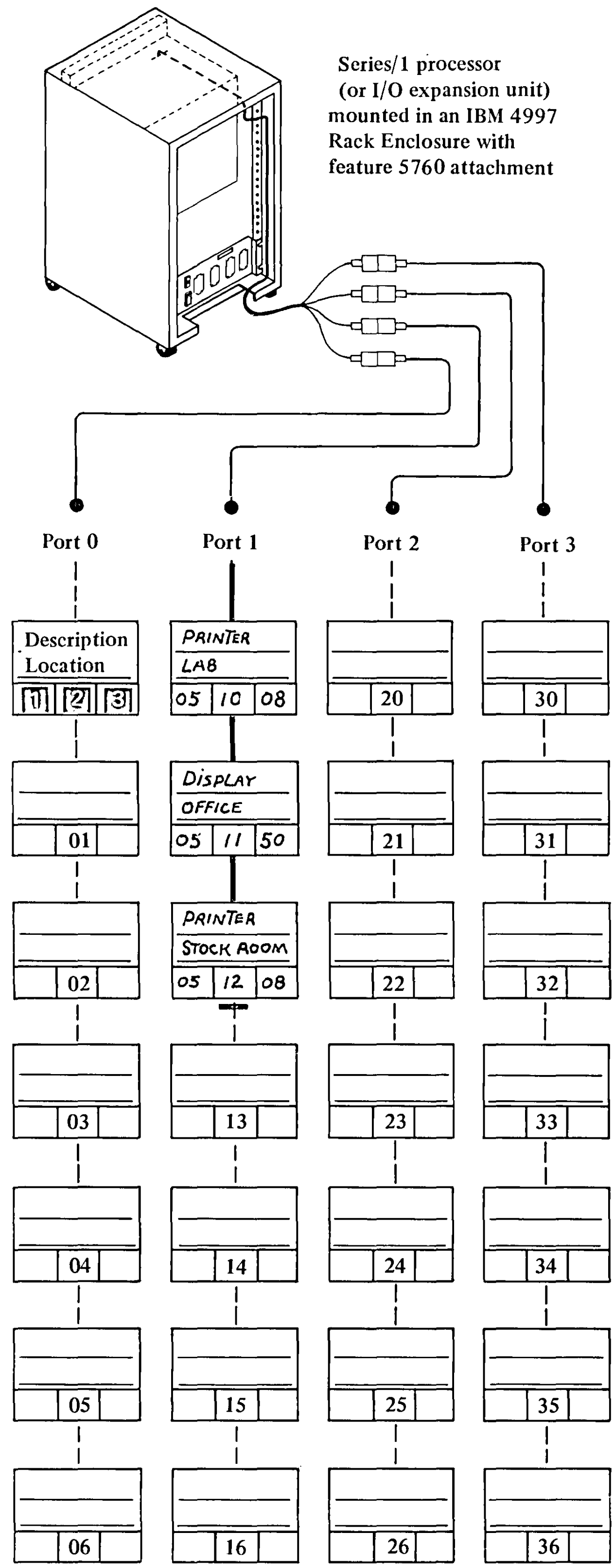


Figure 8-14. Feature 5760 and direct connect attachment

5250 Information Display System attachment planning worksheet

- ▶ Use a separate worksheet for each 1210 feature installed.
- ▶ Fill in the addresses for each unit installed.
- ▶ Complete the network blocks with description and address information.
- ▶ Connect the network blocks below each port used with lines to indicate your 5250 network.

Unit	Device address	Station address	Station data
1	05	__ 0	0 8
2	05	__ 1	5 0
3	05	__ 2	0 8
4	05	__ 3	__ __
5	05	__ 4	__ __
6	05	__ 5	__ __
7	05	__ 6	__ __
8	05	__ 7	__ __
	1	2	3



1 *Device address*

A jumper has been pre-installed on the feature card for address 05. (This address can be changed.)

2 *Station address*

This is the Series/1 port-number and station address.

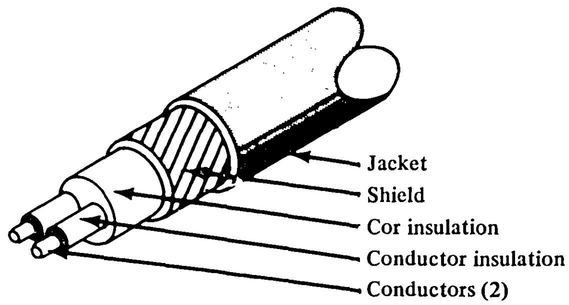
3 *Station data*

08 = Matrix printer
40 = 960 character display station
50 = 960 character display station with magnetic stripe reader
80 = 1920 character display station
90 = 1920 character display station with magnetic stripe reader

Figure 8-15. Sample 5250 Information Display System attachment planning worksheet

Twinaxial Cable Assembly

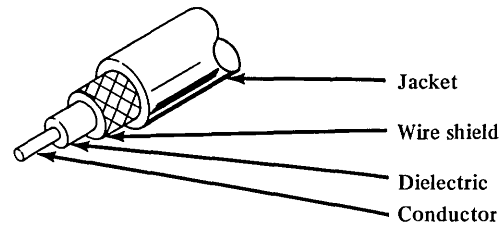
Twinaxial cabling is recommended for use in attaching display stations and printers to the 5251 Model 2 or 12 Display Station or to a host system. Some host system connections must be made with twinaxial cable to ensure specified performance levels. The following are bulk cable specifications for twinaxial cable:

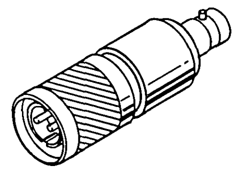


Conductor	AWG wire size	20
	Stranding	7 x 28
	Material	Copper
	Coating	Tin (1 conductor only)
	Resistance	11 ohms maximum per 305 meters (1000 feet)
Insulation	Material	Polyethylene
	Outside diameter	6.1 millimeters (0.24 inch) nominal
Shield	Material	Tinned copper
	Type	Braid, 34 AWG, 7 ends/24 carriers, 9.7 ± 10% picks/inch
	Coverage	95% minimum
	Resistance	3 ohms maximum per 305 meters (1000 feet)
Jacket	Material	Vinyl
	Color	Black
	Average single wall thickness	0.76 millimeter (0.029 inch)
	Outside diameter	8.25 millimeters (0.325 inch) nominal
Rating	Dielectric strength	4500 Vdc for 3 seconds at 28°C (82°F)
Capacitance		16.2 pF/foot maximum
Impedance, characteristic		111 ± 5% ohms at 0.5 MHz 107 ± 5% ohms at 1 MHz 105 ± 5% ohms at 2 MHz and above
Attenuation @ 100 MHz		4.5 dB/30.5 meters (100 feet) maximum at 25°C (77°F) 4.7 dB/30.5 meters (100 feet) maximum at 80°C (176°F)
Velocity of propagation		66% ± 5%
Operating environment		–40°C to 80°C (–40°F to 176°F) 10% to 90% relative humidity

Coaxial Cable Assembly

To accommodate users of previously installed coaxial networks, the twinaxial-coaxial adapter allows connection of twinaxial stations and systems to coaxial cable. (The adapter does not allow attachment of twinaxial cable to coaxial stations or systems.) The adapter must be used at each twinaxial-coaxial attachment point. Some systems do not permit attachment to coaxial cable. If you have an existing coaxial network, check with your IBM installation representative to see if the system you plan to install can be used with coaxial cable. The following are bulk cable specifications for coaxial cable:





Twinaxial-coaxial adapter (IBM part 7363102, Amphenol part 82-5628, or equivalent)

		Indoor[3]	Outdoor[4]
Conductor	AWG wire size	22	22
	Stranding	Solid	Solid
	Material	Copper covered steel 40% conductivity	Copper covered steel 40% conductivity
Shield	Material	Copper braid	Copper braid
	Type	AWG 34	AWG 34
	Coverage[5]		
Jacket	Material	PVC	PVC[5]
	Average single wall thickness	Noncontaminating 0.79 mm (0.031 inch)	Noncontaminating 1.02 mm (0.040 inch) maximum
Rating	Ambient temperature	60°C maximum	60°C maximum
Capacitance, nominal		14.5 pF/foot	14.5 pF/foot
Impedance, characteristic		93 ± 5 ohms	93 ± 5 ohms
Attenuation @ 400 MHz		8 dB/30.5 meters (100 feet) maximum	8 dB/30.5 meters (100 feet) maximum
Velocity of propagation		80%	80%
DC resistance		44 ohms/30/5 meters (1000 feet) maximum	44 ohms/30/5 meters (1000 feet) maximum

[1] For example, when you attach a 5251 Model 11 Display Station to a 5251 Model 12 Display Station with coaxial cable, you need two twinaxial-coaxial adapters, one at each attachment of cable to a machine.
[2] If your host system supports the use of coaxial cable, plan to connect adapters to your coaxial cable as soon as possible for ease of setup.
[3] Cable commercially designated RG 62A/U, meeting the above specifications, is an approved substitute. Cable OD 6.15 ± 0.18 millimeters (0.242 ± 0.007 inch).
[4] Cable commercially designated RG 62A/U, which is modified for outdoor use (including vapor barrier and thicker cover) and which meets the above specifications, is a suitable substitute.
Cable OD 6.6 ± 0.25 millimeters (0.260 ± 0.10 inch).
[5] Seven ends, 16 carriers, 8.2 ± 10% pick per inch, 90% minimum coverage.
[6] Jacket must meet the minimum requirements for underground feeder and branch circuit cable and must also be weatherproofed and sunlight resistant, per UL Subj. 493.

Async Display attachment

Attachment of 3101, 3161, 3163, and 3164 can be made using IBM cables (see Figure 8-16) or you may provide your own attachment cables (see Figure 8-17). Refer to the IBM sales manual for connectors and tool kits. Generally, IBM does not provide bulk cable.

The Multifunction Attachment feature #1310 provides four serial I/O ports for connection of 3101, 3161, 3163, or 3164 display terminals (refer to Figures 8-63 through 8-64 for cable information). Also see the *3101 Display Terminal Description Manual,* GA18-2033, *IBM 3161/3163 ASCII Display Station Description Manual,* GA18-2310, or *IBM 3164 ASCII Color Dislplay Station Description Manual,* GA18-2317 for physical planning cable information.

Note: The 3101,3161,3163, and 3164 direct attach are not supported for outdoor installation.

IBM Cables

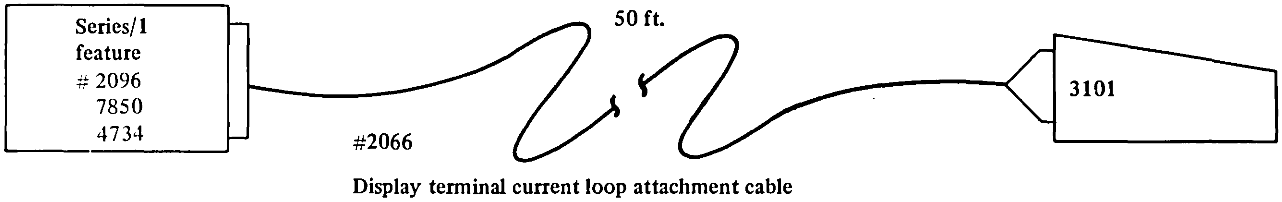
Features		IBM Cable #	Figure
1310	Multifunction	5770	8-66(1)
	Attachment	5790	8-66(2)
1610	EIA Direct Connect	2056	8-21
	Modem	2057	8-22
2092	EIA Direct Connect	2056	8-21
	Modem	2057	8-22
2096	EIA Direct Connect	2056	8-21
	Current Loop	2066	8-18
	Modem	2057	6-17
7850	Current Loop	2066	8-18, 8-41, 8-42
	EIA Voltage	2064	8-19, 8-41, 8-42
		2065	8-20, 8-41, 8-42
4730	Half-Duplex DCE	2130	8-25
4731	Full-Duplex DCE	2130	8-25
4734	TTY Current Attach	2066	8-23
4739	ASC Local	2132	8-24

Figure 8-16. 3101, 3161, 3163, 3164 IBM cable figures

Customer Cables

Features		Figure
1310	Multifunction Attachment	8-66(1), 8-66(2)
1610	EIA Direct Connect	6-9
	Modem	6-9
2092	EIA Direct Connect	6-9
	Modem	6-9
2096	EIA Direct Connect	6-17
	Current Loop	6-18, 6-19
	Modem	6-17
7850	Current Loop	8-41, 8-42
	EIA VOLTAGE	8-40
4730	Half-Duplex DCE	6-21
4731	Full-Duplex DCE	6-22
4734	TTY Current Attach	6-24
4739	ASC Local Attach	6-28

Figure 8-17. 3101, 3161, 3163, 3164 customer cable figures



For further details see Figure 6-19

Note...
#2066 must be modified by CE at installation time depending on what device supplies the current (3101, attachment, or both).

Figure 8-18. 3101 current loop attachment

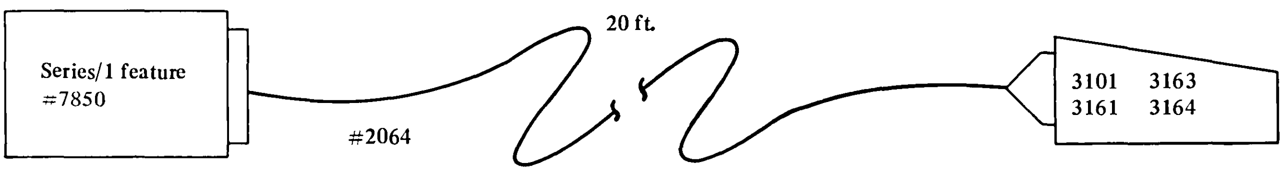


Figure 8-19. 3101, 3161, 3163, 3164 teletypewriter adapter cable with EIA male connector

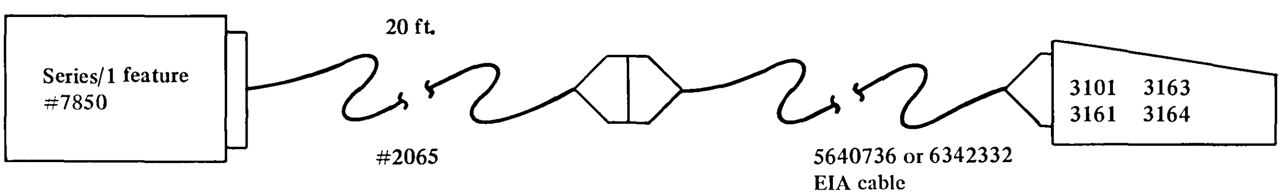
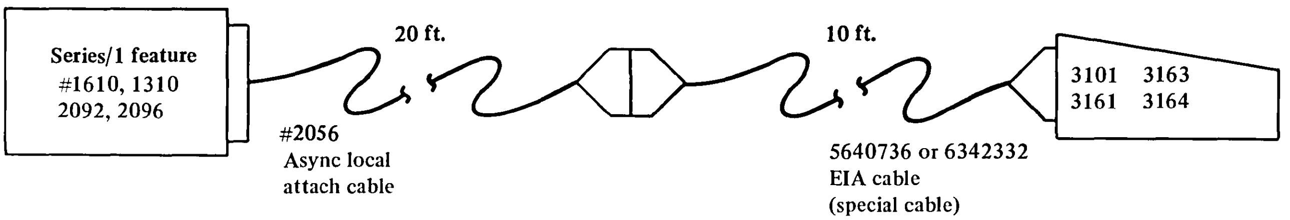


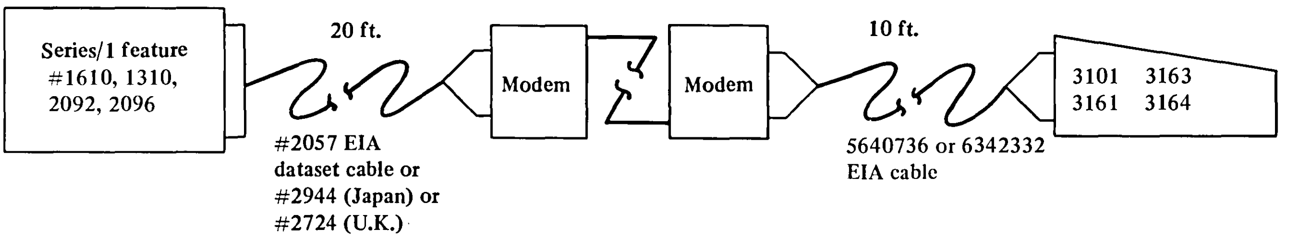
Figure 8-20. 3101, 3161, 3163, 3164 teletypewriter adapter cable with EIA female connector



For further details see Figure 6-9, 6-17, and 8-66

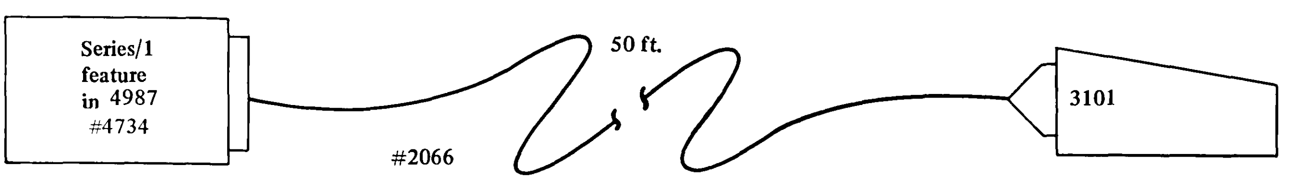
Note...
Feature 1310 uses #5770 for 3101 EIA
(RS422) direct connect attachment.

Figure 8-21. 3101, 3161, 3163, 3164 EIA full-duplex asynchronous local attachment



For further details see Figure 6-9, 6-17, and 8-70

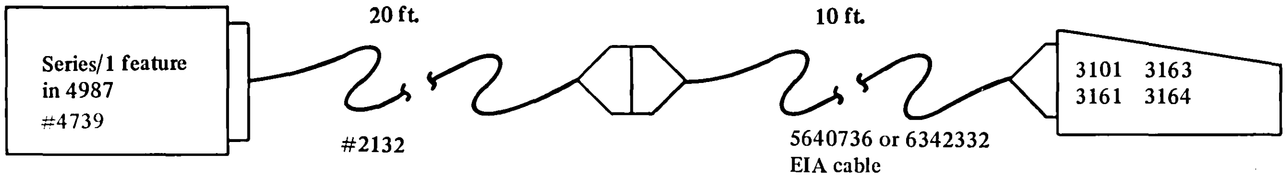
Figure 8-22. 3101, 3161, 3163, 3164 modem attachment



Note...
Feature 2066 requires modification to be used with feature 4734.
Instructions and parts are provided with feature 2066.

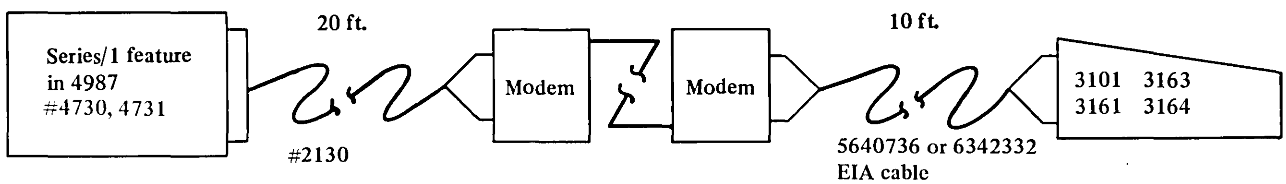
For further details see Figure 6-24

Figure 8-23. 3101 current loop attachment



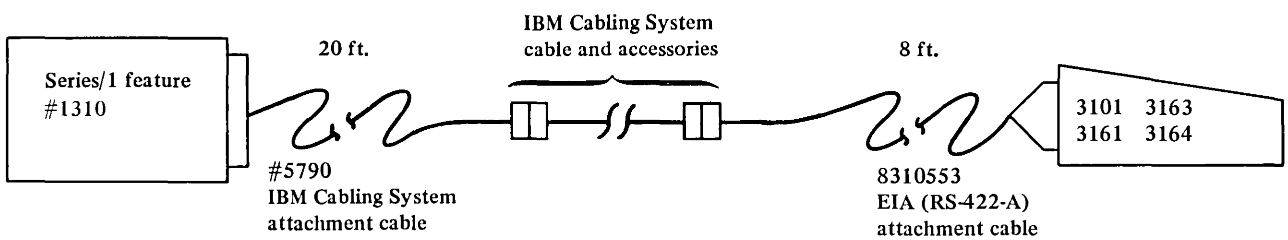
For further details see Figure 6-22

Figure 8-24. 3101, 3161, 3163, 3164 full-duplex asynchronous local attachment



For further details see Figure 6-21 and 6-28

Figure 8-25. (Part 1). 3101, 3161, 3163, 3164 modem attachment



For further details see Figure 8-66(2). Also see *IBM Cabling System Planning and Installation Guide–Cable and Accessories,* GA27-3361.

Figure 8-25 (Part 2). 3101, 3161, 3163, 3164 IBM Cabling System attachment

Optional ways of attaching user equipment to Series/1– depending on requirements of the application and the features selected...

1 User connection to customer access panel at rear of rack enclosure. Internal IBM cables to feature cards in processor or I/O expansion unit. This option cannot be used for connections to the 4982 sensor I/O unit features.

2 User connection to feature cards in sensor I/O unit. Internal IBM cable to sensor I/O unit attachment card in processor or I/O expansion unit.

3 User connection directly to user-attachment feature cards in processor or I/O expansion unit.

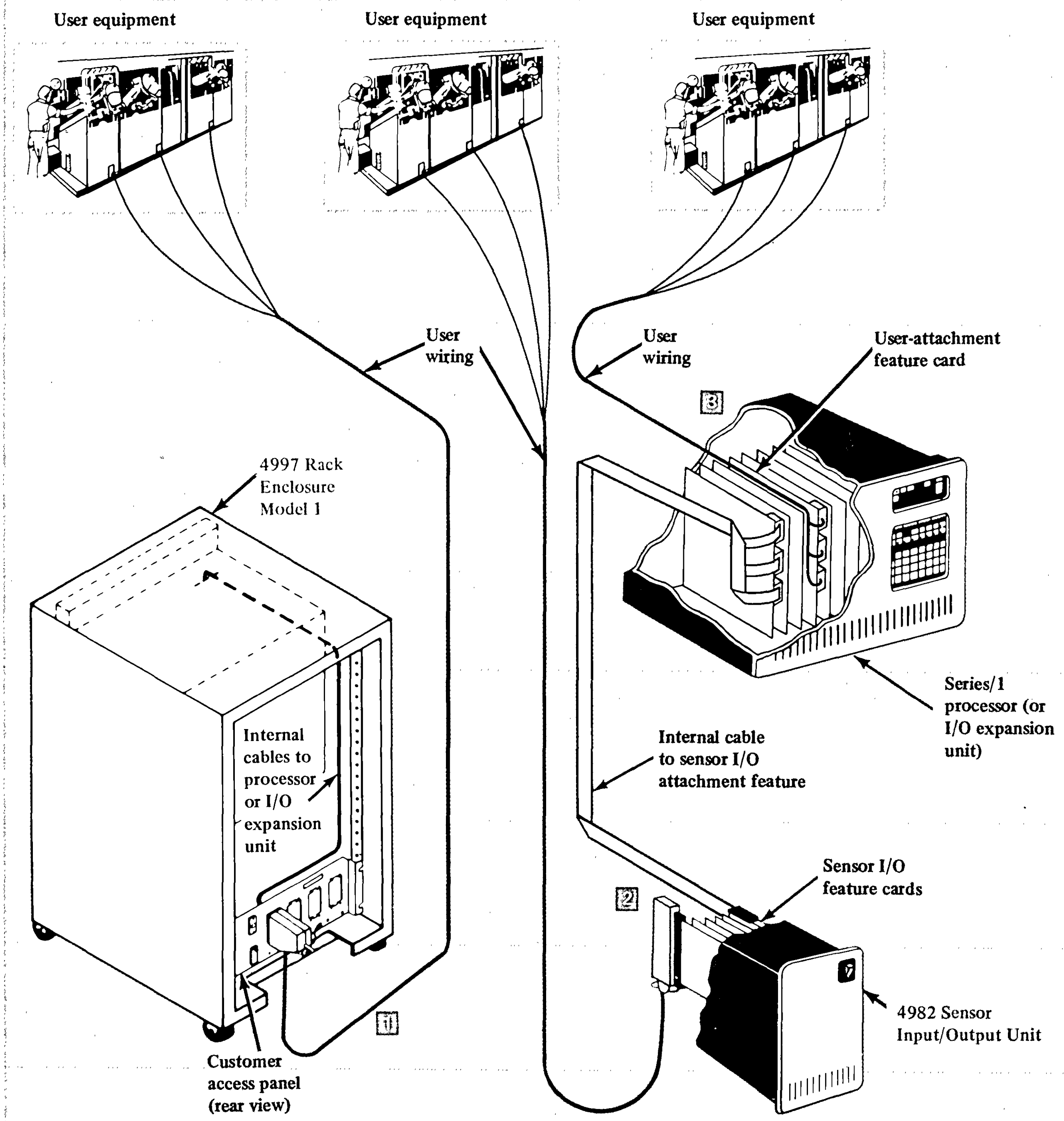


Figure 8-26. User-equipment connecting options

As shown in Figure 8-27, user connections to the feature cards in the sensor I/O unit are made directly to the circuit cards. Connecting to the customer access panel is not an option for sensor I/O features.

The sensor I/O features use two different circuit-card connections depending upon the feature cards selected (Figures 8-27, 8-28 and 8-29).

For all sensor I/O features other than the AO feature card, user connections are made directly to the circuit cards with commercially available edge connectors. The sensor I/O cards (other than AO) require a 56-position connector with 3.96-millimeter (0.156-inch) contact spacing (Continental Connector Corp. connector 600-11-56XA-30 and hood 600-11-56HI, or equivalents). The feature cards are not keyed to the connectors, so you must be sure to put the connector on correctly (observe connector contacts 1 and A at the top of the card, (see Figure 8-27).

The **AO feature card** does not require a special connector. User connections are made directly to screw connectors on the circuit card (see Figure 8-29).

Signal connections are identified in Figures 8-28, 8-29 and 8-36. Before connecting them to your Series/1, verify signal connections in the diagrams shipped with the computer.

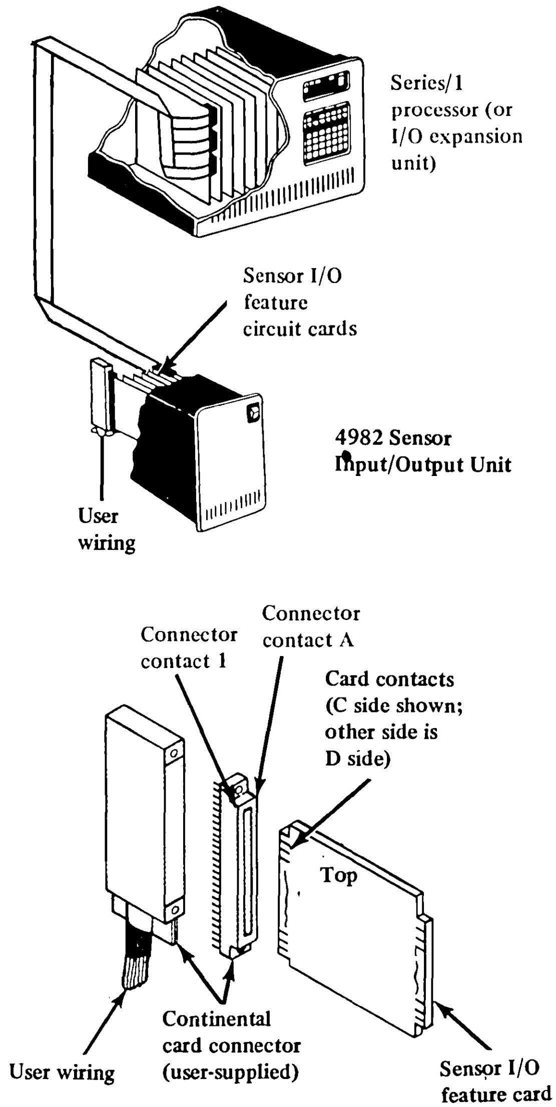


Figure 8-27. User connection feature cards in 4982 sensor I/O unit

Isolated DI/PI card connector

Signal	Card contact	Card contact	Signal
Point 0 high level	D1	C1	Point 1 high level
Point 0 reference	D2	C2	Point 1 reference
Point 0 low level	D3	C3	Point 1 low level
Point 2 high level	D4	C4	Point 3 high level
Point 2 reference	D5	C5	Point 3 reference
Point 2 low level	D6	C6	Point 3 low level
Point 4 high level	D7	C7	Point 5 high level
Point 4 reference	D8	C8	Point 5 reference
Point 4 low level	D9	C9	Point 5 low level
Point 6 high level	D10	C10	Point 7 high level
Point 6 reference	D11	C11	Point 7 reference
Point 6 low level	D12	C12	Point 7 low level
Point 8 high level	D13	C13	Point 9 high level
Point 8 reference	D14	C14	Point 9 reference
Point 8 low level	D15	C15	Point 9 low level
Point 10 high level	D16	C16	Point 11 high level
Point 10 reference	D17	C17	Point 11 reference
Point 10 low level	D18	C18	Point 11 low level
Point 12 high level	D19	C19	Point 13 high level
Point 12 reference	D20	C20	Point 13 reference
Point 12 low level	D21	C21	Point 13 low level
Point 14 high level	D22	C22	Point 15 high level
Point 14 reference	D23	C23	Point 15 reference
Point 14 low level	D24	C24	Point 15 low level
Ground	D25	C25	Ground
Ext. sync input	D26	C26	Ground
+24 V	D27	C27	Ground
Ext. sync ready	D28	C28	Ground

Continental connector (wiring side)

Nonisolated DI/PI card connector

Signal	Card contact	Card contact	Sign…
Point 0 high level	D1	C1	Point 1 hig
Point 2 high level	D2	C2	Point 3 hig
Point 4 high level	D3	C3	Point 5 hig
Point 6 high level	D4	C4	Point 7 hig
Point 8 high level	D5	C5	Point 9 hig
Point 10 high level	D6	C6	Point 11 hi
Point 12 high level	D7	C7	Point 13 hi
Point 14 high level	D8	C8	Point 15 hi
Ground	D9	C9	Ground
Ground	D10	C10	Ground
Point 0 low level	D11	C11	Ground
Ground	D12	C12	Point 1 low
Point 2 low level	D13	C13	Ground
Ground	D14	C14	Point 3 low
Point 4 low level	D15	C15	Ground
Ground	D16	C16	Point 5 low
Point 6 low level	D17	C17	Ground
Ground	D18	C18	Point 7 low
Point 8 low level	D19	C19	Ground
Ground	D20	C20	Point 9 low
Point 10 low level	D21	C21	Ground
Ground	D22	C22	Point 11 lo
Point 12 low level	D23	C23	Ground
Ground	D24	C24	Point 13 lo
Point 14 low level	D25	C25	Ground
Ground	D26	C26	Point 15 lo
Ext. sync input	D27	C27	Ground
+5 V	D28	C28	Ext. sync r

Continental connector (wiring side)

Nonisolated DO card connector

Signal	Card contact	Card contact	Signal
Ground	D1	C1	Point 0
Ground	D2	C2	Point 1
Ground	D3	C3	Point 2
Ground	D4	C4	Point 3
Ground	D5	C5	No connection
Ground	D6	C6	No connection
Ground	D7	C7	No connection
Ground	D8	C8	No connection
Ground	D9	C9	No connection
Ground	D10	C10	Point 4
Ground	D11	C11	Point 5
Ground	D12	C12	Point 6
Ground	D13	C13	Point 7
Ground	D14	C14	No connection
Ground	D15	C15	No connection
Ground	D16	C16	No connection
Ground	D17	C17	Point 8
Ground	D18	C18	Point 9
Ground	D19	C19	Point 10
Ground	D20	C20	Point 11
Ground	D21	C21	No connection
Ground	D22	C22	No connection
Ground	D23	C23	No connection
Ground	D24	C24	No connection
Ground	D25	C25	Point 12
Ground	D26	C26	Point 13
Ground	D27	C27	Point 14
Ground	D28	C28	Point 15

Continental connector (wiring side)

Figure 8-28. Signal connections for sensor I/O feature cards

Solid-state-multiplexer card connector

Signal	Card contact	Card contact	Signal
Channel 0 (+)	D1	C1	Channel 0 (–)
Shield	D2	C2	Shield
Channel 1 (+)	D3	C3	Channel 1 (–)
Channel 2 (+)	D4	C4	Channel 2 (–)
Shield	D5	C5	Shield
Channel 3 (+)	D6	C6	Channel 3 (–)
No connection	D7	C7	No connection
Channel 4 (+)	D8	C8	Channel 4 (–)
Shield	D9	C9	Shield
Channel 5 (+)	D10	C10	Channel 5 (–)
Channel 6 (+)	D11	C11	Channel 6 (–)
Shield	D12	C12	Shield
Channel 7 (+)	D13	C13	Channel 7 (–)
No connection	D14	C14	No connection
Channel 8 (+)	D15	C15	Channel 8 (–)
Shield	D16	C16	Shield
Channel 9 (+)	D17	C17	Channel 9 (–)
Channel 10 (+)	D18	C18	Channel 10 (–)
Shield	D19	C19	Shield
Channel 11 (+)	D20	C20	Channel 11 (–)
No connection	D21	C21	No connection
Channel 12 (+)	D22	C22	Channel 12 (–)
Shield	D23	C23	Shield
Channel 13 (+)	D24	C24	Channel 13 (–)
Channel 14 (+)	D25	C25	Channel 14 (–)
Shield	D26	C26	Shield
Channel 15 (+)	D27	C27	Channel 15 (–)
No connection	D28	C28	No connection

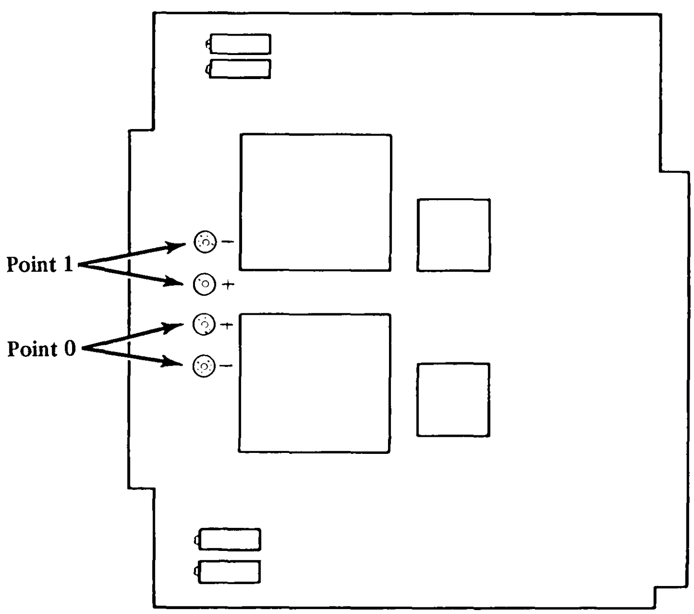
Continental connector (wiring side)

Reed-relay-multiplexer card connector

Signal	Card contact	Card contact	Signal
Channel 0 (+)	D1	C1	Channel 0 (–)
Shield	D2	C2	No connection
No connection	D3	C3	No connection
Channel 1 (+)	D4	C4	Channel 1 (–)
Shield	D5	C5	No connection
No connection	D6	C6	No connection
No connection	D7	C7	No connection
Channel 2 (+)	D8	C8	Channel 2 (–)
Shield	D9	C9	No connection
No connection	D10	C10	No connection
Channel 3 (+)	D11	C11	Channel 3 (–)
Shield	D12	C12	No connection
No connection	D13	C13	No connection
No connection	D14	C14	No connection
Channel 4 (+)	D15	C15	Channel 4 (–)
Shield	D16	C16	No connection
No connection	D17	C17	No connection
Channel 5 (+)	D18	C18	Channel 5 (–)
Shield	D19	C19	No connection
No connection	D20	C20	No connection
No connection	D21	C21	No connection
Channel 6 (+)	D22	C22	Channel 6 (–)
Shield	D23	C23	No connection
No connection	D24	C24	No connection
Channel 7 (+)	D25	C25	Channel 7 (–)
Shield	D26	C26	No connection
No connection	D27	C27	No connection
No connection	D28	C28	No connection

Continental connector (wiring side)

Analog-output card connection



AO connections are made directly to the AO feature card with screw connectors on the card.

Figure 8-29. Signal connections for sensor I/O feature cards

Integrated digital input/output (DI/DO)

User connections to the integrated DI/DO feature can be made in two ways—either directly to the circuit card (Figures 8-30 and 8-31), or to the customer access panel (Figures 8-32 and 8-33).

Connections made **directly to the DI/DO card** require three 2 x 20 connectors (Berg Electronics connector 65405-013, with pin sockets 47712, or equivalent) as shown in Figure 8-30. The connector is polarized by plugging pin position B02.

Connections made to the **customer access panel** use a connector plug supplied with the internal cable that connects the feature card to the access panel (see Figure 8-32).

Connecting to the feature card or to the access panel requires a cable with up to 72 twisted pairs of wire. For connecting directly to the feature card, No. 24 AWG (0.511 mm) twisted-pair flat cable is recommended for easier cable routing.

When connecting to a DI/DO card located in any half-width unit installed in a half-width unit enclosure, the DI/DO cable must be divided into separate cables. Each cable's bulk diameter must be less than 15 mm (0.59 in.). Each cable may contain up to 24 twisted pairs of No. 24 AWG (0.511 mm) wire shielded and jacketed.

Signal connections are identified in Figures 8-31 and 8-33. Before connecting to your Series/1, verify signal connections in the diagrams shipped with the computer.

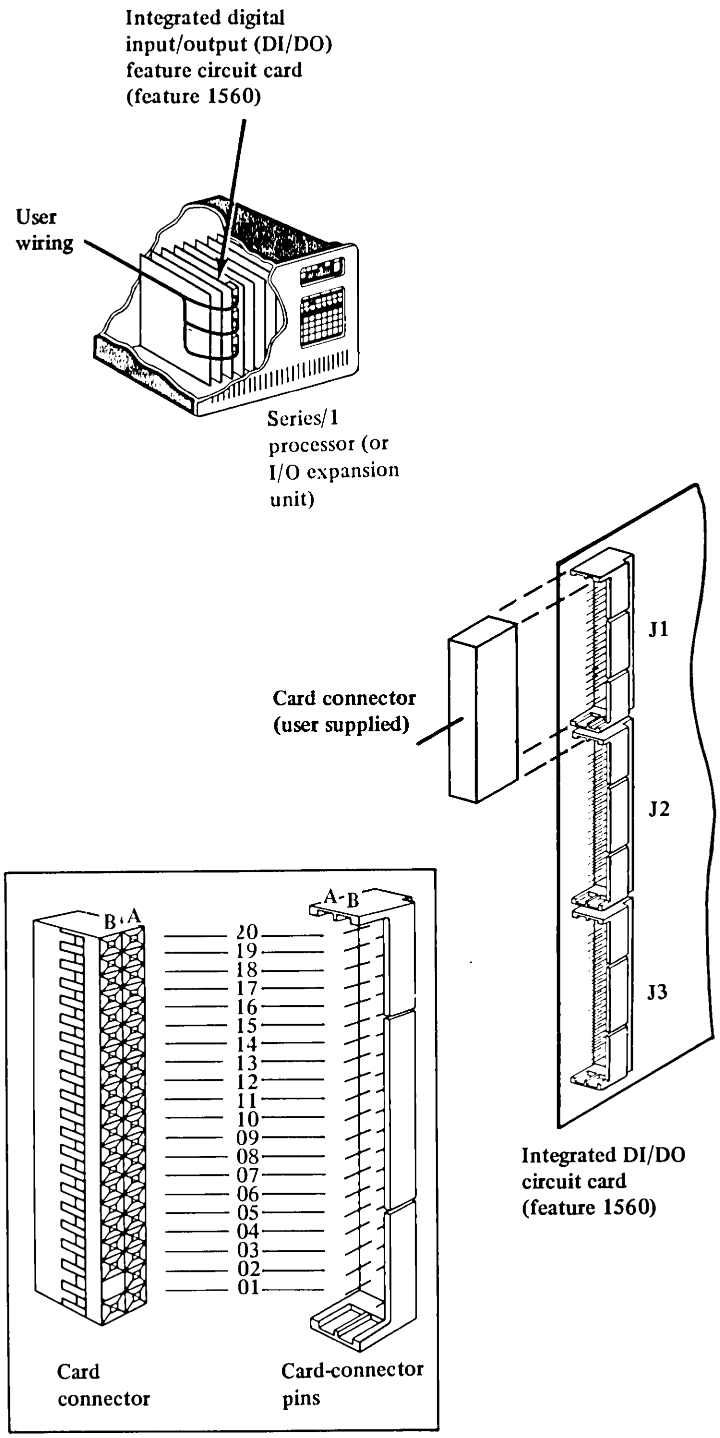


Figure 8-30. User connection directly to integrated DI/DO feature card

Signal connections for DI/DO card connectors

J1

Signal	Group	Pin	A	B	Pin	Group	Signal
DI 00	0	20	□	□	20	0	DI 01
DI 02	0	19	□	□	19	0	DI 03
DI 04	0	18	□	□	18	0	DI 05
Common	-	17	□	□	17	0	DI 06
Common	-	16	□	□	16	0	DI 07
Common	-	15	□	□	15	0	DI 08
Common	-	14	□	□	14	0	DI 09
Common	-	13	□	□	13	0	DI 10
Common	-	12	□	□	12	0	DI 11
Common	-	11	□	□	11	0	DI 12
Common	-	10	□	□	10	0	DI 13
Common	-	09	□	□	09	0	DI 14
Common	-	08	□	□	08	0	DI 15
Common	-	07	□	□	07	1	DI 00
Common	-	06	□	□	06	1	DI 01
Common	-	05	□	□	05	1	DI 02
Common	-	04	□	□	04	1	DI 03
DI 05	1	03	□	□	03	1	DI 04
DI 06	1	02	□		02	-	Polarity pin
DI 08	1	01	□	□	01	1	DI 07

J2

Signal	Group	Pin	A	B	Pin	Group	Signal
DI 09	1	20	□	□	20	1	DI 10
DI 11	1	19	□	□	19	1	DI 12
DI 13	1	18	□	□	18	1	DI 14
Common	-	17	□	□	17	1	DI 15
Common	-	16	□	□	16	0	Ext sync
Common	-	15	□	□	15	1	Ext sync
Common	-	14	□	□	14	2	Ext sync
Common	-	13	□	□	13	3	Ext sync
Common	-	12	□	□	12	-	——
Common	-	11	□	□	11	-	——
Common	-	10	□	□	10	-	——
Common	-	09	□	□	09	2	DO 00
Common	-	08	□	□	08	2	DO 01
Common	-	07	□	□	07	2	DO 02
Common	-	06	□	□	06	2	DO 03
Common	-	05	□	□	05	2	DO 04
Common	-	04	□	□	04	2	DO 05
DO 07	2	03	□	□	03	2	DO 06
DO 08	2	02	□		02	-	Polarity pin
DO 10	2	01	□	□	01	2	DO 09

J3

Signal	Group	Pin	A	B	Pin	Group	Signal
DO 11	2	20	□	□	20	2	DO 12
DO 13	2	19	□	□	19	2	DO 14
DO 15	2	18	□	□	18	3	DO 00
Common	-	17	□	□	17	3	DO 01
Common	-	16	□	□	16	3	DO 02
Common	-	15	□	□	15	3	DO 03
Common	-	14	□	□	14	3	DO 04
Common	-	13	□	□	13	3	DO 05
Common	-	12	□	□	12	3	DO 06
Common	-	11	□	□	11	3	DO 07
Common	-	10	□	□	10	3	DO 08
Common	-	09	□	□	09	3	DO 09
Common	-	08	□	□	08	3	DO 10
Common	-	07	□	□	07	3	DO 11
Common	-	06	□	□	06	3	DO 12
Common	-	05	□	□	05	3	DO 13
Common	-	04	□	□	04	3	DO 14
Ready	0	03	□	□	03	3	DO 15
Ready	1	02	□		02	-	Polarity pin
Ready	3	01	□	□	01	2	Ready

Figure 8-31. Signal connections for integrated DI/DO card connectors

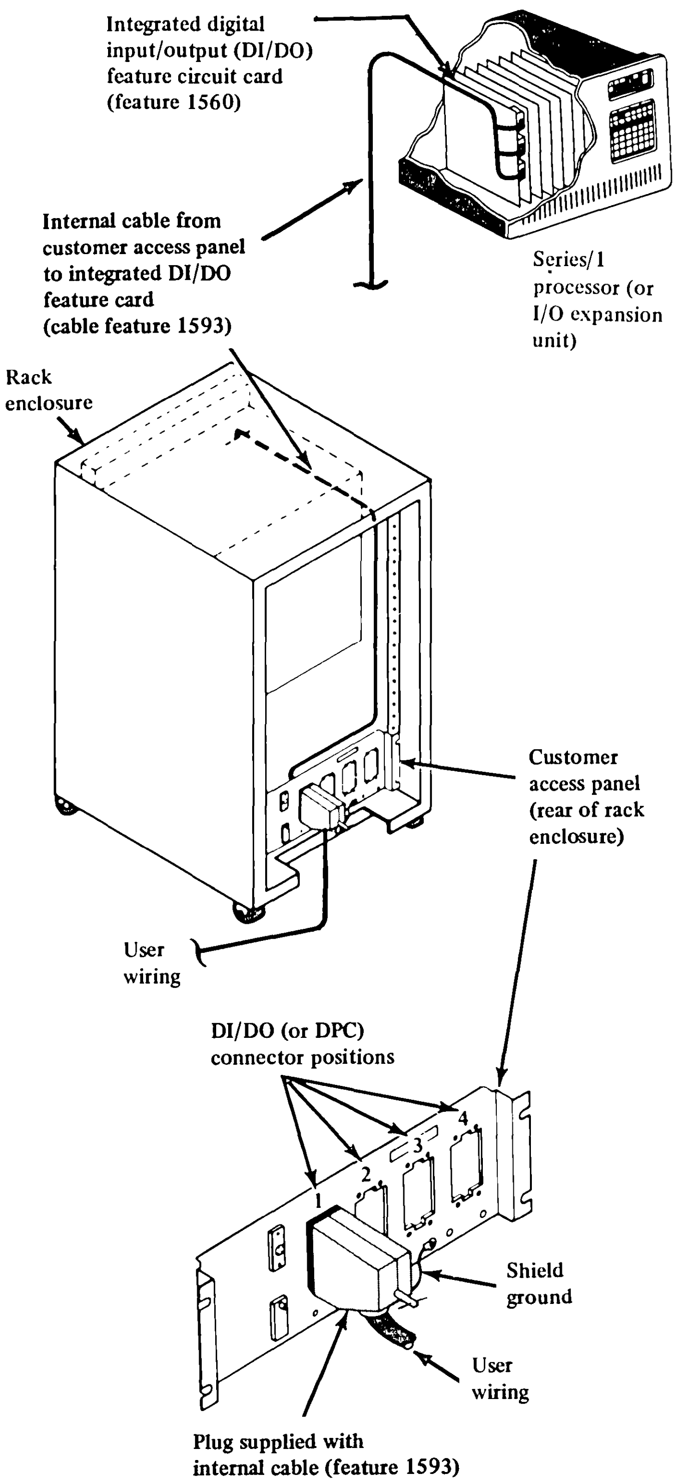


Figure 8-32. User connection to customer access panel for integrated DI/DO feature

Signal connections for integrated DI/DO connector on customer access panel

Digital input						Digital output					
Group 0			Group 1			Group 2			Group 3		
Signal		Pin	Signal		Pin	Signal		Pin	Signal		Pin
DI 00	+	D3	DI 00	+	E2	DO 00	+	K9	DO 00	+	T3
	–	B2		–	B3		–	J2		–	T9
DI 01	+	F8	DI 01	+	D9	DO 01	+	K6	DO 01	+	T2
	–	C9		–	C5		–	G5		–	S5
DI 02	+	D2	DI 02	+	D8	DO 02	+	K5	DO 02	+	T1
	–	A6		–	B7		–	H7		–	V2
DI 03	+	F7	DI 03	+	D6	DO 03	+	K4	DO 03	+	S9
	–	C8		–	B5		–	H6		–	V3
DI 04	+	D1	DI 04	+	D5	DO 04	+	K3	DO 04	+	S8
	–	B6		–	A2		–	H9		–	S2
DI 05	+	F6	DI 05	+	B1	DO 05	+	K2	DO 05	+	S7
	–	C7		–	A5		–	H2		–	N8
DI 06	+	F4	DI 06	+	A9	DO 06	+	K1	DO 06	+	S6
	–	F5		–	A8		–	H1		–	V1
DI 07	+	F3	DI 07	+	D4	DO 07	+	G3	DO 07	+	S4
	–	C4		–	B9		–	G7		–	T8
DI 08	+	F1	DI 08	+	A7	DO 08	+	G2	DO 08	+	S3
	–	C2		–	A4		–	H4		–	T7
DI 09	+	E9	DI 09	+	J6	DO 09	+	J7	DO 09	+	S1
	–	C1		–	G4		–	H3		–	P6
DI 10	+	E8	DI 10	+	M4	DO 10	+	F9	DO 10	+	R9
	–	C6		–	L8		–	F2		–	N1
DI 11	+	E7	DI 11	+	J5	DO 11	+	R2	DO 11	+	R8
	–	E1		–	G9		–	N7		–	P4
DI 12	+	E6	DI 12	+	M3	DO 12	+	T5	DO 12	+	R7
	–	G1		–	M2		–	T6		–	P3
DI 13	+	E5	DI 13	+	J4	DO 13	+	P9	DO 13	+	R6
	–	D7		–	G6		–	N5		–	P2
DI 14	+	E4	DI 14	+	M1	DO 14	+	T4	DO 14	+	R5
	–	C3		–	G8		–	P5		–	P7
DI 15	+	E3	DI 15	+	L9	DO 15	+	P8	DO 15	+	R4
	–	B4		–	M7		–	N4		–	N9
Ext Sync	+	L7	Ext Sync	+	L6	Ext Sync	+	L5	Ext Sync	+	L4
	–	H8		–	J9		–	J1		–	H5
Ready	+	M8	Ready	+	M6	Ready	+	R3	Ready	+	M5
	–	N6		–	P1		–	N2		–	N3

Figure 8-33. Signal connections for integrated DI/DO connector on customer access panel

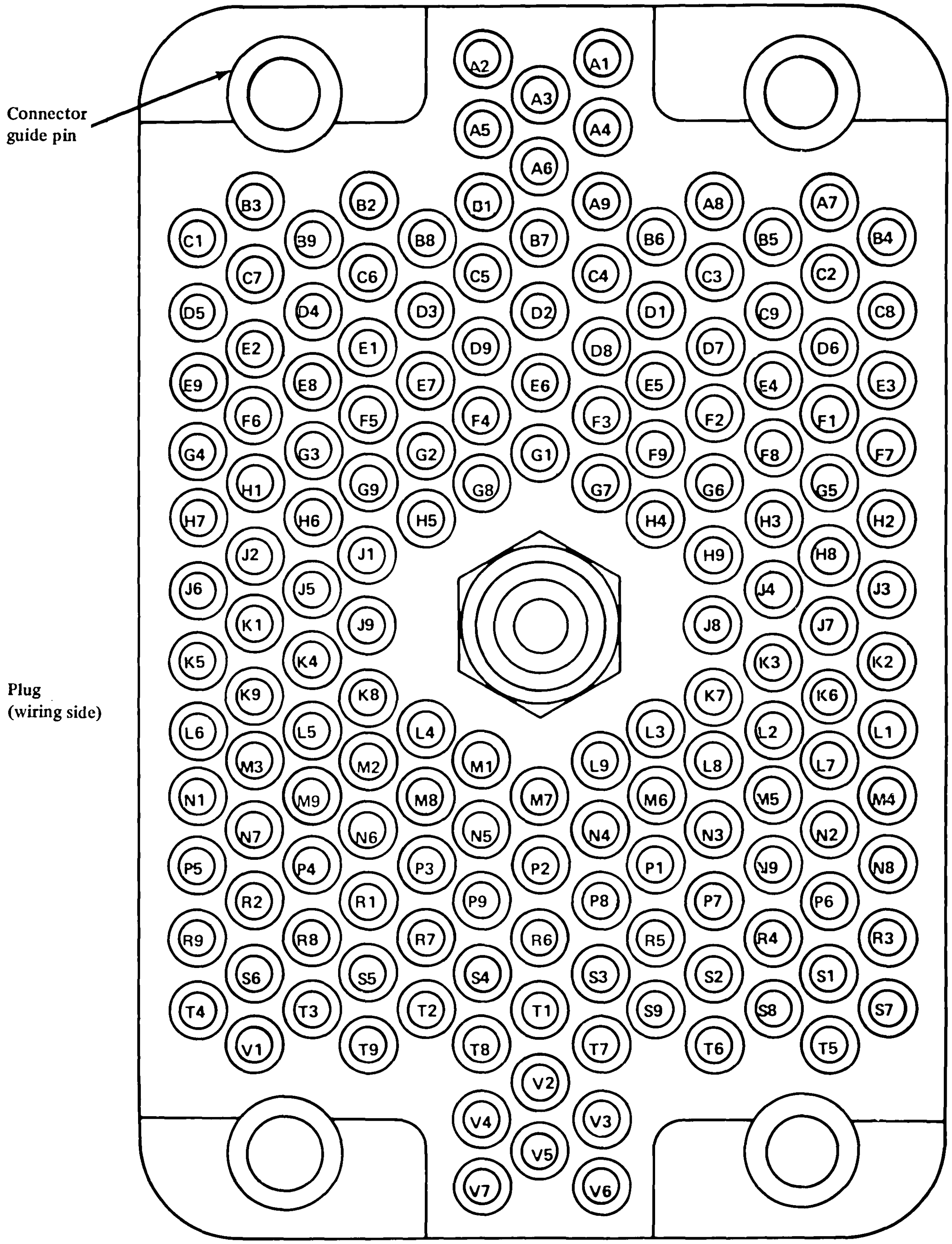


Figure 8-34. Signal connections for integrated DI/DO

Direct program control (DPC) adapter

User connections to the DPC adapter can be made in two ways—either directly to the circuit card (Figures 8-35 and 8-36), or to the customer access panel (Figures 8-37 and 8-38).

Connections made **directly to the DPC adapter card** require three 2 x 20 connectors (Berg Electronics connector 65405-013, with pin sockets 47712, or equivalent) as shown in Figure 8-35. The connector is polarized by plugging pin-position B02.

Connections made to the **customer access panel** use the connector plug supplied with the internal cable. This connects the feature card to the access panel (see Figure 8-37).

Connecting to the feature card or to the access panel requires a cable with 75 twisted pairs of wire. For connecting directly to the adapter card, No. 24 AWG (0.511 mm) twisted-pair flat cable is recommended for easier cable routing.

Signal connections are identified in Figures 8-36 and 8-39. Before connecting to your Series/1, verify signal connections in the diagrams shipped with the computer.

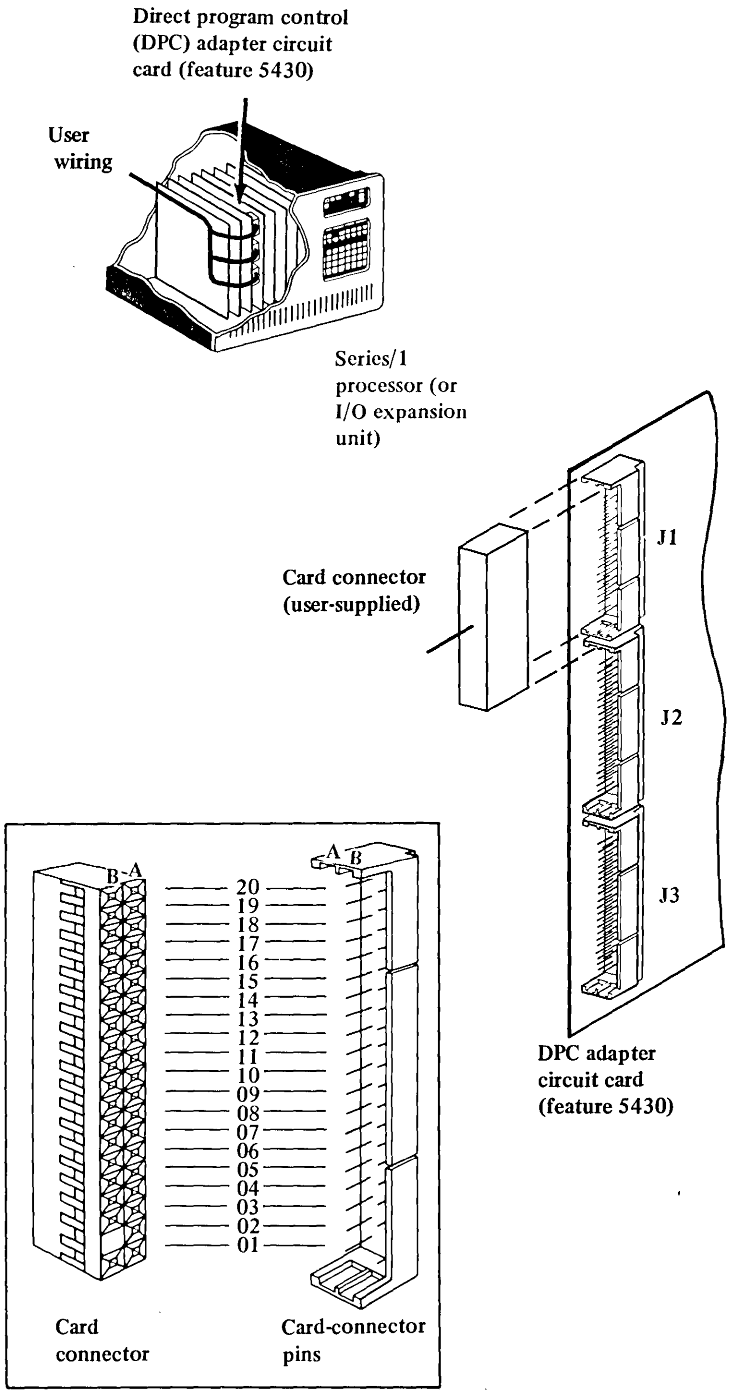


Figure 8-35. User connection directly to DPC adapter card

Signal connections for DPC card connectors

J1

Signal	Pin	Pin	Signal
———	20	20	Ground
Ground	19	19	Function bit 2
Function bit 0	18	18	Function bit 1
Modifier bit 3	17	17	Ground
Ground	16	16	Modifier bit 2
Modifier bit 0	15	15	Modifier bit 1
Data bit in bit 7	14	14	Ground
Ground	13	13	Data bit out bit 7
Data bit in bit 6	12	12	Data bit out bit 6
Data bit in bit 5	11	11	Ground
Ground	10	10	Data bit out bit 5
Data bit in bit 4	09	09	Data bit out bit 4
Data bit in bit 3	08	08	Ground
Ground	07	07	Data bit out bit 3
Data bit in bit 2	06	06	Data bit out bit 2
Data bit in bit 1	05	05	Ground
Ground	04	04	Data bit out bit 1
Data bit in bit 0	03	03	Data bit out bit 0
Ground	02	02	Polarity pin
Parity in 0–7	01	01	Parity out 0–7

J2

Signal	Pin	Pin	Signal
———	20	20	Ground
Ground	19	19	———
Condition code 1	18	18	Condition code 2
Condition code 0	17	17	Ground
Ground	16	16	Diag mode modifier
Select return	15	15	Diagnostic mode
Data bit in bit 15	14	14	Ground
Ground	13	13	Data bit out bit 15
Data bit in bit 14	12	12	Data bit out bit 14
Data bit in bit 13	11	11	Ground
Ground	10	10	Data bit out bit 13
Data bit in bit 12	09	09	Data bit out bit 12
Data bit in bit 11	08	08	Ground
Ground	07	07	Data bit out bit 11
Data bit in bit 10	06	06	Data bit out bit 10
Data bit in bit 9	05	05	Ground
Ground	04	04	Data bit out bit 9
Data bit in bit 8	03	03	Data bit out bit 8
Ground	02	02	Polarity pin
Parity in 8–15	01	01	Parity out 8–15

J3

Signal	Pin	Pin	Signal
Power on reset	20	20	Ground
Ground	19	19	System reset
Data strobe	18	18	Halt or MCHCK
I/O active	17	17	Ground
Ground	16	16	Interrupt service active
Device address bit 2	15	15	Device address bit 3
Device address bit 1	14	14	Ground
Ground	13	13	Device address bit 0
Interrupt request 14	12	12	Interrupt request 15
Interrupt request 13	11	11	Ground
Ground	10	10	Interrupt request 12
Interrupt request 10	09	09	Interrupt request 11
Interrupt request 9	08	08	Ground
Ground	07	07	Interrupt request 8
Interrupt request 6	06	06	Interrupt request 7
Interrupt request 5	05	05	Ground
Ground	04	04	Interrupt request 4
Interrupt request 2	03	03	Interrupt request 3
Ground	02	02	Polarity pin
Interrupt request 0	01	01	Interrupt request 1

Figure 8-36. Signal connections for DPC card connectors

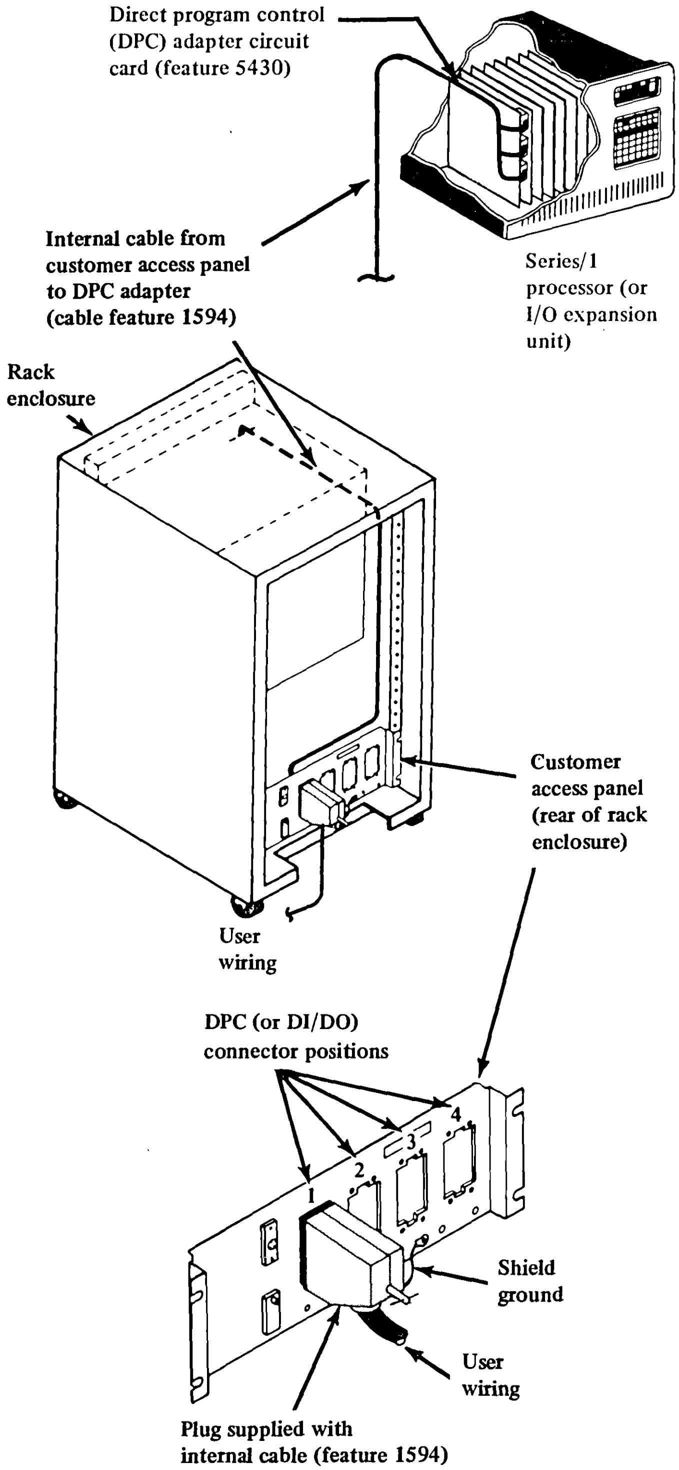


Figure 8-37. User connection to customer access panel for DPC adapter

Signal		Pin	Signal		Pin
Data bus in bit 0	+	A7	Data bus out bit 0	+	B3
	–	A8		–	B2
Data bus in bit 1	+	B4	Data bus out bit 1	+	C1
	–	B5		–	B9
Data bus in bit 2	+	C2	Data bus out bit 2	+	C7
	–	C3		–	C6
Data bus in bit 3	+	C8	Data bus out bit 3	+	D5
	–	C9		–	D4
Data bus in bit 4	+	D6	Data bus out bit 4	+	E2
	–	D7		–	E1
Data bus in bit 5	+	E3	Data bus out bit 5	+	E9
	–	E4		–	E8
Data bus in bit 6	+	F1	Data bus out bit 6	+	F6
	–	F2		–	F5
Data bus in bit 7	+	F7	Data bus out bit 7	+	G4
	–	F8		–	G3
Data bus in bit 8	+	G5	Data bus out bit 8	+	H1
	–	G6		–	G9
Data bus in bit 9	+	H2	Data bus out bit 9	+	H7
	–	H3		–	H6
Data bus in bit 10	+	H8	Data bus out bit 10	+	J2
	–	H9		–	J1
Data bus in bit 11	+	J3	Data bus out bit 11	+	J6
	–	J4		–	J5
Data bus in bit 12	+	J7	Data bus out bit 12	+	K1
	–	J8		–	J9
Data bus in bit 13	+	K2	Data bus out bit 13	+	K5
	–	K3		–	K4
Data bus in bit 14	+	K6	Data bus out bit 14	+	K9
	–	K7		–	K8
Data bus in bit 15	+	L1	Data bus out bit 15	+	L6
	–	L2		–	L5
Data bus in parity 0–7	+	L7	Data bus out parity 0–7	+	M3
	–	L8		–	M2
Data bus in parity 8–15	+	M4	Data bus out parity 8–15	+	N1
	–	M5		–	M9
Modifier bit 0	+	N2	Interrupt request 0	+	A1
	–	M3		–	A4
Modifier bit 1	+	N8	Interrupt request 1	+	A3
	–	N9		–	A6
Modifier bit 2	+	P6	Interrupt request 2	+	A2
	–	P7		–	A5
Modifier bit 3	+	R3	Interrupt request 3	+	B6
	–	R4		–	A9
Device address bit 0	+	N7	Interrupt request 4	+	B8
	–	N6		–	B1
Device address bit 1	+	P5	Interrupt request 5	+	D1
	–	P4		–	C4
Device address bit 2	+	R2	Interrupt request 6	+	D3
	–	R1		–	C5
Device address bit 3	+	R9	Interrupt request 7	+	D2
	–	R8		–	B7
Function bit 0	+	S1	Interrupt request 8	+	E5
	–	S2		–	D8
Function bit 1	+	S7	Interrupt request 9	+	E7
	–	S8		–	D9
Function bit 2	+	T5	Interrupt request 10	+	F9
	–	T6		–	F3
Condition code 0	+	S6	Interrupt request 11	+	G2
	–	S5		–	F4
Condition code 1	+	T4	Interrupt request 12	+	G1
	–	T3		–	E6
Condition code 2	+	V1	Interrupt request 13	+	H4
	–	T9		–	G7
Select return	+	M6	Interrupt request 14	+	H5
	–	N4		–	G8
Diagnostic mode	+	P2	Interrupt request 15	+	L3
	–	M7		–	L9
Diagnostic mode modifier	+	L4	Halt or MCHK	+	R5
	–	M1		–	S3
Interrupt service active	+	M8	System reset	+	R6
	–	N5		–	T1
I/O active	+	P1	Power on reset	+	R7
	–	P8		–	S4
Data strobe	+	P3			
	–	P9			

Figure 8-38. Signal connections for DPC connector on customer access panel

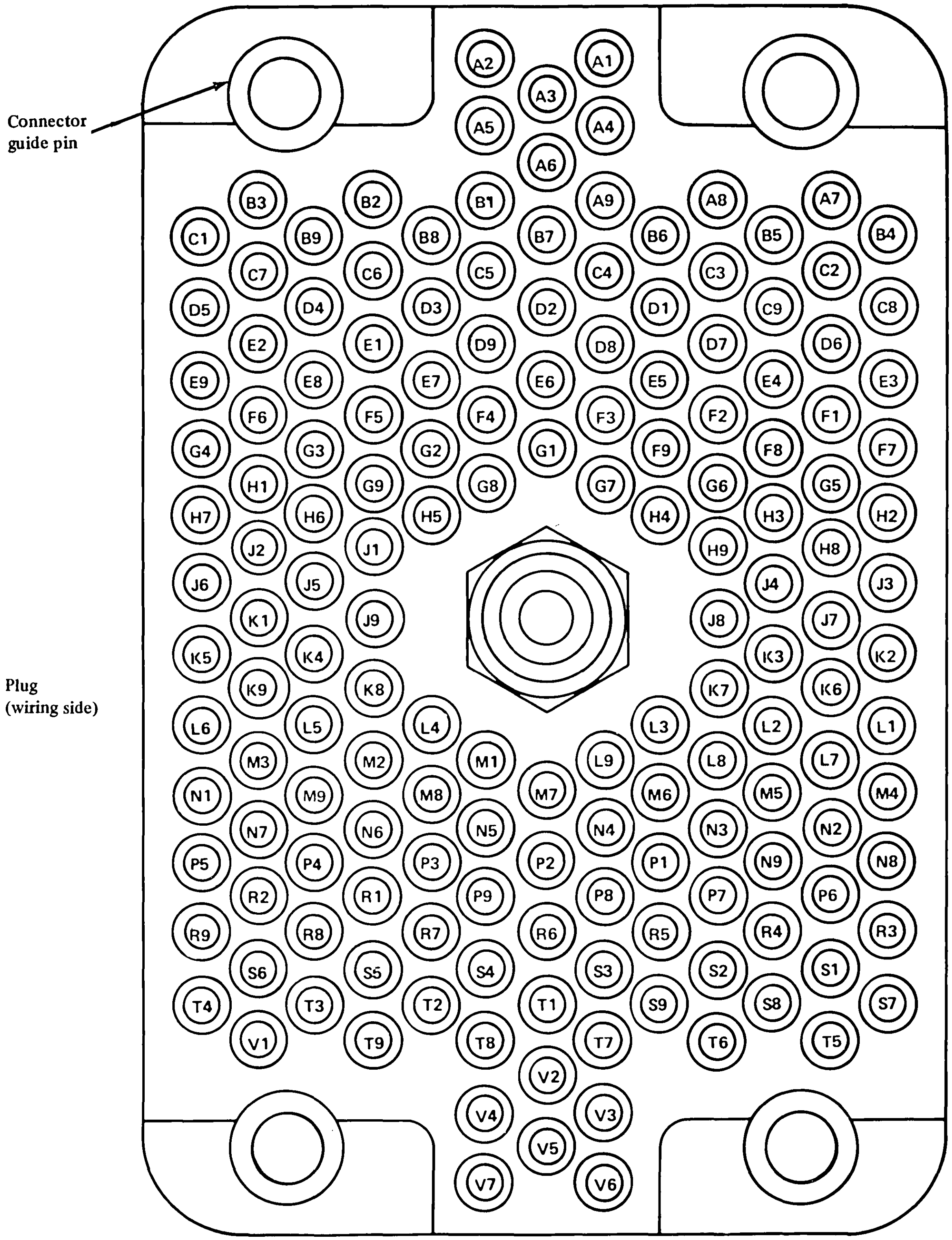


Figure 8-39. Signal connections for DPC connector on customer access panel

Teletypewriter adapter

Teletype Corporation models ASR-33, ASR-35, and KSR-33 teletypewriters (or equivalent devices) can be connected to the Series/1 teletypewriter adapter card in **two ways**—either directly to the circuit card (Figure 8-40), or to the customer access panel (Figure 8-44).

Connections can be made **directly to the adapter card** using the optional 6-meter (20-foot) teletypewriter cable shown in Figure 8-40. This cable is designed for the standard teletypewriter interface and includes the connector for the adapter card.

Connections made to the **customer access panel** use another optional cable. This cable includes the plug for the teletypewriter connector on the access panel (see Figure 8-44). The cable from the access panel to the teletypewriter adapter is provided with the access panel.

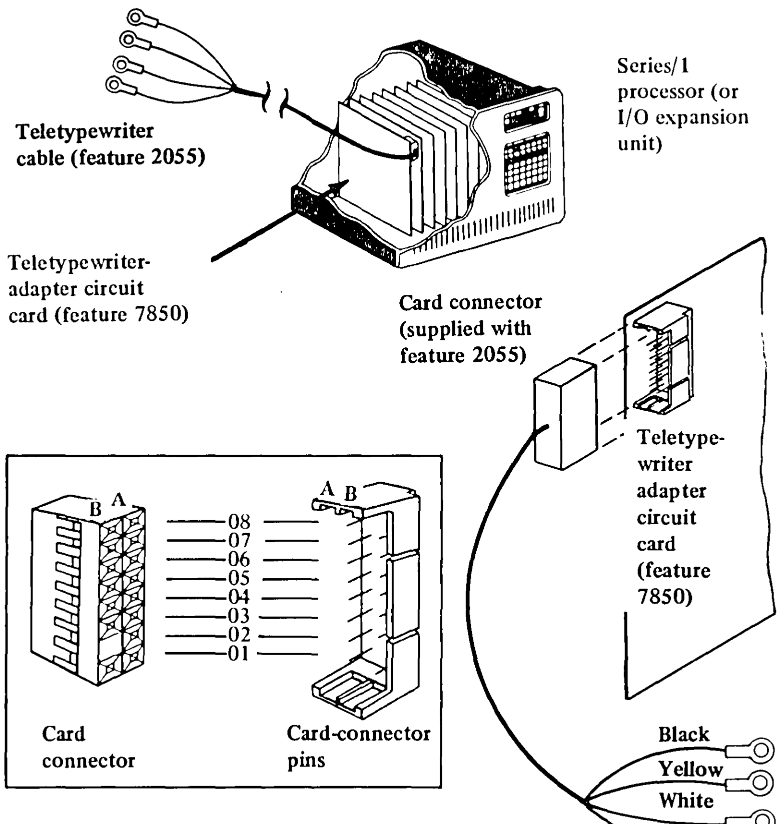
Teletype models ASR-33, ASR-35, and KSR-33 require 24 volts across their transmit output. For devices that require only 12 volts across their transmit output, pin B05 should be used instead of B01 at the adapter-card connector.

The teletypewriter adapter can also be used to attach **other devices** (such as a keyboard-display unit, printer, or plotter) to Series/1. Several interface options are available for these devices:

- Current-loop interface (with user's power supply or equivalent Series/1 ± 12-volt supply)
- Electronic Industries Association (EIA) interface
- Transistor-transistor logic (TTL) interface.

Connections to these interfaces are made directly to the adapter card with user-supplied cables and 2 x 8 Berg connectors (Berg Electronics connector 65405-005, with pin sockets 47712, or equivalent). Signal connections are identified in Figure 8-42.

Before connecting to your Series/1, verify signal connections in the diagrams shipped with the computer, especially EIA device-connector jumpers.



Signal connections for standard teletypewriter interface...

Feature card		Teletypewriter	
Pin	**Signal**	**Wire**	**Signal**
B05	Transmit –	Black	Receive –
A02	Transmit +	Yellow	Receive +
B01	Receive –	White	Transmit –
A03	Receive +	Red	Transmit +

Signal connections for other interface options...

Intf.	Card connector		Device connector
	Pin	**Signal**	**Signal**
Current loop (with user's power supply)	A01	Isolated receive input +	Transmit–
	A03	Isolated receive input –	Transmit +
	B05	Signal ground (transmit –)	Receive +
	A07	SSS closed = data mark	Receive –
EIA	A04	EIA received data in	EIA transmitted data
	B05	Signal ground	Signal ground
	B06	EIA transmitted data	EIA received data
	A06	Data terminal ready	Received line signal detector
TTL	B04	TTL received data	TTL transmitted data
	B05	Signal ground	Signal ground
	A07	SSS closed = data mark or – TTL data out	
		(or)	TTL received data
	B07	SSS open = data mark or + TTL data out	

Figure 8-40. User connection directly to teletypewriter adapter card

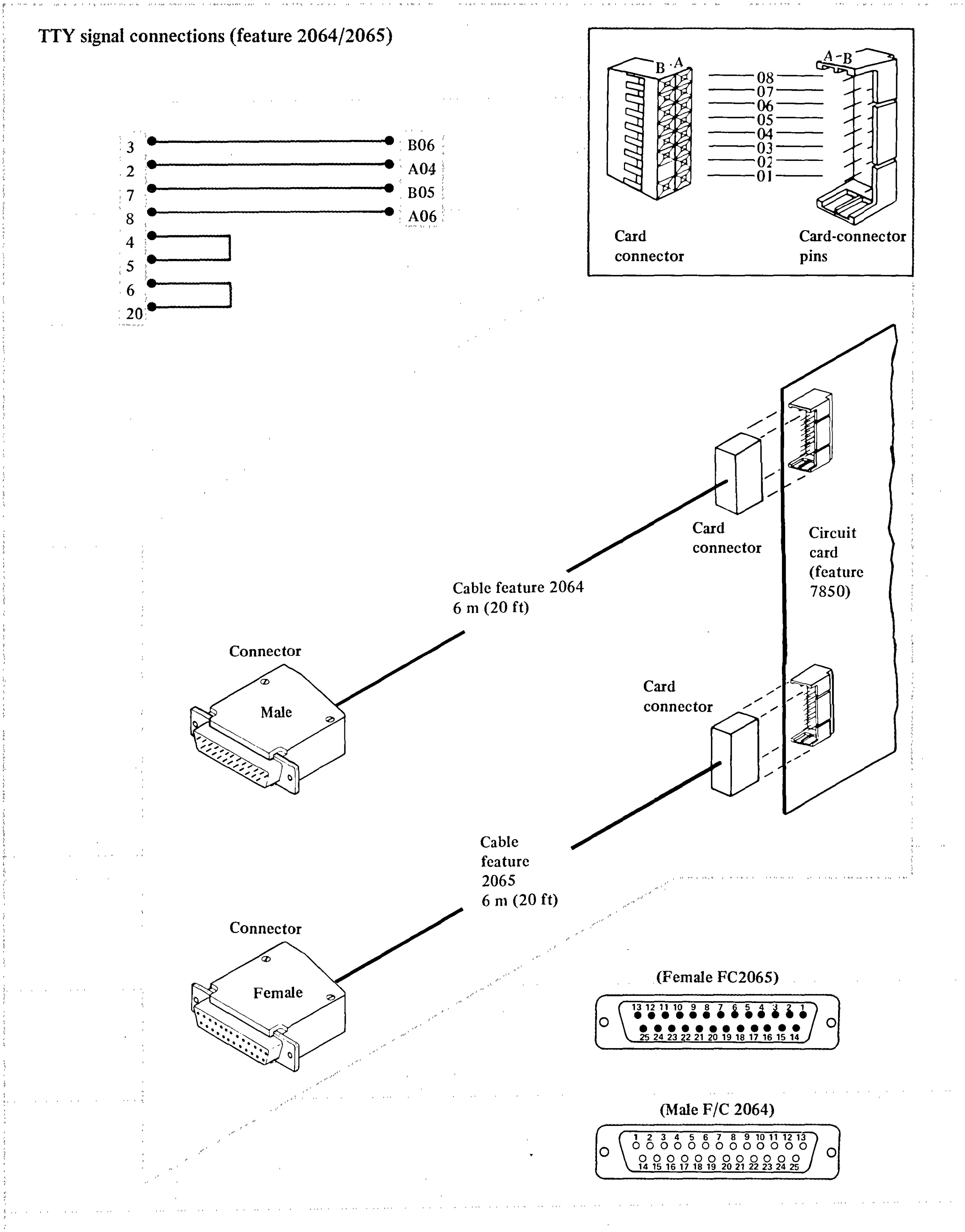


Figure 8-41. Cable connections for feature 7850 attachment

TTY signal connections (feature 2066)

Current loop with 3101 supplying all current (attached to feature 7850)

Note...
Feature 2066 is supplied in this format.

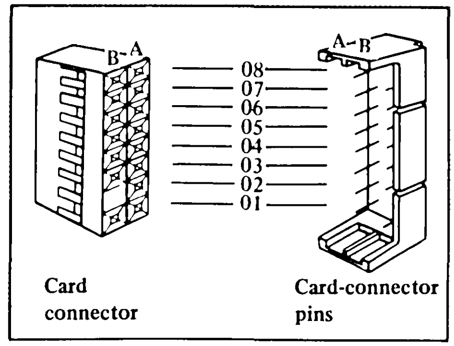
```
17 ●————————● A07
18 ●————————● A03
 7 ●————————● B05
25 ●————————● A01
15 ●———┐
23 ●———┘
24 ●———┐
 1 ●———┘
```

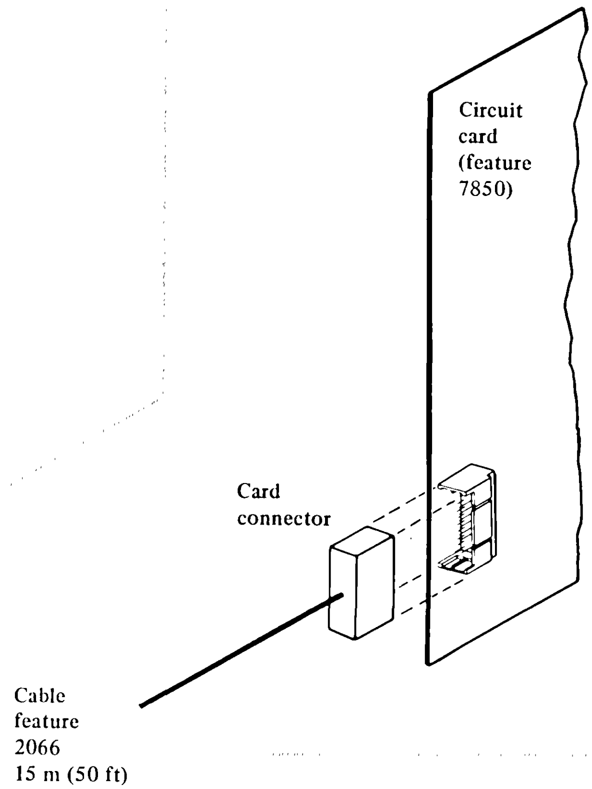
Current loop with feature 7850 supplying all current (attached to 3101)

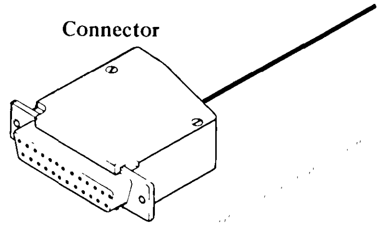
```
24 ●————————● A03
25 ●————————● B01
17 ●————————● B05
15 ●————————● A02
```

Current loop with 3101 and feature 7850 with each supplying its transmit loop current

```
17 ●————————● B05
15 ●————————● A02
18 ●————————● A03
25 ●————————● A01
 1 ●———┐
24 ●———┘
```







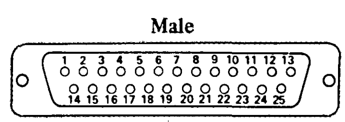


Figure 8-42. Cable connections for feature 7850 attachment

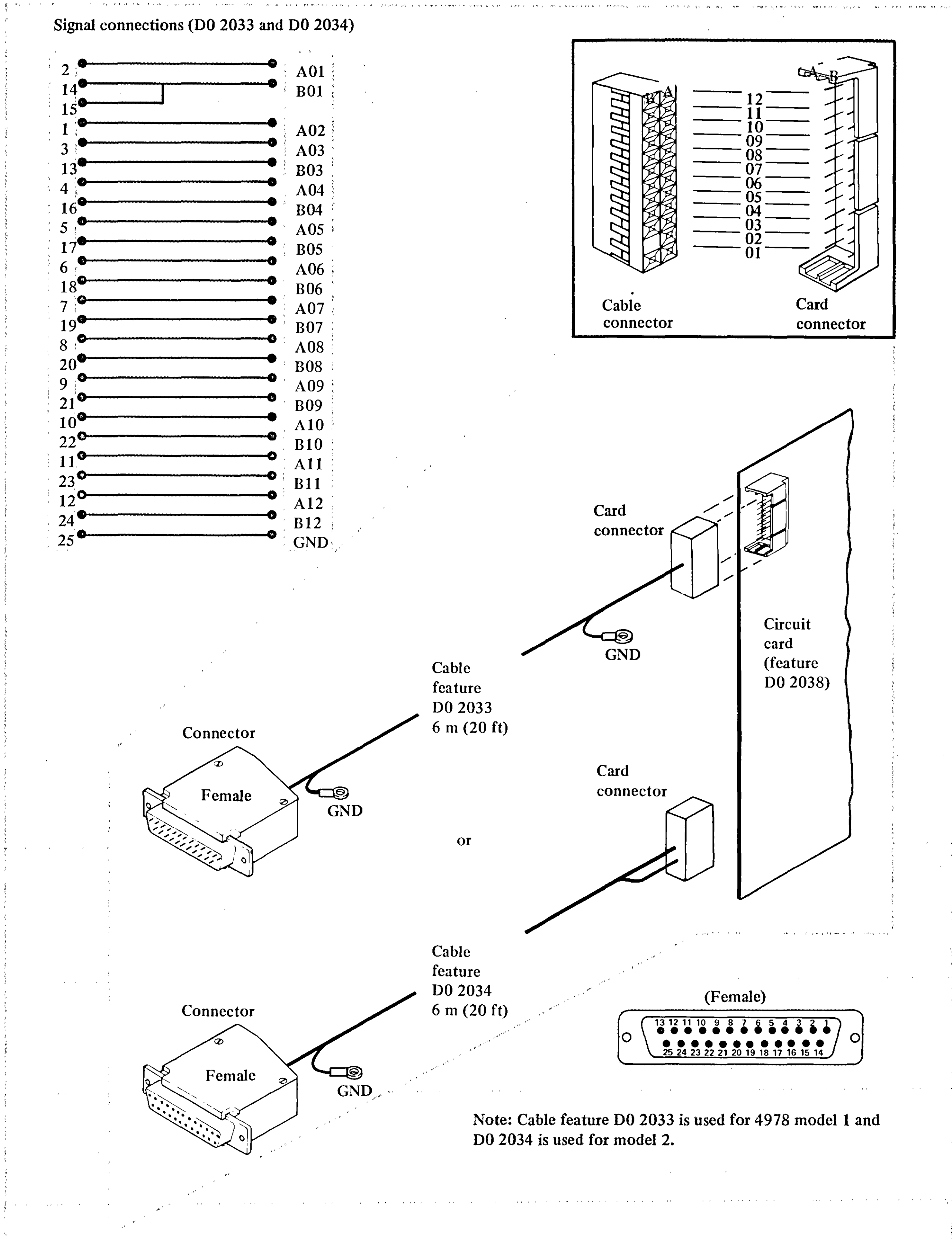
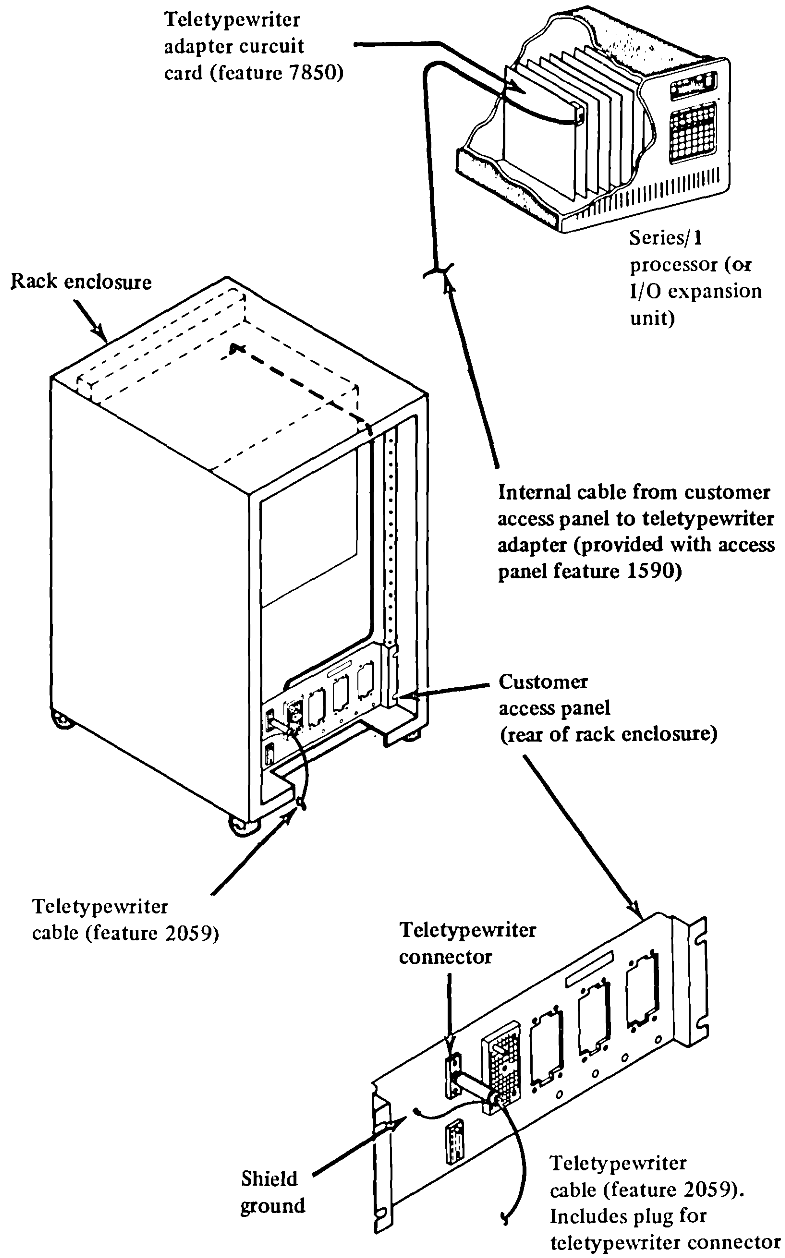


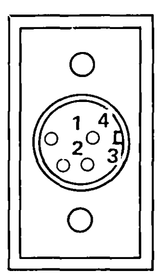
Figure 8-43. Cable connections for 4978 display station attachment

Connections made to the **customer access panel** use another optional cable. This cable includes the plug for the teletypewriter connector on the access panel (see Figure 8-44). The cable from the access panel to the teletypewriter adapter is provided with the access panel.

Teletype models ASR-33, ASR-35, and KSR-33 require 24 volts across their transmit output. For devices that require only 12 volts across their transmit output, pin B05 should be used instead of B01 at the adapter-card connector.



Signal connections for teletypewriter connector on customer access panel...



Feature card		Access panel	Teletypewriter	
Pin	Signal	Pin	Wire	Signal
B05	Transmit -	1	Black	Receive -
A02	Transmit +	2	Yellow	Receive +
B01	Receive -	3	White	Transmit -
A03	Receive +	4	Red	Transmit +

Figure 8-44. User connection to customer access panel for teletypewriter adapter

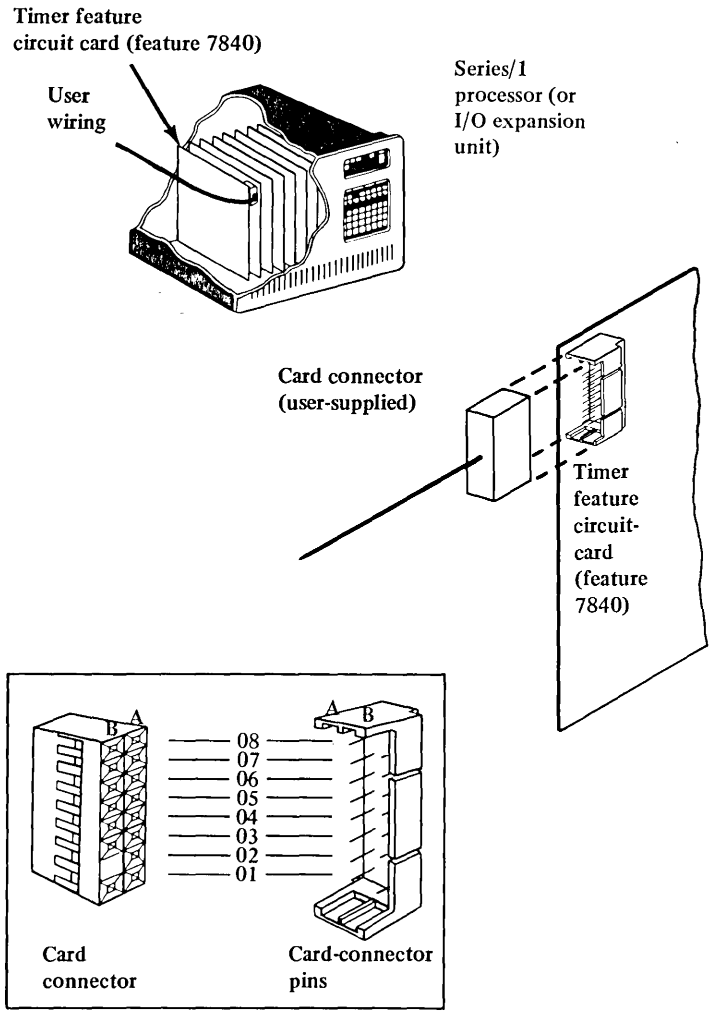
Timer feature

User connections to the timer feature can be made in **two ways**—either directly to the circuit card (Figure 8-45), or to the customer access panel (Figure 8-46).

Connections made **directly to the timer card** require a polarized 2 x 8 connector (Berg Electronics connector 65405-005, with pin sockets 47712, or equivalent) as shown in Figure 8-45.

Connections made to the **customer access panel** (Figure 8-46) use the connector plug supplied with the access panel.

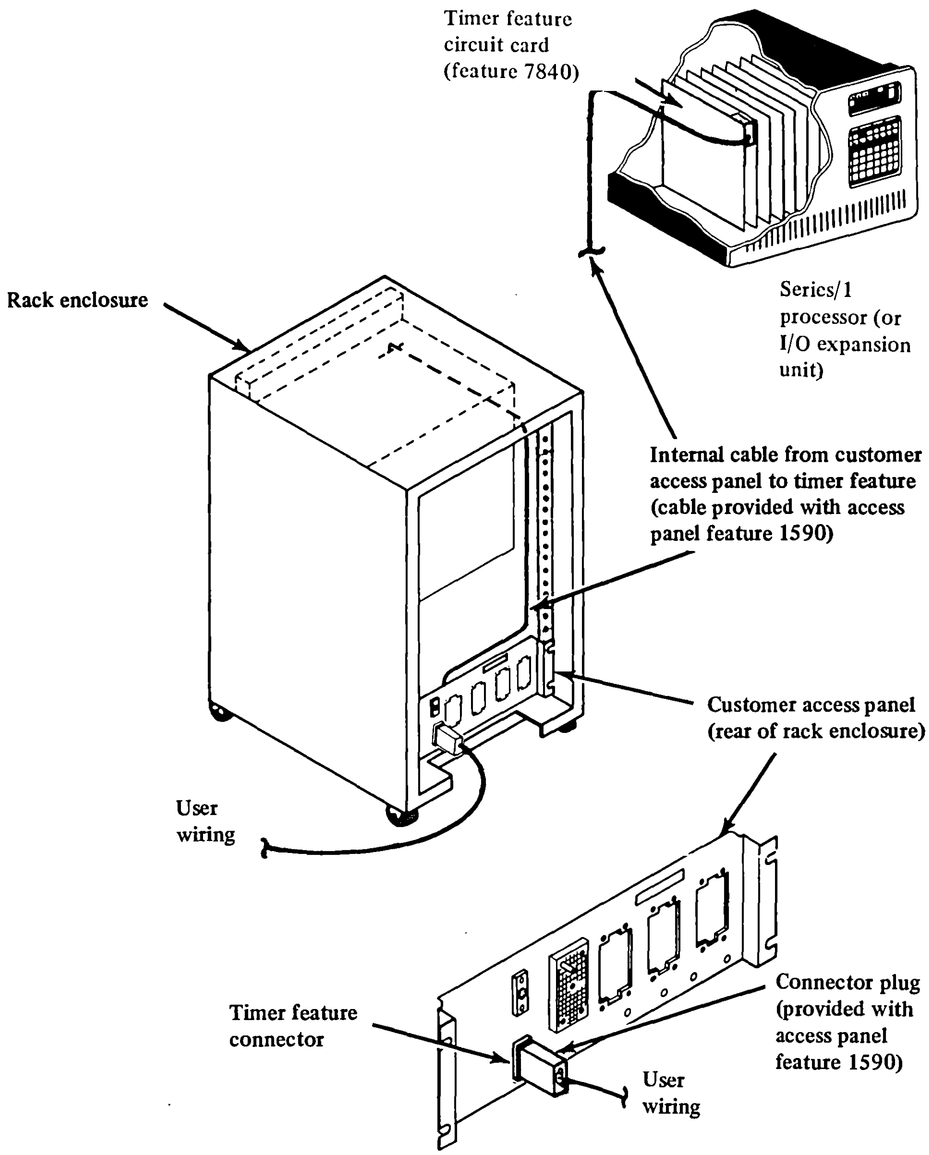
Recommended cable size is No. 24 AWG (0.511 mm). Signal connections are identified in Figures 8-24 and 8-25. Before connecting to your Series/1, verify signal connections in the diagrams shipped with the computer.



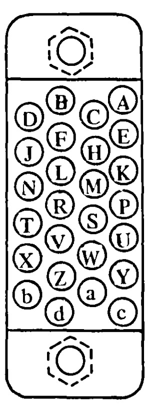
Signal connections for timer feature...

Signal	Pin	A	B	Pin	Signal
Frame ground strap	08	□	□	08	Timer 1 user clock
———	07	□	□	07	Timer 1 external gate
———	06	□	□	06	Timer 1 run state
Timer 0 signal gnd.	05	□	□	05	Timer 1 ext. gate enbl.
Timer 0 ext. gate enbl.	04	□	□	04	Timer 1 signal gnd.
Timer 0 run state	03	□	□	03	———
Timer 0 external gate	02	□		02	Polarity pin
Timer 0 user clock	01	□	□	01	———

Figure 8-45. User connection directly to timer-feature card



Signal connections for timer connector on customer access panel...



Timer 0		Timer 1	
Signal	**Pin**	**Pin**	**Signal**
Customer clock +	A	U	Customer clock +
Customer clock -	E	Y	Customer clock -
External gate +	C	S	External gate +
External gate -	H	W	External gate -
Run state +	B	V	Run state +
Run state -	F	Z	Run state -
Ext. gate enable +	D	T	Ext. gate enable +
Ext. gate enable -	J	X	Ext. gate enable -
Signal ground	K,M,L,N	c,a,d,b	Signal ground

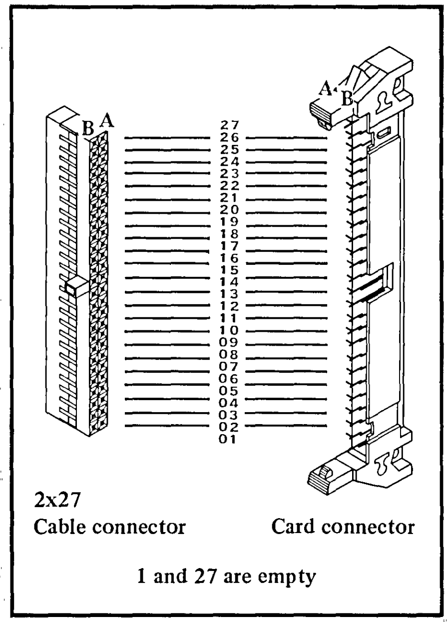
Figure 8-46. User connection to customer access panel for timer features

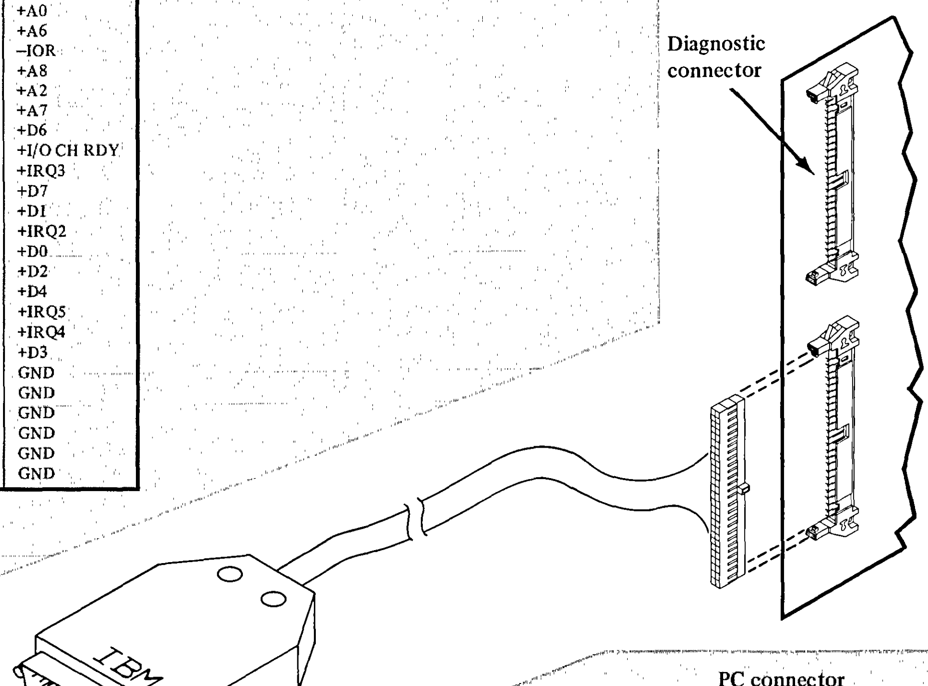
PC connector pins

J1 & J2 connector pins

Following is a list of the line names and the pins assigned at each end of the attachment/Personal Computer interface:

Attachment pin	PC pin	Signal
A15	3	+DIR
A13	4	+ENABLE
B24	7	+A17
B23	8	+A16
B12	9	+A5
B22	11	+A15
B18	12	+A11
B17	13	+A10
B16	14	+A9
B08	15	+A1
B10	16	+A3
B11	18	+A4
B03	20	–IOW
B20	21	+A13
A20	22	+D5
A08	28	+RESET
A06	29	+AEN
B26	30	+A19
B21	31	+A14
B19	32	+A12
B25	33	+A18
B04	34	–MEMR
B05	35	–MEMW
B07	36	+A0
B13	38	+A6
B02	39	–IOR
B15	40	+A8
B09	41	+A2
B14	42	+A7
A19	44	+D6
A14	45	+I/O CH RDY
A10	46	+IRQ3
A18	47	+D7
A24	48	+D1
A09	50	+IRQ2
A25	51	+D0
A23	52	+D2
A21	53	+D4
A12	54	+IRQ5
A11	55	+IRQ4
A22	56	+D3
A26	57	GND
A16	58	GND
B06	59	GND
A02	60	GND
A04	61	GND
A17	58	GND





PC connector (male, pin side)

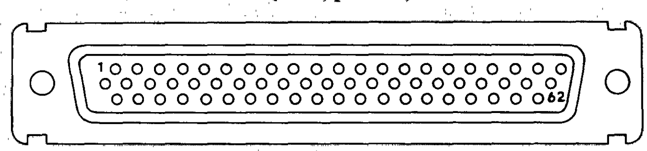


Figure 8-46A. User connection directly to PC feature card

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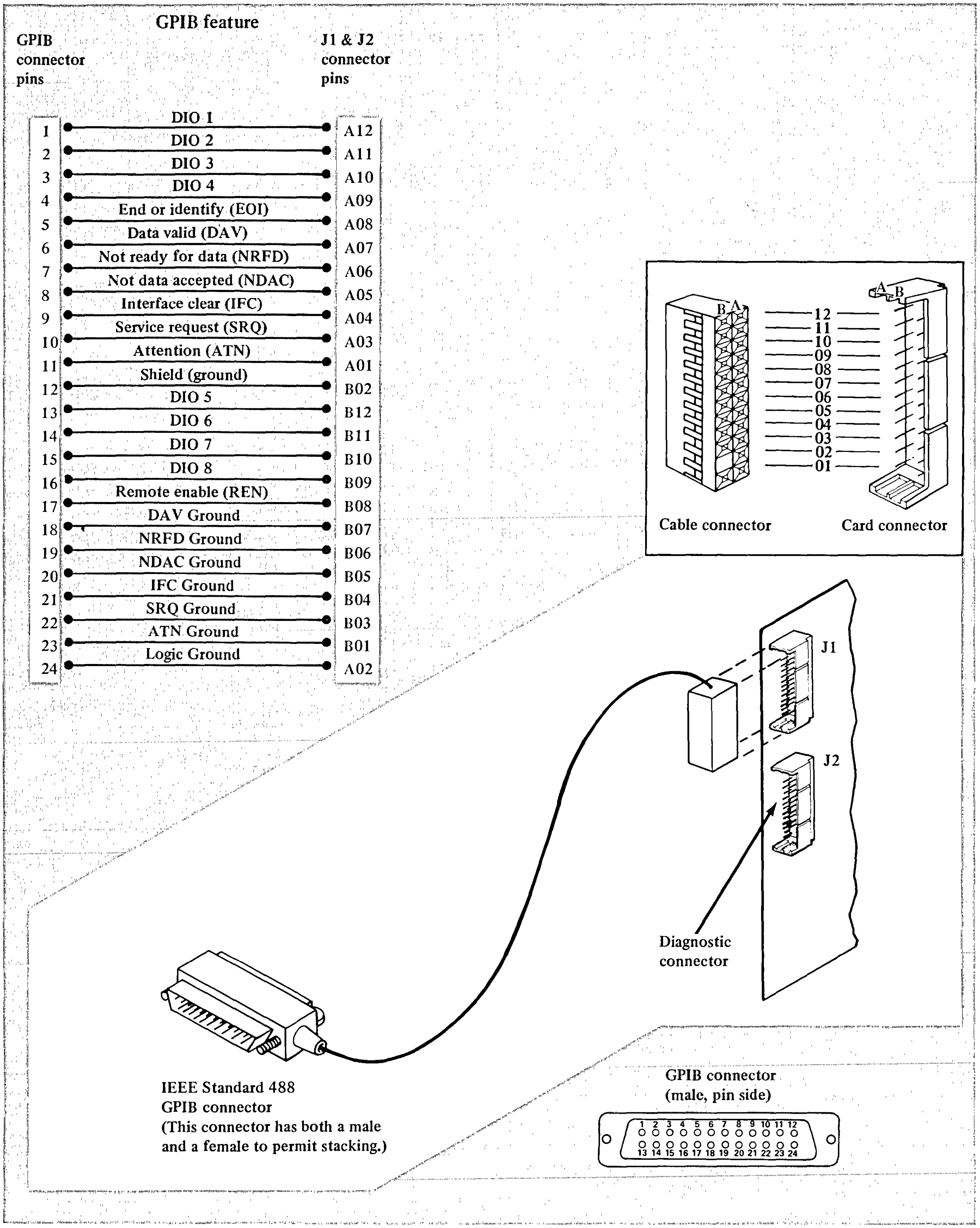
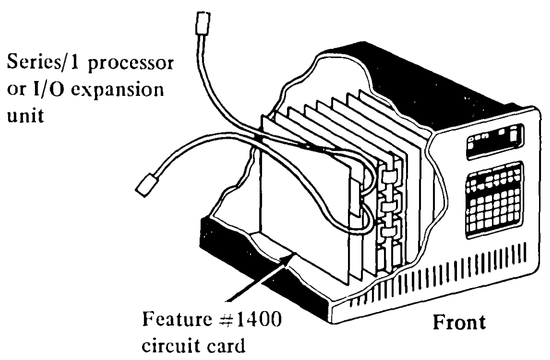


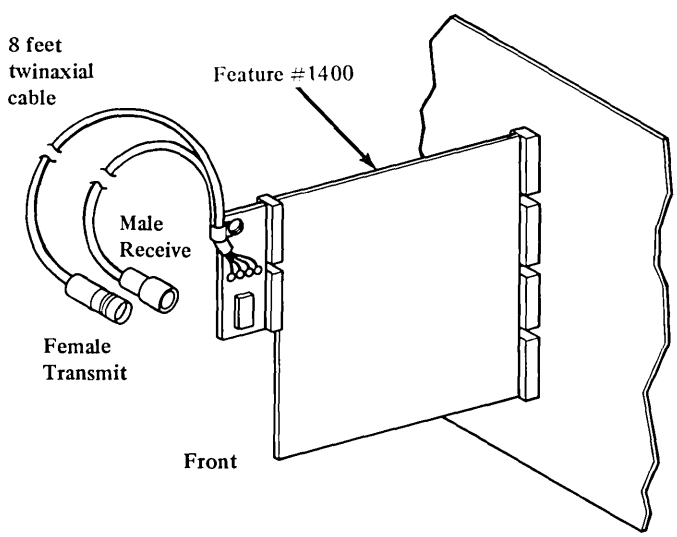
Figure 8-47. User connection directly to GPIB-feature card

Series/1 local communication controller feature

The Series/1 Local Communication Controller feature (feature #1400) fits into a Series/1 Processor or Input/Output Expansion unit and allows you to connect up to sixteen Series/1 processors.

You are responsible for supplying, installing, and maintaining cables for the feature #1400. The following shows the feature #1400 and explains how to order and install bulk cables.





Cable connection from 1400 feature to 1400 feature see Figure 8-52

Figure 8-48. Series/1 Local Communications Controller feature

See the *IBM Cabling System Planning and Installation Guide-Cable and Accessories*, GA27-3361, for information about ordering and installing the IBM Cabling System.

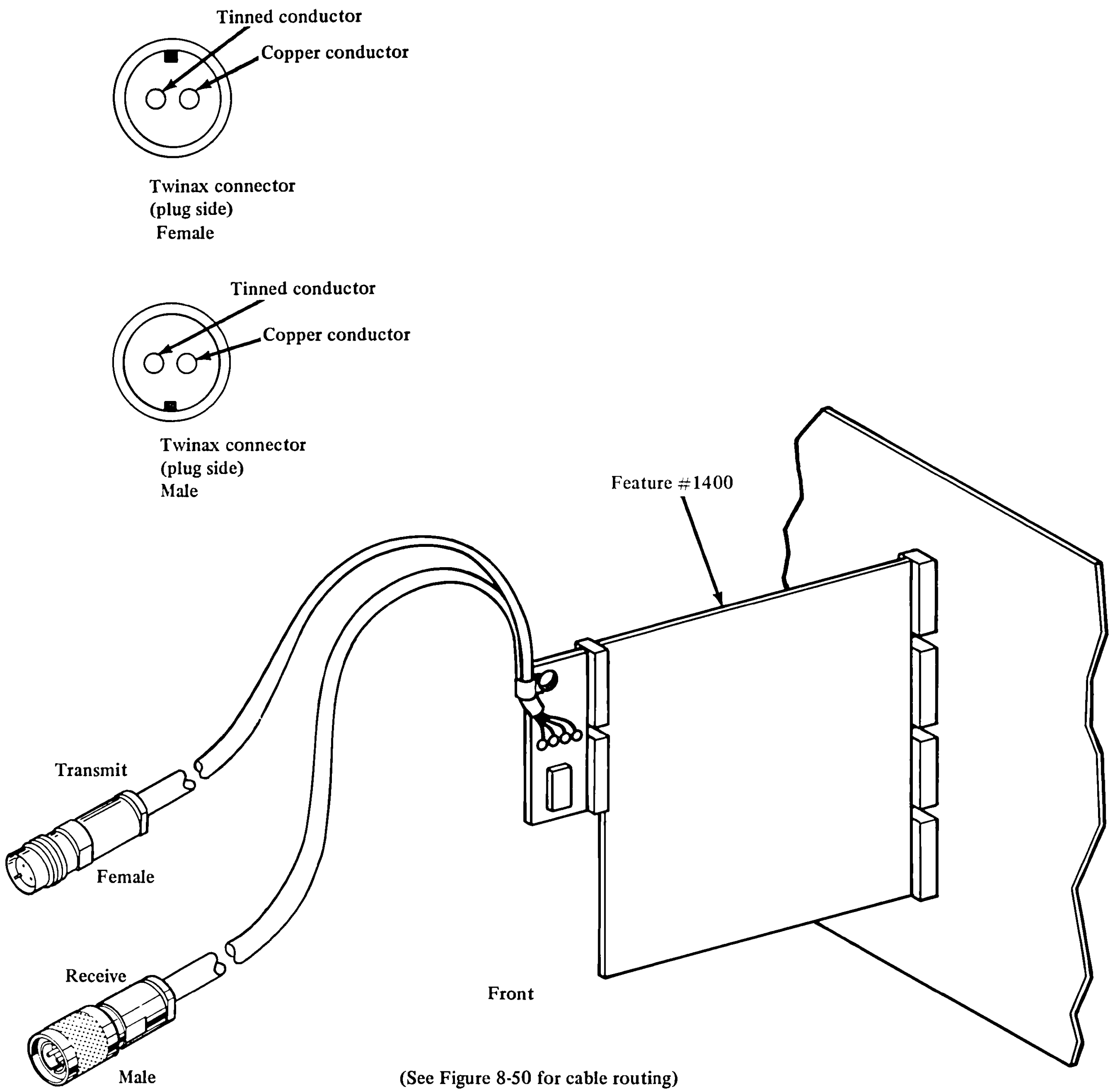
The following table provides order information for twinaxial and coaxial cable.

Part name	Twinaxial cable indoor or outdoor	Coaxial cable Indoor	Coaxial cable Outdoor
Cable Assembly[1] (cable in specified length with connectors at both ends)	IBM 4498426 (one male, one female) IBM 7362267 (2 male) Vinyl IBM 7362062 (2 male) Teflon®	IBM 2577672 (two male connectors)	IBM 1833108 (two male connectors)
Adapter[2] (cable to cable)	IBM 7362230 Amphenol 82-5588	IBM 5252643 Amphenol 31-219	IBM 5252643 Amphenol 31-219
Bulk Cable[1] (cable in specified length, without connectors)	IBM 7362211 Belden 9207 Vinyl IBM 7362061 Teflon®	IBM 323921 RG62 A/U	IBM 5252750 RG62 A/U
Connector Kit	IBM 4498427 (one male, one female) IBM 7362268 (2 male) for Vinyl cable IBM 7362063 (2 male) for Teflon® cable	IBM 1836418 (two male connectors)	IBM 1836419 (two male connectors)
Connector (single male)	IBM 7362229 Amphenol 82-5589	IBM 1836444 Amphenol 31-4541 Bendix 30220-3	IBM 1836447 Amphenol 31-4542 Bendix 39100-16
Station Protector	IBM 7362426	IBM 7362427	
Adapter[3], (single) (twinaxial-coaxial)	IBM P/N 7363102		
Connector (single female twinaxial)	IBM P/N 6838959 Amphenol 82-5591		

[1] Specify the total length of each cable required when ordering. For example, total length = (0.6 m + 1 m [2 ft. + 3.3 ft]) + (distance from table to host system). (0.6 m + 1 m [2 ft. + 3.3 ft.]) = additional clearance for serviceability and cleaning.) (See *Station Protectors* for sample station protector installation information.)

[2] Order one for coaxial cable.

[3] Order two for coaxial cable.



(See Figure 8-50 for cable routing)

Figure 8-49. Cable connections for feature 1400

Cable routing for feature # 1400

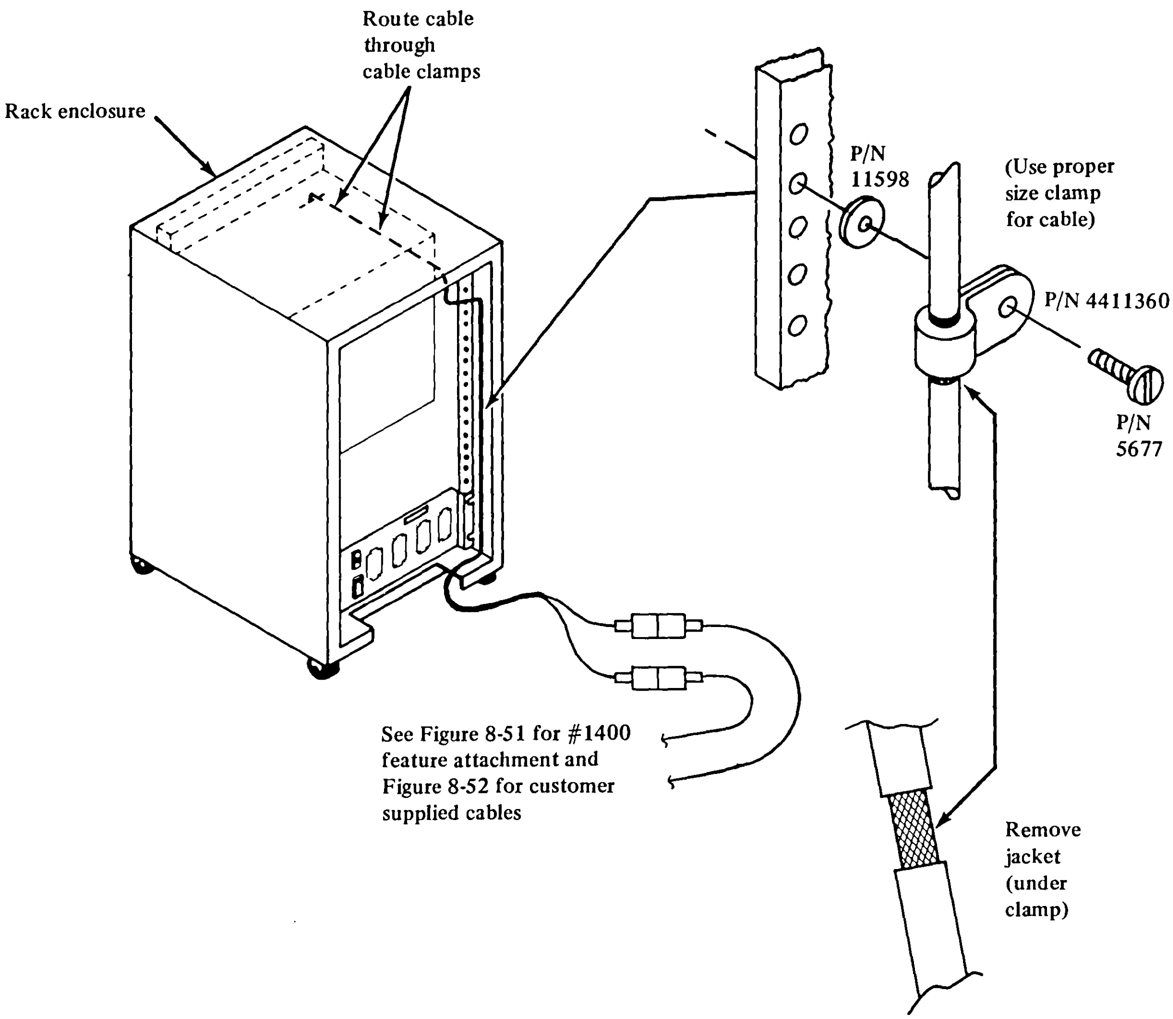


Figure 8-50. Cable routing for feature 1400

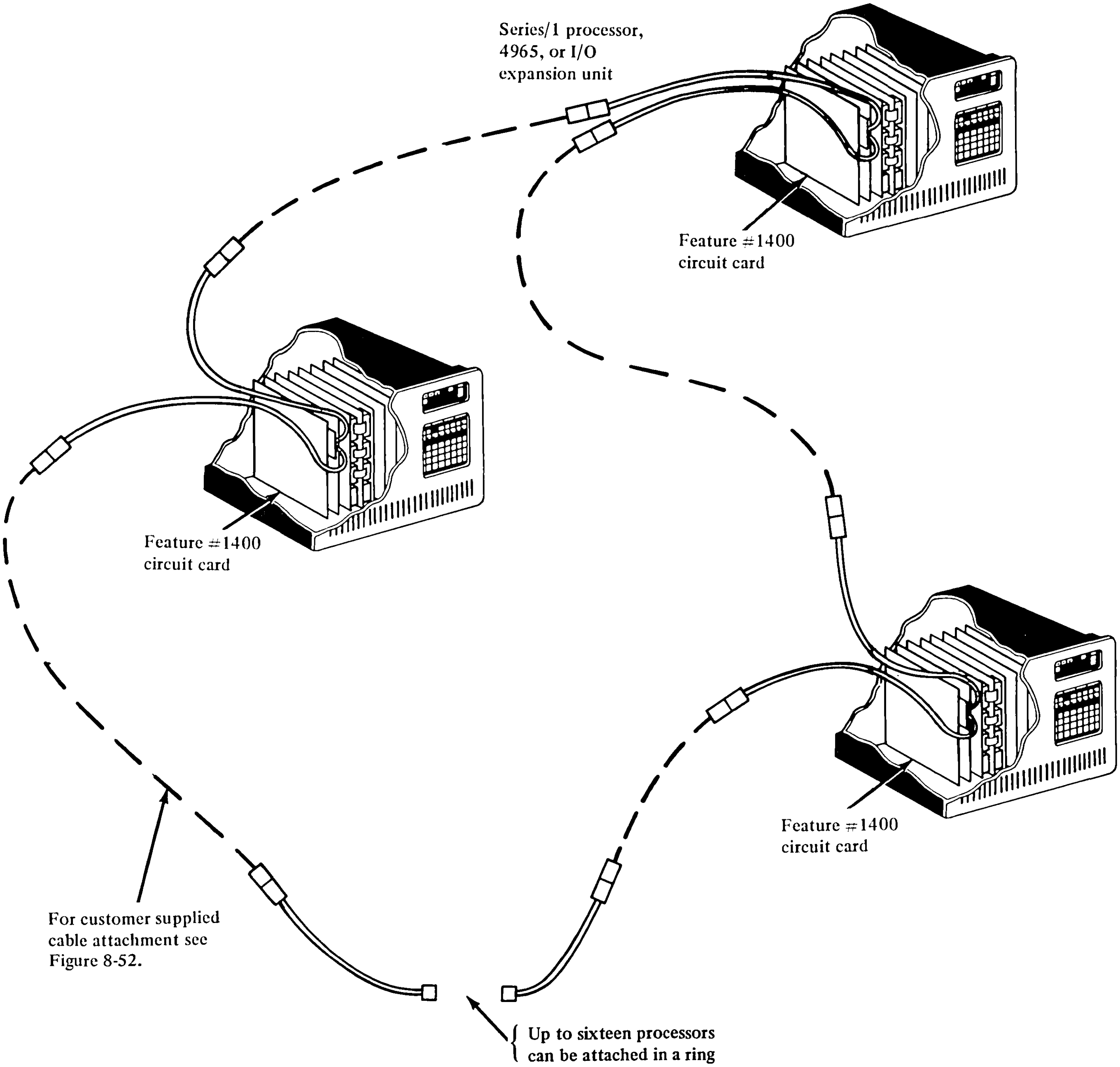


Figure 8-51. Feature 1400 sample configuration

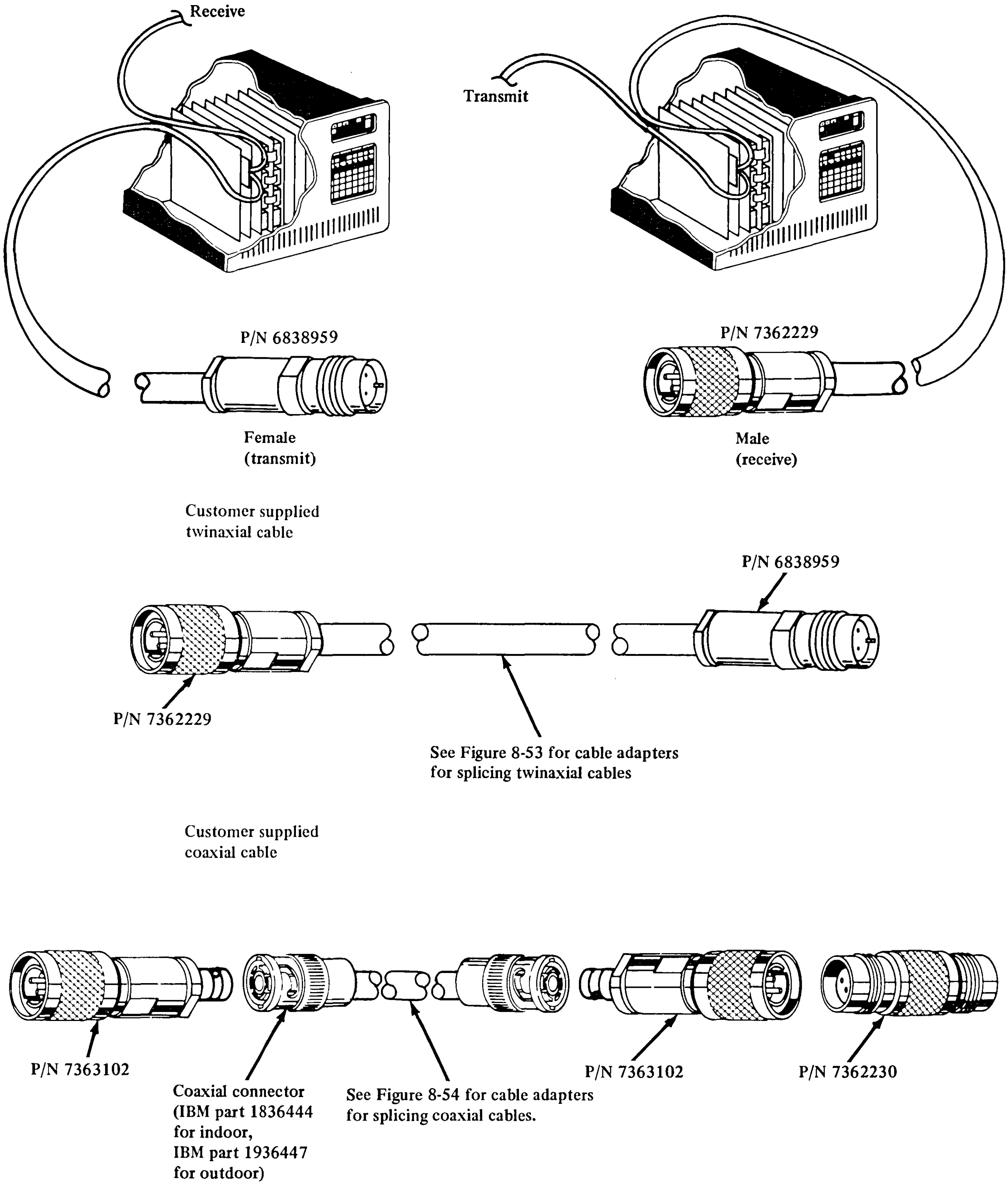


Figure 8-52. Customer supplied cable attachment

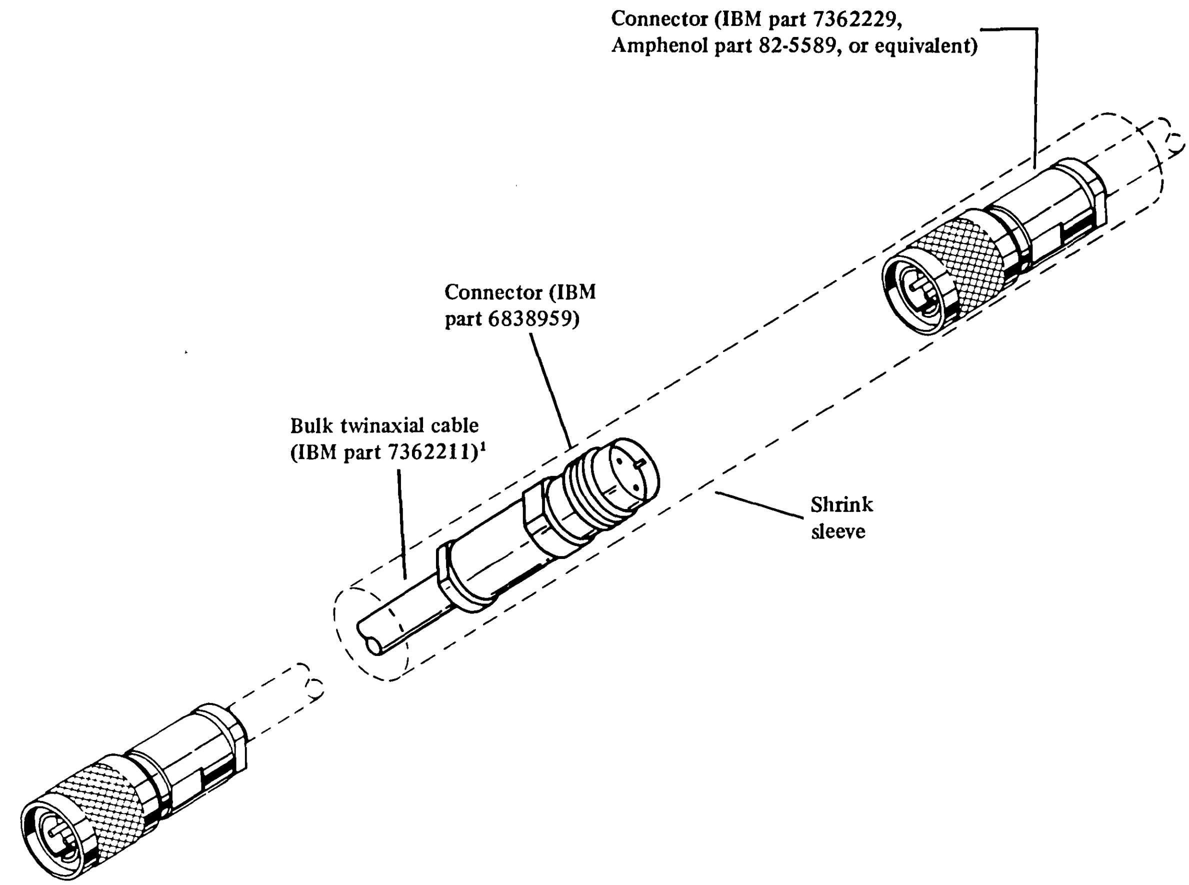
Cable Considerations

- You can use twinaxial coaxial, or IBM Cabling System cables with connectors for coupling the attachment to the customer supplied cables.
- The local communication controller feature line drivers allow a maximum cable length between features of 1,525 meters (5,000 feet) for IBM Cabling System cables for twinaxial, and 610 meters (2,000 feet) feet for coaxial before the line signal must be received or retransmitted by another local communication controller feature.
- It is recommended that the maximum distance between the LCC and the distribution panel not exceed 100 meters, (328 feet) in a building with two or more distribution panels, or 300 meters, (985 feet) in a building with one distribution panel.
- See the *IBM Cabling System Planning and Installation Guide-Cable and Accessories*, GA27-3361, for information about installing the IBM Cabling System cable and recommended cabling limitations.
- Do not mix cable types (twinaxial, coaxial, or IBM Cabling System) between attachments.
- Do not splice cables; use cable connectors.
- Attached cable connectors should be covered with shrink tubing to prevent accidental grounding of the connection
- Twinaxial cable can be ordered in a maximum length of 610 meters (2,000 feet).
- You can have up to four cable junctions between attachments.

Cable Splicing

Do not splice cables; instead, use connectors (IBM parts 6838959 and 7362229) or an equivalent for twinaxial cable and adapter IBM part 5252643, Amphenol part 31-219, or an equivalent for coaxial cable.

The attached cable connectors should be covered with shrink tubing to prevent accidental grounding of the connection. Figure 8-53 illustrates the cable adapter for joining twinaxial cables, and Figure 8-54 illustrates the cable adapter for splicing coaxial cables.



[1] Specify the total length of each cable ordered.

Figure 8-53. Cable splicing for twinaxial cables

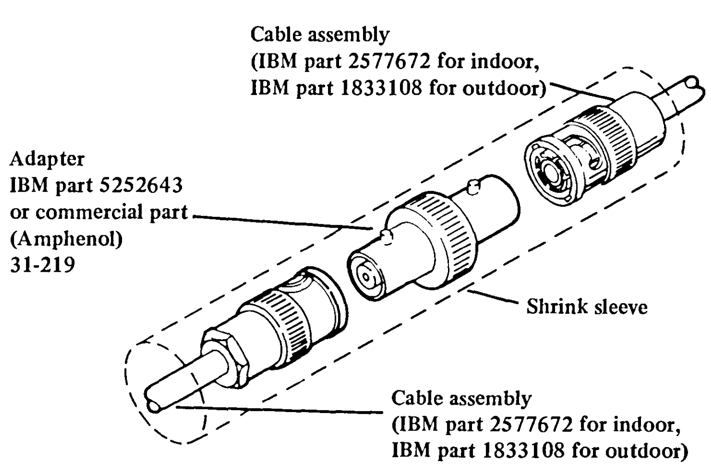


Figure 8-54. Cable adapter for splicing coaxial cables

Outdoor Cable Installation

You can use twinaxial or coaxial cable indoors or outdoors. (There are two types of coaxial cable to accommodate indoor and outdoor use.) For twinaxial or coaxial cable, you need some type of carrier to provide support every 3 meters (10 feet) for overhead installation. Twinaxial cable is not recommended for direct burial (without conduit). Outdoor connections are permitted only if the connections are potted in weatherproof compound. Also, for protection from lightning, you must attach a station protector (see *Station Protectors*) at each end of the cable that is run outdoors (for buried and overhead cables). Following is a list of suggested outdoor installation methods for twinaxial or coaxial cable. They are listed in the order that provides the greatest protection:

- Cable buried in grounded metal conduit.
- Overhead, shielded cable. This shield, which is in addition to the shield in the coaxial or twinaxial cable, should be grounded at each end and at each pole, if possible.
- Cable buried in metal conduit.
- Cable buried in nonmetallic conduit.
- Overhead cable on a carrier with the carrier grounded at each end and at each pole.
- Overhead cable under a shield line. The shield line is a metal cable run on the same poles. (Power lines can also have a shielding effect on cables.) The coaxial or twinaxial cable should hang at least 1 meter (3 feet) below the shield line and should be suspended on nonconducting hangers.

Note: For overhead cables, avoid having the coaxial or twinaxial cable as the highest point in the area. See *Wiring Methods* in this chapter for routing signal cable information.

Station Protectors

Station protectors are required for each outdoor or underground circuit run. A station protector provides for grounding of the cable shield for personnel safety. It also contains solid state components for unit protection. Station protectors must be installed indoors where the cable enters or exits the building. They should be as close as close as possible to a suitable ground. As defined by the National Electric Code (NEC), Article 500, station protectors must not be installed where combustible materials or other hazardous conditions exist; therefore, areas where cables enter and leave the building must meet NEC standards. Also, the station protector must be grounded at the building entrance or exit point (reference Article 800-31 in NEC).

You are responsible for supplying, installing, and maintaining station protectors. You can order a Twinaxial Station Protector Kit or a coaxial Station Protector Kit from IBM. (A kit consists of two station protectors and is sufficient to install one outdoor cable with a station protector at each end).

You can order single station protectors using IBM part 7362426 for twinaxial cable or IBM part 7362427 for coaxial cable.

If you want to connect the station protectors to your lines before the Local Communications Controller feature arrives, order the station protectors separately from your IBM representative, specifying a date earlier than the ship date.

Install the station protectors so that the components in them can be easily inspected and maintained, but cannot be accessed by unauthorized persons who might come in contact with them. During lightning storms, do not handle the station protectors or cable that runs from the protector to the terminal.

Note: Cables are attached to the station protectors using two connectors, IBM part 7362229 or equivalent. Therefore, modify cables fabricated with connector IBM part 6838959, or equivalent, at the station protector end by removing connector 6838959 and replacing it with connector IBM part 7362229, or equivalent.

Grounding Recommendations

You must provide good grounding (grounding conductor and grounding electrode) for the station protector. Following is a list of the minimum recommended requirements for station protector grounding. The grounding conductor should be:

- AWG 6-gauge wire or larger
- Less than 3 meters (10 feet) long
- Run in a straight line to a grounding electrode that has a ground resistance of less than 0.10 ohms.

Also provide common grounding among the station protector, the utility ground, and all extensive metal components in the vicinity of the system to prevent side flashes caused by lightning. The conductor used for interconnecting grounds should be at least AWG 6-gauge wire.

Station Protector Installation Requirements

The station protector should be installed in line with the cable as it enters or exits a building and should be permanently mounted in the building (see Figure 8-55). An example of station protector installations is shown in Figure 8-56.

Vibration limits

It is your responsibility to ensure that vibration does not exceed the specified levels. IBM feature #1400 is designed to operate within the following limits. If these vibration specifications are met, the feature #1400 specifications will be satisfied. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–13 Hz		
continuous	=	0.762 mm (0.030 in.) double amplitude
transient	=	1.016 mm (0.040 in.) double amplitude
13–45 Hz		
continuous	=	0.27 G peak acceleration
transient	=	0.37 G peak acceleration
45–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.75 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

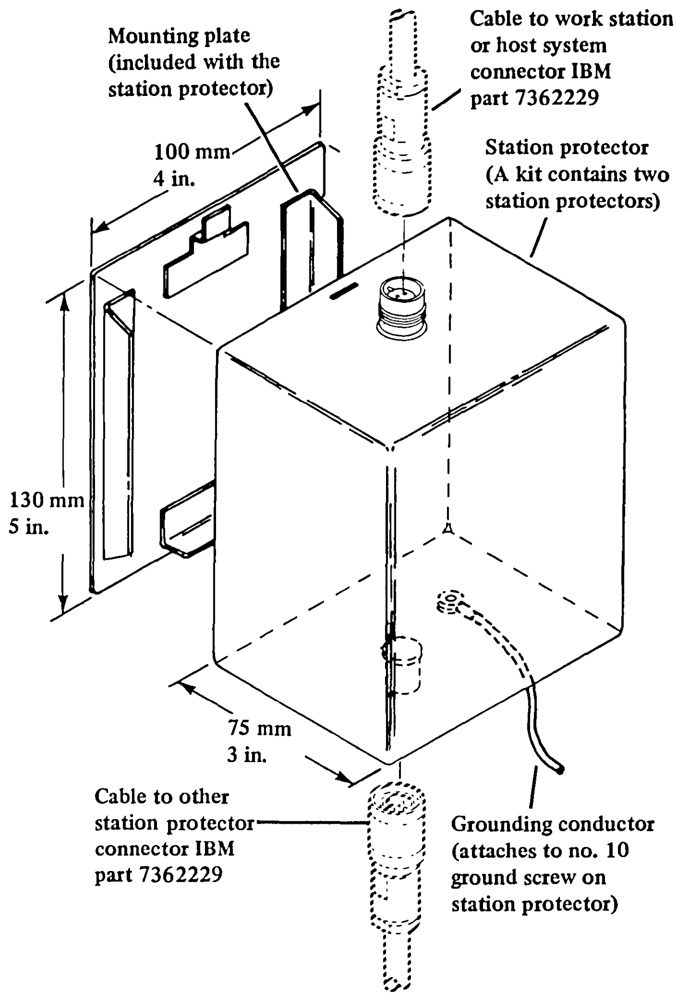


Figure 8-55. Station protector with entering/exiting cables

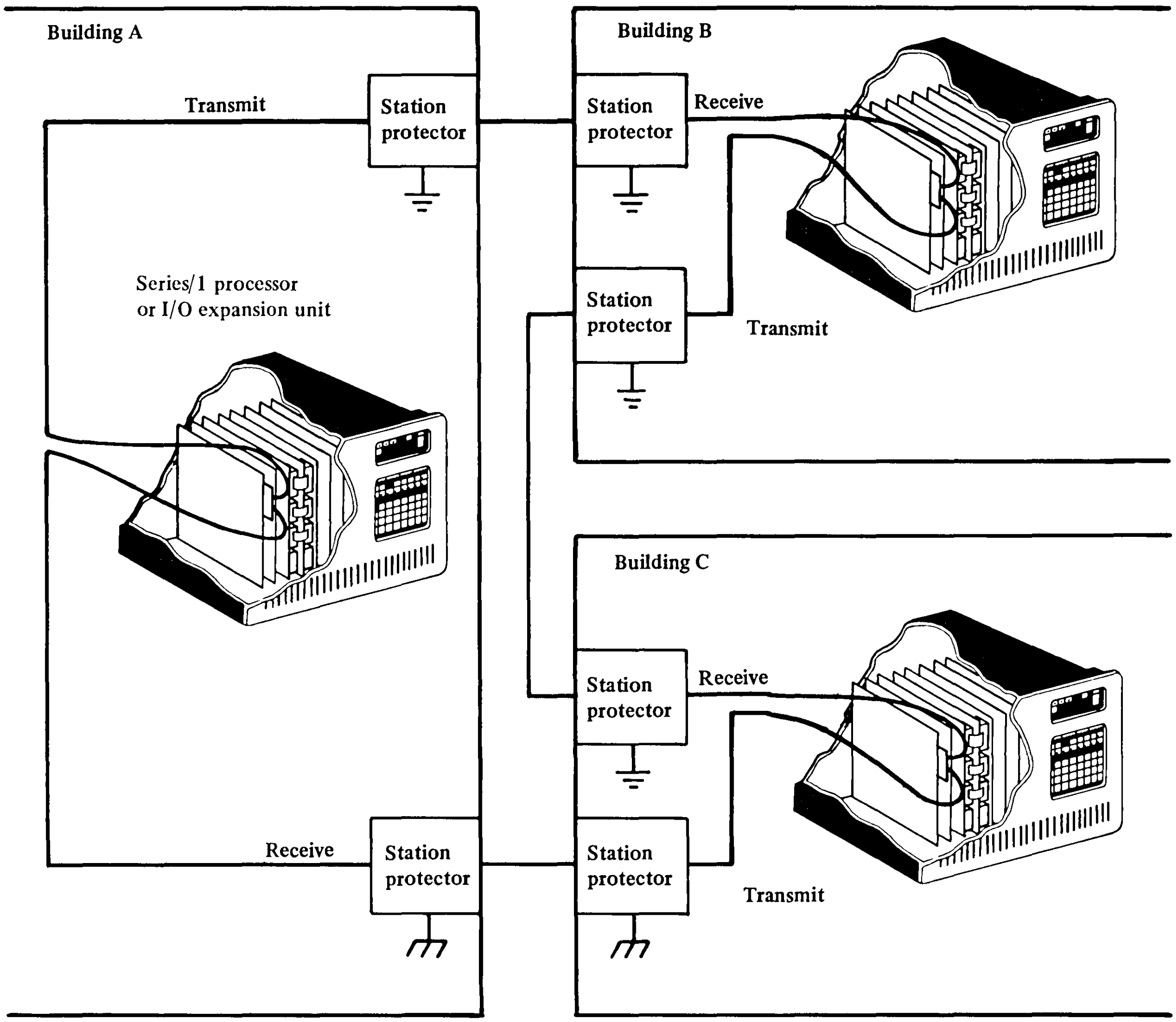


Figure 8-56. Sample station protector installations

Telephone Communication Controller Feature 7880

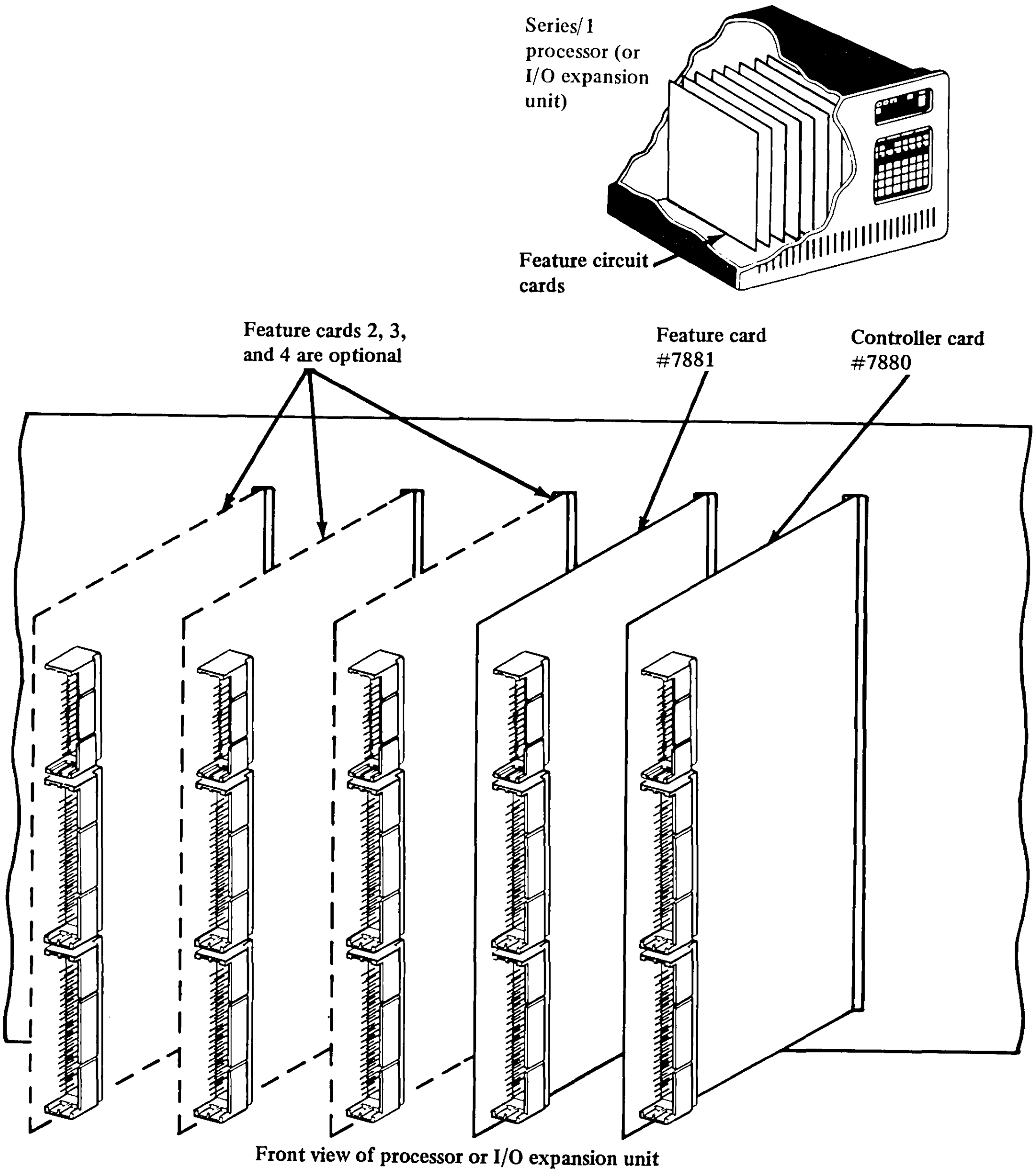
You need a Data Access Arrangement (DAA) or a Voice Connecting Arrangement (VCA)[5] to connect Telephone Communication Controller #7880 and communication adapter #7881 (Figure 8-57) to the telephone line.

Use the RPQ 8D0036 cable assembly to connect the Telephone Communication Adapter #7881 to a 1750/3750 Switching System.[6] The IBM Audio Distribution System Administrator's Guide gives more information about connecting this adapter.

Customer DAA/VCA connections

- Cable feature #2070 connects to the DAA (see Figure 8-58)
- Cable feature #2071 connects to the VCA (see Figure 8-59)
- DAA and VCA installation instructions are supplied with each unit (see Figure 8-61 and 8-62).

U.S. and Canada only
EMEA countries only

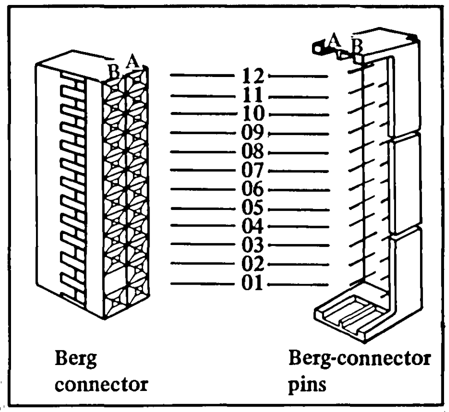


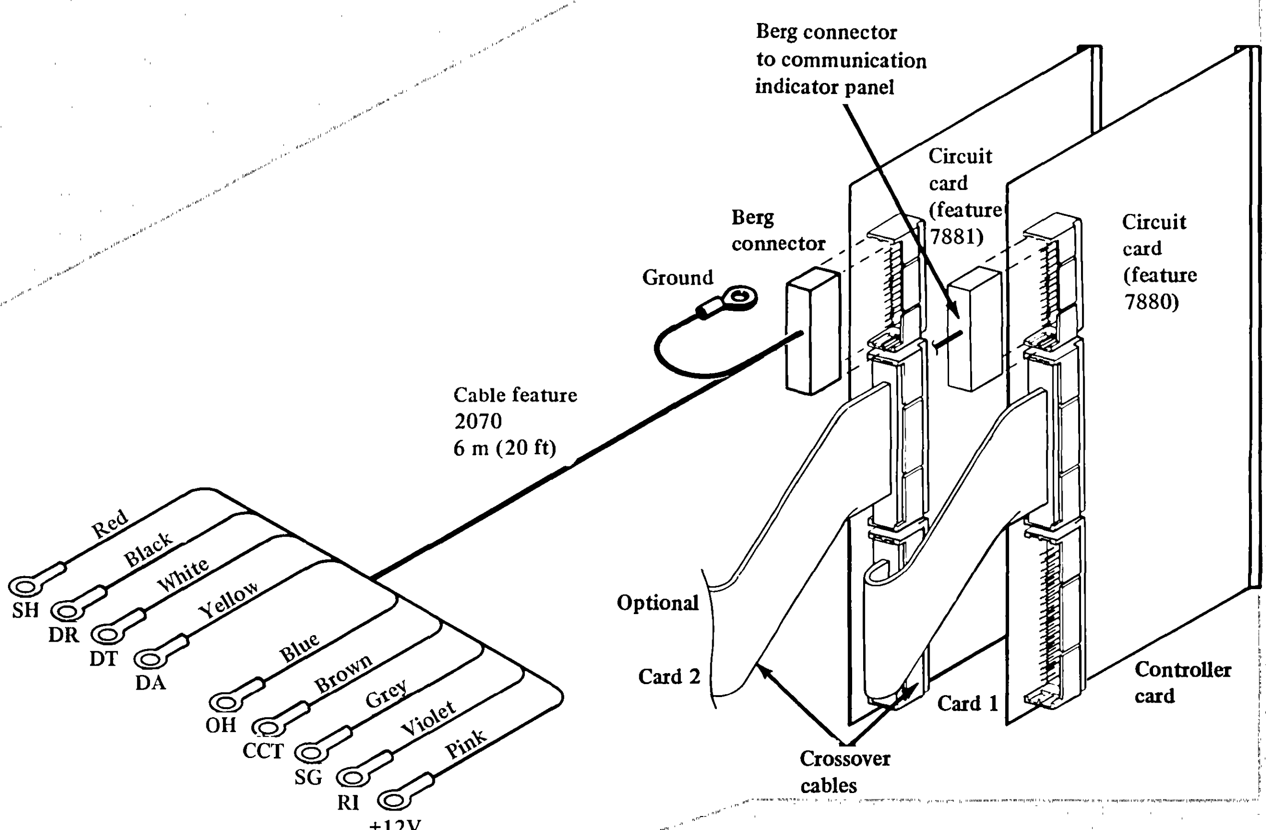
☐ See Figure 8-58 and Figure 8-59 for cable connections of features 2070 and 2071. See Figure 8-60 for cable routing.

Figure 8-57. Telephone communication controller attachment features

Signal connections (feature 2070)

Wire code	Signal	Berg connector
Grey	Signal ground (SG)	A04
Blue	Off hook (OH)	A05
Brown	Coupler cut-thru (CCT)	A08
Yellow	Data mode (DA)	A07
Black	Audio B (DR)	B03
Violet	Ring indicator (RI)	B08
Pink	+12V (Note)	B04
Red	Switch hook (SH)	B07
White	Audio A (DT)	B01
		A02
		A03
		B05
		A06





See Figure 8-60 for cable routing

See Figure 8-61 for connection of DAA

Note...

Customer option - If line busy is required for a non-operational port.

Figure 8-58. Cable and signal connections for feature 2070

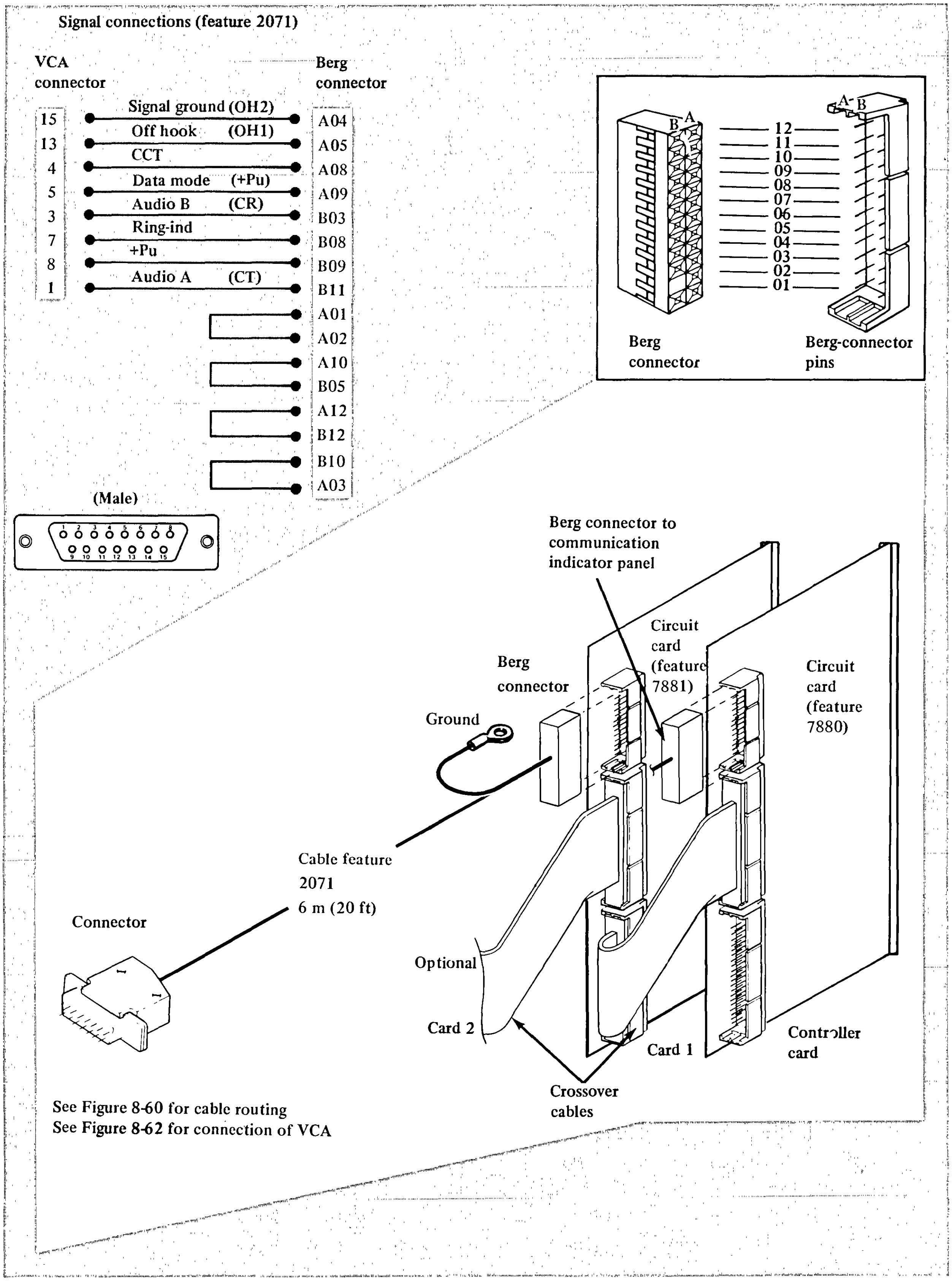


Figure 8-59. Cable and signal connections for feature 2071

Cable routing for 2070 and 2071 cable features

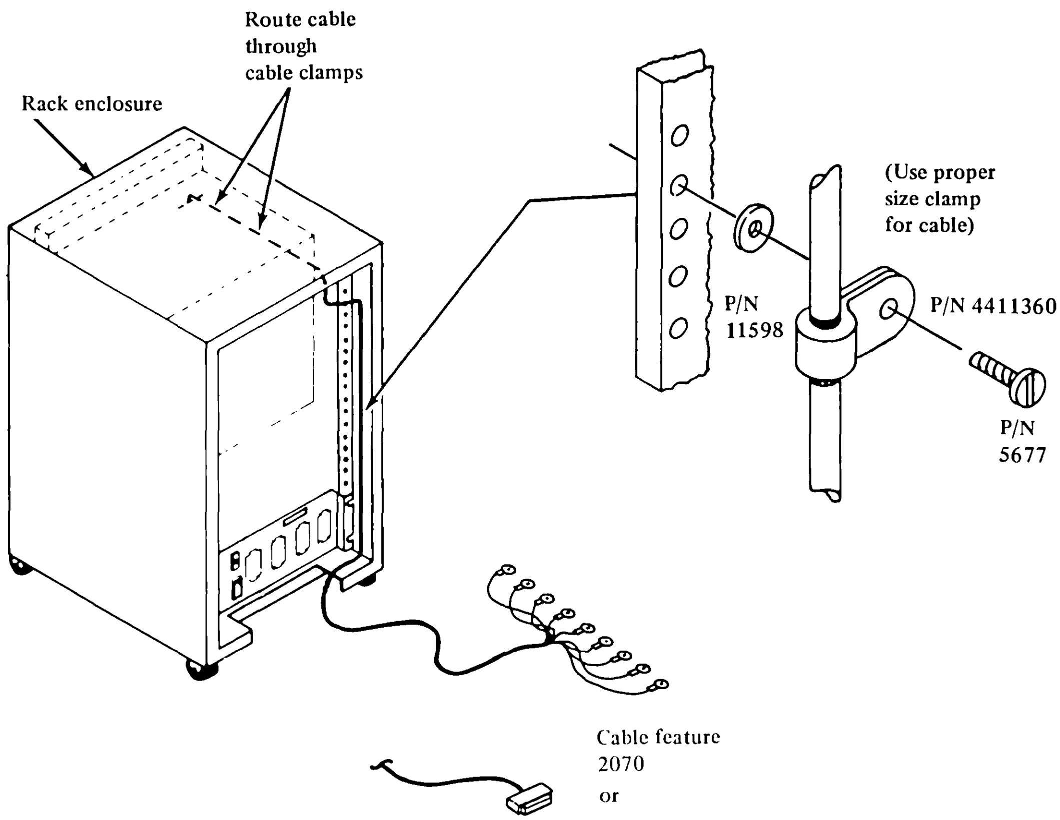
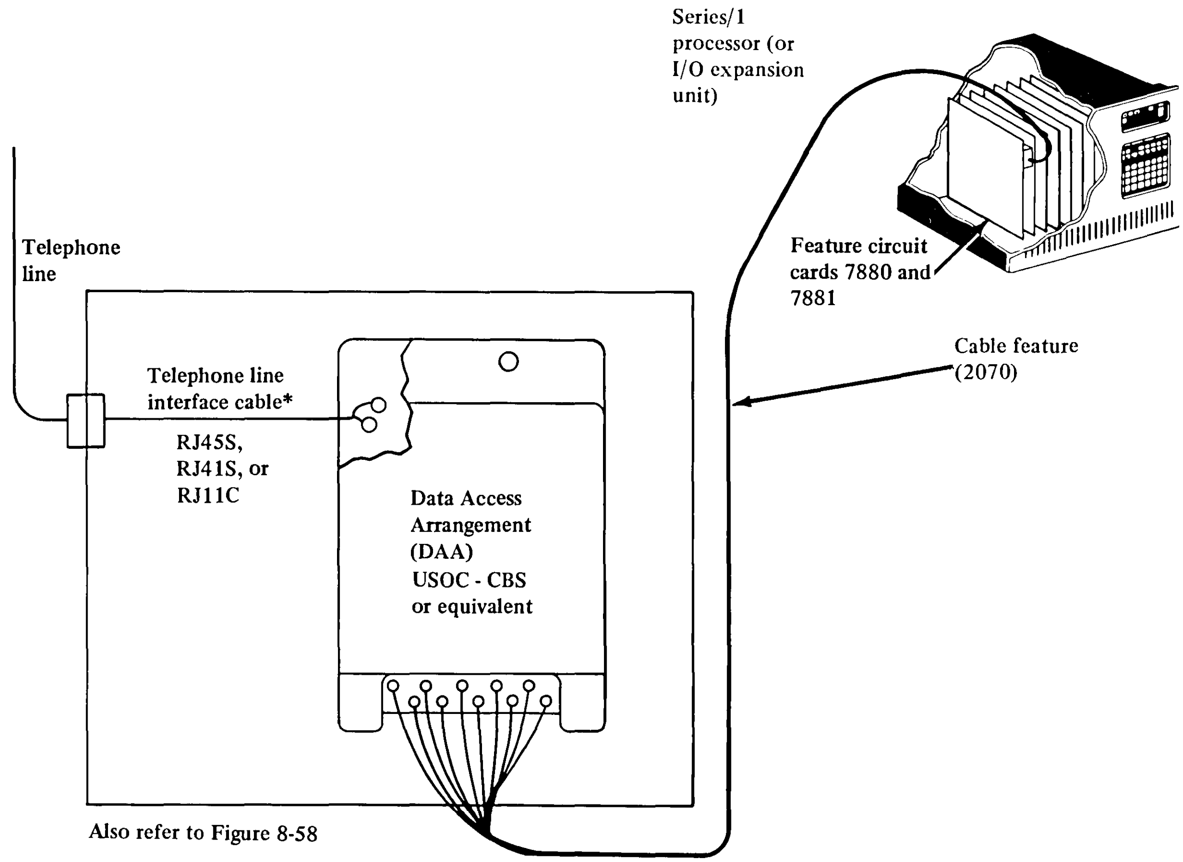


Figure 8-60. Cable routing for feature 2070/2071

DAA connection (feature 2070)

2070 cable		DAA
Grey	Sign Gnd	SG
Blue	Off hook	OH
Brown	Coupler cut-thru	CCT
Yellow	Data mode	DA
Black	Audio B	DR
Violet	Ring indicator	RI
Pink	+12V (Note)	+12V
Red	Switch hook	SH
White	Audio A	DT

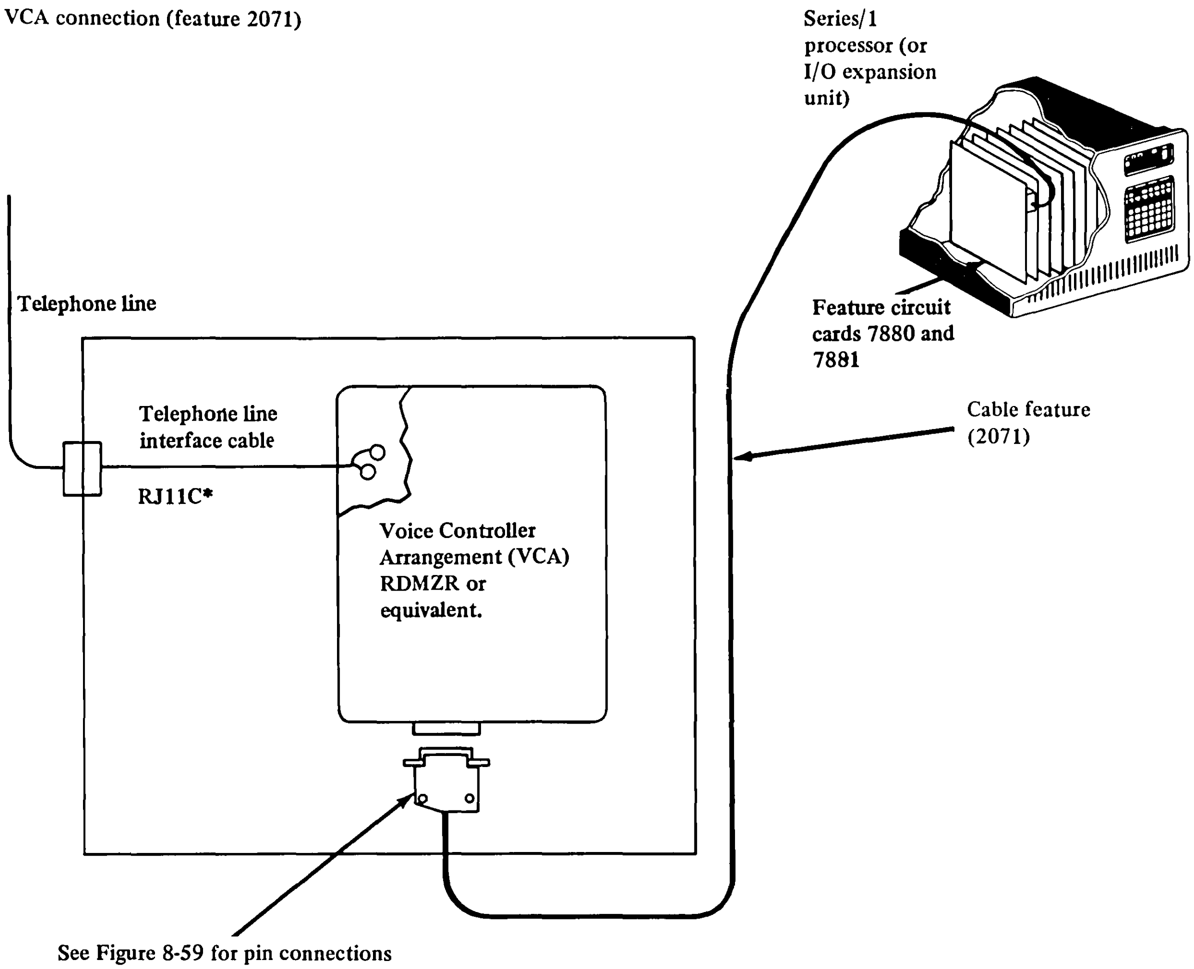


*DAA Cable options
RJ45S–6 pins wired for programmable jack
RJ41S–6 pins wired for fixed-loss jack
RJ11C–4 pins wired for permissive jack (recommended)

Note...
Customer option - If line busy is required for a non-operational port.

Figure 8-61. DAA connection example

VCA connection (feature 2071)



*The VCA can use various connecting services. Consult the documentation of the specific VCA selected for cable options.

Figure 8-62. VCA connection example

Multifunction Attachment Feature

The Multifunction attachment feature 1310 card can be plugged into a Series/1 processor or I/O expansion unit. The attachment provides four serial input/output (I/O) ports for the connections of the following devices:

- IBM Series/1 4975 printers, models 1L, 1R, 2L, and 2R
- IBM 3101 Display terminals, models 10, 12, 13, 20, 22, and 23 using RS-232-C interface and models 13 and 23 using RS-422-A interface
- Asynchronous/synchronous terminals using the RS-232-C interface
- A binary synchronous terminal or host system using the RS-232-C interface
- A combination of up to four IBM 3101 Display terminals and/or 4975 printers, using the RS-422 interface, can be configured for local attachment mode.

Additional information about IBM Series/1 4975 printers can be found in *IBM Series/1 4975 Printers and Multifunction Attachment Feature Description*, GA34-0144. Figure 8-63 shows feature 1310 and Figure 8-64 shows a sample configuration.

Cable considerations

You can use either IBM Cabling System cable and accessories or 22 gauge dual shielded twisted pair cable (see Card and connector table, Page 6-12). connect feature 1310 to the following:

- IBM 3101 Display Terminal Models 13 and 23 with the RS-422A interface.
- 4975 Printer Models 01L and 02L with the RS-422A interface.

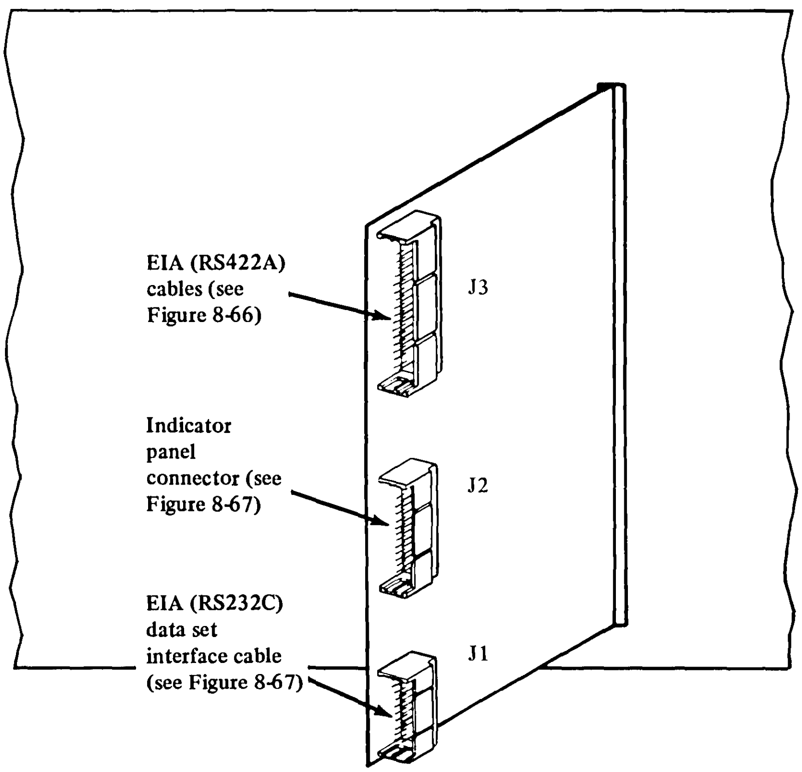
For IBM Cabling System cable, the distance between feature 1310 and the distribution panel should not exceed 100 meters (328 feet). Total IBM Cabling System cable length cannot exceed 600 meters (2,000 feet). See *IBM Cabling System Planning and Installation Guide-Cable and Accessories*, GA27-3361, Chapter 4, for information about installing IBM Cabling System cable.

Do not install cable outdoors for a feature 1310, 3101 Display Terminal or IBM 4975 Printer.

Vibration limits

It is your responsibility to ensure that vibration does not exceed the specified levels. IBM feature 1310 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration



□ **Cable connections for card connectors see Figure 8-65 through 8-70**

Figure 8-63. Multifunction attachment feature 1310

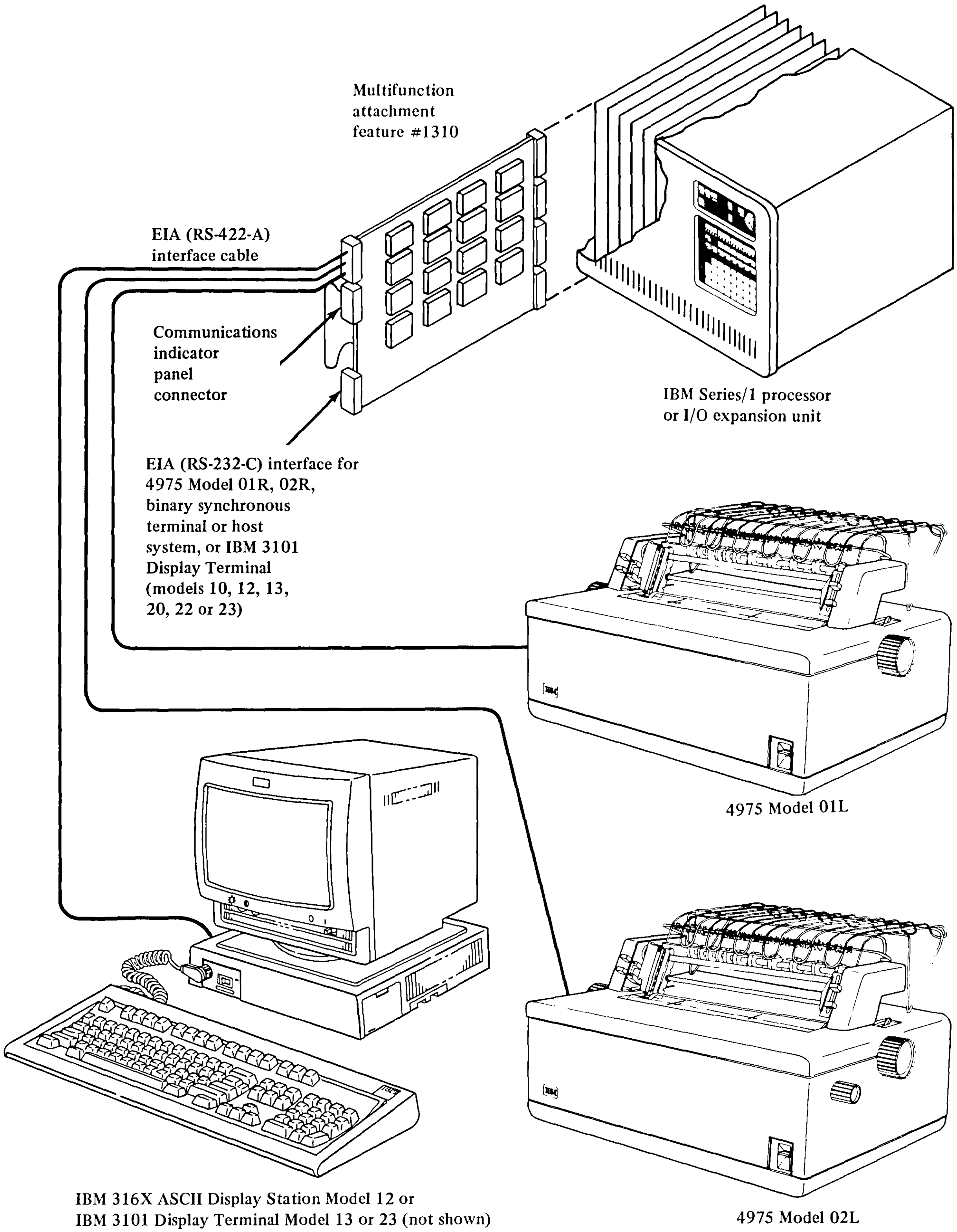


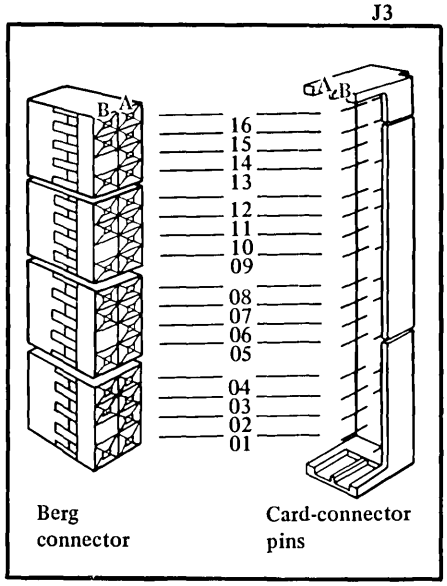
Figure 8-64. Sample configuration

J3 Berg connector signal connections

A16	Transmit (–) data	Port 0	See feature 5770 and 5790
B16	Receive (–) data		
A13	Transmit (+) data		
B13	Receive (+) data		
A12	Transmit (–) data	Port 1	
B12	Receive (–) data		
A09	Transmit (+) data		
B09	Receive (+) data		
A08	Transmit (–) data	Port 2	
B08	Receive (–) data		
A05	Transmit (+) data		
B05	Receive (+) data		
A04	Transmit (–) data	Port 3	
B04	Receive (–) data		
A01	Transmit (+) data		
B01	Receive (+) data		

For cable connection information see Figure 8-66 Part 1 and 2

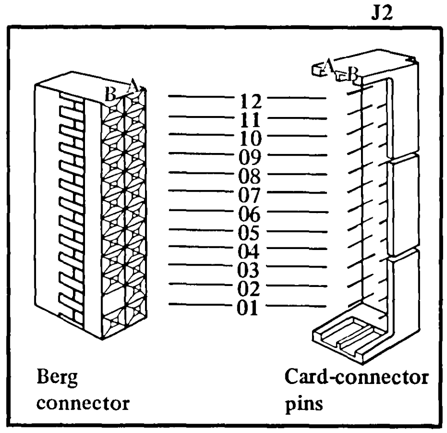
J3



J2 Berg connector signal connections

Pin	Signal
B05	Function/display switch 01
A06	Function/display switch 02
B06	Function/display switch 04
A07	Function/display switch 08
B07	Function/display switch 16
B01	Ground
B12	Lamp driver 00
A12	Lamp driver 01
B11	Lamp driver 02
A11	Lamp driver 03
B10	Lamp driver 04
A10	Lamp driver 05
B09	Lamp driver 06
A09	Lamp driver 07
A04	Line select switch 01
B04	Line select switch 02
A05	Line select switch 04
A03	+5 volts

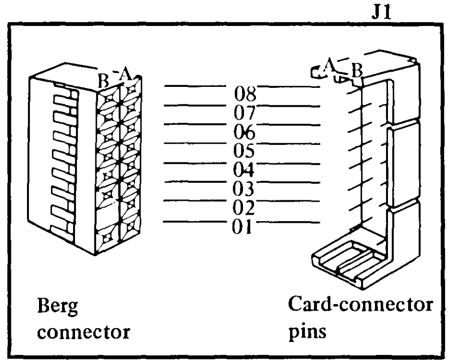
J2



J1 Berg connector signal connections

Pin	Signal	
B03	Clear to send	See features 2056 and 2057
B01	Data set ready	
A02	Data signal rate select	
A01	Data terminal ready	
B06	Receive clock	
B04	Receive data	
A03	Request to send	
B07	Ring indicator	
A08	Signal ground	
A06	Transmit clock	
A04	Transmit data	

J1



For cable connection information see Figure 8-67

Figure 8-65. Signal connections for feature 1310

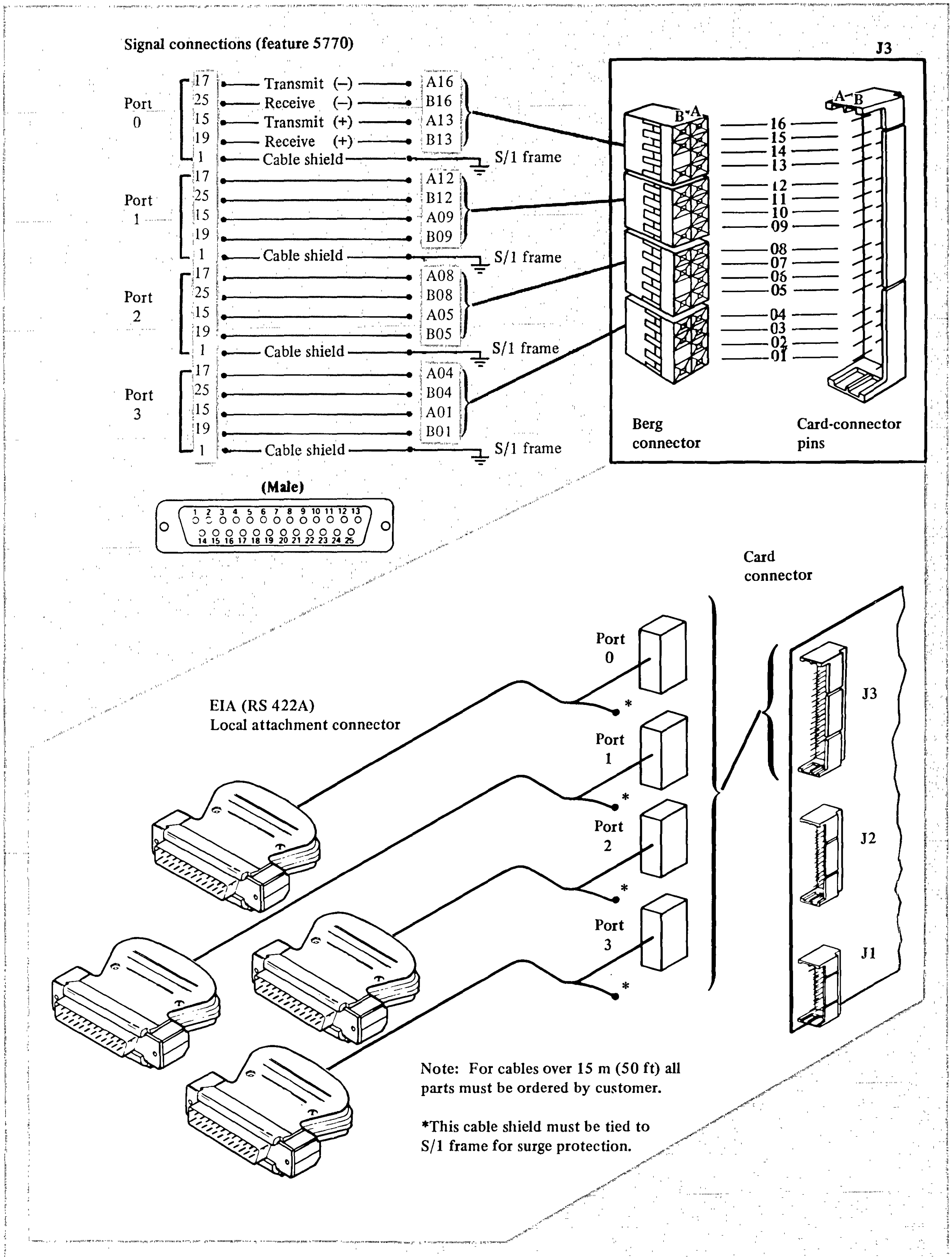


Figure 8-66 (Part 1). Feature 1310 cable and signal connections for 5770 cables

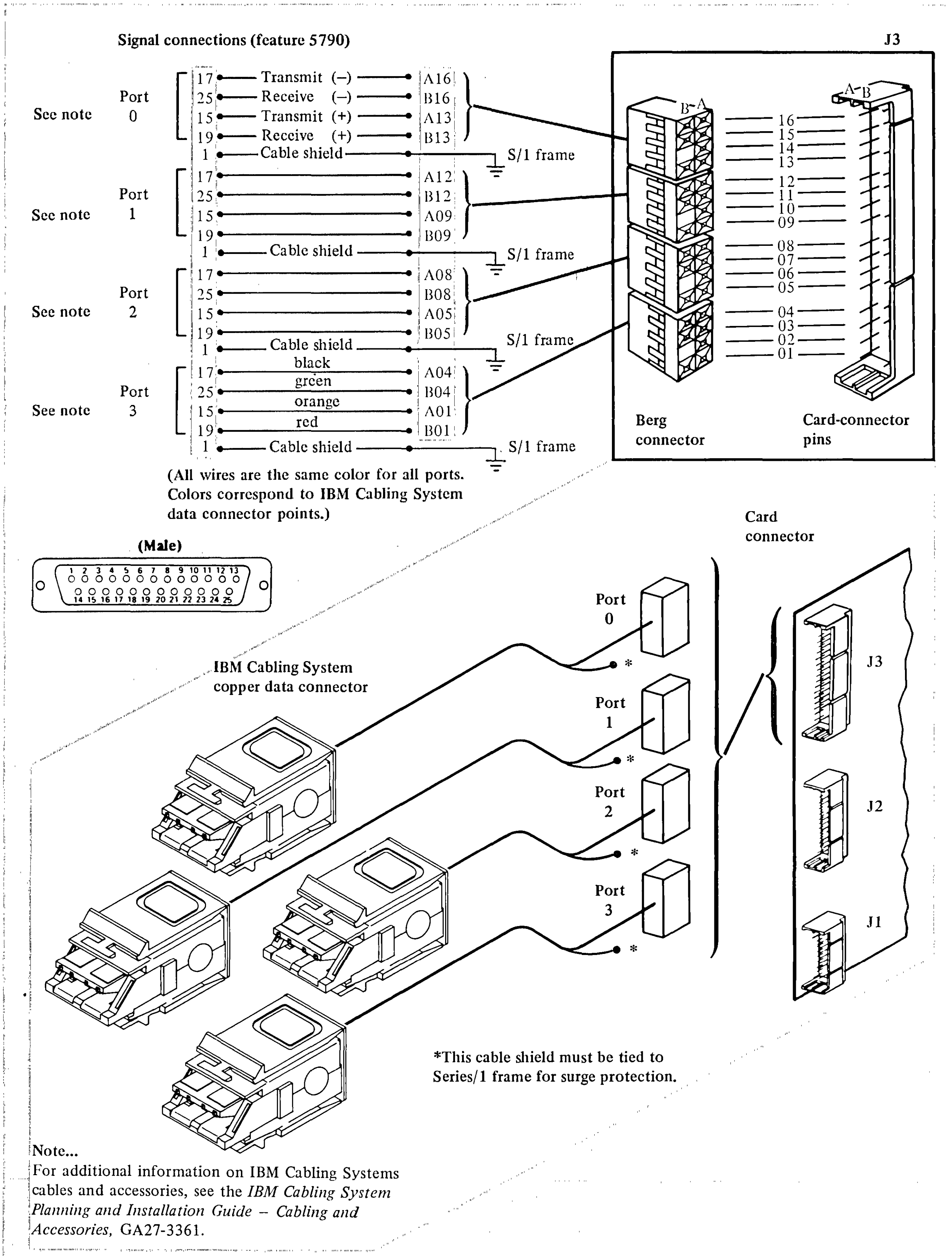


Figure 8-66 (Part 2). Feature 1310 cable and signal connections for 5790 cables

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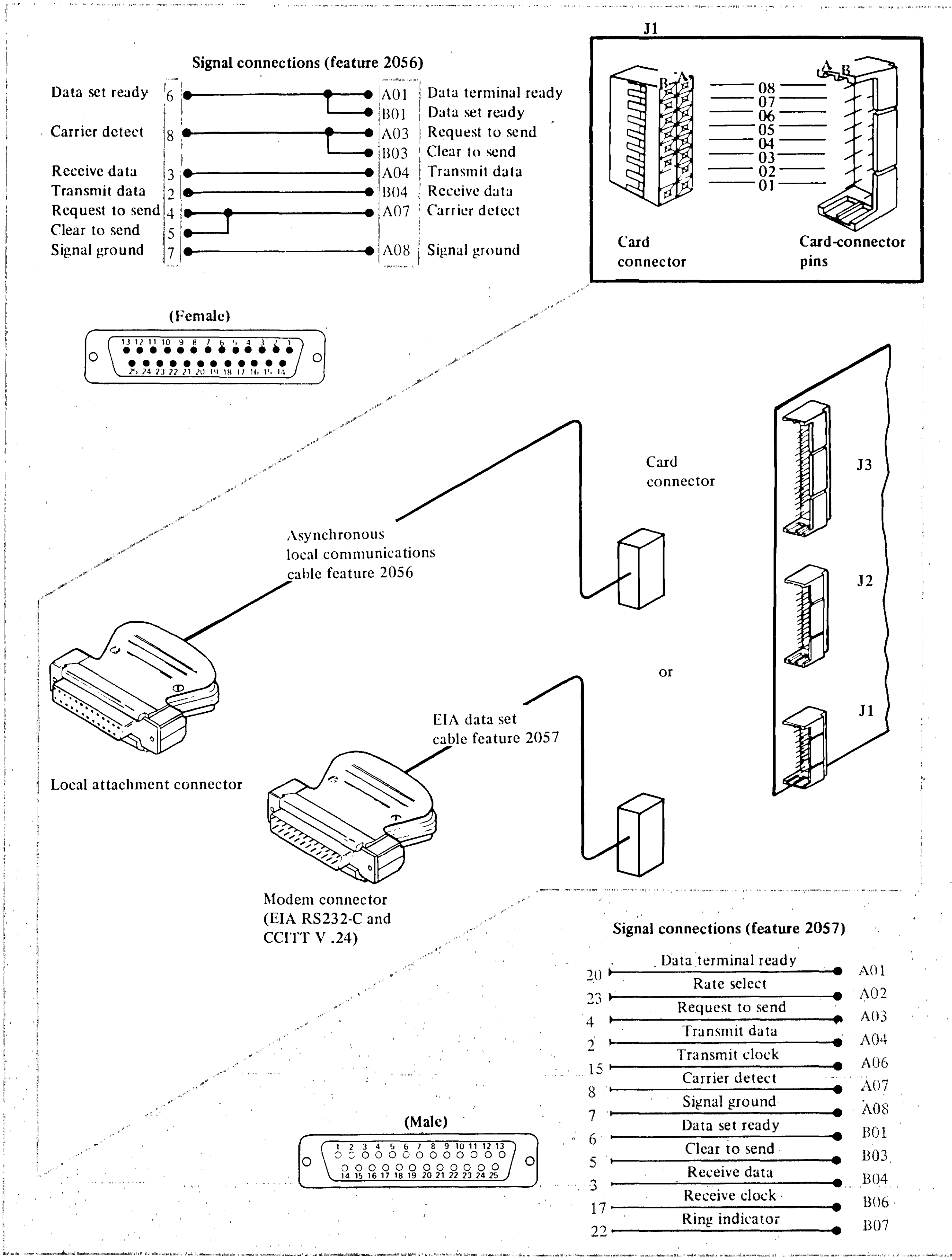


Figure 8-67. Feature 1310 cable and signal connections for 2056 and 2057 cables

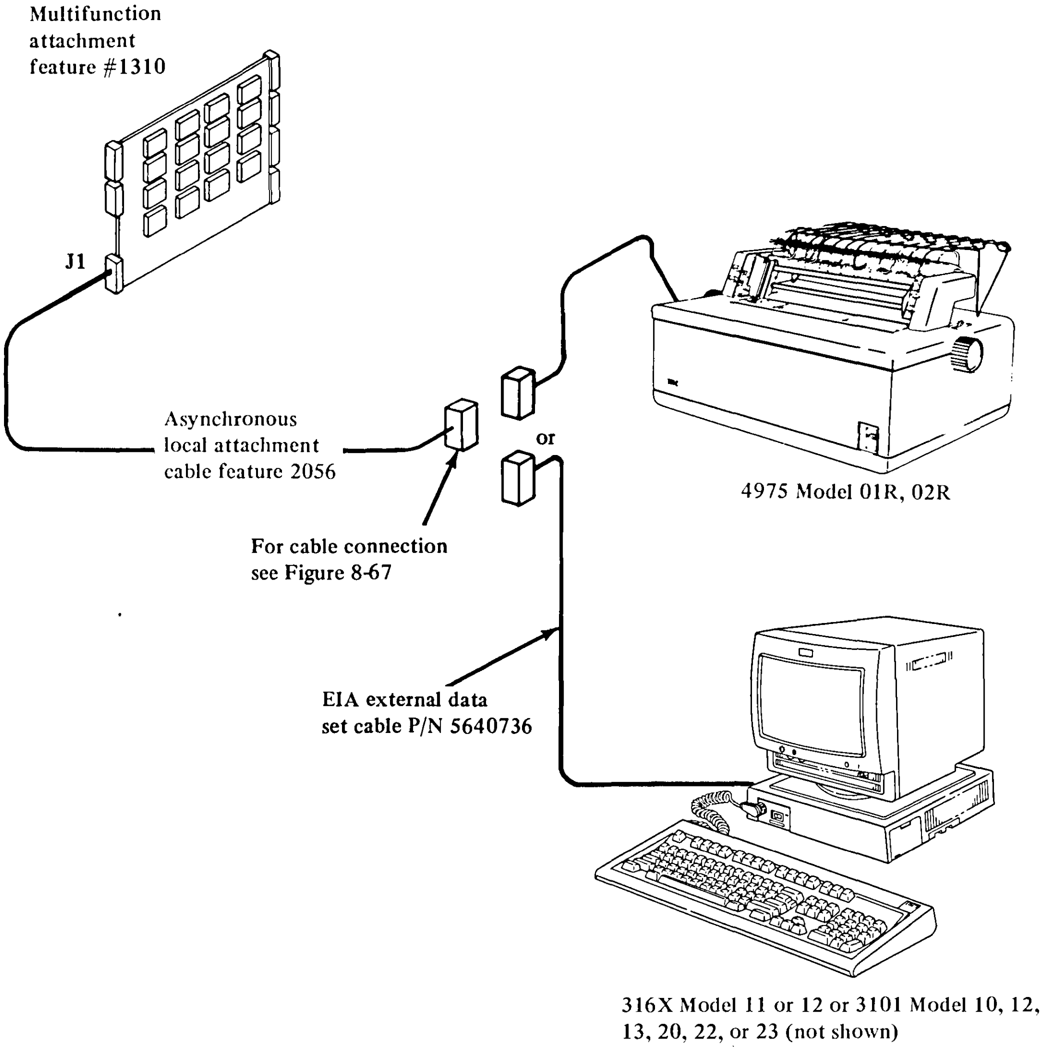


Figure 8-68. Feature 1310 direct connect of IBM 4975 and 316X

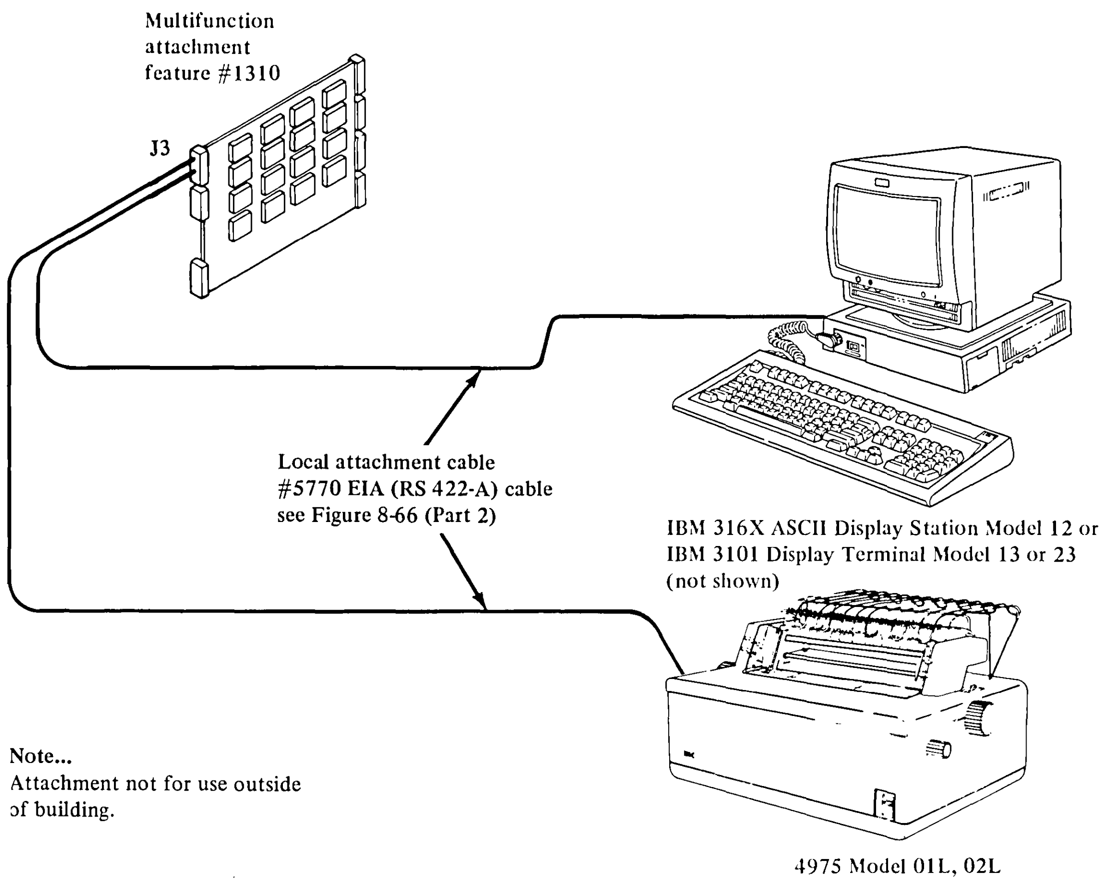


Figure 8-69 (Part 1). Feature 1310 local attachment of IBM 4975 and 316X

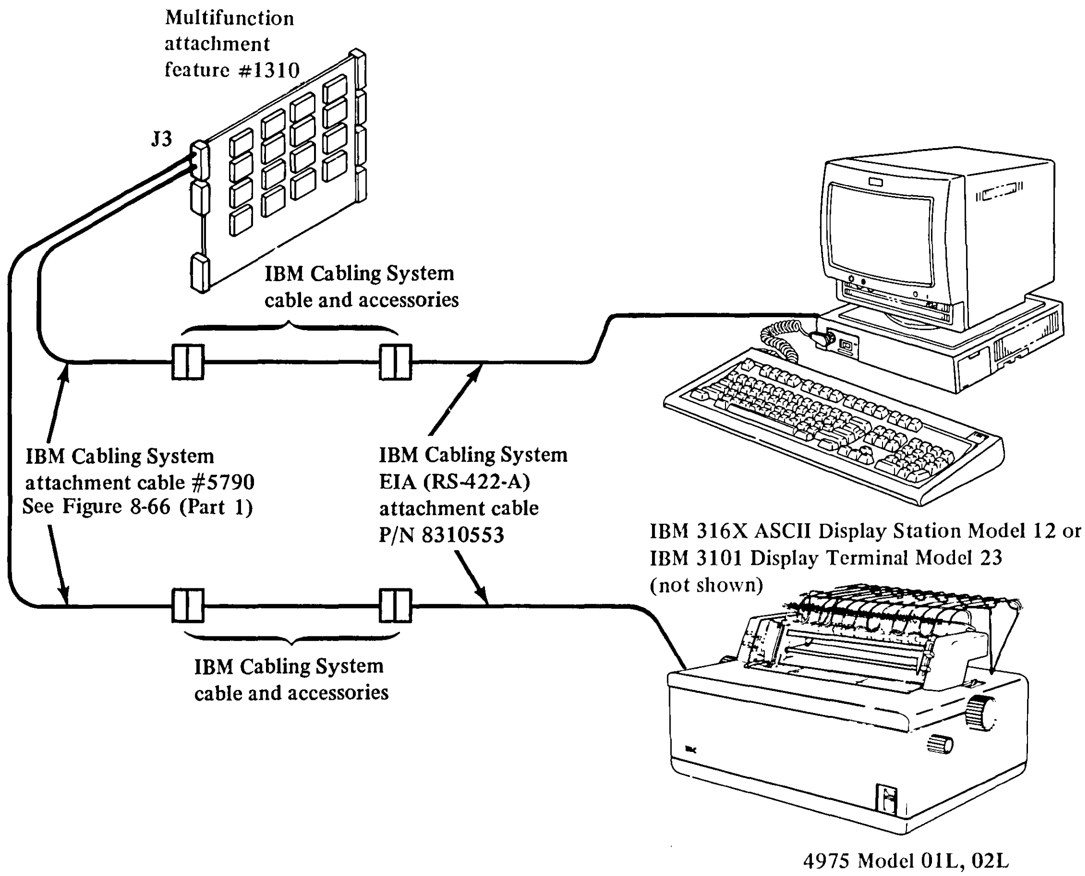
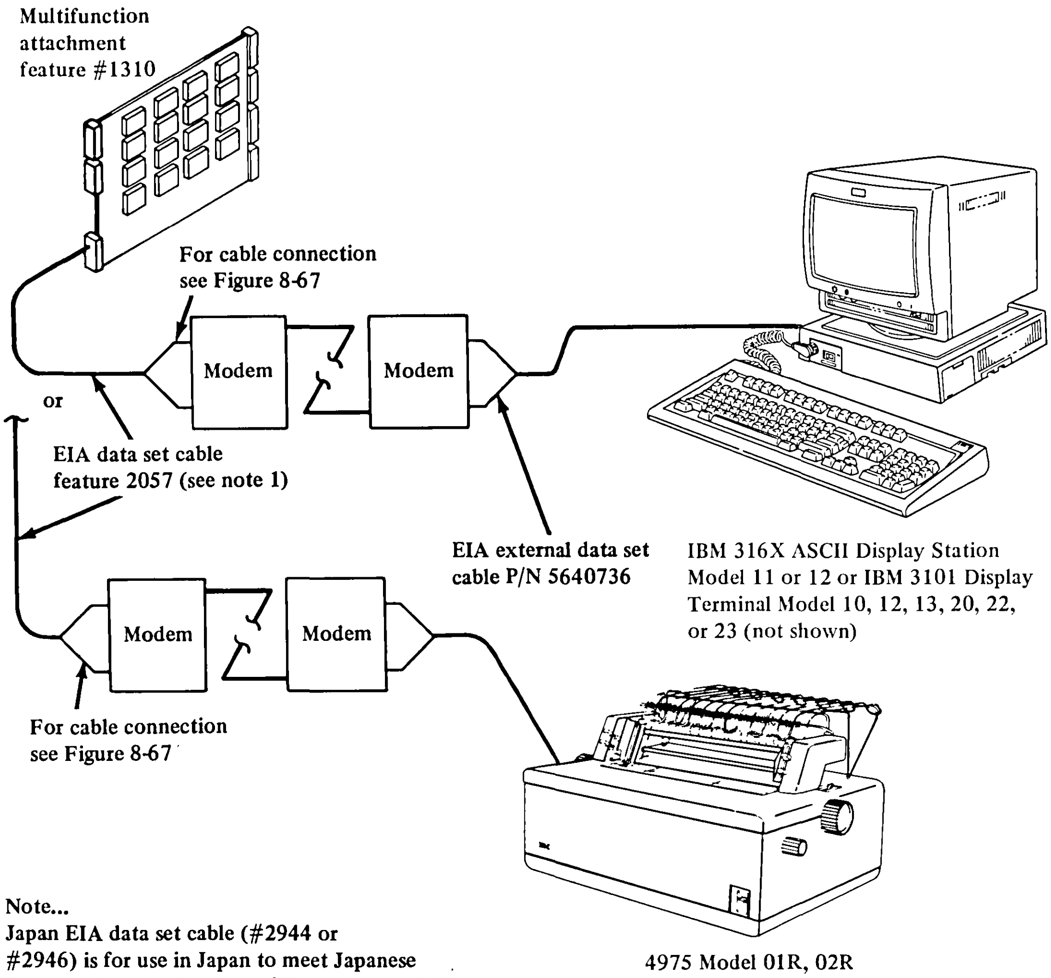


Figure 8-69 (Part 2). Feature 1310 IBM Cabling System attachment of IBM 4975 and 316X



Note...
Japan EIA data set cable (#2944 or #2946) is for use in Japan to meet Japanese PTT requirements in place of EIA Data Set Cables (#2057). Installations using modems manufactured in the U.K., and using EIA Data Set Cable (#2057), also need the Modem Adapter Cable (#2724).

Figure 8-70. Feature 1310 modem attachment of IBM 4975 and 316X

Printer attachment—5200 series (feature 5640)

The attachment for the 5200 series printers (feature 5640) fits into a Series/1 processor or I/O expansion unit and connects up to eight 5200 series printers to the Series/1.

The attachment has two ports. A Cable-thru feature on the printer lets you connect up to seven printers to a single port. A twinaxial cable up to 1 525 meters (5000 feet) in length connects the attachment to the printers.

When all printers are the same type, there are three possible configurations:

- Up to eight 5219s.
- Up to eight 5224s.
- Up to four 5225s.
- Up to two 5262s.

You can connect the printers to the attachment in one of the following ways:

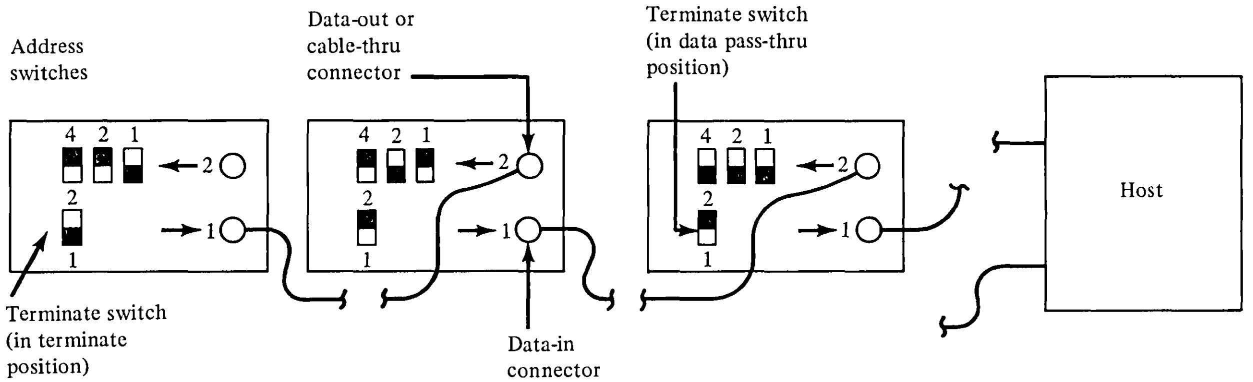
- Any mix of up to eight 5219 and 5224 printers.
- One 5225 printer and any mix of up to seven 5219 and 5224 printers.
- Two 5225 printers and any mix of up to five 5219 and 5224 printers.
- Three 5225 printers and any mix of up to three 5219 and 5224 printers.
- Four 5225 printers and one 5219 or 5224 printer.
- One 5262 printer and up to five 5219 printers.
- Two 5262 printers and up to three 5219 printers.

Note: All printers within a physical distance, not cable length, of 30.5 meters (100 feet) of the attachment must be the same machine type, regardless of the port they are attached to. Printer machine types can be mixed only at distances of at least 30.5 meters from the attachment. At the 30.5 meter distance or more, there are no restrictions on distances between printer machine types.

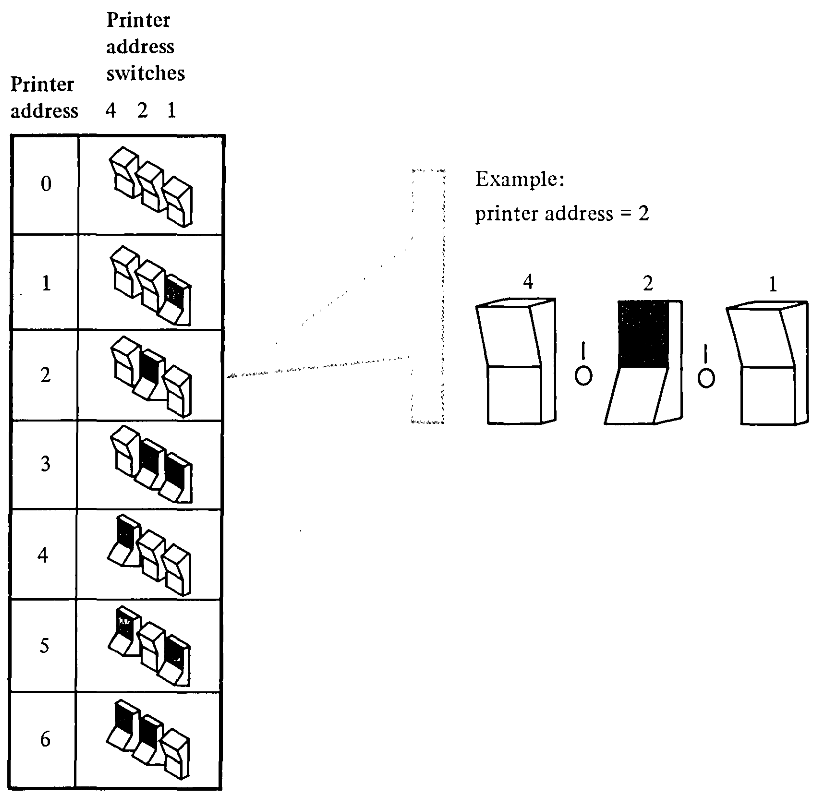
Figures 8-71,8-72, and 8-72A show three sample configurations for feature 5640.

You can order a 6-meter (20-foot) cable with connectors (feature 5780) from IBM. If you supply your own cables, you can order a 2x4 Berg connector kit (part number 6095524) from IBM. See "Twinaxial cable assembly" on page 8-26 for twinaxial cable specifications.

On 5200 series printers that support cable-thru to additional printers, there will be two connectors for attaching cables, a switch for terminating a string of printers, and a set of three switches for specifying a unique printer address. The location and use of those items may vary within the 5200 family of printers. For specific information regarding operation of printers within the 5200 printer family, users should refer to the Operators Guide for each printer. The last printer in a string of printers has only one cable connected to it and must have the terminate switch set to the terminate position. All other printers have two cables connected and must have their terminate switches set to the cable-thru data-pass-thru position.



Each address switch in a string of printers must be set to its own unique value that matches the assigned address in the host application program.



Printer address 7 is invalid

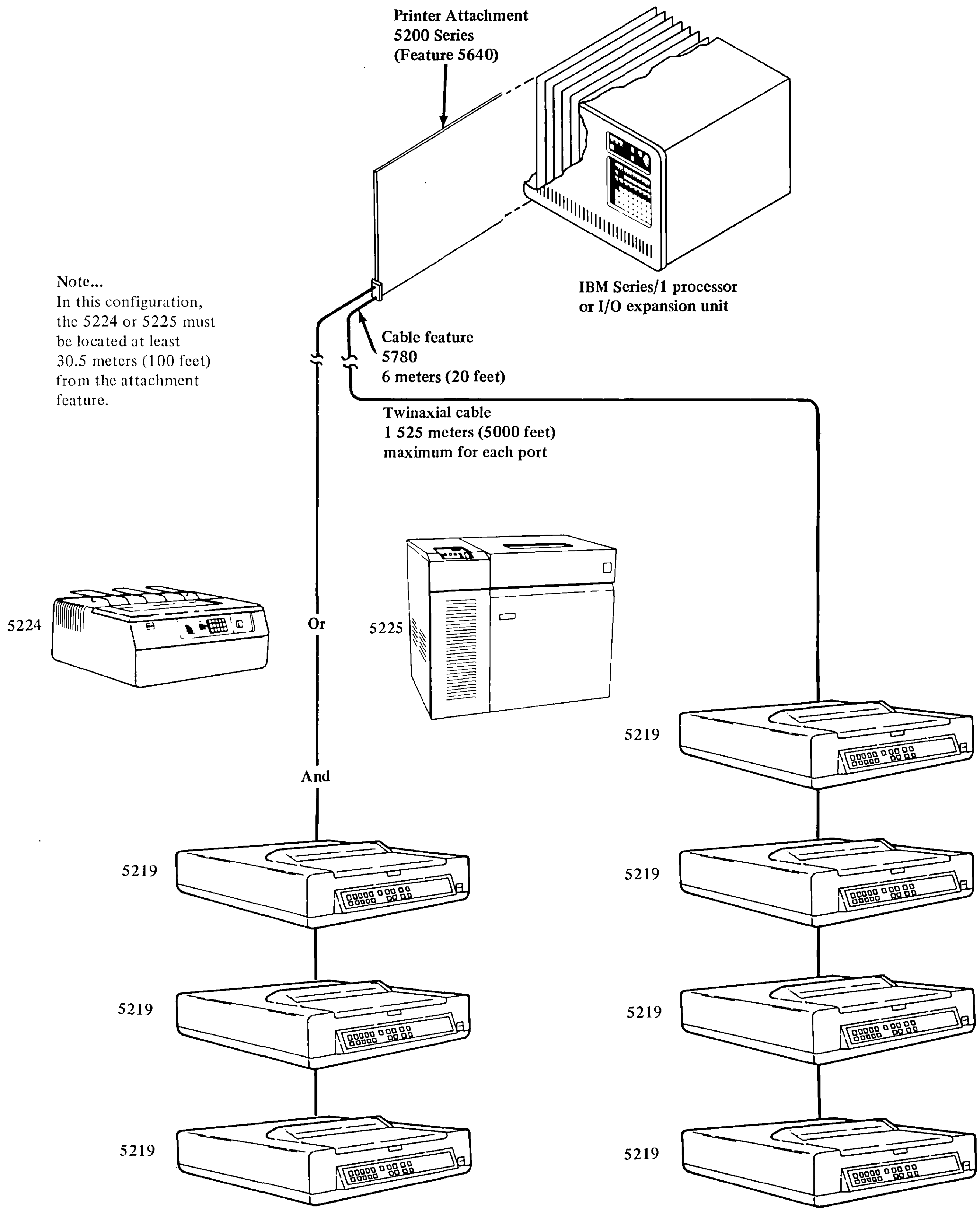


Figure 8-71. Sample configuration for feature 5640

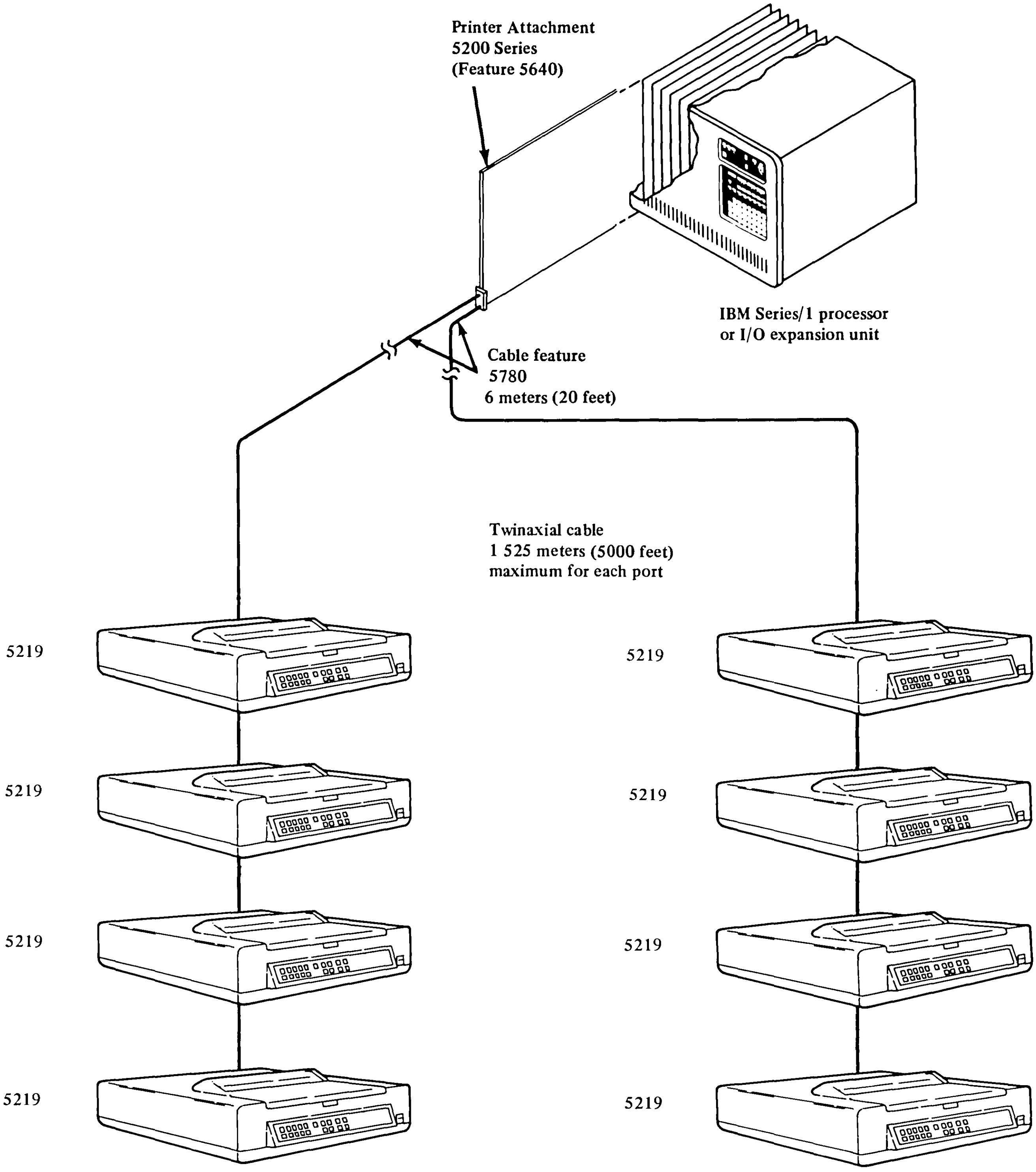


Figure 8-72. Sample configuration for feature 5640

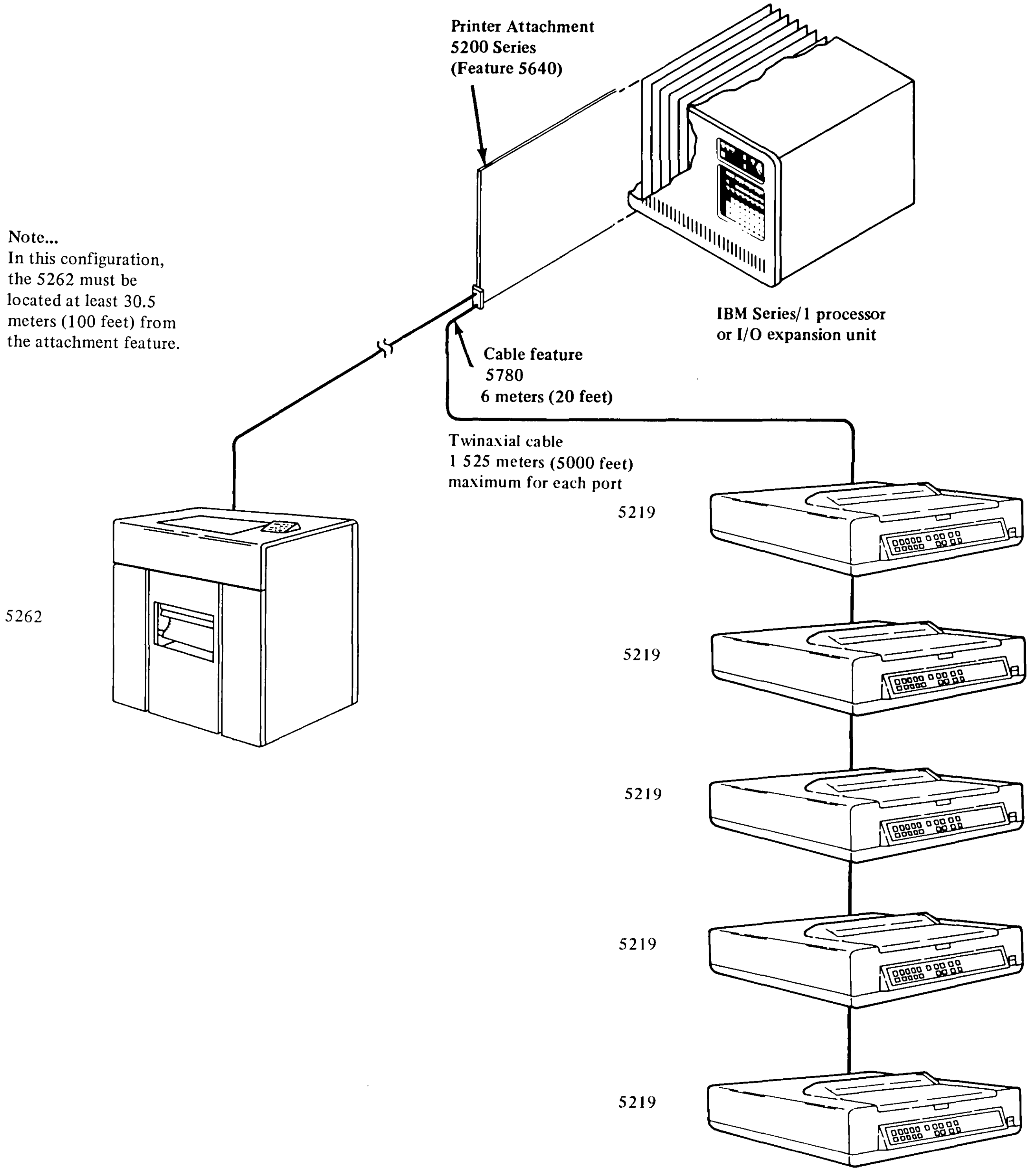


Figure 8-72A Sample configuration for feature 5640

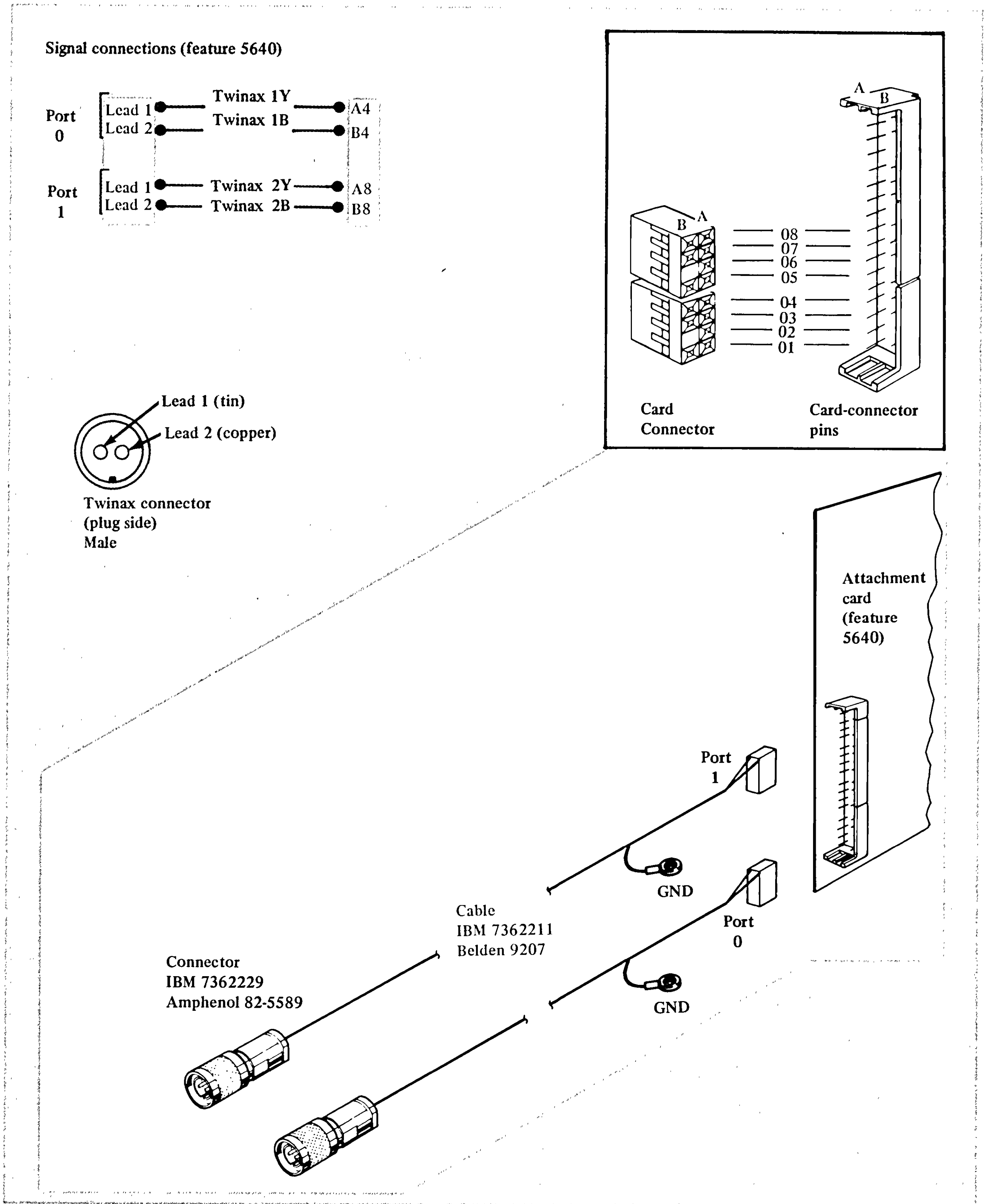


Figure 8-73. Feature 5640 cable and signal connections for 5780 cables

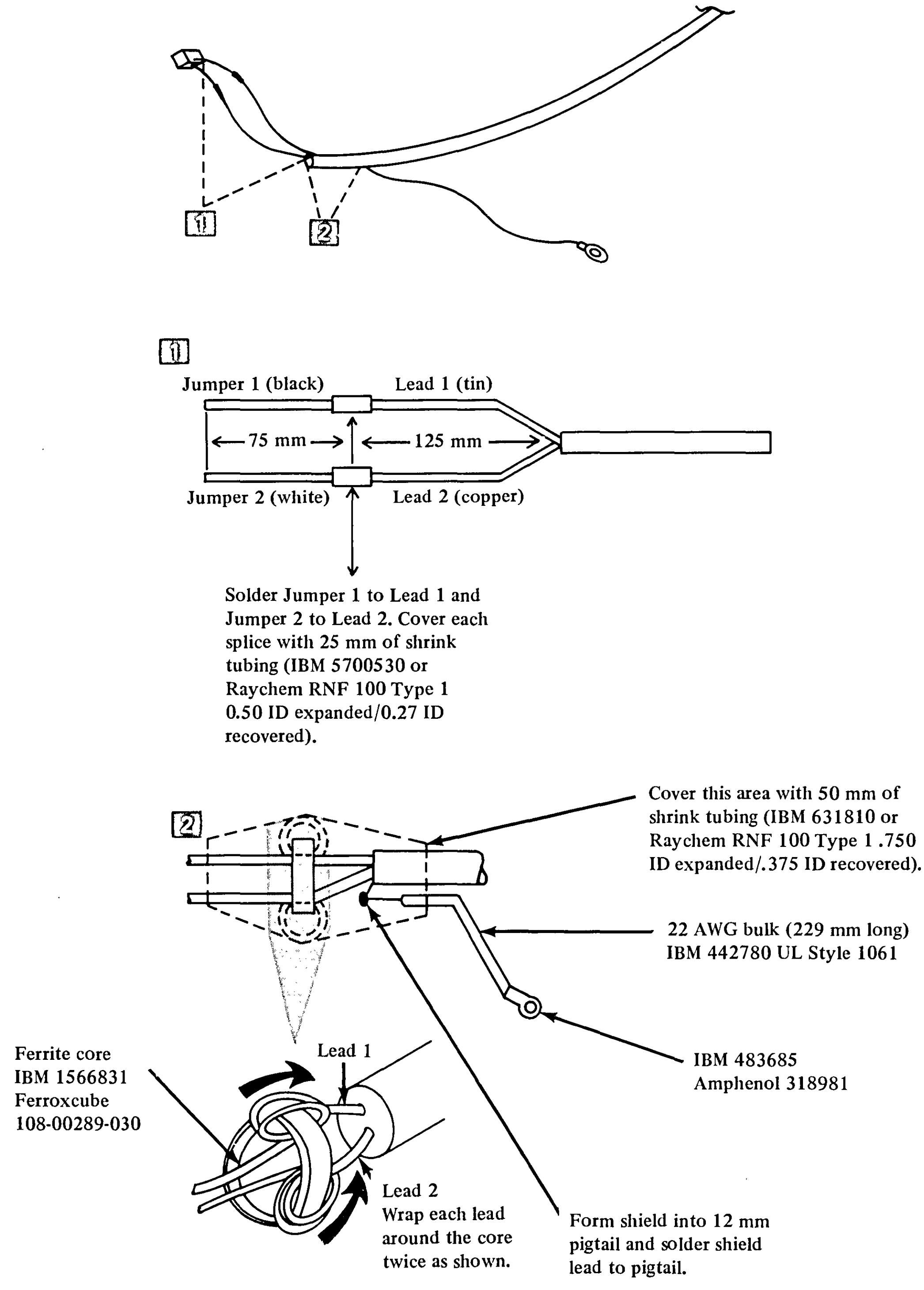


Figure 8-74. Cable assembly for feature 5640

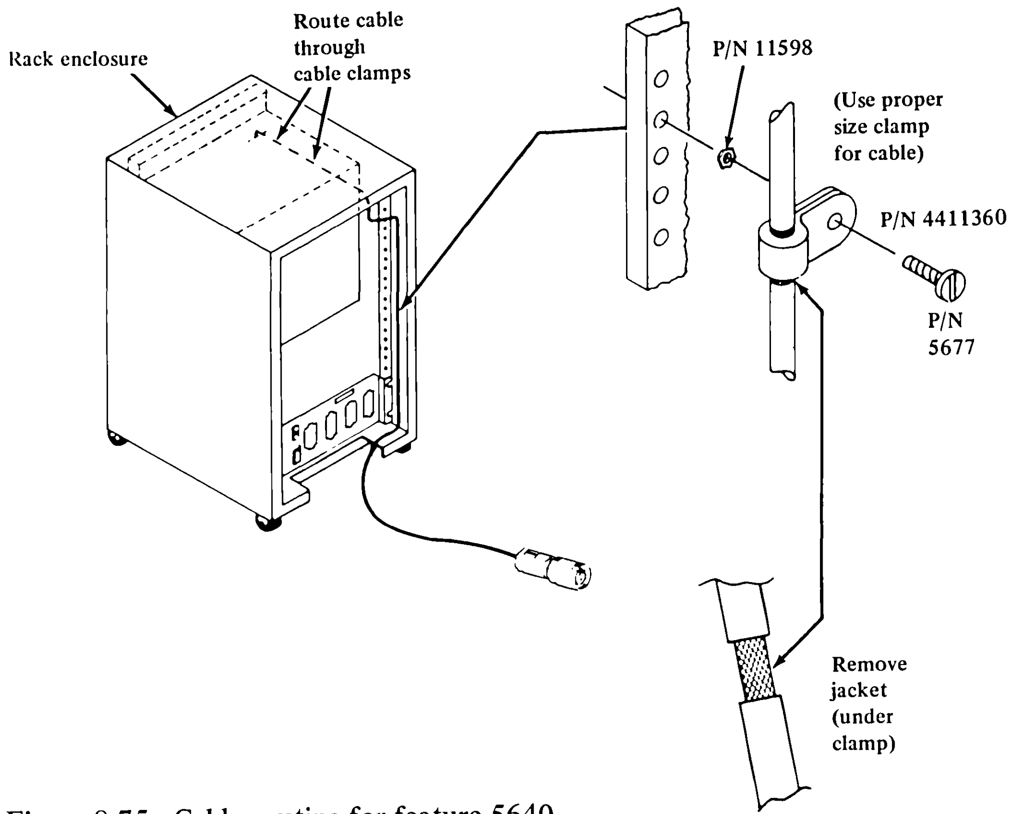


Figure 8-75. Cable routing for feature 5640

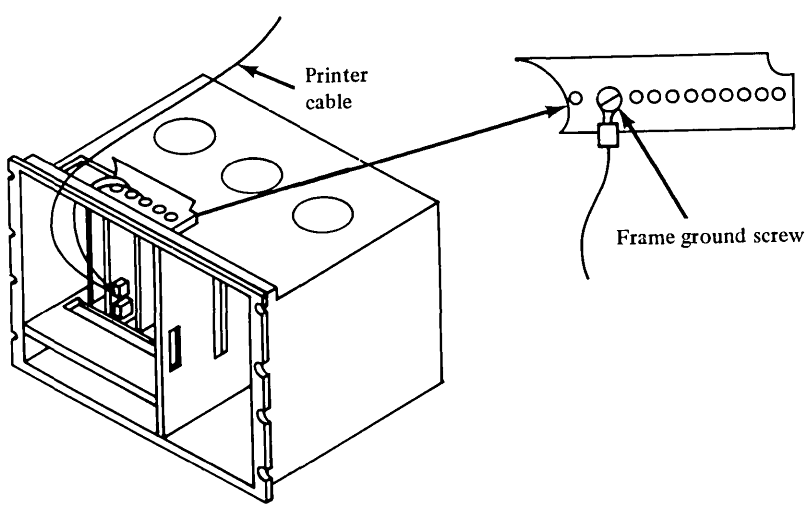


Figure 8-76. Card file cable installation for feature 5640

Outdoor Cable Installation

A list of methods for installing twinaxial cable follows. The methods appear in the order that provides the greatest protection.

- Cable buried in grounded metal conduit.
- Overhead, shielded cable in addition to the shield in the twinaxial cable. It should be grounded at each end and at each pole, if possible.
- Cable buried in metal conduit.
- Cable buried in nonmetallic conduit.
- Overhead cable on a carrier with the carrier grounded at each end and at each pole.
- Overhead cable under a shield line. The shield line is a metal cable run on the same poles. (Power lines can also have a shielding effect on cables.) Hang the cable at least 1 meter (3 feet) below the shield line, and suspend it on nonconducting hangers.

When installing cables overhead, use a carrier every 3 meters (10 feet) of the cable length to support the cable. Also, avoid having the cable as the highest point in the area. See *Wiring Methods* in this chapter for routing signal cable information.

If you connect the cables outdoors, seal the connections in a weatherproof compound.

Vibration limits

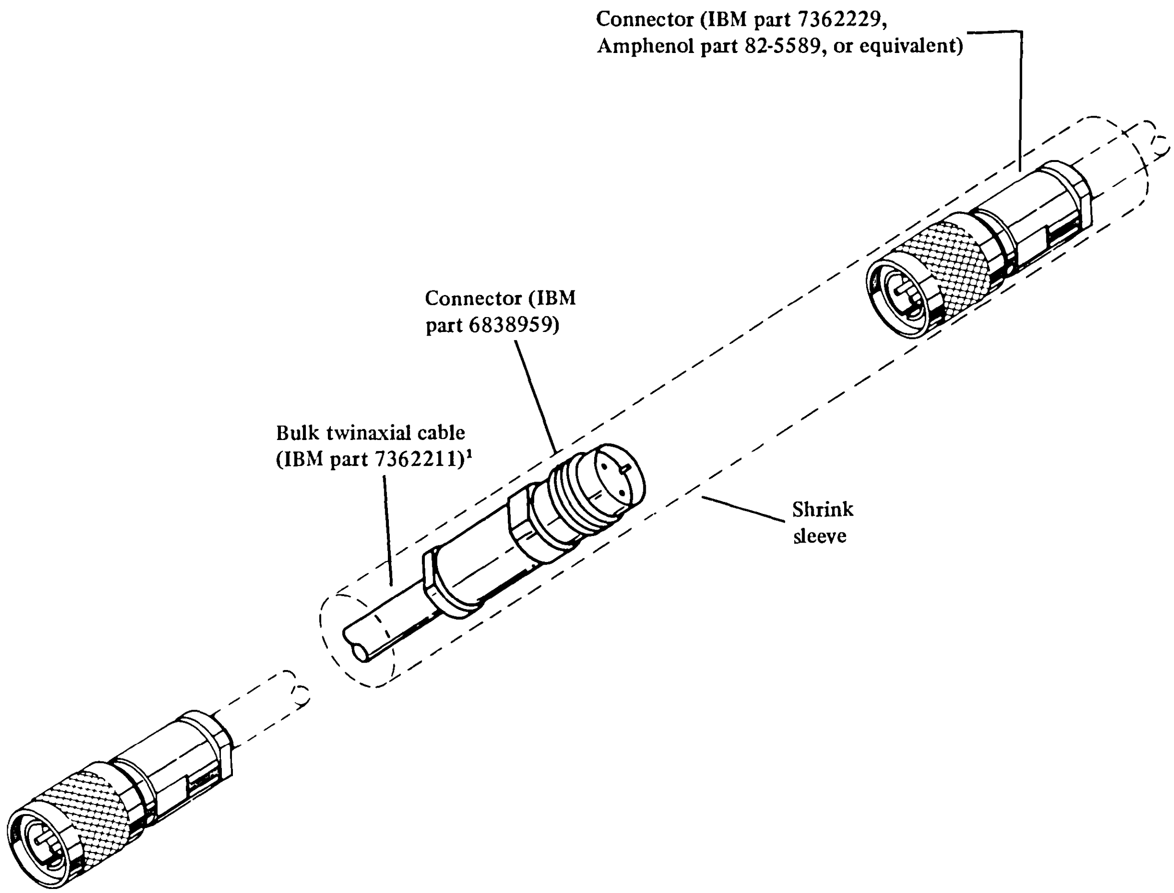
It is your responsibility to ensure that vibration does not exceed the specified levels. IBM feature #5640 is designed to operate within the following limits. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Cable Splicing

Do not splice cables; instead, use connectors (IBM parts 6838959 and 7362229) or an equivalent for twinaxial cable. Cover the cable connectors with shrink tubing to prevent accidental grounding of the connection.

Figure 8-77 illustrates the cable adapter for joining twinaxial cables.



[1] Specify the total length of each cable ordered.

Figure 8-77. Cable splicing for twinaxial cables

Station Protectors

Station protectors prevent the cable and equipment from lightning damage.

Use protectors for outdoor cable installations and for installing indoor cables over 60 meters (200 feet) in length.

You can order single station protectors using IBM part 7362426 for twinaxial cable. Use two connectors, IBM part 7362229, to connect the cables to the protectors.

Keep the station protectors away from combustible materials or other hazards (see National Electric code, article 500). Also, keep station protectors away from areas where unauthorized persons can touch them. During lightning storms, do not handle the station protectors or the cable that runs from the protector to the printer.

Grounding Recommendations

The ground conductor for the station protector should be:

- AWG 6-gauge wire or larger
- Less than 3 meters (10 feet) long
- Run in a straight line to a grounding electrode that has a ground resistance of less than 0.10 ohms.

Also, provide common grounding among the station protector, the utility ground, and all extensive metal components in the vicinity of the system to prevent side flashes caused by lightning. The conductor used for interconnecting grounds should be at least AWG 6-gauge wire.

Station Protector Installation requirements

Install the station protector inside the building where the cable enters or exits the room or building (see Figure 8-78). See Figure 8-79 for an example of station protector installation.

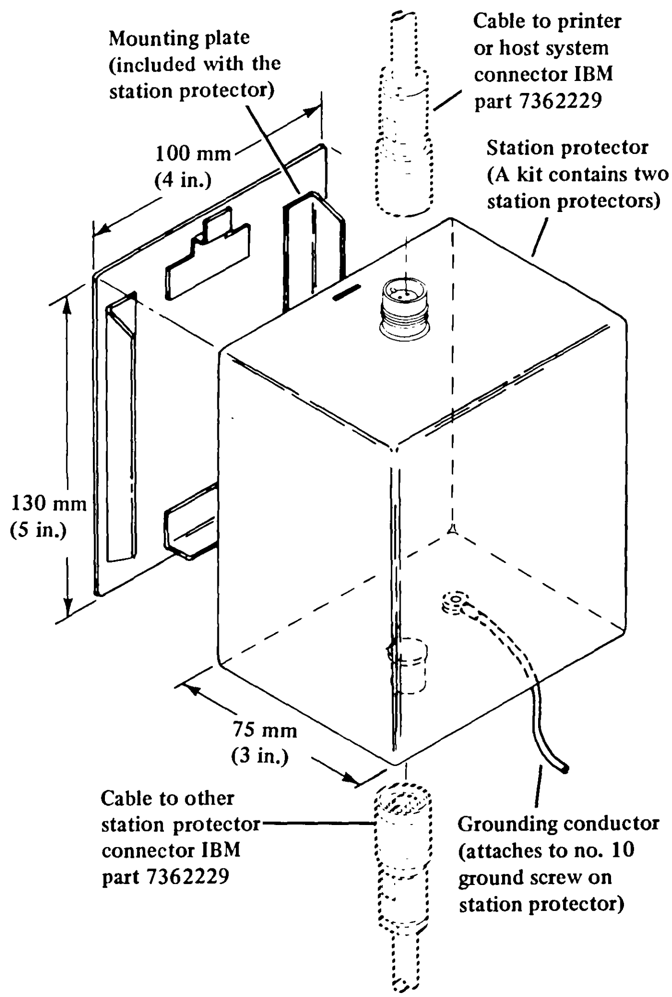


Figure 8-78. Station protector with entering/exiting cables

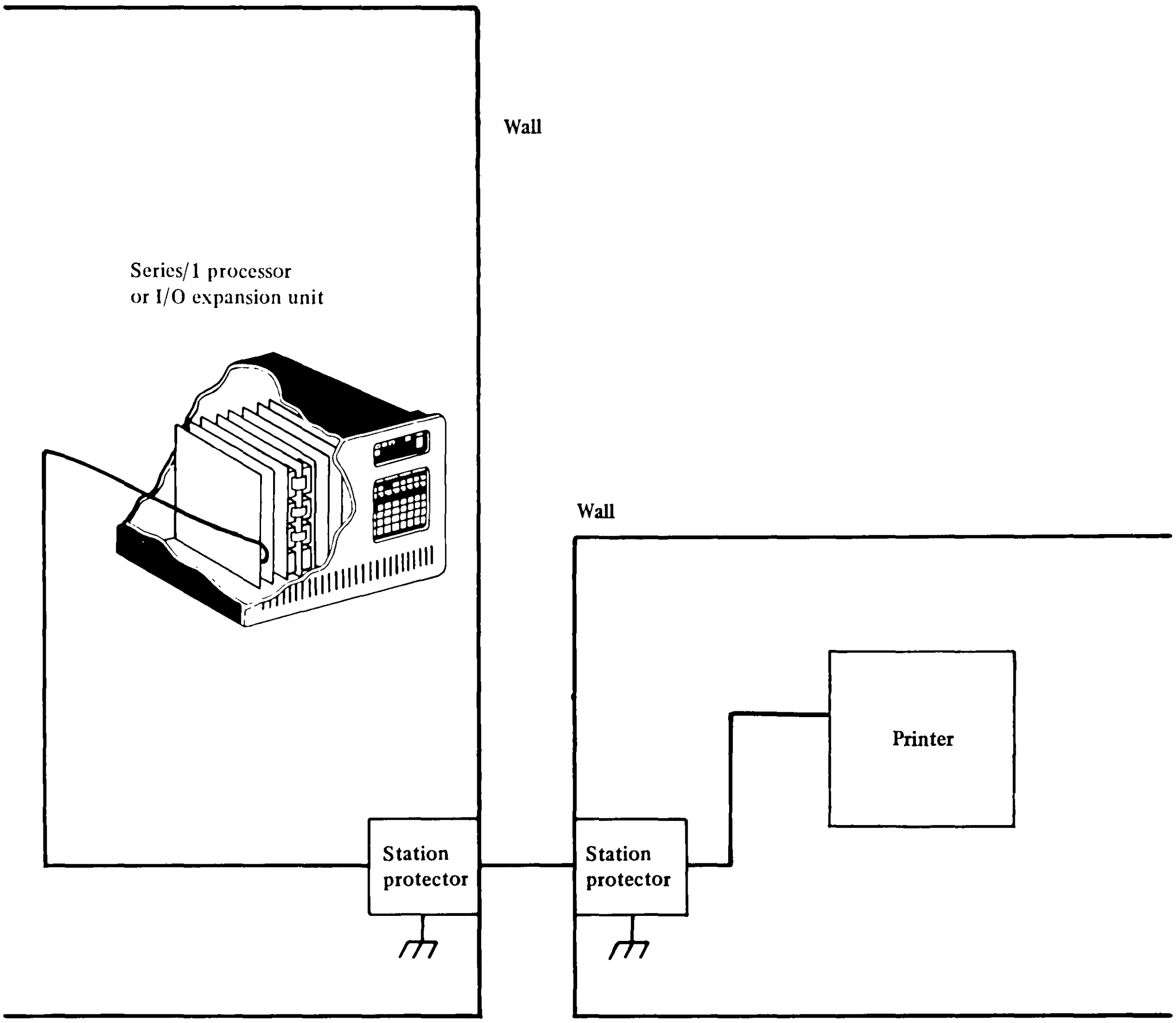


Figure 8-79. Sample station protector installation

Multidrop workstation attachment (feature 1250)

Attachment feature 1250 plugs into a Series/1 processor or I/O expansion unit and connects the 4980 workstation to the Series/1. A Cable-thru option on the workstation lets you connect up to eight workstations to the attachment.

A twinaxial cable or IBM Cabling System cable and accessories may be used to connect the attachment to the workstations. The cable must be installed indoors. See "Twinaxial cable assembly" on page 8-26 for twinaxial cable specifications. See *IBM Cabling System Planning and Installation Guide—Cables and Accessories*, GA27-3361.

You can order a 6-meter (20-foot) cable with connectors (feature 5780) from IBM. If you supply your own cables, you can order a 2x4 Berg connector kit (part number 6095524) from IBM.

Note the following restrictions on speed vs. signal path length.

Data rate	Max. Signal path length
100 Kbps	1 219 meters (4000 feet)
250 Kbps	488 meters (1601 feet)
500 Kbps	244 meters (800 feet)

In the case of twinaxial cable, cable length and signal path length are the same. However, with the IBM Cabling System, signal path length may be double the cable length. This is due to utilization of both twisted pair signal paths within the same cable.

Vibration limits

Make sure that feature 1250 operates within the limits specified below. See the **vibration and shock level** graphs in Chapter 9 for additional information.

5–17 Hz		
continuous	=	0.914 mm (0.036 in.) double amplitude
transient	=	1.22 mm (0.048 in.) double amplitude
17–200 Hz		
continuous	=	0.55 G peak acceleration
transient	=	0.73 G peak acceleration
200–500 Hz		
continuous	=	0.25 G peak acceleration
transient	=	0.33 G peak acceleration

Preparing the Multidrop Workstation for Series/1

Refer to the maximum cable length table on page 8-94 before to planning your installation.

Complete a planning form (Figure 8-81) for each 1250 attachment feature and a setup form (Figure 8-83) for each 4980 workstation on your Series/1. Use these forms to set up your 4980 workstations. Also see *IBM 4980 Display Station Setup Procedures,* GA21-9297, for 4980 installation procedures.

Multidrop Workstation attachment planning form: Make one copy of the planning form (Figure 8-81) for each 1250 attachment on your Series/1. Use the following instructions and example (Figure 8-80) to fill out the form.

Information will be different for each attachment. Make sure that you complete a separate form for each.

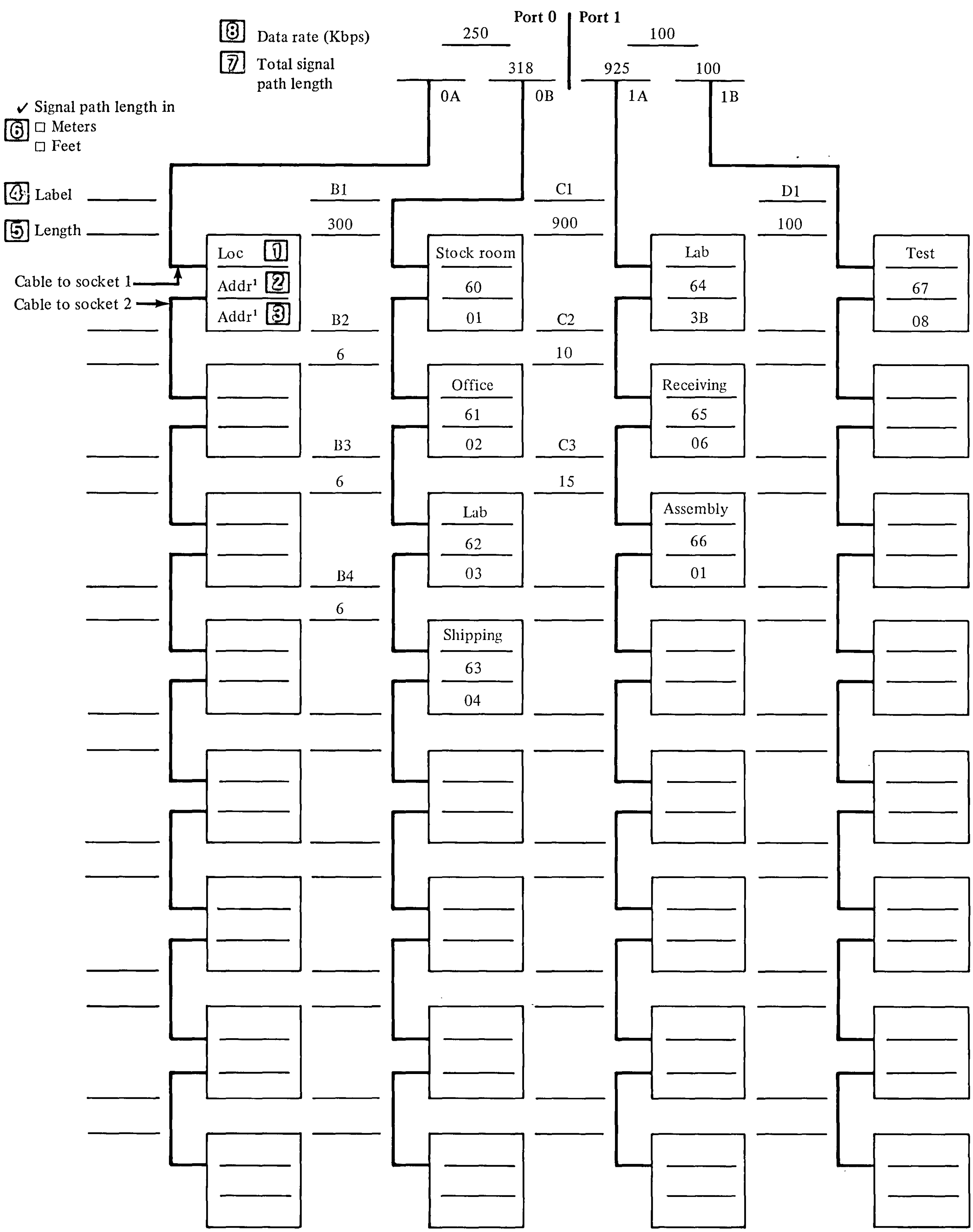
1. Enter the location of each workstation [1]. You can connect up to eight workstations to an attachment.
2. Enter the Series/1 device address for each workstation [2]. Addresses range from 60 through 67 (hexadecimal).

   Note: Jumpers have been installed on the first attachment card for Series/1 device addresses 60 through 67 (hexadecimal). The base address is 60 and the domain (the number of Series/1 addresses reserved by the attachment) is eight. The base address of each additional attachment card increases by a value of hexadecimal 8. Refer to the following table if you wish to change a device address. X can be 0–F hexadecimal.

Number of addresses in the domain	Base addresses permitted (hexadecimal)
1	XX
2	X0, X2, X4, X6, X8, XA, XC, XE
4	X0, X4, X8, XC
8	X0, X8

3. Enter the workstation address for each workstation [3]. Addresses range from 01 through FE (hexadecimal). Each address on a port must be unique.
4. Enter the label identification for each cable[7] [4].
5. Enter the signal path length [5].
6. Check whether the signal path length is measured in meters or feet [6].
7. Enter the total of the signal path segment lengths for each signal path length (enter 0 if cable is not used) [7].
8. For port 0, enter the data rate for the longer signal path length [8].

[7] You should attach labels at both ends of each cable.



[1] Addresses shown are hexadecimal

Figure 8-80. Sample Multidrop Workstation attachment planning form

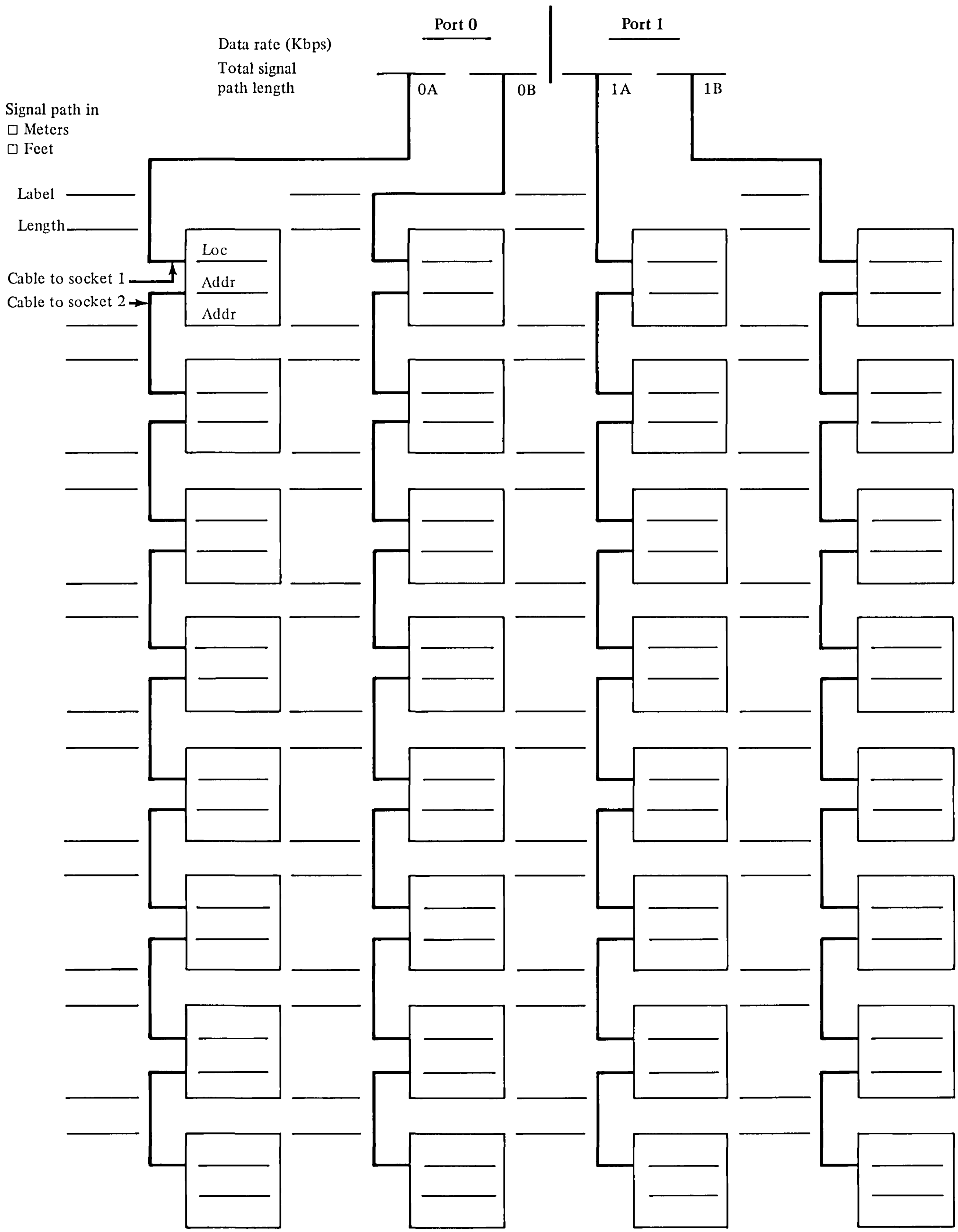


Figure 8-81. Multidrop Workstation attachment planning form

Workstation setup form: Make one copy of the setup form (Figure 8-83) for each workstation to be attached. Use the following instructions and example (Figure 8-82) to fill out the form.

Information will be different for each workstation attached. Make sure that you complete a separate form for each.

1. Copy the information you filled in for the following items on the Multidrop Workstation attachment planning form (Figure 8-81).

   Copy from Multidrop Workstation attachment planning form (Figure 8-81)

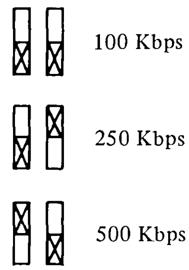
   [1] Location
   [2] Data rate
   [3] Workstation address
   [4] Cable identification

   Copy to Workstation setup form (Figure 8-83)

   [1] Location
   [2] Data rate
   [3] Workstation address
   [4] Cable identification

2. Mark (x) the Speed Select switches [5] for the data rate you entered in [2]. Switch settings for various data rates are shown below.

ART—8080



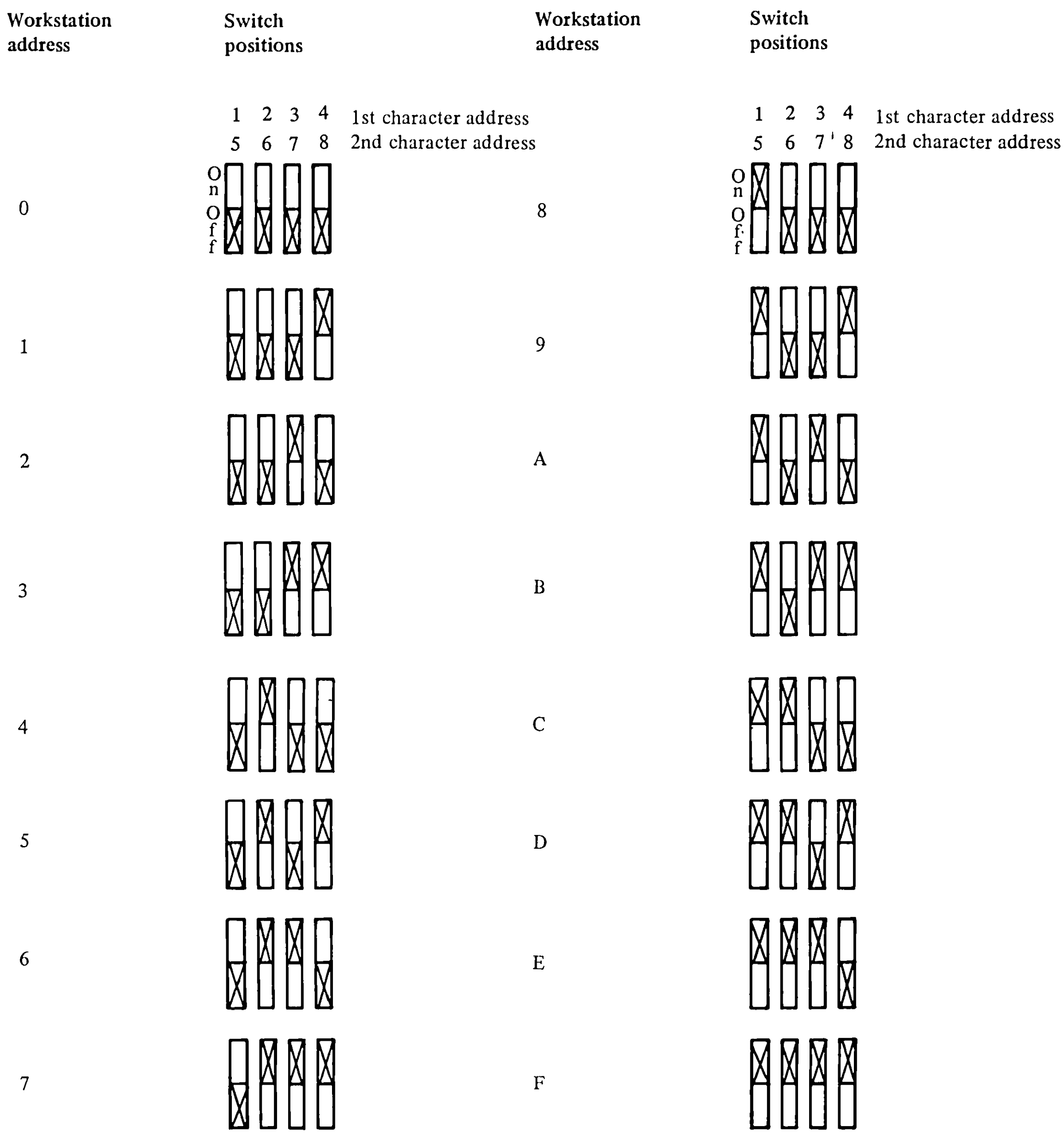
   Note: You can connect up to eight workstations on each cable run from the 1250 attachment. You should set up the workstations in sequence, beginning with the first workstation connected to the 1250 attachment.

3. Use the following table to mark (x) the address switches [6] for the workstation address you entered in [3]. A workstation address consists of two characters. An example is 03. To mark the address switches for 03, you would mark switch positions 1–4 for the first character (0).

You would then mark switch positions 5–8 for the second character (3). See the following table for switch positions of the first and second characters of a workstation address.

4. Fill in your name and phone number so that the person who sets up the workstations can contact you if he or she needs further information $\boxed{7}$.

Switch positions for workstation addresses



SAMPLE

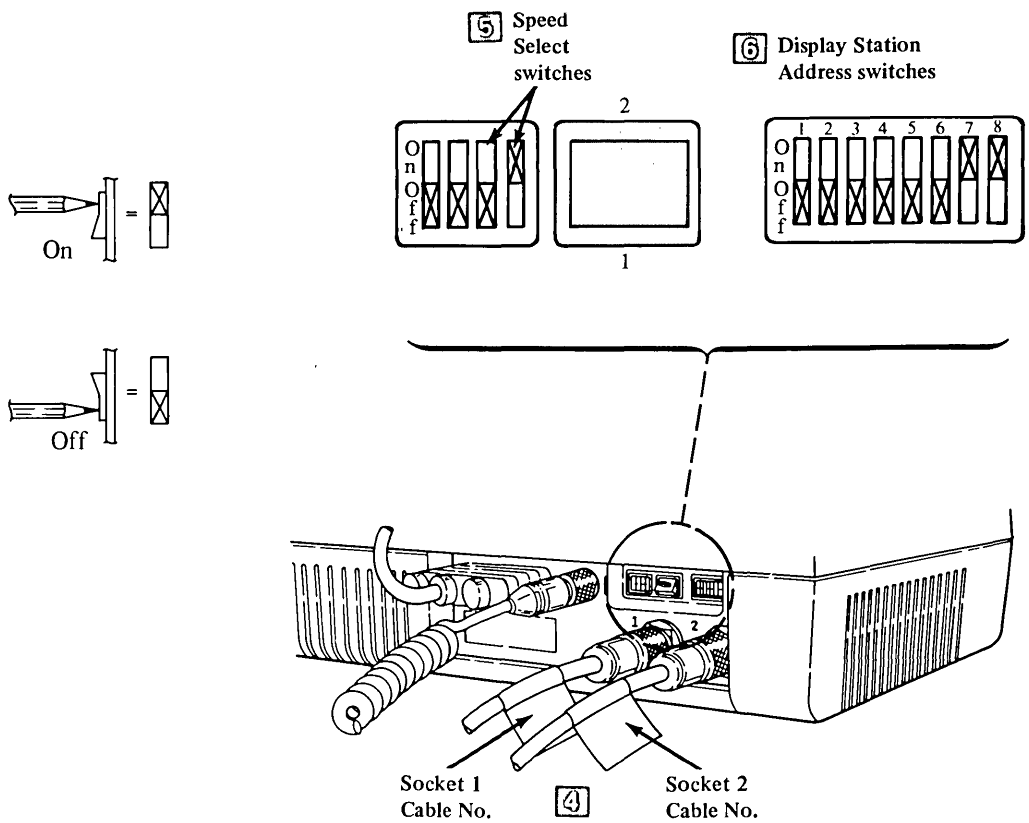
4980 Workstation setup form

This Setup Form gives you the specific information needed to set up the 4980 Display Station at this location and should be used along with the *IBM 4980 Station Setup Procedure,* GA21-9297.

Note: You can connect up to eight workstations on each cable run from the 1250 attachment. You should set up the workstations in sequence, beginning with the first workstation connected to the 1250 attachment.

1 4980 Location ______ Lab ______

Set the Speed Select and Display Station Address switches to their indicated settings. (Switch settings are indicated on the diagram by an X in the on or off position.) Use the tip of a pencil to push in the upper half (on position) or lower half (off position) of the switches as indicated.



83 84

Each cable that you are connecting to your 4980 Display Station should be labeled. The label on the cable should indicate which socket on the display station the cable connects to. If there is no Cable No. given for socket 2, there should not be a cable connected to that socket.

7 If you need help, contact:

Planner/Programmer John Smith

Telephone No. 462-5538

This information is for planner reference only.	
2 Data rate	25∅
3 Workstation address	∅3

Figure 8-82. Sample 4980 Workstation setup form

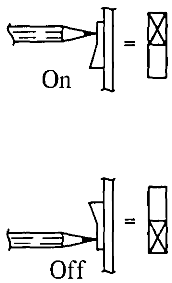
4980 Workstation setup form

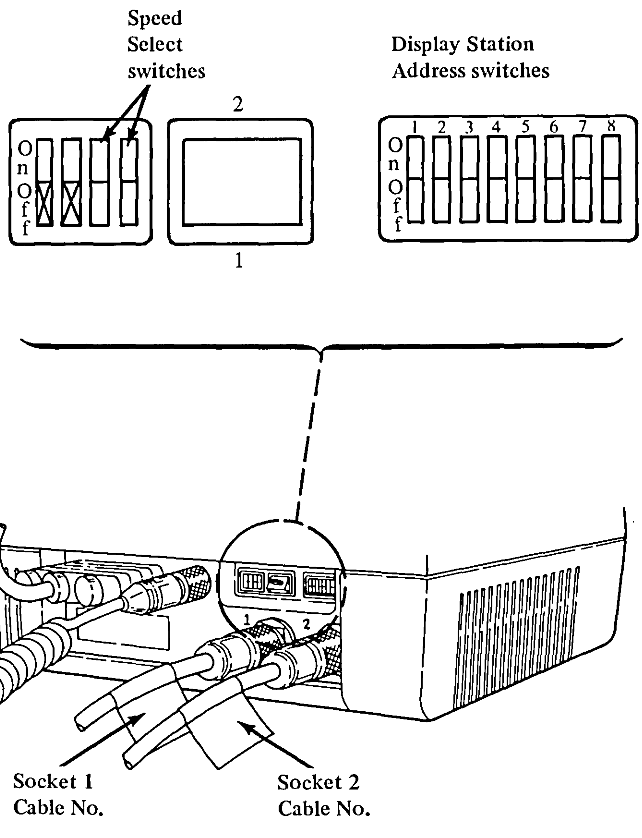
This Setup Form gives you the specific information needed to set up the 4980 Display Station at this location and should be used along with the *IBM 4980 Display Station Setup Procedure,* GA21-9297.

Note: You can connect up to eight workstations on each cable run from the 1250 attachment. You should set up the workstations in sequence, beginning with the first workstation connected to the 1250 attachment.

4980 Location ______________________________

Set the Speed Select and Display Station Address switches to their indicated settings. (Switch settings are indicated on the diagram by an X in the on or off position.) Use the tip of a pencil to push in the upper half (on position) or lower half (off position) of the switches as indicated.





Each cable that you are connecting to your 4980 Display Station should be labeled. The label on the cable should indicate which socket on the display station the cable connects to. If there is no Cable No. given for socket 2, there should not be a cable connected to that socket.

If you need help, contact:

Planner/Programmer ______________________

Telephone No. ______________________

This information is for planner reference only.	
Data rate	________
Workstation address	________

Figure 8-83. 4980 Workstation setup form

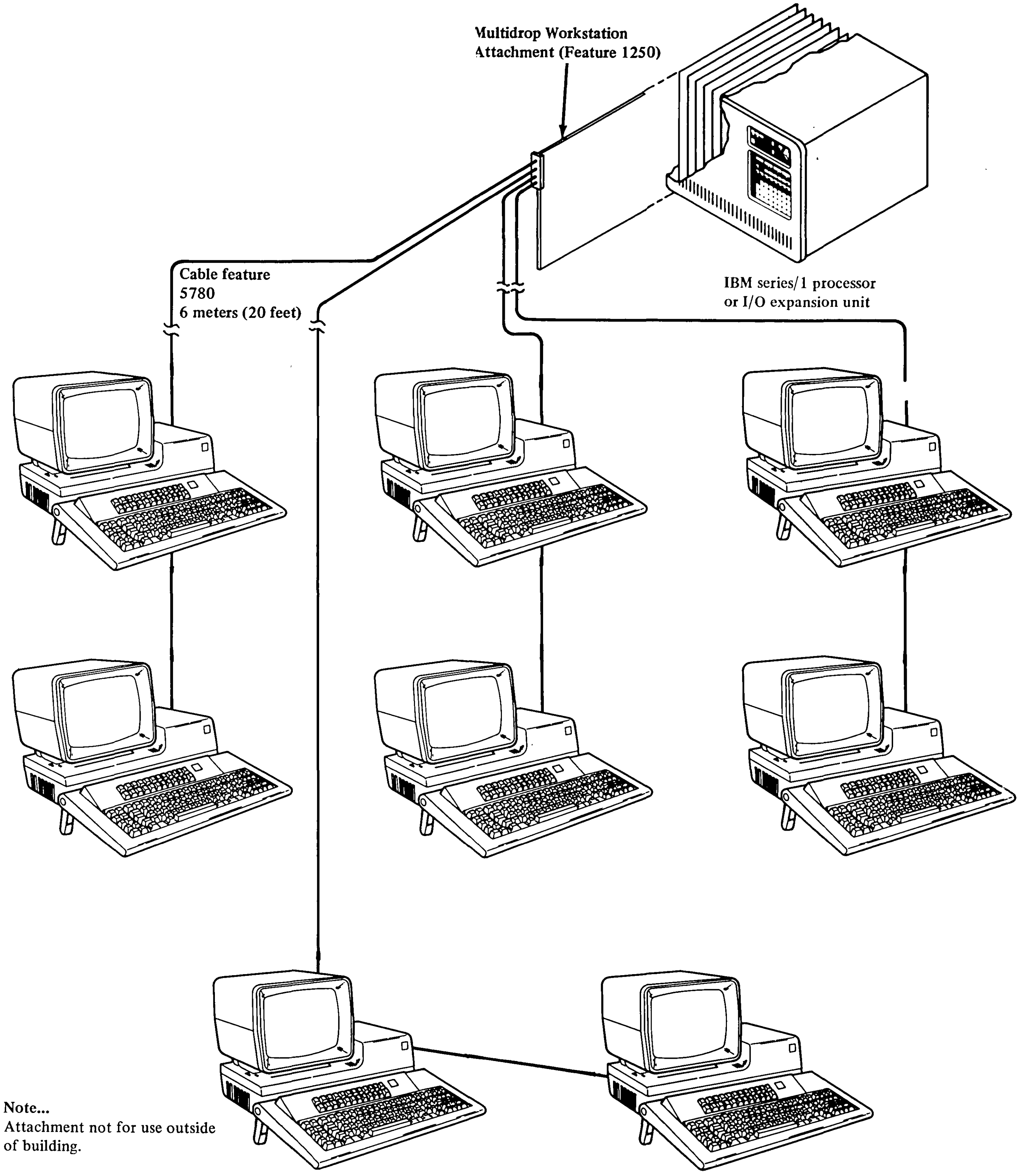


Figure 8-84 (Part 1). Sample configuration for feature 1250 (Twinaxial media)

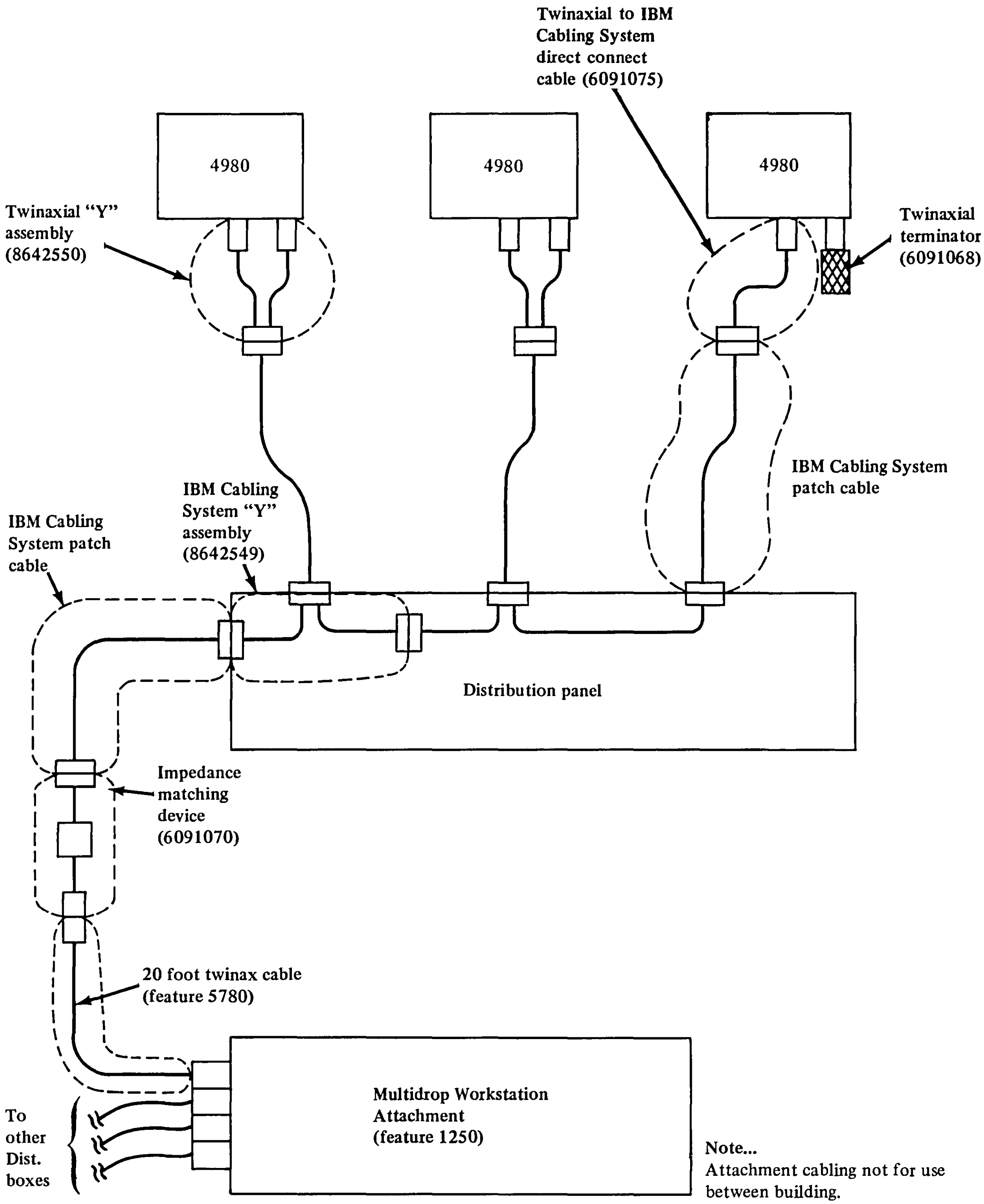


Figure 8-84 (Part 2). Sample configuration for feature 1250 (IBM Cabling System media)

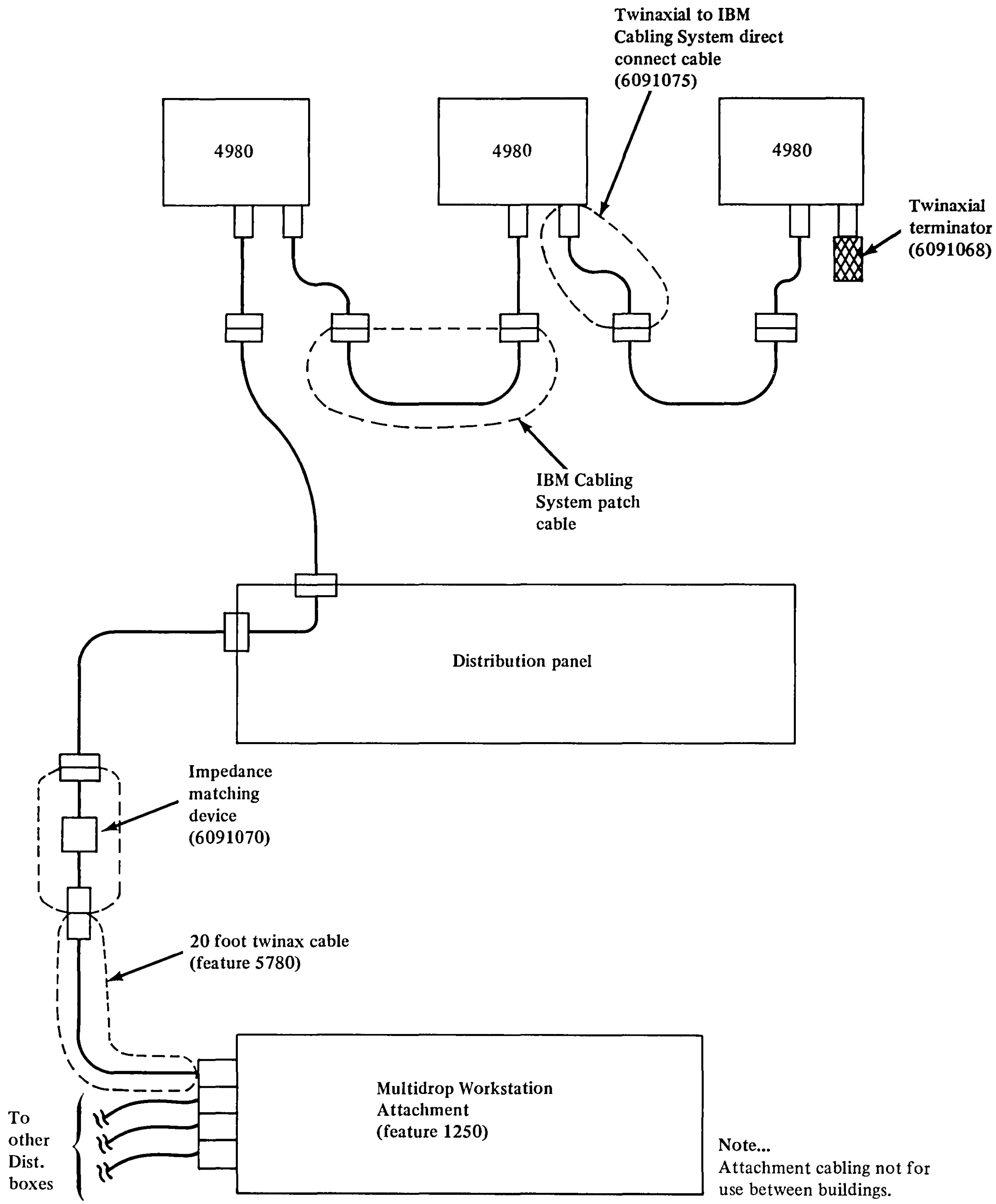


Figure 8-84 (Part 3). Sample configuration for feature 1250 (IBM Cabling System media)

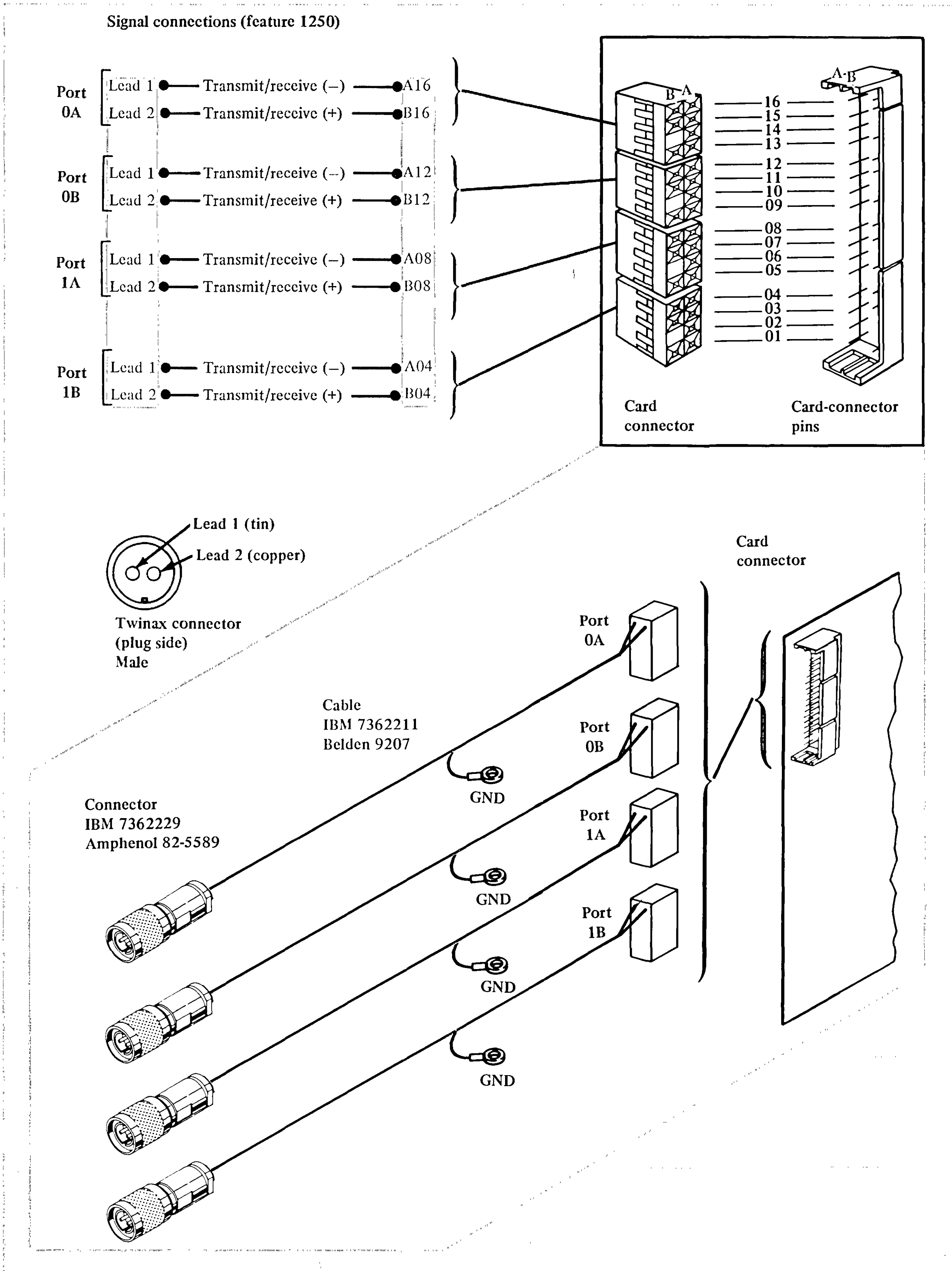


Figure 8-85. Feature 1250 cable and signal connections for 5780 cables

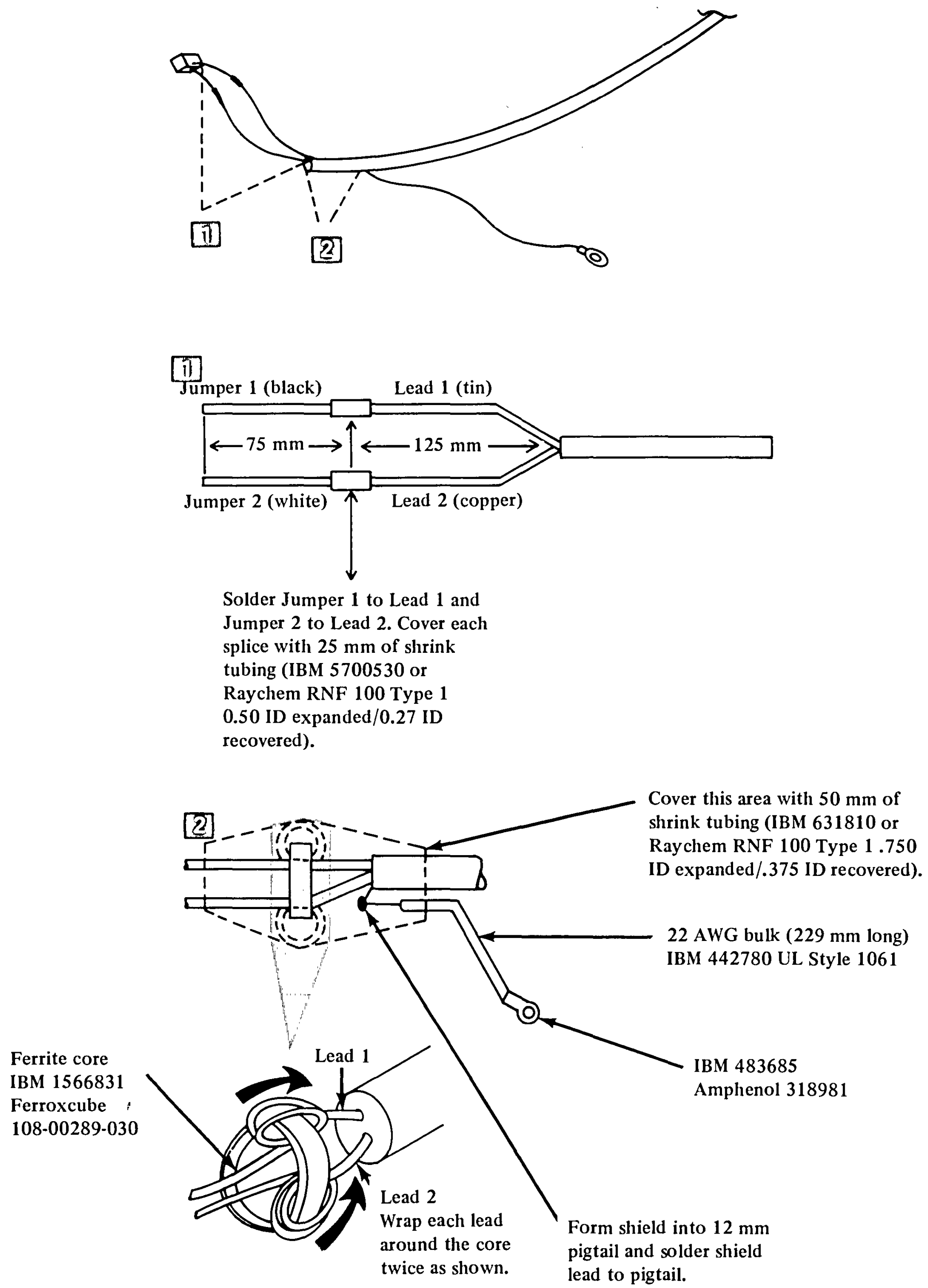


Figure 8-86. Cable assembly for feature 1250

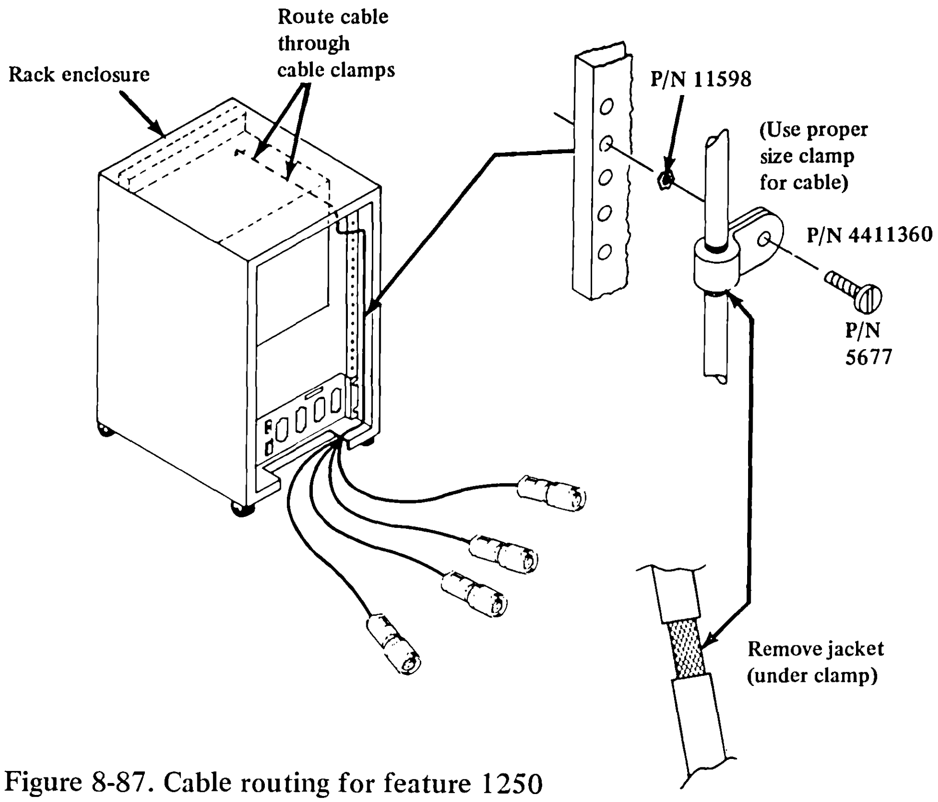


Figure 8-87. Cable routing for feature 1250

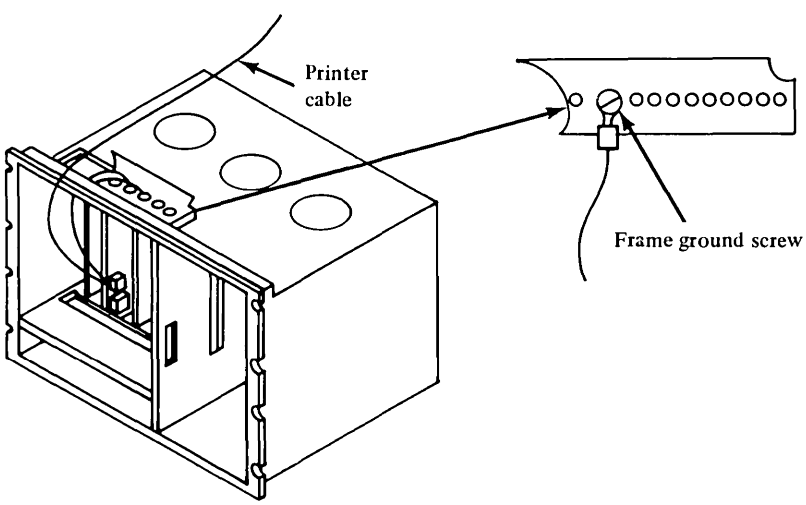


Figure 8-88. Card file cable installation for feature 1250

Chapter 9. Supporting information

This chapter contains information that supports the other chapters of this manual. Included here are...

- ▶ Miscellaneous information
- ▶ Tables and charts used in several of the other chapters
- ▶ Extra copies of worksheets and forms that you may remove or copy

Product and safety standards

Various product and safety standards (or codes) apply to the installation of a Series/1 at a customer site. The customer is responsible for complying with all applicable **national and local standards.**

The following chart shows U.S. standards that apply to procedures in this manual. Consult equivalent or other applicable standards when installing a Series/1 in countries other than the U.S.

U.S. product and safety standards

National Fire Protection Association (NFPA) standards...

- *Carbon Dioxide Extinguishing Systems,* NFPA Standard No. 12
- *Halon Extinguishing Systems,* NFPA Standard No. 12A
- *Inhalation Anesthetics,* NFPA Standard No. 56A
- *National Electric Code,* NFPA Standard No. 70
- *Electronic Computer/Data Processing Equipment,* NFPA Standard No. 75
- *Static Electricity,* NFPA Standard No. 77
- *Purged Enclosures,* NFPA Standard No. 496.

Other standards...

- National Electric Manufacturers Association (NEMA)
- Occupational Safety and Health Act (OSHA)
- *Racks, Panels, and Associated Equipment,* Electronic Industries Association (EIA) Standard RS-310-B
- Underwriters' Laboratories (UL) Listing, UL-478

Topic or procedure (in this manual)...	Standard reference...
Air quality	
Purging and pressurizing a room	NFPA No. 496
Safety and health	OSHA
Communications wiring	NFPA No. 70 (NEC, Article 800)
Emergency-power controls	NFPA No. 75
Fire protection and control	
Fire detection equipment	OSHA
Portable fire extinguishers	NFPA No. 75
Total-flooding systems	NFPA No. 12; NFPA No. 12A; OSHA
Floor-covering resistance (use resistance values in chapter 2 of this manual)	NFPA No. 56A (Section 4628)
Hazardous locations	NFPA No. 70 (NEC, Article 500); OSHA
Lightning protection	NFPA No. 70 (NEC, Article 800)
Low-voltage signal wiring	NFPA No. 70 (NEC, Article 725)
Non-IBM rack enclosure	EIA RS-310-B; UL-478
Outlet (receptacle) specifications	NEMA
Power and grounding	NFPA No. 70; NFPA No. 75
Site construction	NFPA No. 75

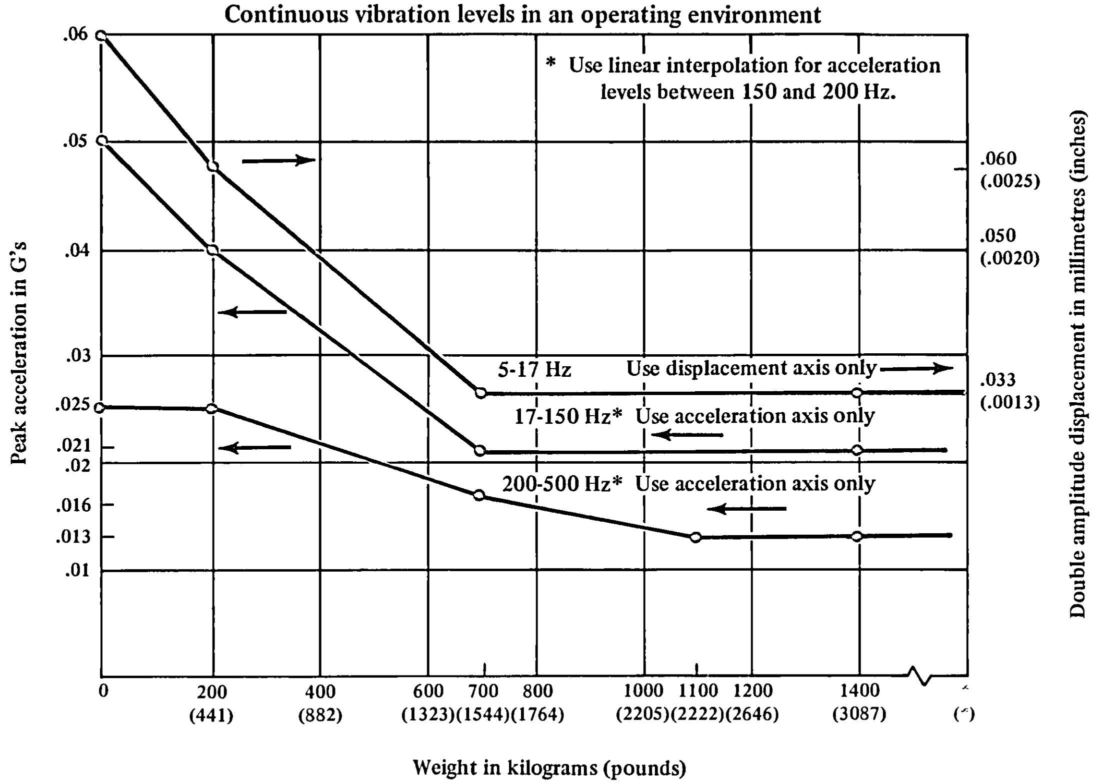
NFPA standards are available from:
National Fire Protection Association
Battery March Park
Quincy, Ma. 02269

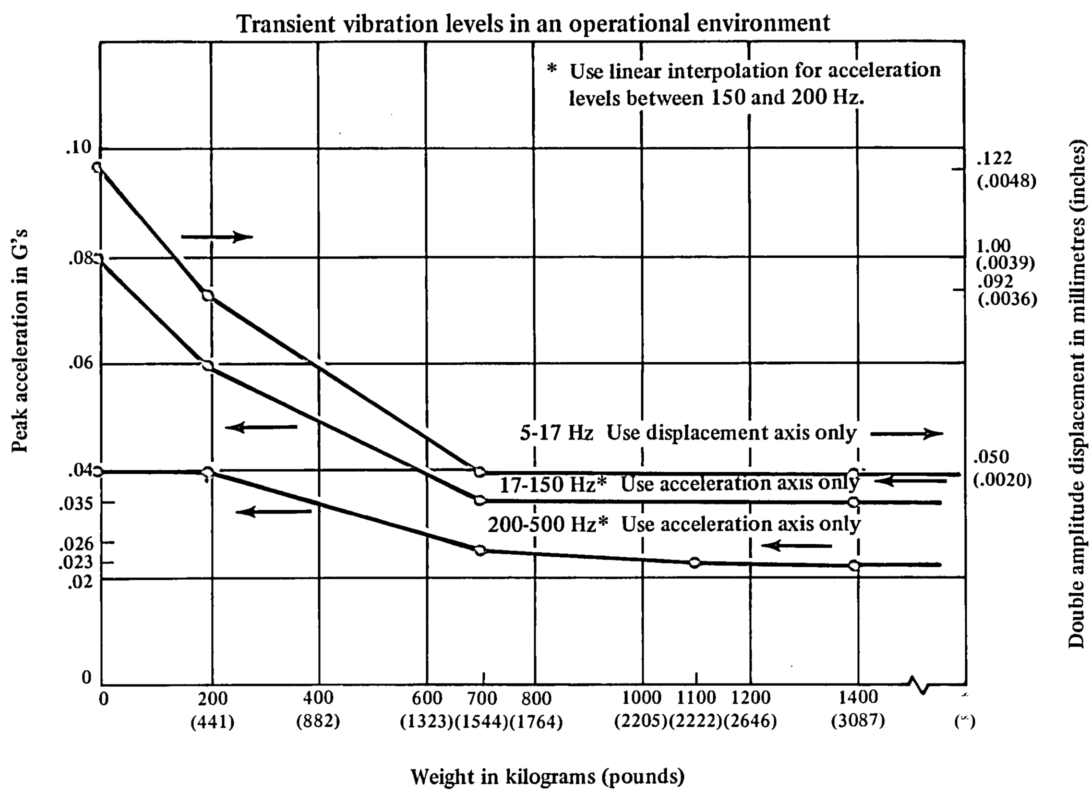
Other IBM Physical Planning Manuals

3101	GA18-2033
5230	GA34-0040
5250	GA21-9337

Vibration and shock levels

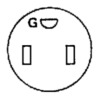
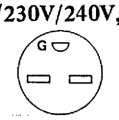
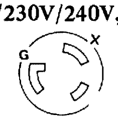
Maximum input at base of machine





Power-outlet specifications

60 Hz outlet specifications (U.S. and Canada)...

Power outlets for Series/1 standalone units (3-wire, grounding, non-locking)	Power outlets for Series/1 rack enclosures (3-wire, grounding, locking)
115V/120V, 15A  NEMA 5-15R	115V/120V, 20A  NEMA L5-20R
208V/230V/240V, 15A  NEMA 6-15R	208V/230V/240V, 20A  NEMA L6-20R

NEMA = National Electric Manufacturers Association

L 6 - 20 R

- R — Receptacle
- 20 — Current rating in amps
- 6 — 208/230 volt rating (6)
- 5 — 115 volt rating (5)
- L — Locking type (L)
- (blank) — Non-locking type (blank)

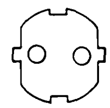
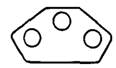
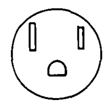
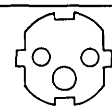
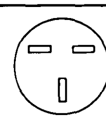
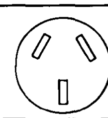
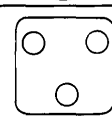
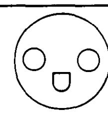
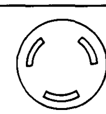
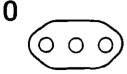
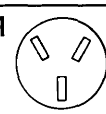
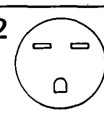
50 Hz and 60 Hz power specifications for countries other than U.S. and Canada...

- **50 Hz power uses blue wire for neutral.**
- **15A single-phase circuit is required for all Series/1 standalone units.**
- **20A single-phase circuit is required for Series/1 rack enclosures.**
- **Rack enclosures, standalone units, and rack units that are not mounted in a 4997 are shipped without power plugs attached to the power cords.**
- **If national or local standards require direct wiring of power cords, complete power-cord wiring before calling the IBM CE for final installation.**

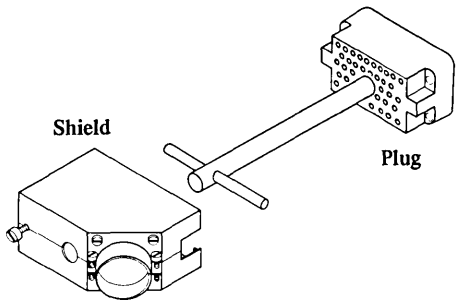
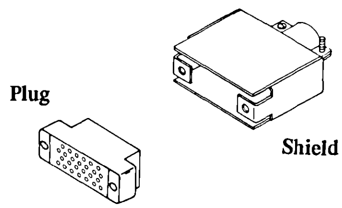
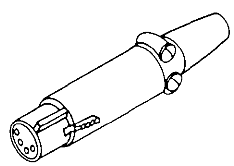
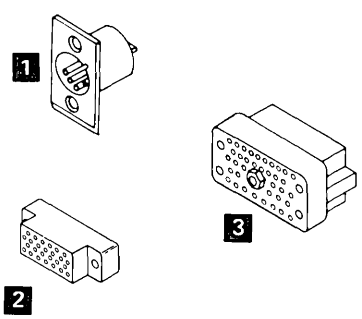
World Trade Countries (Except Canada) Plugs – Customer Setup Units Only

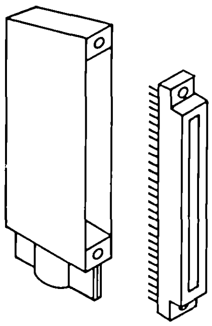
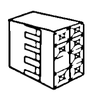
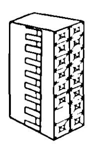
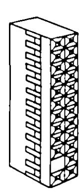
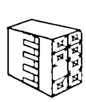
▶ The following plug, designated by country, will be installed on your machine

Country	Plug number	Country	Plug number
Algeria	4	Jamaica	3
Argentina	6	Japan	3, 12
Australia	6		
Austria	1	Malaysia	5
		Mexico	3
Bahamas	3		
Barbados	3	Netherlands	1
Belgium	4	Netherlands Antilles	3
Bermuda	3	New Zealand	6
Bolivia	3	Nicaragua	3
Brazil	3	Norway	1
Bulgaria	1		
		Panama	3
Chile	6	Paraguay	6
Colombia	6	Peru	3
Costa Rica	3	Phillippines	3
		Poland	1
Denmark	8	Portugal	1
Dominican Rep	3		
		Rumania	1
Ecuador	3		
El Salvador	3	Singapore	5
		South Africa	7
Finland	1	Spain	1
France	4	Sri Lanka	7
		Sweden	1
Germany	1	Switzerland	2
Greece	4		
Guatemala	3	Taiwan	3, 12
		Thailand	3, 12
Honduras	3	Trinidad	3, 6
Hong Kong	5	Turkey	1
Hungary	4		
		United Kingdom	5
Iceland	1	Uruguay	6
Indonesia	1		
Iran	1	Venezuela	6
Ireland	5		
Israel	11	Yugoslavia	4
Italy	10		

Plug number	Amperage/voltage
1 	16 A Max, 250 V
2 	10 A Max, 250 V
3 	15 A Max, 125 V
4 	16 A Max, 250 V
5 	13 A Max, 250 V
6 	10 A Max, 250 V
7 	13 A Max, 250 V
8 	10 A Max, 250 V
9 	15 A Max, 125 V
10 	16 A Max, 250 V
11 	10 A Max, 250 V
12 	15 A Max, 200 V

Feature-connector summary (part 1 of 2)

User-attachment connector type		Vendor part number	IBM part number	Used to connect...
	Amp			
	▶ 160-position connector plug	202799-2		Integrated DI/DO or DPC adapter (on customer access panel)
	▶ Shield	202798-1		
	▶ Contact sockets	66109-1		
	▶ Guide–socket	201047-4		
	▶ Connector kit		8327403	
	▶ Tool kit		8327404	
	Crimp tool	90277-1		
	Extractor tool	305183		
	Amp			
	▶ 26-position connector plug	200512-2		Timer feature (on customer access panel)
	▶ Shield	201169-2		
	▶ Contact sockets	66109-1		
	▶ Guide–socket	200390-4		
	▶ Guide–pin	200389-4		
	▶ Connector kit		8327402	
	▶ Tool kit		8327404	
	Crimp tool	90277-1		
	Extractor tool	305183		
	Amphenol			
	▶ 4-position connector plug	91-458		Teletypewriter adapter (on customer access panel)
	▶ Plug kit		8327401	
	Amphenol			
	1 4-position connector block	91-459	5130484	Teletypewriter adapter (on customer access panel)
	Amp			
	2 26-position connector block	201359-1	2122838	Time feature (on customer access panel)
	3 160-position connector block	202800-2	2191078	Integrated DI/DO or DPC adapter (on customer access panel)
	Guide pin	201046-4	2122637	

User-attachment connector type	Vendor part number	IBM part number	Used to connect...
 Continental			
▶ 56-position connector	M600-1156-XA30		Sensor I/O features (4982)
▶ Hood	600-11-56 HI		
▶ Connector kit		8327405	
 Berg			
▶ 2 x 4 connector plug	65043-033	2731843	Multifunction attachment
▶ Pin sockets			Printer attachment - 5200 series
▶ Connector kit			Multidrop workstation attachment
▶ Tool kit			
 Berg			
▶ 2 x 8 connector plug	65405-005		Teletypewriter adapter (on feature card) and timer feature (on feature card)
▶ Pin sockets	47712		
▶ Connector kit		8327397	
▶ Tool kit	HT 208	8327400	
 Berg			
▶ 2 x 12 connector plug	65469-011		IBM 5250 Information Display System (on feature card)
▶ Connector kit		6838819	
▶ Tool kit	HT 73 (HT73-1820)	6838818	
 Berg			
▶ 2 x 4 connector plug	65043-033	2731843	Multifunction attachment
▶ Pin sockets			Printer attachment - 5200 series
▶ Connector kit			Multidrop workstation attachment
▶ Tool kit			

Rack enclosures

Series/1 rack-mounted units are designed to fit a 483-millimeter (19-inch) rack enclosure. (See this Chapter for applicable U.S. standard).

IBM rack enclosure

The **4997 Rack Enclosure** is designed to meet the mounting requirements of Series/1 units. Refer to Figures 9-1 and 9-2.

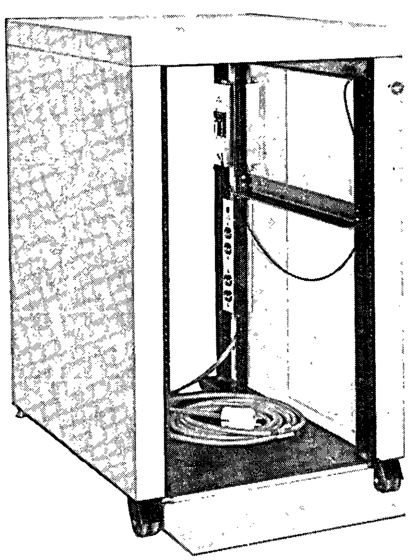
Non-IBM rack enclosure

If you are planning to use a non-IBM rack enclosure for your Series/1 units, the non-IBM rack enclosure **must** have the following:

- Have equivalent mounting hardware and unit service access to the IBM 4997 (Figure 9-3).
- Conform to the dimensions specified in this section (Figure 9-4).
- Present no safety hazards to the IBM customer site representative.

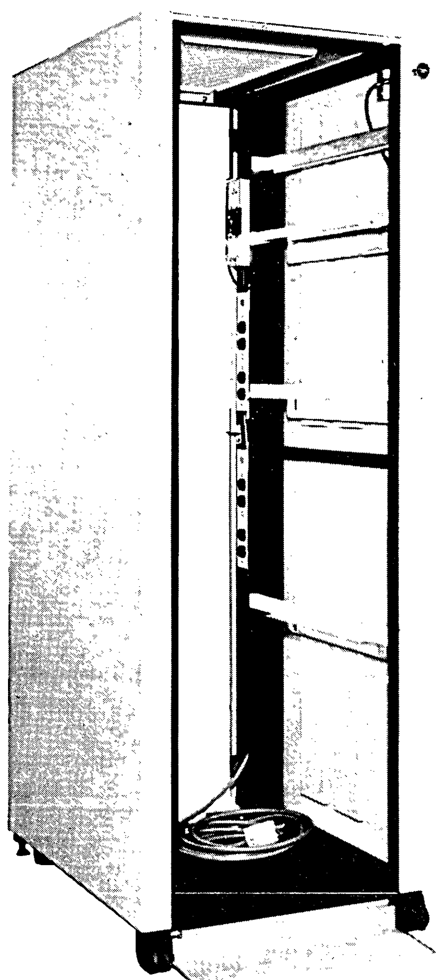
IBM will install and service Series/1 units (except 4969) in a non-IBM rack enclosure when the above requirements are met. If these requirements are not met, the customer is responsible for mounting Series/1 units in a non-IBM rack enclosure. IBM will not assemble or alter a non-IBM rack enclosure to install Series/1 units.

IBM 4997 Rack Enclosure Model 1



(1 meter)

IBM 4997 Rack Enclosure Model 2



(1.8 meters)

Figure 9-1. IBM rack enclosures

- ▶ Series/1 rack-mounted units fit into a 483-mm (19-inch) rack enclosure (see page 9-1 for the applicable U.S. standard).
- ▶ The 4997 Rack Enclosure meets the mounting requirements of the Series/1 units.

Ref. no.	4997 Model 2 features
1	Screw holes for mounting rack units (see Figure 9-4 for hole pattern)
2	EPO (Emergency Power-Off) switch control
3	Horizontal unit supports (apparatus supports)
4	Vertical support columns (six)
5	Vertical support-column spacing for 483-mm (19-in) rack units
6	Vertical support-column spacing for 483-mm (19-in) rack units
7	Enclosure vents (top and bottom covers)
8	Tilt stabilizer
9	Rack adapter for half-width units
10	Casters and leveling pads
11	User-cable opening
12	User-cable routing area
13	Enclosure covers
14	Primary power and ground distribution
—	Fits standard 2.03-m (6-ft, 8-in) door
—	Strength to support total weight
—	Welded frame
—	Qualifies as computer enclosure (UL listed in the U.S., see page 9-1)

Note...
- ▶ The 4997 Model 1 has many of the same features as the Model 2. The main differences are height and venting.

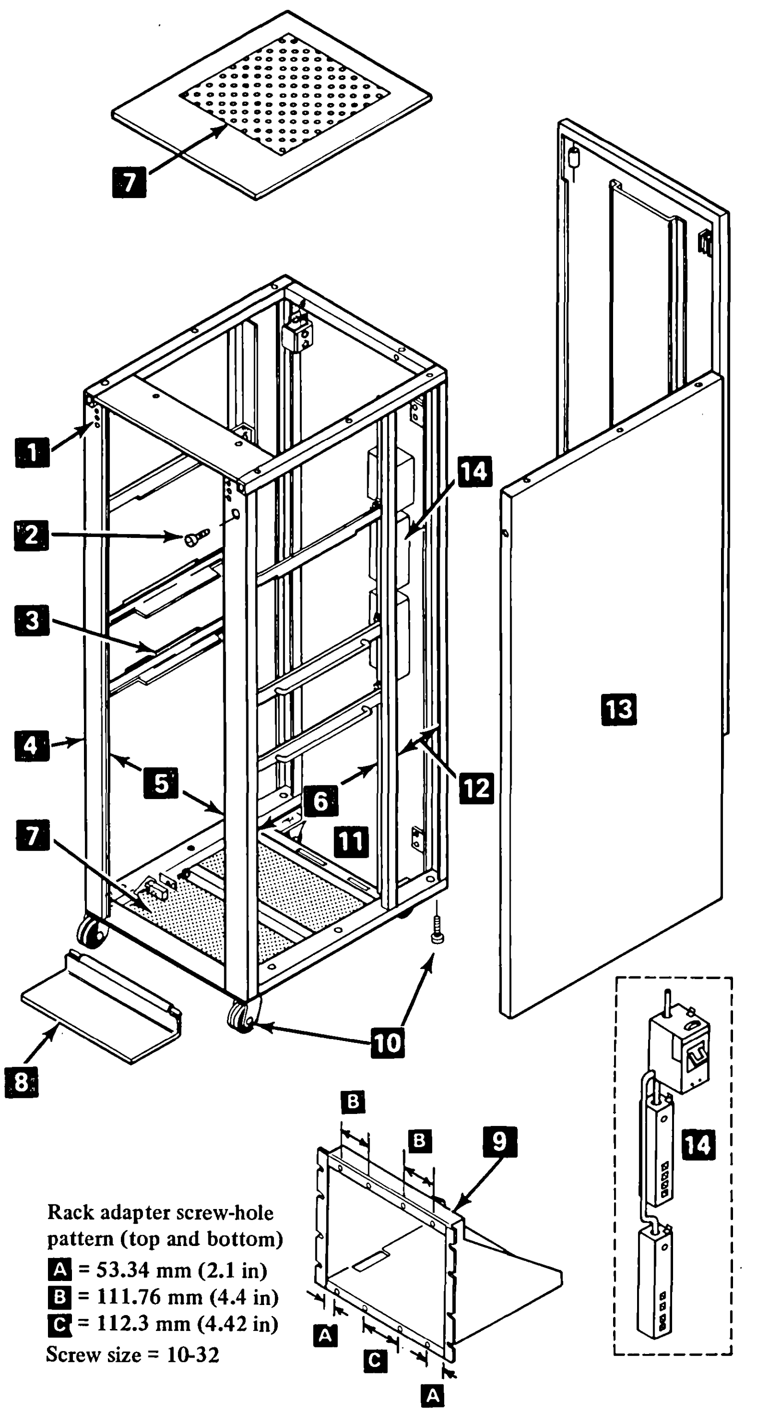


Figure 9-2. IBM 4997 Rack Enclosure Model 2

Non-IBM rack-enclosure requirements

- The chart below lists the rack-enclosure features required for IBM installation and service of Series/1 units in a non-IBM rack enclosure. The numbers in the first column of the chart refer to the equivalent items in the 4997 (see Figure 9-2).

- All Series/1 units in a non-IBM rack enclosure must be supported independently of the front mounting screws for IBM to complete installation and to service. Otherwise, the customer needs to mount the units in the rack and reposition racks or units as necessary for IBM installation and service.

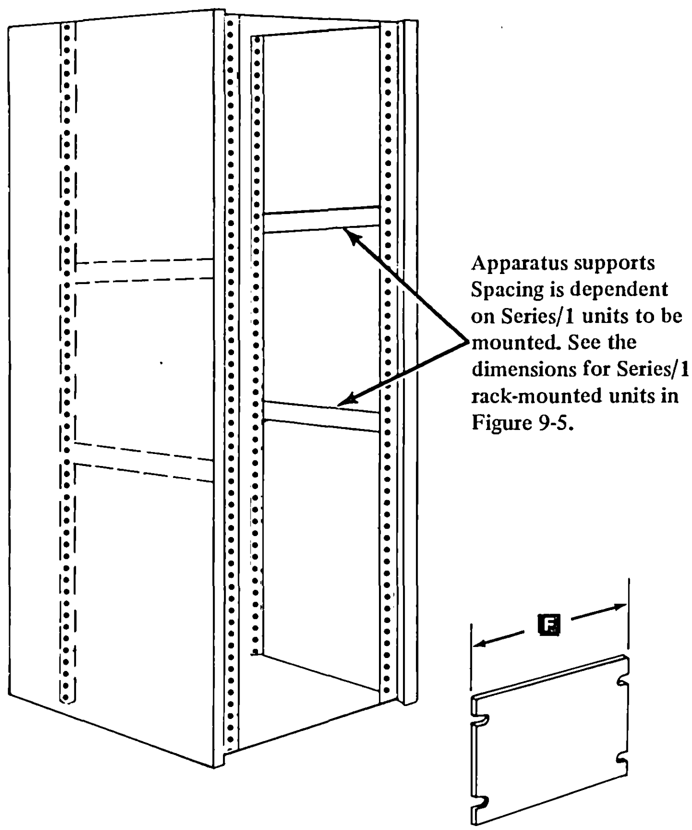
Figure 9-2 ref.	Non-IBM rack enclosures	
1	Screw holes for mounting rack units	Required
2	EPO (Emergency Power-Off)	Required
3	Horizontal unit supports (Apparatus supports)	Required
4	Vertical support columns	Required (four)
5	Vertical support-column spacing for 483-mm (19-in) rack units	Required
6	Vertical support-column spacing for a 4962, 4963, 4966, 4967, or 4969	Required
7	Enclosure vents	Required
8	Tilt stabilizer	Required
9	Rack adapter for half-width units (4952A, 4954A, 4964, 4982, 4999)	As required
10	Casters and leveling pads	Recommended
11	User-cable opening	Required
12	User-cable routing area	Required
13	Enclosure covers	Required
14	Primary power and ground distribution	Required
—	Fits standard 2.03-m (6-ft, 8-in) door	Recommended
—	Strength to support total weight	Required
—	Welded frame	Recommended
—	Qualifies as computer enclosure	Recommended

Figure 9-3. Non-IBM rack-enclosure requirements

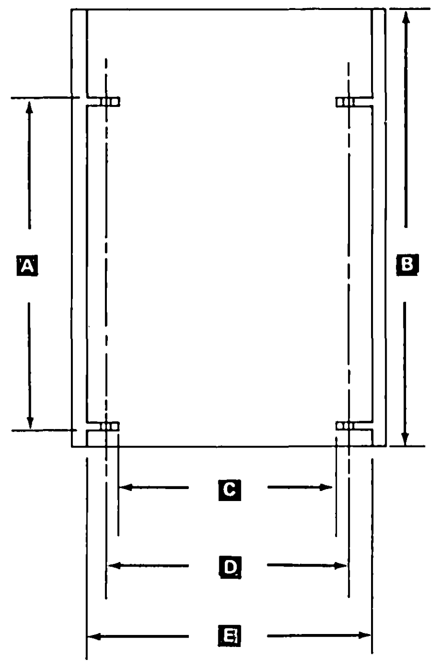
Non-IBM rack-enclosure dimensions

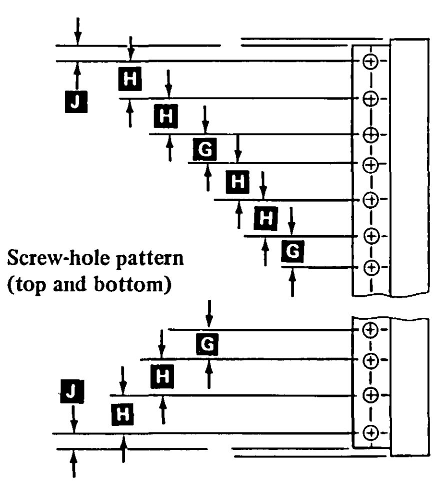
These dimensions are required for non-IBM rack enclosures that will mount Series/1 units.

Typical non-IBM rack enclosure



Top view





Required dimensions:

A = 610 mm (24 in)
required for mounting 4962, 4963, 4966, 4967, 4968, 4969

B = 711 mm (28 in)
minimum rack depth

C = 451 mm (17-3/4 in)

D = 465 mm (18-1/2 in)

E = 483 mm (19 in)

F = 483 mm (19 in)

G = 13 mm (1/2 in)

H = 16 mm (3/4 in)

J = 8 mm (1/2 in)

Figure 9-4. Non-IBM rack-enclosure dimensions

Dimensions of Series/1 rack-mounted units

	Rack-mounted units		Metric-dimensions (mm)			English dimensions (in)		
Type	Model	Unit description	Width	Depth	Height	Width	Depth	Height
4952	A	Processor	216	572	312	8-1/2	22-1/2	12-1/2
4952	B	Processor	483	476	356	19	18-3/4	14
4952	C	Processor	483	470	356	19	18-1/2	14
4952	30D	Processor	480	576	346	19	22-3/4	13-3/4
4954	A	Processor	216	444	356	8-1/2	17-1/2	14
4954	B	Processor	483	476	356	19	18-3/4	14
4954	C	Processor	483	470	356	19	18-1/2	14
4954	30D, 60D	Processor	480	576	346	19	22-3/4	13-3/4
4955	A,B,C,D,E,F	Processor	483	476	356	19	18-3/4	14
4956	B, B10 E, E10	Processor	483	476	356	19	18-3/4	14
4956	C, C10	Processor	483	470	356	19	18-1/2	14
4956	30D,31D, 60D,61D, 60E,E70, G10,H10	Processor	480	576	346	19	22-3/4	13-3/4
4959	A	I/O Expansion	483	476	356	19	18-3/4	14
4962	1, 1F, 3	Disk Storage	483	610	489	19	24	19-1/4
4962	2, 2F, 4	Disk Storage	483	610	489	19	24	19-1/4
4963	All	Disk Storage	483	584	356	19	23	14
4964	1	Diskette	216	590	356	8-1/2	23-1/4	14
4965	1	Storage and I/O Expansion	483	470	356	19	18-1/2	14
4965	30D, 60D	Storage and I/O Expansion	480	576	346	19	22-3/4	13-3/4
4966	1	Diskette Mag. Unit	483	610	356	19	24	14
4967	2CA, 2CB 3CA, 3CB	High-Performance Disk Subsystem	483	635	356	19	25	14
4968	1AS	Autoload Streaming Magnetic Tape Unit	483	563	216	19	22	8-3/4
4969	4D,4N,4P	Magnetic Tape Unit	483	563	709	19	22-1/4	28
4969	7D,7N,7P	Magnetic Tape Unit	483	705	709	19	28	28
4982	1	Sensor I/O	216	536	356	8-1/2	21	14
4987	1	Comm. Subsystem	483	610	356	19	24	14
4993	1	Series/1–System/370 Termination Enclosure	483	325	133	19	12-3/4	5-1/4
4999	1, 2	Battery Backup	216	508	356	8-1/2	20	14

Figure 9-5. Series/1 rack-mounted unit dimensions

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