

GA21-9293-6

File No. S38-15

IBM System/38

**IBM System/38
Installation Manual—
Physical Planning**



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Seventh Edition (March 1983)

This is a major revision of, and makes obsolete, GA21-9293-5 and Technical Newsletter GN21-3007.

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

See *About This Manual* for a summary of major changes in this edition.

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FEDERAL COMMUNICATIONS COMMISSION REQUIREMENTS

Electromagnetic Interference

United States Federal Communications Commission (FCC) rules require IBM to publish the following information, which applies to each unit (including modems and terminals that hereafter will be called *equipment*) described in this manual.

WARNING: *This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manuals, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.*

Instructions Pursuant to FCC Part 15, Subpart J

1. This equipment should not be installed less than 30 meters (98.5 ft.) from radio or television receivers or their receiving antennas.
2. This equipment should not receive its power from branch circuits that also power radio or television receivers.

If this equipment cannot comply with the above distance limitation:

1. Turn the equipment and the receiver on. If no interference is apparent, no further action need be taken.
2. If interference occurs, reorient or relocate the equipment, the receiver, or both.
3. If interference still occurs, contact your IBM representative.

Federal Communications Regulations

FCC (Part 68) Regulations Governing the Operation and Maintenance of IBM 2400 bps and 4800 bps Integrated Modems (Sales Features 5641 and 5741) over the Public Switched Network in the US

Data protective circuitry in the IBM 2400 bps and the IBM 4800 bps Integrated Modems is registered with the US Federal Communications Commission (FCC). The FCC requires that IBM publish the following information about the operation and maintenance of all devices containing registered circuitry. The FCC also requires that all persons who use and maintain devices containing registered circuitry in the US comply with the following FCC rules:

1. To ensure compliance with the regulations regarding the repair of registered circuitry, field repair is limited to replacement of field-replaceable units only. Field replacement of these units will be performed by authorized personnel only. No other field repair or adjustment to the registered circuitry is permitted.
2. If a problem occurs that is determined to be in registered circuitry or to be caused by registered circuitry, the device containing that circuitry must be disconnected from the public switched network immediately by removing its System/38 cable from its network data jack.

If the telephone company detects a problem on the network that has been caused by System/38, the telephone company has the right to temporarily discontinue service to the device containing that circuitry. Service may be discontinued immediately and remain discontinued until the problem no longer exists.

3. Connecting a device containing registered protective circuitry to a party line or to a line serving a coin-operated telephone is prohibited.

4. The telephone company may make changes in its communications facilities, equipment, operations, or procedures, where such action is reasonably required in the operation of its business and is not inconsistent with the rules and regulations of the FCC. If these changes can be reasonably expected to cause your equipment to be incompatible with the telephone company's communications facilities, or to require modification or alteration of your equipment, you will be given adequate advance notice, in writing, to allow you an opportunity to react in a manner that allows you to maintain uninterrupted service.
5. Before a device containing registered circuitry is initially connected to the public switched network, you must contact the telephone company and supply the following information:
 - a. The line to which the device is being connected.
 - b. The FCC registration number and ringer equivalence number of the device.
 - c. The identification of the product containing the registered circuitry. In the case of the System/38, you will identify the product as the IBM 5381.
 - d. The type of communications line jack needed.

See *Cable Installation Responsibility* in this manual for information about the FCC registration number, ringer equivalence number, and type of jack to be reported for Sales Feature 5641 or 5741.

You also must inform the telephone company of all registration numbers associated with other devices that you may have connected on this circuit.

6. You must notify the telephone company upon final disconnection of a device containing registered circuitry, identifying the line from which the device was disconnected.

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About This Manual

PURPOSE OF THIS MANUAL

This manual is task-oriented. Information is presented in separate chapters for: the space planner, the electrical workers, and the heating and air-conditioning workers. This information, and any specific information for each task, should be given to the appropriate workers.

This manual has been updated to include information about the 3430 Model A and 3430 Model B magnetic tape units.

ORGANIZATION OF THIS MANUAL

This manual includes the following information:

- Suggested scheduling of site preparation
- Space requirements
- Recommendations about fire protection and lightning protection
- Cabling information
- Electrical requirements
- Humidity and temperature requirements

IBM recommends that the organization planning to install the system assign someone to coordinate all site preparation planning. This individual will ensure that the necessary site modifications are completed before the system arrives for installation. This manual contains data and recommendations that will help meet these requirements.

IBM assumes that any alterations or additions to the site (such as the addition of some electrical wiring) will be performed by qualified technicians and professionals designated by the coordinator.

Installation and cabling information about IBM 5250 work stations that can be attached to this system is available in the *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337, available through the IBM branch office serving your locality. Installation planning information for external modems is supplied by the modem manufacturer. If an IBM external modem is used, its installation manual is also available from your IBM branch office. Information about the UPS (uninterruptible power supply) system and its cabling is available in the *IBM System/38 Uninterruptible Power Supply Planning Guide*, GA21-9421. IBM recommends the use of these manuals during site planning and preparation.

Although this manual is concerned primarily with the installation of a data processing system, planners must also consider the space, electrical, and environmental requirements of other machines and equipment in the data processing area.

In addition to physical planning, consider the following:

- Obtaining the supplies needed for operating the system
- Writing programs or converting programs from other systems
- Training for programmers and operators

Your IBM sales representative can answer any questions about the programs, manuals, and supplies needed. Classes, as well as demonstrations, can be scheduled for programmers and operators.

Note: This manual follows the convention that *he* means *he* or *she*.



Chapter 1. Scheduling Considerations

PLANNING IN ADVANCE

Because any data processing system occupies space, uses power, and is surrounded by air that must not exceed temperature and humidity limits, you should determine whether your present facilities must be modified to accommodate the system.

If modifications are needed, advance planning lets you complete the work before the system arrives. Then you can install your system quickly, easily, and with minimal disruption of normal business routines.

First you should determine where you are going to install the system. After you have selected a site for your data processing area, you must consider your system installation.

The *IBM System/38 Physical Planning Template*, GX21-9294, is a clear plastic template, drawn to a scale of 1:48, that can help you make a floor plan of your data processing area, showing the arrangement of all the data processing equipment, desks, tables, files, and so on to be used in the area. If you are using a floor plan drawn to a scale of 1:50, the template is slightly larger (4%) than your application. Check any close fit with the actual dimensions shown in Chapter 3. With this floor plan you can determine the following:

- Electrical requirements, including the need for new circuits and the location of power receptacles and control panels. Show these locations on your plan view.
- Routing cables that interconnect various data processing units and lengths of these cables. Show the cable routing on your plan view.

- The possible need for special humidity and temperature control devices. List what is needed and show where it should be located.
- Total space requirements, including storage space for diskettes, forms, cards, and tapes. Consider special humidity and temperature considerations for diskette, card, paper, and tape storage if these will not be stored in the main data processing area. Record any special requirements.

MAKING A SCHEDULE

To be sure that the data processing area is ready when the system is delivered, make a site preparation schedule. Because each installation differs, it is not possible to provide a precise schedule in this publication. However, you can modify the following schedule to suit your installation needs. The *Site-Preparation Scheduling Work Sheet* in this chapter can be used to plan task schedules and to record progress.

Six Months before Delivery

- Request a visit by the IBM installation support representative to discuss all phases of the proposed installation.
- Review the order.
- Prepare a preliminary layout of the proposed data processing area.

Four Months before Delivery

- Complete your floor plan.
- Determine cable lengths (see *Cable Information* in Chapter 4) and provide this information to your IBM representative.
- If building alterations (such as painting, plastering, or expanding electric service or communications facilities) are needed:
 - Complete all necessary drawings and specifications for the alterations.
 - Schedule getting the areas ready so that alterations can be made.
 - Schedule alterations so that they are complete one week before machine delivery.

One Week before Delivery

- All planned modifications for wiring, temperature control, and humidity control should be completed and tested.
- All work station cabling should be installed and tested.
- Communications facilities should be installed and tested.
- All building alterations should be completed.



Chapter 2. Physical Planning Considerations

SPACE PLANNING

To prepare for the installation of IBM data processing equipment, determine where the machines will be placed, and make certain that you can move the equipment from the truck into the selected data processing area. The following factors may help you determine the location of the data processing area and the best way to route system equipment:

- The size of the doorways and halls through which each unit must be moved. (See *Reducing Unit Dimensions*.)
- Elevator capacities and loading facilities that will be used for receiving and moving the various units.
- The amount of site modification required to use each proposed data processing area.
- The amount of electromagnetic interference in each proposed data processing area. Avoid putting a system in an area where high electromagnetic interference can be radiated or conducted. These areas may exist near a radio-frequency source, such as radio transmitting towers (AM, FM, TV, and two-way radio), radar (FAA and military), certain industrial machines (RF induction heaters, RF arc welders, and insulation testers), time clocks, certain electrical heating systems, and high-energy power lines. Should any of these conditions exist, reassess your plans to see if any special installation or product considerations are needed for normal system operation and maintenance. Your IBM installation support representative can help you.

Floor Plans

Consider these factors as you make your floor plans:

- Space for people to work efficiently.
- Space for the system unit, printers, work stations, desks, files, and all miscellaneous equipment.
- Space for servicing the equipment.

- Security areas and methods.
- Storage space for supplies and documentation.
- Aisle space.
- Cable length and cable routing.
- Cable protection, if required. Proper planning will ensure that traffic cannot damage a cable and that workers cannot trip on cables. If cables must cross a line of traffic, you may want to build a ramp for traffic across the cables, run the cables under a raised floor, or eliminate the risk in some other way. (Local codes may dictate the method used.) If you decide to use a raised floor, it can be made of steel, aluminum, or fire-resistant wood (see *Air Temperature and Humidity Considerations* in Chapter 6). A free-access raised floor is best. Build the raised floor high enough to accommodate cables, power distribution, and so on. A floor height between 100 and 300 mm (4 and 12 in.) usually is acceptable.
- Space for future expansion.
- Location of electrical outlets, communications lines, and work station cables.
- Maximum cable lengths. (The *Cable Summary Chart* in Chapter 4 specifies maximum cable lengths, which dictate the maximum distances between the system unit and its cable-connected units.)
- The weights of system components and other equipment in the data processing area.

Weights of the various system components should not exceed the floor-loading capacity of most buildings; however, if it seems that the floor-loading capacity of an area might be exceeded, consult a structural engineer.

Your IBM installation support representative can provide guidance about service clearances, operating convenience service access, data security, and safety.

Servicing

- When you make floor plans of the data processing area, provide space for storing system manuals and maintenance documentation and allow space for servicing the equipment. The service clearance shown in the *Metric Measurements* and *English Measurements* tables are minimum clearances needed to service the equipment. For example, manuals can be placed in a customer engineer's book box, and documentation can be stored within the service area designated for the system. The book box is about 430 mm (17 in.) wide, 600 mm (24 in.) long, and 500 mm (20 in.) high.

Reducing Unit Dimensions

To move some units into your data processing area, you may need to reduce the dimensions of the units. All units in the system can be reduced to the horizontal dimensions of 750 mm x 1520 mm (29-1/2 in. x 60 in.) or smaller by removing unit covers, upending the unit, or both.

To prevent damage, always use an upending kit when upending the unit. You can get this kit by ordering SF9845 from IBM at least 30 days before you need to upend the unit. The kit consists of four casters, which are to be mounted on the left end of the unit after the unit cover is removed.

SF9845 is not available in E/ME/A countries. See unpacking instructions part IE5448 and part IE5449.

OTHER PLANNING

Fire Protection

Provide portable carbon dioxide extinguishers in case of electrical fires and portable pressurized water extinguishers in case of fires involving ordinary combustible material such as paper.

Fire protection around the outside of the data processing room (in adjoining rooms, the floor space above, and the floor space below) is as important to the safety of the system as fire protection within the room itself.

If local building codes or insurance regulations require sprinkler systems, consider using a preaction system that helps prevent accidental release of water.

Lightning Protection

Communications Lines

Lightning striking near a communications line can place a heavy power surge on the line. If this surge is allowed to reach the internal circuits for that line, these circuits can be destroyed.

If you plan to install a communications attachment in an area with a high incidence of severe electrical storms, you should take the following precautions:

- Check with the communications line installer to ensure that all switched network lines have been equipped with lightning protection.
- Consult your IBM installation support representative about the need for installing an undercover lightning arrester (RPQ S40210) for each nonswitched line with an undercover modem.

Work Station Cables

For information about lightning protection on work station cables, refer to your *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337.

Room Acoustics

You can reduce noise by adapting your ceiling. A dropped porous ceiling works best. If there are overhead ducts, prevent these ducts from transmitting sound from another area into your data processing area.

In large rooms, you can reduce noise by applying acoustical material to the floor. If carpeting is used as a floor covering in the data processing area, it should be an antistatic type or should be treated to prevent or minimize static build-up.

Relocation

Before you move any system unit, consult your IBM customer engineer. He will advise you of any special precautions that must be taken to protect your data file or the system units.



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Chapter 3. Physical Planning Requirements

SPACE PLANNING

The arrangement of the units (devices, tables, files) in your data processing area, and the path you will use to move the System/38 devices from the entrance of your building into your data processing area should be determined during planning.

This section includes the following:

- General information about space planning.
- Drawings of the System/38 devices available for your system. These pictures will help you visualize what the devices look like, as you plan their arrangement in the data processing area.
- Summaries of device characteristics in both English and Metric measurements. These charts include space to write in the dimensions, weights, and clearances for all the other significant items to be placed in the room. You will need to know these characteristics as you make the plan view for the arrangement of equipment in the room. The charts will also show power cord lengths for those items that are not powered from other system devices. You will need this power cord length to help you determine where to place the device or the power receptacle for the device. Device weights help you determine floor loading and elevator use.

- At least one plan view for each System/38 device you might install. These are drawn to a scale of 1:48. You can make transparent copies of these plan views or cut them out of the pages. The plan views can then be moved around on a scale drawing of your data processing area (made using a scale of either 1/4 in. = 1 ft. or 1 mm = 50 mm), to determine your system configuration.

Note: When determining the system configuration, consider the maximum cable distance between devices, as shown in Chapter 4, and also the locations of your power outlets. You may need to install new outlets to power your system devices.

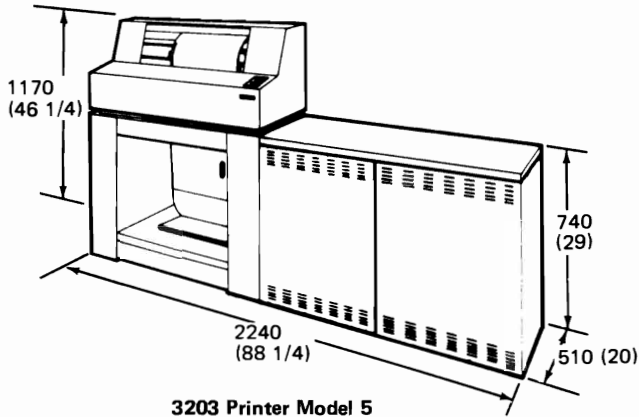
- An 8-1/2 in. x 11 in. grid sheet with the grids marked each 1/4 in. This grid sheet can be used to make your floor plan of the data processing area, and to arrange the devices and associated items in the room. You might want to use a copy of this grid sheet to make plan views of the non-IBM items that will also be in the area. (See the *Floor Plan Work Sheet* in this chapter.)

When you allow space for service clearances, you can overlap the service areas outlined by the dashed lines on the plan views. However, always allow the largest clearance required to open machine covers in the overlapped areas. For example, if a 3370 Model A11 is placed at the right of a 5424, the two machines must be separated by at least 32 in. because the 3370 needs 32 in. of clearance at its left for servicing the machine, while the 5424 needs only 18 in. of clearance at its right.

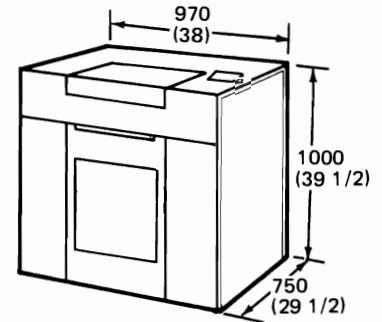
Your final floor plan should include clearly marked locations of electrical outlets that must be installed. The identification number of each receptacle or connector should be indicated on the drawing.

When the floor plan view is complete, make copies and distribute them to the workers who will do the wiring, heating, air conditioning, and moving.

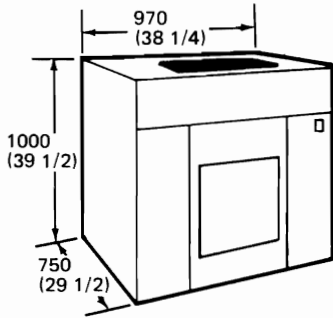
Device Drawings



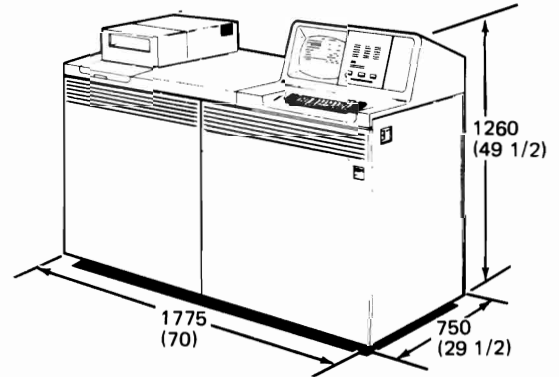
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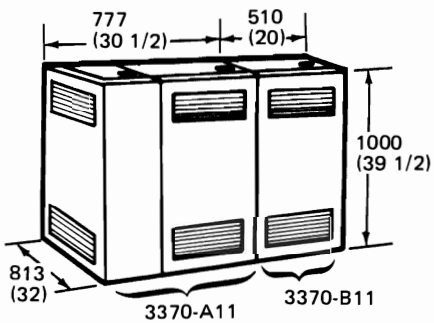
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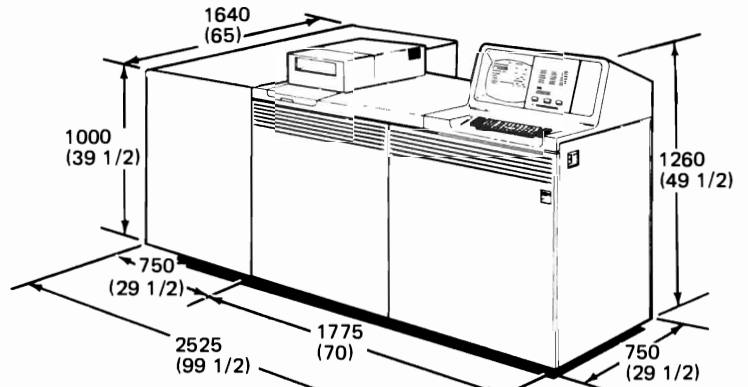
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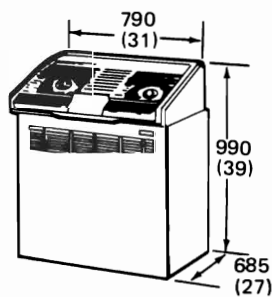
5381 System Unit



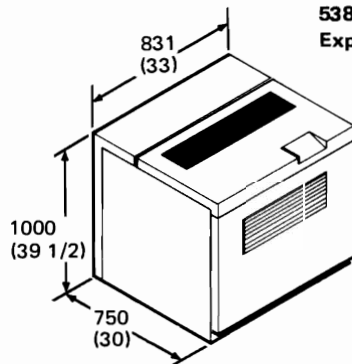
3370 Direct Access Storage



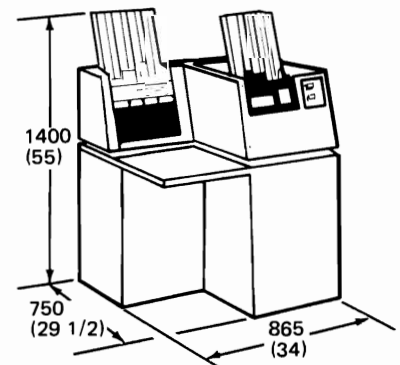
5381 System Unit with
Expansion Enclosure



3411 Magnetic Tape Unit and Control
3410 Magnetic Tape Unit



3430A Magnetic Tape Unit and Control
3430B Magnetic Tape Unit



5424 Multi-Function Card Unit

Metric Measurements

Type	Model	Description	Power Cord Length in Meters	Weight (kg)	Dimensions (mm)			Service Clearance (mm)				Notes (see below)
					Width	Depth	Height	Front	Rear	Right	Left	
3203	5	Printer	4.3	485	2240	510	1170	915	1070	610	610	
3262	B1	Printer	4.1	245	970	750	1000	760	760	760	760	
3370	A11	Direct Access Storage	4.3	260	777	813	1000	760	760	813	813	3
	B11		170	533	813	1000	760	760	813	000	4	
3410	1, 2, 3	Magnetic Tape Unit		80	790	685	990	915	150	000	000	1
3411	1, 2, 3	Magnetic Tape Unit and Control	4.3	150	790	685	990	915	150	000	000	
5211	2	Printer	4.3	240	970	750	1000	760	760	760	760	
5381	-	System Unit without Expansion Enclosure	2.4	600	1775	750	1260	1150	900	500	000	
		System Unit with Expansion Enclosure	2.4	1000	2525	1640	1260	1150	150	500	900	2, 5
5424	A1, A2, K1, K2, K3	Multi-Function Card Unit	2	260	865	750	1400	760	760	460	000	

Notes:

1. Up to three tape units can be attached to, and powered from, the control unit.
2. See the plan view for *5381 System Unit with Expansion Enclosure*.
3. The right service clearance data does not apply if a Model B11 is attached.
4. The right service clearance applies only to the rightmost Model B11, effective width is 510 mm when installed with a Model A11.
5. Expansion enclosure is 1000 mm high.

Note: Write the significant measurements of other items that will affect the layout or wiring of the data processing area in the blank spaces on the chart above. These items must be considered when you are determining the final system arrangement.

English Measurements

Type	Model	Description	Power Cord Length in Feet	Weight (pound)	Dimensions (inch)			Service Clearance (inch)				Notes (see below)
					Width	Depth	Height	Front	Rear	Right	Left	
3203	5	Printer	14	1070	88-1/4	20	46-1/4	36	42	24	24	
3262	B1	Printer	13.5	540	38-1/4	29-1/2	39-1/2	30	30	30	30	
3370	A11	Direct Access Storage	14	575	30-1/2	32	39-1/2	30	30	32	32	4
	B11			375	21	32	39-1/2	30	30	32	00	5
3410	1, 2, 3	Magnetic Tape Unit		180	31	27	39	36	6	00	00	1
3411	1, 2, 3	Magnetic Tape Unit and Control	14	325	31	27	39	36	6	00	00	
5211	2	Printer	14	530	38-1/4	29-1/2	39-1/2	30	30	30	30	
5381	—	System Unit without Expansion Enclosure	8	1330	70	29-1/2	49-1/2	45-1/2	35-1/2	20	00	
		System Unit with Expansion Enclosure	8	2220	99-1/2	65	49-1/2	45-1/2	6	20	35-1/2	3, 6
5424	A1, A2, K1, K2, K3	Multi-Function Card Unit	6.5	570	34	29-1/2	55	30	30	18	00	2

Notes:

1. Up to three tape units can be attached to, and powered from, the control unit.
2. This unit is powered from the system.
3. See the plan view for *5381 System Unit with Expansion Enclosure*.
4. The right service clearance data does not apply if a Model B11 is attached.
5. The right service clearance applies only to the rightmost Model B11, effective width is 20 inches when installed with a Model A11.
6. Expansion enclosure is 39-1/2 inches high.

Note: Write the significant measurements of other items that will affect the layout or wiring of the data processing area in the blank spaces on the chart above. These items must be considered when you are determining the final system arrangement.

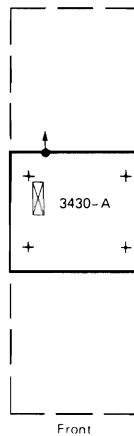
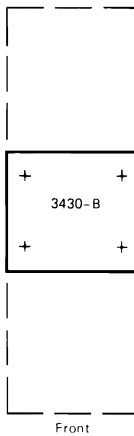
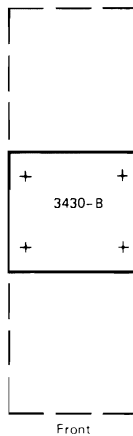
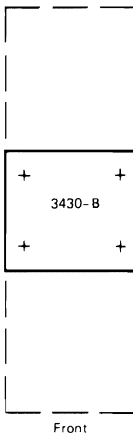
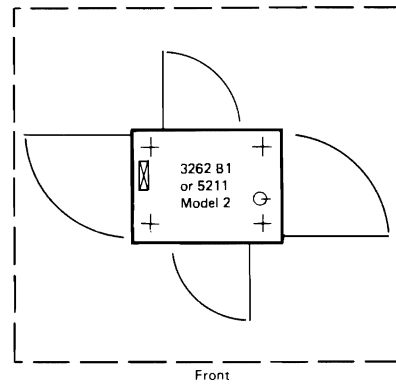
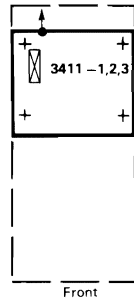
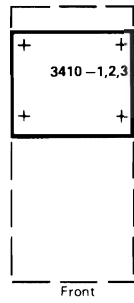
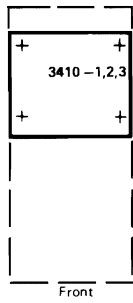
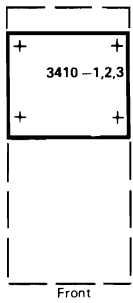
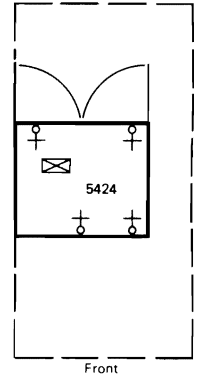
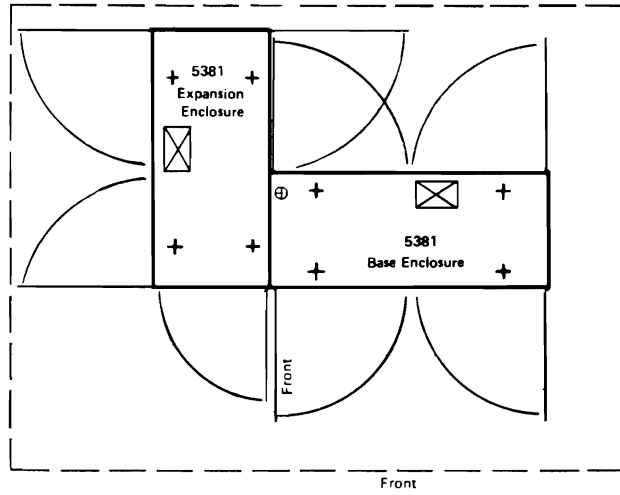
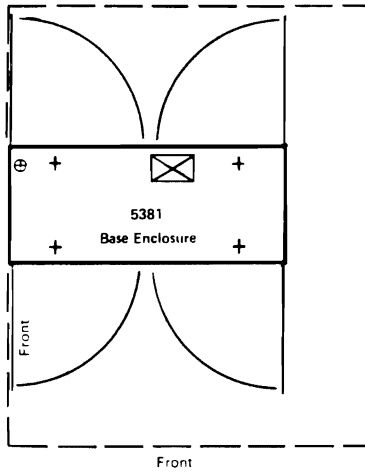


This page is blank so you can use the plan views on the reverse side as templates.



SERVICE PLANNING

Plan Views



Scale 1:48 (see note)

Legend

- ⊕ Power cord exit (power cords are measured from power cord exit)
- ⌒ Cover swings
- Service area boundary
- ⊕ Casters
- Leveling pads or glides
- ⊠ Cable entry/exit area in machine base

Note: These plan views can be used instead of the acetate template on floor plans with a scale of either 1 mm = 50 mm, or 1/4 in. = 1 ft. Where exact size is critical, see dimensions in the measurement charts.

Chapter 4. Cable Requirements

CABLE INFORMATION

This chapter provides cable information you will need as you plan your installation.


The person making your floor plan of the data processing area needs to know the maximum cable lengths to determine device locations. When the floor plan is complete, provide a copy of it, or the length of all variable-length cables, to the person completing the *Cable Summary Chart*.

Cable Length

The cable to the system unit from the 5211 or the 3262-B1 is 6.1 meters (20 ft.) long; the cable from the 5424 to the system unit is 2.0 meters (6.5 ft.) long. All other cables have variable lengths up to the maximum lengths shown in the *Cable Summary Chart* in this chapter. IBM provides all of these cables (except the cables between the system unit and work stations); these cables are made to order so that they are long enough to connect units without having excess cable on the floor.

Making variable-length cables to your specifications requires extra time. Therefore, as soon as you have determined a final floor plan, contact your IBM representative and give him the lengths for the cables you need to ensure you have the cables before your system arrives.

Cable length can be determined by measuring the path the cable takes from the cable entry/exit cutout on the device to the cable entry/exit cutout on the 5381 System Unit.

When you measure to or from a cable entry/exit hole (shown as  on plan views and templates), you must remember the following:

- Include the distance from the edge of the unit to the center of the cable entry/exit hole in the unit.
- Never include any other undercover cable measurements; IBM allows for these when building the cables.
- If you plan to run a cable under a raised floor, add twice the height of the raised floor to the length of the cable route between the attached unit and the system unit.

Measure work station cables from the connector on the outside cover of the work station to the connector on the outside cover of the system unit (see note).

Consider these facts when making this measurement:

- Measure along the intended cable route, including diagonal and vertical cable runs in this measurement.
- The cable connectors on the system unit are mounted about 0.5 meter (1-1/2 ft.) from the floor and are aligned with the cable entry/exit hole.
- The system unit provides a cable clamp at the bottom of the cover near the cable entry. Cables should be routed through this clamp, then to the connectors.
- Add 0.6 meter (2 ft.) to the length of each work station cable to provide cable slack needed to service the system unit.

To find the length of the communications attachment cables, you should measure from the system unit cable entry hole to one of the following:

- The external modem or autocal unit.
- The digital network channel service unit.
- The teleprocessing line connector.
- The protective device, where such a device is required to interface with a switched teleprocessing line.

All cables except work station cables enter the system unit through its cable entry hole at the bottom of the unit. All cables from units other than work stations and communications features leave the units through their cable exit holes at the bottom of the units.

Cable Installation Responsibility

It is your responsibility to install, test, and maintain the cables between the system unit and any attached work stations. (You must also install the work stations.) For appropriate installation planning information, see the *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337.

Under normal circumstances, IBM personnel will install the cables for all other machines. Normal circumstances are those in which there is an easily accessible cable route, including an easily accessible raised floor or cable raceway.

You must supply cable length data to your IBM representative at least 120 calendar days before the scheduled arrival date for your system.

However, if you prefer, you can have the cables installed by non-IBM personnel. When cables are to be installed by non-IBM personnel, IBM will furnish, upon request, a representative to show them which cable belongs to each machine, a copy of the cable layout diagram, and/or printed information applicable to the installation of cables.

It is your responsibility to arrange common carrier service (such as telephone lines) to the point at which such service lines meet IBM cables. Common carrier service should be installed before the scheduled system arrival date.

Switched lines in the US must be connected to a device that has been registered by the US Federal Communications Commission (FCC).¹ It is your responsibility to register the following devices:

- Integrated modems.
- External modems.
- External protective couplers.

If the modem is not registered (examples: Sales Features 5501, 5502, and 5508), you must obtain and install a registered protective coupler to which IBM and the common carrier can connect their cables. For Sales Features 5501 and 5508, obtain FCC-registered CBS-type (or equivalent) couplers; for Sales Feature 5502, obtain an FCC-registered CDT-type coupler.

You should also provide the common carrier with the following information for each FCC-registered device:

- The FCC registration number.
- The ringer equivalence number.
- The uniform services ordering code (USOC), which specifies the type of jack that the common carrier must provide at the end of his cable, and, if required, the USOC codes for the type of handset (with handset options) that the common carrier must provide at the end of his cable.
- The identification of the line to which the device is to be connected.

¹Exception: If the device was connected to the common carrier cable on your premises before 17 October 1977, it does not have to be registered.

Sales Features 5641 and 5741 (IBM 2400 bps and IBM 4800 bps Integrated Modems) contain FCC-registered data protective circuitry. For each of these modems, when you provide information to the telephone company, you must specify:

- An FCC registration number of AN09SA-67992-DP-N.
- A ringer equivalence number of 0.8B.
- A telephone handset with an exclusion key for data operation or a USOC-type RTC with the following options:
 - A2: Data equipment controls line
 - B4: Aural monitoring provided
 - C5 (pushbutton) or C6 (rotary dial)
 - D8: Voice mode indication

You must specify one of the following acceptable jacks:

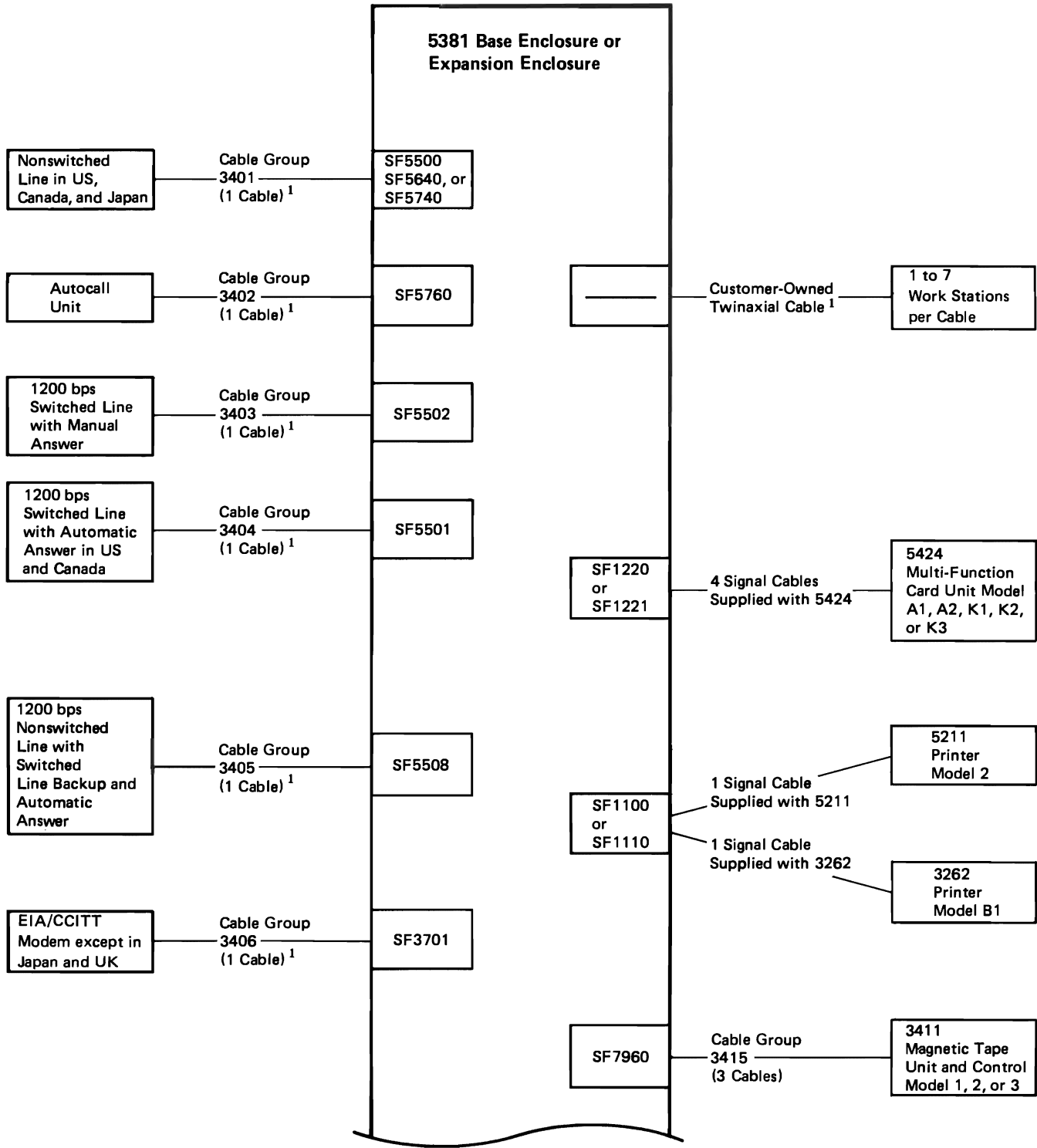
- USOC RJ41S or RJ45S (single line data jacks); type RJ45S is recommended.
- USOC RJ41M or RJ45M (multiple mounting arrangement to accommodate a number of single line data jacks).

The RJ41S data jack must have its associated switch set to PROG (for programmed operation) rather than to FLL (fixed loss loop). The RJ45S data jack provides only programmed operation.

When you order the Digital Data Service (DDS) network for the Digital Data Service Adapter (DDSA) from your telephone company representative, you should specify a CSU (channel service unit) as the customer site termination of the network and the rate at which you intend to operate the DDSA.

CABLE GROUPS

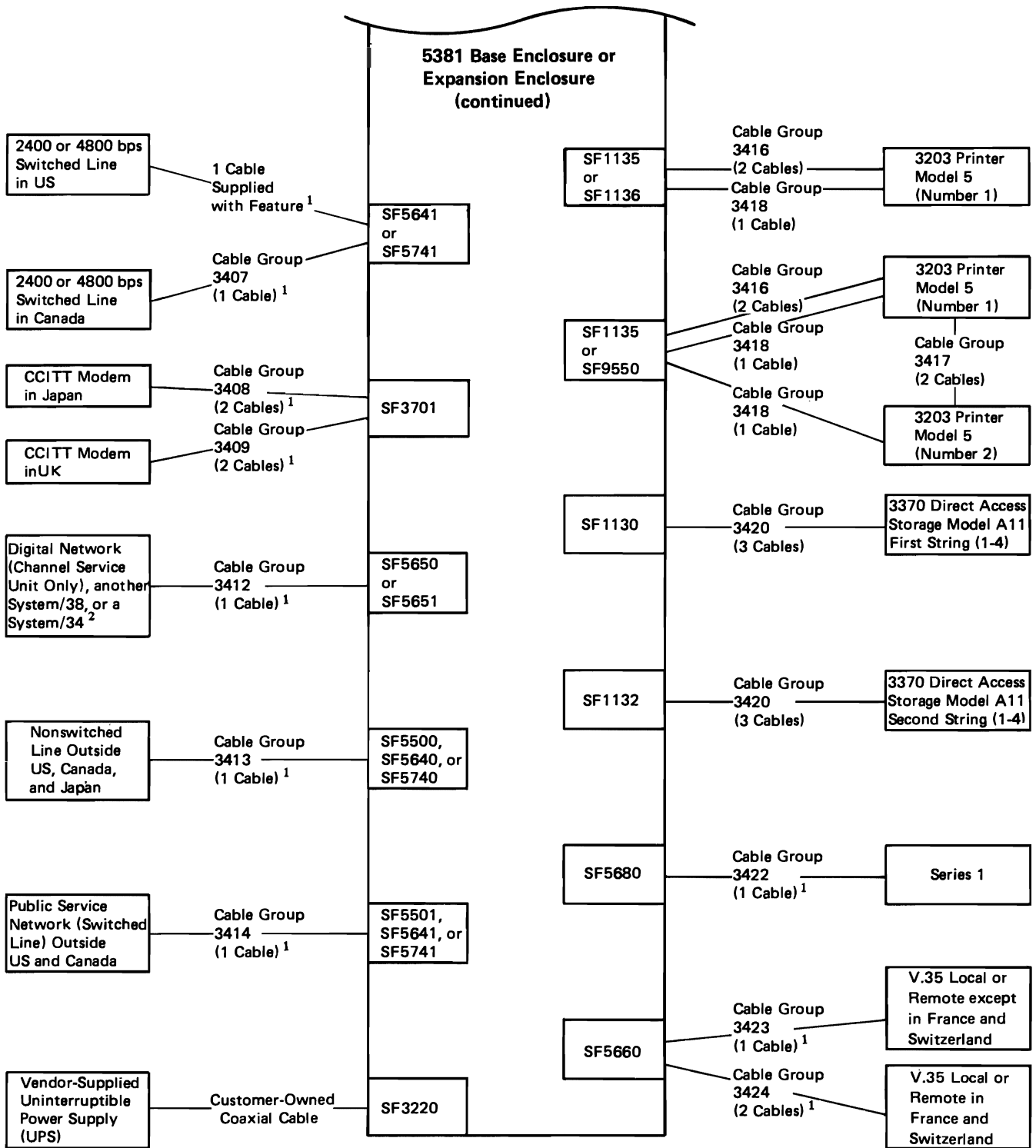
Cable Schematic



(continued)

CABLE GROUPS

Cable Schematic



¹ Transmission cables attached to the second communications attachment and twinaxial cables attached to the third and fourth work station controllers must be attached to the system unit expansion enclosure. All other cables must be attached to the system unit base enclosure.

² SF5650 is required for attachment of another System/38 or a System/34.

Cable Summary Chart

Cable Group Number	No. of Cables	From	To	Sales Feature Required	Cable Lengths			Notes
					Maximum		Length to Be Ordered***	
					Meters	Feet*		
3401	1	Nonswitched Line in US, Canada, and Japan	SU	5500, 5640, or 5740	12	40		1, 6a, 6g, 14
3402	1	Autocall Unit	SU	5760	12	40		1, 6e, 14
3403	1	Switched Line with Manual Answer	SU	5502	12	40		1, 6a, 14
3404	1	Switched Line with Automatic Answer in US and Canada	SU	5501	12	40		1, 6c, 14
3405	1	Nonswitched Line with Switched Line Backup and Automatic Answer	SU	5508	12	40		1, 6d, 14
3406	1	EIA/CCITT Modem Except in Japan and United Kingdom	SU	3701	12	40		1, 6k, 14
3407	1	2400 or 4800 bps Switched Line in Canada	SU	5641 or 5741	12	40		1, 6c, 14
3408	2	CCITT Modem in Japan	SU	3701	12	40		1, 4, 14
3409	2	CCITT Modem in United Kingdom	SU	3701	12	40		1, 5, 14
3412	1	Digital Network (Channel Service Unit Only), another System/38, or System/34	SU	5650 or 5651	12	40		1, 6b, 12, 14
3413	1	Nonswitched Line Outside US, Canada, and Japan	SU	5500, 5640, or 5740	12	40		1, 6f, 14
3414	1	Public Switched Network (Switched Line) Outside US and Canada	SU	5501, 5641, or 5741	12	40		1, 6f, 14
3415	3	3411 Magnetic Tape Unit and Control	SU	7960	9	30		1, 16

Cable Summary Chart

Cable Group Number	No. of Cables	From	To	Sales Feature Required	Cable Lengths				Notes
					Maximum		Length to Be Ordered***		
					Meters	Feet*			
3416	2	3203 Printer Model 5 (Number 1)	SU	1135 or 1136	25	82			1, 9
3417	2	3203 Printer Model 5 (Number 2)	**	1135 and 9550	25	82			1, 9
3418	1	3203 Printer Model 5 (Number 1 or 2)	SU	1135 or 1136	25	82			1, 9
3420	3	3370 Direct Access Storage Model A11	SU	1130 or 1132	60	197			1
3422	1	Series 1	SU	5680	110	360			1, 13, 14
3423	1	V.35 Local or Remote except in France and Switzerland	SU	5660	12	40			1, 6h
3424	2	V.35 Local or Remote in France and Switzerland	SU	5660	12	40			1, 6j, 15
3920 and 1178	2, 1	3430 A Magnetic Tape Unit and Control	SU	7970	61	200			1
Twinaxial	1	Work Station	SU*	None	1525	5000			3, 7, 8, 14
Coaxial	1	Uninterruptible Power Supply (UPS)	SU	3220	152	500			11
							Fixed Length		
							Meters	Feet	
-	1	2400 or 4800 bps Switched Line in US	SU*	5641 or 5741			6.4	21	2, 10, 14
-	1	5211 Printer Model 2	SU	1100 or 1110			6.1	20	2
-	1	3262 Printer Model B1	SU	1100 or 1110			6.1	20	2
-	4	5424 Multi-Function Card Unit	SU	1220 or 1221			2.0	6.5	2

See *Cable Length* in this chapter for information about cable length, where it is measured from and to, and where cables leave and enter units.

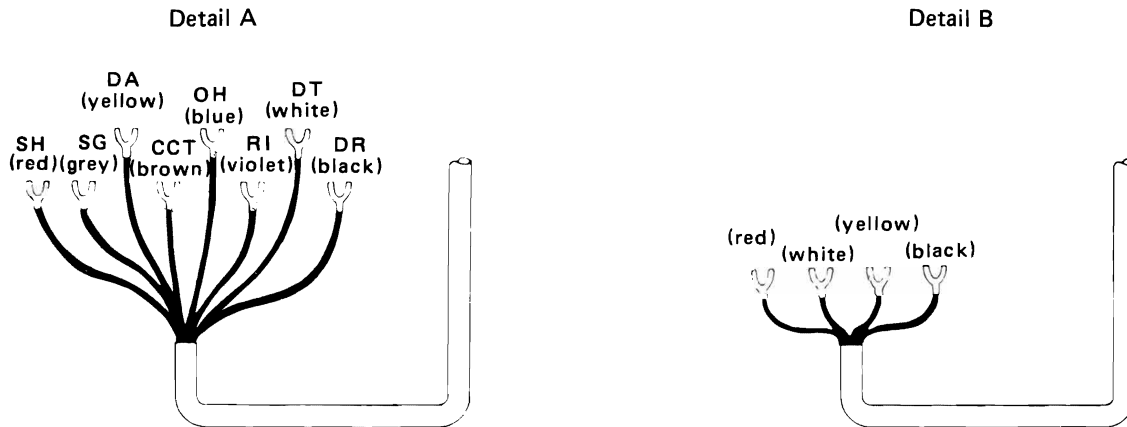
*Rounded.

**3203 Printer Model 5 (Number 1).

***Mark the length of each cable you need in this column. Record either meters or feet, not both. Then provide this information to your IBM sales representative when you order your variable-length cables.

Notes:

1. This variable-length cable is supplied by IBM, and installed by IBM customer engineers. You must specify the length to your IBM representative at least 120 calendar days before the scheduled system arrival date.
2. This fixed-length cable comes with the *from* unit, and is installed by IBM customer engineers. No special ordering is required.
3. You are responsible for ordering, installing, maintaining, and testing all cabling between work stations and the system unit. You connect the cables to the system unit when the system unit has been installed. Work station cabling is available from IBM, either assembled or unassembled. Work station cabling must be installed and tested before the schedule arrival date for the system. For information about ordering, assembling, and installing work stations and work station cabling, see *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337, which is available from your IBM sales office. Add an additional 0.6 meter (2 ft.) to your cable length to allow for servicing the system unit.
4. This adapter, which is 0.3 meter (12 in.) long, is supplied for non-IBM modem attachment in Japan.
5. This adapter, which is 0.3 meter (12 in.) long, is supplied for Datel 600 and Datel 2412 switched service in the United Kingdom.
6. This cable is terminated with (a) plug WE-283B¹, (b) connector DAMA-15-P², (c) 8-spade terminals as shown in Detail A, (d) plug WE-283B¹ plus 8-spade terminals as shown in Detail A, (e) a connector wired for EIA RS 366, and (f) 4-spade terminals as shown in Detail B, (g) for Japan, IBM provides (1) socket, part 5162880, which you must have wired to the PD-1A protective device and (2) loop-back plug, part 1864271, and shorting plug, part 1864272, which are to be used as requested by the NTT in testing the local loop (equivalents of the aforementioned products can also be used), (h) 34-pin connector for V.35/CCITT, (j) 34-pin connector with size 20 pins for V.35/CCITT, and (k) a connector wired for EIA RS 232C.



7. Each work station controller (one work station controller is standard on the basic system) has eight or sixteen ports to which a work station cable can be attached. The work station controller-extended has eight ports.

¹Product of Western Electric, subsidiary of Bell Telephone, 222 Broadway, New York, New York 10038.

²Product of Cinch Manufacturing Company, division of TRW, Incorporated, 1501 Morse Avenue, Elk Grove Village, Illinois 60007.

8. A maximum of seven work stations can be attached to a single port, using a twinaxial cable (attaching six via Cable Thru features); a maximum of twenty work stations can be attached to one work station controller (not extended). But a maximum of 32 work stations can be attached to a work station controller-extended.
9. If you will ever install a second 3203 Printer, the following restriction applies: the total cable length of cable group 3416 plus cable group 3417 must not exceed 25 meters (82 ft.).
10. Sales Features 5641 and 5741 contain protective circuitry registered with the US Federal Communications Commission (FCC) under FCC Part 68. See *Cable Installation Responsibility* for information you must supply to the common carrier.
11. You are responsible for ordering, installing, and maintaining the cable between the vendor-supplied UPS system and the 5381. You connect the cable to the Power Warning feature in the 5381 when the system or warning feature is installed. For information about assembling and installing this cable, see the *IBM System/38 Uninterruptible Power Supply Planning Guide*, GA21-9421.
12. The two systems are interconnected locally, via their respective DDSA cables, by means of one DDS adapter connector (order part 4236967 via MSORDER). Order only one adapter connector for each system-to-system attachment.
13. The two systems are interconnected via their respective Local Attachment feature cables.
14. Transmission cables attached to the second communications attachment and twinaxial cables attached to the third and fourth work station controllers must be attached to the system unit expansion enclosure. All other cables must be attached to the system unit base enclosure.
15. The 0.2-meter (8-in.) adapter is supplied for the non-IBM modem attachment in France and Switzerland.
16. Cable group 3415 is the same as cable group 3-17, used to connect the 3411 to System/3.



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GENERAL POWER INFORMATION

The system will operate satisfactorily using the normal power supplied by most power companies. However, many outside sources can cause transient electrical noise signals or voltage level variations that can affect system operations.

Check the electric power distribution circuits for unusual loads that might induce excessive noise into the branch circuits for the system. Some of the devices that can cause such loads are:

- Air-conditioning devices
- Electric welders
- Electric furnaces
- Elevators
- Electrostatic copying machines
- Large brush-type motors

Switching heavy inductive loads or operating certain types of equipment near the system can cause problems, even though the source is on a different branch circuit. If you suspect such a condition, it may be advisable to provide a separate feeder for the system directly from the main building power. In extreme cases of heavy inductive loads or excessive voltage variations, you may have to install an RF filter, an isolation transformer, a constant voltage transformer, or combinations of these items. Significant magnetic fields, radiation, and high-frequency interference require individual consideration for each installation and should be discussed with your IBM installation support representative. He is also available if you need help determining whether you must alter your facilities to correct or prevent other electrical problems.

Power Specifications

Some units in System/38 must be supplied with standard three-phase power; other units need single-phase power. The power requirements for each unit are specified in the *Electrical Specifications Chart*.

Available nominal voltages are shown on the specifications pages. When a unit is ordered, the order specifies the nominal voltage of the power source to which the unit will be connected. The unit can be changed in the field so that it will operate at a different nominal voltage.

Measure voltage on each unit at its receptacle. A transient-voltage condition must not exceed +15% or -18% of the specified nominal voltage, and must return to the specified range within one-half second.

Voltage limits are shown in Figure 5-1. The *Electrical Specifications Chart* specifies typical plugs, connectors, and receptacles. (50 Hz machines are usually shipped without plugs.)

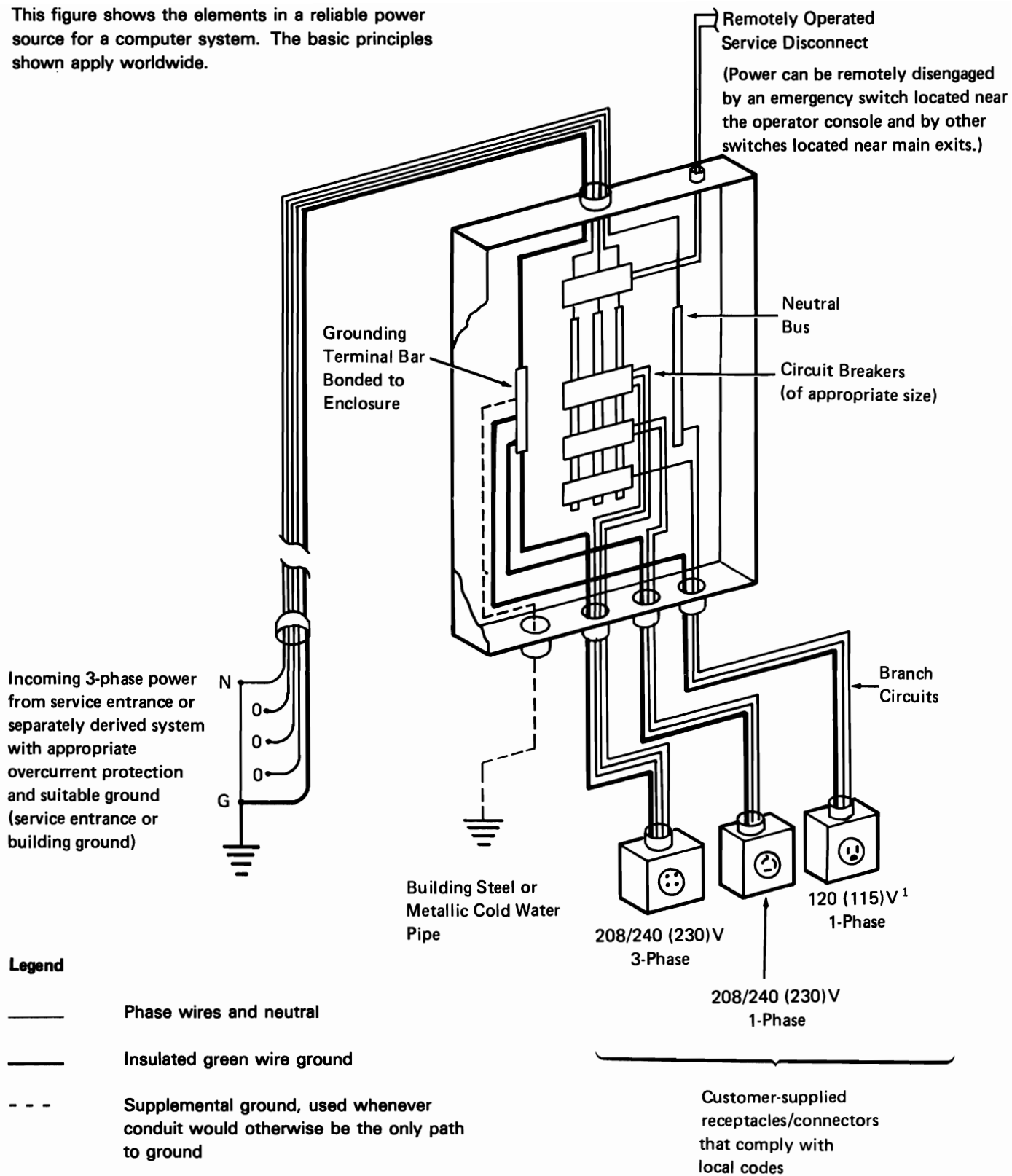
Line frequency must be maintained within $\pm 1/2$ Hz (cycles per second).

The maximum harmonic content of the power system voltage wave forms on the equipment feeder lines must not exceed $\pm 5\%$ when the equipment is not operating.

Nominal Voltage	60 Hz		50 Hz	
	Minimum	Maximum	Minimum	Maximum
100	90	110	90	110
110	96.5	119	96.5	119
120 (115)	104	127	—	—
127	111	137	—	—
200	180	220	180	200
208	187	220	—	—
220	—	—	198	238
230 (240)	208	253	—	—
235 (230/240)	—	—	212	258
380	—	—	342	410
408 (400/415)	—	—	367	448

Figure 5-1. Voltage Limits

This figure shows the elements in a reliable power source for a computer system. The basic principles shown apply worldwide.



¹For loads requiring a neutral. Attach computer/data processing equipment only.

Figure 5-2. A Typical Power Distribution System that Is Grounded Properly

Power Distribution

The system can operate on the feeder that supplies other loads if there are no unusual loads, as discussed in the preceding text. Of course, all wiring installed should comply with local electrical codes.

Branch circuits should be protected by circuit breakers suitable for motor load application and should contain wiring that will handle the same load. The circuit breakers should be placed in an unobstructed and well-lighted area in the data processing room.

The most important fact to remember when you plan a power distribution system for any computer is that *ground loops must be avoided*. Therefore, all power receptacles servicing any unit that is cable-connected to the system (except remote stations) must have a single, common grounding point. Figure 5-2 shows correct wiring for a typical distribution system.

Electrical power to the 3370 is required during nonoperating periods (see 3370 *Direct Access Storage Model A11*).

Grounding

Proper grounding (Figure 5-2) is needed for both safety and machine performance.

Power cords supplied with each IBM unit have a green (or green with yellow trace) wire grounding conductor for equipment ground. The recommended branch circuit receptacles provide for connection of this equipment ground. Each customer-supplied branch circuit must have an insulated wire conductor, equal to the size of the phase conductors, for the purpose of grounding equipment. All branch circuit grounding wires must be tied to a common ground point at the distribution panel, and a single grounding wire must be run from the distribution panel to the service ground or a suitable building ground (building steel, grounded cold water main, and so on). This ground is in addition to the neutral wire in the power circuit.

Conduit must not be used as the only grounding means.

Emergency Power-Off Switch

As a safety precaution, provide some method for simultaneously disconnecting power to all data processing equipment in the room. The means of disconnecting power should be controlled from locations readily accessible to the operator and at designated exits from the data processing room.

Phase Rotation

You should ensure that all three-phase power receptacles to be used for the system are wired for correct phase rotation.

As of 1 April 1982, the correct phase rotation (looking at the face of the receptacle) is clockwise from the ground contact, to the phase 1 contact, to the phase 2 contact, to the phase 3 contact. Machines manufactured or reconditioned prior to that date use receptacles wired in a counterclockwise manner.

Power plugs on all machines wired for use with clockwise-wired receptacles have a label showing the direction of phase rotation.

Note: The 5381 System Unit is not sensitive to phase rotation.

Additional Power Outlets

Be sure to equip the data processing area with enough outlets to satisfy the needs of building maintenance personnel, nonsystem office equipment, miscellaneous lights, and so on.

If the system is powered from a separate feeder circuit, the nonsystem outlets should be connected to lighting circuits or other building circuits, rather than to the system feeder circuit.

Do not plan to use the outlets installed under the covers of some IBM machines; these outlets are to be used by system service personnel only.

Lightning Protection

You should install lightning protection on your secondary power source if the utility company installs lightning protectors on the primary power source, the primary power is supplied by an overhead power service, and/or the area is subject to electrical storms.

ELECTRICAL SPECIFICATIONS

The *Electrical Specifications Chart* in this chapter has spaces to write in the specifications for electrical devices that will be in the data processing room, but are not System/38 devices. After the chart has been completely filled out, determine if additional wiring should be installed by the electrician.

Electrical Wiring

As you plan your electrical wiring needs, consider the following:

- Must you have the power company provide additional service (for example, more power or other voltages)?
- Must you install new circuits or more outlets?
- Are the existing connectors or receptacles the correct style and in the correct locations, or must they be changed?
- Have you ensured that your grounding is acceptable for data processing equipment, and that there will be no extraneous loads or signals on the circuits?

Note that the *Electrical Specifications Chart* has a Qty (quantity) column. If you have more than one device of any type, enter the quantity in this column. Use this information to determine the circuit and receptacle requirements.

The power cord specifications are shown for the benefit of those users who use 50 Hz power. Some 50 Hz machines are shipped without power plugs on the end of the power cords; these users must determine the type of plug to be used with each machine. (Because the plug types vary according to local standards, IBM cannot provide this information.)

The power plug specifications tell you the NEMA (National Electrical Manufacturers Association) number of the plugs supplied on the power cords of IBM devices. Also shown are the shape and NEMA number of the matching receptacles or inline connectors that you must provide and install in the data processing room.

Qty	Device			Purchase Unit	Voltage		kVA		Power Cord Specifications						Power Plug Specifications			Receptacle Config- uration	
	Type	Model	Description		50 Hz	60 Hz	50 Hz	60 Hz	Cable OD			Conductor			ID Number				
									Mm	In	Shield	Qty	Nominal OD		Description	Plug Cap	Inline Connector		Receptacle
													Mm	In					
	3203	5	Printer	3	200, 220, 235, 380, 408	200, 208, 230	3.0	2.8	19.0	0.750	0	5	2.1	0.081	Waterproof	3760 ¹	3934 ¹	3754 ¹	
	3262	B1	Printer	1	Note 3 100, 110, 220, 230, 240	Note 3 100, 110, 120, 127	1.3	1.4	7.6	0.300	0	3	1.1	0.044	Waterproof	3720 U-1 ¹	3913 U-1 ¹	3743 U-1 ¹	
			Locking												L5-20P ²	L5-20R ²	L5-20R ²		
	3370	A11	Direct Access Storage	3	200, 220, 380, 415	200, 208, 240	1.2	1.2	17.3	0.681	1	5	1.6	0.064	Waterproof	3730 ¹	3914 ¹	3744 ¹	
	3370	B11	Direct Access Storage	3			0.8	0.8	This information is not needed. The 3370 B11 is powered from the 3370 Model A11.										
	3410	1,2,3	Magnetic Tape Unit	1			0.3	0.3	This information is not needed. The 3410 is powered by the 3411.										
	3411	60Hz 1,2,3 50 Hz 1	Magnetic Tape Unit and Control	1	200, 220, 235	200, 208, 230	1.2	1.2	13.0	0.510	1	3	2.1	0.081	Waterproof	3750 ¹	3933 ¹	3753 ¹	
	3411	50 Hz 2,3	Magnetic Tape Unit and Control	3	200, 220, 235, 380, 408		1.2		19.0	0.750	1	5	2.6	0.102					
	5211	1,2	Printer	1	200, 220, 240	200, 208, 230	0.7	0.7	11.1	0.435	0	3	1.3	0.051	Waterproof	3720 U-2 ¹	3913 U-2 ¹	3743 U-2 ¹	
															Locking	L6-15P ²	L6-15R ²	L6-15R ²	
	5381		System Unit without Expansion Enclosure	3	200, 220, 235, 380, 408	200, 208, 230	3.7	3.7	22.4	0.883	2	5	2.6	0.102	Waterproof	3760 ¹	3934 ¹	3754 ¹	
	5381		System Unit with Expansion Enclosure	3	200, 220, 235, 380, 408	200, 208, 230	5.9	5.9	22.4	0.883	2	5	2.6	0.102	Waterproof	3760 ¹	3934 ¹	3754 ¹	
	5424	A1,A2, K1, K2, K3	Mult-Function Card Unit	3			1.3	1.3	This information is not needed. The 5424 is powered from the system unit.										

¹This is a Russell and Stoll (Midland-Ross Corporation) catalog number.

²This is an NEMA (National Electrical Manufacturers Association) configuration number.

³The branch circuit requires a delayed-action fuse or circuit breaker with a high-surge tolerance for transformer (high-magnetic) applications.

Chapter 6. Environmental Requirements

ENVIRONMENTAL CONDITIONS

Environment, as used in this manual, refers to the condition of the air in the data processing area.

This section contains information about air pollution, air temperature and humidity, and how temperature and humidity can affect system operation. Consider all of this information carefully when you plan for the system installation.

Air Pollution

The amount of contamination usually found in air within a normal business environment will not interfere with the operation of IBM equipment. However, you should avoid installing system components in environments where significant amounts of dust, liquid, or gaseous atmospheric contaminants exist. Such environments can cause corrosion of copper and other metals used in computer systems, and extended exposure to such environments can result in system malfunctions. If the system must be installed in an area that has a high dust content or where there is an exposure to abrasive or corrosive air pollutants, contact an IBM installation support representative for advice and recommendations.

Air Temperature and Humidity

Each unit in the system has a specified temperature and humidity range listed in the *Environmental Summary Chart*.

The area environment must accommodate all IBM units in the area. Therefore, determine the area environment by combining the most restrictive values from the environment specifications of all the units, as follows:

Dry Bulb Temperature: Use the highest minimum and the lowest maximum temperatures specified for all units and supplies.

Wet Bulb Temperature: Use the lowest maximum wet bulb temperature specified for all the units and supplies.

Note: The following topics describe factors that may affect the environment you provide for the data processing area and the supplies storage areas. Read these sections carefully.

Air Temperature and Humidity Considerations

The system is designed to operate at altitudes from sea level up to 2134 meters (7000 ft.) above sea level. It is air cooled: fans bring cool air into the system, circulate the air, and exhaust the resulting heated air into the room.

However, the temperature and humidity of a data processing area are influenced by many factors:

- Heat produced by mechanical and electrical equipment
- The volume, temperature, and humidity of fresh air entering the room
- The amount of body heat and humidity introduced by personnel
- The amount of heat introduced or dissipated through walls, ceilings, and floors

You may need to control the heat and humidity by means of heating, cooling, and humidity-controlling equipment to maintain an acceptable and stable environment.

Electrostatic Discharge: With low humidity levels, static charges generated by such things as movement of people, carts, furniture, and paper are more readily stored in certain types of floor construction, floor coverings, and furniture. These charges may be high enough that, if discharged by contact with another person or object, will create a static shock and can cause intermittent interference on data processing or other electronic equipment. To minimize electrostatic discharge, do the following:

- Avoid high-resistance floor surface material. Floor surface resistance measured between the floor surface and the building (or applicable ground reference) should be greater than 150 000 ohms and less than 2×10^{10} ohms. The measuring method is specified in NFPA¹ 56A, Chapter 462.
- Avoid carpeting that does not have antistatic properties.
- Avoid plastic seat coverings.
- Avoid low humidity levels.

Temperature- and Humidity-Associated Problems in Tape, Diskette, and Paper Document Storage Areas: Keep storage areas at the same relative humidity and temperature as the data processing room. There are several good reasons for this:

- An extreme humidity difference between the two areas might alter the size of paper documents when they are moved into the working area.
- A rapid change in environment can result in paper warpage, the most frequent cause of feeding and stacking problems.
- Using cold tapes or diskettes in a warm room can cause condensation on the tapes or diskettes.

If working and storage areas cannot be kept at the same relative humidity and temperature, allow enough time for tapes and paper to achieve a temperature and moisture balance with that of the data processing room before using them.

For detailed information about handling, storing, and shipping tapes and diskettes, refer to:

- *Tape Requirements for IBM One-Half Inch Tape Units at 556, 800, 1600, and 6250 BPI, GA32-0006*
- *The IBM Diskette General Information Manual, GA21-9182*

Desired Operating Environment

Operating environment temperatures and humidity as determined in Step 3, on page 6-4 are the limits at which the system will function. However, the system is not intended to operate satisfactorily for a long period of time at these limits. The desired operating environment is the mid-point of the specified limits, for example, 70-75°F dry bulb and 40-50% relative humidity. Air conditioning equipment, required because of extremes in temperature and/or humidity, should be designed to maintain the specified limits. This desired range provides time to react if the temperature and/or humidity leaves the preferred range and begins to approach the limits. The operator can use this time to take corrective action.

¹National Fire Protection Association, 470 Atlantic Avenue, Boston, Massachusetts 02210.

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ENVIRONMENTAL SPECIFICATIONS

The following *Environmental Summary Chart* shows the amount of heat produced by each IBM System/38 device, and its temperature and humidity requirements. These values, and the specifications, are needed by the workers who are ensuring the air cleanliness, and the proper temperature and humidity for your site.

System Heat

Use the following procedure to summarize your environmental needs; then provide this summarized data to your air-conditioning and heating experts.

1. List any other device that produces a significant amount of heat or that has a restrictive environmental specification in the area marked **A** on the *Environmental Summary Chart*. Also list the device heat, temperature, and humidity specifications.
2. Compute the total heat produced by all the devices to be installed in the data processing area (using either watts, kcal/hr, or BTU/hr) and record the sum in box **B**.

3. Use either Celsius (C) or Fahrenheit (F) measurements for the following under the heading *Operating Environment*:
 - a. Under the heading *Min Dry Bulb*, find the highest value for any device to be installed in the data processing area. Record this value in box **C**.
 - b. Under the heading *Max Dry Bulb*, find the lowest value for any device to be installed in the data processing area. Record this value in box **D**.
 - c. Under the heading *Max Wet Bulb*, find the lowest value for any device to be installed in the data processing area. Record this value in box **E**.
 - d. Under the heading *Relative Humidity, Min*, find the highest value for any device to be installed in the data processing area. Record this value in box **F**.
 - e. Under the heading *Relative Humidity, Max*, find the lowest value for any device to be installed in the data processing area. Record this value in box **G**.
4. Repeat a through e of Step 3, under the heading *Non-Operating Environment*.

You have now determined and recorded the total heat to be produced by the data processing area devices, and you have determined the data processing room environments.

Environmental Summary Chart

Device			Heat Produced			Operating Environment								Non-Operating Environment*								Notes
						Temperature						Relative Humidity		Temperature						Relative Humidity		
						Min Dry Bulb		Max Dry Bulb		Max Wet Bulb				Min Dry Bulb		Max Dry Bulb		Max Wet Bulb				
Type	Model	Description	Watts	kcal/hr	BTU/hr	C	F	C	F	C	F	Min	Max	C	F	C	F	C	F	Min	Max	
3203	5	Printer	2400	2100	8150	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	1, 3
3262	B1	Printer	1200	1050	4100	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	1, 3
3370	A11	Direct Access Storage	900	780	3080	16	60	32	90	23	73	8%	80%	10	50	43	110	27	80	8%	80%	
3370	B11	Direct Access Storage	500	430	1710	16	60	32	90	23	73	8%	80%	10	50	43	110	27	80	8%	80%	3
3410	1, 2, 3	Magnetic Tape Unit	250	220	850	16	60	32	90	23	73	20%	80%	10	50	43	110	27	80	8%	80%	3
3411	1, 2, 3	Magnetic Tape Unit and Control	1000	880	3500	16	60	32	90	23	73	20%	80%	10	50	43	110	27	80	8%	80%	
5211	2	Printer	530	460	1800	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	1
5381		System Unit Base Enclosure without Expansion Enclosure	3400	2750	10,850	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	2
5381		System Unit with Expansion Enclosure	5200	4300	16,900	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	2
5424	A1 A3, K1, K2, K3	Multi-Function Card Unit	880	760	3000	16	60	38	100	23	73	8%	80%	10	50	43	110	27	80	8%	80%	1
			8360	7150																		
Total Heat Produced in Data Processing Area <input type="text"/>																						
Temperature and Humidity to Be Maintained When System Is Operating																						
Temperature and Humidity to Be Maintained When System Is Not Operating																						

Notes:

- Paper-handling devices may have feeding and stacking problems when the environment is near the humidity limits.
- These figures assume the system unit is equipped with at least 129 megabytes of auxiliary storage.
- The values shown under the *Heat Produced* heading are for one device only. If two or more devices of this type and model are to be installed, multiply the value shown by the number of identical units to be installed.

*The term non-operating environment refers to the temperature and humidity range that is acceptable while the data processing units are not turned on.



Millimeters →	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	
0										Inches											
100	3.94	4.13	4.33	4.53	4.72	4.92	5.12	5.32	5.51	5.71	5.91	6.10	6.30	6.50	6.69	6.89	7.09	7.28	7.48	7.68	7.87
200	7.87	8.07	8.27	8.46	8.66	8.86	9.06	9.25	9.45	9.65	9.84	10.04	10.24	10.43	10.63	10.83	11.02	11.22	11.42	11.61	11.81
300	11.81	12.01	12.20	12.40	12.60	12.80	12.99	13.19	13.39	13.58	13.78	13.98	14.17	14.37	14.57	14.76	14.96	15.16	15.35	15.55	15.75
400	15.75	15.94	16.14	16.34	16.54	16.73	16.93	17.13	17.32	17.52	17.72	17.91	18.11	18.31	18.50	18.70	18.90	19.09	19.29	19.49	19.69
500	19.69	19.88	20.08	20.28	20.47	20.67	20.87	21.06	21.26	21.46	21.65	21.85	22.05	22.24	22.44	22.64	22.84	23.03	23.23	23.43	23.63
600	23.63	23.82	24.02	24.21	24.41	24.61	24.80	25.00	25.20	25.40	25.59	25.79	25.98	26.18	26.38	26.58	26.77	26.97	27.16	27.36	27.56
700	27.56	27.76	27.95	28.15	28.35	28.54	28.74	28.94	29.13	29.33	29.53	29.72	29.92	30.12	30.32	30.51	30.71	30.91	31.10	31.30	31.50
800	31.50	31.69	31.89	32.09	32.28	32.48	32.68	32.87	33.07	33.27	33.46	33.66	33.86	34.06	34.25	34.45	34.65	34.84	35.04	35.24	35.43
900	35.43	35.64	35.83	36.02	36.22	36.42	36.61	36.81	37.01	37.20	37.40	37.60	37.80	37.99	38.19	38.39	38.58	38.78	38.98	39.17	39.37
1000	39.37	39.57	39.76	39.96	40.16	40.35	40.55	40.75	40.94	41.14	41.34	41.54	41.73	41.93	42.13	42.32	42.52	42.72	42.91	43.11	43.31
1100	43.31	43.50	43.70	43.90	44.09	44.29	44.49	44.69	44.88	45.08	45.28	45.47	45.67	45.87	46.06	46.26	46.46	46.65	46.85	47.05	47.25
1200	47.24	47.44	47.64	47.83	48.03	48.23	48.43	48.62	48.82	49.02	39.21	49.41	49.61	49.80	50.00	50.20	50.39	50.59	50.79	50.98	51.18
1300	51.18	51.38	51.57	51.77	51.97	52.17	52.36	52.56	52.76	52.95	53.15	53.35	53.54	53.74	53.94	54.13	54.33	54.53	54.72	54.92	55.12
1400	55.12	55.31	55.51	55.71	55.91	56.10	56.30	56.50	56.69	56.89	57.09	57.28	57.48	57.68	57.87	58.07	58.27	58.46	58.66	58.86	59.06
1500	59.06	59.25	59.45	59.65	59.84	60.04	60.24	60.43	60.63	60.83	61.02	61.22	61.42	61.61	61.81	62.01	62.20	62.40	62.60	62.80	62.99
1600	62.99	63.19	63.39	63.58	63.78	63.98	64.17	64.37	64.57	64.76	64.96	65.16	65.35	65.55	65.75	65.94	66.14	66.34	66.54	66.73	66.93
1700	66.93	67.13	67.32	67.52	67.72	67.91	68.11	68.31	68.50	68.70	68.90	69.09	69.29	69.49	69.69	69.88	70.08	70.28	70.47	70.67	70.87
1800	70.87	71.06	71.26	71.46	71.65	71.85	72.05	72.24	72.44	72.64	72.83	73.03	73.23	73.43	73.62	73.82	74.02	74.21	74.41	74.61	74.80
1900	74.80	75.00	75.20	75.39	75.59	75.79	75.98	76.18	76.38	76.57	76.77	76.97	77.17	77.36	77.56	77.76	77.95	78.15	78.35	78.54	78.74
2000	78.74	78.94	79.13	79.33	79.53	79.72	79.92	80.12	80.31	80.51	80.71	80.91	81.10	81.30	81.50	81.69	81.89	82.09	82.28	82.48	82.68

Appendix A. Millimeter-to-Inch Conversions

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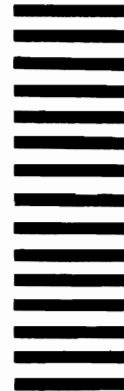


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