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IBM 5250 Information Display System
IBM 5251 Display Station
Models 1 and 11
Models 2 and 12
IBM 5252 Dual Display Station
IBM 5225 Printer
IBM 5256 Printer
Planning and Site Preparation Guide

Third Edition (January 1980)

This is a major revision of, and obsoletes, GA21-9337-1. Because the changes and additions are extensive, this publication should be reviewed in its entirety. Changes are periodically made to the information herein; these changes will be reported in technical newsletters or in new editions of this publication.

This publication is for planning purposes only. The information herein about the 5225 Printer, the 2400 bps Integrated Modem, and the 4800 bps Integrated Modem is subject to change before the products become available. Also, this publication contains an example of a completed *IBM 5250 Communications Network Setup Form.* To illustrate the setup form as completely as possible, the example of the form includes the names of individuals and places. The names and places are fictitious and any similarity to actual names and places is entirely coincidental.

Use this publication only for the purposes stated in the *Preface.*

Publications are not stocked at the address below. Requests for copies of IBM publications and for technical information about the system should be made to your IBM representative or to the branch office serving your locality.

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This manual is intended to assist in the planning, installation, and setup of an IBM 5250 Information Display System. The information and specifications in this manual will help you decide where to install the work stations and what you must have ready when they arrive. This manual also contains information to help your system programmer to configure the system and to prepare instructions for your setup personnel at remote sites.

Personnel with tools and equipment to perform electrical assembly and repairs should assemble bulk cables and connectors, if you decide to assemble your own. Instructions for bulk cable assembly are found in Appendix C.

This manual provides environmental, electrical, communications, space, furniture, and cable specifications.

Appendix B of this manual contains three *Communications Network Setup Forms* which should be copied and completed for each work station you plan to install. These completed forms should be available for your setup personnel when the work stations are delivered.

Customer Setup Units

Customer responsibilities for customer setup units are to:

- Prepare an adequate site and provide the required furniture to support the units (for example, a desk or table top for the 5251, 5252, and/or 5256).
- Procure assembled cables and connectors (or bulk cable and connectors) and any necessary adapters for your 5250 units.
- Procure communications accessories not provided with the 5250.
- Prepare to receive the 5250 units at your receiving dock.
- Unpack and set up the 5250 units, allowing for IBM service access.
- Connect cables to IBM devices incorporating protected access areas and to other equipment manufacturers' communications equipment.
- Configure your 5250 network.
- Set the switches and check out the 5250 work stations. (Each unit contains a setup manual that explains how to set up and check out the machines.)
- If you move your 5250, notify IBM of your new location and address.
- If discontinuing, disconnect, pack, and remove the 5250 to your shipping dock.

Related Publications

- *IBM 5250 Information Display Station System Introduction,* GA21-9246, describes the work stations that make up the 5250 and their available functions and features.
- *IBM 5251 Display Station Models 1 and 11 Setup Procedure,* GA21-9286, gives step-by-step instructions for setup of the 5251 Models 1 and 11 Display Station.
- *IBM 5251 Display Station Models 2 and 12 Setup Procedure,* GA21-9289, gives step-by-step instructions for setup of the 5251 Models 2 and 12 Display Station.
- *IBM 5252 Dual Display Station Setup Procedures,* GA21-9288, gives step-by-step instructions for setup of the 5252 Dual Display Station.
- *IBM 5256 Printer Setup Procedure,* GA21-9290, gives step-by-step instructions for setup of the 5256 Printer.
- *IBM Data Communications Concepts,* GC21-5169, gives an introduction to teleprocessing for persons who plan to include a 5251 Model 2 or 12 in their system.

- *IBM System/34 Installation and Modification Reference Manual: Program Products and Physical Setup,* SC21-7689, gives setup and configuration information for persons who plan to use the System/34 as a host system.

- *IBM System/38 Guide to Program Product Installation and Device Configuration,* GC21-7775, gives setup and configuration information for persons who plan to use the System/38 as a host system.

- *IBM Series/1 System Summary,* GA34-0035, gives an overview of hardware and licensed programs for the Series/1.

- *IBM Series/1 Customer Site Preparation Manual,* GA34-0050, gives setup and configuration information for persons who plan to use the Series/1 as a host system.

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List of Abbreviations

A	amperes
A/U	(a commercial cable designation)
AM	amplitude modulation
avg	average
AWG	American Wire Gage
B/M	bill of material
bps	bits per second
Btu/hr	British thermal units per hour
C	Celsius
CDSTL	connect data set to line
cfm	cubic feet per minute
CF1	Cluster feature 1
CF2	Cluster feature 2
CTS	clear to send
cm	centimeter
dB	decibel
DC	direct current
DDS	Digital Data Service
DSA	Digital Data Service Adapter
DSR	data set ready
DTR	data terminal ready
EIA/CCITT	Electronic Industries Association/Consultative Committee on Internal Telegraphy and Telephony
F	Fahrenheit
FAA	Federal Aviation Agency
FCC	Federal Communications Commission
FM	frequency modulation
ft	feet
I/O	input/output
kg	kilogram
kVA	kilovoltamperes
lb	pound
m	meter
m^3/min	cubic meters per minute
max	maximum
MES	miscellaneous equipment specification
MHz	megahertz
min	minimum
mm	millimeter
N.m	Newton meters
NEC	National Electric Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NRZ	non return to zero
NRZI	non return to zero inverted
OD	outside diameter
P/N	part number
pF/ft	picofarads/foot
PVC	polyvinyl chloride
REC	receive
rf	radio frequency
RFS	ready for sending
RI	ring indicate
RTS	request to send
SDLC	synchronous data link control
SF	sales feature
SNA	systems network architecture
U.K.	United Kingdom
U.L.	Underwriters' Laboratories
USOC	universal service order code
V	volts
Vdc	volts direct current
XMIT	transmit

The *IBM 5250 Planning and Site Preparation Guide* is divided into four chapters and three appendixes.

Chapter 1, *Planning Considerations,* contains a planning checklist that will guide you through your site preparation and preinstallation planning. Determine approximate dates for each event listed. Chapter 1 also outlines space, furniture, lighting, environmental, electrical, and cabling considerations.

Chapter 2, *System Specifications,* provides power cord, plug, and receptacle requirements, as well as, environmental and work area planning information.

Chapter 3, *Cables,* presents cabling information and specifications for the purchase and installation of cables and cable accessories for local and remote work stations.

Chapter 4, *Work Station Configuration,* is written for the system planner who will be installing remote work stations. (If you are not installing remote work stations, you should refer to your host system documentation for configuration guidelines and ignore Chapter 4.) To ensure successful setup of your remote work station network, read all of Chapter 4.

Appendix A is an Inch-to-Millimeter Conversion Chart for use with the plan views in Chapter 2. Appendix B contains the Communications Network Setup Forms and instructions on how to complete them. Appendix C provides instructions on how to assemble bulk cable and connectors.

For more information, consult your host system documentation for planning and site preparation.

The IBM 5250 Information Display System is designed so that you, the customer, can do your own physical planning and setup. (See the *Preface* for a list of customer responsibilities.) This chapter contains information and checklists to help you prepare for your 5250 Information Display System. As you are going through the checklists, refer to the *Plan Views* in Chapter 2 for the dimensions and measurements of each machine.

PLANNING CHECKLIST

This planning checklist is provided as a sample plan; the plan may have to be modified to accommodate your unique system/cluster configuration.

Note: Events highlighted by bold type are for users of a 5251 Model 2 or 12 *only.*

Event	Responsibility		✓	Weeks Before Delivery	Scheduled Date	Completed Date
	Customer	IBM				
Identify the person who will be responsible for all phases of the 5250 setup.	X			16		
Review this planning guide with the project leader.	X					
Decide who will install the device cables, power receptacles, and wiring (your maintenance personnel or a contractor).	X					
Determine the planning checklist schedule dates with the IBM marketing representative. Fill in the dates and give a copy to the IBM marketing representative.						
Identify and schedule data communications needs. Identify the source for communications lines and order as required. Order modems as required.	X					
Lay out the floor plan. **Show the locations of modems and cluster units.** Refer to *Plan Views* in Chapter 2.	X			14		
Review the overall installation plan with the IBM support representative.	X	X				
Place an order for cables and station protectors from IBM or a contractor or order the materials to make the cables yourself. See Chapter 3 for *Cable Specifications.*	X					

Event	Responsibility		✓	Weeks Before Delivery	Scheduled Date	Completed Date
	Customer	IBM				
Determine whether changes are required to the existing programs (system control program, program products, and application programs). If so, schedule the required changes.	X			12		
Prepare a network diagram for all work stations attached directly to the host system. This diagram must contain all station locations and addresses. (Refer to your host system's installation and modification reference manual.)	X					
Order supplies (ribbons, magnetic stripe cards, forms).	X	X				
Arrange for the installation of the work station and the power receptacles and wiring.	X					
Define a training program for employees.	X					
Order the required manual. (See *Preface.*)	X	X				
Determine whether changes are needed for existing furniture to accommodate work stations. If so, modify or order furniture.	X					
Review the progress of the data communications plan. Identify and resolve any schedule conflicts.	X			10		
Review the installation plan with your marketing representative to define any schedule exposures.	X	X		8		
Confirm the arrival of the 5250 work station cables and begin installation of cables and power receptacles.	X					
Start employee training.	X			6		
Check the progress of the site preparation with the IBM marketing representative.	X	X				

Event	Responsibility		✓	Weeks Before Delivery	Scheduled Date	Completed Date
	Customer	IBM				
Receive supplies (ribbons, magnetic stripe cards, forms).	X			4		
Complete the installation of cables and power receptacles.	X					
Complete the checkout of the system cables by doing the *Line Continuity and Polarity Tests* in Appendix C.	X			2		
Ensure that correct power receptacles have been installed. See *Power Cords, Plugs, and Receptacles* in Chapter 2.	X					
Complete the required changes to the existing host system programs.	X					
Complete the site preparation.	X					
Install communication facilities (telephone lines and modems).	X					
If your system communicates with a remote work station or cluster of work stations, a Communications Network Setup Form should be completed for each remote site. (See Chapter 4 for instructions on how to complete this form.)	X			1		
Provide a copy of your setup instructions to your setup personnel so that they can do switch setting.	X					
Receive work stations and complete setup. (Setup instructions are contained in the shipping carton.)				0		

SPACE, FURNITURE, AND LIGHTING CONSIDERATIONS

☐ *Floor plan.* Display stations and printers should be placed to handle work flow efficiently, to provide operator comfort and safety, and to allow for adequate service clearances. Considerations in making a floor plan are:

- The table you set your display station on should allow for adequate operator comfort. The recommended table size for optimum operator performance is:

  Height—660 to 690 millimeters (26 to 27 inches)

  Depth—for 5251 Display Stations, a minimum of 760 millimeters (30 inches); for the 5252 Dual Display Station, a minimum of 910 millimeters (36 inches) to a maximum of 1220 millimeters (48 inches)

  Width—for 5251s, a minimum of 1120 millimeters (44 inches); for the 5252, a minimum of 1680 millimeters (66 inches)

  If your 5251 or 5252 will have the Magnetic Stripe Reader feature attached to it, the length of the cable going from the edge of the display station to the Magnetic Stripe Reader feature is 1.2 meters (4 feet). If your 5251 will have the Selector Light Pen feature attached to it, the length of the cable going from the edge of the display station to the base of the Selector Light Pen feature is 0.9 meters (3 feet).

- The table you set your 5256 Printer on should allow for knob clearance and paper movement. The recommended table size is:

  Height—675 to 750 millimeters (27 to 30 inches)

  Depth—500 to 900 millimeters (20 to 36 inches)

  Width—600 to 750 millimeters (24 to 30 inches)

  A forms stand should be situated behind the 5256 Printer to catch the printer paper. If you do not have a forms stand, a larger table can be used to hold both the printer and the paper.

- The style and height of chair you provide should enable an operator to sit at the display station for extended periods with comfort. The following guidelines will help you select the most suitable chair.
  - — Chairs should be adjustable. Each operator using a particular chair should be able to rest his feet flat on the floor with a slight allowance to relieve pressure on the lower thigh. (This will allow circulation to continue in the operator's lower extremities.)
  - — Chairs should have an adjustable back rest that supports the lower back.

- The receptacles must be close enough to be reached by the power cord on each machine. (See Chapter 2, *System Specifications).*

- Allow enough cable (work station cables that you supply) to connect the 5250 machines to the host system, and to move the machines approximately 1 meter (3 feet) to permit servicing. Allow a minimum of 0.6 meter (2 feet) of cable at the system end. Consider how the cable is entering the system (that is, from the bottom or the top).

- The following lighting factors should be considered when you prepare a display station environment:
  - — Offices should be painted in light colors with white ceilings to enable reflection (rather than absorption) of light.
  - — To lessen glare, ensure that windows are not in the operator's field of vision or directly facing the display screen.
  - — It is best to have a low level of general lighting (300 to 500 lux) with adjustable local lighting at each display station.
  - — To avoid eye fatique, ensure that sources of light are compatible. White and warm white fluorescent lamps are compatible with both incandescent lamps and daylight.
  - — If possible, align the display stations so that they are parallel (front to back) to fluorescent lights. (When the stations are arranged this way, the keyboard will form a T with the line of the lights.)
  - — Avoid direct sunlight on the display screen.
  - — To assist in preparing a floor plan, IBM provides transparent templates of the machines scaled at 1/4 inch to 1 foot. (In the U.S. and Canada, order template GX21-9278; in other countries, obtain templates from the IBM marketing representative.)

☐ *Miscellaneous equipment.* Consider other items that will be or should be in the same area as your system such as office equipment and furniture.

☐ *Storage.* Consider storage space for manuals, printouts, and printer forms.

☐ *Future expansion.* Consider the possible expansion of your data processing operations in the foreseeable future.

ENVIRONMENTAL CONSIDERATIONS AND REQUIREMENTS

☐ *Temperature, relative humidity, and wet bulb.* The following chart shows the temperature and humidity limits for the display system.

Operating Environment:

Temperature	10°C to 41°C (50°F to 105°F)
Relative Humidity	8% to 80%
Maximum Wet Bulb	27°C (80°F)

Nonoperating Environment:

Temperature	10°C to 52°C (50°F to 125°F)
Relative Humidity	8% to 80%
Maximum Wet Bulb	27°C (80°F)

Storage Environment:

Temperature	0°C to 60°C (32°F to 140°F)
Relative Humidity	5% to 80%
Wet Bulb	0°C to 30°C (32°F to 86°F)

Shipping Environment:

Temperature	-40°C to 60°C (-40°F to 140°F)
Relative Humidity	5% to 100% (including condensation, excluding rain)
Wet Bulb	0°C to 30°C (32°F to 86°F)

You should know the humidity limits of your supplies. Humidity limits may differ for various supplies such as forms for the printer. If working and storage areas cannot be kept at the same relative humidity, allow enough time for the supplies to acquire the same humidity level as that in the working area before you use the supplies.

- ☐ *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, they will create a static shock. If discharged to or near data processing or other electronic equipment, *these charges can cause intermittent interference.* To minimize electrostatic discharge:

  - Avoid high-resistance floor surface material. Floor surface resistance measured between the floor surface and the building (or other applicable ground reference) should be greater than 1.5×10^5 ohms and less than 2×10^{10} ohms. The measuring method is specified in NFPA[1] 56A, Chapter 462.

  - Avoid carpeting that does not have antistatic properties.

  - Avoid plastic seat coverings.

  - Avoid low humidity levels.

- ☐ *Electromagnetic compatibility.* Avoid putting a system in areas of high electromagnetic interference that can be radiated or conducted. Such areas may exist near a radio-frequency source, such as radio-transmitting antennas (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. Under these conditions, assess your plans to see whether any special installation or product considerations are advisable to assure normal system operation and maintenance. Your IBM installation representative can help you.

- ☐ *Atmospheric contaminants.* Avoid environments where particulate, liquid, and gaseous atmospheric contaminates exist (as found in some process industries). Such environments can cause corrosion of copper and other metals used in computer systems. Extended corrosive growth in any computer system can produce electrical short circuits or contact failures that result in system malfunctions. Corrosion can become so extensive that an entire system or machine may need to be replaced. If you suspect a problem, contact your IBM installation representative.

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

ELECTRICAL REQUIREMENTS

- ☐ *Voltage and frequency.* The display system machines operate at 50 or 60 hertz plus or minus 0.5 hertz. For the U.S., the voltage is 115 at 60 hertz. For World Trade, the voltage is:

  100/110/123.5/200/220/235 at 50 hertz; 100/115/200/220 at 60 hertz.

  The allowable voltage variation is plus or minus 10%.

- ☐ *Power cords and receptacles.* Each machine has a three-wire power cord that includes an equipment ground wire. See Chapter 2 for more information on power cord lengths, plug styles, and cord styles. Be sure that the correct receptacles are located in reach of the power cord (Chapter 2) and out of a traffic area.

- ☐ *Branch circuits and grounding.* The power cords have a green, or green and yellow equipment ground wire. For safety, each branch circuit must have an insulated wire conductor, equal to the size of the phase conductor, for grounding the equipment. All branch-circuit ground wires should be tied to a common ground at the distribution panel, and a single ground wire should be run from the distribution panel to a service ground or a suitable building ground. The conduit must not be used as the only means of grounding because it may not be continuous. The grounding conductor should be electrically isolated from the system neutral, except at the building ground station, for purposes of avoiding electrical noise.

CABLING CONSIDERATIONS

- ☐ Communications cables are provided by IBM for connecting the 5251 Models 2 and 12 to the common carrier facility.

- ☐ *Purchasing, installation, and testing.* It is your responsibility to purchase, install, and test work station cables. You may purchase preassembled cables or assemble your own from bulk cable and connectors. (Because of the effort and expertise required to assemble cables, purchase of preassembled cables is recommended.)

  You must also have the equipment to make the cables operational and to ensure that they comply with all applicable codes. You should ensure that completion tests of the cables are performed. (See *Completion Tests of Cabling* in Appendix C.)

- ☐ When ordering cables, keep the number of junctions to a minimum. The total number of cable junctions on a line must not exceed 11[1].

[1]A cable junction occurs whenever the cable is broken to attach a work station, station protector, or to join two cables with an adapter.

- ☐ Systems that attach work stations with *coaxial* cable must not cable through any more than one station per line (that is, two stations on each line). The cable thru line (cable to last work station) must be of twinaxial cable and must not exceed 30 meters (100 feet). See the appropriate IBM system *Installation Manual—Physical Planning),* for system limitations.

- ☐ Cabling can be run in the same conduit as telephone lines.

  When two or more cables are installed, each cable should be labeled at both ends to ensure proper connections. (See *Cable Labeling* in Appendix C.)

  Cable runs, both horizontal and vertical, must be supported every 3 meters (10 feet).

- ☐ *Signal Cable Separation Guide.* The following distances are a guide for voltages up to 440 volts; signal cables should not be installed either near electrical equipment that uses or near power lines that carry more than 440 volts.

  The minimum distance allowed between signal cable and fluorescent, neon, or incandescent lighting fixtures is 127 millimeters (5 inches).

  The minimum distance allowed between signal cable and unshielded power lines or electrical equipment depends upon the power consumption of the equipment:

  - 2kVA or below: 127 millimeters (5 inches)
  - 2-5 kVA: 305 millimeters (12 inches)
  - Over 5 kVA: 610 millimeters (24 inches)

  The minimum distance between signal cable and unshielded power lines or electrical equipment with the signal cable enclosed in grounded metallic conduit:

  - 2kVA or below: 63.5 millimeters (2.5 inches)
  - 2-5 kVA: 152 millimeters (6 inches)
  - Over 5 kVA: 305 millimeters (12 inches)

  The minimum distance between signal cable and power lines in grounded metallic conduit:

  - 2 kVA or below: 63.5 millimeters (2.5 inches)
  - 2-5 kVA: 152 millimeters (6 inches)
  - Over 5 kVA: 305 millimeters (12 inches)

The minimum distance between signal cable enclosed in grounded metallic conduit and power lines enclosed in grounded metallic conduit:

- ☐ 2 kVA or below: 30.5 millimeters (1.2 inches)
- ☐ 2-5 kVA: 76 millimeters (3 inches)
- ☐ Over 5 kVA: 152 millimeters (6 inches)
- ☐ *Communications Considerations.* If you order a 5251 Model 2 or 12, consider the following:

  - Availability of a telephone with an outside line (not the same one used for data transmission) near the 5251 Model 2 or 12 to aid in problem determination and communication with the host system.
  - Communications equipment located close to the 5251 Model 2 or 12 (cables can be ordered in 6- or 12-meter [19- or 38-foot] lengths).
  - Space and power for external modems or digital communications equipment.
  - Lightning protection on nonswitched communications lines. Protective devices can be installed by the telephone company. Ask for this protection when you order your communications lines.

This chapter summarizes the measurements and requested specifications for your 5250 Information Display System.

STANDARD SYMBOLS AND SPECIFICATIONS

Standard symbols used on the specifications page and physical planning template are:

Nonraised floor power cord exit

Service area boundary

Signal cable entry and exit

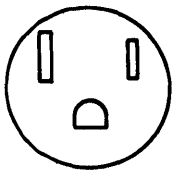
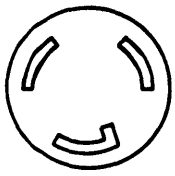
Glide

Optional equipment

Note: Plan view dimensions are shown in inches. The chart in Appendix A can be used for inch-to-millimeter conversion.

POWER CORDS, PLUGS, AND RECEPTACLES

The following are the specifications for plugs and receptacles used in the United States and Canada.

Plug Type	Volts	Rating			Description	Plug Number[1]	Receptacle Number[1]	Receptacle Configuration
		Amperes	Phase	Wires				
H	115	15	1	3	Nonlocking	5-15P	5-15R	
J	115	15	1	3	Locking	L5-15P	L5-15R	

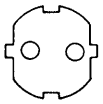
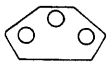
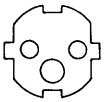
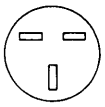
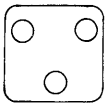
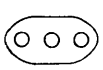
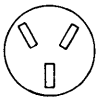
[1]The plug and receptacle numbers shown are National Electrical Manufacturers' Association (NEMA) configuration numbers.

WT Power Plug Requirements

World Trade Countries (Except Canada) Plugs — Customer Setup Units Only

The following plug, designated by country, will be installed on your machine unless you specify feature code 2710, which will give you an attachment cord without a plug.

Country	Plug Number	Country	Plug Number
Algeria	4	Jamaica	3
Argentina	6	Japan	3,9,12
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	Sweden	1
		Switzerland	2
Germany	1		
Greece	4	Taiwan	3,12
Guatemala	3	Thailand	3,12
		Trinidad	3,6
Honduras	3	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

WT Power Cord Information (for machines shipped without plugs)

Style	Cable OD (nominal)	Number of Shields	Conductors		
			Quantity	OD (nominal)	AWG Number
B	10.2 millimeters (0.40 inch)	0	3	1.3 millimeters (0.051 inch)	16
A8	8.9 millimeters (0.35 inch)	0	3	2 millimeters (0.064 inch)	14

Installation of a Power Plug

Because different plugs are used in different countries, it is difficult to cover all plug installations in one procedure.

If you have ordered a power cord without a plug, the following things must be considered:

1. That the shield (if any) of the power cord always has a good electrical connection to the ground pin of the plug.

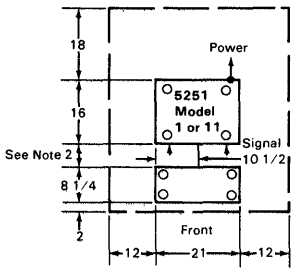
2. That steps be taken to assure that the grounding wire and/or the shield cannot come in contact with (touch) the other (hot) wires.

3. That the grounding wire (green-green/yellow) be properly attached to the grounding terminal in the plug.

4. That the power cord be well secured to the plug in order to prevent strain on the plug/wire contacts.

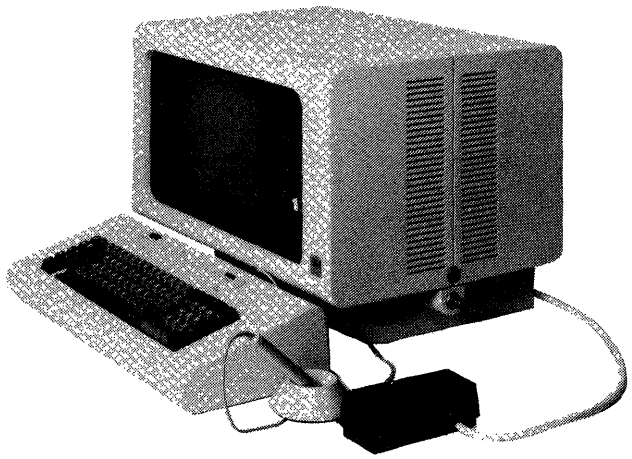
5251 DISPLAY STATION MODEL 1 OR 11

Plan View



Notes:

1. Signal cables connect into the front of the display unit, but are then routed under the unit to the back.
2. The length of the keyboard cable permits the keyboard to be moved up to 13 inches away from the display screen.



This is a picture of a Model 11 (1920-character screen); the Model 1 has a 960-character screen.

Specifications

Dimensions:[1]

	Width	Depth	Height
Millimeters	530	400	400
Inches	21	16	16

Service Clearances:

	Front[1]	Rear	Right	Left
Millimeters		460	300	300
Inches		18	12	12

Weight: 34 kg (75 lb)[1]

Heat Output: 125 watts (425 BTU/hr)

Airflow: 3 m^3/min (100 cfm)

Power Requirements:

Voltage	115
kVA	0.2
Phase	1
Plug type[2]	H or J
Power cord style[2]	B

Operating and Nonoperating Environment:
See *Environmental Considerations and Requirements* in Chapter 1.

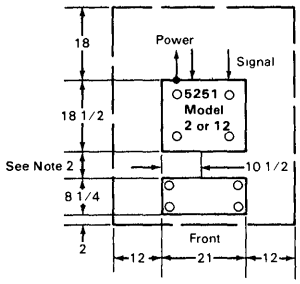
---

[1]The keyboard is 530 millimeters (21 inches) by 210 millimeters (8¼ inches) by 100 millimeters (4 inches) and weighs 6 kilograms (13 pounds). The keyboard may be moved to service the machine. See *Plan View.*

[2]The power cord is 2.4 meters (8 feet) long. For more information, see *Power Cords, Plugs, and Receptacles* in this chapter.

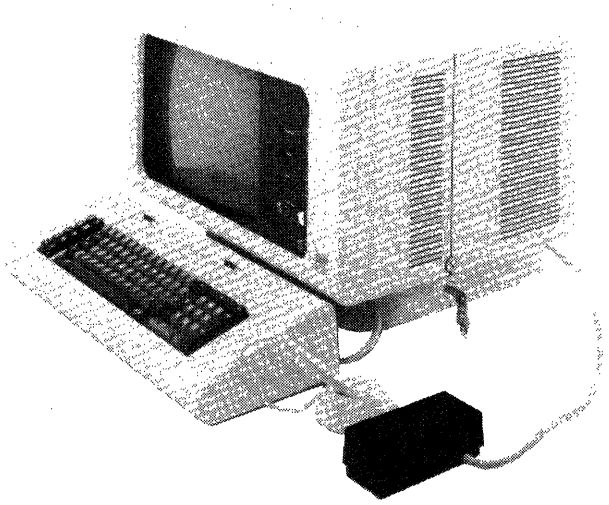
5251 DISPLAY STATION MODEL 2 OR 12

Plan View



Notes:

1. Signal cables connect into the back of the display unit.
2. The length of the keyboard cable permits the keyboard to be moved up to 13 inches away from the display screen.



This is a picture of a Model 12 (1920-character screen); the model 2 has a 960-character screen.

Specifications

Dimensions:[1]

	Width	Depth	Height
Millimeters	530	470	400
Inches	21	18.5	16

Service Clearances:

	Front[1]	Rear	Right	Left
Millimeters		460	300	300
Inches		18	12	12

Weight 45 kg (99 lb)[1]

Heat Output: 136 watts (465 BTU/hr)

Airflow: 3 m^3/min (100 cfm)

Power Requirements:

Voltage	115
kVA	0.2
Phase	1
Plug type[2]	H or J
Power cord style[2]	B

Operating and Nonoperating Environment:
See *Environmental Considerations and Requirements* in Chapter 1.

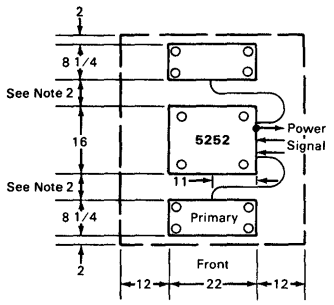
---

[1]The keyboard is 530 millimeters (21 inches) by 210 millimeters (8¼ inches) by 100 millimeters (4 inches) and weighs 6 kilograms (13 pounds). The keyboard may be moved to service the machine. See *Plan View.*

[2]The power cord is 2.4 meters (8 feet) long. For more information, see *Power Cords, Plugs, and Receptacles in this chapter.*

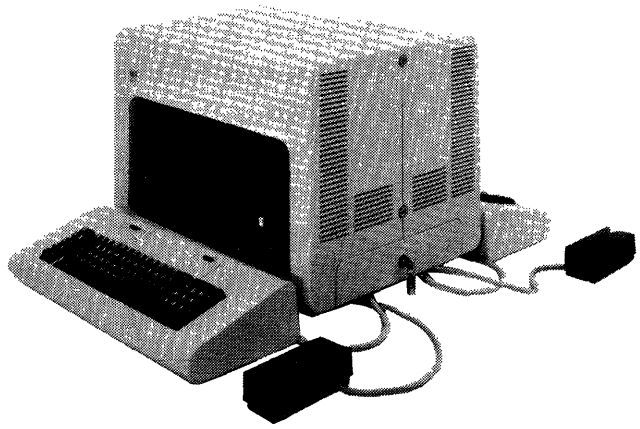
5252 DUAL DISPLAY STATION

Plan View



Notes:

1. Signal cables connect into the side of the display unit.
2. The length of the keyboard cable permits the keyboard to be moved up to 13 inches away from the display screen.
3. The display unit is 560 millimeters (22 inches) wide. The keyboard is 530 millimeters (21 inches) wide.



Specifications

Dimensions:[1]

	Width	Depth	Height
Millimeters	560	400	430
Inches	22	16	17

Service Clearances:

	Front[1]	Rear[1]	Right	Left
Millimeters			300	300
Inches			12	12

Weight: 39 kg (85 lb)[1]

Heat Output: 145 watts (495 BTU/hr)

Airflow: 3 m^3/min (100 cfm)

Power Requirements:

Voltage	115
kVA	0.2
Phase	1
Plug type[2]	H or J
Power cord style[2]	B

Operating and Nonoperating Environment:
See *Environmental Considerations and Requirements* in Chapter 1.

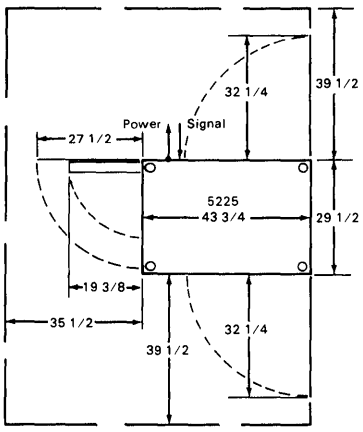
---

[1]The keyboard is 530 millimeters (21 inches) by 210 millimeters (8¼ inches) by 100 millimeters (4 inches) and weighs 6 kilograms (13 pounds) each. The keyboard may be moved to service the machine. See *Plan View.*

[2]The power cord is 2.4 meters (8 feet) long. For more information, see *Power Cords, Plugs, and Receptacles* in this chapter.

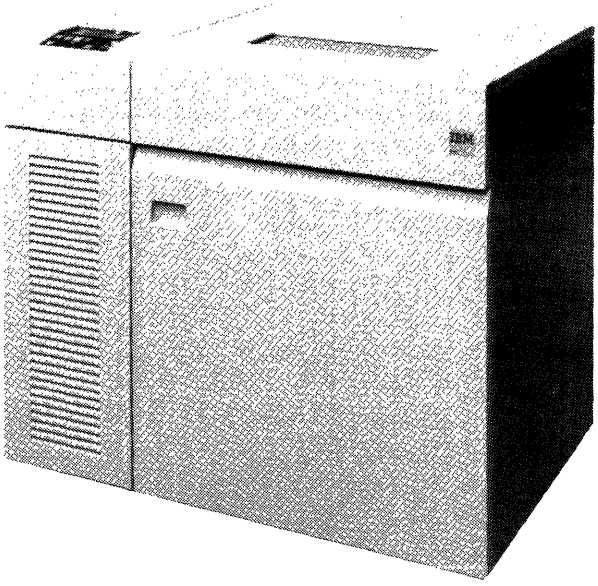
5225 PRINTER

Plan View



Notes:

1. Dimensions are in inches.
2. Signal cables connect into the back of the machine.



Specifications

Dimensions:

	Width	Depth	Height
Millimeters	1110	750	1000
Inches	43¾	29½	39½

Service Clearances:

	Front	Rear	Right	Left
Millimeters	1000	1000	00	900
Inches	39½	39½	00	35½

Weight: 250 kg (550 lb)

Heat Output:

	Model 1	Models 2, 3, and 4
BTU/hr	2740	3420
Watts	800	1000

Airflow: 4.5 m^3/min (150 cfm)

Power Requirements:

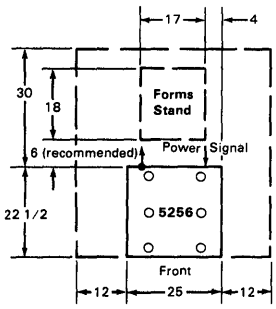
	Model 1	Models 2, 3, and 4
Voltage	115	115
kVA	.75	1.0
Phase	1	1
Plug type[1]	H	H
Power cord style[1]	A8	A8

Operating and Nonoperating Environment:
See *Environmental Considerations and Requirements* in Chapter 1.

[1]The power cord is 2.4 meters (8 feet) long. For more information, see *Power Cords, Plugs, and Receptacles* in this chapter.

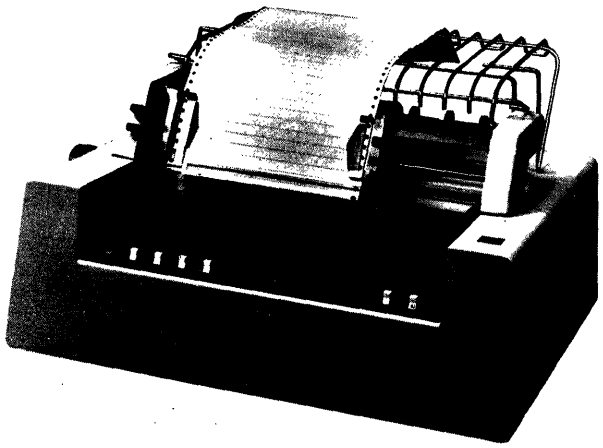
5256 PRINTER

Plan View



Notes:

1. Dimensions are in inches.
2. Signal cables connect into the back of the machine.



Specifications

Dimensions:

	Width	Depth	Height
Millimeters	640	570	370
Inches	25	22.5	14.5

Service Clearances:

	Front	Rear	Right	Left
Millimeters	0	760	300	300
Inches	0	30	12	12

Weight: 36 kg (78 lb)

Heat Output: 185 watts (630 BTU/hr)

Airflow: 1.26 m^3/min (45 cfm)

Power Requirements:

Voltage	115
kVA	0.2
Phase	1
Plug type[1]	H or J
Power cord style[1]	B

Operating and Nonoperating Environment:
See *Environmental Considerations and Requirements* in Chapter 1.

---

[1]The power cord is 2.4 meters (8 feet) long. For more information, see *Power Cords, Plugs, and Receptacles* in this chapter.

Chapter 3. Cables

This chapter explains how to order and install cables for your 5250. (Appendix C provides bulk cable assembly instructions.) This chapter assumes that the person(s) doing the cable installation has the skill required to do this type of work. For ease of installation, you should consider the purchase of a cable assembly with connectors. (See the following chart for order information.)

ORDERING PROCEDURES FOR COAXIAL AND TWINAXIAL CABLES

You are responsible for obtaining, installing, and maintaining cables to attach work stations to the 5251 Model 2 or 12, or to the host system[1]. When ordering the cables, ensure that the cables are long enough to reach from machine to machine. Allow a minimum of 0.6 meter (2 feet) of cable at the system end. Consider how the cable is entering the system (that is, from the bottom or from the top). Allow at least 1 meter (3 feet) of cable so that the work station can be moved for servicing. You may order cables from either IBM or non-IBM companies, and either preassembled or in bulk (unassembled).

If you have an existing coaxial cable network, check with your IBM representative to see if the system you plan to install can be used with coaxial cable.

The limitations of this method of attachment are:

— Some host systems do not support the use of coaxial cable.

— A maximum of two devices can be attached to each port using the Cable Thru feature and the cable thru line must be of twinaxial cable.

— A twinaxial/coaxial adapter must be used at each attachment of coaxial cable to a work station, because work stations have twinaxial connectors.

[1]Some systems may include the cable to attach certain display system units (for example, system console). See the appropriate system's *Installation Manual — Physical Planning.*

The following table provides order information for twinaxial and coaxial cable.

Part Name	Twinaxial Cable Indoor or Outdoor	Coaxial Cable	
		Indoor	Outdoor
Cable Assembly[1] (cable in specified length with connectors at both ends)	IBM 7362267	IBM 2577672	IBM 1833108
Adapter (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	IBM 323921 RG62 A/U	IBM 5252750 RG62 A/U
Connector Kit (two male connectors)	IBM 7362268	IBM 1836418	IBM 1836419
Connector (single)	IBM 7362229 Amphenol 82-5589	IBM 1836444 Amphenol 31-4541 Bendix 30220-3	IBM 1836447 Amphenol 31-4542 Bendix 39100-16
Adapter[2], (kit of two adapters) (twinaxial-coaxial)	IBM B/M 7361118		
Adapter[2], (single) (twinaxial-coaxial)	IBM P/N 7363102		

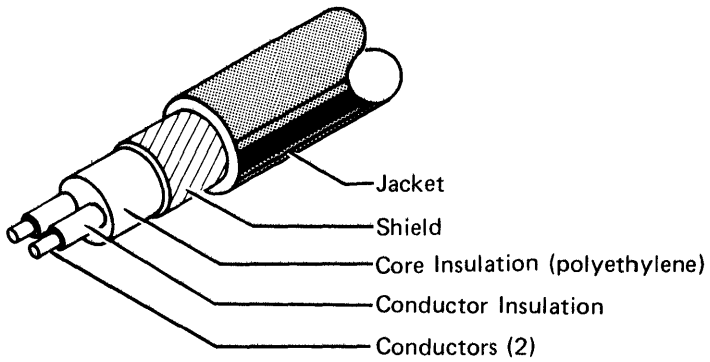
[1]Specify the total length of each cable required when ordering. For example, total length = (0.6 m + 1 m [2 ft. + 3.3 ft.]) + (distance from table to host system). (0.6 m + 1 m [2 ft. + 3.3 ft.]) = additional clearance for serviceability and cleaning.) (See *Station Protectors* for sample station protector installation information.)

[2]Required when using coaxial cable.

When ordering from companies other than IBM:

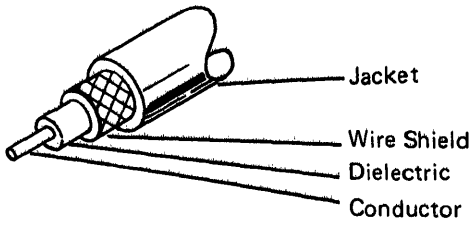
1. See Figures 1 and 2 for the bulk cable specifications you need.
2. Specify the total length of each cable required.
3. Specify Amphenol part or equivalent for the cable connectors.
4. If a cable-to-cable adapter is required, specify Amphenol part or equivalent for the adapter.

For assembly instructions of cable connectors on bulk cables, see Appendix C, *Bulk Cable Assembly.*



Conductor	AWG wire size Stranding Material Coating Resistance	20 7 x 28 Copper Tin (1 conductor only) 11 ohms maximum per 305 meters (1000 feet)
Insulation	Material Outside diameter	Polyethylene 6.1 millimeters (0.24 inch) nominal
Shield	Material Type Coverage Resistance	Tinned copper Braid, 34 AWG, 7 ends/24 carriers, 9.7 ± 10% picks/inch 95% minimum 3 ohms maximum per 305 meters (1000 feet)
Jacket	Material Color Average single wall thickness Outside diameter	Vinyl Black 0.76 millimeter (0.029 inch) 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

Figure 1. Bulk Cable Specifications for Twinaxial Cable (IBM part 7362211 or equivalent)



		Indoor:[1]	Outdoor:[2]
Conductor	AWG wire size Stranding Material	22 Solid Copper covered steel 40% conductivity	22 Solid Copper covered steel 40% conductivity
Shield	Material Type Coverage[3]	Copper braid AWG 34	Copper braid AWG 34
Jacket	Material Average single wall thickness	PVC Noncontaminating 0.79 mm (0.031 inch)	PVC[4] Noncontaminating 1.02 mm /0.040 inch) minimum
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

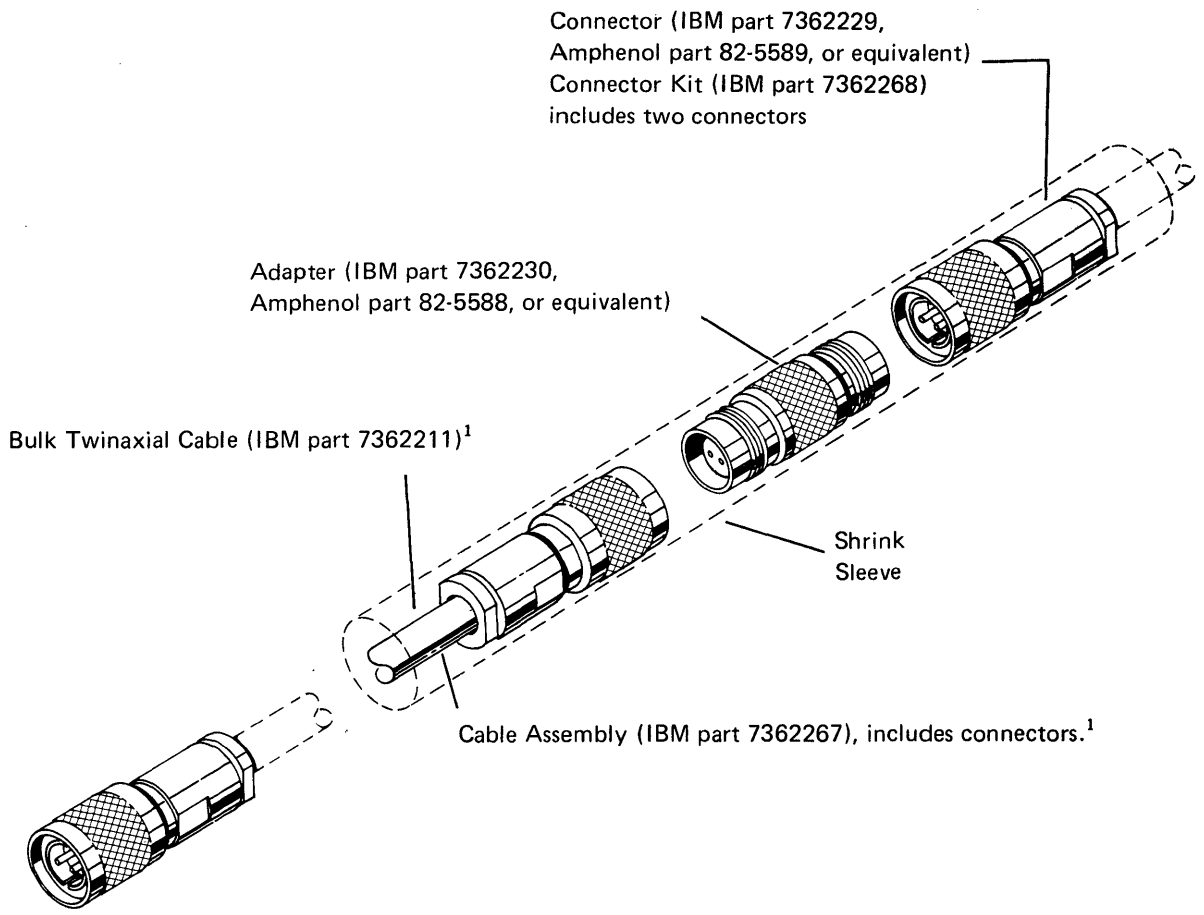
[1]Cable commercially designated RG 62 A/U, meeting the above specifications, is an approved substitute. Cable OD 6.15 ± 0.18 mm (0.242 ± 0.007 inch).
[2]Cable commercially designated RG 62 A/U, which is modified for outdoor use (including vapor barrier and thicker cover) and which meets the above specifications, is a suitable substitute. Cable OD 6.6 ± 0.25 mm (0.260 ± 0.10 inch).
[3]Seven ends, 16 carriers, 8.2 ± 10% pick per inch, 90% minimum coverage.
[4]Jacket must meet the minimum requirements for underground feeder and branch circuit cable and must also be weatherproofed and sunlight resistant, per U.L. Subj. 493.

Figure 2. Bulk Cable Specifications for Indoor Coaxial Cable (IBM part 323921) and Outdoor Coaxial Cable (IBM part 5252750)

Cable Adapters

Do not splice cables; instead, use an adapter (IBM part 7362230), Amphenol part 82-5588, or an equivalent for twinaxial cable and IBM part 5252643, Amphenol part 31-219, or an equivalent for coaxial cable.

This adapter and the attached cable connectors should be covered with shrink tubing to prevent accidental grounding of the connection. Figure 3 illustrates the cable adapter for joining twinaxial cables, and Figure 4 illustrates the cable adapter for joining coaxial cables.



[1]Specify the total length of each cable ordered.

Figure 3. Cable Adapter for Joining Twinaxial Cables

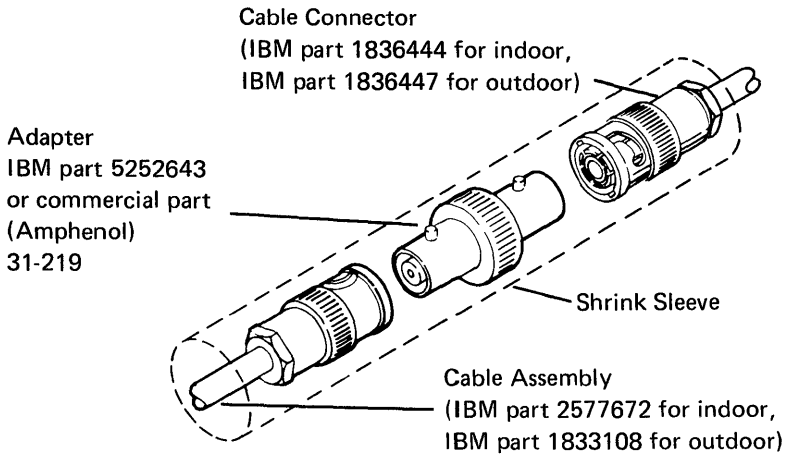
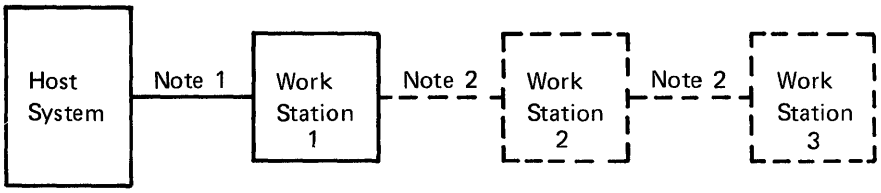


Figure 4. Cable Adapter for Joining Coaxial Cables

CABLING SCHEMATIC

The illustrations on this page are examples of cable connections for 5250 system units. The notes and figures that follow the configurations describe the electrical requirements associated with the connections.

Direct Attachment to Host System



Notes:

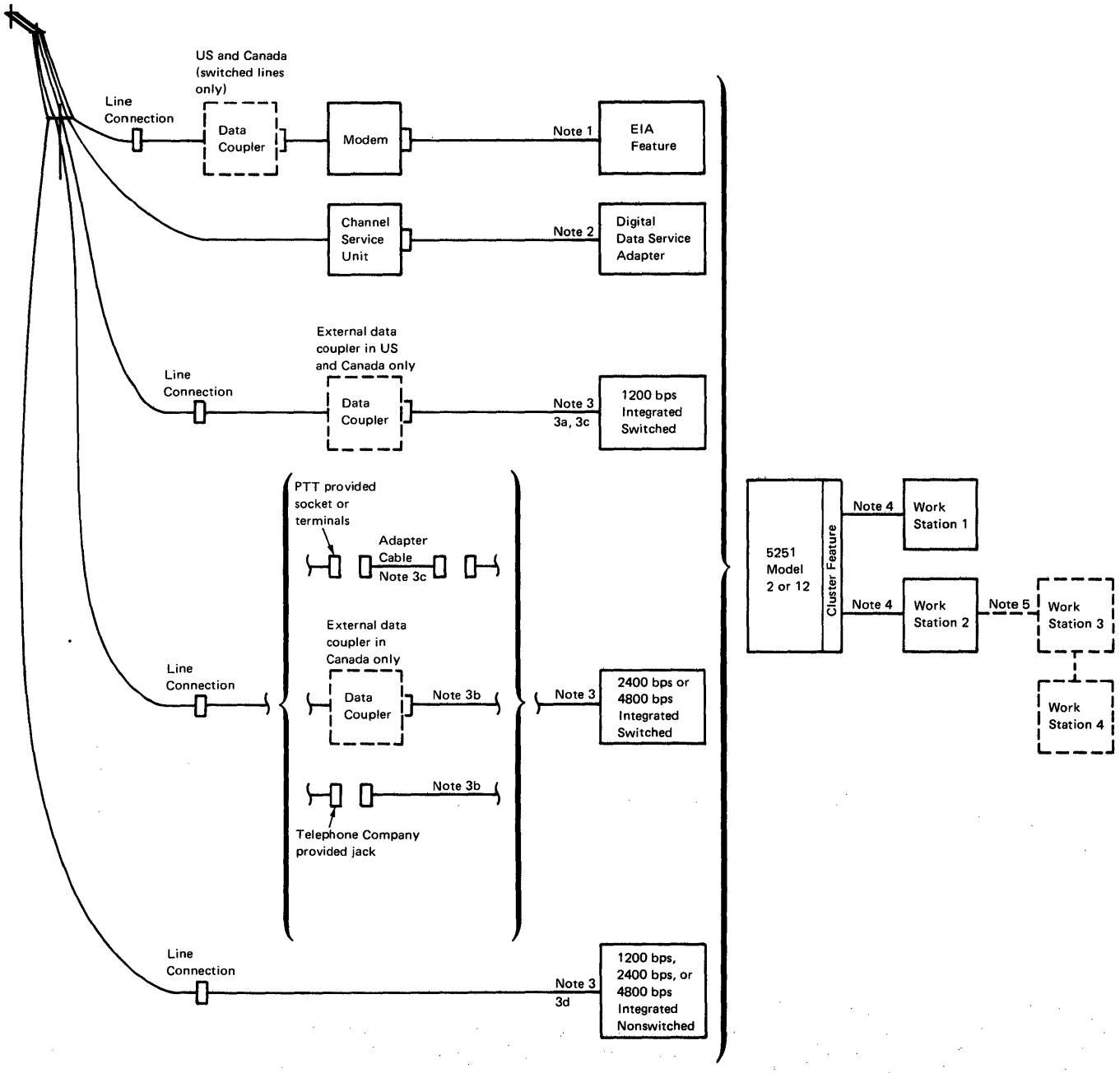
1. For limitations of directly attached 5250 system machines to a host system, see the appropriate system's *Installation Manual-Physical Planning* for your system. You are responsible for supplying, installing, and maintaining the cables. When twinaxial cable is used, a maximum of seven 5250 work stations can be attached to a port (using the Cable Thru feature on the work stations). The maximum cable length is 1525 meters (5000 feet).

   When coaxial cable is used, a maximum of two 5250 work stations can be attached to a port. The second station must be connected to the first with a maximum of 30 meters (100 feet) of twinaxial cable. The coaxial cable is limited to 610 meters (2000 feet) in length and must have a twinaxial-coaxial adapter at each end of the cable. For more information on cables, see *Cabling Considerations* in Chapter 1 of this manual.

   Increase cable lengths at each end by at least 1 meter (3 feet) to ensure that the machine can be moved for servicing.

2. The Cable Thru feature (feature SF2680) is required on work stations 1 and 2 and recommended on work station 3 to aid in changeability.

Remote Attachment to the Host System



Notes:

1. Either a 6-meter (20-foot) cable (standard) or a 12-meter (40-foot) cable (SF9461) may be specified with the EIA/CCITT feature (SF3701). (See Figure 5 for termination.) An adapter cable is supplied with: Datel 600 switched service in U.K., 0.3-meter (12-inch, SF2835); 0.2-meter (8-inch, SF2898); and non-IBM modem attachment in Japan, 0.3-meter (12-inch, SF2946).
2. Either a 6-meter (20-foot) cable (standard) or a 12-meter (40-foot) cable (SF9461) may be specified with the DDS Adapter Feature (SF5651). (See Figure 6 for termination.)
3. Either a 6-meter (20-foot) cable (standard) or a 12-meter (40-foot) cable (SF9461) may be specified with all integrated modems except in the US for the 2400 bps and the 4800 bps Integrated Switched Modems. In the US, either a 2.4-meter (8-foot) cable (standard) or a 7.6-meter (25-foot) cable (SF9461) may be specified with a 2400 bps or a 4800 bps Integrated Switched Modem.

   Terminations at the data coupler or nonswitched communications facilities end of the cable are one of the following:

   a. The communications cable for the 1200 bps Integrated Modem, switched (SF5502) is terminated in two spade terminations (Figure 12) for the US and Canada.
   b. The communications cable for the 2400 bps Integrated Modem, switched (SF5641) and the 4800 bps Integrated Modem, switched (SF5741) is terminated in an eight position modular plug for the US (Figure 15) and in eight spade terminations for Canada (Figure 16).
   c. The communications cable for all integrated switched modems (1200 bps [SF5502], 2400 bps [SF5641], and 4800 bps [SF5741]), is terminated with a WE[1]-283 B plug (Figure 7) for all World Trade countries except France.

      For World Trade systems other than France, a 1.0 meter (39-inch), 4-spade termination adapter (Figure 10) or an adapter with a plug to match the PTT provided socket (Figures 8, 13, 14, switched) is supplied for a cable terminated with a WE[1]-283 B plug (Figure 7). For France, a cable is provided with the correct plug (Figure 11) for the PTT provided socket.
   d. The communications cable for the 1200 bps Integrated Modem, nonswitched (SF5500), the 2400 bps Integrated Modem, nonswitched (SF5640) and the 4800 bps Integrated Modem, nonswitched (SF5740) are terminated with a WE[1]-283 B plug (Figure 7) for all countries except France.

      For systems used in countries requiring a different plug connection, other than France, a 1.0 meter (39-inch), 4-spade termination adapter (Figure 10) or an adapter with a plug to match the PTT provided socket (Figures 8 and 9 nonswitched) is supplied for a cable terminated with a WE[1]-283 B plug (Figure 7). For France, a cable is provided with the correct plug (Figure 11) for the PTT provided socket.
4. You are responsible for supplying, installing, and maintaining work station cables. For more information on cables, see *Cabling Considerations* in Chapter 1 of this manual. Increase cable lengths to each 5250 system machine at least 1 meter (3 feet) to ensure that the machine can be moved for servicing. The total length of cables on any port must not exceed 610 meters (2000 feet) of coaxial cable or 1525 meters (5000 feet) of twinaxial cable. With coaxial cable only one work station can be attached to the Cluster port, and a twinaxial-coaxial adapter must be used on both ends of the cable. If a second station is desired on the same port, a maximum of 30 meters (100 feet) of twinaxial cable must be used to attach it to the first station. With twinaxial cable and the Cluster feature (SF2550), four work stations can be attached; with the Dual Cluster feature (SF2551), eight work stations can be attached.
5. Cable Thru feature (SF2680) is required on work stations 2 and 3 and recommended on work station 4 to aid in changeability.

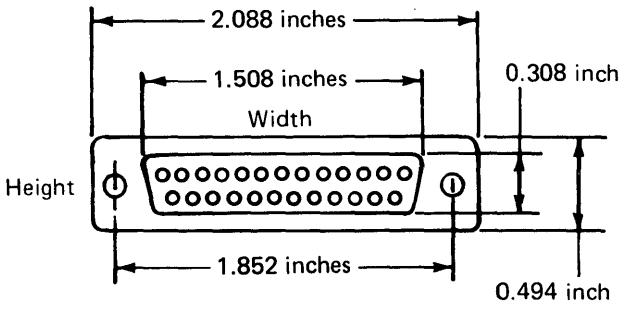


Figure 5. 25-Pin Connector

[1]Western Electric, a division of American Telephone and Telegraph Co., New York, New York 10038

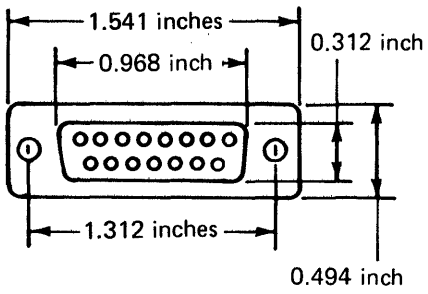


Figure 6. 15-Pin Connector

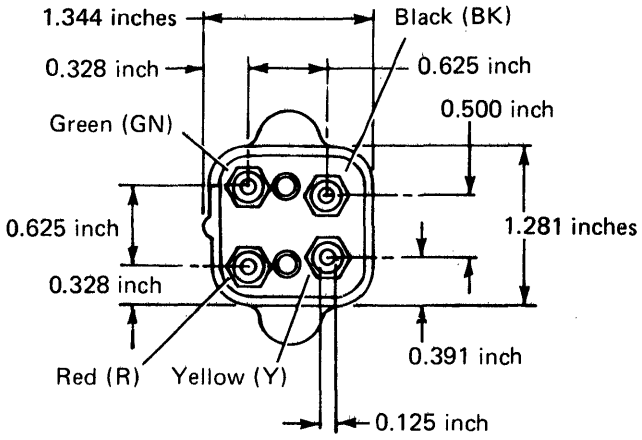


Figure 7. WE-283 B Plug

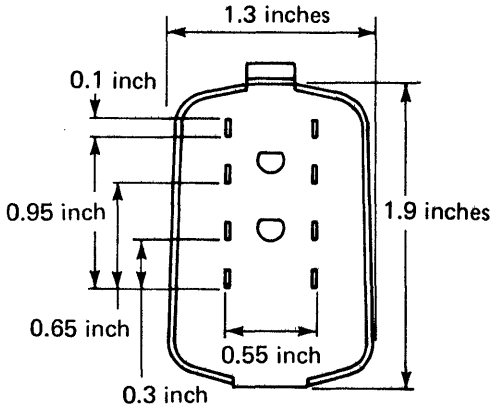


Figure 8. World Trade Communications Plug

Switched	Nonswitched
Austria	Austria
Israel	Belgium
	Israel
	Netherlands
	Switzerland

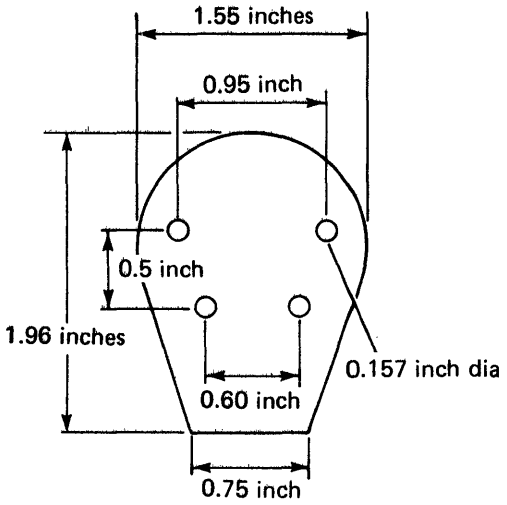


Figure 9. World Trade Communications Plug

Nonswitched
Finland

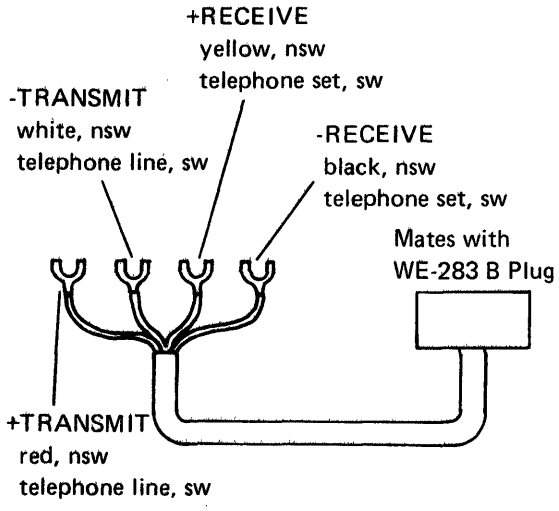


Figure 10. 4-Spade Termination

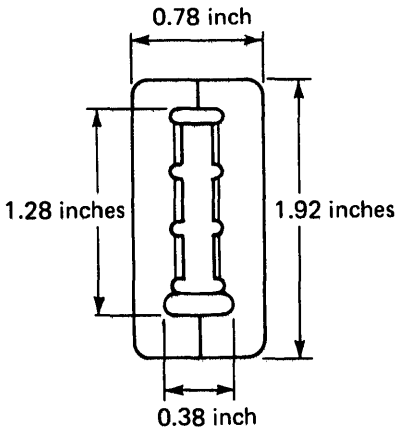


Figure 11. World Trade Communications Plug

Switched	Nonswitched
France	France

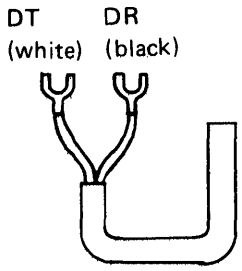


Figure 12. 2-Spade Termination

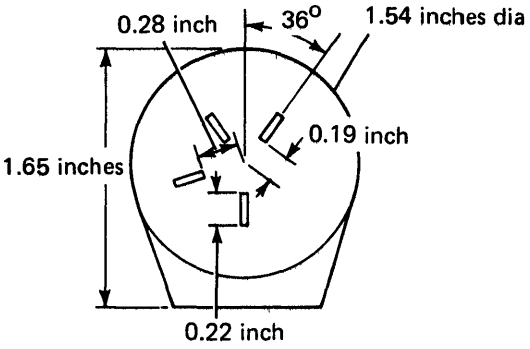


Figure 13. World Trade Communications Plug

Switched
Netherlands

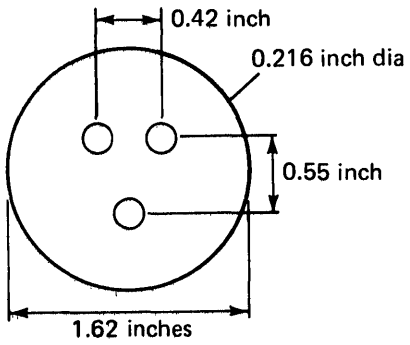


Figure 14. World Trade Communications Plug

Switched
Finland

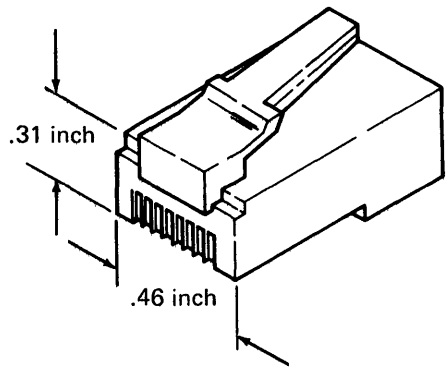


Figure 15. 8-Position Modular Plug

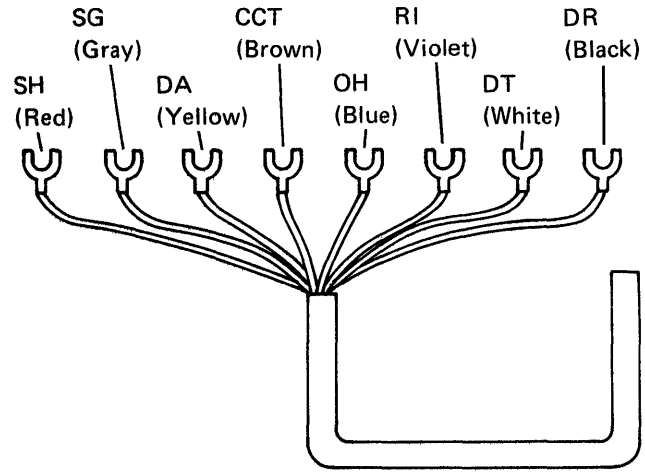


Figure 16. 8-Spade Termination

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 a 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).

The 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 from lightning (1 provides the most protection, 6 the least).

1. Cable buried in grounded metal conduit.

2. 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.

3. Cable buried in metal conduit.

4. 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.

5. Cable buried in nonmetallic conduit.

6. Overhead cable on a carrier with the carrier grounded at each end and at each pole.

Note: For overhead cables, avoid having the coaxial or twinaxial cable as the highest point in the area.

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, and contains solid state components for unit protection. Station protectors must be installed indoors where the cable enters or exits the building and 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 from IBM the Twinaxial Station Protector Kit, IBM part 7361807, or the Coaxial Station Protector Kit, IBM part 7361808. (A kit consists of two station protectors and is sufficient to install one outdoor cable with a station protector at each end.) If you plan to connect your 5250 Information Display System to an existing coaxial cable network, you must replace existing station protectors with part 7361808. You can order single station protectors using IBM part 7362426 for twinaxial cable or IBM part 7362427 for coaxial cable. See order information in this section.

If you want to connect the station protectors to your lines before the work stations arrive, you should order the station protectors separately from your IBM representative, specifying an earlier ship date.

You should install the station protectors so that the components in them can be easily inspected, but not in areas where unauthorized persons might come in contact with them. During lightning storms, you should not handle the station protectors or the cable that runs from the protector to the terminal.

Note: Cables are attached to the station protectors with the same connectors that attach to the system. Therefore, cable lengths and number of connectors ordered must allow for two extra connectors for each station protector in your configuration.

Grounding Recommendations

It is important to provide good grounding (grounding conductor and grounding electrode) for the station protector. The 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 10 ohms

You should also provide common grounding between the station protector, the utility ground, and all extensive metal components in the vicinity of the system. (This prevents 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 protectors 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 17.)

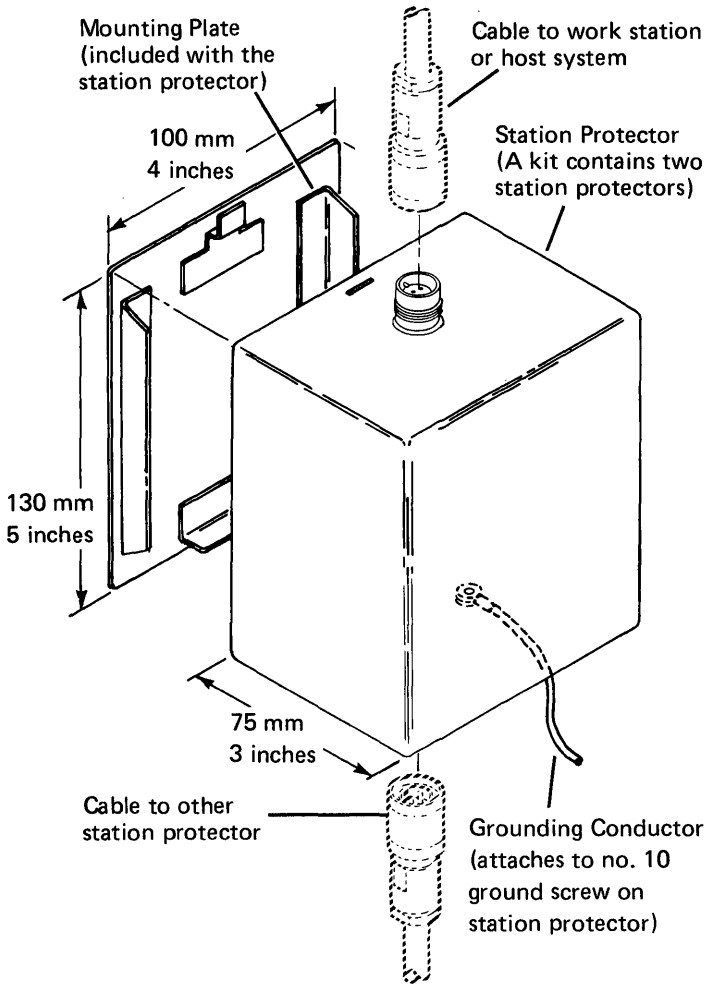
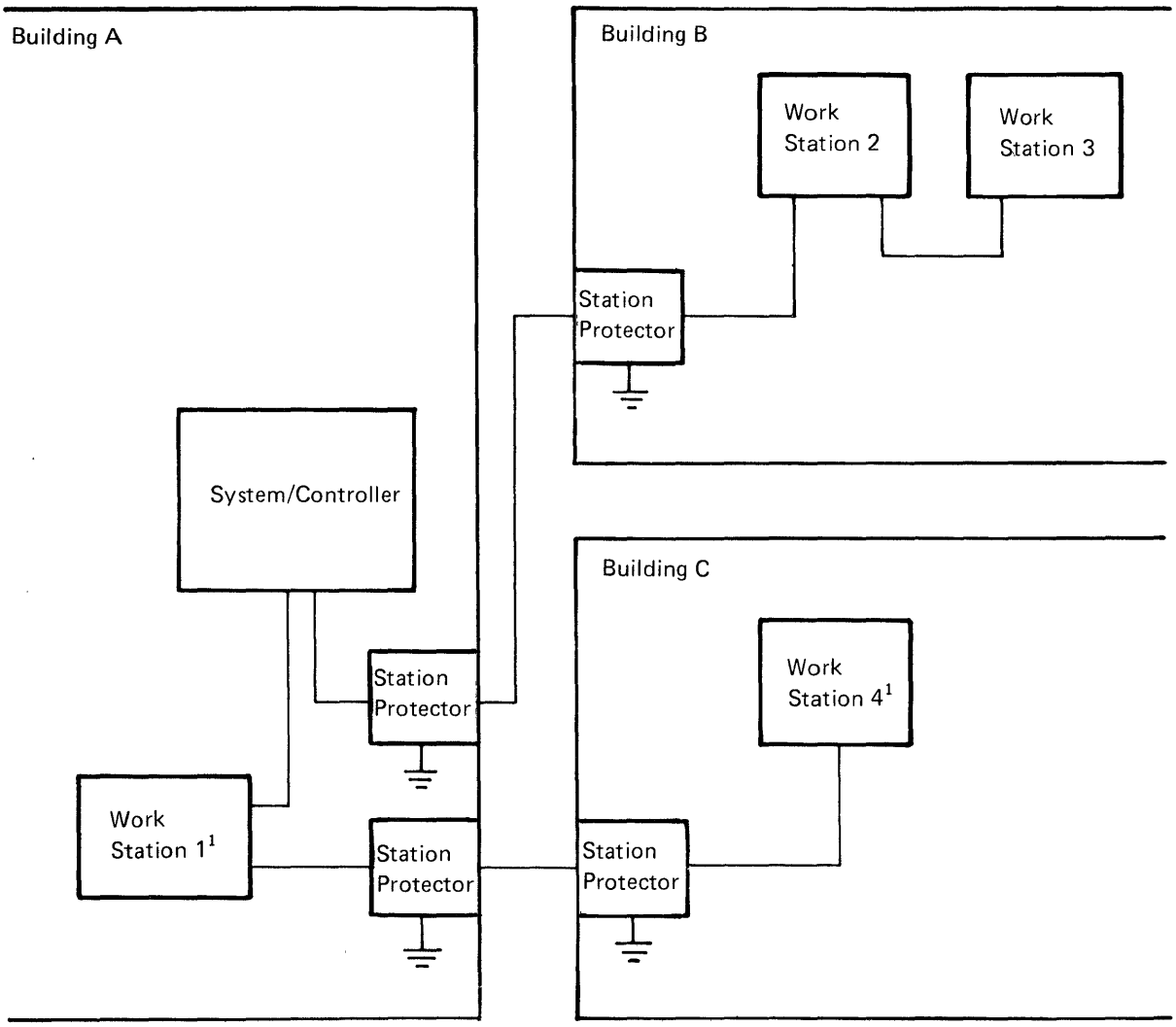


Figure 17. Station Protector with Entering/Exiting Cables

One station protector should be located at the exit in the first building, and the second station protector should be located at the entrance in the second building. Only one station protector kit (two station protectors) can be installed per port; therefore, only one outdoor cable run is allowed for each port used. An example of station protector installations is shown in Figure 18.



[1]Cabling between work stations 1 and 4, for example, consists of three cables as follows: between the two station protectors and between each work station and its adjacent station protector. Each cable must have a connector at each end.

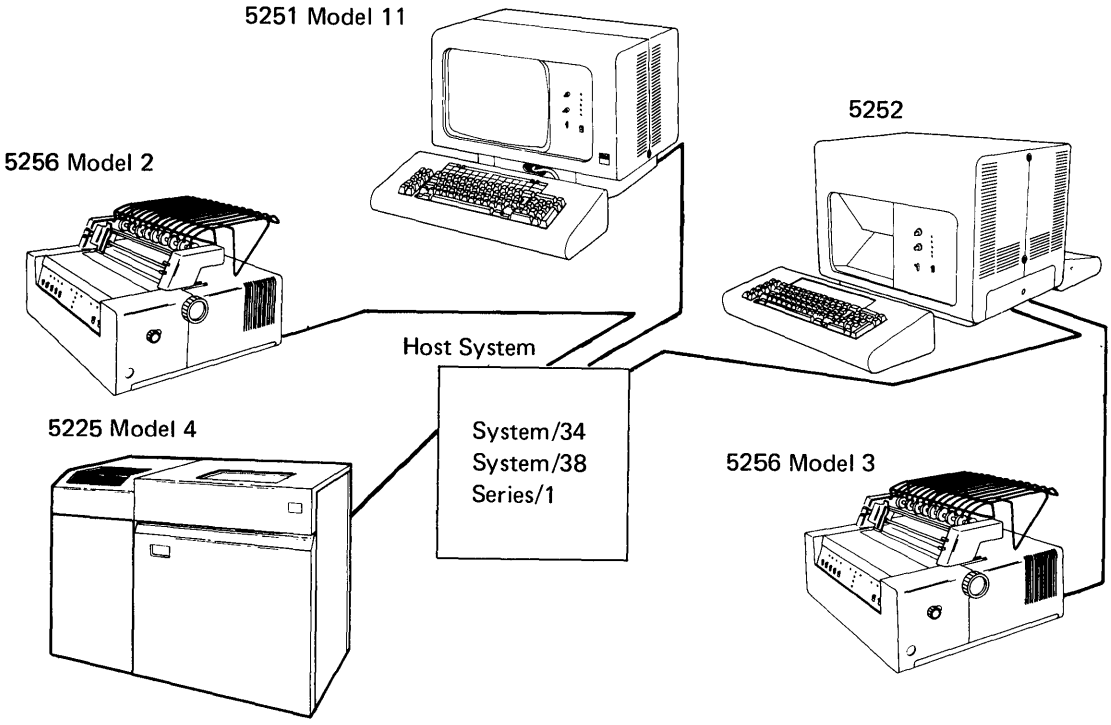
Figure 18. Sample Station Protector Installations

This chapter is included to help you plan for the arrangement and setup of your IBM 5250 Information Display System.

LOCAL WORK STATION CONSIDERATIONS

Because of the possible variation of local attachments, you should refer to the planning and installation/modification guides for your host system when making attachments directly to the host system. Complete the work station network diagram as directed for your host system and provide a copy to your setup personnel.

The following illustrates a local work station configuration:

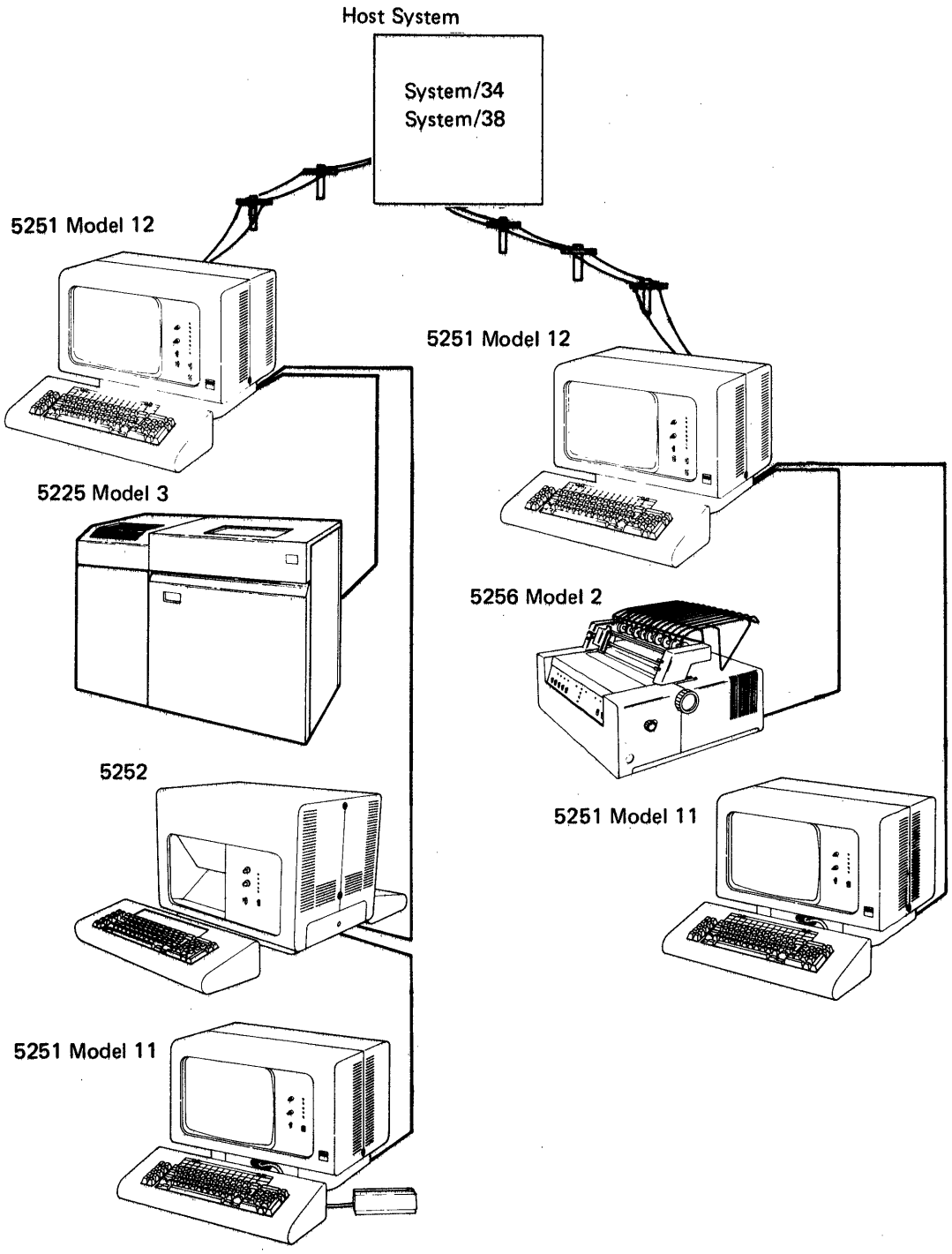


Note: The IBM 5225 Printer might not be supported by all host systems. Check with your IBM sales representative to determine if your system supports the use of the 5225 Printer.

REMOTE WORK STATION CONSIDERATIONS

The remainder of this chapter details possible configurations, limitations, and setup for attachments of work stations to a remote 5251 Model 2 or 12.

The following illustrates a remote work station configuration.



Note: The IBM 5225 Printer might not be supported by all host systems. Check with your IBM sales representative to determine if your system supports the use of the 5225 Printer.

Communications Facilities

Remote work stations communicate with the host system through a 5251 Model 2 or 12. Communications facilities provide the link between the host system and this work station. The publication, *IBM Data Communication Concepts,* GC21-5169, provides information about these facilities.

After you have selected a network, schedule the installation of the communications facilities between the 5251 Model 2 or 12 and the host system. The *Planning Checklist* is provided in Chapter 1 to assist you. Schedules should be established to ensure that the communications facilities and host system communications features are installed and tested before delivery of the 5251 Model 2 or 12 and the attached work stations.

Compatibility among components of a communications network is a major consideration. Request assistance from your communications representative and your IBM service representative to ensure that all components are compatible.

When ordering communications equipment, you may be required to provide certain information to the communications supplier. This chapter is intended to help you provide this information. Refer to the feature heading that applies to your communications network.

EIA/CCITT Interface Feature

When ordering modems to be used with this feature, you should use the following specifications as applicable.

Interface: EIA RS232C (CCITT V.24/V.28 for World Trade Countries)
Speed: 1200 to 9600 bits per second (bps)

Specify the following options to the modem supplier. (All of the options may not apply to certain modems.) For options not listed, follow the modem supplier's recommendation.

- *Auto Answer Control*[1]—Specify: controlled by Data Terminal Ready (DTR) only.

- *Clocking*—Clocking must be provided by the modem for data rates above 1200 bps. At data rates of 1200 bps, the clocking can be provided by the modem or by the 5251 Model 2 or 12.

  If the modem you are going to use with the EIA/CCITT feature does not provide clocking, you must order the Internal Clock feature for the 5251 Model 2 or 12. The Internal Clock feature provides clocking for operation at 1200 bps in the United States and Canada and 1200 or 600 bps in the World Trade countries.

- *Data Set Ready*—If the modem you are going to use has the capability to loop data back to the 5251 Model 2 or 12 for testing, select the option that causes Data Set Ready to be on while the local loopback test is running.

- *Grounding*—The signal ground is connected to the 5251 frame ground; the signal ground should not be connected to the frame ground in the modem.

- *Interface Pin 18*—If this option is available, select the option to provide local loopback.

- *New Sync*—This is not used.

- *Ring Indicate*[1]—EIA/CCITT level signal is required on EIA/CCITT interface pin 22.

- *Request to Send (RTS)/Clear to Send (CTS)*—The modem or Data Service Unit (DSU) must be set for RTS controlled by the 5251 Model 2 or 12; a constant CTS from the modem or DSU is not allowed.

Note: Order the necessary communications lines to match the requirements of the modems. You may need to order a data coupler for switched line modems not supplied by the common carrier (telephone company).

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[1]Applies to switched modems only.

DDS Adapter Feature

With this adapter, you should order DDS service with a Channel Service Unit from your local telephone company. Specify the same data transmission speed that you ordered for your 5251 Model 2 or 12. Also specify that the signal ground is connected to the 5251 frame ground; therefore, the signal ground should not be connected to the frame ground in the Channel Service Unit.

Note: The Channel Service Unit is *not* a modem.

1200 bps Integrated Modem Feature

If you order your 5251 Model 2 or 12 with a 1200 bps Integrated Modem, you must order a communications line suitable for data transmission at 1200 bps, and the Internal Clock feature for the 5251 Model 2 or 12. For operation on a nonswitched line, a 4-wire line is required. For operation on a multipoint network, a 4-wire duplex line is required.

No additional equipment is needed on a switched or nonswitched line except in the United States and Canada. In the United States and Canada, you must provide a CDT type data coupler (sometimes referred to as a data access arrangement), if the 5251 is attached to a public switched network.

Note: The data coupler must be a CDT type regardless of the type used at the host system.

In the United States, for ease of setup and optimum performance, a *programmable* CDT type data coupler (order with a transformer and a DC power cable) with the following characteristics is recommended:

- Adjusts automatically to the maximum allowable transmit power level *without* operator intervention
- Accepts 0 decibel power level from a 5251 Model 2 or 12 (data terminal equipment)
- Has a receive-data path delivering maximum power levels to the integrated modem (that is, a path not degraded by transmit power level attenuation circuitry)
- Complies with Part 68 of the FCC Rules and Regulations

Any data coupler meeting the above specifications can be used. One such known data coupler is manufactured by Pulsecom, Falls Church, Virginia 22041 (Model 1692-18L1).

To order a communications line for use with a data coupler:

- Contact your local telephone company and order a switched (dial-up) line suitable for data transmission at 1200 bps.
- Specify the line connection required by the coupler you plan to use.
- Inform the telephone company that you wish to connect a registered data coupler to the line. You will need to provide the coupler manufacturer's name, the coupler's registration number, and ringer equivalence number. (If you wish to order your communications line before your data coupler arrives, contact your data coupler supplier for this information.)
- For a nonprogrammable data coupler, specify the telephone set as recommended by the data coupler supplier. (The telephone set controls line-option should be specified.) For a programmable type data coupler, you will need a telephone set with the following options:

  A1—Telephone set controls line
  B3—Aural monitoring not provided
  C5—Touch Tone[1] dial or C6-rotary dial
  D7—Switch hook indication

2400 or 4800 bps Integrated Modem Feature

If you order a 5251 Model 2 or 12 with the 2400 bps or 4800 bps Integrated Modem, you must order a communications line suitable for transmission at the same data rate as the integrated modem you order (2400 bps or 4800 bps). For operation on a nonswitched line, a 4-wire line is required. For operation on a multipoint network, a 4-wire duplex line is required.

No additional equipment is needed on a switched or nonswitched line except in Canada. In Canada, you must provide a CBS type data coupler (sometimes referred to as a data access arrangement), if the 5251 is attached to a public switched network.

Note: The data coupler must be a CBS type regardless of the type used at the host system.

In the United States, when ordering a communications line for use on a switched line, do the following:

- Contact your local telephone company and order a switched (dial-up) line suitable for data transmission at the same data rate you are using (2400 or 4800 bps). Also order a telephone set USOC-RTC. If you wish to use an existing line, provide the telephone company with the line number and the data rate to be used. The telephone set, USOC-RTC, will be needed even when using an existing line. A two party line or a line with a coin phone cannot be used.

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[1]Trademark of the American Telephone and Telegraph Co.

- Specify USOC-RJ45S line connection (data jack).

- Inform the telephone company that you wish to connect a display station with registered communications equipment to the line, and provide the following information:
  Equipment manufacturer's name—*IBM*
  Equipment registration number—*Contact your IBM representative for this information.*
  Ringer equivalence number—*.8B*

  - Specify the following options for the telephone set:
    A2—Data equipment controls line
    B4—Aural monitoring provided
    C5—Touch Tone[1] dial or C6-rotary dial
    D8—Voice mode indication

After the telephone company has installed the data jack for the eight position modular plug (Figure 15), and the telephone (and the communications line if a new line was ordered) you should connect the communications cable from the 5251 Model 2 or 12 into the data jack.

There is no reason why the 5251 Model 2 or 12 should cause technical problems on the network. However, should the 5251 Model 2 or 12 cause technical problems on the network, the telephone company will notify you, where feasible, that service may be temporarily discontinued. However, when prior notice is not feasible, the telephone company may discontinue service immediately if such action is reasonable. In the case of a temporary discontinue of service, the telephone company will:

- Promptly notify you of the temporary discontinue of service.

- Allow you to correct or have corrected the problem which caused the discontinue of service.

- Inform you of your right to bring a complaint to the Federal Communications Commission using the procedures defined in the FCC Rules and Regulations, Part 68, subsection E.

All repairs to the communications section of the 5251 Model 2 or 12 attached to the public switched network, must be made in accordance with the procedures specified in the maintenance documentation supplied with the 5251 Model 2 or 12. Failure to do so will invalidate the FCC registration.

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 communication facilities, or require modification or alteration of your equipment, you will be given an adequate notice in writing to allow you an opportunity to maintain uninterrupted service.

[1]Trademark of American Telephone and Telegraph Co.

SUMMARY OF ORDERING INFORMATION FOR COMMUNICATIONS FACILITIES

Communications Feature	Communications Line Type	External Modem Required?	Connection to Communications Line	Equipment and Facilities to be Ordered
EIA	Nonswitched	Yes	Through external modem	Communications line modem[6]
EIA	Switched	Yes	Through external modem[1]	Communications line modem
Digital Data Service	Nonswitched	No	Through a channel service unit[2]	Digital Data Service with a channel service unit
1200 bps Integrated Modems				
Nonswitched	Nonswitched[4]	No	Direct plug connection	Communications line
Switched (US/Canada)	Switched	No	Through a CDT type data coupler[3]	Communications line data coupler
WT PSN	Switched	No	Direct plug connection	Communications line
2400 bps Integrated Modems				
Nonswitched	Nonswitched[4]	No	Direct plug connection	Communications line
Switched				
(US)	Switched	No	Direct plug connection	Communications line
(Canada)	Switched	No	Through a CBS type data coupler[5]	Communications line data coupler
WT PSN	Switched	No	Direct plug connection	Communications line
4800 bps Integrated Modems				
Nonswitched	Nonswitched[4]	No	Direct plug connection	Communications line
Switched				
(US)	Switched	No	Direct plug connection	Communications line
(Canada)	Switched	No	Through a CBS type data coupler[5]	Communications line data coupler
WT PSN	Switched	No	Direct plug connection	Communications line

[1]US/Canada only
For modems not supplied by the common carrier, a data coupler is usually required to attach the modem to the communications line.
[2]Supplied with the Digital Data Service by the common carrier.
[3]A CDT (manual answer) type data coupler must be used to connect the 5251 Model 2 or 12 to the communications line regardless of the type of data coupler used at the host system.
[4]For operation on a nonswitched line, a 4-wire line is required. For operation on a multipoint network, a 4-wire duplex line is required.
[5]A CBS (auto answer) type data coupler must be used to connect the 5251 Model 2 or 12 to the communications line regardless of the type of data coupler used at the host system.
[6]The communications line for use with an external modem may be a 2-wire or a 4-wire line as specified by the modem supplier.

DOCUMENTING YOUR REMOTE WORK STATION CONFIGURATION

Before communication can be established with the host system, you have switches to set and cable connections to complete for the 5251 Model 2 or 12 and any work stations attached using Cluster feature (see 5251 Model 2 or 12 Ports in the chapter). To simplify setting these switches and connecting these cables, you should designate a person in your organization to determine (in advance) the desired configuration(s) and the correct switch settings for all addresses in the 5250 system, for the 5251 Model 2 or 12 Communications switches, and for the Cluster Feature Port switches. You should make this same person responsible for marking and designating cable to port connections for the work stations; this information should be entered on a copy of the *Communications Network Setup Form* in Appendix B. Ensure that those persons doing the setup have this completed form when the 5251 Model 2 or 12 arrives. You will also need the form for system generation (configuration). You should have a completed *Communications Network Setup Form* for each 5251 Model 2 or 12 ordered (see the sample form in Figure 32); these forms should be retained at the machines for service reference.

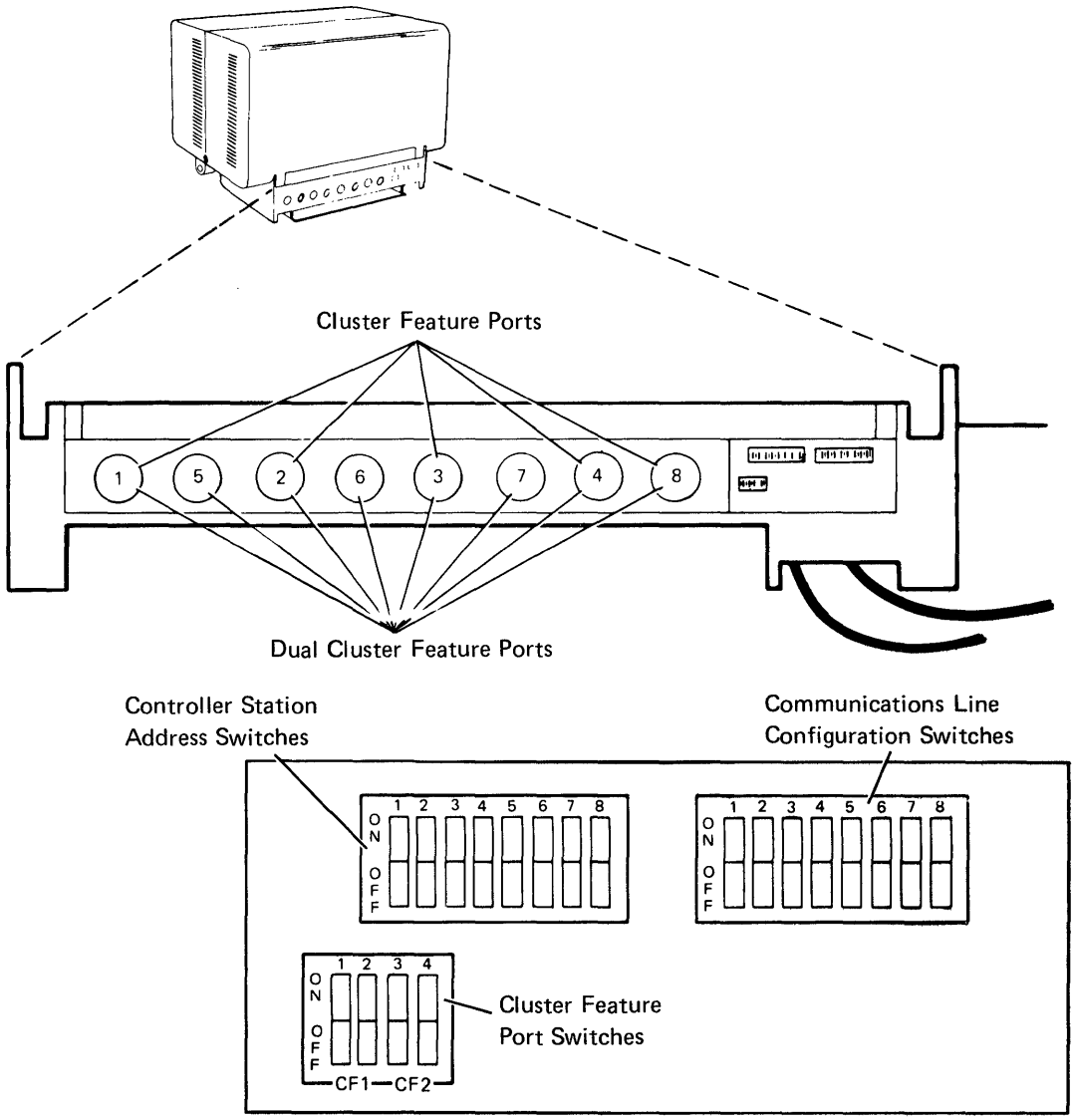
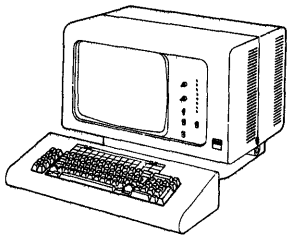


Figure 31 shows a sample configuration for a 5250 Remote Cluster Network. This example will be used throughout this manual to help explain switch settings and cable connections.

The 5251 Model 2 or 12

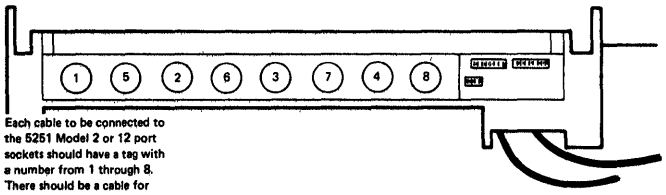
Part 1 of the *Communications Network Setup Form* deals with the 5251 Model 2 or 12, that enables communication with remote work stations, and focuses on the ports and switches found on the Model 2 or 12's rear access panel.



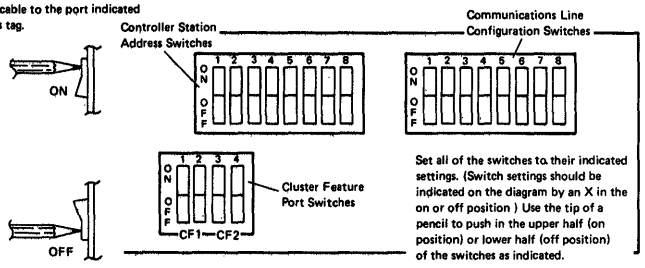
5251 Model 2 or 12 Display Station

Controller Functional Information
- Name
- Location
- City, State
- Telephone
- Controller Station Address
- Host System Line Number
  - Location
  - Telephone

Work Station Functional Information
- Name
- Device Type
- Unit Address 00
- Work Station Address 00



Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.



Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

5251 Model 2 or 12 Ports

Your 5251 Model 2 or 12 may have 4 ports (Cluster feature), 8 ports (Dual Cluster feature), or no ports at all. If you plan to attach work stations to the 5251 Model 2 or 12, your 5251 Model 2 or 12 must have ports on its rear access panel. If it does not, your Model 2 or 12 can function only as a communicating work station; therefore, you should disregard the remainder of this topic and proceed to *5251 Model 2 or 12 Switches.*

Your 5251 Model 2 or 12 may have one or more of the following features:

Cluster feature, an option for the 5251 Model 2 or 12, enables the attachment of as many as four work stations to its four (rear access panel) ports. The Cluster feature ports (1-4) will be referred to as CF1 ports in this manual.

Dual Cluster feature, an option for the 5251 Model 2 or 12, enables the attachment of as many as eight work stations to its eight (rear access panel) ports. The Dual Cluster feature is the Cluster feature plus four more ports (ports 1-4 and 5-8); four work stations may be attached to ports 1-4 and four work stations may be attached to ports 5-8. (A 5252 Dual Display Station is considered as two work station attachments.) The Dual Cluster feature ports will be referred to as CF1 ports (1-4) and CF2 ports (5-8).

Cable Thru feature, an option for the 5251 Model 1 and 11, 5252, 5225, and 5256 work stations, enables the attachment of as many as four work stations to a single cable path when that cable is attached to a 5251 Model 2 or 12. Cable Thru feature is indicated on a 5251 Model 1 or 11, a 5252, a 5225, or a 5256 by cable connectors, several Address switches, and a Terminator switch. Cable Thru feature must be installed on all but the last work station on the cable path. For maximum flexibility in configuring your system, Cable Thru feature is recommended for all devices.

The number of ports used and their assignment depends on the number and type of work stations attached, as well as the routing of connecting cable.

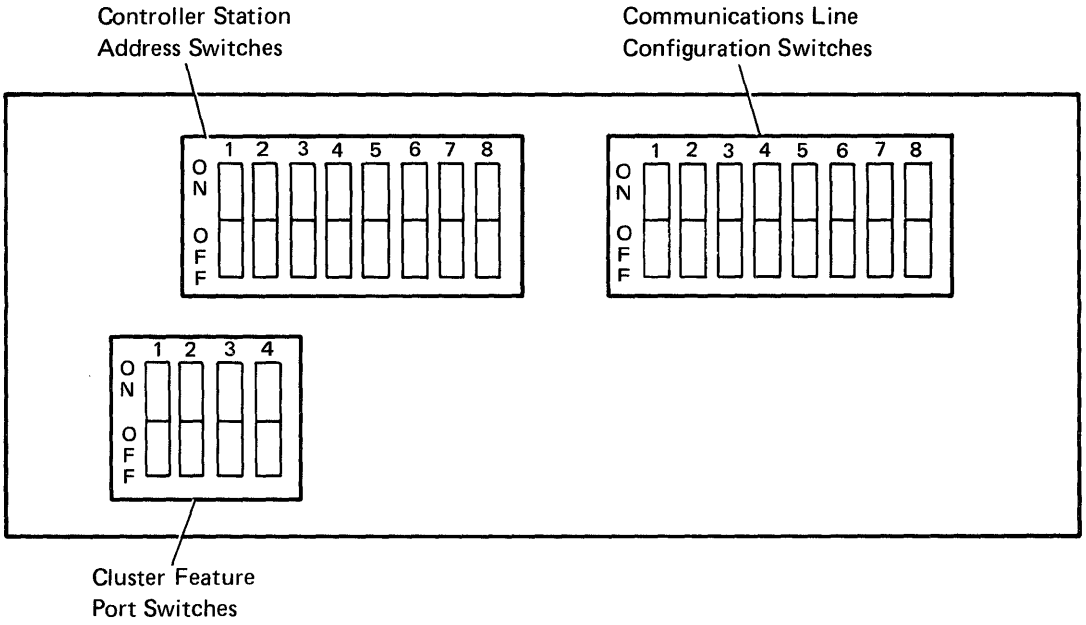
Connections must be made in sequence within each set of four ports until the maximum of four work station attachments has been reached; for example, a work station must be attached to ports 1 and 2 before one can be attached to port 3. The 5252 counts as two work stations.

Figure 31 shows a sample cluster configuration that will serve throughout this chapter as an example to help you plan, configure, and set up your cluster. A series of Cluster Configuration charts (Figures 26-30) is provided to simplify your configuration efforts. Use these figures, charts, and the corresponding examples as your configuration guidelines. Refer to *Using the Cluster Configuration Charts* in this section for more information.

5251 Model 2 or 12 Switches

Your 5251 Model 2 or 12 has three groups of switches to set. They are the following:

- Controller Station Address switches
- Communications Line Configuration switches
- Cluster Feature Port switches



Controller Station Address Switches

The Controller Station Address switches are eight switches that you set to represent the controller station address of the 5251 Model 2 or 12. (This address is used by the host system to select a specific Model 2 or 12 on a communications line.) These switches must be set with the following restrictions in mind:

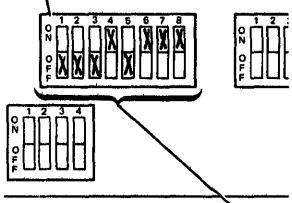
— Your 5251 Model 2 or 12's switches should not be set all on or all off (all 1's or all 0's) as these addresses are not valid and will cause an error.

— Each 5251 Model 2 or 12 attached to the same communications line must have a unique address.

— Each 5251 Model 2 or 12 attached to the same System/34 must have a unique address.

The sample configuration shown in Figure 31 shows a controller station address of 17; the switches in Figure 19 illustrate the corresponding switch setting for that address. (An *x* is used to designate the switch setting.)

Controller Station
Address Switches



Address	Switch Setting	Address	Switch Setting	Address	Switch Setting	Address	Switch Setting
		40	0100 0000	80	1000 0000	C0	1100 0000
01	0000 0001	41	0100 0001	81	1000 0001	C1	1100 0001
02	0000 0010	42	0100 0010	82	1000 0010	C2	1100 0010
03	0000 0011	43	0100 0011	83	1000 0011	C3	1100 0011
04	0000 0100	44	0100 0100	84	1000 0100	C4	1100 0100
05	0000 0101	45	0100 0101	85	1000 0101	C5	1100 0101
06	0000 0110	46	0100 0110	86	1000 0110	C6	1100 0110
07	0000 0111	47	0100 0111	87	1000 0111	C7	1100 0111
08	0000 1000	48	0100 1000	88	1000 1000	C8	1100 1000
09	0000 1001	49	0100 1001	89	1000 1001	C9	1100 1001
0A	0000 1010	4A	0100 1010	8A	1000 1010	CA	1100 1010
0B	0000 1011	4B	0100 1011	8B	1000 1011	CB	1100 1011
0C	0000 1100	4C	0100 1100	8C	1000 1100	CC	1100 1100
0D	0000 1101	4D	0100 1101	8D	1000 1101	CD	1100 1101
0E	0000 1110	4E	0100 1110	8E	1000 1110	CE	1100 1110
0F	0000 1111	4F	0100 1111	8F	1000 1111	CF	1100 1111
10	0001 0000	50	0101 0000	90	1001 0000	D0	1101 0000
11	0001 0001	51	0101 0001	91	1001 0001	D1	1101 0001
12	0001 0010	52	0101 0010	92	1001 0010	D2	1101 0010
13	0001 0011	53	0101 0011	93	1001 0011	D3	1101 0011
14	0001 0100	54	0101 0100	94	1001 0100	D4	1101 0100
15	0001 0101	55	0101 0101	95	1001 0101	D5	1101 0101
16	0001 0110	56	0101 0110	96	1001 0110	D6	1101 0110
17	0001 0111	57	0101 0111	97	1001 0111	D7	1101 0111
18	0001 1000	58	0101 1000	98	1001 1000	D8	1101 1000
19	0001 1001	59	0101 1001	99	1001 1001	D9	1101 1001
1A	0001 1010	5A	0101 1010	9A	1001 1010	DA	1101 1010
1B	0001 1011	5B	0101 1011	9B	1001 1011	DB	1101 1011
1C	0001 1100	5C	0101 1100	9C	1001 1100	DC	1101 1100
1D	0001 1101	5D	0101 1101	9D	1001 1101	DD	1101 1101
1E	0001 1110	5E	0101 1110	9E	1001 1110	DE	1101 1110
1F	0001 1111	5F	0101 1111	9F	1001 1111	DF	1101 1111
20	0010 0000	60	0110 0000	A0	1010 0000	E0	1110 0000
21	0010 0001	61	0110 0001	A1	1010 0001	E1	1110 0001
22	0010 0010	62	0110 0010	A2	1010 0010	E2	1110 0010
23	0010 0011	63	0110 0011	A3	1010 0011	E3	1110 0011
24	0010 0100	64	0110 0100	A4	1010 0100	E4	1110 0100
25	0010 0101	65	0110 0101	A5	1010 0101	E5	1110 0101
26	0010 0110	66	0110 0110	A6	1010 0110	E6	1110 0110
27	0010 0111	67	0110 0111	A7	1010 0111	E7	1110 0111
28	0010 1000	68	0110 1000	A8	1010 1000	E8	1110 1000
29	0010 1001	69	0110 1001	A9	1010 1001	E9	1110 1001
2A	0010 1010	6A	0110 1010	AA	1010 1010	EA	1110 1010
2B	0010 1011	6B	0110 1011	AB	1010 1011	EB	1110 1011
2C	0010 1100	6C	0110 1100	AC	1010 1100	EC	1110 1100
2D	0010 1101	6D	0110 1101	AD	1010 1101	ED	1110 1101
2E	0010 1110	6E	0110 1110	AE	1010 1110	EE	1110 1110
2F	0010 1111	6F	0110 1111	AF	1010 1111	EF	1110 1111
30	0011 0000	70	0111 0000	B0	1011 0000	F0	1111 0000
31	0011 0001	71	0111 0001	B1	1011 0001	F1	1111 0001
32	0011 0010	72	0111 0010	B2	1011 0010	F2	1111 0010
33	0011 0011	73	0111 0011	B3	1011 0011	F3	1111 0011
34	0011 0100	74	0111 0100	B4	1011 0100	F4	1111 0100
35	0011 0101	75	0111 0101	B5	1011 0101	F5	1111 0101
36	0011 0110	76	0111 0110	B6	1011 0110	F6	1111 0110
37	0011 0111	77	0111 0111	B7	0011 0111	F7	1111 0111
38	0011 1000	78	0111 1000	B8	1011 1000	F8	1111 1000
39	0011 1001	79	0111 1001	B9	1011 1001	F9	1111 1001
3A	0011 1010	7A	0111 1010	BA	1011 1010	FA	1111 1010
3B	0011 1011	7B	0111 1011	BB	1011 1011	FB	1111 1011
3C	0011 1100	7C	0111 1100	BC	1011 1100	FC	1111 1100
3D	0011 1101	7D	0111 1101	BD	1011 1101	FD	1111 1101
3E	0011 1110	7E	0111 1110	BE	1011 1110	FE	1111 1110
3F	0011 1111	7F	0111 1111	BF	1011 1111		

Use to set the switches. 0 = OFF, 1 = ON

Figure 19. Switch Settings for Controller Station Addresses

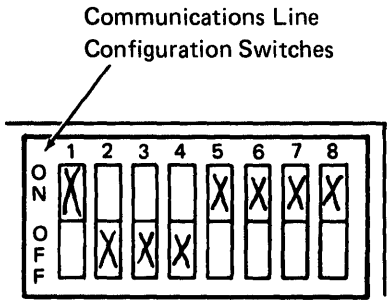
Communications Line Configuration Switches

The Communications Line Configuration switches are eight switches that you set to represent the type of communications configuration used. These switches should be documented on the Communications Network Setup Form and must be set with regard to the five types of communication line facilities possible:

- External modem (EIA/CCITT switched or nonswitched line) with or without Internal Clock
- DDS (Digital Data Service) Adapter (US only)
- 1200 bps Integrated Modem (switched or nonswitched)
- 2400 bps Integrated Modem (switched or nonswitched)
- 4800 bps Integrated Modem (switched or nonswitched)

These steps should be followed for successful Communications Line Configuration switch setting:

1. Refer to the chart (Figure 20 or 21) that applies to your country.
2. Locate your type of communications configuration on the chart. Read any pertinent notes. If necessary, read the description of any of the eight switches on the page that follow the charts.
3. Transfer the indicated switch settings to your Communications Network Setup Form. (See the sample form in Figure 32.) The sample configuration (Figure 22) uses an EIA Interface-nonswitched point-to-point line; IBM 3874 modem 4800 (an Internal Clock feature is not needed on the 5251 Model 2 or 12). The sample switches will be set as follows with an *x* used to designate the switch position:



Switch Settings for the United States and Canada

The following chart applies to Communications Line Configuration switch settings for the United States and Canada.

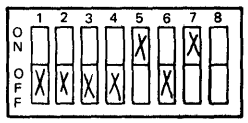
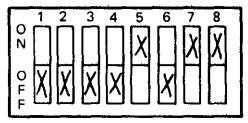
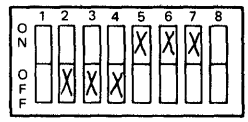
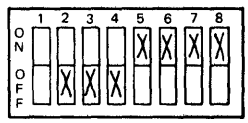
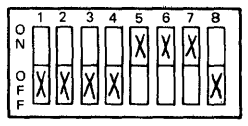
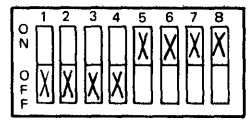
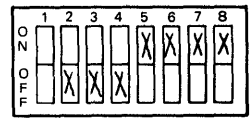
Switch Function	Constant RTS or Normal RTS	Point-to-Point or Multi-point	RFS Delay	Answer Tone	Comm Type	Non-switched or Switched	DTR or CDSTL	NRZI or NRZ	
Number	1	2	3	4	5	6	7	8	
EIA Interface - Switched Line									
Without Internal Clock	OFF	OFF	OFF	OFF	ON	OFF	ON	Note 2	
With Internal Clock	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	
EIA Interface - Nonswitched Line									
Without Internal Clock	Note 1	OFF	OFF	OFF	ON	ON	ON	Note 2	
With Internal Clock	Note 1	OFF	OFF	OFF	ON	ON	ON	ON	
DDS Adapter									
	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	
1200 bps Integrated Modem									
Switched	OFF	OFF	OFF	OFF	ON	ON Note 3	ON	ON	
Non-switched	Note 1	OFF	OFF	OFF	ON	ON	ON	ON	

Figure 20 (Part 1 of 2). Communications Line Configuration Switch Settings for the United States and Canada

Switch Function	Constant RTS or Normal RTS	Point-to-Point or Multi-point	RFS Delay	Answer Tone	Comm Type	Non-switched or Switched	DTR or CDSTL	NRZI or NRZ
Number	1	2	3	4	5	6	7	8
2400 bps Integrated Modem								
Switched	OFF	OFF	Note 4	OFF	ON	OFF	ON	ON
Non-switched Point-to-Point	Note 1	OFF	Note 4	OFF	ON	ON	ON	ON
Non-switched Multi-point	OFF	ON	Note 4	OFF	ON	ON	ON	ON
4800 bps Integrated Modem								
Switched	OFF	OFF	Note 4	OFF	ON	OFF	ON	ON
Non-switched Point-to-Point	Note 1	OFF	Note 4	OFF	ON	ON	ON	ON
Non-switched Multi-point	OFF	ON	Note 4	OFF	ON	ON	ON	ON

Figure 20 (Part 2 of 2). Communications Line Configuration Switch Settings for the United States and Canada

Notes:

1. This switch should be set to on whenever only one 5251 Model 2 or 12 is connected to a 4-wire nonswitched communications line. (This connection is often called a 4-wire point-to-point connection.)
2. This switch should be set to on for all IBM modems. For all other modems, refer to the description of Switch 8 that follows the Communications Line Configuration switch setting charts.
3. The nonswitched position is also used for switched manual answer operation (U.S. and Canada only).
4. This switch is normally set to off. For more information, refer to the description of Switch 3 that follows the Communications Line Configuration switch setting charts.

Switch Settings for World Trade Countries

The following chart applies to Communications Line Configuration switch settings for World Trade countries.

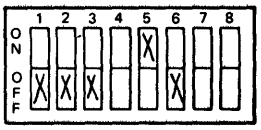
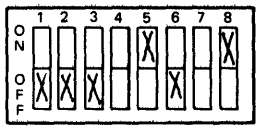
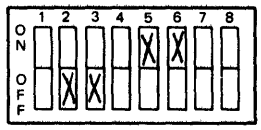
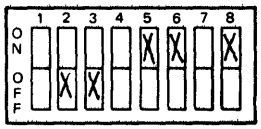
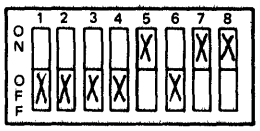
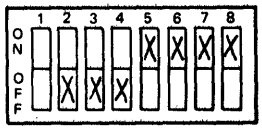
Switch Function	Constant RTS or Normal RTS	Point-to-Point or Milti-point	RFS Delay	Answer Tone	Comm Type	Non-switched or Switched	DTR or CDSTL	NRZI or NRZ	
Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
EIA Interface - Switched Line									
Without Internal Clock	OFF	OFF	OFF	Note 2	ON	OFF	Note 3	Note 4	
With Internal Clock	OFF	OFF	OFF	Note 2	ON	OFF	Note 3	ON	
EIA Interface - Nonswitched Line									
Without Internal Clock	Note 1	OFF	OFF	Note 2	ON	ON	Note 3	Note 4	
With Internal Clock	Note 1	OFF	OFF	Note 2	ON	ON	Note 3	ON	
1200 bps Integrated Modem									
Switched	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	
Non-switched	Note 1	OFF	OFF	OFF	ON	ON	ON	ON	

Figure 21 (Part 1 of 2). Communications Line Configuration Switch Settings for World Trade Countries

Switch Function	Constant RTS or Normal RTS	Point-to-Point or Multi-point	RFS Delay	Answer Tone	Comm Type	Non-switched or Switched	DTR or CDSTL	NRZI or NRZ
Number	1	2	3	4	5	6	7	8
2400 bps Integrated Modem								
Switched	OFF	OFF	Note 5	OFF	ON	OFF	ON	ON
Non-switched Point-to-Point	Note 1	OFF	Note 5	OFF	ON	ON	ON	ON
Non-switched Multi-point	OFF	ON	Note 5	OFF	ON	ON	ON	ON
4800 bps Integrated Modem								
Switched	OFF	OFF	Note 5	OFF	ON	OFF	ON	ON
Non-switched Point-to-Point	Note 1	OFF	Note 5	OFF	ON	ON	ON	ON
Non-switched Multi-point	OFF	ON	Note 5	OFF	ON	ON	ON	ON

Figure 21 (Part 2 of 2). Communications Line Configuration Switch Settings for World Trade Countries

Notes:

1. This switch should be set to on whenever only one 5251 Model 2 or 12 is connected to a 4-wire nonswitched communications line. (This connection is often called a 4-wire point-to-point connection.)
2. This switch should be set to off except in Sweden when using a GH2002L13 modem or in the United Kingdom when using a Datel 1F Model 5 or a Datel 1D Model 5 modem.
3. This switch should always be set to on except in the United Kingdom when using a Datel 1D Model 5 modem.
4. This switch should be set to on for all IBM modems. For all other modems, refer to the description of Switch 8 that follows the Communications Line Configuration switch setting charts.
5. This switch is normally set to off. For more information, refer to the description of Switch 3 that follows the Communications Line Configuration switch setting charts.

Communications Line Configuration Switches Described

Switch 1—Normal or Constant RTS (Request to Send)

On—Constant RTS
Off—Normal RTS

Switch 1 controls the RTS signal line from the 5251 Model 2 or 12 to the modem. When this switch is set to the On position, a constant RTS signal is sent to the modem. (Some modems need a constant RTS to operate; others use it to improve communications line turnaround time.) Switch 1 is set to constant RTS (On) only when the 5251 Model 2 or 12 is operating on 4-wire point-to-point communications lines.

Switch 2—Used only with a nonswitched 2400 bps or 4800 bps Integrated Modem

On—Attached to a multipoint communications line
Off—Attached to a point-to-point communications line

Switch 3—Used only with a 2400 bps or 4800 bps Integrated Modem

For Switched Lines

On—Selects the short RFS (ready for sending) delay; can be used only on local lines to decrease line turnaround time
Off—Selects the normal CTS (clear to send) delay; is recommended for normal use

For Nonswitched Lines

On—Selects long CTS (clear to send) delay to allow increased initialization time; is for use on degraded or poor quality lines
Off—Selects short CTS (clear to send) delay for normal operation

Switch 3 is used to select the delay between RTS (request to send) and CTS (clear to send or also known as RFS which is ready for sending).

Switch 4—Answer Tone (used for switched line operation only)

On—The 5251 Model 2 or 12 sends answer tone
Off—The modem sends answer tone

Switch 4 controls the sending of the answer tone by the 5251 Model 2 or 12. Switch 4 in the On position causes the Model 2 or 12 to generate the answer tone, whereas the Off position causes the Model 2 or 12 to expect a modem generated answer tone. (Most modems automatically generate the answer tone, but some World Trade modems do not.) Switch 4 is set to the Off position for U.S. modems and most World Trade modems.

Switch 5—Communications Type

On—Standard Communications features
Off—R-Loop RPQ (System/38 only)

Switch 6—Nonswitched or Switched Line

On—Nonswitched line or switched (manual answer) line
Off—Switched line (with auto answer capability)

Switch 6 indicates to the 5251 Model 2 or 12 what type of communications line is being used. Switch 6 in the On position indicates that the communications line is nonswitched or switched manual answer (U.S. and Canada only). In the Off position, switch 6 indicates switched line (auto answer); the DTR (data terminal ready) signal line will drop in order to disconnect a call and is not turned on again until the DSR (data set ready) signal line goes off.

Switch 7—CDSTL Line Control

On—DTR (data terminal ready)
Off—CDSTL (connect data set to line)

Switch 7 controls the protocol used between the Model 2 or 12 and the modem to prepare for or answer a call.

The On position of switch 7 indicates DTR protocol; most modems permit the DTR (data terminal ready) signal line to be on if the DSR (data set ready) signal line is not on.

The Off position of switch 7 indicates CDSTL protocol; the modem requires that DTR be turned on when:

— The 5251 Model 2 or 12 takes control of the line to make a call

— The 5251 Model 2 or 12 responds to the RI (Ring Indicate) signal being on and answers a call

Switch 8—NRZI or NRZ Transmission Coding

On—NRZI (non return to zero inverted) option
Off—NRZ (non return to zero) option

Switch 8 selects the SDLC transmission coding option used to minimize the possibility of losing modem synchronization. Switch 8 must be set to the same coding option as all other stations in a network that communicate with each other.

The NRZI option (On position) works best for most external modems and is recommended for all external modems except synchronous transmitted clock type (set switch 8 to Off for these modems) which generate and recover timing signals independent of the data. (A Western Electric[1] 201B or its equivalent is an example of the synchronous transmitted clock type modem.) The NRZI option must be used on the 5251 Model 2 or 12 whenever the Internal Clock feature is installed.

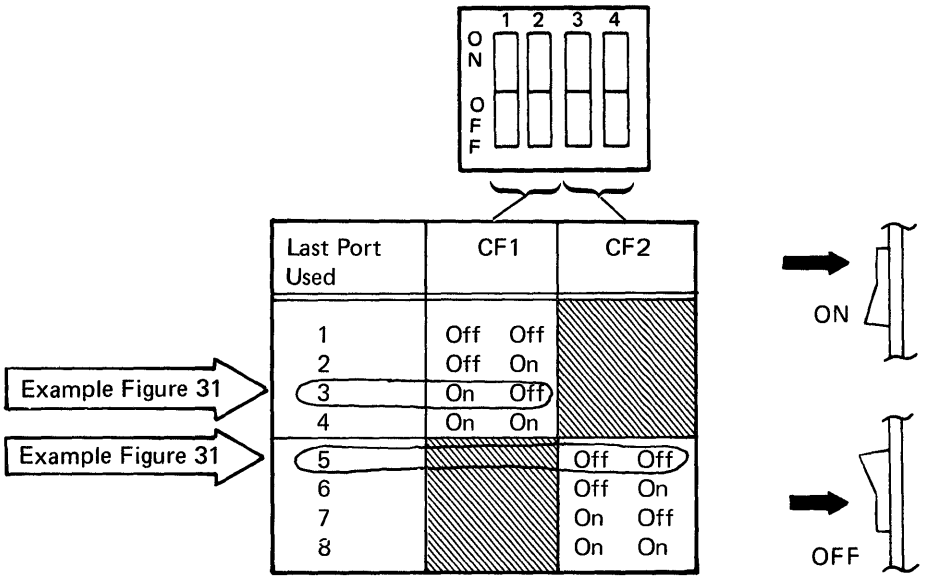
The NRZ option (Off position) is recommended for DDSA to ensure consistency with other IBM products.

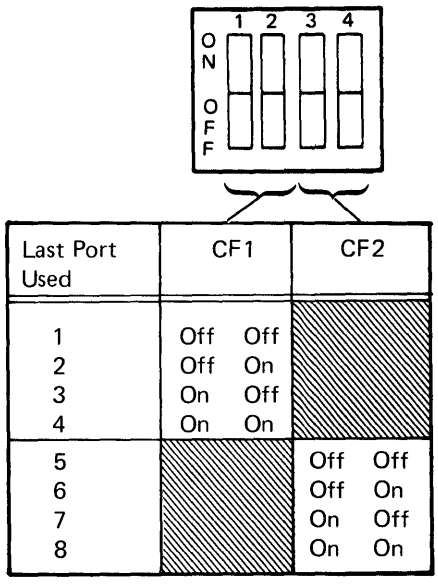
[1]Western Electric is a division of American Telephone and Telegraph Co., New York, New York 10038.

Cluster Feature Port Switches

The Cluster Feature Port switches are four switches that you set to indicate the last port used on each set of four ports. (If your 5251 Model 2 or 12 does not have ports, the Cluster Feature Port switches have no function and may be disregarded.) Switches 1 and 2 are set for the CF1 ports (1-4); switches 3 and 4 are set for the CF2 ports (5-8). All switches must be set when you have the Dual Cluster Feature. (See the following example.)

The following table shows the Cluster Feature Port switch settings for the ports that are used in the sample configuration. (Switch settings are designated with an *x*.)

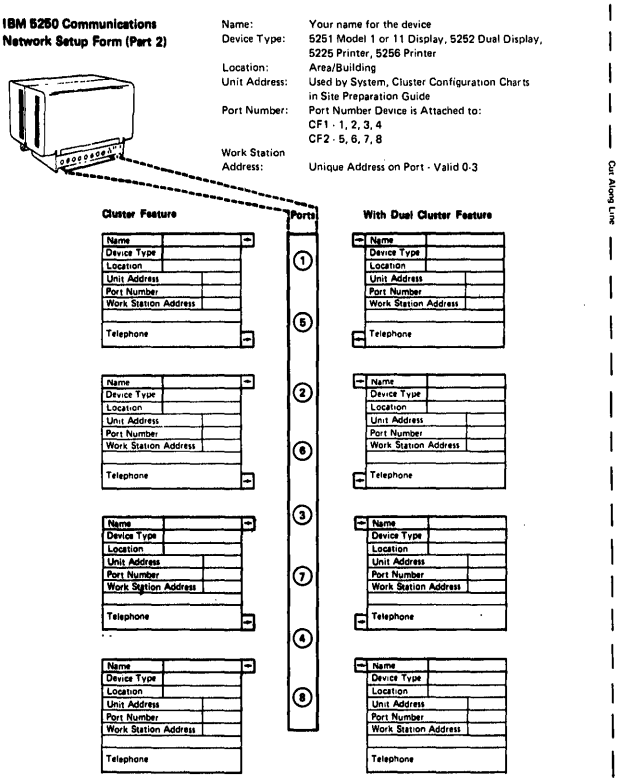




Document your configuration here.

The Remote Work Stations

The work stations that will be attached to the 5251 Model 2 or 12 are the focus of Part 2 of the 5250 *Communications Network Setup Form.* Each work station attached to a Model 2 or 12 port must have a unique address. The work station addressing information and the arrangement of work stations on each port should be entered on Part 2 of your form. Figure 32 shows a completed form for the sample configuration in Figure 31.



For work stations attached to a 5251 Model 2 or 12 there is no direct correlation between the work station address and the unit address. Follow the guidelines for assigning work station and unit addresses in this chapter.

Assigning Work Station Addresses

Certain guidelines must be followed when assigning work station addresses.

1. Work station addresses (set on the switches of the work station) of 0 through 3 are valid for work stations attaching to a 5251 Model 2 or 12.

2. If there is only one work station on a line from a port, its address must be 0. The 0 address must be used on every line used, regardless of the number of attachments.

3. If there is one 5252 on a cable thru line, its primary side should be addressed with an even address (0 or 2) and its secondary side will receive the corresponding default address (1 or 3). If there are two 5252s on a cable thru line, the last work station on the line should have the 0, 1 address combination; the other work station should be addressed 2, 3. (If there are two 5252s on a line, no more attachments may be made to that line or to that cluster of ports.)

4. Attachment of a 5252 Dual Display Station should be made to the first port on CF1 or CF2.

Use the configuration charts in Figures 23 through 30 for other information on determining work station addresses. Work Station Address switches are illustrated in Figure 22. To determine addresses of locally attached work stations, see the appropriate system's planning manual.

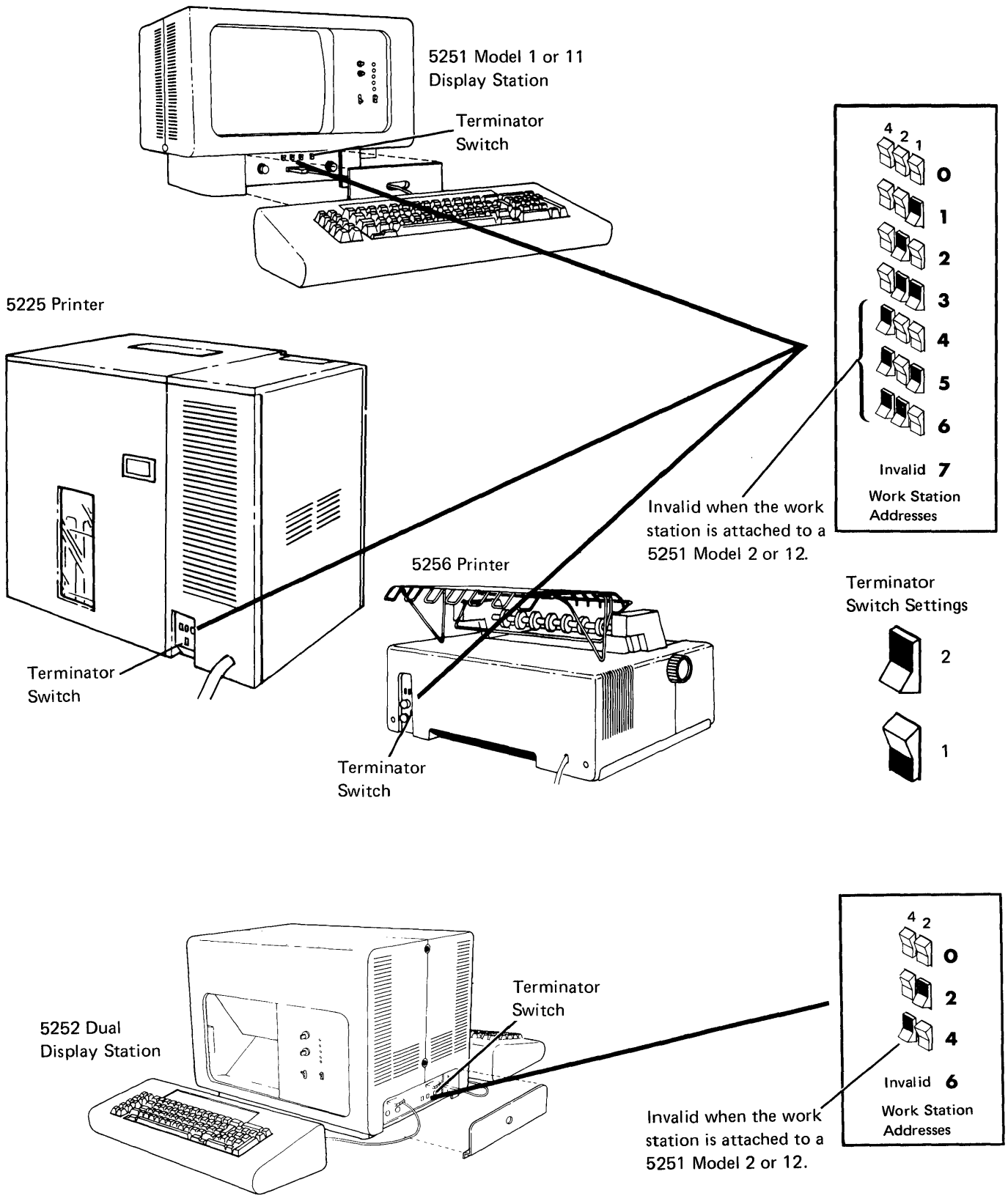


Figure 22. The Location of the Work Station Address Switches and Terminator Switch

Using the Cluster Configuration Charts

The charts in Figures 23-30 will help you to design your remote cluster configuration taking into consideration port assignments, switch settings, work station addresses and unit addresses. The sample configuration in Figure 31 will be used as a guide in explaining the use of these charts.

1. Determine the number of ports used. (Refer to *5251 Model 2 or 12 Ports* and Figure 31.) In the example, a 5252 Dual Display Station is to be attached to the first port of CF1; a 5256 Printer is to be attached to the second port of CF1; and a 5251 Model 11 Display Station is to be attached to the third port of CF1. Because the maximum of four work station attachments has been reached on ports 1-4, the remaining work stations must be attached to ports 5-8.

   In the example, Cable Thru feature is used to attach four work stations to the first port (port 5) of CF2.

   The total number of ports used is three for CF1 and one for CF2.

2. Refer to the appropriate chart for your configuration. Use the Chart Determination Table following.

   Chart Table

CF1		CF2	
Number of Ports Used	Refer to Figure	Number of Ports Used	Refer to Figure
1	23	1	27
2	24	2	28
3	25	3	29
4	26	4	30

   For the example, use Figure 25 for CF1, three ports used and Figure 27 for CF2, 1 port used.

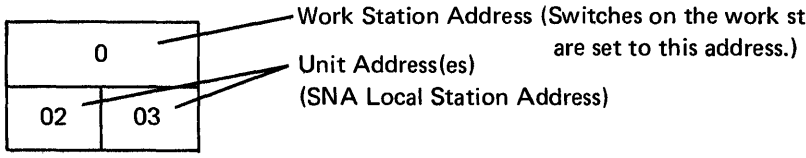
3. Document the Port switch setting on the *Communications Network Setup Form* in Appendix B. The Port switch setting is shown in the left column of the chart. The settings for the first two switches will be shown in Figures 23-26. The settings for the second two switches will be shown in Figures 27-30.

   For the example, the first switch will be set to 1 (ON) and the remaining three switches will be set to 0 (OFF).

4. Select the appropriate configuration combination from those described in the right column. Dotted lines in the configuration illustrations represent optional work station placement; solid lines indicate necessary work station placement for that port usage. Arrows leaving a box indicate that that work station must be equipped with Cable Thru feature.

   The configuration used in the example is indicated on the chart.

5. Document the work station address on the *Communications Network Setup Form* in Appendix B. Each work station is represented by a two (or three) section box in the center column.



The work station address is shown in the upper section of the box. This is the number you should provide to the person who will setup the work station. (Instructions for the Address switch setting when using the Cable Thru feature are given in the setup manual shipped with the workstation. Refer to Figure 22 for the 5251, 5252, 5225, and 5256 switch locations.)

In the example, all work stations on CF1 will have a work station address of 0. Work stations on CF2 are all on the same cable thru line and will have addresses of 0, 1, 2, and 3 as indicated in Figure 31.

6. Document the Unit address on the *Communications Network Setup Form* in Appendix B. The Unit address (to be provided to the host system for system generation/configuration) is in the lower section of the work station box in the center column of the chart. The display and keyboard of the 5251 Model 2 or 12 have a unit address of 0. The remaining unit addresses are assigned according to the work station address given to each work station.

   For the example, unit addresses are 02 and 03 for the 5252 Dual Display Station, 04 for the 5256 Printer, and 05 for the 5251 Display Station (CF1). Unit addresses of 06 (last work station), 07 (work station with work station address of 1), 08 (work station with work station address of 2), and 09 (printer) are assigned to the CF2 work stations. Note that the 5252 Dual Display Station has been given two unit addresses (02 and 03).

Cluster Configuration Chart Checklist:

1. Determine the number of ports used.
2. Refer to appropriate chart.
3. Document the Port switch settings on the *Communications Network Setup Form.*
4. Select the appropriate configuration combination.
5. Document the work station addresses on the *Communications Network Setup Form.*
6. Document the Unit addresses on the *Communications Network Setup Form.*

CF1 Ports

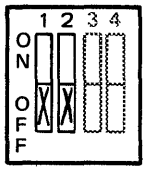
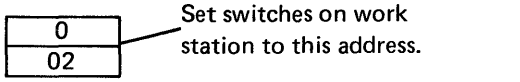
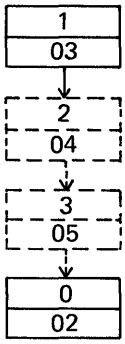
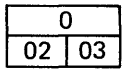
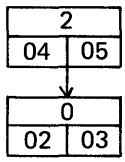
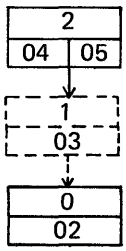
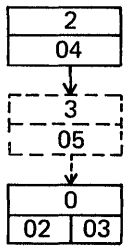
Port Switch Setting	1 ● 2 ○ 3 ○ 4 ○	Description
		A single work station attached to the first port of the Cluster Feature.
		More than one work station attached to the first port of the cluster feature using the Cable Thru feature. *Note:* If all work stations have the Cable Thru feature, the order of attachment may vary from that shown. If one station does not have the Cable Thru feature, it must be the last one on the cable.
		One 5252 Dual Display Station attached to the first port of the Cluster feature.
		Two 5252 Dual Display stations attached to the first port of the cluster feature using Cable Thru feature. If one of the 5252 work stations does not have Cable Thru, it must be the last on the cable.
		One 5252 Dual Display Station and one or two single work stations attached. For this configuration, the 5252 and the second single work station if used, must have Cable Thru.
		One 5252 Dual Display Station and one or two single work stations attached. This configuration requires the Cable Thru feature on the single work stations only.

Figure 23. Possible Configurations for 1 Port-CF1

CF1 Ports

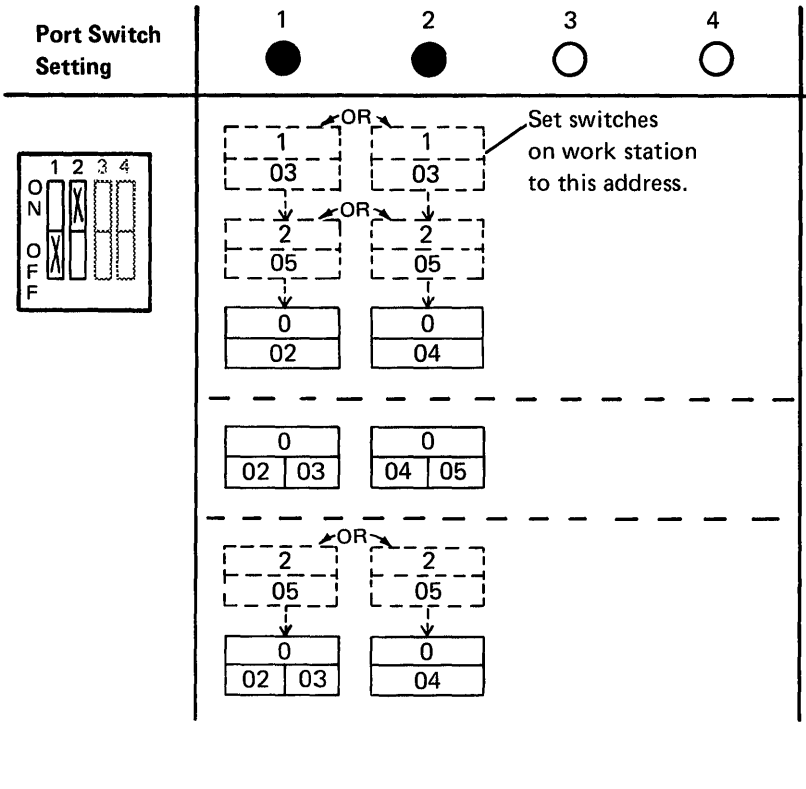


Figure 24. Possible Configurations for 2 Ports-CF1

CF1 Ports

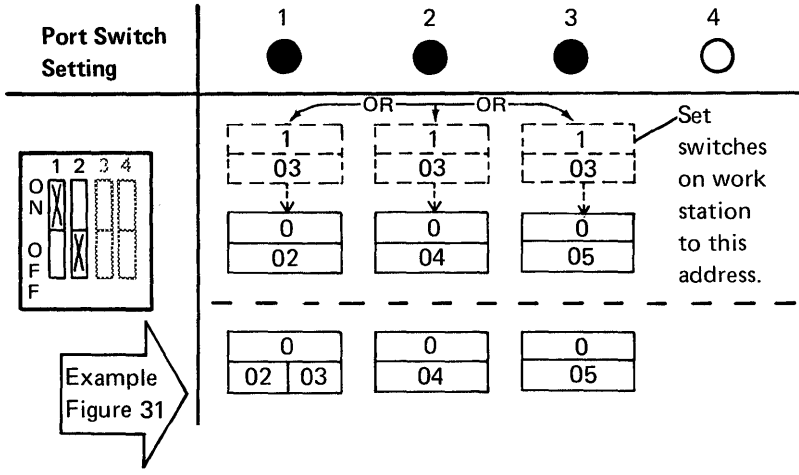
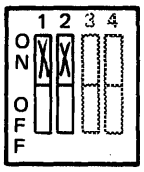


Figure 25. Possible Configurations for 3 Ports-CF1

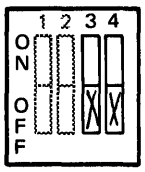
CF1 Ports

Port Switch Setting	1	2	3	4	Description
	0 02	0 03	0 04	0 05	One single work station attached to each port of the cluster feature. No 5252 Dual Display Stations are allowed in this configuration and no other work stations can be attached to this cluster feature.

Set switches on work station to this address.

Figure 26. Possible Configurations for 4 Ports-CF1

CF2 Ports

Port Switch Setting	5	6	7	8	Description
	0 06				A single work station attached to the first port of the Cluster Feature.
Example Figure 31	1 07 2 08 3 09 0 06				More than one work station attached to the first port of the cluster feature using the Cable Thru feature. *Note:* If all work stations have the Cable Thru feature, the order of attachment may vary from that shown. If one station does not have the Cable Thru feature, it must be the last one on the cable.
	0 06 07				One 5252 Dual Display Station attached to the first port of the Cluster feature.
	2 08 09 0 06 07				Two 5252 Dual Display stations attached to the first port of the cluster feature using Cable Thru feature. If one of the 5252 work stations does not have Cable Thru, it must be the last on the cable.
	2 08 09 1 07 0 06				One 5252 Dual Display Station and one or two single work stations attached. For this configuration, the 5252 and a second single work station if used, must have the Cable Thru feature.
	2 08 3 09 0 06 07				One 5252 Dual Display Station and one or two single work stations attached. This configuration requires the Cable Thru feature on the single work stations only.

Set switches on work station to this address.

Figure 27. Possible Configurations for 1 Port-CF2

CF2 Ports

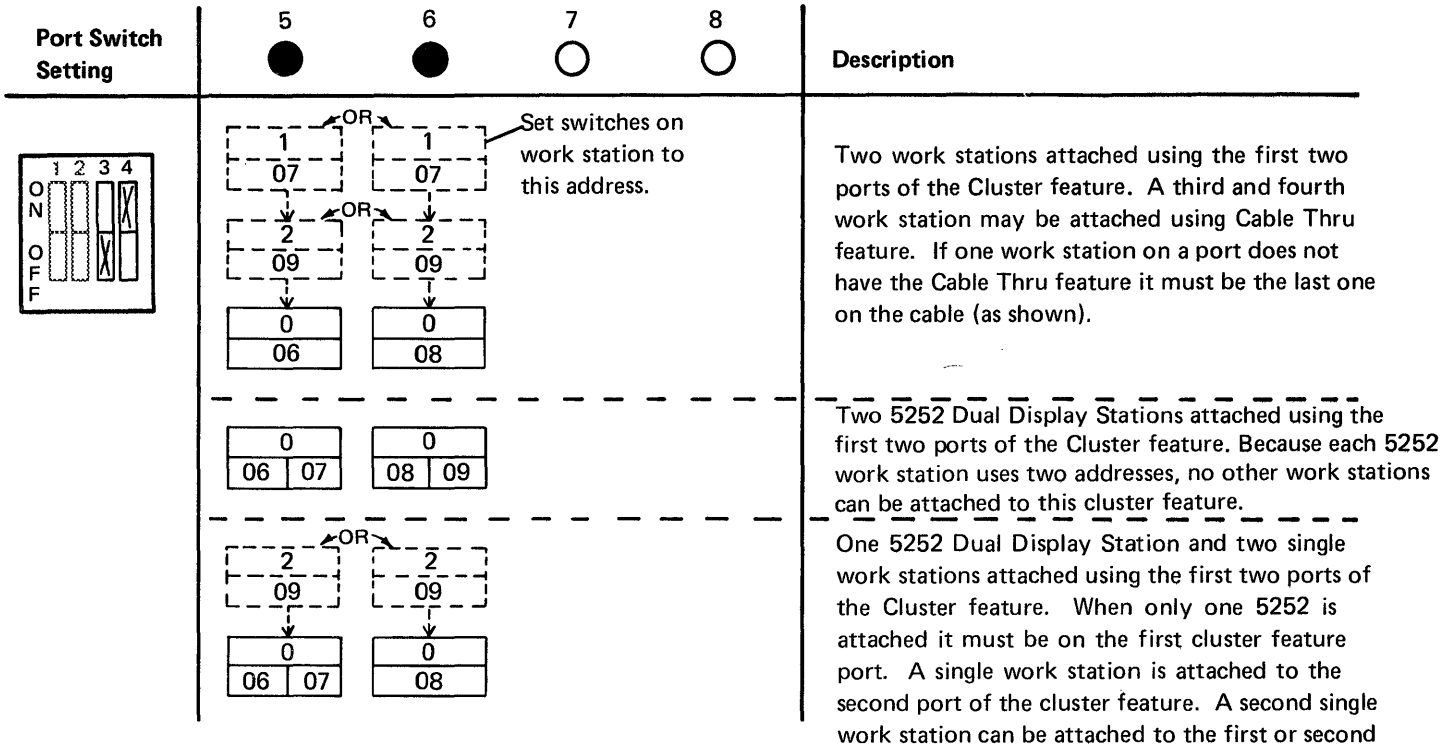


Figure 28. Possible Configurations for 2 Ports-CF2

CF2 Ports

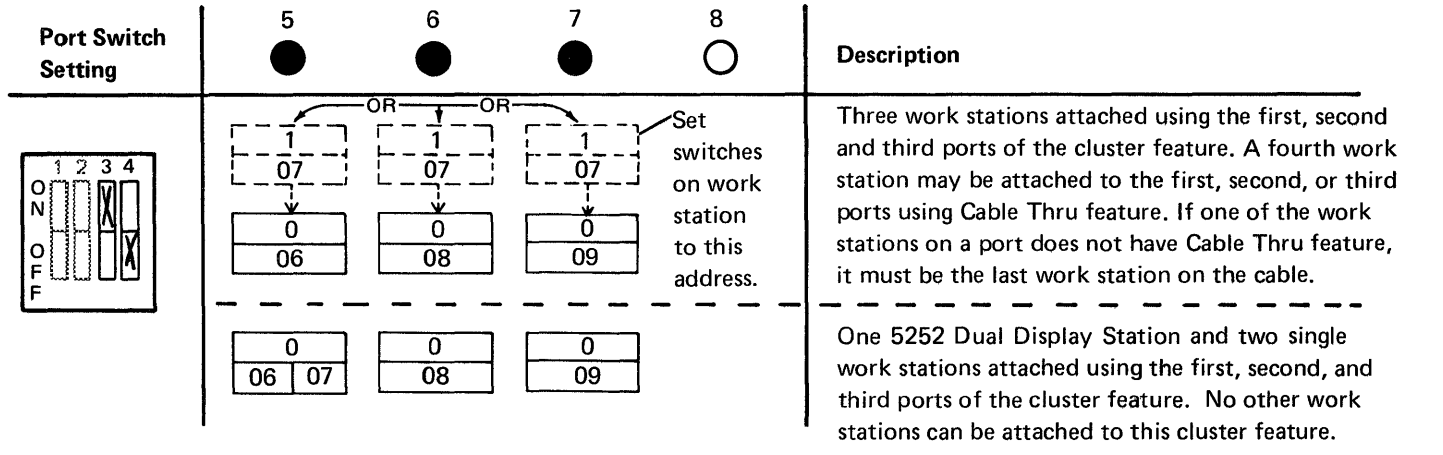


Figure 29. Possible Configurations for 3 Ports-CF2

CF2 Ports

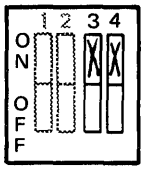
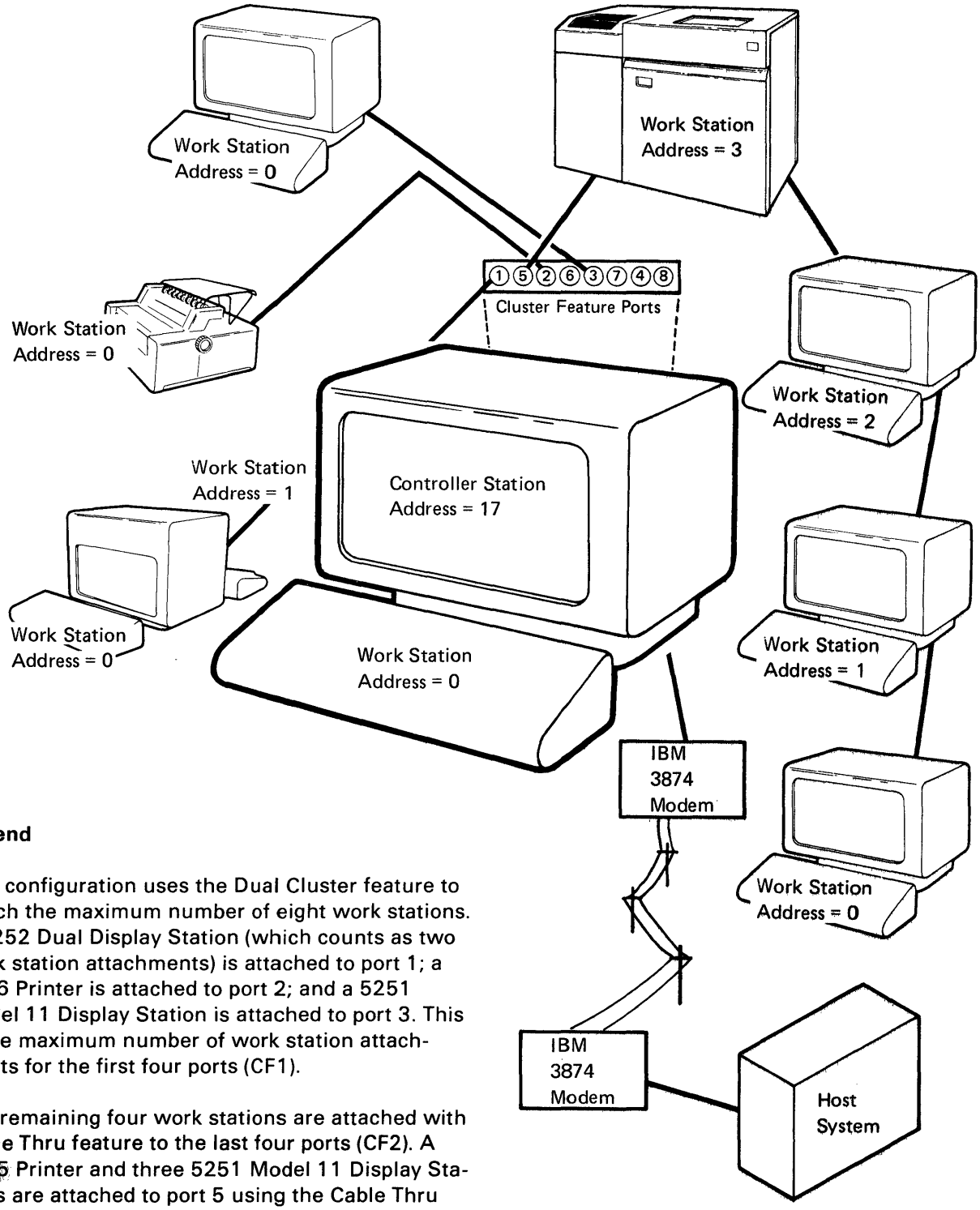
Port Switch Setting	5	6	7	8	Description
	0 06	0 07	0 08	0 09	One single work station attached to each port of the cluster feature. No 5252 Dual Display Stations are allowed in this configuration and no other work stations can be attached to this cluster feature.

Figure 30. Possible Configurations for 4 Ports-CF2



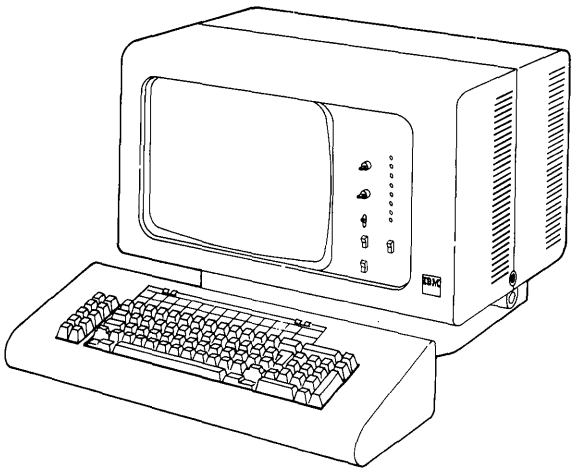
Legend

This configuration uses the Dual Cluster feature to attach the maximum number of eight work stations. A 5252 Dual Display Station (which counts as two work station attachments) is attached to port 1; a 5256 Printer is attached to port 2; and a 5251 Model 11 Display Station is attached to port 3. This is the maximum number of work station attachments for the first four ports (CF1).

The remaining four work stations are attached with Cable Thru feature to the last four ports (CF2). A 5225 Printer and three 5251 Model 11 Display Stations are attached to port 5 using the Cable Thru feature. If one of the work stations does not have the Cable Thru feature, it must be the last work station on the line and its work station address is internally set to 0. This is the maximum number of work stations that can be attached to the last four ports (CF2).

Figure 31. A Sample Configuration of a 5250 Remote Cluster Network

IBM 5250 Communications Network Setup Form (Part 1)



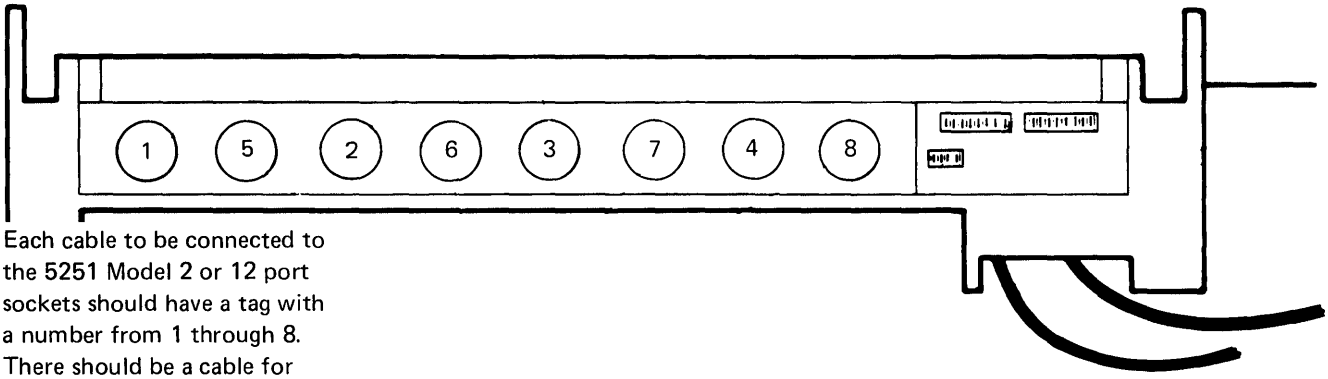
5251 Model 2 or 12 Display Station

Controller Functional Information

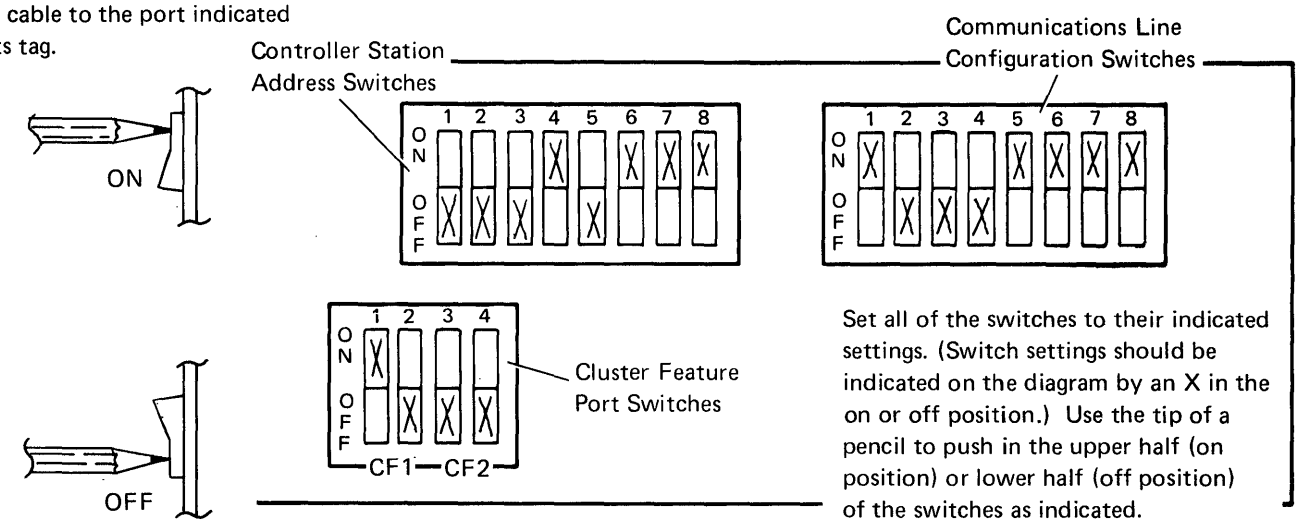
Name MONTRQUEBC
Location Headquarters
City, State Montreal, Quebec
Telephone 514-492-3542
Controller Station Address 17
Host System Line Number 2
Location Computer Center
Telephone 212-466-7434

Work Station Functional Information

Name Phillipe
Device Type 5251 Model 11
Unit Address 00
Work Station Address 00



Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.

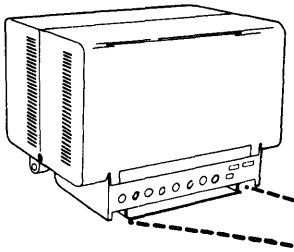


Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

Figure 32 (Part 1 of 2). A Sample *Communications Network Setup Form* Using the Sample Configuration from Figure 31.

IBM 5250 Communications Network Setup Form (Part 2)

Name:	Your name for the device
Device Type:	5251 Model 1 or 11 Display, 5252 Dual Display, 5225 Printer, 5256 Printer
Location:	Area/Building
Unit Address:	Used by System, Cluster Configuration Charts in Site Preparation Guide
Port Number:	Port Number Device is Attached to: CF1 - 1, 2, 3, 4 CF2 - 5, 6, 7, 8
Work Station Address:	Unique Address on Port - Valid 0-3



Cluster Feature | **Ports** | **With Dual Cluster Feature**

Cluster Feature	Ports	With Dual Cluster Feature
Name: Lynn/Pat Device Type: 5252 Location: Warehouse Unit Address: 02-03 Port Number: 1 Work Station Address: 00 Telephone: 0055	1	Name: Carol Device Type: 5225 Location: Accounting Unit Address: 09 Port Number: 5 Work Station Address: 03 Telephone: 5987
	5	
Name: Burt Device Type: 5256 Location: Warehouse Unit Address: 04 Port Number: 2 Work Station Address: 00 Telephone: 0104	2	Name: Ron Device Type: 5251-11 Location: Accounting Unit Address: 08 Port Number: 5 Work Station Address: 02 Telephone: 6996
	6	
Name: Bob Device Type: 5251-11 Location: Receiving Unit Address: 05 Port Number: 3 Work Station Address: 00 Telephone: 3744	3	Name: Lee Device Type: 5251-11 Location: Inventory Unit Address: 07 Port Number: 5 Work Station Address: 01 Telephone: 3579
	7	
	4	
Name: Device Type: Location: Unit Address: Port Number: Work Station Address: Telephone:	8	Name: Art Device Type: 5251-11 Location: Clerical Unit Address: 06 Port Number: 5 Work Station Address: 00 Telephone: 5112

Figure 32 (Part 2 of 2). A Sample *Communications Network Setup Form*

—Cut Along Line—

Appendix A. Inch to Millimeter Conversion Chart

Inches	0	1/4	1/2	3/4
	Millimeters			
0	0	6.	13.	19.
1	25.	32.	38.	44.
2	51.	57.	64.	70.
3	76.	83.	89.	95.
4	102.	108.	114.	121.
5	128.	133.	140.	146.
6	152.	159.	165.	171.
7	178.	184.	191.	196.
8	203.	210.	216.	222.
9	229.	235.	241.	248.
10	254.	260.	267.	273.
11	279.	286.	292.	298.
12	305.	311.	317.	324.
13	330.	337.	343.	349.
14	356.	362.	368.	375.
15	381.	387.	394.	400.
16	406.	413.	419.	425.
17	432.	438.	444.	451.
18	457.	464.	470.	476.
19	483.	489.	495.	502.
20	508.	514.	521.	527.
21	533.	540.	546.	552.
22	559.	565.	571.	578.
23	584.	591.	597.	603.
24	610.	616.	622.	629.
25	635.	641.	648.	654.
26	660.	667.	673.	679.
27	686.	692.	699.	705.
28	711.	718.	724.	730.
29	737.	743.	749.	756.
30	762.	768.	775.	781.
31	787.	794.	800.	806.
32	813.	819.	826.	832.
33	838.	845.	851.	857.
34	864.	870.	876.	883.
35	889.	895.	902.	908.
36	914.	921.	927.	933.
37	940.	946.	952.	959.
38	965.	971.	978.	984.
39	991.	997.	1003.	1010.
40	1016.	1022.	1029.	1035.
41	1041.	1048.	1054.	1060.
42	1067.	1073.	1080.	1086.
43	1092.	1099.	1105.	1111.
44	1118.	1124.	1130.	1137.
45	1143.	1149.	1156.	1162.
46	1168.	1175.	1181.	1187.
47	1194.	1220.	1206.	1213.
48	1219.	1226.	1232.	1238.
49	1245.	1251.	1257.	1264.

Inches	0	1/4	1/2	3/4
	Millimeters			
50	1270.	1276.	1283.	1289.
51	1295.	1302.	1308.	1314.
52	1321.	1327.	1333.	1340.
53	1346.	1353.	1359.	1365.
54	1372.	1378.	1384.	1391.
55	1397.	1403.	1410.	1416.
56	1422.	1429.	1435.	1441.
57	1448.	1454.	1460.	1467.
58	1473.	1480.	1486.	1492.
59	1499.	1505.	1511.	1518.
60	1524.	1530.	1537.	1543.
61	1549.	1556.	1562.	1568.
62	1575.	1581.	1588.	1594.
63	1600.	1607.	1613.	1619.
64	1626.	1632.	1638.	1645.
65	1651.	1657.	1664.	1670.
66	1676.	1683.	1689.	1695.
67	1702.	1708.	1714.	1721.
68	1727.	1734.	1740.	1746.
69	1753.	1759.	1765.	1772.
70	1778.	1784.	1791.	1797.
71	1803.	1810.	1816.	1822.
72	1829.	1835.	1841.	1848.
73	1854.	1861.	1867.	1873.
74	1880.	1886.	1892.	1899.
75	1905.	1911.	1918.	1924.
76	1930.	1937.	1943.	1949.
77	1956.	1962.	1968.	1975.
78	1981.	1988.	1994.	2000.
79	2007.	2013.	2019.	2026.
80	2032.	2038.	2045.	2051.
81	2057.	2064.	2070.	2076.
82	2083.	2089.	2096.	2102.
83	2108.	2115.	2121.	2127.
84	2134.	2140.	2146.	2143.
85	2159.	2165.	2172.	2178.
86	2184.	2191.	2197.	2203.
87	2210.	2216.	2222.	2229.
88	2235.	2242.	2248.	2254.
89	2261.	2267.	2273.	2280.
90	2286.	2292.	2299.	2305.
91	2311.	2318.	2324.	2330.
92	2337.	2343.	2350.	2356.
93	2362.	2369.	2375.	2381.
94	2388.	2394.	2400.	2407.
95	2413.	2419.	2426.	2432.
96	2438.	2445.	2551.	2557.
97	2464.	2470.	2477.	2483.
98	2489.	2496.	2502.	2508.
99	2515.	2521.	2527.	2534.
100	2540.			

Appendix B. 5250 Communications Network Setup Form

The 5250 *Communications Network Setup Form* has been included as a guide for your setup personnel to follow when they setup your 5250 Information Display System and communications network. This form should also be retained for reference, as a guide for service personnel, and in the event of expansion or relocation.

A sample form is shown in Figure 32. It was developed using the sample configuration of the 5250 Remote Cluster Network presented in Figure 31. An EIA Interface Nonswitched point-to-point line was used as the communications line configuration between the host system and the 5251 Model 2 or 12, and IBM 3874 modem (Internal Clock feature not required) is assumed for the example. The sample form indicates that there is only one 5251 Model 2 or 12 on the communications line and that it has a controller station address of 17.

COMPLETING THE COMMUNICATIONS NETWORK SETUP FORM (PART 1)

Part 1 of the 5250 *Communications Network Setup Form* provides for entry of the addressing and switch setting information for your 5251 Model 2 or 12. Because the 5251 Model 2 or 12 is a work station as well as a control unit, part 1 documents information for both functions.

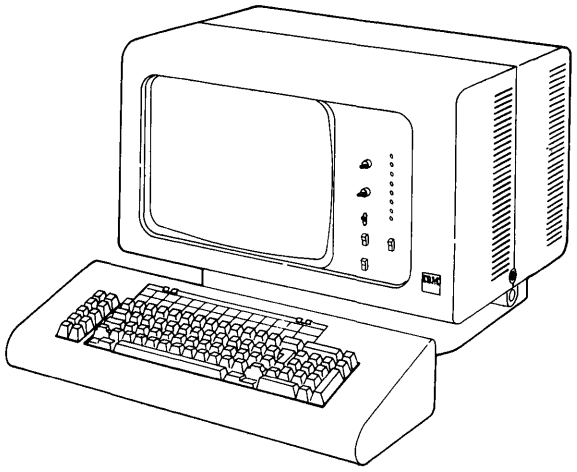
Controller Functional Information

- Your host system may have requirements for a logical ID or a device *name.* See your host system's planning guide for details.
- A unique *controller station address* may be selected from the Controller Station Address chart (Figure 19) in Chapter 4.
- The *host system line number* is the designation of the host system's line to which the 5251 Model 2 or 12 is attached.

Work Station Functional Information (System/38 Only)

- The *name* for the work station portion of the 5251 Model 2 or 12 must not be the same as the name for its control unit function.
- The *device type* will be a description of the work station function of the 5251 Model 2 or 12; that is, either 5251 Model 1 or 5251 Model 11.
- By definition, the *unit* and *work station addresses* of a 5251 Model 2 or 12 are both 00.

IBM 5250 Communications Network Setup Form (Part 1)



5251 Model 2 or 12 Display Station

Controller Functional Information

Name _____

Location _____

City, State _____

Telephone _____

Controller Station Address _____

Host System Line Number _____

Location _____

Telephone _____

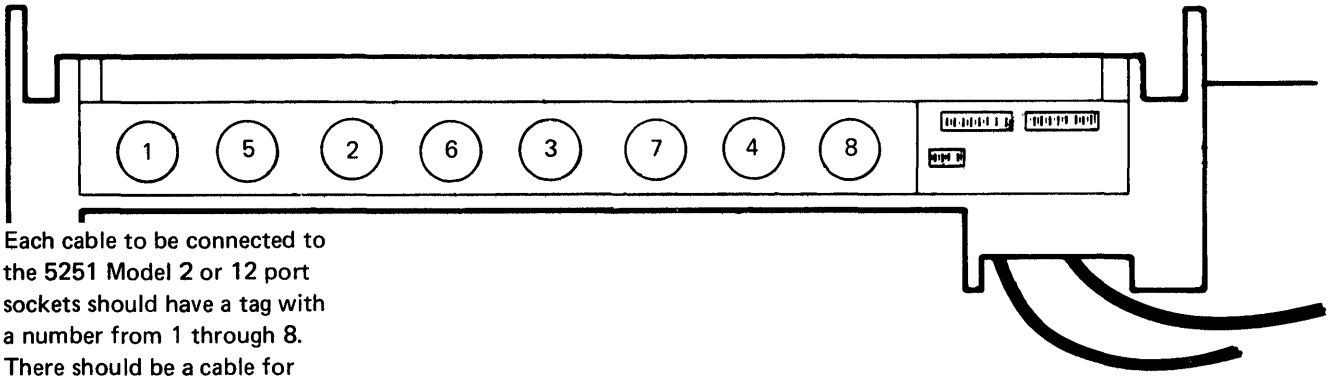
Work Station Functional Information

Name _____

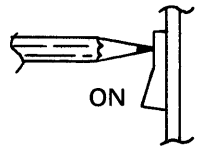
Device Type _____

Unit Address 00

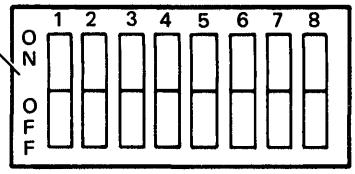
Work Station Address 00



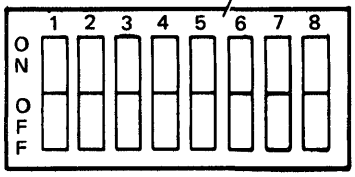
Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.

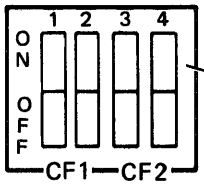


Controller Station Address Switches

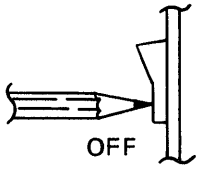


Communications Line Configuration Switches





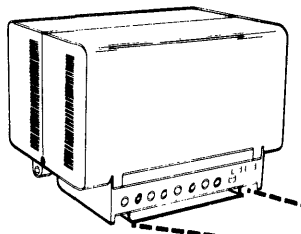
Cluster Feature Port Switches



Set all of the switches to their indicated settings. (Switch settings should be 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.

Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

IBM 5250 Communications Network Setup Form (Part 2)



Name: Your name for the device
Device Type: 5251 Model 1 or 11 Display, 5252 Dual Display, 5225 Printer, 5256 Printer
Location: Area/Building
Unit Address: Used by System, Cluster Configuration Charts in Site Preparation Guide
Port Number: Port Number Device is Attached to:
CF1 - 1, 2, 3, 4
CF2 - 5, 6, 7, 8
Work Station Address: Unique Address on Port - Valid 0-3

Cluster Feature | **Ports** | **With Dual Cluster Feature**

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Ports: 1, 5, 2, 6, 3, 7, 4, 8

Cut Along Line

COMPLETING THE COMMUNICATIONS NETWORK SETUP FORM (PART 2)

Part 2 of the 5250 *Communications Network Setup Form* provides for entry of remote work station information.

- The device *name* you provide for each remote work station can be any unique name that helps to easily identify that station. (Operator names were used in the example in Figure 32.)

- The *device type* will be 5251 Model 1, 5251 Model 11, 5252, 5225, or 5256.

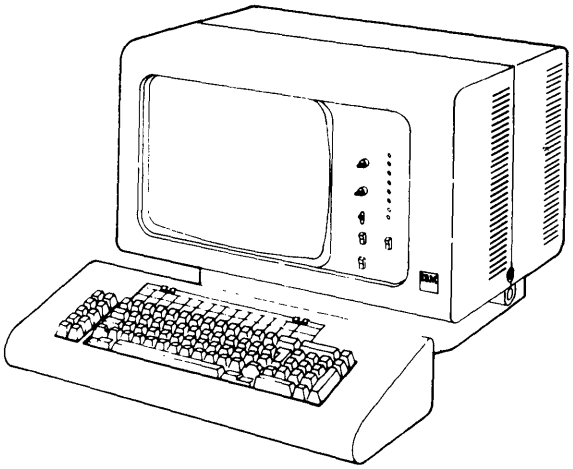
- The *unit address* is required by the host system to define each remote work station. Assignment of the unit address is dependent on the work station address assigned. See *Assigning Work Station Addresses* in Chapter 4.

- The 5251 Model 2 or 12 *port number* identifies to which port each remote work station will be attached. See *5251 Model 2 or 12 Ports* in Chapter 4.

- The *work station address* (set using the switches on the work station) identifies each remote work station to the 5251 Model 2 or 12. The address depends on the number, type, and arrangement of work stations on a line, and also on whether or not the work station has Cable Thru feature. See *Assigning Work Station Addresses* in Chapter 4.

The completed *Communications Network Setup Form* should be at the remote site when the work stations are delivered for setup.

IBM 5250 Communications Network Setup Form (Part 1)



5251 Model 2 or 12 Display Station

Controller Functional Information

Name _____

Location _____

City, State _____

Telephone _____

Controller Station Address _____

Host System Line Number _____

Location _____

Telephone _____

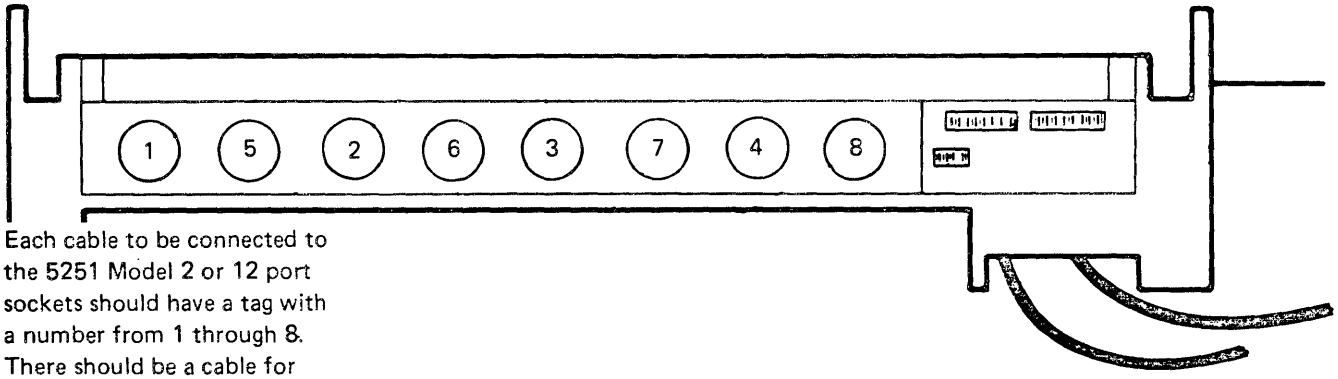
Work Station Functional Information

Name _____

Device Type _____

Unit Address 00

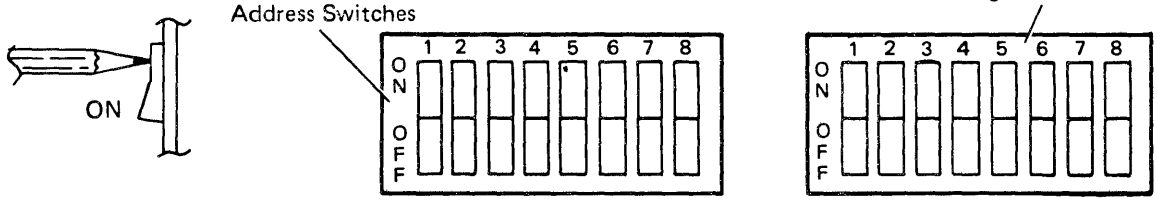
Work Station Address 00

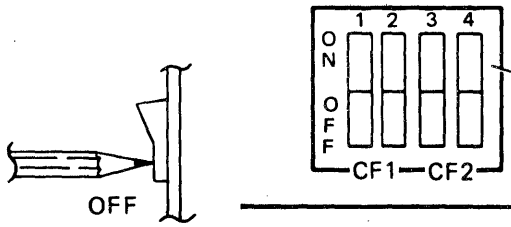


Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.

Controller Station Address Switches

Communications Line Configuration Switches



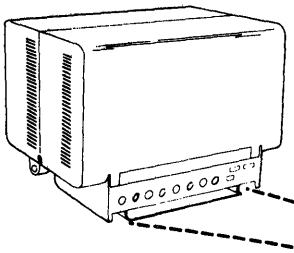


Cluster Feature Port Switches

Set all of the switches to their indicated settings. (Switch settings should be 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.

Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

IBM 5250 Communications Network Setup Form (Part 2)



Name: Your name for the device
Device Type: 5251 Model 1 or 11 Display, 5252 Dual Display, 5225 Printer, 5256 Printer
Location: Area/Building
Unit Address: Used by System, Cluster Configuration Charts in Site Preparation Guide
Port Number: Port Number Device is Attached to:
CF1 - 1, 2, 3, 4
CF2 - 5, 6, 7, 8
Work Station Address: Unique Address on Port - Valid 0-3

Cluster Feature | **Ports** | **With Dual Cluster Feature**

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

1

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

5

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

2

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

6

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

3

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

7

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

4

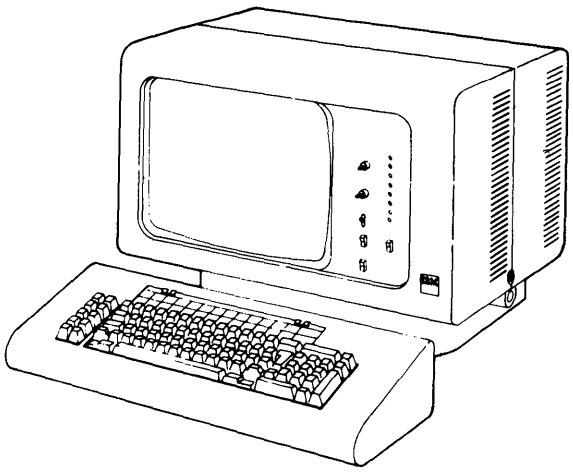
Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

8

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Cut Along Line

IBM 5250 Communications Network Setup Form (Part 1)



5251 Model 2 or 12 Display Station

Controller Functional Information

Name _____

Location _____

City, State _____

Telephone _____

Controller Station Address _____

Host System Line Number _____

Location _____

Telephone _____

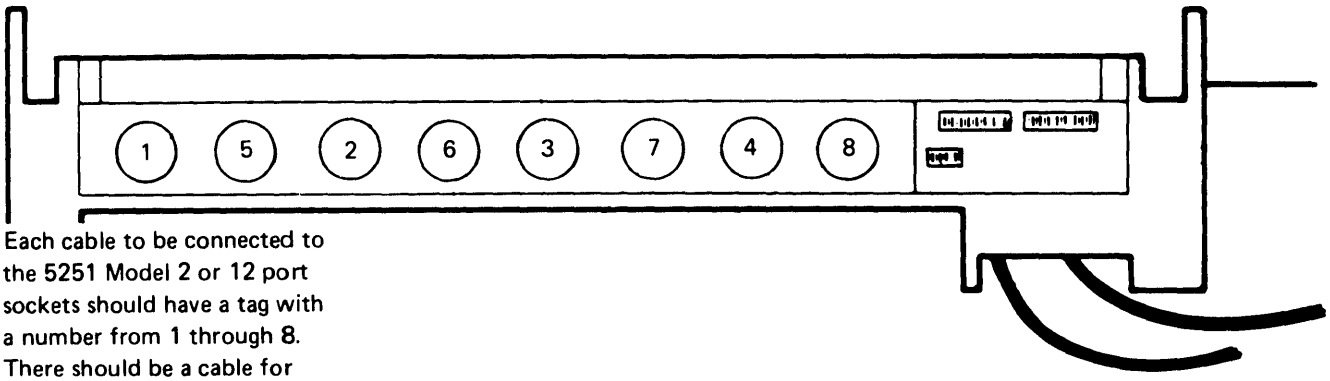
Work Station Functional Information

Name _____

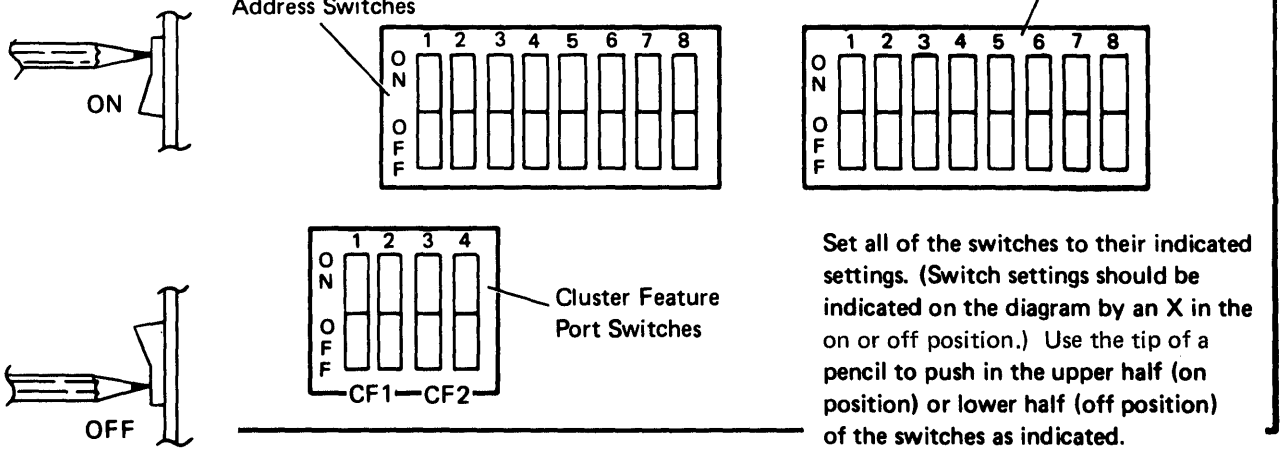
Device Type _____

Unit Address 00

Work Station Address 00



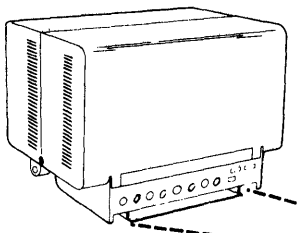
Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.



Set all of the switches to their indicated settings. (Switch settings should be 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.

Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

IBM 5250 Communications Network Setup Form (Part 2)



Name: Your name for the device
Device Type: 5251 Model 1 or 11 Display, 5252 Dual Display, 5225 Printer, 5256 Printer
Location: Area/Building
Unit Address: Used by System, Cluster Configuration Charts in Site Preparation Guide
Port Number: Port Number Device is Attached to:
CF1 - 1, 2, 3, 4
CF2 - 5, 6, 7, 8
Work Station Address: Unique Address on Port - Valid 0-3

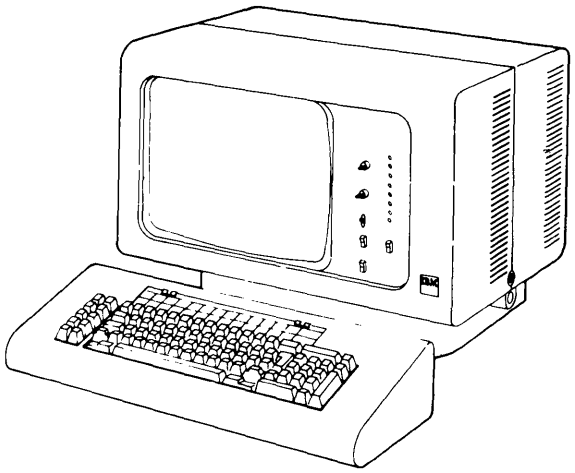
Cluster Feature | **Ports** | **With Dual Cluster Feature**

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Ports: 1, 5, 2, 6, 3, 7, 4, 8

Cut Along Line

IBM 5250 Communications Network Setup Form (Part 1)



5251 Model 2 or 12 Display Station

Controller Functional Information

Name _____

Location _____

City, State _____

Telephone _____

Controller Station Address _____

Host System Line Number _____

Location _____

Telephone _____

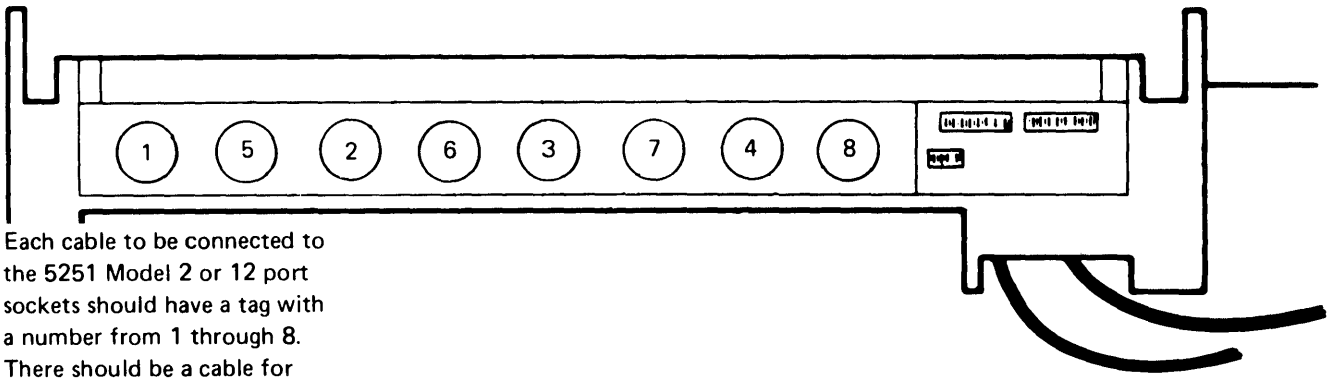
Work Station Functional Information

Name _____

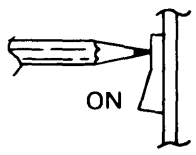
Device Type _____

Unit Address 00

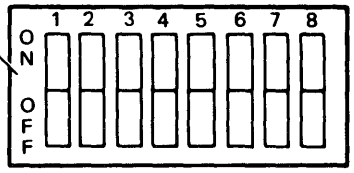
Work Station Address 00



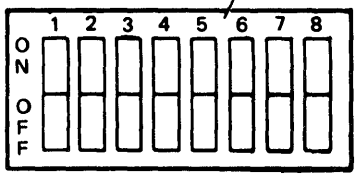
Each cable to be connected to the 5251 Model 2 or 12 port sockets should have a tag with a number from 1 through 8. There should be a cable for each port used as indicated on Part 2 of this form. Connect each cable to the port indicated on its tag.

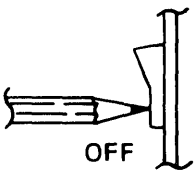


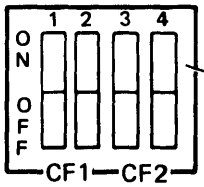
Controller Station Address Switches



Communications Line Configuration Switches





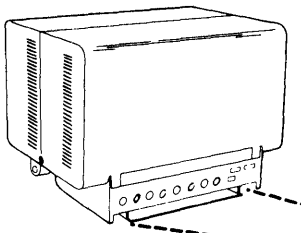


Cluster Feature Port Switches

Set all of the switches to their indicated settings. (Switch settings should be 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.

Note: If the 5251 Model 2 or 12 does not have the Cluster feature, there will not be any port sockets on the machine. If this is the case, the Cluster Feature Port switches should be set to the 'off' position.

IBM 5250 Communications Network Setup Form (Part 2)



Name: Your name for the device
Device Type: 5251 Model 1 or 11 Display, 5252 Dual Display, 5225 Printer, 5256 Printer
Location: Area/Building
Unit Address: Used by System, Cluster Configuration Charts in Site Preparation Guide
Port Number: Port Number Device is Attached to:
CF1 - 1, 2, 3, 4
CF2 - 5, 6, 7, 8
Work Station Address: Unique Address on Port - Valid 0-3

Cluster Feature

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Ports

1
5
2
6
3
7
4
8

With Dual Cluster Feature

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Name	
Device Type	
Location	
Unit Address	
Port Number	
Work Station Address	
Telephone	

Cut Along Line

This section is intended to help you to assemble your own cables from bulk cable and connectors.

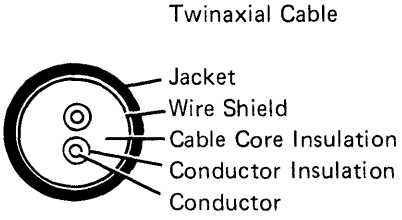
Information on purchasing, labeling, and testing cables is provided in Chapter 3.

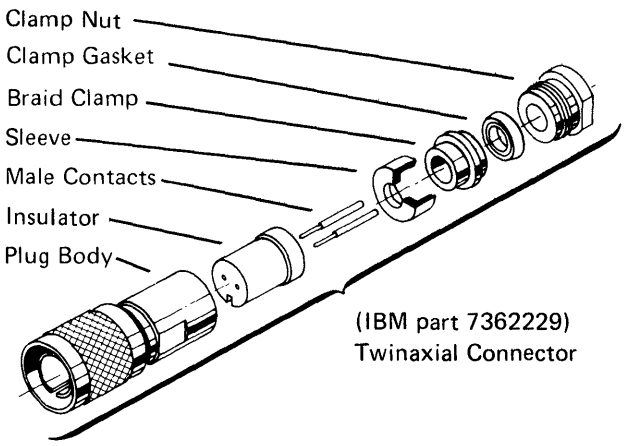
TWINAXIAL CABLE ASSEMBLY

Twinaxial cabling is recommended for use in attaching the 5251 Models 1 and 11 Display Stations, the 5252 Dual Display Station, the 5225 Printer, and the 5256 Printer to the 5251 Models 2 and 12 Display Station and to a host system. Some host system connections must be made with twinaxial cable to ensure specified performance levels.

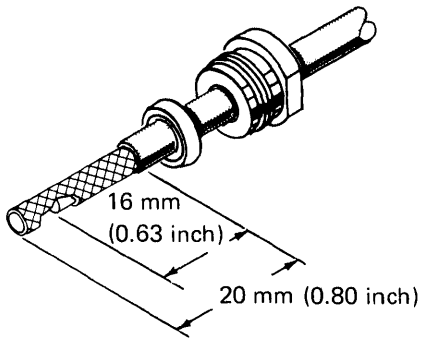
If you purchase bulk twinaxial cables, assemble them as follows. Refer to the illustrations following these instructions for dimensions and assistance in doing these procedures. If you use connectors provided by a company other than IBM, use the instructions provided by the manufacturer.

1. Be certain that the connector kit has all of the required parts. Check the cross-sectional diagram for location of the cable layers.

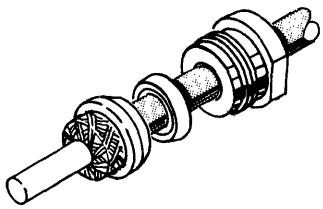




2. Cut the end of the cable sharp and square. Then slide a clamp nut and clamp gasket over the cable jacket and trim the jacket to the dimension given. Push the wire shield back to expose the inner insulation core, and cut the core and conductors to the dimension shown (16 mm-[0.63 inch]). Slide the wire shield back over the core, and taper it to a point for ease of braid clamp assembly in step 3.

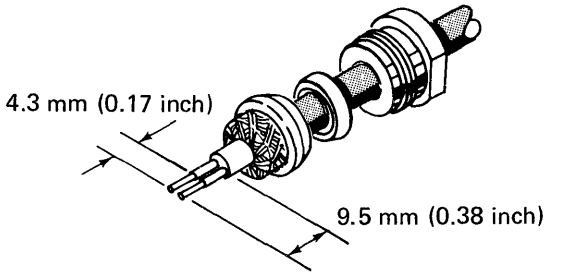


3. Slide a braid clamp over the braid so that its inner shoulder butts against the cable jacket. Then, fold the shield back over the braid clamp and trim below the shoulder.



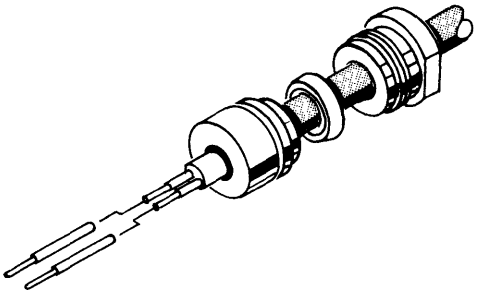
Note: Placement of braid wires over the braid clamp must be uniform to provide good rf (radio frequency) connection of the shield, and to prevent breaking the shield strands.

4. Cut the cable core and the conductor insulation to the dimensions shown. *Do not nich the conductors or the insulation.* If the braid is frayed, retrim the braid as in step 2.

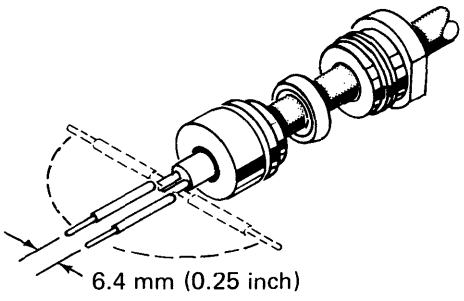


5. Slide the sleeve over the cable core and press the sleeve against the braid wires.

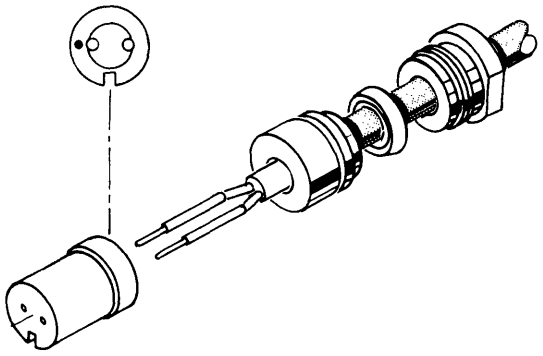
   Using minimum heat, solder the male contacts to the conductors. CLEAN OFF ANY EXCESS SOLDER.



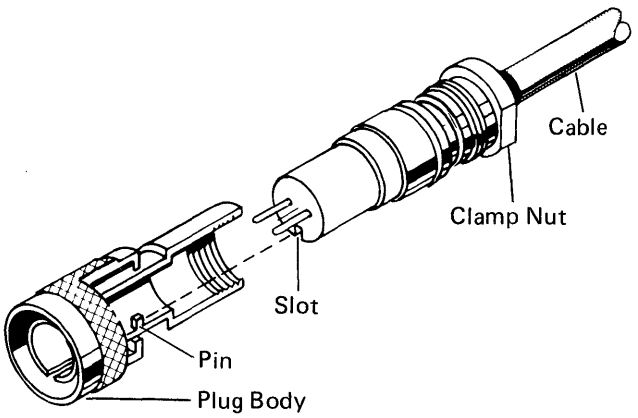
6. Bend the conductors and the contacts out at right angles to the cable axis; then bend the conductors back to parallel (approximately 6.4 millimeters [0.25 inch] conductors).



7. Slide the insulator over the contacts and the cable so that the insulator butts against the sleeve. Press all parts together. The contact on the bare copper lead of the cable goes into the insulator hole that has a dot next to it.



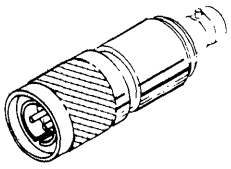
8. Insert the assembly into the connector body, aligning the polarizing slot in the insulator with the polarizing pin inside the plug body. Tighten the clamp nut with 5.7 to 6.8 N.m (Newton meters) (50 to 60 inch lbs) torque. (The cable and plug body should not be allowed to twist as the clamp nut is tightened.)



9. Check for shorts between the conductors and between each conductor and connector body.

COAXIAL CABLE ASSEMBLY

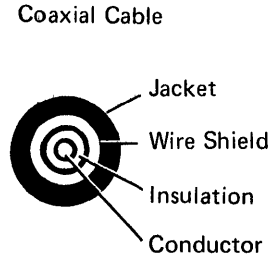
To accommodate users of previously installed coaxial networks, the twinaxial-coaxial adapter is available to allow connection of twinaxial stations and systems to coaxial cable. (The adapter will not allow attachment of twinaxial cable to coaxial stations or systems.) The adpater must be used at each twinaxial-coaxial attachment point[1]. Some systems will 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[2].

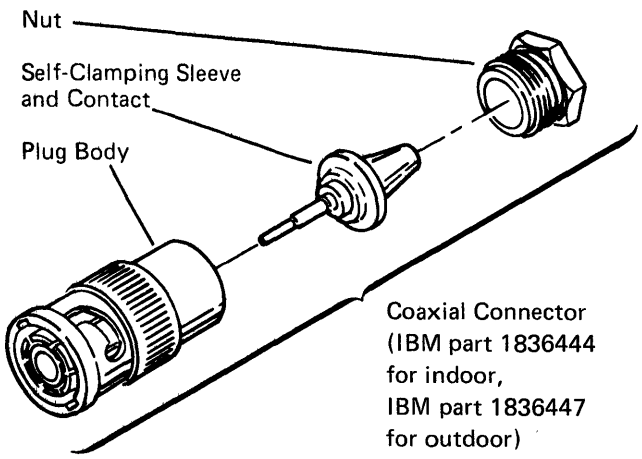


Twinaxial-Coaxial Adapter
(IBM part 7363102,
Amphenol part 82-5628,
or equivalent)

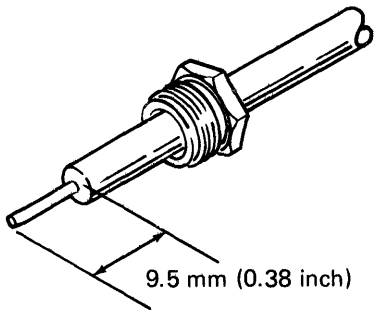
If you purchase bulk coaxial cable (IBM part 323921 for indoor or IBM part 5252750 for outdoor), use the following procedures to attach it to IBM connectors. If you use connectors provided by a company other than IBM, use the instructions provided by the manufacturer.

1. Be certain that the connector has all of the required parts. Check the cross-sectional diagram for location of the cable layers.





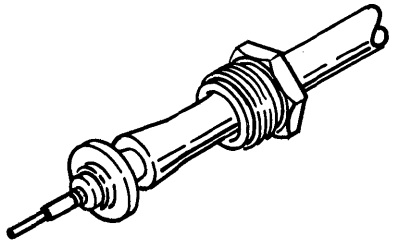
2. Cut squarely through the jacket, shield, and insulation, exposing 9.5 millimeters (0.38 inch) of the conductor. Slip the nut onto the cable.



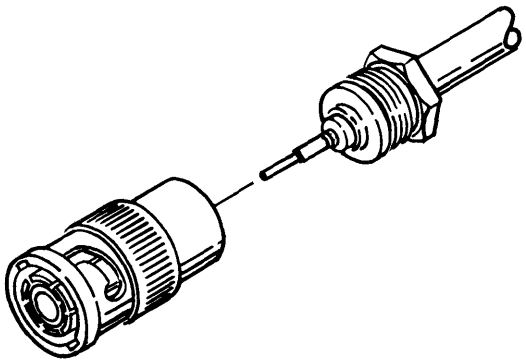
[1]For example, when you attach a Model 11 Display Station to a Model 12 Display Station with coaxial cable, you need two adapters, one at each attachment of cable to a machine.

[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. Insert the conductor into the tapered, self-clamping sleeve and contact; force the edge of the sleeve between the insulator and shield until insulation rides well onto the taper. Solder the conductor to the contact of the solder hole. REMOVE THE EXCESS SOLDER FROM THE OUTSIDE OF THE CONTACT.



4. Fit the contact into the plug body; screw the nut into the body, binding the jacket and shield tightly against the tapered sleeve. The cable should not be allowed to twist as the nut is tightened.



5. Check for shorts between the plug body and the conductor.

CABLE LABELING

To assist in installation and to avoid confusion, label each end of the cable. Each label should include information that identifies:

1. The unit to which the end being labeled is to be connected.
2. The unit to which the other end is to be connected.
3. The physical location of the other end of the cable.
4. The port into which you will plug the cable.

Also, it is often helpful to provide the telephone extension number located near the other end of the cable.

COMPLETION TESTS OF CABLING

Installation of cabling should include completion tests to ensure that there are no faults, no high-resistance connections, and no circuit imbalances. The test for faults should ensure there are no:

1. Open circuits in individual conductors or shields.
2. Short circuits between conductors of the same pair.
3. Grounds on individual conductors, either between a conductor and a shield or between a conductor and a grounded object.
4. Reversed polarities (twinaxial cable only).

Line Continuity and Polarity Tests

The following guidelines can be used for testing line continuity and polarity (twinaxial cable only). The tests should be made for individual cable segments; however, they may be used for a complete cable if the station junctions are connected via an adapter or a 5250 unit having the Cable Thru feature (if the power is off).[1]

Line Continuity

The only tools required for line continuity checks are an ohmmeter and jumpers to connect between the connector pins (signal lines) and the connector body (cable shield). When the following checks are made, the resistance values measured should fall within the indicated ranges (for the maximum 1525 meters (5000 feet) when twinaxial cable is used, and 610 meters (2000 feet) when coaxial cable is used).

Twinaxial Cable: With both ends of the cable open and the cable not plugged into a machine, measure (at either end):

- Conductor-to-conductor—greater than 1 000 000 ohms
- Each conductor to shield—greater than 1 000 000 ohms

  A reading less than 1 000 000 ohms means there is a short.

With both lines tied to the shield at the far end, measure (at the nearest end):

- Conductor-to-conductor—less than 110 ohms[2]
- Each conductor to shield—less than 70 ohms[2]

A reading greater than 110 or 70 ohms, respectively, means there is an open.

Coaxial Cable: With both ends of the cable open and the cable not plugged into a machine or a twinaxial-coaxial adapter, measure the shield to conductor resistance. It should be greater than 1 000 000 ohms.

Short one end of the cable, shield to the conductor, and measure with a ohmmeter across the shield to the conductor at the open end. The reading should be approximately 100 ohms for the maximum length of 610 meters (2000 feet).[2] Unusually high or low readings could indicate shorts, opens, or improperly terminated connections.

Line Polarity (Twinaxial Cable Only)

After testing the line continuity and making any necessary corrections, check the polarity as follows:

With conductor A (Figure C-1) tied to the shield at the far end, measure (at the nearest end): Conductor A to shield—less than 70 ohms. (If over 70 ohms, lines are crossed.)

The polarity of the line must be maintained for each cable segment and for the entire cable run to ensure proper machine operation.

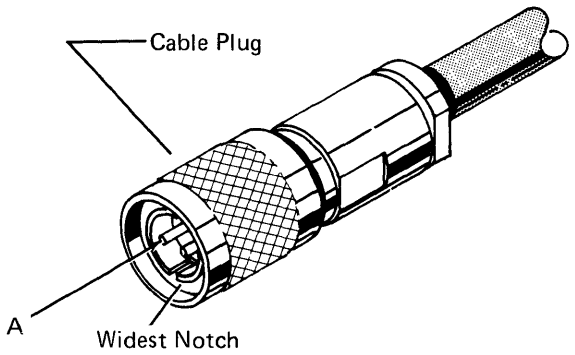


Figure C-1. Cable Plug for Line Polarity Test (twinaxial cable only)

[1]Measurements are not valid with station protectors connected to the line.

[2]Values for shorter lengths are proportional because this is a linear function. For example, a cable with half the maximum length would have half the resistance.

Address switches: Switches that you set to represent the address of a work station of 5251 Model 2 or 12. See *Work Station Address Switches* and *Controller Station Address Switches.*

Cable Thru feature: A special feature that allows multiple work stations to be attached to a single cable path.

CDSTL: Connect data set to line.

Channel Service Unit: An interface unit, supplied by the common carrier, which provides for the attachment of the 5251 Model 2 or 12 to the DDS network via the DDS Adapter feature.

Cluster feature (CF1): A special feature that allows attachment of as many as four work stations to the 5251 Model 2 or 12.

Cluster Feature Port switches: Four switches on the rear access panel of a 5251 Model 2 or 12 Display Station that identify the last port used on each Cluster feature.

coaxial cable: A shielded cable with one conductor that is available in two types for indoor and outdoor use.

Communications Line Configuration switches: Eight switches on the rear access panel of a 5251 Model 2 or 12 Display Station that identify the type of communications configuration being used.

controller function: The 5251 Model 2 or 12 that is linked to the host system via an SDLC communications network and that has work stations attached to it via the Cluster feature.

controller station address: The SDLC line address of the remote 5251 Model 2 or 12 that distinguishes it from other controllers on the same line.

Controller Station Address switches: Eight switches on the rear access panel of the 5251 Model 2 or 12 that indicate the controller station's address to the host system.

data coupler: An electrical isolation device usually required by common carriers to attach to their switched telephone lines. Also referred to as a data access arrangement or protective coupler.

Data Service Unit: An interface unit, supplied by the common carrier, which provides for the attachment of the 5251 Model 2 or 12 to the DDS network via the EIA/CCITT Interface feature.

DDS: Digital Data Service.

DDSA: Digital Data Service Adapter.

direct attachment: Attachment of work stations to the host system with system cable.

display screen: An electronic vacuum tube similar to a TV display tube, used to display entered characters.

display station: An input/output device containing a display screen and an attached keyboard.

display system: A family of display stations and printers that are attached to a system or to a 5251 Model 2 or 12.

Dual Cluster feature (DF2): A special feature that provides eight cable connections and allows the attachment of up to eight work stations to the 5251 Model 2 or 12.

EIA/CCITT: Electronic Industries Association/ Consultative Committee on International Telegraphy and Telephony.

exclusion key: An optional key on the telephone located under the handset that is used to establish communications.

external modem: A device that is used to transmit and to receive data for a 5251 Model 2 or 12 from a position on the communications line.

field: One or more consecutive positions on the display set up for a specific type of data.

frame: A 32-bit (minimum) format that SDLC uses for sending commands and data to and from the work station/controller and the host system.

host system: The controlling or highest level system in a data communications configuration.

integrated modem: A device built up into the 5251 Model 2 or 12 that transmits and receives data.

Internal Clock feature: A special feature that provides clocking for data transmission when the Integrated Modem feature is used that does not provide its own clock.

leased line: See *nonswitched line*

local work station: A work station that is attached directly to the host system with twinaxial or coaxial cable.

modem (modulator-demodulator): A device that modulates an analog carrier signal with digital signals and transmits the composite signal. A modem also receives the composite signal and demodulates it.

nonswitched line: A communications line that is permanently connected, always available, and does not require dialing to establish communications.

NRZ: Non return to zero.

NRZI: Non return to zero inverted.

port: The hardware coupling used to attach the work stations to a 5251 Model 2 or 12.

power cord: A cord that plugs into a wall outlet supplying electrical power.

printer: A device that provides printed output.

remote attachment: Attachment of work stations to the host system through communications lines.

remote work station: A work station that is attached to the host system via communications lines.

RI: Ring indicate.

RTS: Request to send.

screen: See *display screen*

switched line: A communications line that uses the same equipment and transmission lines used for telephone communication. (Dialing is required to establish communication.)

station protector: A device used on the system cable to offer protection against lightning for attachments made in different buildings.

system: The main computer and the programming necessary to execute data processing. The system can have numerous work stations attached.

system cable: A cable that carries commands and data between the system and the locally attached work stations or between the 5251 Model 2 or 12 and attached work stations.

system generation: A procedure used to configure the host system for the particular options and functions chosen.

system operator: A person who uses a display station that is designated as the system console, to activate certain system functions, and control and monitor.

Terminator switch: A switch used to terminate the system cable on the last work station when the Cable Thru feature is used and to provide a feed thru path for other stations on the cable thru line.

twinaxial cable: A shielded cable with two conductors.

unit address: The address used to define each remote work station including the work station portion of the 5251 Model 2 or 12. This address is determined for the remote configuration and must be obtained for use by the host system.

USOC: Universal service order code.

work station: An I/O device that allows either the transmission of data or the reception of data (or both) from a host system, as needed to perform a job; for example, a display station or printer.

work station address: The address to which the switches on a work station are set or the internal default address.

Work Station Address switches: Two or three switches on the access panel of a work station that has a Cable Thru feature. The switches are set to the assigned work station address.

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