IBM System/36

IBM System/36
Single-Line Communications Attachment
Maintenance Information Manual

Order Number
SY31-9017-0

Sections 30, 31, 34, and 36

First Edition (October 1986)

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PUBLICATION DRAWING

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25 FEB 83	826324
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15 FEB 84	826487
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NOTE. ALL ITEMS FOLLOWING THE LAST ROW OF ASTERISKS ARE TO BE SHIPPED.

CHANGE NUMBER	FORM / TNL	DESCRIPTION / COMMENTS
**********	**********	**********
838739	SY31-9007-B	CHECKPOINT 9 DRAFT
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838798	SY31-9007-C	CHECKPOINT 11 DRAFT
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826324	SY31-9007-D	PRELIMINARY VERSION - FIRST EDITION
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826380	SY31-9007-0	RELEASE 1, FIRST CUSTOMER SHIP
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826487	SY31-9007-1	RELEASE 2, FIRST CUSTOMER SHIP
**********	**********	**********
839954	SY31-9007-2	RELEASE 3, FIRST CUSTOMER SHIP

Preface

This manual contains the maintenance information necessary to service the System/36 single-line communications attachment (SLCA). This manual includes maintenance procedures, FRU descriptions, interface descriptions, and sequence of events sections to aid in diagnosing machine failures not found by the MAPs.

This manual uses a specific range of words so that the text can be understood by customer engineers in countries where English is not the normal language.

It is assumed that the hardware service representative using this manual has been trained on System/36, as described in the *System/36-5360 New Product Planning Technical Service Letter*.

About This Manual

The service procedures in this manual are numbered.

- The MAPs can send you to a specific procedure in this manual.
- Other System/36 MIMs can send you to a specific procedure in this manual.
- Steps in a procedure in this manual can send you to another procedure in this manual or in other System/36 MIMs.
- The index can send you to procedures where key words can be found.

This manual also includes:

- A general contents page showing the major sections of this manual and the reference number of each section contents page.
- A detailed contents page for each major section showing all procedures in the section.

Related Publications

System/36 Hardware Publications

- *General Maintenance Information Manual*, SY31-8999
- *Processing Unit and Channel Maintenance Information Manual*, SY31-9000
- *Processing Unit and Channel Maintenance Information Manual (Stage 2 Systems)*, SY31-9015
- *Processing Unit and Channel Maintenance Information Manual (Stage 3 Systems)*, SY31-9035

Other System/36 Publications

- *System Data Areas*, LY21-0592
- *Program Problem Diagnosis and Diagnostic Aids*, SY21-0593
- *Functions Reference*, SA21-9436
- *Interactive Communications Feature: Reference*, SC21-7910
- *System Problem Determination*, SC21-7919

Other Communications Publications

- *Introduction to Data Communications*, SY31-0634
- *Systems Network Architecture Concepts and Products*, GC30-3072
- *Systems Network Architecture Handbook Customer Service Division*, S229-4522
- *IBM Synchronous Data Link Control*, GA27-3093
- *General Information—Binary Synchronous Communications*, GA27-3004
- *Telecommunications SIM*, Z229-4540
- *IBM Implementation of X.21 Interface—General Information*, GA27-3287

Safety

Danger and Caution Notices

In the System/36 maintenance manuals, the word *DANGER* informs you of conditions that could cause personal injury or death. (The word *HAZARDOUS* or *WARNING* may appear on labels on machines and field-supply items.) The word *CAUTION* informs you of an action that could cause damage to a program, to a device or system, or to data.

There are blank lines below each notice. You can translate these notices and write your own words on the blank lines.

Danger Notices

A danger notice appears on page vi of this Safety section, under "Electrical Accidents–First Aid."

Caution Notices

Two caution notices appear in the following procedure:

30-410 Communications Concurrent Diagnostic Tests

Rules for Safety

If you know the safety rules for working with electrical and mechanical equipment and you observe the rules, you can work safely with IBM equipment.

Do not fear electricity, but respect it.

While you are maintaining IBM equipment, observe every safety precaution possible and the following safety rules.

Work Environment

- Do not work alone in hazardous conditions or near equipment that has dangerous voltage. Always inform your manager if the conditions or voltages are a possible problem.
- Always look for possible hazards in your work environment. Examples of hazards are: moist floors, nongrounded extension cables, power surges, and missing grounds.
- Do not perform any action that makes the product unsafe or that causes hazards for customer personnel.
- Before you start the equipment, ensure that other personnal are not in a hazardous position.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that the sleeves of your clothing are fastened or are rolled above the elbow.
- Insert your necktie into your clothing or fasten it with a clip (preferably nonconductive) at approximately 8 centimeters (3 inches) from its end.
- Lift the equipment or parts by standing or pushing up with your stronger leg muscles; this action removes the strain from the muscles in your back. Do not lift any equipment or parts that are too heavy for you.
- Put removed machine covers in a safe place while you are servicing the machine. Reinstall the covers before returning the machine to the customer.
- Always keep your tool kit away from walk areas so that other persons cannot trip over it. For example, keep the kit under a desk or table.
- Observe good housekeeping practices in the area of the machines while you are performing maintenance and after completing it.
- After maintenance, reinstall all safety devices, such as guards, shields, labels, and grounding devices. Exchange safety devices that are worn or defective. Remember, the safety devices protect you from a hazard. You destroy their purpose if you do not reinstall them when you have completed the service call.

Electrical Safety

- If possible, always disconnect the power-supply cables before you work on a machine. When you switch off power at the wall box, lock the switch in the off position or attach a DO NOT OPERATE tag (Z229-0237) to the switch.

  Note: *A non-IBM attachment to an IBM machine may be powered from another source and may be controlled by a different switch or circuit breaker.*

- Switch off all power before:
  - Removing or assembling the main units of the equipment
  - Working near power supplies
  - Inspecting power supplies
  - Installing changes in machine circuits
- If you really need to work on equipment that has exposed live electrical circuits, observe the following precautions:
  - Ensure that another person who understands the power off controls, is near you. Another person must be there to switch off the power, if necessary.
  - Do not wear jewelry, chains, metal-frame eyeglasses, or other personal metal objects. Remember, if the metal touches the machine, the flow of current increases because the metal is a conductor.
  - Use only insulated probe tips or extenders. Remember, worn or cracked insulation is unsafe.
  - Use only one hand while you are working on live equipment. Keep the other hand in your pocket or behind your back. Remember, there must be a complete circuit for an electrical shock to occur. This precaution prevents your body from completing the circuit.
  - When you use a tester, set its controls correctly and use insulated probes that have the correct electrical specification.
  - Do not touch objects that are grounded, such as metal floor strips, machine frames, or other conductors. Use suitable rubber mats obtained locally, if necessary.
- When you are working with machines having voltages more than 30 Vac or 42 Vdc, observe the special safety instructions given in customer engineering memorandums (CEMs).
- Never assume that power has been removed from a circuit. First, ensure that power has been removed.
- Do not touch live circuits with the surface of a plastic dental mirror. Remember, the surface of the dental mirror is conductive and can cause damage or personal injury.
- If an electrical accident occurs:
  - Use caution. Do not be a victim yourself.
  - Switch off the power.
  - Instruct another person to get medical aid.
  - If the victim is not breathing, perform mouth-to-mouth rescue breathing. See "Electrical Accidents–First Aid."

Mechanical Safety

Do not touch moving mechanical parts when you are lubricating a part, checking for play, or doing other similar work.

Safety Glasses

Wear safety glasses when:

- Using a hammer to drive pins or other similar parts
- Using a power drill
- Using a spring hook to attach or remove a spring
- Soldering parts
- Cutting wire or removing steel bands
- Using solvents, chemicals, or cleaners to clean parts
- Working in any other conditions that could injure your eyes

Tools, Testers, and Field-Use Materials

- Do not use tools or testers that have not been approved by IBM. Ensure that electrical hand tools, such as Wire-Wrap[1] tools and power drills, are inspected regularly.
- Exchange worn or broken tools or testers.
- Do not use solvents, cleaners, or lubricants that have not been approved by IBM.

Summary

Prevention is the main aid to electrical safety. Always think about electrical safety and use good practice; for example:

- Ensure that the customer's power receptacle matches the IBM equipment specifications.
- Inspect power cables and plugs; check for loose, damaged, or worn parts.
- Review the procedures in the maintenance documents before you remove a part that can hold an electrical charge from the machine. Carefully discharge the necessary parts exactly as instructed by the procedure.

Never assume that a machine or a circuit is safe. No machine is always completely safe. You may not know the exact condition of a machine because, for example:

- The power receptacles could be wrongly wired.
- Safety devices or features could be missing or defective.
- The maintenance or machine level change history could be wrong or not complete.
- The design could have a problem.
- The machine could have been damaged when it was shipped.
- The machine could have an unsafe change or attachment.
- An engineering change or a sales change could be wrongly installed.
- The machine could be deteriorated because it is old, or because it operates in an extreme environment.
- A part could be defective, therefore causing a hazard.
- A part could be wrongly assembled.

These are some of the ways that the condition of the machine could affect safety. Before you start a service call or procedure, have good judgment and use caution.

Electrical Accidents—First Aid

When performing rescue procedures for an electrical accident, do as follows:

- *Use Caution:* If the victim is touching the electrical-current source, remove the power. To do this, you may need to operate the room emergency power-off switch or the disconnecting switch. If you cannot find the switch, use a dry wooden rod or other nonconductive object to pull or push the victim away so he or she is not touching the electrical-current source.
- *Work Quickly:* If the victim is unconscious, he or she may need mouth-to-mouth rescue breathing and possibly external cardiac compression if the heart is not beating.
- *Get Medical Aid:* Instruct another person to dial the rescue service (such as the ambulance or the hospital).

Determine if the victim needs mouth-to-mouth rescue breathing. If he or she does, perform the following steps:

DANGER

Use extreme care when you perform rescue breathing for a victim who may have breathed in toxic fumes. Do not breathe in air that the victim has breathed out.

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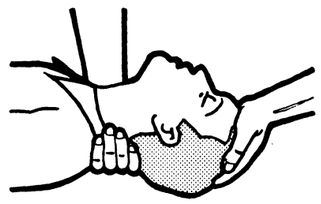
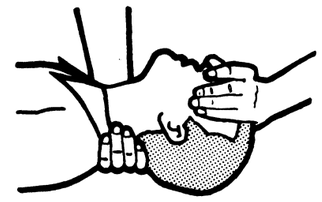
1. Prepare for rescue breathing:
   a. Ensure that the victim's airway is open and that it is not obstructed; check the mouth for objects that may be obstructing the airway, such as chewing gum, food, dentures, or the tongue.
   b. Place the victim on his or her back, put one hand behind the victim's neck, and put the other hand on his or her forehead.
   c. Lift the neck with one hand, and tilt the head backward by pressing on the forehead with the other hand.

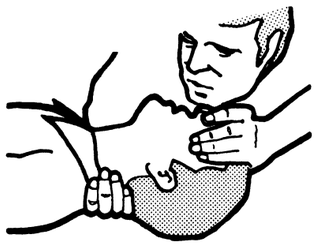


2. Look, listen, and feel to determine if the victim is breathing freely.
   a. Put your cheek near the victim's mouth and nose.
   b. Listen and feel for the breathing out of air. At the same time, look at the victim's chest and upper abdomen to see if they move up and down.
3. If the victim is not breathing correctly:
   a. Keep the victim's head tilted backward. Continue to press on the forehead with your hand; at the same time, position the same hand so that you can pinch together the victim's nostrils with your thumb and finger.



   b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim's and blow into the victim's mouth.

   c. Remove your mouth to let the victim breathe out, and check that the victim's chest moves down.



   d. Repeat steps b and c once every 5 seconds either until the victim breathes for himself or herself, or until medical aid comes.

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1 Trademark of the Gardner-Denver Co.

Reporting Accidents

Report, to your field manager, all electrical accidents, possible electrical hazards, and accidents that nearly occurred. Remember, an accident that nearly occurs might be caused by a design problem; your immediate reporting ensures that the problem will be solved quickly.

Also report all small electrical shocks. Remember, a condition that causes a small shock need only differ slightly to cause serious injury.

General Contents

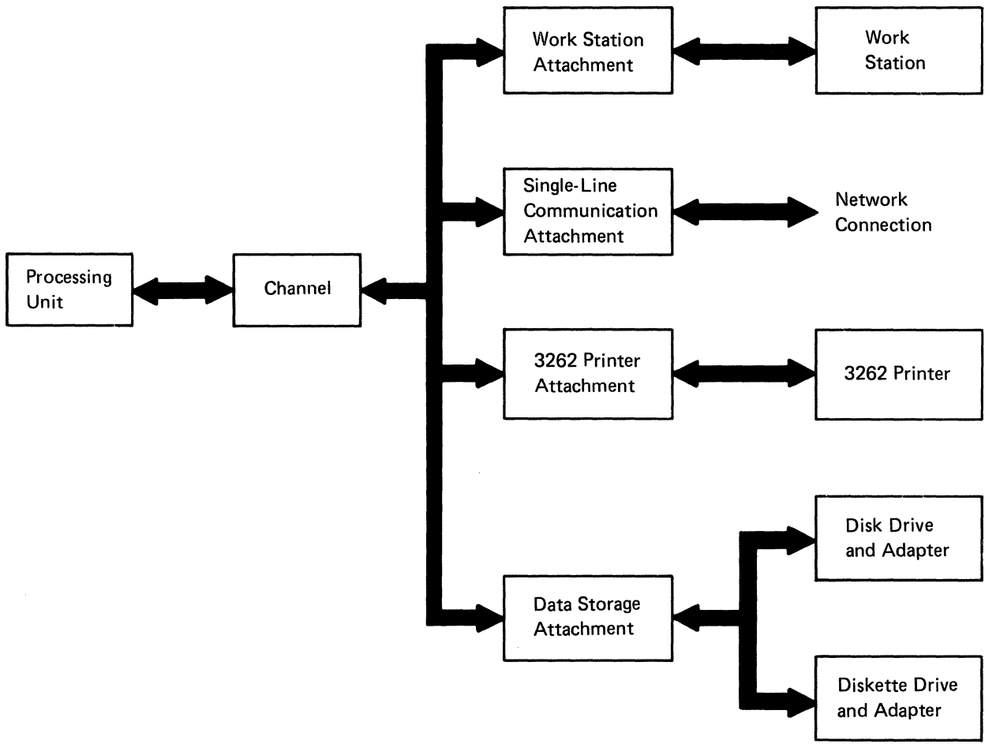
Single-Line Communications

30-000
Contents

OVERVIEW

30-100
Introduction

The single-line communications attachment (SLCA) feature (2550) permits the system to send data to or receive data from another device that has compatible data communications features. The single-line communications feature connects to the control storage processor and main storage through the channel.



30-110
Single-Line Communications Feature

The single-line communications feature (SLCA) connects the system to a remote system or network through one data communications line. With this feature, the control storage processor directly controls all data transmissions. One communications adapter card connects directly to the channel and receives its control from the control storage processor.

The single-line communications feature can use the following communications adapters.

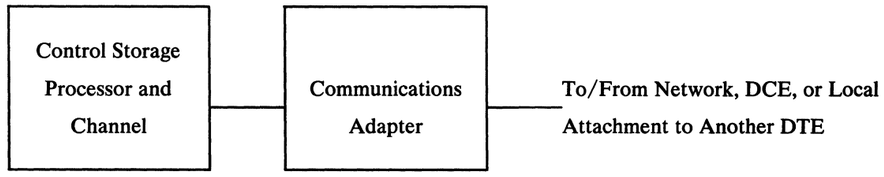
Section 31 — An EIA/CCITT communications adapter (feature code 4552), to connect to an external modem that uses the EIA RS-232-C interface standard (U.S. and Canada) or the CCITT V.24 or V.28 interface standard (World Trade countries) at speeds up to 9600 bps.

Section 34 — A Digital Data Service Adapter (DDSA) (feature code 4555), to transmit and receive data at a rate of 2400, 4800, or 9600 bps.

- In the U.S. and Canada, this feature can also connect to another system that has a DDSA without going through the Digital Data Service network by using a special cable (IBM part 4236967).
- In World Trade countries, this feature can connect only to another system that has a DDSA in a local installation by using a special cable (IBM part 4236967).

Section 36 — An X.21 communications adapter (feature code 4554), to connect to data networks that use CCITT specification X.21. This feature is available only for a nonswitched line with a data rate of 9600 bps or less.

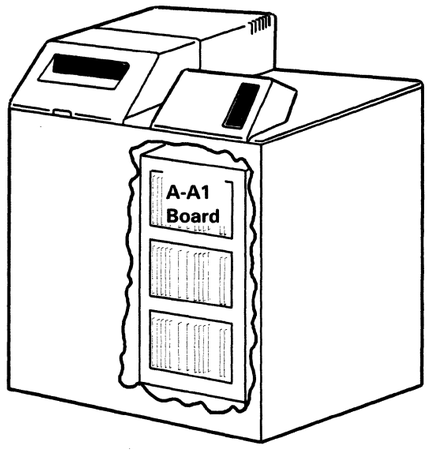
Single-Line Communications Feature



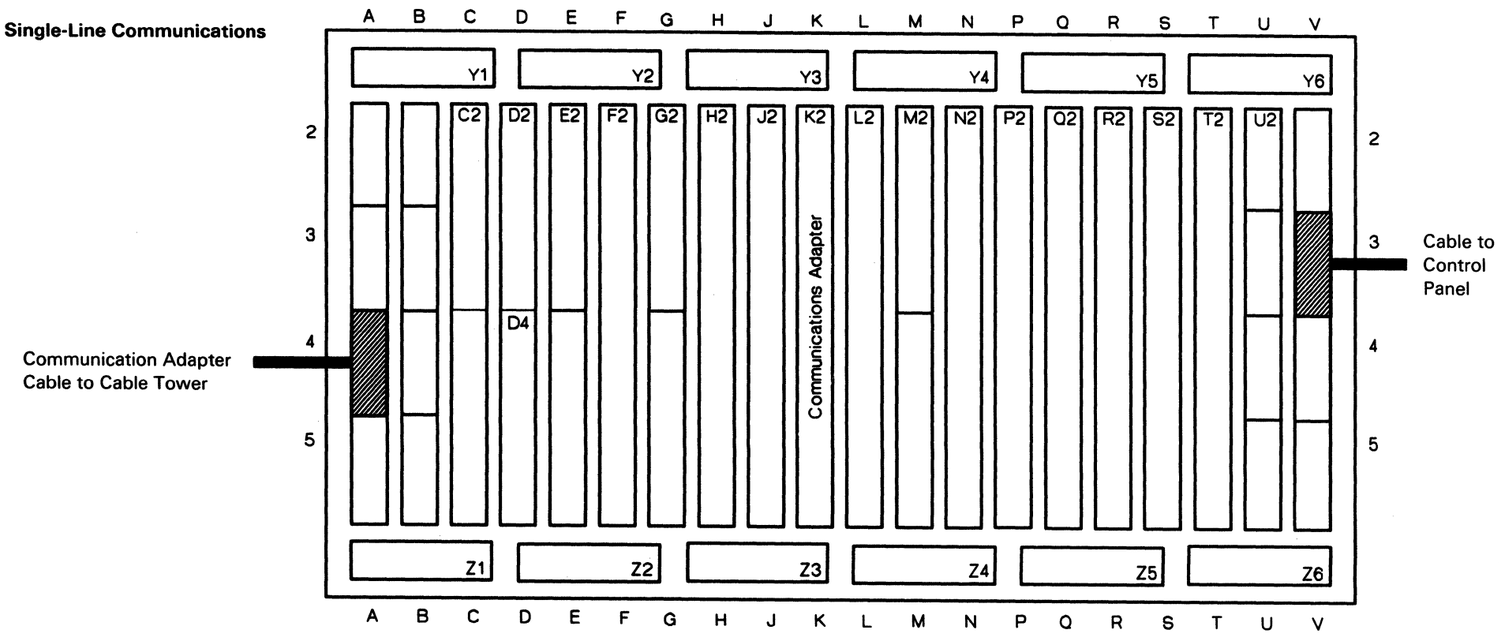
LOCATIONS

30-205
Card Locations

The single-line communications (SLCA) feature can be installed only on the A1 board.



Single-Line Communications



S9017002

Card Locations

Attachment	Part	Line 1
EIA/CCITT communications adapter	EIA communications adapter	A1K2
	I/O cable	A1A4
	Cable tower connector (see Note 2)	Line 1
Digital data service adapter	DDSA communications adapter	A1K2
	I/O cable	A1A4
	Cable tower connector (see Note 2)	Line 1
X.21 communications adapter	X.21 communications adapter (see Note 1)	A1K2
	I/O cable	A1A4
	Cable tower connector (see Note 2)	Line 1

Notes:

1. *X.21 nonswitched network with data rate of 9600 bps or less only.*
2. *A green triangle on the cable tower identifies the communications cable line number (30-210).*

Field Logic Diagrams

Part	Line 1
Control panel cable	RV900
EIA/CCITT line adapter	RK100
DDSA	RK100
X.21 line adapter	RK100
Board edge connector	RG905
Cable tower	RG905

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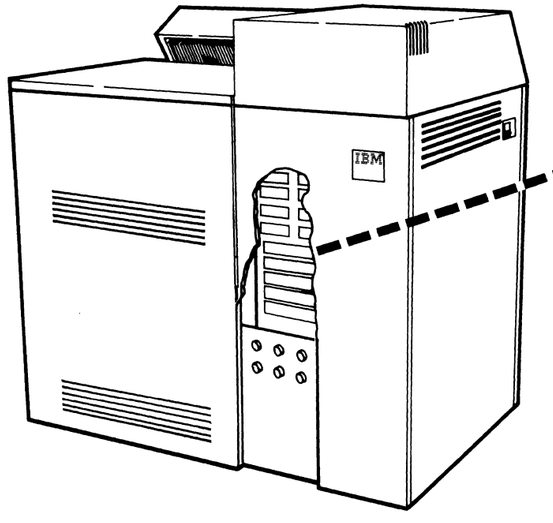
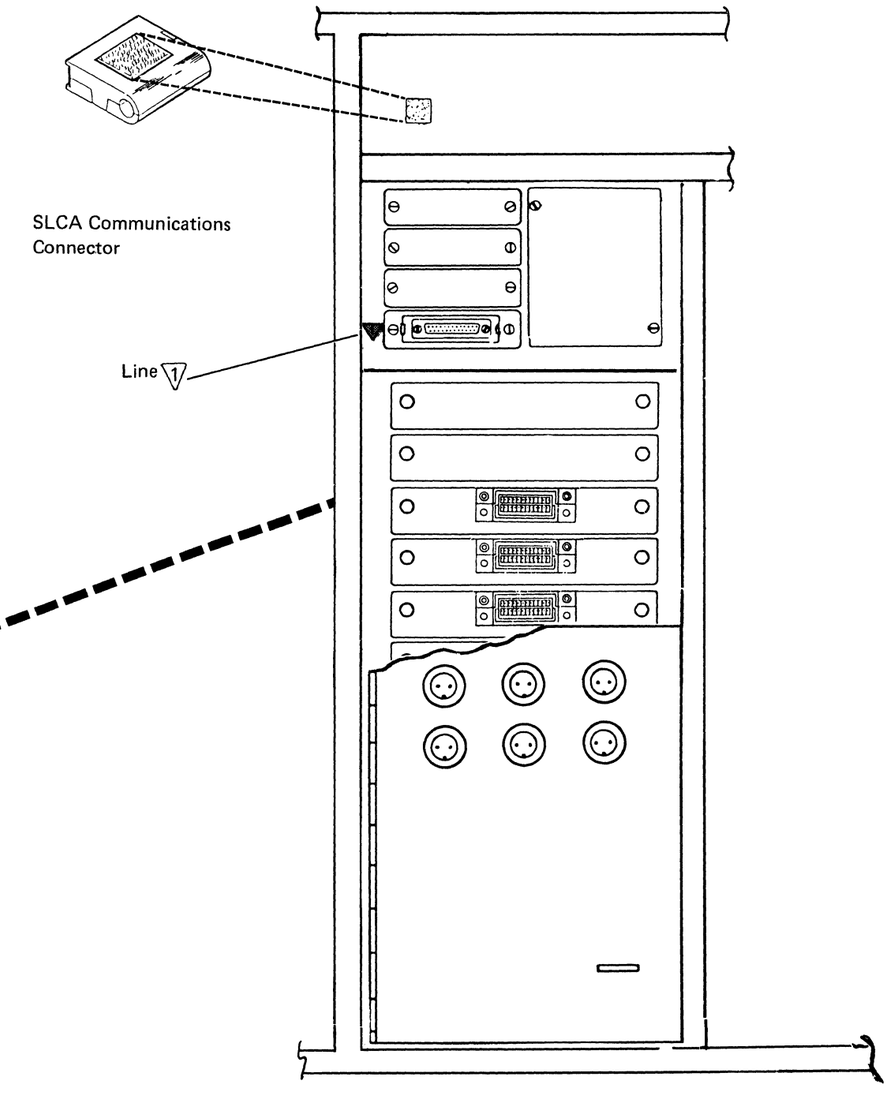
Wrap Connector (Cable Tower)

See MAP 3020, Chart A, for wiring details.



Rear View



DIAGNOSTIC INFORMATION

30-400
Diagnostic Tests

Diagnostic tests for data communications aid the service representative in finding the cause of problems with internal and some external data communications interfaces. This section of the manual explains the types of diagnostic information that are available, and how to use that information.

There are two types of diagnostic tests for data communications:

- Concurrent diagnostic tests: Concurrent tests are run under control of SSP while the system is operating on other jobs. Concurrent diagnostic tests include:
  - COMMTEST (30-410)
  - SDLCTEST (30-415)
  - BSCTEST (30-420)
  - STATEST (30-425)
- Dedicated diagnostic tests: The IPL diagnostic tests are dedicated tests that are run during initial program load. The system cannot run user jobs until the IPL diagnostic tests are complete and SSP is loaded.

The following table shows which area of a communications system is being tested by a specific test to a specific type of interface.

(A) IBM LPDA modem

(B) With internal clock

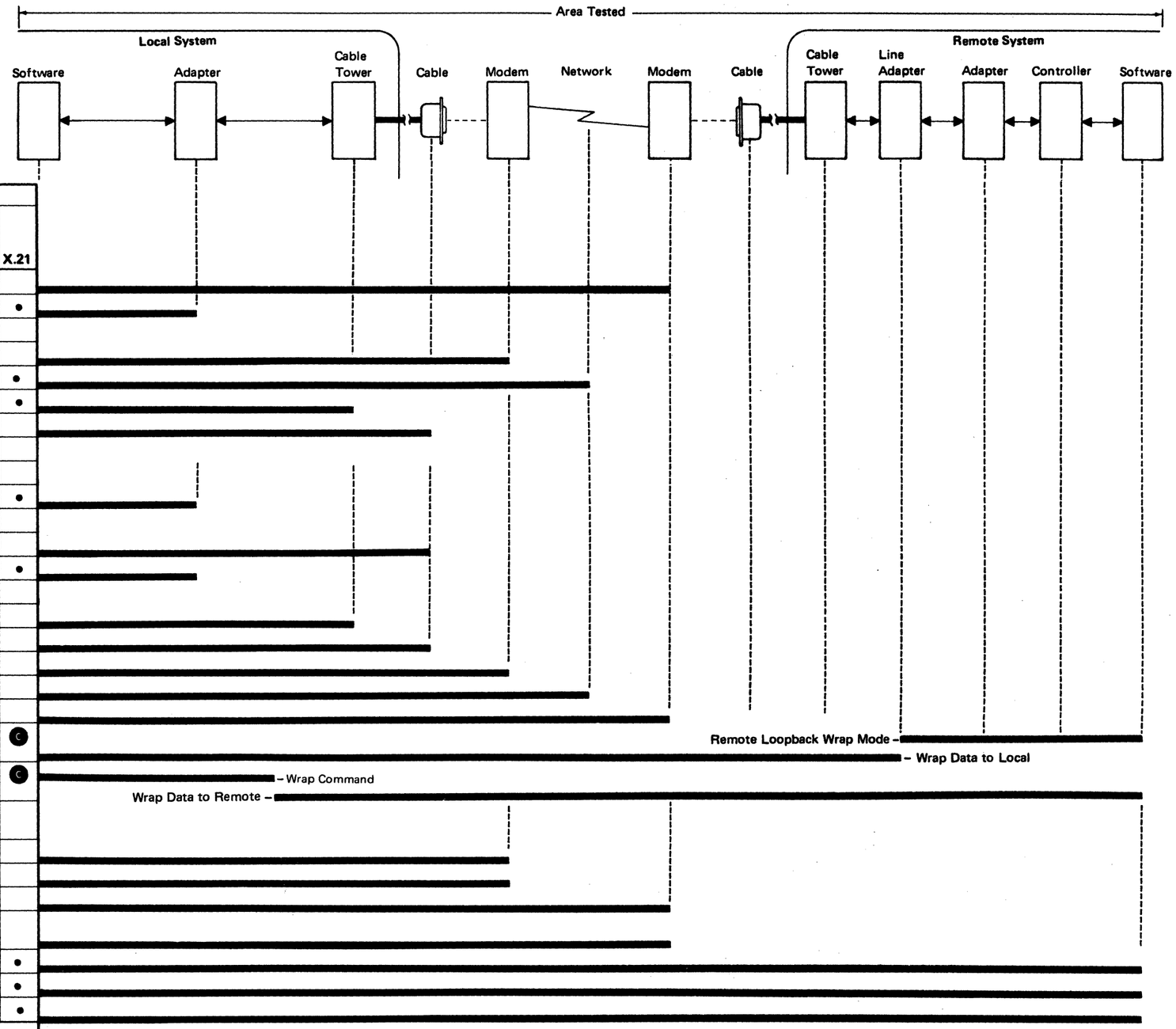
(C) Point-to-point nonswitched

(D) IBM modem that supports a wrap test on pin 18

(E) External modem wrapped with modem wrap switch

Test	Runs Under	Interface Type or Selected Line						
		EIA				DDSA		X.21
Basic test (line wrap)	COMMTEST (30-410) or automatic wrap	(A)[1]						
		•				•		•
		(D)						
								•
	COMMTEST (30-410)	•				•		•
		•				•		
Customer setup verification								
		•				•		•
		•				•		
IPL good machine path (30-460)		•				•		•
Remote loopback transmit/receive test	COMMTEST (30-410)	(B)				•		
		(B)				•		
		(E)						
		•				•		
		(E)						
		•				(C)		(C)
Remote loopback wrap mode	COMMTEST (30-410)	•				(C)		(C)
Local modem self test	COMMTEST (30-410) or automatic wrap	(A)						
Local modem status test		(A)						
Remote modem self test		(A)						
Local/remote modem status		(A)						
BSCTEST	SSP	•				•		•
SDLCTEST		•				•		•
STATEST		•				•		•

[1] Point-to-point nonswitched only



30-410
Communications Concurrent Diagnostic Tests

The communications concurrent diagnostic tests (COMMTEST) have options for testing single-line communications adapters (SLCA). You can run the tests while the system is under control of SSP by entering `COMMTEST` on the command line of any work station connected to the system. After you enter the command, the system displays the Communications Test Selection menu. COMMTEST options include:

- Basic communications diagnostic test
- Additional communications diagnostic tests:
  - IBM LPDA local and remote modem diagnostic tests:
    - — Local modem self test
    - — Local modem status test of the communications line
    - — Remote modem self test
    - — Local and remote modem status test of the communications line
  - Remote loopback tests

Errors that occur during these tests are displayed as messages and system reference codes. To review the system reference codes for communications, see system entry MAP 0113.

Basic Communications Diagnostic Test

CAUTION
If you run this test on a DDSA line that is a multipoint tributary station, the test could generate up to one second of errors on the network.

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This option tests internal hardware and cable by performing internal diagnostic tests indicated in 30-400.

Testing of the external cables, modems, DCE (data communications equipment), and telephone line is performed as indicated in 30-400 when the line configuration permits as follows:

- For configurations without IBM LPDA or IBM wrappable modems, the farthest point of testing can be determined from the message displayed by the COMMTEST utility. For example, if a message is displayed that instructs you to install the external cable wrap connector, the farthest point tested in the communications link is the external cable.
- For configurations with IBM wrappable modems, tests of the external cable and local modems are performed.
- For configurations with IBM LPDA modems, tests of the external cable and local modems are performed. Remote modem tests are also performed if the network is nonswitched point-to-point and the local modem is a control modem.

The basic communications diagnostic test (line wrap) tests the parts of the communications system indicated in 30-400. The test indicates either a failure or no failure found by displaying a system reference code.

You can run this test only when the communications line is not being used. However, the customer can have this test run automatically when a permanent line error is detected.

See 01-610 to run the basic communications diagnostic test. Messages instruct the operator when and where to install the wrap connector, set the cable switch to the Test position, or set the DCE switches to the Test position. Ensure that the hardware is returned to the normal operating conditions when the basic test is complete.

IBM LPDA Local and Remote Modem Diagnostic Tests

The local and remote modem diagnostic tests are for IBM LPDA modems that are connected to the system through an EIA/CCITT communications adapter card. These tests cause the local and remote modems to perform internal diagnostic tests and return the results to the COMMTEST utility. These tests also display the data quality of the communications line (generated by the local or remote modem).

Remote and local/remote tests can be run only if the local modem is a control modem, not a secondary modem.

The following is a summary of IBM LPDA local and remote modem diagnostic tests.

- *Local modem self test:* This test causes local modems to run internal diagnostic tests and return the results to the COMMTEST utility.
- *Local modem status test of the communications line:* This test displays the data quality value stored by the local modem. The data quality value is from 0 through F; the lower the value, the better the communications line. A data quality of 8 or higher indicates bad data transmission.

  The local modem sets the stored data to zero after this test runs. The local modem must be receiving data or a carrier signal to generate a new data quality value.
- *Remote modem self test:* This test causes remote modems to perform internal diagnostic tests and return the results to the COMMTEST utility.
  - The remote modem self test can be run only from stations that have a control modem.
  - On multipoint networks, a station address of a remote modem will be needed.
- *Local and remote modem status test of the communications line:* This test displays a data quality value generated by the local modem and a data quality value generated by the remote modem. The data quality values are from 0 through F; the lower the value, the better the quality of the communications line. A data quality of 8 or higher indicates bad data transmission.

You can run these tests only if the communications line is not being used.

See 01-612 to run the local and remote modem tests.

Remote Loopback Test

The remote loopback test tests the parts of the communications system indicated in 30-400. The test transmits data to an external device where it is wrapped back to this system. The data received is checked to see that it is the same as the data sent. The external device must wrap the data back and supply clocking when necessary.

This test can also put the internal DDSA communications hardware in loopback wrap mode.

You can run this test only if the communications line is not being used.

CAUTION
This test can cause errors at other stations of a multipoint network.

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See 01-613 to run the remote loopback test.

Transmit Test Pattern to a Remote Station That Is in Wrap Mode and Check Received Data

This option transmits data and checks the received data to see if it is the same. An external device is needed to wrap the data back to the system and can be a wrap plug, local modem, remote modem, telephone network, or remote system. The external device need not supply clocking if any of the following are correct:

- An internal modem or DDSA (digital data service adapter) is installed on the selected line.
- The network or modem between this system and the wrapping device supplies clocking.
- The internal clock feature is used on the selected communications line.

This test can be run, for example, to:

- Wrap connectors for the following features:
  - EIA/CCITT (with internal clocking)
  - DDSA (does not include multipoint network)
- The telephone company wrap devices at different points in the network
- Local or remote modems set to wrap mode
- Remote systems that can be put in loopback mode

Activate Wrap Mode at This Station to Echo Received Data

This option puts the internal DDSA communications hardware in wrap mode. All data received will be returned to the system transmitting a test pattern.

30-415
SDLC Online Test

The SDLC online test (SDLCTEST) communicates between SDLC systems and between SDLC devices and a system. Using this test, you can:

- Verify correct operation of the communications link between two systems or between a system and attached SDLC devices
- Analyze difficult communications problems

You can run the test while the system is under control of SSP by entering `SDLCTEST` on the command line of any work station connected to the system (01-625).

When the test finds an error, it performs one of two actions:

- Errors that stop the test: The test displays a description of the error, and indicates possible causes of the error (in order from most probable to least probable).
- Errors that do not stop the test: The test runs to the end and displays a list of all errors that occurred during the test.

The SDLC online test has two routines: a requestor routine and a responder routine. When communicating between SDLC systems, the host system activates the requestor routine and the remote system activates the responder routine. The requestor routine sends an SDLC test command and a data pattern (selected when the test is run) to the responder routine on the remote system. The responder routine receives the test command and data pattern, and transmits the same data pattern back to the requestor routine. When the requestor routine receives the data pattern, it checks the pattern to determine if any errors have occurred.

The SDLC online test can also be run from the system (using the requestor routine) to a remote work station controller. The work station controller must be powered on and varied offline.

30-420
BSC Online Test

The BSC online test (BSCTEST) communicates between BSC systems and between BSC devices and a system. Using this test, you can:

- Verify correct operation of the communications link between two systems or between a system and attached BSC devices
- Analyze difficult communications problems

You can run the test while the system is under control of SSP by entering `BSCTEST` on the command line of any work station connected to the system (01-620).

When the test finds an error, it performs one of two actions:

- Errors that stop the test: The test displays a description of the error, and indicates possible causes of the error (in order from most probable to least probable).
- Errors that do not stop the test: The test runs to the end and displays a list of all errors that occurred during the test.

The BSC online test has two routines: a requestor routine and a responder routine. When communicating between BSC systems, the host system activates the requestor routine and the remote system activates the responder routine. The requestor routine sends a BSC test command and a data pattern (selected when the test is run) to the responder routine on the remote system. The responder routine receives the test command and data pattern, and transmits the same data pattern back to the requestor routine. When the requestor routine receives the data pattern, it checks the pattern to determine if any errors have occurred.

30-425
Station Test

The station test (STATEST) communicates between a system and a remote station using the SDLC protocol. Using this test, you can:

- Verify correct operation of the communications link between the system and the attached station
- Analyze difficult communications problems

You can run the test while the system is under control of SSP by entering `STATEST` on the command line of any work station connected to the system (01-630).

The station test permits you to test:

- A remote work station
- An ICF configured station
- A station that is not configured

After selecting options, you must also select the option to run the test. When the test runs, it sends a test command and a data stream to the selected station. When the selected station receives the test command, it returns the test command and its data to your system. The system receives the command and data, and then indicates that the test ran with no errors.

When the test finds an error, it displays a message on the screen to indicate the probable cause of the error and which part of the system failed:

- The program
- The system communications hardware
- The network
- The remote station

You can run this test on the communications line while other SNA transmissions are using the line; however, the station being tested cannot be used for other transmissions while the test is running.

30-440
SETCOMM Procedure

The SETCOMM procedure under SSP changes some communications parameters in the system configuration record. An initial program load (IPL) must be performed before the changes take effect.

Some communications configuration data changed by the SETCOMM procedure can affect the way communications jobs run. You can use the STATUS COMCNFIG (D H) command to display the present settings (01-605).

The parameters that can be changed by the SETCOMM procedure are described as follows:

- Line number: This parameter specifies the line number for which the values are to be changed.
- Line type: This parameter specifies whether the line is switched or nonswitched, or whether the station is a multipoint tributary station or a control station.
- Internal clock: This parameter specifies that the system supplies a clock signal to the data communications equipment.
- NRZI: This parameter specifies that NRZI data encoding is to be used on the line.
- Continuous carrier: This parameter specifies that the system is to generate a continuous carrier signal. The modem activates the 'request to send' (RTS) signal.
- Answer tone: This parameter specifies that the system generates an answer tone (used in World Trade countries only).
- SDLC idle detect time-out: This parameter specifies a 2-digit time-out value in half-second increments. The first digit indicates the seconds and the second digit indicates the half seconds (0 or 5). The default value is 3 seconds (30).
- SDLC retry count: This parameter specifies the number of times that an SDLC transmission will be attempted before an error causes the end of transmission.
- Modem (EIA/CCITT): This parameter specifies that an IBM LPDA, an IBM wrappable, or a non-IBM modem is installed on a line that has an EIA/CCITT line adapter.
- DDSA line speed: This parameter specifies the data rate of the DDSA line.

30-445
ALTERCOM Procedure

The ALTERCOM procedure under SSP changes some items associated with batch BSC, SDLC, or a communications line. ALTERCOM only changes information for the display station at which it is run. If ALTERCOM is run while an SSP-ICF (interactive communications feature) subsystem or batch BSC job is running, it will have no effect on the job that is running. Changes made using ALTERCOM remain in effect until the ALTERCOM procedure is run again, or until the SETCOMM procedure is run.

Some communications configuration data changed by the ALTERCOM procedure can affect the way communications jobs run. You can use the STATUS COMM (D C) command to display the present settings (01-605).

The parameters that can be changed by the ALTERCOM procedure are described as follows:

- For interactive communications feature (SSP-ICF) BSC systems:
  - Line type
  - Modem speed (full or half)
  - Switched network backup (SNBU)
- For SSP-ICF SDLC systems and for remote work stations:
  - Line type
  - Modem speed (full or half)
  - Switched network backup (SNBU)
  - SDLC time-out value
  - SDLC retry count
- For batch BSC systems:
  - Line type
  - Remote switched line ID
  - Local switched line ID
  - Tributary address
  - Whether to compress or truncate blanks
  - The time to wait for a response before indicating an error condition
  - Whether multiple-volume files are used
  - The record separator
  - The error retry count
  - Modem speed (full or half)
  - Switched network backup (SNBU)

30-460
IPL Good Machine Path

When the system is first loaded (IPL), the system automatically performs some tests on the circuits in the system to ensure that the system is operating correctly (see 01-140). The following sequence is run at that time to ensure that the communications attachment is operating.

TU Sequence	Description
T8401 T8402 T8403 T8404 T8405 T840B T840A T8410 T8411 T8412 T8413 T8414 T8415 T8416 T8417 T8418 T8419 T841B T8421 T8422 T8423 T8424 T8425 T8426 T8427 T8428 T8429 T842A T842B T842C T842D T842E T8431 T8432 T8433 T8434 T8435 T8436 T8437 T843B	Tests the communications adapter
T8438	Performs an internal wrap test of the X.21 communications adapter
T8439	Performs an internal wrap test of the DDSA communications adapter

HOW TO INTERPRET ERAP REPORTS

30-500
Introduction

See 01-360 to run ERAP.

ERAP error information aids in determining the cause of failures in the communications attachment. These failures can be intermittent failures or solid failures that the MAPs do not find.

Run the error recording analysis procedure for the communications attachment that is failing and look at the error information that has been recorded. If a specific error occurs frequently in the latest entries of the table, suspect an intermittent failure.

If there is no frequent pattern associated with the error history information, use the ERAP reports in this section to determine the cause of the error. The information recorded was present when the error occurred.

If your customer is using the MSRJE (multiple session remote job entry) program, it will add 1 to the data communications I/O counter each time MSRJE uses an I/O operation. If an MSRJE error occurs, a value of 1 is added to the suitable data communications error counter. However, MSRJE errors do not add to the data communications error history table.

The following ERAP reports are described in this section.

- BSC
  - Error history table (30-510)
  - Error counter table (30-518)
  - I/O counter table (30-519)
- SDLC
  - Error history table (30-520)
  - Error counter table (30-528)
  - I/O counter table (30-529)
- Asynchronous communications
  - Error history table (30-530)
  - Error counter table (30-538)
  - I/O counter table (30-539)

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30-510
BSC Error History Table

The following table shows the format of the BSC error history table. Use this table to locate the procedures that describe the fields contained in this table.

ERROR HISTORY TABLE FOR BSC LINE 01

FROM: XX/XX/XX XX:XX:XX TO: XX/XX/XX XX:XX:XX

DATE	TIME	SRC	COMMAND CODE	COMMAND MOD	STATUS BYTE 0	RETRY COUNT	COMPLETION CODE	TERMINAL ADDRESS
YY/MM/DD	HH:MM:SS	.....			HEX	.....		
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XXXX
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XXXX
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XXXX

30-511 30-512 30-513 30-514 30-515 30-516 30-517

30-511
System Reference Code

The SRC column contains the system reference code (18xx). See system entry MAP 0113.

30-512
Command Code

Code	Description
80	Control command
82	Receive initial delayed command
83	Receive initial command
84	Transmit-receive overlay command (Note 1)
85	Transmit-receive initial command
86	Transmit-receive command (Note 2) or transmit-only command

Notes:

1. *The received record will write over data in the transmit buffer.*
2. *The receive part in the buffer must follow (be next to) the transmit part of the buffer. At the MSP/CSP interface, a transmit-only command becomes a transmit-receive command with a receive length of zero.*

30-513
Command Modifier

This column contains the command modifier. If the command code is hex 80 (control command), the command modifier is:

Hex 04 = Start 2-second time-out
Hex 80 = Disable command
Hex C0 = Enable command
Hex D0 = Re-enable command (microcode loaded)

If the command code is hex 85 (transmit-receive initial command), the command modifier is:

Hex 00 = Monitor mode
Hex 01 = Control mode

30-514
Status Byte 0

Bit	Description
0	Receive time-out
1	Block check (LRC/CRC/VRC)
2	Transmit adapter check
3	Receive adapter check
4	Invalid ASCII character
5	Abortive disconnect
6	Not data set ready
7	Receive time-out data mode

30-515
Retry Count

This is the number of times that this operation was attempted before it was written to the error history log as a permanent error.

30-516
Completion Code

Code	Description
21	Operation not completed correctly
22	Invalid switched line ID received
23	Data lost because of buffer overflow
24	Abort received
25	Abort disconnect received
26	Delay count overflow
27	Command rejected because of abort request
28	Operation canceled
31	Unexpected response from remote system
32	Data check
33	Invalid response received
34	Adapter check
35	Receive time-out error
36	Data set not ready/connection lost
4B	Invalid ASCII
4D	Invalid request
4E	Delay count overflow
4F	Permanent error
50	No response
51	Data check
52	Lost data
53	Lost connection
54	Invalid response
55	Adapter check
56	Forward abort
57	EOT check

30-517
Terminal Address

This 2-byte field contains the poll/address character in hexadecimal.

30-518
BSC Error Counter Table

The error counter keeps track of the number of errors that occur in each of several groups. Each error is also written in the BSC error history table. The following table defines the error groups and shows how they appear in the completion code in the error history table.

Counter Table Entry	Description	Completion Code(s)
Negative acknowledgments received	A NAK (negative acknowledgment) was received indicating that the remote station had a data check.	21
Data checks (block check)	The block check character that the local station generated for a message did not match the block check character that was generated and sent by the remote station.	32
Forward aborts	The present text transmission was aborted by ending the block with ENQ (enqueue).	56
Aborts received	The remote station sent an EOT (end of transmission) in response to receiving a message test.	24
Adapter checks during transmission	The adapter did not move a character from main storage to the adapter quickly enough for the line speed.	34
Adapter checks while receiving	The adapter did not move a character from the adapter to main storage quickly enough for the line speed.	55
Invalid responses received	One of the following has occurred: • ACK out of sequence • Command not supported by device • Unexpected response	33
Enquiries received as affirmative ACK	This is the number of enquiries except those received because of WACKs (wait before transmitting positive acknowledgment). This error occurs because of a modem or line problem.	
Lost data errors	The length of a received message is larger than the length of the receive data buffer.	23, 52
Disconnect time-outs	The switched network line was disconnected because no valid transmissions were received in 3.25n seconds or less. (n can be selected as 0-7; 7 is the default value.)	53
Receive time-outs	Another block of data was expected from the remote station. The data was not received in 3.25 seconds or less.	35
Transmission time-outs	No acknowledgment was received from the remote station after a message was sent to it.	26, 4E

30-519
BSC I/O Counter Table

The I/O counter keeps track of the number of I/O operations. The following table defines the entries in the I/O counter table.

Counter Table Entry	Description
Text blocks transmitted	The number of text blocks transmitted, including errors, since the counter was last reset.
Text blocks received	The number of text blocks received, including errors, since the counter was last reset.

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30-520
SDLC Error History Table

The following table shows the format of the SDLC error history table. Use this table to locate the procedures that describe the fields contained in this table.

ERROR HISTORY TABLE FOR SDLC LINE 01

FROM: XX/XX/XX XX:XX:XX TO: XX/XX/XX XX:XX:XX

DATE	TIME	SRC	CMD CODE	STATUS BYTE 0	STATUS BYTE 1	CONTROL FIELD	STATION ADDRESS	LINE Q HEADER
YY/MM/DD	HH:MM:SS				HEX			
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XX
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XX
XX/XX/XX	XX:XX:XX	XXXX	XX	XX	XX	XX	XX	XX
		30-521	30-522	30-523	30-524	30-525	30-526	30-527

30-521
System Reference Code

The SRC column contains the system reference code (18xx). See system entry MAP 0113.

30-522
Command Code

Code	Description
80	Control command
82	Transmit command (poll/final bit on)
83	Receive initial command
84	Transmit final command
85	Transmit only command
86	Transmit initial command
87	Receive delayed command
88	Start poll receive ready (primary) Start auto response (secondary)
89	Start poll receive not ready (primary)
8E	Wait for data set ready (DSR)
8F	Stop poll (primary) Stop auto response (secondary)

30-523
Status Information–Byte 0

Bit	Description
0	Time-out • If a primary station, this is a 16-second nonproductive time-out • If a secondary station, this is a 32-second inactivity time-out
1	Frame check (data check)
2	Adapter check (overrun/underrun)
3	Receive buffer overrun
4	Invalid frame
5	Abortive disconnect (DCE clear; X.21 only)
6	Not data set ready
7	Idle detected (primary station)

30-524
Status Information–Byte 1

Status byte 1 is not used.

30-525
Control Field

Format	Control Field Bit Configuration 0	1	2	3	4	5	6	7	Command or Response
I	Nr			P/F	Ns			0	I
S	Nr			P/F	0	0	0	1	RR
	Nr			P/F	0	1	0	1	RNR
NS	0	1	0	P	0	0	1	1	DISC
	0	1	0	F	0	0	1	1	RD
	0	1	1	F	0	0	1	1	UA
	1	0	0	P	0	0	1	1	SNRM
	1	1	1	P/F	0	0	1	1	TEST
	1	0	0	F	0	1	1	1	FRMR
	1	0	1	P/F	1	1	1	1	XID
	0	0	0	F	1	1	1	1	DM

Legend

DISC	Disconnect
DM	Disconnected mode
FRMR	Frame reject
I	Format column: information Command/Response column: sequenced information frame
Nr	Sequence number of the next expected frame
Ns	Sequence number of the last frame sent
NS	Nonsequenced
P/F	Poll bit (P) from the primary station or final bit (F) from the secondary station
RD	Request disconnect
RNR	Receive not ready
RR	Receive ready
S	Supervisory
SNRM	Set normal response mode
TEST	Test
UA	Unnumbered acknowledge
XID	Exchange identification

Note: *If errors occur on receive operations, the control field byte may not be valid.*

30-526
Station Address

If your system is the primary station, the address in this field is the address of the secondary station.

If your system is the secondary station, the address in this field is the address of your station.

30-527
Line Q Header

16 = Line 1 using device address 80

30-528
SDLC Error Counter Table

The error counter keeps track of the number of errors that occur in each of several groups. Each error is also written in the SDLC error history table. The following table defines the error groups and shows how they appear in status byte 0 in the error history table.

Counter Table Entry	Description	Status Byte 0 Bit(s)
Cyclic redundancy check errors	The frame check character that the local station calculated did not match the frame check character that was generated and sent by the remote station.	1
Invalid frame errors	After a start flag is sensed, an invalid frame error is written in the log if: • A second flag is received in less than 32 bits. • A flag is received that is not on a byte boundary. • An invalid sequence (01111111) is received. • An abort sequence (11111111) is received. • A frame was received that was longer than the length specified in the bind.	4
Lost data set ready	The modem or adapter is not ready, or a modem or cable problem caused a time-out error.	5, 6
Nonproductive receive time-out	A primary station in receive mode has detected a not-idle condition on the link that did not result in a valid frame.	0
Adapter check	For a transmit operation, no character was loaded into the buffer before it was time to send that character. For a receive operation, a character was received before the preceding character was moved from the buffer.	2
Idle detected	For an SDLC primary station, an idle was detected and no frame with a valid FCS, and (or) with the final bit on, was received before the idle time-out ended. On a switched line, the activity timer will terminate the operation after 32 seconds of no valid SDLC frames.	7
Frame sequence errors	The Nr-Ns count received was not as expected.	1, 4

30-529
SDLC I/O Counter Table

The I/O counter keeps track of the number of I/O operations that occur in each of several groups. The following table defines the entries in the I/O counter table.

Counter Table Entry	Description
I-frames transmitted	This entry contains the number of I-frames that have been transmitted, including retransmitted I-frames and frames ending in an error.
I-frames retransmitted	This entry contains the number of I-frames that have been transmitted a second time because of: • Idle state detected • Sequence error • Transmit adapter check For sequence errors, all frames that are transmitted again are included in this entry. The entry does not include frames that end in error.
Total frames transmitted	This entry contains the number of frames transmitted, including I-frames retransmitted and frames that end in error.
I-frames received	This entry contains the number of valid, error-free I-frames that have been received.
Total frames received	This entry contains the number of valid, error-free frames that have been received.

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30-530
Asynchronous Communications Error History Table

The following table shows the format of the asynchronous communications error history table. Use this table to locate the procedures that describe the fields contained in this table.

ERROR HISTORY TABLE FOR SDLC LINE 01

FROM:	XX/XX/XX	XX|XX|XX		TO: XX/XX/XX	XX|XX|XX	
DATE	TIME	SRC	COMMAND CODE	COMMAND MOD	COMPLETION CODE	SENSE BYTE	BUFFER LENGTH
YY/MM/DD	HH|MM|SS	.....		HEX		.....	
XX/XX/XX	XX|XX|XX	XXXX	XX	XX	XX	XX	XXXX
XX/XX/XX	XX|XX|XX	XXXX	XX	XX	XX	XX	XXXX
XX/XX/XX	XX|XX|XX	XXXX	XX	XX	XX	XX	XXXX

30-531 30-532 30-533 30-534 30-535 30-536

30-531
System Reference Code

The SRC column contains the system reference code (18xx). See system entry MAP 0113 for the meanings of the communications SRCs.

30-532
Command Code

Code	Description
80	Control command
81	Receive command
85	Transmit command
88	Pass configuration parameters command

30-533
Command Modifier

This column contains the command modifier. If the command code is hex 80 (control command), the following table describes the command modifier.

Hex	Description
80	Disable command
C0	Enable command
E0	Cancel command

If the command code is hex 81 (receive command), the following table describes the command modifier.

Hex	Description
0-6	7-bit binary count of the number of ticks needed before a time-out
7	0 = 131 milliseconds per tick 1 = 1.05 seconds per tick

If the command code is hex 85 (transmit command), the following table describes the command modifier.

Hex	Description
00	Normal transmit
40	Initial transmit
80	Send break

30-534
Completion Code

Code	Description
40	Operation completed correctly
41	Status is contained in sense byte 0
44	Communications controller check

30-535
Sense Byte 0

Hex	Description
01	Receive without data set ready
02	Not data set ready
03	Not clear to send
04	Break detected
08	Stop bit not valid
10	Receive overrun
20	Transmit adapter check
40	Receive parity error
FF	IOB canceled

30-536
Buffer Length

This 2-byte field contains the number of bytes transmitted or the receive buffer size.

30-538
Asynchronous Communications Error Counter Table

The error counter keeps track of the number of errors that occur in each of serveral groups. Each error is also written in the asynchronous communications error history table. The following table defines the error groups and shows how they appear in sense byte 0 in the error history table.

Counter Table Entry	Description	Sense Byte 0
Number of breaks sent	The number of breaks transmitted on the line.	–
Number of breaks received	The number of breaks received on the line.	–
Parity errors	The number of buffers received with bad parity detected.	40
Transmit adapter checks	The number of times a transmit operation showed no activity for at least 5 seconds.	20
Receive overruns	The number of times the number of bytes received was larger than the size of the available buffer space.	10
Invalid stop bit detected	The number of buffers received with at least 1 byte having an invalid stop bit.	08
Not clear to send	The 'clear to send' signal failed to become active when a transmit operation was attempted.	03
Not data set ready	The 'data set ready' signal failed to become active. This error occurs when a modem is not ready.	02
Negative acknowledgments received	The number of frames that were rejected by the remote system.	–
Time-outs	The number of frames sent that received no acknowledgment from the remote system.	–
Checksum errors	The number of frames received from the remote system that contained a checksum value that was not correct.	–
Duplicate data	The number of frames received from the remote system that contained a duplicate frame number of a previous frame.	–
Data ignored	The number of frames received that did not start with a valid start-of-header character.	–
Sequence number error	The number of frames received that contained a frame number that was out of sequence.	–

30-539
Asynchronous Communications I/O Counter Table

The I/O counter keeps track of the number of I/O operations. The following table defines the entries in the I/O counter table.

Counter Table Entry	Description
Transmit IOBs issued	The number of IOBs issued as transmit operations. This includes sending data and sending responses when data is received.
Total data blocks sent	The total number of data blocks sent to the remote system whether or not the operation was successful.
Successful blocks sent	The number of data blocks sent to the remote system without errors.
Unsuccessful blocks sent	The number of data blocks sent in which an error occurred. See the error counter table (30-538) and the error history table (30-530) for possible errors.
Receive IOBs complete	The number of IOBs completed that received data. This count does not indicate the amount of data received.
Total data blocks received	The total number of data blocks received from the remote system whether or not the operation was successful.
Successful blocks received	The number of data blocks received from the remote system without errors.
Unsuccessful blocks received	The number of data blocks received in which an error occurred. See the error counter table (30-538) and the error history table (30-530) for possible errors.

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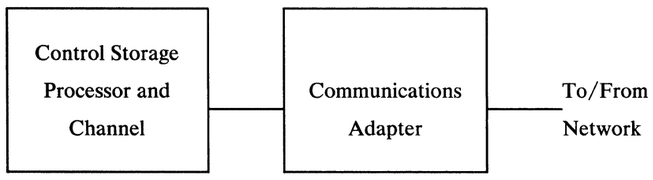
FRU DESCRIPTIONS

30-600
Introduction

This section describes the functions of the single-line communications adapter. It includes only the major areas of the FRU that are necessary to understand the function of the FRU in the system. See 30-855 through 30-875 for descriptions of how the FRUs work with each other during normal data operations.

30-610
Communications Controller

The single-line communications feature (SLCA) does not use a communications controller; the control storage processor (CSP) performs the communications system control functions.

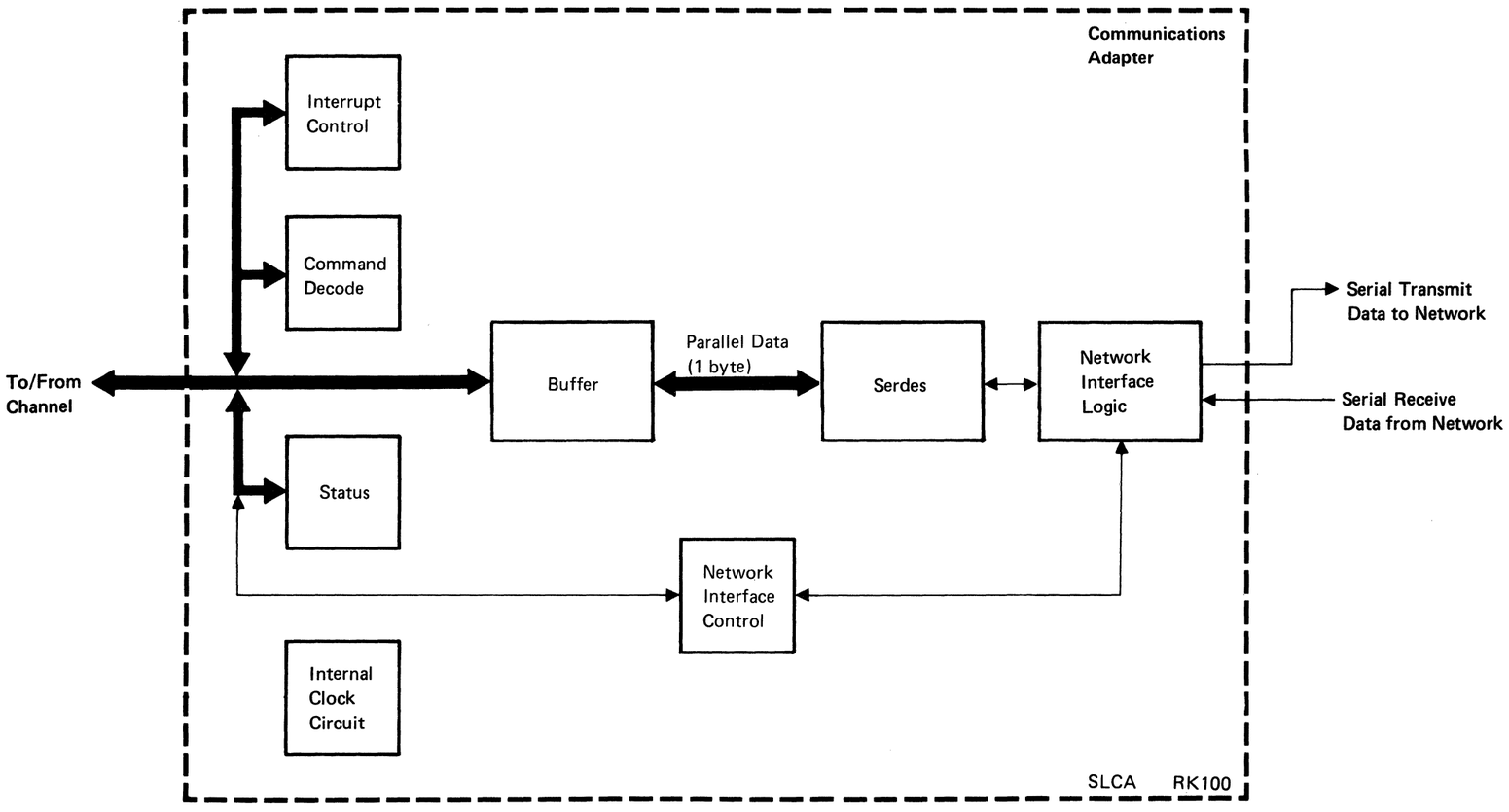


30-620
Communications Adapter

The communications adapter is a single card that receives channel commands and data, and transmits data to or receives data from an external network. The adapter also keeps track of communications line status and sends data and status to the channel.

When the single-line communications feature (SLCA) is installed on the system, the communications adapter attaches directly to the channel.

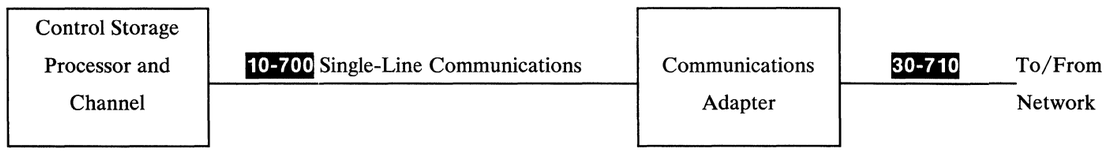
The communications adapter can operate with an internal system clock (running at 1200 bps) or with clock pulse supplied by an external modem.



INTERFACE DESCRIPTIONS

30-700
Introduction

This section describes the interface signals between the control storage processor (CSP) and the communications adapter, and between the communications adapter and the line adapters. The following figure shows the locations of the interfaces described in this section.



30-710
CSP to Communications Adapter Interface Signals

CSP to Communications Adapter

Signal Name	Description
–I/O CBO bit 0-2	Command Bus Out These lines, together with the '–I/O control out' and '–I/O service out' lines, indicate the type of data that is on the DBO bus.
–I/O control out	When active, this line indicates to the adapter that the CBO bus contains information to describe either a base cycle steal or an I/O instruction. This line also can be used with the '–I/O service out' line to force the adapter off the channel.
–I/O DBO bit P, 0-7	Data Bus Out These lines contain data from the channel interface to the adapter during I/O load and I/O control load instructions, and during single byte cycle steal operations. During 2-byte operations, these lines combine with the DBI bus to form an 18-bit bidirectional data path.
–I/O service out	Input operation (data from the adapter to the CSP): This line indicates to the adapter that the data on the DBI bus has been recognized, and the adapter can either present new data or terminate the operation. Output operation (data from the CSP to the adapter): This line indicates to the adapter that the data on the DBO bus is valid. The '–I/O service out' line remains active as long as the data on DBO is valid.
–I/O strobe	This line supplies a timing pulse for the adapter during I/O instructions and during base cycle steal operations.

Communications Adapter to CSP

Signal Name	Description
–I/O DBI bit 0-7	Data Bus In These lines contain data from the adapter to the CSP during I/O sense and I/O control sense instructions, and during single byte cycle steal operations. During 2-byte operations, these lines combine with the DBO bus to form a bidirectional data path that is 18 bits wide.
–I/O intrpt req 2	This line is an interrupt request from the adapter to the CSP to indicate that the adapter needs service from the CSP.
–I/O service in	Input operation (data from the adapter to the CSP): This line indicates to the CSP that the data on the DBI lines and any other input lines will be available to the CSP in the time needed for that operation. Output operation (data from the CSP to the adapter): This line indicates to the CSP that the data on the DBO lines has been received by the adapter.
–I/O TBI 0	Tag Bus In 0 This line indicates to the channel whether the low or high byte of the address is to be used during a cycle steal operation.
–I/O TBI 1	Tag Bus In 1 This line indicates the direction of the data transfer during a cycle steal operation.
–I/O TBI 4	Tag Bus In 4 This line indicates whether cycle steal operations are to or from main storage or control storage.
–I/O ARS 4-7	Address Register Select These lines indicate which cycle steal registers are to be used during a cycle steal operation.
–I/O base cycle steal req	This line is used to request a cycle steal data transfer operation.

DATA PROTOCOLS

SLCA can transmit data using binary synchronous communications (BSC) or synchronous data link control (SDLC) transmission protocols. These protocols do not affect the sequences of events for the hardware, but are only methods of controlling and formatting the data being transferred once the hardware has been activated. This formatting and control is a software function that is shared by the data communications microcode and the processing unit software.

In addition, another layer of protocol can be added to networks that use SDLC to control operations between stations in the network. This layer of protocol can be systems network architecture (SNA). This protocol also is a software function shared by the data communications microcode and the processing unit software.

Because the protocols are only data streams to the hardware, none of the protocols can be checked by probing the hardware. To check the protocol, you must check the data stream by using a line monitor such as the PT-2 line monitor (01-030).

30-855
SLCA BSC Receive Operation

Channel	Communications Adapter
1 Sets up hardware and enables interrupts to indicate when 2 SYN characters have been sensed and a character has been received	
	2 Senses the first SYN character
	3 Senses the second SYN character to complete the character phase
	4 Receives data serially (bit-by-bit) and assembles the bits into data bytes
	5 Generates a character interrupt when a byte of data is assembled
6 Sets up the adapter to enable an interrupt after a delay	
	7 Stores the data from the adapter buffer in a buffer in main storage
	8 Analyzes each character to sense special characters, change of data mode, change of direction, or transparency mode
	9 When the buffer in main storage is full, data may be lost
	10 Collects block check character (BCC) information
	11 Compares the collected BCC with the received BCC
	12 Senses receive adapter checks
	13 Senses time-out conditions and generates a time-out interrupt when a time-out condition occurs
14 Marks the IOB as complete if a change-of-direction character is sensed, a time-out occurs, or an end of message is received	

30-865
SLCA BSC Transmit Operation

Channel	Communications Adapter
1 Sends a request to send command to the adapter	
2 Enables interrupts	
	3 Activates the 'req to send' signal to the modem
	4 Senses the 'clear to send' signal from the modem
	5 Generates an interrupt to the channel
	6 Encodes BSC characters (SYN, pad characters, and BCC only)
7 Sends data from the main storage buffer to the adapter buffer	
8 Enables the adapter to interrupt when it needs another character of data	
	9 Inserts 2 SYN characters every 1 second in the data stream
	10 Transmits data bytes serially
	11 Generates an interrupt when it needs another byte of data
	12 Senses transmit adapter checks
	13 Analyzes each character for change of data mode, change of direction, or transparency mode
	14 Generates the block check character (BCC) and stores it to be transmitted at the end of the transmit operation
15 Senses the end of the transmission and changes the adapter to receive mode when no data is in the transmit buffer	
16 Marks the IOB as complete when receive mode is not wanted	

30-870
Remote Work Station SNA/SDLC Session Sequence

Primary Station	Secondary Station
1 XID (SDLC exchange ID)	
	2 XID (exchange ID response)
3 SNRM (SDLC set normal response mode)	
	4 UA (unnumbered acknowledgment)
5 SDLC information frame: • ACTLU (SNA activate logical unit)	
	6 SDLC information frame: • +RSP (SNA positive response)
7 SDLC information frame: • BIND (SNA bind command)	
	8 SDLC information frame: • +RSP (SNA positive response)
9 SDLC information frames: • WRITE (SNA data transfer) • Data • Data	
10 SDLC response request	
	11 SDLC information frame: • +RSP (SNA positive response)
12 SDLC information frame: • UNBIND (SNA unbind command)	
	13 SDLC information frame: • +RSP (SNA positive response)
14 SDLC information frame: • DACTLU (SNA deactivate logical unit)	
	15 SDLC information frame: • +RSP (SNA positive response)
16 SDLC DISC (disconnect)	
	17 SDLC UA (unnumbered acknowledgment)

30-875
System/36 to Host SNA/SDLC Upline Sequence

Host System	System/36
1 SDLC information frame: • ACTPU (SNA activate physical unit)	
	2 SDLC information frame: • +RSP (SNA positive response)
3 SDLC information frame: • ACTLU (SNA activate logical unit)	
	4 SDLC information frame: • +RSP (SNA positive response)
5 SDLC information frame: • Log on (optional)	
	6 SDLC information frame: • Log on response (if optional log on used)
7 SDLC information frame: • BIND (SNA bind command)	
	8 SDLC information frame: • +RSP (SNA positive response)
9 SDLC information frame: • STSN (SNA set test sequence number) **Note:** *Used during initial sequence or data recovery.*	
	10 SDLC information frame: • +RSP (SNA positive response)
11 SDLC information frames: • SDT (SNA start data traffic)	
	12 SDLC information frame: • +RSP (SNA positive response)
Note: *The following step could be started by System/36 with the host sending the response.*	
13 SDLC information frames: • RSHUTD (SNA request shutdown)	
	14 SDLC information frame: • +RSP (SNA positive response)
15 SDLC information frame: • UNBIND (SNA unbind command)	
	16 SDLC information frame: • +RSP (SNA positive response)
17 SDLC information frame: • DACTLU (SNA deactivate logical unit)	
	18 SDLC information frame: • +RSP (SNA positive response)
19 SDLC information frame: • DACTPU (SNA deactivate physical unit)	
	20 SDLC information frame: • +RSP (SNA positive response)

REFERENCE INFORMATION

30-910
SNA Commands

This section lists the SNA (systems network architecture) commands that System/36 supports. It does not give a complete definition of each command, or information about SNA networks. For that type of information, see *Systems Network Architecture Handbook Customer Service Division*, S229-4522.

See 30-870 or 30-875 for a typical BIND sequence.

Primary Mode

System/36 supports the following SNA commands when operating in primary mode (communicating to a secondary station).

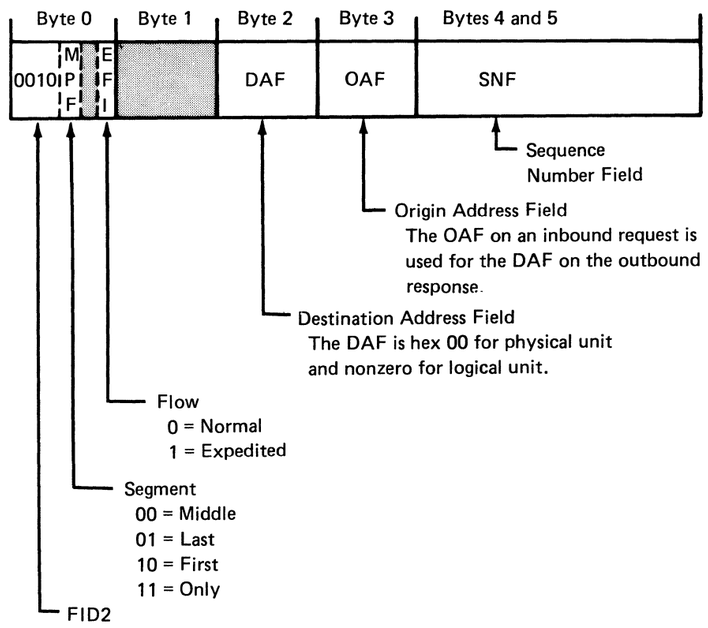
Request Code (Hex)	Command	Function
04	LUSTAT	Logical unit status (data flow control)
0D	ACTLU	Activate logical unit (session control)
0E	DACTLU	Deactivate logical unit (session control)
31	BIND	Bind (session control)
32	UNBIND	Unbind (session control)
41	REQMS	Request maintenance statistics (maintenance services)
83	CANCEL	Cancel (data flow control)
84	RECFMS	Recorded formatted maintenance statistics (maintenance services)
C2	RSHUTD	Request shutdown (data flow control)
C9	SIG	Signal (data flow control)

Secondary Mode

System/36 supports the following SNA commands when operating in secondary mode (communicating to a host system).

Request Code (Hex)	Command	Function
04	LUSTAT	Logical unit status (data flow control)
05	RTR	Ready to receive (data flow control)
0D	ACTLU	Activate logical unit (session control)
0E	DACTLU	Deactivate logical unit (session control)
11	ACTPU	Activate physical unit (session control)
12	DACTPU	Deactivate physical unit (session control)
31	BIND	Bind (session control)
32	UNBIND	Unbind (session control)
41	REQMS	Request maintenance statistics (maintenance services)
80	REQTEST	Request test (maintenance services)
83	CANCEL	Cancel (data flow control)
84	CHASE	Chase (data flow control)
84	RECFMS	Recorded formatted maintenance statistics (maintenance services)
A0	SDT	Start data traffic (session control)
A1	CLEAR	Clear (session control)
C0	SHUTD	Shutdown (data flow control)
C1	SHUTC	Shutdown complete (data flow control)
C2	RSHUTD	Request shutdown (data flow control)
C8	BID	Bid (data flow control)
C9	SIG	Signal (data flow control)

System/370 Upline Transmission Header



Note: Shaded areas are not used.

30-920
SNA Profiles Supported by System/36

The following SNA (systems network architecture) profiles are supported by System/36:

- Upline supports FM (function management) profiles 3 and 4, and TS (transmission subsystem) profiles 3 and 4
- SNA finance system (for example, IBM 3600 and IBM 4700 systems) supports FM profile 3 and TS profile 3 only
- Remote work station (RWS) supports FM profile 7 and TS profile 7 only
- Peer (System/36 to System/36) supports FM profile 18 and TS profile 7 only

For additional information, see the manual *System Data Areas*, LY21-0592.

30-950
Single-Line Communications Configuration Codes

The following tables list the configuration codes that describe the type of single-line communications included in your system. These codes are:

- Country code: Indicates the country for which the system was made.
- Feature code: Describes the communications adapter or communications attachment type.
- Specify code: Adds more information to the feature code.

Country Codes

Code	Country
616	Austria
624	Belgium
649	U.S. and Canada
702	Finland
706	France
724	Germany
756	Israel
760	Japan
788	Netherlands
848	Switzerland
866	United Kingdom

Feature Codes

Code	Feature
2550	Base SLCA communications attachment
4552	EIA/CCITT communications adapter
4554	X.21 communications adapter
4555	DDSA communications adapter

Specify Codes

Code	Description
9000	This line normally communicates with an IBM System/370
9001	This line normally communicates with an IBM System/34
9002	This line normally communicates with another IBM System/36
9003	This line normally communicates with an IBM System/38
9004	This line normally communicates with an IBM Series/1
9005	This line normally communicates with an IBM 5250
9006	This line normally communicates with an IBM 5260
9007	This line normally communicates with an IBM 5280
9008	This line normally communicates with an IBM 5322
9009	This line normally communicates with an IBM 5520
9010	This line normally communicates with an IBM 6580
9011	This line normally communicates with an IBM Office System/6 or an IBM 6670
9012	This line normally communicates with an IBM 3601 or an IBM 4701
9013	This line normally communicates with an IBM 3694
9014	This line normally communicates with an IBM terminal or system that is not included in specify codes 9000 through 9013
9015	This line normally communicates with equipment that is not made by IBM

Code	Description
9101	Line 1 is a nonswitched, point-to-point line
9111	Line 1 is a switched line
9121	Line 1 is a nonswitched, multipoint secondary line
9131	Line 1 is a nonswitched, multipoint control line
9141	Line 1 is a locally attached line
9201	Line 1 is operating at 1200 bps
9211	Line 1 is operating at 2400 bps
9221	Line 1 is operating at 4800 bps
9231	Line 1 is operating at 9600 bps
9261	Line 1 is operating at 1200 bps using the internal clock (feature code 5321)
9697	Adapter card in SLCA line
9711	Line 1 is an EIA/CCITT communications adapter (feature code 4552)
9751	Line 1 is a DDSA communications adapter (feature code 4555)
9781	Line 1 is an X.21 communications adapter (nonswitched) (feature code 4554)

EIA/CCITT Communications Adapter

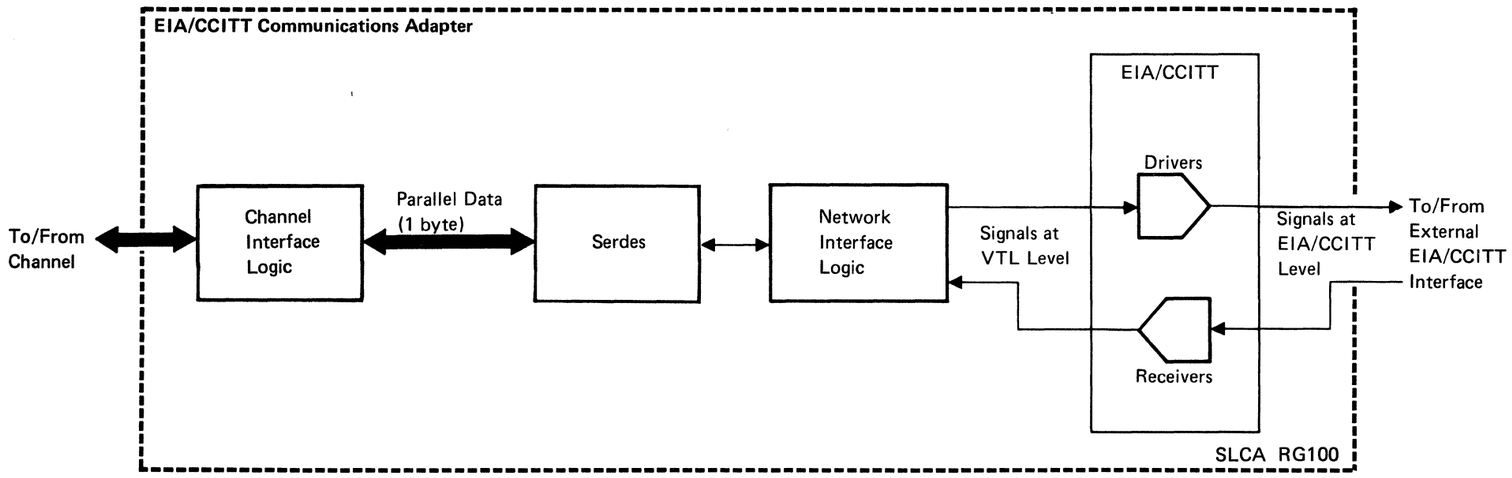
31-000
Contents

OVERVIEW AND FRU DESCRIPTIONS

31-105
Introduction

The EIA/CCITT communications adapter (feature code 4552) converts internal voltage levels to voltage levels specified by EIA specification RS-232-C and CCITT principles; it converts the voltage levels of the communications adapter card to the voltage levels needed by external modems. The circuits also invert the signals as they pass through the adapter card.

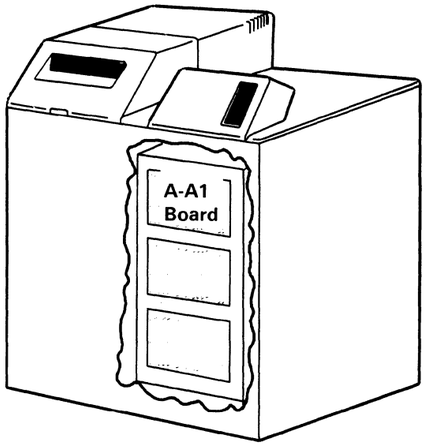
A 1200-bps internal clock is supplied as part of the adapter logic. If an internal clock is needed, it can be selected when configuring the line.



LOCATIONS

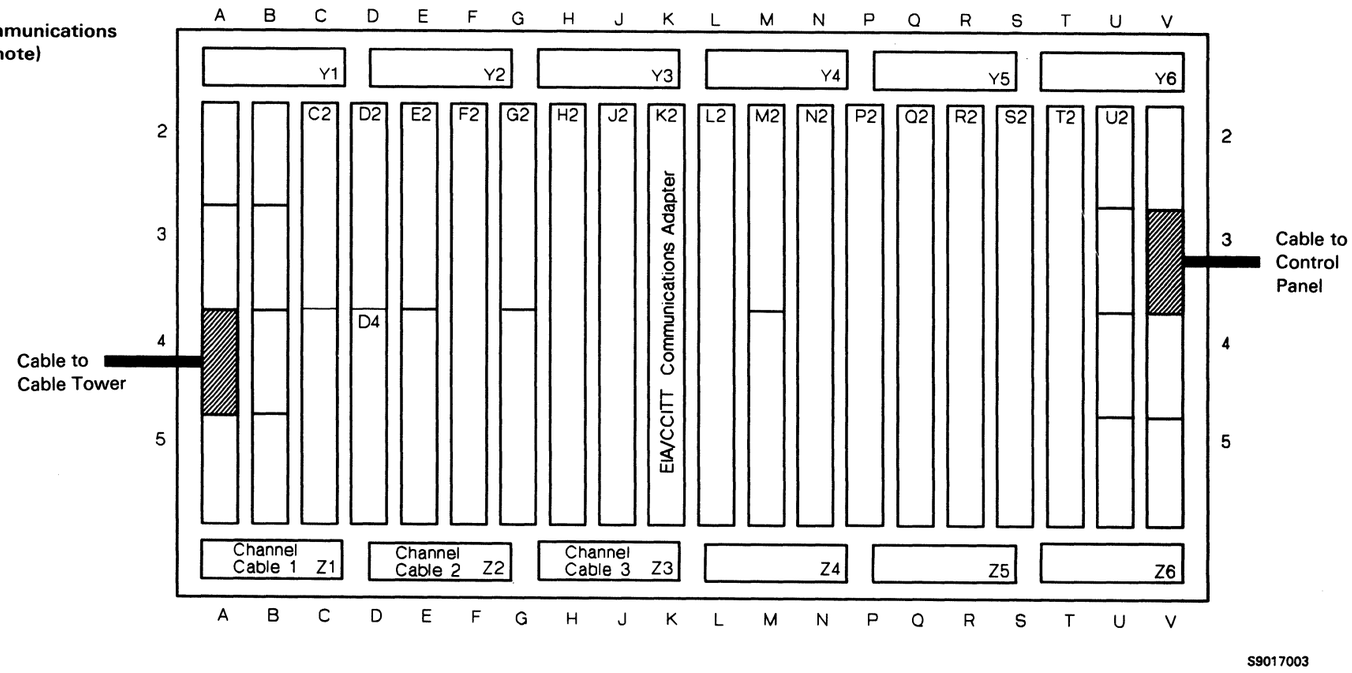
31-205
Card Locations

The single-line communications (SLCA) feature can be installed only on the A1 board.

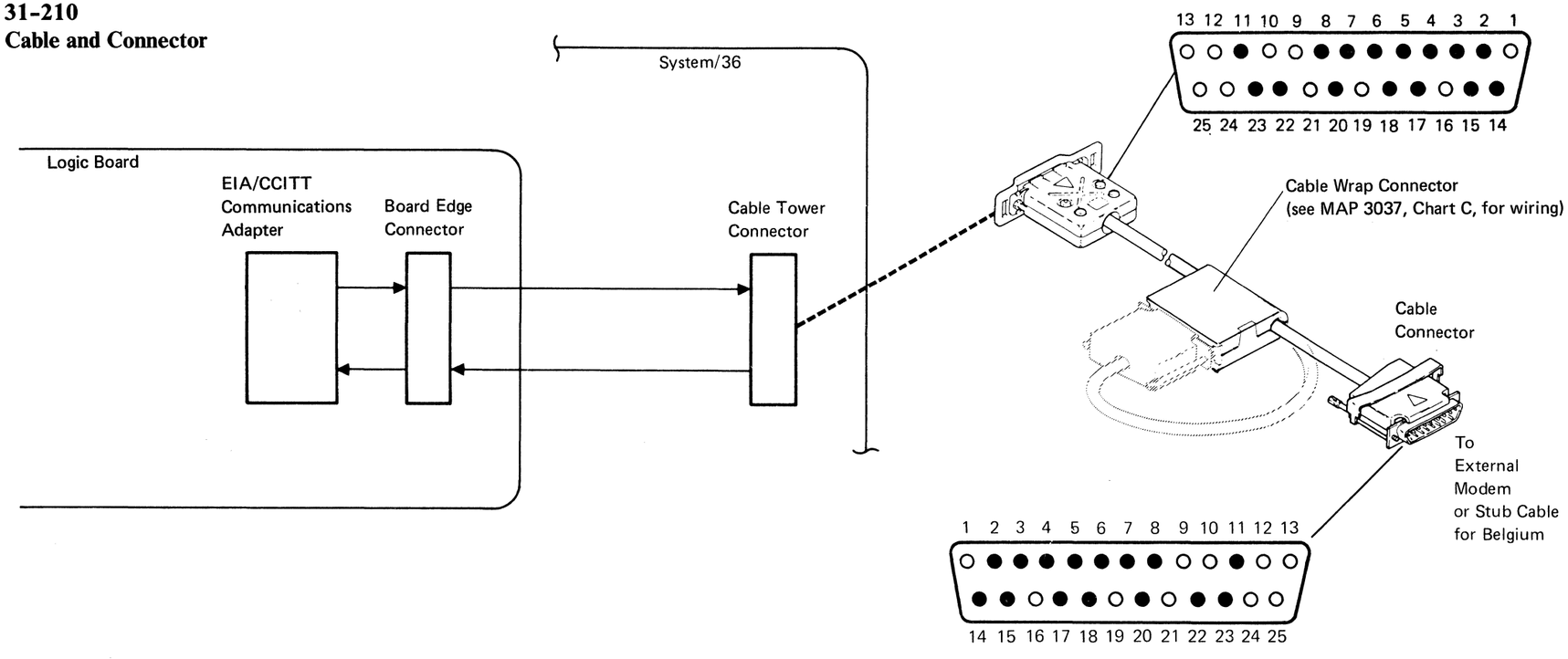


Note: *Check the machine configuration to determine the correct number of cards installed.*

Single-Line Communications (A1 Board; see note)



31-210
Cable and Connector



FLD Pages

Part	SLCA
Control panel cable	RV900
EIA/CCITT communications adapter	RK100
Board edge connector	RG905
Cable tower	RG905

Signal Pins

Pin	Signal Name
2	Xmit data (transmit data)
3	Rcv data (received data)
4	RTS (request to send)
5	CTS (clear to send)
6	DSR (data set ready)
7	Signal ground
8	RLSD (received line signal detector)
11	Sel stby (select standby)

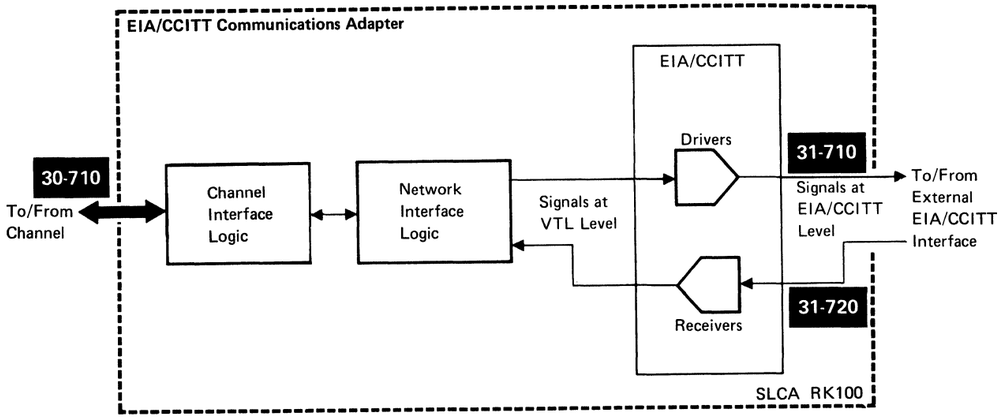
Pin	Signal Name
14	New sync
15	TSET (transmit signal element timing)
17	RSET (receive signal element timing)
18	Test cntl (test control)
20	DTR (data terminal ready)
22	Ring ind (ring indicator)
23	Rate sel (rate select)

Logic Cards

Part	SLCA
EIA/CCITT communications adapter	A1K2
Board edge connector	A1A4
Cable tower connector (green triangles indicate line number)	Line 1

INTERFACE DESCRIPTIONS

31-700
EIA/CCITT Network Interfaces



31-710
Adapter to Modem Interface Signals

Signal Name	Description
+DTR	Data Terminal Ready This signal indicates to the modem that the EIA/CCITT adapter is ready to transmit and receive data.
+New sync	This signal resets automatic gain control (AGC) circuits in 4-wire multipoint control station modems (some external modems only).
+Rate sel	Data Signal Rate Selector The EIA/CCITT adapter uses this signal to instruct the modem to select a high or low transmission rate. When this signal is active, the high rate is selected.
+RTS	Request to Send The EIA/CCITT adapter uses this signal to activate the modulator in the modem. If the 'data set ready' signal is active, the 'request to send' signal causes the modem to activate the carrier signal.
+Sel stby	Select Standby This signal instructs a nonswitched modem with switched network backup (SNBU) to change to the switched network connection.
+Test cntl	Test Control This signal selects the modem wrap function. When the modem wrap test is running, the transmit function of the modem is sent back to the receive function of the modem.
+Xmit data	Transmitted Data The EIA/CCITT adapter sends the data to the modem on this line. When no data is being transmitted, the adapter holds this signal at a mark level to indicate idle time or between-character time.

31-720
Modem to Adapter Interface Signals

Signal Name	Description
+RLSD	Received Line Signal Detector The modem uses this signal to indicate to the adapter that the modem is receiving an acceptable carrier signal. If this signal is not active, the 'rcv data' signal is held at a mark level.
+CTS	Clear to Send The modem activates this signal in response to the 'request to send' signal when it is ready to transmit data. When this signal is active, the adapter can send data.
+DSR	Data Set Ready Nonswitched lines: When active, this signal indicates that the modem is powered on and is ready to transmit and receive data. Switched lines: When active, this signal indicates that the modem is connected to the channel and is ready to transmit data.
+RSET	Receive Signal Element Timing This is an external clock signal from the modem to the adapter that moves data from the modem to the adapter.
+Rcv data	Received Data The modem sends demodulated (digital) data to the adapter on this line. When the modem is not receiving data, the modem normally holds this signal at a mark level to indicate idle time or between-character time.
+Ring ind	Ring Indicate This signal indicates that the modem is receiving a call.
+TSET	Transmit Signal Element Timing This is an external clock signal from the modem to the adapter that moves data from the adapter to the modem.

SEQUENCE OF EVENTS–SWITCHED LINES

The following sequence of events charts show typical sequences only. These charts should not be used to diagnose machine problems; actual sequences may not be the same.

31-810
Data Transmission:
EIA/CCITT Adapter to Modem

EIA/CCITT Adapter	Modem
1 Activates the 'DTR' (data terminal ready) signal	
	2 Activates the 'DSR' (data set ready) signal
3 Activates the 'RTS' (request to send) signal	
	4 Starts generating carrier on the line
	5 Waits for delay to time-out
	6 Activates the 'CTS' (clear to send) signal
7 Generates serial data to modem	
	8 Modulates data with carrier and places it on the line
9 The data transmission is complete	
10 Drops the 'RTS' (request to send) signal	
	11 Turns off carrier
	12 Drops the 'CTS' (clear to send) signal
	13 Turns on echo clamp to inhibit receive circuits
	14 After a delay, turns off echo clamp
15 The transmission sequence is complete	

31-820
Data Receiving:
Modem to EIA/CCITT Adapter

EIA/CCITT Adapter	Modem
1 Activates the 'DTR' (data terminal ready) signal	
	2 Activates the 'DSR' (data set ready) signal
	3 Senses carrier on the line
	4 Activates the 'RLSD' (received line signal detector) signal
	5 Activates the 'RSET' (receive signal element timing) signal
	6 Demodulates data from the line
	7 Generates serial data on the 'rcv data' (received data) line to the line adapter
	8 Senses the loss of carrier on the line
	9 Drops the 'RLSD' signal
	10 Drops the 'RSET' signal **Note:** *Some modems can option the continous receive bit clock. This causes the receive clock signal to always be active on the interface.*
11 The receiving sequence is complete	

SEQUENCE OF EVENTS–NONSWITCHED LINES (4-WIRE)

The following sequence of events charts show typical sequences only. These charts should not be used to diagnose machine problems; actual sequences may not be the same.

31-830
Data Transmission:
EIA/CCITT Adapter to Modem

EIA/CCITT Adapter	Modem
1 The 'DTR' (data terminal ready) signal is always on	
	2 The 'DSR' (data set ready) signal is always on
3 The 'RTS' (request to send) signal is always on	
	4 Continuously generates carrier on the line
	5 The 'CTS' (clear to send) signal is always on
	6 The 'TSET' (transmit signal element timing) signal is always present if an external clock is supplied
7 Generates serial data to modem	
	8 Modulates data with carrier and places it on the line
9 The transmission sequence is complete	

31-840
Data Receiving:
Modem to EIA/CCITT Adapter

EIA/CCITT Adapter	Modem
	1 The 'DSR' (data set ready) signal is always on
	2 Carrier is always on the line
	3 The 'RLSD' (received line signal detector) signal is always on
	4 The 'RSET' (receive signal element timing) signal is always present if an external clock is supplied
	5 Demodulates data from the line
	6 Generates serial data on the 'rec data' (receive data) line to the line adapter
7 The receiving sequence is complete	

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Digital Data Service Adapter

34-000
Contents

OVERVIEW AND FRU DESCRIPTIONS

34-110
Digital Data Service Adapter

The Digital Data Service Adapter (feature code 4555) is an integrated adapter that lets the system interface to a digital data network through a channel service unit supplied by the network. The digital data network permits transmission of data over special data lines. These lines do not need modulation of the data with a carrier as do modems and voice-grade lines. The digital data network is a 4-wire, full-duplex network that operates in synchronous mode. However, the system operates in half-duplex mode only. The digital data network is available in the United States.

34-115
Data Transmission

Data is transmitted serially by bit and serially by character over the digital data network. The network supplies the clock pulses to move data to and from the network.

The transmission rates for the Digital Data Service Adapter (DDSA) are 2400, 4800, and 9600 bps. The transmission rates are set by the system software.

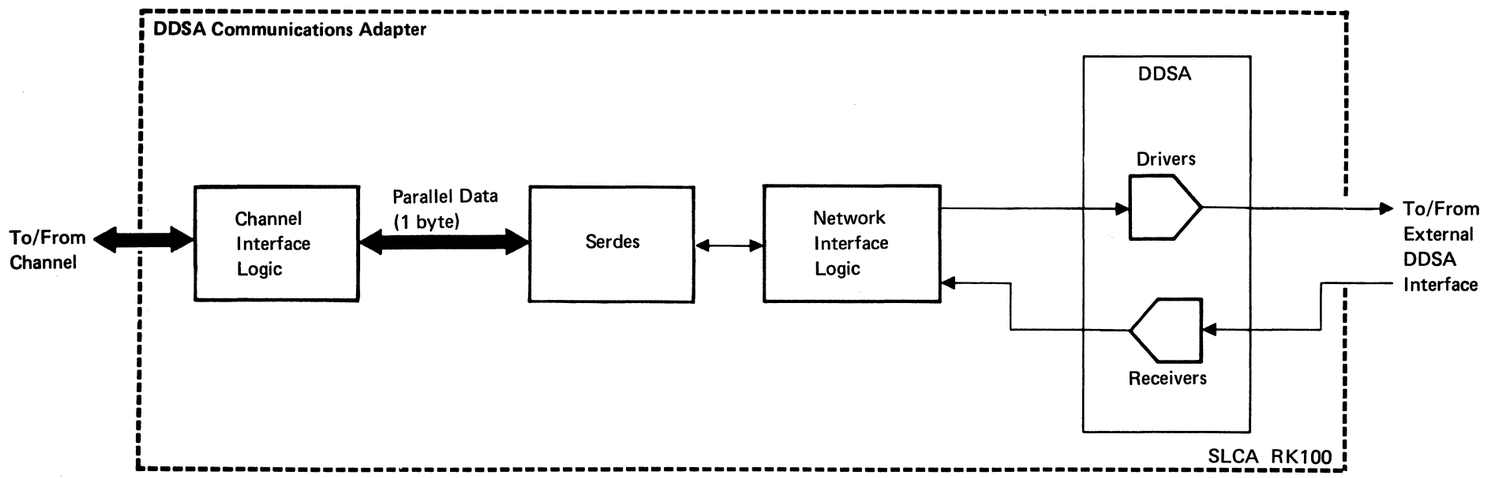
34-118
Network Connection

The Digital Data Service Adapter (DDSA) can be used in a multipoint network or in a point-to-point network. The loopback function of DDSA is enabled or disabled as follows:

- Multipoint network: The system software disables the loopback function of DDSA.
- Point-to-point network: The system software enables the loopback function of DDSA.

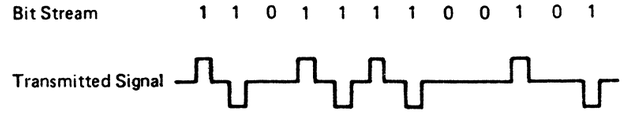
34-120
Direct Local Connection

The Digital Data Service Adapter (DDSA) can be attached directly to another DDSA device by using an accessory adapter cable (IBM part 4236967). Each machine can have up to 40 feet of cable attached to it.



34-125
Transmission Signal

The signal transmitted from the Digital Data Service Adapter (DDSA) to the digital data network is a return-to-zero signal that has two levels of polarity. When transmitting a 0-bit, the signal is at 0 volts. However, when transmitting a 1-bit, the signal is either positive or negative because of the polarity of the last 1-bit transmitted. For example, if a negative 1-bit is transmitted, the next 1-bit will be positive.



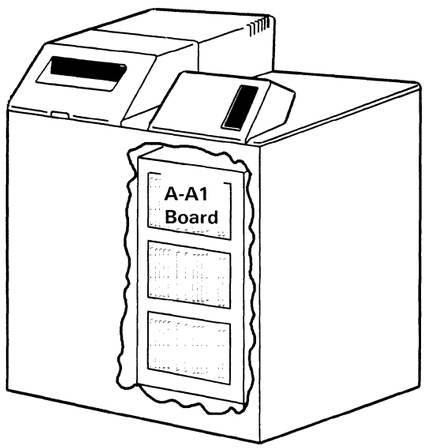
The DDSA uses 3 characters to control the digital data network. These characters are called *violation characters* because they differ from the normal rules for data transmission on the digital data network; that is, 2 consecutively transmitted 1-bits have the same polarity (either negative or positive). The violation characters are:

- Idle: Generated by the adapter to keep the line active when the adapter is not transmitting data (as long as the 'request to send' line is not active).
- Zero suppression: Transmitted by the adapter to maintain bit synchronization. This character ensures that at least one 1-bit is transmitted when the data contains 6 consecutive 0-bits (2400 to 9600 bps).
- Out of service: Generated and transmitted by the digital data network to indicate a problem in the network.

LOCATIONS

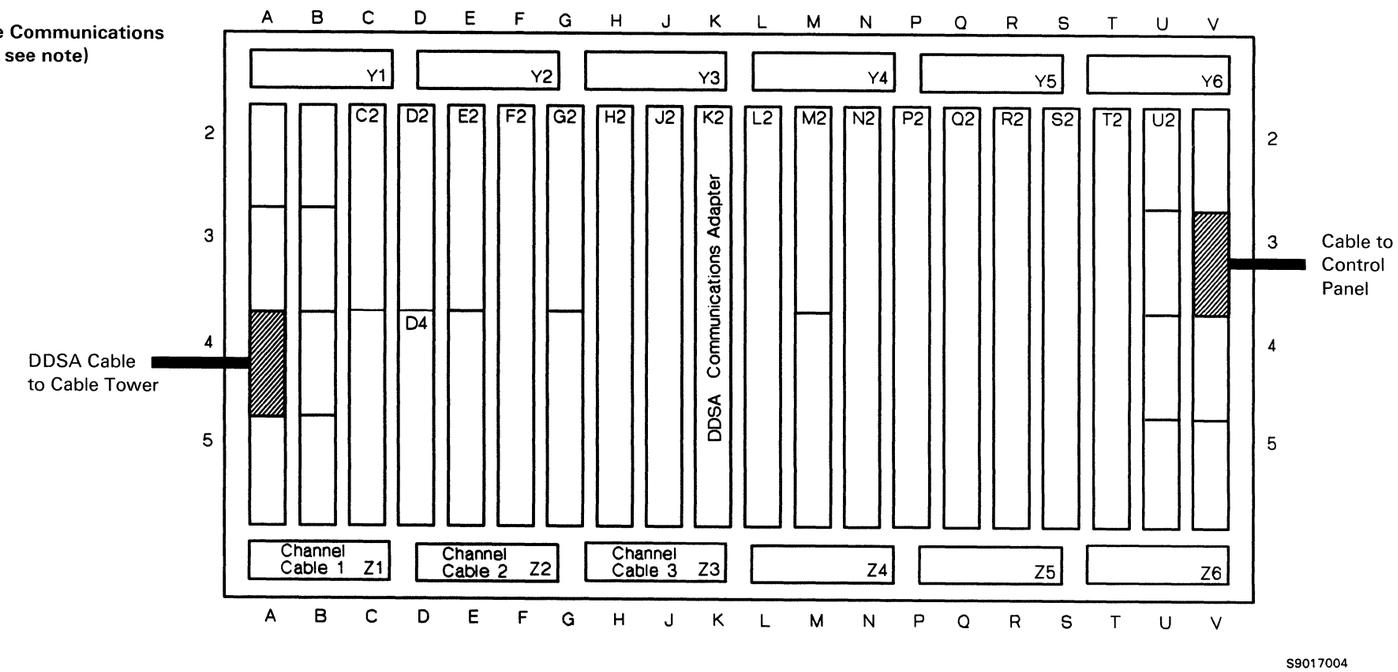
34-205
Card Locations

The single-line communications (SLCA) feature can be installed only on the A1 board.



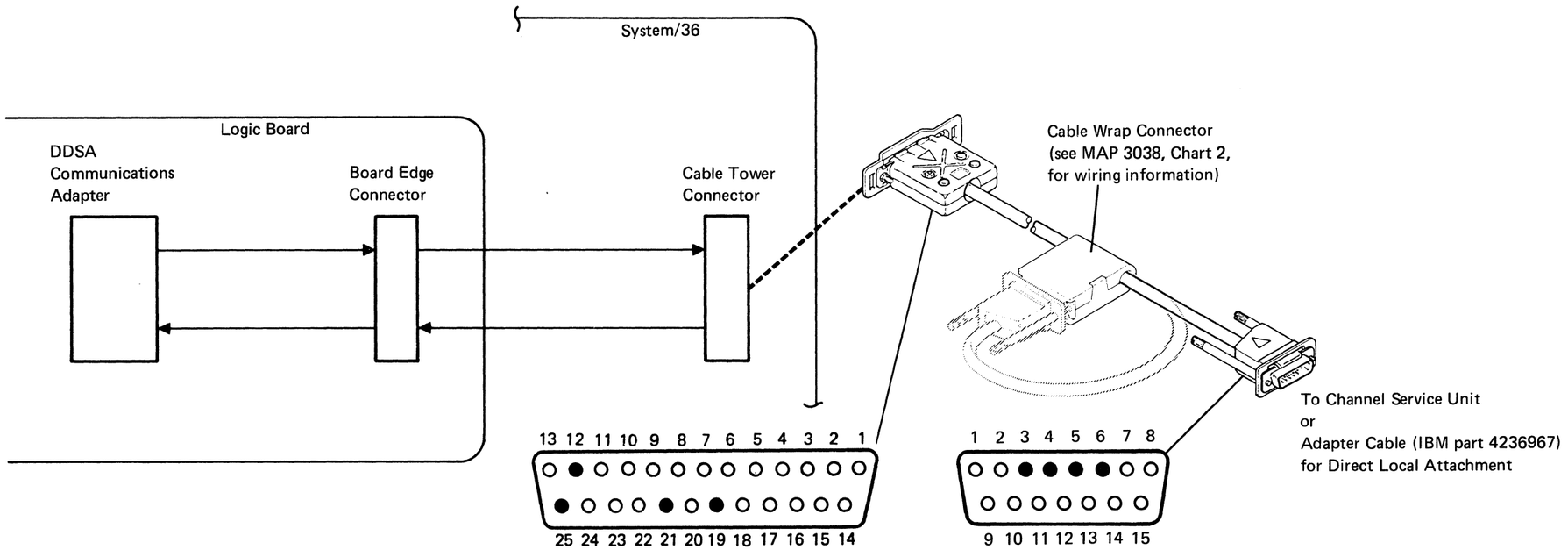
Note: *Check the machine configuration to determine the correct number of cards installed.*

Single-Line Communications (A1 Board; see note)



S9017004

34-210
Cable and Connector



FLD Pages

Part	SLCA
Control panel cable	RV900
DDSA communications adapter	RK100
Board edge connector (I/O cable)	RG905
Cable tower	RG905

Signal Pins

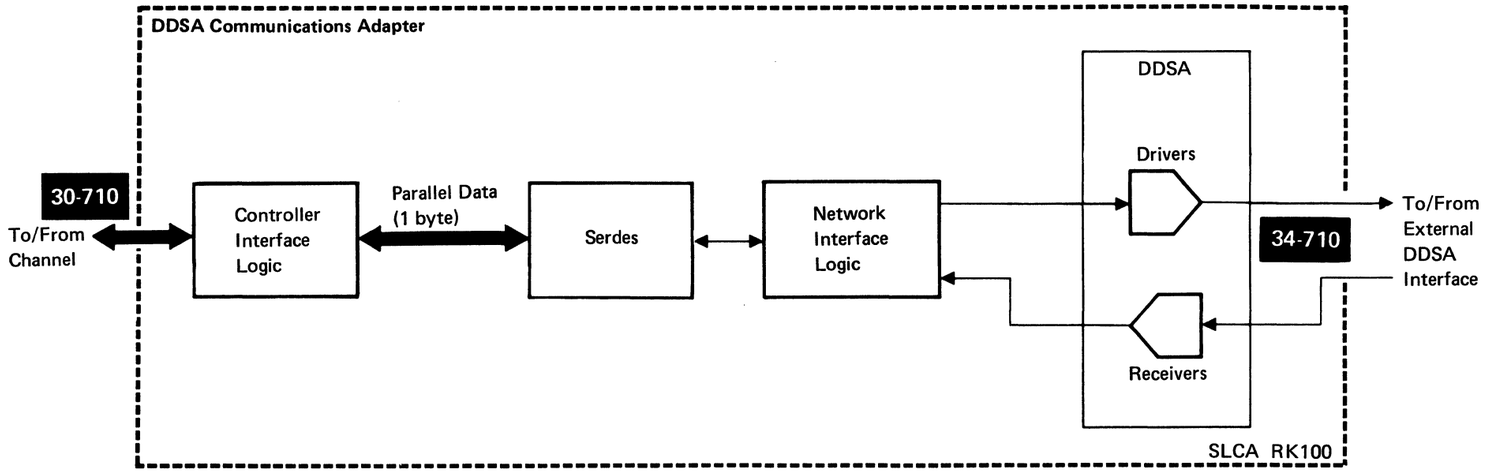
Cable Tower	Cable End	Signal Name
12	3	+Rcv data (receive data)
25	4	-Rcv data (receive data)
19	5	+Xmit data (transmit data)
21	6	-Xmit data (transmit data)

Logic Cards

Part	SLCA
DDSA communications adapter	A1K2
I/O cable	A1A4
Cable tower connector (green triangles indicate line number)	Line 1

INTERFACE DESCRIPTIONS

34-700
DDSA Interfaces



34-710
DDSA Card to Network Interface Signals

Signal Name	Description
+Xmit data −Xmit data	Transmit data lines
+Rcv data −Rcv data	Receive data lines

SEQUENCE OF EVENTS

34-800
Introduction

See 30-865 for data transmission sequence of events;
see 30-855 for data receiving sequence of events.

X.21 Communications Adapter

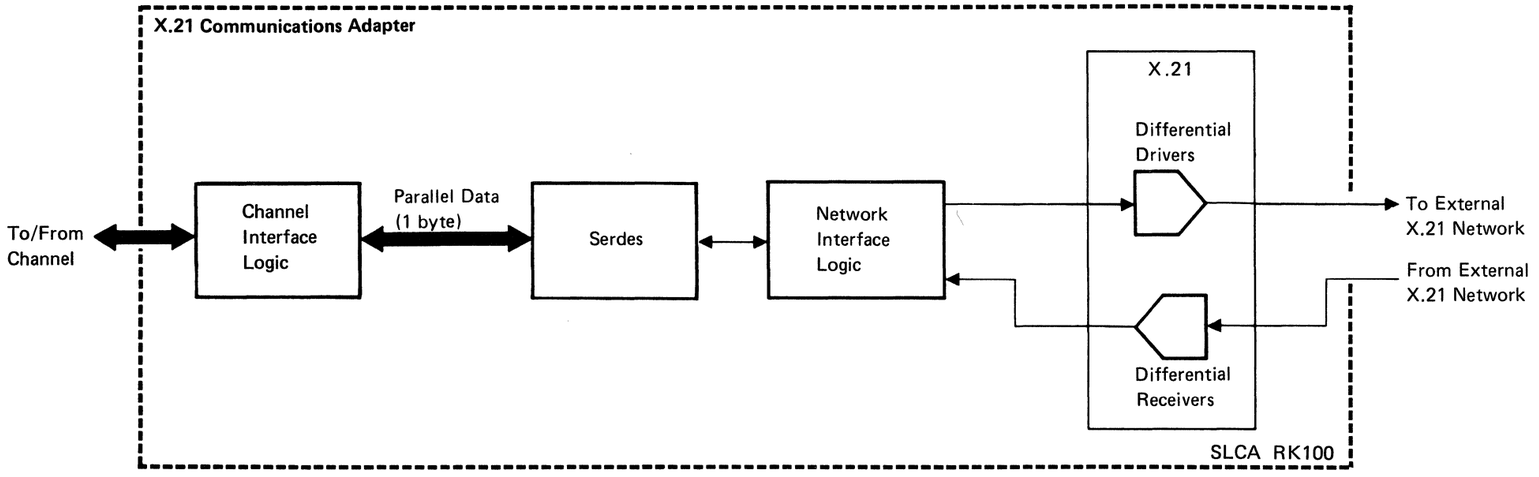
36-000
Contents

OVERVIEW AND FRU DESCRIPTIONS

36-110
X.21 Communications Adapter

The X.21 communications adapter (feature code 4554) connects the system to a data network that follows CCITT specification X.21 for nonswitched connections. The communications adapter converts VTL level signals to the differential signals needed by the X.21 network. The communications adapter can send or receive data at the following rates, as determined by the 'signal A/signal B' clock circuit from the network:

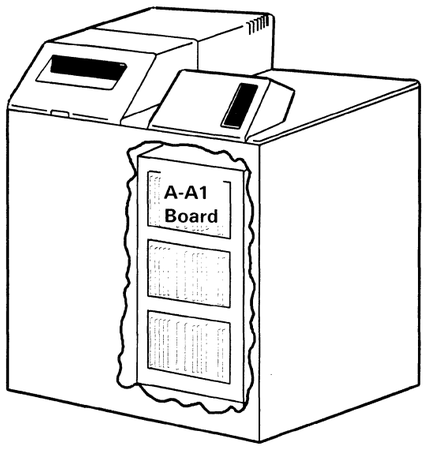
- 600 bps
- 2400 bps
- 4800 bps
- 9600 bps
- 48 000 bps (not used)



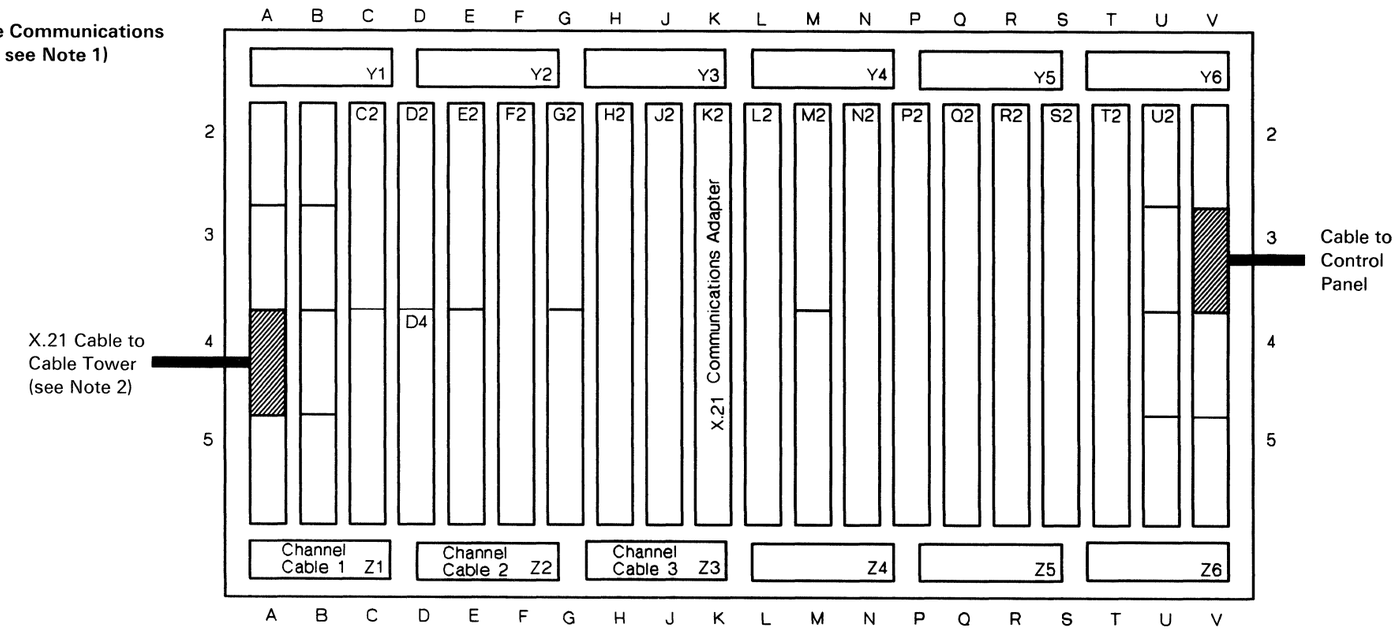
LOCATIONS

36-205
Card Locations

The single-line communications (SLCA) feature can be installed only on the A1 board.



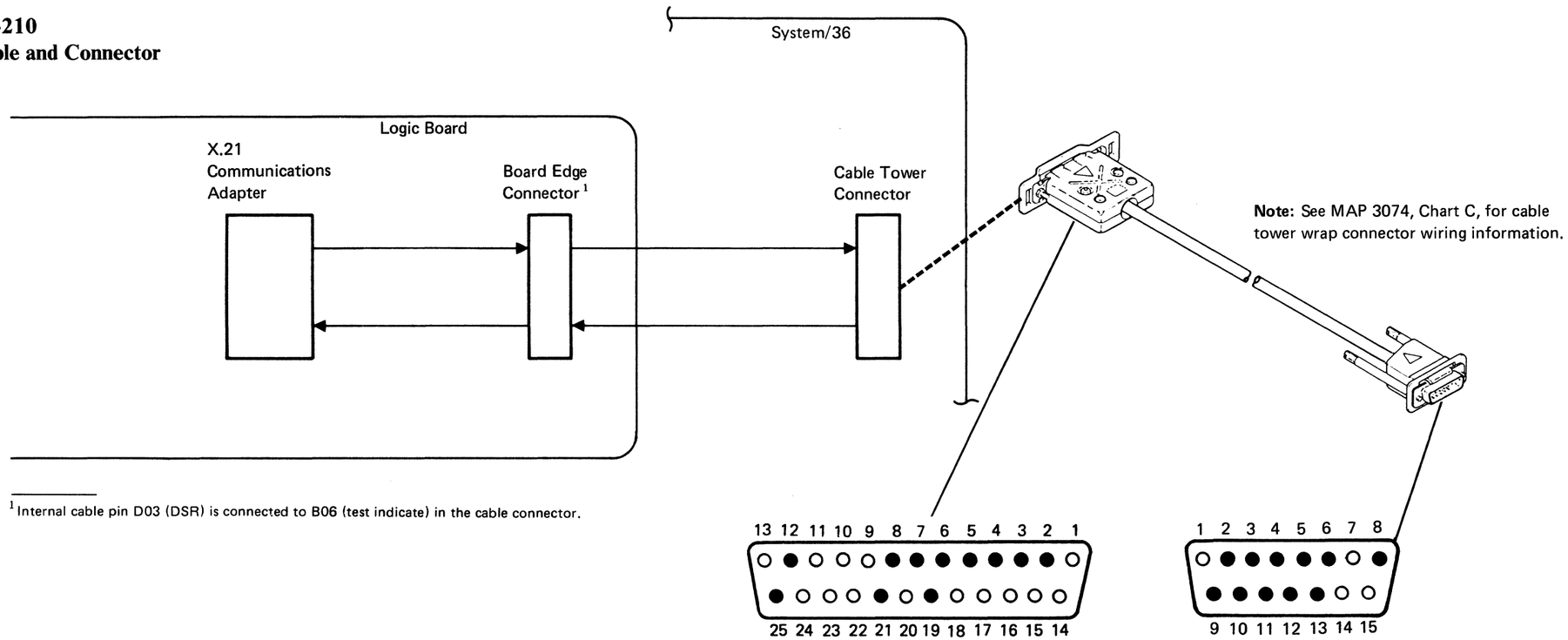
Single-Line Communications (A1 Board; see Note 1)



Notes:

1. *Check the machine configuration to determine the correct number of cards installed.*
2. *The SLCA X.21 adapter can be nonswitched only, and the line speed must not be more than 9600 bps.*

36-210
Cable and Connector



[1] Internal cable pin D03 (DSR) is connected to B06 (test indicate) in the cable connector.

FLD Pages

Part	SLCA
Control panel cable	RV900
X.21 communications adapter	RK100
Board edge connector	RG905
Cable tower	RG905

Signal Pins

Cable Tower		Cable End		
A Circuit	B Circuit	A Circuit	B Curcuit	Signal Name
19	21	2	9	Xmit A/B
2	4	3	10	Control A/B
12	25	4	11	Rcv A/B
3	5	5	12	Ind A/B
6	8	6	13	SET A/B
20	14	–	–	Diag clk A/B
7		8		Signal ground

Logic Cards

Part	SLCA
X.21 communications adapter	A1K2
Board edge connector	A1A4
Cable tower connector (green triangles indicate line number)	Line 1

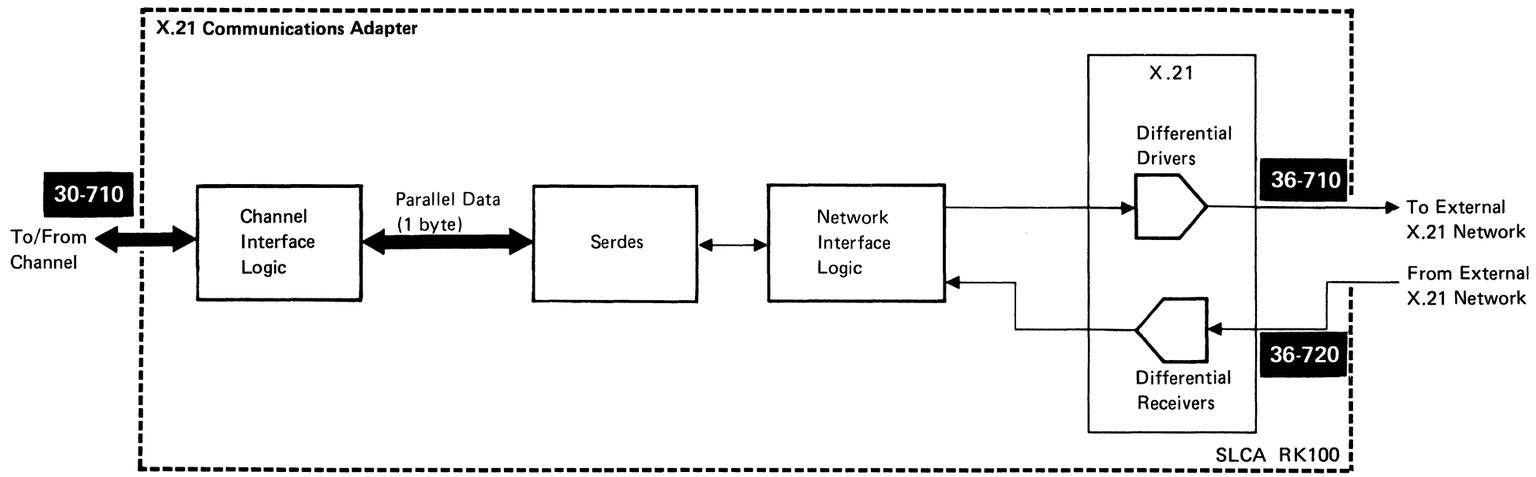
Note: *SLCA X.21 nonswitched network must have a data rate of 9600 bps or less.*

INTERFACE DESCRIPTIONS

36-700
X.21 Interfaces

The signals for the X.21 communications adapter to network interface have two lines to represent each signal: an A signal and a B signal. The voltage difference between the two (A minus B) indicates the condition of the signal:

Active signal: A-B > +0.3 V
Not active signal: A-B < -0.3 V



36-710
X.21 Communications Adapter to Network Interface Signals

Signal Name	Description
+X21 cntl A −X21 cntl B	Control A and B The adapter activates these signals, along with different conditions of the 'transmit' signal, to control the network.
+X21 xmit A −X21 xmit B	Transmit A and B The adapter sends call control signals and data to the network with these signals.

36-720
Network to X.21 Communications Adapter Interface Signals

Signal Name	Description
+X21 ind A −X21 ind B	Indicate A and B The network activates these signals, along with different conditions of the 'receive' signal, to indicate to the adapter the status of the call.
+X21 rec A −X21 rec B	Receive A and B The network sends call control signals and data to the adapter with these signals.
+X21 set A −X21 set B	Signal A and B The network sends timing signals to the adapter with these signals to control transmission rates.

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