IBM System/36

IBM System/36
3262 Printer Attachment
Maintenance Information Manual

Order Number
SY31-9008-1

Section 50

Preface

This manual contains the maintenance information necessary to service the System/36 3262 Printer attachment. 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 customer engineer (CE) or customer service representative (CSR) 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.

Related Publications

System/36 Hardware Publications

- *General Maintenance Information Manual*, SY31-8999
- *Processing Unit and Channel Maintenance Information Manual*, SY31-9000

Other System/36 Publications

- *Functions Reference Manual*, SA21-9436

Second Edition (April 1984)

This major revision makes obsolete SY31-9008-0. Changes were made to reflect technical changes made to the product.

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 no danger notices in this MIM.

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 CEs, and customer personnel, 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 CE 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.

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[1]Trademark of the Gardner-Denver Co.

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, caused 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

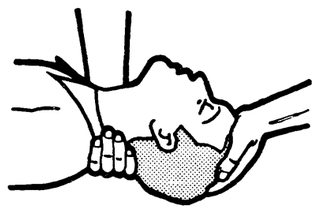
When performing rescue procedures for an electrical accident, do as follows:

- *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:

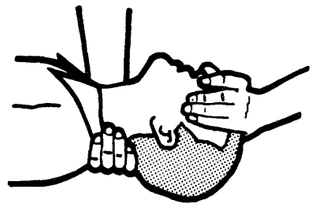
CAUTION
Use extreme care when you perform rescue breathing for a victim who may have breathed in toxic fumes. Do not breathe in air that the victim has breathed out.

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.

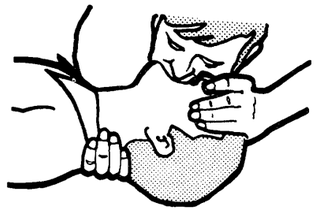


2. Look, listen, and feel to determine if the victim is breathing freely.
   a. Put your cheek near the victim's mouth and nose.
   b. Listen and feel for the breathing out of air. At the same time, look at the victim's chest and upper abdomen to see if they move up and down.

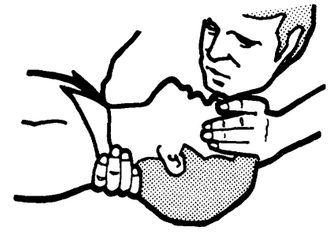
3. If the victim is not breathing correctly:
   a. Keep the victim's head tilted backward. Continue to press on the forehead with your hand; at the same time, position the same hand so that you can pinch together the victim's nostrils with your thumb and finger.



   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.

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.

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Contents

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Overview

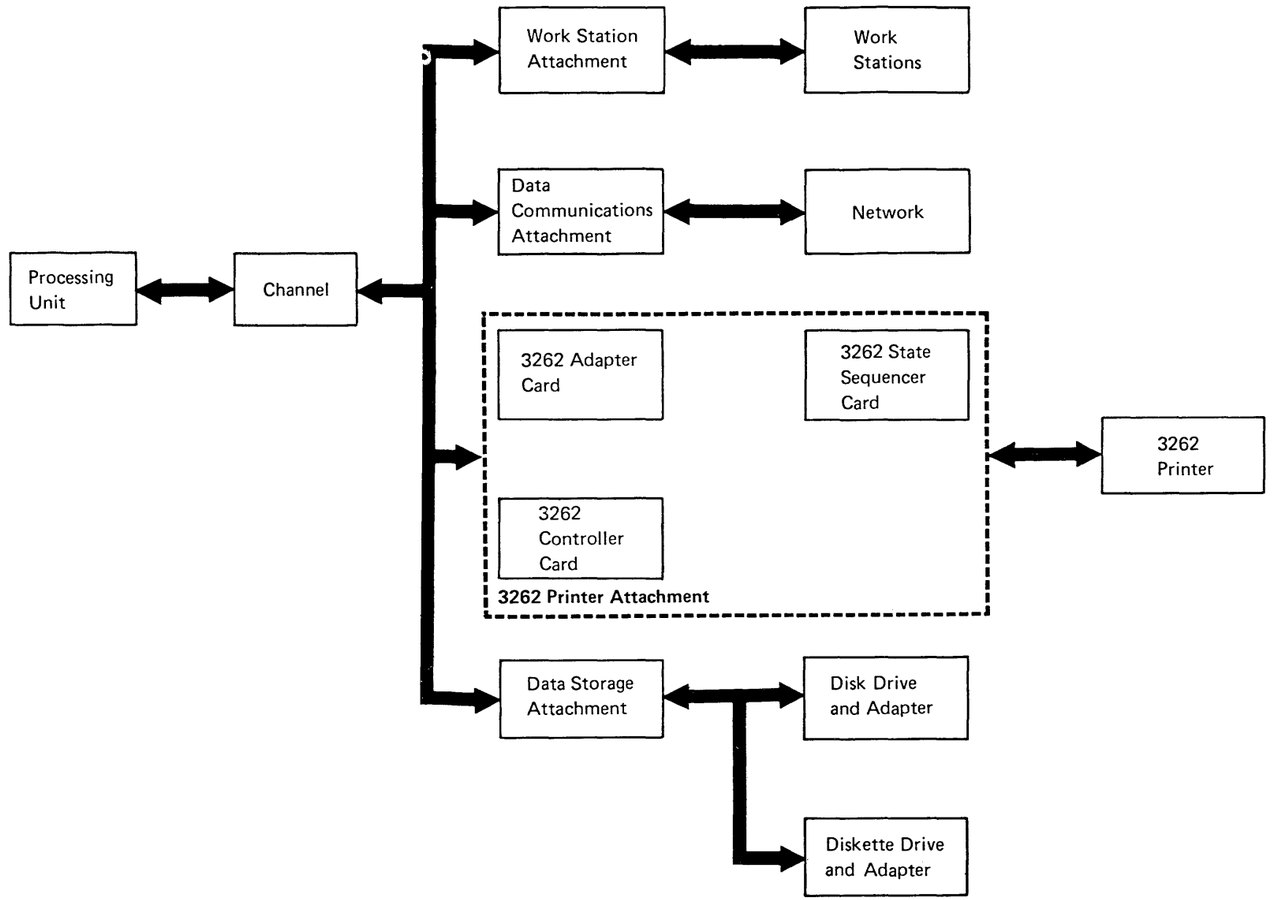
50-110
3262 Printer Attachment

The 3262 Printer is a belt printer that can print up to 650 lines per minute using a 48-character print belt. The printing is done at 6 or 8 lines per inch and at 132 characters per line.

The 3262 Printer is attached to System/36 by the printer attachment. The printer attachment has the following major FRUs: a controller card, an adapter card, and a state sequencer card.

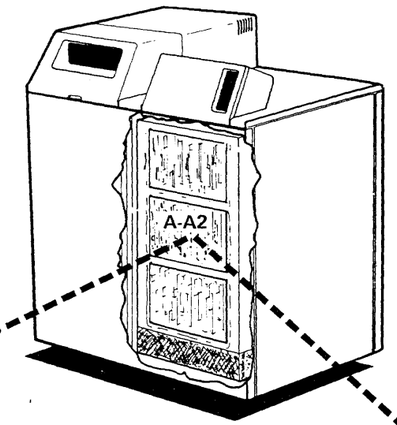
The printer is connected to the system printer attachment at the cable tower (see 50-230). Three flat ribbon cables from the cable tower to the attachment contain three groups of interface lines. The three groups of interface lines and their functions are:

- Print data (hammer address) and fire tier interface lines, which control the print hammers.
- Control interface lines, which control the belt, the carriage, the paper clamp, the 32-volt contactor, and the printer reset.
- Operator panel interface lines, which sense the switches and control the lights on the printer console. In addition, the operator panel interface contains the lines that control the power in the printer.

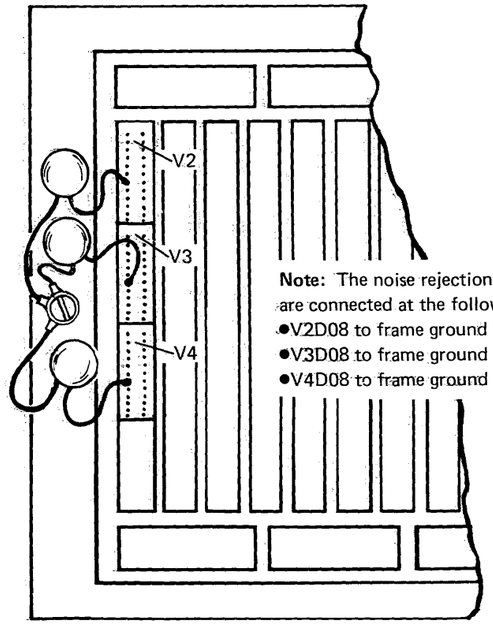


Locations

50-210
Card/Board Locations



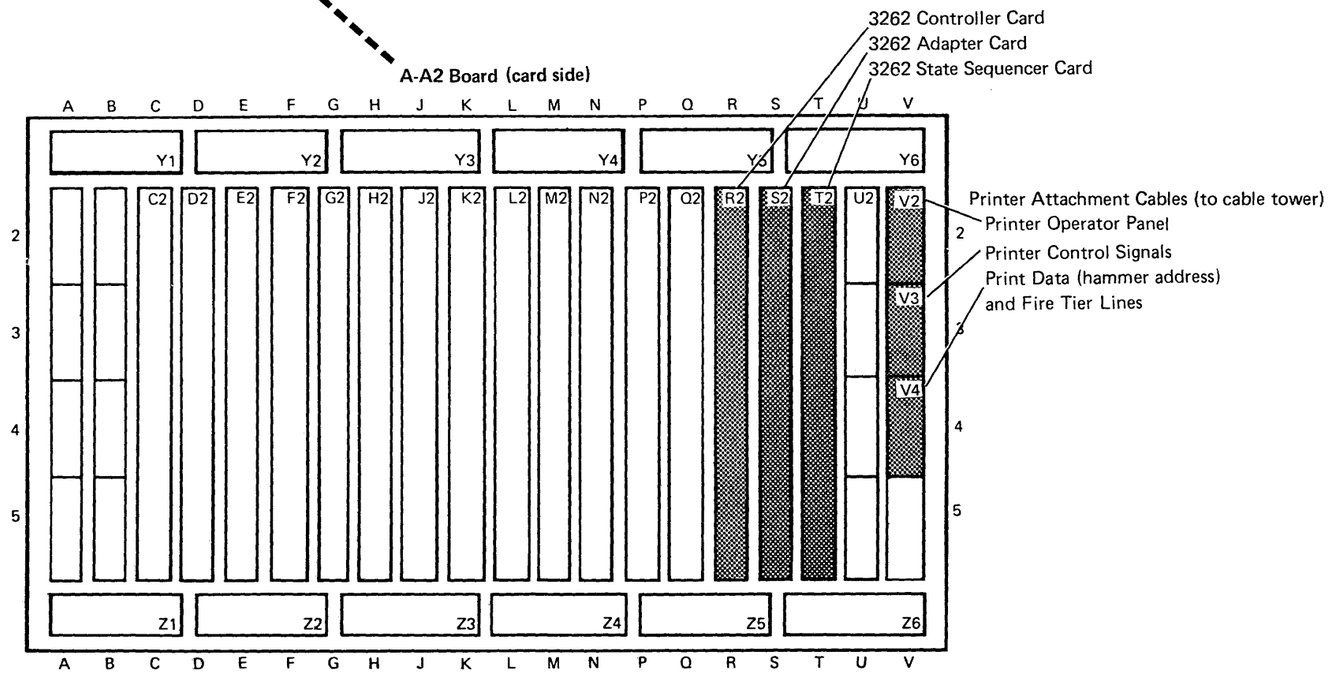
A-A2 Board (pin side)



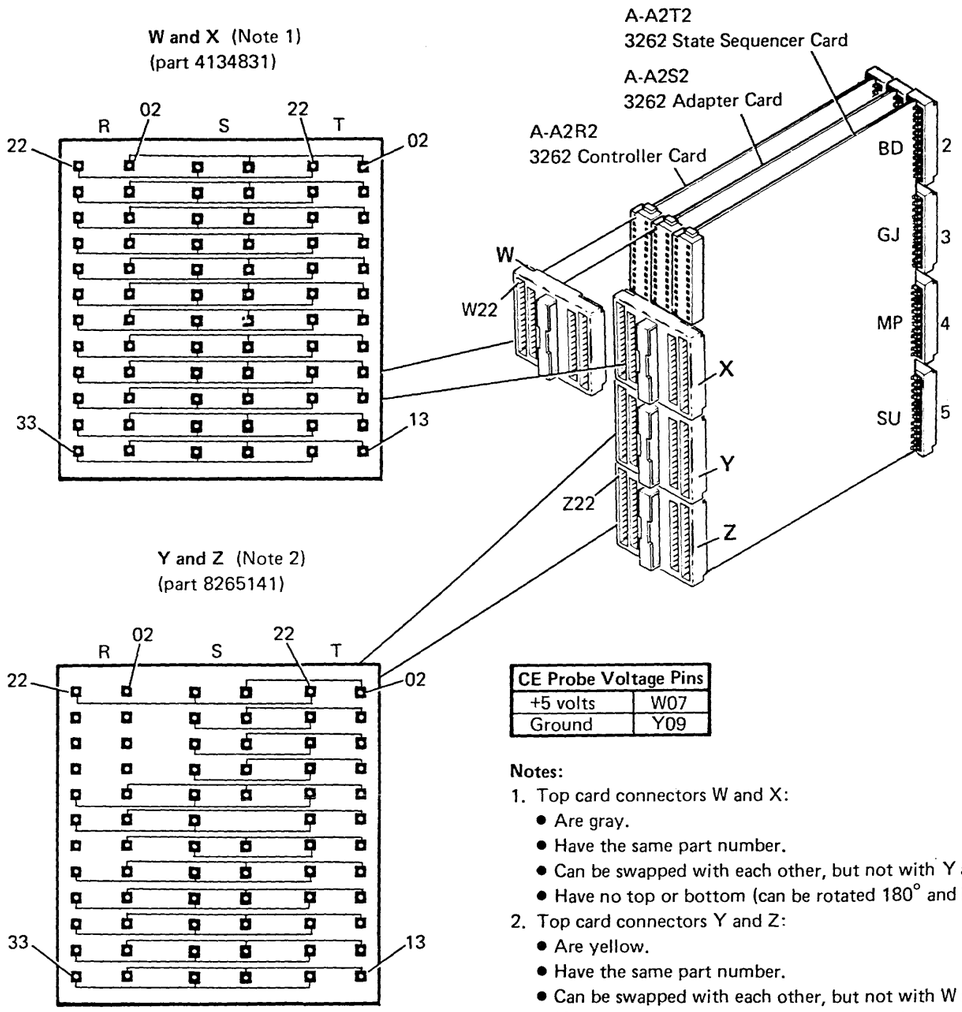
Note: The noise rejection capacitors (0.01 μf), part 2547890, are connected at the following locations:

- V2D08 to frame ground
- V3D08 to frame ground
- V4D08 to frame ground

A-A2 Board (card side)



50-220
Top Card Connectors



CE Probe Voltage Pins	
+5 volts	W07
Ground	Y09

Notes:

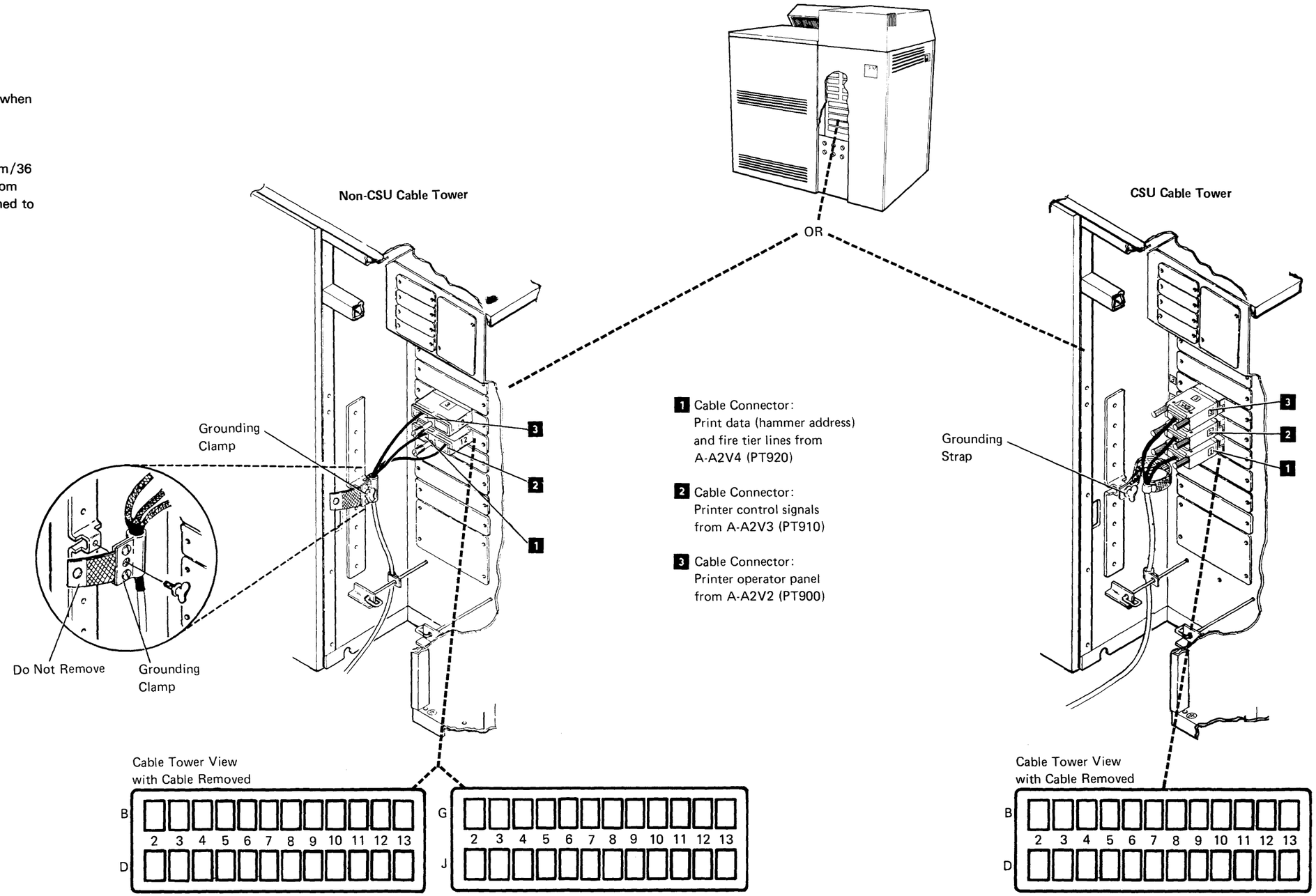
1. Top card connectors W and X:
   - Are gray.
   - Have the same part number.
   - Can be swapped with each other, but not with Y and Z.
   - Have no top or bottom (can be rotated 180° and installed).
2. Top card connectors Y and Z:
   - Are yellow.
   - Have the same part number.
   - Can be swapped with each other, but not with W and X.
   - Must be installed as shown on the top card connector (arrow pointing up).

50-220

50-230
Cable Tower Locations

There are two cable tower configurations:

- CSU (customer setup) cable towers are present when System/36 and a new 3262 Printer are being installed.
- Non-CSU cable towers are present when System/36 is being installed and an existing 3262 Printer from another system (non-System/36) is to be attached to the new system.



Maintenance Procedures

50-300
Introduction

This section contains information that will aid you in diagnosing difficult or intermittent problems on the 3262 Printer and attachment.

Before using the information in this section, you should have performed the action indicated by the system reference code and run the MDIs for the 3262 Printer and attachment.

Printer attachment failures cannot be diagnosed concurrently with normal system operation. They can be diagnosed only on a dedicated system. Problems associated with the 3262 Printer, however, can be diagnosed in either concurrent or dedicated mode. For an overview of the System/36 hardware maintenance plan, see 01-000.

50-310
Data Strobing, Print Position XX

Test Equipment Needed

Tektronix[1] 475 or similar

Scope Setup Procedure

CH 1 Input: -Printer data strobe
CH 2 Input: -Printer data bit X
CH 1 VOLTS/DIV: 2
AC-GND-DC: DC
CH 2 VOLTS/DIV: 2
AC-GND-DC: DC
INVERT:
VERT MODE: CHOP
A and B
TIME/DIV: 5 μs
and DELAY Time: 0
HORIZ DISPLAY: A lock knob
TRIG MODE: NORM
COUPLING: DC
SOURCE: Channel 1
SLOPE: - (minus)

Test Procedure (Machine Operation)

- Determine the printer data bit that you want to scope. Using the table below, select the print position that activates that data bit.

- Use the character print exerciser test (01-755) to print an H in the print position you selected.

To Activate Printer Data Bit	*Select Print Position*
2, 4, or 6	43
1, 3, 5, 7, or P	86
0, 6, or P	131

[1]Trademark of Tektronix, Inc.

Time/Division				0									
Signal Name	**FLD Ref**	**Test Point**	**Level**										
-Printer data strobe	PT920	A-A2V4D06	TTL										
-Printer data bit 0	PT920	A-A2V4B02	TTL										
-Printer data bit 1	PT920	A-A2V4B03	TTL										
-Printer data bit 2	PT920	A-A2V4B04	TTL										
-Printer data bit 3	PT920	A-A2V4B05	TTL										
-Printer data bit 4	PT920	A-A2V4B06	TTL										
-Printer data bit 5	PT920	A-A2V4B07	TTL										
-Printer data bit 6	PT920	A-A2V4B08	TTL										
-Printer data bit 7	PT920	A-A2V4B09	TTL										
-Printer parity bit	PT920	A-A2V4B10	TTL										

50-320
Hammer Sampling

Test Equipment Needed

Tektronix 475 or similar

Scope Setup Procedure

CH 1 Input: See test procedure below.
CH 2 Input: See test procedure below.
CH 1 VOLTS/DIV: 2
AC-GND-DC: DC
CH 2 VOLTS/DIV: 2
AC-GND-DC: DC
INVERT:
VERT MODE: CHOP
A and B
TIME/DIV: 0.2 ms
and DELAY Time: 0
HORIZ DISPLAY: A lock knob
TRIG MODE: NORM
COUPLING: DC
SOURCE: Channel 1
SLOPE: - (minus)

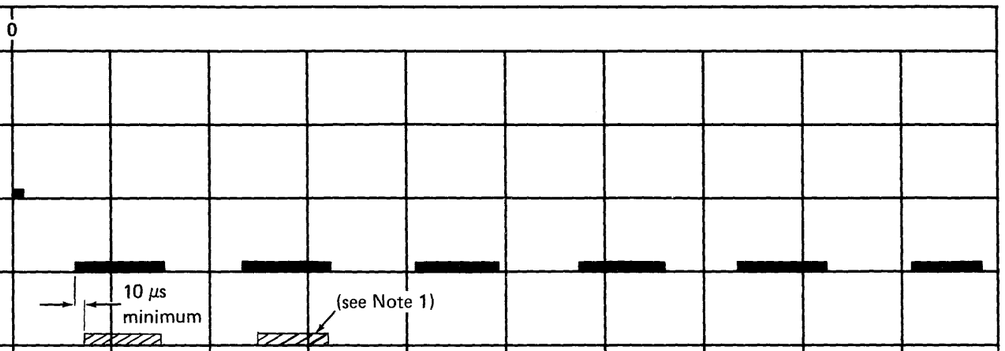
Test Procedure (Machine Operation)

- Use the character print exerciser test (01-755) to print an H in print position 1.
- Display the '-printer data strobe' signal on channel 1 and sync on it.
- Display the other signals using channel 2. The display intensity may have to be increased to view the '-hammer echo return' signal.

Time/Division

0

Signal Name	FLD Ref	Test Point	Level
-Printer data strobe	PT920	A-A2V4D06	TTL
-Print subscans	PT910	A-A2V3B03	TTL
-Hammer sample	PT920	A-A2V4D07	TTL
-Hammer echo return	PT920	A-A2V4B12	TTL
-Not print time	PT920	A-A2V4D04	TTL



Notes:

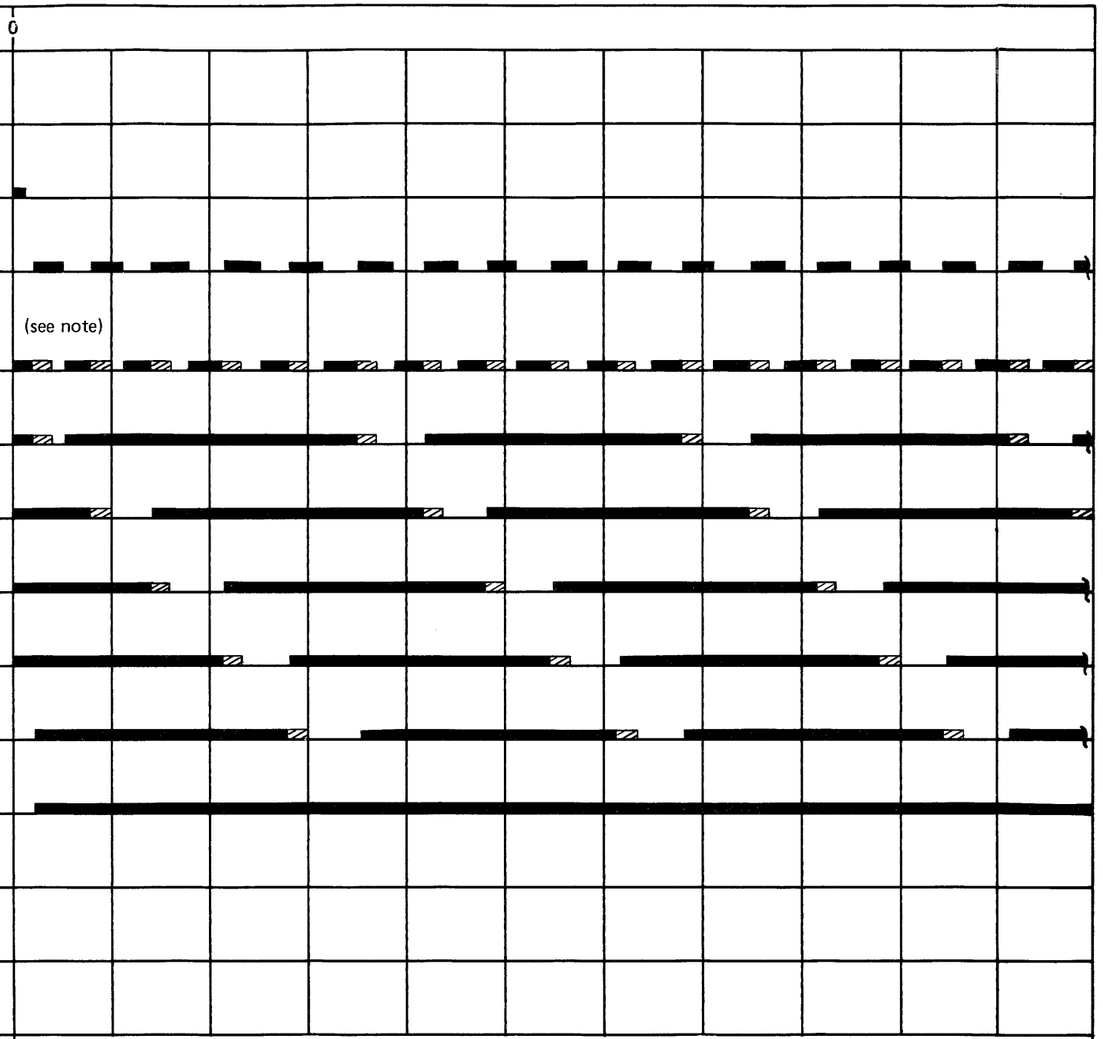
1. 133 '-hammer sample' pulses.
2. One '-hammer echo return' pulse is returned for each set of 133 '-hammer sample' pulses.

Test Equipment Needed
Tektronix 475 or similar

Scope Setup Procedure
CH 1 Input: See test procedure below.
CH 2 Input: See test procedure below.
CH 1 VOLTS/DIV: 2
AC-GND-DC: DC
CH 2 VOLTS/DIV: 2
AC-GND-DC: DC
INVERT:
VERT MODE: CHOP
A and B
TIME/DIV: 0.5 ms
and DELAY Time: 0
HORIZ DISPLAY: A lock knob
TRIG MODE: NORM
COUPLING: DC
SOURCE: Channel 1
SLOPE: - (minus)

Test Procedure (Machine Operation)
- Concurrent mode:
  - Select the Printer selection option.
  - Make the printer ready. The print belt should run.
- Dedicated mode:
  - Use TU select (01-150) to run TU TE217. Make the printer ready. The print belt should run.
- The belt idles down every 2 minutes (with functional microcode loaded). To restart the belt, press the Ready switch.
- Put the '-home' signal on channel 1 and sync on it. Display the other signals using channel 2.

Time/Division



Signal Name	FLD Ref	Test Point	Level
-Home	PT910	A-A2V3D11	TTL
-Print subscans	PT910	A-A2V3B03	TTL
-Impression control single shot	PT910	A-A2V3B08	TTL
-Fire tier 1	PT920	A-A2V4D09	TTL
-Fire tier 2	PT920	A-A2V4D10	TTL
-Fire tier 3	PT920	A-A2V4D11	TTL
-Fire tier 4	PT920	A-A2V4D12	TTL
-Fire tier 5	PT920	A-A2V4D13	TTL
-Belt go	PT910	A-A2V3D12	TTL

(see note)

Note: Signal width changes with the setting of the forms thickness lever.

50-340
Carriage Control, 6 LPI

Test Equipment Needed

Tektronix 475 or similar

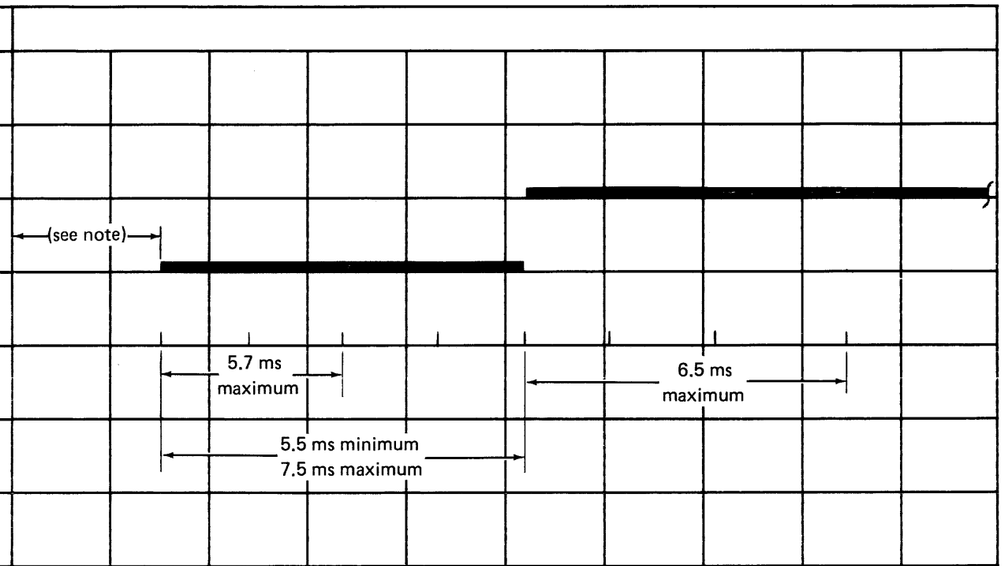
Scope Setup Procedure

CH 1 Input: See test procedure below.
CH 2 Input: See test procedure below.
CH 1 VOLTS/DIV: 2
AC-GND-DC: DC
CH 2 VOLTS/DIV: 2
AC-GND-DC: DC
INVERT:
VERT MODE: CHOP
A and B
TIME/DIV: 2 ms
and DELAY Time: 0
HORIZ DISPLAY: A lock knob
TRIG MODE: NORM
COUPLING: DC
SOURCE: Channel 1
SLOPE: + (plus)

Test Procedure (Machine Operation)

- Set the printer 6/8 LPI switch to 6 LPI.
- Use the character print exerciser test (01-755) to print an H in print position 1.
- Display the '-active paper clamp' signal on channel 1 and sync on it.
- Display the other signals using channel 2.

Time/Division			
Signal Name	**FLD Ref**	**Test Point**	**Level**
-Active paper clamp	PT910	A-A2V3D07	TTL
-Carriage go	PT910	A-A2V3D04	TTL
-Carriage advance	PT910	A-A2V3B07	TTL



Note: The '-carriage go' signal goes active 4 to 4.5 milliseconds after the '-active paper clamp' signal goes not active.

Test Equipment Needed

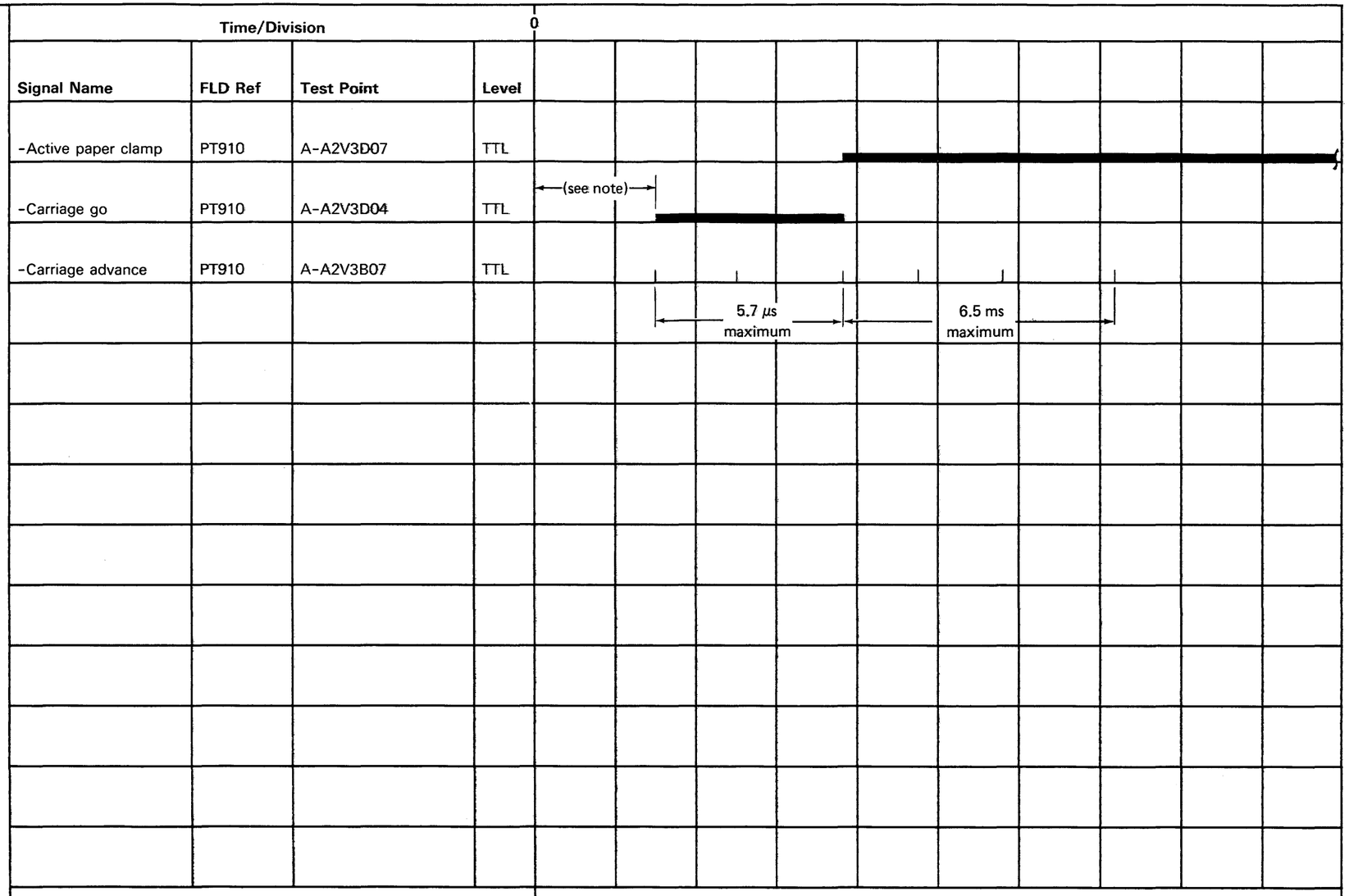
Tektronix 475 or similar

Scope Setup Procedure

CH 1 Input: See test procedure below.
CH 2 Input: See test procedure below.
CH 1 VOLTS/DIV: 2
AC-GND-DC: DC
CH 2 VOLTS/DIV: 2
AC-GND-DC: DC
INVERT:
VERT MODE: CHOP
A and B
TIME/DIV: 2 ms
and DELAY Time: 0
HORIZ DISPLAY: A lock knob
TRIG MODE: NORM
COUPLING: DC
SOURCE: Channel 1
SLOPE: + (plus)

Test Procedure (Machine Operation)

- Set the printer 6/8 LPI switch to 8 LPI.
- Use the character print exerciser test (01-755) to print an H in print position 1.
- Display the '-active paper clamp' signal on channel 1 and sync on it.
- Display the other signals using channel 2.



Note: The '-carriage go' signal goes active 4 to 4.5 milliseconds after the '-active paper clamp' signal goes not active.

MDI Descriptions

MDI	Description	TU Sequence
1 ME201	3262 Channel Interface Test This MDI tests the channel-to-printer attachment interface.	TE209 TE201 TE203 TE204 TE209 TE20A TE208 TE206 TE205 TE207 TE210
2 ME253	3262 Controller Instruction Test 1 This MDI tests part of the controller card logic. The tests include all storage addressing and data wrap tests.	TE220 TE221 TE222 TE223 TE224 TE225 TE230 TE231 TE232 TE226 TE227 TE228 TE229 TE22A TE22B TE21E TE21F TE22E TE236 TE237 TE238 TE239 TE23A TE23B TE23C TE23D TE23E TE23F

MDI	Description	TU Sequence
3 ME255	3262 Controller Instruction Test 2 This MDI tests the part of the controller card logic that was not tested by MDI ME253.	TE240 TE241 TE242 TE243 TE244 TE245 TE246 TE247 TE248 TE249 TE24A TE24B TE24C TE24D TE24E TE24F TE263
4 ME273	3262 State Sequencer Test This MDI performs data wrap tests, register tests, and sequence state tests on the state sequencer card.	TE2A0 TE281 TE287 TE286 TE285 TE284 TE2A3 TE2A7 TE2A4 TE2A2 TE2A6 TE2A1 TE2A9 TE2A8 TE2AA TE28A TE28B TE288 TE289 TE280 TE28D TE283 TE28E TE28C TE263

MDI	Description	TU Sequence
5 ME257	3262 Printer Console Lamp Test This MDI performs a software test of all 3262 Printer console lights except the Power On light.	TE2BA TE2BB TE2B8 TE2B9
6 ME259	3262 Printer Interface Test 1 This MDI and MDI ME261 test the printer control registers on the adapter card and the interface lines between the adapter card and the 3262 Printer.	TE273 TE263 TE26E TE262 TE261 TE262 TE263 TE264 TE265 TE276 TE26B TE277 TE26A TE26C TE269
7 ME261	3262 Printer Interface Test 2 This MDI and MDI ME259 test the printer control registers on the adapter card and the interface lines between the adapter card and the 3262 Printer.	TE268 TE270 TE26F TE272 TE27A TE275 TE279 TE266 TE278 TE297 TE296 TE267 TE28F TE27B TE27C TE282
8 ME267	3262 Printer Console Switch Test This MDI performs a manual test of the 3262 Printer console switches and lights.	TE2BD

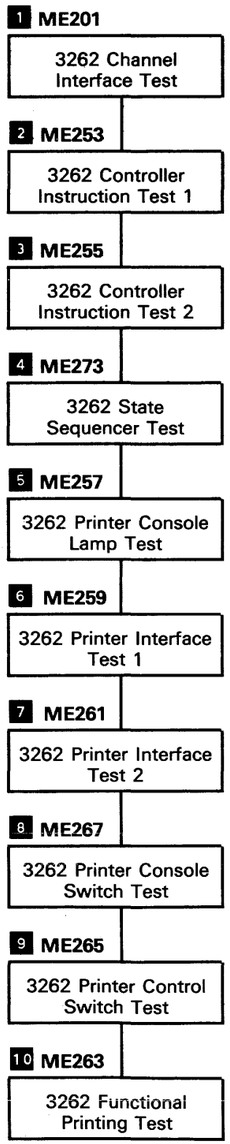
MDI	Description	TU Sequence
9 ME265	3262 Printer Control Switch Test This MDI tests the Throat Interlock switch and the End of Forms switch.	TE2BE TE28C TE217
10 ME263	3262 Functional Printing Test This MDI runs the following printer function tests. These tests can be run in either 6 or 8 lines per inch. • Hammer matrix print test (TE290) • H pattern print test (TE291) • T pattern print test (TE292) • Ripple print test (TE293) • Carriage space or skip test (TE294)	TE290 TE291 TE292 TE293 TE294

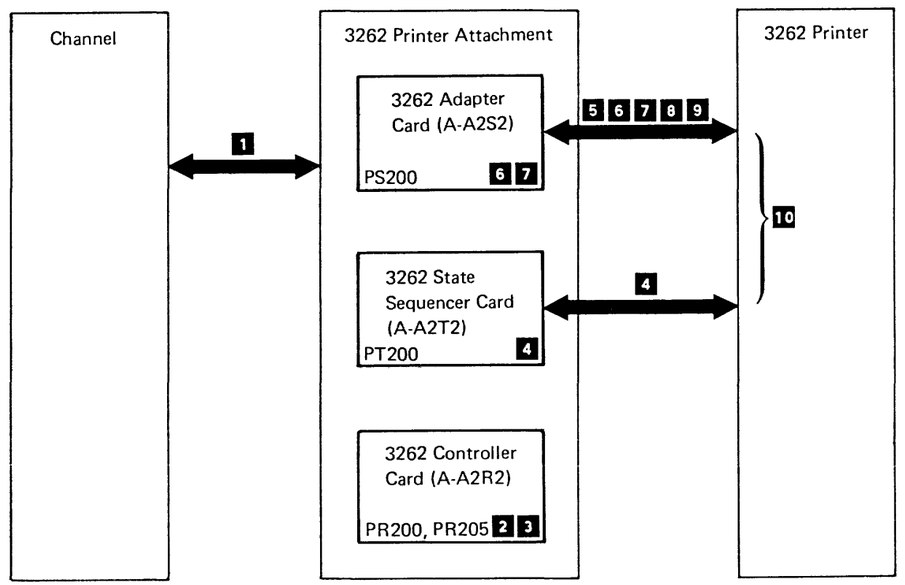
50-410
MDI Good Machine Path

The MDI good machine path tests for correct operation of the printer attachment. Each of the 10 MDIs in the good machine path contains one or more test units (TUs), which test a specific part of the printer attachment. If you do not know how to run the MDIs, see 01-710.

By using this section, you can:

- Find the MDI good machine path
- Determine which part of the printer attachment is tested by each MDI
- Find a description of each MDI
- Find a list of TUs that make up each MDI and the order in which the TUs are run
- Use the list of TUs to find where in the good machine path a failure may have occurred





50-420
IPL Good Machine Path

By using this section, you can:

- Find a list of the test units (TUs) that are run during CSIPL and the order in which they are run.
- Determine which area of the printer attachment is being tested by each TU.
- Determine how to interpret the 6-byte wrap error code (CSIPL from diskette only) to find the TU that failed.

Error during CSIPL from Disk

If a printer error occurs during CSIPL from disk, a 2-byte system reference code is displayed on the system console. See MAPs 0113 through 0116 for a complete list of system reference codes. The 2-byte system reference code has the following format:

CExx
- xx: Printer error occurred during CSIPL from disk

Error during CSIPL from Diskette

If a printer error occurs during CSIPL from diskette, a 6-byte wrap error code is displayed in addition to the 2-byte system reference code. The 6-byte wrap error code has the following format:

E2E0E0FFFFxx
- xx: Last 2 digits of the TU that failed
- FFFF: Device Address
- E0E0: Device ID
- E2:

TU Sequence	Function
TE201 TE209 TE205 TE206 TE208 TE20A	These TUs test the channel-to-printer attachment interface.
TE21E TE22B TE230 TE24E	These TUs test the 3262 controller card logic.
TE262 TE263 TE265 TE266 TE268 TE26F TE279 TE27A TE296	These TUs test the printer control registers on the 3262 adapter card and the interface lines between the adapter card and the 3262 Printer.
TE2A0 TE280	These TUs test the 3262 state sequencer card logic.
TE28F	This TU performs a storage addressing test on the state sequencer card.
TE28D	This TU performs a data transfer from the system to the 3262 Printer.

50-430
Printer Exerciser Tests

The primary function of the printer exerciser tests is to support the 3262 Printer maintenance information. The tests can also be used as a free-lance tool to help in diagnosing intermittent failures. The printer exerciser can run in either concurrent or dedicated maintenance mode.

The following chart shows the two groups of tests, lists and describes the tests that are included in each group, and shows the test ID that you can use to select the group of tests that you want to run. If you do not know how to start the I/O exerciser tests, see 01-755.

Test ID	Test Description
PEXE2P	3262 Function Tests The 3262 function tests check carriage operation, printing, and hammer addressing. This group includes the following tests: • Ripple print test: This test prints all characters in all print positions and is used to inspect print quality. • Character print test: This test is used for belt emitter and flight time adjustments. The test prints the selected character(s) (including blanks) in the selected hammer position(s). • Hammer matrix print test: This test checks for correct hammer addressing. The test prints a diagonal line (1 character per line) until all hammers have been fired once. For example, hammer 1 prints a character 1, hammer 2 prints a character 2, and so on. • Carriage Space/Skip Test: This test checks the carriage, paper path, and stacking operations. The test first prints the number of spaces and the distance in inches that the space/skip operation will take. The space/skip operations start with 1 line and continue through 2, 4, 6, 8, 16, and 32 line space/skip commands. The test is run in both 6 and 8 lines per inch. • H print test: This test prints all Hs until instructed to stop. You can use this test to check for print registration problems. • T print test: This test prints all Ts until instructed to stop. You can use this test to check for print registration problems.

Test ID	Test Description
PEXE2T	3262 Timing Tests The 3262 timing tests check for carriage binds and measures the impression control single shot and emitter delay timing on the emitter control card. This group includes the following tests: • Impression control single shot timing test: This timing test measures the impression control single shot and checks the 3262 emitter control card logic. • Emitter delay timing test: This timing test measures the delay generated by the 3262 emitter control card. • Carriage feedback LED timing test: This timing test measures the carriage advance pulses that are used to drive the carriage stepper motor. The test will diagnose changes in carriage drive speed caused by binds or drag conditions.

50-440
System Test

System test lets you test the 3262 Printer with all other I/O devices in a mode similar to running customer programs. This method of testing the printer can find failures that may not occur when testing a single device.

System test is run under SSP, but must be run on a dedicated system (no customer jobs running). Errors that occur during system test can be displayed or printed. See 01-720 for information on how to run system test and how to display the results.

HOW TO INTERPRET ERAP REPORTS

ERAP information can be used to determine the cause of failure in the 3262 Printer and attachment. These failures may be intermittent failures or solid failures that the MAPs do not find.

Run ERAP for the 3262 Printer and attachment and look at the latest entries in the error history table. An error that occurs many times may indicate a possible problem or intermittent error. Use the following to help you interpret the information on the ERAP reports.

50-500
Error History Table

The error history table contains the status of the printer attachment at the time a failure occurred. The error history table can be displayed on the console or printed on the 3262 Printer. See 01-360 for information on how to run ERAP.

The error history table contains the following:

```
                    ERROR HISTORY TABLE FOR 3262 PRINTER


         FROM: XX/XX/XX XX:XX:XX      TO: XX/XX/XX XX:XX:XX
                                              STATUS BYTES
DATE      TIME          SRC       0     1     2     3     4     5
YY/MM/DD HH:MM:SS                           HEX
XX/XX/XX XX:XX:XX       XXXX      XX    XX    XX    XX    XX    XX
****************************** END OF TABLE ******************************
```

50-510 50-520

50-510
System Reference Code

See MAPs 0113 through 0116 for a list of the system reference codes.

50-520
Status Bytes

Byte 0–Controller Error (Bit 0 On)

Bits 0-7	Description
0	Controller Error (bit 0 is on)
1	Not used
2, 3	Error Type *2 3* 0 0 Time-out 0 1 Data bus parity check 1 0 Data bus parity check 1 1 Storage parity check
4	Not used
5, 6	Printer Speed *5 6* 1 1 These bits are set to 11 to select the 650 lines-per-minute printer. Any other value is not valid.
7	Not used

Byte 0–No Controller Error (Bit 0 Off)

Bits 0-7	Description
0	No Controller Error (bit 0 is off)
1	Unprintable Character A printer character not specified in the belt image was sensed.
2	Hammer Echo Check A selected hammer failed to fire, or a hammer that was not selected was on. See byte 4 for the first failing hammer and byte 5 for the number of hammers that failed.
3	Not Ready This bit indicates that the printer was not ready to print. The not-ready condition may be the result of the Stop key being pressed.
4, 5	Belt Check *4 5* 0 1 Belt up-to-speed check The belt did not reach running speed in 4.5 seconds after being turned on. 1 0 Belt sync check A home pulse occurred when not expected, or a home pulse was missing. 1 1 Belt speed check The '-belt-up-to-speed' line went not active while the '-belt go' line was active.
6	Thermal Check 1 A thermal switch has opened in the printer belt motor, the hammer unit fan, the hammer unit, or the printer power supply.
7	Any Hammer On Check A hammer driver was on when it should not have been. See byte 4 for the first failing hammer and byte 5 for the number of hammers that failed.

50-520 (continued)
Status Bytes

Byte 1

Bit(s)	Description
0	End of Forms
1	Forms Jam
2	Throat Open The paper path throat was open, or the belt cover was not in place.
3	Thermal Check 2 A circuit breaker in the printer has been tripped because of an overcurrent condition.
4	Printer Busy Too Long The '-printer busy' line was on more than 3 seconds during a single print operation.
5	Ribbon Check The ribbon reel was moving too slowly, or both ribbon reverse switches were on at the same time.
6	Cable Interlock A cable is loose in the attachment board (50-210), the cable tower (50-230), or the printer unit; if not, the internal printer console cable, signal cable, or motor cable is loose.
7	Data Parity Check The printer sensed even parity on the '-printer data bits P, 0-7' lines during print time. This check can occur if the '-active paper clamp' line is not active and an attempt is made to print.

Byte 2

Bit(s)	Description
0	Printer Not Powered On The printer is not powered on because of one of the following: • The Power switch is off. • The power cable is disconnected or there is no voltage at the outlet. • A printer unit power supply failure occurred. • A thermal check occurred.
1	Data Transfer Check A data byte being sent from the system to the controller was lost or an extra data byte was sensed.
2	Data Stream Reject The data stream sent to the printer was not valid.
3	Not used
4	SCS Parameter Not Valid One of the parameter bytes following an SCS control character (data stream command) was not recognized by the controller.
5	SCS Command Not Valid The data stream contained a control character that was not recognized by the controller.
6	IOB Not Valid The data stream length in the input/output block was more than 256 bytes, or a command or command parameter was not valid.
7	Carriage Pedestal Check A short circuit in the carriage pedestal driver was sensed.

Byte 3

Bit(s)	Description
0	CE Switch On The CE switch in the printer is on, and any system print commands will be rejected.
1	Lines Per Inch *1* 0 6 lines per inch selected 1 8 lines per inch selected
2, 3	Printer Speed *2 3* 1 1 These bits are set to 11 to select the 650 lines-per-minute 3262 Printer. Any other value is not valid.
4	Fire Tier Check The '-fire tier 1-5' lines were not in sequence.
5	PSS Emitter Check The print subscan emitter failed.
6, 7	Carriage Check *6 7* 0 1 Carriage check 1 The third (last) carriage advance pulse after the drop of the '-carriage go' line was not received by the controller in the time permitted (10 milliseconds) 1 0 Carriage check 3 On a carriage skip beyond one line, five carriage pulses were not received in 2.7 to 6.6 milliseconds when the '-carriage go' line was active. 1 1 Carriage check 4 The first three carriage advance pulses were not received in 6.3 milliseconds after the '-carriage go' line was activated.

Byte 4

Hex	Description
FF	Device Error Status Bytes 0 through 3 contain the error status.
xx	If a hammer echo check or any hammer on check (byte 0, bit 2 or 7) is on, byte 4 contains the hexadecimal number of the first failing hammer. If neither of these checks is set, this byte contains hex 00.

Byte 5

Hex	Description
xx	If a hammer echo check or any hammer on check (byte 0, bit 2 or 7) is on, byte 5 contains the hexadecimal number of the hammers that failed. If neither of these checks is set, this byte contains hex 00.

50-530
Error Counter Table

The error counter table contains a list of the 3262 Printer and attachment errors and the number of times each error occurred. See 01-360 for information on how to run ERAP.

The following chart lists the errors as they appear in the error counter table. The chart also shows the status bit that is set for each error and the MAP that you can use to help find intermittent printer problems.

Error	Status		Intermittent MAP
	Byte	Bit(s)	
Printer controller unit checks	0	0	0350
Data transfer checks	2	1	0350
Fire tier checks	3	4	0350
Print subscan emitter checks	3	5	0350
Any hammer on checks	0	7	0350
Hammer echo checks	0	2	0350
Belt sync checks	0	4	0350
Belt speed checks	0	4, 5	0350
Belt up-to-speed checks	0	5	0350
Printer busy too long checks	1	4	0350
Carriage pedestal checks	2	7	0350
Carriage check 1	3	7	0350
Carriage check 3	3	6	0350
Carriage check 4	3	6, 7	0350
Forms jam checks	1	1	0350
Ribbon checks	1	5	0350
Data parity checks	1	7	0350
Cable interlock checks	1	6	0350
Thermal check 1	0	6	0350
Thermal check 2	1	3	0350
Printer not powered on	2	0	0350
Error could not be identified	See note	See note	See note

Note: The system sensed an error that the error recovery procedures could not identify.

50-540
I/O Counter Table

The I/O counter table contains two counters that show the number of lines printed by the 3262 Printer. One counter, which cannot be reset, shows the date on which the counter was started. The other counter, which can be reset, shows the date on which the counter was last reset.

FRU Descriptions

50-610
Adapter Card

The adapter card Ⓐ, located in the A-A2S2 position, contains logic for the channel interface, the controller card interface, the printer controls, and the printer status.

The printer attachment microcode is loaded through the adapter card into storage on the controller card and the state sequencer card. Printer attachment microcode instructions are executed by the controller card microprocessor and are used by the adapter card to generate control signals for the printer. These control signals include the following:

- Belt controls
- Carriage controls
- Hammer echo checking
- Error checking
- Operator panel controls
- Fire tier lines

50-620
Controller Card

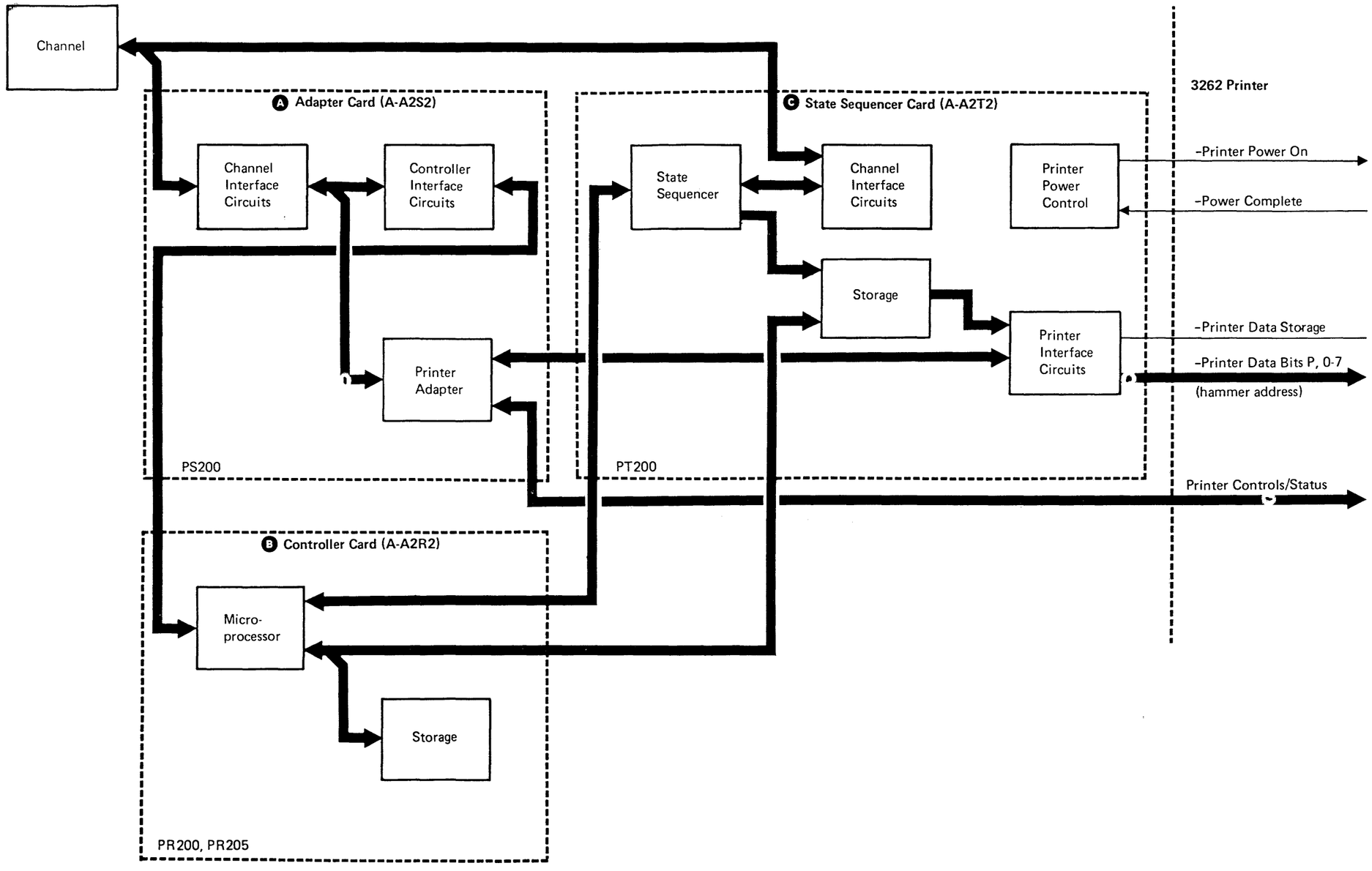
The controller card Ⓑ, located in the A-A2R2 position, contains a microprocessor and storage. The microprocessor executes the printer attachment microcode and performs the following functions:

- Controls data transfer operations
- Controls printer operations
- Generates attachment timing controls (using the 16-MHz oscillator from the adapter card)

50-630
State Sequencer Card

The state sequencer card Ⓒ, located in the A-A2T2 position, contains additional storage for the printer attachment. The state sequencer card steps through sequential states or conditions to perform the following functions:

- Transfers data from the channel
- Selects hammers to print
- Controls power to the printer


Channel
A Adapter Card (A-A2S2)
Channel Interface Circuits
Controller Interface Circuits
Printer Adapter
PS200
C State Sequencer Card (A-A2T2)
State Sequencer
Channel Interface Circuits
Storage
Printer Interface Circuits
Printer Power Control
PT200
3262 Printer
-Printer Power On
-Power Complete
-Printer Data Storage
-Printer Data Bits P, 0-7
(hammer address)
Printer Controls/Status
B Controller Card (A-A2R2)
Micro-processor
Storage
PR200, PR205

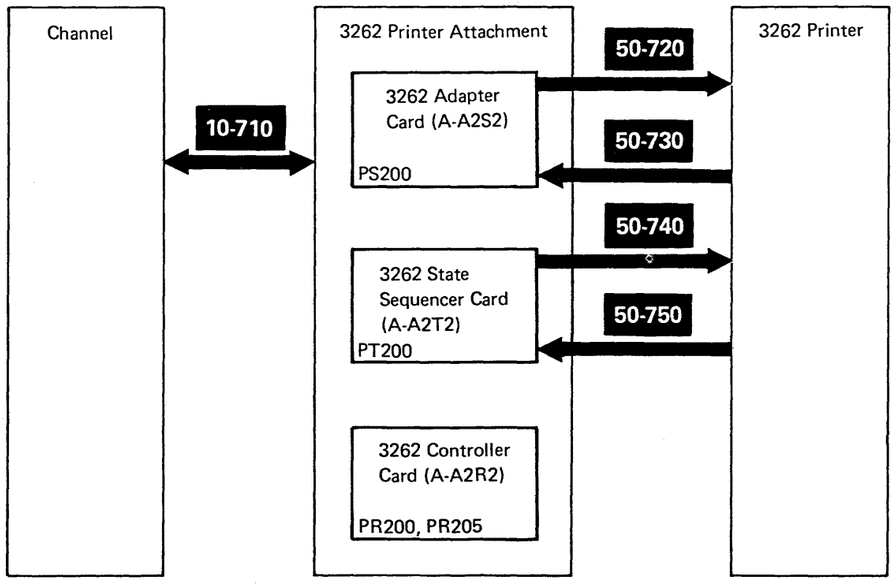
Interface Descriptions

50-710
Interface Locations

See the figure on this page to determine which interfaces are being described and where you can find the description for each interface.

The interface description charts:

- List the interface signals that can be probed
- Describe the interface signals
- Give you a scoping procedure/MDI/TU/manual operation (reference column) that you can use to test each interface signal



50-720
Adapter Card-to-Printer Interface

Signal Name	Description	Reference
-Active paper clamp	This line controls the paper clamp in the printer. This line is not active during carriage operations or when the printer is not ready to permit paper advance.	50-340
-Belt go	This line starts the print belt turning. The '-belt go' line is deactivated if no print command is received in approximately 2 minutes after the belt is up to speed.	50-330
-Carriage go	This line activates the printer carriage motor.	50-340
-Check indicator	This line turns on the printer Check light when a printer error is sensed. If the Forms light is also on, a forms jam or carriage check is indicated.	MDI ME257
-Close contactor	This line controls the +32 Vdc in the printer. When an error is sensed, this line is deactivated to protect the hammer coils.	TE268
-Fire tier 1-5	These lines are sent to the printer to fire the hammers. The attachment uses the '-home', '-print subscans', and '-impression control single shot' lines to generate the '-fire tier 1-5' lines.	50-330
-Forms indicator	This line indicates an end-of-forms condition in the printer. If the Check light is also on, a forms jam or carriage check is indicated.	MDI ME257
-Hammer sample	This line is used with the '-hammer echo return' line to determine the number of hammers on during each subscan.	50-320
-Interlock indicator	This line indicates that the throat is open in the printer or the belt cover is not in place.	MDI ME257
+POR (power on reset)	This line resets the printer circuits to their starting conditions.	TE268
-Ready indicator	This line turns on the printer Ready light when the Ready key is pressed, if there is no check condition.	MDI ME257

50-730
Printer-to-Adapter Card Interface

Signal Name	Description	Reference
-Belt up to speed	This line is activated when the print belt is running at normal speed (4.5 seconds maximum after the '-belt go' line is activated).	TE296
-Cable interlock 1	This line indicates that a cable is not seated correctly in the printer attachment or in the 3262 Printer.	TE263
-Carriage advance	This line is generated as a result of forms tractor movement and is used by the attachment to control the '-carriage go' line.	50-340
-Carriage pedestal check	This line is activated when a short circuit in a carriage pedestal driver has been sensed.	TE294
-Carriage restore key	If this line is active, the attachment activates the '-carriage go' line to move the paper to line 1 of the next form.	MDI ME267
-Carriage space key	If this line is active, the attachment activates the '-carriage go' line to move the paper one line.	MDI ME267
-Carriage 8 LPI	This line is activated by a switch in the printer, which causes the printer carriage to operate at 8 lines per inch. If this line is not active, the printer carriage operates at 6 lines per inch.	MDI ME263
-CE switch on	This line indicates that the CE switch in the 3262 Printer is on.	Toggle the CE switch
-Data parity check	This line is turned on if the printer senses even parity on the printer data bus.	TE266
+End of forms	This line is activated when less than 15 inches of forms are in the printer. The attachment turns on the Forms light and stops the printer when this line is active.	MDI ME265
-Forms pulse	This line is active when the tractor holes are sensed at the left margin of the forms. The line is used to determine a forms-jammed condition.	TE267
-Hammer echo return	This line is used with the '-hammer sample' line to determine the number of hammers that are on during each subscan that the '-not print time' line is active.	50-320
-Home	This line is generated in the printer by sensing the missing timing marks on the print belt and is used to maintain belt synchronization.	50-330
-Impression control single shot	This line controls when the hammers are fired for the different forms thicknesses. The forms thickness control on the printer is used to change the timing.	50-330
-Not print time	If this line is active, no printing occurs and the '-hammer echo return' line is checked to ensure that no hammers are on.	50-320
-Power complete	This line is activated by the printer when the power-on sequence is complete.	TE28C
-Printer busy	This line inhibits printing when the ribbon drive is reversed.	Activate the Ribbon Reverse switch
-Print subscans	This line is used by the attachment to generate the '-fire tier 1-5' lines that control printing.	50-320
-Ready key	If this line is active and there is no check condition, the attachment turns on the Ready light and activates the '-belt go' line.	MDI ME267
-Ribbon check	This line is activated if the ribbon is not moving at the correct speed when printing. The attachment turns on the printer Check light if this occurs.	Activate both Ribbon Reverse switches
-Stop/reset key	If this line is active, the attachment stops the printer, turns off the Ready light, and issues a power-on reset (POR) to the printer.	MDI ME267
-Thermal check 1	This line indicates that a thermal switch has opened in the printer belt motor, the hammer unit fan, the hammer unit, or the printer power supply.	None
-Thermal check 2	This line indicates that a circuit protector has been tripped because of an overcurrent condition.	None
-Throat closed	This line indicates that the throat is closed. If this line is not active, the attachment turns on the Interlock light. The printer cannot be made ready until the throat is closed and the belt cover is in place.	MDI ME265
-Wrap data bit 6, 7, and P	These lines are used for diagnostic purposes only.	None

50-740
State Sequencer Card-to-Printer Interface

Signal Name	Description	Reference
-Printer data bits P, 0-7	These lines determine which hammers are to be fired in each subscan. These lines are also named the hammer address bus.	50-310
-Printer data strobe	This line gates the hammer address on the printer data bus.	50-310
-Printer power on	This line turns the printer power on.	TE28C

50-750
Printer-to-State Sequencer Card Interface

Signal Name	Description	Reference
-Power complete	This line is turned on by the printer when the power-on sequence is complete.	TE28C

Sequence of Events

50-810
Introduction

The operation of the printer attachment is controlled by microcode. The printer attachment microcode is loaded in storage on the controller card and the state sequencer card when an initial program load (IPL) is performed on the system. The control storage processor then starts the controller card microprocessor, and the printer attachment is now ready to receive data from the processing unit.

Before any printing or forms control can occur, the system program transfers the correct forms length, the correct belt image, and the correct translate table (if it is needed) to the printer attachment storage. If the system program does not transfer this information before printing, the printer attachment defaults to the following:

- Belt image is set to 48 characters.
- Forms length is set to one line.
- Translate table is set to not translate (translated to its own value).
- Line length is set to 132.

The processing unit can now send a print data stream to the printer attachment.

A data stream is print data and commands that have been assembled into a series of hexadecimal characters by the system's prepare print buffer program. The data stream contains all the print data, carriage control information, and formatting information that is needed to perform a print operation. The processing unit sends the data stream to the printer attachment, and the attachment generates the necessary commands to control the 3262 Printer and complete the print operation. For a data stream example, see 50-850.

50-820
Data Stream Commands

In a data stream, print data characters have hexadecimal values from 40 to FF, and commands (control characters) have hexadecimal values from 00 to 3F.

A data stream command to the printer is a control character that is usually followed by parameter bytes. See 50-850 for an example of a printer data stream.

The following chart gives a description of the printer commands. For additional information, see the *Functions Reference Manual*.

Code (Hex)	Command	Description
0C	Forms feed	This is a forms eject command that advances the forms to line 1 and print position 1 of the next page.
0D	Carriage return	This command moves the print position to the left margin of the same line. If the current print position is at the left margin, no operation is performed.
15	New line	This command moves the print position to the left margin of the next line. If the print position is on the last line of a page, it is moved to the first line of the next page.
2B	Format	This command sets the forms length, specifies the action to be taken when a character that cannot be printed is sensed in the data stream, or specifies a new belt image. The format character (hex 2B) by itself gives just the starting position of a format data stream. It is followed by one of three parameters (hex C2 for set vertical format, hex D1 for set chain image or translate table, or hex C8 for set graphic error action), a count byte, and other bytes that define the formats.
34	Presentation position	This command moves the print position. The control character (hex 34) is followed by a function parameter and a value parameter. The function parameters are: • Relative vertical position (hex 4C). This moves the forms vertically the number of lines specified by the 1-byte value parameter. • Absolute vertical position (hex C4). This moves the forms vertically to the line number specified by the 1-byte value parameter. • Relative horizontal position (hex C8). This moves the print position horizontally the number of print positions specified by the 1-byte value parameter.

50-830
Printing Operation

The following sequence of events describes a printing operation from the processing unit to the printer. Before the printing operation is started, the data stream is assembled in main or control storage. Each data stream is limited to 256 bytes and has an associated input/output block (IOB) that describes the operation to be performed by the printer. Two or more IOBs can be used together in a chain for a single operation. For more information about the printer IOB, see the *Functions Reference Manual*.

Processing Unit	Printer Attachment	3262 Printer
1 Customer program calls SSP to print data on the 3262 Printer.		
2 SSP issues SVC for I/O service to CSP.		
3 CSP calls the printer I/O control handler routine.		
4 The printer I/O control handler routine moves the data stream into attachment storage, 1 byte at a time, using I/O load commands. See 10-821 (I/O Instruction Transfer).		
	5 The adapter card activates the '-micro interrupt request 4' line when the data transfer (data stream) is complete.	
6 The printer I/O control handler routine marks the input/output block (IOB) complete. Step 4 is repeated if there are additional data streams to send.		
	7 The controller microcode performs the following: • Analyzes the control characters • Compares the print data with the belt image and translates the character if it is needed • Sets the forms length • Controls carriage operations • Keeps track of the belt position • Gives each hammer the option to print	
		8 The 3262 Printer gates the '-print subscans' and the '-home' lines to the attachment when the print belt is up to speed. See 50-330 for a scoping procedure of these two lines.
	9 The state sequencer card places the hammer address on the '-printer data bits P, 0-7' lines and activates the '-printer data strobe' line. The address is placed on the data bus each time the microcode finds the correct character aligned in front of the hammer. See 50-310 for a scoping procedure.	
		10 A printer hammer latch is set on for every hammer that was addressed.
	11 The '-fire tier 1-5' lines from the adapter card fire the hammers that have their latches set on. See 50-330 for a scoping procedure.	
	12 Steps 9 through 11 are repeated until all print positions have been given the option to print.	
	13 If a carriage operation is needed, the attachment microcode controls the operation. See 50-840 for a space or skip operation.	
	14 Steps 9 through 13 are repeated until the printing operation is complete.	

50-840
Space/Skip Operations

The following sequence of events describes a space or skip operation. See 50-830 for the events that occur before the space or skip operation.

Printer Attachment	3262 Printer
1 The controller microcode performs the following: • Analyzes the control characters • Determines the number of lines to be spaced or skipped	
2 The adapter card activates the '-carriage go' line to the printer.	
	3 Pulses appear on the '-carriage advance' line when the carriage starts to move.
4 The controller microcode counts the number of emitter pulses on the '-carriage advance' line until it is determined that the correct number of lines have been skipped.	
5 The adapter card deactivates the '-carriage go' line.	
6 The controller microcode checks the '-carriage advance' line for three more pulses. When these three pulses are received, the space or skip operation is complete.	
Note: See 50-340 and 50-350 for scoping procedures of the '-carriage go' and '-carriage advance' lines.	

50-850
Data Stream Example

The data stream example shown on this page can be used to:

- Give you an overview of how a print data stream is processed.
- Help you recognize a print data stream.
- Determine the action performed by each data stream command. See 50-820 for a description of each command.

The example assumes that the forms length and the belt image have already been set. See 50-830 and 50-840 for a detailed description of a print operation and a space or skip operation.

Ⓐ Forms feed (hex 0C): Moves the print position to the first position of the next page. (For this example, the first position is print position 1 of line 1.)

Ⓑ Relative horizontal position (hex 34C8): Moves the print position 66 print positions (parameter of hex 42 in the command) to print position 67.

Ⓒ Data to be printed: 3262 PRINTER

Ⓓ New line (hex 15): Moves the print position to the first position of the next line (line 2, print position 1).

Ⓔ Absolute vertical position (hex 34C4): Moves the print position (parameter of hex 08 in the command) to line 8.

Ⓕ Relative horizontal position (hex 34C8): Moves the print position 19 print positions (parameter of hex 13 in the command) to print position 20.

Ⓖ Data to be printed: DATA

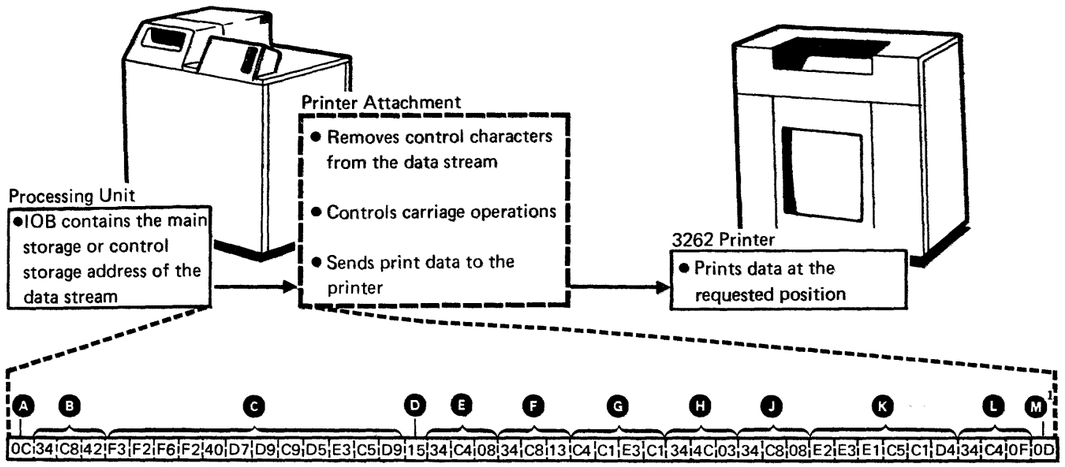
Ⓗ Relative vertical position (hex 344C): Moves the print position 3 lines (parameter of hex 03 in the command) to line 11. The print position is now on line 11, print position 29.

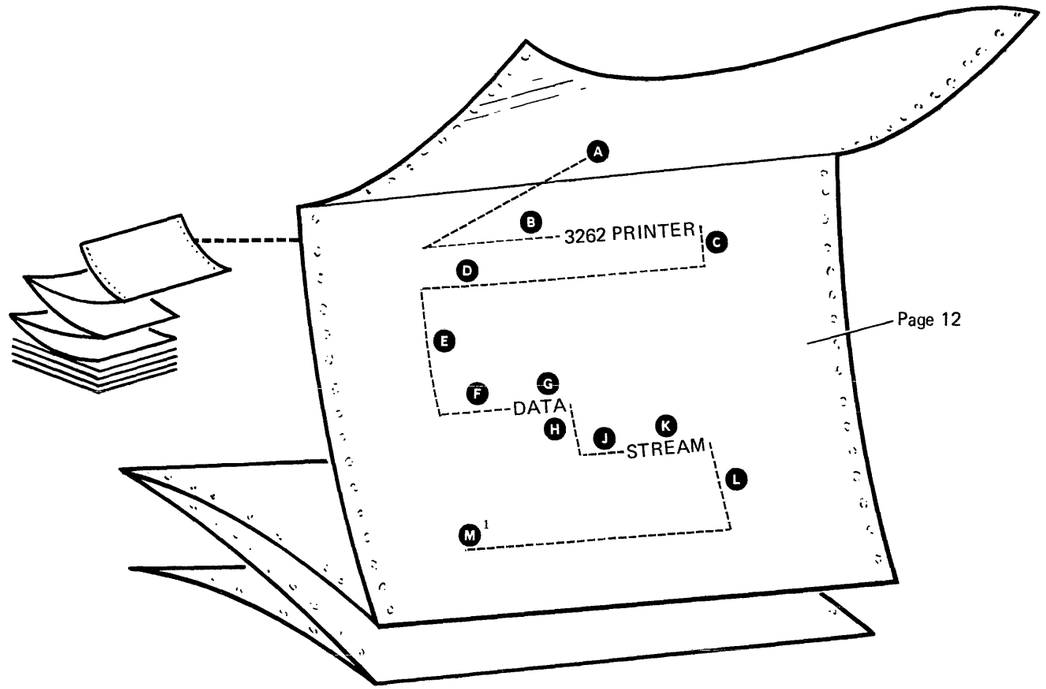
Ⓙ Relative horizontal position (hex 34C8): Moves the print position 8 print positions (parameter of hex 08 in the command) to print position 37.

Ⓚ Data to be printed: STREAM

Ⓛ Absolute vertical position (hex 34C4): Moves the print position (parameter of hex 0F in the command) to line 15.

Ⓜ[1] Carriage return (hex 0D): Moves the print position to print position 1 of the same line (line 15).





[1] This command is shown for example only. It is not required for normal operation.

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