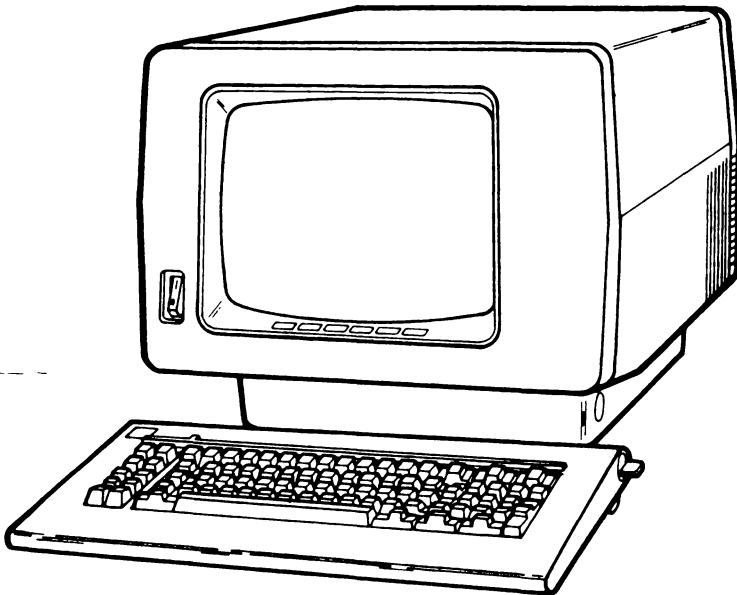


SY31-0644-0

IBM 5292 Color Display Station Maintenance Library

MAINTENANCE
ANALYSIS PROCEDURES (MAPs)
MAINTENANCE INFORMATION
PARTS CATALOG
I/PAR CODE GUIDE AND
CE LOG



Serial No. _____

Install Date _____



SY31-0644-0

**SAFETY
GLOSSARY
LEGEND**

**IBM 5292 Color Display Station
Maintenance Library**

**MAINTENANCE
ANALYSIS
PROCEDURES (MAPs)**

**MAINTENANCE
INFORMATION**

PARTS CATALOG

**I/PAR CODE GUIDE
AND CE LOG**

INDEX

First Edition (August 1982)

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

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

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

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Preface

Customer Engineers use this manual to service the 5292 Display Station. Customer Engineers using this manual should have completed the IBM 5292 Color Display Station education course.

This manual has four major parts: maintenance analysis procedures (MAPs), maintenance information, parts catalog, and I/PAR code guide and CE log. An index at the back of the manual supplies a key word reference to all the information contained in this manual.

A definition of terms and abbreviations that are not common, but are used in this manual, are in the *Glossary of Terms and Abbreviations*.

There are several DANGER and CAUTION notices in this manual. You can use the blank lines below each notice to translate the notice into your own words. The locations of these notices are listed in the *Safety* section.

Related Publications

Related information can be found in the following manuals:

- *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337
- *IBM 5250 Information Display System Reference Card*, GX21-9249
- *IBM 5292 Color Display Station Setup Procedure*, GA21-9415
- *IBM 5292 Color Display Station Operator's Guide*, GA21-9416

Contents

SAFETY	ix
GLOSSARY OF TERMS AND ABBREVIATIONS	xi
LEGEND	xv
MAINTENANCE ANALYSIS PROCEDURES	0000-1
Using the MAPs	0000-3
Conditions After Power On	0000-3
Display Entry MAP	0100-1
Power MAP	0200-1
Video MAP	0300-1
Analog MAP	0400-1
Keyboard MAP	0500-1
Convergence MAP	0600-1
Planar MAP	0700-1
Feature/RPQ MAP	0800-1
Intermittent MAPs	0900-1
MAINTENANCE INFORMATION	1-1
Contents	1-3
Using the Maintenance Information	1-5
Maintenance Procedures	2-1
Tools and Test Equipment	3-1
Theory	4-1
Features and RPQs	5-1
PARTS CATALOG	6-1
Contents	6-3
How to Use This Parts Catalog	6-5
Catalog Selection	6-7
Numerical Index	6-24
I/PAR CODE GUIDE AND CE LOG	7-1
Contents	7-3
Using the Guide	7-5
I/PAR Code Guide	7-6
CE Log	7-14
INDEX	X-1

**Safety
Glossary
Legend**

Safety

Specific DANGER and CAUTION notices are present on pages 2-17, 2-18, 2-48, 2-50, 2-54, 2-55, 2-114, and 3-2. If you desire, translate these notices into your own words and write them on the lines provided.

The IBM 5292 Color Display Station has the following specific DANGERS:

- Line voltage is present at the power supply unit.

- High voltage is present at the anode of the cathode-ray tube and the analog card.

- The cathode-ray tube could implode if it is hit or if it falls.

CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you **MUST** work alone.
2. Remove all power, ac and dc, when removing or assembling major components, working in immediate areas of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. After turning off wall box power switch, lock it in the Off position or tag it with a "Do Not Operate" tag, Form 229-1266. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, observe the following precautions:
 - a. Another person familiar with power off controls must be in immediate vicinity.
 - b. Do not wear rings, wrist watches, chains, bracelets, or metal cuff links.
 - c. Use only insulated pliers and screwdrivers.
 - d. Keep one hand in pocket.
 - e. When using test instruments, be certain that controls are set correctly and that insulated probes of proper capacity are used.
 - f. Avoid contacting ground potential (metal floor strips, machine frames, etc.). Use suitable rubber mats, purchased locally if necessary.
5. Wear safety glasses when:
 - a. Using a hammer to drive pins, riveting, staking, etc.
 - b. Power or hand drilling, reaming, grinding, etc.
 - c. Using spring hooks, attaching springs.
 - d. Soldering, wire cutting, removing steel bands.
 - e. Cleaning parts with solvents, sprays, cleaners, chemicals, etc.
 - f. Performing any other work that may be hazardous to your eyes. **REMEMBER—THEY ARE YOUR EYES.**
6. Follow special safety instructions when performing specialized tasks, such as handling cathode ray tubes and extremely high voltages. These instructions are outlined in CEMs and the safety portion of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles—this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. After maintenance, restore all safety devices, such as guards, shields, signs, and grounding wires.
12. Each Customer Engineer is responsible to be certain that no action on his part renders products unsafe or exposes customer personnel to hazards.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. Ensure that all machine covers are in place before returning machine to customer.

15. Always place CE tool kit away from walk areas where no one can trip over it; for example, under desk or table.
16. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
17. When using stroboscope, do not touch ANYTHING—it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

**Knowing safety rules is not enough.
An unsafe act will inevitably lead to an accident.
Use good judgment—eliminate unsafe acts.**

ARTIFICIAL RESPIRATION

General Considerations

1. Start Immediately—Seconds Count
Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim, or apply stimulants.
2. Check Mouth for Obstructions
Remove foreign objects. Pull tongue forward.
3. Loosen Clothing—Keep Victim Warm
Take care of these items after victim is breathing by himself or when help is available.
4. Remain in Position
After victim revives, be ready to resume respiration if necessary.
5. Call a Doctor
Have someone summon medical aid.
6. Don't Give Up
Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults

1. Place victim on his back immediately.
2. Clear throat of water, food, or foreign matter.
3. Tilt head back to open air passage.
4. Lift jaw up to keep tongue out of air passage.
5. Pinch nostrils to prevent air leakage when you blow.
6. Blow until you see chest rise.
7. Remove your lips and allow lungs to empty.
8. Listen for snoring and gurglings—signs of throat obstruction.
9. Repeat mouth to mouth breathing 10-20 times a minute. Continue rescue breathing until victim breathes for himself.



Thumb and
finger positions



Final mouth-to-
mouth position

Glossary of Terms and Abbreviations

alpha: Alphabetic.

amplifier: A device that increases a voltage or a signal to a usable level.

anode: The high voltage connector on the cathode-ray tube.

analog: A method of controlling electricity by varying the current or voltage.

asterisk: The character *.

attribute: A method that controls how data is displayed on the display screen. For example, the attributes of a display field include blinking, color, and reverse image.

battery: A dc power storage device.

bleeder assembly: An assembly that provides a path for discharging high voltages after the power is turned off.

blink attribute: An attribute of a display field that causes the characters to flash.

blink or blinking: Flashing.

brightness control (operator): A potentiometer for adjusting the brightness of the data on the display screen. This control is accessible to the operator.

buffer: A temporary storage area.

burst: An interval of sound made by the display station alarm. In the single burst mode, one burst is emitted in one time interval. In the double burst mode, two bursts are emitted in one time interval.

buzzer: An audible alarm in the Magnetic Slot Reader.

Cable Thru: A function that permits multiple display stations or printers to be attached serially to a system cable.

capacitive: Having capacitance.

cathode: A negative terminal of a diode or cathode-ray tube that emits electrons.

character matrix: A part of the display screen character window. The character matrix is 9 dots high by 7 dots wide.

Cmd key: The command key on the keyboard that is used to select command functions.

column separator: A dot that separates all the characters in a field of data.

command function keys: The 14 keys in the top row of the display station keyboard that are used with the Cmd (command) key to request functions.

controller: A device that controls the operation of one or more input or output devices.

convergence: The process of pointing the three electron beams in a cathode-ray tube at the same color dot of a color display screen.

CRT: Cathode-ray tube.

D/R: Driver/receiver.

degauss: The process of removing a magnetic field from an object.

diagram: Figure or illustration.

displayable: Something that can be shown on a display screen or printer.

driver: A source that sends (drives) a signal from one location to another.

dynamic convergence: The process of converging the three electron beams of the cathode-ray tube at various points over the display screen.

end-of-queue (EOQ) delimiter: A special code marking the end of the command queue.

end-of-message (EOM): A special code marking the end of a message.

ERAP: Error recording analysis procedure.

field attribute: The control characters that describe a displayed field. For example, a displayed field can be reversed, made to blink, or change color.

fragile: Easily broken.

FRU: Field-replaceable unit.

Gnd: Ground. An electrical return.

hex: Hexadecimal or hexagonal.

I/O: Input/output.

ID: Identification.

implode: To break inward suddenly.

interactive: A system that continuously communicates between the system controller and the work station.

IPL: Initial program load. The first machine program operation after power on.

Keylock: An RPQ consisting of a lock and key that prevents the use of the display station.

keystroke: The action of pressing a key on the keyboard.

LC: Line check. A check for errors that occur during the transmission of data from the system controller to the display station.

LOPT: Line output transformer.

LRC: Longitudinal redundancy check. A type of parity check.

LSID: Logical station identification.

make/break key: A key that generates a scan code when the key is pressed and when it is released.

mandatory: Something that must be done or must be present.

menu: A list of options that can be selected.

metric: A decimal system of measurement based on the meter as a standard of measurement.

microprocessing: Operations performed by the MPU.

microprocessing unit (MPU): A processing unit that is microprogram controlled and performs internal machine operations. The MPU receives data, controls the display of data, and controls the flow of information to and from the controller.

MPU: Microprocessing unit.

MSR: Magnetic Slot Reader; an RPQ that can read magnetically encoded data from an identification card.

multiframe response: More than one frame of data being sent.

N/C: Pertains to a switch setting; normally closed.

N/O: Pertains to a switch setting; normally open.

null: A hexadecimal character code made up of all zeros; this character fills a position in the buffer and is displayed as a blank.

online tests: A series of tests that can be requested from the system after power on and before sign on.

option: One of the items listed on a display screen menu.

overview: A short description which is general in scope.

PC: Printed circuit.

phosphor: A material that emits light when activated by an electron beam.

planar: A printed circuit electronic board used in the display station.

poll: A method the controller uses to determine if a display station is ready to send or receive data.

POR: Power on reset.

port: The place where a cable is connected to a controller.

protector: A device that aids in preventing injuries to persons or damage to machines.

protocol: A specific sequence of rules and the relative timing for exchanging information between communicating persons or machines.

PRT: Printer.

pure (purity): A display screen that is the same shade of one color over all the screen.

PWR: Power.

RAM: Random access memory (storage).

raster: All the area on the display screen that can be lighted.

read-only storage (ROS): A storage area in the MPU that stores information for later use. The information cannot be changed by the MPU.

receivers: Those parts that receive data or voltages.

refresh: The continuous displaying of the same data on the display screen to prevent the data from fading out. Refresh is a function of the display adapter.

regeneration buffer: An area in read/write storage where data is stored before it is displayed.

register: A storage device or circuit that stores those limited parts of data needed by the system to execute input/output, storage, processing, and control operations.

related: Having a common use.

replace: To exchange something; for example, replace a failed part with a new one.

required: See *mandatory*.

retrace lines: The lines that appear on the display screen when the display adapter returns the trace to the upper left corner of the display screen. Retrace lines are normally not displayed.

retry: To repeatedly send frames of information until the frames are received without an error by the display station; the controller sends the frames.

rolling: Pertains to movement on a display screen; the movement can be horizontal, vertical, or a combination of both.

ROS: Read-only storage.

RPQ: Request for price quotation.

Rtn: Return. An electrically zero reference.

SA: System available.

set up: To prepare a device for operation.

shade: Color variation.

shadow: A secondary image visible around or near a primary image.

shorting: Making an electrical short circuit.

sign-on: A logon procedure performed at a display station; the procedure can include entering the sign-on command, a password, or other user-specified security information.

slot: A narrow opening or groove.

SLP: Selector Light Pen; an RPQ that allows the operator to select desired fields on the CRT without the use of a keyboard.

socket: The connectors on the display station to which cables are connected.

speaker: A device that converts electrical signals to audible signals.

start-of-message (SOM): A special code marking the start of a message.

static convergence: The process of converging the three electron beams on one dot in the center of the screen.

storm: Electrical discharges in the air.

stuck key: A key on a keyboard that is jammed, thereby keeping the circuit closed.

Sys Req key: The key that is used to send a request directly to the system.

taper: Increasing in size toward one end.

target: A specific place or character space on a display screen at which a light pen (wand reader) is pointed.

terminator switch: The switch used to terminate the customer system cable at the last display station or printer in a series.

TP: Test point.

transfer: To move from one person, place, or thing to another.

twinaxial cable: A shielded, twisted-pair cable that connects a display station or printer to a controller.

typamatic key: A repeat action key on the keyboard.

U.S.: United States.

undefined: The meaning is not known or described.

underscore: A line under all positions of a field. Underscore is controlled by an attribute.

undisplayable character: A valid hexadecimal character code, but the character cannot be displayed on the CRT.

Vac: Volts alternating current.

Vdc: Volts direct current.


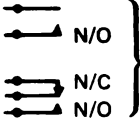












verification: Testing an operation or machine.

video: Pertains to the data displayed on the screen.

yoke assembly: The assembly on the back of the CRT, that contains the horizontal and vertical deflection coils.

Legend

The following symbols are used in flowcharts and figures throughout this manual.

	Display Screen		Switch Contacts
	Start and End of Flowchart		Resistor
	Off-Page Connector		Frame
	On-Page Connector		Earth
	Decision Block		Transformer
	Comment Block		Capacitor
	Information Block		Diodes

Maintenance Analysis Procedures (MAPs)

Using the MAPs
0100 Display Entry
0200 Power
0300 Video
0400 Analog
0500 Keyboard
0600 Convergence
0700 Planar
0800 Feature/RPQ
0900 Intermittent

This page is intentionally left blank.

Using the MAPs

When using the MAPs, you must:

READ CAREFULLY. The MAPs can aid you in finding the failure only if you follow instructions and answer questions accurately.

FOLLOW THE SEQUENCE. Always do the procedure one step at a time.

READ THE COMMENTS. Some steps have additional information that pertains to them. This information, which precedes the question, describes why questions or actions are needed to determine the correct failing part.

FOLLOW THE INSTRUCTIONS. Instructions must be carried out exactly and in the order given. do not change the conditions prepared by the instructions before you answer the questions.

MAP FLOW. Always start with the Display Entry MAP. This MAP will aid you in problem determination and direct you to the correct functional MAP for further repair action. For example, the Power MAP further isolates AC and DC power problems. The Video and Analog MAPs identify display problems. The Keyboard MAP isolates keyboard interface errors. The Convergence MAP finds problems in the convergence control circuits. Errors found during power-on diagnostics are isolated in the Planar MAP. Problems occurring with feature or RPQ circuits are found using the Feature MAP. The Intermittent MAP aids in isolating problems that occur once in a while.

MAINTENANCE CHECKS. Before replacing a part, ensure that all cables to the part are tight. Check all voltages to the part to ensure that it has the correct operating power.

Record all error codes and symptoms in the CE log.

REFERENCES. Three-digit MIM reference numbers in parentheses identify the area in the *Maintenance Information* section of this manual where the repair action is described.

CONDITIONS AFTER POWER ON

A description of the operational display screens is supplied at MIM 410, 412, and 413.

This page is intentionally left blank.

B
1

**MAP 0100
ENTRY MAP**

002

SYMPTOM INDEX	ACTION
Error code on status line	Go to page 5, step 040, Entry Point C
Screen tilted	Replace CRT and yoke assembly (MIM 355)
Keylock problem	GO TO MAP 0800, ENTRY POINT A
SLP or MSR problem	GO TO MAP 0800, ENTRY POINT A

Did you find the symptom in the SYMPTOM INDEX?

Y N

003

- Power off.
- Set the Brightness control near the center of its range (MIM 127).
- Wait 20 seconds.

Normal Power on sequence is as follows:

- Power on.
 - 1) Audible alarm sounds for approximately .5 seconds indicating that the power is OK.
 - 2) Alarm sounds again for a short burst after approximately 12 seconds indicating that the planar diagnostics completed OK.
 - 3) No video should appear on the screen BEFORE 20 seconds after power on.
 - 4) Approximately 30 seconds after power on, video should appear on the status line.

Does this sequence occur?

Y N

004

Is an error code displayed on the status line (MIM 418)?

Y N

1
3 6 5 3
C D E F

F
2

**MAP 0100
ENTRY MAP**

005

Did the power OK alarm sound?

Y N

006

Go To Map 0200, Entry Point A.

007

Did the power OK alarm stop sounding after approximately .5 seconds?

Y N

008

Go To Map 0700, Entry Point D.

009

Did the alarm sound indicating that the planar diagnostics completed OK?

Y N

010

Is the alarm sounding repeatedly in either single or double burst mode (diagnostic error condition) (MIM 417)?

Y N

011

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

012

Go To Map 0700, Entry Point B.

013

Did any video appear on the screen BEFORE 20 seconds after power on?

Y N

014

Is any video displayed on the screen approximately 30 seconds after power on?

Y N

4 4
G H J

J

015

- Turn the Brightness control to maximum.

Is the screen blank?

Y N

016

- Power off.
- Check the continuity of line from J11-8 to J17A-3 (MIM 433).

Is the continuity OK?

Y N

017

Isolate to the cable or Analog card (MIM 433). Repair/replace as necessary.

018

- Perform the Fine Color balance (MIM 236). If the Fine Color balance can not be made;
- Replace the Amplifier card (MIM 351).

019

- Turn the Brightness control fully minimum (MIM 127) to engage the Intensity override switch.

Is the screen blank?

Y N

020

- Set the Brightness control near the center of its range.
- Go To Map 0300, Entry Point A.

021

- Set the Brightness control near the center of its range.

Is the Selector Light Pen (SLP) or Magnetic Slot Reader (MSR) RPQ installed?

Y N

022

Go To Map 0400, Entry Point A.

4
K

G H K
3 3 3

MAP 0100
ENTRY MAP

023

- Power off.
- Disconnect the cable at A7 and A14 on the Display planar (MIM 121).
- Power on.

Is the screen blank?

Y N

024

Go To Map 0800, Entry Point C.

025

Go To Map 0400, Entry Point A.

026

Go to Page 1, Step 001, Entry Point A.

027

- Power off.
- Connect the probe to J4-33 (-Display Rdy) at the front of the Analog card (MIM 434). Use J4-11 as ground.
- Observe the probe.

Does the DOWN light appear on, inside of 5 seconds after powering on, and remain on?

Y N

028

- Press and hold the Cmd key and press the Error Reset key.
- Release the keys.
- Press the 0 key on the top row.
- Press the Enter key.
- Wait 5 seconds.
- Press and hold the Cmd key and press the D key to display the color bar screen (MIM 415).

Does the Brightness control change the brightness of the screen?

Y N

5 5
L M N

0100-4

N

029

Are ALL the color bars displayed?

Y N

030

- Measure the voltages at the following Video card TP's (MIM 123) to the ground strap at the upper left of the Amplifier card bracket.
- The TP voltages should be between -20 and -80 Vdc.

Green grid TP=GG

Blue grid TP=BG

Red grid TP=RG

Is each TP voltage inside the limits?

Y N

031

Is only blue displayed on the screen?

Y N

032

(Entry Point B)

- Check the cable from J15 on the Video card to J17A and J17B on the Amplifier card for a grounded or an open condition (MIM 437). Repair/replace as necessary.
- If no problem is found:
 - Replace the Amplifier card (MIM 351).
 - Replace the Video card (MIM 353).

033

- Power off.
- Check J4-20 for a grounded condition (MIM 114).

Is J4-20 grounded?

Y N

034

Go to Step 032, Entry Point B.

5 5 5
P Q R

E L M P Q R MAP 0100
 2 4 4 4 4 4 ENTRY MAP

035

- Isolate to the cable, Analog card or Amplifier card (MIM 437).
 Repair/replace as necessary.

036

- Replace the Video card (MIM 353).
 - Replace the CRT and Yoke assembly (MIM 355).

037

- Replug all the Amplifier and Video card cables.

038

- Replace the Analog card (MIM 352).

039

- Check the cable from A5-1 to J4-33 at the front of the Analog card for a grounded or open condition. Repair/replace as necessary.
 If no problem is found:
 - Replace the Display planar (MIM 361).

040

(Entry Point C)

STATUS LINE ERROR CODE CHART

ERROR	DEFINITION	ACTION
B1	RAM error	Replace Base planar
B2	ROS error	Replace Base planar
B3	Twinaxial controller error	Replace Base planar
B4	Station address not valid	Replace Base planar.
B5	Twinaxial adapter error	Replace Base planar.
B6	Keyboard interface error	GO TO MAP 0500, ENTRY POINT A
A1	Station address error	Enter station address again. If error continues,

(Step 040 continues)

**MAP 0100
ENTRY MAP**

(Step 040 continued)

		replace Display planar.
C1	CMOS parity error	Reconverge. If error continues, replace Display planar.
D1	CRT interrupt error	GO TO MAP 0700, ENTRY POINT A
D2	Video wrap test error	GO TO MAP 0700, ENTRY POINT A
D3	Convergence RAM error	GO TO MAP 0700, ENTRY POINT A
D4	FBI parity error	GO TO MAP 0700, ENTRY POINT A
D5	Bad parity not detected FBO	GO TO MAP 0700, ENTRY POINT A
D6	No response by convergence	GO TO MAP 0700, ENTRY POINT A
D7	FBO parity error	GO TO MAP 0700, ENTRY POINT A
K1	Keyboard uninstalled error	GO TO MAP 0500, ENTRY POINT A
K2	Keyboard cable wrap error	GO TO MAP 0500, ENTRY POINT A
K3	Key stuck error	GO TO MAP 0500, ENTRY POINT A
xx	ANY error not covered above	GO TO MAP 0700, ENTRY POINT A

041

Is an error code displayed on the status line (MIM 413)?

Y N

042

- Verify that the fan is running by checking for air movement at the slots on the left rear side of the terminal.

Is the fan turning?

Y N

1
S T U

T U
6 6

**MAP 0100
ENTRY MAP**

043

- Measure the ac voltage at J3-11 (115 or 230 Vac) to J3-14 (neutral) (MIM 432).

Is the voltage OK?

Y N

044

- Replace the Power Supply card (MIM 341).

045

- Power off.
- Check the cable from J10 (fan) to J3 (front of power supply) (MIM 432). Repair/replace as necessary.

If no problem is found:

- Replace the Fan (MIM 345).

046

Is the screen filled with bars of red, green, blue or white color?

Y N

047

Is the screen stable?

Y N

048

- Probe A5-11 (-Horiz sync) and A13-3 (-Vert sync) on the Display planar (MIM 121).

Are BOTH the UP and the DOWN lights on constant for each probe point?

Y N

049

Is only the DOWN light on for either of the probe points?

Y N

050

- Replace the Display planar (MIM 361).

1 3
V W X Y

W X Y

051

The line(s) are grounded.

- Use MIM 434 to isolate the grounded condition to either the cable, the Display planar or the Analog card.

052

- Probe J4-1 (-Horiz sync) and J4-28 (-Vert sync) on the front of the Analog card. Use J4-11 as gnd for the probe.

Are BOTH the UP and the DOWN lights on constant for each probe point?

Y N

053

- Check the cable from A5-11 to J4-1 (Horizontal), or A13-3 to J4-28 (Vertical) for continuity. Repair/replace as necessary.

054

- The screen may be unstable if the display station is too close to electromagnetic interference such as printers, certain lighting devices, etc. For more information, see the IBM 5250 Information Display System Planning and Site Preparation Guide, GA21-9337.

- Replace the Analog card (MIM 352).
- Replace the Display planar (MIM 361).
- Replace the Power Supply card (MIM 341).

055

is the SA indicator on solid?

Y N

056

The display station is not communicating with the host system.

Do you want to diagnose this problem at this time?

Y N

8 8
8 A A
Z A B

Z
7
A
A
7
A
B
7

MAP 0100
ENTRY MAP

057

Go to Step 059, Entry Point D.

058

Go to Page 11, Step 115, Entry Point E.

059

(Entry Point D)

- Press and hold the Cmd key and press the Error Reset key.
 - Release the keys.
 - Press the 0 key on the top row.
 - Press the Enter key.
- The alarm should sound for a short burst after approximately 6 seconds.

Did the alarm sound OK?

Y N

060

Is Keylock RPQ installed on the terminal?

Y N

061

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

062

Is the Keylock unlocked?

Y N

063

- Unlock the Keylock.

064

- Do NOT power off.
- Disconnect connector B5 at the Base planar (MIM 122).
- Press and hold the Cmd key and press the Error Reset key.

Is the SELECT indicator on?

Y N

A A A
C D E

0100-8

A A A
C D E

065

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

066

- Replace the Keylock assembly.

067

- Press and hold the Cmd key and press the D key to display the color bar screen (MIM 415).

Is the color bar screen displayed (MIM 415)?
(The colors may be wrong, blurred, misconverged, and so on)

Y N

068

Is the screen completely blank?

Y N

069

Go To Map 0300, Entry Point B.

070

Go To Map 0400, Entry Point A.

071

Are the three primary colors (red, blue, green) present?

Y N

072

Go To Map 0300, Entry Point N.

073

- Turn the Brightness control from limit to limit (MIM 127). Do not engage the Intensity override switch.

At the upper limit the colors should be bright and the correct color (name on the color bar).

At the lower limit the color bars should be just visible.

Is the above correct?

Y N

9 9
A A
F G

A
G
8

**MAP 0100
ENTRY MAP**

074
Does the Brightness control change the brightness of ALL the color bars?

Y N

075
Does the brightness of the RED and GREEN color bars change?

Y N

076
Go To Map 0300, Entry Point L.

077
Go To Map 0300, Entry Point G.

078
- Press and hold the Cmd key and press the 6 key on the top row of keys.

Are there more than 7 distinct bars on the screen?

Y N

079
Are the right and left margins of the color bar screen aligned?

Y N

080
- Press and hold the Cmd key and press the 6 key on the top row.
Go To Map 0600, Entry Point A.

081
- Perform the Fine Color Balance adjustment (MIM 236).
If the adjustment does not solve the problem,
Go To Map 0300, Entry Point A.

082
- Press and hold the Cmd key and press the 6 key on the top row.
Go To Map 0600, Entry Point A.

A
F
8

083
- Press and hold the Cmd key and press the J key.

Are there dark horizontal bars through the green purity screen (MIM 415)?

Y N

084
Skip is suppressed.
- Probe J4-26 (-Skip) at the front of the Analog card (MIM 125). Use J4-11 as gnd for the probe.

Are the UP and DOWN lights on?

Y N

085
- Power off.
- Disconnect the cable A5 at the Display planar (MIM 121).
- Check A5-7 on the cable for a grounded condition.

Is the line grounded?

Y N

086
- Replace the Display planar (MIM 361).

087
- Repair/replace cable from A5-7 to J4-26.
If no problem is found:
- Replace the Analog card (MIM 352).

088
- Replace the Analog card (MIM 352).

089
- Press and hold the Cmd key and press the 6 key on the top row to make the bars disappear.

Do the dark horizontal bars disappear? (The bottom line of the screen should move up.)

Y N

1 1
O O
A A
H J

A A
H J
9 9

**MAP 0100
ENTRY MAP**

090

- Probe J4-26 (-Skip) at the front of the Analog card (MIM 125). Use J4-11 as ground for the probe lead.

Are the UP and DOWN lights on?

Y N

091

- Replace the Analog card (MIM 352).

092

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

093

- Press and hold the Cmd key and press the 6 key on the top row to get the dark horizontal bars back.
- Use this screen and the red purity screen (Cmd H) and the blue purity screen (Cmd K) to check color purity.

Is the shade of color constant over the entire screen for each color (purity)?

Y N

094

Go To Map 0300, Entry Point J.

095

- Press and hold the Cmd key and press the G key to display the red focus screen.

Is focus OK?

Y N

096

- Perform the Fine Focus adjustment (MIM 235).

Does the focus adjustment correct the problem?

Y N

A A A
K L M

A A A
K L M

097

Can you see any change on the screen while the adjustment is made?

Y N

098

- Check P26 (large white inline connector between the Video card and Analog card-MIM 125).

If no problem is found:

- Replace the Analog card (MIM 352).
- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

- Replace the Analog card (MIM 352).

- Replace the CRT and Yoke assembly (MIM 355).

100

Problem fixed.

101

- Press and hold the Cmd key and press the 7 key on the top row of keys.

Does the red focus screen become a flashing green O screen?

Y N

102

- Replace the Display planar (MIM 361).

103

- Set the color mode back to 7 color mode by holding the Cmd key and pressing the 7 key on the top row.

- Press and hold the Cmd key and press the F key to get the alignment screen.

Is the size, centering, and straightness of the outline correct (MIM 231)?

Y N

1 1
A A
N P

A
N
P
1
0

MAP 0100
ENTRY MAP

104

- Perform the Fine Raste: adjustment (MIM 231).
- If the adjustment cannot be made,
- Replace the Analog card (MIM 352).

105

- Press and hold the Cmd key and press the += key on the top row to get the convergence screen.

Is convergence good (MIM 234)?

Y N

106

Go To Map 0600, Entry Point A.

107

- Press the C key to cancel the convergence screen.

Has the customer stated that the character definition is not correct (missing dots, wrong characters, and so on)?

Y N

108

- Loop the Bring Up Diagnostics by holding the Cmd key down and pressing the M key.

Do the Bring Up Diagnostics loop?

Y N

109

Is an error code displayed on the status line (MIM 413)?

Y N

110

- Replace the Base planar (MIM 362).

111

Go to Page 5, Step 040, Entry Point C.

1
3
A
Q

A
R

112

- Press and hold the Cmd and Error Reset key until the alarm sounds.
- Wait 5 seconds and then press the Error Reset key again to get out of select mode.

Does the SA indicator appear on the status line and remain on?

Y N

113

Are the Bring Up Diagnostics looping?

Y N

114

Is the SELECT indicator displayed on the status line?

Y N

115

(Entry Point E)

Is the MSR or SLP RPQ installed?

Y N

116

(Entry Point F)

- Check that there are no other displays on your line that have the same address as your display terminal.
- Check that all the displays on your line have their terminator switches properly set.
- Check the system cable and its connectors.
- Check that the system is configured to include your terminal.
- Verify that the system is operating correctly.

Are the above items correct?

Y N

1
2
A
S

1
2
A
T

1
2
A
U

1
2
A
V

1
2
A
W

1
2
A
X

A A A
V W X
1 1 1

**MAP 0100
ENTRY MAP**

117
- Take the correct action.

118
- Measure the -5 Vdc TP to the GND TP on the Base planar (MIM 122).

Is the voltage between -4.5 and -5.5 Vdc?
Y N

119
- Measure B6-1 (-5 Vdc) to B6-3 (gnd) on the Base planar (MIM 122).

Is the voltage between -4.5 and -5.5 Vdc?
Y N

120
- Check the continuity of the DC distribution cable from B6 to J34 (MIM 431). Repair/replace as necessary.
If no problem is found:
- Replace the Junction block (MIM 348).

121
- Replace the Base planar (MIM 362).

122
- Use MIM 439 to check the Cable Thru assembly on the I/O panel. Repair/replace as necessary.
If no problem is found:
- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

123
- Power off.
- Disconnect cables connected to A7 and A14 on the Display planar (MIM 121).
- Power on.

Does the SA indicator appear on the status line and remain on?

Y N
| |
| |

A A
Y Z

A A A A
S T U Y Z
1 1 1 |

124
- Power off.
- Reconnect the cables removed from A7 and A14 on the Display planar.
- Power on.
Go to Page 11, Step 116, Entry Point F.

125
Go To Map 0800, Entry Point C.

126
- Replace the Base planar (MIM 362).

127
- Replace the Base planar (MIM 362).

128
- Engage the Intensity override switch by turning the Brightness control toward minimum until a click is felt (MIM 127).

Does the screen fill with a white raster?
Y N

129
Go To Map 0300, Entry Point C.

130
- Set the Brightness control near the center of its range.
- Attempt to sign on to the system.

Could you do so?
Y N

131
Are there 2 twinaxial cables attached to the Cable Thru?

Y N
| |

132
Is the terminator switch on the I/O assembly set to '1' (MIM 112)?

Y N
| |

1 1 1 1
A B C D
| | | |

A B B B B
Q A B C D
1 1 1 1 1
1 2 2 2 2

MAP 0100
ENTRY MAP

133

- Set the terminator switch to '1'.

134

- Use MIM 439 to check the Cable Thru assembly on the I/O panel. Repair/replace as necessary.

If no problem is found:

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

135

- Check that the last work station on your twinaxial line is terminated correctly.
- Check that the address of your terminal (MIM 415) is not used by another terminal.

If no problem is found:

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

136

Check out is complete. No problems were found.

137

- Measure the +8.5 Vdc at TP '8.5' on the Video card, to the ground strap on the upper left of the Amplifier card bracket (MIM 123).

Is the voltage between +7.5 and +9.5 Vdc?

Y N

138

- Check the continuity of the cable from J14-3 on the back of the Video card to J35-10 on the Junction block (MIM 434). Repair/replace as necessary.

If no problem is found:

- Replace the Video card (MIM 353).

139

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

A C S V
1 2 6 7

140

Are the bars white or gray?

Y N

141

Go To Map 0300, Entry Point A.

142

Is the Brightness control set near the center of its range?

Y N

143

Go to Page 1, Step 001, Entry Point A.

144

Go To Map 0300, Entry Point B.

145

Go to Page 5, Step 040, Entry Point C.

146

Follow directions.

147

Go To Map 0900, Entry Point A.

This page is intentionally left blank.

POWER MAP 0200

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
9	097	0100	A

001

(Entry Point A)

- Verify that the fan is running by checking for air movement at the slots on the left rear side of the terminal.

Is the fan turning?

Y N

002

Is the power cord plugged into an active outlet and into the back of the terminal?

Y N

003

- Plug power cord in.

004

- Power off.
- Check the main line fuse (F1) (MIM 112).

Is the fuse blown?

Y N

005

- Power on.
- Measure the ac Voltage J3-10 (115 or 230 Vac input) to J3-15 (neutral) at the front of the Power supply (MIM 432).

Is the voltage OK?

Y N

2 2 2 2
A B C D

B C D
1 1 1

**MAP 0200
POWER MAP**

006

- Check the continuity of the ON/OFF switch, power cord, and AC cable assembly (MIM 432). Repair/replace the failing FRU.

007

- Replace the Power Supply card (MIM 341).

008

- Replace the fuse.
- Power on.

Did the fuse blow again?

Y N

009

- Wait approximately 10 minutes.

Did the fuse blow?

Y N

010

Problem fixed.

011

Go to Step 012, Entry Point B.

012

(Entry Point B)

- Power off.
- Disconnect the Power supply card from the J3 connector (MIM 112).
- Replace the fuse again.
- Power on.

Did the fuse blow?

Y N

E F

0200-2

A E F
1 1 1

013

- Power off.
- Reconnect the Power supply card.
- Disconnect J10 (fan-MIM 112).
- Disconnect J27 (degauss coil-MIM 113).
- Power on.

Did the fuse blow?

Y N

014

- Power off.
- Reconnect J27 (degauss coil).
- Power on.

Did the fuse blow?

Y N

015

- Replace the Fan (MIM 345).

016

- Power off.
- Reconnect J10 (fan).
- Replace the Degauss coil (MIM 357).

017

- Power off.
- Replace the Power Supply card (MIM 341).

018

- Power off.
- Remove the line cord from the AC outlet.
- Repair/replace the AC cable assembly (MIM 432).

019

- Power off.
- Wait 20 seconds.
- Power on.

Does the alarm sound for approximately .5 seconds?

Y N

9 3
G H

H
2

**MAP 0200
POWER MAP**

020

Did the alarm sound at all?

Y N

021

Is any video displayed on the screen approximately 30 seconds after power on?

Y N

022

- Power off.
- Measure the +8.5 Vdc TP to the Gnd TP on the Display planar (MIM 121).
- Observe the meter while powering up.

Did the voltage pulse once or several times and then fall to zero? (The voltage pulse may be very small. Turn the meter down a range if necessary.)

Y N

023

Is the voltage constant between +7.6 and +9.4 Vdc?

Y N

024

- Power off.
- Remove the line cord from the AC outlet.
- Remove the Power supply card (MIM 341).
- Remove the plastic shield on the Power supply to check fuse F2 (MIM 126).

Is the fuse blown?

Y N

9 7 4
J K L M N P

M N P

025

- Check the continuity of the LOPT sense winding in the Analog card by measuring the resistance between pins J3-8 and 9 (MIM 432). Ensure that the Power supply card is not plugged into J3.

Is the resistance less than 5 ohms?

Y N

026

- Check the continuity of the cable from J3 to P7 and repair if necessary (MIM 432).

If no problem is found:

- Replace the Analog card (MIM 352).

027

- Replace the Power Supply card (MIM 341).

028

- Do NOT replace the fuse.
- Replace the Power Supply card (MIM 341).

029

- Measure the +5 Vdc TP on the Base planar to the Gnd TP (MIM 122).

Is the voltage between +4.5 and +5.5 Vdc?

Y N

030

- Replace the Power Supply card (MIM 341).

031

- Measure the +5 Vdc TP on the Display planar to the Gnd TP (MIM 121).

Is the voltage between +4.5 and +5.5 Vdc?

Y N

032

- Replace the Power Supply card (MIM 341).

4
Q

L 0
3 3

**MAP 0200
POWER MAP**

033

- Measure the -5 Vdc TP on the Display planar to the Gnd TP.

Is the voltage between -4.5 and -5.5 Vdc?

Y N

034

- Measure the -5 Vdc at A6-4 on the Display planar.

Is the voltage between -4.5 and -5.5 Vdc?

Y N

035

- Check continuity of the cable from A6 to J34 (MIM 431). Repair/replace as necessary.

If no problem is found:

- Replace the Power Supply card (MIM 341).
- Replace the Junction block (MIM 348).

036

- Replace the Display planar (MIM 361).

037

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

038

One of the dc voltages is probably grounded. The following procedures disconnect and reconnect FRUs to find the failing FRU.

- Power off.
- Disconnect the Keyboard cable from the back of the terminal.
- Power on.

Does the alarm sound at all?

Y N

7
R S

S

039

- Power off.
- Reconnect the Keyboard cable.
- Disconnect connectors J14 and J16 on the back side of the Video card (MIM 123).
- Power on.

Does the alarm sound at all?

Y N

040

- Power off.
- Reconnect the Video card connectors J14 and J16.
- Disconnect Amplifier card connectors J17A, J17B, and J18 (MIM 210).
- Power on.

Does the alarm sound at all?

Y N

041

- Power off.
- Reconnect the Amplifier card connectors J17A, J17B, and J18.

Is there a cable at location P36 of the Junction block (MIM 435)?

Y N

042

(Entry Point C)

- Disconnect J34 from the Junction block (MIM 435).
- Power on.
- Measure the voltage between P36-10 (+8.5 Vdc) and P36-19 (gnd).

Is the voltage between +7.6 and +9.4 Vdc and constant?

Y N

7 7 6 6 5
T U V W X

X
4

MAP 0200
POWER MAP

043

- Power off.
- Reconnect the J34 cable (and J36 cable if removed).
- Disconnect the A5 cable at the Display planar (MIM 120).
- Power on.

Does the alarm sound at all?

Y N

044

- Power off.
- Reconnect A5.
- Remove the CRT Hi-voltage cable from the Analog card (MIM 125) by loosening the retaining cap and pulling the cable out. The free end of the Hi-voltage cable is safe - let it remain in the bottom of the box.
- Power on.

Does the alarm sound at all?

Y N

045

- Power off.
- Reconnect the CRT Hi-voltage cable.
- Disconnect J11 at the Brightness control.
- Power on.

Does the alarm sound at all?

Y N

046

- Power off.
- Reconnect J11.
- Disconnect P6 on the side of the Analog card (MIM 125).
- Power on.

Does the alarm sound at all?

Y N

6 A A A
Y Z A B C

Z A A A
A B C

047

- Power off.
- Check cable continuity from J4 (Analog card) to J35 (Junction block) (MIM 434). Repair/replace cable as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).
- Replace the Power Supply card (MIM 341).

048

- Check both yoke coils for a short to frame ground (MIM 436).

Are either of the coils shorted to ground?

Y N

049

- Check the cable from A5-9 to J4-31 for a grounded condition. Repair/replace as necessary.
- If no problem is found:
- Replace the Analog card (MIM 352).

050

- Replace the CRT and Yoke assembly (MIM 355).

051

- Check the Brightness control/intensity override switch assembly for a grounded condition (MIM 433). Repair/replace as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).

052

- Measure the resistance of the Hi-voltage cable (Bleeder assembly) to ground.

Is the resistance equal to or more than 240 M ohms?

Y N

6 6
A A
D E

W Y A A
4 5 D E
5 5

**MAP 0200
POWER MAP**

053

- Replace the Bleeder assembly (MIM 354).

054

- Replace the CRT and Yoke assembly (MIM 355).

055

- Replace the Display planar (MIM 361).

056

- Power off.
- Reconnect J34.
- Leave the meter connected between P36-10 and P36-19.
- Disconnect B6 on the Base planar (MIM 122).
- Power on.

Is the voltage between +7.6 Vdc and +9.4 Vdc and constant?

Y N

057

- Power off.
- Reconnect B6.
- Disconnect B5A on the Base planar.
- Power on.

Is the voltage between +7.6 Vdc and +9.4 Vdc and constant?

Y N

058

- Power off.
- Disconnect the crossover cable at B4 on the Base planar (MIM 122).
- Power on.

Is the voltage between +7.6 Vdc and +9.4 Vdc and constant?

Y N

A A A A
F G H J

V A A A A
4 F G H J

059

- Reconnect B5A (and J36 cable if removed).
 - Check/replace the cable from J34 to the planars (MIM 431).
- If no problem is found:
- Replace the Display planar (MIM 361).

060

- Reconnect J36.
- Replace the Base planar (MIM 362).

061

- Reconnect J36.
- Replace the Alarm assembly (MIM 331).

062

- Reconnect J36.
- Replace the Base planar (MIM 362).

063

- Disconnect J36 from the Junction block.
- Power on.

Does the alarm sound at all?

Y N

064

- Power off.
- Go to Page 4, Step 042, Entry Point C.**

065

(Entry Point D)

- Check the voltage lines of the MSR/SLP cable from J36 to C3, C4, and D3 (MIM 452) for a grounded condition. Repair/replace as necessary.

If no problem is found:

- Replace the MSR adapter card (MIM 363).
- Replace the SLP adapter card (MIM 363).

U
4

MAP 0200
POWER MAP

066

- Power off.
- Reconnect ONLY J17A and J17B.
- Power on.

Does the alarm sound at all?

Y N

067

- Replace the Amplifier card (MIM 351).
- Replace the Power Supply card (MIM 341).

068

Is there a cable in location P36 of the Junction block (MIM 452)?

Y N

069

- Check the cable from J18-14 to J35-4 and J18-15 to J35-6 for a grounded condition (MIM 434). Repair/replace as necessary.
- If no problem is found:
 - Replace the Amplifier card (MIM 351).
 - Replace the Power Supply card (MIM 341).

070

- Power off.
- Reconnect J18.
- Disconnect J36 from the Junction block.
- Power on.

Does the alarm sound at all?

Y N

071

Is SLP installed?

Y N

072

- Check the cable from J18-14 to J35-4 and J18-15 to J35-6 for a grounded condition. Repair/replace as necessary.
- If no problem is found:
 - Replace the Amplifier card (MIM 351).
 - Replace the Power Supply card (MIM 341).

A A
K L

K R T A A
3 4 4 K L

073

- Power off.
- Disconnect the SLP cable from the PTR/SLP location on the Junction block (MIM 435).
- Power on.

Does the alarm sound at all?

Y N

074

- Check the cable from J18-14 to J35-4 and J18-15 to J35-6 for a grounded condition. Repair/replace as necessary.
- If no problem is found:
 - Replace the Amplifier card (MIM 351).
 - Replace the Power Supply card (MIM 341).

075

- Replace the Selector Light Pen.

076

Go to Page 6, Step 065, Entry Point D.

077

- Replace the Video card (MIM 353).

078

- Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.
- If no problem is found:
 - Replace the Keyboard logic card and key assembly (MIM 311).

079

Is the screen stable?

Y N

8 8
A A
M N

A A
M N
7 7

**MAP 0200
POWER MAP**

080

- Power off.
- Disconnect the cable at A5 on the Display planar (MIM 121).
- Power on.

Did the Power OK alarm sound?

Y N

081

- Power off.
- Reconnect the A5 cable on the Display planar.
- Power on.

Go to Step 088, Entry Point G.

082

- Check the cable from A5-11 to J4-1 for a grounded condition (MIM 434). Repair/replace as necessary.
- If no problem is found:
- Replace the Analog card (MIM 352).

083

- Press and hold the Cmd key.
 - Press the Error Reset key.
 - Release the keys.
 - Press the 0 key on the top row of keys.
 - Press the Enter key.
- The display is now in offline Select mode.

Did the alarm sound?

Y N

084

- Measure the voltage at B5A-2 (+8.5 Vdc) on the Base planar to the ground TP (MIM 122).

Is the voltage between +7.5 Vdc and +9.5 Vdc?

Y N

9
A A A
P Q R

A A
Q R

085

- Power off.
- Check the continuity of the crossover cable from B4-11 on the Base planar to A4-11 on the Display planar. Repair/replace as necessary.

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

086

- Probe B5A-1 (-Alarm) on the Base planar (MIM 122).
- Observe the probe as you press and hold the space bar key down.

Did the DOWN light appear on, off, then remain on?

Y N

087

Is the DOWN light on all the time?

Y N

088

(Entry Point G)

- Measure the voltages on the Base planar TPs (MIM 122).

Are the voltages OK?

Y N

089

- Check the + and -5 Vdc on B6 of the Base planar (MIM 431).

Are the voltages OK?

Y N

090

- Use MIM 431 to check the DC distribution cable from B6 to J34. Repair/replace as necessary.

9 9 9 9
A A A A
S T U V

J A A A A MAP 0200
3 P S T U V
8 8 8 8 8 POWER MAP

091

- Replace the Base planar (MIM 362).

092

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

093

- Replace the Alarm assembly (MIM 331).
- Replace the Base planar (MIM 362).

094

- Replace the Alarm assembly (MIM 331).
- Replace the Base planar (MIM 362).

095

- Replace the Base planar (MIM 362).

096

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).
- Replace the Power Supply card (MIM 341).

G
2

097

Go To Map 0100, Entry Point A.

This page is intentionally left blank.

VIDEO MAP 0300

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	B	1	002
0100	C	1	003
0100	G	5	052
0100	J	4	043
0100	L	4	041
0100	N	8	088
0400	D	2	020

001 (Entry Point A)

- Power off.
- Press and hold the Cmd key and the Error Reset key during power on to force offline select mode. Release the keys after the second alarm.
- Wait 20 seconds.
- Press and hold the Cmd key and press the D key to display the color bar screen (MIM 415).

Is the color bar screen displayed?

Y N

002 (Entry Point B)

- Turn the Brightness control fully minimum (MIM 127) to engage the Intensity override switch.

Can you see a raster on the screen?

Y N

8 2
A B C

C

003 (Entry Point C)

- Probe J4-13 (-Force Video) on the front of the Analog card (MIM 434). Use J4-11 as gnd for the probe.

Is the DOWN light on?

Y N

004

- Measure the voltage at J4-42 (-Override N/O). Use J4-11 as ground.

Is the voltage approximately -150 Vdc?

Y N

005

- Measure the voltage at J4-43 (-150 Vdc). Use J4-11 as ground.

Is the voltage approximately -150 Vdc?

Y N

006

- Power off.
- Set the Brightness control near the center of its range.
- Disconnect J11 connector near the Brightness control (MIM 127).
- Check J11-3 for a short to gnd.

Is the line shorted to gnd?

Y N

007

- Replace the Brightness control/Intensity Override switch assembly (MIM 330).

2 2 2 2
D E F G

E F G
1 1 1

MAP 0300
VIDEO MAP

008

- Pull the Analog card from its socket J4 (see the pictures of MIM 352).

Is the line still shorted to ground?

Y N

009

- Replace the Analog card (MIM 352).

010

- Repair/replace the cable from J11-3 to J4-42.

011

- Measure the voltage on P11-5 (-150 Vdc) at the Brightness control (MIM 433). Use J4-11 as gnd.

Is the voltage approximately -150 Vdc?

Y N

012

- Repair/replace the cable from J4-43 to P11-5.

013

- Measure the voltage at P11-3 (-Override N/C).

Is the voltage approximately -150 Vdc?

Y N

014

- Replace the Brightness control/Intensity Override switch assembly (MIM 330).

015

- Repair/replace the cable from J4-42 to P11-3.

016

- Replace the Analog card (MIM 352).

B D
1 1

017

- Measure the +5 Vdc at TP '5' on the Video card (MIM 123) to the ground strap at the upper left of the Amplifier card bracket.

Is the voltage between +4.5 and +5.5 Vdc?

Y N

018

- Check continuity from J14-1 to J35-23 (MIM 434). Repair/replace cable as necessary.

If no problem is found:

- Replace the Video card (MIM 353).

019

- Check for grounds and continuity of the Intensity override switch on the Brightness control and its cable to J4 (MIM 433).
- Check continuity from J4-13 to J16-5 (MIM 434).

If no problem is found:

- Replace the Video card (MIM 353).
- Replace the Analog card (MIM 352).

020

(Entry Point D)

All 3 primary colors (red, green, and blue) should be visible somewhere on the screen.

Are the 3 primary colors visible?

Y N

021

Are only one or two of the primary colors visible?

Y N

4 4 3
H J K

K
2

MAP 0300
VIDEO MAP

022

- Probe TP 'GT' (-Force Video) on the Video card (MIM 123). Use the ground strap at the upper left of the Amplifier card bracket as ground for the probe.

Is the signal normally UP and then go DOWN when the Intensity override switch is engaged?

Y N

023

- Do NOT engage the Intensity override switch.
- Probe J4-13 (-Force Video). Use J4-11 as ground for the probe.

Is the UP light ON and the DOWN light OFF?

Y N

024

Is the DOWN light ON?

Y N

025

- Replace the Analog card (MIM 352).

026

(Entry Point K)

- Measure J4-42 (-Override N/O) on the front of the Analog card to J4-11 (gnd) (MIM 434).

Is the voltage approximately -150 Vdc?

Y N

L M N P

L M N P

027

- Power off.
- Remove the Video card from the end of the CRT.
- Disconnect J16 from the Video card (MIM 123).
- Check P16-5 on the Video card for a grounded condition.

Is the line grounded?

Y N

028

- Check the cable from J4-13 to J16-5 for a grounded condition. Repair/replace as necessary.
- If no problem is found:
 - Replace the Analog card (MIM 352).

029

- Replace the Video card (MIM 353).

030

- Replace the Brightness control/Intensity Override switch assembly (MIM 330).

031

- Engage the Intensity override switch.

Is the DOWN light ON and the UP light OFF?

Y N

032

- Check for continuity of the Intensity override switch and the cable to J4 (MIM 433). Repair/replace as necessary.
- If no problem is found:
 - Replace the Analog card (MIM 352).

033

- Repair/replace the cable from P4-13 to P16-5.

034

- Replace the Video card (MIM 353).

H J
2 2

MAP 0300
VIDEO MAP

035

Turn the Brightness control towards maximum.

Go to Page 5, Step 052, Entry Point G.

036

- Turn the Brightness control toward maximum.

Does the screen still seem to be in the Intensity override condition although the brightness may be adjustable?

Y N

037

Is ONE RASTER permanently on? (That is, there is a solid RED, GREEN, or BLUE background which may be dim or bright.)

Y N

038

Is the Select indicator displayed on the status line (MIM 411)?

Y N

039

- Replace the Base planar (MIM 362).

040

Is the problem that ONE of the 3 primary colors (red, green, blue) is never displayed on the screen?

Y N

7 7 6
Q R S T

0300-4

T

041

(Entry Point L)

- Do NOT engage the Intensity override switch.
- You may have:
 - a) screen too DIM or BRIGHT.
 - b) brightness not variable.
 - c) limited or unstable brightness variation when the Brightness control is turned from minimum to maximum.
 - d) screen BLANK.

Do you have any of the above problems?

Y N

042

- Press and hold the Cmd key.
- Press the H key to get the red purity screen.

Is the red color the same shade of red over the entire screen (purity)?

Y N

043

(Entry Point J)

- Power off.
- Disconnect J27 (Degauss coil MIM 113).
- Measure the resistance of the Degauss coil (MIM 432).

Does the coil measure 15-20 ohms?

Y N

044

- Replace the Degauss coil (MIM 357).

045

- Reconnect J27.
- Power on.
- Do the Fine Purity adjustment (MIM 233).

Can the color purity be adjusted correctly?

Y N

6 5 5 5
U V W X

W X
4 4

**MAP 0300
VIDEO MAP**

046

- Power off.
- Disconnect J19 from the Amplifier card.
- Check the purity coils by measuring the resistance between J19-1 and 4, and J19-3 and 4 (MIM 436).

Are the resistances 130-170 ohms?

Y N

047

- Replace the Convergence assembly (MIM 356).

048

- Reconnect J19.
- Check the fuse F3 on the Amplifier card by measuring the resistance from TP 'K' to TP 'M' on the Amplifier card (MIM 124).

Is the resistance 0 ohms?

Y N

049

- Replace the fuse. If the fuse blows again, replace the Amplifier card (MIM 351).

050

- Replace the Amplifier card (MIM 351).
- Replace the CRT and Yoke assembly (MIM 355).

051

End of MAP.

V
4

052

(Entry Point G)

- Measure the voltages at the 3 Video card TPs listed below (MIM 123) to the ground strap at the upper left of the Amplifier card bracket.
- With the Brightness control set to minimum, the TP voltages should be between -50 and -80 Vdc.
- With the control set to maximum, the TP voltages should be between -20 and -50 Vdc.

GREEN GRID TP = GG

BLUE GRID TP = BG

RED GRID TP = RG

Are all 3 TP voltages OK?

Y N

053

Is only the blue grid voltage bad?

Y N

054

(Entry Point F)

- Adjust the color balance potentiometers on the Amplifier card for the bad color (MIM 124).

Can the bad grid voltage be corrected?

Y N

055

- Check continuity of the cable from J15 (Video card), to J17A and J17B (Amplifier card) (MIM 437). Repair/replace as necessary.
- If no problem is found:
 - Replace the Amplifier card (MIM 351).
 - Replace the Video card (MIM 353).
 - Replace the CRT and Yoke assembly (MIM 355).

6 6 A
Y Z A

Y Z A
5 5 A
5

MAP 0300
VIDEO MAP

056

- Perform the Fine Color balance (MIM 236)

057

Is the blue grid voltage constant and between -10 and -20 Vdc as the Brightness control is varied?

Y N

058

Go to Page 5, Step 054, Entry Point F.

059

- Measure the voltage at TP 'J' of the Amplifier card (MIM 124) to the ground strap at the upper left of the Amplifier card bracket.

Is the voltage less than +.5 Vdc?

Y N

060

Is the SLP RPQ installed?

Y N

061

- Replace the Display planar (MIM 361).

062

- Replace the SLP adapter card (MIM 363).
- Replace the Selector light pen.
- Replace the Display planar (MIM 361).

063

- Replace the Amplifier card (MIM 351).

064

- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

S U
4 4

065

- Measure J4-43 (-150 Vdc) at the front of the Analog card (MIM 434). Use J4-11 as gnd.

Is the voltage OK?

Y N

066

- Replace the Analog card (MIM 352).

067

- Power off.
- Check continuity of the Brightness control/intensity override switch assembly and its cable to the Analog and Amplifier cards (MIM 433). Repair/ replace as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).
- Replace the Amplifier card (MIM 351).
- Replace the Video card (MIM 353).

068

(Entry Point E)

- Press and hold the Cmd key and press the F key.
- Ground each video signal on the Video card (MIM 123), one at a time, to the ground strap at the upper left of the Amplifier card bracket.

GREEN VIDEO TP = G1

RED VIDEO TP = R1

BLUE VIDEO TP = B1

Does the color of the grounded signal appear on the screen?

Y N

069

- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

7
A
B

R A
4 B
6

**MAP 0300
VIDEO MAP**

070

- Ground each video signal on the Display Planar, one at a time, to the planar GND TP (MIM 121).

GREEN VIDEO = A13-5
RED VIDEO = A13-7
BLUE VIDEO = A13-9

Does the color of the grounded signal appear on the screen?

Y N

071

- Check the continuity of the lines below (MIM 434). Repair/replace as necessary.

VIDEO	DISPLAY PLANAR	VIDEO Wire
Green	A13-5	J14-5
Red	A13-7	J14-7
Blue	A13-9	J14-9

If no problem is found:

- Replace the Video card (MIM 353).

072

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

073

(Entry Point H)

- Probe the 3 video signals at the Display Planar (MIM 121);

GREEN = A13-5
RED = A13-7
BLUE = A13-9

Are both the UP and DOWN lights on for each probe point?

Y N

A A
C D

Q A A
4 C D

074

Is only the DOWN light on for any of the probe points?

Y N

075

- Replace the Display planar (MIM 361).

076

- Power off.
- Measure the resistance to ground of the suspect signal.

Is it shorted to ground?

Y N

077

- Replace the Display planar (MIM 361).

078

- Use MIM 434 to isolate the grounded signal to either the cable, the Display planar, or the Video card.

079

- Replace the Video card (MIM 353).
- Replace the Amplifier card (MIM 351).
- Replace the CRT and Yoke assembly (MIM 355).

080

- Probe J4-13 (-Force video) at the front of the Analog card (MIM 434). Use J4-11 as gnd for the probe.

Is the DOWN light ON?

Y N

081

- Measure the +70 Vdc at TP '70' on the Video card (MIM 123).

Is the voltage between +63 and +77 Vdc?

Y N

8 8 8
A A A
E F G

A
1
A
E
7
A
F
7
A
G
7

**MAP 0300
VIDEO MAP**

082

- Measure the voltage at J4-23 (+70 Vdc) to J4-11 (gnd) at the front of the Analog card.

Is the voltage between +63 and +77 Vdc?

Y N

083

- Replace the Analog card (MIM 352).

084

- Check the cable from J16-1 at the Video card to J4-23 at the front of the Analog card (MIM 437). Repair/replace as necessary.

If no problem is found:

- Replace the Video card (MIM 353).

085

- Replace the Video card (MIM 353).

086

Go to Page 3, Step 026, Entry Point K.

087

(Entry Point M)

Are the 7 color bars the correct colors?

Y N

088

(Entry Point N)

Are the only colors displayed white and green?

Y N

089

Is only ONE of the primary colors (red, blue, or green) missing?

Y N

9
A
H
9
A
J
9
A
K
A
L

A
L

090

Does one of the rasters (red, blue, or green) appear to be on all the time?

Y N

091

- Attempt to do the Fine Color Balance adjustment (MIM 236).

Are the 7 colors now correct?

Y N

092

Go to Page 6, Step 068, Entry Point E.

093

Problem fixed.

094

Is the blue raster on all the time?

Y N

095

Go to Page 7, Step 073, Entry Point H.

096

- Vary the Brightness control from limit to limit (do not engage the Intensity override switch).

Does the brightness of the raster change from bright to dim?

Y N

097

- Measure the voltage at J4-20 to ground (MIM 114).

Is the voltage between -120 Vdc and -180 Vdc?

Y N

9
A
M
9
A
N
9
A
P

A A A A A A MAP 0300
H J K M N P
8 8 8 8 8 8 VIDEO MAP

098

- Check the wire from J4-20 to J17A-5 for a grounded condition (MIM 434). Repair/replace as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).
- Replace the Amplifier card (MIM 351).

099

Go to Page 7, Step 073,
Entry Point H.

100

Go to Page 7, Step 073,
Entry Point H.

101

Go to Page 6, Step 068, Entry Point E.

102

- Press and hold the Cmd key and press the 7 key on the top row.

Are the only colors displayed white and green?

Y N

103

Go to Page 8, Step 087,
Entry Point M.

104

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

105

Go to Page 4, Step 041, Entry Point L.

This page is intentionally left blank.

ANALOG MAP 0400

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
6	053	0300	D

001

(Entry Point A)

- Measure the voltages shown in the table below using J4-11 as ground (MIM 125).

ANALOG CARD SOCKET (J4) PIN	VOLTAGES AND TOLERANCES
34	+5.0 Vdc +- 0.8 V
35	+8.5 Vdc +- 1.0 V
29	-5.0 Vdc +- 0.8 V

Are all the voltages correct?

Y N

002

Was any voltage less than 1 Vdc?

Y N

003

- Power off.
- Disconnect the J34 cable at the Junction block (MIM 112).
- Power on.
- Measure the voltage from J3-5 (+103 Vdc) to J3-5 (103 Vdc return) at the front of the Power supply card (MIM 112).

Is the voltage between +110 and +140 Vdc?

Y N

2 2 2 2
A B C D

A B C D
1 1 1 1

MAP 0400
ANALOG MAP

004

- Replace the Power Supply card (MIM 341).

005

- Replace the Analog card (MIM 352).

006

Was only the -5 Vdc wrong?

Y N

007

- Check continuity of the cable from J4 (Analog card) to J35 (Junction block) using the following chart. Repair/replace as necessary.

	J4	J35
+5 Vdc	34	1
+8.5 Vdc	35	9
-5 Vdc	29	5

If no problem is found:

- Replace the Junction block (MIM 348).

008

- Check continuity of cable from J3-29 to J35-5. Repair/replace as necessary.

ALSO:

- The Analog card may have to be replaced (MIM 352).

009

- Measure the voltage between J4-15 (+103 Vdc) and J4-14 (103 Vdc Rtn) at the front of the Analog card.

Is the voltage between +95 and +111 Vdc?

Y N

F

010

- Measure the voltage between J3-5 (+103 Vdc) and J3-4 (103 Vdc Rtn) at the front of the Power supply.

Is the voltage more than +111 Vdc?

Y N

011

- Leave the meter connected to J3.
- Power off.
- Disconnect J3A (inline connector between the Power Supply card and the Analog card and underneath the CRT).
- Power on.

Is the voltage more than +111 Vdc?

Y N

012

- Check the cable from J3A-5 to J3-5 for a grounded condition (MIM 432). Repair/replace as necessary.

If no problem is found:

- Replace the Power Supply card (MIM 341).

013

- Check the cable from P3A-5 to J4-15 for a grounded condition (MIM 432). Repair/replace as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).

014

Is the voltage the same as it was at J4?

Y N

015

- There is a problem in the 103 Vdc lines from the Power supply to the Analog card.
- Use MIM 432 to isolate and repair.

016

Go to Page 3, Step 021, Entry Point B.

3
E F

E
2

**MAP 0400
ANALOG MAP**

017

- Probe A5-1 (-Display Rdy) on the Display planar (MIM 121).

Is the DOWN light ON?

Y N

018

Go to Step 021, Entry Point B.

019

- Measure the following voltages at the Analog card socket J4 (MIM 125). Use J4-11 as ground.

PIN	VOLTAGES AND TOLERANCES
J4-25	+6.3 Vdc +- .8 V
J4-23	+70 Vdc +10 V, -5 V
J4-43	-150 Vdc +- 20 V

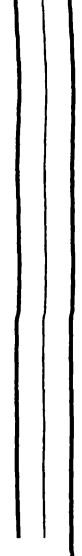
Are All the voltages OK?

Y N

020

Is J4-43 between -70 and -170 Vdc?

Y N



5 5
G H J

J

021

(Entry Point B)

- Power off.
- Disconnect P6 (yoke connector near the center of the Analog card with 4 colored wires) (MIM 125).
The horizontal yoke coil is connected to the RED and BLUE wires.
The vertical yoke coil is connected to the YELLOW and GREEN (or BLACK) wires.
- Measure the resistance of each coil. The resistance should be between 1 and 2 ohms (MIM 436).
- Inspect the short wire jumper on the plug and verify its continuity.

Are both the coils and the jumper OK?

Y N

022

- Repair the wiring or the connector if possible.
- If it is not possible,
- Replace the CRT and Yoke assembly (MIM 355).

023

- Check each coil for a short to frame ground.

Is either coil shorted to ground?

Y N

024

- Reconnect P6
- Power on.
- Measure the +400 Vdc between TP '400' on the Video card and the ground strap at the upper left corner of the Amplifier card bracket (MIM 123).

Is the voltage between +280 and +500 Vdc?

Y N



4 4 4
K L M

L M
3 3

MAP 0400
ANALOG MAP

025

- Replace the Analog card (MIM 352).
- Replace the Video card (MIM 353).

026

- Measure the +5 Vdc between TP '5' on the Video card and the ground strap at the upper left of the Amplifier card bracket (MIM 123).

Is the voltage between +4.5 and +5.5 Vdc?

Y N

027

- Check continuity of the cable from J14-1 (Video card) to J35-23 (Junction block) (MIM 434). Repair/replace as necessary.

If no problem is found:

- Replace the Video card (MIM 353).

028

- Verify the connections to the Brightness control (MIM 433).

Was the problem found?

Y N

N P

K N P
3

029

- Power off.
- Disconnect P21 (CRT Hi-voltage cable) from the side of the Analog card (MIM 125) by loosening the retaining nut and pulling the wire out.
- Touch this end of the Hi-voltage cable to ground.
- Ground the CRT Hi-voltage by holding a screwdriver against the large metal frame around the CRT, and sliding the screwdriver tip under the CRT anode cover (MIM 129).
- Disconnect the CRT Hi-voltage cable from the CRT.
- Measure the resistance of the Hi-Voltage cable from end to end (Bleeder assembly) (18 K- 25 K ohm) and the resistance to ground (greater than 240 M ohm).

Is the resistance correct?

Y N

030

- Replace the Bleeder assembly (MIM 354).

031

- Replace the Analog card (MIM 352).
- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

032

The trouble is fixed.

033

- Replace the CRT and Yoke assembly (MIM 355).

ALSO

- The Analog card may have to be replaced (MIM 352).

H
3

MAP 0400
ANALOG MAP

034

Is the voltage at J4-25 (+6.3 Vdc) incorrect and the voltages at J4-23 (+70 Vdc) and 43 (-150 Vdc) correct?

Y N

035

- Replace the Analog card (MIM 352).

036

NOTE: The heater voltage will rise to +12 Vdc or more if there is an open in the CRT heater circuit.

- Measure the voltage between the Analog card J4-50 (+6.3 Vdc TP) and J4-47 (return TP).

Is the voltage +12 Vdc or more?

Y N

037

Is the voltage less than +5.5 Vdc?

Y N

038

- Replace the Analog card (MIM 352).

039

- Measure the voltage between J4-31 (+12 Vdc LOPT) and J4-11 (gnd).

Is the voltage approximately +12 Vdc?

Y N

040

- Replace the Analog card (MIM 352).

G Q R
3

041

- Power off.
- Remove the Video card from the end of the CRT.
- Disconnect J16 from the Video card.
- Check for a grounded condition from J16-3 on the cable to the ground strap at the upper left corner of the Amplifier card bracket.

Is the line grounded?

Y N

042

- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

043

- Check wire from J4-25 to J16-3 for a grounded condition. Repair/replace as necessary.

If no problem is found:

- Replace the Analog card (MIM 352).

044

There is an open circuit in the +6.3 Vdc heater supply or return from the CRT heaters.

- Power off.
- Check the continuity of the CRT heaters (MIM 437).

The CRT heater resistance is approximately 1.5 ohms.

- Isolate to one of the following:
 - a) Wiring or connectors
 - b) CRT and yoke assembly
 - c) Video card
 - d) Analog card

045

- Turn the Brightness control fully minimum to engage the Intensity override switch (MIM 127).

Can you see a raster on the screen?

Y N

Q R

6 6
S T

S T
5 5

**MAP 0400
ANALOG MAP**

046

- Turn the Brightness control toward maximum to turn off the Intensity override switch.

Go to Page 3, Step 021, Entry Point B.

047

- Check the shape of the raster image. There should be...
 - ...raster(s) of lines so closely spaced that they nearly merge. (Look closely at the left and right hand margins).
 - ...an image filling most of the screen.
 - ...a blank margin on one side, at least.

Is the SHAPE correct?

Y N

048

- Turn the Brightness control toward maximum to turn off the Intensity override switch.
- Perform the HEIGHT, WIDTH, H.CENT, FOCUS 1 and FOC2 adjustments (MIM 231 and 235).

Is the problem corrected?

Y N

049

- Power off.
- Disconnect P6 (yoke connector near the center of the analog card with 4 colored wires) (MIM 125).
 - The horizontal yoke coil is connected to the RED and BLUE wires.
 - The vertical yoke coil is onnected to the YELLOW and GREEN (or BLACK) wires.
- With P6 disconnected, measure the resistance of each coil (MIM 436).

Does each coil measure between 1 and 2 ohms?

Y N

U V W X

U V W X

050

- Replace the CRT and Yoke assembly (MIM 355).

051

- Replace the Analog card (MIM 352).

052

The trouble is fixed.

053

Go To Map 0300, Entry Point D.

KEYBOARD MAP 0500

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER

No entries in this table

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	007	0100	A

001
(Entry Point A)

Did you enter this MAP because of an error code on the status line?

Y N

002

- Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.
- If no problem is found:
 - Replace the Keyboard logic card and key assembly (MIM 311).
 - Replace the Base planar (MIM 362).

003

Is the error code K1?

Y N

004

Is the error code K2?

Y N

005

Is the error code K3?

Y N

006

Is the error code B6?

Y N

007

Go To Map 0100, Entry Point A.

3 2 2 2
A B C D

C D
1 1

MAP 0500
KEYBOARD MAP

008

- Power off.
- Disconnect the Keyboard cable from the back of the terminal.
- Power on.

Does a B6 error appear on the status line again?

Y N

009

- Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.
- If no problem is found:
 - Replace the Keyboard logic card and key assembly (MIM 311).

010

- Power off.
- Disconnect the cable from B7 (Base planar) (MIM 122).
- Power on.

Does the terminal stop with a B6 error on the status line?

Y N

011

- Repair/replace the cable from B7 (Base planar) to the keyboard connector at the rear of the terminal.

012

- Replace the Base planar (MIM 362).

013

Key stuck error

Is something resting on or jamming the keys on the keyboard?

Y N

B E F
1 | |

014

- Power off.
 - Disconnect the cable at B7 (Base planar) (MIM 122).
 - Power on.
- Go to Step 018, Entry Point B.**

015

- Remove the item from the keyboard.
 - OR
 - Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.
- If no problem is found:
- Replace the Keyboard logic card and key assembly (MIM 311).

016

- Power off.
- Disconnect the cable at B7 (Base planar) (MIM 122).
- Power on.

Is error code K1 now displayed on the status line?

Y N

017

- Replace the Base planar (MIM 362).

018

(Entry Point B)

- Probe on the Base planar (MIM 122);
 - B7-6 (+CNT01)
 - B7-7 (+CNT02)
 - B7-8 (+CNT04)
 - B7-9 (+CNT08)
 - B7-10 (+CNT16)
 - B7-11 (+CNT32)
 - B7-12 (+CNT64)
 - B7-13 (-Matrix strobe)

(Step 018 continues)

E F

A
1

MAP 0500
KEYBOARD MAP

(Step 018 continued)

Are both the lights OFF at any of the probe points?

Y N

019

- Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.

If no problem is found:

- Replace the Keyboard logic card and key assembly (MIM 311).

020

- Replace the Base planar (MIM 362).

021

Is the Keyboard cable connected to the I/O panel at the rear of the terminal?

Y N

022

- Plug the Keyboard cable to the I/O panel.

023

- Measure the voltage at B7-5 (+5 Vdc) on the Base planar to the Gnd TP on the planar (MIM 122).

Is the voltage OK?

Y N

024

- Replace the Base planar (MIM 362).

025

- Probe B7-14 (+Key depressed) on the Base planar.

- Press a key on the keyboard.

Does the line pulse?

Y N

| |

G H

G H

| |

026

- Check the Keyboard cables from B7 on the Base planar to the Keyboard (MIM 440). Repair/replace as necessary.

If no problem is found:

- Replace the Keyboard logic card and key assembly (MIM 311).

- Replace the Base planar (MIM 362).

027

- Replace the Base planar (MIM 362).

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CONVERGENCE MAP 0600

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0800	B	1	008
0900	B	1	008

001

(Entry Point A)

- Select the Dynamic convergence procedure (MIM 234), and attempt to converge all 13 positions.

Was the convergence successful?

Y N

002

Did the convergence patterns appear in the correct colors (green, red, and yellow - or blue, red, and pink)?

Y N

003

- Replace the Display planar (MIM 361).

004

The convergence pattern should have moved fairly smoothly when you attempted to reconverge.

Was there any movement?

Y N

005

Go to Step 008, Entry Point B.

006

Was the movement fairly smooth?

Y N

4
A B C

B C

007

- Replace the Display planar (MIM 361).

008

(Entry Point B)

- Measure the Amplifier card TPs in the table below using J17B-4 as ground (MIM 124).

AMPLIFIER CARD TP	VOLTAGE AND TOLERANCE
K (fused)	+12 Vdc +-1.5V
M	+12 Vdc +-1.5V
N	-12 Vdc +-1.5V

Are the voltages OK?

Y N

009

Is the voltage only wrong at TP 'K'?

Y N

010

- Measure the following voltages at the front of the Power supply to gnd (J3-2).

J3-1 +12 Vdc

J3-3 -12 Vdc

Are the voltages OK?

Y N

011

- Power off.

- Replace the Power Supply card (MIM 341).

ALSO;

- Check/replace the fuse on the Amplifier card (MIM 351).

2 2 2
D E F

D E F
1 1 1

MAP 0600
CONVERGENCE MAP

012

There may be a broken connection in the +-12 Vdc supplies or the return to the Amplifier card.

- See MIM 438 to trace the wiring and isolate the failure.

NOTE; check/replace the fuse on the Amplifier card (MIM 351) If the wiring or the fuse was the problem, convergence may have to be performed.

If no problem is found:

- Replace the Amplifier card (MIM 351).

013

- Power off.

- Replace the fuse on the Amplifier card (MIM 351). If the fuse fails again, replace the Amplifier card (MIM 351).

014

- Measure the voltage at A5-9 (+12 Vdc LOPT) to A5-10 (-LOPT rtn) on the Display planar (MIM 121).

Is the voltage between +10 and +14 Vdc?

Y N

015

- Power off.

- Check the 12 Vdc LOPT back to the Analog card (MIM 434).

- Verify the continuity of the cables and connectors.

If no problem is found:

- Replace the Amplifier card (MIM 351).

- Replace the Analog card (MIM 352).

G

016

- Select the Dynamic convergence procedure (MIM 234). All 13 positions should show on the screen at the same time.

Is the convergence good (or nearly good) at the center of the screen, but gets worse near the edges and corners?

Y N

017

- Check the positioning of the Convergence assembly on the CRT (MIM 356).

Is the Convergence assembly positioned correctly?

Y N

018

- Power off.

- Position the Convergence assembly correctly (MIM 356).

- Power on.

- Select the Dynamic convergence procedure (MIM 234). All 13 positions should show.

Go to Step 020, Entry Point C.

019

Go to Step 020, Entry Point C.

020

(Entry Point C)

- Press the space bar slowly, 11 times.

- Press and hold the cursor UP key for 10 seconds.

- Place a small piece of tape near the green pattern to use as a reference guide.

- Observe the green pattern carefully.

- Press and hold the cursor DOWN key.

Does the green pattern move down?

Y N

G

3 3
H J

H J
2 2

**MAP 0600
CONVERGENCE MAP**

021

Go to Step 023, Entry Point D.

022

- Press the space bar one time.
- Press and hold the cursor UP key for 10 seconds.
- Observe the blue pattern carefully.
- Press and hold the cursor DOWN key.

Does the blue pattern move down?

Y N

023

(Entry Point D)

- Power off.
- Remove the tape.
- Disconnect the J19 connector from the Amplifier card (MIM 124).
- Check the resistance of the Convergence coils from the plug on the end of the cable (J19).

COIL	J19 pins		RESISTANCE
RED	11	12	<1 ohm
GREEN	9	10	<1 ohm
BLUE	7	8	<1 ohm
BLUE LAT	5	6	1-5 ohm

Are all the resistances correct?

Y N

024

- Replace the Convergence assembly (MIM 356).

025

- Check the cable from A5 on the Display planar to J18 on the Amplifier card (MIM 434). Repair/replace as necessary.

If no problem is found:

- Replace the Amplifier card (MIM 351).
- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

K

026

- Remove the tape.
- Press and hold the space bar until all 13 convergence patterns are again displayed.
- Press the C key to exit the procedure.

Is the Convergence assembly positioned properly on the CRT (MIM 356)?

Y N

027

- Adjust the Convergence assembly (MIM 356).
- Perform the Fine Static convergence adjustment (MIM 232) and Dynamic convergence (MIM 234).

028

- Perform the Fine Static Convergence adjustment (MIM 232).

Could the Fine Static Convergence adjustment be made?

Y N

029

Go to Step 023, Entry Point D.

030

- Perform the Dynamic convergence procedure (MIM 234).

Is convergence now correct?

Y N

031

- Power off.
- Disconnect J19 from the Amplifier card (MIM 436).
- Check the resistance of the red radial convergence coil: J19-11 to J19-12 (MIM 436).

is the resistance less than 1 ohm?

Y N

4 4 4
L M N

K

A L M N
1 3 3 3

MAP 0600

CONVERGENCE MAP

032

- Replace the Convergence assembly (MIM 356).

033

- Replace the Amplifier card (MIM 351).
- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

034

End of MAP.

035

End of MAP.

- Press the C key to exit the convergence procedure.

PLANAR MAP 0700

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	B	1	002
0100	D	3	024

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
2	012	0800	C

001

(Entry Point A)

Does the error code start with a 'B'?

Y N

002

(Entry Point B)

Is either the MSR or SLP RPQ installed?

Y N

003

(Entry Point C)

Did the alarm sound repeatedly in either single or double burst mode (diagnostic error condition)?

Y N

004

- Check for continuity and shorted lines on crossover cables A2, A3, and A4 (MIM 121).

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

005

Did the alarm sound in single burst mode?

Y N

3 2 2 2
A B C D

B C D
1 1 1

MAP 0700
PLANAR MAP

006

- Check for continuity and shorted lines on crossover cables A2, A3, and A4 (MIM 121).

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

007

- Power off.
- Disconnect the A2 and A3 crossover cables from the Display planar (MIM 121).
- Power on.

Is the alarm sounding in single burst mode?

Y N

008

- Check for continuity and shorted lines on the crossover cables A2 and A3.

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

009

- Check for continuity and shorted lines on the crossover cable A4.

If no problem is found:

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

010

Does the failure occur only when attempting to use the MSR or SLP?

Y N

011

- Power off.
- Disconnect the cables attached to A7 and A14 on the Display planar (MIM 121).
- Power on.

Does the terminal still fail?

Y N

E F G

0700-2

E F G

012

Go To Map 0800, Entry Point C.

013

Go to Page 1, Step 003, Entry Point C.

014

Is the MSR RPQ installed on the terminal?

Y N

015

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the SLP adapter card (MIM 363).

016

Is the SLP RPQ installed on the terminal?

Y N

017

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the MSR adapter card (MIM 363).

3
H

A H
1 2

MAP 0700
PLANAR MAP

018

- Try to isolate the problem to one of the RPQ's by disconnecting the RPQ adaptor cards one at a time and using the MSR/SLP Test (MIM 415), attempt to exercise the other RPQ.
- If the test works OK on the RPQ that is still installed, replace the disconnected RPQ adaptor card (MIM 363).
- If the terminal fails with one of the RPQ cards disconnected, replace the installed RPQ adaptor card (MIM 363), or the Display planar (MIM 361) or cable from A7 and A14 to C3, C4, and D3 on the Feature gate.

019

Is the error code a B4 (station address not valid)?

Y N

020

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

021

- Check the display station address (MIM 415).

Is the address other than 0 through 6?

Y N

022

- Replace the Base planar (MIM 362).

023

- Attempt to correct the terminal address (MIM 415).

If not able to correct the address,

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

024

(Entry Point D)

- No POR.
- Power off.
- Disconnect the A2 and A3 crossover cables from the Display planar (MIM 121).
- Power on.

Did the Power OK alarm stop sounding after approximately .5 seconds?

Y N

025

- Measure the voltages at the Base planar TP's (MIM 122).

Are the voltages OK?

Y N

026

- Measure the voltages at B6 on the Base planar (MIM 122).

Are the voltages OK?

Y N

027

- Trace the missing voltage (MIM 431).
Repair/replace the tailing part.
- If no problem is found:
 - Replace the Junction block (MIM 348).

028

- Replace the Base planar (MIM 362).

029

- Measure the voltages at the Display planar TPs (MIM 121).

Are the voltages OK?

Y N

4 4 4
J K L

J K L
3 3 3

MAP 0700
PLANAR MAP

030

- Measure the voltages at A6 and A9 on the Display planar (MIM 121 and 431).

Are the voltages OK?

Y N

031

- Trace the missing voltage (MIM 431).
Repair/replace the failing part.
- If no problem is found:
 - Replace the Junction block (MIM 348).

032

- Replace the Display planar (MIM 361).

033

- Check for continuity on the A4 crossover cable (MIM 121).
- If no problem is found:
 - Replace the Base planar (MIM 362).
 - Replace the Display planar (MIM 361).

034

- Replace the Display planar (MIM 361).

FEATURE/RPQ MAP 0800

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	C	6	054
0700	C	6	054

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	004	0100	A
4	035	0600	B
5	043	0600	B

001

(Entry Point A)

If an error code appears on the status line while using these MAPs, Go To Map 0700, Entry Point A.

Is the Selector Light Pen RPQ (SLP) failing?

Y N

002

Is the Magnetic Stripe Reader RPQ (MSR) failing?

Y N

003

Is the Keylock RPQ failing?

Y N

004

These MAPs do not address any other RPQs.

Go To Map 0100, Entry Point A.

005

Keylock problem.

Can you sign on the system?

Y N

3 2 2 2
A B C D

C D
1 1

MAP 0800
FEATURE/RPQ MAP

006

- Remove the cable at B5 on the base planar (MIM 106).

Can you now sign on the system?

Y N

007

- Replace the Base planar (MIM 362).

008

- Replace keylock and cable assembly.

009

- Remove the key from the Keylock.

Can you now sign on the system?

Y N

010

Keylock works OK.

011

- Do NOT power off.
- Disconnect B5 on the Base planar (MIM 122).
- Short the contacts of connector B5 on the Base planar together.

Can you now sign on the system?

Y N

012

- Replace the Keylock assembly.

013

- Replace the Base planar (MIM 362).

B
1

014

- Enter OFFLINE SELECT mode (MIM 415).
- Press and hold the CMD key and press the N key to display the SLP/MSR test screen.

Does the following message appear near the bottom of the screen: MSR INSTALLED?

Y N

015

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

If no problem is found:

- Replace the MSR adapter card (MIM 363).
- Replace the Display planar (MIM 361).

016

Has the customer used the Customer Replacement Procedures Manual (shipped with the MSR unit) and determined that the problem is not in their MSR unit?

Y N

017

- Do the tests recommended in the Customer Replacement Procedures Manual (Form No GA24-3663).

Did you find the problem?

Y N

018

Go to Page 3, Step 020, Entry Point D.

019

End of MAP.

3
E

A E
1 2

MAP 0800
FEATURE/RPQ MAP

020

(Entry Point D)

- Check the cable from the Junction block (MSR) to the inline MSR connector (MIM 451). Repair/replace as necessary.
 - Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.
- If no problem is found:
- Replace the Junction block (MIM 348).
 - Replace the MSR adapter card (MIM 363).
 - Replace the Display planar (MIM 361).

021

(Entry Point B)

Selector Light Pen problem

- Enter OFFLINE SELECT mode (MIM 415).
- Press and hold the Cmd key and press the N key to display the SLP/MSR test screen.
- Turn the Brightness control to mid-range (MIM 127).

Does the message 'SLP INSTALLED' appear near the bottom of the screen?

Y N

022

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.
- If no problem is found:
- Replace the SLP adapter card (MIM 363).
 - Replace the Display planar (MIM 361).

F

F

023

- Press the light pen tip (do not point it at the screen).

Do white dashes appear on the screen?

Y N

024

- Measure the voltage at TP 'J' on the Amplifier card (MIM 124) to the ground strap at the upper left corner of the Amplifier card bracket.
- Check using table below.

PEN TIP	VOLTAGE
RELEASED	+0.0 - 0.5 Vdc
PRESSED	+1.0 - 2.0 Vdc

Are the voltages correct?

Y N

025

- Measure the light pen switch voltages (MIM 453) to E3-7 (gnd) using the following table.

PEN TIP	E3-20	E3-5
RELEASED	+2- 3 V	0 V
PRESSED	0 V	+2- 3 V

Are the voltages correct?

Y N

026

- Check the cable from D3-4 to J36-15 and from D3-21 to J36-11 (MIM 453) for an open or grounded condition. Repair/replace as necessary.
- If no problem is found:
- Replace the Selector Light Pen.
 - Replace the Junction block (MIM 348).

5 4 4
G H J

H J
3 3

MAP 0800
FEATURE/RPQ MAP

027

- Probe E3-17 (-Gate SLP) on the Feature gate (MIM 453). Use E3-7 as gnd for the probe.

Does the DOWN light come on and stay on as long as the light pen tip is pressed (do not point the tip at the screen)?

Y N

028

- Replace the SLP adapter card (MIM 363).

029

- Probe A14-7 (-Gate SLP) on the Display planar.

Does the DOWN light come on and stay on as long as the light pen tip is pressed (do not point the tip at the screen)?

Y N

030

- Check the cable from A14-7 to D3-16 for continuity. Repair/replace as necessary.

031

- Check cable from A5-5 to J18-3 on the Amplifier card (MIM 434) for a grounded condition. Repair/replace as necessary.

If no problem is found:

- Replace the Amplifier card (MIM 351).
- Replace the Display planar (MIM 361).

032

- Observe the select indicator on the status line.

Does the blue select indicator vary in brightness as the brightness control is rotated from maximum to minimum?

Y N

K L

033

- Measure the voltage at TP 'BG' (Blue Grid) on the Video card (MIM 123) to the ground strap at the upper left of the Amplifier card bracket.

- Turn the brightness control from minimum to maximum.

The voltage measured should vary from approximately -70 to -20 Vdc.

Does this occur?

Y N

034

- Measure the voltage at TP 'K' on the Amplifier card (MIM 124) to the ground strap at the upper left of the Amplifier card bracket.

Is the voltage approximately +12 Vdc?

Y N

035

Go To Map 0600, Entry Point B.

036

- Power off.
- Check the continuity of the Blue Grid supply: P17B-1 to P15-3 to TP 'BG' to P13-12.
- Check for short to ground.
- Isolate to one of:
 - (a) Wiring
 - (b) Video card
 - (c) Amplifier card.

037

- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

038

- Replace the Amplifier card (MIM 351).

K L

G
3

MAP 0800
FEATURE/RPQ MAP

039

- Press the pen tip against the green * in the lower right corner of the screen.

Does the cursor move to within one position of the *?

Y N

040

Does the cursor move at all?

Y N

041

- Measure the voltages at the following pins to E3-7 (gnd):

E3-16 (+12 Vdc)

E3-19 (-12 Vdc)

MIM 450

Are both voltages present?

Y N

042

- Measure the Amplifier card test points M (+12 Vdc) and N (-12 Vdc) (MIM 124) to the ground strap at the upper left of the Amplifier card bracket.

Are both voltages present?

Y N

043

- There will also be a convergence problem.

Go To Map 0600, Entry Point B.

044

- Measure the voltage at J35-4 (+12 Vdc) and J35-6 (-12 Vdc) to the ground strap at the upper left corner of the Amplifier card bracket.

Are both voltages present?

Y N

6 6
M N P Q R

P Q R

045

- Check the cable from J35-4 to J18-14 (+12 Vdc) and J35-6 to J18-15 (-12 Vdc). Repair/replace as necessary.

If no problem is found:

- Replace the Amplifier card (MIM 351).

046

- Check cable from J36-16 to D3-15 (+12 Vdc) and J36-6 to D3-20 (-12 Vdc) for continuity. Repair/replace as necessary.

If no problem is found:

- Replace the Junction block (MIM 348).

047

- Measure the voltage on E3-6 (-6 Vdc) at the Feature gate (MIM 450) to E3-7 (gnd).

Is the voltage between -5 and -7 Vdc?

Y N

048

- Replace the SLP adapter card (MIM 363).

- Replace the Selector Light Pen.

049

- Probe E3-21 (-SLP signal). It should be UP.

- Set the Brightness control to maximum.

Does the DOWN light come on when the pen tip is pointed at any character on the screen?

Y N

050

- Check that the selector pen lens is clean.

- Check the cable from J36-4 to D3-22 for continuity. Repair/replace as necessary.

If no problem is found:

- Replace the Selector Light Pen.

- Replace the SLP adapter card (MIM 363).

- Replace the Junction block (MIM 348).

6
S

MAP 0800

FEATURE/RPQ MAP

051

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

If no problem is found:

- Replace the SLP adapter card (MIM 363).
- Replace the Display planar (MIM 361).

052

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

If no problem is found:

- Replace the Display planar (MIM 361).
- Replace the SLP adapter card (MIM 363).
- Replace the Selector Light Pen.

053

NO TROUBLE FOUND.

- Replace the SLP adapter card (MIM 363).
- Replace the Selector Light Pen.
- Replace the Display planar (MIM 361).

054

(Entry Point C)

- Power off.
- Reconnect the cables to A7 and A14.
- Disconnect the cable at C3, D3, and C4 on the Feature gate (MIM 452).
- Power on.

Does the failure reappear?

Y N

055

Is there a card in C3 and C4 position (MSR) on the Feature gate?

Y N

056

- Replace the SLP adapter card (MIM 363).

057

Is there a card in D3 and D4 position (SLP)?

Y N

058

- Replace the MSR adapter card (MIM 363).

059

- Power off.
- Reconnect cable C3, D3, and C4.
- Remove the SLP adapter card.
- Power on.

Does the failure reappear?

Y N

060

- Check the cable from J36 to C3, C4, and D3 for opens and shorts to ground. Repair/replace as necessary.

If no problem is found:

- Replace the SLP adapter card (MIM 363).
- Replace the Selector Light Pen.
- Replace the Junction block (MIM 348).

T U
6 6

MAP 0800
FEATURE/RPQ MAP

061

- Replace the MSR adapter card (MIM 363).

062

- Check the cable from A7 and A14 on the Display planar and J36 on the Junction block to C3, C4, and D3 on the Feature gate for continuity and grounded lines (MIM 452). Repair/replace as necessary.

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INTERMITTENT MAPs 0900

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001

001

(Entry Point A)

The following index contains general problem areas. Find the area that your problem most nearly compares with.

Error codes (System or display station)	Go to page 2, step 002, Entry Point B
Alarm problems	Go to page 7, step 017, Entry Point C
Color problem	Go to page 8, step 030, Entry Point D
Size, shape, etc. problem	Go to page 9, step 031, Entry Point E
Keyboard problems	Go to page 9, step 032, Entry Point F
Blank screen problem	Go to page 10, step 033, Entry Point G
Convergence problem	Go to page 10, step 036, Entry Point H
System available problem	Go to page 11, step 037, Entry Point J
Focus or brightness problems	Go to page 11, step 038, Entry Point L
RPQ problems	Go to page 12, step 041, Entry Point M

MAP 0900
INTERMITTENT MAPs

002
 (Entry Point B)

System or display station error codes

Was there a display station error code on the status line?

Y N

003

- Find the last system error code from the error log in column 1 of the chart below.
 - (The latest error code can be determined by noting the date in the error log.)
 - Find the other error code if there is one in column 4.
 - Column 5 lists the probable causes.
- See MIM 427 Error History Table for sense information for the error codes.

1	2	3	4	5
Last Error Code	Name	Error Description	Other Error Code	Probable Cause
0100	No response	This error is reported when a display station is in use and no response to a poll occurs.		System cable Base planar
0101	Transmit operation check	This error is reported by a controller during a poll or command being executed by the controller.		Controller
0103	Receive parity error	This error is reported by the controller when a frame is received and parity is bad in response to a poll command.	0104	Controller Base planar System cable

(Step 003 continues)

6
A

MAP 0900

INTERMITTENT MAPs

(Step 003 continued)

0104	Line parity check	This error is sent in the poll response status from the display station. A line parity check must be reset with a poll command and the reset bit on.	0103	Base planar Controller System cable
0106	Receive length check	The wrong number of bytes was received by the controller as a result of a poll or command.		Base planar
0107	Wrong station responded	Incorrect station address returned in responses to a poll	0103 0104	Base planar System cable System Cable
0108	Power on	The condition is determined in the exception status sent by the display station. It is reported as an error only if the station was in use.		Base planar
0109	Activate command failure	Busy bit was not on after an activate command had been sent		System Cable
0111	Scan code not valid	The 7-bit code sent in the keyboard response frame does not translate to a character or function.	0103 0104	Keyboard System cable System cable
0120	Command not valid	This indicates that the poll command sent to the display is not a valid command or the device identification is wrong.	0103 0104	Base planar System cable System cable
0121	Register value not	This indicates that the address counter value is	0103	Base planar System cable

(Step 003 continues)

MAP 0900

INTERMITTENT MAPs

(Step 003 continued)	valid	not inside the user accessible limits.	0104	System cable
0122	Storage or input queue overrun	This condition occurs when more than 16 commands and associated data frames have been sent, or when an attempt is made to store data beyond the limit of user accessible storage.		Base planar Controller
0123	Null or attribute	Null or attribute not found or address counter points to attribute.		System application program Base planar Controller
0124	Activate not valid	This condition indicates a wrong or not valid activate command was sent to the display station.	0103 0104	System cable System cable
0125	Undefined exception status	Controller determined undefined status returned by station		Power Base planar System Cable
0149	Undefined error status	Incorrect status returned	0125 0103 0104	Base planar Power System Cable
0181	Mag Stripe Rdr. Error	No device status available		MSR MSR Card Display planar
0182	Device type Error	Unsupported device type responded to poll	0103	Base planar System Cable
0183	Wrong size display	Image size ID incorrect		Configuration not correct
0184	Incorrect keyboard ID	Keyboard ID received incorrect		Keyboard ID controller
0185	Keyboard ID	Controller and station		Controller

(Step 003 continues)

MAP 0900

INTERMITTENT MAPs

(Step 003 continued)	mismatch	do not match keyboard ID		keyboard
0189	Invalid OS status	No device status available	0181 0181	SLP MSR SLP
0190	Even/Odd change in status	Status sent to the controller has not changed in 200 milliseconds after the work station has received a poll command with a positive response and a not-busy response.		Base planar
0191	Busy	The controller has found that the busy bit has been on for a time longer than 400 milliseconds.		Base planar

Do you have a common FRU?

Y N

004

- Use Error History Table (MIM 427) and tabulate the errors in the following area.

Error History Table Analysis

0100 System MSG--2 stations with same address if 0104 also occurs in logout.

No errors--system has varied station off.

A B
2 5

MAP 0900

INTERMITTENT MAPs

005

RECORD REPLACEMENT FRU'S

DATE SYMPTOM(S) FRU REPLACED

006

- If you do not know what the error code on the status line was, display the diagnostic error log (MIM 415)

Was the error code a B1 through B5 error?

Y N

007

Was the error code a B6 error?

Y N

008

Was the error code an A1 or C1 error?

Y N

009

Was the error code a D1 through D7 error?

Y N

010

Was the error a K1 through K3 error?

Y N

7 7 7 7 7 7
C D E F G H

INTERMITTENT MAPs

011

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the SLP adapter card (MIM 363).
- Replace the MSR adapter card (MIM 363).

012

- Replace the Keyboard logic card and key assembly (MIM 311).
- Replace the Base planar (MIM 362).

013

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the Junction block (MIM 348).
- Replace the SLP adapter card (MIM 363).
- Replace the MSR adapter card (MIM 363).

014

- Replace the Display planar (MIM 361).

015

- Replace the Base planar (MIM 362).
- Replace the Keyboard logic card and key assembly (MIM 311).

016

- Replace the Base planar (MIM 362).

017

(Entry Point C)

Alarm problems

Did the alarm sound at all?

Y N

018

Was the screen blank?

Y N

019

- Replace the Alarm assembly (MIM 331).
- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).

020

(Entry Point K)

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the Analog card (MIM 352).
- Replace the Amplifier card (MIM 351).
- Replace the Power Supply card (MIM 341).
- Replace the Video card (MIM 353).
- Replace the Brightness control/Intensity Override switch assembly (MIM 330).
- Replace the Alarm assembly (MIM 331).
- Replace the Junction block (MIM 348).
- Replace the CRT and Yoke assembly (MIM 355).
- Replace the MSR adapter card (MIM 363).
- Replace the SLP adapter card (MIM 363).

021

Did the alarm stay on steady?

Y N

022

Did the alarm sound in single or double burst mode (Diagnostic error condition)?

Y N

023

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

J K
7 7

MAP 0900

INTERMITTENT MAPs

024

Was an error code present on the status line (if you do not know, take the N leg)?

Y N

025

Did the alarm sound in single burst mode?

Y N

026

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the MSR adapter card (MIM 363).
- Replace the SLP adapter card (MIM 363).

027

- Replace the Base planar (MIM 362).
- Replace the Keyboard logic card and key assembly (MIM 311).

028

Go to Page 2, Step 002, Entry Point B.

029

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).

030

(Entry Point D)

Color problems

- Replace the Display planar (MIM 361).
- Replace the Amplifier card (MIM 351).
- Replace the Video card (MIM 353).
- Replace the Convergence assembly (MIM 356).
- Replace the CRT and Yoke assembly (MIM 355).

MAP 0900
INTERMITTENT MAPs

031
(Entry Point E)

Size, centering, etc. problems

- Replace the Analog card (MIM 352).
- Replace the Amplifier card (MIM 351).
- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the CRT and Yoke assembly (MIM 355).

032
(Entry Point F)

Keyboard problems

- Replace the Keyboard logic card and key assembly (MIM 311).
- Replace the Base planar (MIM 362).

MAP 0900

INTERMITTENT MAPs

033

(Entry Point G)

Blank screen problems

Did the alarm sound at all?

Y N

034

Go to Page 7, Step 020, Entry Point K.

035

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the Video card (MIM 353).
- Replace the Analog card (MIM 352).
- Replace the Power Supply card (MIM 341).
- Replace the Bleeder assembly (MIM 354).
- Replace the CRT and Yoke assembly (MIM 355).

036

(Entry Point H)

Convergence problems

- Replace the Display planar (MIM 361).
- Replace the Base planar (MIM 362).
- Replace the Amplifier card (MIM 351).
- Replace the Analog card (MIM 352).
- Replace the Convergence assembly (MIM 356).
- Replace the Power Supply card (MIM 341).
- Replace the CRT and Yoke assembly (MIM 355).

MAP 0900

INTERMITTENT MAPs

037

(Entry Point J)

System available problems

- Replace the Base planar (MIM 362).
- Replace the Display planar (MIM 361).
- Replace the I/O assembly (MIM 370).
- Replace the Keylock assembly.

038

(Entry Point L)

Focus or brightness problems.

Did the Brightness control change the brightness of the screen?

Y N

039

- Replace the Brightness control/Intensity Override switch assembly (MIM 330).
- Replace the Analog card (MIM 352).

040

- Replace the Analog card (MIM 352).
- Replace the Video card (MIM 353).
- Replace the CRT and Yoke assembly (MIM 355).

MAP 0900
INTERMITTENT MAPs

041
(Entry Point M)

RPQ problems.

Is the Keylock failing?

Y N

042

Is the MSR failing?

Y N

043

Is the SLP failing?

Y N

044

These are the only RPQs checked out by these MAPs.

045

- Replace the SLP adapter card (MIM 363).
- Replace the Selector light pen.
- Replace the Junction block (MIM 348).
- Replace the Display planar (MIM 361).

046

- Replace the MSR adapter card (MIM 363).
- Replace the Junction block (MIM 348).
- Replace the Display planar (MIM 361).

047

- Replace the Keylock assembly.
- Replace the Display planar (MIM 361).

Maintenance Information

Contents, Using the Maintenance Information
Maintenance Procedures
100 Locations
200 Adjustments
300 Removal/Replacement
400 Service Aids
430 Wiring Diagrams
Tools and Test Equipment
Theory
Features and RPQs

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Contents

USING THE MAINTENANCE INFORMATION	1-3		
MAINTENANCE PROCEDURES	2-1		
100 Locations	2-1		
110 General Locations	2-1		
111 Front Views	2-1		
112 Rear View with Logic Gate Open	2-2		
113 Top View	2-3		
114 Front View with Cover Removed	2-4		
115 Connector Location Chart	2-5		
120 Locations on FRUs	2-6		
121 Display Planar	2-6		
122 Base Planar	2-7		
123 Video Card	2-8		
124 Amplifier Card	2-9		
125 Analog Card	2-10		
126 Power Supply Card	2-13		
127 Alarm Assembly and Brightness Control	2-14		
128 Keyboard Assembly Locations	2-15		
129 Convergence Assembly Location	2-16		
200 Adjustments	2-17		
201 Color Adjustments Basic Purpose	2-17		
202 Replaced FRU Adjustment Summary	2-18		
210 Adjustments Locations	2-20		
211 Offline Select Mode Setup	2-22		
220 Course Adjustments	2-23		
221 Coarse Color Balance	2-23		
222 Coarse Raster Adjustment	2-24		
223 Coarse Focus	2-24		
224 Coarse Static Convergence	2-25		
225 Coarse Color Purity	2-26		
230 Fine Adjustments	2-27		
231 Fine Raster Adjustment	2-27		
232 Fine Static Convergence	2-28		
233 Fine Color Purity	2-29		
234 Dynamic Convergence (color alignment)	2-30		
235 Fine Focus	2-31		
236 Fine Color Balance	2-32		
300 Removal and Replacement Procedures	2-33		
310 Keyboard and Keyboard Cable Removal and Replacement Procedure	2-33		
311 Keyboard (Logic Card and Key Assembly)	2-33		
312 Keyboard Cable	2-34		
313 Keyboard Jumpers	2-34		
320 Covers Removal and Replacement Procedures	2-35		
321 Front Cover	2-35		
322 Rear Cover	2-36		
323 Top Cover	2-37		
324 Tilt Assembly	2-38		
330 Brightness Control/Intensity Override Switch Removal and Replacement Procedure	2-39		
331 Alarm Assembly Removal and Replacement Procedure	2-39		
340 Power Supply Assemblies Removal and Replacement Procedures	2-40		
341 Power Supply Card	2-40		
342 Line Filter, Fuse Holder and Power Cable	2-41		
343 Line Cord	2-42		
345 Fan Assembly	2-42		
346 Power Switch and Cable	2-43		
348 Junction Block	2-44		
350 Display Assemblies Removal and Replacement Procedures	2-45		
351 Amplifier Card/Fuse F3	2-45		
352 Analog Card	2-46		
353 Video Card	2-47		
354 Bleeder Assembly	2-48		
355 CRT and Yoke Assembly	2-50		
356 Convergence Assembly	2-52		
357 Degauss Coil	2-53		
360 Logic Gate Removal and Replacement Procedures	2-54		
361 Display Planar	2-54		
362 Base Planar	2-55		
363 Feature Attachment I/O Cards	2-56		
370 I/O Assembly Removal and Replacement Procedure	2-58		
400 Service Aids	2-61		
410 Status Line Definition	2-61		
411 Normal Status Line After Power-On	2-61		
412 Online Select Mode Status Line	2-62		
413 Offline Select Mode and Error Status Line	2-64		
414 Online Select Mode	2-66		
415 Offline Select Mode and CE Test Screens	2-67		
416 Error Codes	2-74		
417 Diagnostics Error Codes	2-74		
418 Display Station Error Codes	2-75		
420 Convergence Functional Description	2-77		
421 Diagnostic Error Log Operation	2-77		
422 Power-On Sequence	2-78		
423 Power-On Diagnostics	2-79		
424 Sign-On Procedure	2-83		
425 Free Key Operation	2-83		
426 Online Tests	2-84		
427 Error History Table Definition	2-89		

428 Magnetic Slot Reader and Selector Light Pen Test	2-90
429 Attribute Codes	2-92
430 Wiring Diagrams	2-93
431 DC Distribution Cable Wiring	2-94
432 AC Power Cable Wiring	2-95
433 Brightness Control/Intensity, Override Switch, and Alarm Assembly Wiring	2-96
434 Main Power and Signal Distribution Cable Wiring	2-98
435 Junction Block Wiring	2-100
436 Synchronization, Convergence, Purity, and Yoke Assembly Deflection Coils Wiring	2-101
437 CRT Drive Circuits	2-102
438 Amplifier Card Power Circuits	2-103
439 Cable Thru and Terminator Switch Wiring	2-104
440 Keyboard Interface Cable Wiring	2-105
441 Ground Circuits	2-106
450 Feature Gate Wiring	2-108
451 MSR and SLP Internal Wiring	2-109
452 MSR/SLP RPQ Cable Wiring	2-110
453 MSR/SLP Cross-Connector Circuits (not a land pattern)	2-112
460 System Cable	2-114
461 Customer System Cable Signal Quality Check	2-114
462 Station Protector	2-114
463 Cable Assembly Procedures	2-115

TOOLS AND TEST EQUIPMENT 3-1

THEORY 4-1

Overview	4-1
Keyboard Logic	4-1
Keyboard Identification	4-1
Base Planar	4-2
Base Planar Flowchart	4-3
Display Planar	4-4
Display Planar Flowchart	4-5
Amplifier Card	4-6
Video Card	4-7
Analog Card	4-8
CRT and Yoke	4-10
Power Supply Card	4-10
Audible Alarm	4-11
Brightness Control/Intensity Override Switch	4-11

FEATURES AND RPQs 5-1

Keylock RPQ	5-1
Magnetic Slot Reader RPQ	5-1
Selector Light Pen RPQ	5-1
Operation	5-1

Using The Maintenance Information

The maintenance information helps you to service and repair the IBM 5292 Color Display Station. It should be used with the maintenance analysis procedures (MAPs). The MAPs help you to isolate a problem to a field replaceable unit (FRU). The maintenance information helps you correct the problem once it is identified.

The MAPs and the maintenance information contain 3-digit reference numbers to index specific maintenance procedures. For example, (110) refers to *General Locations* under *100 Locations*. The major divisions that are indexed are 100 Locations, 200 Adjustments, 300 Removal and Replacement Procedures, and 400 Service Aids.

MAINTENANCE PROCEDURES SECTION

This section contains location drawings, adjustments, removal and replacement procedures, and service aids, including wiring diagrams and descriptions of the diagnostics.

The location figures start with an overview to identify the major assemblies. Then each of the major assemblies is shown in detail to identify replaceable parts, test points, and adjustments.

The adjustments are presented in the order that ensures the correction of any adjustment, alignment, or convergence problems.

Removal and replacement procedures are supplied for major field replaceable parts.

Service aids consist of a general description of indicators, switches and controls, and a detailed description of the diagnostics available.

The diagnostics include power-on, offline, and online tests, and the free key mode of operation.

Wiring diagrams of power distribution, display signal distribution, and cables are supplied.

No scheduled preventive maintenance is required for this display station.

TOOLS AND TEST EQUIPMENT

The *Tools and Test Equipment* section describes the tools needed to service the display station, including the CE probe.

THEORY

The *Theory* section describes the function of the major field replaceable units (FRUs) of the display station. An overview of the system is included that gives you a general idea of the complete operation of the display station and how the major units relate to each other.

FEATURES AND RPQs

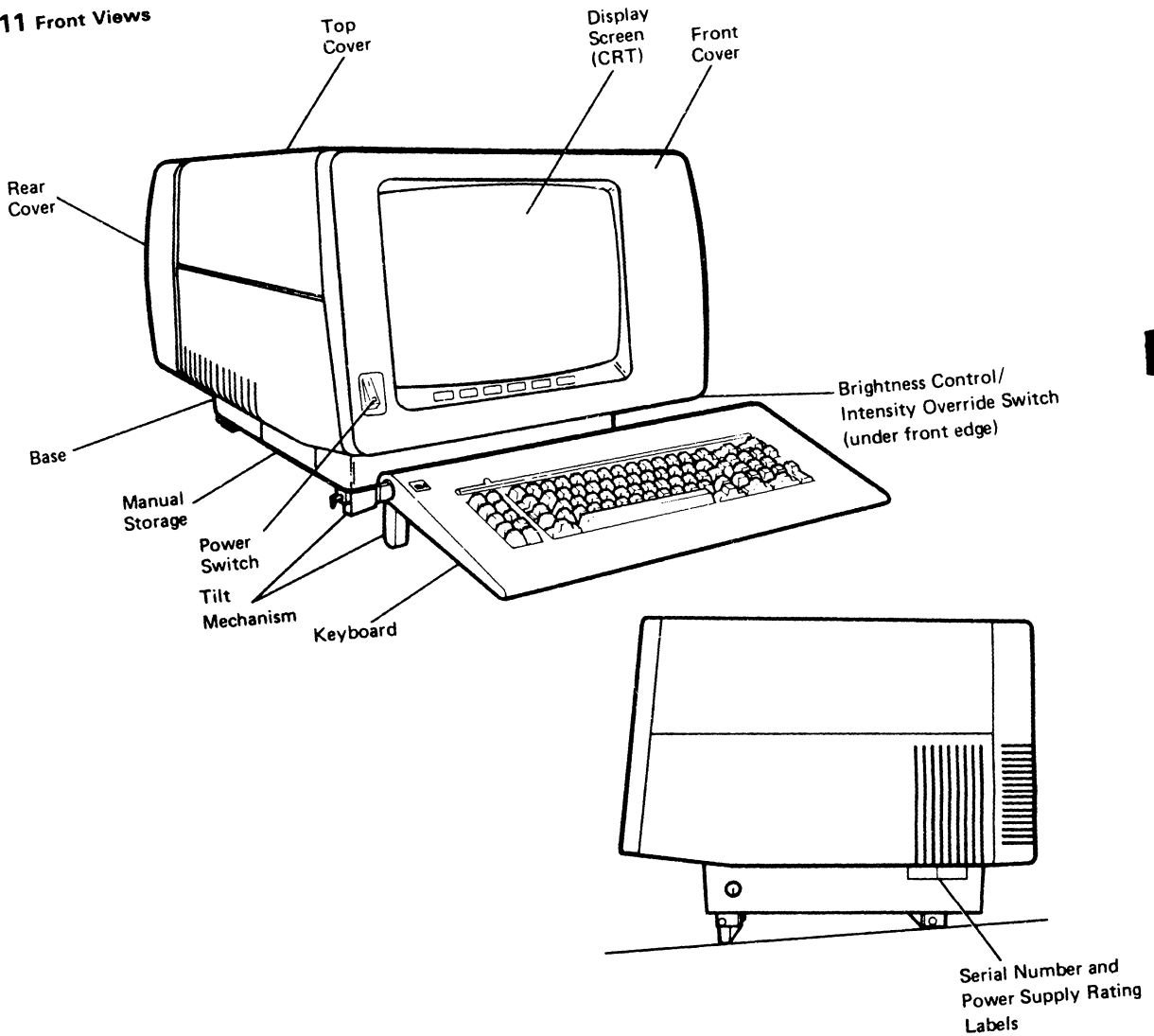
The *Features and RPQs* section describes the features and request for quotation (RPQs) items that are available with the IBM 5292 Color Display Station.

Maintenance Procedures

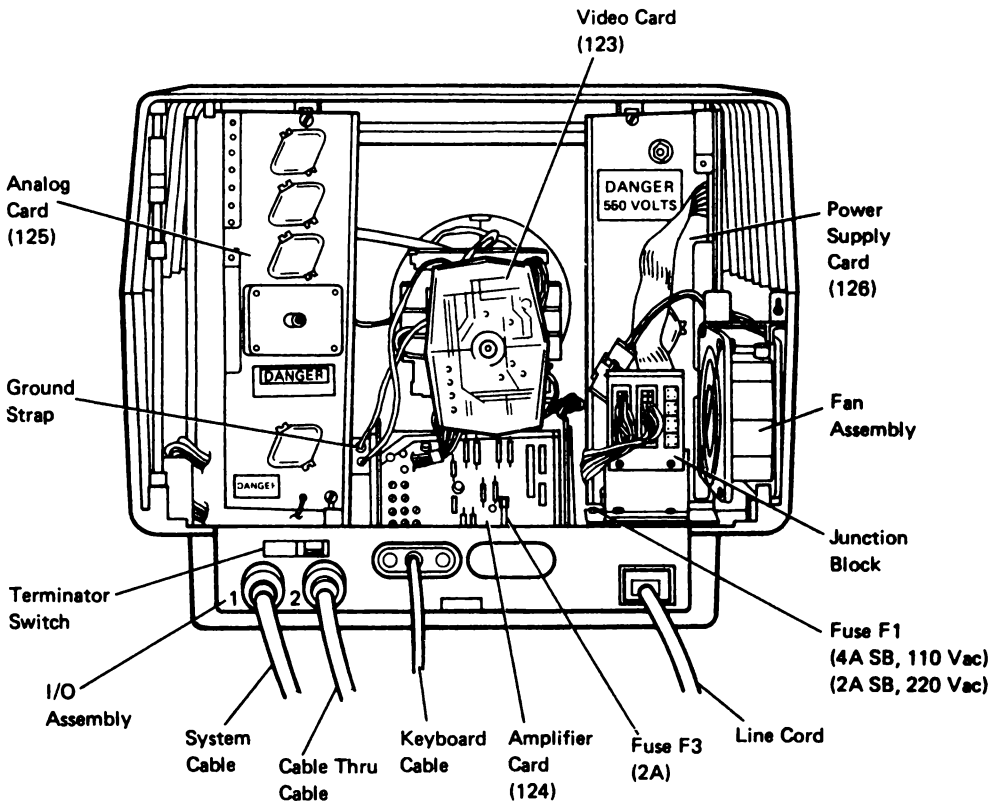
100 LOCATIONS

110 General Locations

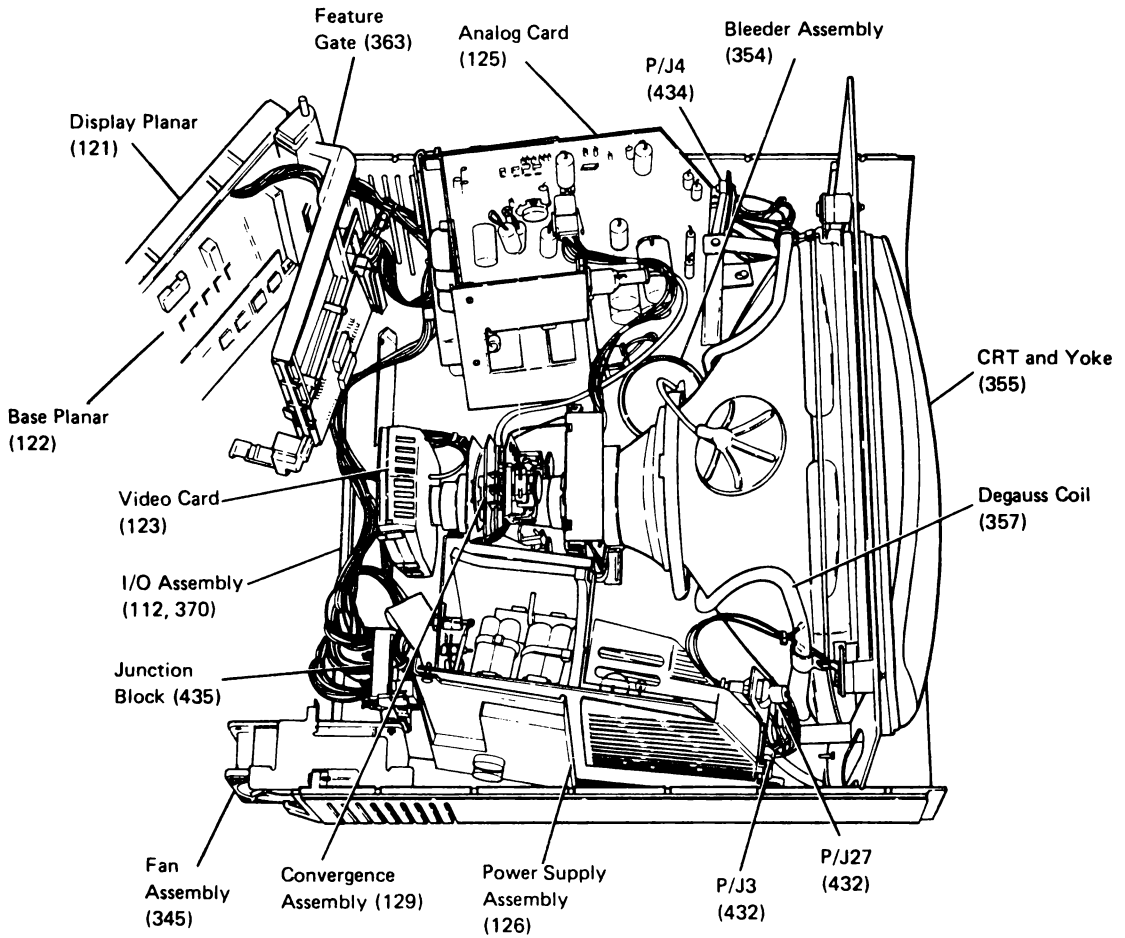
111 Front Views



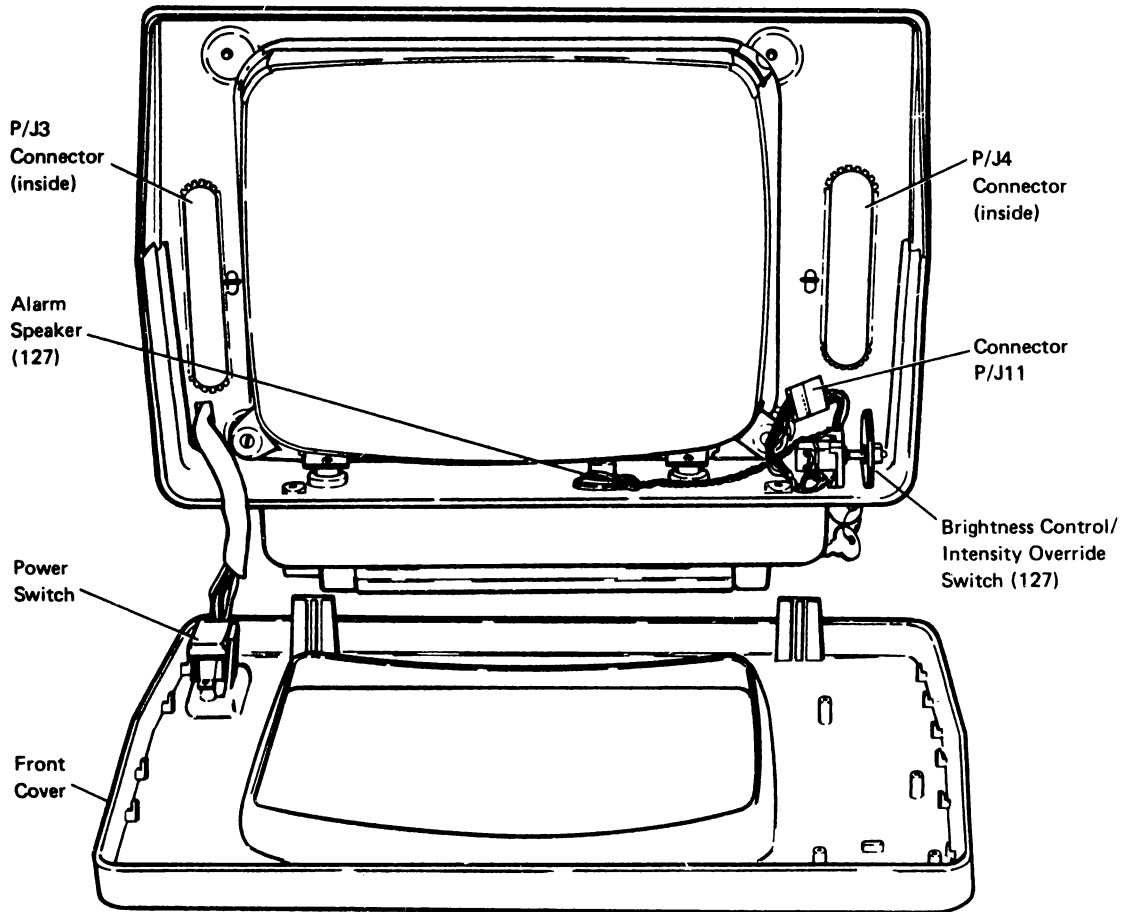
112 Rear View with Logic Gate Open



113 Top View



114 Front View with Cover Removed



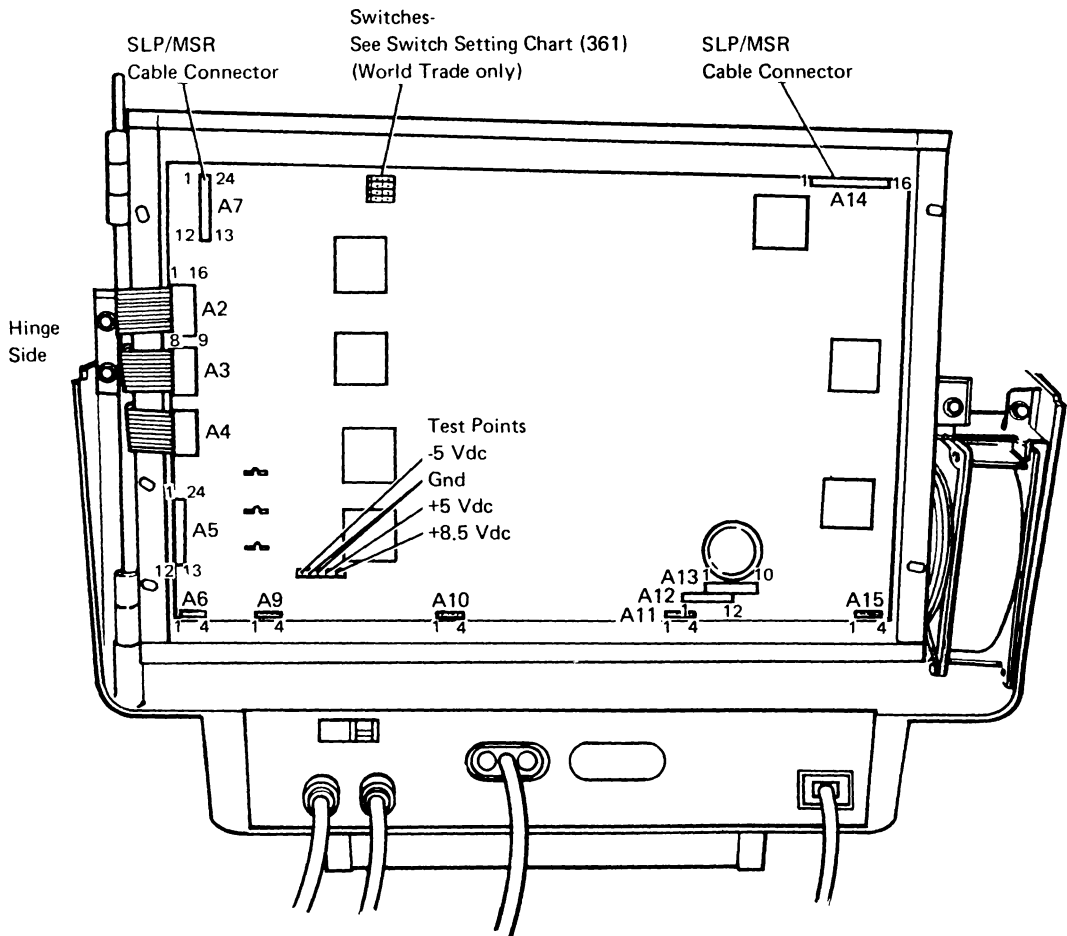
115 Connector Location Chart

Connector (J/P)	Approximate Location
1	Power switch cable
3	Front of the power supply card
3A	Between the power supply card and the analog card
4	Front of the analog card
5	Side of the analog card
6	Side of the analog card
7	Side of the analog card
10	Fan
11	Brightness control
13	Video card
14	Video card
15	Video card
16	Video card
17A	Amplifier card
17B	Amplifier card
18	Amplifier card
19	Amplifier card (convergence coil)
21	Analog card (high voltage)
26	Analog card (focus to video card)
27	Degauss coil
34	Junction block (Vdc to planars)
35	Junction block (Vdc to analog card)
36	Junction block (Vdc MSR/SLP)
A2 through A15	Display planar
B1 through B7	Base planar
C3 and C4	MSR feature card
D3 and D4	SLP feature card
E3 and E4	Test points on the MSR and SLP interposers
MSR	Junction block (to the MSR)
PTR/SLP	Junction block (to the SLP)
PWR	Junction block (from the power supply card)

120 Locations on FRUs

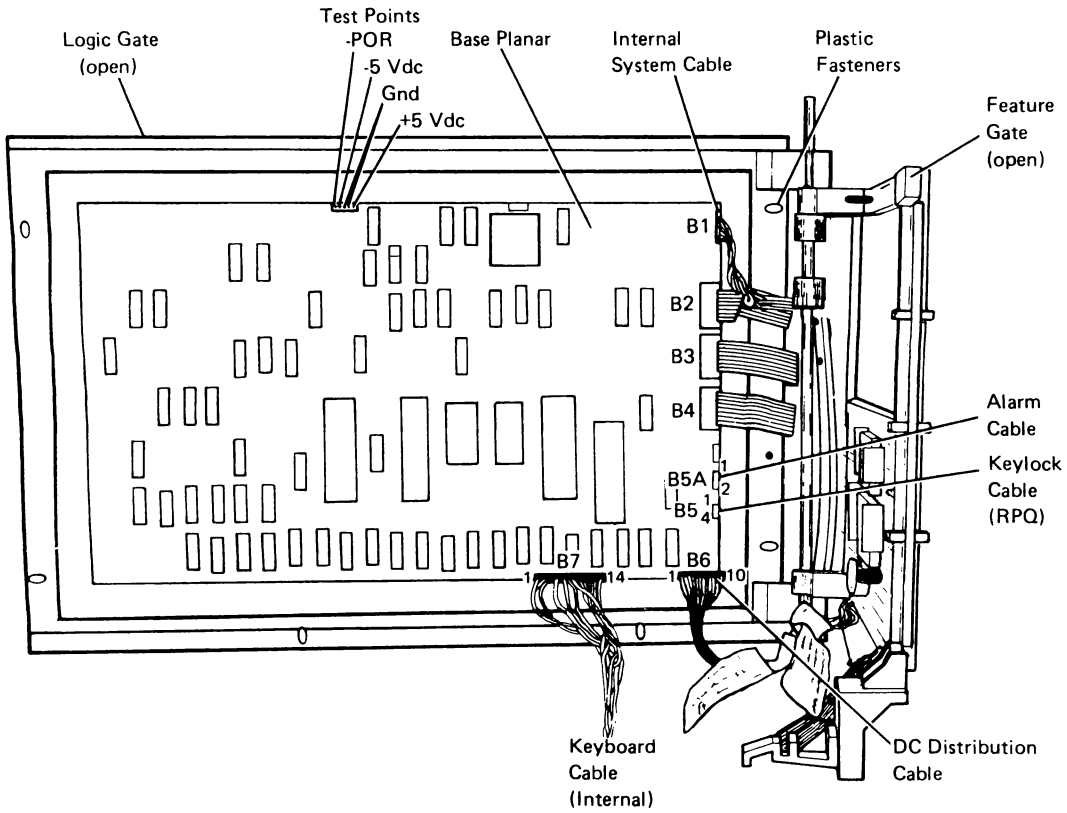
121 Display Planar

(See 113 for location within the display station)



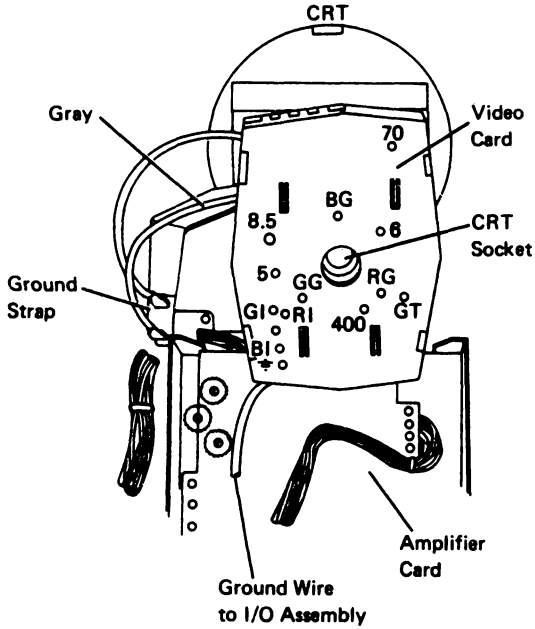
122 Base Planar

(See 113 for location within the display station)

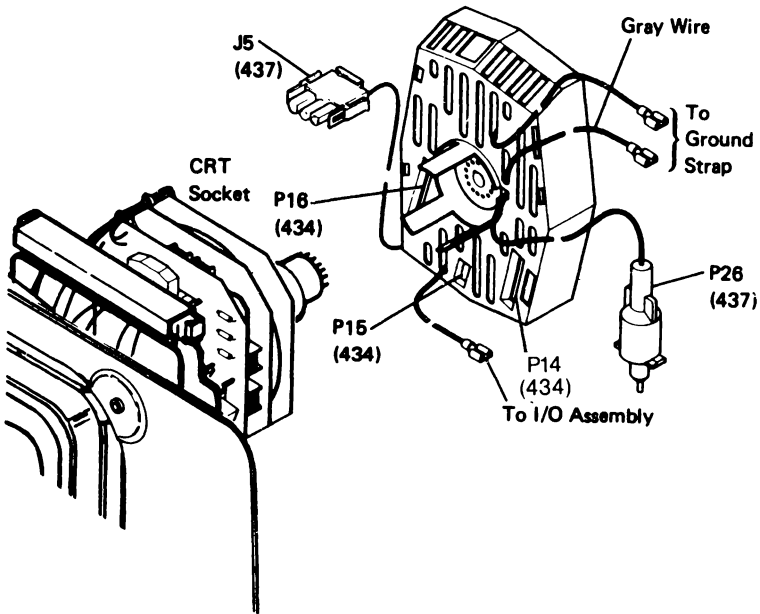


123 Video Card

(See 112 for location within the display station)



Test Point	Description
5	+5 V dc
8.5	+8.5 V dc
70	+70 V dc
⊖	Return 0 V dc
6	+6.3 V dc (Heater)
RI	Red } Video Amp.
GI	Green } Inputs from Display Planar
BI	Blue } (0-5 V dc)
400	Grid Voltage (400 Vdc)
GT	Force Video (0-5 Vdc)
RG	Red } Grid
GG	Green } Voltages from Amplifier Card
BG	Blue } (0 to -150 V dc)

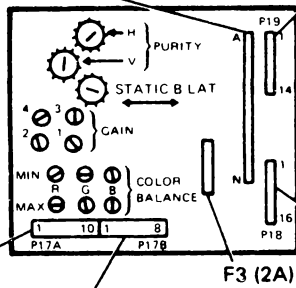


124 Amplifier Card

(See 112 for location within the display station)

Test Points

A	Blue Lateral	} Convergence
B	Blue	
C	Green	
D	Red	} Coil
E	Blue Lateral	} Drive
F	Red	
G	Green	} Inputs from Display Planar
H	Blue	
J	Blue Bright Up	
K	+12 Vdc (Fused)	
L	-150 Vdc	
M	+12 Vdc	
N	-12 Vdc	



P19	(436)
1	V Purity
2	
3	H Purity
4	Gnd
5	Blue Lateral
6	Blue Lateral Rtn
7	Blue Radial
8	Blue Radial Rtn
9	Green Radial
10	Green Radial Rtn
11	Red Radial
12	Red Radial Rtn
13	Gnd

P17A	(434)
1	Brightness 2
2	
3	Brightness 3
4	
5	Color Balance Rtn
6	
7	Red Grid
8	
9	Green Grid
10	

P17B	(434)
1	Blue Grid
2	
3	+12 Vdc
4	12 Vdc Rtn
5	
6	-12 Vdc
7	
8	

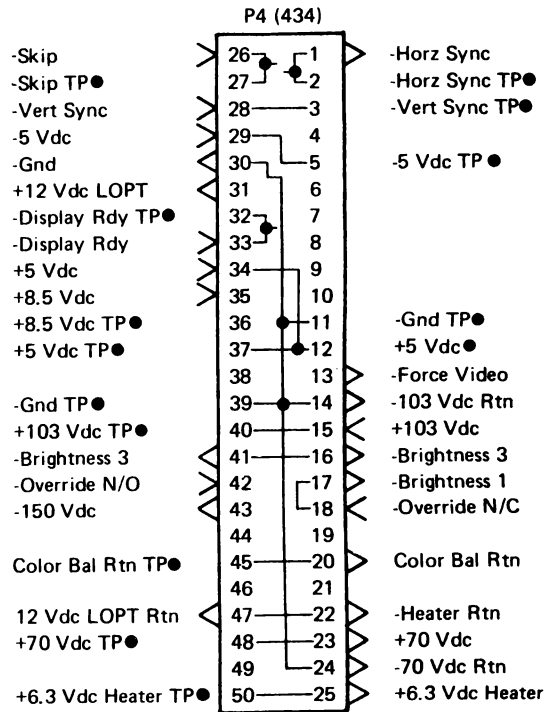
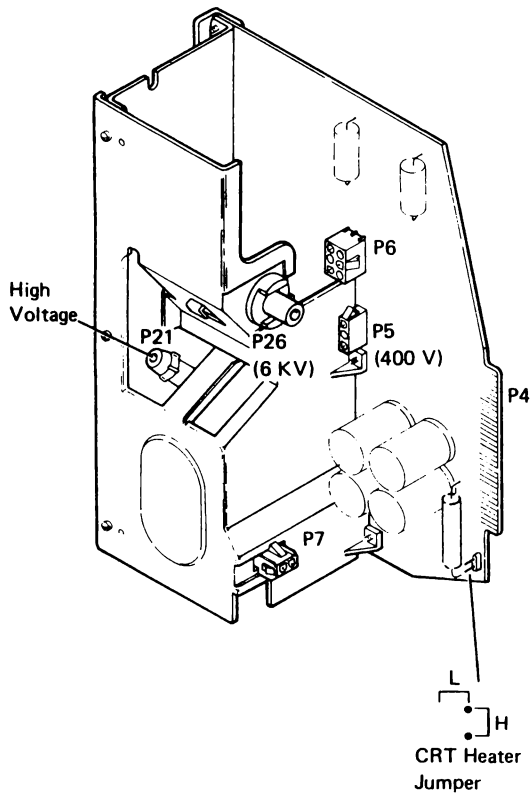
P18	(434)
1	Gnd
2	
3	Blue Bright Up
4	Gnd
5	Blue Radial
6	Gnd
7	Green Radial
8	Gnd
9	Red Radial
10	Gnd
11	Blue Lateral
12	
13	
14	+12 Vdc
15	-12 Vdc
16	

125 Analog Card (1 of 2)

(See 112 for location within the display station)

Note: When exchanging a CRT or Analog Card, match the heater jumper position to the CRT. This sets the heater voltage to the proper value.

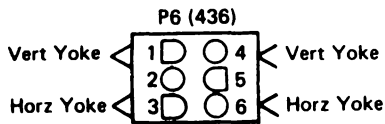
CRT Maker	Heater Jumper
Matsushita Electronics Corporation	L
Mitsubishi Electric Corporation	H



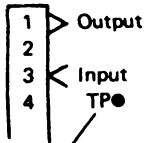
125 Analog Card (2 of 2)

Note: The associated cable reference for the connector shown is in parentheses.

P21 Hi-Voltage to Bleeder Assembly (437)
 P26 6K Vdc Focus to Video (437)



Legend

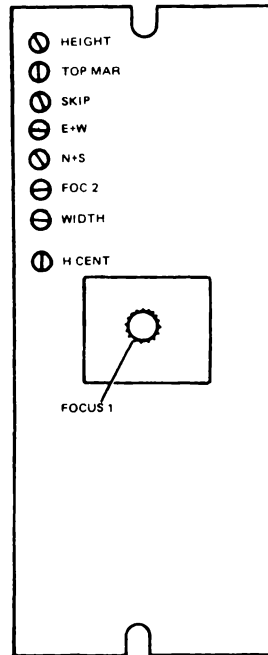
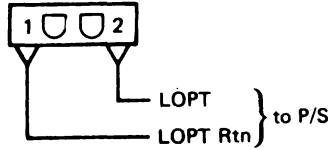


TP = Test Point

P5 (437)



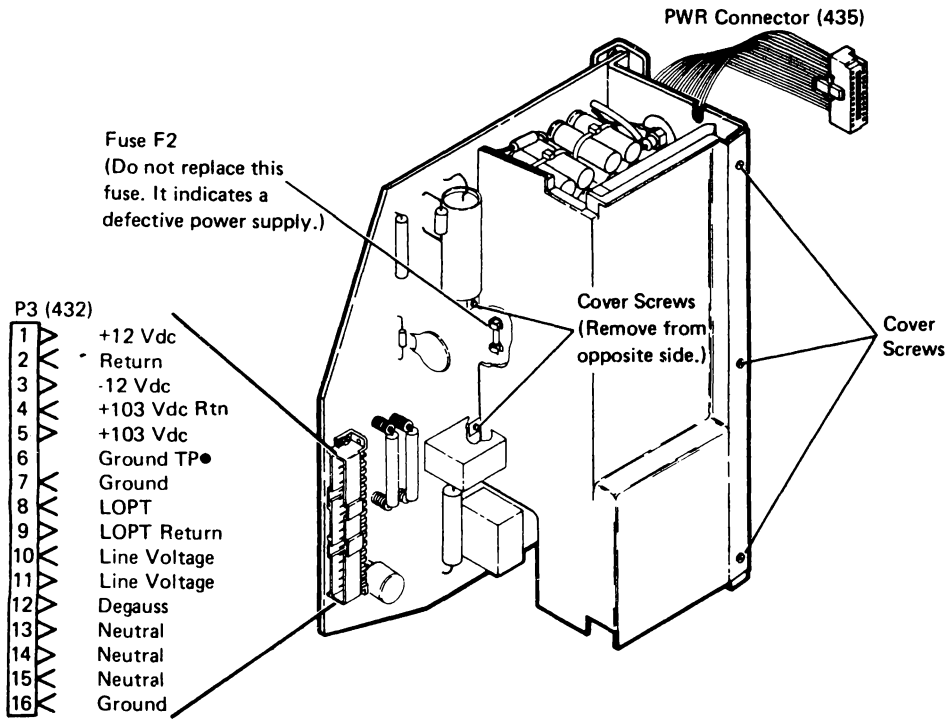
P7 (437)



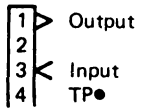
Rear View

126 Power Supply Card

(See 112 for location within the display station)



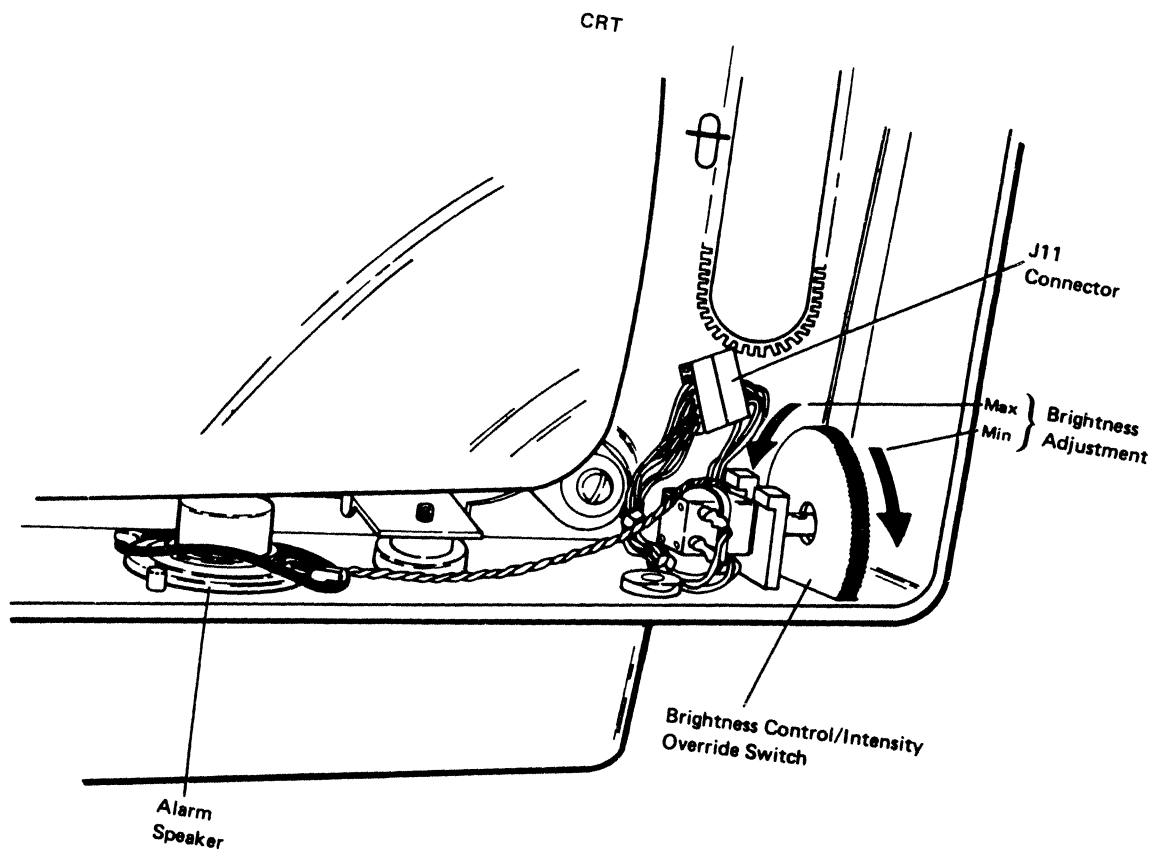
Legend



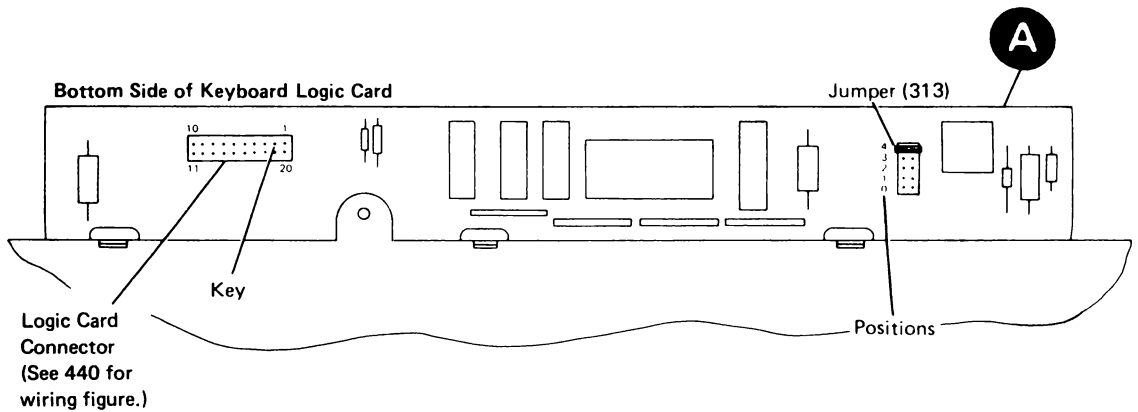
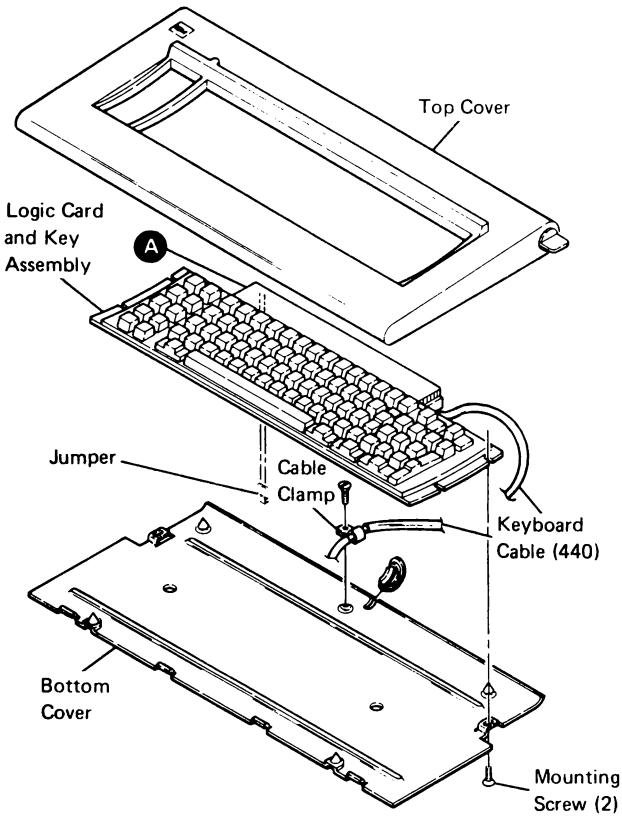
TP● = Test Point

127 Alarm Assembly and Brightness Control

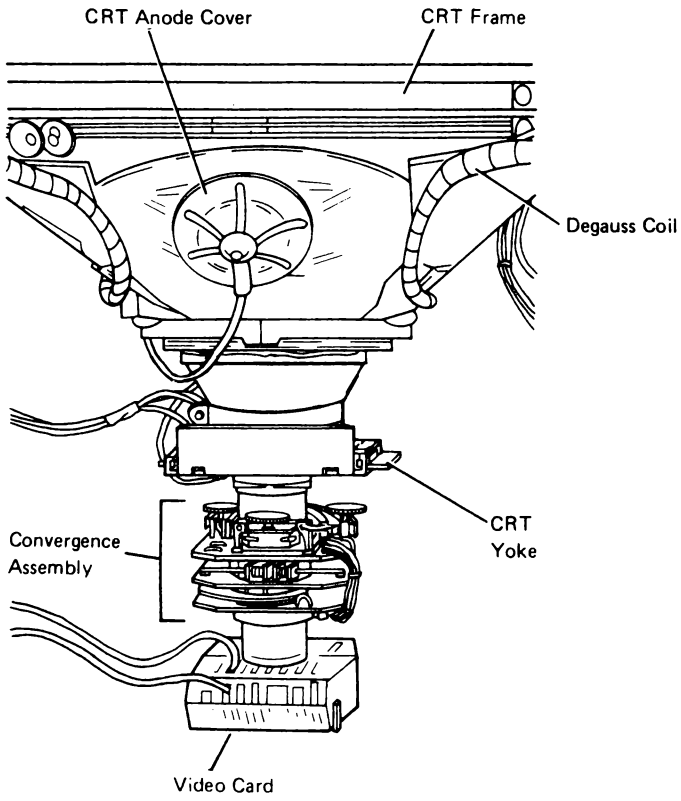
(See 114 for location within the display station)



128 Keyboard Assembly Locations



129 Convergence Assembly Location



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200 ADJUSTMENTS

DANGER

High voltage is present at the CRT anode and analog card. The CRT is easily broken and will implode if cracked or broken. Be especially careful when working around the CRT socket.

Always wear safety glasses when working around the CRT.

Most adjustment, alignment, or convergence problems can be corrected by performing the adjustments in the order given. If any of the adjustments cannot be successfully made, go to MAP 0100.

A mini-potentiometer adjusting tool similar to part number 1864853 is needed to make some of the adjustments.

The stops for the controls on the analog card and amplifier card are easily broken. When adjusting these controls, turn them slowly and carefully.

The following adjustments need no system support. The display station logic contains the alignment patterns and control circuits.

201 Color Adjustments Basic Purpose

The purpose of the color adjustments and the results expected are listed below. The coarse adjustments are used to get the colors close to the correct setting. The fine adjustments complete getting the colors to the correct setting.

Coarse Color Balance Adjustment

The purpose of this adjustment is to get an approximate setting for color intensity and an approximate balance of the three primary colors.

Coarse Raster Adjustment

The purpose of this adjustment is to approximately center the raster on the screen and to get it near to the correct size.

Coarse Focus

The purpose of this adjustment is to get the best focus over all the screen so that all the characters are distinct (not blurred).

Coarse Static Convergence

The purpose of this adjustment is to converge the three primary colors at the center of the screen.

Coarse Color Purity Adjustment

The purpose of this adjustment is to get the same shade of red over all the screen.

Note: At this point, the display screen is approximately in adjustment, and the affect of one procedure on another procedure should be slight.

Fine Raster Adjustment

This adjustment correctly sets the size, centering, and shape of the raster. This is important for performing convergence.

Fine Static Convergence

This adjustment converges the three primary colors at the center of the screen only. The last 12 convergence patterns are adjusted under the dynamic convergence procedure.

Fine Color Purity Adjustment

The purpose of this adjustment is to get the same shade of red, green, and blue over all the screen.

Dynamic Convergence

This adjustment is used to converge the three primary colors over all the screen. (This is the same as customer color alignment.) This adjustment uses all 13 color alignment positions.

Fine Focus

This adjustment sharpens the focus to make the characters distinct over all the screen.

Fine Color Balance Adjustment

The purpose of this adjustment is to set the maximum and minimum brightness levels of the screen and also to balance the intensity of the three primary colors. Balancing the three primary colors ensures that the combination colors pink, yellow, turquoise, and white are correct.

202 Replaced FRU Adjustment Summary

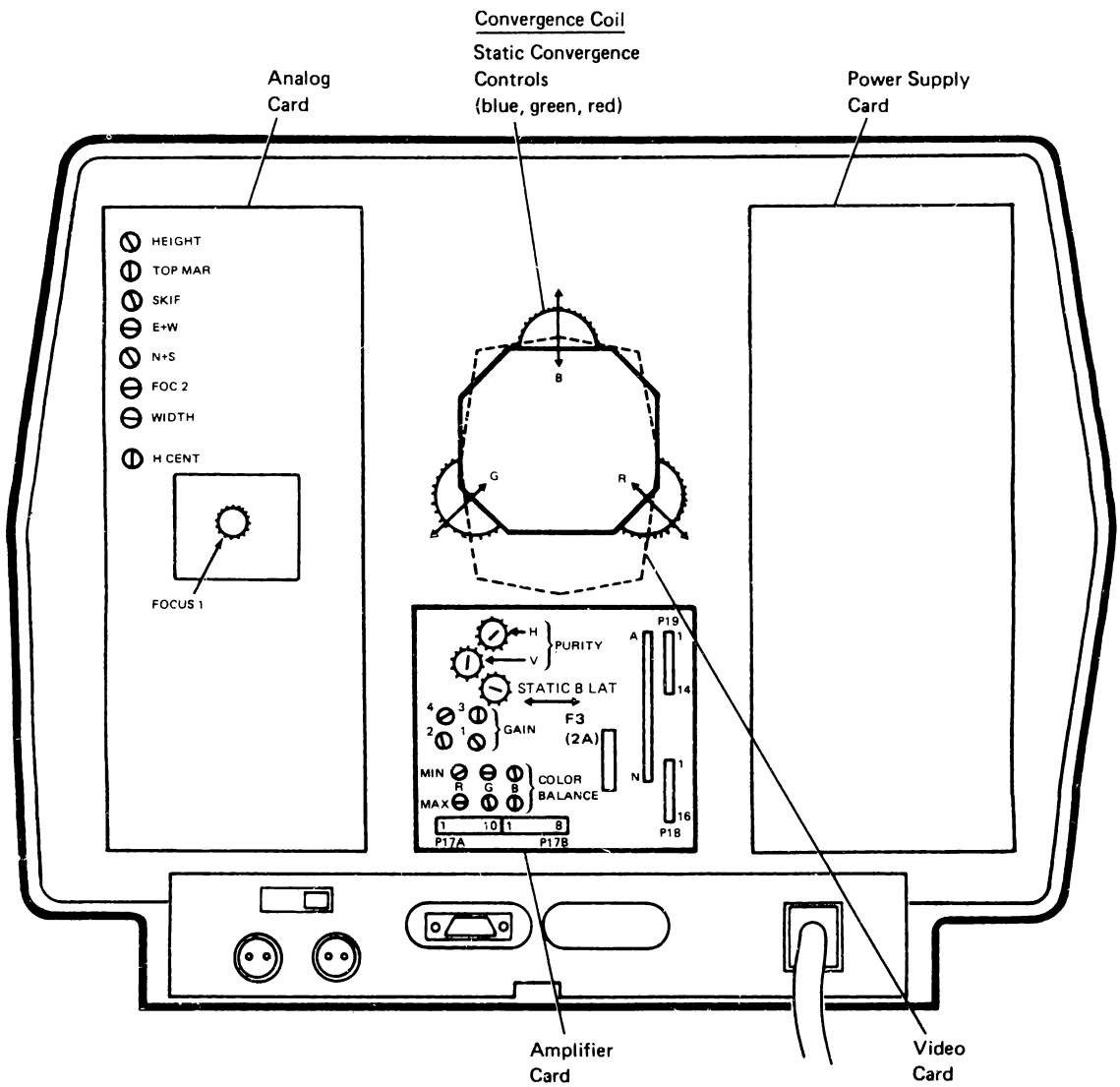
The adjustments affect one another. Therefore, it is important to perform the adjustments in the sequence listed.

The adjustments required after replacing a FRU are listed at the end of the FRU removal and replacement procedure and in the following chart.

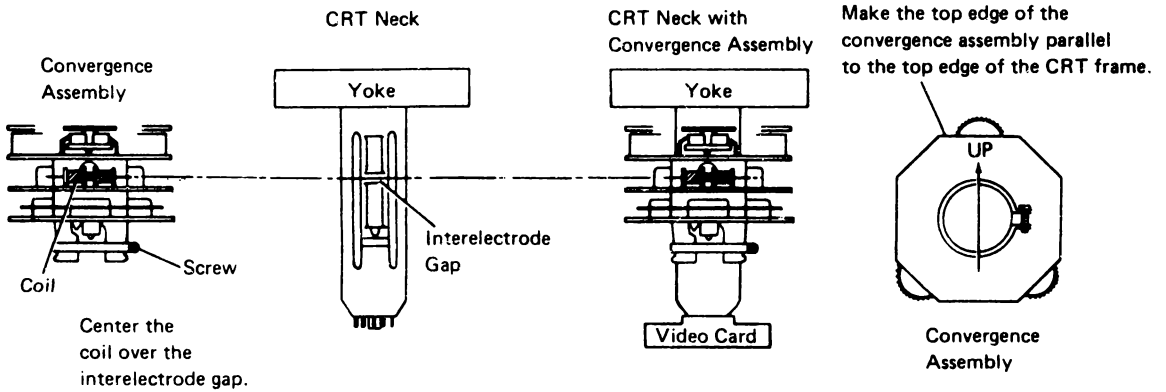
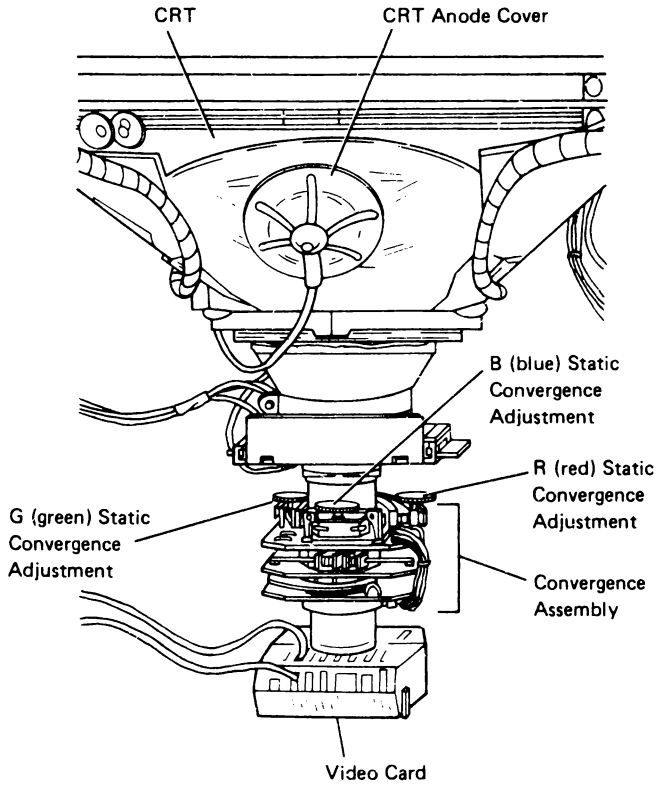
Replaced FRU	Adjustments
Amplifier Card	Coarse color balance (221) Coarse static convergence (224) Coarse color purity (225) Fine static convergence (232) Fine purity (233) Dynamic convergence (234) Fine color balance (236)
Analog Card	Start at the first adjustment (220) and perform all the adjustments except the color balance adjustments (221) and (236).
Convergence Assembly	Fine static convergence (232) Fine purity (233) Dynamic convergence (234)
CRT	Start at the first of the fine adjustments (230) and perform the complete fine adjustment procedure.
Power Supply Card	Start at fine static convergence (232) and perform all the remaining adjustments.
Video Card	Perform the fine color balance adjustment (236).
Degauss Coil	Start at the first of the fine adjustments (230) and perform the entire fine adjustment procedure.
Display Planar	Fine static convergence (232) Dynamic convergence (234) Set station address (415)
Base Planar	None

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210 Adjustments Locations (1 of 2)



210 Adjustments Locations (2 of 2)



211 Offline Select Mode Setup

To place the display station in the *offline* select mode, perform the following steps:

Note: The display station must be signed off before placing it in the *offline* select mode.

1. Press and hold the Cmd key and press the Error Reset key. The blue Select indicator should appear on the Status line.
2. Press the 0 key on the top row of the keyboard. A yellow reverse asterisk (*) should appear on the Status line.
3. Press the Enter key. You are now in the *offline* select mode.

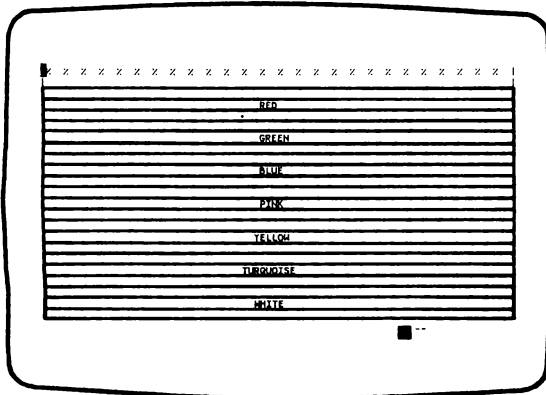
To exit the *offline* select mode:

1. Exit the test you are in (if any).
2. Press the Error Reset key. You are now in normal operation.

For a complete description of the *offline* select mode, go to 415.

220 COARSE ADJUSTMENTS

Note: The raster may be badly adjusted and any characters on the display screen may be distorted. The color of the display screen may not be the same over all the screen. The screen may be dim or completely dark.



Color Bar Screen

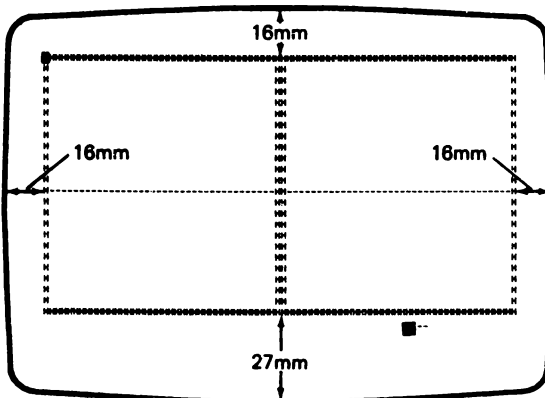
221 Coarse Color Balance

1. Ensure that the display station has been on for 5 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the D key. Release the keys.
3. Set the brightness control to 3/4 of its full maximum rotation (127).
4. Set the R (red), G (green), and B (blue) MAX and MIN controls on the amplifier card fully clockwise (210). The color bars on the display screen should be bright.
5. If the display screen is blank, set the HEIGHT control on the analog card fully counterclockwise (210).
6. Adjust the R MIN control on the amplifier card until the red color bar is at an easy viewing level. The control should be about the center of its rotation.
7. Adjust the G MIN control on the amplifier card until the green color bar is at the same brightness level as the red color bar.
8. Adjust the B MIN control on the amplifier card until the blue color bar is at the same brightness level as the red color bar.
9. Adjust the brightness control toward minimum until one of the color bars is just visible.
10. Adjust the other color MIN controls until the other color bars are equally as dim.
11. Set the brightness control to the center of its rotation.

222 Coarse Raster Adjustment

1. Ensure that the display station has been on for 5 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the F key. Release the keys.
3. If the front cover was removed, tape it temporarily in place.
4. Adjust the WIDTH and H CENT (horizontal centering) controls on the analog card (210) until the outside vertical edges of the alignment pattern are approximately 16 millimeters (5/8 inch) from the sides of the display screen.
5. Adjust the TOP MAR (top margin) control on the analog card until the top line of the alignment pattern is approximately 16 millimeters (5/8 inch) from the top of the display screen.
6. Adjust the HEIGHT control (and, if necessary, the SKIP control) on the analog card until the center line of the bottom row of Hs is approximately 27 millimeters (1-1/8 inch) from the bottom of the display screen.

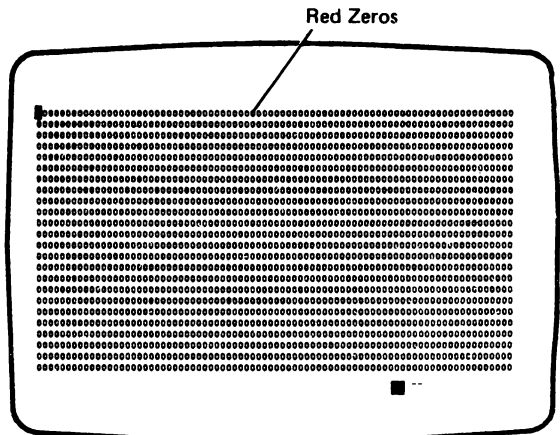
Note: The display screen may become dark if the HEIGHT control is set too low.



Coarse Raster Alignment Screen

223 Coarse Focus

1. Ensure that the display station has been on for 5 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the G key. Release the keys. A screen full of red zeros should appear.
3. Adjust the static FOCUS 1 control on the analog card (210) to obtain the best focus over the entire display screen.



Focus Screen

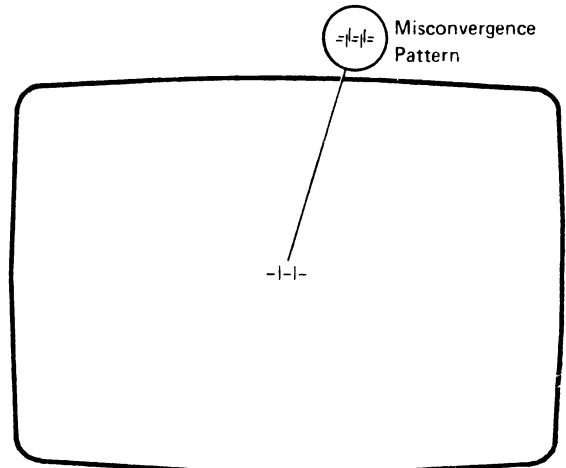
224 Coarse Static Convergence

Note: The raster may still be badly adjusted and any characters displayed badly distorted. The color of the display screen still may not be correct or even over all the screen. This procedure converges the three primary colors at the center of the screen.

1. Ensure that the display station has been on for 5 minutes and is in the offline select mode (211).
2. Ensure that the convergence coil assembly is properly positioned on the neck of the CRT (210).
3. Press and hold the Cmd and Enter keys and press the \pm key on the top row of the keyboard.
4. If properly converged, a yellow $-|-|$ should be displayed at the center of the display screen.
5. Adjust the R (red) and G (green) static convergence controls on the convergence assembly (210) until the two $-|-|$ patterns line up both horizontally and vertically (converge). This should make a single, yellow pattern with no red or green shadows at the edges.
6. Press the Spacebar.
7. Adjust the B (blue) static convergence control on the convergence assembly (210) and the STAT B LAT control on the amplifier card (210) until the $-|-|$ blue and red patterns converge. This should make a single pink pattern with no red or blue shadows at the edges.

To exit this procedure:

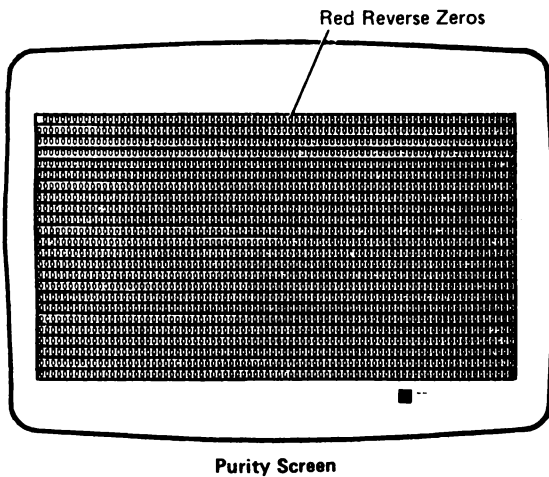
1. Press and hold the Spacebar until all 13 alignment patterns appear on the display screen at the same time. Do not be concerned with the convergence of the remaining patterns.
2. Press the C key.



Static Convergence Alignment Pattern

225 Coarse Color Purity

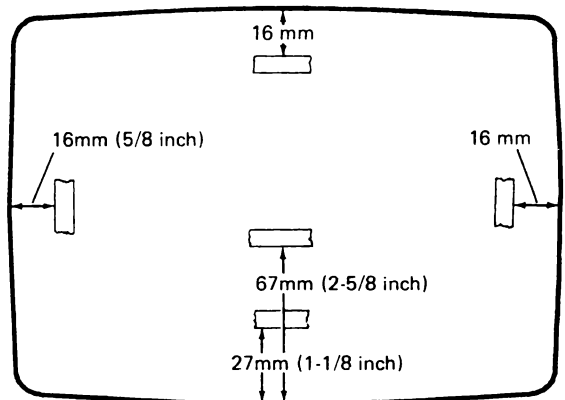
1. Ensure that the display station has been on for 5 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the H key. A red screen should be displayed.
3. If the screen is not the same shade of red all over, adjust the H and V PURITY controls on the amplifier card (210) until the display screen is the same shade of red over all the screen.



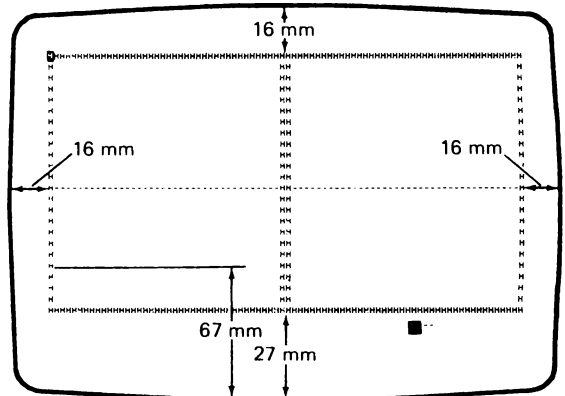
230 FINE ADJUSTMENTS

231 Fine Raster Adjustment

1. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the F key.
3. If the front cover has been removed, tape it in place.
4. Adjust the E + W control on the analog card until the vertical edges of the alignment pattern appear straight.
5. Adjust N + S control on the analog card (210) until the top line of the alignment pattern appears straight.
6. Place small pieces of tape on the display screen as shown in the figure.
7. Adjust the TOP MAR control on the analog card until the crossbar of the Hs is 16 millimeters (5/8 inch) from the top of the display screen.
8. Adjust the WIDTH control and H CENT (horizontal centering) control until the outside vertical edges of the Hs are 16 millimeters (5/8 inch) from the sides of the display screen.
9. Press and hold the Cmd key and press the 6 key on the top row of the keyboard.
10. Adjust the HEIGHT control until the crossbar of the bottom row of Hs is 67 millimeters (2-5/8 inches) from the bottom of the display screen.
11. Press and hold the Cmd key and press the 6 key on the top row of the keyboard.
12. Adjust the SKIP control on the analog card until the crossbar of the bottom row of Hs is 27 millimeters (1-1/8 inches) from the bottom edge of the display screen.
13. Remove the tape from the display screen and ensure that the screen is clean.



Taping of Screen for Alignment



Alignment Screen

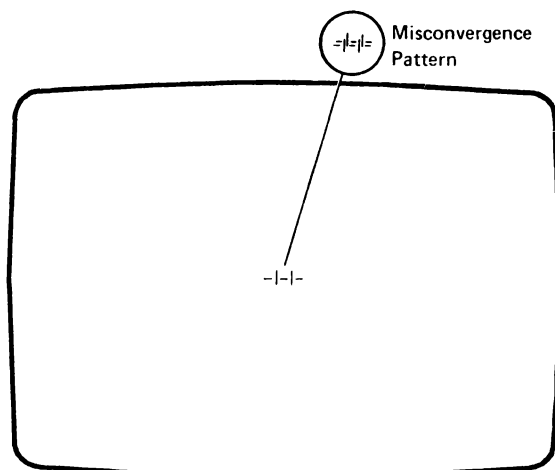
232 Fine Static Convergence

Note: This procedure converges the three primary colors at the center of the screen.

1. Ensure that the convergence assembly is positioned properly on the CRT (210).
2. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
3. Press and hold the Cmd and Enter keys and press the \pm key on the top row of the keyboard. A -|-|- pattern will appear at the center of the screen. If the pattern is not centered on the screen, perform the fine raster adjustment (231), then return here. Two patterns, red and green, will be visible if the colors are not converged.
4. Adjust the R (red) and G (green) static convergence controls on the convergence assembly (210) until the two -|-|- patterns line up both horizontally and vertically (converge). This should make a single yellow pattern with no red or green shadows at the edges.
5. Press the Spacebar.
6. Adjust the STATIC B LAT control on the amplifier card and B (blue) static convergence control on the convergence assembly (210) until the red and blue -|-|- patterns converge. This should make a single pink pattern with no red and blue shadows at the edges.
7. Press the U key. If the pattern is not properly converged (a red and green pattern showing instead of one yellow pattern), go back to Step 3.

To exit this procedure:

1. Press and hold the Space bar until all 13 alignment patterns appear on the display screen at the same time. Do not be concerned with the convergence of the remaining patterns.
2. Press the C key.



Static Convergence Alignment Pattern

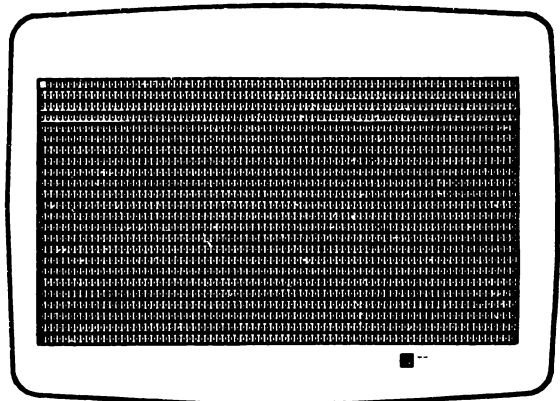
233 Fine Color Purity

Note: This procedure ensures the purity of the three primary colors over all the screen.

1. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the H key. Release the keys. The red purity screen should appear.
3. If the screen is not the same shade of red all over, adjust the H and V PURITY controls on the amplifier card (210) for an even shade of red over all the screen. If good, go to the next step.
4. Press and hold the Cmd key and press the J key to display the green purity screen.
5. If the screen is not the same shade of green all over, adjust the H and V PURITY controls on the amplifier card for an even shade of green over all the screen. If good, go to the next step.
6. Press and hold the Cmd key and press the K key to display the blue purity screen.
7. If the screen is not the same shade of blue all over, adjust the H and V PURITY controls on the amplifier card for an even shade of blue over all the screen.
8. Perform Steps 3 through 7 to see if any additional adjustment is necessary.

Note: If any of the purity adjustments were made, check the fine raster adjustment (231) for both centering and size.

9. Press and hold the Cmd key and press the C key to exit this procedure.



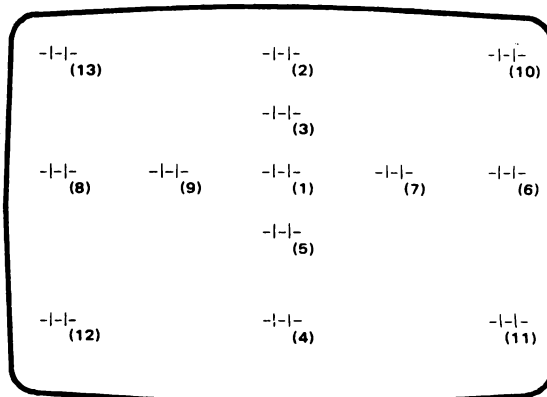
Purity Screen

234 Dynamic Convergence (color alignment)

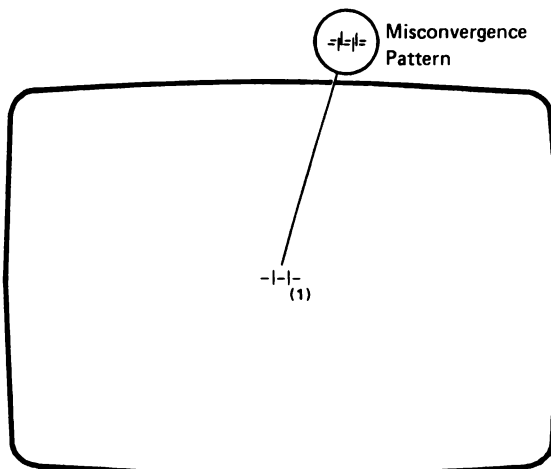
Note: This procedure will converge the colors over all the screen by performing convergence at 13 different places on the screen.

1. If you entered this adjustment from the MAPs, go to Step 3.
2. Check static convergence (232).
3. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
4. Press and hold the Cmd key and press the \pm key on the top row of the keyboard. All 13 $-|-|-$ alignment patterns should appear.
5. If all 13 alignment patterns are properly converged, press and hold the Cmd key and press the C key to exit the procedure.
6. If any one or more of the 13 alignment patterns are not converged, press the Spacebar and continue with this procedure. A single $-|-|-$ alignment pattern should appear in the center of the screen. If all are converged, go to Step 13.
7. Use the cursor control keys to move the green alignment pattern ($-|-|-$) over the red alignment pattern to make a yellow pattern with no red or green shadows at the edges. (See the summary of convergence key operations at the end of this procedure.)
8. Press the Spacebar and use the cursor control keys to move the blue alignment pattern over the red alignment pattern to make a pink pattern with no red or blue shadows at the edges.
9. Press the Spacebar.
10. Repeat Steps 5 through 8 for the 12 remaining convergence areas.
11. At this time, all 13 alignment patterns should be displayed and should be pure white.

12. If any of the patterns need to be converged again, press the R key and repeat Steps 5 through 10. If not, go to the next step.
13. If all 13 patterns have been successfully converged and are present on the display screen, press the C key to exit this procedure.







Screen of 13 Convergence Alignment Patterns
(The numbers in parentheses show the order for performing convergence.)



First Position of the Convergence Procedure

Summary of Convergence Key Operations

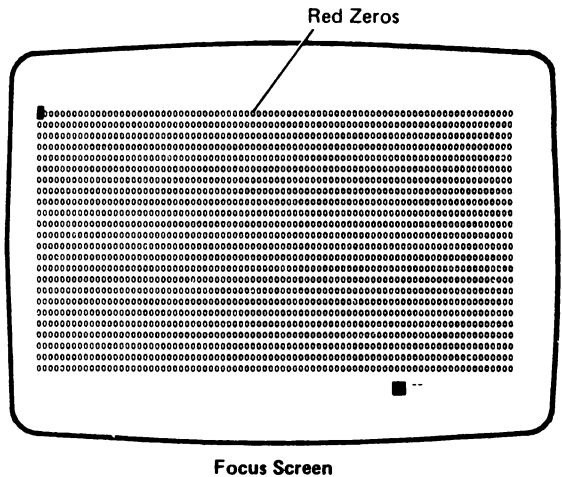
Key	Yellow Alignment Pattern	Pink Alignment Pattern
Cursor up 	Moves green up relative to red	Moves blue up relative to red
Cursor down 	Moves green down relative to red	Moves blue down relative to red
Cursor left 	Moves green left relative to red	Moves blue left relative to red
Cursor right 	Moves green right relative to red	Moves blue right relative to red
Spacebar	Changes color of pattern to pink	Changes to next screen position
'U' Key	Changes color of pattern to pink	Changes color of pattern to yellow
'R' Key	Restarts the convergence procedure at alignment pattern position 1.	
'C' Key	Permits exit from the procedure.	

Note: The R and C keys are active only when all 13 convergence alignment patterns are on the screen.

235 Fine Focus

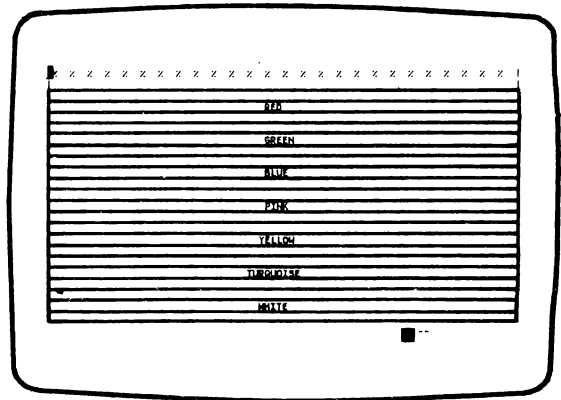
1. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the G key. Release the keys. A red focus screen should appear.
3. Set the FOC2 control on the analog card (210) fully counterclockwise.
4. Adjust the FOCUS 1 control on the analog card for the sharpest image over all the display screen.

Note: The FOC2 control may have to be adjusted slightly also to obtain the best focus.



236 Fine Color Balance

1. Ensure that the display station has been on for 20 minutes and is in the offline select mode (211).
2. Press and hold the Cmd key and press the D key. Release the keys.
3. Adjust the 6 COLOR BALANCE controls (R, G, B MAX and MIN) on the amplifier card (210) fully counterclockwise.
4. Adjust the brightness control to the maximum limit (127). The display screen will be blank at this time.
5. Adjust the R MAX control on the amplifier card until the red color bar appears.
6. Continue adjusting the R MAX control clockwise until the zeros of the % characters in the corners are just filled in with red.
7. Slowly adjust the R MAX control counterclockwise until the dots in the zeros appear. This sets the maximum brightness level of the red color.
8. Press and hold the Cmd key and press the 6 key on the top of the keyboard. The dark skip lines between the color bars will be suppressed.
9. Adjust the brightness control toward the minimum limit until the red bar is just visible.
10. Adjust the G MAX control on the amplifier card until the green bar is visible; then adjust the control until the green bar is as dim as the red bar.
11. Adjust the B MAX control on the amplifier card until the blue bar is visible; then adjust the control until the blue bar is as dim as the red bar.
12. Turn the brightness control toward the lower limit (127). The red, green, and blue color bars should disappear at the same time.
13. Turn the brightness control to the minimum limit. Be careful not to activate the intensity override switch.
14. Adjust the R MIN control on the amplifier card clockwise until the red color bar is just visible and you can still read the words.
15. Adjust the G MIN and B MIN controls until the green and blue bars are equally as dim as the red bar. This sets the minimum brightness level of the display screen.
16. Turn the brightness control at the front of the machine to its maximum limit, then turn it to its minimum limit and back to the maximum limit again to check the balance of all the colors over the full range of the brightness control. Give special attention to the white bar. It should remain white through the entire brightness range.
17. Adjust the brightness control for easy viewing.



Color Bar Screen

300 REMOVAL AND REPLACEMENT PROCEDURES

310 KEYBOARD AND KEYBOARD CABLE REMOVAL AND REPLACEMENT PROCEDURE

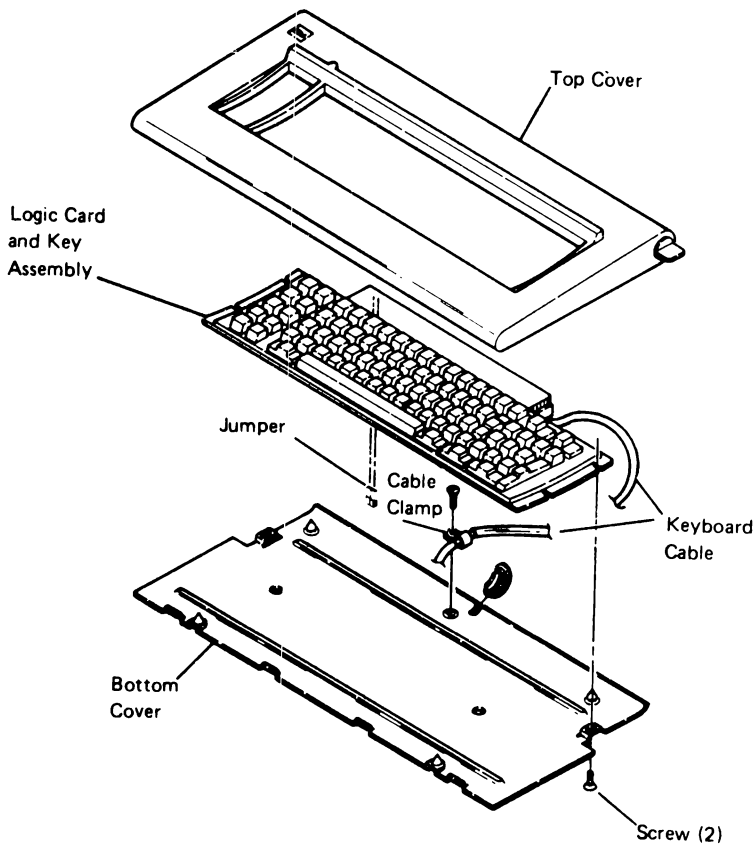
311 Keyboard (Logic Card and Key Assembly)

1. Power off and remove the line cord from the AC outlet.
2. Invert the keyboard unit.
3. Remove the two screws on the bottom cover.
4. Lift off the bottom cover.
5. Disconnect the cable connector from the keyboard logic card.

6. Ensure that the new keyboard is jumpered the same as the old keyboard (313).
7. Lift the logic card and key assembly from the top cover.

Replace the new keyboard in the reverse order of removal.

Ensure that the new keyboard ID, displayed on the status line, is the same as the ID for the old keyboard. (See Keyboard ID Field, 413.)



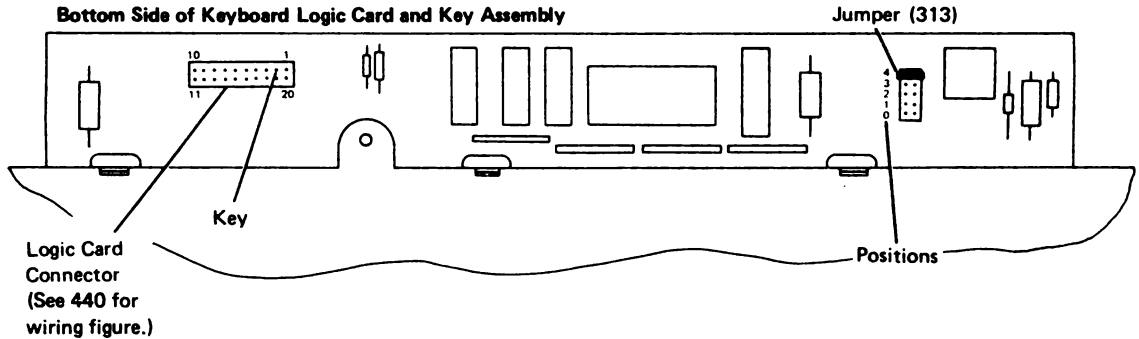
312 Keyboard Cable

1. Power off and remove the line cord from the AC outlet.
2. Remove the keyboard unit bottom cover as follows (311):
 - a. Invert the keyboard unit.
 - b. Remove the two screws on the bottom cover.
 - c. Lift off the bottom cover.
3. Remove the cable clamp from the bottom cover and then the cable.
4. Disconnect the cable from the logic card.
5. Remove the keyboard cable connector from the I/O Assembly.

Replace the keyboard cable in the reverse order of removal.

313 Keyboard Jumpers

ID Code	Language Group	Jumper Position
00	United States and Canada	No jumpers required
01	ASCII International	4
02	United Kingdom	3
03	Japan(English)	3 and 4
04	Spanish Speaking	2
05	Spain	2 and 4
06	Brazil	2 and 3
07	Portugal	2, 3, and 4
08	Austria and Germany	1
09	Finland and Sweden	1 and 4
10	Norway and Denmark	1 and 3
11	Italy	1, 3, and 4
12	France	1 and 2
13	Canada (French)	1, 2, and 4
14	Belgium	1, 2, and 3
15	Japan (Katakana)	1, 2, 3, and 4
16-31	Do not use	0-Not valid



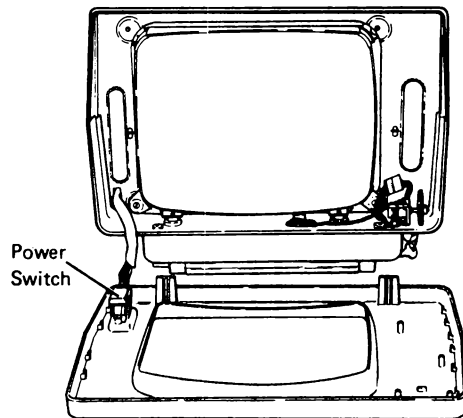
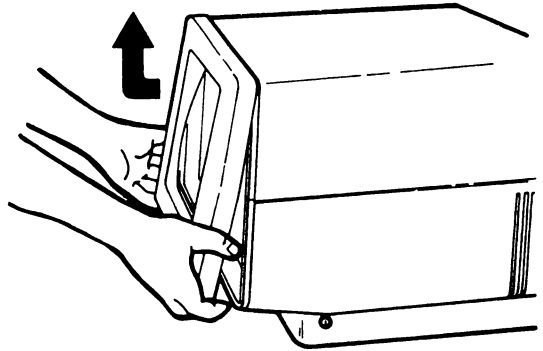
320 COVERS REMOVAL AND REPLACEMENT PROCEDURES

There are three covers on the display station: the front cover, the rear cover, and the top cover.

321 Front Cover

1. Power off and remove the line cord from the AC outlet.
2. Move the keyboard out of the way.
3. Remove the two hex screws from the underside of the front cover (use either a 7-millimeter or 9/32-inch socket).
4. Carefully pull the bottom of the front cover away from the front of the display station and lift upward.
5. Put the front cover down in front of the display station.
6. If you want to replace the front cover, perform Step 7. If you do not want to replace it, stop here.
7. Remove the power switch (346).

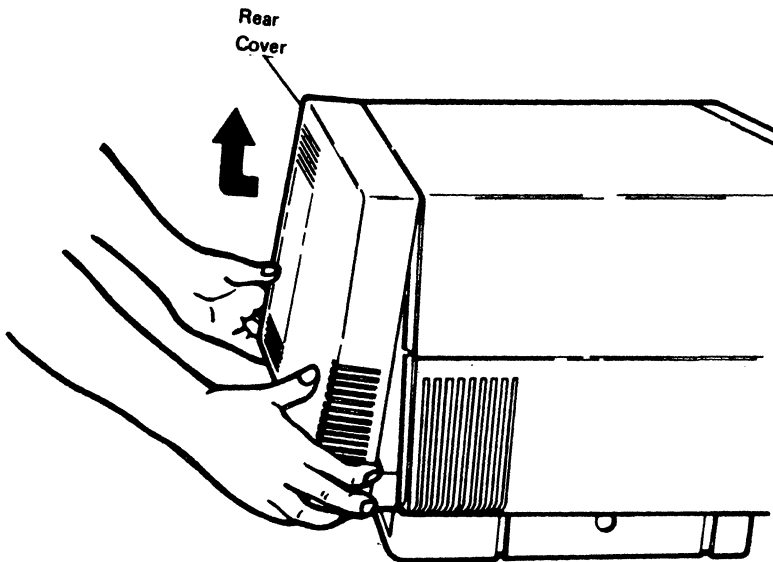
Replace the front cover in the reverse order of removal.



322 Rear Cover

1. Power off and remove the line cord from the AC outlet.
2. Loosen the two hex screws from the underside of the rear cover (use either a 7-millimeter or 9/32-inch socket).
3. Carefully pull the bottom of the rear cover away from the logic gate and lift upward.

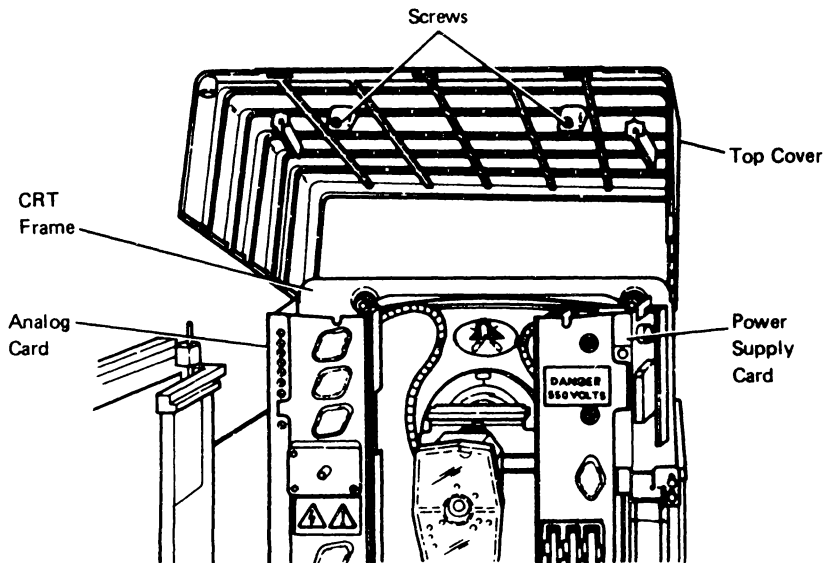
Replace the rear cover in the reverse order of removal.



323 Top Cover

1. Power off and remove the line cord from the AC outlet.
2. Remove the front cover (321). You need not disconnect the power switch.
3. Remove the rear cover (322).
4. Release the latch on the logic gate and pull it open.
5. Loosen the two screws holding the top cover to the power supply card and analog card. These screws are accessible from the rear of the display station.
6. Lift the top cover off the display station.

Replace the top cover in the reverse order of removal. Be careful to properly align the top cover slots with the CRT frame, the power supply card, and the analog card.



324 Tilt Assembly

1. Power off and remove the line cord from the AC outlet.
2. Disconnect all the cables from the rear of the display station.
3. Place the keyboard out of the way.
4. Carefully place the display station on its side with the tilt assembly handles pointing down.
5. Remove the C-clip and washer from the end of the tilt assembly shaft.

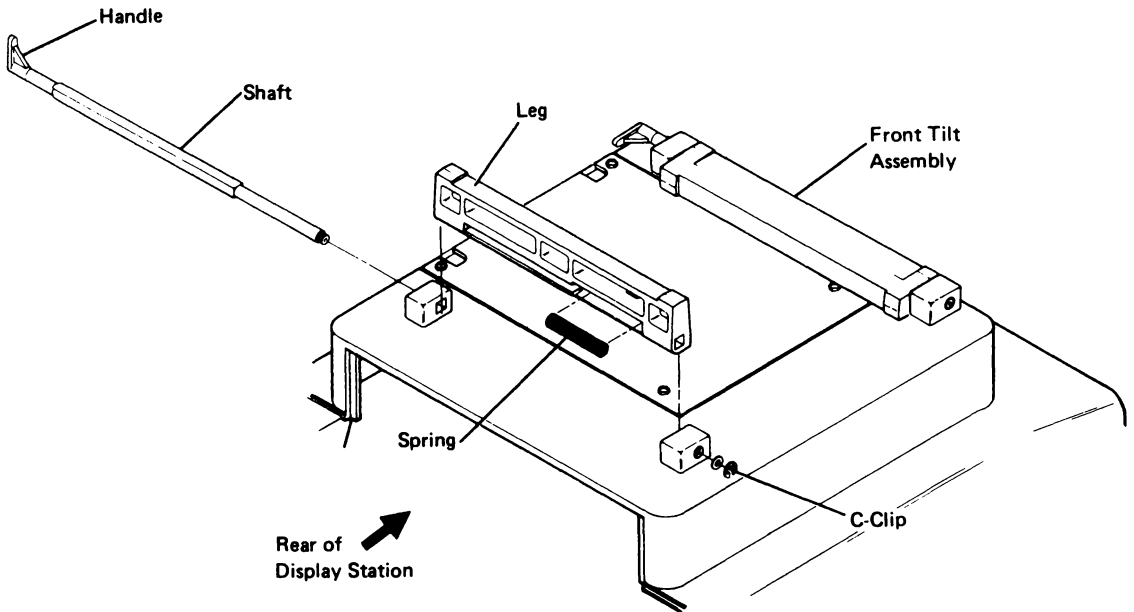
6. Carefully place the display station on its side with the tilt assembly handles pointing up.

Note: When removing the tilt assembly shaft, a spring will be loose and will fall out of the assembly. Be careful not to lose the spring.

7. Pull the tilt assembly shaft up and out of the assembly.

Replace the tilt assembly in the reverse order of removal.

Note: Ensure that the spring is in place in the leg of the tilt assembly before replacing the tilt assembly shaft. The shaft must pass through the spring.



330 Brightness Control/Intensity Override Switch Removal and Replacement Procedure

Note: The brightness control/intensity override switch are physically one unit.

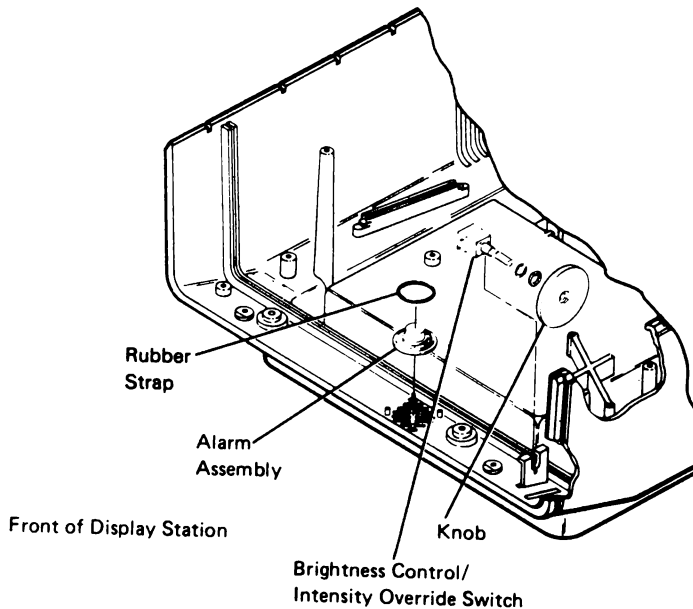
1. Power off and remove the line cord from the AC outlet.
2. Remove the front cover (321).
3. Disconnect the brightness control cable (J11).
4. Loosen the nut holding the brightness control to the bracket on the base.
5. Remove the brightness control.
6. Remove the knob from the old control and put it on the new one.

Replace the brightness control in the reverse order of removal. Check the control for correct alignment and free movement.

331 Alarm Assembly Removal and Replacement Procedure

1. Power off and remove the line cord from the AC outlet.
2. Remove the front cover (321).
3. Disconnect the alarm assembly cable (B5A) from the base planar (122).
4. Remove the rubber strap holding the alarm assembly to the base.
5. Remove the alarm assembly.

Replace the alarm assembly in the reverse order of removal.



340 POWER SUPPLY ASSEMBLIES REMOVAL AND REPLACEMENT PROCEDURES

The power supply assemblies include the power supply card; the line cord; the line filter, fuse holder and AC power cable; the fan assembly; the power switch; and the junction block.

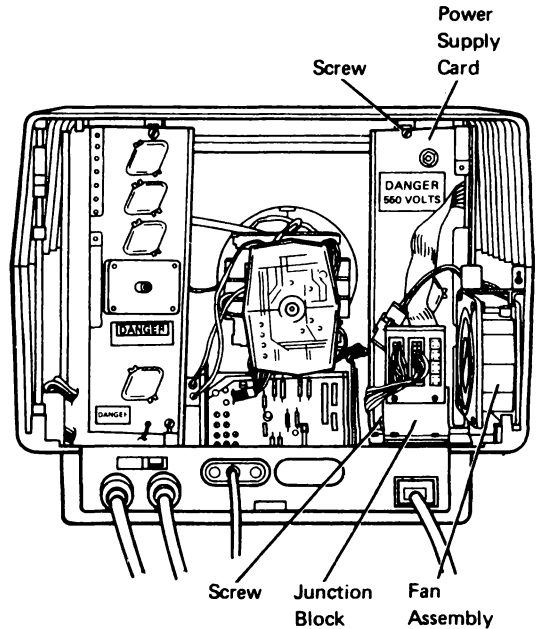
341 Power Supply Card

1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322) and open the logic gate.
3. Loosen and set aside the junction block.
4. Remove the flat, yellow cable at the PWR connector on the junction block.
5. Remove the fan assembly (345).
6. Remove the screw at the top and bottom rear of the power supply card.
7. Carefully remove the power supply card by pulling it free from its connector (J3) at the front of the unit.

Replace the power supply card in the reverse order of removal.

Ensure that the flat, yellow cable from the power supply card plugs into the PWR connector on the junction block.

Start at fine static convergence (232) and perform all the remaining adjustments.



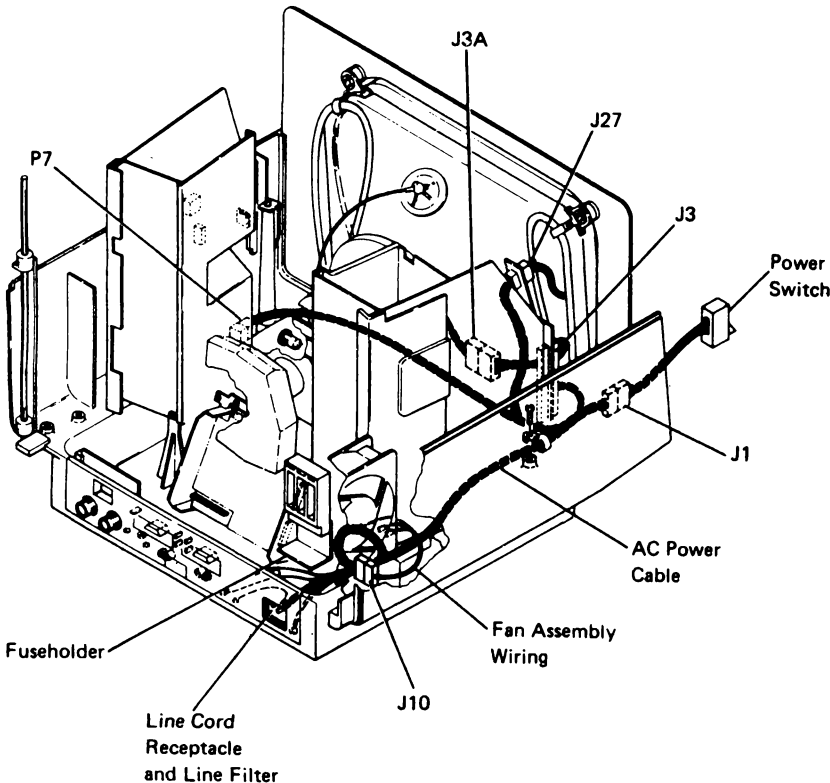
342 Line Filter, Fuse Holder and Power Cable

1. Power off and remove the line cord from the AC outlet.
2. Remove the line cord from the line cord receptacle on the I/O assembly.
3. Remove the top cover (323).
4. Remove the power supply card (341).
5. Loosen the two screws holding the I/O assembly to the base.
6. Slide the I/O assembly back and lift it up and back.
7. Remove the fuse from the fuse holder and keep it to install in the new fuse holder.
8. Remove the ground wires beside the fuse holder and line filter on the I/O assembly.
9. Loosen the fuse holder mounting nut and slide the fuse holder off the line filter cover.

10. Remove the two screws holding the line filter cover to the base.
11. Place the line filter cover and junction block out of the way to permit access to the line filter.
12. Remove the two screws holding the line filter to the I/O assembly.
13. Disconnect the power cable at the:
 - a. Degauss coil connector (J27).
 - b. Front edge connector of the power supply card (J3 and J3A).
 - c. Power switch cable connector (J1).
 - d. Analog card cable (P7).
 - e. Fan assembly (J10).
14. Remove the power cable, the line filter, and the fuse holder from the base.

Note: Observe the path of the power cable as you remove it so that you can properly install the new cable.

Replace the power cable, line filter, and fuse holder in the reverse order of removal.



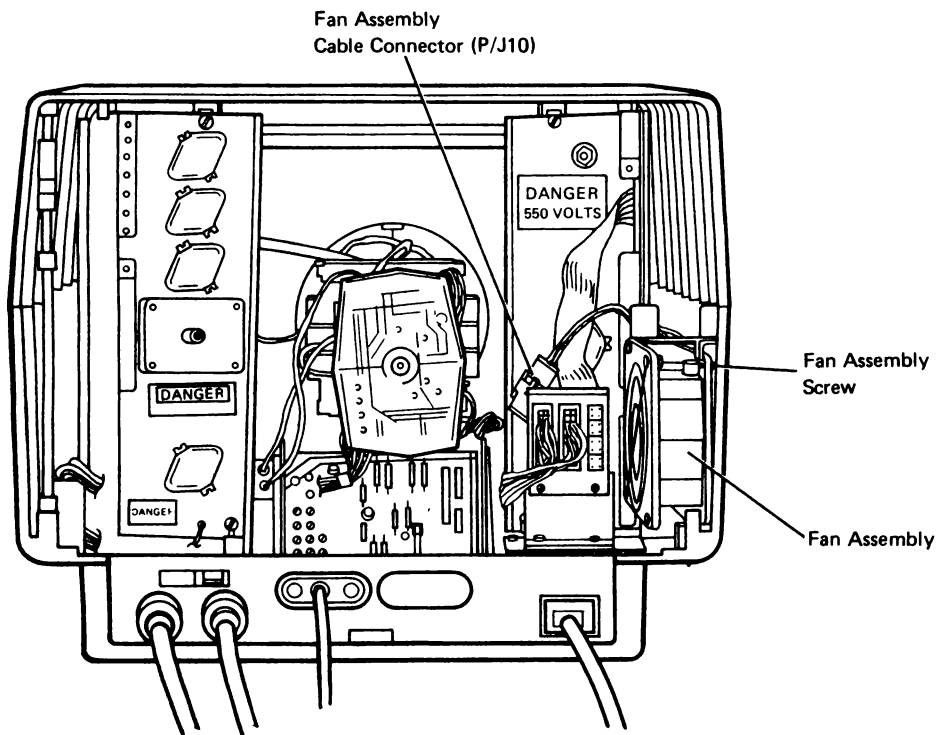
343 Line Cord

Pull the line cord out of the line cord receptacle at the rear of the display station.

345 Fan Assembly

1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322).
3. Open the logic gate.
- 3a. Disconnect the fan assembly ground wire (441)
4. Loosen the fan assembly screw.
5. Remove the fan assembly.
6. Disconnect the fan assembly cable (J10).

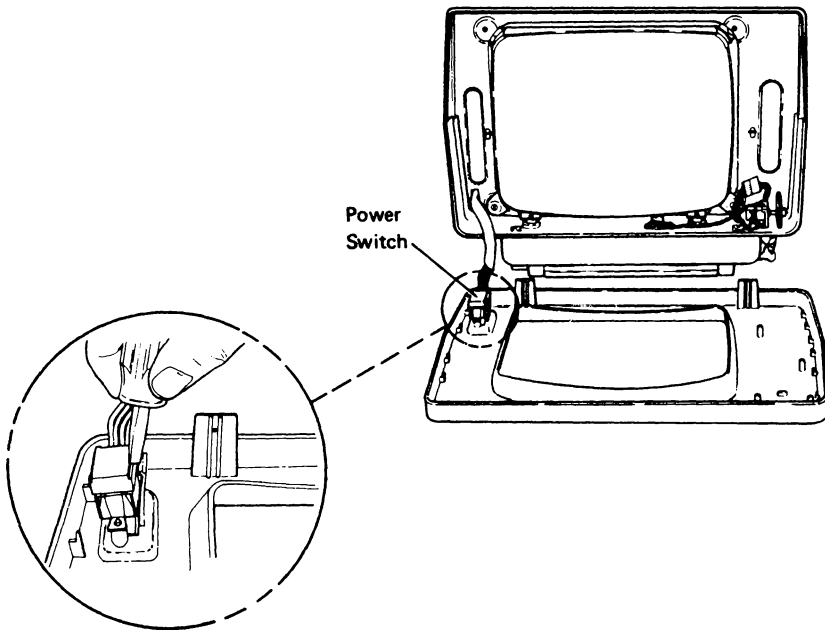
Replace the fan assembly in the reverse order of removal.



346 Power Switch and Cable

1. Power off and remove the line cord from the AC outlet.
2. Remove the top cover (323).
3. Disconnect the power switch cable (J1) (342).
4. Remove the power switch by pulling it up and off of the fasteners. Use a screwdriver to loosen the fastener.

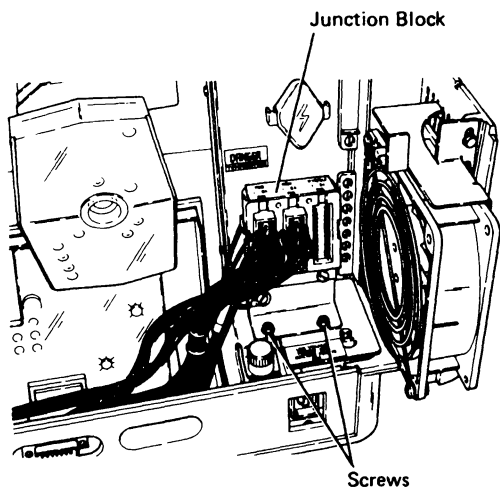
Replace the power switch in the reverse order of removal.



348 Junction Block

1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322).
3. Open the logic gate.
4. If the junction block has a green and yellow ground wire attached, remove it.
5. Loosen the two screws holding the junction block to the line filter cover. Slide the junction block off of the cover.
6. Remove all cables from the junction block.

Replace the junction block in the reverse order of removal. Ensure that the cables are connected properly. (See the wiring figure at reference 435.)



350 DISPLAY ASSEMBLIES REMOVAL AND REPLACEMENT PROCEDURES

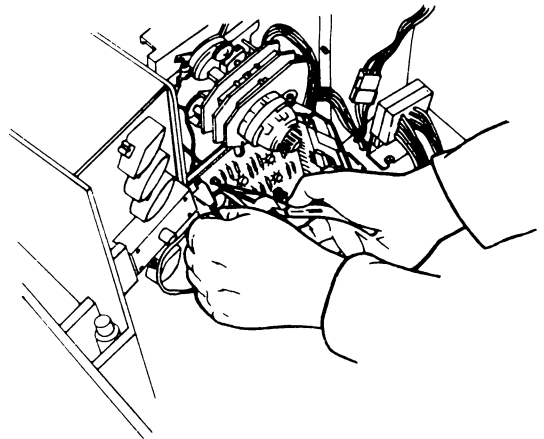
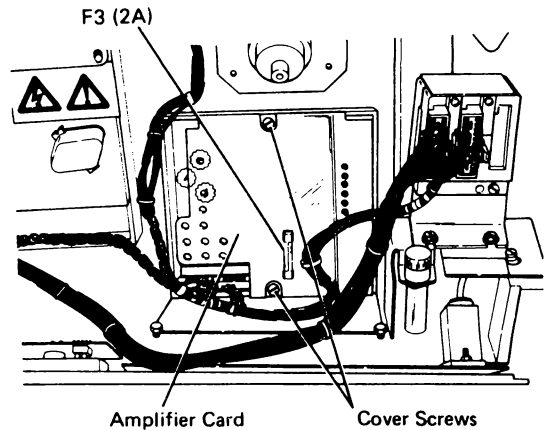
351 Amplifier Card/Fuse F3

1. Power off and remove the line cord from the AC outlet.
 2. Remove the rear cover (322).
 3. Open the logic gate.
 4. Loosen the two screws holding the I/O assembly to the base.
 5. Lift and pull the I/O assembly back to make room for removing the amplifier card.
 6. Pull the video assembly off the CRT and put it out of the way.
 7. Remove all cables from the amplifier card.
 8. Remove the plastic cover over the amplifier card by removing the two screws.
- Note:** The fuse may now be removed.
9. Use a longnosed plier and pinch the plastic fastener while at the same time, carefully pulling the amplifier card toward you. Perform this step on all four fasteners.

Replace the amplifier card in the reverse order of removal.

Perform the following adjustments in the order given:

- Coarse color balance (221)
- Coarse static convergence (224)
- Coarse color purity (225)
- Fine static convergence (232)
- Fine parity (233)
- Dynamic convergence (234)
- Fine color balance (236)



352 Analog Card

1. Power off and remove the line cord from the AC outlet.
2. Remove the top cover (323).

DANGER

High voltage may be present around the CRT anode.

3. Discharge the CRT anode with a screwdriver. Hold the shaft of the screwdriver against the CRT frame while inserting the screwdriver blade under the CRT anode cover.
4. Remove the screw and ground wire holding the analog card to the base.
5. Disconnect the high voltage wire from the analog card by unscrewing the cap and pulling the wire out.
6. Disconnect all cables to the analog card.
7. Carefully pull the analog card free from the front connector (J4) and out of the base unit.

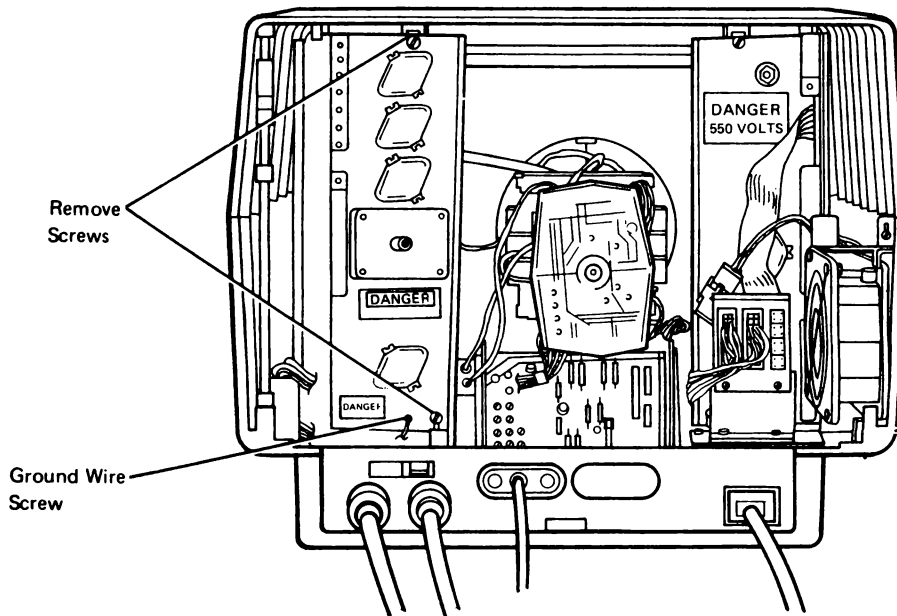
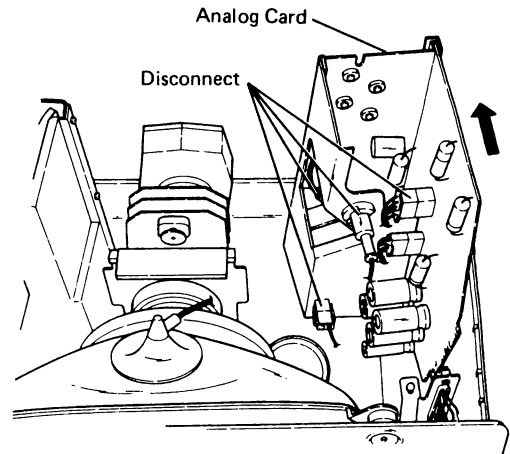
8. If replacing the analog card, check that the CRT heater jumper (125) is jumpered correctly.

Replace the analog card in the reverse order of removal.

Ensure that all cables are connected correctly.

Ensure that the yellow and green wire is connected to the ground screw.

Start at the beginning adjustment (220) and perform all the adjustments except color balance adjustments (221) and (236).



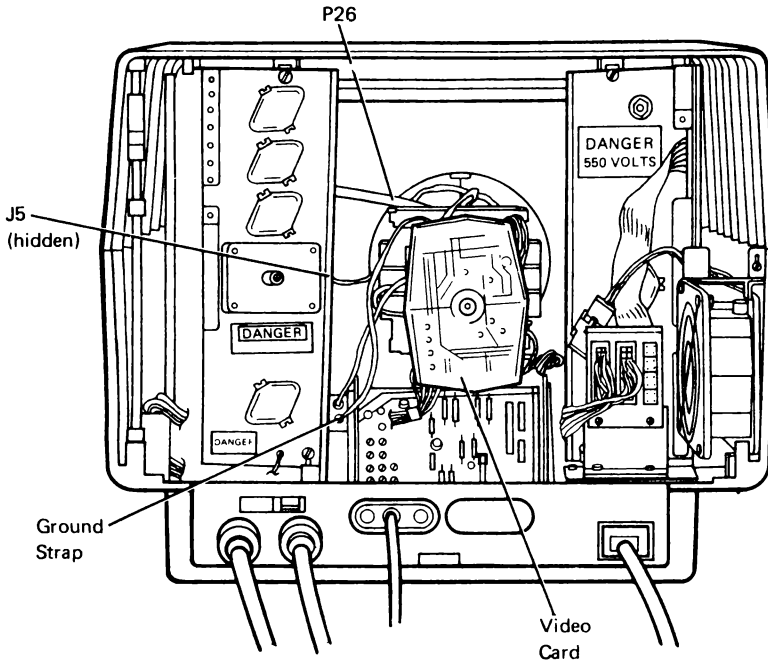
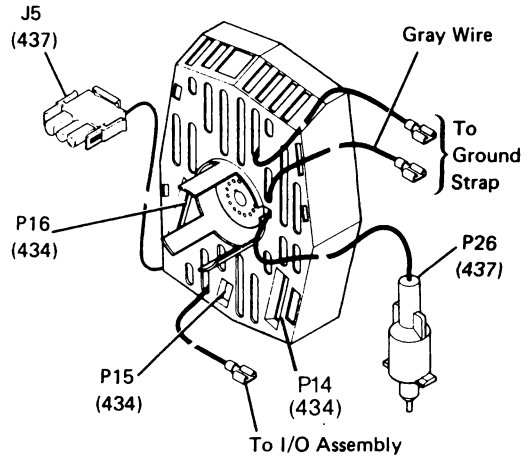
353 Video Card

1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322).
3. Open the logic gate.
4. Remove the two wires from the video card to the ground strap.
5. Disconnect the ground wire from the video and to the I/O assembly.
6. Disconnect the wires from the video card to the analog card at J5 and P26.
7. Carefully pull the video card off the end of the CRT.
8. Remove all cables from the video card.
9. Remove the video card covers. Observe the path for placing the wires fastened to the video card.
10. Save the cover for installation on the new card.

Replace the video card in the reverse order of removal.

Ensure that all cables are correctly connected and that the video card is pressed tightly on the CRT connector.

Perform the fine color balance adjustment (236).



354 Bleeder Assembly

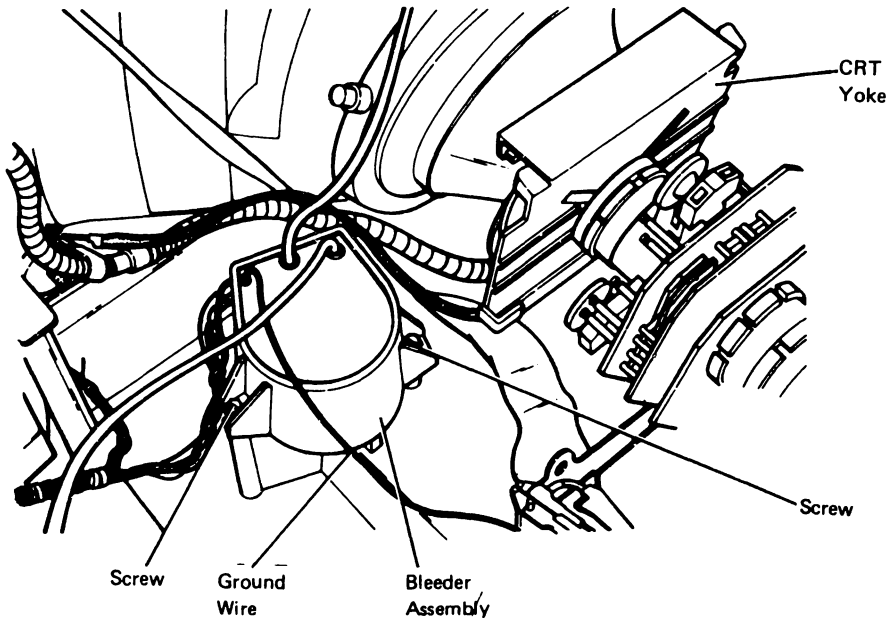
DANGER

High voltage may be present at the CRT anode, around the yoke assembly and the analog card.

1. Power off and remove the line cord from the AC outlet.
2. Remove the top cover (323).
3. Discharge the CRT anode with a screwdriver. Hold the shaft of the screwdriver against the CRT frame while inserting the screwdriver blade under the CRT anode cover (129).

4. Remove the high voltage cable to the CRT anode.
5. Disconnect the high voltage wire from the analog card by unscrewing the cap and pulling the wire out.
6. Remove the bleeder assembly ground wire from I/O assembly.
7. Remove the two screws holding the bleeder assembly to the base unit.
8. Lift the bleeder assembly out of the base unit.

Replace the bleeder assembly in the reverse order of removal.



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355 CRT and Yoke Assembly (1 of 2)

DANGER

Wear safety glasses when working on the CRT. The CRT is fragile and will implode if cracked or broken.

1. Prepare a flat work area on which to place the CRT and yoke assembly after its removal. The work area should have a nonabrasive surface so that the face of the CRT will not get scratched.
2. Power off and remove the line cord from the AC outlet.
3. Remove the top cover (323).

Note: Completely remove the front cover and put it out of the way.

DANGER

High voltage may exist at the CRT anode.

4. Discharge the CRT anode with a screwdriver. Hold the shaft of the screwdriver against the CRT frame while inserting the screwdriver blade under the CRT anode cover.
5. Remove the high-voltage wire from the CRT anode.
6. Remove the video card (353).
7. Remove the convergence assembly (356).
8. Disconnect the CRT yoke assembly cable (J6) from the analog card.
9. Disconnect the degauss coil cable (J27).

10. Disconnect the yoke assembly ground wire from the ground bracket at the amplifier card **(A)**.
11. Disconnect the ground strap coming from the CRT at both the amplifier card ground bracket **(A)** and the I/O assembly.
12. Remove the two CRT frame supports **(C)**.

DANGER

The CRT will implode if it falls or is hit.

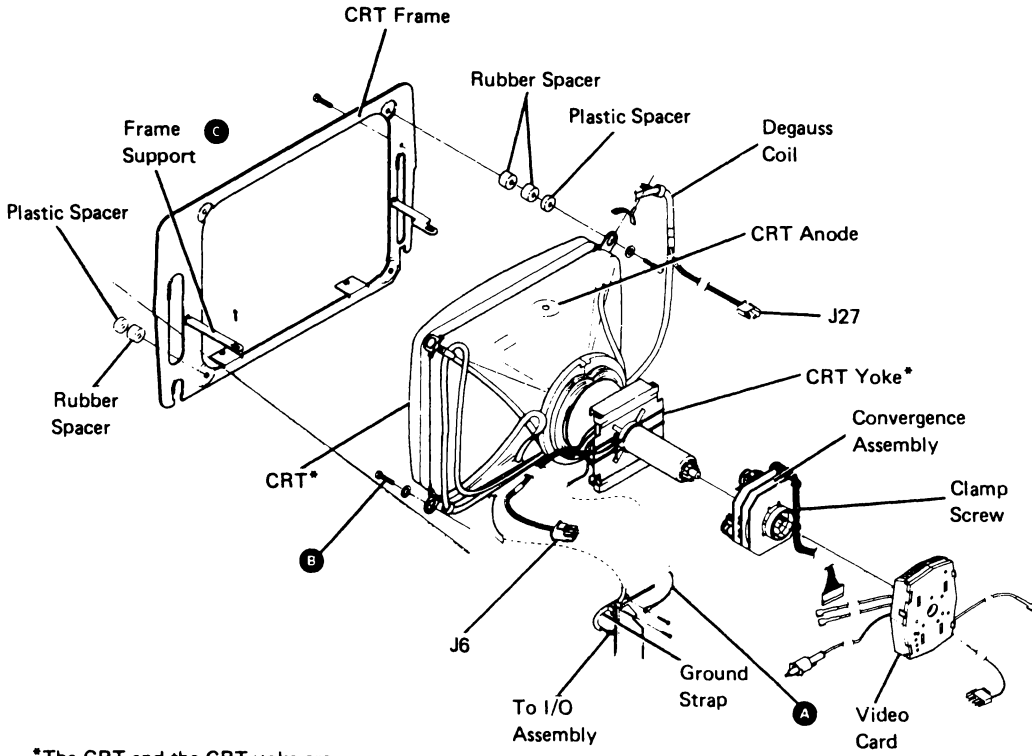
13. Carefully lift the CRT, the yoke assembly and the CRT frame out of the display station and place it face down on the prepared work area. You may need to pull up alternately on first one side of the CRT assembly and then pull up on the opposite side.
14. Remove the four screws holding the CRT to the CRT frame **(B)**.
15. Remove the degauss coil, the ground strap, and the clips.
16. Remove the CRT and yoke assembly from the frame and set it aside.

Replace the CRT and yoke assembly in the reverse order of removal.

Check that the CRT heater jumper on the analog card matches the configuration for the new CRT maker (125).

Start at the first of the fine adjustments (230) and perform the entire fine adjustment procedure.

355 CRT and Yoke Assembly (2 of 2)



*The CRT and the CRT yoke are one FRU, the CRT Assembly.

356 Convergence Assembly

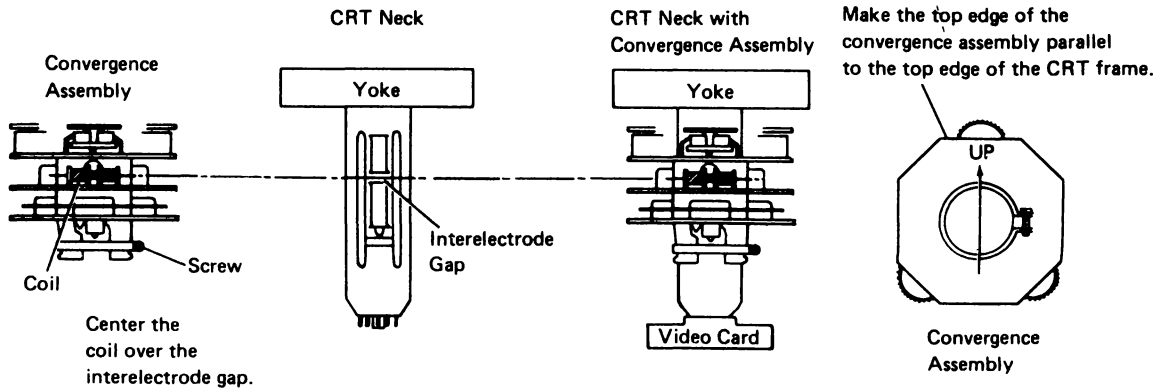
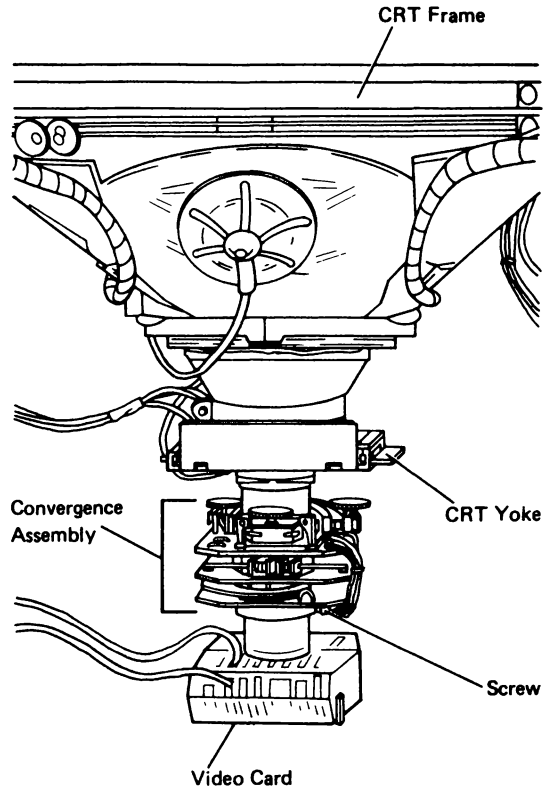
1. Power off and remove the line cord from the AC outlet.
2. Remove the top cover (323).
3. Remove the video card from the CRT connector by carefully pulling it off. Place the video card out of the way.
4. Disconnect the convergence coil cable (J19) from the amplifier card (124).
5. Loosen the clamp screw holding the convergence assembly to the CRT neck.
6. Carefully pull the convergence assembly off the CRT neck.

Replace the convergence coil in the reverse order of removal.

Center the convergence coil over the electrode gap as shown in the figure. Align the convergence assembly parallel to the top of the CRT frame.

Perform the following adjustments in the order given below:

- Fine static convergence (232)
- Fine purity (233)
- Fine dynamic convergence (234)

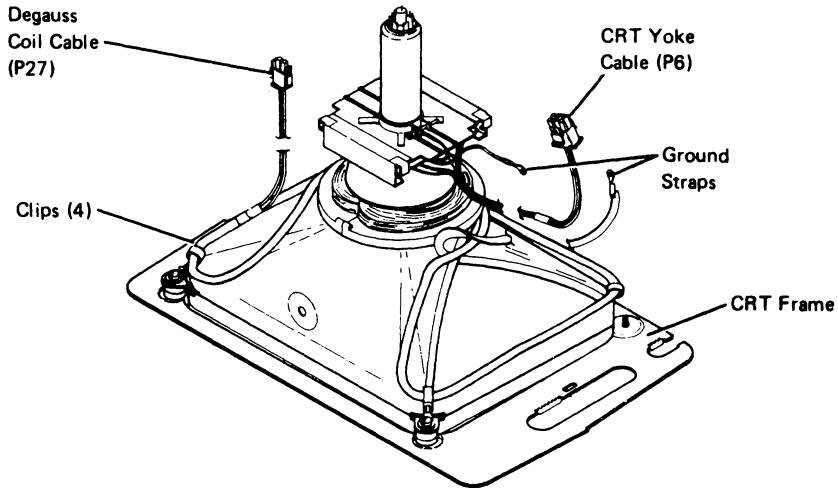


357 Degauss Coil

1. Power off and remove the line cord from the AC outlet.
2. Perform Steps 1 through 11 of the CRT and yoke assembly removal and replacement procedure (355).
3. Remove the degauss coil, the ground strap, and the clips from the CRT at the four corners.

Replace the degauss coil in the reverse order of removal.

Start at the first of the fine adjustments (230) and perform the entire fine adjustment procedure.

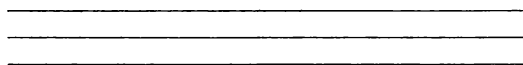


360 LOGIC GATE REMOVAL AND REPLACEMENT PROCEDURES

361 Display Planar

CAUTION

The planar is very fragile. Do not bend or twist it.



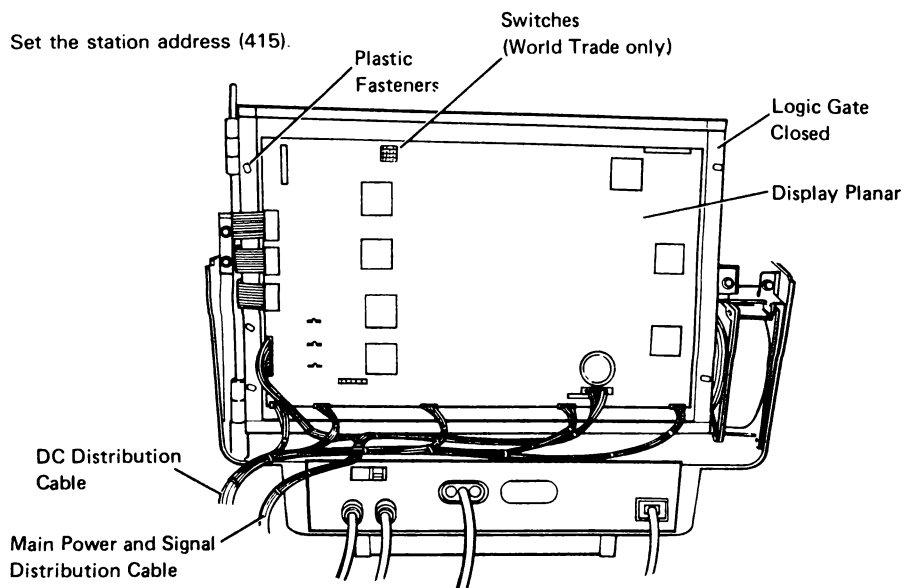
1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322).
3. Disconnect all of the cables from the display planar.
4. Remove the display planar by pulling out the plastic fasteners from around the edges of the planar assembly.

Replace the display planar in the reverse order of removal. See reference 121 for cable connections.

On World Trade machines only, check the switches on the planar for correct language setting.

Perform the fine static and fine dynamic convergence adjustments (232 and 234).

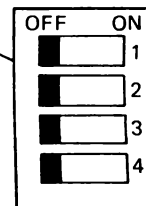
Set the station address (415).



Switch Setting Chart

Language	Hex Code	Switches			
		1	2	3	4
ASCII/International	0	off	off	off	off
U.S. and Canada	1	off	off	off	ON
United Kingdom	2	off	off	ON	off
Japan (English)	3	off	off	ON	ON
Spanish-Speaking	4	off	ON	off	off
Spain	5	off	ON	off	ON
Brazil	6	off	ON	ON	off
Portugal	7	off	ON	ON	ON
Austria/Germany	8	ON	off	off	off
Finland/Sweden	9	ON	off	off	ON
Denmark/Norway	A	ON	off	ON	off
Italy	B	ON	off	ON	ON
France	C	ON	ON	off	off
Canada (French)	D	ON	ON	off	ON
Belgium	E	ON	ON	ON	off

Switch Block on Display Planar



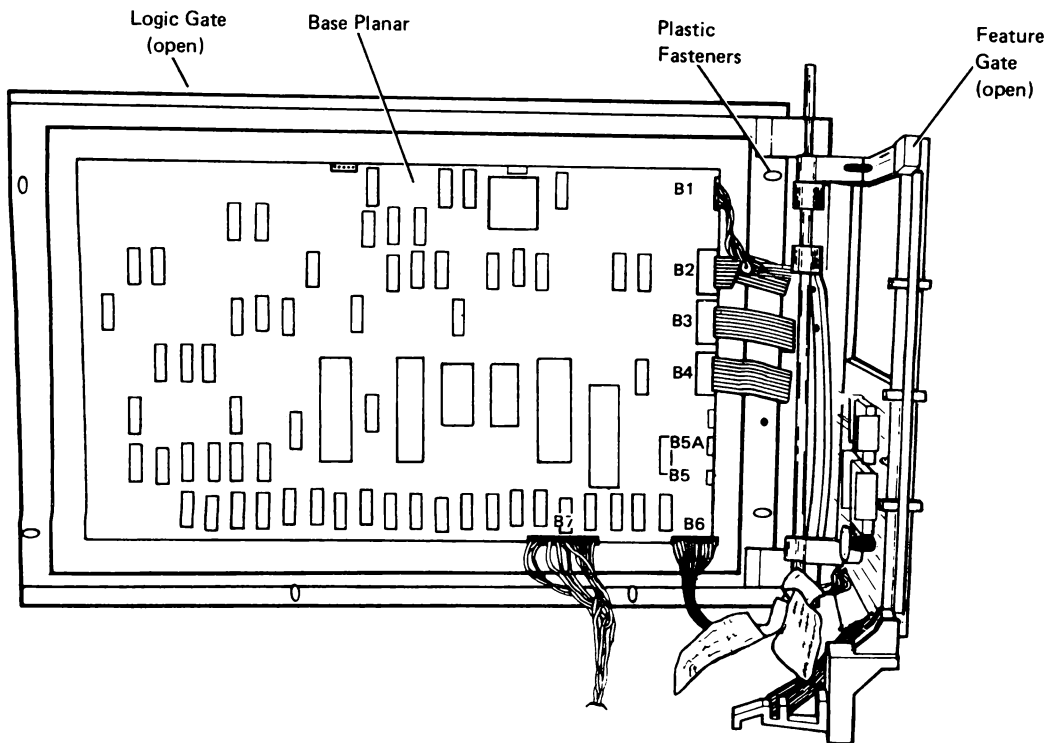
362 Base Planar

CAUTION

The planar is very fragile. Do not bend or twist it.

-
-
-
1. Power off and remove the line cord from the AC outlet.
 2. Remove the rear cover (322).
 3. Open the logic gate.
 4. Open the feature gate, if installed.
 5. Disconnect all of the cables on the base planar.
 6. Remove the base planar by pulling out the plastic fasteners.

Replace the base planar in the reverse order of removal.

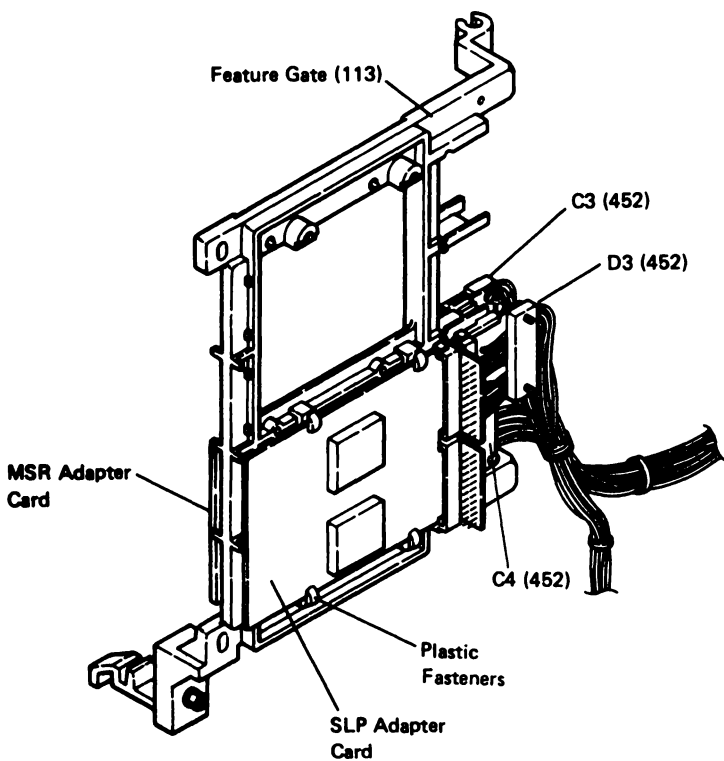


363 Feature Attachment I/O Cards

Note: This procedure is valid for any of the I/O cards on the feature gate.

1. Power off and remove the line cord from the AC outlet.
2. Remove the rear cover (322).
3. Open the logic gate.
4. Open the feature gate (if necessary to get access to the I/O card).
5. Disconnect all of the cables to the I/O card being replaced.
6. Remove the I/O card by pulling out the plastic fasteners from the edges of the card.

Replace the I/O card in the reverse order of removal.




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370 I/O Assembly Removal and Replacement Procedure (1 of 2)

1. Power off and remove the line cord from the AC outlet.
2. Disconnect all the external cables to the I/O assembly.
3. Remove the rear cover (322) and open the logic gate.
4. Loosen the two screws holding the I/O assembly to the base **A**.
5. Pull the I/O assembly out from the base.
6. Remove the ground wires near the line filter **B**.
7. Remove the two screws holding the plastic cover on the I/O assembly **E**.
8. Remove the two screws holding the line filter to the I/O assembly.
9. Remove the ground wires from the slide-on connectors **C**.
10. Disconnect the keyboard interface cable from B7 on the base planar (121).
11. Remove the remaining ground wires on the I/O assembly **D**.
12. Remove the I/O assembly.

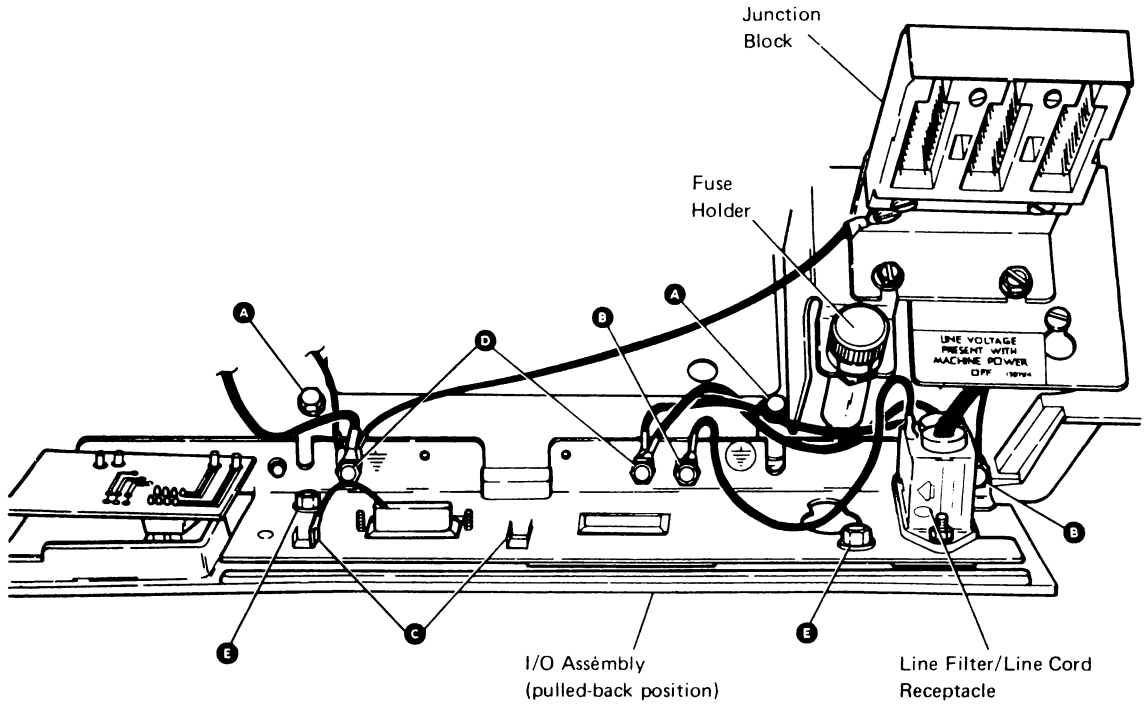
Replace the I/O assembly in the reverse order of removal.

Ensure that the green/yellow ground wire from the line filter is connected next to the ground symbol .

Reconnect the external cables to the I/O assembly.

Ensure that the Terminator switch is correctly set.

**370 I/O Assembly Removal and Replacement
Procedure (2 of 2)**

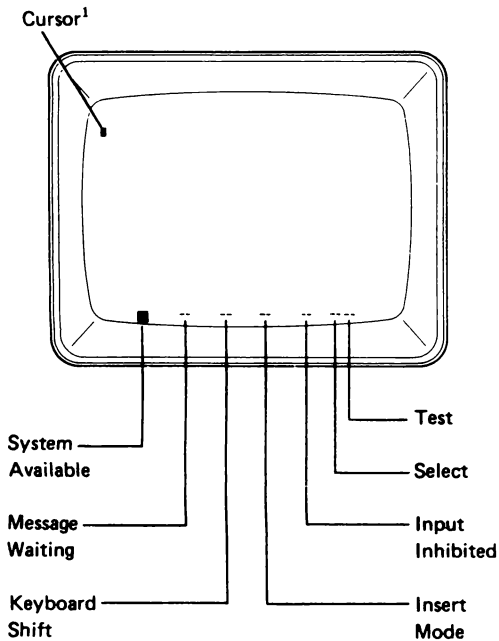


Rear View of Display Station with Rear Cover Removed and the Logic Gate Open (The I/O Assembly has been loosened and pulled back from the base.)

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400 SERVICE AIDS

410 Status Line Definition



411 Normal Status Line After Power-On

System available. When on, it indicates that the system controller is communicating with the display station.

Message waiting. When on, it indicates that a message is waiting for the display station operator.

Keyboard shift. When on, it indicates that the uppercase (level) characters are active.

Insert mode. When on, it indicates that an insert operation is in effect.

Input inhibited. When on, it indicates that the system cannot process a keyboard scan code.

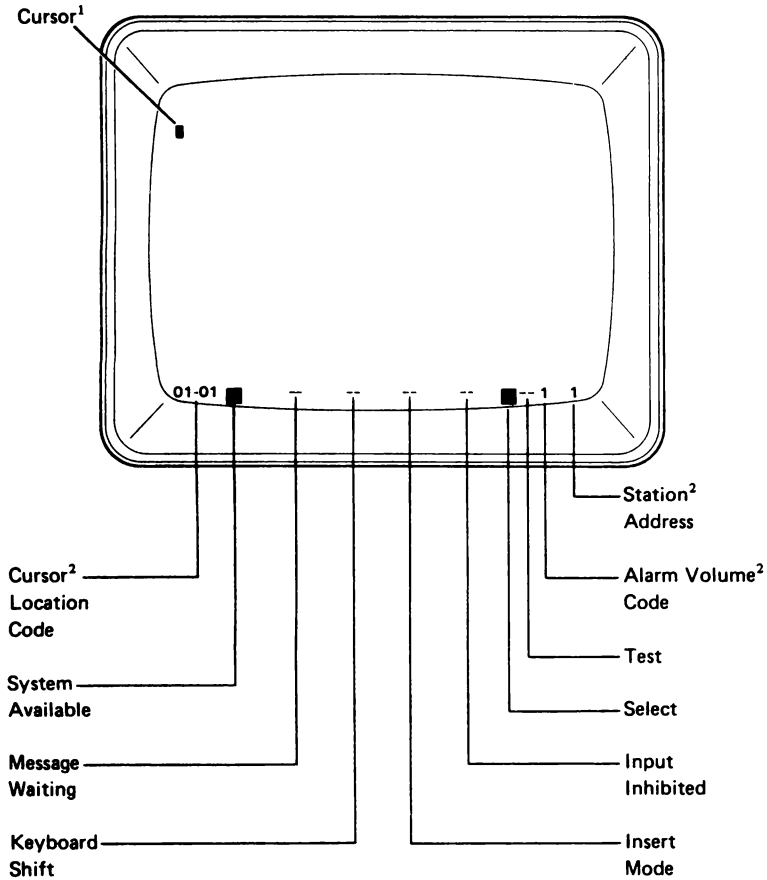
Select. When on, it indicates that the display station is in either the online select mode (414) or the offline select mode (415).

Test. When on, it indicates that the 2-second time-out is inhibited. See the online select mode (414), option key 9.

¹The cursor location is determined by the system. Some systems might display a sign-on menu immediately upon power on. If System Available is not on, the cursor will be located in the upper rightmost corner of the display screen.

Any numbers appearing on the normal status line are the result of online select mode options (414).

412 Online Select Mode Status Line (1 of 2)



¹The cursor location is determined by the system. Some systems might display a sign-on menu immediately upon power on. If System Available is not on, the cursor will be located in the upper rightmost corner of the display screen.

²These codes are options that can be selected. See online select mode options (414).

412 Online Select Mode Status Line (2 of 2)

Cursor location code. When displayed, this five-character code gives the row-column location of the cursor. To display the code, see the online select mode (414), option key 3.

System available. When on, it indicates that the system controller is communicating with the display station.

Message waiting. When on, it indicates that a message is waiting for the display station operator.

Keyboard shift. When on, it indicates that the uppercase characters are active.

Insert mode. When on, it indicates that an insert operation is in effect.

Input inhibited. When on, it indicates that the system cannot process a keyboard scan code.

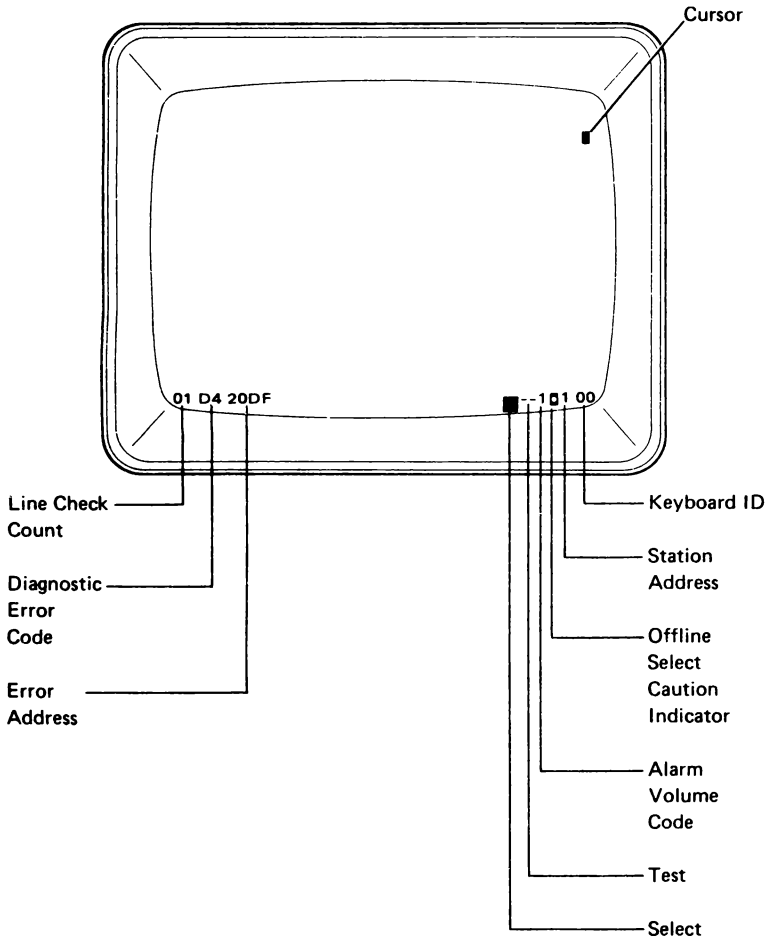
Select. When on, it indicates that the display station is in either the online select mode (414) or the offline select mode (415).

Test. When on, it indicates that the 2-second time-out is inhibited. See the online select mode (414), option key 9.

Alarm volume code. A 1-digit code indicating the relative volume setting for the audible alarm. There are five selections with number five indicating the highest volume level. See online select mode (414), option key 8.

Station address. This 1-digit code shows the station address set in the display station logic. See online select mode (414), option key 4 and offline select mode (415), option key .

413 Offline Select Mode and Error Status Line
(1 of 2)



413 Offline Select Mode and Error Status Line (2 of 2)

The status information displayed in the offline select mode and error condition may vary, depending on the conditions present. Not all of the information shown in the figure is displayed at one time.

Line check count. This 2-digit code is the count of parity errors that occurred during the transmission of data from the system controller. This code only appears when an *online* error occurs.

Diagnostic error code. This 2-digit code identifies a failure occurring during power-on diagnostics. See the list of diagnostic error codes (417) for further information.


Error address. This 4-digit error code is for engineering use only.

Select. When on, it indicates that the display status is in either the online select mode (414) or the offline select mode (415).

Test. When on, it indicates that the 2-second time-out is inhibited. See online select mode (414), option key 9.

Alarm volume code. A 1-digit code indicating the relative volume setting for the audible alarm. There are five selections with number 5 indicating the highest volume level. See online select mode (414), option key 8.

Offline select caution indicator (an asterisk in a yellow reverse field). This indicator turns on when the online select mode (414), option key 0 is selected. The indicator warns the operator that the offline select mode will be entered if the Enter key is pressed.

Station address. This 1-digit code shows the station address set in the display station logic. See online select mode (414), option key 4 and offline select mode (415), option key 

Keyboard ID. This 2-digit hexadecimal code identifies the language group and character set selected by jumpers on the keyboard logic card. (See reference 313 *Keyboard Jumpers*.)

414 Online Select Mode

The online select mode permits the operator to select specific display attributes and status information with no interference to normal operation. The options available and the key sequence for selecting them are supplied in the option chart.

Some options are stored in permanent storage, a battery-powered, permanent storage module. These options will remain even through power off until changed by the operator. The other options will be reset by power-on reset (POR).

While in the online select mode, only the numeric function keys 1 through 0 on the top row of the keyboard are active. Any other key when pressed will sound the alarm.

Online Select Mode Options

START: Press and hold the Cmd key and press the Error Reset key. The Select indicator should be on.

SELECT OPTION: Press the correct numeric key for the desired option. Press the key again to return the option to its original condition.

EXIT: Press the Error Reset key. You should now be ready for normal operation.

Option	Key	Description
Alternate cursor	1	Normally a rectangular block; the option is an underline.
Blink cursor	2	Normally stable; the option is blinking.
Display cursor location	3	Normally not displayed; display a five-character code in the Status line.
Display station address	4	Normally not displayed; the option displays a one-character code in the Status line.
Display field attribute hexadecimal code	5	Normally not displayed; the option displays a hexadecimal code at the start of a specified field.
Suppress line space between lines	6	Normally a line space is present; the option removes (or suppresses) the line space and shortens the display field.
Change color mode	7	Normally in full seven-color mode; the option is a two-color mode, basically green and white. Column separators are still blue.
Adjust alarm volume	8	Normally not displayed; the option is to display the present setting (1 through 5) and permit the volume to be changed by increasing the setting by 1 for each time the 8 key is pressed.
Test mode	9	Normally off; the option turns on the Test indicator on the Status line and inhibits the 2-second time-out operation.
Offline select mode	0	This option sets up the display station for the offline select mode. When the 0 key is pressed, a yellow reverse * appears at right of the status line. To enter the offline select mode, press the Enter key. If you do <i>not</i> want to enter the offline select mode at this time, press Error Reset. You will now exit both option 0 and the online select mode (the Select indicator will be off).

415 Offline Select Mode and CE Test Screens (1 of 7)

The offline select mode permits the operator and customer engineer (CE) to change the display station address, converge the color screen, and display CE screens. The CE screens are used for aligning the display screen, adjusting color control circuits, and testing the SLP/MSR RPOs.

The command function keys 1, 2, 3, 5, 6, 7, and 8 on the top row of the keyboard select the same options offline that are available in the online select mode (414).

Offline Select Mode Options

START:

1. Press and hold the Cmd key and press the Error Reset key. The blue Select indicator should be on.
2. Press the 0 key on the top row of the keyboard. A yellow reverse * should appear near the right end of the Status line.
3. Press the Enter key. The System Available indicator should go off. The display station will perform a short power-on reset.



SELECT AN OPTION: Press the required key(s) for the desired option.

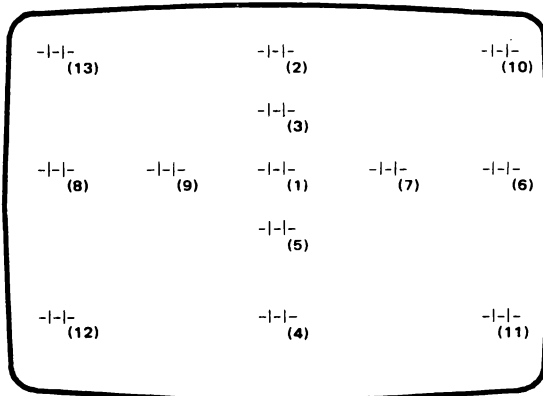
EXIT:

1. To exit the CE options, press and hold the Cmd key and press the C key. The color convergence option can either be repeated by pressing the R key or canceled by pressing the C key.
2. To return to normal operation, press the Error Reset key.

Note: To exit a CE option and the offline mode simultaneously, press and hold the Cmd key and press Error Reset key. You should be ready for normal operation.

415 Offline Select Mode and CE Test Screens
(2 of 7)

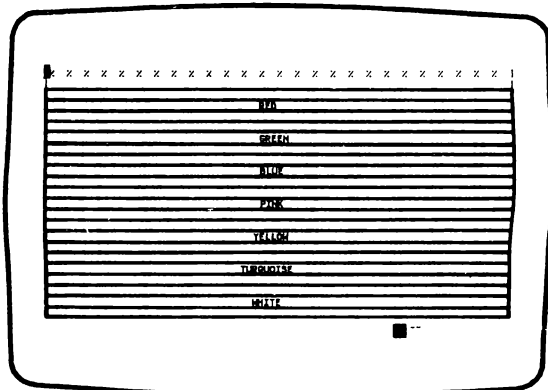
Options	Key(s)	Description
Set station address		Each time you press the key, the station address is increased by one and the address is displayed on the Status line. An address of 0 to 6 may be selected. The selected address is stored in permanent storage.
Color convergence		A convergence test screen of 13 alignment patterns is displayed for inspection. If the convergence is good (all white with no shadows), press the C key to cancel. If any of the patterns are not converged, perform the dynamic convergence procedure (234). A detailed description of the convergence function is given at reference 420.



Screen of 13 Convergence Alignment Patterns
(The numbers in parentheses show the order for performing the convergence.)

CE Test Options

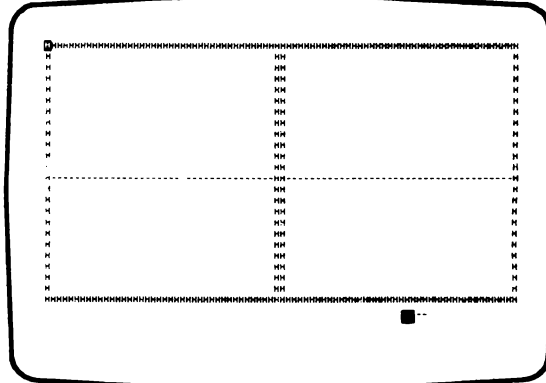
Display color bars	Cmd D	A screen of bars displaying all seven colors appears. This screen is used to adjust the color balance (221, 236).
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Color Bar Screen

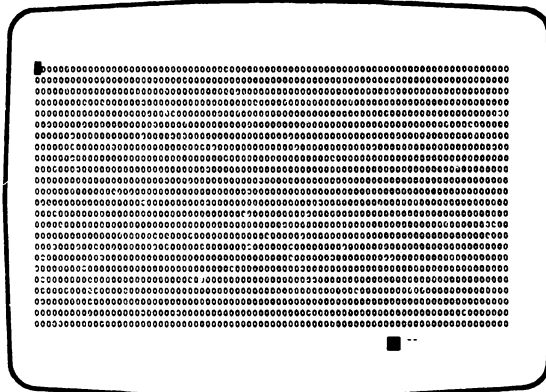
415 Offline Select Mode and CE Test Screens (3 of 7)

CE Test Options	Key(s)	Description
Display the alignment pattern	Cmd F	An alignment pattern appears that specifies the limits of the raster. This screen is used for raster alignment (222, 231).



Coarse Raster Alignment Screen

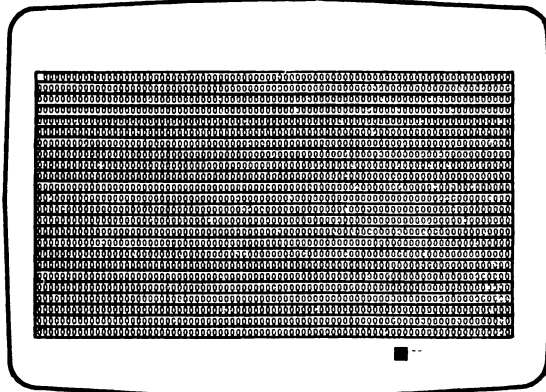
Display a focus pattern	Cmd G	A screen of red zeros appears. This screen is used to adjust the focus (223, 235).
-------------------------	-------	--



Focus Screen

415 Offline Select Mode and CE Test Screens (4 of 7)

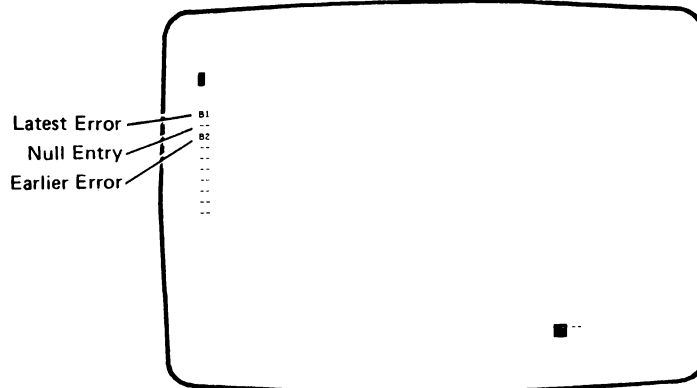
CE Test Options	Key(s)	Description
Display a red purity screen	Cmd H	A screen of red-reverse zeros appears. This screen is used to ensure that the color red is at the same shade and intensity over all the screen (225, 233).
Display a green purity screen	Cmd J	A screen of green-reverse zeros appears. This screen is used to ensure that the color green is at the same shade and intensity over all the screen (233).
Display a blue purity screen	Cmd K	A screen of blue-reverse zeros appears. This screen is used to ensure that the color blue is at the same shade and intensity over all the screen (233).



Purity Screen

Display the diagnostic error log	Cmd L	An error log screen appears. This screen displays up to ten of the latest base and display planar error codes. See reference 421 for a description of the error log operation. See reference 417 for a list of the error codes.
----------------------------------	-------	---

If you want to clear the stack after displaying it, press and hold the Cmd key and repeatedly press the L key until all the error codes on the stack disappear.



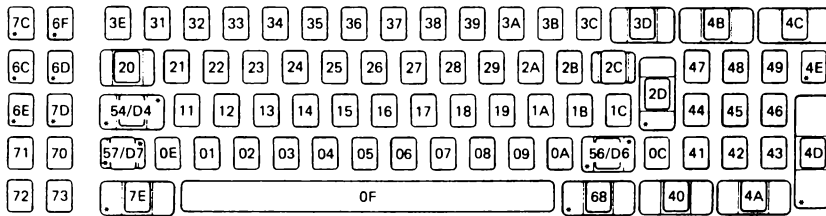
Diagnostics Error Log Screen

415 Offline Select Mode and CE Test Screens (5 of 7)

CE Test Options	Key(s)	Description
Scan code test	Cmd V	A blank screen appears and, as each key is pressed, the two-character hexadecimal scan code for that key appears on the screen. This screen is used to verify correct operation of the keyboard and keyboard adapter on the base planar.

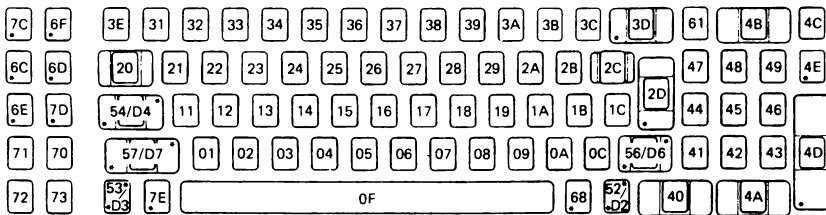
The numbers shown on the keytops in the figure are the hexadecimal scan codes for those key positions.

Standard Keyboard Layout



□ Not a typamatic key. □ A make/break key.

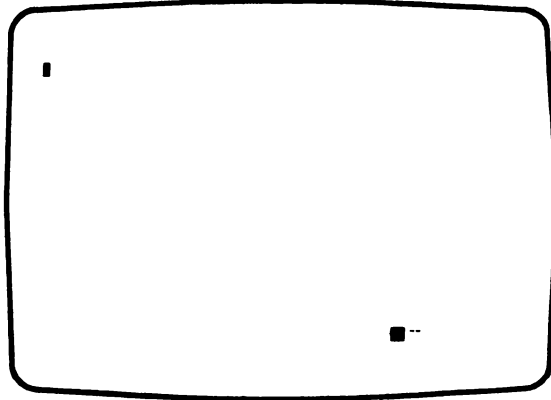
Standard Keyboard Layout (Katakana)



□ Not a typamatic key. □ A make/break key.

415 Offline Select Mode and CE Test Screens
(6 of 7)

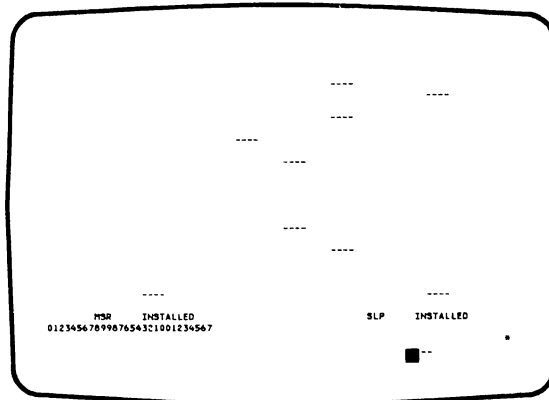
CE Test Options	Key(s)	Option
Hex code entry test (attributes and characters)	Cmd B	A blank screen appears. This test checks the accuracy of the character generator and display logic. When a two-character, hexadecimal character, or attribute code is entered on the keyboard, a comparable character or attribute will be displayed. (See reference 429 for the attribute codes.)



Attribute and Character Hex Code Screen

415 Offline Select Mode and CE Test Screens (7 of 7)

CE Test Options	Key(s)	Description
MSR and SLP tests	Cmd N	A screen of targets (---) appears for testing the light pen (SLP), and space at the bottom of the data screen is reserved for the magnetic stripe reader (MSR) test. For a description of the MSR and SLP tests, see reference 428. If either or both the MSR and SLP are not installed, a message will appear in the reserved space.



MSR and SLP Test Screen

Loop on diagnostics	Cmd M	The screen flashes test data while the power-on diagnostics continuously loop. This test is mainly used to isolate intermittent planar failures. When an error occurs, the tests will stop and an error code will be displayed on the status line.
---------------------	-------	--

For a description of the diagnostic error codes, see reference 417. For a description of the diagnostics, see reference 423.

To exit this option, press and hold the Cmd and Error Reset keys until the alarm sounds. The diagnostics will then stop on the next completion of the tests.

416 Error Codes

417 Diagnostics Error Codes

Whenever an error occurs during the diagnostics, an error code is placed on the status line. A definition of the valid error codes follows:

Error Code	Alarm Burst Mode	Description
B1	Single	Base planar RAM error
B2	Single	Base planar ROS error
B3	Single	Twinaxial controller error
B4	Single	Twinaxial adapter responds to wrong station address
B5	Single	Other twinaxial adapter error
B6	Single	Error on keyboard interface
D1	Double	CRT interrupts occur at wrong frequency
D2	Double	Wrap test of video logic failed
D3	Double	Convergence RAM error
D4	Double	Parity error on the input feature bus
D5	Double	Bad parity on the output feature bus not found
D6	Double	Convergence did not respond to command
D7	Double	Parity error detected by convergence
A1	None	Error when reading station address from permanent storage
C1	None	Error detected in permanent storage during convergence
K1*	None	Keyboard not installed
K2*	None	Keyboard wrap error
K3*	None	Key stuck error
*Not logged in diagnostic error log		

418 Display Station Error Codes (1 of 2)

Errors that are relative to hardware failures or the servicing of a display station are listed first. The controller finds these errors by sensing the status sent from the display station or by sensing either no response or a wrong response. Errors may be stored in the system ERAP in the order in which they are received and are listed here in groups. See the ERAP option under online tests (426). The error codes normally appear on the display screen near the bottom left corner; error code 01xx identifies a display station error. (These numbers are red in the seven-color mode.)

Line/Interface Errors

0100 No Response

This error is reported when a display station and the controller are in session and the display station does not respond to a poll. This error is not normally logged.

0101 Transmit Activity Check

This error is found by the controller when a poll or command is executed by the controller.

0103 Receive Parity Error

The controller reports this error if the wrong parity was received in response to a poll or command.

0104 Line Parity Check

The display station reports this error if the wrong parity was received in a poll or command.

0106 Receive Length Check

The controller received the wrong number of bytes as a result of a poll or command.

0107 Wrong Station Responded

An incorrect station address was returned in response to a poll or other command from the controller.

0108 Power-On Transition

The power-on transition status bits are set when the display station is powered on. This error is reported only if the bits are set while the display station is in session.

0109 Activate Command Failure

The controller checked the device status and found that the busy bit was not on after an activate command had been sent.

Keyboard Errors

0111 Scan Code Not Valid

The 8-bit code sent in the keyboard response frame could not be translated to an assigned character or function that was specified by the controller.

Command/Function Errors

0120 Command Not Valid

This condition indicates that the poll or other command sent to the display station was not a valid command or that the device ID was not correct.

0121 Register Value Not Valid

This condition indicates that the address counter value was not within the user accessible limits.

0122 Storage or Input Queue Overrun

This condition occurs if more than 16 commands and associated data frames are sent to the display station by the controller, or if an attempt is made to store data in storage that is not accessible to the user.

0123 Null or Attribute Exception

This condition indicates that no attribute was found or that the address counter pointed to an attribute.

418 Display Station Error Codes (2 of 2)

0124 Activate Not Valid

This condition indicates that the activate command that was sent to the display station was not valid.

0125 Undefined Exception Status

This condition indicates that an undefined exception status was returned by the display station in response to a poll.

0149 Undefined Error Status

This condition indicates that the controller found an error but the cause of the error cannot be determined.

0182 Device Type Error

This condition indicates that a device not recognized by the system responded to a poll.

0183 Wrong Size Display Assembly

The CRT image size does not match the CRT image size set in the ID word sent by the display station.

0184 Incorrect Keyboard ID

The keyboard ID received by the controller was not correct.

0185 Incorrect Keyboard Specified

The keyboard ID received by the controller does not match the ID in the keyboard table in use for the display station.

0189 Invalid Outstanding Status

An outstanding status was sent in the poll response, and no outstanding status information was available.

Time-Out Errors

0190 Even/Odd Change in Status

This condition indicates that the status sent to the controller from the display station did not change within 225 milliseconds after the controller sent a positive acknowledgment and received a not busy response.

0191 Busy

This condition indicates that the controller found the busy bit had been on for a period of more than 400 milliseconds.

420 Convergence Functional Description

Convergence is the mode used for dynamically aligning the three basic colors of the CRT. When in the offline select mode, convergence is selected by pressing and holding the Cmd key and pressing the \pm key on the top row of the keyboard. At the end of the convergence routine, you can either return to the start of convergence by pressing the R key or you can return to the start of test selection by pressing the C key.

While converging, all the values you enter with the cursor movement keys are stored in the convergence RAM and permanent storage. The convergence value in the RAM is used as the work storage for maintaining convergence while the display station is powered on. When powered off, the RAM values are maintained in the battery powered permanent storage, so that on power on, the diagnostics load the stored values into the convergence RAM to converge the color display.

In the event of a convergence permanent storage error, a set of predetermined convergence values, stored in the control storage (ROS), are loaded into the convergence RAM and permanent storage to first converge the color display. The operator is then required to perform the convergence operation. The new values the operator enters are then stored in the convergence RAM and permanent storage.

A convergence permanent storage error is identified by a C1 displayed in the error code field of the status line.

In the event of a convergence RAM error, the offline diagnostics will stop, a D3 will be displayed in the error code field of the status line, and the alarm will repeat a double sound. In this case, the predetermined values are not loaded and the operation of the display station is stopped. You may power off and power on the display station to see if the error is intermittent. However, if the error remains, the display planar will have to be replaced.

421 Diagnostic Error Log Operation

The diagnostic error log for power-on diagnostic failures is placed in permanent storage. A push-down stack method is used where the latest error code is logged on top of the stack, pushing earlier error codes one position down. The bottom-most error code is pushed out and lost. The stack can hold up to 10 entries. Each time the 'display the error log' option is selected (415), a null is entered on the stack. The null entry separates present error codes from error codes displayed earlier. An example of the error log operation follows:

The diagnostic error log is displayed by entering the offline select mode (415) and selecting the Cmd L option.

Error Log		
Top of Stack	D3	Latest error
	D6	
	--	A null entry
	B1	} Earlier errors
	B1	
	B1	
	-	
	-	
	-	
	-	

If you want to clear the stack after displaying it, press and hold the Cmd key and repeatedly press the L key until all the error codes on the stack disappear.

422 Power-On Sequence

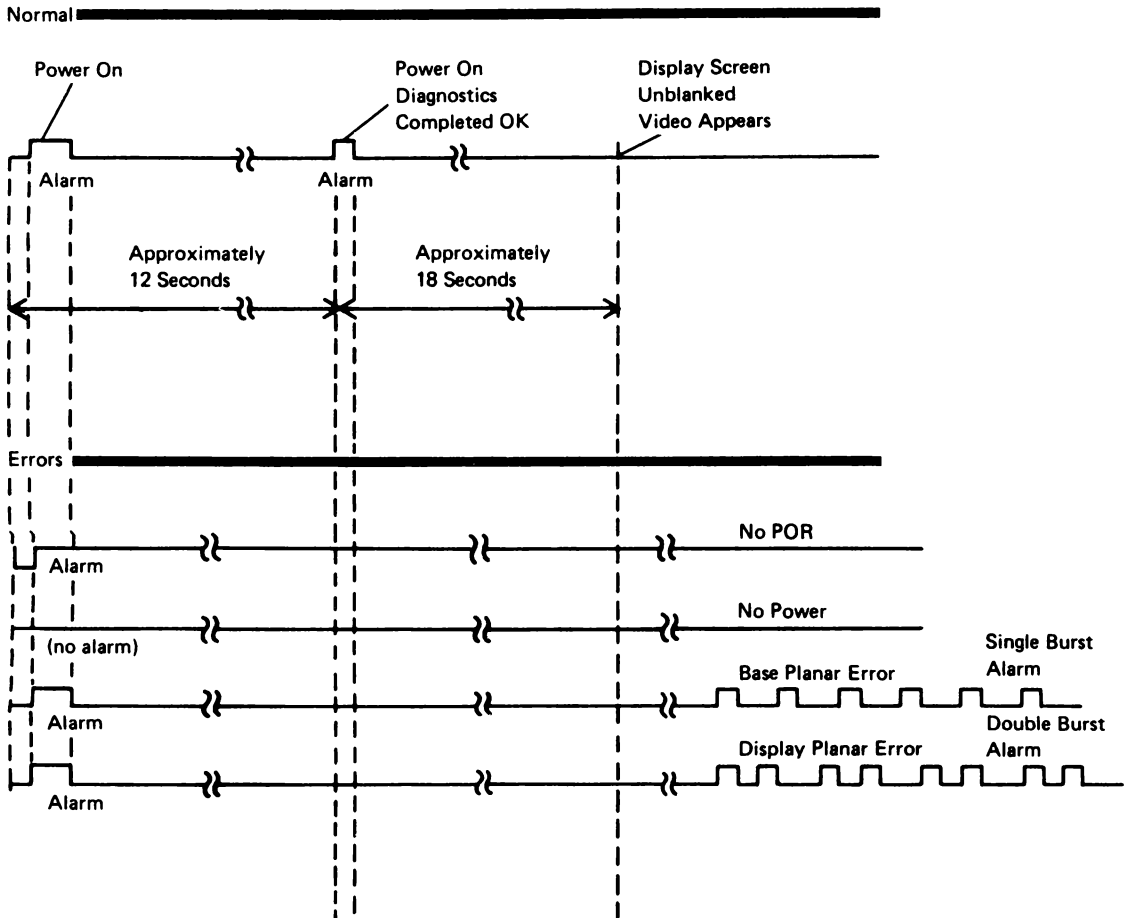
Under normal conditions, the power-on sequence takes from 25 to 40 seconds to complete. The CRT Status indicators and the cursor should then appear.

See reference 417 for a description of error codes and alarm soundings.

After the power-on sequence has been successfully completed, the display station is ready to start normal operation. At this time, you can decide to:

1. Select the online select mode (414) to change the display attributes, or

2. Select the offline select mode (415) to change the station address, perform color convergence, or select CE test options, or
3. Select the free-key mode (425), or
4. Select the online tests (you must first obtain a sign-on menu before entering test request. See reference 426, or
5. Select the Sign-on Menu (424).



423 Power-On Diagnostics (1 of 4)

The power-on diagnostics verify machine operation automatically, as soon as the power switch is set to the on (1) position. The diagnostics are made up of routines that verify the operation of three major display station FRUs (field replaceable units); the base planar, the display planar, and the keyboard. Information supplied by the routines isolates a failure to the correct FRU. The diagnostics take approximately 17 seconds to complete. The following figure shows the power-on diagnostics flow.

Any system reset or any reset issued by the display station microprocessor causes the running of a shortened diagnostic routine. The abbreviated diagnostics perform only the base planar routine. This routine clears the microprocessor registers and all of the read/write storage (RAM). The CRT interrupt is also checked for being at the correct frequency, and the MSR and SLP features are checked for whether or not they are installed. The shortened diagnostics take approximately 5 seconds to complete.

Base Planar Routines

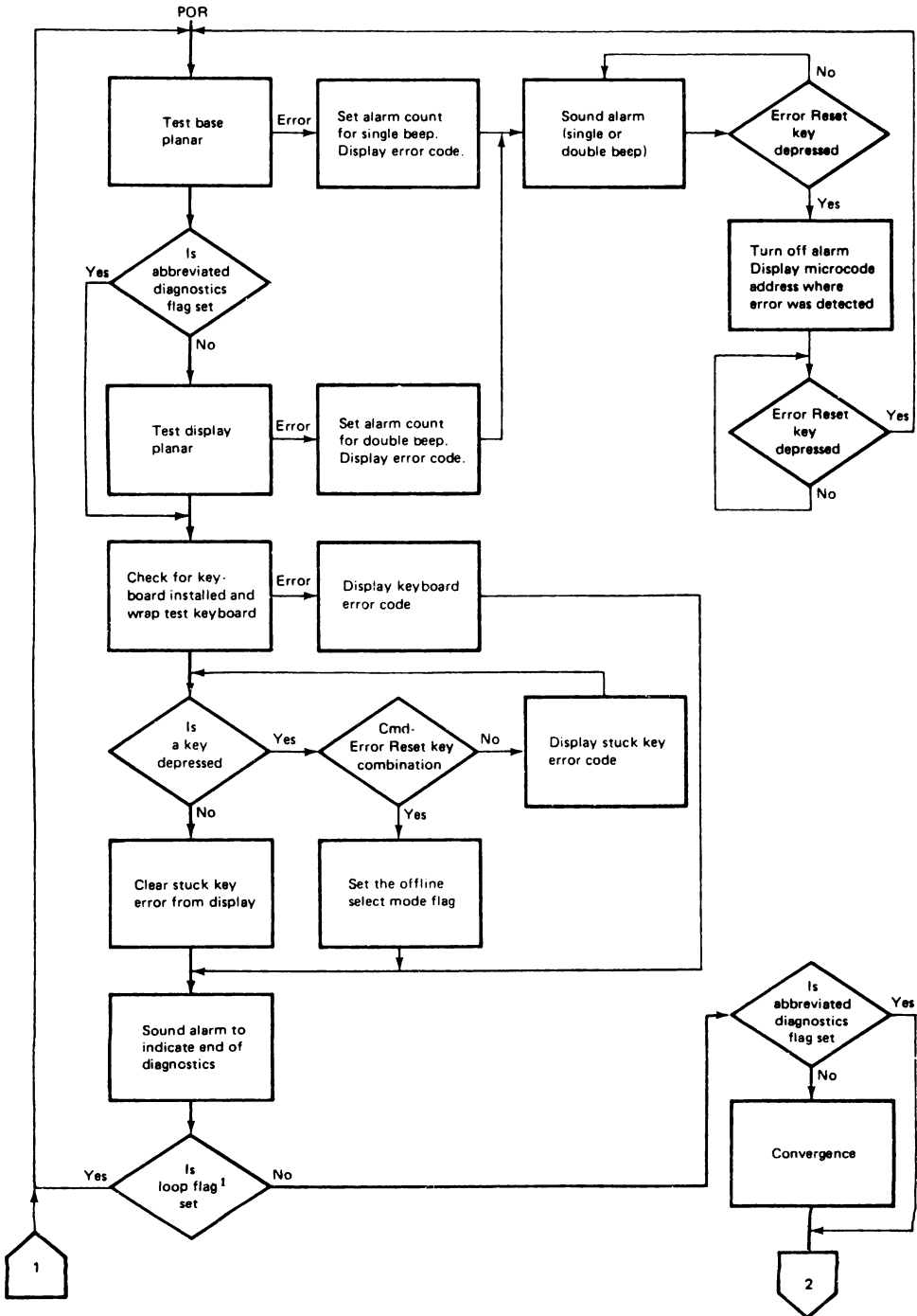
The base planar routines are the microprocessing unit test, the read/write storage test, the read only storage test, the cable adapter test, and the keyboard interface test.

Microprocessing Unit Tests

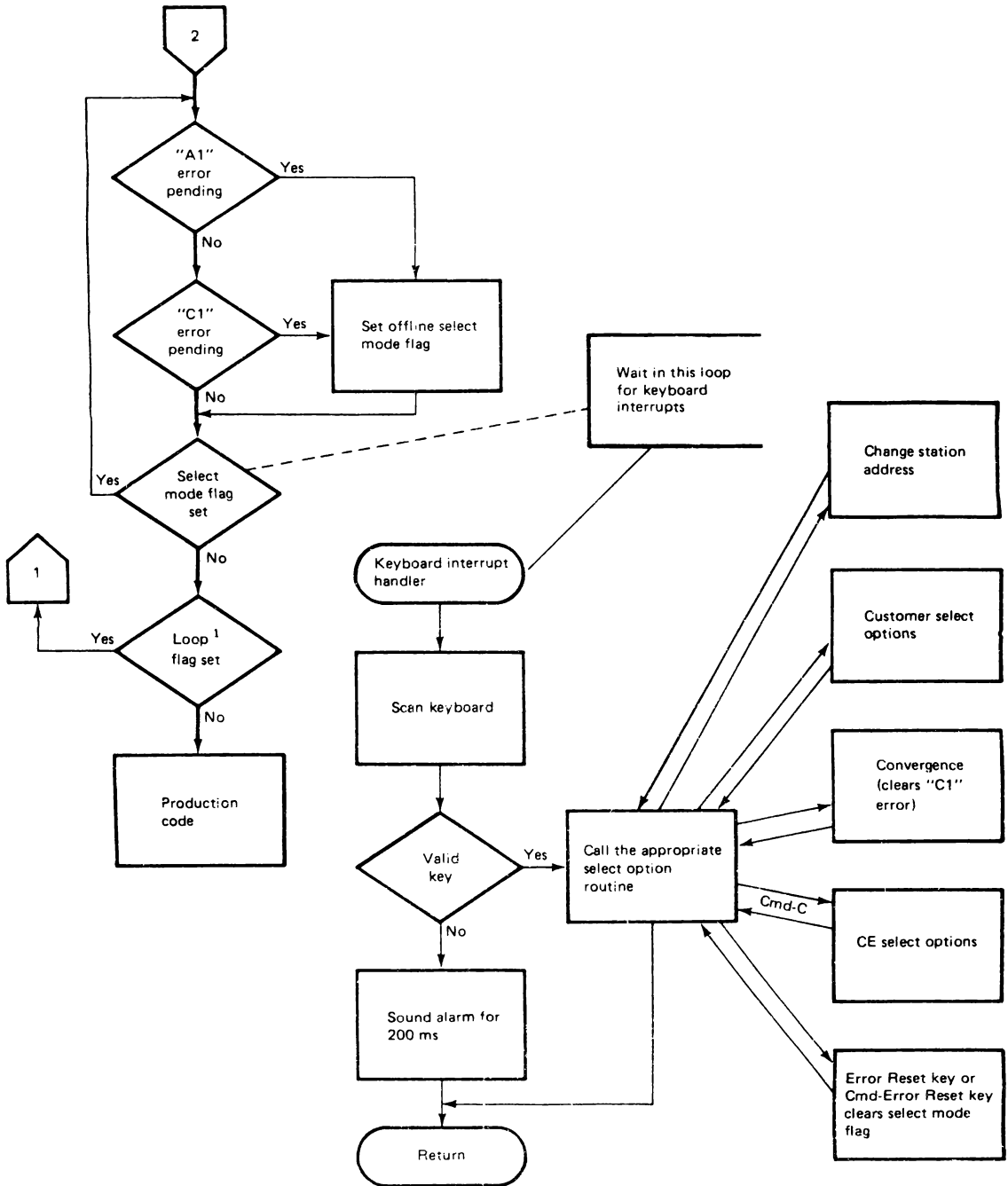
The microprocessing unit (MPU) tests check the condition registers, the microprocessor registers, the add and subtract function, the logic function, and the call instruction.

423 Power-On Diagnostics (2 of 4)

POR DIAGNOSTIC AND OFFLINE SELECT MODE



423 Power-On Diagnostics (3 of 4)



Loop flag is set by selecting the loop on diagnostic option of the offline select mode (415).

423 Power-On Diagnostics (4 of 4)

Read/Write Storage Test

This test has two parts: the address test and the data test. The address test verifies that the address bus is working correctly and that all storage locations that can be addressed are accessible. The data test writes known values into all storage locations that can be addressed and then reads each location and compares the read out with the data written in. Thus, all storage bit locations are verified.

Read Only Storage Test

This test verifies that all of the control storage can be accurately read. The test also verifies the proper operation of power-on reset.

Cable Adapter Test

This test checks the station address comparison logic to verify that the station responds to only one address. It checks the correct operation of the 'activate' commands. It tests the queue overflow indicator and the line parity sense logic for correct operation.

Keyboard Interface Test

This test verifies that each address line and the matrix strobe line can be selectively turned on and off.

Display Planar Routines

The display planar routines include the CRT interrupt test, the video data wrap test, the convergence storage test, and the parity checker test.

CRT Interrupt Test

The frequency of the CRT interrupts, generated by the vertical retrace signal, is tested for occurring every 22 (± 2.2) milliseconds.

Video Data Wrap Test

The video wrap test checks the logic generating the three video colors to the CRT. A test pattern is generated to check each color circuit separately for accurately displaying color data on the screen.

Convergence Storage Test

The convergence storage (RAM) is tested in two parts. The address test verifies the access to all convergence storage that can be addressed. The data stress test verifies that every bit position in the convergence storage is functioning. Also, the feature bus, the feature storage address registers, the parity generator, and part of the feature command decoder is verified.

Parity Checker Test

This test sends a convergence command with known bad parity to the display planar. The feature response bit is checked for a 0 and the parity check bit is checked for a 1 in the display planar status register.

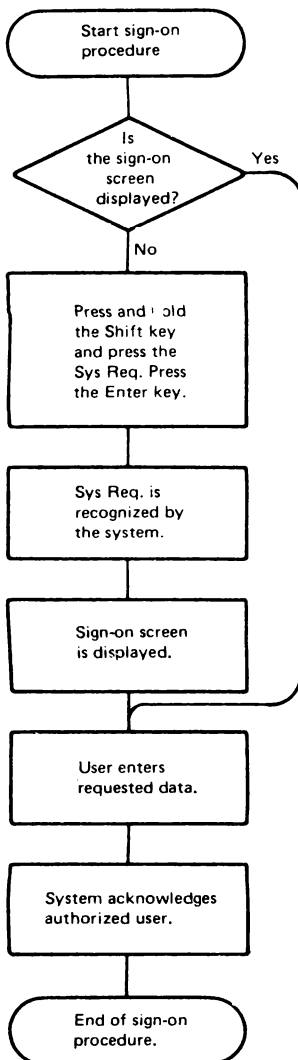
Keyboard and Cable Test

This test first reads the keyboard ID and then displays it on the status line. Next, the keyboard cable is checked for opens or shorts. Then, the keyboard is scanned for a pressed key. If a key circuit is found in the pressed state, a 'stuck key' error code is displayed on the status line, and the test is repeated until the stuck key is released or the test is manually stopped.

424 Sign-On Procedure

This is the procedure that the operator and the customer engineer use to sign on to use the display station online with the system. It is also a check to verify that all parts of the display station, customer system cable, controller, and system are operating correctly.

The system initial program load (IPL) sign-on procedure must be completed before the display station sign-on procedure can be used.



425 Free Key Operation

The display station is in the free key mode after the power-on diagnostics have been completed and the System Available indicator is on, but before the customer signs on. On some systems the free key mode is supported on the online tests Prime Option Menu (426). While in free key mode, the display station communicates with the controller and permits keyed characters to be displayed. This permits you to check most of the alphameric and function keys. If the following function keys are pressed while the display station is in the free key mode, error code 0099 will be returned:

Print	Enter/Record Advance
Help	Test Request
Roll ↑	Attention
Roll ↗	Command function keys 1 through 24

Use the online tests (426) to check these key operations.

426 Online Tests (1 of 5)


Online tests include work station test routines that are contained in the system. When the Prime Option Menu is displayed, it permits the selection of the following: display verification, printer verification, configuration data, ERAP (error recording analysis procedure), and link test. For the purpose of verifying the display station operation, only the Display Verification Menu option is described here.

The Display Verification Menu permits the selection of the following tests: the display attributes test, the displayable characters test, the specified input fields test, and the function keys and features test. The display attributes test and the displayable characters test check the planar. The specified input fields test checks the controller. The function keys and features test checks the system and the features installed on the display station.

Online tests can be run on the work station while other jobs are being run on the system. However, the work station must be in a signed off condition before online tests can be run on that work station. There may be various methods that can be used to terminate or sign off a job. These methods are not described in this manual because they are system operating procedures.

START

To start the online tests, the display station must be communicating with the system (the System Available indicator is on). The following procedure is appropriate for most systems. (Steps 1 and 2 are not necessary if a sign-on menu is already displayed.)

1. Press and hold the Shift key and press the Sys Req key.
2. Press the Enter key.
3. Press the Cmd key and then the test request key 

The online test Prime Option Menu should now be displayed. If it is not displayed, check the following list of possible reasons:

- The display station is not signed off. Check with the operator before signing off the display station.
- The display station is varied off. Call the system operator.
- An error message is waiting on the System Console about this display station. Call the system operator.

EXIT

Follow the exit procedure supplied on the display screens.

426 Online Tests (3 of 5)

Online Test Aids

The following aids will help you to use the online test screens. Most of the screens explain themselves. Read the screen carefully. When you select an option from the screen menu, you must also press the Enter key to activate it. How-to-use-information is supplied here for the following screens:

Display Attributes

This display tests the display screen attributes.

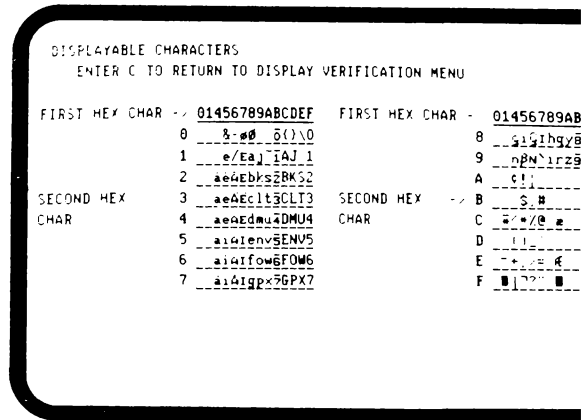
To use this display to check the attribute operation in both two-color and seven-color modes:

1. Press the Spacebar once to position the cursor to the right of SPECIFY ATTRIBUTES statement on the display screen.
2. Key in one of the hexadecimal numbers in the attribute code list (429); press the Enter key.

Observe the results that take place on the right side of the display screen. Compare these results with the attribute description in the list at reference 429.

Displayable Characters

This display shows the characters that are generated when the comparable keyboard keys are pressed. A sample displayable characters screen is shown below. The screen on your display station may not look the same.



xx--xx (station ID) can be up to 10 characters.

The following chart shows the hexadecimal codes for characters that will change from the International language group according to the language group selected.

	Hex: 4A	4C	4F	5A	5B	5F	6A	79	7B	7C	A1	C0
U S and Canada	¢	l	l		¬							
International												
Austria/Germany	À		Ü		ö		§	ß	ä			
Belgium					ù		à		é			
Brazil	É		Ç		ç	ã	Õ	Ä		ó		
Canada (French)	à				ù							é
Denmark/Norway	#		Å		ø		Æ	Ø	ü	æ		
Finland/Sweden	§		Å		ö	é	Ä	Ö	ü	ä		
France	°		§		ù		£	à		é		
Italy	°		é		ò	ù	£	§	ì	à		
Japan (English)	£		l	¥	¬							
Portugal	Ç				õ		À	Õ	ç	ã		
Spain			l	ß	¬	ñ		Ñ				
Spanish Speaking			l		¬	ñ		Ñ				
United Kingdom	£		l	l	¬							

426 Online Tests (4 of 5)

Specified Input Fields

This display tests the controller operations that are used by the display station. Fields of information are entered, read by the controller, and written back to the display screen next to the input field.

To use this display:

1. Press the Spacebar once to position the cursor at the start of the first input field. The cursor moves from the field on the left to the field on the right when the input field information is entered.
2. Enter information in the fields described on the display screen. If an error is made, press the Error Reset key and correct the error.

The field descriptions are:

Alpha or Numeric: Key in five alphabetic or numeric characters.

Mandatory Fill: This field must be filled with five alphabetic or numeric characters.

Alpha Only: Key in five alphabetic characters.

Field Exit Req: Key in five alphabetic or numeric characters and then press the Field Exit key.

Numeric Only: Key in five numeric characters.

Dup Key: Press the Dup key once. The key code of the Dup key is shown until the screen is written by the controller. This field duplicates the Numeric Only field.

Signed Numeric: Key in four numeric characters. The cursor remains under the last character keyed. Press the Field Exit key (positive) or the Field- key (negative).

Bypass: This field is automatically bypassed and no entry is needed.

Upper Case: Key in five alphabetic characters.

Rt Adj Z Fill: Key in one alphabetic or numeric character. Press the Field Exit key. The character keyed is moved to the right (Rt) of the field and the left four positions will be filled with zeros.

Self Check for Modulus 10: Key in A F 1 2 7 6 5 6.

Rt Adj B Fill: Key in one alphabetic or numeric character. Press the Field Exit key. The character keyed will be moved to the right (Rt) of the field and the left four positions are filled with blanks.

Self Check for Modulus 11: Key in A F 1 2 7 6 5 5.

Auto Enter: Key in five alphabetic or numeric characters.

As soon as the last character is keyed, the controller reads all the input fields, sends the information to the system, and writes the information back to the display screen next to the input fields.

428 Magnetic Slot Reader and Selector Light Pen Test (1 of 2)

The machine must be in the offline select mode (415).

This test is selected by pressing and holding the Cmd key and pressing the N key. Line 22 of the display screen will display the status of the selector light pen (SLP) and the magnetic slot reader (MSR). Also, despite the status of either the SLP or MSR, lines 1 through 20 will contain sets of four dashes (----) and line 24, column 79 will contain an asterisk to be used for SLP targets.

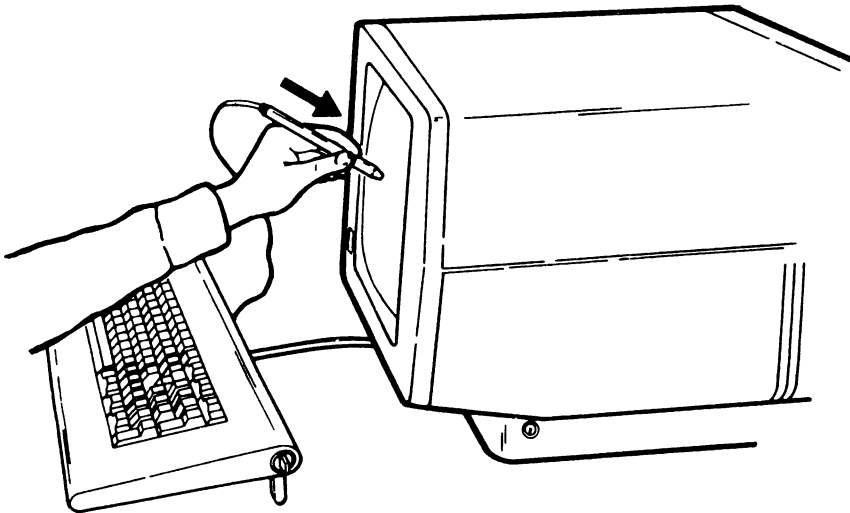
SLP Test

The SLP test verifies the SLP feature for correct operation without system support. A test screen is supplied to test the address counters for correct operation and to verify the SLP for correct operation over all the screen.

Note: Be sure to position the light pen over the target as shown in the figure when making the following tests. The correct positioning of the tip of the pen is very important.

To verify the address counters, position the light pen over the asterisk in the lower rightmost corner of the test screen. Activate the tip switch by pressing the pen against the screen. The cursor location code in the status line should read 24-79 (± 1 column). If the SLP feature passes this test, go to the next paragraph; if it does not pass the test after three attempts, go to MAP 0100, Entry Point A.

To verify the SLP feature for correct operation over all the screen, position the light pen over one of the targets on the screen and activate the tip switch. The cursor should move within three character positions of the desired place. Repeat this test over several places on the screen. If the light pen does not work correctly, go to MAP 0100, Entry Point A.



How to Use the Selector Light Pen

426 Online Tests (5 of 5)

Function Keys and Features

This display tests the roll keys and command function keys.

To use this display:

1. Press and hold the Upper Shift key while you press either the Roll↑ or Roll↓ key.
2. Observe roll lines 1, 2, 3, and 4. You can return lines that have rolled off the display screen by pressing the Enter key.
3. Observe the intensity of the numbers on the display screen while you perform Step 4.
4. Press the Cmd key; then press command function key 1. Repeat until command function keys 1 through 12 have been pressed. Press the Cmd key again; then press and hold the Upper Shift key while pressing command function key 13. Release both keys. Repeat until command function keys 13 through 24 have been pressed.
5. Repeat Step 4 to obtain a normal display of the numbers.

Configuration Data

Remote Stations: The following are descriptions of the configuration data for remote stations:

- Line is the communication line number that this display station is on.
- Station Addr is the address for the 5251 Model 2 or 12 controller. The station address permits the system to address a specific Model 2 or 12 controller.
- LSID (logical station identification) permits the system to identify to the 5251 Model 2 or 12 controller which specific work station it wants to communicate with. The work station address is the last 6 bits of the LSID.
- Logical ID is the name the system uses to address a specific work station.
- Description is the type of device being addressed.

Local Stations: The following are descriptions of the configuration data for local stations:

- Device Addr is the address of the controller.
- Unit Addr is the address of the work station(s) assigned to the controller. The first digit is the physical port/cable number, and the second digit is the station address.
- Logical ID is the name the system uses to address the station(s) assigned to the controller.
- Description is the type of device being addressed.

Error Recording Analysis Procedure (ERAP)

Note: The format requires entering a 2-digit option code. For example, to select ALL, enter 01.

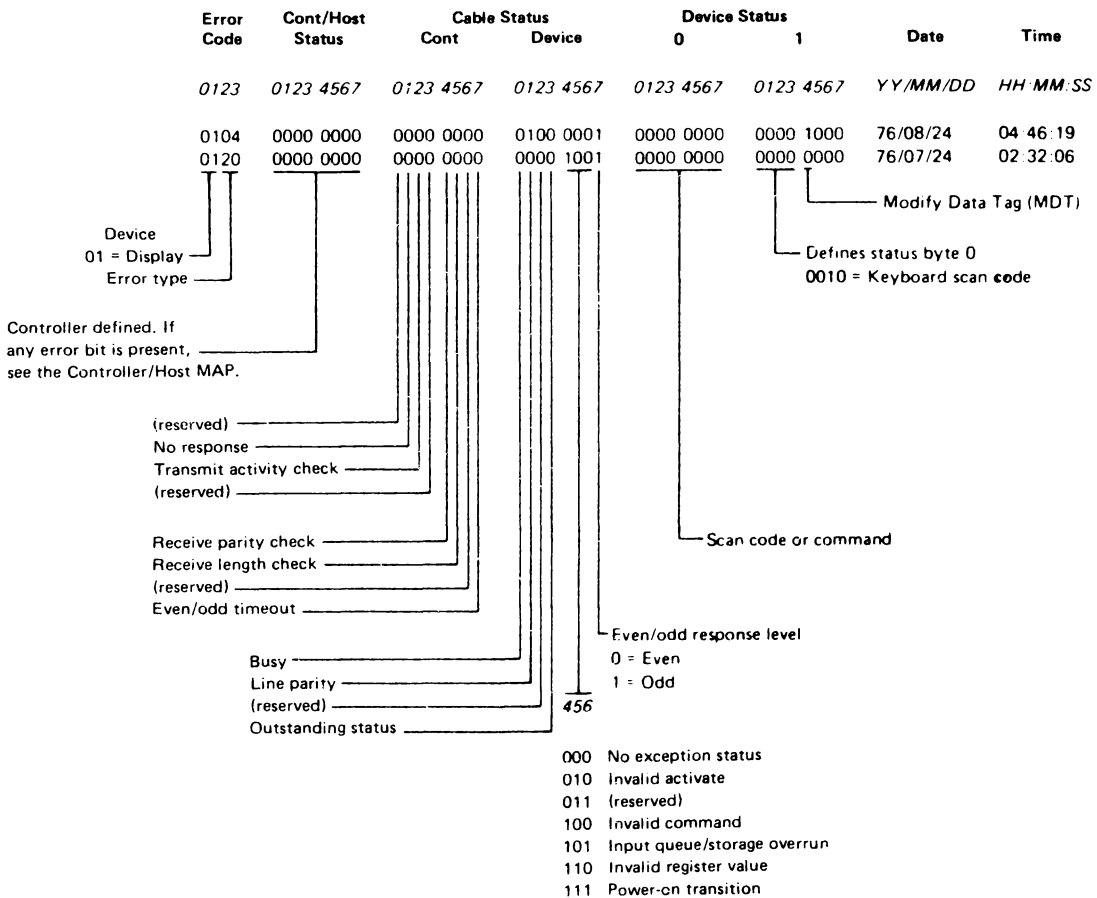
The following are descriptions of the ERAP options:

- If you select the END option, the ERAP function is terminated. If you select the END option and press the Field Exit key, the display returns to the sign-on menu.
- If you select the ALL option, the ERAP tables are displayed one at a time for all devices on the line. When the error history table for the first device is displayed and the Enter key is pressed, the I/O counter table for the second device is displayed. This sequence is repeated until the error history table for the last device on the line is displayed.
- If you select the Work Station Controller option, the Display Stations option, or the Matrix Printers option, you must also select a specific device. The I/O counter table, the error counter table, and the error history table are displayed for the selected device only.

Note: For a description of the error history table, see 427.

427 Error History Table Definition

This figure is an example of an error history table that describes the fields that can be displayed on the display station or printed on a printer.



428 Magnetic Slot Reader and Selector Light Pen Test (2 of 2)

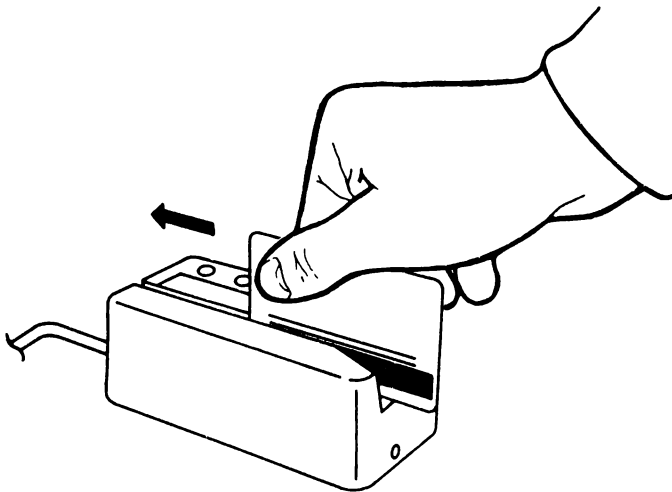
MSR Test

The MSR test verifies the correct operation of the MSR feature without system support. A test card with known values already recorded on the magnetic stripe is supplied with each magnetic slot reader. By passing the test card through the MSR and observing LED indicators on the MSR and line 23 on the display screen, and by also listening for the MSR buzzer, you can determine if the MSR feature is operating correctly. The data on the card will appear on line 23 unless the data is in a protected field. Then the message, SECURE DATA, will appear on the screen. If you determine that the MSR feature is not working correctly, go to MAP 100, Entry Point A.

The green LED on the MSR should be on whenever the display station is powered on. Pass the test card through the MSR in the direction and in the position shown in the figure. If the MSR feature operates properly, the green LED should turn off during the read operation, then turn back on and the buzzer sound. At this time, on line 23 of the display screen, the character equal to the hexadecimal code on the test card should appear. If a card is read containing confidential data, the message SECURE DATA is displayed on line 23.

If an error occurs, only the red LED turns on and the MSR buzzer sounds for approximately one second. The yellow LED indicates that the read operation was successful, but the MSR has not been reset for another read operation. Following read operations cannot be performed while the yellow LED is on.

When an error occurs, and the red LED is still on, pass the test card through the MSR two or three more times to see if a successful read operation can be made. If not, press and hold the Cmd key and press the N key to again initialize the test and to reset the MSR. Pass the test card through the MSR one or two more times to verify the failure.



How to Use the Magnetic Slot Reader

429 Attribute Codes

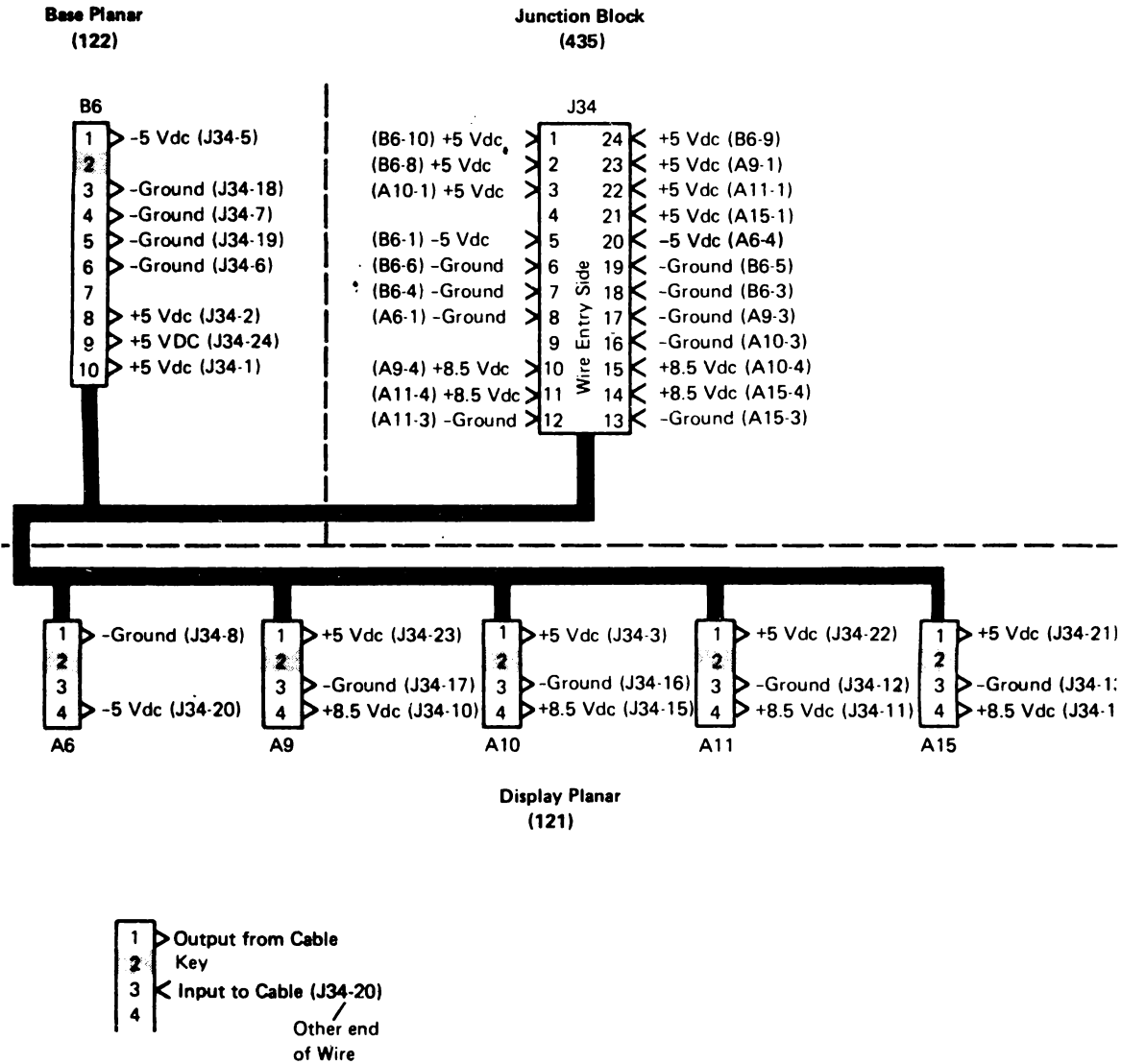
2-Color Attributes	Hex Code	7-Color Attributes
Green data (normal screen)	20	Green data
Reverse image (green background)	21	Green reverse image
White data	22	White data
White reverse image	23	White reverse image
Green data, underscore	24	Green data, underscore
Green reverse image, white underscore	25	Green reverse image, underscore
White data, underscore	26	White data, underscore
No display (blank screen)	27	No display (blank screen)
Blink, green data	28	Red data
Blink, green reverse image	29	Red reverse image
White data, blink	2A	Red data, blinking
Blink, white reverse image	2B	Red reverse image, blinking
Blink, green data and underscore	2C	Red data, underscore
Blink, green reverse image, white underscore	2D	Red reverse image, underscore
Blink, white data, blue underscore	2E	Red data, underscore, blinking
No display	2F	No display
Green data, blue column separators	30	Turquoise data, column separators
Green reverse image, blue column separators	31	Turquoise reverse image, column separators
White data, blue column separators	32	Yellow data, column separators
White reverse image, blue column separators	33	Yellow reverse image, column separators
Green underscore, column separators	34	Turquoise data, underscore, column separators
Green reverse image and underscore, column separators	35	Turquoise reverse image, underscore, column separators
White underscore, column separators	36	Yellow data, underscore, column separator
No display	37	No display
Blink, green data, blue column separators	38	Pink data
Blink, green reverse image, blue column separators	39	Pink reverse image
Blink, white data, white column separators	3A	Blue data
Blink, white reverse image, white column separators	3B	Blue reverse image
Blink, green data, green underscore, column separators	3C	Pink data, underscore
Blink, green reverse image, white underscore, column separators	3D	Pink reverse image, underscore
Blink, white data, white underscore, column separators	3E	Blue data, underscore
No display	3F	No display
<p>Notes:</p> <ol style="list-style-type: none"> 1. Underscore and column separators are always blue and never blink for seven-color attributes. 2. Column separators are dots, not vertical lines. Column separators are suppressed when the option to suppress line space is selected (online select mode, option 6; see reference 414). 3. A dash underscore (_ _ _) results when column separators and underscore are selected together. 		

430 Wiring Diagrams

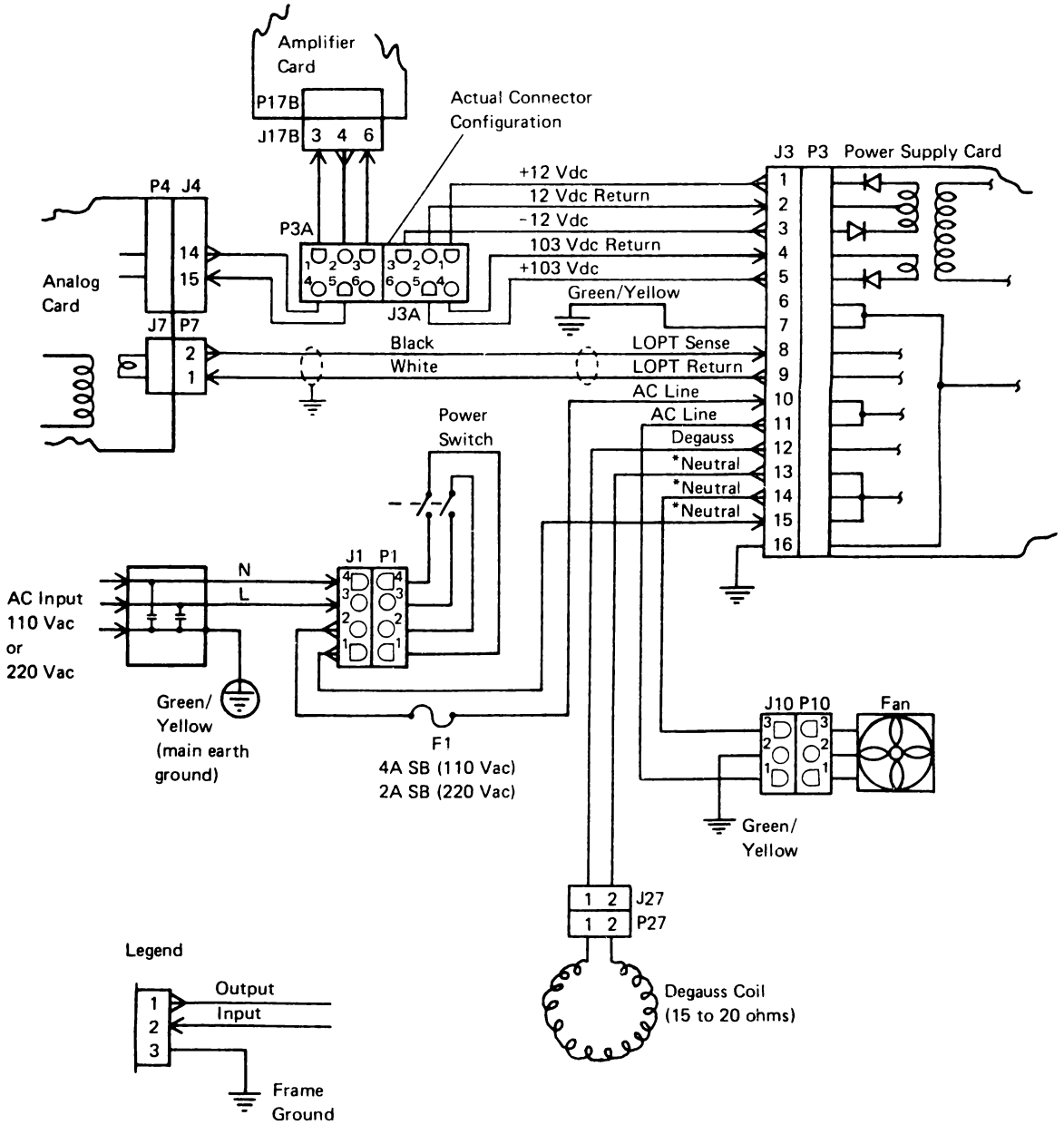
The following pages contain wiring diagrams with voltage and signal identification. A chart giving the approximate location of the cable connectors is also supplied here. Jack (J) connects to a plug (P).

Connector (J/P)	Approximate Location
1	Power switch cable
3	Front of the power supply card
3A	Between the power supply card and the analog card
4	Front of the analog card
5	Side of the analog card
6	Side of the analog card
7	Side of the analog card
10	Fan
11	Brightness control
13	Video card
14	Video card
15	Video card
16	Video card
17A	Amplifier card
17B	Amplifier card
18	Amplifier card
19	Amplifier card (convergence coil)
21	Analog card (high voltage)
26	Analog card (focus to video card)
27	Degauss coil
34	Junction block (Vdc to planars)
35	Junction block (Vdc to analog card)
36	Junction block (Vdc MSR/SLP)
A2 through A15	Display planar
B1 through B7	Base planar
C3 and C4	MSR feature card
D3 and D4	SLP feature card
E3 and E4	Test points on the MSR and SLP interposers
MSR	Junction block (to the MSR)
PTR/SLP	Junction block (to the SLP)
PWR	Junction block (from the power supply card)

431 DC Distribution Cable Wiring

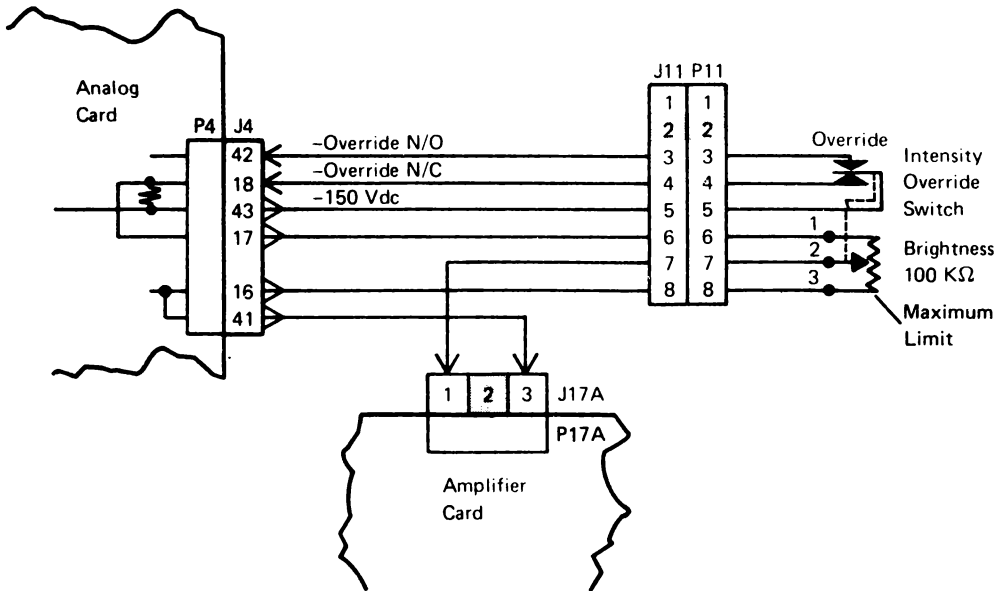
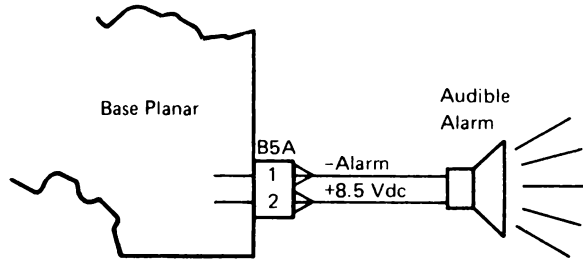


432 AC Power Cable Wiring

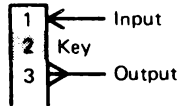


*Neutral on 110 Vac power supplies. AC Line on 220 Vac power supplies.

433 Brightness Control/Intensity Override Switch, and Alarm Assembly Wiring



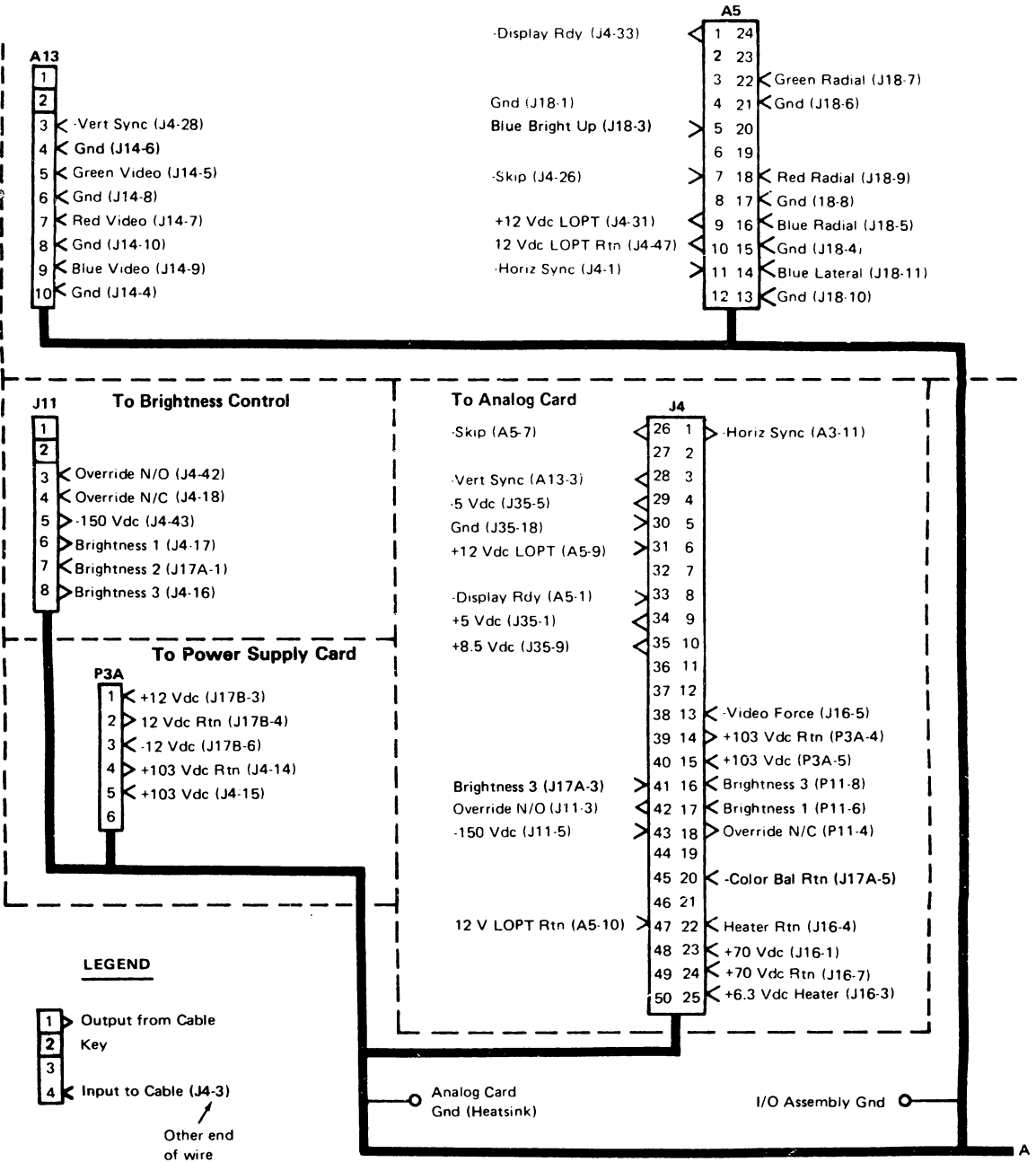
Legend



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434 Main Power and Signal Distribution Cable Wiring (1 of 2)

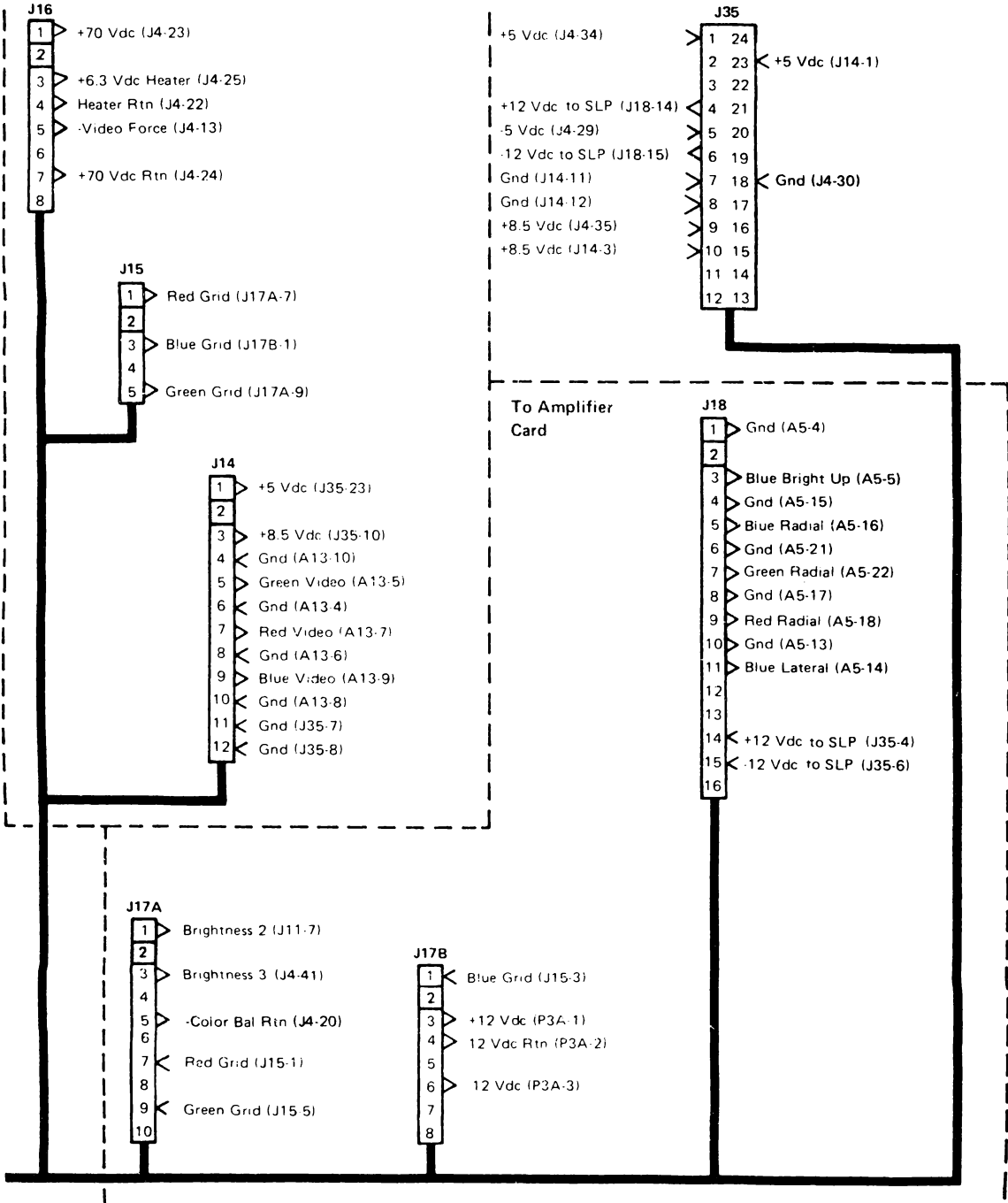
To Display Planar



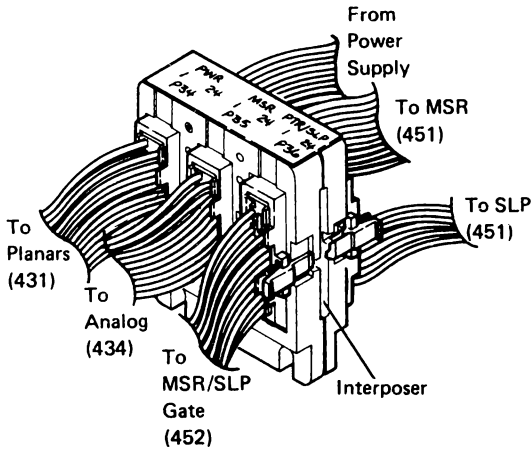
434 Main Power and Signal Distribution Cable Wiring (2 of 2)

To Video Card

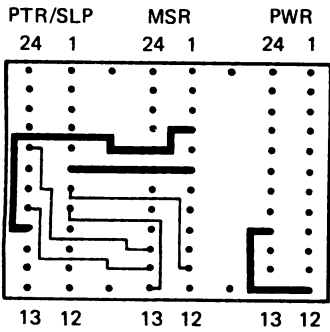
To Junction Block



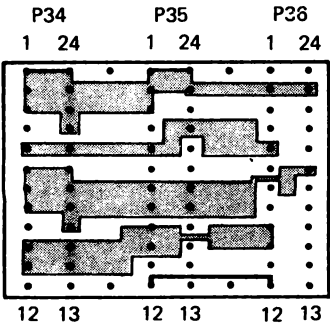
435 Junction Block Wiring



Interposer

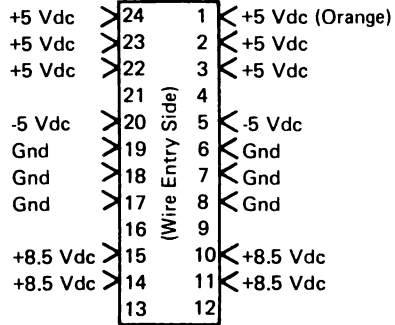


Viewed from Front of Machine



Viewed from Rear of Machine

PWR (from Power Supply Card, 126)



PTR/SLP (451)

- 6 -12 Vdc
- 7 -MSR Red LED
- 8 -MSR Green LED
- 11 -SLP Switch N/O
- 13 -6 Vdc
- 14 -SLP Signal
- 15 -SLP Switch N/C
- 16 +12 Vdc
- 17 -MSR Yellow LED
- 20 +MSR Data

MSR (451)

- 4 +12 Vdc
- 6 -12 Vdc
- 11 -MSR Red LED
- 13 -MSR Green LED
- 14 -MSR Yellow LED
- 15 +MSR Data
- 19 -12 Vdc
- 20 +12 Vdc

P34 (431)

- 1 } +5
- 2 } Vdc
- 5 -5 Vdc
- 6 } Gnd
- 7 } Gnd
- 8 } Gnd
- 10 } +8.5
- 11 } Vdc
- 12 } Gnd
- 14 } +8.5
- 15 } Vdc
- 16 } Gnd
- 17 } Gnd
- 18 } Gnd
- 19 } Gnd
- 20 } -5 Vdc
- 21 } +5
- 22 } Vdc
- 23 } Vdc
- 24 }

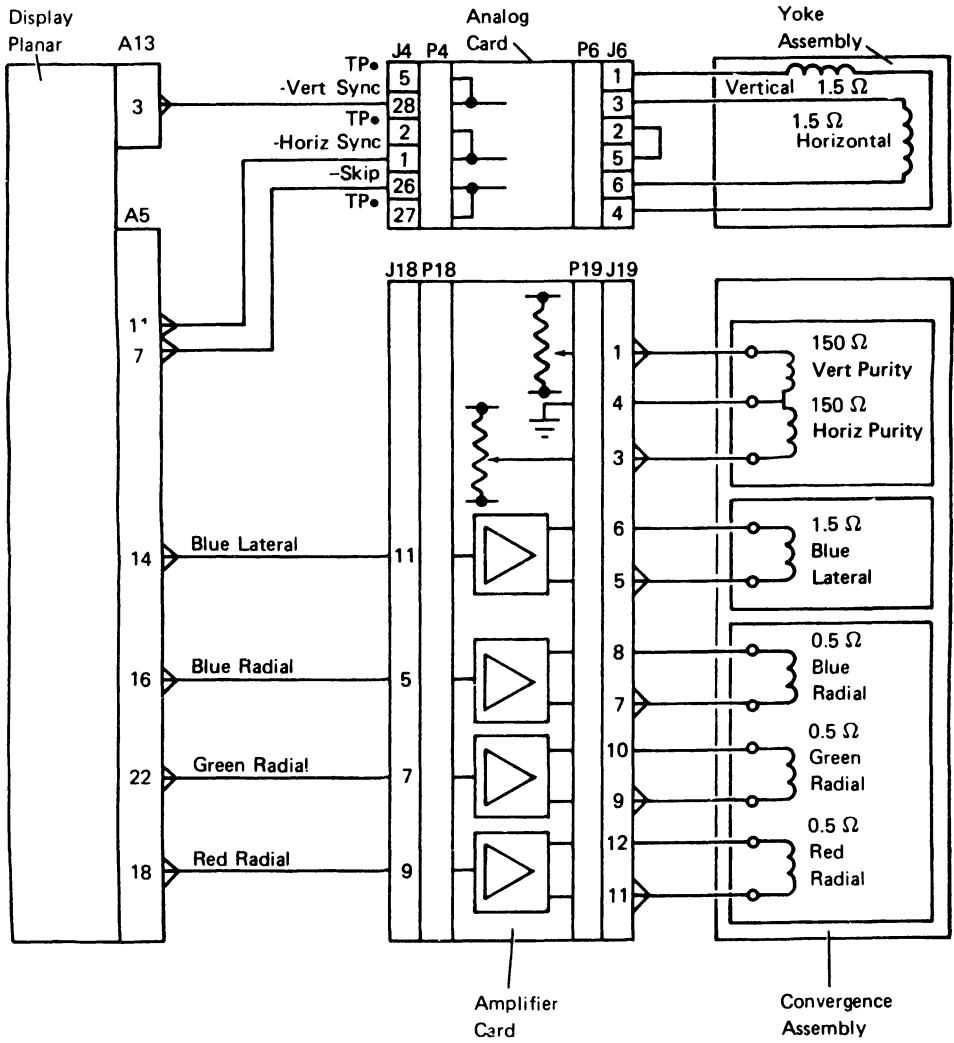
P35 (434)

- 1 } +5 Vdc
- 2 } +5 Vdc
- 3 } +5 Vdc
- 4 +12Vdc
- 5 -5 Vdc
- 6 +12 Vdc
- 7 } Gnd
- 8 } +8.5
- 9 } +8.5
- 10 } Vdc
- 12 -MSR Buzzer
- 17 } GND
- 18 } GND
- 21 -5 Vdc
- 23 } +5
- 24 } Vdc

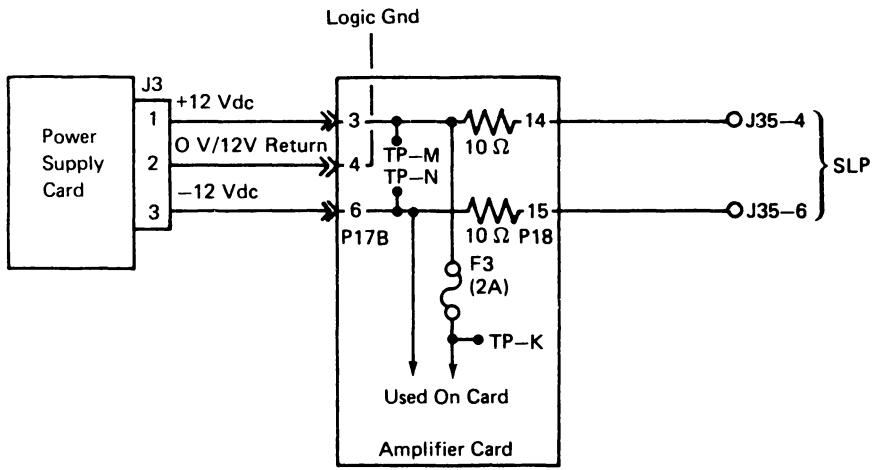
P36 (452)

- 2 +5 Vdc
- 5 -5 Vdc
- 9 +8.5
- 10 } Vdc
- 12 } -MSR Buzzer
- 19 Gnd
- 23 +5 Vdc

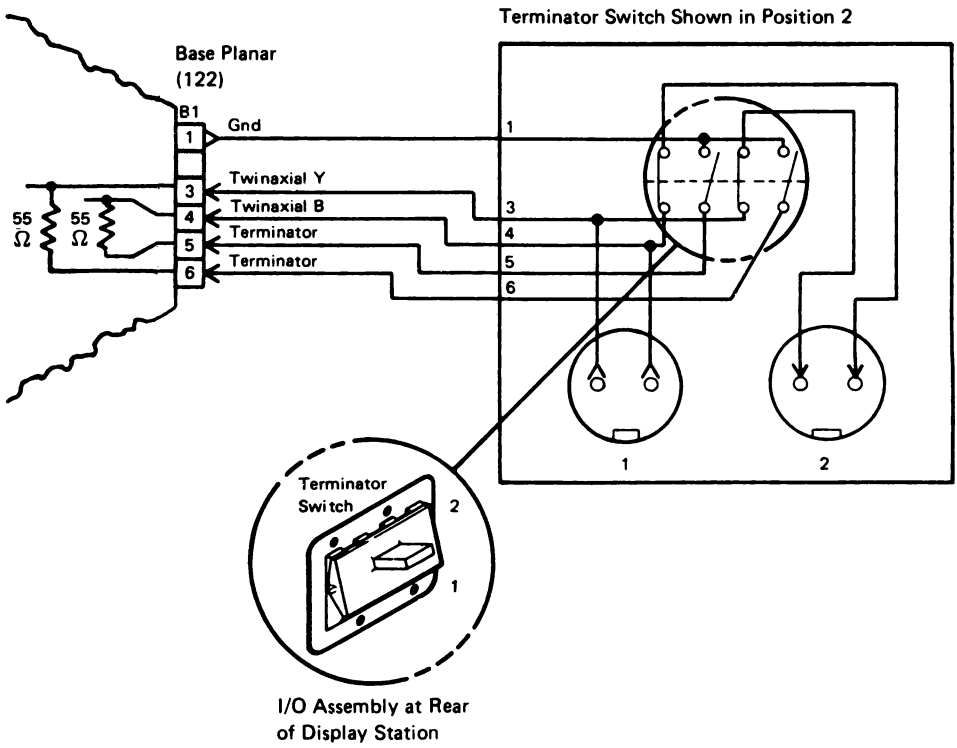
436 Synchronization, Convergence, Purity, and Yoke Assembly Deflection Coils Wiring



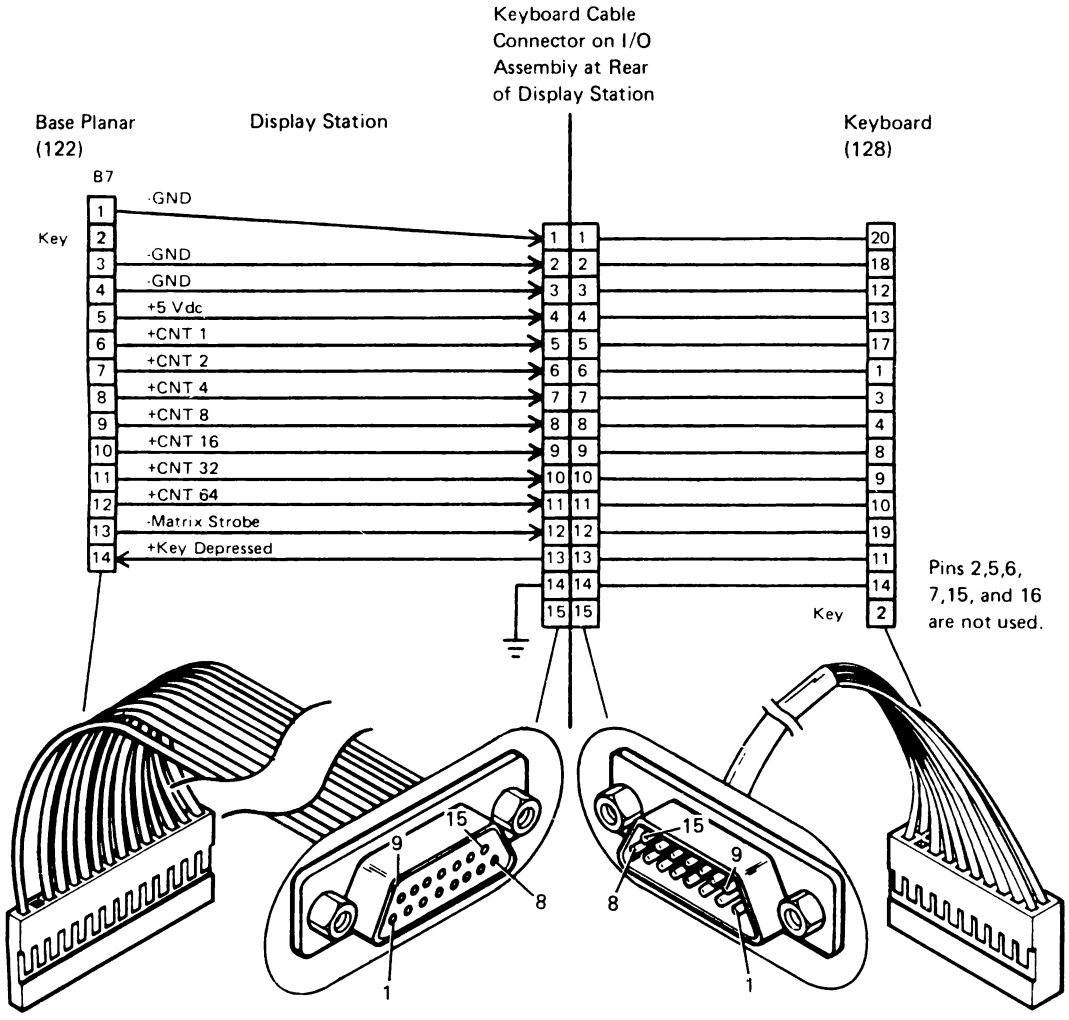
438 Amplifier Card Power Circuits



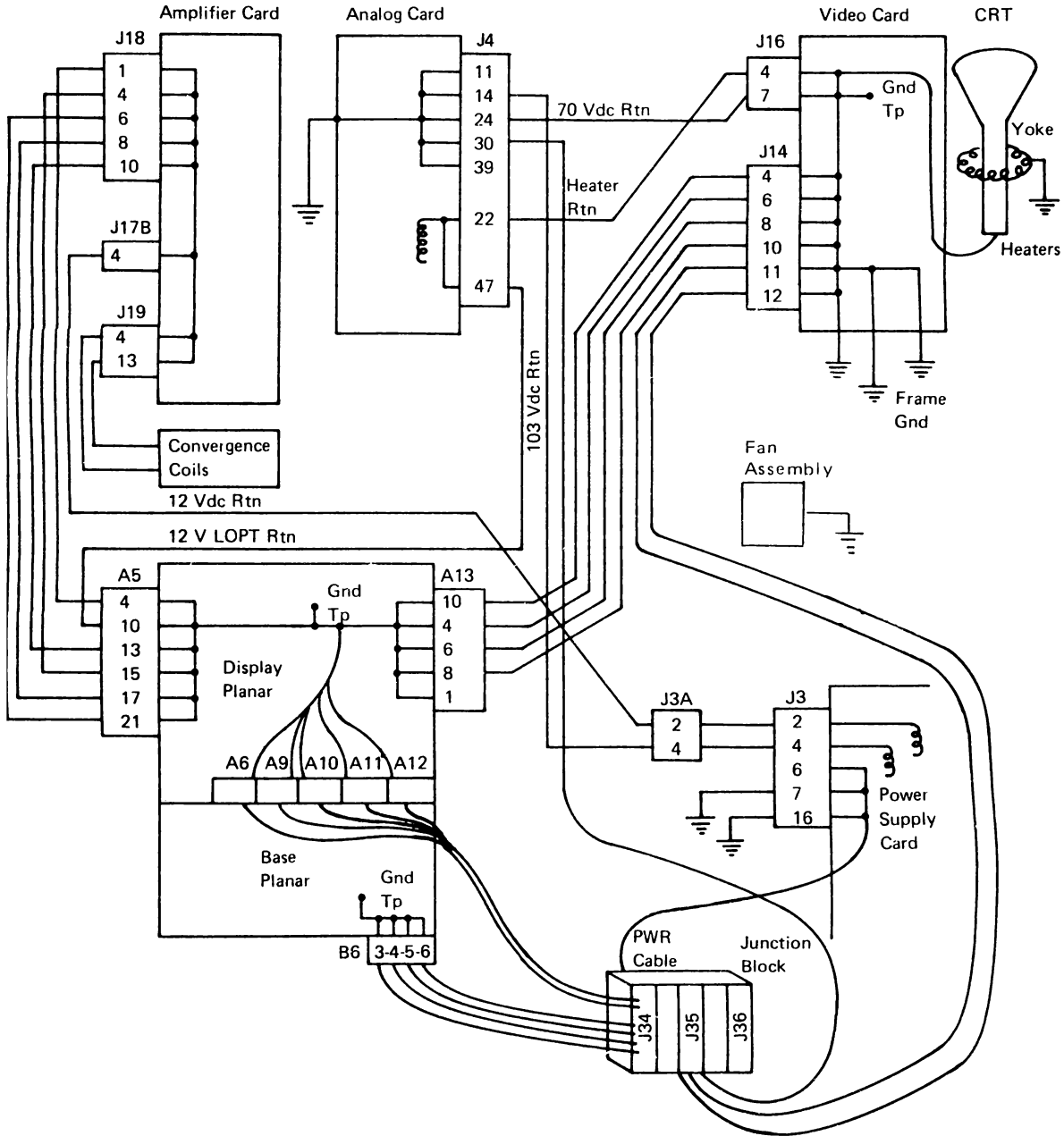
439 Cable Thru and Terminator Switch Wiring



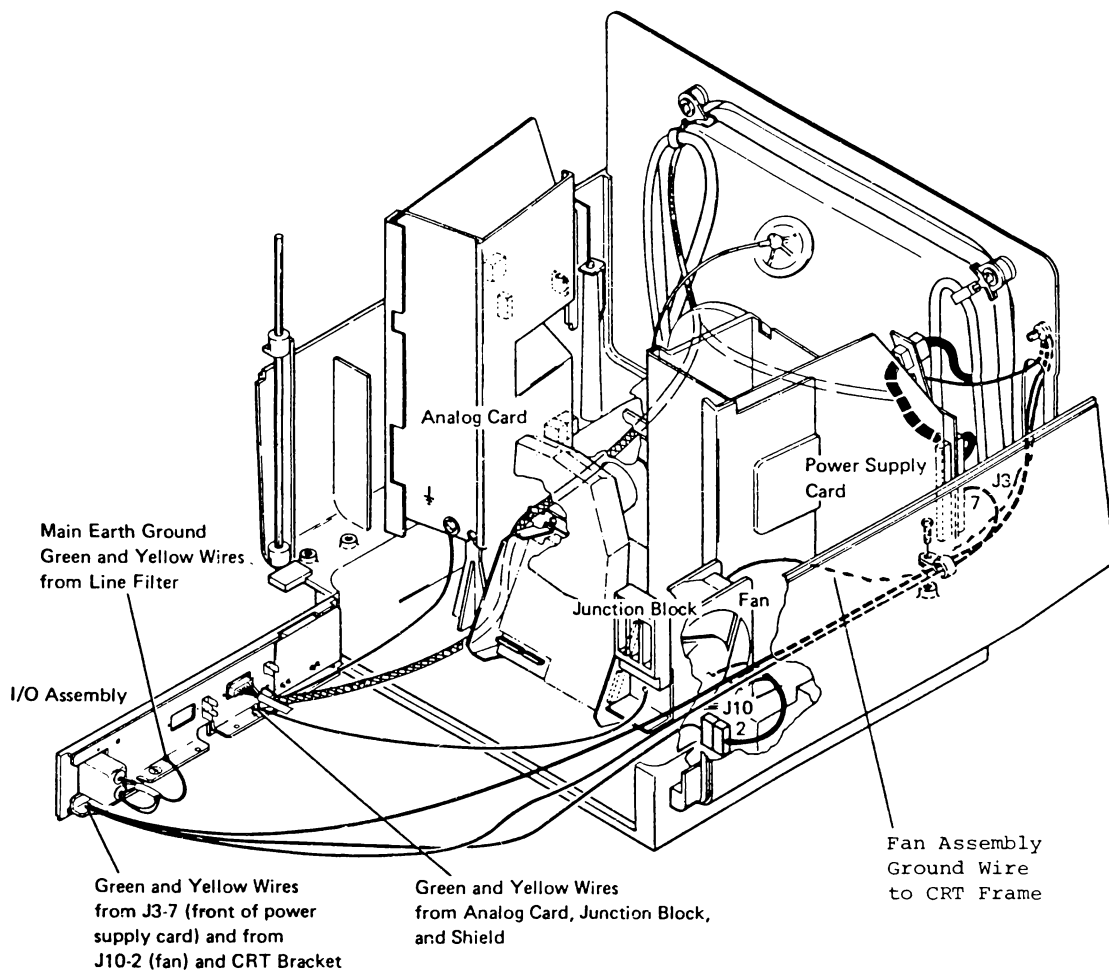
440 Keyboard Interface Cable Wiring



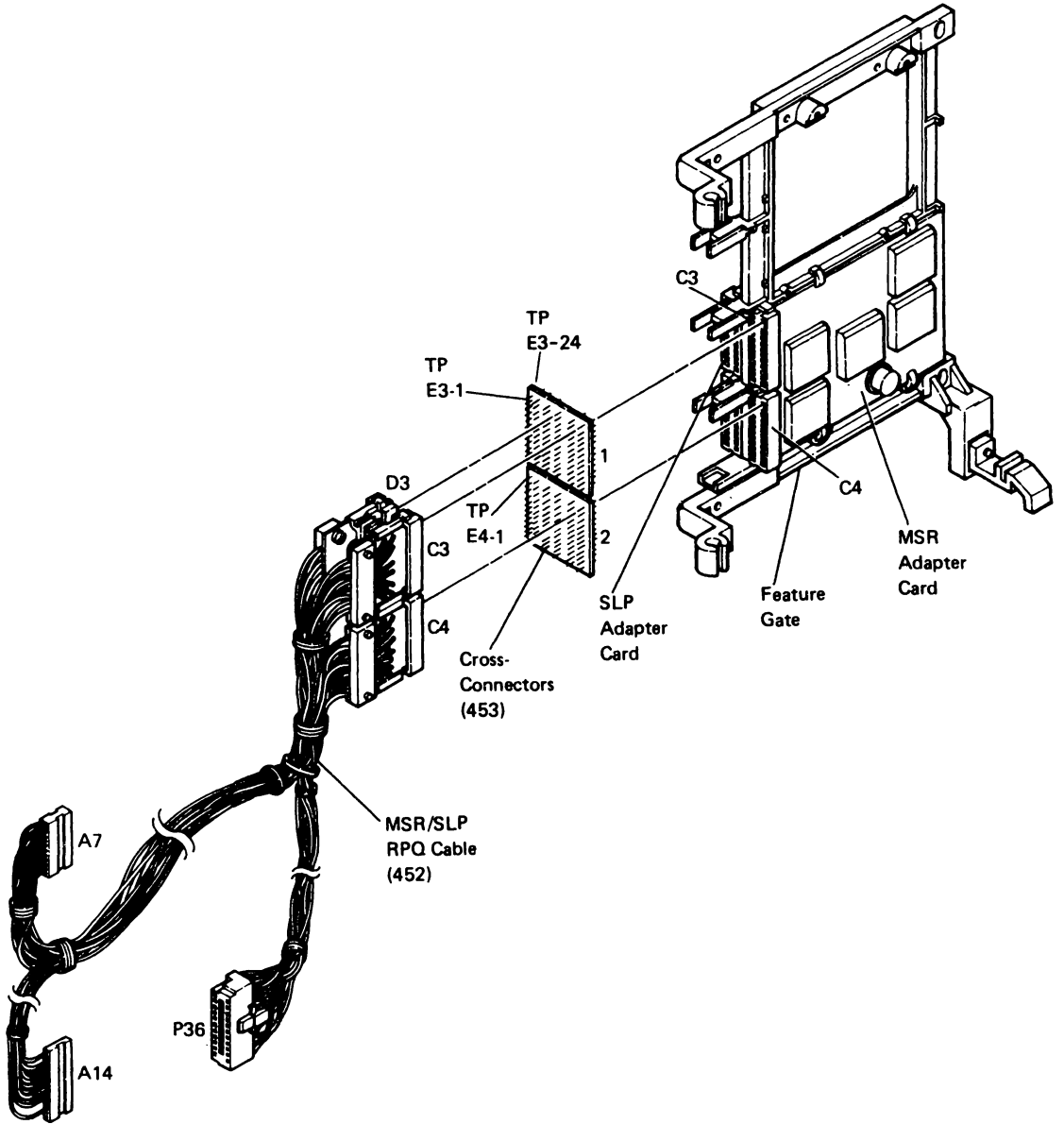
441 Ground Circuits (1 of 2)



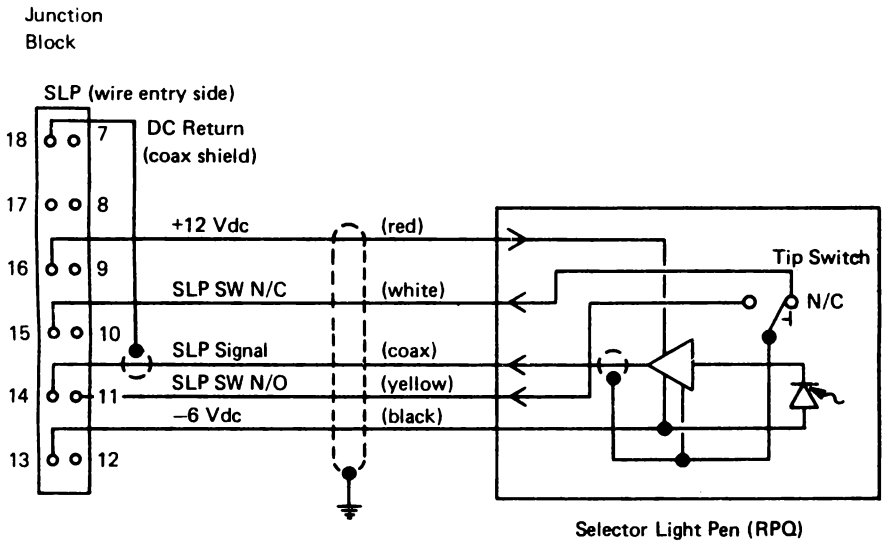
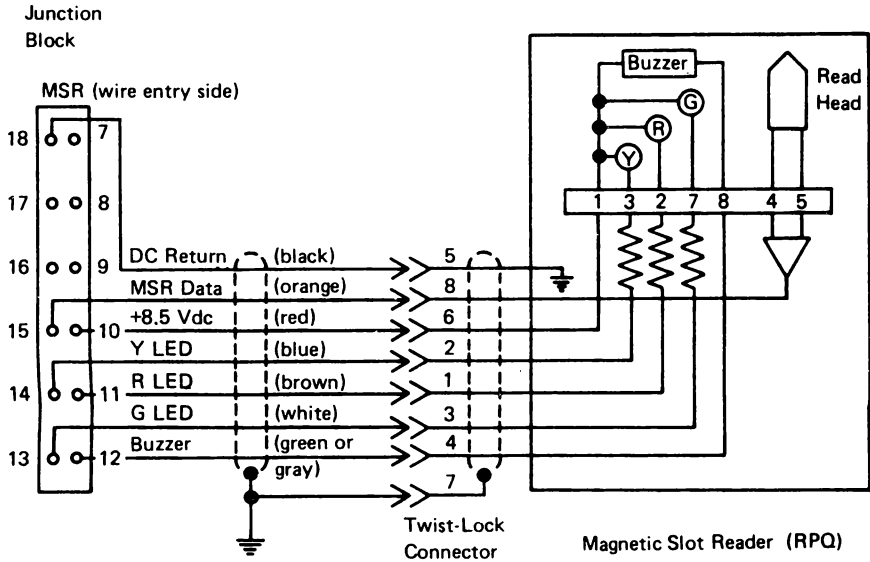
441 Ground Circuits (2 of 2)



450 Feature Gate Wiring

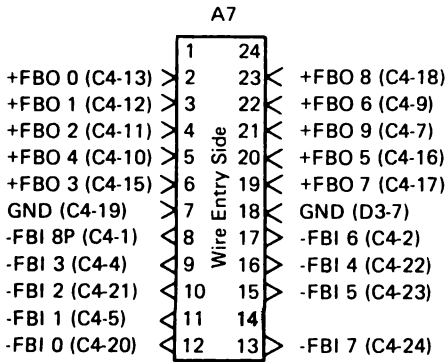


451 MSR and SLP Internal Wiring

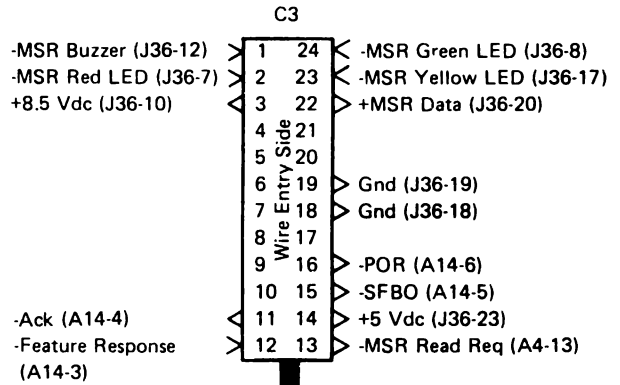


452 MSR/SLP RPQ Cable Wiring (1 of 2)

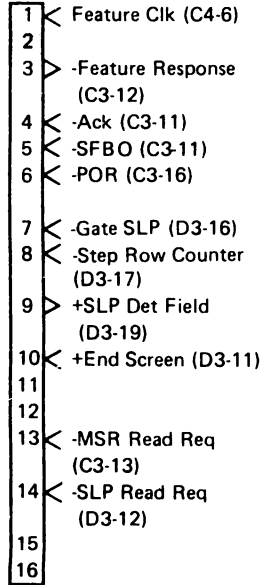
To Display Planar



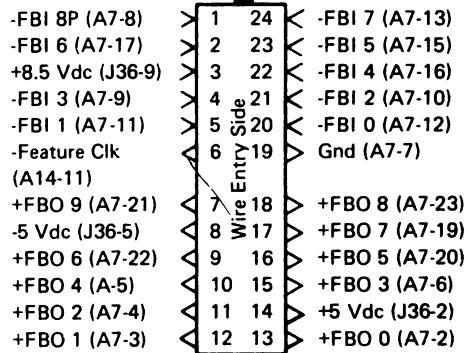
To Feature Gate



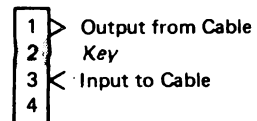
A14



C4



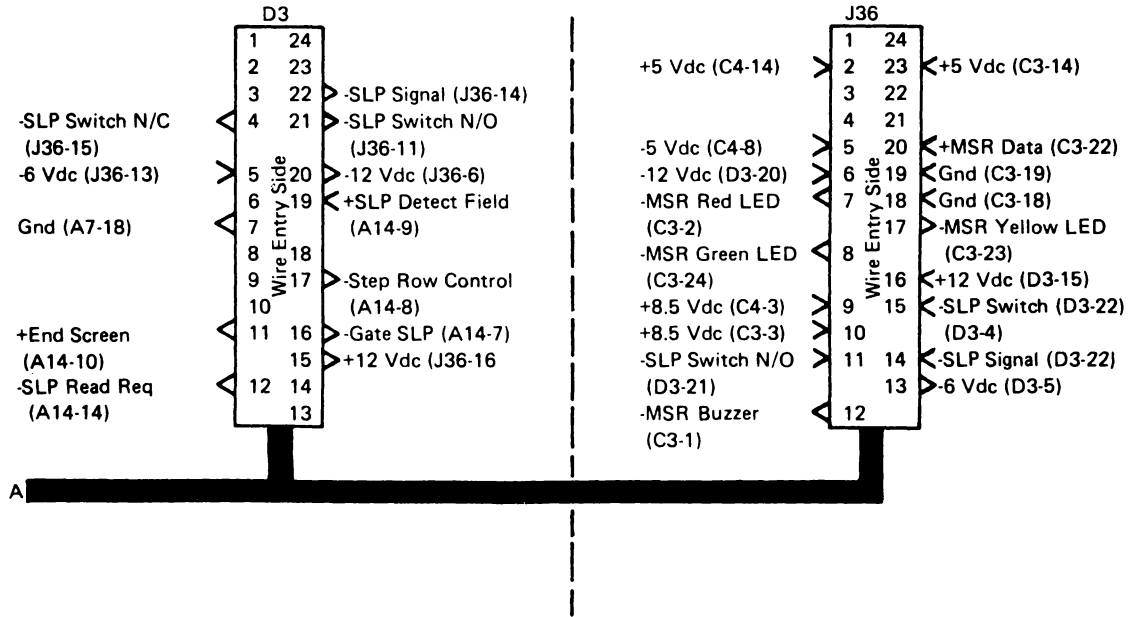
Legend



452 MSR/SLP RPQ Cable Wiring (2 of 2)

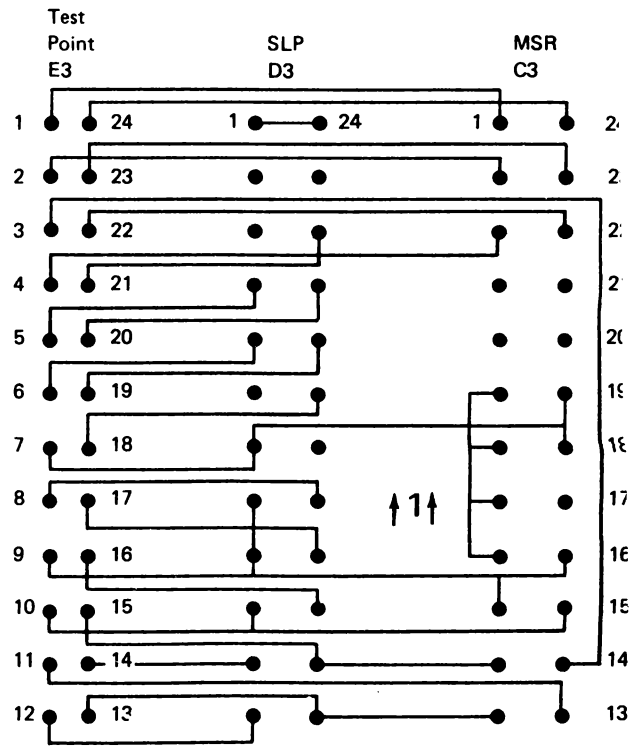
To Feature Gate

To Junction Block

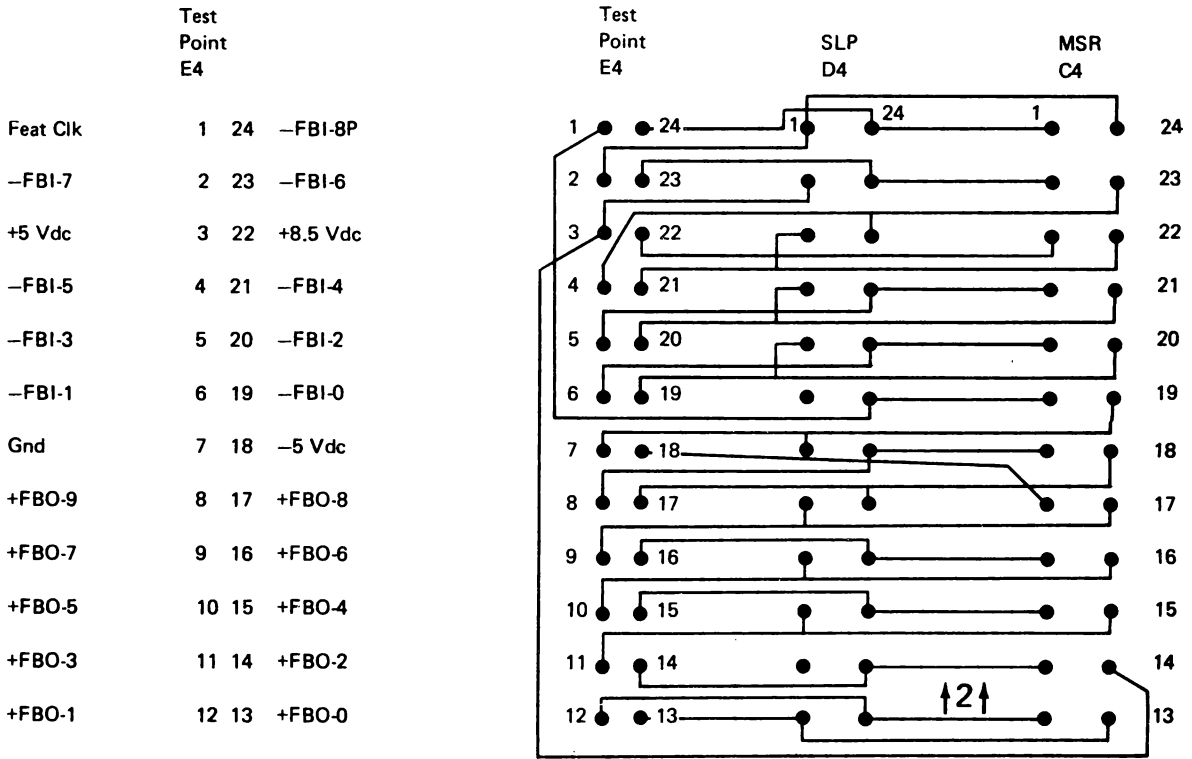


453 MSR/SLP Cross-Connector Circuits (not a land pattern) (1 of 2)

	Test Point E3		
MSR Buzzer	1 24	MSR Green LED	
MSR Red LED	2 23	MSR Yellow LED	
+5 Vdc	3 22	MSR Data	
+8.5 Vdc	4 21	SLP Signal	
SLP SW N/C	5 20	SLP SW N/O	
-6 Vdc (SLP)	6 19	-12 Vdc	
Gnd	7 18	+SLP Detect Field	
Step Row Counter	8 17	-Gate SLP Depress	
-POR	9 16	+12 Vdc	
-Strobe FBO	10 15	-Ack	
-MSR Read Req	11 14	+ End Screen	
SLP Read Req	12 13	-Feature Response	



453 MSR/SLP Cross-Connector Circuits (not a land pattern) (2 of 2)



460 SYSTEM CABLE

461 CUSTOMER SYSTEM CABLE SIGNAL QUALITY CHECK

CAUTION

All of the work stations will be taken offline while the customer system cable signal quality check is being performed.

The customer system cable signal quality check is a *controller diagnostic procedure*. Information on this signal quality check is located in the controller documents.

462 STATION PROTECTOR

See the *IBM 5250 Information Display System Planning and Site Preparation Guide, GA21-9337*, for detailed information.

The station protector is owned and maintained by the customer. Only two station protectors should be connected to any one port.

Disconnecting the cables to the station protector will disconnect the stations from the system.

DANGER

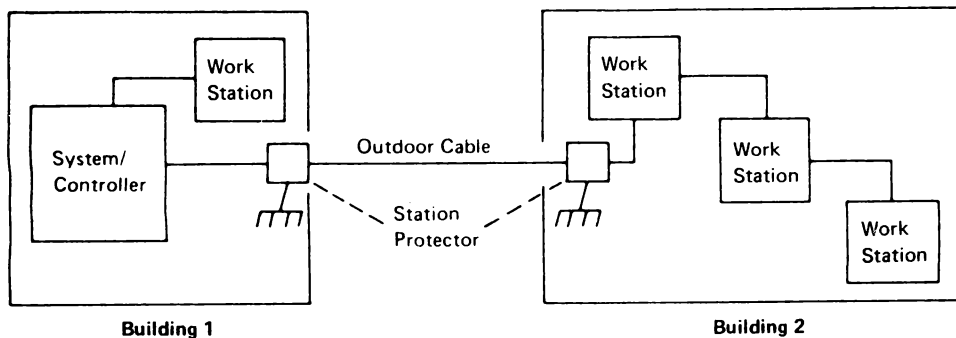
Never handle cables or connectors during an electrical storm.

Service Aids

CAUTION

This service aid is for *temporary* use only. Do not leave the station unprotected.

If you have difficulty isolating the failure to the station protector, you can temporarily bypass the station protector by using the adapter (part 7362230, or a similar part).



463 CABLE ASSEMBLY PROCEDURES

The assembly and maintenance of the customer system cable is performed by the customer. However, if aid is requested, use the procedures in the *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337, to assemble the cables.

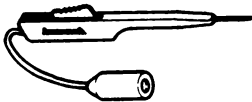
Tools and Test Equipment

The following tools and test equipment are needed to service this display station:

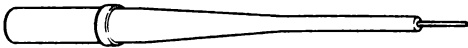
1. CE general logic probe (part 453212) and extender cable (part 453605).
2. Standard CE tool kit

This kit contains tools that are normally used by the customer engineer including the following:

Mini-probe (part 453718) (This is a signal probe only. Do not use for power voltage checks.)



High-voltage probes, red (part 1749249) and black (part 1749250).



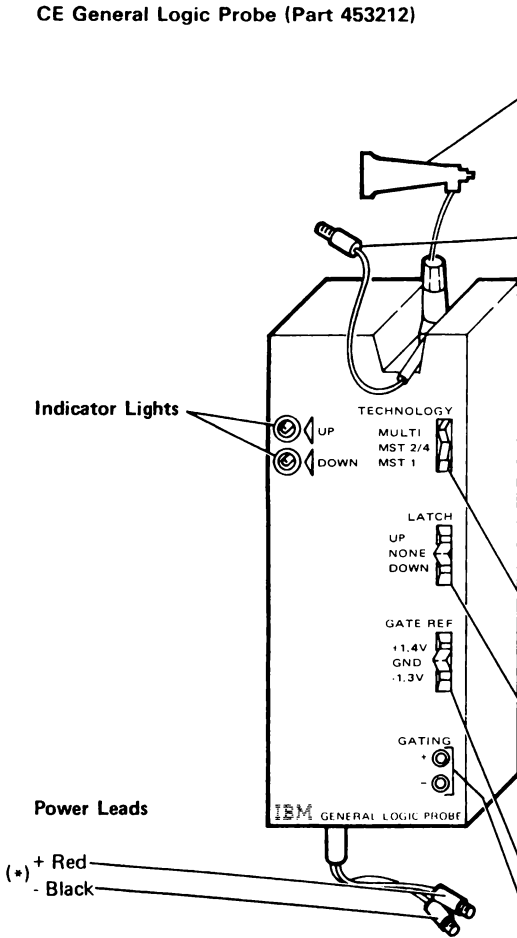
Miniature potentiometer adjusting tool (part 1864853).

3. Metric tool kit

You can order a kit of metric tools from Mechanicsburg by ordering bill of material 1749235.

Note: In the display station, all metric fasteners are blue.

CE General Logic Probe (Part 453212)



Test Terminal

Connect the line being probed to this terminal.

Note: To avoid wrong results, do not place the probe near the high-voltage transformer or near the small diameter part of the cathode-ray tube.

Ground Lead

Connect this lead to any signal ground near the probe point.

CAUTION

Wrong results will occur if this lead is connected to frame ground.

Wrong results will occur if this lead is not connected to the signal ground.

Note: In order to avoid wrong results, do not place this probe near the high-voltage transformer or near the small diameter part of the cathode-ray tube.

Technology Switch (MULTI)

Use the Multi setting for the display station.

Latch Switch (None)

The Up position allows the Up light to be latched on a positive pulse. The Down position allows the Down light to be latched on a negative pulse. The None position resets the lights and prevents any latching action. The None position is used for most probing within the display station.

Gate Ref Volts Switch (GND)

Set the Gate Ref switch to ground (GND).

Gating Terminals

You do not need to use these terminals to probe within the display station.

Power Leads

- (*) + Red
- Black

*Connect the red lead to +5 Vdc and the black lead to Gnd test points on the base or display planar (see 121 and 122).

A voltage difference ranging from 4 Vdc to 12 Vdc is needed to power the probe. The black lead is always the most negative.

Overview

The 5292 Color Display Station is an interactive data entry and command interface to the attaching data processing system. Communication between the display station and the attaching system is made in the same format and by the same protocol used in all the IBM 5250 Information Display System. The difference between the 5250 display stations and the 5292 Color Display Station is that the 5292 Color Display Station can display up to seven colors. In this section, the basic operation of each of the FRUs and of the color circuits will be described. For more information, see the *IBM 5250 Information Display System Functions Reference Manual* and the *IBM 5251 Display Station Models 1 and 11 Maintenance Information and Maintenance Analysis Procedures Manual, Theory* section.

Keyboard Logic

The keyboard assembly contains the key modules, the pad matrix, and logic PC board. The key modules, including the keytops, are the physical switches the operator presses. When a key is pressed, it makes an electrical signal at a discrete location on the pad matrix by capacitive coupling.

The logic compares the key matrix locations to the matrix addresses received from the planar microprocessor.

The microprocessor converts that address to a scan code. The scan code moves through the display station to the controller. The controller interprets and converts the scan code to the character code comparable to the graphic on the keyboard. The keyboard identification (described next) specifies the language to which the character code is to be interpreted. The language specified by the keyboard ID must be the same as the language active on the system.

Typamatic keys are sensed and sent by the microprocessor through the display station to the controller. The typamatic key operation rate is 10 to 15 operations per second (600 milliseconds first cycle time).

The Shift and Shiftlock keys generate a break code pulse. The break code pulse indicates a change in shift status to the controller.

Keyboard Identification

A 4-bit identification (ID) code is sent to the controller on request. The ID code identifies the keyboard to the controller. The ID code is determined by jumpers on the keyboard logic printed circuit board. The ID code informs the microprocessor which country (language group) the keyboard represents. The ID code can be displayed on the status line by entering the offline select mode (415). See 413 to view the keyboard ID. A list of the keyboard ID codes is contained in *313 Keyboard Jumpers*.

Base Planar

The base planar contains the logic and circuitry for the keyboard adapter, cable adapter, and main processing unit.

Cable Adapter

The cable adapter includes the cable drivers, receivers, and cable microprocessor logic on the planar board; this logic handles the incoming and outgoing communications between the controller and the display station.

16-Bit Frame: Communication between the controller and the cable adapter at the display station is carried by 16-bit frames that are sent to and from the controller as needed. The system cable carries no signal between frames.

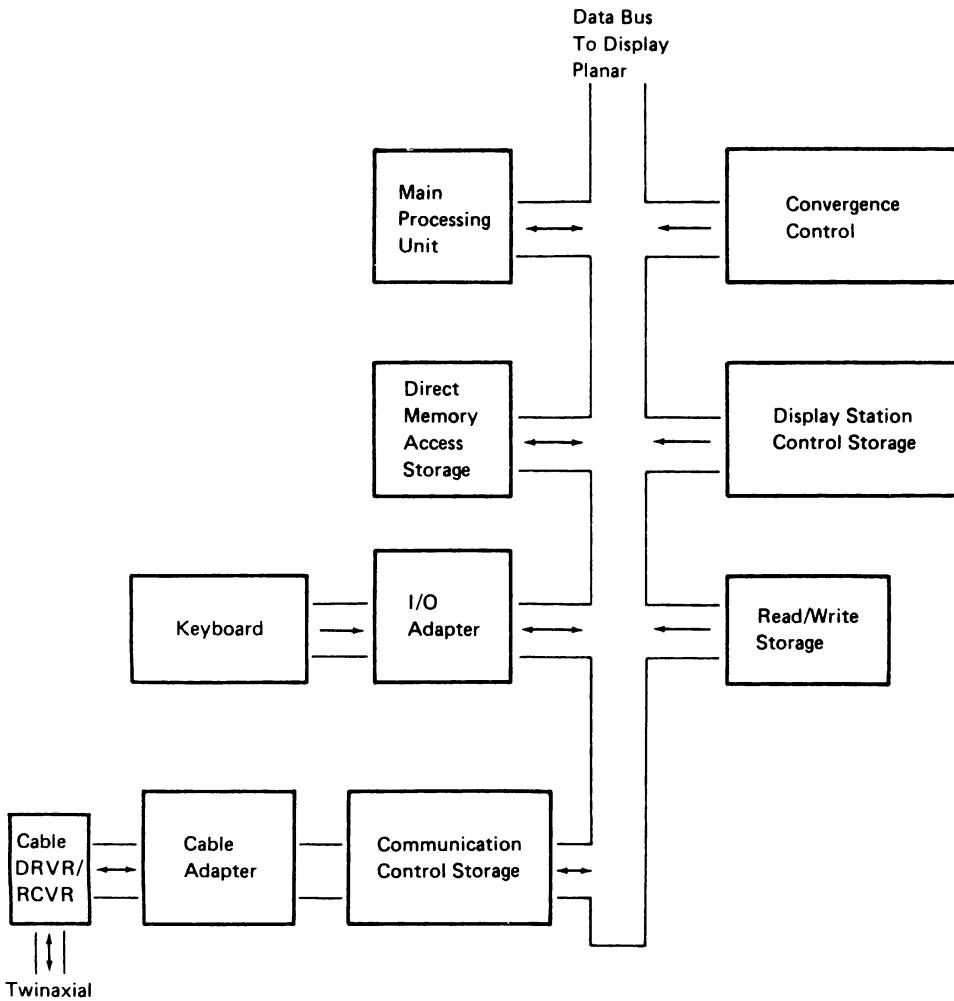
To understand the transmission of data on the system cable, see the controller documentation.

Microprocessing Unit

The microprocessing unit (MPU) is the control center of the display station. The MPU receives data from the keyboard and from input/output controls. The MPU controls the displaying of data, and the flow of information to and from the controller. It is a processing unit that is microprogram controlled and performs internal machine operations such as testing and comparing data, checking for machine errors, operating the I/O devices, and storing and getting data from read/write storage.

The major parts of the MPU are read/write storage, read-only storage, storage registers, work registers, and ALU (arithmetic and logic unit).

Base Planar Flowchart



Display Planar

The display planar contains a refresh buffer, translate table, character generator, convergence storage, attribute control logic, and other CRT control and interface logic. The data bus is the communication link between the base planar and display planar. The refresh buffer is updated with the same data at the same time as the regeneration buffer on the main planar. However, the refresh buffer is separate from the regeneration buffer to permit the CRT to be refreshed without action by the main processor.

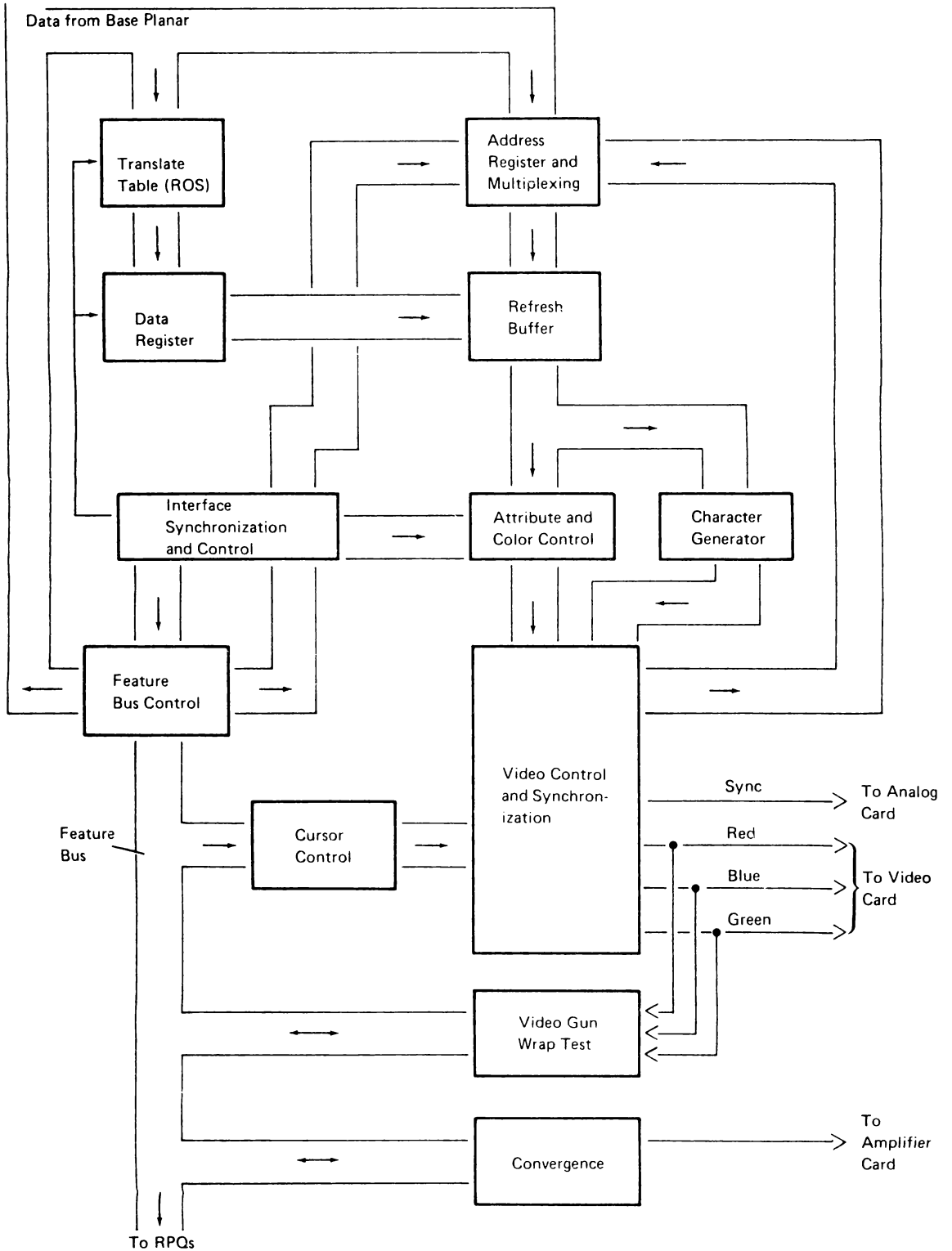
The data received from the base planar is converted to a dot pattern by the character generator. The dot pattern is then shifted into the video signal which is synchronized with the CRT sweep circuits on the analog card.

Color convergence is controlled by values stored permanently in a battery-powered RAM module. When the display station is first set up, convergence values are loaded into the battery-powered RAM from the convergence ROS on the base planar. When the convergence procedure is performed, the new values are stored in the battery-powered RAM. The new values remain stored until changed by performing the convergence procedure.

The video signals from the display planar are sent to the red, blue, and green cathodes of the CRT. The convergence signals are sent to the convergence coils on the neck of the CRT via the amplifier card.

A switch block is located on the planar to permit the selection of different languages (361).

Display Planar Flowchart



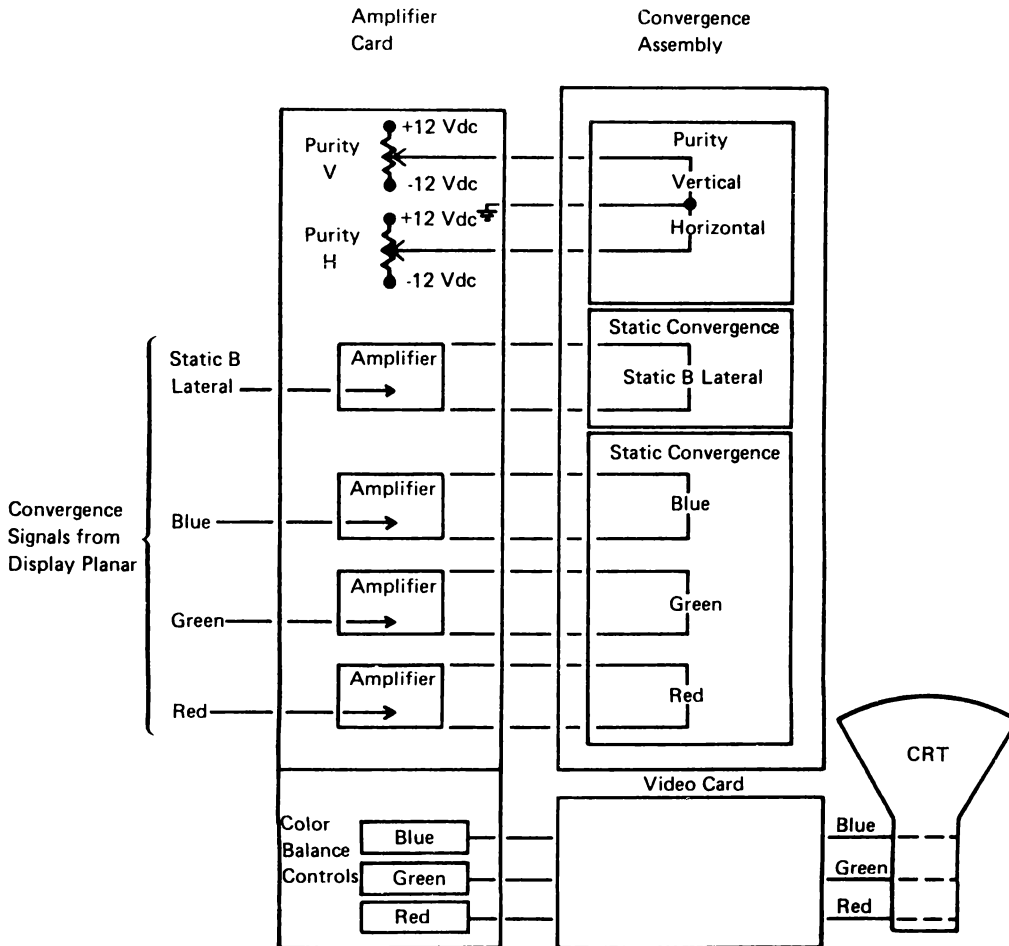
Amplifier Card

The amplifier card contains the convergence amplifiers and the color balance and purity controls.

The convergence amplifiers increase the amplitude of the four convergence signals from the display planar to drive the coils on the convergence assembly.

The six color balance controls on the amplifier card (R, B, G, MIN, and MAX) are used along with the brightness control to set the brightness levels for each of the three basic colors.

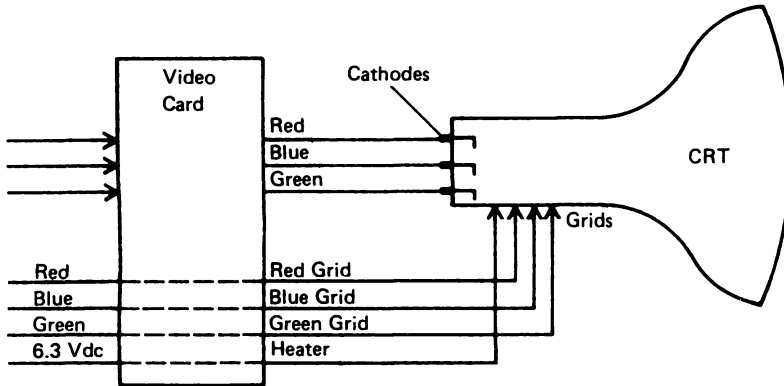
The two color purity controls, H Purity and V Purity are used to adjust each of the three basic colors for an even shade over all the screen.



Video Card

The video card receives three video signals, one for each of the basic colors, from the display planar. The three video signals are increased to drive the CRT cathodes (sometimes named *guns*).

The CRT heater supply and grid voltages (brightness) are connected to the CRT cathode through the video card.



Analog Card

The analog card generates the horizontal and vertical deflection drives to the CRT yoke and generates the voltages for CRT control. A list of the voltages generated by the line output transformer (LOPT) in the horizontal drive circuit and where they are used follows:

DC Voltage	Used
±25	Deflection amplifiers
+12 Vdc LOPT	Display planar
+70	Video card
-150	Brightness control/intensity override switch
+400	CRT focus circuits
+6 K	CRT focus circuits
+25 K	CRT anode
+6.3	CRT heaters

At power-on, + and -5 Vdc, +8.5 Vdc, and +103 Vdc are received from the power supply card. The horizontal drive circuit on the analog card then generates the voltages listed above and supplies an LOPT sense signal to the power supply card. The CRT anode high voltage is present in about 40 seconds from power-on.

Horizontal and Vertical Deflection Circuits

A vertical timebase circuit supplies the timing for the vertical drive and north-south (N-S) pincushion circuits. The vertical drive circuit amplifies the sum of the vertical timebase and pincushion signals to supply the drive current to the vertical deflection coils in the CRT yoke assembly.

The horizontal timebase circuit (sometimes named the horizontal oscillator) supplies the timing for the horizontal drive and E-W pincushion circuits. The horizontal drive circuits generate the drive current to the horizontal deflection coils in the yoke assembly, and it also supplies the CRT anode voltage, the CRT control voltages, and the LOPT sense signal for the power supply card.

The purpose of the pincushion circuits is to correct for the distortion caused when the electron beam from the CRT cathode scans across the almost flat screen. To correct for this effect, the N-S pincushion circuits correct the vertical deflection signals, and the E-W pincushion circuits correct the horizontal deflection signals. The following figure shows the correction needed for the variation in the scan time (distance) of the electron beam.

The horizontal and vertical sync signals from the display planar maintain synchronization of the drive circuits.

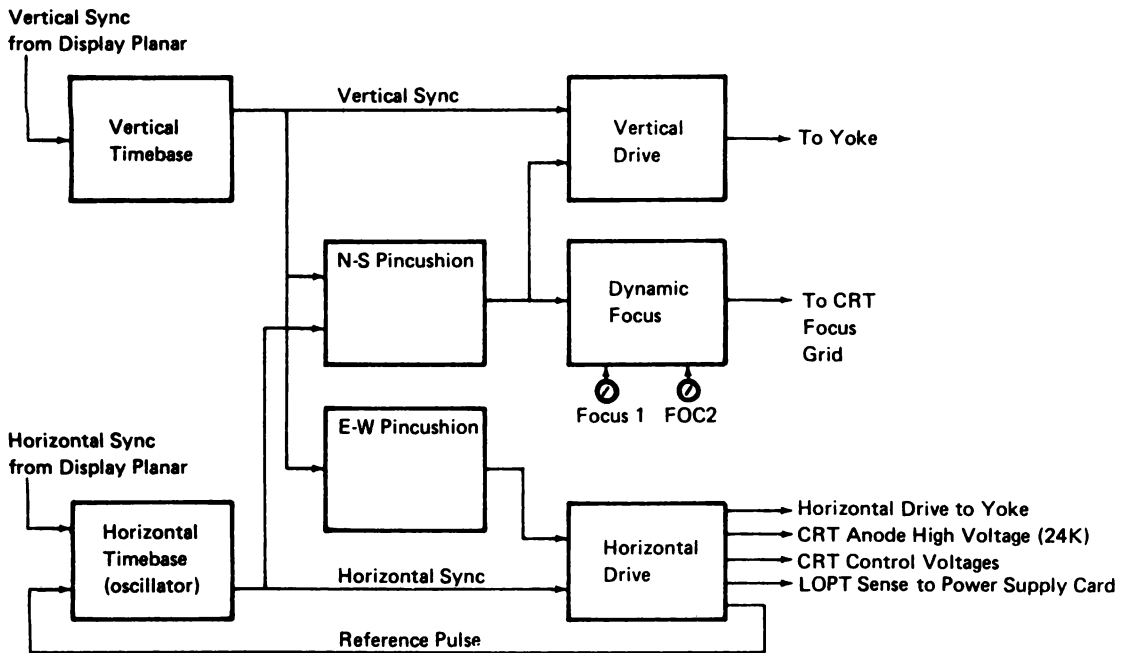
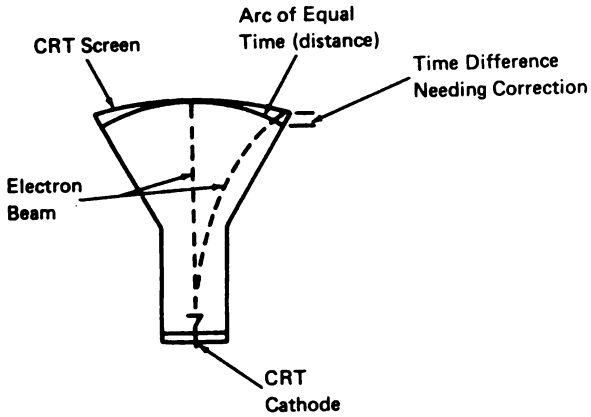
Focusing

A dynamic focus circuit is used to maintain a distinct image on the display screen. This circuit maintains the DC level and the AC signal amplitude of the waveform on the CRT focus grid at a constant level. The level and amplitude are determined by the setting of the Focus 1 and FOC2 controls.

CRT Protection Circuit

The CRT protection circuit controls the electron beam current to prevent damage to the CRT elements and phosphor screen. During the approximately 27-second warmup period, the electron beam is inhibited (the screen is blank). Also, if the vertical or horizontal scan circuits are not operating, or if the electron beam current is too high, the protection circuit will inhibit the electron beam.

Pincushion Effect



CRT and Yoke ✓

The CRT and yoke are bound together to form an integrated assembly. The yoke assembly contains the horizontal and vertical deflection coils for controlling the electron beam scan across the CRT screen. The signals from the analog card drive the deflection coils and yoke coils. These signals control the size and position of the data on the screen. The adjustments for these signals are on the analog card.

The CRT screen is made up of dots having three color phosphors. These phosphors emit red, green, and blue light when they are hit with an electron beam. A combination of these three primary colors generates all other colors.

Red and green = yellow
Red and blue = pink
Green and blue = turquoise
Red, green, and blue = white

There are three cathodes and three sets of control grids in the CRT to make and control the three primary colors. The color circuits on the amplifier card send signals to the cathodes and control grids to make the desired color on the screen. To ensure accurate color generation, color balance, purity, and convergence adjustments are supplied. The balance and purity adjustments are located on the amplifier card. The convergence adjustments are made from the keyboard and convergence assembly. The entry from the keyboard changes the convergence values in permanent storage located on the display planar. These values are then read out of storage in synchronization with the scan of the electron beam. The convergence values are used to control the current to the coils in the convergence assembly which accurately direct the electron beam to the correct dot on the screen.

Power Supply Card

The power supply is a switch mode power supply. Its circuits switch the line voltage at approximately 15 kHz, using pulse-width modulation. The modulated voltage is sent to the primary windings of the power transformer. The outputs from the secondary windings are converted to generate six DC voltages.

±5 Vdc	Planars, analog card, amplifier card, and video card
+8.5 Vdc	Planars, video card, analog card, and convergence assembly
±12 Vdc	Convergence assembly and light pen feature
+103 Vdc	Analog card

The AC voltage input to the power supply may be either of the following, as required by the power supply:

115 (90 to 137) Vac, 50 or 60 Hz
220 (180 to 260) Vac, 50 or 60 Hz

Overvoltage Protection: The output voltages are not sensed directly, but a signal from the analog card, named LOPT, indicates a change in voltage or other circuit failure. An automatic retry circuit is activated if an overvoltage or overcurrent condition is found. The retry circuit will attempt up to 6 retries at one per second to recover from the failure. If the problem continues, the retry circuit then turns off the power supply. An audible sound can be heard for each retry.

Additional protection is supplied by a fuse on the power supply card. This fuse is in series with the input to the power transformer. If this fuse fails, the power supply card must be replaced.

Audible Alarm

The audible alarm is used to warn the operator of the following conditions:

1. The successful completion of the power-on diagnostics after turning on the display station.
2. Diagnostics error conditions.
3. The detection of an error is found by the system. An error code will be displayed.
4. A message from the system or another work station is present. The Message Waiting indicator will be on.

The diagnostic program activates the alarm for about 150 milliseconds upon successfully completing the power-on diagnostics and before entering the production microcode. After entering the production microcode, the alarm is only activated by a 'write control data' command from the system. The alarm sounds for about one second for each 'write control data' command.

The loudness (volume) of the alarm is controlled by the keyboard, using option 8 in the online select mode (414).

Alarm Burst Modes

The alarm has two burst modes. The single burst mode emits one burst per mode interval. The double burst mode emits two bursts per mode interval. The mode interval is repeated for as long as the alarm condition is present.

Brightness Control/Intensity Override Switch

The brightness control adjusts the brightness of the data on the display screen.

The override switch is activated when the control is turned to the farthest minimum limit (see 127). The switch, when on, supplies a display of the CRT raster.

KEYLOCK RPQ

The Keylock RPQ may be installed on the display station for data security.

When the keylock is in the locked position, the display station screen is blank except for the system indicators and cursor. Data displayed at the time the keylock is changed to the locked position is controlled by the application program. Keyboard data entered while the keylock is in the locked position will not be displayed by the display station.

The keylock can be in either the locked or the unlocked position, and the power-on diagnostics still operates the same.

MAGNETIC SLOT READER RPQ

The Magnetic Slot Reader (MSR) reads magnetic stripes on documents such as credit cards or identification cards.

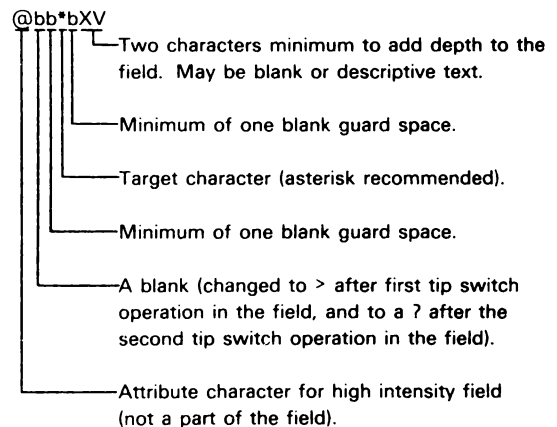
The MSR contains a photocell, a reading head, and an amplifier. The photocell detects a document and prepares the MSR adapter to receive the 5 bit (4 data bits and 1 parity) numeric data from the MSR. As the data is read from the document, it is stored on the MSR card. Up to 128 bytes (125 data bytes plus the SOM, EOM, and LRC characters) can be stored. The MSR card circuits checks for an error condition and sets the error bit on in all data bytes if an error is found. Error conditions checked are:

- No SOM, EOM, or LRC characters
- A parity error
- A speed check or LRC check error

The MSR is owned and maintained by the customer, but the adapter card is maintained as part of the display station.

SELECTOR LIGHT PEN RPQ

The Selector Light Pen (SLP) permits the operator to select the desired fields displayed on the CRT. By using the light pen, the operator can select the fields without the use of the keyboard. The fields selected by the operator must be designed as light pen input fields by a field control word. For correct operation, the following format and guidelines should be used for identifying light pen input fields:



A good guideline is to have only one light pen field per display line. If two or more light pen fields must be on the same display line, place them as far apart as possible. Other input fields or bypass fields may be on the same line.

Operation

The light pen hardware consists of the light pen wand and the light pen logic card.

When the tip switch is activated by pressing the light pen against the face of the CRT, white dashes appear over the character. The light emitted by the dashes is bright enough to be above the threshold value of the light pen photocell. The photocell then sends a signal to the adapter card.

Parts Catalog

PARTS CATALOG



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I

HOW TO USE THIS PARTS CATALOG 6-5

CATALOG SECTION 6-7

Figure 1. Final Assembly	6-9
Figure 2. Base Assembly	6-10
Figure 3. Base Assembly	6-13
Figure 4. Base Assembly	6-14
Figure 5. Base Assembly	6-16
Figure 6. Keyboard Assembly	6-18
Figure 7. CRT Assembly	6-20
Figure 8. Feature Stiffener Assembly	6-21
Figure 9. Line Cord Chart	6-22
Figure 10. Cable Index	6-23

NUMERICAL INDEX 6-24

Quick Reference FRU List

CRT & Yoke	4423392
Video Card	5147216
Analog Card	5147080
Amplifier Card	5149461
Amplifier Card Fuse (2A 3AG 250V)	855231
Convergence Coil Assembly	4423397
Base Planar	7363458
Display Planar (U.S./Canada)	2767929
Display Planar (Multinational)	7267928
Display Planar (Katakana)	2767930
Power Supply Assembly (110V)	5147291
Power Supply Assembly (220V)	5147509
Power Supply Assembly (220V—S. Africa, Finland, Austria)	5147233
Fan Assembly (110V)	4176243
Fan Assembly (220V)	4176240
Fuse (110V) 4A SB	1143492
Fuse (220V) 2A SB	615683

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HOW TO USE THIS PARTS CATALOG

PART 1

To find parts quickly, a general understanding of the structure of this catalog is necessary. The catalog is divided into three major sections:

- The Visual Index, containing overall views of the machine, with call-outs pointing to detailed figures.
- The Catalog Section, containing a pictorial breakdown of assemblies and subassemblies.
- The Numerical Index, which is a numerical list of all parts used in the machine, with cross-references to the figure on which the part is found.

VISUAL INDEX

The Visual Index, located before the Catalog Section, contains a reduced illustration of every figure in the Catalog Section. The reduced illustrations are tied together with flow arrows to form a natural progression from large assemblies to small assemblies and possibly subassemblies. In effect, a visual table of contents is formed by the Visual Index illustrations.

CATALOG SECTION

The Catalog Section contains the full-sized illustrations previously noted in the Visual Index. Index numbers on figures refer to corresponding entries in the Group Assembly Parts List accompanying each figure. Refer to part II for explanation of terms used in the Group Assembly Parts List.

ATTACHING PARTS LIST

The Attaching Parts List contains common screws, nuts, washers, etc. that are used in the machine. Index numbers for attaching parts are on the illustration, and the description is in the Attaching Parts List.

NUMERICAL INDEX

The Numerical Index is located after the Catalog Section and contains a complete list, in numerical order, of all part numbers used on the machine. Listed with the part number is the index and figure number on which the part is illustrated. The numerical index makes it possible to locate a part when only the part number is known.

STACKED INDEX NUMBERS

Stacked Index numbers are used when showing a part and its attaching hardware. The sequence of a typical stack is shown at the right. The circled index number indicates the assembly is broken down within the figure.

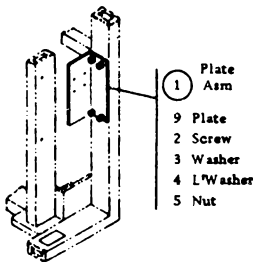


ILLUSTRATION NOTES

Cross-reference notes are directly on the illustration. The illustration's next higher assembly reference, normally located in the upper left corner of the page will read: "For Parts Not Shown See Figure X". If an assembly is referenced to a lower level figure, the note located next to the index number will read: "5 See Figure X."

DOUBLE LINED DETAIL BOX

The double lined box differentiates between parts shown on the basic model and parts related to a level and/or feature difference. An explanation of the level or feature difference is given in the double lined box.

FINDING A PART

The Visual Index is the starting point for locating a part. The illustrations in the Visual Index are reduced versions of all illustrations in the Catalog Section; therefore, the illustrations can be used to find the assembly containing the desired part. Use references to the detailed figure in the Catalog Section, or to another Visual Index illustration, to determine location of part number.

Once the detailed figure in the catalog section is determined, finding the part on the figure and referring to the listing for the part number and description is all that is required in most cases. If the first catalog section figure referenced shows the assembly containing the required part, the index number for the assembly will reference a lower-level figure where the assembly is broken down to its component parts. If the figure referenced by the Visual Index contains neither the part nor an assembly containing the part, it is then necessary to go to the next higher assembly figure. This figure should then contain the part or an assembly containing the part; if not, an even higher level figure must be used. Refer back to the Visual Index for some other figure that could show the desired part.

Note: Many detailed parts are unavailable, because they are part of an inseparable assembly (two or more parts welded or bonded together), or because they are part of an assembly purchased as a unit. If parts are found on a welded or bonded assembly, the following note follows the description of the assembly: "Assembly components are not replaceable." If the part is found on a purchased assembly, and the detail parts of this assembly do not have IBM part numbers, the note following the assembly description will read: "Assembly components are not available." In either case, you need to obtain the part number of the assembly, rather than the detailed part.

EXAMPLE FOR ORDERING PARTS

FIGURE INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 25			
			1	2	3	4
25	2592881		FAN ASM. 90 HZ FOR NEXT HIGHER ASM SEE LIST 23 ADD FOR ILLUSTRATION SEE FIG. 25			
- 1	2172160	1	-	-	-	GUARD
- 2	2591431	AS	-	-	-	BEARING
- 3	2591431	1	-	-	-	TERMINAL
- 4	2591431	1	-	-	-	FAN ASM.
- 5	2592881	1	-	-	-	90S TERMINAL
- 6	1122111	1	-	-	-	CONNECTION
- 7	1190114	1	-	-	-	TERMINAL
- 8	2591431	1	-	-	-	FAN
			FOR ATTACHING PARTS, INDEX NOS. 1-8 ADD ABOVE SEE LIST 23			

If the entire fan is required, part number 2592881 should be ordered (all one dot items will be received). If only the subassembly is required, part number 2591431 should be ordered (all two dot items will be received). Each part may be ordered individually.

Note: If you order a part that requires a label, make sure you order the label in the correct language. For example: A part of a Quebec machine should have a French Canadian language label rather than a French language label.

HOW TO USE THIS PARTS CATALOG

Part II

- A** *AR*
As Required (AR) in the units per assembly column denotes that the quantity is used as required.
- B** *ATT PT*
Attaching Parts: These parts are used to attach a subassembly to an assembly. The attaching parts are listed in the last list just before the numeric index. Special attaching parts are listed with the figure.
- C** *INDENTURE*
The relationship of a part to its next higher assembly is indicated by indentures. For example:

1 2 3 4

Unit

Assemblies and Detail Parts of Unit

Attaching Parts for Assemblies & Detail Parts

Subassemblies

Attaching Parts of Subassemblies

Detail Parts for Subassemblies, etc.

- D** *NR*
The NR in the part number column denotes the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.
- E** *NP*
The entry NP in the part number column denotes the assembly is non-procurable and the detail parts should be ordered separately.
- F** *NO NO.*
When this indication appears in the part number column, it denotes a group of parts for which no assembly part number has been assigned, and the detail parts should be ordered separately.

EXAMPLE OF PARTS LIST

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 5			
			1	2	3	4
F 5	D NO NO.	C	BEZEL AND OPERATOR PANEL ASM FOR NEXT HIGHER ASM SEE FIGURE 1-4 AND FOR ILLUSTRATION FIGURE 5			
- 1	7362008	1	• BRACKET,LED AND SWITCH			
- 2	2767289 NR	1	• POTENTIOMETER			
- 3	7362248	1	• POTENTIOMETER			
- 4	7362263	2	• KNOB ASM			
- 5	2397045	5	• LED LIGHT			
- 6	7362200	1	• BLOCK,LED			
- 7	2632773	AR	• CLIP			
- 8	1608427	2	• SCREW,THD FORM-HEX WSHR HD 6-19 X 1/2 LG			
- 9	7362158	1	• CABLE ASM,CE DIAG IND AND SWITCH			
- 10	7361265	1	• CABLE ASM,AC DISTRIBUTION			
- 11	1608571	1	• SWITCH			
- 12	7362254 NP	1	• BEZEL,ENGLISH			
- 12	7362255 NP	1	• BEZEL,FRENCH			
- 12	7362256 NP	1	• BEZEL,JAPANESE			
- 12	7362257 NP	1	• BEZEL,SPANISH			
- 12	7362258 NP	1	• BEZEL,GERMAN			
- 12	7362259 NP	1	• BEZEL,ITALIAN			

E

CATALOG SECTION

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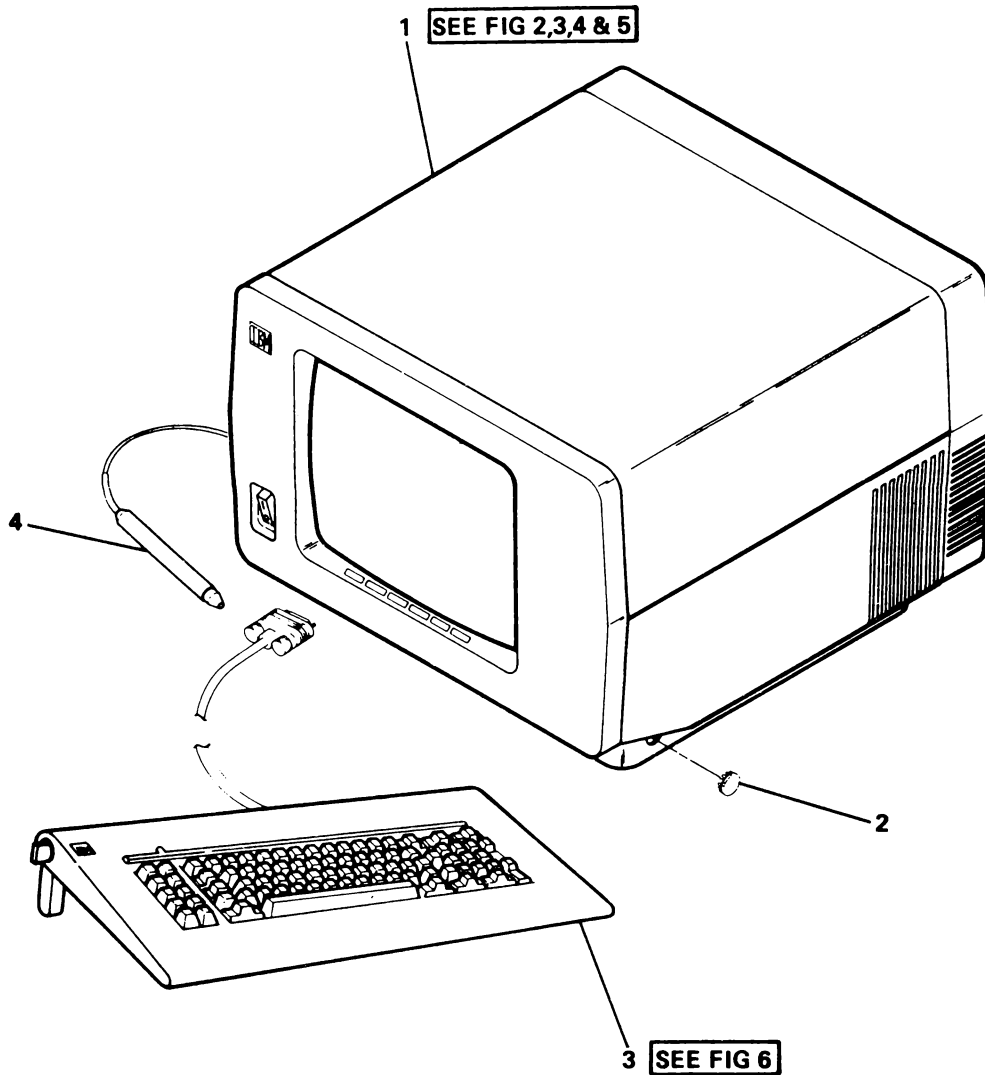


FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 1			
			1	2	3	4
1	NO NO.		FINAL ASSEMBLY			
- 1	NO NO.	1	• Base Assembly			
- 2	4423357	1	• Keylock Plug			
- 3	NO NO.	1	• Keyboard Assembly			
- 4	4423097	1	• Light Pen Assembly (RPQ)			

FIGURE 1. FINAL ASSEMBLY.

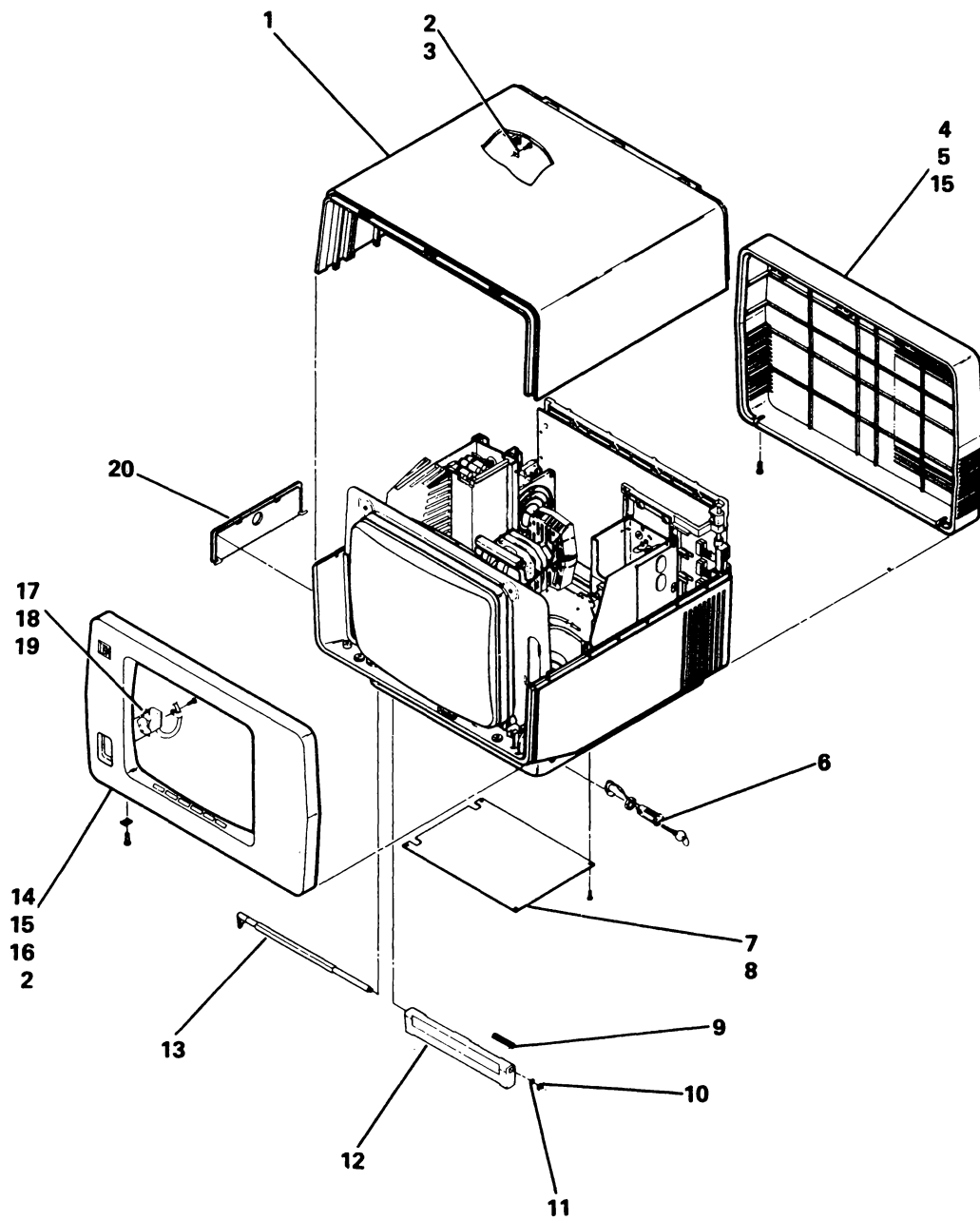


FIGURE 2. BASE ASSEMBLY. SEE LIST 2.

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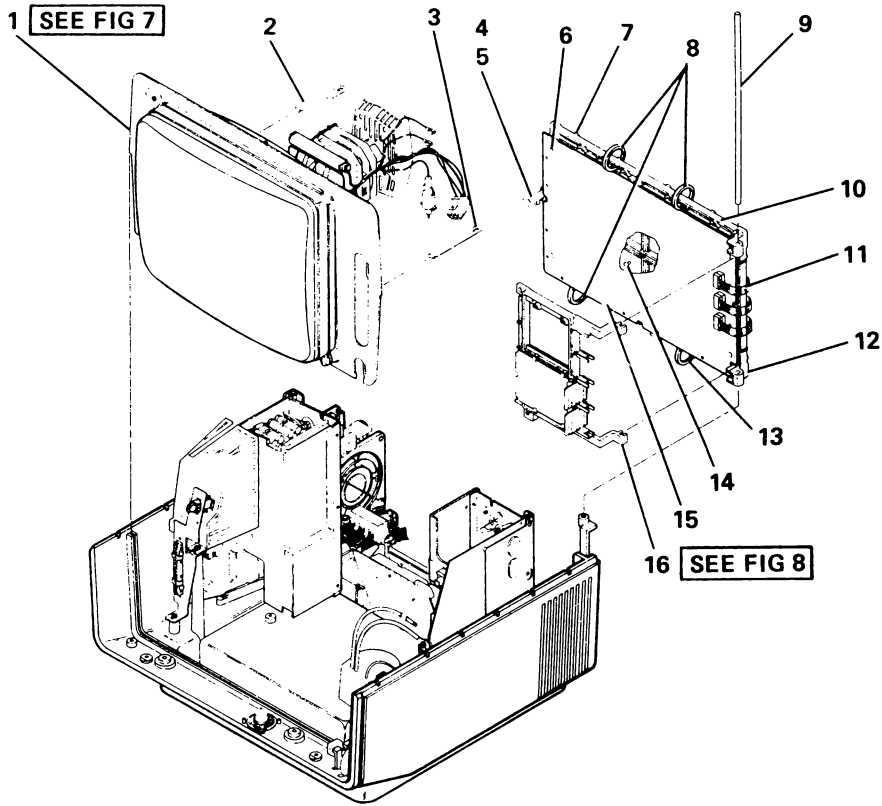


FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 3			
			1	2	3	4
3	NO. NO.		BASE ASSEMBLY			
- 1	NO. NO.	1	• CRT Assembly			
- 2	7363447	1	• Bracket			
- 3	7363446	1	• Bracket			
- 4	7362926	1	• Latch			
- 5	2461889	1	• Screw, Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 6	7362386	30	• Canoe Clip			
- 7	2767958	2	• Extended Canoe Clip			
- 8	1159913	3	• Cable Tie			
- 9	4176264	1	• Hinge Pin			
- 10	2767929	1	• Display Planar (US/Canada)			
- 10	2767928	1	• Display Planar (Multinational)			
- 10	2767930	1	• Display Planar (Katakana)			
- 11	4176263	3	• Crossover Cable			
- 12	4176268	1	• Main Stiffener			
- 13	524519	1	• Cable Tie			
- 14	8330757	2	• Bumper			
- 15	7363458	1	• Base Planar			
- 16	NO. NO.	1	• Feature Gate Assembly			

FIGURE 3. BASE ASSEMBLY.

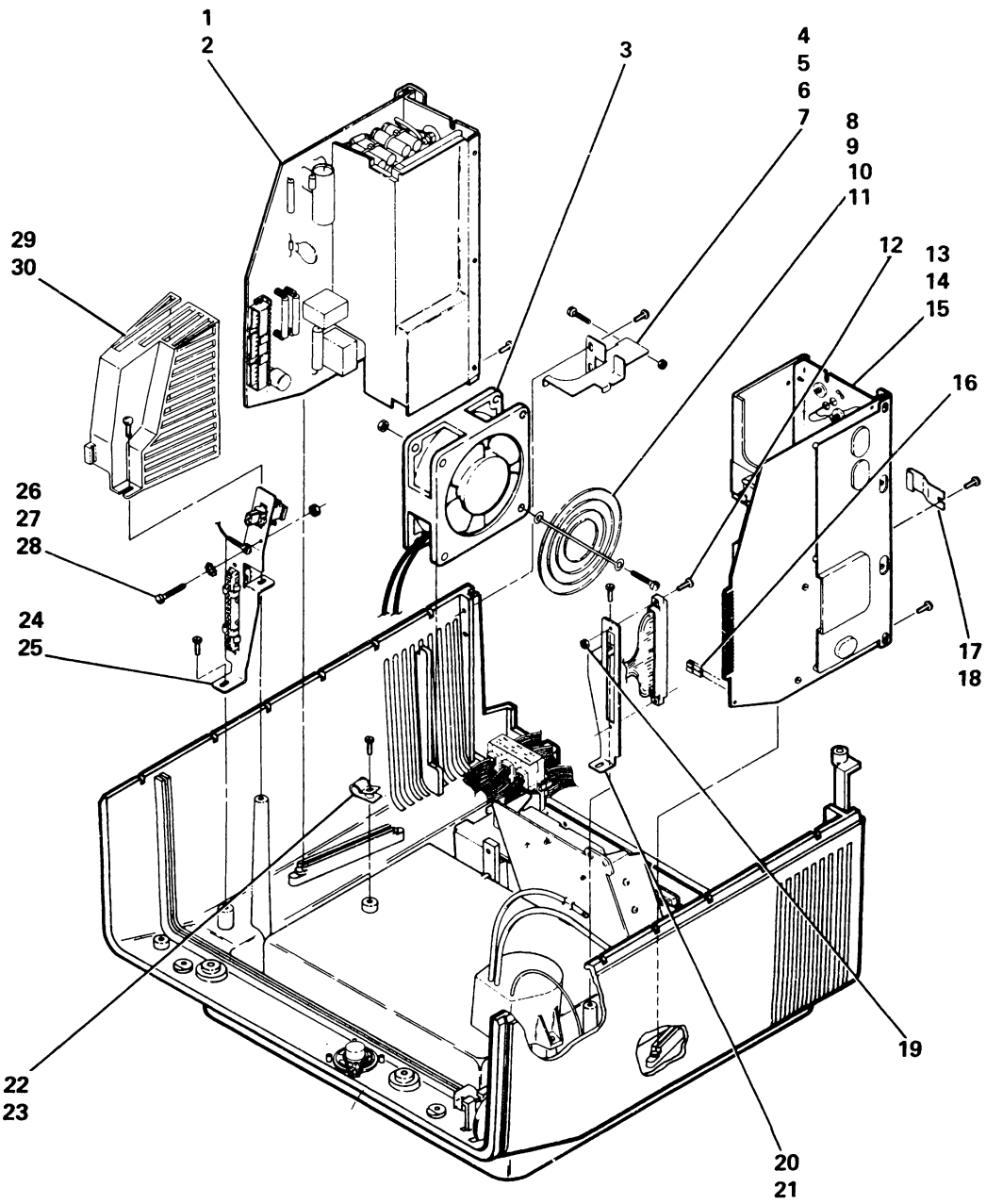


FIGURE 4. BASE ASSEMBLY. SEE LIST 4.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 4			
			1	2	3	4
4	NO NO.		BASE ASSEMBLY			
- 1	5147291	1	• Power Supply Assembly (110V)			
- 1	5147292	1	• Power Supply Assembly (220V)			
- 1	5147233	1	• Power Supply Assembly (220V) South Africa.			
- 1			Finland, Austria			
- 2	1622685	1	• Screw, (P/S Assembly To Base)			
- 3	4176243	1	• Fan Assembly (110V)			
- 3	4176240	1	• Fan Assembly (220V)			
- 4	4176270	1	• Fan Bracket			
- 5	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 5			(Fan Bracket To Base)			
- 6	1621184	1	• Screw,Mach-Slot Pan Hd M3.5 x .6 x 12 Lg			
- 6			(Fan Bracket To Fan)			
- 7	1622402	1	• Nut,Hex-Double Chamfer M3.5 x 6 Fl W x 2.8 Thk			
- 8	2546641	1	• Fan Guard			
- 9	1621184	2	• Screw,Mach-Slot Pan Hd M3.5 x .6 x 12 Lg			
- 10	1622402	2	• Nut,Hex-Double Chamfer M3.5 x 6 Fl W x 2.8 Thk			
- 11	2767931	1	• Shield (220V Only)			
- 12	1621173	2	• Screw,Mach-Slot Pan Hd M3 x .5 x 12 Lg			
- 13	1621190	1	• Screw,Mach-Slot Pan Hd M4 x .7 x 8 Lg (Ground)			
- 14	1622685	1	• Screw (Analog Card to Base)			
- 15	5147080	1	• Analog Card Assembly			
- 16	1650667	1	• CRT Heater Jumper			
- 17	4420437	1	• Clip			
- 18	2549531	1	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 19	1622401	2	• Nut,Hex Double Chamfer M3 x 5.5 Fl W x 2.4 Thk			
- 20	4176272	1	• Analog Card Assembly Mounting Bracket			
- 21	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 22	101922	1	• Clamp			
- 23	2549531	1	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 24	4176273	1	• Power Supply Assembly Mounting Bracket			
- 25	2549531	1	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 26	1622402	1	• Nut,Hex-Double Chamfer M3.5 x 6 Fl W x 2.8 Thk			
- 27	1622345	1	• Washer,Lock-Ext Star 3.7 ID x 7 OD x .4 Thk			
- 28	1621182	1	• Screw,Mach-Slot Pan Hd M3.5 x .6 x 8 Lg			
- 29	4176238	1	• Shield			
- 30	2461889	1	• Screw,Slot Hex Wshr Hd 8-16 x 19.05 Lg			

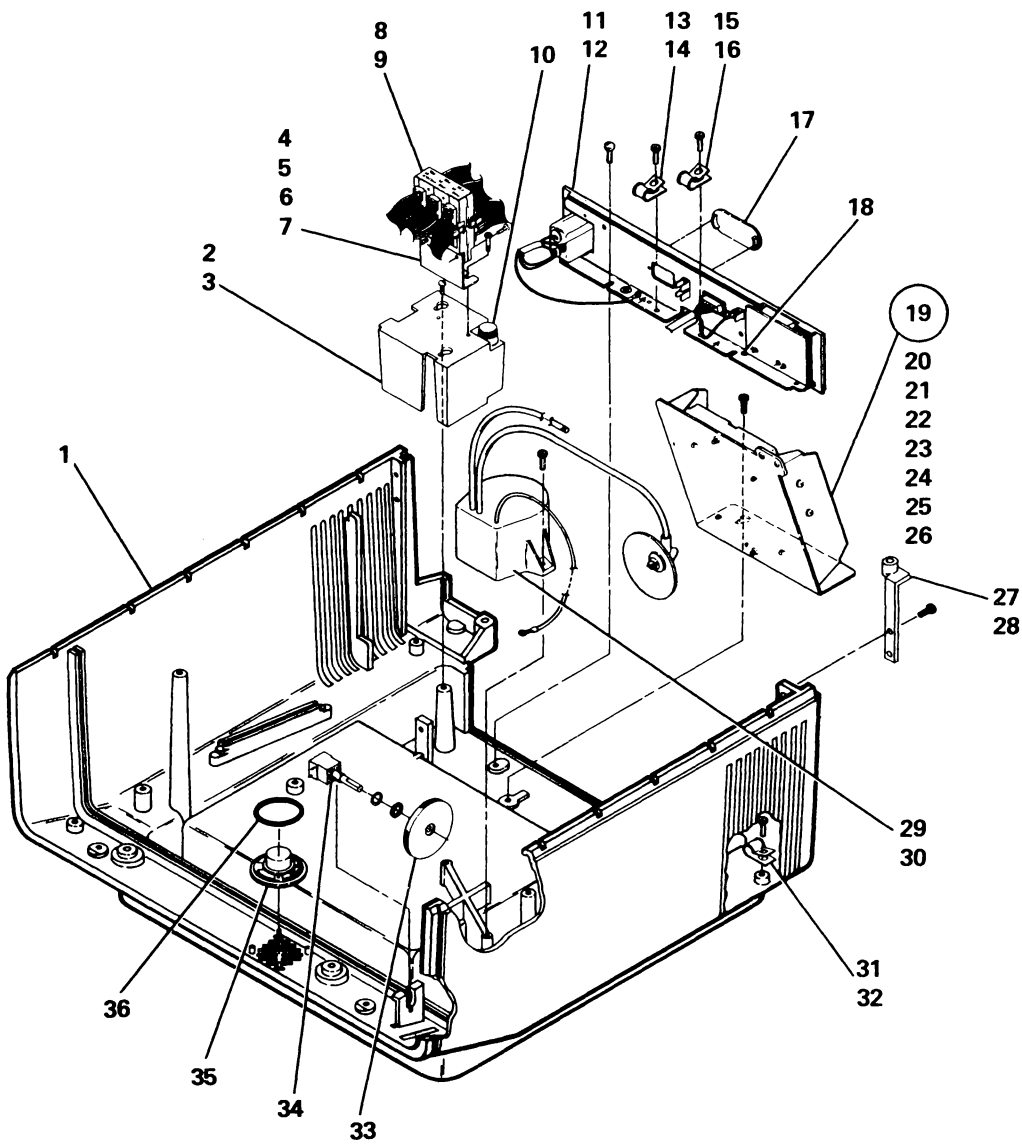


FIGURE 5. BASE ASSEMBLY. SEE LIST 5

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 5			
			1	2	3	4
5			BASE ASSEMBLY			
- 1	NO NO.	1	• Base			
- 2	4176180	1	• Line Filter Cover			
- 3	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 4	4176183	1	• Junction Block Mtg. Bracket			
- 5	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg (Bracket To Cover)			
- 6	7363480	1	• Ground Strap			
- 7	7362130	1	• Screw,Thd-Form Hex Hd M4 x .7 x 6 Lg			
- 8	4176308	1	• Junction Block Assembly			
- 9	1621193	2	• Screw,Mach-Slot Pan Hd M4 x .7 x 16 Lg (Block To Bracket)			
- 9						
- 10	1143492	1	• Fuse (110V) 4A SB			
- 10	615683	1	• Fuse (220V) 2A SB			
- 11	4176307	1	• I/O Panel Assembly (Includes Cable Thru & Keyboard Cable)			
- 11						
- 12	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 13	5213276	1	• SLP Cable Clamp			
- 14	7362130	1	• Screw,Thd-Form Hex Hd M4 x .7 x 6 Lg			
- 15	533289	1	• MSR Cable Clamp			
- 16	7362130	1	• Screw,Thd-Form Hex Hd M4 x .7 x 6 Lg			
- 17	4176277	1	• Plug			
- 18	7362130	5	• Screw,Thd-Form Hex Hd M4 x .7 x 6 Lg (Securing Cable Gnds To I/O Panel)			
- 18						
- 19	NO NO.	1	• Amp Card Assembly			
- 20	4176271	1	• Bracket			
- 21	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg (Bracket To Base)			
- 21						
- 22	5149461	1	• Card			
- 23	855231	1	• Fuse (2A 3AG 250V)			
- 24	2568709	4	• Standoff			
- 25	4423028	1	• Plastic Cover			
- 26	1621195	2	• Screw,Mach-Slot Pan Hd M4 x .7 x 25 Lg (Cover To Bracket)			
- 26						
- 27	4176262	1	• Hinge Bracket			
- 28	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 29	4423146	1	• Bleeder Assembly			
- 30	2549531	2	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 31	532393	1	• Cable Clamp			
- 32	2549531	1	• Screw,Thd-Form Hex Hd M4.5 x 1.5 x 12 Lg			
- 33	5642887	1	• Thumbwheel (Brightness Control)			
- 34	4176222	1	• Potentiometer Assembly (Brightness Control)			
- 35	4176170	1	• Speaker Assembly			
- 36	7363494	1	• 'O' Ring			

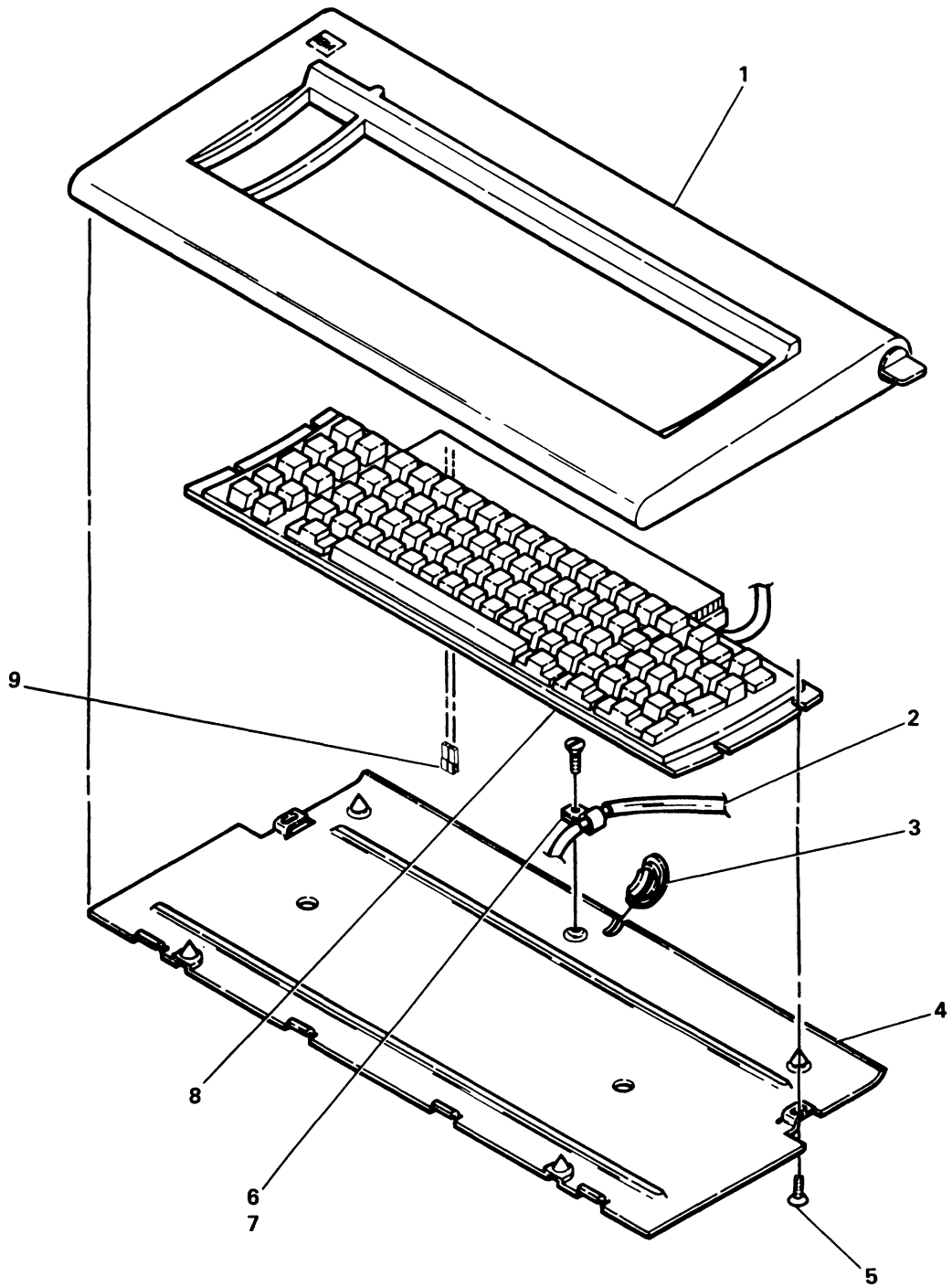


FIGURE 6. KEYBOARD ASSEMBLY. SEE LIST 6.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 6			
			1	2	3	4
6			KEYBOARD ASSEMBLY			
	4176191	1	• Keyboard Assembly (USA & Canada)			
	4176192	1	• Keyboard Assembly (Japanese/English)			
	4176193	1	• Keyboard Assembly (Denmark)			
	4176194	1	• Keyboard Assembly (Sweden & Finland)			
	4176195	1	• Keyboard Assembly (French Azerty)			
	4176196	1	• Keyboard Assembly (French/Canadian)			
	4176197	1	• Keyboard Assembly (Norway)			
	4176198	1	• Keyboard Assembly (United Kingdom)			
	4176199	1	• Keyboard Assembly (Italy)			
	4176200	1	• Keyboard Assembly (Katakana)			
	4176202	1	• Keyboard Assembly (Brazil)			
	4176203	1	• Keyboard Assembly (Spanish Speaking)			
	4176204	1	• Keyboard Assembly (French Query)			
	4176205	1	• Keyboard Assembly (Portugal)			
	4176206	1	• Keyboard Assembly (International)			
	4176207	1	• Keyboard Assembly (Germany)			
	4176208	1	• Keyboard Assembly (Belgium)			
	4176209	1	• Keyboard Assembly (Spain)			
- 1	7363227	1	• Cover Assembly			
- 2	4176297	1	• Cable Assembly			
- 3	7363014	1	• Grommet			
- 4	7363228	1	• Base Assembly			
- 5	5552875	2	• Screw, Hex Hd Thd-Form 8-16 x 9/16 Lg			
- 6	7363003	1	• Clamp (Cable)			
- 7	7362130	1	• Screw, Thd-Form Hex Hd M4 x .7 x 6 Lg			
- 8	2688831	1	• Keyboard Logic Card and Key Asm (USA & Canada)			
- 8	1761209	1	• Keyboard Logic Card and Key Asm (Japanese/English)			
- 8	1761213	1	• Keyboard Logic Card and Key Asm (Denmark)			
- 8	1761222	1	• Keyboard Logic Card and Key Asm (Sweden & Finland)			
- 8	1761215	1	• Keyboard Logic Card and Key Asm (French Azerty)			
- 8	1761206	1	• Keyboard Logic Card and Key Asm (French/Canadian)			
- 8	1761219	1	• Keyboard Logic Card and Key Asm (Norway)			
- 8	1761223	1	• Keyboard Logic Card and Key Asm (United Kingdom)			
- 8	1761218	1	• Keyboard Logic Card and Key Asm (Italy)			
- 8	1761210	1	• Keyboard Logic Card and Key Asm (Katakana)			
- 8	1761205	1	• Keyboard Logic Card and Key Asm (Brazil)			
- 8	1761208	1	• Keyboard Logic Card and Key Asm (Spanish Speaking)			
- 8	1761216	1	• Keyboard Logic Card and Key Asm (French Query)			
- 8	1761220	1	• Keyboard Logic Card and Key Asm (Portugal)			
- 8	1761217	1	• Keyboard Logic Card and Key Asm (International)			
- 8	1761211	1	• Keyboard Logic Card and Key Asm (Germany)			
- 8	1761212	1	• Keyboard Logic Card and Key Asm (Belgium)			
- 8	1761221	1	• Keyboard Logic Card and Key Asm (Spain)			
- 9	2650667	1	• Jumper			

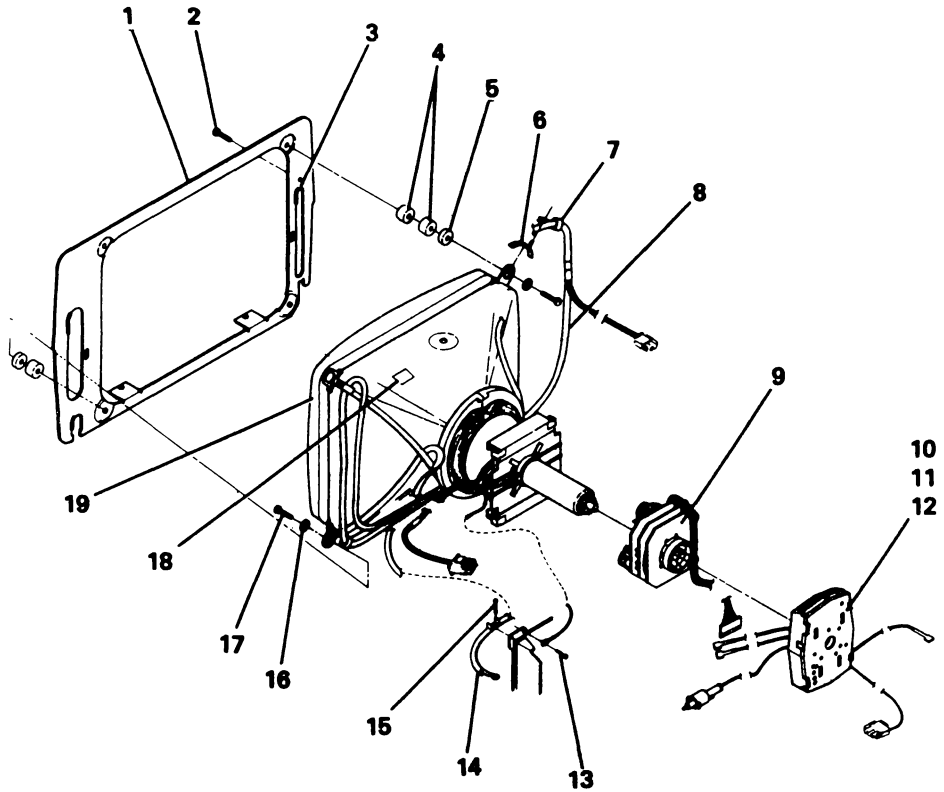


FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 7			
			1	2	3	4
7			CRT ASSEMBLY			
- 1	4176274	1	• Bracket			
- 2	7362385	1	• Screw,Thd-Form Wshr Hd M4 x .7 x 8 Lg			
- 3	730432	3	• Caterpillar Grommet (Cut To Length)			
- 4	4176258	6	• Grommet			
- 5	4176257	4	• Spacer (Plastic)			
- 6	4423317	4	• Clip			
- 7	101922	4	• Clamp			
- 8	6814363	1	• Degaussing Coil			
- 9	4423397	1	• Convergence Assembly			
- 10	5147216	1	• Video Card			
- 11	4422344	1	• Housing			
- 12	4423029	1	• Cover			
- 13	1621190	1	• Screw,Mach-Slot Pan Hd M4 x .7 x 8 Lg			
- 14	4176242	1	• Ground Jumper Assembly			
- 15	7362432	1	• Screw,Pan Hd M2.5 x .45 x 10 Lg			
- 16	237032	4	• Washer,Flat ID x 3/4 OD x 1/16 Thk			
- 17	1621214	4	• Screw,Mach-Slot Pan Hd M5 x .8 x 25 Lg			
- 18	2767971	1	• Label, Warning			
- 19	4423392	1	• CRT & Yoke Asm-Also Order Label (Item No. 18)			

FIGURE 7. CRT ASSEMBLY.

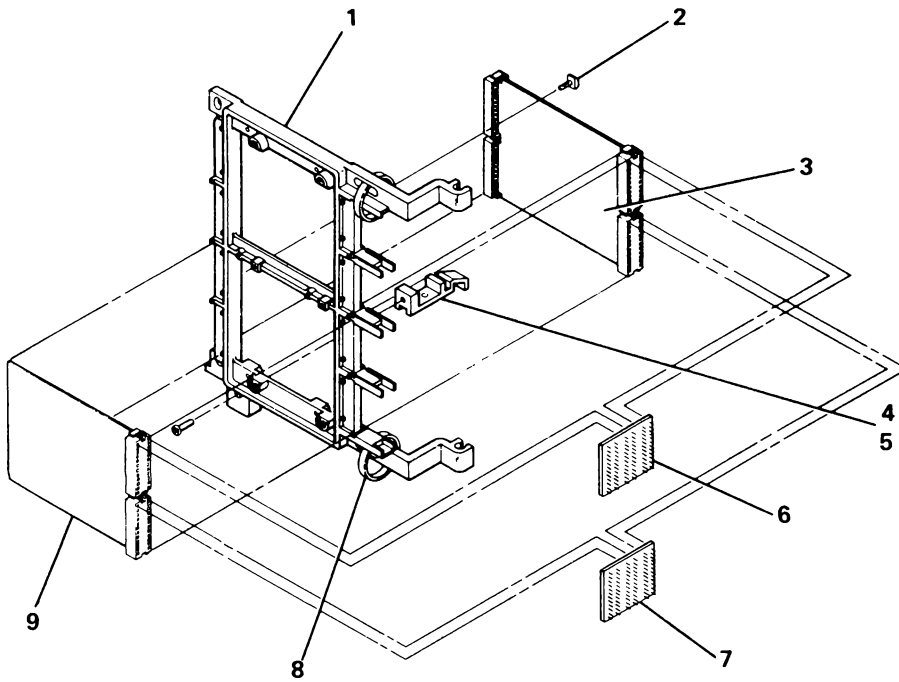


FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION FOR FIGURE 8				
			1	2	3	4	
8			FEATURE GATE ASSEMBLY				
-	1	4176267	1	• Stiffener			
-	2	7362386	8	• Canoe Clip (4 Per Card)			
-	3	1747216	1	• Mag Slot Adapter Card (RPQ)			
-	4	7362926	1	• Latch			
-	5	2461889	1	• Screw, Slot Hex Wshr Hd 8-16 x 19.05 Lg			
-	6	4176239	1	• Cross-Connector #1			
-	7	4176253	1	• Cross-Connector #2			
-	8	1159913	2	• Cable Tie			
-	9	7363482	1	• Light Pen Adaptor Card (RPQ)			

FIGURE 8. FEATURE STIFFENER ASSEMBLY.

Line Cord Chart












Plug	P/N	Country
 Non-Lock	6838234	1.8 M Lg., U.S./Canada
	6841461	2.5 M Lg., U.S., Bahamas, Barbados, Bermuda, Bolivia, Costa Rica, Brazil, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Japan, Mexico, Trinidad, Netherlands, Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, Thailand
No Plug	5642989	WTC, 60 Hz
No Plug	6842371	WTC, 50 Hz
	6841728	Australia, Argentina, Chile, Columbia, New Zealand, Paraguay, Uruguay, Vunexuela, Trinidad
	6841720	Finland, Germany, Norway, Netherlands, Sweden, Austria, Spain, Indonesia, Iran, Bulgaria, Portugal, Iceland, Poland, Rumania
	6841726	United Kingdom, Ireland
	6841724	France, Belgium, Malaysia, Algeria, Hungary, Yugoslavia, Greece
	6841722	Switzerland
	6841732	Denmark
	6841730	Italy
	5642990	South Africa
	5642991	Israel
	5642992	Japan, 15A maximum 200V

FIGURE 9. LINE CORD CHART.

NUMERICAL INDEX

PART NUMBER	LIST AND INDEX NO.	PART NUMBER	LIST AND INDEX NO.	PART NUMBER	LIST AND INDEX NO.	PART NUMBER	LIST AND INDEX NO.
101922	2 - 18	1761211	6 - 8	4176167	2 - 14	4423317	7 - 6
101922	4 - 22	1761212	6 - 8	4176168	2 - 14	4423357	1 - 2
101922	7 - 7	1761213	6 - 8	4176170	5 - 35	4423392	7 - 19
237032	7 - 16	1761215	6 - 8	4176180	5 - 2	4423397	7 - 9
514723	4 - 1	1761216	6 - 8	4176183	5 - 4	4796654	2 - 5
524519	3 - 13	1761217	6 - 8	4176184	2 - 13	5147080	4 - 15
532393	5 - 31	1761218	6 - 8	4176222	5 - 34	5147216	7 - 10
533289	5 - 15	1761219	6 - 8	4176224	2 - 12	5147291	4 - 1
615683	5 - 10	1761220	6 - 8	4176238	4 - 29	5147292	4 - 1
730432	7 - 3	1761221	6 - 8	4176239	8 - 6	5149461	5 - 22
855231	5 - 23	1761222	6 - 8	4176240	4 - 3	5213276	5 - 13
NO NO.	1 - 1	1761223	6 - 8	4176242	7 - 14	5552875	6 - 5
NO NO.	1 - 3	2461889	3 - 5	4176242	10 - 10	5642887	5 - 33
NO NO.	5 - 1	2461889	4 - 30	4176243	4 - 3	6814363	7 - 8
NO NO.	5 - 19	2461889	8 - 5	4176247	10 - 2	7362130	5 - 7
NO. NO.	3 - 1	2546641	4 - 8	4176250	10 - 3	7362130	5 - 14
NO. NO.	3 - 16	2549526	2 - 19	4176251	2 - 6	7362130	5 - 16
1143492	5 - 10	2549531	2 - 8	4176252	10 - 7	7362130	5 - 18
1159913	3 - 8	2549531	4 - 5	4176253	8 - 7	7362130	6 - 7
1159913	8 - 8	2549531	4 - 18	4176254	10 - 1	7362385	7 - 2
1621173	4 - 12	2549531	4 - 21	4176257	7 - 5	7362386	3 - 6
1621182	4 - 28	2549531	4 - 23	4176258	7 - 4	7362386	8 - 2
1621184	4 - 6	2549531	4 - 25	4176262	5 - 27	7362432	7 - 15
1621184	4 - 9	2549531	5 - 3	4176263	3 - 11	7362508	2 - 3
1621190	4 - 13	2549531	5 - 5	4176263	10 - 9	7362926	3 - 4
1621190	7 - 13	2549531	5 - 12	4176264	3 - 9	7362926	8 - 4
1621193	5 - 9	2549531	5 - 21	4176267	8 - 1	7362934	10 - 11
1621195	5 - 26	2549531	5 - 28	4176268	3 - 12	7363003	6 - 6
1621214	7 - 17	2549531	5 - 30	4176269	2 - 7	7363014	6 - 3
1621813	2 - 16	2549531	5 - 32	4176270	4 - 4	7363227	6 - 1
1622345	4 - 27	2568709	5 - 24	4176271	5 - 20	7363228	6 - 4
1622401	4 - 19	2650667	6 - 9	4176272	4 - 20	7363413	2 - 1
1622402	4 - 7	2688831	6 - 8	4176273	4 - 24	7363414	2 - 4
1622402	4 - 10	2767913	2 - 15	4176274	7 - 1	7363415	2 - 20
1622402	4 - 26	2767928	3 - 10	4176277	5 - 17	7363446	3 - 3
1622685	4 - 2	2767929	3 - 10	4176278	2 - 2	7363447	3 - 2
1622685	4 - 14	2767930	3 - 10	4176297	6 - 2	7363448	2 - 11
1650667	4 - 16	2767931	4 - 11	4176307	5 - 11	7363458	3 - 15
1693554	2 - 10	2767958	3 - 7	4176308	5 - 8	7363470	2 - 9
1743178	2 - 17	2767971	7 - 18	4420437	4 - 17	7363480	5 - 6
1747216	8 - 3	4176161	2 - 14	4422344	7 - 11	7363480	10 - 8
1761205	6 - 8	4176162	2 - 14	4423028	5 - 25	7363482	8 - 9
1761206	6 - 8	4176163	2 - 14	4423029	7 - 12	7363494	5 - 36
1761208	6 - 8	4176164	2 - 14	4423097	1 - 4	8330757	3 - 14
1761209	6 - 8	4176165	2 - 14	4423146	5 - 29		
1761210	6 - 8	4176166	2 - 14	4423250	10 - 4		

I/PAR Code Guide and CE Log

**I/PAR CODE GUIDE
AND CE LOG**

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Contents

USING THE GUIDE	7-5
I/PAR CODE GUIDE	7-6
Base	7-6
Keyboard	7-8
Display	7-9
Base Planar	7-10
Display Planar	7-10
Power	7-11
Customer Responsibility	7-12
No Trouble Found	7-12
Features/RPQs	7-13
CE LOG	7-14

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Using the Guide

The minor codes have been expanded to allow additional feedback to identify why a field replaceable unit (FRU) was replaced.

For troubles on which a repair action has been taken:

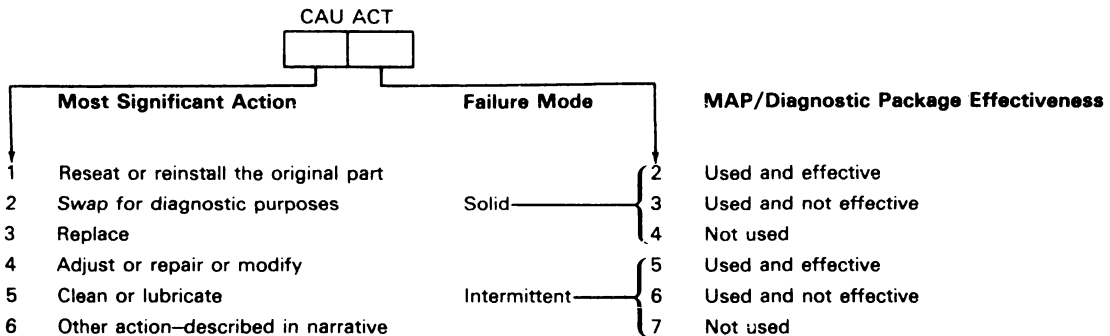
- When a FRU is listed more than once, select the best overall description and add a comment in the narrative section of the I/PAR. Code 00 (other) is not used as a minor code. Use the minor code supplied that best describes why the FRU was replaced.
- Record the 3-digit major and the 2-digit minor codes in the unit field of the I/PAR document.
- Select the cause code that best identifies the action, failure mode, MAP/diagnostic package, and problem determination procedures effectiveness.
- Record the cause code in the CAU ACT field of the I/PAR document.
- Complete the CE log at the back of this guide.

For all *No Trouble Found* calls:

- Refer to major code 960.
- Complete the CE Log at the back of this guide.

Cause Codes

Choose one digit from each column:



Note: Consider the MAPs and diagnostics effective if they identify the failing part or direct you to the appropriate repair action or procedure.

000 BASE

Alarm Assembly

10 Alarm assembly

Control and Switch Assembly

20 Brightness control/override switch assembly

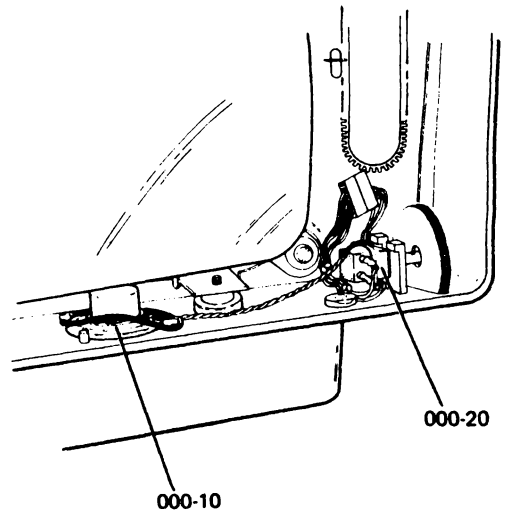
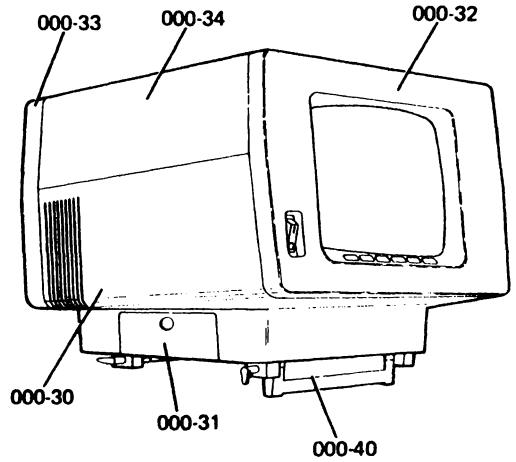
Covers

- 30 Bottom
- 31 Document storage
- 32 Front
- 33 Rear
- 34 Top

Tilt Mechanism

40 Tilt mechanism

DO NOT USE CODE 00



000 BASE (continued)

Distribution Cable

50 Cable, main signal distribution

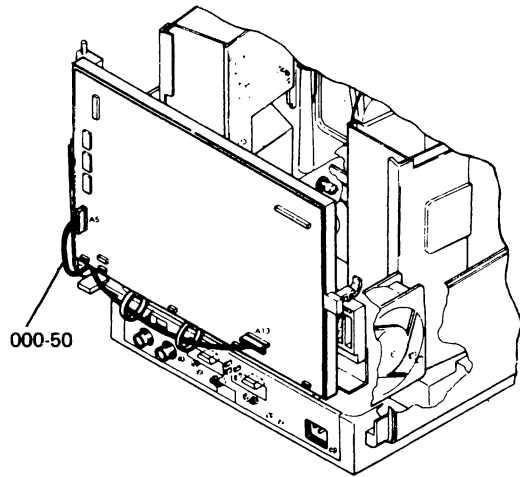
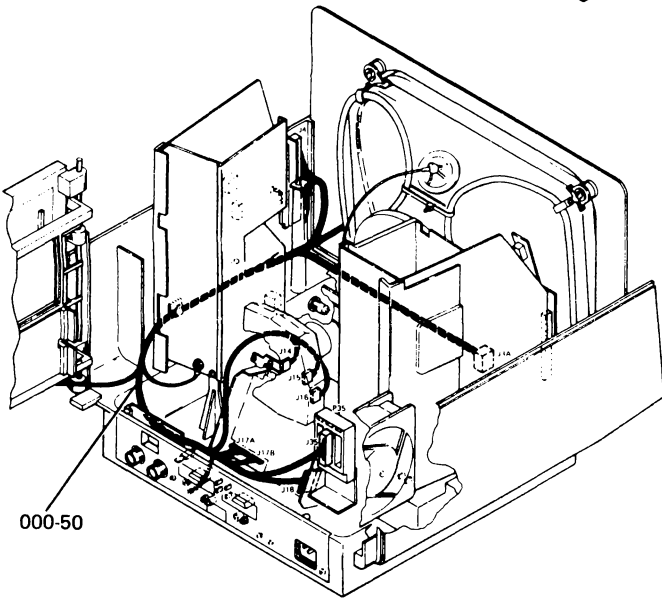
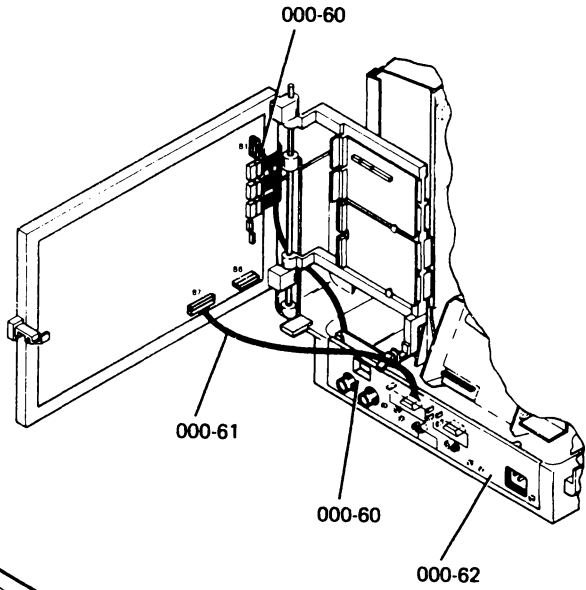
I/O Assembly

60 Cable Thru and terminator switch assembly

61 Keyboard cable (internal)

62 Panel

DO NOT USE CODE 00



040 KEYBOARD

Cable Assembly

- 10 Cable

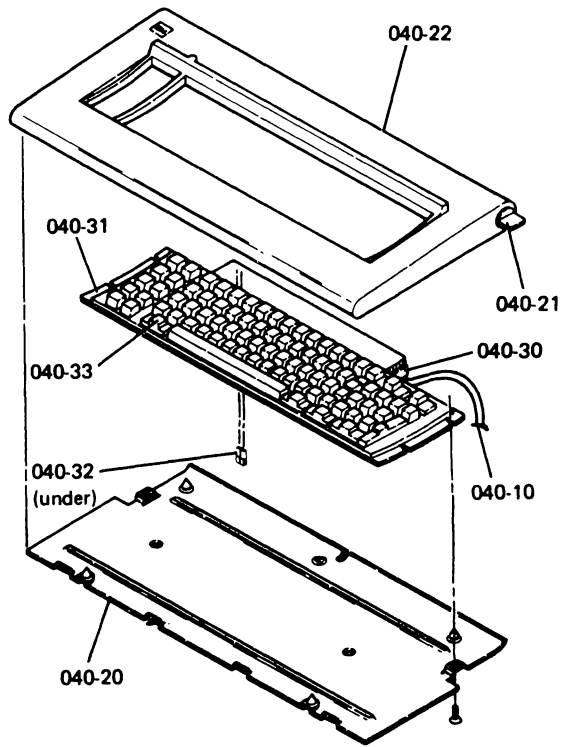
Covers

- 20 Base
- 21 Tilt mechanism
- 22 Top

Logic Card/Key Assembly

- 30 Connector
- 31 Electrical
- 32 Jumpers
- 33 Keystem/keytops

DO NOT USE CODE 00




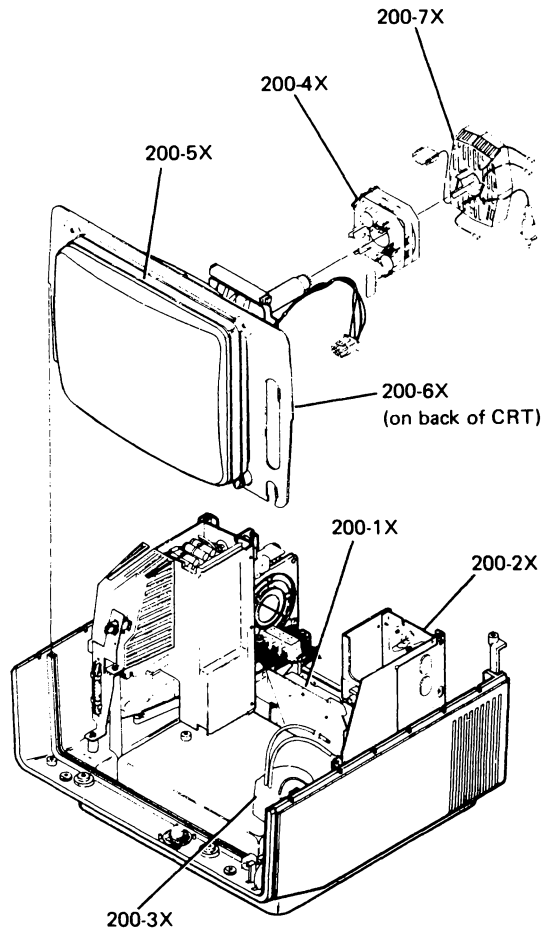
200 DISPLAY

Construct a 2-digit minor code from one choice out of the tens column (to identify the FRU) and one choice out of the units column (to identify the reason for replacing the FRU). Record the minor code in the unit field of the I/PAR document.

- 1 Amplifier card
- 2 Analog card
- 3 Bleeder assembly
- 4 Convergence assembly
- 5 CRT and yoke
- 6 Degauss coil
- 7 Video card

- 1 Color problem
- 2 Color alignment problem
- 3 Fuse
- 4 Screen problem

 Minor Code (record in the unit field of the I/PAR document)



310 BASE PLANAR

(Use minor codes under 320.)

320 DISPLAY PLANAR

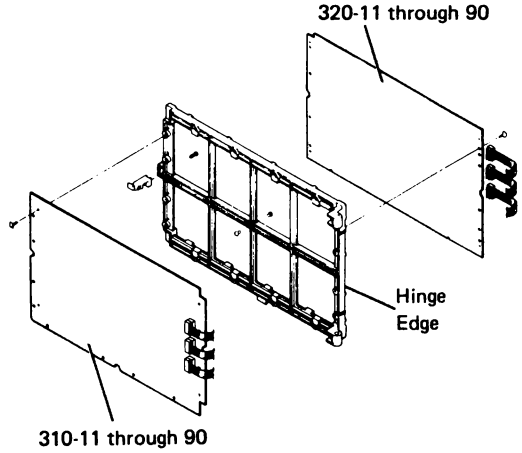
Diagnostic Error Codes

- 11 B1
- 12 B2
- 13 B3
- 14 B4
- 15 B5
- 16 B6

- 21 D1
- 22 D2
- 23 D3
- 24 D4
- 25 D5
- 26 D6
- 27 D7
- 28 A1
- 29 C1

- 31 K1
- 32 K2
- 33 K3
- 35 Cable, cross-connectors
- 40 Color problem
- 50 Communications problem
- 60 Keyboard problem
- 70 Looping on diagnostics
- 80 Screen problem
- 90 System Available indicator off

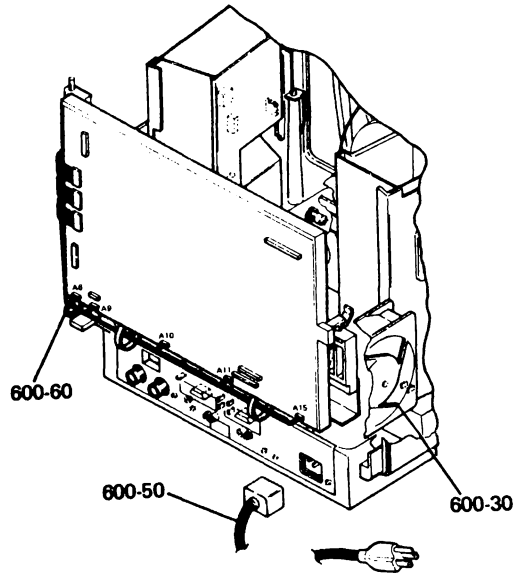
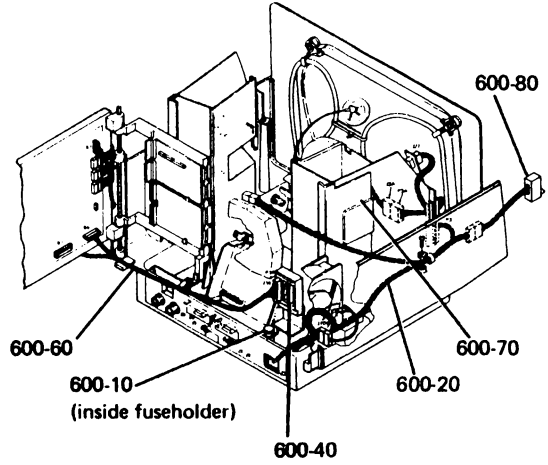
DO NOT USE CODE 00



600 POWER

- 10 AC fuse, F1
- 20 AC power cable (including the line filter, fuse holder, and cable)
- 30 Fan assembly
- 40 Junction block
- 50 Line cord
- 60 Power distribution cable (to the planars)
- 70 Power supply card
- 80 Power switch

DO NOT USE CODE 00



870 CUSTOMER RESPONSIBILITY

Construct a minor code from one choice out of the tens column (7, 8, or 9) and one choice out of the units column (1 through 0). Record the minor code in the unit field of the I/PAR document.

- 7 Customer problem determination—
not used/not provided
 - 8 Customer problem determination—
used and effective
 - 9 Customer problem determination—
used and not effective
- 1 Addressing or termination problem
 - 2 Configuration problem other than
switches or application program
 - 3 Customer application program
 - 4 Environment unsuitable
 - 5 Hardware compatibility
 - 6 Operating procedures incorrect or operator
error
 - 7 Power failure or difficulty (external)
 - 8 Station protectors
 - 9 Twinaxial cable, connectors
 - 0 Color alignment (convergence)

Minor Code (record in the unit field of the I/PAR document)

DO NOT USE CODE 00

960 TROUBLE FOUND

Use major code 960 only to report calls when an error is logged, indicated, or reported, but no specific repair action is taken. Record 960 for the major code and the appropriate two digits for the minor codes.

Error Code

If you have a 4-digit error code, either on the display screen or in the Error History Table, record the first 2 digits for the minor code and the last 2 digits for the cause code of the I/PAR document.

Example:

Major	Minor	Cause
960	01	49

(The error code on the display screen was 0149.)

20 Display Unit

Record the appropriate cause code in the CAU ACT field of the I/PAR document.

40 Keyboard Unit

Record the appropriate cause code in the CAU ACT field of the I/PAR document.

60 Power

Record the appropriate cause code in the CAU ACT field of the I/PAR document.

70 Features

Record the appropriate cause code in the CAU ACT field of the I/PAR document.

DO NOT USE CODE 00

990 FEATURES/RPQs

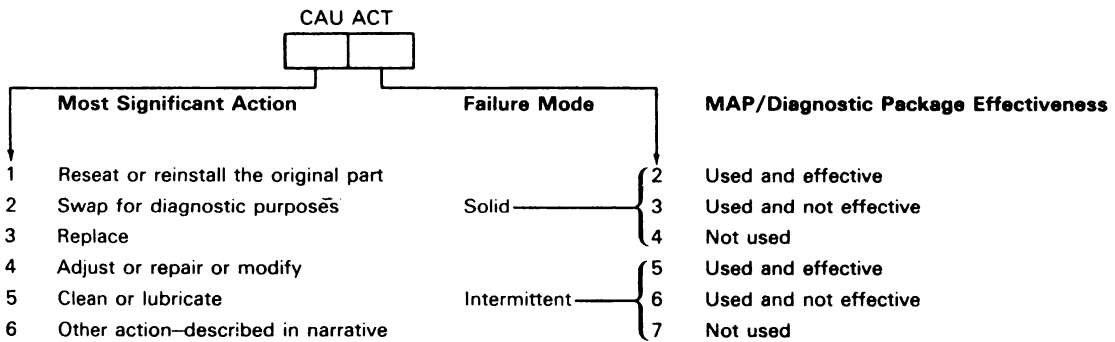
RPQs

- 30 Keylock
- 40 MSR adapter card
- 50 MSR/SLP interposers
- 60 RPQ cable (MSR/SLP)
- 70 SLP adapter card
- 80 SLP assembly

MSR = Magnetic Stripe Reader

SLP = Selector Light Pen

DO NOT USE CODE 00



Note: Consider the MAPs and diagnostics effective if they identify the failing part or direct you to the appropriate repair action or procedure.

Index



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Index

- AC power cable wiring 2-95
- AC voltages 2-95, 4-10
- adapter, cable
 - description 4-2
 - diagnostic test 2-82
 - wiring 2-104
- address, station
 - display 2-66
 - location 2-62, 2-64
 - set/change 2-68
- adjustments 2-17
 - coarse 2-23
 - color alignment (see convergence below)
 - convergence, coarse static 2-25
 - convergence, dynamic 2-30
 - convergence, fine static 2-28
 - convergence key operations, summary 2-18
 - fine 2-27
 - locations 2-20
 - setup 2-22
 - summary 2-18
 - tool 2-17
- aids, service 2-61
- alarm assembly (display station)
 - alarm code (burst mode) 2-74, 4-11
 - description 4-11
 - location 2-4, 2-13
 - removal and replacement 2-39
- alignment (see adjustments)
- amplifier card
 - description 4-6
 - location 2-2, 2-9
 - removal and replacement 2-45
- analog card
 - description 4-8
 - location 2-2, 2-10
 - MAP 0400-1
 - removal and replacement 2-46
- anode
 - danger 2-46, 2-48
 - location 2-15, 2-51
- attachment, cards, feature
 - location 2-3
 - removal and replacement 2-56
 - theory 5-1
- attributes
 - color 2-66
 - display
 - attributes 2-72
 - hex code 2-66, 2-92
 - field 2-66
- base planar
 - description 4-2
 - location 2-3, 2-7
 - removal and replacement 2-55
- bleeder assembly
 - location 2-3
 - removal and replacement 2-48
- brightness control
 - description 4-6
 - location 2-1, 2-4, 2-13
 - removal and replacement 2-39
- buzzer, MSR
 - description 2-91
 - wiring 2-100
- cable adapter
 - description 4-2
 - wiring 2-104
- cable assembly 2-114
- cables
 - AC power wiring 2-95
 - assembly 2-114
 - connector location chart 2-5, 2-93
 - DC distribution wiring 2-94
 - keyboard interface 2-105
 - location
 - AC power cable 2-41
 - DC distribution cable 2-7
 - ground circuits 2-107
 - keyboard cable 2-2, 2-14
 - keylock cable 2-7
 - main power and signal distribution 2-98
 - MSR/SLP RPQ wiring 2-110
 - quality check 2-114
- catalog, parts 6-1
- cathode-ray tube (CRT)
 - description 4-10
 - location 2-1, 2-15
 - removal and replacement 2-50
- Caution notice ix
- CE Log 7-14
- CE probe 3-1
- CE test (see test options)
- CE test screens 2-68
- CE test screens (see also test screens)
- centering
 - adjustments 2-24, 2-27
 - convergence assembly 2-23, 2-52
- character set, displayable 2-86

- code guide, I/PAR 7-1
- codes
 - attribute 2-66, 2-92
 - color 2-66, 2-92
 - error 2-74, 2-75
 - scan 2-71
 - status line 2-61
- color alignment (see convergence)
- color attributes 2-92
- color mode, 2 or 7 2-66
- conditions after power-on 2-61
- connector location chart 2-5, 2-92
- controls, brightness/intensity override
 - description 4-6
 - location 2-1, 2-4, 2-13
 - removal and replacement 2-39
- convergence
 - description 2-77
 - key description, summary chart 2-31
 - MAP 0600-1
 - procedures
 - coarse static 2-25
 - dynamic 2-30
 - fine static 2-28
 - screens 2-25
- covers
 - location 2-1
 - removal and replacement 2-35
- CRT (see cathode-ray tube)
- cursor locations 2-61, 2-64

- Danger notices ix
- DC distribution cable
 - wiring figure 2-94
- DC voltages 2-94, 4-8, 4-10
- deflection circuits
 - description 4-8
 - wiring figure 2-101
- degauss coil
 - location 2-3
 - removal and replacement 2-53
- diagnostic error codes 2-74
- diagnostic error log operation 2-77
- diagnostics
 - display station power-on 2-78
 - error codes 2-74
 - error recording analysis procedure (ERAP) 2-85, 2-88
- display entry MAP 0100-1
- display planar
 - description 4-4
 - location 2-3, 2-6
 - removal and replacement 2-54
 - switches 2-6, 2-54, 4-4
- display screen indicators 2-61
- display screens (see screens)

- display station address (see address)
- display station error codes 2-75
- displayable characters 2-86
 - language jumpers 2-34, 4-1

- error codes 2-74, 2-75
 - alarm burst mode 2-74
- error history table (ERAP) 2-88
- error log operation 2-77
- error recording analysis procedure (ERAP)
 - error codes 2-88, 2-89

- feature gate
 - card removal and replacement 2-56
 - locations 2-3, 2-7, 2-56
- features and RPOs
 - keylock description 5-1
 - magnetic stripe reader (MSR) card
 - description 5-1
 - location 2-56
 - removal and replacement 2-56
 - test 2-73, 2-90
 - MAPs 0800-1
 - selector light pen (SLP) card
 - description 5-1
 - location 2-56
 - removal and replacement 2-56
 - test 2-73, 2-90
- field attributes 2-66
- focus1, FOC2
 - adjustments 2-24, 2-31
 - description 4-8
 - location 2-20
- free key mode 2-83
- front cover
 - location 2-1
 - removal and replacement 2-35
- FRU description (theory) 4-1
- fuseholder
 - location 2-2
 - removal and replacement 2-41
- fuses
 - locations
 - F1 2-2
 - F2 2-9
 - F3 2-2
 - wiring
 - F1 2-95
 - F3 2-103

ground circuits 2-106

heaters, CRT 2-10, 2-12

I/O assembly

location 2-2
removal and replacement 2-58

I/PAR Code Guide 7-1

ID jumpers (keyboard jumpers) 2-34

indicators, display screen 2-61

intensity override switch

description 4-11
location 2-2, 2-13
removal and replacement 2-39

intermittent MAPs 0900-1

jumpers

CRT heater 2-10, 2-102

keyboard ID 2-34

junction block

interposer 2-100
location 2-2
removal and replacement 2-44

keyboard

description 4-1
VD 2-34, 4-1
interface cable 2-105
jumpers 2-34
locations 2-14
MAP 0500-1
removal and replacement 2-33
scan codes 2-71

keylock description 5-1

light pen (see Selector Light Pen)

line cord

location 2-2
removal and replacement 2-42

line filter

location 2-59
removal and replacement 2-58
wiring 2-95

locations

amplifier card 2-2, 2-9
analog card 2-2, 2-10
base planar 2-3, 2-7
cable connectors, chart 2-5, 2-93
connector chart 2-5, 2-93
covers 2-1
display planar 2-3, 2-6
feature card(s) 2-3, 2-56
front view 2-1
intensity override switch 2-4, 2-13
junction block 2-2
keyboard assembly 2-14
power supply card 2-2, 2-12
power switch 2-1, 2-4
rear view with logic gate open 2-2
top view 2-3
video card 2-2, 2-8

magnetic slot reader (MSR)

buzzer description 2-91
card location 2-56
description 5-1
removal and replacement 2-56
test 2-91

main power and signal distribution cable

location 2-54
wiring 2-98

MAPs

analog 0400-1
convergence 0600-1
display entry 0100-1
features 0800-1
intermittent 0900-1
keyboard 0500-1
planar 0700-1
power 0200-1
using 0000-1
video 0300-1

menus (see screens)

MSR/SLP cable

planar connector location 2-6
wiring 2-110

numerical index, parts 6-24

offline select mode 2-67
description 2-67
error status line 2-64
options 2-67
online select mode
description 2-66
error status line 2-62
options 2-66
online tests 2-84
options, select mode
offline 2-67
online 2-66

Parts Catalog 6-1

catalog section 6-7
how to use 6-3
numerical index 6-24
pincushion circuit description 4-8
planar
base
description 4-2
location 2-3, 2-7
removal and replacement 2-55
display
description 4-4
location 2-3, 2-6
removal and replacement 2-54
MAP 0700-1
power cable
location 2-41
removal and replacement 2-41
wiring figure 2-95
power MAP 0200-1
power-on diagnostics 2-79
power-on sequence 2-78
power supply card
description 4-10
location 2-2
removal and replacement 2-40
power switch
location 2-1, 2-4
removal and replacement 2-43
wiring figure 2-95
probe, CE 3-1
probing information 3-1
protector
CRT 4-8
overvoltage 4-10
station 2-114

raster
adjustments 2-24, 2-27
description xiii
rear cover
location 2-1
removal and replacement 2-36
removal and replacement
adjustment summary 2-18
alarm assembly 2-39
amplifier card 2-45
amplifier card fuse 2-40
analog card 2-46
base planar 2-55
bleeder assembly 2-48
brightness control (and override
switch) 2-39
convergence assembly 2-52
covers 2-35
CRT 2-50
degauss coil 2-53
display planar 2-54
fan assembly 2-42
feature card(s) 2-56
fuse holder 2-41
I/O assembly 2-58
junction block 2-44
keyboard cable 2-34
keyboard jumpers (language ID) 2-34
keyboard logic and key assembly 2-33
line cord 2-42
line filter 2-41
override switch (and brightness
control) 2-39
power cable 2-41
power supply card 2-40
power switch 2-43
tilt assembly 2-38
video card 2-47
yoke assembly 2-50
RPQs (and features) 5-1

Safety ix
Caution ix
Danger ix
scan codes 2-71
screens
CE test 2-68
convergence (color alignment) 2-25
offline select mode 2-68
online test 2-84
selector light pen (SLP)
card location 2-56
description 5-1
removal and replacement 2-56
test 2-90

- service aids 2-61
 - status lines 2-61, 2-62, 2-64
- sign-on procedure 2-83
- station protector 2-114
- status lines
 - error 2-64
 - normal 2-61
 - offline 2-64
 - online 2-62
- switches
 - display planar
 - description 4-4
 - location 2-6
 - setting 2-54
 - terminator
 - location 2-2
 - wiring 2-104
- system cable quality check 2-114
- system cabling 2-114
- wiring diagrams 2-93
 - alarm assembly 2-96
 - amplifier card power circuits 2-103
 - brightness control 2-96
 - Cable Thru (twinaxial) circuit 2-104
 - convergence circuits 2-101
 - CRT drive circuits 2-102
 - DC distribution cable 2-94
 - feature/RPQ
 - wiring 2-108, 2-109, 2-110, 2-111, 2-112
 - ground circuits 2-106
 - intensity override switch 2-96
 - junction block 2-100
 - keyboard cables 2-105
 - power and signal distribution 2-98
 - power cable 2-95
 - yoke assembly 2-101
- terminator switch
 - location 2-2
 - wiring 2-104
- test options (CE)
 - offline 2-67
 - online 2-66
 - screen indicator 2-61, 2-62, 2-64
- test screens
 - CE 2-68
 - convergence 2-25
 - offline select mode 2-68
 - online tests 2-84
- theory 4-1
- tilt assembly
 - base
 - location 2-1
 - removal and replacement 2-38
 - keyboard 2-1
- tools and test equipment 3-1
- top cover
 - location 2-1
 - removal and replacement 2-37
- twinaxial cable
 - connector location 2-2
 - wiring, internal 2-104
- video card
 - description 4-7
 - location 2-2
 - removal and replacement 2-47
- video MAP 0300-1

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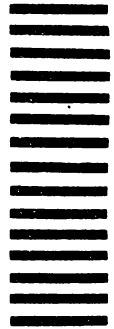


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AND CE LOG**

INDEX